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CANADIAN MACHINERY AND MANUFACTURING NEWS

J1426

A weekly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied field. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

Vol. XVIII—No. 1 Publication Office: Toronto, July 5, 1917 Subscription Price $3.00 per Year

SABEN

SaBeN ExTrA
HIGH SPEED STEEL

SABEN

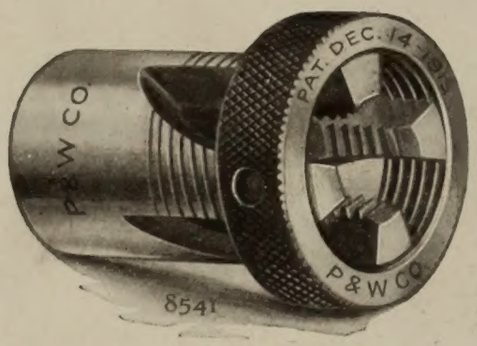
The most economical and efficient steel for machining shells
Manufactured by Sanderson Bros. and Newbould, Limited, Sheffield, England

H.A. DRURY COMPANY LIMITED
MONTREAL TORONTO NEW YORK

SMALL TOOLS

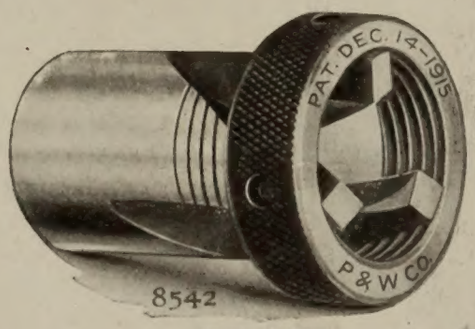
Taper Thread Adjusting Collar

Insures Uniform Concentric Adjustment



Spring Screw Die

P. & W.
Spring Screw Dies and Hollow Mills



Hollow Mill

Advantages of the Taper Thread Adjusting Collar

Ease and delicacy of adjustment to FINE LIMITS are secured without trouble and loss of time.

All lands or prongs of the die or hollow mill are adjusted in or out exactly the same amount by merely turning the collar, thus giving rise to the term CONCENTRIC ADJUSTMENT.

This concentric adjustment results in each land or cutting edge doing its proper share of work, and as a perfect circle is always maintained, accurate results are assured.

By having the bearing always on the point, there is no tearing while backing off, and the correct amount of clearance is obtained.

Write for 4-page descriptive Circular giving size and dimensions.

Precision Machine Tools, Standards & Gauges

PRATT & WHITNEY CO.

of Canada, Limited

Works: DUNDAS, ONTARIO

MONTREAL	TORONTO	WINNIPEG	VANCOUVER
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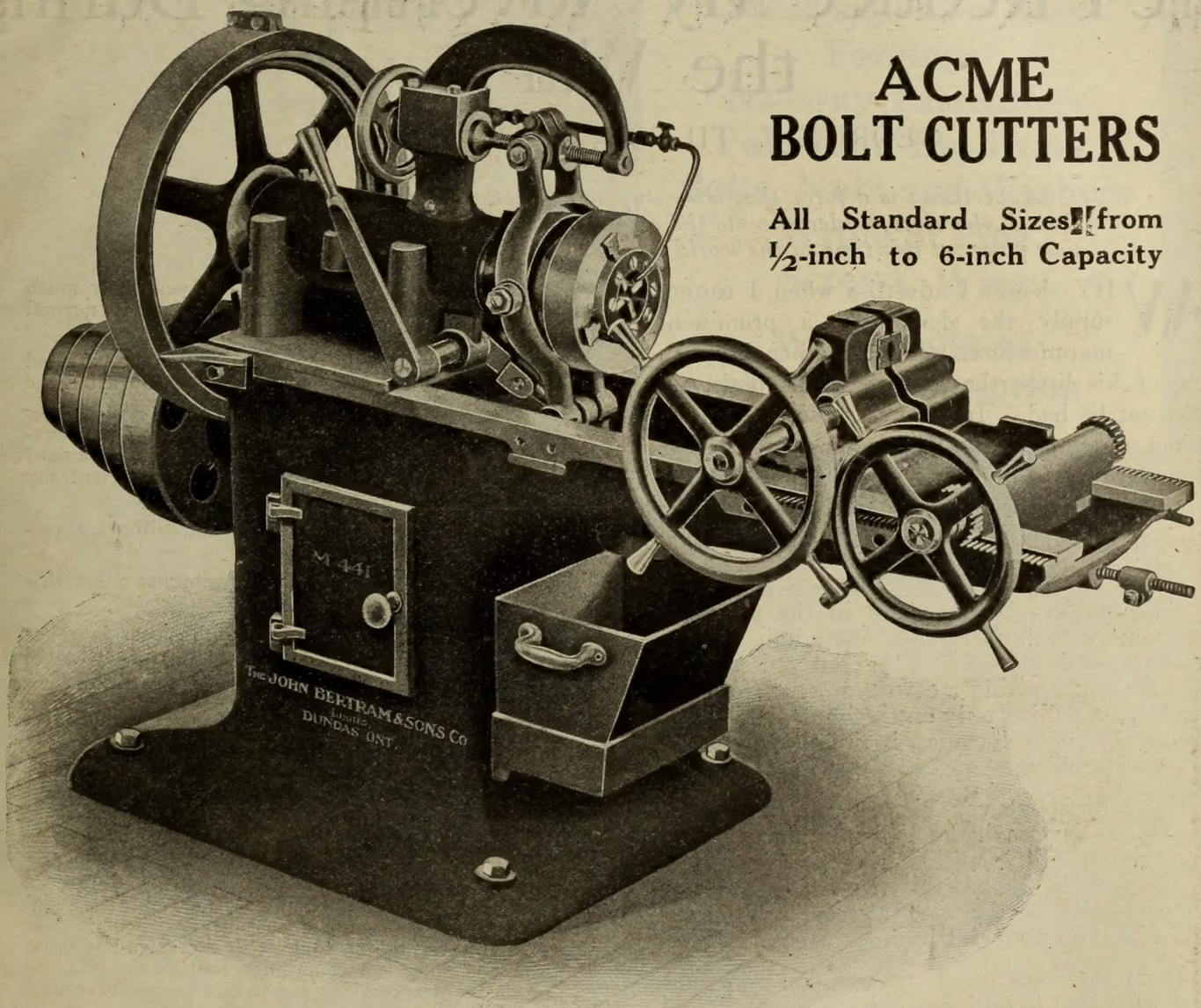
BERTRAM MACHINE TOOLS

ACME BOLT CUTTERS

All Standard Sizes from ½-inch to 6-inch Capacity



Supplied with Leadscrew Attachment for Stay Bolts or other work requiring special Accuracy of Pitch.

WRITE US FOR FULL DETAILS ON ANY MACHINE OR MACHINES IN WHICH YOU ARE INTERESTED

The John Bertram & Sons Company Limited

Dundas, Ontario, Canada

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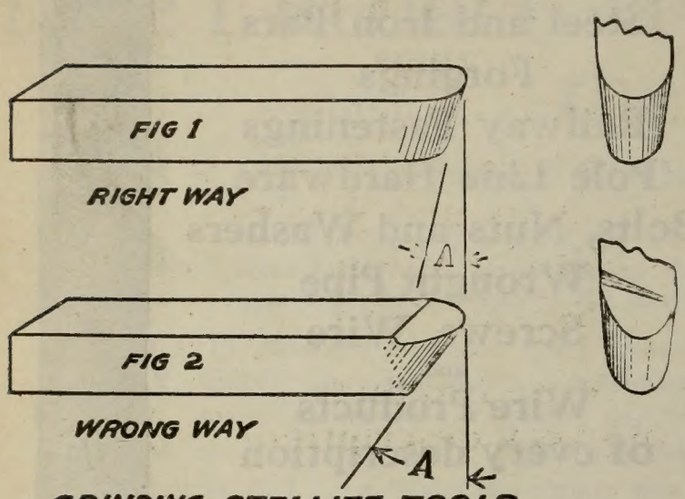
If any advertisement interests you, tear it out now and place with letters to be answered.

STELLITE

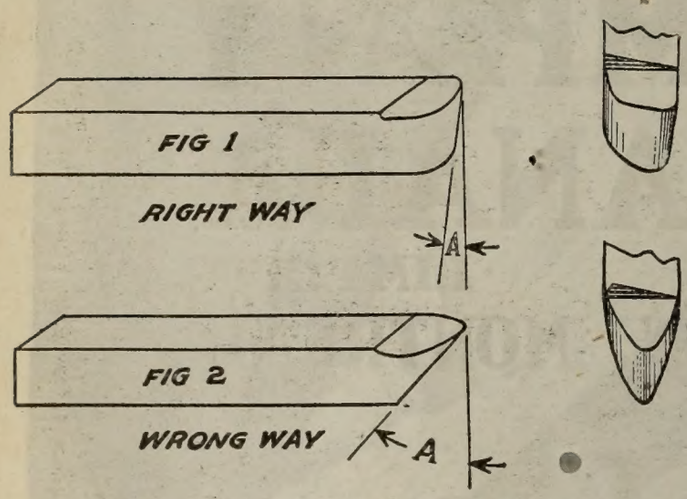
IS NOT STEEL, SO DO NOT ∴ USE IT LIKE STEEL ∴

DIRECTIONS FOR GRINDING

"STELLITE" TOOLS



GRINDING STELLITE TOOLS FOR CAST IRON



GRINDING STELLITE TOOLS FOR 20 TO 100 POINT CARBON STEEL

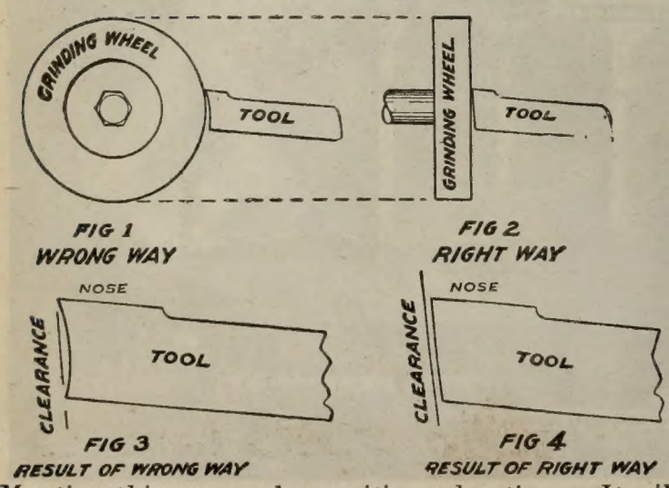


Figure 1 shows the right way to grind a Stellite tool for machining Cast Iron. Give the tool a full Round Nose, and be sure the angle (A) is just sufficient to allow the tool to clear the work. This angle should never be more than six degrees.

Whenever possible, operate the tool without top slope as shown in Figure 2, since the centre of the Stellite bar is not as hard as the outer surface.

Figure 2 shows the improper way to grind the tool. Angle A is entirely too great, and will cause the tool to crumble. This tool should have a full round nose, and the top slope as shown will reduce the cutting qualities of the tool.

Stellite tools cannot be burnt while grinding, because they have no temper. They always remain hard.

Always use No. 3 grade Stellite for turning Cast Iron.

Figure 1 shows the right way to grind Stellite tools for grinding steel. Angle A should be just sufficient to allow the tool to clear the work, and should never be more than six degrees. In turning steel it is necessary to give the tool some top slope to get the proper cutting action between tool and chip. It will be found that due to the high rate of speed at which the Stellite tools operate it requires less top slope than is generally given other tools. A top slope angle of 5 degrees is sufficient.

Figure 2 shows wrong way to grind for turning steel, as Angle A is too great and the shape of the cutting nose is too pointed. The top slope, as shown in figure 2, is too great.

Always use No. 2 grade Stellite for turning 20 to 100 point Carbon Steel.

In Figure 1 the Stellite tool is being ground on the periphery of the grinding wheel, with results as shown in Figure 3. This method is wrong, because a concave clearance is given the tool, as shown, which robs the cutting edge of its maximum support, causing crumbling and failure.

In Figure 2 the Stellite tool is being ground correctly, using the side of grinding wheel. This method gives maximum support to the cutting edge as shown in Figure 4.

Tools ground, as shown in Figure 3, will always give trouble, and are responsible for most failures with Stellite tools.

Never give Stellite tools any more clearance than absolutely necessary.

Always remove the wire edge with a carborundum or oilstone.

Stellite cuts 25% to 300% faster than the best tool steel.

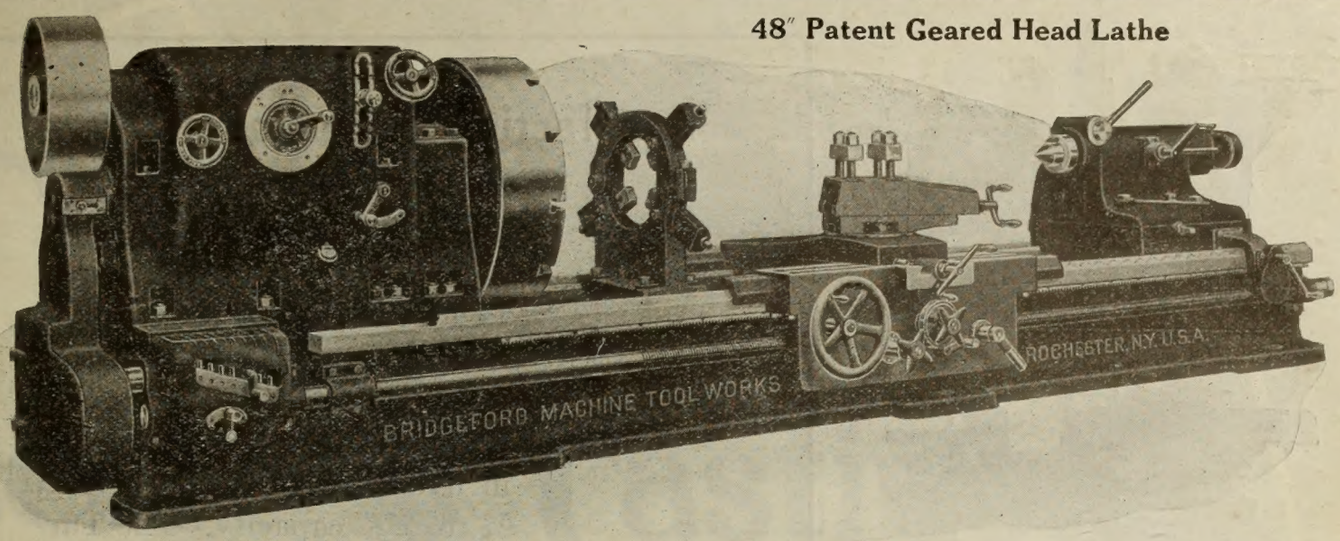
CANADIAN MANUFACTURERS

Deloro Smelting & Refining Co., Limited

DELORO, ONTARIO

Branch Warehouses - TORONTO and MONTREAL

48″ Patent Geared Head Lathe



The Bridgeford for Big Work

That's what this powerful Bridgeford is built for—big work. Has strength and rigidity sufficient to perform the heaviest kind of jobs with perfect accuracy—and it goes through them in record time. Smooth in action. Strongly constructed. Fifteen cutting speeds all easily changed.

Bridgeford's Lathes give maximum production at minimum cost. We'll be glad to give you a full account of what they will do. Write

Bridgeford Machine Tool Works, Rochester, N.Y.

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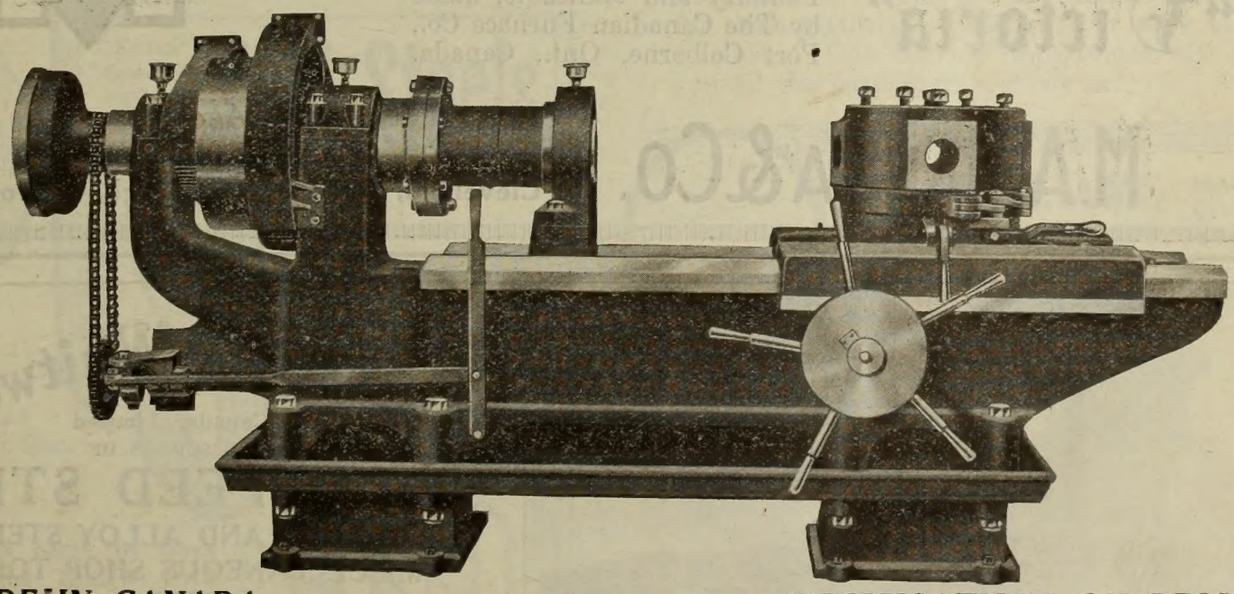
SUBJECT TO PRIOR SALE

H.E.W. Boring Lathes To Handle Shells Up To 6″



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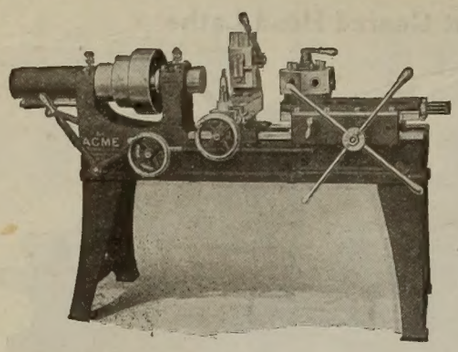
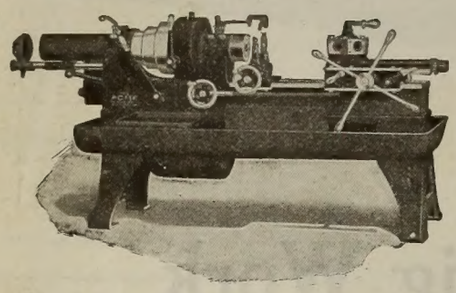
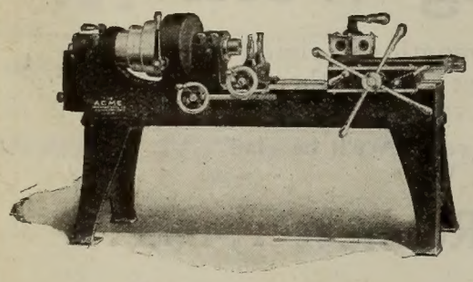


16″ Forming Turret Lathe



2¼″ x 11″ Screw Machine



18″ Turret Lathe

Satisfaction in Cincinnati Acme

The Cincinnati-Acme machines have, by their achievements, proven their sterling worth. Time and experience, coupled with equipment, alone has accomplished this.

The Screw Machines are made in five sizes 11″ to 20″ swing, ⅝″ to 2¼″ capacity. The Turret Lathes are made in four sizes, 14″ to 20″ swing.

It would be a good move on your part to inquire for full information.

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CINCINNATI, OHIO, U.S.A.
Code Word ACME
Canadian Agents:
RUDEL-BELNAP MACHINE CO.
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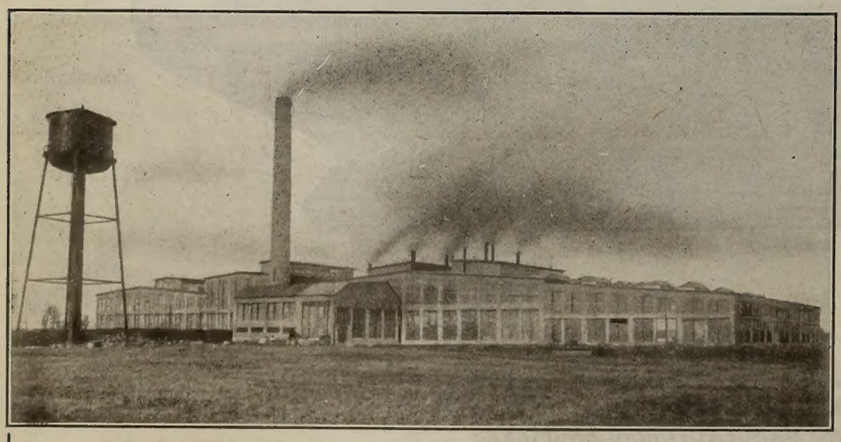
PIG IRON

"Victoria" Foundry and Malleable, made by The Canadian Furnace Co., Port Colborne, Ont., Canada.

M·A HANNA & Co.

M.A. HANNA & Co.

Sales Agents:
Toronto
Cleveland, Buffalo, Pittsburgh, Detroit



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CARBON AND ALLOY STEEL
MISCELLANEOUS SHOP TOOLS

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All Products "MADE IN CANADA"

Steel Castings

No castings too small or too large for the capacity of our plant. Manganese, Vanadium, Titanium, Chrome, Nickel, castings for Marine, Railroad, Mill and hydraulic purposes are our specialty. Made true to specifications and pattern.

Illustration above shows Stern casting for Ice-Breaker, "John D. Hazen."

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Montreal, P.Q. Welland, Ont.

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" **Tool Steels**

SISCO

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

The Life of a Thread Miller

Depends not upon the amount of work it does, but the ease and thoroughness with which the work is done. These Thread Millers are noted for these qualities. Its quality of work is unrivalled. Our Service Department will give you all the particulars. *Write us!*

THE A. R. **WILLIAMS** MACHINERY CO., Limited
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Toronto
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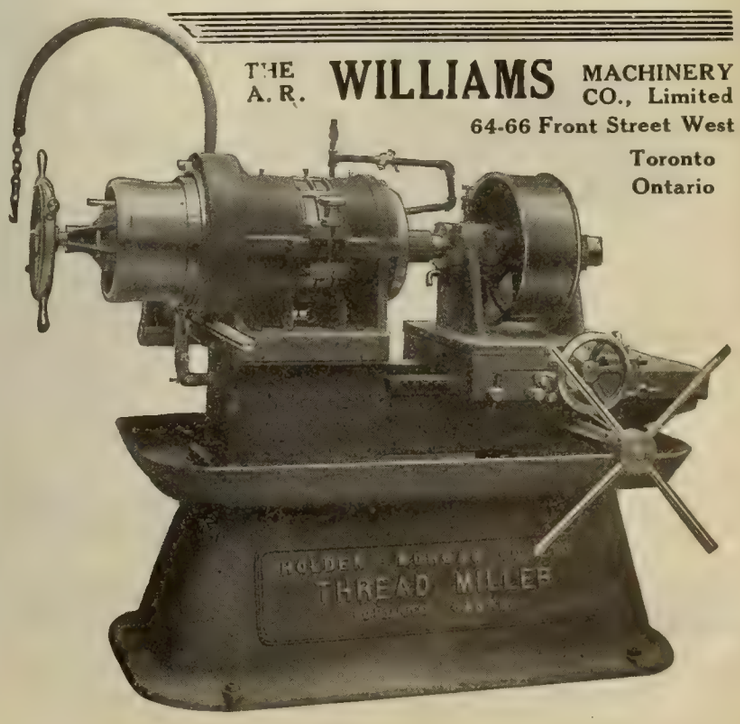
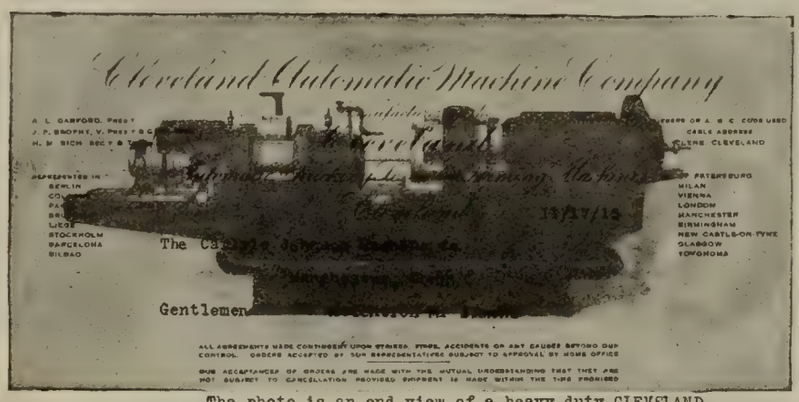


THE JOHNSON FRICTION CLUTCH

A Good Test of Clutch Efficiency


Cleveland Automatic Machine Company

The Ca

Gentlemen

The photo is an end view of a heavy duty CLEVELAND showing position of the Johnson Clutch "A" in the feed mechanism.

The clutch sleeve B is connected by means of miter gears to the feed pulley C and when the clutch is engaged, it transmits the constant high speed idle movement of the machine for indexing, etc.

The clutch A is engaged and disengaged automatically several hundred times during a day by means of adjustable pins D through the lever action shown.

Service of this kind requires a friction clutch of correct design and the Johnson Clutch proves entirely satisfactory in this application.

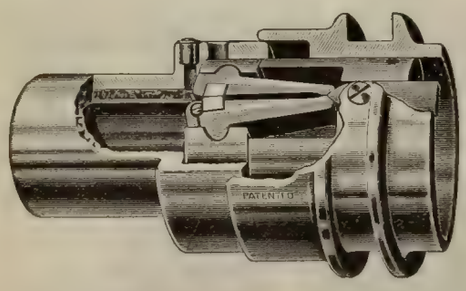
Yours truly
CLEVELAND AUTOMATIC MACHINE CO
J. P. Brophy

JPB EN

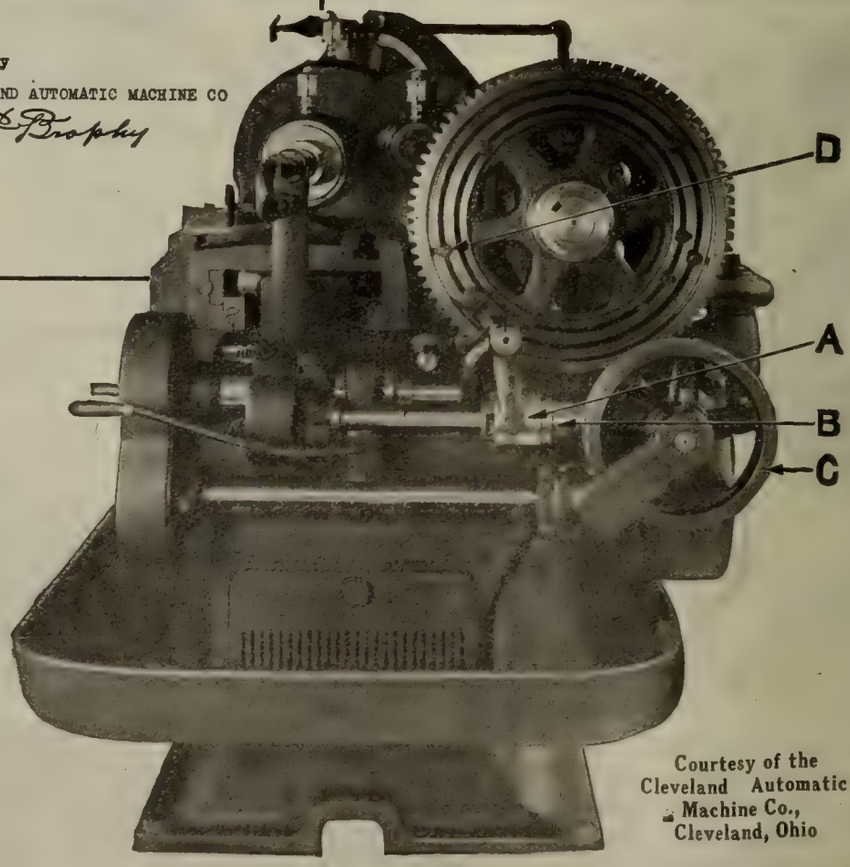
Mr. Brophy, of the Cleveland Automatic Machine Co., knows what the market offers in the way of clutches, and his decision is reached only by process of elimination.

Note what he says about the Johnson Friction Clutch embodied in the Cleveland Automatic.

By the way, are your clutches giving entire satisfaction? If not, let us get together and solve your problems—free.



Section broken away, showing clutch disengaged.



Courtesy of the Cleveland Automatic Machine Co., Cleveland, Ohio

Write for our YELLOW DATA SHEETS and our latest free booklet, "CLUTCHES AS APPLIED IN MACHINE BUILDING."

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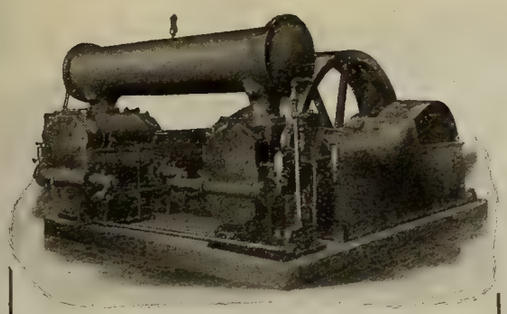
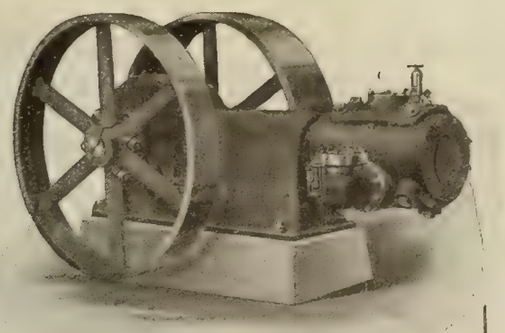
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



JENCKES CLASS DB-2 AIR COMPRESSOR

If you understand compressors look over the following outline. If you are not acquainted with these machines it would delight us to give you an introduction.

Inlet Valves are of the Corliss type, the outlet valves of the disc type; flood type lubrication, allowing a continuous flood of oil over bearings, crank pins, etc., while in motion. Machine of the enclosed type.



JENCKES CLASS CB-1 AIR COMPRESSOR

If your requirements do not justify either of the above machines, just bear in mind that we have a very comprehensive range that will cover all usual and unusual needs. The above is equipped with inlet and outlet disc valves; splash gravity lubrication system; extra large bearings; machine entirely enclosed.

The Jenckes Machine Company, Limited

Works: St. Catharines, Ont.
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SALES OFFICES: 710 C.P.R. Bldg., Toronto; 908 E.T. Bank Bldg., Montreal; West Chester Ave., St. Catharines; Cobalt, Ont.; Exchange Bldg., Vancouver.

DOES IT FIT YOUR REQUIREMENTS?

A 6″ Boring Lathe of exceptional strength. The strong driving gears, the convenience and speed of the tailstock and pilot wheel; these features make you stop. While stopping drop us a card for complete specifications. Our lathes comprise a very complete range. Inquire.

John T. Hepburn, Ltd.

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TORONTO
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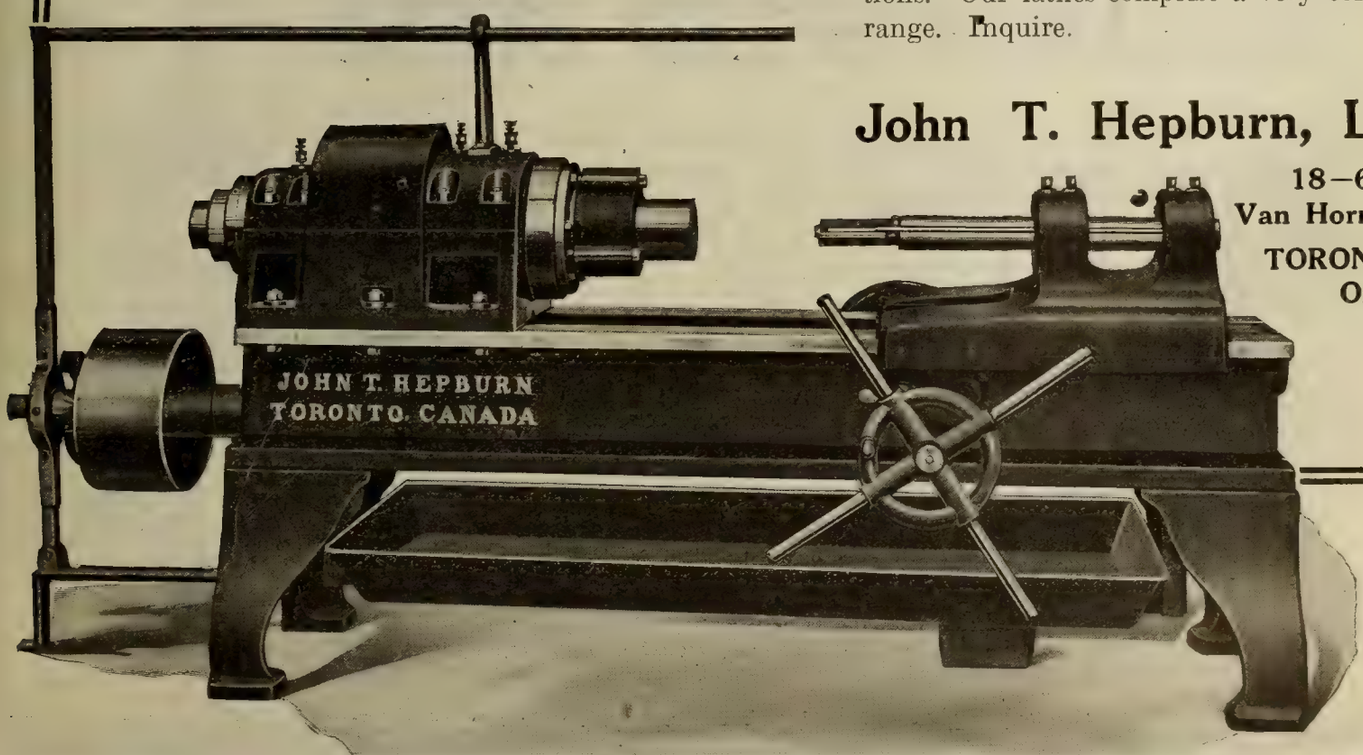
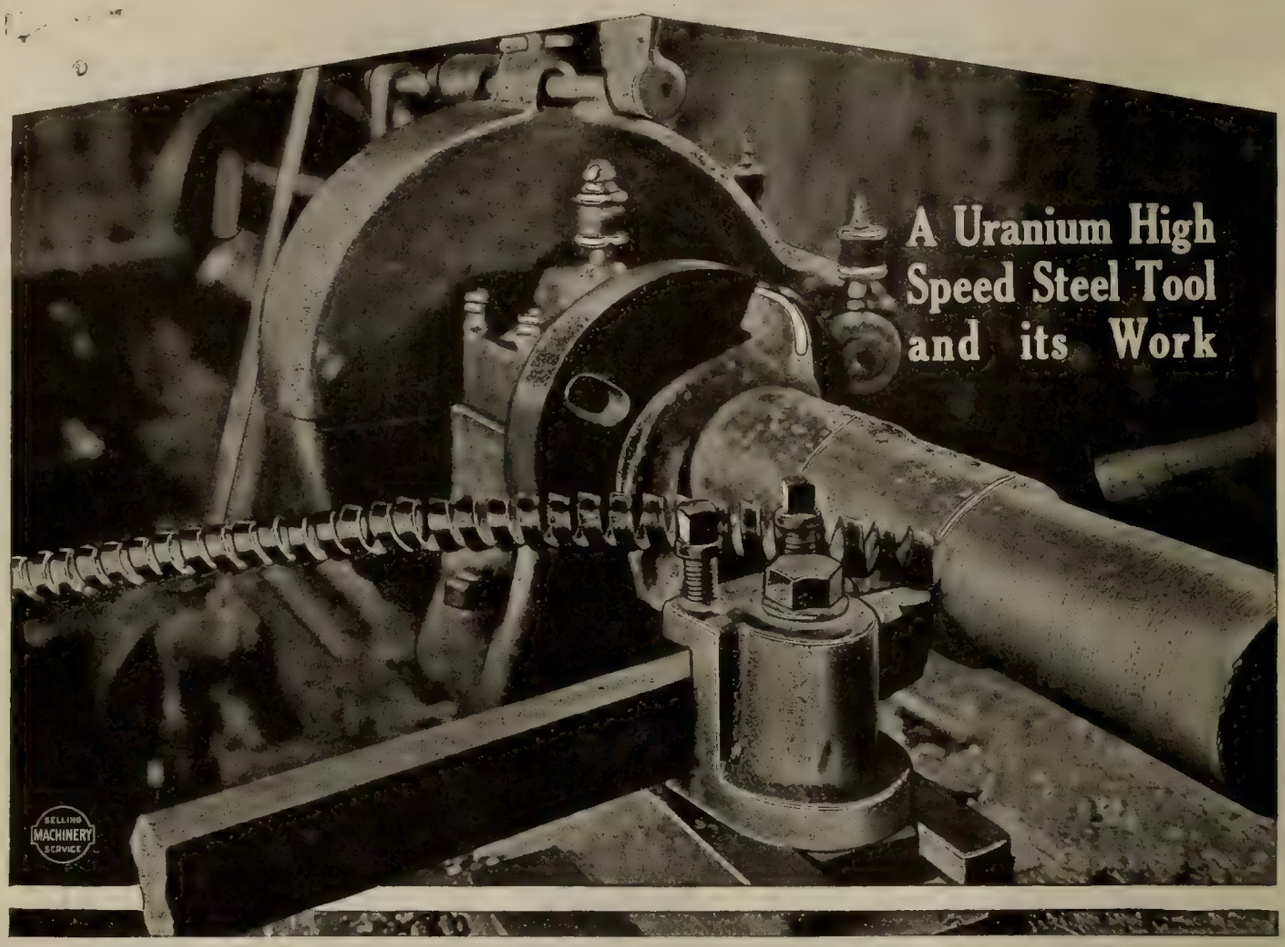




FOR BETTER TURNING TOOLS SPECIFY

URANIUM
HIGH SPEED STEEL

ITS use in high-speed turning tools means longer service between grinds, the ability to stand heavier cuts and coarser feeds and greater "all around" economy. The photograph shows a Uranium Steel Tool, one inch by two inches, turning a heat-treated steel shell forging 4.5″ diameter, taking a quarter-inch cut at a feed of 7/32″ per revolution. The chip coming off is so tough it can hardly be bent with the hands.

If you want better service from high-speed steel tools, regardless of the work they do, specify Uranium High-Speed Steel. Improvement will date from the first job they finish.

Consult your steel man or write us.

STANDARD ALLOYS COMPANY

Forbes and Meyran Avenues, Pittsburgh, Pa.

Sheet Metal Working Machinery

of any description

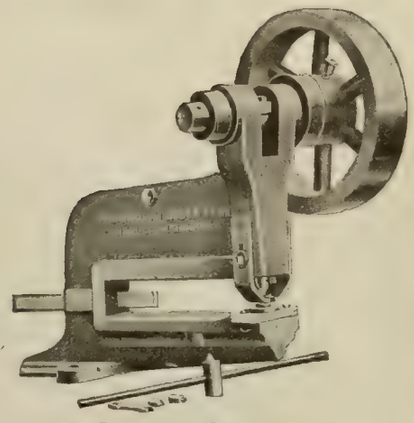
NO 7 SCREW PRESS

For

Quality Efficiency

Durability Speed

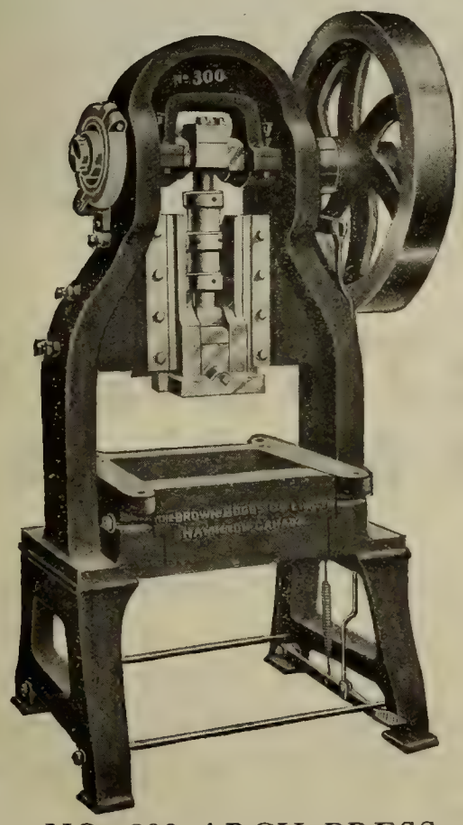
they are unsurpassed.



NO 100 GEARED POWER PUNCH

The Brown, Boggs Company, Limited

Hamilton, Ont.



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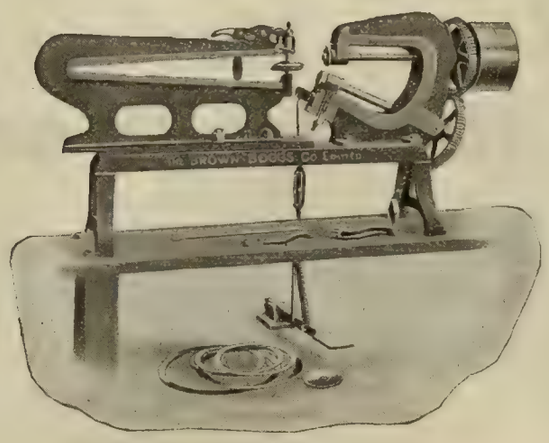
Manufacturers:

Tinsmiths', Heavy Sheet Metal Working Machinery, Canners' and Evaporating Machinery.



NO. 6 COMBINED RING and CYLINDER SHEARS

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Nova Scotia Steel & Coal Company

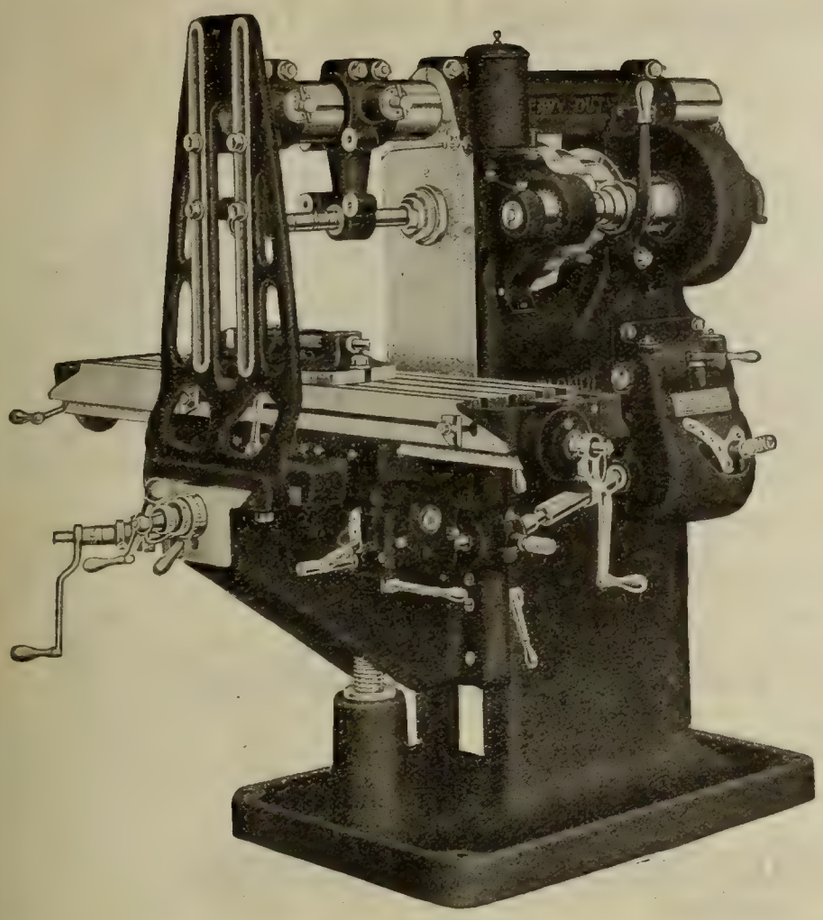
Limited

New Glasgow, Nova Scotia, Canada

FINISHED COUPLING SHAFT, 18 IN. DIAMETER BY 21 FT. LONG.

Heavy Marine Engine Forgings in the Rough or Finish Machined

Our Steel Plant at Sydney Mines, N.S., together with our Steam Hydraulic Forge Shop and modernly equipped Machine Shop at New Glasgow, N.S., place us in position to supply promptly Marine Engine Crank and Propeller Shafting, Piston and Connecting Rods; also Marine and Stationary Steam Turbine Shafting of all diameters and lengths, either as forgings or complete ready for installation, and equal to the best on the American Continent.



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Heavy Duty Milling Machines

Plain or Universal Types—Cone or Gear Drive. All commercial sizes No. 0 to No. 5.

Adapted for the Heaviest Manufacturing or the most exacting tool room service. A suitable Range and Capacity for every class of milling.

Patent Self-Aligning Arbor Supports—Hardened Steel Spindle Bearings—Double-Friction Back Gears—and the simplest type of right-hand control, contribute to an increased production and longer life as a precision machine.

The R. K. LeBlond Machine Tool Company

CINCINNATI, OHIO, U.S.A.

Two Cuts at One Time

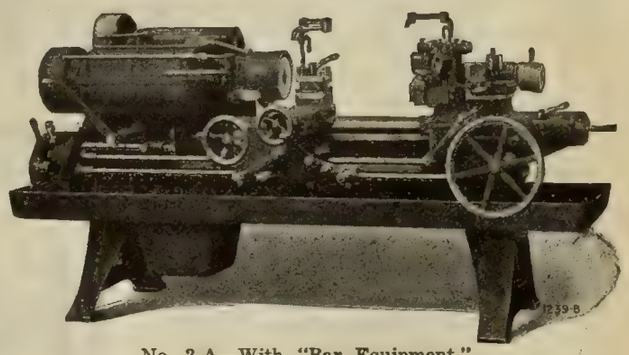
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

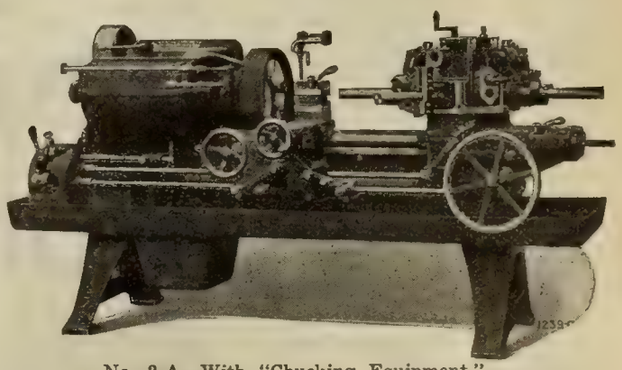
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."



No. 2-A—With "Chucking Equipment."

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal; Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

The Fairley Davidson Steel Co. Inc.

Specialists

	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
High Strength Steels	"Hehtemnd"
High Speed Steel	RUSHITOFF No. 6
Die Steels	"Fondwot" and "Giant"
Magnet Steels	Tungsten or Chrome

CHROME VANADIUM, oil hardening or case hardening
CHROME NICKEL, oil hardening or case hardening

Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

We carry a complete stock at our New York Warehouse

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Canadian Agents:

We carry a complete stock at our Montreal Warehouse

The Canadian Utilities Steel & Engineering LIMITED

151 Craig Street West Montreal, Canada

Electrite Uranium High Speed Steel

Electric furnaces, automatically regulated, the most modern methods, and **the introduction of Uranium**—make this a steel of truly remarkably cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.

LATROBE, PA.

A Keen Cutter

WOLFRAM *Is Both*

VULCAN CRUCIBLE STEEL CO. ESTABLISHED 1900
Aliquippa Pa: U.S.A.
Represented in Canada by Messrs Norton Callard & Company Montreal Que.

Strong in the Neck

TEXTILE BELTING and PACKINGS

HIGH SPEED TWIST DRILLS

J. R. BAXTER & COMPANY LIMITED, MONTREAL.

and GENERAL MACHINERY SUPPLIES

For Export and Import—

Iron — Steel — Metals

Machinery, Raw Products and Manufactured Goods

A. G. KIDSTON & CO.

with offices in

LONDON GLASGOW MONTREAL NEW YORK
AUSTRALIA NEW ZEALAND SOUTH AFRICA

and connections all over the civilized world, have exceptional advantages for the marketing of Canadian and other products. Enquiries invited and promptly handled.

Manager for Canada and U.S.A.:
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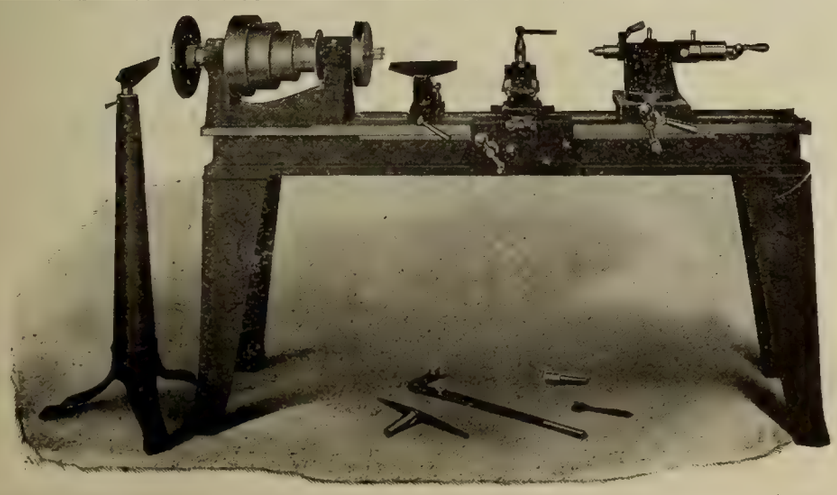
Cables: "KIDCO," Montreal



A Favorite—

Blount Pattern-makers' Lathe

FAST AND ACCURATE—Equipped with set over swivel tailstock and carriage, and outside face plate and tripod. Built in 16" swing with beds 6 or 8 feet in length. Spindle is made of high carbon steel, is hollow and fitted with Morse Taper and runs on self-oiling bronze bearings.

Our catalog gives a full description of this strong and highly efficient machine, also our other quality speed lathes and grinders. Give us your address.

J. G. BLOUNT COMPANY

EVERETT MASS, U.S.A.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

TRADE MARK
"WACO"

Reliance Steel Works
SHEFFIELD, ENG.

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of the Famous

"WACO

Brand

High Speed Steel and Twist Drills

"DOUBLE WACO" Quality

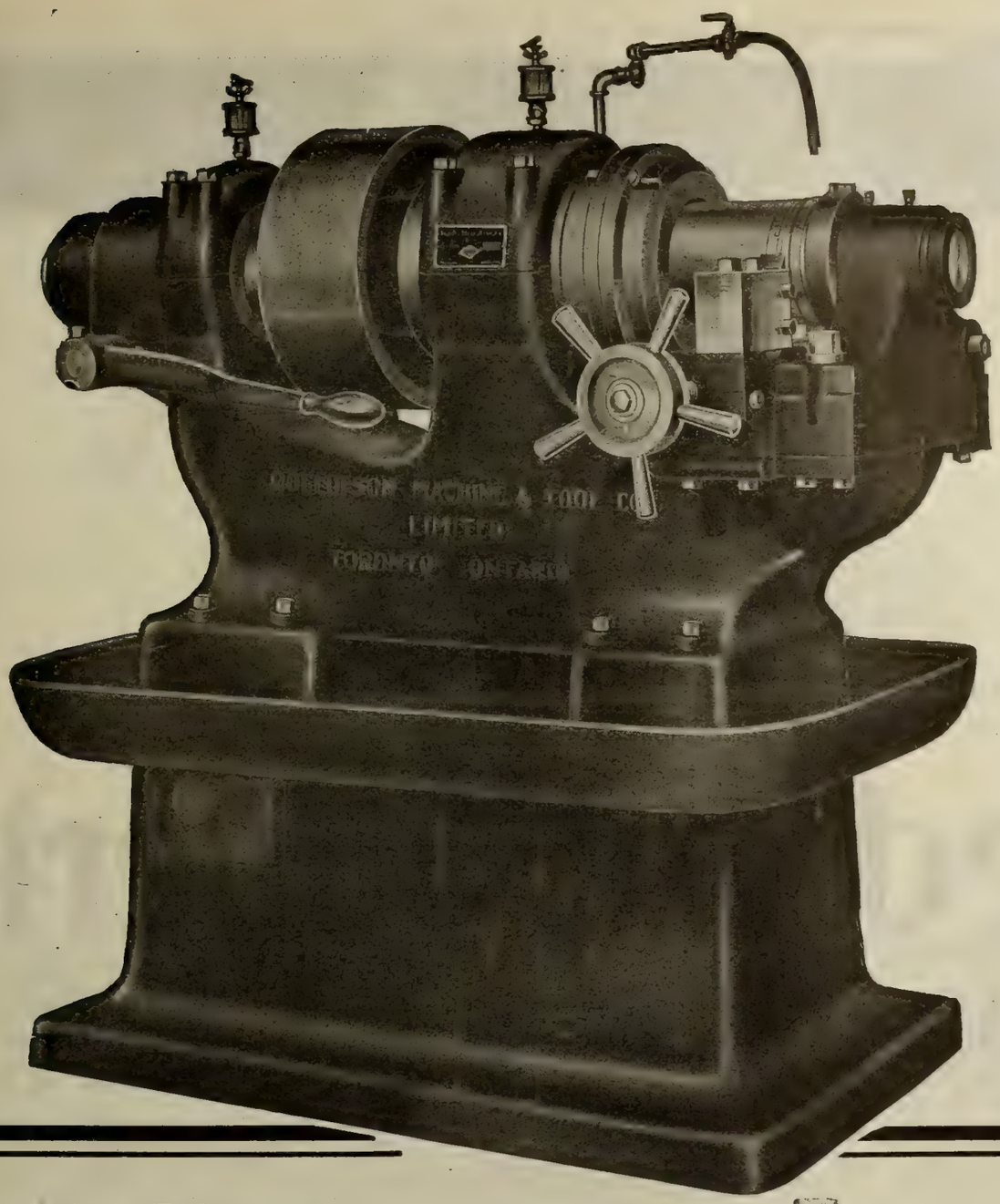
Specially Adapted for all kinds of
AMMUNITION WORK

"Turtle" Brand
High Class Tool Steel, Files, etc.
of all descriptions.

For particulars apply to our
Sole Representatives for Canada

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario



Just Now—

we have two 4.5 machines ready for immediate delivery

THIS Band Turning Machine, by its ability to perform efficiently month after month under exceptional production strains, has proved its worth to munition makers. It is being used by many Canadian munition plants, where it is giving absolute satisfaction.

A glance over some of the features will interest you.

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy chucking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are also built for 15, 18, 60-pdr. and 6" shells.

ROELOFSON MACHINE & TOOL COMPANY, LIMITED

Head Offices: 1501 Royal Bank Bldg., Toronto, Canada. Works: Galt, Canada

If any advertisement interests you, tear it out now and place with letters to be answered.

"Red Cut Superior"

HIGH SPEED STEEL

YOU have thought of many qualities you would like to have in High Speed Steel Tools—such as cutting edges with long life, freedom from brittleness, great reserve strength and toughness to resist shocks and strains, tools that would not require special heat treatment, tools that would take deep roughing cuts or fine smooth finishing cuts, and in addition, could be worked at higher speeds than you ever dreamed of. All these virtues and many more are contained in **"Red Cut Superior"**, a First Quality High Speed Steel. Furnished in Annealed Bar Stock, Discs and Treated Tool Holder Bits.

Send for folder. Are your tools made of **Red Cut**?

VANADIUM-ALLOYS STEEL CO.

Pittsburgh, Penna. Works at Latrobe, Pa.

ECONOMY UNIFORMITY

AMACOL
TENAXAS
TIN TOUGHENED
ATLAS
MASCOT
W.E.W. BABBITT

THIS RANGE OF
ATLAS BABBITTS
WILL MEET ANY OF
YOUR DEMANDS
AND SATISFY YOU

ATLAS METAL and ALLOYS COMPANY of CANADA, Limited
MONTREAL

Sales Agents:

The Canadian B. K. Morton Co., Limited

MONTREAL
49 Common Street

TORONTO
86 Richmond Street East

IF YOU WANT THE

BEST BASE PLUGS, BUY BANFIELD'S

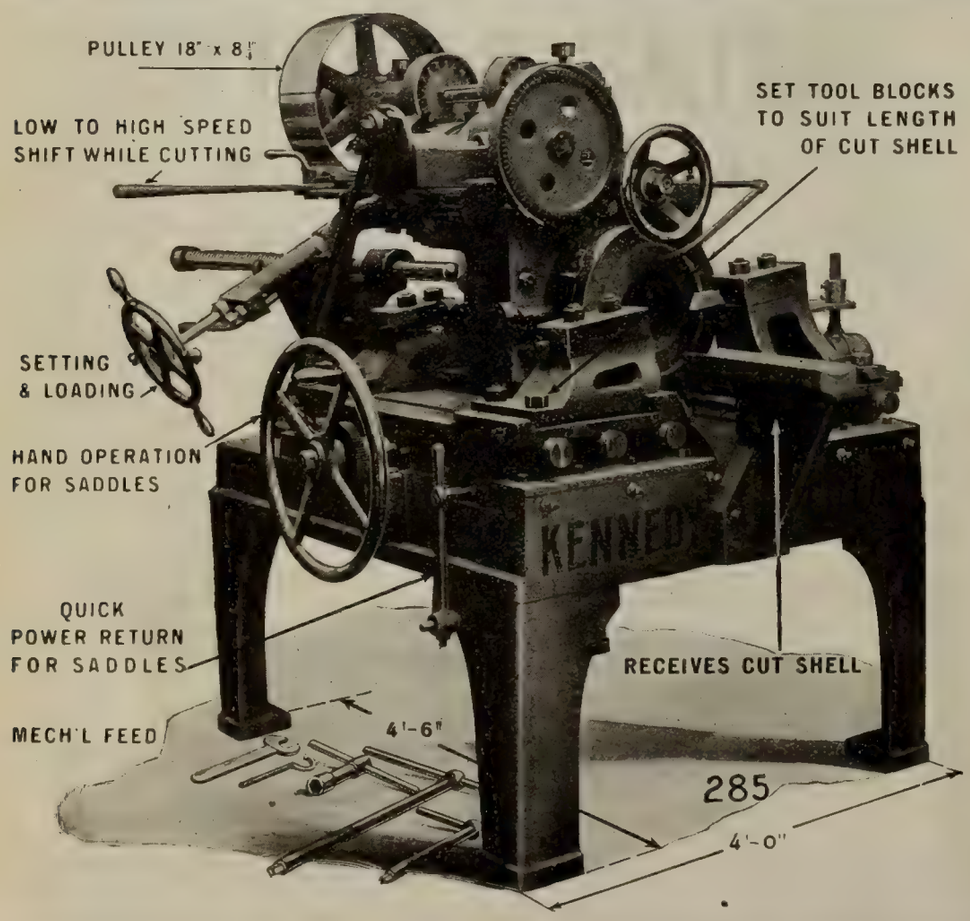
Have in stock for immediate shipment either threaded or bevel Plugs for 4.5", 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. *Write for prices.*

EDWIN J. BANFIELD

STAIR BLDG. ∴ TORONTO, ONT.

Manufacturer of Plug Milling Machines for above size shells. Prices and deliveries on application.



CUTTING-OFF MACHINES

Cuts both ends at once

except 8 in. and 9 in. sizes which cut one end only

Forgings load in one end and discharge out the other when cut

A Girl can operate it

New quick power return for saddles

DELIVERIES REASONABLE

The Wm. Kennedy & Sons, Limited

Owen Sound

THE WALCOTT LATHE

THERE are 36 years of *successful* lathe building to back up any claim we make as to superiority. This length of time has enabled us to study very thoroughly the requirements of a lathe and its present day uses. The outcome of this study is in our product. Our clients will verify our claims as to superiority.

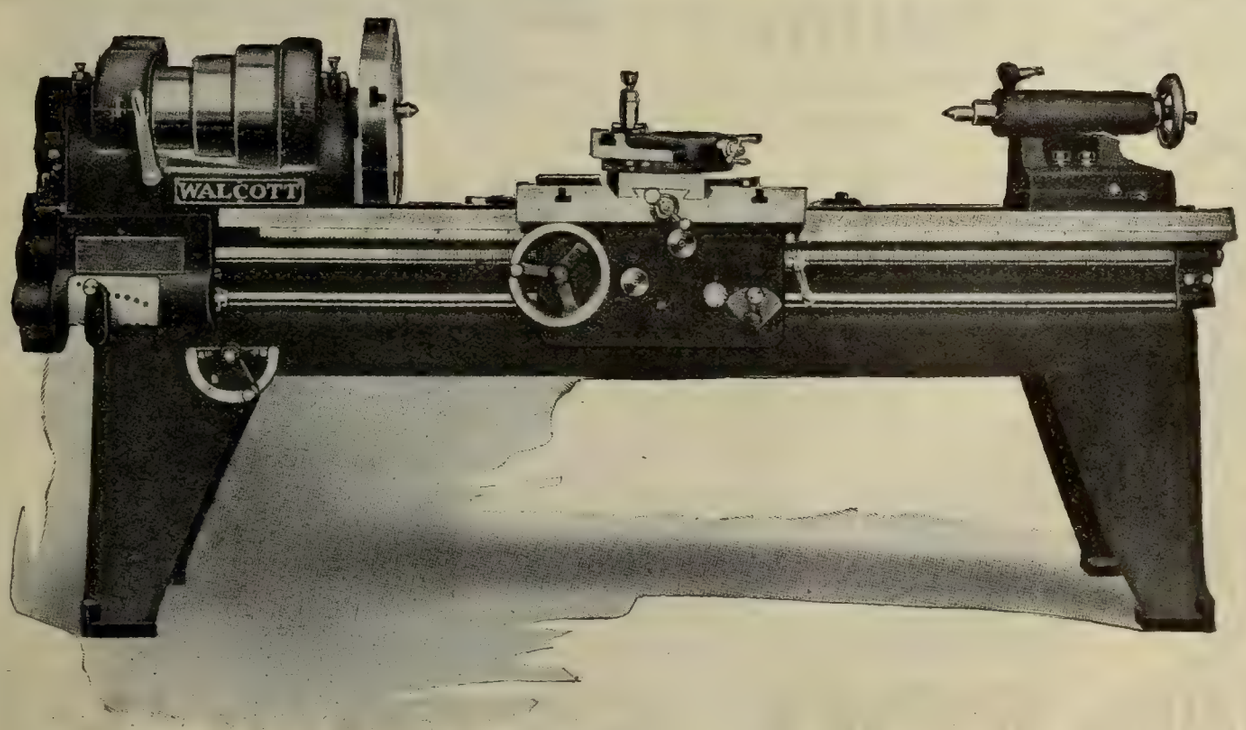
There are two factors that occupy our study very thoroughly—Efficiency and Safety. Not only safety for the operator but for the machine also. This lathe features drop-forged gears in apron, 32 changes, 2 to 112 threads per inch, quick-change-gear. Lines include lathes from 14″ to 28″. An inquiry will get immediate particulars.

Established in 1881

Walcott Lathe Company

414-420 Jackson St. Jackson, Mich., U.S.A.

H. W. PETRIE, TORONTO, ONT., ***Agents***



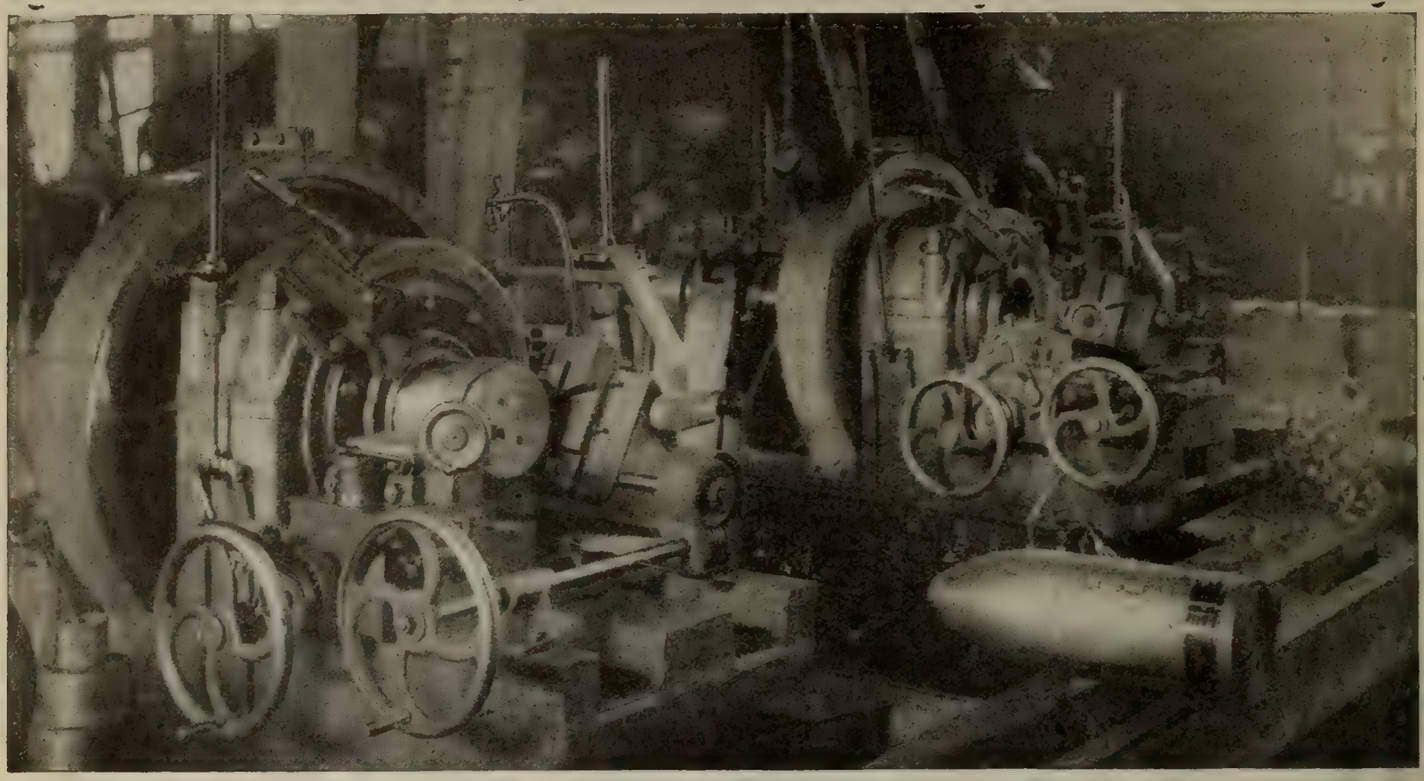


Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

These machines are built for turning bands on 8", 9.2" and 12" snells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. **Write for full particulars and price.**

Bennett Ave. **Warden King Limited** **Maisonneuve, P.Q.**

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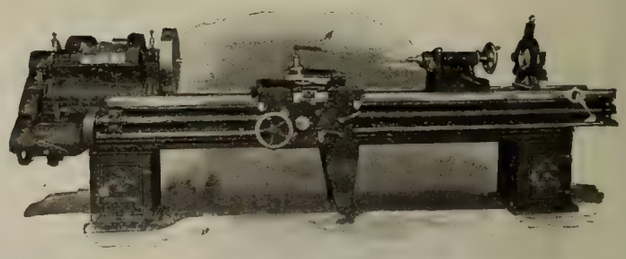
SIDNEY

You'll do mighty well not to forget that name

"SIDNEY"

when you are in the market for



LATHES

Represented in Canada by:

FOSS & HILL MACHINERY COMPANY Montreal, Que.
H. W. PETRIE, LTD. Toronto, Ont.

Write to the above or to the munufacturers:

THE SIDNEY TOOL COMPANY

Sidney, Ohio, U.S.A.

for a copy of the Lathe Bulletin No. 30.

FOR SERVICE!

QUALITY

not Quantity is the Watchword at the Factory of

THE LATHE WITH THE PULL

Every Foreman, every Workman is instructed to this end. Every facility is furnished and applied for accuracy.

CUSTOMERS ARE SATISFIED

or repeat orders would not be sent so often by buyers all over the world who are contented and pleased

WITH CISCO LATHES

MAKE THEM BETTER, THEY ARE GOOD, MAKE THEM BETTER
is humming in the ears of every employee

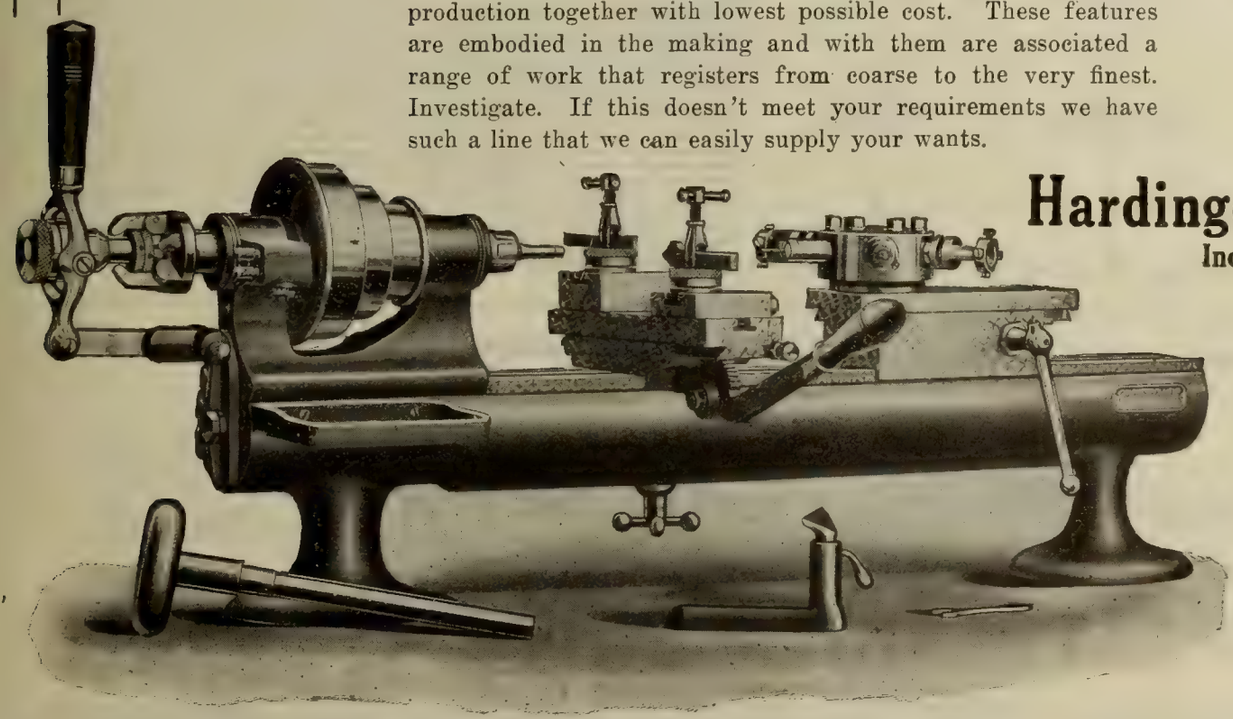
WHY DON'T YOU ASK

The A. R. Williams Machinery Co., Ltd.
SELLERS IN CANADA
OF CISCO LATHES

The Cincinnati Iron and Steel Co.
CINCINNATI, U. S. A.
MAKERS OF 14", 16", 18", 24" LATHES

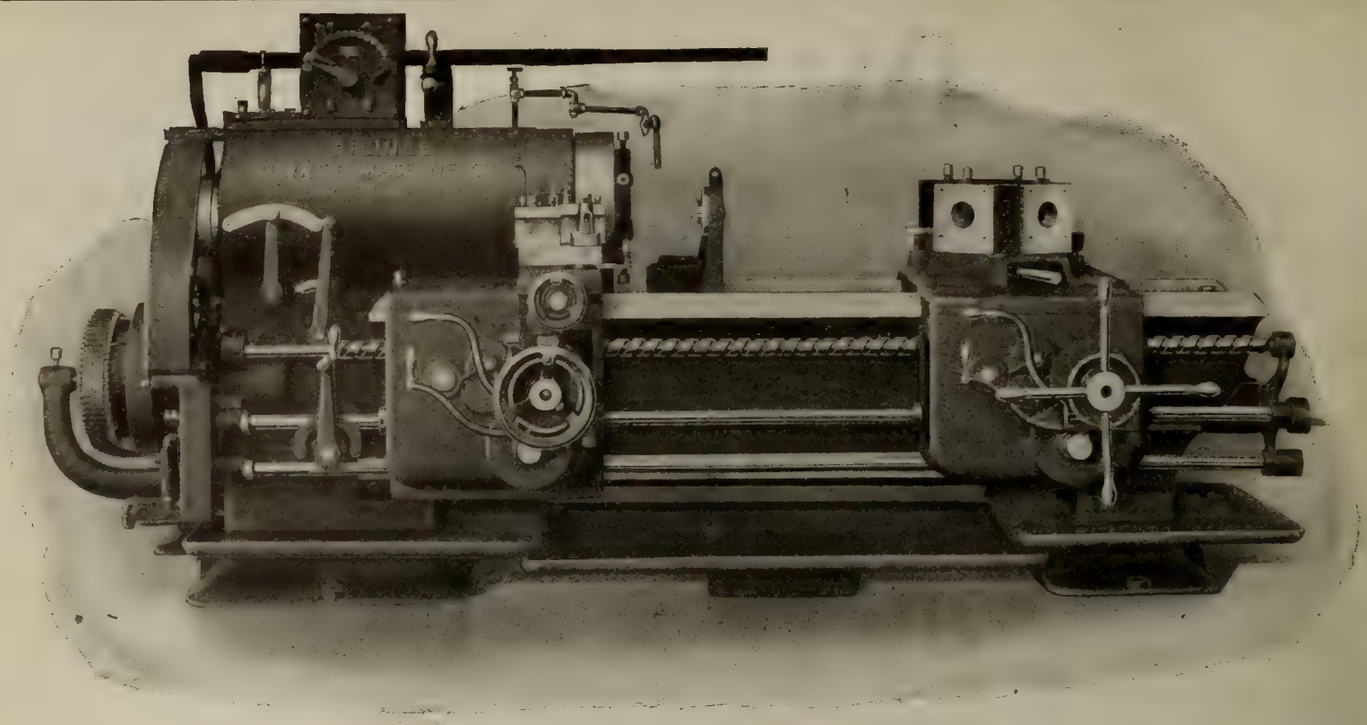
If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.

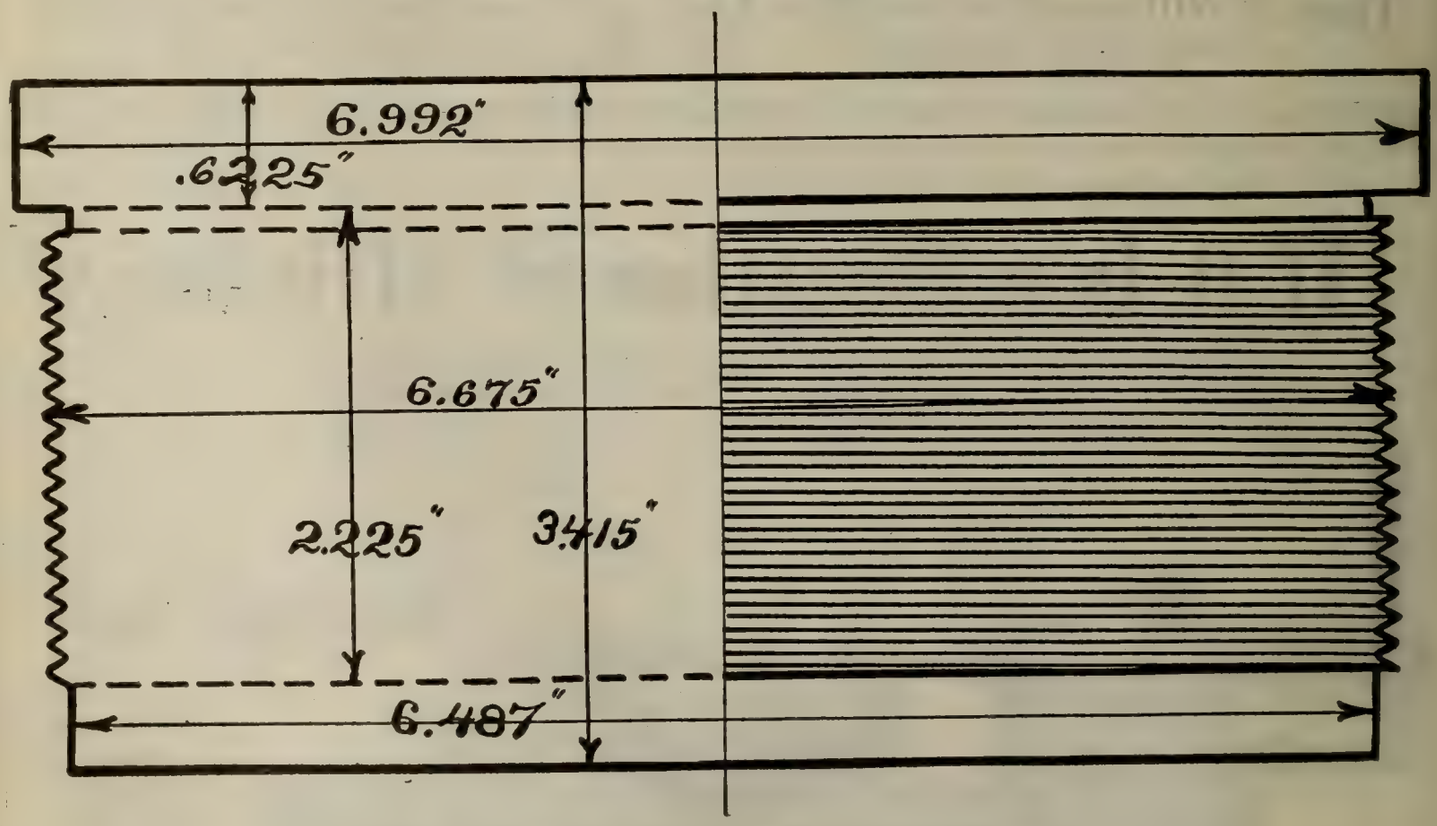


Hardinge Bros
Inc.

1770 Berteau
Avenue,
CHICAGO,
ILL., U.S.A.



A General Purpose Turret Lathe used on Ammunition Work



Base Plug for 9.2-Inch Shell

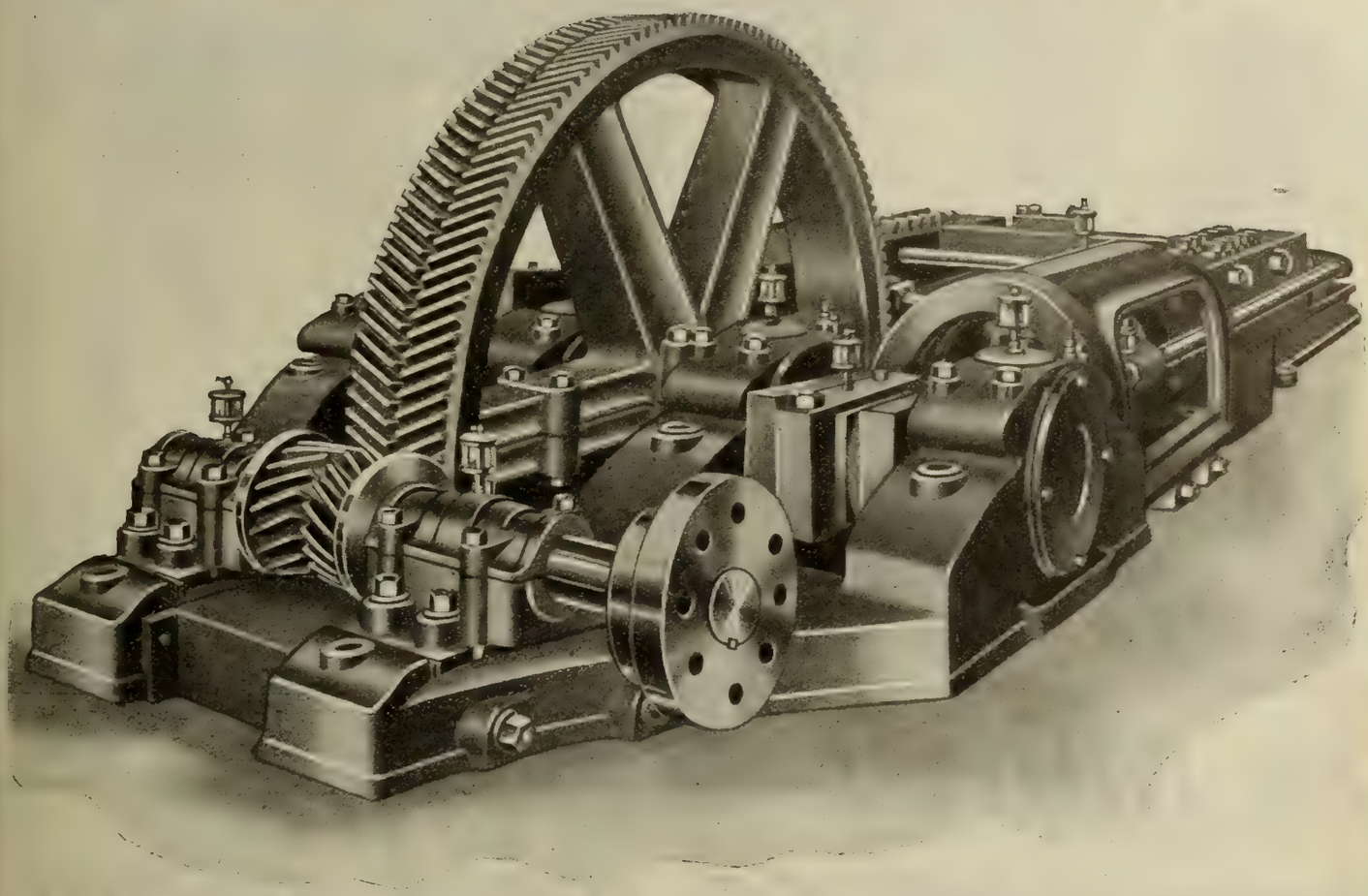
FINISHED COMPLETE ON ABOVE LATHE IN 20 MINUTES

Write for Information

STEINLE TURRET MACHINE COMPANY

MADISON, WISCONSIN, U.S.A.

Hydraulic Pumps



We are builders of High Pressure Pumps to be used in connection with accumulators and presses for making forgings of all kinds.

Immediate shipment to Canada or any part of the world of pumps and motors.

Blake Pump & Condenser Co.

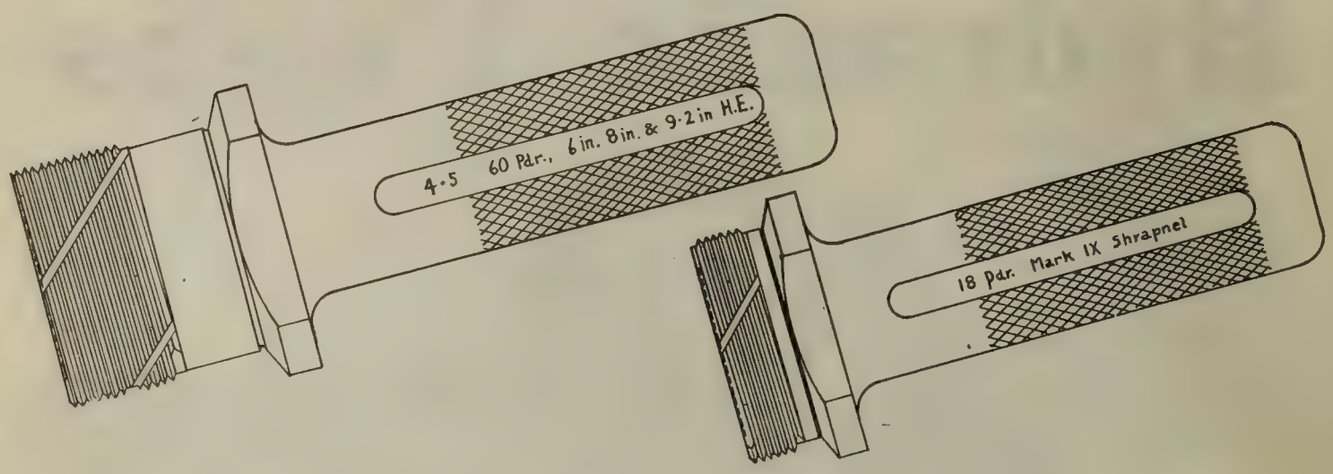
FITCHBURG, MASS. **30 Church Street, NEW YORK**

Cable Address: "Blakepump"

Montreal Machinery & Supplies, Ltd., 260 St. James Street, Montreal, Canada

Representatives for the Province of Quebec.

FUSE HOLE GAUGES



Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

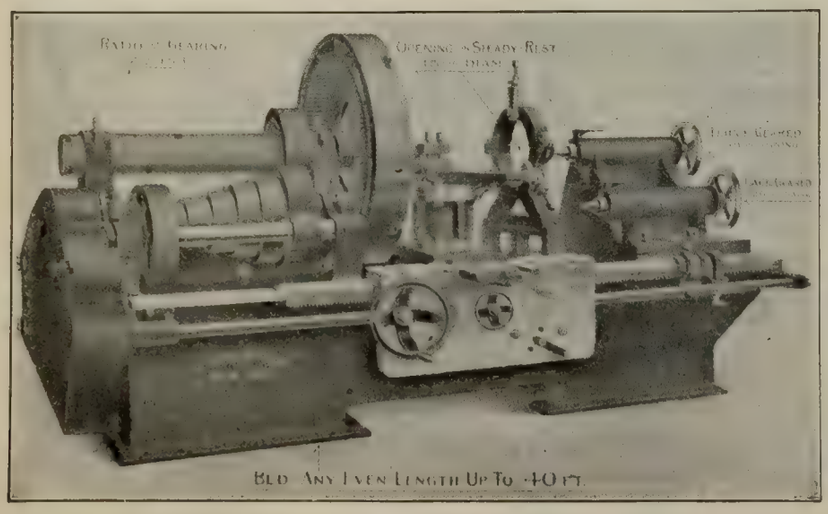
Windsor, Ontario

Do More!

--put on more steam

is the industrial slogan of to-day

You can "do more" with McCabe's "2-in-1" lathe than any other big Lathe built, because you have "more" capacity.



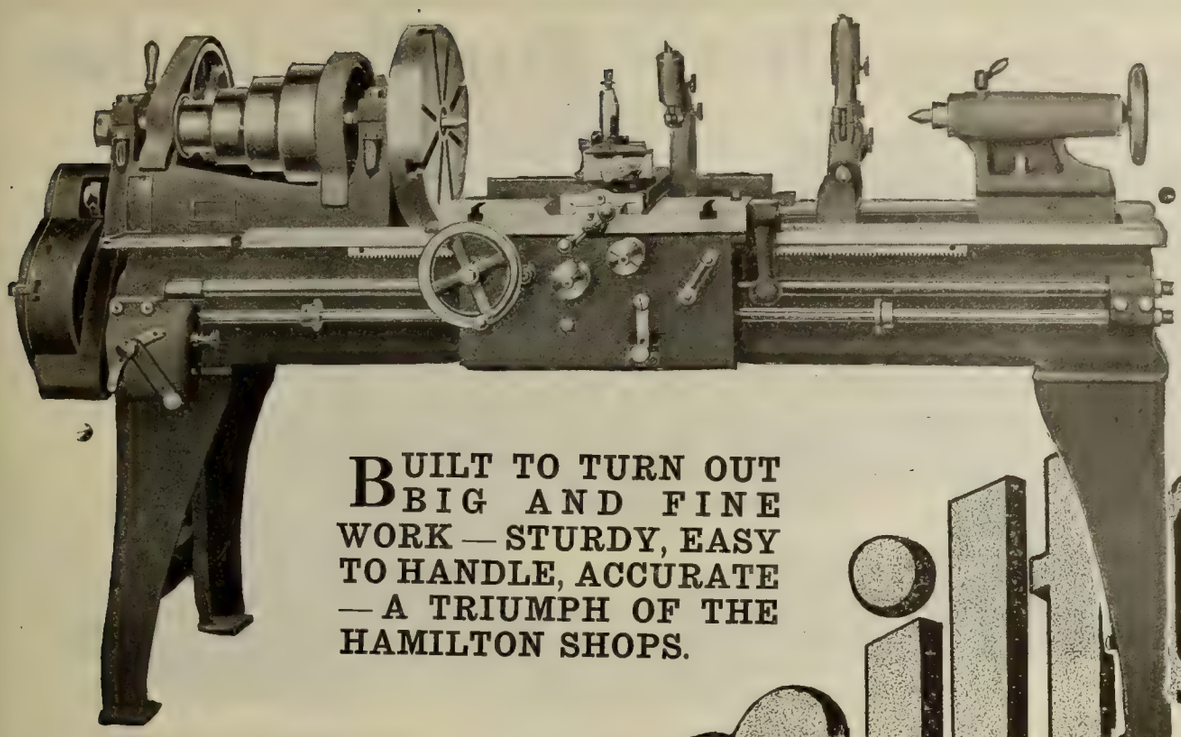
McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing
As a 48 inch Triple-Geared Lathe.

It will carry DOUBLE the burden, by handling such work as you would put in a 26-inch lathe when there's no big work to do, as a 48-inch.

Our most valuable resource is time—save the time other big lathes stand still by installing McCabe's "2-in-1" Double Spindle Lathe. Never idle. Save $1,000 in the price. Other big lathes cost that much more.

Immediate Shipment 12-ft. beds—from stock.

J. J. McCABE
149 Broadway,
NEW YORK



BUILT TO TURN OUT BIG AND FINE WORK — STURDY, EASY TO HANDLE, ACCURATE — A TRIUMPH OF THE HAMILTON SHOPS.

Hamilton

"The Distinguished Service Lathe"

In this Lathe you see exemplified the skill of expert workmen with years of "Hamilton" experience—experience which means something. It is a lathe that well represents the best of our high class machines — a lathe most carefully constructed with lasting materials—a lathe that turns out work of the calibre of its own ideal construction.

The illustration shows the sturdy, easy working "Hamilton" complete with equipment — single back gears, hollow steel spindle, self-oiling bronze boxes, power cross feed, chasing dial, quick change feed box, automatic stop for feed. There is a good deal more we can tell you about this profit-making quality worker. Write to us and we will send you interesting literature.

Rapid Production HAMILTON Machine Tools

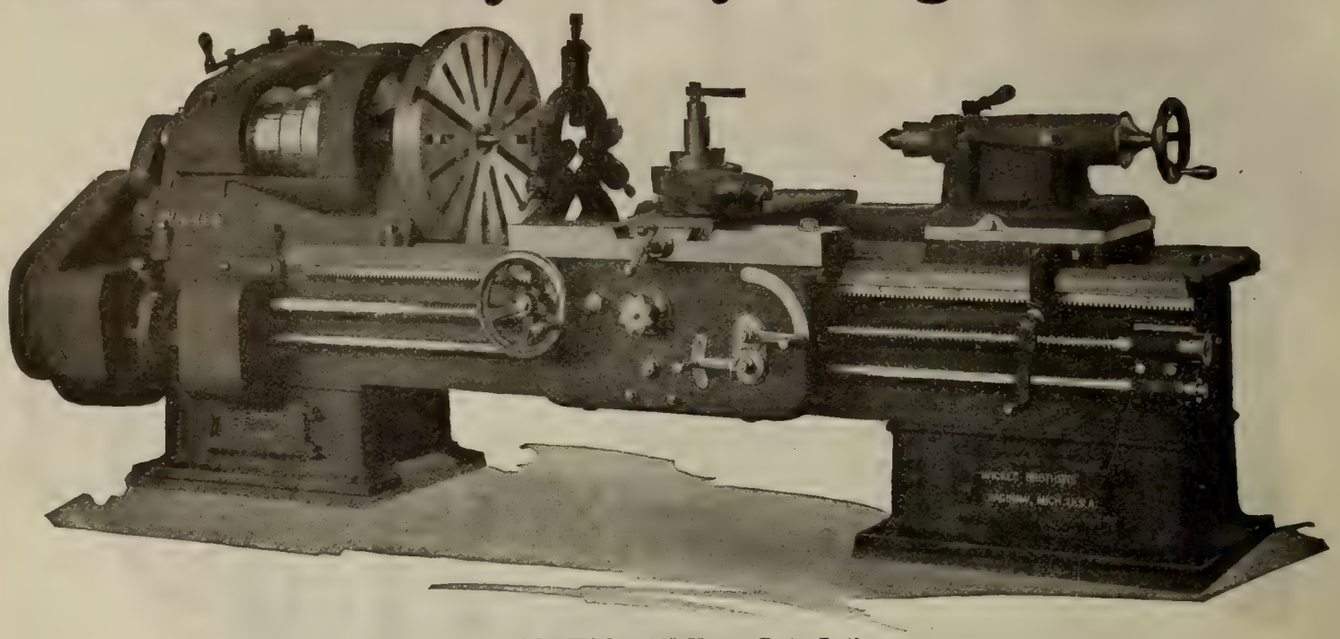
FOR 25 YEARS MAKERS OF FINE MACHINE TOOLS

The Hamilton Machine Tool Co.

HAMILTON, OHIO

Sole Agents for Ontario: H. W. Petrie, Limited, Toronto, Ontario

Wickes Heavy Duty Engine Lathe



The Wickes 26" Heavy Duty Lathe.

Built in lengths from 8 ft. up. Has 3-step cone, is double back-geared and has double plate apron.

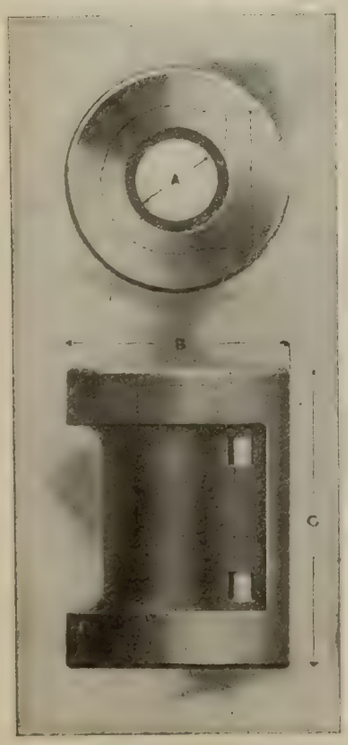
This tool is built for the most severe service; all parts liberal in size; has special ball thrust bearings; steel apron gears; coarse pitch and wide face gears, which are all well guarded.

Let us tell you about this lathe and our 20", 32", also our 17" Rapid Production Lathe for Automobile and other work.

We can make prompt shipment.

WICKES BROTHERS **Saginaw, Michigan**

Mining Machinery Parts



Two-key Tappet

Shoes and Dies, Tappets, Bosses, Cams and Stamp Heads

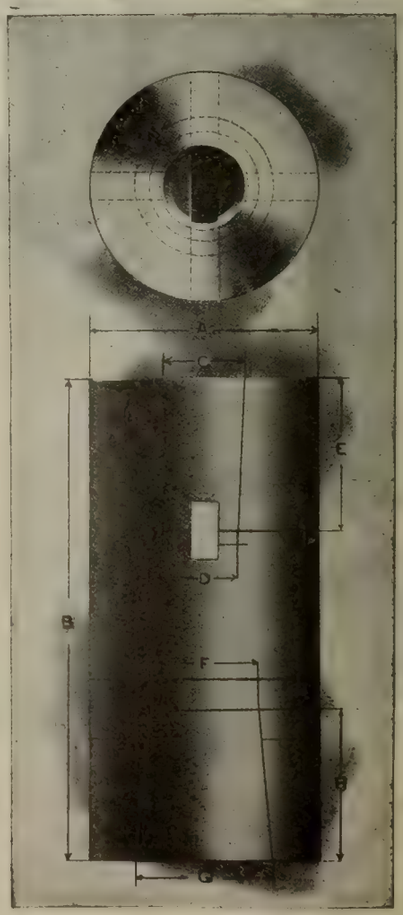
Also Manufacturers of Lining Plates for Ball and Tube Mills Concaves and Heads for Gyratory Crushers.

Machine Moulded Gears

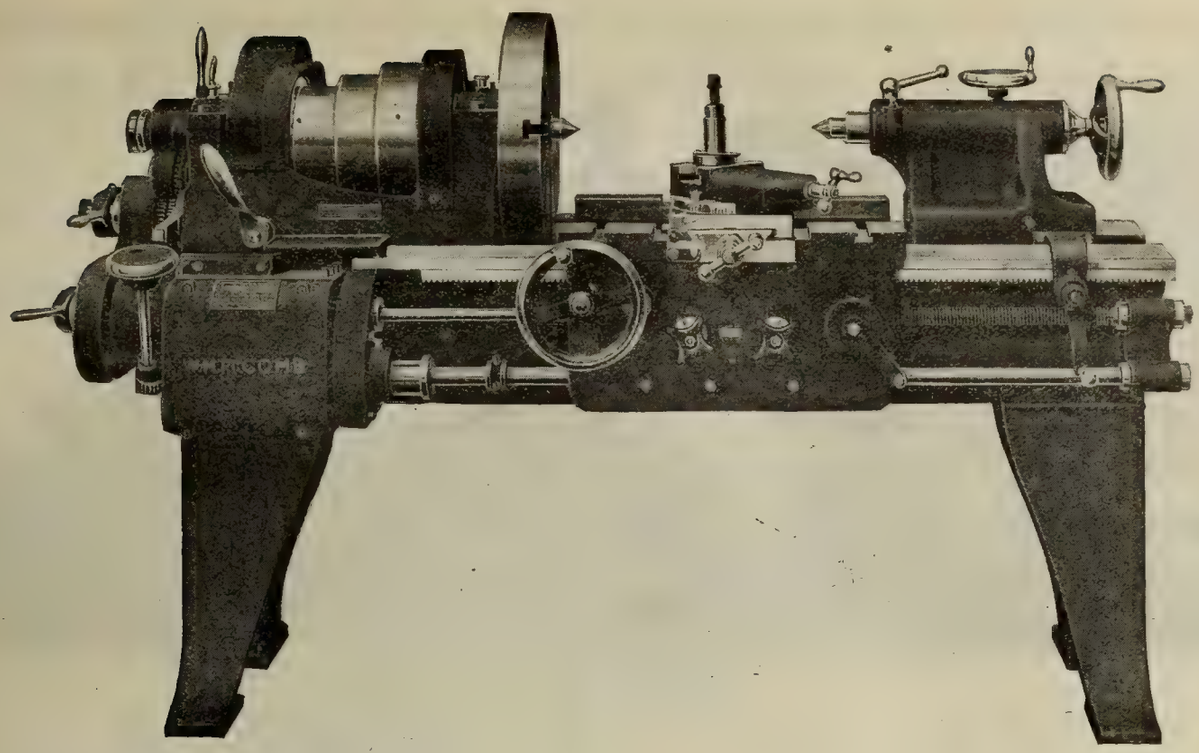
Any size up to 18 feet in diameter.
No patterns needed.

Send Us Your Specifications, We Do the Rest. Write—

Hull Iron & Steel Foundries, Limited
HULL, P.Q.



Stamp Head



THE THREE ESSENTALS OF A GOOD LATHE ARE—

GOOD DESIGN
GOOD MATERIAL
GOOD WORKMANSHIP

How the Whitcomb-Blaisdell Lathe Fulfills the Requirements—

In Design—

Summing up, the Whitcomb-Blaisdell Lathe is a well-balanced tool, heavy and powerful, but light running and not clumsy, consequently adapted for a wide range of work.

In Material—

Here are proofs of the excellent quality of material used in Whitcomb-Blaisdell Lathes—head spindle 65 to 70 point carbon steel; spindle bearings a service-giving bronze that resists wear; beds of semi-steel casting. A similar quality of material is maintained throughout.

In Workmanship—

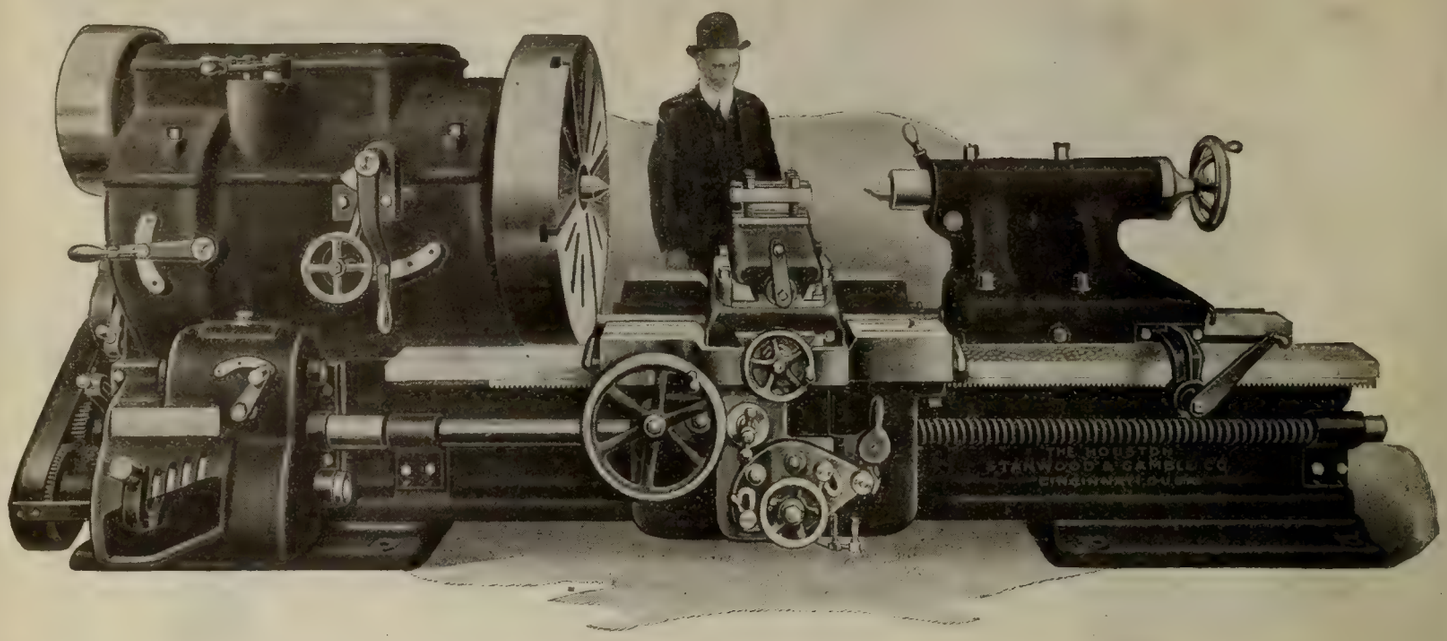
After all, workmanship rests chiefly upon the workman. The men in our shops are capable, experienced and satisfied workers fully understanding and contributing their share to our aim to produce highest grade tools.

Let us send you our Catalog fully descriptive of the many good features of WHITCOMB-BLAISDELL Lathes.

The Whitcomb-Blaisdell Machine Tool Company

Lathes WORCESTER, MASS. Planers

If any advertisement interests you, tear it out now and place with letters to be answered.



H-S-G TRADE MARK. LARGE SWING LATHES BUILT IN 30, 36, 42, 48, 54 AND 60 INCH SIZES

ILLUSTRATION SHOWS 36 INCH SELECTIVE SPEED HEADSTOCK LATHE

Write for bulletins 705, 706 and 707

THE HOUSTON, STANWOOD & GAMBLE COMPANY

CINCINNATI, U.S.A.

Sold by

RUDEL-BELNAP MACHINERY CO.

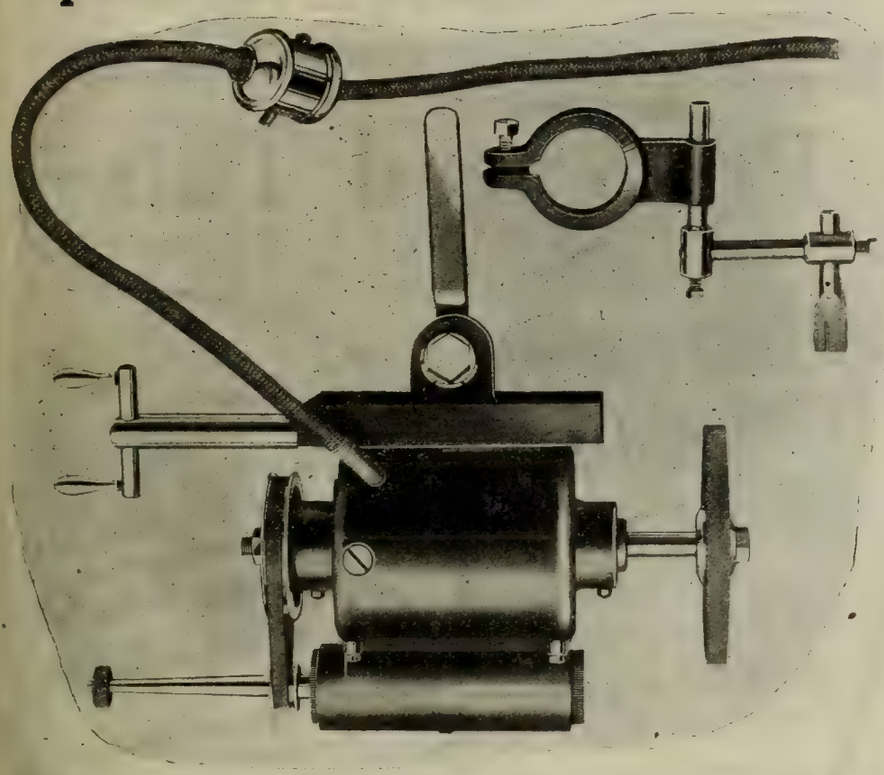
TORONTO and MONTREAL

ARO

Built to bring down High Cost of Grinding

30 Thousand Revolutions per minute

Speediest Portable Electric Grinder on Market



The ARO is absolutely accurate, too. It's strong and durable, a perfectly constructed piece of mechanism, that will surely reduce your grinding costs. Think of it—30,000 R.P.M.

Built on superior lines—Armature, internal spindle, pulleys and large emery wheels are dynamically balanced, preventing vibration. There's no end thrust or side play. Motor and internal spindle are equipped with S. K. F. and "Norma" Bearings.

R. E. T. Pringle, Limited

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OFFICES:

Tyrrell Bldg. - - 95 King St. East, Toronto
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3402 Osler Ave. - - - - Vancouver, B.C.
302 Donalda Block - - - - Winnipeg, Man.

P H

TRADE MARK

Quality Files

Finest Crucible Cast Steel +
Expert Workmanship =
File Perfection

File perfection means P.H. Files which cut faster and wear longer than any other brand.

Let us demonstrate this to you.

Port Hope File Mfg. Co., Ltd.

Port Hope, Ont.

Ask Your Jobber

U. S. Electric Drills and Grinders

Save Time, Labor and Money

They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

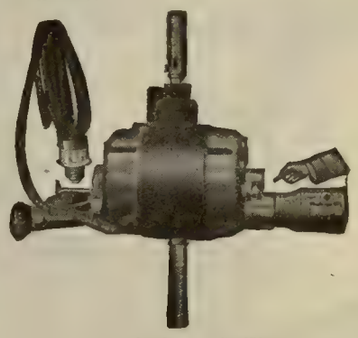
3 SIZES

3-16 inch, W.G.T.	6 lbs.
¼ inch, W.G.T.	9 lbs.
⅜ inch, W.G.T.	12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



½ inch—2 SPEED.
Speed, 400-750 R.P.M.

For Sale By

The Canadian Fairbanks-Morse Co., Limited

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.

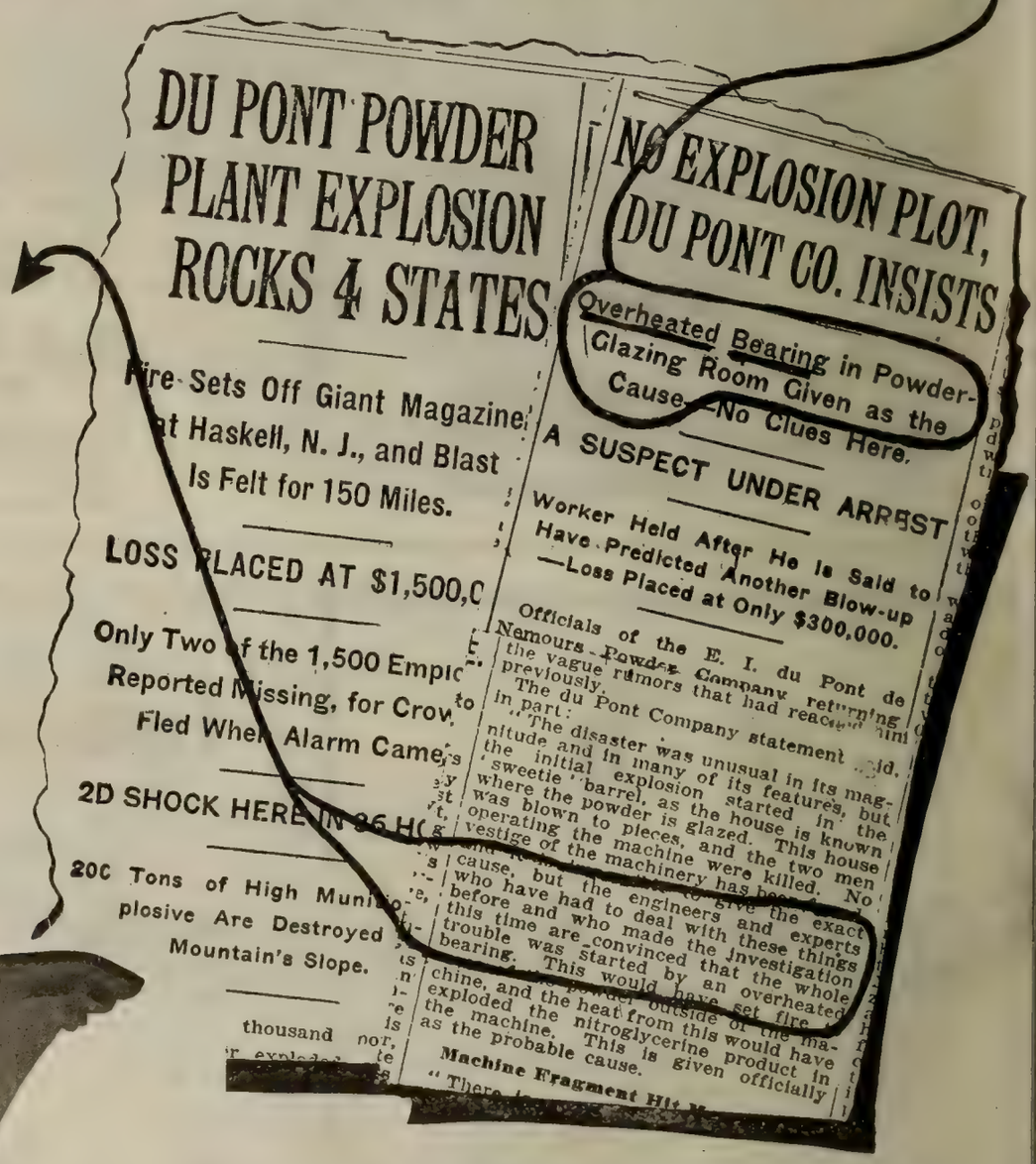
CINCINNATI, OHIO

SKF BALL BEARINGS

Would Have Prevented This

The Du Pont Company, said:—

"The engineers and experts who have had to deal with these things before and who made the investigation are convinced that the whole trouble was started by an overheated bearing."


DU PONT POWDER PLANT EXPLOSION ROCKS 4 STATES

Fire Sets Off Giant Magazine at Haskell, N. J., and Blast Is Felt for 150 Miles.

LOSS PLACED AT $1,500,0

Only Two of the 1,500 Empl Reported Missing, for Crow Fled When Alarm Came

2D SHOCK HERE IN 36 H

200 Tons of High Muni plosive Are Destroyed Mountain's Slope.

NO EXPLOSION PLOT, DU PONT CO. INSISTS

Overheated Bearing in Powder-Glazing Room Given as the Cause—No Clues Here.

A SUSPECT UNDER ARREST

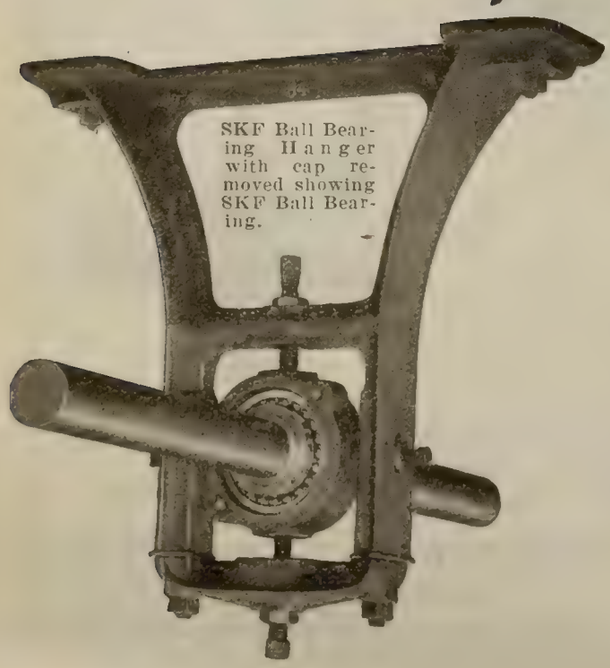
Worker Held After He Is Said to Have Predicted Another Blow-up —Loss Placed at Only $300,000.

Officials of the E. I. du Pont de Nemours Powder Company returning the vague rumors that had reach previously.

The du Pont Company statement in part:

"The disaster was unusual in its magnitude and in many of its features, but the initial explosion started in the 'sweetie' barrel, as the house is known where the powder is glazed. This house was blown to pieces, and the two men operating the machine were killed. No vestige of the machinery has been ... give the exact cause, but the engineers and experts who have had to deal with these things before and who made the investigation this time are convinced that the whole trouble was started by an overheated bearing. This would have set fire ... powder outside of the machine, and the heat from this would have exploded the nitroglycerine product in the machine. This is given officially as the probable cause.

Machine Fragment Hit



SKF Ball Bearing Hanger with cap removed showing SKF Ball Bearing.

What are you going to do about it? Are you going to **keep on** using plain bearings until the disaster hits you—until you wake up some morning and find your plant "gone up in smoke"—or are you going to apply the REMEDY?

SKF Self-Aligning Ball Bearings eliminate hot bearings, reduce fire hazards, save power, lubrication, maintenance, equipment and insure freedom from shut-downs for bearing renewals.

SKF Bulletins explain. Write for them.

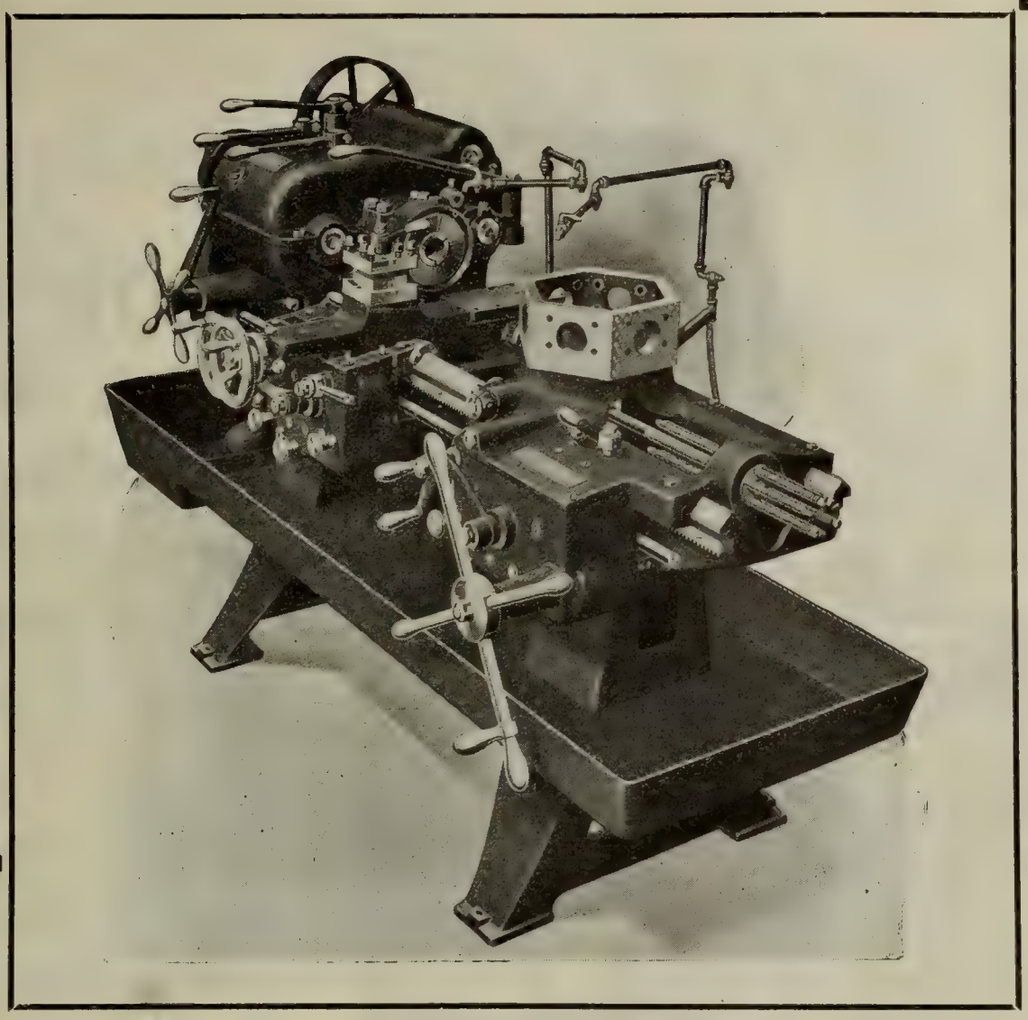
CANADIAN SKF COMPANY
LIMITED
47 King Street West **Toronto, Ont.**

Sole Canadian Agents for SKF Transmission Bearings

THE CANADIAN FAIRBANKS-MORSE CO., Limited

St. John Quebec Montreal Ottawa Toronto Hamilton
Windsor Winnipeg Saskatoon Calgary Vancouver Victoria

FOSTER



FOSTER

No. 1-B Universal Turret Lathe

POWER

One of the secrets behind rapid production is the power behind the cutting tool.

It is the claim of the designer that this Machine has the most powerful head of any machine of its class and size. A few figures substantiating this claim would undoubtedly be of interest.

The 3 in. belt running at a speed of 1600 feet per minute is capable of delivering 5.1 horsepower to the pulley. This is figured at the value of 35 lbs. per inch of width of the belt which is a very conservative figure as a belt in good condition is capable of delivering upwards to 75 pounds per inch of width. The gears and friction clutch are designed for a load greatly in excess of this.

SPEED RANGE

Please note that this covers the requirements for hard cast iron of the largest capacity of the machine up to and including the proper speed for drilling soft steel.

LUBRICATION

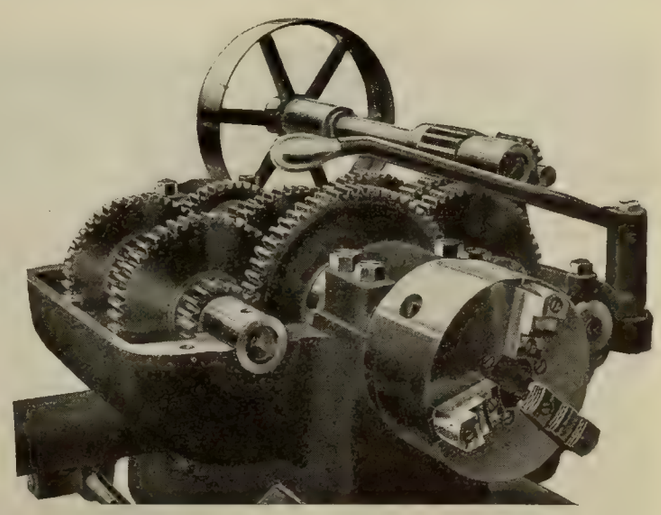
The gears and bearings throughout the head are automatically lubricated. This means minimum of friction and wear and maximum of life.

Note, however, that this is only one of the several machines built by

SPINDLE SPEEDS

R.P.M.	20	27	36	48	64	86	111	148	200	267	355	480
LEV. A	RIGHT	RIGHT	RIGHT	RIGHT	RIGHT	RIGHT	LEFT	LEFT	LEFT	LEFT	LEFT	LEFT
LEV. B	LEFT	LEFT	LEFT	RIGHT	RIGHT	RIGHT	LEFT	LEFT	LEFT	RIGHT	RIGHT	RIGHT
LEV. C	LEFT	RIGHT	CENTR'L	LEFT	RIGHT	CENTR'L	LEFT	RIGHT	CENTR'L	LEFT	RIGHT	CENTR'L

SPEED OF PULLEY - 510 R.P.M.



FOSTER MACHINE COMPANY

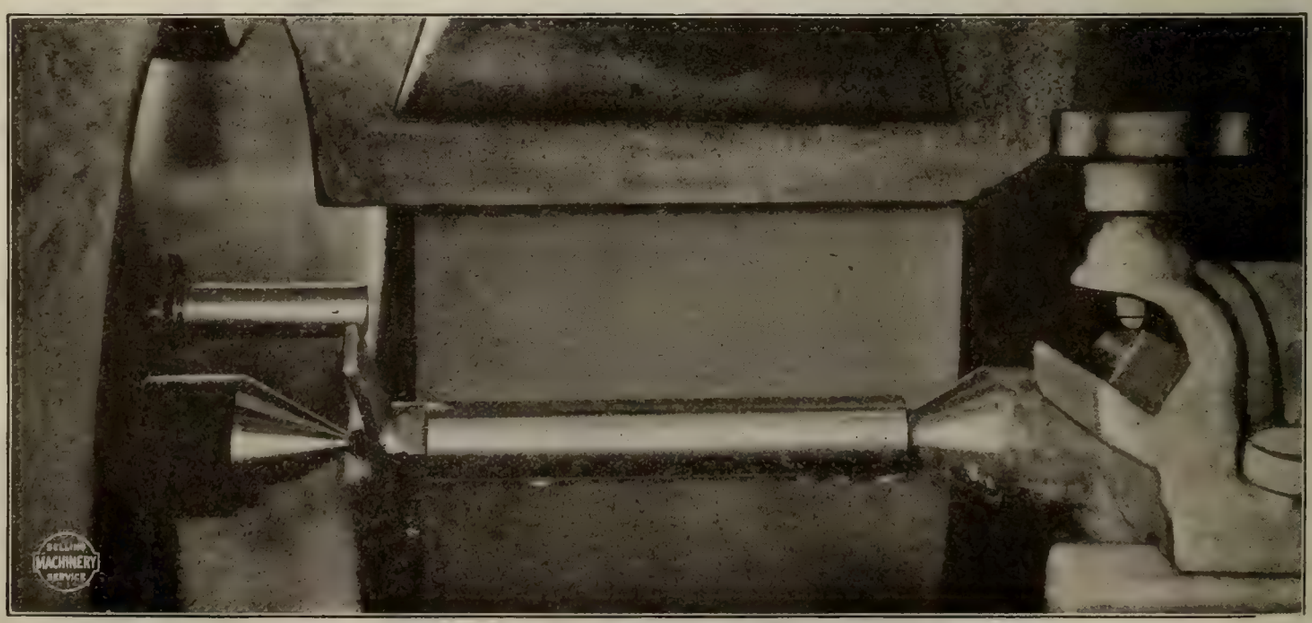
ELKHART, INDIANA, U.S.A.

Another Good Example *of* NORTON "Wide Wheel" Grinding on Automobile Parts

Fast time on automobile parts grinding is being made by the Morrow Mfg. Co., (Elmira, N.Y.) where wheels 6" wide are used and the entire cut taken by feeding the wheel directly into the work. The two pieces shown below are typical of this work.

NORTON GRINDING COMPANY
WORCESTER :: MASS.

Selling Agents for Canada:
Canadian Fairbanks-Morse Company
St. John, Montreal, Quebec, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria



520 N

Grinding Planer Tools With Alundum Wheels

The wheel on the machine shown is a 24-inch Vitrified Alundum, grain 30, grade O, running at a speed of 900 r.p.m. The wheel is in actual operation grinding tools 90 per cent. of the time, and under this service wheels are lasting 4 to 5 months. Equally good results are being made on other grinding operations.

NORTON COMPANY
WORCESTER, MASS.

ELECTRIC FURNACE PLANTS:
NIAGARA FALLS, N.Y., CHIPPAWA, ONT.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B.; Winnipeg, Calgary, Saskatoon, Vancouver, Victoria: F. H. Andrews & Son, Quebec, Que. 862a

Let the ACORN DIE Cut Your Threads

Die and Holder

THE DIE

The adjustment is mechanically perfect—simply turn the cap and all the prongs of the die converge equally—a great advantage over the spring die.

The Acorn Die Holder is smaller in diameter than any other die holder of equal cutting size.

The float permits the die to follow its own lead.

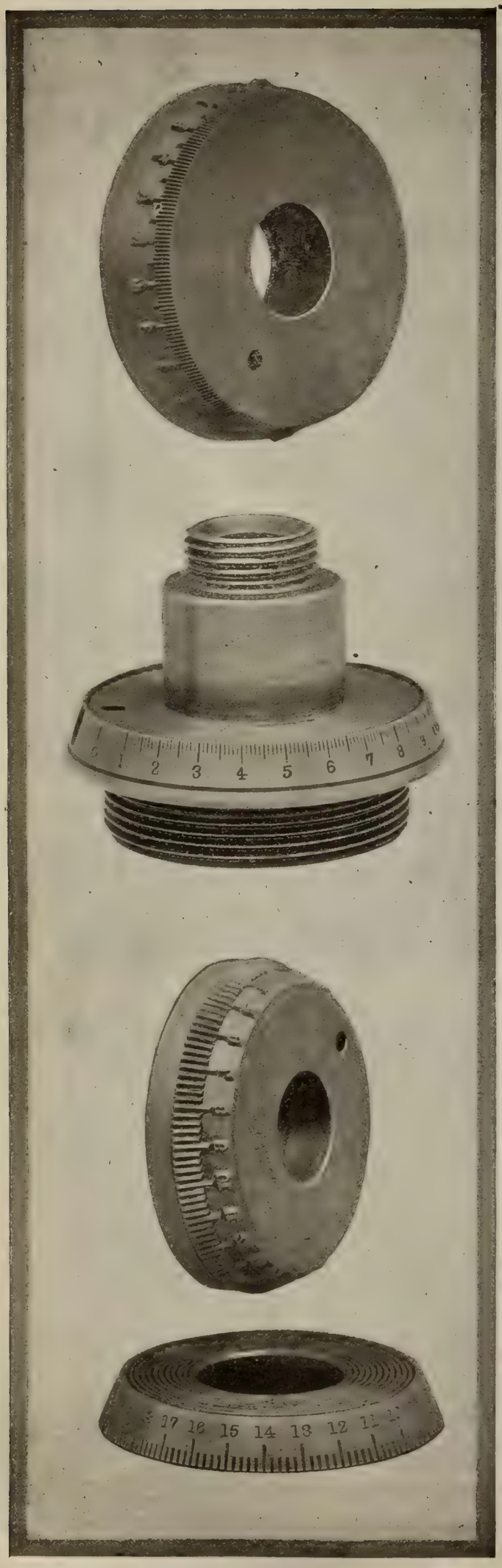
The die projects slightly beyond the adjusting cap, making it admirably adapted for shoulder work—and the chips are thrown ahead of the work, so the die does not clog.

Will you try the Acorn Die on your own work—under your own conditions?

WELLS BROTHERS COMPANY OF CANADA, Limited

GALT - ONTARIO

SALES AGENTS: The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary



MATTHEWS A PRODUCT WORTH MARKING IS WORTH MARKING RIGHT MARKING DEVICES

Steel Roller DIES

For Marking No. 80 Fuse

To economically stamp fuse parts with the clean-cut uniform markings they require, calls for dies that are accurately made and able to stand up. Matthews Steel Dies and Stamps insure the fuse manufacturer just what he wants—the maximum number of markings and clear, true reproductions, according to specifications.

They are made of a special grade of tool steel, hand engraved and heat treated for maximum accurate service. Furnished in three styles, i.e.:

1. For marking graduations only.
2. For marking numbers only.
3. For marking numbers and graduations in one operation, as illustrated.

If your present marking equipment is unsatisfactory for any reason, fill out and return the coupon below.

Sixty-seven years' experience making high-grade marking devices of every type.

Ask for Matthews' Catalog of Steel Lettering Stamps and Dies.

Jas. H. Matthews & Company

67 Years in Business

Forbes Field : : Pittsburgh, Penna.

Distributors for Canada:

Canadian Fairbanks-Morse Co., Ltd.
St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria.

We are making.....Type of Fuse.
Send full particulars as per your advertisement in Canadian Machinery.

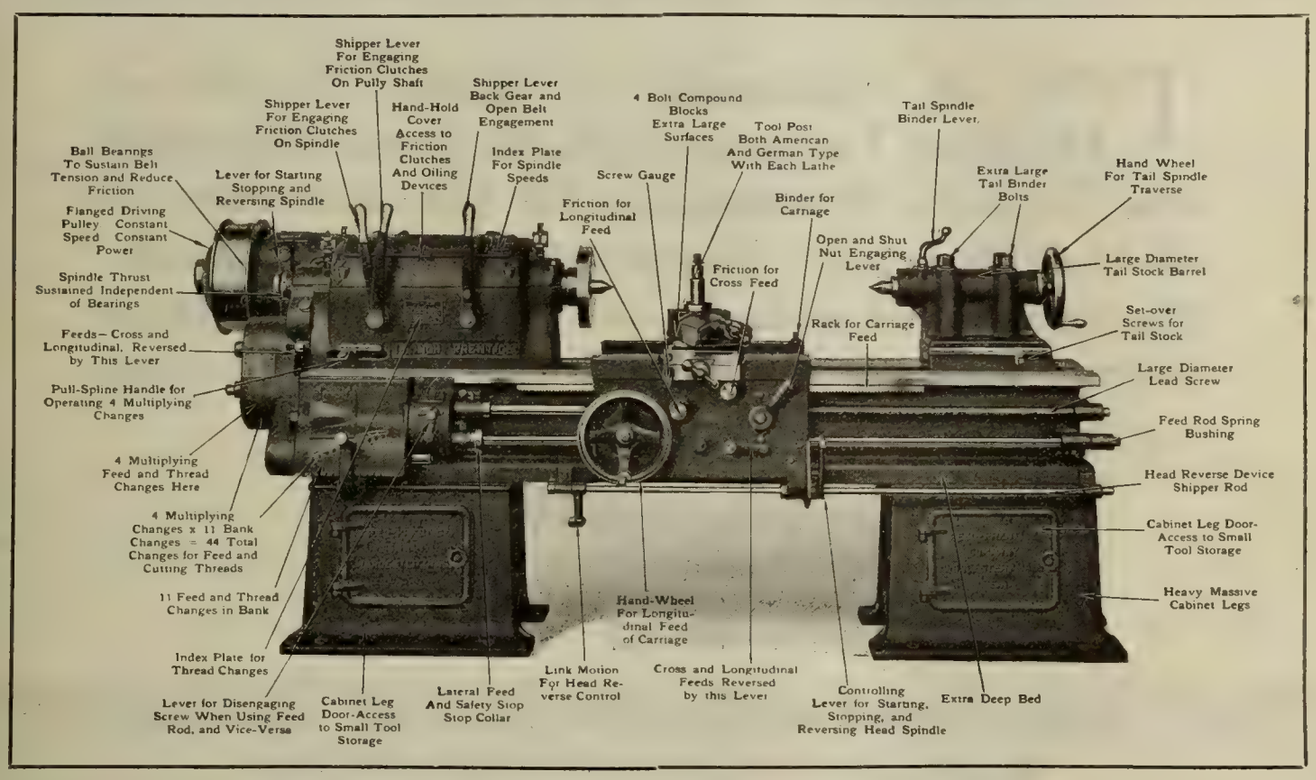
Name.....

Address.....

REED-PRENTICE COMPANY

R-P ©

WORCESTER MASS. U.S.A.



IMAGINE

THAT YOU ARE STANDING IN FRONT OF THE LATHE HERE PICTURED.

COULD YOU WISH FOR A MORE CONVENIENT LOCATION OF THE SPEED, FEED, LEAD-SCREW AND CONTROL LEVERS, OR A MORE PERFECT ARRANGEMENT?

THE SPEED CHANGE LEVERS OPERATE INDIVIDUAL METAL-TO-METAL EXPANDING FRICTION CLUTCHES. SPEEDS ARE CHANGED AT ANY TIME IN ANY WAY—EVEN THOUGH THE TOOL IS CUTTING. THE CHANGE IS SILENT AND INSTANTANEOUS.

FEED-ROD AND LEAD-SCREW CANNOT RUN AT THE SAME TIME CARELESSNESS IN MANIPULATION CANNOT CAUSE DAMAGE TO THIS LATHE.

ASK ANYONE WHO HAS EVER OPERATED A REED-PRENTICE—"WHAT DO YOU THINK OF A REED-PRENTICE?"

THE ANSWER TO THAT QUESTION HAS PROVED THAT THEY ARE UNUSUALLY SATISFACTORY TO BOTH OPERATOR AND OWNER.

REPRESENTED BY

CANADIAN FAIRBANKS-MORSE CO, LTD.

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED.

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

Machine Tools For Immediate Delivery

TENS of thousands of dollars worth of Machine Tools are in stock at our Montreal and Toronto Warehouses for the convenience of the Munition Manufacturers of Canada. Munition contracts do not permit of any time being wasted waiting for a machine tool equipment to perform the work.

PLACE YOUR ORDER WITH OUR NEAREST BRANCH HOUSE, AND SECURE PROMPT DELIVERY.

The Canadian Fairbanks-Morse Co., Limited

"Canada's Departmental House for Mechanical Goods"

ST. JOHN QUEBEC MONTREAL OTTAWA TORONTO HAMILTON WINDSOR
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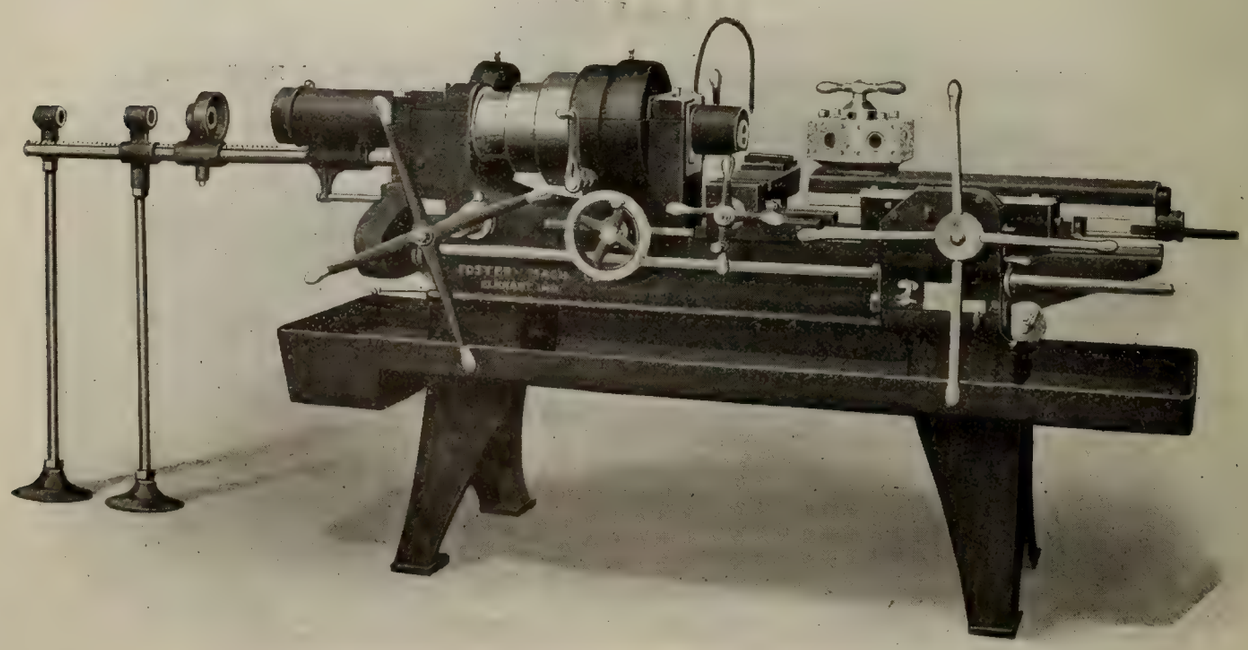
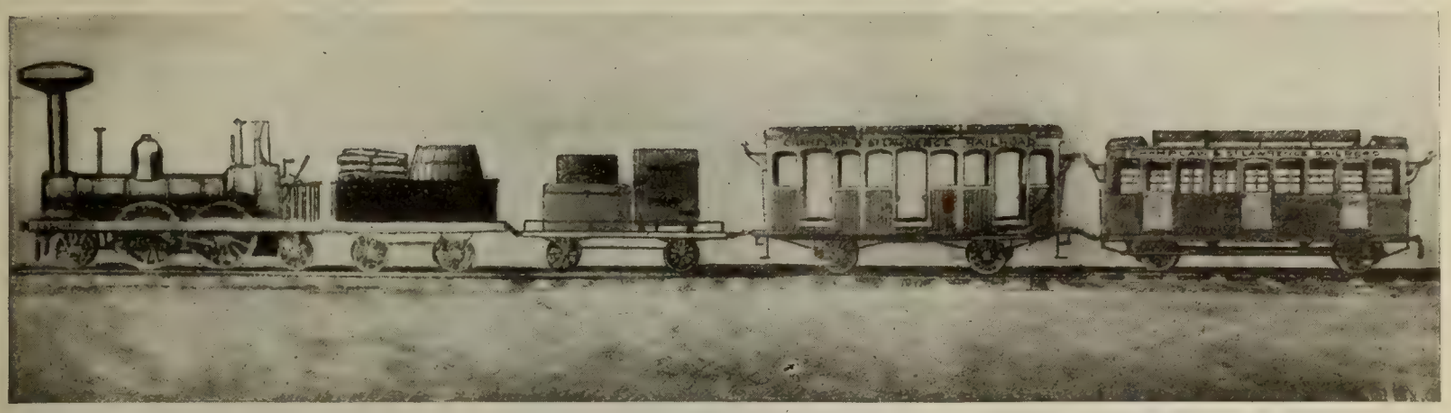




FIRST RAILROAD TRAIN IN CANADA, LAPRAIRIE, QUE.-ST. JOHNS, QUE., YEAR 1836.

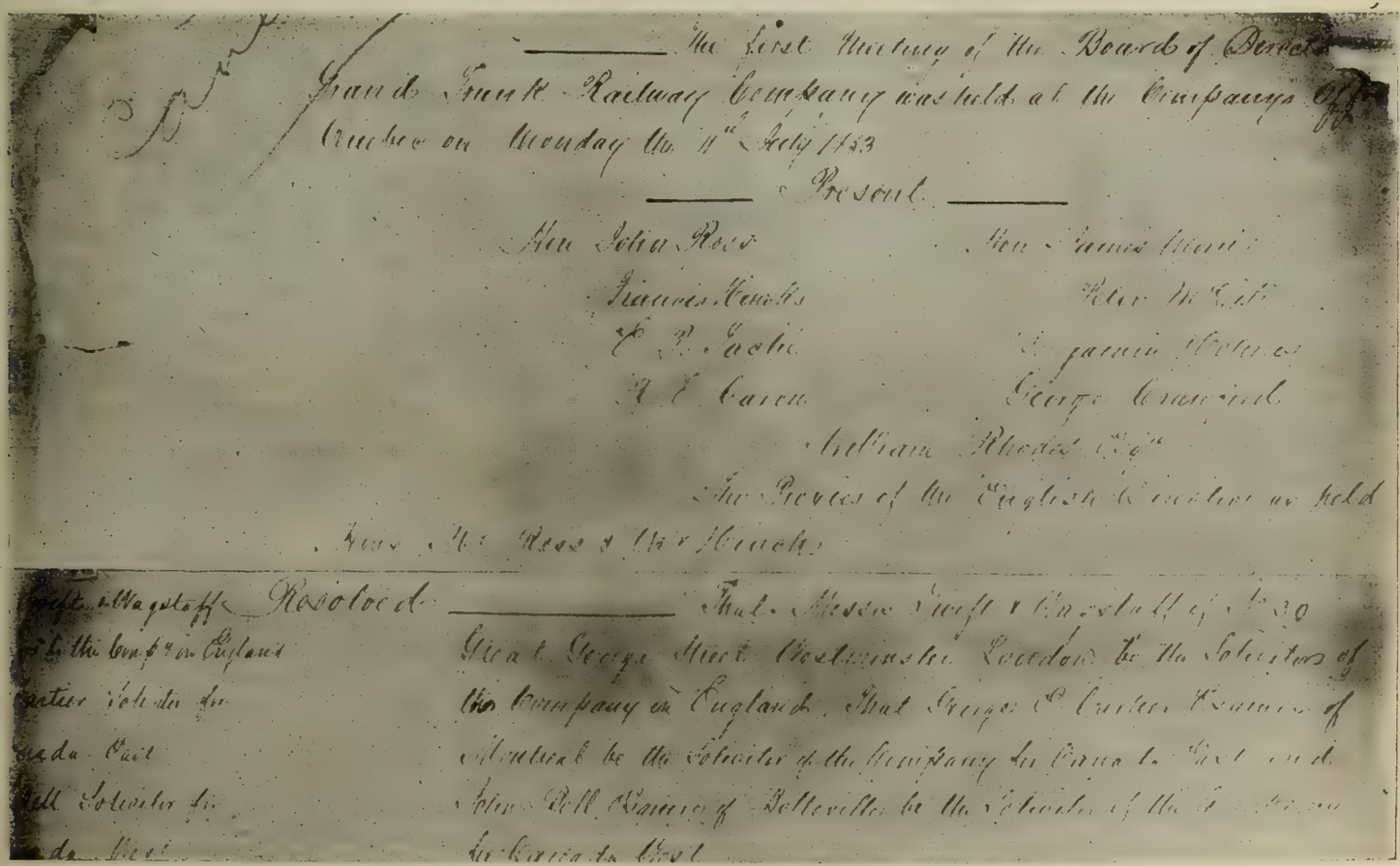
Some Facts and Figures Relating to Canadian Railroads*

By C.T.R.

Railroading has filled a large place in Canadian life and progress from a date around some three decades preceding, and all the way through the Confederation period. Nor is this to be wondered at where account is taken of our gigantic territorial area, our agricultural and mineral wealth, and the opportunities arising therefrom to establish and develop manufacturing and general industrial enterprises. The part played by our railroads has been to bring to and place the man in touch with Canada's variety opportunity.

VICISSITUDE has been as marked in Canada's railroad enterprise as it has been in the spheres of her agricultural, commercial, and industrial endeavor. Despite the progress and development that have taken place since 1836, in which year the first steam railroad train operated on Canadian soil between Laprairie and St. Johns, P.Q., it cannot be truly said taking in toto, the situation as we find it to-day, that the foundation on which our railroad fabric rests is as substantial as is desired, or as had been anticipated. The railroad situation in Canada at the present time furnishes a variety of essentials to constitute it into a burning question, politically and industrially; regarding the merits or demerits of this

*Compiled for the "Mail and Empire" special Confederation Number, and reproduced here.



The First Meeting of the Board of Directors of the Grand Trunk Railway Company was held at the Company's Office Quebec on Monday the 11th July 1853

Present

Hon John Ross — Hon James Morris
Francis Hawkes — Peter McGill
E. P. Tache — Benjamin Holmes
R. E. Caron — George Crawford
William Rhodes Esq.

The Proxies of the English Directors were held by Hon. Mr. Ross & Mr. Hawkes

Resolved — That Messrs Swift & Campbell of No. 30 Great George Street Westminster London be the Solicitors of the Company in England. That Messrs Carter & Carter Barristers of Montreal be the Solicitors of the Company for Canada East and John Bell Barrister of Belleville be the Solicitor of the Company for Canada West

REPRODUCTION OF THE MINUTES OF THE FIRST MEETING OF THE GRAND TRUNK RAILWAY CO.

particular phase of the subject, it is not, however, the purpose of this article to discuss.

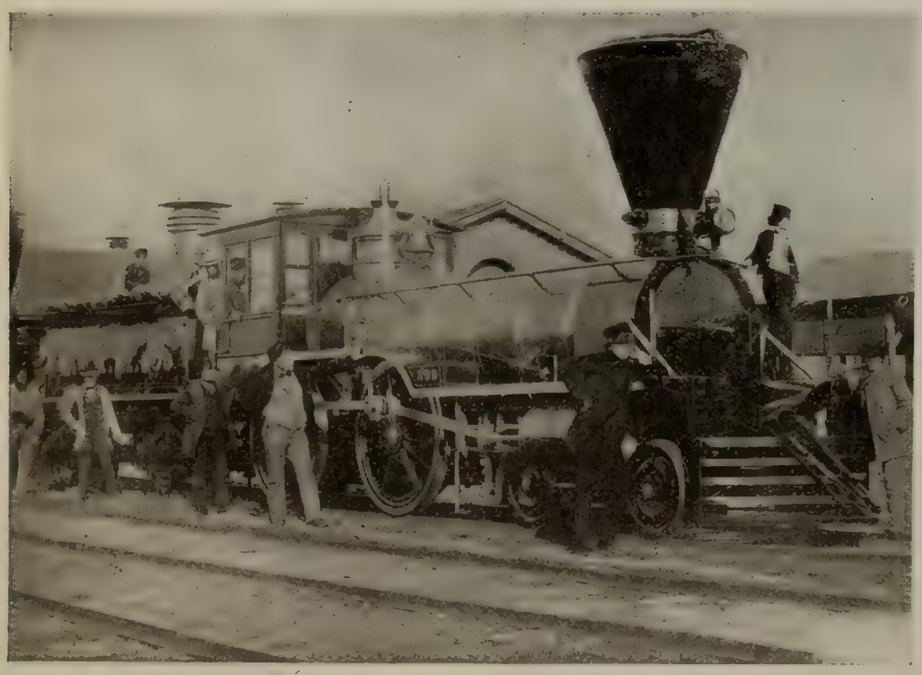
Our Railroad Systems

The group of steam railroads established and now operating within the Dominion may be said to consist of the Grand Trunk Railway System, the Canadian Pacific Railway, the Canadian Northern Railway, and the Canadin Government Rilways, the latter embracing the Intercolonial Railway between Montreal and the Maritime Provinces, and the Grand Trunk Pacific connecting with same at Levis, P.Q., by car ferry to Quebec City, and from there across the continent to Prince Rupert, B.C. Having regard to the territorial extent of our country, there does not appear to exist a superabundance of company organizations, even including the Government-controlled unit; on closer investigation, however, it will be found that we are overstocked as regards transcontinental railroads and shy in the branch line feature.

Railroads are in the nature of life-givers to every country, be the latter young or old as is our habit of classification. In the opening up and development of a new land they are at this stage of the world s history of the greatest importance, and no better exemplification of the truth of this assertion is available than is evidenced by this Canada of ours. Without our railroads, not a tithe of the existing agricultural activity, nor of our mineral resources development would have been possible, and without the agricultural and mineral progress that has taken place, our commercial and manufacturing achievement would have been a sheer impossibility. The most important business in the world is farming, and in this war time—more particularly since Germany's submarine activities became so virulent, we have been made to realize the full meaning of the foregoing statement. Food, by nature is the primal need. In a country such as ours, with its prodigal endownment of not only the wherewithal to raise food crops in abundance, but of natural resources in the spheres of lumber and minerals, all of which pertain to national as well as individual well-being, and because of the increase, the problem of transporting the surplus naturally arose, and through the medium of our railroad installations, same was and is being solved. It is, of course, realised that our magnificent fact that these have been and still are available in quantity far exceeding our own needs, and without doubt will continue so regardless of our population lake, river, and ocean waterways bear a large share of our carrying traffic, notwithstanding, our railroads have claimed and are filling a place both adjacent to and well removed from the sphere of ships and shipping.

NO. 1 C.P.R. LOCOMOTIVE "COUNTESS OF DUFFERIN" AT WINNIPEG.

Railways have been built in territories, the only product of which had been buffalo skins, through forests, the only denizens of which were moose, caribou, and other more or less wild creatures. Heavy financial burdens have been shouldered, and seemingly insurmountable natural obstacles have been brushed aside, as a result, Canada has become to a large extent self-sufficient and self-supporting, in addition taking her place as a world provider. Where the buffalo ranged, there are now to be seen thousands upon thousands of acres of waving grain each season, and when the harvest is in full swing, wheat alone, flows through the city of Winnipeg, Province of Manitoba, at the rate of over one and a quarter million bushels per day, equal to a solid train of cars ten miles long and more. Production is increasing with each succeeding year, all of which has been made possible by the railroad builder.



GRAND TRUNK RAILWAY LOCOMOTIVE BUILT IN THE COMPANY'S SHOPS IN 1859, AND WHICH HAULED THE ROYAL TRAIN WITH THE PRINCE OF WALES (KING EDWARD VII.) ABROAD THROUGH CANADA IN 1860.

GRAND TRUNK RAILWAY SYSTEM

THE Grand Trunk Railway System is closely allied with the early history of the Dominion of Canada and has contributed materially to her subsequent development and progress. Besides being Canada's pioneer railway, the G.T.R. has the unique distinction of being classed among the pioneer railways of this North American Continent, having been incorporated in the year 1852. In the lapsed period, it has acquired by lease, amalgamation, and purchase, numerous other roads of small to medium mileage, the whole being now embodied in one large system of over 7,000 miles. The territory served is that of the most thickly settled and productive of the Dominion—the eastern part; in addition, its ramifi-

cations through the medium of branch lines and feeders are so comprehensive in scope as to serve efficiently the requirements of industry and satisfy fully the lust for health and recreation on the part of those on the lookout for opportunity.

Inception of the Road

No chapter in Canadian history makes more interesting reading than that relating to the inception of the Grand Trunk Railroad. The story takes us back from the present day of high powered locomotives, of luxurious passenger cars with interiors of African mahogany and fitted with every known safety device, to a time when transportation was in a very primitive state.

After the completion of the first steam railway on the American continent—the Baltimore & Ohio, in 1828, the little colony of Lower Canada projected a line from Laprairie to St. John's, Quebec, linking the Richlieu and St. Lawrence rivers and providing a through rail and water route between Montreal and New York. This was opened in 1836. The rails were of wood with flat pieces of iron spiked to them. The first locomotive used on the line was known as the "Kitten," but the engine proved refractory and horses were substituted for it. It is related, however, that on practical advice being obtained, the engine was pronounced to be in good order, requiring only "plenty of wood and water." The opinion proved correct, as the "Kitten" later attained a speed of 20 miles an hour. This little road was afterwards taken over by the Grand Trunk and may be said to constitute the beginning of the present corporation.

So little progress was made, however, in railway construction between 1836 and 1850 that in the latter year there were only fifty-five miles of railway in all the provinces. Government guarantees gave an impetus to the work at this period and

C.P.R. A TRANSCONTINENTAL ROAD. DRIVING THE LAST SPIKE AT CRAIGALLACHIE, NOV. 7TH, 1885.

on request of both the Upper and Lower Provinces—Confederation was still fifteen years distant—the Grand Trunk System was incorporated to give the country real railway facilities. Some construction work had been done on a railway planned to link up Montreal with the Atlantic seaboard at Portland, thus securing the advantages of being open for traffic all the year round. Railway work was also going on in what is now known as the Province of Ontario. The prospectus of the Grand Trunk Railway was issued when arrangements for the fusion of existing companies were concluded. Seven members of the Executive Government of Canada were on the Board of Directors, together with powerful financial representatives of London, England. Baring represented one banking house, and Glyn another, and on the issuance of stock there was great disappointment among those who failed to be allotted the amount asked for.

First G.T.R. Meeting

The first meeting of the Grand Trunk Railway Company was held in the city of Quebec on Monday, July 11, 1853, at which the Board of Directors were elected as follows:—

In London: Thomas Baring, M.P.; Geo. Carr Glyn, N. Wollaston Blake, Robert McCalmont-Kirkman, D. Hodgson, Wm. Thompson, M.P.

In Canada: Hon. John Ross, Benjamin Holmes, M.P.; Hon. Francis Hincks, Hon. E. P. Tache, Hon. James Morris, Hon. Malcolm Cameron, Hon. Peter McGill, Hon. R. E. Caron, Geo. Crawford, M.P.; W. H. Ponton, R. J. Whittemore, and Wm. Rhodes.

The plans of the company called for the completion and operation of the lines of railway between Montreal and Portland, via Richmond and Sherbrooke; the building of a line from Riviere du Loup, via Point Levis to Richmond; the bridging of the St. Lawrence at Montreal, and the extension of the line from Montreal to Sarnia. The Government directors were afterwards dropped from the board but, in spite of its many financial trou-

GRAND TRUNK STATION AT TORONTO IN 1857. —From a painting by W. Armstrong.

bles, the scheme as outlined was completed, and, needless to say, assisted materially in the development of the territory which it served.

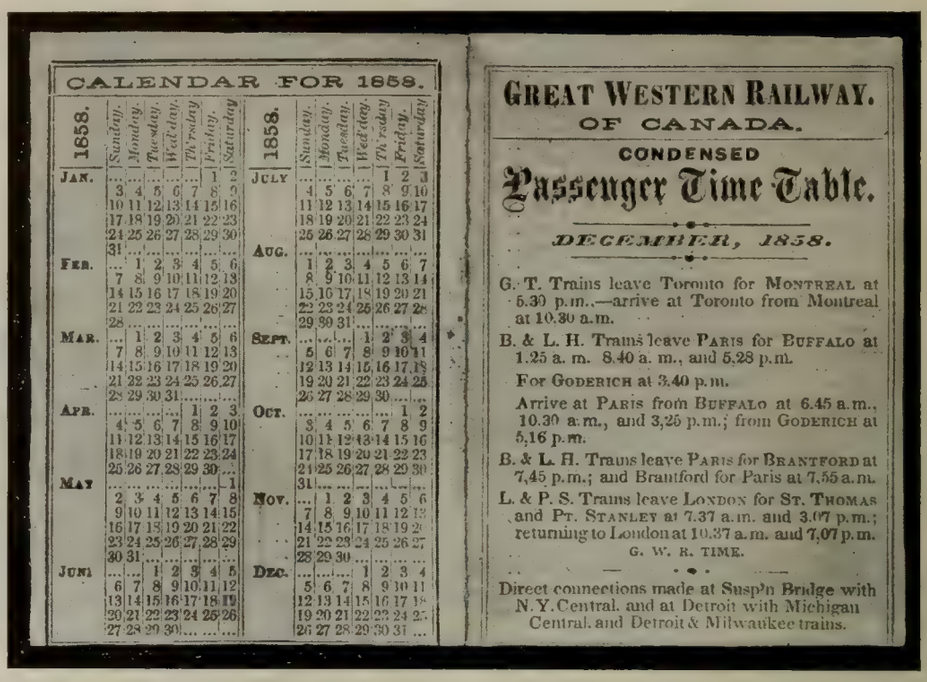
Sectional Development

Various sections of the road were opened as follows: From Portland to Montreal, in 1853; from Richmond to Quebec in 1854; from Montreal to Toronto in 1856; from Toronto to Sarnia in 1858. The original system was completed in 1859 when the Victoria tubular bridge over the St. Lawrence at Montreal was opened for traffic. The line from Detroit to Port Huron was leased in 1859, the Champlain lines in 1863, and the Buffalo and Huron in 1867.

A turning point in the railway's history came in 1867 when Sir Henry Tyler visited Canada and under instructions of the Board of Directors made a special inspection and report regarding existing conditions and future prospects. The report urged the extension of the railway through to Chicago—then the growing emporium of the Great West—recording, as it did, a population of 220,000 souls in 1867, with "a commerce that was one of the marvels of the age." Its commerce has increased proportionately since.

The Matter of Track Gauge

The original gauge of the road was 5 ft. 6 in., except that portion between Port Huron and Detroit, which was 4 ft. 8½ in. Sir Henry Tyler advised that the former be made standard, and the latter for the 60 miles between Port Huron and Detroit be changed to conform thereto. However, in 1874, the gauge of the entire road was altered to the present standard of 4 ft. 8½ in., so as to conform to the practice of North American railways generally, not to speak of the many benefits derivable and economies procurable from the facilities arising from unrestricted car interchanges. The new line to Chicago was completed and opened for traffic in December, 1881, being re-organized in 1900 under the name of the Grand Trunk Western Railway Co., and financed at the same time so as to provide cash for laying the second main track; the latter was practically completed by December, 1903.


CALENDAR FOR 1858.

GREAT WESTERN RAILWAY. OF CANADA.

CONDENSED

Passenger Time Table.

DECEMBER, 1858.

G. T. Trains leave Toronto for MONTREAL at 5.30 p.m.,—arrive at Toronto from Montreal at 10.30 a.m.

B. & L. H. Trains leave PARIS for BUFFALO at 1.25 a. m. 8.40 a. m., and 5.28 p.m.

For GODERICH at 3.40 p.m.

Arrive at PARIS from BUFFALO at 6.45 a.m., 10.30 a.m., and 3.25 p.m.; from GODERICH at 5.16 p.m.

B. & L. H. Trains leave PARIS for BRANTFORD at 7.45 p.m.; and Brantford for Paris at 7.55 a.m.

L. & P. S. Trains leave LONDON for ST. THOMAS and PT. STANLEY at 7.37 a.m. and 3.07 p.m.; returning to London at 10.37 a.m. and 7.07 p.m.

G. W. R. TIME.

Direct connections made at Susp'n Bridge with N.Y. Central, and at Detroit with Michigan Central, and Detroit & Milwaukee trains.

As the result of severe competition bethemselves, the Grand Trunk and the Great Western Railway of Canada amalgamated in 1882. The Great Western controlled lines from the Niagara River to Detroit and Sarnia, as well as the line of the Detroit, Grand Haven & Milwaukee Railway Co., which was built across the fertile State of Michigan from Detroit to Grand Haven, Mich., a port on the lake opposite the city of Milwaukee, Wis. The mileage of the Great Western at the time was 838 miles, and that of the Detroit, Grand Haven & Milwaukee, 189 miles, a total of 1,027 miles being thereby added to the Grand Trunk Railway System. During the immediately succeeding years the following roads were acquired:—

Midland Railway of Canada	472.50
Northern & North Western Ry. ..	482.5
Michigan Air Line	105.60
Toledo, Saginaw	116.41
Beauharnois Junction	19.00
Jacques Cartier Union	6.54
G. T., Georgian Bay & Lake Erie	208.29
Cobourg, Blairton & Marmora ..	14.50
Waterloo Junction	11.73
	1,437.07

The weight of rails on main lines which may be said to have started off at 60 pounds per yard, has, due to the development in rolling stock, now reached a figure almost double; replacements in fairly rapid succession involving first 70 pounds, then 80 pounds, and in more recent years, 100 pounds per yard.

Directorate Reorganized

The Board of Directors of the Grand Trunk Railway located in London, England (to which city the directorate had been transferred from Canada in 1862), was reorganized in June, 1895, with Sir Charles Rivers Wilson as president, and Joseph Price as vice-president. On January 1, 1896, Charles M. Hays (then vice-president and general manager of the Wabash Railway, St. Louis, Mo.), was appointed general manager, with headquarters at Montreal, being the chief executive official in Canada. After the new organization had assumed control, the Central Vermont Railway, with mileage of 513 miles, was acquired, included with the above mileage being the leased lines of the New London Northern Railway, extending from Londonderry, Vt., to New London, Conn., a mileage of 159.5.

In 1902, the Grand Trunk Western Railway acquired jointly with the Toledo, St. Louis & Western Railway the entire capital stock of the Detroit & Toledo Shore Line R.R., extending between Detroit and Toledo.

FIRST DAILY PASSENGER TRAIN FROM THE EAST AT C.P.R. DEPOT, FERNIE, B.C.

The next important addition to the present Grand Trunk System was the purchase of the capital stock of the Canada Atlantic Railway Company, with lines of railway extending from Depot Harbor (on Georgian Bay) to Alburg Junction, Vt., with branch lines from Glen Robertson to Hawkesbury, Ont., and from South Indian to Rockland, Ont. In 1905 a modern car ferry line was established across Lake Michigan, between Grand Haven, Mich., and Milwaukee, Wis. A similar car ferry service was also established across Lake Ontario, between Cobourg, Ont., and Charlotte, N.Y., where connection is made with the Buffalo, Rochester & Pittsburg Ry.

Among other extensive improvements added to the Grand Trunk Railway System, should be mentioned the grain elevator facilities located at various important tide water and lake terminals, including Portland, Me.; Montreal, Midland, Tiffin, Depot Harbor, Goderich, Sarnia, and Fort William; the new terminal and magnificent hotel, "The Chateau Laurier," at Ottawa; the new Montreal offices of the company, while extensive improvements have been made to the great bridges owned by the railroad, including the reconstruction of the Victoria Jubilee bridge across the St. Lawrence at Montreal.

The presidents and general managers who served the company during various terms are as follows:—

Presidents

Hon. Jno. Ross—1852-1862.
Sir Edward Watkin, Bart.—1862-1869.
Richard Potter—1869-1876.
Sir Henry W. Tyler—1876-1895.
Sir Charles Rivers-Wilson—1895-1910
Charles M. Hays (elected)—1910-1912.

General Managers

Sir C. P. Roney (managing director)—1853.
T. E. Blackwell (managing director)—1853-1862.
C. J. Brydges—1862-1874.
Sir Joseph Hickson—1874-1890.
L. J. Seargent—1891-1896.
Chas. M. Hays—1896-1901.
Geo. B. Reeve (one year)—1901.
Chas. M. Hays (vice-president and general manager)—1902-1910.

Alfred W. Smithers was elected the first "Chairman of the Board" in January, 1910, upon the retirement of Sir Charles Rivers-Wilson from the presidency. Following the death of Mr. Hays, Edson J. Chamberlin, who had built the Canada Atlantic Railway, and was at the time vice-president and general manager of the Grand Trunk Pacific, succeeded to the presidency of the Grand Trunk System and all its subsidiaries, save the Central Vermont; of it Mr. Chamberlin became Chairman of the Board of Directors. The Grand Trunk Railway System with its subsidiary lines, exclusive of the Central Vermont and Grand Trunk Pacific, has now a mileage of 4,785 miles, and owns and operates the following rolling stock, in addition to service, equipment, and locomotive and car shops at strategical points.

Locomotives	1,373
Passenger Cars	1,196
Freight Cars	46,430

The capital of the System, again omitting the Central Vermont and the Grand Trunk Pacific, is $450,902,895.

Service in Terms of Population

In the forty principal cities and towns of Canada there is a total population of 2,918,788. These figures are given in the publication "Canada, the Country of the Twentieth Century," prepared by Watson Griffin, and issued from Ottawa by the authority of the Minister of Trade and Commerce, Sir George Foster. They are based upon estimates furnished by the various city clerks and city assessors, and may be considered approximately correct. An examination of these statistics shows in a very striking fashion the notable part which the Grand Trunk System plays in the commercial life of the Dominion. The cities and towns served by the railway and steamship lines owned and operated by the Grand Trunk System have a population, according to these official statistics, of 2,606,435. The Grand Trunk thus serves over 89 per cent. of Canada's urban population grouped in its forty principal centres. In addition, it serves hundreds of communities with populations of less than 12,000, which is the minimum figure for inclusion in the Watson Griffin list.

System Mileage Detail

The Grand Trunk Railway System as now constituted, commences at the eastern termini of the main lines across from the city of Quebec on the St. Lawrence River; at Portland, Maine, on the Atlantic Coast; and at Rouse's Point, on Lake Champlain; extending from the first-named along the shore of the St. Lawrence to Richmond, P.Q., where is formed the junction with the line from Portland, thence running westerly, being joined at St. Lambert by the main line from Rouse's Point, and crossing the St. Lawrence River to Montreal by way of the Victoria Jubilee Bridge. From Montreal the line continues westerly through the thickly settled country along the north shore of the St. Lawrence River and Lake Ontario to Toronto, from thence with diverging lines to the south and west to the fertile Niagara Peninsula, to Niagara Falls and Buffalo, to Windsor and Detroit, to Sarnia, to Niagara Falls and Buffalo, to Windsor and Detroit, to Sarnia and Port Huron, and Chicago, and northerly from Toronto to the ports of Goderich, Kincardine, and Southampton, on Lake Huron; to Wiarton, Owen Sound, Meaford, Collingwood, Midland, and Depot Harbor, on the Georgian Bay; and through the now famous "Highlands of Ontario" to North Bay. A glance at the railway map of Canada, and particularly that relating to the Province of Ontario, will show how thoroughly and completely this pioneer railroad has established its numerous feeders at points of advantage. Of its five main lines from east to west, a total of 650 miles is double-tracked, constituting thereby a claim to being the only double-track railroad in Canada, which reaches a majority of industrial centres.

VICTORIA TUBULAR BRIDGE, MONTREAL. GRAND TRUNK RAILWAY SYSTEM—OPENED FOR TRAFFIC BY H.R.H. THE PRINCE OF WALES, AUGUST 25TH, 1860.

Road's Interest in Its Apprentices

The education and training of its apprentices is an important feature of the operating side of the G.T.R. activities. At each of the locomotive and car building and repair shops distributed over the System, instructors are employed, their duties being to give both theoretical and practical training to the lads on the payroll in the various branches of the motive power side of railroading. Much success

has resulted from the initiation of this scheme, and due to the fact that an examination is held annually in which the apprentices from all over the System compete for prizes offered by the management, not only is a healthy rivalry created, but the ultimate effect is such that quite a little army of highly skilled mechanic is each year added to the productive capacity of the Dominion to the end that we are all the time becoming more fit as a manufacturing community to not only hold our own, but take and maintain a competitive place in the arts, crafts, and manufactures of the world.

THE CANADIAN PACIFIC RAILWAY

PERHAPS the chief cause of Canada's development in recent years, and still operative in accelerat- is still operative in accelerating degree, may be traced to the construction of the Canadian Pacific Railway from Montreal through to the Pacific Coast. The work was undertaken in the face of almost insurmountable difficulties at a period quite early after Confederation, and when both the agricultural and mineral wealth of our Great West were practically unknown and, therefore, unappreciated. It has been stated that without Confederation the construction of a railway uniting the Maritime Provinces with the then Upper and Lower Canada, and the latter with the almost unpeopled North-west Territory and British Columbia, would have been delayed for quite a number of years. Further, we understand that the construction of a railroad to link up Eastern Canada with the seaboard of British Columbia was among the inducements held out to the latter to enter into the pact of Confederation.

However these may be, it is known that the Federal Government in the decade or more following Confederation had under consideration a number of schemes whose objective was the construction of a transcontinental line, but nothing came of them, and not until the Canadian Pacific Syndicate signed a definite contract to proceed with and complete the work were the hopes of those concerned likely to be realized. Not withstanding the now spectacular success of the great undertaking, opinions were freely expressed at the time that even if it were ultimately finished, "the net profits would be insufficient to pay for the axle grease." In the light of Canada's present engineering capacity and length of purse, the launching of a similar proposition and its rapid and successful accomplishment would not be considered much beyond the commonplace, but at that early period in our national career, the engineering and financial problems were of a stupendous nature, particularly the latter, evidence of which is to be found in the fact that it was "nip and tuck" whether not only the C. P. R. failed, but whether in such a circumstance our banks and manufacturing establishments then operating would not also be caught in the maelstrom. Our national credit, in the light of early future development of our agricultural, mineral, and industrial resources was, needless to say, largely at stake.

VISIT OF KING GEORGE AND QUEEN MARY (THEN DUKE AND DUCHESS OF YORK), TO THE VICTORIA JUBILEE BRIDGE, MONTREAL, OCTOBER 16TH, 1901. KING EDWARD DROVE THE LAST RIVET IN THE OLD VICTORIA TUBULAR BRIDGE IN 1860.

Building the Transcontinental Road

In brief, the undertaking of constructing a transcontinental road as agreed to between the contractors and the Government was as follows:—A line was to be built and completed between Montreal and Port Moody, B.C., within a period of ten years, towards which the syndicate were to be subsidized to the extent of $25,000,000 in cash, and were to be given a land grant of 25,000,000 acres in the North-West. In addition, the Government were to hand over to the C.P.R. an existing railway line in British Columbia, of some

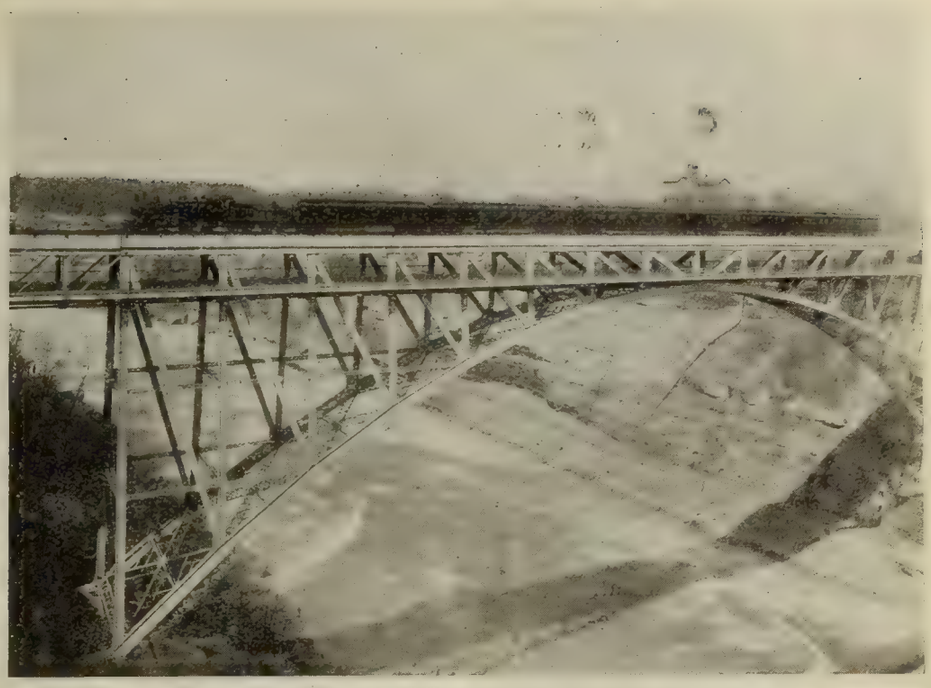
VICTORIA JUBILEE BRIDGE, MONTREAL—GRAND TRUNK RAILW AY SYSTEM—OPENED FOR TRAFFIC, DECEMBER 13TH, 1898.

225 miles in length, also a railway line between Winnipeg and Lake Superior, of some 425 miles in length, both lines being at the time under construction by the Government. The C. P.R. syndicate consisting of R. B. Angus, George Stephen, and Donald Smith —the two latter being afterwards known as Lord Mount Stephen, and Lord Strathcona, respectively, had been interested in the reorganization of an American railroad—afterwards known as the St. Paul, Minneapolis and Manitoba Railway Co., and not only had their efforts been crowned with success, but they had individually realized large fortunes in the process. As a consequence, it was felt that they could be trusted to make good in whatever else they undertook, even to the building of a transcontinental railroad across the Dominion.

The initial move of the syndicate was to organize the Canadian Pacific Railway Co., this being followed by the latter assuming the construction contract already noticed. Work was started in the year 1881, with William Van Horne —later, Sir William Van Horne—in general charge, and was pursued vigorously west of Winnipeg and along the north shore of Lake Superior, with a view to early completion. Some sections of the work were naturally more difficult to negotiate than others, and therefore cost more comparatively, a circumstance and experience common alike to railroad construction and all classes of engineering undertakings on a big scale.

It was neccessary, of course, that the company find a market for its securities, and in view of the heavy drain on its financial resources as a result of the unforeseen expenditures required to overcome construction obstacles, it was highly important that same be readily available. Unfortunately this was not so, largely due to the efforts of opponents of the enterprise, who took advantage of every emergency to criticize the project adversely, and generally throw cold water on it without stint. Towards the end of 1883, the company's exchequer was practically empty, and to keep things going it became necessary for Angus, Stephen, and Smith to lend their credit until a market for the company's securities could be found, or additional Government assistance be forthcoming. Early in 1884, the Government loaned the company the sum of $30,000,000, taking as security everything available whether in the form of road already finished or in process, and all other manner of assets possessed by it.

The disbursements during the following year—1884 were, however, on such a big scale that, before its close, the $30,000,000 loan received from the Government had become exhausted and the financial position of the company had become worse than ever, if that were possible. At this point it should be borne in mind that quite substantial progress had been made in the building of the road, and that the money spent had gone for that purpose. Little wonder is it then that with financial disaster again staring the company in the face that George Stephen, the President of the C.P.R., and Donald Smith his associate. made personal loans, and gave personal guarantees to an extent that jeopardised their individual fortunes, all in order that the company might not only continue the work of construction, but bring it to a successful conclusion.



THE GRAND TRUNK RAILWAY SUSPENSION BRIDGE OVER THE NIAGARA GORGE, AN ENGINEERING ACHIEVEMENT OF THE PAST HALF CENTURY.

Despite the desire of the then Premier, Sir John A. Macdonald, to co-operate to the fullest extent possible so that the road might be completed, he evinced a hesitancy to commit the Dominion Government still further by way of loan advances. Politics and personalities are understood to have also been active against further aid. In the end the reputation of our country in the eyes of the world, and instinct as to what the completion of the road would mean to our future progress, prevailed; as a result, a temporary additional loan of $5,000,000 was made in the early part of the year 1885.

Completion of the Road

This last loan enabled the road to be completed through to Port Moody, the last rail being laid and the last spike driven by Lord Strathcona. The line

MOUTH OF THE ST. CLAIR TUNNEL, AN INTERNATIONAL LINK BETWEEN CANADA AND THE UNITED STATES. THE G.T.R. TRAINS ARE HAULED BY ELECTRIC LOCOMOTIVES THROUGH THIS TUNNEL, WHICH CONNECTS SARNIA, ONT., AND PORT HURON, MICH.

was finished in four years instead of ten which speaks volumes for the energy displayed by those most immediately concerned and interested. In the course of the year 1885, a market was found for the Company's Bonds to the amount of $35,000,000 out of the proceeds of which the government was paid in full, except that, in part payment, the latter consented to take back some 7,500,000 acres of land as representing in value $10,000,000 of the advances.

Dawn of C.P.R. Prosperity

Gradually, with the construction of the transcontinental road off its hands, the Canadian Pacific Railway Co., developed stability, so much so that in the year 1894, when so many railroads on this continent went into the hands of receivers, the worst that happened as far as the C.P.R was concerned, was the suspension of its 5 per cent. dividend for the latter half of that year, and the first half of 1895. Within twelve months, however, payments were resumed, and the progress made since, has been both steady and substantial. In 1890, the net earnings amounted to $6,300,000; while

DOUBLE TRACK MAIN LINE ON THE GRAND TRUNK RAILWAY SYSTEM BETWEEN MONTREAL AND CHICAGO.

LOCOMOTIVE ERECTING DEPARTMENT, C.P.R. ANGUS SHOPS, MONTREAL.

for the year ending June 30th, 1916, the net earnings, excluding those of the Pacific Coast Steamships, Commercial Telepgraph, and News Department, amounted to $36,996,435.44. In the early days of the road's operating activities, the capital stock of the C.P.R. amounted to $65,000,000, and as showing the growth and progress of the road since then, no better evidence could be forthcoming than that which the present capital stock of $260,000,000 (ordinary) demonstrates.

C.P.R. Mileage

The total length of the road as first planned betwen Montreal and Port Moody, B.C., was 2,285 miles; to Vancouver, the present Western Terminal, it is 2,898 miles. The original line ran through Winnipeg, Brandon, Regina, Moose Jaw, Medicine Hat, Calgary, through the Kicking Horse Pass by Banff and Sicamous Junction to Vancouver, but since then a perfect network of lines has been run north and south of it from Winnipeg or from stations some distance west of Winnipeg. There can be little doubt that in the near future an extension will be made in a north-westly direction through the Peace River District, and thence ultimately find an outlet by some comparatively easy northern pass through the Rockies to the Pacific. Already by the Southern extension the company has found another pass through the Rockies—the Crow's Nest Pass, which established the important towns of Lethbridge and MacLeod, and brought into notice and service the coal deposits of Southern British Columbia, and also gave another line of access to the fruit-growing valleys of British Columbia, besides those already in existence from Revelstoke and Sicamous Junction.

The mileage of the C.P.R. lines, including those owned, leased, operated for owners, on which running powers have been granted, etc., according to the Annual Report for the year ended June 30, 1916, is as follows:—Eastern Division, 1609.4 miles; Ontario Division, 1508.6; Lake Superior Division, 1110.2; Altantic Division, 783.5; Manitoba Division, 2463.8; Saskatchewan Division, 2150.1; Alberta Division, 2530.3; British Columbia Division, 1221.3. Mileage included in traffic returns as at June 30th, 1916, totalled 12,993.6, which together with other lines operated of mileage 383.6, makes a grand total of 13,377.2 miles. Of controlled roads, mileage of 4228.3 and 627.7 belong to the Minnea-

GENERAL VIEW OF THE C.P.R. ANGUS SHOPS, MONTREAL.

polis, St. Paul & Sault Ste. Marie, and Duluth, South Shore & Atlantic Railways respectively.

Double Tracking and Grade Reduction

Double tracking of the System has now been in progress for a considerable number of years, as has also been the modification of grades, more especially in the West, and there is little doubt that very great progress as regards the former would have been recorded at this date had not the war supervened. The construction of the Connaught Tunnel noticed later was undertaken with a view to grade modification.

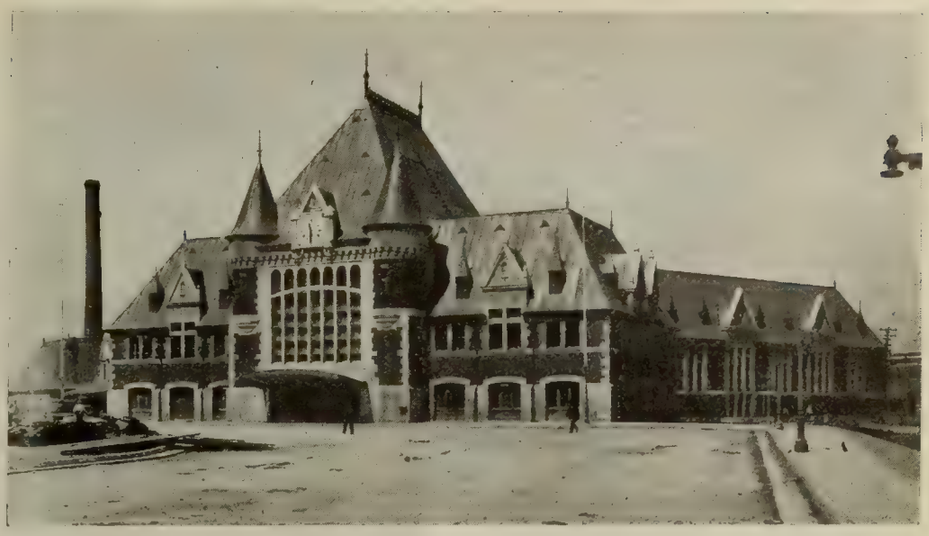
Physical Assets

The assets of the road as per the statement already referred to amount to the substantial total of $960,217,057.89, same including railways, rolling stock, ocean, lake and river steamships; lands, locomotive and car shops, hotels, offices, investments, cash on hand, etc. The rolling stock belonging to the company at 30th June, 1916, was made up as follows: Locomotives, 2,255; first and second class passenger cars, baggage cars, and colonist sleeping cars, 2,183; firt class sleeping, dining and cafe cars, 498;parlor cars, official, and paymasters' cars, 100; freight and cattle cars, all kinds, 87,108; conductors' vans, 1,420; boarding, tool and auxiliary cars, and steam shovels, 6,867. Of the first and second class passenger cars, baggage, and colonist sleeping cars, 12 on the St. John and Boston line, 14 on the Montreal and Boston line, and 19 on the Toronto, Hamilton, and Buffalo line, are outside owned to the extent of 80.04, 68.33, and 63.96 per cent. respectively.

C.P.R. CONNAUGHT TUNNEL ENTRANCE.

Revenue From Land Owned

Naturally with the settlement that has taken place in Western Canada, during the past two decades or less, the land received when construction of the road was undertaken has become a very material source of revenue, and as a comparatively trifling amount of the land then received has so far passed out of the company's control, it will be apparent that income from that quarter will continue for a long period of years to supplement that derived from the purely transportation side of the C.P.R. business.



NEW C.P.R. STATION IN QUEBEC CITY.

C.P.R. Welfare Activities

Welfare of the country, also welfare and well-being of its myriad employees, on the road, on board its ships, in its shops and offices, and of the settlers on it lands, are outstanding features of Canadian Pacific Railway Co. administration, and in this war time exemplification has been had of its Empire spirit in ways and manner too numerous to detail here. The quite recent offer of a loan of $10,000,000 to the Imperial Munitions Board for munitions purchases, and its proposition to raise a sum of $200,000,000 on the road's credit for behalf of the Imperial Government, are perhaps sufficient to cite here. As in the case of the Grand Trunk Railway System, the C.P.R. is also in the marine field, and that on a quite comprehensive scale, owning as it does fleets of ships not only on our great and small inland lakes, but palatial vessels of heavy tonnage plying on our British Columbia coastal waters, and on the broad Atlantic and Pacific Oceans.

Connaught Tunnel

The year 1916 was an interesting one in the history of the Canadian Pacific Railway. It was a year of progress, however, even though the Dominion was still struggling in the great war. As compared with the previous year there had been a tremendous revival of trade. Several important works for which appropriations were made before the war, realized completion, the most important being that of the Connaught Tunnel through Mount MacDonald, in the Selkirk Mountains. The accomplishment of this task is a triumph of engineering and labor seldom equalled anywhere. It is the longest double tracked tunnel in

C.P.R. WINDSOR STREET STATION, MONTREAL.

the Western Hemisphere. The length is about 5 miles. The work was performed in two and a half years, constituting a world's record. The number of men employed was about 600. The Connaught Tunnel to the C.P.R. means the elimination of several miles of snowsheds, reduction of distance connecting railway points, also making effective a big grade reduction. The cost of the undertaking was $6,500,000. The amount of material taken from the bore was approximately 750,000 cubic yards, weighing in round figures over 1,500,000 tons. Much of the centre portion of the bore was through solid rock.

Previous to this achievement, the longest railway tunnel on the American Continent was the Hoosac Tunnel, 4¾ miles long, on the New York Central Railway line. The work of the Connaught Tunnel began in January 1914 and progressed steadily until completion. An interesting feature of the boring operations with regard to the soft material at the start for the main tunnel at the western end was the use of hay to knit together the earth and water which oozed forth like a bleeding wound as the excavation proceeded. The hay was placed in handfuls between the wooden supports used to keep the shafts from falling in.

The tunnel which is 29 feet wide and 23 feet high follows a straight line under Mount MacDonald, emerging in the Beaver Valley at a point about 1,000 feet below the present line. The eastern entrance is directly below Hermit, a station just east of Rogers Pass. The highest point reached in the tunnel is 3,795 feet above the sea level, and 4,065 feet below the summit of MacDonald Peak. The passage through the mountains has a grade of 1 per cent. up to the interior summit. Previous to the war the C.P.R. annually spent from $25,000,000 to $35,000,000 on the development of the West, and the excavation of the Connaught Tunnel during the period of hostidlities shows that Canada is strong to advance at home as she is undoubtedly strong to fight abroad.

C.P.R. "IMPERIAL LIMITED" PASSING ST. ANNE'S, P.Q.

On July 17, 1916, his Royal Highness, the Duke of Connaught, then Governor General, paid a visit to the tunnel and complimented the Canadian Pacific Railway on the progress that the company was making. He baptized the undertaking as "The Selkirk Tunnel," but some weeks later at the request of Lord Shaughnessy, His Royal Highness consented to have the tunnel called after himself.

Recent Station Betterments

Among recent improvements to stations along the Canadian Pacific, the most notable are the new stations erected at Quebec and North Toronto. The latter on upper Yonge Street, was formally opened on June 14th, 1916, when Mayor Church started the first train running between the new terminal and Montreal, and declared the station to be opened for traffic. Mayor Church congratulated the Canadian Pacific on its foresight and enterprise, dealt with the good relations that existed between Toronto and the Company, and referred to the offer of the old station to the city, to be used as a market place. Amongst the speakers was Sir James Carroll of New Zealand who, in expressing his felicitations, described the C.P.R. as a powerful factor in the Empire.

The design of the new station at North Toronto is a free adaption of the Italian Renaissance to the requirements of the present day. It is a single-storey building faced externally with Tyndall limestone. A spacious waiting room 70 by 50 feet of lofty proportions occupies the centre portion of the structure. To the east and west of this central block are two subsidiary wings devoted to general station facilities. To the north of the waiting room is the concourse, opening from which is the midway 20 feet wide by 150 feet long, passing underneath the tracks and from which access is had to the various overhead platforms. Flanking the building at its north-west corner is the clock tower. The vestibule under the tower leads to the concourse. A sidewalk (protected by a marquice), is laid along the south and west sides of the station. Wherever possible, and there are but few exceptions, all materials and labor employed in the construction of C.P.R. buildings are of Canadian and British origin; Canadian timber being used for all woodwork whether as rough lumber or finished millwork.

The new depot at Quebec, opened on August 10th, 1916, is a triumph of modern railway station construction. The building has a central block and two wings, is akin to the old French Chateau style of architecture, and is admirably adapted to the quaintness of our old French-Canadian city. On the occasion of the formal opening, the Mayor of Quebec referred to the advancement of the city in glowing terms, and a tribute was paid to the interest which the

C.P.R. EMPRESS HOTEL, VANCOUVER, B.C.

C.P.R. took in the welfare of the country.

The walls of the spacious waiting hall of the new Canadian Pacific Railway are beautified by a series of mural decorations representing the principal mountains from Calgary to Vancouver. The decorations are the work of Mrs. Adelaide Langford, an artist with a wide reputation.

Railroad Acquired

Recently the C.P.R. acquired the Lake Erie & Northern Railway, and by doing so brought their lines into touch with a flourishing and interesting territory in Western Ontario, running from Galt to Port Dover. The new line has connection with the Canadian Pacific main line at Galt and runs in conjunction with the G. P. & H. Railway which gives access to Berlin and intermediate points, as well as direct connection with Port Dover, Brantford, and neighboring towns. The district in which the L. E. & N. runs will benefit much by the new life which the C.P.R. is putting into the train service there. The transportation of farming produce, so abundant in that part, will be facilitated, and tourists who wish to travel in the beautiful locality will find a convenient and satisfactory service. During the year a new railway station was built at Brantford as a result of an agreement between the C.P.R. and the Hamilton Railway. The new station serves both.

Changes in Executive Personnel

Of those who took an active part in the building of the C.P.R., and helped thereafter to lay the foundations for the gigantic and prosperous corporation we find to-day, almost all have gone to their rest, R. B. Angus and Lord Mount-Stephen being possibly the only ones still with us. New blood as a result has had to be requisitioned, but all of it has the attribute of having been tried and tested in the doing and direction of big things; in consequence no setback has been experienced, rather has it been otherwise, a result largely if not wholly due to the keen judgment in selection displayed by the Chairman of the Board of Directors and President of the Company, Baron Shaughnessy, K.C.V.O.

C.N.R. WHEAT TRAIN, STATION AND ELEVATOR.

CANADIAN NORTHERN RAILWAY

DURING the closing years of the last century the necessity of opening up undeveloped lands in the West for settlers in addition to what the C.P.R. had already done, created a desire for more railways. Charters had existed for long, but the holders had not been able to interest and convince capital to make the investment. However, in 1896, William Mackenzie and Donald Mann, who had already done considerable railroad construction in various parts of Canada, undertook to build a railway in Manitoba, their charter being that of the Lake Manitoba Railway & Canal Co. On Jan. 3, 1897, the Gladstone Winnipegosis section, a distance of 123.4 miles, was opened for traffic, but the work did not stop there, for the same year saw the Winnipeg-Lake Superior line begun. On Nov. 28, 1898, the Winnipeg-Port Arthur line between St. Boniface and Marchand was opened, a distance of 45.4 miles. On Nov. 15, 1899, the Sifton Junction-Swan River line was opened for traffic.

The Canadian Northern Railway, which was incorporated in 1899, had, at the end of this year, 252.6 miles in operation and fully 500 miles under construction. The success which had attended the guarantee method of aid in Manitoba, inspired the Saskatchewan Government to follow the lead given and develop that Province by the construction of railways. In 1900, the Swan River-Prince Albert line as far as Erwood was opened for traffic a distance of 92.5 miles, also the first section of the main line to Edmonton-Gilbert Plains to Grandview, 26.6 miles, was thrown open. Following came the Marchand-Beaudette extension of the Winnipeg to Port Arthur line; this extension covered 106.1 miles. At the end of 1900, 477.8 miles of road were in operation.

In 1901, the Northern Pacific Railway lines in Manitoba were acquired by the Manitoba Government and leased for a long term of years to the Canadian Northern. The Winnipeg-Port Arthur line was extended from Beaudette to Fort Francis, and, at the close of the year, there were 884.3 miles in operation. Other activities besides actual railroad construction claimed their measure of attention in 1901, an elevator of 1,500,000 bushel capacity being built at Port Arthur, Ont., to handle the grain shipped from the newly-opened territories. In 1902, the Beaver to Gladstone line, 17.8 miles, was constructed, giving a through connection for lines built north and west of Gladstone, with Winnipeg. The Winnipeg to Port Arthur line was opened for traffic in the same year, making a total of 1,296.9 miles in operation. During 1901 and 1902, the James Bay Railway Junction line was built out to Parry Sound, Ont., to a junction with the Canada Atlantic Railway. The Great Northern Railway and the Chateauguay & Northern Railway, in Quebec Province, were acquired in 1903, and construction of the Halifax &

C.N.R. STATION, WINNIPEG, MAN., BUILT ON THE SITE OF OLD FORT GARRY.

C.N.R. COAL DOCKS AT PORT ARTHUR, ONT.

Southwestern Railway in Nova Scotia was commenced.

In 1904, considerable development work was undertaken. The C.N.R. elevator at Port Arthur was increased to 7,500,000 bushels capacity; the Winnipeg-Prince Albert north line was extended from Erwood to Melfort, 107.5 miles; the Grandview-Kamsack section of main line was opened for traffic, also the Winnipeg-Oak Point line for a distance of 54 miles. The Toronto-Sudbury line was commenced, and at the end of 1904, there were 1,932.3 miles of road in operation.

The main line, Kamsack to Edmonton, 546.3 miles, was opened for traffic in 1905, while in the same year Brandon was entered by the line from Portage la Prairie. At the end of 1905, there were 2,846.9 miles in operation. In 1906, the Qu'Appelle, Long Lake & Saskatchewan Railway connecting up Regina, Saskatoon and Prince Albert, was acquired. The Winnipeg-Prince Albert line by way of Melfort was opened, thus giving Saskatoon the first competitive line with Winnipeg and the East. In the same year the Toronto-Sellwood line through Parry Sound and Sudbury was opened for traffic. The Quebec & Lake St. John Railway, and the Niagara-St. Catharines and Toronto Railway were also acquired. At the close of 1908 there were 4,361 miles in operation. The Saskatoon-Calgary line was opened as far as Rosetown, Sask., in 1909, and during the same year the Duluth, Rainy Lake and Winnipeg Railway connecting Fort Francis to Virginia, was also in operation. The Central Ontario Railway was acquired and the Hawkesbury-Ottawa line opened for traffic. At the end of 1909 the mileage totalled 4,859.6 miles.

The next few years saw further important developments in the C.N.R. system. In 1910 the Saskatoon-Calgary line was extended to Kindersley, and the Prince Albert-Shellbrook line was opened for traffic. The Bay of Quinte Railway, the Brockville, Westport and Northwestern Railway, and the Irondale, Bancroft & Ottawa Railway were acquired. The "Royal" Line Atlantic steamship service, now a part of the Cunard System, was inaugurated in 1910. The developments in 1911 included the opening for traffic of the Vegreville-Drumheller, North and South lines in Alberta; Hudson's Bay Junction-Le Pas line; the Radville Antar (Moose Jaw) line, and the Shellbrook-Big River line. The Duluth, Winnipeg and Pacific line was also opened for traffic into Duluth, and the Toronto-Ottawa line was opened at Deseronto, Ont. The Saskatoon-Calgary line was extended to Alsask. At the close of 1911 there were 6,491.7 miles of road in operation.

In 1912, the Edmonton-Athabasca Landing line was opened for traffic, and the capacity of the C.N.R. elevator at Port Arthur was increased to 10,000,000 bushels. The Shellbrook-Denholm line and the Gravelbourg and Elrose lines were opened for traffic in 1913, making 6,967.5 miles in operation. On Jan. 1, 1914, the last spike was driven in the Montreal-Port Arthur line at Little White Otter River. The Saskatoon-Calgary line and the Toronto-Ottawa line were opened, the latter road giving connection between Montreal, Quebec, and points in Quebec Province. There were now 7,358.2 miles in operation. On Jan. 23, 1915, the last spike was driven at Basque, B.C., a point 182 miles east of Port Mann on the Transcontinental line between Quebec and Vancouver. At the end of 1915, there were approximately 10,000 miles of road in operation.

The transcontinental system is now an accomplished fact and necessary construction work was undertaken to attain this while the war was in progress. Because of the great conflict in Europe, railway finance has not gone ahead as fast as has railway construction, and therein lies the germ of the railway problem of the present day. One of the reasons for the construction of the C. N.R. line connecting the Prairie Provinces with the Pacific Coast was that it would provide an outlet for wheat and other commodities to the coast for transportation to Europe via the Panama Canal, as now recommended by the Dominion's Royal Commission in its recent reports on Canada to the British Government. The opening up of new territory for settlers and the development of inter-provincial trade were other important considerations. The opening up of the Saskatchewan Valley for American farmers particularly has proved of inestimable advantage to the people of Canada from a production point of view. The C.N.R. has also been a means of creating competition, thus tending to steady freight rates. It has also assisted in the rapid growth of population and increase in production of a large territory.

The lines of the C.N.R. are well located in view of traffic conditions and the construction of the track has been

C.N.R. SPECIAL TRAIN OF FIFTEEN COACHES DRAWN BY ONE LOCOMOTIVE WHICH INAUGURATED A TRANSCONTINENTAL SERVICE FOR ITS PARTICULAR ROAD.

C.N.R. WATERSIDE TERMINALS AT PORT ARTHUR, ONT.

accomplished at a comparatively low cost. Easy grades are a feature of the system and an important one particularly through the Rockies. Had it not been for the war, the C.N.R. would most probably have been able to operate the road profitably, but the financial situation during the past three years has been such that the position of the System has called for Government assistance in some form. It is likely that some means will be found to assist the road until the situation is again normal. Canada went into the building of railways, in advance of settlement, as a business to induce settlement, and that settlement is certain to come within a reasonable number of years.

To carry the road over during the intervening period, that is, until the newly-opened territory becomes a source of revenue, in the form of freight principally, some assistance is necessary. It is generally conceded that in a few years the C.N.R. will be a valuable property. The territory served will become quite thickly populated, and production from the soil in a variety form will naturally increase. This will, of course, benefit not only the railway, but Canada as a whole.

CANADIAN GOVERNMENT RAILWAYS

CANADIAN Government-owned railways in operation include the Intercolonial, which extends from the Atlantic Ocean ports of Halifax, St. John, Sydney, and North Sydney to Montreal; the Prince Edward Island Railway, extending from Tignish to Georgetown, 158.60 miles, and from Charlottetown to Murray Harbor, 52.30 miles, with branches to Souris, Elmira, and Cape Traverse, a total length of road operated of 274.6 miles; the New Brunswick and Prince Edward Island Railway of 36.05 miles in length, running from Sackville to Cape Tormentine and forming a connection between the Intercolonial and the car ferry, between Cape Tormentine and Carleton Point, on Prince Edward Island; the International Railway of New Brunswick; the St. John & Quebec Railway, the Hudson Bay Railway, and the National Transcontinental Railway.

The Intercolonial is the chief of the lot now operating; therefore it will be in order to feature it at least first and in any case most prominently. "Railways and tariffs were so intermingled with politics during the last half of the nineteenth century in Canada that it seemed impossible to separate them," says one writer, and whether much improvement has taken place since it may be left to the reader to judge.

Inception of the "Intercolonial"

As far back as 1835, the Intercolonial Railway project was under discussion, and not only so, but tentative surveys had been made and negotiations conducted at different times in London, England, as well as in the various provincial capitals concerned, with a view to construction being started. Until, however, the pact of Confederation had been sealed, nothing of real value had been accomplished, but action was soon to follow, for completion of the line was a plank in the Confederation platform of the Eastern or Maritime Provinces. As might be expected, more or less diversity of opinion existed concerning method and cost of operation. The final surveys were carried out by Sandford Fleming (later Sir), the exact route fixed, and details of construction generally determined.

The whole line from Halifax to Levis, opposite Quebec City, was opened to traffic on Dominion Day, 1876, at a cost to build of $22,488,000. The through distance was 675 miles. In 1898, as already referred to in the data covering the Grand Trunk Railway System, legislation was enacted and arrangements made whereby continuity of the line was maintained as far as Montreal. Great Britain was originally interested in the Intercolonial because of its convenience for the transportation of troops, and later, she became much more so by guaranteeing construction loans of something like $15,000,000, partly, it is autho-

CANADIAN NORTHERN RAILWAY GRAIN ELEVATOR AT PORT ARTHUR, ONT.

SHOWING C.N.R. ABOVE, C.P.R. BELOW, ALSO FRASER RIVER AND BRITISH COLUMBIA SIDE OF YELLOW HEAD PASS.

ritatively stated, in return for Canada waiving her Fenian Raid claims against the United States. From the like source —Sir Sandford Fleming in the History of the Intercolonial Railway—we learn that had it not been for the reckless surrender of territory by the Imperial Government under the Ashburton Treaty, the distance to cover between Montreal and Halifax would have been less by 200 miles, $10,000,000 of expenditure would have been saved, and a winter port on the Atlantic Coast secured to the Dominion.

I.C.R. Growth and Progress

As showing the growth and progress of the I.C.R. since its completion in 1876, it may be stated that the total length of road operated during the year ended March 31st, 1916, was 1518.39 miles, as compared with 675 miles in the former year; only 66.92 miles are double track, however. Passing sidings amount to 139.21 miles, while other sidings and spurs total 387.43 miles. The total capital expenditure on behalf of the Intercolonial Railway System to March 31st, 1916, amounts to $115,766,560.24. At the end of the first year's operation of the road, 421,327 tons of freight and 613,420 passengers were carried, while for the year ended March 31st, 1916, the figures are 5,447,220 and 4,124,387 respectively. Working expenses and gross earnings of $1,661,673.55 and $1,154,445.33 compare with $12,551,495.84 and $14,068,791.41 for the respective years.

As regards rolling stock, it will have become evident from the figures above quoted that a corresponding development both as to quality and quantity has taken place since 1876. On March 31st, 1916, the equipment consisted of 434 locomotives, 66 sleeping cars, 10 parlor cars, 21 dining cars, 65 colonist cars, 169 first class passenger and official cars, 96 second class passenger cars, 36 postal cars, 75 baggage cars, 26 box baggage cars, 1 air brake instruction car, 1 steam motor car, making a total of 566 passenger cars; 10,099 box cars, 192 refrigerator cars, 3,239 platform cars, 52 pulpwood cars, 55 oil tank cars, 640 hopper cars, 5 gondola cars, 376 twenty-ton coal cars, 526 Hart-Otis steel dump cars, 185 stock cars, 300 Hart convertible dump cars, 4 pit cars, 184 vans, making a total of 15,-863 freight cars; 23 auxiliary cars, 1 store supply car, 2 Pintsch gas cars, 51 common snow plows, 27 wing snow plows, 2 steam rotary snow plows, 2 double track snow plows, 1 double end snow plow, 54 flangers, 22 steam cranes, 2 Rogers ballast spreaders, 1 ballast trimmer, 5 centre ballast plows, 7 side ballast plows, 4 ballast plow unloaders, 1 wing ballast spreader, 4 concrete mixers, 1 sand blast machine, 1 well boring car, 1 ditcher, 1 steam derrick, 1 hand derrick, 4 steam shovels, 1 portable rail sawing and boring machine, 2 pile drivers, 16 survey and inspection cars, 2 rail unloaders, 71 wrecking cars, 62 boarding cars, making a total of 378 work cars.

It may be mentioned at this point that the National Transcontinental Railway is associated with the Intercolonial in the official statement from which these particulars have been drawn. Since the opening of hostilities in Europe three years ago, traffic on the I.C.R. has assumed gigantic proportions; it, therefore, speaks well for the physical condition of the road as a whole that so much has been and is being accomplished with a minimum of inconvenience to shippers.

Large locomotive and car building shops of the Canadian Government Railways are established at Transcona, near Winnipeg; St. Malo, near Quebec City; and Moncton; however, only the latter is engaged on railroad work on a capacity scale. The shops at St. Malo have not been completed, although it is understood that much of the equipment is on the ground and some of it is installed. The I.C.R. shops at Moncton are well organized to secure rapid and substantial outputs of both new and repair work, and as might be expected, the welfare schemes in operation contribute material to that end. The big ocean terminals being constructed at Halifax, N.S., will also embrace the terminal of the Intercolonial there, when completed.

New Brunswick and Prince Edward Island Railway

Under an agreement dated March 18th, 1915, and under an Order in Council of May 12th, 1915, this railway was purchased for $270,000, becoming thereafter a part of the Canadian Government Railway System. The working expenses to March 31st, 1916, amounted to $76,844.63 and the gross earnings to $50,414.34. During the year ended as above, $24,-999.97 was expended to bring the road up to the standard of the Intercolonial branch lines. The rolling stock of the N.B. & P.E.I. Railway consists of the following:—31 locomotives, 23 first-class passenger cars, 13 second class passenger cars, 7 combination second class and

C.N.R. MOUNT ROYAL TUNNEL PORTAL—MODEL CITY END.

baggage cars, 4 postal and smoking cars, 4 combined postal and baggage cars, 8 baggage cars, or a total of 59 passenger cars; 313 box cars, 3 refrigerator cars, 28 stock cars, 1 oil tank car, 15 Hart convertible cars, 12 coal cars, 154 platform cars, 4 vans, or a total of 530 freight cars; 11 snow plows, 8 flangers, 1 steam shovel, or a total of 20 work cars. The gauge of the road as taken over was 3 ft. 6 in.

International Railway of New Brunswick

Under an agreement, dated August 1st, 1914, and under an Order-in-Council of August 27th, 1914, a lease of this railroad was taken by the Canadian Government for a term not exceeding five years at an annual rental of $90,000, payable half yearly, with option of purchase at any time within that period for the sum of $2,700,000. The road was taken over as part of the C.G.R. System on August 1st, 1914. It is 111.30 miles in length, extending from the Intercolonial at Campbellton, N.B., to St. Leonards, N.B. During the fiscal year ended March 31st, 1916, there was expended on capital account the sum of $2,637.47 to bring the road up to the I.C.R. standard for branch lines. The working expenses for the period amounted to $116,651.38, and the gross earnings to $104,623.49, leaving a deficit of $12,027.89. In addition to the working expenses, the sum of $90,000 was paid as rental.

St. John and Quebec Railway

By Act of Parliament of date March 5th, 1912, agreement was made on behalf of the Dominion and the Province of New Brunswick, and the St. John and Quebec Railway Co., for leasing to the first-named the company's railway when fully constructed from the City of St. John, N.B., to a point of connection with the National Transcontinental Railway at or near the town of Grand Falls, N.B. The agreement provided that the railway should be completed and equipped by November 1st, 1915; further, that on construction and equipment of certain sections the Dominion Government would lease and operate same. The road extends from Centreville to Gagetown, 119.87 miles. The portion from Centreville to Fredericton was taken over for operation by the C. G. Railways on January 1st, 1915, and the portion from Fredericton to Gagetown on March 2nd, 1915. The working expenses for the fiscal year ended March 31st, 1916, amounted to $90,757.13, and the gross earnings to $57,742.71, leaving a deficit of $33,014.42.

Hudson Bay Railway

This railway will run from The Pas, Province of Manitoba—a point on the Saskatchewan River, where connection is made with the Canadian Northern Railway System—to Port Nelson, on the western shores of Hudson Bay. The work of construction for the first 185 miles from The Pas to Thicket Portage was placed under contract in August, 1911. A contract for a further distance of 68 miles from Thicket Portage to Split Lake Junction was let on September 20th, 1912, and a third contract, covering the distance, 165 miles, from Split Lake Junction to Port Nelson, on December 17th, 1912, a total distance of 418 miles. The final location into Port Nelson was completed in August, 1914, making the total length of the line from The Pas to Port Nelson 424 miles. By the end of the fiscal year, March 31st, 1916, grading had been completed to mile 378, or within 47 miles of Port Nelson; the track had been laid and the telegraph line built up to mile 241, the first crossing of the Nelson River, Manitou Rapids. The cantilever bridge at this point has a total length of 608 feet; and is to all intents and purposes finished. The right of way has been cleared to mile 395. The work of constructing the terminals for the railway at Port Nelson has been carried on by the Dominion Department of Railways and Canals with a force of men under a supervising engineer. The construction of the permanent deep water works, giving connection between the mainland and deep water by a system of steel bridges—17 spans—has made good progress. Communication with Port Nelson is afforded by means of Marconi wireless stations established there and at The Pas. The expenditure for the fiscal year ended March 31st, 1916, was $4,889,131.77, making the total expenditure up to that date, $15,749,908.43.

National Transcontinental Railway

Under an agreement, dated July 29th, 1903, and a modifying agreement of date February 18th, 1904, the Grand Trunk Pacific Railway Co. have undertaken certain obligations with respect to the construction and operation of a line of railway, wholly upon Canadian territory, between the City of Moncton, N.B., and the navigable waters of the Pacific Ocean. The railway is composed of two divisions, namely, the Eastern Division, between Moncton and Quebec City; thence westerly through the northern part of the Provinces of Quebec and Ontario, and in the Province of Manitoba, to the City of Winnipeg; the Western Division being between Winnipeg and the Pacific Ocean. The Eastern Division is being constructed by the Government, and on completion is to be leased to, and be maintained and operated by the G.T.P. who undertake to construct at their own cost, and maintain and operate the Western Division.

The lease of the Eastern Division is for a period of 50 years at a rental of 3 per cent. per annum on the cost of its construction, the first seven years of the term to be free of rent. Both divisions when completed are to be equipped with ample and modern rolling stock by the G.T.P., the initial equipment to have a value of not less than $20,000,000. By way of assistance to the G.T.P. in the construction of the Western Division, it is provided that the Canadian Government shall guarantee payment of the principal and interest of an issue of bonds of the company for an amount sufficient to produce a sum equal to 75 per cent. of the construction cost, but not to exceed $13,000 per mile in respect of the prairie section from Winnipeg to the Eastern limit of the Rocky Mountains. This limit has been established as the east bank of Wolf Creek, a point 120 miles west from Edmonton, Alta.

The total mileage from Moncton, N.B., to the west side of Water Street, Winnipeg, is 1,804.52 miles; this, however, includes the Quebec Bridge across the St. Lawrence, now in course of completion, the length of which is 1.10 miles. Track laying between Moncton and Winnipeg was completed—with the exception of the Quebec Bridge—in November, 1913, the last spike being driven on the 17th of that month. Pending the completion of the Quebec Bridge, communication across the St. Lawrence River is had by means of the train ferry Leonard. The total expenditures on behalf of the Canadian Government up to March 31st, 1916, amount to $156,701,209.65, which sum includes $36,182.91 for operation in the year 1912-1913 of the section from Moncton to Edmunston, N.B.

The Western Division extends from the western boundary of the Winnipeg terminals, on the east bank of the Assiniboine River, in the City of Winnipeg, to the City of Prince Rupert on the Pacific Coast, a distance of 1,745 miles. It is divided into two sections, namely, the Prairie Section, extending from Winnipeg to the east bank of Wolf Creek, a distance of 915 miles, and the Mountain Section, which extends from the east bank of Wolf Creek to Prince Rupert, a distance of 830 miles. The terminals extend for a further distance of 3¼ miles around the water front of the City of Prince Rupert. The position of the work in the Western Division at March 31st, 1916, as deduced from the report of the chief engineer acting for the Government, appears to be as follows:—

"In order to carry out the contract requirements, work to the estimated value of $2,372,500, covering the making up of embankments, ballasting, passenger station and yard at Edmonton, and erection of permanent structures on the first 280 miles west of Winnipeg, still remained to be done at the close of the fiscal year. Work remaining to be done on the Mountain Section includes the filling in of temporary trestles, certain ballasting, roundhouses, machine shops, completion of divisional sections, and further facilities at Prince Rupert terminals." The estimated cost to complete the foregoing, after making certain allowances, was $3,785.270. The approved and certified expenditure up to March 31st, 1916, amounted on the Mountain Section to $93.160.195.76, of which the amount paid to the G.T.P. was $70.769.300.85, including interest. On the Prairie Section no certificate had been issued since October 31st, 1907, the expenditure to that date being $15.556.482.84, of which the percentage payable was $10,335.482.92. The whole division between Winnipeg and Prince Rupert has been operated since September 6th, 1914.

Quebec Bridge Feature of the N.T.R.

On August 29th, 1907, the cantilever bridge across the St. Lawrence River, above the City of Quebec, and forming a connecting link on the National Transcontinental Railway, collapsed. The enterprise of construction was a private

one; however, the Government had provided for the right of assuming the undertaking, which they did on December 1st, 1908. The deed of assignment and transfer from the construction company to the Government was of date October 18th, 1909. A Board of three engineers was constituted to prepare a new design and specification for the reconstruction of the bridge, with power to call in expert advice if necessary.

A design other than that prepared by the engineers was sent in by the St. Lawrence Bridge Co.—with whom were associated the Dominion Bridge Co. and the Canadian Bridge Co., both Canadian enterprises. Same was accepted by the Board of Engineers because of its features of strength, simplification of erection, economical distribution of material, general appearance, etc. The contract price was in the neighborhood of $8,650,000, and completion is expected in the course of the present year, there being only the centre span to put together and lift to place. It is, of course, well known that accomplishment had reached a similar stage a year ago, completion then being frustrated by an unforeseen eventuality which resulted in the centre span being lost in the river.

The bridge will have a total length of 3,228 feet, or about three-fifths of a mile. The centre span is about 1,800 feet long, its suspended portion being around 640 feet. This span will, for a length of 760 feet over the river, have a height of 150 feet between its lower members and high water. The two cantilevers are each 580 feet long, and the width of the bridge between the trusses is 88 feet, comprising a double track railway and two sidewalks for foot passengers.

GRAND TRUNK PACIFIC RAILWAY COMPANY

THIS has already been noted in connection with the National Transcontinental Railway; however, it may not be out of place to give the G. T. P. view of the undertaking. The country through which the Prairie Section of the railway passes contains land now known to be well adapted for the growing of wheat; in other words, it is the great agricultural belt of the Canadian North-West. This land, now being settled, produces rich crops the first year of cultivation. The Mountain Section, passing through the mineral deposits will take a little longer to develop. One of the important questions to be considered was that respecting the gradients which enter so largely into economical operation, hence the selection of the Yellow Head Pass route through the Rockies to the Pacific Coast.

The Mountain Section lies between the 52nd and 57th parallels of latitude, and it is probable that no other area in North America can equal this portion of British Columbia in natural resources. Where there is no agriculture and pasture, there is mining or lumbering to be developed, and where none of these are in evidence, although they often occur in one district, there is at least trapping and hunting. Coincident with the selection of the route through the Rockies to the Pacific Coast was the location of the terminus. The point selected, namely, Prince Rupert, is situated within 50 miles of the Southern extremity of Alaska, and is reached from the Pacific Ocean via Dixon Entrance and Brown Passage. Prince Rupert harbor possesses some of the greatest advantages to ocean shipping that can be found along the whole Pacific Coast. It has a direct channel passage leading into it of more than half a mile in width, and is sufficient in extent to accommodate shipping in large volume and vessels of the biggest tonnage.

Prince Rupert Terminal

The site of Prince Rupert is a picturesque one. The land slopes back gently for distances ranging from half a mile to two or three miles. Here and there the ground rises abruptly, providing the necessary fall for drainage and sewerage, while a shore line five or six miles in extent sweeps around the front of the city. The view from these elevated stations and from the back is a charming one. On the opposite shore mountains slope down to the water. To the northwest, through a channel studded with islands, is situated the famous Indian village of Metlakatla, known on the coast as the "Holy City."

Prince Rupert is situated about 550 miles north of Vancouver. The new Transcontinental Railway will possess the shortest route from Liverpool to Asiatic ports by at least two days' sail, and this saving in distance will also be realized between American Atlantic ports and Trans-Pacific points. It lies in the centre of the salmon fishing industry of British Columbia, being in the immediate vicinity of a large number of canneries which ship their product throughout the world, and here is also to be found off the banks of Queen Charlotte Islands the finest halibut fishing known to exist, tons of which are taken annually to supply Eastern markets. This traffic will be greatly augmented upon the completion of transportation facilities.

Regarding progress at Prince Rupert, plans were prepared and approved by the Grand Trunk Pacific Development Co. and the British Columbia Government (the former having a three-quarter interest) for the first sub-division of two thousand acres of the townsite, and the first sale of lots was held by auction at Vancouver, B.C., May 25th to 29th, 1910, following which, sales were also held at Victoria and Prince Rupert.

Extraordinary interest is manifested in this new Canadian seaport on the Pacific Ocean, as it is destined to very early develop into a large and important centre of industrial and commercial activity, affording exceptional opportunities for the investment of capital, the present development of the townsite itself, apart from expenditures on the construction of the railway, already representing an investment of several millions of dollars.

On June, 1910, the Grand Trunk Pacific Coast Steamship Co. inaugurated a steamship service between Seattle, Victoria, Vancouver and Prince Rupert, placing in commission the palatial twin screw steamers "Prince Rupert" and "Prince George," which had just been completed at the shipyards of Messrs. Swan, Hunter & Wigham Richardson, Ltd., at Newcastle-on-Tyne, England. This, in addition to several other lines of steamers operating between Victoria, Vancouver and Prince Rupert, and points in Alaska, places the new Pacific Coast terminal in an exceptionally accessible position on the lines of the most modern water transportation, pending and following completion of the railway.

WILL DEVELOP CHEMICAL AND DYE INDUSTRIES

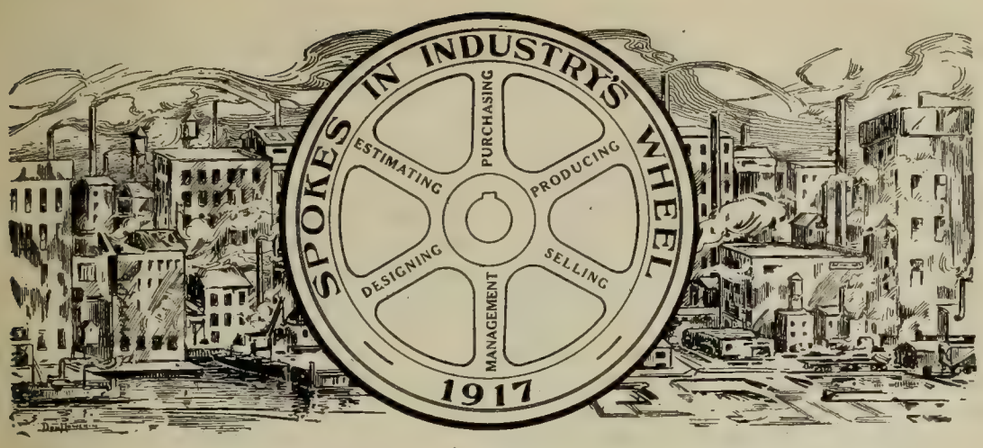
EXPERTS state that it will require almost super-human efforts to establish dyemaking as a Canadian industry, but such a task will eventually be accomplished. The enormous expenditure entailed in the erection of immense plants required for the industry is causing would-be investors to hesitate before making the plunge; but as soon as Canada can provide a market that would warrant the investment the enterprise will be taken up with a view to permanently ousting the German material from the Canadian field.

It is pointed out that chemical industry as a whole is very busy, although prices have risen enormously during the past two years; in some cases over 1,000 per cent. The demand is increasing, but it is very difficult to get supplies. The difficulty confronting the manufacturing chemists is that no business is being done, except for spot lots. The consumers will not trade in futures. Taking it on the whole, the Canadian wholesale chemical business, while active, is virtually on an auction basis.

The war work of the United States has created a shortage for the domestic trade of sulphuric, nitric and other acids used for munitions, and until larger quantities can be produced the price will remain abnormal.

Through the efforts of Canadian chemists, many high explosives are now being made in Canada, and shells can be completed on this side of the Atlantic for use in the war zone. For many months after Canada had gone into the munition business, only the steel and fuse portions of the shells could be made, and the munitions had to be shipped across the border or to Great Britain to be completed.

The efforts of the various chemical interests to permanently establish complete chemical and dye industries in Canada, have resulted in the combination of the interests concerned, who have held meetings to endorse the plan advocated and inaugurate an institution in Canada which will virtually duplicate the work of the Mellon Institute of Chicago. This institute takes up industrial problems and endeavors to solve them in the interests of the industries concerned. The valuable results obtained by this institution has brought up the need of a similar organization in this country.



The constitution of industrial enterprise is largely departmental—"spokes in a wheel." This series of articles has for its object the featuring in a racy, interesting and instructive fashion, the training, experience and achievement of those who to-day are transmitting, effectively, energy in their capacity as "spokes in the wheels" of our metal-working establishments.

WILLIAM RODGER

At no time in the world's history has the need of engineers of resource and ability been so emphasized as now, when the revolutionary yet enlightening discoveries and applications of science and engineering are all essential factors in the problems of the moment, namely, the development of latent forces that have remained so long dormant, and their utilization. What Canada has achieved during the past three years despite almost overwhelming difficulties and erstwhile obstacles, savors in some degree of the miraculous.

The subject of this sketch, William Rodger, designing and constructing engineer for Fraser Brace & Co., also acting in the same capacity for the St. Maurice Construction Co., both of Montreal, has been one of Canada's industrial "spokes' in the past three years of rolling progress. Born of Scotch parents in the town of Pollokshaws, Renfrewshire, Scotland, a few miles south of the city of Glasgow, the boy secured his early education in the Calder Street Public School at Govanhill, another suburb of Glasgow. At the age of 13, shortly after he completed his public school course, he entered the employ of Messrs. Dubs & Co., Glasgow Locomotive Works, where he acquired a thorough knowledge in the design and construction of locomotives, serving a seven years apprenticeship, much of the time being spent in the drawing office. During this preparatory course and for some time afterwards, William endeavored to attain those theoretical fundamentals that are essential to success in every branch of engineering practice. During the season of 1893-4, he was a student in the junior mathematical class at the evening classes of the Abbotsford Public School. In September of 1896 he attended Andersons College evening classes, where he obtained a certificate from the Department of Science and Art, South Kensington, in the elementary stage of Applied Mechanics, also one in steam from Professor Rowden. In the Fall of 1904 he attended the Glasgow and West of Scotland Technical College, under Professor Magnus MacLean, completing the term as a certified graduate in the first course of Electrical Engineering. In 1910 he received a certificate for course I in Mathematics, graduating the same year in the advanced

WILLIAM RODGER.

course of Mechanics and Theory of Structures.

At the age of 21, while still working for Dubs & Co., he was entrusted with the designing and draughting of the plans for engines at the works of the Highland Railway, Inverness; these engines being afterwards built by Dubs & Co. In 1898, at the age of 23, he accepted a position as chief draughtsman with Neilson, Reid & Co., Hyde Park Locomotive Works, Glagow. In addition to his drawing room duties, he was occasionally delegated as inspector of materials received and products delivered by the firm. After remaining with this firm for a period of ten years he went into partnership with Rodger & Harris, electrical engineers, but owing to the depression of trade at that time, the business was given up and our "Spoke" accepted a position as engineer with Telford, Grier & Mackay, installing ammonia machines for creameries. From June 1909 until the spring of 1911, he was employed as a steam expert at the Singer Sewing Machine Co. factory at Clyde bank.

On the 6th of April 1911, he left the Land of the Heather to try his fortune in that of the Maple, leaving Liverpool on the Cunard steamer Lusitania and landing in New York on the 13th of the month. The particular date of his arrival in a new land had no superstitious influence on our "Spoke," and after a few days of sight seeing, he resumed his journey to the Canadian Metropolis. The day following his arrival in Montreal, he started work with the Canadian Pacific Railway at their Angus shops as locomotive and later as elevating draughtsman. While in this position he had the privilege of making the plans for the observation cars Laggan and Louise.

The abnormal activities however, that immediately followed the outbreak of the war, provided additional opportunity for our "Spoke" to acquire that wider experience that is often thrust upon us in periods of extremity. With the C. P. R. actively engaged in furthering the best interests of the country, and their ready response to the urgent call for duty, Mr. Rodger was called upon to assist in the design and construction of special hydraulic presses for the manufacture of shells and cartridge caes. In September 1915, he accepted a position with the Dominion Bridge Co. as mechanical draughtsman, and assisted in laying out the plant of the Dominion Copper Products Co. In December of the same year, he was appointed chief of the engineering department of the Jenckes Machine Co. of Sherbrooke, P. Q., continuing with this firm until the spring of this year, when he accepted his present position with Fraser Brace & Co.

Mr. Rodger's wife is a daughter of Joseph Carruthers, a printer of Glasgow, and they with their two children, a son and daughter, reside at 107 Girouard Ave., Notre Dame de Grace. Like all good Scotch folk, they are affiliated with the Presbyterian Church, our "Spoke" having been one of the managers of Fairmount until leaving for Sherbrooke. His travels have been largely confined to business activity, but in 1914 the family paid a visit to the old home, returning during the stormy days of the opening session of the war. He is an Associate Member of the Canadian Society of Civil Engineers, and a member of the Montreal branch of the Canadian Railway Club. He is also affiliated with the A. F. and A. M., being a member of Fairmount Chapter. Both

he and his wife are members of the Eastern Star.

Speaking of his experience, Mr. Rodger says:—"Technical education must go hand in hand with practical experience in order to attain a reasonable degree of success in any vocational calling, and this is particularly true in science and engineering owing to the rapid strides that are continually taking place in these directions. Conscientious study and hard work are the essentials of success, and close application to details and a thorough knowledge of what is doing in other sections of the engineering field will make good engineers of willing students. In order to keep in close touch with general practice it is imperative that the other fellow's point of view should not be allowed to slip past unnoticed. I heartily approve of the reading of technical papers and make it my duty to enlighten those under me to carefully study same."

MACHINISTS' INSTRUCTION COURSE XXIII.

By J. Davies.

IN cutting spirals on a milling machine, the work is usually held between centres. There are two distinct and separate motions imparted to the work. A rotary motion of the head combined with a longitudinal motion of the table. These motions must maintain the same constant relation to each other. The table travels by means of a feed screw. On the end of the feed screw is a gear which is connected by other gears to the index spindle. It is evident that by this arrangement any motion of the feed screw will cause the table to go backwards or forwards and at the same time cause the index spindle to rotate, so that the pitch of the spiral depends entirely upon the ratio these two motions bear to each other.

Calculating Gears for Cutting Spirals

Before attempting to make any calculations there are two indispensable factors which we must find out—(1) The pitch of the feed screw; (2) the number of complete revolutions the worm spindle must make to turn the head, or the work, once round. Obtain this by actual count of the worm spindle connecting the index head, then measure the feed screw, checking up the measurement by making one revolution of same and measuring the advance of the table. If this precaution is not taken the operator may be misled by measuring a thread with two starts or a compound thread.

Having once obtained these figures they will be used in every calculation for the same machine. We will take the figures that are common on most milling machines. Suppose the feed screw is 4 threads to the inch and the worm shaft makes 40 turns to one of the spindle carrying the work, then it is evident that if they were geared together by equal gears, they would each make a revolution in the same time. Since it would take 40 revolutions of worm spindle to revolve the work once, it follows that the feed screw would also make 40 revolutions in the same time, and as the feed screw is ¼ in. pitch, the table would be advanced 40 times ¼, or 10 in. Under these conditions, the spiral that would be cut would have a lead or pitch of 10 in. From this explanation, the following simple universal rule can be deduced. To obtain gears required, multiply lead in inches of spiral to be cut, by the number of threads per inch of the feed screw (in this case 43), and divide by 40. Note that in calculations for the same machines, the same figures are used every time. The 4 represents the number of threads per inch of the feed screw, and the 40 represents the number of turns of worm spindle to turn the work round once.

To prove example just mentioned:—What gears would be required to cut a spiral with a 10-in. lead? Applying rule just given, $10 \times 4 \div 40 = \frac{10 \times 4}{40} = \frac{40}{40}$

Ratio $\frac{1}{1}$ or any equal gears.

Example 2—It is required to cut a spiral having a lead of 2½ in. with a machine having a feed screw 4 thrds. per in. and requiring 40 revolutions of the worm shaft for one turn of the work.

According to rule—Lead of spiral required multiplied by number of threads per inch of feed screw divided by number of revolutions of worm shaft,

$$\frac{2\frac{1}{2} \times 4}{40} = \frac{10}{40}$$

and any two gears having this ratio or proportion to each other will do.

Use of Compound Gears

Milling machines are usually made so that compound gears may be used if necessary. For example—It is required to cut a spiral having a lead of 15¾ in.

$$\frac{15\frac{3}{4} \times 4}{40} = \frac{63}{40} \text{ ratio of gears.}$$

Divide into factors $= \frac{7 \times 9}{5 \times 8}$ Gears with 7 and 9 teeth would be absurd, so we must raise the value. We can multiply, add, subtract, or divide at will, as long as we are careful to retain the same relative values. Multiplying every figure by $4 = \frac{28 \times 36}{20 \times 32}$

A little consideration is required to find where each gear must be placed. Place the smallest wheel where the most revolutions are required; a moment's thought will show whether this is on the worm shaft or feed shaft.

Sometimes it is impossible to cut the exact spiral required by the gears available; when this is the case, either a special gear must be made, or come as close as you can with the gears you have. Here is a case in point: It is required to cut a spiral with a lead of 11.66 in. $\frac{11.66 \times 4}{40} = \frac{46.64}{40}$. To eliminate fractions multiply by $100 = \frac{4664}{4000}$. Find all the factors of these two numbers by dividing by the prime numbers, commencing at the lowest—a table of prime numbers was given with the screw-cutting calculations recently.

Factors of 4664 are as follow:

$$\begin{array}{r|l} 2 & 4664 \\ \hline 2 & 2332 \\ \hline 2 & 1166 \\ \hline 11 & 583 \\ \hline & 53 \end{array}$$

$= 2 \times 2 \times 2 \times 11 \times 53$

Similarly the factors of 4,000 are $2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 5$.

We have, therefore, the following fraction:

$$\frac{2 \times 2 \times 2 \times 11 \times 53}{2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 5}$$

Cancelling equal factors top and bottom and leaving an equal number of factors above and below, we have

$$\frac{11 \times 53}{20 \times 25} \text{ or } \frac{22 \times 53}{40 \times 25}$$

If any of these gears should happen to be a prime fraction to its lowest terms, thus $\frac{11 \times 53}{20 \times 25} = \frac{583}{500}$

Multiplying this by the ratio of revs. to thds., we have

$$\frac{583 \times 40}{500 \times 4} = \frac{5830}{500} = 11.66 \text{ pitch of spiral.}$$

Approximating the Wheels

If the actual number of wheels required are not available, by using 3 of the set, and substituting for the fourth one a gear with a tooth, more or less, a very close approximation to the required spiral can be cut. Suppose in the example just given we substitute a 54-gear in place of the 53, what actual spiral would be cut? Proceeding as per rule just stated for proving our calculations,

$$\frac{22 \times 54 \times 10}{40 \times 25 \times 1} = \frac{11880}{1000} = 11.88 \text{ actual spiral cut.}$$

In cutting spirals it is very important to secure the work that it will not slip in any direction, as any slipping of the work would be fatal to a good job, even if the job was not entirely spoiled.

It must be borne in mind when selecting a cutter, that a cutter with straight sides will not cut a spiral groove with straight sides; in fact, no cutter with either one of two straight sides will reproduce its own profile in a spiral groove. For producing a spiral groove with straight sides a specially formed cutter or an end mill is required.

Grinding and Setting Lathe and Planer Cutting Tools

Staff Article

Two of the prime essentials, if not the all-important factors in general machine shop practice, and those that are left entirely to the judgment of the individual operator, more particularly in the smaller shops, are the grinding of the various cutting tools and the setting of same in their respective positions. The efficiency of numerous plants is seriously hampered by the lack of knowledge on the part of many operators of the elementary requirements pertaining to their own work. Lubricating or cutting compounds are undoubtedly a great aid in the removal of metal, but the agents that perform the actual work, should receive every attention before their faults are covered with a flow of cooling fluid.

THE primary object of all steel cutting tools is the removal of metal from castings or forgings, and of necessity they are of much harder material than that of metal upon which they operate. It often supposed that ordinary lathe or planer tools accomplish their purpose by shearing action, but certain factors in the removal of the metal are very similar, the actual conditions are widely different. This is more clearly indicated by referring to Fig. 1. The sketch to the left illustrates the method of shearing metal, the stock being severed by means of two blades, the cutting faces of which are in line with each other. In the ordinary power shear the lower of these two blades is stationary, while the upper travels in a vertical direction; the cutting edge of the blade being set at an angle to the one on the fixed table. In the case of a punch and die, the two cutting edges are often left parallel to each other, but "shear" may be given to one or the other by scolloping the cutting edges. Comparing this shearing of metal to the action of the ordinary cutting tool, as used on a lathe or planer, we immediately comprehend the varied conditions.

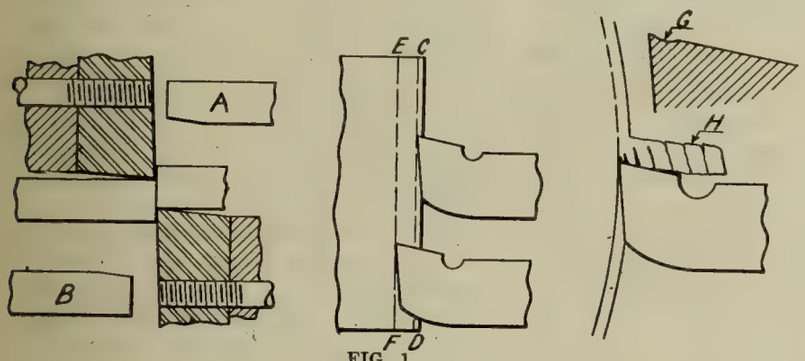


FIG. 1.

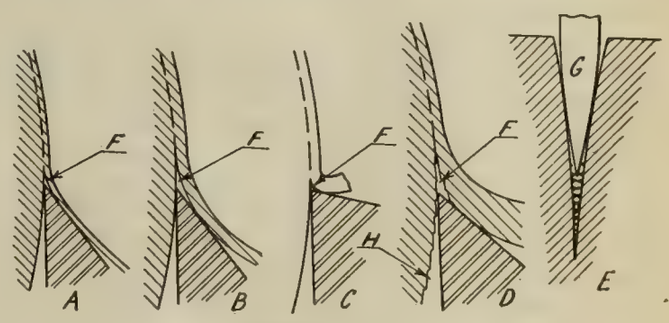


FIG. 2.

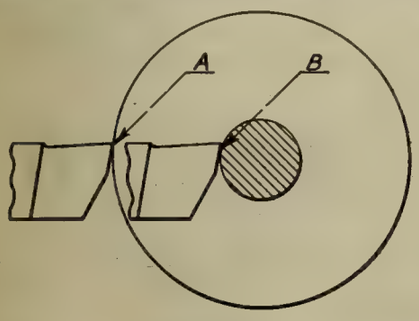


FIG. 3.

The center sketch of Fig. 1 shows a lathe tool set to two different depths of cut, which according to the shearing theory could be taken with the same consumption of power, as the shearing resistance is practically the same along the lines C-D and E-F. We know however, that much more power is required to perform the heavier cut. The feature that dispels the shearing idea is the fact that the work itself occupies the position and is supposed to perform the function of the upper shear blade, shown in the left hand sketch. The detail that may be said to relate these two processes, shearing and cutting, is the compression of the material as the cut is being made. When a piece of material has been sheared the ends will have the appearance shown at A and B, where the metal has been squeezed during the initial stages of the cutting process. This "compression" or distortion is continued further in the case of the cutting tool, owing to two main reasons; that of the relatively small cut, and to the fact that the resistance is continuous. Owing however, to the rake that is given to most tools, this metal ,as it is crushed together, is forced to move along the path of least resistance and when the compression reaches a certain point, the chip is severed more by a tearing process than the actual cutting of the metal.

Chip Appearance

To the right of Fig. 1 is seen a lathe tool and the approximate appearance of a chip as it comes from the work. It will be noticed that the chip is much thicker than the depth of the cut, and broken up into small sections. It may often be observed that after a tool has been used for some time, the cutting edge will have an appearance similar to that shown in the exaggerated sketch at G. Fig. 1, the wear being greater at a short distance from the edge, thus demonstrating that the force required to remove the metal is not one of cutting only, but also one of crushing and bending the chip, following the separation of the molecules from each other.

Separation of the Chip

With the exception of the very lightest of cuts it may be reasonably accepted that the extreme edge of the cutting tool does not perform the function of actually "cutting" the metal, as the wedge shape of the tool is the chief feature in the operation. Close observation of a piece of material that has been turned in the lathe or formed in the planer or shaper, will show that the surface is covered with minute but regular sharp projections, resulting from the action of removing the metal. If this had been cut, the surface would have been smooth, but the existing conditions denote that other factors are at work in separating the chip from the body of the material. What does take place is graphically illustrated in Fig. 2, showing the splitting or tearing action caused by the wedge-shaped tool. When the angle of this wedge is very acute and the chip is light, as shown at A, the process is nearer to a cutting one than when the angle is increased or the chip is heavier. When the chip is thin, the tearing of the metal

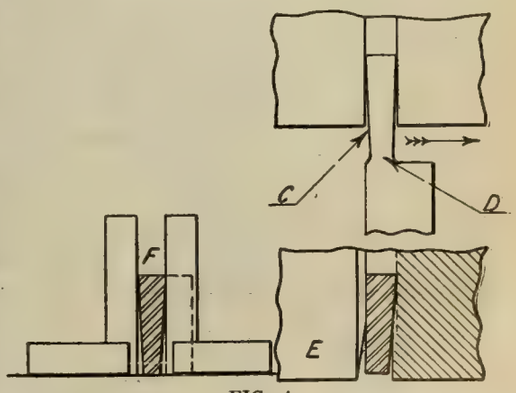


FIG. 4.

extends but a short distance ahead of the tool as the chip bends more freely than that of the heavier cut, as shown at B.

Effective work however, is practically impossible with such an acute angle on the cutting tool, and it is therefore necessary that a suitable angle be used to minimize the objections that are self-evident in those shown at A and B. Whereas the chip in these last two instances remains practically the same thickness as the depth of cut, the chip from the recognized standard tool as shown at C has a different apeparance. As the greater amount of power required to remove the metal is consumed by the tearing apart of the molecules, it has been found advisable to reduce this factor to the lowest minimum. This is accomplished by adopting an angle of rake to best answer all conditions; not the least of these being the heat that is generated during the operation. In addition to the heat that is created by the tearing of the metal, the friction of the chip upon the surface of the tool and also that within the chip, caused by the continual crushing and distortion of the severed metal, results in a rapid heating of the tool, and if excessive rake is used on the tool the point will quickly be destroyed by the abnormal rise in temperature. To aid in the dissemination of this heat, lubricants or cutting compounds are in general use which materially assist the functions of the tools in the efficient removal of the metal; this feature will however, be dealt with at a future time. An exaggerated condition of the ragged surface resulting from the tearing away of the chip is shown at D in Fig. 2, and the direction of these saw-tooth serrations is opposite to what might be supposed, inasmuch as the teeth point toward the cutting tool instead of the other way. This can be easily demonstrated by passing the hand over the work after a cut has been taken.

The scientific grinding of metal cutting tools is receiving increased attention from various plant executives, more particularly among the larger manufacturers where this problem can be effectively handled owing to the greater number of tools employed. The universal tool grinders that are now on the market have done much to not only attain but maintain an efficiency that would be impossible under the old order of things, for by the use of these it is possible to establish a system of tool grinding that cannot be materially effected by the varied ability and lack of knowledge on the part of the different workmen. Where these grinders are installed, it is possible to place the maintenance of all tools in the hands of an experienced operator, so that the work will always be accomplished under the same or relatively the same conditions; the setting of the tools by the individual machine operators being the only factor that will subsequently affect the general efficiency of the tool. This latter feature is however, one of the essentials of machine shop practice that cannot very well be placed owing to the varying characteristics and ability of those who are employed to operate the various classes of machines.

To assist or try to assist those who do not have the advantage of a special on any recognized standard basis, owing grinding machine. or fixture, the full page chart accompanying this article has been prepared, to show the purpose of the different tools, and the rake and various clearance angles that are best suited for general conditions, it being almost impossible to compile data to cover specific cases; these having to be considered according to the work in hand and the particular nature of the tools used.

Taking a tool to the grinding wheel and putting an edge on it may seem a simple matter, but it may be truly said that the usefulness of tools is very often destroyed by hurried or careless grinding. It is not sufficient to put an edge on the tool but this must be done in such a way that the cutting efficiency will still be retained. Many an operator, in his anxiety to get back to his work, will rush the grinding process to such a point that the tool will be unduly heated with the possibility that its cutting qualities will be destroyed by the drawing of the temper; this is more likely when a dry wheel is used. Another feature of hasty grinding is often shown by the gradual disappearance of the rake or clearance, or possibly both, caused by the hurry to get on "edge" and neglecting the more important factors which perform the greater portion of the work.

In the use of the wet wheel, the general overheating of a tool is not so pronounced, but is none the less likely to be partly ruined by careless manipulation. Excessive pressure causes the tool to heat rapidly, this heat being partly disseminated by the flow of the cooling fluid, but the extreme cutting edge heats and cools so rapidly that minute cracks often develop along the edge, these being invisible to the naked eye but when used again on the work will result in the edge crumbling away, thus destroying the effectiveness of the tool. This

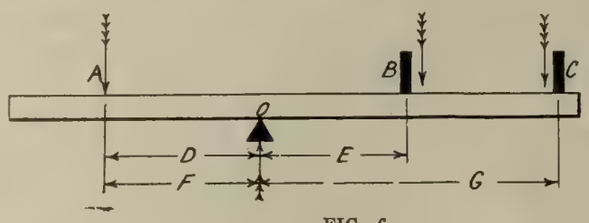


FIG. 6.

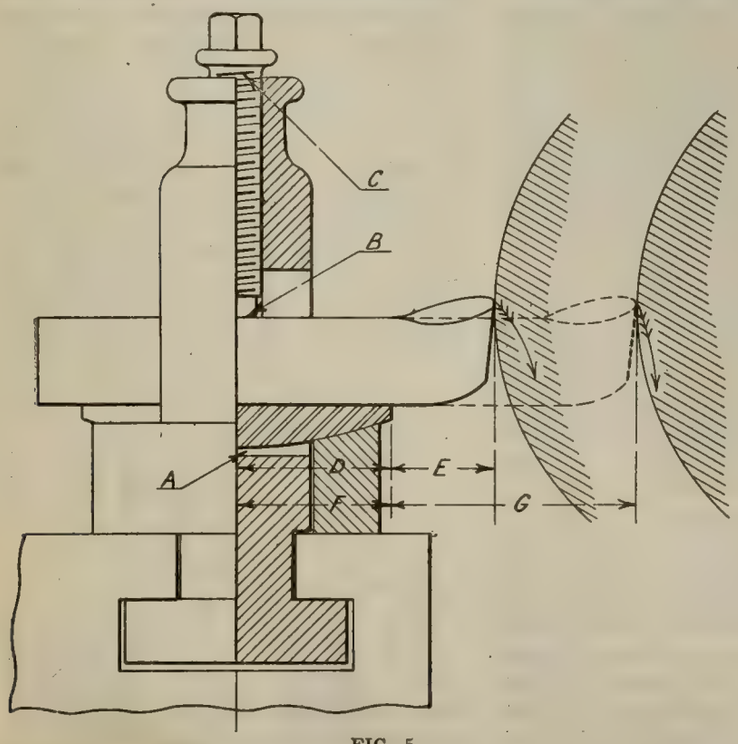


FIG. 5

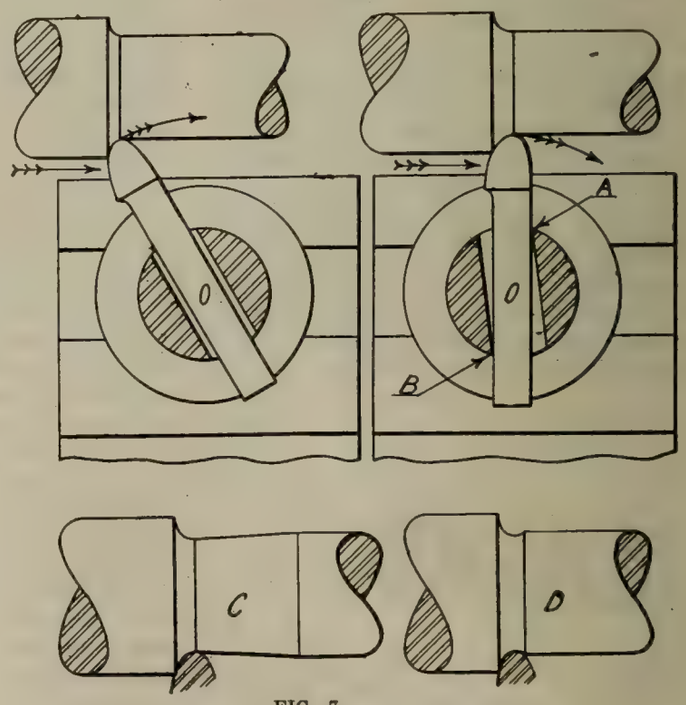


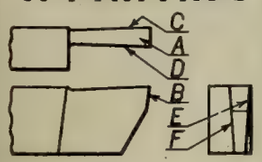
FIG. 7.

TOOL GRINDING CHART

CLEARANCE AND RAKE ANGLES FOR VARIOUS CUTTING TOOLS.

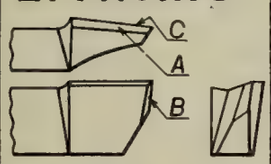
SMALL STRAIGHT ARROWS INDICATE THE DIRECTION OF RAKE ON FACES 'A'.
CURVED ARROWS SHOW POSSIBLE PATH OF CUTTING POINT UNDER PRESSURE.
CENTER COLUMN ILLUSTRATES A FEW SUGGESTIONS FOR SETTING TOOLS.
DISTANCE 'H' SHOULD BE SHORT AS POSSIBLE TO AVOID SPRING AND CHATTER.

1. PARTING

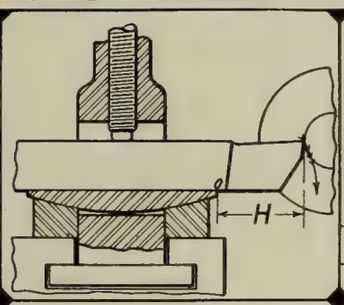


FACE	A	B	C	D	E	F
ANG.	2°	6°	2°	2°	3°	3°

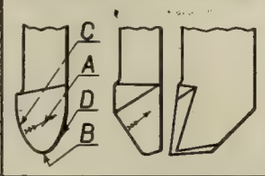
2. FACING



FACE	A	B	C
ANG.	12°	6°	6°

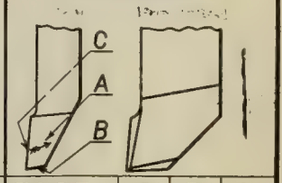


1. ROUGHING



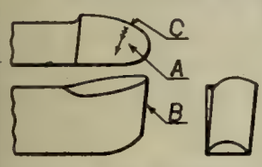
FACE	A	B	C	D
ANG.	12°	4°	6°	C°

2. CORNER



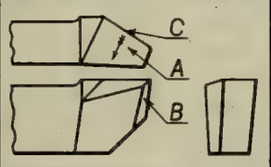
FACE	A	B	C
ANG.	10°	4°	6°

3. ROUGHING

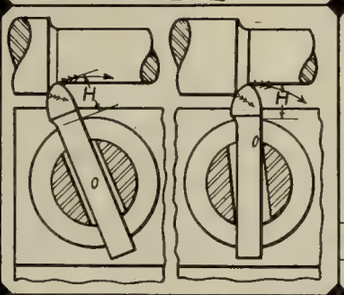


FACE	A	B	C
ANG.	22°	6°	6°

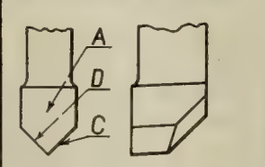
4. ROUGHING



FACE	A	B	C
ANG.	22°	6°	6°

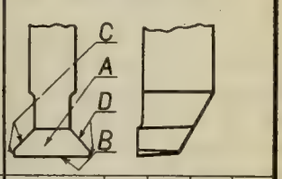


3. CHAMFER



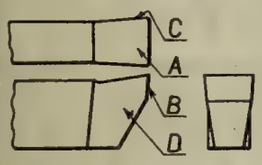
FACE	A	B	C
ANG.	0°	4°	4°

4. 45°-SLOT



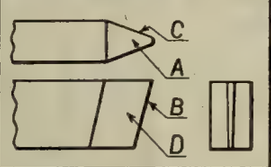
FACE	A	B	C	D
ANG.	0°	4°	4°	4°

5. FINISHING

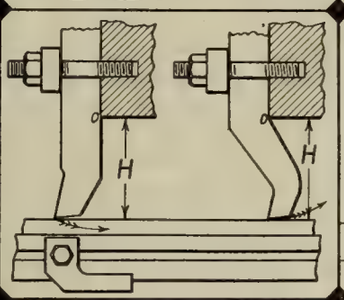


FACE	A	B	C	D
ANG.	10°	6°	3°	3°

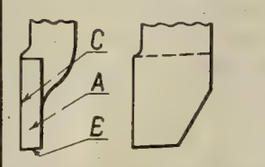
6. BRASS



FACE	A	B	C	D
ANG.	0°	10°	8°	8°

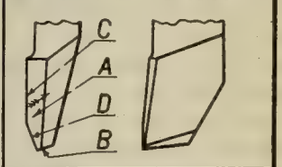


5. VERTICAL



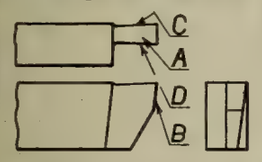
FACE	A	B	C
ANG.	0°	4°	6°

6. SIDE FIN.



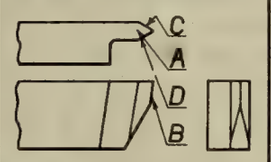
FACE	A	B	C	D
ANG.	18°	6°	6°	4°

7. SQ.-THREAD

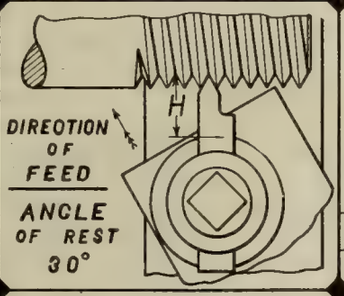


FACE	A	B	C	D
ANG.	2°	6°	10°	0°

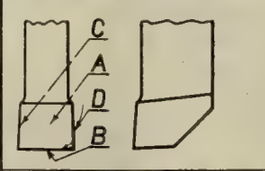
8. V-THREAD



FACE	A	B	C	D
ANG.	0°	15°	12°	6°

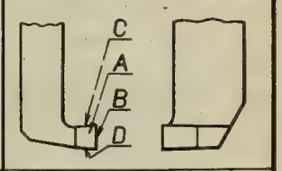


7. FINISHING



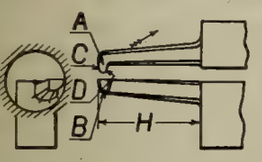
FACE	A	B	C	D
ANG.	7°	4°	3°	3°

8. SIDE SLOT



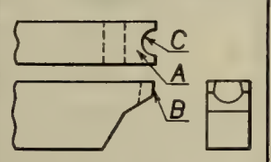
FACE	A	B	C	D
ANG.	6°	4°	3°	3°

9. BORING

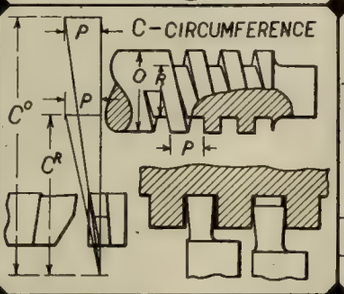


FACE	A	B	C	D
ANG.	5°	8°	6°	6°

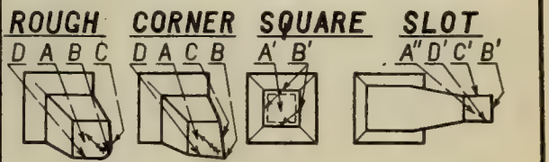
10. BEADING



FACE	A	B	C
ANG.	0°	6°	6°

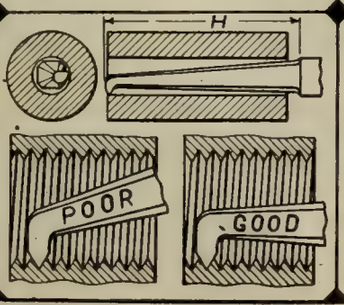


9. SLOTTING TOOLS

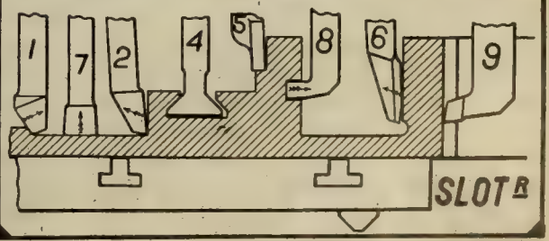


FACE	A	A'	A"	B	B'	C	C'	D	D'
ANG.	8°	0°	6°	6°	4°	4°	3°	4°	3°

SETTING LATHE TOOLS



SETTING PLANER TOOLS



objectionable feature of grinding edge tools is further emphasized if the wheel does not cut freely and undue pressure is required to accomplish the desired purpose.

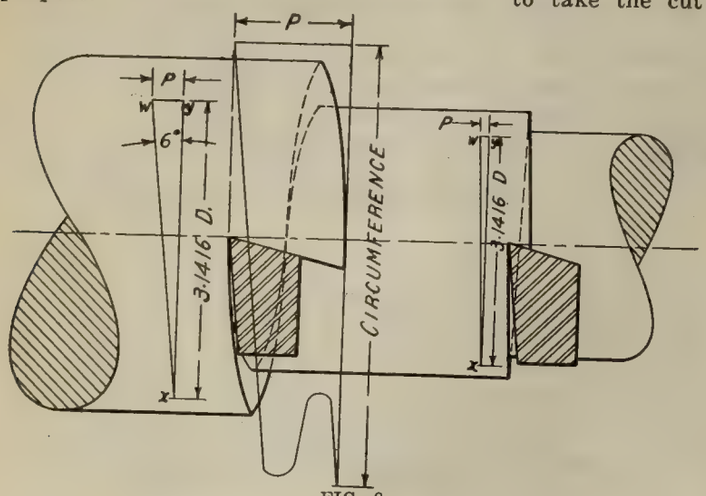


FIG. 8.

Correct Setting Necessary

Accurate grinding of tools may be considered to be one of the essential factors in the metal cutting problem, but the efficiency of good grinding may come to naught if it is not followed by experienced judgment on the part of those who set the tools for the actual performance of the work. Even the scientific grinding to recognized shapes by an expert tool grinder will not compensate for the destruction of the tool through faulty setting of same. In the hands of a novice the setting of the tools may be of much greater importance than careful grinding. Generally speaking, the cutting edge of all tools on lathes should be in the same horizontal plane as the axis of the spindle, or at the same vertical height as the centers upon which the work revolves. This however, can be modified to suit certain conditions, but the rule must be strictly adhered to on work where the tool is operating at different diameters during the same cut; this holding good for all classes of work with the exception of parallel shafts or cylinders. The foregoing can be clearly shown by referring to Fig. 3, which illustrates an ordinary parting tool in the operation of cutting off a shaft. If the edge is placed somewhat above the center as shown at A, the cutting will be entirely satisfactory but, as the tool approaches the center, the clearance of the tool disappears owing to the smaller diameter, thus showing the necessity of keeping the tool on the center line and maintaining a uniform angle of clearance. With the edge above the center, an unobserving or careless workman would have the disposition to "force" the tool on the smaller diameter, causing it to take the cut in jumps, which often destroys the alignment of the shaft or results in the breaking off of the portion being cut.

A parting tool may have every appearance of being correctly ground with the cutting edge on the centre, and yet be of little use for effective work if the side clearance (or lack of it) interferes with the operation of the cut, as shown in Fig. 4. After the tool has been ground, it should show the same clearance on either side of the cutting blade, as illustrated at F; but it should also be seen to that this clearance is maintained after the tool is placed in the holder. For various reasons the tool may acquire a tilt that would eliminate the clearance, with the result that the tool would be forced to one side as it was advanced into the work. With the tool tipped as shown at E, a side thrust would be put upon the tool in the direction of the arrow and, with the saddle fixed, the tool would in all probability rupture at the point D as the weakest section of the tool.

Effect of Overhang

Apart from the actual cutting of the metal there are several incidents in connection with the setting of lathe tools that materially affect the efficiency of the tool being used. Rigidity and stability are undoubtedly the two factors upon which the successful operation of an accurately ground and properly set tool depends. To insure this condition it is at once realized that the cutting point should be as close to the support as circumstances will permit, and therefore the overhang H should be as short as possible. Fig. 5 is a sketch of an ordinary single post tool holder, showing two positions of the tool and illustrating the effect of overhang. The curved arrows indicate the path of the cutting point under the pressure of the cut, the fulcrum being at the point O as shown in the full page chart. The ordinary cutting tool is simply a beam fixed at one end, but is subjected to bending pressure in two directions, that of the downward pressure of the cut and the side thrust caused by the feed along the work.

Fig. 6 is a diagram illustrating the downward action of the cut; O represents the fulcrum or extreme outer support of the tool, the point A being the center of the tool-post screw, and B and C two different positions of the cutting edge. With a tool pressure of 500 lbs. at the point B, and the length E equal to 2 inches, the bending moment about the point O would be 1000 inch lbs., with a similar cut at a distance of G or 4 inches, the bending moment will be 2000 inch lbs. It is therefore obvious that it requires much heavier tools to withstand the same cut at greater distances from the main support, as the holding power in each case is virtually unchanged.

Tool Post Features

There are in the make up of lathe tool-posts, several small details that require careful and constant attention in order that the best work can be performed by the tools. One of these is the space that is necessary below the tilting gib to permit of clamping the tool in position. When the machine is working on cast iron, the cuttings will often accumulate about the post and pack tightly in this space and if not removed will prevent effective clamping of the tool. Another feature that has the same effect is when too short a screw is used in the post, or when an extra shallow tool is used, causing the screw to tighten at the shoulder, before sufficient pressure is exerted on the tool. Still another point that interferes with the clamping facilities is the absence of occasional lubrication on the threads of the screw, especially on the lower end, oil being necessary to reduce the tendency of the screw to seize and thus prevent the required pressure on the tool. It would seem from the position of the curved arrows that any "digging in" would be greater on the shorter than on the longer tool, and while this is true on the diagram, the increased rigidity of the shorter position almost eliminates the tendency to dig in that is so pronounced on the tool with the greater overhang.

Theoretically the longitudinal position of a cutting tool should be at right angles to the line of travel, but this rule is seldom if ever strictly adhered to.

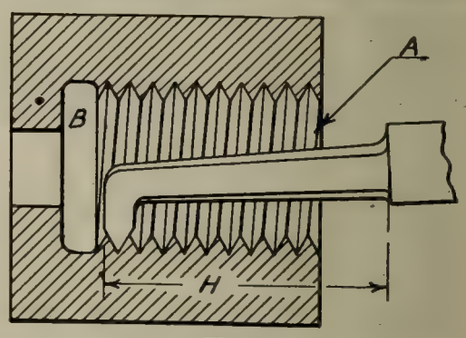


FIG. 10.

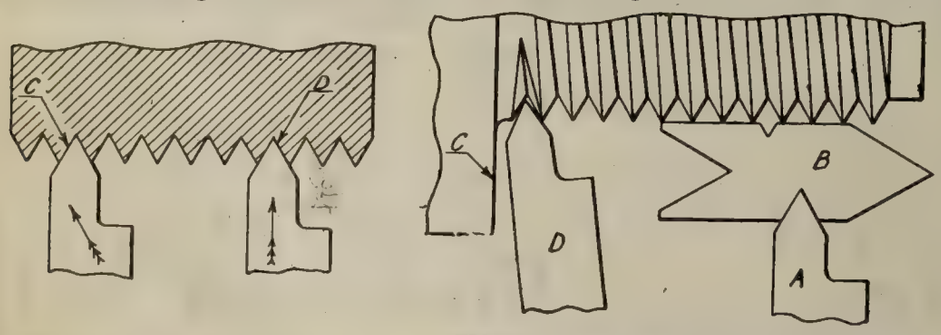


FIG. 9.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

USING WORN AND OUT-OF-DATE TOOLS

By J. Edwin.

ONE often sees tools, especially machinist tools, that have been in constant use for, say, ten, twenty, thirty years, or even longer, and the claim is generally made by the owner that they are just as good or even better than those made to-day. It does not require a very close scrutiny of these tools to see that as well as being far out-of-date, they are worn, nicked, and fit only for the "discard."

Among this class of tools the writer has seen a bevel-protractor having no graduation of degrees on it, bearing the stamp of the year 1864, same having been put on by the owner when he bought it. A four-inch scale is seen still in use stamped with the figures "1875." The four corners of the scale are rounded off, the graduation marks are nearly worn away; therefore, for accurate measuring purposes it is about as useful as a strip of sheet iron. A casual inventory of worn-out and broken tools used by workmen will reveal a considerable number having such defects as warrants their disuse. Included in these are monkey-wrenches with broken handles or handles gone entirely; the adjusting screw with a worn thread and shaky, the knurled end worn smooth; hammers with the flat sides broken off, the handles wired, or partly missing; try-squares nicked, and out of true; pliers and hand-vises which slip and will not take hold; flexible scales broken in two, and numerous other kinds that possibly have come to the reader's attention.

The reason why such tools are still kept and used is because of the associations attached to them; a matter of sentiment. Their use is unprofitable and expensive, because too much care and manipulation are required in operating them. It matters little in how good a condition an old tool might be, for accuracy and convenience it can never compare with those of up-to-date manufacture. Besides, the means for producing first-class working and accurate measuring tools is quite different and more highly specialized than was the case, say, ten to forty or fifty years ago.

Take, for instance, the present type of micrometer, it has in addition to the barrel adjustment, a rachet adjustment, and a binding screw which holds the stem when set, thus eliminating all possibility of its moving after the correct adjustment has been made. Heat treatment of tools is better understood than it used to be. This, of course, is casting no reflection on the old school of mechanics, for many of them were highly skilled, even more so than a great many of our workmen of to-day; but modern machine shop practice, coupled with experience and new ideas, has made possible, by means of special gauges, grinding fixtures, etc., the production of tools that do not vary in the slightest degree of accuracy.

There is little excuse for workmen to continue to use old or out-of-date tools, because the class of the latter that can be bought now are not only moderate-priced, but they contain many useful and improved attachments which makes them still more valuable. It should be as much a rule with mechanics to throw away their old tools as it is of manufacturers to scrap their old machines and replace them with machines of more modern design.

TURRET LATHE PRODUCTION ON AN ENGINE LATHE

By D. H.

THE castings of which a section is shown in Fig. 1, were wanted for some equipment in a munition plant. Being for hydraulic work, the best of iron and workmanship were required. The foundry which took the job could make the iron all right, but had no apparent way to machine them at competitive prices. One hundred and twenty pieces were wanted, all faces to be machined at one setting.

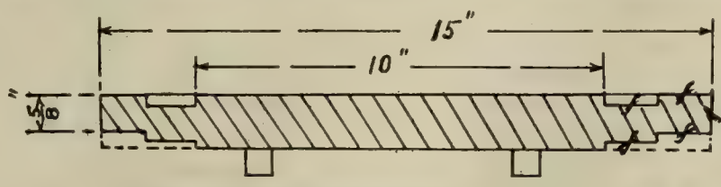


FIG. 1. TURRET LATHE PRODUCTION ON ENGINE LATHE—SECTION OF CASTING.

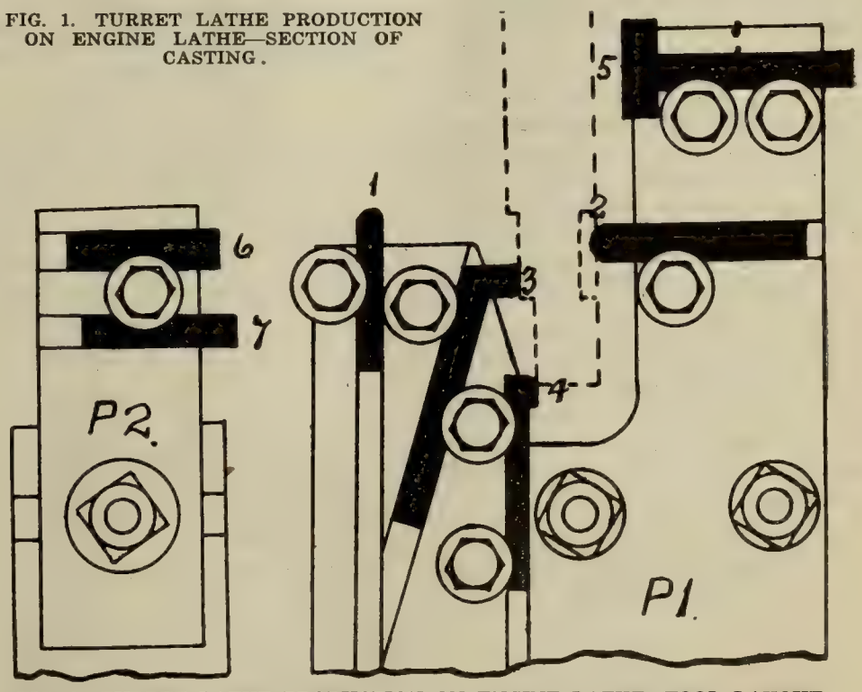


FIG. 2. TURRET LATHE PRODUCTION ON ENGINE LATHE—TOOL LAYOUT.

Tool Layout

After some scheming the tool layout shown by Fig. 2 was evolved and the work was done with it in a 20 in. engine lathe. An iron plate P, 1, was cast, 1½ in. thick, and bolted to the cross slide in place of the tool post. This plate carried five tools, bolted in slots in the upper surface. These tools did all the cutting except the finishing on the chuck side of the castings. Tool 1 turned the outside diameter, tools 3 and 4 roughed the steps on the back, and tool 2 turned the front side. In using the cross-feed, tool 2 began the cut, closely followed by tool 3, making a parallel cut on the back; these two were not directly opposite and when it was time to move tool 3 away to form the step, tool 2 was in position to rough out the depressed ring on the front. After the roughing out, tool 5 was brought up and squared out both corners of the depression.

The back of the casting was left flat as shown by the dotted lines. Actual working proved the wisdom of this; neither of the back tools encountered any sand such as would have been unavoidable if the steps had been cast, the back tool 3 acted as a balancing cut for tool 2 and prevented springing the disc, and having plenty of metal to remove the back tool was not dulled by "skating" over the scale on possible low spots.

Machining the Back

To give a better finish on the back and to square out the corners, two tools, 6 and 7, were mounted in a plate P2, on

a slide rest bolted to the carriage. This slide rest was the familiar auxiliary one with independent hand feed.

The tools used were all high speed tipped, the tips being ⅛ in. x ⅜ in. discards from inserted blade milling cutters. They were brazed to C.D.S. shanks. They averaged three grindings for the job.

Stops were set on the cross slide to gauge the diameters; also stops were used for thickness. A piece of tool steel was milled for a lathe hand's gauge, giving him in one piece a thickness gauge, a depth of slot gauge, a width of slot gauge, and a gauge for the step. This was the only tool he had.

Quick chucking and positive driving were essential. A three-jaw universal chuck was used. Three chucking lugs for this were cast on the back. One of these had an extension that served as a driver. It thus took very little time to set up each piece. Afterwards a few blows with a hammer cracked off the lugs.

A satisfactory time was realized. Including all tools, packing boxes, sharpening of tools, and setting up of the job there was spent an average of fifty-nine minutes on each casting. This included the last of four castings in getting ready.

CAST IRON MILLING CUTTERS

By D. A. Hampson.

IN A pump shop not far from New York City, there are large milling cutters in use, which are made entirely of cast iron. Experiments by the tool room foreman produced the present type which is made by turning up a blank and cutting the teeth just as if it were tool steel. This blank is heated to a red heat, and plunged in a bath of hydrochloric acid. It is then ground as any cutter, but a minimum amount is taken off; provision is made to keep the discs straight in hardening and this materially helps—if too much is ground off the teeth are softer. The cutters are not wonders, but are sufficiently good to be used in place of the 12 in. and 14 in. inserted blade cutters at present steel prices.

Cast iron milling cutters have been used before. Some years ago a railroad shop in the Northwest was making them for their own use. These were hardened by some case-hardening process they had developed and were made in sizes down to 6 in. in diameter.

HYDAULIC AIR COMPRESSOR FOR TIRE SERVICE, ETC.

By C. Mills

THE accompanying sketches illustrate a simple device to inflate automobile or bicycle tires without the usual manual labor. It is cheaply constructed and very serviceable. The tank is an ordinary 30 gal. water service tank using water at city pressure—60 to 70 lbs.—to displace the air, which is taken away by a small pipe at the top and connected to the tire by a small hose. The tank illustrated in Fig. 1 has been found large enough for tires up to 32 x 3½ in., one filling of water being sufficient for two completely deflated tires or four semi-deflated.

To inflate tire, connect hose coupling

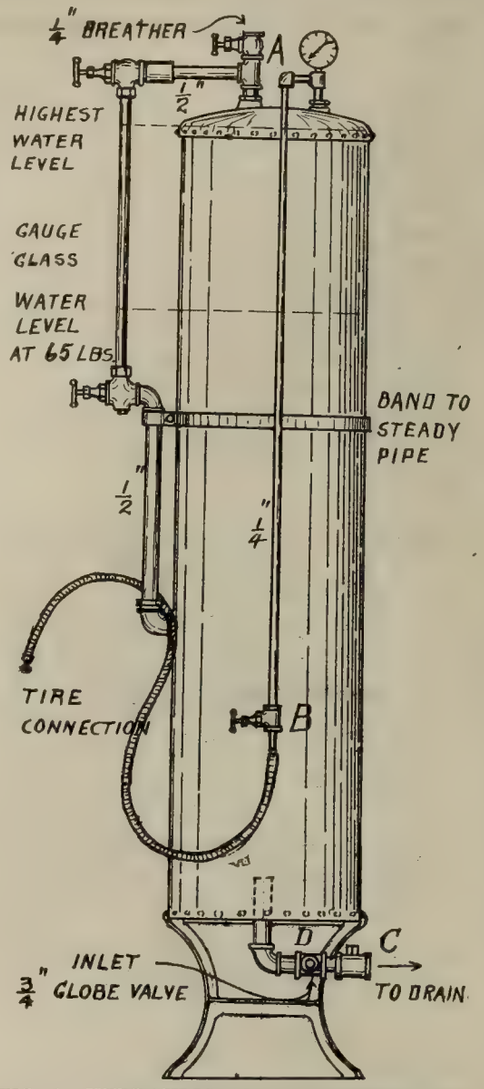


FIG. 1. HYDRAULIC AIR COMPRESSOR FOR TIRE SERVICE, ETC.

to valve stem, close the valves A and C, and open D. The air pressure will rise till it is equal to the water pressure.

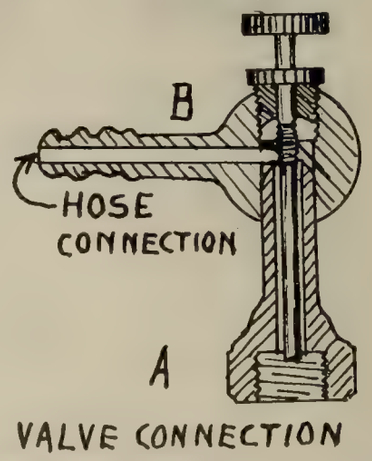


FIG. 2. HYDRAULIC AIR COMPRESSOR FOR TIRE SERVICE, ETC.

When the necessary pressure is acquired, close valve D. Air can be used until the water in gauge glass shows at high level marks, which is about 1 or 1½ in. from top head of tank. Beyond this level, water is liable to get into the air pipe and into the tire. To drain tank, open valves A and C. When empty, it is ready for another charge.

The pressure in the tire will be somewhat less than that in the tank, caused by the tension of the small valve spring in valve stem of tire. If full tank pressure is required, it is necessary to use a small fitting like Fig. 2, which is easily made. It is composed of the usual coupling A soldered into a brass fitting B. A small threaded stem passing down through a stuffing box engages the valve stem, forcing it down from its seat. When inflating tire, turn the small screw two or three turns down after the coupling is connected on valve stem, when tire is full, loosen back the screw before taking off the coupling.

STEAM TENDERS FOR LOCOMOTIVES

THE development of the Mallet locomotive to its enormous dimensions on American railways has resulted in the "triplex" engine having three groups of driving wheels, the rear groups being under the tender. A more recent and more peculiar arrangement is the application of power to tenders for engines of more ordinary type and size. To increase the power of new goods engines of the 2—8—2 type the Southern Railway has taken discarded engines of the 2—6—0 and 2—8—0 types, removed their boilers and placed large tanks or tender bodies on the frames. The cylinders of the tender are reduced to a smaller diameter than those of the engine, and the steaming capacity of the boiler is improved by means of fire-brick arches, while a feed-water heater is added to utilize the exhaust from the air-brake compressor pump. Well-lagged pipes convey either superheated or saturated steam to the tender cylinders.

The 2—8—0 tender increases the drawbar pull of the engine by nearly 40 per cent. The engine has cylinders 27 in. by 30 in., and 63 in. driving wheels, with 51,600 lb. tractive power. The cylinders are bushed to 27 in. by 26 in., giving a tractive effort of 48,000 lb. The 2—8—0 tender with cylinders 20 in. by 24 in., and 50 in. driving wheels has a tractive effort of 28.500 lbs., making a total of 76,500 lbs. The weight of the steam tender is about 85 tons. It carries 8,000 gallons of water. The engine weighs 135 tons with 107 tons on the drivers. On a division seventy miles long, with gradients of 1 in 66 and 1 in 59, the 2—8—2 engines alone can take trains of 1,100 tons on the heavy gradients and 1,150 tons elsewhere. The "duplex" engines—with steam tenders—can take 1,400 tons and 1,600 tons, and increase of 27 and 39 per cent., respecticely.—*The Engineer.*

The Montreal Machinery & Supplies, Ltd., Montreal, have changed the name of the concern to the Standard Machinery & Supplies Ltd.

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CANADA'S RAILROAD DEVELOPMENT

IN our present issue, and by way of supplementing the articles which appeared a week ago covering the Confederation Jubilee of the Dominion of Canada, there is featured, at some length, the development that has taken place in railroading within our borders. Through the courtesy of the various railway executives, we are able to bring to the attention of our readers a number of facts concerning this phase of our national advancement, and through the medium of the illustrations which accompany the article, give them a more vivid realization of the extent and value of the achievement compassed.

It is, of course, generally believed that as far as the construction of transcontinental lines is concerned, we have been more enterprising than wise, in other words, we are provided with facilities very much ahead of their profitable employment. As a result, how best to minimize, if not altogether eliminate the undesirable tendencies arising from the meantime superabundance of across-country transportation, is a question second only in importance, but lacking nothing in magnitude, comparatively, to our part in the prosecution of the war in Europe. The financial side of our railroading is the disturbing factor, and this, of course, is no new thing, as in the early period of our Confederation history, and probably antedating even that, revenue did fall materially short of expectation, and not only so, but short of the existing need. Steps have been taken towards the best possible solution of the problem with which we are meantime menaced, and we are hopeful, having regard to the procedure adopted, and the apparent desire to have highly skilled minds do the work involved, that at no distant date the irksomeness of the situation will be very materially relieved.

The cessation of emigration from the Motherland and Europe generally, as a result of the war, has retarded settlement to a very great extent, hence in some degree the non-fulfillment of anticipations of transportation revenues. Again, in view of the long drawn-out nature of the conflict in Europe, with its life and territory devastating accompaniments, there may well be misgivings as to the number of settlers who may come to our shores in the next decade, or even quarter century. It is of interest to note, however, judging from recent statistics, that large numbers from across the line have taken advantage of the opportunities we have to offer, and perhaps the most satisfactory feature of such a circumstance is to be found in that the influx shows a well-balanced distribution, between the objectives of cultivation of the land, and the establishment of manufacturing plants.

On account of the severity of our winters, we are almost wholly dependent on our railroads for many months; in addition we have to requisition their services unstintingly all the time. The war, while non-hurtful as regards business offering, but rather the reverse, has exercised its influence to the detriment of our railroads in other directions. We refer particularly to the lack and high price of materials entering into road construction and betterment, rolling stock repair and efficiency maintenance. Steel, that primary essential, not only to railroads, but to every conceivable form of industrial enterprise, is not only high-priced, but scarce, and is likely to remain so while the war lasts. Not only are our own steel mills devoting their whole attention to the production of munitions steel, or that to serve a kindred end, but those of the United States from which we have been wont to at least supplement our requirements, are likewise so concentrated.

Much heart-burning has been in evidence with regard to the apparent failure of our railroads to measure up to the needs of the hour, not only with regard to the transportation of much needed munitions and general manufacturing equipment, but to that of maintaining a sufficient fuel supply for daily and coming winter needs. We are of opinion that not only are all the circumstances fully appreciated by our railroad executives, but their efforts are concentrated to overcome the "hard spots." It is impossible to do otherwise than credit the various administrations with as much common-sense as is to be found in the conduct of any other line of business, no matter its nature. No business enterprise can boast of an unblemished record of achievement, and none ever will, it may be added, although not a few still measure up to a comparatively low standard. It may be said of our railroads that their efficiency rating will not suffer by any comparison with industrial enterprise generally.

MONEY A FACTOR IN OUR BUSINESS OUTLOOK

THE money situation, present and prospective, continues an important factor in relation to the business outlook in Canada. However, it is not likely that money shortage will seriously affect the general prosperity of the country, although it may necessitate some changes and adjustments in order that available capital be employed to the best advantage, especially as the American market is becoming more difficult to negotiate for new funds, and may be later closed altogether.

Fundamentally Canada is an agricultural country, and with good crops at the prevailing high prices for foodstuffs, and with war demand for manufactured products, moderate prosperity is assured. That is at least so long as we manage our internal affairs in manner to successfully reach the waiting markets with our natural and manufactured profits. Ruling prices insure the required margin of profit, but it is very important that we should have smoothly working transportation facilities. It is vitally important that we should move products and raw materials in such a manner as to secure quick turnover.

In this connection the car shortage has a direct bearing upon the business situation. The more rapidly that crops or manufactured goods reach their market the more quickly will the capital which they represent be raised for other undertakings. Canada must make delivery—at least to the seaboard—to get the benefit of her production. The more rapid the movement, the greater the amount of business which can be negotiated with the country's available funds.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$47 95
Lake Superior, charcoal, Chicago	57 00
Standard low phos., Philadelphia	82 00
Bessemer, Pittsburgh	55 95
Basic, Valley furnace	50 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	.....

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	12 10
Chequered floor plate, ¼ in.	12 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 50
Tank plates, Pittsburgh	9 00
Structural shapes, Pittsburgh	4 50
Steel hoops, Pittsburgh	5 25

F.O.B., Toronto Warehouse.

Steel bars	5 50
Small shapes	5 75

F.O.B. Chicago Warehouse

Steel bars	5 00
Structural shapes	5 00
Plates	8 50

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22 1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$37 50	$37 00
Electro copper	37 50	37 00
Castings, copper	36 50	36 00
Tin	63 00	66 00
Spelter	12 00	12 00
Lead	14 25	14 25
Antimony	25 00	26 00
Aluminum	70 00	68 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$10 00	$11 00
Heads	10 30	11 30
Tank plates, 3-16 in.	10 10	11 10

WROUGHT PIPE.

Effective May 14, 1917.

Size.	Black Per 100 feet	Galvanized Per 100 feet
Standard Buttweld.		
⅛ in.	$ 4 50	$ 6 00
¼ in.	4 96	7 00
⅜ in.	4 96	7 00
½ in.	6 29	7 86
¾ in.	7 94	10 06
1 in.	11 73	14 88
1¼ in.	15 87	20 13
1½ in.	18 98	24 06
2 in.	25 53	32 38
2½ in.	40 95	51 77
3 in.	53 55	67 70
3½ in.	66 24	83 26
4 in.	78 48	98 65
Standard Lapweld.		
2 in.	28 49	34 97
2½ in.	42 71	52 94
3 in.	55 85	69 23
3½ in.	68 08	86 02
4 in.	80 66	101 90
4½ in.	93 98	118 70
5 in.	109 50	138 40
6 in.	142 10	179 50
7 in.	185 60	232 05
8 L in.	195 00	243 75
8 in.	224 60	280 80
9 in.	269 10	336 38
10 L in.	249 60	312 00
10 in.	321 40	401 70

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 50%.
4½" and larger, 45%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%.
4½" and larger, 20%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$22 00	$22 00
Copper, crucible	26 00	27 00
Copper, heavy	26 00	26 50
Copper wire	26 00	26 50
No. 1 machine composition	22 50	22 00
New brass clippings	18 00	19 00
No. 1 brass turnings	16 00	16 00
Heavy melting steel	20 00	17 00
Steel turnings	9 00	8 00
Shell turnings	12 00	12 00
Boiler plate	15 00	10 50
Axles, wrought iron	23 00	24 00
Rails	19 00	18 00
No. 1 machine cast iron	25 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	17 00	9 00
Scrap zinc	8 00	9 50
Heavy lead	11 50	10 75
Tea lead	7 50	7 00
Aluminum	35 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	25
Stove bolts	55
Plate washers	net list
Machine bolts, 7-16" and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank,	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in. and larger	$7 10
Structural rivets, as above.	7 00
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze.	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$100 00
Open-hearth billets	100 00
O.H. sheet bars	105 00
Forging billets	125 00
Wire rods	95 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 35	5 35
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		6 50
Spikes, ¼ and 5-16 in.		7 00

MISCELLANEOUS.

Solder, strictly	0 38
Solder, guaranteed	0 41
Babbitt metals	16 to 65
Soldering coppers, lb.	0 53
Putty, 100-lb. drum	4 35
White lead, pure, cwt.	19 00
Red dry lead, 100-lb. kegs, per cwt.	13 87
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 62½
Linseed oil, raw, single, bbls.	1 27
Linseed oil, boiled, single bbls.	1 30
Plaster of Paris, per bbl.	2 50
Plumbers' oakum, per cwt.	9 00
Packing, square braided	0 34
Packing, No. 1 Italian	0 40
Packing, No. 2 Italian	0 32
Lead wool, per lb.	0 15
Pure Manila rope	0 37
Transmission rope, Manila	0 43
Drilling cables, Manila	0 39

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto	25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks	list plus 30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 10%; B and C, 10%; cast iron, 35%; standard bushings, 50%; headers, 60; flanged unions, 40; malleable bushings, 50; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, Black, No. 28	$10 00	$10 00
Sheets, Black, No. 10	9 50	10 50
Canada plates, dull, 52 sheets	11 00	11 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	9 75	9 75
Queen's Head, 28 B. W.G.	10 75	10 75
Fleur-de-Lis, 28 B.W. G.	10 75	10 75
Gorbal's Best, No. 28	10 25	10 25
Colborne Crown, No. 28	10 00	10 00
Premier, No. 28 U.S.	10 90	11 70
Premier, 10¾ oz.	11 10	12 00

PROOF COIL CHAIN.

B	
¼ in.	$10 75
5-16 in.	10 40
⅜ in.	10 25
7-16 in.	10 00
½ in.	9 90
9-16 in.	9 90
⅝ in.	9 75
¾ in.	9 50
⅞ in.	9 40
1 inch	9 25
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	55
Kearney & Foot, Arcade	55
J. Barton Smith, Eagle	55
McClelland, Globe	55
Whitman & Barnes	55
Black Diamond	45
Delta Files	40, 5
Nicholson	45
Globe	55
Vulcan	55
Disston	55

COAL AND COKE.

Solvay Foundry Coke	$10 90
Connelsville Foundry Coke.	..
Steam Lump Coal	8 50
Best Slack	8 05

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$33 00	....
1¼ in.	36 00	....
1½ in.	38 00	32 00
1¾ in.	38 00	32 00
2 in.	45 00	33 00
2¼ in.	48 00	35 00
2½ in.	50 00	38 00
3 in.	58 00	45 00
3¼ in.	....	53 00
3½ in.	70 00	55 00
4 in.	82 00	67 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	38
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	13
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	6 15
Lard oil, per gal.	1 50
Union thread cutting oil antiseptic	68
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	11

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No.1	1 50
Leather in sides	1 35

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER SHEETS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	2 50
Polishing wheels, bull-neck	1 35
Emery in kegs, American	06
Pumice, ground	04
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THE decline in prices of soft coal in the United States, ranging from $1 to $1.50 a ton will benefit Canadian consumers, and it is to be hoped that prices of anthracite will also be reduced. The steel market is as strong as ever, and further advances in prices are looked for in the near future. Steel prices are almost getting beyond the reach of the average consumer, and private enterprises are in many cases being restricted. The shortage of steel is also a serious factor and one that will become more acute owing to the increasing demand for war purposes. Domestic pig-irons are still off the market and it is impossible to say when the situation will improve. The furnaces are sold up for the whole of this year with a growing demand for next year's output. Pig-iron prices continue to advance in the United States and the market is very strong. Connellsville coke is also advancing, but supplies are moving forward from the ovens in better volume. The scrap metal market continues dull and featureless, with consumers holding off in expectation of lower prices. Indications, however, point to a firmer market. Prices of non-ferrous metals are holding firm on the basis of last week's quotations; business, however, continues dull, as the trade is still awaiting developments regarding the American Government requirements. The situation in the machine tool market continues unchanged, but general advances are looked for.

Montreal, Que., June 30, 1917.—Industrial conditions in all quarters reflect the pressure that still characterizes every phase of activity. The American situation is clearing but a certain degree of uncertainty marks the developments that are now coming to a climax. Steel conditions have been a little quieter during the week and advances have been less pronounced, but no marked relief has been noted regarding the acute situation in connection with the delivery of all kinds of material.

Pig Iron

Activity in pig iron is still the feature of the iron and steel market with quotations higher on certain grades. The Pittsburgh price on basic pig has again advanced, the quotation this week being $55.95 per ton, an increase on the week of $2 per ton. The demand for low phosphorus pig has never been equalled and as high as $92 is now being paid for this particular grade. Canadian conditions are becoming more acute with producers out of the market and no quotations available.

Steel

With a few notable exceptions the entire situation has taken on a quiet tone and price changes that have been a continual feature for several weeks past, in nearly all lines of product, are this week confined to bars and shapes and also higher quotations for plates; this latter being no surprise in view of the abnormal conditions prevailing in the shipping industry. Every effort is being put forth to facilitate the increased production of steel plates but there appears no possibility of attaining the proportions that are at present required to meet the enormous consumption. The abnormal needs could be still further increased if there was any likelihood of obtaining the material; even the exorbitant prices being a secondary consideration to that of securing the steel. Conditions in the States are still of such a nature as to keep the trade undecided as to what course the government will adopt in connection with the regulation of the prices to be paid for steel and other requirements. What effect the action of the government will have on early future conditions, is as yet, too early to predict, but it is not thought that any great revision will result owing to the heavy demands and constant inquiries from all quarters and for all classes of materials. Mills are still turning down orders for future positions as their books are filled

up in many instances to the end of 1918. The local district continues to suffer owing to the inability to get satisfactory delivery of material; dealers here are closely watching American developments for a lead in future transactions, but the situation is practically unchanged from that of the previous week. All prices are firm with an undertone of increasing strength in plates. Further advances on American quotations would eventually be reflected in local prices. The United States market has had a quiet week respecting price changes; the only ones noted being in steel bars and tank plates, the former on an advance of $5 per ton is now quoted on a base of 4¾c per pound Pittsburgh. The quotation on tank plates has been advanced another $20 per ton, the base price, Pittsburgh, has been advanced another $20 per ton, the base price, Pittsburgh, being 10c flat.

Metals

The general metal situation still carries a burden of uncertainty owing to the delayed action of the American Government in relation to the regulation of price conditions. The nearer approach to a decision in this matter has added to the nervousness that has characterized the market for the past several weeks. The announcement that a price of 25c is to be paid, has done much to clear the atmosphere, but even this price is indefinite as no settled agreement has yet been made between the producers and the government, the price to be later decided after a commission has investigated the present cost of production. Open market prices on copper continue firm. Disturbing factors have made tin weaker. Lead, spelter and antimony are also easier.

Copper.—The American Government has at last decided to fix a price of 25c for their copper requirements; this however with the understanding that the price is subject to the finding of a commission who have been appointed to investigate the present cost of producing copper. This phase of a very uncertain situation has materially relieved the tension of the past few weeks but owing to the indefinite nature of the proposals the market conditions retain a certain degree of nervousness, which will only be finally lifted by the recommendation of the investigating committee. No changes are reported on the New York market, and quotations here remain firm and unchanged; 37½c for lake and electro, and 36½c for castings.

Tin.—The developments of the past few months gradually leading up to the probable control of industrial markets in the States by the Federal government, has created a situation that has culminated in what at present appears to be a disorganized condition in all circles. This is due more to the uncertainty of the government's attitude than to any material upsetting of actual conditions. In face of delayed cables and a falling off of the domestic demand the American market has taken on an easier tone and prices have declined 1¼c on the week, the spot price being now 62¼c per lb. On a quieter market local dealers continue to quote 63c per lb.

Spelter.—The attitude of producers in refraining from accepting orders for future positions, together with the fact that consumers are also holding off, has affected the market to such an extent that weakness has developed with a slight decline in price quotations. New York markets is ¼c lower than a week ago. Local price is unchanged at 12c per lb., market rather quiet.

Lead.—The lull that has come upon the lead market has brought to light considerable metal which may go far to allay the fears of consumers that there was a pronounced shortage of this metal. The range of prices between the leading interests and the independents has again been decreased, the outside quotation being now 11½c, a decline of ½c during the week. The market locally has been steady but this week's quotation of 14¼c is a decline of ½c per lb.

Antimony. — Increased buying has somewhat revived the interest in this metal but the demands for future requirements are very light, and the supplies are much larger than the market can dispose of. The market is easier on the New York quotations but dealers here continue to quote last week's price of 25c per lb.

Machine Tools and Supplies

No important developments have taken place in this branch of industrial activity and conditions continue to reflect the stress that is so pronounced in other directions. Sales are light in munitions machinery but very encouraging in respect to general demand, particularly in connection with equipment for shipbuilding and accessory purposes. The American situation has increased the difficulty of obtaining delivery from firms in the states, owing to the adnormal demand for machines for various purposes. The supply situation maintains its normal condition with prices on all commodities very firm or stronger; a feature that is likely to mark this market for an indefinite period.

Scrap

Dullness has apparently affected the old metal situation, and the waiting attitude seems to be more pronounced than last week. As the time draws nearer for definite action on the part of the American authorities, the nervousness is increasing. These factors are having an influencing effect upon dealers and consumers, and sales are quiet. Local dealers report a strong market with an uncertain undertone.

Toronto, Ont., July 3.—That the trade of Canada continues to expand is shown in the statement recently issued at Ottawa by the Department of Customs. For the month of June the revenue amounted to $15,386,678, compared with $12,030,451 for June, 1916, being an increase of $3,536,226. For the first three months of the present fiscal year the increase in revenue amounted to $11.248,798 over the corresponding period of last year. These figures are very satisfactory in view of the conditions prevailing in regard to shortage and increasing high cost of raw materials and scarcity of labor. A reduction in the price of soft coal ranging from $1 to $1.50 per ton in the United States is welcome news, and will benefit consumers in this section of this country. It is not known as yet if anthracite will be affected, but it apepars likely. The important thing now is to get coal moving in sufficient quantities to fully supply the demand.

Steel

Conditions in the market in the U. S. dominate the situation in Canada to a greater extent than at any other period. Canadian mills, by reason of their heavy commitments of steel for war purposes, can only take care of their domestic business to a small extent; the balance must of necessity, as far as possible, be obtained from the States. In that market, however, conditions are such that domestic consumers there cannot obtain a fraction of the steel they require and private enterprise has fallen off in proportion. Canadian consumers are affected in a like manner, and they are suffering serious inconvenience. Not only is the shortage of steel getting more acute, but prices of many products are becoming almost prohibitive for the average manufacturer, whose only hope is to continue in business as long as his old contracts for steel will carry him, and then await a readjustment.

Although there are no price changes to announce this week, a number of advances are in prospect. Iron and steel bars and structural shapes are expected to advance very shortly. Higher prices on wrought pipe are also looked for. The situation in plates is tighter than ever, and higher prices are inevitable. The plate mills are being taxed to the limit to meet the requirements of the American Government and private shipbuilders. Prices of plates are entirely nominal, and no one can tell what the market is. Conditions in the boiler tube trade are unchanged, and prices continue very firm.

The sheet market continues steady, with prices practically nominal. The commercial demand for sheets continues active, but the mills are refusing to quote on new business not coming from regular customers, conserving as much of their output of sheets of all grades for Government needs. The U. S. Government are ordering sheets at the rate of 19,000 tons monthly.

It is expected that the American Government will shortly announce a decision with regard to contract prices for iron and steel products. In the meantime, prices are advancing, due largely to Government orders, with the result that private consumers are holding off from the market wherever possible.

Pig Iron

Domestic foundry pig irons continue off the market, and the situation is generally unchanged. Pig iron prices in the States, however, are still advancing. At Buffalo, No. 1 foundry, malleable and basic, are now held at $53 to $55. Lake Superior charcoal iron is now $57, Chi-

cago. The coke situation continues to grow serious. Producers are not willing to enter upon contracts at any price, as they say they cannot tell what their production costs will be, nor whether they can secure a sufficient number of cars to make deliveries. Connellsville coke has recently been sold as high as $15.50 ovens, and further advances are expected shortly.

Scrap

The situation in the scrap market is unchanged, and prices are at the same level as quoted last week. Consumers continue to keep out of the market in the expectation of lower prices. Heavy melting steel and machinery cast iron are in good demand and prices are holding firm. Shell turnings are in good supply, and stocks on hand are increasing with a consequent weakening in price. There is a continued scarcity of most old materials which is tending to keep prices up.

Machine Tools

Fair demand for machine tools for general purposes continues to be the feature of market. Prices of practically all lines of tools are very firm, with prospects of advances. In the Chicago district, advances of 5 to 15 per cent. have been made on almost all kinds of machine tools. Radial drills have advanced 15 per cent., and boring mills 10 per cent. There is increasing activity in the market in the States, which will affect deliveries of machinery imported into Canada.

Supplies

Business continues active at firm prices, but there are no changes of particular importance to note this week.

Metals

The metal markets have been more or less inactive during the week, as consumers and producers are awaiting further developments in regard to the American Government buying. Last week the Government purchased a quantity of lead at 8c, St. Louis, while more recently it was announced that 60,000,000 pounds of copper had been purchased at 25c, New York. A decision in regard to the other metals has yet to be made, which introduces an element of uncertainty into the market. There are no price changes to note this week, but quotations generally are holding firm.

Copper.—The purchase of sixty million pounds of copper at 25c by the American Government has created considerable interest in the market, and it is believed to be an indication that the Government consumption for its own use and also that of the Allies is going to be exceptionally heavy. The market is quiet and prices continue more or less nominal for all positions. Lake and electrolytic are quoted at 37c, and castings 36c per pound.

Tin.—The market is dull and featureless, but prices are holding firm. Local quotation, 66c per pound.

Spelter.—The market continues dull, with a continued lack of interest taken in spelter by consumers. It is expected that further U. S. Government orders for spelter will be at prices probably better than were fixed for the previous purchase. Local quotations unchanged at 12c per pound.

Lead.—The tone of the market is easier, and the independents have dropped their price to 11.50c New York, which is now only a shade above the "Trust" quotation. Local quotations unchanged at 14¼c per pound.

Antimony.—Dullness continues to prevail in the market, and prices are unchanged at 26c per pound.

Aluminum.—The market is quiet and demand light, with quotations unchanged at 68c per pound.

Pittsburgh, Pa., June 30.—Buyers of steel are asking each other the question what is to become of the steel market as there is no check to the flight in prices. Long ago they passed the level at which business could be comfortably done, and now they are, to most consumers, altogether prohibitive. Almost throughout this price movement, which began January 1, 1915, there has been the thought that possibly the market would break, as it seemed to be advancing beyond levels that could be maintained, but each time those who expected lower prices have been disappointed. It is surprising how little confidence some buyers have in a decline, and how they halt on the question of whether to buy or not to buy, even though they can see no possibility of securing such prices for their finished wares as would justify their paying the prices for rolled steel now asked.

Of course there are many buyers who have simply dropped out of the market entirely, realizing that there is less danger in not buying than in buying, and thus the market has been made narrower and narrower week by week, in point of tonnage. There seems always to be greater restriction in the offerings than in the demand and thus prices tend to advance more and more. Blue annealed sheets are quotable at 8c to 9c, or half a cent a pound more than the quotation named a week ago, while black sheets, although quotable generally at 8c to 9c, are nearer the higher figure than the lower. Galvanized sheets are quoted all the way from 10.25c to 10.75c for delivery late in the year, depending on tonnage and the standing of the buyer. Tank plate is now quoted at 9c to 10c, or a cent a pound more than a week ago, ship plates being in the neighborhood of 12c.

An Absurd Market

The market is absurd not only in the height it has reached but also in the great disparity now existing between prices quoted as the market on fresh purchases, and prices at which steel is now being delivered. On an average the current market is about double the average invoice price of the steel being shipped. In plates and sheets the divergence is still greater. Probably nearly all of the early contracting in sheets for the present half year was at 3.25c to 3.75c. In the case of plates it is quite certain that the average price on the deliveries now being made by the larger mills is under three cents, or less than one-third the present quoted market. The smaller mills, which do not contract ahead, are, of course, receiving higher prices on their current shipment. The great disparity between market prices and prices on actual shipments makes it particularly difficult for any manufacturer of finished wares, who is not protected, to do business, because the market for the products he sells has not correspondingly advanced.

Government Regulation

The opinion has been spreading rapidly in the past fortnight that there will soon be some form of Government regulation of steel prices. While the steel manufacturers as a rule say nothing on this subject or if they talk simply refer to the difficult or "impossibility" of the Government fixing a schedule of prices on commodities showing such a wide range in size, quality, etc. A few, however, frankly state that they expect Government price regulation to be forced. If such a thing borders on the impossible, so is the present steel market impossible, as rewards the conduct of any regular and orderly business. It is only the buyer placed in exceptional circumtsances who can afford to pay the prices now asked by the few mills that will quote at all

The opinion that there will be Government price regulation in the iron and steel industry has been strengthened by the regulation of coal prices, which was agreed to Thursday, June 28, to become effective July 1. The price for the Pittsburgh coal district is $3 for slack and mine-run, per net tone at mine, this price being net to operators, brokerage up to 25 cents being allowed.

The case of iron and steel, however, is totally different from that of coal. There were few contracts made for the twelve-month beginning April, 1, 1917, and most of the coal movement has either been by actual transactions in the spot market, or by shippers having an understanding whereby they shipped customers at a certain rate, the price being adjusted week by week at the spot market or a shade under. Thus the coal industry starts under the new regime with very little contract tonnage on its books, and the adjustment is easy. The blast furnaces and steel mills, on the other hand, have a great deal of tonnage on books and are behindhand in deliveries. If prices were fixed at much below the present market many contracts would have to be revised. The producers would have nothing to sell for some time to come, and there would be confusion in deliveries. Undoubtedly it would be necessary for deliveries on existing contracts to be regulated also.

Pig Iron and Scrap

ThePittsburgh scrap market has experienced a little break in the past week, and this is attributed to the dealers, fearing that there will soon be such Government regulation of finished steel prices as will reduce scrap values. The pig iron market presents the appearance of continuing to advance, but the advances are not well marked in all districts and the disposition to buy is certainly reduced. As illustrative of the nervous condition of buyers, there was a rumor in New England two or three days ago that the Government

was going to reduce pig iron to $30 a ton. The source could not be identified and the rumor certainly was not authentic, but it caused many of the buyers to question sales agents, seeking further information.

New York, June 30.—Machinery interests throughout the United States are overwhelmed with business. The capacity of the manufacturing plants is sold for six months to a year ahead and deliveries are from seven to eight months in arrears, in not a few instances. To meet the pressure many machine toolmakers and founders are extending plants by building additional shops. The demand at the moment is heaviest for fabricating shop equipment. The new orders come mainly from ship builders who have already secured contracts for cargo boats from the Government. War munition manufacturers are actively in the market and liberal contracts have already been placed by builders of airplanes and motors. Additional order for machine tools are sure to follow the completion of the Government's plans for the enormous fleet of airplanes. It is proposed to appropriate $600,000,000 for this purpose.

Manufacturers of machine tools have again advanced prices from 5% to 15%. Prices of lathes have been advanced 12½% to 15%: planers 10%. and radial drills 15%. The demand is especially active for heavy forging machinery. Boring mills have been advanced 10%, and quite often orders cannot be filled at any price. The inability of builders of machine tools to make early deliveries has compelled many manufacturers to seek for second-hand tools. but dealers find unusual difficulty in obtaining these.

The United States Government has just awarded contracts for several 330-ton electric cranes. These will be the largest of the type that have ever been built, and are to be installed at various navy yards. The Navy Department is also actively buying machine tools to equip the many new plants on the Atlantic coast for which contracts have been let. The Government is also on the point of closing for six 6-ton Heroult electric furnaces as it is claimed that only the high grade steel necessary for special projectiles can be manufactured in this type of furnace.

Private ship yards holding Government contracts have placed substantial orders for travelling and locomotive electric cranes. Manufacturers of ordnance, power and steel companies, are also installing cranes and placing new contracts, although in some cases deliveries cannot be made inside of seven months.

Automobile truck manufacturers in need of radial drills, planers and lathes, are not deterred from placing orders by the sharp advance in prices. Liberal orders for shop equipment are also being placed by automobile manufacturers who have turned to building aeroplane motors and engines. Railroads, after being out of the market for a time, are now actively placing orders for shop equipment, and

(Continued on page 72)

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

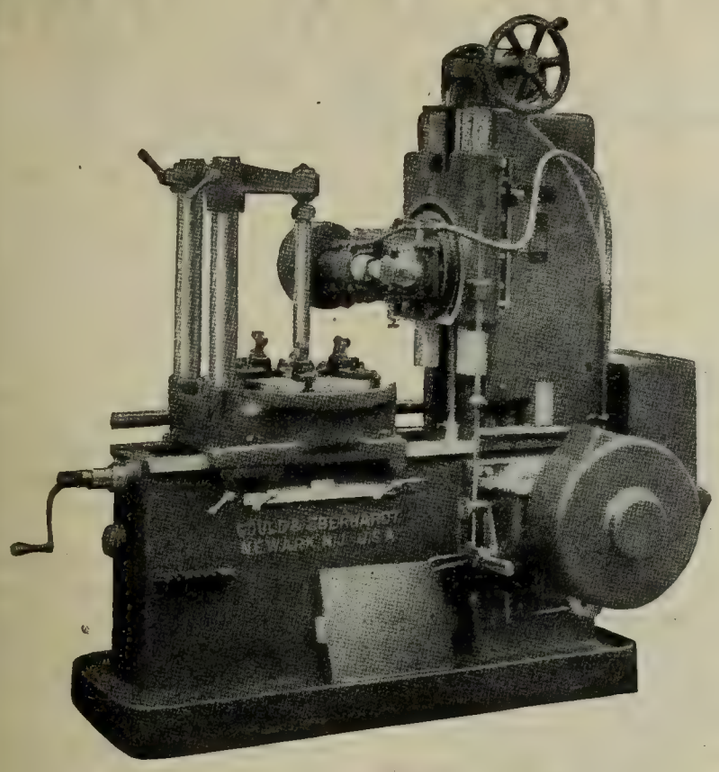
BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.



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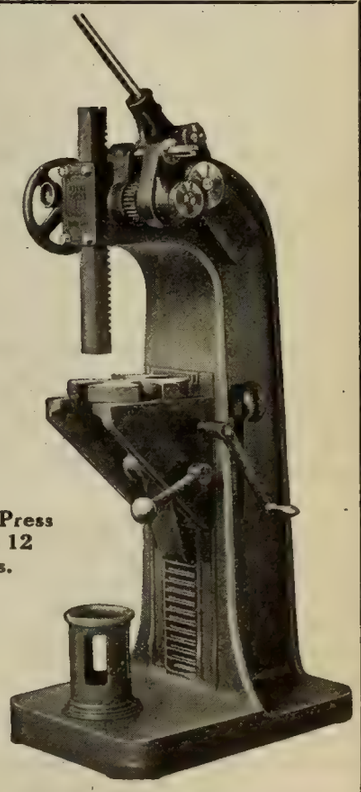

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INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

London, Ont.—E. Leonard & Sons contemplate building an extension to their works.

Hamilton, Ont.—The Canada Screw Co. are considering building an extension to their plant.

Copper Cliff, Ont.—The Canadian Copper Co. are building a pumping station for a sewage disposal plant.

Vancouver, B.C.—The Vulcan Iron Works will build and machine a shop on Industrial Island, to cost $30,000.

Copper Cliff, Ont.—The Canadian Copper Co. will build a blast furnace and converter to cost $200,000. The Dominion Bridge Co. will supply and erect the steel work.

Toronto, Ont.—The Consumers' Gas Co. has been granted a permit to erect a one-storey brick building at the corner of Parliament and Front streets for a "booster" house at a cost of $27,000.

Cookshire, Que.—The Westbury Electric Light & Power Co. are installing a hydro-electric plant. Tenders have already been called for the construction of a concrete dam.

Goderich, Ont. — The National Shipbuilding Co. is arranging for the use of the Paget factory and Mr. Paget, of Huntsville, was in town this week in connection with the arrangements.

Sidney, N.S.—The Dominion Steel Corporation has started extensive improvements to the Wabana properties which will increase the output of iron ore from 800,000 to 1,600,000 tons. The cost of the work is estimated at $1,500,000.

Cobalt, Ont.—It is reported here that construction work on the Hangingstone Falls power plant is about to be suspended owing to the inability of the contractors to secure the required number of workmen to complete the work in the specified time.

GENERAL

Three Rivers, Que.—The Three Rivers Box Co. will build a factory here.

Winnipeg, Man.—The Alaska Bedding Co. are building an extension to their factory.

Curling, Nfld.—Fire at Middle Arm, near here, destroyed Flett's Herring packing plant, several saw mills and other property. No estimate of the damage was obtainable.

Regina, Sask.—The North Star Drilling Co. plant in the northeast part of the city was destroyed by fire last week. The loss is estimated at $18,000, on which there was only $1,500 insurance.

Montreal, Que.—The William Rutherford Lumber Co's. storing warehouse, on the bank of the Lachine Canal, near the Napoleon Bridge, was destroyed by fire last Friday, with damage estimated at about $40,000. The blaze originated from the explosion of a barrel of tar. The loss is covered by insurance.

MUNICIPAL

Calgary, Alta.—The Hospital Board decided to ask the City Council to submit a by-law for $200,000 for hospital extensions.

Montreal, Que.—The Board of Control are considering a proposition made informally by the Cook Construction Co. to discontinue all work on the aqueduct, owing to the scarcity of labor and the price of material.

Owen Sound, Ont.—The County Council have given the third reading to the country good roads by-law. With the adoption by Grey and Bruce Counties of the good roads by-law, the Southern Georgian Bay Counties all come under the provisions of the Statute.

PERSONAL

James Carruthers, of Montreal has donated three aeroplanes valued at $22,500 to the Canadian Aviation Fund.

R. C. Miquelon has been appointed Quebec agent for the Standard Machinery and Supplies Ltd., successors to the Montreal Machinery and Supplies Ltd.

E. H. Beazley, manager of the Union Steamship Co., of British Columbia, left Vancouver, B.C., for England. He is going over to look into the shipping situation, and will be away for several months.

A. M. McLeod has been appointed agent for the lower provinces with headquarters at Sydney, N.S., for the Standard Machinery and Supplies Ltd., successors to the Montreal Machinery and Supplies Ltd.

O. M. Hennessy, manager of the Abitibi Pulp and Paper Co., was drowned in the Couchiching Rapids, near Lake Abitibi. He was appointed manager of the company six years ago when that concern was organized.

N. A. Marsh, of the John verMehr Engineering Co.'s engineering staff, Toronto, has left for an extended trip to Brazil, South America, to supervise the erection of the verMehr water filtration plant which is being constructed at Pernambuco.

A. S. Hamilton, for 14 years Master Mechanic of the Western Fuel Co., Nanaimo, B.C., has resigned from his position owing to ill health. He was recently presented with a cheque and an illuminated address by the staff of the mechanical department as a token of esteem is which he was held by his friends.

H. N. Reynolds has taken a position as sales manager for the Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont. Mr. Reynolds was formerly with the Michigan Alkali Co., of Wyandotte, Mich., and has had considerable experience as a salesman. He will shortly make a trip through Canada in the interests of his firm.

Sub-Lieut. Robert Leckie, D.S.O.—Formerly of Toronto, has been awarded the Distinguished Service Cross for attacking and destroying the Zeppelin L-22 off the east coast of England on May 14th. Lieut. Leckie is a native of Scotland, and was born in Glasgow 24 years ago. He is a nephew of John Leckie, and had been in Toronto for ten years previous to his training here for attachment with the Naval Aerial Service, and was connected with the firm of John Leckie and Co., Marine Supplies, Toronto.

NEW YORK LETTER

(Continued from page 32.)

tractor makers are steady buyers of machine tools.

The United States Government is assuming direct control of the export situation and is reported to have already refused permits for machinery shipments to Sweden, but the Washington administration is disposed to act conservatively in this respect. England and France are quietly placing orders for machine tools for prompt delivery and will be accorded all facilties possible to make speedy purchases and shipments.

All of the United States steel concerns, especially the subsidiaries of the United States Steel Corporation, are giving preference to Government work and some of these mills are taking no commercial orders at all. It is estimated that thus far the army and navy departments have placed miscellaneous orders for about 1,000,000 tons of steel, of which 40,000 tons are for construction of war craft. At the moment all interest is centered in the prices of steel products that the Government will establish.

TENDERS

Outremont, Que.—Tenders will be received up to July 18, for the construction of an incinerator. Specifications may be obtained from J. A. Duchastel, city engineer, City Hall.

Toronto, Ont.—Tenders, addressed to the Secretary-Treasurer of the Board of Education, will be received until July 13, for hardware, Orde Street School. Manual training benches, Earl Grey School, steel work, Queen Victoria School and other midsummer repair work. Specifi-

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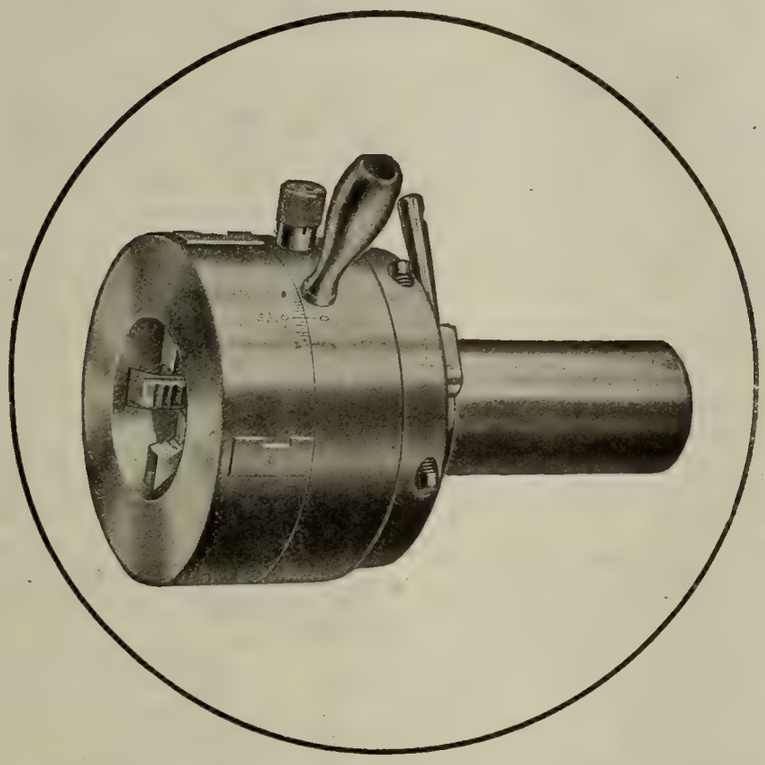

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cations may be seen and all information obtained at the office of the Superintendent of Buildings, Administration Building, 155 College Street.

Kingston, Ont.—Tenders will be received until July 16 for the reconstruction of part of the cribwork wharves at the entrance to the Dry Dock, at Kingston, Ont. Plans and forms of contract can be seen and specifications and forms of tender obtained at the Department of Public Works, Ottawa, the offices of the District Engineer, Equity Building, Toronto, Ont., and on application to the postmaster, at Kingston, Ont.

MARINE

Quebec, Que.—Quinlan & Robertson have a contract for the construction of four steamers.

Quebec, Que.—To encourage shipbuilding the civic authorities probably will open various docks near Quebec, in addition to those that have been working for the last few years on the south shore.

Vancouver, B.C.—The auxiliary schooner Laura Whalen will shortly sail on her maiden trip. She has on board 1,551,401 feet of B. C. lumber, consigned to Port Adelaide, Australia, and Capt. Hugh Docherty will go out in command.

Vancouver, B.C.—The call of the Imperial Munitions Board for tenders for 125 winches and windlasses has been heard and tenders are being filed with the Metal Trades Association. A committee of this body is dealing with the Munitions Board.

Vancouver, B.C.—The schooner Jessie Norcross, now fitting out at North Vancouver, is to leave shortly for Genoa Bay to load lumber for Port Adelaide, Australia, and the Janet Carruthers is to be launched next week from the No. 2 Wallace Yards.

Victoria, B.C.—The extension of the Cameron Genoa Mills Shipbuilders' plant is being made, which will carry the boundaries of the shipyard to a point on the Songhees Reserve almost meeting the area occupied by the Foundation Co., and preparations will soon have been completed for the laying down of the first keel in the Government ship programme.

St. John, N.B.—Grant & Horne have been given a contract by the Imperial Munitions Board to build two wooden ships at their new yard in Erin street. They are to be 250 feet long with 43½ feet beam, and will have 25 feet depth of hold. The speed will be 9½ knots and the boats will have a cargo capacity of practically 3,000 tons. The engines will be supplied by the Board.

Charlottetown, P.E.I.—It is expected that by next August the car ferry "Prince Edward Island" will start running between Point Borden, Prince Edward Island, and Cape Tormentine, N. B., the route for which she was built. The steamer has been running between Charlottetown and Pictou and Georgetown and Pictou for the past two years, as the docks between Tormentine and Borden were not ready.

Vancouver, B.C. — The Vancouver Dredging & Salvage Co. are working on the wreck of the steamer Eva Marie, which went ashore on a reef near Helmcken Island on June 8. Owing to the helpless position of the craft, it has now been decided to salve the boilers and engines and whatever cargo it is possible to reach. To do this it will be necessary to cut the hull open, as there is no hope of saving the steamer in her present position.

Port Arthur, Ont.—On June 23, the Port Arthur Shipbuilding Co. launched the steamer, Ugelstad, which has been built for the Great Lakes Transportatios Co. It is understood the company has already disposed of it to Norwegian capitalists. Miss Eva Powley of Port Arthur christened the boat in the orthodox way. The boat is a freighter of canal size, 261 feet long, 43½ feet beam with a depth of 28 feet. Her carrying capacity is 4,200 tons.

Victoria, B.C.—The sixth and last keel covered by the contracts at present held by the Cameron Genoa Mills Shipbuilders, for auxiliary schooners, was laid down on June 23 on the ways vacated by the schooner Esquimalt, which was launched on the night of June 13. On the completion of these vessels, the company will thereafter have its hands full in rushing to completion the four wooden steamers for which it holds contracts from the Imperial Munitions Board.

Owen Sound, Ont.—Word was brought here a few days ago of the total destruction by fire of the fisheries patrol motor boat "Wawanna," which took place at Fitzwilliam Island, in the channel between Georgian Bay and Lake Huron. The "Wawanna" was formerly a pleasure cruising vessel, built for Henry Manley, of Meaford. Her steam power was removed last summer, a powerful gasoline motor installed and other improvements were made, and the vessel went to Lake Erie to go an patrol service.

Esquimalt, B.C.—The contract for repairing the C.P.R. steamer Princess Maquinna which struck an uncharted reef of Kyuquot Sound, has been awarded to Yarrows, Ltd. The vessel has been hauled out on the ways at the local plant, where a survey was made. It is expected that three weeks will elapse before the Maquinna is ready for service again as there are eleven plates to be removed, five to be taken off and fared and six to be fared in place, in addition to other work, the damage being quite extensive.

Port Arthur, Ont.—When the dredge Kinnequhair leaves the Port Arthur dry dock she will commence a 6,000 mile journey, which will not be completed until Hudson's Bay is reached. The vessel is now having her anchors, cranes and other parts removed in preparation for the trip. The dredge was purchased this spring by the Canadian Government from the Canadian Dredging Co., and will be used in dredging at Port Nelson. It is expected the vessel will be at least one month in making the trip. Capt. W. M. Bradley, of Fort William, will be in command.

St. John, N.B.—B. A. Saker, of Montreal, before the Common Council, made his proposal for the establishment of a shipyard on the Warner Mill on the river front. He has secured the mill property with a thousand feet frontage on the river, and the lease of the adjoining property. He said that it was his intention to spend at least $100,000 during the first year in establishing yards capable of turning out three wooden vessels at the same time. When materials are available agin, he intends to undertake the construction of 3,000-ton tramp steamers, which would require an additional investment of $200,000.

TRADE GOSSIP

The Canadian Furnace Co., Port Colborne, Ont., has increased its capital stock to $1,500,000.

The Deloro Smelting and Refining Co., have opened up their own sales offices at 315 Graig St. West, Montreal, with B. Horwood as manager. The product (Stellite) of this firm was formerly handled by the Canadian B. K. Morton Co. of Montreal.

Nova Scotia Steel Output.—The output of the Nova Scotia Steel and Coal Co., for the first quarter of the year was as follows:—Coal mined, 146,525 tons; ore mined, 12,177 tons, limestone quarried, 21,074 tons; coke made, 25,545 tons; iron made, 21,103 tons; steel ingots made, brushed steel and forgings, 28,598 tons.

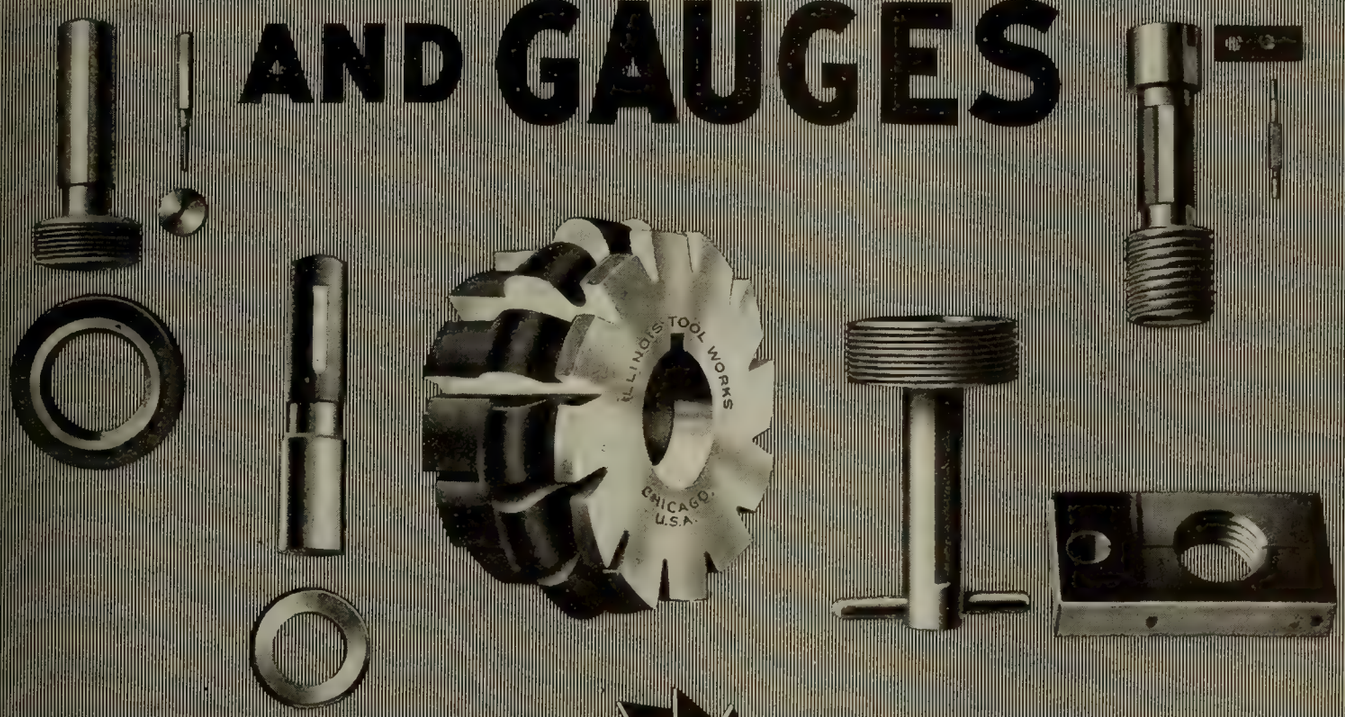
Tungsten More Active.—The demand for tungsten in the primary markets has been quite active recently and considerable business has been done for delivery during the balance of the current year. Beyond this producers are willing to quote. The market in New York is strong on light arrivals. The present market is equivalent to about $2.25 per pound tungsten.

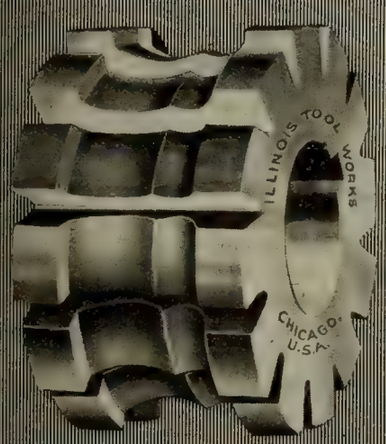
Shortage of Sextants.—Numerous new vessels building in the United States have depleted the stock of chronometers and sextants and with Germany not furnishing them as before, and England requiring those manufactured for British ships, it has been asked that endeavors be made to have the Navy Department assist in relinquishing extra chronometers carried on vessels.

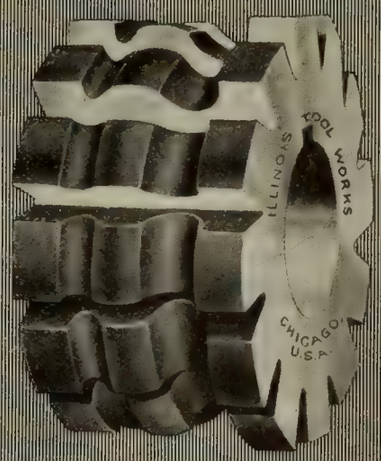
British Government Extends Embargo.—The British Government has prohibited the export of the following materials from the United Kingdom: Bobbins, lactates, lactic acid, potassium carbonate, ferro-manganese, unrifled firearms, hobnails, mica block and splittings, linseed oil, motor spirit, turpentine substitute, paraffin and petroleum, mineral lubricants, oil fuel.

U. S. Government Control.—Extension of American Government control to iron and steel and their products, petroleum and its products, farm implements and sisal, jute and hemp products, such as binding twine has been decided upon as an amendment to the administration food control bill by a

ILLINOIS FORMED CUTTERS AND GAUGES







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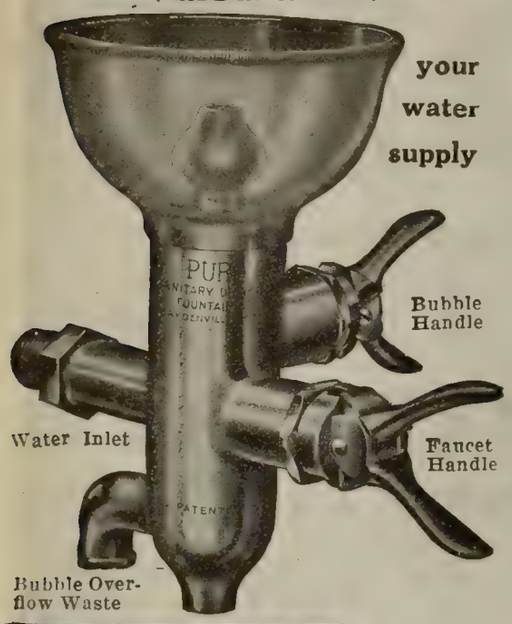

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Safe Simple
SANITARY Economical
Quickly Attached

These are the qualities that forced the leading safety and sanitary engineers to pick Puro in preference to all others.
No device can be as efficient that does not contain all these qualifications; and Puro was not tied for first place; Puro was first.
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If the men in your factory must drink, give them a clean drink.
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Senate agriculture sub-committee. Addition of other articles is under consideration.

Customs Returns Beat All Records.—The Dominion customs receipts in the first three months of the fiscal year, which ended on Saturday, eclipsed all records with a total of $46,680,203. In the corresponding period it was $35,431,-404, or an increase this quarter of $11,-248,798. June revenue was in keeping with the general showing. It amounted to $15,386,678, compared with $12,030,-451, an increase of $3,536,226.

The National Shipbuilding Co., Goderich, Ont., is just completing the first of the marine engines which it has contracted to build and the engine will be ready for shipment shortly. This is a 500 horse power engine and weighs about 20 tons. It will be shipped to the Canadian Vickers, Montreal. The company has contracts for some larger engines, which will be about 1,400 h.p. and will weigh 110 tons. These will be for use in wooden vessels.

Brandon, Man.—Negotiations have been completed for the sale of the Brandon Electric Light Co's. plant, properties and business to the Canada Gas and Electric Corporation, which is understood to be composed of a number of American financiers. The purchase price, it is said by Manager Paterson, is approximately one million dollars. It is the intention of the purchasing company to also acquire the Brandon Gas Co's. plant and business .

Scarcity of Coal in Saskatchewan.—Thomas M. Molloy, secretary of the Government Bureau of Labor, states that the fuel situation in Sasketchewan is serious, and that it will be impossible to secure a sufficient supply of coal to meet the requirements of this province during the coming winter, even if all the Alberta coal mines are to resume operation once. Citizens are advised to use wood in the early fall months and at all other times when weather conditions permit.

Stationary Engineers Meet.—At the annual meeting of the Canadian Association of Stationary Engineers in the Temple Bldg., Toronto, the following officers were elected: President, H. Stevens; vice-president, S. Bamfrith; treasurer, John Brown; recording secretary, G. F. Moore; financial secretary, A. M. Wickens; conductor, H. Taylor; door keeper, W. Turner; delegates to the annual convention, J. Brown and S. Bamfrith; Alternatives, H. Stevens and T. Pope. The convention will be held in Toronto next July.

Restrict Use of Tin.—An announcement by the Commerce Department, Washington, D.C., said that by August 1, tin plate manufacturers will be in a position to furnish can makers with all the tin they need. All supplies of tin have been cut off from users for containers of varnish, blacking, paint, talc, soups, baked beans and various ready-to-eat foods, so that the tin may be used for cans in which perishable food can be packed. No releases of cans to packers of non-perishable products will be made until it is certain that the supply for perishables is ample.

The Winnipeg Gear & Engineering Co.—Makers of all kinds of cut gears, and designers and builders of special machinery, have recently doubled their floor space at 197-199 Princess Street, Winnipeg, Man. They expect before long to occupy the whole of the next floor. Since this company was organized less than a year ago, they have undergone considerable expansion, and are now extending along new lines which necessitates this increased floor space.

Reduction in Coal Prices in the U.S.—An immediate general reduction of $1 to $1.50 a ton in the price of soft coal at the mines was agreed upon at Washington on June 28 by representatives of the coal operators to take effect on July 1. This reduction is expected to be followed by still further decrease in price after investigation into the costs of mining coal, and it is probale that the Government will be given a still lower price than that to the general public. About 600,000,000 tons of coal were mined in the United States last year.

Vancouver, B.C.—The first unit of the Pacific Mills plant at Ocean Falls, is now in operation and is turning out 75 tons of news print daily. By the end of the present year a second unit with a capacity of 120 tons of paper is expected to be in operation, and the daily production will then reach 195 tons. While the present program of development ends with the starting of these two units, it is regarded as probable that there will be extensions to the equipment and a still further increase of production before very long. Meanwhile the plant will be worked to its full capacity.

Canadian Boats in Coastal Trade.—The United States coastwise laws have not been suspended, but arrangements have been made whereby Canadian vessels can trade between American ports. This is a war measure, and the plan, which will increase vessel capacity on this side, will probably be in operation the balance of the season. It is figured there are about twelve or fifteen Canadian vessels that can be placed in American coastwise trade for part of the season, but boats of that class have some contracts, and they will, of course, carry grain as soon as the fall movement starts at the Canadian head of the lakes.

Quebec Bridge Progress.—It is understood that the new Quebec bridge will be ready for placing in position some time in September. Fabrication has been almost completed at the works of the St. Lawrence Bridge Co. and the erection of the span will be immediately proceeded with at the old location at Sillery Cove. It is fully expected that the process of raising the span from the scows to the arms of the cantilevers, will be along similar lines as that adopted last year, but additional precautions will be made for the safety of the workmen.

Nickel in Ontario.—Nickel mining is of first importance in Ontario. In 1915 the nickel contained in Sudbury matte

amounted to 34,039 tons, valued at $17,019,500. In 1915 the output was 42,000 tons, worth $21,000,000. During 1916 both of the operating companies, the Canadian Copper Co. and the Mond Nickel Co., worked to their fullest capacity their mines and smelters in Ontario, as well as their refineries, one of which is in New Jersey, the other in Wales. Other sources of nickel in Canada are the nickel oxide obtained by the refineries from the ore of the Cobalt district and the Alexo mine. A little metallic nickel was obtained elsewhere during the year, but production was relatively unimportant.

Many Oppose Freight Advance.—The railways found solid opposition at the hearings before the Board of Railway Commissioners held at Winnipeg last week for the purpose of considering a proposed freight increase of 15 per cent., and a new freight classification. Representatives of every important industry in Winnipeg presented evidence of a convincing character against the increase. In many cases the proof was so strong as to indicate paralysis of business in certain lines. So many witnesses had to be heard on the subject of revising the demurrage rules and on the re-classification plan that the commission was not able to take up the percentage increase asked by the roads. It was shown by nearly every industry that the proposed new classification, in itself, was an increase in rates more to be feared than the percentage increase. On the demurrage question all shippers stood firmly for an equitable rate, but none believed the $3 a day as a starter after the two free days was justifiable. The Canadian Manufacturers' Association approved of the proposed increase in freight rates.

BUILDINGS

Toronto, Ont.—J. W. Woods, of Gordon McKay Co., has taken a permit to erect a warehouse at 37 Pearl Street costing $15,000.

Toronto, Ont.—A permit has been issued to S. and L. S. Yolles, 67 Baldwin Street, to erect a two-storey brick warehouse at 1100-1104 Queen Street West, the cost of which is estimated at $10.000.

Chatham, Ont.—The Canadian Contractors and Builders, have commenced work on the $60,000 addition to the Queen Mary School. The contract calls for completion of the building by October 15.

RAILWAYS—BRIDGES

Charlottetown, P.E.I.—A campaign has started here to urge the Dominion Government to standardize the gauge of the Prince Edward Island Ry., in order to get full benefit from the car ferry system which it is expected will be inaugurated next August.

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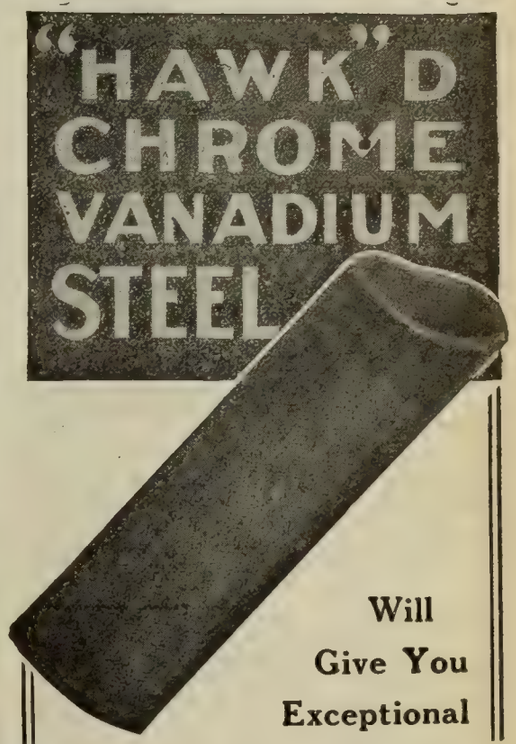

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FOR SALE—TWO 16 x 6 REED PRENTICE Automatic Lathes. One Bertram Gap Lathe, 48 x 10. Four No. 10 Heavy Duty Baker Drills. One No. 2D Colburne Drill. One Heavy Duty Reliance Machine Co. Turret Lathe for inside boring of 6" shells. Canadian Blower & Forge Co., Kitchener, Ont. c24m

WE HAVE ON HAND AT OUR WELLAND Works, for disposal, the following new machinery:—One (1) 18" x 15 ft. Accumulator; one (1) Aldrich Triplex Hydraulic Pump, 180 gals. capacity; two (2) 350-ton B. and B. Presses. All offers will be carefully considered. Canadian Car & Foundry Co., Ltd., Transportation Building, Montreal.

1—ROBB HORIZONTAL STEAM ENGINE, 10 x 12, 35 h.p. Just overhauled by makers. Price $300.00. 1—Heavy Duty Rockford Drill. Suitable for shells or heavy work. Weight of drill 3,600 lbs. Good as new. Write for specification. 1—Jones & Lamson 2 x 24 Turret Lathe, 2¼" hole in spindle, 16" swing, cone drive, collet chucks for bars up to 2" diameter. Or lathe can be fitted with standard universal chuck. Flat turret 16" diameter. Good condition. Price $400.00. 1—Warner & Swasey Turret Lathe. Round turret, diameter 8", hand cross feed for turret. Swing 14". Fairly good condition. Price $200.00. 1—Bertram 2-spindle Thread Miller. Made by makers for threading 18-pdr. shells. Now used for threading sockets. Good condition. Steel Furnishing Co., Ltd., New Glasgow, Nova Scotia. c2m

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1—24" Baker Heavy Duty High Speed Drill.
1—3-spindle 8" overhang Henry & Wright High Speed Drill.
3—12" Leland & Gifford High Speed Bench Drills.
5—20" Buffalo Plain Drill Presses.
4—6-spindle Fox High Speed Drill Presses.
2—4-spindle Fox High Speed Drill Presses.
1—3' Mueller Plain Radial Drill.
1—6' Mueller Plain Radial Drill.

SHAPERS AND SLOTTERS.

1—24" New Barker Crank Shaper.
1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
1—16" Hendey Geared Shaper.
1—16" Garvin Shaper.
1—16" Ohio Crank Shaper.
1—16" Smith & Mills B.G. Crank Shaper.
2—16" New Springfield B.G. Crank Shapers.
1—24" Niles Geared Type Slotter.

PRESSES AND HAMMERS.

1—Waterbury Farrell Straight-sided Geared Press with double cam knock-out.
5—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. Pratt & Whitney Roll Board Hammer.
1—60-lb. Scranton Belt Hammer.
1—24-lb. Bradley Helve Hammer.

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1—8 x 6 Westinghouse Steam Air Compressor.
1—16 x 18 x 12 Union Steam Pump Co. Steam Driven Air Compressor.
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1—10 x 10 Clayton Belt-driven Air Compressor.
1—9 x 8 Ingersoll-Rand Belt-driven Air Compressor.
1—8 x 8 Fairbanks-Morse Electrical-driven Air Compressor.
1—8 x 8 Gardner Single Belt-driven Air Compressor.
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1—28" Hoefer Upright Drill, with sliding head, positive geared feeds.

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77½ Bliss Straight Side Press, single crank, tie rod frame, double geared, friction clutch, 10" stroke, 17" die space, 8" shaft

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No. 2 Diamond Automatic Surface Grinder (36 x 12 x 12).

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No. 3 La Salle Plain Surface Grinder.

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3—Symington Nose Tapping Lathes.
2—Symington Body Grinders.
2—Symington Finish Turn Lathes.
1—Symington Band Recess Lathe.
2—Symington Undercut and Waive Lathes.
2—18" Perkins Profile Engine Lathes.
1—18" Lodge & Shipley Engine Lathe.
1—18" Lodge & Davis Engine Lathe.
1—18" Putnam Engine Lathe.
1—20" Simplex Engine Lathe.
1—24" Davis Turret Lathe.
1—18" Essley Engine Lathe.
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1—30" Colburn, 1 turret head.
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1—34" Rogers, one turret head, Sept. delivery.
1—36" N-B-P, one plain and one swivel head.
2—36" B. & S., one turret head.
12—New 42" Putnam—2 heads, Nov. delivery.
1—53" N-B-P, two swivel heads.
1—72" Niles, two swivel heads.

BORING MACHINES—HORIZONTAL.

1—Lucas, 2¼" bar.
1—New No. 1 Cleveland, 2½" bar.
1—Hoefer Horizontal Driller and Borer with 1 11-16" spindle, vertical adjustment 40", horizontal adjustment 46", size of table 33" x 48".
1—New No. 2 Barrett Cylinder, Nov. delivery.

BULLDOZERS.

1—New No. 4 Garrison, same specification as No. 4 Williams & White.
1—No. 7 Ajax, 20" stroke.
1—No. 7 High-speed Ajax, 16" stroke.

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1—8" x 8" Curtis, belt-driven.
1—10" x 10" x 10" Single Cylinder Smith-Vaile, steam driven.
1—10" x 12" Chicago Pneumatic, belt driven.
1—12" x 12" American, belt driven.
1—16" x 12" Chicago Pneumatic, Duplex, belt driven.
1—10"-16½" x 13" Peerless, cross compound, steam driven.
1—22"-13" x 16" Ingersoll-Rand, motor driven.

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2—No. 0 Brown & Sharpe.
1—2" capacity Warner & Swasey.
2—3" Curtis & Curtis.
3—4" Curtis & Curtis.

CRANES—ELECTRIC.

1—5-ton P. & W., 4-motor, 10' span, 25' lift, 220 v., D.C., with one ton auxiliary hoist.
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1—New 3' Mueller, plain, speed box drive.
1—36" Bickford, plain, speed box drive.
1—New 3½' Mueller, cone drive, July delivery.
1—New 3½' Carlton, cone pulley drive.
1—New 3½" Western, July delivery.
2—4' Mueller, plain, speed box drive.
1—5' Bickford, plain, speed box drive.
1—5' American, plain, motor driven.
5—5' Special, 2½" spindle, arm does not raise and lower, hand feed.
1—New 6' Fosdick, speed box drive, July delivery.

DRILLING MACHINES—HEAVY DUTY.

3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
2—No. 26 Foote-Burt, 44" swing, 3½" capacity in solid steel.

DRILLING MACHINES—MULTIPLE SPINDLE.

1—30C Baush 12-spindle, capacity 1⅛" holes, 30" circle.
1—Gardam, 12-spindle, capacity ⅜" holes, 14" square.
1—No. 5 Fox, 12-spindle, rectangular head, 20" x 30", capacity 1" holes, tapping attachment, speed box drive.
1—14-spindle Baush, capacity 1" holes, 36" circle.

GEAR CUTTING MACHINES.

1—12" G. & E. Gear Hobber.
1—12" Gleason Bevel Gear Planer.
1—15" Gleason Bevel Gear Planer.
1—16" Bilgram Bevel Gear Generator.
1—20" Grant-Lees Gear Hobber.
1—No. 1 20" Schuchardt & Schutte Gear Hobber.
1—22" x 8" Gear Cutter for Spur and Bevel.
1—24" Fellows Gear Shaper.
1—24" x 8" G. & E. for spur and bevel.
1—26" x 10" Cincinnati, spur gears only.
1—No. 3 26" B. & S., spur gears only.
1—New 30" Flather, spur gears only.
3—36" Fellows Gear Shapers.
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1—New Norton, No. 1.
1—New Wilmarth & Morman, style BX.
1—No. 1 Cincinnati.
1—New Walker No. 2, outfit K (capacity 9" x 26").
4—No. 190 Wells.

GRINDING MACHINES—CYLINDRICAL—PLAIN.

1—No. 11 (6 x 30") Brown & Sharpe.
1—6" x 48" Pratt & Whitney.
1—New No. 12 (8" x 26") Brown & Sharpe.
1—10" x 50" Norton.
1—No. 16 (10" x 72") Brown & Sharpe.
6—12" x 24" Modern, self-contained.
6—12" x 36" Modern, self-contained, motor driven.
6—12" x 48" Modern, self-contained, motor driven.
1—14" x 72" Queen City.
1—16" x 66" Landis, with crank grinding.
1—18" x 96" Brown & Sharpe.
1—New 10" x 36" Landis, immediate.

GRINDING MACHINES—CYLINDRICAL—UNIVERSAL.

1—No. 1 Fraser, with surface grinding attachment.
1—No. 1½ (10" x 30") Landis.
1—No. 2½ (10" x 36") Bath.
1—New No. 2 Bath.
1—10" x 42" Modern.
1—No. 2 (12" x 30") Brown & Sharpe.
10—New No. 2 Morse, cap. 12 x 30", Universal, Dec. delivery.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis.

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1—No. 1½ Landis.
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—CYLINDER.

1—No. 27 Brown & Sharpe.
1—No. 60 Heald, single pulley drive.

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1—No. 14 Besley.
1—New No. 17 Gardner (Pattern Makers).
1—No. 41 Oliver (Pattern Makers).

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1—No. 200 Heald.

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1—No. 374 Safety Emery Wheel Co.

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1—No. 1 Diamond, cap. 12" x 12" x 24", automatic.
4—New No. 2 Reid (same as B. & S.).
1—22" x 12" x 60" Springfield, planer type, automatic.

GRINDING MACHINES—DUPLEX.

1—No. 5 Bath, suitable for grinding cylinders, pistons, piston rings, etc., 16" feed, swivel table, water pump.

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1—Diamond Face Grinder, 4' travel, 14" wheels.

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1—200-lb. (no name).
1—400-lb. Billings & Spencer.

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1—400-lb. Zeh & Hahnemann.
1—New 600-lb. Bell.
1—New 3,000-lb. Bell, September delivery.

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1—No. 00 Baker Bros.
2—No. 0 Mitts & Merrill.
1—No. 2 Mitts & Merrill, motor driven.
1—60" stroke Compton Knowles Broacher.

LATHES—ENGINE.

1—14" x 6' Bradford, taper attachment.
2—16" x 6' LeBlond, pan bed, quick-change gears, taper attachment.
1—16" x 6' LeBlond, quick-change gears.
1—New 17" x 8' National, taper attachment.
1—18" x 8' L. & S., geared head, taper.
9—18" x 8' American, geared head.
3—18" x 9' Chard.
1—New 19" x 8' LeBlond, heavy duty.
1—20" x 16' Greaves-Klusman, taper attachment.
3—22" x 10' Davis.
9—22" x 10' Putnam, oil pan, turrets.
4—24" x 10' Reed.
2—24" x 12' S. & B.
1—24" x 14' Lodge & Shipley, patent head.
4—24" x 14' American, quick-change.
3—New 26" x 12' Boye & Emes.
1—26" x 24' New Haven.
4—New 28" x 12' Boye & Emes.
1—28" x 18' S. & B.
5—New 30" x 14' Boye & Emes.
3—New 32" x 12' Pittsburg pattern.
1—36" x 15' Fifield, 36 x 16".
2—New 36" x 18' Putnam, triple geared.
12—New 36" x 24' Putnam, triple geared.
1—25"-45" x 22' McCabe, double spindle.
1—New 66" x 30 Putnam, Dec. delivery.
1—71" x 20' Fifield, triple geared.

LATHES — MANUFACTURING — NOT SCREW WCUTTING.

3—No. 1X Reed-Prentice, semi-automatic.
2—No. 2X Reed-Prentice, semi-automatic.
13—No. 3X Reed-Prentice, semi-automatic.
6—No. 11 Amalgamated, for machining and profiling 5" shells.
6—14" x 6' Reed Stud and Bolt.
3—18" Reed Grooving and Undercutting.
70—New Simplex, 16" x 8'.
22—18" x 8' Battle Creek, heavy duty.
5—20" x 8' Merschon.
5—20" x 10' Hindman, high duty.
12—21" x 8' LeBlond, quick-change with attachment for grooving and facing both ends of shells with air cylinders and mandrels for 5" shells.
18—3½" x 60" Fitchburg, Lo-swing.

MILLING MACHINES—KNEE TYPE—UNIVERSAL.

2—New No. 1 Kempsmith.
1—No. 1½ Garvin.
1—No. 1½ Hendey-Norton.
1—No. 2A Kearney & Trecker, single pulley drive.
1—No. 2 Hendey-Norton.
3—No. 2½ LeBlond, Sept. delivery.
2—No. 3H LeBlond, Sept. delivery.
1—No. 3 Cincinnati, single pulley drive, high power, vertical attachment.
1—New No. 4 LeBlond Heavy Duty, immediate.

MILLING MACHINES—KNEE TYPE—PLAIN.

1—No. 14 Garvin.
1—No. 21 Garvin.
1—No. 0 Pratt & Whitney.
3—New No. 1 Rockford.
2—New No. 1 Kempsmith.
1—New No. 2 Rockford.
1—No. 3 LeBlond.
1—No. 3 Hendey Norton.

MILLING MACHINES—VERTICAL.

3—New Bristol, 10" x 28" table, 21" power feed.
1—New No. 4B Becker.
2—No. 5 Becker.

MILLING MACHINES—PLANER TYPE.

1—No. 1 Beaman & Smith, two vertical spindles, working surface of table 72" x 14".
1—No. 1 Beaman & Smith, combined vertical and horizontal, working surface of table 72" x 18".
1—Beaman & Smith Slab Miller and Shaft Keyseater, with vertical routing attachment, working surface of table 96" x 17".
2—Ingersoll-Rand Slab Millers, working surface of table 60" x 20".
2—No. 4 Beaman & Smith, vertical spindle, open side, working surface of table 120" x 24", removable housing on one side.
1—Ingersoll Single Spindle, side head, motor driven, table 96" x 30", cutter head 30" in diameter.

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1—New 6" Shell Roughing Hercules Lathe.
1—Used 20 x 10 McGregor-Gourlay Lathe, hollow spindle, compound rest, cabinet legs; fine condition.
2—18 x 8 Used Rahn-Larmon Engine Lathes, quick-change gear, double back gear, cabinet legs; in fine condition.
1—No. 4 Windsor Turret Lathe, automatic chuck, friction geared head.
2—New 15 x 5 Carroll-Jamieson Lathes, quick-change gear, oil pan and pump and taper attachment.
1—3 x 36 Double Spindle Jones & Lamson Lathe; good as new.

OUR SPECIAL BARGAIN—1—16" Plain Shaper with vise and countershaft.

1—Used 36 x 36 x 8 Powell Planer, one head.
1—16" Back-geared Canada Machinery Corporation Shaper; first-class condition.
1—20" Bertram Heavy Duty Shaper.
1—Heavy Straight Side Press with 4" stroke, back-geared.
1—20" Bertram Drill Press.
1—24" Sliding Head Barnes Drill Press; fine condition.
6—New Excelsior Sensitive Drill Presses, with square and round table.
1—Nearly new No. 6 Hall Cut-off Machine.
1—Dominion Universal Grinder.
1—Used Wells Universal Grinder.

DOMINION MACHINERY COMPANY

Office, 110 Church Street - Toronto, Ontario, Canada
Warehouse, 14 Darling Ave Phone Main 6519

Rebuilt Machines For Sale

PLANERS

1—Sellers 36x36x10' with 2 heads.
10—Sellers 25x25x6'.
2—Sellers 25x25x8'.
1—Putnam 24x24x8' 6".
1—Putnam 25x25x10'.
1—Wheeler Heavy 30x30x8' 6".
1—Lathe-Morse 24x24x5' 6".
1—New Haven 24x24x7'.
1—Wood Light 30x30x8'.
1—Putnam 42x40x12' 6".

GRINDERS

1—LeBlond Universal Tool and Cutter, power feed, same as new.
1—Bridgeport Plain Grinder, 16x36.
1—No. 1 Landis Universal Grinder.
1—No. 3 Landis Universal Grinder.
2—No. 6X Diamond Double Disc Grinders.
1—Ford Smith Plain Grinder.

AUTOMATICS.

1—1" National Acme Double Belt Type.
1—1⅝" National Acme Double Belt Type.
1—No. 55 National Acme.
1—1" National Acme four spindle.
2—No. 54 National Acme four spindle.
3—2" Cleveland.
1—2¼' Cleveland.
2—2¼" Gridley Single Spindle Motors.
1—3¼' Gridley Single Spindle Motor.

LATHES

1—32x12' Draper Lathe, C.R., H.S.
1—36x22' Fitchburg Lathe, C.R., P.C.F.
1—30x8' Fitchburg, C.R., P.C.F.
3—16x8 Putnam, C.R., taper.
6—18x8 Porter, C.R., semi-quick, taper.
2—18x8 Davis, C.R., pan, pump, taper.
19—16x8 Greaves-Klusman, C.R., pan, pump.
9—20x6 Perkins Plain Turning, pan, pump.
1—14x6 Porter, C.R.
1—20x8 LeBlonde, C.R.
1—13x5 Seneca Falls, C.R., pan.
14—20x6' Perkins Lathes, pan bed, chuck, Fay & Scott turrets.

MISCELLANEOUS.

1—Kempsmith Plain Miller, same as new.
1—9" Industrial Works Slotter.
1—24" Aurora Sliding Head Back Geared Drill.
3—Prentice 24" Sliding Head Drills.
2—Industrial 40" Drills.
1—Western Hydraulic Banding Machine.
1—Jenckes Band Turning Lathe, with 3" Universal Chuck.
1—36" Aurora Drill.
1—12" Bement Travelling Head Shaper.
1—12" Juengst Crank Shaper.
1—90" Putnam Wheel Lathe, double quartering.
1—Sellers Slab Miller, 24x21x12'.
1—No. 21 Lee-Simplex Saw.

This is only partial list—Send for full list

Simmons Machine Company, Inc.

NEW YORK, 1001 Singer Bldg., Telephone Cortlandt 6575
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New York's Greatest Stock

(Partial List)

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Six No. 60½ BLISS, with rack and pinion movement, ADJUSTABLE STROKE FROM 4" to 42"; weight each 12,500 lbs.

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16' Dunkirk

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10,000 lb. Sellers double leg Steam
5,000 lb. Sellers double leg Steam
Two 5,000 lb. Bement double leg Steam
2,000 lb. Morgan Steam Drop
1,800 lb. Billings & Spencer single leg Steam
Three 1,200 Billings & Spencer Board Drop
1,100 lb. Miles-Bement single leg Steam
1,000 lb. Pratt & Whitney Board Drop
800 lb. Pratt & Whitney Board Drop Forging
750 lb. Toledo Rope Drop
Two 600 lb. Niles-Bement-Pond Co. single frame Steam
400 lb. Bement Steam (new)
200 lb. Bradley Upright Compact
200 lb. Bradley Upright Strap
100 lb. Niles-Bement-Pond Hand Drop
Two 60 lb. Bradley Cushioned Helve
40 lb. Bradley Cushioned Helve
40 lb. Gould & Eberhardt Hand Rope Drop (4)

MILLING MACHINES

No. 4B Brown & Sharpe Plain, single pulley drive
No. 4 Brown & Sharpe Plain
No. 4 Cincinnati Plain, heavy duty, single pulley drive
No. 2 Hendey-Norton Universal
No. 2 Cincinnati Universal
No. 2 Cincinnati Plain
New No. 1½ American Improved Plain
No. 1 Kempsmith Plain
No. 1 Pratt & Whitney Plain
No. 3½ Garvin Plain, table 12" x 36"
Beaman & Smith 2 spindle Vertical, table 24" x 48"

BORING MILLS

Two 20" Bullard Vertical Turret Lathes
Three 34" Rogers Vertical, single turret head
Five 30" Bullard Vertical, single turret head
Pratt & Whitney Horizontal, 2¼" bar
48" Niles Car Wheel
45" Putnam Vertical Car Wheel, facing attachment
Underwood Automobile Cylinder, 3⅝" bar

New York Machinery Exchange, Inc.

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Leland H.S.B.B., Bench type.
No. 1½ Knight Driller and Miller.
14" Rockford Sensitive.
20" Kern, b.g.
22" Barnes, s.h., b.g., p.f., tapping attach.
No. 25 Foote-Burt 24" Drill (new).
32" Hamilton s.h., b.g., p.f.
34" W. F. & J. Barnes, S.H., B.G., P.F.
12-spindle Multiple P. and W.
No. 30-C Baush, 12-spindle.
20" W. F. & J. Barnes, 4-spindle.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. Automatic.
30" x 9" G. & E. Auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3 26" B. & S., for spur.
36" Walcott for spur.

GRINDERS

Yankee Drill.
Leland Universal, with power feed.
No. 23 B. & S. Gear Cutter.
8" x 30" Modern Plain (new).
14" x 20" B. & S. Plain
Garvin Hole Grinder.
Gisholt Tool Grinder.
No. 5 Diamond Water Tool.
No. 16 Gardner Disc Grinder.

LATHES

No. 3½ Rivet.
No. 3 Cataract.
No. 5 Cataract.
13" x 5' P. & W. c.r. taper.
14" x 6' Davis, p.r.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
16" x 6' Bradford, c.r., q.c.g.
18" x 8' L. & S., pat. head, c.r. taper.
18" x 10' Fitchburg, c.r
18" x 12' Barker, c.r.
20" x 14' Blaisdell, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
32" x 16' Blaisdell, c.r.
36" x 20' American, t.b.g.
3½" x 60" Fitchburg Lo-Swing.

PLANERS.

30" x 30" x 8' Lodge & Davis, one head.
36" x 36" x 12' Powell, single head, arranged for two.
36" x 36" x 16' Sellers, one head.
36" x 36" x 12' Chandler, two heads, one side head.
40" x 38" x 14' Putnam, one head.
40" x 40" x 12' New Haven, one head, one side head.

SCREW MACHINES.

1" B. & S., Plain.
16" P. & W., Plain.
No. 2 Foster, Plain Head.
No. 2 Costello, Plain Head.
No. 2 P. & W., Friction Head.
No. 3 Foster, Geared Head.
No. 4 Pearson, Geared Head.
No. 3 Bardons & Oliver, Plain Head.
No. 12½ Garvin, Friction Head.
No. 2-G B. & S. Automatic.
2" Cleveland Automatic.
⅞" Cleveland Automatic.
2¼" x 11" Acme (4).
No. 6 Warner & Swasey (3).

TURRET LATHES.

16" Garvin Friction Head, a.c. and w.f.
16" Lodge & Shipley.
25' Niles.
No 2 Warner & Swasey, Hollow Hexagon.
2" x 24" Jones & Lamson.
3" x 36" Jones & Lamson, chucking equipment.
3" x 36" Jones & Lamson, bar equipment.
3" x 36" Jones & Lamson, Double Spindle.
21" Gisholt, with taper.
2—24" Gisholt Turret Lathes, taper attach.

MISCELLANEOUS.

¾" Acme Forging Machine.
52" Niles Car Wheel Boring Mill.
No. 1 Davis Keyseater.
No. 2 M. & M. Keyseater.
No. 3 M. & M. Keyseater.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 3A La Point Broacher.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-Ton Yale Duplex Hoist.
3-Ton Yale Triplex Hoist.

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HORIZONTAL BORING MACHINES.

1—Binsse, 3" bar.
1—Newark, 3" bar.
1—Betts, 2⅞" bar.
1—No. 5 Schuchardt & Schutte.
1—Bement, 2⅞" bar.
1—Beaman & Smith, 2⅛" bar.
1—No. 4 Newton, 2-spindle.
1—Beaman & Smith 2-Spindle Cylinder Borer.

MILLING MACHINES.

1—No. 3 Hendey.
1—No. 2 Cincinnati Univ.
1—No. 20 Osterlein Univ.
1—No. 25 Becker.
1—No. 0-Y Brown & Sharpe.
1—60" x 54" x 8' Ingersol Slab.
1—92" x 72" x 15' Beaman & Smith Slab.
1—No. 2 Beaman & Smith Horiz. and Vert.
1—Hilles & Jones Vertical.
1—No. 6 Becker Brainard Vert.

PLANERS.

1—32" x 32" x 10' Gray.
1—32" x 32" x 8' Gray.
1—30" x 30" x 10' Powell.
1—26" x 26" x 6' American.
1—26" x 26" x 7' Gray.
1—24" x 24" x 10' Lodge & Davis.
1—24" x 24" x 6' Cincinnati.
1—24" x 24" x 6' Gray.
1—24" x 24" x 5' Gray.
1—24" x 24" x 4' Gray.
1—23" x 23" x 5' Flather.
1—22" x 22" x 6' American.

LARGE LATHES.

1—42" x 18' Draper.
11—40" x 16' Pittsburgh.
1—36" x 16' Springfield.
1—32" x 14' New Haven.
1—31" x 14' Pond.
1—31" x 12' Pond.
3—30" x 16' Lodge & Shipley.
5—28" x 14' Lodge & Shipley.
10—28" x 10' Pond.
28—26" x 12' Putnam.
1—26" x 12' Schumacher & Boye.
2—26" x 12' Wickes.
13—26" x 10' American.

Each Machine Is:

1. **Completely Disassembled.**
Even if practically new they are completely disassembled, thoroughly cleaned, flat surfaces tested out with straight edges or surface plates.
2. **Flat Surfaces are Hand Scraped to Brown & Sharpe Surface Plates.**
If badly worn our planer outfit can handle up to very large surfaces and then they are scraped to Surface Plates.
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Cylindrical bearings are where necessary, renewed and then aligned by the aid of precision instruments.
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The old enamel is scraped off, filler applied and rubbed down, bright parts polished, new enamel put on so that the machine looks like new.
5. **Adjustments Made.**
Adjustments are carefully made under the supervision of five competent foremen and an expert superintendent.
6. **Tested Under Belt.**
Each machine is tested under belt both for **Operation** and **Accuracy** before it leaves our plant so that we are confident that it is ready to go to work when you get it.
7. **Covered By Our Broad Guarantee.**
You may choose a machine not suited to your work or your work may change after receiving the machine. Again we may list a machine incorrectly or something may have been "put over" our shop inspectors. Therefore, for your protection we give just one guarantee which covers everything, your mistake or ours, *i.e.*—**if a machine is not suited for your work, if it disappoints you in any way send it back within thirty days from date of shipment, freight prepaid, and we will cheerfully refund your purchase price in full.** *Fair enough, isn't it?*

IN CHICAGO

The Great Machinery Center

LARGE LATHES.

1—26" x 10' Prentice.
1—24" x 14' Blaisdell.
1—24" x 12' Draper.
1—24" x 10' New Haven.
16—24" x 10' Lodge & Shipley.
1—22" x 16' Flather.
1—22" x 10' Schumacher & Boye.
1—22" x 10' Reed.
20—22" x 10' Davis.
38—22" x 8' Hamilton.
4—22" x 8' Davenport
1—22" x 8' Lodge & Shipley.

LARGE TURRET LATHES.

4—No. 3-A Warner & Swasey.
99—24" Gisholt.
52—21" Gisholt.
1—22" Libby.
1—No. 6 Bardons & Oliver.
1—No. 6 Foster.
3—2" Gridley.
1—2" x 26" Pratt & Whitney G. H.
1—3" x 36" Pratt & Whitney.
2—2¼" x 26" Greenlee.
2—2" x 24" Jones & Lamson G. H.
3—2" x 24" Jones & Lamson Cone.

RADIAL DRILLS.

3—5' Niles Semi-Univ.
1—4' Niles Full Univ.
1—3½' Gang.
1—3' Prentice.
1—3' Mueller.
1—2½' Dreses.
4—2½' Fosdick.
2—2½' Mueller.

MISCELLANEOUS.

3—8" Nutter Barnes Cold Saws.
2—72" Bickford Vertical Boring Mills.
1—42" Betts Car Wheel Borer.
1—84" Poole Vertical Boring Mill.
3—No. 73½ Bliss Presses.
1—No. 23½B Niagara Toggle Press.
1—36" Gleason Spur and Bevel Gear Former.
1—1½" Morton Keyseater.
1—10" Bement Slotter.
2—No. 14 Brown & Sharpe Plain Grinders.
1—Gleason Gear Planer, 84" bevel, 96" spur.
1—48" Morton Draw-cut Shaper.

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SEE PAGE 78

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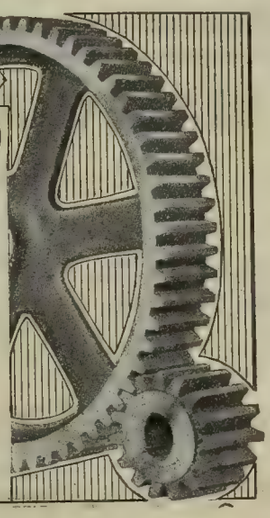

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TORONTO, ONT.

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ONLY $35.00

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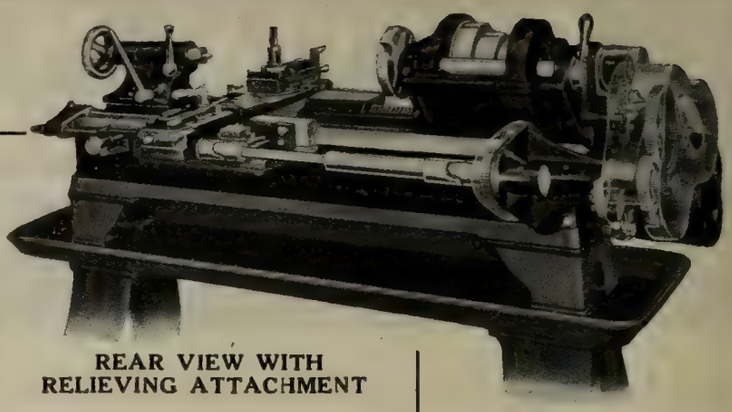

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A QUICK-CHANGE lathe from 12" to 14" swing with a 4-5 or 6' bed, 8-1 and 10-1 gear ratio; 1¾" and 2" belt; 15-16" hole in spindle 6-320 feeds; 17½" carriage 40" between centres; these are a few of the specifications that will give you an idea of the capacity of the machine.

Its construction is such as to conform to the most rigid inspection. For precision work it is ideal. Specially designed tumbler gears insure smooth and quiet running. There is no clashing when the gears engage, this feature lengthens the life of the machine.

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Canadian Representatives:

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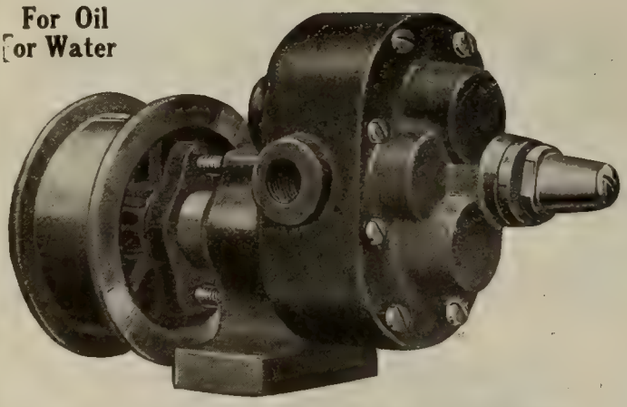

Fig. 1850—With Automatic Relief Valve

A NIAGARA *of* COOLANT

if you wish it, or just enough to cool the tool —whichever you prefer. That is the way TRAHERN ROTARY GEARED PUMPS deliver the lubricant. Don't delay another day—write at once.

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Canadian Agents:

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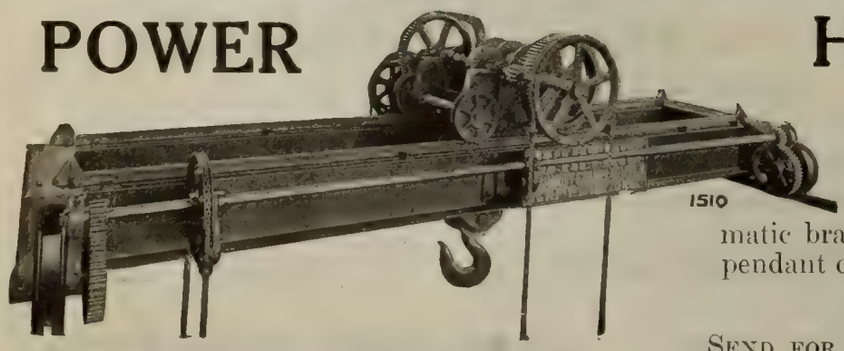

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No. 644—"Old Hickory" $13.50 per dozen pairs (or all rights or all lefts.)

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are doing more than their bit in the shops and foundries. They are preventing millions of accidents daily in the largest plants of Canada, United States and England.

SAVE YOUR WORKMEN'S HANDS

"Old Hickory"—No. 644 shown above is especially designed for sand blasting, and the lighter work about the shop. Other Steel Grip gloves and mittens for handling castings, pig-iron, sheets, bar iron, etc.

Let us serve you.

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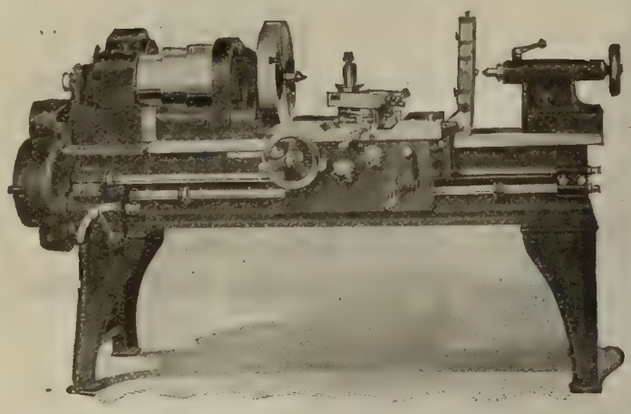

ENGINE LATHES

for delivery from Toronto Stock

13" x 8' Giddings & Lewis Standard Engine Lathes.
Three Step Cone.
Double Back Gears.
Quick Change Feed.
Quick Change Gear Box if desired.

Dimensions:
Swing over bed 18¾.
4' 5" between centers.
Hole through spindle 1½".

These are strongly built, accurate machines. Will give equal satisfaction in tool-room or shop.

The following extras can be furnished if desired: Taper, Relieving or Draw-in attachment, Waving attachment, Hexagon turret on carriage, Pan pump and piping

Write for full specifications and prices.

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Column Type Horizontal Tapper

Tap Breakage Troubles Solved

More Speed—Less Breakage—and Efficient Work.

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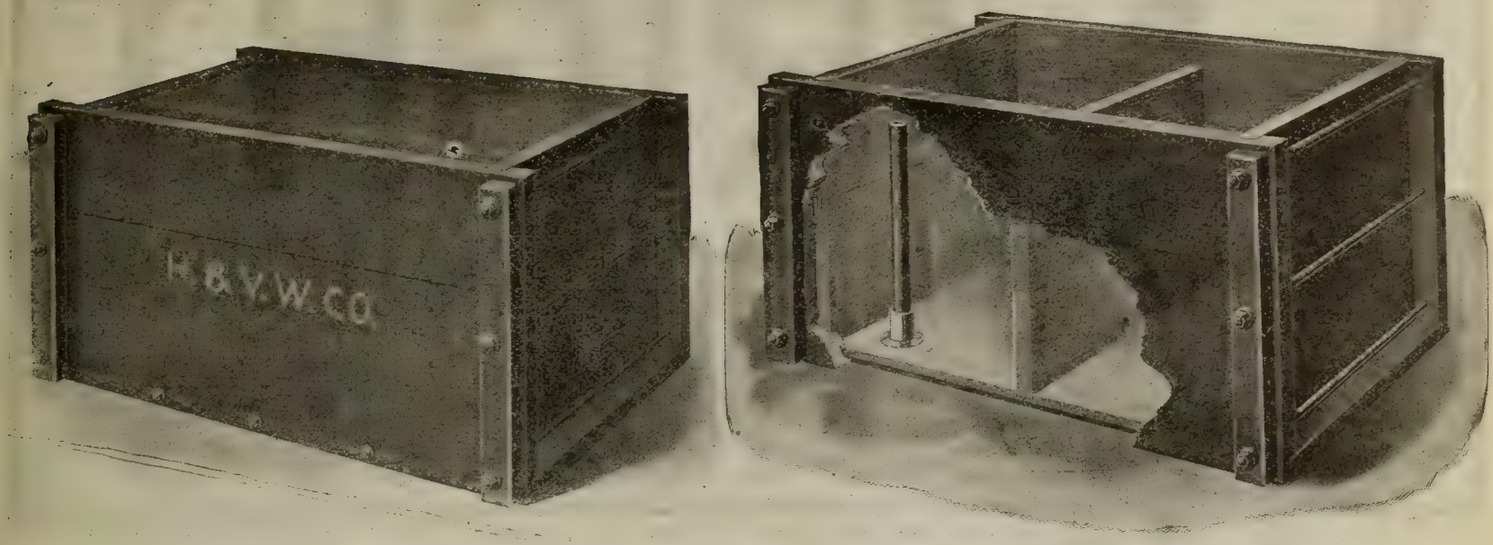
Let us send you detailed particulars—write.

RICKERT - SHAFER COMPANY
ERIE, PA., U. S. A.

This is Our Address—How Can We Serve You?

¼-in. Vertical Tapper

WOOD and STEEL TANKS



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Plain or Lead Lined

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Welded or Riveted Steel Tanks all sizes.
Enquiries Solicited.

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The "never break" feature has instilled confidence into all its users.

Of steel and malleable iron construction, these hoists have a capacity and long life that make them a constant profit-maker.

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Our catalogue and services are at your immediate disposal. "Write Wright's" right away.

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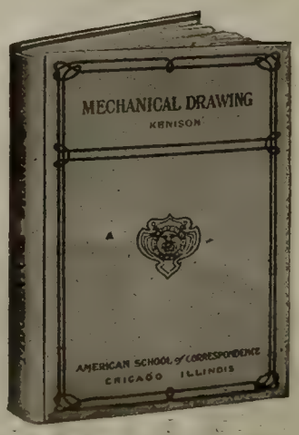
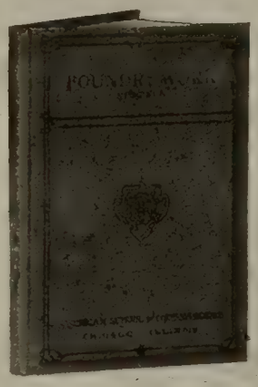
If you are desirous of improving yourself in your trade and so putting yourself in the position of making more money, these Mechanical Engineering Books will be found helpful.

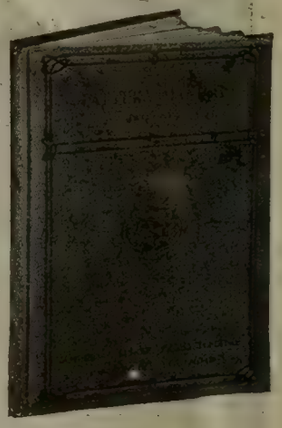
MACHINE-SHOP WORK. By Frederick W. Turner, Instructor in Machine-Shop Work, Mechanics Arts High School, Boston. 208 pp., 241 illus. Cloth binding. The use of various hand tools is explained, followed by a comprehensive discussion of the lathe and lathe tools, with the methods of screw cutting, taper and eccentric turning, etc. The way to figure compound gears for screw cutting; drilling; boring; planers; shapers; slotters; milling machines and cutters; how to cut spirals, gears, cams, etc.; grinding; the operation of automatic machines. Price **$1.50**



MECHANICAL DRAWING. By Ervin Kenison, S.B., Assistant Professor of Mechanical Drawing, Massachusetts Institute of Technology. 176 pp., 120 illus. Cloth binding. Gives a course of practical instruction in the art of Mechanical Drawing, based on methods that have stood the test of years of experience. Includes orthographic, isometric and oblique projections, shade lines, intersections and developments, lettering, etc., with abundant exercises and plates. Price...**$1.00**



FOUNDRY WORK. By Wm. C. Stimpson, Head Instructor in Foundry Work and Forging, Department of Science and Technology, Pratt Institute. 160 pp., 142 illus. Cloth binding. A practical guide to modern methods of moulding and casting in iron, brass, bronze, steel, and other metals, from simple and complex patterns, including many valuable hints on shop management and equipment, useful tables, etc. Price **$1.00**



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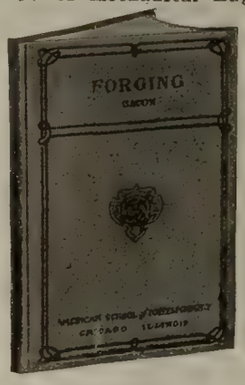

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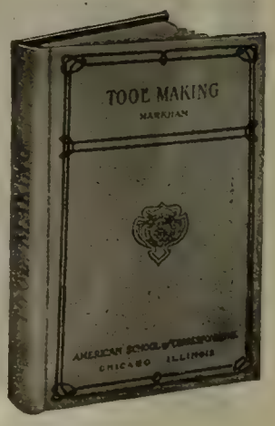

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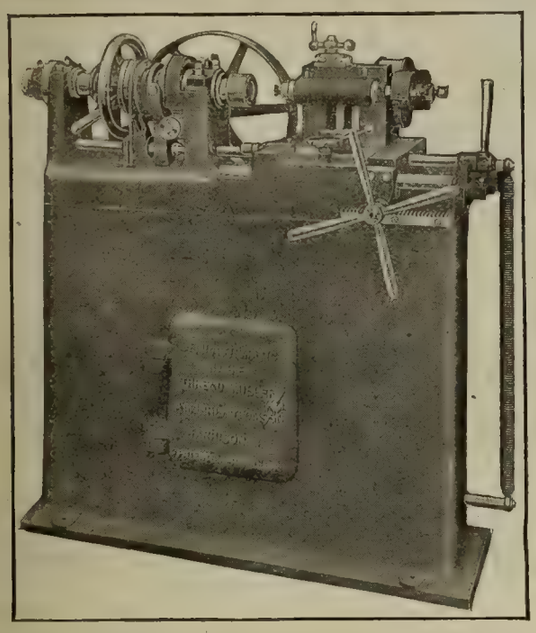

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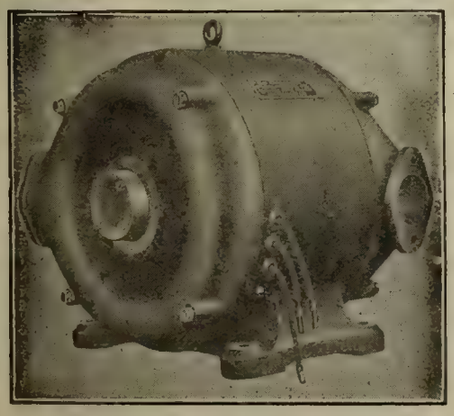

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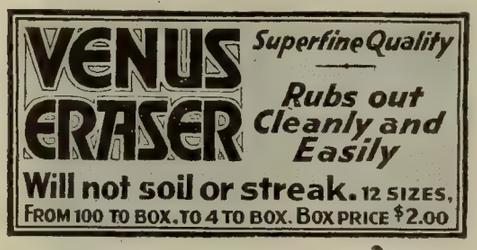

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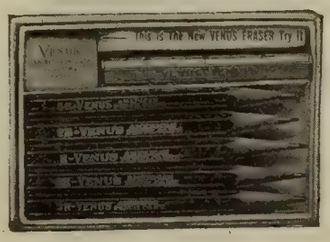

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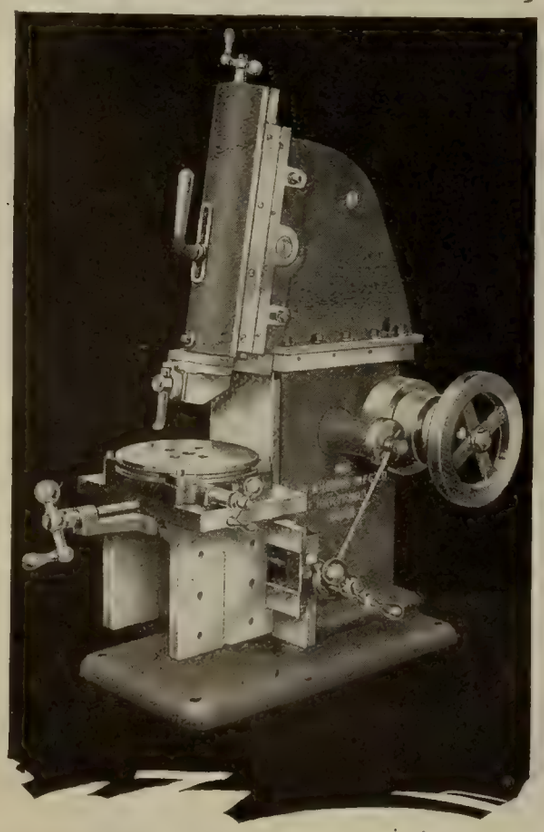
Light-running, easy to handle — far more efficient than heavier and complicated tools. Lead in every way for light and thoroughy accurate work. They're saving production costs in all parts of the world.



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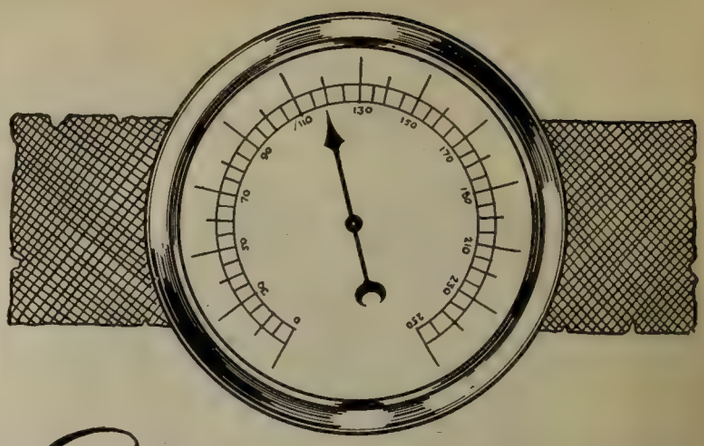

Can you keep the pointer where it belongs?

It's getting near four o'clock. The demand for power is a trifle heavier than usual. The peak is coming. The sockets click one after another in a steady stream. The demand for steam is going up, up, up. Can You Keep The Pointer Where It Belongs?

Sturtevant
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Turbo-Undergrate Blower

will keep steam up. It supplies all the draft you want and just when you want it.
When you buy a blower be sure it's a Sturtevant. The Sturtevant name is a guarantee of mechanical excellence—a guarantee that you will have no breakdown and no bearing trouble. The Sturtevant Set has generous bearings with oil rings and large reservoirs. One filling will last for weeks.
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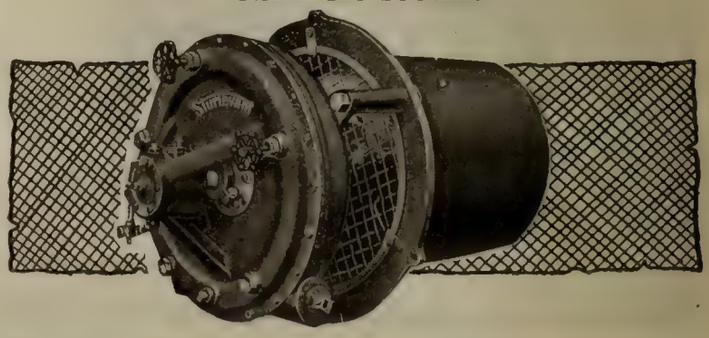

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Are you interested in making a superior article at a substantial reduction in cost?

We want an opportunity to show you how it can be done. Just tell us what you make. Perhaps you can send us a blue-print or a sketch. Our proposition with facts and figures come back in the next mail.

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Manufacturers of

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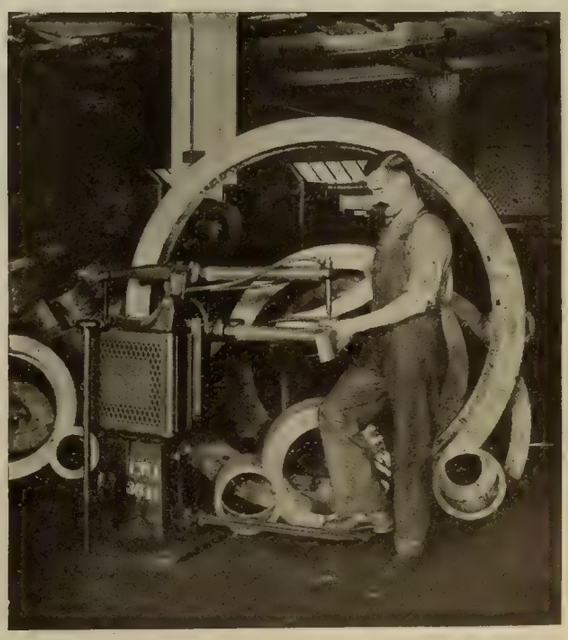
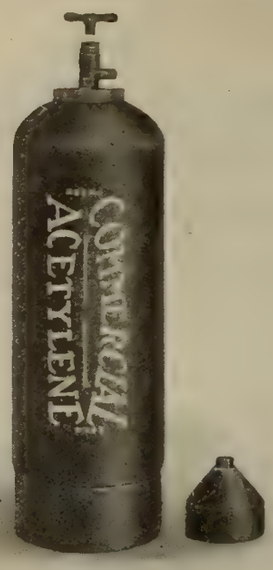
Perhaps you operate a job shop, and have occasion to rivet all kinds of odd shapes and sizes. An electric welder is indispensable in your work. With it one man can spot-weld more work than ten men can rivet, and do it better too. Does that appeal to you? If it does, investigate. It's no trouble to furnish facts that convince.





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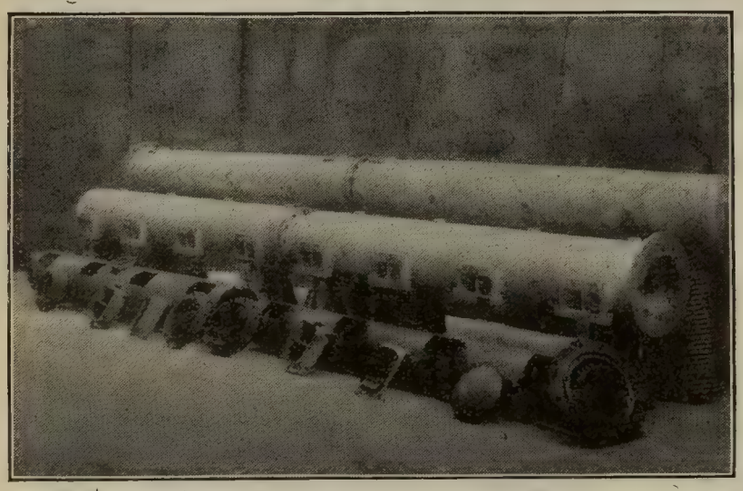

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Oxy-Acetylene Welding is now the method universally adopted for joining metals in all Industries where the highest efficiency is essential—simplifying many manufacturing processes—improving the product—reducing the cost. The tensile strength of the Oxy-Acetylene welded joint being approximately the same as the metal itself.

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Oxy-Acetylene Welding and Cutting Equipment and Supplies of the highest efficiency and of proven merit, backed by Service; manufacturing in Canada the Purest Oxygen and Dissolved Acetylene Gases. Maintaining three factories and a staff of experts, at your service; ready at all times to advise and instruct to ensure your complete satisfaction. You have many uses for it and it will save you money.

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A portable Oxy-Acetylene Welding and Cutting Equipment operated instantly in conjunction with Oxygen and Acetylene Gases, and weighing less than 300 lbs. Ready at all times, wherever required, to repair, reconstruct, or render equal to new any broken casting, machine part, etc. To permanently join two pieces of metal for whatever purpose, at a lower cost, in less time and more effectively than by any other method.

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No stub is so small that you can't make a good tool of it with the

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"It's stronger and has greater radiating surface, and consequently will cut faster."

Write for our free booklet on "Saving High Speed Tool Steel."

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The Growth of Oxy-Acetylene Welding and Cutting and the Increasing Demand for Davis-Bournonville Apparatus

A Year Ago we said—

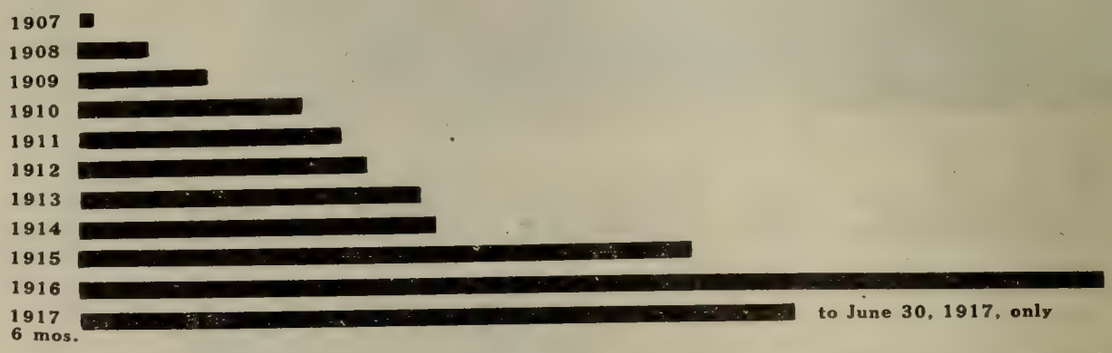
"The growth of Oxy-Acetylene Welding and Cutting in the United States is shown by the increasing use of Davis-Bournonville apparatus, which is inseparably associated with the development and success of the oxy-acetylene industry in this country.

"Ten years ago the process was unknown in the United States. To-day it forms one of the great industries of the country, with its requirements for acetylene, oxygen and efficient apparatus.

"The Davis-Bournonville Company obtained the United States patents for the independent positive-pressure type of welding torch (mixing the gases in an interchangeable tip or nozzle) in 1906—basic principles which have been retained in the D-B torch because of their proven superiority through ten years of development, improvement and the most successful operation.

"There is more Davis-Bournonville welding and cutting apparatus in successful use in the United States than of any other make, and the prominent concerns which have established the greatest success with this process have large installations of D-B apparatus, with from ten to one hundred or more torch units, and from one to six of the largest acetylene generators."

Today— The increasing use of the oxy-acetylene process for welding and cutting and of Davis-Bournonville apparatus are parallel and are graphically shown by the sales of "Davis Apparatus" as charted below:



"Davis Apparatus" Leads the World in Range, Efficiency and Number of Successful Users. Write for bulletins and information showing why it is used by the largest steel mills, foundries, ship-yards, locomotive and car builders, U. S. Navy Yards and government works, mines, sheet metal working factories, tube and barrel welders, scrap yards, and in hundreds of small repair shops and garages.

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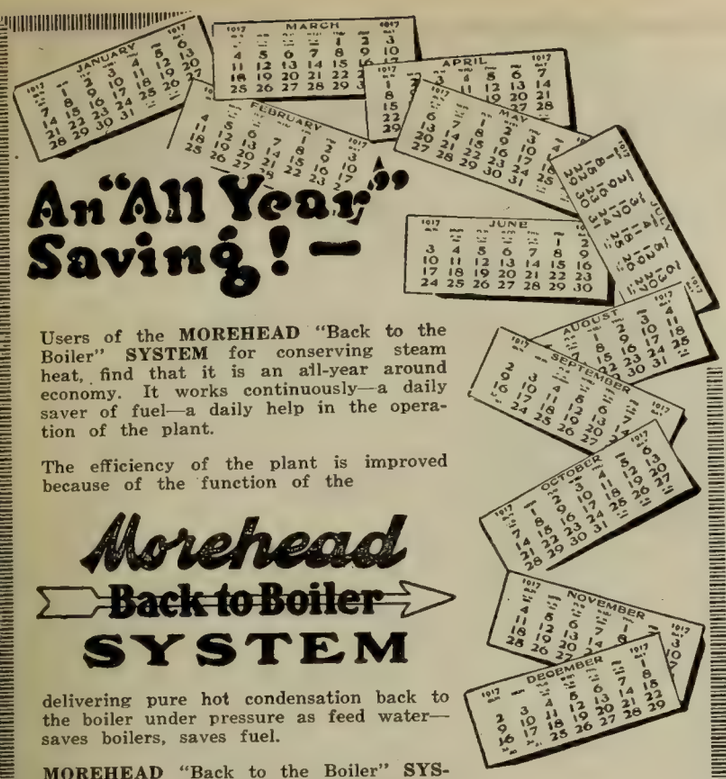
Cleveland	Cincinnati		San Francisco	Toronto

OXY-ACETYLENE WELDING DAVIS APPARATUS DAVIS-BOURNONVILLE CO. N.Y.



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The efficiency of the plant is improved because of the function of the

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delivering pure hot condensation back to the boiler under pressure as feed water—saves boilers, saves fuel.

MOREHEAD "Back to the Boiler" **SYSTEM** stands for economy—every day in the year.

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Economic Boiler Compound

If you have boiler troubles, and wish to clean same at a minimum cost, use ECONOMIC BOILER COMPOUND, it will surprise you.

Manufactured by

CANADIAN ECONOMIC LUBRICANT CO., LTD.

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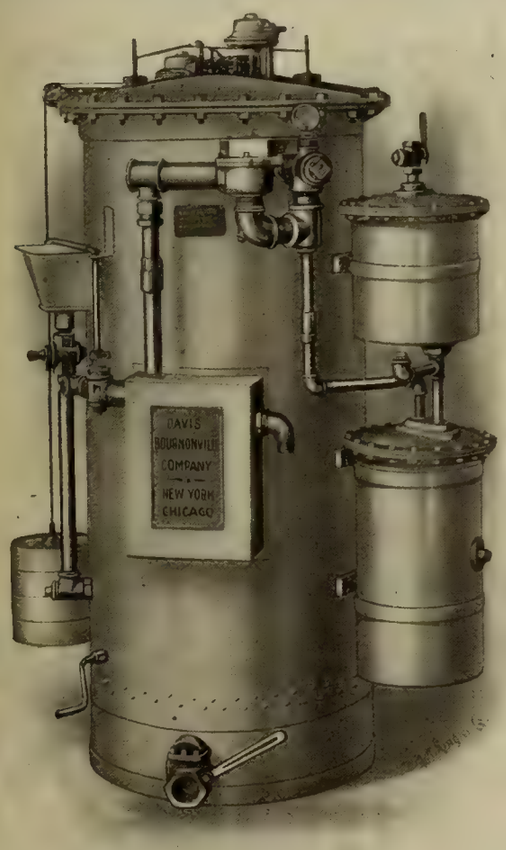

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Why Use Compressed Acetylene

when you can generate your own acetylene at 50% less cost and always have ample gas on hand?

Davis Acetylene Pressure Generators

Made in three types, the standard pressure generator in five sizes, with capacity of 25 lbs., 50 lbs., 100, 200 and 300 lbs. of carbide at each filling,—the portable pressure generator in 25 lb. and 50 lb. capacity sizes,—and the Navy Type two pressure generator with capacities of 100 lbs., 200 lbs., or 300 lbs All pressure generators supply acetylene under pressure up to 15 lbs. The Davis acetylene generator is on the approved list of the National Board of Fire Underwriters. Patented.

Generators of all sizes kept in stock.
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Canadian Agents for
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For General Tool Work

OIL or GAS

These tool Forges are particularly adapted for the requirements of the small machine shop for annealing and tempering dies, cutters, reamers, etc.

For General Shop Work these furnaces are of the greatest service. They are made to stand the highest temperature that may be required. Constructed in the strongest possible nature, with doors properly counter-balanced.

When operated with oil or gas (manufactured or natural), an intense heat is rapidly developed and remains under accurate control. Combustion is perfect and no flames come in contact with the material.

With the use of these furnaces the highest class of work can be uniformly depended on.

Write for our Catalogue showing our complete line of Furnaces.

Bellevue Industrial Furnace Company

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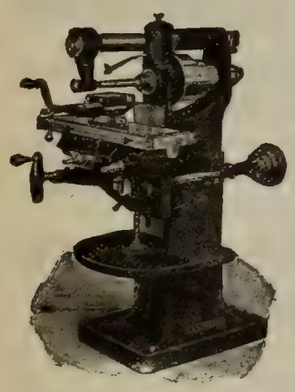
Don't Crowd Your Large Machines



You cannot manufacture small parts economically on a large machine. Steptoe Small Power Feed Millers and Hand Millers are especially adapted for that kind of work, a stiff, heavy tool that can be quickly handled and crowded to the limit. That is the machine to buy for small parts.

If your Planers are crowded take the small jobs and put them on a Steptoe Shaper and you will do them quicker and you will have less money invested in equipment.

STEPTOE SHAPERS "Just a Little Better."

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Our facilities and equipment enable us to give you a top-notch quality at a very reasonable price.

AUTOMOBILE FENDERS, HOODS AND GASOLINE TANKS

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TATE-JONES Circular Semi-Muffle Furnaces, as illustrated above, have been widely adopted by shrapnel makers because of their rapidity, uniformity and convenience of operation.

Proper heating is easily and safely accomplished in furnaces of this type.

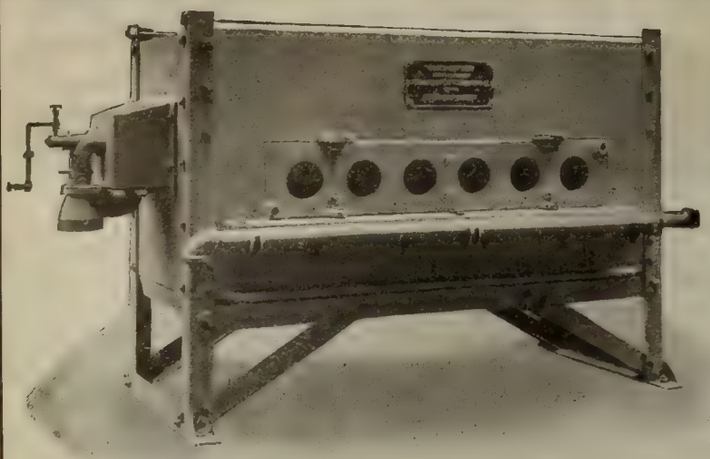
There are numerous complex problems met in the manufacture of heat-treating furnaces—but years of experience, scientific research, unlimited tests and intimate association with all manner of heat-treating processes have enabled us to cope successfully with all difficulties. When you get a Tate-Jones Furnace you can rest assured that you are getting a furnace that will turn out work fast and efficiently.

Before placing your next order for furnaces for Annealing, Hardening, Tempering, etc., it will pay you to make the most minute inspection of the Tate-Jones line and compare it with any other on the market.

Send for Catalog, or ask for Bulletin 148-C, "Shells and Shell Furnaces"

Tate-Jones & Co,, Inc., Pittsburgh, Pa., U.S.A.

FURNACE ENGINEERS

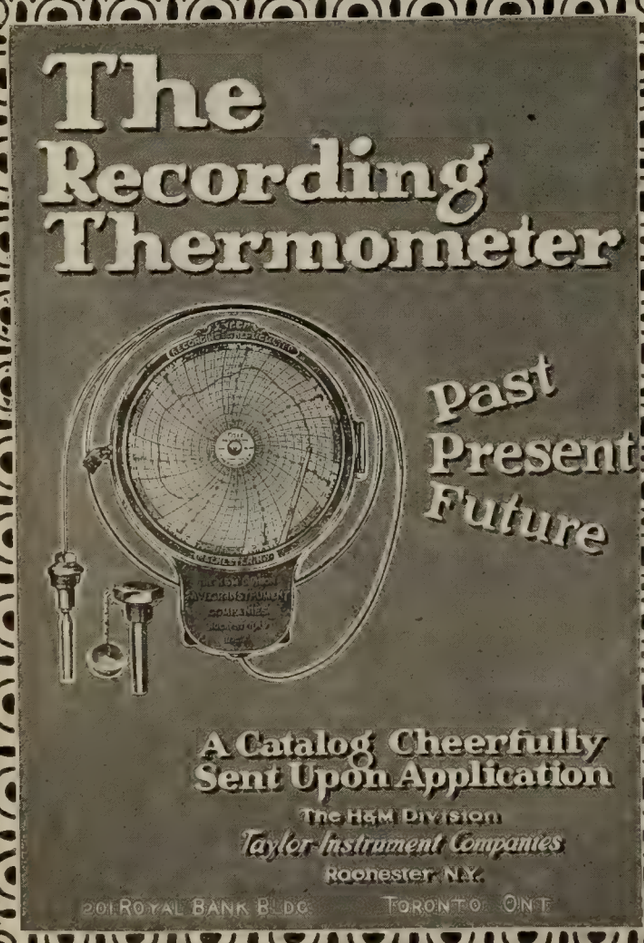


"MECOL"

6'' Shell End Nosing Furnace

We manufacture furnaces for all purposes to be used with any kind of fuel

The Mechanical Engineering Company, Ltd.
THREE RIVERS, QUE., CANADA



High Speed Steel Treated at 1750

by pack hardening in HeTzy

a scientifically compounded and thoroughly tested preparation. Yes, and further, you will find that you

1. keep down H/S steel scrap pile,
2. turn out tools with 30 per cent. more production.
3. eliminate distortion, breaking and pitting.

Prove this at our risk.

Send for 100 lb. container and try it for 30 days. If it doesn't do what we say, return the balance and you owe us nothing.

If still in doubt write for our circular and partial list of 200 representative concerns using HeTzy on all H/S treatment.

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Can be used anywhere that leather can be used.

Scandinavia Belting is a solid woven cotton belt, made of long fibre cotton. It is impregnated to give further solidity, and the impregnation also acts as a moisture resistant. For direct drives where atmospheric conditions remain approximately the same, this belt is probably the best on the market to-day.

It stands up well on shifters.

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Beltings *Packings* *Asbestos*

Determine, Measure and Eliminate

LOST TIME and MOTION

The day of advanced prices only for the purpose of advanced profits has now passed.

To "economize" on selling expenses may be "to save yourself into bankruptcy."

The one opportunity for the manufacturer to increase his profits is by a reduction of costs.

Labor in America will never sell itself cheaper than to-day, and the cost of materials is increasing yearly.

Therefore, increased profits in your plant are dependent upon just on thing:

You must determine, measure and eliminate lost time and motion.

The Master Cronograph will enable you to determine without further calculation just what a man or machine DOES DO and SHOULD DO in an hour or a minute.

With such information, you may STANDARDIZE the operation—INSTRUCT your men to a more profitable effort and MEASURE their work in terms of the new standard—thus extracting from your present conditions an added profit without the expenditure of an extra dollar.

The Master Cronograph is the one device which will show at a single rating the total of its computation. The only watch that will reduce net time to output or production per hour without the use of a pencil. It embodies a 17-jewel time-piece. Write for literature.

MORTIMER J, SILBERBERG **Engineer**
122 So. Michigan Avenue **Chicago, Ill.**

FOR MUNITION WORKERS

WILLSON SAFETY GLASSES
REG U S PAT OFF.

—Including chippers, grinders, machinists, furnacemen, temperers, and those who work in dust or fumes.

Machinists' and grinders' goggle for light work. Albex Eye Protector (Style A1), $1.25

Ventilated leather sideguards, 1⅞ in. amber or clear lenses, flexible cable earbows or detachable elastic headband, and adjustable bridge. Can be worn over other glasses. Per pair, $1.25. Per dozen, $9.60. Look for the name WILLSON stamped on bridge. Accepted by the United States War Department for military wear. **Send for illustrated price list.**

T. A. Willson & Co., Inc., 23 Scott St., Toronto
Factory and Main Offices: READING, PA., U.S.A.

CHICAGO Mallers Bldg. | SAN FRANCISCO Head Bldg. | LONDON 9 Hatton Garden

MAKE NAILS! NOT NOISE!

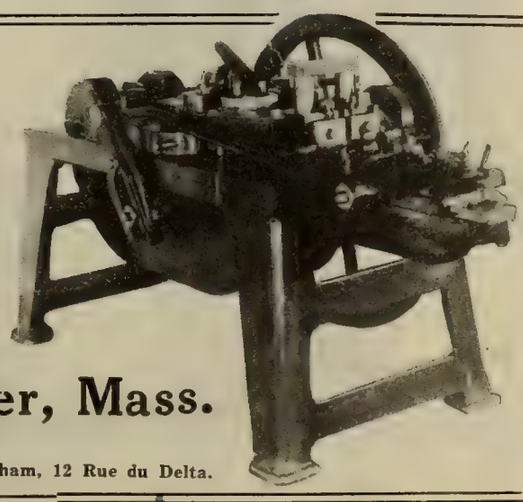
We offer the trade new types of

WIRE NAIL MACHINES

QUIET IN OPERATION; WITH VERY HIGH OUTPUT; ALL PARTS ACCESSIBLE; DECREASED MAINTENANCE COSTS; GREAT CAPACITY; OCCUPYING SMALL FLOOR SPACE.

Smoothly running machines, with balanced mechanical motions and no rotating cams. Built in 5 sizes, handling wire from No. 17 to ⅜" diam.

PRACTICALLY NOISELESS IN OPERATION



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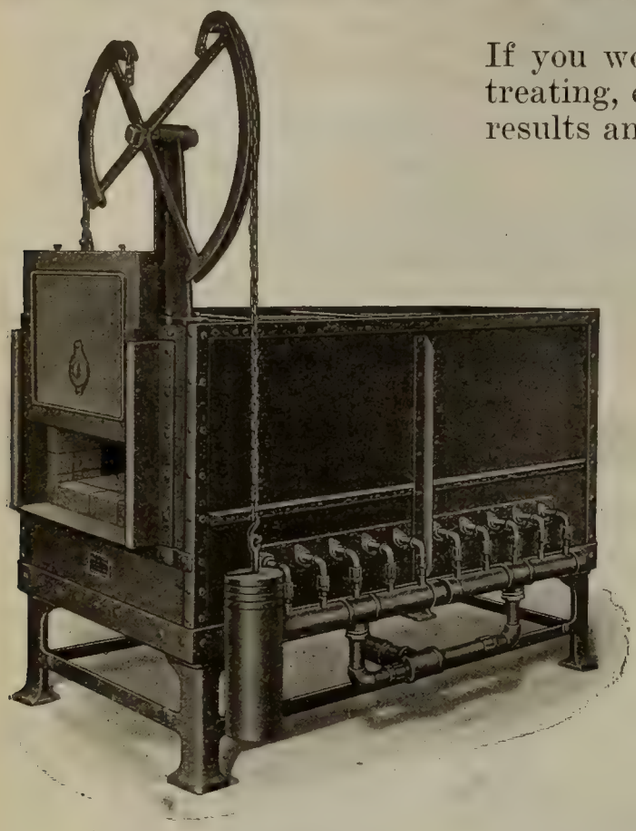
CANADIAN BRANCH, COATICOOK, P.Q.

London, England, F. A. Perry, 63 Queen Victoria Street, E.C. 4. Paris, France, Edgar Bloxham, 12 Rue du Delta.

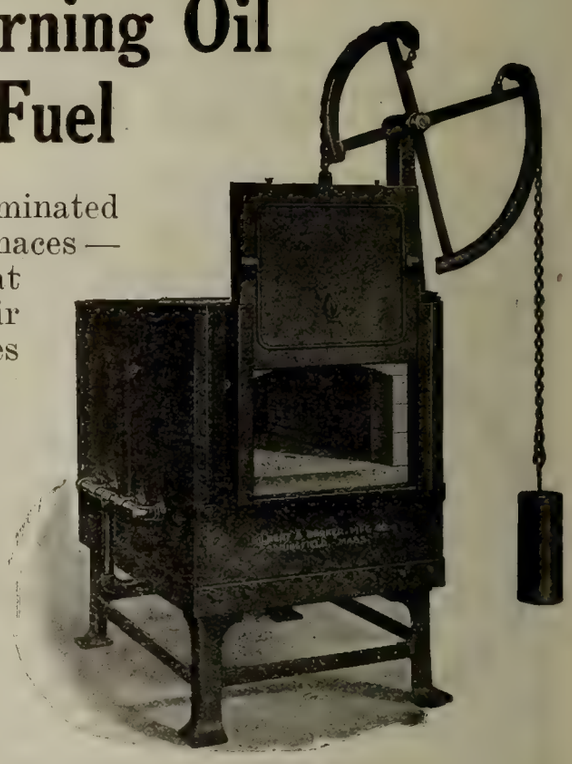


TYPE C—25

If you would do away with coal or coke uncertainty in heat-treating, effect a 25% reduction in spoilage costs, obtain uniform results and a product of better quality—it will pay you to thoroughly investigate

GILBERT & BARKER FURNACES

and Low Pressure System of Burning Oil Fuel

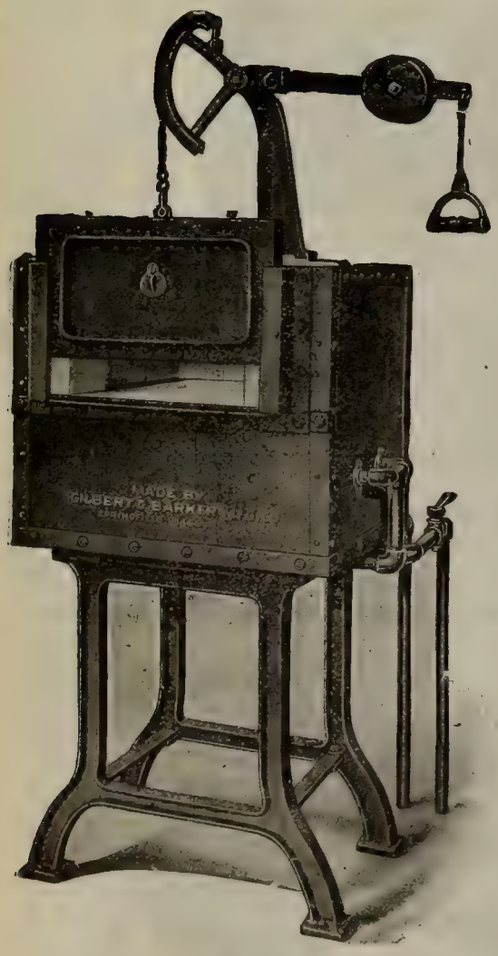


TYPE C—15

Fuel waste is eliminated by these furnaces—every unit of heat is utilized. Their oil or gas fires are valve regulated. An ordinary mechanic can keep them steady and even and work continuously, which means uniform heating, and uniform heating is the great secret of success in hardening steel. Fifty-two years' experience, study and practical experience with gaseous and liquid fuels is behind the manufacturing of more than one hundred types of Gilbert & Barker furnaces. Our line includes furnaces for every need—for forging, welding, lead and cyanide hardening, tempering, bluing, etc., both muffle and semi-muffle types, all made from the best materials.

Put your heat treating problems up to us. We have equipped some of the finest heat treating plants in the world and you may have the benefit of our expert advice without charge.

Just at present we are able to make prompt delivery on many types. Write to-day for your copy of stock list 24.



TYPE C—10
Semi-Muffle Oven Furnace

Gilbert & Barker Mfg. Co.

SPRINGFIELD, MASS.

CANADIAN AGENTS:

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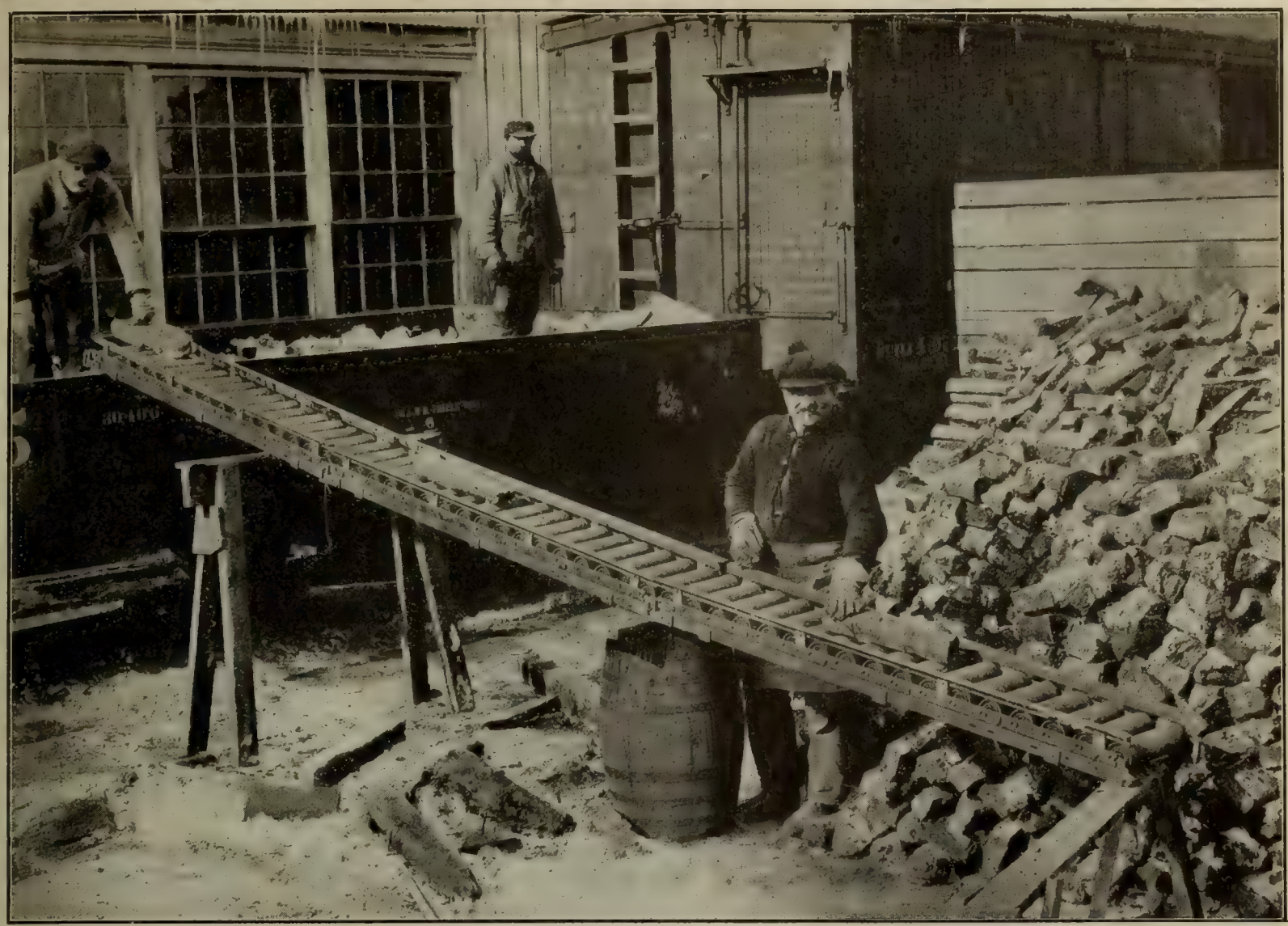

Why pay 50% more than is necessary for unloading your Pig Iron when you can save that percentage by using MATHEWS GRAVITY PIG IRON CONVEYOR? Write for our Bulletin C.

CANADIAN MATHEWS GRAVITY CARRIER CO., Ltd.
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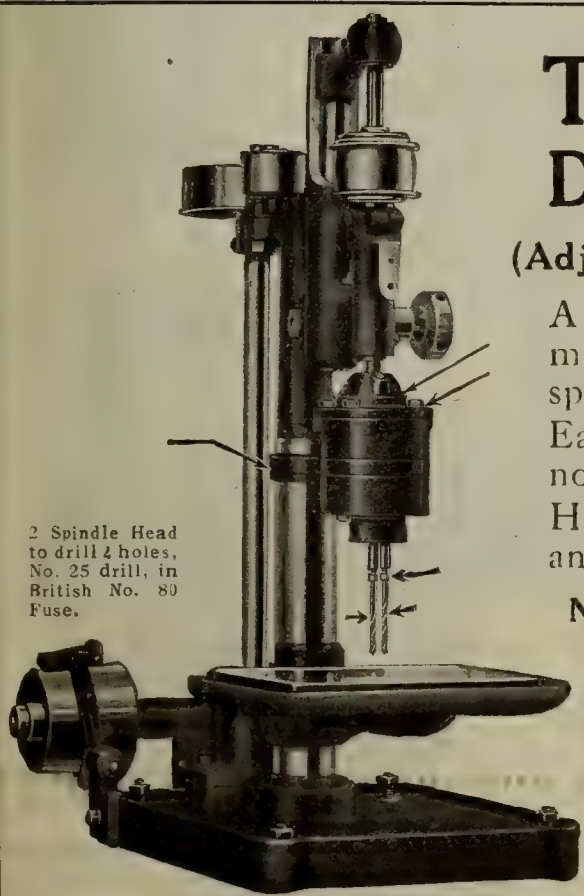

2 Spindle Head to drill 4 holes, No. 25 drill, in British No. 80 Fuse.

THE BUHR DRILL HEAD

(Adjustable and Fixed Centres)

A new and original designed multiple head from 2 to 12 spindles.

Easily attached to any press now on the market.

Heads are furnished in plain and ball bearing.

No Running Hot of Bearings

Buhr Ball Bearing Heads need very little care

Write to-day for information.

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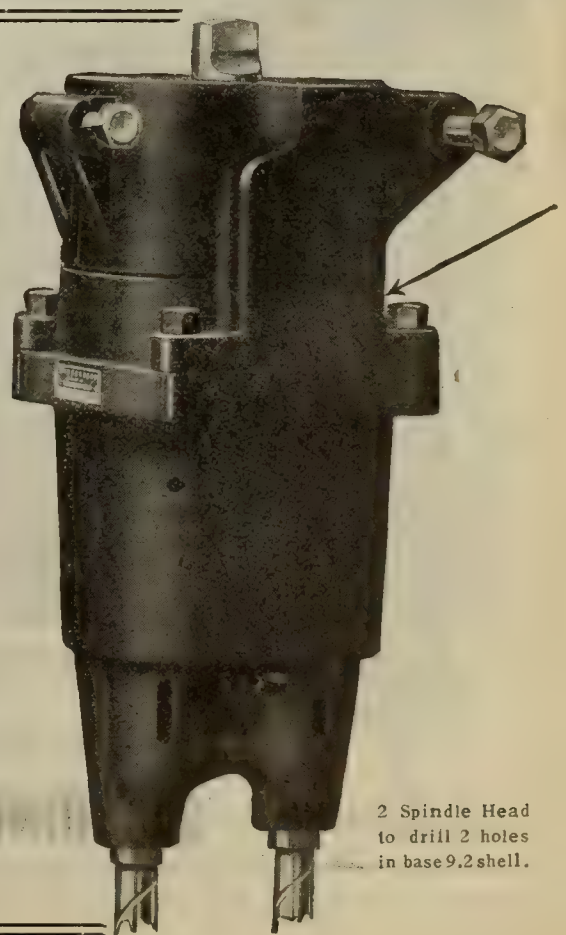


2 Spindle Head to drill 2 holes in base 9.2 shell.

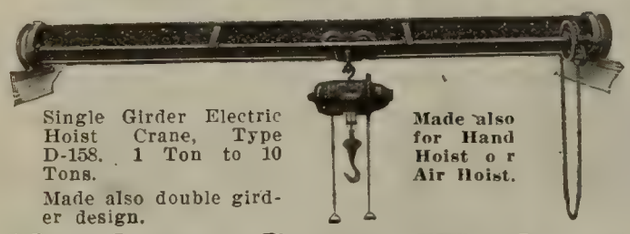
CANADIAN MADE CANADIAN MADE

Electric and Hand Traveling Cranes

Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons.

Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons.

Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

Type D Electric Hoists —½ to 10 Tons.

Air Hoists, Trolleys and Tracks.

Type No. 20 Air Hoist.

Northern Crane Works, Limited

Walkerville, Ontario, Canada

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AIR COMPRESSORS — AIR HOISTS — TROLLEYS AND TROLLEY SYSTEMS—SAND BLASTS—PNEUMATIC AND HYDRO-PNEUMATIC ELEVATORS—JIB AND TRAVELING CRANES.

We have specialized for over 22 years on pneumatic machinery. We have developed the simple air cylinder into a straight line motor with wonderful speed control and dependability capable of the widest application to hoisting problems.

Our new controlled-splash oiling system with regulatable sight feed cylinder oiling is something entirely new in air compressor design.

Complete catalogs and descriptive circulars on our entire line furnished on request.

Curtis Pneumatic Machinery Co.

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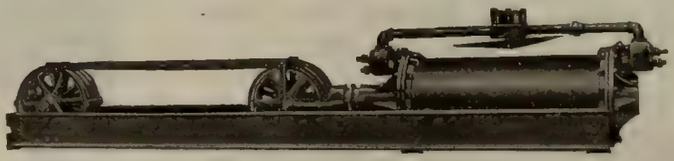

Standard Pressed Steel Company
Philadelphia, Pa., U.S.A.
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"STAR BRAND"
SEAMLESS BRASS

CONDENSER TUBES

TINNED INSIDE AND OUTSIDE

5/8 and 3/4 inch O.D., No. 18 Stubs Gauge—12, 14, 16, 18 and 20 foot lengths

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"STAR BRAND" BRASS CONDENSER TUBE FERRULES

Standard 14 Thread for 5/8 and 3/4 in. Tubes

OUR STOCK ON HAND READY FOR IMMEDIATE SHIPMENT ALSO INCLUDES A FULL LINE OF REGULAR STOCK SIZES AND SHAPES OF THE FOLLOWING

"STAR BRAND" SPECIALTIES

Seamless Brass and Copper Pipe and Tubing, Brass Fittings, Sheet Copper, Copper Bar, Rods and Wire, Copper Nails, Sheet Brass, Brass Rods, Tobin Bronze Rods, Copper Rivets and Burs
AND OTHER PRODUCTS IN BRASS, COPPER, PHOSPHOR BRONZE, ARCHITECTURAL BRONZE, ETC., ETC.

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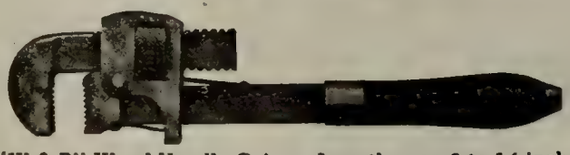
KINDLY ADDRESS INQUIRIES FOR ATTENTION OF DEPARTMENT D.

"W & B" Pipe Wrenches the Only Pipe Wrenches

MADE IN CANADA

The line comprises all sizes from 6 to 48 inches



"W & B" Wood Handle Grips. Length open 6 to 14 inches

"W & B" STEEL Handle Grips. Length open 18 to 48 inches

These Wrenches are extra strong frames well proportioned.

The Jaws are Drop Forged and tempered, giving them strength to resist the most severe strains.

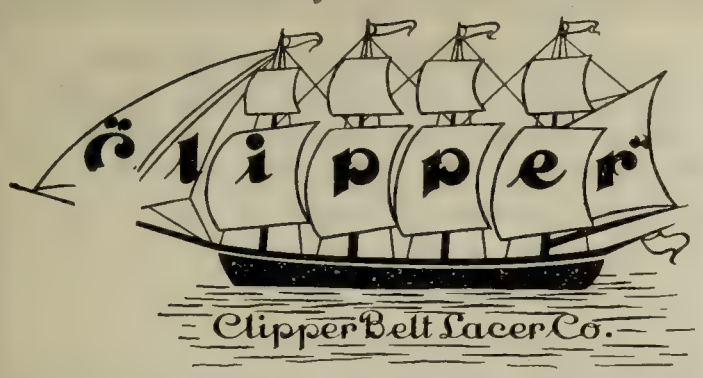
Other patterns of "W & B" SCREW WRENCHES MADE IN CANADA at our St. Catharines factory, are our Machinists' Knife Handle, "Railroad Special," Regular (Agricultural Pattern). Adopt this established line as your standard CANADIAN-MADE WRENCHES.

Complete information and catalog No. 82 on request.

The Whitman & Barnes Manufacturing Company

ESTABLISHED 61 YEARS

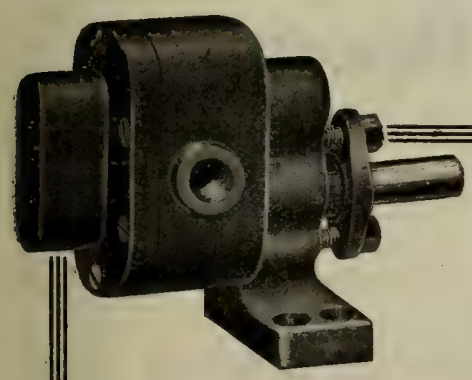
ST. CATHARINES, ONT.



If you would use a stop watch while one of your belt lacing crews were at work you would find that you were paying expert men for a half hour job when any machine operator can lace a belt in THREE minutes with the

CLIPPER BELT LACER

CLIPPER BELT LACER COMPANY
976 Front Ave., N.W. Grand Rapids, Mich.



Speed Up—

You can speed up that machine to its highest capacity and rest assured that Roper's Circulating Pump will keep the machine well oiled.

The machine is so constructed that the lubricant will flow in a steady stream, no halting, pulsating movement at all. This is a feature well worthy of notice. The circular is made in 6 sizes and will adjust itself to any size machine. The pump shown is a one-way lubricator only. We make the other kind.

Inquire.

C. F. ROPER & CO.
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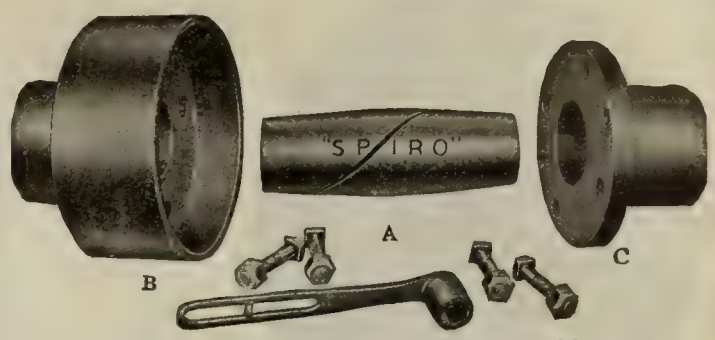


The Bond Patent "Spiro"

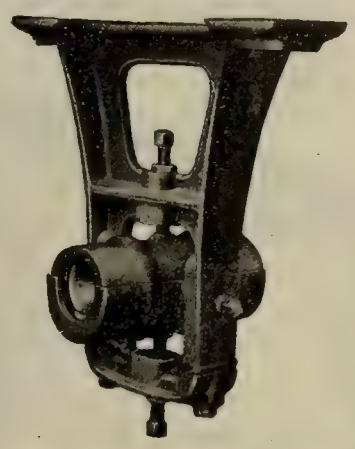
The PRICE is never right if the quality is wrong. QUALITY in Power Transmission Equipment means correct design based on long experience and skill in manufacturing and finishing.

When you buy BOND Transmission machinery, you know the quality is right, for we have had twenty-five years' experience.

And at the same time BOND transmission equipment can be bought at prices as low as are now charged for many inferior lines.

Write to-day for our complete catalogue.

Canadian Bond Hanger & Coupling Co., Limited
Alexandria, Ontario



The Original Four-Point Hanger

Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send to our nearest factory for a trial box.

Manufactured and guaranteed by

The Canada Metal Company, Limited

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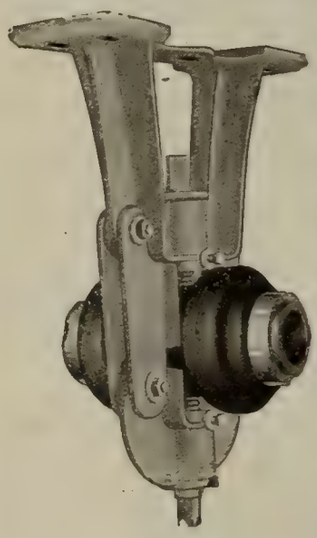


LESS FRICTION—LESS POWER LOSS

There is 75% Less Friction with

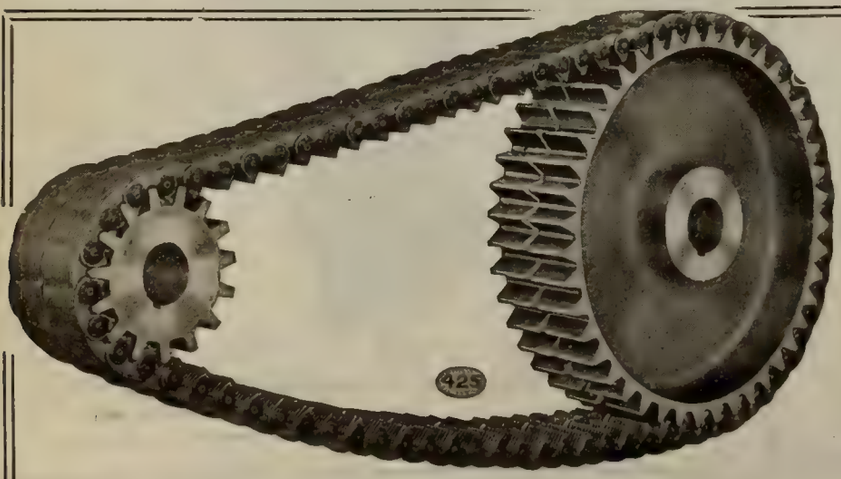
Chapman Double Ball Bearings

A factor of well recognized importance in a shaft hanger is Power Cost.
Power cost goes up with increased friction. Friction in a well designed ball bearing is far less than in a sliding bearing. Then since Chapman Double Ball Bearings are designed solely for transmission purposes, users save 75% of friction loss in transmitting power.
Use of Chapman Ball Bearings means a saving in oil, a saving in labor of oiling and general attention required in Babbitted shaftings—and they are thoroughly dust-proof.

Chapman Double Ball Bearing Company of Canada, Limited

339-351 Sorauren Avenue, Toronto, Ontario

Transmission Ball Bearing Company, 1050 Military Road, Buffalo, N.Y.



RENOLD CHAINS

PATENT SILENT

The proven efficient form of Power Transmission.

Equally suitable for main shaft or machine drives. Save space and power, increase output and ensure durability.

Chain and Parts Carried in Stock.

Sole Canadian Agents

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GRATON & KNIGHT

Standardized Series LEATHER BELTING

Tanned by us for belting use

GRATON AND KNIGHT

Are you trying to drive Pulleys with a Belting Specification?

How often does a belting specification get you the kind of belts you really should have? Do the belts you get agree with the specification? How many men in your plant could tell? Could **you?**

The only specification the belt buyer should attempt to make is a specification of the work to be done. Because to get the work done most efficiently and economically is the only possible reason for any kind of a specification about anything.

Graton & Knight offer you this practical specification—the work to be done. To do the work properly in every case is the basic idea underlying the Graton & Knight Standardized Series Leather Belts.

This Series was evolved to fit the working needs of actual conditions, *not* to meet theoretical conditions as described on paper. Every belt in this Series—and there is one for every transmission purpose—has been standardized only after it has been *proved* right.

Face these facts squarely—then consider the safety, ease and economy of buying Graton & Knight Standardized Belts. Not by guesswork, nor on discount—but on *standardized performance.*

Write for a description of Graton & Knight Belting Standards and a copy of their Book on Belting.

The Graton & Knight Mfg. Co.

Oak Leather Tanners, Makers of Belting, Lace Leather, Packings and Specialties

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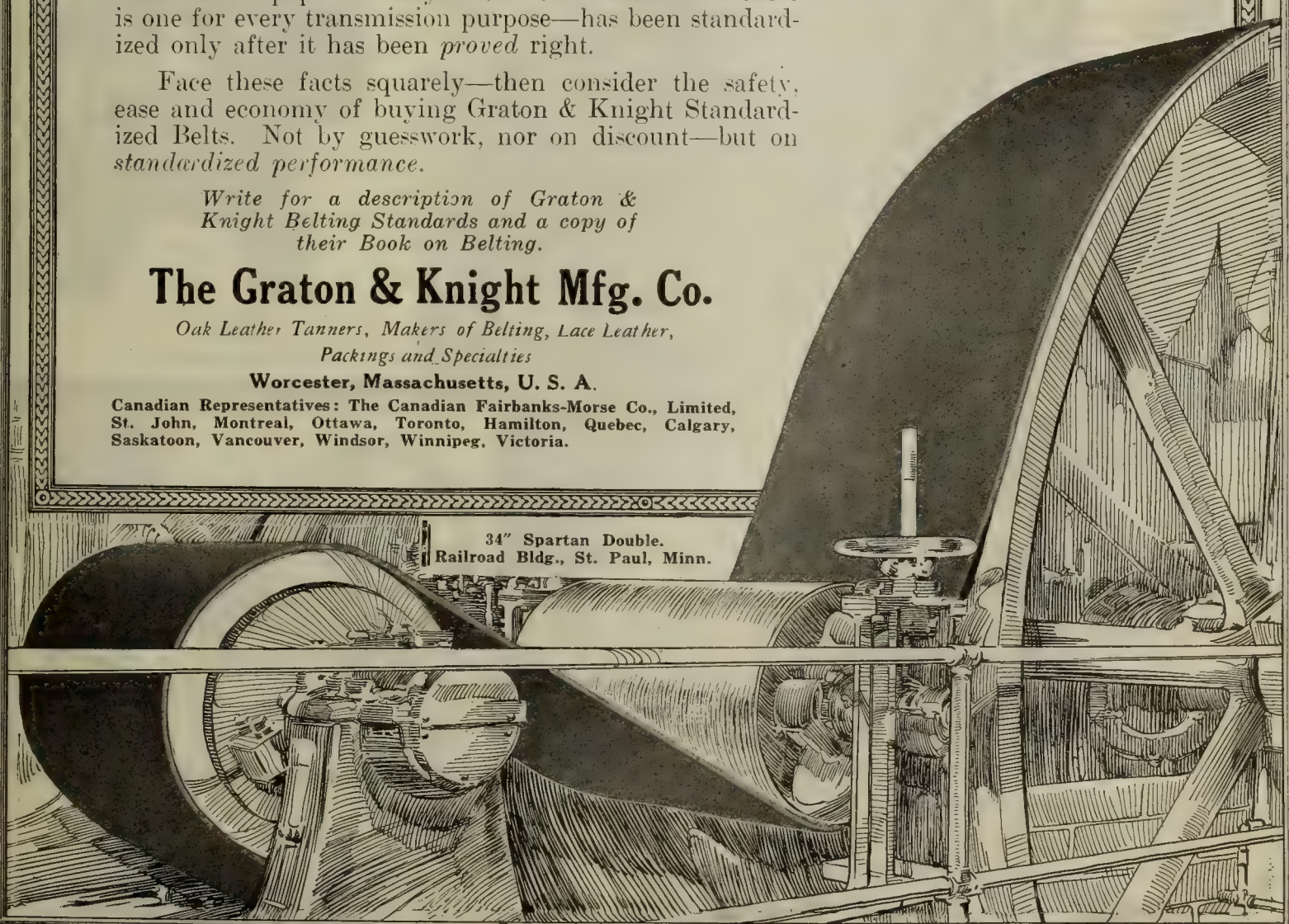
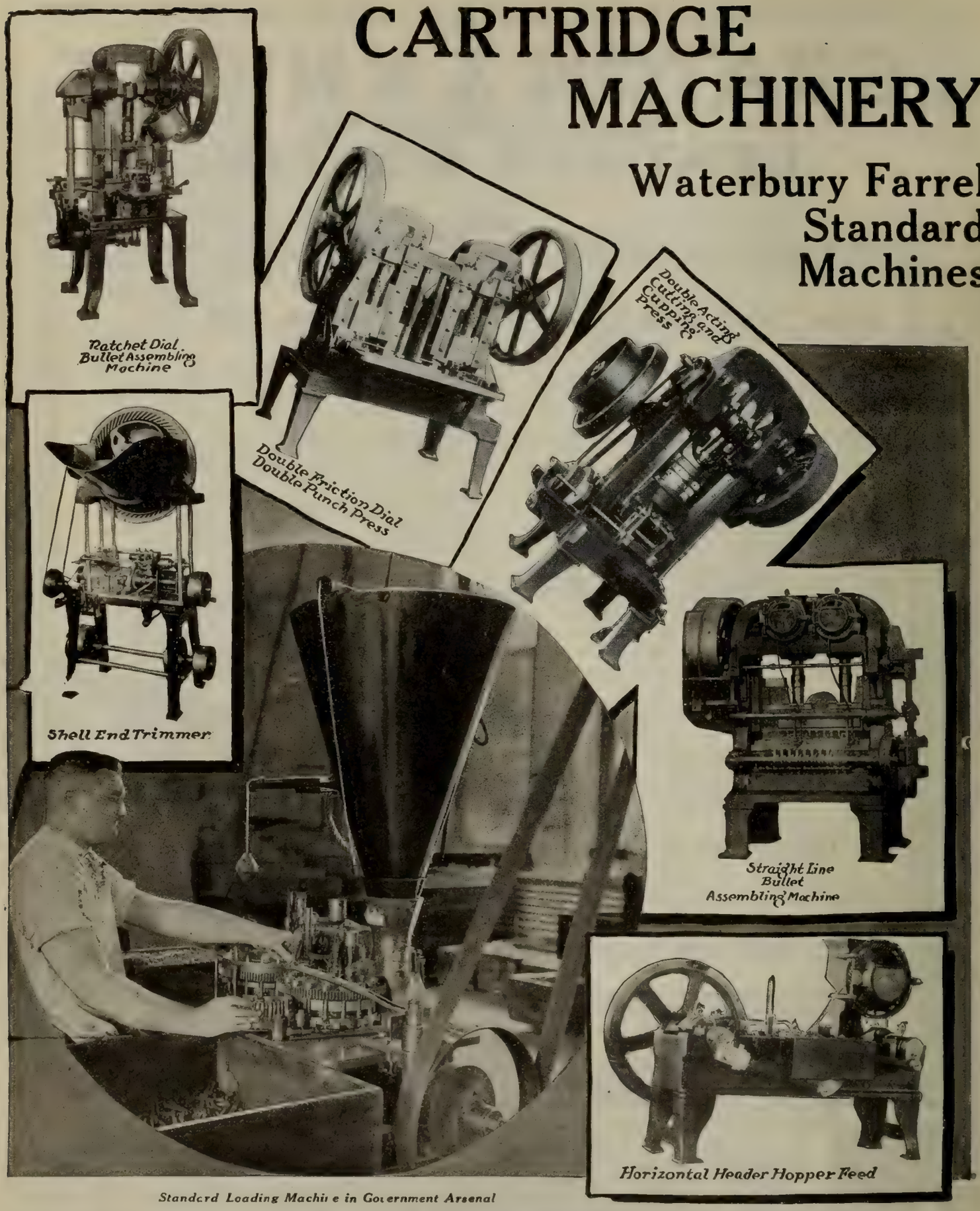


34" Spartan Double. Railroad Bldg., St. Paul, Minn.

CARTRIDGE MACHINERY

Waterbury Farrel Standard Machines



Standard Loading Machine in Government Arsenal

The Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn., U.S.A., has appointed me to be the sole manufacturer for export of their entire line of Cartridge and Shot Shell-Making Machinery. Proposals and Estimates covering complete plants or separate units, required for export will be furnished on request.

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The Value of a Clean-Cut Layout

Unless work is laid out accurately at the start, many difficulties will arise as the job progresses.

A confusion of faint lines may mean lost time and perhaps throwing away a valuable piece of metal.

It is important then that the lines be distinguished quickly, no matter how much they crisscross. The clean-cut lines made with a

TRADE MARK
Starrett
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Surface Gage

will greatly aid machinists in preparing a clean layout on which work can be done accurately. This useful instrument may be used to scribe on all kinds of surfaces and is very handy for transferring measurements for duplicating work.

Our free catalog No. 213 will tell you more about this surface gage, also describes 2,100 sizes and styles of measuring tools. Write for it to-day.

42-661

The L. S. Starrett Co.
The World's Greatest Toolmakers
Athol, Mass.

Rivet Speed

One every second is a speed which this Grant Rivet machine will keep up indefinitely, in any degree of tightness or looseness desired. Each rivet is finished with perfectly shaped head, polished and with no hammer marks showing.

We claim this is the only machine manufactured that will accomplish this feat. Our claims are unchallenged. By writing for our catalogues you may obtain full information regarding the ability of this machine.

We are rivet machine specialists. Get in touch with us.

The Grant Mfg. & Machine Co.
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HIGH SPEED HAMMERS

For High Speed Work

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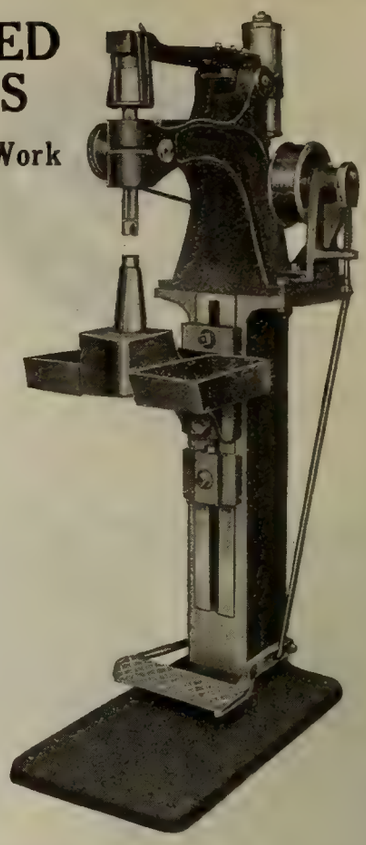
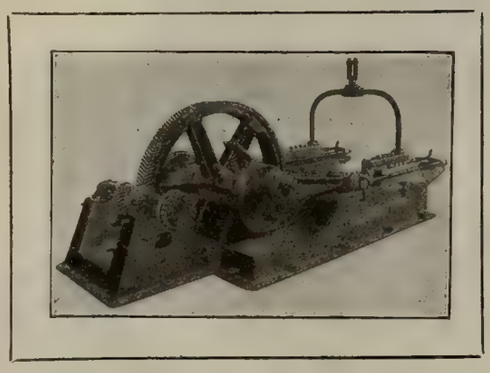


Economy in floor space, elimination of weight and a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushings are used throughout.

No riveting too intricate for us; no riveting which our machine cannot accomplish.

Send for our **High Speed Hammer Book.**

THE HIGH SPEED HAMMER CO.
Rochester, N.Y.
Sales Agents: The A. R. Williams Machinery Company Limited, Toronto, Ontario.



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18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works
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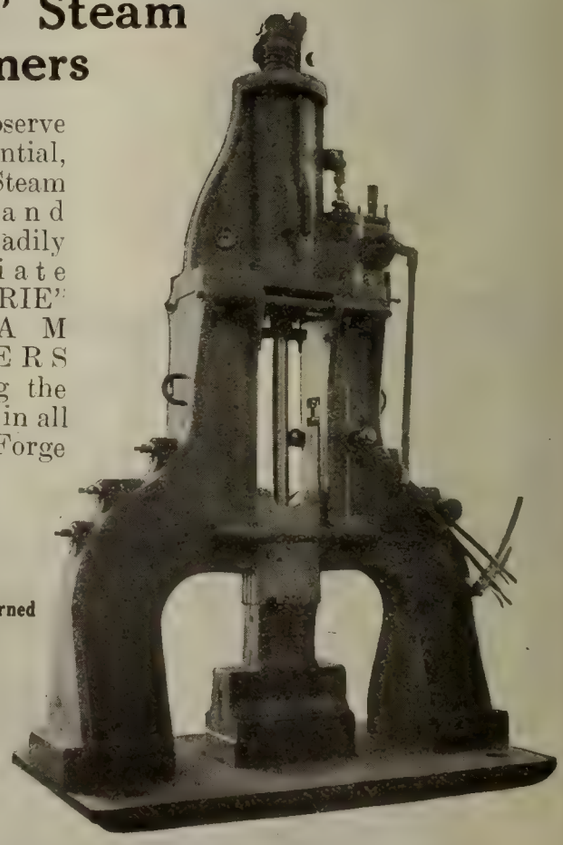
"Erie" Steam Hammers

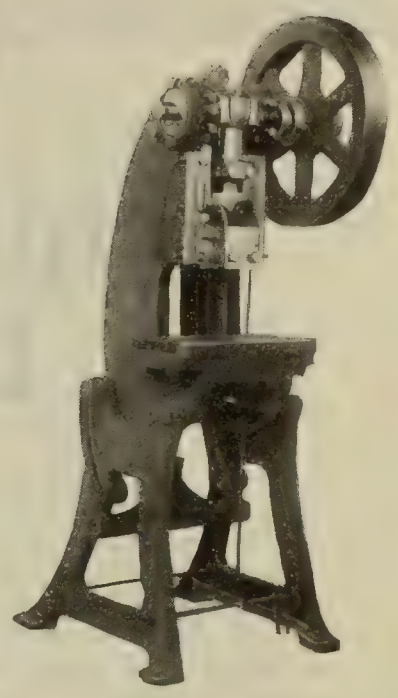
Closely observe this substantial, well built Steam Hammer and you will readily appreciate why "ERIE" STEAM HAMMERS are getting the preference in all modern Forge Shops.



They have earned their enviable reputation.

ERIE FOUNDRY COMPANY
ERIE, PA. U. S. A.

The Connection Screws on Consolidated Presses



are made from steel forgings and are larger in diameter and stronger than on any other presses of corresponding size. Why? Because

The connection screws have to withstand all the pressure applied on the dies. We use only one-piece forgings, and in calculating the size, use a very high factor of safety.

A Press is only as strong as its weakest point. The connection screw is a source of constant trouble on some makes of presses.

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HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* **MICHIGAN**

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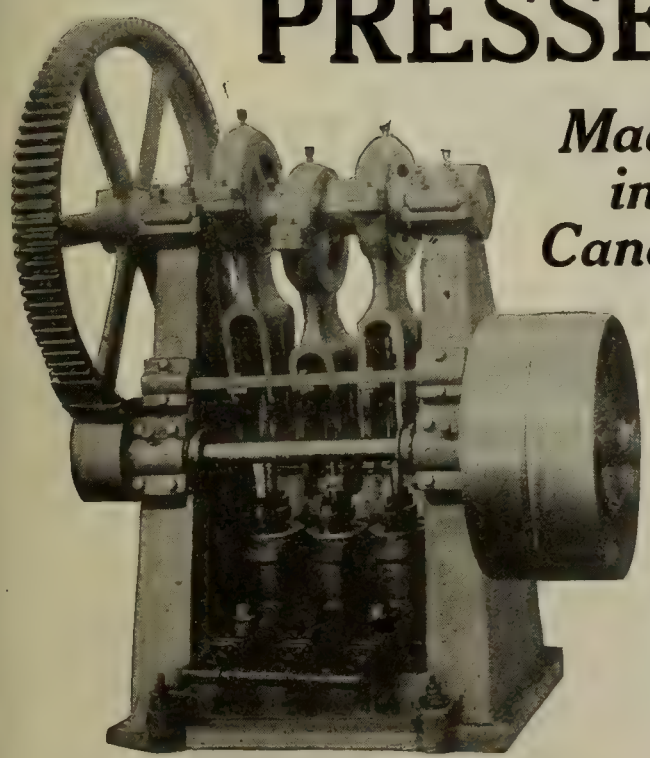

Made in Canaaa

Hydraulic Presses, Pumps and Accumulators for all purposes

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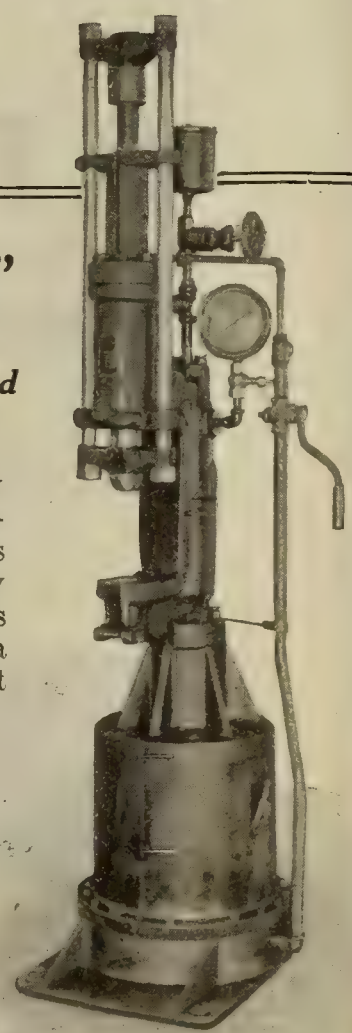
WILLIAM R. PERRIN, Limited
TORONTO, CANADA

Triple Purpose



"METALWOOD" COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.

Metalwood Mfg. Co.

Leib & Wight Sts., DETROIT, MICH. U.S.A.

BOWSER
ESTABLISHED 1885

Helps the Machinist To Do Better Work

The Bowser Lubricating Oil Storage System helps the machinist in many ways to do better work with less effort.

It insures a good supply of pure oil being kept ready for use at all times, and prevents break-downs due to faulty lubrication.

The oil is protected from dust, dirt and deterioration, and retains all its properties as a lubricant.

The Bowser System saves unnecessary labor. It can be placed where most easily accessible.

It can be used either in battery formation or each individual outfit placed where most convenient.

It prevents waste due to dripping, over-filled cans and careless handling.

It eliminates oil-soaked floors and the "fire hazard"—fire interrupts income and progress.

It makes every shop a better, cleaner place in which to work.

There is a Bowser built for every oil storage requirement, any capacity, hand or power operated.

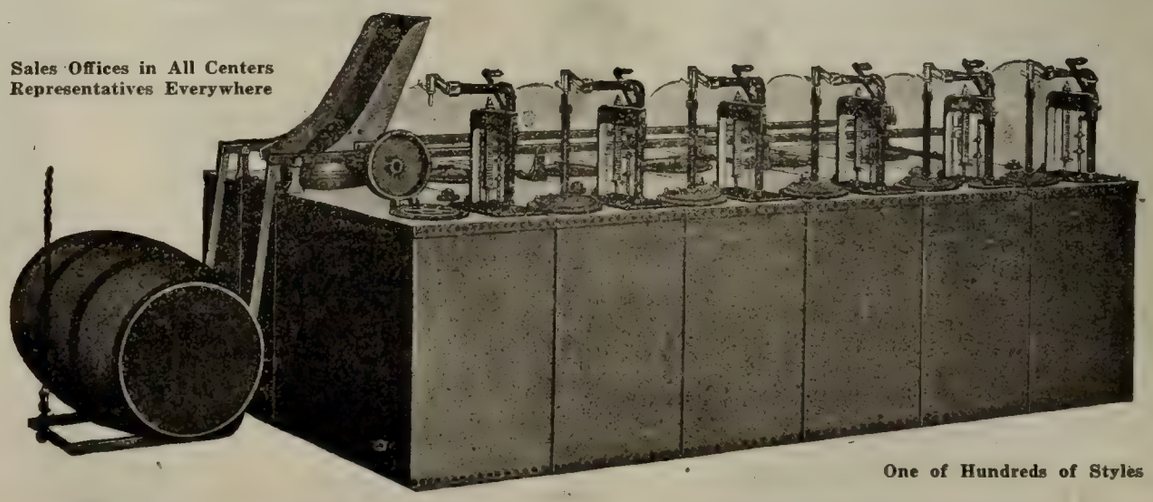
Write for illustrated bulletin

S. F. Bowser & Co., Inc.

ORIGINAL PATENTEES AND MANUFACTURERS OF OIL HANDLING DEVICES

TORONTO, ONT., 66-68 Fraser Ave.

Sales Offices in All Centers
Representatives Everywhere



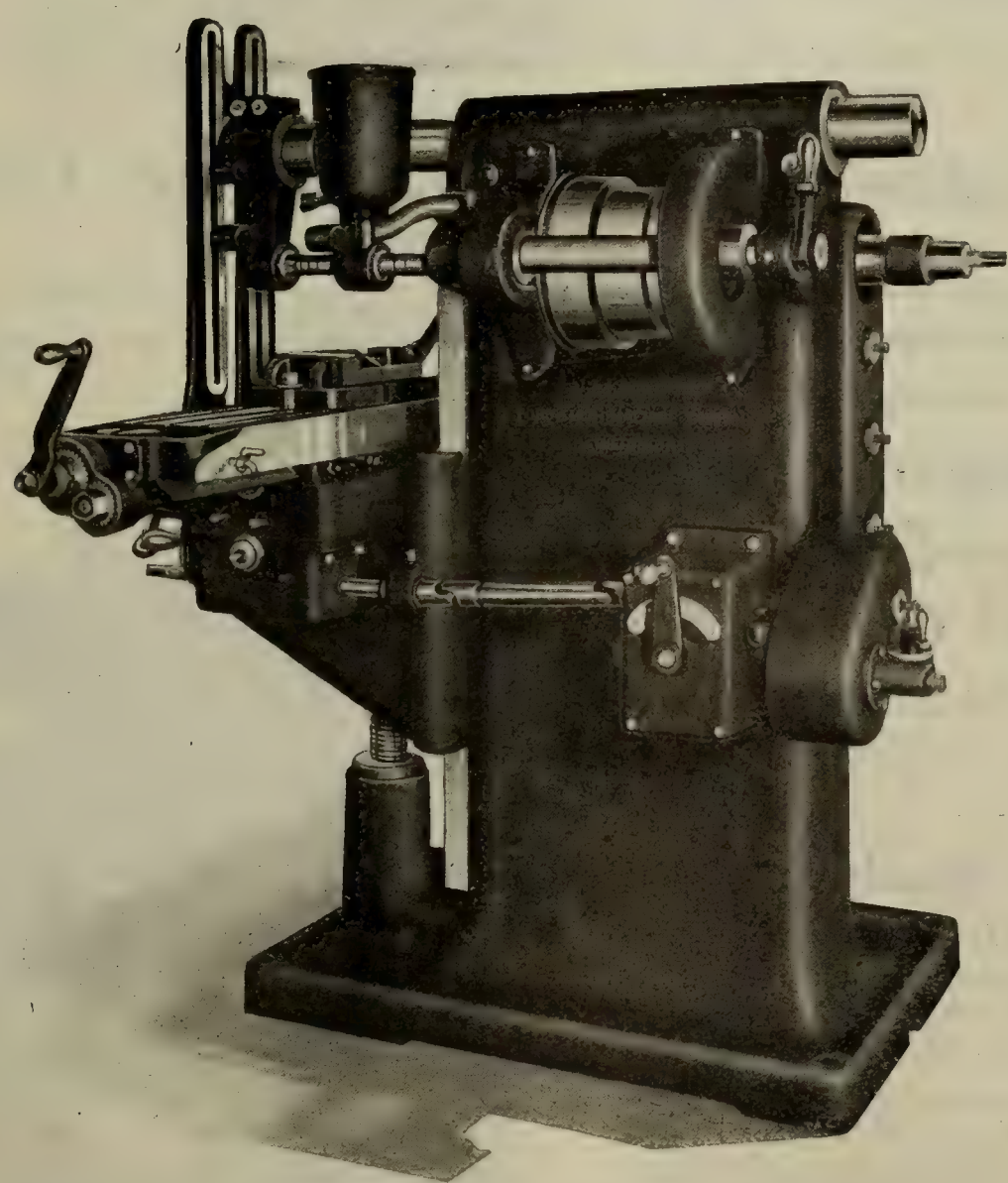
One of Hundreds of Styles

The Ford-Smith Machine Company

Ford-Smith Millers

Built in Four Sizes. All Gear Feeds.

No. 2 Plain—24" x 7½" x 19".
No. 2 Universal—25" x 8" x 18", all power feeds.
No. 3 Plain—34" x 10" x 20".
No. 3 Universal—30" x 10" x 19", all power feeds.

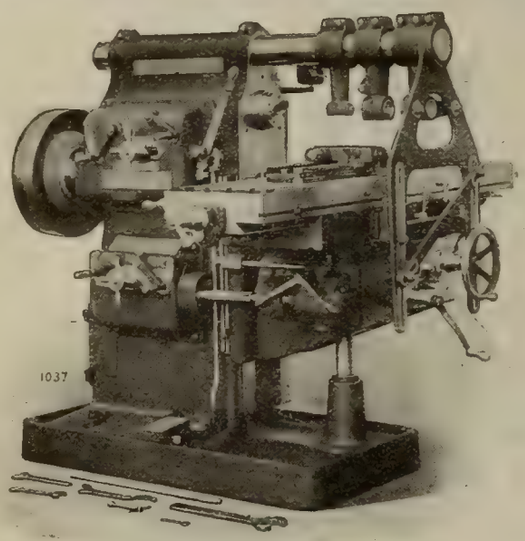


We can now offer interesting deliveries on these machines.
Let us have your enquiry.

The Ford-Smith Machine Company, Limited

HAMILTON, CANADA

Cincinnati High Power Millers



One of our 9 High Power Single Pulley Plain Millers. We also make 9 cone driven plain machines, and a full line of Universals.

Unusual Spindle Power

Heat Treated Alloy Steel Gearing for the Spindle Drive

Flanged Spindle End

which makes Face Milling Cutters Interchangeable in all sizes of Machines.

Handy and Easy to Operate

These are some of the reasons why you should use

Cincinnati High Power Millers

ASK FOR CATALOG

The Cincinnati Milling Machine Company

CINCINNATI, OHIO

Canadian Agents: H. W. Petrie, Ltd., Toronto Ont.; H. W. Petrie of Montreal, Ltd., Montreal, Que.; Taylor Engineering Co., Ltd., Vancouver, B.C.

Bilton Automatic Gear Millers—Spur or Bevel Gears

CAPACITY

No. 1 - - 14 Pitch
No. 2 - - 10 Pitch
No. 3 - - 8 Pitch

The Bilton Machine Tool Company

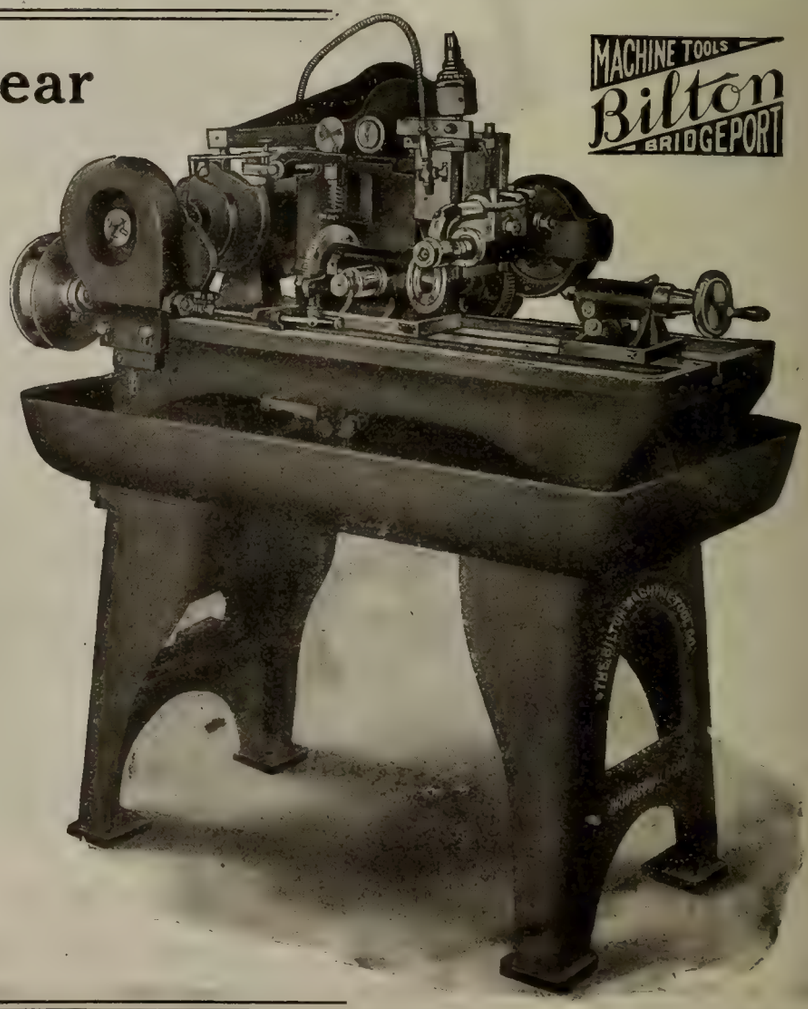
Succeeding The Standard Mfg. Company

Housatonic Ave., Bridgeport, Conn., U.S.A.

Also Manufacturers of —
Plain Horizontal Millers
Automatic Millers
Plain and Ball Bearing
Bench and Column Drills
Riveting Machines
Milling Cutters

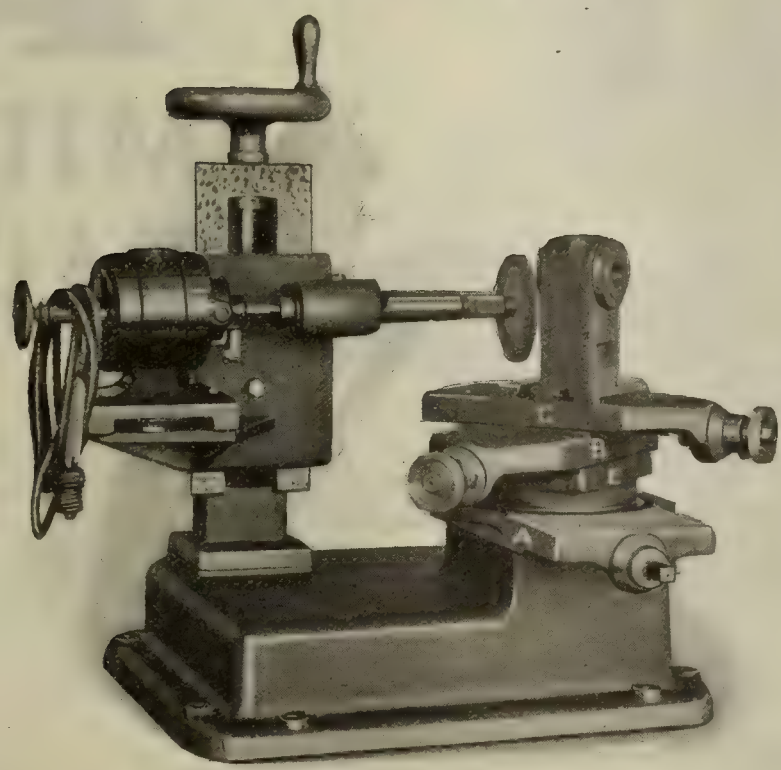
Catalog 30 on request.

Foreign Agents:
Alfred Herbert, Limited
M. Mett Engineering Company
Chas. Churchill Company, Limited



The Cleveland Milling Machine Company

PROFILE GRINDER



Grinds concave and convex milling cutters 12 in. diameter, 3 in. radius, cutters for fluting drills, cutters that are irregular but having a number of true curves, accurately rounding the corners on side mills, face mills, and end mills, formed tools for screw machines and corner rounding tools for the lathe, planer and shaper.

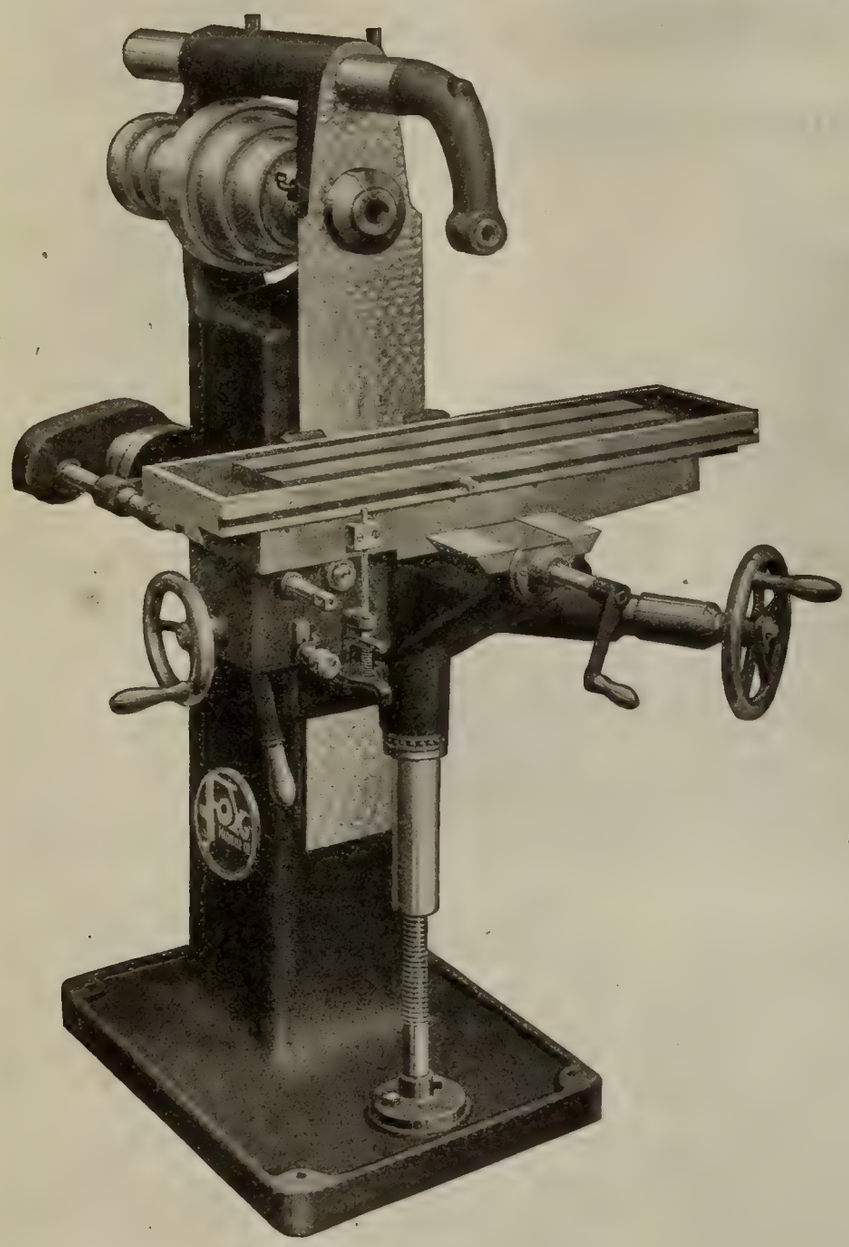
This machine spindle is driven by a Dumore Type D Universal motor, runs on any current. Ten feet of wire with lamp socket and all necessary equipment furnished.

By acting quick you can have immediate delivery.

The Cleveland Milling Machine Co.
18511 Euclid Ave. Cleveland, Ohio

If any advertisement interests you, tear it out now and place with letters to be answered.

The FOX Milling Machine
For Intense Production



FOX
MILLING MACHINES
lead the field

Power Feed Miller No. 3

The Fox Milling Machines are ideal, as they are particularly adapted for just that sort of work.

Every machine is provided with micrometer dials on the vertical and transverse movements, thus insuring accuracy in every detail.

Write for full particulars.

FOX MACHINE COMPANY
1047 W. Ganson Street, Jackson, Michigan

KEMPSMITH

UNIVERSAL MILLING MACHINES

Are built in three standard sizes. They embody every worth-while feature to be found on a tool room Milling Machine.

We call especial attention to the Dividing Head which is part of the regular equipment of every Universal Miller.

The Kempsmith Dividing Head is compact and rigid, unusually convenient in operation and so constructed as to maintain its accuracy under heavy service.

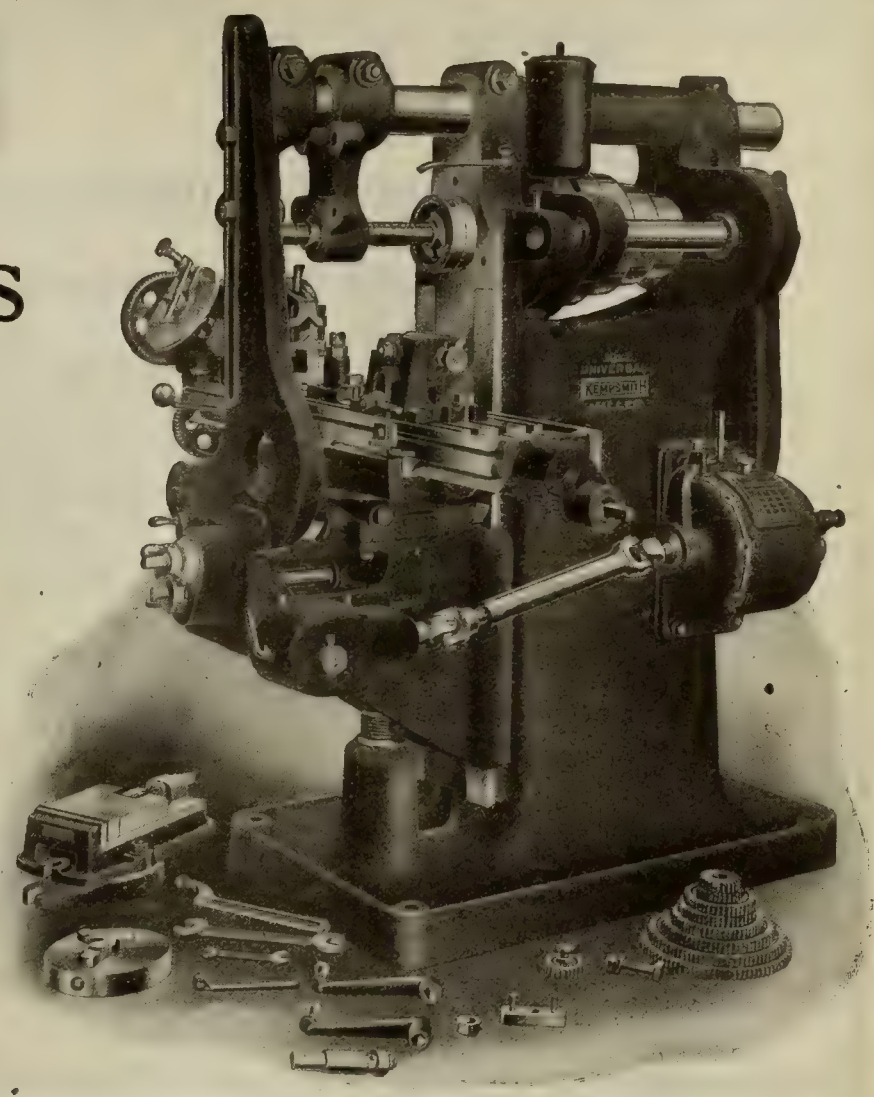
We publish a thirty-two page book elaborately illustrating and describing this Dividing Head. A copy will be sent free on request. Just ask for "Dividing Head Book."

Kempsmith Manufacturing Co.

MILWAUKEE, WIS., U.S.A.

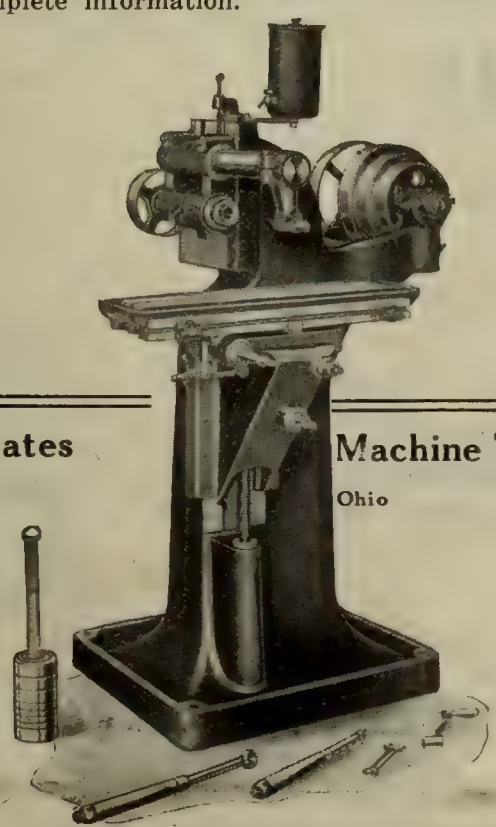
AGENTS:

Foss & Hill Machinery Co., Montreal.
General Supply Company, Toronto and Ottawa.
Canadian Western Foundry & Supply Co., Calgary, Alta.



No. 1 U.S. Milling Machine

Built to take care of the work that it would not pay to put on a larger machine. You would be astonished at the results, the range of work and the compact nature of this machine. An inquiry would secure you complete information.



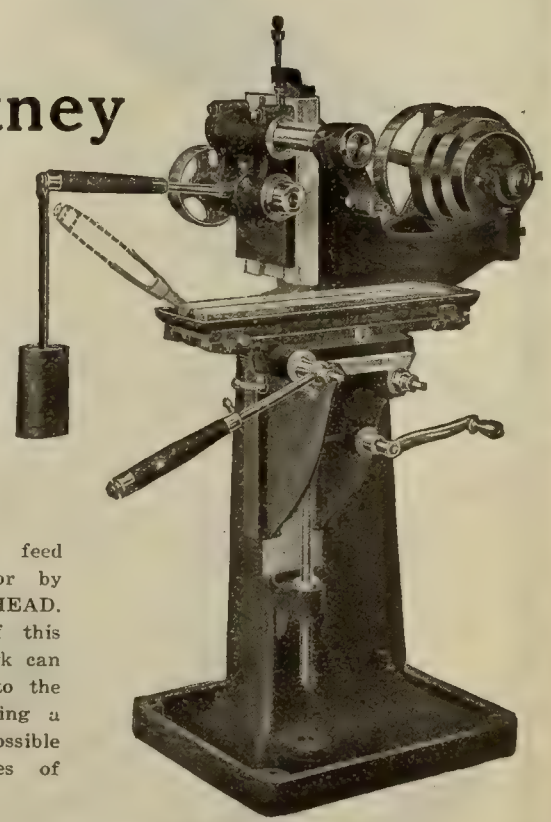
United States Machine Tool Co.

Cincinnati Ohio U.S.A.

THOUSANDS IN USE

The Whitney

Hand (Feed) Milling Machine



The vertical feed is provided for by the SLIDING HEAD. On account of this feature the work can be held close to the table, thus giving a rigidity not possible on other types of Hand Millers.

Send for Catalogue A.

The Whitney Mfg. Co.

Hartford Conn. U.S.A.

Chains—Keys—Hand Milling Machines.

If any advertisement interests you, tear it out now and place with letters to be answered.

HALL

Pipe Threading Machinery
and
Shell Cutting-off Machines

This illustration shows the new No. 8 Hall Gear Box Driven Pipe Lathe. Regular Capacity 2½" to 8" inclusive.

The last word in Pipe Machine Construction.

Let us give you full particulars of this machine which is only one of a large number, having capacity ⅛" to 18" pipe.

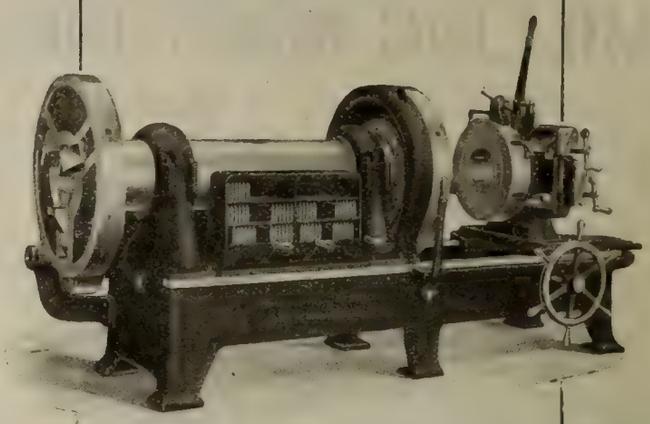
Write us for catalog and prices on:

Pipe Threading Machines
Nipple Threading Machines
Roller Pipe Cutters
or
Cutting-off Machine for shells or bar stock.
Any capacity ⅛" to 18".

JOHN H. HALL & SONS, LIMITED
BRANTFORD ∴ CANADA

EUROPEAN AGENTS:
Universal Machinery Corporation, Limited, London

Made in Canada



Capacity 2½" to 8" inclusive

Mechanics Demand

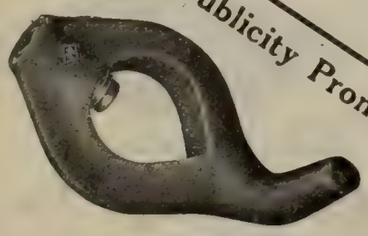
Turn Where You Will
The World Employs

WILLIAMS'

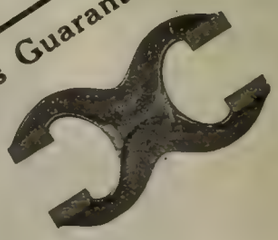
GRAND TRADE MARK W PRIZE

Drop Forged Tools

Dealers Provide

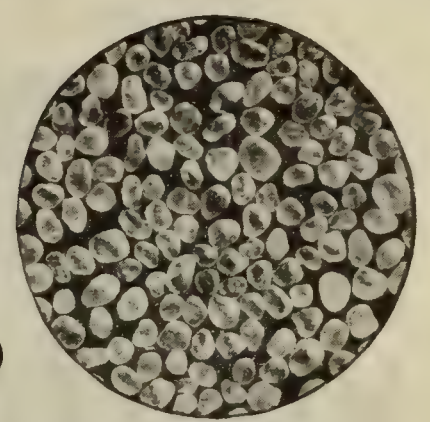


Publicity Promotes



Makers Guarantee

Have You Investigated Flint Shotting of MUNITIONS?



"Every Grain Like a Pearl"

Flint Shotting is *sand blasting* with a college education.

It is doing, in a highly efficient way, work that is commonly done by-guess and by-gad.

Because Flint Shot is not an accidental aggregation of sand grains of various kinds, sizes and hardnesses, but a collection of highly uniform, pearl-like nodules of *pure flint*, secured by the mechanical disintegration of St. Peter's Rock.

Even common sand blasting has advantages over older forms of cleaning brass, iron and steel castings, forgings, etc., that you should know about.

But Flint Shotting *multiplies* these advantages.

We have accumulated a mass of interesting data on the sand blasting of metal surfaces and may have information that will speed up your output, decrease your cost, and improve the character of the finish of your products.

When you send for our Flint Shot Booklet, tell us something about your products and how you clean them.

U. S. Silica Company

430 Peoples Gas Building **Chicago, Illinois**

MUNITION MAKERS

Need the best power blades they can buy for their metal cutting —need them for economy and speed of production and to save blade cost.

Buy your blades by careful efficiency tests for rapidity of cutting and number of cuts and you will standardize on

MILLERS FALLS
STAR HACK SAW BLADES

WE CAN MAKE PROMPT DELIVERY ON ALL SIZES.

Star Blades are made in a different way than any other blade. Patent hardening process makes them harder, faster cutting and more uniform as comparative tests will show.

Your blade cost and your manufacturing cost are less when you buy the Star.

Mechanic's Handbook containing much valuable mechanical information, never before printed, and pocket catalog--free on request.

Millers Falls Company
"Toolmaker to the Master Mechanic"
Millers Falls, Mass.
New York Office: 28 Warren Street

MILLERS FALLS TOOLS

The Reason For So Many Repeat Orders

after comparative tests is that no magnifying glass is necessary to distinguish the increased production and the better class of work on the PEERLESS High-Speed Cutting-off Saw.

A third order just came in from one of the largest concerns in the United States, and is it not a fact after a firm has standardized on a certain make of tool that some real results must be produced in order to effect a change?

One of our customers writes: "It takes us only 1-15th of the time to cut our stock on the PEERLESS that it did on our other machine."

If you are open to conviction we have a proposition to offer that no manufacturer can afford to pass up.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

The Improved
Taylor-Newbold

INSERTED TOOTH COLD SAW
WRITE FOR BULLETIN T-S
Tabor Mfg. Co., Philadelphia, U.S.A.

We will send a Racine on a Trial Basis—*Why?*

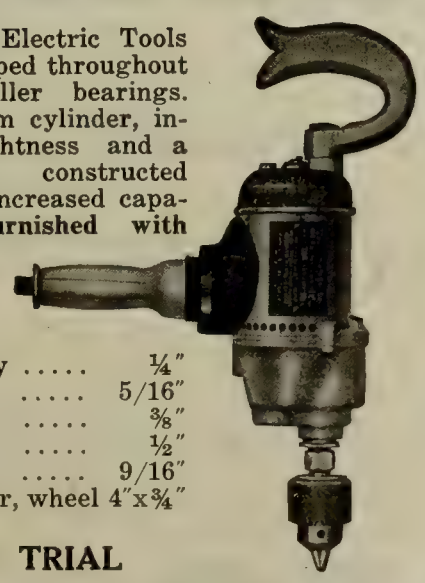
The Racine machine is the only high-speed metal-cutting machine in the world that is absolutely positive in every action, and will duplicate itself in every cut during the entire life of the machine. All wearing parts are adjustable and accurately machined.

Racine Tool & Machine Co.
15 Melbourne Ave., Racine, Wis., U.S.A.

Thor

UNIVERSAL Electric Drills

Licensed Under Burke Universal Motor Patent



The only Portable Electric Tools made that are equipped throughout with ball and roller bearings. Made with aluminum cylinder, insuring extreme lightness and a powerful specially constructed motor resulting in increased capacity. **Can be furnished with Universal, Alternating or Direct current motor 110 or 220 volts.**

000	Drilling Capacity	¼"
00	" "	5/16"
0	" "	⅜"
01	" "	½"
1	" "	9/16"

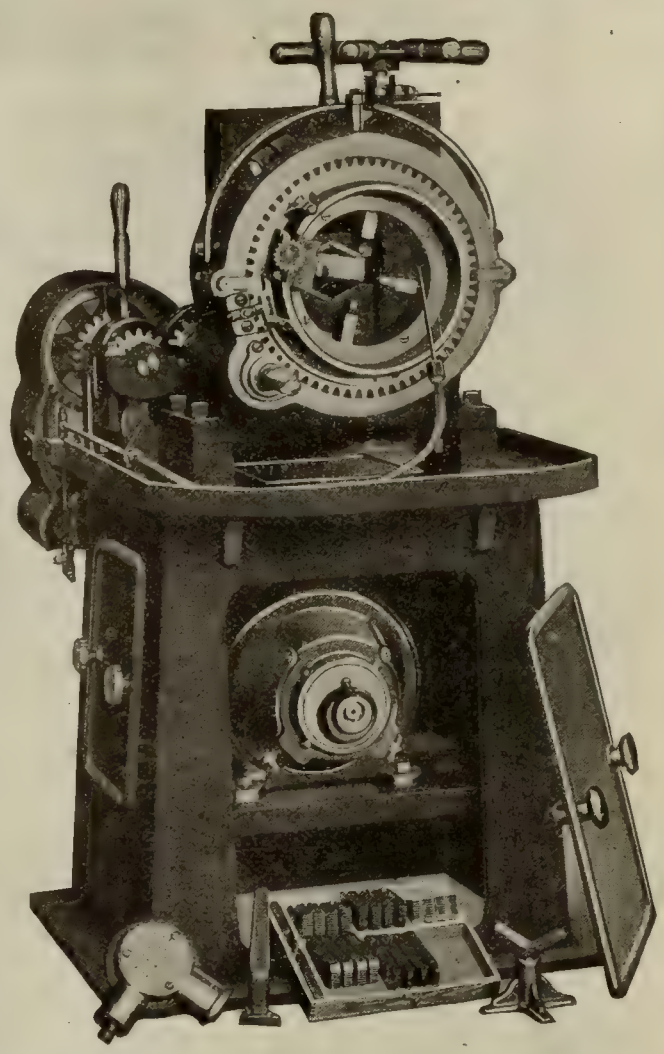
No. 6 Electric Grinder, wheel 4"x¾"

SHIPPED ON TRIAL

Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.

Toronto: 32 Front St. W; Winnipeg: 123 Bannatyne Ave., E; Vancouver: 1142 Homer Street



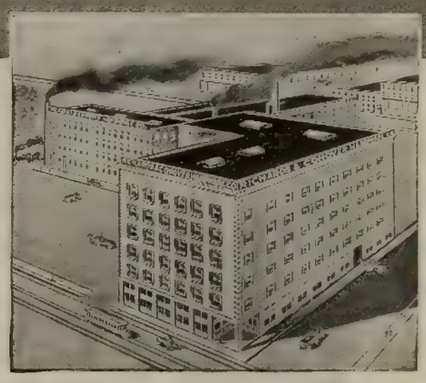
"Forbes Facts"

1. **One man can do the work of six against the old stock and die method of cutting.**
2. **It is the only machine on the market with receding gear.**
3. **It is self-contained and motor-driven.**
4. **It is portable.**

These are convincing arguments for the construction and utility of this machine. Thread cutting can be performed fast, clean and true. Equipped with self-centering vise.

The Curtis & Curtis Co.
115 Garden St. - Bridgeport, Conn.

PEXTO TRAVELS - KANSAS CITY



Home of Richards & Conover Hdwe. Co., Kansas City, where permanent Pexto display, similar to above is maintained.

Display of Pexto Sheet Metal Working Machines and Tools at the recent National Educational Association Convention at Kansas City

Industry's First Choice is the School's First Choice

Just as Pexto Sheet Metal Machines and Tools stand first in the Sheet Metal Industry they also take first rank in the Technical Schools of the country.

Naturally, school officials and school shop instructors who aim to supply capable student graduates look to the advanced industries for guidance in the selection of their equipment.

So you'll find Pexto Equipment in both industry and school—as an example see the illustration above. It is the practical working display of Pexto Sheet Metal Working Machines and Tools that attracted such favorable attention at the National Educational Association Convention held at Kansas City from February 26th to March 2nd. During this most instructive meeting a complete school assortment of Pexto Machines and Tools was operated by several students and a senior student director from the Lathrop Schools of Kansas City.

In addition to the showing of Pexto School Equipment, fifty-one models of sheet metal work produced by students of Carnegie Institute of Technology of Pittsburgh, were on display.

These models, shown in the above illustration were produced under the direction of J. S. Dougherty, Instructor of Sheet Metal Working in this well-known Pittsburgh Institute.

A Permanent Pexto Display at The Richards & Conover Hardware Co.

This well-known institution in the hardware trade maintains a similar display to that shown at the N. E. A. Convention in its permanent exhibiting rooms. It is in this and similar displays in the largest hardware and machinery houses all over the country that you will find the most modern sheet metal working equipment.

Pexto has more than kept pace with the rapid strides made in the industry during the last few years. A visit to any of these displays will be of practical benefit.

In case Kansas City is not a convenient point for you to visit let us direct you to our nearest display, probably in your own city. In the meantime send for our Pocket Manual. It illustrates and describes all of the newest ideas besides giving you much other valuable data. Of course it is sent free.

PEXTO

The Peck, Stow & Wilcox Co.

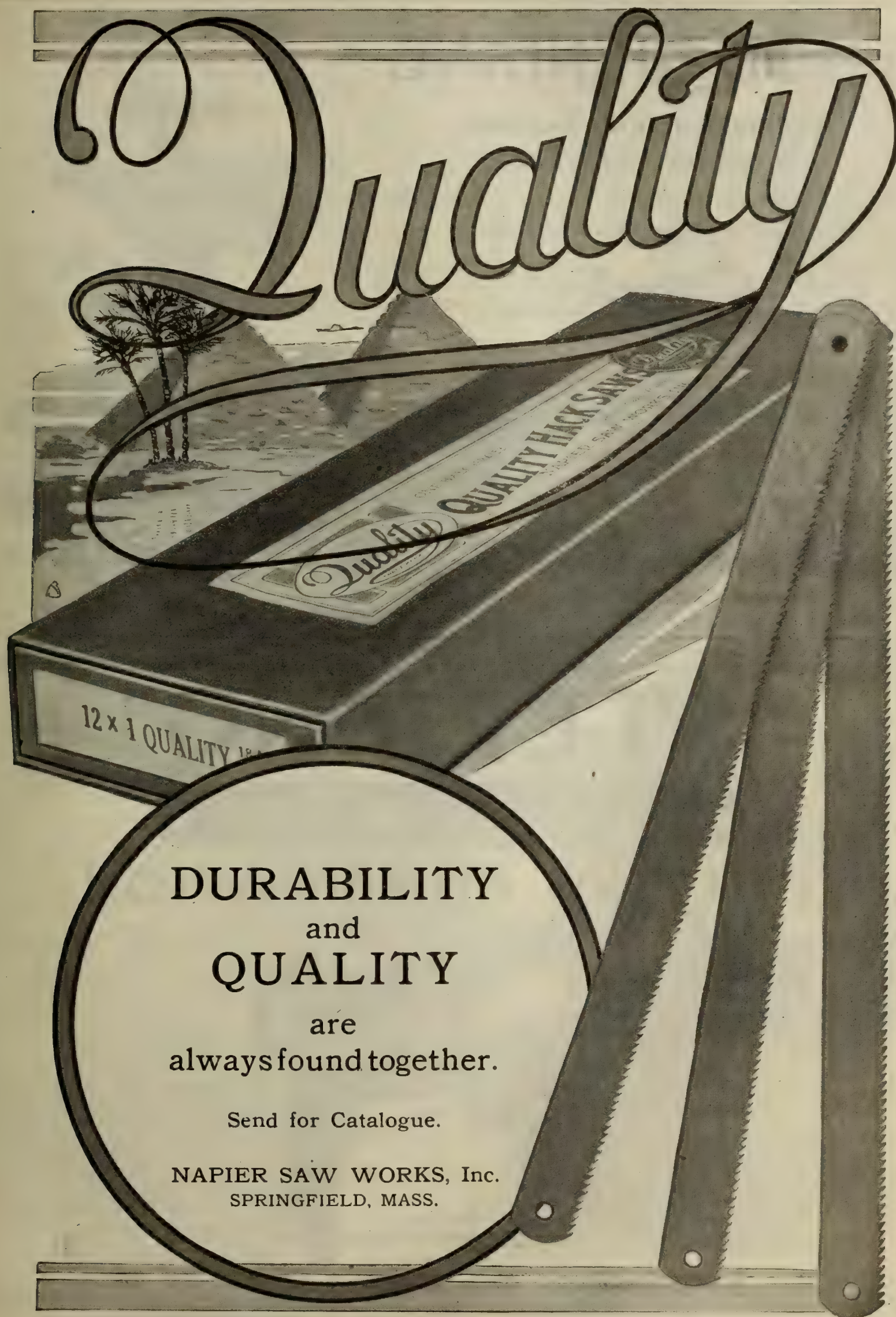
Mfrs. Mechanics' Hand Tools, Tinsmiths' and Sheet Metal Workers' Tools and Machines, Builders' and General Hardware.

Southington, Conn. Cleveland, Ohio

Address correspondence to 205 West Center Street Southington, Conn.

PEXTO

SHEET METAL WORKERS' MACHINES & TOOLS



If any advertisement interests you, tear it out now and place with letters to be answered.

TOOL GRINDING

Milling Cutters, Reamer Counterbores, etc.

can be most conveniently sharpened on the various attachments furnished with the

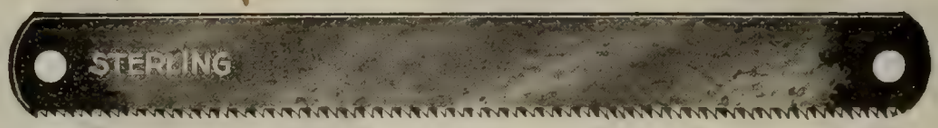
Greenfield

These Attachments are simple, practical and require no complicated adjustments, each being complete in itself. This feature alone will save a vast amount of time in "setting up." We claim, and we believe with perfect justice, that there is no other tool grinder that can be shifted from one job to another as easily and quickly as this one.

We are always glad to send out catalog which illustrates each attachment in actual use. It might have some suggestions for you.

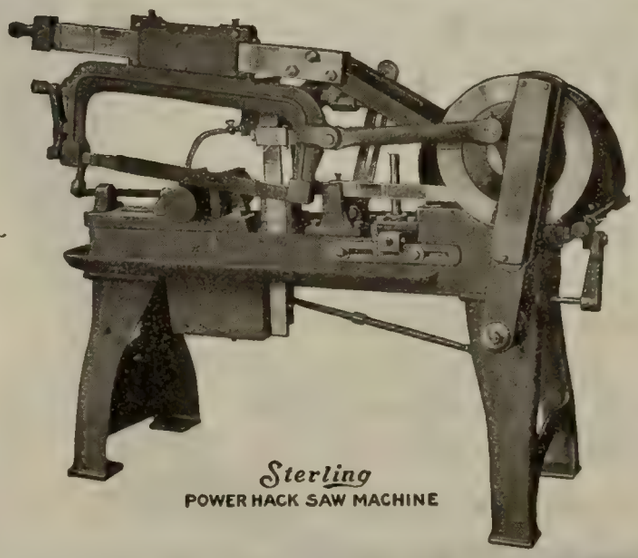
Greenfield Machine Company
Greenfield, Mass., U. S. A.

"STERLING"



CUTTING COMBINATION

For cutting bars and blooms, this heavy-duty Power Hack Saw will do most rapid work, and we believe has no superior in this or any other market. In connection with this machine, to get real, effective, rapid and satisfactory work, a good blade must be used. We don't believe the "STERLING" has any superior — we know it's good.



Sterling
POWER HACK SAW MACHINE

Try the combination.

Manufactured by **Diamond Saw & Stamping Works, Buffalo, N.Y., U.S.A.**

CLEVELAND SAND RAMMERS

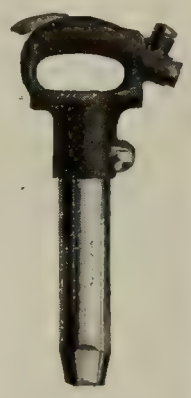
FOR FLOOR, BENCH, PEIN AND FLASK RAMMING

Cleveland Sand Rammers are made in several sizes and weights, and are adapted for all kinds of Ramming in general foundry service.

The Piston Rods are packed with a resilient packing that conforms to the shape of Rod without retarding its free action, and prevents any dirt from entering piston chamber and working parts— Rammers are fitted with either Round or Flat Rods as required. Cleveland Rammers are light in weight, have high speed and practically no vibration, making them ideal foundry tools.

CLEVELAND CHIPPING HAMMERS

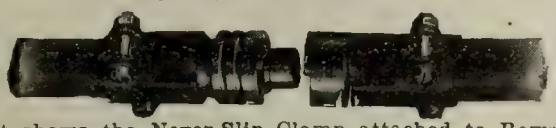
For General Foundry Work. Are furnished in any required size or weight for grey iron or steel castings; they have high speed, and are particularly adapted for fast chipping now required by piece-work operators.



BOWES AIR HOSE COUPLINGS

Over 1,000,000, in General Use

Bowes Couplings are instantly connected or disconnected.



Bowes Couplings are absolutely air tight under all pressures.

Above cut shows the Never-Slip Clamp attached to Bowes Coupling.

In Stock :—RIVETING HAMMERS, DRILLS, REAMING, TAPPING AND FLUE-ROLLING MACHINES, CORNER DRILLS, PORTABLE AND BENCH GRINDERS, ETC.

Catalog No. 12 mailed on request.

ADDRESS ALL INQUIRIES TO

CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED

84 CHESTNUT STREET, TORONTO, ONT.

Agents: A. R. WILLIAMS MACHINERY CO., TORONTO WILLIAMS & WILSON, MONTREAL

Sand Rammer in operation.

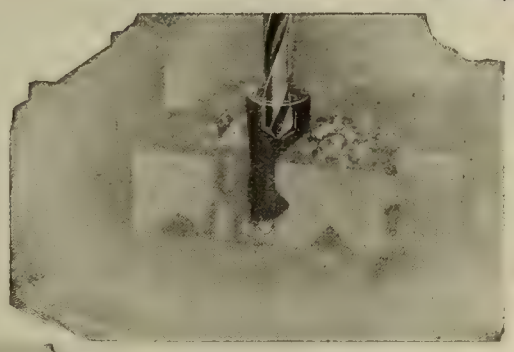
One Firm Saved $187.00 Per Day

By using

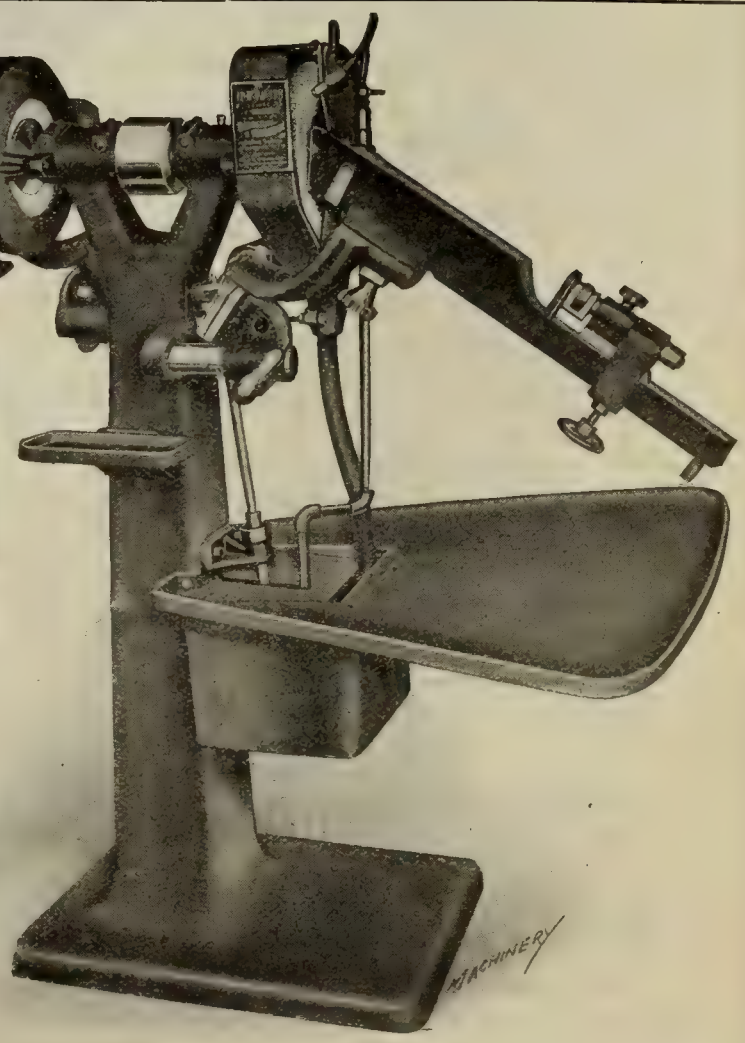
The New Yankee Drill Grinder

It Gives 100% Efficiency

Against



40% with the Old Hand Grinding Method



WILMARTH & MORMAN CO.

1200 MONROE AVE., N.W.

GRAND RAPIDS MICHIGAN, U.S.A.

Manufacturers of Drill—Surface—Universal Grinders

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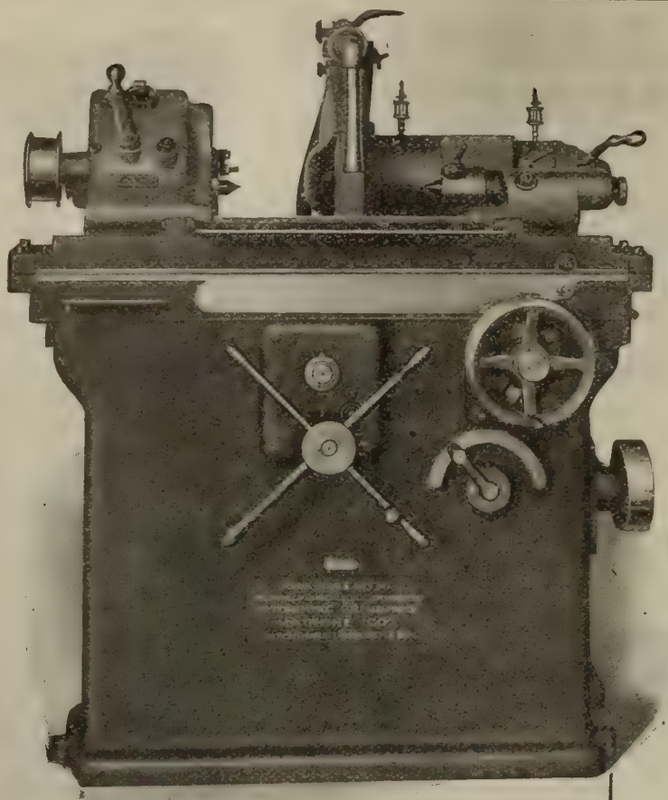
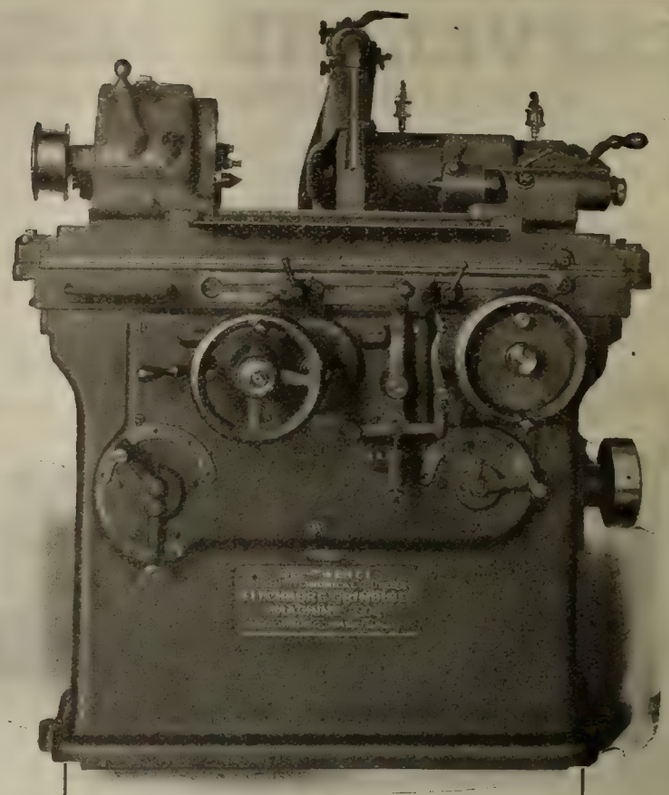




Model "B"

Where precision and mathematical exactness are required, this six by twenty Grinder will handle the work to your entire satisfaction.

The large pilot wheel operating the traverse table is designed to give convenience, speed and full control of the machine. Model "B" is a compact machine occupying only 52" x 66" floor space, yet it is a veritable giant in its capacity for work. Viewed as a unit this Model "B" is decidedly a grinder of real worth, requiring 7 h.p. to operate, 640 R.P.M. on tight or loose pulleys, with a 16" x 2", 3" or 4" face grinding wheel. Three wheel speeds, 1300, 1500, 1800.

We will appreciate an inquiry from you. Our catalogue is at your disposal.

Model "A"

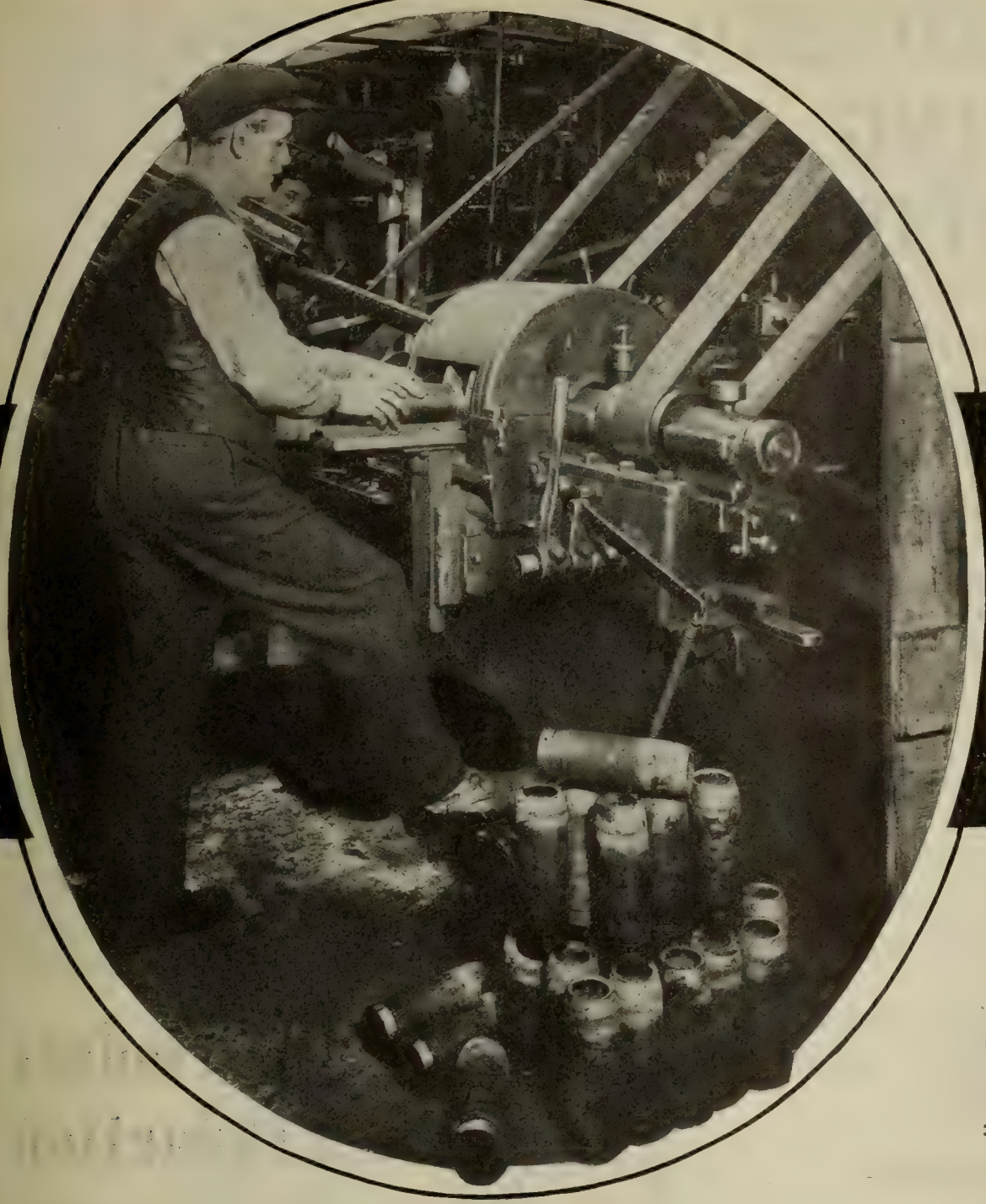
Compactness, speed and range of work comprise the features that point this machine out as one of exceptional merit. Occupying 52" x 66" space it will prove great saver in your floor outlay. A great many of the parts of these two machines are interchangeable.

For grinding straight or taper-work of cylindrical form within its range. Dead or live centres may be used. It has no equals for work of a cylindrical character, and will be a short-cut to increased production.

If you get in touch with us you will benefit by the experience of our engineers who are ready at all times to co-operate with you. No obligation on your part.

Fitchburg Grinding Machine Company

Fitchburg Mass. U.S.A.



Gardner Grinders

GRINDING BASE OF 18-pr. SHELL

This No. 14 Double Disc Grinder is used for accurately sizing the bases of these shells after heat treating. The shell is held in a suitable fixture, which allows it to be revolved slowly between the discs which grind the diameter to within 3.28 and 3.29 inches.

The quality and finish of the work is perfect, and steady production can be maintained at an average rate of 5 per minute.

The discs are faced with abrasive at the outer part only, where the work is done.

All that is best in material and workmanship goes into Gardner Grinders. They last long, do the work as it should be done, and do it economically.

Drop a card for full particulars.

The Gardner Machine Company, Beloit, Wis., U.S.A.

Canadian Sales Agents: THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED
St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

STANDARDIZED CUTTING QUALITIES

Since the one purpose of a file is to cut, the toughness, regularity and sharpness of the teeth are all important.

A capable mechanic can positively "feel" these qualities in a "Famous Five" file.

The sharp, keen-edged teeth arranged in uniform rows—plus the even balance—tells him at once the file is a good serviceable tool.

It is these qualities that have made "Famous Five" Files Standard Grade tools everywhere.

Specify them when ordering.

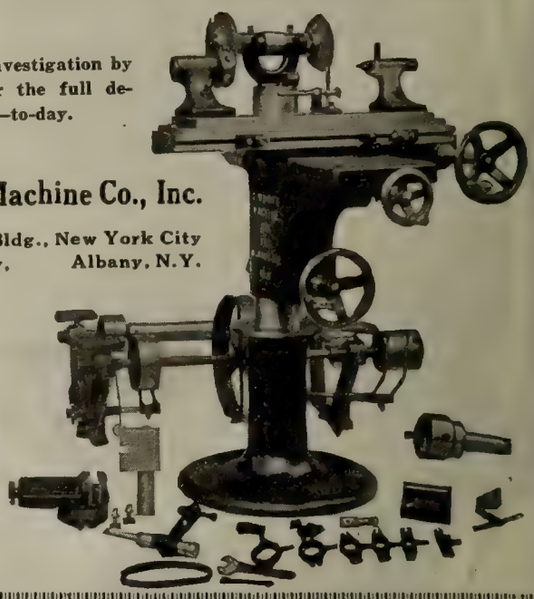
Assuming that you want a grinder that is better than the average—

A grinder with massive table, micrometer adjustments, very long knee and gibs, and extra heavy head and tailstock—it will pay you to investigate the

Standard No. 6
Universal Grinding Machine

In addition, you'll find that the headstock is fitted with large bearing for chuck spindle and with special bronze bearings of navy specifications, spindle is tapped and tapered, bored to take wheel arbors, and bearings are 1 in. in diam. and 2¾ in. long, and an exceptionally simple and sturdy countershaft with self-lubricating bearings.

Start the investigation by sending for the full details—to-day.



Simmons Machine Co., Inc.

1001 Singer Bldg., New York City
981 Broadway, Albany, N.Y.

Stow Shell Grinders Increase Production

Suspended Pedestal Mounted on Truck

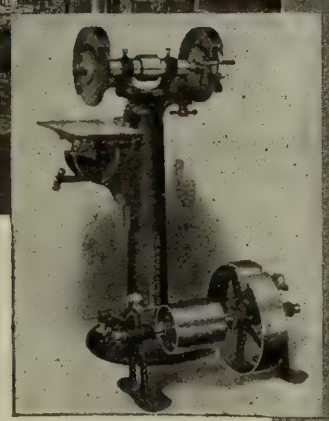
Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.

Binghamton, New York, U.S.A.

Oldest Portable Tool Manufacturers in America



WE BUILD THEM BY HUNDREDS

Standardized Production enables us to offer this powerful **Waterbury Grinder** at such a low price. It grinds rapidly and accurately, all flat surfaces, dies, punches, planer, lathe, and other tools. Has adjustable table and tool rest with large radius of travel. Rigid, 3-point table supports giving great steadiness. A reliable practical grinding outfit.

only $75 Complete

The Blake & Johnson Co., Waterbury, Conn.

Keep Your Grinding Wheels in Trim—

The Diamo-Carbo Emery Wheel Dressers

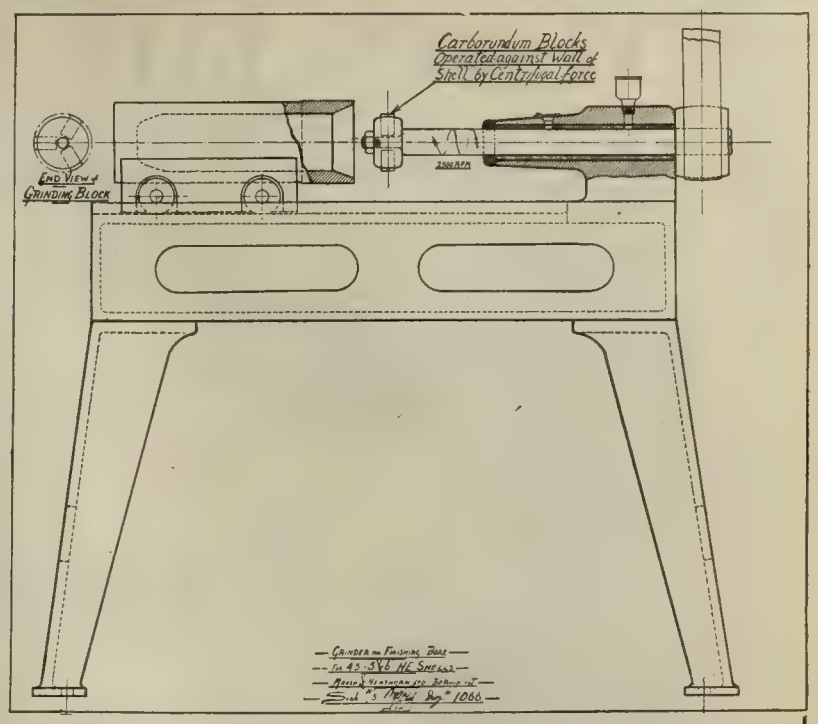
The Diamo-Carbo Dresser is being very generally adopted as a substitute for the expensive diamonds. Diamonds are becoming more scarce and quality is deteriorating. The quality of the Diamo-Carbo is uniform and in most places will do the same work as a diamond. They can be tried at our expense.

The Desmond Huntington No. 2 is the best dresser ever devised for use on large and coarse wheels.

We can make prompt deliveries of any type of Dresser desired.

THE CANADIAN DESMOND-STEPHAN MFG. CO.
HAMILTON, ONTARIO

Alfred Herbert, Limited, Coventry, Eng.
Agent for Great Britain



Smooth Bores

We have designed for our own use a simple and inexpensive grinder to give the final touch to the bore of our shells.

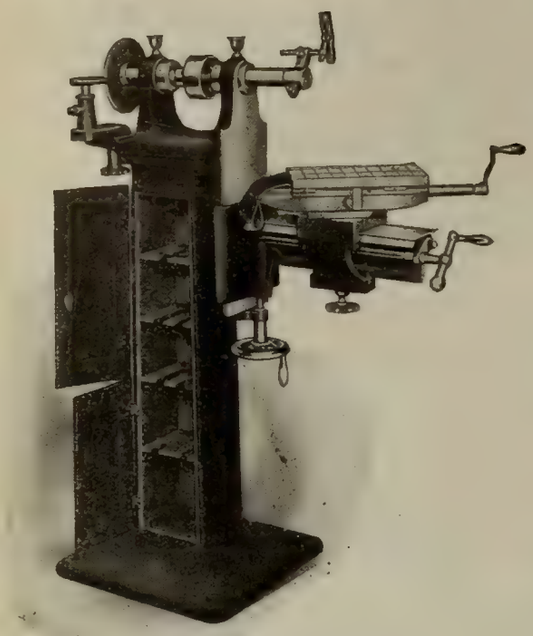
It does the work, and we will have some of these machines on the market shortly.

Write us for our proposition.

Marsh & Henthorn Limited

BELLEVILLE, ONTARIO

OBTAIN THE BEST RESULTS



GARVIN No. 3, Universal Cutter and Surface Grinder. Use Code—Banish.

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL

CUTTER AND SURFACE GRINDERS

Simple - Light Running Accurate

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14 in. x 6 in.; SURFACES, 9½ in. x 6 in.

For Further Information { *ASK YOUR DEALER or WRITE US DIRECT*

IMMEDIATE DELIVERIES

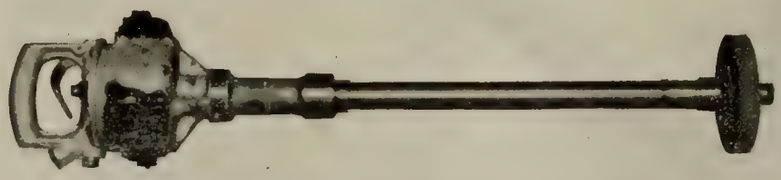
Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) **50 Years New York City**

The Munitions Worker's Grinder



The cut illustrates our No. 7 "LITTLE DAVID" Grinder, fitted with 21" Extension Shaft, housing and outer bearing. The grinding wheel is 6" x 1", of composition suited to the work, and its free speed is 3,000 r.p.m. Weight, 24 lbs.

This style of Grinder is just what you need for grinding the insides of High Explosive Shells, or any work where grinding, buffing, or touching up is to be done.

They are widely used in munitions plants, because they are **convenient, efficient** and **time-saving.** We use them in our own munitions work, and can tell you how to apply them to the best advantage. Ask our nearest branch for information and prices.

CANADIAN INGERSOLL-RAND CO., LIMITED

COMMERCIAL UNION BUILDING - MONTREAL, CANADA

SYDNEY TORONTO COBALT TIMMINS WINNIPEG NELSON VANCOUVER

Works: Sherbrooke, Que.

Grinding Bushings On Drilling Jigs

This is one of the many jobs where the DUMORE comes in handy in a Tool Room. The hardened steel bushings in this Drilling Jig must be finished accurately, and both bushings must be ground at the same operation in order to insure perfect alignment. The

DUMORE
PORTABLE ELECTRIC
GRINDER

is the ideal tool for grinding dies, gauges and similar work where extreme accuracy is necessary. Used in hundreds of machine and repair shops for all kinds of grinding jobs. Manufacturers regard them as indispensable for handling the many difficult, hard-to-get-at jobs that continually arise. They will be the most popular tools in your shop.

The high speed at which DUMORE Grinders operate—10,000 R.P.M. and 30,000 R.P.M.—gives the correct surface speed to wheels of very small diameter. This prevents the wheels from breaking down and your work will be ground accurately and will be entirely free from bell mouth.

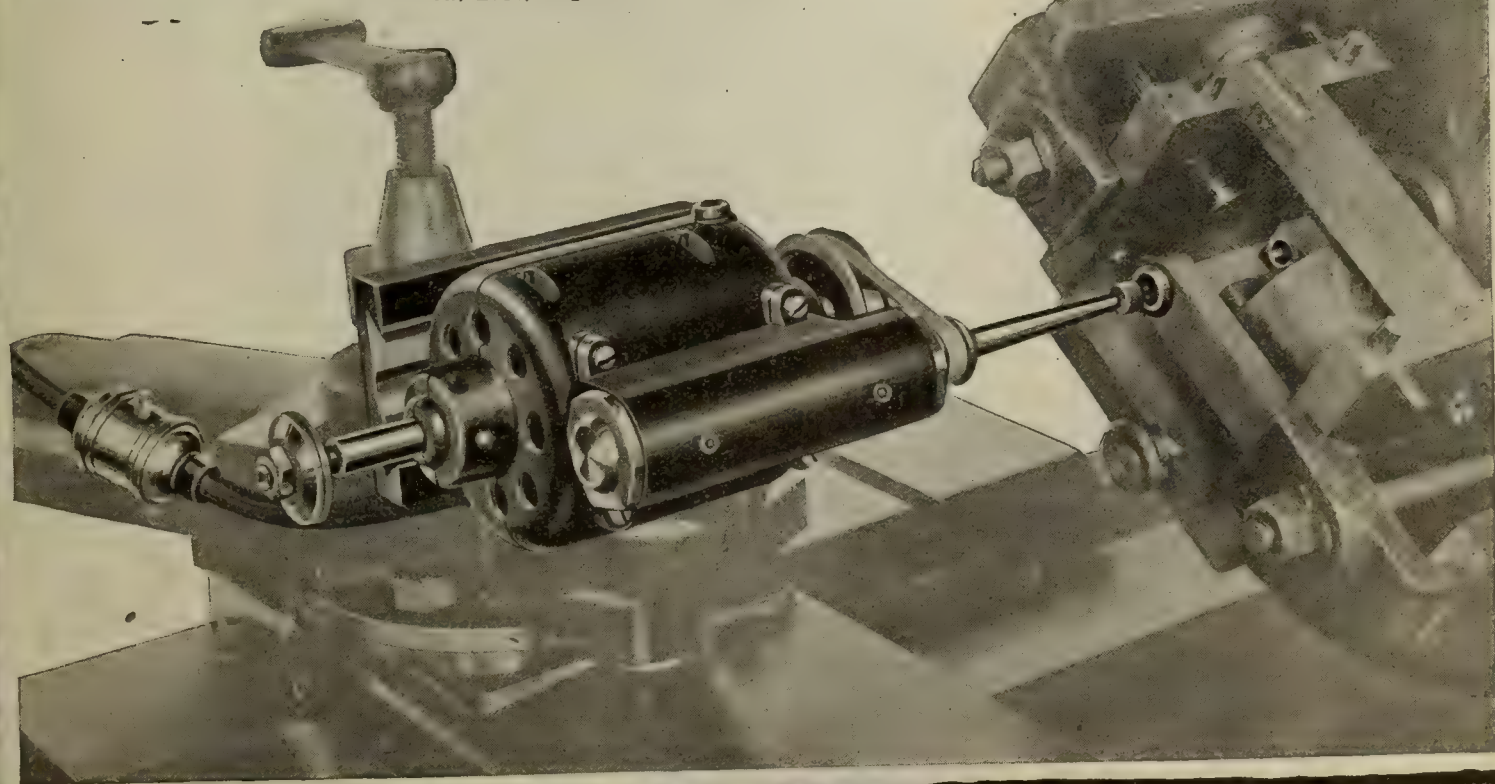
Equipment A as shown below includes the Internal Attachment A which operates at a speed of 30,000 R.P.M. Equipment B includes the Extension Arm B which has a reach of 10″ and which will be found very useful for deep internal work. It is interchangeable with the Internal Attachment A.
Let us send you a DUMORE Grinder on approval. Specify the voltage of your current when ordering.

Literature on request.

Wisconsin Electric Company

1711 Dumore Bldg., Racine, Wisconsin

Sold in England by Canadian-American Machinery Co., Ltd., 8 Bouverie Street London, E.C., England.



That is a HANNIFIN Air Chuck

If your work requires quick handling and a rigid-slip grip, the chuck for the job is the "Hannifin" — increases output from 20 to 100 per cent.

At the Worthington Pump and Machinery Corporation's Hazelton, Pa., plant, Hannifin Air Chucks are in sole possession of the field. The machine photographed shows a 3" Russian shell Hannifin-chucked for inside operations.

These chucks do their work under 75 pounds air pressure and "Aid greatly in speeding up production," says the master mechanic; for outside turning, shells are held on Hannifin Air Operated Mandrels with similar results.

In another busy shell department one operator reports an increase of ten 5" shells per day through the change to Hannifin Chucking, and considerably less fatigue when the day's work is done.

Hannifin Chucks are doing important work on every shell making "front"—also in other lines of manufacture.

Catalog of Air Operated Chucking and Clamping Equipment on request.

HANNIFIN MFG. COMPANY, Chicago, U.S.A.

R. E. Ellis Engineering Company, Chicago, Ill.; Coats Machine Tool Co., New York City, N.Y.; Naumann-Firman Co., Detroit, Mich.; A. R. Williams Machinery Co., Toronto, Ont., Can.; A. R. Williams Machinery Co., Winnipeg, and St. John, N.B.; Williams & Wilson, Montreal, Quebec, Can.; Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, Glasgow and Newcastle-on-Tyne; Fenwick-Freres Company, 1500 Rue Fenelon, Paris, France; Iznosskoff & Co., Petrograd, Moscow, Ekaterinberg, and Odessa, Russia.

Operated Without Wrench

While in Motion

A Wrenchless Chuck is not an improvement on other methods. It is a decided departure in the manufacture of chucks that greatly decreases the operating time, increases production and can be depended upon at all times.

Simple in operation. Can be adjusted as quickly as a face plate. Strong and sturdy.

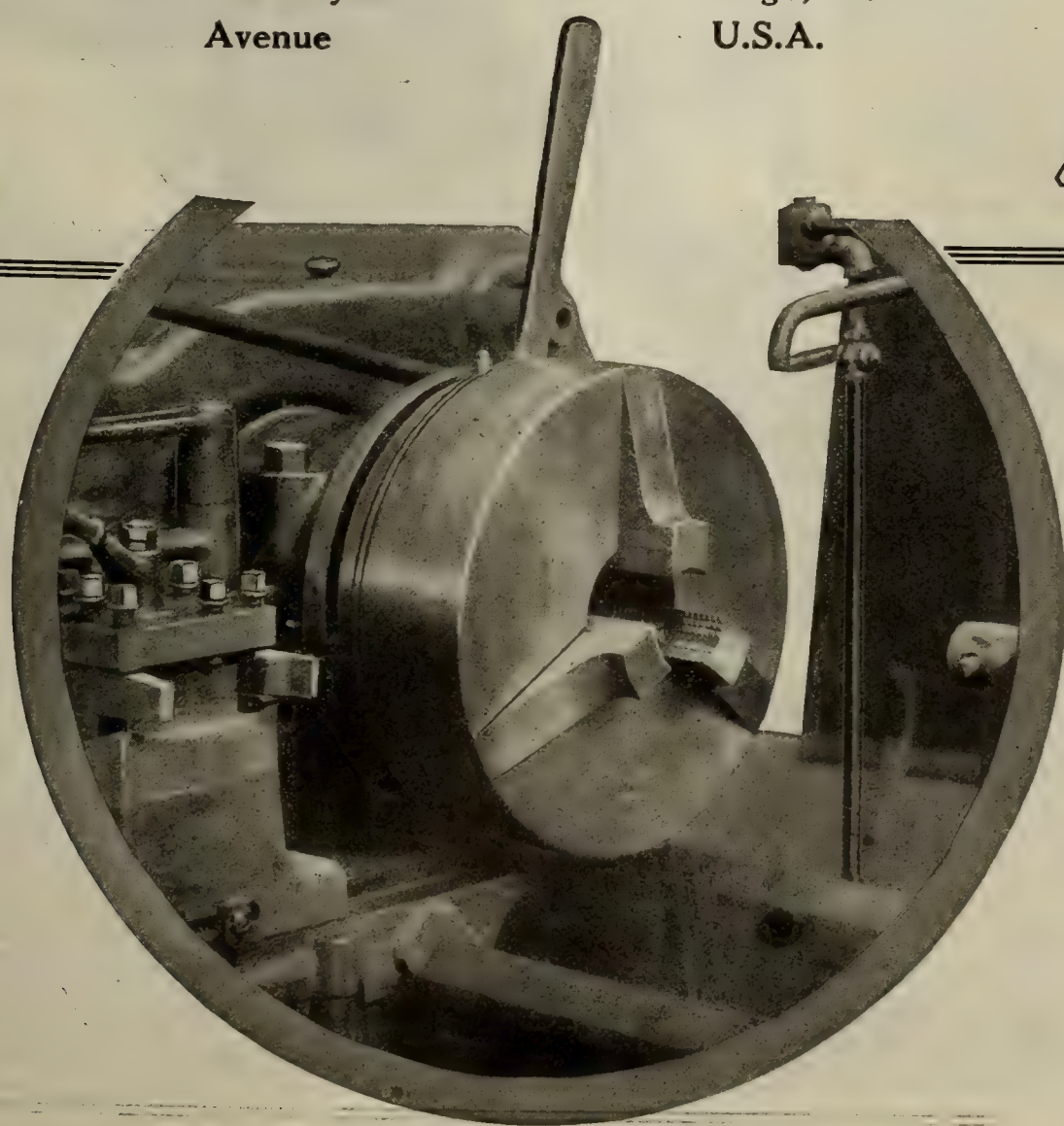
The operating mechanism is in the form of a planetary gear, enclosed within a casing which is carried and held central by the hub of the chuck. It is kept from rotating by means of a U-bar straddling the headstock.

In transmitting the movement from the cam to the jaws a leverage principle is involved which has as its object the elimination of the tremendous friction loss that is inherent in chucks where scrolls or similar wedging members are used.

Send for descriptive literature. We will gladly forward it to you.

Thomas Elevator Company

22 South Hoyne Avenue **Chicago, Ill. U.S.A.**



MODERN

SELF-OPENING and ADJUSTABLE DIE HEADS

The Die Heads that have made good on every threading operation, and which are constantly meeting the demand where Die Heads are required for accurate thread-cutting.

In purchasing "MODERN" Die Heads you have the assurance that you are getting tools of "quality," mechanically perfect in design and construction and uniformly efficient in all sizes.

Illustration shows an installation of "MODERN" Die Heads threading Shell Ogives, where the requirements are precision and large production.

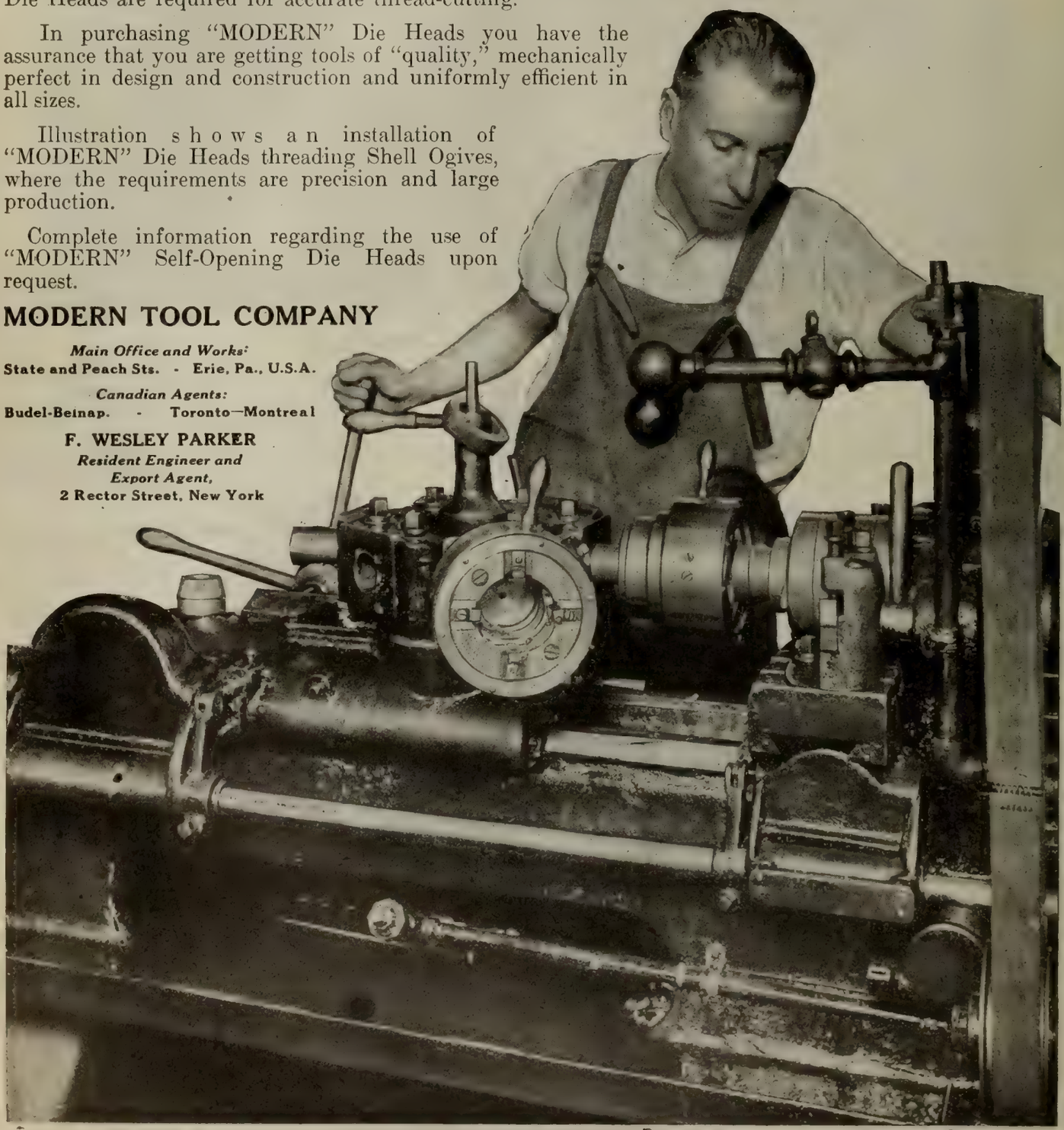
Complete information regarding the use of "MODERN" Self-Opening Die Heads upon request.

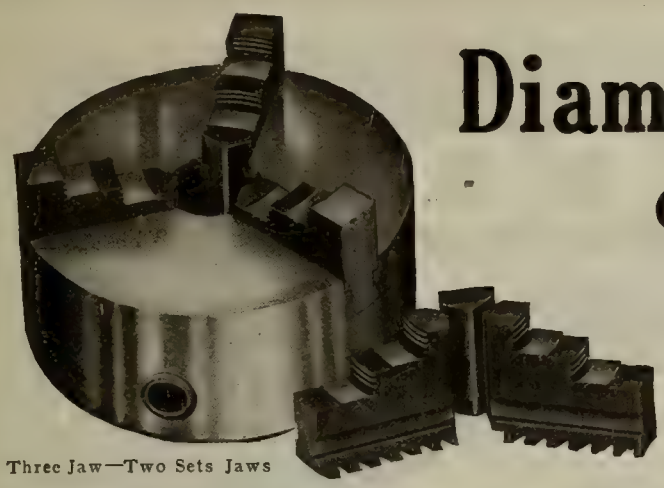
MODERN TOOL COMPANY

Main Office and Works:
State and Peach Sts. - Erie, Pa., U.S.A.

Canadian Agents:
Budel-Beinap. - Toronto—Montreal

F. WESLEY PARKER
Resident Engineer and Export Agent,
2 Rector Street, New York




Three Jaw—Two Sets Jaws

Diamond R Chucks

GEARED SCROLL TYPE

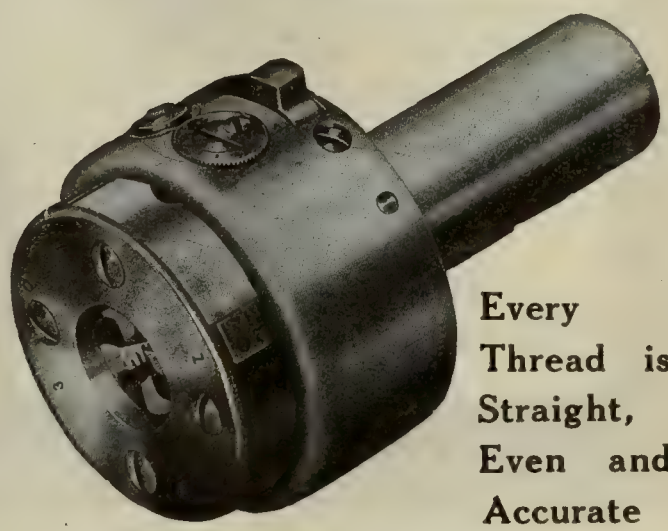
MADE BY

Richmond Manufacturing Co.

183-185 George Street, Toronto, Canada.

ADVERTISING to be successful does not necessarily have to produce a basketful of inquiries every day.

The best advertising is the kind that leaves an indelible, ineffaceable impression of the goods advertised on the minds of the greatest possible number of probable buyers, present and future.



Every Thread is Straight, Even and Accurate

The Chasers in an *H & G Automatic, Self-Opening Die Head* are set and held in place by a steel cam. That cam once adjusted, locks; there is no stoppage or changing in size.

The quick release not only issues the cutting of the thread to a given point every time, but permits cutting right up to a shoulder when required.

Simple, Strong and Compact.

Our booklet tells more. ***Drop a card for it.***

Eastern Machine Screw Corp.

New Haven, Conn.

Double-Quick Cutting-Off

THE HURLBUT-ROGERS CUTTING-OFF AND CENTERING MACHINE has the advantage of two cutting tools.

Each tool is rigidly supported in a stationary block at an angle which permits a strong shearing cut.

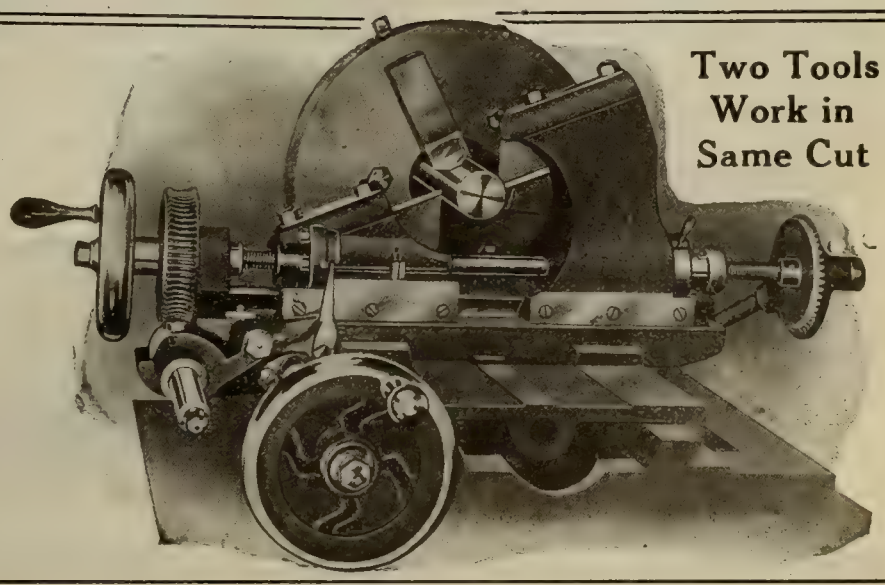
WITH THIS MACHINE PRODUCTION CAN BE NEARLY DOUBLED, and the utmost accuracy maintained under the hardest of work.

Read full details. Write for catalogue.

Hurlbut-Rogers Machinery Company

South Sudbury, Mass., U. S. A.

FOREIGN AGENTS—England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow, Newcastle-on-Tyne. H. W. Petrie, Toronto, Canada.



Two Tools Work in Same Cut

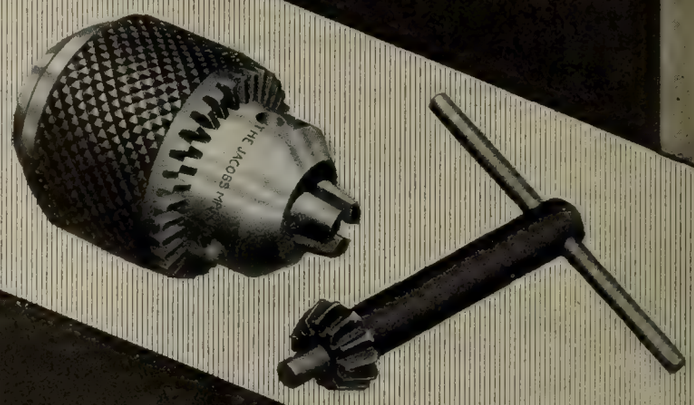
Jacobs
IMPROVED
Drill Chuck

A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.



Reducing the Thread Cutting Costs

NAMCO TAPS COLLAPSING "NO HOLE TOO DEEP"

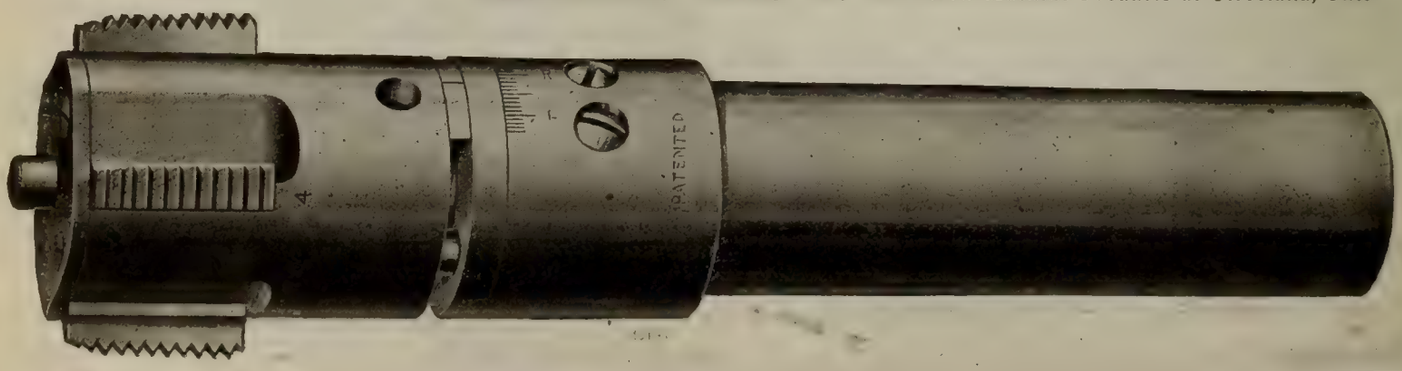
The New NAMCO Positive Collapsing Tap offers an immediate solution to this high threading cost problem.
The NAMCO Tap differs from all other collapsible taps both in design and construction and features many advantages over the old style of tap, namely
—capacity for any depth hole.
—positive collapsing action.
—proper support for chasers while cutting.
—all operating mechanism within body.
The new catalog explaining in detail the reasons for the improvements claimed for NAMCO Collapsible Taps will be sent on request. Ask for "M."

(Capacities 1 1-4 inch up)

THE NATIONAL ACME COMPANY, CLEVELAND, OHIO
New England Plant: Windsor, Vermont **Canadian Plant: Montreal, P. Q.**

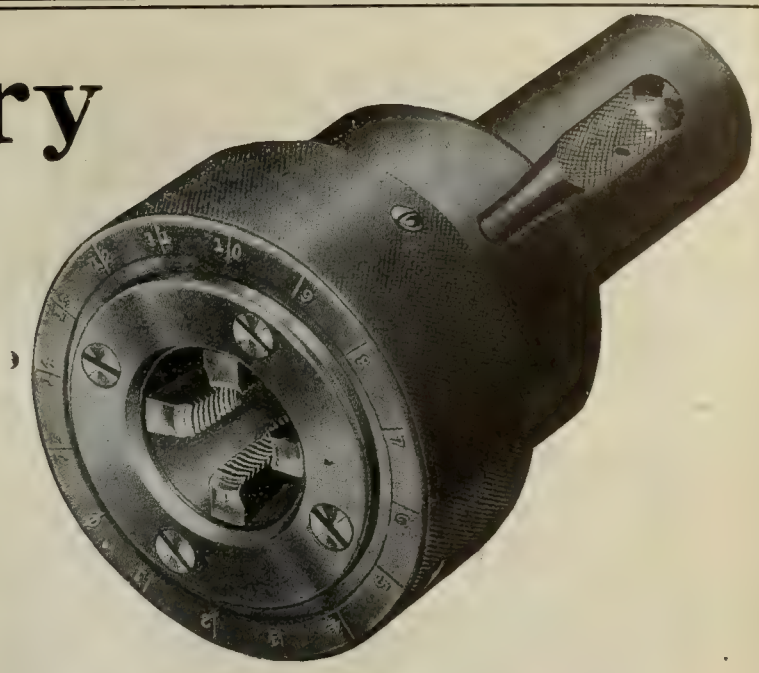
BRANCH OFFICES—NEW YORK, BOSTON, CHICAGO, DETROIT
ATLANTA, SAN FRANCISCO, REPRESENTATIVES IN FOREIGN COUNTRIES

Makers of Gridley Single and Multiple Spindle Automatics at Windsor, Vermont; and Acme Automatics, Threading Dies, and Screw Machine Products at Cleveland, Ohio



Rapid Delivery

Users of Murchey Tools Get Chasers Without Delay



Lightning deliveries—that is a big advantage of using Murchey Tools. No work held up for chasers. We get your order, fill it, and it's on the way back to you just as quickly as the most rapid means of transportation can bring it to you.

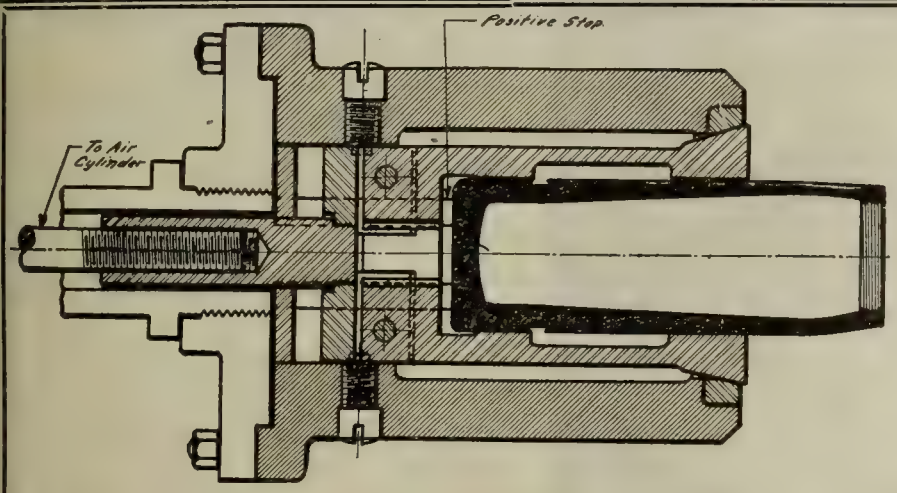
There is no service like the Murchey service, and there are no tools like the Murchey Tools. Send blueprints for estimates.

MURCHEY TAPS are accurate and simple and can be worked with great speed. On 4.5 Mark VII shells Murchey tapping time is just ONE MINUTE.

Murchey Machine & Tool Company

75 PORTER STREET - - DETROIT, MICHIGAN

The Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, S.W., England, Glasgow, Newcastle-on-Tyne, and Fenwick Freres & Company, 15 Rue Fenelon, Paris, France.



Consider Just This One Feature of M.E.C. Air-operated Hinged Collets

They save from 50 per cent. to 90 per cent. of the time usually required to do the same work by an ordinary chuck. While they possess many other points of superiority, the above feature alone is one that should appeal to users of chucks.

May we send full particulars? Just fill in coupon.

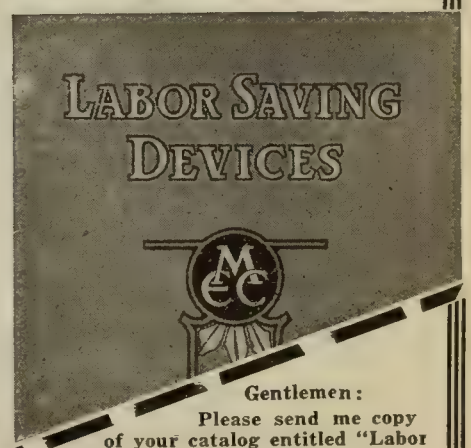
Manufacturers Equipment Co.

175-179 N. JEFFERSON ST. CHICAGO, U. S. A.

NEW YORK OFFICE---30 CHURCH ST.

Canadian Agents---J. R. Stone Tool and Supply Co. Goebel Bldg., Detroit, Mich.

Foreign Agents: C. W. Burton, Griffiths & Co., Ludgate, Ludgate Square, London, England.



Gentlemen:
Please send me copy of your catalog entitled "Labor Saving Devices," according to your advertisement in Canadian Machinery.

Name .....

Address .....

Position .....

With .....

If any advertisement interests you, tear it out now and place with letters to be answered.

MacLean's Magazine
FOR JULY

The Smugglers were Caught

THE true and complete story of a huge smuggling conspiracy which robbed the Canadian and United States Customs Departments of hundreds of thousands of dollars, and which was finally exposed by a Canadian Customs officer, is well told in the July MACLEAN'S. The parties concerned settled by handing over a huge check to the Canadian Government and not a word of the story has ever before been in print. The man who writes the article, J. D. Ronald, was personally concerned in the investigation, and he tells the whole case from first to last, merely changing the names of some of the central figures. This is one of the most striking special features that MACLEAN'S has ever had.

Confederation
the dominant theme of July MACLEAN'S

THE Jubilee of Confederation has led the Editor to make the July MACLEAN'S retrospective and interpretive of Confederation in the character of its main contents—this to meet the certain need and desire of the Canadian people. Note the fine provision of special Confederation article and features:

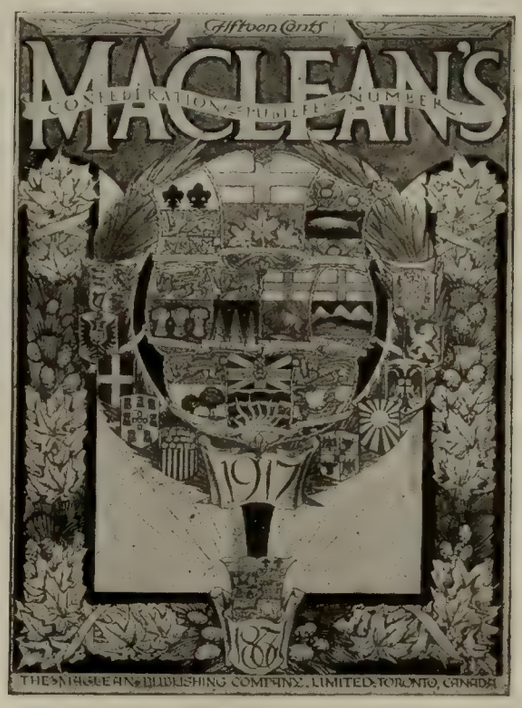
"THE MEETING OF MACDONALD AND BROWN."
By C. W. Jefferys, a frontispiece painted for MACLEAN'S.

"THE STORY OF CONFEDERATION."
By Thomas Bertram. A colorful narrative of the bringing about of the union of provinces.

"FIFTY YEARS OF BUSINESS EXPANSION."
By W. A. Craick, covering all phases of business—banking, insurance, manufacturing, agriculture, transportation, etc.

"THE BUILDING OF THE C.P.R."
By C. H. Mackintosh, former Lieutenant-Governor of the North West Territories, and an ex-editor of the Ottawa Citizen.

"CONFEDERATION AND AFTERWARDS."
By Agnes C. Laut. An article on Confederation and the taking over of the North West Territories from the Hudson Bay Company.



Look for this symbolic cover design in three colors at book stores and news-stands. It is a fine bit of work, and worth preserving.

"SOME CANADIAN CONTRASTS."
By Frank Yeigh. A sketchy article showing some of the most picturesque ways in which Canada has advanced during the last fifteen years.

"THE DRAFT."
By A. C. Allenson. A story of the part which Canadians took in the American Civil War.

MESSAGES ON CONFEDERATION
appear from the Premiers of many of the Provinces of Canada.

Billy Sunday Contributes:

"WHAT I THINK OF CANADA."
A brief article in the crisp, epigrammatical style of the famous evangelist, illustrated by some of his most recent photographs taken in action in New York.

The Fiction Features:

"THE GUN BRAND."
By James B. Hendryx. An interesting instalment of this exciting serial.

"THE OUTLAW BOAR."
By Clark E. Locke. A short story.

"PUTTING IT OVER."
By Hastings Webling. A golf story.

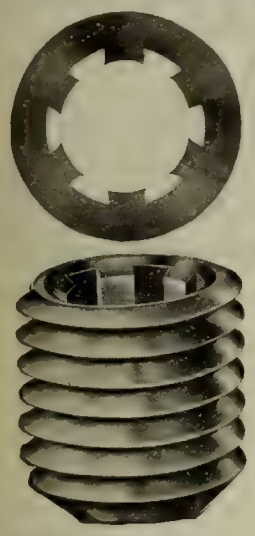
"THE CAPTAIN OF THE SUSAN DREW."
By Jack London. The first instalment of a two-part story—one of the last that London wrote.

The Best Number of MACLEAN'S by long odds

THAT has ever been put out is this July issue. It will be bigger, the articles are stronger, the stories more entertaining, and the illustrations more varied. Stephen Leacock's "Sunshine in Mariposa" is continued in this issue; also the regular Departments, Records of Success, Review of Reviews, The Business Outlook, and Information for Investors.

At All News-Dealers 15c.

HINTS TO BUYERS



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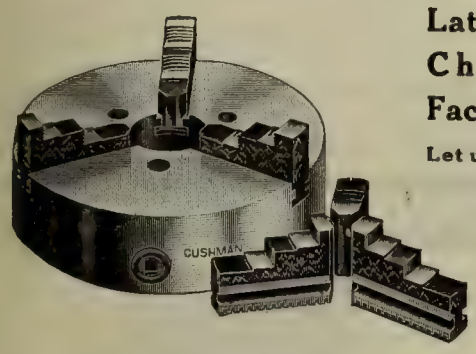

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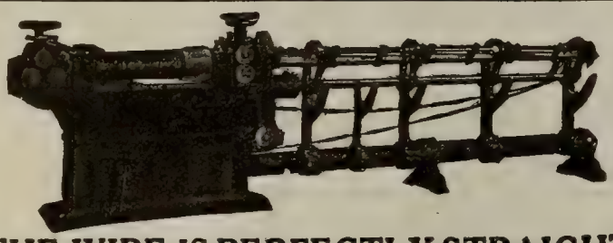

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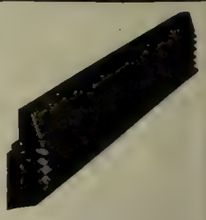

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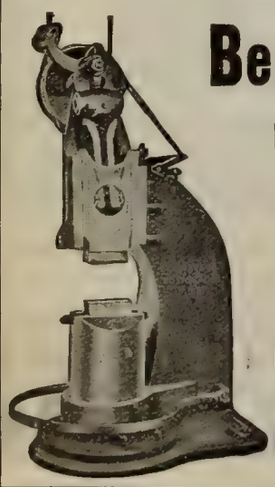

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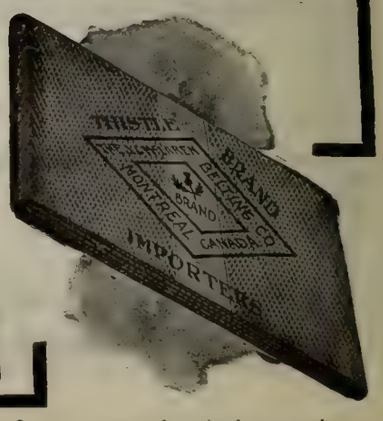

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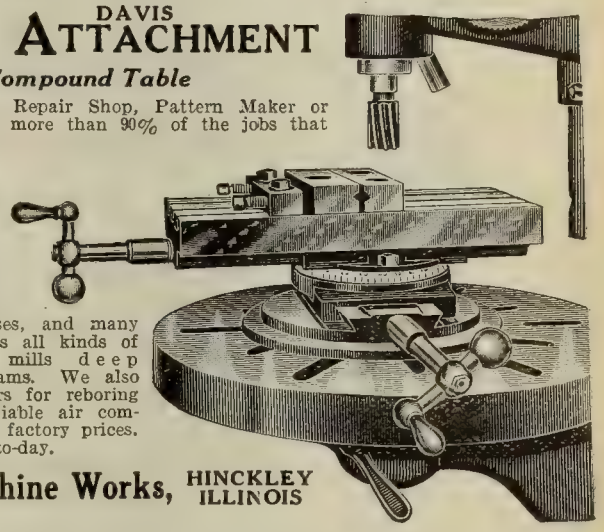

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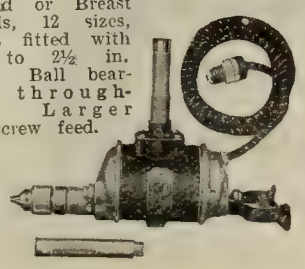

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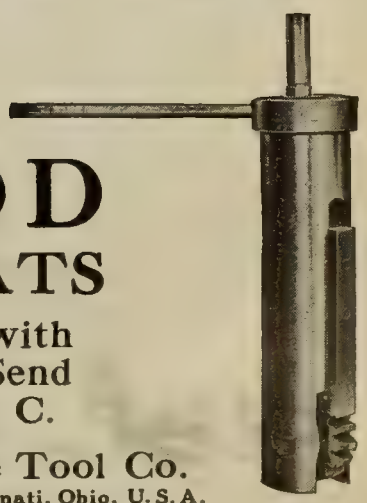

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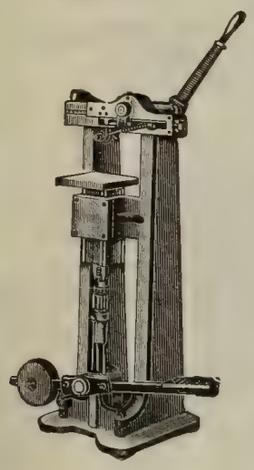

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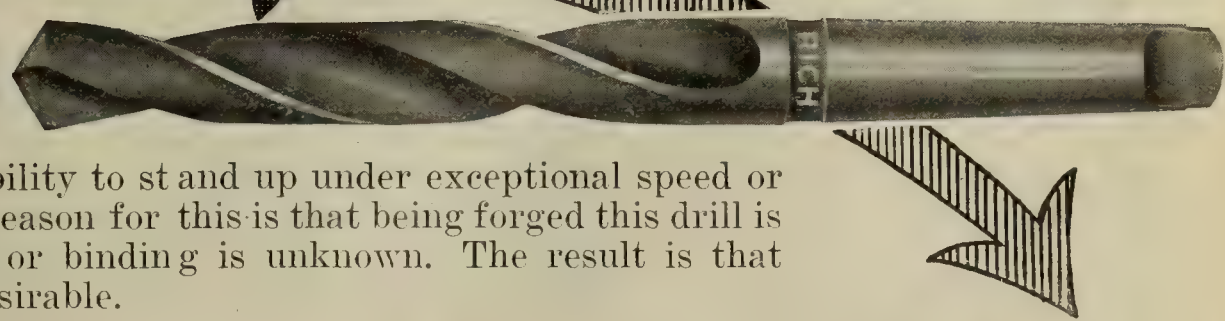

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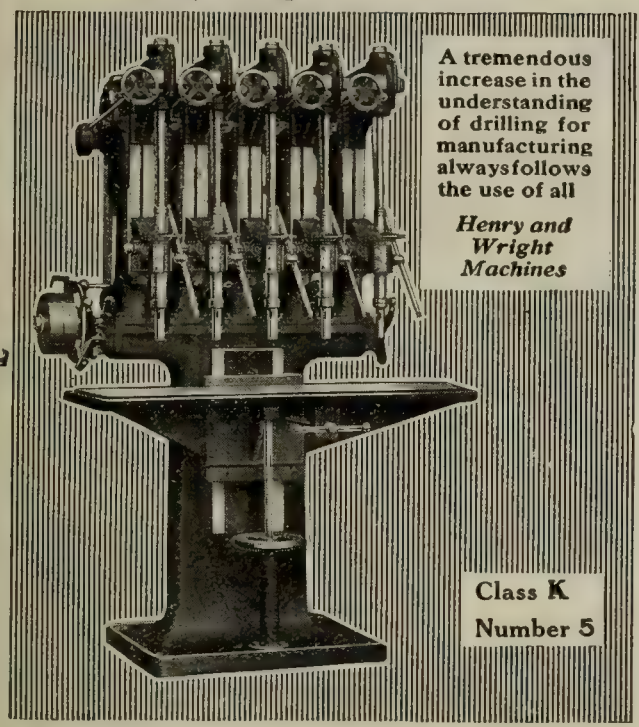

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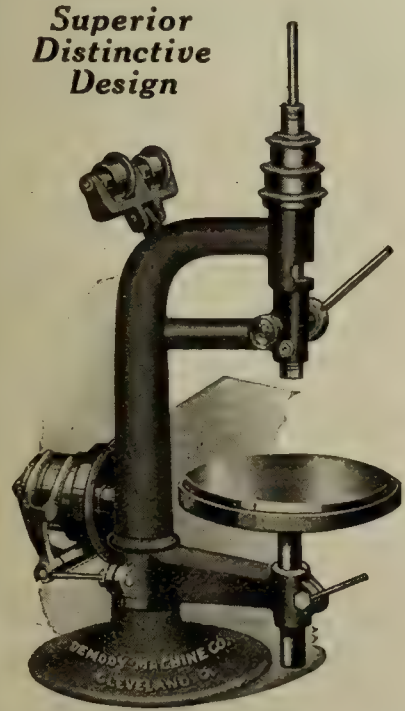

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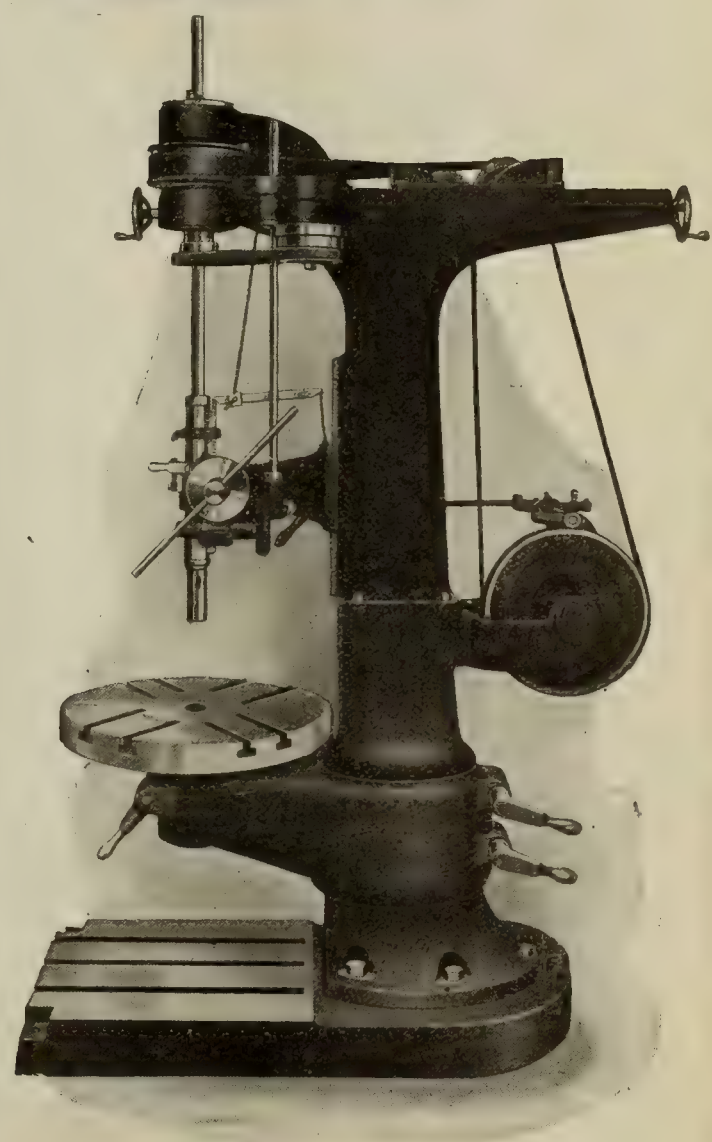

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West Tire Setter Co., Rochester, N.Y.

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L. S. Starrett Co., Athol, Mass.

INDEX CENTRES
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Garvin Machine Co., New York.

INDICATING INSTRUMENTS
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IRON ORE
Hanna & Co., M. A., Cleveland, O.

JACKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Petrie, H. W., Toronto.

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JACKS, PNEUMATIC
Northern Crane Works, Walkerville.

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Pratt & Whitney Co., Dundas, Ont.
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Cincinnati Iron & Steel Co., Cincinnati, Ohio.
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Foss & Hill Machy Co., Montreal.
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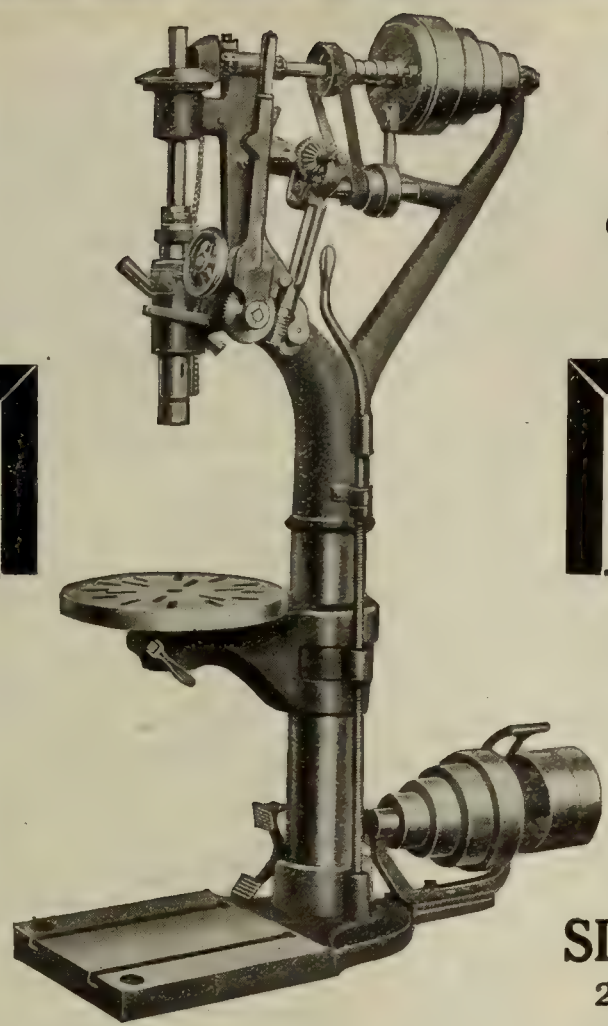

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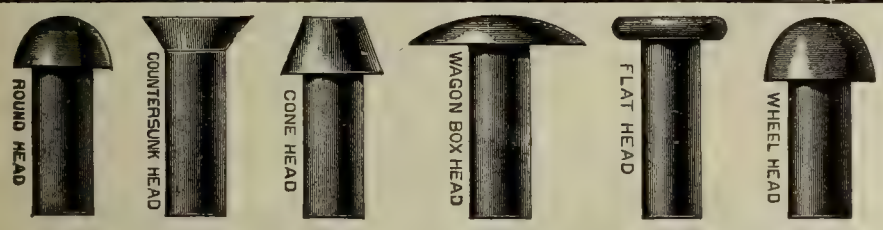

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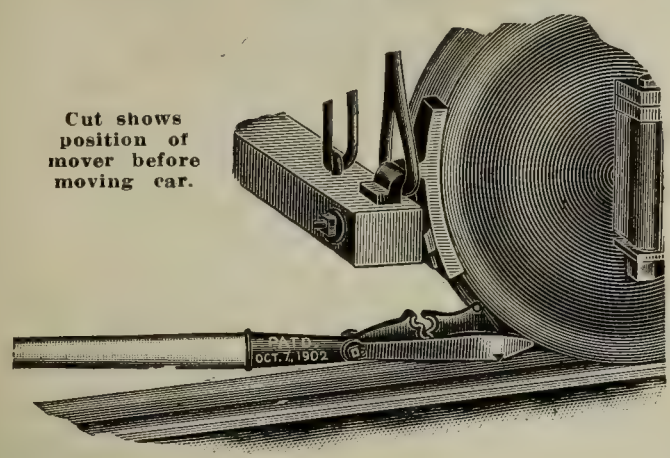

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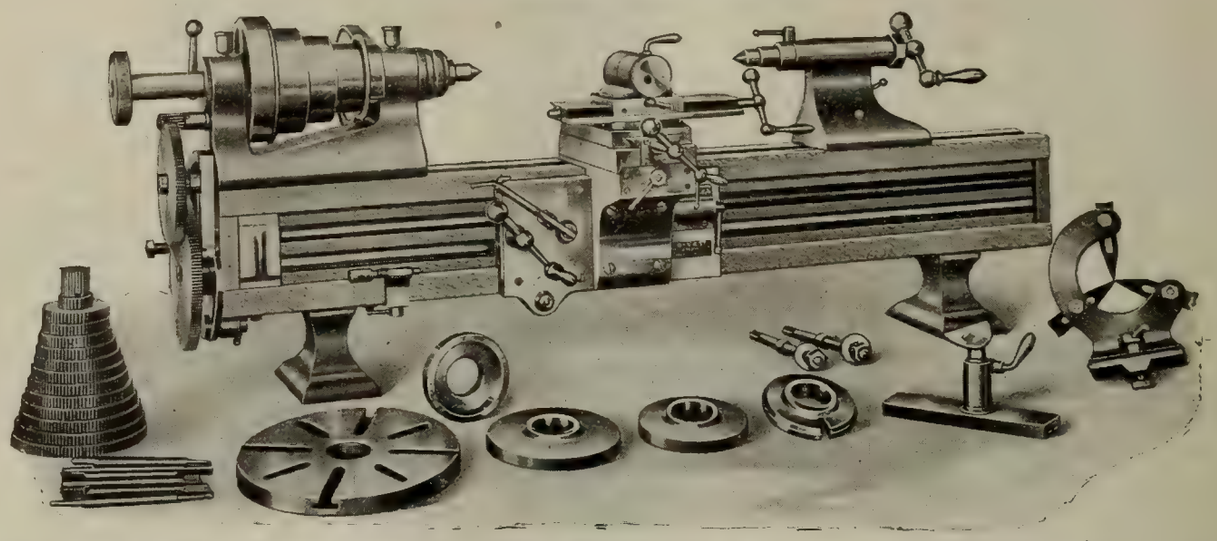

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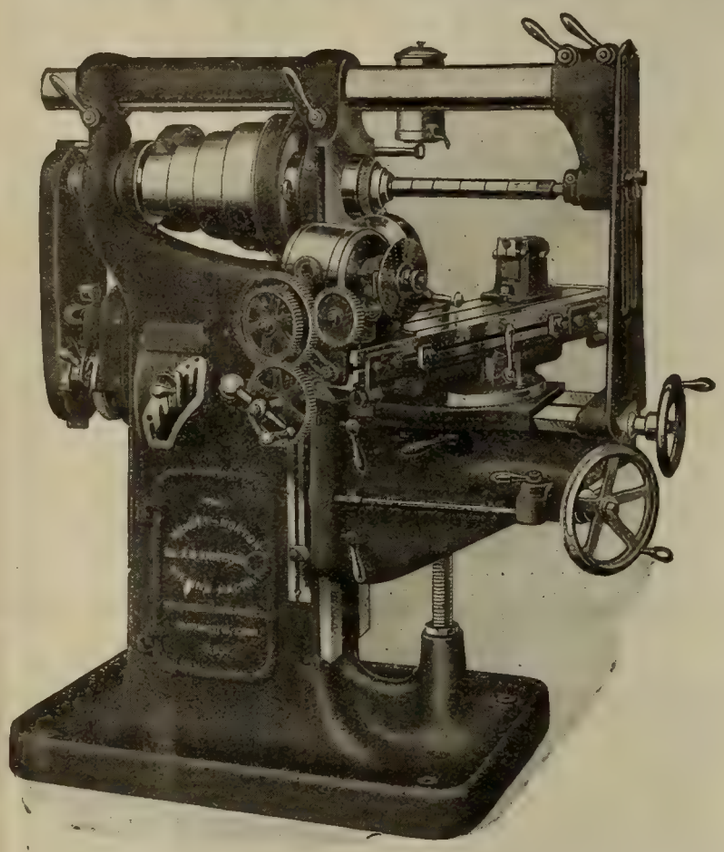

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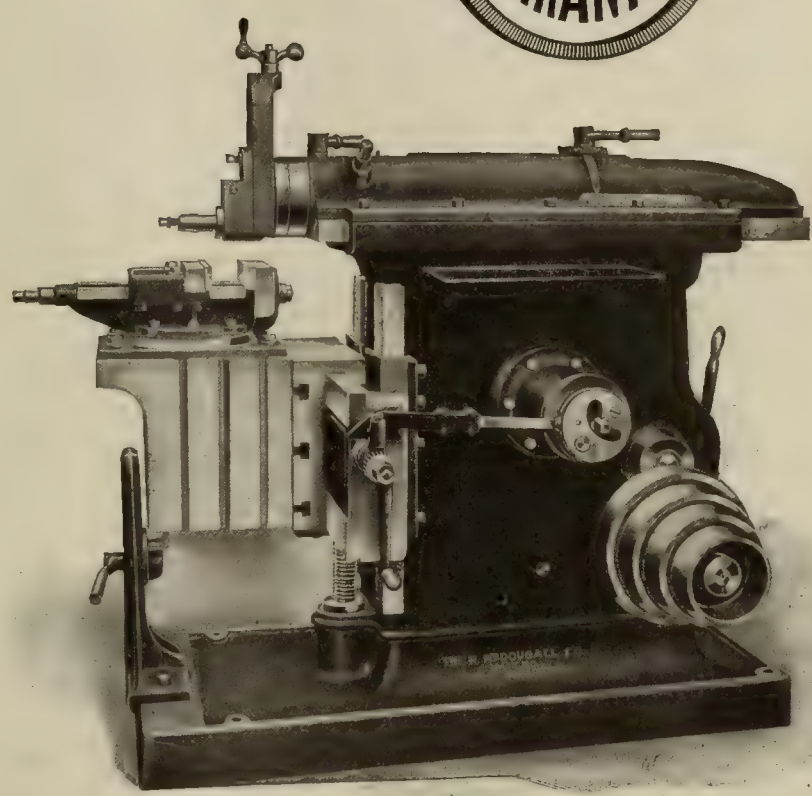

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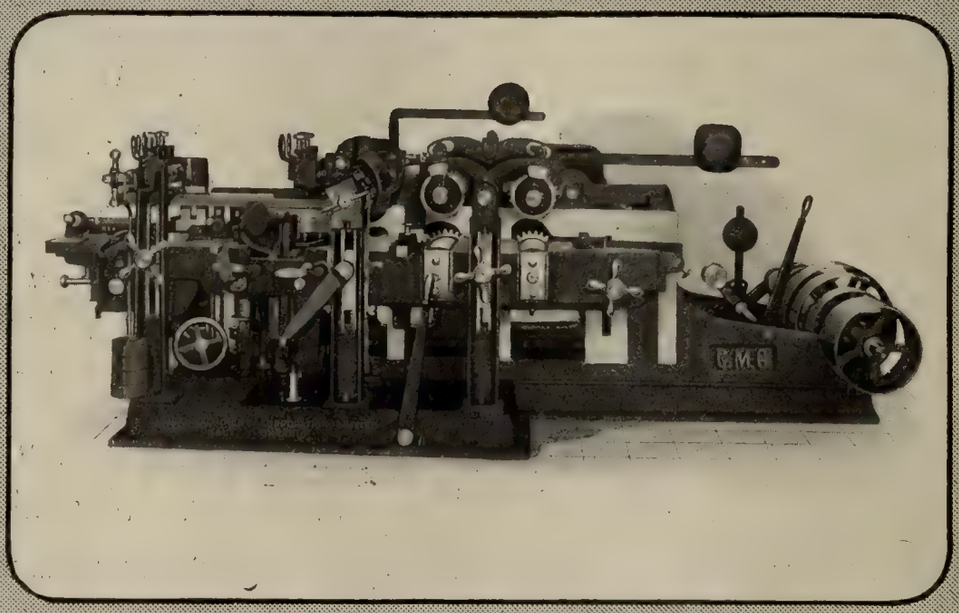

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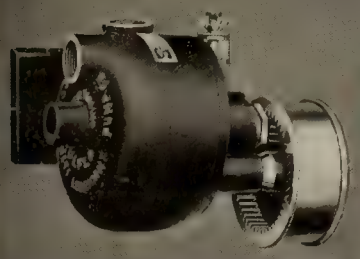

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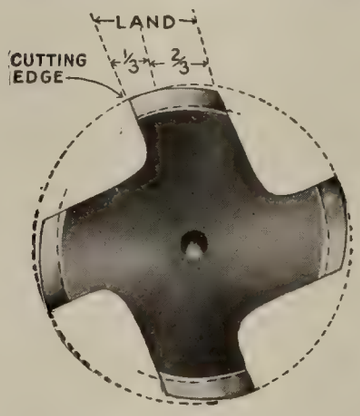

The Taps with the Con-eccentric
Trade-Mark Registered
Land

As will be seen by the cross-section cut above, one-third of the land from the cutting edge has concentric relief. The remaining two-thirds is eccentrically relieved. A tap made in this way can be ground for sharpening at the only correct point—on the face of the cutting edge. Sharpening in no way affects its size or the form of the thread.

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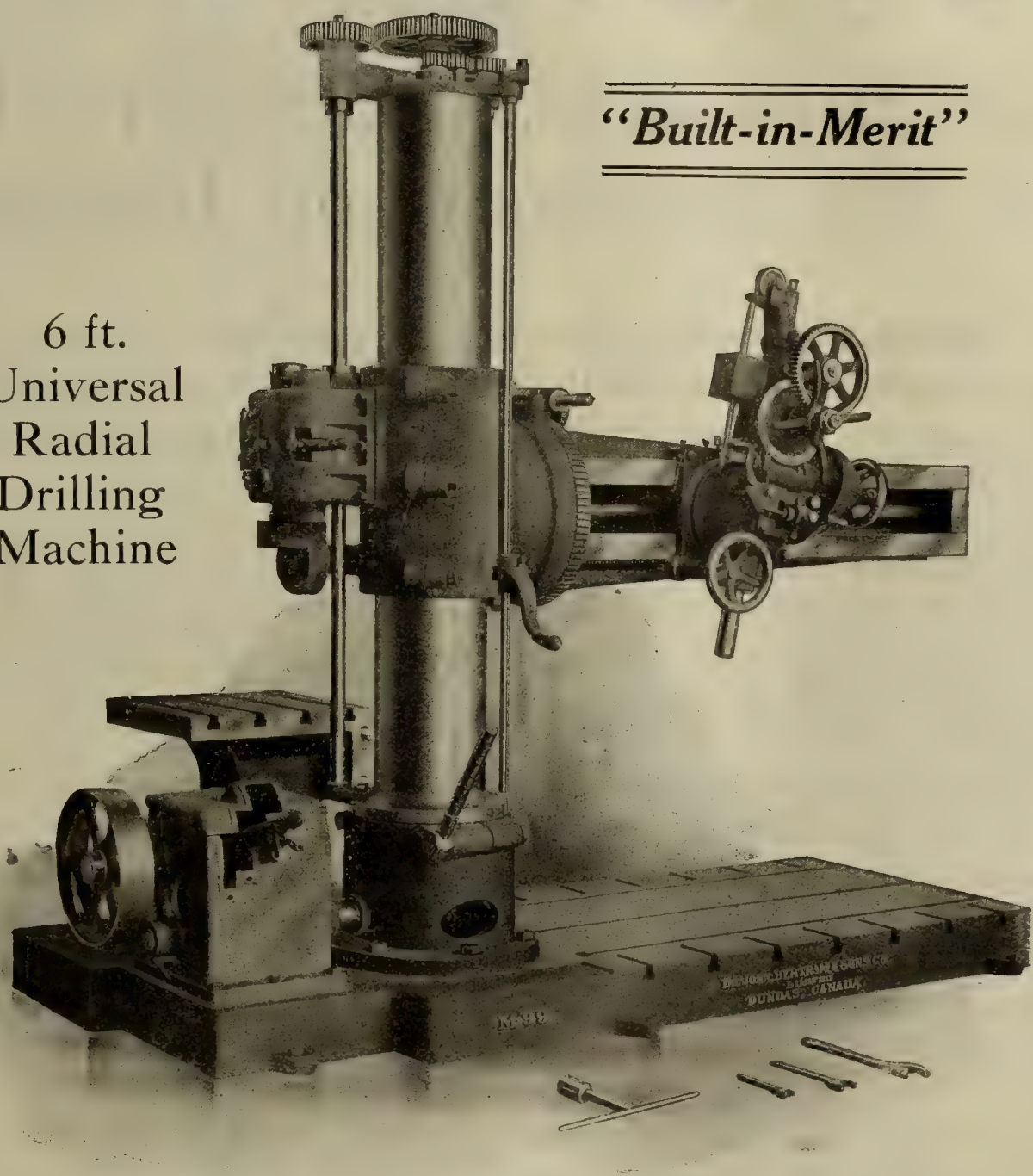

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The Publisher's Page

TORONTO July, 1917

Extract from a Manufacturer's Letter to His Salesmen and Jobbers

A DEALER in Toronto recently received a letter from a manufacturer calling attention to the fact that it is easier to sell advertised products than goods which are not advertised.

The dealer thought the letter a very good one and so passed it on to us. It ***is*** a good letter and so we in turn pass it on to our readers that the usefulness of its message may be multiplied.

"The salesman who sells advertised goods is the man who gets the interview always.

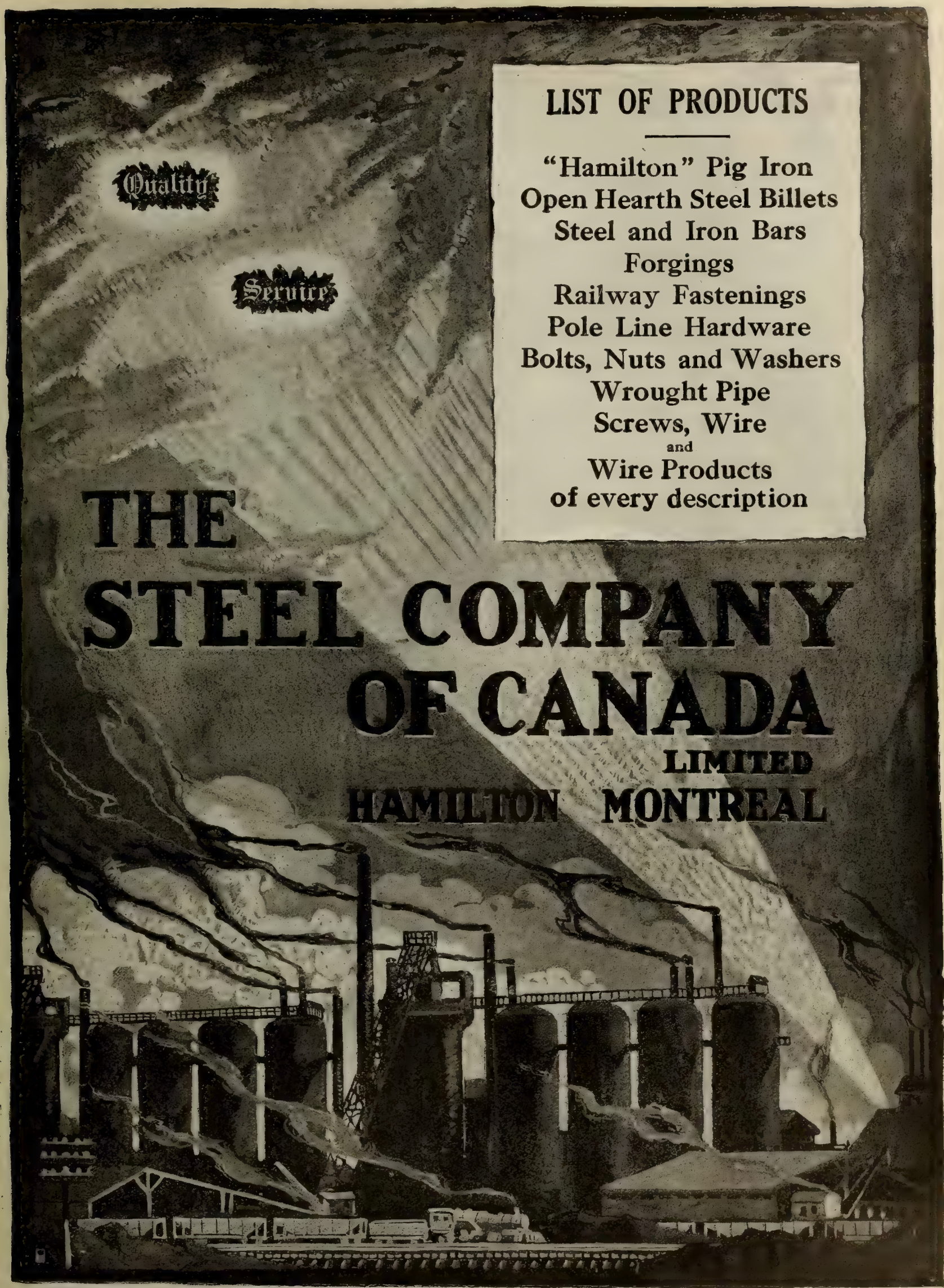
"That's why the salesman of advertised goods can get a good hearing—can get to the order point quickly—why the buyer wastes no time when he talks to representatives of manufacturers who advertise their products.

"You know advertising helps you salesmen. Are you letting our advertising pages help you sell our line?

"Trade paper advertising educates the reader on the worth-while products and puts the manufacturer's claims in black and white—shows why the advertised goods should be used.

"Readers of advertising are informed of the reliable goods in their field—for only reliable products can be continuously advertised. We have been advertising for twenty years.

"We trust you are letting our trade paper advertising help you."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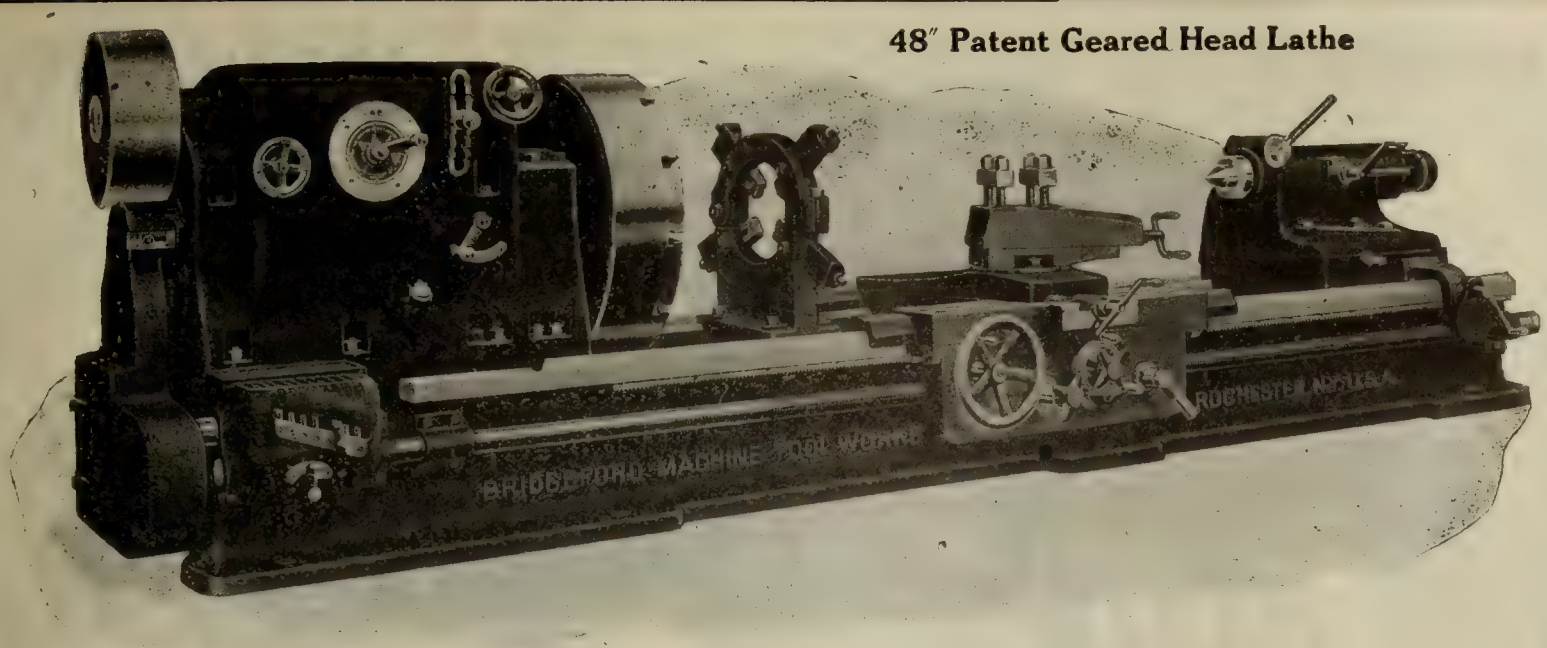

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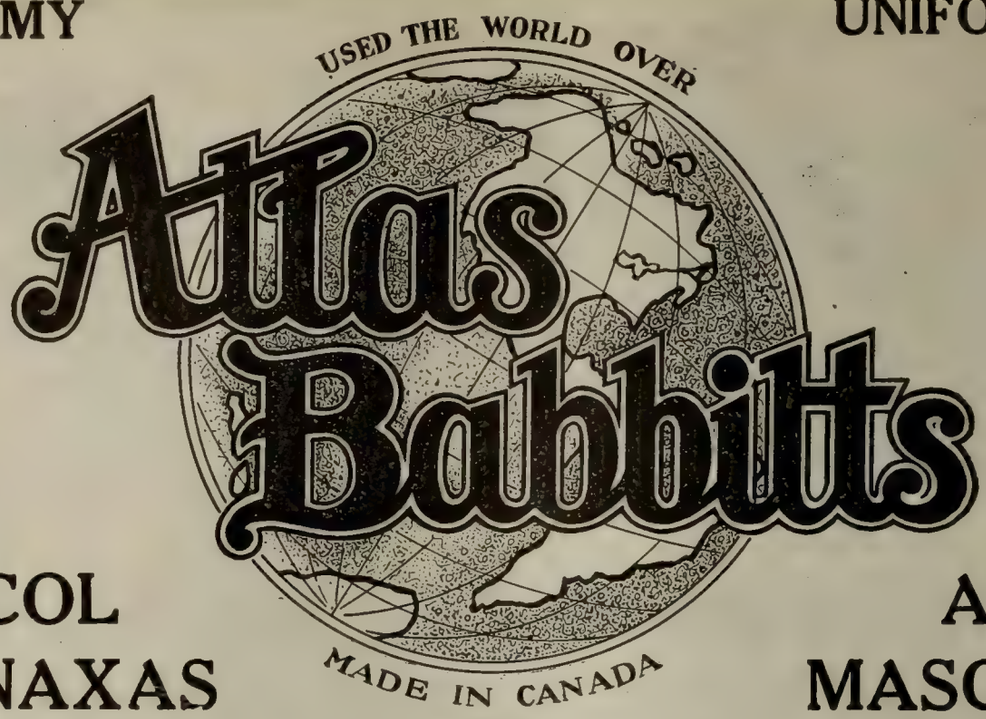

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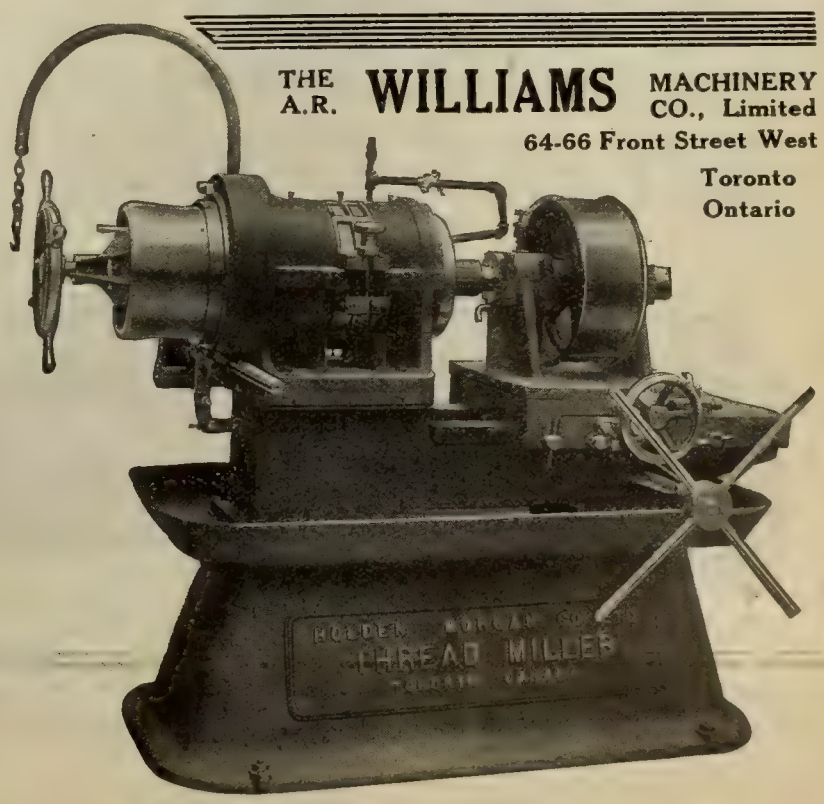
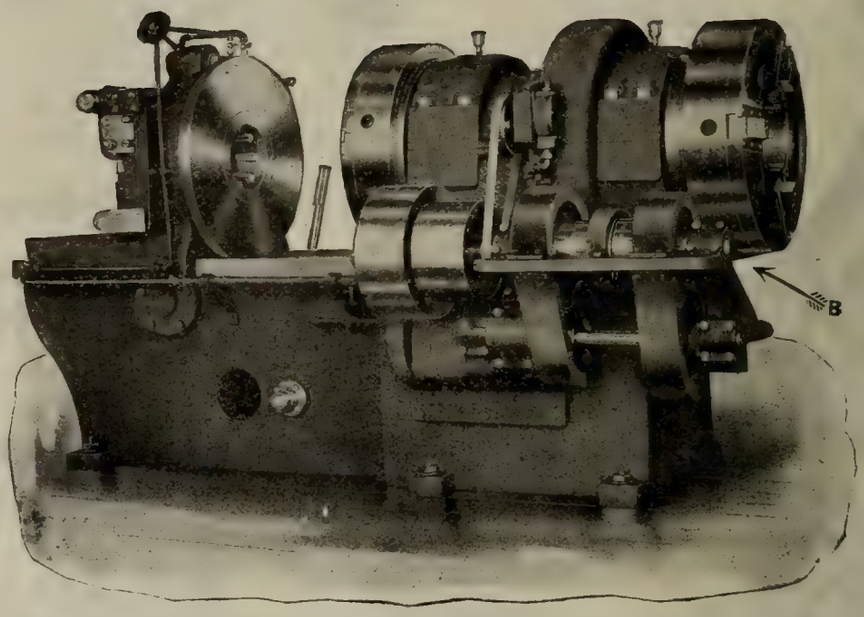


The Johnson Friction Clutch Is Being Used As A Part Of This Machine

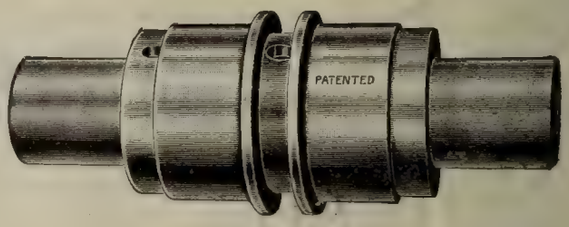
The arrow marks the point where the Johnson Double Clutch is incorporated in the construction of Apex Pipe Threading Machines made by the Merrell Mfg. Co., Toledo, Ohio.



Courtesy of the Merrell Mfg. Company, Toledo, Ohio.

Johnson Double Friction Clutches are well adapted for use on feed and speed changes on all types of machine tools.

Many of the machines in your shop owe their mechanical efficiency to the perfection of Johnson Friction Clutches.



Double Clutch—Exterior

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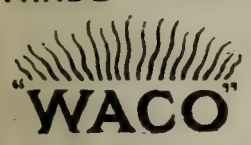

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SHEFFIELD, ENG.

TRADE MARK:

TRADE MARK

of the Famous

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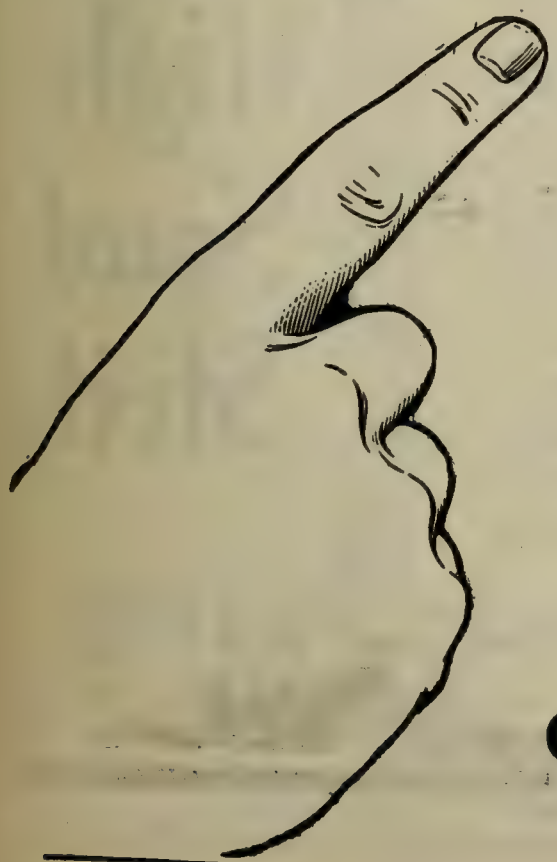

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The most Economical and Efficient Steel for Machining Shells

"Extra" Die Steel another good one

Manufactured by
SANDERSON BROTHERS & NEWBOULD, Limited
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MONTREAL TORONTO NEW YORK

A Keen Cutter

WOLFRAM
Is Both
VULCAN CRUCIBLE STEEL CO.
ESTABLISHED 1900
Aliquippa, Pa: U.S.A.
Represented in Canada by Messrs Norton Callard & Company
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Strong in the Neck

Electrite

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium—make this a steel of truly remarkably cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.
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High Speed Steel

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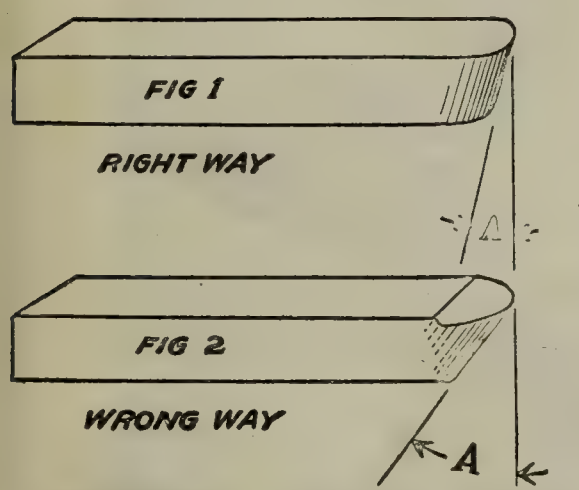
STELLITE

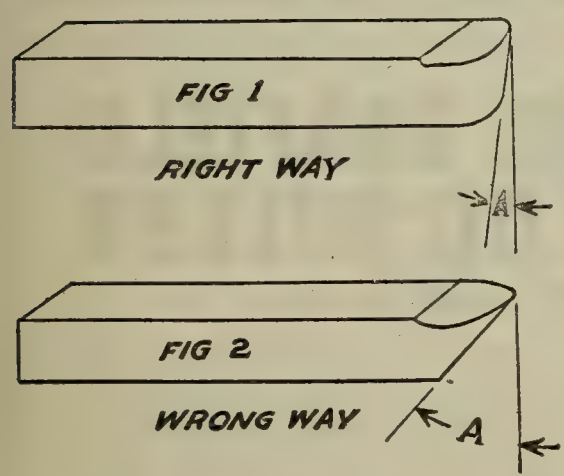
IS NOT STEEL, SO DO NOT ∴ USE IT LIKE STEEL ∴

DIRECTIONS FOR GRINDING

"STELLITE" TOOLS



GRINDING STELLITE TOOLS FOR CAST IRON



GRINDING STELLITE TOOLS FOR 20 TO 100 POINT CARBON STEEL

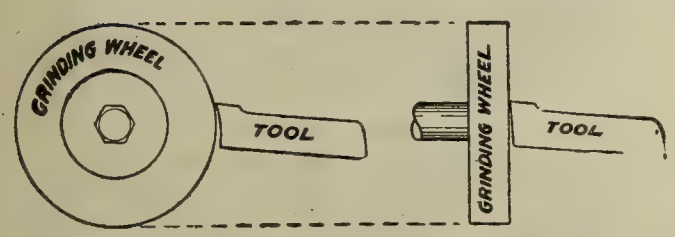


FIG 1 WRONG WAY — FIG 2 RIGHT WAY

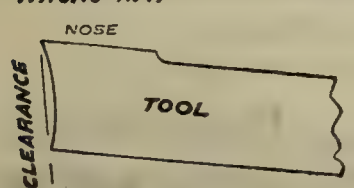


FIG 3 RESULT OF WRONG WAY

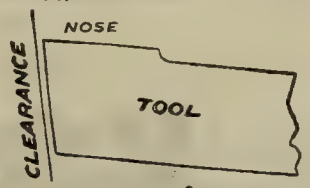


FIG 4 RESULT OF RIGHT WAY

Figure 1 shows the right way to grind a Stellite tool for machining Cast Iron. Give the tool a full Round Nose, and be sure the angle (A) is just sufficient to allow the tool to clear the work. This angle should never be more than six degrees.

Whenever possible, operate the tool without top slope as shown in Figure 2, since the centre of the Stellite bar is not as hard as the outer surface.

Figure 2 shows the improper way to grind the tool. Angle A is entirely too great, and will cause the tool to crumble. This tool should have a full round nose, and the top slope as shown will reduce the cutting qualities of the tool.

Stellite tools cannot be burnt while grinding, because they have no temper. They always remain hard.

Always use No. 3 grade Stellite for turning Cast Iron.

Figure 1 shows the right way to grind Stellite tools for grinding steel. Angle A should be just sufficient to allow the tool to clear the work, and should never be more than six degrees. In turning steel it is necessary to give the tool some top slope to get the proper cutting action between tool and chip. It will be found that due to the high rate of speed at which the Stellite tools operate it requires less top slope than is generally given other tools. A top slope angle of 5 degrees is sufficient.

Figure 2 shows wrong way to grind for turning steel, as Angle A is too great and the shape of the cutting nose is too pointed. The top slope, as shown in figure 2, is too great.

Always use No. 2 grade Stellite for turning 20 to 100 point Carbon Steel.

In Figure 1 the Stellite tool is being ground on the periphery of the grinding wheel, with results as shown in Figure 3. This method is wrong, because a concave clearance is given the tool, as shown, which robs the cutting edge of its maximum support, causing crumbling and failure.

In Figure 2 the Stellite tool is being ground correctly, using the side of grinding wheel. This method gives maximum support to the cutting edge as shown in Figure 4.

Tools ground, as shown in Figure 3, will always give trouble, and are responsible for most failures with Stellite tools.

Never give Stellite tools any more clearance than absolutely necessary.

Always remove the wire edge with a carborundum or oilstone.

Stellite cuts 25% to 300% faster than the best tool steel.

CANADIAN MANUFACTURERS

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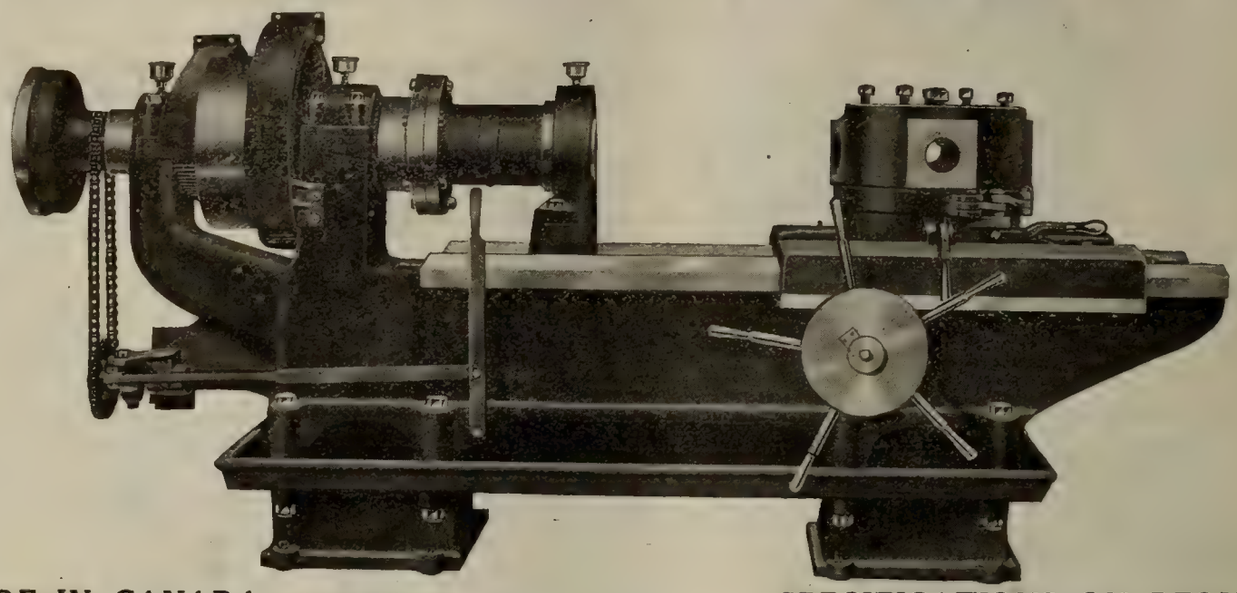

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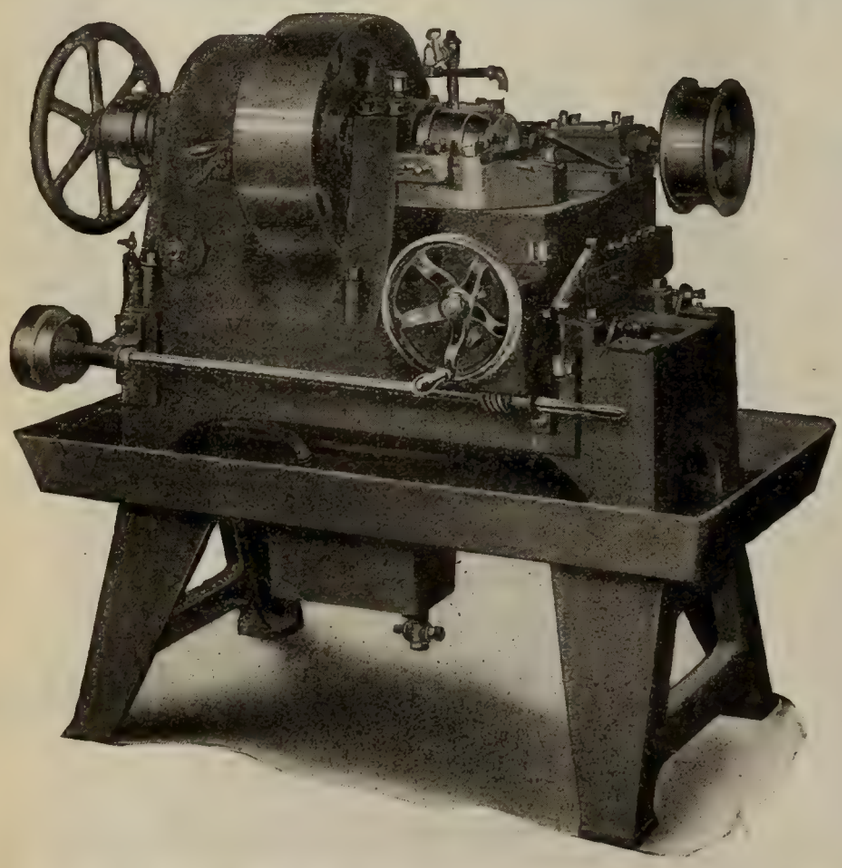

For Turning, Facing and Milling the thread on Gas Check Plugs for 6-inch High Explosive Shells.

THE BANFIELD PLUG MILLER

Patented in Canada and United States

THIS machine is especially designed for finishing base plugs, turning the outside diameter, finishing the face with any camber desired, and milling the thread, all in one chucking, the complete plug being finished in six minutes by unskilled labor.

The machine is equipped with quick draw-in collet. Drive pulley 18" x 6", with bronze bush having cut jaw clutch for turning and facing. Worm gear 100 to 1 ratio, with cut jaw clutch for milling, driven by 10" x 1½" flanged pulley. The milling cutter is driven by an 8" x 2½" flanged pulley. Tool post carriage is equipped with power feed (two speeds) having automatic stop. Power feed pump with relief valve driven from worm shaft (all drives direct from main line shaft). Rigidly built, simple and economical to operate.

Weight 1,800 lbs.

For 18 pdr., 4.5 and 60 pdr. High Explosive Shells. Can furnish machines of same type, but somewhat lighter in construction. Particulars on request. These machines are tooled up for finishing plain machined or bevelled plugs, if desired.

Write for prices and deliveries.

Prompt Shipment

BUILT EXCLUSIVELY BY

Edwin J. Banfield

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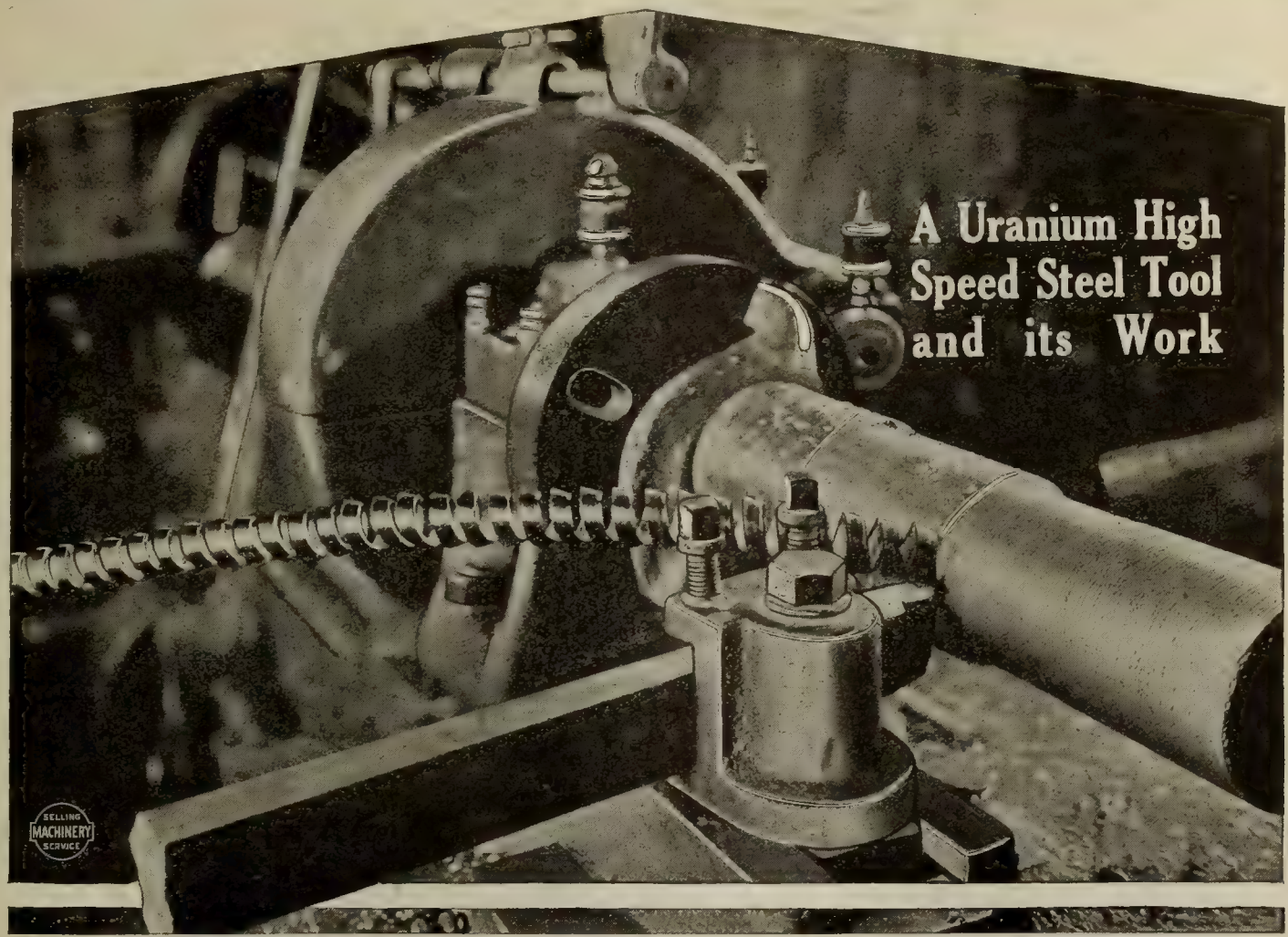


FOR BETTER TURNING TOOLS SPECIFY

URANIUM
HIGH SPEED STEEL

ITS use in high-speed turning tools means longer service between grinds, the ability to stand heavier cuts and coarser feeds and greater "all around" economy. The photograph shows a Uranium Steel Tool, one inch by two inches, turning a heat-treated steel shell forging 4.5″ diameter, taking a quarter-inch cut at a feed of 7/32″ per revolution. The chip coming off is so tough it can hardly be bent with the hands.

If you want better service from high-speed steel tools, regardless of the work they do, specify Uranium High-Speed Steel. Improvement will date from the first job they finish.

Consult your steel man or write us.

STANDARD ALLOYS COMPANY

Forbes and Meyran Avenues, Pittsburgh, Pa.

CO CO
TURNING STEEL
TOOL HOLDER BITS
"THE BIT WITH THE GROOVE"

What CoCo is Doing on Other Jobs

"CoCo" will do the same in your shop,—will cut faster or longer than other steels. Here are some proofs:—

"CoCo" is cutting Semi-steel Castings at 100 ft. per minute, cut ½" deep. 30 hours continuous service between grinds.

"CoCo" is turning Cast Iron Hydrant Caps at 169 ft. per minute, feed ⅛", cut ⅜" and turns 4 hydrants per grind where less that one per grind used to be standard.

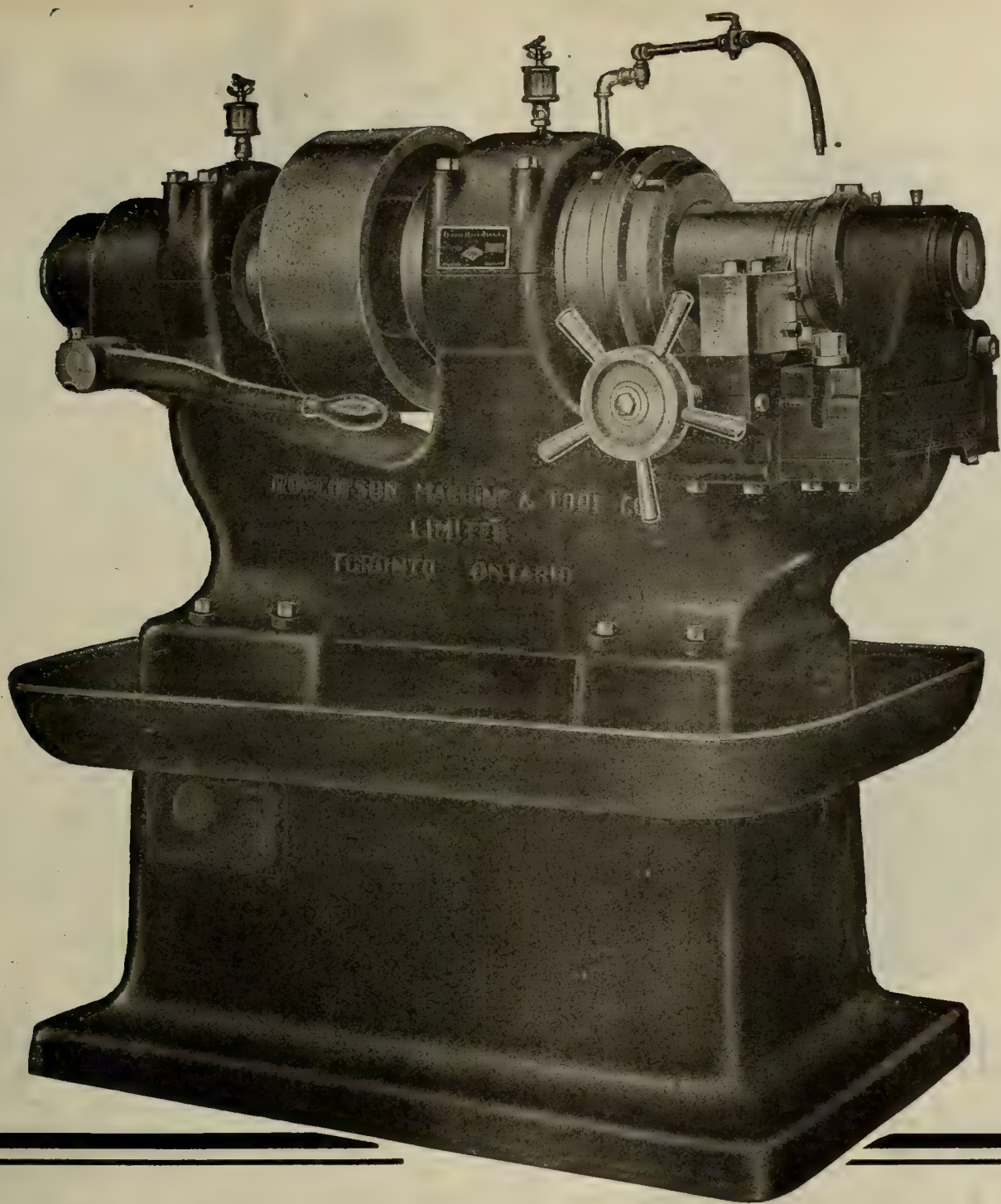
"CoCo" is turning .40 Carbon O. H. Forged Rams at 95 ft. per minute, feed ¼", cut 3/32" turning 3 rams in the same time it formerly took to do one.

CAN YOU BEAT IT?

CoCo Steel does not do stunts—It does the work. It will do yours as well. Ask us.

COLONIAL STEEL COMPANY

PITTSBURGH BOSTON DETROIT NEW YORK PHILADELPHIA ST. LOUIS CHICAGO



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THIS Band Turning Machine, by its ability to perform efficiently month after month under exceptional production strains, has proved its worth to munition makers. It is being used by many Canadian munition plants, where it is giving absolute satisfaction.

A glance over some of the features will interest you.

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy chucking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are also built for 15, 18, 60-pdr. and 6" shells.

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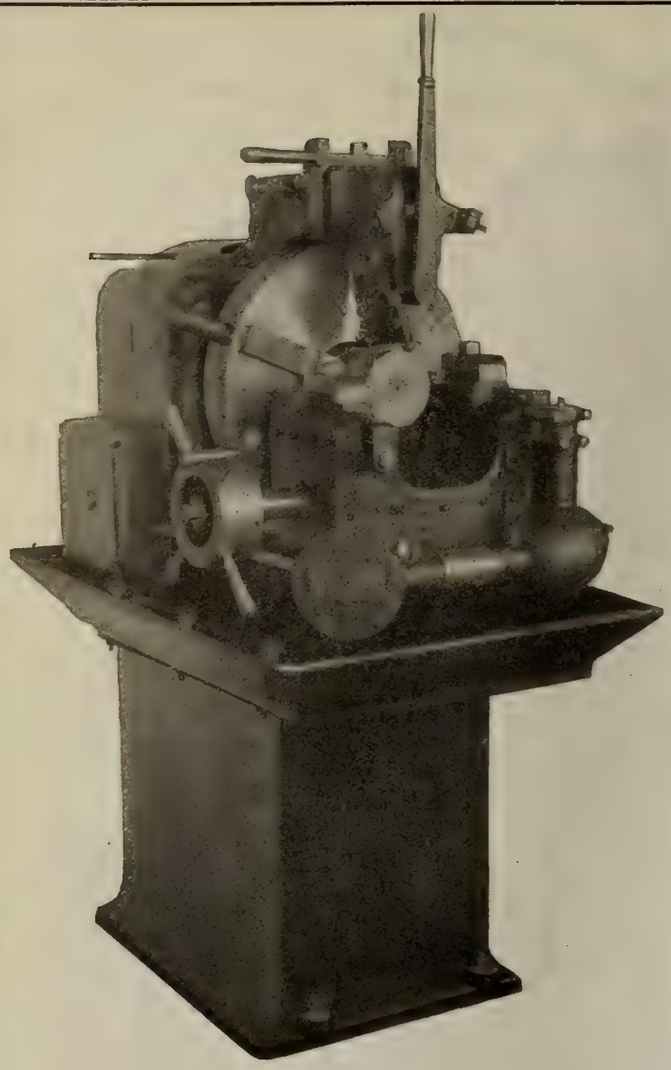

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A 4.5 grooving, waving and undercutting machine.

Rugged, compact, simple and efficient. No cams used.

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Rivet Speed

One every second is a speed which this Grant Rivet machine will keep up indefinitely, in any degree of tightness or looseness desired. Each rivet is finished with perfectly shaped head, polished and with no hammer marks showing.

We claim this is the only machine manufactured that will accomplish this feat. Our claims are unchallenged. By writing for our catalogues you may obtain full information regarding the ability of this machine.

We are rivet machine specialists. Get in touch with us.

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HIGH SPEED HAMMERS

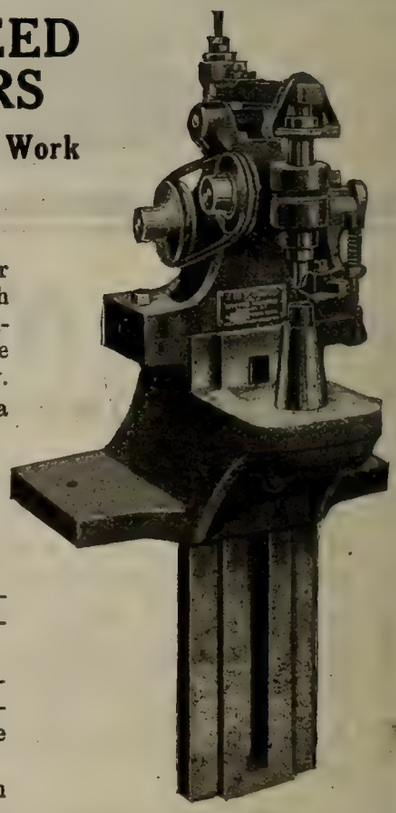
For High Speed Work

FEATURES:

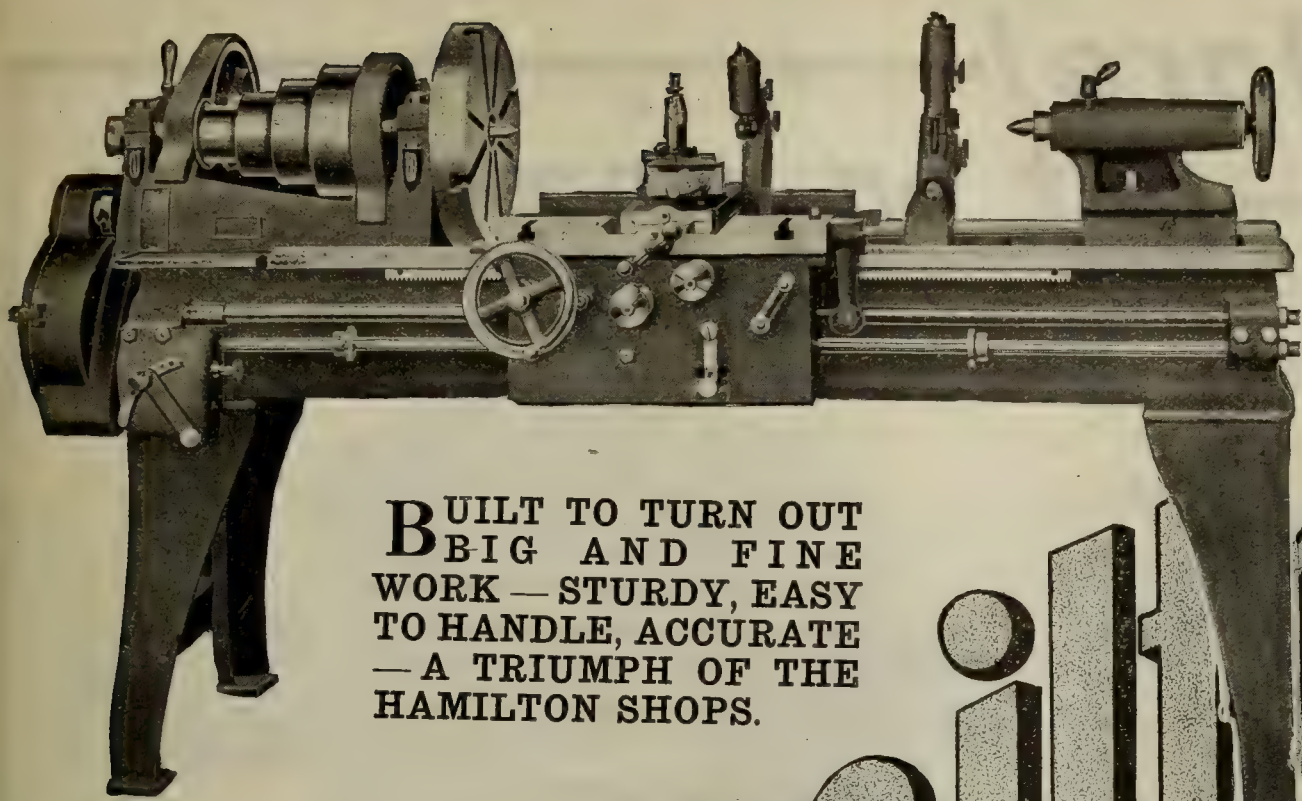
Our Bench Hammer can be adjusted high or low, and spells another economy in space and handy utility. With it you have a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushings are used throughout.

No riveting too intricate for us; no riveting which our machine cannot accomplish.

Send for our **High Speed Hammer Book.**



THE HIGH SPEED HAMMER CO.
Rochester, N.Y.
Sales Agents: The A. R. Williams Machinery Company, Limited, Toronto, Ontario.



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Hamilton

"The Distinguished Service Lathe"

In this Lathe you see exemplified the skill of expert workmen with years of "Hamilton" experience—experience which means something. It is a lathe that well represents the best of our high class machines — a lathe most carefully constructed with lasting materials—a lathe that turns out work of the calibre of its own ideal construction.

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Rapid Production HAMILTON Machine Tools

FOR 25 YEARS MAKERS OF FINE MACHINE TOOLS

The Hamilton Machine Tool Co.

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Sole Agents for Ontario: H. W. Petrie, Limited, Toronto, Ontario

Do More!

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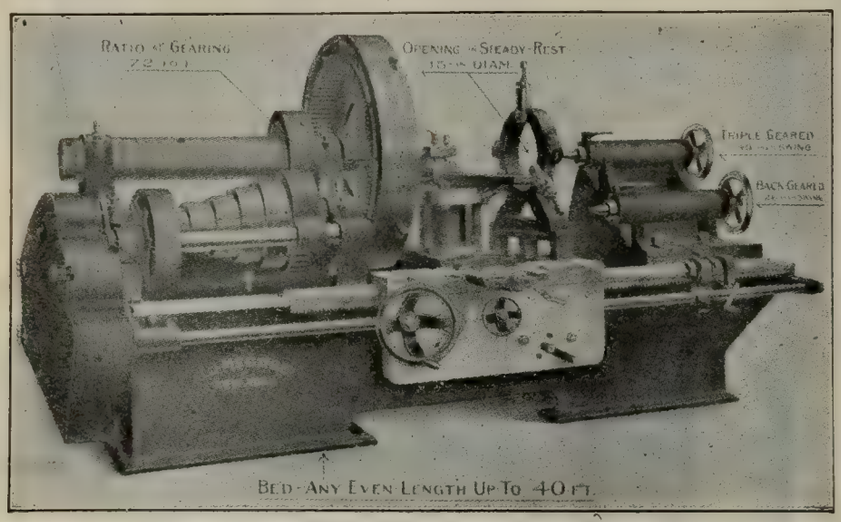
is the industrial slogan of to-day

You can "do more" with McCabe's "2-in-1" lathe than any other big Lathe built, because you have "more" capacity.



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As a 48 inch Triple-Geared Lathe.

It will carry DOUBLE the burden, by handling such work as you would put in a 26-inch lathe when there's no big work to do, as a 48-inch.

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Immediate Shipment 12-ft. beds—from stock.

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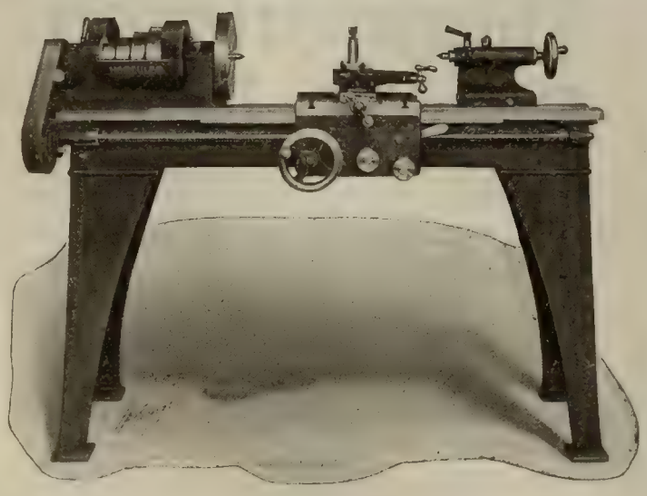

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12", 16", 18" and 21" swing

Strictly modern in design, rigidity and accuracy guaranteed.

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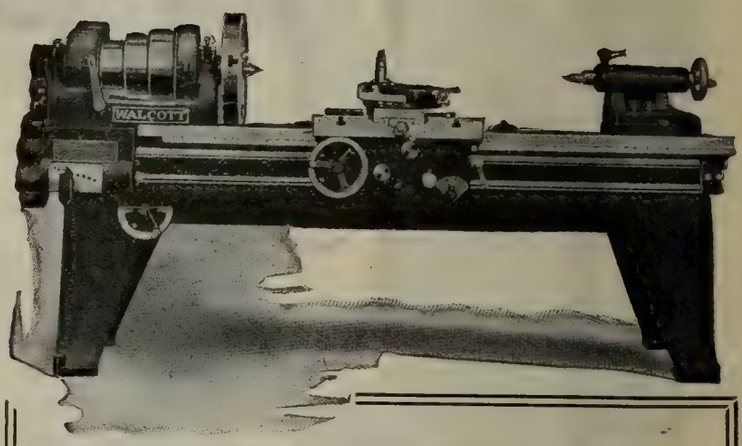

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is backed by lathe-building experience extending over 35 years

These are features of Walcott Lathes: drop-forged gears in apron; all-steel gears in gear-box; large ways on bed, all gears completely enclosed. Parts are interchangeable. Rigid headstock and tail-stock.

You'll **get the full** story in our printed matter. Send for it surely if you are about to buy a lathe.

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Successors to
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Goes Through Work Without a Hitch

BORING UP TO 6 INCHES

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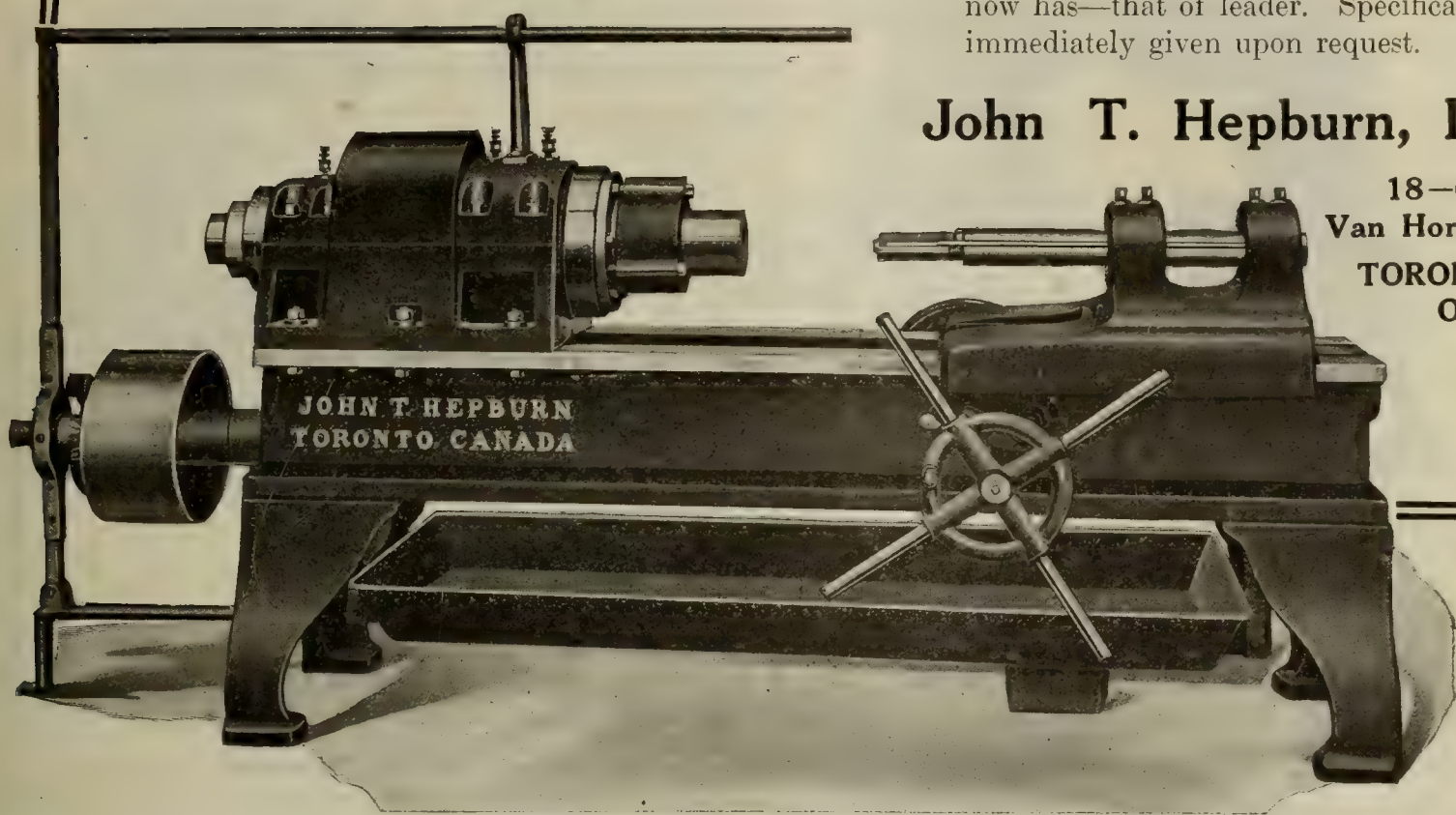

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The Planer With the Second-Belt Drive

A smooth, easy reverse—which permits higher cutting and return speeds yet prolongs the life of the entire machine — that is the outstanding feature of this distinctive Whitcomb-Blaisdell Second-Belt Drive.

Our Planer Book gives the details of design and construction. Write for it.

Whitcomb-Blaisdell Machine Tool Co.
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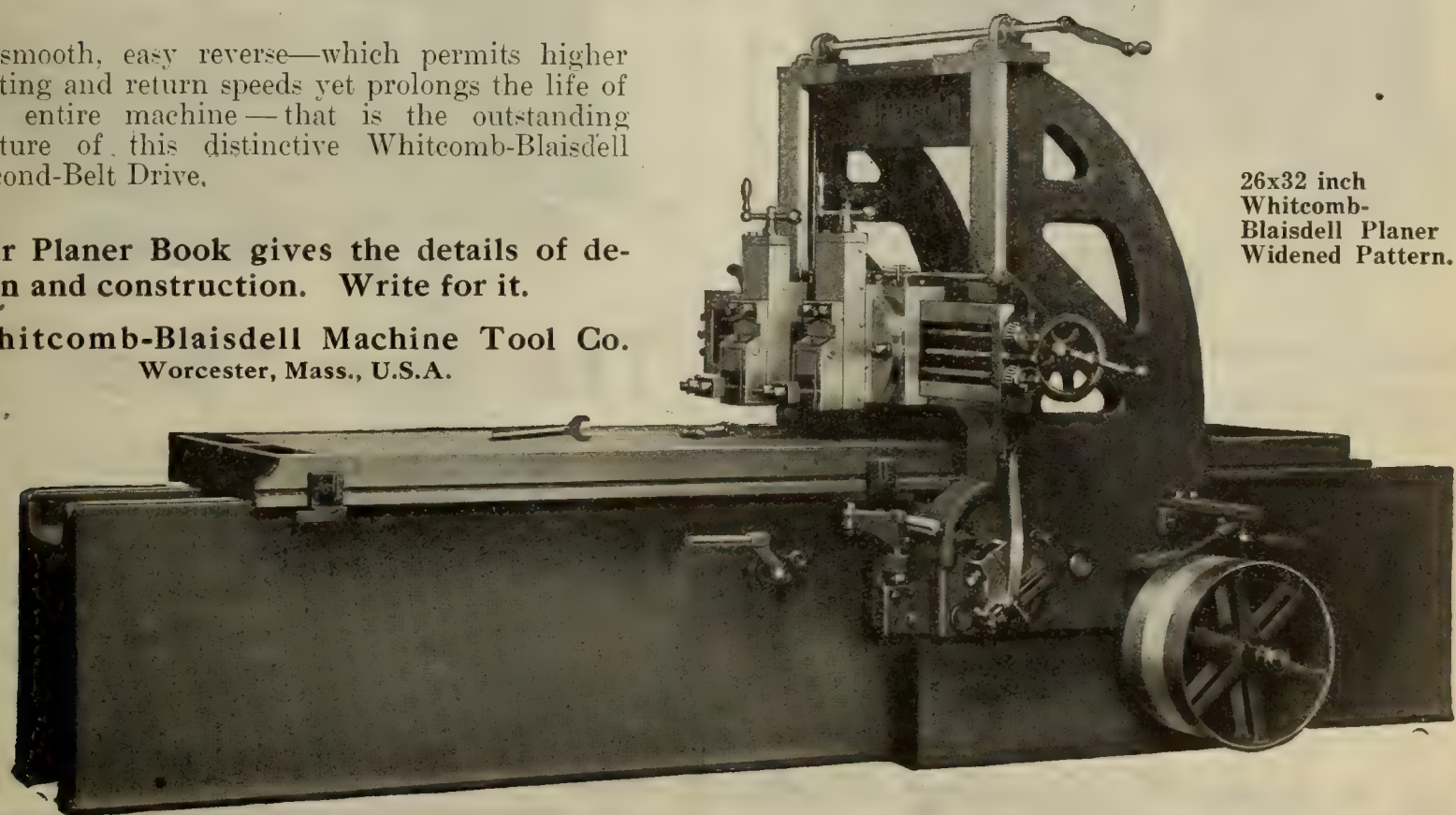

26x32 inch Whitcomb-Blaisdell Planer Widened Pattern.

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The Crank Pins are larger in diameter than the main bearings. This has always been a Consolidated feature. Crank cheeks are liberal and guarantee strength and rigidity in the shaft; this, together with the enlarged crank pin, materially resist torsion when the press is in operation.

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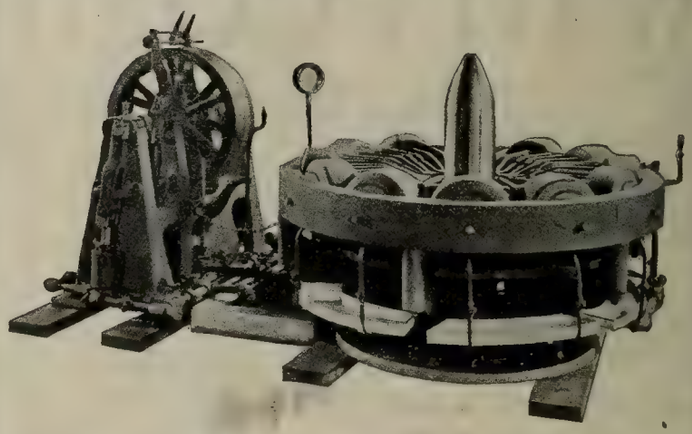

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For 9.2" and 8" shells

12 Cylinders; Ample Power; Ample Strength; Reasonable Price.

NO ACCUMULATOR REQUIRED.

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The "Toledo" No. 6 for cutting, drawing and forming steel wheel hubs, stove trimmings, and a general line of large and small stampings.

Open-Back Inclinable Presses embrace in their construction every modern feature of practical utility.

Heavy, rigid frames; large diameter shafts hammer forged from special steel; extra long and wide slides; positive inclining attachment; connections and slide adjusting screw high carbon steel forgings.

Over 20 sizes for an extensive line of work.

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A Combination of Rigidity, Accuracy, Simplicity and Ease of Operation

Bodies are inclinable and convenient for handling dies and material. Slides are long and well gibbed.

BLISS

Inclinable Power Presses

reduce the maintenance cost of both machine and tools.

BUILT IN EIGHTEEN SIZES.

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Triple Purpose

"METALWOOD"
COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.

Metalwood Mfg. Co.

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Pumps and Accumulators

FOR ALL PURPOSES

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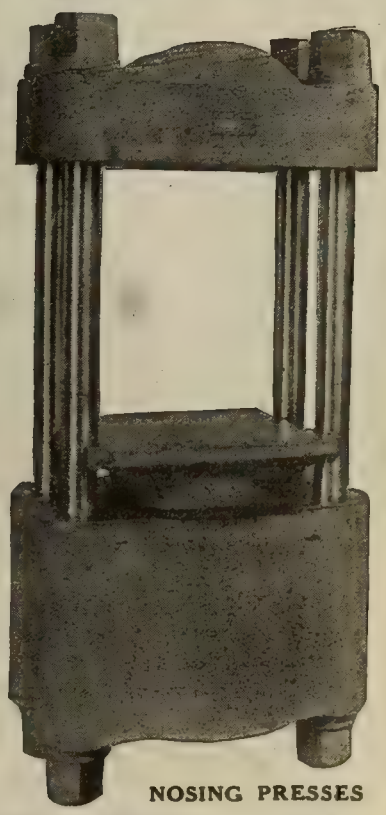

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G&W MACHINERY

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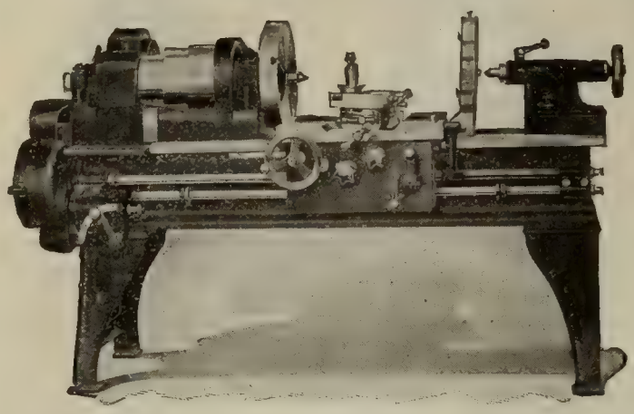

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for delivery from Toronto Stock

18″ x 8′ Giddings & Lewis Standard Engine Lathes.
Three Step Cone.
Double Back Gears.
Quick Change Feed.
Quick Change Gear Box if desired.

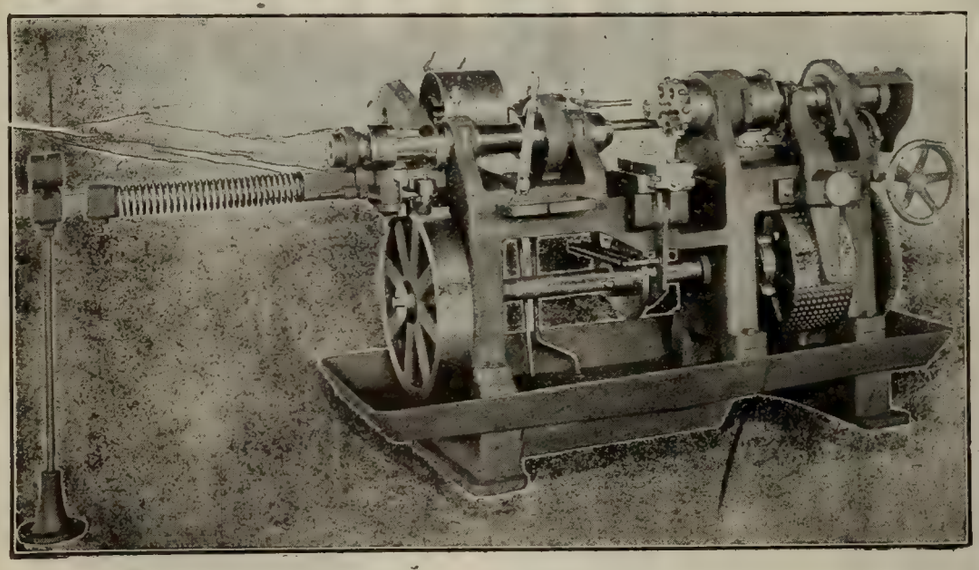
Dimensions:
Swing over bed 18¾.
4′ 5″ between centers.
Hole through spindle 1½″.

These are strongly built, accurate machines. Will give equal satisfaction in tool-room or shop.

The following extras can be furnished if desired: Taper, Relieving or Draw-in attachment, Waving attachment, Hexagon turret on carriage, Pan pump and piping.

Write for full specifications and prices.

METAL and WOODWORKING MACHINERY of all Kinds

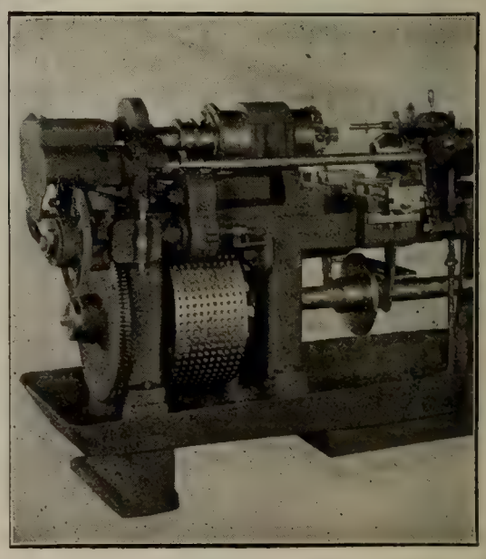


Quick Delivery

In less than six weeks from the time your order reaches us we can place

Chicago Automatic Screw Machines

in your plant ready for operation.



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By an indexing device—selective in type—one or more idle holes—holes not carrying tools—can be skipped in indexing without pause or loss of time—a feature that makes for increased production.

Chicago Automatics stand up under the strain of day and night service and economically turn out any screw machine product in minimum time. They are the result of 10 years' extensive screw machine manufacture. Drop a card now for details and specifications.

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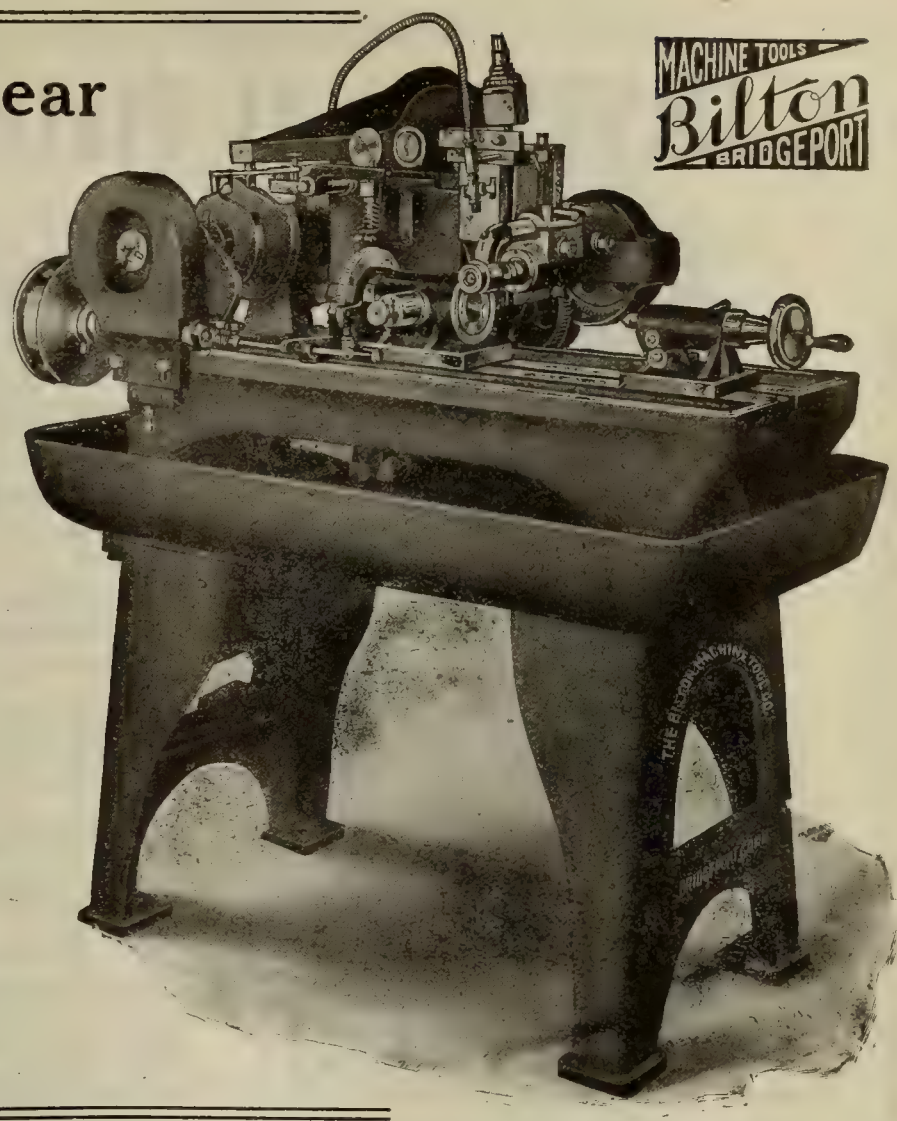
Bilton Automatic Gear Millers—Spur or Bevel Gears



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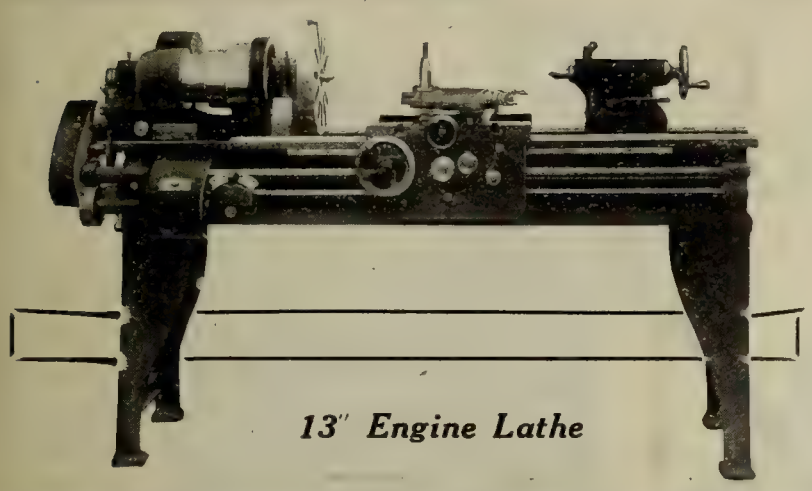

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"Filsmith" Quality

This lathe has won its way through actual experience to be known distinctly as a quality lathe. For the swing it includes, its speed is something to be wondered at. Solid full webbed headstock; 50-point carbon crucible steel spindle; massive, rigidly clamped tailstock. A study of these features on the illustration will give you an idea of its construction. A letter from you would command our immediate attention and secure for you all specifications.

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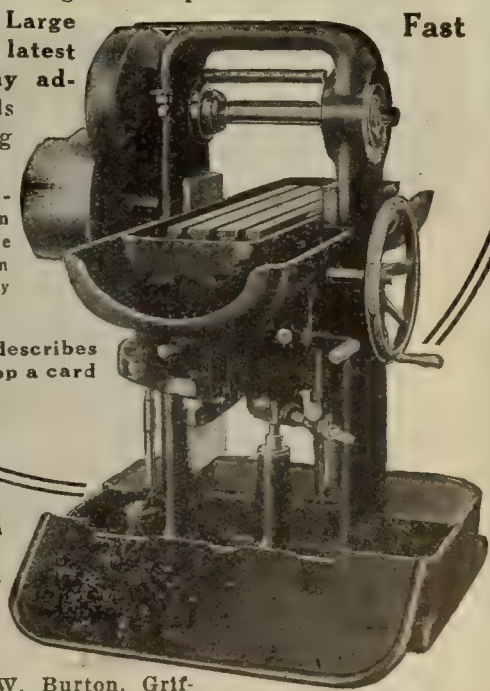

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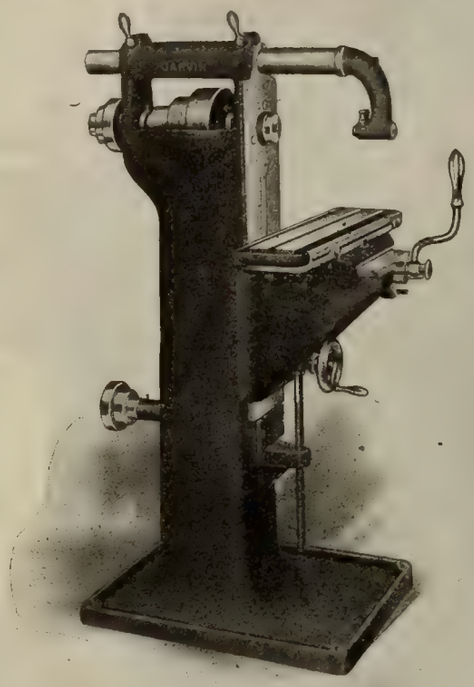
GARVIN No. 11 Plain Milling Machine



No. 11 Plain Milling Machine.
Use Code.....Abode.

Adapted to the lightest kinds of small milling and light manufacturing and suitable for jewelers, makers of electrical goods, brass workers' sewing machine manufacturers and others.

The Features of the Machine Are:

Telescope Arm.
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Spindle Bearing Taper, with adjustment.
Power Feed driven by vertical worm shaft inside of column, which drives a worm gear clutched to the pinion shaft in the knee.

Feed Works located and protected inside of column.

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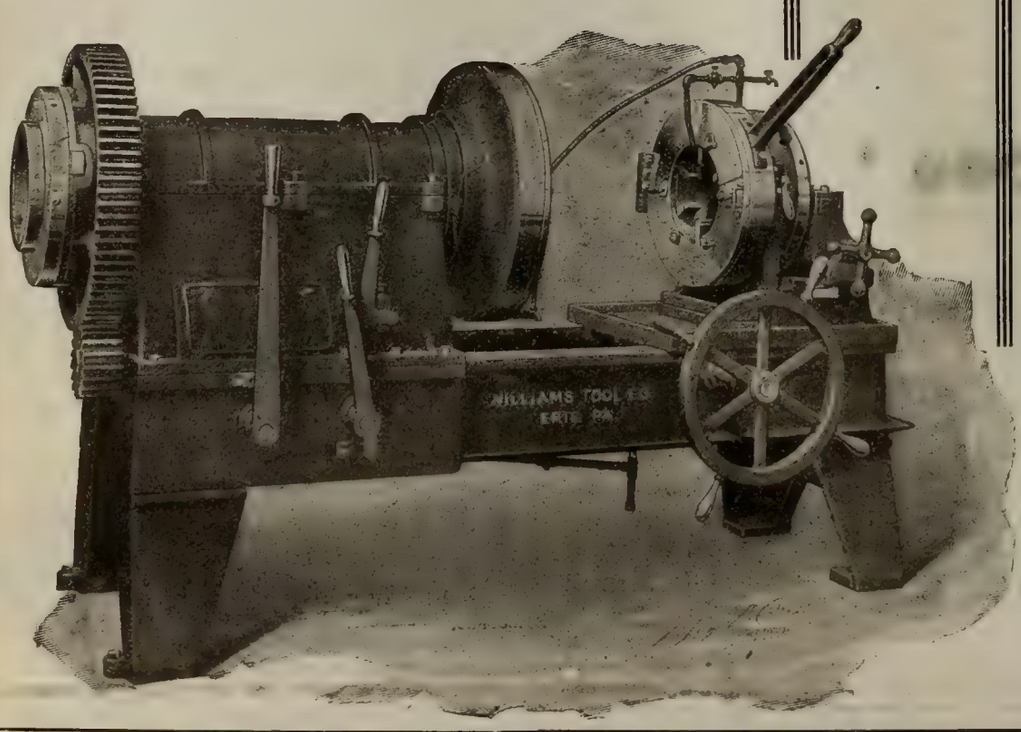

Amongst those who know the value of Williams Cutting and Threading Machine and those who use these machines, there is a confident assurance that at least one department of the works is up to 100% efficiency. They are made in 11 different sizes and each size made to include 10 sizes. For utility and value the Williams have no equal. A letter to us will command our immediate attention.

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We will send a Racine on a Trial Basis—*Why?*

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after comparative tests is that no magnifying glass is necessary to distinguish the increased production and the better class of work on the PEERLESS High-Speed Cutting-off Saw.

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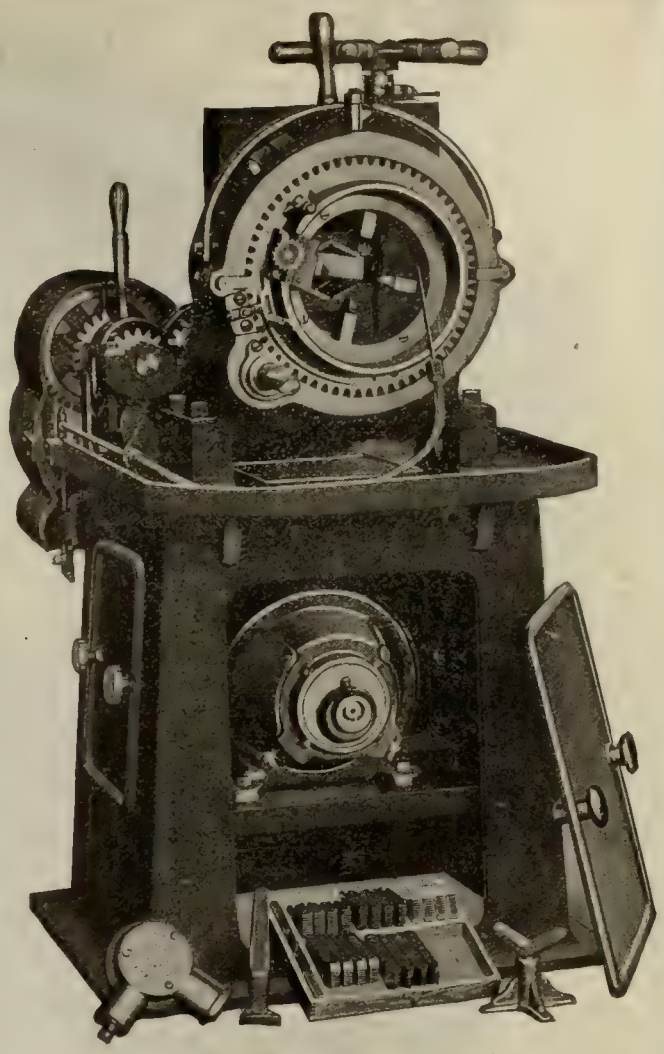
One of our customers writes: "It takes us only 1-15th of the time to cut our stock on the PEERLESS that it did on our other machine."

If you are open to conviction we have a proposition to offer that no manufacturer can afford to pass up.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.



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These are convincing arguments for the construction and utility of this machine. Thread cutting can be performed fast, clean and true. Equipped with self-centering vise.

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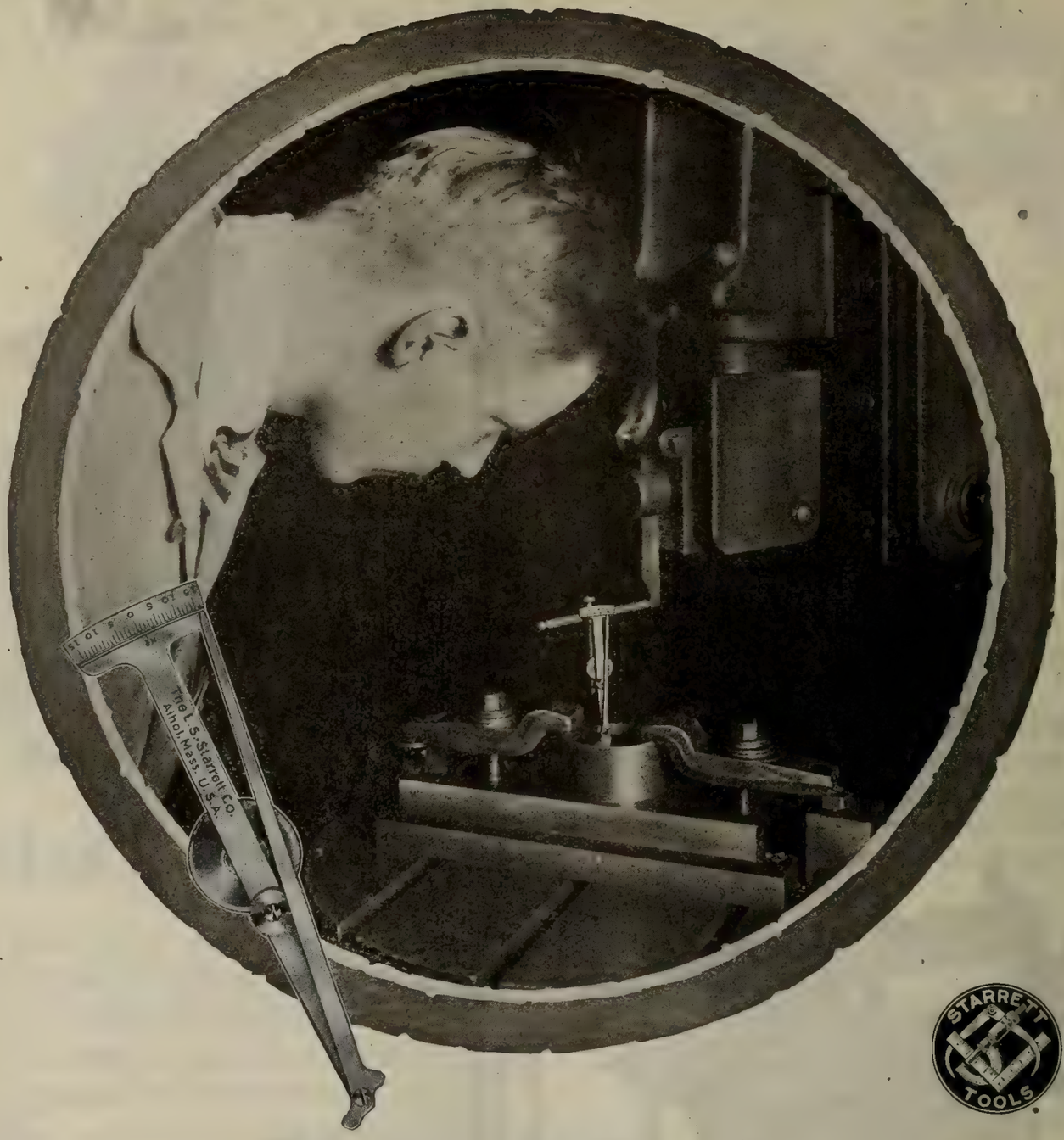

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Reduce Mistakes to a Minimum

One slight error in laying out a job or measuring the progress on it may ruin the stock and render futile the labor spent upon it.

Good men using Starrett Tools reduce mistakes to a minimum. These tools are the standard for accuracy all over the world. The line of these fine measuring instruments includes: rules, squares, levels, calipers, dividers, micrometers, vernier height gages, depth gages, test indicators and hack saws.

Write for free catalog No. 213 *describing the whole* 2100 *styles and sizes of these tools.*

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That's the kind of grinding you want
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WITH THE

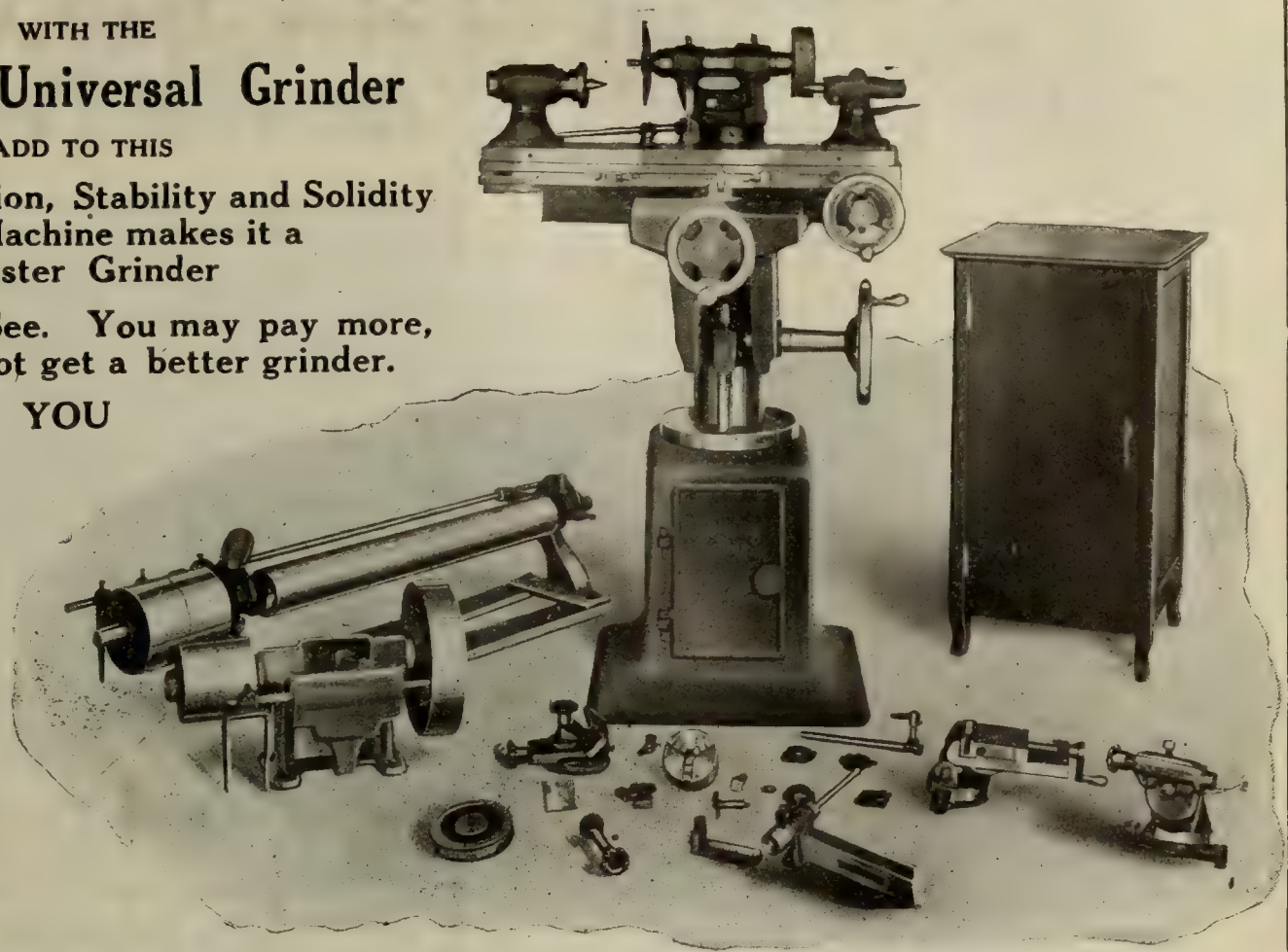
Dominion Universal Grinder

ADD TO THIS

Ease of Operation, Stability and Solidity of the Machine makes it a Master Grinder

Try One and See. You may pay more, but you cannot get a better grinder.

LET US TELL YOU MORE ABOUT IT



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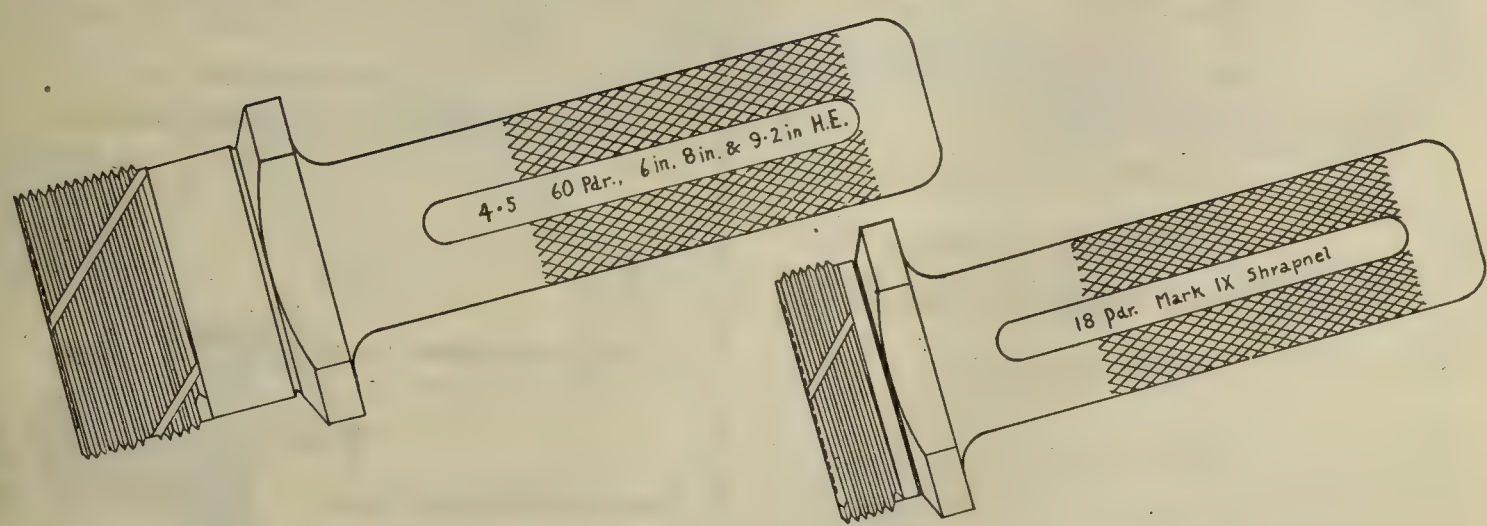

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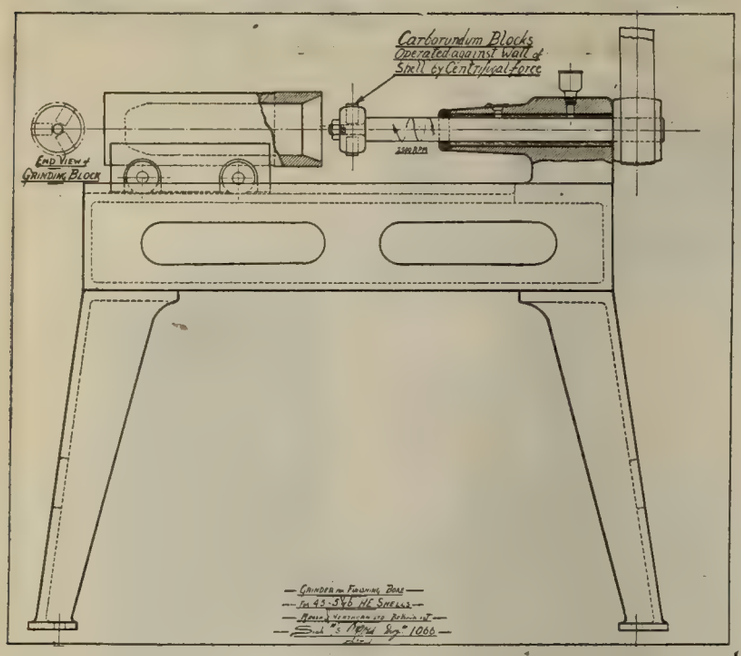

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We have designed for our own use a simple and inexpensive grinder to give the final touch to the bore of our shells.

It does the work, and we will have some of these machines on the market shortly.

Write us for our proposition.

Marsh & Henthorn
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Any Size Any Current

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Assuming that you want a grinder that is better than the average—

A grinder with massive table, micrometer adjustments, very long knee and gibs, and extra heavy head and tailstock—it will pay you to investigate the

Standard No. 6
Universal Grinding Machine

In addition, you'll find that the headstock is fitted with large bearing for chuck spindle and with special bronze bearings of navy specifications, spindle is tapped and tapered, bored to take wheel arbors, and bearings are 1 in. in diam. and 2¾ in. long, and an exceptionally simple and sturdy countershaft with self-lubricating bearings.

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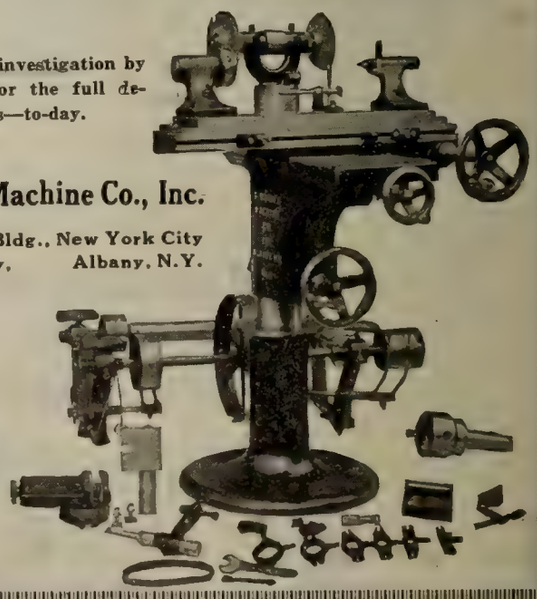

Simmons Machine Co., Inc.

1001 Singer Bldg., New York City
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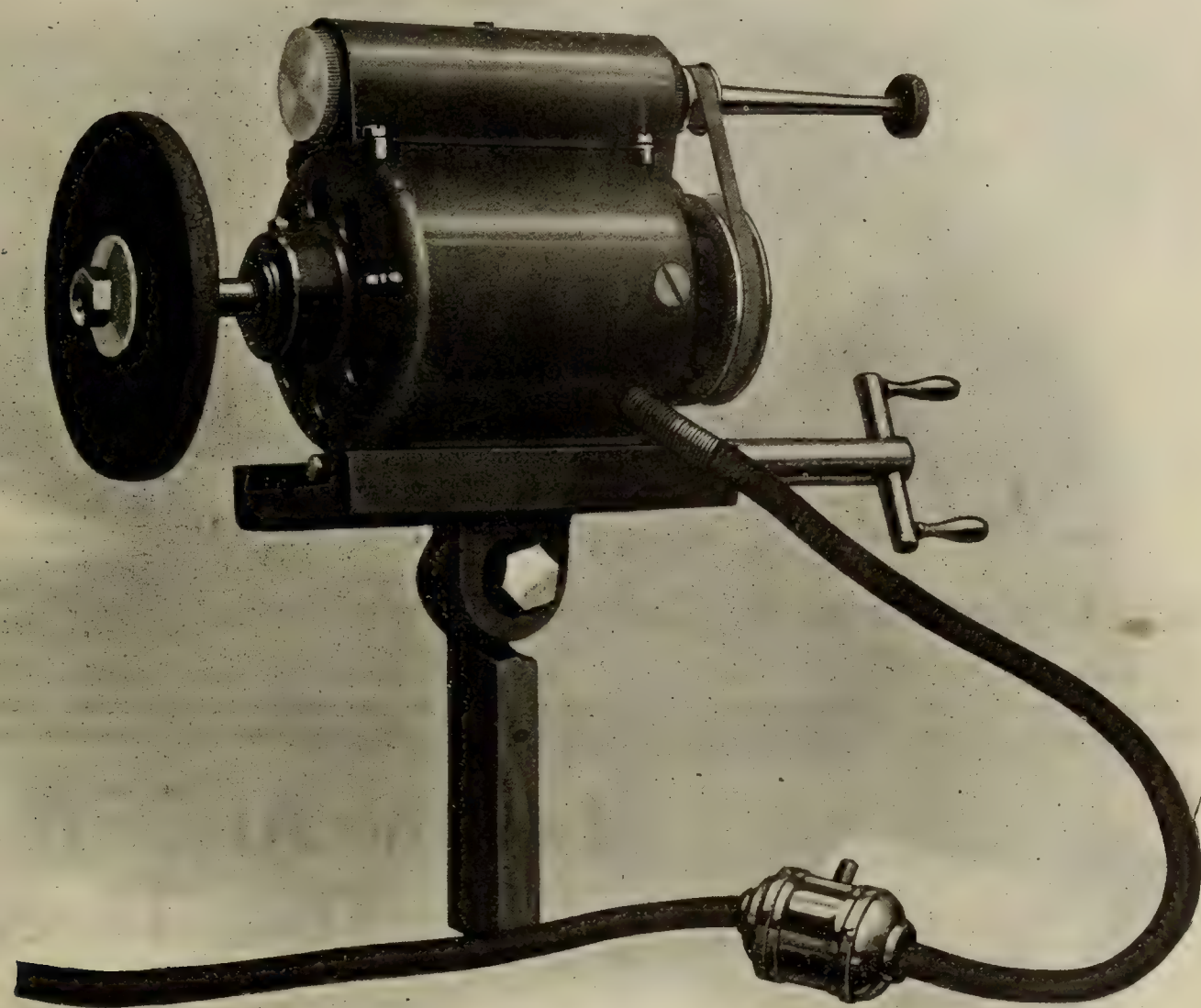
ARO PORTABLE ELECTRIC GRINDER—30,000 R.P.M.



Cut the Cost of Your Grinding Operations

The mere mention of 30,000 revolutions per minute to a man who knows grinders is a volume of information. It means speed in production—and in case of the ARO, it means perfect accuracy, too.

To do quick, accurate work, speed is absolutely necessary. If you are not giving your wheels the correct surface speed, they will break down, making it impossible to maintain accuracy. The ARO, with 10,000 R.P.M. on the motor spindle and 30,000 R.P.M. on the internal attachment, gives you a cutting speed that allows the wheels to clear themselves, and enables the operator to maintain size.

An examination of the ARO proves why it does more work and better work than the ordinary grinder—it is better built. Motor and internal spindle are equipped with S.K.F. Ball Bearings. No complicated parts to get out of order. No end thrust, no side play. Armature, internal spindle, pulleys and large emery wheels are dynamically balanced. This eliminates all vibration and assures you of perfect work, free from chatter marks. The ARO is easily carried from job to job—weighs only 17 pounds. All parts interchangeable.

The ARO Grinder is the most efficient Portable Grinder on the market. Wherever grinding is done, it will materially reduce costs. With the ARO you can do all kinds of grinding — longitudinal, cylindrical, internal grinding and other hard-to-get-at jobs.

Sold on an absolute make-good basis. How can you afford to be without it?

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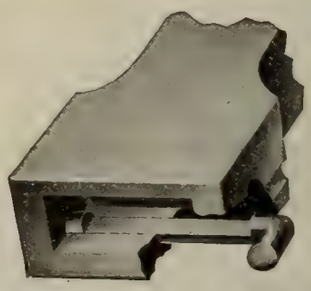
If You Change Markings Often, Use CHAMPION HOLDERS

(Patented)



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MATTHEWS' Improved Champion Steel Holders and Interchangeable Grooved Type were developed to simplify, and to economize the cost of interchangeable marking. Holders are made with spring attachment, which, combined with grooved type, keeps letters or figures securely in place, and insures accurate, straight line marking.

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Matthews' marking devices are the best that skill, 67 years' experience and modern equipment can produce. Matthews' deliveries are prompt and Matthews' prices are right. Any device you may require from a small rubber stamp to a steel stamp for marking shells. Send Matthews a trial order.

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67 YEARS IN BUSINESS

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Let the ACORN DIE Cut Your Threads

Die and Holder

THE DIE

The adjustment is mechanically perfect—simply turn the cap and all the prongs of the die converge equally—a great advantage over the spring die.

The Acorn Die Holder is smaller in diameter than any other die holder of equal cutting size.

The float permits the die to follow its own lead.

The die projects slightly beyond the adjusting cap, making it admirably adapted for shoulder work—and the chips are thrown ahead of the work, so the die does not clog.

Will you try the Acorn Die on your own work—under your own conditions?

WELLS BROTHERS COMPANY OF CANADA, Limited

GALT - ONTARIO

SALES AGENTS: The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver Winnipeg, St. John, Calgary

P H

TRADE MARK

QUALITY FILES

By virtue of their QUALITY, P. H. Files are forging ahead.

Hard as a diamond and straight as a string, they are right because they are "Made for Craftsmen—by Craftsmen."

Port Hope File Mfg. Co., Limited

Port Hope, Ont.

"Ask your jobber"

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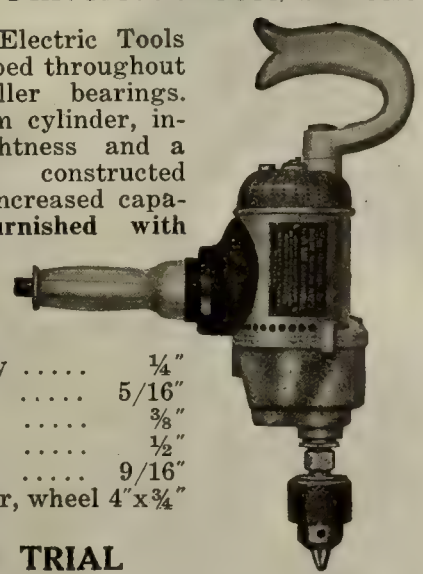
UNIVERSAL Electric Drills

Licensed Under Burke Universal Motor Patent



The only Portable Electric Tools made that are equipped throughout with ball and roller bearings. Made with aluminum cylinder, insuring extreme lightness and a powerful specially constructed motor resulting in increased capacity. **Can be furnished with Universal, Alternating or Direct current motor 110 or 220 volts.**

000	Drilling Capacity	¼"
00	" "	5/16"
0	" "	⅜"
01	" "	½"
1	" "	9/16"

No. 6 Electric Grinder, wheel 4"x¾"

SHIPPED ON TRIAL

Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.

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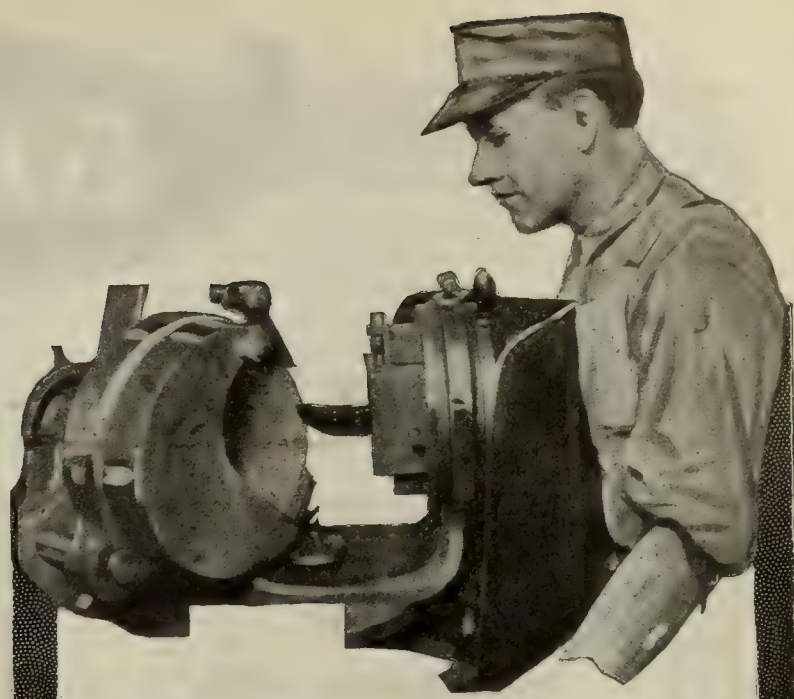

Alundum for High Speed Steel Tools

The grinding of high speed steel tools requires the use of a wide variety of wheels, each one the correct wheel for its purpose.

For offhand grinding the wheels range in grade from M to P and in grain from 20 to 80, according to the size of the wheel. The abrasive is exclusively Alundum and the process both Vitrified and Silicate.

For automatic machines, similar to that pictured above, the wheels usually supplied are listed below.

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20 M and N	**Vitrified Alundum**
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ELECTRIC FURNACE PLANTS:
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Repeat orders are the acid test of a product. No man buys a second time unless he has found a satisfactory product.

In September, 1915, the Colt's Patent Fire Arms Manufacturing Company bought 50 SKF Ball Bearing Hangers—as a trial installation. After a year's trial they bought 400 additional SKF Hangers.

But this is not all. In January, 1917, they bought 200, and in May, 1917, about 500 SKF Hangers, making a total of over 1,000 SKF Hangers.

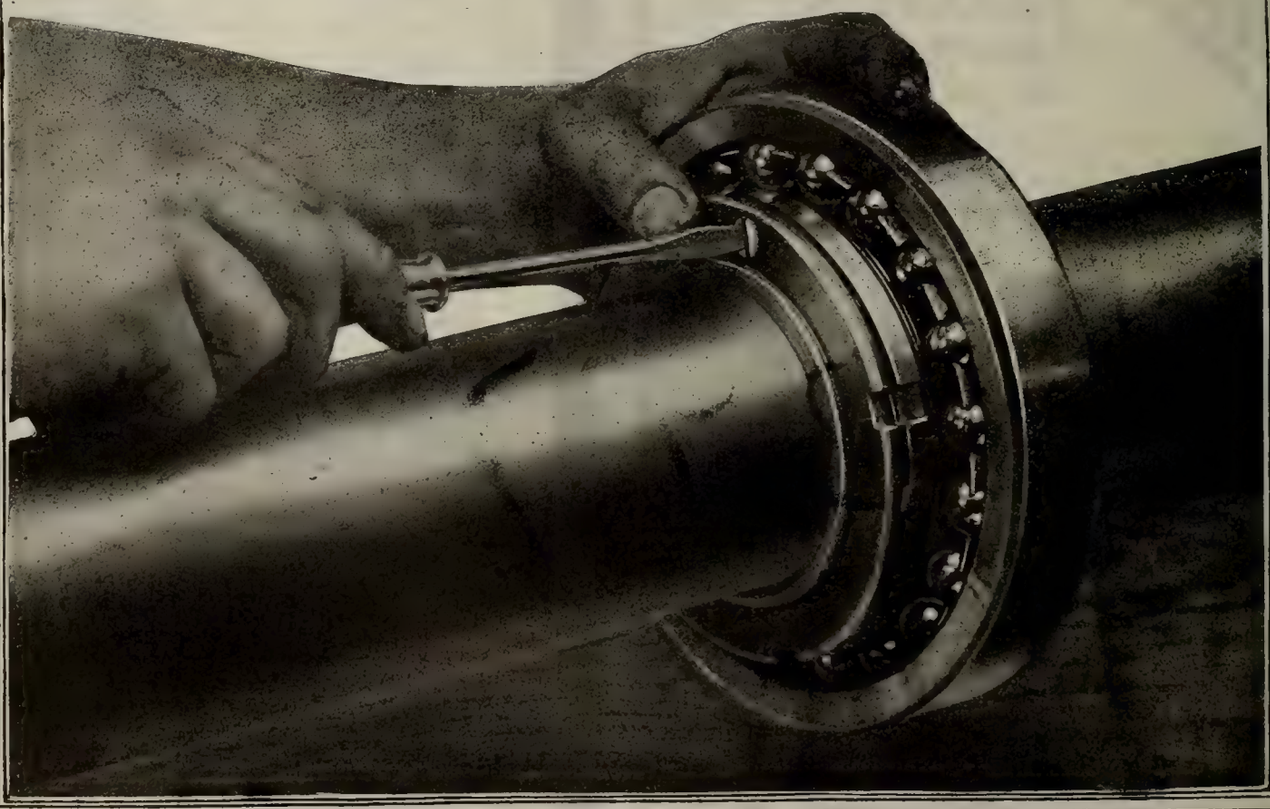
This is satisfaction—SKF satisfaction—and repeat orders are the proof. Our Hanger Catalog No. 78 will give you further proof. Send for it.

CANADIAN SKF CO., LIMITED
TORONTO, CANADA

Sole Canadian Agents SKF Transmission Bearings

The Canadian Fairbanks-Morse Co., Limited

St. John, Windsor, Quebec, Winnipeg, Montreal, Saskatoon, Ottawa, Calgary, Toronto, Vancouver, Hamilton, Victoria



Problems Entering Into Aeroplane Engine Design--I*

By Charles E. Lucke

The aeronautical engine is emerging from the stage of invention to the stage of design, and this paper suggests steps to be taken towards the satisfactory solution of the problem. It resolves the engine into a light, high-tensioned steel structure, consisting of seamless tubing and forged or welded steel parts, possibly formed in drop forge dies. To this steel stress structure are added certain members, such as the piston, exhaust valve and guide, designed primarily for heat-flow conditions and not for stresses; and certain closing members, such as the parts for the intake and exhaust, which can be very properly cast in aluminum; and the oil crank case closure, which can be made of any material desired and readily available.

THE problem of the aeroplane engine appeals strongly to every engineer because it is a problem of the lightest power plant. The lightest weight in engine proper per horse-power is to be secured first by obtaining maximum mean effective pressure at maximum speed; in other words, the product of mean effective pressure and speed must be a maximum. At the same time the weight of metal per cylinder, or per cubic inch of cylinder displacement per working stroke must be a minimum — and with both of these factors the engine must be reliable in operation. So far, this reliability factor has been weakest, though lightness has been secured in engines good for short periods of running.

Metal and Fuel Weights

Not only must the metal weight of engine per horse-power be a minimum, but in addition the fuel weight to be carried must also be a minimum because, as can be readily seen, the fuel weight necessary for flights of any length predominates over the engine weight. For example, taking a half pound of fuel and oil per hour per horse-power as a fair value, it is readily seen how quickly that will catch up on engine weight when the latter is 4 or 5 lbs. per horse-power.

In undertaking an analysis of the aeroplane-engine problem from the records, the only conclusion that can be drawn is along the line of type. Data are almost entirely lacking. On the question of general engine types, attention might be called to a few points:—

The air-cooled motor has entirely failed in comparison with the water-cooled motor—the reasons are perfectly sound and secure. The 2-cycle engine has given way to the 4-cycle type. Fixed cylinders have prevailed over rotating cylinders. Odd cylinder arrangements of queer, freaky forms have all been relegated to the scrap heap in favor of a few modern arrangements. The standard cylinder arrangements of to-day, which are the survivors of what may be called the inventive period, or at least the first inventive period, are the six and eight cylinders in line and the eight, twelve and sixteen V's.

Standardization and Perfecting of Certain Types

It really appears, therefore, that the one valuable result of all our experience has been the selection of a few typical arrangements which we are now compelled to study, as minutely as circumstances permit, for the purpose of standardizing and mechanically perfecting these particular types as standard machines which will run as reliably as our stationary engines and which can be manufactured as economically. Taking up each of the factors of aeroplane- engine design that seems important, in as specific a way as seems proper, the first one I wish to consider is the value of efficiency and relation of efficiency to minimum weight.

Plotting hours of running as abscissae against weight of engine with fuel and oil, as ordinates, for the air-cooled and the water-cooled types of motor, respectively, so that the intercept on the vertical axis represents the weight of engine metal alone, and the ordinates away from the axis represent the weight of metal plus fuel and oil, one finds that the two curves cross at some period of running beyond which, therefore, the water-cooled heavier engine, because of its lower fuel consumption, becomes lighter in comparison. The metal weight of the water-cooled motor is about one and one-half times that of the air-cooled motor, and the slope of the combined-weight line of the latter compared with that of the former is as two is to one—that is to say, the consumption of the air-cooled motor is approximately twice that of the water-cooled motor. These facts are responsible for the crossing of the lines.

Efficiency Relative to Fuel Weight

Of the conditions for efficiency which bear upon this question of fuel weight, and which have led to the selection of the water-cooled motor as a type, the first is the compression. The higher the compression the higher the efficiency, and there is no limit until preignition occurs. Statements will be found in textbooks to the effect that there is a limit, but they are the results of mistakes in interpretation, and are erroneous. The amount of compression possible is limited, however, by the metal temperature and by the temperature of the mixture as admitted. Naturally, the warmer the mixture during suction, the sooner it reaches ignition temperature by compression. Therefore, suction heating is a limit. Again, the interior metal temperature, if it is high (as it is always), may cause trouble by the contact with the mixture during compression, and some portion of the mixture may be brought to its ignition temperature by hot-wall contact long before the main mass is brought to this ignition temperature by compression alone. It requires only one such hot spot to wreck a well-laid plan.

The Explosive Mixture

The next factor in efficiency is the mixture quality, and in this there are the following controlling elements: first, mixture proportions. Any excess fuel means direct waste, but it also means carbonization and fouling. Excess air quickly makes the mixture practically non-burnable. Therefore, mixture proportions must be accurately controlled—more accurately than is possible with any existing carburetor. Carburetors are not yet satisfactory, and as soon as satisfactory carburetors are secured from the standpoint of proportionality of the mixture, we may expect to see a further reduction in fuel consumption and more reliable operation.

Dryness of mixture is a matter of coordinate importance with mixture proportions. When mixtures are wet, that is, not completely vaporized, the air and fuel cannot be uniformly distributed to the various cylinders by the manifold system. One cylinder will get a different charge from another, as can be easily proved by pressure gauges. There are rarely two cylinders alike as to maximum pressures on a multi-cylinder engine using wet mixtures. Drying of the mixture will cure that fault, and also cure the carbonization that comes from the vaporization of the liquid in the presence of the burning gas when it has been admitted to the cylinder in a liquid state.

The third factor of the mixture question is homogeneity. However accurately the mixture may be adjusted as to fuel and air ratio, however carefully the mixture may be distributed, cylinder to cylinder, the fact remains that, in order to produce economical results, the charge in any one cylinder must be uniform in every cubic inch of it. It is not sufficient that the right amount of air be in the cylinder even if the fuel is vaporized, when the latter is all in one corner.

Flame Propagation and Piston Speed

Following mixture quality, the next factor in efficiency is rate of flame propagation with reference to piston speed. It can be shown that the explosion line of the indicator card following compression must be maintained vertical for maximum efficiency. Now, the rate of propagation is the one factor that tends to hold it vertical. If the propagation rate

*Abstract of A.S.M.E. Spring Meeting Paper.

is high enough for a given piston speed, so that the explosion line is vertical, the efficiency will be high. But should the piston speed exceed a certain value, then the explosion line will begin to lean toward the expansion line, until by and by it becomes horizontal and merges into the expansion line, with a consequent large loss of work area and low efficiency or high fuel consumption. Therefore, there is for every given mixture a limiting piston speed that cannot be exceeded without destroying efficiency, and we are now approaching that speed in aeroplane engines.

M. E. P. and Speed

The next related factors are mean effective pressure and speed. These are the prime factors for the output of a cylinder. If the mean effective pressure were constant, then the horse-power with reference to the speed would follow a straight line. The mean effective pressure is not constant as the speed varies, however. Therefore, plotting horse-power against speed gives a curve having the general form of concave downward and consisting of several separate portions, each worthy of study. There is usually a straight portion over a given speed range, during which the mean effective pressure is constant. For lower speeds the mean effective pressure is lower, and for higher speeds the mean effective pressure is again lower. From the point where, with increasing speed, the straight line becomes a concave-downward curve, the mean effective pressure is decreasing as speed increases, until at the point where the tangent to the curve becomes horizontal, the rate of increase of speed is exactly equal to the rate of decrease of mean effective pressure. At a little higher speed mean effective pressure decreases faster than speed increases, and finally the curve drops down toward zero power.

So much for the facts. An analytical engineer cannot be content with those facts, however, but finds it necessary, if he is to apply a cure, to go behind the facts to ascertain the reasons. The first step in doing that is to determine the volumetric efficiency of the engine by measuring the air and fuel and comparing total volume of mixture taken in with the piston displacement. If the volumetric efficiency be plotted against the speed much light is thrown on the situation. In the first place, the volumetric efficiency falls off in the region of very low speed, where the mean effective pressure is low; it is constant over the region of constant mean effective pressure, where the horse-power-speed line is straight, and then at some high speed it again decreases. It is clear, therefore, that curvature of the horse-power-speed line is due to a corresponding variation of volumetric efficiency. It may be found, however, that at some high speed the horse-power-speed line falls before the volumetric efficiency. This calls attention to the fact that the falling-off of mean effective pressure at high speeds may not be due primarily to volumetric efficiency but to other causes, and recognition of this starts a search for those causes.

The first of these causes is too slow a combustion, or too high a piston speed. That is to be corrected by adding an additional ignition source, or by moving the spark plug from a side wall to a centre point. Igniting at more than one point or at a more central point will cure this defect, and again cause the dropping points of both horse-power-speed and volumetric efficiency-speed curves to lie on the same speed line. Again, it will be found that a change in the valve setting changes this mean-effective-pressure at both ends, but every change in the valve setting also changes the mean effective pressure, and the volumetric efficiency is itself the direct measure of whether or not one has the best valve setting.

Now, it is curious that most people have played with cams and adjusted them back and forward by guesses, and have never bothered about the air meter, which is the only positive means of arriving at best cam forms and valve timing for sustained mean effective pressure at high speeds. Many more analyses along the above lines could be given, but enough has been said to call attention to this most important means of studying the problem of maximum power at high speed, not only revealing what is the matter but pointing out clearly the direction in which to correct the fault.

So much for efficiency and mean effective pressure, or efficiency and horse-power per cubic foot of cylinder. Those two factors bear directly on the fuel weight to be carried and the output per cubic foot of cylinder. What will be the weight of that cubic foot of cylinder? This has to be judged both by qualitative and quantitative analysis. It is impossible to give any quantitative analysis without long mathematical treatment, so I will undertake only the qualitative analysis.

Unit Metal Weight of Multi-Cylinder Engine

The first point in qualitatively analyzing unit metal weight of the multi-cylinder engine is to recognize that the engine can be divided laterally by planes into sections of one cylinder each. The end sections are the same as each other, but are different from the intermediate sections. Therefore, to study qualitatively the relative weights of two typical constructions, the mind must be concentrated upon these sections, each one of which includes a cylinder, a piece of frame, a piece of shaft and the other parts that go with the section.

From this point of view, consider multiplication of cylinders in line vs. radially or circumferentially. It will appear that the weight of the cylinder, piston and connecting rod is just the same no matter how the cylinders are arranged, but the frame weight and shaft weight are reduced by any multiplication. It is clear also that, other things being equal, the lighter arrangement is circumferential rather than longitudinal multiplication. Going back to the history of the situation, we find every conceivable combination has been tried, but these have finally crystalized to not more than two kinds, giving the V-type engine and the engine with cylinders in line.

Considering the effect of cylinder diameter upon unit metal weight, it will appear that from the unit-weight standpoint the cylinder diameter should be as large as possible, because the wall thickness of a cylinder is always greater than necessary for the stress for other structural reasons. A 1/16 in. cylinder of steel will not be stressed over, say, 10,000 lbs. per sq. in. The cylinder could be made much thinner than this and still have a good working stress if there were not other structural objections to it. This being the case, the larger the cylinder for a cubic foot of displacement the less the unit metal weight in the wall and the only limit to large diameter is good running.

Considering the stroke, as this is increased, the metal in the cylinder piles up endwise, or axially, too fast with reference to volume, and therefore for minimum unit metal weight the shorter the stroke the better. In proportion, we are using, normally, shorter strokes in aeronautical motors than in automobile engines for that reason. Again, as affecting the metal weight, we have the connecting-rod length. Clearly, the shorter the connecting rod the shorter the frame, and therefore the more metal saved. The only objection to the shorter connecting rod is an excessive angularity, which introduces stresses requiring metal thickening in other places.

Number of Cylinders

The number of cylinders should be as large as possible up to the point where the weight of the connecting parts has to be increased. A 2-cylinder engine has less than twice the weight per cubic foot of displacements than a single cylinder for the reason that the number of end supports from the shaft, etc., is not increased. Similarly, a 3-cylinder has less than three times, a 4-cylinder less than four times, and so on; and the weight per cubic foot of displacement gets less and less until a certain number of cylinders—somewhere about six—is reached where the shaft diameter and the weight of the frame must be increased so as to retain the necessary stiffness, whereupon the saving in weight by multiplication is neutralized. This appears to be about the limit of saving by line multiplication.

The metal weight per cubic foot of cylinder displacement has to be taken up along the lines indicated, extending the study to the form vs. weight of each individual member. It will appear, as one examines the forms of these individual members, that one form is clearly susceptible of less weight than another—even with the same working stresses or with equal factors of safety.

Aluminum Alloy for Machining.—A suitable mixture for small castings upon which a thread has to be cut, or machine work has to be done, is obtained from 82 per cent. aluminum, 15 per cent. zinc, and 3 per cent. copper. This alloy cuts freely and does not clog the tool.

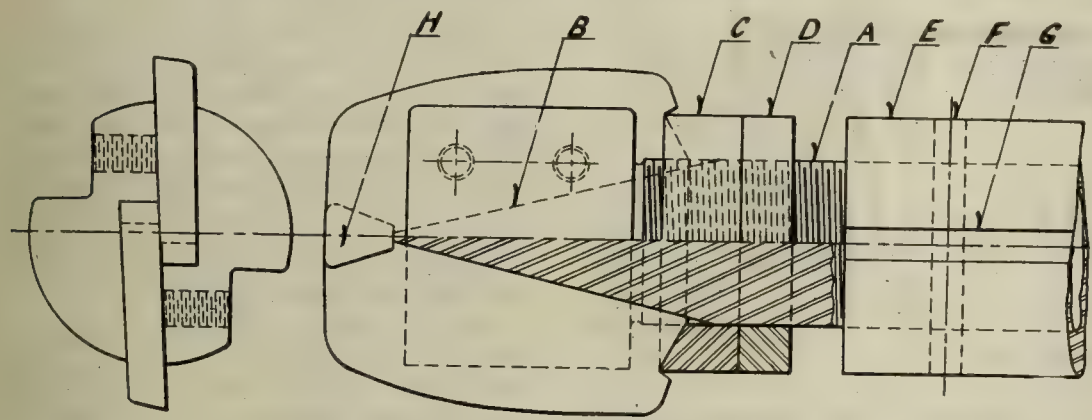
PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

ADJUSTABLE BORING BAR

By J. H. R.

MAINTAINING the size of base boring cutters as used on the high explosive shell, has been and still is one of the problems of the munitions shop. With the ordinary solid, one-size cutter, it is necessary to carry quite a stock to meet all possibility of wear and breakage. With the boring bar here shown, designed and constructed by John McDougall Caledonian Iron Works, the life of the cutters has been increased indefinitely, one of these bars having been in use for several months with the original cutters. The sketch illustrates quite clearly the construction of the device. The bar A, 1⅝ inches in diameter, has a large end in which the cutter slots are milled at an angle with the axis as shown at B. The front nut C is bevelled on the side adjoining the cutters so as to assist in retaining the latter in position; these adjusting nuts C and D when locked together take the end thrust of the cutters, which are additionally secured by means of the two grub screws shown. On the back portion of the bar the sleeve E is placed, this sleeve fitting the hole in the turret. The sleeve is locked to the bar by the pin F, and along the top of the sleeve a small copper tube is inserted to carry the lubricant to the forward end of the bar when same is working in the shell. To provide for sufficient adjustment, and still retain metal enough for end cutting, the cutters are made with lips that overlap each other, as shown at H. These boring bars have been in continual operation and are giving every satisfaction.



ADJUSTABLE BORING BAR.

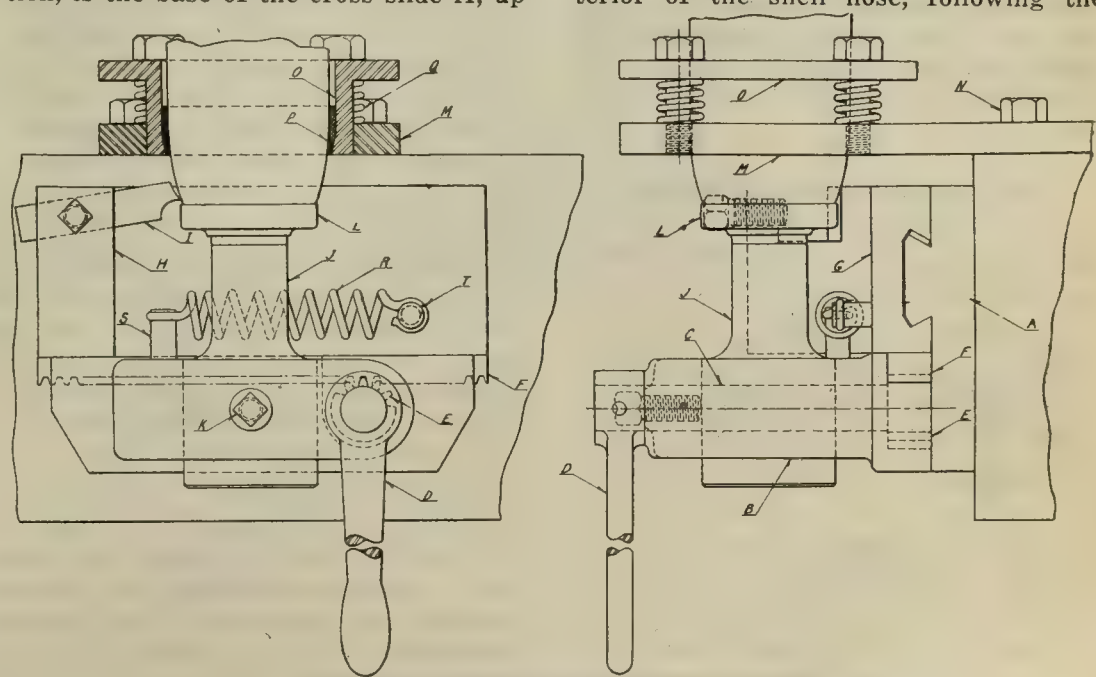
FIXTURE FOR TURNING CRIMPING GROOVE

By S. B.

INGENIOUS methods have undoubtedly been an outstanding feature in the machining of the various types and sizes of shells, and it is very interesting and instructive to study a few that have been developed for the purpose. In view of the sudden and widespread growth of the munitions industry, it is not surprising to see such a variety of mechanical appliances in use, for the accomplishment of the different operations; the successful achievement of which has been attained through many channels, hewn out according to the wide range of experience and varied resources of the many men and plants involved. Maximum production depends largely upon speed and accuracy, and it has been with this object in mind that the great number of machine attachments have been designed and constructed.

The accompanying cut illustrating a general arrangement of a lathe fixture for turning the crimping groove in Mark IX. shrapnel, was designed and is used by the Nova Scotia Steel & Coal Co. The entire attachment might be classed as a unit in itself, as it comprises a steady head, tail support for shell, and cross slide for cutting tool; all secured to and moved in conjunction with the carriage. Secured to the carriage in a fixed position, is the base of the cross slide A, upon the side of which is the upright housing B that carries the operating shaft C. To the top end of this vertical shaft is the lever D, the movement of which controls the feed of the cutting tool, by the action of the pinion E in the rack F; the latter being secured to the side of the cross slide G. One end of this slide is provided with a suitable lug H, to support the cutting tool I. Passing through the housing B, and concentric with the lathe spindle, is the short shaft J adjustable to correct position by means of the screw K. The outer end of this short shaft carries the revolving head L that supports the mouth end of the shell while the groove is being cut.

As an additional support for the shell, a special steady head has been devised. The plate M is firmly bolted to the front of the carriage as shown at N, and a hole is bored in the upper portion, central with the lathe spindle, to receive the bush O, which in turn is lined with a bronze bush shown at P. The springs Q, between the fixed plate M and the flange of the bush O, permit of the steady rest accommodating itself to any slight variation in the shell diameter. The cutting point of the tool I is always in relatively the same position to the revolving head L, and it is therefore obvious that the groove will be cut in a uniform location on each shell, irrespective of the latter's position when held in the chuck. The tension spring R is used to withdraw the tool from the work after cutting; one end being secured to the fixed stud S, and the other to the pin T, secured to the movable tool slide G.

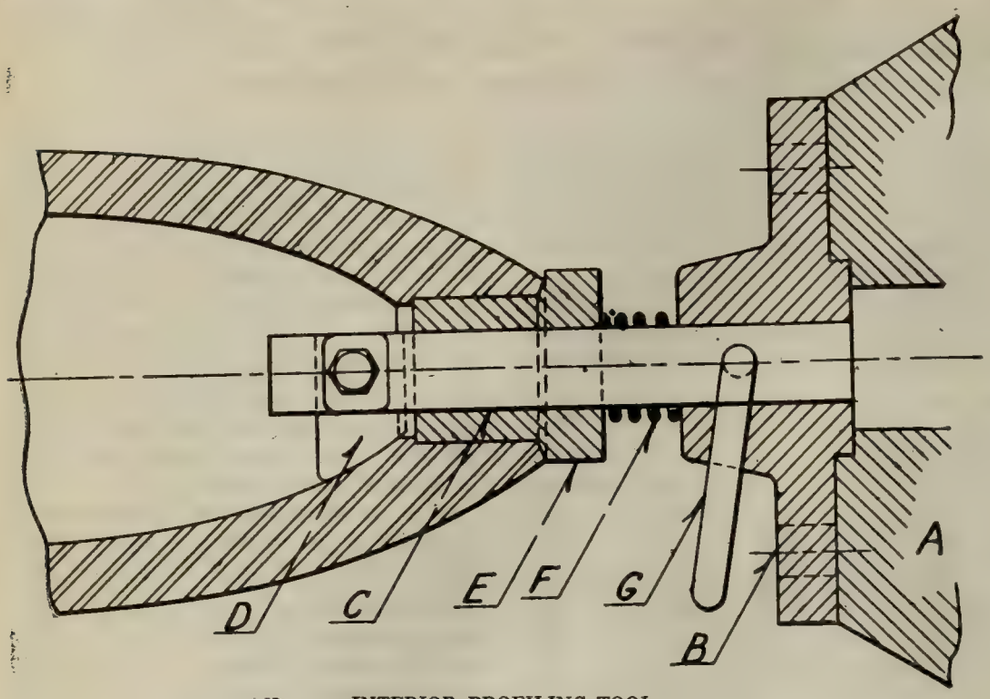

LATHE FIXTURE FOR CRIMPING GROOVE.

INTERIOR PROFILING TOOL

By R. Hamilton.

THE smoothing and sizing of the interior of the shell nose, following the hot closing process, has brought into play many unique tooling devices for the machining of this particular portion. Ow-

ing to the small opening at the nose it is somewhat difficult to sufficiently support the tool while the irregularities are



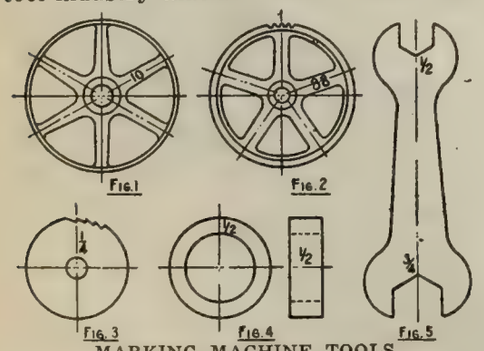
INTERIOR PROFILING TOOL.

being removed. The sketch shows a special boring attachment developed by the Canadian Buffalo Forge Co., and used on the ordinary turret. The bar holder B is bolted to the face of the turret A, and supports the rear end of the boring bar C, through a slot in the inner end of which the forming tool D is secured. The bush E is a close sliding fit on the bar and also in the hole of the shell previously bored to the proper size. The spring F is for the purpose of pressing the bush forward so as to steady the bar while the tool is cutting. Owing to the absence of lateral movement of the turret, it is necessary to insert the bar into the shell nose and then bring the turret forward to engage with the shank of the bar, the locking pin G being placed in when the holes are in line. Although the bar in this instance is comparatively light, the stead bush E provides a rigid support while the cutting tool is operating.

MARKING MACHINE TOOLS

By E. Bailey.

IT is a peculiar oversight in the machine tool industry that more tools do not have



MARKING MACHINE TOOLS.

their size and number stamped or cast on them. This branch of work is neglected to such an extent that considerable time is wasted and much inconvenience caused by these omissions. Only certain kinds of tools are usually to be found marked, these including counterbores, reamers, drills and similar specialties.

There is hardly any class of tools in a machine shop that are constantly handled or used but require or should have their sizes or number visibly and properly stamped or cast on them. The advantages to be derived from this are so many that it is surprising that they have been overlooked so long. Take for instance driving shaft pulleys. How much measuring and calipering is done to find out their diameters; gears also, involving the hunting or counting the number of teeth; all of which is time unnecessarily wasted. The sizes and numbers of these should be cast on the arms in raised figures as shown in Figs. 1 and 2.

Another case is that of wrenches, it is always necessary to try several of these before one of the right size is found. The opening in a wrench should be marked as in Fig. 5. Metal saws for slotting screws generally have to be sorted out and tried in a thickness gauge before the right size for a certain diameter of screw is found. The size for which they may be used should be stamped on as shown in Fig. 3. Collars that are used in milling machine arbors suggest themselves as instances in which figures are improperly placed, because they cannot be seen when fastened on the arbor, especially between two cutters. A great many times the wrong collar is put on, or the need of making sure of this is often necessary, and they have to be taken off and examined. Collars should always be stamped with the figures on the circumferential face, not on the side. See Fig. 4.

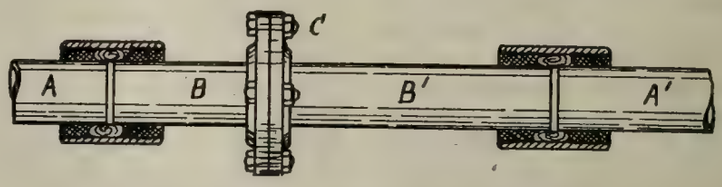
It is readily seen from this short review what variety of tools unmarked or improperly so, there are, and how important it is that steps be taken to give these matters attention.

EMERGENCY REPAIR ON WATER PIPE

By John Port

A CAST iron water pipe, 4 in. in diameter, carrying water at 80 pounds pressure, cracked, and a section five feet long had to be cut out. There was no cast iron pipe on the job, but a couple of short pieces of 4 in. wrought iron pipe, a 4 in. flange coupling, and two 6 in. pipe couplings were rooted out. The two short pieces, of pipe were connected with the flanges C. the couplings were slipped on and back over the ends of the cast pipe ends A.A¹. Then the 6 in. couplings were drawn back over the pieces B.B¹, after they had been put in place.

Oakum packing was driven into the couplings, as shown by the section, and lead joints run and caulked in the usual way. There is nothing extraordinary in this repair, but it just shows that there is generally some way to overcome a difficulty. In this case lack of cast iron pipe and sleeves did not prevent the man in charge making a proper and permanent repair.

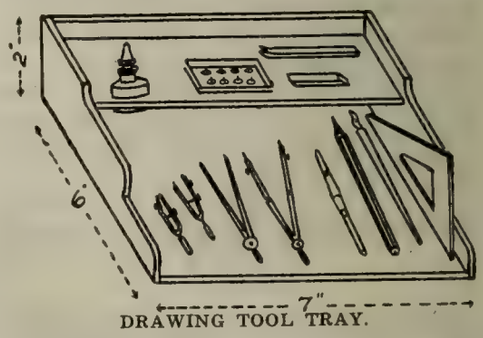


EMERGENCY REPAIR ON WATER PIPE

A DRAWING TOOL TRAY

By A. M. Y.

THE accompanying sketch shows a very handy tray for holding drawing instruments. Draftsmen are well aware of the inconvenience of having tools spread out on a drawing board. It is usually necessary to pick up each one when taking up a drawing or when cleaning off the board; by this arrangement the tools can



DRAWING TOOL TRAY.

always be kept together and carried about from one board to another. The tray is made of white wood, shellaced over. The ink bottle fits into a hole in the shelf to prevent it from being upset

and spilled. The shelf can also be used for holding thumb tacks, erasers, and others small accessories. A tray of the dimensions given, takes up very little room and is easily moved about.

HANDY RULE FOR FINDING CONTENT OF CYLINDRICAL TANKS

By C. T.

THE following table is useful in arriving at the contents of cylindrical tanks placed horizontally, i.e., with the two circular ends standing vertically. The diameter referred to is one passing vertically through the centre of the circular end. The table can be used for finding how much has been run off (up to one half) if the percentage of the diameter be counted from the top of the diameter. If the measurement along the diameter be made from its bottom end, the quantity remaining in the tank, (up to one half) can be at once found.

HORIZONTAL AND CYLINDRICAL TANKS CAPACITY IN PER CENT. OF DIAMETER.

1%	of diameter is	0.0017	of capacity.
2%	"	0.0048	"
3%	"	0.0087	"
4%	"	0.0134	"
5%	"	0.0187	"
6%	"	0.0245	"
7%	"	0.0308	"
8%	"	0.0375	"
9%	"	0.0446	"
10%	"	0.0520	"
11%	"	0.0598	"
12%	"	0.0679	"
13%	"	0.0764	"
14%	"	0.0851	"
15%	"	0.0941	"
16%	"	0.1033	"
17%	"	0.1127	"
18%	"	0.1224	"
19%	"	0.1323	"
20%	"	0.1424	"
21%	"	0.1527	"
22%	"	0.1631	"
23%	"	0.1737	"
24%	"	0.1845	"
25%	"	0.1955	"
26%	"	0.2066	"
27%	"	0.2178	"
28%	"	0.2292	"
29%	"	0.2407	"
30%	"	0.2523	"
31%	"	0.2640	"
32%	"	0.2758	"
33%	"	0.2878	"
34%	"	0.2998	"
35%	"	0.3119	"
36%	"	0.3241	"
37%	"	0.3363	"
38%	"	0.3487	"
39%	"	0.3611	"
40%	"	0.3735	"
41%	"	0.3860	"
42%	"	0.3986	"
45%	"	0.4112	"
44%	"	0.4238	"
45%	"	0.4364	"
46%	"	0.4491	"
47%	"	0.4618	"
48%	"	0.4745	"
49%	"	0.4873	"
50%	"	0.5000	"

The value for intermediate percentages may be obtained by interpolation without any serious error.

The table given only extends as far as half the diameter but can readily be extended the whole way by any reader who wishes to use it. For example assuming that it is being used for estimating the liquid actually in tank, and the percentage of the diameter thus counted starts from the bottom, then 51 per cent. from the bottom is 49 per cent. from the top, subtracting from unity the fraction of the capacity representing the top 49 per cent. viz., 0.4873, 51 per cent., of the diameter is found to represent 0.5127 of the capacity, 52 per cent. is 1—0.4745 or 0.5255 of the capacity, 53 per cent. 1—0.4618 or 0.5382 and so on.

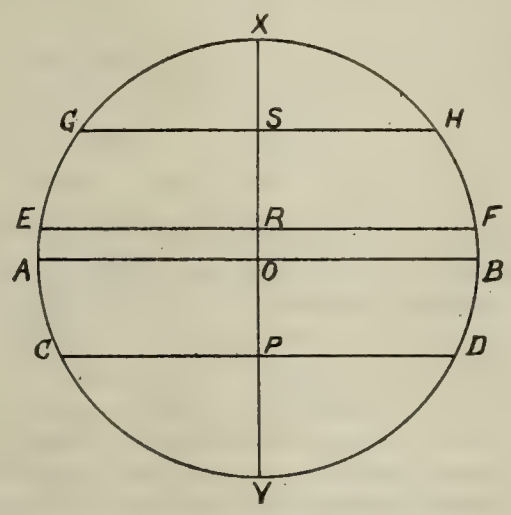


DIAGRAM OF CYLINDRICAL TANK CAPACITIES.

Referring to the diagram which represents one of the circular ends standing vertically, if the surface of the liquid is at AB, then the tank is half full, OY being 50 per cent. of the diameter XY. If it stands at CD the tank contains 0.2523 of its capacity, PY being 30 per cent. of the diameter XY. When more than half full, proceeding as already shown, at EF the tank is 1—0.5382 full as XR is 47 per cent. of the diameters, and at GH it is 1—0.1424 or 0.8576 full, as XS is 20 per cent. of the diameter XY.

White Castings for Motor-car Work.—A mixture which has given satisfaction for motor-car fittings and which can be polished the same as nickel-plated work, is as follows: Copper, 50 lbs.; zinc, 35 lbs.; nickel, 15 lbs.; aluminum, 2 oz. The copper may be increased to 55 lbs., when the resulting castings are required to be very hard and white.

EMERGENCY MEASURING METHODS

By T. Sim.

OFTEN when a man should have a measuring rule with him on some job, he discovers that he has laid it down somewhere and forgotten to take it up again, or perhaps it has fallen out of his pocket. Usually he will "curse" or "bless" his luck, and return to the workshop for a "rule." There are a number of ways for taking measurements with things that are always with us, and other things usually with us. These measurement things will give us approximate measurements only, unless we use considerable care, but if a little trouble is taken to memorize the tips here given, they will often come in handy.

The Dominion $1 and $2 bill is 7 1/16 in. long. An American or Canadian "quarter" is very close to 1 in. in diameter.

Look at Fig. 1. The upper joint of the averge female thumb is usually very close to one inch. In the average male it is about 1⅛ to 1½ in. The old hand outstretched measure, as shown in Fig. 2, will come close to 8¼ in. in the male. Fig. 3 shows the forearm measure—from the point of the elbow to the tip of the middle finger will be about 20 inches in the adult male and 16 inches in a female. No doubt most readers have seen the store ladies stringing yards of lace or other material, by stretching the material from the chin to the tip of their outstretched hand.

It is a good idea to ascertain the length you take while walking. If you have a knowledge of this, it is an easy matter to figure any distance required by counting your steps. Many men can pace or step off any distance, taking three feet to the step, and come out at the end very nearly correct. A little practice will enable any man to do this with a fair degree of success.

FIG. 1

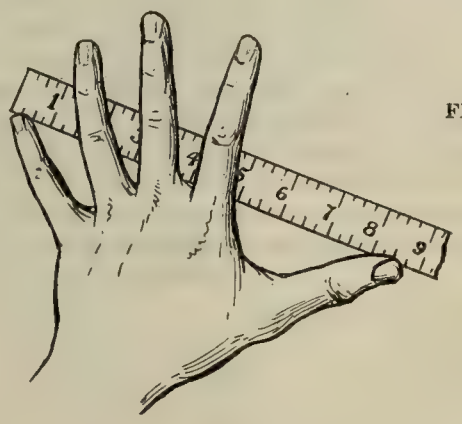


FIG. 2

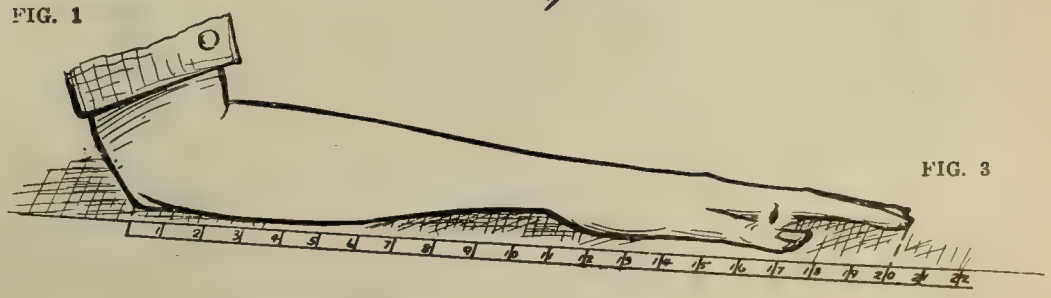


FIG. 3

EMERGENCY MEASURING METHODS

PLAYING HOSE STREAMS ON CHARGED ELECTRIC WIRES

FROM the earliest days of the adaptation of electricity to commercial purposes there has been, says *The Travelers Standard*, a more or less hazy notion that turning a stream of water on a live wire is a highly dangerous proceeding. Only a few years ago the statement was frequently made in the newspapers that firemen were hampered in their efforts to control a fire because of their fear of directing a stream of water on a high-tension circuit. Such a notice appearing in a paper to-day would reflect on the efficiency and standing of the particular fire department referred to. A study of the question has been made, with the result that every modern fire department has the necessary equipment to protect the firemen from shock. This equipment is in the form of rubber gloves and boots, insulated handles on the nozzles, a marline covering over all hose connections, or other equally effective insulating devices.

Probably the most authentic information on this subject may be had from the records of the fire departments in the principal cities in the United States. These fail to show that any fatal or even serious injury has been caused by directing a hose stream against a high-tension circuit, although a number of departments report that slight shocks have been felt by hosemen. This excellent record is accounted for in part by the fact that overhead circuits are seldom found having pressures above 30,000 volts, within the territory of the fire departments.

Hazard Determination Tests

The Pennsylvania Railroad Co. carried out a series of tests to determine the hazard involved in directing a stream of water on to a high-tension line. Three circuits were available for the purpose—one direct-current circuit of 525 volts pressure, one alternating-current circuit of 2,300 volts, and one of 4,600 volts pressure. Solid streams of fresh water from ⅝-inch and 1-inch nozzles were played on these circuits from various distances, and the difference in potential between the nozzle and the ground was measured by a voltmeter. The summarized results of these tests are shown in Tables 1 and 2. From these tables it is evident that a person standing ten feet away from circuits of the above-mentioned potentials runs no great risk of dangerous shock.

Table 1.—Voltage to Ground from a Five-eighths-inch Nozzle

Voltage on wire.	Distance from nozzle to wire.	Volts between nozzle and ground.
525 (D.C.)	7 ft. 5 in.	20
525 "	4 ft. 9 in.	38
525 "	3 ft. 7½ in.	60
525 "	2 ft. 2 in.	70
525 "	0 ft. 7½ in.	210
2050 (A.C.)	6 ft. 6½ in.	Static
2050 "	3 ft. 5½ in.	Static
4100 "	6 ft. 6½ in.	Static
4000 "	3 ft. 5½ in.	Static

Table 2.—Results of Demonstration at Altoona.

Size of Nozzle	Voltage on Wire	Distance from Nozzle to wire (Feet)	Volts between nozzle and ground
⅝ in.	525 (D.C.)	3	Slight indications of static electricity to the hand
1 in.	2300 (A.C.)	8	Slight indications of static electricity to the hand
1 in.	4600 (A.C.)	10	Slight indications of static electricity to the hand

An important point brought out in connection with these tests is the fact that playing a solid stream from a hand chemical extinguisher on a high-potential circuit is an extremely dangerous proceeding. The difference in potential between the nozzle of a chemical extinguisher and the ground is approximately seventy-five per cent. of the difference between the line itself and the ground, provided the nozzle is held nine or ten inches from the circuit. Assuming a circuit of 3,000 volts and a nozzle ten inches away, the person holding the extinguisher would be subject to a shock from a potential of approximately 2,000 volts. It seems, then, that the stream from a chemical extinguisher does not offer the same resistance to an electrical current; or in other words, it is a better conductor than fresh water.

With nozzles of larger diameters and circuits of higher potentials the resistivity of the water largely determines the hazard to the men directing the stream. This fact was brought out by a series of tests made at Ohio State University, in which use was made of potentials ranging from 5,000 to 30,000 volts. Nozzles 1½ inches and 1⅛ inches in diameter were used, these being the two sizes generally employed by fire departments.

Increased Water Pressure Increases Resistance

One of the important points determined by these tests is the fact that an increase of water pressure increases the resistance, because it tends to cause the stream to break up at a shorter distance from the nozzle than when a lower pressure is employed. As the solid stream breaks up into separate drops the resistance rises suddenly, thus preventing the flow of electric current in dangerous potentials. It was found that with a 1⅛-inch nozzle the solid stream began to break up after travelling 15 to 17 feet, according to the water pressure, and with a 1½-inch nozzle after it had travelled 20 feet. This shows that for safety when playing streams on circuits above 5,000 volts, the hosemen, using 1⅛-inch or 1½-inch nozzles, should stand at least 20 or 25 feet respectively from the wires; and, in addition, at these distances all modern insulating precautions should be observed.

Overhead high-tension circuits within the fire department limits or near buildings are carried on poles 25 to 40 feet high, so that there is little danger that the firemen while standing on the ground will receive shocks through the streams of water directed on the circuits. Modern fire-fighting apparatus, however, includes metal ladders and extension towers, and it is quite possible for firemen working from either a ladder or a tower, to unintentionally bring the nozzle close enough to a high-tension circuit to receive a serious or fatal shock.

INCREASE IN CANADIAN CUSTOMS

CUSTOMS returns for the month of May show an increase of sixty per cent. in the total trade of Canada over the corresponding month last year. The total trade for May amounted to $256,653,615, and for May, 1916, was $164,350,950. For the two months of the fiscal year which have elapsed the total trade of Canada was $408,606,873 compared with $269,590,815 for the same period last year.

The customs revenue for May was $17,082,823, an increase of $4,000,000 over May of last year. The value of Canadian imports during May was $107,596,379, of which $56,479,482 were dutiable goods and $51,116,897 were free goods. The increase in imports for the month amounted to $38,000,000. For the first two months of the fiscal year the total imports amounted to $194,404,188 and for the first two months of the last fiscal year $119,845,642.

Exports for May totalled $149,057,236 and for the same month last year $94,653,138. For the two months the total exports were valued at $214,202,685 and for the corresponding months last year $149,745,173. All classes of exports show considerable increases, but this was most marked in agricultural products, animals and their produce and manufactures. The value of animals and their produce exported in May was $11,376,808 and in May, 1916, was $6,287,620; agricultural products, $71,793,023 compared with $47,433,750; manufactures, $52,949,623 compared with $27,734,477.

Intensive Output, Overhead Charges, and Selling Price*

By F. T. Clapham, M.I. Mech. E.

It may be said that a proper appreciation of what the three-part title of this article involves is essential to the wise and therefore most likely successful management of any business enterprise. Whether in detail or in combination, thoroughlly practical treatment is accorded the subject, on which account, if for no other reason, employer and employee alike may profit by a perusal of the data given to the extent of greater co-operative effort.

IN bringing this subject forward I should like to commence by pointing out the fact that the illustrations which I shall give are not an elaborate hypothesis, but have actually come under my notice during sixteen years' experience as a works manager. I must also appeal for open minds. In the past there has been much mistrust and more unbelief in the actions and words of both employer and employed, and if any of it remains, my time in writing this paper is pure waste. We all know what production by labor means, and the selling price of a finished article, but do we know what difficult things establishment charges are? I think not. If there is a subject less understood than any other by both employer and employee, this is it.

Establishment Charges Defined

First, what are establishment charges? The title covers a number of expenses which must be met in any business that is carried on, and includes rent of premises, ground rent of land on which a leasehold works may be built, rates, taxes, advertising, travellers' expenses and commission, salaries of staff—such as manager, foremen, draughtsmen, clerks, storekeeper, timekeeper, and watchman—postage, telephones, and telegrams, all kinds of stationery, lighting, provision of steam, gas power or electricity, repairs, fire insurance, patent fees, depreciation of buildings and machinery, legal expenses, cartage, provision of loose tools, belting, tools for machines, and a host of small items, all of which go to swell the total.

All these things are necessary; all must be bought, and therefore all must be paid for. It is not possible to charge any given job or contract with any definite proportion of this total otherwise than by adding a percentage. For instance, suppose a firm has an order for 10,000 castings, all machined to a given pattern. They may find it advisable to buy a turret lathe and give $2,500 for it. It would not be sound policy to charge this lathe to the cost of the contract, because the lathe would be in the shop, and well able to do other work when the contract was completed. If it was intended to be charged to the job, it would mean an addition of 25 cents each to the castings in the estimate, and the result would be, there would be no necessity to buy the lathe.

Departmental Charges Vary

Again, establishment charges vary in proportion in each part of the works. In the machine shop it will be found that the average works out at 13 men to 12 machines. In the foundry it is 1 machine to 20 men. Now, it must be perfectly clear that the establishment charges of the foundry cannot be anything like as high as they are in the machine shop. Other shops run on much the same lines. In the machine shop the charges even vary with some of the machines. Let us consider a few instances. Here is a very large planing machine. It occupies, with its travelling table, 20 square yards of shop room. It can be driven one way with two horse-power, but the necessity of all planing machines is, they must be driven both ways, and therefore must be reversed continuously. This reversing action uses up more horse-power than the actual cut of the tool—hence the machine must be provided with eight horse-power. Taking horse-power at 2 cents per hour, we find the power cost alone of this machine is 16 cents.

Now we will take a 4ft. arm radial drill. This can be easily driven with .75, or three-quarters, of one horse-power, therefore its cost is 1¼ cents per hour. or ten times less than the planing machine, and it occupies one-sixth of the floor space.

Again, we have a wet, traversing, high precision grinder. For its actual size and weight it has cost more than any other machine in the shop. It requires three horse-power to drive it, and costs more than any other tool for upkeep. It must have a good supply of corundum and carborundum wheels of many sizes and sections to do its many duties. All these wheels must be kept in first-class order, by means of a diamond, for truing up. The life of this tool for high precision work, under the best conditions, does not exceed five years, if kept regularly at work. All three tools are a necessary part of a modern machine shop, and their running cost in each case is different; therefore, in some modern works the establishment charge is fixed for each machine per hour.

Now, it must be clear that when the machine is standing this establishment charge is not earned. The absent operative, if charged with this loss, might reply, "If the machine is standing, it is not using the power." This is only partly true. The power is provided, the tool-room, engine attendants, and other items which make up the whole of the establishment charges are running just the same. This brings up another point. In a slack time, when possibly half the machines are standing, the establishment charges are very much higher, because the machines at work must earn the charges of those standing. There is one foreman for 30 or 60 machines, the same tool-room, and so on through the whole of the staff.

I know a firm whose establishment charges in the machine shop are 225 per cent. of the labor. They have a most elaborate tool-room, shop inspector, and viewers, an up-to-date prime costing department, and are engaged on the very best class of high precision work. A fairly general average of machine shop charges will be 150 per cent. of the labor, and this is the figure I shall use in my illustrations.

Foundry Establishment Charges

Shortage of orders also make the charges very high is an ironfoundry. There is the cupola man and his mate. They can melt eight tons per day, or one ton, as necessity arises, but in wages alone it costs eight times as much to melt the one ton as it does to melt each of the eight tons. Again, most foundries have the main bay served by an electric or belt-driven overhead crane. This can serve thirty moulders, or five, as the case may be. Assume the crane driver to have $7.00 per week, and serve thirty moulders, this works out at say 25 cents per man per week; but if work is so scarce that only five moulders are on the floor, the cost instantly rises to $1.50 per man per week. Figure this out, and apply it to a large works short of orders in all their departments, and then pity the works manager, who must finds means to earn the establishment charges, or work at a loss. I think it is made clear that these charges must and do vary considerably on different machines, and in different departments, but their sum total over a whole works does not vary; indeed, one to two per cent. can be safely reckoned as the margin of fluctuation.

Relation of Labor

I trust this explanation of what establishment charges, or running costs, are, is clear. Let us now consider the relationship of labor, not only to these charges, but to the prime cost of the article produced. An estimate may be said to contain briefly three main items: —(1)—Material, (2)—Wages, (3)—Establishment charges. There are other small items, but for our purpose here they are negligible. The sum total of these three items is called the prime cost.

*From a paper read before the Exeter, England, Chamber of Commerce.

Some time ago I took a contract for 20,000 bars, cut to a given length, faced at each end, and rough turned all over. The material was supplied by the customer, and the turning consisted in reducing the diameter by ⅜in. This meant a cut 3/16in. deep, and I hoped to get it off in one cut. I put a very heavy lathe on the job, with a 3in. belt to drive it, and a fairly good machinist. From start to stop he took 45 minutes, and said the lathe jibbed at the job. I told him to try another. He did so, but with no better result. I got the foreman to try, and told him to put in a new tool, ground at 88 deg., so as to get good support under the cutting edge. He did one bar in 42 minutes. I then suggested that we should run the lathe in single gear and bring the bar down to size in two cuts instead of one. This reduced the time to 40 minutes, but that was eight times too long for me. I put the matter before my directors, and told them I must have a new strong lathe that could do the job better. I was fortunate to get one from stock immediately, with a 4in. belt drive, and put it to work. Before we consider the work of the new lathe, I must give you the cost on the old lathe:—

Machinist, three-quarters of an hour at 16 cents .....=12c
Establishment charges, 150 per cent. .....=18c

Prime cost .....=30c

I had another machinist on the new lathe, and in a few days he turned out 36 a day, against 10 on the old lathe; but he was not doing anything like what the machine was capable of, and I told him so. At the end of a week I said, "Tom, I want 80 bars off this lathe to-morrow; it is capable of 120, and unless you can give me 80, you and I must part. The price is 2 cents each, and I do not care how many more you do, the price is the same." The next day he did 79, and in four days worked up to 129. I will take his average at 108, which is 12 per hour. How did the cost work out? Taking three-quarters of an hour, which is the time it took the other man to do one bar, we get:—

Nine in three-quarters of an hour at 2 cents each .....=18c
Establishment charges, 150 per cent. .....=28c

46c

Total 46c ÷ by 9 = 5c each prime cost.

Look at these startling figures. Labor has increased its earnings by no less than 50 per cent., from 12 to 18 cents, but the prime cost has actually been decreased by 600 per cent., from 30 to 5 cents. Could there be a better illustration of intensive production cheapening the cost and benefiting labor at the same time?

What right had the turner to offer 36 bars for a day's work by means of restricted production? Did he benefit? Is it not a fact that by his very act he tripled the prime cost? If so, for what purpose? These are the things which have embittered the employer in the past. In the present days and in the days to come these dishonest tricks must find no place in sane, well-meaning trades unionism. There ought to be some court whereby such an offender could be heavily fined. A court set up by the trades unions, and presided over by them, for their own protection and self-respect. There is, however, another side to the picture, and in common fairness I must give it. I have known cases where an employer has set up an arbitrary standard of piecework. He has said, "No man will be allowed to earn more than time and a quarter; if he does, his price will be reduced." This is wrong from every point of view in my judgment.

Modern Tools a Necessity

Let me demonstrate the perversity of some employers. I had an extraordinary experience over the machining of some iron tank plates. The tool on which these plates were machined was an old planer, too slow for words, neither use nor ornament, and I told my directors that if the operator worked for nothing we were still unable to compete with other firms. I described the machine I wanted, and said if my words were not true concerning its value over the old planing machine, I would pay for it, and, further, I would leave them to judge the matter. The machine was bought, and after a while delivered and fixed.

Such an expression of opinion over an old machine, which had long been in their service, and was therefore almost a part of the fixtures, was unpardonable, and I was asked to prove that, with a man working for nothing, the machine could not compete with the new tool. The results worked out as follows:—The plates were 5ft. square, and had flanges 3in. deep. The old planing machine did three in a day of nine hours. The new machine did fourteen in the same time, but being a much simpler tool to handle it was operated by a handy man.

On the Old Machine

Man, nine hours at 16c $1.44
Establishment charges, 150 p.c.. 2.16

$3.60

Prime cost $3.60 ÷ 3 = $1.20 per plate.

On the New Machine

Man, nine hours at 14c..... $1.26
Establishment charges, 150 p.c.. 1.86

$3.12

Prime cost $3.12 ÷ 14 = 22c per plate.

Going back to the first cost, let us take away the man's wages, and there remains $2.16 of charges—we cannot run a shop without these $2.16 ÷ 3 = 72c per plate, with the man working gratis, against 22c per plate with a man being paid 14c per hour. Here, then, is indisputable proof that labor at its best is useless if not equipped with modern machine tools.

Given modern tools, what a scandal it is that labor should sometimes desire to restrict production, and so discount the value of the new tools, by claiming that in fixing new piecework prices the rate must be based on the production of the slowest worker in the shop. Piecework oils the brain. It stimulates the worker to use his ingenuity to get out the greatest possible amoust of work done in the least possible time. If the time of the slowest worker is set up as a standard, call it what you will, it is no longer piecework.

If a dozen men are doing exactly the same job, the time of the quickest worker ought to be taken into account in fixing the piecework price. The laggards must be asked to speed up. It is absolutely wrong to ask the quickest worker to slow down to that of the slowest worker, and yet I know that is done. How can a firm meet their competitors when this is the case?

I once had an inquiry from an old friend for 3,000 brass cocks. I consulted our men—for we were not busy—to see what could be done. They declined to make any reduction whatever on their piecework, and asked a price which I knew made the estimate hopeless, and I told them so. I quoted $4.20 each. A few weeks afterwards I saw my friend, and he said, "You did not want those cocks, then?" I said, "No, not very much; the fact is, they are not quite in our line at present. The machines they ought to be done on are otherwise employed." He said, "That accounts for the high price, then." He showed me a quotation which he had accepted at $2.34 each. I can assure you that there is nothing more humiliating to a sensitive man than to know he has sent in a prime cost so hopelessly high as to appear really silly, and cover the firm he represents with ridicule. Materials cost about the same anywhere, and as establishment charges are based on the labour, it is labor that is to blame for a high price, assuming, of course, that a suitable machine exists to do the work.

I contend that it is the duty of both employer and employed to get the very utmost out of every machine, and when a new machine is bought piecework prices must be adjusted to the new conditions. What is the good of an employer buying a new machine to do more work, and to do it better, if he has to pay the same labor cost? Yet this attitude is really and seriously taken up. The law of progress is eternal. A firm is either doing better work, and increasing its trade, to the material benefit of its shareholders and employees, or it is steadily slipping back into mediocrity and dissolution. There is no half-way state.

There is another curious instance of the unrealized value of establishment charges which I should like to bring before you. I once obtained a foreign order for $150,000 worth of work, amongst which was 150 tons of cast iron special pipes. These specials were included in our estimate at $55 per ton. The foundry was badly equipped in one or two notable things, and, in consequence, was short of work. One of my directors sent out an inquiry for those

specials, and obtained a quotation for them at $52.50 a ton. He said to me, "I think it advisable to buy these out. In any case, we stand to get a clear profit of $375, because I can buy the whole lot at $2.50 a ton cheaper than our estimate." "Exactly," I replied, "but while you are getting $375 clear profit, you are paying away your own establishment charges." "How do you mean?" "Just this. Our moulders can make these pipes at $10 a ton. The establishment charges, including melting charges of the cupola and the coke, are $7.50 per ton. On 150 tons this works out at $1,125; deduct the $375 profit you say you can make, there remains a net loss of $750 in charges." I need hardly add that we made those pipes in the foundry, and although they cost the $55 a ton of the estimate, we actually earned $1,125 of charges, which were a great help to the inevitable running costs of the shop.

Conclusions Drawn

What do these examples teach us?

(1)—That intensive production is absolutely necessary to the worker, he wishes higher wages. Why? Because it is proved that wages are included in the selling price of the article produced; consequently, the more articles that are sold the greater the amount of wages paid out, and vice versa.

(2)—That to intensify production the employer must be ready to supply the worker with the best and most modern machine tools that can be obtained.

(3)—That intensified production cheapens the cost of the article produced. Therefore labor can materially benefit by being able to buy boots, clothes, and many foodstuffs at a lower price than formerly, assuming, of course, that all trades give a greater output.

(4)—That out-of-date machinery cannot successfully compete with modern tools, even if the operators work for nothing. Therefore they should be scrapped.

(5)—That high wages and high production mean low prime costs and low selling prices.

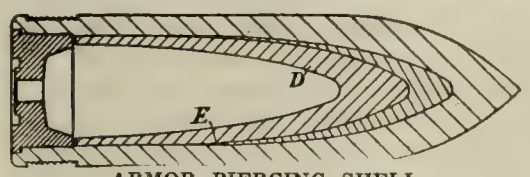
(6)—That restricted labor means low wages, high prime costs, high selling prices, and restricted markets for the goods in consequence.

(7)—That establishment charges are not paid for or put on labor. They are based on the cost of labor, but always paid by the consumer. This must be so, because the article is mostly quoted for and sold before labor starts to make it.

(8)—That until capital and labor fully realize that the one is useless without the other, that their true interests lie close together, that they cannot afford to quarrel, that they have still to agree afterwards, there cannot be any abiding prosperity for either party. What are you going to do about it, if these things are true? Which of you will say they are false?

ARMOUR PIERCING SHELL INVENTION

AN invention in armour-piercing shells, recorded by *The Engineer*, London, England, provides an improved system of manufacture with a view to securing more uniform hardness and strength. It consists in making the shell with an outer envelope and two or more close fitting liners of a contour similar to that of the outer envelope, the total thickness of the envelope and liners corresponding to the standard thickness of metal in ordinary projectiles, each being machined and hardened on its inner and outer surfaces. A recess E may be provided between the inner wall of the outer envelope and the liner D to serve as an air vent when the latter is being forced into position. In this way the inventors say they are able to produce a projectile which is much



ARMOR PIERCING SHELL.

more uniform in hardness and strength than those made according to present methods. Also, in a projectile made according to this invention the force of impact would be taken equally by the head and walls of the outer envelope and liners, and thereby transferred direct to the base of the projectile, and the greatly increased strength given to these vital parts by the more uniform hardening of practically the whole thickness of metal, gives to the projectile a superiority in quality of metal over the armour against which it is fired.

HUGE GRAB-BUCKET DREDGE

THE use of the grab-bucket type of dredge has reached two special developments in American practice. First, great depth of dredging, with short reach of jib to load material into barges alongside; this is for harbor work. Secondly, comparatively shallow dredging, but with immense reach; this is for use in river work, and for building dykes or levees along rivers to afford flood protection.

A huge dredge of this latter type has been built for work on rivers in California. The hull is 140 ft. by 61 ft., built of steel trusses and frames, with steel plating for the sides and a timber bottom and deck. It is 13½ ft. deep on the centre line. At the forward end is an A-frame 68 ft. high, built of timbers 20 in. by 20 in., each 76 ft. long. This is supported by inclined back-legs seated at the stern. Midway between the feet of the A-frame is a heel casting, to which is fitted a timber boom or jib 195 ft. long, 22 in. by 22 in. in section, trussed vertically and laterally. A topping lift or luffing tackle leads from the end of the boom to the top of the A-frame. All machinery is in the hull. The superstructure has the crews' quarters at the deck level, with the officers' cabins above, and over all the enclosed operating house, corresponding to the pilot house of a steamer. The jib carries a clamshell or two-section bucket of 5 yards capacity.

When at work the boat is held by three vertical timbers or spuds, resting on the river bed. The stern spud is fitted to a slotted casting, attached to a steam cylinder. Steam being admitted to the cylinder, the dredge is pushed forward. The dredge has two tandem cross-compound condensing engines on the ends of the main shaft from which the cable drums are driven by gearing.

DOMINION STEEL CORPORATION

MARK WORKMAN, president of the Dominion Steel Corporation; William McMaster, vice-president; and W. G. Ross, a member of the executive committee, have returned after a two weeks' inspection trip, in which they visited the properties of the company, at Sydney, C.B., Wabana, Newfoundland, and St. John, N.B.

On his arrival in Montreal Mr. Workman stated that they had found the plant at Sydney looking exceptionally well, with all departments working to capacity. He would not discuss the question of earnings, but it is understood from other sources that a new high water mark was reached in May.

Extensive extensions and improvements, which will tend towards the efficiency of the plant are now in progress and good headway is being made along these lines. Mr. Workman would not state how much had already been expended at Sydney, but it is understood to be in the vicinity of $2,000,000, and the work is not by any means completed yet.

The first battery of sixty coke ovens being installed will be ready during the winter, and the next battery of the same size about a year from now.

Work on the new blast furnace has made rapid progress, and it will be ready for use in two or three months. This furnace will mean an increase in output from thirty-five to forty thousand tons per year, at the minimum. Last year the total output from the Sydney plant was something like 360,000 tons.

The output for the month of June shows little change from previous months of late, and as the plant is working to capacity, and has been for some time, increases cannot be looked for until the additions now under way are completed. The output for June was as follows:

	Tons.
Pig iron	29,375
Ingots	30.647
Blooms	15,980
Shell blooms	11.485
Shell bars	4,868
Rods	10,400
Nails	3,534

As this is the first time output figures have been given out for a number of years, it is not possible to make any comparisons, but they are believed to be well up to the high record, although they show but a small advance from the same month last year. Pig iron output was slightly better than a year ago, while ingots fell off slightly.

Mr. Workman explained that the labor situation was the source of a good deal of uneasiness. La-

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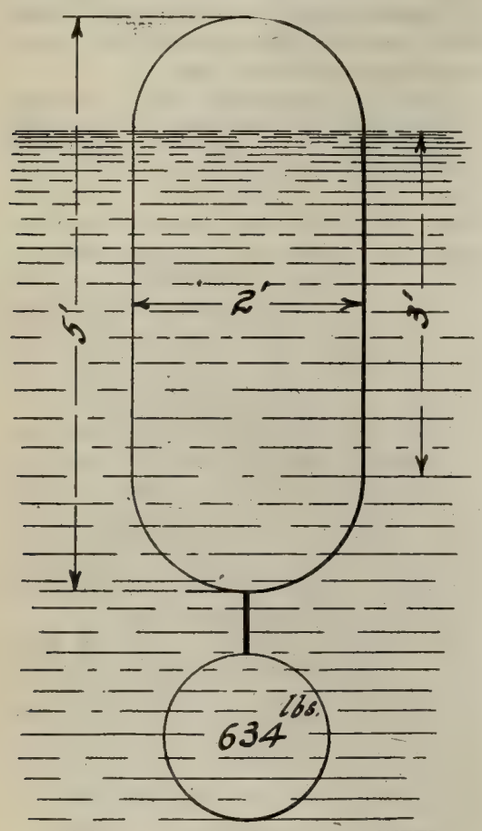
PROVIDING VERTICAL FLOTATION OF A STEEL CYLINDER

A STEEL cylinder with spherical ends, made of ⅛ inch plate, has an overall length of 5 feet, and an appropriate diameter of 24 inches. What weight of solid cast iron would require to be hung on the lower end to maintain the cylinder in a vertical position when placed in water, leaving only the semi-spherical top protruding above the surface?—C. P. M.

The amount of metal used in the construction of the cylinder would equal the metal required for the parallel portion plus that required for the two ends. The



VERTICAL FLOTATION OF A STEEL CYLINDER.

parallel section would have a length of 5 feet minus 2 feet, or 3 feet; and with a diameter of 24 inches and a weight of, say, .283 lb. per cubic inch, the weight of the straight part would be .283 × 24 × 3.1416 × 36 × .125 equals 96 lbs. Combining the two ends, the weight of both would be .283×24×3.1416×.125 equals 64 lbs. Then the total weight would be 96 plus 64 equals 160 lbs. Placed in water without additional weight, the cylinder would displace an equal weight of water, the volume of which would be 160 divided by .03616 (for fresh water), or 4,397 cu. in. The volume of one of the spherical ends would be 24×.5236, 2 equals 3,619 cubic inches. Subtracting this from the value 4,397 gives 778 cubic inches, which is the volume of the parallel portion of the cylinder that is submerged; and the depth will equal this divided by the area of the cross section, or

$$\frac{778}{24 \times .7854} \text{ equals 2 inches nearly.}$$

The additional depth to which the cylinder must be submerged (by the application of the weight) will be 36 minus 2 equals 34 inches. This will equal a displacement of 24×.7854×34 equals 15381 cu. in., with a corresponding weight of water of .03616×15381 equals 556.2 lbs. This, then, would be the weight of cast iron required to submerge the cylinder to the desired depth; but with the anchor weight below the water, sufficient weight must be added to overcome the buoyancy of the water. This added weight will approximate the weight of displaced water, or about 78 lbs. The weight of the cast iron anchor would then be 556 plus 78 equals 634 lbs. nearly.

HANDY CHART FOR ESTIMATING PULLEYS, FLYWHEELS, ETC.

By "Woodworker."

HERE is a chart that will come in handy in a number of ways wherever circular motion is to be computed or estimated. Knowing any two of the factors shown in columns A or B, the third can be found.

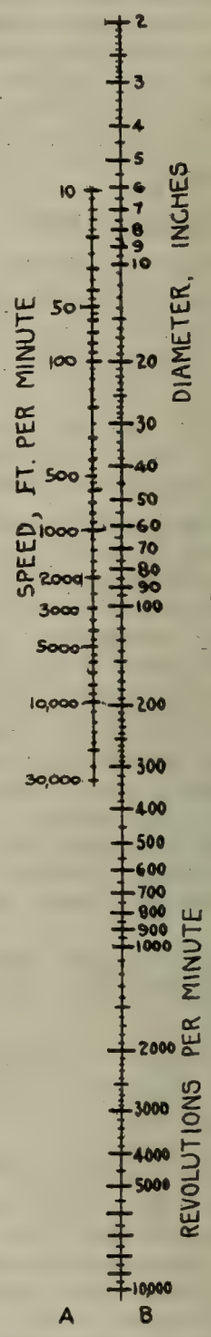
For example, a 20-inch pulley makes 600 revolutions per minute. What is the speed of the pulley periphery in feet per minute? This is a very common problem.

Find the 20 (column B) and the 600 (also in column B), and then locate the point half-way between them. This is done by folding a strip of paper, by means of a pair of dividers, with a ruler, etc. There are many good ways in which to find a mid-point. Directly opposite that mid-point is the answer—very close to 3,200 feet per minute.

This answer is not exact, of course, nor does a slide rule give an absolutely accurate answer, but it is close enough for most practical purposes. The designer is generally most anxious to keep well within the bounds of safety. Well, 3,200 ft. per minute is a safe speed for almost any pulley. In fact, a mile a minute is usually given as the maximum speed for wood pulleys, cast iron pulleys, and others of a brittle nature. Steel pulleys are often allowed to run at 6,000 to 7,000 ft. per minute, and in extreme cases even that speed has been beaten, but nobody should ever attempt a greater speed than a mile a minute without being absolutely sure of himself, his calculations, his design, etc. It has often been pointed out that the energy stored in a flywheel sometimes reaches stupendous proportions and when a flywheel explodes we all know the attendant results.

Again, when it is desired to determine the approximate number of revolutions per minute at which a given pulley will run when the diameter and belt speed are known, the chart is used in this way:

Take the same example as above. Let us assume that the diameter of the pulley is 20 inches and the speed of the



HANDY CHART FOR ESTIMATING PULLEYS, FLYWHEELS, ETC.

belt 3,200 ft. per minute. What will be the r.p.m.?

Find the distance between the 20 (column B) and the 3,200 (column A), and measure that self-same distance downward from the 3,200, and there's the answer in column B = 600 r.p.m. This method is just the inverse of the first, of course.

Lastly, if the speed in feet per minute is known and if the r.p.m are known, the diameter in inches of the required pulley is found by following the same tactics as in the last example. Using 600 and 3,200 as known quantities, the answer will be found to be 20 inches.

In metal turning, also, this chart will be found useful for determining cutting speeds. Knowing the diameter of the stock and the r.p.m., the cutting speed is found as in the first problem cited here. If the diameter is 1 inch, use the 10 on the chart and mentally divide the answer by 10. If the diameter is 1.5 inches, use the 15-inch mark, and again mentally divide the answer by 10. It is thus evident that the range of the chart is virtually unlimited.

THIS WAY SPELLS SUCCESS

By W. G. D.

WHAT makes one man a success and another man a failure? Simply this, perseverance, push, going ahead and doing something, making a start and keeping at it until it is finished. Nothing is ever done by sitting still. No one knows what they can do until they make a start and try. The successful in the business world never knew what they could do till they went at it and accomplished what they did. Neither will you ever know unless you attempt something and keep at it.

Whether you turn out a successful man or a ne'er-do-well is simply a matter of your own choosing. It isn't talent or inspiration or any of these age-worn terms that makes greatness, or does big things, any more than it is good looks or a bushy crop of hair. It is simply just yourself having the push to make the start, and then keeping it up. That is all there is to it.

Begin to-day and make a start. Keep it up, and do each task a little better than the one before it—a little better than the best. Be wrapped up in your work, hold on and do not let go until you have finished it; not until it has finished you, but stand right up to it, and give blow for blow to the last round, or until you are awarded the decision. The man who lays down to a mere nothing, who sees a mountain where there is only a mole-hill, who has to be boosted over every hurdle, is going to be far back in the running when the winners cross the line.

He who rises every time he falls, who never falters when he hits an obstacle, must necessarily forge ahead every time he moves. A few scratches are not defeats. It is in believing that you can do things, that it is in your power to accomplish what you set out to do, that pulls you forward and wins a victory. It does not matter how high you have to climb, or how rough the road is over which you need to travel, these are but minor considerations. If you falter you fail. The real matter is, that you stick to your purpose to the very end.

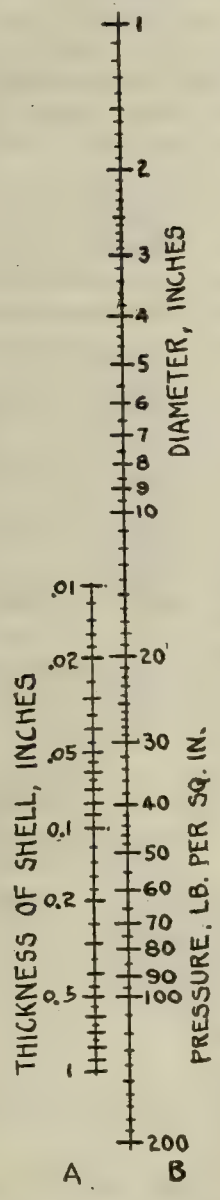
It is this determination to hang on in spite of discouragements and blockades that accomplishes the things that live forever. This is what makes one man successful and another man a failure—the thing that takes a block of marble and sculptures a lasting monument; that stretches a piece of canvas and paints a picture that posterity treasures; that writes "ten-commandments" that endure for ages and directs mankind to success—not failure.

HANDY CHART FOR BOILER SHELL COMPUTATIONS

By W. B.

THE accompanying chart will be found useful for determining three different things:

1.—It will give the shell thickness of the boiler, knowing the pressure in pounds per sq. in., and knowing the diameter of the boiler in inches.



HANDY CHART FOR BOILER SHELL COMPUTATIONS.

2—It will give the pressure in pounds per square inch when the other two factors mentioned in (1) are known.

3—It will give the diameter of the boiler in inches when the other two factors also mentioned in (1) are known.

For example, given a boiler made of mild steel, whose internal diameter is 34 inches, and whose shell thickness is .25 inch. What pressure may be safely held within the shell? ?

Find the 34 in column B and measure the distance down to .25 in column A. Then from the .25 measure downward that self-same distance, and the answer will be immediately found in column B as 150 pounds per square inch. This chart is based on 10,000 pounds per square inch as the safe stress to which the metal can be subjected, therefore the answer is the safe working pressure to which the shell can be subjected.

In case it is desired to find the thickness of shell, knowing the other two factors, all that is necessary is to locate the two known points in column B and then find the mid-point. The answer is to be found directly opposite that mid-point in column A.

To find the diameter to which a boiler can be safely made, knowing the shell thickness, and knowing the pressure, the operation is practically the same as in the first example cited. This will be better understood when it is pointed out that the shell thickness would have to be the same for a pressure of 34 pounds and a diameter of 150 or for a pressure of 150 pounds and diameter of 34 inches. Do you get the point? That is why the chart is reversible.

The range of the chart is wide enough to cover nearly every common boiler condition. Its highest pressure is 200 pounds per square inch and the highest shell thickness is one inch.

In case the metal is steel, this chart is especially applicable, allowing a factor of safety of nearly six. In other words, where the breaking strength of the metal is 60,000 pounds per square inch, this chart automatically includes the factor of safety of six. If the metal is cast iron, or something weaker, the chart will not hold without allowance being made, of course.

ELECTRICAL QUERIES AND REPLIES

Question.—Define the terms Volt, Ampere, Ohm, Watt, and explain their relationship to electrical horse-power?—M. A. C.

Answer.—The volt is the unit of measurement of force, or strength of electric current, commonly known as electromotive force, or E.M.F. The ampere is the unit of measurement of electric current quantity. The ohm is the unit of resistance to a current passing through a unit length of wire of unit diameter; and the watt the product of one volt and one ampere = volts × amperes. An electrical horse-power = 746 watts, which is equivalent to that of the steam engine, viz., 33,000 foot pounds.

* * *

Question.—What means are employed to prevent any part of an electrical circuit from becoming overheated?—P. H.

Answer.—A fusible cut-out or fuse which consists of a strip of lead or other readily melted substance is introduced at a convenient point. Then, if from any cause the current becomes greater in intensity than the lead and its connections can comfortably and safely stand, the fuse owing to its resistance becomes overheated and melts, thus breaking connection and preventing overheating of parts in the circuit beyond.

Safety Standards for Power-Transmission Machinery

By Carl M. Hansen and Rufus W. Hicks

What follows constitutes the tentative draft of a Code of Safety Standards for Power-Transmission Machinery compiled by the authors under the direction and with the consent of the Committee on Health and Safety, National Association of Manufacturers, and presented at this year's spring meeting of The American Society of Mechanical Engineers. An authors' note states that the use of properly designed, constructed, and installed individual motor-driven equipment with electrical power distribution not only eliminates many of the hazards demanding this Code, but also gives an uninterrupted distribution of natural and artificial light, and a greater flexibility and range of speeds than is otherwise possible.

THE specifications describe standard guards for all power-transmission equipment hereinafter mentioned, and apply to all main shafting, jack shafting, drive shafting and countershafting, and their belts and other attachments up to but not including belts actually driving machines.

Class A Guards—If the clearance between the guard and the guarded part is less than five inches, a metal guarding material that will not admit objects larger than one-half inch in diameter, strong enough to withstand loads to which it may be subjected, durable enough to withstand ordinary wear and tear, substantially fabricated and erected, and free from sharp points and edges.

Class B Guards—If the clearance between the guard and the guarded part is five inches or more, a metal guarding material that will not admit objects larger than two inches in diameter, strong enough to withstand loads to which it may be subjected, durable enough to withstand ordinary wear and tear, substantially fabricated and erected, and free from sharp points and edges.

Handrails—If the clearance between the guard and the guarded part is fifteen inches or more (measured horizontally from extreme parts within six feet of floor), a handrail forty-two inches in height with at least one intermediate rail, supported at least every eight feet, substantially fabricated and erected, with no sharp points or edges.

If constructed of pipe, the rails and posts shall be at least equal in strength to 1¼ inch standard-weight pipe.

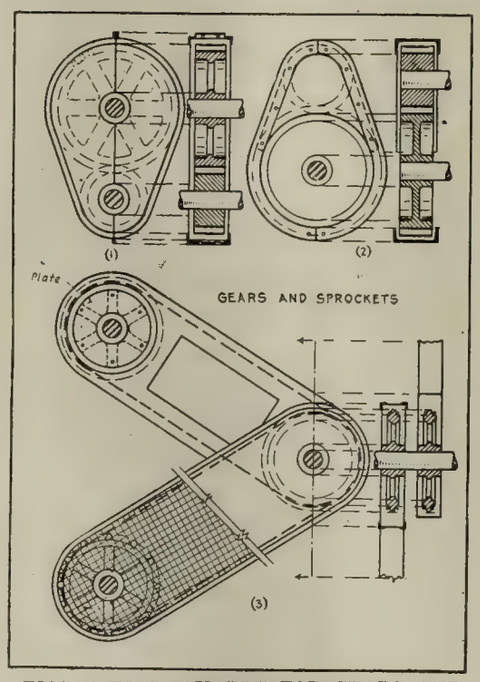
If constructed of structural metal, the rails and posts shall be at least equal in strength to 2x2x¼-inch angles.

If constructed of wood, the top rail shall be 2x4 inches, and the posts 4x4 inches, all straight-grained lumber dressed on four sides, or other construction of equal strength.

Toe Boards—When power-transmission equipment extends through floors or into pits, Class A and B guards shall extend to the floors, or toe boards six inches in height shall be provided around the floor opening in addition to standard handrails. (See Figs. 6, 7, 11, 14, 30, 31, 34, 48.)

Sanitary Bases—Class A and B guards, for power-transmission equipment not extending through floors, shall enclose exposed sides to two inches below the bottom of the lowest moving part when the clearance between that part and the floor is less than eight inches; or when the clearance between the lowest moving part and the floor is eight inches or more, the guards shall be closed on the bottom, or extended on all sides down to six inches above the floor. (See Figs. 15, 26, 36-40, 42, 43, 49.54.)

Gears and Sprockets—All power-driven gears and sprockets shall be completely enclosed on exposed sides with standard guards as specified in Class A or B, except in cases where the design and operation of the parts to be guarded make a complete enclosure clearly impractical, in which case the face of the gears or sprockets shall be covered with a band guard surrounding all exposed teeth, with flanges on both sides extending inward beyond the roots of the teeth, and there shall be a continuous smooth web cast or fitted between the hubs and rims of the gears or sprockets. (See Figs. 1, 2, 3.)



FIGS. 1 TO 3. GUARDS FOR GEARS AND SPROCKETS.

Vertical and Inclined Belts, Ropes, Chains—All vertical and inclined belts, ropes and chains used for transmitting or distributing power (except belts traveling less than 120 feet per minute, or transmitting so little power that accidental contact therewith could cause no accident), shall be provided with standard guards as specified in Class A or B, six feet high on exposed sides, or on exposed sides and top, or with a standard handrail on exposed sides. (See Figs. 4 to 46, inclusive.)

Horizontal Belts, Ropes, Chains—All horizontal belts, ropes and chains used for transmitting or distributing power (except belts traveling less than 120 feet per minute, or transmitting so little power that accidental contact therewith could cause no accident), shall be guarded as follows:

Low Belts—If the upper part of the belt is lower than six feet above the floor or working platform, it shall be provided with standard guards specified in Class A or B, six feet high on exposed sides, or on exposed sides and top, or with a standard handrail on exposed sides. (See Figs. 47-50.)

Medium Belts—If the upper part of the belt is higher than six feet above the floor or working platform and the lower part of the belt is lower than six feet above the floor or working platform, it shall be provided with standard guards as specified in Class A or B, six feet high on exposed sides, or with a standard handrail on exposed sides. (See Figs. 51-58.)

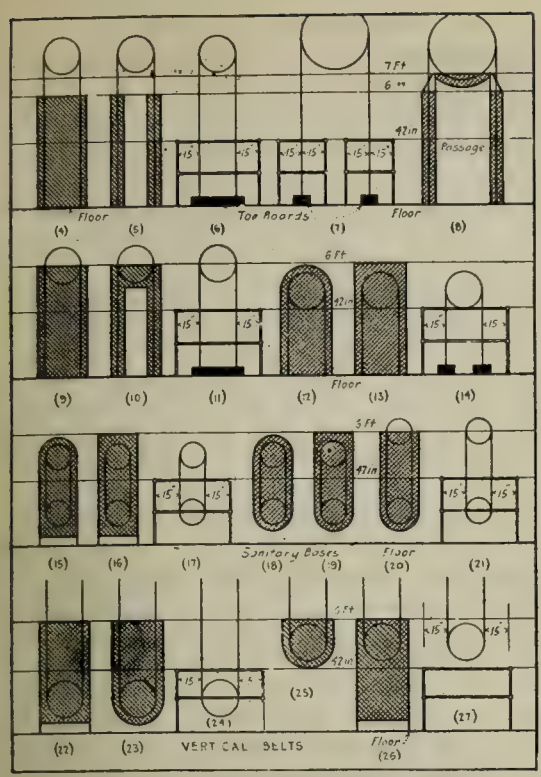
High Belts—If the lower part of the belt is higher than six feet above the floor or working platform and lower than seven feet above the floor, it shall be provided with standard guards as specified in Class A or B, on exposed sides and bottom, or with standard handrail on exposed sides. (See Figs. 59, 60.)

Belts over Driveways—Where a horizontal belt is located over a driveway or passageway, the highest floor of any wagon or truck passing beneath the belt shall be considered a working platform.

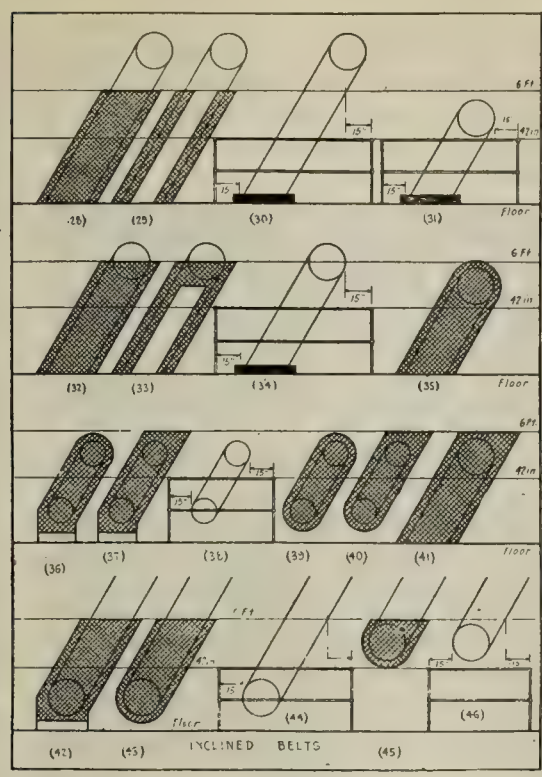
Belt Fasteners—All belts not provided with guards as specified in Class A or B and within seven feet of the floor or working platform shall be free from metal lacings and metal fasteners.

Belt Shifters—Belt shifters shall be provided for all tight- and loose-pulley belts, and shall be so designed and constructed that ordinary vibrations or accidental contact will not alter the set position, and shall have a controlling handle conveniently located. (See Figs. 61-63.)

Pulleys—Pulleys belted from above or from the side in such a way as to allow passage beneath the pulley, and within seven feet of the floor or working platform and not completely enclosed by standard belt guards or handrails, shall



FIGS. 4 TO 27. GUARDS FOR VERTICAL BELTS.



FIGS. 28 TO 46. GUARDS FOR INCLINED BELTS.

be guarded to the top of the pulley or to a height of seven feet above the floor or working platform on exposed sides and beneath by guards as specified in Class A or B, or be enclosed on exposed sides by standard handrails. (See Figs. 64-67.)

Bearing Clearance.—The clearance on shafting between pulleys and bearings or between pulleys and fixed objects shall be not less than thirty-six inches and wider than the belt, or the pulleys shall be guarded on the near side with stationary guards as specified in Class A or B, and all revolving objects in the clearance shall be smooth, cylindrical and concentric with shafting. (See Figs. 68-73.)

Belt Clearance—The clearance on shafting between pulleys and pulleys, collars, couplings or other revolving attachments shall be wider than the widest belt used, or the pulleys shall have flanges or guards to prevent the belt from dropping into the clearance. (See Figs. 68-73.)

Abandoned Pulleys—Pulleys without belts shall be guarded as though belted, or removed from revolving shafts.

Clutches—Friction clutches, jaw clutches and compression clutches within seven feet of the floor or working platform or within thirty-six inches of a bearing shall have their operating mechanism completely enclosed in stationary guards as specified in Class A or B, or in smooth, concentric revolving guards of solid construction with no projecting parts or attachments.

Couplings—All couplings within seven feet of the floor or working platform or within thirty-six inches of a bearing shall be guarded as follows:

Rigid Couplings—Sleeve couplings and flange couplings shall be cylindrical and concentric with the shafting and with no parts or attachments projecting beyond the largest periphery of the coupling or its projecting flanges. (See Figs. 74, 75.)

Flexible Couplings—Flexible and universal couplings shall be completely enclosed in standard stationary guards as specified in Class A or B, or in smooth concentric revolving guards of solid construction.

Clamp Couplings—Clamp couplings and makeshift devices of irregular shape or unknown strength are prohibited on power-driven shafting.

Collars—Assembled collars shall be smooth, cylindrical and concentric with shafting, with no projecting parts or attachments. See Figs. 76, 77.)

Set Screws—All set screws in revolving parts not enclosed by standard guards as specified in Class A or B shall be flush with or countersunk below the periphery Figs. 76, 77.)

Keys—All keys or keyways in revolving shafting not enclosed by standard guards as specified in Class A or B shall be made flush with the end and periphery of the shaft or enclosed by smooth, cylindrical concentric guards.

Vertical Shafting—Vertical shafting with or without collars, couplings, clutches, pulleys, or other attachments shall be enclosed on exposed sides with standard guards as specified in Class A or B to a height of six feet above the floor or working platform, or with a standard handrail. (See Figs. 78, 79.)

Horizontal Shafting—Horizontal shafting with or without collars, couplings, clutches, pulleys, or other attachments, including dead ends, within seven feet of the floor or working platform, shall be enclosed on all exposed sides with standard guards as specified in Class A or B or with standard handrail, or with freely revolving tubing. (See Figs. 80-82.)

Shafting over Driveways—Where horizontal shafting is located over driveways or passageways, the highest floor of a wagon or truck passing beneath the shafting shall be considered a working platform.

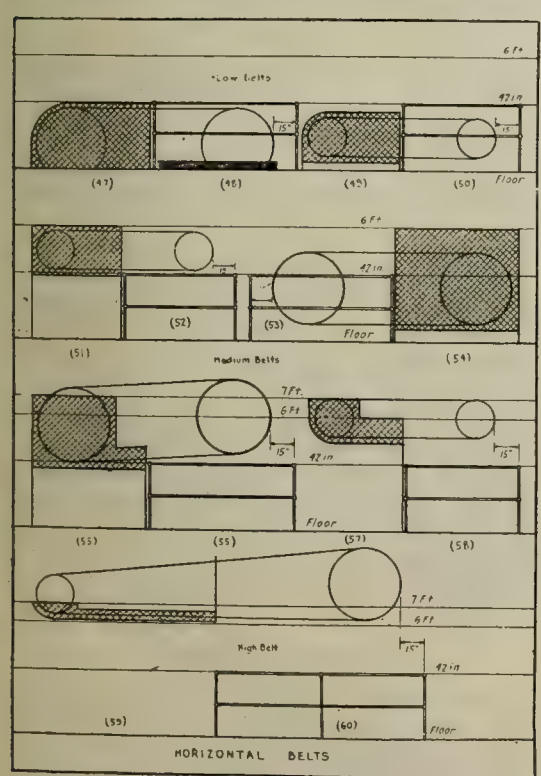
Emergency Stop Stations—A station or stations shall be provided in each room, section, or department to stop immediately all power-transmission equipment therein. Such station or stations shall be properly marked and easily accessible and provided with means for locking in "stop" position.

Bearings—Where possible, bearings shall be of a self-oiling type with reservoir capacities for at least 24 hours' running or shall have other methods of oiling which do not bring the oiler in the danger zone, and shall have necessary drip cups and pans securely fastened in position.

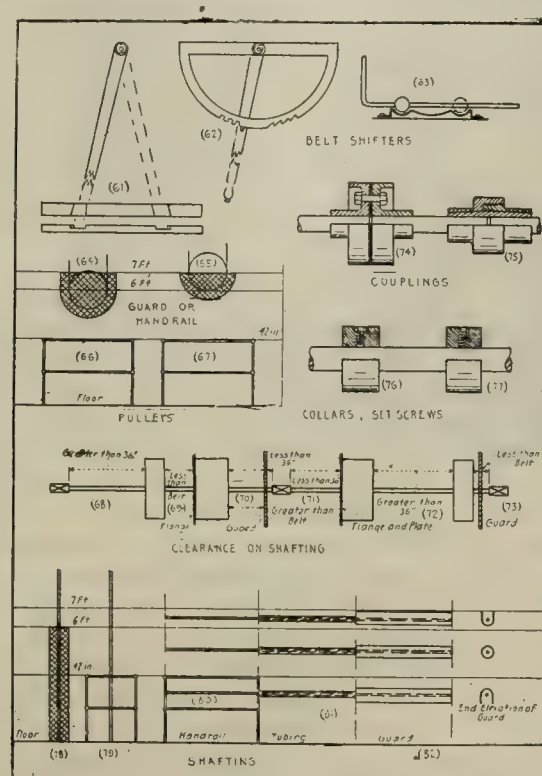
Lubrication—Oiling which brings the oiler in a danger zone shall be done only by an authorized person, and while the machinery is not in motion.

Oiler's Clothes—The oiler must not wear loose or flowing clothing.

Oiler's Lock—The oiler shall be provided with a lock and key or with a key



FIGS. 47 TO 60. GUARDS FOR HORIZONTAL BELTS.



FIGS. 61 TO 82. GUARDS FOR MISCELLANEOUS EQUIPMENT.

to the locks at the emergency stop stations, and with a warning sign to display at the stations when at work on machinery controlled by that station. He shall be required to lock the station in a "stop" position and display the sign before going to work, and unlock and remove the sign when the work is completed and all men have left dangerous places.

Starting Signals—Ample notice should be given by means of an effective alarm or signal in all departments before power-transmission equipment is started.

Inspection — All power-transmission equipment should be carefully inspected at frequent and regular intervals by foremen or authorized inspectors, and defective equipment should be reported for repair and records kept of inspections.

Repairs and Adjustments—Repairs and adjustments to power-transmission equipment or guards therefor shall be made only when the power is cut off from that equipment, and guards shall be replaced in protective before the power is cut on.

Removing Guards—Guards installed in accordance with this Code shall not be removed or rendered ineffective.

GRINDING WHEEL AND GRINDING MACHINE IN AUTOMOBILE MANUFACTURE

TO mention all the parts of an automobile that come in contact with the grinding wheel would be to name almost every essential part, the possible exceptions being the sheet metal fenders, hood over the engine, radiator and the rubber tires; even the glass wind shield, the springs in the cushion, enamelled number plate, the clutch and brake pedals and the button to the Klaxon horn are ground. The following are important parts which depend upon the modern grinding wheel and grinding machine for the accuracy demanded:

Crankshafts, piston pins, piston rings, pistons, cam shafts, eccentric rods, steering knuckles, rear axle housings, worm gears, spline shafts, push rods, valves, bearings, both ball and roller. This list is not by any means complete, however.

The grinding wheel also has what may be called an indirect bearing on the manufacture of automobiles. The metal tools used in lathes, planers, boring mills, milling machines and so forth must be sharpened when they become dull. A great many of these tools are made of alloy steel which can only be satisfactorily shaped by using a grinding wheel. Stellite is a material which is rapidly coming into use. It, too, depends upon the grinding wheel to shape it as desired. When we consider this phase of the subject the importance of the grinding wheel is strongly emphasised and warrants one making the statement that present day production would be only a dream if it were not for artificial abrasives.

Precision Grinding Machine

There is a type of grinding machine known as the precision grinding machine. The word precision is used because machines of this type must be capable of producing work of great accuracy. The art of precision grinding has advanced very rapidly during the past few years, and the demand of the automobile manufacturer should get credit for producing most of the advance.

It is now possible to grind more than one diameter at one time with one wheel. This is an outgrowth of the use of very wide wheels taking extreme cuts without any traverse of the table or the wheel. A conception of the refinement necessary in the modern grinding machine will become evident by considering the following:

A machine using a very wide wheel, say, 10 in. or 12 in., must have great rigidity as well as be capable of producing refined work. Imagine the forces present when a wheel weighing 150 or 200 pounds revolves on a spindle in plain bearings at 1,000 to 1,200 revolutions per minute. There must be accuracy to keep this spindle in perfect alignment so that the face of the grinding wheel will produce an absolutely straight cylinder, and the weight required in the base of the machine and the wheel slide to absorb all vibration caused by the revolving mass must be ample. Another factor which must be borne in mind is the risistance which is offered when the wheel is brought in contact with the work, as small particles of a very hard material are removed at an extremely rapid rate. It has been calculated that on a wheel 24 in. in diameter and 4 in. wide there are 1,860,171,000 cutting particles coming in contact with the work each minute. The spindle bearings must be so adjusted that the boxes will be quite hot when the machine is in operation; in fact, a temperature of about 140° F. is desirable.

Limits on the work being ground of .0005 in. are very common, those of .00025 quite common, and in some cases requirements are so exacting that less than .00025 in. is demanded. It should also be borne in mind that when the work is reduced .00025 in. the massive slide carrying the wheel spindle and the grinding wheel moves forward only half of this distance; in other words, 000125 in. If it were possible to split a piece of tissue paper into 12 thicknesses, the thickness of one of the resulting pieces would represent the motion of the wheel slide when the grinding wheel removes .00025 in. from the work. Bear in mind that this accuracy must be maintained not only where very small cuts are taken, but also under conditions where the object is to grind off as many cubic inches per minute as possible.

Many more interesting points could be given, but it is hoped the few mentioned above are sufficient to have awakened a sense of appreciation of the modern grinding wheel and grinding machine.

The next time you look at the engine and transmission machinery in your car do so wit ha certain amount of reverence, and take a few moments from your busy life to reflect that a product of the electric furnace has made all this possible, a product known as—artificial abrasives.—"Grits and Grinds."

PRECISION GRINDING

A PAPER on the general subject of precision grinding was read by H. H. Asbridge before the Manchester (Great Britain) Association of Engineers. The machine should not be regarded, he said, as a competitor of the lathe or other tool as a remover of metal, but rather as a means of removing metal in which finishing is included. The grinding machine will remove metal more quickly than the cutting tool, as shown by the lathe finishing tool tests of Dempster Smith, whose object was to determine the maximum area of steel shaft that could be finish-machined for a minimum wear of tool. The diameter of shaft was 8 in., traverse per revolution 1/20 in., depth of cut 0.003 in. The tests indicated that the best finishing speed was about 70 ft. per minute, or 7¼ min. to finish turn an 8 in. shaft 1 ft. long. The same work in a grinding machine comparable in size to the lathe on which the shaft was turned, the author said, would require 1½ min. If the sizing operation to a 0.005 in. limit, were included, the total time would not exceed 4 min. per foot of shaft.

Speeds for Cylindrical Grinding

For cylindrical grinding, Mr. Asbridge said the best average surface speed of modern grinding wheels made of artificial abrasives is about 6,000 ft. per minute for external cylindrical grinding, and the useful speed range is from 6,500 ft. to 5,500 ft. per min.; below this speed excessive wheel wear is liable and probable. Grinding machines should be arranged so that the effective life of the wheel falls within this range. The effective life of the wheel is that portion outside the minimum diameter which can be used owing to the limitations of the machine or the method of mounting. He emphasized the necessity of maintaining the speed of the wheel during the cutting operation, no matter what the speed may be. The drive should be sufficiently powerful to prevent slowing down during momentary heavy cutting.

The ideal traverse per revolution of the work is about two-thirds the width of the wheel for external grinding, but it should not, except for finishing, be less than half the width. The speed of the table travel becomes of great importance if a maximum production is to be assured. The main factor governing production on external cylindrical grinding machines is the combination of wide wheels with fast table speeds. The machine which possesses these advantages is the most efficient tool. Work speed has only an indirect effect on the output. With a good wheel it makes little difference to the finish obtained, the author holds, whether the work surface speed be, say, 30 ft. or 60 ft. per minute, except that if the lower speed is persisted in, it limits the table travel, and so in turn limits the output.

Internal Grinding

As regards internal grinding, the idea that the spindle should run at from 30,000 to 50,000 r.p.m. was entirely erroneous. The grinding wheel surface speed for internal grinding has little effect on

production. It has been found that the effective speed range of a good grinding wheel is greater than in any other form of grinding, and ranges from about 1,000 ft. to 4,000 ft. per minute. Much of the most successful grinding is done at a surface speed of from 1,500 ft. to 2,500 ft. Such results have only been made possible by spindle construction of the utmost rigidity. Rigidity is of more importance than actual wheel speed. The later design of internal spindle is so constructed that the spindle bearings never enter the hole being ground. The wheel is carried on an adapter fitted into the main spindle, and held by a draw-bolt. If the work to be ground is of limited range, the adapter portion is formed integral with the main spindle.

For internal grinding, wide wheels and a table traverse up to 9 ft. to 10 ft. per minute are advocated. For surface grinding the best wheel speed is about 4,000 ft. per min.

Grinding is probably the only cutting operation in machine work in which the output cannot be calculated with any approach to accuracy on the usual basis of cutting speed and feed. However, he maintained that grinding times for external cylindrical work could be based by means of the following formula: Diameter of work in inches × length in feet × constant = grinding time in minutes for the removal of 1/32 in. diameter and finishing to commercial limit.

Table of Constants for Determining Grinding

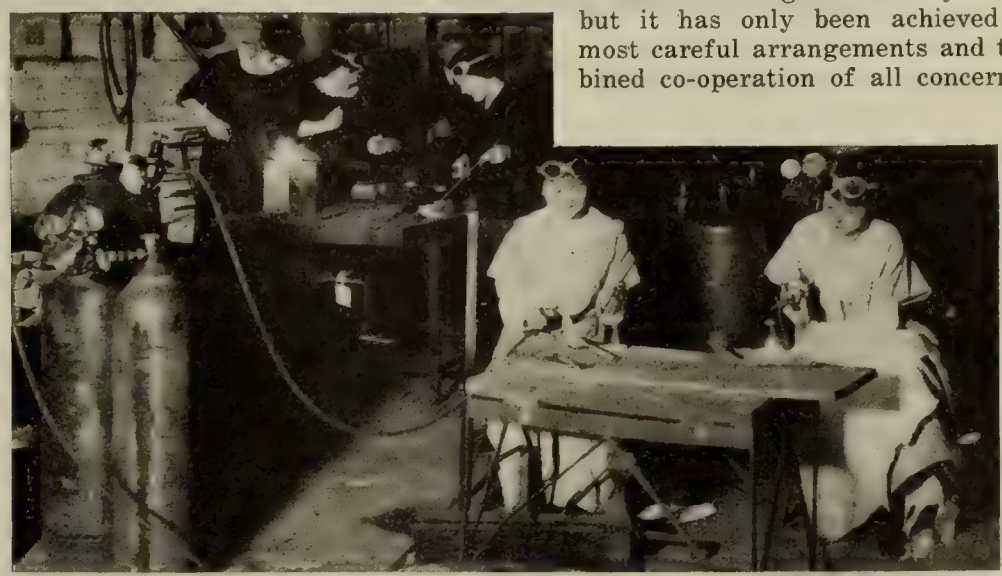
Diameter of Work.	Size of Wheel	Constant
4" shaft and upward.....	26" x 3"	1.3
3" shaft and upward.....	26" x 3"	1.4
2" shaft and upward.....	26" x 3"	1.8
1½" shaft and upward.....	26" x 3"	2.2
1" shaft and upward.....	26" x 3"	3
3" shaft and upward.....	14" x 2"	2.2
2" shaft and upward.....	14" x 2"	3
1½" shaft and upward.....	14" x 2"	3.7
1" shaft and upward.....	14" x 2"	5
3" shaft and upward.....	12" x 1"	3
2" shaft and upward.....	12" x 1"	3.8
1½" shaft and upward.....	12" x 1"	4.5
1" shaft and upward.....	12" x 1"	6.3

For the removal of 1/64 in. diameter it was necessary to allow two-thirds of the time obtained. For work below 1 in. diameter the grinding time tended to increase, depending entirely on the rigidity of support afforded, while extra time should be allowed to special limits, such as might be required for drive fits, etc., or for special finished surfaces, such as were necessary for spindles and gauges.

WOMEN WELDERS USE OXY-ACETYLENE APPARATUS

CURRENT developments all tend to show that when the interests of their country demand it, Canadian women will be found willing and able to help in any possible manner. Among the many industrial occupations which have been invaded so successfully by women in Britain is that of blow-pipe operation involving the use of oxy-acetylene apparatus for welding and cutting. It is a peculiar fact that, while the physical effort required in this work is small, every aspirant to the occupation does not always turn out successfully. Skill, concentration of mind, lightness of touch and deftness of hand and eye are necessary factors of success, and that the female temperament contains these qualifications is evidenced by the number of women operators who have recently acquired a high degree of proficiency in this work.

The rapid development of aeroplane construction in this country opened up much work in the welding and cutting line which was particularly suited to the employment of women workers. Of comparatively small dimensions, and light weight, and, from their very nature, necessitating the utmost reliability of manufacture, the parts required are now being satisfactorily made by locally trained female operators. For some considerable time now, selected pupils have been receiving instruction in the shops of the Carter Welding Co., Toronto, and the high percentage of these who make successful operators has been a most pleasing feature of this interesting industrial development.



GROUP OF PUPILS RECEIVING PRACTICAL TRAINING IN CUTTING, WELDING AND BUILDING UP AEROPLANE PARTS.

CANADIAN GIRLS WHO HAVE QUALIFIED AS WOMEN WELDERS IN THE USE OF OXY-ACETYLENE APPARATUS.

SHIPBUILDING IN GREAT BRITAIN

ALL THIS year, the efforts of the British shipyards and of the Shipping Controller have been concentrated on the task of pushing on the Government standard and other mercantile vessels which are in hand. These efforts are meeting with success, and the output of merchant tonnage is steadily increasing, but it has only been achieved by the most careful arrangements and the combined co-operation of all concerned—the Admiralty, the shipyard officials and workers, the iron and steel producers, the marine engine-makers—and these in turn have meant an insistent call for raw and finished materials, which are now, by all accounts, coming forward satisfactorily.

Iron ore is being mined at home and imported from Spain on a larger scale, the ironmasters have lighted additional furnaces, and the output of steel has been steadily increased. All the reports from the iron and steel centres agree that supplies of ship plates and angles, as well as forgings and castings, are now more in keeping with the demand than they were last year. The assembling and allocation of skilled and unskilled labor to the different yards has been no easy task, but it has been accomplished by dint of organization, and to-day there are even women doing useful work in our shipyards. The result is seen in the launching, fitting out, and completion of merchant ships, of which the world hears nothing.

"What dirty hands you have, Johnny," said his teacher.

"What would you say if I came to school that way?"

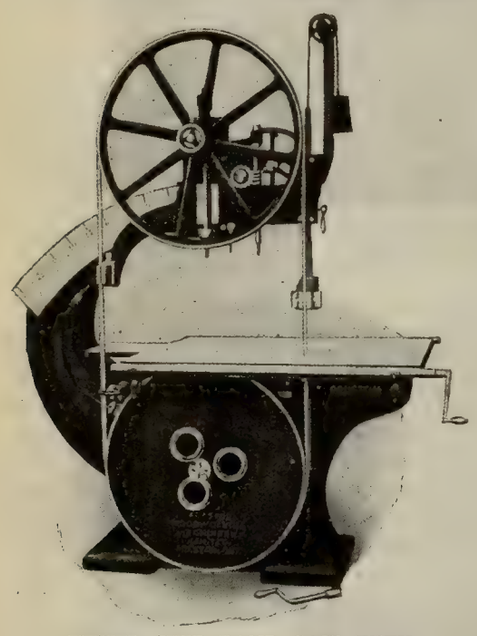
"I wouldn't say nothin'," replied Johnny. "I'd be too polite."

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

ADJUSTABLE BEVEL SHIP BAND SAW

THE band saw illustrated in the accompanying engravings is intended for all classes of band sawing where heavy stock has to be sawn bevelling. It is a recent product of the Preston Woodworking Machinery Co., Preston, Ont., and is specially adapted



BEVEL SHIP BAND SAW WITH DISC LOWER WHEEL.

to the use of ship and boat builders, navy yards, carshops, and all work where irregular sawing is done.

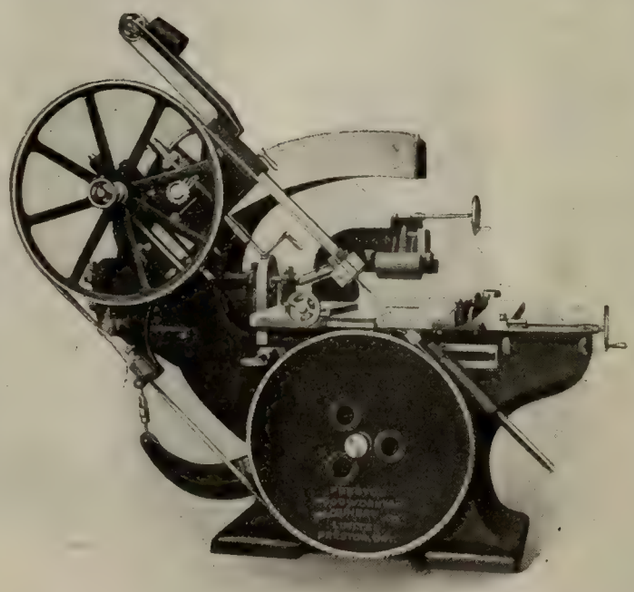
The frame is a one-piece casting, cored out in such a manner as to best distribute the material in order to eliminate vibration and ensure steadiness in running.

The wheels are 42 in. diameter and 2½ in. face. The bottom wheel is of solid web construction, the top being of arm pattern to make it as light as possible consistent with strength. They are very accurately balanced and covered with the best rubber covering. The top wheel frame can be adjusted to saw from square to any angle up to 45 deg. to the left, and can be adjusted to 10 degs. to the right from perpendicular. This latter is a very important feature. The wheel runs in long self-lubricating bronze bearings and is mounted in such a manner that it can be adjusted by hand wheel while in motion, for regulating the path of the saw to any position on the face of the wheel.

Adjustments can be made while the saw is in motion, by crank connection with worm and worm wheel on front, or by a large handwheel at the back of machine. Both back and front segments are graduated so that the operator can properly adjust the machine from either side. The bottom wheel shaft is very heavy and runs in long self-lubricating babbitt bearings or optional ball bearings, and is provided with a third bearing outside the tight and loose pulleys.

The table is of iron very heavily ribbed, and is 41 ins. x 43 ins. It is adjustable on main frame by hand-wheel as shown on cut. Adjustable iron plates are fitted into the table to close the opening when the saw is adjusted for different angles. The upper guide is fitted with hardened and ground steel roller back of the saw and with hard maple side guides. The guide bar is of steel 1½ ins. square and carefully counterbalanced. The lower guide with its attachment is automatically adjusted to the correct position to the saw blade at all times and at any angle.

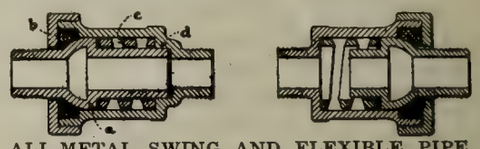
When using the power feed rolls this machine has a capacity up to 4 in. in thickness and 10 in. between the saw blade and the feed works stand. The capacity of the ripping gauge is from ¼ in. to 15 in. in width. A large saving is accomplished when using this machine for preparing cants used in the manufacture of columns, piping or any other class of work that requires building up, as there is practically no waste except the saw kirf. The net weight of this machine is 4.500 lbs. and floor space occupied is 4 ft. 3 in. x 7 ft. 10 in. It is supplied complete with belt shifter, brush for lower wheel, brazing clamp tongs and wrenches and one 2½ in. blade.



BEVEL SHIP BAND SAW ARRANGED FOR ANGULAR CUTTING.

ALL-METAL SWING AND FLEXIBLE PIPE JOINT

SWING and semi-pipe joints, which dispense with the use of packing and are suitable for steam, water, gas and oil, are made by the Rostern Co., People's Gas Building, Chicago. The joints, for which patents are pending, are made entirely of metal, the special feature being a ball-shaped shoulder revolving on a ring of anti-friction metal. Both types of joints are illustrated, one being designed for straight runs, while the other is intended for connections that are not tapped true.



ALL-METAL SWING AND FLEXIBLE PIPE JOINT.

The standard form of joint consists of a hollow cylinder having a ball-shaped shoulder (a) revolving on an anti-friction metal bearing ring (b). A cast metal spring (c), together with the pressure of the steam or other liquid passing through the joint, is relied upon to hold these two surfaces in close contact, the cylinder being kept in alignment by revolving in a socket (d). All of the parts of the joint are enclosed by the cap and the body. In the case of the oscillating joint, which can be adjusted for various differences of alignment up to 6 degs., the hollow cylinder that carries the ball-shaped shoulder is shortened. If a greater oscillation than 6 degs. is required, a special type of joint is supplied.

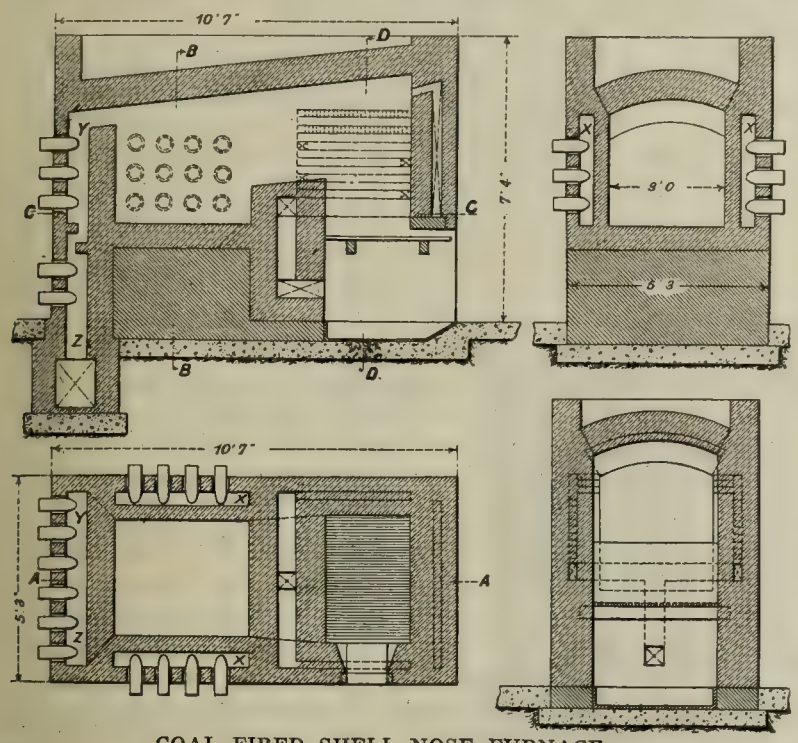
The joints have been found adaptable for connections between the platens of steam vulcanizing and wood bending presses, on laundry, paper and pulp machinery, for flexible pipe lines in mines and quarries, for steam blowers in locomotive roundhouses, for water doors or open-hearth furnaces, etc. In connecting two steam platens it is suggested by the manufacturers that the semi-flexible joints be used on press platens to overcome irregularities in closing, and to care for holes that are tapped out of line. A series of the joints in connection with ordinary pipes and elbows will give a maximum of flexibility.

The Rostern Co. reports tests in which the joints were used with steam at 350 degs. Fah. alternating with water at 64 degs. Fah., the changes being made rapidly and with no unfavorable results. The joints are of bronze in sizes ranging from ⅜ to 2 in., with larger sizes in steel, iron and special metals, and also with elbow ends.

Reading makes a full man; writing an exact man; conference a ready man.

COAL FIRED SHELL NOSE FURNACE

THE accompanying illustrations show an improved coal-fired furnace, specially designed for reheating shell noses, in use in several munition factories in England, and built from the designs of S. Ogden, 372 Fairmount-terrace, Thornley-lane, Reddish, Stackport. The special feature of the furnace is to obviate any possibility of the flame coming in contact with the metal, as this tends to overheat and crack it. To attain this end, the side walls of the furnace are doubled, with a space between, and the shells at the outside are placed horizontally in apertures in the outer wall, their noses protruding into the intervening space between the two walls marked X on the plan and one of the cross-sections. The inner wall prevents the flames from coming in contact with the noses of the shells, while at the same time the heat penetrating through the inner wall suffices to take the chill off the shell, and anneals the nose without overheating it. When thus gradually heated up, the shells are transferred and placed horizontally in apertures, the nose penetrating into a space between the two back walls, which are marked Y and Z in the longitudinal plan of the furnace, where they come in direct contact with the flames in their passage from the furnace to the uptake or chimney. The temperature here reaches 2,000 degs. Fah. The dimensions of the furnace are given, and practically self-explanatory. It may be added that one such furnace is sufficient to keep two or three presses going constantly. The furnaces, of course, are built to take any size of shell.



COAL FIRED SHELL NOSE FURNACE.

METHOD OF USING RADIUS GAUGE.

B.C. MINERAL PRODUCTION INCREASED 44 P.C.

THE total value of the mineral production of the Province of British Columbia for all years to the end of 1916 was roughly $558,500,000, says Premier Brewster. The value of the output for 1916 was nearly $42,300,000, an increase of forty-four per cent. over that of the preceding year. The output from metalliferous mining in 1915 was valued at nearly $21,000,000, while in 1916 it was more than $32,000,000, an increase over the first-mentioned year of about $11,000,000, or fifty-four per cent., while, as compared with the previous record, which was for the year 1912, the increase was seventy-six per cent.

While some of this enormous increase in value is undoubtedly due to the higher market value of most of the metals, yet in each of the metals, except gold there has been a largely increased quantity produced. Of the more important economic metals, lead, the output of which in 1915 was 46,500,000 pounds, was in 1916 nearly 49,000,000 pounds, an increase of 2,500,000 pounds of metal produced. Similarly, the ouput of copper increased from 57.000.000 pounds to nearly 65.500.000 pounds, an increase of about 8 500.000 pounds, and the quantity of zinc produced increased from about 13,000,000 pounds in 1915 to 37,000,000 pounds in 1916, an increase of 24,000,000 pounds, or nearly 200 per cent.

These facts, represented by figures, indicate that the industries as a whole have been enjoying a profitable and successful year, while there is every reason to expect that such will continue during 1917, the first three months of which year have already expired and have given such definite indications that it is safe to predict that the mineral output for 1917 will be greater by $50,000,000.

The tonnage of ore mined in the Province in 1915 was about 2,700,000 tons, while in 1916 it was about 3,200,000 tons. There was no doubt but that this great increase in output was stimulated by the high prices of metals due to war conditions, but it is now practically assured that these high prices will continue for the full year 1917. Coal mining is largely dependent upon other mining for a market and the increase in metal mining has had its influence on the coal and coke output, which in 1916 was nearly $2,000,000 higher than the preceding year, while it seems probable that a similar increase will be made in 1917, bringing the gross value of the products of the collieries up to more than $11,000,000.

RADIUS GAUGE

A CONVENIENT form of radius gauge has been gotten out by the Moss-Ochs Co., Cleveland, O., which enables the correctness of concave and convex radii to be accurately determined in increments of ⅛ in., from ⅛ in. to 1 in. It consists of eight plates of suitably tempered steel, one end being concave and the other convex. They are hinged as illustrated, so that when closed the larger and stouter sizes protect the more delicate plates from injury. It can be instantly made to any size, and enables the accuracy of surfaces under inspection to be rapidly and reliably determined.

Passing through a military hospital, a distinguished visitor noticed a private in one of the Irish regiments who had been terribly injured.

To the orderly the visitor said: "That's a bad case. What are you going to do with him?"

"He's going back, sir," replied the orderly.

"Going back!" said the visitor, in surprised tones.

"Yes," said the orderly. "He thinks he knows who done it."

INTERNAL AND EXTERNAL RADIUS GAUGES.

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DEVELOP OUR WHITE COAL

CANADA is facing a very serious problem as regards her fuel supply. In Ontario and other Eastern sections of the Dominion, we are almost entirely dependent upon the United States. Should anything fail in that source, our industrial and domestic life would be seriously menaced.

For the time being the question is largely one of transportation. However, with a shortage in the States and with rising costs of production, there is more than a possibility that our supply may in the future be permanently restricted. Activity should be directed along two lines of inquiry—to investigate the possibilities of our own coal resources; to consider an alternative means for the creation of heat and energy. In the latter connection, hydro-electric power at once comes to mind. Canada has almost unlimited hydro resources. It is largely a case of encouraging the development of potentialities into actualities. How can this best be done? No one can say that there can be too much development for the good of the community.

"SHOP SECRET" MYTH

WHAT are the advantages of the extreme secrecy practised by certain firms relative to methods employed and equipment installed for doing things? While there may be some shops that are virtually in possession of unique methods that prove an essential factor in "putting it over the other fellow," the vast majority of so-called "shop secrets" are very often the greatest stumbling blocks in the path of a firm's progress; not that the particular method or idea is inefficient, but that sometimes the firms are blind to the fact that their competitors may already know of the features that they are so anxious to conceal. Many men are apparently impressed with the thought that they monopolize the source of all good ideas, and that the development of such ideas, together with their practical application, could not have matured in any other mind How often have you noticed a man's line of thought running along a channel from which it is almost impossible to divert him? If this determination is based on sound principles, the fault, if you may so call it, is a very good one, but if he has become so obsessed as to be impregnable to others' suggestions, then he may be standing in his own light.

We call to mind an instance some few years ago, where a certain attachment was developed from designs suggested by the superintendent of the plant for the making of certain sheet metal products. Considerable experimenting was subsequently required before the machine could be successfully operated. For some time after it was put in service, it created much interest among the various workmen in the shop, several of whom in course of time were privileged to operate it, each employee becoming more or less familiar with its construction and operation. A curious fact, however, in connection with this particular machine, was that when outside visitors — presumably competitors—were being shown around the shop, instructions were issued beforehand and forwarded to the foreman, so that when the visitors were present, the machine was "idle" and the "shop secret" isolated from view by means of a suitable covering.

One day, some two years after the discovery of the new-born idea, the shrouding process was inadvertently neglected, with the result that a visitor became unconsciously a spy, so to speak. With the "secret" detected, the visitor was asked to comment upon its action, and rather surprised the superintendent by replying, that a similar device had been working in a certain shop in another district for some years, but that several improvements of more recent origin had greatly increased the earlier efficiency. Following several improvements suggested, the inevitable result was better and larger production.

Apart from coincident possibilities, such as above related, the floating character of the human element must make it apparent to all that interchange of ideas and methods must eventually follow the adoption of new and interesting discoveries. Pride in our own achievements should be one of the essential arguments in favor of publicity of ideas. Few, if any of us, are so original that we are entirely self-reliant. If the truth were really known, the birth of many, I was going to say all, of the much vaunted "shop secrets" could be traced to a previous idea or suggestion, verbally expressed or drawn from the text-book of another mind.

Surely then, if we are willing to accept another's suggestion, from which we might build, we should endeavor to reciprocate in so far as we are able. Fear of having our ideas copied should not deter us from bringing them to the notice of another. It is seldom that a device of special design would be copied in its entirety; and even if it were, much of its usefulness would be lost owing to the lack of that experience that can only be acquired by the actual evolution of the idea. Interchange of thoughts and ideas are often the means of converting the ordinary into the exceptional achievement. The mythical nature of the "shop secret" is daily becoming more fully appreciated. Reciprocity is recognized as one of the factors of success. Instead of the isolating spirit of shop secrecy we should cultivate the spirit of Kipling's words:

"They copied all they could follow,
But they couldn't copy my mind,
And I left them swearing and stealing,
A year and a half behind."

INDUSTRIAL NOTABILITIES

MARK WORKMAN, president, Dominion Steel Corporation Ltd., Montreal, Que., controlling Dominion Iron & Steel Co.; Dominion Coal Co., etc.; president, Mark Workman Co., Montreal, Que., manufacturers of military clothing, also interested in Jacobs Asbestos Co., Thetford Mines, Que., and the B. Gardner Co., clothing manufacturers, Montreal, Que., was born in Buffalo, N.Y., August 4, 1864, son of Isaac and Sarah (Rosenthal) Workman. He was educated in Public Schools, and came to Montreal with his father in 1876 and associated with him in the clothing business; becoming the real head

MARK WORKMAN

of the business in 1880. The company was incorporated in 1906, and under his able management the business has steadily grown to its present magnitude. For the past eighteen years he has been a contractor for the Dominion and British Government for military clothing.

Mr. Workman is one of the largest shareholders in the Dominion Steel Corporation, having been an active member of the Board of Directors since 1911. He was elected President in January, 1916. He is a very liberal giver to charitable institutions, his yearly benefactions being estimated at $50,000 to $60,000. Has given most generously to the Patriotic Fund and to the various regimental funds. He subscribed $200,000 to the Canadian War Loan.

Mr. Workman married Miss Rachel Lewis, Syracuse, N.Y., February 18, 1886, the family consisting of four daughters and one son.

His residence is 585 Sherbrooke St. W., Montreal.

—Photo, Courtesy British and Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$47 95
Lake Superior, charcoal, Chicago	57 00
Standard low phos., Philadelphia	82 00
Bessemer, Pittsburgh	55 95
Basic, Valley furnace	50 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	.....

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	12 10
Chequered floor plate, ¼ in.	12 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 50
Tank plates, Pittsburgh	9 00
Structural shapes, Pittsburgh	4 50
Steel hoops, Pittsburgh	5 25

F.O.B., Toronto Warehouse.

Steel bars	5 50
Small shapes	5 75

F.O.B. Chicago Warehouse

Steel bars	5 00
Structural shapes	5 00
Plates	8 50

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$37 00	$36 00
Electro copper	37 00	36 00
Castings, copper	36 00	35 00
Tin	63 00	66 00
Spelter	12 00	12 00
Lead	13 75	14 25
Antimony	24 00	26 00
Aluminum	70 00	68 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$12 00	$11 00
Heads	12 30	11 30
Tank plates, 3-16 in.	12 65	11 10

WROUGHT PIPE.

Effective July 5, 1917.

Size.	Black Per 100 feet	Galvanized Per 100 feet
Standard Buttweld.		
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00
Standard Lapweld.		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$21 00	$22 00
Copper, crucible	25 00	27 00
Copper, heavy	25 00	26 50
Copper wire	25 00	26 50
No. 1 machine composition	21 50	22 00
New brass turnings	17 00	19 00
No. 1 brass turnings	15 00	16 00
Heavy melting steel	20 00	17 00
Steel turnings	9 00	8 00
Shell turnings	12 00	12 00
Boiler plate	15 00	10 50
Axles, wrought iron	25 00	24 00
Rails	19 00	18 00
No. 1 machine cast iron	26 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	17 00	9 00
Scrap zinc	8 00	9 50
Heavy lead	11 50	10 75
Tea lead	7 50	7 00
Aluminum	35 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank,	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in. and larger	$7 10
Structural rivets, as above.	7 00
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze.	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30. 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$100 00
Open-hearth billets	100 00
O.H. sheet bars	105 00
Forging billets	125 00
Wire rods	95 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		6 50
Spikes, ¼ and 5-16 in.		7 00

MISCELLANEOUS.

Solder, strictly	0 38
Solder, guaranteed	0 41
Babbitt metals	16 to 65
Soldering coppers, lb.	0 53
Putty, 100-lb. drum	4 35
White lead, pure, cwt.	19 00
Red dry lead, 100-lb. kegs, per cwt.	13 87
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 62½
Linseed oil, raw, single, bbls.	1 27
Linseed oil, boiled, single bbls.	1 30
Plaster of Paris, per bbl.	2 50
Plumbers' oakum, per cwt.	9 00
Packing, square braided	0 34
Packing, No. 1 Italian	0 40
Packing, No. 2 Italian	0 32
Lead wool, per lb.	0 15
Pure Manila rope	0 37
Transmission rope, Manila	0 43
Drilling cables, Manila	0 39

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks	list plus 30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 10%; B and C, 10%; cast iron, 35%; standard bushings, 50%; headers, 60; flanged unions, 40; malleable bushings, 50; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, Black, No. 28	$10 00	$10 00
Sheets, Black, No. 10	11 50	10 50
Canada plates, dull, 52 sheets	11 00	11 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	9 75
Queen's Head, 28 B.W.G	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	11 70
Premier, 10¾ oz.	13 85	12 00

PROOF COIL CHAIN.

B	
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$10 90
Connelsville Foundry Coke.	...
Steam Lump Coal	8 50
Best Slack	8 05

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$33 00	....
1¼ in.	36 00	....
1½ in.	38 00	32 00
1¾ in.	38 00	32 00
2 in.	45 00	33 00
2¼ in.	48 00	35 00
2½ in.	50 00	38 00
3 in.	58 00	45 00
3¼ in.	....	53 00
3½ in.	70 00	55 00
4 in.	82 00	67 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	38
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	13
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	6 15
Lard oil, per gal.	1 50
Union thread cutting oil antiseptic	68
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	11

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No.1	1 50
Leather in sides	1 35

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER SHEETS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THE situation in the iron and steel trade is becoming more acute and the market is in a very unsettled condition, due largely to the uncertainty as to the American Government requirements, and the prices which have yet to be fixed. Until this question is disposed of, consumers are holding off, not knowing what may develop. In spite of everything, however, prices of steel products continue to advance steadily, and the outcome is looked upon with mixed feelings. That prices are already too high is the opinion of many in the trade, but there seems to be no means of restricting the upward movement. Wrought pipe has again advanced and higher prices on other products are looked for in the near future. There has been as yet no material improvement in the coal situation, although efforts are being made to increase supplies for the coming winter. There is still a scarcity of coke, and the quality is said to be not up to former standards. The coke situation is causing some uneasiness while, in addition, prices are advancing. There is no change in the domestic pig-iron situation and no prices are obtainable. In the States, pig-iron prices are still advancing which will affect local consumers. Prices of scrap are unchanged from last week and the market continues dull and featureless. Prices of steel and cast iron scrap are firm, but copper and brass are weak. There is a general scarcity of most old materials which is tending to support the market. The non-ferrous metal markets are dull with a weak undertone. Copper has declined, otherwise prices are unchanged. Uncertainty as to the American Government requirements and prices is depressing the market, and consumers are holding off pending developments. Prices of machine tools continue to advance and deliveries are getting more backward. There is a good demand for machine shop supplies at firm prices. Files have advanced, while higher prices on twist drills, lathe chucks and vises are looked for in the near future.

Montreal, Que., July 9, 1917.—The market has again been featured by a general advance in pig iron, and as this is the basis of the entire steel industry, it exemplifies the conditions which characterize the situation in all branches of activity. The return of warm weather has resulted in the curtailment of production, and the shortage of coke has made the situation more acute. Shipbuilding and the demand for plates continue to occupy the centre of interest, and the impossibility of meeting the increasing requirements in this direction has resulted in a very strong market, one that is likely to remain for a long period after the war.

Pig Iron

The pig iron market, after a short period of comparative lull, has developed additional strength, and American prices have again advanced. The situation has been somewhat affected by the advent of warm weather, resulting in the falling off of production; this, however, has been counteracted by a slight increase in blast furnace units, which in turn have created an additional demand for raw material, and a pronounced shortage of coke has resulted, being reflected in this week's quotation of $15.75 for Connelsville furnace coke, an advance over last week of $2.25 per ton. With the exception of the Pittsburgh district, all American pig has been subjected to an advance approximating $2 per ton; the quotation of composite pig iron is now $52.96 per ton. The rapid advance of pig may be gathered from the fact that the price a year ago was less than $20 per ton. No quotations are made on domestic pig, these being practically off the market.

Steel

Domestic consumers are feeling more and more the existing tension, as the present war requirements and the possible increase in this direction make it very difficult to get delivery on material

for general commercial purposes. Demands on Canadian mills are such that the output is insufficient to meet Government needs, while the situation in the States has also become so acute that activity in private enterprise has of necessity fallen off. In addition to the pronounced shortage of steel for domestic use, the abnormal high cost is having a great influencing effect upon general construction, and much needed expansion has been unavoidably deferred. Considerable interest is centred in the possible developments that may place one of Canada's largest iron industries under the control of British or American interests. Shells steel requirements continue heavy, and it is impossible to meet the demands of the shipbuilders for plates. The market in billets and sheet bars remains steady, with prices firm and unchanged. The Pittsburgh quotation on iron bars has been advanced $5 per ton, the base price being now 5c per lb. The continued placing of American Government orders for sheets, together with the filled up condition of the mills, has again resulted in an advance of approximately $10 per ton on blue annealed sheets, the Pittsburgh quotation being on a base of 8½c per lb. Galvanized sheets at the same source are quoted at 11c, this being $20 per ton higher than a week ago. Local dealers have readjusted their sheet prices, the advance being approximately 10 per cent. over those previously quoted. Following the gradual increase in the American plate market, the situation here has become stronger and local prices have been revised; ¼ in. to ½ in. plates are now listed at 12c, heads at 12.30c, and 3/16 in. tank plates at 12.65c per lb. It is reported that sales have been made on certain ship plates as high as 15c per lb. No cessation in the demand for pipe has developed, and prices have become higher on a 7-point advance, the quotation being now 42 per cent. off for steel pipe and 33 per cent. off for wrought iron pipe. Local prices on proof coil chain have again been revised, the advance ranging from $1.25 on ¼ in. to 85c on 1 in. per 100 pounds; complete price list will be found in the selected market quotations. General conditions here are much the same, the market continuing very active on the advancing prices.

High Speed Steel

The market in high speed steel is well maintained, although a slight falling off has been noted owing to the reduction of large shell output. The uncertainty that prevails as to the permanency of this branch of munitions work causes the situation to retain strength, which, together with the abnormal high cost of all classes of material and labor, maintains prices at a very high level.

Metals

Comparative inactivity has characterized the metal situation of the past week, and prices have consequently declined. American conditions are still unsettled, although action has been taken regarding certain features of trade regulations. The situation is however, very uncertain, and will continue so until the policy of the Government is definitely known. Copper is slightly weaker, but uncertain. Tin is uncertain, but retains its strength. Spelter is very dull, with little demand. Lead demand is falling off and quotations are declining. Antimony is lower on weak demand. Aluminum is firm, but with a weak undertone.

Copper.—The American market has apparently quieted down after the understanding that the Government would pay a flat price of 25c per lb. The fact that no confirmation is available regarding this has had the tendency to retain much of the uncertainty that was so marked some weeks ago. Leading producers are supplied with large quantities of copper, but are not in the market, and small holders are apparently setting the current prices, recent sales having resulted in a weaker tendency. The New York electrolytic price has declined 1c on the week, the present price being 31½c per lb. On a decline of ¾c castings are quoted at 29¼c per lb. Local dealers report a steady market, but prices asked are ½c lower than last week, the quotations being 37c for lake and electro, and 36c for castings.

Tin.—Despite the disturbing influences of political developments the market in tin continues very firm. Reports from England are very irregular, and local and American markets are a little unsettled in consequence. New York prices show a firm market, with quotations ¼c higher than last week. Local conditions are unchanged, with dealers asking 63c per lb.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

Spelter.—The poor demand and the accumulation of supply has resulted in a very dull and inactive market, and the lack of interest on the part of consumers seems to offer little encouragement for an early revival of former interest. As production is carried on at the present time on practically a cost basis, it is unlikely that prices will decline much lower, and, therefore, New York continues to quote about 9⅛c per lb. The conditions here are unchanged, with prices showing a weaker tendency; dealers are asking 12c per lb.

Lead.—A quiet market has created a weaker tone in the general situation, with the independent producers lowering quotations to meet it. Outside prices are nearly on a par with those of the trust, and it is anticipated that the latter will shortly reduce their quotation to conform with the trend of the market. The outside price is now 11⅛c, with the leading interests asking 11c. On a weaker demand local dealers have declined their quotations to 13¾c, this being ½c lower than last week.

Antimony.—The market has become somewhat irregular, following the placing of orders for the American Government, this having been done quietly, the effect being to upset some of the plans of those dealers not involved in the deal. Supplies being placed on the market have had the effect of a decline of 1¾c on the New York quotation, the nominal price asked being 17c per lb. Local dealers report a weaker market, with prices 1c lower at 24c per lb.

Machine Tools and Supplies

The decline in the production of the heavy shells has materially affected this particular field of machine tool business, but considerable business is still being done in small machinery for light shells and fuses. Interest, however, is being transferred to general tool equipment to handle the increasing business that is characterizing the developments of the shipbuilding industry. Many small plants are actively engaged in the manufacture or repair of various ship machinery and accessories, and inquiries along these lines are very encouraging. The securing of raw materials is still a feature of the situation, the combination of all circumstances making the cost of equipment second only to the getting of it. The demand for supplies is well maintained, with prices firm or advancing.

Scrap

Irregularity is noted in the general market, more particularly in the States, where the situation continues uncertain. Buying is light, both dealers and consumers being reluctant to accumulate heavy supplies under existing conditions. Local conditions are not so erratic, but, apart from the iron and steel scraps, the market has taken on a weak tone. Coppers and brass scraps and also machine compositions have declined locally 1c per pound, 21c being asked for the light copper and 25c for the heavier grades; 17c and 15c for brass clippings and turnings respectively, and 21c for machine compositions. Wrought iron axles have advanced 2c to 25, and machine cast iron 1c to 26c per lb.

Toronto, Ont., July 10.—All indications point to an improvement in the coal situation within the next few months. The fuel controller C. A. Magrath has requested all manufacturers and other large users of coal to state their requirements so that an equitable distribution may be made. The co-operation of the railways in furnishing cars is anticipated. Only by drastic methods can the present serious situation be relieved.

Steel

While prices of iron and steel products continue very firm, the market has become unsettled owing to the uncertainty which prevails in regard to future developments. The rapid advance in prices has reached a somewhat dangerous point and many private consumers

are hesitating, not knowing what may happen in the more or less immediate future. It is generally conceded that the prevailing high prices have been caused to a considerable extent by consumers practically bidding against each other in an effort to obtain material. These interests needed steel and there was apparently no alternative but to pay current prices. The situation has become more complicated since the United States entered the war. It is known that the American Government requires large tonnages of steel in addition to what has already been purchased. The present unsettled situation is due to this fact and also because no contract prices have yet been fixed, except some tentative figures given out some weeks ago. Consumers therefore are waiting to see what prices will be fixed on government requirements and in the meantime are restricting their purchases as far as is conveniently possible. At the same time the high cost of iron and steel is also a deterrent to business and the shortage is having a similar affect. Notwithstanding the prevailing high prices it seems likely that the top has not yet been reached as indications point to an increase in demand at a time when the mills are sold up months ahead. However, when government prices have been fixed, the situation will be clearer; until then it is largely a matter of speculation as to what will happen.

At the moment prices are still climbing and although there are comparatively few changes to announce this week, quite a number of advances are in prospect. There has been another advance in wrought pipe due to the scarcity and high cost of skelp. The new prices represent an advance of two points in all sizes, black and galvanized. On account of the uncertain situation, orders for 2½ in. pipe and larger will only be accepted on a basis of price ruling on day of shipment. Steel washers are also higher, the new discount being list plus 10 per cent. as against net list formerly. Cut nails have advanced, and are now $5.75 per keg base. The new discount on wire tacks is 60 and 10 per cent. There is no improvement in the steel plate situation. The plate demand particularly for shipbuilding is enormously heavy and will continue to be so for many months. The scarcity of plates, and fear that the supply will be severely restricted by government purchases, have created much uneasiness among consumers. Quotations continue entirely nominal and no formal prices exist for delivery at mill convenience. Prices of iron and steel bars, and shapes are very firm.

The situation in black sheets is getting tighter in the primary market as government requirements are getting heavier. Little business for forward deliveries is being taken by the mills in view of the increasing demand both from the government and from contractors doing government work. Sales of sheets to regular customers are being steadily restricted, and a number of leading mills are out of the market as sellers. Current prices on black, blue annealed, and galvanized sheets, are firm but unchanged in the meantime.

The steel market in the United States is quieter but prices continue very firm with an upward tendency. The market is however in a very unsettled condition owing to the uncertainty of the government attitude with regard to prices. The possibility of government intervention in the steel market is having an unsettling influence. Private consumers are being held up because of government work.

Pig Iron

The pig iron market in the States continues very firm and prices are still advancing. The general situation is practically unchanged but there is considerable uneasiness in some quarters about the possibility of Government regulation of pig iron prices. The local situation is unchanged as domestic pig irons are still off the market.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Scrap

There is no appreciable change in the local scrap situation. The market is featureless and prices are unchanged on the basis of last week's quotations. Scrap steels and machinery cast iron are holding firm but there is a decided weakness in coppers and brass. Stocks of scrap are very light which is having a tendency to keep prices from falling.

Machine Tools

Interest at the present time lies principally in the situation across the line, the chief feature being further advances in prices of machine tools. A few manufacturers of turret lathes have announced a 10 per cent. increase. A manufacturer of radial drills has raised his prices 15 per cent. so that higher prices on these tools are likely to become general. Sensitive drill presses have advanced 10 per cent. and grinders 5 per cent. Owing to the increasing demand in the States, deliveries are being extended still further. Second hand equipment is getting very scarce. The A. R. Williams Machinery Co., have issued a list of their requirements for engineering tools but it is believed that considerable difficulty will be experienced in purchasing the equipment needed.

Supplies

The market for machine shop supplies continues active and there is a general tendency towards higher prices. One manufacturer of lathe chucks recently advanced prices, and other makers will likely follow suit. Higher prices on twist drills and vises are also looked for in the near future. All makers of files have advanced aproximately 10 per cent. Higher prices have been recorded on Lufkin rules and tapes.

Metals

Continued dullness characterizes the metal markets this week and prices have a weaker tendency, although copper is the only metal which has declined. The other metals are unchanged at last week's levels. No further developments have materialized in regard to the American Government's purchases of metals and as a result the markets are more or less stagnant pending some definite news as to Government requirements.

Copper.—The market in New York is weak in spite of rumors of impending purchases of copper by the Allies. The recent purchase by the American Government has not affected the market as yet, as no official statement has been made as regards the price. The strike at several copper mines in the U.S. has assumed a serious aspect and production has been in the meantime cut down about one half. Although prices of copper are lower, the shortage of metal in the next few, months, owing to the strike, will probably result in an advance. Copper has declined one cent locally, lake and electrolytic being now quoted at 36c and castings at 35c per pound.

Tin.—The market is quiet and unsettled at unchanged prices. There is very little business as importers are not pushing sales and consumers are well stocked. Local price 66c per pound.

Spelter.—The spelter situation is unsatisfactory due to lack of demand from the average consumer. The market is dull and quotations unchanged at 12c per pound.

Lead.—The market is dull and weaker but quotations are in the meantime unchanged although indications point to a decline in prices. More metal is being offered than there seems to be a demand for, thus tending to weaken the market local price 14¼c per pound.

Antimony.—The market is dull and irregular. There are plenty of sellers but few buyers. The revolution in China unless settled soon will strengthen the market.

Aluminum.—The market is easier on freer offerings and practically no demand. Consumers are hesitating pending the American Government's acceptance of 27c for aluminum. Local price unchanged at 68c per pound.

New York, July 7.—The United States Steel Corporation is completing plans for the construction of a large shipbuilding plant in the Hackensack Meadows, on Newark Bay, in the vicinity of New York City. Recently several million dollars were appropriated by the Finance Committee of the Board of Directors for this purpose. At that time details had not been decided upon; even now, official announcement is withheld. It is semi-officially known, however, that the plant will be built speedily and that 12,000 tons of structural steel will be required for the construction of shipways, crane runways, machine and fabricating shops, power houses and other buildings. To equip these various units, it is estimated that $1,000,000 will be spent. It would not be surprising to find that orders for electric and other cranes and for shop equipment, including turret lathes, drills, boring machines and other tools, already have been placed, as it is expected that steel shipbuilding will begin within four months.

The new plant will be constructed and operated by the American Bridge Co., the fabricating subsidiary of the Steel Corporation. The Bridge Co. for years has been building barges, car floats, and other craft, and in the past year, also has fabricated steel for ocean-going boats, for the Chester Shipbuilding Co. The steel has been fabricated at the Ambridge plant and assembled at the Trenton plant of the Bridge Co. Plans now maturing call for the extension and equipment of existing shops, as well as for the construction of new shops which will require the purchase of more machinery. The Corporation has also appropriated funds for the building of another shipyard in the South by the Tennessee Coal, Iron & Railroad Co. Details concerning this project will probably be announced next week.

Machine tool makers and dealers in the last week have received additional orders from five other shipyards on the Atlantic coast, the Newport News Shipbuilding & Drydock Co. alone having released orders for $75,000 worth of tools. Agents of three shipbuilding plants on the Pacific coast have also placed orders for cranes and machine tools and are still negotiating.

Manufacturers of airplanes, motors, and engines have closed contracts for between $500,000 and $1,000,000 worth of tools. One large company has ordered tools costing several hundred thousand dollars. The latter company, as well as most of the shipbuilders in the market in the past two weeks, are working almost exclusively on Government contracts, and it is expected that the Steel Corporation will build 100 steel cargo boats on an intensified standardized plan for the United States Emergency Fleet Corporation.

Manufacturers of ordnance, mines, bombs and other war munitions, in an effort to push Government contracts, are now in the market with numerous small lists for machine tools. Under these circumstances, it is not surprising that other manufacturers of turret lathes and of radial drills have advanced prices 10 to 15 per cent. Manufacturers of milling machines, punching and shearing machinery, of drill presses and of grinding machines also have advanced prices 5 to 10 per cent.

Buying of machinery for export continues active although no large individual orders are being placed. Most of the buying is for machine tools to be shipped to Great Britain, France, and Italy, but orders have also come from South Africa and from India. Before the war, of course, these countries purchased tools in England. Spanish manufacturers have also been in the market, but the United States Government has refused to allow the orders to be executed because of the belief that the machines were designed to assist German interests.

Pittsburgh, Pa., July 7.—The iron and steel trade is rapidly coming to the opinion that there will be some form of price regulation. The amendment added to the Food Bill in the Senate, giving the President power to control prices of iron and steel as well as of foodstuffs, is expected to stay in the bill through the conference with the House, whose bill referred only to food, and the balance of probability is that if the President were given the power he would exercise it. Of course there are many who cannot believe that such a drastic operation would be undertaken, but they are among the slow thinkers. Those who realize both the seriousness of the war situation and the utterly absurd position into which the steel market has worked itself, feel that regulation by this means or that is bound to come.

There is of course the possibility of the steel makers adjusting their market so as to forestall formal action by the Government, but this possibility is relatively remote. The United States Steel Corporation undertook something of the sort, when last April it withdrew almost altogether from the markets. Since then, except in a few instances, it has maintained nominal or official prices then ruling, and has not sold except to some regular customers and then at its special prices. Those independent mills still in position to sell continued to advance prices, however, and the market as now generally quoted is far above the Steel Corporation levels. The action of the Corporation did not keep the market from advancing and indeed it seems to have had the opposite effect, as the withdrawal of its sales left the demand for the independents.

In case of prices being fixed in the iron and steel industry, it would be absolutely necessary that deliveries on existing contracts be regulated. Contracts higher than the fixed level would of course be revised and as the mills are as a rule sold up fully to the regular trade, with the prospect that deliveries must be held back to give priority to Government orders, the distribution of the tonnage that could be spared from day to day or week to week would require regulation. Details, both as to prices and as to deliveries, would probably be left to the steel manufacturers, after some general rules have been drawn up.

There is no doubt that if regulation is undertaken at all it will apply to practically everything in the iron and steel industry, that is, it would not be feasible or fair to regulate steel prices and not pig iron prices, or pig iron prices and not coke prices. There are some critics who say that Government regulation is well-night impossible, but they lose sight of the fact that the present price structure is a worse mess than anybody could possibly make if he started out with a clean slate. For instance, a year ago Connellsville furnace coke was selling regularly at about one-seventh the price of pig iron, comparing coke per ton at ovens and pig iron per gross ton at valley furnaces. At the present time pig iron is three times the price of a year ago, while just before Independence Day, when there was a particular rush to buy coke to tide over the holiday, there was coke sold at $16.25, or almost one-third the price of pig iron, although pig iron was selling at three prices.

Possible Price Limits

If price limits are fixed they would naturally be very much lower than the prices now quoted as the market, as these prices are done merely on odd lots for deliveries in the next few months, when the large mills are with scarcely an exception sold up into the new year and only the small mills are in a position to sell. Probably the highest prices that would be considered at all would be the prices at which the bulk of the deliveries are now being made, against old contracts. Such prices would probably be 4c or under for sheets, 3c or under for bars and shapes, and perhaps a somewhat higher price for plates. However, the Federal Trade Commission has been instructed to investigate and report upon costs in the iron and steel industry, and should it find that the costs have greatly increased, the limits might be considerably higher.

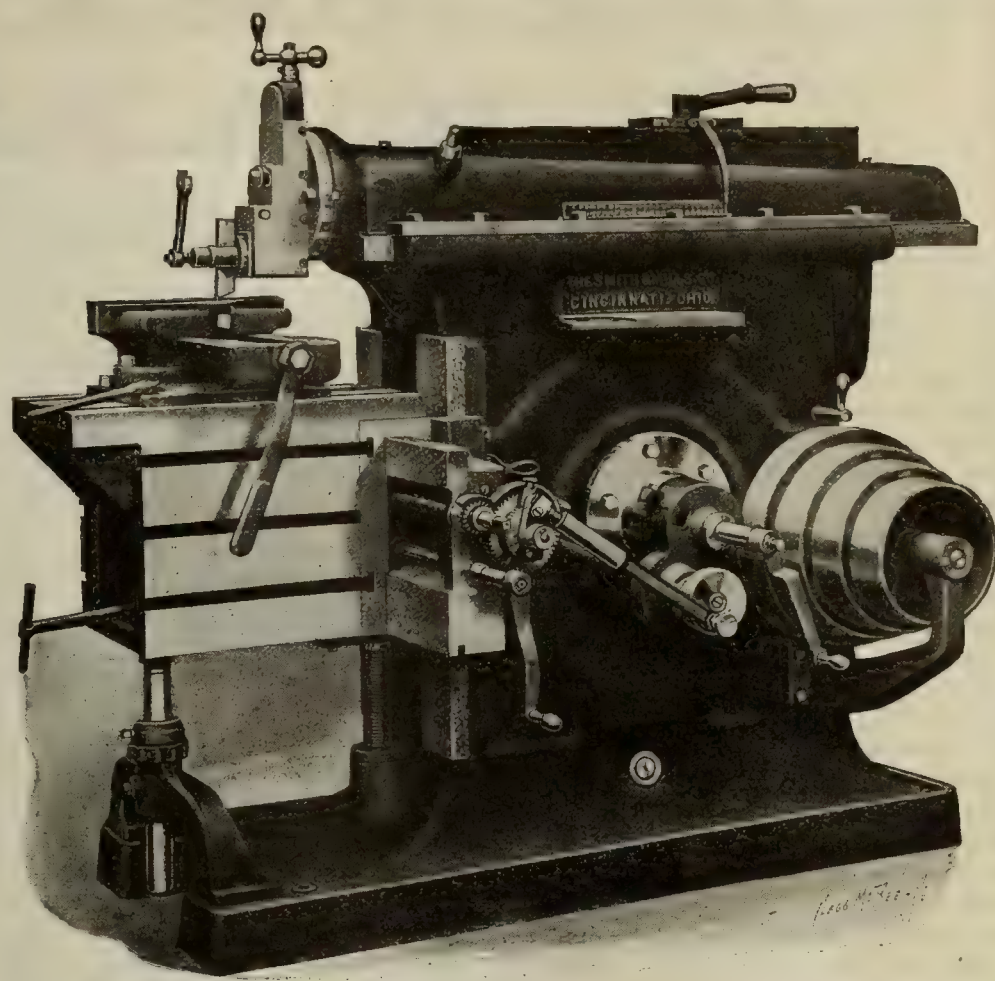
There is practically no discussion as to what would be done in the case of export business. For some time past export enquiries have scarcely been considered at all by the mills, and such exports as are made would probably be confined almost entirely to the needs of our Allies in Europe. The limiting of prices would be for two principal objects, first, to make it easier for the Government to arrange for its own requirements and those of the Allies, at perhaps somewhat lower than the general limit prices, and second, to enable consumers of iron and steel to stay in business, for the general good of the country. In this philosophy there is no place provided for the ordinary consumer of steel outside the United States.

Steel Market Very Quiet.

The steel market has continued to grow quieter until now it is almost stagnant. Buying for really forward deliries practically ceased two months or more ago. Since then the buying, such as has occurred has been for earlier and earlier deliveries, naturally of smaller and smaller volume as there is little steel to be had for early deliveries even at the

(Continued on page 60.)

Smith & Mills SHAPERS



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Further particulars should interest you.

Every Thread is Straight, Even and Accurate

The Chasers in an *H & G Automatic, Self-Opening Die Head* are set and held in place by a steel cam. That cam once adjusted, locks; there is no stoppage or changing in size.

The quick release not only insures the cutting of the thread to a given point every time, but permits cutting right up to a shoulder when required.

Simple, Strong and Compact.

Our booklet tells more. *Drop a card for it.*

Eastern Machine Screw Corp.
New Haven, Conn.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Chatham, Ont.—The International Harvester Co. of Hamilton, Ont., will build a foundry here.

Kitchener, Ont.—The Canadian Consolidated Rubber Co., propose building an addition to their machine shop.

Hamilton, Ont.—The Hamilton Steel Wheel Co., will build an extension to their plant at a cost of $25,000.

Toronto, Ont.—The Russell Motor Co. have a permit to erect an addition to their munition factory near King and Dufferin streets at a cost of $7,500.

Toronto, Ont.—The Booth-Coulter Copper & Brass Co. have been given a permit to build an extension to their factory at 115 Sumach Street, to cost $6,500.

Toronto, Ont.—The John Inglis Co. have been granted a permit to erect a brick and tile machine shop on Strachan Avenue, south of the G. T. R. tracks, at a cost of $45,000.

Montreal, Que.—The Imperial Oil Co. is proceeding energetically with the construction of the extension of its refinery in Montreal East. It is announced that the total investment there is now three million dollars.

Shawinigan Falls, Que.—The Canadian Aloxite Co., which will go extensively into the manufacture of carborundum and other abrasives, has started construction of a large plant at Shawinigan Falls. It will be completed some time towards the end of the year. The Shawinigan Water & Power Co., have contracted to supply 20,000 h.p. to the Canadian Aloxite Co., which is a subsidiary of the big Carborundum Co., of Niagara Falls. N.Y.

Sherbrooke, Que.—There was no opposition at the ratepayers' meeting at the City Hall to the by-law authorizing the borrowing of $150,000 for the construction of a transmission line from Weedon to Sherbrooke and for the erection of a sub-station at Sherbrooke. A few months ago the ratepayers approved of a by-law for the purchase of the Two Miles Falls power plant for $375,000, but an additional by-law was necessary to provide for the transmission line and sub-station. The authorized expenditure to date is, therefore, $525,000.

New Westminster, B.C.—It is understood that machine shops in this district will build at least twelve sets of engines, including the main and auxiliary machinery, for the wooden steamers, orders for which have been placed by the Imperial Munitions Board. Under the plan now adopted, no shop will have a contract to build complete sets, but every shop will build such parts, and such quantity as it is properly equipped to handle. The complete sets will then be assembled at a central establishment to be created by the board. In the meantime, plans, engine drawings, specifications, etc., have been received in the city and distributed to the various machine shops, including the Heaps Engineering Co., the Schaake Machine Shops, Webb & Gifford, and the Westminster Ironworks.

MUNICIPAL

Tilbury, Ont.—The Town Council are considering installing a pumping plant.

Toronto, Ont.—The City Council have passed a by-law authorizing the guaranteeing of a bond issue of $4,000,000 for harbor improvements.

Hamilton, Ont.—City Engineer Gray has been notified by W. F. Tye of Montreal that the report on the common railway entrance into Hamilton has been completed.

Hamilton, Ont.—City Clerk Kent has received the certificate of approval from the Provincial Board of Health authorizing the installation of additional pumps at the waterworks pumping house. Without this certificate the city could not proceed with the work.

PITTSBURG LETTER

(Continued from page 56.)

extremely high prices bid, say 8c to 9c for blue annealed and black sheets, 10c to 11c for galvanized sheets, 8c to 10c for tank plate, 4.50c for bars and shapes, etc.

Some agricultural implement makers have been sounding the market for bars and other materials for the first half of next year, and this is likely to start something, as they will hardly be quoted at prices that they could possibly consider. The implement makers may go to Washington with the argument that next year's crops will be curtailed if they are not put in position to make implements at prices the farmers would pay.

Pig Iron Quieter

Activity in pig iron has been steadily decreasing, but, unlike the case of finished steel, there is still a regular market for pig iron. There are transactions for deliveries in the first quarter and in the first half of next year, as well as some transactions for prompt shipment and deliveries later this year. The total turnover has decreased to rather small proportions, however. There have been no price advances of the least moment in the past week, and from some viewpoints Southern iron appears to be a shade easier. Whether this reflects the buying pressure having spent its force, or reflects a new attitude on the part of consumers due to the talk of Government price regulation, cannot well be determined.

London, Ont.—The City Council have decided to accept a proposition from the Ajax Rubber Co. and will submit a by-law at a special polling on July 31, to have the people guarantee the bonds of the company to the extent of $450,000. The company agrees to establish a large plant in this city that will have an annual wage bill exceeding $250,000. In the event of the passage of the by-law by a majority of the people, work will be undertaken forthwith.

GENERAL

Petrolea, Ont.—The Colonial Knitting Co., contemplate erection of a knitting factory here.

Springfield, Ont.—The Springfield Milk Co., contemplates building an addition to their factory.

Montreal, Que.—L. A. Gosselin,, 6 Chenneville St., proposes to erect a factory estimated to cost $15,000.

Newcastle, N.B.—The New Brunswick Sulphite Fibre Co., of Millerton, will open up the mill shortly.

Hamilton, Ont.—The National Gas Co. has struck a well on the farm of William Pettigrew, Seneca, with a flow of 1,000,000 feet a day.

Brandon, Man.—The Western Canada Flour Mills are planning to double the output of their branch at Brandon, which at present has a capacity of 700 barrels per day. The output of this branch will then be 1,400 barrels per day.

Kingston, Ont.—K. R. McDonald of Kansas City, has secured from R. A. McLelland an option on the elevator and buildings formerly used by the Cereals, Ltd. The elevator and buildings were the site of the now defunct Orange Meat Co: Mr. McDonald proposes to turn the establishment into a plant to mill flour.

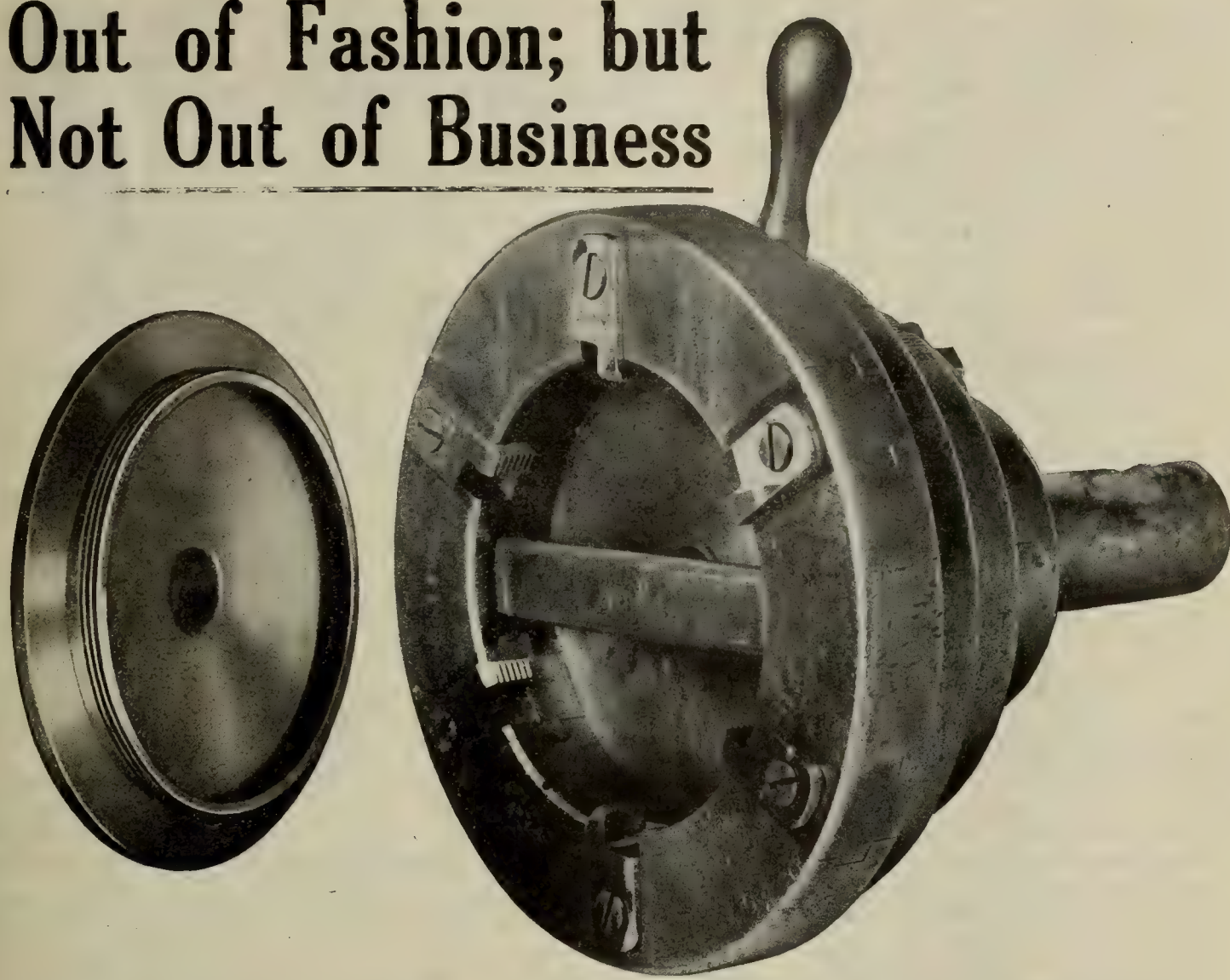
TENDERS

Outremont, Que.—Tenders will be received up to July 18, for the construction of an incinerator. Specifications may be obtained from J. A. Duchastel, city engineer, City Hall.

Lauzon, Que.—Tenders will be received until July for the construction of a transmission pole line between the new and old dry docks at Lauzon, Que. Plans and forms of contract can be seen and specification and forms of tender obtained at the Department of Public Works, Ottawa and at the Post Office, Quebec, Que.

Montreal, South, Que.—Tenders are invited, and will be received up to July 19 for the laying of sanitary sewers, watermains, valves, fire hydrants, etc. Also for an elevated steel tank, one hun-

Out of Fashion; but Not Out of Business



This old "war horse" of a Geometric Die Head has been cutting Screw Threads for a Chicago concern for seventeen years. It was recently sent back to the Geometric Factory for overhauling, and has gone again to Chicago, for possibly seventeen years more of duty.

A Geometric Collapsing Tap, purchased by the same people seventeen years ago, is still cutting the inside threads to match. Can you match that?

Geometric Thread Cutting Tools of to-day can surpass it. What thread cutting method are you using? Learn the Geometric way. It is a path others have trod for the past twenty-five years. Geometric experience has smoothed the path of thread cutting for many. What will you let it do for you?

We could help you—let us.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONNECTICUT, U.S.A,

Canadian Agents: **WILLIAMS & WILSON, LIMITED, MONTREAL. THE A. R. WILLIAMS MACHINERY COMPANY, LIMITED, TORONTO, WINNIPEG AND ST. JOHN, N.B.**

dred thousand Imperial gallons capacity, and one hundred feet to bottom. Plans can be seen and specification and forms of tender may be had at the office of the engineer, E. Drinkwater, Montreal South.

Winnipeg, Man.—Tenders addressed to the Chairman, Board of Control, will be received up to Friday, July 27th, 1917, for the supply and delivery f.o.b., Winnipeg, of 4,500, more or less, complete high voltage porcelain insulators. Instructions to bidders, specification and form of tender may be obtained at the office of the City Light and Power Department, 54 King Street.

Toronto, Ont.—Tenders, addressed to the Secretary-Treasurer of the Board of Education, will be received until July 13, for hardware, Orde Street School, Manual training benches, Earl Grey School, steel work, Queen Victoria School and other midsummer repair work. Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, Administration Building, 155 College Street.

Toronto, Ont.—Tenders will be received addressed to the chairman, Board of Control, City Hall, up to July 31, for the complete construction and equipment of a single track extension to the Bloor Street Division of the Toronto Civic Railway. Specifications and forms of tender may be obtained upon application at Room No. 313, Department of Works, City Hall, on payment of ten dollars ($10), this sum to be refunded upon return of specifications, forms of tender and plans.

Kingston, Ont.—Tenders will be received until July 16 for the reconstruction of part of the cribwork wharves at the entrance to the Dry Dock, at Kingston, Ont. Plans and forms of contract can be seen and specifications and forms of tender obtained at the Department of Public Works, Ottawa, the offices of the District Engineer, Equity Building, Toronto, Ont., and on application to the postmaster, at Kingston, Ont.
Contracts

INCORPORATIONS

The New Westminster Construction & Tug Co.—Has been incorporated at Victoria, B.C., with a capital of $30,000. Head office is at New Westminster, B.C.

The Globe Engineering Co., has been incorporated at Ottawa with a capital of $100,000 to take over as a going concern the Globe Electric Machine Co. of Hamilton, Ont.

Power Development Co., has been incorporated at Ottawa with a capital of $500,000 to carry on the business of an electric light and power company with head office at Montreal. Incorporators are G. A. Coughlin, F. G. Bush and G. R. Drennan all of Montreal.

The Fox Chain Co. of Canada, Ltd., have been incorporated at Toronto with a capital of $200,000 to manufacture chains and automobile accessories of all kinds at Hamilton, Ont. The provisional directors are Cecil V. Langs, Ewart G. Binkley and N. Moore all of Hamilton.

Fraser Companies, Ltd., have been incorporated at Ottawa with a capital of $10,000,000 to acquire and take over as a going concern the business now carried on by Fraser Ltd., and also to manufacture pulp and paper. The head office is at Plaster Rock, N.B.

The Lyman Rubber Mfg. Co. of Canada, Ltd., has been incorporated at Ottawa with a capital of $10,000 to manufacture rubber goods of all kinds at Montreal. The incorporators are C. G. Derome, Jules Bruneau and Jean Ducharne all of Montreal.

The Ontario Woodworking Co., has been incorporated at Toronto with a capital of $50,000 to carry on a woodworking business in all its branches at Kitchener, Ont. The provisional directors are David B. Betyner, E. B. Betyner and Owen Hamilton all of Kitchener, Ont.

The Hosmer Stamping & Die Works, Ltd., has been incorporated at Toronto, with a capital of $10,000 to manufacture metal products of all kinds at Toronto. The provisional directors are William Steward, William G. Winchester and Stephen M. Hosmer all of Toronto.

The Clemens Electrical Corporation of Canada, Ltd., has been incorporated at Ottawa with a capital of $50,000 to manufacture electrical apparatus and devices of all kinds at Hamilton, Ont. The incorporators are H. N. Kittson, Alex. Wetherell and W. D. Dailey all of Hamilton, Ont.

Canada Emery Wheels Ltd., has been incorporated at Ottawa with a capital of $50,000 to manufacture abrasive materials into any form and also to manufacture grinding machinery etc., at Hamilton, Ont. The incorporators are Frank Radigan, G. G. Sutherland and Charles Nield all of Hamilton, Ont.

Motor Products Corporation Ltd., has been incorporated at Ottawa with a capital of $500,000 to manufacture iron, steel, copper and wood products of all kinds at Walkerville, Ont. The incorporators are Y. H. Coburn, A. J. Gordon and John E. Laughlin all of Walkerville, Ont.

The Chelsea Green Iron Works, Ltd., have been incorporated at Toronto with a capital of $200,000 to manufacture copper, iron, brass goods and machinery of all kinds at Fergus, Ont. The provisional directors are William G. Beatty, Wesley L. Ham and Robert D. Kerr all of Fergus, Ont.

Canadian Sprinkler Equipment Co., has been incorporated at Ottawa with a capital of $50,000 to manufacture automatic sprinklers, and fire extinguishing apparatus of all kinds. The head office is at Toronto and the incorporators are John G. Leckie, George G. Beckett and John A. Kent all of Toronto.

The Maritime Electric Co., has been incorporated at Ottawa with a capital of $1,000,000 to manufacture or produce gas for all purposes and to carry on the business of a power company at Fredericton, N.B. The incorporators are John J. F. Winslow, John J. McCaffrey and Ernest A. McKay all of Fredericton, N.B.

The Electric Steel & Engineering Co., which was recently incorporated at Ottawa with a capital of $2,000,000 is a merger of three concerns and the head office will be at Welland, Ont. The three companies included in the incorporation are Electric Steel & Metals, Ltd., of Welland, Ont., the Boving Hydraulic Engineering Co. of Lindsay, Ont., and the Wabi Iron Works of New Liskeard, Ont. No announcement as to plans will be made until after a meeting of the directors which is to be held shortly.

TRADE GOSSIP

The Canada Pipe & Steel Co., Toronto has increased its capital stock to the sum of $600,000.

The Valleyfield Tool Mfg. Co., has changed its name to that of the Canadian Marine Engineering Co. ,

A. B. Jardine & Co., of Hespeler, Ont., makers of woodworking machinery, etc., has ben incorporated at Ottawa with a capital of $300,000.

The National Steel Car Co., of Hamilton, Ont., has received an order for one thousand freight cars for the Canadian Government Railways.

G.T.R. Want More Apprentices.—The Grand Trunk Railway has decided to cut down the period of apprenticeship in their shops from four to three years and to increase the boys' wages.

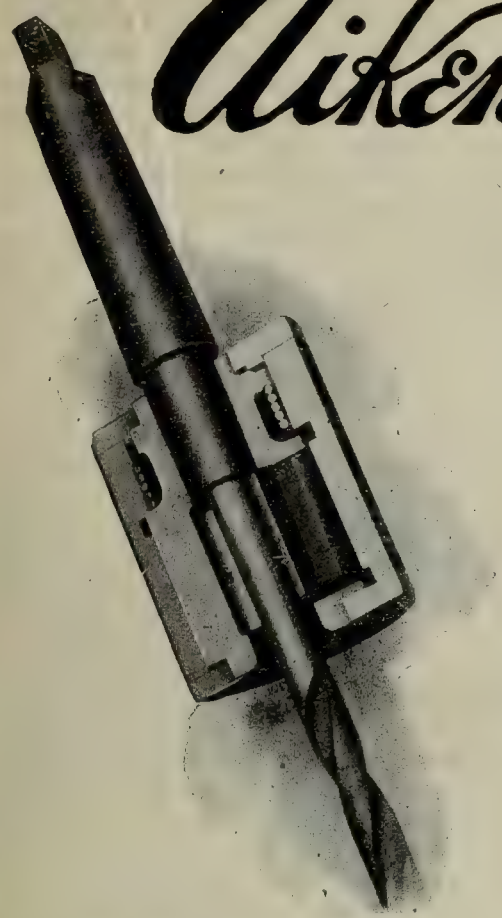
Brantford, Ont.—The Turbine Equipment Co., Toronto, have been awarded the contract for booster pumps, and the Canadian Westinghouse Co., Hamilton, the contract for motors and electrical equipment for the city.

Trenton, Ont.—The Homestead Canning Factory, at Picton, has received further orders from the British Government for pork and beans which, it is stated, will tax the capacity of the factory until the first of October.

Huge Earnings From Steel.—Pittsburg steel statisticians calculate that if prices now quoted on the market were to be obtained on the entire steel output, the steel industry would make $2,000,000,000 a year greater profit than the rate of earnings during the first quarter of this year.

Port Arthur, Ont.—Earnings of the Port Arthur Shipbuilding Co. are reported as running at an extremely satisfactory rate, with raw material arriving ahead of requirements. Contracts now on the books of the company for delivery prior to the close of navigation, 1918, total approximately $6,000,000.

Western Coal to Cost More. — Coal prices will be increased from 28 to 35 per cent. as a result of the changed conditions under which the coal mines of Alberta and Southern British Columbia are now being operated, according to a prominent operator. This will approximate seventy-five cents to one dollar per ton at the mines.



Aikenhead's New Chuck

Will stop you losing your drilling profits

Minutes mean profit—are you losing minutes? There is no loss of time in tool changes when you use a

WAHLSTROM CHUCK

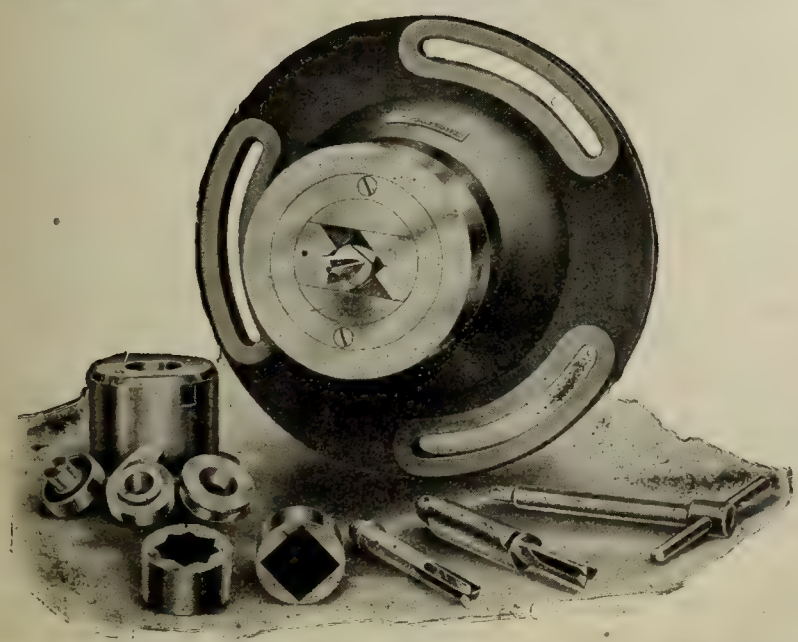
It is entirely automatic in its action — tool changes may be made without stopping the spindle—just grasp the shell of the chuck with one hand and make the tool change with the other. The change is made in a tenth of the time required with the ordinary chuck—and the tool automatically centers itself.

The Wahlstrom comes in two types—one for straight shank tools —the other for Nos. 1, 2 and 3 M.T. shank tools—they are both "Production Increasers," which demands your attention. Write for information now.

AIKENHEAD HARDWARE LIMITED

17, 19, 21 Temperance Street - Toronto, Canada

Aikenhead's RADBORE HEAD



MAXIMUM ACCURACY—MINIMUM COST

Drills Square Holes Accurate

Radbore Heads will drill square holes through the material or they will drill square holes to any desired depth with perfectly flat bottoms! Once in your shop the uses that spring up for this head will be remarkable.

Aikenhead Hardware Limited

17, 19, 21 TEMPERANCE STREET, TORONTO

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

Toronto Building Permits. — During last month 495 permits for new buildings of the approximate value of $693,224 were issued by the City Architect's Department, showing an increase in values of $119,355 compared with June of last year. The total increase in values for the first six months of the present year compared with last is $641,919.

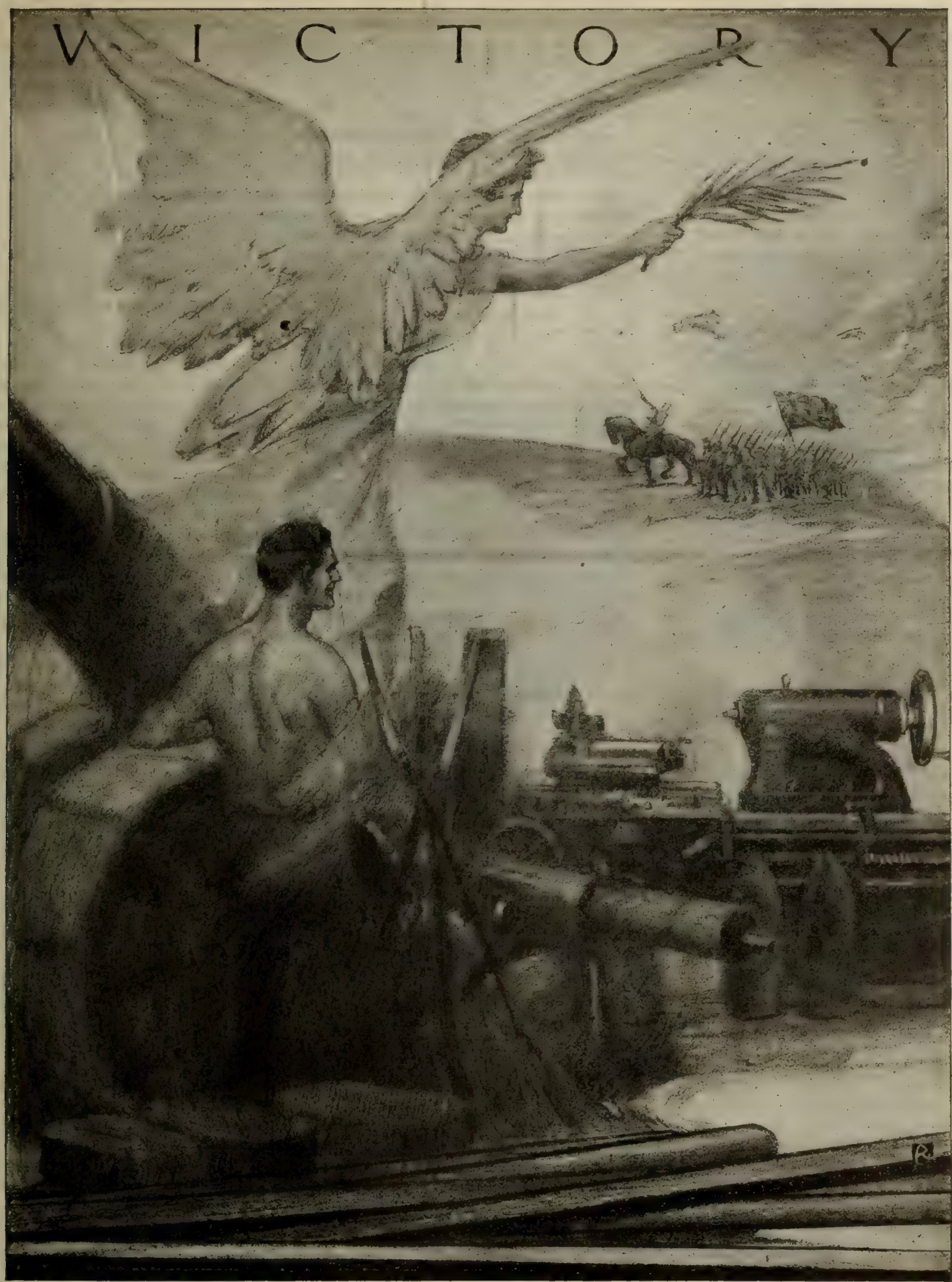
"The Cillingwood Steamship Co." is the name of an organization which has been formed in Collingwood, Ont., to carry on a steamship service between Collingwood and Sault Ste. Marie, Ont. Capt. G. C. Coles is the president of the new company; M. P. Byenes is vice-president; Harry Storey, secretary; J. F. Zimmerman, treasurer, and Capt. F. G. Moles, manager. The steamer City of Meaford has been secured, and will be put into commission at once.

Freight Embargo. — Possible congestion of traffic at the port of Montreal is responsible for an embargo issued by the G.T.R. on all carload freight for export via this port. Exceptions made affect freight consigned on account of the Imperial Government, and carload freight, when specific steamship space has been secured, and acceptance authorized by officials of the General Foreign Freight Department, either at Montreal or Toronto.

Load Freight Cars to Capacity.—In view of the existing car shortage, traffic officials and operating departments of railways say that the only way to improve present conditions is to secure greater efficiency in the present equipment, terminal trackage and man power. The railways cannot do this alone. They say consignees can help by ordering full carloads instead of the minimum authorized in the tariffs and classifications and consignors can help by loading cars to their full authorized carrying capacity.

L. P. Burns and A. R. Roberts, both of Toronto, have formed a partnership under the name of Burns and Roberts, with offices in the Bank of Hamilton Building, Toronto. Mr. Burns is the head of the Burns Cement-Gun Construction Co., of Toronto, and Mr. Roberts has been acting for some time past as the Canadian representative of the Chapman Valve Mfg. Co. of Indian Orchard, Mass., and of the Cement-Gun Co., Inc., of Allentown, Pa. The new firm will handle contractors' supplies, reinforcing material, valves, factory equipment, etc.

Increased Chilean Copper Output.—Reports from Chile show that the output of the copper mines during 1916 was the largest in the history of that country, the exports of 1916 being 58,000 tons of fine copper in bars, something over 4,000 tons in concentrates, and over 9,000 tons of ores. The United States imports of copper from Chile in 1916 were 77,000,000 pounds of pigs and ingots against 36,000,000 pounds in 1915, and 24,000,000 pounds in 1914, while the copper content of the ore and matte from Chile was 44,500,000 pounds, against 33,435,000 pounds in 1915, and 30,563,000 pounds in 1914.



Here the artist has depicted VICTORY about to welcome and crown the brave legions returning from overseas. Notice that the figure is a companion of Industry which in this case is represented by the maker of munitions.

A limited number of copies, suitable for framing and free from advertising, will be mailed without charge upon request to the makers of Red Cut Superior the Nationally Known First Quality High Speed Steel.

Publisher's Note.—Owing to a typographical error the word "quick" was substituted for "high" in the above advertisement for the Vanadium-Alloys Steel Co., Pittsburgh, Pa., in our June 28th issue. The mistake was very much regretted and we would ask our readers to kindly accept this correction.

The Canadian B. K. Morton Co. have been granted a license at Toronto to carry on business in the Province of Ontario, providing that their capital does not exceed $40,000.

Canada's Revenue Goes Up.—The returns to the Department of Finance, Ottawa, for the first three months, ended June 30, of the present fiscal year, show a total revenue of over sixty-three million dollars, as compared with fifty millions for the same period last year. On the other hand, the capital expenditure of the Dominion has declined three millions, chiefly on public works and railways and canals account. The ordinary expenditure, which includes interests upon the war debt and pensions, is practically the same as last year.

H. W. Petrie, Ltd., of Toronto, have reorganized their machinery supplies department which occupies the building 147 Front street, adjoining the Union Station. A larger and more complete stock of supplies is now carried and the company are now in a position to take care of the increase in business. They have taken over several new lines, including the American steel split pulley and also carry a bigger stock of Brown & Sharp cutters and Starrett fine tools. T. H. C. Alison is manager of the supply department. The company contemplate opening a branch at Hamilton.

The Galt Foundry Co., Galt, Ont., have recently closed contracts for a large number of their Galt Sprinkler stokers to the order of many prominent concerns, some of which are included among the following. The T. Eaton Co., 3-stokers at Toronto and 12 at Winnipeg; Dryden Pulp & Paper Co., Dryden, Ont. 12 stokers; Hinde & Dauch Paper Co., Toronto, 8-stokers; Spanish River Pulp & Paper Co., Sturgeon Falls, Ont., 4 stokers; Hamilton Cotton Co. 6 stokers; Dominion Power & Transmission Co., Hamilton, 3 stokers; City of Brandon 2 stokers and Dominion Oilcloth Co., Co., Montreal, 4 stokers.

No Brazilian Rubber For Allies' Enemies.—The Brazilians have shown their interest in the cause of the Allies by compiling a list of firms to whom it is considered inadvisable to ship rubber. Judging from the latest reports this blacklist on the Amazon has been a great success. It came into effect here on March 29, 1916, from which date to March 30, 1917, crude rubber was exported to the amount of 34,424 tons. Of this, 19,631 tons, or 57 per cent., went to Allied and American firms, 12,741 tons, or 37 per cent., to Brazilian or Portuguese firms, and only 2,052 tons, or 6 per cent., to enemy and blacklisted firms.

Victoria, B.C.—The B. C. Metal Trades Association has been furnished with two sets of plans giving the details of the main engines required for the standard wooden steamers to be built by the Imperial Munitions Board. There are eighteen blue prints to a set, and local engine builders are looking them over with a view of putting in tenders. Bids have already been asked by local representatives of the Munitions Board for fifty winches, and upon the arrival here from the East of Messrs. Chisholm and Russell, representatives of the Imperial Munitions Board, for the purpose of looking into the facilities in British Columbia, it is expected that large orders will be placed in the Province.

Wood Car Passing.—The building of wooden passenger train cars has practically ceased. The *Railway Age Gazette* shows that there were in passenger train service in the United States on January 1, 1909, approximately 629 all steel cars and 673 cars having steel underframes. On January 1, 1917, there were in such service 15,754 all steel cars and 6,136 cars having steel underframes, representing increases of 2,405 per cent. and 812 per cent. respectively. There are now in service 36,169 wooden cars in passenger train service, indicating a retirement of 8,957 wooden cars from service since January 1, 1912, the date of the previous census. Of this number 2,213 were retired during the calendar year 1916. This record includes a total of 61,309 passenger train cars and covers reports from roads representing 235,406 miles of railway in the United States.

Newfoundland Revenue.—The greatest surplus of revenue over expenditures ever obtained by the Colony of Newfoundland is shown in preliminary statements for the fiscal year which ended on June 30. Revenue from all sources was approximately $5,000,000, nearly $1,000,000 in excess of expenditures. This is double the surplus of the previous fiscal year. The increase is due to the enhanced value of fishery and other products of the island, the high prices received having enabled the people to import exceptionally large stocks of goods of all kinds on which heavy duties were paid. It is understood the surplus will be applied toward paying the cost of the colony's participation in the war.

Japan's Shipping for American Steel.—It is reported that the Japanese Government is making arrangements with the United States Government whereby Japan will get steel in exchange for ships. The first part of the agreement will be that the United States expedite shipments of steel for Japanese shipyards, and in return Japan will send about 50,000 tons of ships to carry United States troops and war material to Europe. "A further effort will be made by Japanese ship builders to induce Gen. Goethals to order ships for the emergency fleet from Japan. The shipowners say they can complete steel steamers and have them in commission in four months if they get the steel.

Manufacturers Asked to State Coal Needs.—If the steps taken by the newly-appointed fuel controller, C. A. Magrath, to ascertain the requirements of manufacturers, as well as those of Governmental, municipal and other public institutions, for bituminous coal meet with the co-operation of the large consumers, the difficulties of obtaining adequate supplies which were experienced last winter will be considerably minimized, if not altogether removed. Apprehension as to future supplies has already been expressed in many local quarters, and the information which is now being requested from all industrial concerns will, it is expected, be of considerable value towards relieving the situation, and all manufacturers have been notified through the Canadian Manufacturers' Association to give particulars of their coal consumption during 1916-17 and to estimate what they will require for 1917-18. Once these requirements have been obtained an equitable distribution—it is stated—will be made of the allotment to Canadian industries.

Fuel Controller Organizing Work.—The Dominion Fuel Controller, C. A. Magrath, who has spent the past fortnight in securing all available preliminary data with regard to present and prospective fuel supplies in Canada, announces that one of the leading fuel and transportation experts in the United States has been secured to look after Canadian fuel interests at the United States sources of supply. Efforts are being made to speed up imports of coal, which are now considerably behind the normal, for the district from Montreal to Winnipeg. Mr. Magrath states that he is now in a position to deal with deliveries and complaints, and urges importers of coal who desire to make use of the Fuel Controller's organization to furnish immediate information regarding the quantity of coal contracted for, the quantity received so far, and what must still be contracted for. Mr. Magrath is arranging to get in touch with all the mines, so as to enable him to accelerate deliveries in all cases where there is now delay. He asks that importers communicate their requirements to him promptly at Ottawa.

PERSONAL

W. N. Campbell, who for 22 years was with the Reeves Pully Co., Toronto, has jointed the sales staff of H. W. Petrie, Ltd., Toronto, in the transmission department.

John G. Kent has been appointed manager of the Canadian National Exhibition, Toronto in succession to Dr. Orr who has retired on account of failing health.

H. J. Matthews, general manager of the Quebec Street Railway, Heat & Power Co., died on July 3 at the Jeffery Hale Hospital, Quebec, from an operation.

D. J. McQuaig, acting master mechanic at Montreal, has been appointed master mechanic of the Ontario lines of the Grand Trunk system, with headquarters at Toronto.

James M. Sclanders, of Saskatoon, has been appointed industrial commissioner for the Canadian Border Municipalities of Windsor, Walkerville, Ford and Sandwich, Ont., at a salary of $5,000 per annum.

Charles A. Paquet, president of the General Car & Machinery Works, Montmagny, Que., has resigned from that

position to take over the general managership. Mr. Paquet succeeds Robert Patterson, who has asked to be relieved on account of ill-health.

R. R. Gray Chisholm and T. H. Russell, representatives of the British Ministry of Shipping and the Imperial Munitions Board respectively, have arrived at Victoria, B.C., to confer with Mr. Butchart and Capt. J. W. Troup, local representatives of the Munitions Board.

F. C. Gamble, chief engineer of the British Columbia Government Railways, has resigned. Mr. Gamble was born in Toronto in 1848, and went to British Columbia thirty years ago. About four years ago he was appointed to the position which he has now vacated.

D. O. Lesperance has been elected president of the General Car & Machinery Co., Montgomery, Que., in succession to **C. A. Paquet,** who has been appointed general manager. Mr. Lesperance is also president of the A. Belanger Co., Montreal, and chairman of the Quebec Harbor Commission.

David Spiers one of the most prominent citizens of Galt, Ont., died there last Monday. He was 85 years of age, and he resided in Galt continuously since 1851, when he came to Canada from Scotland. He was at one time owner of the Galt Electric & Gas Light Co., until the advent of the Hydro system.

MARINE

To Remove Plankinton Wreck.—The work of salvaging the cargo and machinery of the steamer John Plankinton, which sank in the Canadian channel of the Detroit River several weeks ago in collision with a Grand Trunk car ferry has begun.

Victoria, B.C.—Rapid progress continues on the old Songhees Reserve, where the Foundation Co. and the Cameron-Genoa Mills Shipbuilders are busily engaged in making preparations for laying down keels for the wooden steamers to be built in Victoria to the order of the Imperial Munitions Board.

Toronto, Ont.—Work will be commenced shortly on the construction of two modern vessels, canal size, for the Imperial Munitions Board. The vessels will be built on the new industrial area at Ashbridge's Bay. The contracts for the vessels were awarded to Messrs. John E. Russell, of the Russell Contracting Co., and John J. Manley, manager of the C. S. Boone Co. The steamers will be constructed of British Columbia firm. Modern engines will be installed in addition to all modern machinery for hoisting and handling bulk freight.

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WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.
Comes to you heat-treated and ready for use.
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In clean, fresh drinking water for everybody.
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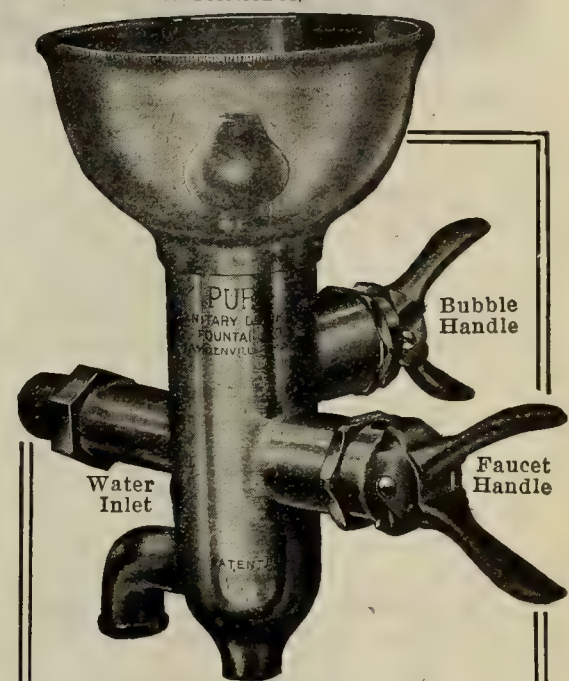

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An ugly statement, isn't it? But true, absolutely.
When a man comes to work in your factory he puts his health in your keeping.
Are you willing to take chances on such a trust?
Impure drinking conditions are responsible for more tragedies than any machine ever built.
Apply the "Safety First" Principles to your water supply; don't deny your men a clean, fresh drink of water.
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Install the Gold Medal winner Puro in your plant, office and shop alike.
The only Sanitary Drinking Fountain that is safe, sanitary, simple, automatic in control and easily attached.
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FOR SALE—THREE 26" x 12' C.M.C. DOUBLE back geared quick change gear engine lathes; never been used. McKinnon Dash Company, St. Catharines, Ont. c2m

FOR SALE—4 REED PRENTICE ROUGH Turning Lathes with cut-off attachments in first-class condition. These will make an excellent machine for 4.5 shells. The Hayes Wheel Co. of Canada, Ltd., Chatham, Ont. c5m

FOR SALE—10 PRACTICALLY NEW NO. 7-C Heavy Duty Racine Hack Saw Machines. Suitable for all cutting purposes. For further information and price address The Peck Rolling Mills, Limited, Montreal. c3m

ONE BRAND NEW 10 x 36 NORTON PLAIN grinding machine. This machine on our floor still crated, never been used. For price and further particulars address Windsor Machine & Tool Works, Windsor, Ontario. c5m

FOR SALE—2 36" HARRINGTON DRILLS, 3 No. 14 Colborn Standard Heavy Duty Drills, 1 Cincinnati 32" Drill, back-geared, sliding head, power and wheel feed. Anxious to dispose of these tools quickly. Wire or write if interested. Metal Drawing Co., Ltd., St. Catharines, Ont. c1m

WE HAVE ON HAND AT OUR WELLAND Works, for disposal, the following new machinery:—One (1) 18" x 15 ft. Accumulator; one (1) Aldrich Triplex Hydraulic Pump, 180 gals. capacity; two (2) 350-ton B. and B. Presses. All offers will be carefully considered. Canadian Car & Foundry Co., Ltd., Transportation Building, Montreal.

1—ROBB HORIZONTAL STEAM ENGINE, 10 x 12, 35 h.p. Just overhauled by makers. Price $300.00. 1—Heavy Duty Rockford Drill. Suitable for shells or heavy work. Weight of drill 3,600 lbs. Good as new. Write for specification. 1—Jones & Lamson 2 x 24 Turret Lathe, 2¼" hole in spindle, 16" swing, cone drive, collet chucks for bars up to 2" diameter. Or lathe can be fitted with standard universal chuck. Flat turret 16" diameter. Good condition. Price $400.00. 1—Warner & Swasey Turret Lathe. Round turret, diameter 8", hand cross feed for turret. Swing 14". Fairly good condition. Price $200.00. 1—Bertram 2-spindle Thread Miller. Made by makers for threading 18-pdr. shells. Now used for threading sockets. Good condition. Steel Furnishing Co., Ltd., New Glasgow, Nova Scotia. c2m

PATENTS

TAKE NOTICE—THAT WE, THE UNDERsigned attorneys for the patentee, are prepared to supply at a reasonable price any demand for the water purifying apparatus described in Canadian Letters Patent No. 127372, granted August 16th, 1910, to Lucien Linden, and assigned to W. J. Stewart. We are also prepared to receive offers for the purchase of the patent or for licenses to manufacture under the same. Ridout & Maybee, 59 Yonge Street, Toronto, Canada. c2m

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SHELL PLANT FOR SALE — COMPLETE plant—installed since 1914, for the machining and assembling of 4.5 inch H.E. shells, situated at Dartmouth, Nova Scotia, on line of Intercolonial Railway, with siding running into the works. Will sell the equipment outright, with privilege of renting the building in event of the purchaser engaging in the same business. Starr Manufacturing Co., Limited, Dartmouth, Nova Scotia, Canada. c26m

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20" Bullard Projectile Lathe
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20" x 6' Florence Turret Chucking Lathe
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18" x 10' Rahn-Larmon Engine Lathe, new
18" x 12' Rahn-Larmon Engine Lathe, new
3 x 36" Jones & Lamson Flat Turret Lathe, Chucking
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Ford-Smith Grinders for 3" shells (12)
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Brownell Machinery Co.
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PRACTICAL WORKS MANAGER AND MEchanical expert with years of experience in United States and Canada, a specialist in munition work, open for engagement. Best of references. Apply Box 304, Canadian Machinery. c4m

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New 16" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
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New 20" x 8' Petrie Heavy Duty Manufacturing Lathes.

TURRET, SPEED AND BRASS LATHES SCREW MACHINES

New 13" x 7' Putman Speed Lathe.
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New 3' Dresses Plain Radial, Gear Box Drive.
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New 12" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. Combination Grinder and Buffer.
New 12" Ford Smith S.O. Buffing Machine.
New Style B, Point Yankee Twist Drill Grinder.

MISCELLANEOUS

S.H. No. 22 Garvin Vertical Milling Machine.
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13" Perfect, 2-spindle.
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1—3¼ x 36 Jones & Lamson Flat Turret Lathe, S.G.H.
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No. 23 New Britain Chucking.
No. 33 New Britain Chucking.

BROACHING MACHINES.

No. 1 J. N. Lapointe.
No. 2 Lapointe Machine Tool Co.
No. 3 Lapointe Machine Tool Co.

DRILLING MACHINES.

15" Barnes.
10' Burke Sensitive.
4-Spindle Allen.
4-Spindle No. 1¼ Foote-Burt Rail.
4-Spindle No. 2 Avey.
2-Spindle No. 2 Avey.

GRINDERS.

6" x 32" Norton.
10" x 50" Norton.
10" x 30" Landis.
No. 1 Cincinnati Cutter.
No. 2 Brown & Sharpe Universal.
No. 2½ Bath Universal.
No. 3 Osterlein.
No. 12 Gardner, duplex disc.
24" Double Wet Tool.
20 x 1½ Single Wet Tool.
No. 200 Heald, ring.

HAMMERS.

35-lb. Williams & White, power tire welding.
No. 3 Standard, 300-lb. Belt Drop.
1200-lb. Bell, Steam.

KEYSEATERS.

No. 1 Davis.
No. 2 Mitts & Merrill.
18" x 1½" Norton.

LATHES.

14" x 6' Sebastian.
14" x 6' Reed, Extra Heavy Stud.
16" x 6' Lodge & Shipley, Patent Hd.
16" x 8' Walcott.
16" x 8' Reed Stud.
16" x 6' Harrington.
16" x 10' Rahn-Carpenter.
18" x 8' Lodge & Shipley, Three-step Cone, D.B.G.
18" x 8' Lodge & Shipley, Pat. Head.
18" x 8' LeBlond.
18" x 8' Bradford.
18" x 8' Walcott, Q.C.
18" x 10' Monarch, Q.C.
18" x 12' Monarch, Q.C.
20" x 8' Walcott, Q.C.
30" x 14' Lodge & Shipley.

MILLING MACHINES.

No. 2 Osterlein.
No. 7-H Becker, Lincoln Type.
No. 00 Brown & Sharpe.
No. 8 Pratt & Whitney, hand.
No. 10 Pratt & Whitney, hand.

PLANERS.

24" x 24" x 5' Blaisdell, one head.
26" x 26" x 6' Pond.
36" x 36" x 10' Sellers, 4 heads.

PIPE MACHINES.

12" Curtis & Curtis.

PRESSES.

No. 2 Consolidated, Plain Inclinable.
No. 5 Stiles & Parke Blanking Press.

SAWS.

6" Atkins "Kwick-Kut."
7" High Duty Paragon.

SCREW MACHINES.

1½" Foster, motor drive.
1½" Warner & Swasey.
4½" Bardons & Oliver.

SLOTTERS.

12" Industrial.

TURRET LATHES.

2" Jones & Lamson.
14" Warner & Swasey.
16" Bardons & Oliver.
21" Gisholt.
22" Libbey.
24" Gisholt.

MISCELLANEOUS.

Flywheel Balancing Machine, Rockford.
Oil Separator, Curtis.

The Costliness of Man-time

HOWEVER necessary it may be to employ flesh and blood salesmen to sell your merchandise to farmers, you cannot possibly overtake all your prospects by this method alone. It would bankrupt you.

You must employ the method of influence and persuasion known as Modern Advertising. By this means you can make known what you have to sell to all farmers everywhere, simultaneously.

Suppose you cannot afford to use all the farm papers, and are looking for one having national circulation. This one medium is

The FARMER'S MAGAZINE

This should impress you: **The Farmer's Magazine** is the best produced farm paper in Canada—3-color covers, fine illustrations, good paper, good typography and printing, and most important of all, the best edited. A sample copy will convince you.

If the farmer is your customer, use **The Farmer's Magazine.**

N.B.—Objectionable advertising not accepted. Both editorial and advertising columns are closely censored to keep them clean and decent.

Published by
The MacLean Publishing Co., Limited
143-153 University Avenue, Toronto, Ontario.

GOOD USED EQUIPMENT

ELECTRIC TRAVELING CRANES.

50-Ton Niles, 61' 7" span, 550 volts, D.C., with 10-ton auxiliary hoist.
25-Ton Browning, 40' 0" span, 220 volts, D.C., with 5-ton auxiliary hoist.
20-Ton Alfred Box, 49' 0" span, 220 volts, D.C., with 5-ton auxiliary hoist.
20-Ton, hand, 29' 6" span.
10-Ton, hand, 55' 0" span.
Hand Cranes, 2 to 7½ tons, 22' span (13).

BRAKE AND PRESSES.

13' 6" Garrison Brake or Press, double back-geared, capacity ¼" plate full width, weight about 156,000 lbs.; condition like new.
No. 11 Perkins (Trimming), 4" stroke, 16,500 lbs.
No. 225 Adriance (Punch), 2" stroke, 7,000 lbs.
No. 65 Toledo (Cam Drawing), B.G., 13,000 lbs.

PUNCHES AND SHEARS.

Punch, New Doty (hand), 15" tht., cap. ¾x½".
Punch and Shear (hand), Ohl, cap. ¼"x¼".
Punch and Shear, 17" throat, cap. ¾ through ¾".
P. & S. Cleveland, cap. 1x¾", 28" throat.
P. & S. No. 3 H. & J., cap. 1¼x1", 36" throat.
P. & S. Coulter & McKenzie, cap. 3x½" spr. steel.
P. & S. 48" tht., cap. 3x1¼", steam engine.
Shear, Alligator, No. 2 Farrell, cap. 1" sq.
Shear, Angle (double), H. & J. No. 2, cap. 6x6x⅝".
Shear, Plate (splitting), 18" blade, cap. ¾".
Shear, Lennox Rotary Bevel, cap. ½" plate.
Shear, Lennox Rot. (splitting), cap. ¼" plate.

MISCELLANEOUS.

Acme Rivet and Upsetter, 1½" cap.
Bending Roll, 6', drop end, 6½ and 8" rolls.
Bending and Straightening Mch., 24" cap., 9" jaw.
Cold Saw, Newton, 40" blade, two tables.
Wall Drills, 15' reach (2).
First-class second-hand condition.

PROMPT SHIPMENTS.

McCoy-Brandt Machinery Co.
Office and Warehouse:
216-218 Penn Ave., Pittsburgh, Pa.

FOR SALE

Equipment used for making 18-pr. Shells.

1—Warner & Swasey Turret Lathe, 2" x 24", with attachments.
1—Linderman Double Spindle Boring Machine, with attachments for finish boring shrapnel and nose turning H.E.
1—Flather & Co. 14" x 5' 0" Lathe, with chuck and countershaft.
1—Fosdick 16" x 6' 0" Lathe, with collet chuck and countershaft.
1—Braopose 16" x 6' 0" Lathe, collet chuck and taper attachment.
1—Goldie & McCulloch Nosing Press with Dies.
1—Beatty Accumulator.
1—Lees-Bradner Thread Miller, with attachments and countershaft.
1—Jones & Lamson Turret Lathe, 2" x 24".
1—40-gallon Bowser Tank and Pump; good as new.
1—Cold Saw, with variable speed motor, 60 cycle, 220 volt, cuts up to 9" stock, complete with three saws.
1—4-Connection Pyrometer with Rheostat, made by Taylor Instrument Co.
1—Thermo Couples, 39" long, bent 12½" from nose.
1—Thermo Couples, 39" long, straight.
1—One-Connection Tycos Pyrometer, made by Taylor Co.
1—Bertram Band Turning Attachment, for 24" Lathe, Ball-bearing Centre.

All the above located at Welland. Prices. Delivery and full particulars gladly furnished.

M. Beatty & Sons, Limited
Welland, Ont.

Machine Tools

IN

Cleveland Stock

BORING MILLS.

Foote-Burt 2-Spindle Vertical Cylinder Boring Machine, 4" spindles, 10" table feed.
36" Bullard 2-Swivel Head Vertical Boring Mill, 3-jaw table chuck, gear feed, cone drive; very good.

DRILLS.

20" Prentiss, hand and power feed, sta. hd., upright; very good.
24" Aurora, sliding head, power feed, bk. dg.; very good.
26" Barnes, sta. hd., bk. gears, power feed; good.
36" Bickford Plain Radial Drill, cone drive, swinging table, belt power feed; very good shape.
42" Bickford, plain radial, single pulley drive, gear feed, tapping att., square box table, planed base; A1.

GRINDERS.

Greenfield Tool and Cutter Grinder, complete.
Landis 10 x 20 Universal Grinder, with all parts; very good.

LATHES.

14" x 6' LeBlond, with plain rest and plain feeds; good.
14" x 6' LeBlond Regular Engine Lathe, taper att., hollow spindle, screw cutting; complete.
24" x 24' Pond Comp. Rest Lathe, arranged for shaft turning, and including double tool holder and rests.
32" x 12' Prentiss Comp. Rest Lathe, belt feed, hollow spindle, all change gears and parts; in excellent condition.

PRESSES.

No. 2C Stiles Plain Punch Press, 12" throat, 1½" stroke, 24" flywheel; excellent condition.
76½ Bliss Straight Side Press, single crank, tie rod frame, double geared, friction clutch, 18" stroke, 12" die space, 7" shaft.
77½ Bliss Straight Side Press, single crank, tie rod frame, double geared, friction clutch, 10" stroke, 17" die space, 8" shaft.
78½ Bliss Straight Side Press, single crank, tie rod frame, double geared, friction clutch, 10" stroke, 24" die space, 10" shaft.
165½ Toledo Single Crank Toggle Drawing Press, capacity up to 25" blanks, 19" punch, will draw and lift out up to 9½".

MISCELLANEOUS.

75-lb., 7 150-lb. Bradley Upright Strap Hammers, good shape.
30" American Wood Band Saw, plain table, 4-step cone drive for 8" belt.
Peerless High-speed Cut-off Saws, 6"-9"-13" sizes.
Grant-Lees 18 x 4 Hobbing Machine, for spirals, spurs and worms.
Bement Miles Heavy Vertical Boring Machine, 7" spindle, capacity for drilling up to 12" or 15", solid steel.

CYRIL J. BATH & CO.

Offices	Warehouse
428 Leader-News Bldg.	1031 West Front St.

CLEVELAND, O.

NEW MACHINE TOOLS
FOR IMMEDIATE DELIVERY

LATHES.

9" x 4' Seneca Falls Bench Lathe, with compound rest and countershaft.
14" x 6' Monarch Quick-change Lathes, with cpd. rest.
17" x 8' Sidney Quick-change Lathe, with 3-step cone and double back gear.
16" x 7' Oliver Quick-change Lathe, with 3-step cone, double back gear, pan and pump.
24" x 10' Wickes Standard Lathe, with 3-step cone nad double back gear.
24" x 12' Wickes Standard Lathe, with 3-step cone and turret tool post.

GRINDERS.

No. 2 Cincinnati (12 x 36) Plain Grinder.
Six-Fifteen Fitchburg Plain Grinder (Hand Feed).
Six-Fifteen Fitchburg Grinder (Automatic Feed).
No. 2 Bath Universal Grinder (10 x 25), "C" equipment.
No. 2½ Bath Universal Grinder (10 x 36), "C" equipment.
No. 3 Wilmarth & Morman Surface Grinder (8 x 24).
No. 2 Diamond Automatic Surface Grinder (36 x 12 x 12).
No. 2 Oesterlein Universal Cutter and Tool Grinder.
No. 3 La Salle Plain Surface Grinder.
Capitol Internal Grinder.

DRILLS.

No. 1-S Garvin B. G. Duplex Horizontal Drill.

MILLERS.

No. 1 American Lincoln Type Miller.
No. 6 Whitney Hand Milling Machine.
No. 1½ Valley City B. G. Plain Milling Machine.

POWER PRESSES.

No. 3 Niagara O-B-I Power Press.
No. 5 Niagara O-B-I Power Press.
No. 6 Niagara O-B-I Power Press.
No. 5 Toledo Geared O-B-I Power Press.

MISCELLANEOUS.

1½" Dreses Friction Head Screw Machine, Power Feed to Turret.
No. 15 Lea-Simplex Cold Metal Saw.
No. 18 Lea-Simplex Cold Metal Saw.
¾" Geometric Threading Machine.

THIS IS ONLY PARTIAL LIST—SEND US YOUR INQUIRIES.

Also Woodworking Machinery, Shop Tools and Supplies.

Address: Machinery Dept.,
Chas. A. Strelinger Co., Detroit, Mich.

C. W. CULLEN
MACHINERY CO.

LEADER-NEWS BUILDING

CLEVELAND, OHIO

American 5' Plain Radial Drill, 3" spindle, box table, b.g., tapping attachment, M.D.
Bickford 4' Plain Radial Drill, cone drive.
La Pointe Broaching Machine.
Toledo No. 204 Spc. Double Crank Press.
Toledo 400-lb. Board Drop Hammer.
2—P. & W. No. 2 Cutting-off Machines.
Bement Miles & Co. 7½" Spindle, Vertical Drilling and Boring Mill, 68" swing.
Gardner No. 24 Belt-driven Disc Grinder.
Bradley 150-lb. Upright Strap, 150-lb. helve, 75-lb. Upright Strap Hammers.
Detroit Japanning Ovens, 8' 10" x 8' x 152".
Gisholt 28" Turret Lathe, taper attachment, M.D.
Pratt & Whitney 48" Gap Lathe.
Hanna 30-ton Riveter.
Pangborn Sand Blast, 84" rotary table, M.D.
3—800-ton G.E. Hydraulic Double Action Presses.
1—Toledo Toggle Press, No. 165½.
1—Ferracute Press, Dagg 66.
Bliss Presses—3 No. 60½, rack and pinion; 1 No. 77½; 1 No. 87 special geared.
3—2¼ Cleveland Automatics; prac. new.
10—¾" B. & S. Automatics.
5—3" x 36" J. & L.
Allis-Chalmers 150 H.P. Corliss Engine, 12' F.W.
Bruce MacBeth 150 H.P. Gas Engine; new.
2—Rathmann Jones Gas Engines, 125 and 225 H.P.

If any advertisement interests you, tear it out now and place with letters to be answered.

FOR SALE

BORING MACHINE—VERTICAL.

1—30" Colburn, 1 turret head.
1—New 30" Gisholt, one turret head, Sept. delivery.
1—34"-42" New Colburn, one turret head, Aug. delivery.
1—34" Rogers, one turret head, Sept. delivery.
1—36" N-B-P, one plain and one swivel head.
2—36" B. & S., one turret head.
12—New 42" Putnam—2 heads, Nov. delivery.
1—53" N-B-P, two swivel heads.
1—72" Niles, two swivel heads.

BORING MACHINES—HORIZONTAL.

1—Lucas, 2¼" bar.
1—New No. 1 Cleveland, 2½" bar.
1—Hoefer Horizontal Driller and Borer with 1 11-16" spindle, vertical adjustment 40", horizontal adjustment 46", size of table 33" x 48".
1—New No. 2 Barrett Cylinder, Nov. delivery.

BULLDOZERS.

1—New No. 4 Garrison, same specification as No. 4 Williams & White.
1—No. 7 Ajax, 20" stroke.
1—No. 7 High-speed Ajax, 16" stroke.

COMPRESSORS—AIR.

1—8" x 8" Curtis, belt-driven.
1—10" x 10" x 10" Single Cylinder Smith-Vaile, steam driven.
1—10" x 12" Chicago Pneumatic, belt driven.
1—12" x 12" American, belt driven.
1—16" x 12" Chicago Pneumatic, Duplex, belt driven.
1—10"-16½" x 13" Peerless, cross compound, steam driven.
1—22"-13" x 16" Ingersoll-Rand, motor driven.

CUTTING-OFF MACHINES.

2—No. 0 Brown & Sharpe.
1—2" capacity Warner & Swasey.
2—3" Curtis & Curtis.
3—4" Curtis & Curtis.

CRANES—ELECTRIC.

1—5-ton P. & W., 4-motor, 10' span, 25' lift, 220 v., D.C., with one ton auxiliary hoist.
1—8-ton Phoenix, 38' 10" span, 220 v., D.C.

DRILLING MACHINES—RADIAL.

1—New 3' Mueller, plain, speed box drive.
1—36" Bickford, plain, speed box drive.
1—New 3½' Mueller, cone drive, July delivery.
1—New 3½' Carlton, cone pulley drive.
1—New 3½" Western, July delivery.
2—4' Mueller, plain, speed box drive.
1—5' Bickford, plain, speed box drive.
1—5' American, plain, motor driven.
5—5' Special, 2½" spindle, arm does not raise and lower, hand feed.
1—New 6' Fosdick, speed box drive, July delivery.

DRILLING MACHINES—HEAVY DUTY.

3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
2—No. 26 Foote-Burt, 44" swing, 3½" capacity in solid steel.

DRILLING MACHINES—MULTIPLE SPINDLE.

1—30C Baush 12-spindle, capacity 1⅛" holes, 30" circle.
1—Gardam, 12-spindle, capacity ⅜" holes, 14" square.
1—No. 5 Fox, 12-spindle, rectangular head, 20" x 30", capacity 1" holes, tapping attachment, speed box drive.
1—14-spindle Baush, capacity 1" holes, 36" circle.

GEAR CUTTING MACHINES.

1—12" G. & E. Gear Hobber.
1—12" Gleason Bevel Gear Planer.
1—15" Gleason Bevel Gear Planer.
1—16" Bilgram Bevel Gear Generator.
1—20" Grant-Lees Gear Hobber.
1—No. 1 20" Schuchardt & Schutte Gear Hobber.
1—22" x 8" Gear Cutter for Spur and Bevel.
1—24" Fellows Gear Shaper.
1—24" x 8" G. & E. for spur and bevel.
1—26" x 10" Cincinnati, spur gears only.
1—No. 3 26" B. & S., spur gears only.
1—New 30" Flather, spur gears only.
3—36" Fellows Gear Shapers.
1—50" x 11" G. & E., spur gears only.

GRINDERS—UNIVERSAL—FOR CUTTERS, DRILLS, REAMERS, ETC.

1—New Norton, No. 1.
1—New Wilmarth & Morman, style BX.
1—No. 1 Cincinnati.
1—New Walker No. 2, outfit K (capacity 9" x 26").
4—No. 190 Wells.

GRINDING MACHINES—CYLINDRICAL—PLAIN.

1—No. 11 (6 x 30") Brown & Sharpe.
1—6" x 48" Pratt & Whitney.
1—New No. 12 (8" x 26") Brown & Sharpe.
1—10" x 50" Norton.
1—No. 16 (10" x 72") Brown & Sharpe.
6—12" x 24" Modern, self-contained.
6—12" x 36" Modern, self-contained, motor driven.
6—12" x 48" Modern, self-contained, motor driven.
1—14" x 72" Queen City.
1—16" x 66" Landis, with crank grinding.
1—18" x 96" Brown & Sharpe.
1—New 10" x 36" Landis, immediate.

GRINDING MACHINES—CYLINDRICAL—UNIVERSAL.

1—No. 1 Fraser, with surface grinding attachment.
1—No. 1½ (10" x 30") Landis.
1—No. 2½ (10" x 36") Bath.
1—New No. 2 Bath.
1—10" x 42" Modern.
1—No. 2 (12" x 30") Brown & Sharpe.
10—New No. 2 Morse, cap. 12 x 30", Universal, Dec. delivery.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis.

GRINDING MACHINES—INTERNAL.

1—No. 1½ Landis.
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—CYLINDER.

1—No. 27 Brown & Sharpe.
1—No. 60 Heald, single pulley drive.

GRINDERS—DISC.

1—No. 14 Besley.
1—New No. 17 Gardner (Pattern Makers).
1—No. 41 Oliver (Pattern Makers).

GRINDING MACHINES—RING.

1—No. 200 Heald.

GRINDING MACHINES—EDGE.

1—No. 374 Safety Emery Wheel Co.

GRINDING MACHINES—SURFACE.

1—No. 1 Diamond, cap. 12" x 12" x 24", automatic.
4—New No. 2 Reid (same as B. & S.).
1—22" x 12" x 60" Springfield, planer type, automatic.

GRINDING MACHINES—DUPLEX.

1—No. 5 Bath, suitable for grinding cylinders, pistons, piston rings, etc., 16" feed, swivel table, water pump.

GRINDING MACHINES—FACE.

1—Diamond Face Grinder, 4' travel, 14" wheels.

HAMMERS—POWER—FORGING.

1—40-lb. Bradley Helve.
1—150-lb. Bradley Helve, upright.

HAMMERS—BOARD LIFT—DROP.

1—200-lb. (no name).
1—400-lb. Billings & Spencer.

HAMMERS—STEAM—FORGING.

1—400-lb. Toledo.
1—400-lb. Zeh & Hahnemann.
1—New 600-lb. Bell.
1—New 3,000-lb. Bell, September delivery.

KEYSEATERS.

1—No. 00 Baker Bros.
2—No. 0 Mitts & Merrill.
1—No. 2 Mitts & Merrill, motor driven.
1—60" stroke Compton Knowles Broacher.

LATHES—ENGINE.

1—14" x 6' Bradford, taper attachment.
2—16" x 6' LeBlond, pan bed, quick-change gears, taper attachment.
1—16" x 6' LeBlond, quick-change gears.
1—New 17" x 8' National, taper attachment.
1—18" x 8' L. & S., geared head, taper.
9—18" x 8' American, geared head.
3—18" x 9' Chard.
1—New 19" x 8' LeBlond, heavy duty.
1—20" x 16' Greaves-Klusman, taper attachment.
3—22" x 10' Davis.
9—22" x 10' Putnam, oil pan, turrets.
4—24" x 10' Reed.
2—24" x 12' S. & B.
1—24" x 14' Lodge & Shipley, patent head.
4—24" x 14' American, quick-change.
3—New 26" x 12' Boye & Emes.
1—26" x 24' New Haven.
4—New 28" x 12' Boye & Emes.
1—28" x 18' S. & B.
5—New 30" x 14' Boye & Emes.
3—New 32" x 12' Pittsburg pattern.
1—36" x 15' Fifield, 36 x 16".
2—New 36" x 18' Putnam, triple geared.
12—New 36" x 24' Putnam, triple geared.
1—25"-45" x 22' McCabe, double spindle.
1—New 66" x 30 Putnam, Dec. delivery.
1—71" x 20' Fifield, triple geared.

LATHES — MANUFACTURING — NOT SCREW WCUTTING.

3—No. 1X Reed-Prentice, semi-automatic.
2—No. 2X Reed-Prentice, semi-automatic.
13—No. 3X Reed-Prentice, semi-automatic.
6—No. 11 Amalgamated, for machining and profiling 5" shells.
6—14" x 6' Reed Stud and Bolt.
3—18" Reed Grooving and Undercutting.
70—New Simplex, 16" x 8'.
22—18" x 8' Battle Creek, heavy duty.
5—20" x 8' Merschon.
5—20" x 10' Hindman, high duty.
12—21" x 8' LeBlond, quick-change with attachment for grooving and facing both ends of shells with air cylinders and mandrels for 5" shells.
18—3½" x 60" Fitchburg, Lo-swing.

MILLING MACHINES—KNEE TYPE—UNIVERSAL.

2—New No. 1 Kempsmith.
1—No. 1½ Garvin.
1—No. 1½ Hendey-Norton.
1—No. 2A Kearney & Trecker, single pulley drive.
1—No. 2 Hendey-Norton.
3—No. 2½ LeBlond, Sept. delivery.
2—No. 3H LeBlond, Sept. delivery.
1—No. 3 Cincinnati, single pulley drive, high power, vertical attachment.
1—New No. 4 LeBlond Heavy Duty, immediate.

MILLING MACHINES—KNEE TYPE—PLAIN.

1—No. 14 Garvin.
1—No. 21 Garvin.
1—No., 0 Pratt & Whitney.
3—New No. 1 Rockford.
2—New No. 1 Kempsmith.
1—New No. 2 Rockford.
1—No. 3 LeBlond.
1—No. 3 Hendey Norton.

MILLING MACHINES—VERTICAL.

3—New Bristol, 10" x 28" table, 21" power feed.
1—New No. 4B Becker.
2—No. 5 Becker.

MILLING MACHINES—PLANER TYPE.

1—No. 1 Beaman & Smith, two vertical spindles, working surface of table 72" x 14".
1—No. 1 Beaman & Smith, combined vertical and horizontal, working surface of table 72" x 18".
1—Beaman & Smith Slab Miller and Shaft Keyseater, with vertical routing attachment, working surface of table 96" x 17".
2—Ingersoll-Rand Slab Millers, working surface of table 60" x 20".
2—No. 4 Beaman & Smith, vertical spindle, open side, working surface of table 120" x 24", removable housing on one side.
1—Ingersoll Single Spindle, side head, motor driven, table 96" x 30", cutter head 30" in diameter.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 32 N. Clinton St. | **CINCINNATI, OHIO** 1018 Union Central Life Bldg. | **CLEVELAND, OHIO** 508 Leader News Bldg. | **NEW YORK CITY** Singer Bldg.

Rebuilt Machines For Sale

PLANERS

1—Sellers 36x36x10′ with 2 heads.
5—Sellers 25x25x6′.
2—Sellers 25x25x8′.
1—Putnam 24x24x8′ 6″.
1—Putnam 25x25x10′.
1—Wheeler Heavy 30x30x8′ 6″.
1—Lathe-Morse 24x24x5′ 6″.
1—New Haven 24x24x7′.
1—Wood Light 30x30x8′.
1—Putnam 42x40x12′ 6″.

GRINDERS

1—LeBlond Universal Tool and Cutter, power feed, same as new.
1—Bridgeport Plain Grinder, 16x36.
1—No. 1 Landis Universal Grinder.
1—No. 3 Landis Universal Grinder.
2—No. 6X Diamond Double Disc Grinders.
1—Ford Smith Plain Grinder.

AUTOMATICS.

1—1″ National Acme Double Belt Type.
1—1⅝″ National Acme Double Belt Type.
1—No. 55 National Acme.
1—1″ National Acme four spindle.
2—No. 54 National Acme four spindle.
3—?″ Cleveland.
1—2¼″ Cleveland.
2—2¼″ Gridley Single Spindle Motors.
1—3¼″ Gridley Single Spindle Motor.

LATHES

1—32x12′ Draper Lathe, C.R., H.S.
1—36x22′ Fitchburg Lathe, C.R., P.C.F.
1—30x8′ Fitchburg, C.R., P.C.F.
3—16x8 Putnam, C.R., taper.
6—18x8 Porter, C.R., semi-quick, taper.
2—18x8 Davis, C.R., pan, pump, taper.
10—16x8 Greaves-Klusman, C.R., pan, pump.
9—20x6 Perkins Plain Turning, pan, pump.
1—14x6 Porter, C.R.
1—20x8 LeBlonde, C.R.
1—13x5 Seneca Falls, C.R., pan.
14—20x6′ Perkins Lathes, pan bed, chuck, Fay & Scott turrets.

MISCELLANEOUS.

1—No. 3 Kempsmith Plain Miller, same as new.
1—9″ Industrial Works Slotter.
1—24″ Aurora Sliding Head Back Geared Drill.
3—Prentice 24″ Sliding Head Drills.
2—Industrial 40″ Drills.
1—Western Hydraulic Banding Machine.
1—Jenckes Band Turning Lathe, with 3″ Universal Chuck.
1—36″ Aurora Drill.
1—12″ Bement Travelling Head Shaper.
1—12″ Juengst Crank Shaper.
1—9″ Putnam Wheel Lathe, double quartering.
1—Sellers Slab Miller, 24x21x12′.
1—No. 21 Lee-Simplex Saw.
1—26x10 Cincinnati Gear Cutter.

This is only partial list—Send for full list

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The Crop and Business

In view of the great importance of the crop in relation to the Empire's food supply and Canada's business prosperity, THE FINANCIAL POST will present each week a special article dealing with the developments in a broad way and as they affect the business situation as a whole. This article will be edited by F. M. Chapman, Editor of The Farmer's Magazine, who will have direct and authoritative information on the Western Canadian situation supplied regularly by Miss Cora Hind, a former member of our staff, but now Agricultural Editor of the Manitoba Free Press, a publication whose information for some years has not taken second place even to the current Government statistics. Miss Hind's service will be supplemented by reports from the Provincial Departments of Agriculture from time to time.

THE POST believes that this special on agricultural conditions as presented to the readers of THE POST will prove a very valuable guide to the manufacturers and business men, as well as to the investing public as to the developments of the crop in relation to general business and financial affairs.

This is only one of the many news features that THE POST gives its readers every week. It has become so valuable that thousands of them renew year after year.

The Financial Post of Canada

143-153 University Avenue
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New York's Greatest Stock

(Partial List)

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48″ SELLERS PUNCH, CAPACITY 6″ THROUGH 2″
General Engineering Co. Multiple Punch, gap type, punch any length plate, weight about 20,000 lbs.
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Hetherington & Berner double geared Beam Punch, 17″ throat
Pels Beam Shear "T-40"
Alligator Shear, 15″ throat, capacity 1″ x 6″ flats
Kling Bros. Rotary Splitting Shear, capacity ⅝″ plate, any width, weight 13,000 lbs.
No. 17 Niagara Rotary Shear, circle cutting attachment
Perkins Model "M" Rotary Shear
Wm. Sellers double end Punch & Shear, 21″ throats, punch 1½″ through 1″, shear 1″ x 6″ flats
Bass double end Punch & Shear, 20″ throats, capacity 1¼″ through ¾″
No. 4 Industrial double end Punch and Shear, 20″ throats, punch 1″ through 1″
No. 4 Royersford Punch and Shear, 18″ throat, punch 1″ through ⅞″, shear 3″ x 8″ flats
McDougall double end Punch and Shear, 15″ throat, punch 1″ through ¾″
Hilles & Jones single end Punch and Shear, punch ¾″ through ⅜″, shear ⅜″ x 3½″ flats
Coping Machine, 3″ stroke, weight 10,000 lbs.

BENDING ROLLS

Ship Plate, 9′2″ between housings
Niles Plate, 8′6″ between housings, drop end housings
Niles double geared, drop end housing, 40½″ between housings

MILLING MACHINES

No. 4B Brown & Sharpe Plain, single pulley drive
No. 4 Brown & Sharpe Plain
No. 4 Cincinnati Plain, heavy duty, single pulley drive
No. 2 Hendey-Norton Universal
No. 2 Cincinnati Plain
No. 2 Cincinnati Universal
No. 1½ New American Improved Plain
No. 1 Kempsmith Plain
No. 1 Pratt & Whitney Plain
No. 3½ Garvin Plain, table 12″ x 36″
Beaman & Smith 2 spindle Vertical, table 24″ x 48″

BORING MILLS

Two 20″ Bullard Vertical Turret Lathes
Three 34″ Rogers Vertical, single turret head
Five 30″ Bullard Vertical, single turret head
Pratt & Whitney Horizontal, 2¼″ bar
48″ Niles Car Wheel
Underwood Automobile Cylinder, 3⅝″ bar

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Leland H.S.B.B., Bench type.
No. 1½ Knight Driller and Miller.
14" Rockford Sensitive.
20" Kern, b.g.
No. 25 Foote-Burt 24" Drill (new).
32" Hamilton s.h., b.g., p.f.
12-spindle Multiple P. and W.
No. 30-C Baush, 12-spindle.
20" W. F. & J. Barnes, 4-spindle.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. Automatic.
30" x 9" G. & E. Auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3 26" B. & S., for spur.
36" Walcott for spur.

GRINDERS

Yankee Drill.
Leland Universal, with power feed.
No. 23 B. & S. Gear Cutter.
8" x 30" Modern Plain (new).
14" x 20" B. & S. Plain
Garvin Hole Grinder.
Gisholt Tool Grinder.
No. 5 Diamond Water Tool.
No. 16 Gardner Disc Grinder.
No. 24 Gardner Disc Grinder.

LATHES

No. 3½ Rivett.
No. 3 Cataract.
No. 5 Cataract.
13" x 5' P. & W. c.r. taper.
14" x 6' Davis, p.r.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
16" x 6' Bradford, c.r., q.c.g.
18" x 8' L. & S., pat. head, c.r. taper.
18" x 10' Fitchburg, c.r
18" x 12' Barker, c.r.
20" x 14' Blaisdell, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
32" x 16' Blaisdell, c.r.
36" x 20' American, t.b.g.
3½" x 60" Fitchburg Lo-Swing.

PLANERS.

36" x 36" x 12' Powell, two heads.
36" x 36" x 16' Sellers, one head.
40" x 38" x 14' Putnam, one head.
40" x 40" x 12' New Haven, one head, one side head.

SCREW MACHINES.

1" B. & S., Plain.
16" P. & W., Plain.
No. 2 Foster, Plain Head.
No. 2 Costello, Plain Head.
No. 2 P. & W., Friction Head.
No. 3 Foster, Geared Head.
No. 4 Pearson, Geared Head.
No. 3 Bardons & Oliver, Plain Head.
No. 12½ Garvin, Friction Head.
No. 2-G B. & S. Automatic.
⅞" Cleveland Automatic.

TURRET LATHES.

16" Garvin Friction Head, a.c. and w.f.
16" Lodge & Shipley.
25' Niles.
No 2 Warner & Swasey, Hollow Hexagon.
2" x 24" Jones & Lamson.
3" x 36" Jones & Lamson, chucking equipment.
3" x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt Turret Lathes, taper attach.

PUNCHES AND SHEARS.

No. 2 L. & A. Angle Iron Shears, 5" x 5" x ½" (new).
No. 5 L. & A. Double Punch and Shear, ⅝" in ⅝", 3" x ⅝", 1⅛rd (new).
No. 1 L. & A. Multiple Punch (new).
No. 2 L. & A. Multiple Punch (new).
No. 1 L. & A. Horizontal Punch, ½" in 1" (new).

MISCELLANEOUS.

¾" Acme Forging Machine.
52" Niles Car Wheel Boring Mill.
No. 1 Davis Keyseater.
No. 2 M. & M. Keyseater.
No. 3 M. & M. Keyseater.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 3A La Point Broacher.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-Ton Yale Duplex Hoist.
3-Ton Yale Triplex Hoist.

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1 Landis No. 3 Universal Grinder 12" x 42", complete equipment, less internal grinding attachment. . $1,500

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $2,200

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $1,800

These machines are particularly good value, and may be seen at our works.

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18" x 10' Rahn Mayer H.S., C.R., T.A.
17" x 8' NEW Sidney, D.B.G., quick change.
6—19" x 8' NEW Sidney, D.B.G., quick change.
20" x 8' Prentice, H.S., C.R., T.A.
26"-48" x 14' NEW style, McCabe, double spindle, heavy pattern, new lathes.
No. 3 Cincinnati high power Universal Miller.
3—No. 1½ NEW American plain Millers.
No. 1 NEW Hendey Universal Miller.
No. 0 Steptoe New hand Millers.
14" NEW Steptoe Shaper.
16" NEW Steptoe B.G. Shaper.
15" Bement traveling head Shaper.
20" NEW Steptoe B.G. Shaper.
24" Flather, B.G. Shaper.
No. 3 B.&S. Universal Grinder.
Bath Universal Grinder, 10" x 25".
50" x 11" Gould & Eberhardt Gear Cutter.
28" NEW Superior sliding head Drill.
3—25" NEW Superior sliding head Drills.
D4 Colburn high duty Drills.
3—20" Rockford high duty drills.
4' Harrington Radial Drill.

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1—76″ x 48″ x 18′ Woodward & Powell.
1—32″ x 32″ x 10′ Gray.
1—32″ x 32″ x 8′ Gray.
1—30″ x 30″ x 10′ Powell.
1—26″ x 26″ x 7′ Gray.
1—26″ x 26″ x 6′ American.
1—24″ x 24″ x 6′ Cincinnati.
2—24″ x 24″ x 5′ Gray.
1—24″ x 24″ x 4′ Gray.
1—22″ x 22″ x 6′ American.
1—22″ x 22″ x 5′ Flather.

SHAPERS.

1—48″ Morton Draw Cut.
1—24″ Queen City.
1—24″ Gould & Eberhardt.
2—16″ Barker.
1—15″ Hendey.

MILLING MACHINES.

1—No. 3 Hendey.
1—No. 5 Schuchardt & Schutte.
1—No. 25 Becker-Brainard.
1—Hilles & Jones Vertical
1—No. 2 Cincinnati Universal.
1—No. 20 Oesterlein Universal.
1—No. 1½ Brown & Sharpe Universal.
1—60″ x 54″ x 8′ Ingersoll
1—92″ x 72″ x 15′ Beaman & Smith.
1—No. 2 B. & S. Combin. Horiz. and Vert.
1—No. 15 Garvin Profile Miller.

VERTICAL BORING MILLS.

1—84″ J. Morton Poole.
2—72″ Bickford.
1—42″ Colburn.
1—42″ Betts Car Wheel Borer.
1—36″ Bridgeport.
1—36″ Brown & Sharpe Chucking.
2—34″ Colburn.
1—31″ Baush.
1—2-spindle Beaman & Smith.

HORIZONTAL BORING MACHINES.

1—Binsse, 3″ bar.
1—Newark, 3″ bar.
1—Betts, 2⅞″ bar.
1—Bement, 2⅞″ bar.
1—Beaman & Smith, 2⅛″ bar.
1—No. 3 Barnes Double End.
1—No. 4 Newton, 2-spindle.
1—Beaman & Smith, 2-spindle.

RADIALS.

3—5′ Niles Semi-Universal.
1—4½′ Niles Universal.
1—3½′ Gang.
1—3′ Prentice.
1—3′ Mueller.
4—2½′ Fosdick.
2—2½′ Mueller.
1—2½′ Dreses.

TURRET LATHES.

1—2″ x 26″ P. & W.
1—2½ x 26 P. & W., Gd. Hd.
4—No. 3-A Warner & Swasey.
1—22″ Libby.
52—21″ Gisholt.
3—2″ Gridley Automatic.
99—24″ Gisholt.
1—No. 2 Warner & Swasey.
2—2″ x 24″ J. & L., Cone Head.
2—2″ x 24″ J. & L., Gd. Hd.
2—2½″ x 26″ Greenlee.
1—3″ x 36″ P. & W.

PRESSES.

1—No. 5 Consolidated.
1—No. 5 Niagara.
1—No. 20-U Ryerson.
1—No. 30 Perkins.
1—No. 23½-B Niagara.
1—No. 17 Williams & White.

MISCELLANEOUS.

1—10″ Bement Slotter.
1—1½″ Morton Keyseater.
1—1½″ Baker Keyseater.
1—Gleason Gear Planer, 84″ bevel, 96″ spur.
1—36″ Fellows Gear Shaper.
2—24″ Fellows Gear Shapers.
2—No. 3 Cincinnati.

GEAR CUTTERS.

1—No. 14 B. & S. Plain Grinder.
1—10-spindle Foote-Burt Rail Drill.
1—Niles 41″ x 8′ Cylinder Lathe.

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ON PAGE 68
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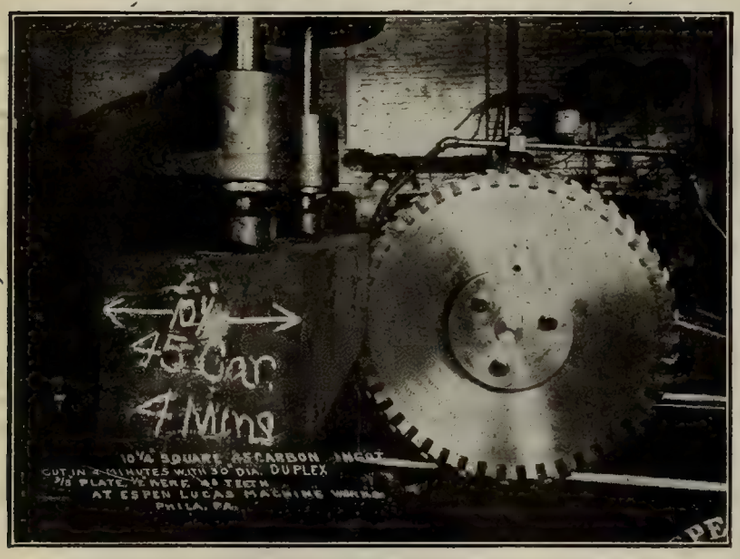

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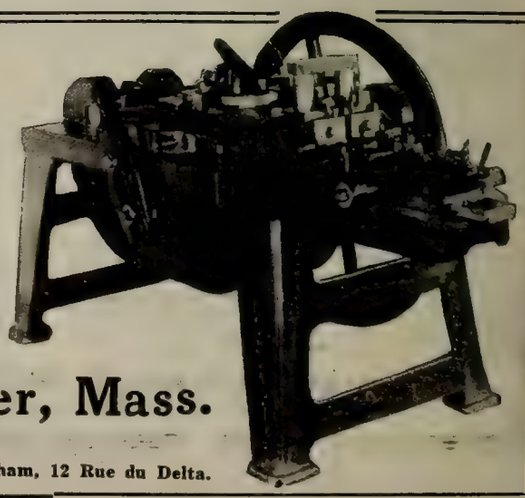

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54" x 54" x 15' Pond, 2 heads.
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40" x 54" x 8' Betts, single head, very heavy type.
30" x 30" x 6' Sellers, 1 head on cross rail, 1 side head.
30" x 30" x 10' Pease, single head.
30" x 30" x 8' Harrington, 2 heads.
25" x 25" x 6' Sellers, single head.

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6' Bickford, 2 swivel heads, excellent condition.
14' Standard, 2 swivel heads.
Two 36" Bullard, 2 swivel heads, back geared.
30" Bullard, single turret head.

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Niles, 3½" bar, knee type.
Beaman & Smith, cylinder, 2 boring and 1 facing spindle, square and circular table.
(2) Bement, 3" bar, knee type.

MILLING MACHINES

No. 2 Brown & Sharpe Universal, dividing heads, etc.
No. 2 Putnam Universal, dividing heads, etc.
Beaman & Smith, open side, planer type, table 24" x 6', 1 vertical spindle.
Ingersoll, planer type, 36" x 36" x 8', 2 vertical spindles.

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Baush, 12 spindles, 12 1½" holes, weighs 22,000 lbs., good as new.
Baush, 10 spindles, 1½" holes, drills rectangular space 36" x 48", weighs 25,000 lbs., good as new.
Foote-Burt, 2 spindle, adjustable rail, extra heavy, 60" maximum distance center to center of spindles, weighs 12,500 lbs.

RADIAL DRILLS

4' Gang, with tapping attachment.
3' Gang, with tapping attachment.
6' Pond.
6' Dreses.
5' Prentice.
4' Prentice, tapping attachment.
4' Bickford, tapping attachment, direct connected to variable speed motor.
4' Niles, arranged for motor drive.
4' Fish.
42" Bickford, single pulley drive through gear box.

SLOTTERS

36" Bement, geared, weighs 35,000 lbs.
12" Bement.

LATHES

(4) 27" x 14' Lodge & Shipley, geared head, single pulley drive, quick change gear, etc.
52" x 16' Gleason, face plate drive.
84" x 27" Putnam, motor driven.

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Long & Alstatter Multiple Punch, 50 holes in half inch metal, easily converted to Gate Shear, 48" between housings.

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500 lb. Bradley Upright.
(3) 200 lb. Bradley Upright.
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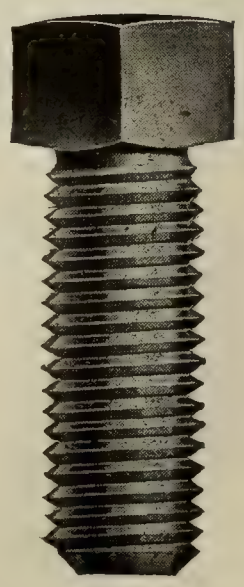

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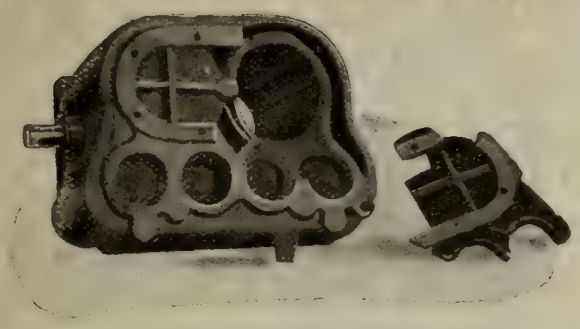
CANADIAN HOSKINS, LIMITED

ELECTRIC, GAS AND OIL FURNACES AND PYROMETERS

G. F. Sheppard, 224 St. James St., Montreal **WALKERVILLE, ONT.**

DIVIDEND-PRODUCING FACTS about OXY-ACETYLENE WELDING



Broken Cylinders Before Welding

Why not cut the losses? The installation of an Oxy-Acetylene Welding Equipment means but a very small investment compared to the savings in time and money it effects. It is an investment that will bring hundreds per cent. return, and it is good business to keep your plant always running. Is this worth investigation?

You are protected against loss. Not only can Oxy-Acetylene Welding be profitably employed for coping quickly with repairs, "break-downs," "tie-ups"—preventing losses by delay in replacements, but it is universally adopted in many manufacturing processes where a greater efficiency and an improved product are essential.

"A. L. S." Oxy-Acetylene Welding and Cutting Equipment is Backed by "A. L. S." Service

We maintain three factories in Canada and a staff of experts in the process, making Service to you a feature of our business; manufacturing the Purest Oxygen and Dissolved Acetylene, and Equipment of the highest efficiency.

Improved methods mean increased business and bigger profits.

Same Cylinders After Welding

Many problems in the Metal Industry are being solved by Oxy-Acetylene Process

Write to-day for particulars, without obligation. We can tell you how, and why.

L'AIR LIQUIDE SOCIETY

Pioneers of the Process

Factories the world over

MONTREAL, Cor. 1st Ave. and Ernest
TORONTO - - 26 Boler Street
WINNIPEG - - - - 1297 Pine

What Will Drop-Forged Tools Cost In 1918 ?

Will you be able to get them at all?

Will your present stocks carry you over till such time as drop-forging equipment can dispose of the great volume of special work it will shortly be called upon to perform?

Will it carry you enough longer to permit the steel makers to replenish the drop-forgers' stocks?

A decreasing supply and an increasing demand with unprecedented shortage of raw material and a growing scarcity of men can hardly be expected to produce low prices for drop-forged products.

Analyze—Answer—Act !

All types of Williams' "AGRIPPA" Tool Holders and many other classes of tools can be shipped promptly from stock if ordered now!

J. H. WILLIAMS & CO., 45 Richard St., Brooklyn, N.Y.

IN STOCK READY TO SHIP

"STAR BRAND"
SEAMLESS BRASS

CONDENSER TUBES

TINNED INSIDE AND OUTSIDE

5/8 and 3/4 inch O.D., No. 18 Stubs Gauge—12, 14, 16, 18 and 20 foot lengths

AND

"STAR BRAND" BRASS CONDENSER TUBE FERRULES

Standard 14 Thread for 5/8 and 3/4 in. Tubes

OUR STOCK ON HAND READY FOR IMMEDIATE SHIPMENT ALSO INCLUDES A FULL LINE OF REGULAR STOCK SIZES AND SHAPES OF THE FOLLOWING

"STAR BRAND" SPECIALTIES

Seamless Brass and Copper Pipe and Tubing, Brass Fittings, Sheet Copper, Copper Bar, Rods and Wire, Copper Nails, Sheet Brass, Brass Rods, Tobin Bronze Rods, Copper Rivets and Burs
AND OTHER PRODUCTS IN BRASS, COPPER, PHOSPHOR BRONZE, ARCHITECTURAL BRONZE, ETC., ETC.

U. T. HUNGERFORD BRASS & COPPER CO.

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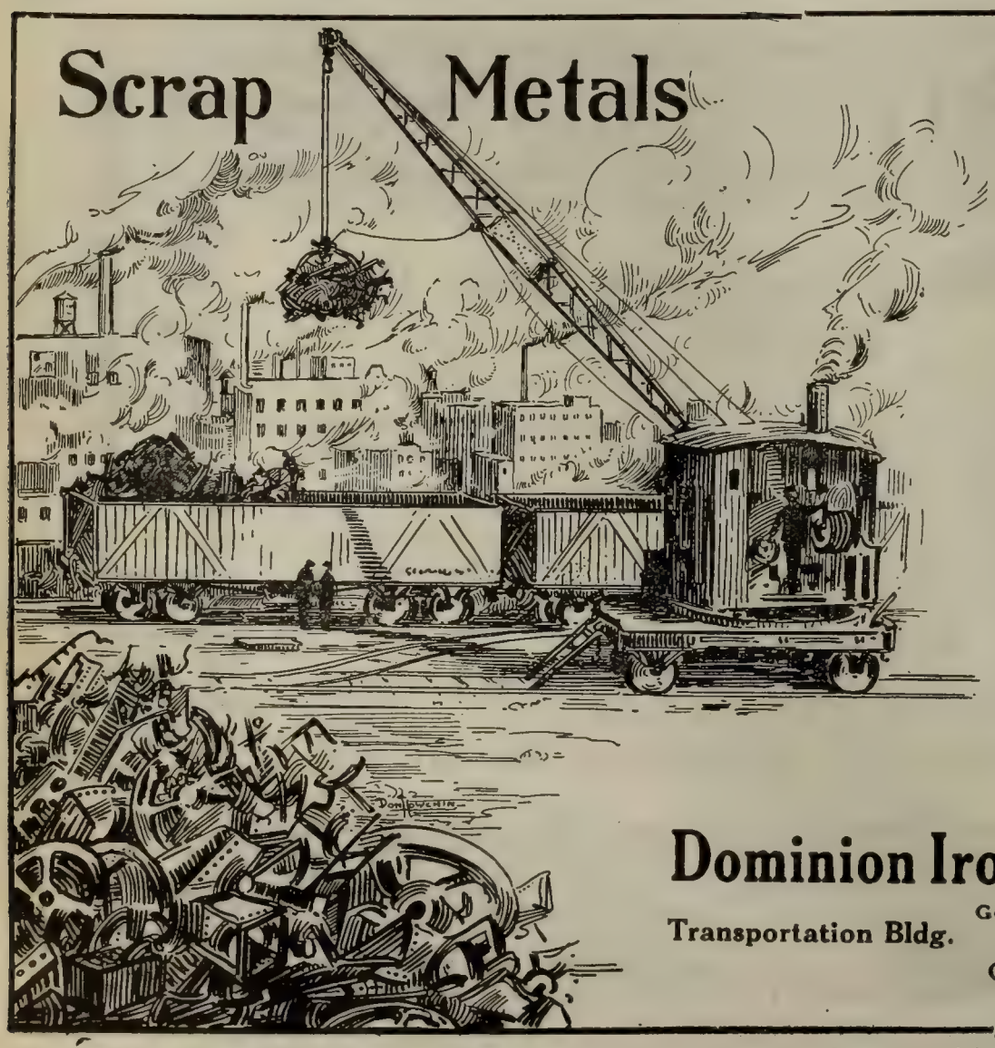


Scrap Iron, Steel and Metals

No undertaking is too large for us. We are Scrap Metal Specialists, and can co-operate with you in the dismantling of railway equipment, bridges, plants, steamers, mills and will take your rails and machinery.

Shell Makers. We can take care of all your scrap materials, at highest prices.

Give us particulars and we will relieve you of all worry.

Dominion Iron & Wrecking Co.

LIMITED

Transportation Bldg. General Offices: Quebec, Que. Montreal, Quebec

THE BASIS OF A GOOD FILE IS THE STEEL

Unless the steel is such that the tool will stay hard for a reasonable length of time, the file will not give good results—neither will it be economical to use.

The steel from which the "Famous Five" files are cut is a high carbon steel made from our own formulas —which have proven satisfactory after years of practical experience.

This, plus the sharpness and regularity of the teeth, ensures a tool that will stay hard and sharp for a long time. Consequently the "Famous Five" are the most economical Files to buy.

Specify them when ordering.

The Labor Saver

Showing Truck in Elevated Position

THIS

ELEVATING TRUCK

greatly reduces cost of producing

SHELLS

or any factory product where numerous operations are required.

All material is stacked on the platforms. To move material the truck is backed under the platform; the handle of the truck is then pushed down, keeping the button depressed, which raises the truck bed, and with it the loaded platform, at the same time automatically locking it in its raised position.

When hauled to the desired position the button is pressed and the handle raised, lowering the platform to the floor. The truck is then drawn from underneath and is ready to move another platform.

Raising and lowering of the truck can be operated with one hand—can be raised or lowered at any angle. Specially designed ball-bearings throughout.

We also manufacture **Loading Funnels, Ball-Bearing Tightening Nuts, Belt-Driven Loading Vibrators, Bench Vises** and PRESSES WITH ATTACHMENTS FOR PRESSING IN BAND—fixtures especially adapted for the manufacture of 18-pr. Shrapnel Shells.

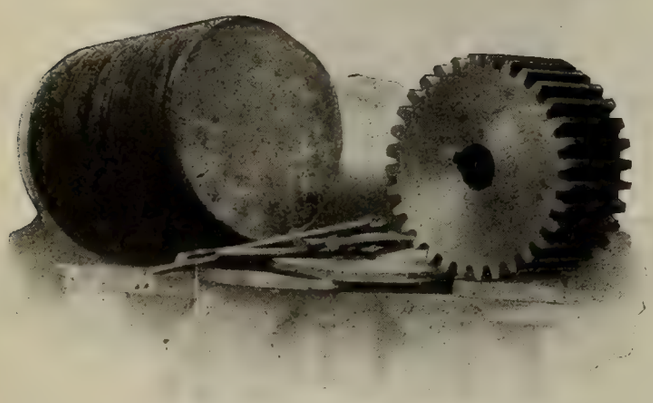
You will profit by getting in touch with us now for prices and full information.

THE CHAPMAN DOUBLE BALL BEARING CO. OF CANADA
LIMITED
339-351 Sorauren Ave. - TORONTO, CANADA

TRANSMISSION BALL BEARING CO., INC.
1050 Military Road, Buffalo, N.Y.

CUT GEARS

Use Quiet Rawhide Pinions for Motor Drives

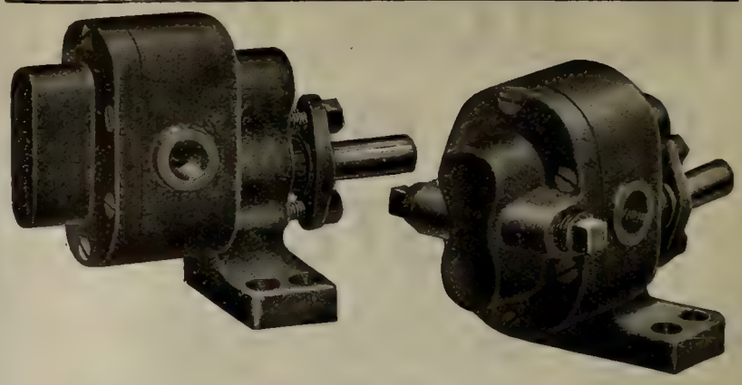


The rough material and a finished pinion.

Our large stock of rawhide pinion material is at your service for quick delivery.

Write us for quotations.

Hamilton Gear & Machine Co.
Van Horne Street, TORONTO



Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.

Core Ovens

Perfect cores are a big item in cutting foundry costs.

Use Whiting Ovens and obtain uniform heating and regulation. Years of experience are back of our designs.

Send for catalog 121

Complete Foundry Equipments

WHITING
FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
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Cranes of all kinds

The Spiro Never Slips

The Spiro Compression Coupling is locked to the shaft by a graduated grip.

The pull of the bolts on the two halves of the coupling acts on the spiral slotted sleeve until it grips the full surface of the shaft with a never-slip hold.

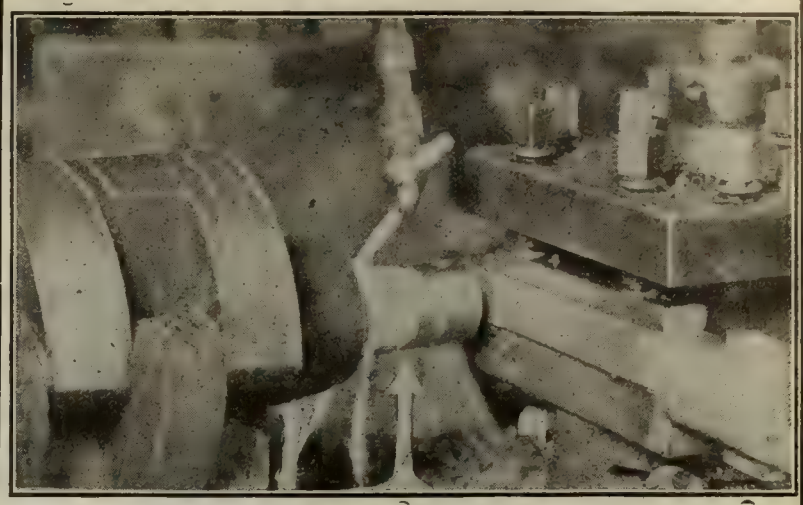
Every bolt pulls, and at every pull the grip grows.

And last, but not least, the Spiro can be removed as quickly and easily as it can be applied.

The Bond Booklet describes our complete line of Power Transmission Devices.

Canadian Bond Hanger & Coupling Company, Limited

Alexandria Ontario



ECONOMIC WATER OIL

SHELL MANUFACTURERS use ECONOMIC WATER OIL for METAL CUTTING of every description; it will not gum nor rust, and it SAVES TIME AND LABOR.

WE CAN SAVE YOU 50% in the **COST** of your **CUTTING MIXTURE** BECAUSE

ONE GALLON of ECONOMIC WATER OIL will mix readily with **30 to 50** gallons of WATER, making a thick, creamy emulsion, and giving you a cutting mixture which will not only be **satisfactory**, but will produce very **ECONOMIC RESULTS.**

One TRIAL ORDER will **prove** our STATEMENT.

Made in Canada

Canadian Economic Lubricant Co.
LIMITED
1040-1042 Durocher St. MONTREAL

Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send to our nearest factory for a trial box.

Manufactured and guaranteed by

The Canada Metal Company, Limited

Hamilton Montreal TORONTO Winnipeg Vancouver

Increased Production Means Increased Profits

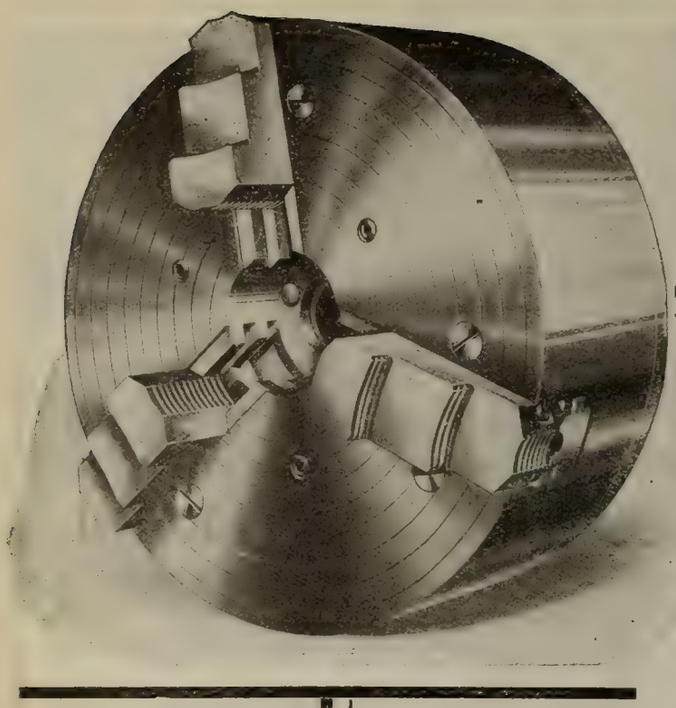
Large Millers for large work — STEPTOE MILLERS for small work.

Will result in increased production; less money invested in machinery, and increased profit.

Large Planers for large work — STEPTOE SHAPERS for small work.

THE JOHN STEPTOE COMPANY
CUMMINSVILLE, CINCINNATI, OHIO, U.S.A.

If any advertisement interests you, tear it out now and place with letters to be answered.



Indispensable Where Rapid Manufacturing Methods Prevail

The M. E. C. Three-Jaw Air-Operated Chuck (steel body) eliminates the troublesome time-losing, hand-operated chuck. Operating on tests of long periods it will show an increase in production of from 25 to 90 per cent. Once chucked, the work stays chucked. Vibration doesn't affect it—it holds tight regardless of cutting strain. Saves energy and time. Most of the work of medium diameter is chucked and released without stopping machine spindle.

Ask for full details. By all means get our interesting catalog on Labor-Saving Devices. Write for it NOW, it's **free.**

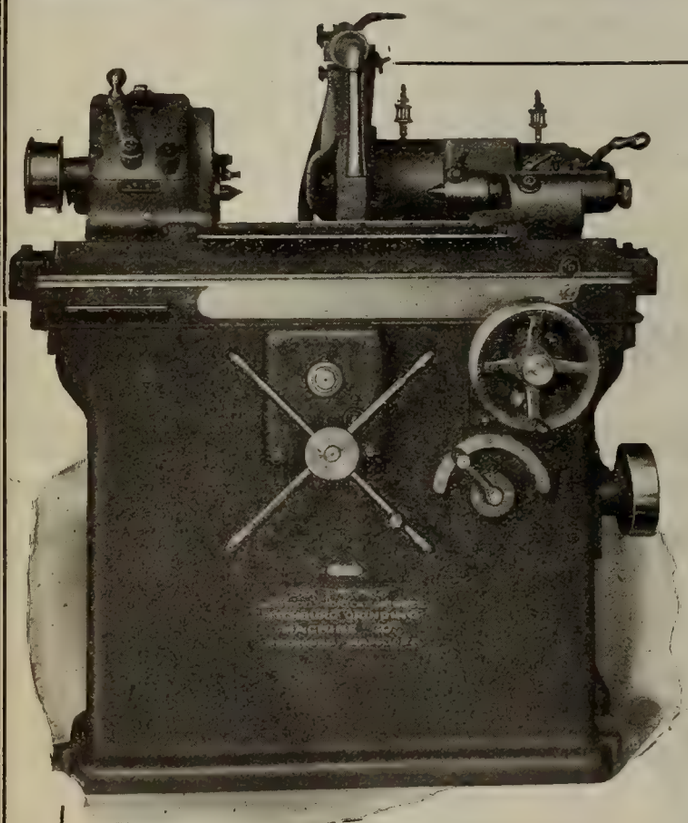
By All Means Get Our Interesting Catalog on Labor Saving Devices

MANUFACTURERS EQUIPMENT COMPANY

171 N. Jefferson Avenue **Chicago, U.S.A.**

Agents for Central and Eastern States and Canada: J. R. Stone Tool & Supply Co., Goebel Bldg. Detroit, Mich.

Foreign Agents: C. W. Burton Griffiths & Co., Ludgate, Ludgate Square, London, England.



MODEL "B"

Six x Twenty Grinder

A Fitchburg Model

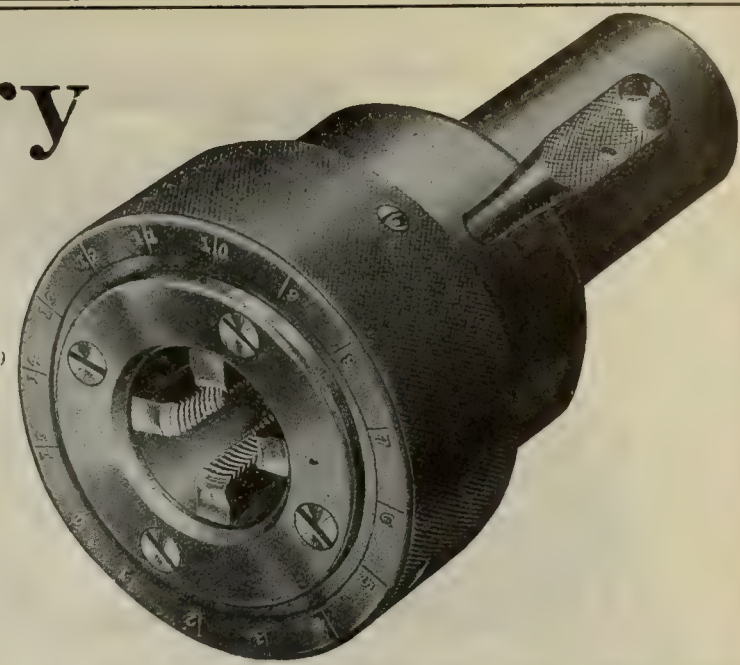
Equally as efficient on small work as on that of larger dimensions. Therein lies its value. It is a compact, energetic worker that will do more for its size than any machine of similar wheel dimensions. It is saving in floor space. Its speed will give you greater production. Investigation or trial will impress you. 1300 to 1800 R.P.M. 16 x 3 grinding wheel. 6 x 4 pulleys. 7 horsepower required. Floor space 52 x 66. Send for complete specifications.

Fitchburg Grinding Machine Co.

FITCHBURG MASS. U.S.A.

Rapid Delivery

Users of Murchey Tools Get Chasers Without Delay



Lightning deliveries—that is a big advantage of using Murchey Tools. No work held up for chasers. We get your order, fill it, and it's on the way back to you just as quickly as the most rapid means of transportation can bring it to you.

There is no service like the Murchey service, and there are no tools like the Murchey Tools. Send blueprints for estimates.

MURCHEY TAPS are accurate and simple and can be worked with great speed. On 4.5 Mark VII shells Murchey tapping time is just ONE MINUTE.

Murchey Machine & Tool Company

75 PORTER STREET - - DETROIT, MICHIGAN

The Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, S.W., England, Glasgow, Newcastle-on-Tyne, and Fenwick Freres & Company, 15 Rue Fenelon, Paris, France.

Jacobs

IMPROVED

Drill Chuck

A Winner By Sheer Merit

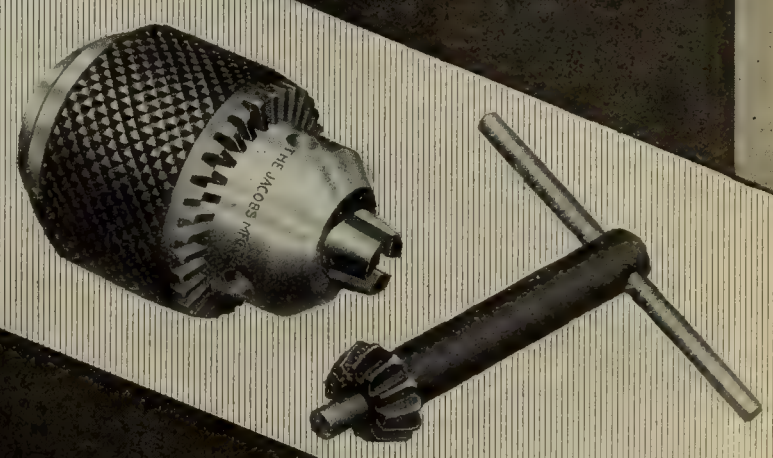
Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

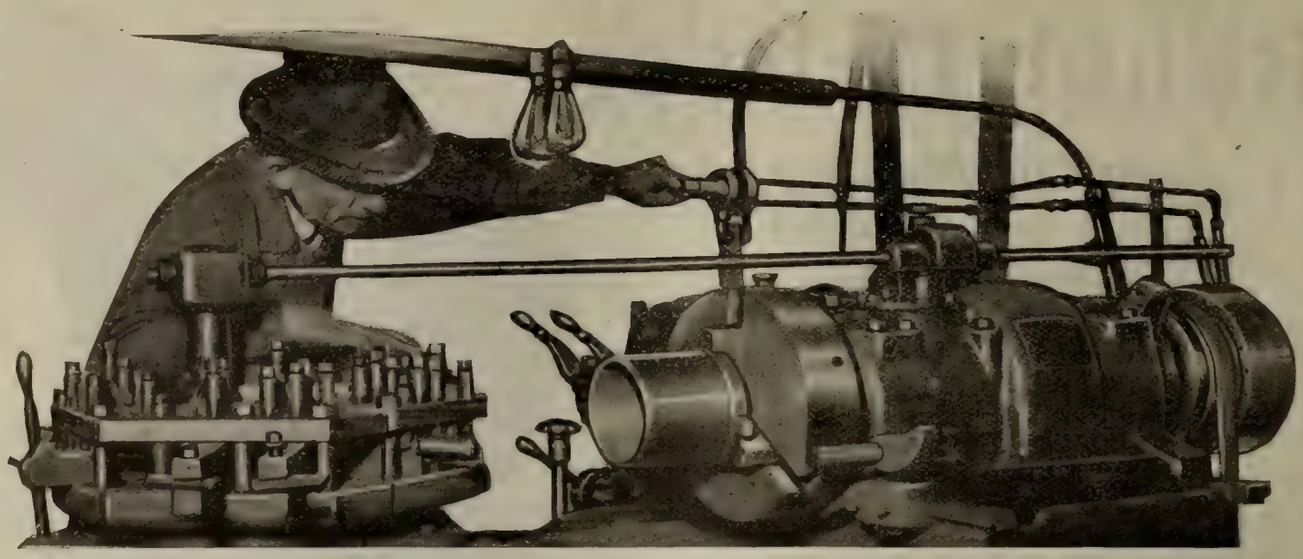
Try them and see for yourself.

MADE BY

The Jacobs Manufacturing Co.

Hartford, Conn., U.S.A.





The Woman in the Shop Has Come to Stay

Thrust into the industrial field by unprecedented world conditions, women have more than made good. Lacking masculine brawn, they have by instinct the deft, sure touch and quick perceptions that go to make a highly skilled operator; aided by modern labor-saving devices they equal, and in many cases surpass, the output of the expert workman.

One of the woman machinist's chief helps is the Hannifin Air Chuck, by means of which work is chucked and rigidly gripped by simply turning a lever. Another turn effects the release. The Hannifin Chuck is almost instantaneous in action, holds securely, cannot slip, saves labor, and saves time to the extent of increasing output 20 to 100 per cent.

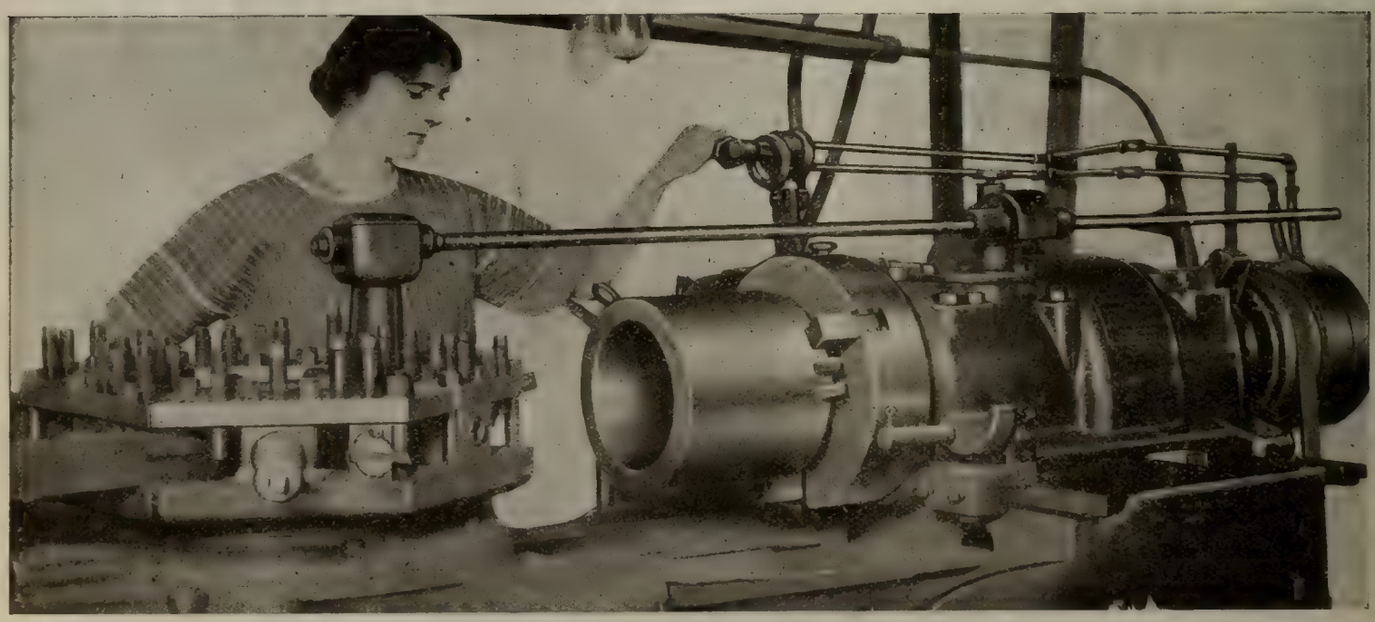
Every argument is in favor of the Hannifin Air Chuck. Order one on trial and let it prove its own case.

HANNIFIN Air Chucks

Write for catalogue covering Air Operated Chucking and Clamping Equipment.

HANNIFIN MFG. COMPANY, Chicago, U.S.A.

REPRESENTATIVES:—R. E. Ellis Engineering Co., Chicago; Coats Machine Tool Co., New York City; A. R. Williams Machinery Co., Toronto; Williams & Wilson, Montreal; The Canadian Fairbanks-Morse Co., Montreal. EUROPEAN REPRESENTATIVES:—Coats Machine Tool Co., Ltd., London; Fenwick Freres & Co., Paris; Iznosskoff & Co., Petrograd.



Every Butterfield Tap comes to you ready for long, hard service.

It is made by expert workmen—from the finest materials obtainable—and thoroughly tested before shipment.

For the tap that is uniformly dependable in service — specify Butterfield.

Butterfield & Co., Inc.
Rock Island :: Quebec

Toronto Office:
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H. A. Harrison, Manager.

Catalog No. 16 containing the complete line of Butterfield Tools awaits your request.

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Accidents break down the efficiency of your organization, lead to legal troubles, loss of time and money.

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BRISTO

REG. U. S. PAT. OFFICE

SAFETY SET SCREWS

insure safety. They also protect themselves because of their patented construction. The dove-tailed design of wrench and screw contracts the metal under pressure. The harder you twist the wrench the more the metal of the screw is compressed.

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Waterbury, Conn., U.S.A.

Uncertainty becomes Certainty when you have your material and apparatus tested and inspected by us.

Get the benefit of many years of service.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED

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NEW GLASGOW.

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WATERPROOF CEMENT LEATHER BELTS

Will Save You Much Money, Time, Trouble and Worry

"Viking" Belts are just in their element when in wet places and under adverse conditions.

A trial will convince you that they are all-round savers.

Write for particulars.

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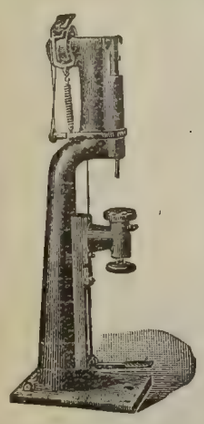
MONTREAL TORONTO WINNIPEG

STEEL CASTINGS

We are well equipped to make all kinds of steel castings, 100 lbs. to 50,000 lbs.

Dominion Steel Foundry Co.
Hamilton LIMITED Ontario



IS YOUR RIVETING PROFITABLY DONE?

Our Elastic Rotary Blow Riveting Machine does profitable work, because one machine will do the work of several hand riveters, and do it better.

Every head is perfectly formed, any shape, round, flat, oval, rectangular, etc.

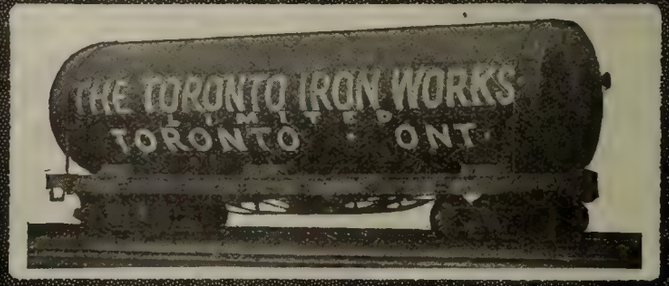
Catalogue C tells more about it.

The F. B. SHUSTER COMPANY
New Haven, Conn.

Formerly John Adt & Son. Established 1866.

Also makers of Wire Straighteners and Cutter, Cotter Pin Machines, etc.

RIVETED STEEL TANKS FOR EVERY PURPOSE



OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
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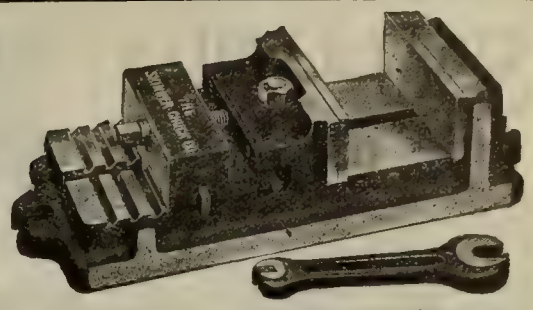
Send us your inquiries. Let us quote.

H. E. STREETER

523 New Birks Building MONTREAL, P.Q.

SKINNER DRILL PRESS VISE



A substantial, durable tool which will pay for itself in short order in any machine shop. Four sizes to accommodate a wide range of work. Try one and you'll buy more.

Printed matter promptly mailed on request.

THE SKINNER CHUCK COMPANY

New York Office, 94 Reade Street — London Office 149 Queen Victoria St. — San Francisco Office Rialto Bldg.
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Zenith Coal & Steel Products Limited

COAL COKE HACK SAW BLADES
CARBON STEEL MACHINERY STEEL
HIGH SPEED STEEL

Royal Bank Bldg., Toronto; McGill Bldg., Montreal, Que.

Greenfield

Trade Mark Reg. U. S. Pat. Office

A universal grinder. A grinder with all attachments. A grinder that will handle all kinds of tool-sharpening as well as cylindrical, internal and surface grinding. An all-around machine for your tool-room.

Catalog No. 6.

Greenfield Machine Co.

Greenfield, Mass., U.S.A.

Oxy-Acetylene Welding and Cutting Apparatus

OXY-ACETYLENE WELDING DAVIS APPARATUS DAVIS-BOURNONVILLE CO. N.Y.

Carter Welding Co., General Dealers Toronto

For Davis-Bournonville Oxy-Acetylene Apparatus
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Write for interesting printed matter.

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in shop and laboratory use the

Standard Scleroscope

Universally adopted; direct reading; inexpensive, and the only instrument that agrees with others of its kind in all parts of the world, thus solving problems of ordering materials to specification.

BOOKLET FREE.

THE SCLEROSCOPE (Set)

Heat Indication

by optical means is fast becoming the correct thing. The PYROSCOPE has solved the problem. Perfect constancy, inexpensive, no electricity used. Built to stand rough usage and upon common-sense lines. Used by the Government and best firms.

Shore Instrument & Mfg. Co. 555-7 W. 22nd St. New York

Agents for Canada: A. R. Williams Machy. Co., Ltd., Toronto, Can.

YOURS IS READY TO MAIL YOUR WHAT?

YOUR CIRCULAR regarding Surface Grinders, New Yankee Drill Grinders, Universal Grinders.

Manufactured by

WILMARTH & MORMAN COMPANY
[illegible] Monroe Ave. N.W. Grand Rapids, Mich.

SEND FOR YOUR CIRCULAR NOW

You want Tool Holders that have made good

ARMSTRONG TOOL HOLDERS
Won The
GRAND PRIZE

THE HIGHEST POSSIBLE AWARD AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

THEY ALWAYS MAKE GOOD

Write for Catalog.

Armstrong Bros. Tool Co.

"The Tool Holder People"

306 N. Francisco Ave., CHICAGO, U.S.A.

SHAFTING

Cold Drawn, Turned and Polished Steel, Rounds, Squares, Hexagons and Flats, Steel Piston Rods, Pump Rods.

Special facilities for Keyseating up to 6 in. diameter.

THE
Canadian Drawn Steel Co.
Limited

HAMILTON CANADA

If any advertisement interests you, tear it out now and place with letters to be answered.

SILVER DRILLS

Increase the Output

Wherever these 20-inch drills have been introduced there has always followed a greater production of work. They are fast and sure. Four styles made. Either round or square base. Also made in gangs of 2, 3 and 4 spindles. Many other features—let us fully explain them.

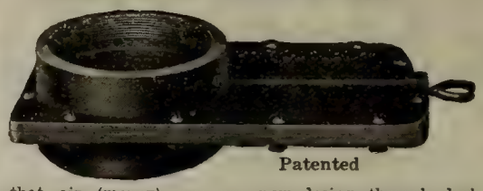
Write to-day. Quick Deliveries.

Silver Manufacturing Co.
290 Broadway, Salem, Ohio

Also Made in Gangs of Two, Three and Four Spindles

NEW AIR-TIGHT BLAST GATE

FOR LOW PRESSURE AIR



Patented

Save that air (money) you are now losing through leaky blast gates. Our NEW AIR-TIGHT BLAST GATE stops this loss.

Circular 123-B explains its many other advantages, outlining clearly its all-round superiority over the ordinary light, flimsy, cheap, leaky and unreliable blast gates, and the heavy, cumbersome, expensive and slow-acting gate valves and stop cocks.

Ask for circular and list of users.

W. S. ROCKWELL COMPANY
FURNACE ENGINEERS AND CONTRACTORS
50 Church Street New York
Hudson Terminal Building

FERALIUM THE ULTIMATE IN DIAMOND SETTING IT IS GUARANTEED

Norton Shank Exact Size

Finest Diamonds and Diamond Tools
THE GENERAL SUPPLY CO. of Canada, Limited
OTTAWA TORONTO MONTREAL WINNIPEG
356 Sparks St., 125 Adelaide St. W., 408 McGill Bldg., 85 Water St.
Sole Canadian Agents for
GEO. A. JOYCE CO., Ltd.
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Landis Shank Exact Size

Our Ballas Diamonds Give Excellent Service

NORTON JACKS

FOR ALL KINDS OF HEAVY LIFTING

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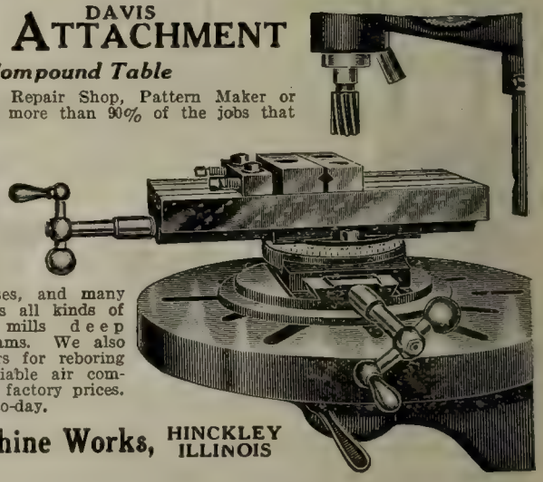

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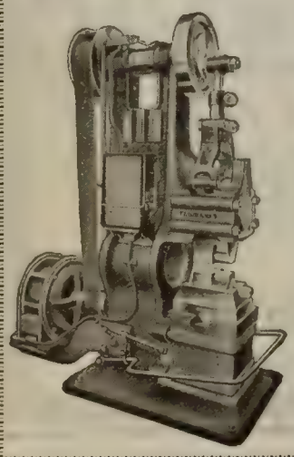

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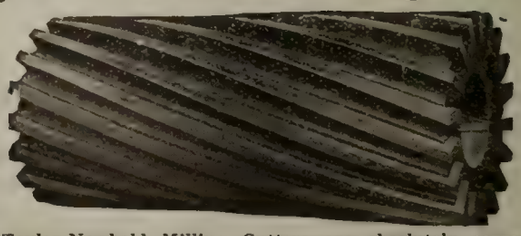

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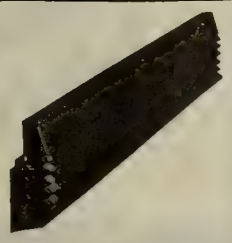

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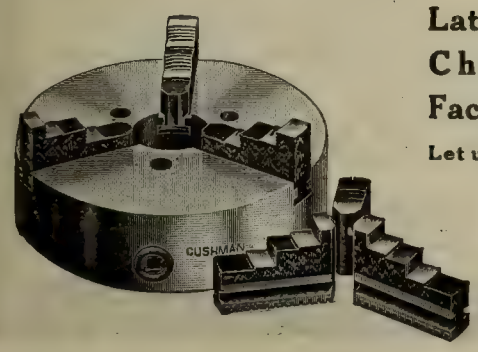

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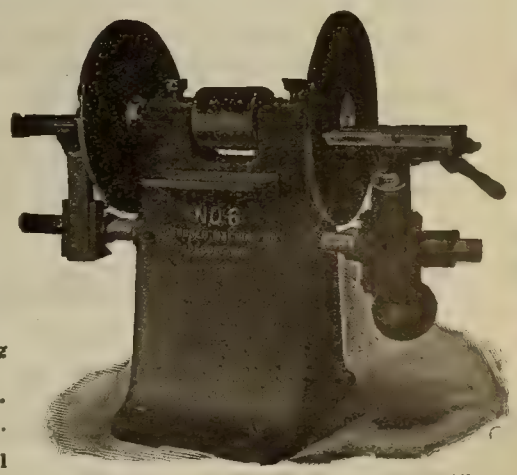

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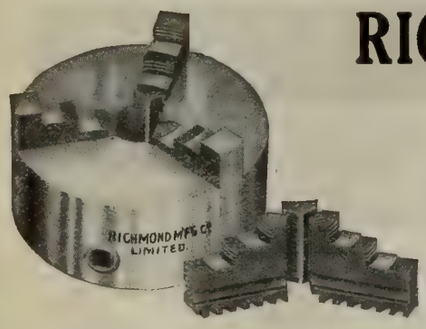

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Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.
Hyde Engineering Works, Montreal.
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Manufacturers Equipment Co., Chicago, Ill.
CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.
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Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Millers Falls Co., Millers Falls, Mass.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Richmond Mfg. Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Skinner Chuck Co., New Britain, Conn.
Thomas Elevator Co., Chicago, Ill.
D. E. Whiton Machine Co., New London, Conn.
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Corbet Fdry. & Mach. Co., Ltd., Owen Sound, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mg. Co., Hartford, Conn.
Richmond Mfg. Co., Toronto, Ont.
CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.
CHUCKS, GEARED SCROLL
Richmond Mfg. Co., Toronto, Ont.
CHUCKS, MAGNETIC
H. E. Streeter, 523 New Birks Bldg., Montreal, Que.
CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.
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Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.
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Bernard Industrial Co., A., Fortierville, Que.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.
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MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
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Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.
COLLARS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
COLLECTORS, PNEUMATIC
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Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
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Hyde Engineering Works, Montreal.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.
Stone Tool & Supply Co., J. R., Detroit, Mich.
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Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Cos., Rochester, N.Y.
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Hungerford Brass & Copper Co., New York, N.Y.
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H. W. Petrie, Toronto.
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Whiting Foundry Equipment Co., Harvey, Ill.
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John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.
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Morse Twist Drill & Machine Co., New Bedford.
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Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
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CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
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Northern Crane Works, Walkerville.
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Dominion Bridge Co., Montreal.
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Niles-Bement-Pond Co., New York.
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Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.
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Northern Crane Works, Walkerville.
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Sheldons, Ltd., Galt, Ont.
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Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
H. W. Petrie, Ltd., Montreal.
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CUTTERS, PIPE (SEE PIPE CUTTERS)
CUTTERS, MILLING
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
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Illinois Tool Works, Chicago, Ill.
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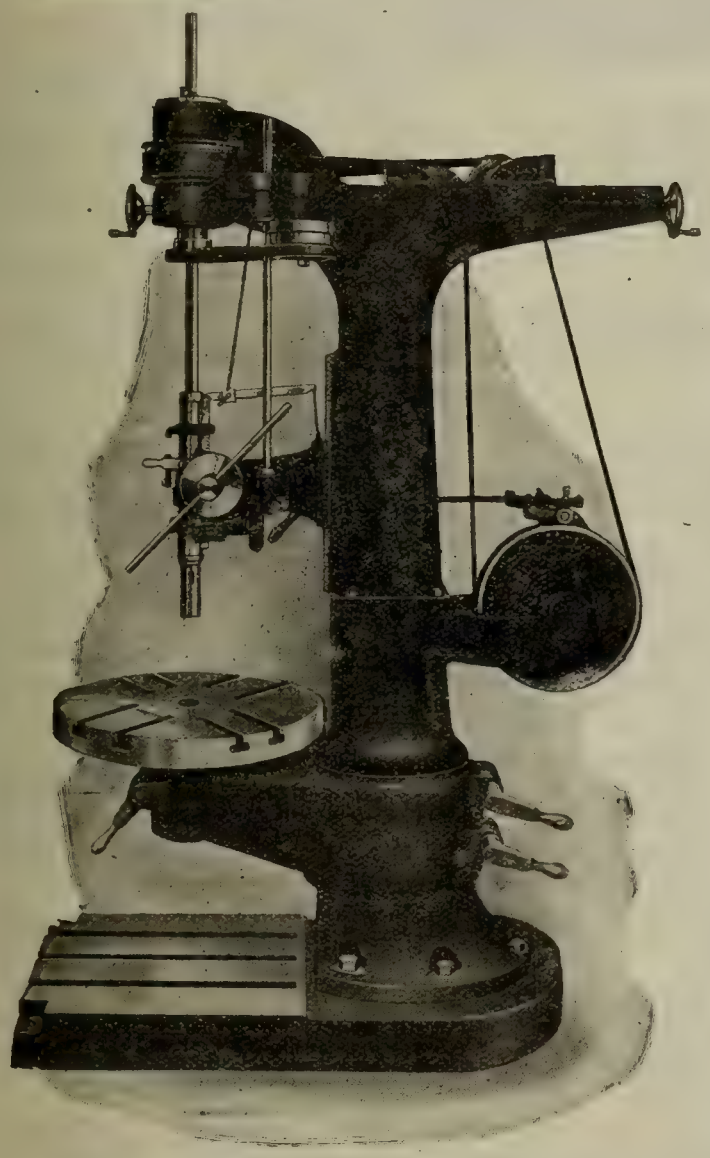

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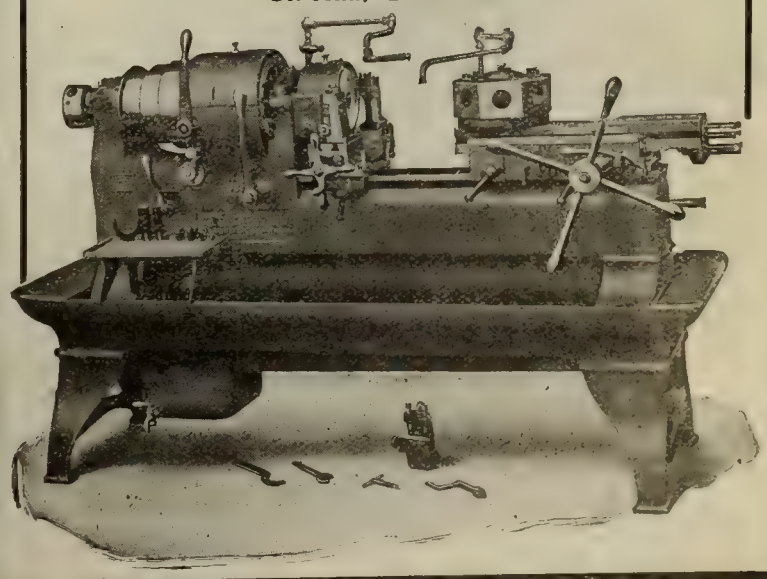

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Garlock-Walker Machinery Co., Toronto, Ont.
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Dominion Machy. Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
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R. McDougall Co., Galt.
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A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
Morse Twist Drill & Mach. Co., New Bedford.

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Francis & Co., Hartford, Conn.
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Norton Co., Worcester, Mass.
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H. W. Petrie, Toronto.
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Canadian Fairbanks-Morse Co., Montreal.
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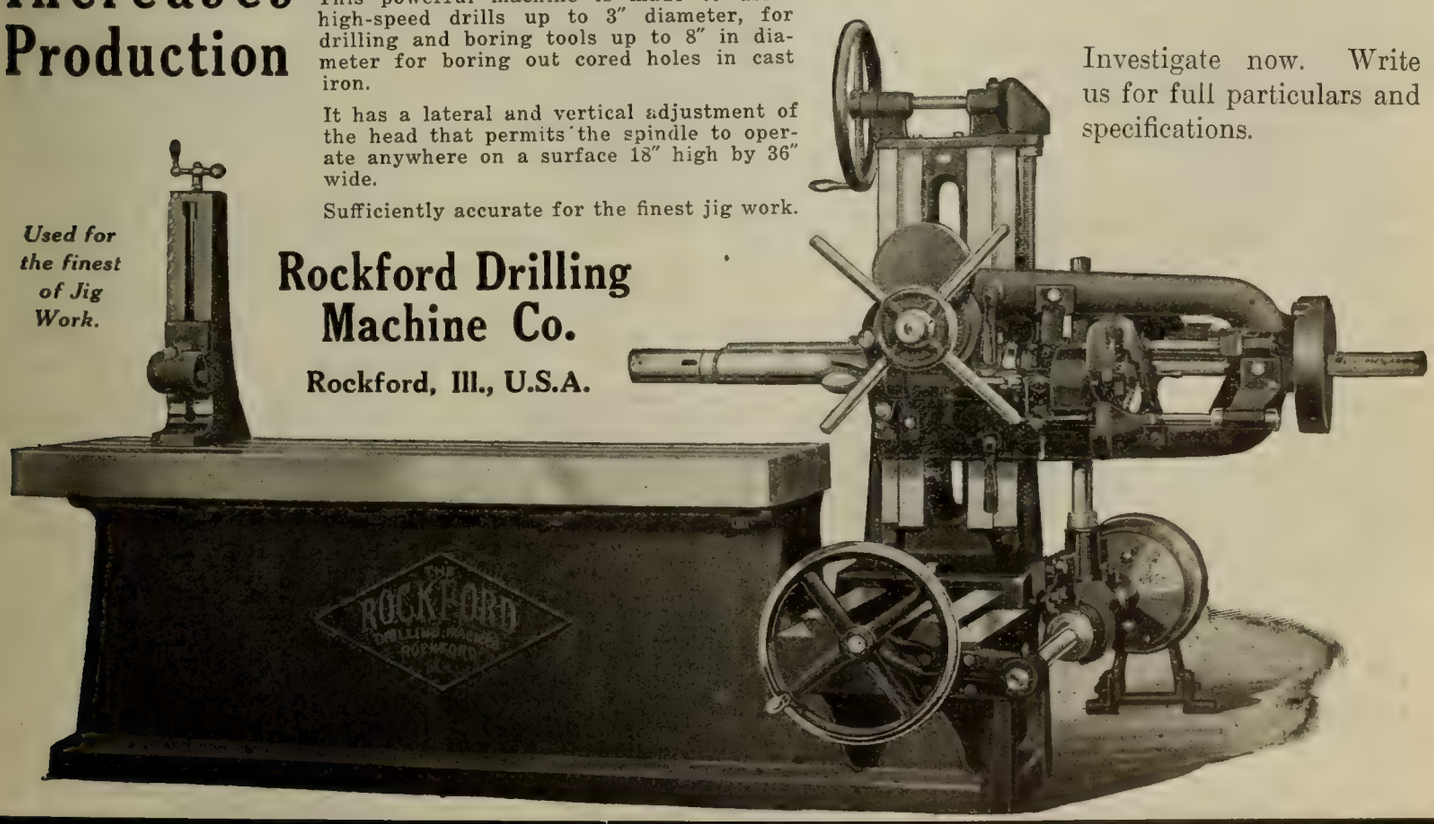

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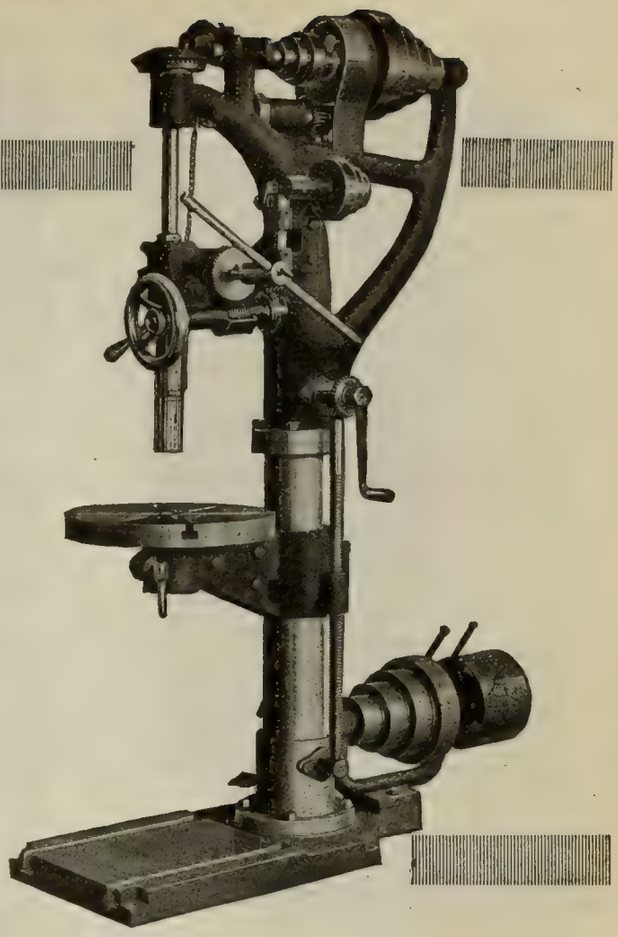

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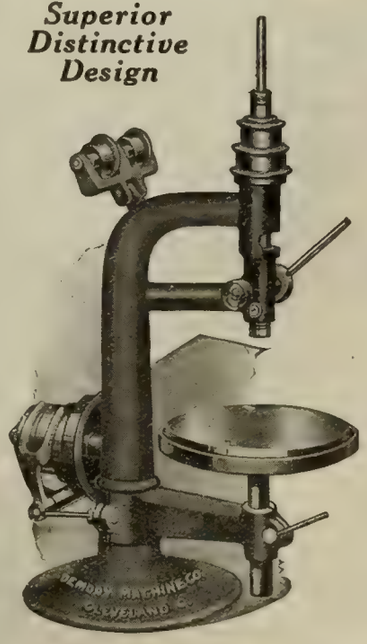

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LATHES, ENGINE
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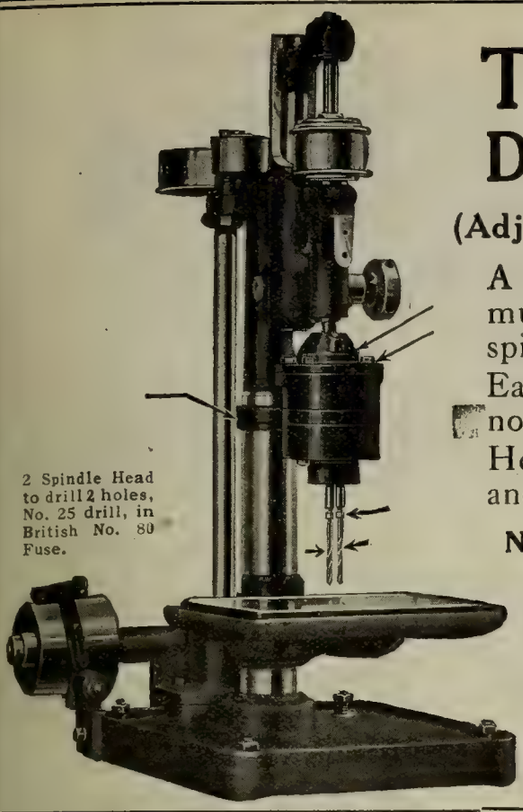

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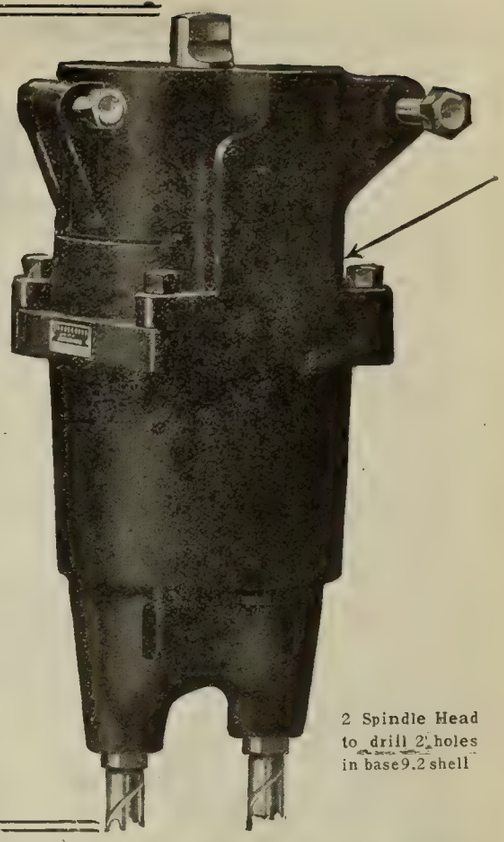

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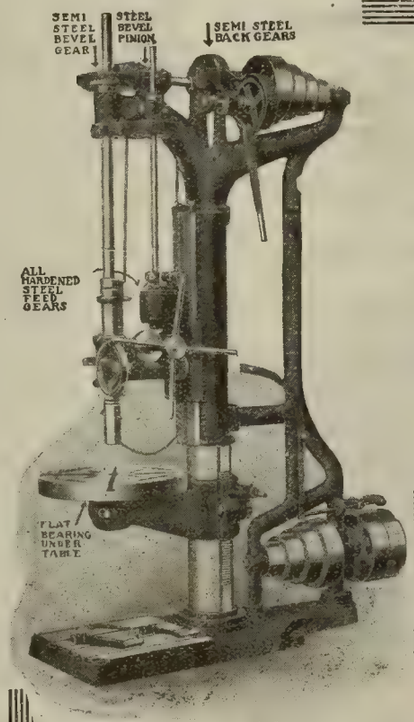

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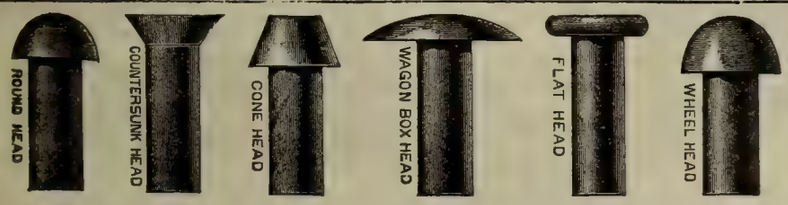

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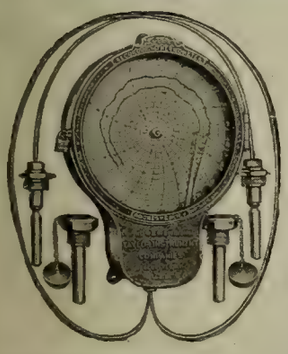

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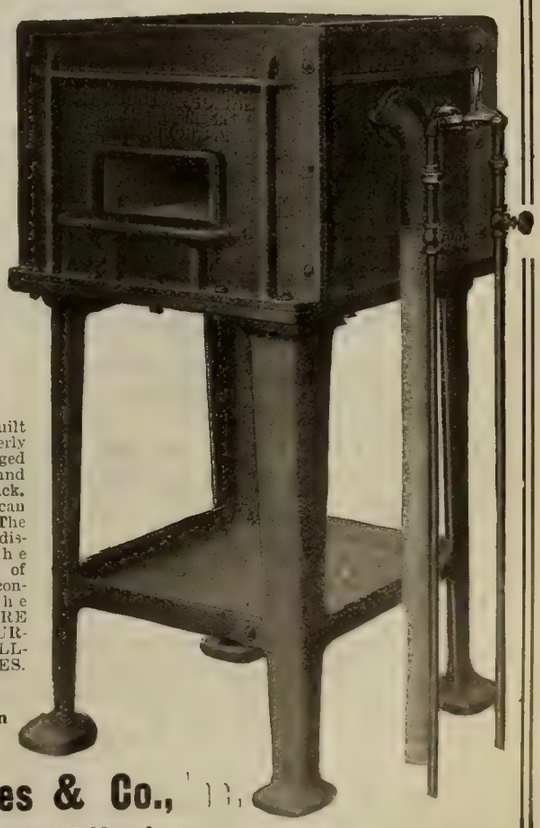

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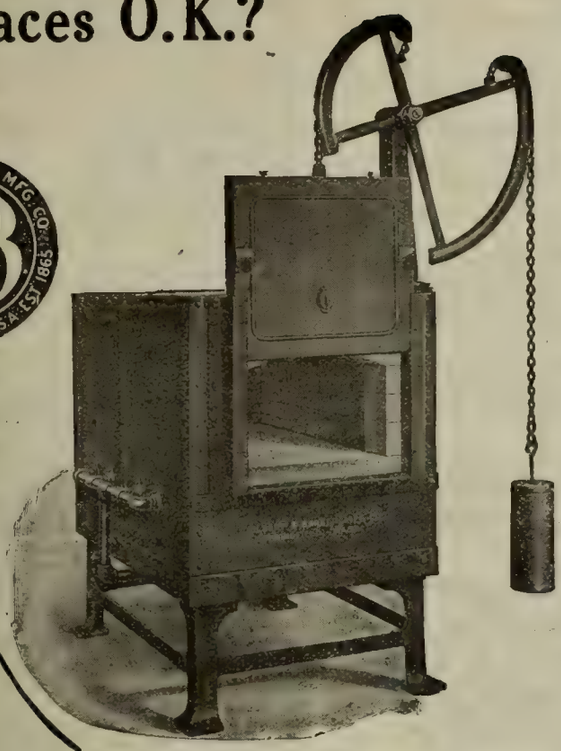

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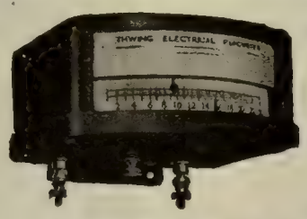

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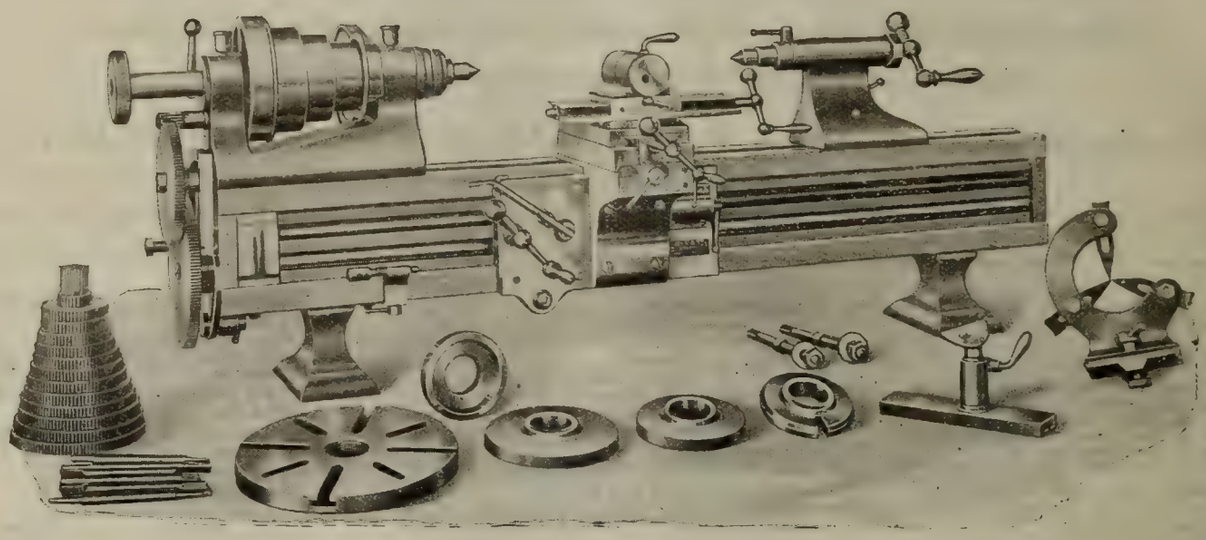

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A weekly newspaper devoted to the machinery and manufacturing interests.

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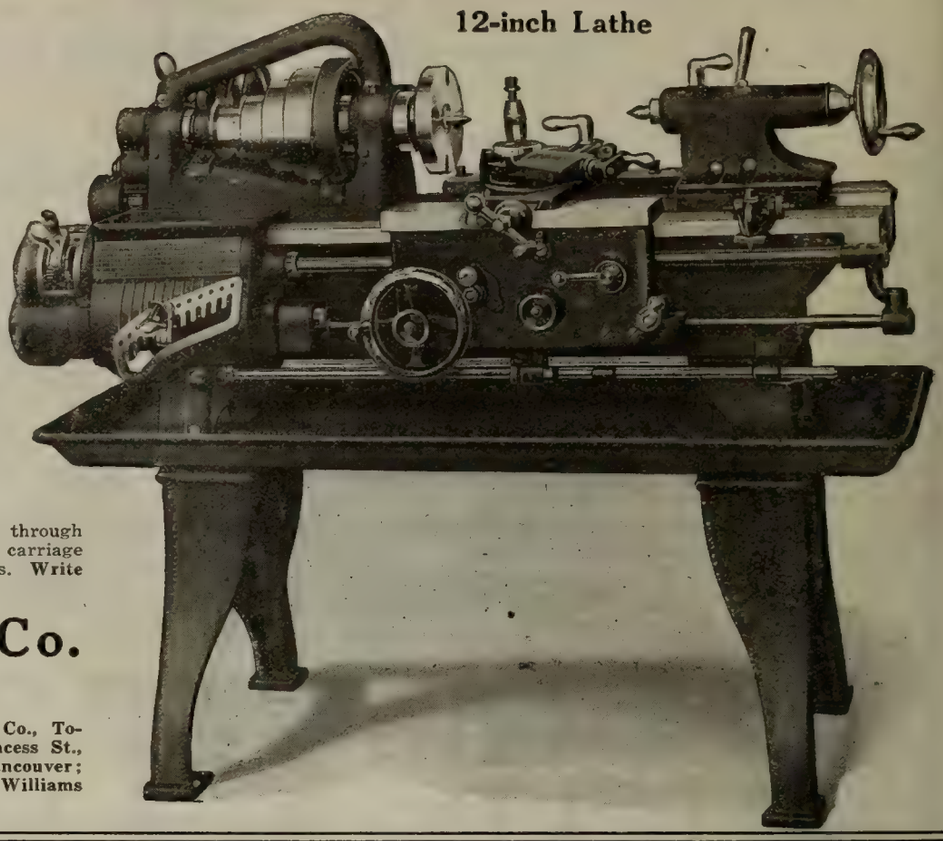

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They are plain in design, yet embody all essential features necessary for efficient work.

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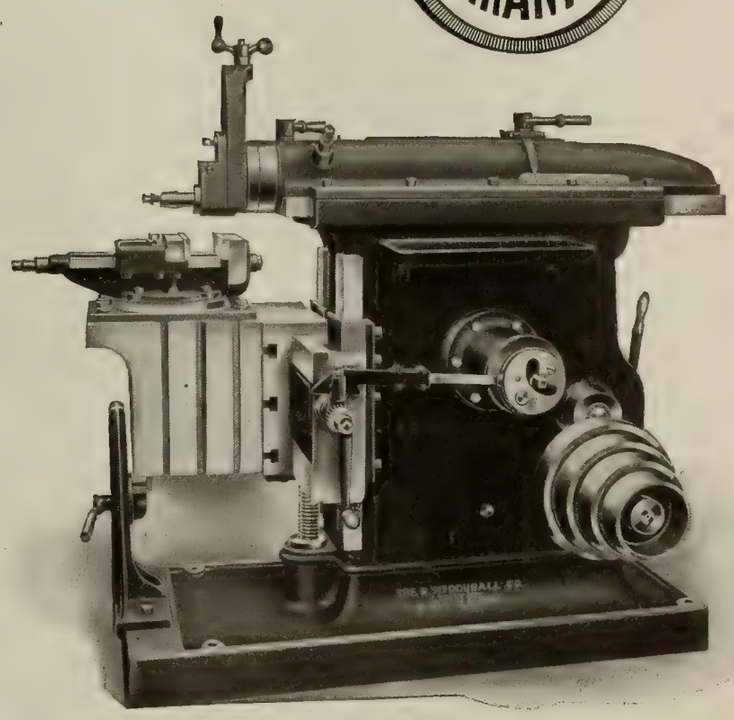

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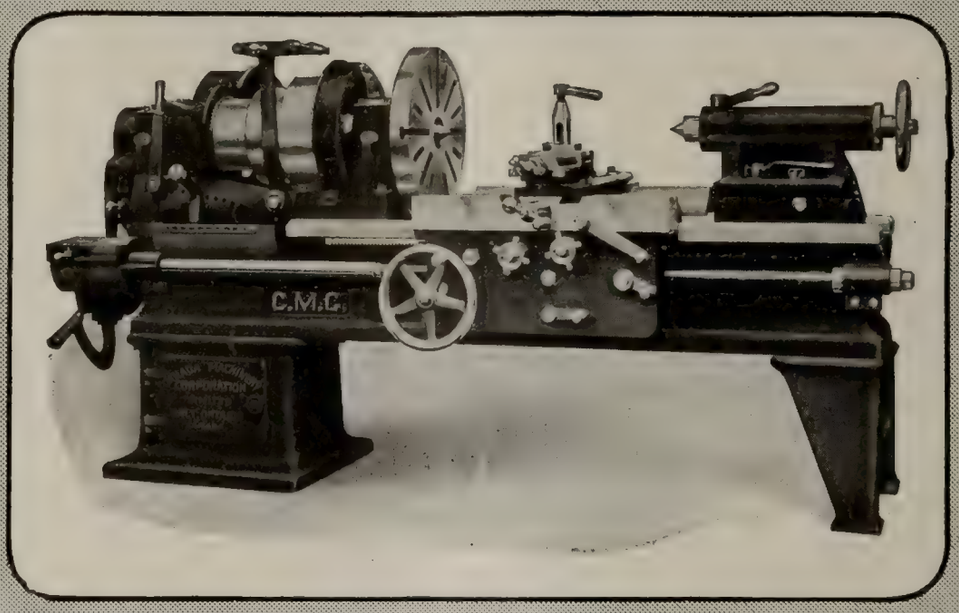

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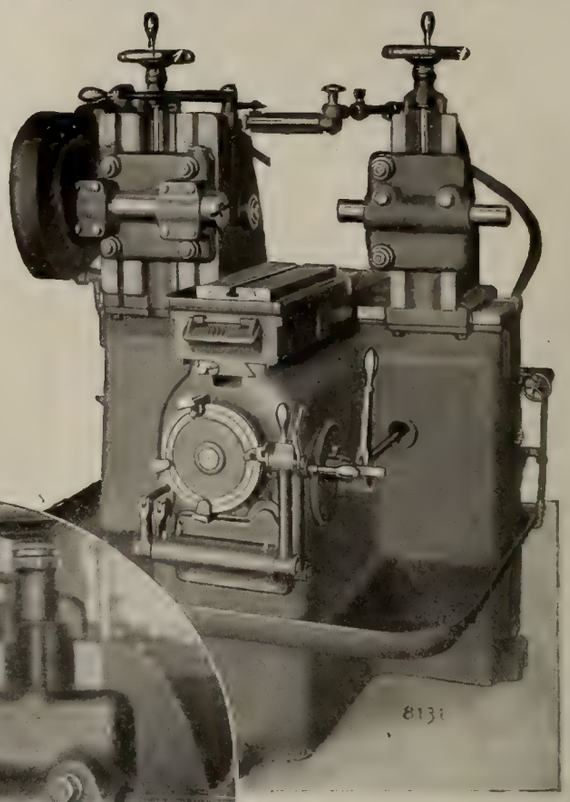
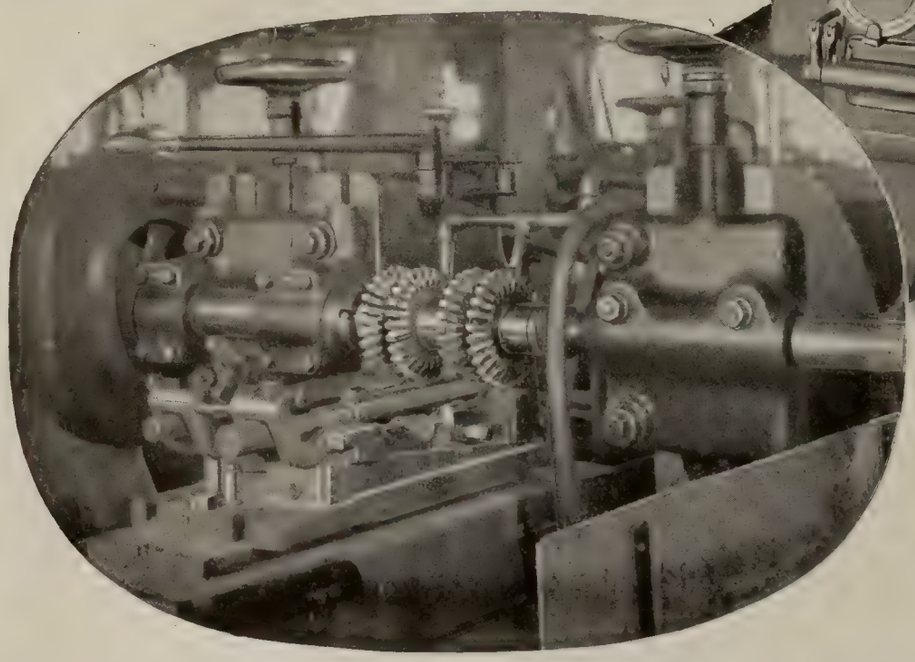


A high production manufacturing tool of extreme accuracy; automatic in operation and especially adapted to the diversified milling requirements of fire arms production and similar work.



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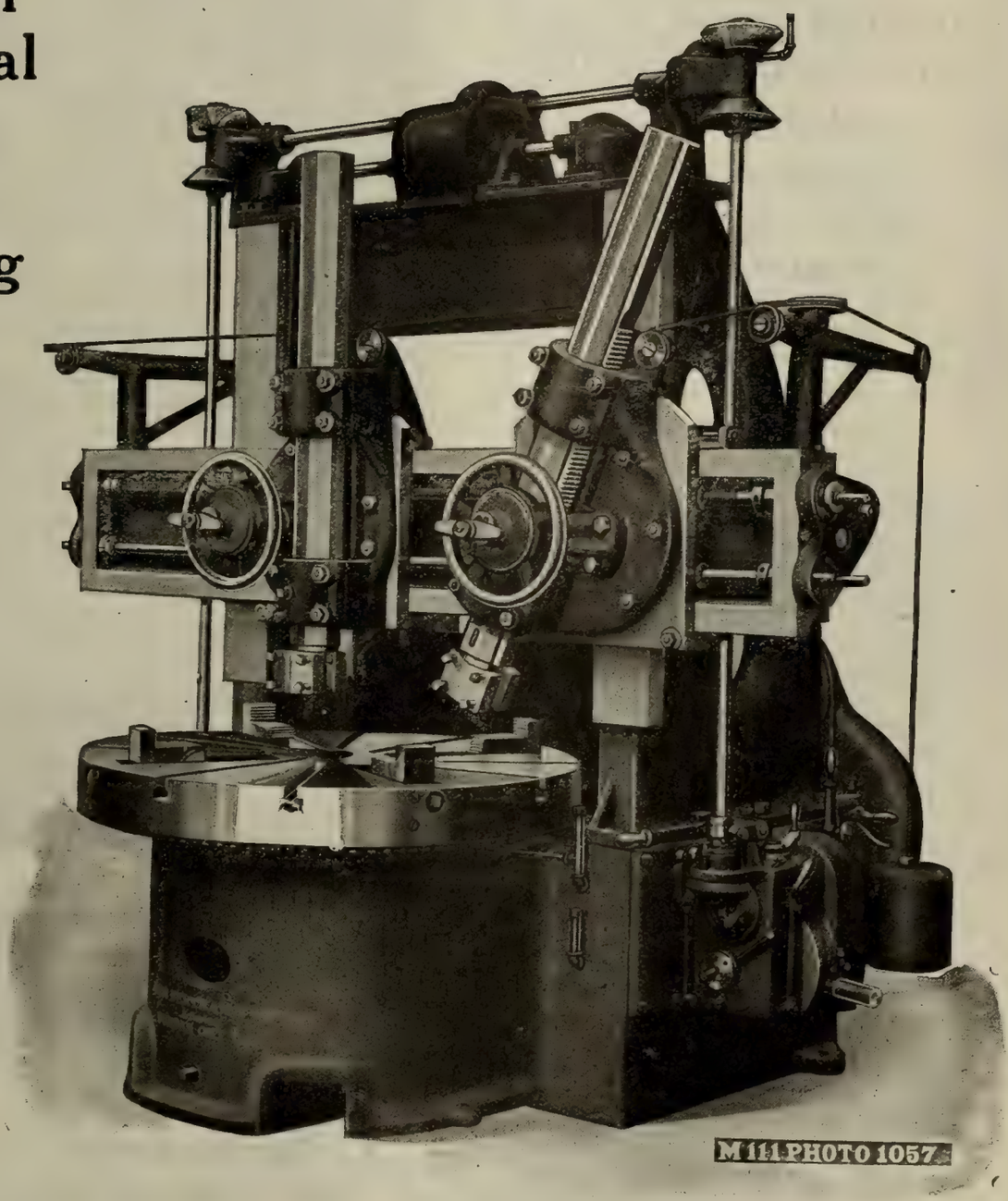
42-inch Vertical Boring and Turning Mill

Niles Type

Motor-Driven Through Speed Box

Built in sizes from 42-inch to 100-inch Swing.

Drop us a line for Photographs and full particulars.



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Dundas, Ontario, Canada

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The Publisher's Page

TORONTO July, 1917

An inquiry from a prospective customer 12,000 miles away

THE Canadian Morehead Manufacturing Co., makers of the famous "Back to Boiler" Steam Trap, are advertising in Canadian Machinery. A few days ago Mr. King, general manager of the Can. Morehead Manufacturing Co., very kindly showed us an inquiry which had been received from a prospective customer in Tasmania (Australia), some 12,000 miles away!

The inquiry itself is interesting and we have pleasure in reproducing it, together with the advertisement which prompted it.

Canadian Machinery was the first Canadian journal to publish export numbers. For well over a year the first issue of each month to the extent of well over 1,000 copies, is mailed abroad to a carefully compiled list of machinery importers.

A supply of each export number is also sent to each Canadian Trade Commissioner and excellent work has been done by these officials in bringing our paper to the attention of interested parties.

We have received many letters from our advertisers testifying to the splendid results they are obtaining. We appreciate their frankness in telling us of results secured because such reports encourage and spur us on to even greater efforts.

There are many difficulties in the way of doing a profitable export business at this time. It must not be forgotten, however, that an export connection is not built up in a day or a year, and the full force of the advertising in our export numbers will be felt months and perhaps years hence.

To the foresighted firms who are reaching out into the future we take off our hats. Some day Canada will have a *real* export business to brag about. You will find that the concerns who are getting the thin end of the wedge in now will be in the front row of exporters then.

Our next Export Number is due to appear August 2nd, forms closing July 26. Why not take advantage of it?

F. ROWNTREE & SON,
Consulting Engineers
Telephone 205

37 Montpelier Road,
Hobart, May 26th, 1917
Tasmania, Australasia

The Canadian Morehead Manufacturing Co.,
Woodstock, Ontario.

Gentlemen:—

We have under our supervision the steam plant of the leading "Temperance Hotel" of this city, and seeing your add. in the February issue of "Canadian Machinery"—

"Morehead Back to Boiler System"

we thought your system might be applied with profit to our plant.

Herewith please find sketch showing relative positions of the various parts in use.

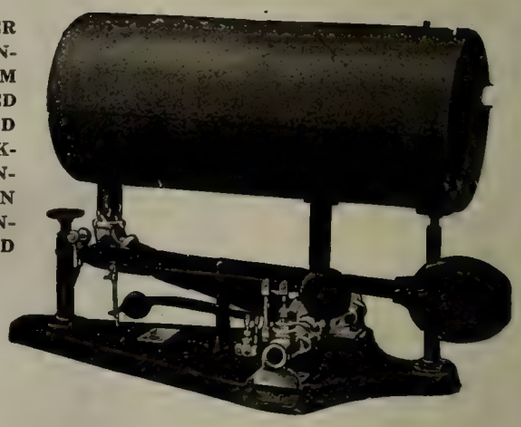
Should you feel disposed to communicate with us at the other extremity of the Grand British Empire we shall esteem it a favor.

Allow us to congratulate Canada on the noble sons she has sent to the "Help of the Lord against the Mighty," and the splendid work they have accomplished; God bless them all.

Yours truly,
F. ROWNTREE & SON,
Per Francis Rowntree

37 Montpelier St.
Hobart
Tasmania, via Australia.

THE PIONEER AND ORIGINAL IN STEAM TRAPS. USED THE WORLD OVER. BACKED BY TWENTY-SEVEN YEARS OF UNQUALIFIED SUCCESS.



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Back to Boiler
SYSTEM

Assures a better heat and a saving of fuel, time and labor.

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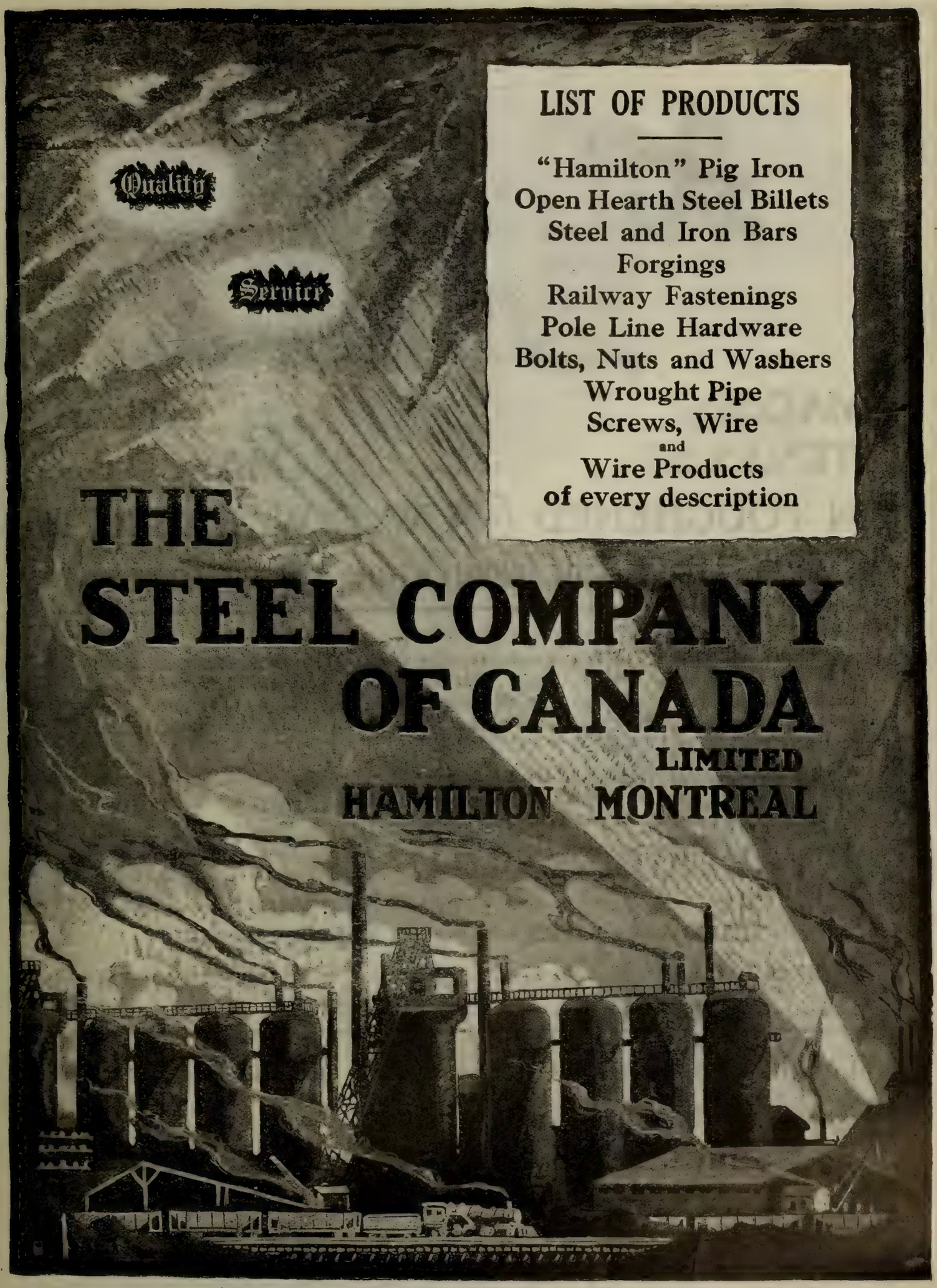
An attractive proposition for foreign buyers.

Write us direct.

Canadian Morehead Mfg. Co.
Woodstock, Ontario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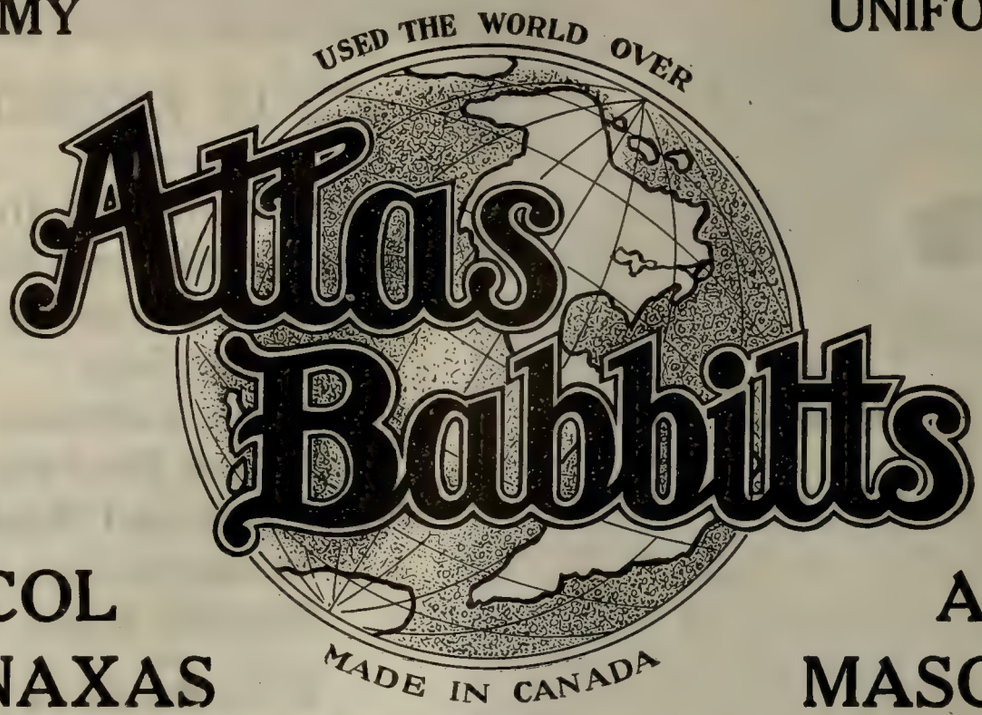

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ATLAS Brands are not alloys that *sometimes* give *satisfaction.* They are alloys that can be implicitly relied upon *always.* They are alloys with our *prestige* and *reputation* always behind them.

DO not let prejudice stand between *you* and *profit* You can obtain the *maximum efficiency* from you plant at a *minimum of cost* by using ATLAS BABBITTS.

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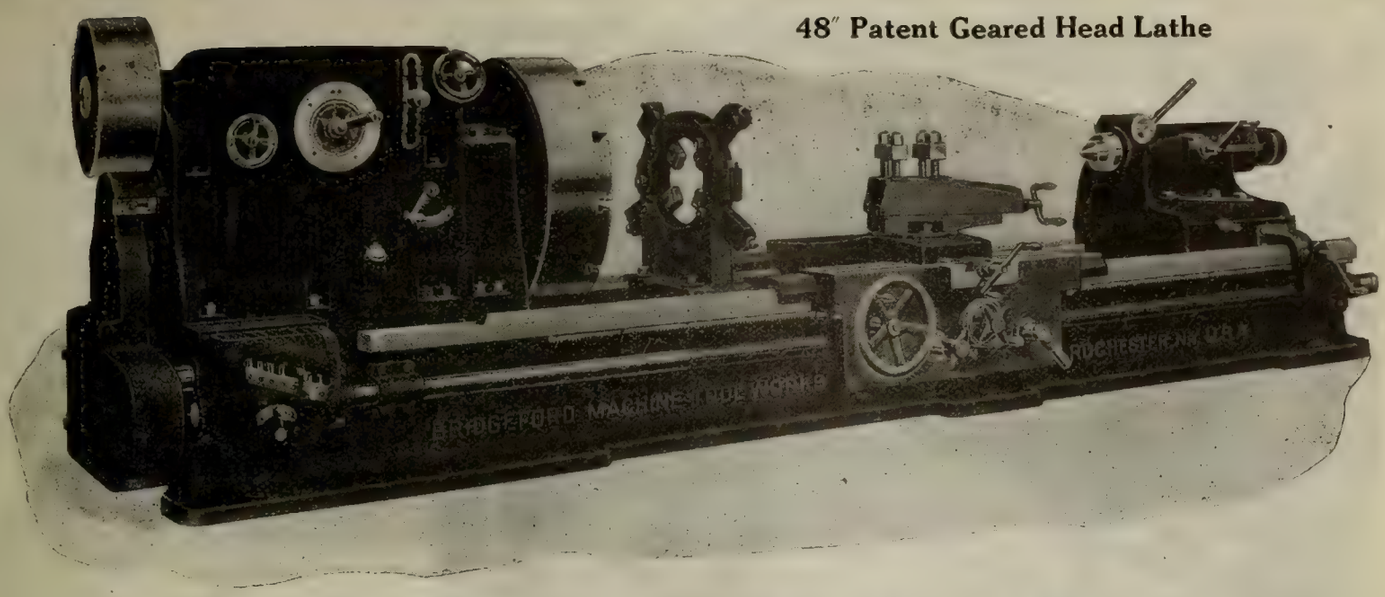

48″ Patent Geared Head Lathe

The Bridgeford for Big Work

That's what this powerful Bridgeford is built for—big work. Has strength and rigidity sufficient to perform the heaviest kind of jobs with perfect accuracy—and it goes through them in record time. Smooth in action. Strongly constructed. Fifteen cutting speeds all easily changed.

Bridgeford's Lathes give maximum production at minimum cost. We'll be glad to give you a full account of what they will do. Write

Bridgeford Machine Tool Works, Rochester, N.Y.

161 WINTON ROAD

Two Cuts at One Time

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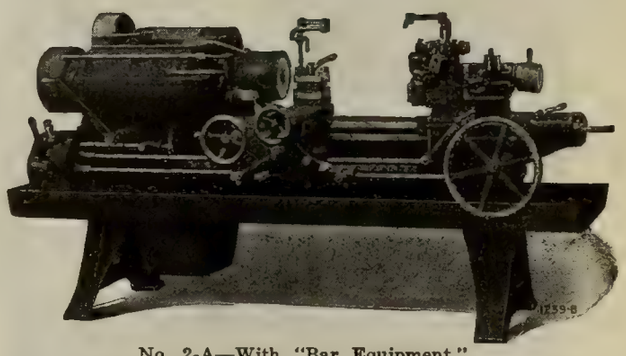
Universal Hollow-Hexagon Turret Lathes

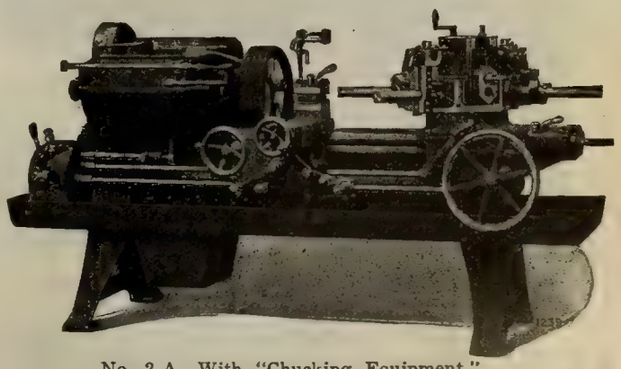
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



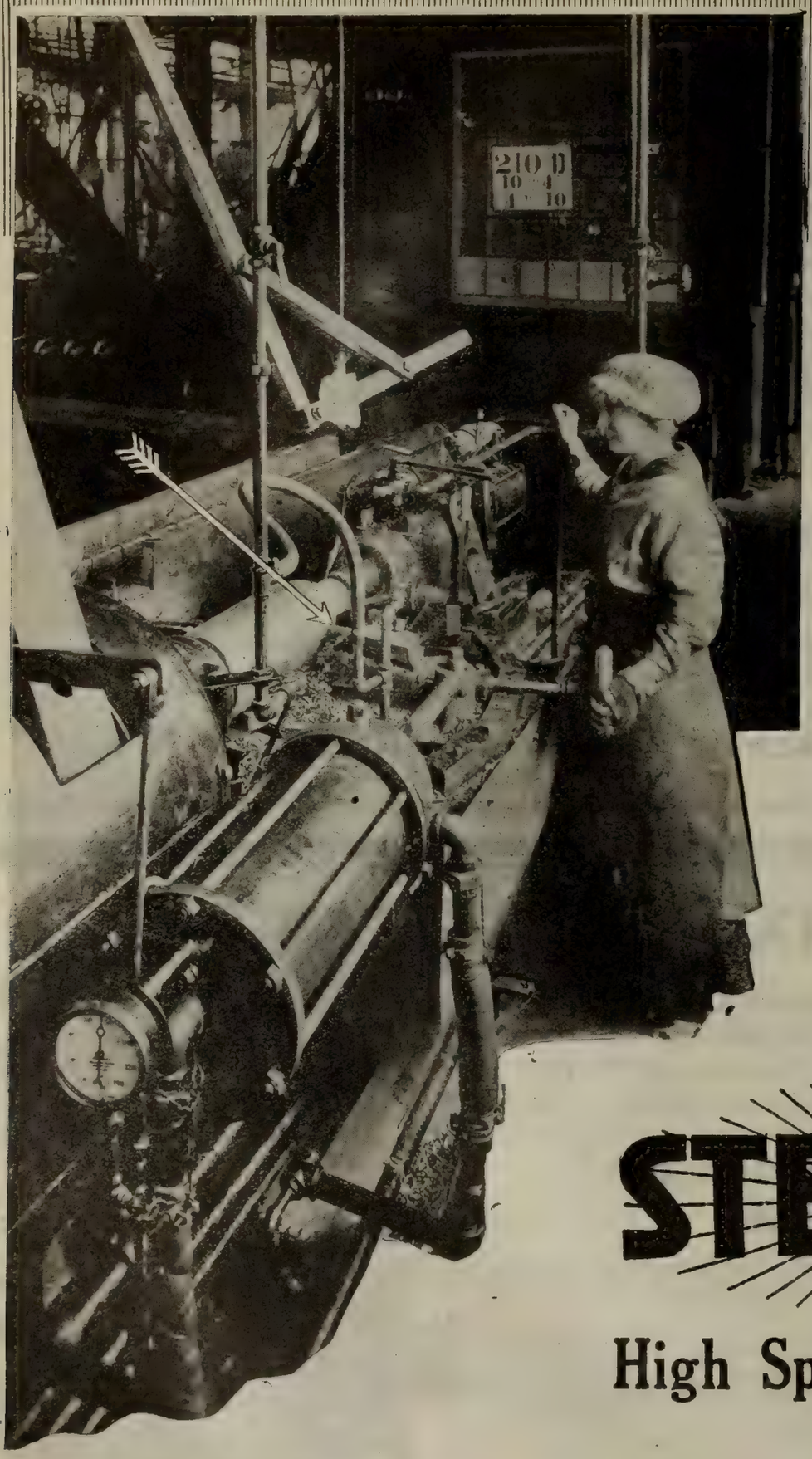
No. 2-A—With "Bar Equipment."



No. 2-A—With "Chucking Equipment."

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal; Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia



"Not a Steel, but its Master"

FINISHING the profile of 8-in. Howitzer shells made from rolled steel forgings.

The cut starts at a speed exceeding 200 ft. per min. and machines the surface 9 in. long in 1 min. 24 sec.

The tool is given a feed of 1/8 in. per revolution and imparts a highly finished surface to the work.

An output of 55 shells per grinding is maintained easily.

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Stellite is harder and tougher than steel. Cuts longer and 25 to 300% faster. Requires no forging, and cuts as well when running at red heat as when cold—does not lose its temper. Convince yourself that STELLITE stands behind bigger production and tool economy by giving it a try-out.

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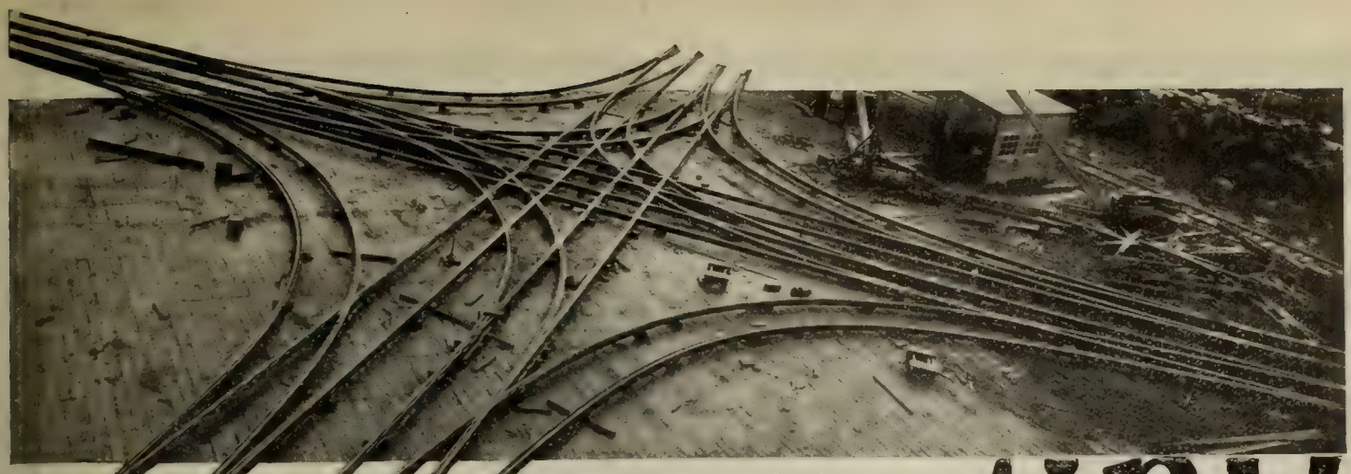
Deloro Smelting & Refining Co., Limited Stellite Sales Dept. DELORO, ONT.

Toronto Branch: 200 King Street West Montreal Branch: 315 Craig Street West



Solid Manganese Steel Intersection for Montreal Tramways Company.

Steel Castings

For Hydraulic, Mill Gear, Locomotive, Rolling Stock, Marine—in fact we make castings of any size and any kind—Manganese, Vanadium, Titanium, Chrome, Nickel, etc. Dependable products always.

Canadian Steel Foundries, LIMITED
MONTREAL WELLAND

SISCO

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" **Tool Steels**

Made in Sweden from selected Dannemora Ore

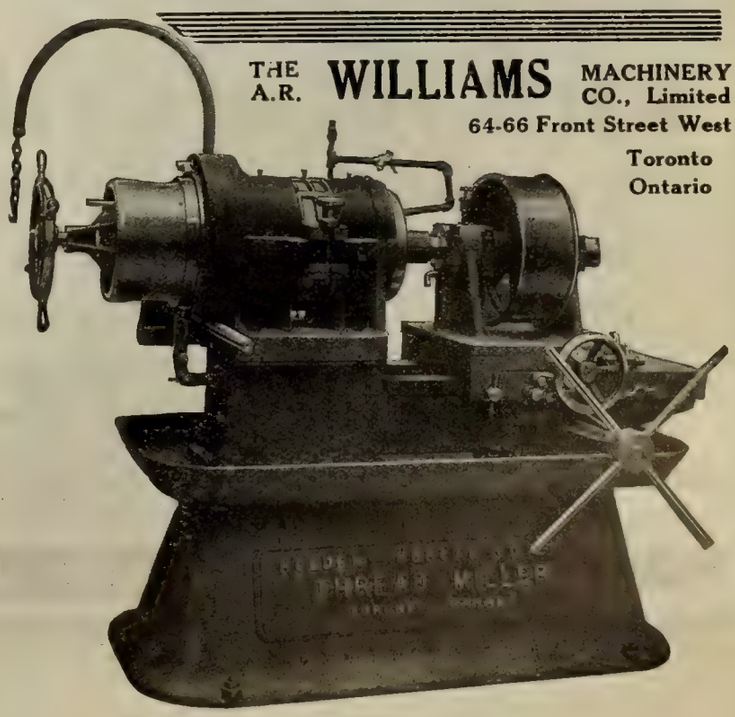
We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SIS-CO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

The Life of a Thread Miller

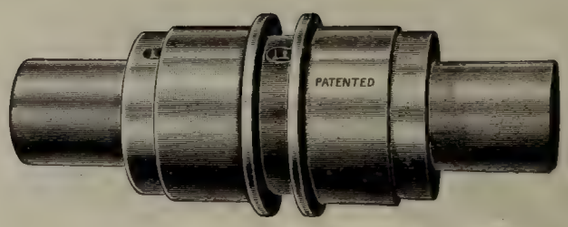
Depends not upon the amount of work it does, but the ease and thoroughness with which the work is done. These Thread Millers are noted for these qualities. Its quality of work is unrivalled. Our Service Department will give you all the particulars. *Write us!*

THE A.R. **WILLIAMS** MACHINERY CO., Limited
64-66 Front Street West
Toronto
Ontario



THE JOHNSON FRICTION CLUTCH

"A Machine Is As Good As Its Clutches"

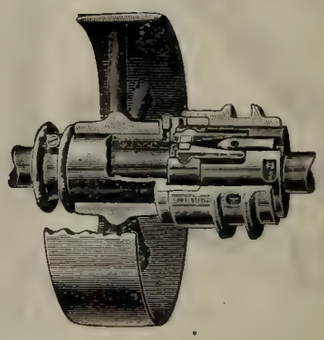


Double Clutch—Exterior.

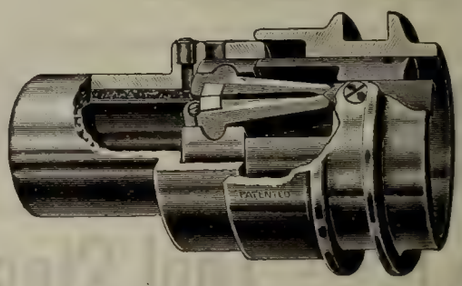
The finest materials and workmanship that enter into the construction of machine tools are dependent upon the clutch for smooth running and mechanical perfection.

Therefore, a machine is as good as its clutches. This fact is so thoroughly appreciated among machine tool designers that Johnson Friction Clutches are specified wherever clutches can be used.

We are always ready to talk over any mechanical problem to which clutches may be applied and help the designer or machine tool builder. If our various types of clutches do not meet your needs, we are prepared to make any modifications which may be necessary.



Single Clutch with Pulley on Hub.



Section broken away, showing clutch disengaged.

WRITE FOR OUR YELLOW DATA SHEETS

They describe the JOHNSON CLUTCH fully. Our latest booklet, **Clutches as Applied in Machine Building,** illustrates machines similar to yours.

GET THIS LITERATURE NOW.

England—The Efandem Co., 159 Gt. Portland St., London. W., England. Sole Agents for the British Isles. **Canada**—Williams & Wilson, Ltd., 320 St. James St., Montreal. Canadian Fairbanks-Morse Co., Limited, Toronto.
AUSTRALIA—George Wills & Co., Brisbane, Queensland.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

We will Fill Your Requirements *Send us Your Inquiries*

Air Compressor Evidence

The greatest evidence of the value of any article is the demand for it after investigation and trial. Below are four carloads of our compressors which fills one order to a large concern in Canada. Our line of compressors is very large.

Write us and explain your requirements.

The Jenckes Machine Company, Limited

WORKS: Sherbrooke, Que.

CANADIAN SALES OFFICES: Sherbrooke, Montreal, St. Catharines, Toronto, Cobalt, South Porcupine, Vancouver.

WORKS: St. Catharines, Ont.

Electrite

Electric furnaces, automatically regulated, the most modern methods, and **the introduction of Uranium**—make this a steel of truly remarkably cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.

LATROBE, PA.

Uranium

High Speed Steel

WOLFRAM

MADE IN THE U.S.A.

HIGH SPEED STEEL

TRADE MARK

A Keen Cutter

WOLFRAM *Is Both*

VULCAN CRUCIBLE STEEL CO. ESTABLISHED 1900 Aliquippa, Pa. U.S.A.

Represented in Canada by Messrs Norton Callard & Company Montreal Que.

Strong in the Neck

The Ford-Smith Machine Company

The Stamp of Approval is on the Well Advertised Article

So quote all the authorities on this subject.

So far it has been our policy to simply show a photograph and let it go at that—but ***Now*** we intend covering in a series of ***10 Issues***—the chief reasons why a ***FORD-SMITH MILLER*** should form a part of ***your Shop Equipment.***

Follow us up on these Advertisements—We will appreciate it—at the same time—It will pay you—***and be Time Well Spent.***

NO SWEEPING SLOGANS WILL BE USED

Simply plain, understandable language—foolish talk never lasts long anyway

When we get through let us hear from you—***good, candid criticism will be welcomed.***

Our Special Miller Bulletins—and also our General Catalogue describe to fuller extent than we can in these columns ***our Complete Line.***

Suppose we send you one, so you can get better acquainted with our Various Lines ***including Millers, Grinders and Special Machinery.***

WATCH FOR OUR COMING ADVT. No. 1

These advertisements will appear every second week on page 10.

The Ford-Smith Machine Company, Limited

HAMILTON, ONTARIO CANADA

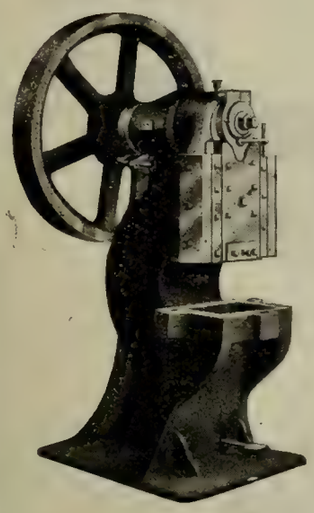
Sheet Metal Working Machinery of Any Description

B.B. Presses for

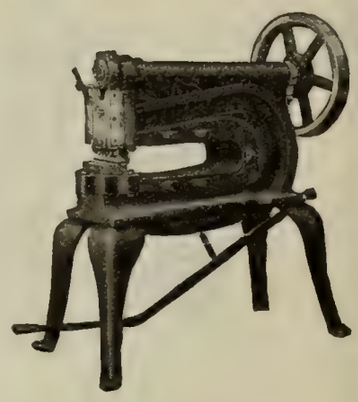
Quality, Efficiency,

Durability, Speed,

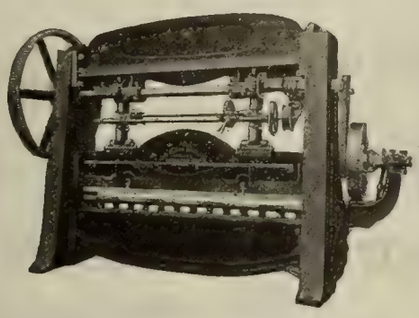
Accurate Production.



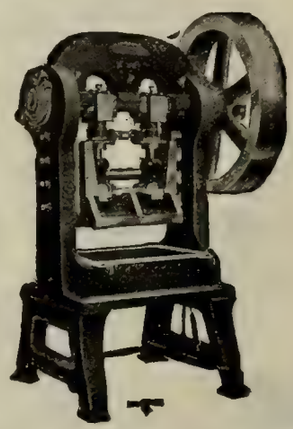
No. 2—G.A. Press



No. 126
Deep Throat Power Punch



No. 500—Power Brake or Press



No. 20½—Power Press

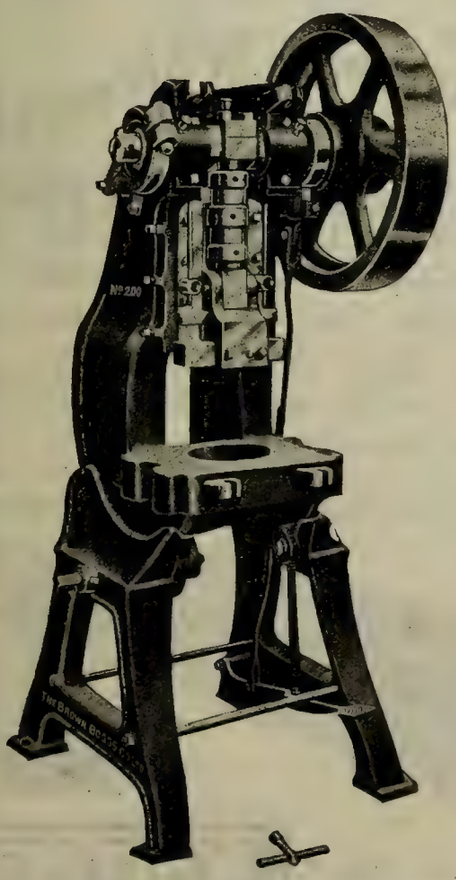
B.B. Presses embody special features for minimizing maintenance cost of both machines and tools.

The Brown, Boggs Company, Limited

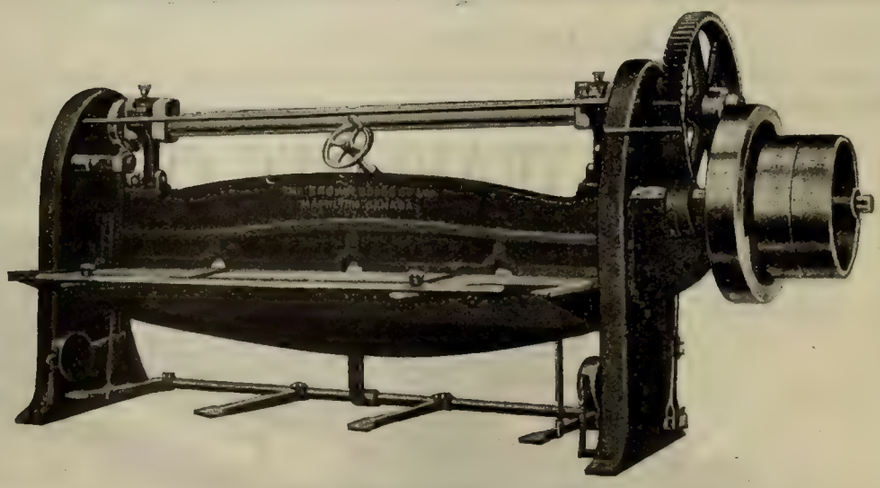
HAMILTON ONTARIO

MANUFACTURERS OF

Tinsmiths' Heavy Sheet Metal Working Machinery

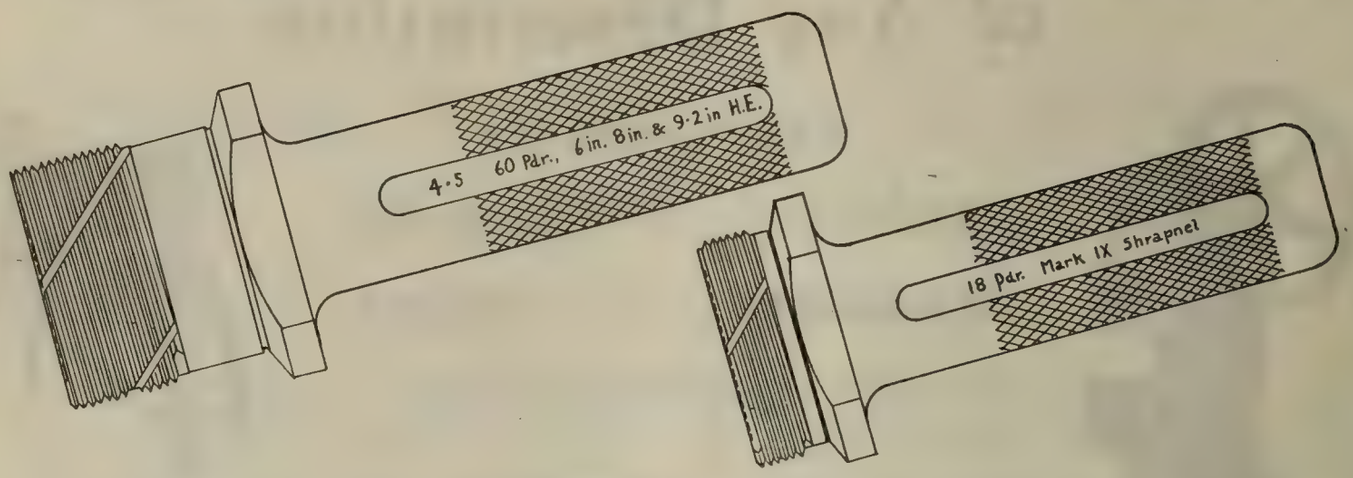


No. 200—Power Press



No. 960—Overhead Shear

FUSE HOLE GAUGES



Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

Works: LONGUEUIL, QUE.

Armstrong Whitworth

of Canada, Limited

MANUFACTURERS OF

HIGH SPEED STEEL

CARBON AND ALLOY STEEL

MISCELLANEOUS SHOP TOOLS

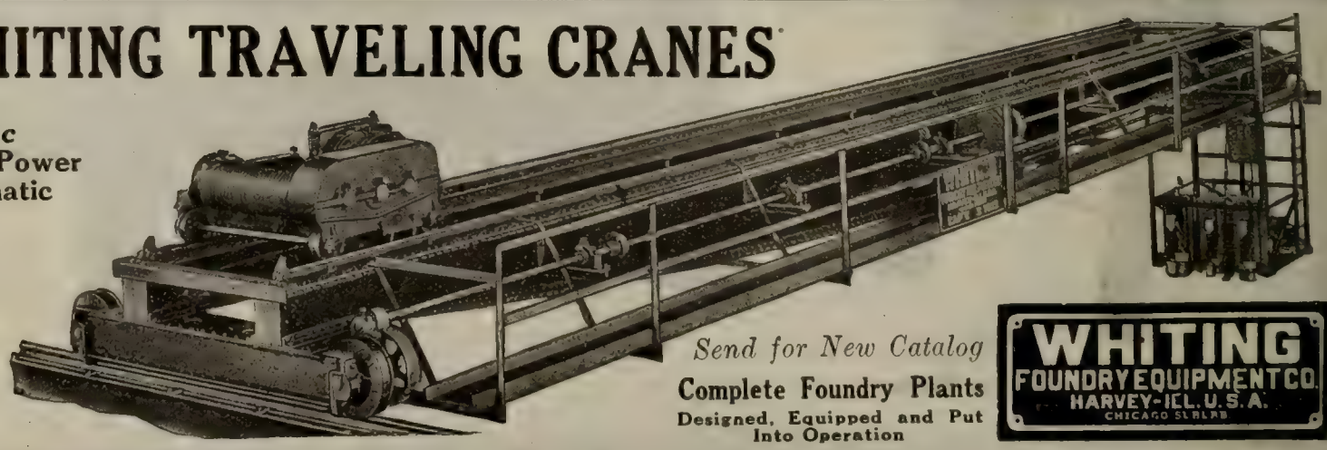
HEAD OFFICE: 298-300 St. James St., Montreal

Branches: Dominion Bank Bldg., TORONTO
27 King William Street, HAMILTON
McArthur Bldg., WINNIPEG, MAN.

All Products "MADE IN CANADA"

WHITING TRAVELING CRANES

Electric
Hand Power
Pneumatic



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Complete Foundry Plants

Designed, Equipped and Put Into Operation

WHITING FOUNDRY EQUIPMENT CO. HARVEY-ILL. U.S.A. CHICAGO SUBURB

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

TRADE MARK "WACO"

Reliance Steel Works
SHEFFIELD, ENG.

TRADE MARK

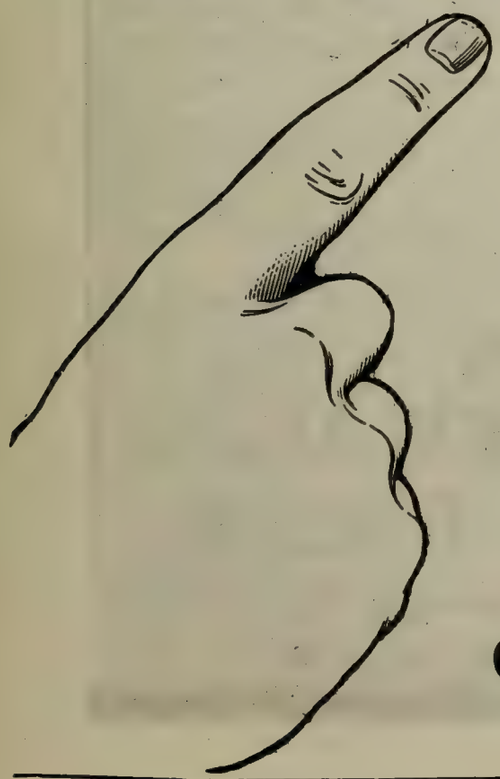
TRADE MARK

of the Famous

"WACO

Brand

High Speed Steel and Twist Drills



"DOUBLE WACO" Quality

Specially Adapted for all kinds of
AMMUNITION WORK

"Turtle" Brand
High Class Tool Steel, Files, etc.
of all descriptions.

For particulars apply to our
Sole Representatives for Canada

GEO. A. MARSHALL & CO.
70 Lombard Street Toronto, Ontario

STEEL

FOR

SHRAPNEL SHELLS

AND SHELL BLANKS

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.'

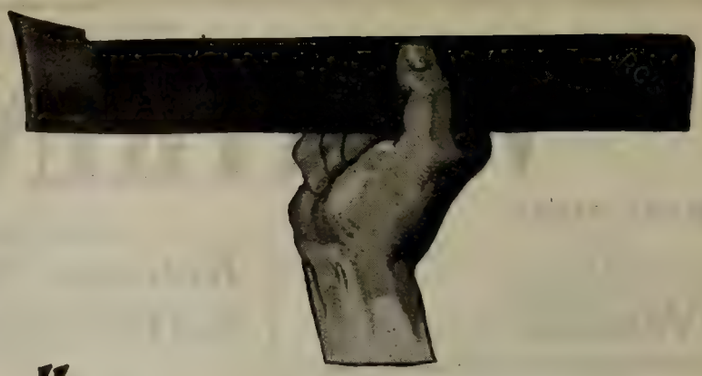
Nova Scotia Steel and Coal Company

Limited

Head Office: NEW GLASGOW, N.S.

Western Sales Office:

Room 14, Windsor Hotel, MONTREAL



"Red Cut Superior"

HIGH SPEED STEEL

YOU have thought of many qualities you would like to have in High Speed Steel Tools—such as cutting edges with long life, freedom from brittleness, great reserve strength and toughness to resist shocks and strains, tools that would not require special heat treatment; tools that would take deep roughing cuts or fine smooth finishing cuts, and in addition, could be worked at higher speeds than you ever dreamed of. All these virtues and many more are contained in "Red Cut Superior", a First Quality High Speed Steel. Furnished in Annealed Bar Stock, Discs, and Treated Tool Holder Bits.

Are your tools made of Red Cut?

Send for folder

VANADIUM-ALLOYS STEEL COMPANY

Pittsburgh, Pa.

Works at Latrobe, Pa.

TEXTILE BELTING and PACKINGS

HIGH SPEED TWIST DRILLS

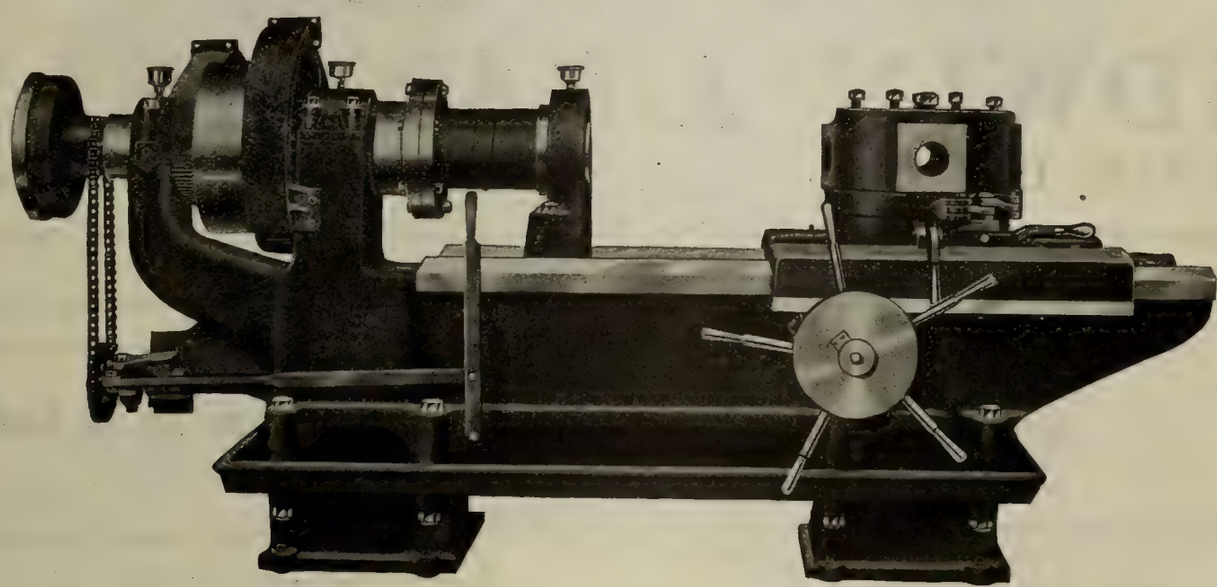
J.R. BAXTER & COMPANY LIMITED, MONTREAL

and GENERAL MACHINERY SUPPLIES

IN STOCK—FOR IMMEDIATE SHIPMENT

SUBJECT TO PRIOR SALE

H.E.W. Boring Lathes To Handle Shells Up To 6"



MADE IN CANADA *SPECIFICATIONS ON REQUEST*

HYDE ENGINEERING WORKS

CONSULTING AND MANUFACTURING ENGINEERS

P.O. Box 1185 27 William Street, MONTREAL, P.Q.

Don't Crowd Your Large Machines

You cannot manufacture small parts economically on a large machine. Steptoe Small Power Feed Millers and Hand Millers are especially adapted for that kind of work, a stiff, heavy tool that can be quickly handled and crowded to the limit. That is the machine to buy for small parts.

If your Planers are crowded take the small jobs and put them on a Steptoe Shaper and you will do them quicker and you will have less money invested in equipment.

STEPTOE SHAPERS "Just a Little Better."

CIRCULAR ON REQUEST.

John Steptoe Co., Cumminsville, Cincinnati, Ohio, U.S.A.

If any advertisement interests you, tear it out now and place with letters to be answered.

IF YOU WANT THE

BEST BASE PLUGS, BUY BANFIELD'S

Have in stock for immediate shipment either threaded or bevel Plugs for 4.5", 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. *Write for prices.*

EDWIN J. BANFIELD

STAIR BLDG. ∴ TORONTO, ONT.

Manufacturer of Plug Milling Machines for above size shells. Prices and deliveries on application.

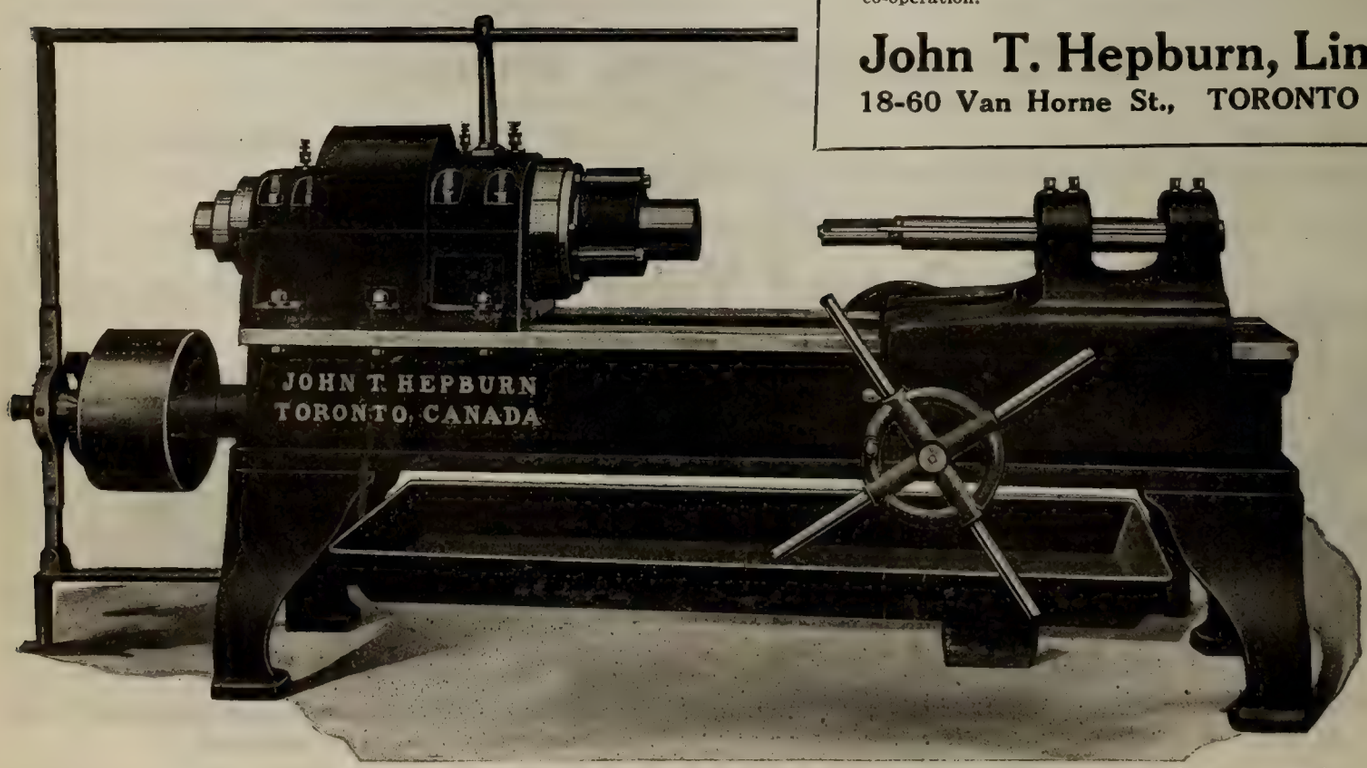
Boring Up to 6 Inches

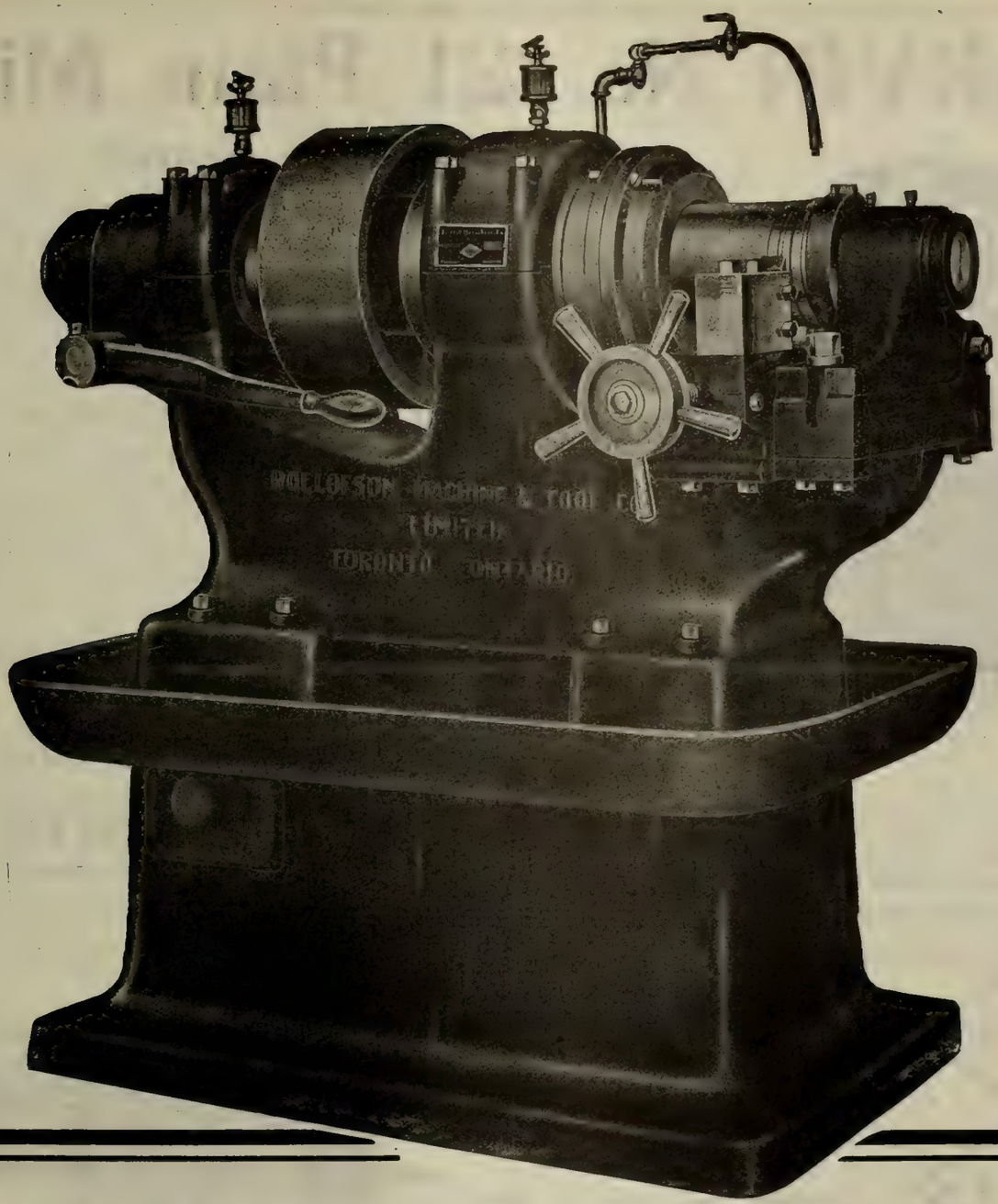
The demand for speed in production was met and exceeded by this Single Bar Boring Lathe which includes sizes up to and including 6". It is a lathe of exceptional strength and in accuracy and quality of production it has proven itself a leader

An inquiry would secure specifications and our immediate co-operation.

John T. Hepburn, Limited

18-60 Van Horne St., TORONTO Ontario





Just Now—

we have two 4.5 machines ready for immediate delivery

THIS Band Turning Machine, by its ability to perform efficiently month after month under exceptional production strains, has proved its worth to munition makers. It is being used by many Canadian munition plants, where it is giving absolute satisfaction.

A glance over some of the features will interest you.

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy chucking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are also built for 15, 18, 60-pdr. and 6" shells.

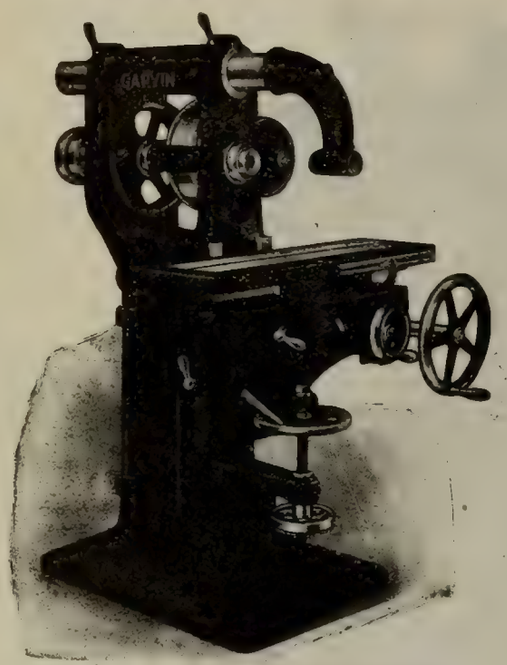
ROELOFSON MACHINE & TOOL COMPANY, LIMITED

Head Offices: 1501 Royal Bank Bldg., Toronto, Canada. Works: Galt, Canada

If any advertisement interests you, tear it out now and place with letters to be answered.

GARVIN No. 21 Plain Miller

Back Geared



No. 21 B.G. PLAIN MILLING MACHINE
Back Geared
Use Code - Abject

For Plain and Gang Milling for general manufacturing, and is used mostly in gangs of 5 or 6 machines to one operator. Spindle runs in adjustable bronze boxes, and is driven by a 3″ belt through back gears (3 to 1).

Knee is our improved solid top design, rigid and stiff to resist side pressure of heavy cuts.

DIMENSIONS:

Automatic Feed of Table	18 in.
Adjustment in line with Spindle	6 in.
Vertical adjustment under Spindle	13 in.
Table, inside Oil Pockets	6 x 30 in.
Changes of Speed	6
Changes of Feed	6
Net Weight, Skidded	1,575 lbs.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City

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S•••••
SI••••
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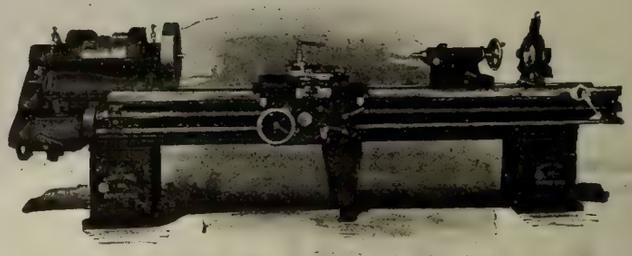
SIDN••
SIDNE•
SIDNEY

You'll do mighty well not to forget that name

"SIDNEY"

when you are in the market for



LATHES

Represented in Canada by:

FOSS & HILL MACHINERY COMPANY Montreal, Que.
H. W. PETRIE, LTD. Toronto, Ont.

Write to the above or to the manufacturers:

THE SIDNEY TOOL COMPANY

Sidney, Ohio, U.S.A.

for a copy of the Lathe Bulletin No. 30.

FOR SERVICE!

Compact and rigid in build.
Insuring strength and power.
Satisfying every Lathe customer.
Combining accuracy with efficiency.
One of its strongest points is economy.

CISCO Lathes were designed for you. **CISCO Lathes are built for you.**

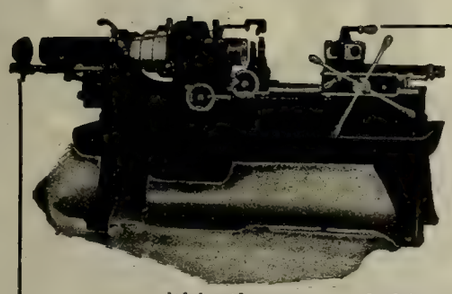
Built with the greatest care, of best material, and by skilled mechanics. Good now (well worth the money), yet improving daily, therefore the best.

EVERY LATHE IS GUARANTEED. ***EVERY MACHINE IS***

THE LATHE WITH THE PULL

The A. R. Williams Machinery Co., Ltd.
SELLERS IN CANADA OF CISCO LATHES

The Cincinnati Iron and Steel Co.
CINCINNATI, U.S.A.
MAKERS OF 14", 16", 18", 24" LATHES



Cincinnati - Acme
2¼"x11" Screw Machine

⅝" to 2¼"; 11" to 20" swing, with plain or friction geared head, with or without automatic feed to turret. Does your requirements come within the range of this machine? If not, get in touch with us, give us data regarding your requirements, we will be glad to co-operate with you.

Our Screw Machines represent the highest efficiency that is to be attained in this class of machinery. They are producers of accurate work, and are the same in light or heavy work where strength is required.

Special tool equipment and estimates in production. This is part of our service. Ask us.

The Acme Machine Tool Company
Cincinnati, Ohio, U.S.A. **Code Word: Acme.**
Can. Agents: Rudel Belnap Mach. Co. Montreal and Toronto.

Bilton Automatic Gear Millers—Spur or Bevel Gears

CAPACITY

No. 1 - - 14 Pitch
No. 2 - - 10 Pitch
No. 3 - - 8 Pitch

The Bilton Machine Tool Company

Succeeding The Standard Mfg. Company
Housatonic Ave., Bridgeport, Conn., U.S.A.

Also Manufacturers of —
Plain Horizontal Millers
Automatic Millers
Plain and Ball Bearing
Bench and Column Drills
Riveting Machines
Milling Cutters

Catalog 30 on request.

Foreign Agents:
Alfred Herbert, Limited
M. Mett Engineering Company
Chas. Churchill Company, Limited

KEMPSMITH

UNIVERSAL MILLING MACHINES

Are built in three standard sizes. They embody every worth-while feature to be found on a tool room Milling Machine.

We call especial attention to the Dividing Head which is part of the regular equipment of every Universal Miller.

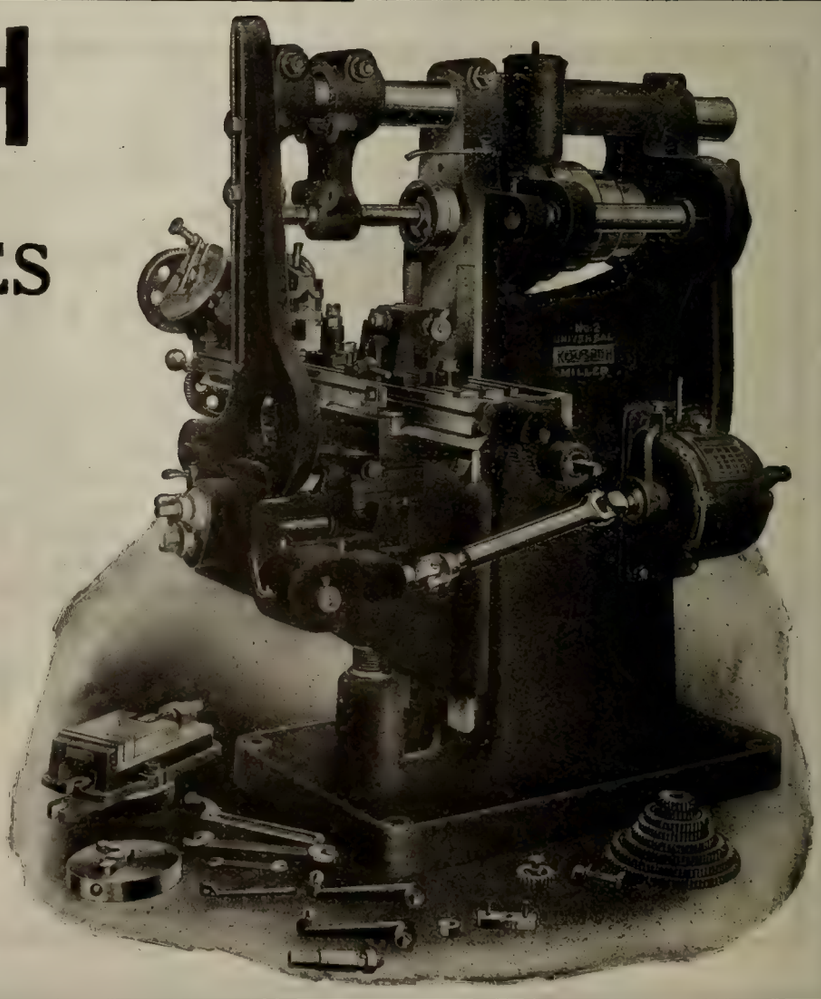
The Kempsmith Dividing Head is compact and rigid, unusually convenient in operation and so constructed as to maintain its accuracy under heavy service.

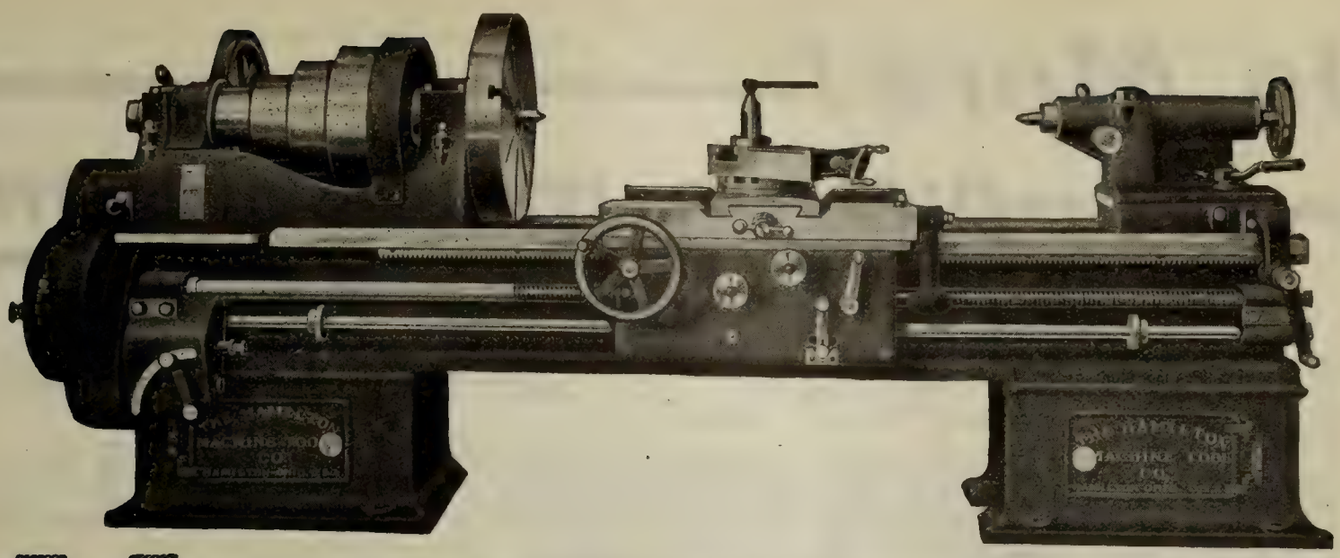
We publish a thirty-two page book elaborately illustrating and describing this Dividing Head. A copy will be sent free on request. Just ask for "Dividing Head Book."

Kempsmith Manufacturing Co.

MILWAUKEE, WIS., U.S.A.

AGENTS:
Foss & Hill Machinery Co., Montreal.
General Supply Company, Toronto and Ottawa.
Canadian Western Foundry & Supply Co., Calgary, Alta.





Hamilton Lathes

Is Your Cost of Production too high?

In the well-managed factory there is no greater loss of time—and therefore of money—than that resulting from the use of old style machinery.

All over the country shops are now running at top speed, and producing more for the dollar than ever before. Why? Because they are installing modern machine tools—tools built to withstand all the strain put upon them by the use of high speed tool steel.

You cannot expect to meet the competition of to-day with the methods of yesterday. To-day your equipment must be of the best, otherwise your costs will go up as your production goes down.

Investigate "HAMILTON" Lathes, put them in your factory—then watch the balance swing the other way. Speed, durability and accuracy are the points that make "HAMILTON" tools indispensable in cutting your cost of production.

Rapid Production
HAMILTON
Machine Tools

For 25 Years Makers of fine Machine Tools

The Hamilton Machine Tool Co.

HAMILTON, OHIO

Sole Agents for Ontario:

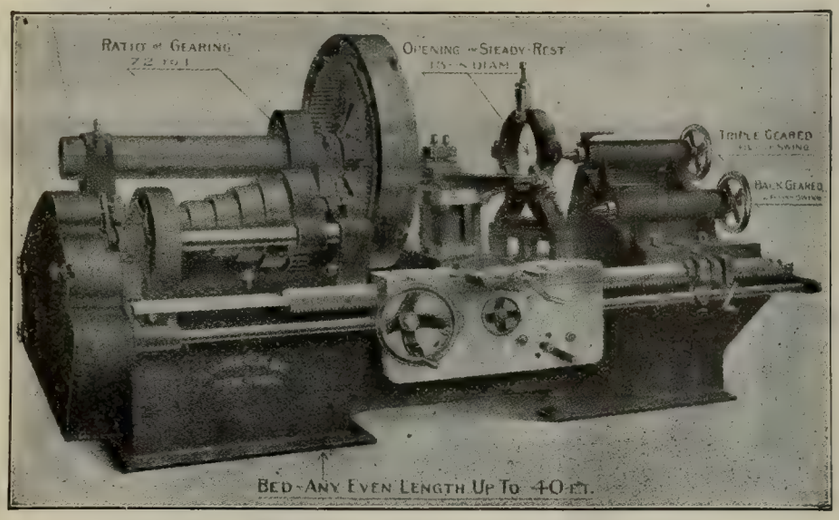
H. W. Petrie, Ltd., Toronto, Ont.

Do More!

--put on more steam

is the industrial slogan of to-day

You can "do more" with McCabe's "2-in-1" lathe than any other big Lathe built, because you have "more" capacity.



McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing
As a 48 inch Triple-Geared Lathe.

It will carry DOUBLE the burden, by handling such work as you would put in a 26-inch lathe when there's no big work to do, as a 48-inch.

Our most valuable resource is time—save the time other big lathes stand still by installing McCabe's "2-in-1" Double Spindle Lathe. Never idle. Save $1,000 in the price. Other big lathes cost that much more.

Immediate Shipment 12-ft. beds—from stock.

J. J. McCABE
149 Broadway,
NEW YORK

NEW BRITAIN

Drop-Head Polishing Machines

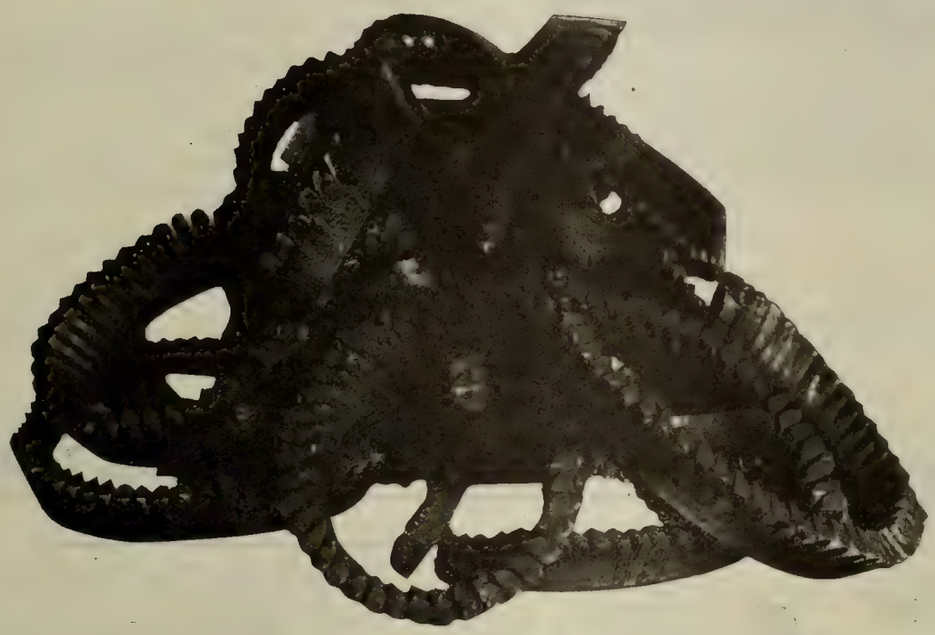
Self-Contained—Self-Oiling—Quick-Stopping

THE adoption of the Drop-Head Type of Polishing Machine for all the big arms factories erected the past year or two is convincing testimony to its superiority. Machine is belted from below, eliminating all countershafts, clutches, and loose pulleys and effecting a marked saving in power. The downward pull of the belt offsets any tendency to vibration and insures a smooth running wheel. Belt is in tension only when running and can be tightened without shortening. The enclosure of the belt excludes those air currents which with exposed belting carry injurious particles of emery to the lungs. Bearings are self-aligning and self-oiling. The Drop-Head Polishing Machine shows a 50% saving in floor space as compared with back-belted machines. For complete description send for Bulletin No. 1103.

"Built Like a Machine Tool"

The New Britain Machine Company
"Shop Furniture Originators" New Britain, Conn. U.S.A.

Specimen Cuttings Made with URANIUM HIGH SPEED TOOLS



Note Depth of Cut on the Tests Below

Tool	Feed	Speed, Feet Per Minute	Depth of Cut	Material Cut Before Grinding
U-8	1/16 in.	45	5/8 in. to 3/4 in.	Ran 87 in. most of time the nose of tool was on scale.
U-8	1/16 in. to 1/10 in.	38	15/16 in.	Ran 127 in. Time 3 hrs., speed increased to 65 ft. p.m. after tool had gone 105 in.
U-8	1/16 in.	60	1 1/16 in.	Ran 12 in.

See your tool steel man or write us.

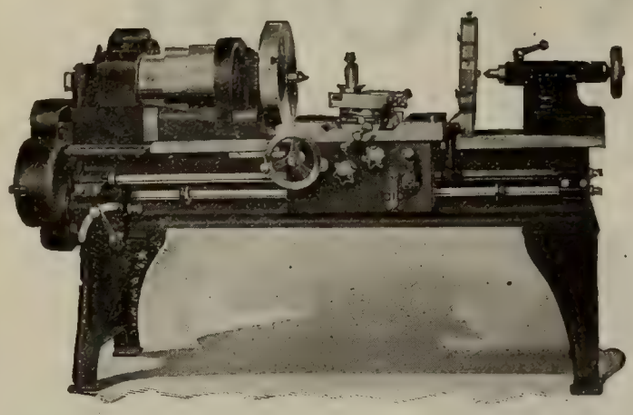
Standard Alloys Company

Forbes and Meyran Aves. **PITTSBURGH, PA.**

GARLOCK-WALKER MACHINERY CO. LIMITED

G&W MACHINERY

32 FRONT ST. WEST, **TORONTO** TELEPHONE MAIN 5346



ENGINE LATHES

for delivery from Toronto Stock

18" x 8' Giddings & Lewis Standard Engine Lathes.
Three Step Cone.
Double Back Gears.
Quick Change Feed.
Quick Change Gear Box if desired.

Dimensions:
Swing over bed 18¾.
4' 5" between centers.
Hole through spindle 1½".

These are strongly built, accurate machines. Will give equal satisfaction in tool-room or shop.

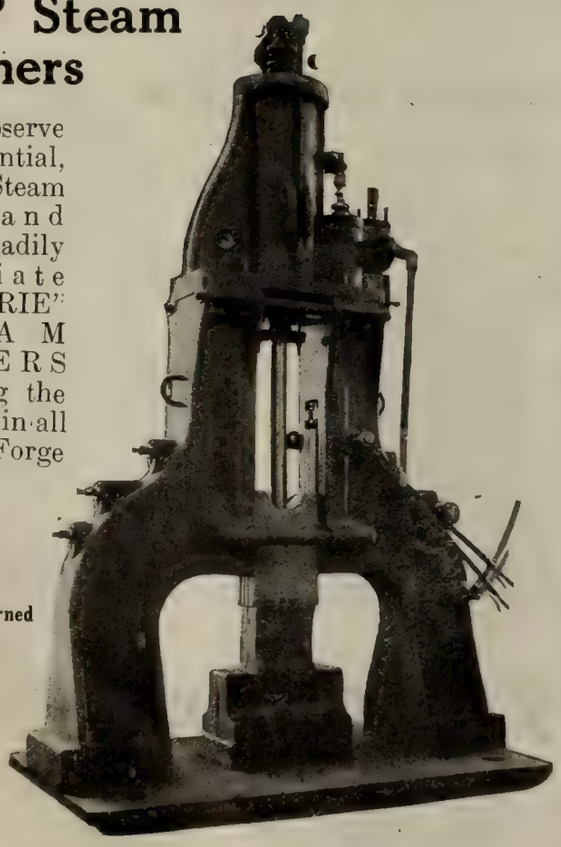
The following extras can be furnished if desired: Taper, Relieving or Draw-in attachment, Waving attachment, Hexagon turret on carriage, Pan pump and piping.

Write for full specifications and prices.

METAL and WOODWORKING MACHINERY of all Kinds

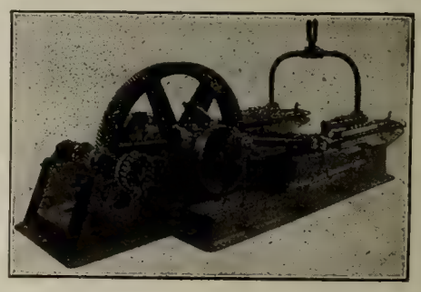
"Erie" Steam Hammers

Closely observe this substantial, well built Steam Hammer and you will readily appreciate why "ERIE" STEAM HAMMERS are getting the preference in all modern Forge Shops.



They have earned their enviable reputation.

ERIE FOUNDRY COMPANY
ERIE, PA. U. S. A.



ELMES

18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217 No. Morgan Street CHICAGO, ILL.

HAVE you examined the patented Ball Joint Connection on the smaller Consolidated Presses? This ball joint is instantly adjustable for wear, all lost motion can be eliminated by loosening the locking screws and adjusting the ball cap downward—no machining or filing required.

There is another important feature in considering this connection. The ball cap and adjustable split bushings can be removed from the connection screw without removing the screw from the connection or disassembling any other parts.

That is economy that cannot be overlooked.

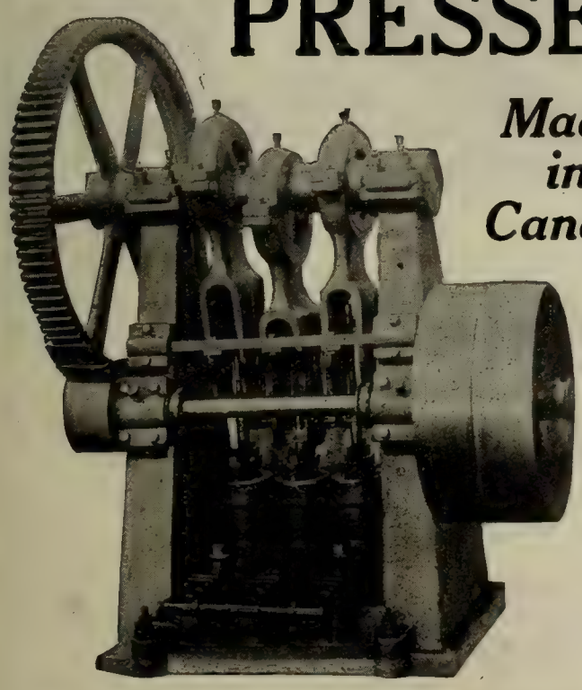
Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* **MICHIGAN**

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

PRESSES

Made in Canaaa



Hydraulic Presses, Pumps and Accumulators for all purposes

WRITE FOR PRICES AND DELIVERIES

WILLIAM R. PERRIN, Limited

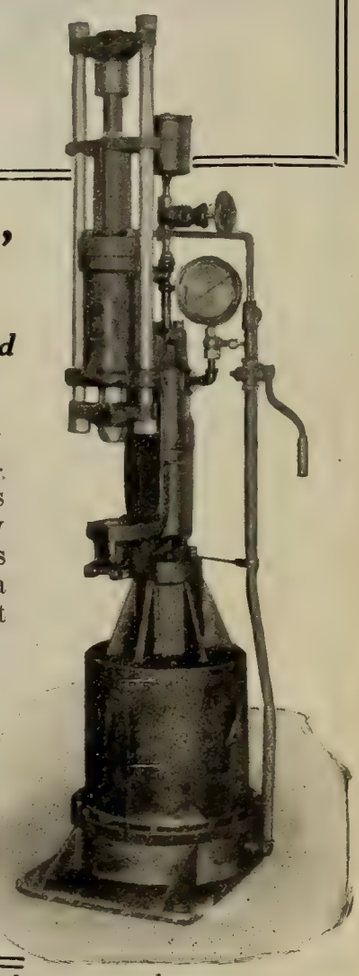
TORONTO, CANADA

Triple Purpose

"METALWOOD" COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.



Metalwood Mfg. Co.

Leib & Wight Sts., DETROIT, MICH. U.S.A.

TRADE MARK

Starrett Tools

REG. U.S. PAT. OFF.

Reduce Mistakes to a Minimum

One slight error in laying out a job or measuring the progress on it may ruin the stock and render futile the labor spent upon it.

Good men using Starrett Tools reduce mistakes to a minimum. These tools are the standard for accuracy all over the world. The line of these fine measuring instruments includes: rules, squares, levels, calipers, dividers, micrometers, vernier height gages, depth gages, test indicators and hack saws.

Write for free catalog No. 213 *describing the whole* 2100 *styles and sizes of these tools.*

The L·S·Starrett Co·Athol·Mass·

World's Greatest Toolmakers

42-671

ARO 30,000 R.P.M.

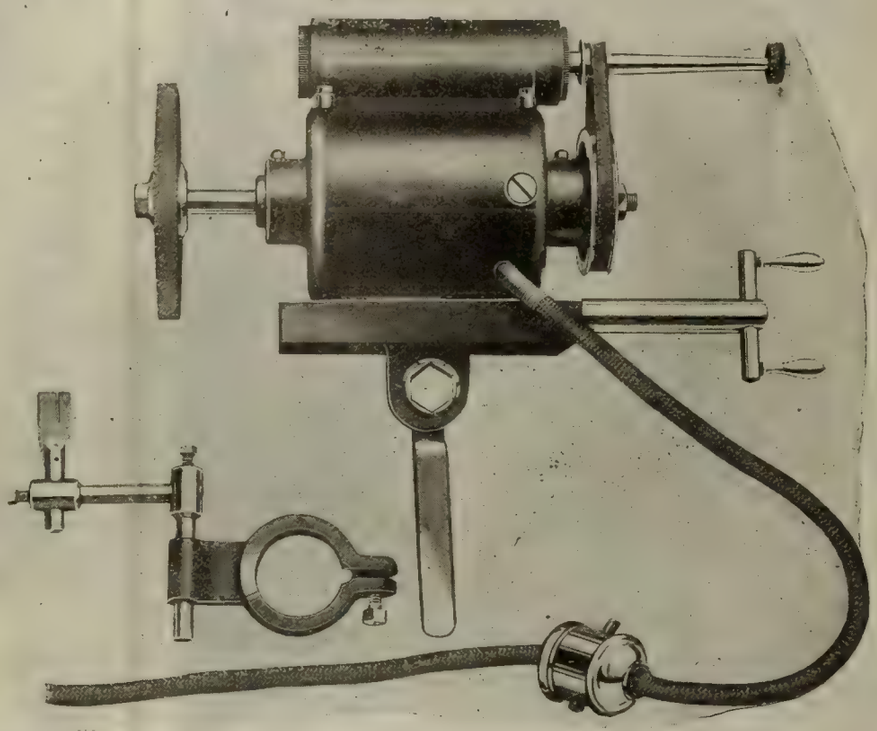
A Portable Electric Grinder with such extreme speed as the ARO should appeal strongly to every shop which has grinding to do—it will surely cut down costs.

While the ARO is noted for its marvellous speed, that's not all it has to recommend it. It is absolutely accurate and built for a long life of service. Superior to all other grinders.

Perfectly constructed—Armature, internal spindle pulleys and large emery wheels are dynamically balanced, preventing vibration. There's no end thrust or side play.

Motor and internal spindle are equipped with S K F and "Norma" Bearings.

Write for full details.



R. E. T. Pringle, Limited

Manufacturers' Agents

OFFICES:

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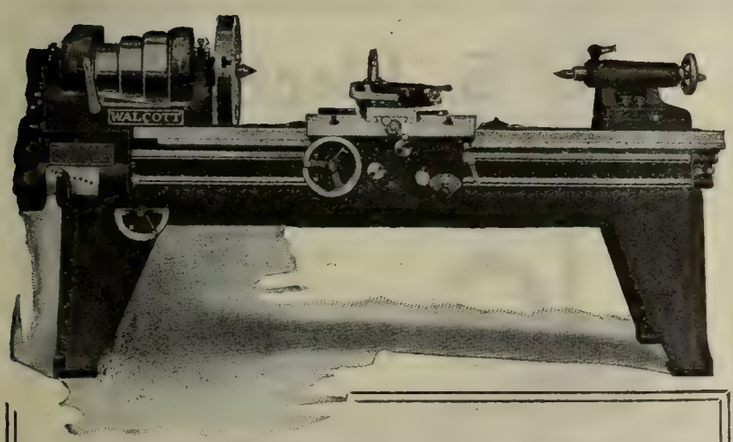
3402 Osler Ave. - - - - Vancouver, B.C.
302 Donalda Block - - - -Winnipeg, Man.



THE WALCOTT LATHE

is backed by lathe-building experience extending over 35 years

These are features of Walcott Lathes: drop-forged gears in apron; all-steel gears in gear-box; large ways on bed, all gears completely enclosed. Parts are interchangeable. Rigid headstock and tail-stock.

You'll **get the full** story in our printed matter. Send for it surely if you are about to buy a lathe.

WALCOTT LATHE COMPANY

Successors to

Walcott & Wood Machine Tool Co., Calhoun St., Jackson, Michigan

P H

TRADE MARK

Quality Files

Finest Crucible Cast Steel +
Expert Workmanship =
File Perfection

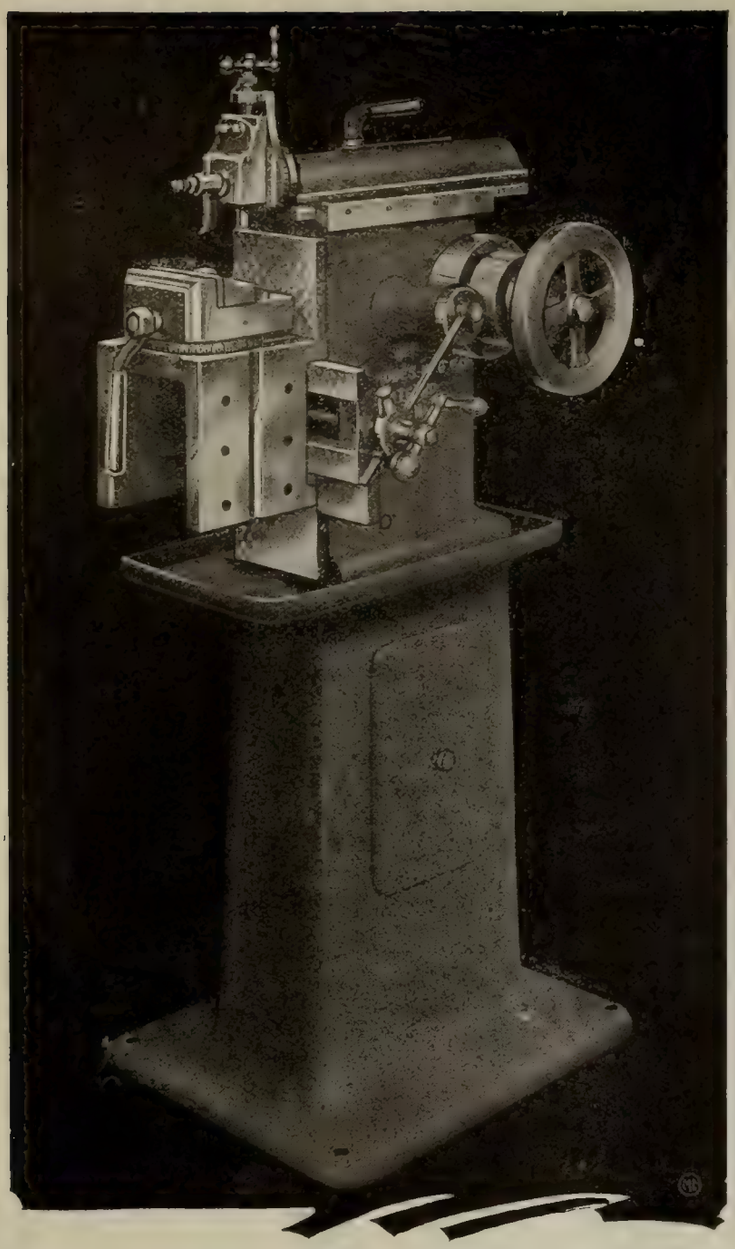
File perfection means P.H. Files which cut faster and wear longer than any other brand.

Let us demonstrate this to you.

Port Hope File Mfg. Co., Ltd.

Port Hope, Ont.

Ask Your Jobber



RHODES

Vertical and Horizontal Shaper Gives Maximum Efficiency at Minimum Cost

Don't do your shaping and slotting, tool-making, die-making, modeling and other classes of light work on big and expensively-operated machines when all this work can be done more accurately, quicker and cheaper by far, with the RHODES Machine. Being introduced all over the world on their cost-cutting merits.

They will increase your profits. Look into the matter. Write for description of various types—do it now.

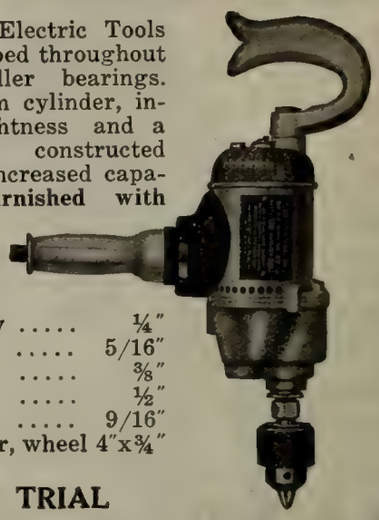
The Rhodes Mfg. Co.

Hartford, Conn., U.S.A.

Thor

UNIVERSAL Electric Drills

Licensed Under Burke Universal Motor Patent



The only Portable Electric Tools made that are equipped throughout with ball and roller bearings. Made with aluminum cylinder, insuring extreme lightness and a powerful specially constructed motor resulting in increased capacity. **Can be furnished with Universal, Alternating or Direct current motor 110 or 220 volts.**

000	Drilling Capacity	.....	¼"
00	" "	.....	5/16"
0	" "	.....	⅜"
01	" "	.....	½"
1	" "	.....	9/16"

No. 6 Electric Grinder, wheel 4"x¾"

SHIPPED ON TRIAL

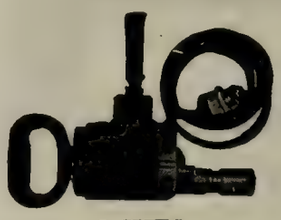
Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.

Toronto: 32 Front St. W; Winnipeg: 123 Bannatyne Ave., E; Vancouver: 1142 Homer Street

U. S. Electric Drills and Grinders

Save Time, Labor and Money



3 SIZES

3-16 inch, W.G.T.	6 lbs.
¼ inch, W.G.T.	9 lbs.
⅜ inch, W.G.T.	12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.

They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

½ inch—2 SPEED. Speed, 400-750 R.P.M.

For Sale By

The Canadian Fairbanks-Morse Co., Limited

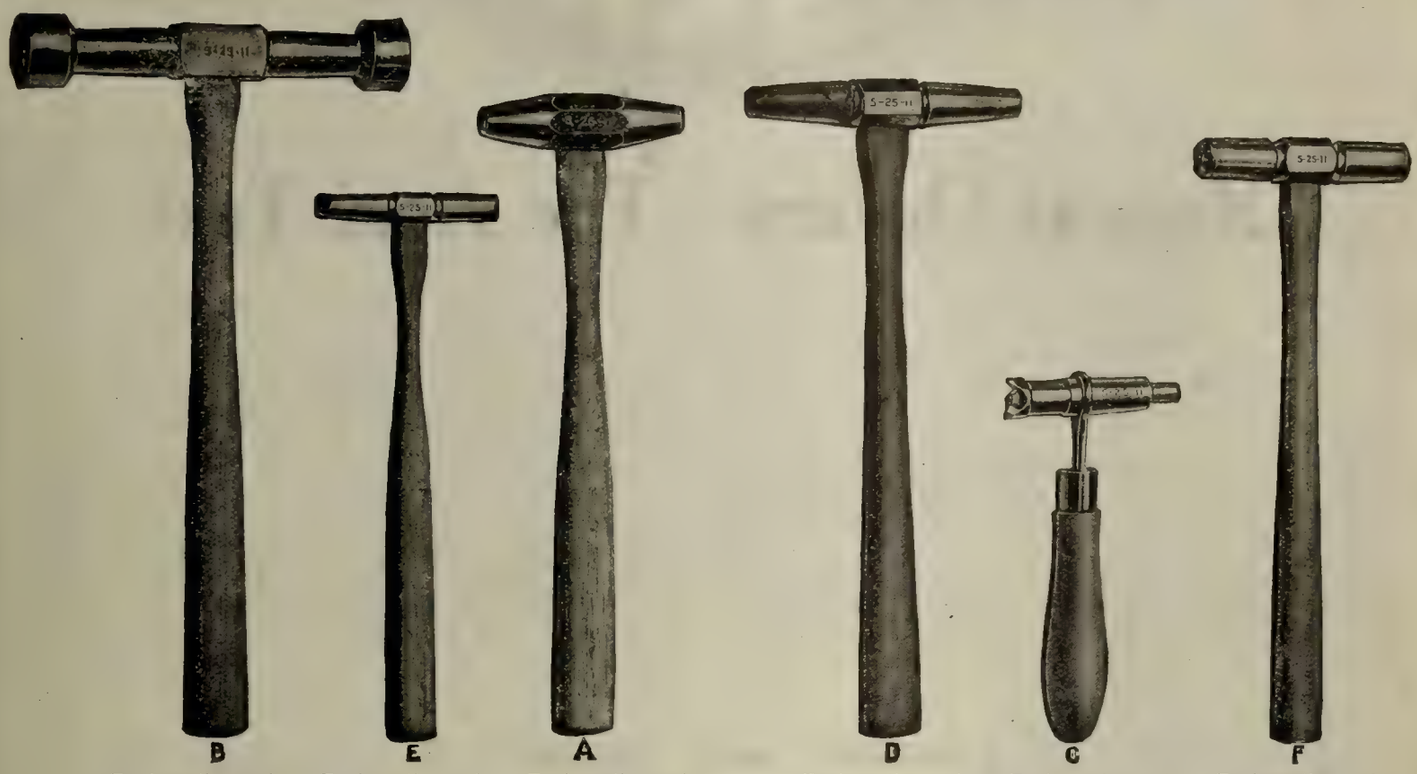
Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.

CINCINNATI, OHIO

INSPECTION

THE MOST IMPORTANT MANUFACTURING OPERATION REQUIRES PROPER MARKING TOOLS



B — For inspection marking of ties, timber, etc.

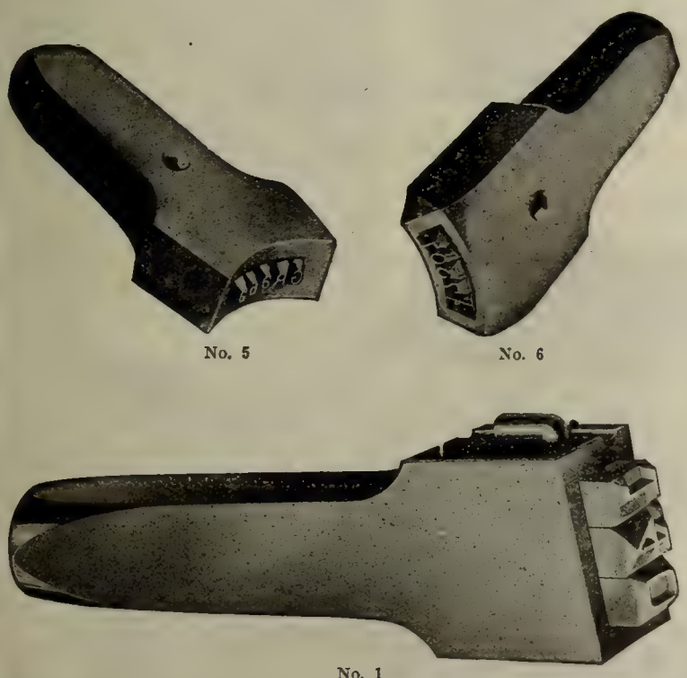
E — For inspection marking to record operation of employees.

A — For inspection marking of rails, billets, bars, beams, shells, etc.

D — For inspection marking of brass, copper, soft metals, etc.

C — For inspection marking of parts having a convex surface.

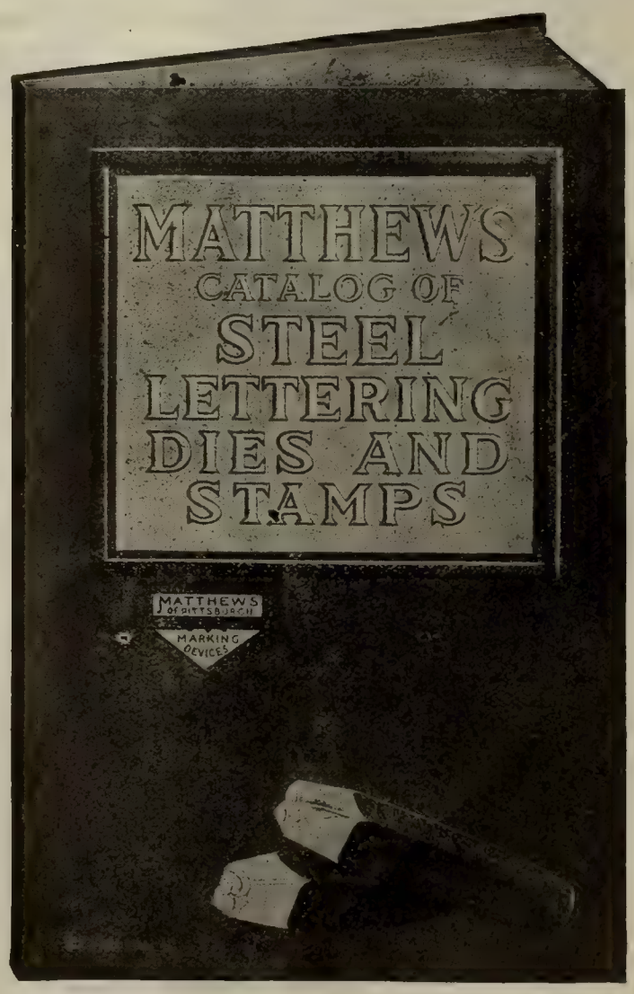
F — For inspection marking of tool steel, machine parts, etc.



No. 5 No. 6

No. 1

Three styles of "Champion" Steel type holders for placing of inspection dates, serials, symbols, etc., on metal products, all kinds.



This book gives details of inspection marking devices of all kinds. Get it to-day.

JAMES H. MATTHEWS & CO.

Established 1850

Marking Devices

FORBES FIELD PITTSBURGH, Pa.

Canadian Distributors: **Canadian Fairbanks-Morse Co., Ltd**

If any advertisement interests you, tear it out now and place with letters to be answered.

SKF

Repeat Orders—The Acid Test

Repeat orders are the acid test of a product. No man buys a second time unless he has found a satisfactory product.

In September, 1915, the Colt's Patent Fire Arms Manufacturing Company bought 50 SKF Ball Bearing Hangers—as a trial installation. After a year's trial they bought 400 additional SKF Hangers.

But this is not all. In January, 1917, they bought 200, and in May, 1917, about 500 SKF Hangers, making a total of over 1,000 SKF Hangers.

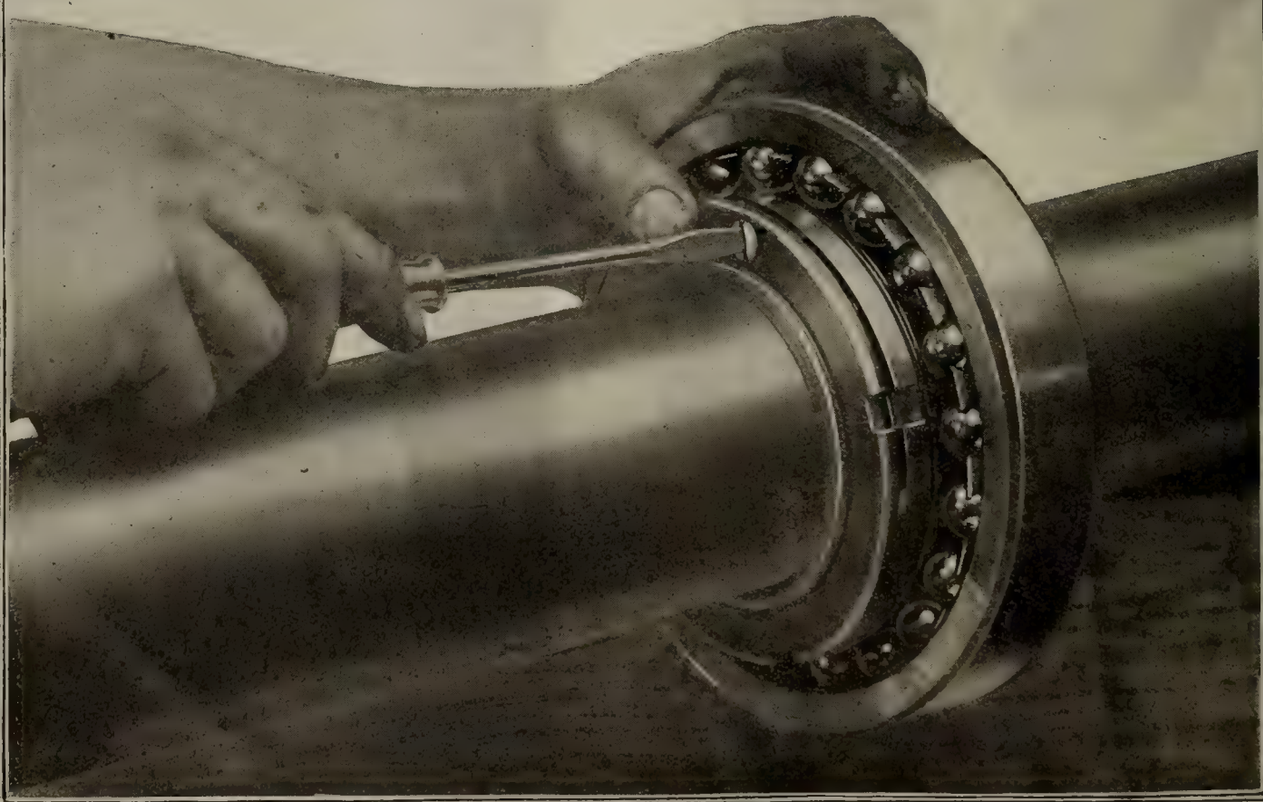
This is satisfaction—SKF satisfaction—and repeat orders are the proof. Our Hanger Catalog No. 78 will give you further proof. Send for it.

CANADIAN SKF CO., LIMITED
TORONTO, CANADA

Sole Canadian Agents SKF Transmission Bearings

The Canadian Fairbanks-Morse Co., Limited

St. John, Windsor, Quebec, Winnipeg, Montreal, Saskatoon, Ottawa, Calgary, Toronto, Vancouver, Hamilton, Victoria



R-P
REED-PRENTICE COMPANY
WORCESTER MASS. U.S.A.
24-IN. "PRENTICE" LATHE
This Geared Head Lathe will do the most work in the least time with the minimum of fatigue to the operator.
Canadian Fairbanks - Morse Co., Limited
JUDGE IT
TEST IT
OUR CATALOGUE WILL FOCUS YOUR ATTENTION

Grinding Planer Tools With Alundum Wheels

The wheel on the machine shown is a 24-inch Vitrified Alundum, grain 30, grade O, running at a speed of 900 r.p.m. The wheel is in actual operation grinding tools 90 per cent. of the time, and under this service wheels are lasting 4 to 5 months. Equally good results are being made on other grinding operations.

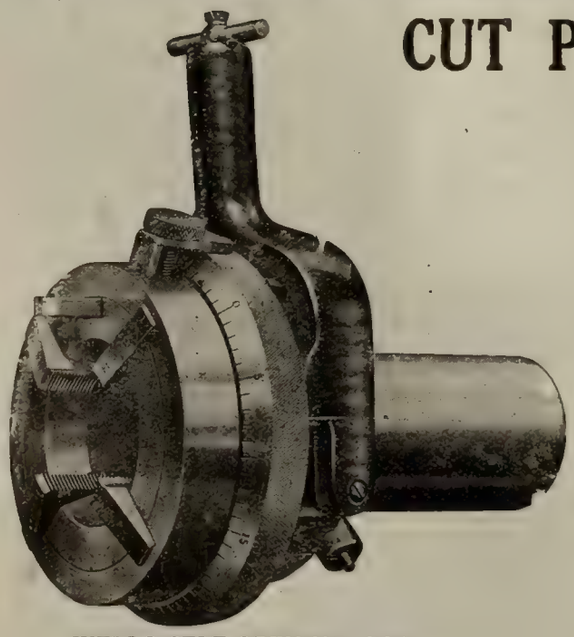
NORTON COMPANY
WORCESTER, MASS.

ELECTRIC FURNACE PLANTS:
NIAGARA FALLS, N.Y., CHIPPAWA, ONT.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto Ottawa, St. John, N.B.; Winnipeg, Calgary, Saskatoon, Vancouver, Victoria: F. H. Andrews & Son, Quebec, Que. 862a

WELLS SELF-OPENING DIES

CUT PERFECT SCREW THREADS



WELLS SELF-OPENING DIE
has both face and hand trip.

The Wells Self-Opening Die cuts the thread with a fine shearing cut, then opens with a quick, positive snap.

Adaptability

The Wells Self-Opening Die can be used on screw machines, lathes, automatics, drill presses and bolt cutters.

Chaser Principle

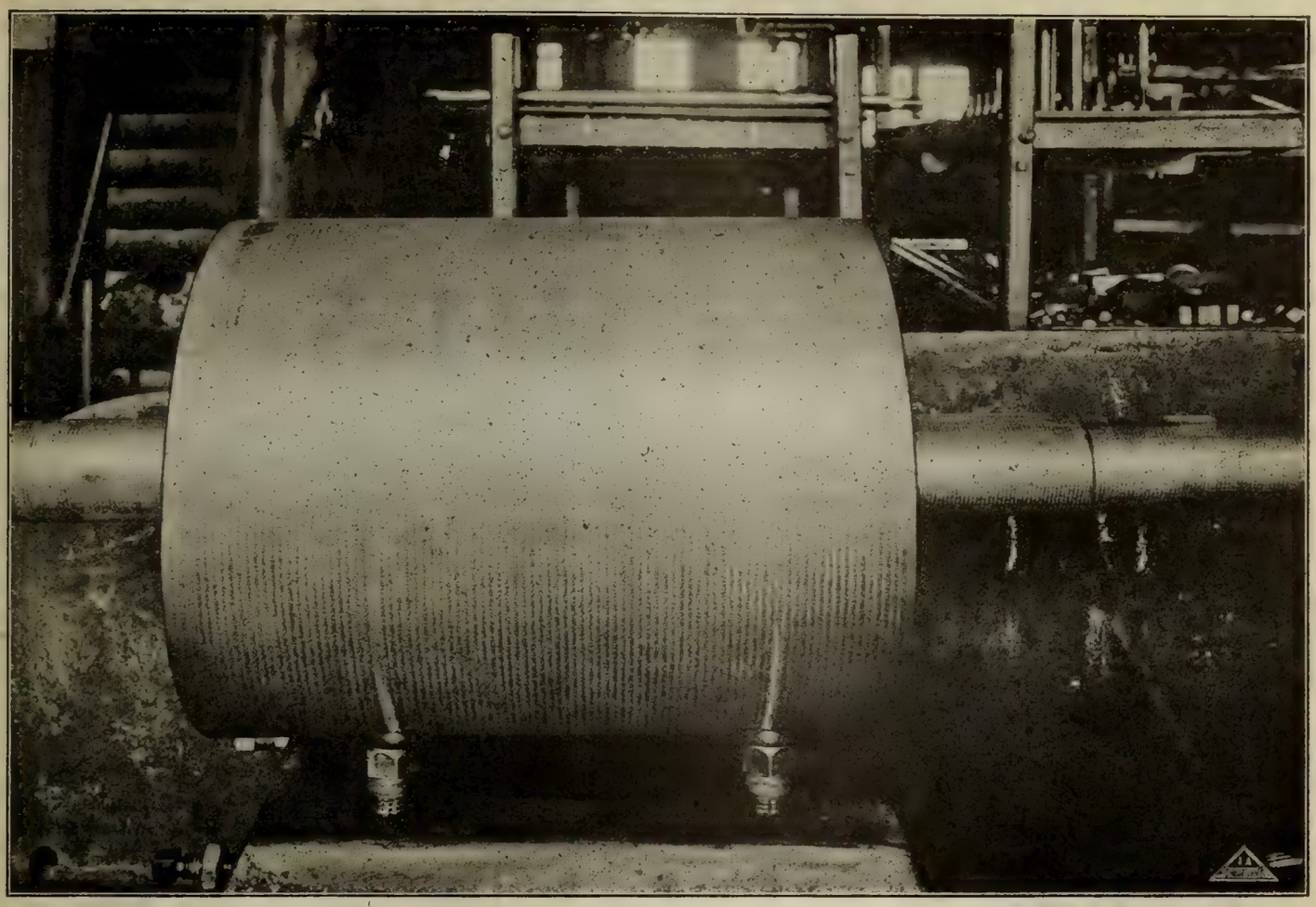
The Wells Self-Opening Die embodies an entirely new principle of design. The chasers are about four times as long as the threaded portions and are supported throughout their entire length and width by the solid sides of the slots in the body. They cannot squirm away from the work. Wear is reduced to a minimum throughout. Adjustment is simple, positive and accurate.

A large number of these Dies in stock for Immediate Shipment.

Wells Brothers Company of Canada, Limited

GALT, ONTARIO

Sales Agents: The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary



Grind Wherever and Whenever You Can

The Norton Grinding Machine will cut your costs and production time.

You wouldn't think of performing rough cuts at coarse feeds and high speeds on the ordinary grinding machine. You would do it on the lathe instead. But why do it on a lathe when you can get much better results in the Norton way? The Norton Grinding Machine will do everything but extremely heavy and rough work.

The illustration shows a rough turned roll 2′ 9½″ over all, with a 12″ body and 2⅜″ shaft. In 45 minutes 1/64 of stock was removed from the diameter.

Interesting, isn't it? We have many more such cases to tell you about. May we?

NORTON GRINDING COMPANY

WORCESTER, MASSACHUSETTS, U.S.A.

Canadian Sales Agents: THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED

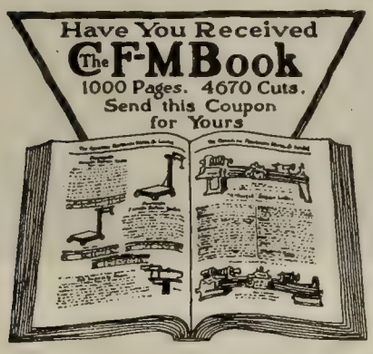
St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg. Saskatoon, Calgary, Vancouver, Victoria

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED.

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

Manufacturing Plant Equipment

Boilers
Pipe
Valves
Fittings
Scales
Coal Conveyors
Ash Conveyors
Wheelbarrows
Shovels
Gauges
Whistles
Safety Valves
Injectors
Pumps
Feed Water Heaters
Separators
Oil Filters
Engine Stops
Indicators
Packing
Metal Hose
Steam Traps
Industrial Track
Chain Hoists
Tools of all kinds
Engines
Motors
Generators
Storage Batteries



1.—The Power House

The heart of every manufacturing plant is the power house. Here is developed the mechanical or electrical power necessary to carry on the production of goods in each and every department of manufacture.

Here we can supply every single necessary item from cotton waste to the large engines. The list in the margin will give you a slight idea of some of the equipment necessary for power production.

Let us have your inquiries. We carry the largest stock in Canada, and our prices are reasonable.

Canada's Departmental House for Mechanical Goods.

The Canadian Fairbanks-Morse Co., Ltd.

St. John, Windsor, Quebec, Winnipeg, Montreal, Saskatoon, Ottawa, Calgary, Toronto, Vancouver, Hamilton, Victoria

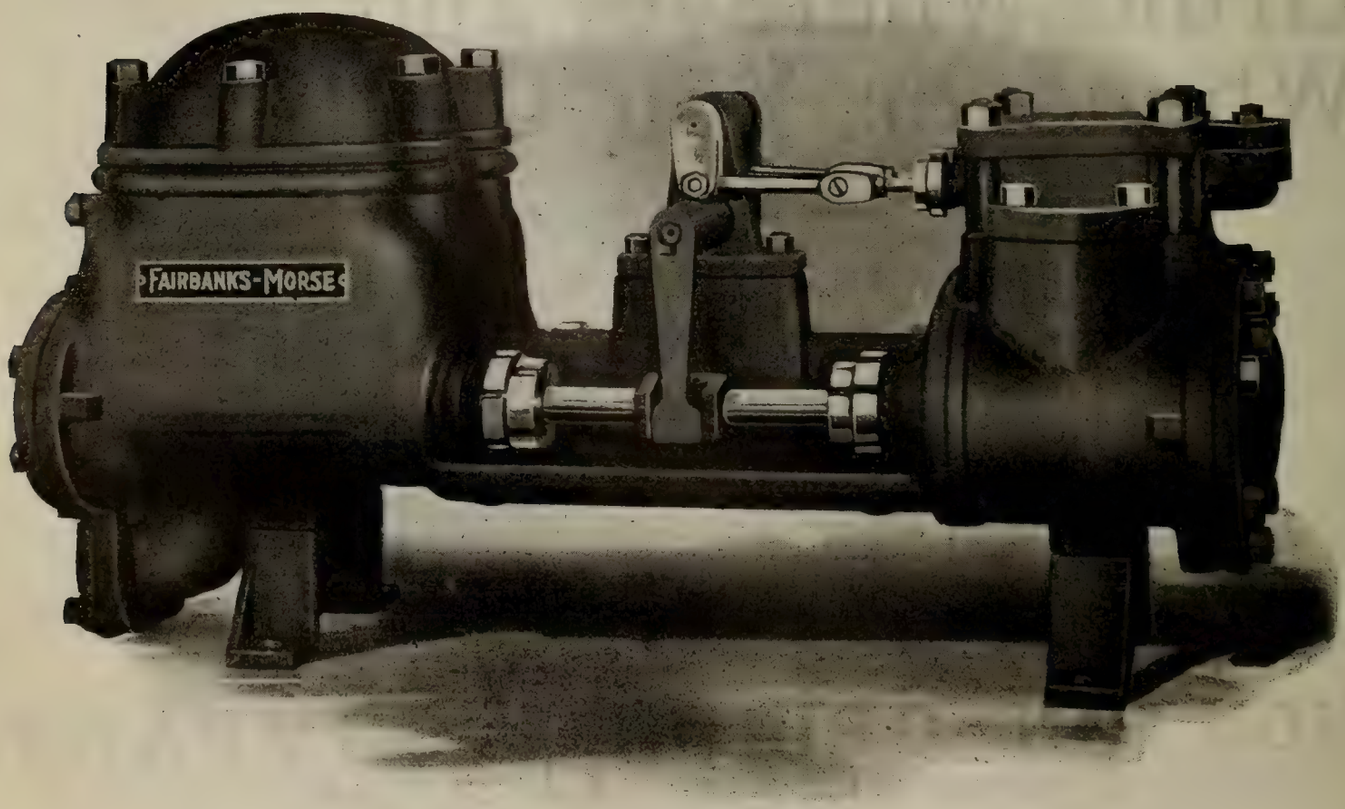


FIG. 1. VI EW OF MAIN BAY SHOWING ASSEMBLY BENCHES AND WORK IN PROGRESS. MACHINE DEPARTMENTS ARE LOCATED IN EACH SIDE BAY.

The Chapman Double Ball Bearing Co. in U.S. Territory

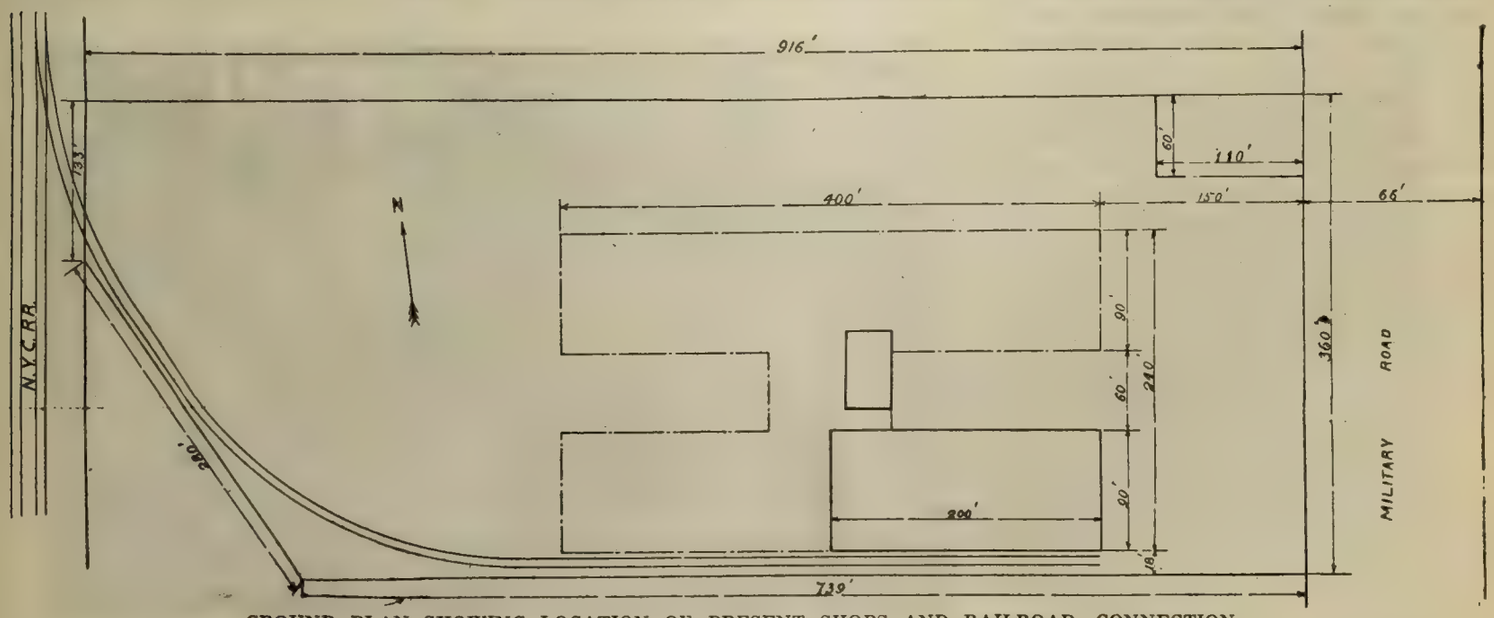
Staff Article

It is a significant fact that the Chapman Double Ball Bearing Co., of Toronto, Ont., have in the past developed and improved and finally exported to the United States a type of ball bearing which originated there, and which according to all expectations should have attained in the hands of its originators a development far exceeding that possible in this country with its limited market, and inherent manufacturing handicaps. As a further indication of what has been accomplished, the accompanying article is ample proof.

A FEATURE of Canadian industrial development during the past fifteen or twenty years has been the continual and, latterly, rapidly increasing influx of branch houses and factories from United States concerns. Few lines, indeed, have been exempt from the attention of our Southern neighbors, and while the influx has, on a whole, been beneficial to this country, there has occasionally been just a tinge of regret that the movement should be so one-sided. The relative degree of development attained by either country was always such that the initiative in many branches of industry, by force of circumstances to a great extent, originated in the more densely populated parts of the continent, and it was only in such cases where natural resources and other factors beyond human control had counteracted prevailing influences that Canada was enabled to attain an equal level and perhaps forge slightly ahead in industrial enterprises of various kinds.

A Pioneer Firm

Ball-bearing manufacture, together with several allied industries, has experienced tremendous developments in recent years; an essential component of the automobile, the production of this engineering accessory, has been compelled to undergo continuous expansion to keep pace with the requirements of car builders, and it would seem, therefore, that this preoccupation had been the opportunity whereby the perseverance of a pioneer Canadian firm has been rewarded with the ability to carry the fight into the enemy's camp, so to speak. It is a significant fact, however, that the past fourteen years have seen the Chapman Double Ball Bearing Co., Ltd., develop, introduce, improve, and finally export to



GROUND PLAN SHOWING LOCATION OF PRESENT SHOPS AND RAILROAD CONNECTION.

the States a type of ball-bearing which originated across the line, and which, according to all ordinary business expectations should have attained, in the hands of the originators, a development far exceeding that possible in this country with its limited market, and inherent manufacturing handicaps.

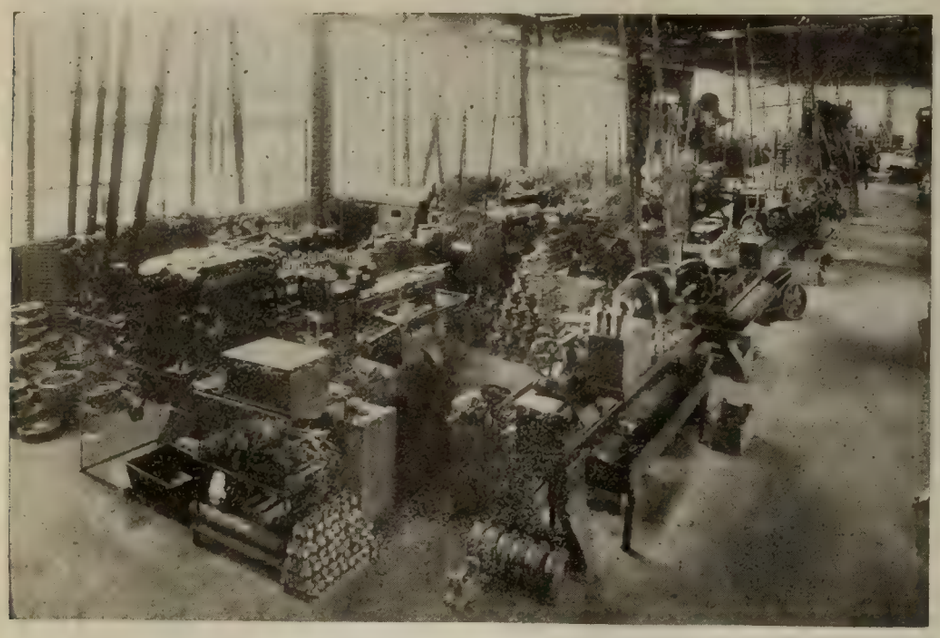


FIG. 3. PART OF LATHE DEPARTMENT SHOWING EXCELLENT LIGHTING, ARRANGEMENT OF MACHINES AND TYPE OF SAFETY GUARDS INSTALLED.

Despite all of these conditions, the enterprise of what might be termed the Canadian branch, has succeeded in creating a demand from U. S. manufacturers which has resulted in the former "branch" house establishing a branch of its own whereby the American markets can be more effectively supplied with the Canadianized product.

Opportunity Offered

Two years ago, when U. S. industries began to enter that period of activity, the end of which is not yet in sight, certain Canadian and American interests incorporated the Transmission Ball Bearing Co., and manufacturing operations were commenced in the City of Buffalo. That the occasion was opportune, has been proven by the rapid and continuous development forced upon the new concern. Producing an article adapted to a wide range of applications, perfected as the result of many years use under all sorts and conditions of service, and supported by an organization which had grown up with the business, the U. S. branch had everything in its favor to insure success from its inception. The necessity for securing enlarged manufacturing facilities quickly became evident, culminating in the erection of an entirely new plant in the Blackrock district, on the immediate outskirts of Buffalo City.

Location and Type of Plant

A site was secured on Military Road, the main thoroughfare between Buffalo and Niagara Falls, having a frontage of 360 ft., with a depth of 916 ft., the rear boundary abutting on the main line of the New York Central R.R. Both labor and material are thus easily obtainable, an excellent car service existing between the plant location and all residential districts. The future growth of the factory was kept well in mind, and a glance at the plan view reproduced in line drawing, Fig. 2, shows the ample provision for expansion. Destined to ultimately occupy a space of 240 ft. by 400 ft., the complete plan calls for two main bays, 90 ft. wide, separated for most of their length by a 60 ft. space, which insures ample light and ventilation.

The building, of which the accompanying views are illustrative, is exactly half of what will be later a main bay, being 200 ft. long by 90 ft. wide. It is of the monitor-daylight type, the roof being carried on rolled steel girders and columns, the side columns being surrounded by a light brick filling, which adds to the stability and appearance of the building without an appreciable diminution of lighting area. Hinged panels in the steel sash lights, both inside walls and monitor sides, insure an excellent degree of ventilation; while radiators extend continuously around the brick filling from the floor to the steel sash.

Department Arrangement

A general view of the interior is shown in title illustration, Fig. 1, from which the principal features of the shop layout can be gathered. The shafting is laid out in two main lines, one to each wing, located close to the main columns so as to give a suitable length of belt drive to the machine countershafts. The lathe department occupies the left foreground, the grinding department the right fore, with assembly benches and material extending across the centre aisle back to the tool crib, which is exactly in the centre of the shop within equal and convenient access from all departments.

The lathe department equipment is quite varied in view of the variety of work involved in producing the different parts, such as cast iron housings, steel sleeves, cone wedges, and numerous items of transmission equipment, such as pillow blocks, loose pulley sleeves, etc. Turret lathes, made by Pratt & Whitney, Acme Mach. Tool Co., Jones & Lamson, and Bardons & Oliver, are installed for this work, and a double spindle Jones & Lamson for certain details which lend themselves to production on this machine. The heavier work is done on a Libby turret lathe, while much miscellaneous and special work is handled to advantage on a Lodge & Shipley lathe with turret carriage, one Bullard and one Colburn boring mill, and a Kelly shaper. Much work of a suitable nature is found to keep a Foster screw machine fully employed, also a National speed lathe.

The amount of drilling required is comparatively slight, and is well taken care of by a couple of medium drill presses by W. F. & J. Barnes and Rockford Machine Tool Co.

Lathe Department

A view of the lathe department is given in Fig. 3, a feature of which is the extensive provision of wire guards. The State regulations in this matter are very rigid, and include such features as arrangement of the machines themselves

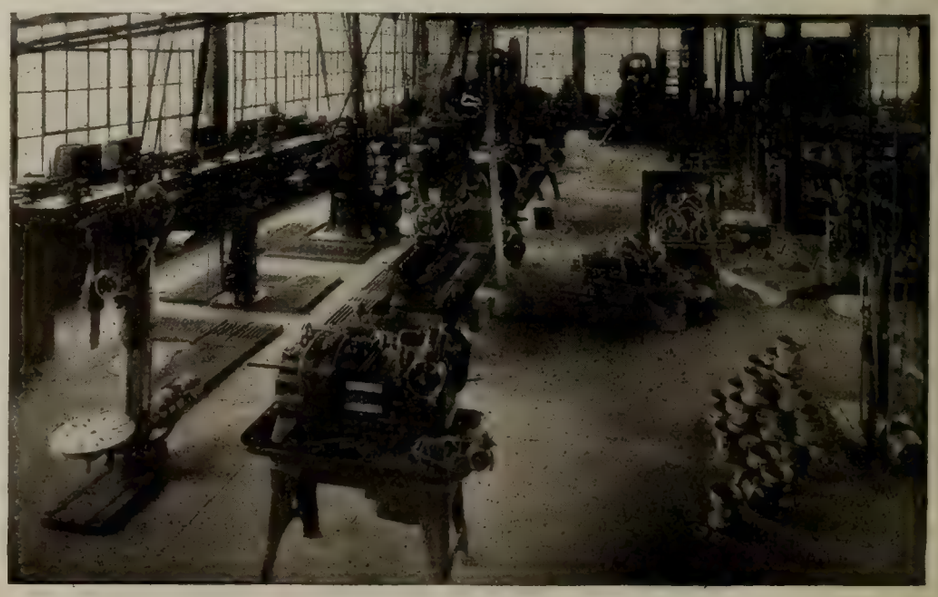


FIG. 4. TOOL ROOM SHOWING SPACIOUS LOCATION OF MACHINES.

independently of such handling systems or manufacturing methods which may be desired by the firm.

Beyond the lathe department is the tool room, which, like all parts of the building, is spacious, orderly and well equipped. The line shaft from the lathe department extends to the tool room with a clutch drive between the motor pulley and the lathe department. This allows the tool room to be run by itself on accasion, and, as it is a much smaller load than the lathe department, it does not add appreciably to the load when the latter department has to run extra time. The equipment illustrated in Fig. 4 is representative of good modern practice, being suited for the production of jigs and fixtures as well as a tooling outfit and upkeep—one 20 in., one 18 in., and one 14 in. American lathes; one No. 2 Kempsmith universal miller; one Cincinatti shaper; one Excelsior sensitive drill; one Universal, one Blount, and one La Salle grinder.

Power Press Department

At the extreme end of the left wing is the press department. This consists of five power presses driven from a shaft running transversely. These are used for stamping and forming the cup and cone ball races, drawing sleeves and housings for power table bearings, and stamping out ball cages or containers. Two large presses are made by the Toledo Mach. & Tool Co., and Niagara Mach. & Tool Works, with one medium and two small machines by the latter maker.

Three phase 25 cycle current at 440 volts is used throughout the factory, the lathes and tool room being operated by a 35 horse-power G. E. induction motor, and the cross shaft in press department by a ceiling type of Crocker-Wheeler motor.

Grinding Department

Returning to the right foreground of Fig. 1, the grinding and polishing of the ball races is here performed. Extreme accuracy is called for in this work which consists of parallel grinding on the outside of the outer race, taper grinding on the inside of the inner race, and radius grinding on the ball tracks of both races.

The first and last are done on three No. 3 modern universal grinders, while the radius work is done on No. 1 Landis radius grinders with automatic swivelling head carrying the work. Preliminary rough grinding or dressing is done on a Gardner double disc grinder, while a high speed polishing spindle is provided for finishing the ball tracks to that degree necessary for long and successful operation.

Suitable space is set aside in this department for an electric spot welding machine which unites the two halves or sides of the ball cages. These are of special design as developed for Chapman bearings, which allows them to be assembled and adjusted complete with balls in position before putting in the housing. The convenience of being thus able to complete the manufacture of the cage without riveting or other work after assembling is a feature peculiar to this type of bearing and greatly facilitates replacements and repairs when necessary.

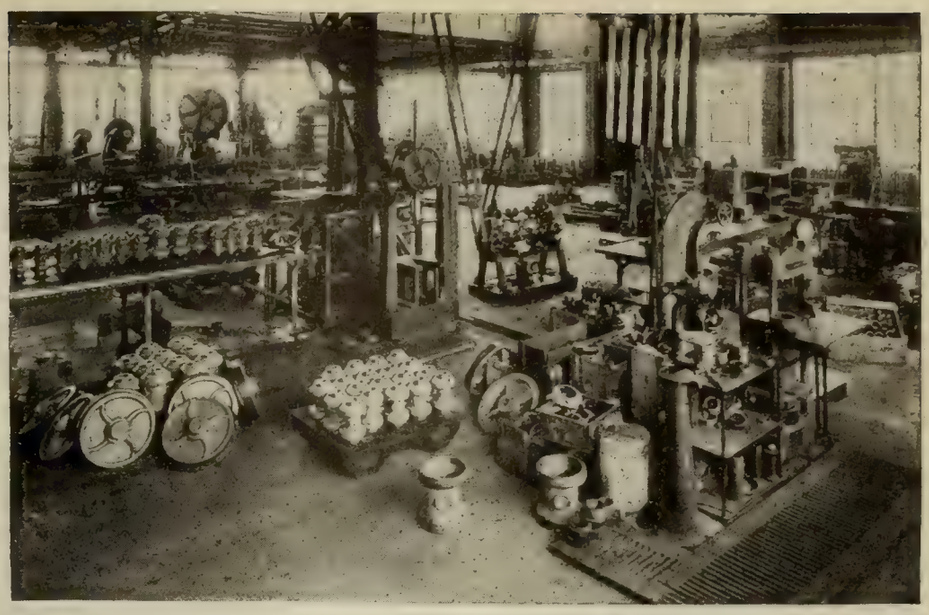


FIG. 5. FINAL TEST DEPARTMENT WHERE BEARINGS ARE ADJUSTED AND RUN UNDER SPECIFIED LOADS, ETC.

Final Testing

Assembling and testing is an important feature of the work, the satisfactory service of these bearings being due to accurate adjustment of parts followed by severe testing under abnormal running conditions. Hydraulic power is utilized in obtaining a uniform degree of pressure on each individual bearing as its components are put together, a Perrin four column press and a Lucas gear-hydraulic power press. The testing of balls and ball races is accomplished by means of three stands on which various sizes of shafts can be quickly arranged so that a definite controllable load can be put on a number of bearings simultaneously by adjusting a hydraulic jack. A specified length of run and amount of load proportioned to the various sizes of bearings enables their reliability under service to be accurately determined before going into use.

A view of this department is given in Fig. 5, showing the Lucas press and testing stands in the centre, with numbers of shafting bearings and ball-bearing car wheels in course of assembly.

In the right bay, immediately beside the tool crib is the stock room and shipping department. Here are stored the detail parts used in final assembly as well as raw material and supplies for manufacture and shop operation. A 50 horse-power motor which operates the line shaft to the grinding room is installed in a suitable location here, as is also the transformer equipment, and main switch board.

The manufacture of elevating transfer trucks, into which ball-bearings enter largely, has been an important branch of the firm's activity for some years. The patented design has certain exclusive features which have aided largely in securing a growing demand for it, a fact of special interest being that the apparatus was invented and developed to its present state entirely in Canada, and as such reacts favorably in regard to the friendly rivalry, in trade exportation which is referred to at the beginning of the article.

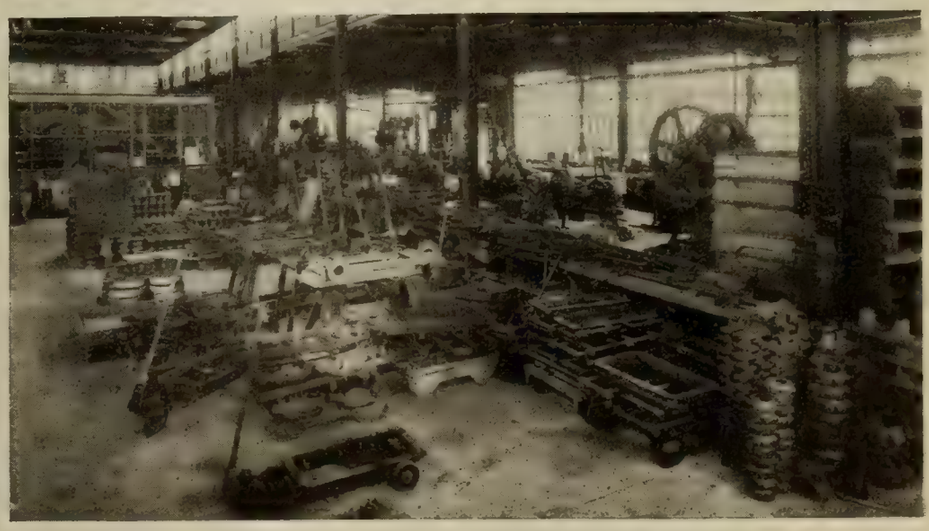


FIG. 6. ELEVATING TRUCKS ARE BUILT ON A CONSIDERABLE SCALE AS SHOWN HEREWITH.

MONTREAL EAST'S BIG OIL INDUSTRY

THE expedition which has marked the construction of the new industrial centre recently established in Montreal East by the Imperial Oil Company has attracted more than passing attention from those who have been watching the growth of the city as a manufacturing centre. The plant is so extensive and has become so important a factor, not only in the business life of the community, but in the war requirements of the nation, that its completion in a remarkably short time is the subject of many congratulations. The Montreal refinery completes a system of great distributing and refining plants, extending across the country, all controlled by the Imperial Oil Co. It is one of the largest and most important of the five refineries located respectively at Montreal, Vancouver, Regina, Sarnia and Halifax. It represents an investment of over $3,000,000, and in equipment is as modern as any refinery plant on the continent, with, in addition, unique deep water shipping facilities.

Refinery Site

The site of the refinery accupies some 90 acres in Montreal East, and is bounded on the south by the St. Lawrence River, and traversed by Notre Dame Street East, the tramway to Bout de I'lle, and the Canadian Northern Railway System. Construction of the refinery and asphalt plants began a little over a year ago, and eleven hundred men have been engaged in building operations ever since. Of the block of land occupied, one-quarter is on the south side of Notre Dame, while three-quarters is on the north side of that thoroughfare.

When the Montreal Harbor Commissioners realized the importance of the enterprise which the Imperial Oil Co. had in hand, they began the construction of a wharf 900 feet long and 300 feet wide, with 28 feet depth of water. While the wharf is scarcely completed, tank steamers, carrying upwards of 50,000 barrels of crude oil from Tampico, Mexico, from which port the company's supply of crude oil is obtained, are making regular trips to the Montreal refinery. The round trip occupies thirty days, and the system of oil tanks extending for and aft of the SS. "Luz Blanca," the SS. "Imperoyal," and other tankers engaged in the trade, are of great interest. The pumping and pipe line system is so efficient that an entire cargo can be transferred from the ship's tanks to the reservoirs in thirty hours or less.

Refinery Capacity

It is understood that the annual amount of business of this Montreal refinery will reach a million barrels, and the storage capacity of the company will be large enough to carry over crude oil to last from the close of navigation to the following spring. It is evident that little has been spared to make this plant one of the finest on the continent, and when the last details of construction are completed, a sum well on to three million dollars will have been expended in the town of Montreal East by the company. Of the eleven hundred men employed since the breaking of the ground a year ago in May last, half of the number have been skilled and half unskilled labor, and A. W. Forman, superintendent of the works, states that when the manufacturing and refining process is well under way the permanent force employed will most likely reach from five to six hundred men.

The housing of all these men is a problem which had to be solved, and the company is encouraging the construction of not less than one hundred houses in the vicinity, which will rent at about twenty dollars per month.

The Asphalt Unit

The asphalt unit of the refinery plant is located between Notre Dame street and the river, and is one of the most interesting features of the undertaking. The several tanks and buildings for the manufacture of this modern commodity are constructed of brick and steel. The plant is practically finished, and the company now in the asphalt market.

The refinery and its subsidiary plants are located on the north side of Notre Dame street, the whole being connected with the different transportation systems by the Harbor Commissioners and Canadian Northern tracks, as well as the Montreal Tramway Co. So the company considers its transportation difficulties have been practically mastered. In a few weeks' time, the whole series of pipe lines, tanks, and all other appliances required for the operations of the refinery will be completed.

THE ELECTRIC TRUCK

IT IS stated that the total value of electric trucks in the United States is approximately $36,000,000. If the same ratio in proportion to the population were obtained, Canada should possess electric trucks to the value of about $3,000,000. Information at hand shows that the total investment in electric trucks in the Dominion of Canada very likely does not exceed $300,000. From the above we can conclude that the field in Canada for the sale of electric trucks is very fertile and offers great possibilities either to the manufacturer or central station that is willing to put forth the proper amount of effort, said the report of the Canadian Electrical Association.

The principal reasons for the rapid success of the electric truck are the low up-keep and reliability. Supplementary reasons are the improvements in charging apparatus, the development of charging stations equipped with proper facilities, together with the increased capacity of storage batteries. In this connection it is interesting to note that the storage battery, as manufactured at present, possesses an average life of double that of a few years ago. The modern electric truck in city and suburban service is capable of going from 40 to 50 miles on one battery charge, a total travel per day that well satisfies the requirements of most commercial transportation. By using a spare battery this mileage may be easily doubled.

Large manufacturers and others requiring extensive trucking or large departmental stores have proved the immense value of the electric truck. Departmental stores in larger cities have come to depend nearly exclusively upon their electric delivery system, utilizing electric cars from 1,000 to 2,000 lbs. capacity, for their house to house delivery.

OUR UNDEVELOPED WATER POWERS

WHEN the present survey of Canada's natural resources are completed under the auspices of the Canadian Pacific Railway, it will doubtless contain a great deal of new information relative to the undeveloped waterpower of Manitoba, Saskatchewan and Alberta. Investigations already made by a sub-department of the Ministry of the Interior, it is claimed, establish the fact that in the Saskatchewan River, with its tributaries furnishing the water arteries of a vast expanse of country, and in the Winnipeg River and other streams emptying into Lake Winnipeg, there is hydro-electric energy sufficient to harness 1,172,000 horse-power.

In the upper reaches of these provinces, the Athabasca, Peace and Churchill Rivers, with a number of other large streams, in their long course to the Arctic Ocean and Hudson Bay, afford new sources of energy equivalent to at least 5,500,000 horse-power. Out of this aggregate of over 1,000,000 horse-power, only a little over 100,000 has been employed. Manufacturers, it is expected, after the war, will take on new life at Calgary, within 100 miles of the Selkirk range of mountains. The Bow River, from which 31,000 horse-power has been drawn, has at least 75,000 undeveloped reserve power available for the industries of that city.

S.S. "WAR WASP" LAUNCHED

THE S.S "War Wasp," the first steel ocean-going steamer built in Nova Scotia was successfully launched at New Glasgow, N.S., 10 days ago by the Nova Scotia Steel and Coal Co. Work on this vessel was started in October of last year, and when launched, was practically ready for sea. The boat has a carrying capacity of about 2.000 tons, a displacement when loaded of 2,870 tons, and a speed of 11 knots. The "War Wasp" has been sold to the British Government and will be taken across by the British representative in a few days. A second vessel, about 25 per cent. larger, is now under construction, and a third vessel will immediately occupy the berth vacated by the "War Wasp." Townspeople of New Glasgow presented Col. Thomas Cantley with an address and silver plate, while the Town Councils of New Glasgow and Trenton also presented the former Scotia president with addresses, adding the hope that the East River of Pictou would become the Clyde of Canada.

Women are now employed in the chemical laboratory of the Algoma Steel Corporation. Two-thirds of the force of routine chemists are girls, who have shown aptitude, accuracy and notable orderliness after a short period of training.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

INSIDE PROFILING ON SHELLS

AN OBJECTIONAL feature in connection with the inside profiling of the various sizes of shells, is that of the shells running out of true when thi operation is being performed. To many this detail seems to be one of minor importance and therefore sufficient attention is not given to prevent the possibilities of eccentricity at this particular juncture. Another cause of rejections for faulty machining at this point is that arising from making the diameter too great by allowing the tools to undercut. A tool that has materially assisted in the elimination of these errors is shown in the accompanying sketch; the design of this bar is such that not only is the danger of undercutting prevented, but extra weight has been given to the bar to provide increased cutting power not available in the lighter bar generally used. After the bar is bent to the desired shape, the slot for the cutter is milled-in, and the cutter inserted and afterwards caulked-in to prevent it from maving in either direction. The bar is made long enough to permit of a screw A being placed through the end; this screw is adjustable so that the point B rides on the parallel bore of the shell while the cutter is working, thus following the slight irregularities in eccentricity resulting from the hurried setting of the shell in the chuck. As the cutter is ground from time to time, the adjusting screw A can be set back to conform to the changed conditions.

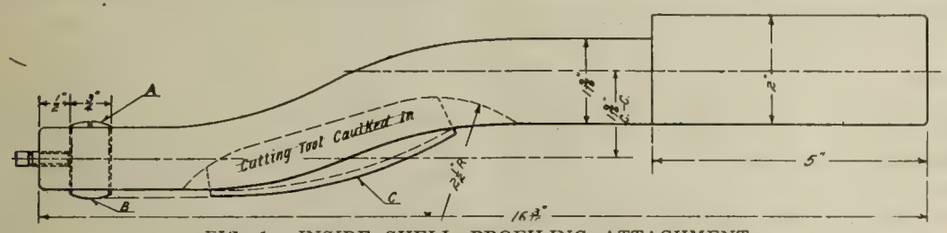


FIG. 1. INSIDE SHELL PROFILING ATTACHMENT.

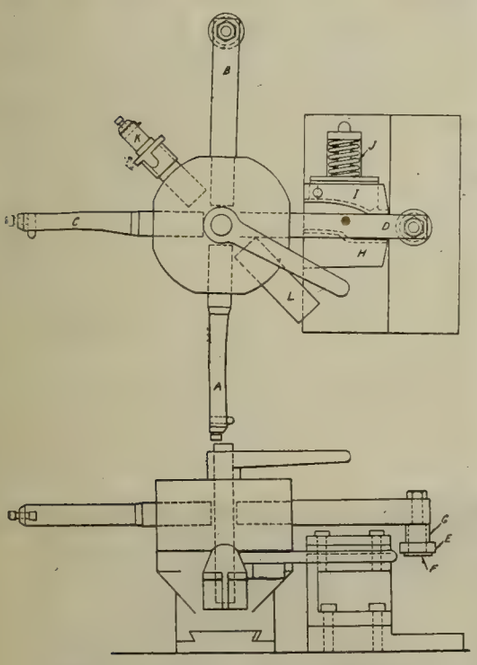


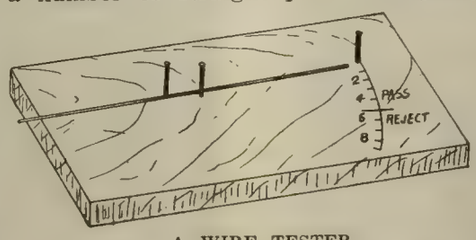
FIG. 2. INSIDE SHELL PROFILING ATTACHMENT.

Another interesting profiling arrangement is here illustrated, the inner profile being generated by means of a cam motion, that is transferred to the cutting tool by the use of bars held in the turret. After the shell has been placed in the chuck, the roughing of the inside contour is accomplished by the tool held in the bar A, its motion being guided by the roller in the bar B on the opposite side of the turret. The finishing is performed by the tool in the bar 6, the motion being controlled by the passage of the roller opposite, through the cam H; this cam being bolted to a fixed support secured to the bed of the lathe, back of the saddle. Opposite to the generating cam H is the pressure plate I, which is forced forward by the spring J. The object of this plate is to always retain the rollers against the generating cam H. The undercutting for the fuse thread is accomplished by the small tool in the short bar K, this bar being provided with an adjustable gauge for the desired position and depth of cut. When the shells are being placed in the chuck, the carriage is moved to the extreme forward position, with the short bar I in line with the lathe spindle, the shell position in the chuck being determined by the gauge stop L.

A WIRE TESTER

By D. A. Hampson.

A CERTAIN manufactured article uses a number of straight pieces of spring wire ⅛ in. in diameter. This wire is bought from various makers, test pieces are selected at random from each lot received, and samples are submitted in competitive solicitation of orders. Some means of comparing and testing has to be employed and, outside of a fatigue test, which consists of bending the wire back and forth in a machine several hours at a time, the most satisfactory test as well as the simplest to arrange is the test board shown in the drawing.



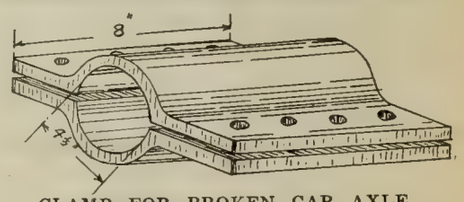
A WIRE TESTER.

A polished maple board has two nails driven in it and the straightened wire is laid between them. With the wire extending 6 in. from the last nail, a zero point is made with a third nail. An arc is drawn, graduated, and the face shellaced. Now, any wire which can be pulled to the No. 5 in. mark and return to zero without acquiring a permanent bend, or "set," will go. If they bend before they reach the 5, the wire or the lot is rejected. Those that remain straight when pulled farthest beyond No. 5 are rated the highest and this grade selected.

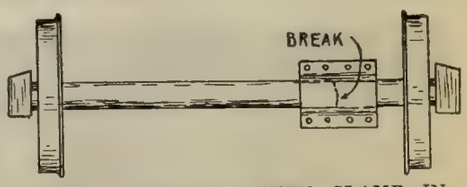
REPAIRING BROKEN STREET CAR AXLES

By H. Middleton.

BROKEN axles on street cars are not frequent, but when they do occur they produce a lot of trouble, expense and delay, particularly if the accident happens where traffic is dense. The way in which one company combats the delay is to use the clamp shown, which is wide enough to reach on each side of the break, and stiffen the axle sufficiently to keep it together while the car is being towed to the barns. Half a dozen clamps for each size of axle are made up and a complete set left at as many stations throughout the city. This avoids the delay of sending to distant shops for repairs and materially cuts down the time of blocking the line of cars and vehicular traffic.



CLAMP FOR BROKEN CAR AXLE.



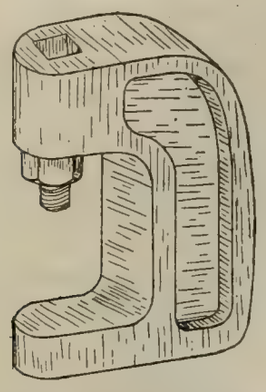
BROKEN CAR AXLE WITH CLAMP IN POSITION.

IMPROVED C-CLAMP

By H. A. D.

AN inventor has just been granted claims on an improved C-clamp. All who have used the ordinary kind, even the highest priced, have had trouble with

their slipping off sloping or rounded surfaces; this has caused the C-clamp to get a name for unreliability in machine shops and their use in some cases to be forbidden by safety inspectors. The trouble lies in the screw end which (in spite of various swivels) turns as the



C.—CLAMP WITH NON-REVOLVING.

screw is turned and just naturally slides away from the work.

This new clamp has a screw which does not turn. The screw is moved longitudinally by turning the nut. The screw head is square and travels in a squared opening—this prevents turning. The screw used is an ordinary set screw and its point end engages the work. It takes hold—bites in—rounded and slanting surfaces with no chance of slipping because it is fed in without turning. It has an easy renewability—ordinary nuts and set screws are found in every shop. This construction puts the wear not on the clamp itself, but on loose pieces—renewable parts.

PLANING A LARGE COMPRESSOR BED

By D. S. Mann

IN machining the large compressor bed shown in the accompanying cuts several interesting problems were encountered, the shop not being equipped to handle such large work. One of these was the planing, there being considerable of this work on the casting, it having been designed especially to be handled on an open-side machine. The main bearings were to be planed out as well as faced off at the ends; the top also required machining for the oil cover. There were also three openings on the one side and two on the other. The bottom was left rough. The casting weighed practically 7,000 pounds and was over eight feet long.

The only planer with which the shop was equipped was a 30 in. x 30 in. unit, and considerable scheming was indulged in before it was finally decided to do the job at home. The photos show quite clearly how it was handled. A heavy ribbed casting was made to bolt to the planer table, being provided with tongues to fit the table slots so that the strain would be relieved from the clamping bolts. This casting extended about 39 ins. over the edge of the table and was machined to the same dimensions as the regular crossrail so that the saddle could be removed from the planer proper and used on the table. The regular feed screw was also used, the planed portion of the casting being the same length as the crossrail. This necessitated the making and machining of but the one casting. All feeling of the tools had to be done by hand. of course. To prevent the table rising from the reaction of the cut, it was loaded with a number of counterweights.

The bed was placed alongside the planer on the floor and levelled up; due to its weight, no clamping was necessary except when planing out the main bearings when it was placed at right angles to the machine. Several settings were, of course, required and it was necessary to line the bed up for each one. As the bed had previously been bored, this was not a difficult task. The outfit gave good satisfaction, and the bed was finished in record time. Of course, it was impossible to take the heaviest cuts at the outer end of the fixture, but this caused little delay. Needless to say, considerable time was saved over what would have been necessary had the casting been finished on the outside.

BRITISH MUNITIONS OUTPUT

DR. CHRISTOPHER ADDISON, Minister of Munitions, speaking in the House of Commons, London, England, recently, on the estimates for his department, gave a striking account of the work of the department since it started a little more than two years ago.

Dr. Addison said that some conception of the magnitude of the production of explosives might be formed from the fact that in March of 1917 the capacity for the production of high explosives was more than four times that of March of 1916, and 28 times that of March of 1915.

The Ministry had recently reached such a state of production with respect to gun munitions that it was able to divert certain national factories to assisting other sections of the munitions programme.

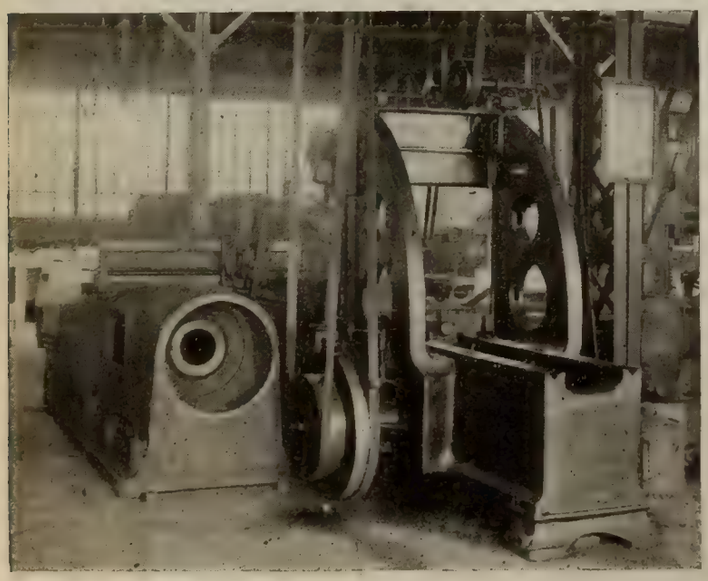
He mentioned the discovery of a component of a new type which possessed great advantages for certain purposes. A large supply of this had been produced in a short time, and was proving of the greatest value in facilitating the advance at the front and in saving life.

Enormous Stock of Shells

The requirements regarding the accumulation of a great reserve of field gun ammunition would be met in good time, and, despite the enormous expenditure in the first nine weeks of the offensive, the stock of shells had only fallen off seven per cent. Field Marshal Haig had enthusiastically reported on the accuracy and fine detonating quality of the ammunition, whether it was used for wire cutting, barrage, or other purposes.

The ouput of machine guns and rifles was full equal to the demands, while for railway purposes tracks pulled up in England, Australia and Canada, had been utilized. Canada had arranged to pull up 800 miles of track and ship it complete when wanted. More than 2.000 miles of track had already been supplied in complete condition, and nearly 1,000 locomotives, apart from hundreds supplied by the railways.

The supplies of new design tanks were coming forward excellently, and, continued the Minister, "the end of the story is not yet, for the enthusiasm of Colonel



PLANING A LARGE COMPRESSOR BED.

PLANING A LARGE COMPRESSOR BED.

Stern, the inventor of the tanks, and his colleagues knows no limits.

Steel Output Increasing

With respect to steel, the Minister said that the output of steel before the war had for some time been stationary at a little over seven million tons yearly. The output was ten million tons, and he would be disappointed if the country did not reach a twelve million ton output by the end of next year. Within fourteen months the capacity for the manufacture of basic steel had increased by thirty per cent.

The demands for steel were so many that the control had been very close, and despite all the help from Canada and the United States, he would not offer any immediate prospect of relief. Notwithstanding the cost of material and labor, the Government was obtaining steel plates at home, at less than half their cost in the United States, while shell steel cost 30 per cent. less.

Referring to salvage operations at the front, the Minister said it was now possible to reform hundreds of thousands of 18-pounder cartridge cases weekly at a cost of fourpence each, compared with seven shillings for new cases. Regarding trench warfare, he said:

"While we started behind in the race, we are prnbably now as superior to the Germans in this section of warfare as we are in that of artillery."

Enormous Demands

More than 1,500,000 steel helmets had been supplied in the last six months, and whereas in December the tonnage required for trench warfare material was 7,648 tons, in the last six months it was 17,963 tons. The work of the Ministry had almost doubled within the last twelve months. The aircraft supply alone at the beginning of the year required an additional 10,000 workers, and that which applied to the aircraft applied also to shipbuilding, gunmaking, tanks, agricultural implements and other necessities of war.

The widespread employment of women had been attended, singularly, with little difficulty. From 60 to 80 per cent. of the machine work on shells, fuse and trench warfare supplies was done by women.

Comparing the cost of ammunition during the past year with what the same would have cost the previous year, said Dr. Addison, the saving was £43,000,000.

Dr. Addison said that before the war the production of spelter in Britain was only one-third of the natural requirements, but that he hoped the capacity would be doubled before the end of the year. Part of the plan involved the working of Australian zinc concentrate, which formerly was under German control. Some time ago steps were taken to obtain control of the wolfram ores of the Empire, with a view to regulating the stock of tungsten for production of steel, and if the prices at Sheffield were compared with those in New York it would be found that the country had profited enormously by the enterprise.

Sub Losses Are Small

Arrangements were in hand, the Minister continued, which increased the home production of aluminum by 45 per cent., while a committee of experts was considering development of copper and other mineral resources of the United Kingdom.

At the suggestion of the United States Government, negotiations are now in progress for further consolidation of interests in America and England. The results of these negotiations, if successful, would be of enormous value, not only in enabling the American Government to place its great resources more readily and effectively at the disposal of the Allies, but in promoting economy in purchase. Dr. Addison said these arrangements had been facilitated greatly by the work of the Balfour mission in the United States.

The Munitions Ministry, Dr. Addison continued, had an interest in nearly 1,500,000 tons of shipments monthly. The submarine campaign, bad as it was, did not provide much comfort for the enemy when he knew, for example, that of the shell components shipped from North America, the total since the commencement of unrestricted submarine warfare, had been only 5.9 per cent. of the amount shipped.

LEATHER BELTING NOTES

IN the choice of a belt, the first consideration is that it be made from a good hide. Some indicative opinion may be had by cutting a thin shaving from the samples offered, and tearing them between the fingers. This will enable even the unskilled to form an opinion as to how much of his purchase is leather, and how much simply weight-making material.

Leather belts lose a good deal of their strength and nature unless impermeated with a certain amount of oil. Good quality cod oil is largely used for this purpose. An ordinary belt thus lubricated, develops a stretching propensity, which is, of course, both troublesome and wasteful. The problem, therefore, is to secure the admittedly advantageous features of "lubrication without stretch." The solution is obvious—Stretch the belt fully before application.

The ultimate tensile strength of belting is not generally a factor in power transmission calculations. It may be reckoned at an average of, say, 3,500 pounds per square inch. Variation in ultimate strength is due not only to possible variation in the quality of the material, but to want of its homogeneity as well. The ultimate strength of a laced joint well put together should be taken at from 1,000 to 1,500 pounds per sq. inch, while that of a riveted joint may be taken as equal to one-half of the strength of the solid belt.

Adhesion of Belts

The motion transmitted by a belt is maintained solely by the frictional adhesion of the belt to the pulley rim. Belts do not communicate motion with precision on account of their liability to slip. The adhesive grip of a belt is greater on wooden than on cast iron rims.

A belt will slip just as readily on a pulley four feet in diameter as it will on a pulley two feet in diameter, provided the conditions of the faces of the pulleys, are area of contact, the tension and the number of feet the belt travels per minute, are the same in both cases. Causes of slippage are because belts are overloaded, dirty, clogged, dried up and neglected.

It stands to reason that while slip may be prevented by undue tightening, this is not the right method to make the belt do its full duty. A belt properly filled and of correct dimensions for its work, should break before slipping.

Engineers usually pay little attention to their belting except that which is giving immediate trouble. The ingredients of a leather, cotton, or camel's hair belt, Manila or hemp driving rope, slowly dry out and leave the contact surfaces hard. Unless something is added to replace these natural ingredients the belt or rope cannot be expected to grip the pulley close enough to transmit full load.

Creep of Belt

By creep of Belt is meant its stretching and contracting propensity as it passes over the pulleys, and is due to inherent elasticity and nature of load. The net result is a continuous creep or shifting of the belt around the pulleys in a direction opposite to that in which the belt runs. Belt creep in practice is usually kept within a one per cent. limit, and to make certain of its attainment, the working strain for best material belt body and substantial joint is taken at 40 pounds per inch width single belt, 70 and 100 ditto for double and treble belts respectively.

When a belt runs at a high velocity, centrifugal force produces tension in addition to that existing when the belt is at rest or moving at a low velocity. This diminishes the effective driving force. Double belts are less pliable than single belts and the centrifugal force is greater. Furthermore, the tension is seldom increased proportionately; for these reasons, double belts should not be expected to transmit more than 8-5ths the power of single belts.

Could Spare Father.—Little Denis, out for a walk with mother, noticed a poor, ragged little urchin.

"Yes, dear," said mother. "That poor little boy has no father to give him toys and things, like you have. Wouldn't you like to do something for him? Wouldn't you like to give him your rabbit?"

Denis thought a moment, and then suggested:

"I'd rather give him father!"

A Hedger.—A Cockney teacher was giving a lesson to a class of children and questioning them about the various joints of mutton. The neck, shoulder, leg, and loin had been mentioned. "Now," said the teacher, "there is another joint no one has mentioned. Come, Mary, I know your father is a groom. What does he often put on a horse?"

"A shilling each way, miss," was the unexpected answer.

Problems Entering Into Aeroplane Engine Design--II*

By Charles E. Lucke

The aeronautical engine is emerging from the stage of invention to the stage of design, and this paper suggests steps to be taken towards the satisfactory solution of the problem. It resolves the engine into a light, high-tensioned steel structure, consisting of seamless tubing and forged or welded steel parts, possibly formed in drop forge dies. To this steel stress structure are added certain members, such as the piston, exhaust valve and guide, designed primarily for heat-flow conditions and not for stresses; and certain closing members, such as the parts for the intake and exhaust, which can be very properly cast in aluminum; and the oil crank case closure, which can be made of anymaterial desired and readily available.

CYLINDER METAL—CAST IRON

THE first cylinders built were made of cast iron, with head cylinder and jacket cast in one piece, and the valves being arranged in a side pocket—the ordinary T or L-head construction. It is clear that the weight of the valve pocket is detrimental. The first step in any cylinder-weight reduction, then, is to take that pocket away, retaining the cast cylinder (on the assumption that we do not know how to make any other kind) and putting the valve in the head. This results in the valve-in-head construction, which is now practically universal, but which, strange to say, it took six or seven years to realize.

A similar instance of slow realization of facts exists with reference to the cast-iron jacket wall, which has no other function than to hold water. Cast iron for that purpose, especially in an aeroplane engine is wasteful of material, so the next step is to get rid of the cast iron. When one stops to think how it is to be done, a structural difficulty becomes apparent, and therefore one must not too readily condemn the holding on to the cast iron jacket. The difficulty is of course the necessity of providing openings for the intake and outlet from each valve, an igniter plug hole and at least two pipe connections for the jacket, and in an aeronautical engine under heavy stress there is some driving gear which requires fastenings. This naturally tends toward the use of a casting.

Suppose such a casting is used, with inlet and one exhaust valve each with a port leading out, and such valve seating in the head which turns down to form the cylinder; then the casting may be led around the top, forming the enclosure of the head jacket and joining the several outlets and coming down outside the cylinder. The cylinder-head jacket casting ends in the form of a skirt at about the level of the valve deck, and to this end a tube jacket can be added by any one of several possible fastenings. That is the next step: cast iron for the cylinders, head and head jacket in a one-piece casting, but with sheet metal for the jacket over the cylindrical barrel. It is a logical step, but it took several years to reach it just the same.

Proceeding along the same line of weight reduction, the next step is to cut away this cast iron joining the ends of the ports and forming the wall of the head jacket, and substitute sheet metal welded to the ports by the oxygen welding system. Wherever there are connections to be made for attachment of gears there must be some additional supports welded or brazed on. The cast-iron cylinder is still there, and with cast-iron ports.

Cylinder Metal—Steel

There is a fundamental objection to a cast-iron cylinder for aeronautical work, and it is a perfectly valid one. Cast-iron cylinders do not have to be very thick to be amply strong, so far as the gas-pressure stresses are concerned, but the fact remains that so long as they are cast-iron, no one knows whether they are good cast iron inside or not, and the use of cast iron cut down to ⅛ inch in thickness incurs taking some chances. Hence attention is turned toward steel.

Drawn steel or forged steel is a reliable material and a logical selection, so designers have sought means of using it; but when one stops to think how to use a drawn-steel tube for a cylinder, and get the necessary attachments on it, one soon recognizes that the matter is not so easy as it looks. That is the reason the adoption of the steel cylinder was so long delayed.

There are now several schemes developed for steel cylinders. The first of these is a steel cylinder of a drawn tube formed without a head, screwed into a separate head carrying the ports and the head jacket cast in one piece. This is rather a satisfactory way of attaching a head, but it involves more than one difficulty. When such a screwed head is set up against the shoulder, it is not at all clear just where it is going to stop; and to secure the proper position one must either scrape the faces or shim them—neither of which is a nice job. A further objection is the considerable weight of the cast iron in a rather complicated casting, and also the inner wall of that cast iron is a stress wall, the stress of which must pass through the thread to the cylinder. There is no objection to using a casting if it is not stressed, but a casting under stress is not satisfactory and is to be retained only in the absence of something better.

Complete elimination of castings has been tried by using all-steel and sheet metal welded together, but this did not prove satisfactory for a very interesting reason. A flat sheet-metal head on which the valves are seated will not remain flat, and a round valve seat will not stay round. Such sheet metal tends to warp out of shape, and with it the valves will not stay tight. However, the material does not break, which is something worthy of thought.

To eliminate the weld between the steel cylinder and head, another construction was developed. In this, a seamless drawn-steel shell with head just like a cartridge is used, and two holes are arranged in the head to seat the valves. It is evident that this is a structure which is sound against all kinds of stresses. It still has some of the difficulties of warping the seats, causing leakage of the valves; and when a valve leaks the amount of heat developed is tremendous. Once a valve starts to leak, it is only a question of a short time before it will be completely destroyed.

Aluminum Combination Cylinders

The particular construction of cylinder just described is rather difficult to attach to its jacket ports. It is interesting to note one case at least in which a satisfactory attachment has been worked out, and that is the Hispano-Swissa engine, now used on the European war front, and now also being built in this country. In this particular engine the entire outside of the cylinder is threaded, and the cylinders are screwed into an aluminum casting which is double-walled just like the cast-iron block casting of an automobile engine. The thread performs the double purpose of holding the cylinder in place and bringing its head up against the aluminum cast head which carries the ports, and also acting as a thermal bridge between the metal of the cylinder and the metal of the aluminum casting which carries the jacket water. Without the latter there would be poor thermal contact and overheating of the cylinder. While this construction is not entirely satisfactory, it is nevertheless very interesting and suggestive. It immediately calls attention to the fact that a water jacket may be made of an aluminum casting and the ports formed just as easily as in iron, the steel interior carrying the stress due to the interior gas pressures.

It is, however, quite feasible to get rid of the double aluminum wall down along the cylinder barrel into which this steel cylinder is placed and which carries the ports above, by leaving out its interior wall and retaining the outside, or even by stopping the wall just below the head as a skirt to take a short thin tube which may itself be of aluminum, ending at the bottom in a cast stuffing-box ring to act as a joint against the steel cylinder. That, so far as I know, represents the last word in this direction, the steel cy-

*Abstract of A.S.M.E. Spring Meeting Paper.

linder head being bolted up to the aluminum head-port casting at the valve-seat bases, and not just pressed up against it by a remote thread.

One-piece Steel Forged Cylinder

Finally, there is to be noted the one-piece steel-forging construction for cylinder, cylinder-head, ports and ignition holes, surrounded by a sheet-metal welded jacket, a very satisfactory though expensive construction.

These heads are themselves a subject of considerable study. We have first a plain head in which the valve inside diameter is half the cylinder less the width of seat, and half the bridge between the valves. Both valves have stems pointing upward and parallel. The plain cylinder, then, which can be made of a plain, seamless-drawn steel cartridge, and which is so desirable structurally, limits valve diameter, and this is a factor against it. Valve diameter is a strong influence in volumetric efficiency and weight of charge, controlling, as it does, flow-resistance conditions. Naturally, designers must get the volumetric efficiency as high as possible by keeping flow resistance as low as possible. Therefore, the tendency is to go towards larger valves than is possible with the previous arrangement.

Block Arrangement vs. Separate Units

One variation in form for this purpose is the flat bulged head where the valve diameter is larger than before by the amount of the bulge. The flat bulged head is a very desirable thing for larger volumetric efficiency and higher mean effective pressure, but offers some difficulty in manufacture when one is making a one-piece seamless-drawn steel job, but not a serious difficulty.

Another suggestion for getting the same result is to bulge this head upward in the form of two flats and put the valves on the two inclines. It is perfectly clear that a very large increase in diameter can be secured in this way. The valve stems in this case are not parallel but diverge at any angle and the limit is reached when the angle is 180 degrees, in which case they are horizontal.

Block Arrangement vs. Separate Units

The question of block arrangement of cylinders and their jacket vs. separate units deserves some attention. In some cases each cylinder with its jacket and head is entirely separate. In other cases the jackets are cast or welded in a block form, around more than one cylinder — sometimes two and sometimes four, and in some cases six. It is clear that the more cylinders included in the jacket block the less will be the weight of the jacket, because the length of the tangent to two jacket circles is less than a half circumference. But there are objections to the block, and in some cases it may not pay to use it.

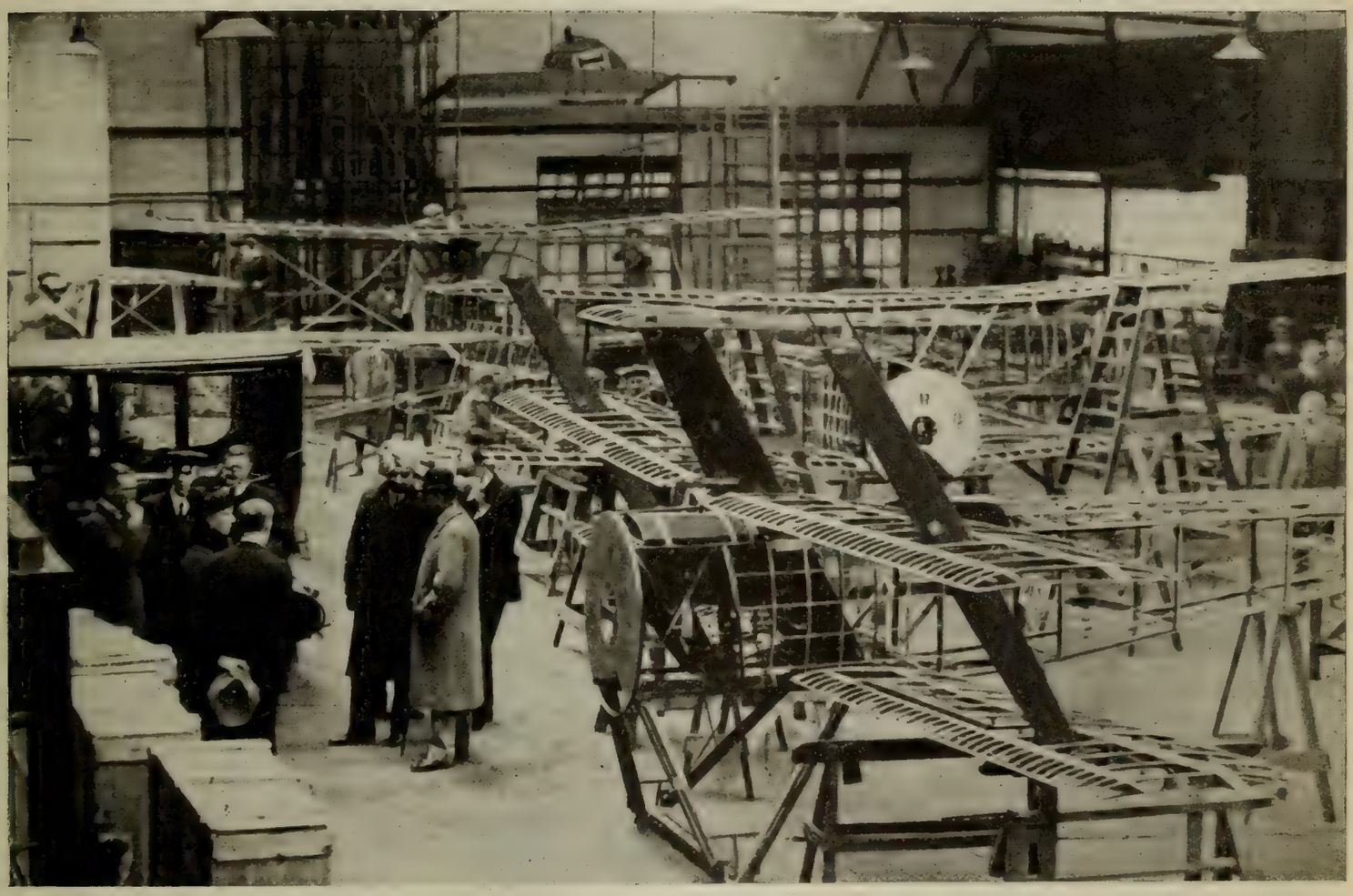
In a case in point, a cast-aluminum block jacket was set down over four steel cylinders which were bolted to the frame by their usual flanges and studs. These cylinders gave trouble on the outer flanges, the end studs breaking off or pulling out. The trouble was caused by the crank case running hot, expanding, and the aluminum block cylinder casting running cool, because it was water-jacketed, not expanding. The cylinders being bent inward tore the stud ends right out.

Another point: the steel cylinder is naturally flexible, and it belongs—in fact, the entire motor belongs—to that class of structures which should properly be termed flexible, exactly similar to bridge structures.

These flexible motors weave just as the engine of a steamship weaves. To attempt to hold one against springing is to attempt what is practically impossible. The cylinders of aeroplane engines should all be perfectly free to go as they will, and not be held on the top in any way. All the block arrangements of cylinders of the sort just described are therefore, objectionable. Steel cylinders have a natural spring and give to them, and if let alone they will serve well; but attempting to secure them may result in serious distortions, or in highly localized excess stresses.

Typical Valve Gears

It was my intention to elaborate on the different arrangements of valves and valve gears, but that would take up too much space, so I will first just draw attention to some typical gears. One of these has a rocker arm overhead, worked



OUR KING AND QUEEN, ACCOMPANIED BY THE MAHARAJAH OF BIKANER, IN THE ASSEMBLY DEPARTMENT OF ONE OF BRITAIN'S NUMEROUS AEROPLANE FACTORIES.

by a push rod from a camshaft in the crank case. In some cases this one push rod works two valves. When the valve stems are in line with the rocker fulcrum placed in the middle, each may be worked alternately. This push-and-pull may be secured by a single cam having a plus and a minus face, or by two opposed plus face cams having a plus face with a fork—the second form being far preferable. That particular form of driving the overhead valve by a rocker from a crankcase camshaft is now regarded as old-fashioned, but here is one case where there is something in favor of the old-fashioned. The new fashion is the overhead camshaft, where one camshaft, running along over a whole line of valve stems, will work them directly, or, being offset a little bit, may work through rockers, all stems being equidistant from the camshaft. When the two valves for one cylinder are on a line at right angles to the shaft, the camshaft may be placed between them, working with double rockers.

The objection to the overhead camshaft is two-fold. In the first place, a camshaft mounted on separate cylinder heads exerts a restrainst against their free movement. The variance of that camshaft will necessarily cause a stress, and the camshaft will be bent, and it is only a question of time when something will fail—either by wear or breakage. Again, the cam is very close to the valve stem, and the adjustment of timing is very delicate. It is difficult to adjust a valve directly driven by a cam so that it will be accurately timed, and stay timed, when a difference of 0.01 in. means several degrees.

The location of the camshaft down in the crankcase, with rods coming up to the rocker arms or levers, allows each cylinder to be entirely free, and does not interfere with its turning in any direction whatever. Also it permits the use of longer levers and a far more accurate adjustment of the timing clearances between the cam and the stem on the long reach rod; but such a reach rod should be either a tension rod or should not be used at all. A push rod in a place like that seems to be fundamentally wrong. Here is a case of a long column of thickness of about half one's little finger, which is, in many cases, opening a valve —an exhaust valve—against an internal pressure of 40 lb. per sq. in., and a diameter of 2 in. or more, and, in addition, overcoming all the inertia of the gear and valve at perhaps 2,500 r.p.m. That is not a proper function for a long column, but is a perfectly proper function for a tension rod, or steel wire, and why no one has put a steel wire between the valve stem and camshaft, which will allow the whole structure to go the way it wants to, instead of abandoning the crank case camshaft, is more than I can see. Of course, the block construction is more favorable to the overhead camshaft, but it has not all the advantages.

Valve Types

Coming now to the question of valves, everyone knows that it is of no consequence to lift a poppet valve more than one-quarter of its diameter. It is also true that the valve will work better, and the volumetric efficiency and mean effective pressure be better, the larger the diameter of the valve and the smaller the lift. That is, the valve should not approach the quarter-diameter lift. That condition conforms to good principles of gaseous flow.

It is also a fact that the timing of the valves on the high speeds in aeroplane engines, when one is desirous of getting the largest possible mean effective pressure, is a matter of basic importance. In no case should an inlet valve close sooner than 20 degrees late, and the amount more than 20 degrees late must still be determined experimentally for each machine, because the porting and manifold is different on each machine and no general formula has yet been found. Likewise the exhaust opening must be 45 degrees plus something ahead; the exhaust closing 5 degrees late plus something, etc. The inlet opening is the only period that does not seem to matter.

Suppose one had a valve lift of 0.4 in.—which would be reasonable for one of these motors—the valve is supposed to lift 0.4 in. and close again in the open period of the valve, which we may assume is 200 degrees in round numbers. If one examines that 0.4 in. lift and 200 degres of crank angle, one finds that a variation of 0.01 in. in the lift corresponds to 5 degrees of crank-angle timing effect. It is clear, therefore, that with valve lifts of the order we are dealing with, in facing the problem of accurate timing we are running into a question of very great accuracy of dimensions, where a difference of 0.01 in. in any part between the cam and the valve stem means a difference of 5 degrees in time, and that means a loss of 5 per cent. in power.

A valve is normally made of a quite thin disk with a small diameter stem joined by a fillet. It sits in a seat supposedly water-cooled. It is a stress member, and is normally designed for stress. Designers talk about Grashof's formulæ for flat plates as the basis for its design, but that has nothing to do with the case.

These valves, designed according to this formula, will burn out. If they are designed according to the flat-plate formula they are quite thin, and their stems also—when calculated for compression loads. Consider heat being added to the outside face of that whole disk, and at a rate that is not equalled in any other structure that we have anything to do with. In the case of the exhaust valve there is some heat added on the other side, too, and when the valve opens there is a tremendous increase on the back, as is also true when the valve leaks. But excluding that extra heat, and considering only the heat added on the flat of the disk, the valve can attain a steady state of temperature only when the heat is being disposed of at a rate equal to that at which it is received. Where is the heat going to go? How is it going to get out? It is perfectly evident that the problem of keeping the valve cool is entirely a problem of providing for getting the heat out, because there is no control over what comes in. The heat flow is radially inward, then axially upward to a stem bearing. After the heat gets up the stem, it turns off through the stem bearing to the water.

When it is remembered that the conductivity of a gas film is ever so much less than the conductivity of the metal through which the heat is flowing, and that the same is true of the water which must ultimately receive it, it is perfectly clear that the amount of area in the stem guide must be very large in proportion to the area of this stem circle carrying the heat up to it, and the ratio of one to the other should be based somewhat on the conductivities, with due regard to gas-oil and water-film thicknesses. Also, the heat received on the disk must pass through the cylinder of metal constituting the stem. Therefore, the stem thickness must bear a logical relation to the disk face, and the thickness of the face should regularly increase toward the centre. If one followed this out, one could easily develop a rational form for valve based not on stresses, but on heat flow.

The ratio of the conducting area to the heating surface becomes the prime variable, and it is perfectly evident that that ratio ought to be the same all through one piece of metal itself, and ought to be increased when the heat must cross a bridge, as at the stem guide where there is a film of oil or dead gas, by an amount representing the ratio of thermal resistances. If one does that, he is carrying through the principle of establishing a regular temperature gradient from the most distant point; and it only requires one or two experiments in that direction to decide what metal to use, and what shape, and how close it ought to fit, in order that any fixed temperature will not be exceeded at the hottest part. So long as it remains below a red heat a valve is all right, but as soon as it attains a red heat it will first oxidize and warp, and then will cause preignition.

This thermal study of a valve has not been undertaken by anyone in the shops. It is one of the things that the scientific men are contributing to this problem, but it is now about to be put to practical use. The same situation exists with respect to the piston, as the following shows:

Piston Types

The ordinary piston, as built for aeronautical motors, has been a failure; and even in the best motors to-day I venture to say that, next to the exhaust valve, the piston is the source of greatest trouble. I put it before the exhaust valve. I think more accidents and trouble can be traced directly to pistons than any other single part of the engine structure, and yet pistons have been entirely neglected from this thermal standpoint. In the first place, the aeronautical man, in starting out to build his aeroplane on the automobile model, had in mind only one thing—to take metal away from every possible place with the idea that the metal was there only for stress purposes and might be taken away as long as the stress did not go above a certain value. What happened? In the first place, the piston was cut off from one

and one-half diameters long to less than one diameter long, which reduced the contact between the piston barrel and the cylinder. Not being satisfied with that, the early designer bored holes in the piston and then cut the head down until it was ⅛ in. in maximum thickness, and frequently only 1-16 in. across the top. So far as stresses were concerned the piston thus reduced was all right, but it ran hot and soon gave trouble.

Consider the piston from the standpoint of heat dissipation, and something surprising follows the logic of the analysis. The piston is receiving heat all over the top at a very high rate. Where is the heat going? It must go out through the barrel walls and the oil film to the cylinder—that is the only place it can go.

It is perfectly clear that the heat received within a circle drawn concentrically on the head must pass radially outward through a cylindrical surface equal to the circumference of the circle multiplied by the head thickness at that point. The heat received within a larger circle drawn on the head, passing also radially outward, must have a larger head thickness at its circumference. If the temperature is not to get unduly high, then the head thickness must regularly increase from centre outward, so that the metal-conducting area bears a constant ratio to the area of the heat-receiving circle to control the temperature gradient from centre to edge. The principle is the same as is used in designing copper electrical conductors to control the voltage drop. It can be shown by a simple equation that the thickness ought to increase on a straight line.

When the heat gets to the edge, it is clear that it must flow down the piston barrel. Therefore, there ought to be as much metal behind the first ring as the thickness of the head at the inside edge of the barrel. Practically no heat can get through the ring, this being a floating member. Then the barrel thickness can be regularly decreased toward the open end, to control the temperature gradient from end to end. It is also clear that the more surface there is around the barrel, and the better the fit, the easier it is to establish a low-temperature gradient between piston barrel and cylinder wall, providing there is sufficient conducting metal in the piston walls, head and barrel. From considerations of that character, backed up by any number of broken and burnt pistons, it is about time we stopped cutting the metal out of the pistons and began putting in considerably more metal. The additional weight is not going to injure the motor at all, but will permanently have the effect of enabling it to run longer periods of time.

Motor Frames

A qualitative analysis of frames is also worth while. The frame of the aeronautical motor has been regarded as a thing that nobody has to be bothered about. It was a crankcase and, of course, we had lots of crankcases. Automobile crankcases had been made in great numbers and variety, and it seemed a simple thing to create an aeronautical-motor crankcase from that of an automobile motor.

Now, it is a fundamental fact that if one is going to reduce the metal weight of a structure such as this, to a minimum, every piece of metal should be required to carry a very heavy stress—as heavy a stress as possible, and do it all the time. The basic principle, then, of weight reduction, after the thermal considerations have been disposed of, and the conditions for high mean effective pressure and thermal efficiency properly met, is to make the metal carry real loads. That is not to be accomplished with the ordinary crankcase construction, because the crankcase is a reasonably heavily stressed member, and is subjected to complicated sets of stresses that cannot be opposed with any economy of metal weight by a common casting of box form—which is all that the ordinary crankcase is.

The old-style crankcase, of upper and lower halves, formed a box with holes on top to take the cylinders. The lower half of the box carried webs, which in turn carried the bearings with top caps. If one started off with the idea of designing a structure as little adapted to the stress conditions as possible, this is about what he would get. Consider the fact that the stress due to the gas pressures is always upward, producing tension in the cylinder and its fastening to the frame that is carried out along the flat top of the box as a beam load and down along the upper side walls as tension; then through the parting joint to the lower side walls, and then through the webs as beams from both sides to the main bearing and shaft, where it finally ends. Coming around like that is an excellent example of indirectness of stress transmission and consequent demand for the maximum of metal.

Consider also that the crankcase is stressed in another way, in that it has in the 4-cylinder motor a pair of cranks acting downward between a pair acting upward, so that there is a rotating radial centrifugal load due to both rotating mases and the inertia of the reciprocating parts. This sort of loading puts on the crankcase the duty of a beam, but in which the direction of loading rotates. It would appear that the box structure is rather better for the beam-load condition than it is for this tension condition.

Slowly these ideas have percolated, and the effects are to be seen. The first direct effect is noticed when this bottom web is eliminated, and the bottom crankcase member ceases to be a stressed member, and becomes merely what it ought to be—a cover. The web is introduced in the top half, and the bearing now has bottom bearing caps held by studs in the top web. Now the gas pressure stress can come straight down through the webs. This, however, is not as satisfactory as it might be, because each web is a plate subjected to the same kind of stresses as a truss is. The next suggestion, therefore, is to build it truss-like; and we find top-web castings taking truss forms, cutting out holes in the unstressed section of the web member. That is an example of appreciation of the nature of the problem. The next step, however, shows rather more intelligence, where there is substituted for the cast web member a high-tension steel long-bolt member running up through a hole in the web. That bolt takes a bearing cap on one end and takes the cylinder flange on the other end. This represents the last word to-day.

It is my belief that the next step should be to eliminate the cast-aluminum webbed box member entirely, and to build the whole thing of direct truss form, using nothing but steel. Furthermore, I do not hesitate to say that it is my belief, founded upon the study of practice and on some analyses, that no member of the aeronautical engine that is subjected to heavy stress should be anything but steel, except when that member is subjected to heat-carrying conditions and must be designed for heat-carrying, rather than stress resistance, in which case it will be found that there is more than enough metal for stress. This leaves only one other class of member, which is the enclosing member, and which can be made of whatever suggests itself.

Now, in the course of this designing, it is necessary to build, test, analyze results and repeat. One can argue, as I have done, at very great length from the standpoint of qualitative analysis; but that sort of analysis, however nicely it leads into certain directions, as shown, does not give the right answer. It requires in addition a quantitative analysis, which can only be obtained experimentally, and which is the final step which we, as engineers, are bound to demand.

CANADIAN BOUNTIES

ACCORDING to the latest report issued by the Department of Trade and Commerce at Ottawa, the following trade bounties were paid out in one year:—

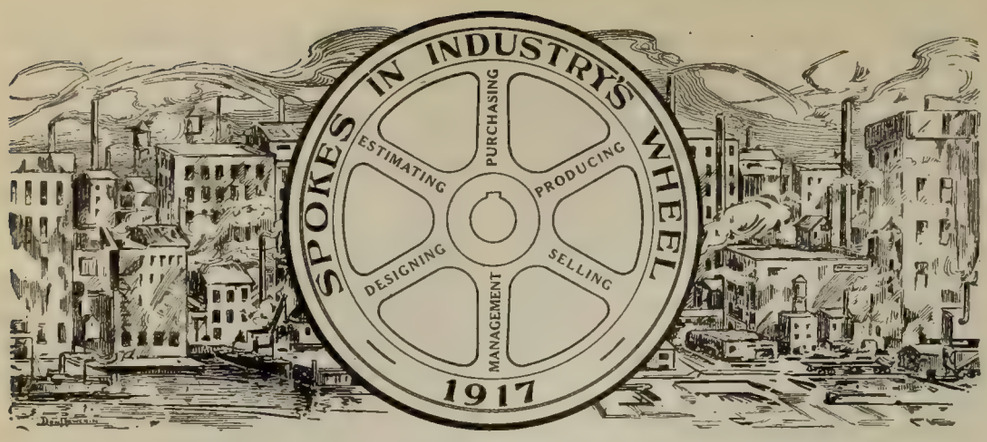
Total bounties paid $21,669,965

Metal	Amt., Tons	Bounty
Pig iron	5,431,547	$7,097,041
Puddled iron bars	42,812	113,674
Steel	4,448,780	6,706,990
Manufactures of steel	499,312	2,868,122
Lead (pounds).	1,187,083,350	1,979,164
Manila fibre (pounds) ...	108,048,641	367,962
Crude petroleum (gallons) ...	169,134,123	2,537,012

Their Pet Names.—A very tall, thin boy reported to a battalion in Flanders. His colonel was bald and elderly, but adored by his men. After a few days' experience of his new command the sub. approached the officer commanding and asked permission to ventilate a grievance.

"I wish you would use your influence, sir, to restrain my platoon from referring to me as 'Legs,'" he said.

"Sure! my lad, sure!" replied the colonel, solemnly; "if you'll use yours to stop my whole battalion callin' me 'Old Baldy.'"



The constitution of industrial enterprise is largely departmental—"spokes in a wheel." This series of articles has for its object the featuring in a racy, interesting and instructive fashion, the training, experience and achievement of those who to-day are transmitting, effectively, energy in their capacity as "spokes in the wheels" of our metal-working establishments.

WILLIAM A. SWEET

THE development and transmission of electrical power has advanced to such a point, and demands such qualifications in the individual that it may well be said that wires like guns need men behind them. Electrical engineering in its operative features, requires a degree of practical experience equalled only by mechanical engineering, and obtainable only by lapse of time and occurrence of trouble. Just as it is impossible to cross bridges before you come to them, so is it impossible to gauge one's ability to overcome trouble until unwelcome events have presented themselves for solution. While it is not implied that the subject of these remarks has a special leaning toward trouble, it is believed that, because of the closeness with which his personal career and activity are interwoven with the development of his present duties, his biographical details possess more than passing interest for readers of this journal.

The early days of electrical engineering were characterized by a rapidity of development experienced by few other industries and the fact that our "Spoke's" experience with electrical machinery dates from the early "Eighties" is sufficient evidence that he not only knows how to meet trouble when it comes but what is perhaps more important, is capable of maintaining a preventive attitude against the trials and sorrows of the station engineer.

Born in the county of Wentworth, township of Salt Fleet, May 3, 1862, William A. Sweet is a Canadian son of Canadian parents, although four generations back his forefathers were of Holland birth. After receiving the ordinary school education of that period, he commenced work at the age of sixteen, learning the milling trade in the town of Woodburn, Ont., where he was employed at the Woodburn Flour Mills. They were owned by John Edmonds and during the three and a half years he was there, Mr. Sweet had charge of a beam engine having a cylinder 20 in. dia. by 5 ft. stroke, running at 30 revs. per min. An interesting feature of this plant was the presence of a water tube boiler of which the following description is given: A main horizontal shell about 6 ft. dia., and proportionate length, had a central rectangular flue 48 in. wide by 30 in. high. About 500 tubes were disposed vertically in this flue, connecting the water spaces above and below the square flue. This boiler was made by some firm in Hamilton, whose name history recordeth not.

W. A. SWEET.

After a short time with Morgan Bros., who owned a flour mill in Hamilton, Mr. Sweet decided to become a real out and out engineer, and with this end in view he commenced his apprenticeship in 1882 with the firm of Reid & Barr, who were engaged in the building of stationary and portable engines and also boilers. The four years spent there were full of opportunity, particularly as regards the operation of machinery, a fact which was to be of considerable influence in the later activities of our friend.

At this time, Mr. Sweet devoted considerable time to study, taking both the electrical and steam engineering courses of the Scranton School, so that he was amply qualified to take charge of the electrical plant at the Royal Distillery, Hamilton. This equipment included one bi-polar dynamo of 400 light capacity, 2 bi-polar motors and one electric lift. Three boilers of 125 horse-power were installed, and the engines were one 100 horse-power, and one 20 horse-power, the latter being an Armington & Simms, built by the Inglis Co., of Toronto. The electrical machinery was built by Tom Kay, of Hamilton.

Mr. Sweet's connection with the various plants now owned by the Dominion Power & Transmission Co., dates from June 1, 1894, when he took charge of the power plant of the Hamilton, Grimsby and Beamsville Electric Railway, this plant being under his care till the present time. His duties were extended in Sept., 1896, to include the power plant of the Hamilton Radial Electric Railway, this latter plant being in continuous operation as a generating plant until 1901, when it was converted to a transformer and motor-generator station. At this time Mr. Sweet was placed in charge of all stations owned by the Hamilton Cataract Power, Light and Traction Co., these consisting of the old electric light plant on King street, the Street Railway plant at the foot of John street, and the Grimsby Electric plant.

The formation of the Dominion Power and Transmission Co., solidified the various electric projects in the Hamilton district and incidentally increased Mr. Sweet's responsibilities so that in addition to the companies mentioned he has charge of plants belonging to Hamilton & Dundas Street Railway, Dundas Electric Co., Brantford & Hamilton Elec. Ry., Hamilton Terminal Co., and Western Counties Electric Co. The Victoria Ave. sub-station belonging to the old Cataract Co., is the only plant where steam generation is still in use.

Social and political activities of limited degree have characterized Mr. Sweet's past life. Radical in politics and Anglican in religion, he has never been attracted by municipal politics. A Mason and member of the I.O.O.F., he is also a member of the C.A.S.E., being one of the old members of No. 2 Lodge, past president of the C.A.S.E. executive, and a warm friend of that organization.

Hunting is his chief relaxation, and a fall trip has been an annual feature for the last 25 years.

On Jan. 26, 1889, he married Cozens Tryphena, of Hamilton, the union being

blessed with two sons and two daughters, one of each of whom is married; the family residence being 78 Colborne St., Hamilton, Ont.

Outside of his duties, Mr. Sweet has various interests, one of special interest at this time being the Hamilton Molybdenum Alloys Co., of which he is a director. His success in life he attributes to a lot of mighty hard work, not a little of it being study in the wee sma' hours of the morning; in fact, he admits that his wife has occasionally hidden books from him for days at a time. She cannot, however, deprive him of technical papers, which appear regularly, and Mr. Swet regards these as one of the necessities of life for the modern aspirant to success.

Cool collectedness is particularly necessary for successful electric station operation and both Mr. Sweet's personality and the various plants under his control bear out the truth of this assertion.

RUSSIA PRESENTS VALUABLE MARKETS

A SPECIAL REPORT on trade conditions in Russia has been forwarded to the Department of Trade and Commerce at Ottawa by C. F. Just, Canadian Trade Commissioner, Petrograd, Russia.

Contrary to expectations, on this side of the Atlantic the many plans for the extension of Russo-Canadian trade have not been interfered with to any appreciable extent by the revolution; in fact, acording to the latest advices, much new development work will be the outcome of the revolution as soon as order is brought out of chaos.

Mr. Just states that the important programs which have been authorized in connection with Russia railway construction, the development of the road system of the empire, the improvement of internal navigation, land reclamation, colonization and settlement should provide numerous opportunities for Canada's participation in supplying a wide range of machinery and of general supplies which will be called for and for which, at the outset at all events, the administration must depend upon outside sources of supply. These should include many of our Canadian specialties which have been evolved by these same conditions and the same necessities of development as those which confront Russia of to-day. It is pleasant to know that the authorities are prepared to recognize the help which Canada can render their country in this respect, and it would seem that they are willing to give us a preference in such matters within reasonable limits.

The question of finance and the difficulties of exchange as well as of transportation throughout the year have had considerable influence in delaying the placing of orders in Canada for any requirements of a character which were not absolutely necessary for war purposes.

Agricultural Machinery

Among the great and immediate necessitities of Russia must be classed a fuller supply of agricultural machinery. The seriousness of the present short supply, due to the reduction of local production and to the interruption of imports, is fully recognized by the Russian authorities, and there is every disposition on the part of the Government, acting in co-operation with the chief zemstvo unions and agricultural credit associations, to meet the situation as far as circumstnces will allow. There is room here for a fuller participation of Canadian works. It is true that the contracts for the 1917 campaign allotted to Canada were larger than in former years. They were confined, however, to a single Canadian firm. Contracts for 1918 will be arranged doubtless during the spring of the year. The requirements to be met are bound to be larger than ever, and it rests with our manufacturers to take advantage of the position.

The question of forest exploitation, particularly in northern Russia, was the subject of prolonged and careful investigation by the Russian Government during the year, and the decision was arrived at to encourage by generous commission the development of exports on a greatly increased scale.

The only possible market of Russia open to Canada now is the Russian Far East, with Vladivostok as the chief centre, and a good many inquiries have reached me in this regard. Complaints have come to hand, however, from the importing houses in Vladivostok of the difficulty in getting Canadian firms to agree to the terms of settlement—i.e., cash against documents in Vladivostok, which prove acceptable to shippers in other countries. It is much to be desired that some kind of agreement could be reached that would enable Canadians to obtain a firm foothold in that market.

Getting Business By Correspondence Futile

Judging by the inquiries I am receiving from Canada there is too great a tendency with Canadian firms to rely merely on correspondence for securing business. This course in a general way is quite a futile proceeding. As I have repeatedly pointed out, little progress can be made in this market without a personal understanding of the situation and without creating a selling organization founded on local knowledge. It is absolutely necessary for Canadian firms which are in earnest regarding the Russian market to send over responsible representatives.

I am fully aware that the question of winning the war must be our chief preoccupation in Canada, and that this will interfere for the present in many instances with such a course. The prolongation of the war makes the resumption by Germany of her old activities an ever remoter possibility, and the way will be rendered easier for entry of new firms and for the formation of new connections. The commercial and financial circles in Russia, however, are looking with some impatience for fuller proofs of interest on the part of the allied countries in this regard, and the matter is one which we shall do well to provide for.

Pooling Business Advised

Perhaps the best advice I can offer to Canadians is to urge again this practical consideration upon their attention. My firm belief is that the position is to be best met, so far as Canada is concerned, by the grouping of like or correlated industries interested in the Russian market, and of frankly pooling Russia business. Under the conditions that are likely to exist after the war such collective or co-operative effort will be more adapted to success than by the old part of individual effort. Again it is not unreasonable to ask that Canadian firms which are believed to have made unusual profits during the war should set apart a portion of those profits as a fund for investigating possibilities of new markets, including that of Russia, and for forming necessary connections in order to maintain their present enlarged output.

Prior to the war Canada was a terra incognita in Russian commercial and fincial circles, but time and circumstances are working a change, and the evidence of Canada's industrial strength and varied production is receiving generous recognition, which only requires to be supported by practical work on the spot in order to secure substantial results. Canada, with her new capacities and new spirit of self-reliance, will find in Russia a rich field for her newly-devoted energies, but manufacturing ability must receive its direction from well-informed commercial enterprise, and both the support of far-sighted and patriotic finance and carefully-matured transportation facilities.

RESTRICT USE OF PLATINUM

NOW that the price of platinum has risen to such a figure that its use by chemists and chemical manufacturers is now practically prohibited, large stores of the metal are in the hands of jewellers who are holding it for making up into rings and other similar articles to sell to people who will pay for it the present inflated price, which is five times that of gold. When sold in small quantities, such as is usually the case, an insignificant amount of platinum will go a long way, it being the third most ductile, as well as malleable, of the metals, but the total of all these small sales reveals the fact that the price of the metal has been forced up to such an extent that its purchase for chemical use, except in these microscopic quantities, is indeed at a minimum.

Platinum is one of the essentials in the manufacture of sulphuric acid by the contact process; in the methods of obtaining nitric acid by the oxidation of ammonia, in the production of explosives and as a catalyst in many other operations.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

MACHINISTS' INSTRUCTION COURSE—XXIII.

By J. Davies

GRINDING is a term that is used for many different operations, many different kinds of material including all kinds of metal, glass, rubber, wood etc., being ground by emery

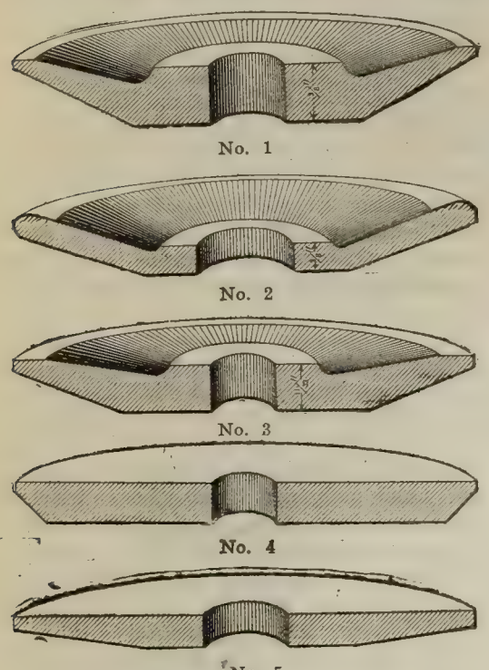


FIG. 85.—TYPES OF EMERY WHEELS IN GENERAL USE.

wheels. It is not our intention to discuss grinding in its many varied phases, but only as it applies to modern machine shop practice. Our old friend the grindstone is rapidly losing its popularity and is conspicuous by its absence in most machine shops. Carpenters and patternmakers, however, regard it with more favor than the machinist. They claim that for grinding tools that have sharp thin cutting edges the grindstone can't be beat, because it does not draw the temper of the steel, and leaves the tool in good cutting condition.

Care of Grindstones

Grindstones are usually run in a trough partly filled with water, as they cut more freely when wet; the water also keeps the work cool and washes away particles of dislodged stone and steel. Grindstones are softer when wet than dry, and for this reason the water should be drained out of the trough every night. If the stone is allowed to remain all night partly submerged in water, next day the wet side will wear away faster than the dry side and there will be great difficulty in keeping the stone true.

Grindstones under favorable conditions rapidly work out of truth and require truing up. This is most often accomplished by a steel bar, or an old file, but the most popular tool is a piece of old gas or water pipe, which is supported on a rest and rolled across the face of the stone. Be sure to have the rest close up to the face of the stone or the end of the pipe may slip in between the stone and the rest; also have the pipe long enough to give a good leverage. The modern machinist is a hog for speed so he has practically discarded the grindstone in favor of the emery wheel, and the word emery wheel in shop language includes all kinds of built up wheels of different grades and materials. Emery wheels are made in different grades of hardness, and makers have their own system of grading.

Selecting a Wheel

In selecting a wheel, more depends upon the material that is being ground, and upon the finish required than upon the grade or hardness of the wheel. It does not follow that a fine grain wheel will always produce a fine finish, and a coarse grain wheel rough finish, irrespective of the material being ground and the nature and conditions of the work. Generally speaking the harder the material to be ground the softer and coarser should the wheel be. When grinding steel or chilled iron the harder the steel the softer the wheel, and vice versa. Brass and copper require very soft wheels. When grinding brass, or copper, or any of the soft metals or alloys with a fine hard wheel, you will have trouble with the particles of metal sticking to the wheel.

Emery wheels are practically cutting tools that are bound together to form a circular cutting tool that presents thousands of cutting edges to the work. These thousands of minute particles break away from the wheel more or less readily according to the hardness of the material being ground, so that when grinding hardened steel it is necessary to have a soft wheel so that these numerous cutting edges will be worn or broken away rapidly and new cutting edges presented to the work.

Shape of Wheels

Figs. 85 and 86 show the most common form of wheels in general use. Nos. 1, 2 and 3 are difficult forms for endurance in cutting into sharp corners. No. 5 is a solid soft free cutting wheel, and is used on fluted reamers and milling cutters, it is made with both sharp and round corners. No. 6 is a cupped wheel used for face cutter sharpening or face grinding. No. 7 is a plain cylindrical wheel used for general work and surlace grinding. No. 8 is a very narrow wheel for cutting-off hardened stock, slotting or similar work; these are made as narrow as 1/16 in. No. 9 is a cone which can be used for wood gouges that

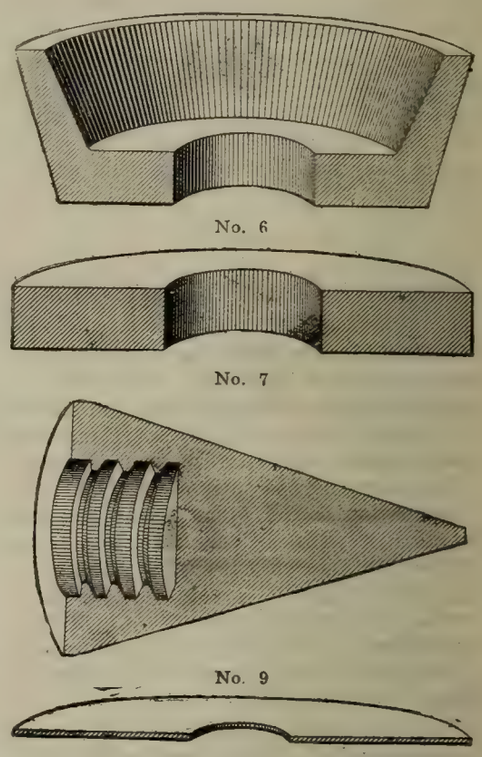


FIG. 86.—TYPES OF EMERY WHEELS IN GENERAL USE.

are ground on the inside of the curve of the blade. Many other shapes are manufactured but these are the principal ones used. These wheels can be altered to other forms as desired.

Truing Emery Wheels

It is essential that the grinding wheel should run quite true and bear evenly against the work over its entire cutting surface. A diamond is undoubtedly the best tool for truing small wheels but unfortunately diamonds are quite expensive and are not very much in evidence in general machine shops being the exception rather than the rule. When they can be obtained, they should be set in the end of a round bar, Fig. 87 which enables them to be used in any position. Some machines have devices for holding the diamond point to the wheel, but the writer has observed that most grinder

FIG. 87.—DIAMOND DRESSER.

operators prefer to hold the tool by hand, resting it upon some stationary object while the revolving wheel moves back and forth past the tool, or the tool moves past the wheel.

Truing with a diamond is not practicable for rough work, and where large and coarse wheels are used, some other method of dressing the wheel must be resorted to. A dressing tool made of steel or chilled iron disks that are free to revolve on a central spindle is shown in Fig. 88. This tool is pressed against the wheel and as the disks revolve, the teeth strike the wheel and dislodge particles of emery thus making an even surface. A very useful dressing tool is a lump broken out of an old wheel that is coarse and harder than the wheel to be dressed. It should be kept moving around, applying the different edges to the stone.

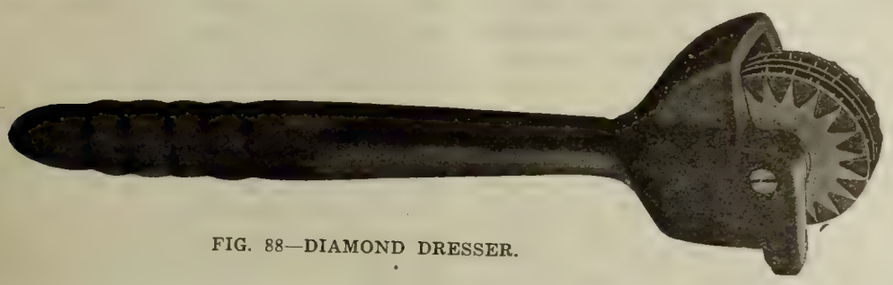


FIG. 88—DIAMOND DRESSER.

Chatter and Its Causes

It often happens that the wheel leaves a lot of peculiar wavy lines called chatter marks. These marks may be due to a number of different causes the name given to them suggests the cause, chatter. The grinding wheel spindle may be loose in its bearings and so chatter,—the work itself may be slender and not properly supported, or the wheel may be too hard. Chattering may often be overcome by usisg a softer or a narrower wheel,—of course the narrower wheel means a slower feed, and speed is sacrificed for a better job.

In grinding cylindrical work where there is a fair amount of metal to remove, it is necessary to flood the work with water to carry away the heat and prevent distortion of the work. Many experiments have been made which prove conclusively that if a round bar is ground in the middle only, and the heat is allowed to generate and spread itself unevenly through the bar it is impossible to grind the bar round. Here is how one operator greatly reduced the heat trouble, he was grinding very thin stock on the surface grinder, and found that the unequal distribution of the heat caused unequal expansion and when his work was finished and cooled off it was unequal in thickness. He therefore turned a groove in the face of his wheel which not only reduced the bearing surface, but also provided an air space which helped materially to keep the work cool.

POWDER MONKEYS

By H. H. Brown.

IN Canada there are four plants manufacturing smokeless powder for use as a propellant in cannon. Two of these plants manufacture "cordite," which originally is an English powder, having been first made about twenty-five years ago. The name cordite was derived from the shape of the finished powder, which resembles a cord in appearance. It ranges in length from ten to twenty-six inches, depending on the calibre of the gun in which it is used. Cordite is a mixture of gun-cotton, nitro-glycerine, acetone, and a small per cent. of vaseline. After being mixed into a thick paste, it is pressed through apertures of an hydraulic press and comes out like macaroni, is cut into proper length, dried, and packed ready to be shipped to the loading station, where it is placed in the cartridges. This kind of powder is made at —— and ——.

The other two plants making smokeless powder are located at —— and ——. Their product is known as N.C.T. (nitro-cellulose tubular) powder. The finished product is cylindrical in shape, having perforations running lengthwise, therefore the name tubular. Grains vary in size, according to calibre, but the average is about one-half inch in length and one eight-inch in diameter. Nitro-cellulose powder is nitrated cotton treated with ether and alcohol, pressed into cakes resembling a cheese both in appearance and consistency, then pressed through dies, similar to the cordite apertures, and cut into grains of the proper length by machinery. The capacity of these plants vary, the largest being equal to 50,000 lbs. per day.

At the latter of these two plants about twelve hundred men work day and night turning out finished powder from raw material. The three main constituents of smokeless powder are sulphuric and nitric acid and cotton. Sulphur from the State of Alabama is used to make the sulphuric acid, nitrate of soda from South America for the nitric acid, and American cotton for the cellulose. After the cotton has been nitrated with a mixture of nitric and sulphuric acid (forty pounds of mixed acid to one pound of cotton), it is beaten into a plup and put through a process of purification, after which it is ready for the "powder line." In this state, nitro-cellulose is also known as "pyro."

Powder Line

The pyro is dehydrated with alcohol by means of hydraulic pressure to take out the moisture that remains in the cotton after it has passed through the hydro-extractors or centrifugal wringers. After treatment with alcohol it is then mixed with ether, which changes the pyro into a collodion state resembling a mealy dough. While being handled in this form, the ether rapidly volatilizes, filling the shop with heavy fumes and intoxicating the operators in a manner similar to an alcoholic drink. On account of the silly capers the men on the powder line perform while drunk on ether fumes, they have been given the name "powder monkeys." Some will sing, dance, and play, while others are made melancholy and are wont to sleep. Some perform silly stunts such as untieing a fellow workman's shoestring. Sleepiness and nausea often follow an ether drunk. The fumes are generally heavy in the "finishing press" house where the powder is pressed through performating dies and granulated by cutting machines while still in a plastic form and exuding fumes. Ether fumes are highly inflammable, almost explosive. Often a spark from a cutting machine will cause the entire room to burst into blue flame intensely hot.

After granulation, the powder is dried and ready to be loaded into cartridges. The process of drying takes about nine days.

Canary Birds

Picric acid, which is probably the heaviest explosive used in high explosive shells, gives off a yellow fume which stains the skin, hair and clothing of the workmen with a staying quality that is faster than the fastest dyes. The hair is dyed a greenish yellow which remains so until it grows out and is cut off. These men are called "canary birds" from their bright yellow appearance.

Acid Rats

"Acid Rats" is the name given to the operators in nitric and sulphuric acid. They are not dyed as deep yellow as their cousin, the canary bird, nor do they present as good an appearance on account of their acid-eaten clothes, which are often reduced to mere rags. Woollen cloth withstands ocid much better than cotton, consequently nitrators wear thick, cheap woollen garments often made in rich colors and large checks. The Inferno is very applicable to the nitrating room, where the nitrators slowly shuffle to and fro with long iron forks, dressed in red checkered trousers, colored shirts, rubber boots and aprons, and capped off with white handkerchiefs to shied their mouths and noses from the hot pungent fumes that float up from the acid pots over which they stand and stir with long iron forks.

No greater field for the study of human nature could be chosen than a smokeless powder plant. In such a plant in the United States, twenty thousand men at work are to be found, representatives from practically every nation and race on earth. In this mass of humanity is found every type from the lowest to those who have scaled the heights of success and known the better things in life. There are representatives from the chosen professions, such as doctors, lawyers, etc., as well as a fine collection of ex-pugs and jail birds working side by side for thirty cents an hour.

The Canadian plants have about the same variety of racial representation as do the large plants in the States.

STEEL INDUSTRY DEVELOPMENTS

The War-Created Stimulus given the Steel Industry is Reflected alike in the Nature and Application of New and Improved Equipment being Installed and Developed.

TURBO-BLOWERS FOR BLAST FURNACES—I.*

By R. H. Rice and S. A. Ross.

THE blowing of blast furnaces is a process which, at best, is attended with considerable variation, both in the operation of the furnace, and in the factors which are necessary to the proper working of the plant as a whole. In modern furnace practice every effort is being made to reduce the number of variables and increase the steadiness of operation, and a careful study of these variables and what is being done to decrease or eliminate them will be useful. The variable elements which enter into the operation of a blast furnace are as follows:—

1.—Variations in the composition of the ore, and variations in the size of the particles thereof.

2.—Variations in the composition and in the size of the particles of the limestone.

3.—Variations in the carbon content, strength and size of the coke.

4.—Variations in the quantity of oxygen blown into the furnace, due to variations in barometer, temperature, and humidity of the entering air.

5.—Variations in the pressure and volume of the blast, due to the character of the blowing agent.

Of variables which have no relation to the blast, these are dealt with as follows:—

1.—Variations in the composition of the ore are being dealt with by proper combinations of ore; and variations in the size of the ore are being dealt with by proper means of sizing the ore, including crushing, screening, sintering and roasting.

2.—Analyzing and mixing various compositions of limestone in order to secure a uniform quality.

3.—Careful choice of coke, and proper attention to the uniformity of manufacture.

4.—An attempt to decrease variables in blowing was made by the introduction of the dry blast. The expense of the plant for this method of removing the moisture from air and the operating cost thereof is so great that this method of treating the blast has not made any considerable progress recently.

5.—The introduction of the turbo-blower has provided a means of rendering the blast conditions more uniform. Not only is the blast pressure held steady but also the very steadiness of the blowing permits accurate measurement of the air volumes, and accurate adjustments thereof, and compensation for variations in barometer, thermometer and humidity; so as to insure a constant rate of flow of oxygen into the furnace, and the accurate adjustment of this rate to the needs of the furnace conditions.

Steadiness and Control of Blast

It is difficult to demonstrate, to those furnace operators who have not had experience with the steadiness and ready controllability of the blast from a centrifugal compressor, what the effect of this steadiness of conditions will have on the furnace; which is in direct contrast to the attitude of those who have had experience with the operation of such units. In no case has there been a failure on the part of the people who have acquired experience with this method of blowing, to appreciate the improvements which result from these conditions.

It is only recently, however, that an accurate means has been provided for correcting the rate of blowing to correspond with the variations in atmospheric conditions. Experience with the use of these corrections is very limited; only one case is known to the writers where some of these corrections have been applied by observation of the atmospheric conditions and an arbitrary correction of the weight beam in accordance with this observation, and in this case (speaking of the Northern Iron Co., Port Henry, N. Y.), the correction has only been made for barometer and temperature, and no attempt has been made to correct for humidity.

It is not to be wondered at that those whose experience is exclusively with ordinary methods of blowing should fail to appreciate the desirability of the steady blast and the accurate measurement of oxygen, for the reason that there are so many variables which necessarily have occupied the attention of our blast furnace operators that it has been almost impossible to differentiate and evaluate the various variables which have to be dealt with. By the recent improvements in the operation of furnaces, which permit the removing of some of the variables by sizing of the ore, and by proper attention to the coke and limestone charges, some of these variables are being removed and the final step would seem to be the removal of all possible variations from the blast itself.

Blast Pulsations Absent

It goes without saying that the blast from a centrifugal compressor will be a steady flow without pulsations. The very nature of the apparatus necessitates this. It also seems evident, and has been proved by actual observation of the blast delivered from a reciprocating machine discharging its air in puffs, each puff corresponding to one stroke of the engine, that the flow of the blast must be more variable and produce some variations of effect in the furnace. Whatever these variations are, it seems evident that it is desirable to remove them. Experience with centrifugal machines on blast furnaces demonstrates this, and shows that an improved output, a somewhat less quantity of dust, and a general steadying up of conditions has resulted. A part of this improvement is due to the steadiness of the blast, and a part is due to the more accurate control of the rate of blowing.

An interesting experience which shows the importance, and even absolute necessity, of accurate control of the rate of air flow has been had with a blast furnace centrifugal compressor within the last few years. In this case the measuring device which was relied upon to determine the rate at which the blast was being blown was so located that the indications of this measuring device were inaccurate; at some time indicating more blast than was actually flowing and at other times less. The result of this inaccurate measurement of air was an inaccurate adjustment of the machine, causing excessive quantities of dust to be produced and a decreased output from the furnace as compared with the reciprocating engines, which were installed to blow the same furnace in alteration.

After operation in this condition for a considerable period the measuring device was relocated where the connections were more accurate. I am informed that the result of this relocation and consequent more accurate operation of the blower, was to decrease the quantity of dust to normal and increase the output of the furnace. In order to determine the effect of improvement in these parts such instances are of extreme value. They show the importance of the proper regulation of the rate of flow of blast and indicate the possibilities which can be expected when inequalities and irregularities are entirely removed.

Governor Controlled Rate of Blowing

A governor has been devised that is capable of accurately controlling the rate of blowing. This governor is used on blast furnace blowers built by the General Electric Co. It consists of a disc riding on the ingoing air in the centre of a frustro-conical portion of the inlet pipe. Movements of the disc are transmitted direct to the valve gear, and ample power is secured by the use of very moderate dimensions. The angularity of the walls of the conical pipe is determined by the desired accuracy of regulation. No packing is necessary and the device is therefore practically frictionless and wear-proof. Differing rates of flow are secured by moving a weight along a scale beam, which is graduated in cubic feet of free air per minute, and calibrated at

*From a paper read before the Engineers' Society of Western Pennsylvania.

**Of the Engineering and Turbine Research Departments, General Electric Co., Lynn, Mass.

the factory before shipment. A recent improvement of this governor consists of a means of adjusting the index on the sliding weight to compensate so that the weight can readily be reset to take account of variations in atmospheric conditions. The following is a description of this device, which is called a volume corrector.

Description of Volume Corrector

On the scale beams are marked with various numbers of cubic feet per minute. An index marked on the sliding weight is set opposite the number of cubic feet per minute which is desired should be held by the constant volume governor. This index is adjustable and its exact position is secured by the setting of three scales which are carried on the sliding weight. These scales are for barometer, atmospheric temperature, and atmospheric humidity. Proper settings on these three scales are made corresponding to atmospheric conditions, and this automatically sets the index on the sliding weight in such a position that the corresponding volume on the scale beam is corrected for the atmospheric conditions as set.

A phenomenon with which we had to deal in the early days of our experience with centrifugal compressors on blast furnaces was the so-called "surging" which appeared when the machines were operated at considerably less rates of blowing than those for which they were designed, or when excessive pressures were met with, as in case of tightening up of the furnace. The occasional phenomenon which is often called "surging" is only met with when, at normal pressures, the volume being blown through the centrifugal compressor is considerably less than that for which it was designed. In case of high pressures, for instance, with a tight furnace, this phenomenon may be met with, although the volume discharged is about that for which the machine was designed. It consists of an alternate forward and backflow of air through the compressor, and is the result of the improper functioning of the discharge vanes owing to the variation of blowing conditions from those for which the vanes were designed.

These alternate forward and back flows through the compressor result in a variation of pressure in the discharge mains of sometimes as great as two pounds, and cause some irregularity in the working of the furnace. This phenomenon is not peculiar to any one type of centrifugal compressor, but is met with in all types. For some time after the installation of our first machines this phenomenon was difficult to deal with, particularly as the first machines were designed for much larger quantities than have ever been blown through them. However, in the 10 years of experience which we have had with this apparatus effective means have been devised and applied which render it unnecessary that any such phenomenon should again give difficulty.

"Surge" Elimination

The steps which have been taken to eliminate this surging are: First, the reasonable proportioning of the machine to the requirements of the furnace; second, provision of a by-pass with an automatic valve which, under conditions which would ordinarily permit surging, leads back into the inlet a small quantity of air. This valve is self-compensating for variations in volume and pressure, and once adjusted needs no attention. The use of this apparatus increases the efficiency of operation in conditions where it is operative, since it maintains the proper air discharge pressure without diminution.

The centrifugal compressor, therefore, properly governed, affords a means of blowing the blast furnace with the steadiest possible conditions of blast and the most uniform rate of inflow of oxygen contents; a means of blowing which can be adjusted to meet any variations which may be necessary in the composition and mechanical conditions of the charge; and one which is automatic in operation when set for any existing condition and quickly reset for any change of condition of furnace or atmosphere, and one which requires comparatively little care and attention on the part of the operating staff.

Another feature, which tends to uniform operations, and permits of more accurate determination of the blowing conditions, is the fact that the turbo-blower is readily manufactured in such sizes that a single blower can be used for blowing a single furnace. In this way each blowing unit is adjustable to meet the exact furnace conditions with certainty, thereby increasing the uniformity of the product and the amount thereof; also decreasing the gas consumption, since the turbo-blower is more efficient in the larger sizes than in the smaller, and also because two units, whether of turbines or of engines, are less efficient than a single unit. This is on account of the fixed losses which exist in every turbine or engine unit and which do not increase in proportion to the size of the unit.

Turbine Efficiency

The efficiency of the turbine need hardly be argued here. It is the cause of its adoption as a prime mover in all our central power stations, and in practically all our industrial plants throughout the country in competition with all other forms of units. Very recent improvements in turbine construction have greatly improved the efficiency of such units, and these units of increased efficiency are now available in cases where steam consumption is an important requirement of blast furnace blowers. The discussion which will follow as to the cost of blowing furnaces will be based upon the use of one of these modern units. Another feature of this type of blowing apparatus is that, considering its efficiency, its first cost and cost of installation, its operating costs are also low.

Operation Costs

Reliable figures have been obtained from existing plants to the actual cost of operation, both for the gas plant and the steam plant. While these figures were not obtained from plants of the same magnitude, or located in exactly the same places, the conditions are so nearly uniform as to location, and figures for gas engines are obtained from plants which are so much larger than the turbine plants compared with them, that it is felt that the comparison is not unjust; in fact, any advantage which would obtain from the character of the plant appears to be in favor of the gas engine. It is well known that large plants operate with greater economy than smaller ones.

The gas engine figures are not those obtained from any one location, but are the result of comparison of figures of plants in several locations. In every case where choice of data could be made those results most favorable to the gas engine have been chosen. In selecting the gas engine installations best adapted for comparison with the steam turbine plant, the best possible examples of recent gas engine practice have been chosen; plants which are in the hands of most capable operators, installed for the purpose of securing the highest efficiency and containing all the various elements for proper operation for such plants. Furthermore, by reason of the care and supervision which is exercised over these plants it is believed that they are, without unnecessary expenditures, now in the best possible condition for service, and maintained at the highest practical efficiency.

Again, the physical location of these plants is also favorable, since they are placed at such points as give them readily proper supplies of ore, fuel, limestone, water and all the other materials necessary for economical operation, and they are equipped with handling devices for storing and transportation of these materials to the fullest practical extent. They are large plants, involving more than four blast furnaces, but in order to bring the plant unit down to one which would be most practical for consideration in new installations they have been reduced to the equivalent of a four furnace plant.

Plant Size Feature

In making this reduction no allowance has been made for a decrease of operating efficiency which would result in the reduction in size. On the other hand, the turbo-blower plant which has been selected for comparison is one which is used with only two furnaces. In enlarging it to the four-furnace plant no account has been taken of the increased economies which would result from the increase in size. Therefore it will be seen that the turbo-blower suffers in two directions: first, that the gas engine plants selected for comparison are larger than the plant which is taken as the standard unit, and second, the turbine plant, which is selected for comparison is, in turn, smaller. If these facts were taken into account we should expect that the figures would come out more favorable to the turbine than results actually given; but it is not desired, in making this comparison, to leave any doubt as to the conservatism of the result.

Installation First Cost

In considering the installation of a gas

engine equipment for a steel mill of the type under consideration, the first fact which strikes the investigator is the first cost of the installation. It has not been customary in the past to consider the addition to operating cost which results from the charges necessitated by this capital investment. It is, however, of vital importance in considering the desirability of installation of one type of prime mover or another, that all the elements involved be taken into account in the same way that they are taken into account in other cases involving differences of first cost.

It is obvious that the capital invested in such plants must give some return to the investor, and a proper allowance for this return is a just and legitimate charge against operating expense. Furthermore, these investments involve taxes, which also should go against operating expense; and insurance is an item of the same class. Again, and more important than any of these, is the question of obsolescence, by which is meant the amount to be laid by as a sinking fund to retire or amortize the plant at the time when its usefulness becomes extinguished by the improvements in the available apparatus, whether as to efficiency, as to increased reliability, or in other ways; also to provide for the general ageing of the apparatus which takes place no matter how carefully the repairs and renewal of parts are taken care of. That is to say, this obsolescence charge which I am now discussing also includes depreciation.

It is, perhaps, not necessary to go too deeply into the necessity of an obsolescence or depreciation charge, but a familiar instance which is often cited, to show the necessity of the charge, is the case of the horse, investment in which is automatically extinguished by the ageing of the horse no matter how carefully he is taken care of, kept free from sickness, and otherwise preserved so far as possible in good condition. While the depreciation of machinery is often not so rapid or so easily seen as in the case of the horse, the two instances are fairly analogous.

If these fixed charges on the investment are not taken care of by charges against operating expense, they must be handled in some other manner, by charges against the product of the mills, or otherwise; which charges are wrongly allocated and do not show, unless put into operating expenses, the true value of investment in the various types of apparatus.

In most steel plants it has been the custom to consider merely the running charges. The management has been given the plants to operate, and it has been judged by this cost of operation without including the fixed charges due to investment. This had led to an inaccurate view of the desirability of extreme efficiency in the prime mover and does not consider the cost of obtaining this high efficiency. This leads to a use of the most expensive plant, provided such plant gives a larger output from the gas available without regard to the first cost.

OPERATING COSTS ADVANCE 80 PER CENT.

IN the United States there is a very general demand on the part of traction concerns for higher fares, due to the increased operating costs since the outbreak of the war. To show how the high cost of fuel and materials have affected the traction companies, the following compilation of the costs of fuel and materials in 1914, as compared with 1917, and the percentage of increase, is given:

	1914 Price.	1917 Price.	P.C. of Increase
Cast iron car wheels, each	$ 7.06	8.15	15.15
Steel iron car wheels, each	15.00	22.50	50.0
Round steel axle blanks, each	30.45	23.51	14.65
Brill axles	17.12	18.84	9.96
Armature coils, G-57, each	125.00	151.56	21.2
Armature coils, W. H.-510, each	26.00	40.66	51.2
Copper wire, per lb.	30.00	62.50	107.0
Soft steel, per cwt.	.16	.35	118.9
Glass, for car windows, per box	1.65	4.50	172.5
Brake shoes, per ton	4.05	5.07	25.2
Street car controller, each	25.00	45.00	80.0
Trolley bases, each	17.00	24.00	41.1
Rail, per ton	32.40	60.00	85.1
Track bolts, per cwt.	2.25	3.58	59.1
Track spike, per cwt.	1.85	2.39	29.18
Oak ties, each	.69	.88	27.6
Crushed stone, per cu. yd., delivered	1.25	1.70	41.60
Tongue switches and mates complete, each	290.00	355.00	22.40
Wire nails, per keg	1.88	3.45	78.20
Portland cement, per bbl.	1.30	2.19	68.50
Sand, per cu. yd. delivered	.50	1.25	150.00
Gravel, per cu. yd., dlvd.	.85	1.25	47.10
Structural beams, per cwt.	1.10	4.00	263.60
Coal, per ton, delivered	1.50	4.50-6.50	333.33

In addition to the foregoing, it is pointed out that wages have increased during this interim from 15 to 25 per cent. and that whereas two years ago a mile of trolley wire only meant an investment of $325, it now requires $725. Altogether the traction companies must now pay on an average of 80 per cent. more for fuel, materials, etc., than they did heretofore.

WORK OF CANADIAN RAILWAY TROOPS

THE Government at Ottawa has received from General Headquarters in France the following summary of the work of the Canadian railway troops for the month of April:

Broad gauge lines—

Miles located	44.75
Miles graded	36.25
Miles grade repaired	43.55
Miles track laid	51.50
Miles ballasted	46.45
Miles surfaced	43.67
Average number of miles maintained	60.70
Average number O.R. (ordinary ranks) C.R.T., daily on construction	1,597
Average number O.R., C.R.T., daily on maintenance	686
Casualties from shell fire, officers	none
O. R.	7
Average number of British unskilled labor attached	2,660

In most cases these lines were laid over the remains of old metre-gauge lines, which tended to hinder rather than help the work. Owing to the destruction of the lines by the enemy, it was necessary to do a considerable amount of bridge work.

Narrow gauge lines—

Miles located	57.58
Miles graded	64.98
Miles grade repaired	28.74
Miles track laid	72.89
Miles ballasted	77.84
Miles surfaced	49.63
Average number of miles maintained	100.06
Average number O.R., C.R.T., daily on construction	2,504
Average number O.R., C.R.T., daily on maintenance	1,258
Casualties from shellfire, offiers.	3
O.R.	75
Average number of British labor attached	3,276

Weather conditions during the beginning of April were bad. In many cases, building of narrow gauge railways was carried out under shell and machine gun fire, the former necessitating constant patrolling and repairing.

TRADE ENQUIRIES

THE following enquiries relating to Canadian trade have been received by the Department of Trade and Commerce, Ottawa from which further particulars may be obtained.

1023. **Railway sleepers.**—A railway engineer in France wishes to arrange for supplies of railway sleepers in lots from 100,000 to 1,000,000. The sizes of sleepers generally used are:—

2	metres	60	centimetres	long.
0	"	24	"	wide.
0	"	14	"	Thick.

1024. **Machines, tools and materials.**—A French concern which is erecting large works for the manufacture of locomotives and railway materials wishes to secure supplies of machines, tools and materials from Canada.

1025. **Locomotives and railway materials.**—A French railway engineer wishes to get in touch with Canadian manufacturers of locomotives and railway materials.

1028. **Galvanized sheets.**—A hardware firm in British Guiana desires to import from Canada galvanized iron sheets and barbed wire.

1062. **Motor-cars and accessories.**—A manufacturers' agent in Jamaica would like to secure an agency for motor-cars and accessories.

Military Inspecting Officer—"Now, sergeant, what precautions do you take against infected water?"

Sergeant—"Well, sir, first we boil it,"

Officer—"Good."

Sergeant—"Then we filter it."

Officer—"Excellent!"

Sergeant—"Then we drink beer!"

Assist in the work of preventing accidents for your own sake and for the good of our country at large.

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PUBLISHERS OF

CANADIAN MACHINERY
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A weekly newspaper devoted to the machinery and manufacturing interests.

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MERCHANT SHIPBUILDING PUBLICITY

AT the beginning of the present month, the United States authorities at Washington gave official intimation that the lid would be shut down tight on information to the public so far as the development and progress of the national shipbuilding programme was concerned. Apparently, the circumstances necessitating such a drastic measure left no alternative—the activities of German sympathizers being directed against new plant establishments at various centres and with, unfortunately, some considerable degree of success. War vessel construction and movements, and the latter even so far as merchant craft are concerned, are on common-sense as well as strategical grounds closely veiled from the public, but whether due to instinct or education, the lack of this data neither arouses curiosity nor causes irritation. In peace times, little of real naval construction achievement gets beyond a very charmed circle in any country, and even when a type ship and its equipment passes into the fleet reserve and, later, into the discard, the detail does not become publicly available. This, of course, is as it should be, for the possibilities are many that in some feature or features even a discard might provide the stepping stones of advantage to an unfriendly or unscrupulous competitor.

To merchant ship construction the public maintain an altogether different attitude, and while instinct may be wholly absent, it can truthfully be stated that education is largely responsible for the stand taken. In no previous war has merchant shipping figured so prominently, whether the latter be relative to what they have accomplished and continue to accomplish, or to the enormous tonnage losses sustained. Their vocation is rightfully looked upon as a peaceful one, in consequence their construction comes under the same category. On this account, instead of a spirit of curiosity being aroused when secrecy is enjoined and enforced, there is liable to supervene a considerable degree of irritation.

It would appear that Hun "submarines" are operative on land as well as at sea if we judge the situation rightly in the United States, and we might as well admit straightaway, that our views as to combatting them do not lie along the lines of secrecy. Meeting the submarine emergency, as the latter is popularly known, whether it be on sea or land, will be most promptly and effectively accomplished by dealing with the devils directly, instead of dodging them as appears to be the meantime tendency both ashore and afloat. We talk of sea power and as individual nations we claim to have land power, to the extent at least of the territory and the people embraced; but have we? Germany is endeavoring to show us that she owns both the land and sea power of the world meantime. Further, she is making a fairly effective display of her ownership. Isn't it just about time we told her and showed her otherwise? Publicity is the most potent known adversary of evildoing as it is of everything else that cannot measure up to the very moderate standards of human decency, then why not lengthen and strengthen its arm instead of paralyzing it?

Let us show Germany, that not only in the United States but here in Canada, we are openly planning and procuring accomplishment of the means whereby her devilishness is going to be absolutely squelched, and let us make the demonstration so comprehensive, and so public, that she will realize that her game of world-conquest is up, and that the oceans and their highways are free to all, irrespective of nationality, creed or color. In our haste to establish shipyards, munition factories, infantry and aviation camps, let us not forget internment camps for the Hun "submarines" at large in our cities and towns, if our jails are already or are likely to become too full. Both Canada and the United States have thousands of acres lying idle on which to erect domiciles for their enemies, besides the adjacent land might be none the worse for tilling.

Many things call for censorship in times like these, and while it may appear to be politic to have the ban operate as comprehensively as can be determined, a big advertising campaign concerning our merchant shipbuilding effort would undoubtedly shake German confidence to its foundations more quickly than will "sealing the lid" tight.

WATER POWER TO SAVE COAL

CANADA depends upon the United States for a large portion of her coal supply both for domestic and industrial purposes; she is therefore much interested in the coal conditions obtaining there. A recent communication from Secretary F. K. Lane, of the U.S. Dept. of the Interior shows how acute the situation has been made by the entrance of our neighbors into the war. One of the remedies urged, particularly applicable to Canada, is the immediate conservation of fuel by the efficient use of all available water power. Elimination of unnecessary consumption of coal is considered a problem of national interest and of immediate concern.

New power requirements should therefore be met, so far as practicable by utilization of hydro-electric energy; this would also apply to present steam generating energy consuming coal or oil in its production. Thus, all water available at water power plants should be utilized to produce energy up to the capacity of the works and the requirements of the population and industries within transmission distance of the site; every facility should also be given for the efficient development of new sites. In regions where water power can be made available, steam power plants should be operated only to carry loads in excess of those that can be carried by water power plants. The adoption of this course, in many cases, would mean cheaper operation, particularly in view of the rapidly increasing price of coal.

Every additional hydro-electric horse-power used in Canada means the yearly liberation of from 10 to 12 tons of coal for domestic heating or other purposes where hydro-electric energy cannot be so effectively substituted.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$47 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	55 95
Basic, Valley furnace	53 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	.....

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	12 10
Chequered floor plate, ¼ in.	12 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 50
Tank plates, Pittsburgh	9 00
Structural shapes, Pittsburgh	4 50
Steel hoops, Pittsburgh	5 25

F.O.B., Toronto Warehouse.

Steel bars	5 50
Small shapes	5 75

F.O.B. Chicago Warehouse

Steel bars	5 00
Structural shapes	5 00
Plates	8 50

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$35 00	$36 00
Electro copper	35 00	36 00
Castings, copper	34 00	35 00
Tin	62 00	65 00
Spelter	11 00	11 50
Lead	13 75	14 00
Antimony	20 00	24 00
Aluminum	70 00	65 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$12 00	$12 00
Heads	12 30	12 30
Tank plates, 3-16 in.	12 65	12 25

WROUGHT PIPE.

Effective July 5, 1917.

Standard Buttweld.

Size.	Black Per 100 feet	Galvanized Per 100 feet
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00

Standard Lapweld.

2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$21 00	$22 00
Copper, crucible	25 00	27 00
Copper, heavy	25 00	26 50
Copper wire	25 00	26 50
No. 1 machine composition	21 50	22 00
New brass turnings	17 00	19 00
No. 1 brass turnings	15 00	16 00
Heavy melting steel	20 00	17 00
Steel turnings	9 00	8 00
Shell turnings	12 00	12 00
Boiler plate	15 00	10 50
Axles, wrought iron	25 00	24 00
Rails	19 00	18 00
No. 1 machine cast iron	26 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	17 00	9 00
Scrap zinc	8 00	9 50
Heavy lead	11 50	10 75
Tea lead	7 50	7 00
Aluminum	35 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up..	net
Coach and lag screws	25
Stove bolts	55
Plate washers ....List plus	10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less..	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd.. steel	10
Machine screws, fl. and rd. hd.. brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in. and larger	$7 10
Structural rivets, as above.	7 00
Wood screws, flat, bright..	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass..	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze.	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws...list plus	20
Collar screws ....list plus 30.	10
Thumb screws	20
Thumb nuts	65
Patch bolts ..... add 40,	10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$100 00
Open-hearth billets	100 00
O.H. sheet bars	105 00
Forging billets	125 00
Wire rods	95 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		6 50
Spikes, ¼ and 5-16 in.		7 00

MISCELLANEOUS.

Solder, strictly	0 38
Solder, guaranteed	0 41
Babbitt metals	16 to 65
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drum	4 35
White lead, pure, cwt.	19 00
Red dry lead, 100-lb. kegs, per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 62½
Linseed oil, raw, single, bbls.	1 27
Linseed oil, boiled, single bbls.	1 30
Plaster of Paris, per bbl.	2 50
Plumbers' oakum, per cwt.	9 00
Packing, square braided	0 34
Packing, No. 1 Italian	0 40
Packing, No. 2 Italian	0 32
Pure Manila rope	0 37
British Manila Rope	31
New Zealand Hemp	31
Cotton Rope ¼-in. and up..	47
Transmission rope, Manila	0 43
Drilling cables, Manila	0 39
Sandpaper, B. & A. ..list plus	20
Emery Cloth .....list plus	33 1-3
Borax, cyrstal	15

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	36
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks list plus	30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 50%; headers, 60; flanged unions, 40; malleable bushings, 50; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$11 00	$11 00
Sheets, black, No. 10.	11 50	11 50
Canada plates, dull, 52 sheets	11 00	11 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	11 70
Premier, 10¾ oz.	13 85	12 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$10 90
Connelsville Foundry Coke.	...
Steam Lump Coal	8 50
Best Slack	8 05

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$33 00	....
1¼ in.	36 00	....
1½ in.	38 00	32 00
1¾ in.	38 00	32 00
2 in.	45 00	33 00
2¼ in.	48 00	35 00
2½ in.	50 00	38 00
3 in.	58 00	45 00
3¼ in.	....	53 00
3½ in.	70 00	55 00
4 in.	82 00	67 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	13
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	6 15
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	11

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 50
Leather in sides	1 35

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THERE has been as yet no marked changes in the coal situation, although an improvement is looked for within the next few months. There appears to be some possibility of a decline in the price of soft coal, but not in anthracite. Prices of steel products continue firm, but there have not been so many advances this week. The situation in the steel trade is somewhat uncertain and developments in the United States are being watched closely. A tentative agreement has been made at Washington between the Government and the steel interests, but no definite prices have yet been fixed. The main point of interest is the probable affect of the pending decision on prices of steel to private consumers. In the meantime buying is being restricted to more urgent requirements. The situation in the pig-iron market is very similar to that in the steel market, and consumers are generally waiting developments. Quotations on domestic foundry irons are still withdrawn. There is no improvement in the coke situation, prices are still very high and supplies are coming forward slowly. The scrap metal market continues dull and prices have a lower tendency with the exception of steel and cast iron scrap, which are firm. Prices of old materials are unchanged. Machine shop supplies are moving out in good volume at steadily advancing prices. Higher prices have been issued on some makes of stocks and dies, pipe cutters, die plates, dry batteries, hammer and file handles, screw jacks, etc. The non-ferrous metal markets are quiet and prices lower on tin, spelter, lead, antimony and aluminum. Machine tools continue to advance and deliveries are getting more backward.

Montreal, Que., July 16, 1917.—Still hovering between uncertainty and possibility, the entire industrial situation is in an unsettled condition, due largely to the delayed action of the American Government in their policy of price regulation on materials required for the war programme. Recent developments have opened the way for relief in the coal situation, both in the States and in Canada, and the early future may have a similar effect in other lines of industry. The uniform price policy contemplated by the United States Government does not entirely meet with the approval of the producers, as they intimate that this would disorganize business, and have a serious effect upon early future conditions. The Canadian situation is, comparatively speaking, unchanged, but interests here are patiently awaiting American developments as a guide to future conditions.

Pig Iron

Although disturbing conditions still prevail in the American situation owing to the uncertainty of the Government's attitude regarding the regulation of prices, current quotations continue to move to higher levels. The nearer approach to decisive action on the part of the authorities has resulted in a rather unsettled market, with activity on the wane. Canadian conditions are much the same, no quotations being available.

Steel

That the situation in steel is nearing a point where a better understanding will be marked between the producer and the consumer seems very apparent, as American developments seem to indicate that the marketing of steel will be placed on such a basis that much of the trafficking will in future be largely eliminated. The scramble for steel on the part of consumers has undoubtedly been one of the chief causes of the present high levels of steel prices, and if the sale and purchase of material is systematically controlled by the Government it may be the means of placing the market in such a position that much, if not all of the uncertainty, will be done away with. Prices are still in the ascendency, but there is the belief that with few excep-

tions the apex has been about reached.

Interest is still centred in the needs of the shipbuilding plants, and to fill the heavy demands for plates remains the unsolved question of the present abnormal situation. Forging billets have again been advanced, the current quotation at East Pittsburgh being $130 per ton, this price being $5 above that quoted last week. The week's advance on steel bars, New York, has been $20 per ton, the prevailing price this week being 5.669c per pound. Tank plates are again stronger, with quoted advances in some quarters; others are expected. The market in sheets, in common with that of other commodities, is strong, but unsettled, owing to pending developments. The United States requirements for steel supplies are being contracted for, with the price to be paid arranged at a later date; the prevailing tentative price to be readjusted following certain investigations into the cost of raw materials and production. The entire situation in respect to early future conditions would seem to hinge on the decision of the Government as to whether the cost to the domestic consumer shall be the same as that to the Government. Price lists on cold rolled shafting have been subjected to another readjustment, the discount being now only 5 per cent. off. Other commodities are practically unchanged, with prices very firm. Local conditions are much the same, with quotations steady; delivery has been relieved a little, but considerable difficulty is still experienced in obtaining material.

Metals

The influencing feature in the metal situation is the pending developments in the American Government policy in connection with the regulation of prices for the various war requirements; this condition is resulting in considerable uneasiness concerning the early future of these markets, and much anxiety is expressed by both producers and consumers as to the final attitude of the Government and its ultimate effect upon industrial conditions generally. The market has developed weakness followed by easier prices. Copper is quieter and lower. Tin remains inactive, and has declined slightly. Spelter has a weak undertone, but is at present quiet. Lead is wavering on possible developments. Antimony continues to weaken on poor demand. Aluminum is steady and firm.

Copper.—The statement that the American Government would pay 25c per pound for their copper requirements, pending a later price adjustment based on the actual cost of production, seemed for a time to clear the atmosphere regarding present conditions, but the report that this price may also apply to all consumers, Government and domestic alike, has created a condition that promises some very interesting developments unless further consideration is given to the matter. In the present state of the market, it is not anticipated that the Government will completely tie the hands of the producers in connection with the domestic demand. The effect of the uncertainty existent has been to develop a weakness that has been reflected in lower prices, the New York quotations having declined 1½c on lake, 2c on electro, and ½c on castings; the prevailing prices this week being 30c, 29½c and 28¾c respectively. On a quiet market local dealers have shaded prices 2c per pound, the current quotations being 35c for lake and electrolytic and 34c for castings.

Tin.—The regulations contemplated by the American Government to control the sale of war materials are not expected to have the same effect on the tin market owing to the fact that the source of supply is in foreign countries; to some extent, however, this metal will no doubt be influenced by the developments that are now pending. The New York market has experienced a fluctuating tendency during the past week, and is at present ½c lower than a week ago, the quotation being 62c per pound. The local market continues firm, but quotations show a decline of ½c on the week, the present price asked being 62½c per pound.

Spelter.—As an inducement for consumers to buy metal, concessions continue to feature the market. Should the regulations that are proposed by the American Government be delayed much longer it is anticipated that the market will become still weaker, as the uncertainty is so influencing the situation that early interest may be hard to revive. The absence of demand has again resulted in a slow market, and prices have consequently declined, the quotation of 8⅞c showing a decline of ¼c on the week Locally the price of spelter has declined 1c, the quotation being 11c per pound.

Lead.—Like other metals, lead has become quite stagnant on the United States market, as a result of the delayed action of the Government in connection with the regulation of prices. The possibility that a one price to all policy may be adopted by the authorities is causing considerable uneasiness, as this would undoubtedly mean a price much lower than that prevailing at the present time, the previous price paid for Government requirements being about 8c per pound. The outside quotation on the New York market is now on a par with the leading interests after the week's decline of ⅛c per pound, the general quotation being now 11c per pound. The local price is well maintained at 13¾c per pound.

Antimony.—This market, while quiet, is not as weak as price quotations would indicate, as these are largely an inducement to draw out buyers, the actual strength of the market being covered by the uncertainty of present conditions. The New York quotation of 16c shows a decline on the week of 1c per pound. The quieter market abroad has been reflected here by a falling off in price quoted, dealers asking 20c, a decline on the week of 4c per pound.

Machine Tools and Supplies

The increased activity in the States has stepped into the breech that was all too evident after the shell industry had attained its maximum in Canada, and at a time when the demand for equipment had fallen off considerably. The machine tool requirements in the States to-day reflect a similar condition to that prevailing in Canada during the first year of the war, with the possible exception that the producers are not so pressed for delivery owing to the large volume of machinery that is at present available, due to the decline in the manufacture of munitions for the British Government; America having completed her contracts in this connection. Owing to the condition of the general steel and iron market the prices on all kinds of machinery continues very firm or stronger, but early developments make the position very uncertain, as the projected regulation of prices may also affect machine tools. The demand for all classes of supplies is well maintained with quotations taking an upward trend.

Scrap

With few exceptions the market in old materials has become weaker and prices have shown a decline. This is largely due to the nervous state that prevails in the market over the pending American regulations covering transactions in sale and purchase of the various commodities. The eventual control of iron and steel must necessarily cover the scrap market, to avoid a very perpelxing situation in speculation enterprise. The American market generally has become weaker, coppers and brass being about ½c lower; with the exception of wrought iron, which is slightly stronger, the situation in scrap iron and steel is considerably easier, Pittsburgh quotations on hydraulic compressed and low phosphorus steel being about 4c lower on the week. The local market is unchanged, with iron scraps showing a weak undertone.

Toronto, Ont., July 17.— The announcement made recently that orders for blankets aggregating one million dollars had been placed among Canadian manufacturers by the American Government for army purposes is an interesting development in Canadian industrial circles, and may be the forerunner of further business.

Although there has been as yet no reduction in prices of soft coal in this district, it is possible that within the next week or so something will be done along this line. At the present time there does not appear to be much hope for lower prices on anthracite coal. The coal situation, although serious, may ultimately be less acute when relief measures have had time to become effective. There appears to be a shortage of coal at the mines, as well as insufficient transportation facilities.

Steel

The situation in the steel market is less tense following the agreement which has been reached between the American Government and the steel interests. It was announced that the entire output of the mills will be made available for the Government's war purposes at a price to be determined on the basis of a cost of production inquiry being conducted by the Federal Trade Commission. It is assumed that when prices are actually fixed that they will be considerably below the

market. It is also predicted that steel prices will decline for the private consumer as well as the Government. What will actually happen in regard to the private consumer is problematical, but in view of the urgent demand for steel and restriction in available supplies for the private consumer it is difficult to see how prices can decline to any great extent. The action of the Government will doubtless have the effect of curbing the upward movement in prices, and thus be a distinct benefit to the trade. While the Canadian steel companies are not directly affected by any action that the American Government may take, domestic consumers are in many cases vitally interested, and are naturally closely watching developments across the line. One thing is certain that there will be no relief in the shortage of steel, so in any event no real relief to the situation is anticipated. Prices of all steel products continue very firm, but there are no important price changes to note in the meantime except plates, which have advanced to $12.

Prices of sheets continue to advance, No. 28 gauge black being now quoted at $11 and No. 10, blue annealed, $11.50. The situation in sheets is getting tighter. There has been a large increase in direct Government orders, and also for making products for the Government. The distribution of sheets from the mills to domestic consumers is getting steadily less as the Government demands increase.

The situation in the steel trade in the United States has not as yet been affected by the Government agreement in regard to fixing prices, but the demand has declined pending further developments. Unfilled tonnages are decreasing principally because of the inability of the mills to accept orders that are offered.

Pig Iron

Prices of domestic foundry irons are still withdrawn, and there is no change in the situation. In the Buffalo market prices are very firm, with an advancing tendency. Developments, however, seem to indicate that prices of pig iron will eventually work to a lower level. Because of this prospect consumers are holding off. Very little tonnage of any grade is procurable from the furnaces in the Buffalo district for 1917 delivery.

Scrap

The market for old materials is dull, with prices generally showing a lower tendency. An exception, however, must be made in cast iron and steel scraps, which are holding firm.

Machine Tools

The chief feature in the machine tool market is the continued high cost of equipment of all kinds, due to the renewed activity in the United States. For the same reason deliveries are getting more backward. Business continues fairly good, the demand being chiefly for general engineering tools.

Supplies

Prices of machine shop supplies are still advancing, due to the high cost of raw materials. Some supplies, which have recently advanced, include Beaver stocks and dies, Gardner governors, Simplex jacks, file and hammer handles. Dry batteries have advanced approximately 10 per cent. All lines of Butterfield goods have advanced, including stocks and dies, die plates, pipe cutters, pipe taps, etc.

Metals

The dullness which has characterized the metal markets during the past few weeks is even more pronounced this week and prices of all metals have declined, with the exception of copper, which is unchanged. Copper, however, is weaker, and the tendency is for lower prices. Appearances seem to indicate that prices have reached the top, and that adjustments probably to lower levels are likely. Although the American Government has not issued any definite statement regarding prices, reports from Washington indicate that prices on Government purchases of metals will be considerably below the market, and also that prices to the private consumer will also be lower than obtain at present. On account of the uncertain situation the market is quiet and little activity is to be expected until the outlook clears.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Copper.—Prices continue nominal and easy, while the market is dull and unsettled. The market has been depressed since the price of 25c was fixed on a purchase of copper by the American Government. It is now reported that a still lower price of probably 20c will be in future paid by the Government, and also that the price to private consumers will be at the same rate. This latest development has further upset the market. The strikes have caused a considerable reduction in output of copper, and unless they are settled now, a greater scarcity of metal than at present exists will result. Local quotations are unchanged, lake and electrolytic being quoted at 36c and castings at 35c per pound.

Tin.—The London tin market is weaker and prices lower, but New York has not followed the lead. The market, however, is uncertain, and very little business is passing at the present time. The position of tin continues to be a strong one, and no marked weakness is anticipated further than a decline of 1c locally. Tin is now quoted at 65c per pound.

Spelter.—The market is weaker and lower, the decline being due to lack of buying support. It is reported that at present prices some producers are losing money, and that some furnaces have been shut down, presumably for repairs. Spelter has declined ½c locally, and is now quoted at 11½c per pound.

Lead.—In keeping with the general position of all the metals, lead is quiet. Apart from requirements for munitions, there is little forward movement, and increasing production is not calculated to strengthen the situation. Lead has declined ½c, and is now quoted at 14c per pound.

Antimony.—Little interest is shown in antimony and lack of demand has resulted in lower prices. Local price is 26c per pound, representing a decline of 2c.

Aluminum.—The market is quiet and demand light. Aluminum has declined 3c, and is now quoted at 65c per pound.

New York, July 16.—Important developments have occurred in the steel industry during the last week, and all branches of manufacture dependent upon iron and steel have been affected. All collateral lines of trade reflect, or will reflect, the agreements, made at the Washington conferences, between Government officials and representatives of the Iron and Steel Institute. The latter were, and are, in a position to speak and to act in full measure for the entire industry. The administration gave assurance of reasonable prices, including a fair profit, to be paid to the steel manufacturers for all commodities by the Army and Navy Departments. The steel companies in turn placed the entire productive capacity of the country, at the disposal of the Government and confidently left the settlement of prices to the Administration, which is now endeavoring to ascertain productive cost of various commodities through the Federal Trade Commission.

Immediately following the happy outcome of the price controversy, came the interesting decision made by the United States Transportation Commission, to renew efforts to distribute orders for the construction of 80,000 steel cars and 2,000 locomotives among American manufacturers. The plan to build railroad equipment by the Government was recently held in abeyance because of a belief that steel would not be available in ample tonnage to build all steel cars; but it is now understood that the mills have given assurance that a full amount of steel will be provided to enable the Commission to carry out its original intention. It is estimated that 800,000 tons of steel will be required to build the cars and 400,000 tons of steel to construct the locomotives, included in the program. Deliveries of the steel probably will be made in monthly installments over a year.

Another and most important development was revealed by the startling announcement made by Major General Goethals, now in supreme command of the Government shipbuilding activities, that the United States Emergency Fleet Corporation will take bids to-day for the construction of two large shipbuilding plants, to be owned and operated by the Government, in which 400 fabricated steel ships of 2,500,000 tons displacement, will be constructed. It is estimated that the building of ship ways will require 12,000 tons of structural steel and that the plants will be ready for the erection of ships inside of four months. The 800,000 tons of steel shapes and plates required in building these cargo ships, will be fabricated by various commercial shops and delivery will be expedited because of this fact.

The latest development is the appropriation of $640,000,000 by the House of Representatives to build a gigantic air fleet and to train and equip an army of 75,000 aviators. The Government has also distributed numerous additional munition contracts and has given various orders for structural steel to be used in improvements at navy yards and arsenals and to build storehouses, hangars and for a key bridge over the Potomac river.

All of these activities are reflected in the machine tool industry. Sixteen manufacturers with munition contracts have placed orders for machinery and negotiations continue actively on many more machine tools. Six more shipbuilding concerns also have placed orders for shop equipment and several large manufacturers of motors and engines for airplanes have closed contracts for machinery and buying continues apace.

Builders of machine tools having contracts to supply the United States Navy, either directly or indirectly, are required by the Compensation Board to give facts and figures to justify the high prices now prevailing for their products.

In the export trade for machine tools, the latest important feature is the resale of many tools originally sold to Russia. France and Great Britain have placed additional orders for lathes and drills and have put out new inquiries for portable electric tools.

Pittsburgh, Pa., July 14.—The pig iron and steel markets have become completely stagnant, the cause commonly assigned being the prospect that there will be regulation of prices, either voluntarily on the part of the producers or through direct action by the Government. A contributing cause, however, is undoubtedly the very high level to which prices have risen, a level that the average consumer cannot see his way clear to follow. In the case of pig iron, all descriptions except Southern iron at Birmingham are above $50 at furnace. If the furnaces have cleaned up their deliveries at $18, furnace, they have done so only lately. Certainly the average foundryman would have difficulty in adjusting the selling prices of his finished products so as to provide for a tripling in the cost of the pig iron. As to the steel works, they of course have high prices and can pay almost any price for pig iron if they need it.

In the case of the finished steel market, really forward buying many weeks ago dwindled to practically insignificant proportions. The forward market practically disappeared, the only market left being the prompt market, for delivery in say from two or six months. Prices in this market have been made by buyers who were exceptionally situated. Either they were making a product that would bring almost any price or they needed some little additional tonnage to average with much lower priced tonnage. Thus the quotable market, which is really a prompt market, has ascended until it averages about double the level at which the great bulk of the steel shipments are being made, under old contracts.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

Price Regulation

This subject takes a new aspect almost every day. To the "food bill" which is having such a tortuous course in the Senate, there was added an amendment giving the President power to regulate iron and steel prices as well as food prices. Within the past week a substitute bill has come to the front, with no price regulation except for food, and the prospect has been that this bill, rather than the other, would be the one that would eventually pass. Now a totally new turn has occurred. The general committee of the American Iron and Steel Institute, the chief body representing the steel makers in connection with sales of steel to the Government, was called to Washington for Wednesday, July 11. After they had been in session one day, the President issued a statement called an "appeal" that manufacturers forego unusual profits at this time, promising all manufacturers a fair profit, so as to maintain prosperity, and enunciating clearly the entirely new doctrine that prices to the Government and to the ordinary consumer be the same, intimating, perhaps, that the Government is as well able to pay as the private consumer, but laying stress upon the fact, which the iron and steel industry has been coming to realize of late, that it is impossible to draw a clear distinction, when we are endeavoring to prosecute the war with our full material resources, where Government purchases end and purely private purchases begin.

On the second day of the conference, after this proclamation had been issued, Secretary of War Baker made a public statement that an agreement had been reached as to Government purchases of steel, the Federal Trade Commission to determine costs, and prices to be fixed so that reasonable profit would be assured, asd attention given to the needs of the steel industry for expansion. As the President's "appeal" must have been intended quite largely to refer to iron and steel, the conclusion to be drawn is that prices to all buyers are to be scaled down very greatly from the present fictitious level. In view of the fact, however, that the aspect of affairs has been continually changing this conclusion may have to be modified or dropped entirely within a few days.

Unfilled Tonnage Decreases

The unfilled obligations of the United States Steel Corporation decreased 503,304 tons during June, to 11,383,287 tons, equal to about a nine months' run, provided the orders were equally distributed in the different departments, which is not the case. The decrease in June was equal to about 40 per cent. of the month's shipment, bookings of all descriptions being about 60 per cent. of shipments. These bookings were made up of Government orders and of special transactions with preferred customers, whose continued needs must be taken care of as old obligations are filled.

The Export Embargo

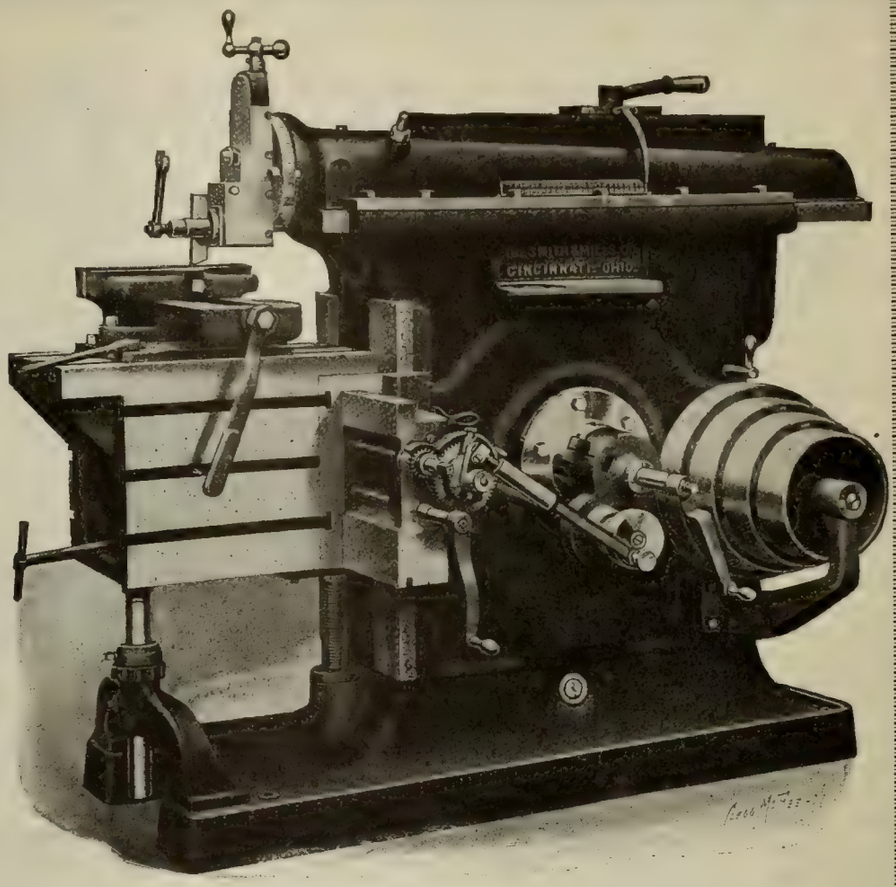
The export embargo proclaimed by the President to become effective July 15, includes in iron and steel commodities, coke, pig iron, billets, plates, and structural shapes. Licenses are to be granted by the Secretary of Commerce. To what extent such licenses will be granted remains to be seen. The object, of course, is primarily to prevent material reaching Germany but there is the further object of conserving supplies for the United States and its Allies. From one view point, Canada might be held to fall between, but there is no use speculating.

Pig Iron

There has been practically no change in pig iron prices for a fortnight, but the market has become stagnant. There is a little buying of odd lots for early deliveries and that is about all. Perhaps sellers would make price concessions if that were likely to result in sales but it is obvious that decline in the market would merely confirm the views of buyers that they had better stay out.

U. S. Steel Corporation Unfilled Tonnage.—The unfilled tonnage of the U. S. Steel Corporation on June 30, 1917, was 11,383,287 tons, a decrease of 503,304 tons, compared with the figures for May 31, according to the monthly report recently issued.

Smith & Mills SHAPERS



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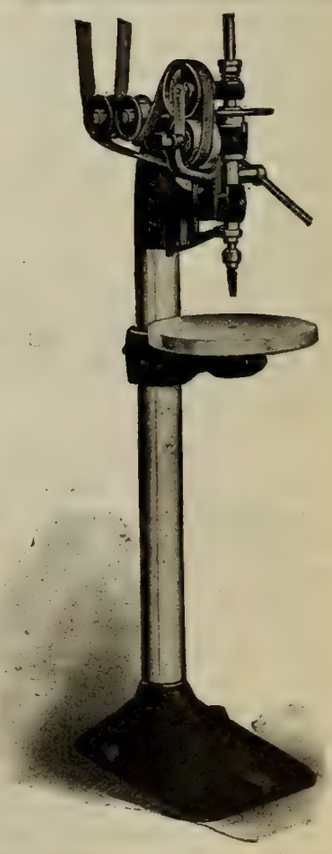


¼-in. Vertical Tapper

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Montreal, Que.—Mansions, Ltd., have obtained a permit to build a boiler room at Lincoln Avenue, to cost $4,000.

Oshawa, Ont.—The directors of the Canada Malleable & Steel Range Co. have decided to dispose of the plant.

Owen Sound, Ont.—Green & Woolrich have begun the construction of a new coal dock for the malleable iron plant. The new structure will be 80 ft. wide by 200 ft. long, and 200 piles will be driven.

Montreal, Que.—A permit has been taken out by the Frederick Thompson Co., electrical engineers, to erect a factory at 7-11 St. Genevieve Street. The building will be 60 x 104 feet, four storeys, and will cost $30,000.

Montreal, Que.—It is expected that the Montreal Tramways Co.'s new steam plant will be in operation within two weeks. This plant has a capacity of 12,000 k.w.h., or of about 17,000 h.p., developed from steam turbine, and a similar installation will be added next year, making a total of 34,000 h.p.

Hamilton, Ont.—The National Abrasive Co. will begin at once the erection of a factory and office building on Biggar Avenue, at an estimated cost of $16,700. The contract has been awarded to the Hamilton Bridge Works, and completion is expected before September. The company will manufacture artificial abrasive, principally polishing and grinding materials. The initial investment in the Hamilton plant will be about $75,000.

Amherst, N.S.—Fire in the International Engineering Works here on July 11, did damage estimated at between $75,000 and $100,000. The blaze developed in the pattern storage room and spread rapidly, completely destroying that building. Other buildings were threatened, but were saved. The origin of the outbreak is unknown. The destroyed building and its contents were partially insured.

GENERAL

Kitchener, Ont.—The W. E. Woelfle Shoe Co. are building an addition to their factory.

Montreal, Que.—The Dominion Oil Cloth Co. have got a permit to build a warehouse, 102 x 75, at 1,235 Notre Dame East, to cost $2,500.

Halifax, N.S.—J. E. Chipchase, the eastern manager for Hinde & Dauch Paper Co., of Canada, Ltd., manufacturers of corrugated and fibre containers, has been in the city for the past week interviewing the box users and gathering the box data, with the view to the further development of this industry in the Maritime Provinces.

Ingersoll, Ont.—The John Morrow Screw & Nut Co. is building an addition to its plant to cost $30,000.

Fergus, Ont.—John Watson will erect a sawmill to cost $10,000, to replace the one recently destroyed by fire. New machinery and equipment will be required.

Strathroy, Ont.—Fire, entailing an estimated loss of $175,000, totally destroyed the three-storey building and its contents of the Strathroy Canning Co. here on July 13. The company is a branch of the Dominion Canning Co., of Hamilton, Ont.

Nobleford, Sask.—A large number of grain elevators are to be erected this summer in the West, according to reports received. The McLaughlin Co. is projecting the erection of one at Nobleford, Sask. It will be the first one built by this concern in the West.

MUNICIPAL

Grandmere, Que.—The Town Council are considering extending the municipal pumping plant.

London, Ont.—Tenders will be called shortly for a motor-driven hose truck for the fire department.

London, Ont.—The Council have decided to purchase a booster pump, on the recommendation of Fire Chief Aitken.

Sarnia, Ont.—A by-law for $25,000 will shortly be submitted to the people for an incinerator plant. John A. Baird, City Engineer.

Verdun, Que.—The City Council have decided to proceed with the laying down of an underground conduit system, for which there is an authorized loan of $225,000.

Hamilton, Ont.—The City Council recently made an appropriation of $2,500 to aid the Engineering Department in the preparation of a report regarding the remodeling of the sewer and sewage disposal system.

Galt, Ont.—It is believed that there is considerable leakage in the water mains, and the Water Commission is considering the advisability of making a test to find the leaks. Dr. Radford, chairman of the commission, suggests buying a pitometer.

St. Catharines, Ont.—The Water and Light Committee have recommended the acceptance of the tender of the Jenckes Machine Co. for castings for the year 1917 at the following prices: Manhole tops, $20.75 each; gulley tops, $20.70 each; Tomlinson traps, $10.25 each.

Welland, Ont.—Tenders for street sprinklers have been received as follows:—Somerville & Son, Sawyer Massey sprinkler, flusher and oiler combined, $600; Studebaker sprinkler, $450; Austin sprinkler, $547; Tiffin sprinkler, $592. No award has yet been made.

Oshawa, Ont.—A by-law calling for construction of a $38,000 filtration plant, was carried here on Saturday by a vote of three to one. Work on construction of the plant will be started at once by the John ver Mehr Engineering Co., of Toronto.

Windsor, Ont.—This city will refuse to recognize an estimate of $40,300 as its share of the apportionment of the cost of the proposed sewer and water improvements submitted in a report by Maurice Knowles, engineer of the Essex Border Utilities Commission. At a recent meeting of the commission, Mayor Tuson declared the city will not sell its waterworks, but is ready to supply water at a reasonable rate.

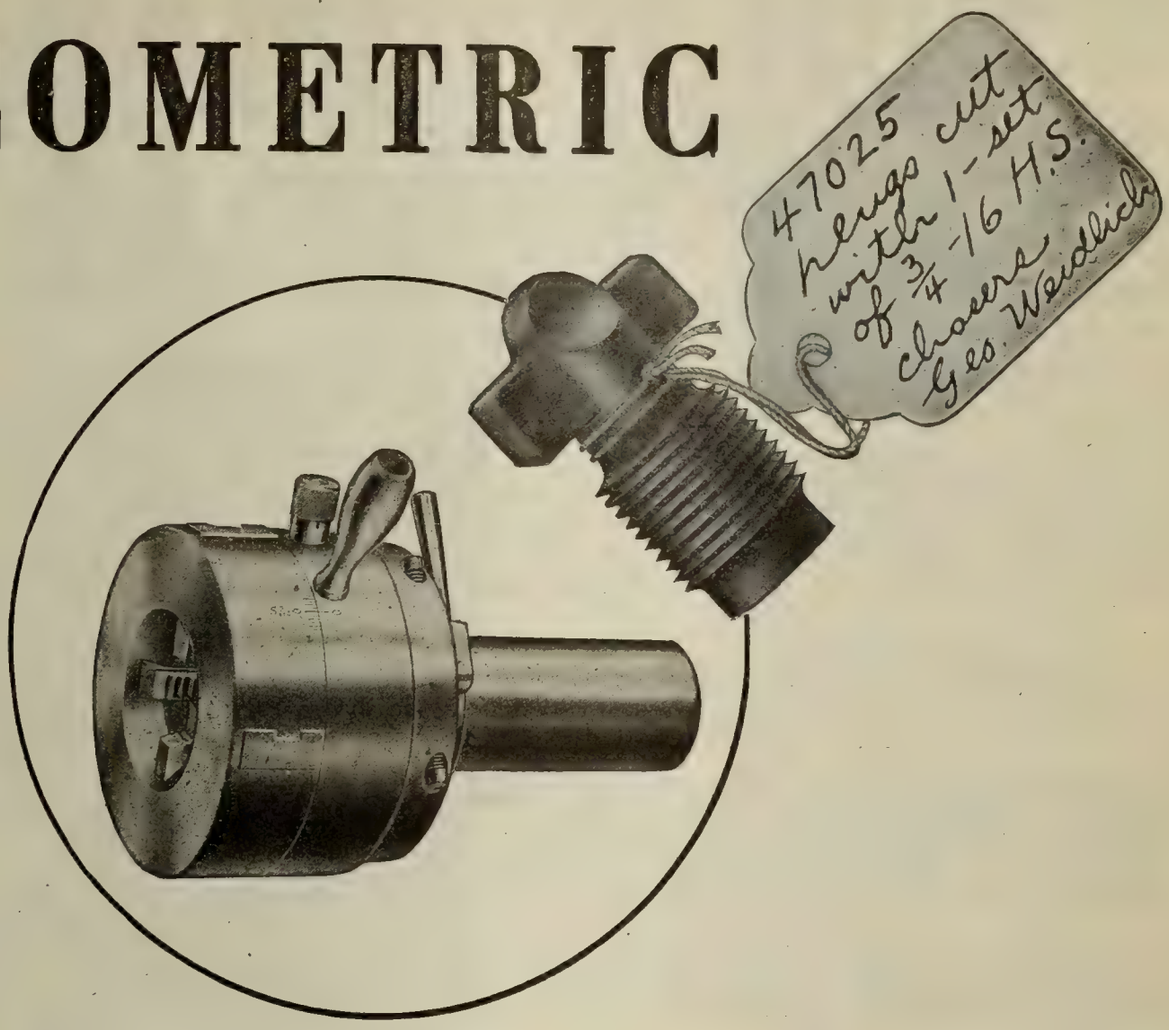
Montreal, Que.—Only one tender—that of the Montreal, Light, Heat & Power Co., was received by the Board of Control for the civic power supply for lighting the streets and for operating the low level pumping station. The company offers to supply primary power for lighting purposes at $27.50 per h.p., and secondary power for lighting at $25.50 per h.p. per year. For the pumping station $26.50 is tendered for primary power and $24.50 is bid for secondary power.

Weston, Ont.—Plans and data for the reconstruction of the sedimentary basin and the laying of a new intake pipe, have been ordered by the Weston Water, Power & Light Commission, to be ready by July 24, so that tenders may be called for as soon as possible. This action was taken upon a special report submitted by Engineer E. A. James, of Toronto, in which he advised immediate adjustment of the water system, as the present equipment does not meet the growing demands of the town.

Swift Current, Sask.—At the City Council meeting held on July 3, on motion of Ald. West and Carter, the Mayor and Clerk were authorized to sign the contract with Theodore Kipp, of Oshawa, Ont., for the purchase of the Diesel oil engine that is to take the place of the present steam plant at one of the city's power stations. The engine is to cost $53,000, and the city will receive $45,000 for the old steam plant. It is expected that delivery will be made within a month of so, or as soon as the necessary money by-laws can be put through.

Swift Current, Sask.—Engineer Calder has recommended the immediate purchase of a 75 h.p., induction motor to be used as an auxiliary. This motor will be a necessary precaution in case of fire and will cost $1,175. He also recommended the purchase of repair parts for pumps, as well as calling for tenders for piping and specials and for the laying

GEOMETRIC



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Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

of the concrete foundation for the new Diesel engine. These recommendations were all adopted.

Winnipeg, Man.—Rapid progress is being made with the construction of the big lock-joint aqueduct from Deacon to the Red River. The Lock Joint Pipe Co. acting as subcontractors for the Winnipeg Aqueduct Construction Co., have fully 20 per cent. of the pipe made and ready for laying. The only remaining contract to be let is that for the big syphon under the Red River and piping on to the McPhillips reservoir, but this, together with the projected reservoir on the site of the present Victoria Park, will, it is thought, not be commenced until the winter of 1918-1919.

ELECTRICAL

Beeton, Ont.—The Hydro Commission engineers estimate that it would cost $15,000 to install a transmission and lighting system in Beeton. A by-law will be submitted to the ratepayers.

Brantford, Ont.—Hydro-Electric service for the suburbs of Brantford Township has been approved, only 36 votes being cast in opposition, out of a total of 193. The by-law, authorizing the issue of debentures by the Township Council to finance the undertaking, received a majority of 158.

New Westminster, B.C.—Permission to run a power line from Third Avenue and Eleventh Street down Third Avenue and across to Poplar Island, to serve the shipbuilding plant of New Westminster Construction and Engineering Co., was granted to the Western Power Co. of Canada, by the City Council.

BUILDINGS

Toronto, Ont.—The Separate School Board have secured a permit to erect a two-storey brick school on the south side of Westminster avenue, at a cost of $21,500.

Toronto, Ont.—A building permit has been issued to the Dominion Bank for a new building to be erected at the corner of Yonge Street and St. Clair Avenue, to cost $35,000.

Montreal, Que.—A permit has been taken out by the Merchants' Bank of Canada to build a new bank building at the corner of Harvard and Sherbrooke streets, to cost $20,000.

Regina, Sask.—In response to the call for tenders for the children's home which is to be built at an approximate cost of $35,000, ten bids have been received by the architects, Storey & Van Egmond.

Toronto, Ont.—E. D. Norris, 97 Waverley road, has been granted a permit by the City Architect to erect a store and apartment building of concrete block construction at 2102 Queen street east, at an estimated cost of $25,000.

Toronto, Ont.—On the recommendation of the City Architect and Property Commissioner, it was decided to advise the Council to sanction the cancellation of the contract for the erection of a dormitory building at the Women's Industrial Farm, and that it be completed by the

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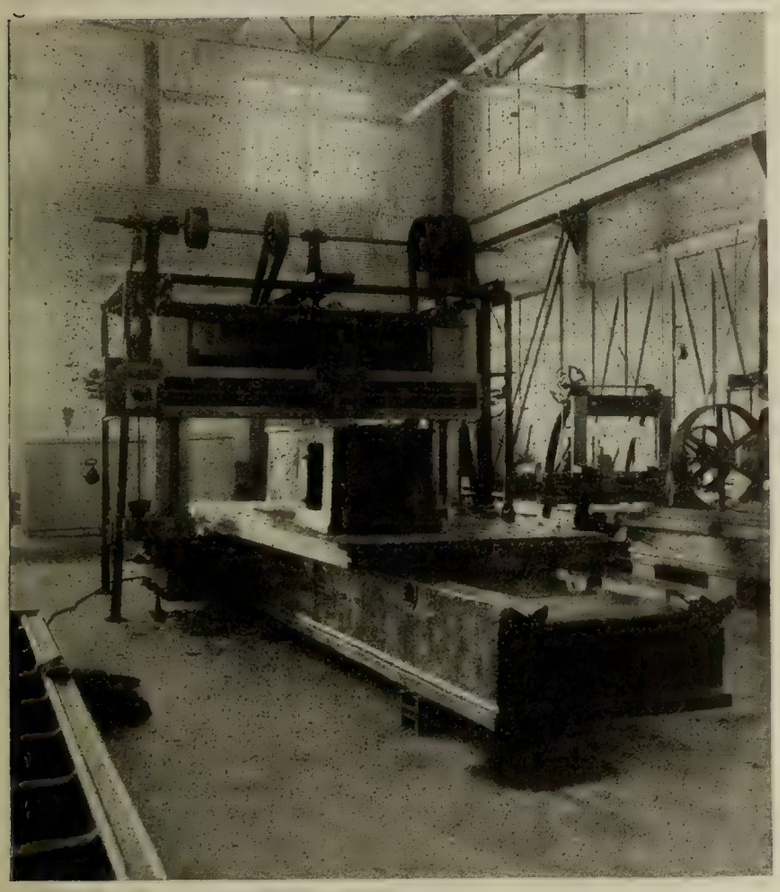

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at the left shows the bed of a large Horizontal Boring Machine being replaned. Every remanufactured machine is disassembled as completely as this machine has been, and the important surfaces and bearings tested with B. & S. precision instruments. If they are inaccurate for any reason, they are replaned, worn or broken parts are replaced where necessary, and the finished machines tested under belt for operation and accuracy.

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1—Betts, 2⅞" bar.
1—Bement, 2⅞" bar.
1—Beaman & Smith, 2⅛" bar.
1—No. 4 Newton, 2-spindle.
1—Beaman & Smith 2-Spindle Cylinder Borer.

MILLING MACHINES.

1—No. 3 Hendey.
1—No. 2 Cincinnati Universal.
1—No. 20 Oesterlein Universal.
1—No. 25 Becker.
1—No. 5 Schuchardt & Schutte.
1—No. 0-Y Brown & Sharpe.
1—60" x 54" x 8' Ingersoll
1—92" x 72" x 15' Beaman & Smith Slab.
1—No. 2 Beaman & Smith Horiz. and Vert.
1—Hilles & Jones Vertical

PLANERS.

1—32" x 32" x 10' Gray.
1—32" x 32" x 8' Gray.
1—30" x 30" x 10' Powell.
1—26" x 26" x 6' American.
1—26" x 26" x 7' Gray.
1—24" x 24" x 6' Cincinnati.
1—24" x 24" x 6' Gray.
1—24" x 24" x 5' Gray.
1—24" x 24" x 4' Gray.
1—23" x 23" x 5' Flather.
1—22" x 22" x 6' American.

LARGE LATHES.

1—42" x 18' Draper.
11—40" x 16' Pittsburgh.
1—36" x 16' Springfield.
1—32" x 14' New Haven.
1—31" x 14' Pond.
1—31" x 12' Pond.
3—30" x 16' Lodge & Shipley.
4—28" x 14' Lodge & Shipley.
10—28" x 10' Pond.
28—26" x 12' Putnam.
1—26" x 12' Schumacher & Boye.
2—26" x 12' Wickes.
13—26" x 10' American.
1—26" x 10' Prentice.
1—24" x 14' Blaisdell.
1—24" x 12' Draper.
1—24" x 10' New Haven.
16—24" x 10' Lodge & Shipley.
1—22" x 16' Flather.
1—22" x 10' Schumacher & Boye.
1—22" x 10' Reed.
20—22" x 10' Davis.
38—22" x 8' Hamilton.
4—22" x 8' Davenport.
1—22" x 8' Lodge & Shipley.

LARGE TURRET LATHES.

4—No. 3-A Warner & Swasey.
99—24" Gisholt.
52—21" Gisholt.
1—22" Libby.
1—No. 6 Bardons & Oliver.
3—2" Gridley.
1—2" x 26" Pratt & Whitney G. H.
1—3" x 36" Pratt & Whitney.
2—2¼" x 26" Greenlee.
2—2" x 24" J. & L., Gd. Hd.
2—2" x 24" J. & L., Cone Head.

RADIAL DRILLS.

3—5' Niles Semi-Universal.
1—4½ Niles Full Universal.
1—3½' Gang.
1—3' Prentice.
1—3' Mueller.
1—2½' Dreses.
4—2½' Fosdick.
2—2½' Mueller.

MISCELLANEOUS.

3—8" Nutter Barnes Cold Saws.
2—72" Bickford Vertical Boring Mills.
1—42" Betts Car Wheel Borer.
1—84" Poole Vertical Boring Mill.
3—No. 73½ Bliss Presses.
1—No. 23½B Niagara Toggle Press.
1—36" Gleason Spur and Bevel Gear Former.
1—1½" Morton Keyseater.
1—10" Bement Slotter.
2—No. 14 Brown & Sharpe Plain Grinders.
1—Gleason Gear Planer, 84" bevel, 96" spur.
1—48" Morton Draw-cut Shaper.

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city. The work should have been finished in December, but the contractors have been unable to obtain labor, and have been delayed by weather conditions.

TRADE GOSSIP

The Canadian Locomotive Works Co., of Kingston, Ont., has been given an order for six switch engines for the Toronto, Hamilton and Buffalo Railway. They are to be delivered some time next March and are to be used in the operation of the T. H. & B., at Bridgeburg.

No Embargo on Coal from U.S.—Fuel Controller Magrath has received a message from Washington stating that the United States authorities had issued instructions to all customs and other border officials to allow all coal shipments to pass freely. This means that there is to be no fuel embargo against Canada. Complete blanket license is granted.

Government Will Advertise in France.—In the Dominion Senate on July 10, a resolution offered by Senator Beaubien, urging the Government to advertise Canadian products in France by means of an exhibition train of sample goods for the purpose of obtaining for Canadian producers a larger share of the French market, especially at the cessation of hostilities, was adopted.

Montreal, Que.—A rich deposit of graphite has been discovered at St. Remi d'Amherst, about 50 miles from here. The results of the tests of the analysts and engineers to whom have been submitted samples of this graphite, have been remarkably favorable. One American milling firm declares that the sample they have analyzed shows a recovery of 47 per cent. graphite of a very high carbon content from the raw material.

New Fibre Containers.—Several canning companies that have used the new containers, which are a sort of fibre-ware which has been thoroughly treated with paraffin, are very pleased with the results. The containers are light in weight, and said to be absolutely sanitary, as they are germ and moisture proof. It is not proved yet whether they will stand long shipments and consequent knocks, but so far everyone seems satisfied.

U. S. Will Build 400 Steel Ships.—An agreement has been reached regarding the proposed shipbuilding programme. The plan as outlined in a communication by General Goethals to Chairman Denman, calls for the immediate construction of two Government shipbuilding plants to produce 400 fabricated steel ships of 2,500,000 tonnage; the commandeering of 1,500,000 tons of shipping now under construction for private account in American yards, and for another big appropriation for building ships.

The Power Plant Equipment Co., Toronto, has recently been reorganized and the scope of the concern's activities considerably extended. The manager, L. O. Smith, is well known to local engineers and has been in business for sometime under the above firm name. J. M. Prentiss who was for a number of years secretary of the Chartered Trust & Executor Co., has taken charge of the office and Thomas Henry, for many years chief engineer of the Interurban Electric Co., and later connected with the Toronto Electric Light Co., has charge of the electrical department.

Ontario Gold Output Increases.—It is estimated that the output of the Northern Ontario gold camps for the current year will reach $17,000,000. In 1916 the united output of the gold and silver mines of the province was $23,500,000, a sum which will be considerably surpassed this year. The gold for the year was valued at $10,000,000, and the silver at $13,500,000. In 1915, the figures were lower. In that twelve months the gold value was $8,501,391, and the silver value, $11,742,463, or a total of $20,243,854, the increase in 1916 over 1915 being thus about 16 per cent.

Canadian Railways Increasing Rates.—Canadian railways are increasing their class rates from points in Canada to points in the United States in line with the decision recently given at Washington by the Interstate Commerce Commission, on the application of the American companies for a 15 per cent. advance. There companies have been allowed something in the neighborhood of from 12 to 14 per cent., which will also apply to freight consigned to Canada, and in order to maintain the same relationship Canadian railways have advanced their international rates to the same extent. The new tariff will come into effect between July 16 and Aug. 1.

Increase in Loading Draft.—Increases in loading draft averaging from two to four inches are reported by the Lake Carriers' Association. The upbound draft for Lake St. Clair remains the same, while the downbound draft is increased two inches. There is an increase of four inches in downbound draft in the American and Canadian locks, and an increase in upbound draft at the American lock of one inch. The upbound draft recommended in the American lock is 20 feet 3 in. and in Lake St. Clair 20 feet 4 in. Downbound boats can load not to exceed 20 feet 6 in. for either the American or the Canadian lock.

Glycerine From Sugar.—Discovery in the U.S. Internal Revenue Division laboratory of a process for the manufacturing of glycerine from sugar was announced recently by the Treasury Department, Washington, D.C. Under the secret process evolved the cost of this substance, a heavy factor in the manufacturing of explosives, will be reduced to slightly more than one-fourth of its present cost. Glycerine is at present manufactured almost entirely from fats at a cost of ninety cents a pound, which is six times its cost of production before the war. Extraction of the product from sugar will ensure production, officials estimate, at 25 cents a pound or less.

Steel Co., of Canada Acquire Ore Lands.—The directors of the Steel Company of Canada, at a meeting held in Toronto recently, practically adopted a

new policy which is likely to have an important bearing on the future of the company. In co-operation with American interests, the directors propose to acquire certain ore and coal properties situated in an advantageous location in the eastern States, from which such of its supply as is necesary in the future will be drawn. Hitherto the company has not controlled its supply of raw material, although it has enjoyed the reputation in the steel trade of having the benefit of some exceptional contracts. It is understood that the plans of the company included the construction of a considerable plant for the production of coke. The Steel Company of Canada has been the only large domestic steel corporation without its own ore and coal reserves.

M. A. Hanna & Co., Cleveland, Ohio, have taken over the bulk of the Hill ore properties on the Minnesota ranges. Together with the recent leases to the Jones & Laughlin and Inland steel companies, this transaction practically removes the Hill interests from the ore market. They are said to retain only about 15 per cent. of their original holdings, this ore being largely low-grade. The Hanna company has been ore agent for the Hill interests for some time.

Trade When War Is Over.—A despatch from Ottawa states that Sir Frederic Nichols has secured the adoption by the Senate of a resolution declaring it expedient that the Senate "appoint a committee to enquire into and report upon the best method of conserving and increasing our domestic and overseas trade to the end that our present prosperity may not unduly suffer when the stimulus resulting from orders from munitions and other war supplies is removed."

Steel Co's. co-operate with U.S. Government.—Formal announcement was made at Washington by Secretary of War Baker, on July 12 that an agreement has been reached with representatives of the American Steel Industry in conference here, under which the entire product of the industry would be made available for the Government's war purposes at a price to be determined on the basis of a cost of production inquiry being conducted by the Federal Trade Commission. On their side the Government representatives assured the steel men that reasonable profits would be included in the price fixed and that provision also would be made to care for the expansion of the industry to meet new demands. The Government also assured the steel men that its war order would be distributed over the entire iron and steel producing capacity of the country leaving no single producer or group of producers to carry an unfair share of the war burden.

PERSONAL

C. W. Stokes has been appointed assistant general publicity agent for the C.P.R.

Clifford B. Langstroth, supervisor of the heat-treating drop-forge departments of the Ross Rifle Co., Quebec, has

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We are manufacturers of stamped parts for other manufacturers.
We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.
We can finish steel stamping in Nickel, Brass or Copper.
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"Barnes-made" SPRINGS
are the result of over sixty years' experience in spring making, combined with unsurpassed equipment and the workmanship of men who have been with us, ten, twenty and in some cases thirty years.
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Established 1857.
THE WALLACE BARNES COMPANY
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Man'frs of "Barnes-made" Products
Springs, Screw Machine Products, Cold Rolled Steel and Wire

"HAWK" D CHROME VANADIUM STEEL

Will Give You Exceptional
Shell Forging Production
WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.
Comes to you heat-treated and ready for use.
It does not stick to the work.
There are many cases where each punch has turned out over 2,000 shells.
It means more shells, per machine per day.
STEEL OF EVERY DESCRIPTION.
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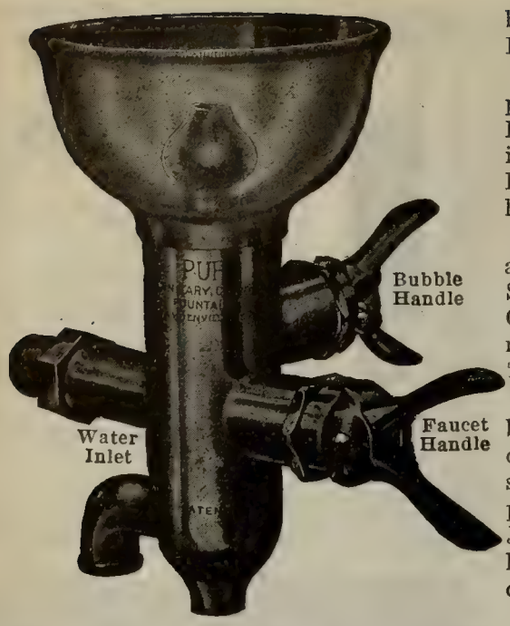

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The manner in which you handle the drinking water problem in your plant may seem to be a small matter to you —but investigate. The results will be surprising.

The old-time faucet is costly. Running hour after hour, day after day, its ceaseless flow is costing you money, yet without any better service.

Puro Saves 35%

A Puro Sanitary Drinking Fountain will cut that water bill 35%. We can prove that it has done that for others.

It will give every employee a safe, saner draught of bubbling water free from the contamination of the common drinking cup.

In a word, it is the only sanitary Drinking Fountain that is really safe, sanitary, simple, automatic in control, and easy to attach.

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147 University Ave., Toronto, Canada

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Owen Sound Iron Works
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Tank Work
Smoke Stacks,
Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order

been appointed metallurgist with the Link-Belt Co., Indianapolis.

J. White, of the ornamental iron department of Canadian Allis-Chalmers, Ltd., has been appointed general superintendent of the Canada Foundry Co.'s Davenport works, in place of J. J. Scollan, who recently resigned.

Frank H. Crockard, the new president and general manager of the Nova Scotia Steel & Coal Co., has arrived at New Glasgow, N.S. He recently attended a meeting of directors and was introduced to the heads of the various departments.

W. J. Amor, of Transcona, Man., has been appointed acting superintendent of the Canadian Government railway shops and yards at Transcona, filling the position made vacant by the death of J. L. Hodgson. Mr. Amor is a well known Transcona man and a former councillor.

H. E. Streeter, manager of the Montreal agency of the Swedish Gage Co., will in future also handle the following lines of percision tools and equipment:—universal angle plates, bench lathes, surface grinders, magneic chucks, adjustable reamers, scleroscopes, pyroscopes and Higley saws.

Cadet Claire A. Page, of the Royal Flying Corps, was accidentally killed on July 10, when his machine crashed down on a road near Ypres Junction, near Camp Borden, during an electric storm. Cadet Page belonged to Hamilton, where he was formerly sales manager of the Canadian Hart Wheels, Ltd.

H. P. McCue, general manager of transportation for the Pittsburg Coal Co, and vice-president of the Montour Railroad, has been appointed by the Canadian Government to fill the newly created position of assistant fuel director. In his new position Mr. McCue will be charged with responsibility of hurrying forward supplies of coal to Canada.

R. S. White, who a few months ago resigned his post as Collector of Customs of the Port of Montreal, after twenty-one years' services, was presented with $21,000 and an illuminated eddress by importers, manufacturers, merchants, and representatives of railway and steamship companies in Montreal, in appreciation and acknowledgment of his administration of the Customs service and courtesies during his tenure of office.

Geo. F. Sheppard, who has been manager of the Toronto office of the Canadian Hoskins, Ltd., Walkerville, Ont., has been transferred to the Montreal office, 31 Ottawa Bank Building. In addition to handling the business of the Canadian Hoskins, Ltd., he will have the Canadian agency for the Ideal Electric and Manufacturing Co., of Mansfield, Ohio; the Winfield Welding Machine Co., of Warren, Ohio; the Enterprise Electric Co. of Warren, Ohio, and the Claywood Electric Co., of Toronto, Ont.

E. F. Ashley Cooper, well known in Victoria, B.C., shipping circles, and for many years connected with the various steamers plying in the British Columbia coastal service, having served as purser aboard vessels of the C. P. R. and G. T. R. fleets, is now a lieutenant in the Royal Naval Volunteer Reserve. Mr. Cooper left Victoria last September to join the R.N.V.R. as a sub-lieutenant and the news of his promotion was received in the city recently. He is at present serving on H.M.S. Research.

Lieut. A. S. Bertram, who was reported wounded a few days ago, died of his wounds in a military hospital in London, according to information received on July 11, by his uncle, Brigadier-General Sir Alexander Bertram. Lieut. Bertram was the son of Henry Bertram, of the firm of John Bertram & Sons Co., of Dundas, Ont. He was a graduate of Queen's University, Kingston, in applied science, and after serving his apprenticeship with his father, entered the employ of the Dominion Bridge Co., in Montreal. Early in the war he joined the 58th Westmount Rifles, and later was given a commission in the 5th Pioneer Battalion. He, however, did not go to the front with that unit, being, instead, transferred to an infantry battalion on the firing line. Lieut. Bertram is the second member of the Bertram family to make the supreme sacrifice in the present war, a cousin of his, Capt. J. K. Bertram, who was for a time adjutant of the 20th Battalion, and later one of the officers of Major-General Garnet Hughes' staff, being killed in action. He was in his fourth year medicine at McGill University, prior to enlisting. Three other members of the Bertram family are still on the firing line.

TENDERS

Port Arthur, Ont.—The Canadian General Electric Company have secured the contract for the sub-station and electrical equipment for the plant of the Eastern Terminal Elevator, now being built at Current River, Port Arthur, for Jas. Richardson & Sons.

Lauzon, Que.—Tenders will be received until July 26 for the construction of a transmission pole line between the new and old dry docks at Lauzon, Que. Plans and forms of contract can be seen and specification and forms of tender obtained at the Department of Public Works, Ottawa, and at the post office, Quebec, Que.

Winnipeg, Man.—Tenders addressed to the chairman, Board of Control, will be received up to July 27, 1917, for the supply and delivery f.o.b. Winnipeg, of 4,500 more or less, complete high voltage porcelain insulators. Instructions to bidders, specification and form of tender may be obtained at the office of the City Light and Power Department, 54 King Street.

Toronto, Ont.—Tenders will be received addressed to the chairman, Board of Control, City Hall, up to July 31, for the complete construction and equipment of a single track extension to the Bloor Street Division of the Toronto Civic Railway. Specifications and forms of tender may be obtained upon application at Room No. 313, Department of Works, City Hall, on payment of ten dollars ($10), this sum to be refunded upon return of specifications, forms of tender, and plans.

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Direct from the South African Diamond Fields. All sizes at your command, either unmounted or mounted in any style holder, **MADE IN CANADA.**

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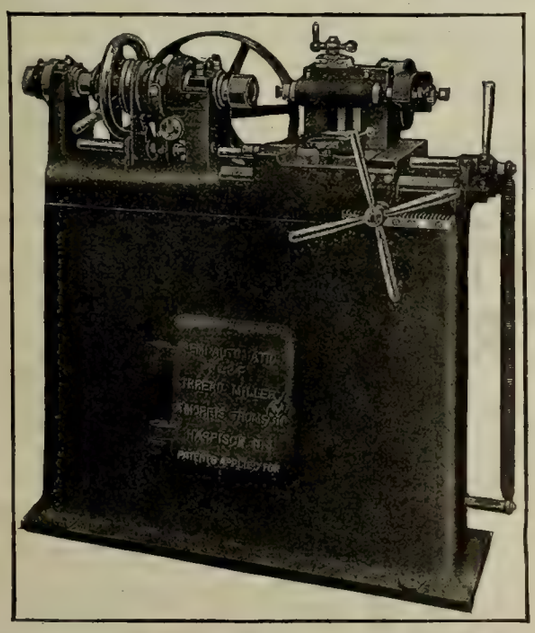
88 West Pitt Street WINDSOR, ONTARIO

The Morris Thomson Semi-Automatic Thread Miller



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Quick Deliveries. Hundreds in Use.

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Spend just a few minutes with your pencil and you will realize that the returns on your fuel and equipment investment can be surprisingly increased with a **MOREHEAD** "Back to the Boiler" **SYSTEM.**

Every heat unit in your steam represents so much coal —so much cold cash. The **MOREHEAD SYSTEM** enables you to get full use of every one of these heat units. The

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takes every ounce of condensed moisture from your steam lines and returns it to the boiler—without waste —automatically. The operation is 90% cheaper than a pump can do it—and the condensation is 100° to 150° hotter.

If you want the very best method of handling condensation — interest yourself in the **MOREHEAD SYSTEM.**

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FOR SALE

1 24" CONRADSON TURRET LATHE. APPLY McGregor, McIntyre, Limited, Toronto, Ont. c3m

FOR SALE—THREE 26" x 12' C.M.C. DOUBLE back geared quick change gear engine lathes; never been used. McKinnon Dash Company, St. Catharines, Ont. **c2m**

FOR SALE—4 REED PRENTICE ROUGH Turning Lathes with cut-off attachments in first-class condition. These will make an excellent machine for 4.5 shells. The Hayes Wheel Co. of Canada, Ltd., Chatham, Ont. c5m

FOR SALE—10 PRACTICALLY NEW NO. 7-C Heavy Duty Racine Hack Saw Machines. Suitable for all cutting purposes. For further information and price address The Peck Rolling Mills, Limited, Montreal. c3m

ONE BRAND NEW 10 x 36 NORTON PLAIN grinding machine. This machine on our floor still crated, never been used. For price and further particulars address Windsor Machine & Tool Works, Windsor, Ontario. c5m

FOR SALE—2 36" HARRINGTON DRILLS, 3 No. 14 Colborn Standard Heavy Duty Drills, 1 Cincinnati 32" Drill, back-geared, sliding head, power and wheel feed. Anxious to dispose of these tools quickly. Wire or write if interested. Metal Drawing Co., Ltd., St. Catharines, Ont. c1m

1—ROBB HORIZONTAL STEAM ENGINE, 10 x 12, 35 h.p. Just overhauled by makers. Price $300.00. 1—Heavy Duty Rockford Drill. Suitable for shells or heavy work. Weight of drill 3,600 lbs. Good as new. Write for specification. 1—Jones & Lamson 2 x 24 Turret Lathe, 2¼" hole in spindle, 16" swing, cone drive, collet chucks for bars up to 2" diameter. Or lathe can be fitted with standard universal chuck. Flat turret 16" diameter. Good condition. Price $400.00. 1—Warner & Swasey Turret Lathe. Round turret, diameter 8", hand cross feed for turret. Swing 14". Fairly good condition. Price $200.00. 1—Bertram 2-spindle Thread Miller. Made by makers for threading 18-pdr. shells. Now used for threading sockets. Good condition. Steel Furnishing Co., Ltd., New Glasgow, Nova Scotia. c2m

HYDRAULIC EQUIPMENT FOR SALE.—The equipment listed below is in first-class shape having only been used about three months. Blue prints and specifications and foundations drawings will be furnished. 2—14 x 12 x 5" Fairbanks-Morse duplex steam driven high pressure pumps at 80 gals. per minute capacity each against 600 lbs. pressure, steam pressure 150 lbs. 1—Weighted Accumulator good for 1000 lbs. per sq. inch, 16" diameter, plunger 11 ft. stroke with squeezing water cushion and wooden outside bumper blocks. The tank for the weighing material surrounding the cylinder is 10' 7" in diameter and 11' 0" high. 1—Return Suction Tank for above pumps and accumulator. Height, 9' 0", diameter 8' 0". Capacity, 2700 Imperial gallons. This equipment can be shipped immediately and is open for inspection at the company's plant. Prices on application. The Canadian Copper Company, Copper Cliff, Ont. c8m

BUSINESS CHANCES

SHELL PLANT FOR SALE — COMPLETE plant—installed since 1914, for the machining and assembling of 4.5 inch H.E. shells, situated at Dartmouth, Nova Scotia, on line of Intercolonial Railway, with siding running into the works. Will sell the equipment outright, with privilege of renting the building in event of the purchaser engaging in the same business. Starr Manufacturing Co., Limited, Dartmouth, Nova Scotia, Canada. c26m

FOR SALE—A MEDIUM-SIZED TWO-STOREY brick factory situated in the best small city in Ontario. Buildings in good condition, suitable for either metal or wood-working; shipping facilities unexcelled. Two trunk lines; direct connections east, west, north and south. Educational advantages the very best. Plant will be sold at a bargain and on easy terms of payment, if desired. Apply Box 294, Canadian Machinery. c2m

SPECIAL MACHINERY

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto.

WANTED TO BUY

WANTED—SECOND-HAND POWER SQUARing shear to cut No. 10 gauge steel up to 24" wide. Must be in good working condition. Packard Electric Company, St. Catharines, Ont. c4m

FOR

IMMEDIATE DELIVERY

No. 28—17" x 96" Brown & Sharpe Plain Grinder.

Pratt & Whitney Vertical Surface Grinder, 36" Table.

No. 1½ Bath Universal Grinder, complete tool room equipment.

No. 1½ Landis Universal Grinder, for Internal and External Grinding.

36 ft. Niles Plate Planer.

Lynd-Farquhar Co.

Boston, Massachusetts

SITUATIONS WANTED

PRACTICAL WORKS MANAGER AND MEchanical expert with years of experience in United States and Canada, a specialist in munition work, open for engagement. Best of references. Apply Box 304, Canadian Machinery. c4m

MACHINE SHOP FOREMAN DESIRES change as shop foreman or master mechanic; acquainted with scientific management; 26 years' experience. Box 322, Canadian Machinery.

FOREMAN TOOL MAKER OPEN FOR ENgagement July 15th. Expert on gauges, jigs, dies and tool equipment, both for shells, fuses and interchangeable manufacturing; 15 years' experience. Apply to J. T. Jamieson, 2647 St. Urbain St., Montreal, Que. c2m

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States will be open for position as superintendent or general foreman, July 15th. A1 references. Address Producer, Box 321, Canadian Machinery. c3m

SITUATIONS VACANT

THOROUGHLY CAPABLE BRASS FOUNDRY Foreman to take charge of small foundry doing a general jobbing business and also munition work. Location Montreal. Address for information, "Brass Foreman," P.O. Box 1934, Montreal. c26m

WANTED—TWO EXPERIENCED BORING lathe hands to take charge on day and night shifts, of battery of boring lathes for 6" Mark III. shell. Only men who can get good bores and high production need apply. Give in the first instance, experience, wages required and full particulars, otherwise application will not be considered. Box 317, Canadian Machinery. c26m

WANTED — ASSISTANT SUPERINTENDENT for six-inch shell factory. Must be capable of getting maximum production from an established plant and have good mechanical experience. Duties to consist chiefly in supervising production. Give full particulars in writing of previous experience, age, references, and salary required, to Henry Hope & Sons of Canada, Ltd., Peterboro. All information will be treated in the strictest confidence. c5m

TECHNICAL ADVERTISING MAN — LARGE manufacturing concern near Toronto, building a general line of heavy machinery, requires a young man to take care of its advertising; must be able to prepare machine descriptions from blue prints and to write clear, concise English; advertising experience desirable, but not necessary; please state age, nationality, experience and salary desired, and send samples of your work with first letter. Box 320, Canadian Machinery. c26m

FOR MILL MACHINE SHOP—A COMPETENT foreman with energy and resource, with some knowledge of French; also general machinists for small shop in a modern town with established manufacture. This is an opportunity for family man to locate to permanent benefit. William S. Nish, 53 Maple Avenue, Shawinigan Falls, Quebec. c3m

FOR SALE

Five Newton Cold Saws 22" and 26" blades for either Belt or Motor drive, complete, first-class condition.

The Canada Metal Co.
35 Fraser Ave.
TORONTO, ONT.

FOR SALE

20" Bullard Projectile Lathe
21" Gisholt Turret Lathe
20" x 6' Florence Turret Chucking Lathe
16" x 7' Oliver Engine Lathe, new
18" x 10' Rahn-Larmon Engine Lathe, new
18" x 12' Rahn-Larmon Engine Lathe, new
3 x 36" Jones & Lamson Flat Turret Lathe, Chucking
3¼ x 36" Cincinnati Acme Flat Turret Lathe, Chucking (4)
Ford-Smith Grinders for 3" shells (12)
Allis-Chalmers Banding and Waving Machines (10)
Copper Band Turning Machine
Greenlee Gang Boring Machine
Holden-Morgan Thread Miller

Brownell Machinery Co.
Providence, R. I.

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There is something there which is meant for you.

Don't Overlook It!

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Avenue
TORONTO, ONTARIO, CANADA

H. W. PETRIE of MONTREAL Limited Montreal, Que.

LIST OF NEW AND USED MACHINERY IN STOCK FOR IMMEDIATE SHIPMENT

ENGINE LATHES

New 13" x 5' Lancaster Sgl. B.G., Geared Feed.
New 15" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
S.H. 15" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 16" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 15" x 7' Oliver Dbl. B.G., Q.C. Gear, Oil Pump and Pan.
New 16" x 24" x 10' South Bend Gap Sgl. B.G., Stan. Change Gears.
S.H. 17" x 8' Greaves Klusman Sgl. B.G., Geared Feed.
New, 18" x 8' Greaves Klusman Dbl. B.G., Geared Feed.
New 18" x 8' Giddings & Lewis Dbl. B.G., Geared Feed.
New 18" x 8' Stevens Sgl. B.G., Standard Change Gears.
New 18" x 8' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 18" x 10' Muller Sgl. B.G., Standard Change Gears.
New 18" x 12' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 20" x 10' Flather Sgl. B.G., Standard Change Gears.
S.H. 36" x 10' Fay & Scott Sgl. B.G., Stand. Change Gears.

HEAVY DUTY MANUFACTURING LATHES

New 20" x 8' Petrie Heavy Duty Manufacturing Lathes.

TURRET, SPEED AND BRASS LATHES SCREW MACHINES

New 13" x 7' Putman Speed Lathe.
S.H. 15" x 5' 6" Fox Brass Lathe with Chasing Attachment.
S.H. 30" x 10' Vilter Lathe, Friction B.G., Geared Feed with 18" Hex. Power Feed Turret.
New No. 0 Foster Plain Head Screw Machine, with wire feed and automatic chuck.

DRILLS

New 3' Dresses Plain Radial, Gear Box Drive.
New 20" Excelsior, Back Geared Wheel Lever, Power Feed.
New 20" Silver, Back Geared Wheel Lever Power Feed.
New 14" Leland Gifford Single Spindle Sensitive.
S.H. 14" Avey Spingle Spindle Sensitive.
S.H. 14" Foote-Burt Four.
New No. 1 Emco Bench Single.

HACK SAW MACHINES

New Peerless High Speed.
New No. 1 Atkins Kwit-Kut.

GRINDING AND BUFFING MACHINES

New 20" Ford Smith Water Tool Grinder.
New 18" Ford Smith S.O. General Purpose Pedestal Grinder.
New 16" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. Combination Grinder and Buffer.
New 12" Ford Smith S.O. Buffing Machine.
New Style B, Point Yankee Twist Drill Grinder.

MISCELLANEOUS

S.H. No. 22 Garvin Vertical Milling Machine.
S.H. No. 0 Burke Hand Milling Machine.
New 1¼" National Bolt Cutter with Lead Screw Attachment.
New No. 1 Grabo Metal Saw Table.
New D4 Rock River Slitting Shear.
New No. 4 Chicago Steel Bending Brake.

Telegraph, Phone or Write for Prices and Further Particulars

H. W. PETRIE of MONTREAL
LIMITED
MONTREAL, QUEBEC

PETRIE'S LIST

Of New and Used Machine Tools Stock for IMMEDIATE DELIVERY

TURRET LATHES AND SCREW MACHINES

15" x 5½' American, fox.
16" x 6' Pratt & Whitney, turret.
18" x 6' Prentice, high speed.
22" x 8' Pratt & Whitney.
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
32" x 18" Lodge & Shipley, pulley.
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

14" x 6' Lodge & Shipley.
15" x 6' London, back geared.
16" x 8' McDougall, back geared.
16" x 8½' Cincinnati, D.B.G.
17" x 8' Blaisdell, back-geared.
18" x 6" New Haven.
18" x 10' Putnam, back-geared.
20" x 8' Fifield, back geared.
21" x 9' back-geared, single purpose (4).
22" x 8' Bawden, heavy duty.
24" x 11' Pond, back-geared.
30" x 10' Ames, back geared.
31" x 16' Fifield, back-geared.
18" x 32" x 12' C.M.G. gap.
20" x 38" x 16' double back gear, gap.
24" x 44" x 20' C.M.C., gap.

UPRIGHT DRILLS

13" Perfect, 2-spindle.
14" Excelsior, sensitive.
16" Barr, sliding head.
18" Buffalo, post drill.
20" Perfect, lever feed.
20" Silver, back-geared.
22" Barnes, back-geared.
24" Kerkhoff, sliding head.
40" Bickford, back geared.
64" Canedy-Otto, wall radial.
No. 10a Baush, 16-spindle.
No. ½ Avey, ball-bearing, bench.

GRINDERS

No. 1 Wilmarth & Morman.
No. 1 Cincinnati, universal tool.
No. 2 Landis.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 14 Besly, with shell holder.
26" Gardner, disk.

IRON PLANERS

20" x 20" x 5' Bertram.
24" x 24" x 6½' Bertram.
24" x 34" x 8' Cincinnati, 2 heads.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Sellers, 4 heads.
40" x 40" x 12' New Haven, power feed.

MILLING MACHINES

Nos. 0 and 1 Burke, hand feed.
Bertram, plain.
Brown & Sharpe, power feed, plain.
Fitchburg, geared, plain.
Monarch, vertical.
Loudon, universal.

SHAPERS.

16" Hendey.
16" Queen City, back geared.
20" Cincinnati, back geared.
24" Gould & Eberhardt.
30" Morton, draw cut.

MISCELLANEOUS

6" and 8" Racine Hack Saws.
4" and 6" Robertson Hack Saws.
6" Kennedy Cutting-off Machine.
12" Hall Pipe Machine.
No. 2 Colburn Keyseater.
No. 5 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 2 Bliss Foot-power Press.
Brown-Boggs Punching Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
7' Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.
FRONT STREET WEST, TORONTO

RIVERSIDE'S Machinery List

We Own Every Tool Offered

ENGINE LATHES

1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—28 x 15 Putman Standard Engine Lathe.
1—22 x 14 Putman Standard Engine Lathe.
3—New 18 x 8 Springfield Engine Lathes.
1—New 16 x 8 Springfield Engine Lathe.
1—New 14 x 6 Springfield Engine Lathe.
2—16 x 8 Davis Engine Lathes, taper attachment.
1—18 x 6 Jones & Lamson Standard Engine Lathe.
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 6 Lodge & Shipley Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Hamilton Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.

TURRET AND SCREW MACHINES.

1—3¼ x 36 Jones & Lamson Flat Turret Lathe, S.G.H.
1—2¼ x 24 Jones & Lamson Flat Turret Lathe, S.G.H.
1—2 x 24 Jones & Lamson Flat Turret Lathe, cone head.
4—No. 4 Foster F.G.H. Hand Screw Machines.
1—No. 3 Foster F.G.H. Hand Screw Machines.
1—No. 5 Pierson F.G.H. Hand Screw Machine.
1—No. 4 Smurr & Kamen Hand Screw Machine.
4—New 14" Pierce Turret Lathes.
2—New 1 x 8 Pierce Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND PLANERS.

5—No. 1½ Knight Milling and Drilling Machines.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
1—No. 1 Cincinnati Plain Milling Machine.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
1—27 x 27 x 7' Cincinnati Planer.
1—22 x 22 x 5' New Haven Planer.
1—20 x 20 x 3' New Haven Planer.

DRILL PRESSES.

1—24" Baker Heavy Duty High Speed Drill.
1—3-spindle 8" overhang Henry & Wright High Speed Drill.
3—12" Leland & Gifford High Speed Bench Drills.
5—20" Buffalo Plain Drill Presses.
4—6-spindle Fox High Speed Drill Presses.
2—4-spindle Fox High Speed Drill Presses.
1—3' Mueller Plain Radial Drill.
1—6' Mueller Plain Radial Drill.

SHAPERS AND SLOTTERS.

1—24" New Barker Crank Shaper.
1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
1—16" Hendey Geared Shaper.
1—16" Garvin Shaper.
1—16" Ohio Crank Shaper.
1—16" Smith & Mills B.G. Crank Shaper.
2—16" New Springfield B.G. Crank Shapers.
1—24" Niles Geared Type Slotter.

PRESSES AND HAMMERS.

1—Waterbury Farrell Straight-sided Geared Press with double cam knock-out.
5—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. Pratt & Whitney Roll Board Hammer.
1—50-lb. Scranton Belt Hammer.
1—24-lb. Bradley Helve Hammer.

AIR COMPRESSORS.

1—8 x 6 Westinghouse Steam Air Compressor.
1—16 x 18 x 12 Union Steam Pump Co. Steam Driven Air Compressor.
1—10 x 10 Ingersoll Sargent Belt-driven Air Compressor.
1—10 x 10 Clayton Belt-driven Air Compressor.
1—9 x 8 Ingersoll-Rand Belt-driven Air Compressor.
1—8 x 8 Fairbanks-Morse Electrical-driven Air Compressor.
1—8 x 8 Gardner Single Belt-driven Air Compressor.
1—8 x 8 Union Steam Pump Co.'s Belt Air Compressor.
1—7½ x 6 Chicago Pneumatic Tool Co. Belt-driven Air Compressor.
1—6 x 6 Chicago Pneumatic Tool Co. Belt-driven Air Compressor.

We also carry a large stock of Steam Engines, Steam Pumps, and Electrical Equipment of all kinds.

We are in the market to purchase machine tools, both large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

GOOD USED EQUIPMENT

ELECTRIC TRAVELING CRANES.

50-Ton Niles, 61' 7" span, 550 volts, D.C., with 10-ton auxiliary hoist.
25-Ton Browning, 40' 0" span, 220 volts, D.C., with 5-ton auxiliary hoist.
20-Ton Alfred Box, 49' 0" span, 220 volts, D.C., with 5-ton auxiliary hoist.
20-Ton, hand, 29' 6" span.
10-Ton, hand, 55' 0" span.
Hand Cranes, 2 to 7½ tons, 22' span (13).

BRAKE AND PRESSES.

13' 6" Garrison Brake or Press, double back-geared, capacity ¼" plate full width, weight about 156,000 lbs.; condition like new.
No. 11 Perkins (Trimming), 4" stroke, 16,500 lbs.
No. 225 Adriance (Punch), 2" stroke, 7,000 lbs.
No. 65 Toledo (Cam Drawing), B.G., 13,000 lbs.

PUNCHES AND SHEARS.

Punch, New Doty (hand), 15" tht., cap. ¾x½".
Punch and Shear (hand), Ohl, cap. ¼"x¼".
Punch and Shear, 17" throat, cap. ¾ through ¾".
P. & S. Cleveland, cap. 1x¾", 28" throat.
P. & S. No. 3 H. & J., cap. 1¼x1", 36" throat.
P. & S. Coulter & McKenzie, cap. 3x½" spr. steel.
P. & S. 48" tht., cap. 3x1¼", steam engine.
Shear, Alligator, No. 2 Farrell, cap. 1" sq.
Shear, Angle (double), H. & J. No. 2, cap. 6x6x⅝".
Shear, Plate (splitting), 18" blade, cap. ¾".
Shear, Lennox Rotary Bevel, cap. ½" plate.
Shear, Lennox Rot. (splitting), cap. ¼" plate.

MISCELLANEOUS.

Acme Rivet and Upsetter, 1½" cap.
Bending Roll, 6', drop end, 6½ and 8" rolls.
Bending and Straightening Mch., 24" cap., 9" jaw.
Cold Saw, Newton, 40" blade, two tables.
Wall Drills, 15' reach (2).
First-class second-hand condition.

PROMPT SHIPMENTS.

McCoy-Brandt Machinery Co.
Office and Warehouse:
216-218 Penn Ave., Pittsburgh, Pa.

FOR SALE

Equipment used for making 18-pr. Shells.

1—Warner & Swasey Turret Lathe, 2" x 24", with attachments.
1—Linderman Double Spindle Boring Machine, with attachments for finish boring shrapnel and nose turning H.E.
1—Flather & Co. 14" x 5' 0" Lathe, with chuck and countershaft.
1—Fosdick 16" x 6' 0" Lathe, with collet chuck and countershaft.
1—Braopose 16" x 6' 0" Lathe, collet chuck and taper attachment.
1—Goldie & McCulloch Nosing Press with Dies.
1—Beatty Accumulator.
1—Lees-Bradner Thread Miller, with attachments and countershaft.
1—Jones & Lamson Turret Lathe, 2" x 24".
1—40-gallon Bowser Tank and Pump; good as new.
1—Cold Saw, with variable speed motor, 60 cycle, 220 volt, cuts up to 9" stock, complete with three saws.
1—4-Connection Pyrometer with Rheostat, made by Taylor Instrument Co.
1—Thermo Couples, 39" long, bent 12½" from nose.
1—Thermo Couples, 39" long, straight.
1—One-Connection Tycos Pyrometer, made by Taylor Co.
1—Bertram Band Turning Attachment, for 24" Lathe, Ball-bearing Centre.

All the above located at Welland. Prices, Delivery and full particulars gladly furnished.

M. Beatty & Sons, Limited
Welland, Ont.

CHAS. A. STRELINGER CO.

43-51 Larned St. East Detroit, Mich.

Machine Tools In Stock For Immediate Shipment

DRILLING MACHINES.

No. 3 Barnes Horizontal Radial Drill.
No. 4-B 8" overhang Henry & Wright Sensitive Drill.
No. 1 Class I. 12" overhang Henry & Wright Sensitive Drill.
No. 1-S Garvin B.G. Horizontal Drill, with pump and piping.

GRINDERS.

Six-Fifteen Fitchburg Grinder (Automatic Feed)
Six-Fifteen Fitchburg Grinder (Hand Feed).
No. 2 Diamond Aut. Surface Grinder, belt driven.
No. 2 Bath Universal Grinder (10x25), with "C" equipment.
No. 2½ Bath Universal Grinder (10x36), with "C" equipment.
No. 1 Wilmarth & Morman Aut. Universal Grinder, complete.

HAMMERS—POWER.

Small and Large Quick-work Power Hammers.

LATHES.

No. 5½ Sloane & Chase 7" x 35" Precision Bench Lathe, with compound rest and cshaft.
14" x 8' American Q.C. Lathe, with Taper Attachment and regular equipment.
14" x 6' Monarch Q.C., S.B.G. Engine Lathe.
17" x 8' Sidney Q.C., 3-step Cone, D.B.G. Engine Lathe.
No. 65-E 13" x 6' Seneca Falls Lathe, with countershaft.
9" x 12" Porter-Cable Lathe, with regular equipment.

MILLING MACHINES—HAND.

No. 1 Standard Hand Miller, with oil pump equipment and countershaft.
No. 6 Whitney Hand Miller with countershaft.

POWER PRESSES.

No. 4 Niagara O.B.I. Power Press.
No. 5 Niagara O.B.I. Power Press.

SAWS—HACK.

No. 1 Racine H.S. Metal Hack Saw, cap. 6" x 6".
Peerless H.S. Metal Hack Saw, cap. 6" x 6".

SHEARS—ROTARY.

No. 1 Quick-work Rotary Shear.
No. 5 Quick-work Rotary Shear.

TAPPING MACHINES.

No. 1 Garvin Aut. Tapper, cap. ⅜" with countershaft.
3-16" and 5-16" Rickert-Shafer Tapping Machines.

C. W. CULLEN MACHINERY CO.

LEADER-NEWS BUILDING
CLEVELAND, OHIO

American 5' Plain Radial Drill, 3" spindle, box table, b.g., tapping attachment, M.D.
Bickford 4' Plain Radial Drill, cone drive,
La Pointe Broaching Machine.
Toledo No. 204 Spc. Double Crank Press.
Toledo 400-lb. Board Drop Hammer.
2—P. & W. No. 2 Cutting-off Machines.
Bement Miles & Co. 7½" Spindle, Vertical Drilling and Boring Mill, 68" swing.
Gardner No. 24 Belt-driven Disc Grinder.
Bradley 150-lb. Upright Strap, 150-lb. helve, 75-lb. Upright Strap Hammers.
Detroit Japanning Ovens, 8' 10" x 8' x 152".
Gisholt 28" Turret Lathe, taper attachment, M.D.
Pratt & Whitney 48" Gap Lathe.
Hanna 30-ton Riveter.
Pangborn Sand Blast, 84" rotary table, M.D.
3—800-ton G.E. Hydraulic Double Action Presses.
1—Toledo Toggle Press, No. 165½.
1—Ferracute Press, Dagg 66.
Bliss Presses—3 No. 60½, rack and pinion; 1 No. 77½; 1 No. 87 special geared.
3—2¼ Cleveland Automatics; prac. new.
10—¾" B. & S. Automatics.
5—3" x 36" J. & L.
Allis-Chalmers 150 H.P. Corliss Engine, 12' F.W.
Bruce MacBeth 150 H.P. Gas Engine; new.
2—Rathmann Jones Gas Engines, 125 and 225 H.P.

DOMINION MACHINERY CO. TORONTO

THE REAL GOODS AT RIGHT PRICES

MUST BE SOLD THIS WEEK

1—Warner & Swasey Turret Lathe, 2" capacity through automatic chuck. Friction geared head, power feed, oil pan.

2—No. 2 Foster Turret Lathes. Automatic chuck, wire feed, 1 1/16 cap, oil pan.

In Splendid Condition.

DOMINION MACHINERY COMPANY

Office, 110 Church Street - Toronto, Ontario, Canada
Warehouse, 14 Darling Ave Phone Main 6519

Rebuilt Machines For Sale

PLANERS

1—Sellers 36x36x10' with 2 heads.
5—Sellers 25x25x6'.
2—Sellers 25x25x8'.
1—Putnam 24x24x8' 6".
1—Putnam 25x25x10'.
1—Wheeler Heavy 30x33x8' 6".
1—Lathe-Morse 24x24x5' 6".
1—New Haven 24x24x7'.
1—Wood Light 30x30x8'.
1—Putnam 42x40x12' 6".

GRINDERS

1—LeBlond Universal Tool and Cutter, power feed, same as new.
1—Bridgeport Plain Grinder, 16x36.
1—No. 1 Landis Universal Grinder.
1—No. 3 Landis Universal Grinder.
2—No. 6X Diamond Double Disc Grinders.
1—Ford Smith Plain Grinder.

AUTOMATICS

1—1" National Acme Double Belt Type.
1—1⅝" National Acme Double Belt Type.
1—No. 55 National Acme.
1—1" National Acme four spindle.
2—No. 54 National Acme four spindle.
3—2" Cleveland.
1—2¼" Cleveland.
2—2¼" Gridley Single Spindle Motors.
1—3¼" Gridley Single Spindle Motor.

LATHES

1—32x12' Draper Lathe, C.R., H.S.
1—36x22' Fitchburg Lathe, C.R., P.C.F.
1—30x8' Fitchburg, C.R., P.C.F.
3—16x8 Putnam, C.R., taper.
6—18x8 Porter, C.R., semi-quick, taper.
2—18x8 Davis, C.R., pan, pump, taper.
10—16x8 Greaves-Klusman, C.R., pan, pump.
9—20x6 Perkins Plain Turning, pan, pump.
1—14x6 Porter, C.R.
1—20x8 LeBlonde, C.R.
1—13x5 Seneca Falls, C.R., pan.
14—20x6' Perkins Lathes, pan bed, chuck, Fay & Scott turrets.

MISCELLANEOUS

1—No. 3 Kempsmith Plain Miller, same as new.
1—9" Industrial Works Slotter.
1—24" Aurora Sliding Head Back Geared Drill.
3—Prentice 24" Sliding Head Drills.
2—Industrial 40" Drills.
1—Western Hydraulic Banding Machine.
1—Jenckes Band Turning Lathe, with 3" Universal Chuck.
1—36" Aurora Drill.
1—12" Bement Travelling Head Shaper.
1—12" Juengst Crank Shaper.
1—93" Putnam Wheel Lathe, double quartering.
1—Sellers Slab Miller, 24x21x12'.
1—No. 21 Lee-Simplex Saw.
1—26x10 Cincinnati Gear Cutter.

This is only partial list—Send for full list

Simmons Machine Company, Inc.

NEW YORK, 1001 Singer Bldg., Telephone Cortlandt 6575
ALBANY, N. Y., 985 Broadway, Telephone 4876 Main

New York's Greatest Stock

(Partial List)

PUNCHES AND SHEARS

48" SELLERS PUNCH, CAPACITY 6" THROUGH 2"
General Engineering Co. Multiple Punch, gap type, punch any length plate, weight about 20,000 lbs.
Reade Multiple Punch, 15" throat
Hetherington & Berner double geared Beam Punch, 17" throat
Pels Beam Shear "T-40"
Alligator Shear, 15" throat, capacity 1" x 6" flats
Kling Bros. Rotary Splitting Shear, capacity ⅝" plate, any width, weight 13,000 lbs.
No. 17 Niagara Rotary Shear, circle cutting attachment
Perkins Model "M" Rotary Shear
Wm. Sellers double end Punch & Shear, 21" throats, punch 1½" through 1", shear 1" x 6" flats
Bass double end Punch & Shear, 20" throats, capacity 1¼" through ¾"
No. 4 Industrial double end Punch and Shear, 20" throats, punch 1" through 1"
No. 4 Royersford Punch and Shear, 18" throat, punch 1" through ⅞", shear 3" x 8" flats
McDougall double end Punch and Shear, 15" throat, punch 1" through ¾"
Hilles & Jones single end Punch and Shear, punch ¾" through ⅜", shear ⅜" x 3½" flats
Coping Machine, 3" stroke, weight 10,000 lbs.

BENDING ROLLS

Ship Plate, 9'2" between housings
Niles Plate, 8'6" between housings, drop end housings
Niles double geared, drop end housing, 40½" between housings

MILLING MACHINES

No. 4B Brown & Sharpe Plain, single pulley drive
No. 4 Brown & Sharpe Plain
No. 4 Cincinnati Plain, heavy duty, single pulley drive
No. 2 Hendey-Norton Universal
No. 2 Cincinnati Plain
No. 2 Cincinnati Universal
No. 1½ New American Improved Plain
No. 1 Kempsmith Plain
No. 1 Pratt & Whitney Plain
No. 3½ Garvin Plain, table 12" x 36"
Beaman & Smith 2 spindle Vertical, table 24" x 48"

BORING MILLS

Two 20" Bullard Vertical Turret Lathes
Three 34" Rogers Vertical, single turret head
Five 30" Bullard Vertical, single turret head
Pratt & Whitney Horizontal, 2¼" bar
48" Niles Car Wheel
Underwood Automobile Cylinder, 3⅝" bar

New York Machinery Exchange, Inc.

50 Church Street . . . New York City

If any advertisement interests you, tear it out now and place with letters to be answered.

IMMEDIATE DELIVERY

DRILLING MACHINES
Leland H.S.B.B., Bench type.
No. 1½ Knight Driller and Miller.
14" Rockford Sensitive.
20" Kern, b.g.
No. 25 Foote-Burt 24" Drill (new).
32" Hamilton s.h., b.g., p.f.
12-spindle Multiple P. and W.
No. 30-C Baush, 12-spindle.
20" W. F. & J. Barnes, 4-spindle.

GEAR CUTTERS
Reynolds Hobber.
No. 11 B. & S. Automatic.
30" x 9" G. & E. Auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3 26" B. & S., for spur.
36" Walcott for spur.

GRINDERS
Yankee Drill.
Leland Universal, with power feed.
No. 23 B. & S. Gear Cutter.
8" x 30" Modern Plain (new).
14" x 20" B. & S. Plain
Garvin Hole Grinder.
Gisholt Tool Grinder.
No. 5 Diamond Water Tool.
No. 16 Gardner Disc Grinder.
No. 24 Gardner Disc Grinder.

LATHES
No. 3½ Rivett.
No. 3 Cataract.
No. 5 Cataract.
13" x 5' P. & W. c.r. taper.
14" x 6' Davis, p.r.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
16" x 6' Bradford, c.r., q.c.g.
18" x 8' L. & S., pat. head, c.r. taper.
18" x 10' Fitchburg, c.r
18" x 12' Barker, c.r.
20" x 14' Blaisdell, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
32" x 16' Blaisdell, c.r.
36" x 20' American, t.b.g.
3½" x 60" Fitchburg Lo-Swing.

PLANERS.
36" x 36" x 12' Powell, two heads.
36" x 36" x 16' Sellers, one head.
40" x 38" x 14' Putnam, one head.
40" x 40" x 12' New Haven, one head, one side head.

SCREW MACHINES.
1" B. & S., Plain.
16" P. & W., Plain.
No. 2 Foster, Plain Head.
No. 2 Costello, Plain Head.
No. 2 P. & W., Friction Head.
No. 3 Foster, Geared Head.
No. 4 Pearson, Geared Head.
No. 3 Bardons & Oliver, Plain Head.
No. 12½ Garvin, Friction Head.
No. 2-G B. & S. Automatic.
⅞" Cleveland Automatic.

TURRET LATHES.
16" Garvin Friction Head, a.c. and w.f.
16" Lodge & Shipley.
25' Niles.
No. 2 Warner & Swasey, Hollow Hexagon.
2" x 24" Jones & Lamson.
3" x 36" Jones & Lamson, chucking equipment.
3" x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt Turret Lathes, taper attach.

PUNCHES AND SHEARS.
No. 2 L. & A. Angle Iron Shears, 5" x 5" x ½" (new).
No. 5 L. & A. Double Punch and Shear, ⅝" in ⅝", 3" x ⅝", 1⅛rd (new).
No. 1 L. & A. Multiple Punch (new).
No. 2 L. & A. Multiple Punch (new).
No. 1 L. & A. Horizontal Punch, ½" in 1" (new).

MISCELLANEOUS.
¾" Acme Forging Machine.
52" Niles Car Wheel Boring Mill.
No. 1 Davis Keyseater.
No. 2 M. & M. Keyseater.
No. 3 M. & M. Keyseater.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 3A La Point Broacher.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-Ton Yale Duplex Hoist.
3-Ton Yale Triplex Hoist.

Stocker-Rumely-Wachs Company, 117 N. Jefferson St., CHICAGO, ILL.

Polson Iron Works
Limited
TORONTO

Surplus Machinery for Sale

2—3" Hall Cut-Off Machines
1—Lodge & Shipley Turret Lathe, 22" x 10'
1—Lodge & Shipley Turret Lathe, 24" x 10'
2—Libby Turret Lathes, 18"
1—Gisholt Turret Lathe, 18"
2—Gisholt Turret Lathes, 21"
1—Gardner Shell Base Grinder, 4A
1—Ford-Smith Grinder, 20"
2—Landis Traverse Grinders, 4'
1—Symington Band Turn Lathe, 3"
1—Goldie McCullough Band Press and Pump, 3"
1—3" Stamping Machine
2—Tate-Jones Shell Furnaces
3—Blowers

Consult these firms

If you are too busy, or if your plant is not equipped to handle all parts of your contracts, let these firms help you.

These firms have confidence in their ability to help you, else they wouldn't advertise their services. You'll find the reason for their confidence if you place your problems before them.

Canadian Machinery
Contract Work Section
143-153 University Avenue TORONTO

BORING MACHINES—VERTICAL.

1—30" Colburn, 1 turret head.
1—New 30" Gisholt, one turret head, Sept. delivery.
1—34"-42" New Colburn, one turret head, Aug. delivery.
1—34" Rogers, one turret head, Sept. delivery.
1—34" Gisholt, including motor.
2—36" N-B-P, one plain and one swivel head.
2—36" B. & S., one turret head.
12—New 42" Putnam—2 heads, Nov. delivery.
1—53" N-B-P, two swivel heads.
1—72" Niles, two swivel heads.
1—New 8' Bickford, December delivery.

BORING MACHINES—HORIZONTAL.

1—Lucas, 2¼" bar.
1—Hoefer Horizontal Driller and Borer with 1 11-16" spindle, vertical adjustment 40", horizontal adjustment 46", size of table 33" x 48".
No. 2—Rochester 3" bar power feed to table in all directions.
2-Spindle Beaman & Smith 3¾" bar, page 48-G of G-1907 Cat.

BULLDOZERS.

1—New No. 4 Garrison, same specification as No. 4 Williams & White.
1—No. 7 Ajax, 20" stroke.
1—No. 7 High-speed Ajax, 16" stroke.

COMPRESSORS—AIR.

1—8" x 8" Curtis, belt-driven.
1—10" x 10" x 10" Single Cylinder Smith-Valle, steam driven.
1—10" x 12" Chicago Pneumatic, belt driven.
1—10"-16½" x 13" Peerless, cross compound, steam driven.
1—22"-13" x 16" Ingersoll-Rand, motor driven.
1—Ingersoll-Sargent Duplex 8" x 14½" x 8".
1—Ingersoll-Sargent steam driven, 345 cu. ft.
1—Cincinnati cross compound, two-stage, 790 cu. ft.

CUTTING-OFF MACHINES.

2—No. 00 Brown & Sharpe.
1—2" capacity Warner & Swasey.
4—3½" Hall.
10—4½" Williams.
3—4" Curtis & Curtis.

DRILLING MACHINES—RADIAL.

2—New No. 3 American plain cone drive.
3—New 3' Americans, sensitive tapping attachment.
7—New 3' Prentice, July delivery.
1—New 3' Mueller, plain, speed box drive.
1—New 3½' Mueller, cone drive, July delivery.
1—New 3½' Western Drill, 86" circle.
2—4' Mueller, plain, speed box drive.
1—3' Bickford gear drive.
1—5' Bickford, plain, speed box drive.
1—5' American, plain, motor drive.
5—5' spindle, arm does not raise and lower, hand feed.
1—5' Fosdick plain cone drive tapping attachment.
1—6' Baush plain cone driver.

DRILLING MACHINES—HEAVY DUTY.

3—No. 14 Colburn 24" swing, capacity 2" in solid steel.
2—D-3 Colburn plain table.
2—No. 26 Foote-Burt, 44" swing, 3½" capacity in solid steel.
1—No. 310 Baker single pulley drive, late type.

DRILLING MACHINES—MULTIPLE SPINDLE.

1—No. 30C Baush 12-spindle, capacity 1⅛" holes, 30" circle.
No. 24 Baush, 12 spindles.
1—Gardam, 12-spindle, capacity ⅜" holes, 14" square.
1—14-spindle Baush, capacity 1" holes, 36" circle.
No. 11, Pratt & Whitney 16-spindle cap. 10 spindles, ¼" cap.

GEAR CUTTING MACHINES.

1—New 6" Standard gear cutter, spur.
1—12" G. & E. Gear Hobber.
1—12" Gleason Bevel Gear Planer.
1—15" Gleason Bevel Gear Planer.
1—16" Bilgram Bevel Gear Generator.
1—20" Grant-Lees Gear Hobber.
1—No. 1 20" Schuchardt & Schutte Gear Hobber.
1—24" Fellows Gear Shaper.
1—22" x 8" G. & E. spur and bevel cutter.
1—24" x 8" G. & E. for spur and bevel.
1—26" x 10" Cincinnati, spur gears only.
1—New 30" Flather, spur gears only.
3—36" Fellows Gear Shapers.
1—50" x 11" G. & E., spur gears only.
1—No. 3 Brown & Sharpe Auto gear cutter, spur.

GRINDERS—UNIVERSAL—FOR CUTTERS, DRILLS, REAMERS, ETC.

1—New Norton, No. 1.
1—New Wilmarth & Morman, style BX.
1—No. 1 Cincinnati.
1—New Walker No. 2, outfit K (capacity 9" x 26").
8—No. 190 Wells.

GRINDING MACHINES—CYLINDRICAL—PLAIN.

1—No. 11 (6 x 30") Brown & Sharpe.
1—6" x 48" Pratt & Whitney.
1—New No. 12 (8" x 26") Brown & Sharpe.
1—10" x 50" Norton.
1—New 10" x 72" Norton, plain.
1—No. 16 (10" x 72") Brown & Sharpe.
20—12" x 24" modern, self-contained.
6—12" x 36" Modern, self-contained, motor or belt driven.
6—12" x 48" Modern, self-contained, motor or belt driven.
1—16" x 66" Landis, with crank grinding.
12 x 32 Landis, rebuilt.
1—18" x 96" Brown & Sharpe.
1—New 10" x 36" Landis, immediate.

GRINDING MACHINES—CYLINDRICAL—UNIVERSAL.

1—No. 1 Fraser, with surface grinding attachment.
1—No. 1½ (10" x 30") Landis.
1—No. 2½ (10" x 36") Bath.
1—New No. 3 Bath.
1—No. 2 New Walker, 9" x 26".
1—10" x 42" Modern.
1—No. 2 (12" x 30") Brown & Sharpe.
10—New No. 2 Morse, cap. 12 x 30", Universal, Dec. delivery.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis.

GRINDING MACHINES—INTERNAL.

1—No. 1½ Landis.
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—CYLINDER.

1—No. 27 Brown & Sharpe.
1—No. 60 Heald, single pulley drive.

GRINDERS—DISC.

1—No. 14 Besley.
1—New No. 17 Gardner (Pattern Makers).

GRINDING MACHINES—RING.

1—No. 200 Heald.
1—No. 210 Heald.

GRINDING MACHINES—EDGE.

1—No. 374 Safety Emery Wheel Co.

GRINDING MACHINES—SURFACE.

1—No. 1 Diamond, cap. 12" x 12" x 24", automatic.
4—New No. 2 Reid (same as B. & S.).
1—22" x 12" x 60" Springfield, planer type, automatic.
1—New No. 1 Wilmarth & Morman.

GRINDING MACHINES—DUPLEX.

1—No. 5 Bath, suitable for grinding cylinders, pistons, piston rings, etc., 16" feed, swivel table, water pump.

GRINDING MACHINES—FACE.

1—Diamond Face Grinder, 4' travel, 14" wheels.

HAMMERS—POWER—FORGING.

1—40-lb. Bradley Helve.
1—150-lb. Bradley Helve, upright.

HAMMERS—BOARD LIFT—DROP.

1—400-lb. Billings & Spencer.
2,000-lb. Chambersburg.

HAMMERS—STEAM—FORGING.

1—New 600-lb. Bell.
1—New 3,000-lb. Bell, September delivery.

KEYSEATERS.

2—No. 0 Mitts & Merrill.
1—No. 2 Mitts & Merrill, motor driven.
1—60" stroke Compton Knowles Broacher.

LATHES—ENGINE.

6—New 12 x 4 Shepard reverse head.
8—New 12 x 5 Shepard reverse head.
3—New 12 x 6 Shepard reverse head.
1—14" x 6' Bradford, taper attachment.
2—16" x 6' LeBlond, pan bed, quick-change gears, taper attachment.
1—18" x 8' L. & S., geared head, taper.
3—18" x 9' Chard.
1—18 x 10 Kendry quick change gear, 14" chuck.
1—New 19" x 8' LeBlond, heavy duty.
22—20" x 8' Lodge & Shipley, quick change gear.
7—New 20" x 8' American heavy duty.
9—22" x 10' Putnam, oil pan, turrets.
4—24" x 10' Reed.
2—24" x 12' S. & B.
1—24" x 14' Lodge & Shipley, patent head.
4—24" x 14' American, quick-change.
3—New 26" x 12' Boye & Emmes.
1—26" x 24' New Haven.
4—New 28" x 12' Boye & Emmes.
1—28" x 18' S. & B.
5—New 30" x 14' Boye & Emmes.
3—New 32" x 12' Pittsburg pattern.
8—New 36" x 24' Putnam, triple geared.
1—38" x 19' Steptoe single back gear.
1—36" x 15' Fifield, 36' x 16".
1—24"-45" x 22' McCabe, double spindle.
1—48" x 27'—9" Betts triple back gear.
1—60" x 27" Betts triple back gear.
1—New 66" x 30' Putnam, Dec. delivery.
1—71" x 20' Fifield, triple geared.

LATHES — MANUFACTURING — NOT SCREW CUTTING.

13—No. 3X Reed-Prentice, semi-automatic.
14—Reed-Prentice shell lathes for 4" or 18 lbs. American shells.
60—14" x 6' Reed stud and bolt.
5—16" x 8' Fairbanks-Morse, heavy duty.
70—New Simplex, 16" x 8'.
14—16" x 8" Simplex single pulley drive.
22—18" x 8' Battle Creek, heavy duty.
5—20" x 8' Merschon.
50—20" x 10' Hindman, high duty.
12—21" x 8' LeBlond, quick-change with attachment for grooving and facing both ends of shells with air cylinders and mandrels for 5" shells.

MILLING MACHINES—KNEE TYPE—UNIVERSAL.

2—New No. 1 Kempsmith.
1—No. 1½ Hendey-Norton.
1—No. 2 Kempsmith back geared.
1—No. 2 new Cincinnati.
3—No. 2½ LeBlond, Sept. delivery.
2—No. 3H LeBlond, Sept. delivery.
1—No. 3 Cincinnati, single pulley drive, high power, vertical attachment.
1—New No. 4 LeBlond Heavy Duty, immediate.

LATHES—TURRET.

5—2 x 24 Jones & Lamson.
5—3 x 36 Jones & Lamson.
18—6A Potter & Johnson.
2—21 Gisholt.

MILLING MACHINES—KNEE TYPE—PLAIN.

1—No. 0 Pratt & Whitney
3—New No. 1 Rockford.
2—New No. 1 Kempsmith.
1—½" American.
1—New No. 2 Rockford.
1—No. 3 LeBlond.
1—No. 3 Cincinnati.
1—No. 4 Garvin.

MILLING MACHINES—VERTICAL.

4—New No. 4B Becker.
No. 2 New Cincinnati.
2—No. 5 Becker.

MILLING MACHINES—PLANER TYPE.

1—No. 2 Beaman & Smith.
2—Ingersoll slab millers, working surface of table 60" x 20".
2—No. 4 Beaman & Smith, vertical spindle, open side, working surface of table 120" x 24", removable housing on one side.

PLANERS

1—24" x 24" x 6' Gray, one head on cross rail.
1—26" x 26" x 8' Gray, one head on cross rail.
1—30" x 30" x 8' Gale planer, one head.
1—30" x 30" x 8' Whitcomb, one head.
1—New 36" x 36" x 12' Powell high speed, one head.
1—36" x 30" x 12' New Haven, one head.
1—36" x 36" x 9' Sellers, four heads.
1—36" x 36" x 9' Sellers, two heads.
2—New 36" x 36" x 12' Woodward & Powell, two heads on cross rail, one side head, October delivery.
1—36" x 36" x 14' Sellers, four heads.
1—40" x 40" x 11' Niles, four heads.
1—42" x 10' Hews & Phillips, one head on rail, one side head.
1—42" x 14' Pond, two heads.
1—48" x 48" x 16' Sellers, one rail head, two side heads.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL.	CINCINNATI, OHIO	CLEVELAND, OHIO	NEW YORK CITY
32 N. Clinton St.	1018 Union Central Life Bldg.	508 Leader News Bldg.	Singer Bldg.

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SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

Jobbing Machine Shop Owners

will find it to their advantage to mail us a list of their equipment and state what line of work they prefer to undertake.

Address

METAL MANUFACTURERS SERVICE

75 Sun Life Building, Toronto, Ontario

D. C. SWEET, Manager

GEARS!

HAMILTON

GEAR & MACHINE CO.

Cor. Concord & Van Horne **TORONTO**

CUT GEARS

High-grade gears are the best value per dollar at first cost.

HIGH CARBON STRUCTURAL

STEEL TUBING

BUTTED & BRAZED
BENDS & SHAPES

SHEET METAL STAMPINGS

CANADIAN METAL PRODUCTS, Limited,
GUELPH, ONTARIO

SHEET METAL STAMPINGS

Dominion Forge & Stamping Co., Limited

WALKERVILLE ONTARIO

DROP FORGINGS

Our facilities and equipment enable us to give you a top-notch quality at a very reasonable price.

AUTOMOBILE FENDERS, HOODS AND GASOLINE TANKS

SPECIAL MACHINERY

Special Machinery, Gears, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Etc.

CONTRACT WORK

GAUGES AND TOOLS

OUR SPECIALTY

How is This?

No. 28 THREAD GAUGE FOR NOSE OF SHELL

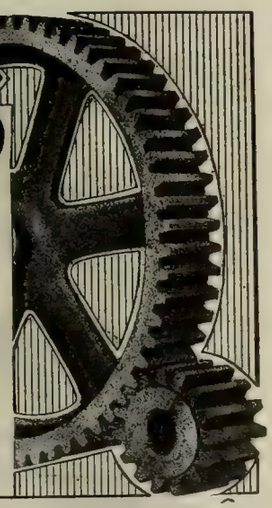
ONLY $35.00

CAN DELIVER FROM STOCK.

THE MONARCH BRASS MFG. COMPANY, LIMITED

71 Browns Ave., Toronto

CUT GEARS



Rawhide — Steel — Brass — Cast Iron

Try our W-G Rawhide Silent Gear. Designers and Builders of Special Machinery.

Winnipeg Gear & Engineering Co.

197-199 Princess St., Winnipeg, Man.

TORONTO TOOL CO. TORONTO TOOL CO.

SPECIAL TOOLS

Gauges Taps Jigs

AUTOMATIC MACHINERY FOR MUNITIONS

4.5 Mark VII Shell Milling Machines

TORONTO TOOL CO.

TORONTO, ONT.

516 Richmond St. West Phone A. 1181

Special Machinery

WE DESIGN AND BUILD ALL KINDS; ALSO ATTACHMENTS FOR ALL PURPOSES.

GENERAL MACHINE WORK.

Hyde Engineering Works

Consulting Engineers and Manufacturers

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Are Your Men Filing Away Time?

You pay for and expect to get results—with men as well as with tools.

A good mechanic working with a "Famous Five" file is an unbeatable combination for filing.

The file is hard, and sharp, and will file fast for a long time. The mechanic knows this and is encouraged to do his best because he has a good tool.

Almost all purchasing agents now specify "Famous Five" Files when ordering. They are Standard quality tools.

THOUSANDS IN USE

The Whitney

Hand (Feed) Milling Machine

The vertical feed is provided for by the SLIDING HEAD. On account of this feature the work can be held close to the table, thus giving a rigidity not possible on other types of Hand Millers.

Send for Catalogue A.

The Whitney Mfg. Co.

Hartford Conn. U.S.A.

Chains—Keys—Hand Milling Machines.

Rivet Speed

One every second is a speed which this Grant Rivet machine will keep up indefinitely, in any degree of tightness or looseness desired. Each rivet is finished with perfectly shaped head, polished and with no hammer marks showing.

We claim this is the only machine manufactured that will accomplish this feat. Our claims are unchallenged. By writing for our catalogues you may obtain full information regarding the ability of this machine.

We are rivet machine specialists. Get in touch with us.

The Grant Mfg. & Machine Co.

Holland Ave., Bridgeport, Conn., U.S.A.

Mechanics Demand

Dealers Provide

Turn Where You Will
The World Employs

WILLIAMS'

GRAND TRADE MARK W PRIZE

Drop Forged Tools

J. H. WILLIAMS & CO.
THE WRENCH PEOPLE
45 RICHARDS STREET BROOKLYN, N.Y. CITY

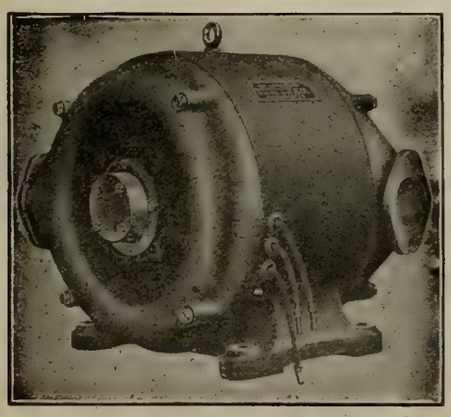
Publicity Promotes

Makers Guarantee

The Lancashire Dynamo & Motor Company, of Canada, Limited

107-109 Duke Street, TORONTO

ELECTRICAL MACHINERY for all Purposes.
ELLIOTT BROS'. { INSTRUMENTS / RECORDING GAUGES



PIPE VENTILATED A C MOTOR
FOR VERY DIRTY PLACES

PRACTICALITY

AFTER fifteen years' study of the Miner's and Lumberman's wants, we know just what is and what is not required in tools for them.

Practicality has been the keynote of our organization. Experience has aided us in eliminating all unnecessary parts and in perfecting the design of our tools.

The use of best material and finest workmanship enable us to manufacture tools that are unexcelled.

We make a complete line.

Write us for prices.

J. W. CUMMING & SON, LTD.
NEW GLASGOW, - - CANADA
Wood or Steel, let Cummings make it.

If any advertisement interests you, tear it out now and place with letters to be answered.

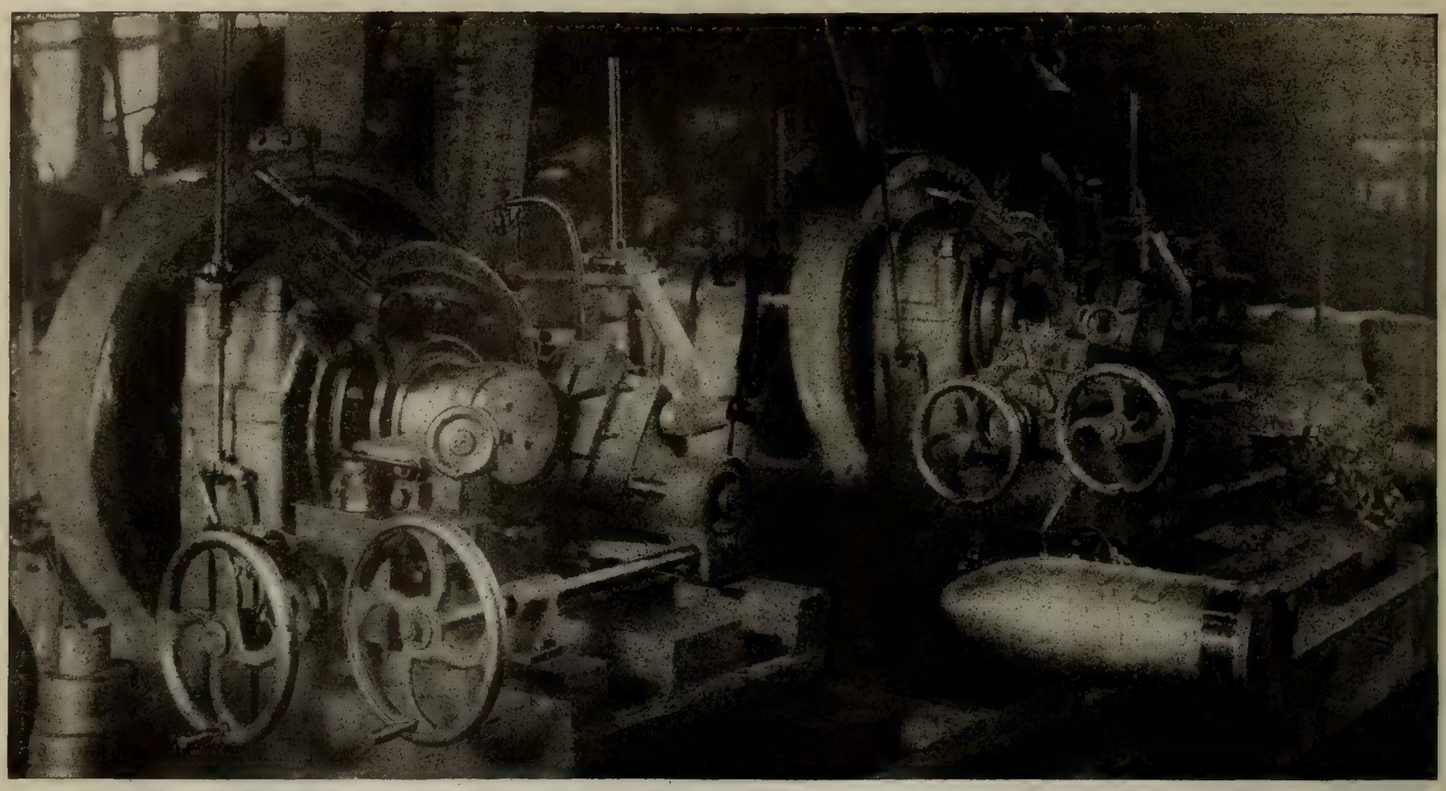


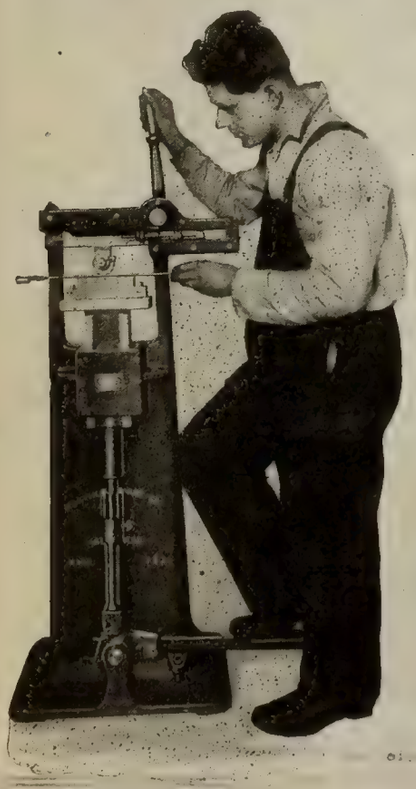
Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

These machines are built for turning bands on 8", 9.2" and 12" shells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. Write for full particulars and price.

Bennett Ave. **Warden King Limited** Maisonneuve, P.Q.

Here's One Means of Saving Time In Munition Manufacture—

The marking of Range Rings, Rifle Parts, Timing Fuses, Gun Sights, Shells, Sharpnel or round or flat surfaces of tools or other work.



Martin

No. 6
Hand Marking Machine

This machine was designed to cut time and costs in this work. How well it does it is evidenced by the records it has made. With these machines your marking can be accomplished in minimum time at a lower cost than by hand and in a much more satisfactory manner.

Send us your prints or samples and we will give you full particulars. Send now.

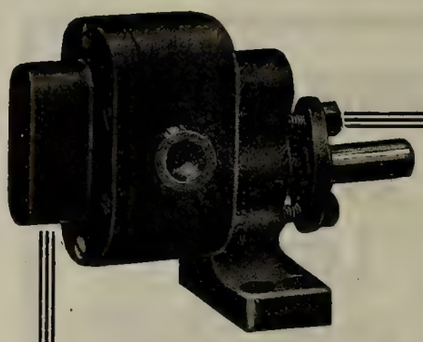
Write to

"The Marking Machine People"

Martin Machine Co.
Greenfield, Mass.
U. S. A.

Manufacturers of both Hand and Power Machines.

Canadian Representatives. —The Canadian Fairbanks-Morse Co., Ltd., Calgary, Montreal, Toronto, Vancouver, Winnipeg, St. John.



Speed Up—

You can speed up that machine to its highest capacity and rest assured that Roper's Circulating Pump will keep the machine well oiled.

The machine is so constructed that the lubricant will flow in a steady stream, no halting, pulsating movement at all. This is a feature well worthy of notice. The circular is made in 6 sizes and will adjust itself to any size machine. The pump shown is a one-way lubricator only. We make the other kind.

Inquire.

C. F. ROPER & CO.
HOPEDALE : MASS. : U.S.A.

Double-end External Limit Gage

Single-end External Gage

Adjustable Limit Gage

Taft-Peirce Tool Room Specialties

TAFT-PEIRCE
WOONSOCKET RHODE ISLAND, U.S.A.

The Taft-Peirce Mfg. Company

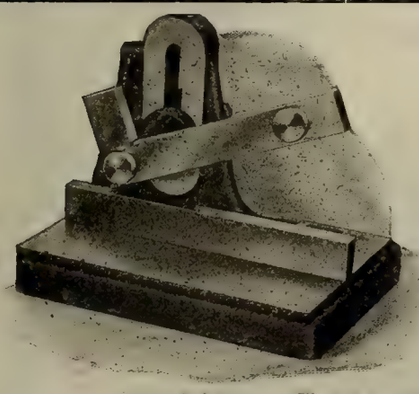
Woonsocket Rhode Island

NEW YORK, 233 Broadway
DETROIT, 1311 Majestic Building

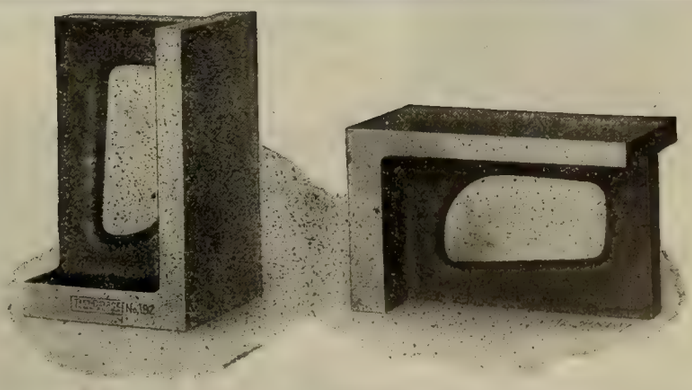
IN Taft-Peirce Tool Room Specialties we offer accessories needed in every tool room where accurate work is performed, devices designed and manufactured to replace those you have heretofore made yourself to facilitate machining or inspecting operations. We have standardized these tools, manufacture in quantities and can sell them at prices much lower than the cost of home-made devices. The line is quite complete also arranged to meet most requirements.

The T-P Double-end and Single-end External Limit Gages are particularly strong and durable and have large wearing surfaces. T-P Angle Plates will be found highly useful in laying out work, irregular shapes in particular. The Sine-bar Fixture shown is arranged with a supported sine-bar which is set on end to obtain the sine of the complement of any required angle between 45 and 90 degrees.

Catalogue "E" shows and describes the complete line. Send for a copy.



Sine-Bar Fixture



Universal Right-angle Irons

If any advertisement interests you, tear it out now and place with letters to be answered.

IN STOCK READY TO SHIP

"STAR BRAND"
SEAMLESS BRASS

CONDENSER TUBES

TINNED INSIDE AND OUTSIDE

5/8 and 3/4 inch O.D., No. 18 Stubs Gauge—12, 14, 16, 18 and 20 foot lengths

AND

"STAR BRAND" BRASS CONDENSER TUBE FERRULES

Standard 14 Thread for 5/8 and 3/4 in. Tubes

OUR STOCK ON HAND READY FOR IMMEDIATE SHIPMENT ALSO INCLUDES A FULL LINE OF REGULAR STOCK SIZES AND SHAPES OF THE FOLLOWING

"STAR BRAND" SPECIALTIES

Seamless Brass and Copper Pipe and Tubing, Brass Fittings, Sheet Copper, Copper Bar, Rods and Wire, Copper Nails, Sheet Brass, Brass Rods, Tobin Bronze Rods, Copper Rivets and Burs AND OTHER PRODUCTS IN BRASS, COPPER, PHOSPHOR BRONZE, ARCHITECTURAL BRONZE, ETC., ETC.

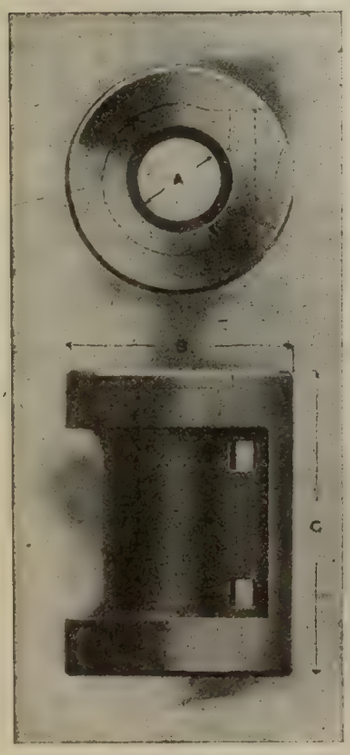
U. T. HUNGERFORD BRASS & COPPER CO.

BRANCHES:
BOSTON
BALTIMORE
PHILADELPHIA
SAN FRANCISCO

HUNGERFORD BUILDING
Lafayette, White and Franklin Sts.
NEW YORK, U.S.A.

KINDLY ADDRESS INQUIRIES FOR ATTENTION OF DEPARTMENT D.

Mining Machinery Parts



Two-key Tappet

Shoes and Dies, Tappets, Bosses, Cams and Stamp Heads

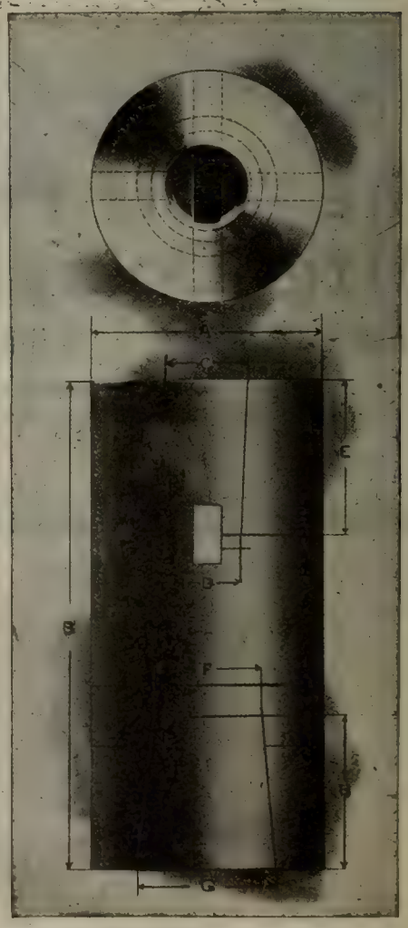
Also Manufacturers of Lining Plates for Ball and Tube Mills Concaves and Heads for Gyratory Crushers.

Machine Moulded Gears

Any size up to 18 feet in diameter. No patterns needed.

Send Us Your Specifications, We Do the Rest. Write—

Hull Iron & Steel Foundries, Limited
HULL, P.Q.

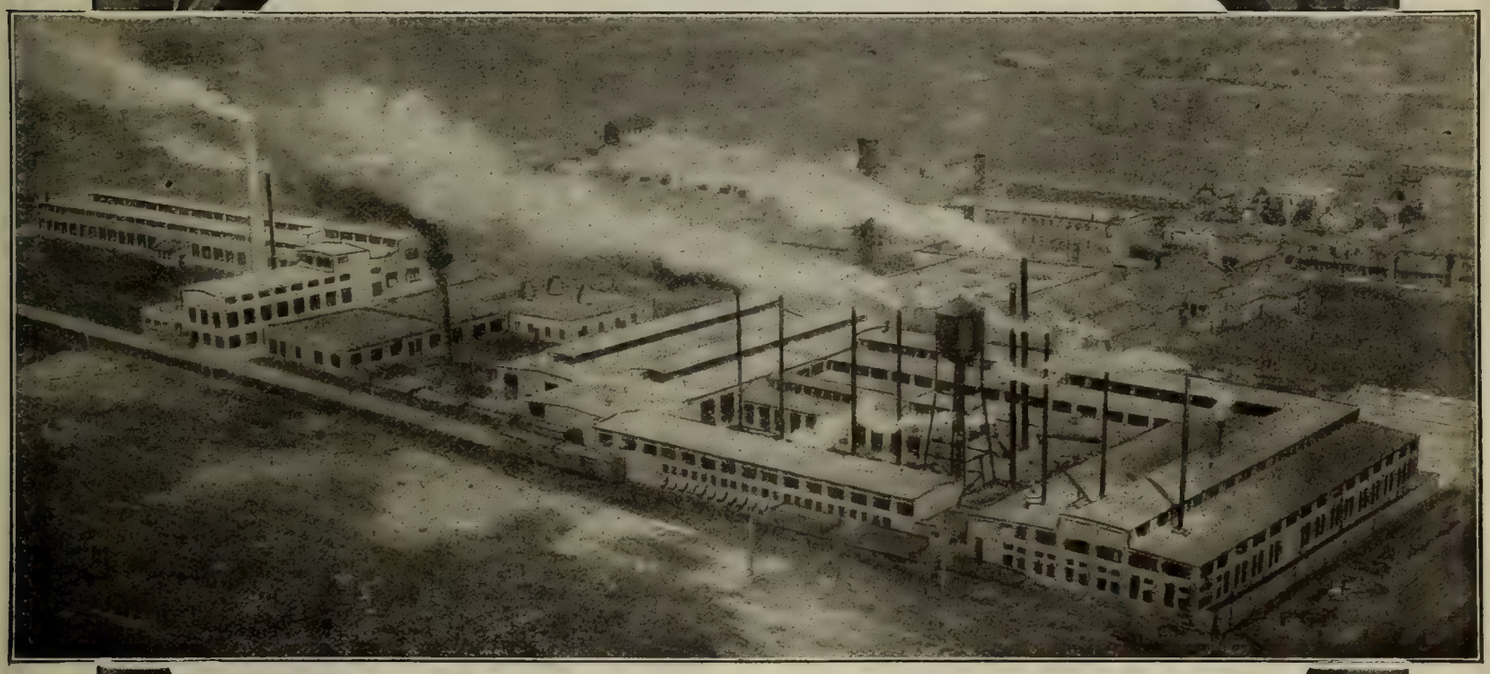


Stamp Head

BROWN'S

BEAVER BRAND METALS

BRASS, BRONZE,
CANADA SILVER and GILDING METAL
In Sheets, Rolls, Plates and Rods



Brown's Copper & Brass Rolling Mills, Limited

General Offices and Works:
New Toronto, Ontario, Canada

COPPER & BRASS
BROWN'S
QUALITY
ROLLING MILLS

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Oxy-Acetylene Welder at Work in Machine Shop

Oxy-Acetylene Welding Effects Important Savings

In practically every metal manufacturing industry, oxy-acetylene welding is providing better, neater appearing and more lasting joints than have been hitherto attainable by riveting, threading or other methods, and at the same time is lowering production costs. Operations on metal parts, large and small, are handled easily, quickly and economically by this process. Welded joints can be built up to give added strength if desired. The metal is left in satisfactory condition for subsequent machining. For repair work it more than pays its way—preventing costly delays and replacements—handling the jobs "right on the spot" with efficiency and dispatch.

If you are interested in making your plant more profitable — in reducing operating costs and effecting many economies in production—if you wish to make your product stronger, neater, better—investigate what Prest-O-Lite Welding will accomplish for you.

Prest-O-Lite Process

employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene (ready-made carbide gas) is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost. Avoids the large initial outlay and heavy depreciation incurred in making crude acetylene in a carbide generator.

Apparatus consists of an equal pressure blow pipe, automatic regulators and gauges, and all necessary equipment.

Adaptable for oxy-acetylene cutting by the addition of special cutting blow pipe.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

Many savings and advantages are possible in **your** shop or factory. Where you now use rivets, bolts or threaded joints, investigation may show a real need for welding. Write for valuable illustrated literature and data on work others are doing by the Prest-O-Lite Welding Process. It may point out ways to solve **your** problems.

Address Dept. C-107.

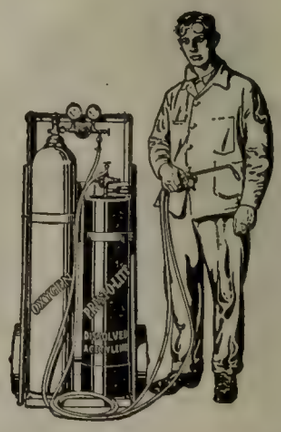
THE PREST-O-LITE COMPANY, Inc.

Canadian General Offices: 913-14 C.P.R. Building, Toronto

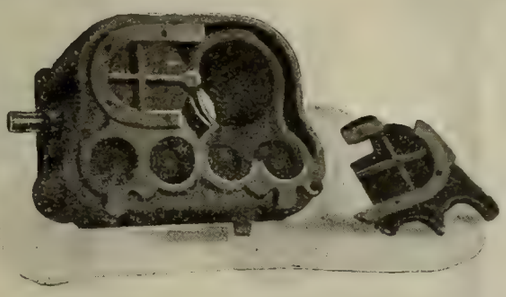
Direct Factory Branches:
Montreal, Toronto, Merriton, Winnipeg

Canadian Plants:

Toronto, Ontario
Merriton, Ontario
Winnipeg, Manitoba
Shawinigan Falls, P.Q.
(Under Construction)



DIVIDEND-PRODUCING FACTS about OXY-ACETYLENE WELDING



Broken Cylinders Before Welding

Why not cut the losses? The installation of an Oxy-Acetylene Welding Equipment means but a very small investment compared to the savings in time and money it effects. It is an investment that will bring hundreds per cent. return, and it is good business to keep your plant always running. Is this worth investigation?

You are protected against loss. Not only can Oxy-Acetylene Welding be profitably employed for coping quickly with repairs, "break-downs," "tie-ups"—preventing losses by delay in replacements, but it is universally adopted in many manufacturing processes where a greater efficiency and an improved product are essential.

"A. L. S." Oxy-Acetylene Welding and Cutting Equipment is Backed by "A. L. S." Service

We maintain three factories in Canada and a staff of experts in the process, making Service to you a feature of our business; manufacturing the Purest Oxygen and Dissolved Acetylene, and Equipment of the highest efficiency.

Improved methods mean increased business and bigger profits.

Same Cylinders After Welding

Many problems in the Metal Industry are being solved by Oxy-Acetylene Process

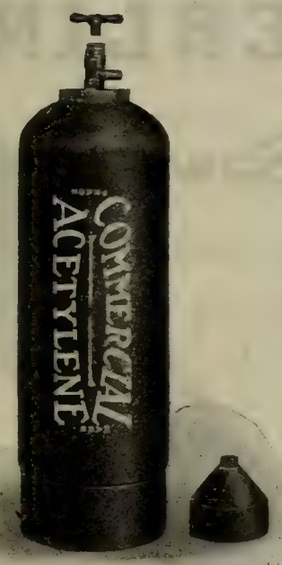
Write to-day for particulars, without obligation. We can tell you how, and why.

L'AIR LIQUIDE SOCIETY

Pioneers of the Process

Factories the world over

MONTREAL, Cor. 1st Ave. and Ernest
TORONTO - - 26 Boler Street
WINNIPEG - - - - 1297 Pine



Quality Quantity *Guaranteed*

Write US About Your Acetylene Supply

Commercial Acetylene Welding Co., Inc.

103 Bay Street, Toronto

ATLANTA, GA.
AURORA, ILL.
BOSTON, MASS.
BOUND BROOK, N.J.
EAST DEERFIELD, MASS.

TORONTO, ONT.
SAN FRANCISCO, CALIF.
MOBERLY, MO.
W. BERKELEY, CALIF.

Main Office
80 Broadway, New York

If any advertisement interests you, tear it out now and place with letters to be answered.

MUNITION MAKERS

Need the best power blades they can buy for their metal cutting —need them for economy and speed of production and to save blade cost.

Buy your blades by careful efficiency tests for rapidity of cutting and number of cuts and you will standardize on

MILLERS FALLS
STAR HACK SAW BLADES

WE CAN MAKE PROMPT DELIVERY ON ALL SIZES.

Star Blades are made in a different way than any other blade. Patent hardening process makes them harder, faster cutting and more uniform as comparative tests will show.

Your blade cost and your manufacturing cost are less when you buy the Star.

Mechanic's Handbook containing much valuable mechanical information, never before printed, and pocket catalog--free on request.

Millers Falls Company

"Toolmaker to the Master Mechanic"

Millers Falls, Mass.

New York Office: 28 Warren Street

MILLERS FALLS TOOLS

Grinding Wheel Efficiency

Results both in quantity and quality of the grinding wheel depends upon its surface. A slight coating on the wheel affects both.

No one type of Dresser is best adapted for all wheels. We are specialists in Grinding Wheel Dressers, and can recommend and supply the type of Dresser that is best adapted to your particular needs.

The Canadian Desmond-Stephan Mfg. Co.

Hamilton, Ontario

Alfred Herbert, Ltd., Coventry, Eng., Agent for Great Britain.

"STERLING"

Hack Saws

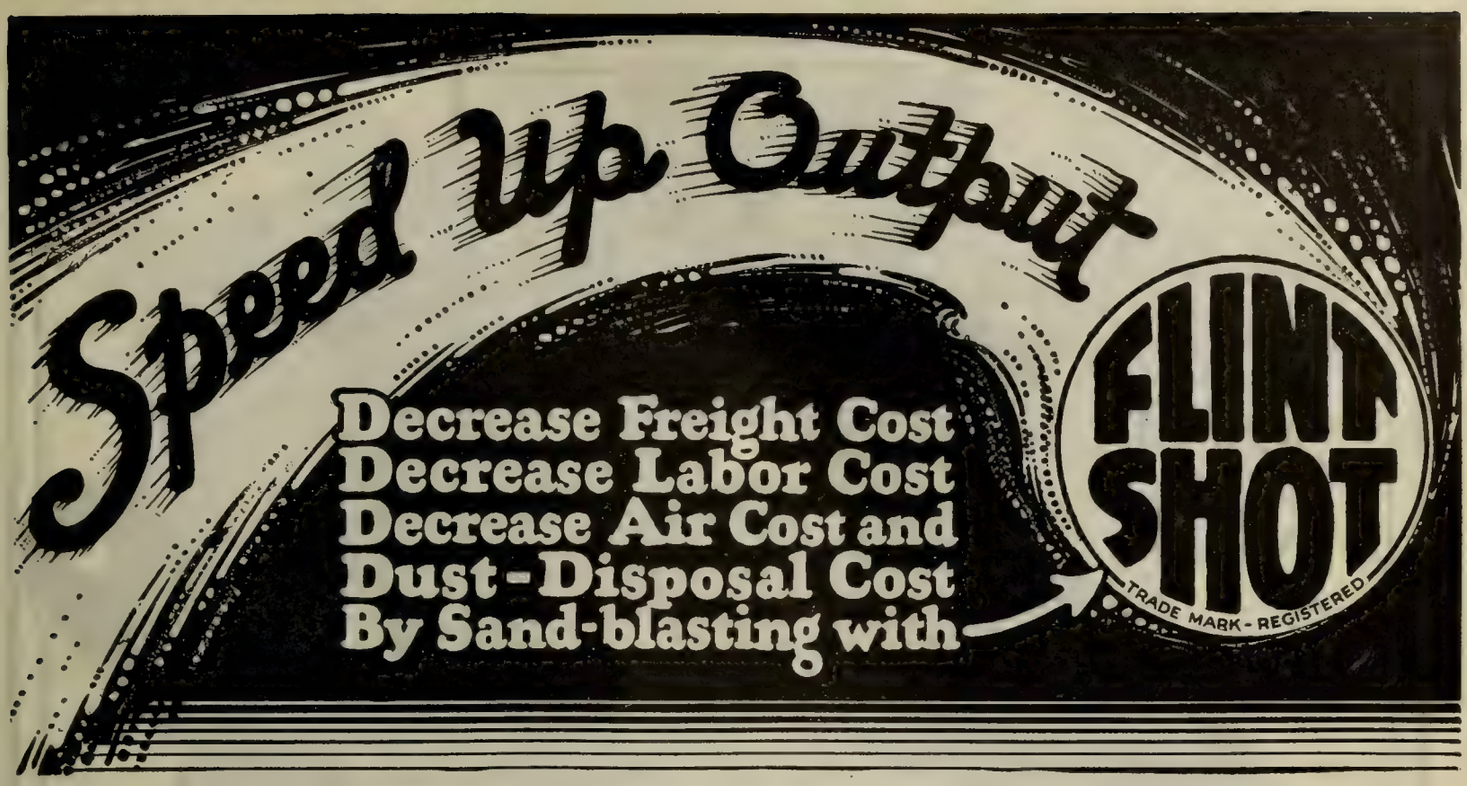
Will prove an economical investment and should be used in every machine shop.

If you care to save money, use "Sterling" Blades.

MANUFACTURED BY

DIAMOND SAW & STAMPING WORKS

BUFFALO, N.Y., U.S.A.



Better Than Sand

Flint Shot is to a bank or ocean sand what a regiment is to a mob—it is an *organized* product of similar units, equal in size, texture, shape, hardness and in their resistence to splitting.

Sand is unorganized, unequal and therefore not uniform in the work done by the granule-impact.

As the foreman of the enameling department of the Chicago Hardware Foundry put it: "Flint Shot has more 'pep'—takes a better 'bite'—goes twice as far—makes a cleaner, evener surface."

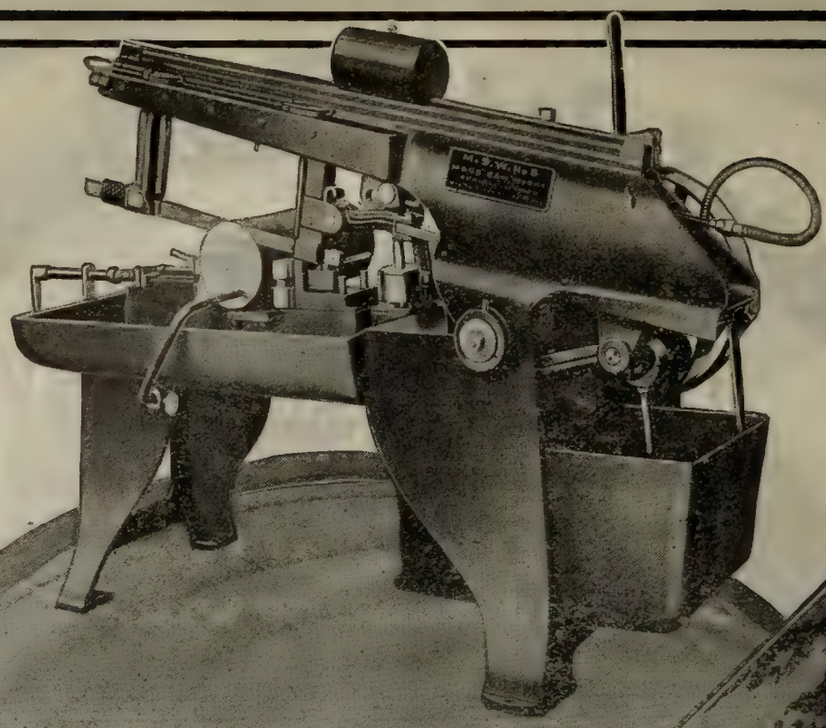
Let us send you a bag or two for working test — free of charge, freight prepaid

Ask for our Flint Shot Book

U. S. SILICA COMPANY

430 Peoples Gas Building **Chicago, Illinois**

Nine Inches of Solid Steel



V. S. W. No. 5
High Speed Hack Saw Machine

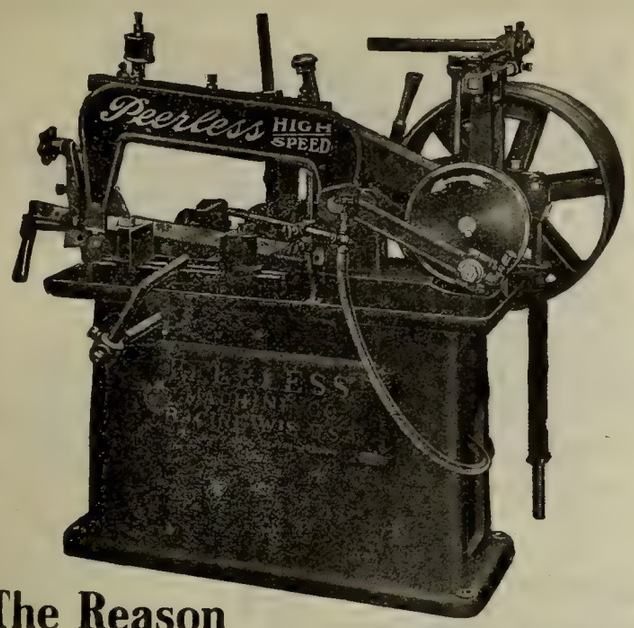
A high grade machine tool in design construction, and workmanship—for the economical cutting of all metals up to 9" x 9".

Built heavier and stronger than actually necessary to stand the modern tendency to over crowd and over speed without unnatural wear or getting out of order.

We cannot emphasize too strongly its high grade construction, the simplicity of its devices, its silence and smoothness in operation, and its rigidity and strength.

You should have a **V. S. W.** machine
Plus **VICTOR** blades, of course.
Write us for complete description.

VICTOR SAW WORKS LIMITED
HAMILTON, CANADA



The Reason For So Many Repeat Orders

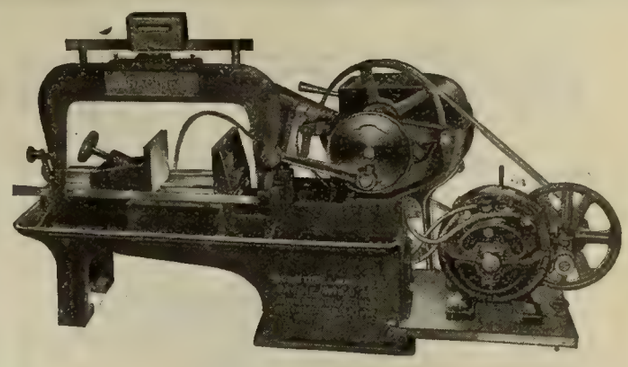
after comparative tests is that no magnifying glass is necessary to distinguish the increased production and the better class of work on the PEERLESS High-Speed Cutting-off Saw.

A third order just came in from one of the largest concerns in the United States, and is it not a fact after a firm has standardized on a certain make of tool that some real results must be produced in order to effect a change?

One of our customers writes: "It takes us only 1-15th of the time to cut our stock on the PEERLESS that it did on our other machine."

If you are open to conviction we have a proposition to offer that no manufacturer can afford to pass up.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

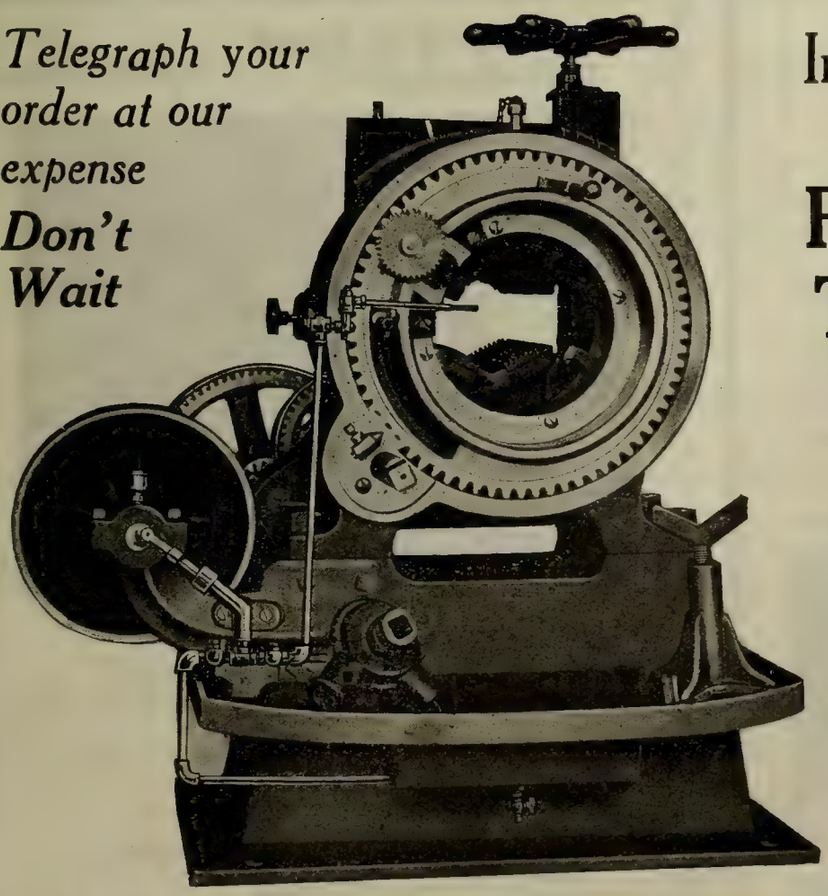


We will send a Racine on a Trial Basis—*Why?*

The Racine machine is the only high-speed metal-cutting machine in the world that is absolutely positive in every action, and will duplicate itself in every cut during the entire life of the machine. All wearing parts are adjustable and accurately machined.

Racine Tool & Machine Co.
15 Melbourne Ave., Racine, Wis., U.S.A.

Telegraph your order at our expense
Don't Wait



In These WAR Times

If you have need of a

Pipe Cutting and Threading Machine

You want to know three things and in this order:

Delivery

All sizes up to 15", for either Hand, Belt or Electric drive, kept in stock for immediate shipment. No waiting.

Quality

The original FORBES. Our specialty since 1882. More than 25,000 in use.

Price

Less than any other Standard Machine on the market, and less than half of many. Our system is the reason.

THE CURTIS & CURTIS CO., 115 Garden Street, Bridgeport, Conn.

The Right Heat

is the only heat to work with if you are going to turn out good work.

An ordinary mechanic can keep a Gilbert & Barker Furnace steady and even, insuring a uniform temperature. Fuel waste is eliminated and your steel hardening problems are solved because uniformity is the secret of success in hardening steel.

And in every G. & B. furnace you get the benefit of 52 years of experience and study with gaseous and liquid fuels. Our line includes more than one hundred types of furnaces.

At present we are making prompt delivery on many types. Stock list 24 describes them all.

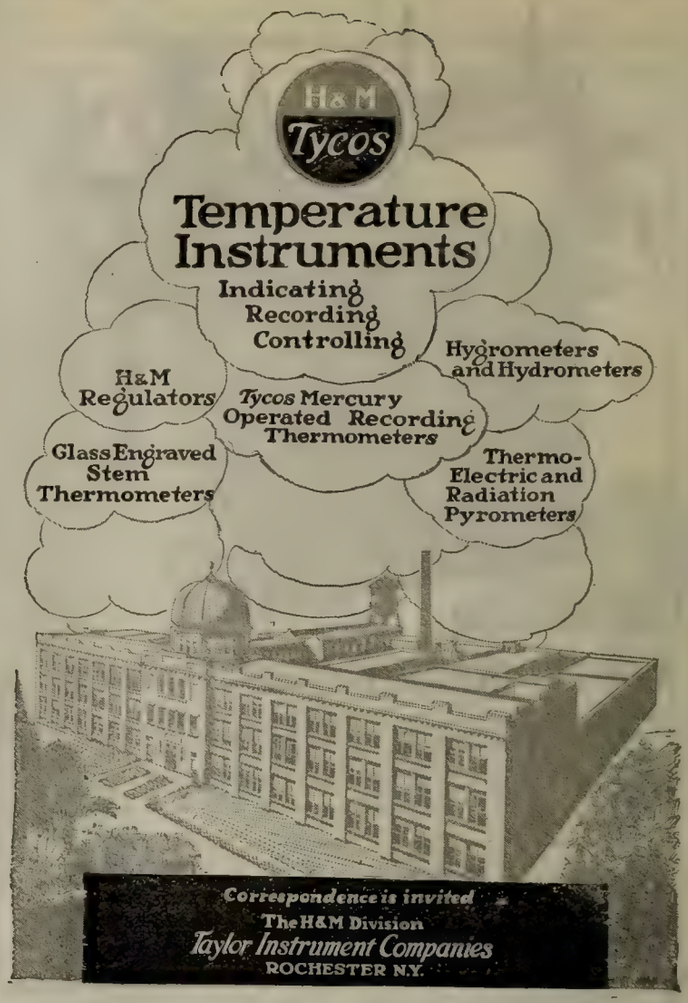
Gilbert & Barker
Manufacturing Company

West Springfield Mass.

Canadian Agents:
WILLIAMS & WILSON, LIMITED
Montreal, Que.
JAMES DEVON.
227 Davenport Rd., Toronto, Ont.

GILBERT & BARKER MFG. CO. G&B SPRINGFIELD, MASS. U.S.A. EST. 1865

Type C-15 in Stock



201 Royal Bank Bldg., Toronto, Ont.

"I have paid for myself in a day."

Crit Point

Feeling the Pulse of Steel

Most Steels Treated

materially above the critical temperature show coarse crystallization and brittleness.

below the critical temperature show a lack of hardness.

at the critical temperature indicate maximum hardness and strength.

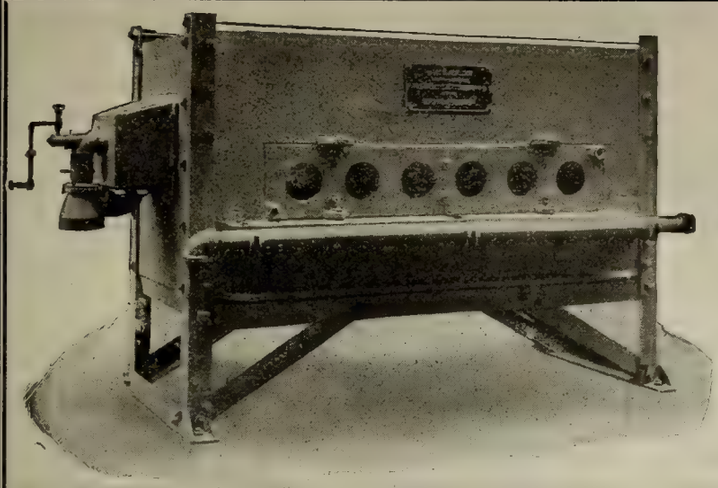
THE "CRIT-POINT"

infallibly indicates whether the steel is or is not up to the critical point.

THIS REVOLUTIONARY METHOD RESULTS

in uniformly perfect product at minimum labor and fuel expense. **PRICE $85.00**

GIBB INSTRUMENT COMPANY
5716 Euclid Avenue Cleveland, Ohio



"MECOL"

6'' Shell End Nosing Furnace

We manufacture furnaces for all purposes to be used with any kind of fuel

The Mechanical Engineering Company, Ltd.

THREE RIVERS, QUE., CANADA

The Oven Equipment & Manufacturing Company

NEW HAVEN, CONN.

"CRAWFORD SECTIONAL" OVENS

Heated with our Enclosed Flame Gas Burners, or Electricity

FOR BAKING JAPANS AND OTHER FINISHES ON METAL.

Ovens carried in stock and built to meet requirements of manufacturers.

Builders of All-Steel Oven Trucks with Roller Bearings.

Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.

ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

Even Temperature is What You Want

—You get it in a Tate-Jones Annealing Furnace—That's certain.

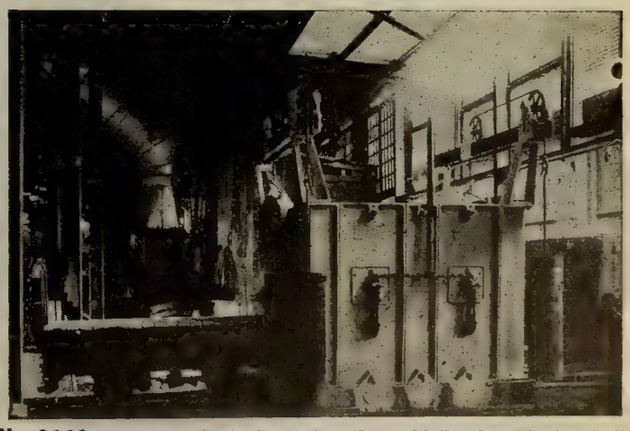
In industries where a great deal of annealing, pack-hardening and heat treating of special and alloy steels is done a furnace is required that will handle a big output and still insure an even temperature which can be accurately controlled. Here is a furnace where Evenness of Temperature and Accurate Control are certain.

We will be pleased to explain the many good characteristics of our double and single annealing furnaces, also our other lines of furnaces, if you will send us your address.

Write for Catalog C.

TATE-JONES & COMPANY, Inc.

Furnace Engineers PITTSBURGH, P.A.



No. 3063 Furnace for Chain Annealing—James McKay Co., Pittsburgh, Pa.

If any advertisement interests you, tear it out now and place with letters to be answered.

Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send to our nearest factory for a trial box.

Manufactured and guaranteed by

The Canada Metal Company, Limited

Hamilton Montreal TORONTO Winnipeg Vancouver

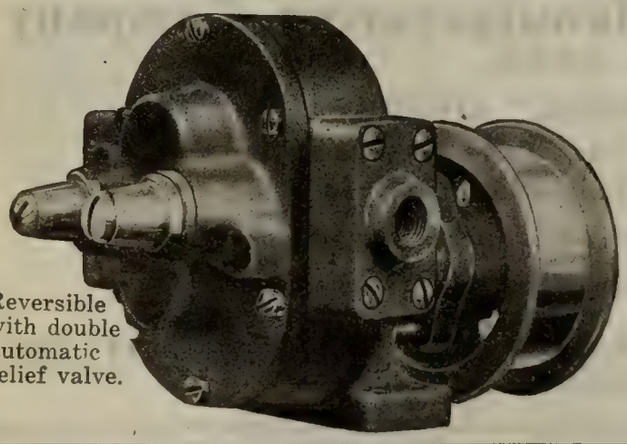
Copious - Clean - Coolant

TRAHERN ROTARY GEARED PUMPS do not clog, and if equipped with strainers it is impossible for foreign matter to pass through pump and damage cutting tool. The cost of one such accident would pay for many pumps. Think it over—then write to us.

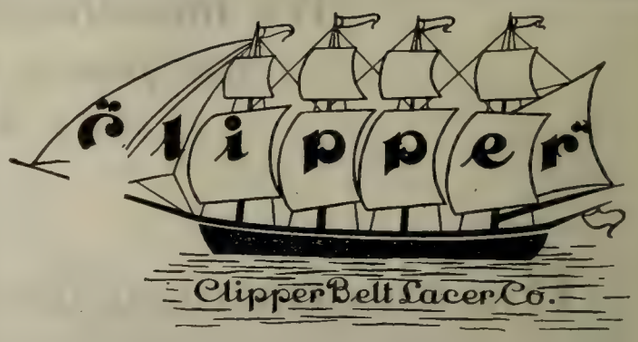
Trahern Pump Company

ROCKFORD, ILLINOIS

Canadian Agents: A. R. WILLIAMS MACHINERY CO.
Toronto, Ontario



Reversible with double automatic relief valve.

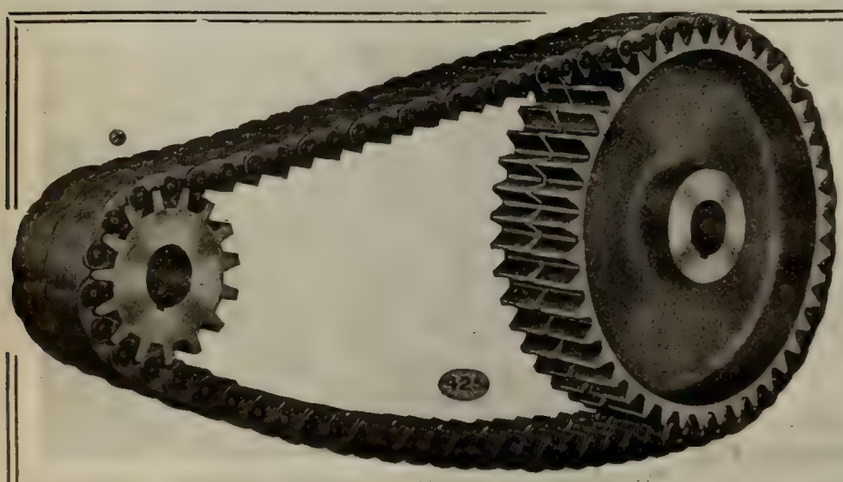


If you would use a stop watch while one of your belt lacing crews were at work you would find that you were paying expert men for a half hour job when any machine operator can lace a belt in THREE minutes with the

CLIPPER BELT LACER

CLIPPER BELT LACER COMPANY

976 Front Ave., N.W. Grand Rapids, Mich.



RENOLD CHAINS

PATENT SILENT

The proven efficient form of Power Transmission.

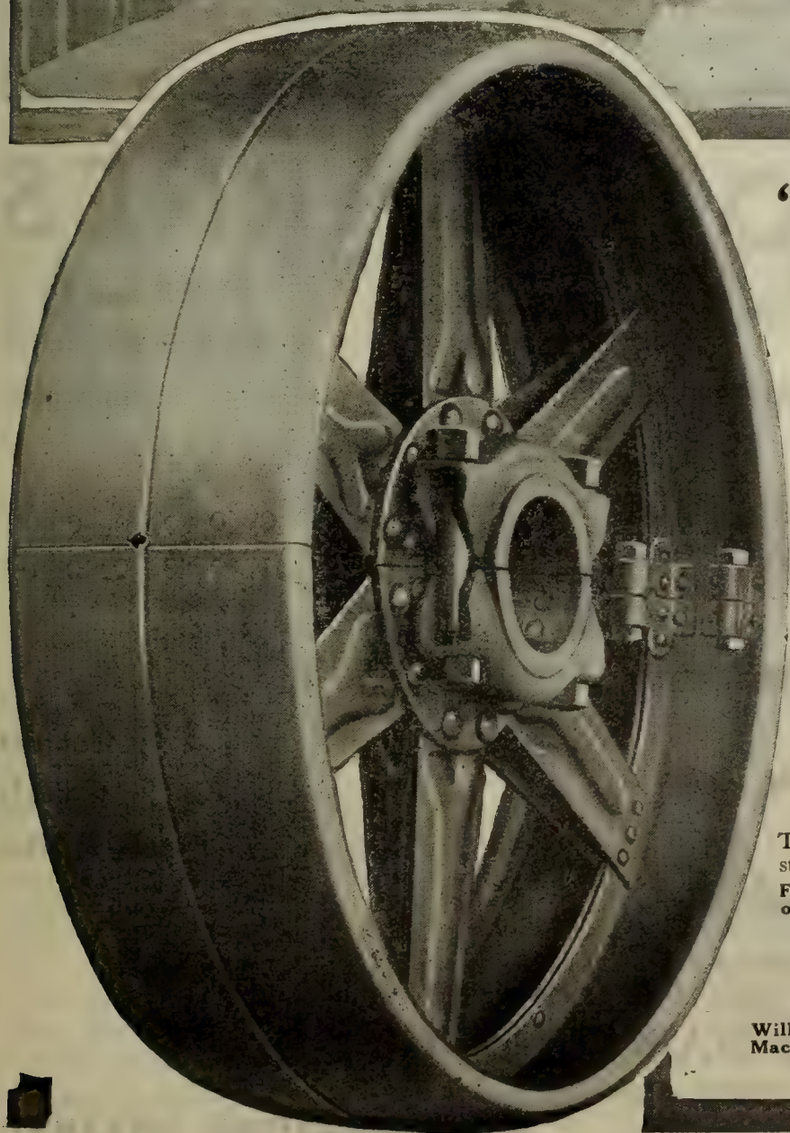
Equally suitable for main shaft or machine drives. Save space and power, increase output and ensure durability.

Chain and Parts Carried in Stock.

Sole Canadian Agents

Jones & Glassco. (Reg'd)

Branch Office: TORONTO, ONT. ENGINEERS **St. Nicholas Bldg. MONTREAL, P.Q.**



"We Must Stop These Pulley Losses"

Pulley breakdowns—men and machines idle—are all too frequent in some plants.

Belt slip and air resistance eat up power.

Not enough attention is paid to the selection of pulleys. Perhaps wood and iron pulleys are still being used. Their first cost may be low, but their last cost is far higher than

AMERICAN STEEL SPLIT PULLEYS

The flat A-braced arms of "American" Pulleys cut the air and save enormously on power.

Belt slip is reduced to a minimum.

"Americans" are guaranteed to perform double belt duty under all conditions not demanding a special pulley.

They are capable of enduring higher speeds than any other standard metal pulley.

FREE BOOK—"Pulley Efficiency" sent on request. Full of money-saving pulley information.

THE AMERICAN PULLEY CO.

Philadelphia, Pa.

Canadian Distributors:

Williams & Wilson, Ltd., Montreal, Que. A. R. Williams Machinery Co., St. John, N.B.; Toronto, Ont.; Vancouver, B.C.; Winnipeg, Man.; H. W. Petrie, Ltd., Toronto, Ont.

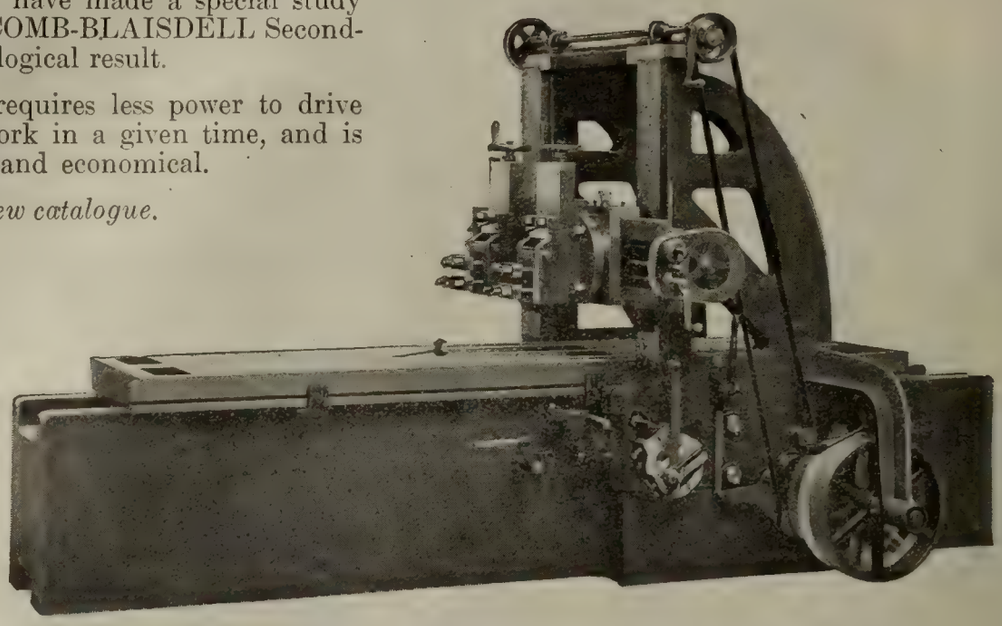
If any advertisement interests you, tear it out now and place with letters to be answered.

WHITCOMB-BLAISDELL
Second-Belt Drive Planers

Does power saving, time saving and increased production interest you? We have made a special study of these points and WHITCOMB-BLAISDELL Second-Belt Drive Planers are the logical result.

The second-belt drive requires less power to drive the machine, does more work in a given time, and is noiseless, smooth running and economical.

Write for new catalogue.



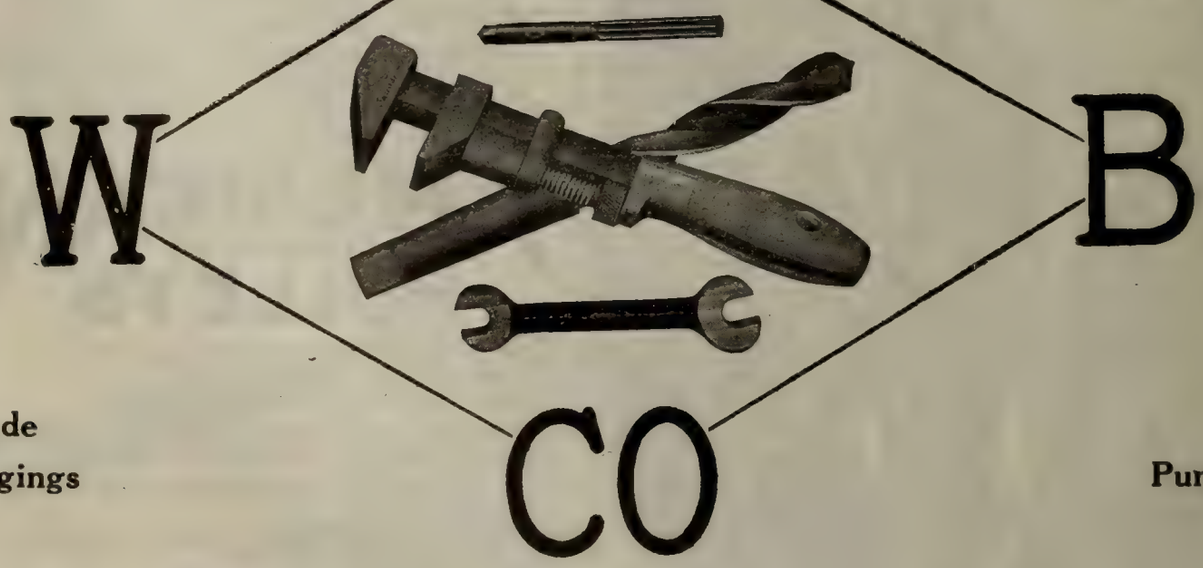
30"x30"x8"
PLANER

WHITCOMB-BLAISDELL MACHINE TOOL CO.
Worcester, Mass., U. S. A.

WHITMAN & BARNES

Twist Drills
and
Reamers

Screw and Drop
Forged Wrenches
Hammers



Special
High Grade
Drop Forgings

Cotters
Chisels
Punches, Etc.

Users recognize "W & B" Tool Quality, backed by 62 Years' Uninterrupted Manufacturing Experience. If your Jobbers and Dealers cannot supply, write us and we will see that you are supplied. Send for Catalog No. 86-H.

THE WHITMAN & BARNES MFG. CO.
ESTABLISHED 1854

CANADIAN OFFICE AND FACTORY ∴ ∴ ST. CATHARINES, ONTARIO

The Spiro Never Slips

The Spiro Compression Coupling is locked to the shaft by a graduated grip.

The pull of the bolts on the two halves of the coupling acts on the spiral slotted sleeve until it grips the full surface of the shaft with a **never-slip** hold.

Every bolt pulls, and at every pull the **grip** grows.

And last, but not least, the **Spiro** can be removed as quickly and easily as it can be applied.

The Bond Booklet describes our complete line of Power Transmission Devices.

Canadian Bond Hanger & Coupling Company, Limited

Alexandria **Ontario**

Economic Boiler Compound

If you have boiler troubles, and wish to clean same at a minimum cost, use ECONOMIC BOILER COMPOUND, it will surprise you.

Manufactured by

CANADIAN ECONOMIC LUBRICANT CO., LTD.

MONTREAL

CHAPMAN

DOUBLE BALL BEARINGS

Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with out little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.

339-351 Sorauren Ave., TORONTO, Canada

TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.

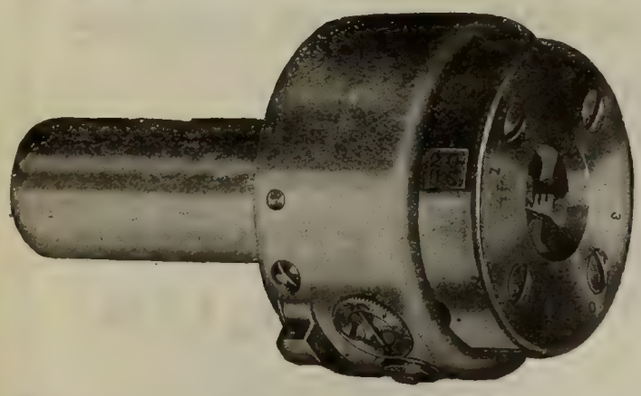
FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

M.A. HANNA & Co.

Sales Agents:
CLEVELAND

Canadian Office:
703 C.P.R. Bldg., Toronto



Desirable Threads

Are easily obtainable with an H. & G. Automatic Self-opening Die Head.
The Chasers are set and held in place by a steel cam which, once adjusted, locks. No stopping or changing required to keep to size. There are a good many other features on this Die Head.

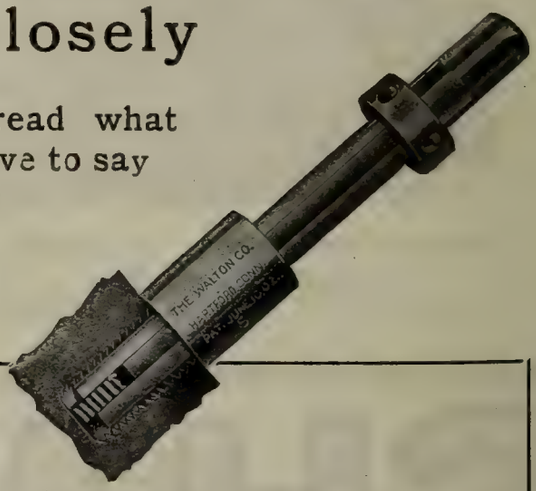
"Write us!—write now."

EASTERN MACHINE SCREW CORP.
NEW HAVEN CONN., U.S.A.

H & G

Look at this again —closely

and read what we have to say below

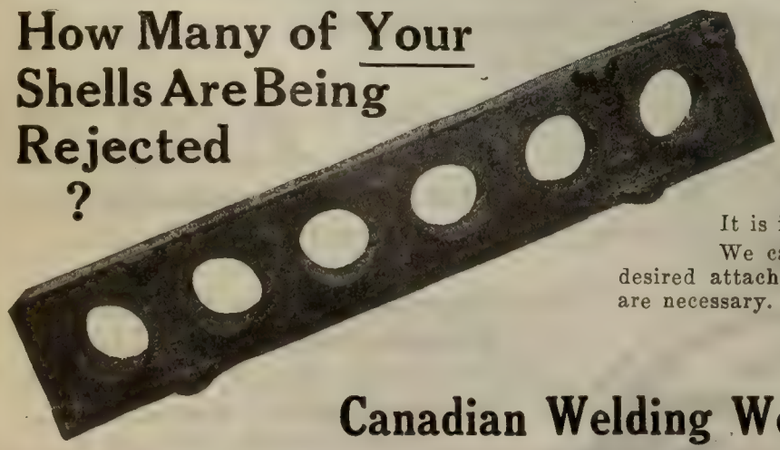


WHEN a tap breaks off close or below the surface, you'll find this Walton Tap Extractor will save a great deal of time and trouble. The crucible fingers grasp the flutes of the tap, a twist of the wrench and the piece is out.

Don't you think it would pay to have a few lying around on your benches?

The Walton Company
Hartford, Conn.

How Many of Your Shells Are Being Rejected ?



Water Jacket for Nosing Furnace

This **STEEL** jacket holds a large amount of water, which keeps the body of shell cold, and permits of proper heating of the nose for nosing operations.

Being made of steel, it stands contraction and expansion —not possible with cast iron.

It is indestructible and fool-proof. Made for all sizes of shells.

We can make this jacket to any special dimensions, with any desired attachments. No patterns are required—specifications all that are necessary.

Tested and Guaranted
IMMEDIATE DELIVERY.

Canadian Welding Works, Ltd., 51 Montfort Street, **Montreal, P.Q.**

HANNIFIN AERO CHUCKS M'F'G CO

Hannifin Air Chucks

Their operation, their simple construction, their efficiency-promoting qualities have impressed the Canadian manufacturers in such a manner that they are becoming an established part of the shop equipment.

After demonstrating its superiority over other chucks the Hannifin Air Chuck has been adopted by a popular line of Canadian lathes.

There is no wear on these chucks. The pressure is uniform and positive. Our catalogue will give such data and specifications as to convince you of the Hannifin superiority.

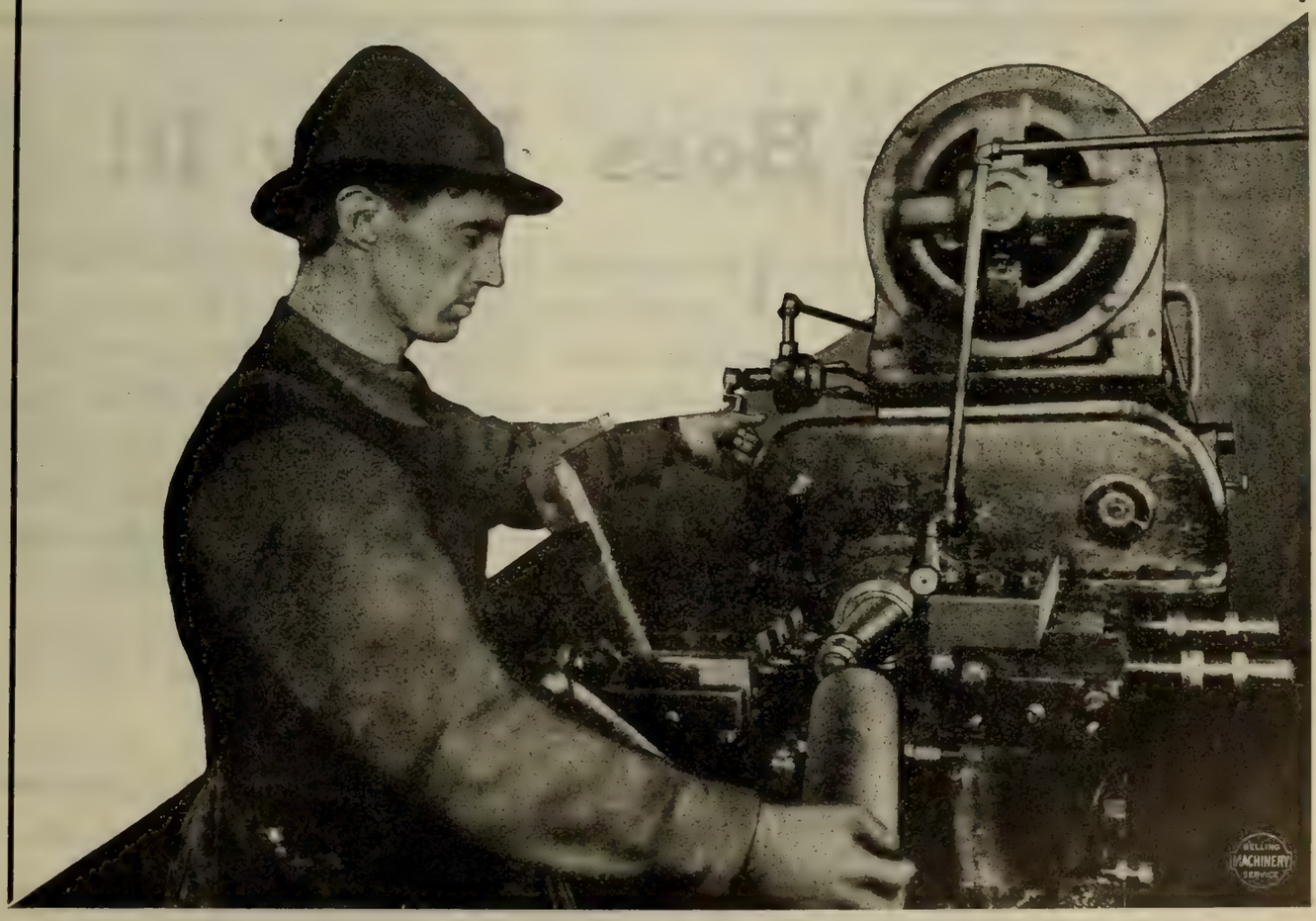
Our Catalogue is at Your Disposal

Hannifin Manufacturing Company

CHICAGO U.S.A.

Representatives
R. E. Ellis Engineering Co., Chicago
Coats Machine Tool Co., New York City
A. R. Williams Machinery Co., Toronto
Williams & Wilson, Montreal

Representatives
The Canadian Fairbanks-Morse Co., Montreal
European Representatives
Coats Machine Tool Co., London
Fenwick, Freres & Co., Paris
Iznosskoff & Co., Petrograd



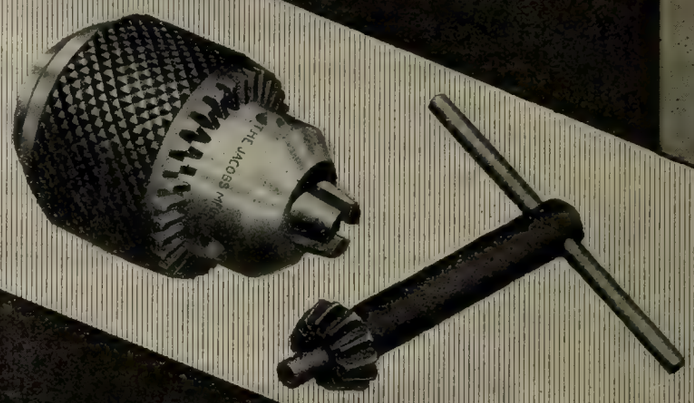
Jacobs
IMPROVED
Drill Chuck

A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.



Let the Boss Know It!

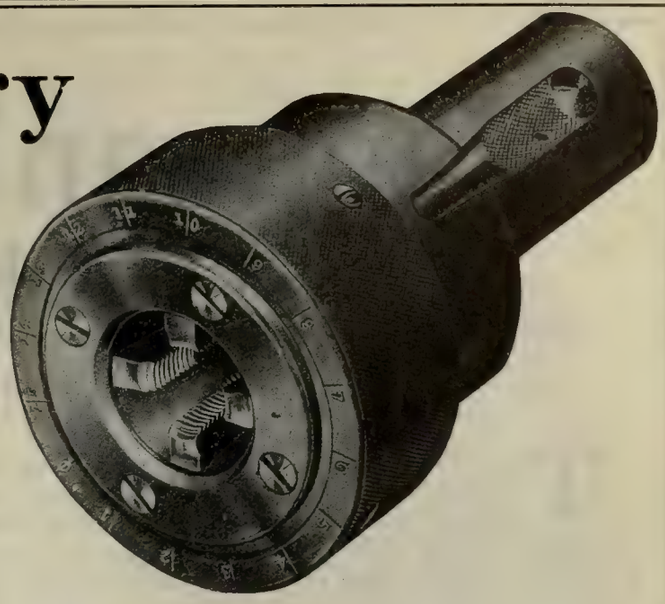
IF you are a reader of Canadian Machinery, go tell your employer about it some convenient time! You couldn't tell the up-to-date manufacturer anything that would please him more. He would know that you are abreast of the times; that you are ambitious and interested in your work; that you are acquainted with methods and machinery which make for greater efficiency. He will say softly to himself: "Here is a live wire,—I'll just keep my eye on that chap."

If you are not a regular reader it will pay you to become one right away—quick.

Subscription price—$3.00 per year. 52 issues.

Rapid Delivery

Users of Murchey Tools Get Chasers Without Delay



Lightning deliveries—that is a big advantage of using Murchey Tools. No work held up for chasers. We get your order, fill it, and it's on the way back to you just as quickly as the most rapid means of transportation can bring it to you.

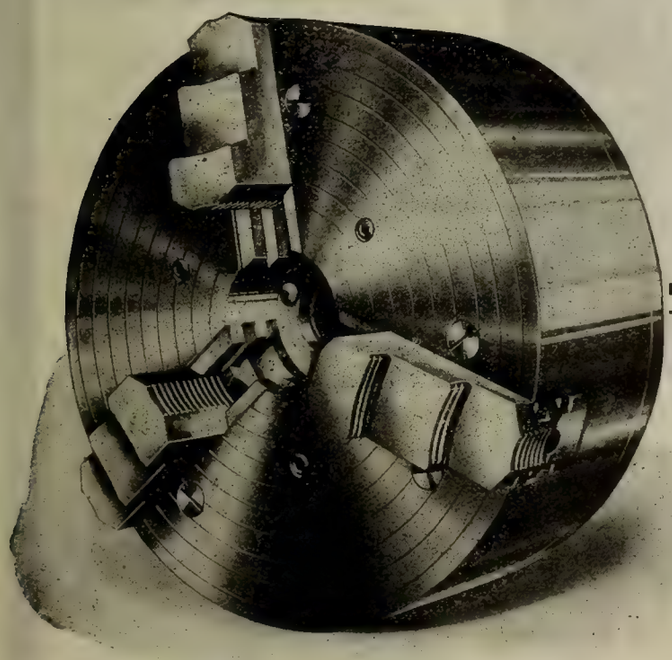
There is no service like the Murchey service, and there are no tools like the Murchey Tools. Send blueprints for estimates.

MURCHEY TAPS are accurate and simple and can be worked with great speed. On 4.5 Mark VII shells Murchey tapping time is just ONE MINUTE.

Murchey Machine & Tool Company

75 PORTER STREET - - DETROIT, MICHIGAN

The Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, S.W., England, Glasgow, Newcastle-on-Tyne, and Fenwick Freres & Company, 15 Rue Fenelon, Paris, France.



Indispensable Where Rapid Manufacturing Methods Prevail

The M. E. C. Three-Jaw Air-Operated Chuck (steel body) eliminates the troublesome time-losing, hand-operated chuck. Operating on tests of long periods it will show an increase in production of from 25 to 90 per cent. Once chucked, the work stays chucked. Vibration doesn't affect it—it holds tight regardless of cutting strain. Saves energy and time. Most of the work of medium diameter is chucked and released without stopping machine spindle.

Ask for full details. By all means get our interesting catalog on Labor-Saving Devices. Write for it NOW, it's **free.**

By All Means Get Our Interesting Catalog on Labor Saving Devices

MANUFACTURERS EQUIPMENT COMPANY

171 N. Jefferson Avenue **Chicago, U.S.A.**

Agents for Central and Eastern States and Canada: J. R. Stone Tool & Supply Co., Goebel Bldg. Detroit, Mich.

Foreign Agents: C. W. Burton Griffiths & Co., Ludgate, Ludgate Square, London, England.

If any advertisement interests you, tear it out now and place with letters to be answered.

MacLean's Magazine
FOR JULY

The Smugglers were Caught

THE true and complete story of a huge smuggling conspiracy which robbed the Canadian and United States Customs Departments of hundreds of thousands of dollars, and which was finally exposed by a Canadian Customs officer, is well told in the July MACLEAN'S. The parties concerned settled by handing over a huge check to the Canadian Government and not a word of the story has ever before been in print. The man who writes the article, J. D. Ronald, was personally concerned in the investigation, and he tells the whole case from first to last, merely changing the names of some of the central figures. This is one of the most striking special features that MACLEAN'S has ever had.

Confederation
the dominant theme of July MACLEAN'S

THE Jubilee of Confederation has led the Editor to make the July MACLEAN'S retrospective and interpretive of Confederation in the character of its main contents—this to meet the certain need and desire of the Canadian people. Note the fine provision of special Confederation article and features:

"THE MEETING OF MACDONALD AND BROWN."
By C. W. Jefferys, a frontispiece painted for MACLEAN'S.

"THE STORY OF CONFEDERATION."
By Thomas Bertram. A colorful narrative of the bringing about of the union of provinces.

"FIFTY YEARS OF BUSINESS EXPANSION."
By W. A. Craick, covering all phases of business—banking, insurance, manufacturing, agriculture, transportation, etc.

"THE BUILDING OF THE C.P.R."
By C. H. Mackintosh, former Lieutenant-Governor of the North West Territories, and an ex-editor of the Ottawa Citizen.

"CONFEDERATION AND AFTERWARDS."
By Agnes C. Laut. An article on Confederation and the taking over of the North West Territories from the Hudson Bay Company.

Look for this symbolic cover design in three colors at book stores and news-stands. It is a fine bit of work, and worth preserving.

"SOME CANADIAN CONTRASTS."
By Frank Yeigh. A sketchy article showing some of the most picturesque ways in which Canada has advanced during the last fifteen years.

"THE DRAFT."
By A. C. Allenson. A story of the part which Canadians took in the American Civil War.

MESSAGES ON CONFEDERATION
appear from the Premiers of many of the Provinces of Canada.

Billy Sunday Contributes:

"WHAT I THINK OF CANADA."
A brief article in the crisp, epigrammatical style of the famous evangelist, illustrated by some of his most recent photographs taken in action in New York.

The Fiction Features:

"THE GUN BRAND."
By James B. Hendryx. An interesting instalment of this exciting serial.

"THE OUTLAW BOAR."
By Clark E. Locke. A short story.

"PUTTING IT OVER."
By Hastings Webling. A golf story.

"THE CAPTAIN OF THE SUSAN DREW."
By Jack London. The first instalment of a two-part story—one of the last that London wrote.

The Best Number of MACLEAN'S by long odds

THAT has ever been put out is this July issue. It will be bigger, the articles are stronger, the stories more entertaining, and the illustrations more varied. Stephen Leacock's "Sunshine in Mariposa" is continued in this issue; also the regular Departments, Records of Success, Review of Reviews, The Business Outlook, and Information for Investors.

At All News-Dealers 15c.

HINTS TO BUYERS

Eliminate Danger

Accidents break down the efficiency of your organization, lead to legal troubles, loss of time and money.

TRADE MARK

BRISTO

REG. U. S. PAT. OFFICE

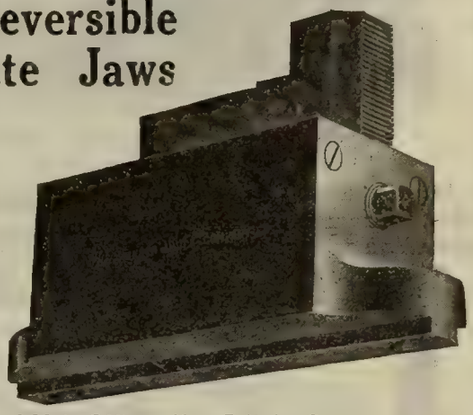
SAFETY SET SCREWS

insure safety. They also protect themselves because of their patented construction. The dove-tailed design of wrench and screw contracts the metal under pressure. The harder you twist the wrench the more the metal of the screw is compressed.

Write for BULLETIN I-809

THE BRISTOL COMPANY
Waterbury, Conn., U.S.A.

Skinner Reversible Face Plate Jaws



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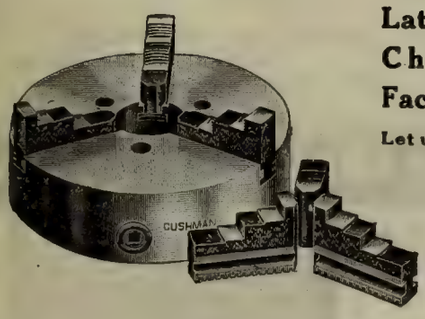

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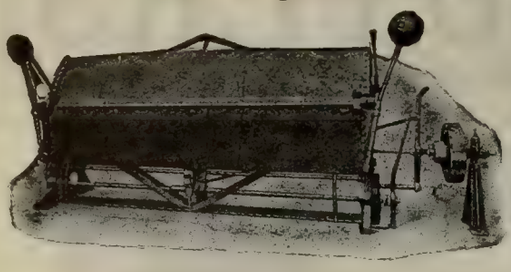

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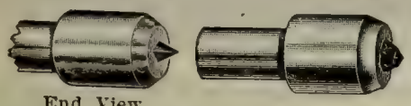

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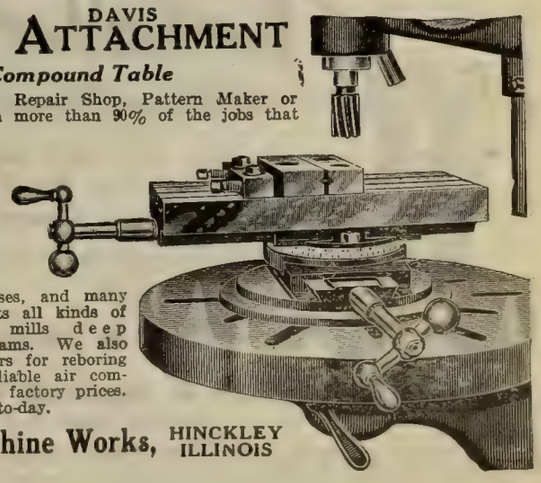

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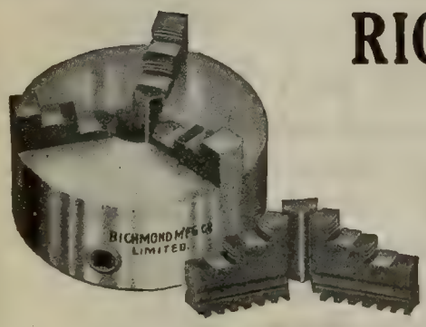

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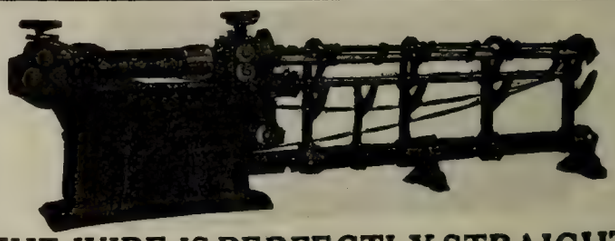

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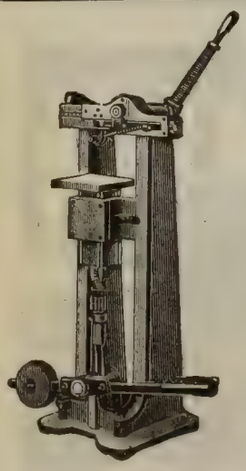

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Parmenter & Bulloch Co., Gananoque.
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Alexander Fleck, Ltd., Ottawa.
Hungerford Brass & Copper Co., New York, N.Y.
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Alexander Fleck, Ltd., Ottawa.
Gardner, Robt., & Son, Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.
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CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
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Pratt & Whitney Co., Dundas, Ont.
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Garlock-Walker Machinery Co., Toronto, Ont.
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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.
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Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.
Hyde Engineering Works, Montreal.
CHUCKS, AIR
Manufacturers Equipment Co., Chicago, Ill.
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Hannifin Mfg. Co., Chicago, Ill.
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Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
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Richmond Mfg. Co., Toronto, Ont.
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H. W. Petrie, Toronto.
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Thomas Elevator Co., Chicago, Ill.
D. E. Whiton Machine Co., New London, Conn.
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Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.
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Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.
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Hardinge Bros., Inc., Chicago, Ill.
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Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.
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Hanna & Co., M. A., Cleveland, O.
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Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
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Hardinge Bros., Inc., Chicago, Ill.
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Manufacturers' Equipment Co., Chicago, Ill.
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Hinckley Machine Co., Hinckley, Ill.
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H. W. Petrie, Toronto.
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Hepburn, John T., Ltd., Toronto, Ont.
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Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.
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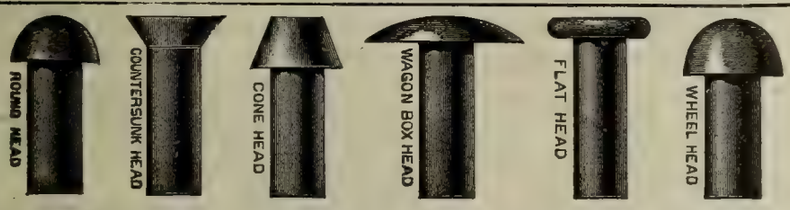

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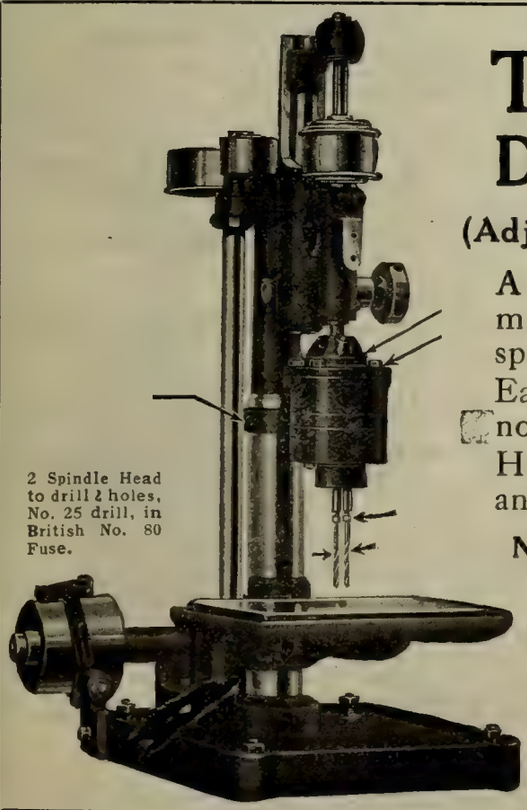

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H. W. Petrie, Toronto.
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A. R. Williams Machinery Co., Toronto.

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Garlock-Walker Machinery Co., Toronto, Ont.
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Morse Twist Drill & Machine Co., New Bedford.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
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United States Electrical Tool Co., Cincinnati.
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Garlock-Walker Machinery Co., Toronto, Ont.
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Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Niles-Bement-Pond Co., New York.
R. E. T. Pringle, Ltd., Toronto, Ont.

DRILLS, PNEUMATIC CORNER
Independent Pneumatic Tool Co., Chicago, Ill.

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Armstrong Bros. Tool Co., Chicago.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Millers Falls Co., Millers Falls, Mass.
Morse Twist Drill & Mach. Co., New Bedford.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Dominion Machy. Co., Toronto.
Foss & Hill Machy. Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
Morse Twist Drill & Mach. Co., New Bedford.

DRILLS, TWIST
Atkins & Co., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sheldons, Ltd., Galt, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Canada.
Sheldons, Ltd., Galt, Ont.

DUST ARRESTERS (FOR TUMBLING MILLS)
Northern Crane Works, Walkerville.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

DYNAMOS AND ELECTRICAL SUPPLIES
Canadian Fairbanks-Morse Co., Montreal.
Dominion Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
A. R. Williams Machy. Co., Toronto.

ELEVATOR ENCLOSURES
Canada Wire & Iron Goods Co., Hamilton, Ont.

ELEVATORS AND BUCKETS
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Whiting Foundry Equipment Co., Harvey, Ill.

ELEVATING AND CONVEYING MACHINERY
Banfield, Edwin J., Toronto.
Can. Matthews Gravity Carrier Co., Toronto, Ont.

EMERY GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Stow Mfg. Co., Binghamton, N.Y.

EMERY AND EMERY WHEELS
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Ford-Smith Mach. Co., Hamilton, Ont.
Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

ENGINES, BALANCED VALVE
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Plessisville Foundry Co., Plessisville, Que.

ENGINES, STEAM, GAS, GASOLINE
Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
H. W. Petrie, Toronto.
Riverside Machinery Depot, Detroit, Mich.

ENGINES, HORIZONTAL AND VERTICAL
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Johnson Mach. Co., Carlyle, Manchester, Conn.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
A. R. Williams Machy. Co., Toronto.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Hungerford Brass & Copper Co., U. T., New York.
Parmenter & Bulloch Co., Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Canada.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Canada.
R. E. T. Pringle, Ltd., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

FAUCETS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FENCE, IRON AND FACTORY
Canada Wire & Iron Goods Co., Hamilton, Ont.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

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Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Can. B. K. Morton Co., Toronto, Ont.
Delta File Works, Philadelphia, Pa.
Marshall, Geo. A., 70 Lombard St., Toronto.
Nicholson File Co., Port Hope, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Port Hope File Mfg. Co., Port Hope, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

FILING MACHINES
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FILTERS, WATER
W. B. Scaife & Sons, Pittsburgh, Pa.

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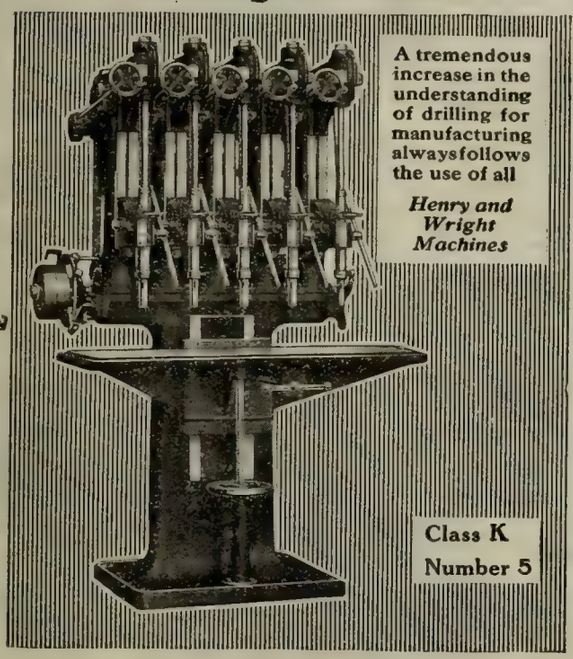

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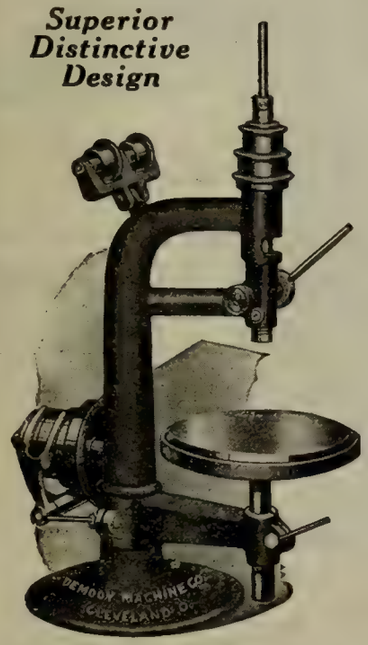

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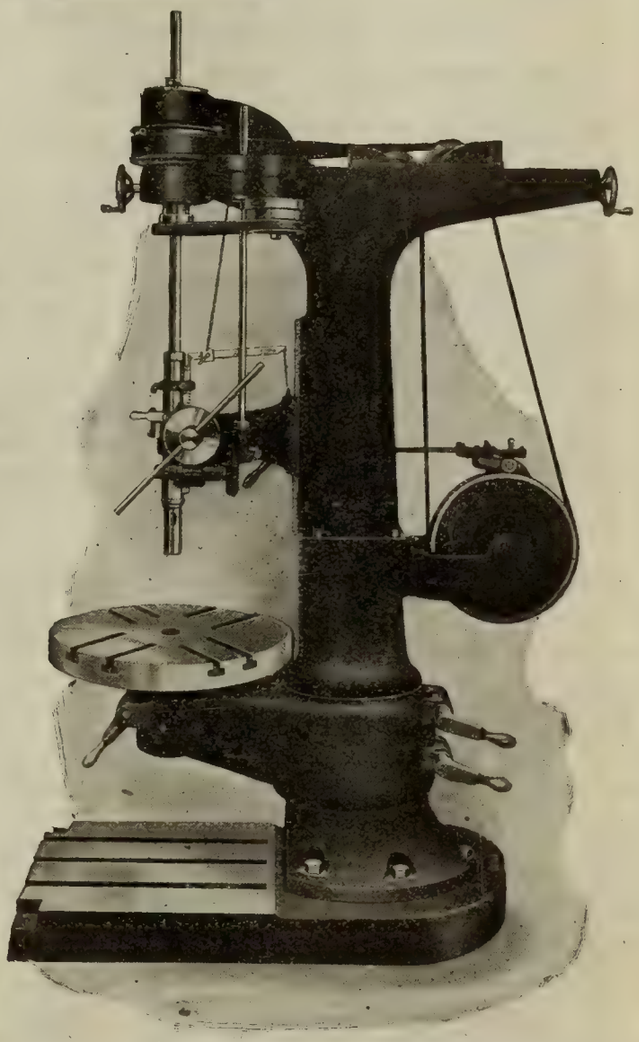

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Gardner, Robt., & Son, Montreal.
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A. R. Williams Machy. Co., Toronto.
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A. R. Williams Machy. Co., Toronto.
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Hickory Steel Grip Glove Co., Chicago, Ill.
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GRINDER ATTACHMENTS
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Wilmarth & Morman, Grand Rapids, Mich.
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Blake & Johnson Co., Waterbury, Conn.
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Garlock-Walker Machinery Co., Toronto, Ont.
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New Britain Machine Co., New Britain, Conn.
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H. W. Petrie, Toronto.
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Slocum, Avram & Slocum, Inc., New York.
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Brown & Sharpe Mfg. Co., Providence, R.I.
Foss & Hill Machy. Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
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Norton Grinding Co., Worcester, Mass.
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GRINDERS, DIE AND CHASER
Landis Machine Co., Waynesboro, Pa.
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National-Acme Co., Cleveland, Ohio.
GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
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Garvin Machine Co., New York.
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Brown & Sharpe Mfg. Co., Providence, R.I.
Fitchburg Grinding Mach. Co., Fitchburg, Mass.
Foss & Hill Machy. Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
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Brown & Sharpe Mfg. Co., Providence, R.I.
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Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
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Rivett Lathe & Grinder Co., Brighton, Mass.
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Armstrong Bros. Tool Co., Chicago.
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Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
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Carborundum Co., Niagara Falls.
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Millers Falls Co., Millers Falls, Mass.
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L. S. Starrett Co., Athol, Mass.
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Zenith Coal & Steel Products, Montreal, Que.
HACK SAW FRAMES
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Erie Foundry Co., Erie, Pa.
HAMMERS, COPPER
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Canadian Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
Erie Foundry Co., Erie, Pa.
High Speed Hammer Co., Rochester, N.Y.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Plessisville Foundry Co., Plessisville, Que.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
HAMMERS, HELVE POWER
Canada Machinery Corp., Galt, Ont.
West Tire Setter Co., Rochester, N.Y.
HAMMERS, POWER
Beaudry & Co., Boston, Mass.
Erie Foundry Co., Erie, Pa.
United Hammer Co., Boston, Mass.
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Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
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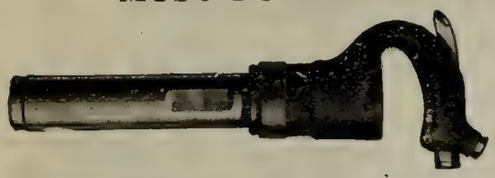
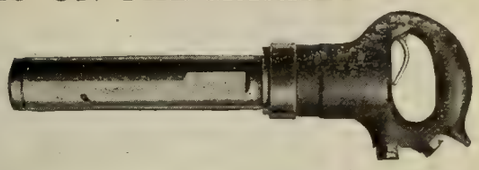
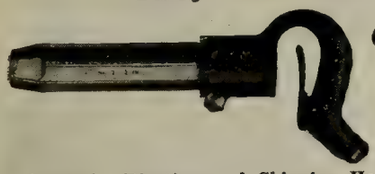
MOST POWERFUL AND EFFICIENT AIR TOOLS ON THE MARKET



Pocket-in-Head Riveters are made in 15 styles, with Outside and Inside Latch, and have driving capacities of ¼-in. to 1½-in. rivets in Boilers, Tanks, Stacks, etc.



They have an enviable record for durability and economy in service.

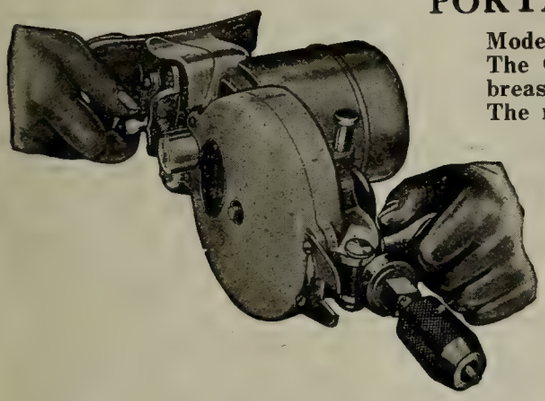


CLEVELAND CHIPPING HAMMERS

are made in 19 styles and sizes to suit all classes of work. They are ideal tools for foundries, as they have high speed, no recoil, and are practically dust-proof.

In stock: Riveting and Chipping Hammers, Air Drills, Corner Drills, Sand Rammers, Portable Grinders, Bowes Couplings, Chisels, Rivet Sets, etc.

PORTABLE ELECTRIC DRILLS



Model "B" Drill illustrated, shows compactness of design. The Casing, Switch and Gear Covers are aluminum; the breast plate, motor-head and handle supports are of steel. The machine is light in weight, convenient in shape; has high speed; operates on either A.C. or D.C. currents and runs either forward or reverse as desired. Model "C" has two speeds and in construction is similar to Model B.

Bulletins mailed on request.

Address All Inquiries to

CLEVELAND PNEUMATIC TOOL COMPANY OF CANADA, LIMITED

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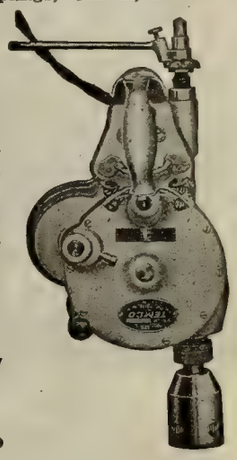

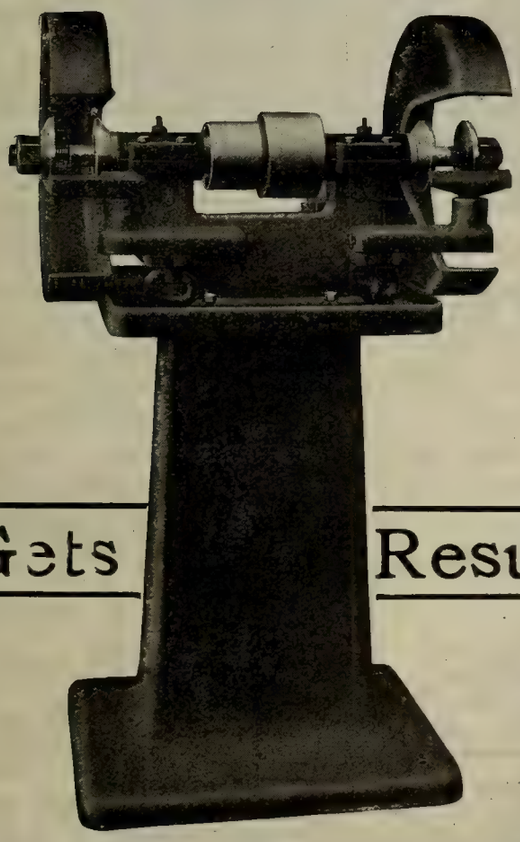

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A grinder whose efficiency will answer requirements. The bearings for the 16″ wheels, the spindle, the speed and the smoothness of operation are all of the quality that will give you the maximum efficiency with the minimum cost. An inquiry will be thoroughly attended to.

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A grinder with massive table, micrometer adjustments, very long knee and gibs, and extra heavy head and tail-stock—it will pay you to investigate the

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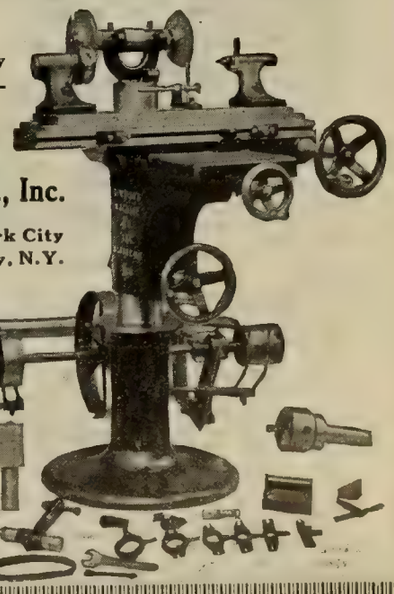
Start the investigation by sending for the full details—to-day.



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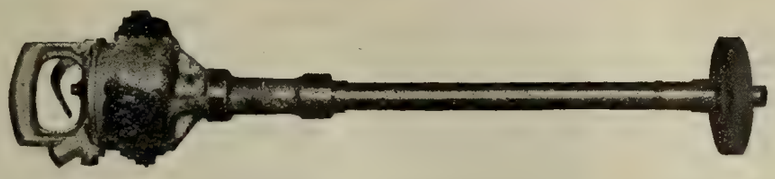

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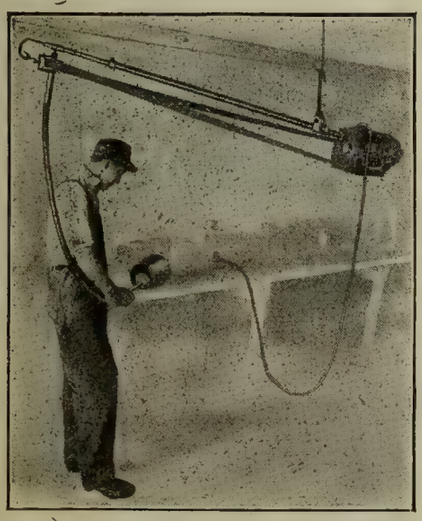

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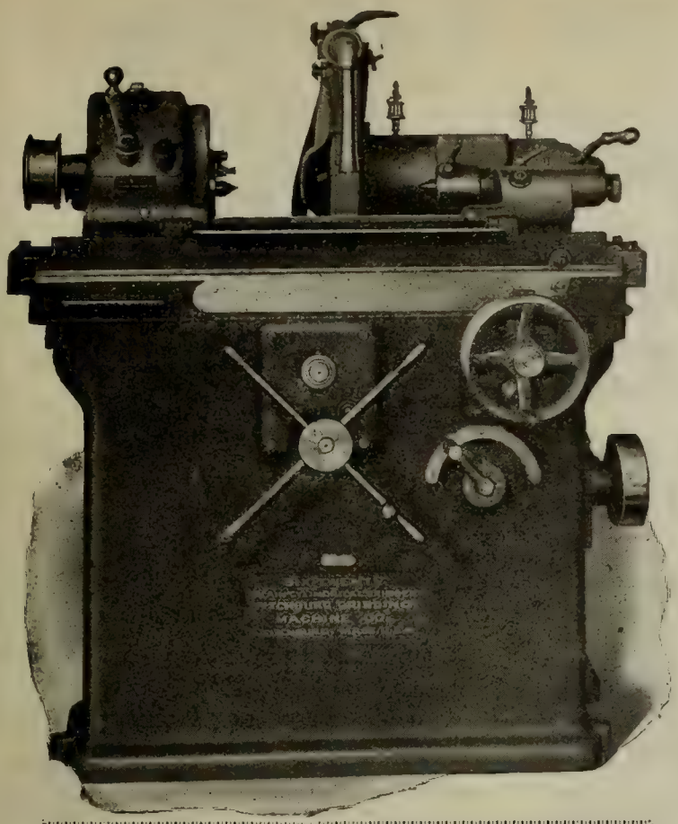

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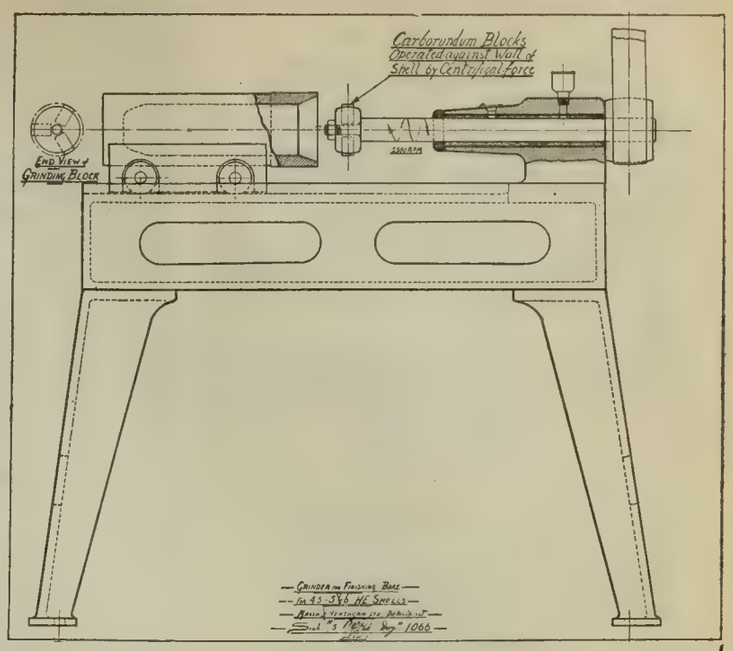
Model "A" illustrated here is a machine whose chief feature is its capacity for size, variety and quality of work. Its speed will give you greater production; its size, convenience, increased production, strength and saving in floor space will effect such a saving as to make it preferable over all other machines of similar character.

It is specially adapted for grinding straight or taper shafts.

An inquiry would speedily get you valuable information and data.

Fitchburg Grinding Machine
COMPANY

Fitchburg, Mass. U.S.A.



Smooth Bores

We have designed for our own use a simple and inexpensive grinder to give the final touch to the bore of our shells.

It does the work, and we will have some of these machines on the market shortly.

Write us for our proposition.

Marsh & Henthorn
Limited

BELLEVILLE, ONTARIO

Bertrams, Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
A. R. Jardine & Co., Hespeler.
Montgomery, Smith & Co., Keynsham, Somerset, Eng.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Toledo Machine & Tool Co., Toledo.

SHEET METAL STAMPINGS
Dominion Forge & Stpg. Co., Walkerville, Ont.

SHELL BANDING MACHINES, HYDRAULIC
Chapman Double Ball-Bearing Co., Toronto, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., W. R., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

SHELL PAINTING MACHINE
Can. Blower & Forge Co., Kitchener, Ont
Sheldons, Ltd., Galt, Ont.

SHELL RIVETERS
Grant Mfg. & Machine Co., Bridgeport, Conn.
High Speed Hammer Co., Rochester, N.Y.

SHELL WASHER
Can. Economic Lubricant Co., Montreal, Que.

SHRAPNEL SHELL MARKER
Brown-Boggs Co., Hamilton, Ont.
Noble & Westbrook Mfg. Co., Hartford, Conn.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton, Toronto, Montreal.

SIGNS, ENAMEL
Strong, Kennard & Nutt Co., Cleveland, Ohio.

SILVER SOLDER
Hungerford Brass & Copper Co., U. T., New York
Geo. H. Lees & Co., Hamilton, Ont.

SKATE SHARPENERS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

SLOTTERS
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Rhodes Mfg. Co., Hartford, Conn.

SMOKESTACKS.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford
J. H. Williams & Co., Brooklyn, N.Y.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Can.

SOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Hungerford Brass & Copper Co., U. T., New York
Tallman Brass & Metal Co., Hamilton.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Banfield, Edwin J., Toronto.
Banfield, W. H., & Sons, Toronto.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
Grant Mfg. & Machy. Co., Bridgeport, Conn
John H. Hall & Sons, Brantford.
Gray Mfg. & Mach. Co., Toronto, Ont.
Himoff Machine Co., New York, N.Y.
Hyde Engineering Works, Montreal, Que.
Jardine, A. B., & Co., Hespeler.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McClean & Son, F. W., Niagara Falls, Ont.
National-Acme Co., Cleveland, Ohio.
D. McKenzie Machinery Co., Guelph, Ont.
Mulliner & Enlund Tool Co., Syracuse, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
T. C. M. Mfg. Co., Harrison, N.J.
Victoria Foundry Co., Ottawa, Ont.
William R. Perrin, Ltd., Toronto.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

SPRINGS, MACHINERY
Barnes, Wallace, Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele, Ltd., Guelph, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

SPIRAL CONVEYORS
Can. Matthews Gravity Carrier Co., Toronto, Ont.

SPROCKETS, CHAIN
Grant Gear Works, Boston, Mass.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

SOLDER
Jobborn, Geo. A., Hamilton, Ont.

SPROCKET WHEELS, CAST
Perrin, Wm. R., Toronto.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS
Dillon Mfg. Co., Oshawa, Ont.
Dom. Forge & Stpg. Co., Walkerville, Ont
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Brown, Boggs & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.
Noble & Westbrook Mfg. Co., Hartford, Conn.

STAMPS STEEL ALPHABET, FIGURES
Matthews, Jas. H. & Co., Pittsburgh, Pa
Noble & Westbrook Mfg. Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal
Can. Morehead Mfg. Co., Woodstock, Ont.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

STEEL ALLOY (SEE ALLOY STEEL)

STEEL BENDING BRAKES
Steel Bending Brake Works, Ltd., Chatham, Ont

STEEL FOR AXES, PLOWS, SAWS, DRILLS, ETC.
Colonial Steel Co., Pittsburgh, Pa.

STEEL, CARBON, FERRO-TUNGSTEN
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Comstedt, Josef F. A., 120 Broadway, N.Y.
Latrobe Electric Steel Co., Latrobe, Pa.
Michigan Steel Exchange, Inc., Detroit, Mich.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa
Vulcan Crucible Steel Co., Aliquippa, Pa.
Zenith Coal & Steel Products, Montreal, Que.

STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

STEEL DRUMS
Smart-Turner Machine Co., Hamilton, Ont

STEEL PRESSURE BLOWERS
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal.
Can. Fairbanks-Morse Co., Montreal
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Comstedt, Josef F. A., 120 Broadway, N.Y.
H. A. Drury Co., Ltd., Montreal.
Fairley Davidson Steel Co., New York, N.Y.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Geo. A., 70 Lombard, Toronto.
Michigan Steel Exchange, Inc., Detroit, Mich.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Toronto.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium Alloys Steel Co., Pittsburg, Pa
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.
Zenith Coal & Steel Products, Montreal, Que.

STEELS, HIGH STRENGTH, HOT-WORKING, DIE, MAGNET
Fairley Davidson Steel Co., New York, N.Y.

STEEL VANADIUM
Comstedt, Josef F. A., 120 Broadway, N.Y.
Drury, H. A., Co., Montreal, Que.
Michigan Steel Exchange, Inc., Detroit, Mich.
Standard Alloys Co., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa.

STELLITE, HIGH-SPEED TOOL METAL
Can. B. K. Morton Co., Montreal, Que.
Deloro Smelting & Refining Co., Toronto, Ont.

STOCK RACKS FOR BARS, PIPING, ETC.
New Britain Machine Co., New Britain, Conn.

STOCKS FOR DIES
Wells Bros. Co. of Canada, Galt, Ont.

STOCKS, PIPE
Butterfield & Co., Rock Island, Que.

TOOLS, STEEL, SHOP
Dennis Wire & Iron Works, London, Canada.
New Britain Mach. Co., New Britain, Conn.

STRAIGHTENING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

TACK (DOUBLE POINT) MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

TANKS, GASOLINE AND OIL
Dominion Forge & Stpg. Co., Walkerville, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.

TANKS, STEEL, WATER PRESSURE
Can. Welding Works, Montreal, Que.
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Toronto Iron Works, Ltd., Toronto.

TANK WAGONS
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
Toronto Iron Works, Ltd., Toronto.

TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.

TAPPING MACHINES (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto
Greenfield Tap & Die Corp., Greenfield, Mass.

TAPPING MACHINES AND ATTACHMENTS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Rickert-Shafer Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.

TAPS, ADJUSTABLE
Baxter Co., Ltd., J. R., Montreal, Que.
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.

TAPS, COLLAPSIBLE
Geometric Tool Co., New Haven, Conn.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich
Osborn (Canada, Ltd., Sam'l, Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

TAPS, DIES AND WRENCHES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
Geometric Tool Co., New Haven, Conn.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Machine Co., New Bedford.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wells Bros. Co. of Canada, Galt, Ont.

TESTING INSTRUMENTS METALLURGICAL
Shore Instrument & Mfg. Co., New York City.

THERMOMETERS, ALL KINDS
Taylor Instrument Co., Rochester, N.Y.
Bellevue Industrial Furnace Co., Detroit, Mich.

TESTING LABORATORIES
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Geometric Tool Co., New Haven, Conn.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
H. W. Petrie, Ltd., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

THREADING TOOLS
Rivett Lathe & Grinder Co., Brighton, Mass.

THREAD MILLING MACHINES
Gray Mfg. & Mach. Co., Toronto, Ont.
Taft-Peirce Co., New York, N.Y.
T. C. M. Mfg. Co., Harrison, N.J.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Steel Bending Brake Works, Ltd., Chatham, Ont.
Peck, Stow & Wilcox, Cleveland, Ohio.

TIRE SETTING MACHINES, HYDRAULIC
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES
Union Tool Chest Works, Rochester, N.Y.

TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland.
Can. B. K. Morton, Toronto, Montreal.
Deloro Smelting & Refining Co., Toronto, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
J. H. Williams Co., Brooklyn, N.Y.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOL STEEL
Atkins & Co., Wm., Sheffield, Eng.
Armstrong, Whitworth, Ltd. of Canada, Montreal.
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Deloro Smelting & Refining Co., Toronto, Ont.
H. A. Drury Co., Montreal.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Geo. A., 70 Lombard, Toronto.
Michigan Steel Exchange, Inc., Detroit, Mich.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Toronto, Ont.
Swedish Steel & Importing Co., Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago, Ill.
H. W. Petrie, Ltd., Montreal.
R. E. T. Pringle, Ltd., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
A. R. Williams Machy. Co., Toronto.
United States Elec. Tool Co., Cincinnati, O.

TOOLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

MAKE NAILS! NOT NOISE!

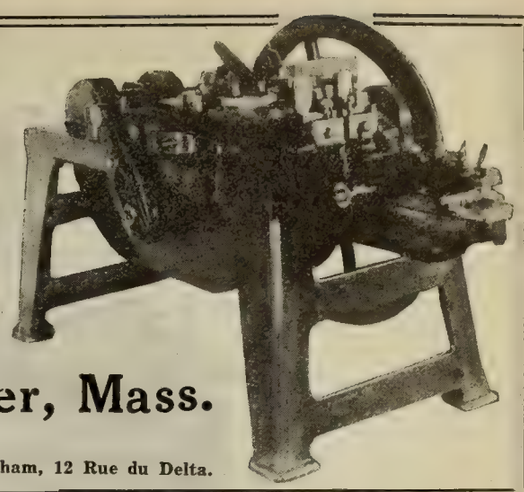
We offer the trade new types of

WIRE NAIL MACHINES

QUIET IN OPERATION; WITH VERY HIGH OUTPUT; ALL PARTS ACCESSIBLE; DECREASED MAINTENANCE COSTS; GREAT CAPACITY; OCCUPYING SMALL FLOOR SPACE.

Smoothly running machines, with balanced mechanical motions and no rotating cams. Built in 5 sizes, handling wire from No. 17 to ⅜" diam.

PRACTICALLY NOISELESS IN OPERATION



Sleeper & Hartley, Inc., Worcester, Mass.

CANADIAN BRANCH, COATICOOK, P.Q.

London, England, F. A. Perry, 63 Queen Victoria Street, E.C. 4. Paris, France, Edgar Bloxham, 12 Rue du Delta.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Canada.

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Peck, Stow & Wilcox, Cleveland, O.
Steel Bending Brake Works, Ltd., Chatham, Ont

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

TORCHES, STEEL
Armstrong, Whitworth of Canada, Ltd., Montrea
Prest-O-Lite Co., Inc., Toronto, Ont.

TRACK SYSTEMS
Dillon Mfg. Co., Oshawa, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
A. R. Williams Machy Co., Toronto.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Hamilton Gear & Mach. Co., Toronto.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co., Montreal.
Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Ltd., Toronto, Ont.
The Smart-Turner Machine Co., Hamilton.

TRANSMISSION TOWERS
Curtis Pneumatic Machinery Co., St Louis, M
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TRUCKS, FACTORY, FREIGHT, ETC.
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill

TRUCKS, LUMBER AND KILN
Sheldons, Ltd., Galt, Ont.
Northern Crane Works, Walkerville.

TUBING, SEAMLESS, BRASS & COPPER
Hungerford Brass & Copper Co., New York, N.Y
Lyman Tube & Supply Co., Montreal, Que.
Standard Tube & Fence Co., Woodstock, Ont.

TUMBLING BARRELS
Baird Machine Co., Bridgeport, Conn.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TUNGSTEN FILAMENT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

TURNBUCKLES
Canadian Billings & Spencer, Ltd., Welland.

TURNTABLES
Whiting Foundry Equipment Co., Harvey, Ill.

TURRET MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURBINE WATER WHEELS
Jenckes Mach. Co., Sherbrooke, Que.
Wm Kennedy & Sons, Ltd., Owen Sound, Ont.

UPSETTING AND BENDING MACHINERY
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Cook, Asa S., Co., Hartford, Conn.
A. B. Jardine & Co., Hespeler.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Ltd., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

VACUUM PUMPS
Can. Blower & Forge Co., Kitchener, Ont.
Smart-Turner Machine Co., Hamilton, Ont.

VALVE LEATHERS
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Montreal.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

VALVES, FOOT
Smart-Turner Mach. Co., Hamilton.

VALVES, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

VALVES, BACK PRESSURE, STEAM
Sheldons, Limited, Galt, Ont.

VENTILATING APPARATUS
Brantford Oven & Rack Co., Brantford, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt.
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto.

VISES, AIR OPERATED
Hannifin Mfg. Co., Chicago, Ill.

VISE STANDS, PORTABLE
New Britain Mach. Co., New Britain, Conn.

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.

VISES, PIPE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
J. H. Williams & Co., Brooklyn, N.Y.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Barnes, Wallace, Co., Bristol, Conn.
Dillon Mfg. Co., Oshawa, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
Hungerford Brass & Copper Co., New York, N.Y.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WATCHES, TIME STUDY
Silberberg, M. J., Chicago, Ill.

WATER PURIFYING AND SOFTENING APPARATUS
Wm. B. Scaife & Sons Co., Pittsburgh, Pa.

WATER CINDER MILLS
Whiting Foundry Equipment Co., Harvey, Ill.

WATER JACKETS
Can. Welding Works, Montreal, Que.

WATER TOWERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

WATER WHEELS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont
Sleeper & Hartley, Inc., Worcester, Mass.

WAVING AND UNDERCUTTING MACHINES AND ATTACHMENTS
Gray Mfg. & Mach. Co., Toronto, Ont.

WELDING MASKS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

WELDERS, ELECTRIC, SPOT, BUTT, ETC.
National Electric Welder Co., Warren, O.
Tabor Mfg. Co., Philadelphia, Pa.
Thomson Electric Welding Co., Lynn, Mass.
Winfield Electric Welder Co., Warren, Ohio.

WELDING, WORK AND SUPPLIES (Autogenous and Oxy-Acetylene). SEE

OXY-ACETYLENE

WINCHES
John H. Hall & Sons, Brantford.
Kennedy & Son, Wm., Owen Sound, Ont.
Northern Crane Works, Walkerville.

WIRE COILING AND POINTING MACHINERY
Baird Machine Co., Bridgeport, Conn.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE CLOTH AND PERFORATED METALS
Canada Wire & Iron Goods Co., Hamilton
Hungerford Brass & Copper Co., U. T., New York

WIRE FORMING AND STAMPING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
McClean & Son, F. W., Niagara Falls, Ont.
F. B. Shuster Co., New Haven, Conn.

WIRE NAILS
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

WIRE SOLDER
Hungerford Brass & Copper Co., U. T., New York.

WIRE, STEEL, BRASS, COPPER, BRONZE
Hungerford Brass & Copper Co., U. T., New York
Steel Co. of Canada, Ltd., Hamilton, Ont.

WOOD BORING MACHINES
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.

WIRE STRAIGHTENERS AND CUTTERS
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.

WOODWORKING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto.
New Britain Machine Co., New Britain, Conn
Oliver Machy. Co., Grand Rapids, Mich.
H. W. Petrie, Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
R. E. T. Pringle, Ltd., Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machy. Co., Toronto.

WOOD LATHES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

WORKS STANDS, PORTABLE
New Britain Mach. Co., New Britain, Conn.

WRENCHES
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canadian Billings & Spencer, Ltd., Welland.
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros. Co. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St Catharines, Ont
Williams & Co., J. H., Brooklyn, N.Y.

WRENCHES, AUTOMOBILE NARROW JAW AND MONKEY
Bemis & Call Hdwe. & Tool Co., Springfield, Mass
Whitman & Barnes Mfg. Co., St. Catharines, Ont

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Aikenhead Hardware Co., Toronto, Ont.
Bemis & Call Hdwe. & Tool Co., Springfield, Mass
Wells Bros. Co. of Canada, Galt, Ont.
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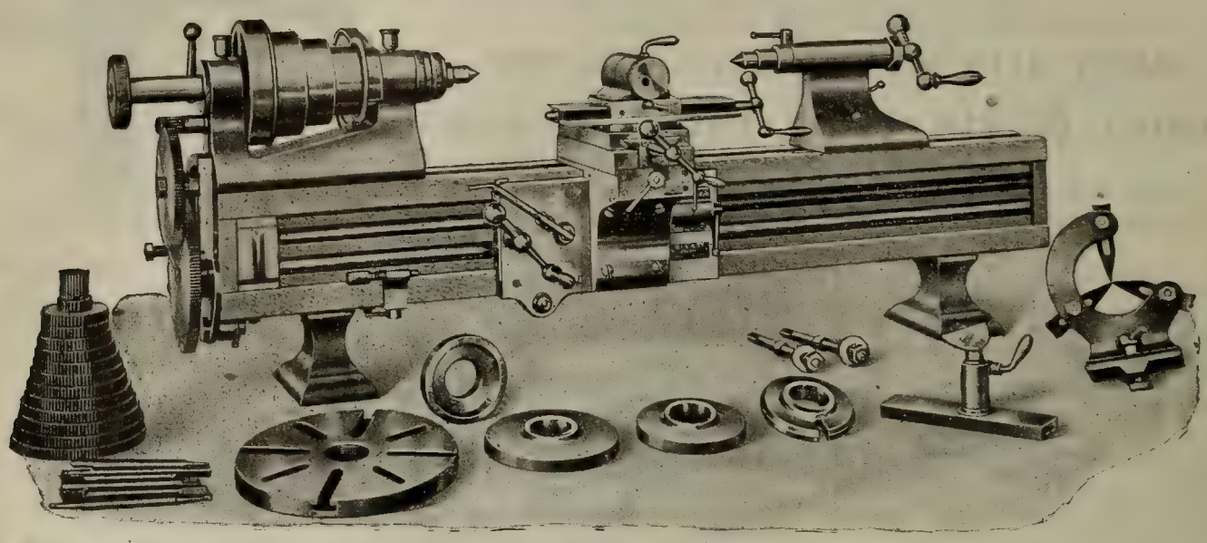
WIRE STRAIGHTENING AND CUTTING MACHINERY (AUTOMATIC)
Sleeper & Hartley, Inc., Worcester, Mass.

Here's a Masterpiece in Mechanical Construction



RIVETT PRECISION LATHES

Our 608

Illustration shows type No. 608, Back-Geared Precision Lathe. A Lathe of exceptional accuracy and highest grade finish, suitable for fine tool room, experimental and model work, and a wide range of light manufacturing. Equipped with compound Slide Rest and thread-cutting equipment. Designed for bench mounting, but may be furnished with combination stand and oil pan or oak cabinet and installed as an independent unit.

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BRIGHTON DISTRICT OF BOSTON MASS., U.S.A.

Builders of Highest Grade Precision Tools

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XVIII. TORONTO, JULY 19, 1917 No. 3

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THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, Pres. H. T. HUNTER, Vice-pres. H. V. TYRRELL, Gen. Man.

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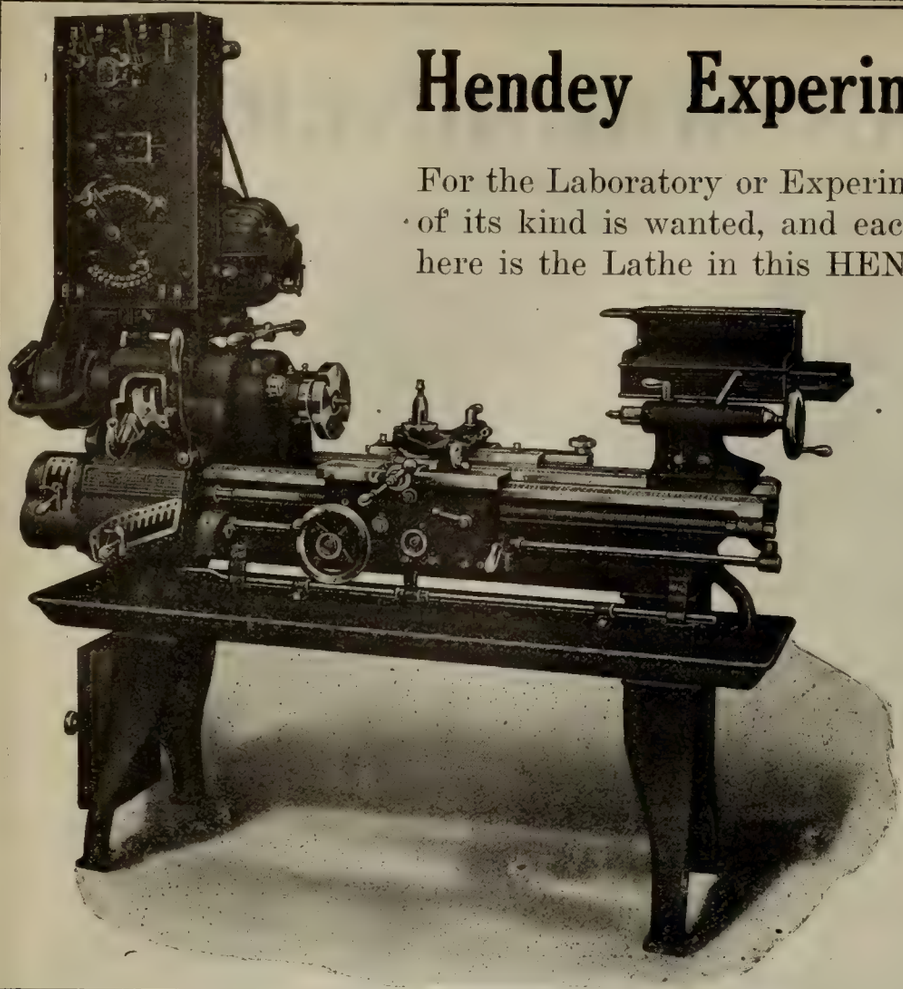

Hendey Experimental 12" Lathe

For the Laboratory or Experimental Department where the best of its kind is wanted, and each machine must be motor-driven, here is the Lathe in this HENDEY 12".

In addition to its complete regular equipment it has Small Tool Cabinet for operators' fine tools, also gear closet for extra gears to cut special threads.

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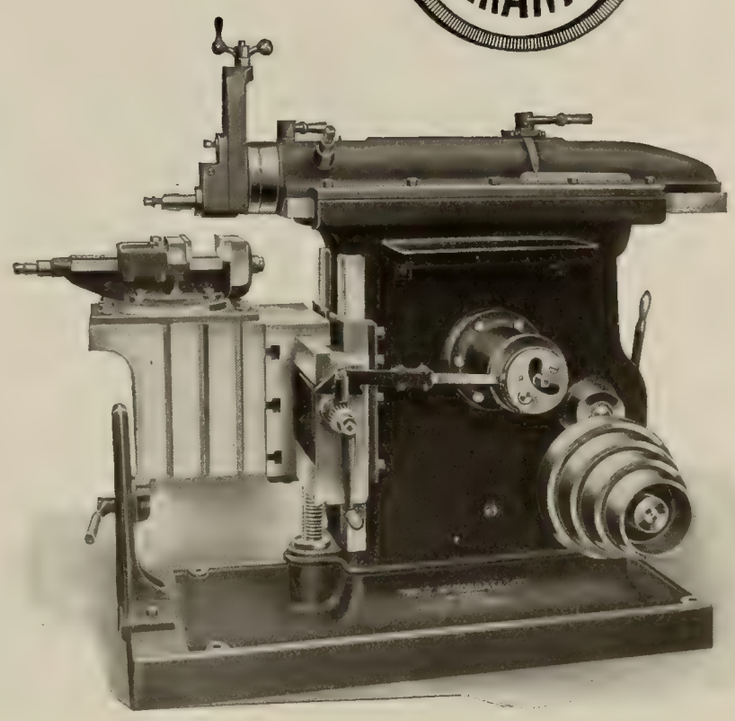
ARE-MAC-DEE IS A GUARANTEE

These are up-to-date Shapers, designed for modern shop production.

They are plain in design, yet embody all essential features necessary for efficient work.

Every adjustment is convenient for the operator and fine for the most accurate work.

Let us have your inquiry.



The R. McDougall Company Limited

Manufacturers

GALT, ONTARIO, CANADA

The Canadian Fairbanks-Morse Company, Limited
Sales Agents

For Immediate Delivery

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1—No. 25 Ohio Heavy Universal Miller
1—No. 2B Hendey Heavy Universal Miller
1—No. 2 Ford-Smith Plain Miller
1—No. 2 Brown & Sharpe Plain Miller (used)
1—No. 2 Kempsmith Universal Miller

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1—No. 4 Gardner B.B. Disc Grinder
1—W. F. Fraser Universal Cutter & Tool Co.
1—No. 3 Ohio Universal Cutter & Tool Grinder
1—Garvin Surface Grinder
1—Style B Yankee Drill Grinder
1—Style F Yankee Drill Grinder

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1—28″ Sibley Sliding Head
1—24″ Sibley Sliding Head
1—28″ Barnes Sliding Head (used)
12—20″ Back Geared Drills
6—14″ Sensitive Drills
2—2 Spindle Sensitive Drills
2—3 Spindle Sensitive Drills
1—4 Spindle Sensitive Drill
1—No. 1 Sipp High Speed Sensitive Drill

SHAPERS

1—20″ Queen City Back Geared
1—20″ Ohio Heavy Duty Crank Shaper
1—20″ Smith & Mills Back Geared

LATHES

4—21 x 8 LeBlond heavy duty Turret Lathes, Q.C. gear box, air cylinders and chucks, for 4.5 shells
8—21 x 8 LeBlond Q.C.G. Lathes for turning 4.5 shells (used)
5—18 x 8 Battle Creek heavy duty Turning Lathes for 4.5 shells (used)
1—24 x 12 Boye & Emmes Lathe, 3 step cone, D.B.G.
4—26 x 12 Boye & Emmes Lathes, 3 step cone, D.B.G.
4—30 x 4 Boye & Emmes Lathes, 4 step cone, D.B.G.
2—19 x 10 Sidney Lathes, Q.C.G. and D.B.G.
3—18 x 8 Mueller Lathes, Q.C.G. and D.B.G.
1—15 x 10 South Bend Standard Lathe
1—13 x 5 Champion Standard Engine Lathe
1—19 x 12 Sidney Q.C.G. Lathe with taper attachment, draw-in attachment and collets
1—17 x 10 Sidney Q.C.G. and D.B.G. Lathe
2—12 x 5 Mulliner Tool Room Lathes with pan, taper attachment, draw-in attachment and collets
2—6″ Dalton Bench Lathes

The Foss & Hill Machinery Company

305 ST. JAMES ST., MONTREAL, QUE.

CANADA MACHINERY CORPORATION *Limited.*

GALT ONT.

MACHINE TOOLS

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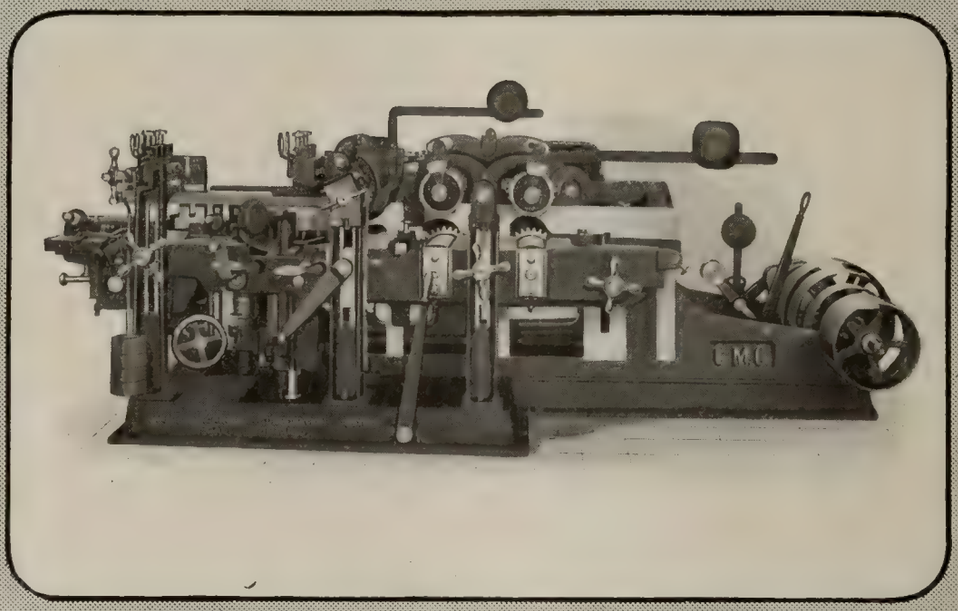
SHAPERS
DRILLS
HAMMERS
PLANERS
SLOTTERS
PUNCHES
SHEARS
PRESSES



WOODWORKING MACHINERY

MOULDERS
PLANERS
MATCHERS
RIP-SAWS
BAND-SAWS
SANDERS
BORERS
TENONERS
MORTISERS

SHOW-ROOMS
BROCK AVE. SUBWAY
TORONTO

C.M.C.

WORKS AT
GALT AND
HESPELER

CANADIAN MADE MACHINERY OF THE HIGHEST STANDARD OF WORKMANSHIP AND DESIGN.

SOLD DIRECT

AND BY LEADING MACHINERY DEALERS.

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CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied field. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

Vol. XVIII—No. 4 Publication Office: Toronto, July 26, 1917 Subscription Price $3.00 per Year

BERTRAM MACHINE TOOLS

Our Plate and Structural Steel Machinery is Particularly adapted to ***Shipbuilding Plants.*** Carefully designed, Conservatively rated and Built for Heavy Service.

We will be glad to submit photographs and specifications on request.

The John Bertram & Sons Co., Ltd.

DUNDAS, ONT., CANADA

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WINNIPEG 1205 McArthur Bldg.

JB&SCo JB&SCo

SMALL TOOLS

P. & W. Combination Lathe Knurling Tool

Combines Three Distinct Knurling Tools in One

You will save time by using this three-in-one Lathe Knurling Tool. It carries three pitches of knurls, fine, medium and coarse, as shown in sample. This does away with necessity of having three holders or of changing knurls where but one holder is available. Same knurls can be used in this holder as are used in our regular Lathe Knurling Tool.

Fine Medium Coarse

PROMPT SERVICE

is assured at our nearest store where P. & W. Small Tools are carried in stock for immediate delivery. Place your order there to-day.

Regular Lathe Knurling Tool

Precision Machine Tools — Standards & Gauges

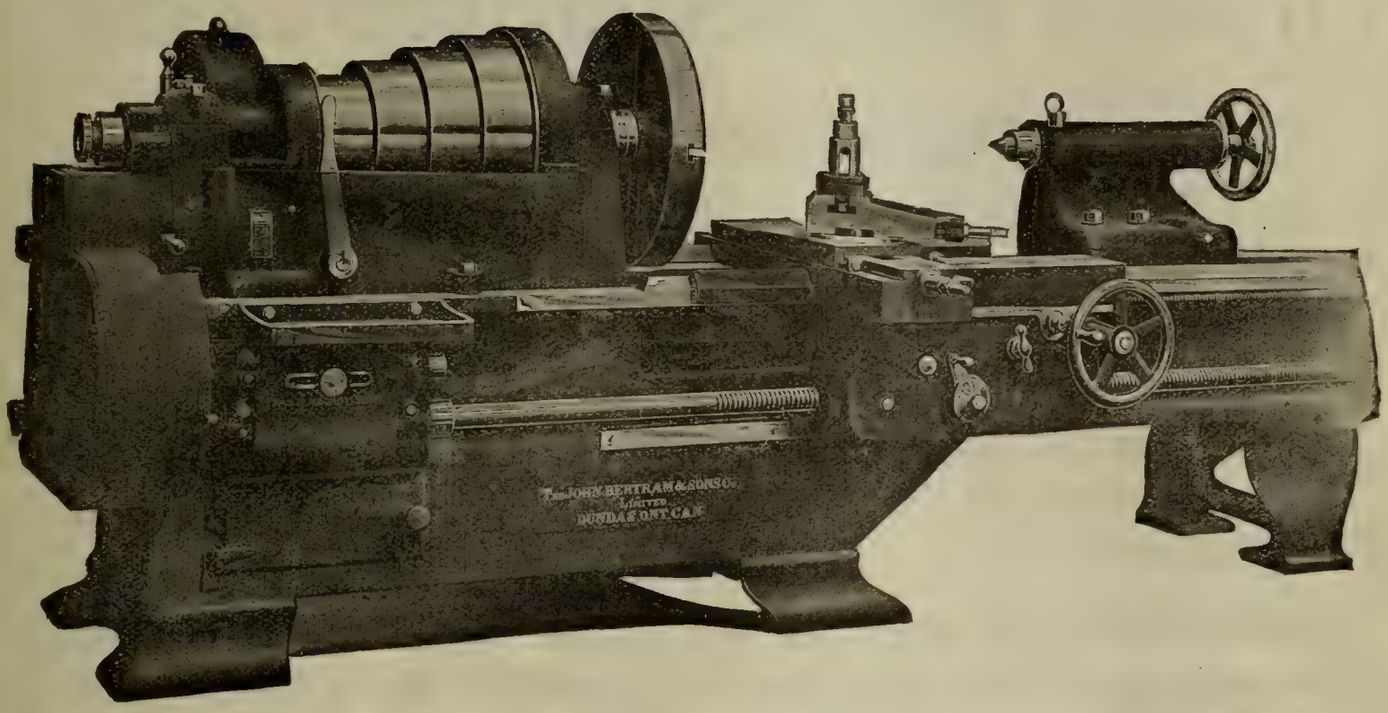
PRATT & WHITNEY CO.

of Canada, Limited

Works: DUNDAS, ONTARIO

MONTREAL	TORONTO	WINNIPEG	VANCOUVER
723 Drummond Bldg.	1002 C.P.R. Bldg.	1205 McArthur Bldg.	B.C. Equipment Co.

BERTRAM MACHINE TOOLS



Double Back Geared Gap Lathe

26-inch x 42-inch Swing

Bertram Machine Tools are built for safety and service, and are backed by a concern with sixty years' experience and the largest of its kind in Canada.

The John Bertram & Sons Co., Limited

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VANCOUVER
609 Bank of Ottawa Bldg.

WINNIPEG
1205 McArthur Bldg.

The Publisher's Page

TORONTO July 26, 1917

Which is the best advertisement in this issue?

WE believe that the advertisements in CANADIAN MACHINERY are not surpassed in attractiveness and informativeness by the advertisements in any other technical journal.

A comparison of the advertising in this issue with the advertising in any other technical journal will bear us out in this contention.

But good as they are, are the advertisements in CANADIAN MACHINERY all that you would like them? Are they giving you all the information you would like? Are they technical enough? Do they give you the kind of information you want?

It would be very interesting to have the full, frank and free criticism of our readers, and if we mistake not, it would be most helpful to all concerned.

We should like to hear, therefore, from our readers, with expressions of opinion regarding the advertising now appearing in CANADIAN MACHINERY, together with suggestions for possible improvement.

In conversation with many mechanics we have always been impressed with the excellent ideas they have regarding advertising. It has been gratifying indeed to know with what keen interest the advertising pages of CANADIAN MACHINERY are scanned regularly. In this connection we might mention that one superintendent told us recently that he had followed the advertising of a certain machine for *two* years before he found himself in a position to purchase.

We shall treat all letters on the above subject in the strictest confidence and we trust this invitation will meet with a wide acceptance and that we shall hear from many of our readers.

If any advertisement interests you, tea r it out now and place with letters to be answered.

SKF
BALL BEARINGS

G. E. La Page of the Falls Machine Co., Sheboygan Falls, Wis.

"S K F Ball Bearings were selected as standard equipment by this company because of their hardness, uniformity, perfect spacing and self-aligning features."

E. J. Bell of the Dauber Bell Machine Co., Oshkosh, Wis.

"After trying two or three other makes of bearings, we finally adopted your make of self-aligning bearings, and it gives us pleasure to say that out of all bearings of your make we have put on the market, we have not had a single one prove defective."

The Choice of the Woodworking Industry

Some of the first S K F Ball Bearings made were used in woodworking machines. They are running to-day. Thousands upon thousands of S K F have been built into woodworking machines since then. To-day, practically every ball bearing woodworking machine is S K F equipped. Be sure yours is.

Be sure you get the best when you buy. You know how vitally your machines depend on the bearings. Read what prominent manufacturers say of S K F. They use S K F because they know of no better guarantee of service.

To users of woodworking machinery our new Woodworking Folder will be of interest. Send for your copy.

J. A. Taggart, Advance Machinery Co., Toledo, Ohio.

"We have tried every make of ball bearings and while yours cost us more money than any other make we have ever used, we have found them to be superior in every way and much more economical on account of their superiority."

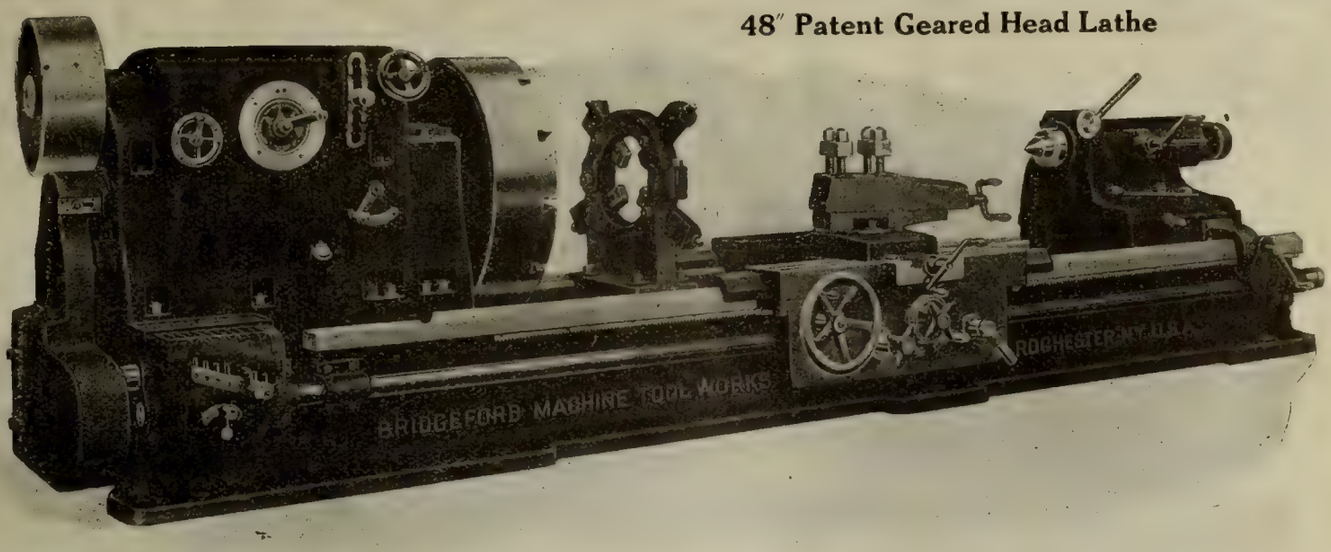
Canadian SKF Co.
LIMITED
TORONTO CANADA

Paul L. Prybil of Paul Prybil Machine Co., New York, N. Y.

"We have been using S K F Ball Bearings on some of our wood-working machines for the past three or four years and are very well pleased and satisfied with the results obtained."

SELF-ALIGNING SKF BALL BEARINGS

48″ Patent Geared Head Lathe



The Bridgeford for Big Work

That's what this powerful Bridgeford is built for—big work. Has strength and rigidity sufficient to perform the heaviest kind of jobs with perfect accuracy—and it goes through them in record time. Smooth in action. Strongly constructed. Fifteen cutting speeds all easily changed.

Bridgeford's Lathes give maximum production at minimum cost. We'll be glad to give you a full account of what they will do. Write

Bridgeford Machine Tool Works, Rochester, N.Y.

161 WINTON ROAD

FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

M.A. HANNA & Co.

Sales Agents:
CLEVELAND

Canadian Office:
703 C.P.R. Bldg., Toronto

Works: LONGUEUIL, QUE.

Armstrong Whitworth

of Canada, Limited
MANUFACTURERS OF

HIGH SPEED STEEL

CARBON AND ALLOY STEEL
MISCELLANEOUS SHOP TOOLS

HEAD OFFICE: 298-300 St. James St., Montreal

Branches: Dominion Bank Bldg., TORONTO
27 King William Street, HAMILTON
McArthur Bldg., WINNIPEG, MAN.

All Products "MADE IN CANADA"

Forging Ahead on Quality

Stands the Strain

Morton's Crucible Cast Steel for Taps, Dies and All General Tool Purposes

Full Stocks ***Prompt Shipment***

The Canadian B. K. Morton Co., Limited

49 Common Street, Montreal, Que.

86 Richmond Street E. Toronto, Ont.

Steel Castings

Our lengthy and varied experience in making Manganese, Vanadium, Titanium, castings assures you of getting the best of products.

Anything in castings from 1 lb. to 50 tons is right in our line. Ships' castings our specialty.

Castings made true to specifications and patterns.

Propeller shaft Bearing for Ice-Breaker "John D. Hazen."

Canadian Steel Foundries
Limited

GENERAL OFFICE: Transportation Bldg. Montreal, Canada.

LONDON (England) OFFICE: Trafalgar House, Waterloo Place

WORKS: Welland, Ont.; Point St. Charles, Montreal; Longue Pointe, Montreal.

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" **Tool Steels**

SISCO

Made in Sweden from selected Dannemora Ore

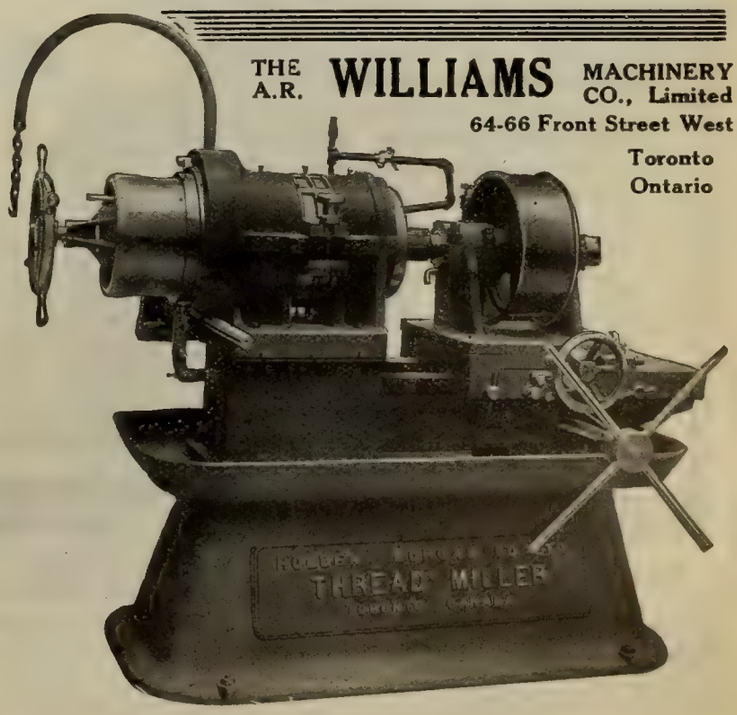
We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

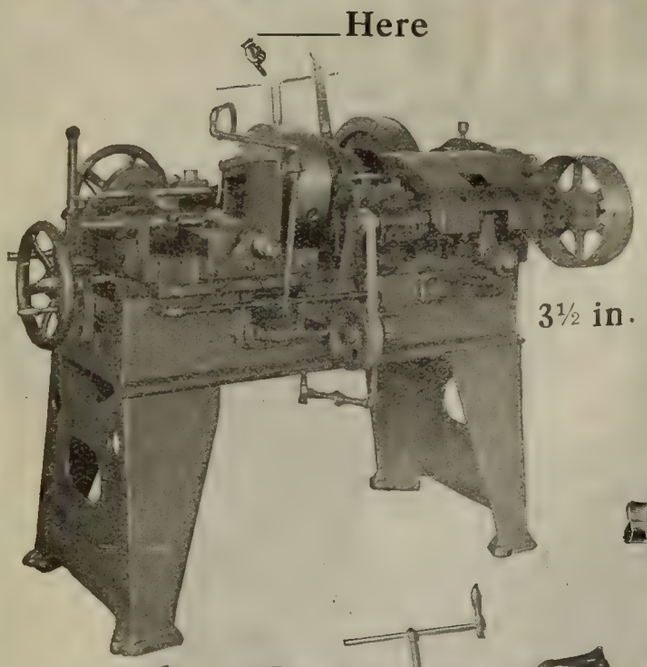
The Life of a Thread Miller

Depends not upon the amount of work it does, but the ease and thoroughness with which the work is done. These Thread Millers are noted for these qualities. Its quality of work is unrivalled. Our Service Department will give you all the particulars. *Write us!*

THE A.R. **WILLIAMS** MACHINERY CO., Limited
64-66 Front Street West
Toronto
Ontario

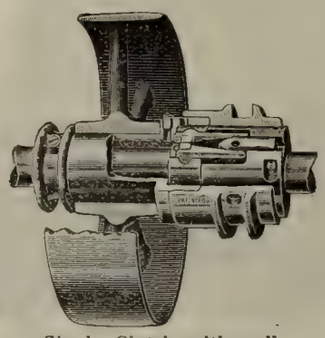


THE JOHNSON FRICTION CLUTCH



"Spreading!"

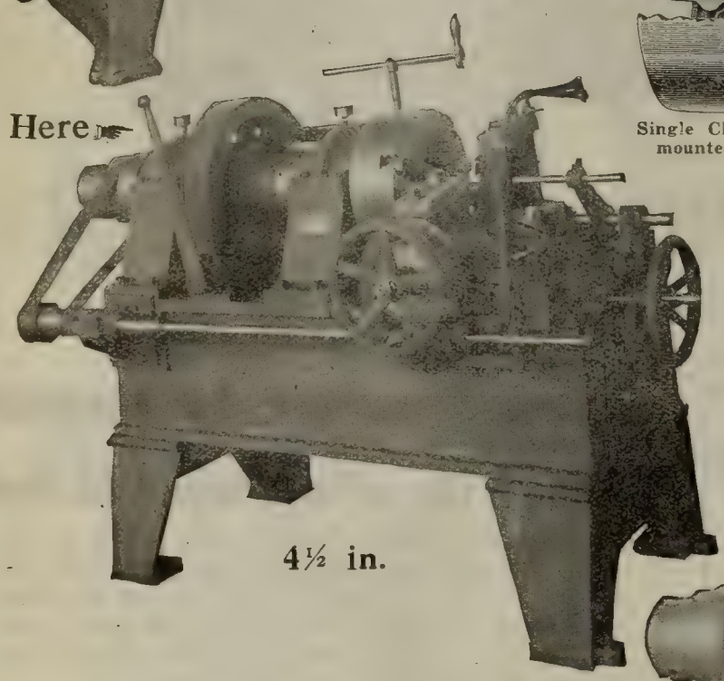
The value of the **Johnson Friction Clutch** is finding increased recognition wherever the consideration of **Quality** is allowed to rule.

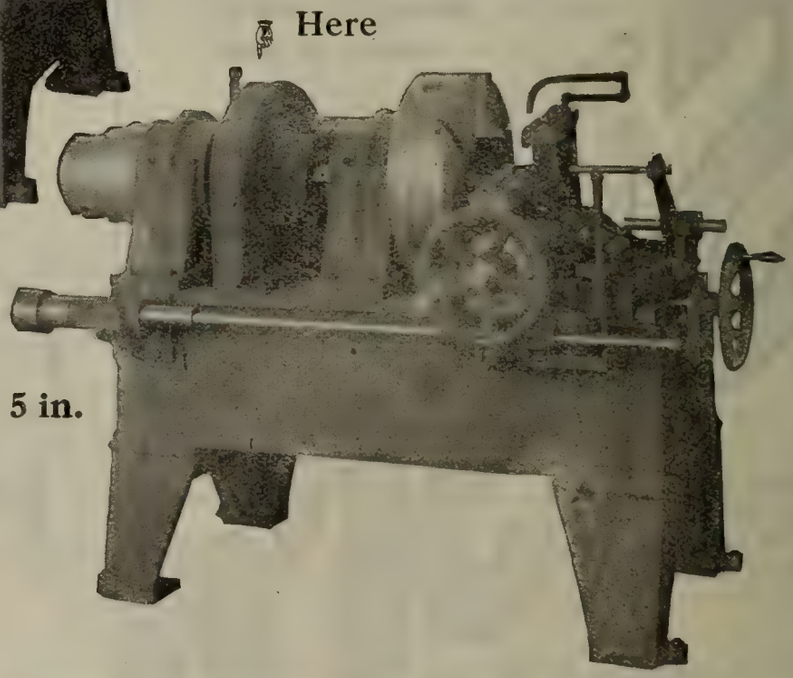


Single Clutch with pulley mounted on the hub.

A large user is the Williams Tool Co., Erie, Pa., who have adopted it for their heavy Cutting Off Machines illustrated here, the capacity of which ranges from 3½ to 5 in. of heavy bar steel.

The clutches are located in the headstock, as indicated by the arrows, being operated by the simple lever action characteristic of all Johnson Clutches. The clutch is located between two spur gears and operates both for stopping and starting and change of speed.





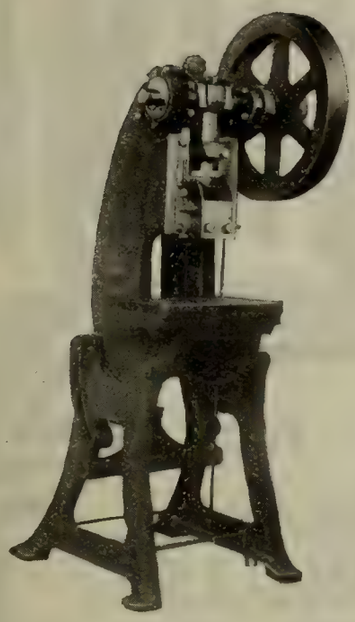
If you have not considered the manifold advantages of the JOHNSON Friction Clutch—it is nearly time to do so or your machine may suddenly fall into line with the "one-lung" auto and the tall hat—merely objects of curiosity.

"Clutches as applied in Machine Building" is a live book well worth reading by every machinist and machine builder. Why not write for a copy.

Send for our yellow data sheets descriptive of these Clutches

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

England—The Efandem Co., 159 Gt. Portland St., London, W., England. Sole Agents for the British Isles. **Canada**—Williams & Wilson, Ltd., 320 St. James St., Montreal. Canadian Fairbanks-Morse Co., Limited, Toronto. AUSTRALIA: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.



THE Self-Oiling Bearings on all Consolidated Presses are another source of satisfaction to Consolidated Press users. A constant supply of lubricant is furnished to the main bearings, the crankshaft revolving on a film of oil, automatically applied.

Provision is made for draining off the oil to be renewed from time to time.

This is a feature you cannot conscientiously overlook.

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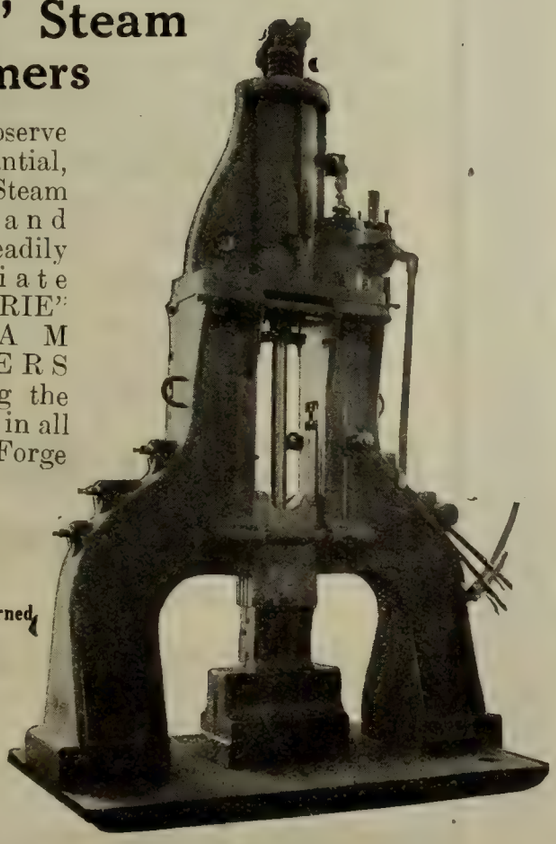
Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

"Erie" Steam Hammers

Closely observe this substantial, well built Steam Hammer and you will readily appreciate why "ERIE" STEAM HAMMERS are getting the preference in all modern Forge Shops.

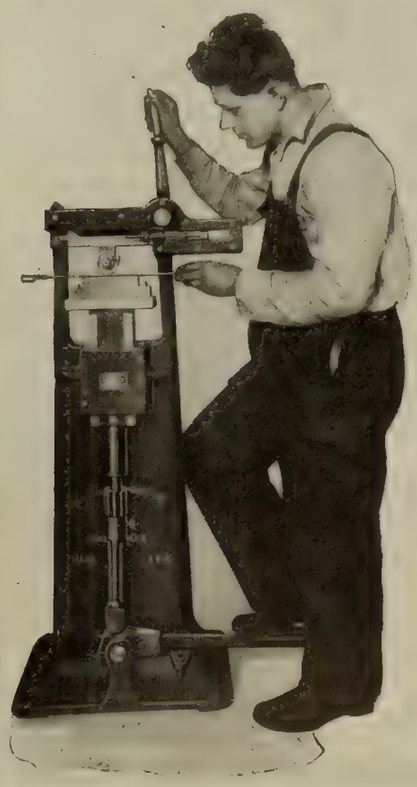


They have earned their enviable reputation.

ERIE FOUNDRY COMPANY
ERIE, PA. U. S. A.

Here's One Means of Saving Time In Munition Manufacture—

The marking of Range Rings, Rifle Parts, Timing Fuses, Gun Sights, Shells, Shrapnel on round or flat surfaces of tools or other work.



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No. 6 Hand Marking Machine

This machine was designed to cut time and costs in this work. How well it does it is evidenced by the records it has made. With these machines your marking can be accomplished in minimum time at a lower cost than by hand and in a much more satisfactory manner.

Send us your prints or samples and we will give you full particulars. Send now.

Write to

"The Marking Machine People"

Martin Machine Co.
Greenfield, Mass.
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Manufacturers of both Hand and Power Machines.

Canadian Representatives.—The Canadian Fairbanks-Morse Co., Ltd., Calgary, Montreal, Toronto, Vancouver, Winnipeg, St. John.

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HIGH SPEED STEEL

YOU have thought of many qualities you would like to have in High Speed Steel Tools—such as cutting edges with long life, freedom from brittleness, great reserve strength and toughness to resist shocks and strains, tools that would not require special heat treatment, tools that would take deep roughing cuts or fine smooth finishing cuts, and in addition, could be worked at higher speeds than you ever dreamed of. All these virtues and many more are contained in "Red Cut Superior", a First Quality High Speed Steel. Furnished in Annealed Bar Stock, Discs, and Treated Tool Holder Bits.

Are your tools made of Red Cut?

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VANADIUM-ALLOYS STEEL COMPANY

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FOR SHRAPNEL SHELLS AND SHELL BLANKS

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

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Brand

High Speed Steel and Twist Drills

"DOUBLE WACO" Quality

Specially Adapted for all kinds of
MUNITION WORK

"Turtle" Brand
High Class Tool Steel, Files, etc.
of all descriptions.

For particulars apply to our
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GEO. A. MARSHALL & CO.

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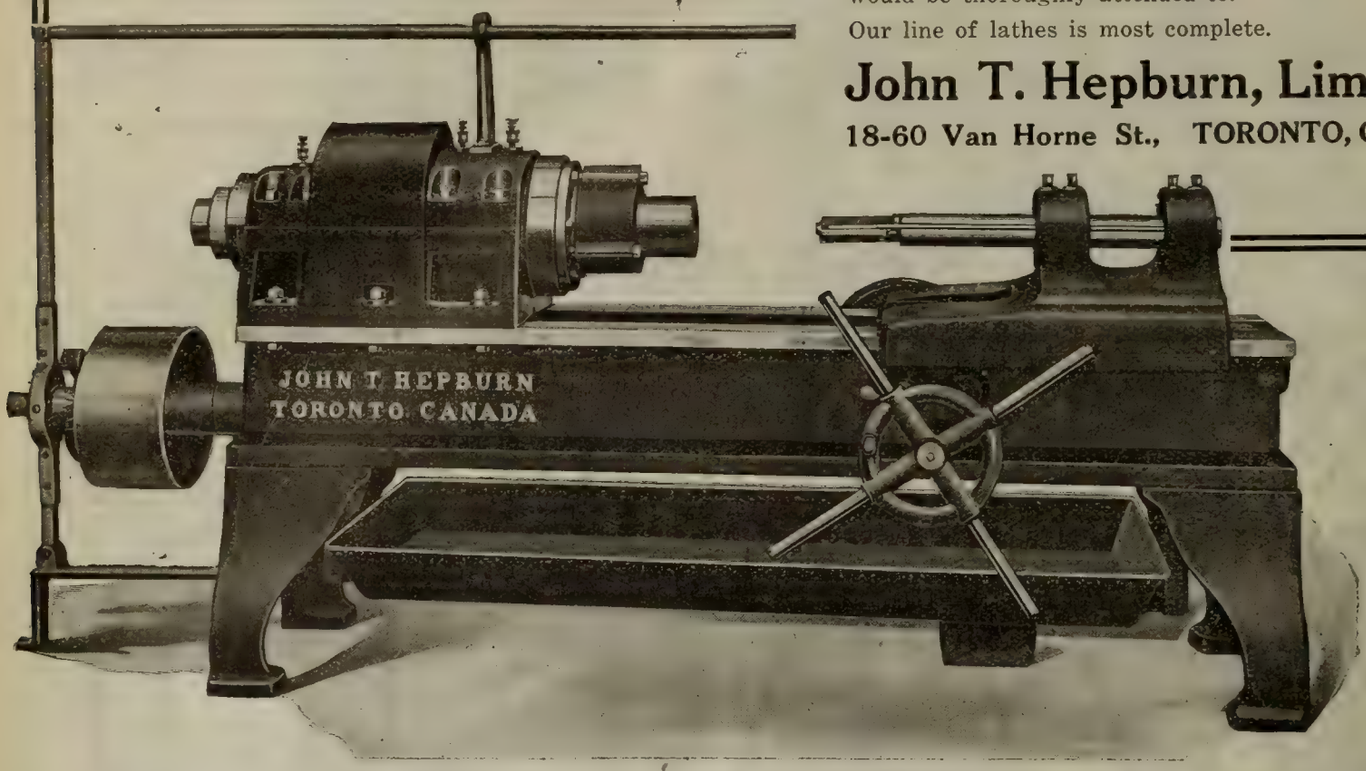
Its Construction and Achievements

The array of performances this lathe has made in boring shells up to 6″ is sufficient to warrant the confidence that our clients express in them. While speed is a great asset, yet the quality of work done and the condition of the machine after excess use have excited the most favorable comment. An inquiry would be thoroughly attended to.

Our line of lathes is most complete.

John T. Hepburn, Limited

18-60 Van Horne St., TORONTO, Ontario



Electrite Uranium

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium—make this a steel of truly remarkably cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.

LATROBE, PA.

High Speed Steel

A Keen Cutter

WOLFRAM *Is Both*

VULCAN CRUCIBLE STEEL CO.
Aliquippa ESTABLISHED 1900 Pa: U.S.A.
Represented in Canada by Messrs Norton Callard & Company MONTREAL QUE.

Strong in the Neck

STELLITE

This Wonderful Metal

is made in different Grades and can be adapted for
A MULTITUDE OF OPERATIONS.

Remarkable Results are Being Obtained

in machining Steel, Iron, Bronze, Brass,
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are cast for hot or cold drawn work.

Write us for particulars, stating the class of work you are on, and what your difficulties are. Our Engineering Staff is at your disposal.

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CO CO
TURNING STEEL
TOOL HOLDER BITS
"THE BIT WITH THE GROOVE"

What CoCo is Doing on Other Jobs

"CoCo" will do the same in your shop,—will cut faster or longer than other steels. Here are some proofs:—

"CoCo" is cutting Semi-steel Castings at 100 ft. per minute, cut ½" deep. 30 hours' continuous service between grinds.

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"CoCo" is turning .40 Carbon O. H. Forged Rams at 95 ft. per minute, feed ¼", cut 3/32" turning 3 rams in the same time it formerly took to do one.

CAN YOU BEAT IT?

CoCo Steel does not do stunts—It does the work. It will do yours as well. Ask us.

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URANIUM
HIGH SPEED STEEL

STANDS UP UNDER
SHOCKS
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WHICH ARE INCIDENTAL IN CUTTING
STEEL AND IRON
at
HIGH SPEEDS
Due to
ROUGH SPOTS
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See Your Tool Steel Man or Write Us

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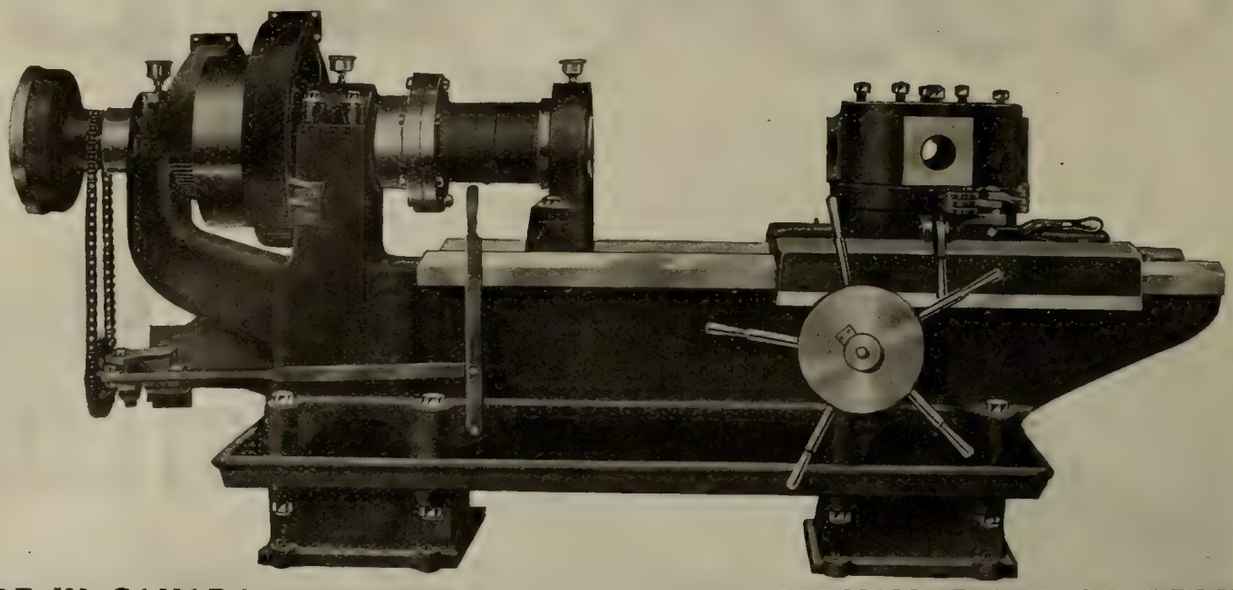
IN STOCK—FOR IMMEDIATE SHIPMENT

SUBJECT TO PRIOR SALE

H.E.W. Boring Lathes To Handle Shells Up To 6"



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HYDE ENGINEERING WORKS

CONSULTING AND MANUFACTURING ENGINEERS

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BEST BASE PLUGS, BUY BANFIELD'S

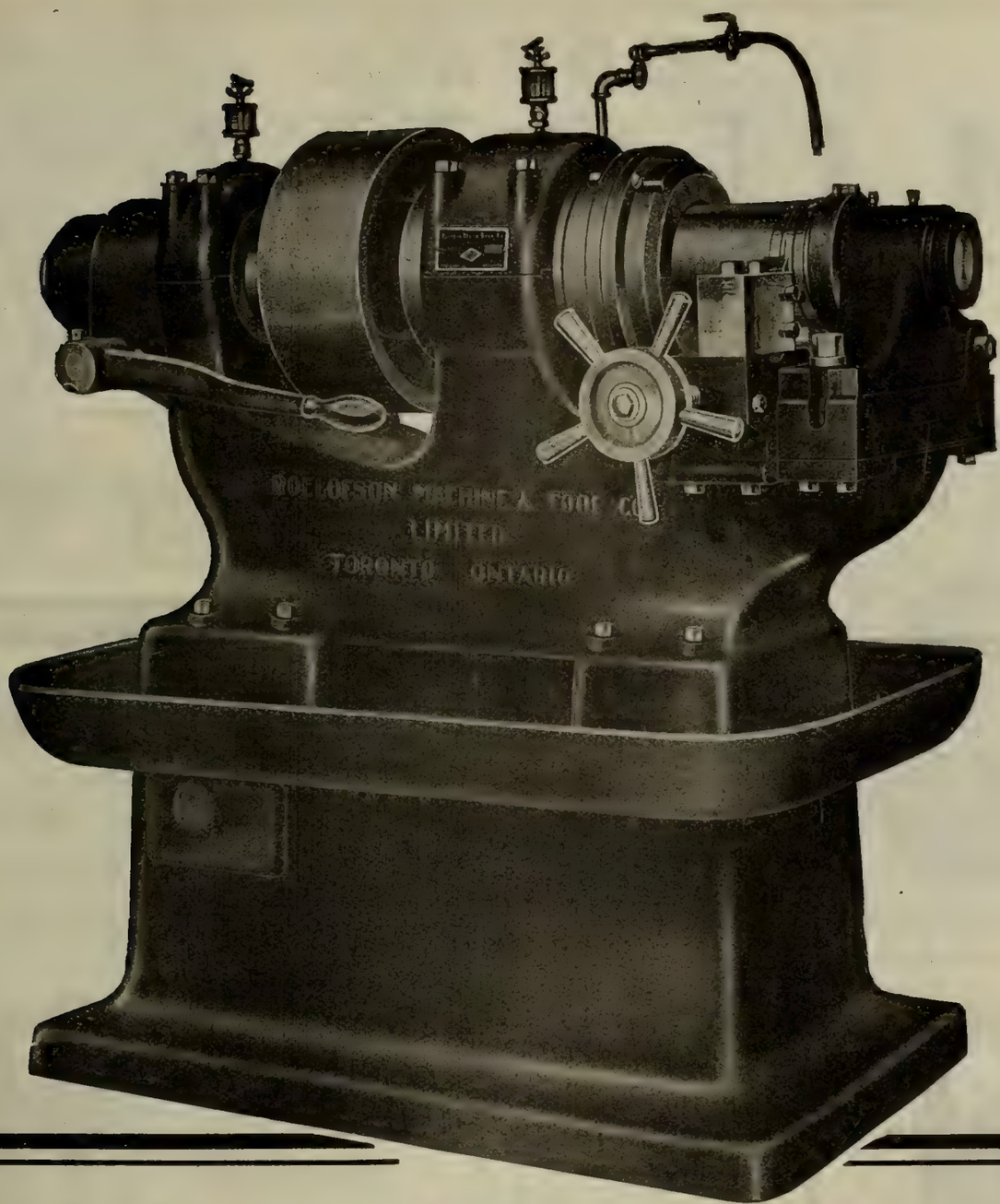
Have in stock for immediate shipment either threaded or bevel Plugs for 4.5", 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. *Write for prices.*

EDWIN J. BANFIELD

STAIR BLDG. ∴ TORONTO, ONT.

Manufacturer of Plug Milling Machines for above size shells. Prices and deliveries on application.



Just Now—

we have two 4.5 machines ready for immediate delivery

THIS Band Turning Machine, by its ability to perform efficiently month after month under exceptional production strains, has proved its worth to munition makers. It is being used by many Canadian munition plants, where it is giving absolute satisfaction.

A glance over some of the features will interest you.

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy chucking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are also built for 15, 18, 60-pdr. and 6" shells.

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MUSHET

High Speed Steel

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Alloy Steels

SOLE MAKERS
Samuel Osborn & Co. Ltd.
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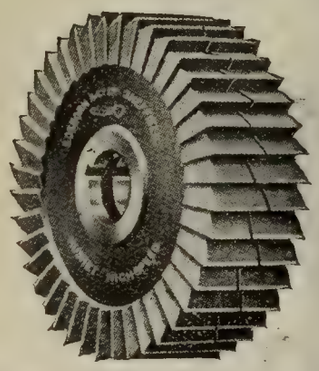

Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)
Limited
Head Office and Works: Montreal, P.Q.
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Your Riveting?

How is it done? Are you getting the necessary speed? Is the quality of the highest character? How much is it costing you?

The Grant Rivet Machine has established the records of one clean, perfectly finished rivet per second. Is that speedy enough, or is it too speedy? This is the fastest any similar machine will work and if too speedy it could be worked in conjunction with some other work.

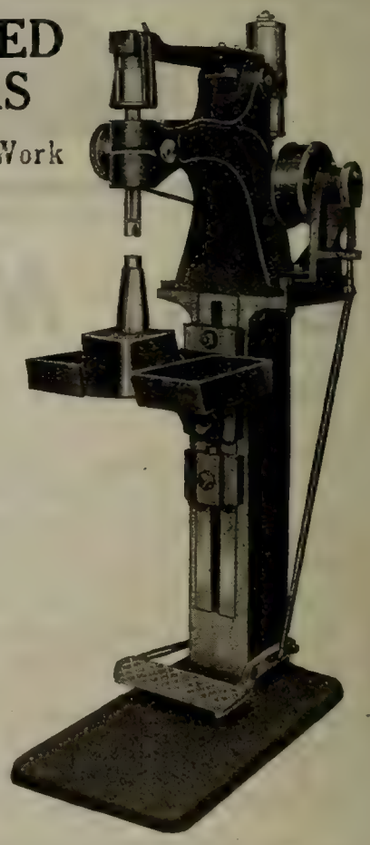
Our catalogue is worth writing for. There is one for you.

THE GRANT
Mfg. & Machine Co.
Holland Ave.
Bridgeport Conn.

HIGH SPEED HAMMERS

For High Speed Work

FEATURES:



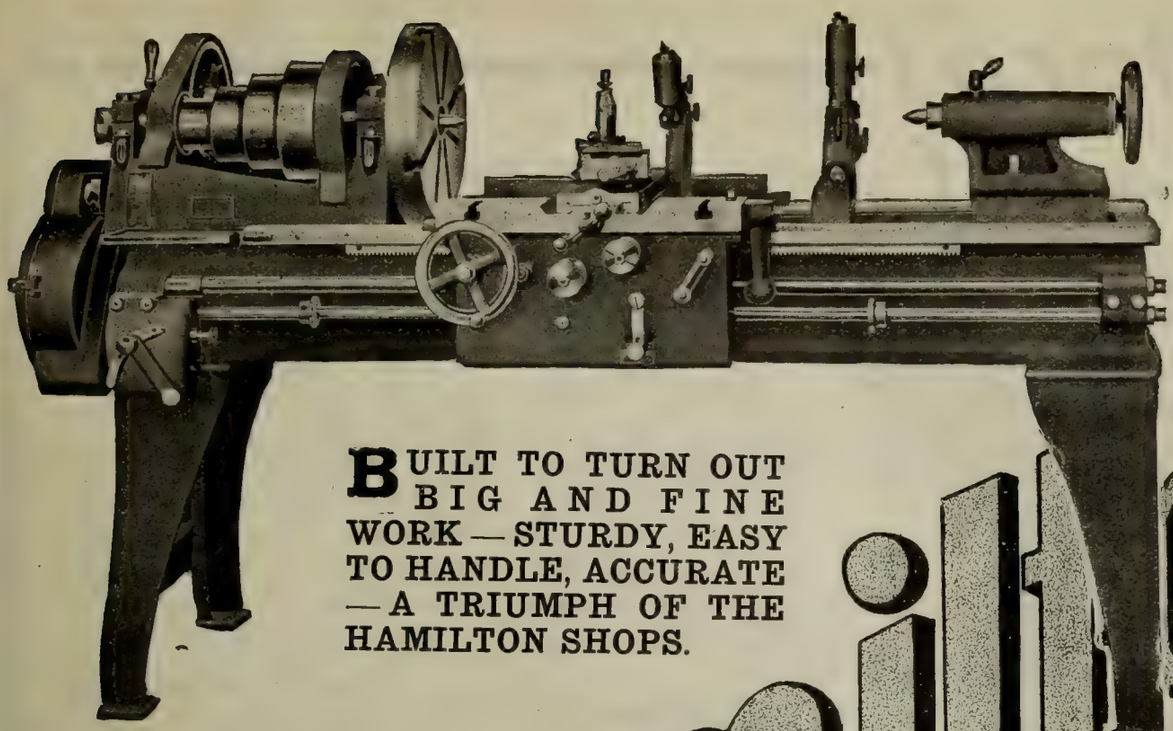
Economy in floor space, elimination of weight and a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushings are used throughout.

No riveting too intricate for us; no riveting which our machine cannot accomplish.

Send for our High Speed Hammer Book.

THE HIGH SPEED HAMMER CO.
Rochester, N.Y.

Sales Agents: The A. R. Williams Machinery Company, Limited, Toronto, Ontario.



BUILT TO TURN OUT BIG AND FINE WORK — STURDY, EASY TO HANDLE, ACCURATE — A TRIUMPH OF THE HAMILTON SHOPS.

Hamilton

"The Distinguished Service Lathe"

In this Lathe you see exemplified the skill of expert workmen with years of "Hamilton'" experience—experience which means something. It is a lathe that well represents the best of our high class machines—a lathe most carefully constructed with lasting materials—a lathe that turns out work of the calibre of its own ideal construction.

The illustration shows the sturdy, easy working "Hamilton" complete with equipment — single back gears, hollow steel spindle, self-oiling bronze boxes, power cross feed. There is a good deal more we can tell you about this profit-making quality worker. Write to us and we will send you interesting literature.

Rapid Production HAMILTON Machine Tools

FOR 25 YEARS MAKERS OF FINE MACHINE TOOLS

The Hamilton Machine Tool Co.

HAMILTON, OHIO

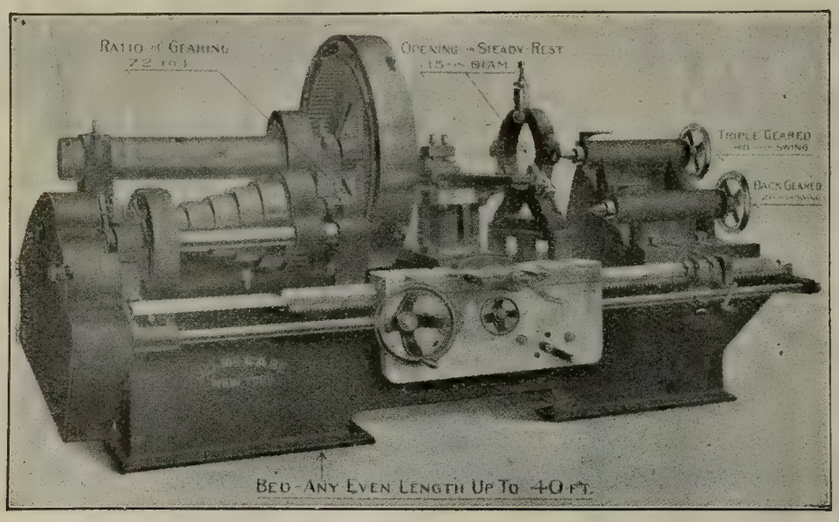
Sole Agents for Ontario: H. W. Petrie, Limited, Toronto, Ontario

Do More!

--put on more steam

is the industrial slogan of to-day

You can "do more" with McCabe's "2-in-1" lathe than any other big Lathe built, because you have "more" capacity.



McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing
As a 48 inch Triple-Geared Lathe.

It will carry DOUBLE the burden, by handling such work as you would put in a 26-inch lathe when there's no big work to do, as a 48-inch.

Our most valuable resource is time—save the time other big lathes stand still by installing McCabe's "2-in-1" Double Spindle Lathe. Never idle. Save $1,000 in the price. Other big lathes cost that much more.

Immediate Shipment 12-ft. beds—from stock.

J. J. McCABE
149 Broadway,
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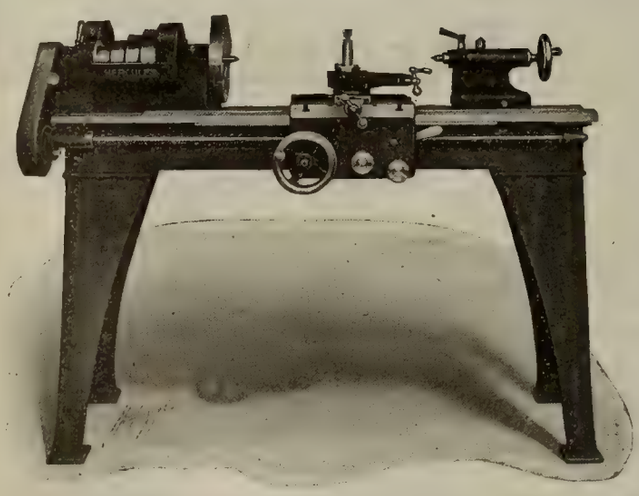
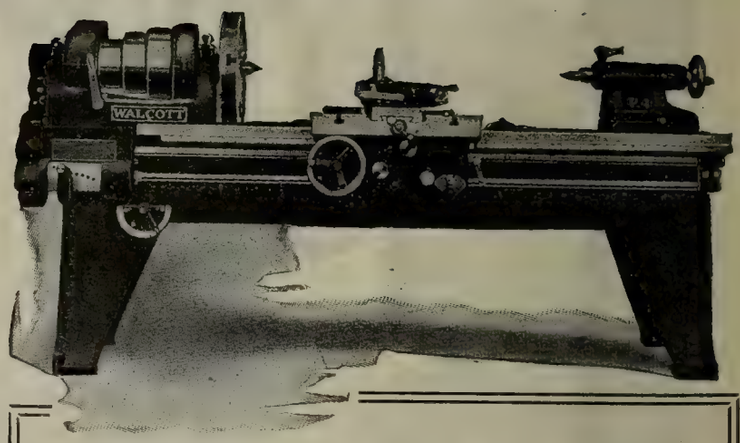


LATHES

12", 16", 18" and 21" swing

Strictly modern in design, rigidity and accuracy guaranteed.

Himoff Machine Company
45 Mills Street
Astoria, City of New York, N.Y.



THE WALCOTT LATHE

is backed by lathe-building experience extending over 35 years

These are features of Walcott Lathes: drop-forged gears in apron; all-steel gears in gear-box; large ways on bed, all gears completely enclosed. Parts are interchangeable. Rigid headstock and tail-stock.

You'll **get the full** story in our printed matter. Send for it surely if you are about to buy a lathe.

WALCOTT LATHE COMPANY
Successors to
Walcott & Wood Machine Tool Co., Calhoun St., Jackson, Michigan

Improved Centering Machine

Mr. Shell Manufacturer:

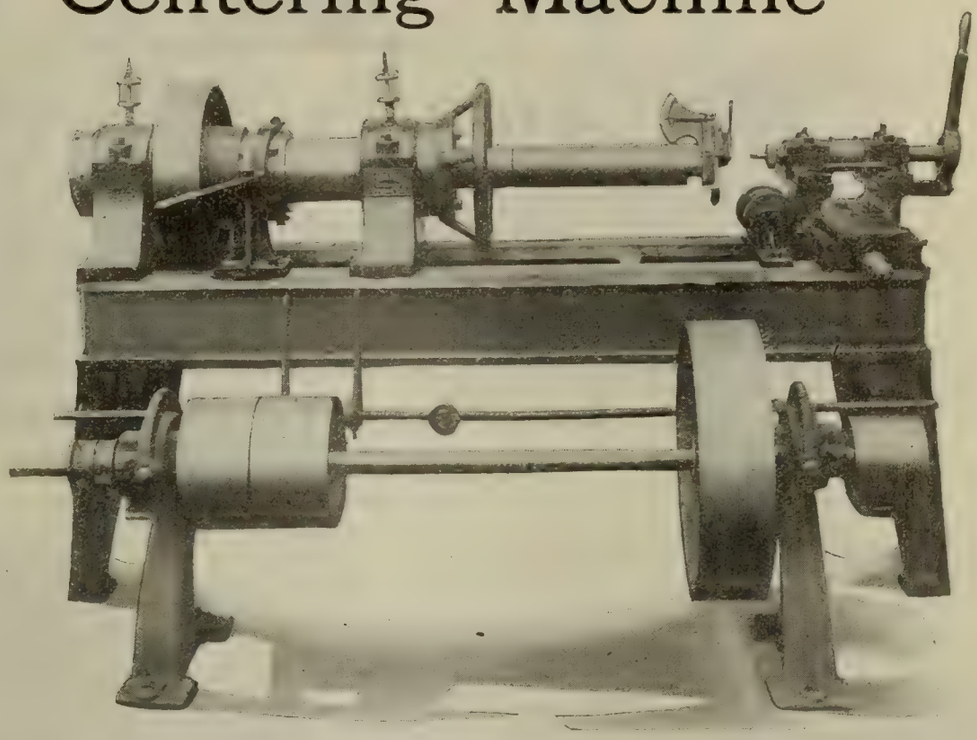
The importance of centering is obvious.

This tool is giving real satisfaction every day and stays on the job.

Write for price and description.

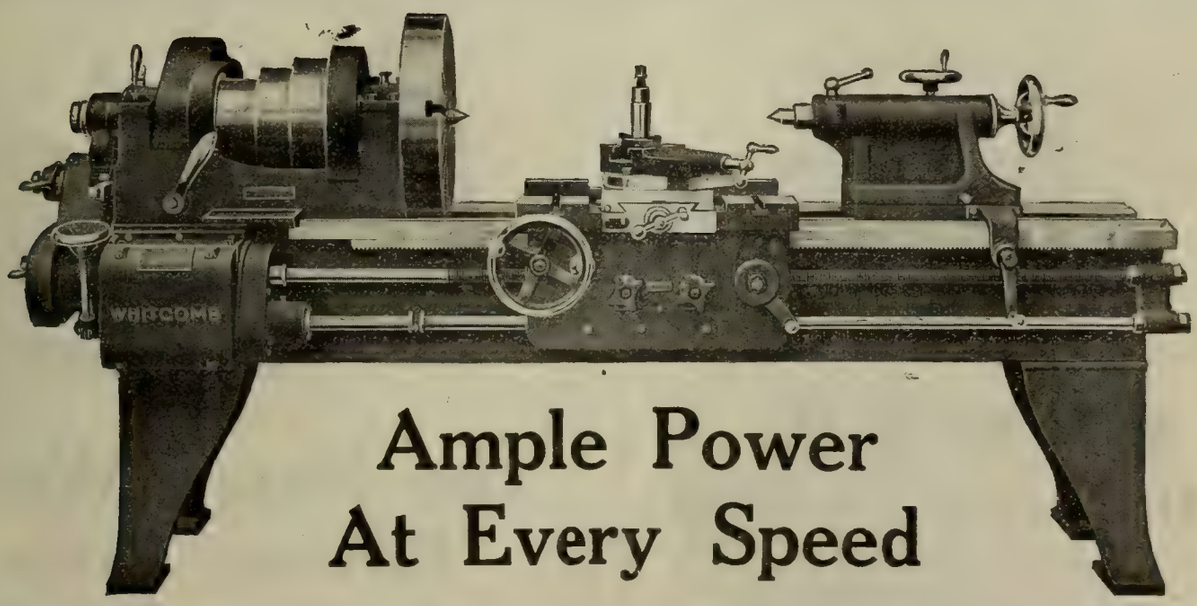
Delivery, ship 10 days after order.

Shipping weight 2040 pounds.



VICTORIA FOUNDRY COMPANY, LIMITED

OTTAWA, ONTARIO



Ample Power At Every Speed

On this 18-in. Whitcomb-Blaisdell Lathe, the drive is through double back gears and a three-step cone pulley carrying a wide belt. Thus nine changes of spindle speeds are obtained, yet at the different speeds the effective power is far more nearly equal than in the usual construction with plain back gears.

Just one detail—but typical of the many details which unite to make this machine tool capable of turning out the nicest work with great rapidity. **Read all about it—in our latest catalog.**

Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass., U.S.A.

LATHES **PLANERS**

If any advertisement interests you, tear it out now and place with letters to be answered.

We will Fill Your Requirements *Send us Your Inquiries*

Air Compressor Evidence

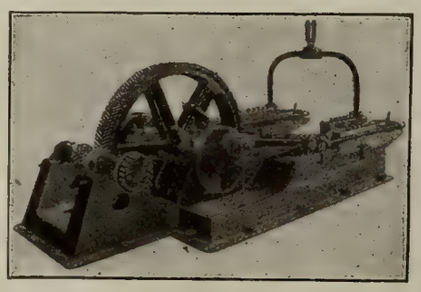
The greatest evidence of the value of any article is the demand for it after investigation and trial. Below are four carloads of our compressors which fills one order to a large concern in Canada. Our line of compressors is very la·ge. Write us and explain your requirements.

The Jenckes Machine Company, Limited

CANADIAN SALES OFFICES:
Sherbrooke, Montreal St. Catharines, Toronto.
Cobalt, South Porcupine, Vancouver.

WORKS: Sherbrooke, Que.

WORKS: St. Catharines, Ont.



ELMES

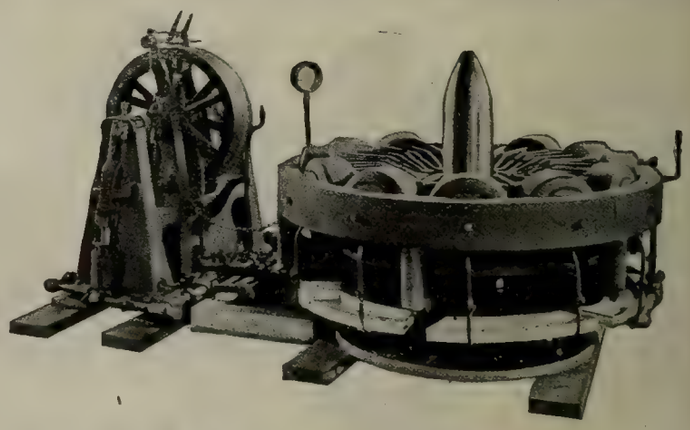
18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217 No. Morgan Street CHICAGO, ILL.



The New "West" Banding Press

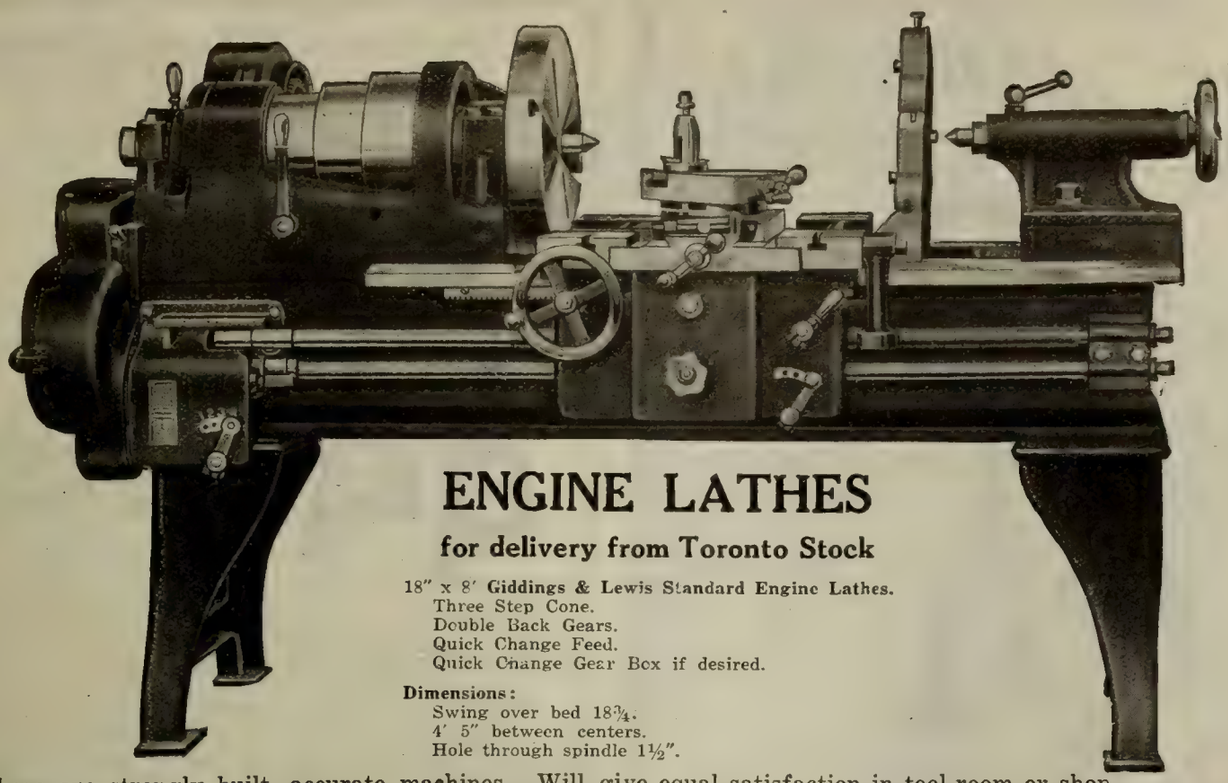
For 9.2" and 8" shells

12 Cylinders; Ample Power; Ample Strength; Reasonable Price.

NO ACCUMULATOR REQUIRED.

The West Tire Setter Co.

255 Mill Street, Rochester, N.Y.



ENGINE LATHES

for delivery from Toronto Stock

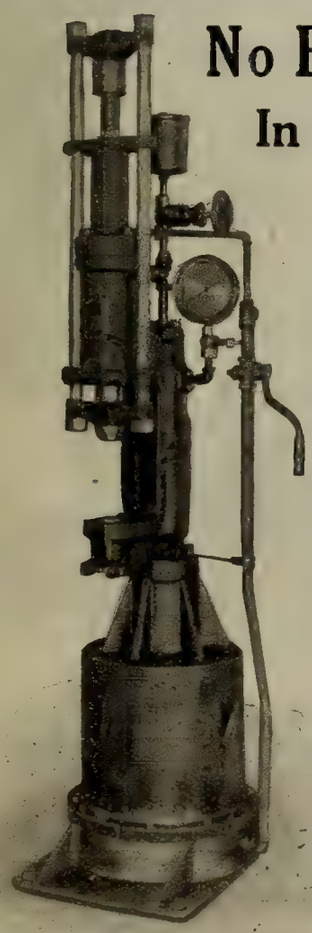
18" x 8' **Giddings & Lewis Standard Engine Lathes.**
Three Step Cone.
Double Back Gears.
Quick Change Feed.
Quick Change Gear Box if desired.

Dimensions:
Swing over bed 18¾.
4' 5" between centers.
Hole through spindle 1½".

These are strongly built, accurate machines. Will give equal satisfaction in tool-room or shop.
The following extras can be furnished if desired: Taper, Relieving or Draw-in attachment, Waving attachment, Hexagon turret on carriage, Pan pump and piping.

Write for full specifications and prices.

Garlock-Walker Machinery Co., Ltd., 32 FRONT ST. WEST, Telephone MAIN 5346 **Toronto**



No Excess Parts In This Triple Purpose Machine

"Metalwood" Hydro-Pneumatic Combination Forcing, Broaching and Straightening Press is essentially a production machine. It is adaptable to many uses and is built without a single excess part. Auxiliary tables and fixtures add further to its usefulness.

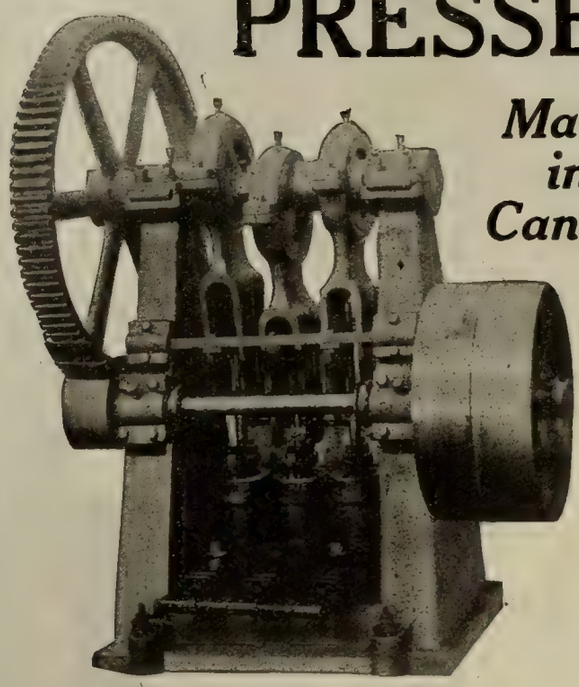
Metalwood Mfg. Co.

Leib & Wight Sts., DETROIT, MICH. U.S.A.

For Great Britain and Continent address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

PRESSES

Made in Canada



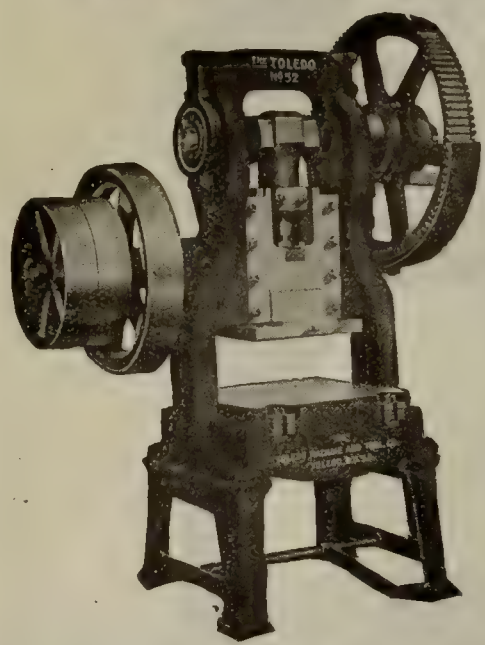
Hydraulic Presses, Pumps and Accumulators for all purposes

WRITE FOR PRICES AND DELIVERIES

WILLIAM R. PERRIN, Limited
TORONTO, CANADA

If any advertisement interests you, tear it out now and place with letters to be answered.

The "TOLEDO" ARCH PRESSES



with slight modifications will operate nearly all the blanking, forming, horning, wiring and combination dies ordinarily used in the manufacture of all kinds of pieced tinware, lard pails, buckets, pans, etc. Furnished with solid or removable front piece to bed and on upright or inclined standards. Particularly efficient for shops where saving of space is an object.

The Toledo Machine & Tool Co.
Toledo, Ohio

A Combination of Rigidity, Accuracy, Simplicity and Ease of Operation

Bodies are inclinable and convenient for handling dies and material. Slides are long and well gibbed.

BLISS

Inclinable Power Presses

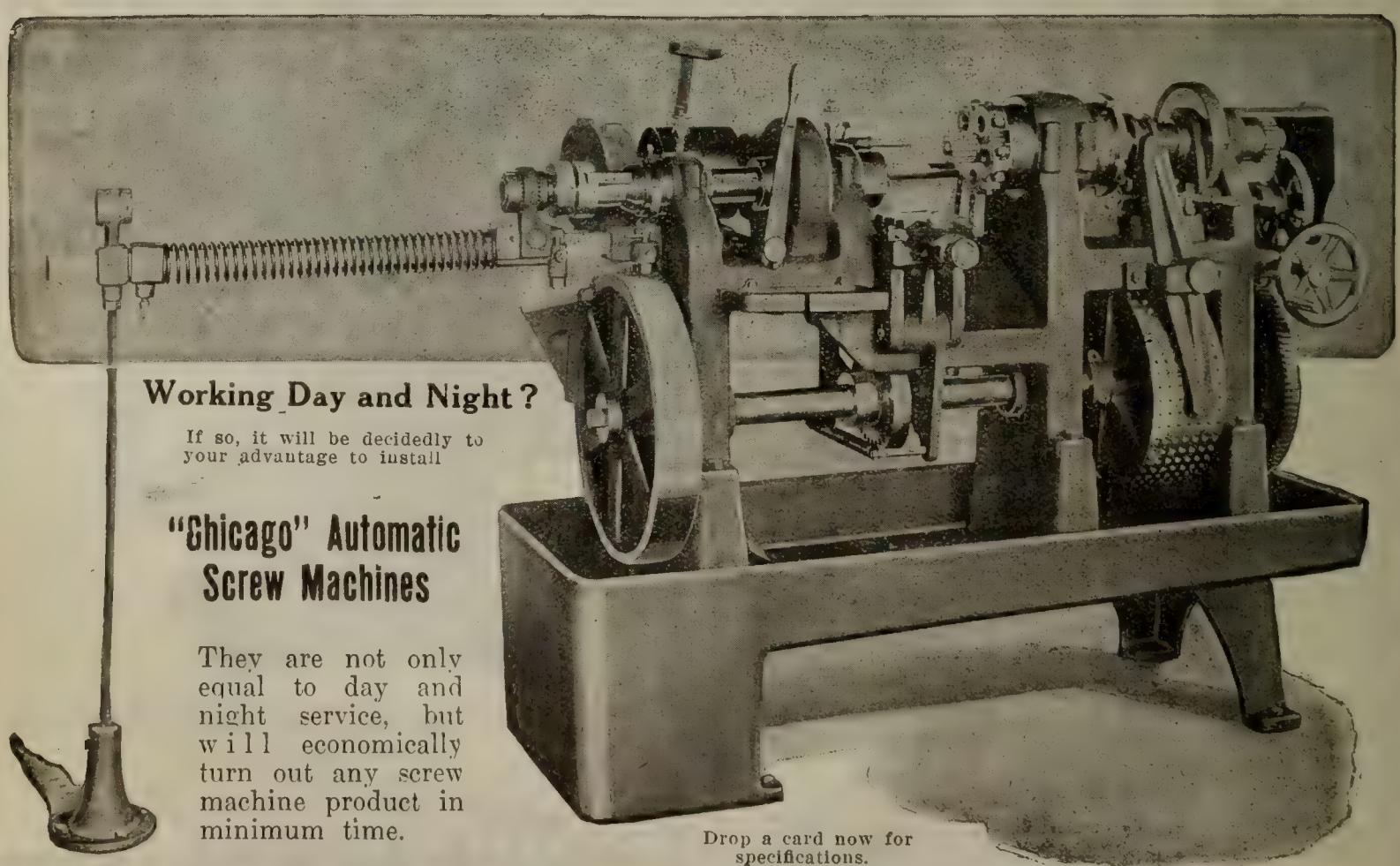
reduce the maintenance cost of both machine and tools.

BUILT IN EIGHTEEN SIZES.

Adapted for many operations in the manufacture of tin cans, pieced tinware, metal packages, brass goods, electrical goods, trimmings, etc. *Catalog 2-G, describing them, sent on request.*

E. W. Bliss Co., 20 Adams Street, Brooklyn, N.Y. U.S.A.

Chicago Office: Peoples' Gas Bldg.; Detroit Office: Dime Bank Bldg.; Cleveland Office: Union Bank Bldg. Offices in Europe: 100 Boulevard Victor Hugo, St. Ouen, Paris; Pocock St., Blackfriars Rd., London, S.E.



Working Day and Night?

If so, it will be decidedly to your advantage to install

"Chicago" Automatic Screw Machines

They are not only equal to day and night service, but will economically turn out any screw machine product in minimum time.

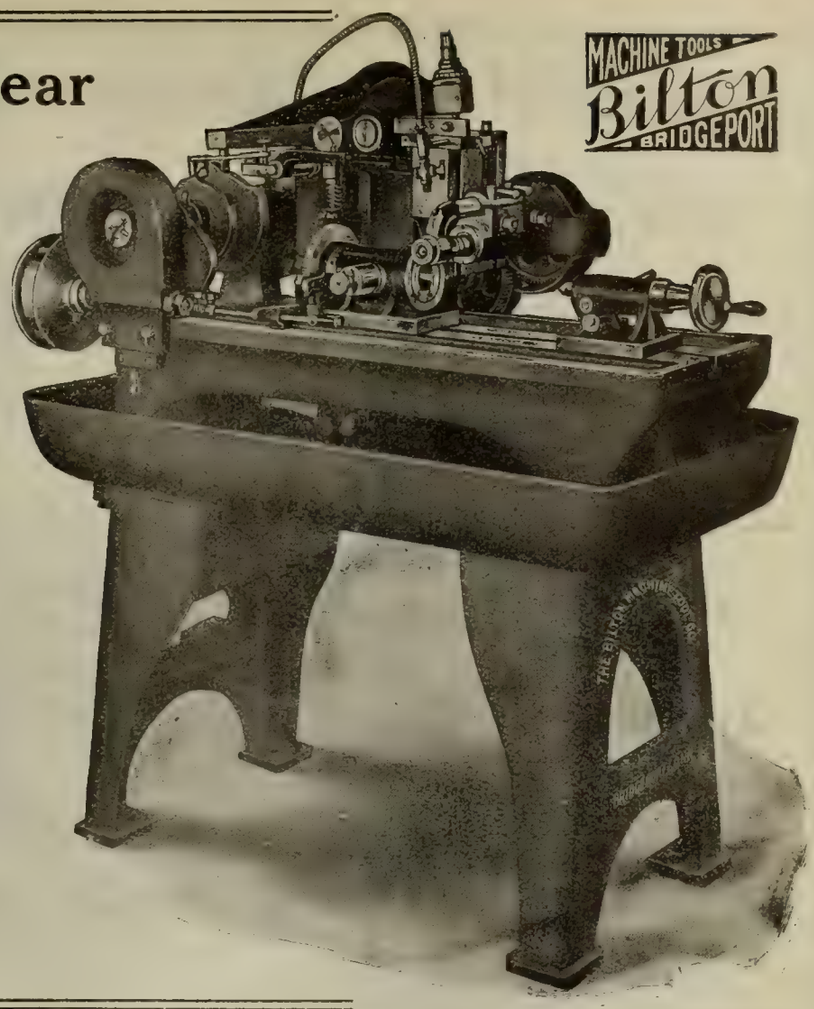
READY FOR OPERATION IN YOUR PLANT IN LESS THAN SIX WEEKS from the time your order reaches us.

Drop a card now for specifications.

The John MacNab Machinery Co., 90 West Street NEW YORK

European Representative: John MacNab, Hyde, England.

Bilton Automatic Gear Millers—Spur or Bevel Gears



CAPACITY

No. 1 - - 14 Pitch
No. 2 - - 10 Pitch
No. 3 - - 8 Pitch

The Bilton Machine Tool Company

Succeeding The Standard Mfg. Company

Housatonic Ave., Bridgeport, Conn., U.S.A.

Also Manufacturers of —
Plain Horizontal Millers
Automatic Millers
Plain and Ball Bearing
Bench and Column Drills
Riveting Machines
Milling Cutters

Catalog 30 on request.

Foreign Agents:
Alfred Herbert, Limited
M. Mett Engineering Company
Chas. Churchill Company, Limited

For Rapid Production and Accurate Work

USE THE

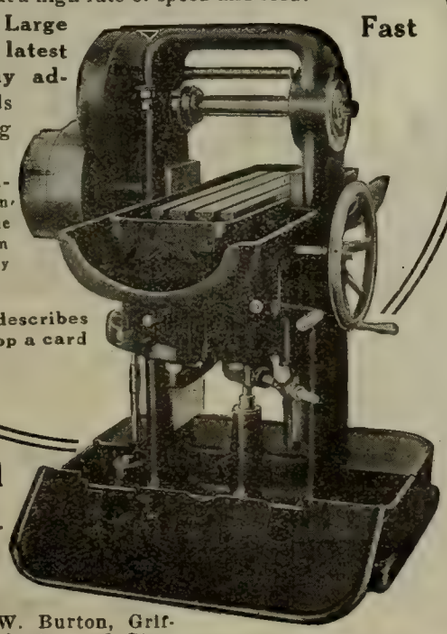
"BRIGGS"

The Briggs Miller handles work no other machine of its size can touch. It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

The Base Tank and Large Gear Pump is the latest addition to its many advantages. Tank holds 20 gallons of cutting lubricant

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

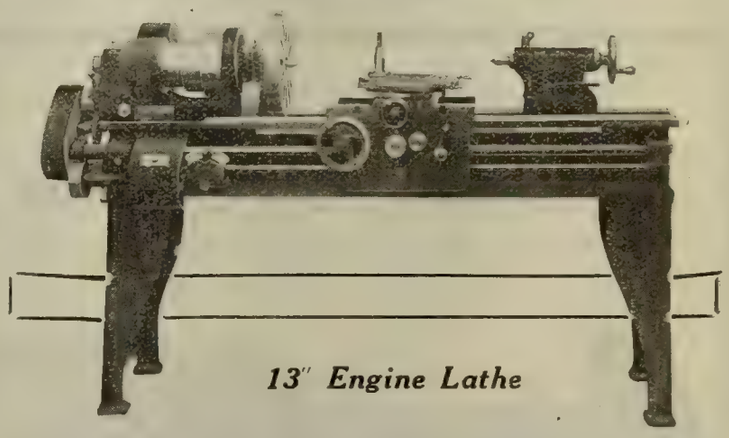
Fast



Our booklet describes fully. Drop a card for it.

Gooley & Edlund Inc.
Cortland, N.Y., U.S.A.

Foreign Agents: Allied America, France, Belgium, Italy, Switzerland, Machinery Company of Russia, Scandinavia, C. W. Burton, Griffiths & Co., London, Manchester and Glasgow, Barandiaran, Metivier, Gazeau & Cia, San Sebastian, Spain.



13" Engine Lathe

"Filsmith" Quality

This lathe has won its way through actual experience to be known distinctly as a quality lathe. For the swing it includes, its speed is something to be wondered at. Solid full webbed headstock; 50-point carbon crucible steel spindle; massive, rigidly clamped tailstock. A study of these features on the illustration will give you an idea of its construction. A letter from you would command our immediate attention and secure for you all specifications.

The Philip Smith Mfg. Company
Sydney Ohio U.S.A.

SMOOTH AS GLASS

That's the kind of grinding you want
That's the kind you get

WITH THE

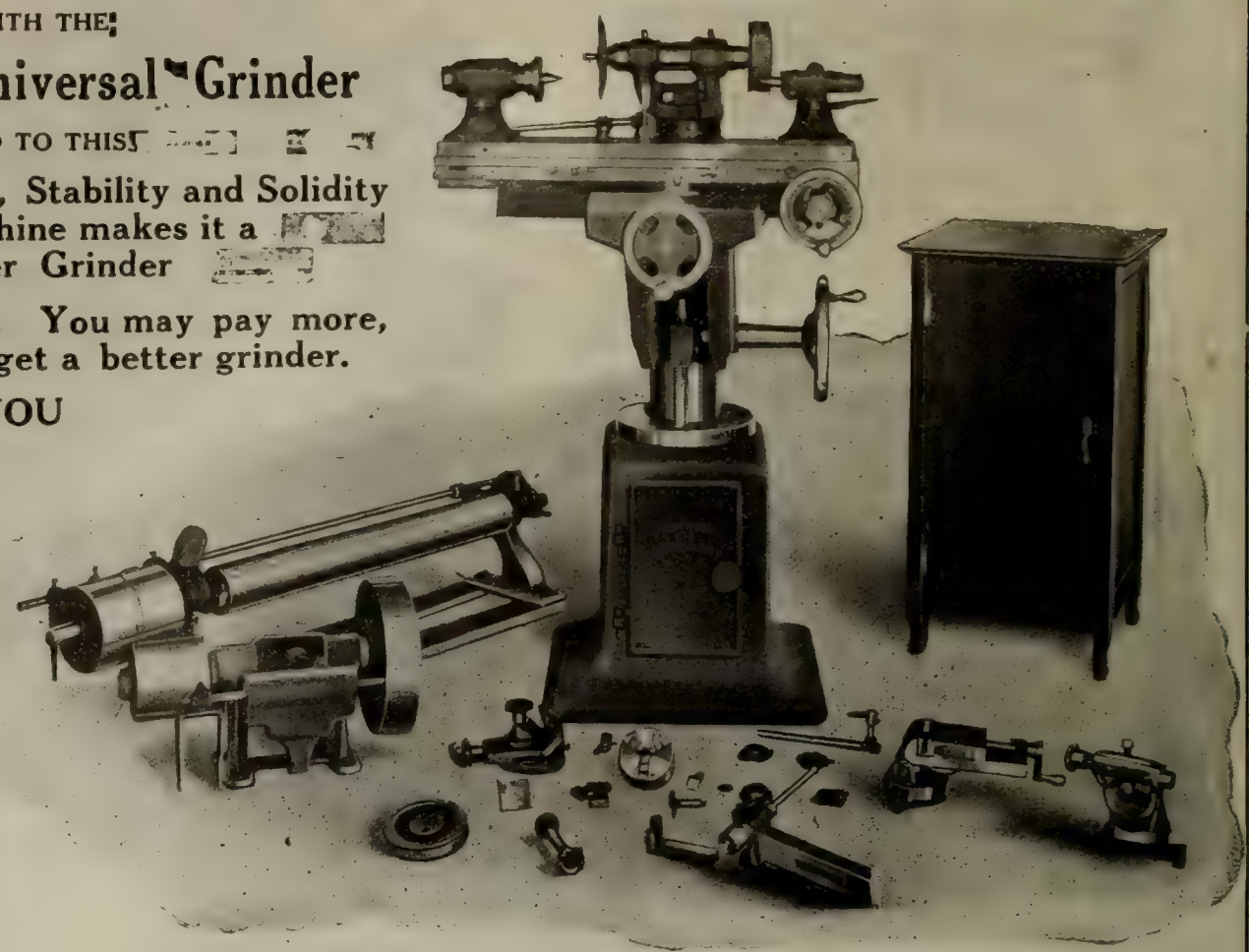
Dominion Universal Grinder

ADD TO THIS

Ease of Operation, Stability and Solidity of the Machine makes it a Master Grinder

Try One and See. You may pay more, but you cannot get a better grinder.

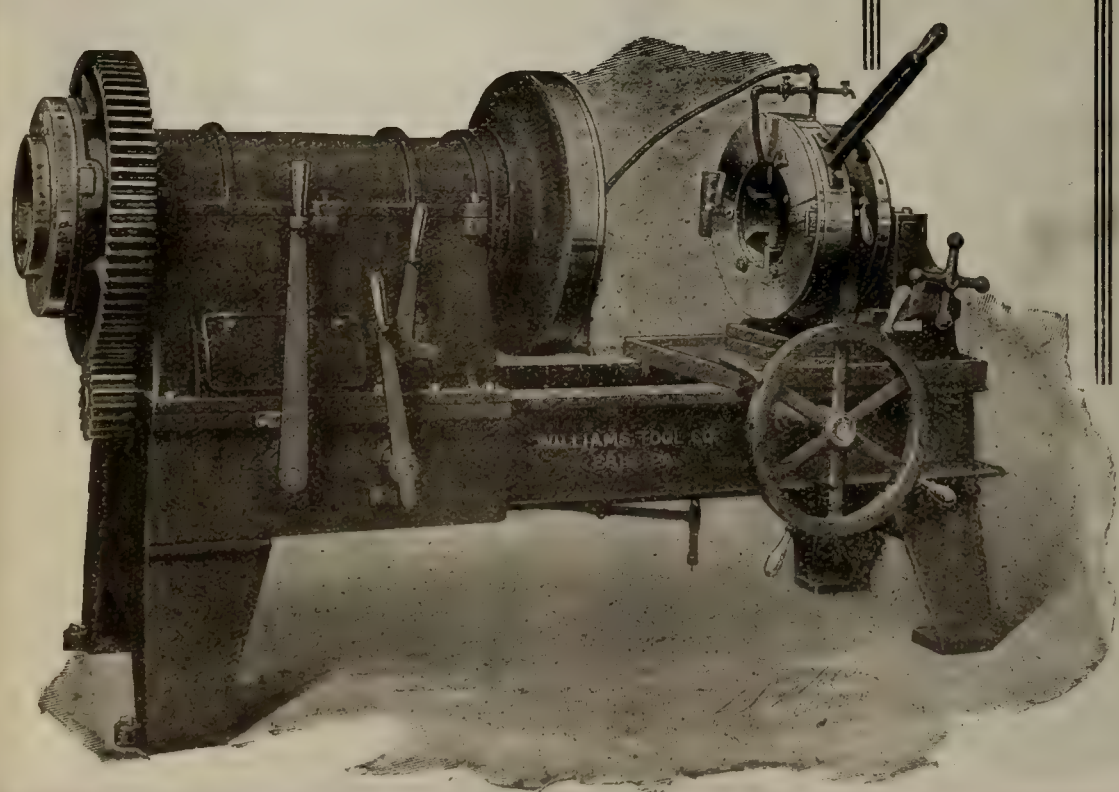
LET US TELL YOU MORE ABOUT IT



Dominion Machinery Company

110 Church St.
Toronto, Ont.
Canada

Williams Gives You Quality "Insurance"

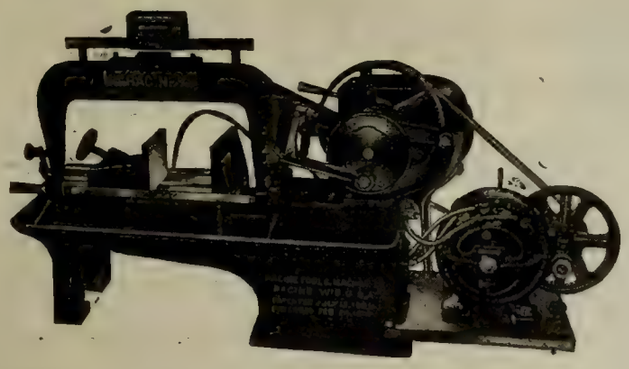


Amongst those who know the value of Williams Cutting and Threading Machine and those who use these machines, there is a confident assurance that at least one department of the works is up to 100% efficiency. They are made in 11 different sizes and each size made to include 10 sizes. For utility and value the Williams have no equal. A letter to us will command our immediate attention.

Williams Tool Co.

Erie, Penn. U.S.A.

Can. Agents:
The A. R. Williams Machinery Co., Ltd., Toronto, Canada



We will send a Racine on a Trial Basis—*Why?*

The Racine machine is the only high-speed metal-cutting machine in the world that is absolutely positive in every action, and will duplicate itself in every cut during the entire life of the machine. All wearing parts are adjustable and accurately machined.

Racine Tool & Machine Co.
15 Melbourne Ave., Racine, Wis., U.S.A.

The Reason For So Many Repeat Orders

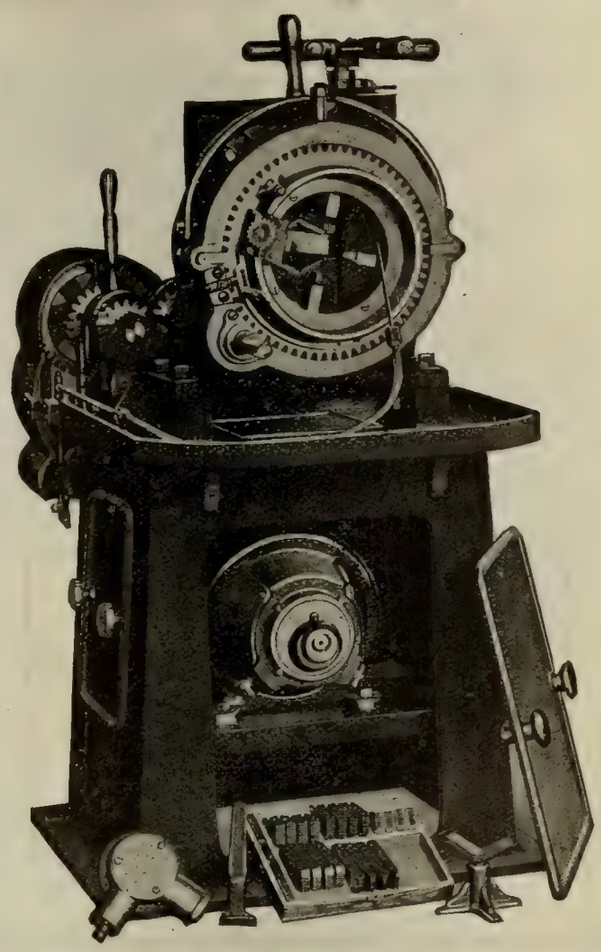
after comparative tests is that no magnifying glass is necessary to distinguish the increased production and the better class of work on the PEERLESS High-Speed Cutting-off Saw.

A third order just came in from one of the largest concerns in the United States, and is it not a fact after a firm has standardized on a certain make of tool that some real results must be produced in order to effect a change?

One of our customers writes: "It takes us only 1-15th of the time to cut our stock on the PEERLESS that it did on our other machine."

If you are open to conviction we have a proposition to offer that no manufacturer can afford to pass up.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

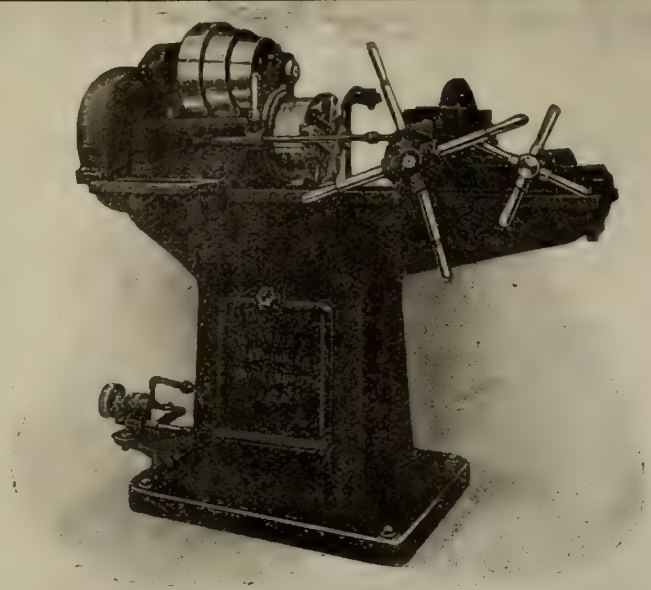


"Forbes Facts"

1. One man can do the work of six against the old stock and die method of cutting.
2. It is the only machine on the market with receding gear.
3. It is self-contained and motor-driven.
4. It is portable.

These are convincing arguments for the construction and utility of this machine. Thread cutting can be performed fast, clean and true. Equipped with self-centering vise.

The Curtis & Curtis Co.
115 Garden St. Bridgeport, Conn.



Economical Production More Important Now Than Ever

Now is the time to install the Landis Die in your shop when you want continuous production at a minimum cost of upkeep.

Landis Die Heads and Machines will not only stand up to your work, but will give a better quality and quantity of threads at a lower cost than is possible with any other threading machine.

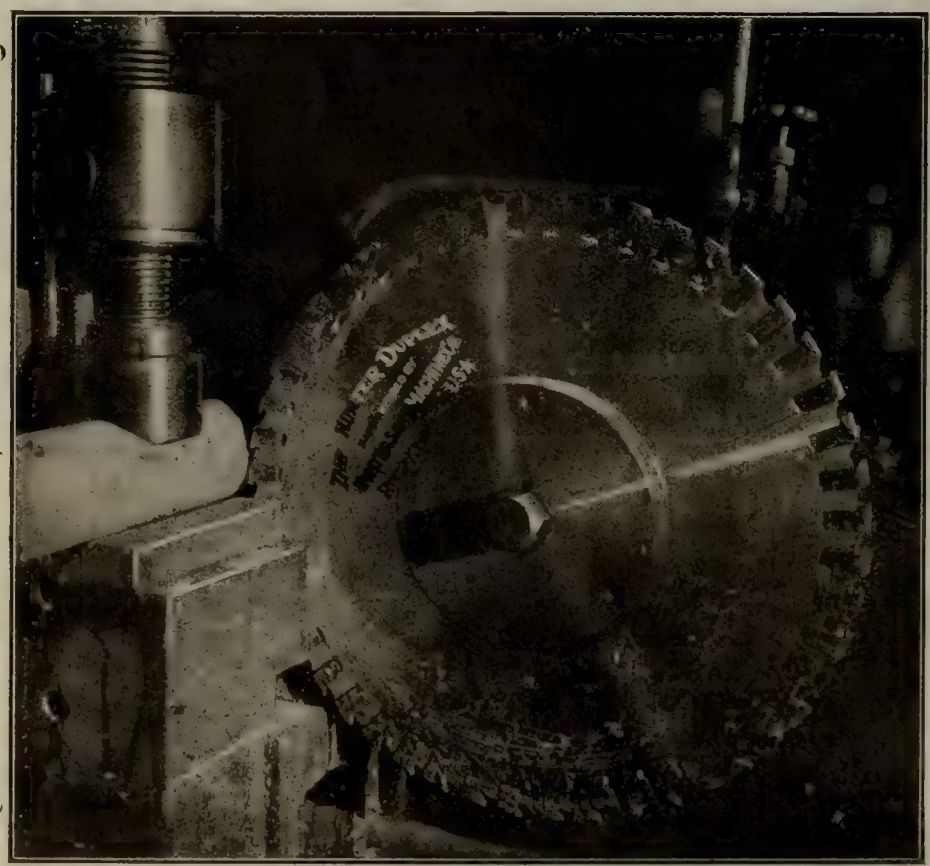
Remember the Landis points of superiority—long life, high cutting speed, variable rake angle, interchangeability of chasers, absence of annealing, hobbing and retempering, permanent throat, etc.

It's up to you to investigate this die—send your specifications and let our Engineering Department show how the Landis Die will handle your requirements.

Catalogues upon request.
No. 22 Bolt Cutter Die Heads and Machines.
No. 23 Pipe Threading Die Heads and Machines.

LANDIS MACHINE CO.
WAYNESBORO, PA.

A Hunter "Duplex" on Shrapnel Stock



FAST GOING
on Newton Machine

Through 3½" round 60 Carbon, 70 Manganese Shrapnel Stock every

2 MINUTES

The secret of Hunter "Duplex" Saw speed is the method of holding the high speed teeth.

You can use this speed profitably — on shrapnel or any other stock.

Let us send full Particulars.

HUNTER SAW & MACHINE COMPANY, Pittsburg, Pa.

Two Cuts

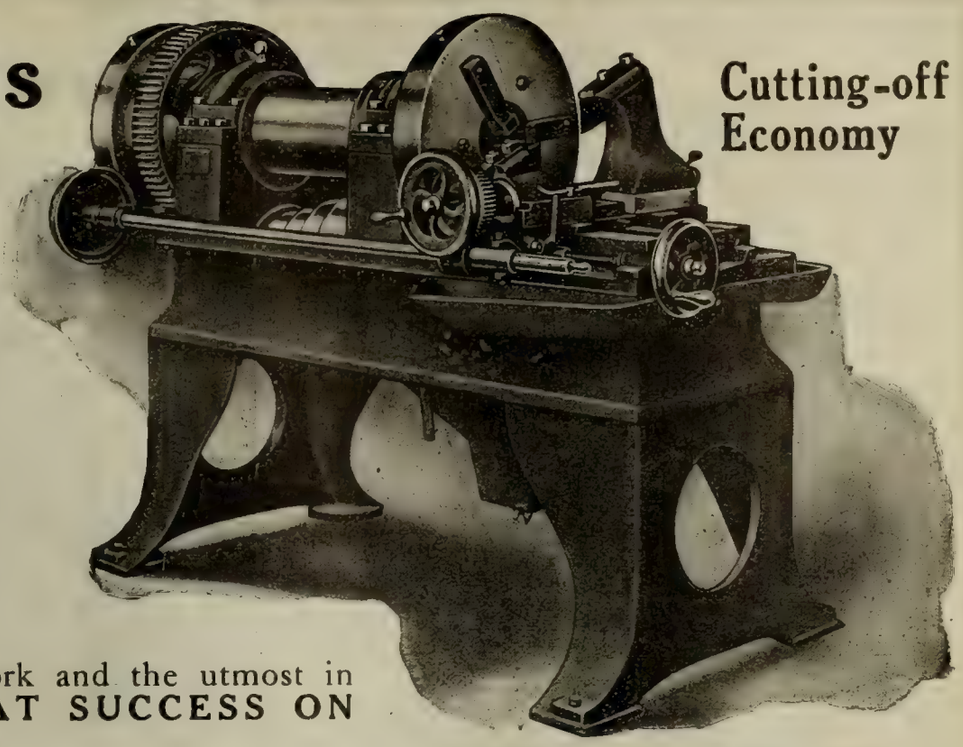
Simultaneously

One up, the other down. This is what makes the **Hurlbut-Rogers Cutting-Off and Centering Machine** virtually double the output and reduce the cost per piece about one-half.

The Hurlbut-Rogers Machine gives you capacity of two machines at the expense and in the floor space of one machine.

We build them for hard work and the utmost in accuracy—and their **GREAT SUCCESS ON SHELLS** shows it.

Let us go into details.



Cutting-off Economy

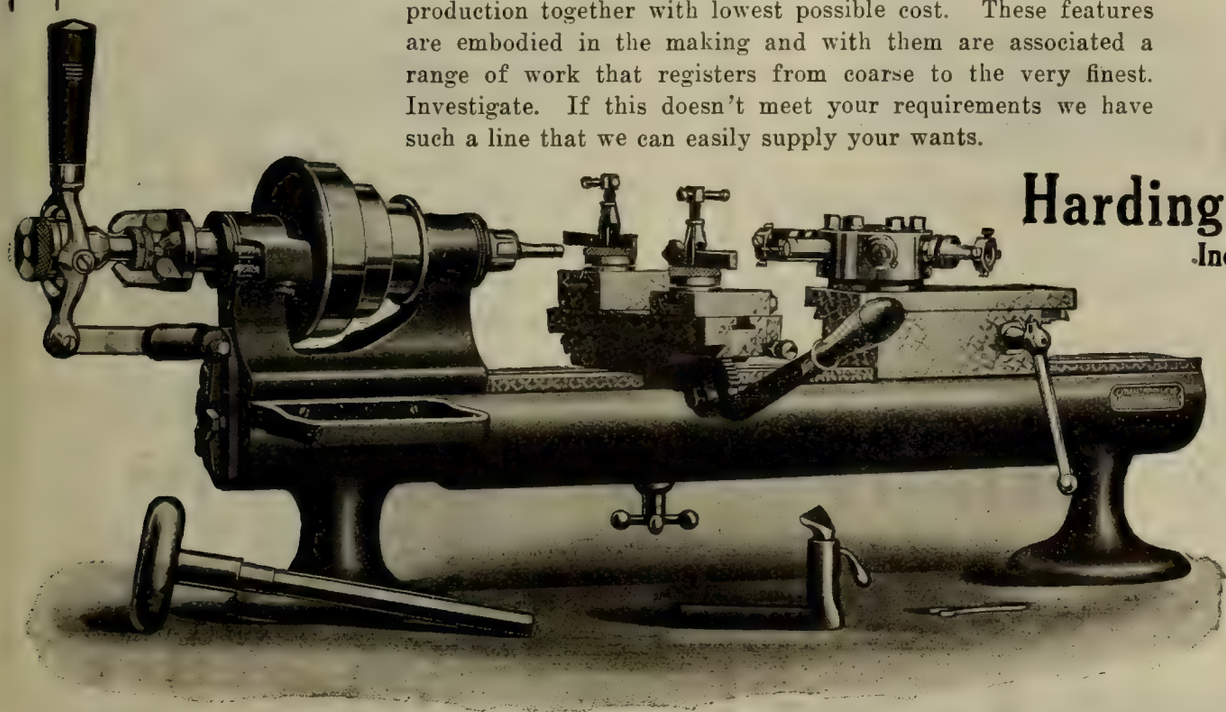
5-inch Cone-Driven Machine

HURLBUT-ROGERS MACHINERY CO., South Sudbury, Mass.

FOREIGN AGENTS—England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow and Newcastle-on-Tyne. H. W. PETRIE, TORONTO, CANADA.

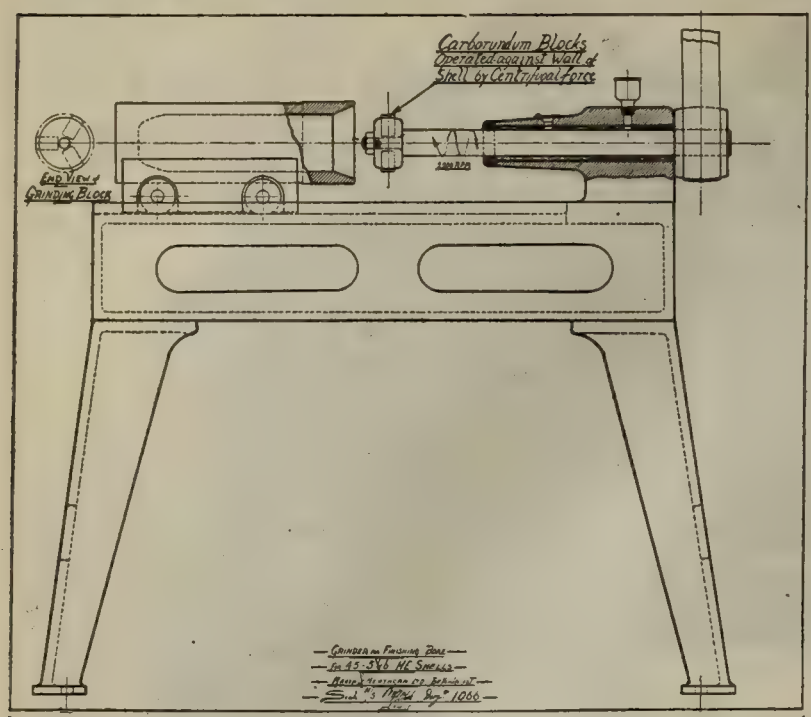
If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.



Hardinge Bros. Inc.

1770 Berteau Avenue,
CHICAGO,
ILL., U.S.A.



Smooth Bores

We have designed for our own use a simple and inexpensive grinder to give the final touch to the bore of our shells.

It does the work, and we will have some of these machines on the market shortly.

Write us for our proposition.

Marsh & Henthorn
Limited

BELLEVILLE, ONTARIO

Stow Shell Grinders Increase Production

Suspended Pedestal Mounted on Truck

Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.
Binghamton, New York, U.S.A.
Oldest Portable Tool Manufacturers in America

Assuming that you want a grinder that is better than the average—

A grinder with massive table, micrometer adjustments, very long knee and gibs, and extra heavy head and tailstock—it will pay you to investigate the

Standard No. 6
Universal Grinding Machine

In addition, you'll find that the headstock is fitted with large bearing for chuck spindle and with special bronze bearings of navy specifications, spindle is tapped and tapered, bored to take wheel arbors, and bearings are 1 in. in diam. and 2¾ in. long, and an exceptionally simple and sturdy countershaft with self-lubricating bearings.

Start the investigation by sending for the full details—to-day.

Simmons Machine Co., Inc.

1001 Singer Bldg., New York City
981 Broadway, Albany, N.Y.

ARO PORTABLE ELECTRIC GRINDER

The Speediest and Most Efficient Grinder on the Market

30,000 R.P.M.

This marvellous speed will cut the cost of your grinding operation and pay for the grinder in short time. Built to do perfect work, too.

Dynamically balanced. Motor and internal attachments equipped with S K F Ball Bearings. No end play—no vibration.

Does all kind of grinding—longitudinal, cylindrical, internal and other hard-to-get-at jobs. Easily portable.

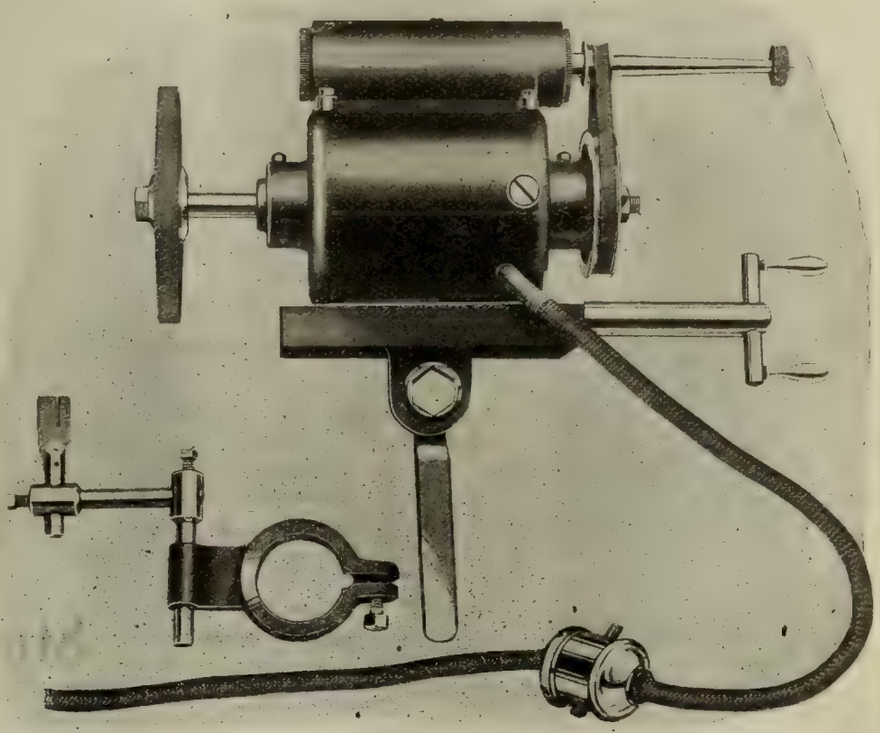
Write for full details.

R. E. T. Pringle, Limited

Manufacturers' Agents

OFFICES:

Tyrrell Bldg. - - 95 King St. East, Toronto
809 Unity Bldg. - - - - - Montreal, Que.
3402 Osler Ave. - - - - Vancouver, B.C.
302 Donalda Block - - - - Winnipeg, Man.

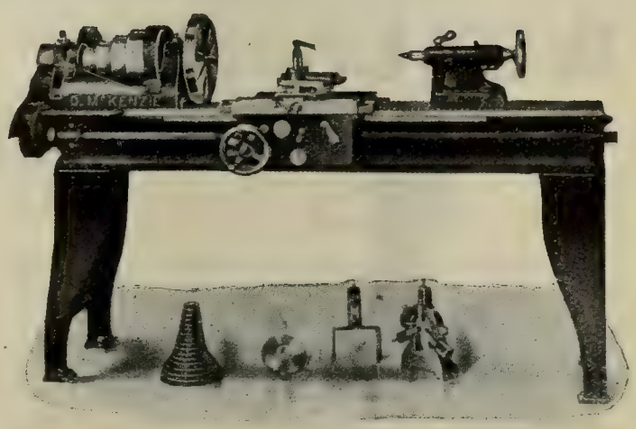


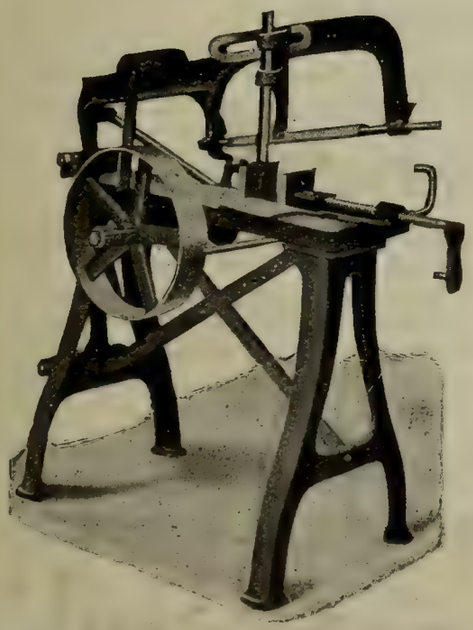
The "McKenzie" Engine Lathe

The Standard of Accuracy

Made from new patterns, of improved design, and constructed of the very best material by expert workmen. Every part is mechanically perfect and excellently finished. Its accuracy and durability mean a big saving of money to you.

Let us put full details before you. Write!





The Improved Power Hack Saw

will cover its cost many times over with the money it saves through long, efficient service.

Saws bars 6 x 6 in., either round or square, and is so constructed as to require no attention after work is put in vise, and stops automatically when piece is cut off.

The improved Saw Guide is a Special Feature—it keeps the saw perfectly in line at all times.

The D. McKenzie Machinery Company

Guelph, Ontario

MATTHEWS
Marking Devices

Quality of material assured, the success of a steel lettering die depends on its accuracy. Matthews of Pittsburgh made that discovery 67 years ago, and make marking devices accordingly. Matthews' facilities are complete. Specially designed machines, expert operators, skilled hand workers—we have them all, plus ability to make prompt deliveries. Mark what you make—mark it right—mark it with a "Matthews" stamp.

Complete Catalogue of Steel Lettering Dies and Stamps sent on request.

JAS. H. MATTHEWS & COMPANY

67 Years in Business

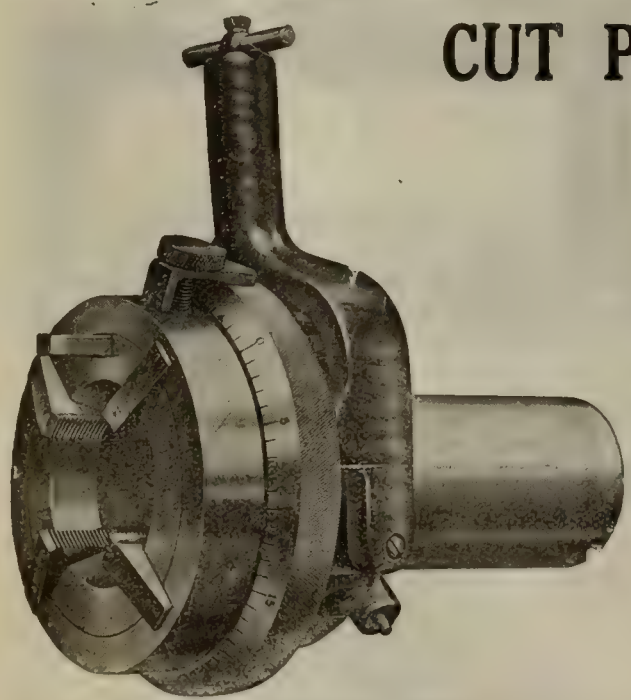
Forbes Field, PITTSBURGH, P.A.

Distributors for Canada:

Canadian Fairbanks-Morse Company, Ltd.

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria.

WELLS SELF-OPENING DIES
CUT PERFECT SCREW THREADS



WELLS SELF-OPENING DIE has both face and hand trip.

The Wells Self-Opening Die cuts the thread with a fine shearing cut, then opens with a quick, positive snap.

Adaptability

The Wells Self-Opening Die can be used on screw machines, lathes, automatics, drill presses and bolt cutters.

Chaser Principle

The Wells Self-Opening Die embodies an entirely new principle of design. The chasers are about four times as long as the threaded portions and are supported throughout their entire length and width by the solid sides of the slots in the body. They cannot squirm away from the work. Wear is reduced to a minimum throughout. Adjustment is simple, positive and accurate.

A large number of these Dies in stock for Immediate Shipment.

Wells Brothers Company of Canada, Limited
GALT, ONTARIO

Sales Agents: **The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary**

Grinding Planer Tools With Alundum Wheels

The wheel on the machine shown is a 24-inch Vitrified Alundum, grain 30, grade O, running at a speed of 900 r.p.m. The wheel is in actual operation grinding tools 90 per cent. of the time, and under this service wheels are lasting 4 to 5 months. Equally good results are being made on other grinding operations.

NORTON COMPANY
WORCESTER, MASS.

ELECTRIC FURNACE PLANTS:
NIAGARA FALLS, N.Y., CHIPPAWA, ONT.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto Ottawa, St. John, N.B.; Winnipeg, Calgary, Saskatoon, Vancouver, Victoria: F. H. Andrews & Son, Quebec, Que. 862a

The "FEEL" of a Tool

Every good mechanic knows what the "Feel" of a tool is. The poise, and the balance, the weight, and the shape—all go to make up that elusive Quality.

EACH

P H

TRADE MARK

QUALITY FILE

is made specially for the job for which it is intended. It has that "Feel" which good mechanics know everywhere as the sign-mark of a Fine Tool.

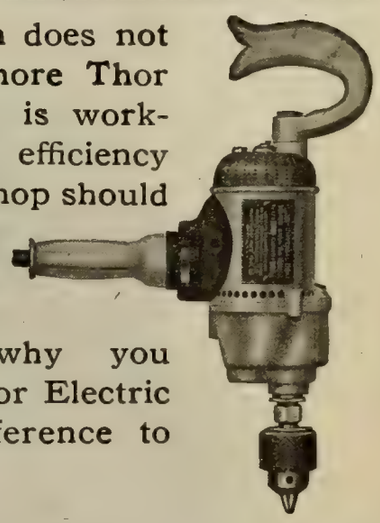
P. H. FILES *CUT*—AND THEY *WEAR*.

Port Hope File Mfg. Co., Ltd.
Port Hope, Ont.

"ASK YOUR JOBBER"

Thor UNIVERSAL Electric Drills

Licensed Under Burke Universal Motor Patent



No shop which does not use one or more Thor Electric Drills is working to full efficiency which every shop should do during these critical times. Let us demonstrate why you should use Thor Electric Tools in preference to other makes.

Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.

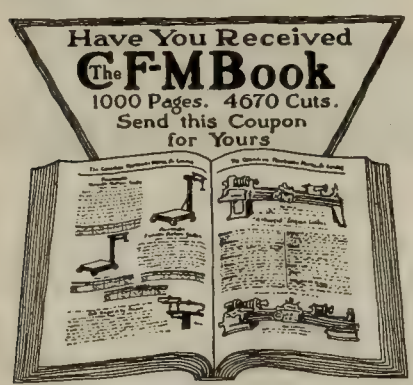
Toronto: 32 Front St. W; Winnipeg: 123 Bannatyne Ave., E; Vancouver: 1142 Homer Street

If any advertisement interests you, tear it out now and place with letters to be answered.

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED.

Manufacturing Plant Equipment

G. & K. Leather Belting
Dick's Balata Belt
Cotton and Rubber Belt
Lacings and Fasteners
Belt Tools and Lacing Machines
Belt Clamps
Belt Dressings
Shafting
Collars
Plate, Compression and Flexible Couplings
Hangers
Pillow Blocks
Floor Stands
Wall Frames
Wood Pulleys
Friction Transmismission
Variable Speed Transmission
Belt Tighteners
S.K.F. Ball Bearings
U.G. Friction Clutches
Cut-Off Couplings
Silent Chain Drive
Rope Transmission
Babbitt Metal
Grease
Sprocket Chain
Spur and Bevel Gears
F.M. Motors
Motor Generator Sets
Transformers
Regulators
Starters



2.—*Power Transmission*

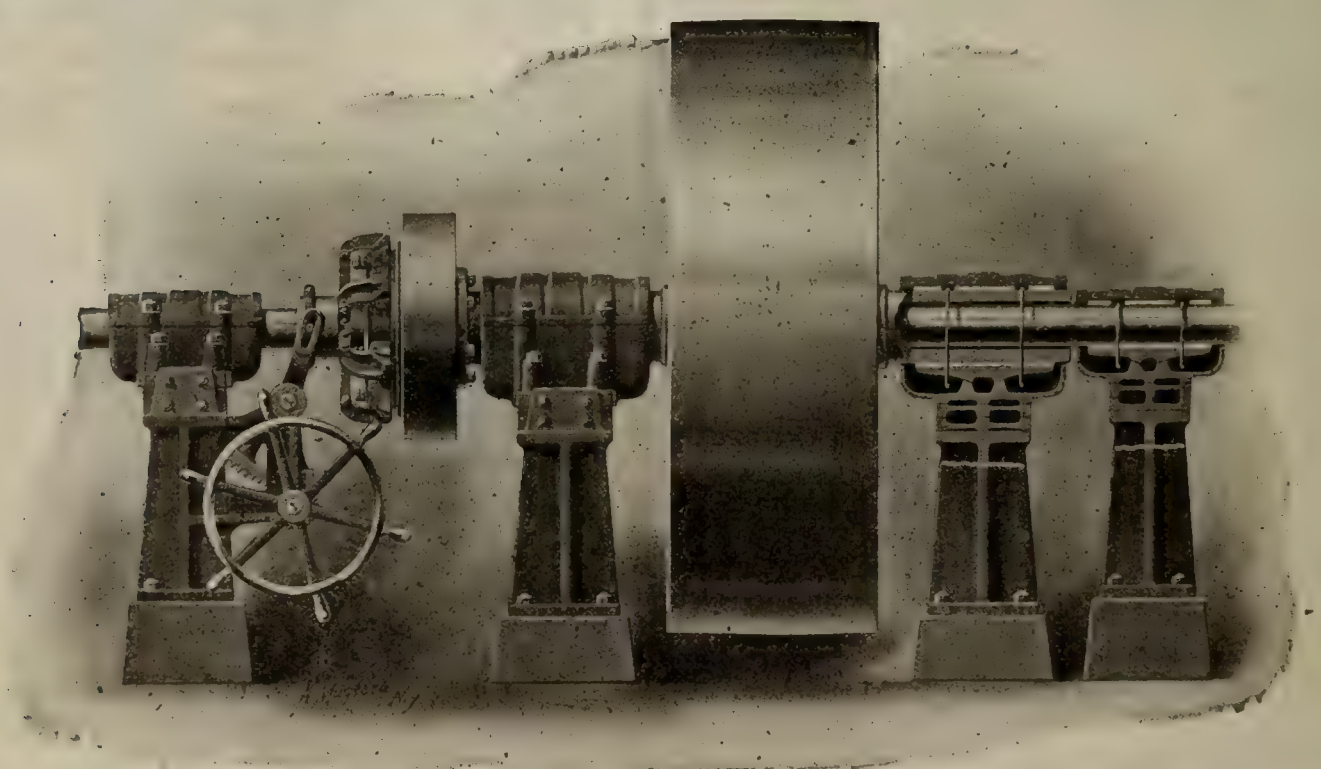
The power—no matter what it is—developed in the power house, must be transmitted with the smallest loss to the machine where it is to be turned into effective work.

Fairbanks-Morse Transmission Appliances have been selected for their efficiency, and long life. There is nothing essential to the most economical transmission of power, which we cannot supply.

Your enquiries will receive prompt attention, and we can assure you of the best deliveries, consistent with the present market conditions.

The Canadian Fairbanks-Morse Co., Ltd.

St. John Quebec Montreal Ottawa Toronto Hamilton
Windsor Winnipeg Saskatoon Calgary Vancouver Victoria



Grinding and Setting Lathe and Planer Cutting Tools--II.

Staff Article

Two of the prime essentials, if not the all-important factors in general machine shop practice, and those that are left entirely to the judgment of the individual operator, more particularly in the smaller shops, are the grinding of the various cutting tools and the setting of same in their respective positions. The efficiency of numerous plants is seriously hampered by the lack of knowledge on the part of many operators of the elementary requirements pertaining to their own work. Lubricating or cutting compounds are undoubtedly a great aid in the removal of metal, but the agents that perform the actual work, should receive every attention before their faults are covered with a flow of cooling fluid.

RUNNING a lathe should not be confused with the operation of same. It is not sufficient that a lathe hand should "run a machine," but every little detail should receive careful attention to insure maximum achievement by economic and accurate manipulation. Owing to the fact that most lathes are adapted for chuck and center work, the head or live center is often removed when work is held in the chuck, and when machining is done in such, it is impossible to prevent the cuttings from lodging in the hollow spindle or the hole provided for the center. When changing from center to chuck work, the opening should be protected by means of a suitable wooden plug or what is more common a piece of waste, while the chuck work is being performed. The importance of this detail is too often overlooked by many lathe hands, and inaccuracy of machine work has very often been traced to carelessness in replacing the centers.

The clinging of a small piece of metal or dirt may prevent the center from attaining its proper position in the spindle; an exaggeration of this fault is illustrated in Fig. 13. Under the conditions here shown it is obvious that the center will be eccentric to the spindle, with the central axis out of alignment as shown at D. Work turned with the head center in this position will be concentric with the lathe spindle, but the head end of the shaft will be eccentric with the center upon which it was turned; this error diminishing toward the tail end. If the tail of the driving dog is placed in the opposite slot, any error will be immediately discovered, or if the work calls for a reversal from end to end, any eccentricity will be at once evident.

Particular care should be given to the accuracy of the head center before commencing to machine a piece of work upon the centers; in addition to running perfectly true, the shape of the conical section should be maintained at a uniform angle of 60 degrees. The centers should always be placed back in the same position, suitable marks being provided for this purpose, and tested for alignment before starting to machine the work. The features above mentioned in connection with the head center also apply to the tail center, but the error is not so marked in the latter case. When grinding the centers, particular attention should be exercised in maintaining a uniform angle of 60 degrees, and the centers in the work should also conform to this standard angle.

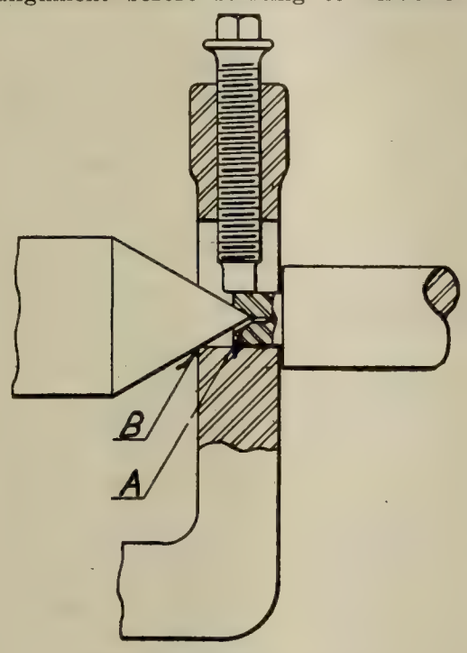


FIG. 14—CENTER TROUBLES

One of the troubles occasionally in evidence in machining small shafts is that illustrated in Fig. 14, where a short section is turned to a comparatively small diameter, and when the dog is placed on for driving purposes the lower outer edge may bear on the center as shown at B, thus preventing proper contact in the shaft center, leaving an opening as at A. This may happen without the immediate knowledge of the operator unless special care is taken to see that the dog is clear before starting the cut.

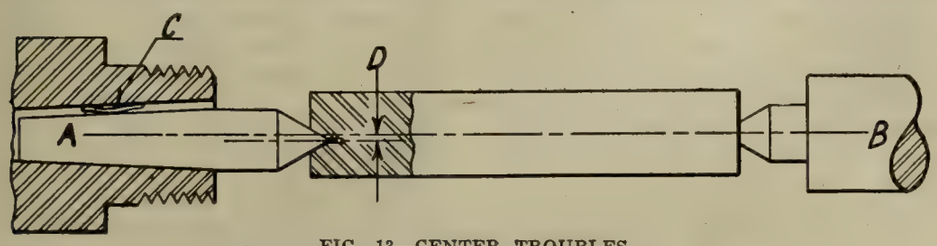


FIG. 13—CENTER TROUBLES.

When using a dog in turning taper work it is necessary to see that the driving of same is maintained during the full revolution of the work. During the turning operation the tail of the dog has a lateral motion in the driving slot, and this action may have either or both of the results illustrated in the sketch Fig. 15. Referring to the cut, it is obvious that the face plate, being fixed to the lathe spindle, will revolve on the axis A—B, while the work will revolve on the line of the latre centers C—D, thus causing the dog to oscillate as the work is turned upon the centers, the extreme movement in either direction being when the dog is in the horizontal position. When the tail is at the front of the lathe, it will be at its greatest distance in the slot and it is well to see that no interference takes place at G, as this would tend to have the same effect as that noted in Fig. 14. On the other hand, when the tail is at the opposite horizontal position there is the possibility that the tail of the dog will leave the slot, as shown at H.

Owing to the angle that the two axial centers make with each other, it is clear that the lathe centers cannot fit the centers in the work, and this condition is more pronounced when the taper is sharp in proportion to the length. An example of this is illustrated in the sketch Fig. 15, showing the relative position of the centers on either end of the work. It will be noticed that the pressure of the cut comes on the very point of the lathe center in the tail-stock at I, the other contact point being at J, directly opposite and on the outer edge of the work; the opposite conditions being effected at the head end of the work. A brief study of these facts will impress the imperative necessity of having the ends of the work faced perfectly square before off-setting the tail-stock.

In the upper right hand corner of Fig. 15 an enlarged view of these conditions is shown. Here the end of a shaft is shown where the end is not square with the axis of the work, the variation being exaggerated to demonstrate the possibilities more clearly. The full and dotted lines represent the two extreme positions on the horizontal line, while the line E—F shows the neutral line, square with the axis of the shaft. It is therefore clear that the back support between

the lathe center and that of the work will vary in one revolution from the points M to N, thus placing excess pressure at the point O when the high side is opposite. Work performed under these conditions will have a slightly elliptical shape.

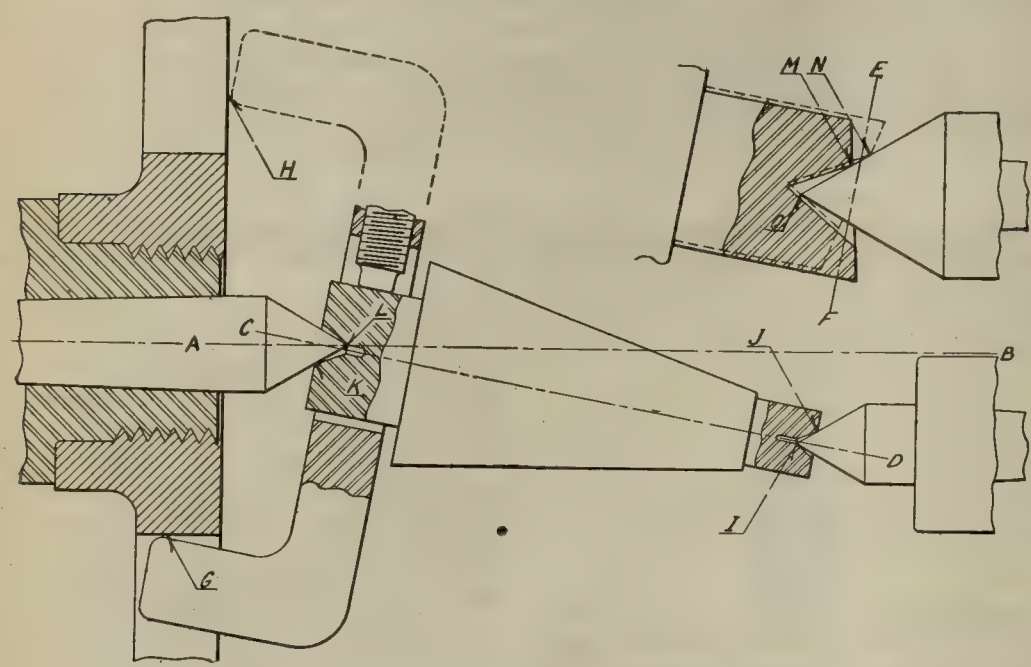


FIG. 15—TAPER WORK SUGGESTIONS.

WORLD'S SULPHITE OUTPUT DECLINING

CONSIDERING the indispensability of sulphur and its chemical compounds in the manufacture of fertilizer and munitions, it is important to note the recent declining world production of sulphur and the curtailed exports of pyrites from Spain, caused by the scarcity of ships and submarine warfare. The United States domestic production of pyrites in 1916 was about 450,000 tons, and imports from Spain and Portugal amounted to about 1,250,000. The domestic supply is clearly inadequate to meet the sulphuric acid needs of the country, and the National Fertilizer Association estimates that about 600,000 tons of sulphur will be needed during the current year to replace pyrites in the manufacture of sulphuric acid.

Figures indicating the production of sulphur for the world and by the principal countries for 1913-1916, inclusive, in metric tons, follow:—

Country	1913.	1916.
Sicily	243,907	355,349
Italy (other regions)..	35,000	38,722
Total Italy	278,907	394,071
United States	450,000	316,575
Japan	*	49,131
Other countries	25,000	50,000
	753,907	809,777

*Figures not available.

The decline in total production especially calls for note when the increasing demand is considered, as it is estimated that the annual consumption of sulphur has grown from 300,000 tons in normal times to 900,000 tons in 1916, and 1917 requirements are estimated at 1,000,000 tons.

FOUNDRY FACINGS*

By H. Winterton

HOW frequently coal dust has been blamed for many a scabbed casting, when perfectly blameless, will never be known. In too many foundries in past times the question of the admixture of coal dust with sand has been considered of too little importance to warrant either extreme care or even more than cursory attention. In quite a large number of foundries, the "fat" is mixed on scientific lines by experienced hands, whose variations of mixtures are worked out almost to fractions. The functions of coal dust are threefold. In the first place the heat engendered in the mould when in contact with the coal dust forms a gas which gives a lead through the sand to the gases formed by the iron in the mould. Second, the absorption of the coal particles by the heat clears a way for the passage of those gases. Third, and by no means the least important phase, is the formation on the face of the mould of a layer of gas which prevents in a measure the actual contact of the iron with the sand.

Coal Quality

One result of this is that a skin on fine surface is formed on the face of the casting, and, according to the strength of the coal dust, so is the colour of this skin heightened or deepened. If this be the case it follows that great care should be taken to obtain coal dust of a suitable quantity, and, amongst the points to be noted, it will be necessary to include the bituminous quality of the coal, its comparative freedom from ash, its volatile content, and also its proportion of fixed carbon. I am aware that many differences of opinion exist as to the kind of coal to be used, but for the purposes of this paper, rather than go to extremes, it would be advisable to take a coal of a fairly good quality. Writers on this subject have in the past built their ideals round a coal containing an extremely low percentage of ash, and a high percentage of carbon, forgetting that a coal of this character must necessarily prove low in bituminous qualities, and, in fact, be of too refractory a character altogether to carry out satisfactorily the functions just indicated. On the other hands, there have been tried coals containing as high as 25 per cent. of ash, the results of which when heat is applied can only be to produce a casting with a skin of an extremely grey colour and a rough surface.

A good working coal dust for general foundry use should not exceed 12 per cent. of ash, 37 per cent. of volatiles, and 51 per cent. of fixed carbon. It might be contended that the percentage of ash in this coal is high. But the volatiles have to be taken into consideration, and I knew I am right in saying, that with mixtures in which the ash was much lower, castings were scabbed and the skin had a harsh and uneven appearance. Especially was this the case in some experiments made with a good-class anthracite, in which the percentage was under 4. I arrived at the conclusion that the coal dust had resisted the heat so much, owing to the presence of a high percentage of carbon, that it had acted as a refractory, and actually prevented the escape of the gases from the mould by closing up the pores.

As in all matters appertaining to the foundry, however, there is a limit in the direction indicated, and care should be taken, while not exceeding the minimum in one direction, not to approach too closely the maximum in the other. It would never do, of course, to make use of such a coal as was submitted to me recently as suitable for use in the moulds, the analysis of which came out as follows:—Ash, 43.85; volatile matter, 29.80; fixed carbon, 26.35.

Varied Grist of Coal

It is well known that it is very necessary to have various grists of coal dust according to the class of work carried out in each foundry, and according to the grade of sand used. For very light castings a coal dust of exceedingly fine grist is necessary, especially if the sand has an open tendency, while a slightly coarser, yet still fine grist should be used for heavier work. The medium and coarse grades come in for the larger classes of castings, in which it is necessary for the gases engendered to be carried away quickly, while the work of providing a skin to the casting is left to a larger extent for the blackings or facings.

In many instances I have found that where a good superfine coal dust is used a splendid casting with a capital skin has been produced, it necessarily following that on account of the lightness of metal the gases formed in the mould have not been overpowering, while the heat of the smaller body of iron would not have been sufficiently great to fuse any coal particles of more than infinitesimal size. This brings me to a source of

*From a paper read before the Birmingham Branch of the British Foundrymen's Association.

GEAR TOOTH EQUIVALENTS.

Diametral Pitch (P) = Number of teeth divided by pitch diameter in inches.

$$P = \frac{3.14159}{C} = \frac{25.39997}{M}$$

Circular Pitch (C) = Distance from centre of one tooth to centre of next on the pitch line.

$$C = \frac{3.14159}{P} = .123685 \times M$$

Module (M) = Pitch diameter in millimetres divided by number of teeth. Also equal to addendum measured in millimetres.

$$M = \frac{25.39997}{P} = 8.0850 \times C$$

Diametral Pitch.		Circular Pitch in inches.		Module Addendum in m/m.	
1	1.0000		3.1416		25.3999
	1.0472	3"	3.0000		25.2552
	1.0583		2.9684	24	24.0000
1¼	1.2500		2.5133		20.3199
	1.2566	2½"	2.5000		20.2127
	1.2700		2.4737	20	20.0000
	1.4111		2.2263	18	18.0000
1½	1.5000		2.0944		16.9333
	1.5708	2"	2.0000		16.1701
	1.5875		1.9789	16	16.0000
1¾	1.7500		1.7952		14.5143
	1.7952	1¾"	1.7500		14.1488
	1.8143		1.7316	14	14.0000
2	2.0000		1.5708		12.7000
	2.0944	1½"	1.5000		12.1276
	2.1166		1.4842	12	12.0000
2¼	2.2500		1.3963		11.2888
	2.3091		1.3605	11	11.0000
2½	2.5000		1.2566		10.1600
	2.5133	1¼"	1.2500		10.1063
	2.5400		1.2368	10	10.0000
2¾	2.7500		1.1424		9.2363
	2.8222		1.1131	9	9.0000
3	3.0000		1.0472		8.4666
	3.1416	1"	1.0000		8.0850
	3.1750		.9895	8	8.0000
	3.3510	15/16"	.9375		7.5797
3½	3.5000		.8976		7.2570
	3.5904	7/8"	.8750		7.0744
	3.6285		.8658	7	7.0000
	3.8666	13/16"	.8125		6.5690
4	4.0000		.7854		6.3500
	4.1888	¾"	.7500		6.0638
	4.2333		.7421	6.0	6.0000
	4.5696	11/16"	.6875		5.5584
	4.6182		.6803	5.5	5.5000
	4.7124	⅔"	.6666		5.3900
5	5.0000		.6283		5.0800
	5.0265	⅝"	.6250		5.0531
	5.0800		.6184	5.0	5.0000
	5.5851	9/16"	.5625		4.5478
	5.6444		.5566	4.5	4.5000
6	6.0000		.5236		4.2332
	6.2832	½"	.5000		4.0425
	6.3500		.4947	4.0	4.0000

Diametral Pitch.		Circular Pitch in inches.		Module Addendum in m/m.	
7	7.0000		.4488		3.6285
	7.1808	7/16"	.4375		3.5372
	7.2571		.4329	3.5	3.5000
8	8.0000		.3927		3.1750
	8.3776	⅜"	·3750		3.0319
	8.4666		.3710	3.0	3.0000
9	9.0000		.3491		2.8222
	9.2363		.3401	2.75	2.7500
	9.4248	⅓"	.3333		2.6950
10	10.0000		.3142		2.5400
	10.0531	5/16"	.3125		2.5265
	10.1600		.3092	2.5	2.5000
	11.2888		.2783	2.25	2.2500
12	12.0000		.2618		2.1166
	12.5664	¼"	.2500		2.0212
	12.7000		.2474	2.0	2.0000
14	14.0000		.2244		1.8143
	14.5143		.2164	1.75	1.7500
	15.7080	⅕"	.2000		1.6170
16	16.0000		.1963		1.5875
	16.7552	3/16"	.1875		1.5159
	16.9333		.1855	1.5	1.5000
18	18.0000		.1745		1.4111
	18.8496	⅙"	.1666		1.3475
20	20.0000		.1571		1.2700
	20.3199		.1546	1.25	1.2500
	21.9911	⅐"	.1428		1.1550
22	22.0000		.1428		1.1545
24	24.0000		.1309		1.0583
	25.1327	⅛"	.1250		1.0106
	25.3999		.1236	1.00	1.0000
26	26.0000		.1208		.9769
28	28.0000		.1122		.9071
	28.2743	⅑"	.1111		.8983
30	30.0000		.1047		.8466
	31.4159	1/10"	.1000		.8085
32	32.0000		.0982		.7937
	33.8666		.0927	0.75	.7500
34	34.0000		.0924		.7471
36	36.0000		.0873		.7055
38	38.0000		.0827		.6684
40	40.0000		.0785		.6350
50	50.0000		.0628		.5080
	50.2655	1/16"	.0625		.5053
	50.7999		.0618	0.50	.5000

ALFRED HERBERT LTD. COVENTRY.

GEAR TOOTH EQUIVALENT CHART DEVELOPED BY ALFRED HERBERT, LTD., COVENTRY, ENGLAND, AND REPRODUCED HERE BY COURTESY OF THE LATTER.

frequent complaint which arises when founders are using a coal dust of too coarse a grist. It is then found that small pits are left on the face of a casting when cooled, and these are easily distinguishable by their formation from those indentations caused by particles of sand insufficiently milled. The application of heat from the molten metal to the small particles of coal forms a gas, as has been previously indicated, and in the case of light castings, the effect can usually be seen on the face in the shape of small pits made by that gas taking the line of least resistance into the molten metal in the endeavor to free itself. Where larger castings are concerned, the heavier weight of metal and the consequent increase of temperature prevent such indentations, particularly as the coating of blacking on big moulds is generally more pronounced, and, in fact, is applied with a particular object in view.

Coal Dust and Blemishes

It must not be thought, however, that every blemish on the face of a casting or a great deal of the scabbing is always due to the coal dust. In one splendidly-equipped foundry the presence of small rusty-looking spots was promptly placed to the credit, or discredit, of the coal dust; luckily, after a series of tests, it was definitely established that the fault was due to the presence of lime particles in the sand. Again it has been proved, time after time, that scabs on castings have been due to excessive moisture in the mould, or indifferent ramming. At all events, I think I have said sufficient under this head to show the importance of giving careful consideration to a point which frequently escapes notice. I say nothing upon the question of mixture, though this, too, is a matter of importance, and modern foundry practice tends all in the direction of power mixers.

As to actual mixtures, local circumstances, i.e., class of casting, sand, mixing, quality of coal dust, and the exigencies of the moment, bear largely upon this point. But I may quote two mixtures, the first for heavy castings, and the second for light work, which have been used with good results. One mixture was:—55 parts old sand, 30 parts new, and 15 parts coal dust. The other was: 70 parts old sand, 25 parts new, and 5 parts coal dust. There are, of course, many variations, and I do not for one moment suggest that the above are infallible recipes.

Blackings

There is a divergence of opinion on the use of blacking, whether for loam, dry sand, green sand, or cores. The facings may be divided and sub-divided into various classes, and again into further sections. The old-fashioned ideas of blacking moulds with all and sundry compounds, many of them evil smelling, some of doubtful efficacy, and not a few positively deleterious to the casting, seem to be rapidly passing, and in many foundries today the preparation of cores and moulds is carried out with meticulous care. To-day the foundryman demands various facings suitable for the particular class of casting upon which he may be engaged, care being taken to bear in mind the thickness of metal, the heat of the molten iron, and the general characteristics of the finished casting.

For light castings, nothing exceeds in efficiency a charcoal blacking of good quality, though expert practical men are not quite in agreement as to whether a pure wood charcoal or one slightly stiffened by a mineral admixture produces the better results. Some foundries go even further. I have in my mind two light-casting foundries in the Black Country, each of which has a special facing to its own formulae, and which in turn differ to a marked degree in essential particulars. Certain it is that both these foundries enjoy a high reputation for the excellence of their castings, while the proprietor of one assured me that since introducing the new method he had experienced far less trouble in his fettling shop, and at considerably reduced outlay under that head.

For ordinary green-sand work, which requires sleeking, there are now prepared many mineral blackings, sometimes called "patent," which gladden the eyes of the moulder, and assist to bring out a casting with that beautiful blue glossy skin so much sought after by founders. The true functions of these facings are reflected by this very anxiety on the part of the founder. He knows that given a good highly-refractory substance, the pores on the face of the casting will be closed, and therefore the utility of the skin before-mentioned does not end with the colour. He knows, too, that with a blacking of the right character the cleaning off or "fettling" of the casting is going to be a matter of comparative simplicity, and this remark applies, not only to green-sand, but also to loam, dry-sand, and core work.

The Refractory Feature

It is of course necessary to have a stronger or, as it is termed, heavier facing for the larger castings, for not only has the weight to be considered, but the casting temperature in large moulds becomes a serious factor. Hence it is necessary to provide a strong refractory in which the percentage of carbon grows higher in accordance with the strain placed upon it. It is on this very point that theory breaks down, and when this happens, as occasionally it may, it becomes necessary to search for the real reason. On the face of the previous remarks it might be thought that to get good results in all cases it would only be necessary to raise the carbon content, but this is not all that is required. Some refractories are of so harsh a character as to preclude all thought of sleeking on a green-sand mould, or mixing with water in a "boss," especially when newly prepared. It is here that the skill of the blender is required, and by his agency devious facings are produced which can be held to cover all classes of moulds. In many instances I have found that the slightest modifications of mixtures have made all the difference between a good-looking casting and one that would be described as something worse than indifferent.

It is only seeking trouble to make use of a facing that does not process refractory characteristics to a high degree to face a mould of considerable size, and which is to be at a high temperature. On the other hand, the presence in the blacking of too great a proportion of siliceaus matter would cause infinite trouble in the way of scabbing and burning. But, as previously indicated, the use of a high refractory for light castings is not generally advisable.

For cores a sound refractory must be used, but the necessity of providing something that will not easily rub off after baking must be kept clearly in view. Here, again, the task of the expert has been to provide an article which will perform its work perfectly under varying conditions, and, I think I am right in saying that the work in the fettling shop has been very decidedly lessened in the past few years, and on this account. With regard to graphites, graphite facings may be divided into three parts, and roughly classed as plumbago, graphite, and black-lead. There are numerous qualities but it is more or less a matter of carbon content, and those who are satisfied with the poorer kinds must not expect to obtain such good results as other founders who endeavor to obtain the highest grades. Here, again, it is a matter of individual practical test in the various foundries, but to-day the founder who knows what he wants and asks for it is sure to find satisfactory supplies.

Steel Refractories

These are in a class by themselves, and instead of aiming for carbon content the founder looks for materials high in silica. For loam work nothing has been found to exceed in efficiency the silica compositions at present in use. It is not for me to place before experts the various methods of building up the moulds, but I may be permitted to point out the extreme importance of procuring a composition in which, while possessing a high percentage of silicates, is not so closely composed as to interfere with the proposity of the finished mould.

One important factor in these manufacturers is the practical, if not absolute, banishment from the material used of iron oxides. These should be carefully eliminated, for as surely as they enter into the mould in anything like an appreciable proportion so surely will the trouble of the moulder begin. This remark applies with even greater force to the preparation of the facing of "paint," as it is commonly called, with which the mould is finally dressed. The effect of this paint is practically the same as the blacking on an iron mould, and when the high casting temperature of steel is borne in mind it can easily be comprehended how necessary it is to use an article which is above reproach as a refractory.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

BASE RECESS AND PLUG FACING TOOLS

By R. Hamilton.

AN operation that requires considerable attention in order that production be maintained on an economic basis is that of machining the bases of the smaller sizes of high explosive shell to receive the gas plate or base plug. The location and shape of this recess, together with that of the outer portion, necessitates the special arrangement of tooling equipment for satisfactory accomplishment. This operation is now generally performed by means of gang tools set in a special holder or head, in the desired position to cut away the metal by the one movement of the carriage or the turret directly into the work. The tool head shown in Fig. 1 was designed in the plant of the Jenckes Machine Co. and continues to give satisfactory results. The main holder is a steel casting having two cored holes in such a position as to give a tool cutting rake of 15 degrees. Two of these are placed at one side of the center while the other is located on the opposite side. The tool A, of ⅞ inch flat face, is set with one edge slightly over the axial line of the fixture to insure cutting to the center; while the tool B, of 1½ inch flat face, is set to remove the remainder of the stock for the minimum diameter of the recess. The forming tool C is used to cut the portion outside of the recess and shape the riveting flange. Between the tools A and C, a steel spacing block is placed to bring the forming tool to the correct position. The head is so designed that the holding screws force the back of the tool upon a flat surface, to provide increased rigidity when cutting; additional clamping being obtained by the end screws shown. When tools are in a cutting position, the working edge of the recess tools are ⅞ inch from the front face of the fixture.

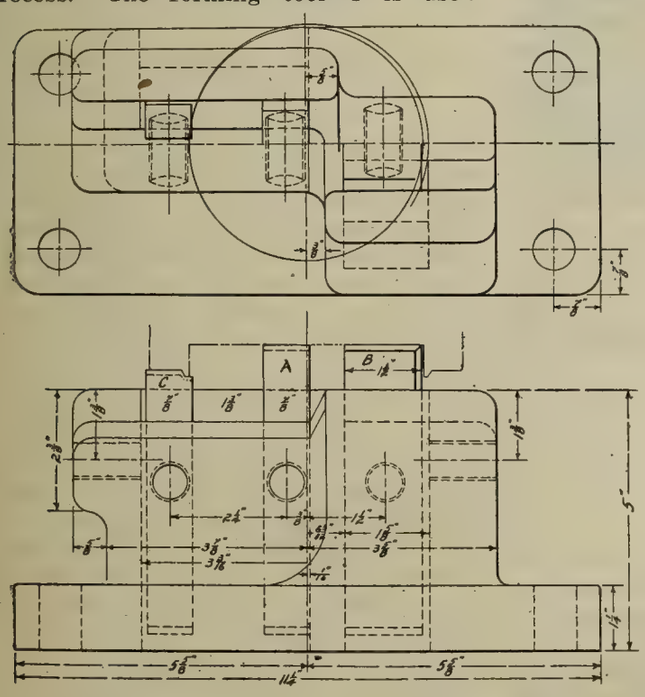


FIG. 1—BASE RECESS ROUGHING TOOL.

The same firm also uses a somewhat similar tool for facing off the base plates after they are riveted in position. This is illustrated in Fig. 2, the head in this case being fitted to the holes in the turret in place of being bolted to the face. The head A has two slots B milled-in at an angle of 15 degrees on either side of the center line, and in such a position that the cutting edge of the tools C come ½ inch from the face of the holder. After the tool slots are milled-in, the collar D is shrunk on to provide metal for the holding screws F, and also to prevent the head from springing; the screws E passing through the collar and the head to allow the thrust of the tool to come on the back surface. The cutters are 1 13/16 inch face, and the base plates are faced off by a direct movement along the axis of the work.

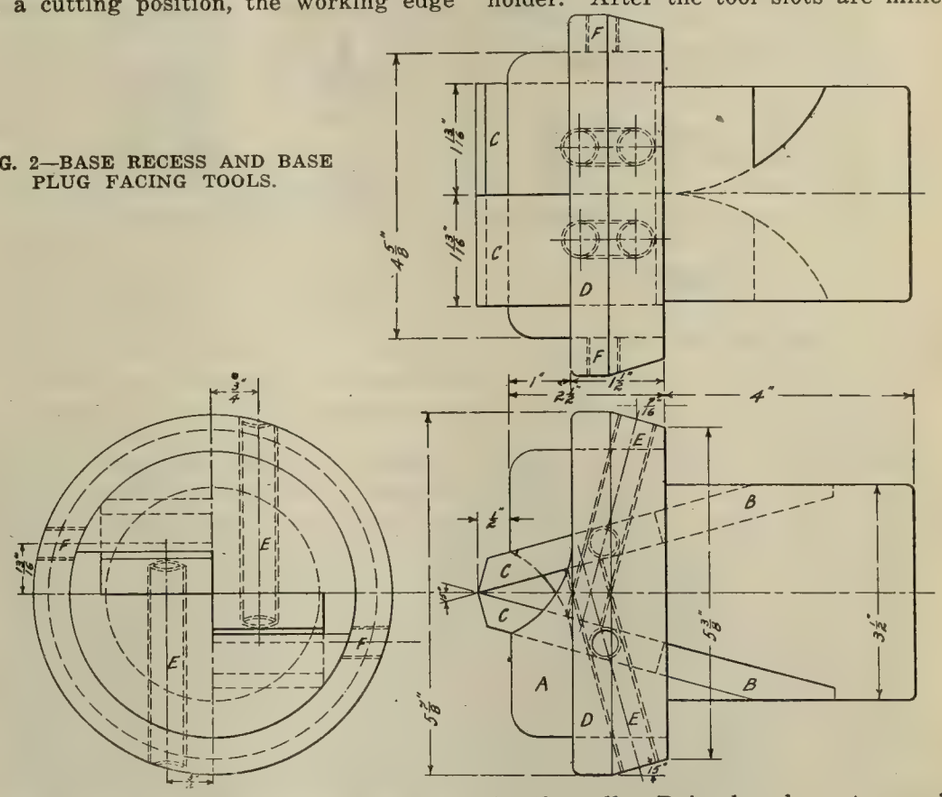


FIG. 2—BASE RECESS AND BASE PLUG FACING TOOLS.

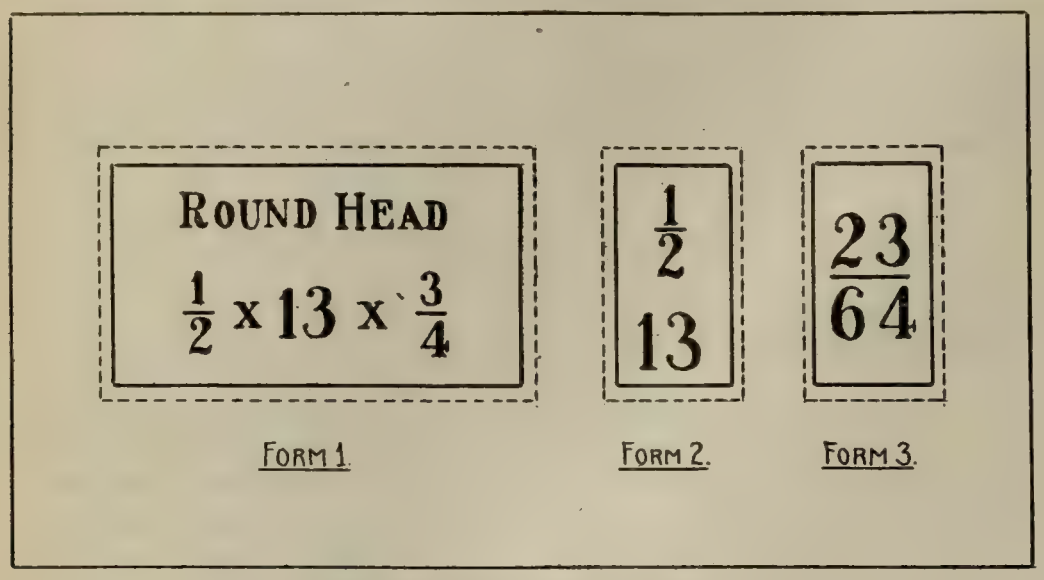
TOOL AND STOCK-ROOM LABELS

By J. E. C.

ONE of the first requisites necessary in starting a factory or when moving into a new building, is that of arranging and putting in order materials, tools, etc., in tool and stock-rooms, and having all properly ticketed or labeled. The work of labeling all tools, is generally a big item, and is a problem requiring a great deal of time and study, for these reasons a considerable number of labels are usually hurriedly required.

The usual procedure is to paint the sizes of tools, materials, etc., on cardboard labels, and in many cases, the marking is done directly on the woodwork, where the tools are placed. This latter method has always been found inconvenient, for the reason that when tools are changed about, it is necessary to scrape off the dimensions indicating sizes, thus marring the woodwork or injuring it otherwise, besides there is the trouble of renewing the figures elsewhere. The work of marking labels is

a long and tedious process, being usually done by hand. Little, if any, attempt has been made to have labels printed and on hand, and to have them in certain standard sizes so that they could be used anywhere as necessary.



TOOL AND STOCK ROOM LABELS.

Having had an unusual amount of experience in this line of work I have found that three forms of printed labels are sufficient in nearly all cases to take care of the various sizes of tools, materials, etc., in stock and tool-rooms. The first of these Form 1, see illustration, is for standard machine screws. Screws as is well-known are placed in racks provided for the purpose. This label indicates the diameter of head, pitch of thread, length underhead, and style of head. The size of label is 3-in. long by 1⅝ in. wide. Several of these labels with standard dimensions and style of heads can be made up by a printer. The style of screws may be stated as headless, round head, filister head, square head, collar head, and hexagon head.

Form 2 label, is 1-in. by 1⅝ in., and is used for standard size taps, nut arbors, and nuts.

Form 3, in size is the same as above, and is printed with whole and fractional numbers. This form of label will be required in large quantities as compared with the other two mentioned, its chief use being for drills, reamers, pod-drills, butt-mills, etc., and mandrels. The labels indicated look much neater when printed, then when done by hand, and it is as important to keep well stocked up in these, as it is in having on hand, pads, paper or similar factory supplies.

WHAT HAPPENS TO TECHNICAL MAGAZINES

By A. F. Menzies

THAT a large amount of valuable information published in CANADIAN MACHINERY and other technical magazines is wasted goes without saying. A considerable reduction in this waste would take place if a convenient means of saving the information were available. If the magazines are preserved in their entirety, the amount of space required for their storage is considerable, and, after being consulted, unless carefully returned to their proper place, an extended search is required to find any given issue. It is rare also, that the title of an article is remembered, the index therefore, is not of much assistance.

Should the bound volume method be resorted to, the storage space required, although less, is still enough to make one think, especially if one has not finished ones wanderings. Further, a caluable part of the magazine, the advertising section, is lost. Clipping files of endless variety have been evolved; but for cheapness and convenience the following is hard to beat, specially for a beginning. After the file has grown large enough to warrant it and the owner thereof feels justified in making the investment, a metal filing case large enough to take the sheets without folding can be purchased.

A box of 250 common envelopes was obtained, the box was used as a filing case and the envelopes used to hold the clippings. It was found more convenient to remove the flap of the envelope. The index was arranged as shown in Fig. 1. By keeping the envelopes in alphabetical order no trouble is found in locating the one desired, and when located, the contents can be read at a glance. Care must be taken that the clippings are returned

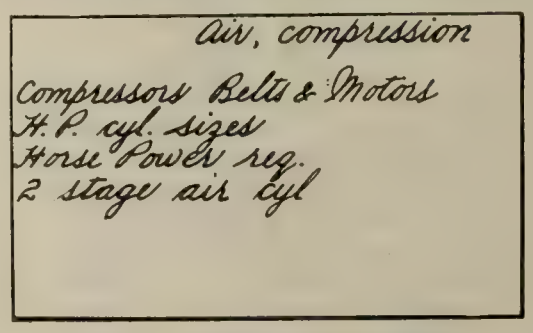


FIG. 1. INDEXED ENVELOPE.

to the envelope and that the envelope itself is returned to its correct place. To strengthen the box, strips of ⅜ in. tape were glued on as shown in Fig. 2. Small pieces of tape will also prevent the corners of the lid from cracking.

In reading over the magazines, the desired material can be marked and cut out at some future time, or simply cut out when it is decided that it is liable to be of use. It is as well to err on the side of too many clippings rather than to run the risk of enjoying the doubtful pleasure of kicking oneself for not keeping a certain article. The advertising section of the magazine should not be overlooked. Discounting the fact that the ad. writer is, so to speak, blowing his own horn, there is often as much meat to be found there as in the reading section.

It sometimes happens that two desirable articles on widely different subjects are printed on the oppoite sides of the same sheet. It can, of course, only be filed under one head. To care for this a title of the other article with a very brief synopsis may be written out and noted thereon the heading under which the article will be found. This slip should then be filed in place of the article.

Such a method of keeping clippings is open to the objection that is applicable to any other thing that is worth while; in other words, to keep it up-to-date, a certain amount of persistence and patience is required.

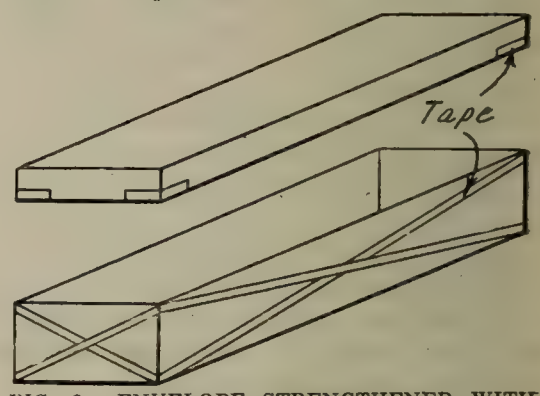


FIG. 2. ENVELOPE STRENGTHENED WITH TAPE GLUED ON.

SMALL WOOD PULLEY CONSTRUCTION

By J. E. McCormack

MUCH difficulty is often experienced in keeping small wooden pulleys from slipping on the shaft, owing to the fact that efficient clamping facilities are not provided. The writer succeeded in overcoming this objection by designing pulleys similar to those here illustrated. In the construction of a pulley of this description, it is very important that ample space be provided for the manipulation of the wrench when tightening the clamping bolts, and yet have these openings in such a position that the belt surface is not interferred with. For pulleys of average width of face, eight pieces are used, four similar to Fig. 1 and four shaped as in Fig. 2; the dotted portion in each case representing the completement of the one-half section. When these piecese are being prepared, they are planed on all faces except the outer diameter, this being left rough for subsequent turning. When assembling, two of the pieces A are clamped together on the shaft in the ordinary way, and the other pair are treated likewise but at right angles to the first pair. The pieces B are then placed in position and bolted

to the opposite center section, to bind the component parts together; slots being provided in the pieces B to permit of future adjustment. The slots in the segment pieces B are made wide enough to permit of easy operation of the wrench. After the parts have been assembled, the pulley is turned to the required diameter and afterwards located in its intended position on the line or counter shaft.

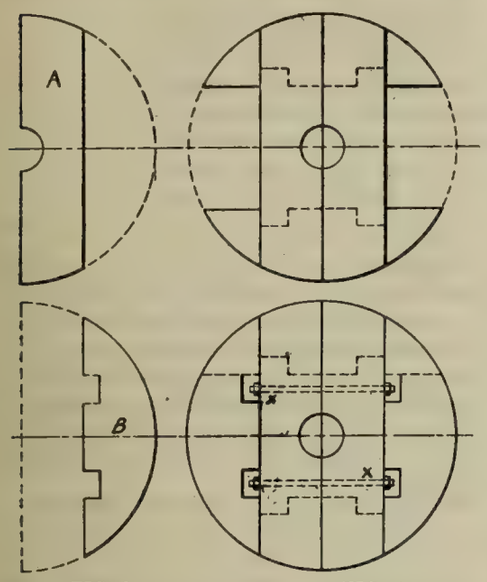


FIG. 2. FIG. 4.
SMALL WOOD PULLEY CONSTRUCTION.

For pulleys of eight to twelve inches in diameter, we have followed the successful method illustrated in Fig. 6, where the half pulley consists of five sections; the lower piece being made the full width required for the pulley and the filler pieces placed on as shown; the dotted portion illustrating the added segment. When the shaft is of large diameter, it is necessary to have the clamping sections of ample thickness to provide sufficient strength back of the center hole. However, it is advisable to keep this dimension as small as possible so as to permit of a heavier segment being used above the spacing pieces. When assembling these, it is best to glue the parts and nail them well, using nails of sufficient length, where practicable, to bind the various sections more firmly together. Nail heads are set in below the depth required for finish turning. The upper portion of Fig. 6 shows the assembled pulley with clamping bolts in position.

FIG. 5.

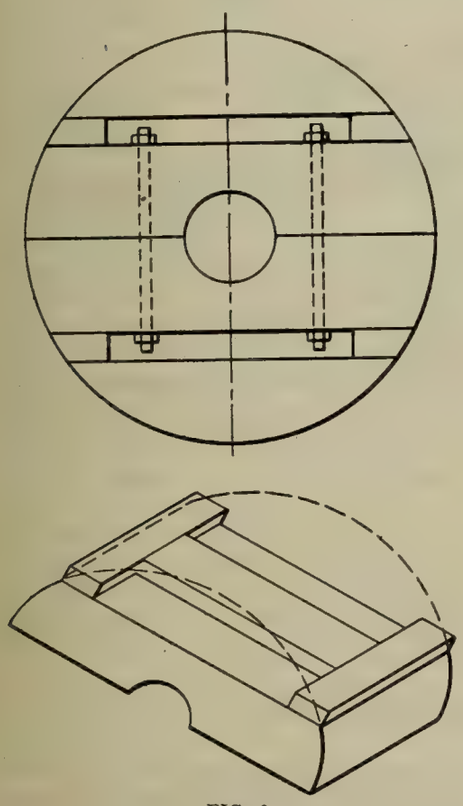


FIG. 6.

VALVE GRINDING COMPOUND

By B. Rice

FOR grinding-in the valves of gas engines, the usual method is to use emery and oil. Great care must be exercised to prevent this being carried on down into the cylinders unless it is possible to thoroughly clean them out. This work often being done directly on the engine without removing the cylinders, it is impossible to get at the inside and any emery which finds its way into the cylinder will do incalculable damage. The following compound has proved to be much superior to oil and emery:—Mix one-half pound of white lead with one cake of yellow laundry soap. To this thick paste add equal parts of No. 80 and 100 carborundum until the desired consistency is obtained. When using, add a drop or two of water instead of oil. Due to its consistency, there is no tendency for the mixture to run off the seat and the particles of grinding compound stay where needed.

A VACUUM SYSTEM

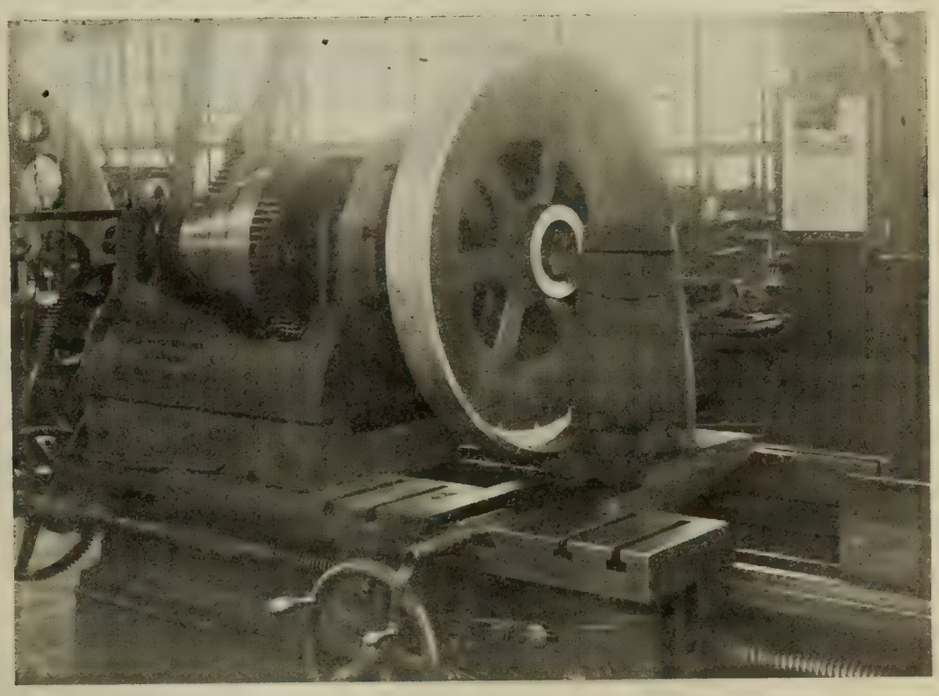
By R. B.

COMPRESSED air is almost universally used in the machine shop for blowing out chips and drillings and keeping the machines clean. While it certainly has its place for much of this work, we all know how disagreeable it is to be standing nearby and find oneself covered with chips and dirt. Not only that, but these same chips find their way into the bearings of the machines and do endless damage. In going through a large plant devoted to the manufacture of planers, and where work of the highest accuracy had to be maintained, the writer noticed that there were no chips being blown around, and upon inquiry found that they were using a vacuum instead of a pressure system. Long pipes were provided for reaching into holes and good sized pieces of iron could be drawn up into the air hose. This kept down all dust and insured cleanliness and safety.

AN EXTENDED TOOL POST

By A. L. Loy.

THE extended tool post shown in the accompanying photo was made of cast iron of liberal section, and was arranged to swivel so as to enable it to be used either for right or left hand work. It has proved especially valuable in turning large crank shafts. The tool slot was cored in the one side, the tool being held by the set screws at the top. The writer has seen these tool posts made from steel castings, but they were never as stiff as this one from cast iron, the latter being preferable when it can be made large enough.



AN EXTENDED TOOL POST.

Somebody Did.—The bride and bridegroom sat side by side.

"Dearest," he said.

"Yes, love?" she responded in soft, frightened tones.

"If I had known that the tunnel was so long I would have kissed you."

"Didn't you kiss me?" she asked, with much surprise.

"No," he replied.

"Well, somebody did."

Practice of Oil Burning Under Stationary Steam Boilers*

By B. S. Nelson

The scarcity and high price of coal for steam raising, etc., has naturally directed attention to the subject of oil fuel as a substitute. In recent years much progress has taken place in the direction of high degree efficiency of equipment for oil burning, and many installations have been made in consequence. While there is little prospect of an oil scarcity devloping, there is nevertheless a tendency for its price to soar, a very material increase being noted in the period covered by the war to date. Advantages of oil over coal, aside from cost, are dealt with in the accompanying article, and are worthy of close study.

FUEL oil is oil which is more valuable to the producer as fuel than as a refined product. Due to the rapid increase in use of gasoline in motor vehicles and the use of distillates in stationary engines, and also to the improvements in refining crude oils, it is probable that very little crude oil will be used for fuel, and that the fuel most used will be some sort of residuum or scalped oils; that is, being distilled and the residue used as fuel. The result of this will be that more attention will have to be paid to the oil-burning system than was necessary with the lighter crude oils used heretofore, because a scalped oil is heavier and more viscous than crude oil. One advantage in using a scalped oil is that there is less fire risk, because its flash point is higher than the flash point of the crude oil.

The flash point of an oil is of interest particularly from the standpoint of safety. On land installations, where the oil is usually buried in a closed tank, the flash point is of less importance than on shipboard, where inflammable vapors are apt to accumulate in the hull or to be freed in a closed boiler room, due to leaky piping.

The viscosity of an oil is the principal

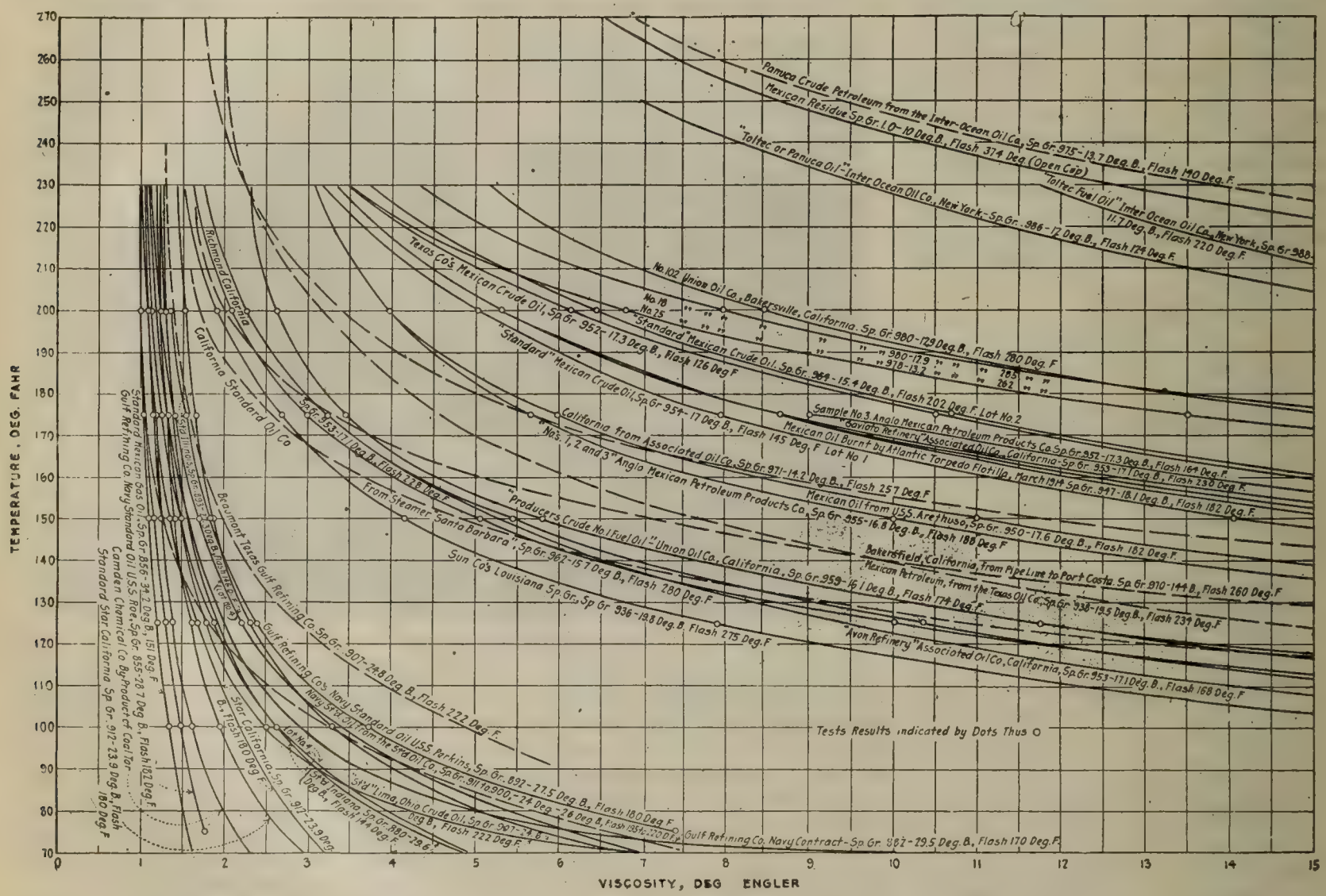


FIG. 1. TEMPERATURE VISCOSITY DIAGRAM OF FUEL OILS, REPRODUCED FROM CURVES OF LT.-COM. JOHN J. HYLAND, U.S.N., WITH ADDITIONS (SHOWN IN DOTTED LINES) BY E. H. PEABODY.

the oil from which the lighter constituents have been distilled off. Though the Mexican oils are, as a rule, heavier and contain less of the lighter constituents than American oils, even they are now

Fuel Oil Classification

Fuel oils may be classified according to several of their characteristics, which are more or less dependent upon each other. Some of these are the flash point, or temperature at which an oil will give off inflammable vapors; the viscosity, which may be explained as the molecular friction; the specific gravity, the heat value, and the sulphur content.

consideration in the actual burning of that oil, because the success of the burner or atomizer depends largely on its ability to atomize the fuel into sufficiently fine particles to insure satisfactory combustion, and the more viscous the oil the more difficult this atomization. There are various methods of expressing the viscosity, one of the most used being in terms of the Engler scale. Degrees

*From a paper presented at a joint meeting of the Louisiana Association of Members of the American Society of Civil Engineers and the New Orleans Section of the American Society of Mechanical Engineers.

Engler means simply the ratio of the time it takes a given quantity of an oil to flow through a standard orifice as compared to the time it would take the same volume of water to flow through. Oil is usually sold, however, on the basis of its specific gravity (generally measured in degrees Baume) and its heat value and moisture content. It is usually assumed that the heavier an oil in degrees Baume, the more viscous is that oil, but this is not always strictly true.

Through the courtesy of E. H. Peabody, Mem. Am. Soc. M.E., in Fig. 1 is reproduced a very interesting chart giving the characteristics of some thirty different oils. This chart gives the temperature-viscosity diagram of these fuels, the specific gravity, the degrees Baume and the flash point. Comparing two crude oils from these curves brings out the relation, or rather lack of relation, between degrees Baume and degrees Engler:

	Deg. B.	Flash Pt.	Deg. Eng. at 230 Deg. Fahr.
Panuca Crude	13.7	140	13.75
No. 18 California.	12.7	285	5.2

It is to be regretted that oil is not specified in terms of specific gravity instead of degrees Baume, because in any calculations involving the weight of the oil per gallon or per barrel it is necessary to refer back to specific gravity. Further, the heaviest oil that can be designated on the Baume scale for liquids lighter than water is 10 deg. B., or unit specific gravity. There are oils being used now of 10 and 12 deg. B., and no doubt still heavier oils will be used, which will call for two different Baume scales and cause confusion.

Spindle Top oil has a specific gravity of about 0.92, corresponding to 22 deg. B., and its heat value averages about 19,700 B.t.u. California oil is somewhat heavier, the average grade of that oil having a specific gravity of about 0.95, or 18 deg. B., heat value about 18,500 B.t.u. The Mexican oils vary considerably in specific gravity and heat value, but as a rule they are much heavier than either the California or Texas oils; a typical oil now used has 0.99 sp. gr., or 12 deg. B., with a heat value of about 18,200 B.t.u.

Table I compares the prices of coal and oil, taking as a basis coal of the quality of Pratt, Alabama, and Pittsburgh coal, sold in the New Orleans market. While with these coals an evaporation of 10 lb. from and at 212 deg. can be realized with well-designed water-tube boilers when the boilers have ample heating surface and are in the hands of skillful firemen, it is extremely doubtful if any boilers in regular service are showing better than 8 lb., and the great majority are below this figure. Therefore, if we take 8 lb. as a basis, we are giving the coal its full value. Now, with oil giving 19,500 B.t.u. per lb., an evaporation of 14.5 lb. should be readily obtained if the apparatus for supplying the oil to the furnaces is of first-class design and if the furnaces are properly arranged. With this ratio as a basis, it is apparent that a pound of coal is equivalent to 8/14.5 or 0.541 lb. of oil. A barrel of crude oil weighs approximately 325 lb., therefore one ton (2000 lb.) of coal is equivalent in practical heating value to 3.34 bbl. of oil.

TABLE I—COMPARISON OF PRICES OF COAL AND OIL.

Coal, Dollars per Ton, 2,000 lb.	Oil, Dollars per Bbl.	
5.00	1.50*	1.66†
4.75	1.43	1.60
4.50	1.35	1.50
4.25	1.28	1.42
4.00	1.20	1.33
3.75	1.13	1.25
3.50	1.05	1.02
3.25	.98	1.01
3.00	.90	1.00
2.75	.83	.92
2.50	.75	.83
2.00	.60	.66
2.25	.68	.75

*Not allowing for labor saving.

†Assuming 10 per cent. of cost of fuel in labor of firing and handling ashes saved by using oil, a conservative estimate for plants of over 300 h.p.

An interesting point to note with reference to the heat value of an oil is that the B.t.u. usually given is the high heat value or heat value determined in a bomb calorimeter. The actual heat value available in a boiler furnace is less because all fuel oil contains a considerable percentage of hydrogen, and the latent heat of the steam formed by the combustion of this hydrogen passes up the stack as waste heat.

In all the heavier grades of fuel, particularly the Mexican oils, water mixed with the oil is in the form of an emulsion and will not settle out in a tank as it will with the lighter American crudes. This is not so much a disadvantage as it would seem, other than causing a lowering of the heat value. With an oil light enough for the water to settle out of its own accord, this water will frequently accumulate in the tank and piping and go over into the burners in a slug, putting the burners out; but with heavy oil a very considerable amount of water can go through the burner with no bad effect. The writer is inclined to believe that a small quantity of water in heavy oil is an advantage in that these oils are usually heated above the boiling point of water to effect atomization, and the vaporizing of the moisture in the oil as it leaves the burner tip probably helps to atomize the oil more thoroughly.

Oil Advantages Over Coal

Oil has numerous other advantages over coal than cost of fuel. The storage space required is much less for an equal number of heat units; there are no ashes to be disposed of; less boiler-room help is required for firing; the wear and tear on the furnace lining is smaller because the firedoors do not have to be opened, with the consequent chilling of the hot brickwork. Very few repairs are necessary to the grate bars; a much smaller stack can be used for the same boiler horse-power; the boiler can be forced with natural draft considerably beyond what it can with coal, an important feature where boiler capacity is scant; where feedwater is bad, it is often possible to carry a load with two oil-fired boilers which would require three boilers were coal used, thus allowing the cleaning and repairing of one dirty boiler at a time. Steam can be raised much more quickly and with no loss due to banking fires. It takes about 10 per cent. of the fuel normally consumed by a boiler at rated load to keep its fire banked with coal. In case of an emergency the fire can be instantly extinguished; any one who has had to draw a hot coal fire in an emergency can appreciate this particular advantage.

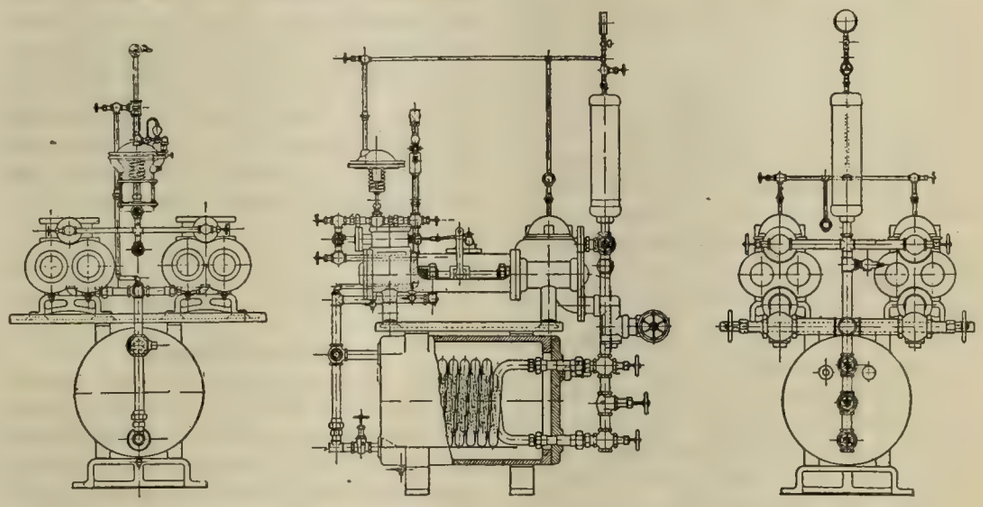


FIG. 2. OIL PUMPING SET, SHOWING DUPLICATE PUMPS WITH PRESSURE GOVERNOR, AIR CHAMBER, GAUGE, SUCTION STRAINERS, RELIEF VALVE AND HEATER.

Successful Oil-Burning Installation Data

There are several factors entering into the successful oil-burning installation, some of which affect the reliability of the system and others its efficient operation.

The first consideration for reliability is the oil supply to the burners, involving the storage tanks, pumping outfit, and heaters. The size of a storage tank varies, of course, with the size of the boiler plant, but it should be large enough, at least, to hold a carload of oil. A very popular size of tank is a 10,000-gal. tank, which is about 8 ft. in diameter and about 30 ft. long. These tanks are usually built of ¼-in. steel with ⅜-in. heads, though if the tank is subject to corrosion from the outside it should be made of heavier material. The tank should be equipped with a manhole and filling pipe, a suction opening, a vent opening, and openings for steam-heating-coil connec-

tions. The insurance requirements call for the tank to be below the level of the pumps and burners, which means that it is usually buried in the ground.

The Oil Pumps

The oil pumps are the next consideration. The pump that has given the best results is a duplex steam pump, piston-pattern type, with brass valves, metallic packing in the oil piston and special gaskets and piston-rod packing. The size of pump should be based on a very low piston speed.

The pump should be fitted with an air chamber on the discharge side to steady its pulsation of pressure, and a governor on the steam end to maintain the pressure constant. The pressure at which the oil is delivered to the burners depends largely on the character of the oil, varying from 40 lb. for oil of 26 to 30 deg. B. to 80 lb. for oil of 12 deg. B. The pump should also be equipped with strainers on the suction side to keep trash from getting under the pump valves. Duplicate pumps should always be installed, so that if anything goes wrong with one pump the other may be put in service.

The pump should be set as near the level of the oil as possible to give the minimum suction lift, and the suction pipe should be as straight as possible, preferably with bends instead of elbows. Where the suction pipe is long, a foot valve at the bottom of the suction line in the tank is desirable. This should be a valve without leather seats, as fuel oil deteriorates leather. A very good valve to use is a horizontal-swing check used in a vertical position. In addition to air chamber and governor, the pump should be equipped with a relief valve set at a pressure heavier than the working pressure, so as to minimize the danger of breaking the pump. This relief valve should be of the enclosed type, so that its overflow be returned to the tank.

The heavier oils require heating in the suction tank in order to enable the pump to lift them. The temperature must not be high enough to cause the oil to vaporize under the suction pull of the pump. The writer has found a temperature of 110 to 130 deg. about right for Mexican oil of 12 to 18 deg. B. According to Commander John J. Hyland, U.S.N. (*Jour. A. S. N. E.*, May, 1914), the viscosity of the oil had to be reduced to 375 deg. Eng. in order to obtain full capacity from a Blake pump. In order to gauge this temperature accurately, a thermometer should be installed in the suction line near the pump. If this suction line is long, or has several elbows in it, it should be made one or two sizes larger than the suction opening of the pump.

The Heater

The next question is that of the heater. Practically all the oil now burned as fuel requires heating in order to reduce its viscosity and facilitate atomization at the burner. There is a wide choice of heaters, but the principal considerations are, first, to have the heater of ample heating surface, and second, to be sure that this heating surface is all utilized. In heating oil with a steam coil in a vessel of oil there is a tendency to local heating; that is, the oil next to the coils may be very warm; but this heat is not readily transmitted to the adjacent oil, so that a heater in which the oil is kept in rapid motion over all the heating surface in the coil is apt to give best results.

There are several pumping sets on the market which combine all the requisites enumerated above in one self-contained unit. Fig. 2 shows such an outfit which, it will be noted, consists of duplicate pumps with pressure governor, air chamber, gauge, suction strainers on pumps, relief valve and heater.

Oil Heating Temperature

The temperature to which the oil must be heated naturally varies with its viscosity. For fuel oil usually burned in the South, a temperature from 180 to 220 deg. is satisfactory, the higher temperature being for oil of 12 deg. B. As far as we know, no experiments have been made to determine the degrees Engler to which oil must be heated, but judging from our experience and with the aid of the temperature-viscosity diagrams, we should say that about 8 to 9 deg. Eng. is the viscosity required for a steam-atomizer burner. It has been stated, however, that any oil which can be pumped readily can be atomized by a steam atomizer. After the oil is heated at the pump (and its temperature should be read by a thermometer permanently fixed in the discharge line from the pumps), care should be taken to keep the oil hot until it reaches the burner by proper covering of the pipes.

Burner Feature

More stress has probably been laid on the oil burner than on any other part of the installation, which has led to the belief on the part of people unfamiliar with the burning of oil that the burner is the whole thing, whereas, as a matter of fact, the burner contributes but a very small part to the success of the installation. The term burner is really a misnomer, because the only function the burner performs is to atomize the fuel into sufficiently fine particles to effect complete combustion in the furnace.

For land installations, the type of burner which has proved best is the steam-atomizer burner with oil supplied to it under pressure. The essentials of such a burner are simplicity, cheaply renewable wearing parts, economy in steam for atomizing, and the production of a flame of such shape that makes good combustion and, hence, high boiler efficiency possible. The burners may be of either the round-flame or flat-flame type. The flat-flame type is preferable because it uses less steam for atomizing and produces a flame of such shape as to permit proper mixture of air to support combustion without excess air, which is not the case with a round-flame burner.

The use of a target wall is not necessary, and may cause injury to the heating surface of the boiler by causing the flame to concentrate on a small portion of the surface, resulting in what is termed "blow-pipe" action.

The general type of flat-flame burner is a tip in which are two narrow parallel and horizontal slots, the oil flowing out of the upper slot in fan shape on to the fan-shaped jet of steam issuing from the lower slot.

The position of the burner depends largely on the type of boiler. For a boiler with a long unobstructed furnace, such as a horizontal return tubular, or a boiler of the Heine or Erie City type, a burner set in the firing door is very satisfactory. For boilers where the furnace is short and the travel of the gases is upward, such as in the Babcock & Wilcox or Stirling boiler, the best arrangement is to put the burner at the back, shooting toward the front of the boiler. In either case air should be admitted to the furnace through a checkerwork of firebrick laid on the grate bars. The shape of this checker work should approximate the shape of the flame and thus reduce excess air, and the area of all the holes should be equal to 4 sq. in. per boiler horse-power.

Steam and oil connections to a burner should be made to allow for the expansion and contraction of the oil and the steam headers, and should have unions above and below the burner to enable the latter to be taken out quickly for cleaning. A very essential point in installing a burner is to see that it gets dry steam. The simplest way to do this is to take the steam from the top of the auxiliary steam header. A steam connection should be provided on each burner for blowing the oil out of the burner when it is shut down, as otherwise this oil will carbonize, due to the heat radiated from the hot furnace.

The principal consideration affecting the efficiency of an oil-burner installation, other than the choice of a burner economical in the use of steam (and giving the proper shape of flame), is the proper control of the air supply. One of the advantages of burning oil, mentioned above, was the possibility of reducing the excess air to effect combustion. Conversely, one of the principal losses is the ease with which excess air can be admitted. For any particular installation (assuming the setting is tight and checkerwork properly arranged), the best draft should be determined by installing a draft gauge on each boiler connected to the furnace, then gradually closing the damper until there appears just a faint trace of black smoke at the stack, and finally maintaining the draft at that point. It should be noted, however, that there can easily be smoke with excess air for two reasons: first, if the checkerwork is not properly arranged in the furnace there will be excess air, even though the combustion be incomplete, and second, poor atomization of the oil at the burner will give a grayish-white smoke, which is often mistaken for insufficient air. A more accurate method of gauging the air supply is to make periodical analyses of the stack gases and keep a record of the stack temperatures. The stack gases should not be over 100 deg. hotter than the steam, and no difficulty should be experienced in getting 13 to 14 per cent. CO_2 in regular operation.

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MACHINISTS' INSTRUCTION COURSE—XXIV.

By J. Davies

GRINDING in some form or other has been employed since the first man sharpened his scythe with a whet stone, and is an absolutely indispensible factor in modern machine shop practice; covering as it does a very wide range of operations, from the rough castings that the apprentice is given to

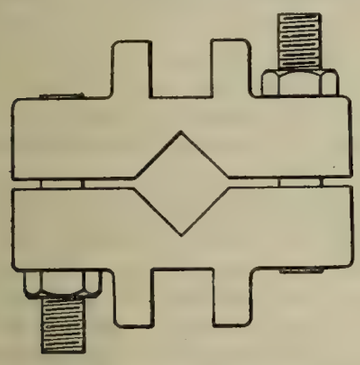


FIG. 89. BALANCED GRINDER DOG.

grind the lumps off, to the very finest work that can be done in the shop. It might be in place here to give just a word of warning to the apprentice on his first few trips to the emery wheel; always take care that the tool rest is close up to the stone, particularly if the object to be ground is a small one. If an opening is left betwen the surface of the stone and the rest, the tool or material being ground has a tendency to get caught and perhaps your fingers with it —this has happened scores of times, or the wheel might burst or fragments be chipped off, resulting in injury to yourself or nearby workmen. Never grind on the side of the stone if the work can be done as well on the face. I have seen apprentices, and others as well, when grinding the end of a bar or a bolt, gouge a groove in the side of the stone and thus ruin it for good work afterwards. If the side of the wheel must be used move the work gradually and carefully across the surface of the stone, this will help to keep the stone true. To prevent the wheel developing into a useless condition, occasional dressing is very necessary.

The tendency in all machine shops, where it is no one's duty to look after the emery wheels, is to make it to "my" job if possible, no matter what the condition of the stone, and leave the other fellow to true up the wheel. No one would think of using a wheel in a grinding machine that was badly out of true, and it is certainly quite as necessary to have an accurate wheel when grinding by hand. It is not long since that grinding was looked upon as a sort of special method for finishing hardened steel, but now many kinds of work that formerly were performed exclusively by lathe, shaper or planer can be done quite as economically and also more accurately on the grinder. Both the headstock and tail centers of grinding machines are dead; that is, they remain stationary while the work revolves upon them. This overcomes any error there might be through inaccuracy of the spindle or the centers being out of true. If a piece of work is reversed that has been turned or ground between two centers, one live and the other dead, and then tested with an indicator, in nine cases out of ten it will not run perfectly true on account of error in live center, driving spindle, unequal wear of center, etc. Work ground between centers is driven with a special form of dog, similar to that shown in Fig. 89. This should be as light as the general work of the machine will permit, and balanced, so that the centrifugal force will not affect the grinding operations. Usually the dog has two slots, diametrically opposite, and is driven by two pins fastened in the face plate. Following are a few practical examples of machine grinding.

Grinding Cutters

Cutters may be ground by various methods, in fact the modern tool room grinder affords a large scope for ingenuity and inventiveness and often a job must be done, not as you would like to do it, but the best way you can. Referring to the sketch we will describe one method in common use. It is a well known principle that to turn or grind a taper,

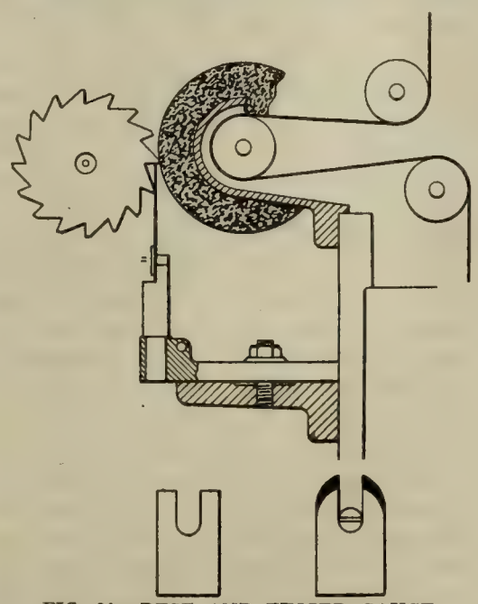


FIG. 90. REST AND FINGER GAUGE.

the cutting point must meet the work in the same horizontal plane as the axis of the work, and that in grinding a tapered reamer it is essential that the cutting edge of the tooth being ground should lie in this horizontal plane. When grinding a straight cutter or reamer this is not so important, and the cutter is often swung above or below the center to give the necessary clearance. When operating any grinding machine it will be found very useful to first adjust the grinding spindle so that its axis lies in the same plane (horizontally) as the axis of the work, and make a permanent mark

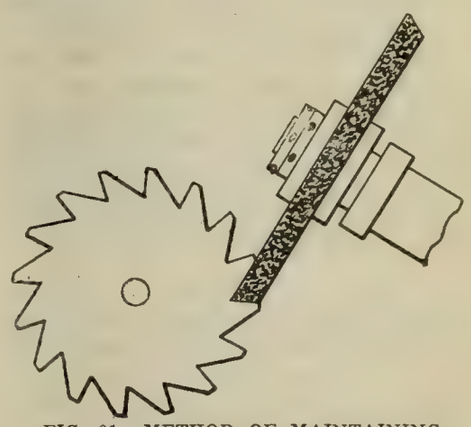


FIG. 91. METHOD OF MAINTAINING ORIGINAL DIAMETER.

on the top of the housing for future reference; this will be the setting for grinding revolving work. To grind a cutter in order to obtain the proper clearance the wheel is set above the center as shown in Fig. 90; only practical experience can determine the amount that the wheel should be raised, as this will vary with the size of the wheel.

Different men have different ideas as to the amount of clearance that a cutter should have, but the general practice is about 3 degrees for iron and steel, and slightly more for softer metals. Too much clearance on a milling cutter makes it dig in and chatter, besides ensuring early destruction of its cutting edge. With too little clearance the cutter refuses to cut, or does not cut freely. Having set the wheel to the desired height for clearance, it is necessary to clamp the tooth rest bracket to coincide with the height of the center of the cutter. The blade Fig. 90 provides a rachet action as the cutter is moved from tooth to tooth; this blade or finder is adjusted under one of the teeth, as shown in the sketch, so that the grinding wheel is in contact with the back portion of the hand. This finger should be a little wider than the grinding wheel, in order to support the cutter at each end of the tooth, just before it reaches, and after it leaves the grinding wheel. If the finger is too narrow the cutter is liable to slip off before the tooth is completely ground. The wheel should always revolve in such a direction that the tooth being ground is pressed against the finger stop. The teeth are then ground one by one by light cuts, as it is better to take two or

three light cuts around the cutter than attempt to finish with one heavy cut; the latter method producing the tendency to draw the temper and leave the cutter soft.

Blade 1 is the kind generally used for grinding straight cutters and reamers. The second blade is used for spiral or helical cutters; the ends of this blade being on a radius coinciding with the center of the clamping screw. The blade can then be moved in either direction without altering the height. It will be noted in the sketch that the blade is clamped against a concave surface in order that a slight tightening of the screw will hold it in place. Fig. 91 shows a method of sharpening an ordinary straight reamer without altering its diameter. This is done by tilting the spindle to the angle required and surface grinding the face of the tooth with a beveled wheel. As the old solid reamer found in many machine shops is made to a standard size, this is about the only way they can be ground without appreciably changing the diameter.

DON'TS FOR GRINDING AND SETTING OF CUTTING TOOLS

By J. H. R.

Don't oil the live center.

Don't use a broad nose tool on small or slender work.

Don't force a parting tool into the work if it does not cut freely.

Don't allow the cuttings to accumulate beneath the tool-post gib.

Don't set a threading tool by guess work; use a suitable gauge.

Don't allow the driving dog to bind in the slots of the face plate.

Don't forget that increased lead will decrease the clearance of the tool.

Don't forget to lubricate the tail center; siezure might cause the point to twist off.

Don't allow the tail of the dog to come out of the slot when turning tapers.

Don't use excessive pressure when grinding tools; overheating will destroy their usefulness.

Don't forget that a little oil on the tool-post screw will increase the holding power.

Don't have excessive overhang on the tool; keep the cutting edge as close to the support as possible.

Don't forget to keep the cutting point level with the center when cutting to the axis of the work.

Don't sacrifice the rake angle for a keen edge without it; take time to properly grind the tool.

Don't fail to see that proper clearance is available for backing out an internal threading tool.

Don't fail to see that the tool-post screw is sufficiently long to prevent binding at the top shoulder.

Don't allow the chips from a parting or thread cutting tool to curl against either side of the groove.

Don't fail to face the ends of a shaft square before turning the outer surface; this particularly applies to taper work.

Don't start a finishing cut until you are sure the centers are free from dirt or cuttings, (this also applies to roughing cuts.)

Don't forget that when the work slips in the driver, the feed continues to force the tool into the work and invariably breaks the tool.

REMOVING IRON PLATE RUST.

By M. M.

AN easy, cheap and effective method of removing rust from corroded and pitted iron plates has been evolved as a result of recent practical experiments in this direction. The method consists in the application to the surface of the iron of a mixture of two parts of finely crushed sodium bisulphate and one part of common salt. This mixture is prepared, then wetted (just sufficiently to be cohesive), and applied to the plate. The moist mixture can be left till the plate is clean, but the action is more rapid if the mixture is scraped off every two or three hours and the iron scrubbed thoroughly with a wire brush and water. The treatment is repeated till the plate is clean. Usually twenty-four hours is sufficient for a badly corroded plate. When the plate is thoroughly clean. it is well washed with an alkaline solution and dried quickly. A coating of paraffin oil is at once applied to protect the surface against oxidation. This method is found to be more effective than hammering, chiseling, the use of wire brushes or even a sand blast.

BRASS ASHES.

By L. E.

BRASS ashes usually contain from 2 to 8 per cent. of metal. This metallic content is partly due to inefficiency of employees in foundries, but the greater loss, however, is due to the cracking of the crucibles after they have had several heats. There are two methods for recovering the metallic contents in brass ashes, the wet and the dry method. The dry method is not used to any great extent owing to the varying results obtained and this is especially true when the material is damp. The wet method is universally employed in consequence of the accurate and uniform results obtained after the machinery is properly installed. Concentrates from the dry method rarely, if ever, run over 50 per cent. whilst concentrates from the wet method average from 60 per cent. to 65 per cent.

In the wet method, treatment of brass ashes, the latter are first run into an elevated revolving screen by means of a cup elevator. If the material can be run direct from the car, the screen can be elevated close to the car, so that the material can be shovelled direct from the car into the revolving screen. The cup elevator at the start should be avoided, as it easily clogs up, owing to large pieces of coke and metal which fall under the pulley at the bottom of the elevator. The screen should be about 6 feet long, tapered from 2 feet to 1½ feet with ¾ inch opening on the screen. The material that is screened drops into a sluice box, which is built with a slope of 45 degrees from each end of the revolving screen. This sluice box is also built up to the centre of the screen with a catch box directly under the middle of the screen meeting the sluice box with a 45 degree slope from each end of the screen.

Running water is introduced into the sluice box by means of two one inch pipes at each end of the screen with ¼ inch holes an inch apart in each pipe. The water running into the sluice box under the revolving screen forces the screened material through the catch box into the sluice box from the catch box to the rolls where the material is finely crushed. The fine material is then run into the sluice box, which is built under the rolls to the cup elevator and into the jig where separation takes place. The rough material that does not go through the screen, goes through a box at the small end of the screen and into a crusher or chaser, where the material is crushed. From there it passes into the rolls, where it is crushed more finely and then goes to the jig with the screened material that is first crushed.

The jig is 16 feet long by 6 feet high, by 4 feet wide, and is separated into four hatches. Each hatch is 6 ft. by 4 ft., by 6 feet high, with the inside built with a 45 degree slope so that the metal falling through the grates at the top of each hatch can roll to 3 inch stop cocks placed outside of the middle hatch. The hatches are not built on a level, but each one is about 2 inches lower than its neighbor, so that the material running over the top is slowly separated, the metal going to the bottom and the coke continuing its journey clear over all the hatches, it being of no further value. Each hatch must be filled with water before the machinery is started. Plungers are attached to each hatch and when the machinery is started, the suction formed by the plungers separates the materials as described. The stop cocks at the bottom of each hatch are opened every few minutes to collect concentrates.

UNMACHINED JOINT FACES.

By D. Street.

CAST iron possesses not only "flow" properties under prolonged stress, but is also much more elastic than is commonly supposed. Indeed, there is a widespread notion among the mechanically educated that cast iron "will break before it will bend." Yet cast iron will spring to a quite appreciable amount, as witness the deflection shown by a cast iron test bar before breaking occurs, or the "wind" of a lathe-bed resting on faulty foundations. Joints in which any kind of sheet jointing material is used have hitherto been rough machined. The machining has been considered necessary in order to true the surfaces, which, at the same time have had to be left rough in order to provide a grip on the packing.

It is now found that, given careful moulding, machining can be eliminated altogether on certain joints, such as those of hydraulic pump-valve covers. The parts are cast with the faces well serrated, and by using stout millboard

jointing, the sand finish is entirely successful, and the joint answers satisfactorily all tests. Up to the present it has been found necessary to machine the joint faces of pump bodies and cylinders, but hopes are entertained that in course of time even this will be eliminated for ordinary pump joint faces. The practice is dependent upon the ability of the foundry to turn out surfaces reasonably flat; more studs are required than would otherwise be employed. Joints tibht under 500 lbs. hydraulic pressure can be made with 18 in. by 12 in. rectangular covers over 1 in. thick, having a diagonal wind of ⅛ in., using 3 -16 in. millboard, and no trouble whatever is experienced under test.

If special attention is paid to the moulding and casting of the parts, the number of wasters in the foundry can be kept very low. Lumps and bumps of a decided character render jointing impossible, but a surface reasonably level, even if it depart considerably from the straight line, is no barrier under the persuasion of the nuts on bolts or studs. Damp sand and molten metal scarcely seem an ideal combination for finished work possessing relative accuracy, but if the foundry product be examined, it will be realized that the normal deviation from truth can be kept well within the permissible tolerance. It may prove requisite to use an adequately reinforced core, levelled properly after storing, and applied at the point where the jointing face is desired, the latter being poured face downwards. If it becomes clear that the work on one moulder under inspection proves more accurate than the rest, it is safe policy to study his precise methods. The practice of finishing cold-water pump covers without machining is in actual daily operation at the present time.

STANDARD SHIPS AND ROLLING STOCK.

By C. T.

THE movement toward standardization in engineering manufacture has received during the war an enormous impetus, which has spread far beyond the confines of arms and munitions. The provision of transport material is proving to be only second in importance and urgency to the provision of munitions and the engineering mind has naturally been turned to the questions of placing the building of ships and rolling stock on the same basis of standardized repetition production as has yielded such unprecedented results in the making of shells and guns.

The advantages of such a course are obvious. Once let a standard design for, say, a 5,000 ton cargo steamer be agreed upon by the leading shipowners, and it becomes possible for identical ships to be laid down in batches, and for the suppliers of the raw material for shipbuilding to put down special plant for the repetition production of the standard parts; whilst it also means a very considerable economy in the stocking of parts for subsequent replacement. The building of cargo vessels along these lines has been going forward for some time in England, a company having been formed last year for this especial purpose by a number of leading shipping concerns, and, although the tonnage under construction thus far is minute in comparison with the total volume of British shipbuilding, the results of establishing and constructing standard designs of cargo vessels by one composite shipbuilding company are likely to be far greater than can be measured by its own actual ouptut.

The building of standard ships entails the provision of standard engines, and it is here that the greatest differences of opinion as to which is the best all-round type are likely to be found. The settlement of the point can hardly be left to general discussion or reached by weighing the counter-claims of individual preferences, and the Northeast Coast Institution of Engineering and Shipbuilders has rendered a signal service in appointing a committee to draft specifications for reciprocating engines of various powers for cargo boats. The aim is to arrive at the type of engine which shall be most suitable for the general run of cargo work, and at the same time be designed as to its details with a view to the greatest ease and rapidity of production.

Rolling Stock Standardization.

Sea transport is of paramount importance to Great Britain, and rail transport is to France, therefore, almost exactly the same procedure is being followed in Great Britain in the case of shipping as is being adopted in France in regard to rolling stock. A company has been formed by the leading steel and rolling stock manufacturers for the purpose of producing standard lines of locomotives, wagons, etc. It is intended that compulsory as well as persuasive powers shall be employed to induce the railways to give up individual whims, and agree to standard patterns which can be produced in quantities cheaply and at a quick rate. Even where special bodies are required, it will still be possible under this arrangement to have the wheels, axles, underframes, coupling gear, fittings, etc., made to the same drawings and the same specifications, and as the old equipment in all its diversified patterns becomes obsolete, all parts for manufacture and repair will be interchangeable on all lines.

Periodic Revision of Standards.

There is, of course, a danger in all premature specifications. There is always a tendency to believe that the design of the moment is the final word in development, and once a design is standardized and enforced improvements are apt to be difficult of introduction. To guard against such an eventuality, the council of the Northeast Coast Institution of Engineers and Shipbuilders make it clear at the outset that any specifications now agreed upon will be revised annually by the members of the institution, in open discussion, in order to bring it up-to-date. However, there does, in fact, come a stage in the development of some mechanisms when the most cautious can feel assurance that something like finality has been reached. The bicycle is a case in point. Ships and railway rolling stock are certainly a long way yet from any such finality, but there are elements in both which, in practice, might be standardized to very great advantage.

CONSERVING AND DEVELOPING CANADIAN TRADE.

THE special committee of the Canadian Senate appointed to consider the best method of conserving and increasing domestic and overseas trade that prosperity may not unduly suffer when the stimulus resulting from munitions orders is removed, have made the following recommendations:

First, the securing of overseas trade to replace munition orders.

Second, the financing of overseas contracts.

The organization of a trade bank is recommended. It would be known as the Canadian Trade Corporation, and would be similar to the British Trade Corporation, recently organized in the Motherland on the recommendation of a committee appointed by the British Government.

The British Trade Corporation has for its objects the giving of advice and financial assistance to British commercial and industrial undertakings generally, and to further development of British trade, industry and commerce; to assist in obtaining orders from abroad for British manufacturers and traders and to grant financial facilities for the execution of such orders; to acquaint themselves with conditions of trade and the business requirements of all countries of the world and to enter into banking arrangements with such countries, or, where necessary to open branches in such countries; to establish information bureaux to furnish British merchants and manufacturers with reliable data upon openings of trade, etc.; to act as an agent for carrying through overseas commercial and financial transactions in which His Majesty's Government may be interested and to receive official recognition and assistance.

The Senate Committee states that the Canadian banks and some of the leading industrial and commercial companies and individuals of Canada are willing to undertake the organization and operation of a Canadian Corporation similar to the British organization, to conserve and extend Canada's trade after the war. It is noted that while the British Trade Corporation, although not directly under the control of the British Government, was nevertheless organized directly at the instigation of that Government, which has accorded them privileges and measures of assistance and official recognition.

The Canadian Senate Committee, therefore, recommends:

"That the Senate of Canada forward to the Right Hon. the Prime Minister Sir Robert Borden, a copy of this report of the special committee on the conservation of Canadian trade, with the request that due regard and consideration be given to the importance and advisibility of aiding in such manner as may be deemed prudent and advisable the formation

of a Canadian Trade and Banking Corporation which will meet the requirements as set forth."

The adoption of the report comes up for discussion during the present week.

CANADIAN RAILROAD LEGISLATION.

LEGISLATION necessitated by the financial difficulties confronting the Canadian Northern and Grand Trunk Railway Companies will be brought before Parliament when the Military Service Bill has left the Commons. It is believed in Ottawa, that, in view of existing conditions, the solution proposed by the Government will be of a temporary character. It will involve complete Government control of the operations of the two companies while preserving their separate identity until a final solution of the railway situation as a whole is possible.

In dealing with the present crisis in the railway companies' affairs the Government has been faced by a number of difficulties. It has to keep before it the necessity of safeguarding Canada's credit, that the country's participation in the war may not be hampered by lack of necessary money. It has also had to frame a policy which will keep the railways in operation in order that Canada may not suffer from lack of transportation facilities and congestion and delay of traffic. The commitments of the two railways maturing in the near future aggregate many million dollars. Since the outbreak of war the companies have been financed by short date loans, which must shortly be liquidated or renewed.

For the railways to meet these loans by repayment is impossible. For the Government, at a time when the money markets are closed to all but war borrowings, to divert such sums from the war treasury is equally not feasible.

Control by Government.

Immediate Government ownership would mean the assumption of heavy liabilities, and to permit a receivership would injure the credit of the Dominion and all the Provinces whose guarantees have been given to the companies.

The question, therefore, before Parliament is who best can secure renewals of outstanding loans, the companies or the country. Hence it is felt in the capital that the Government can best secure renewals, which must be forthcoming, and that this must carry with it complete Government control. This control, it is felt, should be maintained until such time as money is available to meet the companies' commitments and the roads are absorbed into the Government system or become self-supporting and a final solution is possible.

CALCUM CARBIDE INDUSTRY DEVELOPS.

ONE of the great industries of the Dominion that has grown to an enormous extent, due to the cheap supply of electric power, in the last few years is the manufacture of calcium carbide. In the report of the Department of Trade and Commerce, recently issued, it is shown that from a small beginning, a few years ago, this industry is now among the largest. Previous to the year 1915 the exports of this material did not exceed $200,000 in any one year, but in that year the exports increased from five millions to thirty-six million pounds, and the value from $161,026 to $1,117,118. The following year, however, showed that exports had increased to over three times the figure for 1916, being 112,974,900 pounds, valued at $3,485,670.

For the year which ended on March 31, 1917, the value had increased further to $4,379,564. The demand for this material was formerly to provide acetylene lighting in remote districts and plants where electric light was then not obtainable, but with the coming of electric light the demand fell off until the newer uses of aceteylene in oxy-aceteylene welding and the manufacture of acetone so increased the demand that it may soon be one of Canada's monopolies—Canadian Chemical Journal.

C. N. R., MT. ROYAL TUNNEL ELECTRIFICATION.

IN order to obviate the smoke nuisance and generally to improve the working of its terminals in the City of Montreal, the Canadian Northern Railway is adopting electricity instead of steam for working the trains through the Mount Royal tunnel which gives it access to the Montreal Station and the yards adjacent thereto. For the collection of current, overhead conductors will be used, with electric locomotives of a type believed to be specially adapted to give the best results in the conditions under which they will work.

The locomotives are designed for 2,400 volts d.c., and in many respects are very similar to those in use on the Butte, Anaconda, and Pacific Railway. Each has four axles with all the weight on the eight driving wheels. The running gear consists of two four-wheel trucks, articulated together by a strong and heavy hinge. The equalization of the trucks is effected by a semi-elliptic leaf spring over each journal box, connected through spring hangers to the frame and to the equalizer bars. The friction gear is mounted in the end frame casting of the truck. The cab is of the box type and is divided into three compartments, the centre one being for the apparatus and the end ones for the operator. Each of the operator's compartments is fitted with a controller, control switches, ammeter, air brake, and pantograph control, air gauges, and other equipment, thus giving the locomotive double-end control.

Locomotive Structure.

The following are some of the principal dimensions and characteristics of the locomotives:

Length inside knuckles, 37 ft. 4 in.; length over cab, 3 ft.; overall heigth, pantograph down, 15ft. 6 in.; height over cab, 12ft. 10in.; overall width, 10ft.; total wheelbase, 26ft.; rigid wheelbase, 8ft. 8in.; total weight on drivers, 83 tons; wheel diameter, 46in.; tractive effort at 30 per cent. tractive coefficient, 49-800lb.; tractive effort at one-hour rating, 20-300lb.; tractive effort at continuous rating, 14-500lb.

The underframing is of the centre-box girder construction with two 9in., 15lb., chanels, spaced 16¾in. back to back, and fitted with a top cover plate 26in. by ¼in. and a main bottom plate of 24in. by ⅜in. The body and end cills are of structural steel shapes and the bolsters are built up of plates and angles. The flooring has a bottom layer of spruce, tongued and grooved, upon which is placed a thickness of three-ply "Salamander." Between this and the main floor is an intermediate insulating floor of ⅛in. steel plate, over which is placed another layer of three-ply "Salamander." The main side posts are of 3in. by 5-16in. rolled steel angles, which act as a stiffner to the side sheeting. At the belt rail the sheeting is again stiffened by a 4in. by ½in. bar, which extends the full length of the body. The corner posts are built up of 3in. by 2in. angles, with 3-16in. pressed steel cover plate. The side sheets are of 0.110in. thich cold-rolled steel plate.

Electrical Equipment.

The motor equipment consists of four G. E. 229 A. commutating pole motors wound for 1,200 volts and insulated for 2,400 volts. Two of these motors are permanently connected in series for operating on the 2,400 volt trolley circuit. The one hour rating of each motor is 315 h.p. at 1,200 volts. The motors have forced ventilation, obtained from a blower in the cab. The locomotives are geared for a running speed of about 45 miles an hour, and are operated as two-speed engines with 10 points in series and nine points in series parallel. The master controller is of the non-automatic type. It has the contractor energizing the circuits are designed for 125 volts, the current being supplied to them by a motor generator set, the motor of which has two 1,200 volt. windings and two 1,200 volt commutators in series. This set is mounted in the centre of the cab, and also supplies the lighting current.

The trolleys are on what is known as the Butte roller pantograph type, operated pneumatically and mounted on insulated bases. Each locomotive has two pantographs and a hand pump is used in cases where the locomotive has been standing for a time and therefore has no air supply.—Times Engineering Supplement.

Quebec Bridge Progress.—The new span for the Quebec Bridge is well under way at Sillery, being now about one-third completed—and it is expected that it will be finished in September. No change has been made in the method of putting it in place. Every care is being taken to assure that there be no defect in the material which could cause another disaster. Government engineers visit the scene of the work every week to supervise the construction of the span.

CONTEMPORARY WAR ARTICLES

Embracing Information and Data Drawn from a Variety of Sources Relative to and Arising from the Prosecution of this Many-Sided European War

JIGS AND FIXTURES IN MUNITION WORK*

THE unstinted admiration, even astonishment, which has been accorded to the marvellous and protean aspects of the new machine tools that have been designed to facilitate the production of munitions, has perhaps, with superficial observers, obscured the important part taken by the extraneous appliances which have been designed with the same ultimate object. Among these aids the jigs and fixtures occupy a foremost place, for apart from their assistance, the dilution of labor could not have been accomplished to the enormous extent which has been achieved. Neither would the output have been so vast, nor the very close approximations to accuracy that are demanded have been secured. A large portion of the merit of these achievements must be credited to the tools used in the machines—those which are specially designed and set up—but in most instances also the tools, apart from the control exercised over them by the fixtures and jigs, would have failed to secure the high grade of efficiency required.

The difference between a jig and a fixture is that the first is an extraneous element attached to a piece of work to guide or control the movements of tools, while the second receives the piece to be tooled, holding or enclosing it, and is secured to the machine table in some suitable way. It may or may not include provision for the guidance of the tool or tools. Thus, the fixture may include the element of tool control—the jig—or the latter may be employed alone, or not be used at all. The primary function and the great utility of the jig is, therefore, to locate the tool or tools precisely alike in operating on any number of similar pieces; that of the fixture is that any number of like parts can be set in exactly the same positions, to be submitted to the action of the tools. In each instance an equally important fact is that repetitive results exactly alike are assured without tentative settings and measurements or the exercise of the skill of a trained mechanic.

Precedence of the Jig

The jig preceded the fixture in point of time, the earliest form being the drilling jig, or "templet," as it was once termed, through the holes in which the correct centring of one or more drills is controlled. Though this has always been used, its employment has extended amazingly. The fixture is an appliance of relatively recent growth, being mainly one of the developments associated with the interchangeable system of manufacture, now grown until it has reached in many instances an unprecedented degree of complexity, ingenuity, and large dimenssions. The tool-room is largely engaged with the design and construction of jigs and fixtures, each of which has to be schemed for just the piece of work that has to be tooled under its coercion.

During the growth of the drilling jig it has developed great improvements over its prototype, the templet. Generally it is built much more stoutly, and it is rendered more durable by the insertion of hardened steel bushes for the guidance of the drills, reamers, and taps. Although the jigs differ with every job, the elements themselves are standardized in shops, and there are differences in fitting the elements to suit varied conditions. The bushes are a large genus, and a study of them would reveal some dozens of variations. Nearly all the earlier drilling templets dealt simply with holes in one plane, but many jigs now include provision for being turned about to various angles to present more than one face to the tool, and having means for locking it at each position during drilling. One of the valuable features of a drilling jig is that it provides the only means by which a hole can be drilled on a sloping surface, to enter accurately, that is, where the drill does not enter normally to the surface. Without the control of the jig the drill would slip and make its hole somewhere below the correct point on the slope. Holes of this class occur in adapters, shell noses, and fuse parts. These are drilled correctly through a jig combined with a fixture, which hugs the curved or tapered contour, and has a considerable substance of metal, with a deep bush in close contact with the surface to coerce the drill.

Leading Aspects of the Fixture

Into all high-class fixtures that are required for long service, with the embodiment of fine limits, two essential conditions enter—means for exact location of the work and provision for the durability and permanence of the fixture. To secure the first there are a myriad devices, having for their sole object the rapid, accurate, and uniform setting of hundreds or thousands of similar pieces, often, too, of pieces which are as yet rough castings or forgings, having, therefore, uncertain variations in dimensions. The second condition is met by the selection of those materials which are best calculated to fulfil the requirements, in suitable proportioning and in treatment. In consequence, a large classification of the appliances into typical groups exists, such as the open and the box forms, and into standardized elements—the bushes, pins, screws, and so on. Cast iron, wrought iron, mild steel, and carbon steels, hardened and ground, enter into these constructions. Draughtsmen and designers in office and tool-room are occupied exclusively with the scheming of the fixtures and jigs, and groups of mechanics in the tool-room are engaged in producing them.

When pieces are held in fixtures, they are either set by portions that have already been tooled, or by rough-cast or rough-forged surfaces. The first are readily dealt with. When a setting surface has not been tooled, its equivalent is often provided so far as the setting is concerned by the method of "spotting," that is, facing an area, or areas, small but sufficient to make accurate contact with a locating plug or pin. When location must be done by rough surfaces, then methods are devised for making slight adjustments of some elements of the fixture in order to accommodate pieces that vary slightly in dimensions. Again, a fixture often has to carry articles that are of a very flimsy character, and liable therefore to become distorted by the exercise of undue pressure. These present similar problems to those which confront the machinist when he fixes such articles directly on machine tables. Packing has to be provided in the fixture in opposition to clamps to afford sufficient support, without severe pressure.

Rapidity of Action

When the question of the design of fixtures is raised, rapidity of action in setting and removing is of nearly equal importance with that of any other aspect of the problem of production. Fixtures afford many illustrations of alternative methods of this character. One of the most valuable is the hinged bolt, pivoted to be thrown back on one side, instead of requiring time to be spent in unscrewing a nut and pulling a bolt out of its hole. Among the clamping devices which act with rapidity are cam levers. A lever boss has its outline shaped eccentrically, with the result that the movement of the lever through a small arc causes the increasing radius to press on the work and grip it instantaneously. A simple clamp, which is nearly instantaneous in action, is a swinging plate which is pivoted on a bolt at one end and tightened on the work with a bolt at the other. The latter fits in an open-sided slot hole, to avoid running a nut off and on. When the object, say a shell blank, is inserted in the fixture to be cut off or centred, the clamp is swung over it, and one turn of the nut secures it. Similar to this is the hinging of cover plates or the pivoting of a fixture. In making settings, stops against which one particular portion of the piece of work is pushed avoid the waste of time involved in all tentative settings by measurement, and ensure unifromity of setting in hundreds of similar pieces.

Locating plugs form a large group of time-saving elements. They are generally used in preference to fixture faces, even when they locate a plane face, but they have a wider sphere. For plane

*From Times' Engineering Supplement.

faces they are plane or cylindrical, but for holes they are of conical section, for external cylindrical surfaces they take the form of vee blocks, for the ends of cylinders hollow cones, and so on. The fixture is very often designed to fulfil the function of a dividing plate or head, as when several holes have to be drilled in faces, or on peripheries at exact angular distances apart, or when facets have to be milled in strict geometrical relations. Holes and a plug, or notches and a latch, provide the means of instant location. In those shops where motion studies and route systems are installed these minute economies rank as of far higher value than in those factories where little account is taken of the number of movements made by the operators.

Dimensions and Scope of Fixtures

Many of the fixtures used for the parts of guns, rifles, and revolvers are of small dimensions, and are, therefore, easily handled, but at the other extreme the help of a crane is wanted. Large numbers of fixtures are allied to the machine vises, but they are shaped, as far as the arrangements and forms of the jaws are concerned, solely in order to enable them to take the one article for which they are designed. Jaws are as often set at various angles as disposed parallel. Frequently the resemblance to ordinary jaws is disguised, as happens when the shape of a piece entails the fitting of three or more grips disposed at various angles. These are usual in dealing with some parts of revolvers, for milling, shaping, slotting, and drilling operations.

In its wider developments the fixture is not limited to securing a single article. It may include a long row of small pieces, the number being limited only by the maximum capacity of the machine for milling, planing, or drilling. The heavier the fixture or the more severe the character of the tooling done, the more massively must it be proportioned in order to avoid spring and vibration.

Some Contingent Results

One utility of the fixture, secondary only in the sense that it is not the original function, is that it, with its contained piece, can have different faces presented to the tools on a single machine, or it can be transferred between several machine tools, where operations of a similar or a different character may be performed on it. How great the resulting economy is may be imagined if comparison is made with the time that would be occupied in resetting an intricate or a flimsy article or a series of such pieces directly on machine tables. The fixture and the piece which it encloses are virtually one and the same element, ensuring that each portion tooled will occupy correct relations to every other portion, and that a thousand or ten thousand pieces so treated will interchange with each other.

Another aspect of the fixture is that a very large amount of care, thought, and labor is frequently spent on an nelaborate fixture to enable a small and apparently trifling operation, such perhaps as the drilling of a single small hole, or the milling of an edge, to be performed. The explanation is that without the employment of a fixture the assembling of thousands of similar pieces on an absolutely interchangeable system would not be possible, and hand correction and adjustment would be entailed. Then, not only would the cost of production be immensely enhanced, but the supply of spares to replace those worn or damaged at the seat of war could not be guaranteed.

Predominance of Drilling

Probably three-fourths of the work that is done in fixtures consists of drilling and allied operations, simply because the central fact of exact control is more readily carried out in drilling than in milling, planing, or shaping. A drill or a boring tool can be coerced in holes in fitxure or jig, but other tools must be set in some way, so that the function of the fixture in these is limited to securing the work in one unvarying position. Drilling functions may be extended to include a series of drills, or allied tools, reamers, etc., for simultaneous action.

Other machines in which fixtures are employed are milling, planing, shaping, slotting, and face grinders. In the face grinders, and in milling machines and planers, the fixture is utilized in a way which marks a vast extension of its original function, in what is termed continuous tooling. A series of similar pieces is arranged lineally or grouped on a circular table, and gripped in one fixture on the table, while the tool cuts over the series.

In the case of pieces which offer irregular outlines to be milled, forms control the outline. A form on a hinged portion of the fixture, the shape of which will produce the irregular outline to be milled, is moved under the coercion of a roller against the pressure of the milling cutter. Fixtures of this kind are used in milling the outlines of sword bayonets, and in dealing with some of the small parts of rifles.

A good many fixtures are designed merely for drilling the chucking centre in the blank end of a shell forging in a vertical drilling machine. As the forging at this stage is rough, it is centred by the rough interior, through the medium of a stem smaller than the bore, but provided with adjustable hinged fingers which are moved outwards with nuts. The fixture is hinged to its base, which is attached to the table of the machine, and the stem is tilted outwards to an angle for the purpose of slipping the shell over it. In some the stem is lowered to a right angle.

Although the usual practice is to bore, tap, and recess the mouths of shells in a lathe of some kind, yet these operations have been regularly done on vertical drilling machines. The shell is held on the outside in a fixture which carries four vee'd jaws that grip it on the outside through right and left hand screws turned by a hand wheel. The tools are guided through a central hole in a bridge piece. Similarly a shell is set on a stem in a vertical position to have the base plate forced into the end, in cases where it is not screwed in. The post or stem is hinged as before, and the plate is pressed in, riveted, or caulked by ram or hammer, depending on the system adopted. A shell is gripped in a longitudinal position on vee-blocks, integral with the fixture for the drilling of a hole in the nose. A conical locating plug centres the nose, a swinging clamp plate is brought in opposition against the base, and an arched end receives the bushed hole through which the drill is coerced.

Continuous Tooling

Many massive fixtures have been designed solely to perform the preliminary task or cutting off shell blanks from solid bars, or for rough-facing the ends of forged shells. The first include fixtures for use with a single saw, or with the multiple milling cutter type of saws, or with the rotary cutting-off machines. In the second case the ends of the forgings are trimmed with a face mill, either on a plane miller or with cutting tools on the table of a vertical boring machine. When gang saws or face mills are used, and the fixtures occupy the whole length of the machine tables, an additional economy is secured—borrowed from planing machine practice—that of setting up pieces on one portion of the table, while tooling is proceeding on those that occupy the other portion. There is ample time for doing this when a long table may occupy from one to four hours in its total traverse.

Fixtures for Fuse Bodies

In the case of fixtures for fuse bodies, problems in drilling are presented which can be solved only by the employment of fixtures or of machines having drill spindles built exclusively for dealing with these bodies. The fixture permits of the employment of the standard machines, but several fixtures are required for a single size of body, since it is necessary to use some holes as the means of location for the drilling and tapping of others, and fixtures of different shapes are required to hold and present the various holes suitably to the drills and taps. The graduated time ring for fuses is the subject of several fixtures and drilling jigs.

Milling Fixtures

Extensive employment is found for milling fixtures in the small parts of rifles and revolvers, which include many awkwardly intricate and irregular shapes, all to be tooled to extremely fine limits. Many of the fixtures deal with profile milling. The number of separate and distinct operations in some single pieces is remarkable. The forging termed the "action body" of a Lee-Enfield rifle, which weighs in the rough about 5 lbs., is reduced to 1⅛ lbs. after 150 operations have been performed on it. The breech bolt entails 46 toolings, the trigger guard 35, the nose cap 48, and other parts run these closely. The "body" of a revolver goes through 76 operations, including milling, copy-milling, drilling slotting, shaping, and drifting, requiring the services of about a dozen machines and double that number of fixtures.

The Fixture in the Small Shop

One benefit which the fixture confers, and which has proved of much value at the present period, is that it often en-

ables machines to be used which would, without its aid, not be qualified to deal with the tasks required of them. An enormous volume of work has been done by these alternative methods of manufacture under the stress of necessity. Many small shops to which work has been sublet have been but poorly furnished with machine tools; hence they have taken such sections from the big controlled firms as they have been able to deal with, and produced them with the help of fixtures and jigs adapted to the tools in their possession. The inspectors are not concerned with details of this kind. The final results as revealed by tests is their business.

No operation is too insignificant, even though tooling is not involved, to be dealt with by the aid of a fixture. The tiny percussion needles in fuses are carried each in a small plug, and have to be fastened securely in their plugs. As they are too small to be screwed, they are held frictionally by a process termed "spinning," that is, a small annulus of metal on the face of the plug is closed round the pin after its insertion in the plug by the pressure of two rotating rolls or wheels. The needles have to be dropped into their holes and drilled in the plugs by hand, which would be tedious in the absence of a guide. A fixture is, therefore, made to hold a number of plugs, and a plate is dowelled on it, having countersunk holes in alignment with the plug holes below. The pins, being dropped into the bell-mouthed holes in the plate, enter the plugs at once, and, the top plate having been lifted off, the fixture is taken to the machine to have the pins secured.

CASTING TEMPERATURE OF ALUMINUM

THE casting temperature exercises a decided influence on the physical properties of aluminum alloys, according to F. H. Hurren in his summary of a paper read before the Birmingham branch of the British Foundryman's Association. To a certain point, the lower the casting temperature, the better the mechanical properties. At temperatures below 650 deg. C., there appears to be very little change in the tensile tests, and at this temperature almost any properly-gated casting can be run. It is, of course, absurd to dogmatise, and say that no mould must be poured at a temperature exceeding 650 deg. C., as factors may be present which render it desirable or necessary to cast at a higher temperature. For instance, aluminum aeroplane cylinders require a higher temperature to ensure freedom from mis-runs in the very thin cooling fins, and in the remarks on porosity an example being cited where a temperature of 675 deg. gave the best results. Speaking generally, however, most commercial casting can be performed at a temperature of 650 deg. C., or under, by paying proper attention to the method of gating, and obviation of air locks. Pyrometry is just as important when dealing with molten metals as in annealing and hardening processes. Many aluminum castings are poured from two crucibles simultaneously, and it is to court trouble to have the two lots of metal at different temperatures. By "drawn" melting in bulk the risk of this happening is not so great as when melting in small crucibles in coke or oil furnaces. Many of the vexatious cracks and "drawn" places are due to this cause.

Again, the "burnt" metal danger appears to be an imaginery one. By proper attention to casting temperature, it does not matter what temperature the metal has attained, nor how long it has remained in the furnace; results may be obtained equalling those from metal which has been melted with every care. I think that most of the trouble which has been ascribed to "burnt" metal, is really due to crude methods of judging temperature, and could be avoided by the introduction of a pyrometer. It is difficult, if not impossible, to correctly estimate the temperature of a body of molten aluminum, by the eye. A crucible of metal has been heated to, say, 880 deg. C.; it is drawn from the furnace, stirred, pieces of scrap or ingot metal added, stirred again, termed "right" (when perhaps the temperature is still as high as 720 deg. C.), and when a "waster" results, it is credited to "burnt" metal. Actually it is due to a high casting temperature, and had a pyrometer been used and the metal cooled to, say 620 deg. C., no doubt a perfect casting would have resulted.

Aluminum is still sufficiently fluid at 540 deg. C. to run thick castings, and there is no visible difference between metal at that temperature and metal at 700 deg. C. No one would deliberately leave metal in the furnace for a long period after it has melted, owing to the waste of fuel and increased melting loss, but where this is unavoidable figures obtained indicate that the metal does not suffer deterioration. There is no danger in using metal which has been left in the furnace for two hours, provided attention is paid to casting temperature.

CARE OF BELTING

LEATHER belts should be protected against water and other moisture by using a waterproof dressing. Belts made of coarse, loose fibred leather give best service in dry and warm places. For damp or moist conditions, the very finest and firmest leather should be used. Oil should not be allowed to drip on belts. Leather belting may not safely be run constantly when the surrounding temperature is over 110 degs. Fah.

It is usually preferable to joint the ends of a belt by splicing and cementing, as this ensures against irregularity of operation. Laced belts should have the lace holes punched with an oval punch, whose longer axis is parallel to the belt lengthways. Lacing should not be crossed on the driving face. The greatest allowable belt tension is not constant, neither is the belt velocity even with pulleys revolving at constant speed. Ball and roller bearings in the shafting hangers have contributed materially to an increase in over-all efficiency of belt drives.

BEARING LUBRICATION

A STUDY of the influence of surface velocity on the mean film thickness in the lubrication of bearing forms the subject of the paper which received the student prize of the American Society of Mechanical Engineers in 1917. The paper was prepared by Boynton M. Green, of Leland Stanford, Jr., University.

The apparatus used in the experiments on which the paper was based is shown in Fig. 1. It is non-adjustable and consists of a plain phosphor-bronze sleeve about 3¼ in. in diameter and 7 in. long, pressed into a cast-iron housing which was bolted to a lathe bed. Lubrication was effected by two steel oil rings of rectangular section. Two sets of oil grooves were cut in the upper half of the bronze as shown in the sketch. On assembling the bronze sleeve and housing it was found that the bronze was elliptical in section, the major axle being vertical. The average difference in diameters was 0.001 in.

While for best results the sleeve should have been reamed after pressing it into the housing, the inaccuracy did not seem to affect the results appreciably. The journal was a piece of mild steel ground to a diameter of 3.244 in., giving a running fit allowance of 0.0035 in., or about 0.001 in. per inch of diameter. On each end of the journal a 67-lb. cast-iron flywheel was secured by a nut. The total weight of the assembled journal, flywheels and nuts was 165.5 lb., making a nominal load on the bearing of 7.275 lb. per sq. in. of projected area. The entire apparatus was mounted on two parallel lathe beds, and three lathe heads with four-step pulleys were utilized for the drive. To locate the position of the journal relative to the bearing, three micrometers were used, spaced 120 deg. apart around the bearing in a plane through its centre and perpendicular to its axis.

In determining the mean thickness of oil films, the following approximations were made:—(a)—The loaded portion of the film was that below the horizontal plane through the centre of the bearing. (b)—The thickness of the film at this plane and on each side of the journal was equal to the radial bearing allowance. (c)—The mean thickness of film was the average of the thickness at this plane and the minimum thickness of the film. The minimum thickness of the film is the radial allowance minus the distance between axes of the journal and bearing.

The curve plotted from the results gave the general equation:

$$y = b + c^a \sqrt{V}$$

in which y = means thickness of film in inches.

b = one half the radial allowance.

c = constant, dependent on allowance and possibly on viscosity.

a = constant, dependent on viscosity and possibly on allowance.

V = surface velocity of journal in feet per minute.

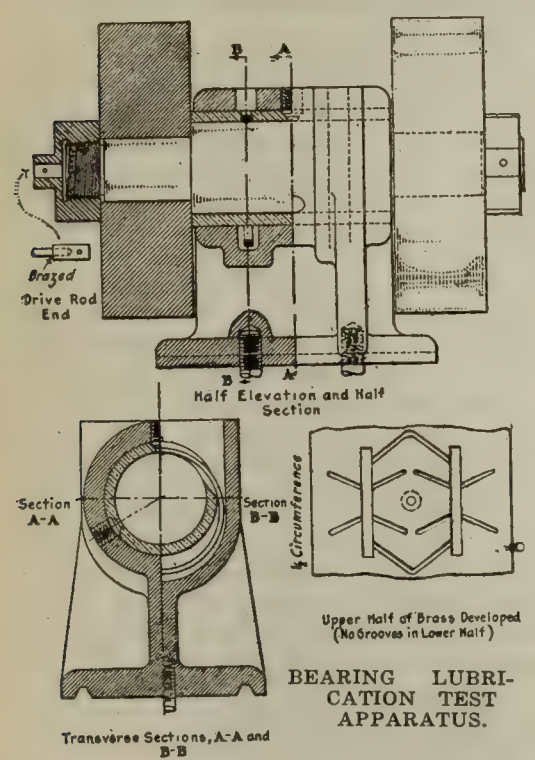
From the experimental figures the values of c and a were found to be: c =

0.0000049; a = 1.8, and the resulting empirical equation is

$$y = 0.0000049^{1.8} \sqrt{V}$$

As to the application of the empirical equation in the general equation for bearing lubrication, it may be said that it can be used directly for conditions of the same allowance and the lubricants having the same viscosity. For other allowances and lubricants the change of (c) and (a) cannot be stated definitely. In general (c) will change with some function of the allowance and (a) with some function of the viscosity.

The oil used during the experiment was an ordinary mineral oil known as "vacoline," manufactured by the Standard Oil Company. Its viscosity was given by the Engler viscosimeter as 11.0 at 20 deg. C. and 2.95 at 50 deg. C., compared with water at 20 deg. C., which gave a specific viscosity of 38.9 at 20 deg C. and 8.7 at 50 deg. C.—



BEARING LUBRICATION TEST APPARATUS.

POWER TRANSMISSION BY CHAIN

ALTHOUGH the question of power transmission is only one of many to which the engineer has to give his attention, yet in these days of great and increasing activity, it comes about that none of us can afford to be indifferent to any factor which makes for better, quicker or cheaper production. Plants, factories and mills are extending in every direction as the supply falls short of the demand, and it is the engineer with the knowledge of where to save, who is mainly responsible for these extensions. That chain driving, which has many advantages over other methods of power transmission in many cases is a factor of considerable importance, is evidenced by the fact that in every part of the world engineers are using this drive to a large extent. Space does not permit us to discuss the design of chains and their many applications, opportunity will therefore only be taken to summarize a few of the advantages accruing from their service adoption.

The chain drive is positive, inasmuch as the chain cannot slip on the wheels. It is elastic, inasmuch as the weight of the chain which hangs between the wheels may act as a spring; the lubricant in the bearings, and in certain cases even the shape of the links adding to this quality. The effect of this elasticity is to considerably reduce the vibration and noise inseparable from such a positive power transmission as spur gearing, while the positive nature of the chain drive has in many cases increased the production of machines from 15 to 30 per cent.

Chain driving is highly efficient; experiments having shown that the efficiency of a well-designed chain drive is somewhere between 97-98½ per cent. Also, the nature of the action of the chain upon the wheels is such that this high efficiency is maintained throughout the life of the drive, and is not seriously affected by minute inaccuracies of erection, as in the case with some forms of tooth gearing.

As compared with rope or belt, the centre distance for chain driving never exceeds 8 feet or 9 feet and can, if circumstances require, be made so small that the chain wheels barely clear one another. For this reason it is even possible to take out a pair of spur wheels, replace them by chain wheels of smaller diameter and get, as the result, a highly satisfactory drive as regards efficiency and absence of noise and vibration.

Partly on account of the above advantages, and partly because it is not necessary that there should be any greater initial tension in the chain than such as is caused by its own weight, there are very heavy incidental economies, effected by chain driving. The absence of tension results both in saving of power and in reduction of wear and tear of bearings, shafting and machine parts.

Chain Drive Limitations

There are many locations and conditions particularly suited for belts, ropes and gears, and these systems will never be discarded; yet as the system of power transmission by chain has become more widely known, its advantages have been quickly appreciated and its popularity greatly increased among prominent Canadian firms. Chain driving, of course, has its limitations; for instance, where power has to be transmitted at right angles, or where the driving and driven shafts run in opposite directions. This latter instance in itself debars its use on fully half the machine tools in service, and where otherwise it would be applicable. Chains are not affected by moisture, heat or oil; belts and ropes tend to slip under such conditions, with resultant loss of power accompanied by destructive heat. It was, however, in cases where shafts were too far apart for gears, and too close for belts or ropes, that chains made their debut. Their success in these fields suggested trials in others.

Quiet Running and Compactness

In many instances, the gear makes no greater sound than a medium-sized belt. It is impossible to have metallic pieces moving with absolute silence, and its degree is affected by the speed of the chain and the number of teeth in the sprockets. Noise is only produced when the chain speed is excessive, and when the number of teeth becomes very low.

Compactness is probably one of the most important advantages chain transmission offers over belts or ropes, and it secures admission for the system into an unlimited field of application. The chain sprockets are approximately one-half the size of belt pulleys of the same capacity, and they may be placed quite close together, thus economizing in space, and often providing a more convenient and satisfactory arrangement of machines. Again, the width of the chain is usually about one-third the width of a belt for the same power.

First Cost

To many, the first cost of a chain drive is an obstruction; this being about 50 per cent. for small powers, and as low as 35 per cent. for large powers, higher than a belt drive of equal capacity. It should be borne in mind, however, that higher efficiency, saving in power and increased production, mean more satisfactory transmission at low cost. There are several hundred chain drives in use in Canada, a large majority of which are transmitting upwards of 200 h.p., with centres as short as six feet.

ROPE TRANSMISSION

THE main features of an ideal rope-drive are that the diameter of the pulleys shall not be less than thirty times the diameter of the rope used, and the driving and driven pulleys shall, if possible, be of equal diameter, but where this cannot be arranged, their ratios should not be greater than 5 to 1. The distance between the pulley faces should, if possible, be not less than 25 feet, and the drive should be horizontal, with the slack side of the rope on the top. The speed may be from 2,000 feet to 4,000 feet per minute, but if too low the ropes are apt to slip, and if too high, the action of centrifugal forces affects the efficiency.

There should be a distance of from 4 to 6 feet clearance under the ropes, and these must, of course, not rub on anything. An allowance of 2 or 3 inches clearance between the bearing foundations and the sides of the pulleys must be made so as to leave room for the ropes to be put on to the pulley. The pulleys must also be accurately in line, well balanced, and the grooves exactly alike.

All gears between the prime mover and the rope-drive should, if possible, be avoided; the ropes should be kept dry, properly lubricated, and not too tight. They should all be put on at one time, and the full load applied to them as soon as possible after they are in place. Carrier pulleys, rollers, and angular drives should be avoided as much as possible.

Rope driving is applicable and works satisfactorily in cases of indirect as well as direct requirement.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

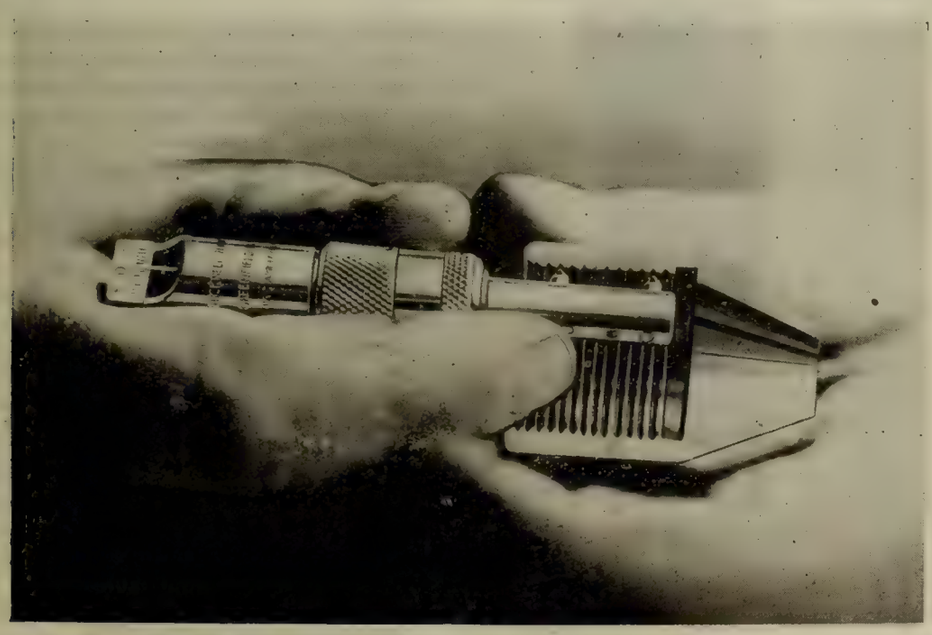
INDICATOR FOR LEAD ON SCREW THREADS

A DEVICE for testing the lead on external and internal screw threads has been brought out by the Bicknell-Thomas Co., Greenfield, Mass. Screws of any of the customary diameters can be measured and the smallest size of tapped hole that the indicator will enter is ½ in. in diameter. This, it is pointed out, enables the lead of the thread on the small sizes of screws and the tapped holes in which they fit to be tested.

THREAD LEAD INDICATOR TESTING EXTERNAL THREAD.

The device consists of two points which are capable of adjustment for various leads, mechanism for transmitting the motion of these points to the indicating needle and a set of graduations to show the departure of the lead from the normal amount. A table on which the screw rests when being tested is provided. This can be adjusted to accommodate various diameters of screws and, when internal threads are being measured, the thumb screw holding the table in place is loosened and the latter removed. A master is furnished with each gauge to enable the operator to make certain that the needle point is on the zero mark when the gauging points are properly spaced. If it is necessary to test threads having odd pitches, such as 13 threads to the inch, a master can be furnished for adjusting the indicating needle.

In use, a screw is placed on the indicator which is held in one hand, preferably the left, and is pressed against the two points which are spaced ¼, ½ or 1 in. apart, as may be desired. The indicator needle will remain at the centre graduation, which is zero, if the lead of the thread is normal, moving downward toward the plus side if the lead is long and in the opposite direction if the lead is short. The exact amount of discrepancy is indicated by the graduations, each of which corresponds to 0.001 in. For internal threads the procedure is the same except that the table is removed as mentioned, and the indicator is inserted in the tapped hole.



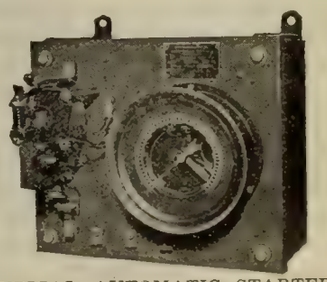
THREAD LEAD INDICATOR TESTING INTERNAL THREAD.

AUTOMATIC STARTERS FOR INDUCTION MOTORS

DUE to the unprecedented demand for manufactured products of every kind, industrial plants in all parts of the country are being taxed to their utmost capacity. In addition, the cost of labor and machinery has been increasing at an extremely rapid rate. The magnitude of these factors has forced manufacturers to employ every means available in an effort to increase production or to reduce operating expenses. This may be accomplished by reducing the number of operators, by simplifying the duties of the present operators so that more attention may be devoted to the production of a larger quantity and a higher grade of product, or by furnishing better protection to the apparatus installed, thereby insuring continuity of service.

One of the factors by which the desired results may be accomplished is the use of automatic starters and controllers for the motor-driven machinery employed. Among the companies producing such control apparatus is the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., several of whose starters are shown in the accompanying illustrations. These automatic starters are for use with single phase or polyphase squirrel cage and wound-rotor induction motors, where it is desired to start the motor from a remote point, or where automatic acceleration is required to guard against improper starting by unskilled operators. They are simple, reliable, and rugged in construction, consisting of a magnetic contactor panel and a master switch, which may be either a push button, a float switch, a pressure regulator, or similar device for closing the control circuit, depending upon the service. The vital element is the magnetic contactor. The contactors used on these starters are of a type which has been used by the Westinghouse Co. with marked success in steel mill, cement plant, and mine installations where the requirements are extremely severe. The contactors are opened by strong spring action, assisted by gravity. The destructive action of the arc is reduced to a minimum by strong blow-out coils and arcing horns.

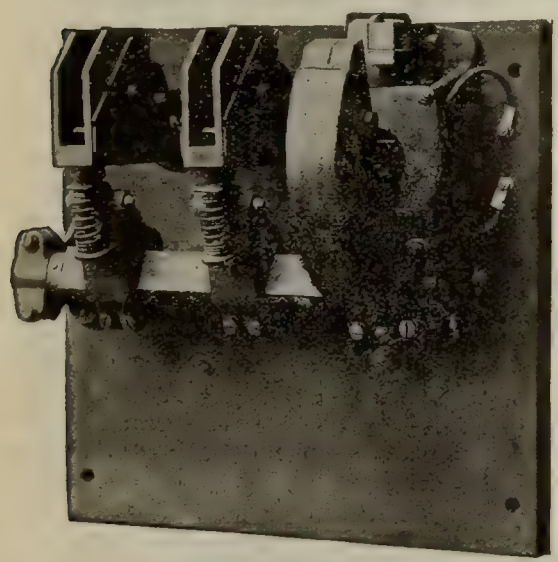
TYPICAL AUTOMATIC STARTER EQUIPMENT.



TYPICAL AUTOMATIC STARTER EQUIPMENT.

The operation of the starters is exceeringly simple. When starting motors driving line shafting, wood-working and metal-working tools and similar apparatus, it is only necessary to press a button and close a small knife or snap switch. The starter then automatically makes the proper connections to limit the starting current to a suitable value and to vary the time required for acceleration according to the load on the motor, thus preventing damage to the machinery by too slow or too rapid acceleration, and saving time by bringing the motor to full speed at the most rapid permissible rate. When used for pump or compressor service in connection with a float switch or pressure gauge, the action of the starters is entirely automatic, the motors being started when the pressure or liquid level of the tank controlled falls to a predetermined point and stopped when the desired maximum pressure or level is reached, or vice versa.

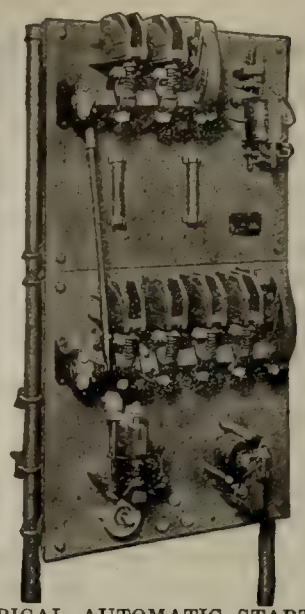
The automatic starters for squirrel cage motors are most frequently employed for starting motors operating centrifugal pumps, air compressors, fans, blowers, metal-working and wood-working machines, and other apparatus requiring starting torque less than full load torque. This type of starter, however, owing to the wide application of squirrel cage motors for industrial service, can be applied economically for starting service in nearly every industry.



TYPICAL AUTOMATIC STARTER EQUIPMENT.

Squirrel cage motors of 5 horse-power and smaller are usually connected direct to the line. Large squirrel cage motors are first impressed with low voltage from auto transformers or connected to the line through resistance, so that in either case the starting current is reduced. When the speed of the motor has reached such a point that the starting current has decreased sufficiently the motor is then automatically connected to the line.

The automatic starters for wound rotor motors are particularly adaptable for starting motors driving plunger pumps, positive pressure blowers, air compressors, long line shafts, and loads having heavy inertia. The severe starting conditions encountered in this class of service require from 100 to 200 per cent. full load torque in starting, making automatic starting a very desirable feature.



TYPICAL AUTOMATIC STARTER EQUIPMENT.

When an automatic starter is used in connection with a wound-rotor motor, the line switch is first closed, with the maximum resistance in the rotor circuit. When the speed falls to a predetermined value, a relay closes a magnetic contactor, which cuts out a part of the resistance in the rotor circuit. Each contactor operates in a similar manner, cutting out its portion of the resistance at the proper time until all the resistance is short circuited by the last contactor.

TYPICAL AUTOMATIC STARTER EQUIPMENT.

The power on any circuit may fail suddenly; therefore, it is important that some protection be afforded both operator and motor against an unforeseen return of power. This protection may be provided for motors, operating pumps, compressors, etc., by a low-voltage release to disconnect the motor from the line when the voltage is low or power fails entirely; then, as soon as power returns, the motor will automatically start up again. In many applications, however, such as for motors operating metal-working or wood-working machine tools, low voltage protection is required. Motors so protected are disconnected from the line when power fails, and will not start when power comes on again until the operator presses a button or there is no danger from the unexpected starting of a machine.

The advantages resulting from the use of automatic starters for induction motors comprise: absolute protection to both operator and expensive machinery, proper starting at the most rapid permissible rate, economy in operation and maintenance, convenience of remote control, and automatic operation.

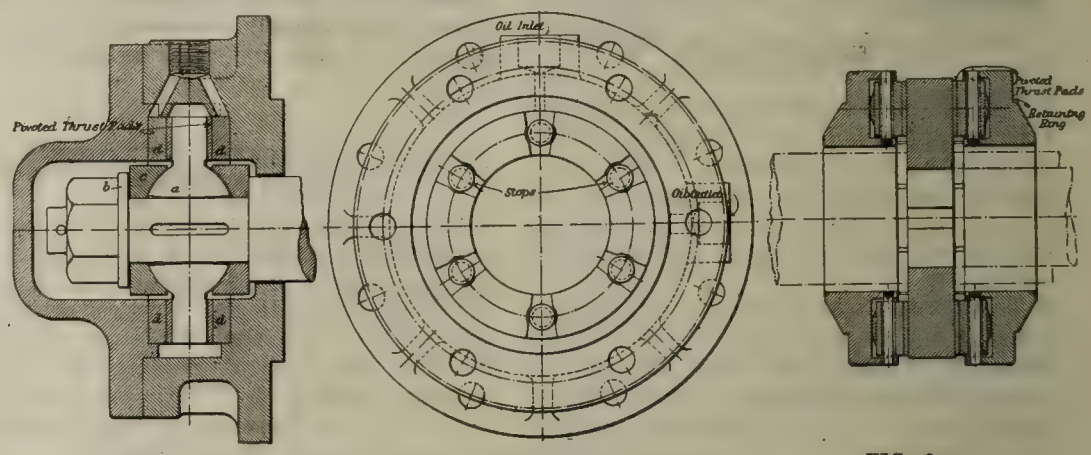


FIG. 1. FIG. 2. FIG. 3.
MICHELL THRUST BEARING DETAILS.

"MICHELL" THRUST BEARINGS

WITH a view to manufacture in quantity and placing them on the market on the same basis as that on which ball bearings have long been sold, Broome & Wade, of High Wycombe, Berks, England, are now standardizing certain sizes of Michell thrust bearings, says Engineering.

One form of standardized design is illustrated in Figs. 1 and 2. In this case the thrust collar (a) is bored to a barrel section and instead of being clamped between its spherical seats is loosely held, as is indicated by the space shown between the washer (b) and the opposing face of the seat (c). It is thus capable of taking slight tilts so as to distribute the load equally, in spite of any bending or deflection of the shaft. The collar transmits the thrust to the series of pivoted blocks or pads shown in position at (dd)—of these one set serves to take a thrust and the other a pull. Provision is made, it will be seen, for a continuous supply of oil. This pattern, being entirely enclosed, is suitable for use on pumps, fans or worm gears.

Another form of standardized thrust

block is shown in Fig. 3. Here the bearing is not complete in itself, but is designed to fit into seats machined for it in the gear casing or whatever other machine part to which the bearing is to be applied. In this case the blocks are, it will be seen, mounted on two retaining rings. These, when the bearing is mounted in place, fit on bevelled seats, sufficient freedom being allowed to permit of the pressure being fairly distributed over the pads. The rings are prevented from being carried round with the revolving shaft by feathers on the housing of the machine. This pattern is made in sizes to fit shafts from 1 in. up to 3½ in. in diameter, and to carry loads from 1,000 lb. to 8,000 lb. In this case the pads pivot about a point contact, whilst in the case of the pattern represented in Figs. 1 and 2, which is intended for heavier loads, the pads have line contact with the housing. Both types of bearing can be run at very high speeds, since centrifugal action in no way affects their working. With loads of 400 lb. to 500 lb. per square inch the coefficient of friction is commonly about 0.0015.

MOTOR BOATS IN FISHING INDUSTRY.

ACCORDING to the latest statistics, there are 9,302 motor boats employed in the Canadian fishing industry, besides a number of motor vessels of the larger type. This is an increase of 600 motor boats in a year, and 3,400 in two years.

The boats are employed almost entirely in the Maritime Provinces and on the Pacific coast, where the greater number are engaged in the halibut fishery, the vessels employed ranging from small motor boats, carrying four to ten men, to large auxiliary schooners and steamers.

The introduction of the motor boat has revolutionized the fishing industry and largely increased the production. It has saved the fisherman time and rendered him independent of the wind. He can also make longer journeys off shore to the fishing grounds, thereby increasing his sphere of operations. One of the most important points is the increase in the catch, owing to the fact that the fishermen can get to the fishing grounds quicker, remain there a longer time, carry a greater load, and get back to port in less time than by the sail and oar method.

In the larger auxiliary schooners, the motor saves towage bills, enables the vessel to be manoeuvred in narrow channels, and brings her into the market quicker, with the fish fresher. There is less risk for the dory fishermen in squally weather on the Banks, as they can be picked up quicker.

TRADE ENQUIRIES.

THE following enquiries have been received by the Department of Trade and Commerce, Ottawa, from which further particulars may be obtained.

1072—Saw-mill Plant—An important company having a large amount of capital invested in Zanzibar, wishes to secure from Canada a saw-mill plant to cut about 10,000 feet a day. The plant must include boiler and engine and all machines to turn out lumber dressed four sides, with saws, knives, etc., and spare parts to provide for wear and breakage. Also a shingle machine to cut 16-inch, 18-inch and 20-inch shingles.

1075.—Railway Sleepers.—A Birmingham firm wishes to hear from Canadian manufacturers of railway sleepers in position to export large quantities.

1080—Asbestos Fibre and Board — A Canadian of high standing who has been established in Japan for many years, wishes to secure supplies of asbestos fibre and board in lots of from one to twenty tons. Sample of the fibre can be seen at the Department of Trade and Commerce, Ottawa. He says those able to supply the present demand will find big business in future with Japan. Canadian producers are asked to send samples with full particulars of prices and code words together with advice as to quantities available.

BOILER SERVICE MAINTENANCE

A BOILER is in a dangerous condition when the plates, bolts, braces or rivets of which it is constructed become weakened to such an extent that the internal force or pressure equals the tensile strength of the material at the weakest section or sections. In this condition, strains due to varying temperature will cause rupture and an explosion, the volume and destructiveness of which would be in accordance with the size of the boiler and the pressure carried therein.

The moment a boiler is placed in service it gradually becomes weaker, due to the destroying forces continually acting upon it. These forces are of both a chemical and mechanical nature. Corrosion and oxidation are continually acting on the material from which a boiler is constructed, and take place both internally and externally, these processes being the two most serious and subtle causes of weakening to which a boiler is subjected. Evidences of these are most noticeable in the grooving and pitting of plate, and more especially at locations most subject to deposits of mud, scale and organic substances.

Expansion and contraction also play a very important part in the destruction and weakening of a boiler, more especially when concentrated at any one point, such as at sharp bends or flanges in the plates where the inner and outer sheets are subjected to different temperatures. Constant working or bending of bolts, flanges or angles, however slight, will sooner or later destroy the fibres in the material at points subjected to it, causing crystalization, cracking, and leaving same more susceptible to the chemical action of the feed water.

It is therefore obvious that only thorough examination by competent inspectors who understand the construction, nature of defects, and remedies to be applied, will maintain a steam boiler in safe working condition.

Screenings

Feared the Worst.—An Irishman coming out of ether in the ward after an operation exclaimed audibly: "Thank God! That is over!' "Don't be so sure," said the man in the next bed. "They left a sponge in me and had to cut me open again.' And the patient on the other side said: "Why, they had to open me, too, to find one of their instruments." Just then the surgeon who had operated on the Irishman stuck his head in the door and yelled: "Has anybody seen my hat?" Poor Patrick fainted.

* * *

Not Much to Ask.—The landlady bustled up to her new lodger as he came down to breakfast the first morning.

"Good morning, sir," she wheezed.

"Good morning," said the lodger.

"I hope you've had a good night's rest," said the landlady.

"No," said the mild-mannered little man. "Your cat kept me awake."

"Oh," said the landlady, tossing her head, "I suppose you're going to ask me to have the poor thing killed."

"No-no, not exactly," said the gentle lodger. "But would you very much mind having it tuned?"

* * *

Hoaxing a Bishop.—Funny stories are told about Archbishop Trench, who, seeing one day in Dublin a little girl trying to reach a door-knocker, came to her assistance.

"Rap hard!" said the little innocent.

He did so.

"Now, run like the very devil!"

Trench always feared paralysis. One day at a dinner party he started probing his knee with his fork, and not feeling any pain, exclaimed: It's come at last, I am afraid."

"It's my knee," said the lady next to him!

* * *

The Scotch of It.—An enterprising drummer attempted to bribe an old Scotch merchant by offering him a box of cigars.

"Na, na," said the old chap, shaking his head gravely. "I canna take 'em."

"Nonsense," said the drummer. "If you have any conscientious scruples you may pay me a quarter for the box."

"Weel, weel," said the old Scot. "I'll tak' two boxes."

* * *

Hotel Advertising.—The customer at a London hotel gazed at his plate.

"Waiter," he called. "I should like to know the meaning of this. Yesterday I was served with a portion of pudding twice the size of this."

"Oh," said the waiter. Then, after a moment: "Did ye 'appen to be sittin' by the window, Sir?"

"Yes."

"Then that accounts for it," he said confidently. "We always give people by the windows large portions. It's a good advertisement."

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H. V. TYRRELL - - - - - - General Manager

PUBLISHERS OF

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

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THE BUSINESS OUTLOOK

BUSINESS interests are awaiting the announcement of the Minister of Finance regarding the result of his negotiations for a loan in the United States. An important point will, of course, be the amount. Sir Thomas White will undoubtedly secure all the credit he can, and he will be wise to do so at this time, with the future so uncertain. Whether he will be able to secure enough to postpone a domestic loan is questionable.

Reports as to business conditions throughout the country continue to be of a satisfactory character. From some parts of the prairie territory there are indications that depressing crop prospects have had the effect of curtailing credits, but this is not by any means general. Labor conditions are very unsettled, the rising cost of living being an important factor in this connection. June trade figures issued at Ottawa continue to show a development in imports and exports. Exports were $116,285,841 and imports $87,515,067. There is still a very fair balance of trade, but it is decreasing. A country so heavily in debt as Canada is and with foreign capital scarce and expensive, should keep the trade balance substantially on the safe side if possible, and it is questionable if some action should not be taken by taxation or other means to curtail imports of luxuries.

The outlook all round may be regarded as satisfactory. High prices will overcome any crop shortage, and demand for manufactured products will continue strong while the war lasts at least. What we need is careful administration of our internal affairs so as to use our rather limited liquid assets to the best advantage.

HESITANCY IN CANADIAN SHIPBUILDING ENTERPRISE

THE Nova Scotia Government at the last session of the Legislature placed the sum of $2,000,000 at the disposal of a Commission to be used in any way that they considered wise in order to stimulate steel shipbuilding in Nova Scotia. The Commission is finding difficulties in the way. Even with the tremendous demand for tonnage it is not easy to get capitalists willing to invest the large sums necessary to build a modern shipyard. The element of uncertainty is not lacking in the future. Again, the Commission is faced with the labor difficulty; skilled men are not to be had. A number of interests have been in touch with the Commission, but so far nothing has materialized. If the Province of Nova Scotia, with the many advantages that it possesses as a shipbuilding centre, is up against trouble and indifference with regard to shipbuilding plant establishment, what hope is there for the industry being other than local and limited elsewhere in the Dominion as at present and in the immediate future?

Don't let us be content with the projected shipbuilding programmes of others; let it be our business to go in and win on this matter of ship construction, and by so doing it will probably be found that instead of being crowded out, we will have contributed to the establishment of an industry, not only of front rank national importance, but comparable in scope and achievement with that operative in any country of the world.

THE COMING WINTER'S FUEL SUPPLY

WE are just now being uncomfortably impressed with the fact that this is "The Good Old Summer Time," therefore, it is somewhat natural that little care or concern should be in evidence with regard to conditions which will prevail, at best only a few months hence. "Lest we forget," or that our indifference have fuller scope for its exercise than it ought, the attention of manufacturers and operators is drawn to the accompanying more or less official memoranda which indicates that there will be a greater coal shortage next winter than last, and that therefore, we should arrange and secure now our fuel requirements.

Great Britain is short 15,000,000 tons of coal; France lacks even more; the coaling of Allied warships on the Atlantic coast, the naval, domestic and industrial requirements incident to the entrance of United States as a belligerent, all mean that the coal production must be increased.

United States officials anticipate that next fall there will be unprecedented demands on rolling stock for handling the production.

The situation is that the United States companies have placed an embargo on coal going out of that country, and the United States desires to keep coal cars in that country for any emergency that may arise.

The present rather acute shortage of coal in many quarters will not be helped by war conditions in the United States.

Coal prices have generally increased, and, unless there is Government regulation, they will reach higher levels.

The United States Geological Survey, as well as other agencies having knowledge of the facts, is urging all consumers of coal, both large and small, to store their winter's fuel during the summer months.

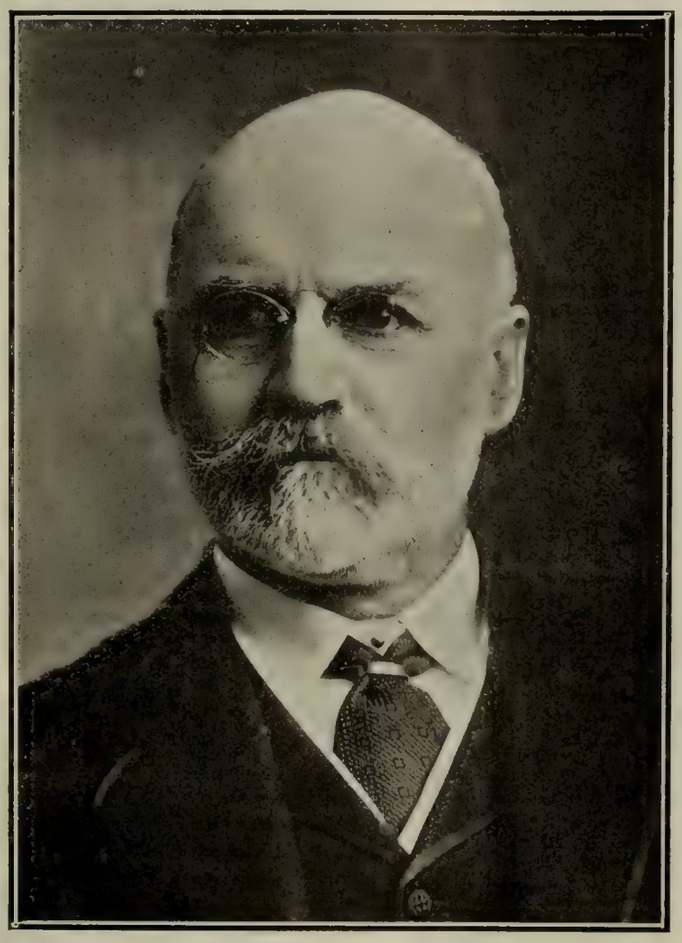
In so far as Central and Western Canada is concerned, the situation is intensified by the fact that owing to the coal strike in the West some 200,000 tons or more has been lost from production this year; also, owing to the shortage of ships and the great demand for iron ore for the manufacture of munitions, much less coal than ordinarily was brought up the Great Lakes last year, so that there are practically no supplies on hand.

From the above it is evident that, to be assured of our winter's supply of coal and, at the same time, save inconvenience and perhaps higher prices, we should buy coal during the summer months wherever and whenever it is available.

The Dominion Government has appointed a Fuel Controller to take charge of the situation, and the coal dealer, the manufacturer and householder can assist by filling their bins now with sufficient coal to last through the whole winter. By so doing they will help out conditions when the railway congestion occurs next fall.

INDUSTRIAL NOTABILITIES

WILLIAM I. GEAR, Colonel, Justice of the Peace, merchant, steamship owner and agent, Montreal; director of steel shipbuilding, Imperial Munitions Board, Ottawa; vice-pres., the Robt. Reford Co., steamship agents, 20 Hospital Street, Montreal; president, Crown Trust Co.; president, Canada Nitro-Products, Ltd.; director, Bank of Toronto; director, Keewatin Flour Mills Co., director, Cairn Line of Steamships, Ltd., and connected with



WILLIAM I. GEAR

various other enterprises, was born in Toronto, Ont., May 20, 1857, son of Henry J. and Jane (Martin) Gear. He is Lt.-Col. O. C. 1st Regiment (Canadian Grenadier Guards); was president, Corn Exchange, Montreal, 1902; president, Montreal Board of Trade, 1905; member of Committee, Chambre de Commerce, Montreal, 1913 and 1916, and represented transportation interests on the St. Lawrence River Commission, 1911-1912. He served as Alderman, Longueuil, Que., from 1908-1912.

Col. Gear's clubs are St. James'; Canada; Canadian; M.A.A.A., etc., of Montreal; Rideau (Ottawa); Union (St. John); Halifax (Halifax); British Empire and Royal Colonial Institute, etc., (London, Eng.). His residence is 450 Mackay St., Montreal; the summer he, however, usually spends at Longueuil, Que.

Photo courtesy British and Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$47 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	55 95
Basic, Valley furnace	53 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	.....

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	12 10
Chequered floor plate, ¼ in.	12 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 50
Tank plates, Pittsburgh	9 00
Structural shapes, Pittsburgh	4 50
Steel hoops, Pittsburgh	5 25
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 50

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$34 00	$35 00
Electro copper	34 00	35 00
Castings, copper	33 00	34 00
Tin	62 00	63 00
Spelter	11 00	11 00
Lead	13 50	13 00
Antimony	20 00	20 00
Aluminum	70 00	64 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$12 00	$12 00
Heads	12 30	12 30
Tank plates, 3-16 in.	12 65	12 25

WROUGHT PIPE.

Effective July 5, 1917.

Size.	Black Per 100 feet	Galvanized Per 100 feet
Standard Buttweld.		
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00
Standard Lapweld.		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$21 00	$22 00
Copper, crucible	24 00	27 00
Copper, heavy	24 00	26 50
Copper wire	24 00	26 50
No. 1 machine composition	20 00	22 00
New brass turnings	16 00	19 00
No. 1 brass turnings	14 00	16 00
Light brass	10 50	10 50
Medium brass	16 00	16 00
Heavy brass	18 00	18 00
Heavy melting steel	20 00	17 00
Steel turnings	9 00	8 00
Shell turnings	12 00	12 00
Boiler plate	15 00	10 50
Axles, wrought iron	25 00	24 00
Rails	19 00	18 00
No. 1 machine cast iron	26 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	17 00	9 00
Car wheels, iron	$25 00	$25 00
Steel axles	30 00	30 00
Mach. shop turnings	8 50	8 50
Cast borings	8 50	8 50
Stove plate	19 00	19 00
Scrap zinc	8 00	9 50
Heavy lead	11 00	10 75
Tea lead	7 00	7 00
Aluminum	35 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in. and larger	$7 10
Structural rivets, as above	7 00
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	35
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$100 00
Open-hearth billets	100 00
O.H. sheet bars	105 00
Forging billets	125 00
Wire rods	95 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		6 50
Spikes, ¼ and 5-16 in.		7 00

MISCELLANEOUS.

Solder, strictly	0 38
Solder, guaranteed	0 41
Babbitt metals	16 to 65
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drum	4 35
White lead, pure, cwt.	19 00
Red dry lead, 100-lb. kegs, per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 62½
Linseed oil, raw, single, bbls.	1 27
Linseed oil, boiled, single bbls.	1 30
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery Cloth	list plus 33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.37
British Manila Rope	.31
New Zealand Hemp	.31
Transmission rope, Manila	.43
Drilling cables, Manila	.39
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks	list plus 30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 50%; headers, 60; flanged unions, 40; malleable bushings, 50; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$11 00	$11 00
Sheets, black, No. 10.	11 50	11 50
Canada plates, dull, 52 sheets	11 00	11 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	11 70
Premier, 10¾ oz.	13 85	12 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

	B
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$10 90
Connelsville Foundry Coke	...
Steam Lump Coal	8 50
Best Slack	8 05

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$33 00	....
1¼ in.	36 00	....
1½ in.	38 00	32 00
1¾ in.	38 00	32 00
2 in.	45 00	33 00
2¼ in.	48 00	35 00
2½ in.	50 00	38 00
3 in.	58 00	45 00
3¼ in.	....	53 00
3½ in.	70 00	55 00
4 in.	82 00	67 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	13
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	11

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No.1	1 50
Leather in sides	1 35

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THE MARKETS AT A GLANCE

DEVELOPMENTS at Washington have in many respects an important bearing on the situation in Canada, and the actions of the American Government are being followed closely locally on this account. The steel market is quiet and buying has fallen off pending a definite announcement in regard to prices. There is also considerable uncertainty as to the amount of steel available for private consumers after Government needs have been provided for. This uncertainty and high prices are restricting business and the market will be unsettled until the situation clears up. It is freely predicted that steel prices have about reached the top, but this depends largely on the action of the American Government in its influence on the steel trade. The pig-iron market is marking time pending developments at Washington and the demand has fallen off in view of the possibility of lower prices. The local situation is unchanged and prices are still withdrawn. The scrap market continues weak with a tendency to lower prices, although in the meantime quotations are unchanged. Non-ferrous metals are weaker and prices have declined throughout the list. Consumers are keeping out of the market in anticipation of lower prices following action by the American Government in this direction. For this reason the markets are unsettled and the outlook is uncertain. The machine tool market is quiet with no feature of outstanding importance.

Montreal, Que., July 23, 1917.—While the adjustment period is in progress in the United States the markets maintain a pronounced condition of unsettlement, which has not been confined to America alone but has also effected general conditions here in Canada. Industrial conditions to-day are dependent largely on the attitude to be taken by the American Government concerning the prices to be paid for its war material requirements. No definite decision has as yet been arrived at and meantime the trading is more or less of a hand-to-mouth nature, buyers being reluctant to place contracts until a final understanding has been reached.

Pig Iron

The week's market in pig iron has been very quiet, no doubt affected by the developments across the line and the attitude of the American Government in the proposed regulation of prices on all war commodities, either of a direct or indirect nature. In view of early possibilities, the market has not been active, which in comparison with the recent excitement may foreshadow a stationary, if not a declining condition. The quotation on Pittsburgh basic has declined $1 on the week, the price being now $54.95 per ton. Bessemer is also 50 cents a ton lower, being quoted at $57.95. Low phosphorus f.o.b. Lebanon is now quoted at $85, or five dollars below last week. Canadian conditions are unchanged with producers still out of the market.

Steel

The warm weather is affecting the production of steel to some extent and curtailment is more pronounced through strikes and labor shortage. With the selective draft system being put into force in the States, it is expected that some readjustment will be necessary to maintain the present industrial strength of the country. The announcement that the American Government will pay a price decided on by the Trade Commission, after a thorough investigation into

the cost of production, has placed the market in a somewhat better position, but owing to the inability of producers to meet the requirements for prompt delivery, the situation continues very quiet as consumers are not over anxious to place orders for far future delivery. The fact also that the finding of the Commission may be on a much lower basis than that prevailing at the present offers some possibility that the cost to domestic consumers may be more on a par with what the Government will have to pay.

Owing to the abnormal demand for all kinds of steel, the price for domestic consumption may not be affected unless specially stipulated in the forthcoming regulations. One prospect however appears, that further advances may be curbed by the attitude of the Government, as the possibility of lower prices being announced may have the effect of restricting a climb to still higher levels. The condition of the steel market for some time to come will however, not provide any considerable relief to the users of steel. with the exception that they may be able to place orders at a fixed price for delivery at mill convenience. The general market is on the same level as the previous week and few changes are reported. American regulations will not directly effect Canadian producers, but owing to the fact that many consumers are dependent on the States for their supplies, trade here are particularly interested in developments across the line. The quiet undertone is reflected in the entire absence of price advances; in fact, the quotations on rolling billets, Philadelphia, has declined $5 per ton, the price this week being $105 per ton. The coke situation is also easier, spot furnace having declined $2 during the week, the quotation being now $12 per ton. The Canadian situation is practically unchanged, prices remaining firm with delivery not much improved. The past few days of very warm weather has somewhat curtailed production in raw and finished material.

Metals

The metal market is still influenced by the situation in the States, as pending developments tend to maintain considerable uncertainty as to early future conditions. This nervousness has been reflected throughout the general market in the weakness that has been evident in nearly all the metals. The Canadian situation is not so affected by American conditions, but the local markets must nevertheless experience some of the reactions of the basic market. Copper is quieter and weaker. Tin is comparatively firm but with an easier tendency. Spelter is inactive and weaker. Lead is declining on poor demand. Antimony is weaker on an inactive market.

Copper.—Despite the fact that the American Government have virtually come to an agreement regarding the price to be paid for their copper requirements based on the finding of the Trade Commission, domestic consumers are still in the dark as to their position with the producers, as there is apparently no definite understanding as to the price to be paid outside of Government requirements. The tone of the market however, would seem to indicate that a settlement price would be made on a much lower basis than that at present prevailing. What market there is seems to be made by the presence of resale metal, as inquiries for metal have not been followed by the placing of orders, and the situation is therefore very quiet. New York quotations on lake have declined one cent on the week, and electro and castings are 2¼ cents lower; the respective prices being 29 cents, 27¼ cents and 26½ cents per pound.

The market here is active but prices have followed the trend of the American market. Lake and electro are quoted at 35 cents, and castings at 34 cents per pound, a decline in each case of one cent per pound.

Tin.—The situation in this metal continues firm although an undertone of weakness has followed a week of light activity. Spot supply is none too plentiful but early arrivals are expected and future positions are easier. New York has been a little unsettled but the present quotation of 62½ cents shows an advance on the week of ½ cent per pound. The market here is fairly active with prices unchanged at 62 cents per pound.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

Spelter.—Consumers are very reluctant about filling their requirements and what market exists is being made by the dealers who are apparently stocking up a few supplies, influenced by the comparatively low price level prevailing. The uncertainty as to what the attitude of the American Government will ultimately be regarding the regulated prices of this metal, has resulted in a very dull market, which is likely to continue until a definite announcement has been made. Owing to the total absence of consumer buying, the New York market this week is ⅜ cent lower, the quotation being 8½ cents per pound. The local market is quiet but dealers continue to quote 11 cents per pound.

Lead.—Producers continue to make concessions on future positions, but very few buyers are in the market. The situation is marked by pronounced inactivity and prices are still declining. New York reports a further decline of ¾ cent on independent quotations, the nominal price being 10¼ cents per pound. The "trust" prices is firm at 11 cents per pound. The local market is steady on a decline of ¾ cents, the current quotation being 13 cents per pound.

Antimony.—This metal is dull on poor demand, the market being very dull with prices going lower. New York is quoting the nominal figure of 15 cents, a decline of one cent on the week. Local antimony has a weak undertone but present prices are unchanged at 20 cents per pound.

Aluminum.—The market in aluminum is steady with prices firm but having a slight undertone of weakness; the nominal quotation in New York having declined approximately 2 cents per pound. Dealers here are quoting last week's price of 70 cents per pound.

Machine Tools and Supplies

Canadian machine tool activity is confined to a normal business in general engineering equipment, with a few small orders for munitions machinery. Much of the present activity is for machinery required to meet the demands of the ship building trade, as many shops, both large and small, are more or less engaged in this expanding industry. Owing to a diversity of conditions, the cost of all classes of machinery continues to be the most important factor in the securing of equipment. Conditions in the States have made it increasingly difficult to obtain machine tools from that source and Canadian machine tool plants are quite busy endeavoring to meet the immediate needs. Recent developments have decreased the quantity of second hand machinery on the market. Supplies of all kinds are still in heavy demand, with prices firm or higher.

Scrap

The market in old materials, more especially that of metals, is suffering from inactivity, and prices are consequently declining. Added to this is the prolonged period of uncertainty that has accompanied the developments in American political circles in connection with the contemplated price regulation of war and kindred materials. Pending an announcement by the authorities, the New York market has shown a tendency to weaken and quotations have generally declined. The local market is easier on metals, but iron and steel scrap continues firm. Heavy coppers and old brass are one cent lower than last week: also machine compositions. Old lead has declined ½ cent during the week.

Toronto, Ont., July 24.—The industrial situation continues satisfactory in regard to the volume of business, and the trade returns are exceptionally gratifying in spite of the various handicaps, such as shortages of labor, raw materials and coal. Unfortunately there is little prospect of any real relief owing to prevailing conditions, and the industrial situation will continue to be adversely affected. Manufacturers using iron or steel are in a difficult position owing to the increasingly heavy demand for these materials for munitions and other war

purposes. Steel prices are very high and deliveries more backward than ever, while, in addition, the shortage is causing considerable inconvenience and restricting production.

Steel

The situation in the steel trade has not improved, and there is a marked absence of activity in the market. The uncertain outlook in regard to prices is restricting business, while the usual summer dullness is also affecting the situation. The steel mills in Canada are not affected by the unsettled situation, but the output will be somewhat curtailed during the hot weather, which will tend to further decrease the available supplies of steel for private consumers. The increase in tonnage of steel required for war purposes is making it more difficult for the mills to promise deliveries to their regular consumers, and because of this uncertainty there has been a considerable falling off in buying. The prevailing high prices of steel are also curtailing business, as manufacturing costs are getting almost prohibitive for many lines. Definite action by the American Government in regard to the fixing of prices on steel products is awaited with interest and some anxiety, as it is not known what effect the Government's decision will have on the market. No further statement has been given out, and it does not appear probable that there will be any important developments for some time. In the meantime the market is very dull, with consumers holding off, pending developments. The opinion is held by many in the trade that prices have about reached the top, and that adjustments in a downward direction are probable. Whether this contingency will materialize or not depends to a large extent upon the action of the American Government as regards the extent of its ability to control prices, more especially to private consumers. There have been no price changes this week.

The situation in sheets is getting tighter in the primary market, as Government requirements of sheets are steadily increasing, and shipments to private consumers are reduced proportionately. Several of the larger sheet mills have been practically out of the market for several months as active sellers. Prices continue practically nominal and are unchanged.

The steel market in the United States is dull and comparatively little new business is being placed pending the final action of the American Government in fixing prices. If the Government has the power and thinks that it is feasible and desirable to fix prices of steel products sold direct to private consumers, there would likely be a general downward readjustment of prices. On the other hand, if the Government decides not to interfere in this direction, prices may continue to advance, although perhaps not so rapidly as has been the case in recent months.

Pig Iron

The market is dull for much the same reason as that of the steel situation. It is not likely that there will be much activity until the American Government has reached a decision in regard to prices for iron, and until the Government policy as to private transactions in iron is definitely made known. The local situation is unchanged.

Scrap

There is no change in the situation in the market for old materials. The market is stagnant and prices have a weak tendency for all metals except heavy melting steel and machinery cast iron, which are holding firm. Consumers are practically out of the market, and are not showing any interest.

Machine Tools

Seasonal quietness prevails in the machine tool trade, but the situation in regard to prices and deliveries shows no improvement. The increased activity in the machine tool market in the United States is affecting the local situation more than ever, and deliveries are getting more backward. Prices of machine tools are advancing on account of the high cost of all raw materials. There is a fair demand for aeroplane-making equipment, while some inquiries have been received recently by local machinery houses for motor car building tools. Tenders are being called by the Military Hospitals Commission for machine tools for the Hart House, Toronto, for a workshop for returned soldiers, which is being established.

Supplies

Prices of machine shop supplies continue very firm, and dealers report considerable difficulty in obtaining a number of lines. Ball pein machinists' hammers have advanced, the new prices being as follows:—6-oz., 8-oz., and 12-oz. are $7.65 per dozen; 1-lb., $8 per dozen; 1¼-lb., $8.40 dozen; 1½-lb., $9 per dozen; 1¾-lb., $10 dozen; 2-lb., $10.60 dozen; 2½-lb., $12 dozen. An advance of approximately 10 per cent. has been made on American coil chain, while Challenge and carborundum grinders have also advanced. An advance of approximately 10 per cent. has been made in vises of various descriptions, such as machinists', parallel, pipe and blacksmiths'. Coppered oilers have been advanced a similar amount, namely, 10 per cent. Higher prices in these lines is due largely to the condition in the steel and raw material markets. Steel and wood tackle blocks have advanced 10 per cent., while "Disston" hack saw blades are also 10 per cent. higher.

Metals

The metal markets are in a very unsettled condition in New York on account of the fear that the American Government will control prices. In the event of this happening there is little doubt that there would be a general readjustment of prices in a downward direction. This condition is reflected locally and prices of all metals have declined. Consumers are buying hand-to-mouth meantime, and no marked activity is expected until the situation becomes more settled.

Copper.—In view of the possibility of considerably lower prices on copper, consumers are keeping out of the market, only covering for more urgent requirements. It is predicted that the Government will compromise with producers at 23c per lb. in fourth quarter metal. The consumption of copper, however, is particularly heavy and production pretty well controlled, which will help to support the market. Copper has declined 1c locally, lake and electrolytic being quoted at 35c and castings 34c per pound.

Tin.—A decline in the London market has been followed by lower prices locally. No announcement has yet been made by the tin committee at Washington. Tin has declined 2c locally, and is now quoted at 63c per pound.

Spelter.—The market is dull, and prices have declined a half cent. The demand is light, as buyers are keeping out of the market owing to the uncertainty with regard to the Government price situation. Local quotations, 11c per pound.

Lead.—The market is still weaker and prices have been forced down. The outlook is uncertain, and the tendency is toward still lower prices. Lead has declined 1c, and is now quoted at 13c per pound.

Antimony.—The market is heavy, with stocks in excess of the demand, the result being that prices have declined 4c, making the current quotation 20c lb.

Aluminum.—The market is quiet and lack of buying support has weakened it. Aluminum has declined 1c, and is quoted at 64c per pound.

Sydney, N.S., July 20.—C. A. Magrath, the newly appointed Fuel Controller was in Halifax on July 13 and 14, and convened a meeting of the coal operators of Nova Scotia on these dates, at which every operating colliery was represented. Mr. Magrath, before proceeding West, wished to satisfy himself that the coal requirements of Nova Scotia and the Maritime Provinces, including Newfoundland, could be met by Nova Scotia's own production, and on this

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MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

point the coal operators were able to give assurances that this could be done. The production of coal in Nova Scotia was estimated in the memorandum given to the Controller at almost six million tons, or about 200,000 tons less than last year. As the export to Montreal and St. Lawrence ports will not exceed 200,000 tons, compared with 490,000 tons in 1916, it is evident that the quantity of coal available for use in the Maritime Provinces will be for all practical purposes identical with the quantity available last year. The requirements of the steel industry will be about the same as 1916, and the amount of coal supplied as steamships bunkers will not greatly exceed that supplied last year.

Output Distribution.

The enquiries of the Fuel Controller on this occasion were confined to the needs of the Maritime Provinces and Newfoundland, but it will be noted that any assistance that can be given to points outside the Maritime Provinces is extremely small, and even the small tonnage available is destined almost exclusively for the use of the railways.

The operators undertook not to increase the price of coal beyond the current maximum prices, namely $5.00 per ton for screened coal on the mainland, and $4.75 to $5.00 per ton for screened coal in Cape Breton. Run mine coal is fixed at $4.75 at the mainland collieries and $4.50 to $4.75 per ton at the Cape Breton collieries, all prices being per net ton f.o.b. at the pit-mouth. These prices are subject to the continuance of present conditions of wages and cost of material, but any change in price necessitated by extraordinary conditions which increase the cost of mining, is first to be submitted to the Controller. It will be seen that these prices represent only a moiety of the price delivered to the consumer, but the question of transportation costs is one that is not under the control of the coal operators.

The operators estimated the shortage of production due to the lack of men at 1,750,000 tons over the calendar year 1917, and stated the output could be restored to the normal rate of production provided men could be obtained—which is of course a sheer impossibility so long as the war lasts.

New York, July 23.—The inharmony at Washington over the shipbuilding programme has delayed for another precious week the placing of contracts to construct two Government shipyards and 400 cargo boats, the country's need of which is most imperative. Two groups of large financial interests are willing, ready and eager to assist General Goethals, general manager of the United States Emergency Fleet Corporation, to make an immediate start to carry out the plans he has outlined. One of these groups include the American International Corporation, which is already building a large number of wooden boats for the Government in conjunction with the American Bridge Co. and the McClintic-Marshall Construction Co. The other combination includes the Submarine Boat Co., the Lackawana Bridge Co., the Worden & Allen, the Phoenix Bridge Co., the Hay Foundry & Machinery Co., and several independent fabricating shops. It is believed that President Wilson will take long-delayed action this week to settle the controversy between Gen. Goethals and Chairman Denman, of the Shipping Board. In the meantime, the two large shipbuilding corporations concerned have not been idle, but have placed additional large contracts for cranes, transmission machinery, power equipment and machine tools that will be needed eventually.

Several other shipbuilding interests are actively in the market for machinery, the most important inquiries coming from the Foundation Co., which has just secured a contract to build 40 steel cargo boats for the French Government. These boats are expected to be constructed at the Newark yards. It will be recalled that the Foundation Co. recently secured orders for 100 ships from the Entente Allies, which boats will probably be built in yards near Vancouver, B.C.

The Downey Shipbuilding Co., with a Government contract to build ten steel ships, has made its final payment of $1,300,000 to secure the Millikin structural plant on Staten Island, and is now in the market for cranes to be installed at the six ship ways, and for machine tools to equip the eight buildings, which are to be erected at once.

Equipment Purchases Heavy.

The Newport News Shipbuilding & Drydock Co. has added $50,000 worth of machine tools to its recent heavy purchases of shop equipment. The Globe Shipbuilding Co. is rushing work on the equipment of its shipyards at Superior, Wisconsin, and expects to begin construction of ocean-going cargo boats before the end of the month. The United States Navy Department continues to place orders for tools for its $4,000,000 machine shop at the Norfolk Navy Yards. This shop is designed to be the largest in America, with five acres of floor space, according to Admiral Harris, chief of the Bureau of Yards and Docks. The Navy Department is also buying power equipment and transmission machinery for the power house and drydock at Norfolk. The Government will spend approximately $30,000,000 for the improvements to the Norfolk Navy Yards.

The heavy sales made by manufacturers of electric cranes are indicated in the bids recently made to the Navy Department on travelling cranes to be installed in the structural shop at the New York Navy Yard; the builder's specified deliveries to be made in 180 to 400 days. A feeling is prevalent in the trade that the oversold condition of the machinery and machine tool manufacturers will prevent the equipment of shipyards as speedily as anticipated by the Government, but it is understood that the Navy Department will not hesitate to commandeer plants whenever necessary.

Manufacturers of ordnance, shrapnel and high explosive shells have received additional orders from the Government, and have placed new orders for tools, and others are now actively in the market for shop equipment. The America Brake Shoe & Foundry Co. has put out a list for 240 machines, and an Ohio manufacturer is in the market for 60 machines. The Erie Forge Co. is buying tools for making six-inch guns. The T. H. Symington Co. has just received an additional order from the Government, and is buying machinery heavily in New York.

Pittsburgh, Pa., July 21.—The stagnation in the markets which had developed just ahead of our report of a week ago has continued during the past week, and has, indeed, been intensified. There has been practically nothing done in pig iron except a few small transactions in prompt deliveries together with a little reselling by consumers at prices under the regular furnace levels. For two or three weeks past there has been nothing of importance done in billets or sheet bars. All the finished steel markets are very quiet as regards actual transactions.

Price Regulation.

The cause commonly assigned for the stagnation in the markets is the statement of President Wilson, published throughout the country on the morning of July 12, appealing to mine operators and manufacturers to "forego unusual profits," and enunciating the doctrine that there should be one price for both the Government and private consumers. Taken in connection with the knowledge that prices for Government steel would be fixed at a relatively low level, compared with the recent market, it was assumed that prices to the general trade would, therefore, be at a comparatively low level also.

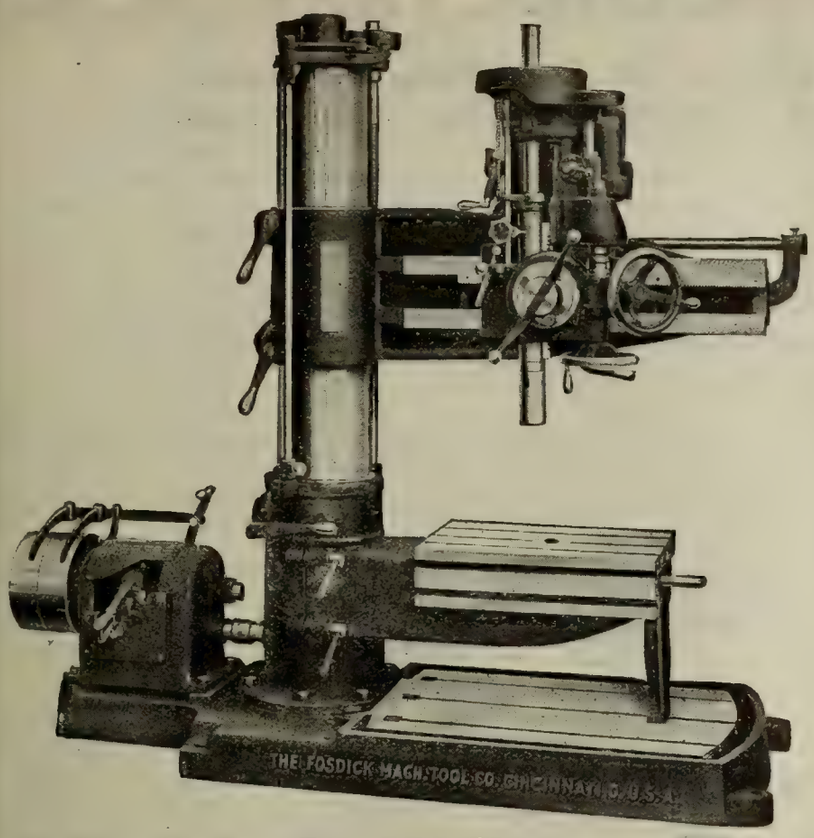
While all the surface indications are that the stagnation is due to the President's statement, it must be admitted that there were contributing causes. The buying of finished steel products for regular forward deliveries, such as the large mills could make, practically ceased two or three months ago, sales of steel lately having been almost entirely of small lots for delivery in from two to five months, such deliveries as some of the smaller mills could make. The buying of pig iron had come to be on a reduced scale. There is every reason to believe that the buying movement was rapidly petering out, and that buyers were coming to the conclusion that they could not stand the pace and had better wait developments. The statement of the President served to crystallize sentiment.

Thus the situation was fully ripe for a cessation in activity, particularly so as the proverbially dull summer months had been entered upon, and President Wilson's appeal came at the psychological moment. He is a psychologist, which has made him an astute politician. Perhaps he knows more about the psychology of business than he would naturally be entitled to know considering his training and experience.

Mills and Furnaces Booked Months Ahead

The mills and furnaces are very well filled with business for months to come,

(Continued on page 64.)



Radial Drills

for Immediate Shipment

1 New 4-ft. Mueller
Heavy Duty Speed Box Drive

3 New 5-ft Reed-Prentice
Standard Speed Box Drive

Write for Prices

The A. R. Williams Machinery Co., Limited

63-66 FRONT STREET WEST, TORONTO, ONTARIO

A Salesman Always on the Job

IT is the constant dropping that wears the stone away. It is the constant knocking at the door of attention and favor that in the end gives you ready access to the good-will of buyers of your merchandise.

You can keep up a constant knocking—a bid for attention, a reminder of yourself, a spokesman of your message—this by using regularly

The FARMER'S MAGAZINE

No man whose customers and should-be customers are farmers should be absent from their attention. Their will and purpose to buy may mature at any time. The salesman on the spot stands the best chance to get the order.

All this you know, but—do you live up to the behest of your knowledge?

Let us tell you more about The Farmer's Magazine in a special letter.

N.B.—Objectionable advertising not accepted. Both editorial and advertising columns are closely censored to keep them clean and decent.

Published by

The MacLean Publishing Co., Limited
143-153 University Avenue, Toronto, Ontario

"Williams" List of Machine Tools

FOR IMMEDIATE SHIPMENT

New Lathes
3—16 x 8 "CISCO"
4—18 x 10 "CISCO"
2—17 x 8 Le BLOND
6—19 x 10 Le BLOND
6—21 x 8 Le BLOND
1—25 x 10 Le BLOND
6—24 x 12 C.M.C.
1—36 x 26 PITTSBURG (triple geared)

Used
3—16 x 6 CINCINNATI Q.C.G.
5—20 x 10 HINDMAN
2—20 x 10 LODGE & SHIPLEY (geared head)
8—22 x 10 PUTNAM
1—24 x 16 BERTRAM
1—27 x 16 REED PRENTICE
6—24" DAVIS Boring Turret Lathes
7—18" LIBBY Turret Lathes
No. 2 WARNER & SWASEY Turret
2 x 24 JONES & LAMSON Turrets

Automatics
2—2 x REED PRENTICE
3—2 x REED PRENTICE
10—2¾ CLEVELAND
18—6A POTTER & JOHNSON

Drills
New 28" BARNES
6—26" BARNES
3—25" SUPERIOR
1—22½" BARNES
1—24" AURORA
1—26" AURORA
2—D 1. COLBURN
3—D 8. COLBURN
1—New BUFFALO Heavy Duty

New Radials
1—4' MUELLER
3—5' REED-PRENTICE (speed box drive)

New Shapers
2—14" SMITH & MILLS
4—16" SMITH & MILLS
2—20" SMITH & MILLS
4—20" GOULD & EBERHARDT
4—24" GOULD & EBERHARDT
1—28" GOULD & EBERHARDT

Millers
New 3 H. Le BLOND UNIVERSAL
New No. 25 BECKER PLAIN
No. 2 CINCINNATI UNIVERSAL
No. 2 KEARNEY & TRECKER

Planers
36 x 36 x 11 INDUSTRIAL
36 x 36 x 12 C.M.C.
52 x 52 x 16 McKECKNIE BERTRAM (two heads)

Slotters
8½" BERTRAM
10" BERTRAM
16" SMITH, PEACOCK & TANNET

Miscellaneous
3000 lb. MORGAN Steam Hammer
BERTRAM Horizontal Boring Machine
32' LONDON Vertical Boring Mill
NEWTON Vertical Miller

This is only a partial list. Write stating your needs.

A. R. WILLIAMS MACHINERY CO., LIMITED
64 Front Street West **Toronto, Ontario**

If any advertisement interests you, tear it out now and place with letters to be answered.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Hull, Que.—Fire at the Hull Iron & Steel Co.'s plant recently did about $5,000 damage.

Windsor, Ont.—The Maxwell Motor Co., of Detroit, Mich., will erect an automobile factory here.

Shawinigan Falls, Que.—The Electric Products, Light & Power Co. propose building an extension to their plant here to cost $56,000.

Chatham, Ont.—The plan to establish a municipal cold storage plant has been abandoned as the Department of Agriculture is not granting subsidies for this purpose.

St. Lambert, Que.—This town will get a cotton and textile plant, if the people will vote the company a bonus of $95,000 and a tax exemption for twenty years. About seventy-six acres have been acquired as a site between Lapiniere road and the G.T.R. tracks.

Winnipeg, Man.—A plant will probably be installed near here for treating lignite and converting it into fuel. Manufacturers have keenly interested themselves in the matter and steps are now being taken to secure the necessary finances to get the requisite plant into operation. The research council has asked the federal government for a $500,000 grant for this new department, and a portion of the grant will be for the construction of the coal-treating plant.

ELECTRICAL

Kingston, Ont.—The Utilities Commission hopes to have Hydro-Electric power in Kingston by October. Delays have been caused owing to the difficulty of getting electrical apparatus.

Brantford, Ont.—Two weeks must elapse after the passing of the Township Hydro-Electric by-law before any action can be taken toward the erection of equipment or installation can be proceeded with by the Township Council.

MUNICIPAL

Woodstock, N.B.—A by-law will be submitted to the ratepayers on Aug. 10 to authorize the installation of a mechanical filtration plant.

St. Marys, Ont.—At the special meeting of the Town Council the by-law giving a bonus of $5,000 to the Thames Quarry Co. was carried. The by-law will be submitted to a vote of the ratepayers on August 18.

Owen Sound, Ont.—At a special meeting of the Town Council held recently it was decided to grant a loan of $75,000, in three instalments, to a company who propose building a factory here for making screws by a new process.

Toronto, Ont.—The Board of Control has received only one tender for the construction of the temporary single track line extension of the Bloor street civic car line from Quebec Avenue to Runnymede Road. The contractor will do the work for $7,655, and will supply second-hand T rails and second-hand quality of ties. If the city supplies the rails, bolts, spikes and plates, there will be a reduction of $2,500 in the contract price. The contractor agrees to complete the work in twenty days.

PITTSBURG MARKET LETTER

(Continued from page 108.)

and consumers are likewise covered. There is every prospect that there will be a stagnant market for months, until a new alignment occurs. No once can tell whether the pressure will come first from producers, to sell, or from buyers, to buy, but in all the past, once the market has become stagnant at a high level, the staying powers of the buyers have easily been the greater.

At this time it is to be considered that the ordinary consumptive requirements of the country are decreasing rapidly. The report of the Bridge Builders' and Structural Society showed fabricated steel lettings in June equal to only 47½ per cent. of the fabricating capacity, about 180,000 tons per month, against 56½ per cent. in May. The railroads have ceased buying altogether. Ordinary building has almost stopped.

Government requirements in steel for war purposes are not involving as large a tonnage as was estimated from 30 to 60 days ago. When was was declared, there were estimates that the requirements would be from 5 to 15 per cent. of the output. Later the estimates were swelled to a possible 40 or 50 per cent. Now the estimates are lower again. Thus, if the Government were to take out of the situation 25 per cent. of the production and the ordinary requirements were to decrease only 25 per cent. the situation would be unchanged. The reduction, however, promises to be much more than 25 per cent., hence lower prices are practically assured, when the market against develops itself.

Pig Iron.

Furnace quotations are unchanged, but practically nothing is being done. Resale Bessemer iron has gone at $1 or $2 below furnace quotations. Market quotations can hardly be said to be changed, but instead of its being a trading market, it is now merely a nominal asking market.

Steel.

Based on transactions several weeks old, billets are $95 to $100, and sheet bars $105 to $110, but there has been nothing done lately. It is doubtful whether any large tonnage of billets, say 100,000 tons, could be sold even at $75. Finished steel products for early deliveries are quotable at same prices as formerly. The mills, being sold up, have no incentive to quote lower prices until it is seen that there would be a reasonable amount of buying.

GENERAL

Listowel, Ont.—The Perfect Knit Mill Co. will build a factory here.

New Westminster, B.C.—Fire at the Glenrose Cannery recently caused a loss of $1,000.

Toronto, Ont.—The Dominion Envelope Co., has been given a permit to erect a factory at Duchess street at a cost of $40,000.

Davidson, Sask.—A. C. Paulson & Co. will extend their elevator here to increase the capacity to 40,000 bushels. All the present machinery will be replaced with new equipment.

Montreal, Que.—Confirmation of the rumor recently reported that the Dominion Textile Co., was interested in the alleged cotton mill project for St. Lambert, was received in an interview with F. G. Daniel, the general manager. The company contemplates the erection of a mill with an installation of 100,000 spindles, and 3,000 looms. It is expected that the number of hands employed would range from 1,500 to 2,000. The cost of the undertaking, including the machinery, based on pre-war prices, will be about $2,750,000.

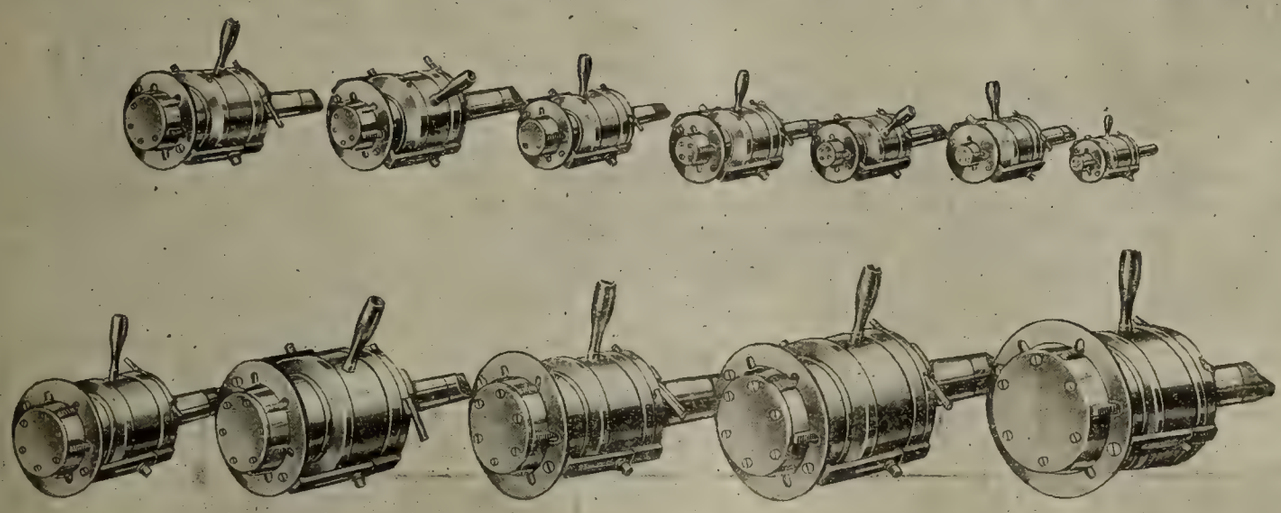
TENDERS

Dorval, Que.—Tenders will be received until July 31, for the construction of a filtration plant for the Town of Dorval, Que. Plans and specifications may be seen at the office of Dupont, Roy & Beaudoin, engineers, 225 St. James, Montreal.

Montreal, Que.—Tenders will be received up to the July 27, by the East End District Commissioners of the Catholic School Commissioners of Montreal, for alterations in the heating system of the St. Paul School, 2nd Avenue, Viauville, Paroisse St. Clement. For plans and specifications, apply to the Modern Heating & Engineering Company, Limited, 83 Bleury Street, Montreal.

Toronto, Ont.—Tenders addressed to the Secretary-Treasurer of the Board of Education, will be received until July 27, for steam fitting, plumbing, electrical work, tinsmithing, castings for repairs to furnaces and other trades required for midsummer repairs. Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, Administration Building, 155 College Street, Toronto.

GEOMETRIC TAPS



FOR U.S.

SIZES ¾" TO 6"—AT A U.S. ARSENAL

This illustrates only one of the groups of Geometric Collapsing Taps that have gone into United States Arensals and Navy Yards to bear out the reputation that attaches to all Geometric Thread Cutting Tools.

These taps are equipped with the roughing and finishing attachment, a feature of Geometric Taps that are required for close work.

A micrometer scale adjusts them for a tight or loose thread. Because of the adjustable feature, Geometric Taps always produce accurate threads, no matter how often the chasers have been ground.

When ground beyond further use, the chasers may be replaced, while the tap remains as good as new.

Chasers recede automatically when the required depth of thread is reached.

Geometric Collapsing Taps can be fitted to Screw Machine or Turret Lathe, also live spindle.

Why not put your tapping proposition up to a Geometric?

THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

Toronto, Ont.—Tenders will be received at this department until July 21, for new boiler plant to be installed in the main boiler house, now in course of erection, and alterations to heating system, at the Hospital for Insane, Hamilton. Plans and specifications can be seen at this department and at the office of the Bursar of the Institution. H. F. McNaughten, Secretary, Public Works Department, Toronto.

Hamilton, Ont.—Tenders will be received up to July 30, for supplying and installing one 10 million Imperial gallon steam turbine driven centrifugal pumping unit; one synchronous motor; two transformers; switching apparatus; two venturi meters; two water-tube boilers, and one 10 million Imperial gallon motor-driven centrifugal pump, at Beach pumping station. Specifications and forms of tender can be obtained from office of City Engineer E. R. Gray.

Toronto, Ont.—Tenders will be received addressed to the chairman, Board of Control, City Hall, up to July 31, for the complete construction and equipment of a single track extension to the Bloor Street Division of the Toronto Civic Railway. Specifications and forms of tender may be obtained upon application at Room No. 313, Department of Works, City Hall, on payment of ten dollars ($10), this sum to be refunded upon return of specifications, forms of tender, and plans.

Halifax, N.S.—Tenders, addressed to J. W. Pugsley, secretary, Department of Railways and Canals, Ottawa, Ont., will be received up to July 25, for the construction of a freight shed extension at Halifax, N.S. Plans, specifications, and blank form of contract may be seen at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, at the office of the Chief Engineer, Moncton, N.B.; at the office of the Resident Engineer, Truro, N.S., and at the office of the Resident Engineer, Halifax Ocean Terminals, Halifax, N.S.

Toronto, Ont.—Tenders will be received by registered post only, addressed to the Purchasing Agent, Military Hospitals Commission, "D" Unit, 1 Queen's Park, up to 12 o'clock noon, on Thursday, July 26., for the following Work-shop Equipment, to be delivered to Hart House, University Bldgs., Toronto, during the week of August 24 to 31.

1—Browne & Sharpe (or Cincinnati) Universal Miller, No. 1 (with improved spiral dividing head and swivel vise).

1—McKenzie Engine Lathe, 14" x 6' with 8" four-jaw independent chuck.

1—Barnes Drill Press, 15", with chuck and arbor.

1—3-h.p. Motor, 110 d.c. compound wound (1,200 to 1,700 r.p.m.), (Westinghouse or General Electric).

1—No. 2 American Bench Gas Forge.

1—No. 3 Root's Acme Blower.

1—No. 2 "Perfect" power hack saw.

Set Stock and Dies, ¼" to ¾" (Little Giant).

Set Stocks and Dies, 1-64" to 14-20" (Little Giant).

1—Preston Dimension Saw, No. 125.

1—20" Sidney Band Saw.

1—Blount Speed Lathe, 11" x 5'.

1—Bench Emery Stand, 8" diameter x 1" wheel.

1—Universal Grinder, No. 1, with automatic feed (Le Blonde).

36 ft. of 1 7-16" Shafting, one pair couplings, five 16" hangers.

Tenders may be for all or part of the equipment above mentioned. Lowest or any tender not necessarily accepted.

T. HARBRON, Lieut.,
Purchasing Agent.

PUMPING EQUIPMENT REQUIRED

Tender forms, specifications and drawings have been received from D. H. Ross, Canadian Trade Commissioner, Melbourne, for the supply and delivery of pumping plant and equipment for the Commonwealth naval dockyard, Cockatoo Island, Sydney, N.S.W., and are open for inspection at the Department of Trade and Commerce, Ottawa (refer to File No. A-1901). Tenders addressed to either the Director of Navy Contracts, Navy Office, Melbourne, or the Director of Naval Contracts, care Commonwealth Naval Dockyard, Cockatoo Island, Sydney, N.S.W., close on October 10, 1917. The particulars are as follows:

Two main dock pumps with vertical spindle motors and control equipments.

One vertical spindle motor and control equipment.

Four sluice valves with four motors and control equipment.

Two drainage pumps with motors and equipment.

Two air exhaust pumps with motors and equipment.

One enclosed motor and equipment for dock caisson.

BUILDINGS

Toronto, Ont.—The Imperial Oil Co., will construct a one storey exhibition building at 56 Church street to cost $35,000.

Toronto, Ont.—The Women's Cottage Hospital, 125 Rusholme road, have received permission to extend their premises at a cost of $30,000.

Toronto, Ont.—The Canadian Hanson Van Winkle Co., have been granted a permit to erect an office building and garage at 12 Morrow avenue, to cost $8,000.

Toronto, Ont.—Construction work on the Harbor Commission office building, which is being erected just to the east of the T. Eaton Co.'s dock on the waterfront is now well under way. It is hoped that the building will be ready for occupation by the end of next January.

RAILWAYS—BRIDGES

Three Rivers, Que.—The Three Rivers Shipyard Co. will establish a shipbuilding plant here.

St. Catharines, Ont.—The G.T.R. are to build a modern station building here. Work will be started at once.

St. Catharines, Ont.—The by-law authorizing the construction of an extension of the N.S. & T. R. local line, has been passed by the Council.

London, Ont.—The London Railway Commission has stated that it would put down a switch into Beattie Bros.' factory at Chelsea Green on the usual terms.

Toronto, Ont.—Four new steel bridges must be built along the Toronto-Hamilton highway to replace the old structures now in use, and the Ontario Railway Board has been asked to apportion the cost. The spans of the new bridges vary from 100 to 140 feet. There is a new bridge to be built over the Mimico Creek, one over the Etobicoke Creek, another across the Credit River, and the fourth over the Twelve Mile Creek at Bronte.

St. Catharines, Ont.—At a special meeting of the City Council, a motion was carried that the City Council join with Lincoln County Council in forwarding a memorial to the Minister of Railways and Canals, asking that safety devices, in the way of gates or watchmen be placed at each of the Welland Canal bridges, and also that the Queenston street bridge, where recently a serious accident occurred, should be replaced with a wider bridge to accommodate vehicular and pedestrian traffic.

AUXILIARY MACHINERY REQUIRED.

Tender forms and specifications have been received from D. H. Ross, Canadian Trade Commissioner, Melbourne, for supply and delivery of auxiliary machinery for the Flinders naval base, via Melbourne, Victoria, and are open for inspection at the Department of Trade and Commerce, Ottawa (refer to File No. A-1901). Tenders addressed to the Director of Navy Contracts, Navy Office, Melbourne, close on October 24, 1917. The particulars are as follows:

Two electrically-driven air pumps, with complete set spare parts.

One steam driven air pump, with complete set of spare parts.

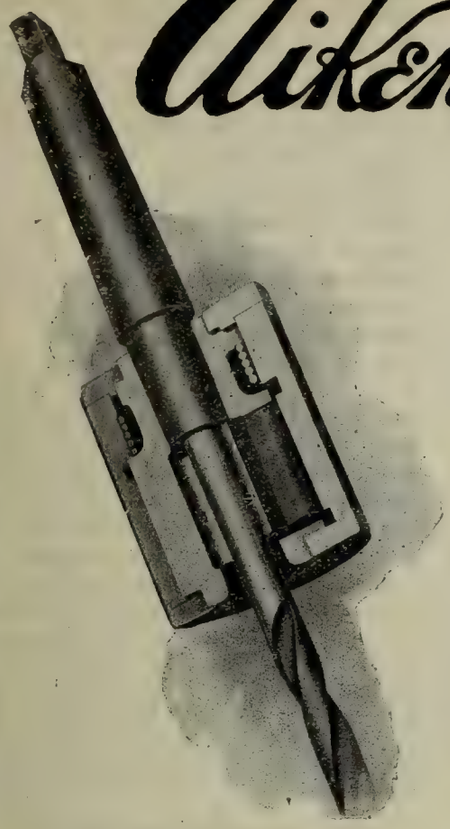
Two small circulating pumps.

One large circulating pump.

One large feed pump, with complete set of spare parts.

One small feed pump, with complete set of spare parts.

One oil-fuel pump with complete set of spare parts.



Aikenhead's New Chuck

Will stop you losing your drilling profits

Minutes mean profit—are you losing minutes? There is no loss of time in tool changes when you use a

WAHLSTROM CHUCK

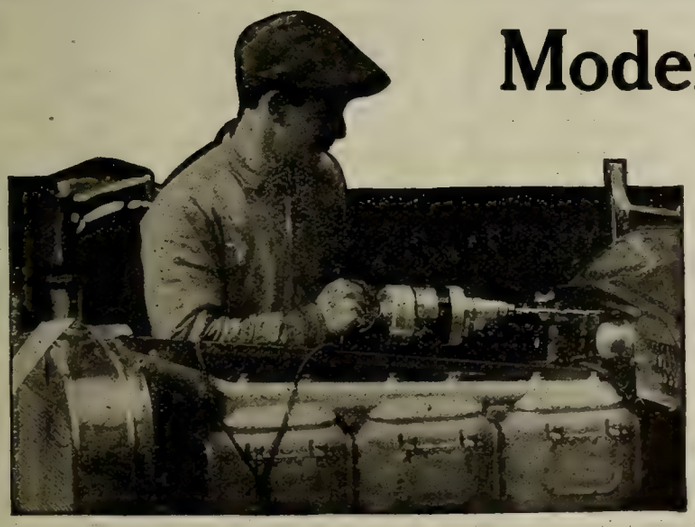
It is entirely automatic in its action — tool changes may be made without stopping the spindle—just grasp the shell of the chuck with one hand and make the tool change with the other. The change is made in a tenth of the time required with the ordinary chuck—and the tool automatically centers itself.

The Wahlstrom comes in two types—one for straight shank tools —the other for Nos. 1, 2 and 3 M.T. shank tools—they are both "Production Increasers," which demands your attention. Write for information now.

AIKENHEAD HARDWARE LIMITED

17, 19, 21 Temperance Street - Toronto, Canada

Modern Drilling Methods



By constructing the "Van Dorn" Portable Drill 100% overstrength, we have made great strides in promoting the efficiency and utility of a shop.

The "Van Dorn" Universal Portable Drills consume power only when in operation, and may be attached to any lamp socket.

The special fan-cooled "Van Dorn" motor is capable of 100% overload. The switch is quick acting.

Sticking and fusing of contacts practically eliminated.

Phosphor bronze and ball bearings. Hardened gears.

We will gladly forward any information you may desire regarding portable drills, grinders, blowers, die filers, riveters, etc. Write us to-day.

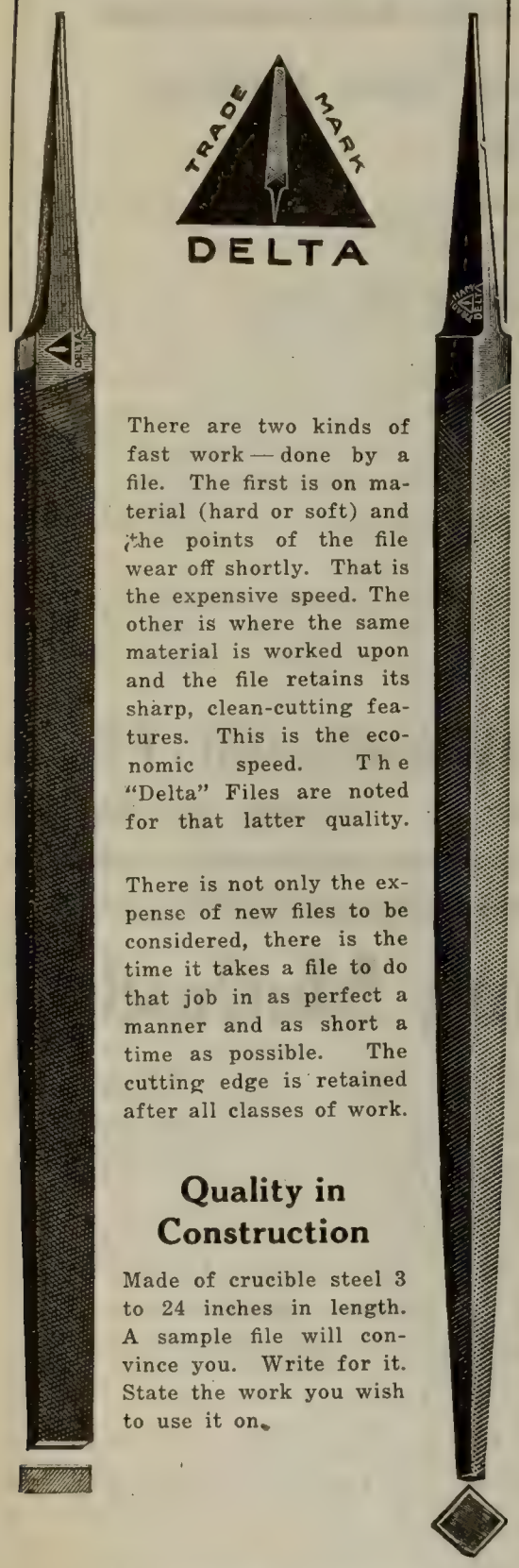
Aikenhead's

17, 19, 21 TEMPERANCE STREET
TORONTO, ONTARIO, CANADA

Canada's Leading Tool House

If any advertisement interests you, tear it out now and place with letters to be answered.

Fast Work



There are two kinds of fast work — done by a file. The first is on material (hard or soft) and the points of the file wear off shortly. That is the expensive speed. The other is where the same material is worked upon and the file retains its sharp, clean-cutting features. This is the economic speed. The "Delta" Files are noted for that latter quality.

There is not only the expense of new files to be considered, there is the time it takes a file to do that job in as perfect a manner and as short a time as possible. The cutting edge is retained after all classes of work.

Quality in Construction

Made of crucible steel 3 to 24 inches in length. A sample file will convince you. Write for it. State the work you wish to use it on.

All Leading Jobbers

Delta File Works

Philadelphia, Pa. U.S.A.

Can. Agents:

H. S. Howland, Sons & Co., Toronto; Starke, Seybold, Montreal, Quebec; Wm. Stairs, Son & Morrow, Halifax, N.S. Merrick Anderson, Co., Winnipeg, Man.

TRADE GOSSIP

The Eastern Machinery Co. of Montreal, has increased its capital stock to $95,000.

Tungsten Prices Advance. — The demand for tungsten continues active with only light supplies of ore coming on the market. Prices have advanced under buying pressure to between $22 and $23 for Wolframite and $26 for Scheclite. Inquiries are in the New York market to cover the balance of the year and a portion of next.

Cobalt, Ont.—The Dominion Reduction Co. of Cobalt, expect to have their hot dern furnaces for the treatment of the concentrates from their oil flotation process in operation within the next few weeks. Experiments have proven very satisfactory, and the process will greatly facilitate the marketing of the produce of the oil flotation plants in the camp.

The Eagle & Globe Steel Co., sole Canadian agents for Arthur Balfour & Co., Sheffield, England, have moved their Toronto office and warehouse from 373 Front street East, to more central and commodious premises at 36 Colborne street which will enable them to deal more effectively and promptly with the increasing business. John L. Milner. Ontario representative is in charge of the Toronto office.

Big Order For Blankets.—Orders for $1,000,000 worth of blankets have been placed among Canadian manufacturers by the United States Government for army purposes, according to the head of one of the largest industrial corporations in Canada. Orders have been distributed with Penmans Ltd., and the Toronto Carpet Co., and the Smart-Woods Co. has been awarded a large contract for tents. The specifications were submitted to Canadian mills, with prices fixed by the United States Authorities.

Molybdenite Property.—Private advices from Halifax, N.S., state that Molybdenite mine has been discovered in that province, and after operating it on a small scale for some time it has turned out to be one of the richest in Nova Scotia. As this metal has increased greatly in value since the war the property has attracted considerable attention in interested circles, several people from the United States having inspected the property to which they were conducted by C. L. Normandin of Halifax, who is in charge of its affairs.

The International Engineering Works, Inc., Framingham, Mass., has purchased the plant and business of the International Engineering Works, a Canadian corporation, in the United States. The new company is organized under the laws of Massachusetts, with capital stock of $500,000, and has no connection with the Canadian company. J. Philip Bird, general manager of the National Association of Manufacturers, is president; Harry V. Bady, vice-president; Frew W. Chipman, treasurer; William H. Walker, sales manager.

India's Trade With Canada.—The Imperial Institute in London has been charged by the Secretary of State for India with an enquiry into the openings within the Empire for the various raw materials of India which have hitherto gone in large amount to enemy countries. Already one important result of this aciton is that tanners in Canada have stated that they are interested in the raw cowhides which formerly went from India chiefly to Germany, and from which a high-class leather can be manufactured. Another subject of importance to Canada is the possibility of direct trade with India in shellac.

Pine Oil in Northern Ontario.—Albert A. Grigg Deputy Minister of Lands and Mines for Ontario, has received a sample of red pine oil, manufactured in the north, which oil is extensively used to recover ore from the dumps in the mining fields. Before the war it had been obtained in Germany, but recently a variety made in California has been used. If it is found that the oil can be made economically from the red pine stumps of Northern Ontario, a new and important industry will no doubt be developed. In addition to the oil a black tar is extracted from the stumps and the remnants can be converted into an excellent charcoal.

Nova Scotia Steel Output.—The output of the Nova Scotia Steel & Coal Co., continues to reflect satisfactory progress. Tons of coal mined show an increase of 5,551 tons in the second quarter, as compared with the first. Steel ingots and finished steel forgings showed a large increase of 33,683 tons. Comparisons with the first quarter are as follows:

	2nd Q'ter	1st Q'ter	Ins.
Tons, coal ..	152,076	146,525	5,551
Tons, ore ..	14,238	12,177	2,061
Limestone ..	20,896	21,074	x178
Tons, coke ..	25,784	25,555	329
Tons, iron ..	21,971	21,103	868
Steel, ingots	33,377	28,598	33,683
Finished steel	28,904	.....	.....

xDecrease.

Bordeaux Exhibit Shows World Trade.—The May bulletin of the Chambre de Commerce, Montreal, calls the attention af the business community to the opportunities of expansion of Canadian trade offered by the Bordeaux Exhibition, which will be held from September 1 to September 15 this year. This fair has been conducted annually for eleven years and even the war has not interfered with its usefulnes. It is international in its scope and has proved one of the most valuable centres for exchange of international commodities. Owing to difficulties of transportation it is not expected that there will be any large Canadian exhibit this year, but both exporters and importers are displaying considerable interest. E. Lacas, 11 St. Sacrament street, Montreal, has been appointed official representative of the Bordeaux Fair and is working energetically to develop Canadian interest. He plans to attend the fair himself.

PERSONAL

Geo. E. Templeman has succeeded R. H. Balfour as chief engineer of the Montreal Electrical Commission.

Capt. William Matthews, a well-known mariner of the Great Lakes, died at Cobourg, Ont., on July 17, aged 69.

John Webber, manager of the steel department at the Toronto office of the Steel Company of Canada, has left for a trip up the Saguenay.

Paul G. Chace, Vice-President of the Port Arthur Shipbuilding Co., who was in Port Arthur, Ont., recently for a few days, has returned to his home in New York.

Chas. B. Ellis, formerly supply sales specialist, Northern Electric Co., Montreal, has recently been appointed superintendent of supply sales, Canadian General Electric Co., Montreal.

W. J. Lynch, for some time controller of the Quebec Railway, Light, Heat & Power Co. has been appointed general manager to fill the vacancy caused by the death of H. E. Matthews.

R. Bruce Wallace, for many years with the Western Dry Dock & Shipbuilding Co., Port Arthur, Ont., has been appointed manager of the American Shipbuilding Co., at Norfolk, Va.

R. B. Priestman, formerly connected with the Eagle & Globe Steel Co., Montreal, has enlisted for overseas, having signed up with the Cobourg Heavy Battery. He has since been promoted to the position of Corporal.

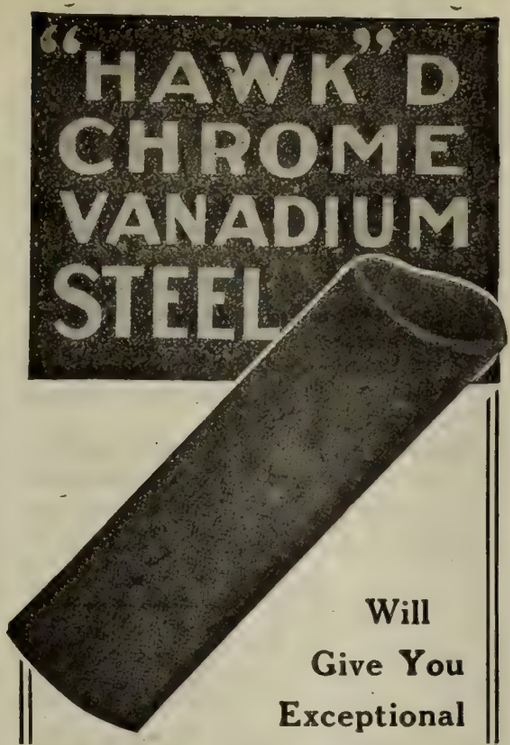
Capt. David Sylvester, well known on the Great Lakes, died in Toronto on July 18. Capt. Sylvester was born in Scarborough, Ont., in 1838. For some years he conducted a commission and brokerage business at Church Street Wharf, Toronto.

Harry A. McKnight has resigned as superintendent of the plant of the American Car & Foundry Co., Jeffersonville, Ind., to enter the operating department of the Canadian Car & Foundry Co., Montreal, Que.

H. C. Opie for several years connected with the sales staff of Alexander Gibb, Montreal, has become associated with the Eagle & Globe Steel Co. of Montreal, following the resignation of R. B. Priestman who has enlisted for overseas.

Fred S. Henning, who was superintendent of the Island filtration plant, Toronto for a number of years died recently in Toronto after a long illness. Mr. Henning was born at St. Catharines, Ont., in 1856 and was at one time Grand President of the Canadian Marine Engineers.

Allen O. Leach, of Toronto, has been appointed supervising engineer in charge of construction of Camp Dodge, six miles from Des Moines, Iowa. Mr. Leach has been granted six months leave of absence by his employers, the Canadian Northern Railway. Mr. Leach is 25 years of age, having been appointed valuation engineer of the C. N. R. two years ago.



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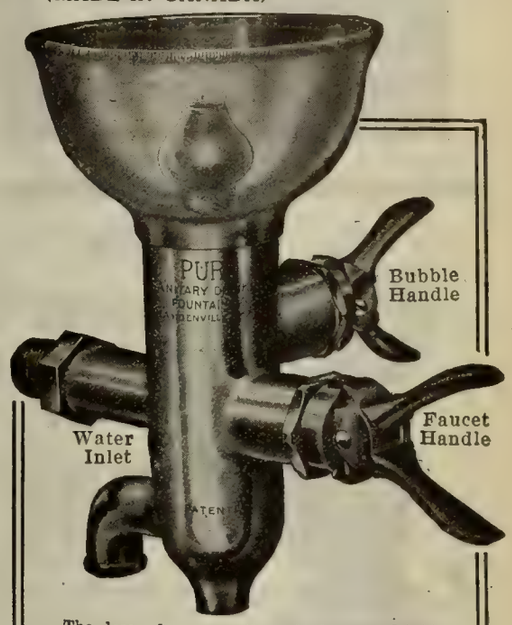

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REFRIGERATION

Belleville, Ont.—The Graham Co., will build a cold storage plant and warehouse here.

Toronto, Ont.—The Harris Abattoir Co. have been given a permit to build a bone drying room on St. Clair Avenue to cost $2,000.

Toronto, Ont.—The Swift Canadian Co. will build an extension to their packing plant which will include cooling rooms and a larger fertilizer plant.

Vancouver, B.C.—The Great Northern Canneries is having its fish canning and preserving plant equipped with refrigerating machinery.

Toronto, Ont.—The Swift Canadian Co., St. Clair Avenue and Keele Street, will erect an addition to the fertilizer building on Keele street, at a cost of $13,000.

Vancouver, B.C. — Geo. E. Mitchell, 1028 Pender street, W., merchant, has purchased a 5-ton refrigerating machine from the Armstrong Machinery Co., Spokane, Wash., for installation in his store.

Cornwall, Ont.—The Cornwall Dairy Co. have equipped a new creamery and dairy and in connection with same built cold storage rooms for butter, eggs, cheese, etc., and will install a refrigerating plant manufactured in the United States.

St. Johns, Nfld.—The Reid Newfoundland Co. are erecting a cold storage and fish freezing plant, three stories high. The storage rooms will have a capacity of about 10,000,000 pounds of fish. They are also planning to build six branch houses at different points with an approximate capacity of 500,000 pounds each.

WOODWORKING

Owen Sound, Ont.—Fire on July 22, did considerable damage to the North American Bent Chair Co. factory.

North Vancouver, B.C.—A fire broke out recently at Mosquito Creek, totally destroying the lumber mill there, owned by Messrs. Chubb. Barton & Campbell. The loss will be about $6,000, and there was no insurance on the mill.

CONTRACTS

Stratford, Ont.—The Weber Chimney Co., Chicago. Ill., have been awarded the contract for $4,000 chimney for city.

Toronto, Ont.—The S. F. Bowser Co. have been awarded a contract by the Ottawa Car Co. for tanks and pumps, etc.

Coaticook, Que.—The Wm. Hamilton Co., Peterboro, have the contract for water-wheel for power plant for Penman's, Ltd.

St. Johns, Que.—City Council have awarded the contract for the construction of filter, tank and the improvements to the city waterworks to Laurin & Leitch, Montreal, for the sum of $195,975, made up as follows:—Filter, $109,975; water tank, $26,000; improvements, $60,000.

Winnipeg, Man.—The Board of Control have awarded a contract to Babcock & Wilcox for a boiler for the incinerator at $4,970.

Oshawa, Ont.—The Water Commission have accepted the tender of the Turbine Equipment Co., of Toronto, for the installation of a 1,000 gallon a minute, 2-stage electric turbine pump, for $2,265.

Montreal, Que.—The G. T. R. has placed an order for one thousand box cars with the American Car & Foundry Co. The cars are to be of 80,000 pounds capacity, and of the most modern type, with steel underframe and standard safety appliances.

Islington, Ont.—Tenders for waterworks supplies were opened at a recent meeting of the York County Council, and that of T. Tomlinson & Son, quoting 100 large frames and covers at $21 each; 14 small frames and plugs at $21 each, and four special frames at $42 each were accepted.

Toronto, Ont.—The contract for the 36-inch pipe to be laid by the city from the main pumping station at the foot of John street to Front street, has been awarded to the National Iron Works, at $215 a length, and the contract for the steel castings to the Reid & Brown Structural Steel & Iron Works, Ltd.

INCORPORATIONS

The Federal Steel & Foundry Co., has changed its name to that of the Monarch Tractor Co. of Canada, Ltd.

Leather Products Ltd., has been incorporated at Ottawa, with a capital of $20,000, by George S. Gibbons, Thomas G. Wilson and Edward H. Brund all of Toronto to manufacture leather and leather products at London, Ont.

The Burns Cement-Gun Construction Co., has been incorpared at Toronto by G. C. Loveys, G. W. Morley and W. M. Smith of Toronto, to carry on the business of general contractors, with a capital of $40,000.

Dann Spring Insert Ltd., has been incorporated at Ottawa by G. R. Harvey, C. V. Langs and E. G. Binkley all of Hamilton, Ont., to manufacture automobile parts and accessories at Hamilton, with $40,000 capital.

The Nicu Steel Corporation has been incorporated at Ottawa by Joseph M. Gordon, Donald R. Hossack and M. L. Chamberlain of Toronto to manufacture and deal in iron, steel, nickel, copper, etc., at Toronto with a capital of $200,000.

The Canadian Incinerator Co., has been incorporated at Ottawa by Samuel Rogers, Henry M. Frickle and Alan G. Keith of Toronto to manufacture furnaces, incinerators, boilers, engines, pumps, etc., at Toronto with a capital of $50,000.

Gas Processes Ltd., has been incorporated at Ottawa by George C. Loveys, George W. Morley and William M. Smith to carry on the business of electrical

mechanical and gas engineers. The company is capitalized at $50,000 and the head office is at Toronto.

The New Mfg. Co., has been incorporated at Ottawa with a capital of $45,000 to manufacture all kinds of heating devices and apparatus at Ottawa, Ont. The incorporators are Thomas R. Beament, Alan H. Armstrong and Robert J. Smith all of Ottawa.

Chambers, McQuigge & McCaffrey Co., have been incorporated at Ottawa with a capital of $450,000 to carry on business as a general engineering and construction company at Toronto. The incorporators are R. H. Parmenter, A. J. Thompson and S. D. Fowler all of Toronto.

The Canadian Life Buoy Co., has been incorporated at Toronto with a capital of $100,000 to purchase the British and Canadian patents of a new life preserver and to manufacture same at Windsor, Ont. The provisional directors are C. W. Coldwell, O. E. Fleming and F. E. Harvey all of Windsor, Ont.

MARINE

St. John, N.B.—After being in commission less than six months the new four masted schooner Letitia T. Mackay, has been sold at Bordeaux, France, for $110,000.

Kingston, Ont.—The Kingston Shipbuilding Co. is asking for the consent of the municipality to extend its plant 75 feet further into the harbor, in view of the great increase in shipbuilding operations here.

Sarnia, Ont.—The old steamer Saronic, at one time known as the United Empire, is again in commission, and is now the W. L. Kennedy, having been converted into a bulk steamer. The Saronic was launched at this port in 1882.

Vancouver, B.C.—The auxiliary schooner Janet Carruthers, which was launched recently at North Vancouver, has been chartered by the Canadian Trading Co. to load lumber at Vancouver for Port Adelaide, Australia. The lumber will be supplied by the Rat Portage mill.

Vancouver, B.C.—The other auxiliary schooners on passage besides the Mabel Brown, are the Margaret Haney, for Bombay; the Geraldine Wolvin, for Sydney; the Laura Whalen, for Port Adelaide. The Jessie Norcross is now at Genoa Bay loading for Port Adelaide.

Owen Sound, Ont.—Word has been received here that the Great Lakes steamer Scottish Hero, has been torpedoed while en route from Sidney, N.S., to Havre, France, with a cargo of steel products. She was commanded by Captain Luke Holmes, of Sydney, N.S.

Victoria, B.C.—Announcement was made at the plant of the Cameron Genoa Mills Shipbuilders, Ltd., that the fifth auxiliary schooner, which is now in an advanced stage of construction at the yard for the Canada West Coast Navigation Co., will be christened "Jean Steedman."

New Westminster, B.C.—The first carload of machinery for the shipbuilding

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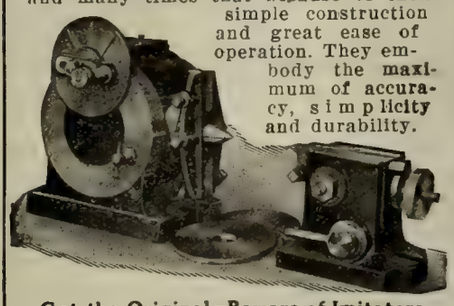
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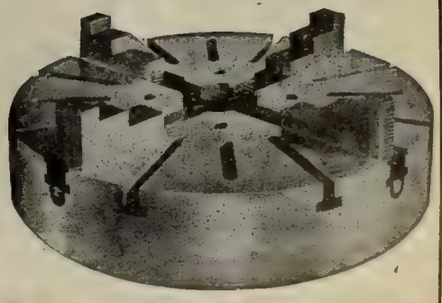
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ON PAGE 74
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plant now in course of being established on Poplar Island by New Westminster Construction and Engineering Co., has arrived, and installation will begin shortly. The company have a contract for building four vessels for the Imperial Munitions Board.

Vancouver, B.C.—The building of the auxiliary fleet has meant a great deal for the British Columbia lumber trade. There are 12 vessels in the programme and of these seven have been launched. As each vessel uses a million and a quarter feet of lumber in her construction it is seen that 15,000,000 feet will be used in construction alone. Each vessel carries at least 1,500,000 feet, so that the vessels will take out of this province 18,000,000 feet as cargo.

Fort William, Ont.—Benjamin Leavitt, a Toledo man, descended 180 feet into the waters of Lake Superior recently, and located the hulk of the steamer Pewabic, which was sunk with a valuable copper cargo on the night of August 9, 1865. The Pewabic went down at a point seven miles off Thunder Bay Island, after being rammed by the steamer Meteor. One hundred and twenty-five persons lost their lives. The copper cargo is reported to be worth a million dollars.

Victoria, B.C.—The auxiliary schooner Mable Brown arrived at Sydney, Australia, on June 29, with a cargo of British Columbia lumber, having made the voyage from Vancouver in 80 days. The Mabel Brown was launched from Wallace Shipyard No. 2, North Vancouver, on January 27, and she had her trials in the Gulf on March 22 and March 25. On March 29 she left Vancouver for Chemainus, where she loaded 1,534,903 feet of lumber. The vessel left Chemainus early on April 15, with Capt. Boyd in command.

Vancouver, B.C.—The Lyall Shipbuilding Co., expects to lay the keel immediately for the first of the six wooden ships, which this company has contracts to build for the Imperial Munitions Board. About four and one-half months will be required for the construction of each of the ships. Pending the completion of the two wooden vessels at present under construction by the Wallace Shipyards Co., the Lyall Company will start operations on the western portion of the property. On this two new shipbuilding berths will be constructed at once.

Vancouver, B.C.—The auxiliary schooner Janet Carruthers was launched at the Wallace Shipyards on June 29, being christened by Mrs. Norman Burkinshaw. This vessel is the seventh to take the water within the past year of the fleet of twelve ordered by the H. W. Brown Co. The Janet Carruthers is of wooden construction, 260 feet over all with 44 feet beam. She is equipped with semi-Diesel engines, Bolinder type, which generate 320 horse-power. She has twin screws. Three more vessels are under construction at the Cameron-Genoa Mills Shipbuilders' plant, where the others were built, and two more are nearing completion at the Wallace shipyard.

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We can give the best of service in all kinds of welding repair jobs. We have successfully repaired the most difficult jobs. Our work is high-class and our prices moderate.
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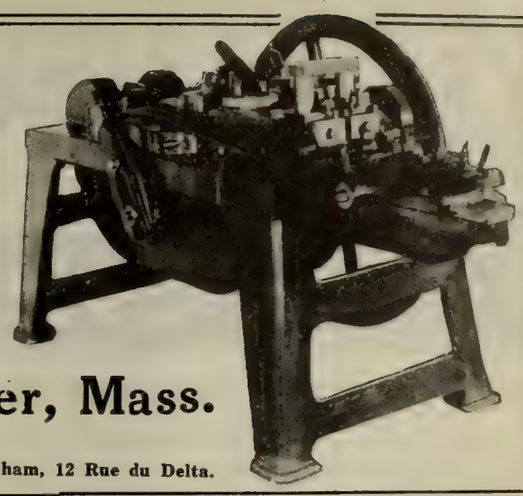

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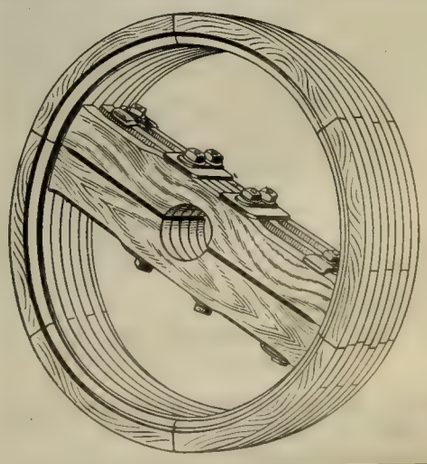

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FOR SALE—10 PRACTICALLY NEW NO. 7-C Heavy Duty Racine Hack Saw Machines. Suitable for all cutting purposes. For further information and price address The Peck Rolling Mills, Limited, Montreal. c3m

ONE BRAND NEW 10 x 36 NORTON PLAIN grinding machine. This machine on our floor still crated, never been used. For price and further particulars address Windsor Machine & Tool Works, Windsor, Ontario. c5m

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WANTED—SECOND-HAND POWER SQUARing shear to cut No. 10 gauge steel up to 24" wide. Must be in good working condition. Packard Electric Company, St. Catharines, Ont. c4m

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4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

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1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 13 B. & S. Automatic Gear Cutter.

1—30" Newark Automatic Gear Cutter.

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THOROUGHLY CAPABLE BRASS FOUNDRY Foreman to take charge of small foundry doing a general jobbing business and also munition work. Location Montreal. Address for information, "Brass Foreman," P.O. Box 1934, Montreal. c26m

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WANTED — ASSISTANT SUPERINTENDENT for six-inch shell factory. Must be capable of getting maximum production from an established plant and have good mechanical experience. Duties to consist chiefly in supervising production. Give full particulars in writing of previous experience, age, references, and salary required, to Henry Hope & Sons of Canada, Ltd., Peterboro. All information will be treated in the strictest confidence. c5m

TECHNICAL ADVERTISING MAN — LARGE manufacturing concern near Toronto, building a general line of heavy machinery, requires a young man to take care of its advertising; must be able to prepare machine descriptions from blue prints and to write clear, concise English; advertising experience desirable, but not necessary; please state age, nationality, experience and salary desired, and send samples of your work with first letter. Box 320, Canadian Machinery. c26m

FOR MILL MACHINE SHOP—A COMPETENT foreman with energy and resource, with some knowledge of French; also general machinists for small shop in a modern town with established manufacture. This is an opportunity for family man to locate to permanent benefit. William S. Nish, 53 Maple Avenue, Shawinigan Falls, Quebec. c3m

PROMPT SALE
and
DELIVERY

Steel shed, corrugated iron roof, 108′ x 292′; 40′ maximum height; eight years old, in new condition; about 433 tons.

Two Brown Gantry Cranes, total span 300′, inside span, 180′; both equipped with 10″ x 12″ three-drum engines; 50 H. P. boilers, maximum capacity 15,000 lbs.; coal conveying capacity 4,000 lbs., 350 feet per minute.

Lot of extra equipment! Can be seen in operation. Good as new.

New York Machinery Exchange

50 Church St., New York City

FOR

IMMEDIATE DELIVERY

No. 28—17″ x 96″ Brown & Sharpe Plain Grinder.

Pratt & Whitney Vertical Surface Grinder, 36″ Table.

No. 1½ Bath Universal Grinder, complete tool room equipment.

No. 1½ Landis Universal Grinder, for Internal and External Grinding.

36 ft. Niles Plate Planer.

Lynd-Farquhar Co.

Boston, Massachusetts

H. W. PETRIE of MONTREAL Limited Montreal, Que.

LIST OF NEW AND USED MACHINERY IN STOCK FOR IMMEDIATE SHIPMENT

ENGINE LATHES

New 13″ x 5′ Lancaster Sgl. B.G., Geared Feed.
New 15″ x 6′ South Bend, Sgl. B.G., Stan. Change Gears.
S.H. 15″ x 6′ South Bend, Sgl. B.G., Stan. Change Gears.
New 16″ x 6′ South Bend, Sgl. B.G., Stan. Change Gears.
New 15″ x 7′ Oliver Dbl. B.G., Q.C. Gear, Oil Pump and Pan.
New 16″ x 24″ x 10′ South Bend Gap Sgl. B.G., Stan. Change Gears.
S.H. 17″ x 8′ Greaves Klusman Sgl. B.G., Geared Feed.
New, 18″ x 8′ Greaves Klusman Dbl. B.G., Geared Feed.
New 18″ x 8′ Giddings & Lewis Dbl. B.G., Geared Feed.
New 18″ x 8′ Stevens Sgl. B.G., Standard Change Gears.
New 18″ x 8′ South Bend Sgl. B.G., Stand. Change Gears.
S.H. 18″ x 10′ Muller Sgl. B.G., Standard Change Gears.
New 18″ x 12′ South Bend Sgl. B.G., Stand. Change Gears.
S.H. 20″ x 10′ Flather Sgl. B.G., Standard Change Gears.
S.H. 36″ x 10′ Fay & Scott Sgl. B.G., Stand. Change Gears.

HEAVY DUTY MANUFACTURING LATHES

New 20″ x 8′ Petrie Heavy Duty Manufacturing Lathes.

TURRET, SPEED AND BRASS LATHES SCREW MACHINES

New 13″ x 7′ Putman Speed Lathe.
S.H. 15″ x 5′ 6″ Fox Brass Lathe with Chasing Attachment.
S.H. 30″ x 10′ Vilter Lathe, Friction B.G., Geared Feed with 18″ Hex. Power Feed Turret.
New No. 0 Foster Plain Head Screw Machine, with wire feed and automatic chuck.

DRILLS

New 3′ Dresses Plain Radial, Gear Box Drive.
New 20″ Excelsior, Back Geared Wheel Lever, Power Feed.
New 20″ Silver, Back Geared Wheel Lever Power Feed.
New 14″ Leland Gifford Single Spindle Sensitive.
S.H. 14″ Avey Spingle Spindle Sensitive.
S.H. 14″ Foote-Burt Four.
New No. 1 Emco Bench Single.

HACK SAW MACHINES

New Peerless High Speed.
New No. 1 Atkins Kwit-Kut.

GRINDING AND BUFFING MACHINES

New 20″ Ford Smith Water Tool Grinder.
New 18″ Ford Smith S.O. General Purpose Pedestal Grinder.
New 16″ Ford Smith S.O. General Purpose Pedestal Grinder.
New 12″ Ford Smith S.O. General Purpose Pedestal Grinder.
New 12″ Ford Smith S.O. Combination Grinder and Buffer.
New 12″ Ford Smith S.O. Buffing Machine.
New Style B, Point Yankee Twist Drill Grinder.

MISCELLANEOUS

S.H. No. 22 Garvin Vertical Milling Machine.
S.H. No. 0 Burke Hand Milling Machine.
New 1¼″ National Bolt Cutter with Lead Screw Attachment.
New No. 1 Grabo Metal Saw Table.
New D4 Rock River Slitting Shear.
New No. 4 Chicago Steel Bending Brake.

Telegraph, Phone or Write for Prices and Further Particulars

H. W. PETRIE of MONTREAL
LIMITED
MONTREAL, QUEBEC

PETRIE'S LIST

Of New and Used Machine Tools Stock for IMMEDIATE DELIVERY

TURRET LATHES AND SCREW MACHINES

12″ x 42″ Foster, plain head.
15″ x 5½′ American, fox.
16″ x 6′ Pratt & Whitney, turret.
18″ x 6′ Prentice, high speed.
22″ x 8′ Pratt & Whitney.
24″ x 8′ Lodge & Shipley.
26″ x 8′ Fay & Scott, B.G.
No. 2 Hercules screw machine.
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

14″ x 6′ Lodge & Shipley.
15″ x 6′ London, back geared.
16″ x 8′ McDougall, back geared.
16″ x 8½′ Cincinnati, D.B.G.
17″ x 8′ Blaisdell, back-geared.
18″ x 6″ New Haven.
18″ x 10′ Putnam, back-geared.
20″ x 8′ Fifield, back geared.
21″ x 9′ back-geared, single purpose (4).
21″ x 8′ Bawden, heavy duty.
24″ x 11′ Pond, back-geared.
30″ x 10′ Ames, back geared.
31″ x 16′ Fifield, back-geared.
18″ x 32″ x 12′ C.M.G. gap.
20″ x 38″ x 16′ double back gear, gap.
24″ x 44″ x 20′ C.M.C., gap.

DRILLS

13″ Perfect, 2-spindle.
14″ Excelsior, sensitive.
16″ Barr, sliding head.
18″ Buffalo, post drill.
20″ Perfect, lever feed.
20″ Silver, back-geared.
22″ Barnes, back-geared.
24″ Kerkhoff, sliding head.
40″ Bickford, back geared.
64″ Canedy-Otto, wall radial.
No. 10a Baush, 16-spindle.
No. ½ Avey, ball-bearing, bench.

GRINDERS

No. 1 Wilmarth & Morman.
No. 1 Cincinnati, universal tool.
No. 2 Landis.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 14 Besly, with shell holder.
26″ Gardner, disk.

IRON PLANERS

20″ x 20″ x 5′ Bertram.
24″ x 24″ x 6½′ Bertram.
24″ x 34″ x 8′ Cincinnati, 2 heads.
25″ x 25″ x 12′ Lodge & Davis.
36″ x 36″ x 10′ Sellers, 4 heads.
40″ x 40″ x 12′ New Haven, power feed.

MILLING MACHINES

No. 0 Burke, hand feed.
Bertram, plain.
Brown & Sharpe, power feed, plain.
Fitchburg, geared, plain.
No. 2 Ford-Smith.
Monarch, vertical.

SHAPERS.

16″ Canada Mach. Corp.
16″ Hendey.
16″ Queen City, back geared.
20″ Cincinnati, back geared.
24″ Gould & Eberhardt.
30″ Morton, draw cut.

MISCELLANEOUS

6″ and 12″ Racine Hack Saws.
4″ and 6″ Robertson Hack Saws.
6″ Kennedy Cutting-off Machine.
12″ Hall Pipe Machine.
No. 2 Colburn Keyseater.
No. 5 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 2 Bliss Foot-power Press.
Brown-Boggs Punching Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
7′ Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.

FRONT STREET WEST, TORONTO

RIVERSIDE Machinery List

We Own Every Tool Offered

ENGINE LATHES

1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—28 x 16 Putnam Standard Engine Lathe.
1—22 x 14 Putnam Standard Engine Lathe.
3—New 18 x 8 Springfield Engine Lathes.
1—New 16 x 8 Springfield Engine Lathe.
1—New 14 x 6 Springfield Engine Lathe.
1—18 x 6 Jones & Lamson Standard Engine Lathe.
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Lodge & Shipley Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.
1—11 x 5 Seneca Falls Engine Lathe.
1—No. 3 Hartiarge Bench Lathe.

TURRET AND SCREW MACHINES

1—2¼ x 24 Jones & Lamson Flat Turret Lathe, S.G.H.
1—2 x 24 Jones & Lamson Flat Turret Lathe, cone head.
2—No. 6-A Potter & Johnson Automatic Lathes.
3—No. 4 Foster F.G.H. Head Screw Machines.
2—No. 3 Foster F.G.H. Hand Screw Machines.
1—No. 5 Pierson F.G.H. Hand Screw Machines.
1—No. 4 Smurr & Kamon Hand Screw Machine.
4—New 14" Pierce Turret Lathes.
2—New 1 x 8 Pierce Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jogger feed.

MILLING MACHINES AND GRINDERS

2—No. 3 Cincinnati Universal, cone type.
5—No. 1½ Knight Milling & Drilling Machines.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
1—No. 1 Cincinnati Plain Milling Machine.
1—No. 13 ½ Garvin Plain Milling Machine.
1—No. 2 Hendey Plain Milling Machine.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
1—No. 2½ Bath Universal Grinder.
1—No. 170 Wells Cutter Grinder.
1—Mina Valley Universal Cutter Grinder.
4—No. 0 Burke Bench Millers (new).

DRILL PRESSES

1—3-spindle 8" overhang Henry & Wright High Speed Drill.
3—12" Leland & Gifford High Speed Bench Drills.
5—20" Buffalo Plain Drill Presses.
4—6-spindle Fox High Speed Drill Presses.
2—4-spindle Fox High Speed Drill Presses.
1—3' Mueller Plain Radial Drill.
1—4' Bickford Radial Drill, with T.A.
1—6' Mueller Plain Radial Drill.
1—16-spindle Natco.

SHAPERS AND PLANERS

1—24" Ohio H.D., B.G. Crank Shaper.
1—24" New Barker Crank Shaper.
1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
1—16" Hendey Geared Shaper.
1—16" Garvin Shaper.
2—16" New Springfield B.G. Crank Shapers.

PRESSES

1—Watertown-Farrell Straight Sided Geared Press with double cam knock-out.
1—No. 10 Perkins Drawing Press.
5—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—50-lb. Scranton Belt Hammer.
1—25-lb. Bradley Helve Hammer.

AIR COMPRESSORS

1—8 x 6 Westinghouse Steam Air Compressor.
1—16 x 18 x 12 Union Steam Pump Co., steam driven air compressor.
1—10 x 10 Ingersoll Sargent Belt Driven Air Compressor.
1—10 x 10—Clayton Belt Driven Air Compressor.
1—8 x8Fairbanks-Morse Electircal Driven Air Compressor.
1—8 x 8 Gardner Single Belt Driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt Driven Air Compressor.
1—7½ x 6 Chicago Pneumatic Tool Co. Belt Driven Air Compressor.
1—6 x 6 Chicago Pneumatic Tool Co. Belt Driven Air Compressor.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machines tools both large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

GOOD USED EQUIPMENT

ELECTRIC TRAVELING CRANES.

50-Ton, 61' 7" span, four motor, 550 volts, D.C.
25-Ton, 40' 0" span, four motor, 220 volts, D.C.
25-Ton trolley, three motor, 220 volts, D.C.
10-Ton, 40' span, 80' lift, three motor.
21, 14 and 4½ H.P. Shaw crane motors, 220 volts, D.C.
10 H.P. Akron crane motor, 220 volts, D.C.
2 to 7½ Ton hand cranes, 22' span.
10-Ton hand crane, 55' 0" span.
20-Ton hand crane, 29' 6" span.

BRAKE AND PRESSES.

No. 11 Perkins (Trimming), 4" stroke, 16,500 lbs.
No. 225 Adriance (Punch), 2" stroke, 7,000 lbs.
No. 65 Toledo (Cam Drawing), B.G., 13,000 lbs.

PUNCHES AND SHEARS.

Lever Shear (double), cap. 2" sq.
28" throat (single), cap. ⅞x⅞" (belt).
36" throat (single), cap. 1¼x1" (belt).
48" throat (single), cap. 3x1¼" (steam).
16" throat (single), cap. 1½x1½ (belt).
38" throat (single), cap. 1x1" (belt).
36" throat (single), cap. ⅞x⅞" (belt).
17" throat (single), cap. ¾x¾" (belt).
15" throat (single), cap. ¾x½" (hand).
10" throat (double), cap. 1½x1" (belt).
Angle Shear (double), cap. 6x6x⅝" (belt).
Angle Shear (double), cap. 6x6x¾" (belt).
Plate Shear (Univ.), 18" blade, cap. ¾".
Rotary splitting, 30" throat, cap. ½".
Rotary bevel, 5" throat, cap. ½".
Coulter & McKenzie, cap. 3x½", spring steel.
Alligator, 7" blade, cap. 1" squares.
Guillotine, Perkins, No. 6, cap. 2½ sq.

MISCELLANEOUS.

Acme Rivet and Upsetter, 1½" cap.
Bending Roll, 6', drop end, 6½ and 8" rolls.
Bending and Straightening Mch., 24" cap., 1" stroke.
Cold Saw, Newton, 40" blade, two tables.
Rotary Planer, 36", Cleveland No. 2.
First-class condition—quick shipments.

McCoy-Brandt Machinery Co.
Office and Warehouse:
216-218 Penn Ave., Pittsburgh, Pa.

FOR SALE

Equipment used for making 18-pr. Shells.

1—Warner & Swasey Turret Lathe, 2" x 24", with attachments.
1—Linderman Double Spindle Boring Machine, with attachments for finish boring shrapnel and nose turning H.E.
1—Flather & Co. 14" x 5' 0" Lathe, with chuck and countershaft.
1—Fosdick 16" x 6' 0" Lathe, with collet chuck and countershaft.
1—Braopose 16" x 6' 0" Lathe, collet chuck and taper attachment.
1—Goldie & McCulloch Nosing Press with Dies.
1—Beatty Accumulator.
1—Lees-Bradner Thread Miller, with attachments and countershaft.
1—Jones & Lamson Turret Lathe, 2" x 24".
1—40-gallon Bowser Tank and Pump; good as new.
1—Cold Saw, with variable speed motor, 60 cycle, 220 volt, cuts up to 9" stock, complete with three saws.
1—4-Connection Pyrometer with Rheostat, made by Taylor Instrument Co.
1—Thermo Couples, 39" long, bent 12½" from nose.
1—Thermo Couples, 39" long, straight.
1—One-Connection Tycos Pyrometer, made by Taylor Co.
1—Bertram Band Turning Attachment, for 24" Lathe, Ball-bearing Centre.

All the above located at Welland. Prices, Delivery and full particulars gladly furnished.

M. Beatty & Sons, Limited
Welland, Ont.

CHAS. A. STRELINGER CO.

43-51 Larned St. East Detroit, Mich.

Machine Tools In Stock For Immediate Shipment

DRILLING MACHINES.

No. 3 Barnes Horizontal Radial Drill.
No. 4-B 8" overhang Henry & Wright Sensitive Drill.
No. 1 Class I. 12" overhang Henry & Wright Sensitive Drill.
No. 1-S Garvin B.G. Horizontal Drill, with pump and piping.

GRINDERS.

Six-Fifteen Fitchburg Grinder (Automatic Feed)
Six-Fifteen Fitchburg Grinder (Hand Feed).
No. 2 Diamond Aut. Surface Grinder, belt driven.
No. 2 Bath Universal Grinder (10x25), with "C" equipment.
No. 2½ Bath Universal Grinder (10x36), with "C" equipment.
No. 1 Wilmarth & Morman Aut. Universal Grinder, complete.

HAMMERS—POWER.

Small and Large Quick-work Power Hammers.

LATHES.

No. 5½ Sloane & Chase 7" x 35" Precision Bench Lathe, with compound rest and cshaft.
14" x 8' American Q.C. Lathe, with Taper Attachment and regular equipment.
14" x 6' Monarch Q.C., S.B.G. Engine Lathe.
17" x 8' Sidney Q.C., 3-step Cone, D.B.G. Engine Lathe.
No. 65-E 13" x 6' Seneca Falls Lathe, with countershaft.
9" x 12" Porter-Cable Lathe, with regular equipment.

MILLING MACHINES—HAND.

No. 1 Standard Hand Miller, with oil pump equipment and countershaft.
No. 6 Whitney Hand Miller with countershaft.

POWER PRESSES.

No. 4 Niagara O.B.I. Power Press.
No. 5 Niagara O.B.I. Power Press.

SAWS—HACK.

No. 1 Racine H.S. Metal Hack Saw, cap. 6" x 6".
Peerless H.S. Metal Hack Saw, cap. 6" x 6".

SHEARS—ROTARY.

No. 1 Quick-work Rotary Shear.
No. 5 Quick-work Rotary Shear.

TAPPING MACHINES.

No. 1 Garvin Aut. Tapper, cap. ⅝" with countershaft.
3-16" and 5-16" Rickert-Shafer Tapping Machines.

C. W. CULLEN MACHINERY CO.

LEADER-NEWS BUILDING
CLEVELAND, OHIO

American 5' Plain Radial Drill, 3" spindle, box table, b.g., tapping attachment, M.D.
Bickford 4' Plain Radial Drill, cone drive,
La Pointe Broaching Machine.
Toledo No. 204 Spc. Double Crank Press.
Toledo 400-lb. Board Drop Hammer.
2—P. & W. No. 2 Cutting-off Machines.
Bement Miles & Co. 7½" Spindle, Vertical Drilling and Boring Mill, 68" swing.
Gardner No. 24 Belt-driven Disc Grinder.
Bradley 150-lb. Upright Strap, 150-lb. helve, 75-lb. Upright Strap Hammers.
Detroit Japanning Ovens, 8' 10" x 8' x 152".
Gisholt 28" Turret Lathe, taper attachment, M.D.
Pratt & Whitney 48" Gap Lathe.
Hanna 30-ton Riveter.
Pangborn Sand Blast, 84" rotary table, M.D.
3—800-ton G.E. Hydraulic Double Action Presses.
1—Toledo Toggle Press, No. 165½.
1—Ferracute Press, Dagg 66.
Bliss Presses—3 No. 60½, rack and pinion; 1 No. 77½; 1 No. 87 special geared.
3—2¼ Cleveland Automatics; prac. new.
10—¾" B. & S. Automatics.
5—3" x 36" J. & L.
Allis-Chalmers 150 H.P. Corliss Engine, 12' F.W.
Bruce MacBeth 150 H.P. Gas Engine; new.
2—Rathmann Jones Gas Engines, 125 and 225 H.P.

ReMANUFACTURED -(ORIGINATED BY US)- MACHINE TOOLS

GUARANTEED TOOLS FOR IMMEDIATE DELIVERY

Our Guarantee

Your money back if you return a machine within 30 days from date of shipment, freight prepaid.

NO EXCUSES NECESSARY.

Some Choice Ones

ENGINE LATHES —Latest Models

24—22″ x 8′ Hamilton, D.B.G., C.R., Semi-Q-C.
5—22″ x 8′ Hamilton, D.B.G., Turret tool post.
4—22″ x 8′ Davenport, D.B.G., Turret tool post.
7—22″ x 10′ Hamilton, D.B.G., C.R., Semi-Q.C.G.
2—22″ x 10′ Hamilton, D.B.G., Turret tool post, Semi-Q.C.G.
20—22″ x 10′ Davis, D.B.G., C.R., Q.C.G.
8—24″ x 10′ Lodge & Shipley, D.B.G., C.R., Q.C.G.
8—24″ x 10′ Lodge & Shipley, Selective Gd. Hd.
11—26″ x 10′ American, D.B.G., C.R., and carriage turret.
2—26″ x 10′ American, D.B.G., carriage turret.
19—26″ x 12′ Putnam, carriage turret, semi-Q.C.
9—25″ x 12′ Putnam, C.R., Semi-Q.C.
2—26″ x 12′ Wickes, D.B.G., C.R., Semi-Q.C.G
10—28″ x 10′ Niles, Bement, Pond, D.B.G., Q.C.G.
4—28″ x 14′ Lodge & Shipley, Select, Gd. Hd., motor drive, turret and taper.
3—30″ x 16′ Lodge & Shipley, D.B.G., C.R., turret and taper.
11—40″ x 18′ Pittsburgh, triple geared, Q.C.G.

TURRET MACHINES —Latest Models

25—21″ Gisholts, 3½″ hole, 2-step, 5″ belt.
25—21″ Gisholts, 3½″ hole, motor arrangement.
15—24″ Gisholts, 4¼″ hole, 3-step, 4″ belt.
40—24″ Gisholts, 6″ hole, 2-step, 6″ belt.
42—24″ Gisholts, 6″ hole, motor arrangement.
2—2¼″ x 26″ Greenlee Flat Turrets.
2—2½″ x 26″ Pratt & Whitney, Gd. Hd. Turrets.
4—3-A Warner & Swasey (bar machines).

DRILLING MACHINES.

1—24″ Baker High Duty.
1—2 spindle Foote-Burt.
4—2 spindle Baker Vert. Cyl. Bor., adj. spindle.
1—4 spindle Foote-Burt Rail Drill.
1—10 spindle Foote-Burt Rail Drill.
1—12 spindle Moline Rail Drill.

HORIZONTAL BORING MACHINES.

1—Beaman & Smith, 2⅛″ bar.
1—Bement, 2⅞″ bar.
1—Betts, 2⅞″ bar.
1—No. 3 Barnes Double End.
1—Newark, 3″ bar.
1—No. 4 Newton 2 spindle, 4″.
1—2-spindle Beaman & Smith Cyl. Boring.
4—P. & W. 2-spindle Rifle Barrel Drilling.

SHAPERS.

1—15″ Hendey Friction.
1—16″ Perkins Friction.
2—16″ Barker Plain Crank.
1—24″ Gould & Eberhardt Back Geared Crank.
1—24″ Queen City Back Geared Crank.
2—48″ Morton Draw Cut.

MILLING MACHINES.

2—No. 5 Brainard.
1—No. 3 Brainard Plain.
1—No. 20 Oesterlein Universal.
1—No. 1½ Brown & Sharpe Universal.
1—No. 25 Becker Plain.
1—No. 2 Cincinnati Universal.
1—No. 5 Schuchardt & Schutte Plain.
1—No. 3 Hendey Plain.
4—No. 2 Pratt & Whitney Lincoln.
1—60″x48″x8′ Ingersoll Slab.
1—Beaman & Smith, 2 vert. heds., 1 hor. cross bor. hd.
1—No. 2 Beaman & Smith Combination Horizontal and Vertical.

MISCELLANEOUS.

1—10″ Bement Slotter.
1—15″ Betts Slotter.
1—No. 15 Garvin Profiler.

New Green List Just Out

Write or wire for this "Green List" as it gives full description of the above list of machines and also hundreds of others.

HILL, CLARKE & CO. OF CHICAGO

625 WASHINGTON BLVD., CHICAGO, ILL.

IMMEDIATE DELIVERY

DRILLING MACHINES

Leland H.S.B.B., Bench type.
No. 1½ Knight Driller and Miller.
14" Rockford Sensitive.
20" Kern, b.g.
22" W. F. & J. Barnes, s.h., b.g., p.f.
No. 25 Foote-Burt 24" Drill (new).
32" W. F. & J. Barnes, s.h., b.g., p.f.
32" Hamilton s.h., b.g., p.f.
No. 30-C Baush, 12-spindle.
20" W. F. & J. Barnes, 4-spindle.
3' W. E. Gang Plain Radial.
3½' W. E. Gang Plain Radial.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. Automatic.
30" x 9" G. & E. Auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3 26" B. & S., for spur.
36" Walcott for spur.

GRINDERS

Yankee Drill.
Leland Universal, with power feed.
No. 23 B. & S. Gear Cutter.
8" x 30" Modern Plain (new).
14" x 20" B. & S. Plain
Garvin Hole Grinder.
Gisholt Tool Grinder.
No. 5 Diamond Water Tool.
No. 16 Gardner Disc Grinder.
No. 24 Gardner Disc Grinder.

LATHES

6" x 30" Dalton.
No. 3½ Rivett.
No. 3 Cataract.
No. 5 Cataract.
13" x 5' P. & W. c.r. taper.
14" x 6' Davis, p.r.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
18" x 8' L. & S., pat. head, c.r. taper.
18" x 10' Fitchburg, c.r
18" x 12' Barker, c.r.
20" x 14' Blaisdell, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
32" x 16' Blaisdell, c.r.
36" x 20' American, t.b.g.
3½" x 60" Fitchburg Lo-Swing.

PLANERS.

36" x 36" x 16' Sellers, one head.
40" x 38" x 14' Putnam, one head.
40" x 40" x 12' New Haven, one head, one side head.

SCREW MACHINES.

1" B. & S., Plain.
16" P. & W., Plain.
No. 2 Foster, Plain Head.
No. 2 Costello, Plain Head.
No. 2 P. & W., Friction Head.
No. 3 Foster, Geared Head.
No. 4 Pearson, Geared Head.
No. 3 Bardons & Oliver, Plain Head.
No. 12½ Garvin, Friction Head.
No. 2-G B. & S. Automatic.
⅞" Cleveland Automatic.

TURRET LATHES.

16" Lodge & Shipley.
25' Niles.
No 2 Warner & Swasey, Hollow Hexagon.
2" x 24" Jones & Lamson.
3" x 36" Jones & Lamson, chucking equipment.
3" x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt Turret Lathes, taper attach.

PUNCHES AND SHEARS.

No. 2 L. & A. Angle Iron Shears, 5" x 5" x ½" (new).
No. 5 L. & A. Double Punch and Shear, ⅝" x ⅝", 3" x ⅝", 1⅛rd (new).
No. 1 L. & A. Multiple Punch (new).
No. 2 L. & A. Multiple Punch (new).
No. 1 L. & A. Horizontal Punch, ½" in 1" (new).

MISCELLANEOUS.

No. 2 Kempsmith Universal Miller.
50-lb. Bradley Strap Hammer.
100-lb. Bradley Helve Hammer.
¾" Acme Forging Machine.
52" Niles Car Wheel Boring Mill.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 3A La Point Broacher.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-Ton Yale Duplex Hoist.
3-Ton Yale Triplex Hoist.

Stocker-Rumely-Wachs Company, 117 N. Jefferson St., CHICAGO, ILL.

Polson Iron Works
Limited
TORONTO

Surplus Machinery for Sale

2—3" Hall Cut-Off Machines
1—Lodge & Shipley Turret Lathe, 22" x 10'
1—Lodge & Shipley Turret Lathe, 24" x 10'
2—Libby Turret Lathes, 18"
1—Gisholt Turret Lathe, 18"
2—Gisholt Turret Lathes, 21"
1—Gardner Shell Base Grinder, 4A
1—Ford-Smith Grinder, 20"
2—Landis Traverse Grinders, 4'
1—Symington Band Turn Lathe, 3"
1—Goldie McCullough Band Press and Pump, 3"
1—3" Stamping Machine
2—Tate-Jones Shell Furnaces
3—Blowers

MACHINE TOOLS IN STOCK

13" x 7' 6" NEW Carroll-Jamieson.
15" x 8' NEW Carroll-Jamieson.
12—17" x 8' NEW National, quick change.
18" x 10' Rahn Mayer H.S., C.R., T.A.
17" x 8' NEW Sidney, D.B.G., quick change.
6—19" x 8' NEW Sidney, D.B.G., quick change.
20" x 8' Prentice, H.S., C.R., T.A.
26"-48" x 14' NEW style, McCabe, double spindle, heavy pattern, new lathes.
No. 3 Cincinnati high power Universal Miller.
3—No. 1½ NEW American plain Millers.
No. 1 NEW Hendey Universal Miller.
No. 0 Steptoe New hand Millers.
14" NEW Steptoe Shaper.
16" NEW Steptoe B.G. Shaper.
15" Bement traveling head Shaper.
20" NEW Steptoe B.G. Shaper.
24" Flather, B.G. Shaper.
No. 3 B.&S. Universal Grinder.
Bath Universal Grinder, 10" x 25".
50" x 11" Gould & Eberhardt Gear Cutter.
28" NEW Superior sliding head Drill.
3—25" NEW Superior sliding head Drills.
D4 Colburn high duty Drills.
3—20" Rockford high duty drills.
4' Harrington Radial Drill.

FRANK TOOMEY, INC.
127-131 North Third St., PHILADELPHIA, PA., U.S.A.

We Have for Immediate Delivery the Following Second-hand Machinery in Good Operative Condition

1 Landis No. 3 Universal Grinder 12" x 42", complete equipment, less internal grinding attachment. . $1,500

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $2,200

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $1,800

These machines are particularly good value, and may be seen at our works.

A. B. JARDINE & COMPANY
HESPELER, ONT.

Rebuilt Machines For Sale

PLANERS

1—Pond 42x42x10.
1—Powell 24x24x6.
5—Sellers 25x25x6'.
2—Sellers 25x25x8'.
1—Putnam 25x24x8' 6".
1—Putnam 25x25x10'.
1—Wheeler Heavy 30x30x8' 6".
1—Lathe-Morse 24x24x5' 6".
1—New Haven 24x24x7'.
1—Wood Light 30x30x8'.
1—Putnam 42x40x12' 6".

GRINDERS

1—LeBlond Universal Tool and Cutter, power feed, same as new.
1—Bridgeport Plain Grinder, 16x36.
1—No. 3 Landis Universal Grinder.
2—No. 6X Diamond Double Disc Grinders.
1—Ford Smith Plain Grinder.

AUTOMATICS

1—1" National Acme Double Belt Type.
1—1⅝" National Acme Double Belt Type.
1—No. 55 National Acme.
1—1" National Acme four spindle.
2—No. 54 National Acme four spindle.
3—2" Cleveland.
1—2¼" Cleveland.
2—2¾" Gridley Single Spindle Motors.
1—3¼" Gridley Single Spindle Motor.

LATHES

1—32x12' Draper Lathe, C.R., H.S.
1—36x22' Fitchburg Lathe, C.R., P.C.F.
1—30x8' Fitchburg, C.R., P.C.F.
3—16x8' Putnam, C.R., taper.
6—18x6' Porter, C.R., semi-quick, taper.
2—18x8' Davis, C.R., pan, pump, taper.
10—16x8' Graves-Klusman, C.R., pan, pump.
9—10x6' Perkins Plain Turning, pan, pump.
1—14x6' Porter, C.R.
1—20x8' LeBlond, C.R.
14—20x6' Perkins Lathes, pan bed, chuck, Fay & Scott Turrets.

MISCELLANEOUS

1—16" Niles B. G. Shaper.
2—310 Baker Drills.
1—9" Industrial Works Slotter.
1—24" Aurora Sliding Head Back Geared Drill.
3—Prentice 24" Sliding Head Drills.
2—Industrial 40" Drills.
1—Western Hydraulic Banding Machine.
1—Jenckes Band Turning Lathe, with 3" Universal Chuck.
1—36" Aurora Drill.
1—12" Bement Travelling Head Shaper.
1—12" Juengst Crank Shaper.
1—Sellers Slab Miller, 24x21x12'.
1—No. 21 Lee-Simplex Saw.
1—26x10 Cincinnati Gear Cutter.

This is only partial list—Send for full list

Simmons Machine Company, Inc.
NEW YORK, 1001 Singer Bldg., Telephone Cortlandt 6575
ALBANY, N. Y., 985 Broadway, Telephone 4876 Main

New York's Greatest Stock

(Partial List)

HAMMERS

10,000 lb. Sellers double leg Steam
5,000 lb. Sellers double leg Steam
Two 5,000 lb. Bement double leg Steam
2,000 lb. Morgan Steam Drop Hammer
1,800 lb. Billings & Spencer Board Drop
Two 1,600 lb. Bement single leg Steam
Two 1,500 lb. Billings & Spencer Board Drop
Three 1,200 lb. Billings & Spencer Board Drop
1,100 lb. Miles-Bement single leg Steam
1,000 lb. Pratt & Whitney Board Drop
800 lb. Cockburn & Barrow single leg Steam
750 lb. Toledo Rope Drop
Two 600 lb. Niles-Bement-Pond single frame Steam
New 400 lb. Bement-Miles double leg Steam
200 lb. Bradley Upright Strap
200 lb. Bradley Upright Cushioned Compact
100 lb. Niles-Bement-Pond Hand Drop
75 lb. Belden Strap
Two 60 lb. Bradley Cushioned Helve
40 lb. Bradley Cushioned Helve
Four 40 lb. Gould & Eberhardt Hand Rope Drop

BORING MILLS

10' Poole heavy duty Vertical, two heads, motor driven
52" Bement-Miles Vertical, two heads, motor driven
Three 34" Rogers Vertical, single pulley drive, turret head
Five 30" Bullard Vertical, turret head
20" Bullard Vertical Turret Lathe, two heads
18" Bullard Vertical Turret Lathe, two heads
Betts Horizontal, 4" bar
Bement Horizontal, 3⅞" bar
Betts Horizontal, 2" bar
Pratt & Whitney Horizontal, 2¼" bar
48" Niles Car Wheel
Underwood Automobile Cylinder, 3⅝" bar

MILLING MACHINES

No. 4B Brown & Sharpe Plain, single pulley drive
No. 4 Cincinnati Plain, heavy duty, single pulley drive
No. 4 Brown & Sharpe Plain
No. 2 Hendey-Norton Universal
No. 2 Cincinnati Universal
No. 2 Cincinnati Plain
No. 1½ New American Improved Plain
No. 1 Kempsmith Plain
No. 14A Garvin Plain, table 13¼" x 44"
No. 3½ Garvin Plain, table 12" x 36"
Beaman & Smith 2 spindle Vertical Slab, two spindles
Two No. 5 Brown & Sharpe Vertical
Four Brown & Sharpe Plain Manufacturing, table 9½" x 19"
Two No. 1 Garvin 2 spindle Profilers
No. 4 Garvin Profiler

PLANERS

25 FT. NILES PLATE
16' Dunkirk Plate
60" x 60" x 28' Betts, two heads
55" x 46" x 14' Lincoln, four heads
48" x 48" x 12' Powell heavy duty, three heads

New York Machinery Exchange, Inc.
50 Church Street . . . New York City

Immediate Delivery BARGAIN MACHINERY *Excellent Condition*

Included in the list are Electric Locomotives, Air Compressors, Electric Motors, Snow Plows, Motor Trucks, etc.

Following is a partial list:

5—Air Compressor—1186 cu. ft. per min., 110 lbs. pres. Class C-2. Speed 160 r.p.m., 2-stage Cross comp., cylinder dimension LP 22", HP 14", stroke 18"; pulley wheel 106" dia., 26" face; length overall 13' 0"; width overall, 10' 0"; weight complete, 28,200 lbs.; belt driven by 225 H.P. C.G.E. motor, sliding base; Type 1-12 600 r.p.m., form K, 3-phase, 60-cycle, 52 amp., 2,200 volts; motor pulley 28" dia. x 26" face; distance between pulley centers 25' 0"; leather belt, 2-ply, 25" wide, 68' long; C.G.E. Starting Compensator, Type NR 1858, form A1, with no voltage release; C.G.E. panel EN 16868, with Thomson Ammeter; C.G.E. Oil Switch, Form K3, Type F, 200 amp., 4,500 volts; contract 5/27/12.

1—Aftercooler—4,000 cu. ft. of air, 640 sq. ft. of cooling surface; 294 No. 13 steel tubes, 6' 6" long, 1½" O.D.; dimension, 42" dia. x 15' 6" long, 13' 6" between center of air intake and outlet; 8" air intake and outlet; 2½" water inlet and outlet; 120 lbs. per sq. in. working pressure; weight 6,600 lbs.; order No. 1256.

1—Aftercooler—1300 cu. ft. of air, 230 sq. ft. of cooling surface; 44 tubes, 10' 0" long, 2" O.D.; dimensions, 24" dia. x 11' 0" long, 7' 6" between center of air intake and outlet; 6" air intake and outlet; 2" water inlet and outlet; 1" 110-lb. safety valve; weight 3,450 lbs.; order No. 1255.

1—Alco Motor Truck—2 tons, chain drive; H.P. 32.4; speed, high 17.86 m.p.h., low 5.98 m.p.h., inter., 9.33 m.p.h, reverse, 4.57 m.p.h.; 4 cylinder motor (4½" bore x 5½" stroke); water cooled centrifugal pump circulation; 3 point suspension tubular radiator; splash lubrication; multiple disc clutch, sliding gear transmission, Bosch magneto, DU4, model 4; frame of 5" channel; 112" standard wheel base; semi-elliptic spring; solid rubber tires; gasoline capacity 27½ gallons.

2—Air Reheaters—Sterling size F; capacity 250 cu. ft. free air per min.; type of ignition A.C.; size of inlet and outlet 1¼"; height 26 inches; weight 160 lbs.; order No. 1236.

2—Air Receivers—Designed for 125 lbs. pressure; size 72" dia. x 188' 0" long shell 7-16" steel plate, heads ½" steel plate; shell seams lap joint double riveted; circular seams single riveted; 10" flange openings; ordered about 7/7/12.

2—Rip Saw—Cowan M 246; capacity for 42"; speed 450 r.p.m.; stationary iron table heavily ribbed, 3' 10" x 7' 6"; bevel fence, varying angles to 45 deg.; elevating arbor, 13" vertical adjustment; tight and loose pulleys, each 22" dia. x 10" face; belt driven; order No. 189, 1271.

1—36" Band Saw, complete, with tight and loose pulley 14" x 4"; belt driven; order No. 1271.

Hand Power Liberty Shears, complete with Knives and Measuring Gauge (for cutting iron)—1 only, Shear H-7, cuts plates ⅜"; flat bars 6½ x 19/32; round bars 1⅛; square bars 1"; angles 2¾ x 11/32; ts 2¾ x 11/32; mitre on angles and ts 11/32; approximate weight 330 lbs.; price $182.75.

2 only—Shears F-3, cuts flat bars 3½" x ½"; round bars 1"; square bars ⅞"; angles 3⅛ x ⅜; ts 3⅛ x ⅜; approximate weight 220 lbs.; price $152.25.

2 only—Shears F-4, cuts flat bars 4 x 9/16; round bars 1 3/16; square bars 1"; angles 4 x ⅜; approximate weight 400 lbs.; price $231.00.

About 8 Round Ore Buckets—capacity 1½ cu. yds.; 43" dia. x 49" depth; straight side with pin and ring fastening; weight 660 lbs.; order No. 22.

8—Round Ore Buckets, capacity ½ cu. yd.; straight side with pin and ring fastening; bought Nov. 30, 1916, from Deakin Cons. Co.

About 4 Square Ore Buckets, Class "C"; capacity 1 cu. yd.; straight side; self-dumping and self-righting; order No. 88.

1—Snow Plow, made of No. 10 steel plate and reinforced with angles; same as used on Montreal Tramway Mountain cars; order No. 9258.

1—Commer Motor Truck, 7 tons, type P.G., 65 H.P.; drive chain enclosed in aluminium oil-tight covers; five speeds and one reverse; 4 cylinder motor (5½" bore x 6" stroke); water-cooled, centrifugal pump circulation; 3 point suspension tubular radiator; splash and pump lubrication; cone clutch, sliding gear transmission; Bosch magneto DU4, model 4; Standard lorry body, length 20' 3" x width 7' 4½"; semi-elliptic spring; 162" wheel base; solid rubber tires (front single, rear dual); gasoline capacity, 35 gallons; weight 11,000 lbs.; voucher No. 1377.

4—Blowers, Root No. 3 Tangent Arc Impeller; horizontal power blowers; capacity 1,000 cu. ft. of air pressure at 5 lbs. pressure per sq. in.; speed 1,200 r.p.m.; bottom intake, top discharge, 12" opening; geared both ends; extended driving shaft fitted with C.I. cut gear, 4" face, 36 teeth and outboard bearing; blower mounted on C.I. bed-plate with extension for motor drive; without motor; order Nos. 233 and 2515.

About 3 "Glengarry" Cars—3 cu. yd. two-way side dump; height from rail to floor, 3"-3½"; height from rail to top of box 4' 11½"; height to center of draw bar 1' 7"; dimension of box, 6' 0" wide x 8' 0" long, 1' 8" deep (inside); ends, doors and floor 2" thick; overall dimensions 6' 4" wide x 12' 0" long, dump 45 degrees; spring draw heads; link and pin coupling; wheels 16" dia.; axles 3" dia.; gauge 36"; babbitted journal boxes of oil tray type; without brakes; order No. 2412.

About 40 "Muck" Cars—1 cu. yd., 1¾ tons, one end dump; height from rail to floor, 1' 8"; height from rail to top of box 3' 4"; wood box 3' 2" wide x 6' 6" long x 1' 8" deep, lined with ¼" thick steel plates; one end hinge for tipple dumping; steel truck frame; helical spring support; ⅝" x 4" through draw bar; link and pin coupling; solid wheel 18" dia.; axle 3" sq.; gauge 36"; overall dimensions 4' 0" wide x 7' 6" long; without brakes; weight empty, 1,500 lbs.

About 50—Sand and Stone Cars, 1¼ cu. yd., 1½ tons, bottom dump; height from rail to floor 1' 8"; height from rail to top of box 4' 4"; wood box with ends inclined for 45 deg. dump; double steel doors operated with side lever for dumping between rails, opening 18" x 22"; steel truck frame; helical spring support; ⅝" x 4" through draw bar; link and pin coupling; solid wheel 18" dia.; axle 3" sq.; gauge 36"; overall dimensions 4' 0" wide x 7' 6" long; without brakes; weight empty, 2,100 lbs.

About 20 "V" Shaped Dump Cars, 1 cu. yd., two-way side dump; height from rail to floor 1' 8"; height from rail to top of box 5' 0"; steel box (3/16" plate) "V" shaped of Hudson type; steel truck frame; helical spring support; ⅝" x 4" through draw bar; link and pin coupling; solid wheel 18" dia.; axle 3" sq.; gauge 36"; overall dimensions 4' 0" wide x 7' 6" long; without brakes.

About 15 Dump Cars, two-way side dump; height from rail to top of box ———; standard M.C.B. wheel and axle; formerly "Bay of Quinte"; bought from C.N.R.

1—Cement Gun—Type FD, equipped with air motor; weight 1,500 lbs.; order No. 11,076.

2—Caniff Grout Machine—Standard type, for pressures up to 150 lbs.; construction—steel cylinder with conical hopper bottom, flat top with charging door, mounted on three-legged base; piping and levers on one side for operation from one position;; operation —cement, sand and water admitted at top, mixed by compressed air entering bottom; discharged at bottom by air entering top; two-bag batch of grout required about 60 cu. ft. of air if working at 80-lb. pressure; order Nos. 12,192 and 12,437.

2—Travelling Crane—5 ton, double girder type, 35 ft. span; geared trolley and geared bridge travel; hand operated throughout with floor control; overall length of girders 36' 0"; center to center of rail 35' 1¾"; trolley gauge 1' 10½"; order Nos. 7,944 and 9,816.

DRILL STEEL.

1" Cruciform Best Cast Drill Steel, 5,158 lbs. (Jessop's).

1⅛" Cruciform Best Cast Drill Steel, 3,936 lbs. (Jessop's).

1¼" Cruciform Best Cast Drill Steel, 2,246 lbs. (Jessop's).

1⅜" Cruciform Best Cast Drill Steel, 7,018 lbs. (Jessop's).

1½" Cruciform Best Cast Drill Steel, 6,595½ lbs. (Jessop's).

1¾" Cruciform Best Cast Drill Steel, 450 lbs. (Jessop's).

2" Cruciform Best Cast Drill Steel, 5,537 lbs. (Jessop's).

2¼" Cruciform Best Cast Drill Steel, 5,726 lbs. (Jessop's).

2½" Cruciform Best Cast Drill Steel, 457 lbs. (Jessop's).

1—Roll Hammer Crusher, Kennedy No. 12, belt driven; base heavily ribbed, extra strong casting; hammers, housing and grid screen of manganese steel; pulley of high speed roll, 16" x 14", 1,000 r.p.m.; pulley of slow speed roll, 54" x 4", 50 r.p.m.; opening of feed hopper, 12" x 14"; overall dimensions 6' 0" x 6' 4¾" x 4' 0' high; order No. 806.

2—Gyratory Rock Crusher, Kennedy No. 7½; capacity 75-125 tons per hr. passing 3" ring; size of openings (two each) 15" x 56"; combined openings 15" x 112"; speed of driving pulley 400 r.p.m.; size of pulley 40" dia. x 18" face; requires 100 H.P. motor for driving; equipped with manganese mantle and concaves; steel spider, hammered steel shaft, and babbitted eccentric and ball; weight 70,000 lbs.; order Nos. 806 and 6,000.

1—Gyratory Rock Crusher, Kennedy No. 30; capacity 2,500-5,000 tons per hr. passing 4" ring; size of openings (two each) 30" x 116"; combined openings 30" x 230"; speed of driving pulley 300 r.p.m.; size of pulley 64" dia. x 34" face; right-hand drive; requires 200 H.P. motor; equipped with No. 2 corrugated manganese mantle; No. 1 manganese concaves, steel spider, nickle steel shaft, and babbitted eccentric and ball; weight 225,000 lbs.; order No. 10,456.

1—Bucket Elevator—"Link Belt" open top type; capacity 175 tons crushed stone per hr. at a speed of 60 ft. per min.; dimensions—carrier 78' 0" long between centers, inclined at 19 deg. from vertical; buckets 24" pitch x 30" wide attached to two strands of 24" pitch steel strap roller chain; buckets supported by CI rollers running on 20-lb. rails; equipped with 2 CI sprocket wheels, 7 teeth, 55⅝" dia., 24" pitch, keyed to 6⅞" dia. head shaft; 1 CI equalizing gear, 84 teeth, 74.87 dia., 2.8 pitch, 8¾" face; 1 CS equalizing pinion, 12 teeth, 10.69" dia.; 2.8 pitch, 8¾" face, keyed to 4⅞" dia., 75 H.P. motor shaft; 2 CI sprocket wheels, 7 teeth, 55¼" dia., 24" pitch, keyed to 3 7/16" foot shaft; 2 bottom take-ups; order No. 12,574.

3—"Word" Drill Sharpeners—For 10 ft. steels; sharpens 800-1,000 drills or 500 new bits/10h; does not require change of dies or dollies for different gauges; dollies forge two wings of the bit at a time, working the steel from center out, equalizing the metal and filling out the corners; dead block driven by friction gear and a pulley belted to line shafting or motor; hand and foot control, levers controlling dead block, horizontal and vertical pistons operated from one position; operates at 80-100 lbs. pressure. Order Nos. 62 and 6,354.

3—Hammer Drills, Class DB-19. Order No. 2,135.

About 20 Rock Drills—3⅝", Class UH-2 Water Type; air differential valve; chuck bushing for 1½" round hollow steel; order Nos. 2,649 and 7,284-5.

About 30 Rock Drills—2⅝", Class FF-12 Water Type; chuck bushing for 1⅛" hollow hexagon steel; voucher Nos. 909 and 426.

2 Rock Drills—2⅝", Class FF-12; without water attachment; chuck bushing for 1⅛" hexagon steel; order No. 2,326.

About 6 Rock Drills—3¼", Class FL-12 Water Type; order No. 6,301.

About 12 Hammer Drills—Hardy Simplex Type B-6; weight 27 lbs.; order No. 1,237 and 3,745.

2—Hammer Drill—Hardy Simplex Type B-7; order No. 9,408.

2—Hammer Drill—Type BCR-33, Butterfly Self-rotating; order No. 930.

2—Hammer Drill—Class A-345, Self-rotating; order No. 1,308.

1—Dake Engine, No. 4; 10 H.P. non-reversible air engine, 400 r.p.m.; order No. 3,105.

1—Vertical Engine, slide valve; cylinder dimensions 6" dia. x 6" stroke; fly wheel; order No. 15,194.

1—Vertical Engine, slide valve; cylinder dimensions 6" dia. x 7" stroke; flywheel; throttling governor; bought from Comp. Engineer.

About 8 Heading Bars, Class U-24; 4" single screw columns 8' 0" long each, complete with 4 arms and 4 braces.

2—4" Double Screw Columns, 9' 0" long each, complete with 4 arms and 4 braces.

2—4" Single Screw Columns 11' 0" long each, complete with 4 arms and 4 braces. Order 105,303.

About 7 Columns—Class U-29; 5½" Single Screw 11' 0" long each, with 2' 6" center supporting brace; order Nos. 2,649, 6,292.

4—5½" Single Screw 12' 0" long each, with 2' 6" center supporting brace; order No. 7,977.

About 8 Tripods—Class U-3, adjustable; complete with saddle, legs and weights; contract of June 17-12, and order No. 2,326.

1—25 K.W. Generator, type DLC, 202, form A, speed 900 r.p.m.; volts no load 120, full load 125; amp. 200; commutating pole; sliding base; order Nos. 5,921 and 3,189.

1—25 K.W. Generator, Type CLC 20, speed 1,200 r.p.m., volts 125; armature No. 12,098; sliding base; order No. 2,836.

1—20 K.W. Generator, Type CVC, speed 1,200 r.p.m., volts 125; commutating pole; sliding base; order No. 4,197.

2—Derrick, Stiff-leg Type; capacity 5 tons; boom 10" x 12" x 50' 0" long; mast 12" x 12" x 30' 0" long; stiff legs 12" x 12" x 52' 0" long; sills 12" x 12" x 46' 0" long; complete with bull ring; order No. 101.

1—Electric Hoist, Style No. 206; single drum 32" dia. x 22" long; bed plate, approx. 6' 0" wide x 8' 0" long, complete with C.G.E. motor (547,298), type ITC, form M, 37 H.P., 3 phase, 60 cycle 550 volt, 42 amps.; frame No. 5,012; controller (262,016); type T, 10J, EN 9117; 1G rheostats No. 20,071 Dr. 20,428; shipping weight with motor approx. 7,000 lbs.; rope cap. of drum 2,300 ft. of ⅝" cable; hoisting speed at full load 400 ft. per min.; pull on single line 4,000 pounds; order Nos. 850, 1,992.

2—Shaft Cages; capacity 5 tons; self-dumping; equipped with safety catches; platform contains 3 ft. gauge track for end dump cars; order No. 622.

1—Electric Hoist, for shaft work; single fixed drum 52" dia., 32" face, grooved for 1⅛" diam. rope, cap. 900'; duty 6,200 lbs. at 200 ft. per min.; bed plate 74" wide x 106" long; complete with G.E. induction motor No. 547,978, speed 575-600 r.p.m., 550 volt, 3 phase, 60 cycle, magnetic brake No. 6,699; controller T 10 J No. 5,224 EN 9,117; rheostats No. 20,073 Dr 20,439; limiting switch; dial indicator; contract 7/22/12.

1—Hoist Engine—Double drum 10" x 18" drum cap. 800' each of ⅝" cable; cylinders 5" x 8"; pull on single line 2,000 pounds.

1—Hoist Engine—Single drum 20" x 14"; cap. 1,150' ⅝" cable; double cylinders 5" x 7"; hoisting speed 125 ft. per min.; pull on single line 1,800 lbs.; order No. 3,875.

1—Hoist Engine—Size No. 26, 8 H.P. single drum 18" dia. x 14" face; double cylinders 5" dia. x 7" stroke; 1,800 lbs. on single line at 150 ft. per min.; bed plate 37" wide x 45" long; shipping weight approx. 1,900 lbs.; rope cap. of drum 1,050' of ⅝" cable; voucher No. 84.

1—Hoist Engine—Double drum 12" x 24"; cap. each 960' ¾" cable; double cylinder 7" dia. x 12" stroke; complete with boiler, swinging gear (extra); pull on single line 7,000 lbs. at 140 ft. per min.; order, Engine and Boiler No. 64; swinging gear No. 488.

Full particulars on request. ***All goods subject to prior sale.***

J. R. BAXTER & COMPANY, LIMITED **102 St. Antoine Street, Montreal, P.Q.**

LOOK—HERE THEY ARE

BORING AND TURNING MACHINES—VERTICAL.

1—30" Bullard, 1 turret head.
1—34"-42" New Colburn, one turret head; Aug. delivery.
1—34" Rogers, one turret head; Sept. delivery.
2—36" N-B-P, one plain and one swivel head.
2—36" B. & S., one turret head; Dec. delivery.
1—37" Niles, one swivel, one turret head.
1—72" Niles, two swivel heads.
1—84" Sellers, one head.
1—New 8' Bickford; December delivery.
1—10' Niles, two swivel heads.

BORING MACHINES—HORIZONTAL.

1—Lucas, 2¼" bar.
1—Hoefer Horizontal Driller and Borer, with 1 11-16" spindle, vertical adjustment 40", horizontal adjustment 46", size of table 33" x 48".
1—No. 1 Barrett Cylinder Borer, 3¾" bar type.
1—Conradson Motor-driven Driller, Borer and Tapper, 5' adjustment of head on column, 2' spindle travel.
1—Lane & Bodley, capacity 68" x 15' floor, plate 19', 8" boring bar, motor-driven.

BULLDOZERS.

1—New No. 4 Garrison (same as No. 4 Williams-White).
1—No. 7 Ajax, 20" stroke.
1—No. 7 High-speed Ajax, 16" stroke.

COMPRESSORS—AIR.

1—8" x 8" Curtis, belt-driven.
1—10" x 10" x 10" Single Cylinder Smith-Valle, steam driven.
1—10" x 12" Chicago Pneumatic, belt-driven.
1—10"-16½" x 13" Peerless, cross compound, steam driven.
1—22"-13" x 16" Ingersoll-Rand, motor driven.
1—Ingersoll-Sargent Duplex, 8 x 14½ x 8".
1—Ingersoll-Sargent Steam Driven, 345 cu. ft.
1—Cincinnati Cross Compound, two-stage, 790 cu. ft.

CUTTING-OFF MACHINES.

2—No. 00 Brown & Sharpe.
1—2" capacity Warner & Swasey.
4—3½" Hall.
10—4½" Williams.
3—4" Curtis & Curtis.

DRILLING MACHINES—RADIAL.

2—New 2' American, cone drive.
1—3' Bickford, semi-Universal table.
1—New 3½' American, tapping attach.; Sept. del.
3—New 3' Americans, sensitive tapping attachment.
4—New 3' Prentice, July delivery.
1—New 3' Mueller, plain speed, box drive.
1—New 3½' Mueller, cone drive; July delivery.
1—New 3½' Western Drill, 86" circle.
1—3' Bickford, gear drive.
2—4' Mueller, plain, speed box drive.
2—New 4' American, tapping attach.; Sept. del.
2—New 5' American, tapping attach.; Sept. del.
1—5' Bickford, plain, speed box drive.
1—5' American, plain, motor drive.
1—5' Fosdick Plain, cone drive, tapping attach.
5—5' Spindle, arm does not raise and lower, hand feed.
1—6' Baush Plain, cone driven.
1—6' Dresses, tapping attachment.
10—New 6' Triumph, motor drive; Sept. del.

DRILLING MACHINES—HEAVY DUTY.

3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
2—D-3 Colburn, plain table.
4—No. 310 Baker, single pulley drive, late type.

DRILLING MACHINES—MULTIPLE SPINDLE.

1—No. 11 Pratt & Whitney, 16 spindle, capacity 10 spindles, ¼" cap.
1—Gardam, 12 spindle, capacity ⅜" holes, 14" square.
1—14-spindle Baush, capacity 1" holes, 36" circle.
1—No. 24 Baush, 12 spindles.
1—No. 30C Baush, 12 spindle, capacity 1⅛" holes, 30" circle.

GEAR-CUTTING MACHINES.

1—No. 1 Whiton.
1—No. 3 Brown & Sharpe Auto. Gear Cutter, Spur.
1—New 6" Standard Gear Cutter, Spur.
1—12" Gleason Bevel Gear Planer.
1—15" Gleason Bevel Gear Planer.
1—16" Bilgram Bevel Gear Generator.
1—20" Grant-Lee Gear Hobber.
1—No. 1 20" Schuchardt & Schutte Gear Hobber.
1—24" Fellows Gear Shaper.
1—22 x 8 G. & E. Spur and Bevel Cutter.
1—24 x 8" G. & E. for Spur and Bevel.
3—36" Fellows Gear Shapers.

GRINDERS—UNIVERSAL FOR CUTTERS, DRILLS, REAMERS, ETC.

1—LeBlond.
1—No. 1 Cincinnati.
1—New Norton No. 1.
1—New Walker No. 2, outfit K (capacity 9" x 26").
1—New Wilmarth & Morman, style B.X.
8—No. 190 Wells.

GRINDING MACHINES—CYLINDRICAL—PLAIN.

1—6" x 48" Pratt & Whitney.
1—10" x 50" Norton.
1—New 10 x 72 Norton, Plain.
1—New 10 x 36" Landis; immediate.
1—10" x 60" Landis.
1—New No. 12 B. & S. 8" x 26"; Sept. del.
6—12" x 36" Modern, self-contained, motor or belt driven.
6—12" x 48" Modern, self-contained, motor or belt driven.
20—12" x 24" Modern, self-contained.
1—New No. 12 (8" x 72") Brown & Sharpe.
1—No. 16 (10" x 72") Brown & Sharpe.
1—16" x 66" Landis, with crank grinding.
1—12 x 32 Landis; rebuilt.
1—18" x 96" Brown & Sharpe.

GRINDING MACHINES—CYLINDRICAL—UNIVERSAL.

1—No. 1½ (10" x 30") Landis.
1—New No. 2 Bath.
1—No. 2 New Walker, 9" x 26".
1—No. 2 (9" x 20") Bath.
1—No. 2 (12" x 30") Brown & Sharpe
10—New No. 2 Morse, cap. 12" x 30", Universal; Nov. delivery.
1—No. 2½ (10" x 36") Bath.
1—No. 3 (12" x 40") Brown & Sharpe.
1—10" x 42" Modern.
1—12" x 42" Landis.
1—Brown & Sharpe No. 13, 8" x 24".

GRINDING MACHINES—INTERNAL.

1—No. 1½ Landis.
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—CYLINDER.

1—No. 27 Brown & Sharpe.
1—No. 60 Heald, single pulley drive.

GRINDERS—PROFILE.

1—New Cleveland.

GRINDERS—DISC.

1—New No. 7 Gardner (Pattern Makers).

GRINDING MACHINES—RING.

1—New No. 14 Beasley, two-ring chucks.
1—No. 200 Heald.
1—No. 210 Heald.

GRINDING MACHINES—EDGE.

1—No. 374 Safety Emery Wheel Co.

GRINDING MACHINES—SURFACE.

1—New No. 1 Wilmarth & Morman.
1—No. 1 Diamond, capacity 12" x 12" x 24", automatic.
4—New No. 2 Reid (same as B. & S.).
1—New No. 2 Brown & Sharpe.
1—22" x 12" x 60" Springfield, planer type, automatic.

GRINDING MACHINES—DUPLEX.

1—No. 5 Bath, suitable for grinding cylinders, piston rings, etc., 16" feed, swivel table, water pump.

GRINDING MACHINES—FACE.

1—Diamond Face Grinder, 4' travel, 14" wheels.

HAMMERS—POWER—FORGING.

1—40-lb. Bradley Helve.
1—150-lb. Bradley Helve, upright.

HAMMERS—BOARD LIFT—DROP.

1—400-lb. Billings & Spencer.
1—2000-lb. Chambersburg.

HAMMERS—STEAM—FORGING.

1—Used 600-lb. Niles Single Frame.
1—3000-lb. Bell; Sept. delivery.

KEYSEATERS.

2—No. 0 Mitts & Merrill.
1—No. 2 Mitts & Merrill.
1—60" stroke Compton Knowles Broacher.

LATHES—MANUFACTURING—NOT SCREW CUTTING.

13—No. 3X Reed-Prentice, semi-automatic.
14—Reed-Prentice Shell Lathes, for 4" or 18 lbs. American shells.
60—14" x 6' Reed Stud and Bolt.
5—16" x 8' Fairbanks-Morse, heavy duty.
70—New. Simplex, 16" x 8'.
14—16 x 8 Simplex, Single Pulley Drive.
22—18" x 8' Battle Creek, heavy duty.
5—20" x 8' Merschon.
50—20" x 10" Hindman, high duty.

LATHES—ENGINE.

6—New 12 x 4 Shepard, reverse head.
8—New 12 x 5 Shepard, reverse head.
3—New 12 x 6 Shepard, reverse head.
1—14" x 6' Bradford, taper attachment.
2—16" x 6' LeBlond, pan bed, quick-change gears, taper attachment.
1—18" x 8' Lodge & Shipley, geared head, taper.
3—18" x 9' Chard.
1—18 x 10 Hendey, quick-change gear, 14" chuck.
1—New 19" x 8' LeBlond, heavy duty.
22—20" x 8' Lodge & Shipley, quick-change gear.
7—New 20" x 8' American, heavy duty.
9—22" x 10' Putnam, oil pan turrets.
1—24" x 24' Perkins, single back geared, raising blocks to 40", 18" chuck.
2—24" x 12' S. & B.
1—24" x 14' Lodge & Shipley, patent head.
4—24" x 10' Reed.
4—24" x 14' American, quick-change.
1—24" x 45" x 22' McCabe, double spindle.
1—26" x 24' New Haven.
4—27" x 14' Patent Head Lodge & Shipley, double back geared.
1—28" x 18' New Haven, single back geared.
1—28" x 18' S. & B.
4—New 28" x 12' Boye & Emmes.
5—New 30" x 14' Boye & Emmes.
3—New 32" x 12' Pittsburg pattern.
8—New 36" x 24' Putnam, triple geared.
9—New 36" x 12' Putnam, geared head; Nov. delivery.
1—38 x 19' Steptoe, single back gear.
1—48 x 27'-9" Betts, triple back gear.
1—60 x 27 Betts, triple back gear.
1—New 66" x 30' Putnam; Dec. delivery.
1—71" x 20' Fifield, triple geared.

LATHES—TURRET.

5—2 x 24 Jones & Lamson.
5—3 x 36 Jones & Lamson.
18—6A Potter & Johnson.
2—21 Gisholt.

MILLING MACHINES—KNEE TYPE—UNIVERSAL.

1—No. 1½ Hendey-Norton.
1—No. 2 Kempsmith, back geared.
1—No. 2 New Cincinnati.
2—New No. 2½ LeBlond; Sept. delivery.
2—No. 3H LeBlond; Sept. delivery.
2—New No. 3 Becker, August delivery.
2—New No. 3 Cincinnati.
1—New No. 4 LeBlond, heavy duty; immediate.
1—New No. 24 Oesterline.

MILLING MACHINES—KNEE TYPE—PLAIN.

1—No. 0 Pratt & Whitney.
1—New No. 1 Brown & Sharpe.
2—New No. 1 Kempsmith.
1—New No. 1½ American.
1—New No. 2 Rockford.
1—No. 3 LeBlond.
1—No. 3 Cincinnati.
1—No. 4 Garvin.

MILLING MACHINES—VERTICAL.

4—New No. 4B Becker.
2—No. 5 Becker.

MILLING MACHINES—PLANER TYPE.

1—No. 2 Beaman & Smith.
2—Ingersoll Slab Millers, working surface of table 60" x 20".
1—No. 4 Beaman & Smith, vertical spindle, open side, working surface of table 120" x 24", removable housing on one side.

PLANERS.

1—24" x 24" x 6' Gray, one head on cross rail.
1—26" x 26" x 8' Gray, one head on cross rail.
1—30" x 30" x 8" Gale Planer, one head.
1—30" x 30" x 8' Whitcomb, one head.
1—New 36 x 36 x 12' Powell High Speed, one head.
1—36" x 30" x 12' New Haven, one head.
1—36" x 36" x 9' Sellers, four heads.
1—36" x 36" x 9' Sellers, two heads.
2—New 36" x 36" x 12' Woodward & Powell, two heads on cross rail, one side head; Oct. delivery.
1—36" x 36" x 14' Sellers, four heads.
1—40" x 40" x 11' Niles, four heads.
1—42" x 10' Hews & Phillips, one head on rail, one side head.
1—42" x 14' Pond, two heads.
1—Gray, 42", widened to 56" x 42" x 16, two heads.
1—48" Cleveland Rotary Planer.
1—48" x 48" x 16' Sellers, one rail head, two side heads.
1—50" x 14' Powell, one head.
1—60" x 60" x 18' Woodward-Powell, four heads.
1—72" x 72" x 26' Motor drive, Betts, four heads.

SCREW MACHINES—AUTO.

3—No. 51 National Acme.
2—No. 52 National Acme.
2—No. 53 National Acme.

SHAPERS.

1—New 16" Springfield.
1—16" Motor-driven Rockford.
2—New 24" Milwaukee.
1—New Barker, 24".
3—New 24" Steptoe, back gear.
1—30" Walcott, gear drive.
1—Spindle 30" Norton, with 7' Universal Radial Drill on base plate.

SLOTTERS.

1—New 10" Newton.
1—120" Vertical Slotter, 10' stroke, two heads.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 32 N. Clinton St. — **CINCINNATI, OHIO** 1018 Union Central Life Bldg. — **CLEVELAND, OHIO** 508 Leader News Bldg. — **NEW YORK CITY** Singer Bldg.

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Jobbing Machine Shop Owners

will find it to their advantage to mail us a list of their equipment and state what line of work they prefer to undertake.

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GEAR Wheels Cutting of every description

Matchless Rawhide Pinions in 24 hours.

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Try our W-G Rawhide Silent Gear. Designers and Builders of Special Machinery.

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We have the largest Jobbing Brass Foundry in Canada.

Can make prompt delivery.

Tallman's reputation is in the goods.

Tallman Brass & Metal Co.

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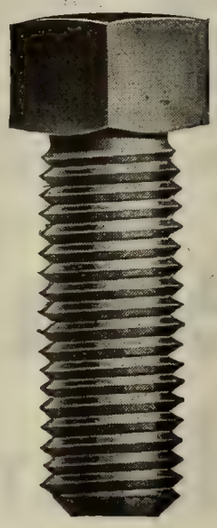
CANADA

ACCURACY



The discriminating buyer is the one we like to meet—the one who insists on accurate product. He will eventually buy "GALT" Cap and Set Screws because they measure up to his standard.

Your rush orders for S. F. Hex. nuts taken prompt care of. Better finished nuts—try a sample.

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GALT MACHINE SCREW CO., LIMITED

GALT, ONTARIO

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GAUGES AND TOOLS

OUR SPECIALTY

How is This?

No. 28 THREAD GAUGE FOR NOSE OF SHELL

ONLY $35.00

CAN DELIVER FROM STOCK.

THE MONARCH BRASS MFG. COMPANY, LIMITED

71 Browns Ave., Toronto

Col. MacLean was in Germany When War Broke Out

HOW he got out, what he saw, heard, learned and concluded, he tells in the August number of MACLEAN'S MAGAZINE. Colonel MacLean knows Europe thoroughly. He knows high-up men in all the great political and commercial capitals of Europe—diplomats, bankers and great merchants. These men told him freely and plainly many startling things about Germany and her intentions.

In a contribution of truly sensational interest, abounding in most startling facts, Colonel MacLean points out "The Dangers Ahead." His aim is to arouse Canadians out of their unwarranted confidence and out of their content. You will find in this article by Colonel MacLean strange, even shocking revelations, and things hard to believe—and you ought to read "The Dangers Ahead" in order that you may help in their avoidment by Canada and her people.

MacLean's for August Is a Midsummer Number

The August MACLEAN'S is excellently balanced, as you will see from these contents:

CONTENTS

The Dangers Ahead. By John Bayne MacLean.

The Menace of Canadian Titles. By Joseph Martin, M.P.P.

Rev. C. A. Eaton—A Canadian Who Speaks Out. By Beatrice Redpath.

Frenzied Fiction for the Dog Days—(Done by the Dipperful.) By Stephen Leacock.

The Human Side of Conscription. By H. F. Gadsby.

Winning the War in the Air. By Agnes C. Laut.

A Circus Story. By L. B. Yates.

Mam'selle Butterfly. By Arthur Beverly Baxter.

The Captain of the Susan Drew. By Jack London.

An Andy Doolin Yarn. By Hopkins Moorhouse.

A Detective Story. By Robert E. Pinkerton.

The Gun Brand. By Jas. B. Hendryx.

Canada's First Woman Member.

Economy in Preserving and Canning.

Women and Their Work—A New Department. Review of Reviews—Regular Department.

Yates who writes the Circus Story, was born in Hamilton. He wrote those stories about Paragon Pete and The Singin' Kid in the **Saturday Evening Post.**

Leacock is excessively humorous in his Dog Days Sketch, in which he talks about summering and simmering.

Miss Laut fancies that the war may be won by the birdmen, and if Uncle Sam produces 100,000 planes, she may be right.

Gadsby sits in the Press Gallery at Ottawa, and writes brilliantly always. His "Conscription" article is in order.

Pinkerton who writes the detective story, "Old Twilight," knows how to write this class of story.

By the way, Lord Northcliffe has promised an article for the September MACLEAN'S.

You can see that MACLEAN'S for August is just the right type for August.

At All News-Dealers 15 cents

One of the

Steels of the Century

Centurion High-Speed

Made from the BEST Materials

Iron, Tungsten, Chrome, Vanadium

Melted by the BEST Process

The Crucible Furnace Method

Handled by the BEST Workmen

Melters, Forgemen, Annealers, Metallurgists

CONSEQUENTLY

Will do the BEST Work

Quality ***Delivery*** ***Service***

We have a catalog waiting for you. Write for it.

THE CENTURY STEEL CO. OF AMERICA

MANUFACTURERS OF HIGH-GRADE CRUCIBLE STEELS

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Cut Your Shop Costs

Nobody would think of putting 16-inch lathe work on a 30-inch lathe, then why leave small parts on a large Milling Machine?

A Steptoe Hand Miller or small power feed can be handled quickly and will cut your production cost. You will have less money invested in your Milling Machines and have more machines to do the work.

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A Steptoe Shaper will do the work faster because it can be handled quicker.

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WHY TOLERATE

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Eliminate all difficulties by using High-Grade Selected

DIAMONDS

Direct from the South African Diamond Fields. All sizes at your command, either unmounted or mounted in any style holder, **MADE IN CANADA.**

Try our **CAST STEEL** mounting for complete satisfaction of performance.

Wheel Trueing Tool Company

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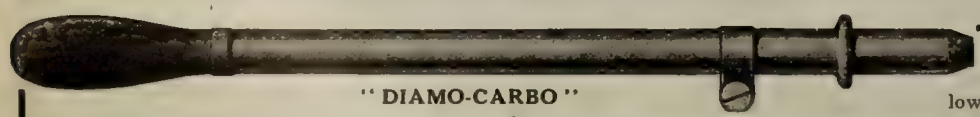

"DIAMO-CARBO"

You can make your dull or coated grinding wheels like new in efficiency by dressing them with

DESMOMD-STEPHAN GRINDING WHEEL DRESSERS

and you will eliminate delayed production and lost time, due to the loss of their cutting properties.
Insist upon having your dealer supply you with one of our tools for trial. If he cannot, write us, and we will send any of them on approval.

The Canadian Desmond-Stephan Mfg. Company
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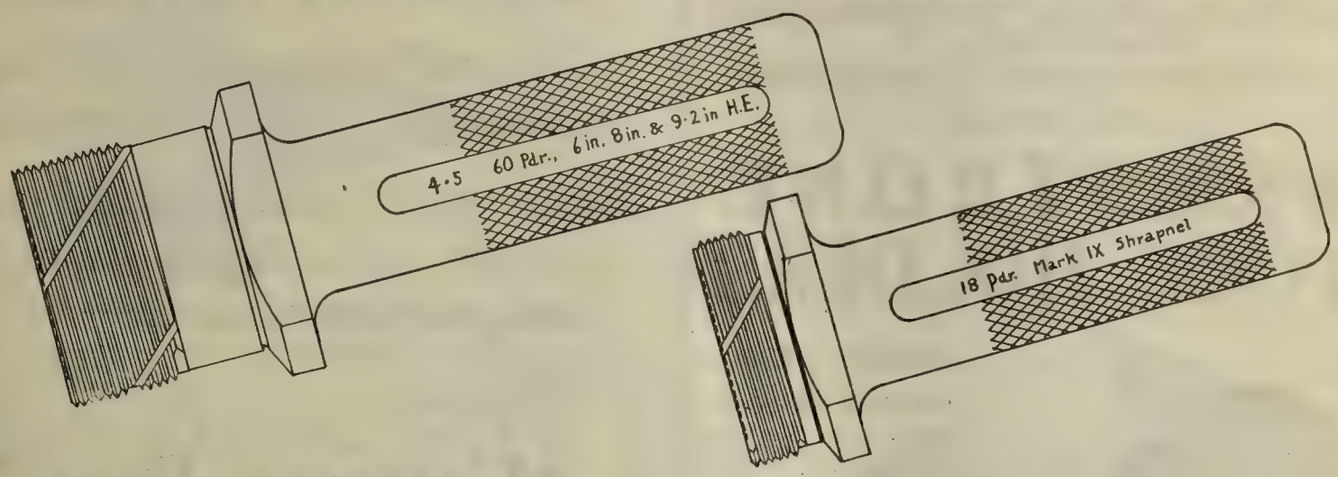
Our "Diamo-Carbo" Dressers are the economical substitute for the Black Diamond Dressers. They are so low-priced that each grinding stand may be provided with its own dresser.
Our "Sherman-Huntington" Dressers are for use on large and coarse wheels upon which the Diamond cannot be used. It is the most satisfactory Dresser ever designed.

"SHERMAN HUNTINGTON"
Alfred Herbert, Ltd, Coventry, Agents for Great Britain

FUSE HOLE GAUGES



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NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

No. 12 Plain Milling Machine—Use Code Abrade

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rapidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments.....18 x 6 x 15 in.

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Awarded separately and independent of other lines exhibited at the

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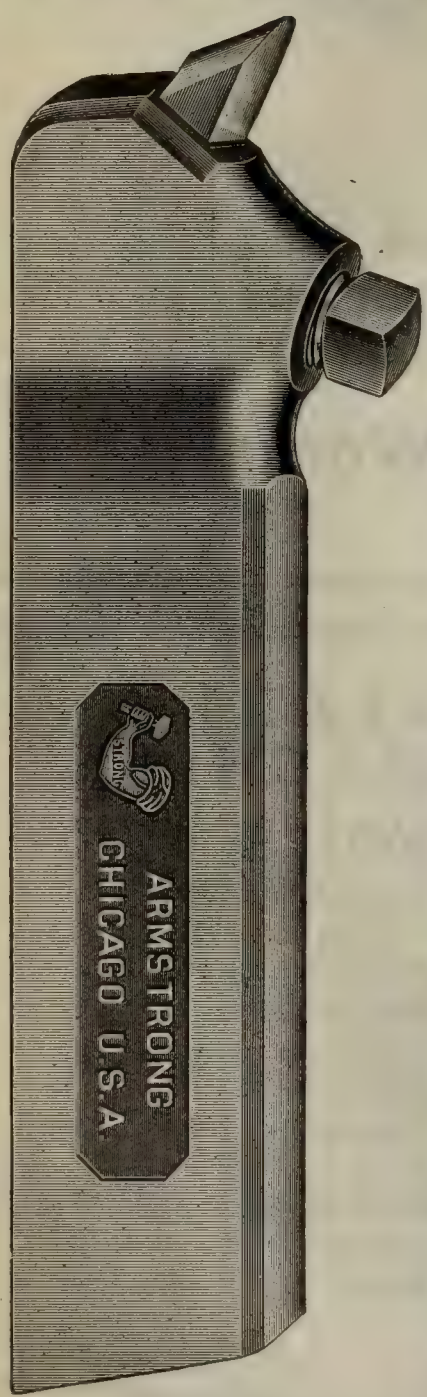

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They Are Saving Millions of Dollars in High Speed Steel

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The Panama-Pacific MEDAL OF HONOR was also won by ARMSTRONG Drop Forged Wrenches, Ratchets, Clamps, Lathe Dogs, Etc.

High Carbon Steel

Scientifically "heat treated"—

Ground accurately by machinery—

Cut with mathematical accuracy as to depth, number and position of teeth—

Make the

"Famous Five" Files

the standard tools of their class.

It is a pleasure for a mechanic to work with them—

Consequently they give good results economically.

Always specify them when ordering files.

"TANGENT"

HAND
SHEET SHEARING MACHINE

Can. Pat. No. 167666

Capacity 3/16-in. steel ; ¼-in. softer metals. Weight 60 lbs.

SELF-FEEDING EASILY PORTABLE

Invaluable in Boiler Shops, Shipyards, Railway Shops, etc.

Gives clean cut with minimum distortion.

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Applications for selling agencies or rights to manufacture under license will be considered.

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If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor
or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

CANADIAN MACHINERY

Classified Advertising Section

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FOR MARKING SHELLS, ETC.

We will Give You Satisfaction on All Work of this Kind

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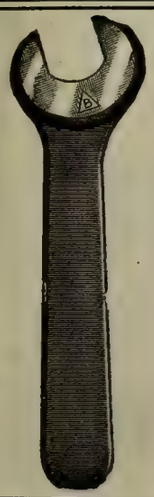
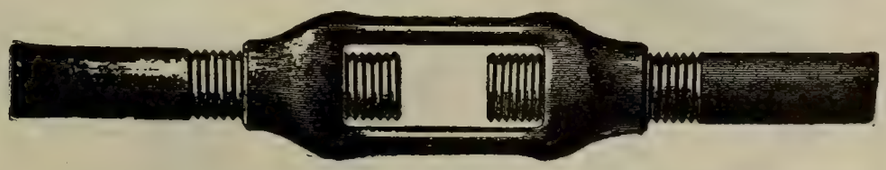


Plyers, Structural Wrenches, Track Wrenches, Machine Wrenches, Eye Bolts, Lathe Dogs, Journal Box Wedges, Etc.



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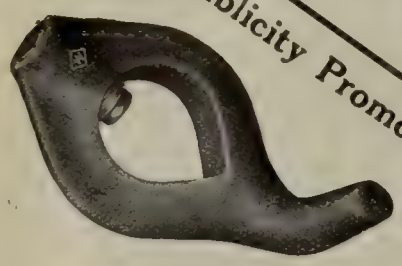

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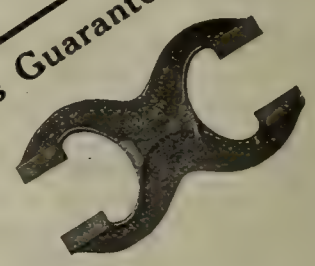
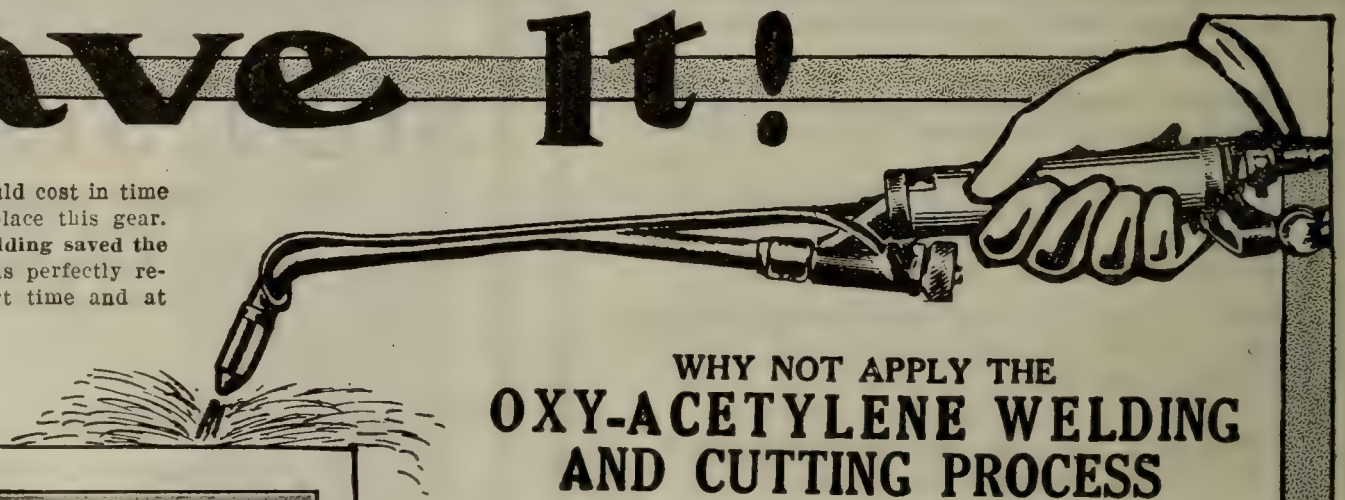


Makers Guarantee

Save It!

Think what it would cost in time and money to replace this gear. **Oxy-Acetylene Welding saved the day.** The gear was perfectly reclaimed in a short time and at low cost.



WHY NOT APPLY THE

OXY-ACETYLENE WELDING AND CUTTING PROCESS

for your REPAIRS and in your MANUFACTURE?

It saves you money, delays and trouble. It brings you money. We manufacture Welding and Cutting Plants — Portable and Stationary.

"CLAUDE" OXYGEN—made from liquid air. The most efficient —absolutely sold in purest form—full measure—at low price. We also supply **PURE DISSOLVED ACETYLENE.** Put your name and address on this coupon and mail it to us. **Full particulars will be sent at once.**

L'AIR LIQUIDE SOCIETY

Factories the World over: 26 Boler St., WEST TORONTO; Maisonneuve, MONTREAL; 325 William Ave., WINNIPEG.

L'Air Liquide Society, Maisonneuve, MONTREAL, P.Q.

Gentlemen,—Will you please send, without obligation to me, postpaid, your New Booklet?

Name .....

Address ..... Date .....

Province .....

Business ..... C M

TRADE MARK

Starrett

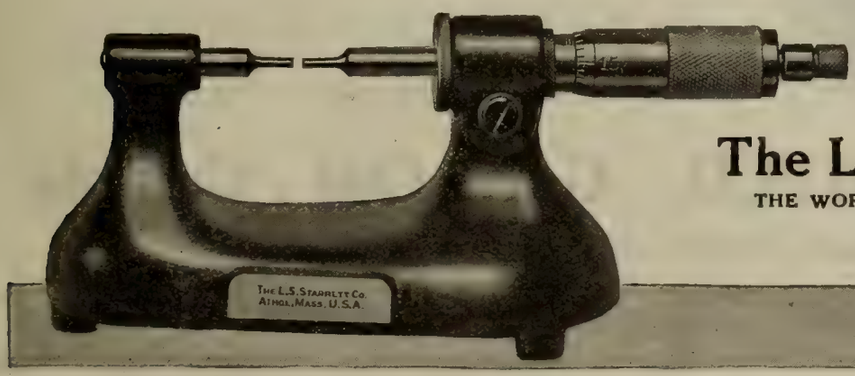
REG. U.S. PAT.

Bench Micrometer

Here are facts that will interest manufacturers in their inspection work.

In the first place the Starrett Bench Micrometer Caliper, because of the lock nut, can be used as a gage to determine the accuracy of duplicate parts of any size up to an inch. You will notice, it has a heavy base and a three-point support so that it will stand firmly on any surface.

It is readily adjustable for wear, too, a most important feature. Just bring the points together, turn the graduated sleeve with the small spanner wrench until the lines marked zero coincide—and there you are. You have a gage that may be used to maintain the accuracy of parts of a thousand different sizes—and it is always accurate.



Send for free catalog No. 213 describing 2100 styles and sizes of fine tools.

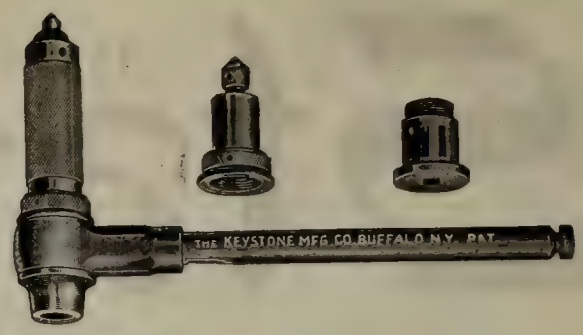
The L. S. Starrett Co.

THE WORLD'S GREATEST TOOLMAKERS

Athol, Mass.

42-687

If any advertisement interests you, tear it out now and place with letters to be answered.



Convenience
Quality

Keystone tools bear the stamp of quality that makes them to be desired because they are made in the most convenient shapes and give the maximum in service and economy.

Our ratchets and adjustable wrench illustrated here are samples of our line. The Keystone brand are carried by the best houses. Inquire of your dealer.

The Keystone Mfg. Co.
BUFFALO N.Y. U.S.A.

HEATING and VENTILATING

"Keith" Fans will be found more economical and have a greater efficiency where conditions are unusually severe, because they possess advantages over other Fans used for the same purpose.

The "Keith" Fan is the one that will give you continued and unqualified satisfaction.

Our New Catalogue No. 55 has just come from the Press. Tell us where to address it and you will receive one by first mail.

SHELDONS LIMITED, Galt, Ont., Canada

Toronto (Canada) Office: 609 Kent Building.

Messrs. Ross & Greig, 412 St. James St., Montreal, Que.
Messrs. Walkers, Ltd., 259-261 Stanley St., Winnipeg, Man.

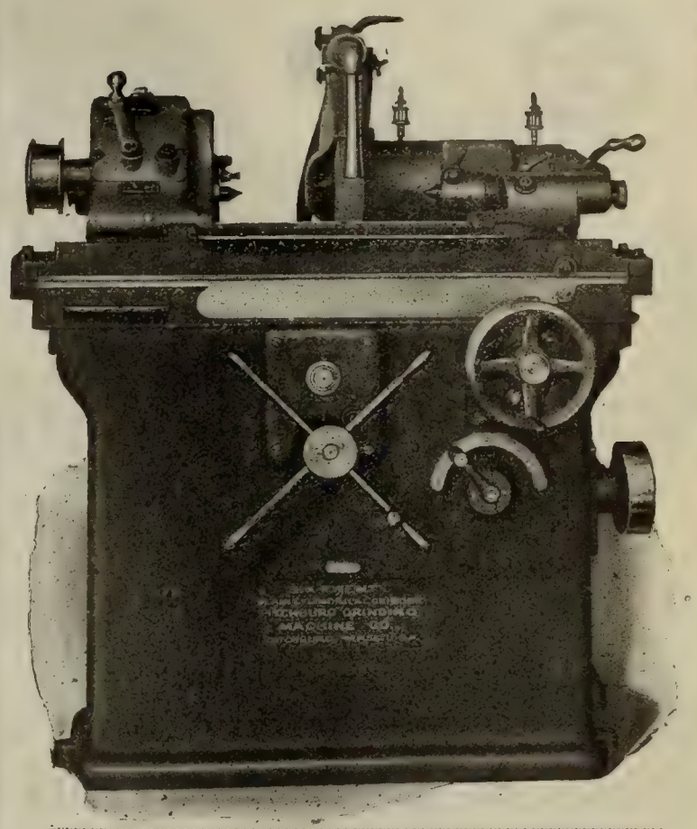
AGENTS:
Messrs. Gorman, Clancy & Grindley, Ltd., Calgary and Edmonton, Alta.
Messrs. Robert Hamilton Co., Ltd., Bank of Ottawa Bldg., Vancouver, B.C.

Smooth-On Iron Cement No. 1

will stop steel or water leaks in castings, boilers, pipes, etc.

Our new 144-page instruction book is free. It illustrates by photographs of actual repairs how thousands of dollars have been saved with Smooth-On. Send for your copy now.

SMOOTH-ON MFG. CO.
570-574 Communipaw Avenue
JERSEY CITY, N.J.
(For Sale by Supply Houses)



Fitchburg Grinders

Model "A" illustrated here is a machine whose chief feature is its capacity for size, variety and quality of work. Its speed will give you greater production; its size, convenience, increased production, strength and saving in floor space will effect such a saving as to make it preferable over all other machines of similar character.

It is specially adapted for grinding straight or taper shafts.

An inquiry would speedily get you valuable information and data.

Fitchburg Grinding Machine COMPANY
Fitchburg, Mass. U.S.A.

TRADE B&C MARK

Convenience

This wrench will conveniently get at that nut "just around the corner" or in other inconvenient places where a straight handled wrench would be awkward. Easily operated and handled by one hand. We can give you service and good prices.

BEMIS & CALL
Hardware & Tool Company
Springfield Mass., U.S.A.

IN STOCK READY TO SHIP

"STAR BRAND"
SEAMLESS BRASS

CONDENSER TUBES

TINNED INSIDE AND OUTSIDE

5/8 and 3/4 inch O.D., No. 18 Stubs Gauge—12, 14, 16, 18 and 20 foot lengths

AND

"STAR BRAND" BRASS CONDENSER TUBE FERRULES

Standard 14 Thread for 5/8 and 3/4 in. Tubes

OUR STOCK ON HAND READY FOR IMMEDIATE SHIPMENT ALSO INCLUDES A FULL LINE OF REGULAR STOCK SIZES AND SHAPES OF THE FOLLOWING

"STAR BRAND" SPECIALTIES

Seamless Brass and Copper Pipe and Tubing, Brass Fittings, Sheet Copper, Copper Bar, Rods and Wire, Copper Nails, Sheet Brass, Brass Rods, Tobin Bronze Rods, Copper Rivets and Burs
AND OTHER PRODUCTS IN BRASS, COPPER, PHOSPHOR BRONZE, ARCHITECTURAL BRONZE, ETC., ETC.

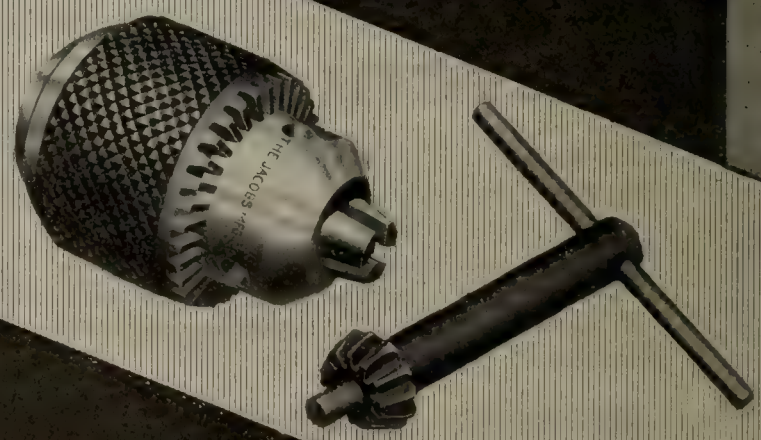
U. T. HUNGERFORD BRASS & COPPER CO.

BRANCHES:
BOSTON
BALTIMORE
PHILADELPHIA
SAN FRANCISCO

HUNGERFORD BUILDING
Lafayette, White and Franklin Sts.
NEW YORK, U.S.A.

KINDLY ADDRESS INQUIRIES FOR ATTENTION OF DEPARTMENT D.

Jacobs
IMPROVED
Drill Chuck



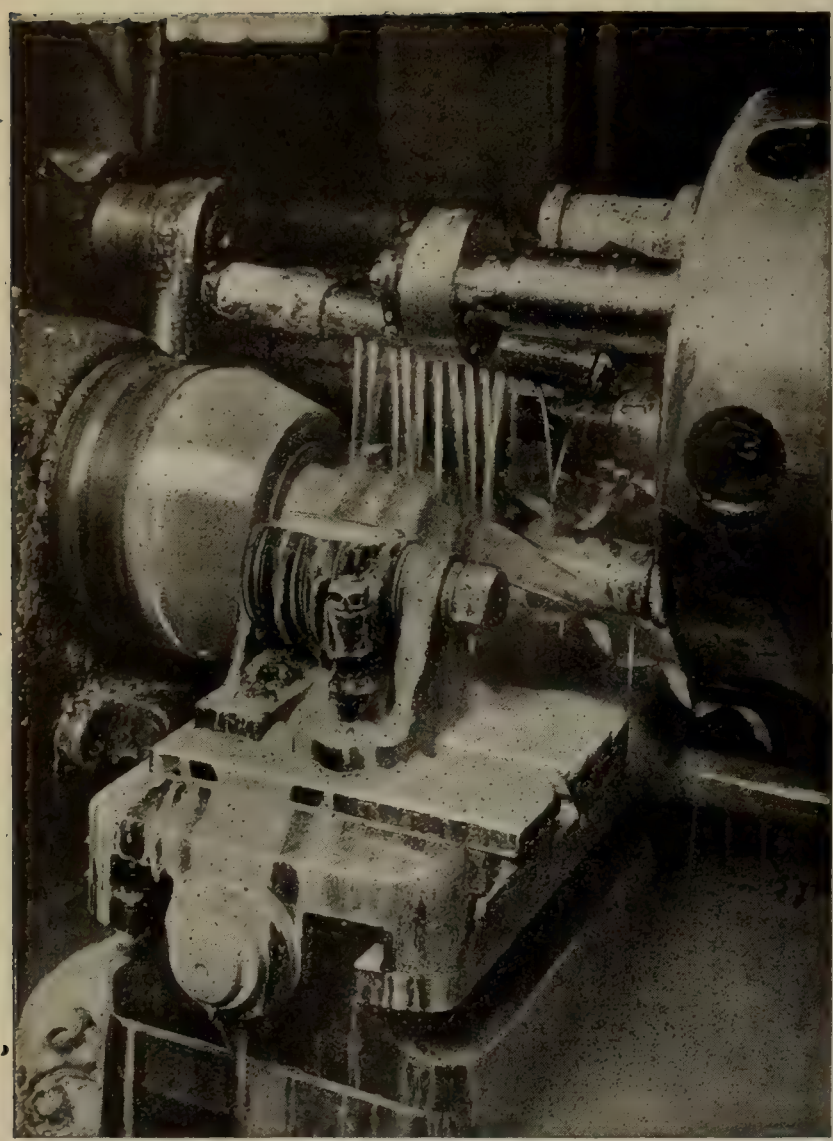
A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.

BROWN'S
BEAVER BRAND METALS
BRASS, BRONZE,
CANADA SILVER and GILDING METAL
In Sheets, Rolls, Plates and Rods
Brown's Copper & Brass Rolling Mills, Limited
General Offices and Works:
New Toronto, Ontario, Canada
COPPER & BRASS
BROWN'S
QUALITY
ROLLING MILLS



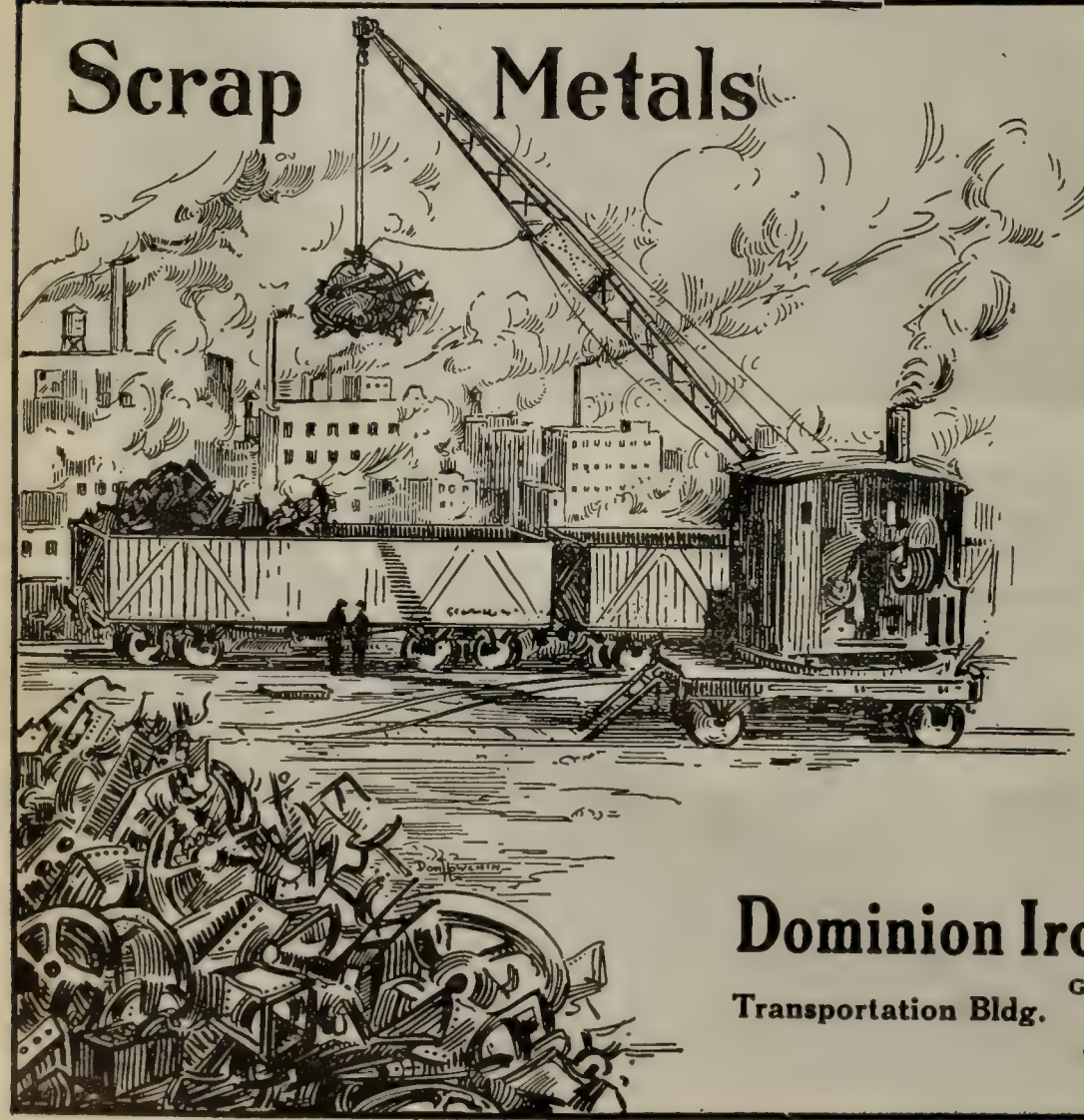
MYSTIC
CUTTING COMPOUND

Increases production because it keeps tools in best of condition.

It is far more efficient than any oil. The ideal lubricant for shell work.

Let us demonstrate its merits in your plant, free of cost, in order to show you what a really remarkable cutting compound it is.

CATARACT REFINING CO., LTD.
TORONTO, CANADA.



Scrap Iron, Steel and Metals

No undertaking is too large for us. We are Scrap Metal Specialists, and can co-operate with you in the dismantling of railway equipment, bridges, plants, steamers, mills and will take your rails and machinery.

Shell Makers. We can take care of all your scrap materials, at highest prices.

Give us particulars and we will relieve you of all worry.

Dominion Iron & Wrecking Co. LIMITED

Transportation Bldg. General Offices: Quebec, Que. Montreal, Quebec

FREEDOM FROM PUMP PROBLEMS

if you use a TRAHERN ROTARY GEARED PUMP. Will deliver in a full even stream, free from pulsations, all the coolant that can be forced through the discharge opening; this increases the production capacity of your present equipment. Positively will not clog or lose its prime. With TRAHERN positive drive you can shoot lubricant into deep bores, or other work difficult to cool; this is not possible with a centrifugal pump. These are FACTS, not statements of prediction, and we will prove them by submitting sample free of charge, if you will but send in your address.

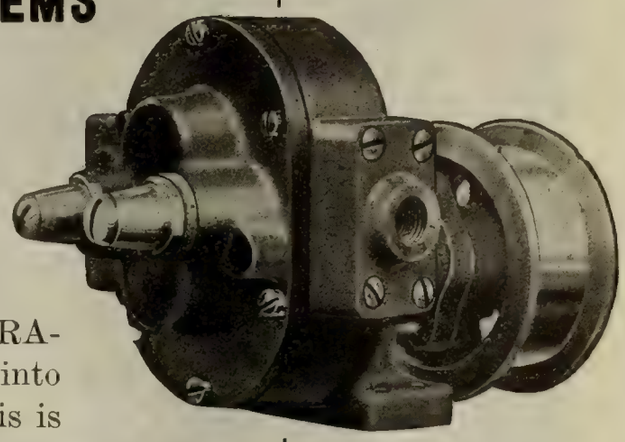


Fig. 1854
Reversible with double automatic relief valve.

TRAHERN PUMP COMPANY

ROCKFORD, ILLINOIS

Canadian Agents: A. R. WILLIAMS MACHINERY CO., Toronto, Ontario

CHAPMAN

DOUBLE BALL BEARINGS

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.

If your work requires quick handling and a rigid-slip grip, the chuck for the job is the "Hannifin" — increases output from 20 to 100 per cent.

Catalog of Air Operated Chucking and Clamping Equipment on request.

At the Worthington Pump and Machinery Corporation's Hazelton, Pa., plant, Hannifin Air Chucks are in sole possession of the field. The machine photographed shows a 3" Russian shell Hannifin-chucked for inside operations.

These chucks do their work under 75 pounds air pressure and "Aid greatly in speeding up production," says the master mechanic; for outside turning, shells are held on Hannifin Air Operated Mandrels with similar results.

In another busy shell department one operator reports an increase of ten 5" shells per day through the change to Hannifin Chucking, and considerably less fatigue when the day's work is done.

Hannifin Chucks are doing important work on every shell making "front" — also in other lines of manufacture.

HANNIFIN MFG. COMPANY, Chicago, U.S.A.

R. E. Ellis Engineering Company, Chicago, Ill.; Coats Machine Tool Co., New York City, N.Y.; Naumann-Firman Co., Detroit, Mich.; A. R. Williams Machinery Co., Toronto, Ont., Can.; A. R. Williams Machinery Co., Winnipeg, and St. John, N.B.; Williams & Wilson, Montreal, Quebec, Can.; Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, Glasgow and Newcastle-on-Tyne; Fenwick-Freres Company, 1500 Rue Fenelon, Paris, France; Iznosskoff & Co., Petrograd, Moscow, Ekaterinberg, and Odessa, Russia.

MORSE Silent Chain POWER TRANSMISSION

There are many "Silent" Chains, but only one has the "Rocker-Joint".

The Exclusive Patented Feature of THE MORSE, distinguishing it from all others.

means

Sensible Conservation

and

Practical Thrift

The Law of the Land To-day:

"Get All The Power You Pay For"

This is possible: But *only by using the Morse "Rocker-Joint"* wherever power is used. *Why?* Because the *"Rocker-Joint"* is the Only Frictionless Joint.

Results:

1. No Power Loss. 2. Longest Service
3. Minimum Lubrication. 4. Highest Speed

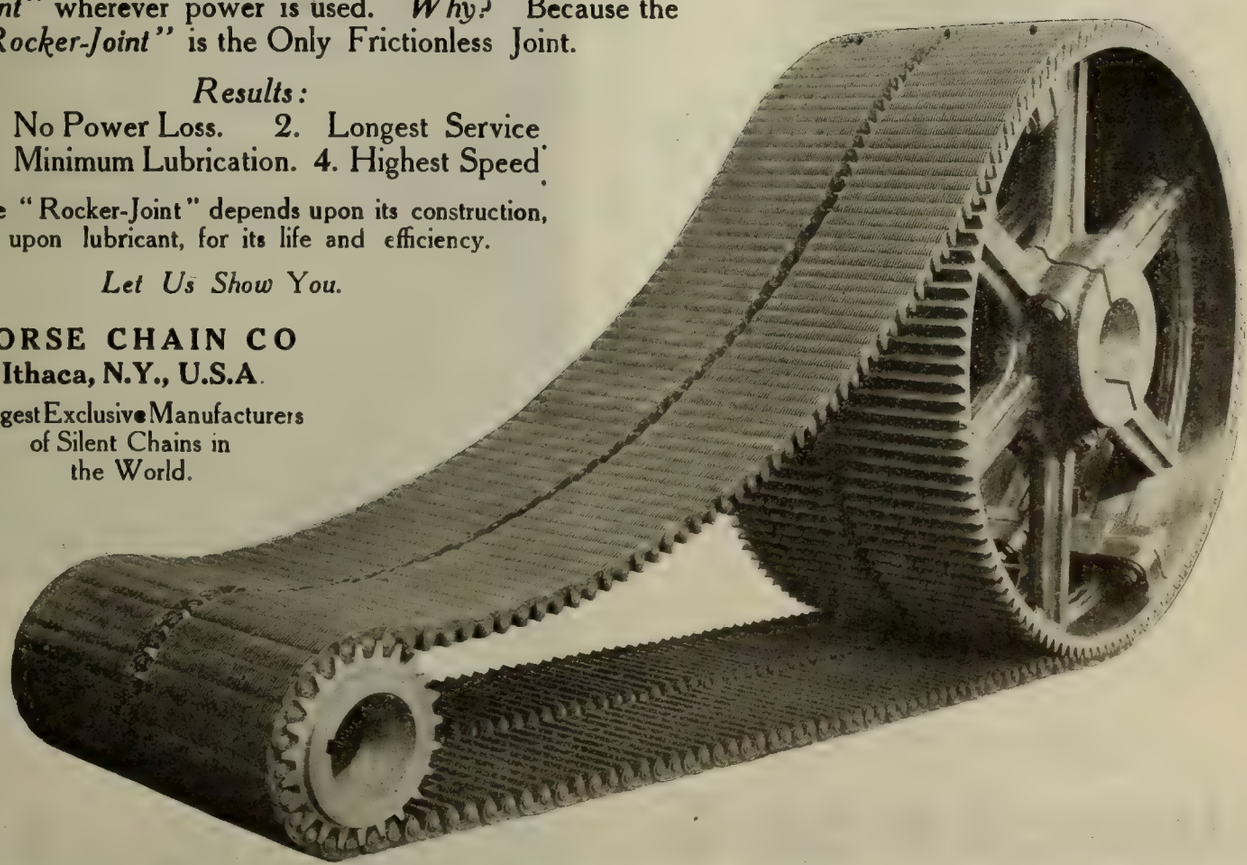
The "Rocker-Joint" depends upon its construction, not upon lubricant, for its life and efficiency.

Let Us Show You.

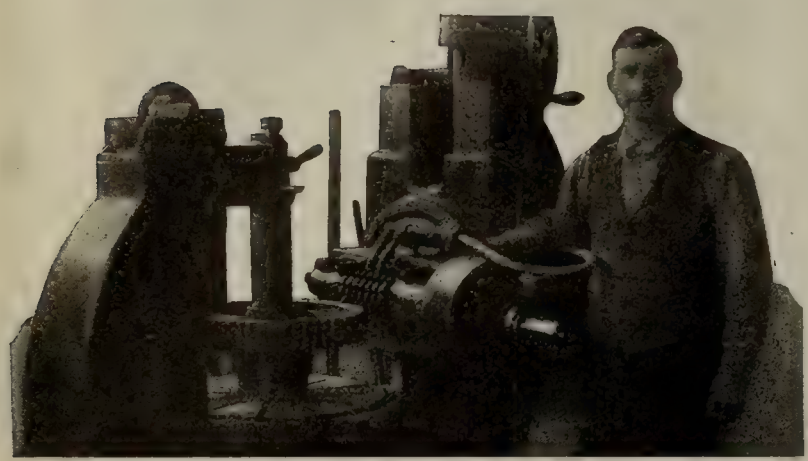
MORSE CHAIN CO
Ithaca, N.Y., U.S.A.

Largest Exclusive Manufacturers of Silent Chains in the World.

C-8



CUT GEARS



54-in. Hobber for Spur, Helical or Worm Gears

You appreciate real Gear Service

Try what we can do for you

Write for quotations

Hamilton Gear & Machine Co.

Van Horne Street - TORONTO

FORD TRIBLOC

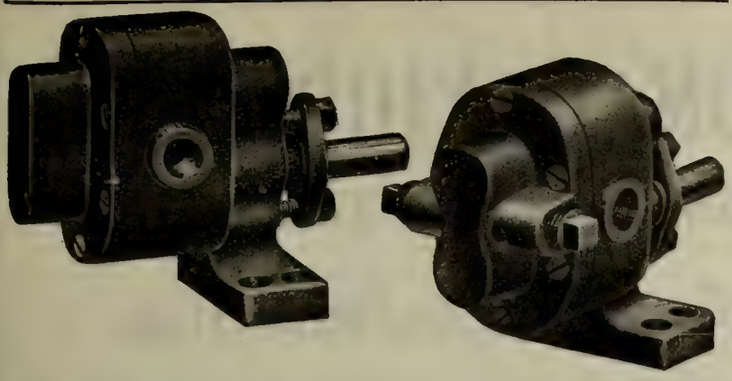
The Chain Hoist in the Foreground of Service

They say you can always tell whether a picture of a street scene is real by looking for the Fords. The same is true of shop scenes—only in this case the Fords are Ford Tribloc Chain Hoists. Manufactured, marketed and guaranteed for five years by Ford of Philadelphia.

Ask For Catalogue

FORD CHAIN BLOCK & MFG. CO.

139-141 Oxford Street - PHILADELPHIA, PA.

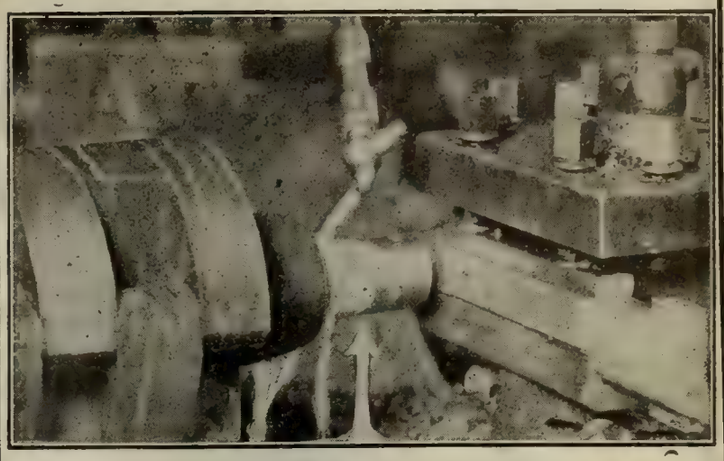


Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.



ECONOMIC WATER OIL

SHELL MANUFACTURERS use ECONOMIC WATER OIL for METAL CUTTING of every description; it will not gum nor rust, and it SAVES TIME AND LABOR.

WE CAN SAVE YOU 50% in the **COST** of your **CUTTING MIXTURE** BECAUSE

ONE GALLON of ECONOMIC WATER OIL will mix readily with 30 to 50 gallons of WATER, making a thick, creamy emulsion, and giving you a cutting mixture which will not only be **satisfactory,** but will produce very **ECONOMIC RESULTS.**

One TRIAL ORDER will prove our STATEMENT.

Made in Canada

Canadian Economic Lubricant Co.
LIMITED
1040-1042 Durocher St. MONTREAL

The WHITING CONVERTER

The increasing demand for steel castings on machinery of all kinds and the savings effected by the side-blow converter process prove that

It Pays to Make Your Own Steel Castings

right at home.

A more uniform product of whatever analysis required, reduced pattern expense, and castings when you want them are some of the reasons why every user of steel castings should investigate the Whiting Converter.

Write for Catalog 106

Complete Foundry Plants

WHITING
FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB.

Cranes of all

CANADIAN NATIONAL EXHIBITION

AUGUST 25 TORONTO *SEPTEMBER 10*

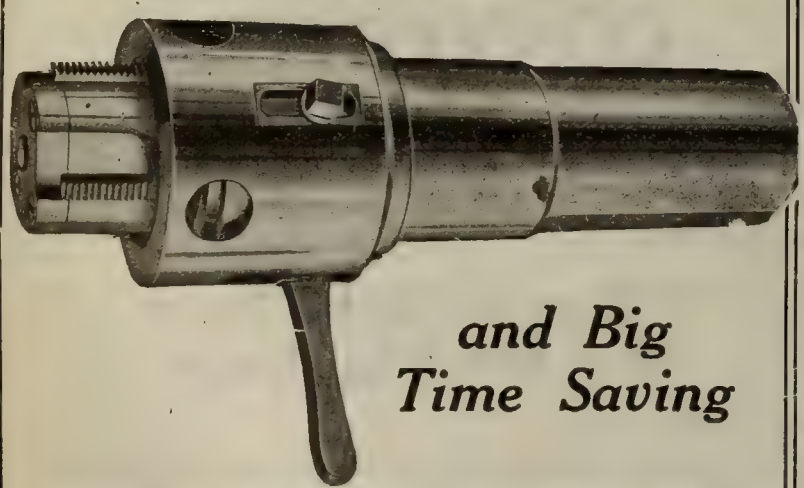
Fiftieth Anniversary of Canadian Confederation

1200 PERFORMERS JUBILEE SPECTACLE 1200 PERFORMERS

Super-Climax in Spectacular Pageantry. Mobilization of Resources. National Service Exemplified. Motor Show—First Showing of 1918 Models. Fine Arts from Many Lands. Innes' and a Score of other Leading Bands. Giant Display of Live-stock and Agriculture. Tractor Display.

NEW FEATURES IN EVERY DEPARTMENT. REDUCED FARES AND EXCURSIONS ON ALL LINES OF TRAVEL.

For Positive Accuracy—



and Big Time Saving

VICTOR Collapsible TAPS

"Victor" Collapsible Taps are simple in construction; the few parts can be made large and strong; the body is machine steel, and the chasers are high-speed; screw adjustment from front end makes it easy to maintain close accuracy; trip is automatic; reset by means of lever. The above features—and others—make the "Victor" a time and money saver for severe service. It is being used by many shell manufacturers.

Victor Tool Company
Waynesboro, Pa., U.S.A.

Desirable Threads

Are easily obtainable with an H. & G. Automatic Self-opening Die Head.
The Chasers are set and held in place by a steel cam which, once adjusted, locks. No stopping or changing required to keep to size. There are a good many other features on this Die Head.

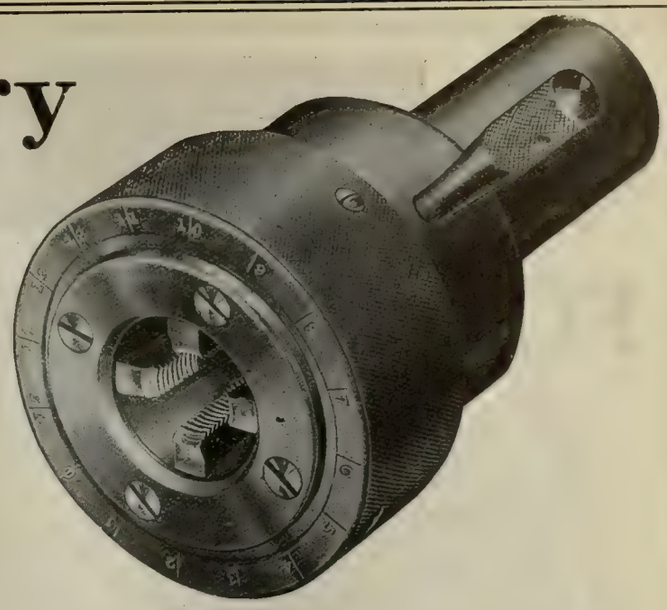
"Write us!—write now."

EASTERN MACHINE SCREW CORP.
NEW HAVEN CONN., U.S.A.

H & G

Rapid Delivery

Users of Murchey Tools Get Chasers Without Delay



Lightning deliveries—that is a big advantage of using Murchey Tools. No work held up for chasers. We get your order, fill it, and it's on the way back to you just as quickly as the most rapid means of transportation can bring it to you.

There is no service like the Murchey service, and there are no tools like the Murchey Tools. Send blueprints for estimates.

MURCHEY TAPS are accurate and simple and can be worked with great speed. On 4.5 Mark VII shells Murchey tapping time is just ONE MINUTE.

Murchey Machine & Tool Company

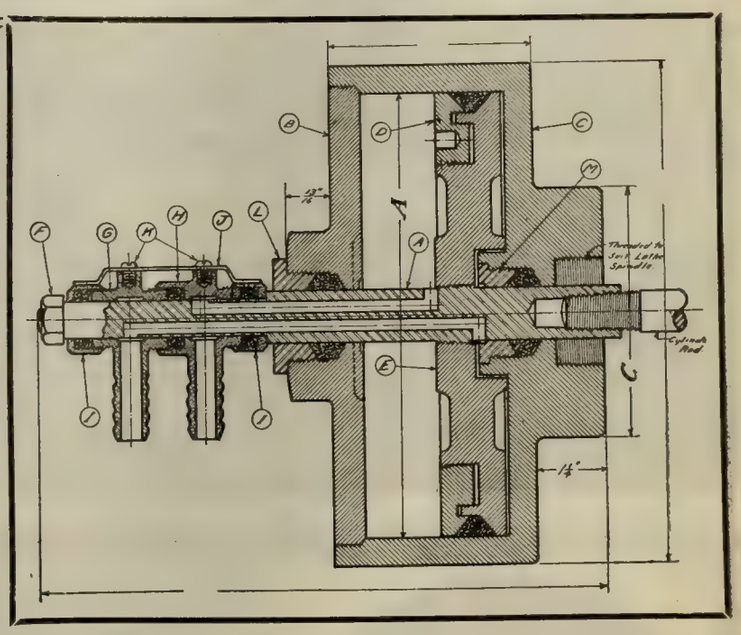
75 PORTER STREET - - DETROIT, MICHIGAN

The Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, S.W., England, Glasgow, Newcastle-on-Tyne, and Fenwick Freres & Company, 15 Rue Fenelon, Paris, France.

The Stamp of Approval

has been placed on

M.E.C. Double Acting Air Cylinders



by every one who has used them, including the largest munition works, automobile factories and gas engine builders in the country.

They increase output, decrease operating cost and improve product.

Our catalog explaining the salient features of this and other M.E.C. Labor-Saving Devices will prove interesting and profitable to you. Send for it now—use the coupon.

Manufacturers Equipment Co.

171 West Jefferson Street - Chicago, Ill.

Also makers of M.E.C. Two-and-three-Jaw Air Operated Chucks, Expanding Mandrels and Collapsible Taps.

Canadian Agents—J. R. Stone Tool & Supply Co., Goebel Building, Detroit, Mich.

Foreign Agents—C. W. Burton, Griffiths & Co., Ludgate, Ludgate Square, London, England.

Gentlemen:—

Please send me copy of your catalog entitled "Labor Saving Devices," according to your advertisement in Canadian Machinery.

Name.....

Address.....

Position.....

With.....

If any advertisement interests you, tear it out now and place with letters to be answered.

FOR HIGH SPEED ENGINES

Encanto, Calif.,
March 3, 1916.

Magnolia Metal Co.,

Gentlemen:—

You may use this letter for publication, if the same will in any way help to further your best interest.

Your metal has given me the best satisfactory results in high speed engines.

I have used this metal for main bearings and crossheads, it has stood up under all conditions and I never have found MAGNOLIA METAL anything but what you have represented it to be.

Very respectfully yours,
J. L. WURTHMANN.

PRACTICAL ENGINEER POCKET BOOK:
Over 600 pages. A valuable reference work imported from England and sold as an advertising medium at the low price of 40c post paid.
Address Montreal Office.

SOLD BY LEADING DEALERS EVERYWHERE OR BY
MAGNOLIA METAL CO.
OFFICE AND FACTORY:
225 St. Ambroise St. MONTREAL

Electric Travelling Cranes
(Direct or Alternating Current)

Steam and Electric Derricks
(Stationary or Travelling)

Up-to-date design. Built for fast, continuous service.
ACCESSIBILITY—DURABILITY.

Dominion Bridge Company, Limited
MONTREAL

Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send to our nearest factory for a trial box.

Manufactured and guaranteed by

The Canada Metal Company, Limited
Hamilton Montreal TORONTO Winnipeg Vancouver

Every Butterfield Tap comes to you ready for long, hard service.

It is made by expert workmen—from the finest materials obtainable—and thoroughly tested before shipment.

For the tap that is uniformly dependable in service — specify Butterfield.

Butterfield & Co., Inc.
Rock Island :: Quebec

Toronto Office:
1505 Traders Bank Building : Phone Main 1382
H. A. Harrison, Manager.

Catalog No. 14 containing the complete line of Butterfield Tools awaits your request

BUTTERFIELD

If any advertisement interests you, tear it out now and place with letters to be answered.

HINTS TO BUYERS

Eliminate Danger

Accidents break down the efficiency of your organization, lead to legal troubles, loss of time and money.

TRADE MARK

BRISTO

REG. U. S. PAT. OFFICE

SAFETY SET SCREWS

insure safety. They also protect themselves because of their patented construction. The dove-tailed design of wrench and screw contracts the metal under pressure. The harder you twist the wrench the more the metal of the screw is compressed.

Write for BULLETIN I-809

THE BRISTOL COMPANY
Waterbury, Conn., U.S.A.

THOUSANDS of Dollars are saved every year by our clients, because we have experts who are traind to make exhaustive tests of all the material you are purchasing, whether raw material or finished products.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED

Head Office and Main Laboratories—MONTREAL

Branch Offices and Laboratories:
TORONTO, WINNIPEG, EDMONTON, VANCOUVER, NEW GLASGOW.

"THISTLE" BRAND RUBBER BELTING

"Maintenance of Quality"

is our motto, and our experience in the manufacture of belting since the year 1856 should be invaluable to you. Let us tell you all about this friction faced belting. The price will appeal to you.

Write to-day.

J. C. McLAREN BELTING CO., LTD.
TORONTO, MONTREAL, WINNIPEG

STEEL CASTINGS

We are well equipped to make all kinds of steel castings, 100 lbs. to 50,000 lbs.

Dominion Steel Foundry Co.
Hamilton LIMITED Ontario

IS YOUR RIVETING PROFITABLY DONE?

Our Elastic Rotary Blow Riveting Machine does profitable work, because one machine will do the work of several hand riveters, and do it better.

Every head is perfectly formed, any shape, round, flat, oval, rectangular, etc.

Catalogue C tells more about it.

The F. B. SHUSTER COMPANY
New Haven, Conn.

Formerly John Adt & Son. Established 1866.

Also makers of Wire Straighteners and Cutter, Cotter Pin Machines, etc.

RIVETED STEEL TANKS FOR EVERY PURPOSE

OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
PNEUMATIC WATER SUPPLY TANKS - SMOKE STACKS
BOILER BREECHING - RIVETED STEEL PIPE - BINS & HOPPERS

Northern Crane Works
LIMITED
WALKERVILLE
ONTARIO

Electric Cranes
Hand Cranes
Foundry Equipment

NORTHERN CRANES

CRANES
MADE IN CANADA

Electric Hoists
Air Hoists
Cupolas
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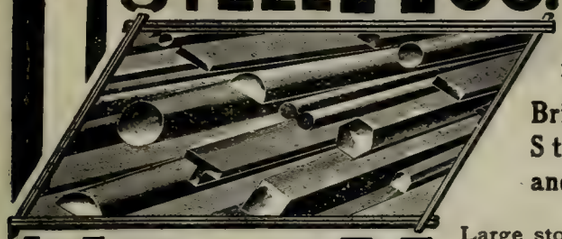

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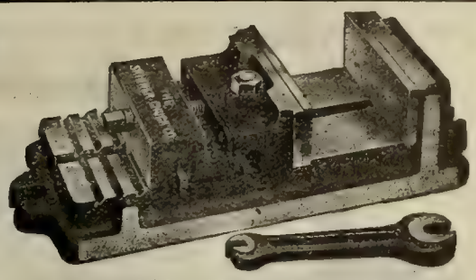

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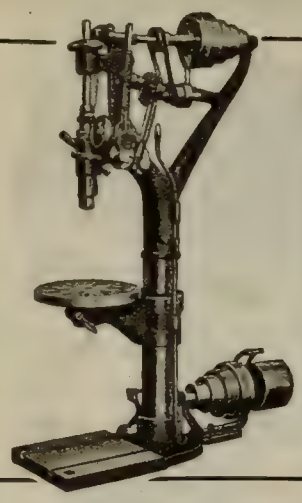

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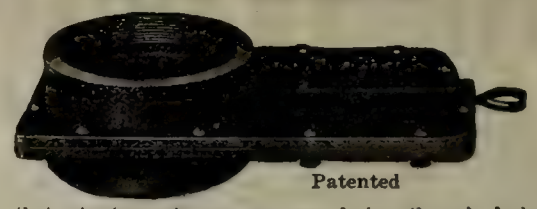

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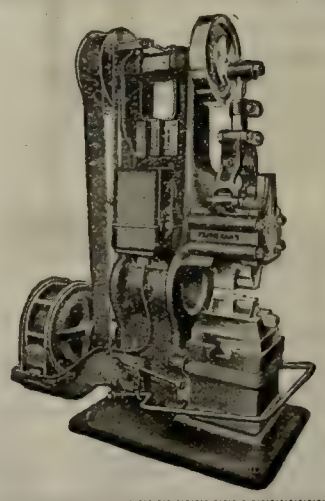

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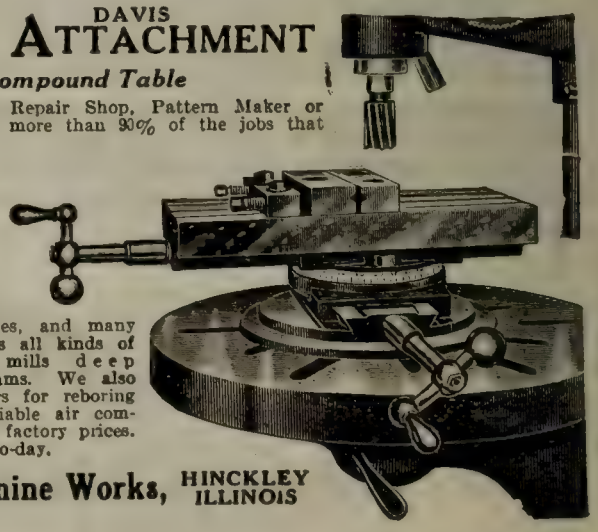

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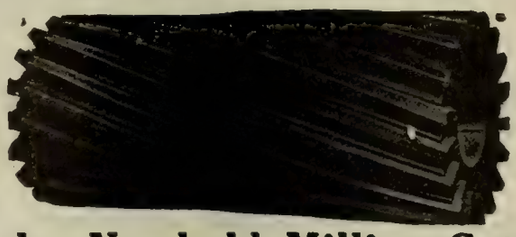

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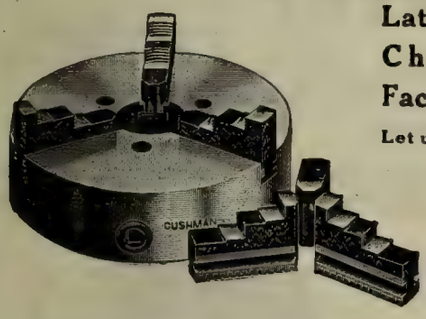

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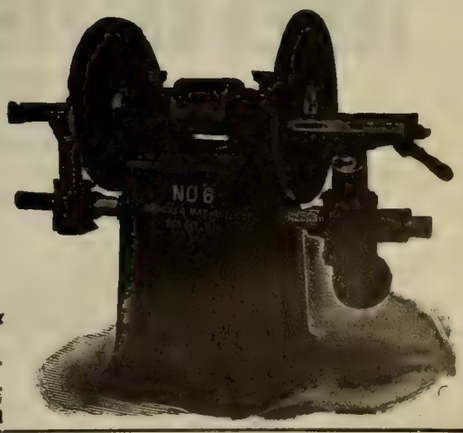

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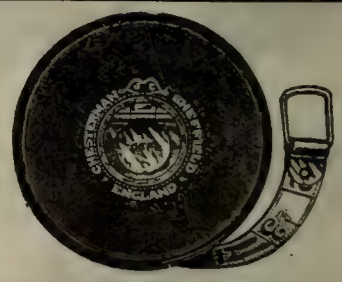

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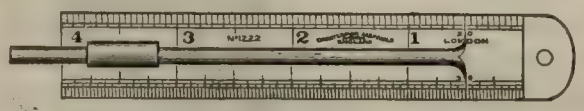

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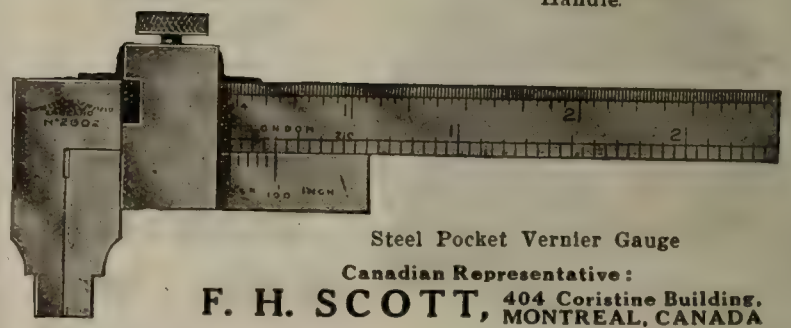

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Garlock-Walker Machinery Co., Toronto, Ont.
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Roelofson Machine & Tool Co., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Stow Mfg. Co., Binghampton, N.Y.

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Foss & Hill Machy. Co., Montreal.
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Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto, Ont.
Warner & Swasey Co., Cleveland.
Niles-Bement-Pond Co., New York.
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H. W. Petrie, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
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Garlock-Walker Machinery Co., Toronto, Ont.
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R. E. T. Pringle, Ltd., Toronto, Ont.

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Whiting Foundry Equipment Co., Harvey, Ill.
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Canada Machinery Corp., Galt, Ont.
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Hungerford Brass & Copper Co., New York, N.Y.
Parmenter & Bulloch Co., Gananoque.
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Brown, Boggs & Co., Hamilton, Can.
Prest-O-Lite Co., Inc., Toronto, Ont.
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Corbet Fdry. & Mach. Co., Ltd., Owen Sound, Ont.
Can. Blower & Forge Co., Kitchener, Can.
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Sheldons, Limited, Galt, Ont.
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Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
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Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.
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Dominion Steel Foundry Co., Ltd., Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.
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Cumming & Son, J. W., New Glasgow, Canada.
CASTINGS, NICKEL STEEL
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Gardner, Robt., & Son, Montreal.
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Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
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Foss & Hill Machy. Co., Montreal.
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H. W. Petrie, Toronto.
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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.
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Union Tool Chest Works, Rochester, N.Y.
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Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.
Hyde Engineering Works, Montreal.
CHUCKS, AIR
Manufacturers Equipment Co., Chicago, Ill.
CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.
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Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
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Richmond Mfg. Co., Toronto, Ont.
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H. W. Petrie, Toronto.
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Thomas Elevator Co., Chicago, Ill.
D. E. Whiton Machine Co., New London, Conn.
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Corbet Fdry. & Mach. Co., Ltd., Owen Sound, Ont.
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Whitney Mg. Co., Hartford, Conn.
Richmond Mfg. Co., Toronto, Ont.
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Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.
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Richmond Mfg. Co., Toronto, Ont.
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H. E. Streeter, 523 New Birks Bldg., Montreal, Que.
CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
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Rivett Lathe & Grinder Co., Brighton, Mass.
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New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.
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Hardinge Bros., Inc., Chicago, Ill.
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Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
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Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Hyde Engineering Works, Montreal.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.
Stone Tool & Supply Co., J. R., Detroit, Mich.
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Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
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Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
H. W. Petrie, Ltd., Montreal.
CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto.
CUTTERS, PIPE (SEE PIPE CUTTERS)
CUTTERS, MILLING
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Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Goddard Tool Co., Chicago, Ill.
Illinois Tool Works, Chicago, Ill.
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H. W. Petrie, Toronto.
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Foss & Hill Machinery Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
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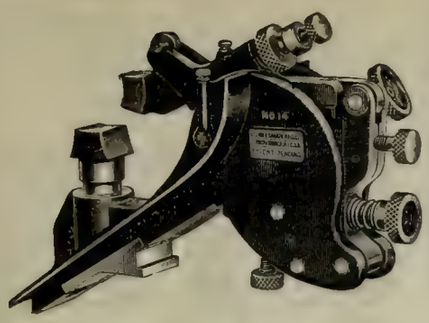

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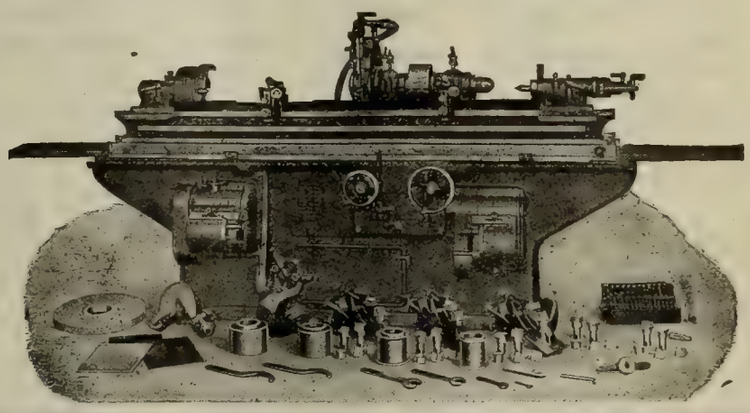

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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
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National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
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H. W. Petrie, Toronto.
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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
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Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Dominion Machy. Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
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R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto

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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
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Morse Twist Drill & Machine Co., New Bedford.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Cleveland Pneumatic Tool Co. of Canada, Toronto.
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Prest-O-Lite Co., Inc., Toronto, Ont.
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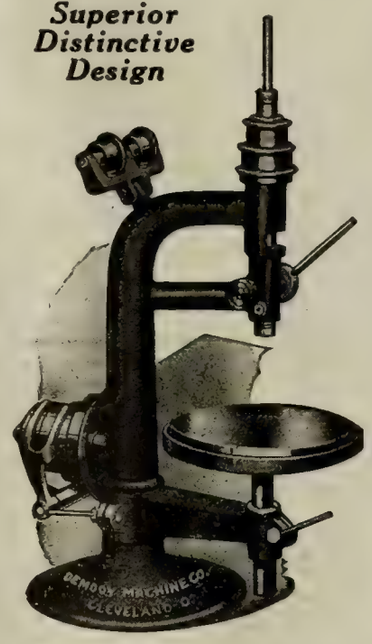

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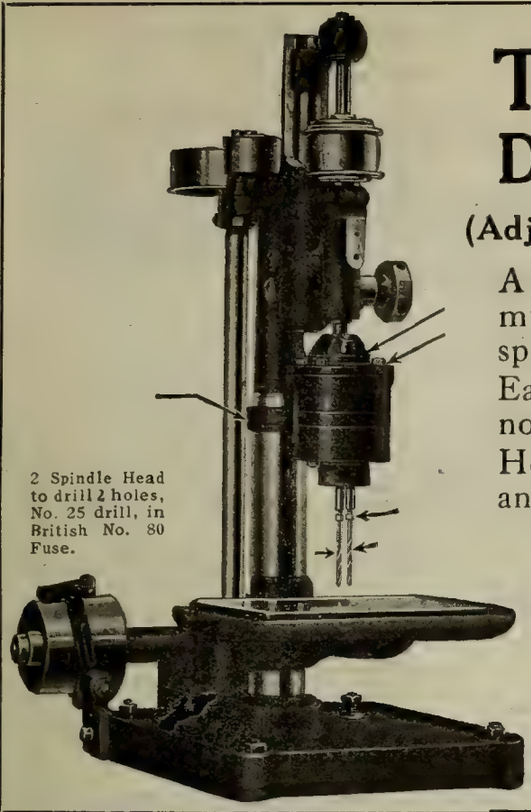

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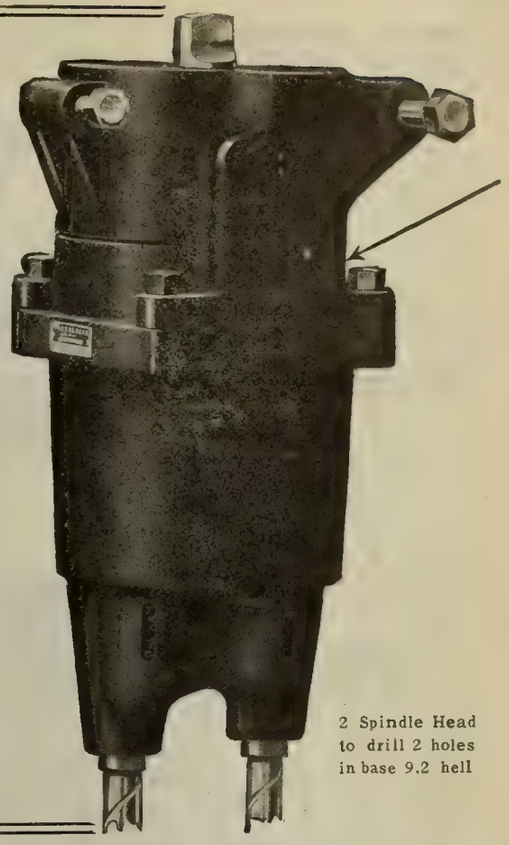

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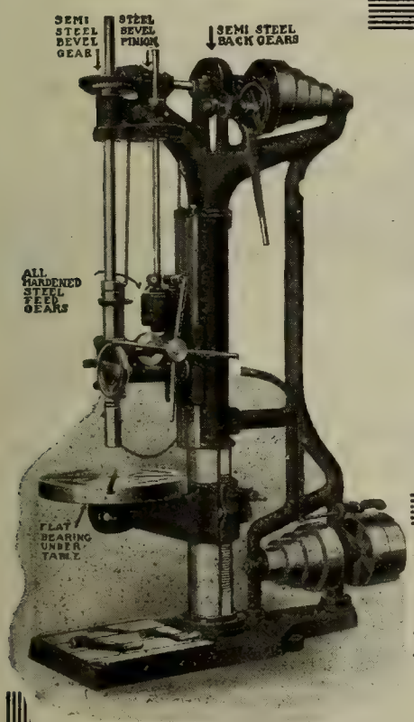

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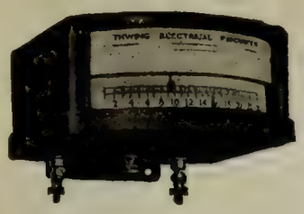

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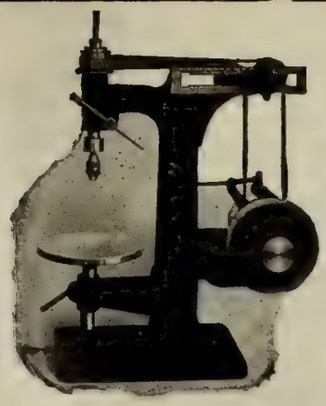

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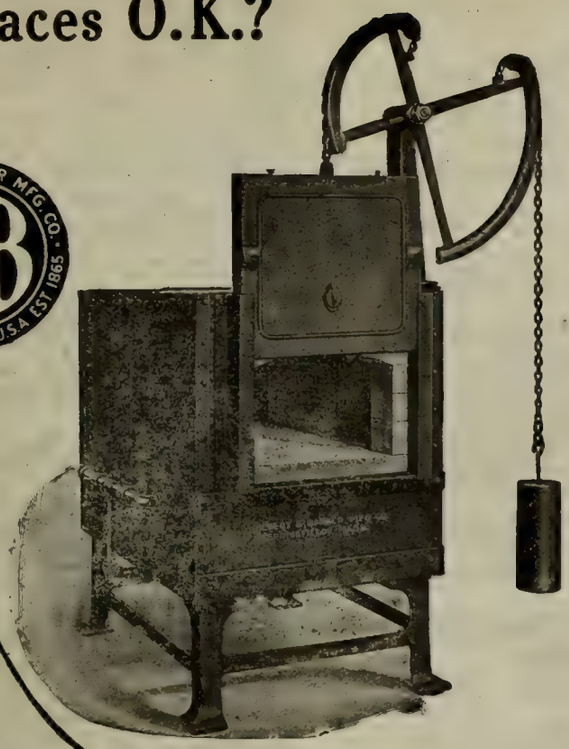

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If still in doubt write for our circular and partial list of 200 representative concerns using HeTzy on all H/S treatment.

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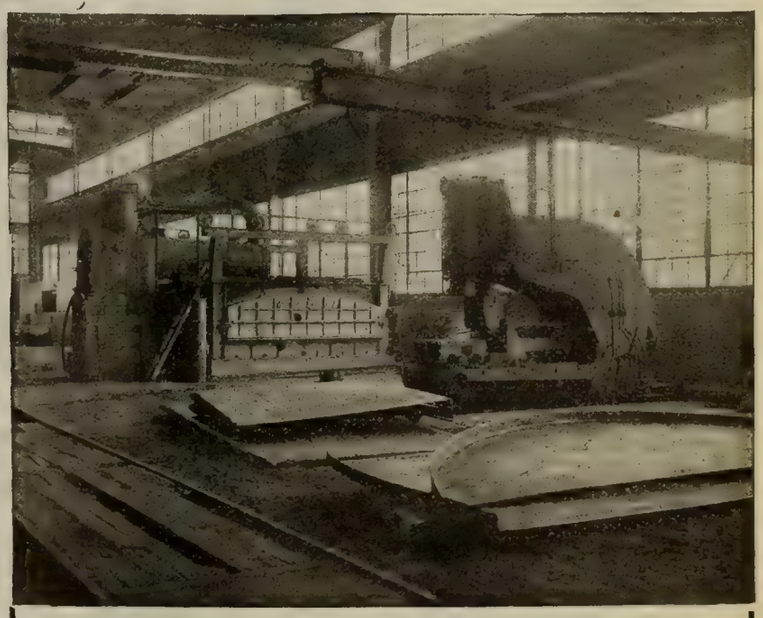

PLATE AND ANGLE HEATING FURNACES OF THE TATE-JONES MAKE EXCEL

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Write for Bulletin No. 153-C.

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Philadelphia Gear Works, Philadelphia, Pa.

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Perrin, Wm. R., Toronto.

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Vulcan Crucible Steel Co., Aliquippa, Pa.
Zenith Coal & Steel Products, Montreal, Que.

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Union Drawn Steel Co., Hamilton, Ont.

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Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

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Fairley Davidson Steel Co., New York, N.Y.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Geo. A., 70 Lombard, Toronto.
Michigan Steel Exchange, Inc., Detroit, Mich.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
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Vanadium Alloys Steel Co., Pittsburg, Pa.
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Zenith Coal & Steel Products, Montreal, Que

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STEEL VANADIUM
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Michigan Steel Exchange, Inc., Detroit, Mich.
Standard Alloys Co., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa.

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MacKinnon, Holmes & Co., Sherbrooke, Que.

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Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Toronto Iron Works, Ltd., Toronto.

TANK WAGONS
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MacKinnon, Holmes Co., Sherbrooke.
Toronto Iron Works, Ltd., Toronto.

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A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Rickert-Shafer Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.

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National-Acme Co., Cleveland, Ohio.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.

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Victor Tool Co., Waynesboro, Pa.

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Foss & Hill Machy. Co., Montreal.
Geometric Tool Co., New Haven, Conn.
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Morse Twist Drill & Machine Co., New Bedford.
Murchey Machine & Tool Co., Detroit.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
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L. S. Starrett Co., Athol, Mass.
Wells Bros. Co. of Canada, Galt, Ont.

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THERMOMETERS, ALL KINDS
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Bellevue Industrial Furnace Co., Detroit, Mich.

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Toronto Testing Laboratory, Toronto.

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National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
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Wells Bros. Co. of Canada, Galt, Ont.

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Peck, Stow & Wilcox, Cleveland, Ohio.

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West Tire Setter Co., Rochester, N.Y.

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Union Tool Chest Works, Rochester, N.Y.

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Armstrong Bros. Tool Co., Chicago.
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Can. B. K. Morton, Toronto, Montreal.
Deloro Smelting & Refining Co., Toronto, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
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Armstrong Bros. Tool Co., Chicago.

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Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
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H. A. Drury Co., Montreal.
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United States Elec. Tool Co., Cincinnati, O.

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Curtis Pneumatic Machinery Co., St. Louis, Mo
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

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TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

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Armstrong, Whitworth of Canada, Ltd., Montreal
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Northern Crane Works, Walkerville.
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Sheldons, Ltd., Galt, Ont.
Northern Crane Works, Walkerville.

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Standard Tube & Fence Co., Woodstock, Ont

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Whiting Foundry Equipment Co., Harvey, Ill.

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Smart-Turner Machine Co., Hamilton, Ont.

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Smart-Turner Mach. Co., Hamilton.

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J. H. Williams & Co., Brooklyn, N.Y.

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Graton & Knight Mfg. Co., Worcester, Mass
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Steel Co. of Canada, Ltd., Hamilton, Ont.

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Whiting Foundry Equipment Co., Harvey, Ill.

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Toronto Iron Works, Ltd., Toronto.

WATER WHEELS
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Sleeper & Hartley, Inc., Worcester, Mass.

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Baird Machine Co., Bridgeport, Conn.
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F. B. Shuster Co., New Haven, Conn.

WIRE NAILS
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

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Hungerford Brass & Copper Co., U. T., New York.

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Hungerford Brass & Copper Co., U. T., New York
Steel Co. of Canada, Ltd., Hamilton, Ont.

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Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.

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Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machy. Co., Toronto

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Garlock-Walker Machinery Co., Toronto, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

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Butterfield & Co., Rock Island, Que.
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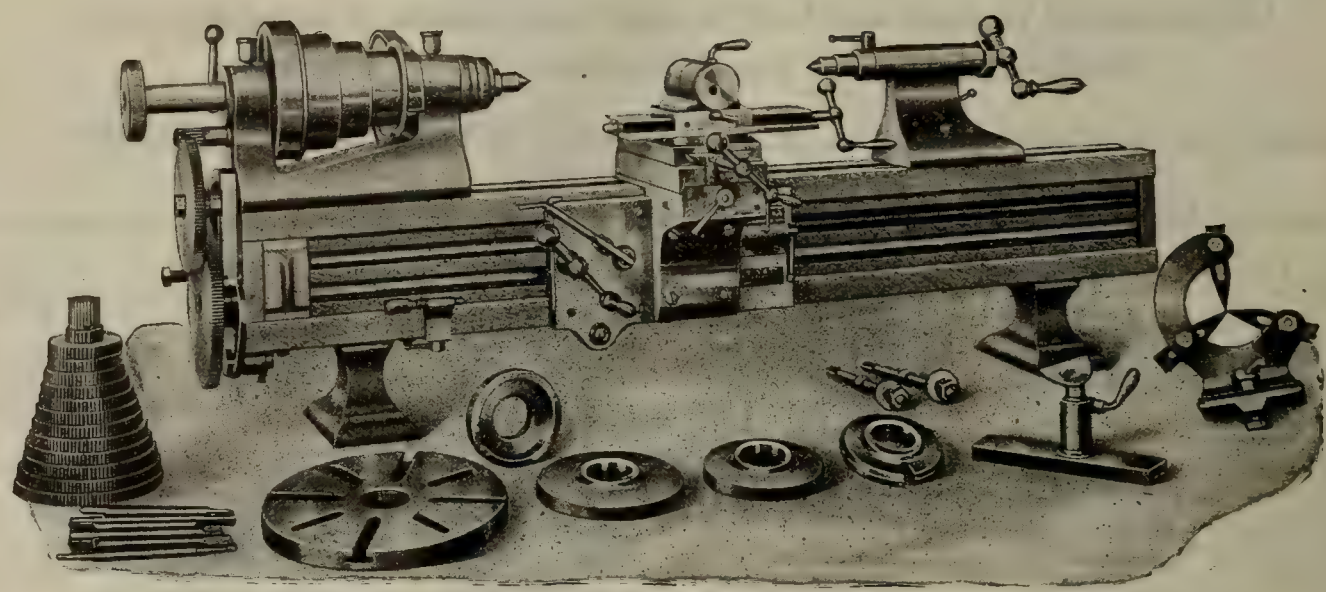

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CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XVIII. TORONTO, JULY 26, 1917 No. 4

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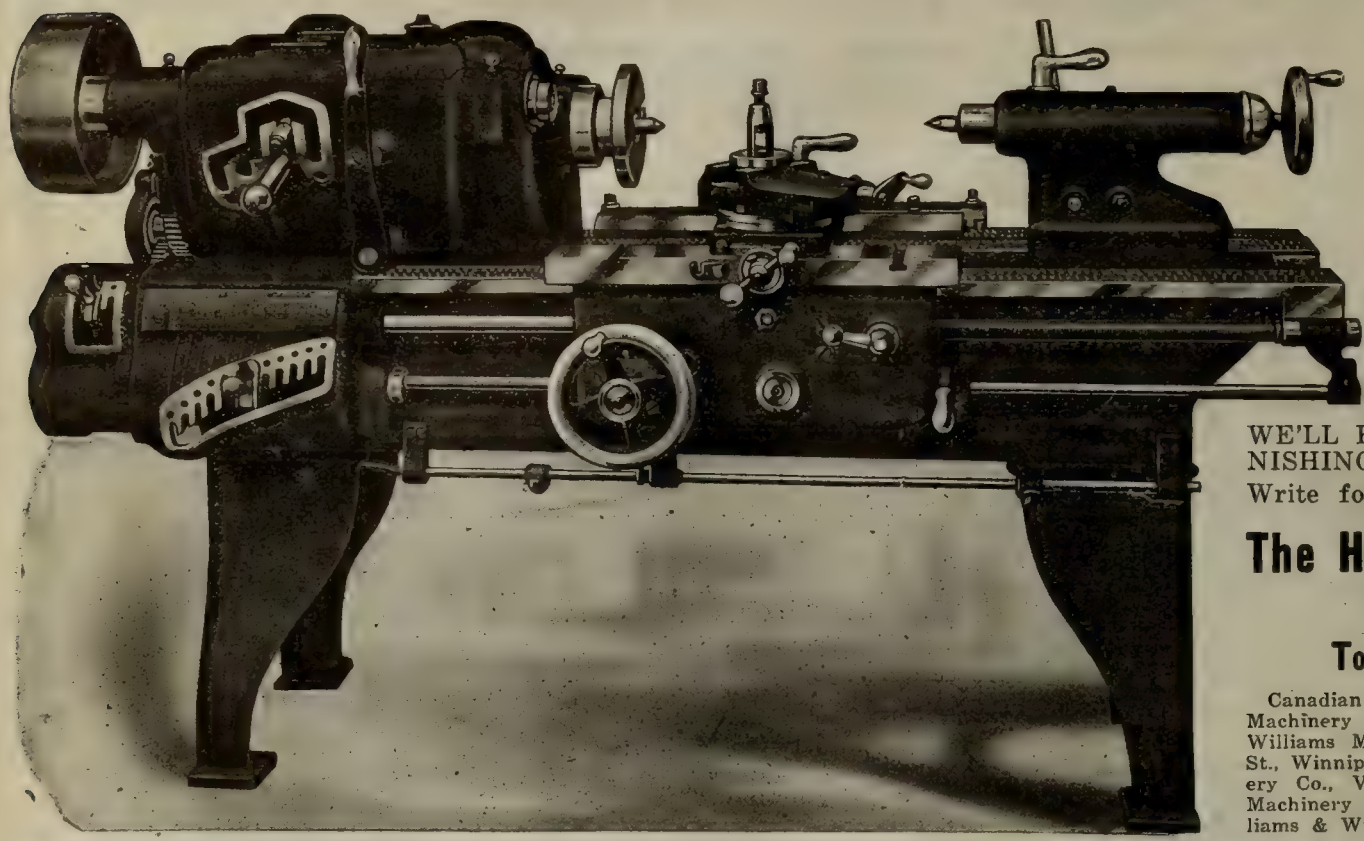

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They are plain in design, yet embody all essential features necessary for efficient work.

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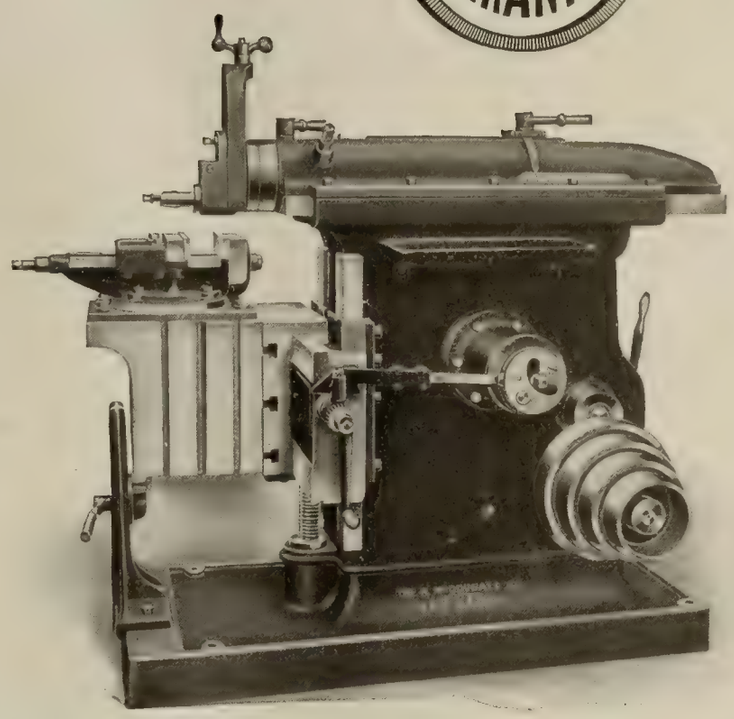

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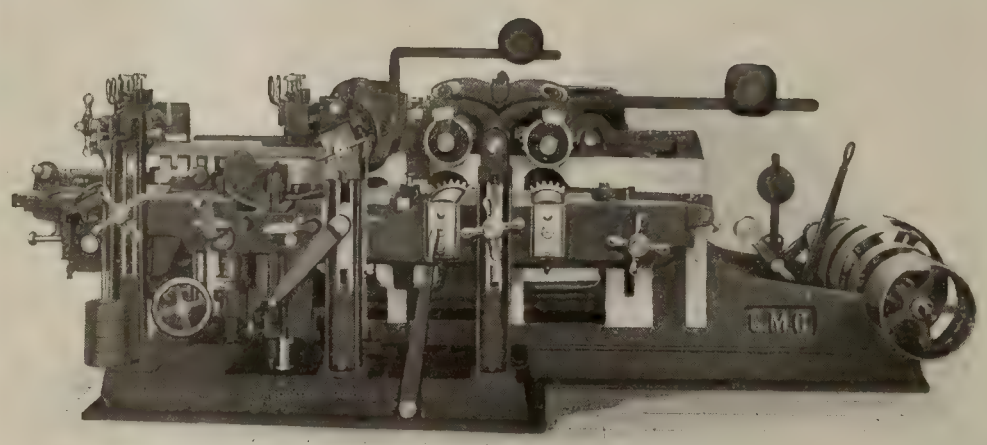

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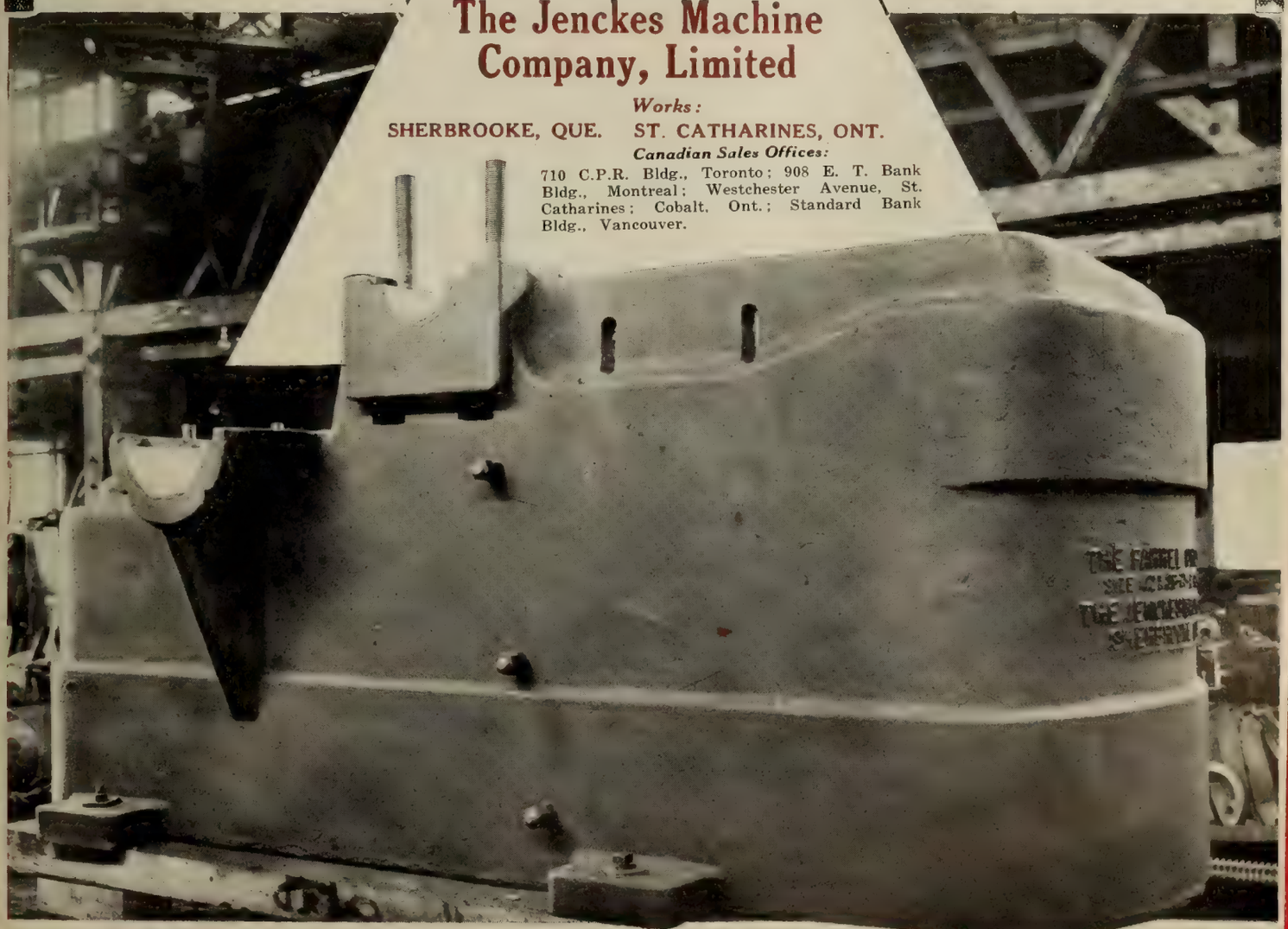

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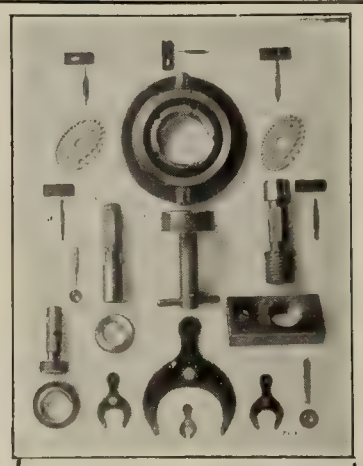

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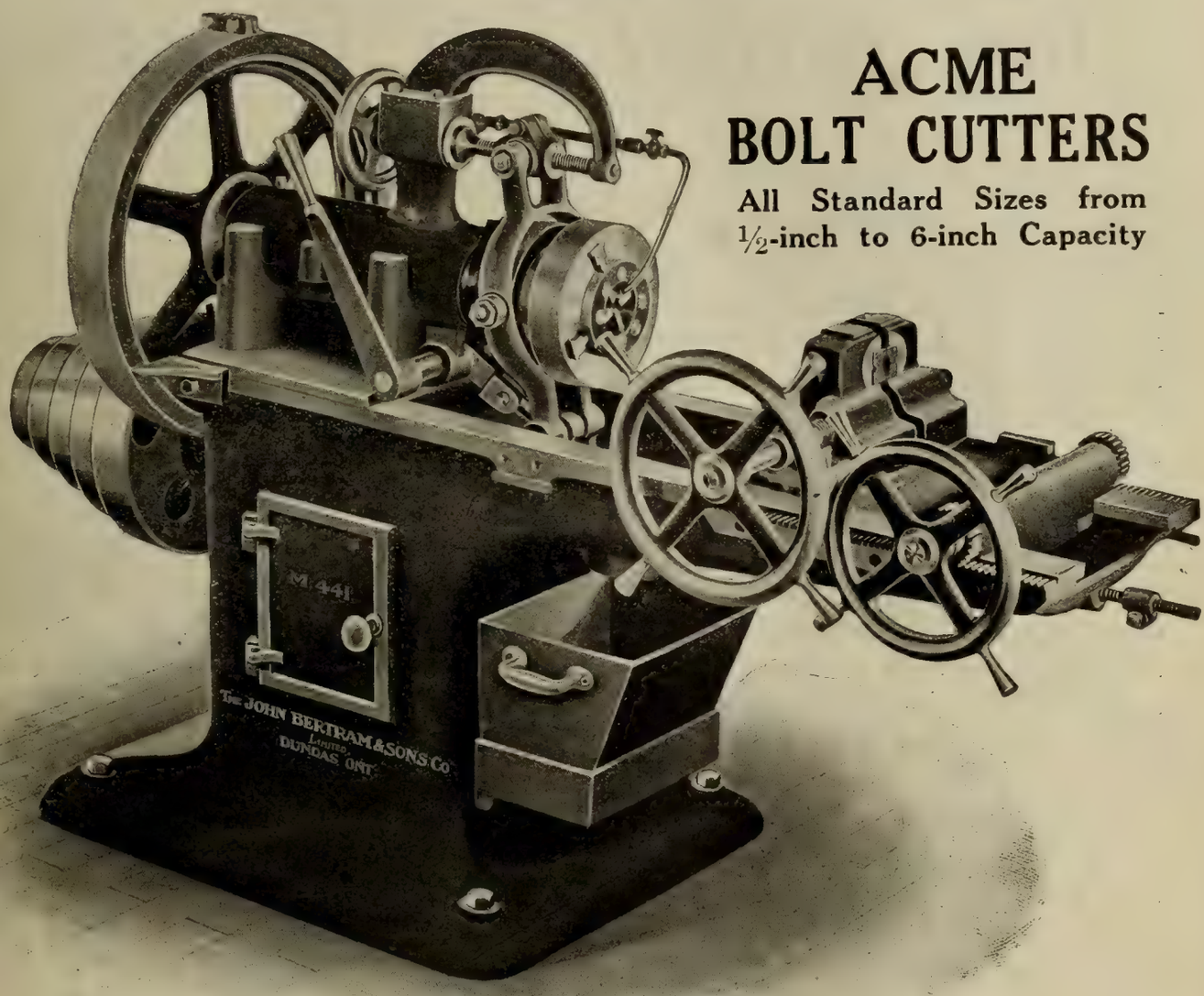

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The Publisher's Page

TORONTO August 2, 1917

How Advertising Protects

A CERTAIN Canadian manufacturer recently received a long distance telephone message, asking him to quote on a lot of equipment required for a certain big undertaking. He caught the first train for the city in which the inquiry originated and as a result closed an order for over $50,000!

This manufacturer took the trouble to come into our office one day this week and frankly told us of the circumstances under which the order referred to had been secured. It developed that the manufacturer in question knew absolutely nothing about the tender being out and it was solely through the appearance of a full page advertisement in our paper that he received the inquiry which resulted in the order for $50,000.

Here was a manufacturer, a keen wide-awake man, with a supposedly efficient sales organization, equipped for keeping in touch with all worth while developments. Had this manufacturer relied solely upon his sales staff he would have lost out but, as we said before, being keen and wide-awake, he had provided for just such contingencies by *advertising*.

Advertising—the salesman who is everywhere at all times, who never sleeps, who is ever on guard,—proved his worth in this case just as he has shown his mettle so often before.

Even in this instance advertising might not have received the credit for the splendid results secured had not our good friend and advertiser taken the trouble to ascertain just how and why he received the inquiry which led to the order.

Naturally the manufacturer in question asked us for obvious reasons to refrain from mentioning any names at the present time, but the facts were so interesting that we felt impelled to pass them on that a consideration of them might strengthen the already unwavering conviction of those who have advertised long and believe fully in the power of advertising, and encourage those who are almost but not quite convinced that advertising is a necessary force in business. And there are still a few in this state of mind.

If any advertisement interests you, tear it out now and place with letters to be answered.

This Wonderful Metal

is made in different Grades and can be adapted for
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Remarkable Results are Being Obtained

in machining Steel, Iron, Bronze, Brass,
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are cast for hot or cold drawn work.

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200 King Street West

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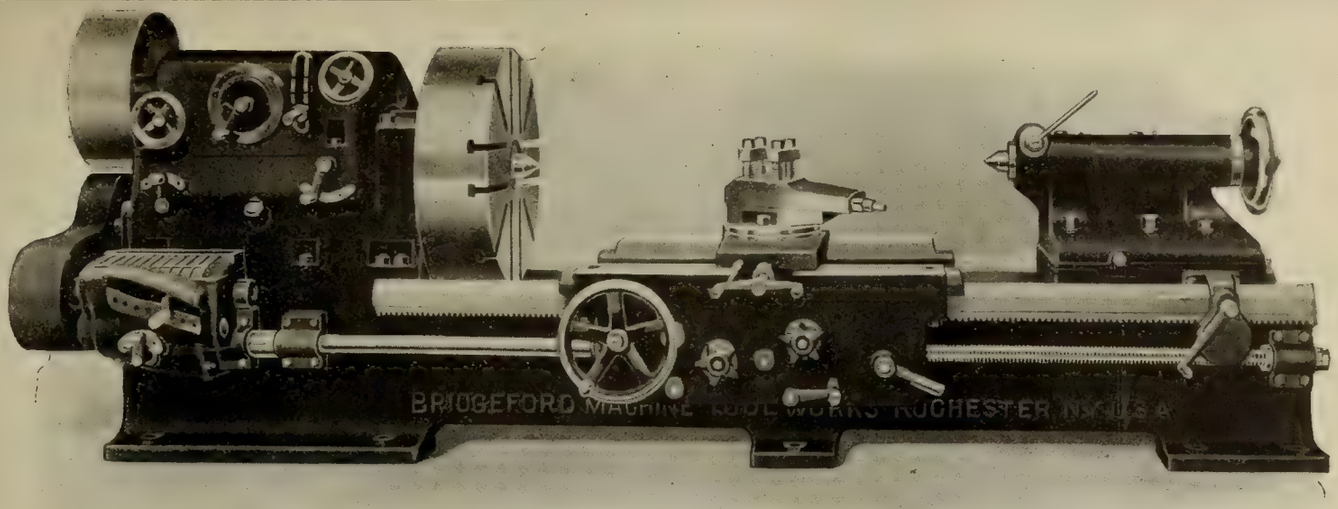
315 Craig Street West



Bridgeford 36" Patent Geared Head Lathe HEAVY PATTERN

Accurate This is one of those heavy duty "Bridgefords," celebrated for its accuracy and speed. Has ideal combination of cutting speeds and changes are made with quickness and ease. You can bank on this lathe to go through the toughest proposition in quick order where the average lathe would fall down.

All Bridgeford Lathes are built to cope with the severest requirements. Let us tell you more about them.

Bridgeford Machine Tool Works, Rochester, N.Y.

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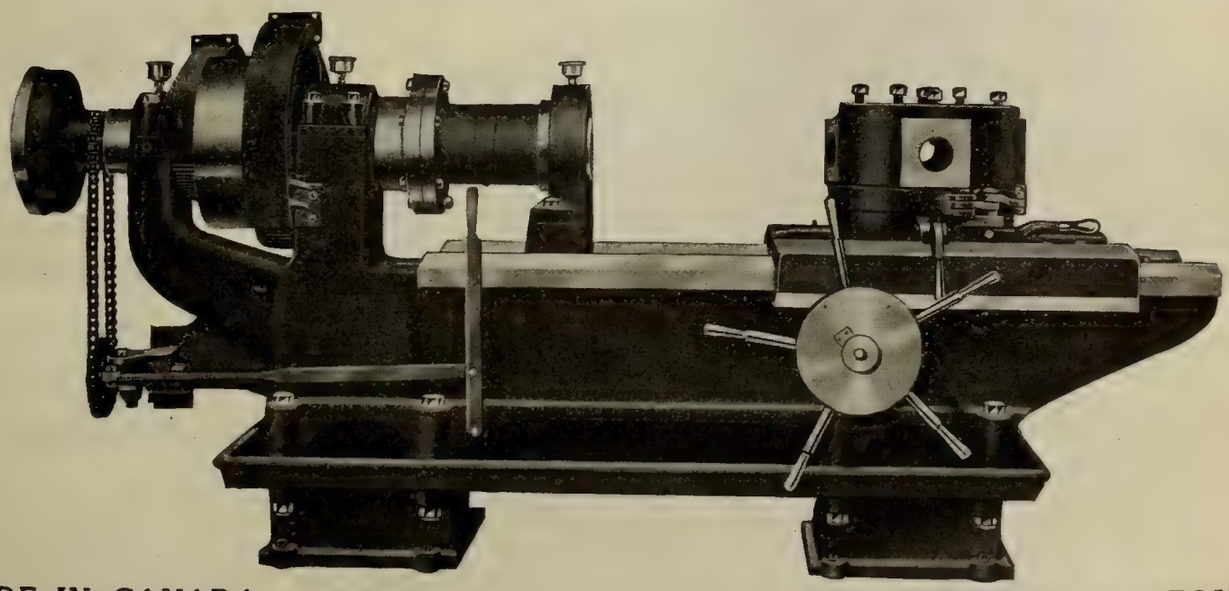
H.E.W. Boring Lathes To Handle Shells Up To 6"



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HYDE ENGINEERING WORKS

CONSULTING AND MANUFACTURING ENGINEERS

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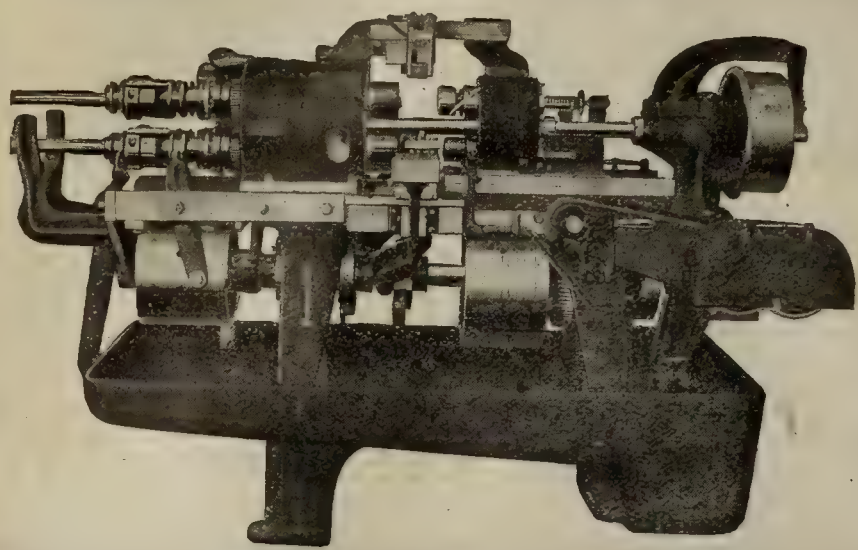
The Man Who Uses ACME Automatics

The ACME Automatic Multiple Spindle Screw Machine, Capacities Up to 3¾" Diameter

Ask him why he uses them?

He will tell you that better finish, greater production and lower cost per piece were his reasons for specifying Acmes.

Moreover, the Acme Adaptability to such operations as cross milling, drilling, slabbing and slotting before the work leaves the machine means a saving in the cost per piece which in many cases has paid for the machine.



Let us show you the true economy of the Acme Way Send a sample or blue print.

The National Acme Co.

Cleveland Ohio

New England Plant: Windsor, Vermont
Canadian Plant: Montreal, Quebec

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REPRESENTATIVES IN FOREIGN COUNTRIES

Makers of Gridley Single and Multiple Spindle Automatics at Windsor, Vermont; and Acme Automatics, Threading Dies, and Screw Machine Products at Cleveland, Ohio.

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Made by The Canadian Furnace Co.
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Canadian Office:
703 C.P.R. Bldg., Toronto

Works: LONGUEUIL, QUE.

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are you using Steel

MADE IN CANADA?

We are manufacturing at our works at LONGUEUIL, QUE.

SPECIAL HIGH SPEED AND CARBON TOOL STEELS, MISCELLANEOUS SHOP TOOLS, GAUGES, Etc.

ARMSTRONG WHITWORTH of CANADA
LIMITED

HEAD OFFICE: 298-300 St. James St., Montreal
Branches: 27 King William Street, HAMILTON
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Our lengthy and varied experience in making Manganese, Vanadium, Titanium, castings assures you of getting the best of products.

Anything in castings from 1 lb. to 50 tons is right in our line. Ships' castings our specialty.

Castings made true to specifications and patterns.

Propeller shaft Bearing for Ice-Breaker "John D. Hazen."

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GENERAL OFFICE: Transportation Bldg. Montreal, Canada.

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WORKS: Welland, Ont.; Point St. Charles, Montreal; Longue Pointe, Montreal.

We guarantee shipment within 24 hours of receipt of order

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"Extra" "Special" "High Speed" **Tool Steels**

Made in Sweden from selected Dannemora Ore

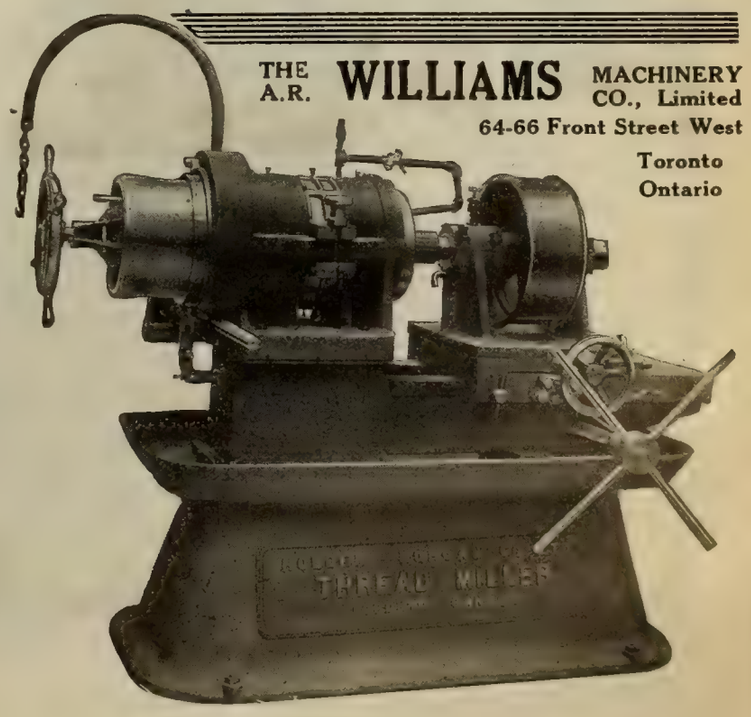
We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

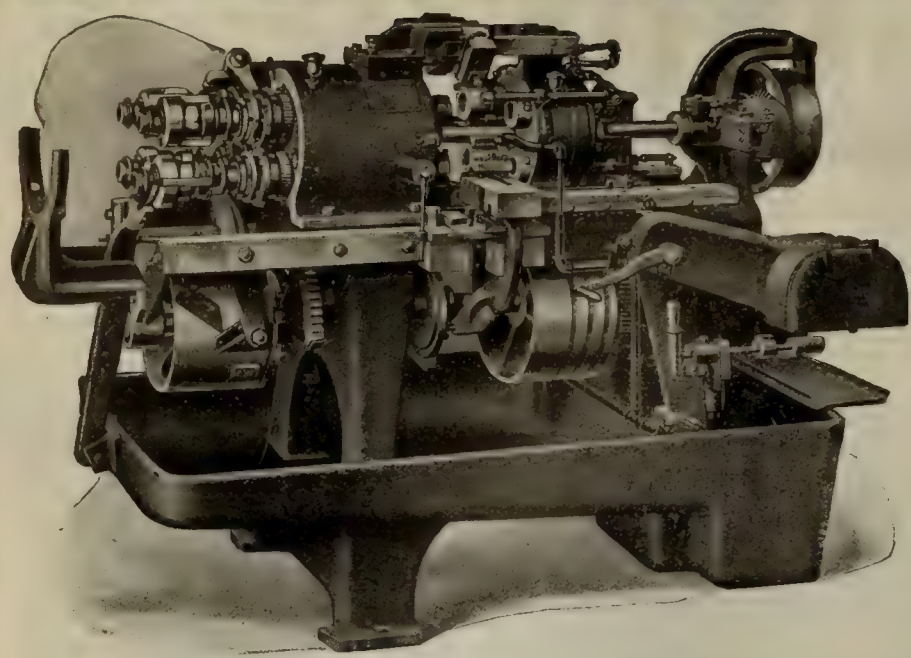
The Life of a Thread Miller

Depends not upon the amount of work it does, but the ease and thoroughness with which the work is done. These Thread Millers are noted for these qualities. Its quality of work is unrivalled. Our Service Department will give you all the particulars. *Write us!*

THE A.R. **WILLIAMS** MACHINERY CO., Limited
64-66 Front Street West
Toronto
Ontario

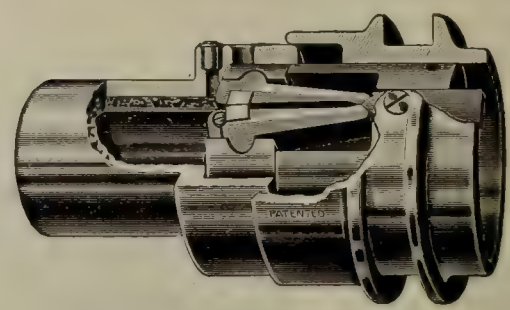


THE JOHNSON FRICTION CLUTCH



Courtesy: National-Acme Mfg. Co., Cleveland, Ohio.

IS used by the leading machine builders. Do you use the Johnson Friction Clutch as part of your machines? If not, it will pay you to look into our clutches. May we send our Booklet, Clutches as Applied in Machine Building? It's free. Write for your copy to-day.



Single Clutch, Sectioned, showing Interior.

The Johnson Friction Clutch is incorporated by the leading automatic machine builders. Note the automatic machines shown on this page.

National-Acme Mfg. Co., Cleveland, O., say:

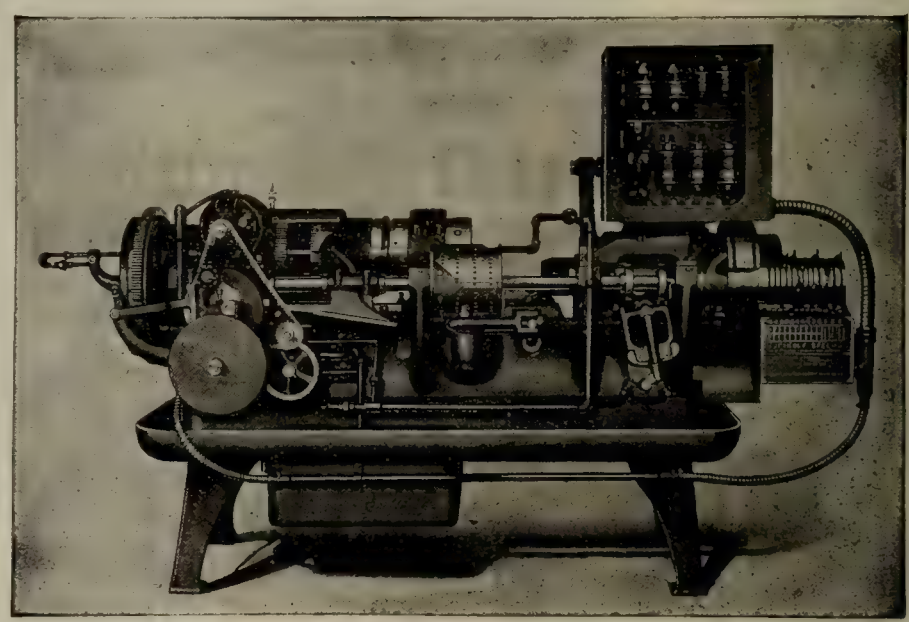
"It will pull a heavy load. Very easy to shift. Fitted well into the plan of the machine."

Cleveland Automatic Machine Co. say:

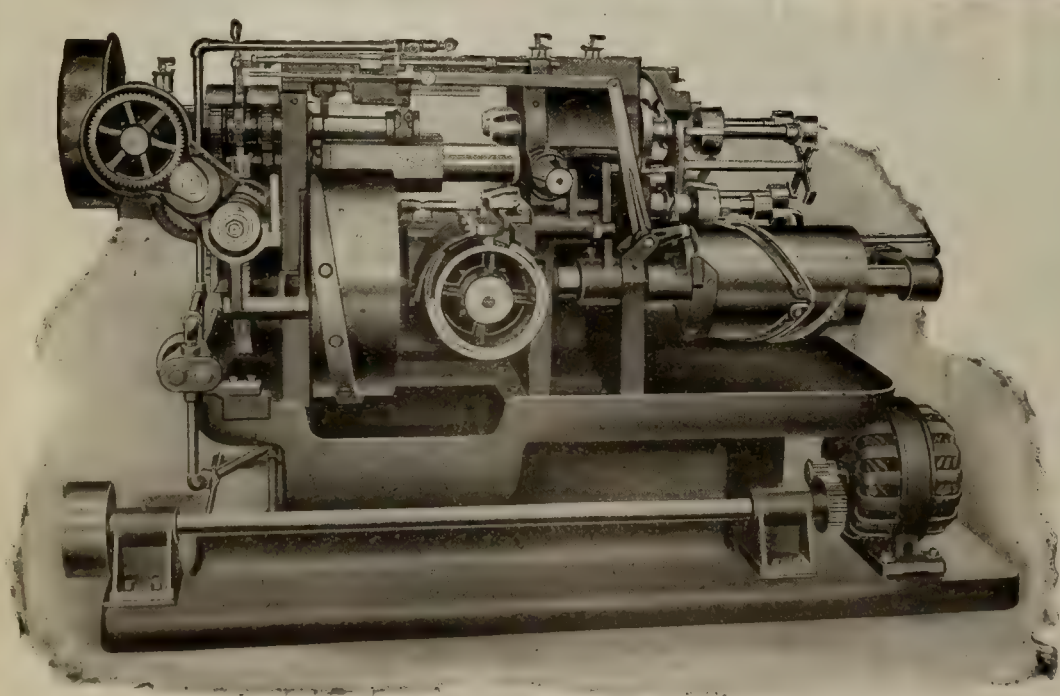
"Service of this kind requires a friction clutch of correct design and the Johnson Friction Clutch proves entirely satisfactory."

National-Acme Mfg. Co., Windsor, Vt., said:

"It works very successfully. We will use them in the future."



Courtesy: Cleveland Automatic Mach. Co., Cleveland, Ohio.



Courtesy: National Acme Mfg. Co., Windsor, Vt.

Our Engineering Department is maintained for your benefit and our engineers will give you any information you may desire. Write to-day, sending a sketch of the part of your machine into which you wish to work the Johnson Friction Clutch. We will draw in the proper size of clutch.

This is part of the service we render our customers and we invite you to use is as freely as you desire.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

England—The Efandem Co., 159 Gt. Portland St., London, W., England. Sole Agents for the British Isles. Canada—Williams & Wilson, Ltd., 320 St. James St., Montreal. Canadian Fairbanks-Morse Co., Limited, Toronto. AUSTRALIA: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.

The Fairley Davidson Steel Co., Inc.

SPECIALISTS

	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
High Strength Steels	"Hehtemnd"
High Speed Steel	RUSHITOFF No. 6
Tool and Die Steels	"Fondwot" and "Giant"
Magnet Steels	Tungsten or Chrome
Non-Changeable Die Steel	Nugget "B" oil hardening

CHROME VANADIUM, oil hardening or case hardening
CHROME NICKEL, oil hardening or case hardening
Steam Hammer Forgings to Sketch
We guarantee to supply the correct steel at once, eliminating costly experiments
We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

Canadian Agents:

The Canadian Utilities Steel & Engineering, Limited

149 Craig Street West, Montreal, Canada

We carry a complete stock at our Montreal Warehouse

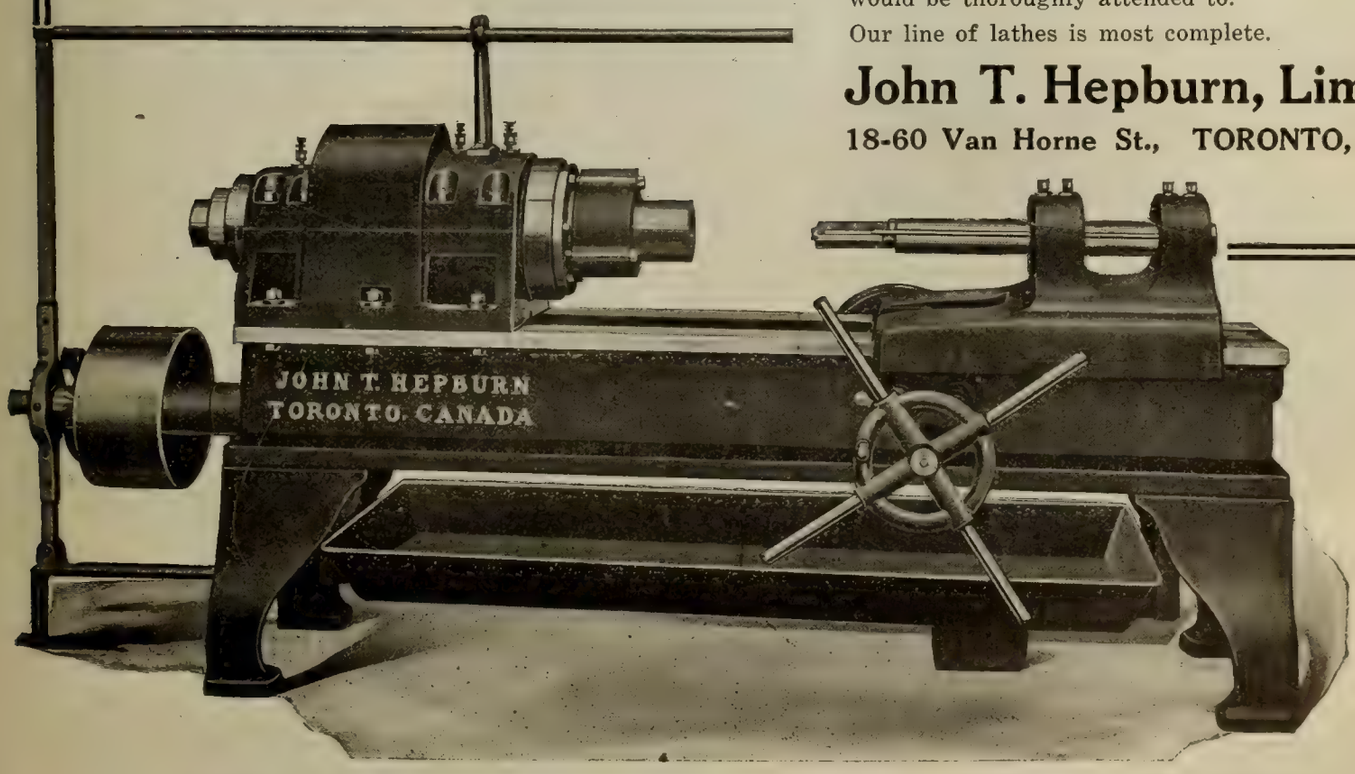
Its Construction and Achievements

The array of performances this lathe has made in boring shells up to 6″ is sufficient to warrant the confidence that our clients express in them. While speed is a great asset, yet the quality of work done and the condition of the machine after excess use have excited the most favorable comment. An inquiry would be thoroughly attended to.

Our line of lathes is most complete.

John T. Hepburn, Limited

18-60 Van Horne St., TORONTO, Ontario



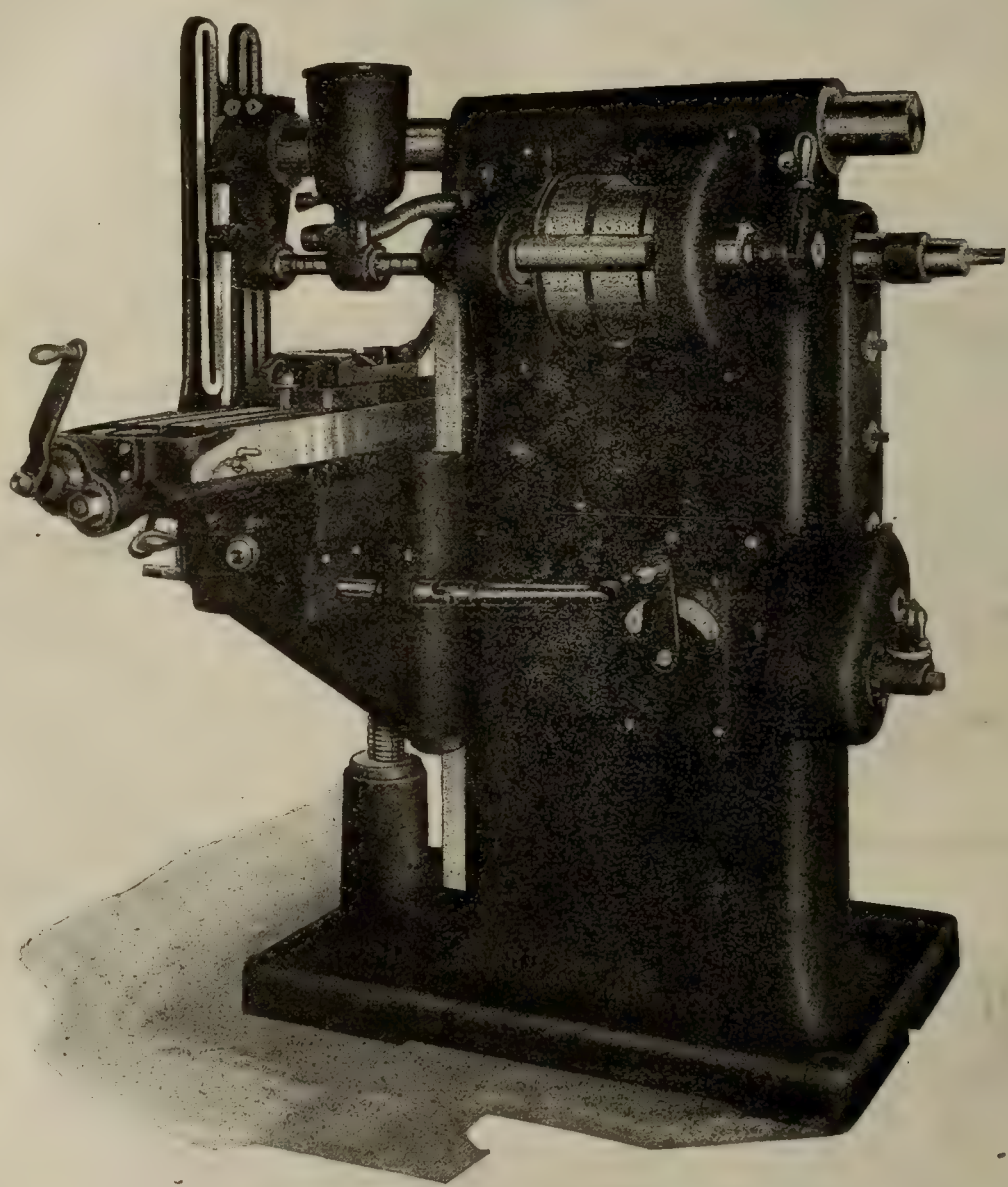
The Ford-Smith Machine Company

Adv't. No. 1 Miller Series

First let us tell you the various sizes of Millers we manufacture:—

No. 2 Plain	27" x 19" x 7½"	No. 2 Universal	25" x 18" x 8"
No. 3 Plain	34" x 20" x 10"	No. 3 Universal	34" x 19" x 10"

—WITH ALL GEAR FEEDS—



We leave you to study this photograph—and next issue will describe various reasons why our Millers are to be found in most up-to-date Machine Shops and Tool Rooms.

The Ford-Smith Machine Company, Limited

HAMILTON ONTARIO CANADA

Sheet Metal Working Machinery of Any Description

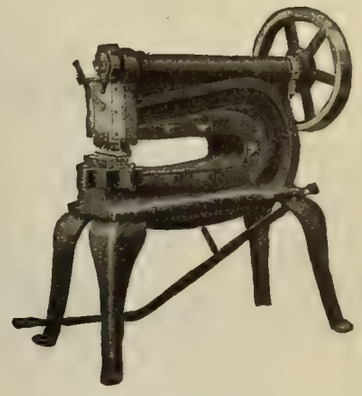
B.B. Presses for

Quality, Efficiency,

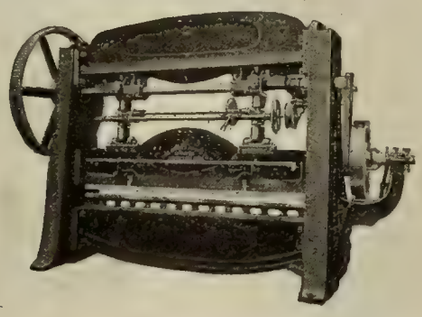
Durability, Speed,

Accurate Production.

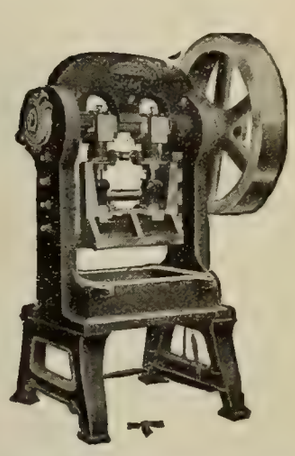
No. 2—G.A. Press



No. 126
Deep Throat Power Punch

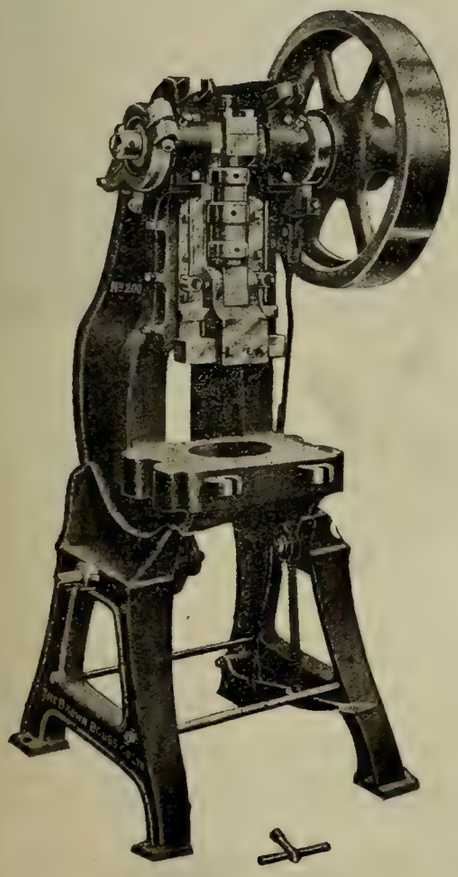


No. 500—Power Brake or Press



No. 20½—Power Press

B.B. Presses embody special features for minimizing maintenance cost of both machines and tools.



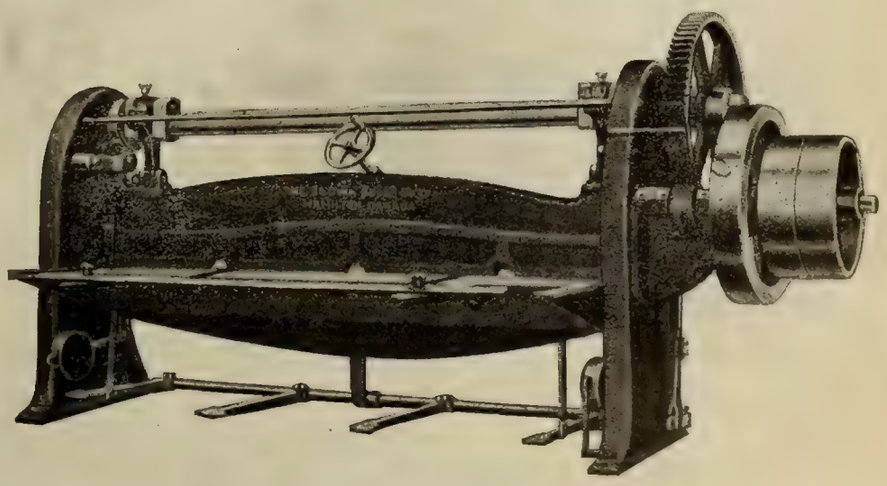
No. 200—Power Press

The Brown, Boggs Company, Limited

HAMILTON ONTARIO

MANUFACTURERS OF

Tinsmiths' Heavy Sheet Metal Working Machinery



No. 960—Overhead Shear

Nova Scotia Steel & Coal Company
Limited

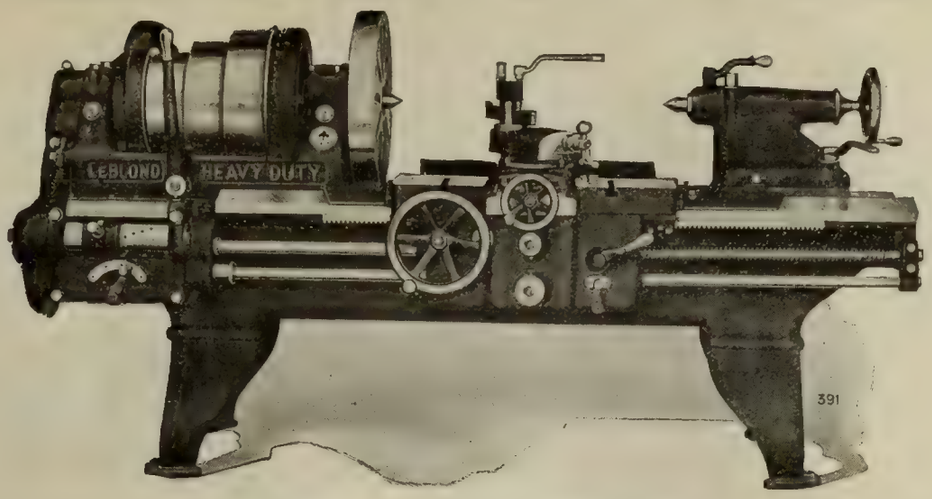
New Glasgow, Nova Scotia, Canada

RUDDER FOR SS. "LUX." WEIGHT 9 TONS, LENGTH 42 FEET

Ship Forgings of all Shapes, Sizes and Weights up to 75 Tons

We manufacture, of Fluid Compressed Steel, forgings entering into the construction and equipment of steel vessels up to and including the largest building or afloat, and embracing Rudder Frames—sectional or one piece, also Rudders complete; Stern Posts and Stern Brackets for single, Twin and Triple Screw Ships, Rudder Heads, Boat Davits, Derricks, etc.

LEBLOND HEAVY DUTY LATHES



Are lathes built for a definite service—And this a class of Production to which only LeBlond Heavy Duty Lathes are adapted.

There's a reason—
Hardened Spindle Bearings—
One-piece, box section, aprons—
Patent Compensating Vee Bed Design—
Double Friction Back Gears—
and LeBlond Workmanship *do add to the continuous productive life of a lathe.*

The R. K. LeBlond Machine Tool Co.
Cincinnati, Ohio, U. S. A.
Agents in Principal Cities

Two Cuts at One Time

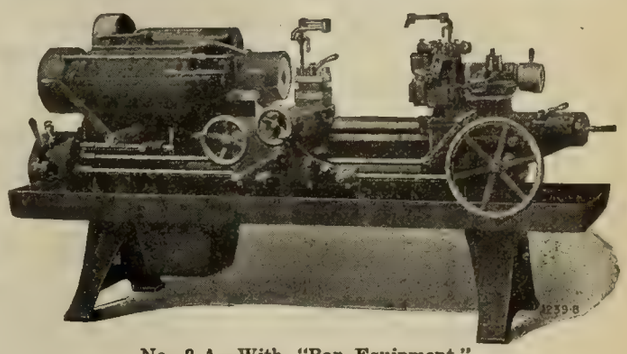
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

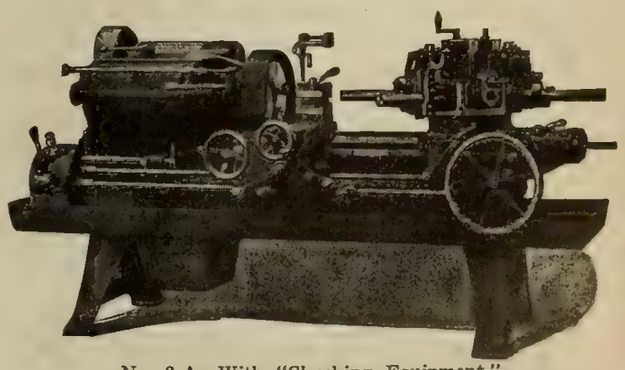
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."

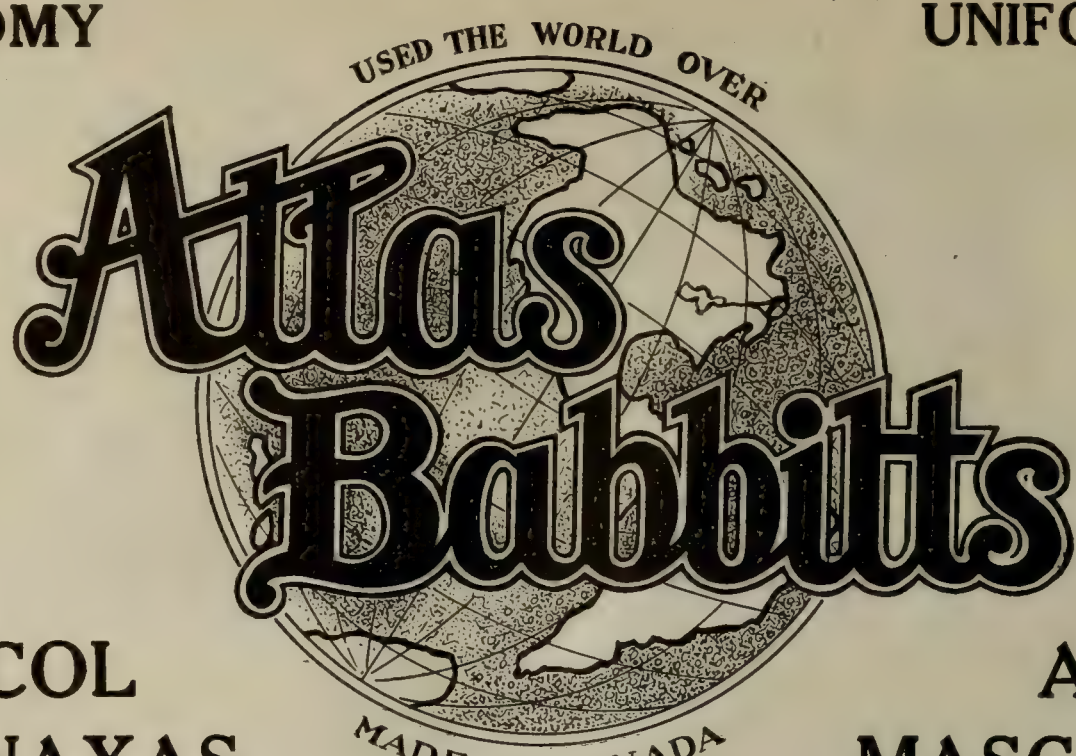


No. 2-A—With "Chucking Equipment."

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal; Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

ECONOMY UNIFORMITY



AMACOL ATLAS
TENAXAS MASCOT
TIN TOUGHENED W. E. W. BABBITT

HAVE A WORLD-WIDE REPUTATION FOR UNIFORMITY

ATLAS Alloys are scientific products—the result of much patient research and long years of experience. They are manufactured under the most modern scientific conditions, thereby eliminating any element of chance in their composition and ensuring a standard maintenance of quality and uniformity.

ATLAS Brands are not alloys that *sometimes* give *satisfaction.* They are alloys that can be implicitly relied upon *always.* They are alloys with our *prestige* and *reputation* always behind them.

DO not let prejudice stand between *you* and *profit.* You can obtain the *maximum efficiency* from your plant at a *minimum of cost* by using ATLAS BABBITTS.

THERE IS AN ATLAS BRAND TO MEET ANY NEED

NO SHOCK TOO SEVERE NO WEIGHT TOO HEAVY NO SPEED TOO GREAT

Atlas Metal and Alloys Company of Canada, Limited
MONTREAL

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AUSTRALIA NEW ZEALAND SOUTH AFRICA

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Cables: "KIDCO," Montreal

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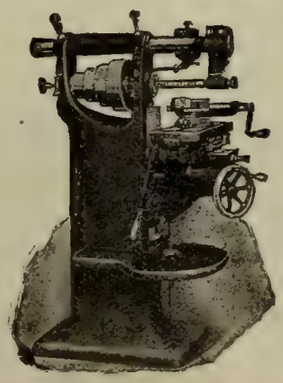
Large Millers for large work — STEPTOE MILLERS for small work.

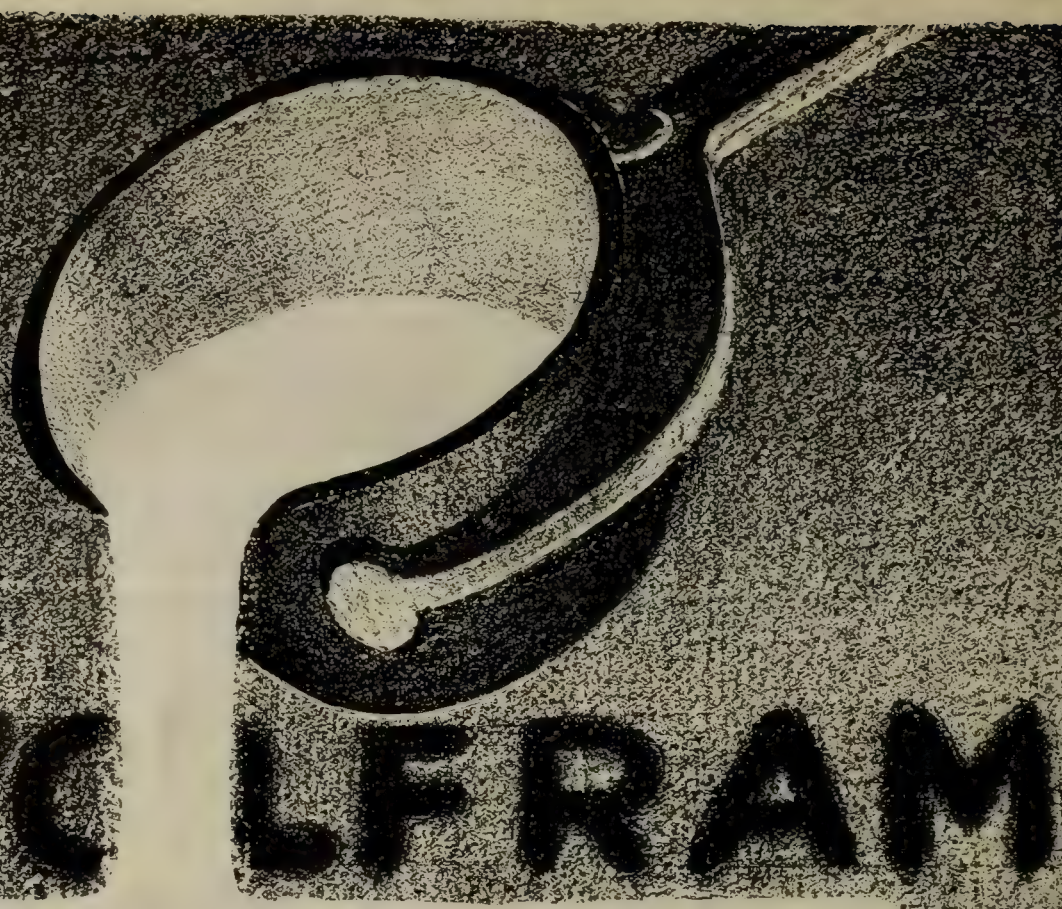
Will result in increased production; less money invested in machinery, and increased profit.



Large Planers for large work — STEPTOE SHAPERS for small work.

THE JOHN STEPTOE COMPANY
CUMMINSVILLE, CINCINNATI, OHIO, U.S.A.

If any advertisement interests you, tear it out now and place with letters to be answered.



Some Facts About Tungsten

The qualities of heat resistance, uniformity, and endurance—essential to a standard High Speed Steel—are admirably well supplied by Tungsten.

As high as 18% of Tungsten can be used beneficially in tool steel; this is not true of any other alloy. The consequent heat resisting powers of the steel are remarkable. Carbon Steel without Tungsten will harden at 1400 deg. F., and will coarsen at 1500 deg. The same steel containing 18% Tungsten will not coarsen even at 2350 deg.

Tungsten, the most stable alloy, supplies infinite endurance. Repeated redressing. hardening and heavy usage do not affect the cutting power of the steel.

WOLFRAM

The Standard Tungsten High Speed Steel is of uniform high quality, and may be worked down to the last ounce without variation.

VULCAN CRUCIBLE STEEL CO.

ALIQUIPPA ESTABLISHED 1900 **PA. U.S.A.**

Represented in Canada by **Messrs. NORTON, CALLARD & COMPANY**
MONTREAL, QUEBEC

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

TRADE MARK "WACO"

Reliance Steel Works
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TRADE MARK:

TRADE MARK

of the Famous

"WACO

Brand

High Speed Steel and Twist Drills

"DOUBLE WACO" Quality

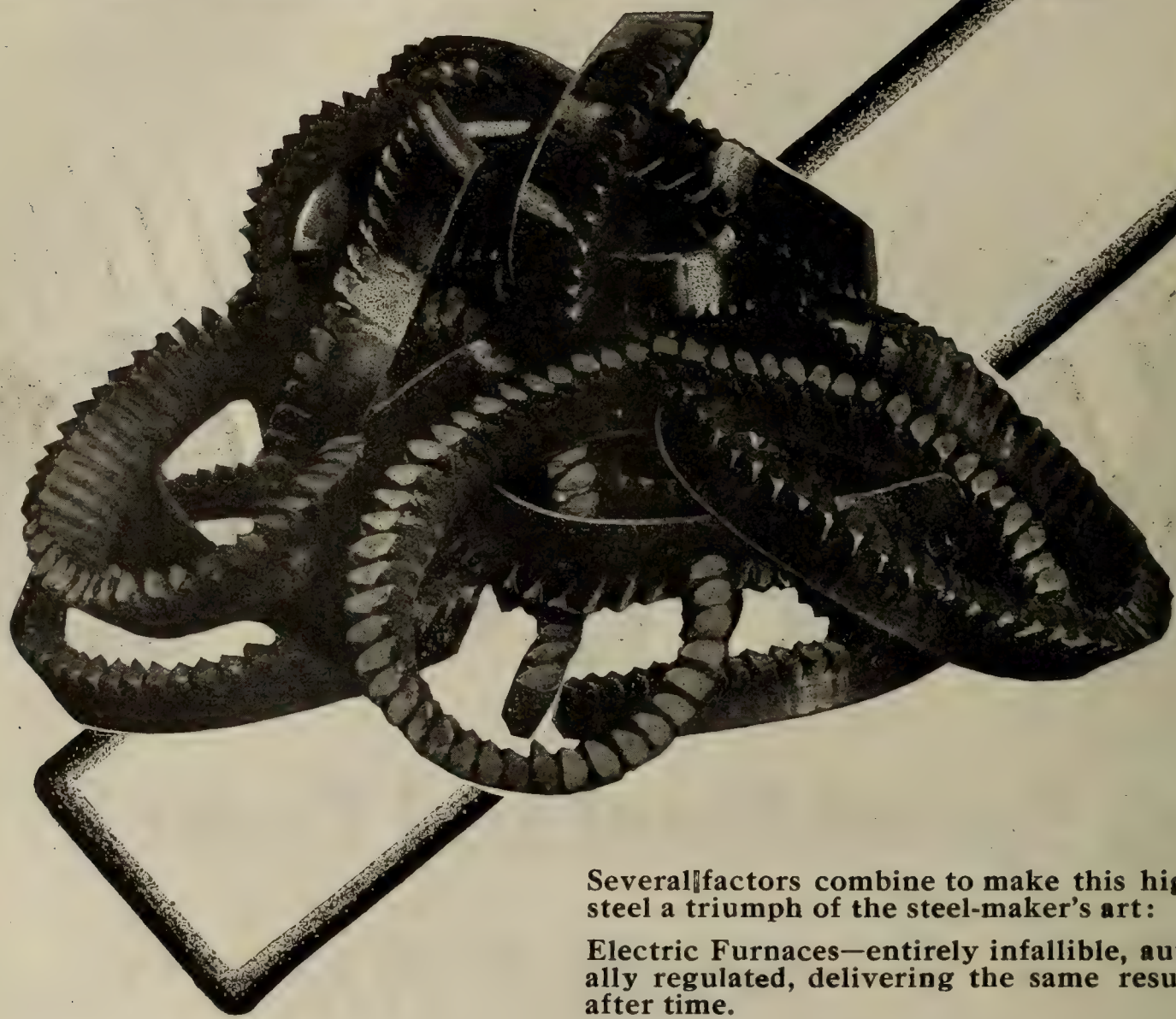
Specially Adapted for all kinds of
MUNITION WORK

"Turtle" Brand
High Class Tool Steel, Files, etc.
of all descriptions.

For particulars apply to our
Sole Representatives for Canada

GEO. A. MARSHALL & CO.
70 Lombard Street Toronto, Ontario

Electrite-Uranium



Several factors combine to make this high speed steel a triumph of the steel-maker's art:

Electric Furnaces—entirely infallible, automatically regulated, delivering the same results time after time.

Uranium—this rare element, cousin to Radium, effects a profound change in the texture and quality of the steel.

Added to these, the constant care and skill of years of steel making experience make the result of each melt a foregone conclusion.

Latrobe Electric Steel Company

Latrobe, Penn.

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Ferro-Uranium

The Latest Discovery in Alloys for Efficient

HIGH-SPEED

AND OTHER

STEELS OF QUALITY

It insures tools that

STAND UP ON THE JOB

Largest Producers in the World of URANIUM

WRITE US FOR PARTICULARS

STANDARD ALLOYS COMPANY

Forbes and Meyran Aves. -:- Pittsburgh, Pa.

One of the

Steels of the Century

Centurion High-Speed

Made from the **BEST** Materials

Iron, Tungsten, Chrome, Vanadium

Melted by the **BEST** Process

The Crucible Furnace Method

Handled by the **BEST** Workmen

Melters, Forgemen, Annealers, Metallurgists

CONSEQUENTLY

Will do the **BEST** Work

Quality ***Delivery*** ***Service***

We have a catalog waiting for you. Write for it.

THE CENTURY STEEL CO. OF AMERICA

MANUFACTURERS OF HIGH-GRADE CRUCIBLE STEELS

Works:
POUGHKEEPSIE, N.Y.

Sales Offices:
120 BROADWAY, NEW YORK

"Red Cut Superior"

HIGH SPEED STEEL

YOU have thought of many qualities you would like to have in High Speed Steel Tools—such as cutting edges with long life, freedom from brittleness, great reserve strength and toughness to resist shocks and strains, tools that would not require special heat treatment, tools that would take deep roughing cuts or fine smooth finishing cuts, and in addition, could be worked at higher speeds than you ever dreamed of. All these virtues and many more are contained in "**Red Cut Superior**", a First Quality High Speed Steel. Furnished in Annealed Bar Stock, Discs and Treated Tool Holder Bits.

Send for folder. Are your tools made of **Red Cut** ?

VANADIUM-ALLOYS STEEL CO.

Pittsburgh, Penna. Works at Latrobe, Pa.

IF YOU WANT THE

BEST BASE PLUGS, BUY BANFIELD'S

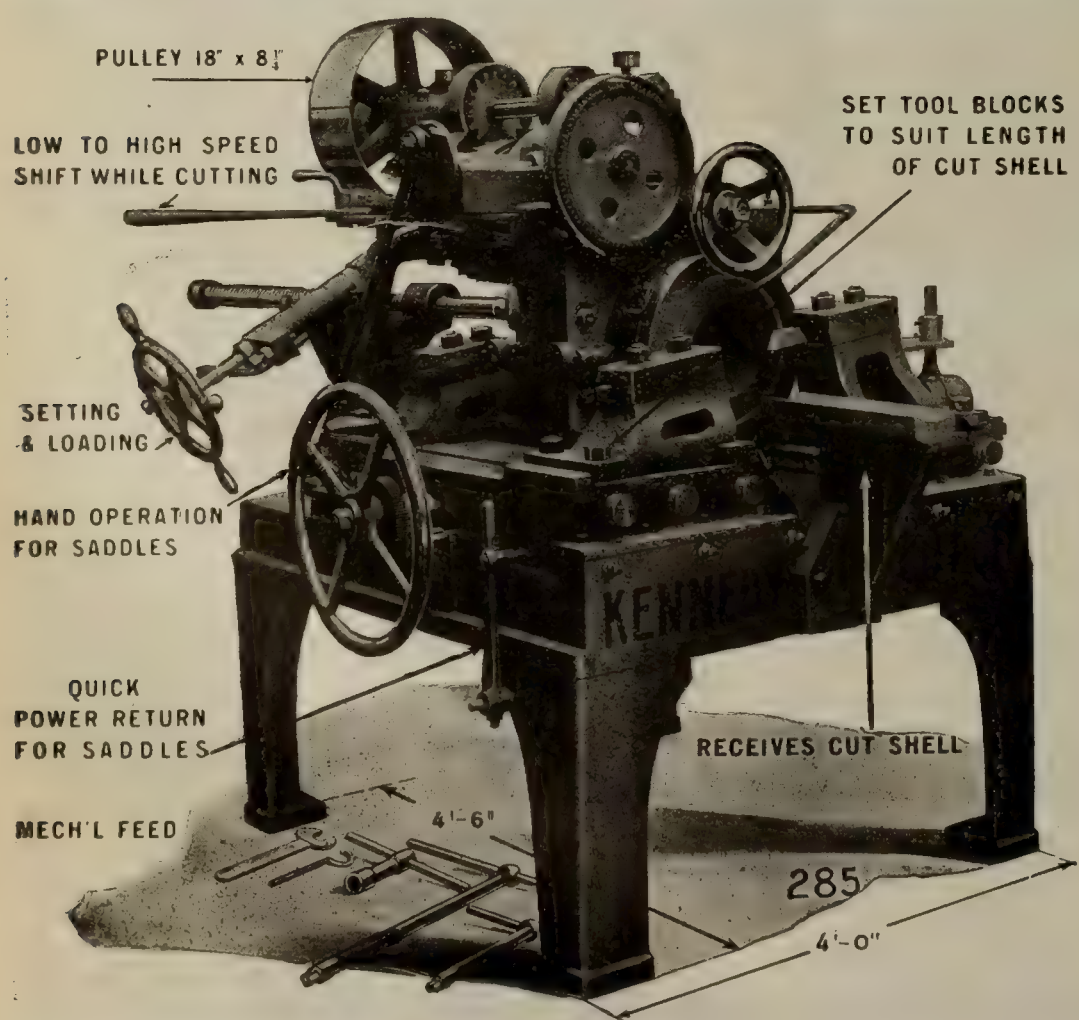
Have in stock for immediate shipment either threaded or bevel Plugs for 4.5", 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. *Write for prices.*

EDWIN J. BANFIELD

STAIR BLDG. ∴ TORONTO, ONT.

Manufacturer of Plug Milling Machines for above size shells. Prices and deliveries on application.



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Cuts both ends at once

except 8 in. and 9 in. sizes which cut one end only

Forgings load in one end and discharge out the other when cut

A Girl can operate it

New quick power return for saddles

DELIVERIES REASONABLE

The
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Limited
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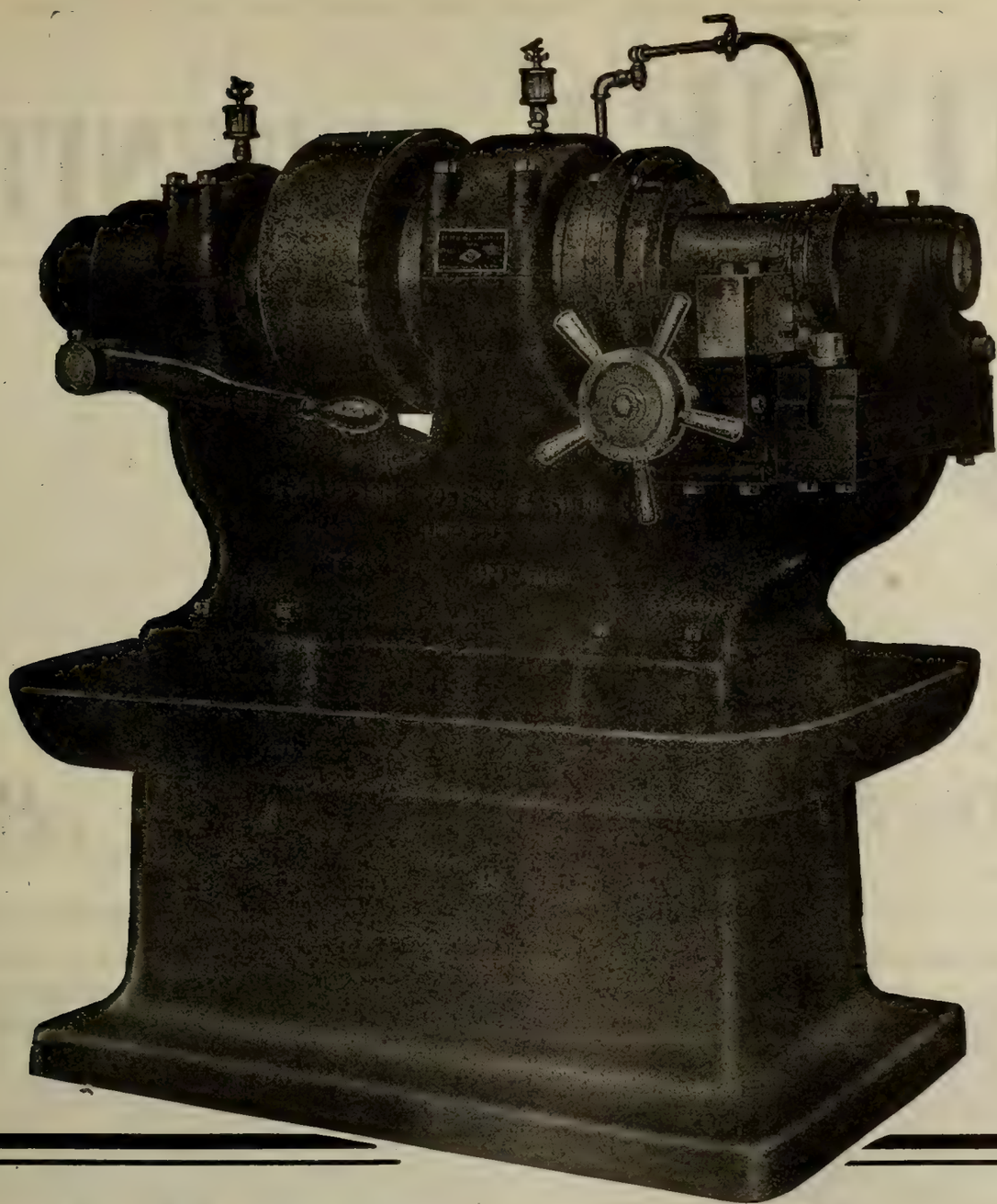


Just Now—

we have two 4.5 machines ready for immediate delivery

THIS Band Turning Machine, by its ability to perform efficiently month after month under exceptional production strains, has proved its worth to munition makers. It is being used by many Canadian munition plants, where it is giving absolute satisfaction.

A glance over some of the features will interest you.

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy chucking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

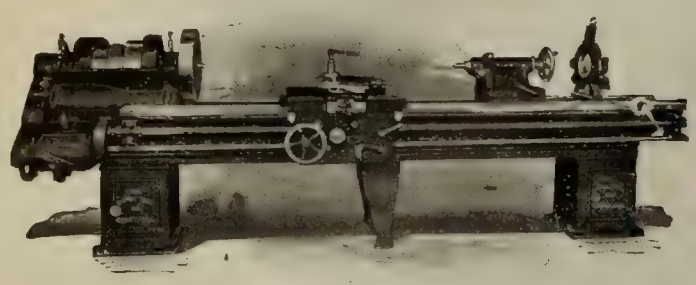
Machines are also built for 15, 18, 60-pdr. and 6" shells.

ROELOFSON MACHINE & TOOL COMPANY, LIMITED

Head Offices: 1501 Royal Bank Bldg., Toronto, Canada. Works: Galt, Canada

If any advertisement interests you, tear it out now and place with letters to be answered.

SIDNEY SERENITY



We hear much of Nations standing "serene in the face of danger." But what about the machines that stand serene in the face of terrific service demanded by the abnormal conditions of war, and which must be met?

It takes correct design, the best materials, rigidity, convenience and INBUILT-SERVICE to enable Lathes to "stand up" with serenity under the driving and crowding imposed by war conditions—and SIDNEYS stand the gaff. A study of their construction tells why. Bulletin 30 contains the story. Write us—or get in immediate touch with one of our Canadian Agents:

Foss & Hill Machinery Co.
Montreal, Que.

H. W. Petrie, Limited
Toronto, Ont.

The Sidney Tool Company
Sidney, Ohio, U.S.A.

SIDNEY SERVICE

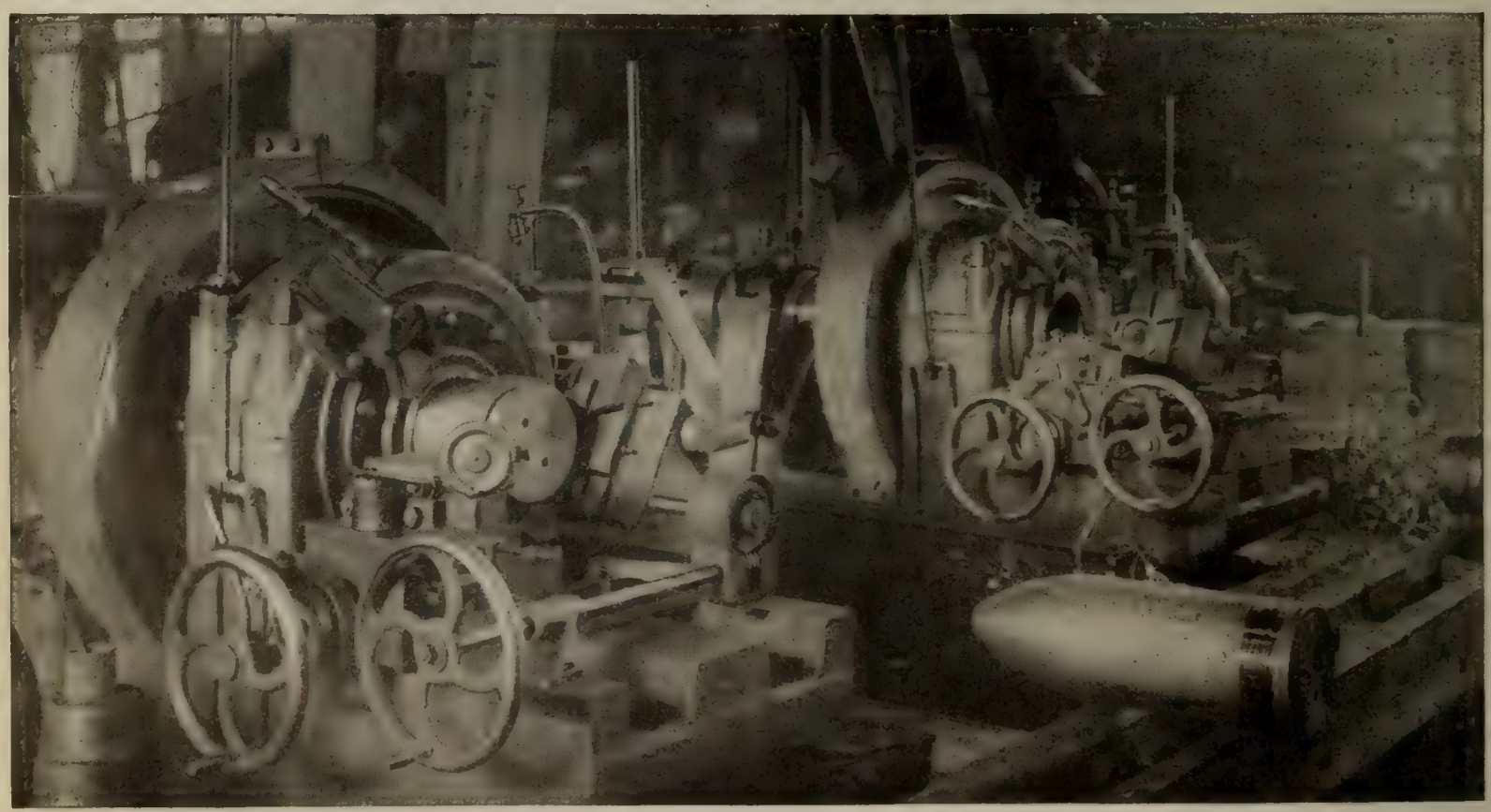


Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

These machines are built for turning bands on 8", 9.2" and 12" shells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. **Write for full particulars and price.**

Bennett Ave. **Warden King Limited** **Maisonneuve, P.Q.**

TWO HUNDRED POUNDS

TWO HUNDRED POUNDS MORE THAN THE CIRCULAR WEIGHT; THAT'S WHAT THE LATEST CISCOS WEIGH.

A	14	by	6	weighs	1700	pounds	net	instead	of	1500
A	16	"	6	"	2550	"	"	"	"	2350
A	18	"	8	"	3700	"	"	"	"	3500

and EVERY POUND COUNTS because EVERY POUND DOES its ALLOTTED work.

Cisco Lathes are not just sheer heavy, a bulky mass of iron.

Their design is so CAREFULLY studied that there is NO WASTE material.

DID YOU EVER SEE A BOY OPERATE ONE? HE CAN.
DID YOU EVER SEE A CISCO LATHE USER'S REPAIR BILLS? NOT OFTEN.
DID YOU EVER RUN A MORE SATISFACTORY LATHE? MIGHTY SELDOM.

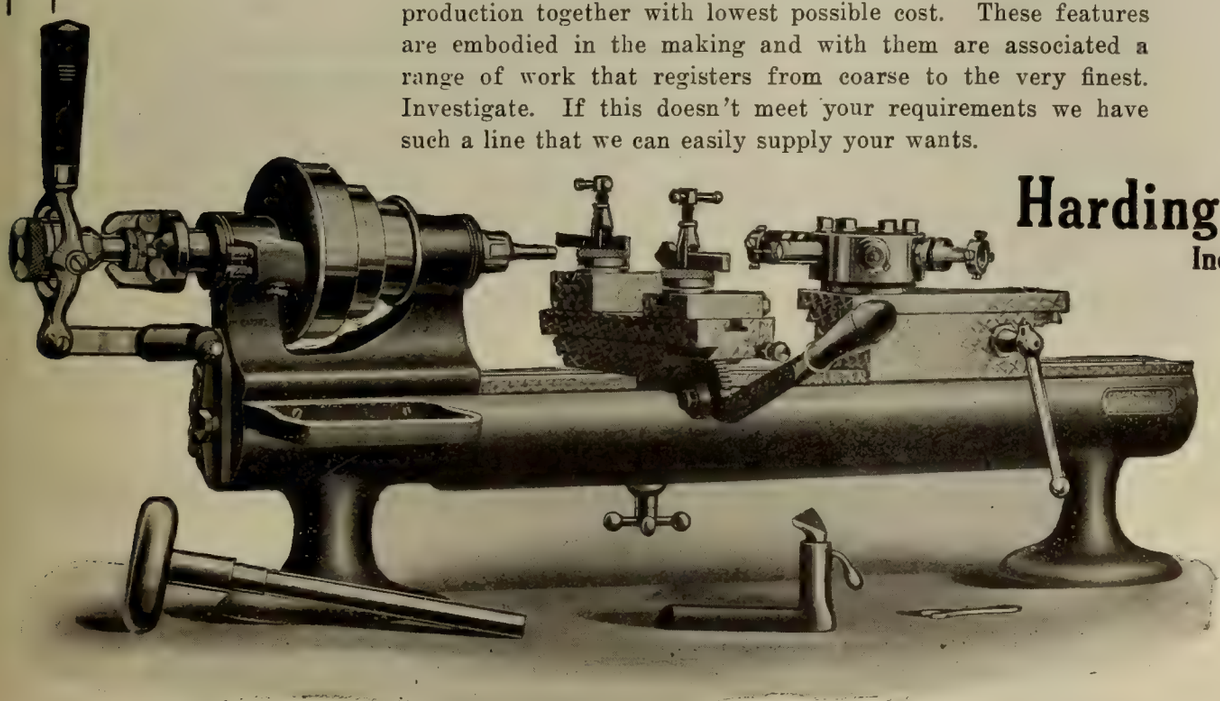
That's Why They Buy CISCO—THE LATHE WITH THE PULL

Sold extensively and exclusively in Canada by
The A. R. Williams Machinery Co., Ltd.

MADE IN CINCINNATI, U.S.A., BY
The Cincinnati Iron and Steel Co.
14", 16", 18" 24" Sizes

If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.



Hardinge Bros.
Inc.

1770 Berteau Avenue, CHICAGO, ILL., U.S.A.

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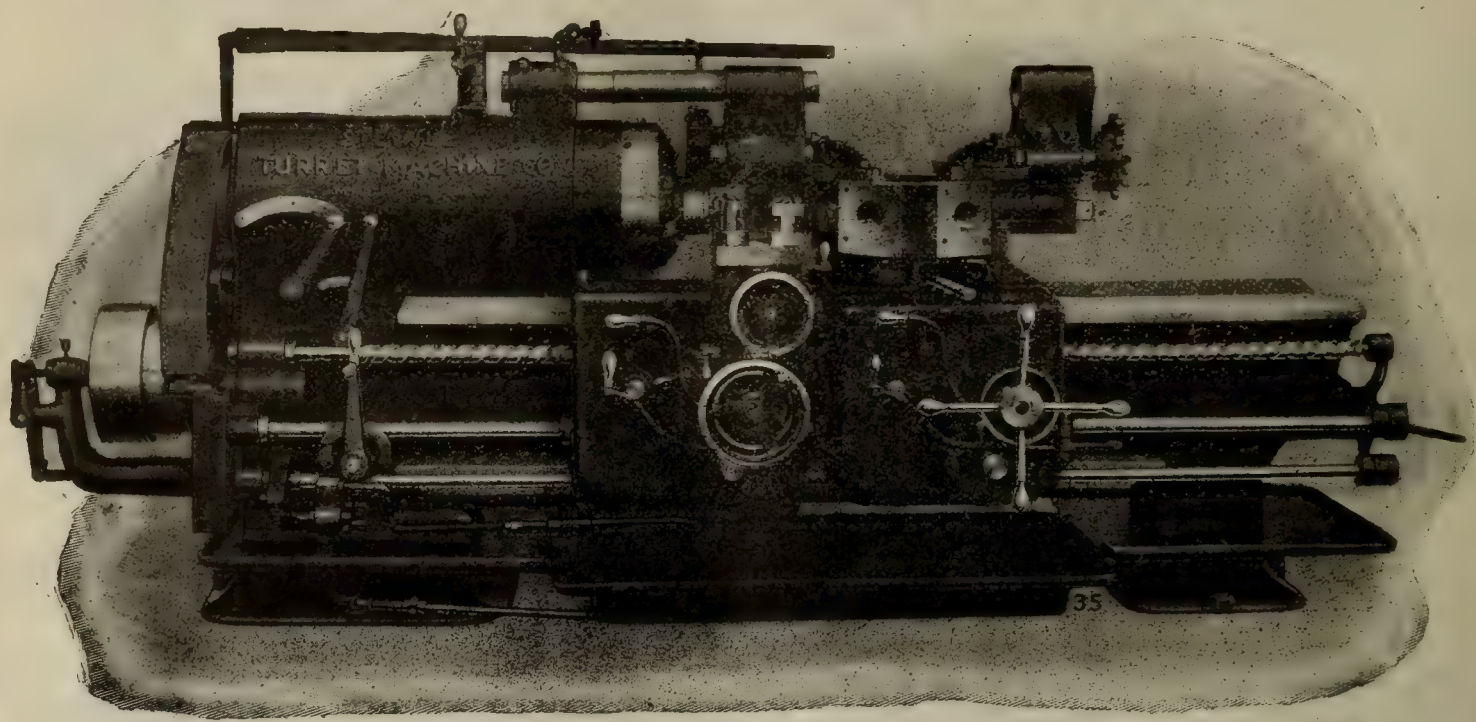
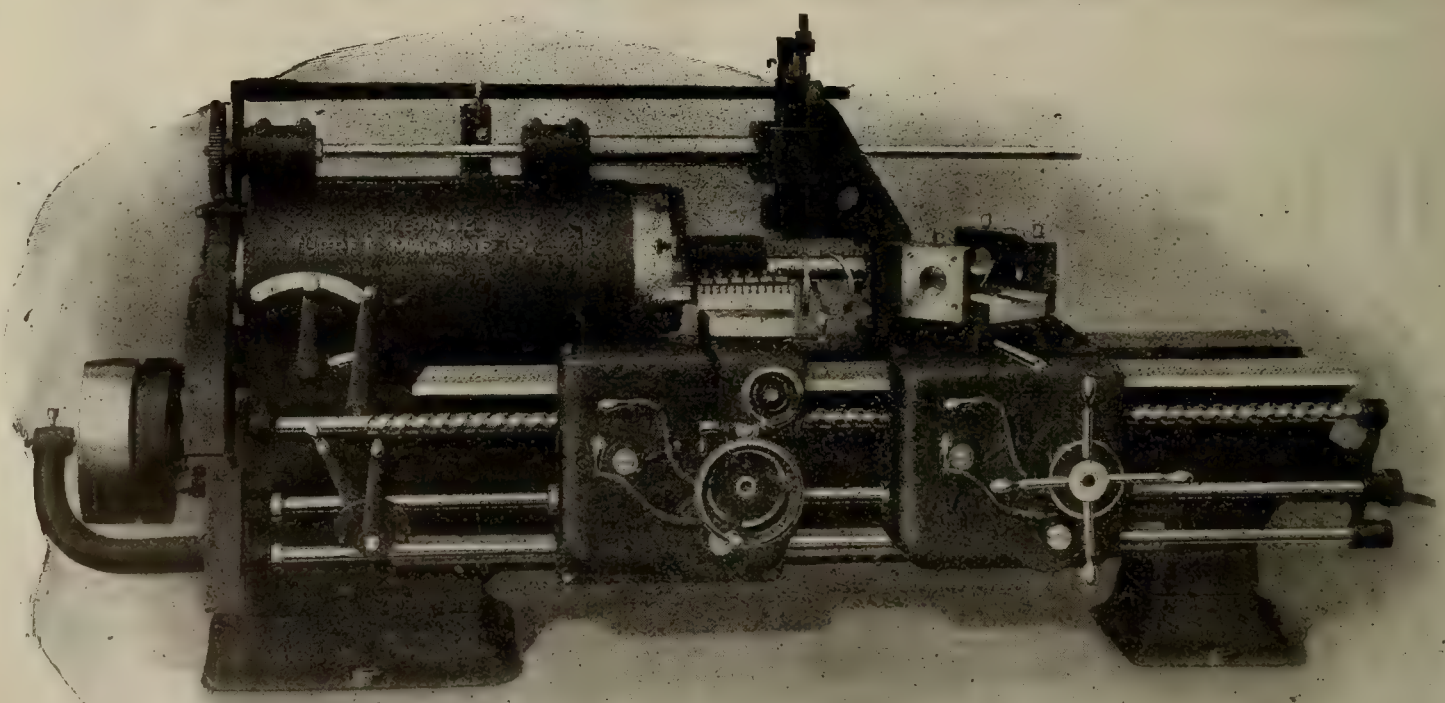
A GENERAL PURPOSE HEAVY DUTY TURRET LATHE

Adapted to a Wide Range of Work



Standard Machine Equipped with Tools for Munition Work

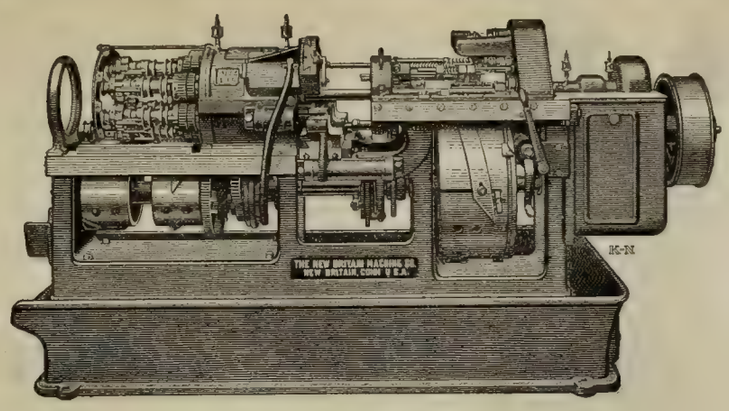


Same Machine Tooled Up for Manufacturing Piston Rings

WRITE FOR INFORMATION

STEINLE TURRET MACHINE COMPANY

MADISON, WISCONSIN, U.S.A.

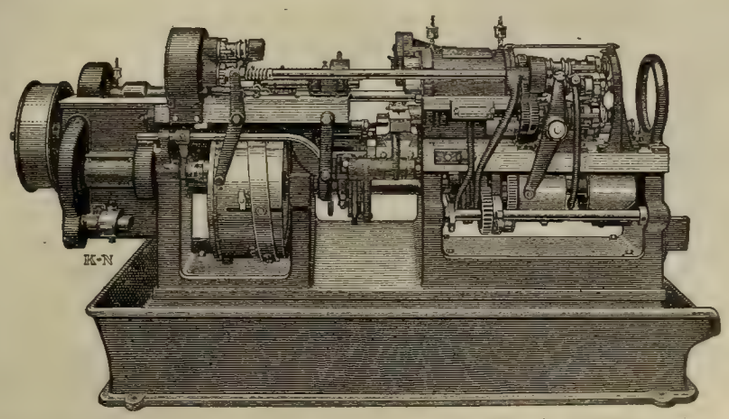


NEW BRITAIN SIX-SPINDLE AUTOMATICS

"The Last Word in Screw Machines"

For complete information address:

THE NEW BRITAIN MACHINE COMPANY
New Britain, Conn., U.S.A.



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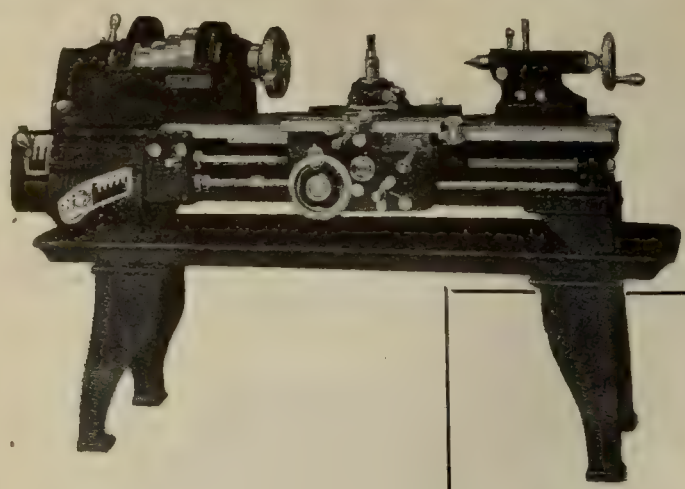


37 Feeds

By the feeds and speed is the value of the machine judged. 37 feeds is the range of this machine and its speed is decided in two ways. The specially designed tumbler gears insure absolute minimum of wear, there being no clashing when the gears engage. This allows for greater speed. The absolute lack of all superfluous mechanism is another feature that promotes speed. Sizes 12″ to 14″ with 4′, 5′ or 6′ bed. The other features are amply shown and illustrated on our bulletin which is waiting for your inquiry.

Mulliner-Enlund Tool Co., Inc.

Syracuse, N.Y. U.S.A.

Canadian Representatives:

H. W. PETRIE, TORONTO FOSS & HILL, MONTREAL

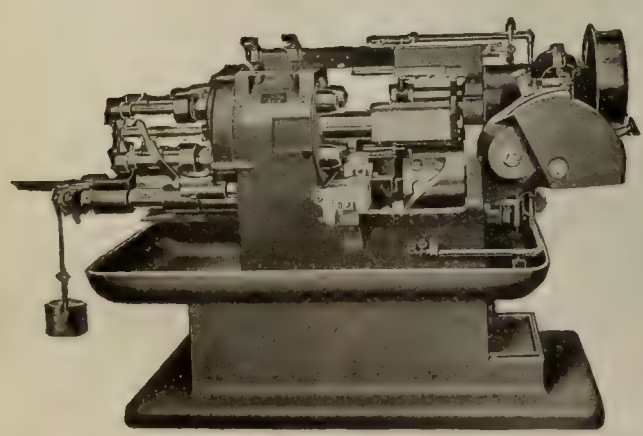
The PROOF *of* SATISFACTION

is found in the *continued use of* and the *increased demand for*

GRIDLEY MULTIPLE SPINDLE AUTOMATIC SCREW MACHINES

Years of satisfactory service uphold the reputation of Gridley Automatics for DURABILITY, ACCURACY and RAPID PRODUCTION.

Well-planned designing and careful workmanship have guaranteed these qualities.



GRIDLEY MULTIPLE SPINDLE AUTOMATIC
Chuck capacity up to 2⅝ in.—Length of feed 7 in.

Gridley Multiple Spindle Machines handle work up to 2⅝″ chuck capacity. Single Spindle Machines up to 5″ bars or single-piece chucking.

Descriptive bulletins, or quotations on your blueprints, will be sent without obligation to you.

THE NATIONAL ACME COMPANY
WINDSOR, VERMONT

GENERAL OFFICES, CLEVELAND, O.
CANADIAN SCREW PLANT, MONTREAL, P.Q.

BRANCH OFFICES

NEW YORK BOSTON CHICAGO DETROIT ATLANTA SAN FRANCISCO

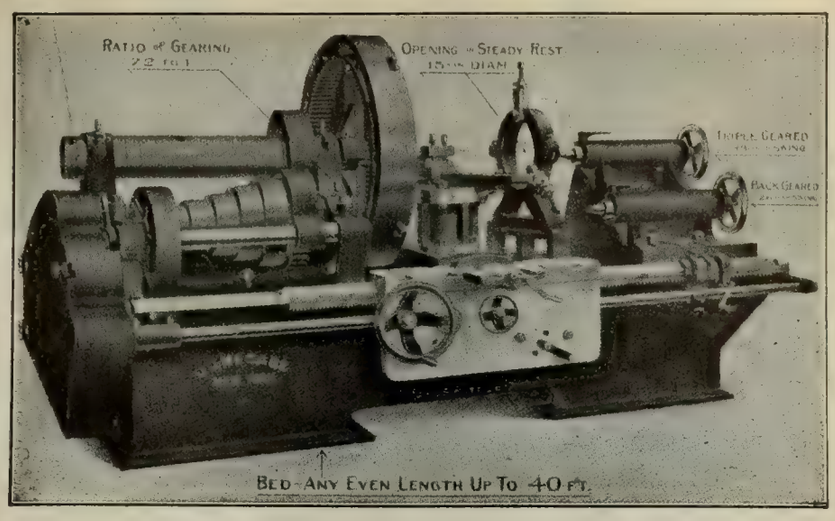
Warehouses: New York and Chicago Representatives in Foreign Countries

Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont, and Acme Automatics, Threading Dies, and Screw Machine Products at Cleveland, Ohio.

One Ship-building Plant

wrote to six different Lathe-Builders

and bought McCabe's "2-in1" Double-spindle Lathe—on a 30-ft. bed—because it was "different" and built especially for such a wide range of work.



McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing As a 48 inch Triple-Geared Lathe

What other big Lathe can you get, and have full use of your Lathe, whether you have big or small work?

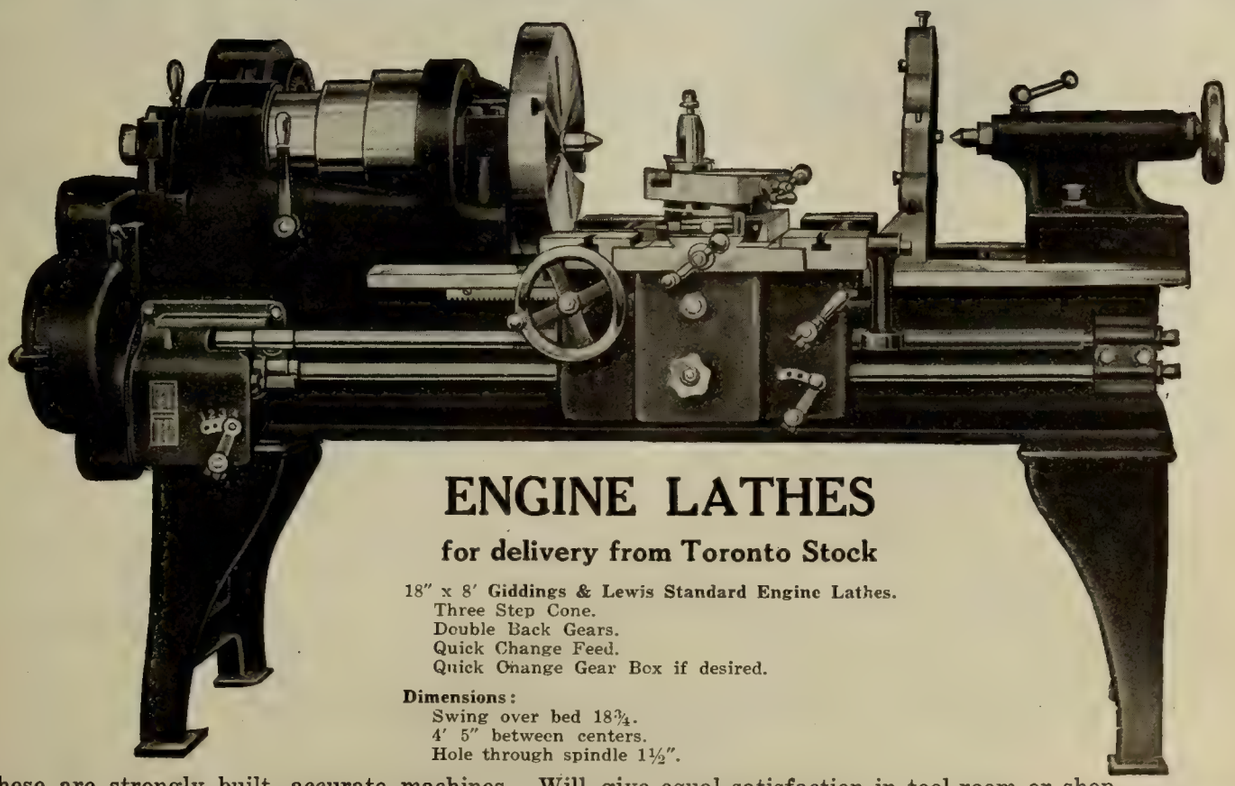
What Lathe Manufacturers except McCabe could make such a low price possible?

No other Lathe builder turns out 48-inch Lathes in such big lots at a time, making the parts all duplicate and interchangeable.

And in addition to the 48-inch Triple-geared Lathe, the 26-inch is the "Lathe plus" feature McCabe offers you—at no extra cost.

DOUBLE service—convenience and capacity—all described in Latest Bulletins.

J. J. McCABE, 149 BROADWAY, NEW YORK



ENGINE LATHES

for delivery from Toronto Stock

18" x 8' **Giddings & Lewis Standard Engine Lathes.**
Three Step Cone.
Double Back Gears.
Quick Change Feed.
Quick Change Gear Box if desired.

Dimensions:
Swing over bed 18¾.
4' 5" between centers.
Hole through spindle 1½".

These are strongly built, accurate machines. Will give equal satisfaction in tool-room or shop.
The following extras can be furnished if desired: Taper, Relieving or Draw-in attachment, Waving attachment, Hexagon turret on carriage, Pan pump and piping.

Write for full specifications and prices.

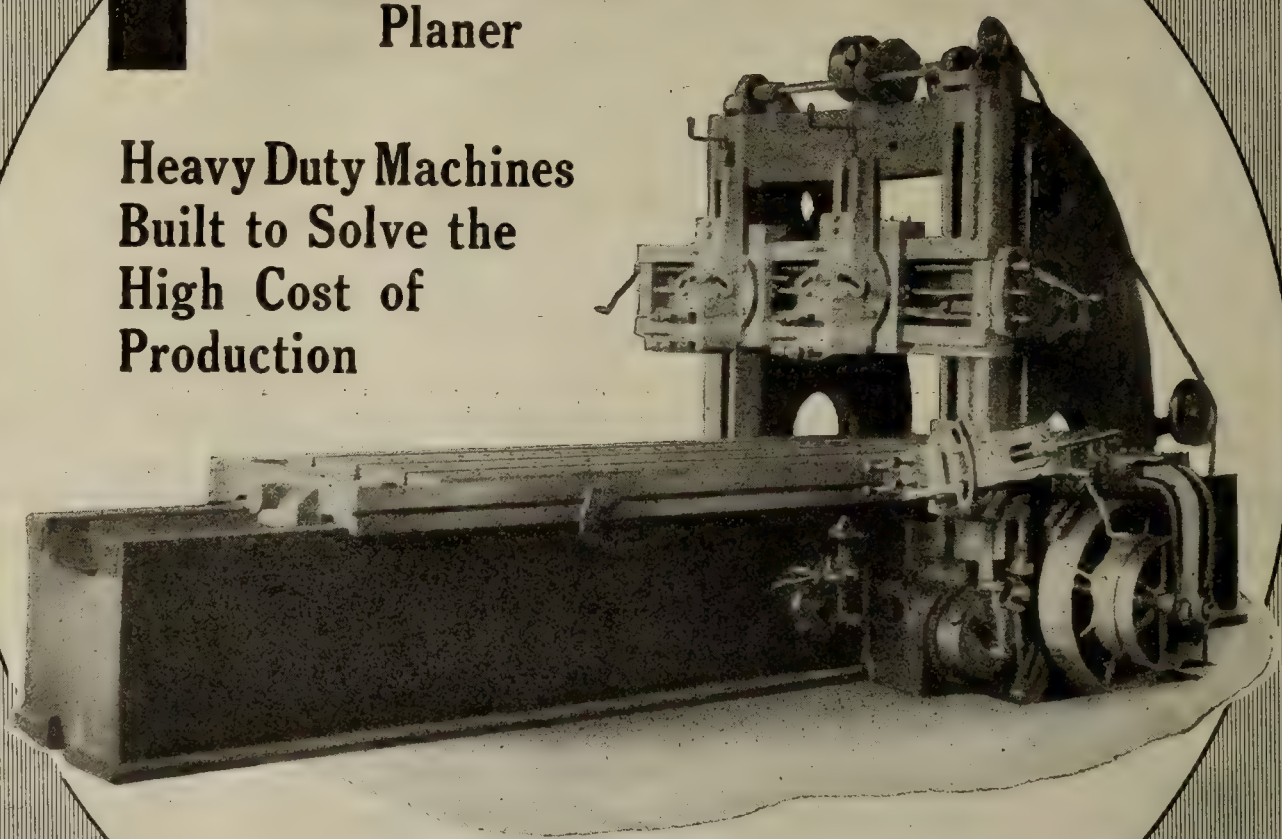
Garlock-Walker Machinery Co., Ltd., 32 FRONT ST. WEST, Telephone MAIN 5346 **Toronto**

If any advertisement interests you, tear it out now and place with letters to be answered.

HAMILTON PLANERS

Hamilton 36" x 36" Planer

Heavy Duty Machines Built to Solve the High Cost of Production



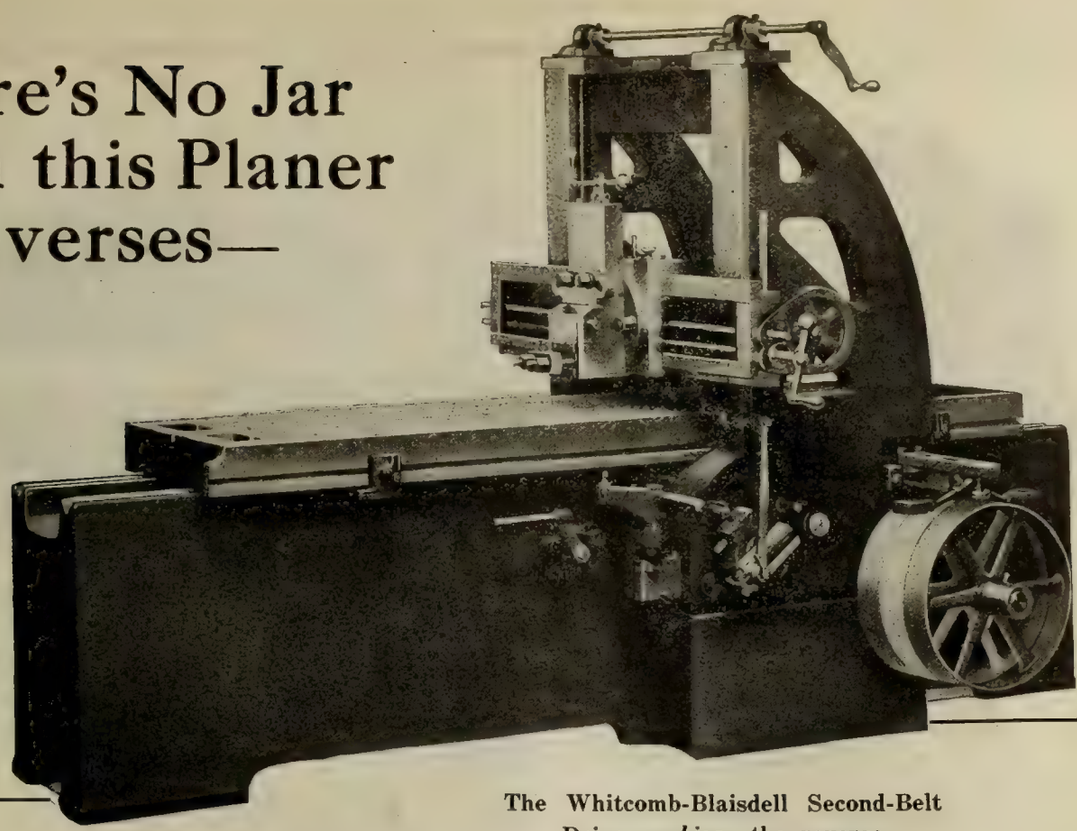
WEIGHT, RIGIDITY, DIMENSIONS and POWER—these are the combination of assets that give exceptional productive ability to "HAMILTON" PLANERS.
The installation of the "HAMILTON" strikes a crushing blow at the High Cost of Production. They do big work fast and accurately. Sizes from 24" x 24" to 54" x 54".

Our bulletin will tell you all about this planer. Give us your address.

The Hamilton Machine Tool Company, Hamilton, Ohio

H. W. PETRIE, LIMITED, TORONTO, Sole Agents for Ontario.

There's No Jar When this Planer Reverses—



Whitcomb-Blaisdell 24-inch Planer with Second-Belt Drive.

The Whitcomb-Blaisdell Second-Belt Drive *cushions* the reverse

The "Second-Belt" replaces the usual bull-wheel and train of high speed gears.

All the shocks and jars of rapid-running gears are entirely eliminated. The Second-Belt, while driving positively, imparts to the table a smooth, easy action.

It secures greater accuracy and better finish. Furthermore, it prolongs the life of the entire machine.

The absence of shock at the end of stroke—the "cushioning" of the reverse—permits the Whitcomb-Blaisdell to run at extremely high table-speeds.

Thus the Second-Belt Drive secures speed, smoothness, and accuracy in cutting.

There are many details of construction in the Whitcomb-Blaisdell—details that mean PRODUCTION—that you should know

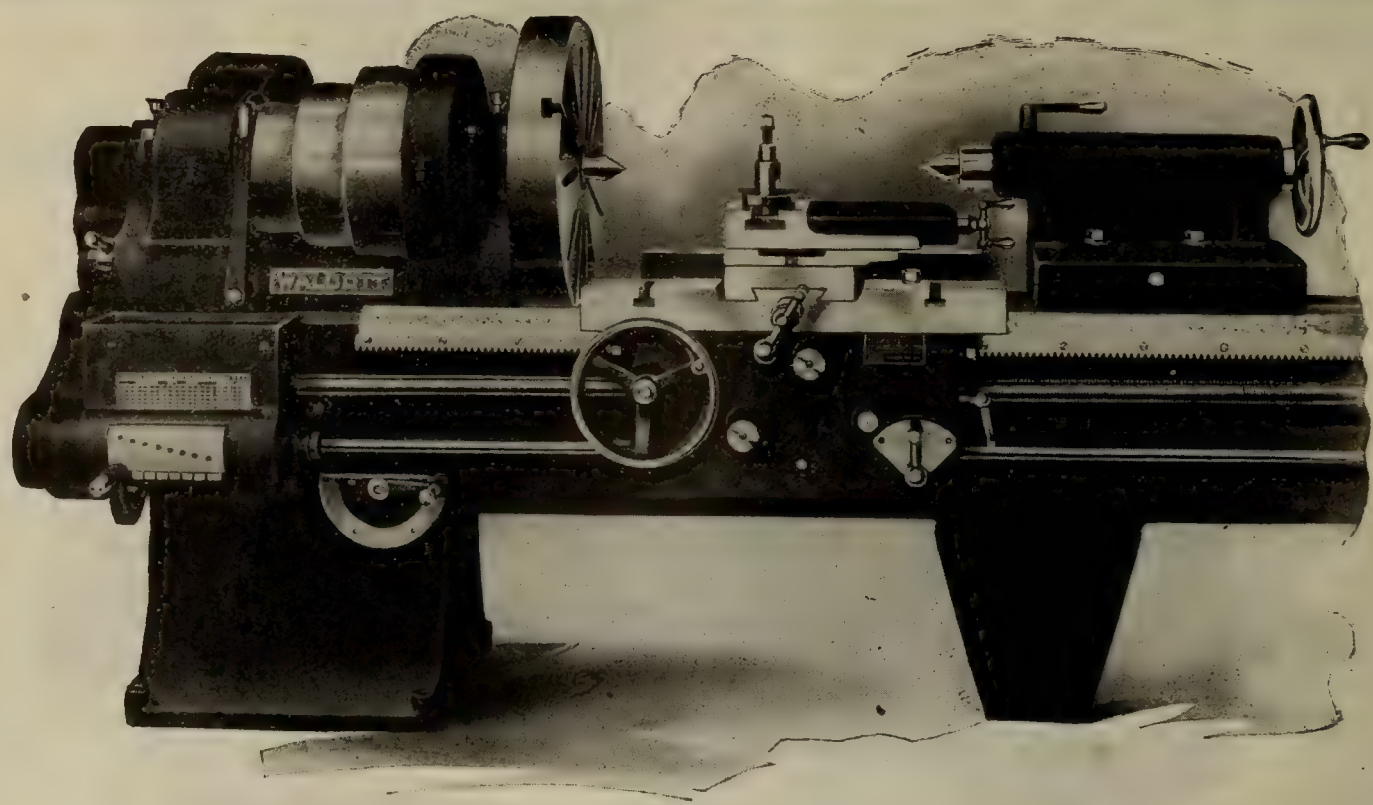
Write for the Whitcomb Blaisdell Planer Book.

LATHES From 14" to 30" SWING

WHITCOMB-BLAISDELL MACHINE TOOL CO.
WORCESTER, MASS., U.S.A.

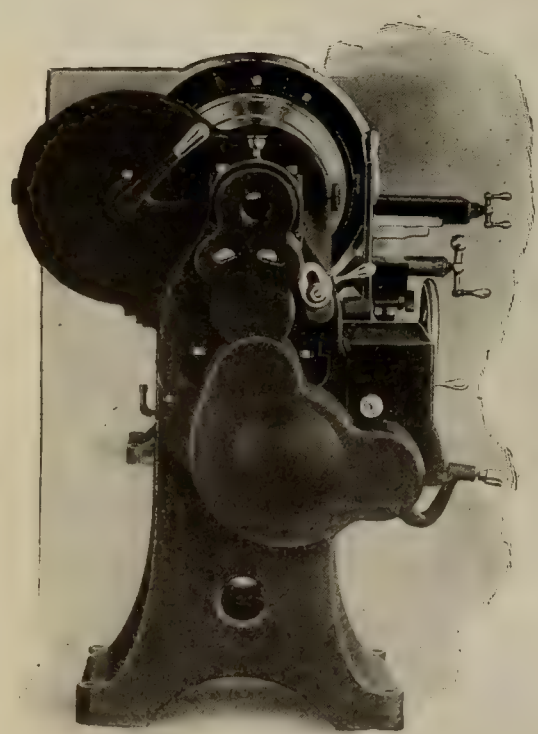
PLANERS From 17" to 48" WIDE

If any advertisement interests you, tear it out now and place with letters to be answered.



Walcott Lathes—Time Tested

It did not take 36 years to establish a reputation, but you can benefit by that experience.



YOU can subject this 26″ Engine Lathe to any test and at the outcome you will find that 36 years of lathe building have enabled us to present a machine that answers the most rigid requirements.

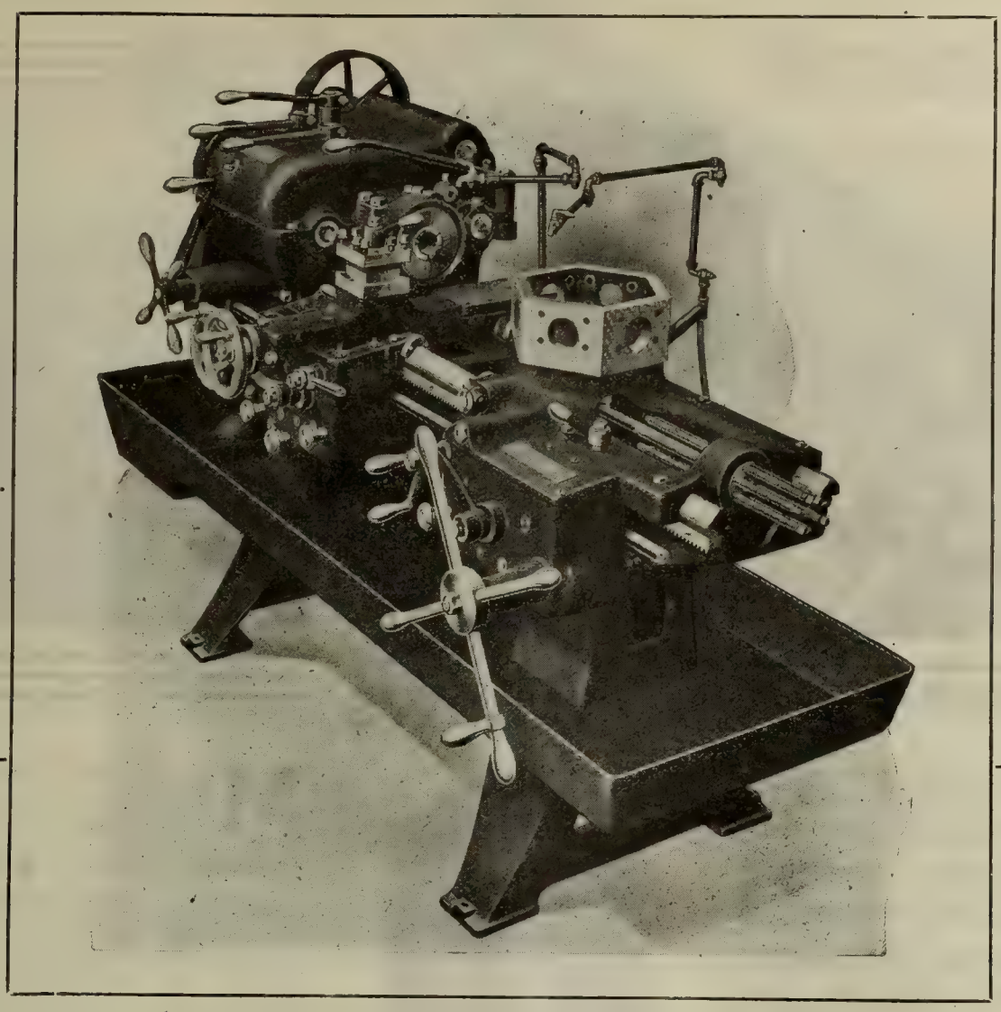
Reinforced and strengthened at the points of stress, this machine includes such features as: double apron plate, drop forged gear in apron, rigid compound rest, back gear arm reinforced by one-piece gear guard and headstock, not a single tooth exposed, feed gears run in oil, large frontway on bed, rod and screw feed, and quick change gear box.

Made in 14″, 16″, 18″, 20″, 26″ and 28″ sizes.

Our experience and co-operation are entirely at your disposal. Write us.

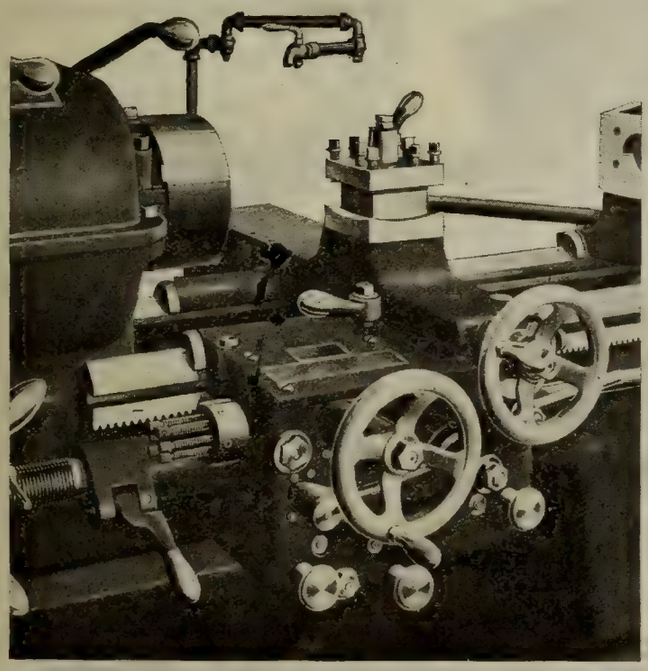
Walcott Lathe Company

Calhoun Street, Jackson, Mich.



RIGIDITY

Another secret behind rapid production is the rigidity of the tool and work support. It is the further claim of the designer that this is the most rigid machine of its class and size. The overhand of the spindle nose is unusually short. The entire carriage unit is built to make an extremely rigid support for the cutting tool.



Square Turret, Cross Slide and Carriage.

FEED RANGE

FEEDS PER REVOLUTION

	.0016	.0027	.0047	.0082	.0083	.0141	.014	.019	.025	.033	.059	.100
KNURL	IN	IN	IN	OUT	IN	OUT	IN	OUT	IN	OUT	OUT	OUT
KNURL	OUT	IN	IN	IN	OUT	IN	OUT	IN	OUT	OUT	OUT	OUT
CNSB	CENTER	OUT	IN	CENTER	CENTER	OUT	OUT	IN	IN	CENTER	OUT	IN

This covers the requirements from turning soft cast iron and up to and including wide forming in steel. Furthermore, the feed changes are obtainable in the apron which is ideal.

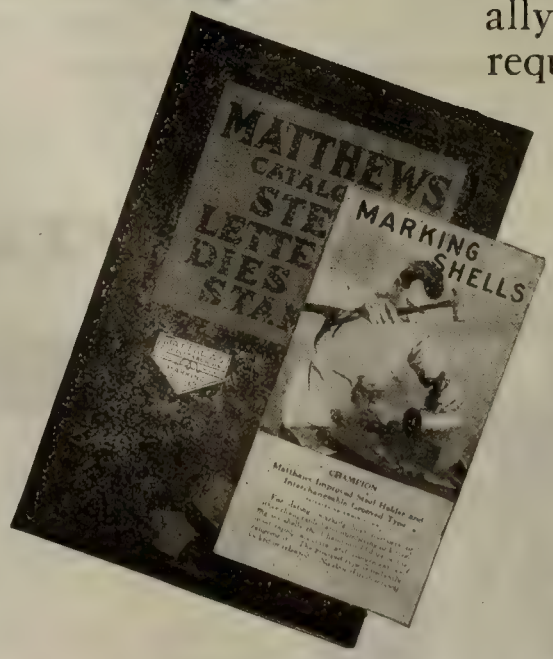
Please note, however, that this is only one of the several machines built by

Foster Machine Company
ELKHART, INDIANA

The House of Matthews

MATTHEWS of Pittsburgh makes but one class of goods — marking devices—and on the word of the men who use them they make the best devices the market affords.

Matthews has been in business 67 years. The Matthews factory is the largest of its kind in this country, fully equipped to make every marking device of which any industry has need.



Write for copies of "Matthews' Catalogue of Steel Lettering Dies and Stamps"—the only complete catalogue of steel dies published — and "Marking Shells." Both for the asking.

Write now -- nothing to be gained by waiting.

MATTHEWS' policy is to make and hold customers through quality of product and prompt, dependable service.

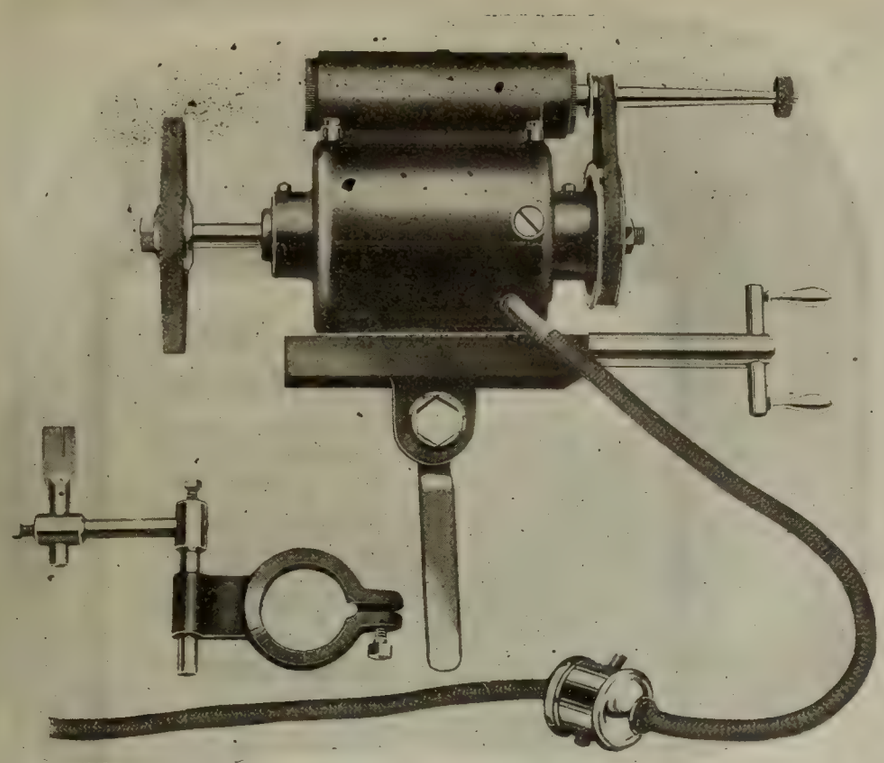
This is the combination Matthews offers you: steel stamps, letters, figures, etc., marking devices of any type —designed and made especially to meet your individual requirements, and delivered in the shortest possible time.

If you agree with Matthews that "any product worth making is worth marking right," these booklets will prove profitable reading.

JAMES H. MATTHEWS & CO.

FORBES FIELD ***67 Years in Business*** **PITTSBURGH, PA., U.S.A.**

Distributors for Canada: CANADIAN FAIRBANKS-MORSE COMPANY, LTD., St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria.



ARO

The **30,000** revolutions per minute that this **Aro** grinder attains can only be **maintained** with least wear on the bearings and motor by perfectly balanced and proportionate construction of the mechanism.

The rigid construction, the armature, internal spindle pulleys and large emery wheels are dynamically balanced, preventing vibration. No end thrust or side play. These features contribute to the accuracy and durability for which the *Aro* is specially noted.

The motor and internal spindle are equipped with S K F and "Norma" Ball Bearings.

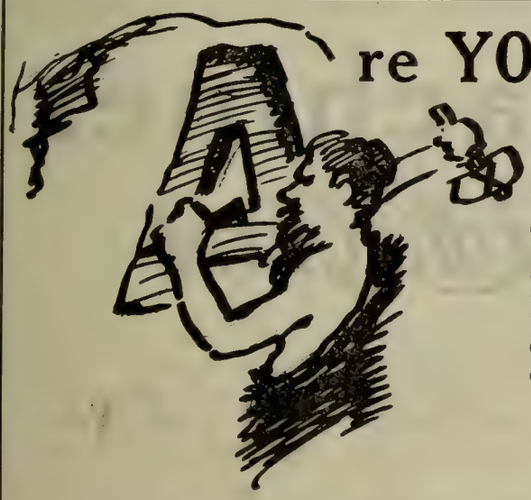
An inquiry will receive intelligent attention.

R. E. T. Pringle, Limited

Manufacturers' Agents

OFFICES:

Tyrrell Bldg. 95 King St. East, Toronto **3402 Osler Ave., Vancouver, B.C.**
809 Unity Bldg., Montreal, Que. **302 Donalda Block, Winnipeg, Man.**

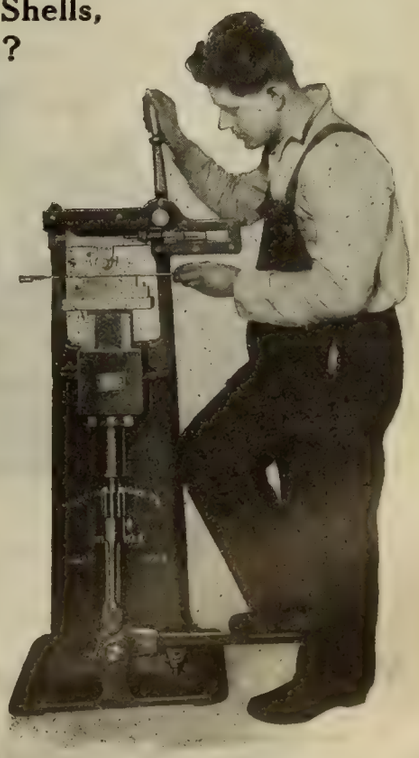


re YOU Primitive in Your Methods?

Do you mark your various Tools, Rifle Parts, Timing Fuses, Shells, etc., in the Stone Age Manner?

If you wish to mark your name, trade, sizes or patent marks quickly, accurately and legibly on your various tools, purchase a

Martin



Low in price, simple in construction and extremely rigid, the "Martin" No. 6 Hand Marking Machine instantly appeals to the practical shop man. They give your products the distinction which comes only with clean, distinct and artistic impressions. Surely if you have marking of any kind to do it will pay you to investigate the "Martin" at once. Simply tell us what you require and we'll send full particulars by return mail. Write to-day to the

"MARKING MACHINE PEOPLE"

MARTIN MACHINE CO.

GREENFIELD, MASS., U.S.A.

Manufacturers of both Hand and Power Machines.

***Canadian Representatives*—THE CANADIAN FAIRBANKS-MORSE CO., LIMITED, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria.**

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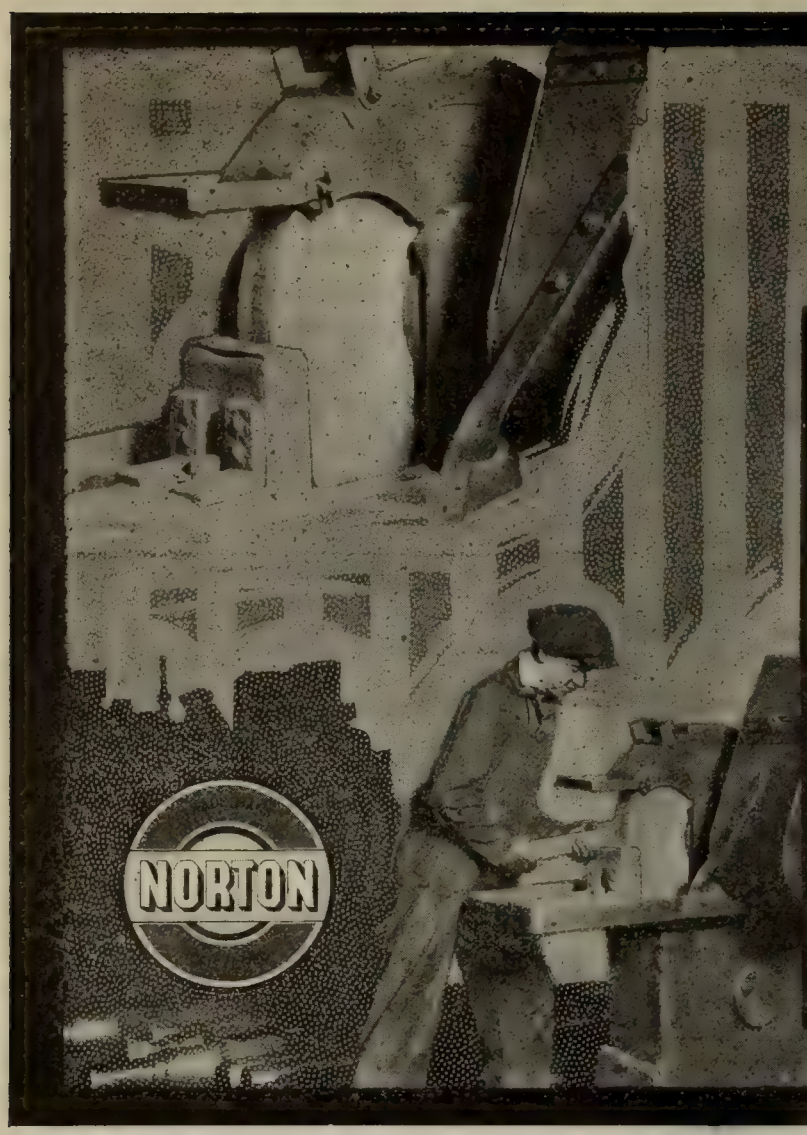


Grinding Planer Tools With Alundum Wheels

The wheel on the machine shown is a 24-inch Vitrified Alundum, grain 30, grade O, running at a speed of 900 r.p.m. The wheel is in actual operation grinding tools 90 per cent. of the time, and under this service wheels are lasting 4 to 5 months. Equally good results are being made on other grinding operations.

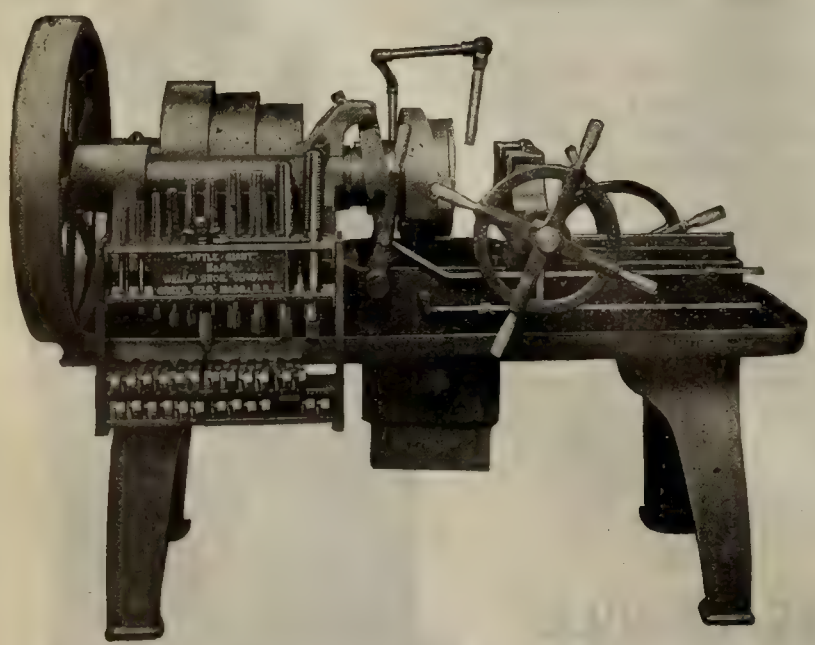
NORTON COMPANY
WORCESTER, MASS.

ELECTRIC FURNACE PLANTS:
NIAGARA FALLS, N.Y., CHIPPAWA, ONT.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto Ottawa, St. John, N.B.; Winnipeg, Calgary, Saskatoon, Vancouver, Victoria: F. H. Andrews & Son, Quebec, Que. 862a

Threading Machines

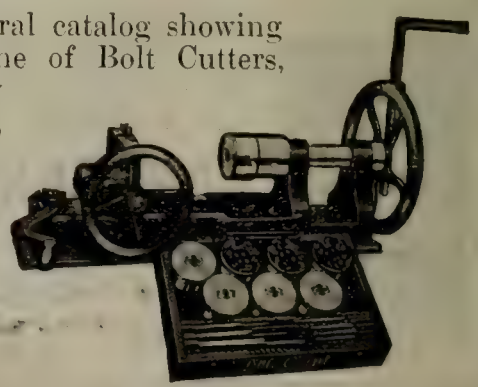
Little Giant



threading machines are free from time-consuming complications. Any shop employee can set them up in a few minutes. They are very easily operated. Any length of thread can be cut with the power machines, as they are fitted with hollow spindles.

The Little Giant line includes a complete range from the power machines with Automatic Opening Die Heads to the small bench machines with Solid Die Heads.

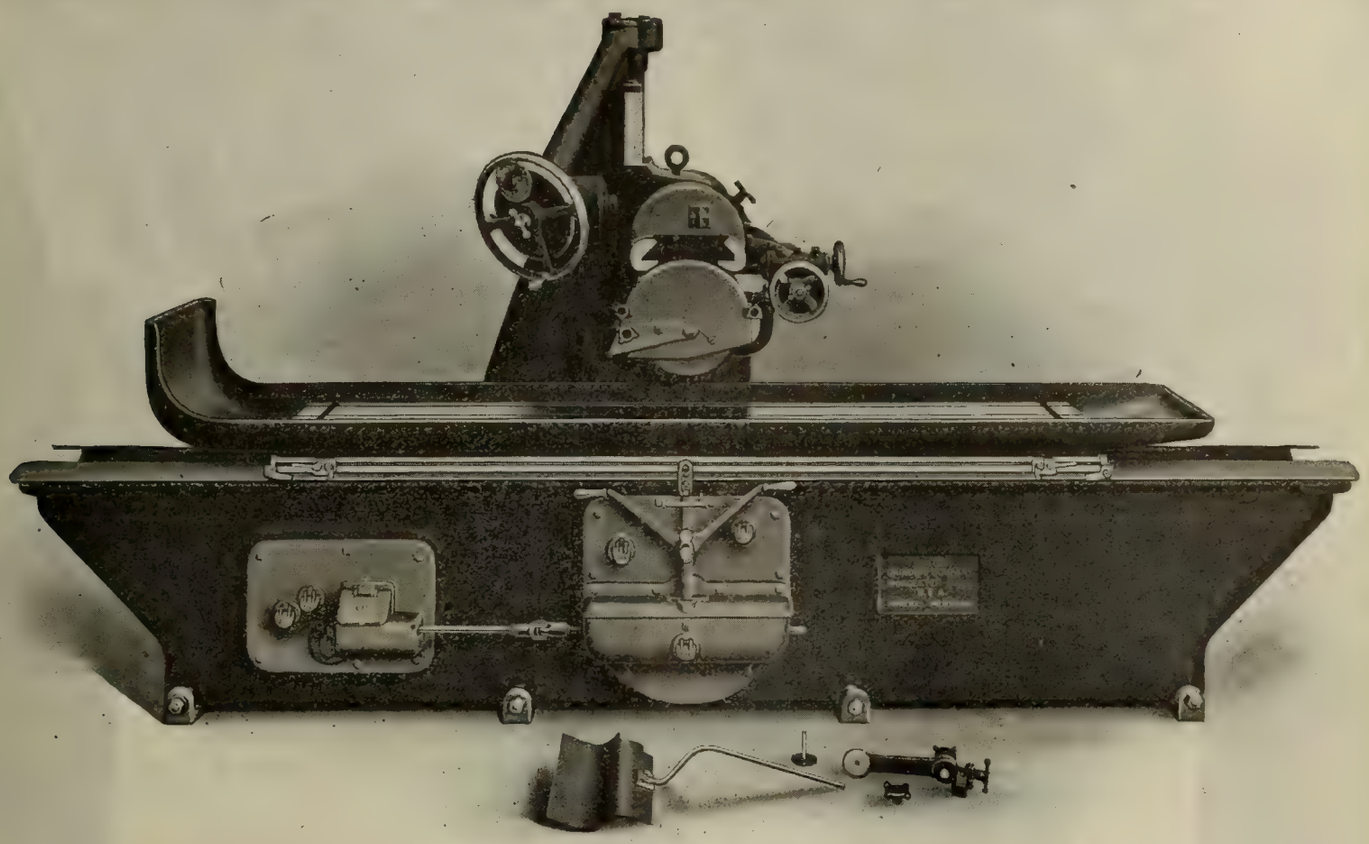
Send for general catalog showing our complete line of Bolt Cutters, Taps, Dies, Screw Plates, Gages, Reamers, etc.



Wells Brothers Co. of Canada, Limited
GALT, ∴ ONTARIO

Sales Agents: THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED.
Montreal Toronto Vancouver Winnipeg, St. John, Calgary.

The New Norton



Features That Mean Production

The Wide Wheel

For the ordinary line of work the wheel is of 6″ face. No automatic feed of the wheel is provided. But a hand traverse so locates the grinding wheel that the full width of the wheel face is utilized,—thereby production.

The wheel head can be raised to give a distance of 17″ between the surface of the table and a 14″ diameter wheel, thus making provision for use of magnetic chuck or supplementary table.

The Entire Working Surface

of the table can be ground in place. On all tables this is 15″ wide and 6′, 8′, 10′, 12′ and 14′ long, depending on the length of machine.

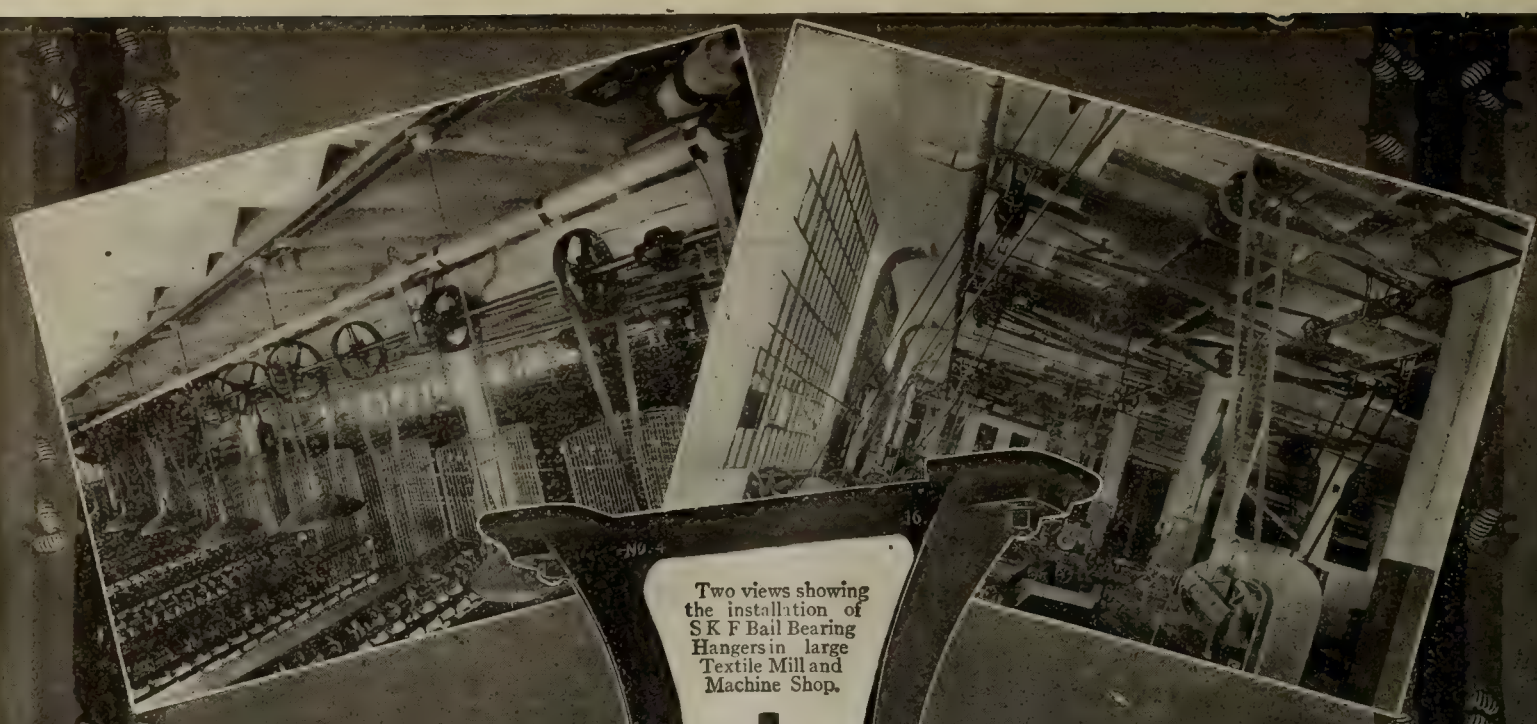
In addition to grinding all kinds of plane surfaces this Norton Grinding Machine can be used for grinding a variety of shape surfaces—for which a special forming attachment is used to true the wheel face to produce the shape required.

Norton Grinding Co., Worcester, Mass.

Canadian Selling Agents: The Canadian Fairbanks-Morse Co.

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

Note the Open Side



Two views showing the installation of S K F Bail Bearing Hangers in large Textile Mill and Machine Shop.

RELIABILITY

What is more essential than reliable power transmission? A hot box can tie up production for hours, till repairs are made.

Are you still using plain bearings on your lineshafting? If so, then you know the countless troubles that are ahead of you. Hot boxes, worn bearings, rebabbitting, continuous oiling—all of these are trouble-makers and mean delay.

This delay can be eliminated. You can put an end to all trouble by using S K F Self-Aligning Ball Bearing Hangers. S K F Ball Bearings do not wear down; they do not heat. They are positive preventers of trouble.

Send for information.

Canadian SKF Company, Limited

TORONTO, ONTARIO

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SKF BALL BEARINGS

REED-PRENTICE COMPANY

R-P Co

WORCESTER MASS. U.S.A.

THIS 21-INCH EXTRA HEAVY UPRIGHT DRILL

WOULD PLEASE YOU BECAUSE

IT IS BUILT WELL
IT LOOKS WELL
IT ACTS WELL

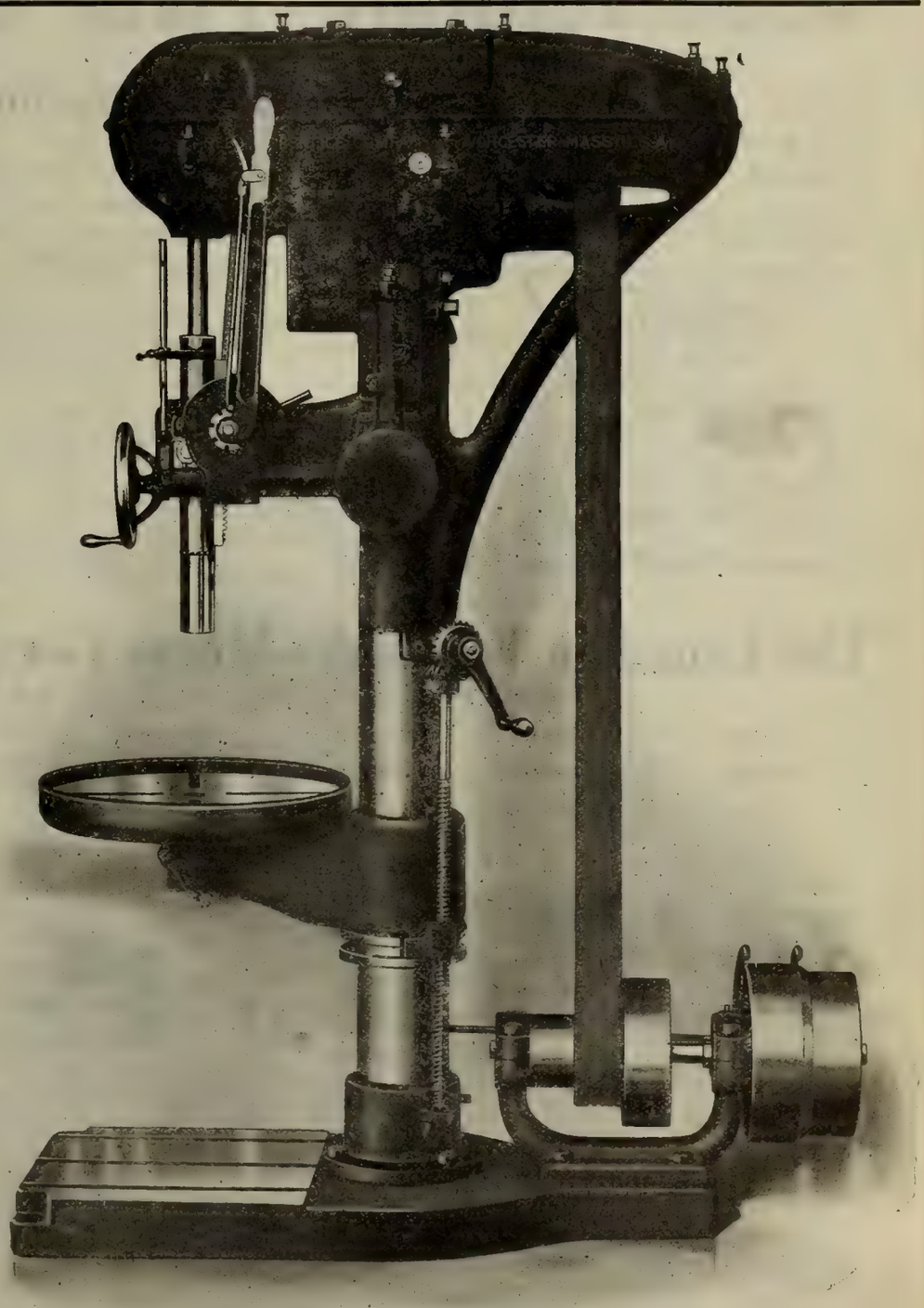
ALL DRIVING SHAFTS RUN ON BALL BEARINGS. A VERY HIGH PERCENTAGE OF THE POWER APPLIED AT THE PULLEY COMES OUT AS CHIPS FROM THE WORK.

A DEEP TROUGH CIRCLES THE TABLE TO CATCH ANY LUBRICANT THAT MAY BE USED.

THE HEADWORKS ARE COMPLETELY ENCLOSED KEEPING OIL IN—DIRT OUT.

THE MAN WHO BUYS A REED-PRENTICE GETS A THOROUGHLY GOOD MACHINE TOOL.

WE GUARANTEE PROMPT DELIVERY



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THE CANADIAN FAIRBANKS-MORSE CO, LIMITED

If any advertisement interests you, tear it out now and place with letters to be answered.

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED.

Manufacturing Plant Equipment

Planers
Shapers
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Tapping Machines
Milling Machines
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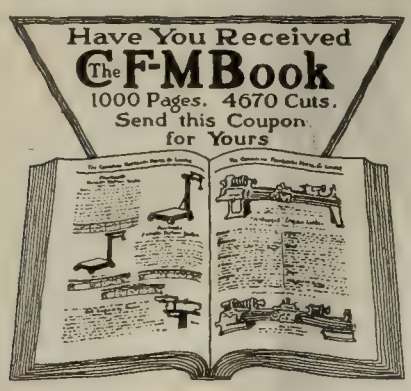
Profilers
Cutting-off Machines
Hack Saws
Grinders



No. 3—Machine Tools

Having developed the power, and then transmitted it to the shop, we wish to call your attention to our Machine Tool Department. Here you may select a machine to perform practically every operation necessary to the metal working industry.

The demand for machine tools during the past two years has been extreme. In spite of this fact, we have been able to secure the shortest possible deliveries for our customers.

The list on the left gives a partial idea of the tools which we have been supplying to the Manufacturers of Canada for many years.

Let us know your requirements, and look up our large stocks in Toronto and Montreal, before placing your order.

The Canadian Fairbanks-Morse Company, Limited

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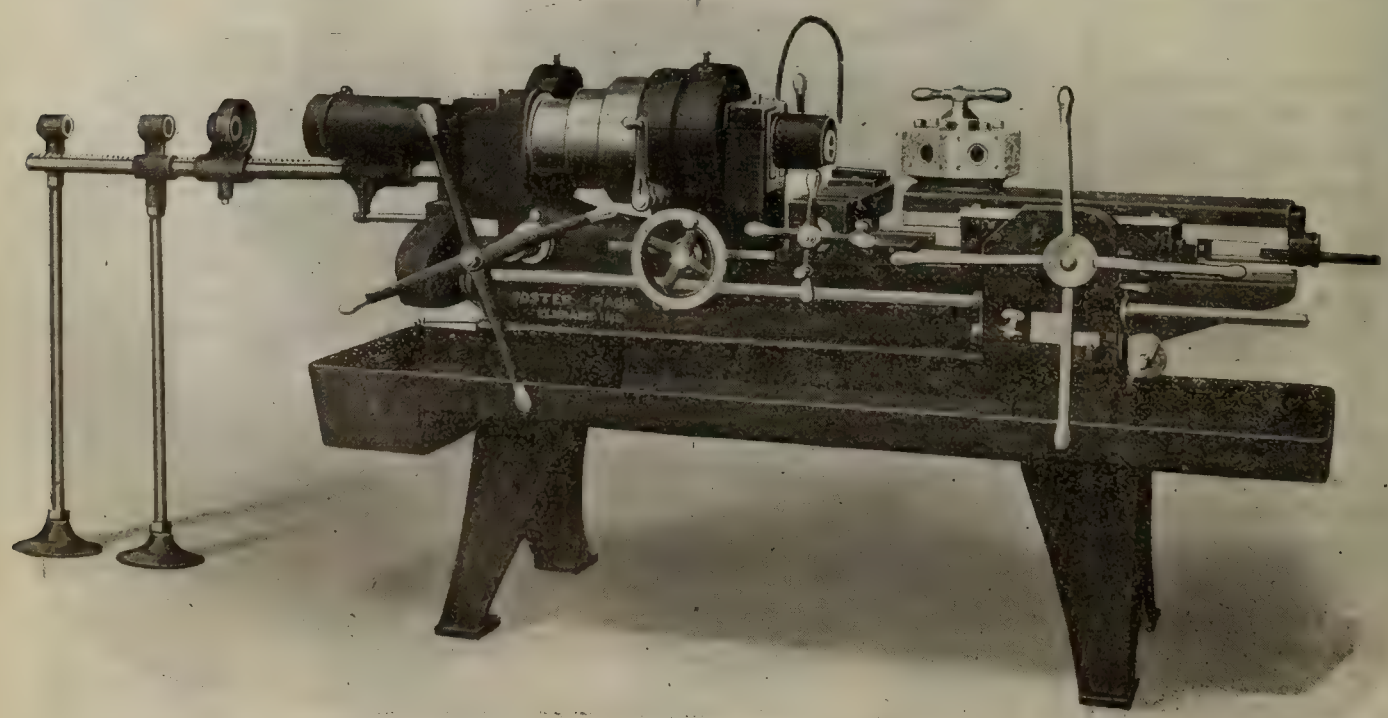


Utilizing a Pre-War Factory for Shell Machining and Forging

Staff Article

The plant illustrated and described in the accompanying article is an interesting example of the manner in which the manufacture of shells has brought into use many previously discarded plants. Formerly engaged in an entirely different branch of industry, the advent of munitions manufacture has witnessed a revival of activity beyond that of former times.

WHILE lesser in degree but not in effectiveness, the numerous Canadian munition plants and their output form an interesting subject of comparison with the controlled establishments of Great Britain. There are some specially built plants in this country, both as regards buildings and machinery, but their number is small, and their size little, compared with the National shell factories with which Britain is now dotted through the length and breadth of the land. The proximity to headquarters, the constant and wide control possible, and the immense industrial resources available for introducing improvements and changes desirable, are features which have distinguished home as compared with Colonial practice, with corresponding differences in many of the plants and methods in use.

Plant and Product

The plant described in this article is housed in a building which were erected some years before the war and formed a branch establishment of an agricultural implement concern but had been idle for some considerable time when conditions rendered them desirable for use as a shell factory. While lacking in occasional refinements found in some of the highly specialized plants, considerable success has attended the efforts of the management, the production of 6 in. forgings having been successfully carried out on a scale of considerable magnitude, in addition to the machining of 4.5 in. high explosive shells from blanks supplied. The buildings, as will be noticed from the accompanying illustrations are of the single floor, saw tooth type, and have undergone little if any change from their original condition, the principal item being the provision of roof housings above the hydraulic forging presses and hinged sections on the roof for ventilation in hot weather. The familiarity of our readers with shell production renders interesting an interesting brief resume of the work.

4.5 in. Shells

As mentioned above, the 4.5 in. shell forgings are shipped in, the receiving track being immediately alongside the preliminary operations department, so that the material is unloaded directly on to the floor beside the machine which performs the first operation, i.e., cutting-off the open end to length measured from the bottom inside. This is done in a Williams machine with a single tool, following which a Hall cutting-off machine removes the excess metal on the base, leaving a centre tit of ample diameter to take the centre hole with a reasonable allowance for eccentricity in the forging. This arises from the fact that the shell is held by the outside while cutting-off the base, and is carried on an arbor when centering, so that any descrepancy in the shape of the forging is at once noticed when the centre hole is being drilled.

The centering machine is of the double motion type in which the work and the drill revolve in opposite directions, and is composed of an old lathe bed on which are mounted two brackets carrying the work arbor. Parallel with the arbor, and back of it is a bar, also carried in a couple of brackets and having its right hand end projecting so as to form a suitable support for a swinging link and a small belt driven gear. The free end of the link carries the drill spindle, geared to the wheel on the bar, and moved back and forth by a hand lever hinged in the back bar and used also for swinging the link in and out of position similar to a chasing slide on a brass finisher's lathe.

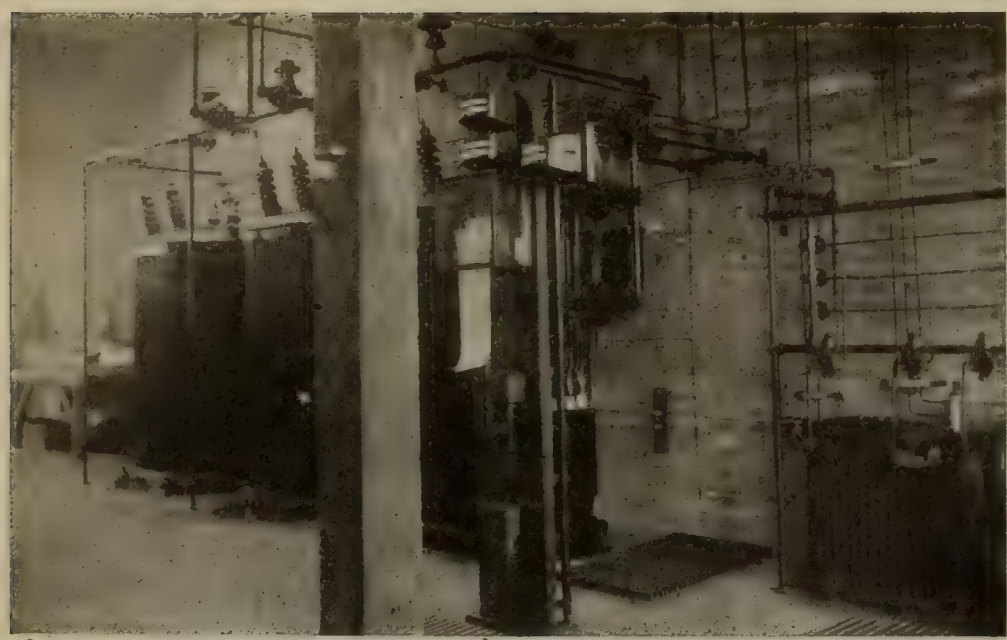
Preliminary Machining

Two lathes, one Hepburn and one Simplex are engaged on rough turning. In this operation the work is driven by an automatic expanding arbor of the eccentric grooved type while the base end is supported in the tail centre. This is a plain turning operation and allows full advantage to be taken of the capacity of the machines.

The machining of the bore requires longer time per shell consequently a larger equipment is necessary, the machines used for this purpose being special shell boring machines of Canadian manufacture. Three Corbet and one Hepburn are in use, features of their design being a large diameter circular turret carried on a massive saddle sliding on a square gibbed bed with central rack and pinion traverse. Single pulley drive geared heads with Hannifin air operated chucks enable the work to be done and handled in an efficient manner. The actual operation itself is performed in the simplest manner, formed cutters of the spade type producing a perfectly smooth bore of the desired shape, while the nose is chamfered on the outside to facitate the shaping of the nose to the required form.

Floor inspection by government offi-

VIEW OF STORAGE YARD WHERE 6 IN. SHELL BILLETS AND FORGINGS ARE HANDLED.



TRANSFORMER EQUIPMENT IN ELECTRIC SUB-STATION.

cials is done at this stage so that any rectification necessary can be done before nosing.

Nose-Forming and Finishing

A six-hole Tate-Jones oil fired furnace heats the shells for the nosing operation which is performed in the usual manner in a four-column hydraulic press. A split chuck of the hinged type holds the shell in position on the lower or moving table which forces the heated nose into a water cooled die which in turn forms the nose to the correct curve. Immediately on withdrawal from the die, the forgings are laid in a thick bed of flake mica which retards the rate of cooling so as to avoid any undue hardness in the metal, from which trouble might arise during the finishing of the nose.

The internal machining of the nose is done in convential manner on two Rahn Larmon engine lathes with turret saddles, the operations being rough bore and chamfer, finish bore, blend interior profile with main bore, and finish fuse seat. These machines are fitted with Harmifin air chucks, the pneumatic service being supplied by a 2-cylinder belt driven oir compressor built by the Hamilton Motor Works. The shell being chucked by the outside, the nose hole is machined true with the bore, as that operation was also done with the shell held in the same manner.

VIEW OF MACHINE SHOP FOR PRELIMINARY OPERATIONS ON 4.5 IN. SHELLS.

Two engine lathes take care of the final turning of the body diameter and profile. The carriages are fitted with radial tool slides of sector shape which are moved round the nose curve by means of a hand wheel on a pivotally mounted screw, the entire carriage being moved along the bed to machine the parallel diameter. During this operation, the shell is driven by an expanding arbor in the plain bore of the nose, while the base is still supported by the tail centre.

After having the thread milled in the nose on a Holden-Morgan miller, the shell is shop weighed and preliminary inspected after which the heat number or mark is transferred from the base to the body of the shell.

Wave-Groove and Base Recess

Waving is done on an ordinary engine lathe fitted with the Bertram grooving and waving attachment, the feature of which is a tool-holding bracket mounted on the bed underneath the shell, and carrying a grooving tool at the rear and a waving tool at front, both of which are fed by cam rods fastened to the carriage and fed along with it; the waving tool is reciprocated by a cam on the face plate in the familiar manner. The thread in the nose is utilised to drive the shell while the base is still supported by the original centre so that concentricity is assured between the bottom of the band groove and the longitudinal axis of the shell.

VIEW IN FORGE DEPARTMENT SHOWING HYDRAULIC PRESSES FOR 6 IN. SHELL FORGINGS.

Base recessing is handled in four stages; drilling machine, turret lathe, drilling machine, and engine lathe. In the first, the shell is held in a split chuck and drilled with a medium size centre-pointed drill to almost the depth of the recess; next, the recess is roughed out with a flat tool and a ridge formed on the base for riveting over on the base plate. Following this, the diameter is sized to gauge by holding the work in an angle bracket on the drill table, a pilot bushing fitting over the base of the shell and locating the recess concentrically; the fourth operation being to take a

light final cut across the bottom of the recess, the work being held in a sleeve chuck in an outer bearing.

Washing, weighing, and shop inspection with all preliminary gauges is now performed, special attention being given to the finish of the bore, followed by preliminary government inspection in the government inspection department. The departments where this work is done are suitably situated so that the shells proceed continuously by rolling along the bench till they pass through a sliding door to the government officials, passing out again in a similar manner at a point where they receive the base plates. These plates are of standard type with square boss by which they are chucked while being turned and faced at the one setting. A Holden-Morgan base-plate machine is in use, the thread milling device being idle since plain plates were adopted instead of threaded. The square boss is cut off in a hacksaw immediately after the plates have ben gauged.

Base Riveting and Finishing.

The riveting of the plates is done by pneumatic hammer clamped in a simple form of cast iron column, similar in shape to a light punch press. The shell rests in a revolving cup mounted on a horizontal hinge with a hand lever adjustment so that the hammer can be made to strike on any desired circle around the edge of the plate. After being carefully sounded with a hand hammer for any looseness, the riveted bases are finally faced, followed by the forming of a recess at the bottom of the nose threads, in order to provide a seat for a certain component. After hand tapping the threads, all burrs are removed on and under the seat, the three slots milled in the outside of the fuse seat and the nose gauged with the shop screw gauges.

Copper banding is done in a 6-cylinder radial press and the finish machining of the band in a Jenckes band turning machine with air chuck.

Inspection and Shipment.

The shell is now shop inspected with all final gauges and base stamped with makers initial, numerals and nomenclature. It is now washed inside and outside and varnished, being finally inspected by the shop in the varnishing room, from which it passes by gravity conveyors to the government inspection department for final government inspection. On the conclusion of this, they pass along another gravity conveyor to the shipping room where threads are greased, shipping plug inserted, cleaned outside and given a coat of yellow paint, followed by boxing, official sealing, and placing in bond room to await shipment in cars. With the equipment described and handling facilities such as elevating transfer trucks, etc., an average output of fully 2,000 shells per week is continuously maintained.

INSTALLATION OF DISTRIBUTING GRAVITY CONVEYORS FOR 6 IN. SHELL FORGINGS.

6-Inch Shell Forging.

As mentioned at the beginning of the article, the forging of 6-in. blanks is also carried on in the same establishment, the equipment consisting of six oil-fired furnaces of the inclined type, three forging presses, and one accumulator of suitable capacity. This plant is housed in a portion of the main buildings which has a railroad track on either side so that the raw material, which comes in the form of billets cut to length, passes from the freight cars on to the storage platform at the back of the furnaces. Its movement is continuous thenceforward, as it emerges from the hot end of the furnaces at a spot convenient to the forging presses, and after forging is dropped through holes in the floor onto underground conveyor chains which elevate the hot blanks and deliver them to a system of distributing conveyors in the cooling room. A view of these conveyors is reproduced, they, as well as special conveyors with formed wooden rollers used for handling 4.5-in finished shells, being installed by the Canadian-Matthews Gravity Carrier Co. Three conveyors distribute the hot blanks over the cooling room floor, and a special elevating conveyor delivers the forgings directly to the cars on the second railroad track mentioned above.

Power Plant.

Low pressure air for the furnaces is supplied by two 42-in. Buffalo stel plate high pressure fans, driven by 30-horsepower Westinghouse motors. The powerhouse installation consists of hydraulic pumps for the presses and an air compressor for high pressure fuel supply to the furnaces. The former comprise two sets horizontal high pressure Deane Steam Pump Co.'s pumps, belt driven through reducing gears, by 250 horsepower General Electric induction motors using 30-in. belts.

The air compressor is built by the Union Steam Pump Co., and is also belt driven, by a 50-horse-power Fort Wayne Electric motor using an 11-in. belt. All of the electric equipment is of the 3-phase, 25 cycle type.

Kingston, Ont.—The need for help in the country is so urgent that the feldspar mines in some parts are being closed down and the men paid off.

DEPARTMENT FOR FINAL OPERATIONS ON 4.5 IN. SHELLS.

EDUCATION OF MARINE ENGINEERS

THE Council of the Institute of Marine Engineers, having considered the subject of the future supply of engineers for the merchant service, and also the qualifications of men to fill the higher and more responsible positions, realizing at the same time the important part the marine engineer must play in the development of the British mercantile marine, is of opinion that these questions require the earnest consideration of State departments and all parties directly interested in the shipping industry, and that immediately after the restoration of peace, steps should be taken to ensure that the marine engineer of the future will be trained so that he may be thoroughly qualified to meet any calls demanded by his profession. The views of the council are embodied in the following report:—

Apprentice Education

We are of opinion that the present system of education is capable of considerable improvement, and the Board of Education or other educational authority should be urged to take steps to improve it.

1—By giving boys at the ordinary schools, up to the age of 14, a sound training in arithmetic, mathematics, drawing, elementary physics, electricity and chemistry.

2—By providing an increased number of junior technical or day trades-preparatory schools at which boys between the ages of about 14 and 16 years preparing to enter on a mechanical career may attend, and where the elementary teaching of the subjects cited above, and their general education, including languages, may be further developed.

3—By encouraging and giving facilities to boys during their apprenticeship to attend classes in mathematics, mechanics and engineering, so that this period of their lives will be devoted to a combination of their practical and theoretical education.

4—By the provision of scholarships so that boys of exceptional ability may, after serving for a period of, say, three years or more in the workshops, continue their studies in the more advanced technics of engineering, subject to the approval of their employers.

5—It is suggested that in large centres of industry it should be required that employers provide facilities during working hours for the technical education of at least a proportion of their apprentices.

Marine Engineers' Examinations

The examinations of marine engineers for first and second class certificates should embrace the technical subjects specified above and their application to practical engineering, and candidates should be required, as part of their qualification, to submit certificates or otherwise demonstrate that they have attained a certain standard of proficiency in mathematical and scientific knowledge.

The local or other educational authorities in all the large seaports should be urged to provide facilities in existing technical schools, or provide additional marine schools at which the course of study should be specially adapted for marine engineers preparing for their certificate examinations.

The requirements of first and second class engineers' certificates should be of a more exacting character, both as regards sea service and range of subjects set for the examinations, and a period should be set for the introduction of this higher standard.

Third Class B. O. T. Certificate

Simultaneously with the introduction of the higher standard of qualification, a third class Board of Trade certificate should be introduced.

The qualifications for examination for the third class certificate should be that the candidate should have the usual workshop training or its equivalent as now required for the second class certificate, together with one year's service at sea on regular watch, and the nature of this examination should be similar to the present examination for a second class certificate.

For a second class certificate the candidate should have a further sea service of twelve months in a qualifying capacity.

For a first class certificate the candidates should have a further sea service of eighteen months in charge of a watch.

Further to the proposals contained in the preceding paragraphs, we are of opinion that when the additional third class certificate is issued, the numbers of certificated engineers carried on the articles of all steamers should be revised.

Apprenticeship Period

We are also of the opinion that the qualifying period of apprenticeship should be at least five years. No time before the age of sixteen should be counted except in the case of junior technical schools, where time after the age of fourteen may be allowed at an appropriate value. Where the workshop service is performed in works where engines and boilers are made or repaired the following requirements are suggested:

Not less than 2½ years should be spent at fitting, erecting or repairing engines or machinery, either in the works or outside. The remaining 2½ years may be made up of time spent (1) at fitting, erecting or repairing engines or machinery; (2) at one of the other trades described below; (3) at an approved technical college. Time so spent to count as follows:—

Fitting, erecting, repairing or turning—Full time.

Working in drawing office—Full time up to two years, provided that an adequate period has been previously spent in the workshops, and beyond two years, half-time.

Pattern making—Full time up to twelve months; beyond twelve months, half-time, with a maximum allowance of two years.

Planing, slotting, shaping and milling—Full time up to a maximum of one year.

Boiler-making, repairing, or smith's work—Full time up to one year; beyond one year, half-time, with a maximum allowance of two years.

Coppersmith work—Full time up to a maximum of six months.

Brass or iron moulding—Half-time up to a maximum allowance of one year.

Attendance at an approved technical college—Two-thirds time: equivalent allowance to be made for attendance at junior technical schools.

In the event of the apprenticeship time being extended to six years or more, five years at turning, followed by one year at fitting or erecting, may be accepted as qualifying.

Where the workshop service is performed wholly or in part in works where engines and boilers are not made or repaired, it may be accepted if it is considered useful training for an engineer, but in such cases additional service must have been performed either in a marine shop or at sea, as enacted in the present Board of Trade regulations.

It has been suggested that licenses should be granted to "handymen" to enable them to take charge in low powered steamers, or to take charge of a watch in larger vessels. We are of the opinion that this is not desirable.

In this report, under paragraph 1, the education and training of the marine engineer have only been considered in a general sense. It is our opinion that this important matter should form the subject of consideration before a joint national committee representative of all the various interests.

HORSE POWER OF BELTING

USERS of belting are frequently misled as to the amount of work which should be got from a good belt.

The power of belting is determined by the number of foot pounds which can be transmitted by one pulley to another, and is arrived at by multiplying the effective pull in pounds per inch of width by belt width in inches and by belt speed in feet per minute; thereafter dividing by 33,000.

The effective pull or the force tending to turn the pulley is the difference in tension between the slack and driving sides of the belt and is largely dependent on the arc of contact between the belt and the smaller pulley. To find the effective pull it is necessary to determine the number of degrees in the arc of contact. This can be arrived at by mutiplying the difference between the pulley diameters in inches by four and three-quarters, dividing the product by the distance between the pulley centres in feet, and subtracting the quotient from 180 degrees.

The allowable working strain for a single belt with 180 degrees contact is, 40 pounds per inch width. This multiplied by the arc of contact found in the previous calculation and divided by 180 will give the effective pull allowable in pounds.

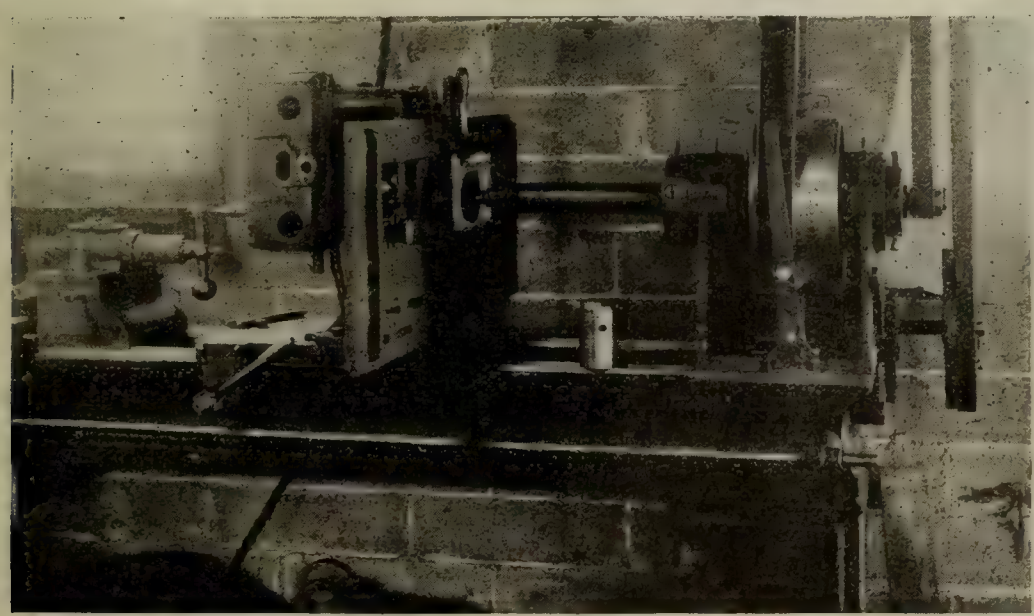
PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

ANOTHER USE FOR THE LATHE

By D. S. M.

IN a small shop devoted mainly to the repair of autos, motorcycles, lawn mowers, etc., a lathe with rather a long bed was in use. A great deal of auto cylinder reboring came to this shop, and the grinder shown in the accompanying photo was built and attached to the end of the lathe bed. It was readily removable in case of necessity. The carriage carrying the cylinder fitted the regular vees of the bed, and was provided with a power feed from the lead screw, this being at the back of the bed. It was driven, when used for the grinder, by the belt shown at the extreme right. This lathe was quite old; it will be noticed that the regular feed shaft is at the front. When reboring a cylinder preparatory to regrinding, the wheel was removed and the cutter head standing on the lathe bed screwed on to the end of the arm carrying the spindle. The centre belt supplied the power to the grinding wheel spindle, the eccentricity of which could be adjusted to suit by means of screws in the inner end of the main shaft.



ANOTHER USE FOR THE LATHE.

SAVING THE HARD CASTING

By A. S. Loy.

WHEN running on to a hard spot in a casting when machining, don't throw the casting away and then condemn the foundry. Perhaps they have had some troubles of their own, and sometimes the foundry superintendent is not always supplied with the grade of iron which he orders. To keep things running smoothly, simply heat the offending part red hot and place a little sulphur on the hard spot allowing the casting to cool slowly. This will enable the piece to be machined without difficulty and will save the price of many an intricate casting. This little kink has proved itself especially useful when machining thin pulleys, the edges of which are often extremely hard. The edge of the pulley was heated and dipped directly into the sulphur.

DON'TS FOR MACHINISTS.

By S. B.

Don't use a scale for a scratch awl or a chisel.

Don't make an anvil of the saddle or the tail-stock.

Don't litter the saddle with a lot of tools or material.

Don't allow grit or dirt to gather in the centre lubricant; this will often cause serious trouble.

Don't use the fingers to clean out small bored holes; the fingers may easily be injured.

Don't start work on a new machine until you acquaint yourself with the operating mechanism.

Don't get the habit of using belt dressing whenever the belt slips; look elsewhere for the trouble.

Don't fail to see that the hollow spindle and the centre are perfectly clean when the latter is placed in position.

Don't use metal belt fasteners on belts that are to be shifted by hand; loose ends are very dangerous.

Don't forget that it is often a costly practice to pull cuttings from the work while same is in motion.

Don't over lubricate screws and slides that are exposed to dirt or cuttings; occasional cleaning and light oiling are more efficient.

Don't think that good work can be done on poor centres; these should be kept in god condition and maintained at an angle of 60 degrees.

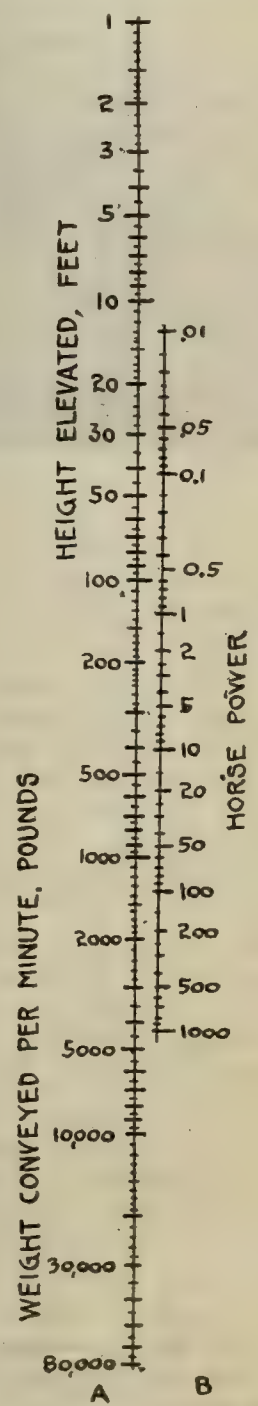
Don't slack off the gib screws unless the slide is too tight; the stiffness may result from an accumulation of dirt or grease, which should be removed.

Don't forget that heat will be generated very rapidly when turning small shafts, causing them to elongate; the tail centre requires to be eased back to avoid buckling or distortion of the shaft.

HORSEPOWER REQUIRED TO CONVEY MATERIALS.

By N. G. Near.

CONVEYORS are becoming more and more in evidence, and as a result it is increasingly important that we know more



CONVEYOR HORSE POWER CHART.

about the power required to convey. Almost everything is being conveyed these days, but in and about the power plant coal and ashes are the principal materials. However, no matter what the material, whether coal, ashes, wheat, oats, barley, corn, gravel, clinker, cement, or what not, this chart will do the work so long as the weight to be handled per minute is known. The method of using the chart is the same as with other charts of a similar nature already published, but to make it perfectly clear we will take an example.

Let us suppose that you wish to convey 35,000 pounds of coal per minute to a height of 50 feet. What horsepower will be required?

Find the 35,000 in column A, and then find the 50, also in column A. Next find the point half-way between these two. Directly opposite the mid-point is the answer—100 horsepower.

Of course this answer is not "absolutely accurate," because every conveyor has friction to contend with, but this chart is based on average practice, and the results can generally be depended upon. Therefore, if the conveyor is to be operated by electric motor, one would be safe in buying a 100 horsepower motor for the conveyor. It is generally better to be equipped with apparatus that is able to do just a little more than required of it, because of overloads that sometimes spring up unexpectedly. This is a well-known engineering practice and needn't be enlarged on here. In other words, to use the chart, find the mid-point between the two known values in Column A and the answer is immediately found opposite the mid-point in column B.

The chart can be used in the "reverse" way also. If you have a given engine or motor and a given height to which materials must be elevated, and the weight that can be handled per minute is required, simply find the distance between the known point, column A, and the known point column B, and measure downward from the known point in column B. The answer will be found in column A.

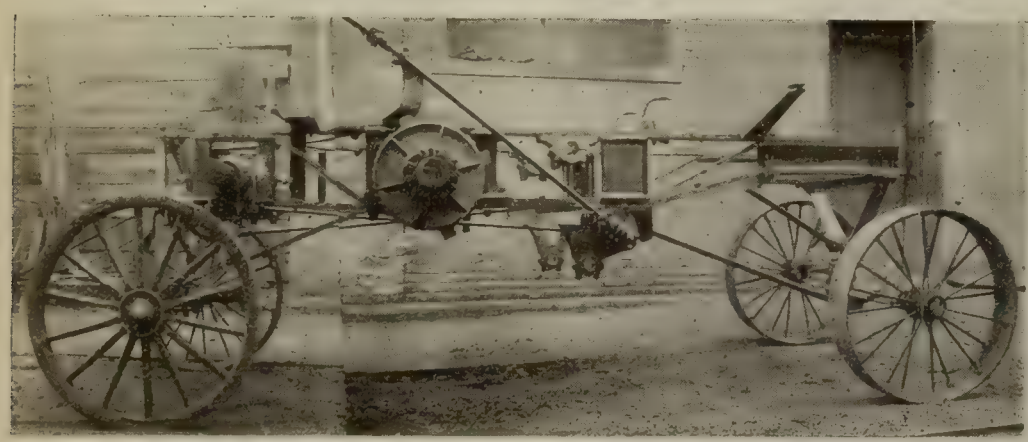
For example, again, if the height to be conveyed is 50 feet and the horsepower is 100, find the distance between the 50 and the 100 and measure downward from the 100 and the answer is found in column A to be 35,000 pounds per minute.

Still again, knowing the weight to be conveyed and the horsepower, the possible height is obtained in the inverse manner. After working one or two problems, the reader will have no difficulty in understanding the chart and solving any one of the three kinds of problems.

USING OLD PRINCIPLES IN NEW WAYS

By D. O. B.

IN the construction of the ordinary gas tractor, it is customary to make the main frame from standard steel sections, either I-beams or channels. Having the webs solid, the bearings for the countershafts must be placed either above or below, otherwise it becomes necessary to cut through the web with a consequent weakening of the beam. In the gas tractor truck shown in the accompanying cut, the designer departed from the usual practice and made use of the principles of design which have been successfully carried out in other lines, such as the construction of bridges and car trucks. It will be noticed that the main frame is constructed in the form of a truss, with three main members, the compressive stresses being cared for by the vertical castings. This not only produces a lighter frame for a given strength, but also leaves the centre open so that the bearings may be placed at the most convenient point without making other sacrifices in the design.



USING OLD PRINCIPLES IN NEW WAYS.

In designing any piece of machinery, it is not always necessary to follow in the beaten path, and some of the greatest successes have been due to the fact that some of the designers have been able to strike out for themselves and adapt principles which were, of course, sound, to some new line. Oftentimes engineers secure the most valuable ideas from some field entirely foreign to that in which they are working; they should, therefore, be on the alert at all times to see if it is not possible to make some new and valuable adaptation of an old principle.

BELT PULLEY NOTES

IN determining what pulleys are best to use in any equipment, the factors of windage, weight, balance, belt contact, powerful compression to avoid keyseating of shaft, and convenience of handling should each have consideration. A choice of pulleys which fulfils these requirements may mean a somewhat high initial outlay, but will mean annually much reduced operating expense.

Pulleys as manufactured are of cast iron, wrought iron, mild steel, wood and iron or steel in combination. For good belt contact, minimum slippage, and least power absorbed without undue recourse to belt dressings to secure adhesion, the wood rim is to be commended. It should, of course, be borne in mind that there are good and bad features in wood pulleys. Belt contact, reduced weight, and facility of handling, are, generally speaking, strong points in their favor, but unless at least the equivalent windage of a well-designed cast iron pulley be had, the other gains may be partly offset. The properly designed wood pulley should be the equal of other types in their best features, and their superior otherwise.

An absence of windage is not always a feature of wood pulleys. The improvement necessary in the reduction or absence of windage in wood pulleys lies in the arm attachment between rim and hub. The arms should be of a shape corresponding to those in cast iron or similar; the material light, rigid, reliable, and attached securely to rim and hub.

The wood pulley has advantage over those of iron or steel, in that it can be run at a much higher speed.

The outer face of a belt travels faster than the inner, causing compression of the latter and extension or stretching of the former. This process has a naturally injurious effect on the substance and life of the belt and should be minimized to the fullest extent possible by using large diameter pulleys, those especially with little crown. Horizontal shaft pulleys should have about ⅛ inch per foot crown, while those on a vertical shaft should have about twice that amount.

Installation of Belting

In applying new belts, care should be taken that the proper side goes next to the pulley. Belts have what is known as a flesh and a hair face; the former of which to the uninitiated might suggest itself as the driving face. This is not so, however, for the reason that the flesh face being tougher, is better able to stand the stretching already referred to, and the hair side which is predisposed to cracking, wears better under compression.

The top end of splices connecting the laps should point in the running direction of the belt. Horizontal belts and angle drives up to 45 degrees from the horizontal plane, should have a sag of about ⅛ inch per foot, and the underside be the driver. Vertical belts should be pulled tight to ensure grip on the lower pulley. Shafting and machinery should be so arranged that belts will run from the former to the latter in opposite directions to equalize the strain and pull on the bearings. Increase of belt width should mean a corresponding increase in thickness, and it is probably true that a thick and narrow belt is more durable and works rather more satisfactorily than does one wide and thin.

Development of Ocean Service Shipbuilding in Canada --V.

By C. T. R.

In addition to the widespread requisitioning of vessels for transportation purposes by the Allies, the war attendant and normal merchant ship losses and the many months' almost complete cessation of new construction on the part of the latter, the merchant marine of the world has had the misfortune to become to a large extent the target for enemy submarine activity. All nations have suffered in this respect, hence the almost feverish anxiety being displayed by shipping interests to have the losses made good at the earliest possible moment.

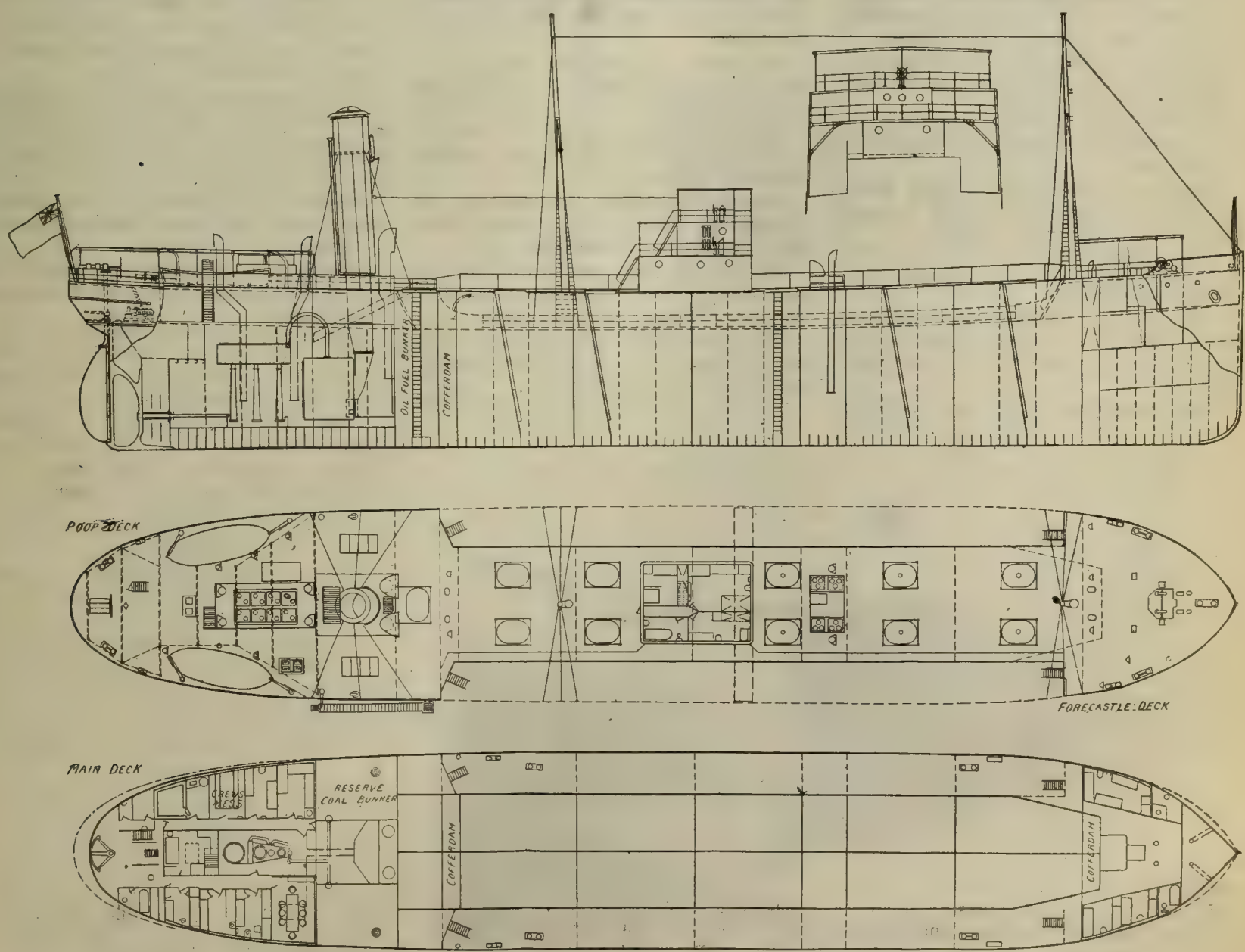
OCEAN GOING OIL TANKER LAUNCHED AT COLLINGWOOD

THERE was launched by The Collingwood Shipbuilding Co., Collingwood, Ont., on Thursday, June 21, the oil tank steamer Reginolite, which has been built to the order of the Imperial Oil Co., Toronto. This is the fourth vessel the builders have constructed for The Imperial Oil Co. and leaves a fifth, the Talarolite still on the stocks. The Reginolite is intended entirely for ocean service and is of the following dimensions: 250 ft. between perpendiculars; 259 ft. over all; 43 ft. 9 in. beam; 25 ft. deep to the upper deck, deadweight carrying capacity, 3500 tons.

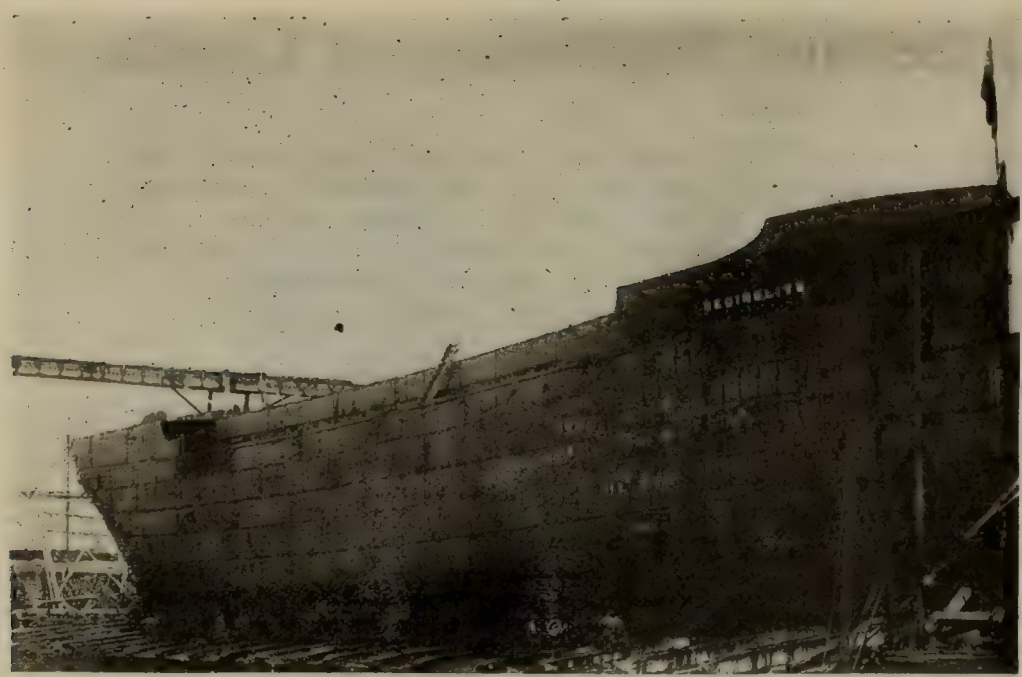
The propelling machinery consists of a set of triple expansion engines with cylinders 18 in., 30 in. and 50 in. by 36 in. stroke. Steam is supplied by two Scotch boilers 13 ft. 6 in. diameter by 11 ft. long, working at 180 lbs. pressure. The vessel takes the highest class in Lloyd's Registry for ocean service and the construction has been under the supervision of Captain R. W. Henderson, marine superintendent for the owners. From the line drawing showing the vessel profile and deck plans, a very good idea is to had of the general design and detail arrangement.

"WAR WASP" LAUNCHED

ON July 9, the steel freighter War Wasp was successfully launched from the shipbuilding plant of the Nova Scotia Steel & Coal Co., at Trenton, N.S. She is the first ocean-going steel steamer to be built in the Province of Nova Scotia, and naturally the event created unusual interest. Residents of New Glasgow and Trenton were out in large numbers to witness the vessel take to her native element, in addition many visitors from adjacent towns helped to swell the crowds who lined the banks of the East River. Miss Marion Cantley, daughter of the chairman of "Scotia," performed the christening ceremony, following which Mayor Grant presented Col. Cantley with a piece of silver from the citizens of New Glasgow, to commemorate the occasion. Congratulatory addresses were also presented to Col. Cantley by the town councils of Trenton and New Glasgow. A description and illustration of the War Wasp appeared in our April 5 issue. We understand the vessel has been sold to the British Government, although primarily intended for the company's own coal and ore-carrying trade.



PROFILE, POOP AND MAIN DECK PLANS OF OIL TANKER "REGINOLITE."



OIL TANKER "REGINOLITE" ON THE WAYS

INSTITUTE OF METALS CONVENTION PROGRAMME

THE tentative programme for the meeting of the American Institute of Metals, to be held September 25-28, at Boston, has been issued. Separate sessions will be devoted to the discussion of crucibles and furnaces, the melting and casting of nonferrous metals, casting in connection with munition making, the testing of nonferrous metals and metallography. The tentative list of papers is as follows:

Crucibles and Furnaces:

"The Crucible Situation," by Prof. A. V. Gleininger, Bureau of Standards, Pittsburgh.

"Melting Yellow Brass in New Form of Induction Furnace," by G. H. Clamer, Ajex Metal Co., Philadelphia.

"The Crucible Situation," by M. McNaughton, Joseph Dixon Crucible Co., Jersey City, N.J.

"The Electric Furnace and Nonferrous Metals," by Dwight D. Miller, the Society for Electrical Development, New York.

"My Experience with Metal Melting Furnaces," by W. H. Parry, National Meter Co., Brooklyn.

Melting and Casting Nonferrous Metals:

"Casting Bearings in Sand and Metal Molds," by R. R. Clarke, Pittsburgh.

"The School End of the Job in Training Foundrymen," by C. B. Connelly, Dean, Carnegie Institute of Technology, Pittsburgh.

"The Flux and Cleaner Question of Brass," by E. A. Frohman, S. Obermayer Co., Pittsburgh.

"Negative Experiments on Waste Core Sand," by Dr. H. W. Gillett, Bureau of Mines, Ithaca, N.Y.

"Pyrometers—Their Construction and Application," by John P. Goheen, Brown Instrument Co., Philadelphia.

"Surface Tension and Deoxidizing of Metals," by W. J. Knox, Metals Deoxidizing & Refining Co., New York.

"The Briquetting of Nonferrous Light Metal Scrap," by A. L. Stillman, General Briquetting Co., New York.

"The Swelling of Zinc Base Die Castings," by H. M. Williams, National Cash Register Co., Dayton, Ohio.

Munitions, Etc.:

"The Present Status of Tin Fusible Plug Manufacture and Properties," by Dr. George K. Burgess, Bureau of Standards, Washington.

"Stellite," by Elwood Haynes, Haynes Stellite Works, Kokomo, Ind.

"Fire Prevention in Large Industrial Establishments," by C. W. Johnson, Westinghouse Electric & Mfg. Co., Pittsburgh.

"The Use of Die Casting in Munitions," by Charles Pack, Doehler Die Casting Co., Brooklyn.

"A Few Points on Alloy Patents," by William J. Rich, Patent Office, Washington.

"Shrapnel Bullets," by Harold J. Roast, the James Robertson Co., Ltd., Montreal.

"Recent Industrial Uses of Aluminum," by F. G. Shull, Aluminum Co. of America, Boston.

Testing Nonferrous Metals:

"Some Comparative Tests on Test Bars and Actual Castings," by W. M. Course, the Titanium Alloy Mfg. Co., Niagara Falls, N.Y., Buffalo.

"Analysis of Babbitts and Brasses," by E. W. Hagmaier, Buffalo.

"Standard Test Bars of 88-10-2 and 88-8-4, Being the Result of Co-operative Work of Six Foundries; a New Series of Tests," by C. P. Karr, Bureau of Standards, Washington.

"The Expansion Coefficients of Alpha and Beta Brass" and "The Corrosion of Manganese Bronze Under Stress," by Dr. Paul D. Merica, Bureau of Standards, Washington.

"Corrosion of Brasses of the Muntz Metal Type," by H. S. Rowdon, Bureau of Standards, Washington.

"Analysis of Cadmium in Brass," by Dr. F. Schramm, Bureau of Standards, Washington.

Metallurgy and Metallography:

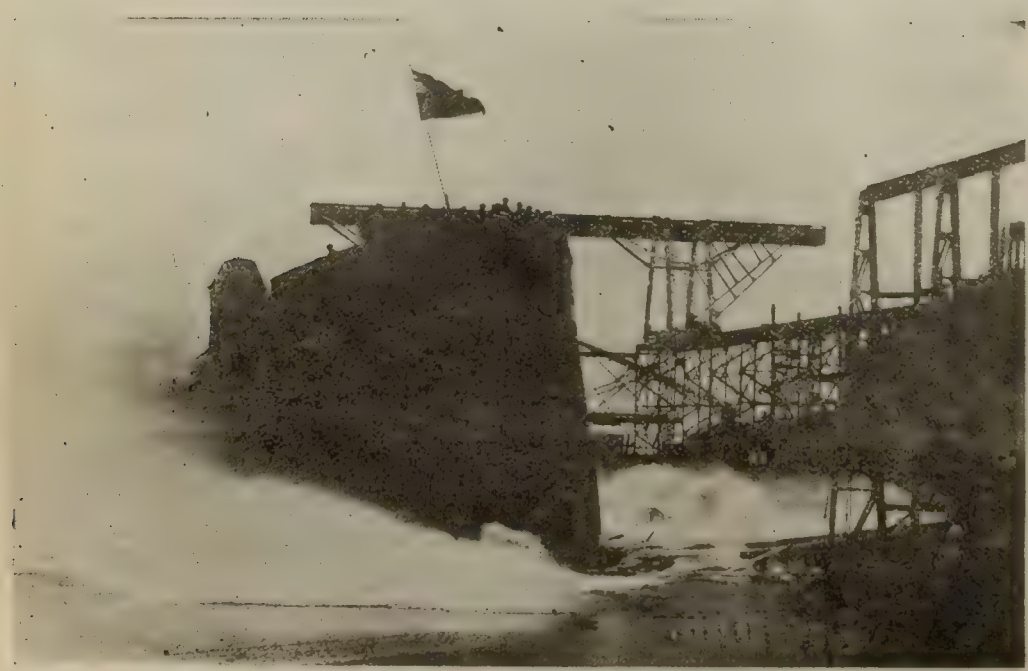
"The Electrolytic Production of Antimony," by Prof. D. J. Demorest, the Ohio State University, Columbus.

"The Electrical Properties of Some High Resistance Alloys," by Prof. M. A. Hunter, Rensselaer Polytechnic Institute, Troy, N.Y., and F. M. Sebast.

"The Amorphous Theory in' Metals," by Prof. Zay Jeffries, Case School of Applied Science, Cleveland.

"The Uses and Metallurgy of Antimony," by K. C. Li, Wah Chang Mining & Smelting Co., Inc., New York.

"Development and Reabsorption of the Beta Constituent in Alloys Which Are Normally of the Alpha Type," by Prof. C. H. Mathewson, department of mining and metallurgy, Yale University, New Haven, Conn., and Philip Davidson.



OIL TANKER "REGINOLITE" ENTERING THE WATER.

Financial Aid for Drydocks.—The Dominion Government has decided to increase the subsidy for drydock undertakings by way of promoting them. A subsidy representing a percentage of the total outlay has heretofore been given. This percentage will be raised, because at present it is an insufficient encouragement to build docks.

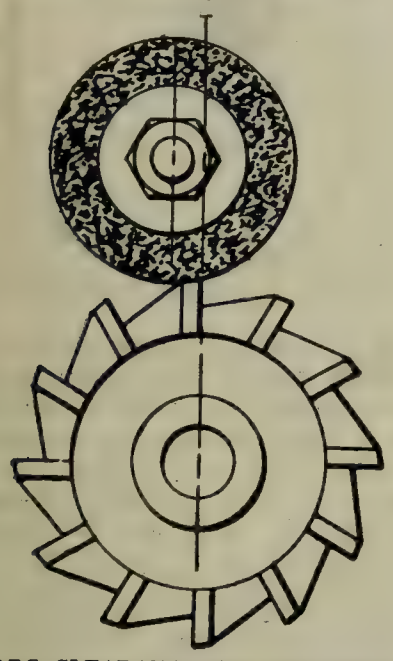
EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

MACHINISTS' INSTRUCTION COURSE—XXV.

By J. Davies.

WHILE most grinding machines are provided with graduations to facilitate the setting of the various heads and holders, these aids should not be absolutely relied on. When



ARC CLEARANCE ON THE LAND.
FIG. 92.

adjusting the machine, set the swivels to the desired graduations to conform to the angle required; for example, suppose you wish to grind a parallel bar or cutter, it is first necessary to see that the graduations are set to the zero mark, then take a trial cut and test with the

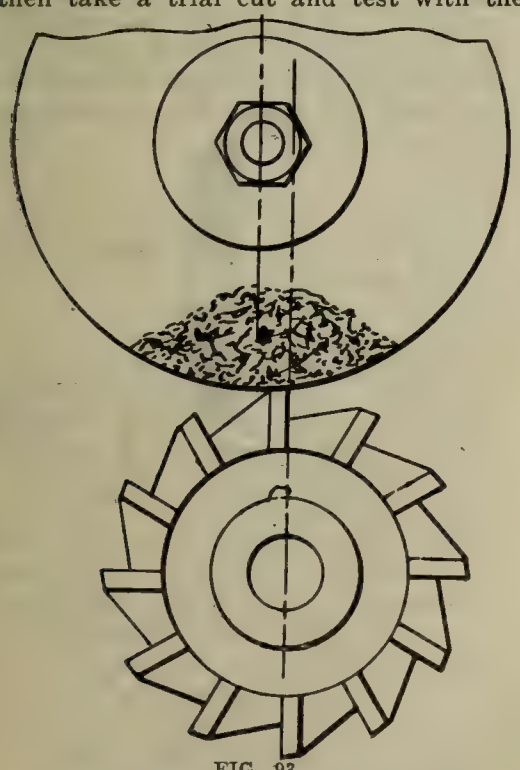


FIG. 93.
ARC CLEARANCE ON THE LAND.

micrometers. By carefully noting the appearance of the sparks an experienced operator can rectify any error he can detect with the measuring instruments. A tool-room grinder is the most sensitive machine in the shop; that is to say, you can remove the least amount of metal in one cut by this method, it being practically impossible to remove fractions of a thousandth by the use of an edge tool. If you were not grinding anything off at one end and .0001 inch off the other end, it is possible to detect it by the condition of the sparks. When finishing a very fine or accurate piece of work, let the sparks nearly die away to take all the spring out of the arbor.

When grinding or backing off the land of a cutter or reamer with an ordinary disc wheel, cutting on its periphery or outside diameter, the shape of the clearance, left on the land of the cutter, must of necessity conform to the shape of the wheel, and will, therefore, be ground hollow. This condition is all right for a razor, but inefficient for a milling cutter. The larger the grinding wheel used, the less pronounced will the arc be on the back of the cutter. By using a cup wheel

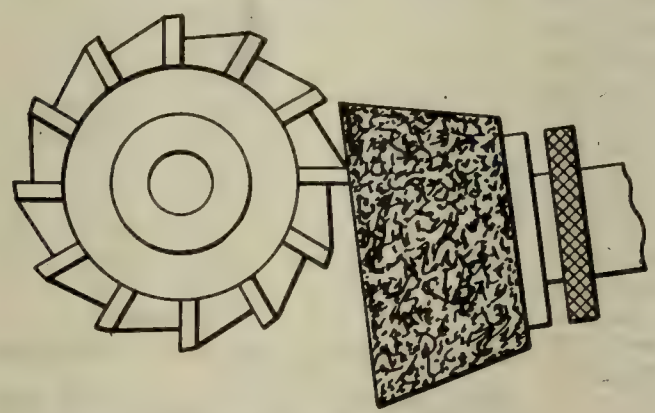


FIG. 94. STRAIGHT CLEARANCE ON THE LAND.

the land of the cutter can be ground perfectly flat. The ideal form of clearance is the eccentric shape as shown in the sketch, Fig. 95; this gives a well-supported cutter edge, but unfortunately it is a very difficult shape to grind without a special machine or attachment. Fig. 92 illustrates a very poor method of backing off; the hollow form of the clearance being excessive by the use of too small a grinding wheel. Fig. 93 is an improvement on Fig. 92, as the arc on the land is much reduced by using a wheel as large in diameter as possible. Fig. 94 shows the general practice for backing off the teeth, the flat surface being obtained by using a cup wheel. The theoretical correct form of clearance is illustrated in Fig. 95, the outer edge of the land taking the shape of an arc eccentric with the diameter, and the centre of which would fall within the cutter and close to the centre of the latter; this, however, is seldom used owing to the special facilities required to produce the desired shape. An approximation to this land can nevertheless be obtained by draw filing the land before hardening or by using a hand stone afterwards.

Figs. 96 and 97 show two methods of setting up bevel cutters for grinding. In Fig. 96 a cup wheel is used, which leaves a flat surface, the headstock or attachment that holds the work being swivelled to correspond to the angle of the cutter.

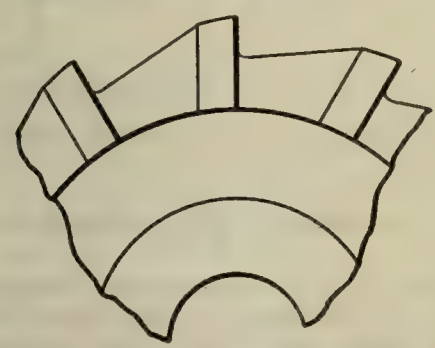


FIG. 95. ECCENTRIC CLEARANCE.

The guide finger is then adjusted to keep the tooth being ground in the same plane as the table; this can be tested with the surface gauge. The grinding spindle is then tilted and clamped at the proper angle for clearance and the work moved past the wheel by the cross feed. Fig. 97 shows the cutter mounted on a bar held in a swivel head device, which is set by the graduation, or by a surface gauge from the table. The guide finger is adjusted and the cutter is traversed past the face of the grinding wheel by moving the table to which the holding attachment is fastened.

Space would not permit to enumerate one-tenth of the attachments and ingenious devices designed for and used on the modern grinding machine.

For any kind of repetition work it pays

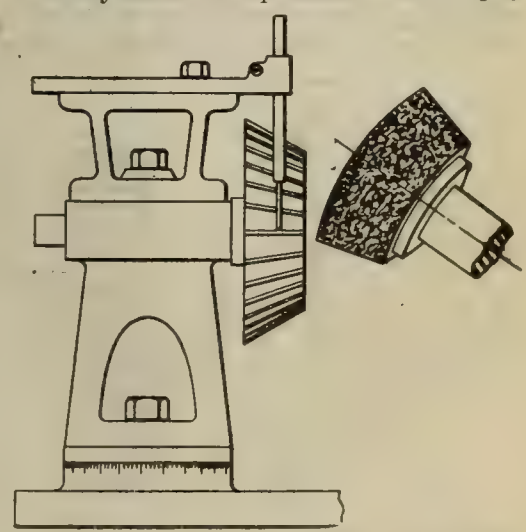


FIG. 96. GRINDING BEVEL CUTTERS.

to construct a special holding device, as that is practically what all grinding jigs consist of; some means of holding the

work to be ground in proper relation to the grinding wheel, and a fixture that can be set quickly and accurately. One of the most useful standard attachments

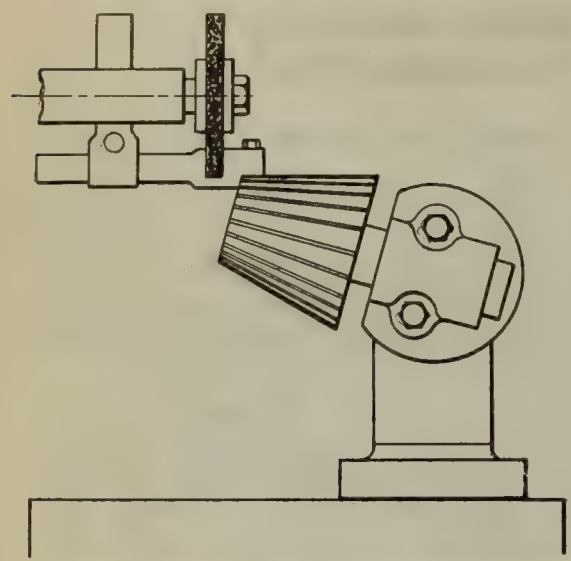


FIG. 97. GRINDING BEVEL CUTTERS WITH DISC WHEEL.

is the vee centre head. Fig. 98 illustrates how a pair of these may be used for holding a piece that is too long to go between the centres, or a reamer with an extremely long shank. By putting a plate across the vee-shaped jaws it can be converted into a vise for holding flat work.

Fig. 99 is an example of grinding a shaft close up to a large shoulder; it can be seen at a glance that an ordinary flat wheel could not be used because the nut and washers necessary to fasten the wheel to the spindle would not clear the shoulder of the work, and for this reason some form of dished wheel is necessary. When preparing a piece of work to be ground right up to a shoulder or square corner, always slightly undercut the work in the corner to the finished size, or a little below if the work will permit it, as it is extremely difficult to keep a perfectly square corner on a grinding wheel.

The grinding of a snap or caliper gauge is shown in Fig. 100; the gauge is fastened to the table by any convenient means, particular care being taken that it is not sprung in any way when fastening it down. The wheel should be set at right angle to the table and recessed at both sides as shown, so that the cutting surface of the wheel will pass entirely over that portion of the gauge being ground. In grinding a saw of any kind, provided with a jig having a spacing device, always fix the locating finger or other indicating device, in the space next to the tooth being ground, in order that every tooth will be of uniform shape and dimension.

On internal work it is obvious that the grinding wheel must be smaller than the hole to be ground; when working on very small holes it is impossible to obtain the correct cutting speed, although as high a speed as 50,000 revolutions per minute has been obtained on specially designed machines. Under these conditions it is very advisable to get all the speed possible with the machine and tools available. The lower we fall below the proper speed the more pressure will be required to make the wheel cut; use a soft wheel, and if there is any looseness whatever in the spindle, extra care is required when the wheel strikes the sides of the hole, as there is a great possibility

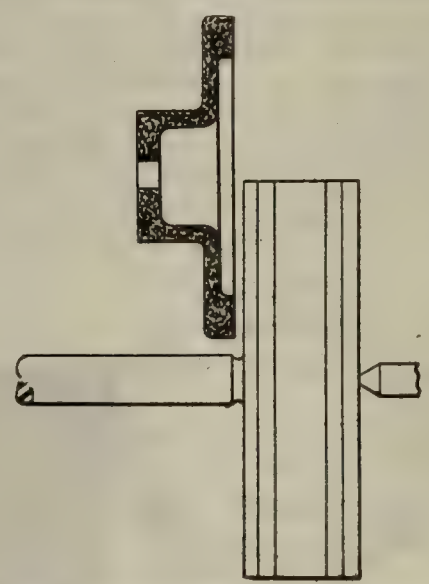


FIG. 99. GRINDING TO SQUARE SHOULDER.

of making the hole larger at the ends. To avoid this tendency, shorten the travel so that the width of the wheel is always in the hole.

VARIATION IN SHELL FORGINGS

By R. Hamilton

IT has been estimated by a certain manufacturer who has been machining 6 inch shell for a couple of years, that from one to two dollars is wasted on every shell forged in Canada. This firm has, owing to existing conditions, been

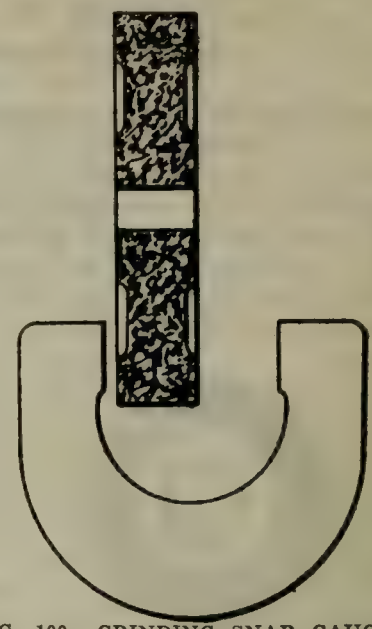


FIG. 100. GRINDING SNAP GAUGES.

forced to obtain or accept forgings from whatever source these were available, and its experience, which is undoubtedly that of many others, has demonstrated the advisability of forging to much closer and more accurate dimensions than has been the general practice here. This particular plant has found that the production from shell forged in the States has resulted in an increased machining output of from 10 to 20 per cent., over similar blanks forged in this country. Roughing operations on the different forgings have had a variation often as great as 40 per cent.

Neglecting the physical qualities of the steel which it is understood are invariably more uniform in the American made product, the feature that makes the difference is that of the dimensions of the rough forgings; the Canadian blanks averaging about ¼ inch larger on the outer diameter and about ⅛ inch smaller in the bore. This approximates

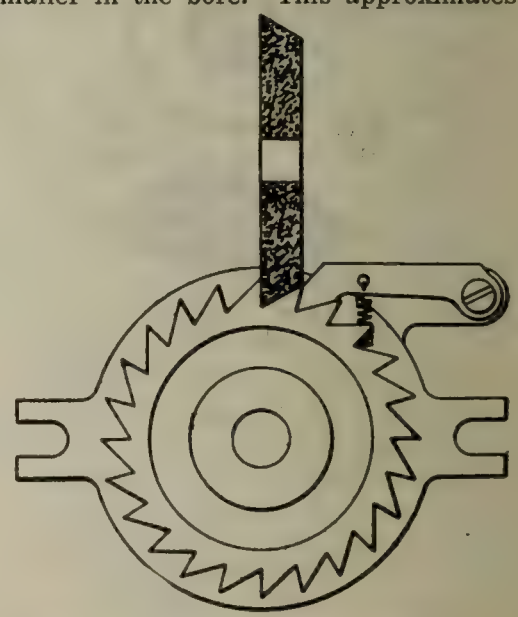


FIG. 101. GRINDING SAW TEETH.

a surplus of between 25 and 30 pounds on each forging; which at say 5 cents per pound, runs to about $1.40 on every

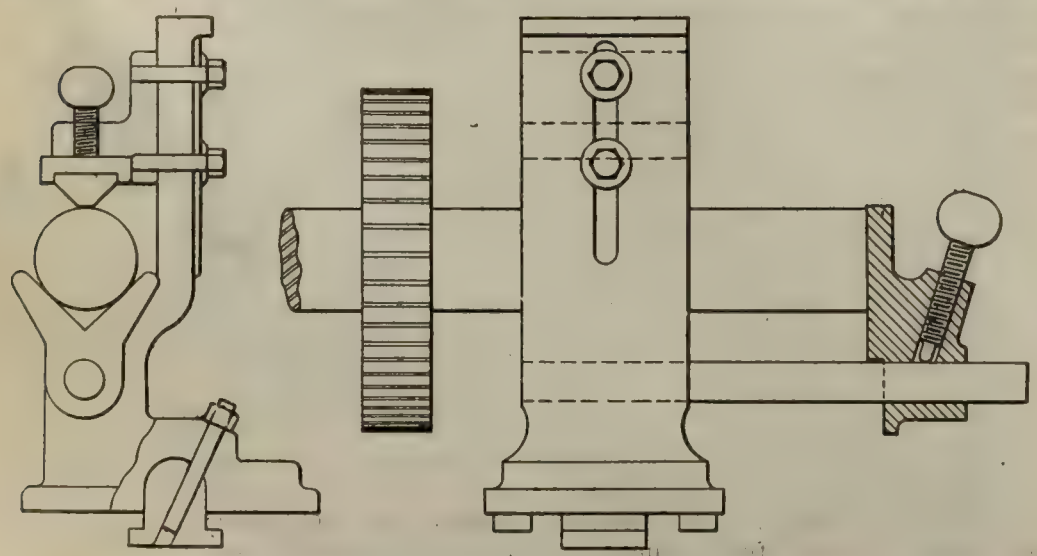


FIG. 98. GRINDING WITH VEE BLOCKS.

shell. In addition, however, to the extra weight of metal, the factor of concentricity is more pronounced in the American made forging, necessitated by the adherence to closer working dimensions. It has often been noticed on many Canadian made shells that the eccentricity has been such as to require a ⅞ inch depth of cut on the heavy side of the forging against ⅛ or ¼ inch on the opposite side. This condition is not general, but is nevertheless so common as to emphasize the contrast between the different makes of forgings.

To produce shell blanks that will minimise the roughing operations in the machining of the shells necessitates greater accuracy in the forging process, but the extra attention given at this initial stage more than offsets the increased difficulties contingent on the machining of extra heavy and abnormally eccentric forgings. It is therefore much more economical to work to close dimensions during the forging process, as the ultimate results mean less waste, due to scrapped and dejected shells, much of which can be directly traced to the original excessive eccentricity.

SHELL INSPECTION.

By J. H. R.

MANY reports have been circulated as to the apparent unfairness of shell inspection, resulting in much inconvenience and often material loss to manufacturers. In view of the abnormal conditions under which the munitions industry has been expanded, it was to be expected that the problem of effective inspection would unquestionably be a serious one, but while there have evidently been many faults in the methods adopted, it is nevertheless true that, with few exceptions, the work has been carried on with the main object of efficiently protecting those whose duties involve the handling and discharging of the shells on the various battle fronts. The very large number of men required for the progressive and final inspection of shells made it, of course, practically impossible to obtain a sufficiency with previous experience that would especially qualify them for this seemingly incidental but none-the-less essential work.

With the probable exception of a number of the chief inspectors the work was detailed to men whose knowledge of steel and scientific measuring instruments was in many features very meagre, their effort in consequence, was rather that of the automaton than of men well primed with technical and mechanical ability. Their judgment was more of the hand than of the brain, and where a possible doubt arose, they invariably safe-guarded themselves by placing the shells in question to one side, to be subsequently examined by the chief inspector. Under the circumstances this proctice is no doubt the safest to follow, but it has aften placed the plant executive in temporary difficulties, owing to the accumulation of semi-finished or finished product. The preliminary or progressive inspection of shells has now become one of gauging only, as the under inspectors, invariably, will not pass a shell unless the requirements are exact; the question of reasonable judgment and application of gray matter being the duties of the district or chief inspector.

It is claimed that shells primarily rejected by the local inspectors are placed aside for examination by the district inspectors, and if finally passed by this authority, are done so subject to a discount of 5 per cent. on the manufacturers' price. Just recently a certain plant had a considerable percentage of a series placed in the "doubtful" section, over 90 per cent. of which were subsequently passed by the district inspector; an apparent injustice to the manufacturer. This particular firm—making six inch shells, have three floors equipped for progressive production; forgings entering the basement and progressing to the top floor, where they receive their final inspection. When commencing work at this plant, considerable inconvenience was experienced from the inspection methods, which often necessitated shells being sent back to the floor below for correction of errors. This has now been adjusted by the placing of a reliable inspector on each floor, so that once the shells are taken to the flor above, they are never required again to pass to the one below. The comparatively small remuneration, in relation to that received by the average machine operator, is a feature that tends to place the work of inspection on a physical rather than an intellectual basis. The importance of this essential phase of munitions manufacture deserves equal consideration with the machining operations, to insure proper and complete co-operation.

BRITISH ADMIRALTY WANTS B. C. LUMBER

WHILE British Columbia has, for the past two years, been supplying the Imperial Government with quantities of silver spruce for use in the manufacture of aeroplanes, and repeated inquiries have been made of British Columbia lumber concerns as to the possibility of securing still greater supplies, the Admiralty has again made inquiries as to the likelihood of large quantities being secured. Premier Brewster is in receipt of inquiries from the Admiralty, and Hon. T. D. Pattullo, Minister of Lands, is now securing information and will forward it to London.

Not long ago it was announced from Portland that an embargo against exportations of such materials to England had been placed against the Northwestern States and British Columbia. The Forest Branch here took the matter up, but could get no definite information other than so far as was known in England no embargo existed against British Columbia. A considerable quantity of spruce which is being used in the manufacture of aeroplanes for service at the front, has been shipped from the Province. The great demand in England evidently must be met by further importations of the British Columbia product.

RAILWAY BOARD TO OPERATE C. N. R. AND G. T. P.

OPERATION of the Canadian Northern and Grand Trunk Pacific Railways by a board appointed by the Government is involved in the plans which were submitted to a caucus of ministerial supporters at Ottawa last Friday.

Nationalization at this stage is not proposed because, in view of the heavy expenditures incidental to the war, the financial burden would be too heavy. Complete control is the interim remedy. The plan goes further. It contemplates such co-ordination of the service of the three roads as will obviate unnecessary expense in operation and thus tend to reduce, if not wipe out altogether, the recurrent deficits of these roads. The corporate identity of the companies will be retained, but some changes made in the directorate. Railway experts are proposed for the operating board, and the idea is to eliminate unnecessary duplication of lines, and generally link up the services.

Financial assistance by the Government to the extent of about thirty or forty millions will enable the companies to meet their maturing obligations and renew the short-date issues on the New York and London markets.

The scheme, as stated, does not involve any Government ownership now, but is designed to provide effective financial and operative control, and leave the door open for the wider plan of ultimate nationalization when the country's finances permit of it.

STATIONARY ENGINEERS' CONVENTION.

THE 28th annual convention of the Canadian Association of Stationary Engineers, held in Toronto on July 24th, 25th and 26th, was up to the high standard of previous gatherings, both as regards the discussions at the meetings of the delegates and the exhibit of power supplies. In the exhibition hall about fifty manufacturers occupied booths, making an interesting display of power plant equipment and supplies, and showing the development in these lines by way of securing greater efficiency and saving in power. The C. A. S. E. have recently secured a Dominion charter and will thus be enabled to extend the scope of its activities. The executive are endeavoring to arrange for provincial reciprocity in licenses, and it is hoped that graded certificates will be given in 1918. Legislation to this end has been inaugurated. The convention next year will be held at London, Ont.

The following C. A. S. E. executive officers were elected for the ensuing year: Past President, W. G. Forbes; President, R. G. Gofton; Vice-President, W. Cooke; Secretary, John H. Hale; and Treasurer, A. W. Heath. The officers of the Exhibitors' Association are as follows: Past President, Earl Hetherington; President, Flight-Lieut. Lloyd Archibald; 1st Vice-President, C. W. Schrag; 2nd Vice-President, J. S. Mock; Secretary, Gordon C. Keith; Assistant Secretary, L. H. Rummage, and Treasurer, B. G. Newton.

PROCESSES IN MANUFACTURE

Inventive Genius and Research Operate to a Dual End — They Aim to Improve What We Now Possess and Bring to Our Service Commodities Before Unknown

HAMMER-HOUR OVERHEAD SYSTEM FOR DROP FORGE SHOPS*

By R. T. Herdegen.**

THE success of any drop forge plant depends upon many different factors. Of all of the latter which play a part in the industry there is none of greater importance than the proper determination of costs. Regardless of a favorable location, good management, and ample finances, if the costs are not accurately known, the plant will never be permanently successful.

There are three main items entering into the cost of any forgings, viz.: material, labor and overhead. The material required for any forging is easily determined, but proper allowance should always be made for defective work and scrap. The productive labor cost is also a simple matter to obtain. With an office time-keeping department properly organized and with men in the shop checking up all counts, the opportunity for error in this particular direction is small. The overhead item, however, affords a great opportunity for most careful study. It is comparatively speaking, a simple matter to obtain the sum total overhead charge for any specific period of time, such as a year or a month. The difficulty arises when it is desired to segregate this sum total overhead for application to the various jobs that were run during that period.

The time honored system of dividing this overhead is on the basis of productive labor. It is a simple system and has been passed on to the forging business from machine shop practice. In machine shops of several years ago, the system used was to charge the proper productive labor to the various jobs, and at the end of the month to divide the month's overhead among the various jobs on the basis of the productive labor charge against each job. This system was reasonably satisfactory, particularly if the machine tools were of about the same initial cost, and if the operators on the various machines earned about the same wage.

With the advent of massive machine tools, however, the machine-shop men began to realize that the division of overhead on the basis of productive labor charges could no longer be used. It was easily possible, for example, for a swift man working on a small, inexpensive shaper, to make almost as much money as a man working on the large and many times more expensive planer. The machine shop men thereupon started the system of charging the overhead against the large planer at so much per hour regardless of the productive labor charge. This was the beginning of the machine rate system. It was an effort to divide overhead on a basis independently, as far as possible, of productive labor.

TABLE I.—PERCENTAGE BASIS FOR GROUP DIVISION OF OVERHEAD CHARGES.

Group Letter	No. Un.	Type and Size Units	Wght.	Wt. & Pcs.	Steam Const	Elect. Const.	Stm. & Elect.	Floor Space	Asset Value	Furn. Charge	Val. of Outp't	Die Rm
A	5	Board	17	41		43	22	30	24	25	14	22
B	2	Medium and Small...	11	11	22	3	12	13	13	14	12	18
C	2	2500 and 3000 lbs....	33	22	35	5	20	22	20	29	33	31
D	1	5000 lbs.	20	11	43	6	25	11	23	16	25	18
E	1	Small Upsetter	7	5		14	7	9	6	7	6	4
F	1	Large Upsetter	12	10		29	14	15	14	9	10	7

Hammer Hour Rate System.

The forge business is now duplicating the experience of the machine shop. Several forge shops have already abandoned the old system and are now operating under the machine rate system, or as it is called in the forge business, hammer-hour rate system. The overhead costs obtained by the percentage system are fairly reliable in a small shop, particularly where all the units are of the same size and of the same type. A shop, however, which has a varied assortment of steam hammers board hammers and upsetters, can certainly not afford to use the percentage system.

The initial cost. operating charges, and repair bills for a board hammer are less than those for an equivalent steam hammer. It is possible for a man operating a board hammer to draw the same amount of pay for a day's work as the man operating an equivalent steam hammer. With the percentage system of figuring overhead, the actual overhead charge against a job would be the same whether run in the board or the steam hammer. This we know is not theoretically correct. Take another example.

Consider a 5,000 lb. steam hammer running on a comparatively light job which requires a hammerman and only one heater. This very same hammer might, the following week, be used for a very heavy job which would require a hammer-man, a couple of heaters, and a scale blower. Using the percentage system of figuring overhead, the second piece of work would have a greater overhead charge against it per hour than the first piece, and yet from a theoretical standpoint the actual overhead charge should not be very different for the two jobs for the same period of time. The probable truth of the matter is that the actual charge in the first case is too small, and in the second case is too large.

It would be possible to cite examples without end showing improper costs obtained by using the percentage system of figuring overhead, but we will assume that all are agreed that a hammer-hour rate system is the proper one, and will develop a method for properly apportioning the overhead charges among the various pieces of equipment in the forge plant.

Operation of Hammer-Hour Rate System

The overhead for the entire factory is first obtained. This total overhead should be divided among the various forge shop departments, viz.: the forge shop proper, the die room, and possibly other allied departments, such as the heat treating department. The division among these departments is, compara-

TABLE II.—NON-PRODUCTIVE LABOR ITEMS AS CHARGED TO MACHINE GROUPS.

No.	Non-productive Activity.	Total overhead	A 5-Boards	B 2-1500 lbs. Steam	C 2-2500 lbs. Steam	D 1-5000 lbs. Steam	E 1-small Up-setter	F 1-large Up-setter
S- 1	Repairs to Machinery	618.29	117.56	132.42	164.41	145.06	20.20	38.64
S- 2	Unloading Rough Stock—Bar Steel	73.29	12.46	8.06	24.19	14.66	5.13	8.79
S- 3	Trucking Rough Stock to Shears & Hammers	263.04	44.72	28.93	86.80	52.61	18.41	31.57
S- 4	Trucking Forged or Partly Forged Pieces...	233.19	39.64	25.65	76.95	46.64	16.32	27.99
S- 5	Loading Finished Forgings	118.20	20.09	13.00	39.01	23.64	8.27	14.19
S- 6	Cutting and Handling Scrap	71.98	12.24	7.92	23.75	14.40	5.04	8.63
S- 7	Foremen	394.43	67.05	43.39	130.16	78.89	27.61	47.33
S- 8	Inspection of Product	214.17	87.81	23.56	47.12	23.56	10.71	21.41
S- 9	Boiler Room Labor and Steamfitters	90.50		19.90	31.70	38.90		
S-10	Electrical Work	54.10	23.27	1.62	2.70	3.24	7.57	15.70
S-11	Oiling	29.50	6.49	3.54	5.90	7.38	2.06	4.13
S-12	Sweeping and Watching	59.52	17.86	7.74	13.09	6.55	5.35	8.93
S-13	Repairs to Buildings and Grounds	6.79	1.63	.88	1.36	1.56	.41	.95
S-14	Repair to Miscellaneous Tools and Equipment	94.09	22.60	12.24	18.80	21.60	5.65	13.20
S-15	Perishable Tools	37.60	9.03	4.88	7.52	8.65	2.26	5.26
S-16	Experimental Work	42.20	10.10	5.48	8.47	9.74	2.52	5.89
S-17	Moving Machinery	4.92	1.18	.64	.98	1.13	.30	.69
S-18	Miscellaneous Non-Productive Labor	31.64	7.59	4.11	6.33	7.27	1.91	4.43
	Totals.....	2437.45	501.32	343.96	689.24	505.48	139.72	257.73

*Paper read at the Drop Forge Supply Association Convention.

**Dominion Forge & Stamping Co., Walkerville, Ont.

tively speaking, a simple matter, as practically all of the overhead charges can be debited directly to one department or another. This division of the entire forge shop overhead among the two or three departments comprising that forge shop will not, however, be discussed. We will deal exclusively with the problem of dividing the forge shop proper overhead among the various groups of equipment within that forge shop itself. The word "Forge Shop" as used hereinafter will be used in the narrower sense of that term, meaning the sum total of **productive** equipment of the plant, such as hammers, upsetters, etc.

It is not necessary to separate one hammer from another of the same size in determining an hour rate. It is sufficient to obtain the overhead for a certain group of hammers, all about the same size, and to divide that total equally among the hammers of that group. A certain job might be set up in a hammer and due to no fault of that particular piece, the job might be held up considerably, due to breaking rods or other hammer troubles. It would not be right to discriminate against this piece on that account.

A record is kept of the total number of hours that the hammers in any group operate. A record is also kept of the number of hours that any particular piece of work occupies a hammer of any group. In figuring the amount of time that a certain piece occupies a hammer, all time consumed in setting and repairing dies is charged to that particular piece, as well as the number of hours the hammer was productively engaged on that piece of work. If, however, the hammer should be shut down on account of lack of power for several hours, that time should not be charged against the particular piece of work, nor should it be considered in obtaining the total number of hours that a certain group of hammers operated. It is compensated for by the smaller divisor used in obtaining the overhead at the end of the month.

We will assume that the accounting period under consideration is a month, and that the plant is operating day and night, with a total of possible working hours for the month of about three hundred and thirty. We will further assume a shop having a fairly diversified equipment. The use of the percentage system for the division of the overhead for this plant would, therefore, be very liable to play such havoc with the individual costs as to make it possible for the plant to lose money and at the same time make it difficult for the management to determine where the trouble lay. We are listing below the equipment of this hypothetical plant, with its six groups of different types of equipment.

A—5 units, 1,000 lb. board hammers.
B—2 units, 1,500 lb. steam hammers.
C—2 units, 2,500 lb. steam hammers.
D—1 unit, 5,000 lb. steam hammer.
E—1 unit, 1½ in. upsetter.
F—1 unit, 3 in. upsetter.

Taking for granted that the total factory overhead has already been apportioned among the various departments and that the correct amount has been charged against the forge shop proper, we next divide the forge shop overhead proper among the six groups contained in this hypothetical shop. It is evident that there are items of overhead which can be charged directly to a certain group of equipment. The time and cost department, for example, can keep a careful record of the repairs to the machinery of each group. There are other charges, however, the basis of which must of necessity be theoretical, and there will always be a difference of opinion as to whether the basis chosen for division in each case is the correct one. The writer has selected what seemed to him to be the proper basis of division for each of the overhead items. Everyone, however, is entitled to have his own opinion. It is very probable though, that the results finally obtained by different methods of distribution will not vary greatly, provided the theoretical basis of division selected is reasonable in each case.

There are two great classes of overhead charges to be divided. The first class is the nonproductive shop labor. The second class includes all office expenses and the great number of overhead material purchases, and miscellaneous expenses of all sorts. Besides these, there are also the charges for dies and depreciation. We will consider first the question of non-productive shop labor.

Non-Productive Labor Charge System.

Doubtless every shop has a non-productive labor charge system with various symbols for the various non-productive activities in the plant, such as trucking, repairs, inspection, etc. Some plants have many charging numbers for these non-productive activities, and other plants have not so many. It would appear that there is a middle ground which is detailed enough to give the management a proper grasp of their non-productive expenses without going into such detail as to make it cumbersome for the time and cost department to obtain the information. In this paper the writer takes the liberty of using his own system. The items are grouped according to the basis upon which they are later apportioned among the various groups of hammers.

Direct Charge.

S-1—Repairs to machinery.

Weight of Output.

S-2—Unloading rough stock — bar steel.

S-3—Trucking rough stock to shears and hammers.

S-4—Trucking forged and partly forged pieces.

S-5—Loading finished forgings.

S-6—Cutting and handling scrap.

S-7—Foremen.

Weight and Number of Pieces of Output.

S-8—Inspection of product.

Steam Consumption.

S-9—Boiler room labor and steam-fitters.

Electric Power Consumption.

S-10—Electrical work.

Steam and Electrical Consumption.

S-11—Oiling.

Floor Space.

S-12—Sweeping and watching.

Asset Value.

S-13—Repairs to buildings and grounds.

S-14—Repairs to miscellaneous tools and equipment.

S-15—Perishable tools.

S-16—Experimental work.

S-17—Moving machinery.

S-18 — Miscellaneous non-productive labor.

Referring to non-productive activities tabulated above, as stated before, there is an opportunity for discussion as to the basis of division used for some of these various charges. We will discuss several of these in detail.

All repairs to a machine are charged directly to the group to which that machine belongs. This is necessary for the repair charge is always an appreciable percentage of the total non-productive labor charged against the plant, running as high as 25 to 35 per cent. of that total. It is also very different for the different classes of equipment as is shown by table II.

The apportionment of all the material handling on the basis of the weight of output of the groups seem to be a rea-

TABLE III.—NON-PRODUCTIVE PURCHASE AND EXPENSE ITEMS AS CHARGED TO MACHINE GROUPS.

No.	Item.	Total	A 5-Boards	B 2-1500 lbs. Steam	C 2-2500 lbs. Steam	D 1-5000 lbs. Steam	E 1-Small Upsetter	F 1-Large Upsetter
1	Boiler fuel and water ...	747.55		164.46	261.64	321.45		
2	Electric power	195.58	84.10	5.87	9.78	11.73	27.38	56.72
3	Material purchases	1553.47	372.83	201.95	310.69	357.30	93.21	217.49
4	Insurance and taxes	121.64	29.19	15.81	24.33	27.98	7.30	17.03
5	Furnace fuel	875.04	219.14	122.50	253.50	139.90	61.25	78.75
6	Int., disc. and pref. div...	735.72	103.00	88.30	242.70	184.00	44.15	73.57
7	Office expense	812.61	105.70	97.50	276.20	203.20	48.75	81.26
	Totals.....	5041.61	913.96	696.39	1378.84	1245.56	282.04	524.82

TABLE IV.—DIE ROOM MATERIAL, LABOR AND OVERHEAD ITEMS AS CHARGED TO MACHINE GROUPS.

Die material	601.77	132.39	108.32	186.55	108.32	24.07	42.12
Die labor	1024.86	225.48	184.47	317.71	184.47	40.99	71.74
Overhead	1281.07	281.85	230.59	397.13	230.59	51.24	89.67
Totals.....	2907.70	639.72	523.38	901.39	523.38	116.30	203.53

sonable division. It is interesting to know that the sum total of the monthly charges for trucking when plotted against the monthly output of the plant are found to vary directly with the latter, which would indicate that the basis of division is theoretically correct.

Charging of foremen's time on the basis of weight of output may be open to some argument, but a study of table I. would indicate that this is probably the most logical method of handling this item. A division on the basis of value of output would produce about the same result.

The division of inspection on the basis of weight and number of pieces of output is used rather than a basis of either weight or pieces alone. The former would place too great a burden on the large hammers, and the latter method would swamp the swift board hammers. An average of the two would, therefore, seem to be better.

Apportioning the boiler room labor and the steam-fitters' time on the basis of the steam consumption of the various units would be open to little argument. The same remark applies to the division of electrical power consumption. Oiling being required by both steam and electrically driven units, was divided on the basis of the average of the two. Sweeping and watching were apportioned on the basis of floor space. Under the heading of asset value are a number of non-productive activities, no one of which are comparatively large. It is probable that some of these activities could be divided on a more theoretically correct basis, but the amount involved is too small to justify the additional labor.

Non-Productive Purchase and Expense Items.

We will next consider the second class of overhead charges which include all office expenses and the great number of overhead material purchases and expenses of all sorts. These are tabulated in the same manner as were the non-productive items, namely on the basis of the method of charging them against the various groups of equipment.

Steam Consumption.

Coal or other fuel used in boilers.
Water for boilers.

Electric Power Consumption.

Electric power bill.

Asset Value.

Material purchases.
Insurance and taxes.

Furnace Fuel Consumption.

Fuel oil or gas for heating furnaces.

Value of Output.

Interest, discount and preferred dividend.
Offices expenses.

TABLE V.—DEPRECIATION AS CHARGED TO MACHINE GROUPS.

Per month	1046.14	251.07	136.00	209.23	240.61	62.77	146.46

Referring to the above the division of boiler fuel and watercharges among the hammers on the basis of their steam consumption is a logical one. The apportionment of the cost for electric power on the basis of the actual power used per group is also theoretically correct..

The charge for non-productive material purchases and miscellaneous expenses is the most difficult one to apportion properly. It includes a multitude of miscellaneous purchases and expenses, such as:

Shop supplies of all kinds.
Office supplies.
Hand tools and perishable tools.
Oil, waste, compounds, gasoline, etc.
Repair parts.
Advertising and travelling expenses.
Telegrams and telegraph charges.
Company trucking.
Trucking by other companies.
Express charges.

The basis of division used for these expenses is open to discussion. Wherever it is possible to do so, individual purchases are charged directly to the proper group. A new cylinder, for example, purchased for a 5,000 lb. hammer, is charged directly to group D. After all possible charges, which may be handled in a direct manner are thus made. the balance is divided on the basis of the asset value of the equipment. Insurance and taxes are also divided on the basis of asset value.

The fuel oil or gas used in the furnaces is apportioned on the basis of the amount of fuel used by the furnaces of each group. To be sure the amounts will vary with pieces of different weights, but an average may be found which will be sufficiently accurate for all cases within one group.

Interest, discount and preferred dividend are apportioned on the basis of the value of the output. These are fundamentally borrowing charges and depend on the amount of money tied up on a forging, whether that money has been expended for material, labor or overhead. The office expenses are also divided on this basis as this seems a fairer basis than either weight or an average of these two would be.

Die Room Charges.

We have scrupulously refrained thus far from any discussion of the die room. As mentioned before, the general overhead for the entire plant is first divided among the forge shop proper, the die room, and perhaps other allied departments. The actual die room overhead, is therefore, known. The value of new die blocks used per month and the die room labor charge for the month can also be found.

There is a great diversity of opinion as to the proper method of handling these die room charges. When a forge man accepts an order for a new piece, the customer is usually obliged to pay a die charge. If the order is a large one, or if there are repeat orders, new dies must later be made up, and these additional dies are made up at the expense of the forge man. The first dies really represent insurance on the part of the Forge Company against a cancellation of the order. After this first order is completed, or after the first set of dies is worn out, the forge man usually feels that he can trust his customer sufficiently to make further dies.

If a forge man will keep track of the actual dollars and cents received for new dies during the month and compare that with the charges against the die room for material, labor and overhead, it will be seen that the amount of cash received any one month is relatively small. This is particularly true in large shops with only a few customers who give big repeat orders. The writer feels the only safe way to handle the die room is to charge its entire expense for material, labor and overhead. directly against the forge shop itself. Undernoted are shown the die room charges, and the basis according to which they are apportioned among the machine groups. The basis of division used is dependent upon the actual die material and die labor cost of the dies for each group.

Die Costs.

Die room material; die room labor; die room overhead.

Depreciation Charge.

There is another item which must be considered in properly determining the

TABLE VI.—OVERHEAD SUMMARY.

	A 5-Board Hammers 1280 Hours				B 2-1500 Lbs. Steam Hammers 517 Hours				C 2-2500 Lbs. Steam Hammers 520 Hours			
	Amount	Total	Rate per Hour	Total Rate	Amount	Total	Rate per Hour	Total Rate	Amount	Total	Rate per Hour	Total Rate
Non-productive labor	$ 501	$ 501	$0.39	$0.39	$344	$ 344	$0.67	$0.67	$ 689	$ 689	$1.32	$1.32
Expenses	914	1415	0.71	1.10	696	1040	1.35	2.02	1379	2068	2.65	3.97
Die material, labor and overhead	640	2055	0.50	1.60	523	1563	1.01	3.03	901	2969	1.73	5.70
Depreciation	251	2306	0.20	1.80	136	1699	0.26	3.29	209	3178	0.40	6.10

	D 1-5000 Lbs. Steam Hammer 260 Hours				E 1-Small Upsetter 225 Hours				F 1-Large Upsetter 200 Hours			
	Amount	Total	Rate per Hour	Total Rate	Amount	Total	Rate per Hour	Total Rate	Amount	Total	Rate per Hour	Total Rate
Non-productive labor	$ 505	$ 505	$1.94	$1.94	$140	$ 140	$0.62	$0.62	$ 258	$ 258	$1.29	$1.29
Expenses	1246	1751	4.80	6.74	282	422	1.25	1.87	525	783	2.63	3.92
Die material, labor and overhead	523	2274	2.01	8.75	116	538	0.52	2.39	204	987	1.02	4.94
Depreciation	241	2515	0.93	9.68	63	601	0.28	2.67	146	1133	0.73	5.67

hammer-hour overhead rate, and that is the depreciation charge. The depreciation charge is the depreciation charge against the entire factory. The hammer shop should carry the entire charge, as it is the only producer of an output which is sold. The value used was obtained by employing rates of depreciation recommended by a reliable firm of public accountants. This charge was divided among the various groups on the basis of their asset value.

Referring to Table I, it is probably interesting to know the manner in which the various percentages given there were determined. The methods were simple and can be used by any plant. It is is doubtless true that the actual percentages may vary with different plants, but when the final results are obtained, they will probably not vary considerably.

Percentages for weight and number of pieces were determined by carefully tabulating a year's forging reports which showed the daily weight output and piece output of each group.

The steam consumption percentages were determined theoretically, the percentage being based on cylinder sizes with slight additions in the case of the smaller hammers to compensate for the more rapid cooling of the cylinders.

The electric power consumption percentages were determined by meter measurements. The power used by the trimming presses of each group was charged against that group.

The floor space allotted to each unit was not the actual floor space occupied by the unit alone, but by the unit and its tributary press and furnace.

The asset value for the machinery was taken from the company's records and from information obtained from the manufacturers of hammers and upsetters. Particular care was taken to be sure the prices were all for the same date. The varying prices of units during the past year or two would have produced very contradictory results if this care had not been taken.

The furnace percentage charges were obtained from a series of heating tests conducted on the furnaces of each group.

The value of the output was determined by tabulating in groups the value of the production as shown by a year's forging reports.

The percentages which were used to apportion the die room material, labor and overhead, represents an average of two preliminary sets of percentages. The first set of percentages was based on the value of the die blocks used by each group of hammers for a definite period of time, and the second set was based on the die room labor expended on the dies used by each group of hammers for the same period of time.

The forge department's records were consulted and one entire season's work was tabulated and arranged according to the group of machinery in which the work was done. A study was then made of the pieces in each group with a view of determining the average size of the die blocks used by each group. A study was next made of the number of the average impressions per set of blocks and the average number of pieces made per impression. Knowing the value of the steel contained in these die blocks, the die block steel cost per piece was determined, and finally the cost per hour for die blocks was obtained, using the average number of pieces made per hour and the unit of that group as a basis.

In the same manner the die room labor was tabulated and arranged for one season's production according to the group in which the work was done. These calculations are really not as complicated as they look, and any shop can obtain the results with a, comparatively speaking, small amount of figuring. The percentages obtained by each of these methods were very nearly the same. As stated before, the percentages given in Table I. were obtained by averaging these two preliminary sets.

We have now considered all of the proper charges which enter into the computation of a system of hammer-hour overhead rates. We first showed the methods used for obtaining the amounts of these various items of overhead. We then apportioned among different groups these various charges in the case of an hypothetical shop consisting of six groups of different units. We have discussed in detail the basis of division of each of these and the methods by means

TABLE VII.—SAMPLE COST FIGURED WITH HAMMER HOUR BASIS AND PERCENTAGE BASIS.

	Hammer Hour System	Percentage System
Material	16.12	16.12
Productive labor	2.40	2.40
Overhead	20.34	7.20
	38.86	25.72

of which these percentages were determined. We will now consider actual figures.

A set of figures has been made up for this hypothetical shop, using as a basis data collected by the writer for different types of equipment during the several years back. It is probable that figures of this character will vary with the different shops, but the final results obtained should not vary greatly.

Table II. shows non-productive labor items as charged against the machine group on the basis of the percentages given in Table I.

Table III. shows the non-productive purchase and expense items charged against the machine group on the basis of the percentages given in Table I.

Table IV. shows the die room expenses charged against the machine groups on the basis of the percentages given in Table I.

Table V. shows the depreciation charged against the machine groups on the basis of the percentages given in Table I.

Tables II. to V., inclusive, should be perfectly clear, and anyone who wishes to check any of the figures can do so by obtaining the proper percentages in each case for Table I.

Table VI. is the final summing up of the data contained in Tables II. to V. inclusive. In order to simplify the figures, only dollars have been considered.

This tabulation shows the six different groups, the number of units in each group, the character of those units, and the total number of hours the hammers in each group operated. As stated before, the period of time under consideration would have made possible a total of three hundred and thirty hours per unit. From this it can be seen that the average efficiency of the equipment under question from a time standpoint was about 80 per cent. This is probably as high a percentage as can be obtained when a shop is operating both day and night.

The information is so tabulated that it is possible to see not only the total hammer-hour charge, but the effect that each of the four major non-productive activities has on this total hammer-hour rate. For example, the hammer-hour rate developed for the board hammer is $1.80; of this, 39c is accounted for by non-productive labor. It is possible to go back still further and to note that in Table II. under non-productive labor, there is an amount of $117.56 charged against repairs to machinery in the grand total of $501, and debited to non-productive labor for board hammers. This indicates that 9c of the 39c charged to non-productive labor is chargeable directly to repairs to machinery. A careful analysis in this manner of all of the larger charges which go to make up the total hammer-hour rate should make it possible to effect economies in any shop.

Referring to Tables II. to V., inclusive, it will be noted that the sum total of the overhead charged against the forge shop proper was $11,432.90. The productive labor for this period of time was $3,800.00, which would produce a shop overhead, figured according to the old method, of 300 per cent.

We will now consider a definite piece, and figure the cost of same by means of the hammer-hour rate system and the percentage system with a view to noting whether there is any difference in the final results. This example is taken from an actual piece—an eyebolt weighing eight pounds, forged in the writer's factory. The costs of this part per hundred pieces are shown in Table VIII.

The material and labor charges are, of course, the same in both instances. The overhead in the case of the hammer-hour system was figured on the basis of a production of 270 pieces, made in nine hours in a 2,500 lb. steam hammer, the hammer hour rate of which was $6.10 per hour. The overhead in the case of the percentage system was obtained by using a 300 per cent. overhead.

The writer has always maintained, that whereas a certain piece of apparatus may cost $2.00 an hour to operate in a certain shop, the very same piece of apparatus may cost $3.00 an hour to operate in another shop, or vice versa. This means that a certain forging may have a different cost in every factory, and that these costs may differ due to natural causes and not due to inefficiency or improper methods.

NEW METHOD OF ARTIFICIALLY LOADING GENERATORS FOR TEST.

IN making tests on hydro-electric plants, it is quite frequently found necessary to provide artificial loads for the generators, says a writer in *The General Electric Review*. In such cases it has been the general practice to use a liquid rheostat formed by placing the electrodes in either the forebay or the tailrace, according to convenience, or sometimes in a special tank with salt solution. Such an apparatus, besides having numerous troubles of its own, produces only a unity power-factor load; whereas the majority of generators are designed for operation at about 0.8 power-factor.

A scheme free from the objections to the liquid rheostat method was first made public in a paper on the Huronian Co. Power Development by Robert A. Ross and Henry Holgate, read before a joint meeting of the Mechanical and Electrical Sections of the Canadian Society of Civil Engineers, April 25, 1907. Since then the method has been used a number of times in various tests by R. A. Ross & Co., consulting and supervising enginers, of Montreal. Through the courtesy of J. Norman Smith, chief engineer of that company, the writer has been given the most important details from its experience; and these are now published for the benefit of any who may desire to use this method.

This same scheme was independently originated and successfully used by O. H. Ensign, Chief Engineer of the United States Reclamation Service, in testing the generators at the Cross Cut Hydro-electric Station, Salt River Project. With these exceptions, this method of loading generators does not seem to be as generally known as its merits justify.

The scheme is exceedingly simple, and consists merely in connecting another generator (when one is available), to the machine under test, with one phase reversed, so that the load generator runs in the opposite direction of rotation as a synchronous motor. When both machines are up to speed and are excited to full voltage, the gates of the wheel which is motoring are gradually opened until the required load is obtained, the wheel in this case acting as a water brake. The generator and motor fields may now be varied to produce any power-factor and voltage desired.

The following instructions prepared by R. A. Ross & Co. for the guidance of their men are of interest:

Instructions for Running Water-Wheel Generator-Motor Test

1—Transpose any two legs of the motor leads (this will reverse the direction of rotation of the motor; see Fig. 1. Say place B in A and A in B on the motor leads).

2—Close the main generator switches connecting the generator and the motor electrically together.

3—Excite both the generator and the motor.

4—Admit water to the generator wheel only, until both machines are turning over.

5—Note that the motor is operating in the reverse direction to that which it would operate as a generator.

6—Raise the voltage and the speed of the generator to normal by operating its field rheostat and by admitting water to the generator wheel.

7—Admit water slowly to the motor water-wheel to act as a brake, as required, to secure any desired load on the generator up to its wheel capacity.

8—Vary the field excitation on the generator and the motor to secure any desired power-factor.

9—The generator instruments will indicate the output of the generator; the instruments on the motor need not be taken into consideration.

10—If the exciters are directly connected to each generator and one exciter is not sufficient to excite the two machines, it will be necessary to reverse the exciter connection on the motor exciter to suit the reversal of direction of rotation.

11—The governor mechanism should be disconnected from the motor, as it might be damaged by reversal of rotation, but an operator should be in attendance, to shut off the water to this wheel, in case of the circuit opening to the motor, when the water passing into the motor water-wheel would stop same, and reverse direction of rotation, causing it to speed up rapidly and possibly run away.

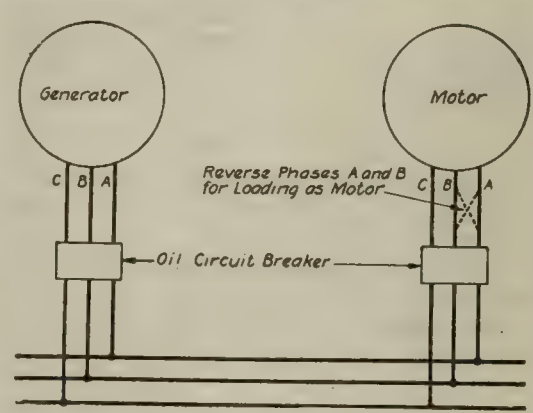


FIG. 1

12—By actual operating conditions it has been found that quite a small gate opening on the motor water-wheel is all that is necessary to produce full load on the generator under test.

Troubles Experienced

A few of the troubles experienced by others are noteworthy. One most important point is to have the draught tube of the motoring unit filled with water before attempting to start; otherwise the hunting and surges set up by the wheel revolving against a load which is intermittent rather than steady may trip the oil circuit-breakers, or cause the machine to break from it. synchronism. On starting, the motoring unit cannot be started from its own wheel, as it would then run in the wrong direction. Usually two duplicate machines can be started together from rest, as described in the foregoing instructions; viz., by exciting both fields, connecting the armatures together, and admitting water to the generator wheel until it starts. The low-frequency currents produced in the generator armature will then drag along the field of the motoring unit and the two machines will run in synchronism from the start.

Trouble may occasionally be encountered due to high static friction in the bearing of one or both machines. This would necessitate opening the generator wheel-gate so wide, in order to "break it from rest," that the resultant large amount of water would cause the generator to accelerate too rapidly and it would break from synchronism with the motor. This may be overcome, in some cases, by starting the machine as a plain induction motor; i.e., by not exciting the motor field until it is partly up to speed. If this is not successful, the gates of both units may be opend just enough to start them turning over, **without** switching them together. As soon as the units start revolving, the gates should be closed and field applied to whichever unit is necessary to make them come to rest **at the same instant.** Just before they stop they should be switched together, fields applied to both machines, and the generator gate opened until they start together. This procedure will eliminate the high static bearing friction and no difficulty should then be experienced in geting started.

It is doubtful if much trouble will be encountered with horizontal units; but vertical machines, especially those equipped with Kingsbury or plate-type thrust bearings, are likely to be obstinate. It should be particularly noted that Kingsbury bearings are usually designed for **one direction of rotation only,** and some care must be taken when applying the test herein described to machines equipped with them.

The question may be raised as to what effect this method of testing will have on the water-wheels; whether impelling them directly against the flow of water will not result in strains and distortions that may be injurious. The writer has referred this subject to a number of the most prominent water-wheel builders in the United States, and very few have cared to make any very definite statements on this point. The consensus of opinion, however, seems to be that there is little question of harmful stresses in high-head wheels, but there may be some doubt as to low-head units. The writer would recommend conferring with the water-wheel builders in each individual case where this method of test is being considered. It is believed that when this method shall have become better known and more generally used, wheel builders will be less conservative about approving

Merits of Some Recent Developments in Air Pump Design*

By E. Jones

In this paper there are discussed the merits of some of the more recent developments pertaining to a piece of equipment installed in most power stations. An air pump is a very essential part of the condensing plant, without which any of our modern steam-operated power stations or, indeed, any machines used for the generation of power, employing steam as the working fluid, would be practically of no value except for very small units.

It may be advisable at the outset to run very briefly over the various types of condensing plant at present in use, in order to arrive at the cause of inventors turning their attention to the design of new types of air pumps. There are five types of condenser, viz., evaporative, ejector, barometric, jet, and surface.

Evaporative Condenser

Evaporative condensers are expensive because of the large cooling surface required to condense the steam, and are only adopted when it is almost impossible to obtain water which can be utilized for cooling purposes. Steam flows inside of the tubes, which are grouped together in sections, and all joined up to the header pipes or steam mains. Cooling is obtained by air, and the radiation effects caused by allowing a stream of water to continually pass over the tubes. There are a great many joints in the apparatus which tend to make this type of condenser unsuitable for modern requirements.

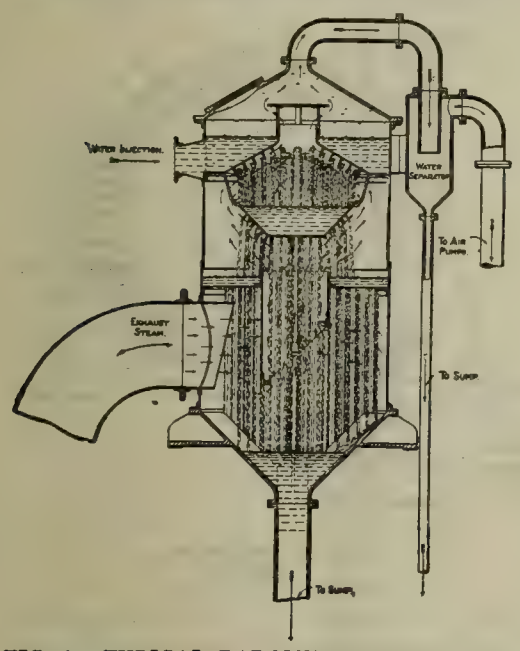


FIG. 1. TYPICAL BAROMETRIC JET PLANT.

Ejector Condenser

The ejector condenser deals with the steam and air without the use of an air pump. The steam to be condensed is delivered into the condenser body, which is fitted with a specially designed series of nozzles. The cooling water enters under pressure at the top of these nozzles, condensing the steam and entraining the air and incondensable gases, the whole passing down the discharge pipe. Despite the simplicity of these condensers, they do not appear to have found general favor.

The foregoing types would appear to be still in the embryo stage, and open up large fields for further investigation.

Barometric Condenser

The barometric condenser is, of course, a jet condenser, in which the cycle of operations of the cooling water is just the reverse of the cycle used in the low-level jet plant—that is to say, the cooling water is pumped into the condenser and flows away by gravity down the tail pipe. It is, therefore, necessary to place this condenser at a height above the level of the water in the outlet sump, equal at least to the height of the water column which could be supported by the vacuum plus a marginal head of at least 3 ft. or 4 ft., to allow for pipe friction and to cause flow of the water. This very often means that the condenser has to be placed on the top of a building, or on a staging specially erected to accommodate it at the required height. Occasionally cases crop up where a barometric plant can be installed at the ground level of the engine room, but this means that the cooling water is at a level of at least 34 ft. below, and, therefore, if the pumping plant is of the centrifugal type, it is necessary to have a pump house considerably nearer the cooling water level, which means that the plant is not compact or self-contained. This is a decided disadvantage. Another point which does not tend to add favor to the barometric plant when placed at a distance above the exhaust branch of the prime mover is the long length of exhaust steam main, which is not only expensive, but often a source of trouble, due to the greater number of joints, which have to be kept perfectly air-tight.

Low Level Jet and Surface Condensers

It is chiefly for these reasons that the barometric jet-condensing plant has been superseded by the low-level jet plant. At the present time the majority of condensing installations are either of the jet or surface type, and the choice generally depends on local conditions and sometimes by the amount of money available for the scheme on hand. With the low-level type of jet plant, the cooling water is drawn into the condenser which is under vacuum. The water and steam mix freely, and the latter is condensed, and the cooling water and condensate are extracted from the condenser by means of a pump which is invariably, as far as the writer's experience goes, of the centrifugal type, specially designed to meet the requirements of drawing water from a space under a very low absolute pressure and discharging at atmospheric pressure or against an external head. The air and gases which are not liquefiable under the conditions obtaining in the condenser, are dealt with by some type of dry air pump. The advantages of this type of plant over the barometric jet plant are that it can be placed immediately below the turbine, thereby reducing the possibility of air leaks. The whole equipment is self-contained and compact, and can be operated and regulated at very short notice by the engine-room attendant. Fig. 1 and 2, show a typical barmetric jet plant and low level multiple jet plant of the Leblanc type.

Surface Condenser for Marine Work

Perhaps the most important type of condensing plant is the surface condenser, inasmuch as it is used almost invariably for marine installations, and in a lesser degree for large power units, the reason for this being that the condensate is an important item, as it supplies a source of excellent boiler feed-water and also under the same external conditions, the power required to operate a surface condensing plant is generally less than for a jet plant. The design of modern

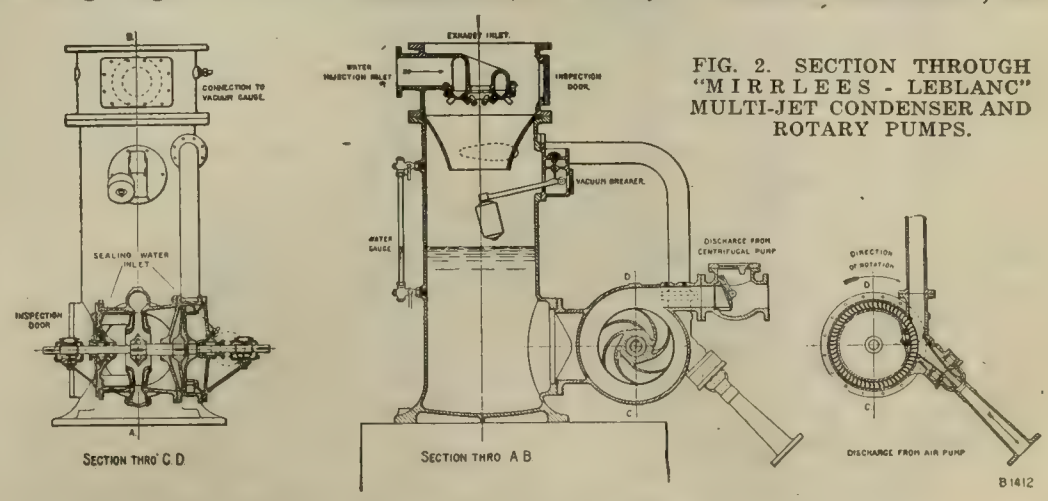


FIG. 2. SECTION THROUGH "MIRRLEES - LEBLANC" MULTI-JET CONDENSER AND ROTARY PUMPS.

*From a paper read recently before the Institution of Engineers and Shipbuilders, Glasgow, Scotland.

surface condensers, as far as the condenser itself is concerned, has not changed materially for the last 30 years or so, so that there is no need to go further into details on this point. The cooling water is usually supplied by means of a centrifugal pump, except in cases where a syphonic action can be utilized or where the existing pumping plant is capable of taking care of the requirements of the condenser. A condensate pump is necessary to deliver the condensate from the condenser to the boiler feed-tank, and a dry air-pump to deal with the air and unliquefiable gases which find their way to the condenser. Alternately, an Edwards air pump can be adopted to deal with both the condensate and air. If the disposition of the various parts of the installation demand it, a hot-well will also be required. The above table may be of interest in noting the relative costs and requirements of the last three types of condensers which have been considered.

Type of plant.	Consisting of—	Approximate net weight of apparatus.	H.P. required to drive condenser and auxiliaries.	Present day costs.	Equivalent ratio.
Barometric.	Condenser, staging, air-pump, injection pump, driving motor, switchgear, air and tail piping, main-exhaust piping and sluice valve, auto-exhaust valve. Complete erection.	40 tons.	89 B.H.P.	£2,700	1·286
Low-level jet.	Condenser, water-extraction and air-pumps, driving motor, switchgear, main sluice-valve, adapting and expansion pieces, auto-exhaust valve. Complete erection.	22 tons.	87 B.H.P.	£2,100	1·00
Surface.	Condenser, rotary air-pump, extraction pump and circulating pump mounted on common bedplate with driving motor and switchgear. Necessary interconnecting pipes, main exhaust steam-sluice-valve, expansion piece, adapting piece, automatic atmospheric-valve. Complete erection.	30 tons.	78 B.H.P.	£3,300	1·571

FIG. 2a. RELATIVE COSTS AND REQUIREMENTS OF THE FOREGOING THREE TYPES OF CONDENSERS.

The conditions which have been assumed are the same for each case, and are as follows:—Steam quantity, 40,000 lbs. per hour, vacuum 28½ inches (barometer 30 inches)—95 per cent. of the barometer, cooling water 60 deg. Fah., prime mover, high pressure steam turbine. For the barometric plant, .25 inch has been added to the vacuum to allow for the drop between the turbine-exhaust flange and the condenser. It should be noticed here that under the present abnormal conditions, surface condensers are in a practically unfortunate position, owing to the cost of the materials used for the tubes and tube plates, which is approximately 27½ per cent. of the value of the whole equipment. The price of tubes to-day is 38 cents per lb., whereas, in 1914, just prior to the commencement of the war, the price was 15 cents per lb., so that the increase in the cost of tubes is 240 per cent., and the increase in the cost of plates is approximately the same. Therefore, if times were normal, surface-condensing equipment would appear in a much better light, and although it is not proposed to suggest an accurate figure for surface plant with tubes at 15 cents, it is clear that a reduction of from $2,500 to $3,000 should be possible in the case given above. This would bring the cost ratio of the surface plant, when compared with a multi-jet plant, from 1.57 to about 1.3.

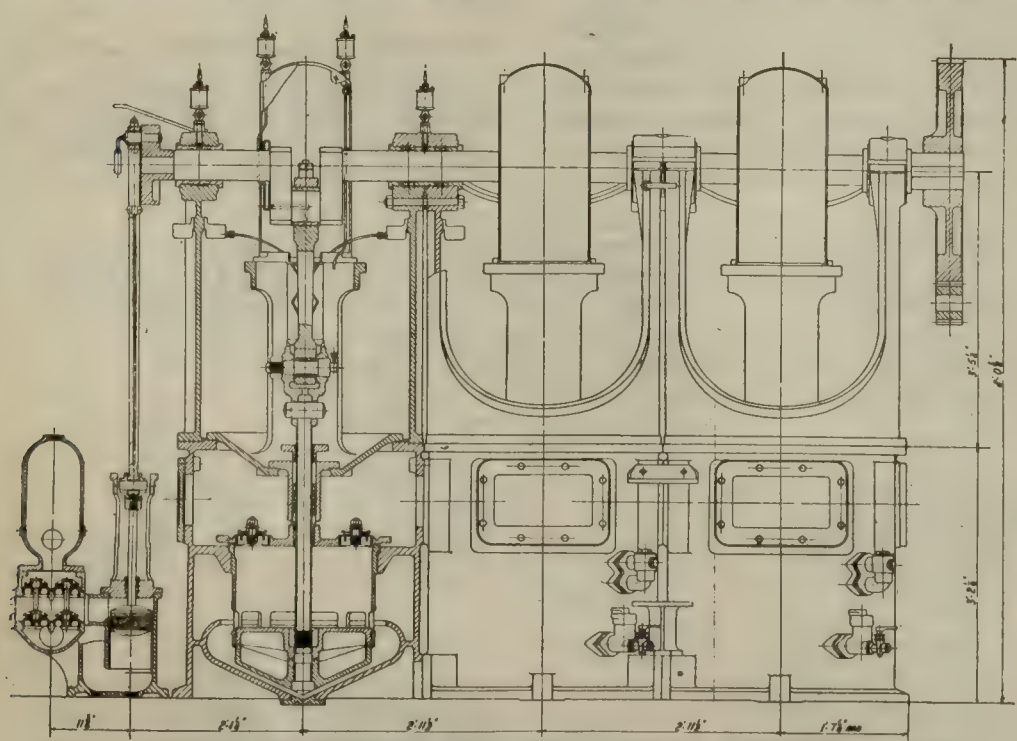


FIG. 3. SURFACE CONDENSING EQUIPMENT SHOWING SECTION THROUGH "EDWARDS" AIR PUMP.

With the earliest types of surface condensing equipment, it was usual to use one pump for removing both the condensate and air from the condenser. This pump was known as a "wet" air pump, and a good example of this type is the Edwards air-pump, one of the most efficient of its class. It is shown in section in Fig.3. The chief advantages of this type of pump are:—Low power required for driving; positive action and consequent stability; ability to cope with excessive air leakages. While the Edwards pump is still an excellent pump for units up to,say, from 3,000 to 4,000 k.w., it must be remembered that, with the ever-growing size of power units, its disadvantages should be kept in view. For large units with Edwards pumps, it is necessary that they should run at a very low speed, and consequently they are very cumbersome, and take up a large amount of floor space. With jet plants, the Edwards pump is sometimes used as a dry air-pump. It is necessary, of course, to provide a small quantity of water for sealing purposes. Volumetric efficiency in this pump varies considerably with the degree of vacuum required, and decreases as the vacuum increases from about 50 per cent. at 3½ inches absolute pressure to 18 per cent. at 1 inch absolute pressure.

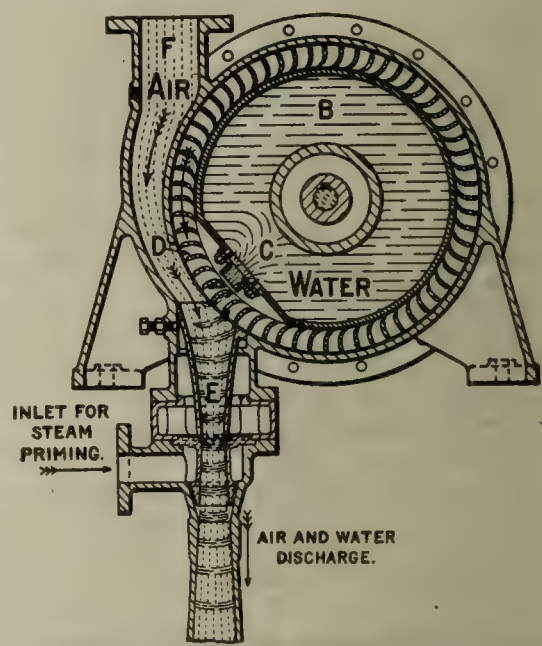


FIG. 4. "LEBLANC" ROTARY DRY AIR PUMP.

Dry Air Reciprocating Type Pump

Another system is that in which a dry air-pump of the reciprocating type is used to remove the air and uncondensed gases, and a separate pump to remove the condensate. The advantages and disadvantages of this system are the same as for the Edwards air pump, but the efficiency is rather better. Previous to the introduction of the steam turbine, condensing plant equipments were furnished with air pumps of one or other of the types mentioned above, but as soon as the turbine became a commercial pro-

position, it was necessary to look for a type of pump having features specially adapted to its requirements. With turbine installations, it is essential to use a high vacuum in the condenser, whereas

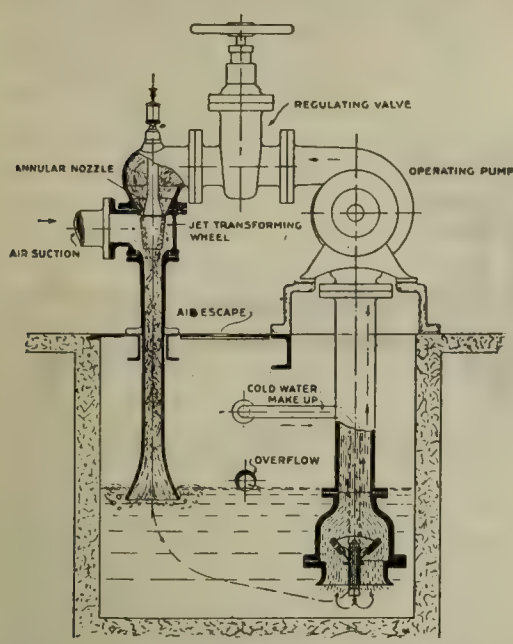


FIG. 5. HYDRAULIC VACUUM PUMP ON EJECTOR PRINCIPLE.

with steam engines of the reciprocating type a vacuum of more than 26½ inches was seldom required. In fact, it is questionable whether using a higher vacuum than 26½ inches would not be considered a disadvantage. With the turbine, however, a vacuum less than 27 inches is rarely asked for, and sometimes the specified figure is as high as 29.25 inches with the standard barometer reading of 30 inches.

In considering these figures, due allowance must be made for the altitude of the place. The most economical vacuum for a turbine installation depends on a variety of things, and each case has to be considered on its merits. On reference to steam tables it will be seen that an increase in vacuum from 27 inches to, say, 29 inches, other conditions as air leakage remaining the same, necessitates an increase in the capacity of the air pumps from 1.00 to 3.25, which for a large installation with Edwards or reciprocating dry air pumps is a very serious

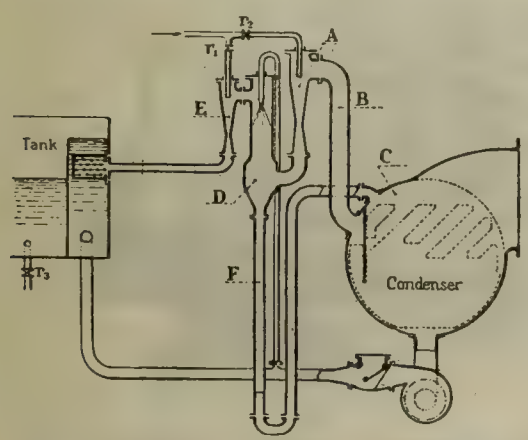


FIG. 6. EJECTOR AIR PUMP CONSISTING OF TWO EJECTORS WORKING IN SERIES.

matter. Hence it is that various types of rotary pumps, which are specially suitable for dealing with large volumes of air at low tension, have been designed since the adoption of the steam turbine, several of which have proved very successful. The general design of these pumps is much the same, in so far as they use a certain quantity of what is termed "operating water," for which various devices have been invented to cause this water to move in such a manner as to entrain the air from the condenser and discharge it to the atmosphere.

Leblanc Rotary Dry Air Pump

Perhaps one of the best known rotary dry air-pumps is the one invented by Prof. Maurice Leblanc. It has been used to a very large extent all over the world and its action is shown in Fig. 4. This pump is capable of maintaining a very high vacuum, and for this reason, coupled with the fact that it is very simple in construction and not likely to get out of order, it has been largely used

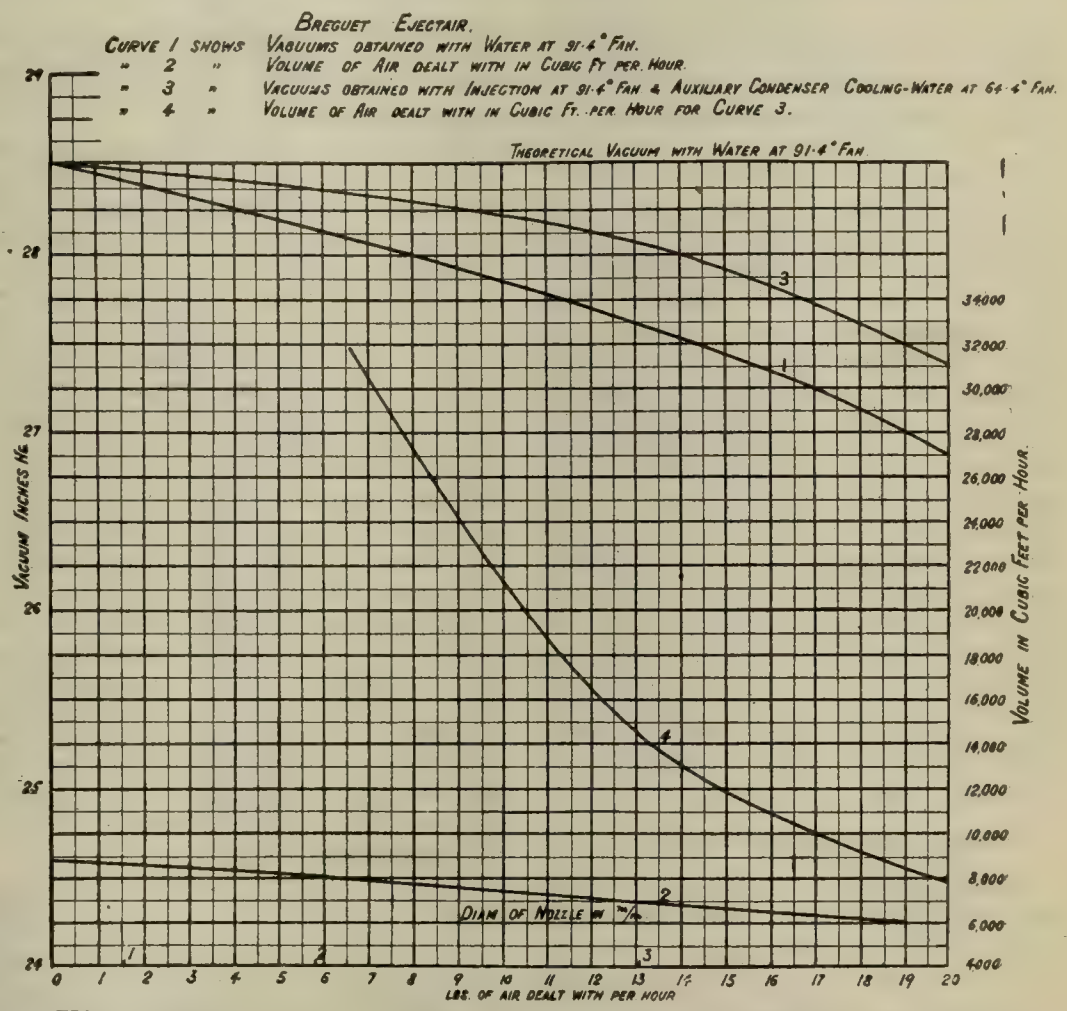


FIG. 7. PERFORMANCE DIAGRAM OF "EJECTAIR," OR EJECTOR AIR PUMP.

for turbine installations. It cannot be claimed for this pump—or indeed for any type of rotary air-pump—that it can successfully deal with an excessive air leakage, but consideration will show that this quality is not essential in the case of turbine installations where air leakage is reduced to a minimum by the adoption of steam or water-sealed glands where the shaft passes out of the turbine casing. With a surface-condensing plant, it is only possible for air to be brought into the system by the feed-water and carried over with the steam, or by leaking in at the joints. With jet plants, the air brought in with the injection water has to be allowed for in addition to the above, and it is for this reason that the air-pump on a jet plant requires to be larger than that for a surface-condensing plant doing the same steam duty.

The power required to drive these pumps is rather higher than that required for an Edwards or other good type of reciprocating air-pump, and consequently a good deal of attention has been paid recently to another type of pump which would incorporate the simplicity and compactness of the rotary pump and the low-power consumption of the Edwards and other reciprocating pumps. The general trend of thought seems to have been in one direction, and there are now on the market, and in commercial use, air-pumps operating on the ejector principle. Nearly all the leading condenser manufacturers now construct air-pumps of this description.

Worthington Hydraulic Vacuum Pump

The Worthington Pump Co. manufacture a patent hydraulic vacuum pump on the ejector principle, as illustrated in Fig. 5, which consists of the injection head, the air - suction chamber, the rotary wheel, and the throat and tail pipes. The operating water passes between two nozzle rings, and the cone of water passes between the body of the wheel and the outer sleeve, impinging on the inclined surfaces of the vanes, thus imparting a rotary motion to the wheel. To operate the pump, it is necessary to provide a certain amount of sealing water, which is supplied from a tank situated as convenient as possible to the pump. The sealing water takes up a certain amount of heat from the air and water vapors withdrawn by the air-pump, and a piping arrangement is provided for withdrawing a certain amount of this water by means of a by-pass connection on the operating pump discharge,

this by-pass being fitted with a controlling reflux valve. The quantity of water withdrawn in this manner is replaced by make-up water drawn from the circulating inlet piping or an independent supply, thus cooling the water used in the cycle of operation. This apparatus is doing regular service on one of the turbo-alternator groups at the Glasgow Corporation power station at St. Andrew's Cross. A number of installations have also been supplied to other concerns.

Willans-Muller Ejector Air Pump

Willans & Robinson, of Rugby, manufacture the Willans-Muller ejector air-pump, which is operated by the circulating water, either on the series or shunt system. With the series system, the whole of the circulating water passes through the ejector before entering the condenser. With the shunt system, only a portion of the cooling water passes through the ejector, which, after use, is returned to the pump suction or the source of supply. A third method of operating this ejector is by the separate pump system, in exactly the same manner as described with reference to the Worthington pump. The Glasgow Corporation have a set of this apparatus at work at Pinkston Power Station, and good results have been obtained, and a second set is just being installed at St. Andrew's Cross.

Hick, Hargreaves "Ejectair"

Another type of ejector air-pump is that manufactured by Hick, Hargreaves & Co., Bolton, under license from the Maison Breguet, Paris, which is really two ejectors working in series with an auxiliary condenser placed between the first and second stage of the ejectors. A number of these air-pumps, termed "Ejectairs," have been supplied or are under construction for the French navy. Referring to Fig. 6, it will be observed that the primary ejector is placed in direct communication with the main condenser, and extracts the aerated vapor, being operated by a single steam jet or nozzle. The mixture of steam and partly compressed vapor is then discharged to the auxiliary condenser, and the water returned to the main condenser to be dealt with by the extraction pump. The second stage ejector is coupled up to the auxiliary condenser, and draws the air away, discharging it to the feed-tank. An automatic air-inlet valve is fitted to the auxiliary condenser, to regulate the absolute pressure therein. It is claimed that taking air from the atmosphere in this manner materially assists the stability of the plant, and also renders it more flexible.

These ejectairs are designed for working with steam pressures at 55 lbs. per square inch or above, and, with a special arrangement of nozzles, lower pressures can be used in the primary ejector, although the advantage of this is not apparent if it is impossible to work the other ejector under the same conditions, neither is it clear whether this can be accomplished or not.

The curves, Fig. 7, show the performance of an ejectair. Steam to the ejectors had an absolute pressure of 125 lbs. per square inch, and the steam consumption is given as 194 lbs. per hour, of which 129 lbs. are recoverable. The apparatus, worked in conjunction wi a small jet condenser, dealing with 94 gallons of injection water per minute.

Curve 1 gives the vacuums obtained with water leaving the condenser at a temperature of 91.4° Fah. (33° C.), and the auxiliary condenser out of action; Curve 2 the volume of air dealt with in cubic feet per hour; Curve 3 the vacuums obtained with given air leaks, and the water leaving the main condenser as for Curve 1, but with the auxiliary condenser supplied with cooling-water at 66.2° Fah. (18° C.), and Curve 4 the volumes of air dealt with under the same conditions. It was caluculated that the air coming in with the injection-water and at leaky joints amounted to 1.102 lbs. per hour (.5 kg.).

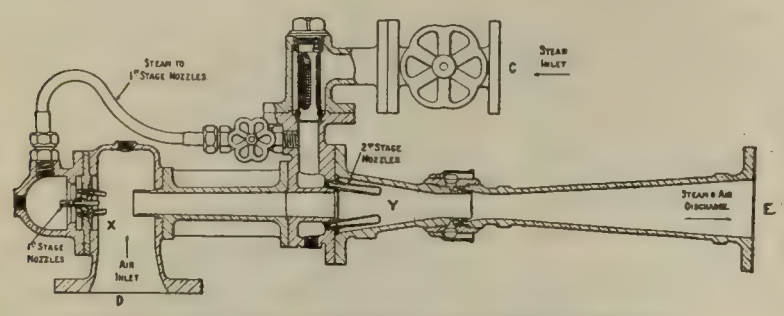


FIG. 8. "LEBLANC" EJECTOR AIR PUMP—SECTION 1.

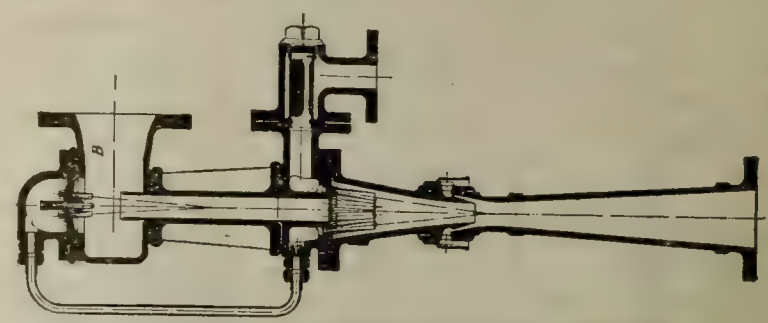


FIG. 9. "LEBLANC" EJECTOR AIR PUMP—SECTION 2.

Leblanc Ejector Air Pump

The British Westinghouse Electric & Mfg. Co., Manchester, and Mirriless Watson Co., Glasgow, manufacture an ejector air-pump, under license from the Societe Anonyme Westinghouse, Paris and Le Havre, which is another invention of Monsieur Maurice Leblanc. It is the outcome of many months of arduous research work, during which time innumerable difficulties were surmounted by the inventor, with the result that a really first-class ejector air-pump has been evolved. Figs. 8, 9 and 10 show the general layout of the apparatus. The pump is arranged to work in two stages, and the steam is admitted to the second stage of the ejector by opening the stop valve. Immediately it is opened, steam fills the annular space behind the nozzle plate, and finds its way into the throats of the group of nozzles attached to this plate; it then passes along the steam pipe which supplies the first-stage nozzles, which are also attached to a nozzle plate. The supply of steam in this set of nozzles is controlled by the stop valve on the steam-supply pipe. The pump is connected to the condenser at the branch, which is the air-inlet branch.

At the entrance to each of the steam spaces, fine wire-gauze strainers are fitted to prevent any foreign matter which may have primed over with the steam from the boilers, from entering the nozzles, thereby intercepting any stoppage in the nozzle throats, and consequently a loss of vacuum. These nozzles are efficiently locked to the nozzle plates. The mixture of air and steam is discharged at the mouth of the divergent cone, and led away to the boiler feed tank, so that the heat units contained in the operating steam can be reclaimed by heating the feed-water. To start the pump to work, it is only necessary to open up the steam valve, and the vacuum will at once commence to increase in the condenser or other vessel to be evacuated. When the vacuum gauge becomes sta-

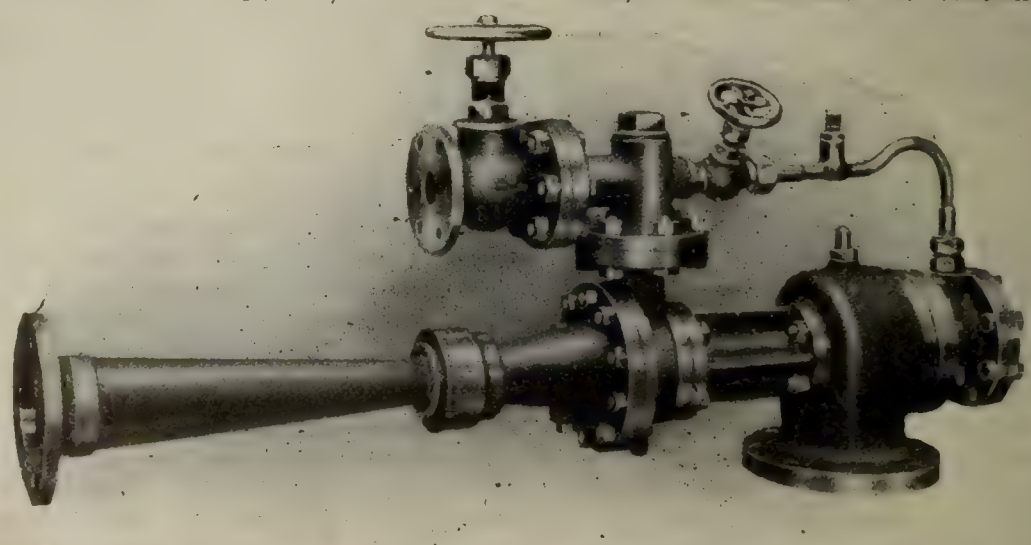


FIG. 10. "LEBLANC" EJECTOR AIR PUMP—EXTERIOR VIEW.

tionary, the second-stage steam-inlet valve is opened up to bring the vacuum to a maximum. A very important feature in this pump is the absence of moving parts. The simplicity of the apparatus is even more remarkable than that of the Leblanc rotary pump.

Advantages of Ejector Air Pump

The advantages claimed are as follow:—Extreme simplicity; the small amount of energy required for operating purposes; the high efficiency obtained; ease with which starting can be effected, and the small amount of attention required whilst at work; ability to produce the highest possible vacuums; stability. In scanning these claims we can pass over the first, which has already been mentioned and is obvious; there are simply two steam valves to open. The second deserves some consideration. The operating steam in passing through the nozzles decreases in pressure, and consequently in temperature, and also, after passing through the nozzles, does work in accelerating the velocity of the air, increasing its temperature and compressing it. There is also a small amount of heat lost, due to friction in passing through the diffuser portion of the ejector, which might be considered negligible. Beyond this, the whole of the heat in the steam can be utilized to heat up the boiler feed-water, and in order to obtain full benefit from the apparatus, it is highly desirable to use the discharge from the ejector for heating purposes of some description. Thus, both the steam and air can be made to do useful work. In view of this, it must not be forgotten that when an ejector of this type is specified as requiring so many pounds of operating steam per hour, this is only the apparent quantity, the actual quantity is really far less, since the great majority of heat units in the steam are still available for further work. The actual heat units recovered can easily be calculated from steam tables, since it is known that the steam and air leave the ejector at a pressure of from 10 to 12 lbs. per square inch by gauge.

Auxiliary Condenser Not Required

It will be observed that with a Leblanc multijector, an auxiliary condenser is not required, and in this respect it differs materially from the "Breguet" ejectair. The employment of an auxiliary condenser has the disadvantage that the total heat units of the steam used in the first-stage ejector, which amount to an appreciable percentage of the total heat units used on the whole apparatus, are dissipated and lost. The makers give this percentage as about 33. Another reason for dispensing with the auxiliary condenser will be apparent from the following:

In all steam-operated ejectors, one of the difficulties that have to be contended with is the fact that the steam leaves the nozzles at a velocity varying from about 3,000 to 3,600 feet per second, while the velocity of the fluid to be entrained is practically nil. This is the cause of considerable loss of efficiency in any ejector, but if an auxiliary condenser is used, the defect is doubled, because the velocity of the fluid to be entrained, which has been imparted to it by the operating steam during its passage through the first-stage ejector, is dissipated and lost as soon as it enters the condenser. The cooling water used on the auxiliary condenser has to be dealt with by the condensate pump, thus increasing the power absorbed by the plant. When working with surface condensers this water must be of good quality, as it has to be returned to the boilers.

The third claim relates to efficiency. It is well known that ordinary single-stage ejectors only work well when the compression ratio is as 1 : 7, and it is partly for this reason that the Breguet Co. have introduced the auxiliary condenser, so that the vacuum obtaining in this condenser is about 25.6 inches with the barometer at 30 inches, the compression being approximately as 11 : 76, or roughly, 1 : 7. The overall efficiency of this plant is, therefore, apparently still further reduced, because air is admitted from the atmosphere into the auxiliary condenser which is under a vacuum of 25.6 inches, and this, together with the air from the condenser, has also to be ejected by the secondary ejector to the atmosphere.

FIG. 11. STEAM NOZZLE DIAGRAM.

When Professor Leblanc set out to design his ejector he foresaw the possibility of using an intermediate condenser, but he also appreciated its disadvantages, and decided to do without it if at all possible. At the same time, he knew that it was essential to use two stages in order to get a stable and efficient ejector. With this end in view, certain steam nozzles were designed on the lines of the formulae of Professor Rateau, and the action of the steam issuing from these nozzles when under high vacuum was directly observed. The result is shown by Fig. 11. The steam issuing from the mouth of the nozzle expands and contracts alternately, ultimately assuming a section of constant area. It was found that a number of these nozzles grouped together gave far better results than a single nozzle of the same throat area as the group of nozzles.

Number and Size of Nozzles

The reason for this is to a large extent due to the fact that the alternate increasing and decreasing of the cross sectional area of the steam stream is minimized by the contact of one steam stream with the next, when groups of nozzles are employed, and this helps to considerably increase the surface available for the entrainment of the air and gases. This entrainment is carried on mainly by friction, and it will be seen that if an appreciable amount of gas has to be dealt with the frictional surface exposed to the gas has to be as large as possible. It is also inversely proportional to the density of the gas or fluid. The number and size of the nozzles depends entirely on the space available in the diffuser, and keeping within the limits of workshop practice.

The smallest number employed by the Mirrlees Watson Co. is three, each of which has a throat diameter of 1 mm. These are first-stage nozzles. On the largest size of pump, and in the second stage the number of nozzles is 30, and these have a throat diameter of 5.2 mm., when using operating steam at 90 lbs. per square inch. Professor Leblanc, in his paper of 1911 to L'Association Technique Maritime, says that "the operating steam entrains the air by friction. During entrainment it is the velocity of the steam which is utilized, and not its kinetic energy." Calling M the weight of operating steam used per second, V its velocity at the outlet of the nozzles, m the weight of air drawn in per second, and W the velocity of the mixture of air and steam, then—$MV = (M + m)\ W$.

The ratio of kinetic energy, $\frac{mW^2}{2}$ of the air drawn into the kinetic energy, $\frac{MV^2}{2}$, contained in the operating steam as it comes out of the nozzles, can, therefore, be stated as

$$\frac{m\,W^2}{M\,V^2} = \frac{m\,M}{(M+m)^2}$$

so that when $\frac{m}{M} = 1,\ \frac{1}{2},\ 1\text{-}3,\ \frac{1}{4},\ 1\text{-}5.$

$$\frac{m\,M}{(M+m)^2} = .25,\ .222,\ .187,\ .160,\ .139.$$

This shows that if the utilization of the kinetic energy is to be the basis of the design, then for maximum efficiency it is necessary to bring the ratio

$$\frac{\text{Air dealt with}}{\text{Operating steam used}}$$

as near to unity as possible.

M. Leblanc continues:—"We tried to diminish the loss of kinetic energy by producing at the entrance of the diffuser a higher vacuum than was necessary, so that the fluid drawn in came in contact with the operating steam with a considerable velocity. If the efficiency of the diffuser could be brought almost to unity, we could add considerably to the over-all efficiency, but this has been found to be impracticable. Following on this, it was suggested to use puffs of steam after the manner of steam coming out of locomotive chimneys, but the complications involved in making arrangements for stopping the inlet of air during each puff were such that it would have been easier to use a centrifugal compressor. Afterwards we tried to compensate for the bad efficiency due to frictional entrainment by transforming heat into kinetic energy in the nozzles. Superheating the operating steam, although so useful for turbine work, is, however, not good for an ejector, because it is more difficult to effect compression in the diffuser which outweighs the advantages obtained in the nozzles. The next scheme was to use hot water in the nozzles, but this likewise proved unsuccessful."

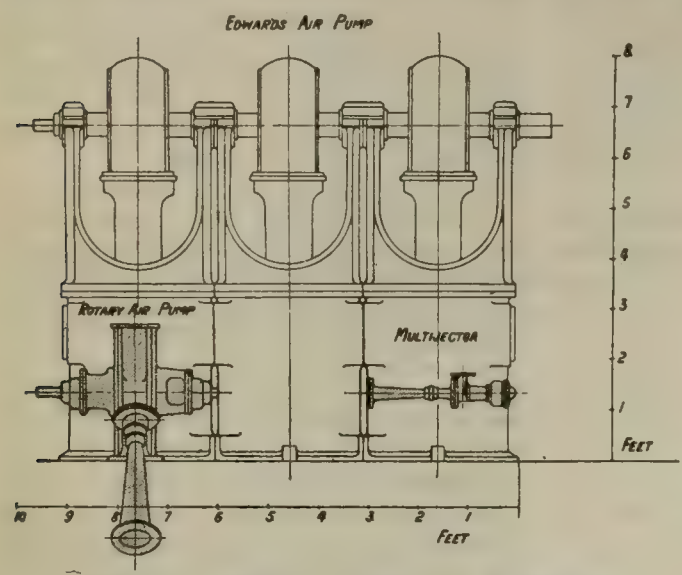


FIG. 12. RELATIVE SIZES OF "EDWARDS," ROTARY, AND MULTIJECTOR AIR PUMPS FOR SAME STEAM DUTY. WEIGHTS 20,832 LBS., 4,480 LBS., 97 LBS. RESPECTIVELY

Entrainment by Friction

After numerous other trials, it was decided that entrainment by friction was most economical, and various types of diffusers and different groupings of nozzles were experimented with, until the present ejector, as shown in Figs. 8, 9 and 10, was decided to be the most suited for condenser work. To go through the various stages in detail which led up to this design would take up too much time. With the form of ejector adopted, it has been found that the efficiency of the nozzle is on an average 85 per cent., whilst that of the diffuser is 70 per cent. It will be seen that this ejector agrees very well with the ideal ejector which Prof. Leblanc had in his mind. The first stage, which consists of a small group of nozzles, serves a triple purpose, inasmuch as it effects a certain amount of compression heats up the entrained air, and gives it considerable velocity, and consequently an increase in momentum. The second stage has a larger number of nozzles, and it is here where the major portion of the work is done, the air being compressed from approximately 26 inches vacuum up to something more than atmospheric pressure. To be more accurate, the steam used in the first stage is about 5 per cent. of the total.

High Vacuum Results

In support of the fourth advantage which this air-pump is supposed to possess, the following figures were obtained on the French torpedo-destroyer Boutefeu. The turbines were stopped, but steam was on the glands. The volume to be evacuated was about 635 cubic feet. After one minute, the vacuum was 6 5-16 inches, two minutes 15 inches, three minutes 22 13-16 inches, four minutes 25 9-16 inches, five minutes 26¾ inches, and six minutes 27 9-16 inches. The theoretical vacuum corresponding to the temperature of the water 67.1 deg. Fah., viz., 28¼ inches, was attained in 11 minutes. It was also arranged later to allow certain known air leakages to enter the condenser. With a 5 mm. nozzle which passes 36.2 lbs. of free air per hour, the vacuum dropped only ⅜ inch. With a 15 mm. nozzle, which is equivalent to 326 lbs. of air per hour, the vacuum was 21¼ inches. With an inch cock full open it took 11 minutes for the vacuum to fall to 12¼ inches, at which figure the mercury column remained steady. On closing the regulating valve below the nozzle,

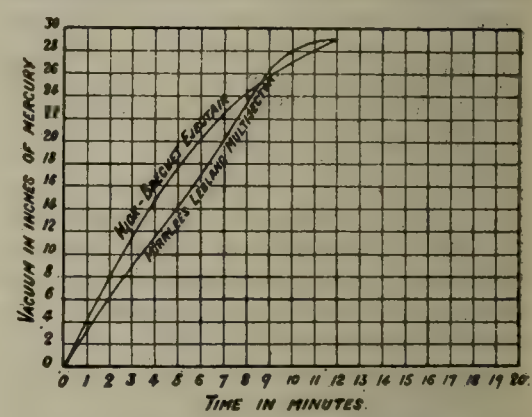


FIG. 14. DIAGRAM OF TIME TAKEN TO START UP A "HICK-BREGUET" EJECTAIR, AND A "MIRRLEES-LEBLANC" MULTIJECTOR.

the vacuum at once rose and attained the maximum almost immediately.

There is a central station near Glasgow where this type of apparatus is at work with a multi-jet condenser. Sometimes when changing machines they are liable to partially lose their water for a minute or so, but none of the staff ever have to trouble about the ejectors for, as soon as the water comes back again, the vacuum at once builds up, and the set is never shut down through failure of the air-pumps. As a matter of fact, in the case above stated, it is highly probable that during the period that the water supply to the condenser is very small, there is an air passage between the water spaces of the other condensers in the station and the multi-jet plant which would allow of a very excessive quantity of air getting into the condenser on load. This also shows that stability, the sixth claim, is another salient point.

That high vacuum can be obtained is proved by the fact that this apparatus is now being used in the French navy and mercantile marine, as well as on some land installations for refrigerating pur-

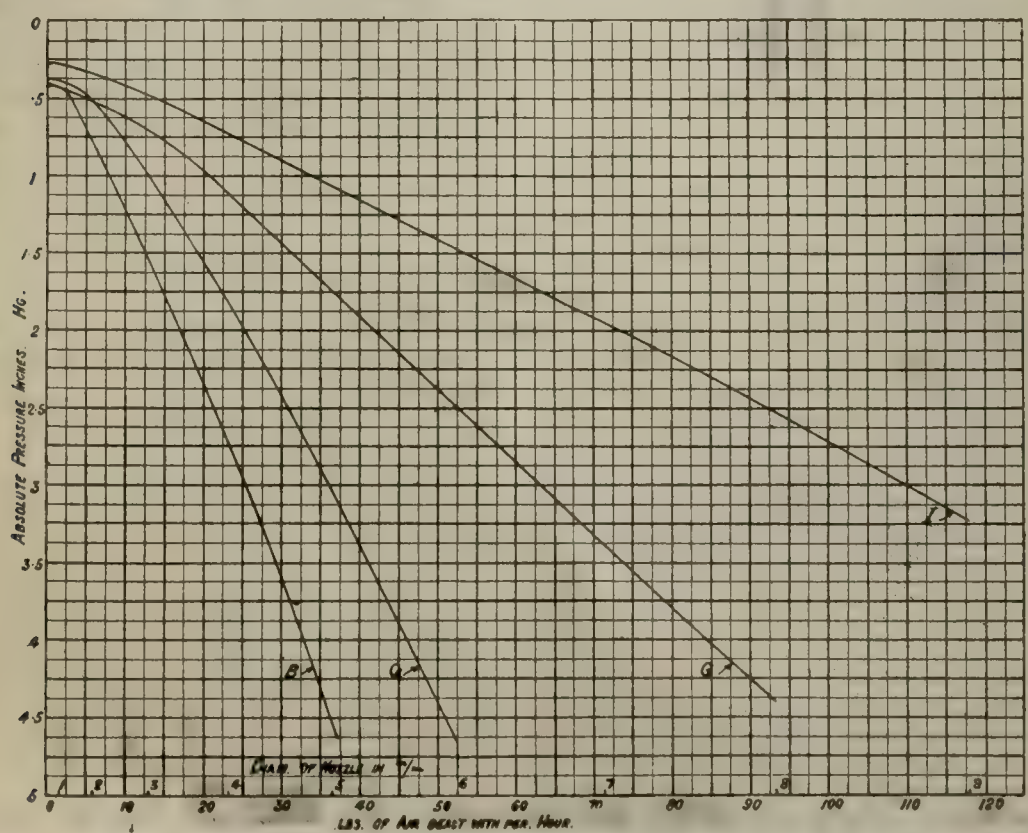


FIG. 13. AIR DEALING CAPACITY OF VARIOUS "MIRRLEES-LEBLANC" MULTIJECTORS.

poses, and installations are at work where the maximum vacuum obtained is within 1 mm. of the barometer. For condenser work the best results obtained so far by the French Westinghouse Co. are within 5 mm. of the barometer. From the foregoing remarks it would appear that this type of air-pump is ideal for use on board ship, and particularly in the navy, where space is so valuable and weight of such consideration. To illustrate this point, Fig. 12 has been produced, and represents to the same scale an Edwards' air pump, Leblanc rotary air pump, and Leblanc multijector for a steam duty on a surface condenser of 40,000 lbs. per hour, with water at 60 degs. The vacuum 28½ inches, and barometer 30 inches. The weights are approximately 20,832 lbs., 4,-480 lbs., and 97 lbs. respectively. For land work it is equally suitable, and will soon supersede the rotary pump in many power stations. For sugar refineries, chemical, and other allied works it should prove exceptionally attractive, and take the place of many reciprocating dry air-pumps, particularly as in such factories the exhaust steam can generally be utilized to the fullest advantage on other processes. It may be advisable to point out here that this pump is purely a dry air-pump, so that for surface condensers as additional water or condensate extraction pump is still required, and for jet plants, the usual extraction pump.

No. 18 M. J. Condensing Plant with motor-driven Water-Extracting Pump, 1-Size "G" and 1-Size "I" Multijector Air-Pump installed at the Scottish Central Electric Power Co., Ltd., Bonnybridge.

Duty—50,000 lbs. steam per hour.
Vacuum—28·5″ (Bar. 30″).
Injection Water—3,800 Galls. per min., Temp. 65° Fah.
Air-Pump Capacity—84 lbs. air per hour with guaranteed vacuum and water temperature.
Large Ejector to operate condenser alone on loads over ⅓ and up to ⅔ full load.
Small Ejector to work alone on loads of ⅓ full load and under.
Both Ejectors to work on loads over ⅔ full load.

Time.	Load.				Vacuum.		Barometer.	Steam Press. on Ejectors.		Steam Press. on Turbine.	Injection Water.		Extraction Pump.			
	Volts.	Amps.	P.F.	K.W.	Turbo.	Condr.		"G."	"I."		Inlet.	Outlet.	Press. Gauge.	Amps.	Volts.	R.P.M.
8.45 P.M.	6350	130	·75	1070	28·1	28·2	29·8	120	Shut off.	152	—	—	5	58/60	440	480
11.0 A.M.	6350	266	·7	2000	28·5	28·5	29·66	122	130	152	43	70	4	60	,,	,,
12.0 A.M.	6350	280	·7	2152	28·6	28·5	29·63	122	125	152	43	70	4½	59	,,	,,
12.5 A.M.	6400	270	·7	2090	—	28·2	29·63	Shut	125	152	43	70	4½	59	,,	,,
2.15 P.M.	6400	325	·75	2700	28·2	28·25	29·59	125	160	150	43	72·5	5	62½	,,	,,
2.45 P.M.	6450	345	·76	2970	28·2	28·3	29·59	125	157	157	43	72·5	5	62½	,,	,,
3.0 P.M.	6500	280	·74	2330	28·2	28·4	29·6	122½	160	153	43	65·5	4	62½	,,	,,
3.30 P.M.	6500	230	·7	1812	28·5	28·5	29·6	120	150	154	43	65·5	2	53	,,	,,

OFFICIAL TEST DATA OF "MIRRLEES-LEBLANC" MULTIJECTOR AIR PUMP.

Fig. 13 shows the aid-dealing capacity of various sizes of multijector pumps taken from the actual tests. The maximum vacuum in each case is equivalent to the theoretical, the slight difference at the origin of the curves being due to the different conditions under which each pump was tested.

The Table of Tests is taken from a plant installed at the Scotish Central Power Station at Bonnybridge at a date six months after the plant was put on commercial load. This Company have just decided to order another plant, and have specified Mirrlees-Leblanc multijector air-pumps.

Fig. 14 shows the time taken to start up a Hick-Brequet ejector and that of a Mirrlees-Leblanc multijector.

Figs. 15 and 16 show an application of Leblanc ejectors for refrigerating purposes. The arrangement is that supplied for magazine cooling on the French cruiser "Souffren."

There is no doubt that considerable improvements have been effected in air-pump design during the last few years, nevertheless there is still room for much further progress, and it is to be hoped that when hostilities cease and the British engineer has time once again for research work of this nature we shall have to drop all our present-day notions of efficient air-pumps for a type which will compel all others to become obsolete.

POWER PLANT OPERATION AND MANAGEMENT

TO obtain the greatest efficiency possible in a power plant is not only a matter of design, but a good deal a matter of proper operation and management. Most power plants could make large savings in this way, and there are exceptionally few where some improvements could not be made without spending a dollar for new equipment. To obtain full benefit from the equipment on hand, the men operating it must be made more efficient, and this can be done by education, strict supervision, pay according to merits (bonus system), competition and advancement, welfare.

Education, while the most important, is also the most neglected factor in economic operation of a power plant. This is especially true in the boiler room where the waste is greatest. Skilled labor should be employed. Ordinarily, anyone is hired who will work for low wages and maintain the steam pressure. Every boiler room should have a man with authority to give orders and with sufficient personality to have his orders respected. This man should predetermine by the proper use of various instruments, the most economical ways of burning coal and instruct the firemen as to the best methods, and then insist that these methods be carried out.

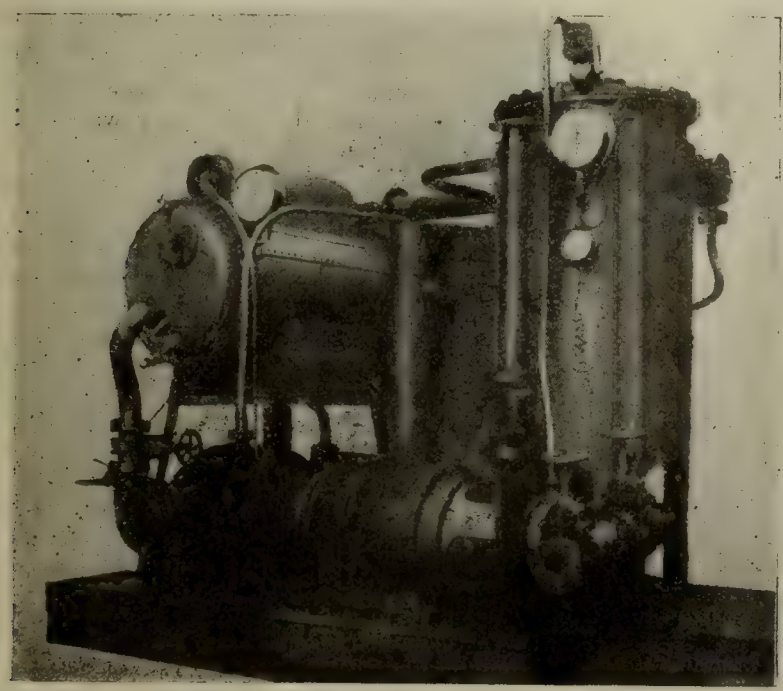


FIG. 15. APPLICATION OF "LEBLANC" EJECTORS FOR REFIGERATING PURPOSES.

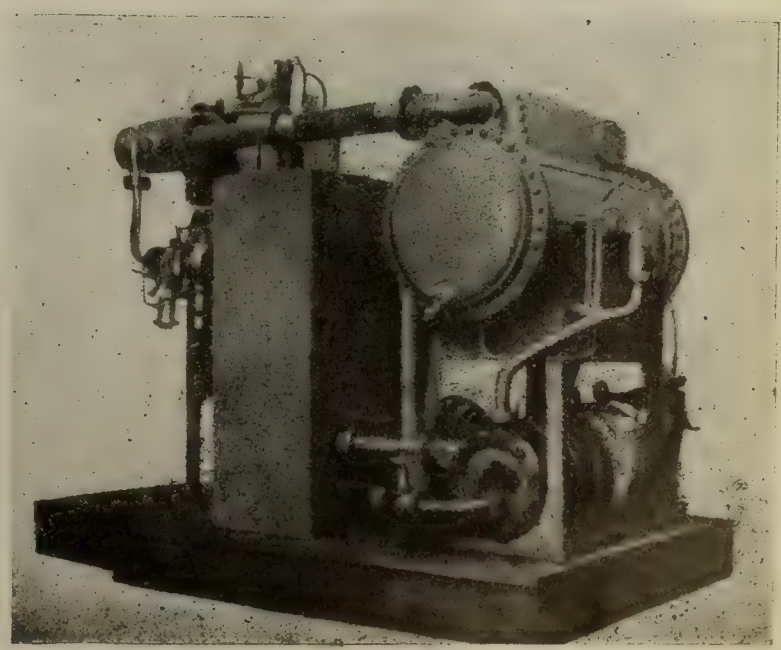


FIG. 16. APPLICATION OF "LEBLANC" EJECTORS FOR REFRIGERATNG PURPOSES.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

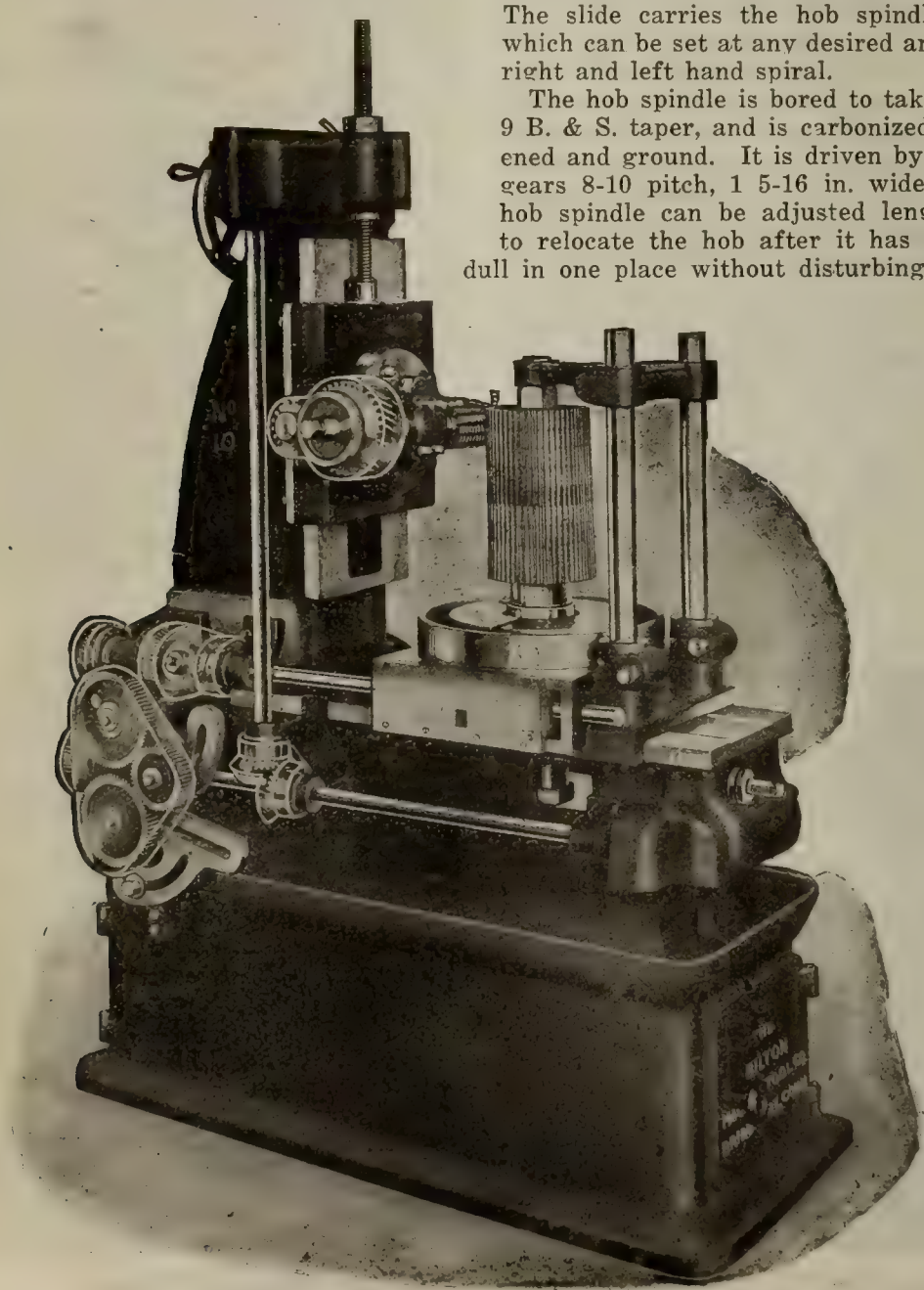
UNIVERSAL GEAR HOBBER.

THE latest product from the works of the Bilton Machine Tool Co., Bridgeport, Conn., is a Universal Gear Hobber. This machine completes their line of equipment designed for cutting gears of fine pitches and of every type except internal gears. The Bilton gear miller and gear hobber have capacity for small gears up to 10 in. diameter, and, are designed to cut teeth as coarse as 8 pitch. The rated capacity of the No. 10 gear hobber is gears of 10 in. outside diameter, 10 diametrical pitch, 10 in. width of face. It will be noticed from the illustration that the frame design is proportioned and reinforced to insure rigidity and to absorb any vibrations.

The work table is driven by bronze worm gear, 11½ in. diameter. This gear in turn is driven by a steel worm, automatically lubricated and fitted with ball thrust bearing. The hole in work table is 1⅜ in. diameter, so that teeth can be hobbed in end of a shaft 1⅜ in. diameter by 24 inches long. The table has three slots. It is also fitted with deep oil grooves having drain running to base of machine, where there is an oil reservoir. This reservoir is removable so that it can be cleaned out. The feeding mechanism consists of two shafts in vertical and horizontal position driven by means of bevel and helical gears. The horizontal feed shaft has micrometer dial. Automatic stops are fitted to vertical and horizontal feeds. All driving gears are made of steel.

The differential gears, which are shown in cut, and the feed and index gears, which are on rear end of machine, all have teeth of 14 pitch, thus making them interchangeable and allowing the fewest number of gears to be used. The vertical slide is made extra long, having flat ways with large bearing surfaces. The slide carries the hob spindle head which can be set at any desired angle for right and left hand spiral.

The hob spindle is bored to take a No. 9 B. & S. taper, and is carbonized, hardened and ground. It is driven by helical gears 8-10 pitch, 1 5-16 in. wide. This hob spindle can be adjusted lengthwise to relocate the hob after it has become dull in one place without disturbing the adjustment of the spindle bearings. The hob speeds range from 50 to 250 r.p.m. The range of hob feed to each revolution of work is .010 to .125. The machine is driven by three -step cone pulley, having 2½ in. belt. The net weight of machine is 1,100 lbs.



UNIVERSAL GEAR HOBBER.

OPTICAL PYROMETER FOR WORKS USE

FOR the measurement of temperatures above say 1400° F., only two methods have been found practicable for works service. One of these is based on the thermocouple, used either with the millivoltmeter or with the more accurate and reliable potentiometer. The other method is based on the laws of radiation and includes both the radiation pyrometer, which would be more properly named the "total radiation" pyrometer, and the optical pyrometer, which utilizes only that radiant energy visible to the human eye.

CASE CONTAINING BATTERY, RHEOSTAT AND MILLI-AMMETER FOR USE WITH OPTICAL PYROMETER.

For many services the inexpensive and sturdy base-metal couple may be used for accurate measurements up to 2000° F., with entire satisfaction; the more fragile and expensive platinum couple may be used up to 2800° F., but, the thermocouple, like thermometers in general, must assume the temperature of the hot object by conviction, conduction, radiation, or all combined. This fact militates against its use for measuring the temperature of molten brass, iron and other metals, or for measuring temperatures in gas producers and other locations where the thermocouple would be subjected to rough mechanical treatment or to contamination by vapors and gases, which would rapidly impair its accuracy. In many industries the temperatures used are far above the range of thermocouples.

Measurements by radiation can be carried out at a distance, once the laws connecting temperature of radiating body and intensity of radiation have been determined, and the radiation receiving and measuring part need not be heated to the temperature of the radi-

ating body, nor even anywhere near to that temperature. Pyrometers utilizing radiation are divided into two classes, those which measure as heat energy the total radiation falling upon the receiving part of the instrument, and those, known as optical pyrometers, which are based upon the fact that the luminous radiation or light varies in a definite manner as the temperature of the hot body changes.

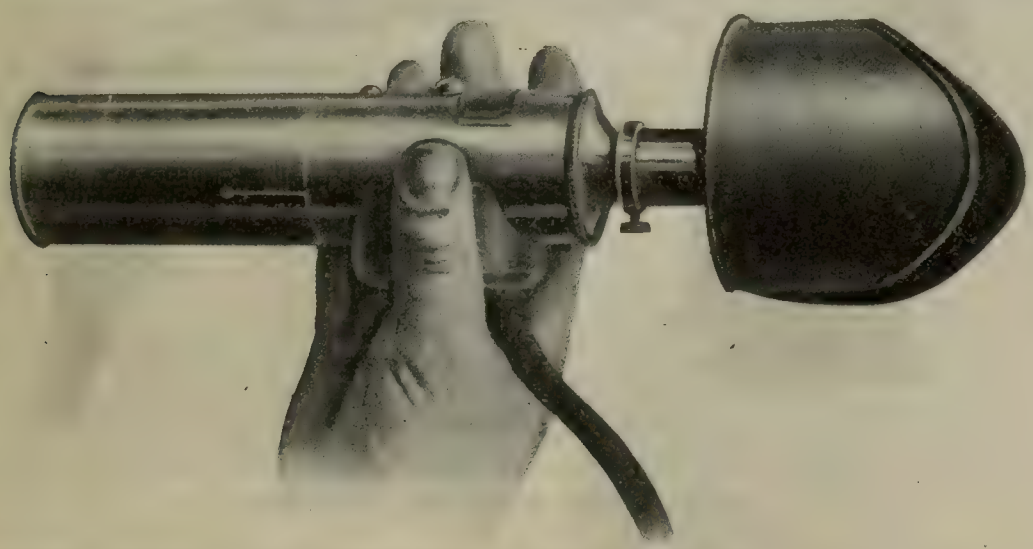
The greatest success has been attained by separating out one kind or wave length of radiation, usually that which excites the sensation of red, and comparing the intensity of this one-color light with the intensity of the light of the same color emitted by a standard source of light. The eye is very sensitive when comparing the brightness of two surfaces when one is superposed upon the other, and after having arranged to have light from the hot body and light from the standard of comparison viewed in this relation, they can be made equal, either by varying the amount of light received from the incandescent object, or by varying the intensity of the standard of comparison.

The latter method, that is, variation of the intensity of the standard of comparison, is preferred and used by the U.S. Bureau of Standards, also by the Reichsanstalt, of Berlin, where its practical application has been brought to a high degree of perfection by Messrs. Holborn and Kurlbaum. The Leeds & Northrup Co., Philadelphia, working under the fundamental Morse patents, has lately carried on a prolonged investigation and development of this type of optical pyrometer with a view to realizing a high degree of accuracy and reliability in a simple and portable device. The instrument, which is illustrated herewith, is suitable for measuring from dull red (about 1100° F.) up to the highest known temperature.

The manner in which the luminous radiation from the hot body is balanced against that from a standardized source will be understood by reference to the accompanying figure. L is a lens by which rays from the hot body at C are brought to a focus in the plane F, where there is located a tungsten lamp filament. By means of the eye piece E, the observer views the incandescent filament which appears to lie upon the image, just as the cross hairs in a surveyor's telescope appear upon the distant object looked at. By means of a rheostat in a case slung about the neck,

OPTICAL PYROMETER IN USE.

the case also containing a storage battery and a milliammeter, the current through which the lamp is adjusted until the brightness of the filament is just equal to the brightness of the image produced by the lens, that is, so that the filament blends with, or becomes indistinguishable upon, the background formed by the hot object. The observer then notes the reading of the milliammeter, which may be provided either with a special scale to read in degrees of temperature, or the temperature corresponding to the current may be read from a calibration curve supplied with the instrument. The adjustment is made with great accuracy and certainty, as the effect of radiation upon the eys varies some 20 times faster than does the temperature at 1300° F., and some 14 times faster at 3400° F., while as above stated, the eye is very keen in distinguishing differences in brightness between superposed objects.



THE PYROMETER IN OPERATOR'S HAND.

At high temperatures the light emitted by both the hot body and the filament would become dazzling, and comparison would be difficult. For this reason a red glass is placed in the eye piece at R, which has the further advantage that light of only one color then reaches the eye and no difficulty is introduced by lack of color identity between the light emitted by the hot body and that emitted by the filament. The intensity of light radiation of any one color increases progressively in a definite manner as the temperature of the radiating body rises, and nothing is therefore lost by eliminating all other light from the comparison. As only brightness, not color, of light is matched, inability to distinguish colors and color-blindness do not interfere with the use of the instrument. In fact, in the region of temperatures used for hardening steel, for example, different observers using this instrument agree in their readings within 6° F.

The brightness of the image of the hot body produced by the lens L is almost absolutely constant, irrespective of the distance from the hot body, although the size of the image varies with the distance. Since it is the brightness of the image and not the total radiation received through the lens that is measured, it is possible to measure the temperature of a small body or of a body at a distance equally as well as that of a large body or of one near at hand. It is not at all necessary that the hot body should fill the entire field of view of the instrument, as with total radiation pyrometers.

In observing bodies at very high temperatures, as 2,500° to 10,000° F., the light received through the lens would be too blinding for direct observation, even through the red glass of the eye piece, and the intensity of the image might also become greater than that at which it is practicable to burn the tungsten filament, so that a balance would become impossible. Some method for reducing the intensity of the light from the hot body, such as by varying the aperture through which the light is received or by placing a screen to intercept some of the light, is therefore necessary. A screen is used, placed between the lens and the image so that it reduces the light from the hot body, but not that from the filament. With the reducing screen it is possible to make direct observations of the most brilliant light sources, as the electric arc or the surface of the sun.

It is not feasible to calibrate the instrument at such high temperatures by direct comparison, since they are above all known melting points and the ranges of contact thermometers, but fortunately a relation has been found to exist between temperature and intensity of radiation of any one color or wave length of light. By making use of this relation, known as Wien's Law, and reducing the intensity of the image in a known ratio by means of the screen just referred to, it is possible to extend the scale of the instrument to the highest temperature. The scale thus obtained has been found to agree very closely with a scale of temperatures established

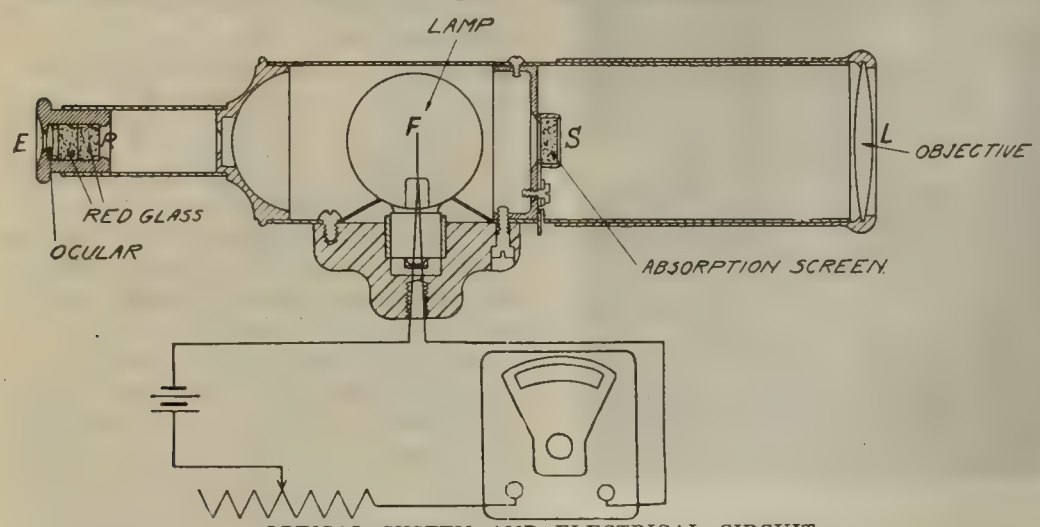
by known facts about the relation between temperature and total radiation. In other words, this form of optical pyrometer gives the same scale of temperature as do total energy pyrometers used with the precautions necessary to secure accuracy and precision in the measurement of total radiation.

The screen used for cutting off part of the radiation from very hot bodies can be thrown into or out of the field of view by means of a milled disk projecting through an opening in the tube of the instrument. With the absorbing screen in use, a different milliammeter scale or calibration curve is required, but as the range of the instrument without the absorbing screen overlaps many hundred degrees with the range for the absorbing screen, the accuracy of the two scales can always be checked by observing a hot body whose temperature lies within this range.

The readings obtained with this instrument are always the same for the same temperature, if the body viewed is surrounded by other objects, such as the walls of a furnace at the same temperature. Also no correction is required in the case of so-called "black bodies," such as incandescent carbon, when viewed in the open. For iron and steel in the solid state, the corrections required for readings taken in the open are also negligible.

Objects having a metallic sheen, that is, a surface which reflects light freely, as molten metal or polished platinum, do not give the same readings when viewed in the open as when viewed in the furnace, or as a black body would give with this or any other radiation or optical pyrometer. The readings, however, are always consistent for the same material under the same conditions, and by using suitable reduction factors, can be converted to true temperatures. Furthermore, the readings obtained with this type of instrument when sighted upon a body in the open differ less from those given for the same body at the same temperature enclosed in a furnace, or for a black body at the same temperature, than do the readings of instruments which measure the total radiated energy. In other words, the correction where there is a departure from "black body" conditions is smaller than with the total radiation pyrometer.

The instrument can be calibrated by sighting it upon bodies whose temperatures are known, either by means of a thermocouple pyrometer, or by the melting or freezing of various substances. The constancy or reliability depends upon the constancy of the lamp, that is, its ability always to shine with the same intensity when receiving the same current. This matter has been investigated exhaustively by the U.S. Bureau of Standards and by the Nela Park Laboratory of the National Electric Light Association, also in the laboratory of the Leeds & Northrup Co., and it has been found that after a tungsten filament is thoroughly aged, that is, burned for some time at a temperature higher than that to which it will be subjected in service, no sensible variation thereafter occurs. The instrument is so designed that one lamp can quickly be replaced by another, and by keeping two lamps, their correctness can always be insured by checking one against the other.



OPTICAL SYSTEM AND ELECTRICAL CIRCUIT.

The instrument itself is handy and portable, weighting only about a few ounces, and can be sighted as easily as an opera glass. The case, containing the battery, rheostat and milliammeter, is designed to be slung about the neck, and weighs about 10 lb.

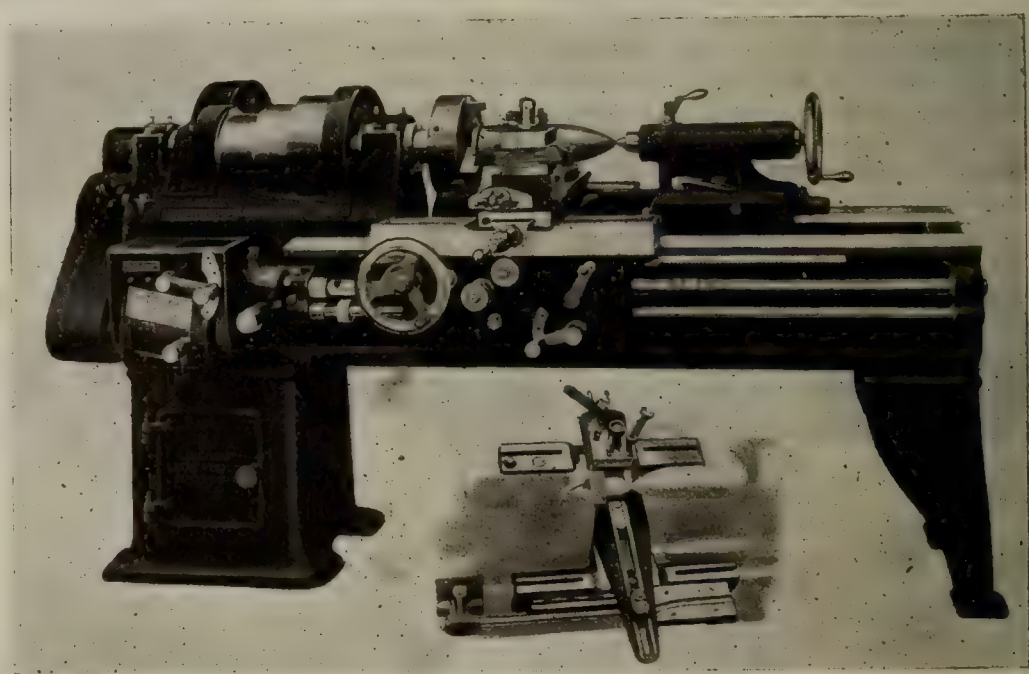
18-IN. ENGINE LATHE, WITH SHELL EQUIPMENT

THE engine lathe shown in the accompanying engraving is a standard 18-in. engine lathe with special equipment for machining 6-in. shells, consisting of 9-in. universal chuck, square European tool block, and radius forming attachment. In the lower part of the illustration is shown a plan view of the carriage with work in place and the cam roller in position at the beginning of the cam groove which forms the profile.

The cam block is held stationary by an adjusting rod carried in an anchor bracket clamped on the back vee. It is supported by a slide formed on the back of the carriage and imparts the required movement to the tool block by means of a cam roller mounted in a bow, which is fastened to the tool block. Both longitudinal and lateral adjustment of the path traversed by the cutting tool are easily obtained.

Actual tests have shown the ability of this lathe to machine a 6-in. shell to the exact radius in 16 min. 48 sec., the depth of cut being ½ in., with 1-32-in. feed, at 130 rev. per min. The shell was composed of 50-point carbon steel, having 12 radius, and was cut at the rate of 204 ft. per min., decreasing to 69 ft. per min. at the end of the radius.

This lathe is the product of the Cincinnati Lathe and Tool Co., Cincinnati, and is regularly furnished with cabinet leg under headstock, double wall apron, automatic stop, chasing dial, 3 or 4-step cone, and any length of bed complete ready for use.


18-IN. ENGINE LATHE WITH SHELL EQUIPMENT.

URANIUM HIGH SPEED STEEL TESTS

CONSIDERABLE interest has been manifested in recent developments of high speed steel containing uranium as

the controlling element, and additional tests carried out by the makers amplify still further the high expectations entertained with regard to this product. Illustration Fig. 1 shows a uranium high-speed steel tool, 1 in. by 2 in., turning a 4.5-in. shell forging of heat treated steel at a speed of 70 ft. per min. The depth of cut is ¼ in., with a feed of 7-32 in. per rev. The chip produced at this rate of operation can be barely bent with the hands.

An idea of the "hogability" of this steel will be gained from the following table:

Tool	Feed	Speed ft. per min.	Depth of cut	Material Cut Before Grinding.
U-8	1/16"	45	⅝" to ¾"	Ran 87". Most of time the nose of tool was on scale.
U-8	1/16" to 1/10"	38	15/16"	Ran 127". Time 3 hrs. Speed increased to 65 ft. per min. after tool had gone 105".
U-8	1/16"	60	1 1/16"	Ran 12".

A blooming mill was turned as a further test. This material is 1.00 per cent. carbon steel with a diameter of 30 in. Using uranium high speed steel, this work was done at a cutting speed of about 18 ft. per min., the depth of cut being in excess of one inch with a feed of 13-64 in. per rev. Fig. 2 shows samples of chips from this job, the handful illustrated weighing about 2 lbs.

The comparative ability of uranium high speed steel at high cutting speeds will be understood from the following table, the distances referred to being across the face of the pinions, parallel with their axis. The best run obtained with other high speed steel was quarter of a pinion faced with one grinding, equal to a distance of 1¼ in.

CUTTING 50 CARBON PINION BLANKS 5" FACE.

Tool	Feed	Speed ft. per min.	Depth of cut	Remarks.
U	1/32	94.6	3/16	Faced 85 pinions with 5 grindings.
U	1/32	100	¼	Faced 3¼ pinions or a distance of 16¼" at one grinding.
U	1/32	100	¼	Faced 5½ pinions or a distance of 27½" at one grinding.

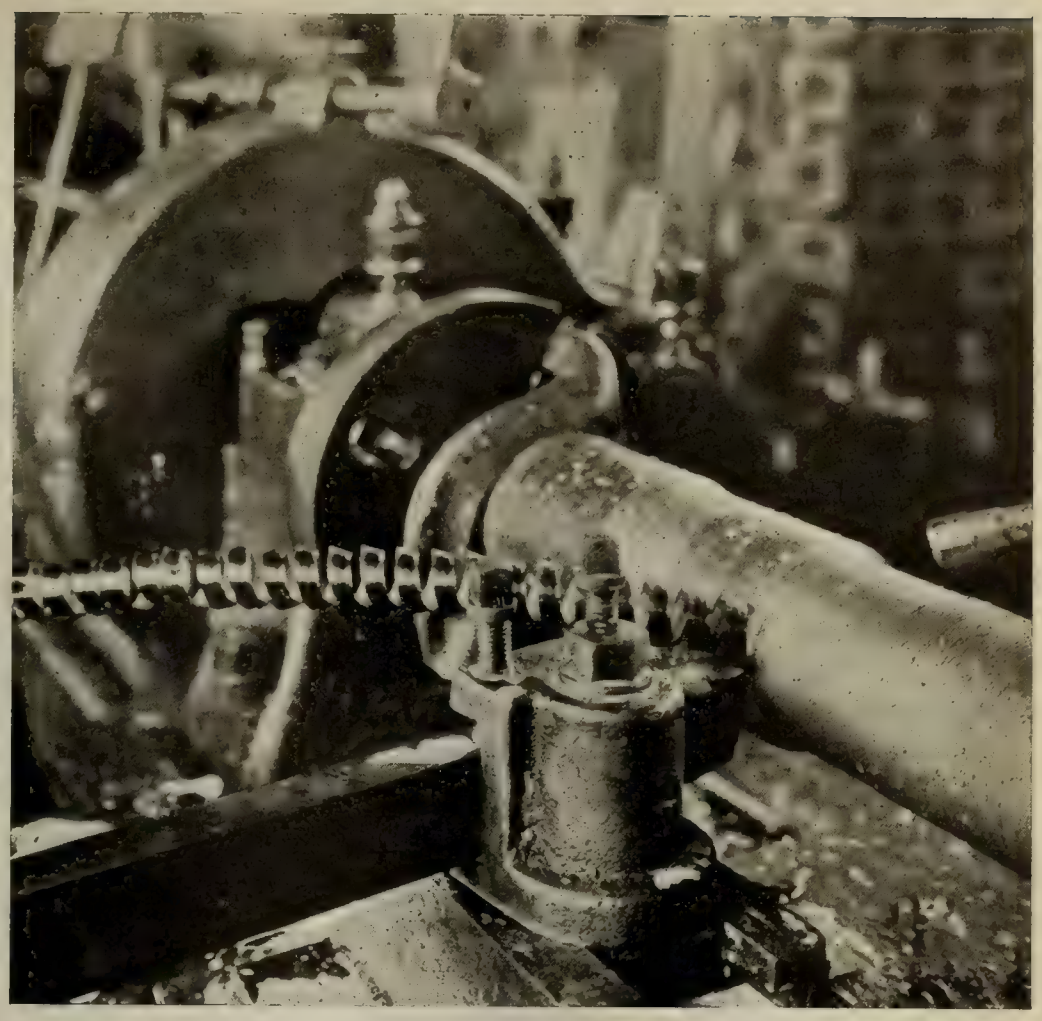


FIG. 1. MACHINING 4.5 IN. SHELL FORGING AT 70 FT. PER MIN. CUT, ¼ IN. X 7-32 IN. FEED.

Screenings

Tony, the office janitor had been working faithfully at his job for several years, when he surprised his employer one day by asking for a vacation.

"We can't get along very well without you," said the boss. "You don't need a vacation. You'll only blow in your money and come back broke."

"I like to have vacation," persisted Tony. "I get married, and I kinda like to be there."

Two young Irishmen in a Canadian regiment were going into the trenches for the first time, and their captain promised them five shillings each for every German they killed.

Pat lay down to rest while Mick performed the duty of watching. Pat had not lain long, when he was awakened by Mick shouting:

"They're comin'! They're comin.!"

"Who's comin'?" shouts Pat.

"The Germans," replied Mick.

"How many are there?"

"About fifty thousand."

"Begorra," shouts Pat jumping up and grabbing his rifle, "our fortune's made."

Mother—"Johnny, you said you'd been to Sunday school this afternoon. Now I want to know how it happens that your hands smell so very strongly of fish?"

Johnny—"I carried home the Sunday-school paper, an' the outside page is all about Jonah and the whale."

FIG. 2. A HANDFUL OF CHIPS WEIGHING 2 LBS. REMOVED FROM ROLL IN FIG. 2.

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THE PROJECT TO DEVELOP CANADIAN TRADE

IN view of the interest being taken by the business and investing public in the matter of trade after the war, considerable attention has been attracted by the recommendation of the special committee of the Senate on conservation of Canadian trade that there be established in Canada a Canadian Trade Corporation. The idea, a draft of which appeared in our July 26 issue, page 93, follows along the lines of the organization which has been formed in England known as the British Trade Corporation, being the outgrowth of the proposal for the establishment of a British trade bank. According to the report of the Senate Committee, the aim is to secure orders for overseas trade, to replace in part the great volume of orders that during the war have been received for munitions and supplies, and to finance the undertaking of large overseas contracts along the lines of the British organization.

From information available, we find the future outlook very much clouded with regard to trade matters. It is difficult to forecast what conditions may be and, therefore, very hard to organize to meet possibilities. There can be no doubt but that such an organization as proposed might be an important factor in relation to the country's trade in securing information as to foreign markets. This would require a wide service employing practical men and would mean the expenditure of considerable sums in order to give it that effectiveness in securing actual orders which has been lacking in connection with the past service of our Trade and Commerce Department. To provide the necessary funds, a Government subsidy would be almost necessary.

So far as the conditions in England and Canada are concerned, it may be pointed out that there is considerable difference as to the need for such an organization. England is now out to compete more closely with Germany. She is, therefore, adopting some of Germany's methods. In England, up to the present time the banks have been practically nothing more than trust organizations, lending money on good security, but not financing new business with attendant risks. On the other hand, Germany built up her foreign trade through her banking system which was used for the encouragement of industrial expansion. Now England proposes to take a step in the same direction. In Canada the banking system has been considered as being something between the English and German standards. Facilities have been provided for financing foreign trade through exchange and other arrangements for settlement of accounts, but the banks have not themselves taken the actual risks of manufacture.

The project, as it has been launched in the Senate, is evidently an effort to combine the trading and banking ideas so as not only to provide a market, but to aid in supplying the products to meet it. The possibilities presented are both important and interesting and the matter will no doubt receive considerable attention by the business and industrial community. Speaking with regard to the project, Senator Nichols, president of the Canadian General Electric Co., recently said in the Senate:

Great Britain has already taken action, Japan has taken action, and no doubt honorable gentlemen have all read in the despatches what Australia is doing. The Australian Government is now considering the expenditure of $50,000,000 to assist private capital, thus recognizing the pressing necessity of aiding individual enterprise. I am not one of those who believe that the Government should take any large measures of responsibility, but it can do a great deal. We are now employing 300,000 workpeople directly on munitions, and possibly 200,000 more in the production of other war supplies. When the war is over we shall have to provide these men with new employment, and we shall also have to take care of four, five or six hundred thousand returned soldiers. I think I have made that clear. No concerted action has yet been taken, so far as I can see, in an endeavor to grapple with these problems; and I feel that if concerted action is taken there is no better place for the genesis of the movement than in the Upper House of the Parliament of Canada.

During the present week, the committee report comes up in the House for adoption, and doubtless both the essentials to the success of the project and the extent of the support likely to be accorded it will become manifest.

U.S. SHIPBUILDING DEADLOCK ENDED

THE advantage of having a competent national chief executive officer received striking exemplification a few days ago when the feud between Denman and Goethals ceased to exist as a public inconvenience, or near-national scandal, so far as the United States shipbuilding programme is concerned. It has been aptly said that President Wilson is a psychologist, and being such has made him an astute politician. He is believed to be better versed in the psychology of business than would naturally be expected, in view of his training and experience and, in not a few recent instances of the exercise of his prerogative, the estimate of his capacity along the direction indicated has been fully justified. When every endeavor has been made to reconcile conflicting interests, be these individual or corporate, without closing the breach, nothing but the most drastic action remains to be taken—firing, and the community or nation executively equipped for performing the job is luckily situated these strenuous days.

"Britain need only sell Canada to us in order to pay her war expenses and also the war indemnity due to Germany and her Allies." This astonishing suggestion was made in all seriousness recently by Prince Frederick zu Lowenstein in an address on "Germany's economic future and the German peace" in Munich. How does Canada feel about it?

INDUSTRIAL NOTABILITIES

WILLIAM CLARK HAWKINS, M.E., managing director, Dominion Power & Transmission Co., Ltd., Hamilton, Ont., was born at Orange, N.J., Sept. 5, 1866, son of John Thomas and Harriet Olivia (Clark) Hawkins.

He received his education at Grammar and High Schools, Taunton, Mass., and his technical education at the Stevens Institute of Technology, Hoboken, N.J.

His career began with a position as machinist with the Campbell Printing & Press Mfg. Co., 1899, becoming draughtsman in 1890; assistant chief engineer, Third Avenue Cable Road, New York City, 1891; manager, Plymouth Electric Light Co., Plymouth,

WILLIAM CLARK HAWKINS, M.E.

Mass., 1892; manager, Concord Land & Water Power Co., Concord, N.H., 1894-96; with Columbia Water Power Co., Columbia, S.C., 1896-98; with Local Companies Committee, Schenectady, N.Y., as traveling, inspecting, and consulting engineer, 1898-1901.

Mr. Hawkins became associated with his present company in 1901, as secretary and manager of the Hamilton Electric & Cataract Power Co., later the Hamilton Cataract Power, Light & Traction Co., finally Dominion Power & Transmission Co., Ltd., being appointed managing director, Sept. 30, 1912. He is also a director of the Southern Canada Power Co.

On Dec. 28, 1898, Mr. Hawkins married Mary Elizabeth Chambers, daughter of Frank Ross Chambers, Bronxville, N.Y., their family consisting of one son and one daughter.

Clubs: Hamilton; Caledon Mountain Trout; Hamilton Racquet; Canadian; Tamahaac.

Societies: A.S.M.E.; A.I.E.E.; Beta Theta Phi; Theta Nu Epsilon.

Recreations: Angling; Tennis; Racquets.

Photo Courtesy British and Colonial Press

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$47 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	55 95
Basic, Valley furnace	53 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	.....

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	12 10
Chequered floor plate, ¼ in.	12 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 50
Tank plates, Pittsburgh	9 00
Structural shapes, Pittsburgh	4 50
Steel hoops, Pittsburgh	5 25
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 50

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22 1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$34 00	$35 00
Electro copper	34 00	35 00
Castings, copper	33 00	34 00
Tin	62 00	63 00
Spelter	11 00	11 00
Lead	13 50	13 00
Antimony	20 00	20 00
Aluminum	65 00	64 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$12 00	$12 00
Heads	12 30	12 30
Tank plates, 3-16 in.	12 65	12 25

WROUGHT PIPE.

Effective July 5, 1917.

Size.	Black Per 100 feet	Galvanized Per 100 feet
Standard Buttweld.		
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00
Standard Lapweld.		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.

4½" and larger, 40%.

4" and under, running thread, 25%.

Standard couplings, 4" and under, 35%.

4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$23 00	$22 00
Copper, crucible	26 00	27 00
Copper, heavy	26 00	26 50
Copper wire	26 00	26 50
No. 1 machine composition	20 00	22 00
New brass turnings	16 00	19 00
No. 1 brass turnings	14 00	16 00
Light brass	12 00	10 50
Medium brass	16 00	16 00
Heavy brass	18 00	18 00
Heavy melting steel	22 00	17 00
Steel turnings	11 00	8 00
Shell turnings	12 00	12 00
Boiler plate	18 00	10 50
Axles, wrought iron	25 00	24 00
Rails	21 00	18 00
No. 1 machine cast iron	28 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	19 00	9 00
Car wheels, iron	27 00	25 00
Steel axles	30 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	8 50
Stove plate	19 00	19 00
Scrap zinc	8 00	9 50
Heavy lead	11 00	10 75
Tea lead	7 00	7 00
Aluminum	35 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank,	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in. and larger	$7 10
Structural rivets, as above.	7 00
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze.	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$100 00
Open-hearth billets	100 00
O.H. sheet bars	105 00
Forging billets	125 00
Wire rods	95 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		6 50
Spikes, ¼ and 5-16 in.		7 00

MISCELLANEOUS.

Solder, strictly	0 38
Solder, guaranteed	0 41
Babbitt metals	16 to 65
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drum	4 35
White lead, pure, cwt.	19 00
Red dry lead, 100-lb. kegs, per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 60
Linseed oil, raw, single, bbls.	1 27
Linseed oil, boiled, single bbls.	1 30
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery Cloth	list plus 33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.37
British Manila Rope	.31
New Zealand Hemp	.31
Transmission rope, Manila	.43
Drilling cables, Manila	.39
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks	list plus 30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 50%; headers, 60; flanged unions, 40; malleable bushings, 50; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$11 00	$11 00
Sheets, black, No. 10	11 50	11 50
Canada plates, dull, 52 sheets	11 00	11 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	11 70
Premier, 10¾ oz.	13 85	12 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

	B
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$10 90
Connelsville Foundry Coke.	...
Steam Lump Coal	8 50
Best Slack	8 05

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$33 00	....
1¼ in.	36 00	....
1½ in.	38 00	32 00
1¾ in.	38 00	32 00
2 in.	45 00	33 00
2¼ in.	48 00	35 00
2½ in.	50 00	38 00
3 in.	58 00	45 00
3¼ in.	....	53 00
3½ in.	70 00	55 00
4 in.	82 00	67 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	13
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	11

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No.1	1 50
Leather in sides	1 35

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THE steel and metal markets are marking time pending developments in the price fixing situation at Washington. Until some announcement is made in this connection by the American Government it is not likely that there will be much activity. Consumers, hoping for a general decline in prices, are holding off and consequently business is quieter. The question of the moment is, will steel prices decline, remain stationary or will a buying movement set in and cause a resumption of the upward movement, recently halted on account of the uncertain outlook? Consumers have perforce adopted a conservative attitude and are waiting developments. Whatever may develop in regard to prices there is little doubt but that the scarcity of steel will become more acute as war requirements are bound to increase, thus diminishing available supplies for the private consumers. This will be a serious handicap, particularly for the manufacturer, whose plant operations will in consequence be curtailed and production correspondingly decreased. The situation is affecting the pig-iron market in a like manner, as it is not yet known to what extent Government control, if any, will affect furnace operations. The local pig-iron situation is unchanged and no prices are obtainable. The non-ferrous metal markets continue dull, and demand is light owing to the uncertain outlook. Consumers are keeping out of the market in anticipation of lower prices following Government action in fixing prices. The copper market is a little firmer, but quotations are unchanged. The scrap metal market continues dull and featureless, but prices are firmer. The increased activity in the machine tool industry in the States is affecting the local trade on account of the backward deliveries and high prices.

Montreal, Que., July 30, 1917.—Industrial activity proceeds unabated, although the hot weather of the past week has slowed up production. Manufacturers are still in difficulties over the inability of obtaining sufficient supplies for their requirements, and little encouragement is afforded by early prospects. The situation in the States and the approach of conscription in this country, together with the possibility of a general election in the near future, promises to place a further handicap upon present activities. Realizing the magnitude of the task before them, the American Government continues to increase the appropriations for the various needs of the many war departments, and this is having the effect of placing additional pressure on the various sources of supply, with the inevitable result that domestic enterprise is virtually at a standstill.

Pig Iron

At the close of a quiet week the pig iron situation is practically unchanged, the market being influenced by the general uncertainty that tends to disturb a relatively strong market. In common with other industries, that of pig iron is affected by existing conditions, and the position of this metal is dependent upon the attitude of the United States in the matter of fixing prices for war and kindred requirements. The local situation is unchanged, dealers reporting a

steady market, but guarded buying on the part of consumers. Canadian iron is still off the market.

Steel

A combination of circumstances have resulted in a quiet and listless market; the uncertainty that has pervaded the situation for several weeks is still pronounced, and buyers are more reluctant to enter the market owing to its unsettled conditions. The extreme hot weather has materially affected production, and the general tendency appears to be in direct contrast to the nervous disposition to secure material a short time ago, irrespective of the price asked by the producers. The feature of the present situation seems to be the waiting attitude of the consumers in regard to the action of the American Government in relation to the fixing of prices on war requirements. The impression seems to be spreading that the "one price to all" will not be strictly enforced, and it is expected that this policy will only apply to such contracts that are made exclusively for Government or war purposes. During this temporary lull, producers and dealers are endeavoring to dispose of their surplus supply of stock on hand. A feature that is creating some little concern in the United States situation is the increased appropriations being made by the Government for the various war necessities, tending to still further disturb the general market. The absence of any marked activity is reflected in the quiet condition of the iron and steel market, the general situation having taken on a strain of listlessness. With the market at present in a presumably strong position, the early future is dependent on the decision of the U. S. Government in connection with the finding of the commissions now inquiring into the present cost of production of steel and metals. The outstanding feature in respect to existing conditions is the impetus that has been given to the shipbuilding activities and the increased demands placed upon the plate mills for requirements in this connection, and it is now anticipated that the pressure on the mills will be much greater than previously expected. The enormous demands for tin plate for food and sundry requirements have necessitated considerable tonnage of sheets being reserved for this purpose. Quotations on all commodities indicate the uncertainty that prevails in all circles. Local conditions are unchanged, as the situation here is more or less affected by the existing conditions across the line. Dealers here report an exceptionally quiet week, with all quotations firm and unchanged.

Metals

Despite the uncertainty that is still marked in all circles, the general tendency this week seems to have improved, although price quotations are still about the same. Copper is returning to a stronger position after a period of weakness. Tin is not active, but has a stronger tone. Spelter is quiet, but with a better undertone. Lead is again gaining strength. Both antimony and aluminum are quiet, with the latter easier.

Copper.—Following the contention some few weeks ago, that the price of copper would be adjusted to a lower figure than that prevailing on the open market, the buying movement on the part of consumers fell off considerably, with a corresponding decline in listed quotations; however, during the past few days an evident reluctance to dispose of their metal has been evident on the part of producers and holders of metal, and in what sales have been made, the price shows another upward tendency. This condition has not, however, given much stimulus to the market, as the trade is still holding aloof awaiting the final decision of the American Government regarding price regulations. The London market is £5 lower than last week, but the New York report shows a slightly stronger position, lake having advanced 1c and electro 1¼c per lb, the respective quotations being 30c and 28½c. Prices on the local market are firm and unchanged; lake and electro at 34c, and castings at 33c per lb.

Tin.—Despite the fact that consumers are not actively interested in the market the tin situation is developing a stronger tone, which has been reflected in both London and New York prices. Spot tin is rather scarce owing to difficulty in obtaining shipping permits from England. The delayed action of the American Government is still a restraining feature of the market. The London market is about £4 higher and New York quotations of 62⅞c show an advance of ⅜c per lb. Local tin is firm at 62c, but with a stronger undertone.

Spelter.—With the prospect that price regulations may result in a better position for spelter, owing to the margin between the existing price and the cost of production, the buying of this metal has improved during the past week, but so far no marked strength has been added to the market. New York continues to quote the nominal price of 8⅝c per lb. Dealers here report a firm, but quiet market, with quotations unchanged at 11c per lb.

Lead.—The downward tendency that was so apparent last week has evidently been stopped, and lead is again returning to a stronger position, as reflected in the higher quotations on the New York market. The feeling that large quantities of lead will be required for the war programme of the American Government has had the effect of stiffening the market. An apparent reluctance on the part of producers and dealers to dispose of any but small quantities of metal has resulted in the outside quotation again advancing to the same level as that quoted by the Trust—namely, 11c per lb. The local situation is steady, with prices firm at 13½c per lb.

Antimony.—The market is quiet and featureless, with the supply exceeding the demand, although a slight undertone of strength seems apparent. New York continues to quote the nominal price of 15c on a light demand. Local conditions are unchanged at last week's price of 20c per lb.

Aluminum.—The market in this metal has developed a weaker tendency following a decrease in the demand, and consequently prices have become easier. Dealers here are quoting 65c on a quiet market, a decline on the week of 5c per lb.

Machine Tools and Supplies

The machine tool requirements are now covering a more general line of equipment owing to the increased activity in the shipbuilding and other industries. Demand for munition machinery is very quiet at present, especially here in Canada, owing to the capacity production of those plants now working on shells. There has been, however, a marked increase in the inquiries for general engineering tools as a result of the impetus in the manufacture of marine accessories. The situation in the States is featured by the possibility that the Government may commandeer all available equipment suitable for their immediate requirements. In the case of tools now under construction for private interests, it may be required that these are to be used for Government work, or have them revert to plants working on war contracts.

The pressure that is being placed on the machine tool builders in the States is making it increasingly difficult for Canadian manufacturers to obtain delivery on ordered equipment, and these conditions may call for additional activity on the part of tool builders here to meet the steady Canadian demand. The continued advance in the cost of raw materials is being shown in the higher prices that are asked for tool equipment; this condition also applies to all classes of supplies.

Scrap

While the general situation is comparatively quiet, due to pending political developments in the States, the market has become a little stronger and in many cases prices have advanced. Old coppers have advanced 2c per lb., the price range being 23c for light and 26c for heavy. Heavy melting steel and steel turnings have advanced $2, quotations being $22 and $11 per ton respectively. Old boiler plate on a $3 advance is quoted at $18 per ton. Rails at $21, machine cast iron at $28, and wrought iron pipe at $19, show an advance of $2 per ton each. Cast borings are now quoted at $12 per ton.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

Toronto, Ont., July 31.—The outlook for the manufacturing interests is steadily becoming more confused in spite of the large volume of business offering. The shortage of raw materials, particularly iron and steel, is becoming more acute, while the labor situation is also becoming a menacing problem to handle owing to the difficulty in obtaining sufficient help. There appears to be no doubt that the coal situation is serious, and the uneasiness among those interested in securing large supplies of fuel is increasing. Drastic measures will have to be adopted if factories are to be kept in operation this coming winter. Much valuable time has already been lost in dealing with the situation, and much remains to be done before the desired relief is effected.

Steel

The situation in the steel trade at the present time is one of doubt and uncertainty; many consumers consequently are staying out of the market pending developments. There is now considerable difference of opinion as to the extent and probable effect of the American Government price fixing scheme. There is a growing belief that the Government actions will not be so drastic as was at one time considered probable. It is felt that while steel prices for Government needs will likely be fixed on some equitable basis, it will be a more difficult matter to control the situation as affecting private consumers. It is also doubtful whether such action on the part of the Government is either feasible or desirable. Until this question is settled, little activity may be looked for in the market. For the same reason there has been a lull in the upward movement in prices, and here again opinions differ as to the probable effect on the situation by Government action. Some believe that the crest has been reached, while others declare that the law of supply and demand will prevail, and consequently prices will continue to advance. What will actually happen is exceedingly difficult to foretell, and the prevailing policy of watchful waiting seems to be the correct one.

There is no change in the situation in the primary market as regards black sheets. The American Government buying of sheets is increasingly heavy, which is restricting available supplies for other consumers. The output of sheets of all grades is pretty well sold up for the remainder of the year. No prices on sheets have as yet been fixed by the American Government, although it is paying considerably under the market for current requirements. The steel market in the United States is quiet, pending developments in the price situation. The new demand for steel products of all kinds is light, as consumers are holding off until it is known what the Government will do in the matter of prices. There have been no price changes this week.

Pig Iron

The pig iron market is less active than formerly on account of the uncertainty as to what the Government attitude is with respect to prices. For this reason buying has fallen off considerably until the situation clears. There is no change in the Canadian situation and prices are still withdrawn.

Scrap

The scrap market continues dull and unsettled, with a lack of interest on the part of consumers. Prices on scrap with the exception of heavy melting steel and machinery cast iron, are weak and unchanged.

Machine Tools

The situation in the machine tool trade locally is practically unchanged, the general run of business being principally for equipment for general engineering purposes. In the United States, Government business is the most important feature, and is occupying the attention of the trade almost exclusively. Deliveries are not any better, except on ordinary lathes, which are fairly easy to obtain. Large swing lathes, however, are difficult to get. Grinders, milling machines, both plain and universal screw machines, boring mills and planers are scarce. Prices of all types of machine tools are very firm, with an upward tendency owing to the continued high cost of raw materials.

Supplies

Prices of practically all lines of machine shop supplies continue to advance steadily owing to the high cost of raw materials, while deliveries are not showing any improvement. It is anticipated that there will be some restriction in the consumption of gasoline, as a serious shortage is feared. Although prices are unchanged in the meantime, it is likely that there may be an advance.

Metals

The metal markets continue dull and weak, but prices are unchanged meantime. Trading has again been light, as consumers are keeping out of the market in view of possible lower prices following Government price regulation. Locally business continues good, principally because of war orders, but the ordinary demand is also active.

Copper.—The market has a stronger undertone, but prices continue nominal and unchanged. There has not been a great deal of actual business, but more interest has been shown, which may result in a buying movement in the near future. Lake and electrolytic are quoted at 36c and castings at 35c per pound.

Tin.—The market is quiet but firmer, and quotations continue nominal. There is a scarcity of spot tin in New York caused by an unwillingness to grant shipping permits in England. Government price regulation continues to restrain the market. Local price, 63c per pound.

Spelter.—The American Government has recently purchased a considerable quantity of spelter at 11c and 11½c, according to grade, which represents an advance of 2c over the previous purchase. The price indicates that the Government authorities agree with the producers that the present production cost of spelter has been too close to the selling price. Following this transaction, the spelter situation has improved and the market is firmer. Local quotation unchanged at 11c per pound.

Lead.—The market continues strong and quotations are firmer. There is not enough lead in sight to satisfy current demand, especially for immediate or nearby delivery, and independents are now quoting the same price as the Trust, viz., 11c New York. The local situation is unchanged at 13c per pound.

Antimony.—The market has a weak tendency at unchanged and nominal prices. Local price, 20c per pound.

Aluminum.—The market continues quiet and lack of buying support has weakened it. Local price, 64c per pound.

New York, July 30.—Machinery manufacturers and machine tool builders in the United States are flourishing as never before. It is estimated that contracts secured in July call for the payment to the builders of approximately $10,000,000 and inquiries are now in the market aggregating as much more. As heretofore, the greatest demand comes from shipbuilders who have closed or are about to close large Government contracts, but manufacturers of airplanes, of motor trucks, of engines and motors, and of electrical apparatus—also holding large Government contracts, or anticipating them, are feverishly in the market to satisfy pressing needs for shop equipment.

It is not surprising under present extraordinary conditions that machinery manufacturers are overwhelmed with conflicting demands for priority tool shipment, so much so, that some of the requests are being referred to the Priority Board at Washington for settlement. It is significant that when the tools purchased are found to be for private work, steps are being taken to divert shipments to plants holding Government contracts, and this practice is likely to be extended widely in the next few months until Government needs, directly and indirectly, have been satisfied.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Shipbuilding Enterprise

The Federal Shipbuilding Co. is the name of the new subsidiary of the United States Steel Corporation to which reference was made several weeks ago. The initial appropriation to build this plant, including twelve shipways, is $6,000,000, and other funds will be available as they are needed. It is expected to build ships within six months, which means that the cranes and necessary tools to be installed must be delivered in four months. The American Bridge Co., which will build the plant and furnish the fabricated steel for ships, is placing substantial orders for special machinery.

The settlement of the controversy between Chairman Denman of the Shipping Board and General Goethals, general manager of the Emergency Fleet Corporation, by the withdrawal of both officials from Government service, and the appointment of their successors by the President, has been followed by the announcement that fifteen contracts, some of them carrying ten to twenty ships, have been approved by the Shipping Board, and the execution of the contracts only awaits the confirmation of the other new members of the Board by the Senate. There is small doubt now that contracts for building two large Government shipyards, in which to build 400 steel ships, will be awarded within a week, and work will be rushed upon these vessels. The large private interests identified with this enterprise have continued to place orders for cranes and for machinery, requesting deliveries on some tools in two months.

Two other shipbuilders having Government contracts—the Kelly-Atkinson Construction Co., and the Groton Iron Works, are actively in the market for cranes and for shop equipment. The latter company, alone, will expend $2,000,000 to equip a plant at New London, Conn.

The Navy Department is negotiating for machinery and tools to cost $2,500,000 to equip the new shops to be built at the Washington Navy Yards for the manufacture of torpedoes, mines, mounts, telescopes, sights, optical instruments and miscellaneous ordnance supplies.

The six manufacturers who have been awarded contracts by the United States Army Department to build 10.650 motor trucks, at an aggregate cost of $33,179.026, are already in the market for steel castings and machine tools of special design.

Many other large manufacturers, both with and without Government contracts, are in the market for several million dollars' worth of machinery. The General Electric Co., has closed for twelve cranes and is negotiating for $1,000,000 worth of shop equipment to be used in the manufacture of turbine engines for the United States Navy. Export inquiry continues active, mainly for shipment to Italy and Japan.

Pittsburgh, Pa., July 28.—The iron and steel markets continue stagnant, and the chief interest of the trade is with respect to the question when market prices will be so readjusted that buying can be resumed in normal volume. There is no keen interest even in that question, however. Conditions have been so tense for a long time, and business has been conducted under such high pressure, that the trade welcomes the relief, and is glad to take a breathing spell. It is vacation season, too.

The turnover in pig iron in the past week has been extremely light. There has been practically no business done in forward deliveries, and in early deliveries the transactions have been surprisingly few in number. Pig iron quotations are substantially unchanged. There has been a little reselling by consuming interests at slight cuts from furnace quotations, but not enough to make a fresh market. Some furnaces have dropped maximum quotations, but have not reduced minimum quotations. Some interesting, almost amusing, reports are going around about furnaces fixing limits beyond which they promise not to advance because they "think prices high enough." The action is quite gratuitous.

In unfinished steel, billets and sheet bars, there has been no business done in the past two or three weeks to show where the market stands. There has been some inquiry, which has elicited the same quotations as formerly from producers, and a statement from buyers that they will wait a while. Mills are calling upon contract customers to furnish heavier specifications for billets, which is probably a significant development. An observer with wide opportunities for gathering information ventures the opinion that a round lot of billets could not be sold for over $80. The market is quotable, nominally unchanged at former prices: $95 to $100 for billets and $105 to $110 for sheet bars. As for many months past, the mills have sold billets and sheet bars for early deliveries only, except for their regular long term contracts, a definite break can easily come earlier in billets than in pig iron or finished steel products.

In finished steel there has been a minimum of business. The large mills have booked favorite customers for some additional tonnages, as old contracts became nearer worked out, but such business is done at inside prices and is not significant. In prompt deliveries little has been done, there being less demand and extremely little mill capacity available. Prices are not quotably changed, though in some quarters the market may be described as a shade easier.

Price Control

The opinion is not so strong as a fortnight ago that the Government will eventually control iron and steel prices to the general trade. It has no authority to do so, and there is no strong feeling in Congress in favor of the power being created. There is little doubt that the Administration would seek the power if prices continued to advance, or even if it seemed probable that they would not decline, but it is now established that the market will eventually decline if left to its own devices.

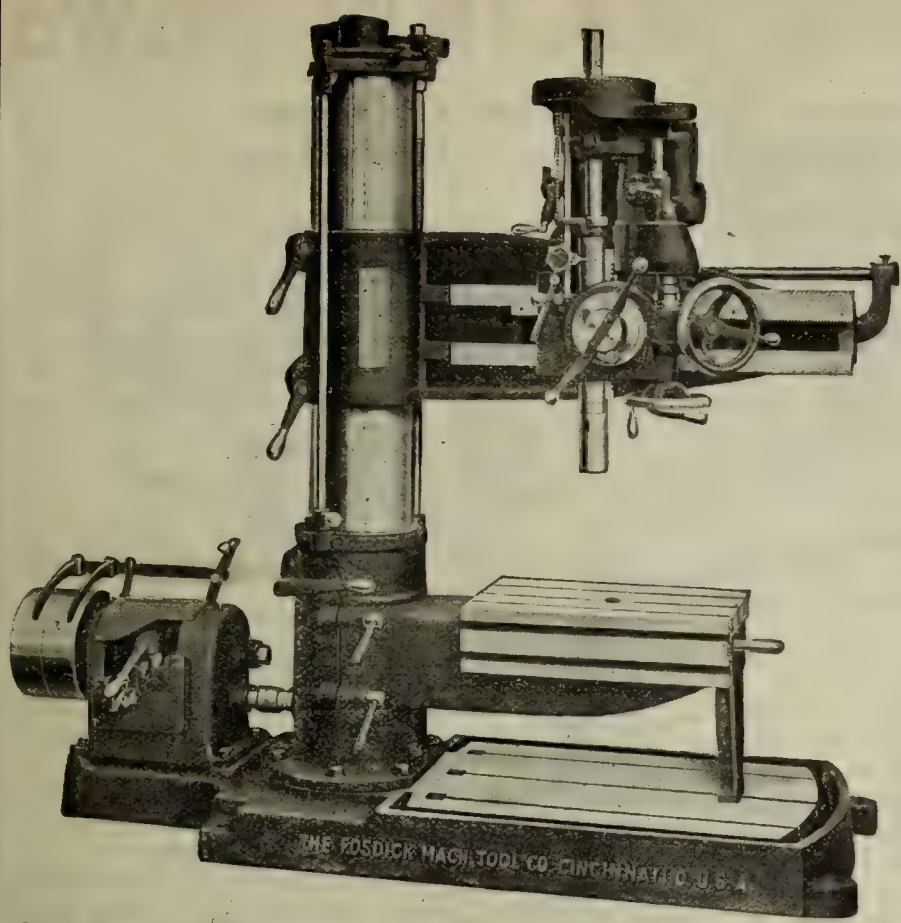
There is one direction in which the Government can exercise an influence on iron and steel prices generally, and that is in coke, provided the Food Control Bill as it is put into shape by the conference now in progress between the House and Senate carries the provisions as to coke contained in the Senate bill, as passed July 21. That bill gave the President authority to fix prices for "food, feed and fuel," the fuel including coke, petroleum and gasoline. In the case of coke, for instance, he would be empowered to take over and operate a coke works, selling the product to the public, or he could require the owner to sell to the public, or to a Government agency to be established, coke at a fixed price. To comply with constitutional requirements, the compensation fixed by the President, either for the product or the use of a plant, is made conditional, the owner of the plant having the option of accepting the price or accepting 75 per cent., and suing the United States, according to established practice, for whatever more he thinks he is entitled to.

Should the President exercise this authority with respect to coke, Connellsville furnace coke, which sold up to $16 per net ton at ovens just before Independence Day, and is now about $10, would probably be fixed at about $5 and kept there, and buyers of pig iron would expect at least as large a concession. This would start the ball rolling, and a general decline in iron and steel prices would probably be precipitated.

As to prices on steel for the Government, an arrangement was made a fortnight ago between the steel committee of the American Iron and Steel Institute and representatives of the Government that the Federal Trade Commission should determine the present cost of production, prices then to be fixed to furnish a reasonable, but what the Government would call a "liberal" profit. The cost report was expected in about three weeks, but latest advices are that it will be many weeks still before it is forthcoming. It is expected in most quarters that these prices, when made public, will have a sentimental influence in pulling down the whole market, not necessarily to the Government level, but at any rate by a large amount.

Jobbers Unloading

Many jobbers are now offering freely certain descriptions of steel, evidently because they wish to enter the period of readjustment with as light stocks as possible. Their stocks are not particularly large in the aggregate, but they will stand considerable paring down. Manufacturing consumers are reported to be fairly well stocked, better than would have been supposed, considering the pressure they have been exerting on mills in the past few months for deliveries. Buyers are taking deliveries quite well, but are not urging heavier shipments, and their specifications on contracts are at a still more reduced rate, the first noticeable decrease in specifications having occurred early in June.



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DETROIT, MICHIGAN

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Windsor, Ont.—The Maloney Electric Co. are erecting a $12,000 reinforced concrete and brick factory addition.

Sherbrooke, Que.—The Canadian Ingersoll-Rand Co. will start work shortly on the construction of a new machine shop.

Halifax, N.S.—L'Air Liquide Society of Montreal will build a factory here to cost about $20,000. Contracts have been let.

Montreal, Que.—The Magnolia Metal Co. is making arrangements for the erection of a plant estimated to cost $60,000.

Montreal, Que.—The Mount Royal Tunnel & Terminal Co. are disposing of a large quantity of contractors' machinery and equipment.

Fort William, Ont.—The Canadian Car & Foundry Co. are finishing their plant here in preparation for the building of freight cars for the Dominion Government.

Montreal, Que.—It is reported that the Dominion Government may take over the munitions plant at Verdun. This institution is now under the control of the British authorities. The plan is that the Government should operate it until the close of the war.

Palmerston, Ont.—The Village of Moorefield, seven miles south of Palmerston, voted last Friday to have Hydro electric connection with Palmerston. Only three opposed the project. Drayton, which has already carried the by-law, will be connected with Palmerston also.

Estevan, Sask.—W. J. Dick, mining engineer of the Commission of Conservation at Ottawa, announces that he understands the Government has appropriated $250,000 for the purpose of establishing a briquetting plant at Estevan, where the lignite coal in Southeastern Saskatchewan will be treated.

Windsor, Ont.—At a cost of $150,000, a factory will be built here for the Maxwell Motor Co., of Detroit. R. Westcott, contractor, of Windsor, has been awarded the contract. The building will be two-storey, 100 feet frontage and 300 feet deep. Automobiles for Canadian and British Empire trade will be manufactured at this factory.

Hamilton, Ont.—H. N. Cole, of Syracuse, N.Y., is visiting Hamilton. Mr. Cole explained that he is here in the interests of the Semet-Solvay Co. of Syracuse, which contemplates establishing a coke plant in this city. The company's prospective site is at the foot of Depew Street, and Mr. Cole is here to make some detailed report of the property.

Amherstburg, Ont.—Within twelve months, if the present schedule is carried through, the big local plant of the Brunner Mond Co., Canadian branch of the Solvay Process, will be in full operation. The excavations of the big ten-story main building have already been completed, and the form work for the concrete foundations is partially in. Part of the reinforced concrete for the cellars has already ben run. Excavations for the boiler-house, milk of lime house and lime kiln are in and work on two chimneys, one 250 feet high and the other 175 feet, have already been started by the Canadian Kelly Co. A waterworks system will be installed.

ELECTRICAL

Moorefield, Ont.—With the help of the Township of Maryborough, the police Village of Moorefield is moving to have Hydro-Electric light and power supplied by the Hydro Commission; $4,500 will be the amount necessary, it is estimated. Twenty-year debentures will be issued for the amount, if the necessary by-law is carried.

Brockville, Ont.—At a joint meeting of the Town Council and Public Utilities Commission a resolution was passed authorizing the Ontario Hydro Electric Power Commission to proceed with the delivery of power to Brockville, to be furnished by the Cedar Rapids Transmission Co. at a price of $35.95. Brockville will require a block of 1,500 horsepower at 2,200 volts for the present. It was said that this arrangement which the Hydro Electric has made with the Cedar Rapids concern will probably be only temporary, as the commission hopes to supply Eastern Ontario with electrical energy developed at the Long Sault Rapids before many years.

GENERAL

Jonquiere, Que.—Price Bros. & Co. will build an extension to their paper mill here.

New Westminster, B.C.—The Dominion Products Co. will build an addition to their plant.

Chambly, Que.—The Canadian Leatherboard Co. have let a number of contracts for their new factory.

Brantford, Ont.—The Slingsby Manufacturing Co., has secured a permit for a new house to cost $5,000.

Brantford, Ont.—The Kitchen Overall Co., which has been occupying rented premises in the city since its organization, has secured land on George street and will shortly build a complete new factory.

London, Ont.—Penmans, Ltd., announce the opening of a new mill here,

AUXILIARY MACHINERY REQUIRED.

Tender forms and specifications have been received from D. H. Ross, Canadian Trade Commissioner, Melbourne, for supply and delivery of auxiliary machinery for the Flinders naval base, via Melbourne, Victoria, and are open for inspection at the Department of Trade and Commerce, Ottawa (refer to File No. A-1901). Tenders addressed to the Director of Navy Contracts, Navy Office, Melbourne, close on October 24, 1917. The particulars are as follows:

Two electrically-driven air pumps, with complete set spare parts.

One steam driven air pump, with complete set of spare parts.

Two small circulating pumps.

One large circulating pump.

One large feed pump, with complete set of spare parts.

One small feed pump, with complete set of spare parts.

One oil fuel pump with complete set of spare parts.

PUMPING EQUIPMENT REQUIRED

Tender forms, specifications and drawings have been received from D. H. Ross, Canadian Trade Commissioner, Melbourne, for the supply and delivery of pumping plant and equipment for the Commonwealth naval dockyard, Cockatoo Island, Sydney, N.S.W., and are open for inspection at the Department of Trade and Commerce, Ottawa (refer to File No. A-1901). Tenders addressed to either the Director of Navy Contracts, Navy Office, Melbourne, or the Director of Naval Contracts, care Commonwealth Naval Dockyard, Cockatoo Island, Sydney, N.S.W., close on October 10, 1917. The particulars are as follows:

Two main dock pumps with vertical spindle motors and control equipments.

One vertical spindle motor and control equipment.

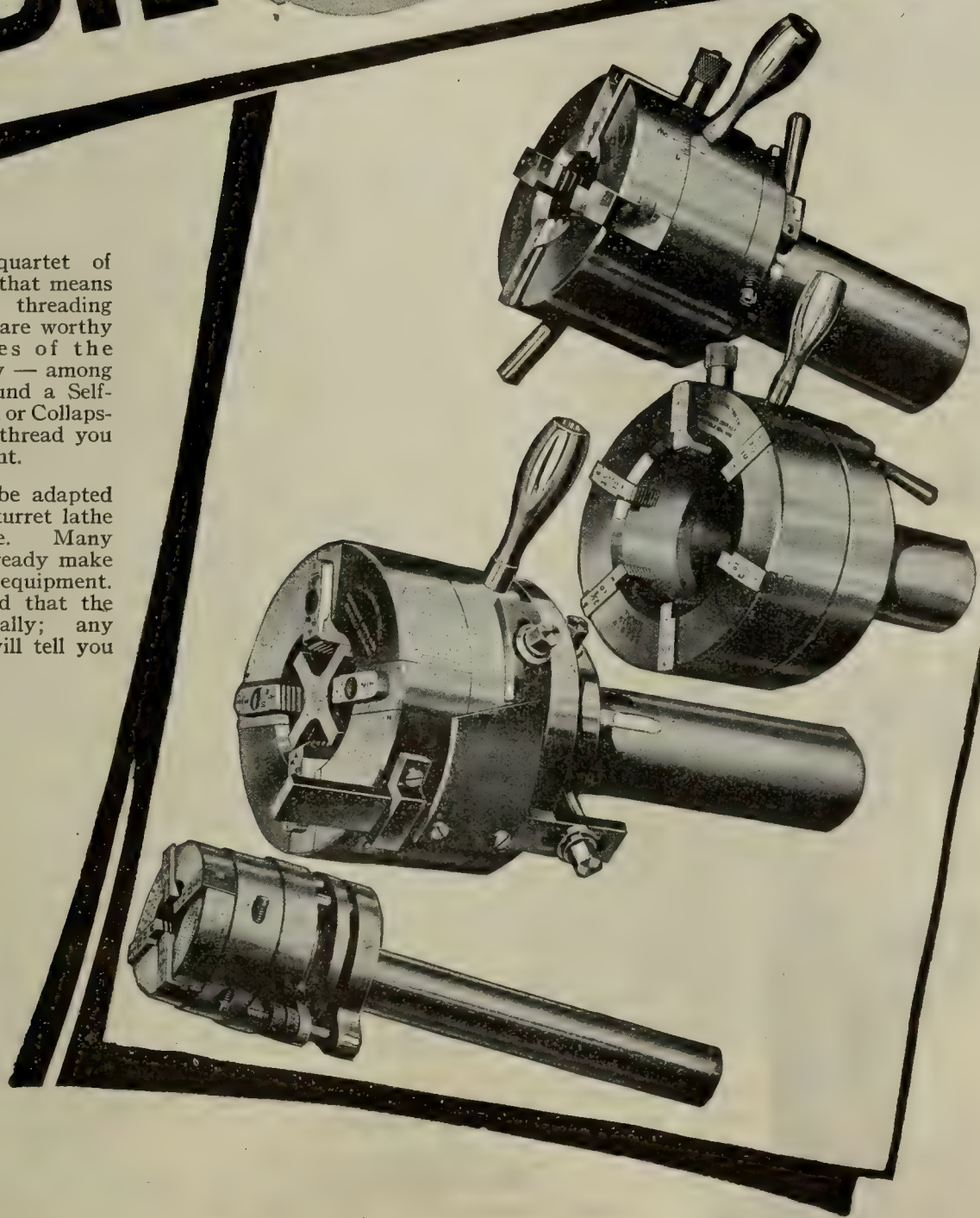
Four sluice valves with four motors and control equipment.

Two drainage pumps with motors and equipment.

Two air exhaust pumps with motors and equipment.

One enclosed motor and equipment for dock caisson.

GEOMETRIC DIE-HEADS



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These tools can be adapted to any make of turret lathe or screw machine. Many manufacturers already make them standard equipment. We are convinced that the rest will, eventually; any Geometric user will tell you why.

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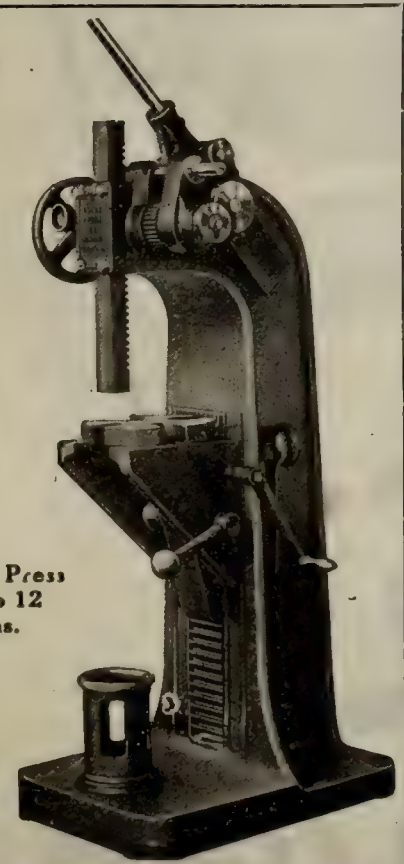
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330 N Park St.
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with some 75 employees, and it is hoped to increase this number very shortly to 175. The work in this mill consists in finishing the underwear which is made in Paris and elsewhere and also in knitting hosiery.

Winnipeg, Man.—The Reliance Investment and Developing Co., capitalized at $500,000, are now preparing plans for the erection of a modern clay products plant which will be built adjoining their property in the north-west part of the city. It is the intention of the company to equip this plant with suitable machinery for the manufacture of high-grade burned clay products. The plans of the company call for the erection of a fireproof plant, costing approximately $100,000. In the installation of the machinery equipment all possible arrangements will be made to produce economical operation in order to turn out these materials at a minimum cost. A. E. Hilder is the manager of the concern.

MUNICIPAL

Verdun, Que.—The City Council have passed the first reading of a by-law empowering the city to issue bonds for $200,000 general improvements.

Winnipeg, Man.—The Board of Control are receiving bids on a quantity of road and contractors' machinery and equipment, electrical apparatus, pumps and scrap metals, etc.

Beeton, Ont.—The ratepayers will vote on August 6 on the Hydro enabling by-law and also on a by-law to raise $15,000, which sum, it is estimated, will be necessary to put the transmission plant in good order.

London, Ont.—The ratepayers will vote on a proposal to guarantee the bonds of the Ajax Rubber Co. to the extent of $450,000. The company agrees to build and equip with machinery and manufacturing accessories a plant to cost at least $300,000, and to make at least 900 tires daily, also to employ at least 250 hands.

Smith's Falls, Ont.—At the special meeting of the Town Council two by-laws were introduced and will be presented to the electors. The first is to raise the sum of $135,000 to purchase the two local electric light plants. The Smith's Falls Electric Light Co. $75,000, and the Citizens' Electric Light Co. $60,000. Also a by-law to take the votes of the ratepayers of the town on a question to be submitted whether the ratepayers are in favor of an agreement with the Hydro-Electric Power Commission and to appoint officials.

PERSONAL

Arthur Vincent, C.E., has been appointed town engineer of Longeuil, P.Q., in succession to the late F. Barbeau.

Mark Workman, president of the Dominion Steel Corporation, has left Montreal for Cape Breton, where he will visit the scene of the disastrous explosion which occurred at New Waterford recently.

B. F. Repton has been appointed comptroller of the Canadian Car & Foundry Co. and its subsidiaries, with full charge of the accounting work in its various phases. Mr. Repton was associated with Messrs. Price, Waterhouse & Co., in New York, for over ten years, and subsequently held the position of general auditor to the Dominion Steel Corporation in Sydney, N.S., for several years. Mr. Repton has already entered upon his new duties.

Roland C. Harris, Commissioner of Works for the City of Toronto, has been appointed to act, in an honorary capacity, as Fuel Commissioner for the Province of Ontario, in association with the Federal Fuel Commissioner, C. A. McGrath. Mr. Harris will co-operate with the Federal Commissioner in all matters affecting the fuel situation within the Province of Ontario, and it is understood that his appointment will be ratified by a Dominion Order-in-Council.

James Fulton Cummings, a pioneer electrical engineer, who for many years was associated with the interests controlled by Thomas A. Edison, died on July 27, at Long Beach, N.Y. Mr. Cummings, who was born in London, Ont., 48 years ago, installed the first electric light stations in Philadelphia, Cincinnati and a number of other cities. He then went to Russia, where he worked out the plans by which electric wires in St. Petersburg, as the capital was then called, were placed in underground conduits. He did similar work in London and other English cities. He was considered one of the foremost engineers in that particular line of work.

TRADE GOSSIP

Maple Leaf Tires Co., has changed its name to that of the Mackintosh Rubber Co. of Canada, Ltd.

Toronto, Ont.—It is reported that the Thor Ironworks have been sold to the Standard Shipbuilding Co. of New York.

Quebec, Que.—It is reported that the centre span of the Quebec bridge will be put in place on the morning of September 12.

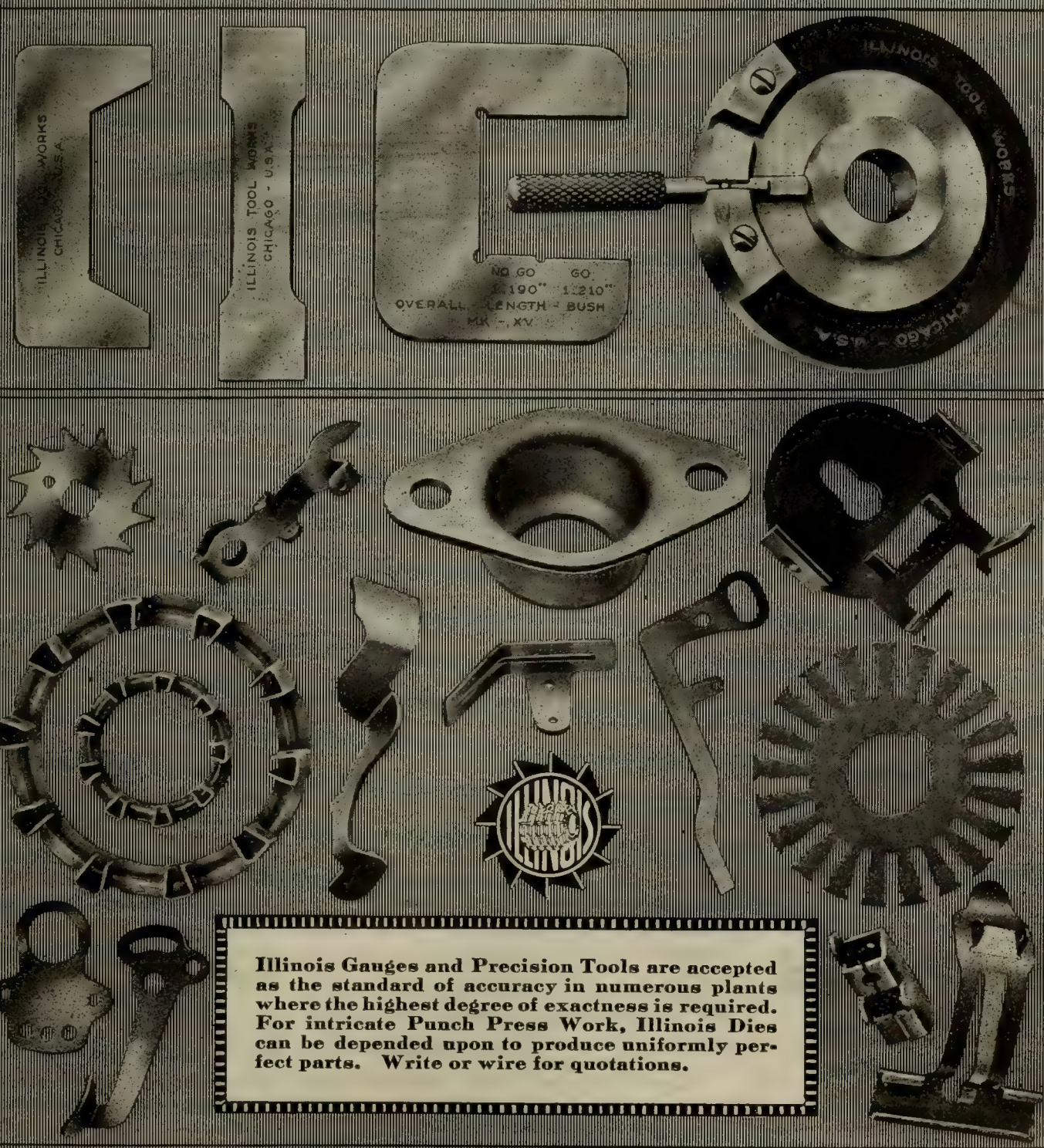
The Roelofson Elevator Works, of Galt, Ont., have been awarded a contract for elevators for A. Burritt & Co.'s knitting factory at Mitchell, Ont.

Tungsten Prices Firm.—The supply of tungsten ore is light and the market continues proportionately strong. High grade wolframite in New York has sold at $25 for spot and scheelite at $26. Buyers are inclined to cover requirements during the balance of this year. Producers are firm at current prices.

Big Order for Penmans.—Penmans, Ltd., of Paris, Ont., has received the greater part of the contract recently placed in Canada by the United States Government for 30,000 dozen of cotton underwear, and further orders are in sight. The American Government offered to contract for 50,000 at a cost of around $1,000,000.

Bids for Natironco Wreck.—Six bids have been received by the underwriters for the purchase of the wrecked Canadian steamer Natironco, which was sunk in collision in the Lower Detroit River several weeks ago. The bids

ILLINOIS GAUGES & DIES



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ranged all the way from $25,000 to $32,000, the latter being by A. B. Mackay, of Hamilton, former owner of the vessel, who acted for French interests.

Railway Board to Take Over Intercolonial.—A despatch from Ottawa states that the Intercolonial Railway will be placed under the jurisdiction of the Dominion Railway Board. The necessary legislation, promised some time ago, has been introduced in the Commons by Hon. Frank Cochrane. The measure is an important one, it that it will give the Railway Board full control over rates, freight and passenger traffic, etc.

Trade Inquiry—The following inquiry has been received by the Department of Trade and Commerce: Ottawa: 1084—Machine tools, metals, chemicals, oils and foodstuffs.—A Swedish firm established in Stockholm, Sweden, and Petrograd, Russia, desires to get in touch with Canadian manufacturing concerns wishing to develop export business after the war, especially machine tools, metals, chemicals, oils and foodstuffs—A representative of the firm is now in New York City. The address can be obtained on application to the Commercial intelligence Branch, Department of Trade and Commerce, Ottawa.

C. P. R. Open Club House.—Every facility for outdoor recreation is offered at the new club house and grounds of the C. P. R. Recreation Club, at Sortin Junction, near Montreal, which has been opened this summer and is now being enjoyed by about 750 members. With sixty acres of grounds and the use of forty acres more, and with a modern and commodious building of forty-five rooms, employees are provided at an annual membership fee of $1, with the attractions of a first class country club. The club was formed last fall as a social organization, but did not grow rapidly. This year some heads of departments and higher officials became interested in it and extended its scope.

May Restrict Use of Coal.—C. A. Magrath, Fuel Controller for Canada in an interview at Ottawa recently urged the people of the country to be prepared to submit to inconveniences and personally to do all in their power to conserve the coal supply. Moreover, he called upon coal dealers to unload shipments of that fuel delivered to them as rapidly as possible in order that as many cars as possible might be available to bring supplies into the country. He intimated that if the war dragged on for many months longer, he might find it necessarv to place restrictions in the use of all sorts of fuel, including coal, wood, gasoline and even natural gas.

Would Welcome Lower Freight Rates—That Canadian manufacturers would certainly appreciate a reduction of ocean freight rates which is promised by the Shipping Commission represented by the Governments of Great Britain and the United States, was the opinion expressed by William Rutherford, president of the Montreal Branch of the Canadian Manufacturers' Association recently. The question of tonnage and high rates was a matter, he said, of considerable concern to the exporter, and the announcement that there would be a sweeping reduction in the latter would be especially acceptable in view of the fact that many goods could not be exported owing to the present prohibitive rates.

The British Corporation Registry of Glasgow, Scotland, at the instance of the Imperial Munitions Board, has established a branch in Toronto. Owing to the large number of hulls on the stocks in the various shipbuilding yards, the Imperial Munitions Board deemed it necessary that official surveyors should constantly be in touch with the work. For the past seven years Captain J. B. Foote, manager of the Marine Department of the Toronto Insurance and Vessel Agency, has had complete charge of the survey work in the matter of classing and supervising steel ships. Under the new arrangement Messrs. David Arnott and P. R. Court, naval architects and surveyors, who have arrived from Glasgow, Scotland, will be associated with Captain Foote in the work.

Ontario Water Powers Investigation.—Hon. I. B. Lucas, Attorney-General, announces that three High Court judges, Chief Justice Sir William Meredith, Justice Sutherland and Justice Kelly, had been appointed by the Ontario Government as a commission to investigate the amount of water used for power by the different electrical developing companies in the province. Under the Water Power Regulation Act passed at the last session of Parliament authority was given to the Government to name such a commission, whose duty it would be to investigate the amount of water used in the generation of power, the amount of power developed or generated, and the works or equipment installed by the various companies, in order that they might not exceed the limits to which they were entitled. The commission will begin operations within a few weeks, and will report as to the price that should be charged the companies for the excess power developed.

TENDERS

Strathroy, Ont.—Tenders are requested for direct connected motor-driven turbine pump, 80 Imperial gallons capacity, against a head of 20 feet. For full particulars, apply Public Utilities Commission, Strathroy, Ont.

Strathroy, Ont.—Tenders are requested for building concrete reservoir and pump houses. Specifications and tender forms may be obtained from Messrs. Kerry & Chace, engineers, Toronto, or Public Utilities Commission, Strathroy, Ont. Tenders received by the Commission, Strathroy, up to noon, August 8.

Ottawa, Ont.—Tenders will be received until August 27 for plumbing pipes and fixtures required in the reconstruction of the Parliament Buildings. All tenders to be based on the execution, erection and completion, including all labor and materials required for the installation of the plumbing system, together with all fixtures, apparatus and appliances as called for in the plans and specifications. Plans, specifications and

any other information can be obtained at the office of the general contractor, P. Lyall & Sons, Construction Co., Ottawa.

BUILDINGS

Cordage Co. will build a warehouse at their factory on St. Patrick Street.

Toronto, Ont.—Lieut.-Col. W. S. Dinnick, president of the Anglo-American Hotel Co., states that the building of the new Devonshire Hotel will be delayed owing to the difficulty in obtaining steel.

Galt, Ont.—Plans for the new hydro station are now in the hands of the Ontario Hydro Commission for its endorsation, and as soon as this is obtained tenders for the construction of the building will be called for.

Toronto, Ont.—The Royal Bank of Canada will erect a new branch office at 456 Yonge Street. The City Architect has approved of the plans for a stone and brick building estimated to cost $22,000, and a permit has been issued accordingly.

INCORPORATIONS

The Gaylord Engineering & Construction Co., has been granted an Ontario provincial license to carry on business as a contracting and construction company. W. J. Elliott of Toronto is the Attorney.

Techno-Chemicals, Ltd., has been incorporated at Ottawa with a capital of $49,900 to manufacture chemical products and compounds at Montreal. The incorporators are Charles Hurtubuise, Gabriel Hurtubuise and E. Jaquemont all of Montreal.

The British American Shipbuilding Co., has been incorporated at Ottawa by F. H. Keefer and A. L. Martin of Thorold, Ont., also A. A. Kinghorn of Toronto, to build and repair ships of all types with a capital of $1,000,000. The head office is at Toronto.

The Richmond Mfg. Co., has been incorporated at Toronto with a capital of $200,00 to make general munitions machinery including chucks of all descriptions, reamers, taps, cutters, etc., in Toronto. The provisional directors are W. W. McNight, N. Cowrian and E. B. McNight all of Toronto.

RAILWAYS—BRIDGES

Edmonton, Alta.—It is expected that the Peace River bridge, which is being built by the Central Canada Railway Co., will be finished this fall. The bridge will cost, when completed, about one million dollars.

Toronto, Ont.—The bridges which the C. P. R. will construct on the line between Leaside and North Toronto will be built of reinforced concrete, and will be 386 feet long. Wells & Gray have the contract for one bridge, and the Dominion Bridge Co. will build the other. J. H. Barber is chief engineer in charge of the work.

Toronto, Ont.—The C. P. R. have started in to rush construction of the small piece of new line between North Toronto and Leaside, and thereby couple

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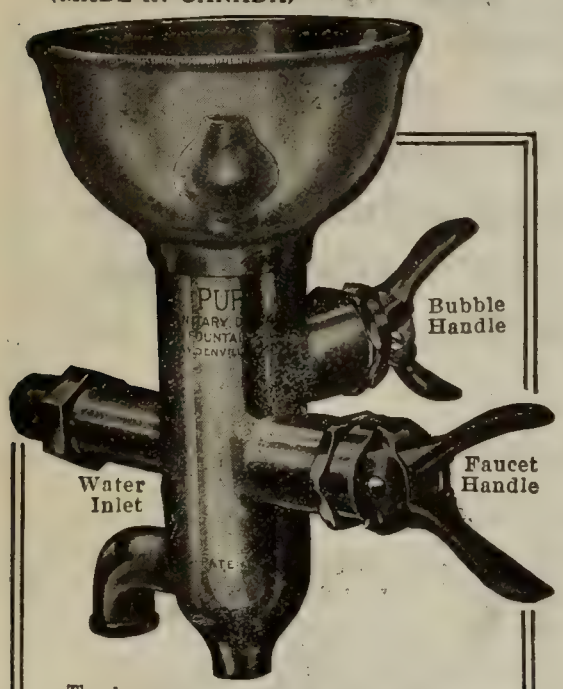

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Order

their double track from Agincourt via North Toronto to Guelph Junction (43 miles). This little piece is just over a mile, from the east end of the North Toronto yard to the west end of the Leaside yard; but it includes in its specifications two new and expensive bridges and a high-class subway. The first bridge will be a three-track one over Reservoir Park ravine; the second one a double-track one over the Belt Line ravine, nearer Leaside.

WOODWORKING

Midland, Ont.—The new company which was recently incorporated with a capital stock of $200,000 for the purpose of taking over all the property owned by Benson & Bray, Ltd., and the business which has been conducted for the last six months by Playfair & Pratt, is to be known as the Midland Wood Products, Ltd. For the present this new concern will make shell boxes, excepting that a portion of this plant will be leased to the Midland Engine Works for the purpose of making shells.

Vancouver, B.C.—Announcement that the receiver for the Canadian Pacific Lumber Co. has leased for a term of three years the four mills of the company at the foot of Salsbury drive, Port Moody, Alberni Canal and the upper Arrow Lake, was made recently by C. B. Macneill, K.C. The four mills have a united production of 80,000,000 feet of lumber yearly, and will aid materially to meet the demand for B. C. lumber, which at present is so great that orders for Eastern Canada as well as orders for abroad are being refused.

CONTRACTS

St. John's, Que.—The Laurin & Leitch Construction Co., Montreal, have the general contract for pumping and filtration plant for the Town Council.

Tecumseh, Ont.—J. R. Sculland, of Windsor, has the contract for reinforced concrete water tower and basin costing $6,500 for the Eau Claire Waterworks Co.

MARINE

Basin, N.S.—The Chester Basin Shipbuilders, Ltd., has been incorporated and proposes to establish a shipbuilding plant at Basin.

Toronto, Ont.—A floating drydock has arrived here for the Toronto Dry Dock Co., who will operate a shipbuilding plant at Ashbridge's Bay.

Ottawa, Ont.—The House has passed votes aggregating $338,000 for bridges and harbor works in Ontario. This includes $96,000 for harbor improvements at Port Stanley.

Halifax, N.S.—The Tusket Shipbuilding Co. have purchased the saw mill of the Parker-Eakins Co., at Tusket Lakes, and are laying the foundation for a new mill at Milner's Lake.

Goderich, Ont.—Word has been received that an appropriation of $55,000 has been made for the harbor work needed at Goderich in connection with the establishment of the Goderich Shipbuilding Co.'s plant here. The work includes the construction of slips for launching into and dredging.

Vancouver, B.C.—A new concern, the Vancouver Shipyards & Engine Works, contemplate establishing a shipbuilding plant here. The company is said to be capitalized at $750,000, and has left contracts for the preliminary work which will prepare the building ways. S. Matheson is interested in the company.

Montreal, Que.—The Montreal Dry Dock Co. have practically rebuilt their plant on Mill Street. Since last year, when the dock had a capacity equal only to repairing scows and barges, extensive alterations have been made. The dock has been deepened, and machinery added to the equipment. The dock is 428 feet long and 30 feet deep.

CATALOGUES

The Greenfield Tap & Die Corporation, Greenfield, Mass., have published an interesting manual containing instructions and information issued to their employees.

Firebox Boilers.—Catalogue No. 62 issued by the Dominion Radiator Co., Toronto, illustrates and describes the Safford-Kewanee firebox boilers for steam and water heating. The catalogue also contains specifications and price lists and sectional views of boiler settings.

Anti-Fouling Compositions.—The American Venexiani Paint Co., New York City, have issued a catalogue describing the "Lamoravia" anti-corrosive and anti-fouling compositions for ships bottoms. The merits of the various compositions and methods of application are dealt with while the various claims as to the durability and efficiency of these materials are also discussed at length.

"Mor-Lite" Plant.—Canadian Fairbanks Morse Co., Montreal and Toronto, have issued an attractive booklet illustrating their Mor-Lite self-starting, self-stopping and self-running electric light generating plants for private use. Complete specifications of the plant are given, and its compactness combined with convenience for country homes are the chief features.

Electric Lamps.—Bulletin No. 78 describes the Cooper Hewitt electric lamps for photographic purposes. The bulletin gives full particulars and prices of the various outfits and different apparatus used in connection, accompanied by illustrations. The bulletin also contains suggestions as to the proper outfit to be used for various purposes in photography with illustrations showing studio arrangements. Copies of the bulletin may be obtained from The Cooper Hewitt Electric Co., Hoboken, N.J.

Manufacturing Lathe.—A catalogue recently issued by the Porter-Cable Machine Co. of Syracuse, N.Y., features a manufacturing lathe specially designed for the economical production of duplicate parts in large quantities. The catalogue is arranged in two sections. The first section contains a detailed description of the principal features embodied in the design of this lathe with illustra-

tions showing these parts and attachments. The second section illustrates and describes several universal milling attachments, the principle feature of each being referred to. Boring heads and end mills are also described while the concluding page contains a partial list of users of the Porter-Cable manufacturing lathe.

BOOK REVIEW

Progress in Water Works Pumps.—Waterworks pumping plants have recently undergone a rapid and radical evolution. The tremendously heavy and expensive, although efficient, triple-expansion pumping engine has given place to the more compact, simple and less costly steam-turbine-driven centrifugal pump. The efficiency of the latter has risen steadily with the experience of its builders and with improvements in auxiliary equipment, until duties under standard steam conditions exceeding 150,000,000 ft. lb. per 1,000 lb. of steam are now obtained. The De Laval Steam Turbine Co., of Trenton, N.J., builder of the largest pumps of this type, has just issued, under the title "Progress in Water Works Pumps," a 48-page booklet discussing the general economic and engineering conditions affecting the design and installation of such pumps. Installations in 15 of the principal cities of this country and Canada are described, including 34 units aggregating 999,000,000 gals. per day capacity. The publication should be of value to any one interested in the handling of water in large quantities.

The Economical Purchase and Use of Bituminous Coal for Heating Homes.—The University of Illinois has issued a circular dealing with the economical operation of small house heating plants and the saving in coal that can be effected. The University of Illinois has discussed, in the circular referred to, the more important factors involved in the installation of a satisfactory house heating system, and has set forth the most economical methods of firing soft coal and operating a house heating plant. The properties of fuels, and the processes attending their combustion are discussed in a fashion which is intended to help the average householder to understand his problem and to secure the economics of intelligent operation. Copies of this circular may be had by addressing the Engineering Experiment Station, Urbana, Illinois. The price is ten cents.

He was one of those clever people who are always trying to take a rise out of someone, and his latest selected victim was a lady bus conductor.

"Berlin, please!" he said with a grin, tendering a penny as she come for the fares.

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4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

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New 15" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
S.H. 15" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 16" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 15" x 7' Oliver Dbl. B.G., Q.C. Gear, Oil Pump and Pan.
New 16" x 24" x 10' South Bend Gap Sgl. B.G., Stan. Change Gears.
S.H. 17" x 8' Greaves Klusman Sgl. B.G., Geared Feed.
New, 18" x 8' Greaves Klusman Dbl. B.G., Geared Feed.
New 18" x 8' Giddings & Lewis Dbl. B.G., Geared Feed.
New 16" x 8' Stevens Sgl. B.G., Standard Change Gears.
New 18" x 8' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 18" x 10' Muller Sgl. B.G., Standard Change Gears.
New 18" x 12' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 20" x 10' Flather Sgl. B.G., Standard Change Gears.
S.H. 36" x 10' Fay & Scott Sgl. B.G., Stand. Change Gears.

HEAVY DUTY MANUFACTURING LATHES

New 20" x 8' Petrie Heavy Duty Manufacturing Lathes.

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New 3' Dresses Plain Radial, Gear Box Drive.
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S.H. 14" Avey Spingle Spindle Sensitive.
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New 16" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. Combination Grinder and Buffer.
New 12" Ford Smith S.O. Buffing Machine.
New Style B, Point Yankee Twist Drill Grinder.

MISCELLANEOUS

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S.H. No. 0 Burke Hand Milling Machine.
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22" x 8' Pratt & Whitney.
24" x 8' Lodge & Shipley.
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18" Buffalo, post drill.
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22" Barnes, back-geared.
24" Kerkhoff, sliding head.
40" Bickford, back geared.
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No. 10a Baush, 16-spindle.
No. ½ Avey, ball-bearing, bench.

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No. 1 Cincinnati, universal tool.
No. 2 Landis.
No. 2 Sellers, universal.
No. 3 Modern, universal.
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36" x 36" x 10' Sellers, 4 heads.
40" x 40" x 12' New Haven, power feed.

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Monarch, vertical.

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1—Garvin Hand Miller.
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1—3' Mueller Plain Radial Drill.
1—4' Bickford Radial Drill, with T.A.
1—6' Mueller Plain Radial Drill.
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36" throat (single), cap. 1¼x1" (belt).
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16" throat (single), cap. 1½x1½ (belt).
38" throat (single), cap. 1x1" (belt).
36" throat (single), cap. ⅞x⅞" (belt).
17" throat (single), cap. ¾x¾" (belt).
15" throat (single), cap. ¾x½" (hand).
10" throat (double), cap. 1½x1" (belt).
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MISCELLANEOUS.

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Cold Saw, Newton, 40" blade, two tables.
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First-class condition—quick shipments.

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Equipment used for making 18-pr. Shells.

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1—40-gallon Bowser Tank and Pump; good as new.
1—Cold Saw, with variable speed motor, 60 cycle, 220 volt, cuts up to 9" stock, complete with three saws.
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1—Bertram Band Turning Attachment, for 24" Lathe, Ball-bearing Centre.

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No. 3 Wilmarth & Morman Surface Grinder.
No. 3 La Salle Grinder, complete.
Geometric Chaser Grinder, with countershaft.
No. 4 and No. 6 Gardner Pl. Bearing Disc Grinder.
No. 2 Diamond Wet Tool Grinder with wheel truing device.

LATHES.

No. 10-K Seneca Falls 9" x 4' Bench Lathe.
14" x 6' Monarch Q.C., S.B.G. Engine Lathe.
17" x 8' Sidney Q.C., D.B.G. Engine Lathe.
19" x 8' Sidney Q.C., D.B.G., Engine Lathe.
16" x 7' Oliver Q.C., D.B.G. Lathe, with pan and pump.

SCREW MACHINES.

No. 1 New Howe Pl. Hd. Screw Machine, with auto. chuck.
1½" Dreses Screw Machine, F.B.G., Power Feed.

MILLING MACHINES.

Wisconsin Hand Miller on column, complete.
No. 6 Whitney Hand Miller, complete with countershaft.
No. 1 U.S. Hand Miller, complete with cshaft.
H. B. Smith Hand Miller, complete with cshaft.
No. 1 Standard Hand Miller, with oil pump equipment.

PRESSES.

Atlas Presses, No. 0 to No. 5 inclusive.
Greenerd Arbor Presses, No. 1 to No. 5 inclusive.
No. 5 Toledo Geared O.B.I. Power Press.
Manhattan Ratchet Type Screw Press.

THREADING MACHINES.

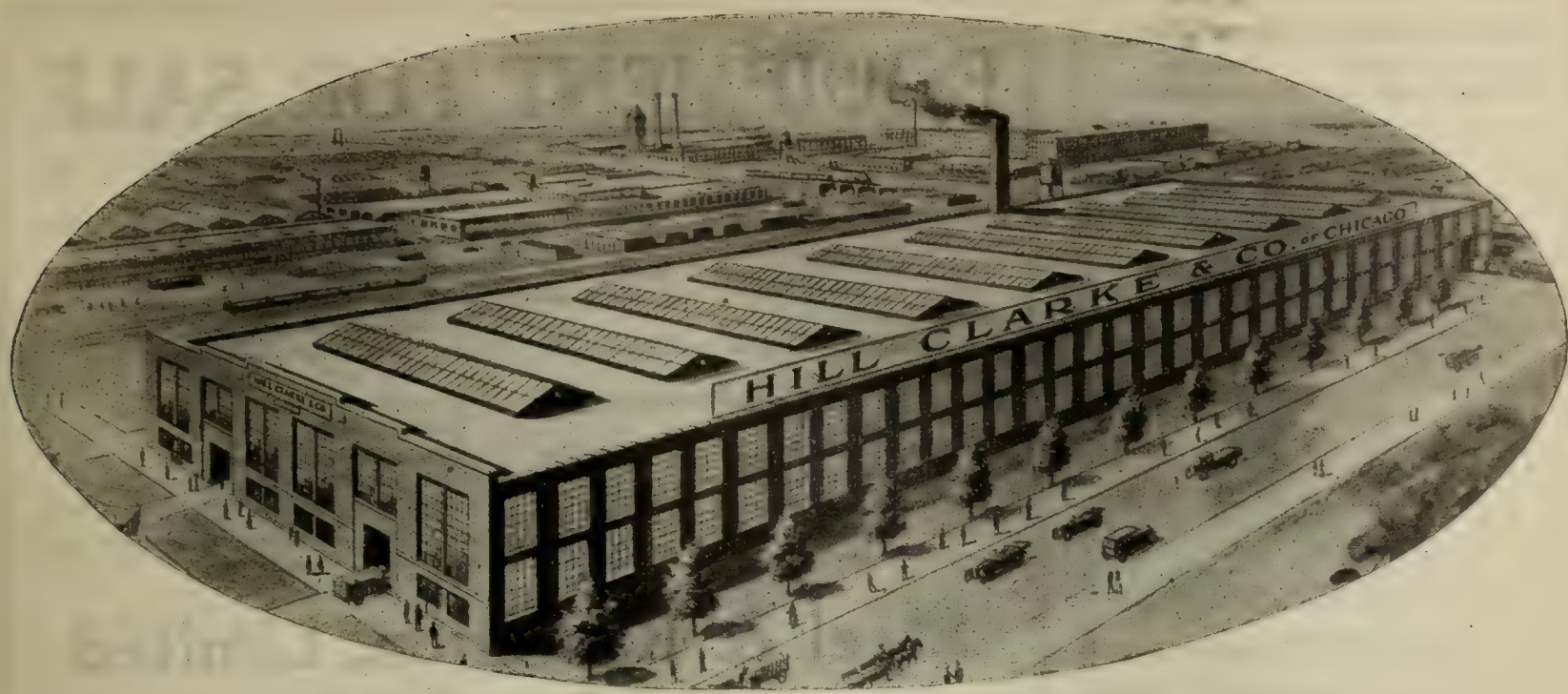
Geometric ¾" Threading Machine.
No. 38 Curtis & Curtis Hand Power Pipe Machine.
No. 5½ Merrill Comb. Hand and Power Pipe Machine.

C. W. CULLEN
MACHINERY CO.

LEADER-NEWS BUILDING

CLEVELAND, OHIO

American 5' Plain Radial Drill, 3" spindle, box table, b.g., tapping attachment, M.D.
Bickford 4' Plain Radial Drill, cone drive,
La Pointe Broaching Machine.
Toledo No. 204 Spc. Double Crank Press.
Toledo 400-lb. Board Drop Hammer.
2—P. & W. No. 2 Cutting-off Machines.
Bement Miles & Co. 7½" Spindle, Vertical Drilling and Boring Mill, 68" swing.
Gardner No. 24 Belt-driven Disc Grinder.
Bradley 150-lb. Upright Strap, 150-lb. helve, 75-lb. Upright Strap Hammers.
Detroit Japanning Ovens, 8' 10" x 8' x 152".
Gisholt 28" Turret Lathe, taper attachment, M.D.
Pratt & Whitney 48" Gap Lathe.
Hanna 30-ton Riveter.
Pangborn Sand Blast, 84" rotary table, M.D.
3—800-ton G.E. Hydraulic Double Action Presses.
1—Toledo Toggle Press, No. 165½.
1—Ferracute Press, Dagg 66.
Bliss Presses—3 No. 60½, rack and pinion; 1 No. 77½; 1 No. 87 special geared.
3—2¼ Cleveland Automatics; prac. new.
10—¾" B. & S. Automatics.
5—3" x 36" J. & L.
Allis-Chalmers 150 H.P. Corliss Engine, 12' F.W.
Bruce MacBeth 150 H.P. Gas Engine; new.
2—Rathmann Jones Gas Engines, 125 and 225 H.P.



The Only ReManufacturing Plant in the World

ReMANUFACTURED MACHINE TOOLS
-(ORIGINATED BY US)-

OUR GUARANTEE:
Your money back, if you return machine within 30 days from date of shipment, freight prepaid.

No Excuses Necessary

Some very latest models—None over 2 years old

TURRET MACHINES.

25—21″ Gisholts, 3½″ hole, 2-step, 5″ belt,
25—21″ Gisholts, 3½″ hole, motor arrangement,
15—24″ Gisholts, 4¼″ hole, 3-step, 4″ belt,
40—24″ Gisholts, 6″ hole, 2-step, 6″ belt,
42—24″ Gisholts, 6″ hole, motor arrangement,
2—2¼″ x 26″ Greenlee Flat Turrets,
2—2½ x 26″ Pratt & Whitney Gd. Hd. Turrets,
4—No. 3-A Warner & Swasey (bar machines).

ENGINE LATHES.

24—22″ x 8′ Hamilton, D.B.G., C.R., Semi-Q.C.,
5—22″ x 8′ Hamilton, D.B.G., Turret tool post,
4—22″ x 8′ Davenport, D.B.G., Turret tool post,
7—22″ x 10′ Hamilton, D.B.G., C.R., Semi-Q.C.G.,
2—22″ x 10′ Hamilton, D.B.G., Turret tool post, Semi-Q.C.G.,
20—22″ x 10′ Davis, D.B.G., C.R., Q.C.G.,
8—24″ x 10′ Lodge & Shipley, D.B.G., C.R.,
8—24″ x 10′ Lodge & Shipley, Selective Gd. Hd., C.R., Q.C.G.,
11—26″ x 10′ American, D.B.G., C.R., and carriage turret, Q.C.G.,
2—26″ x 10′ American, D.B.G., carriage turret,
19—26″ x 12′ Putnam, carriage turret, Semi-Q.C.G.,
9—26″ x 12′ Putnam, C.R., Semi-Q.C.G.
2—26″ x 12′ Wickes, D.B.G., C.R., Semi-Q.C.G.,
10—28″ x 10′ Niles, Bement, Pond, D.B.G., Q.C.G.,
4—28″ x 14′ Lodge & Shipley, Select. Gd. Hd., motor drive, C.R., turret and taper,
3—30″ x 16′ Lodge & Shipley, D.B.G., C.R., turret and taper,
11—40″ x 18′ Pittsburgh, triple geared, Q.C.G.

The above are a few representative machines. We also have a big list of Planers, Vertical and Horizontal Boring Mills, Millers, Shapers, Gear Cutters, etc.

SEND FOR GREEN LIST DESCRIBING THESE AND HUNDREDS OF OTHERS

HILL, CLARKE & CO. OF CHICAGO

625 WASHINGTON BLVD., CHICAGO, ILL.

If any advertisement interests you, tear it out now and place with letters to be answered.

Federal Machinery Sales Company

18 No. Jefferson St., Chicago, Ill.

Rebuilt Tools—Immediate Shipment

DRILLS.

24" Hoefer, upright, sliding head, b.g., p.f.
25" Hamilton, sliding head, b.g., p.f.
2-spindle 20" Barnes, gang, b.g., p.f.
Silver, 20", wheel and lever feed (15), new.
Silver, 20", b.g., p.f., automatic stop (20), new.

GEAR CUTTERS.

Gould & Eberhardt, 22" x 5" x 6 pitch, auto. spur and bevel.
Whiton 24" Automatic Spur Gear Cutter.

GRINDERS.

No. 2 Oakley Universal Cutter and Tool Grinder, new.
No. 2 American Surface Grinders (2), new.
Landis 8" x 20" Universal.
Landis 16" x 66" Crank Grinder with extra plain heads if desired.

LATHES.

16 and 17" x 8' Engine Lathe (6), Porter, Cincinnati, etc.
16" x 8' South Bend (2), new.
18" x 12' American, c.r., h.s.
17" x 6' National, quick-change gear, c.r., h.s.

MILLING MACHINES.

Pratt & Whitney Lincoln type (2).
No. 1½ American Universal.
No. 3 Aurora, plain, back-geared.
No. 1½ Grand Rapids, back-geared, plain.
No. 13 Brown & Sharpe Mfg., plain.
4-spindle Warner & Swasey Valve Miller, good as new.

PRESSES.

No. 5 Cleveland, open back, inclinable, plain, new.
C1 Ferracute, open back, inclinable, plain, new.

SCREW MACHINES AND TURRET

2¼" Acme, fric. grd. head, p.f. to turret.
Bardons & Oliver No. 1, 13-16" cap.
Hamilton, 20" swing x 8' bed, fric. head, eng. tur. lathe, pan bed, power feed turret on bed.
Pond 21" Heavy Duty Rigid Turret Lathe, geared head.
Jones & Lamson 3" x 36" Grd. Sliding Head Turret Lathe, bar equipment.

SHAPERS.

20" Hendey Friction Shaper.
20" Cincinnati Back-geared Shaper.

MISCELLANEOUS.

High Speed Hammer Co.'s No. 4A Riveting Hammer.
3" Smith & Post Cold Saw.
D14 Rock River Geared Power Splitting Shear.
60" Bertsch Foot Power Gap Squaring Shear.

Send for complete list.

EQUIPMENT FOR SALE

One Brantford Preheating Oven, 7' 0" x 4' 6", complete with gas burners.

One Bowser Varnishing Tank, complete, 18 x 26 x 28.

One Double Spindle Henry & Wright Drill, equipped complete with jigs for drilling and tapping fixing screw hole.

Two Bertram wave and undercut attachments for 18 pr. shells.

One Holden & Morgan Mechanical Plug Wrench.

One Holden-Morgan Base Thread Milling Machine, with countershaft.

Two Bertram Double Spindle Thread Milling Machines, with countershaft.

One Garvin Turret Lathe and Countershaft.

One Putnam Light Speed Lathe, 16" x 4' bed, with countershaft.

One Gaylor Cross and Speer Light Turning Lathe, with countershaft.

One 44" x 11' bed Russell Turret Lathe, with chuck and countershaft.

1—Gardiner Grinder, No. 50.
2—D-8 Colborne Drills.
1—4-Spindle Drill.
1—16" Bickford Drill.
1—Petrie 12" Drill.
1—Bertram Steam or Air Hammer.
1—Nazel Air Hammer.
1—Henry & Wright, No. 793 2-Spindle Drill.

Specifications and prices will be given upon application.

Steel & Radiation, Limited

Fraser Avenue, Toronto

c6m

Long Distance is Calling!

Telegrams and Long Distance Telephone Messages are not uncommon among the replies to ads in our Classified Advertising Section.

A Salesman Always on the Job

IT is the constant dropping that wears the stone away. It is the constant knocking at the door of attention and favor that in the end gives you ready access to the good-will of buyers of your merchandise.

You can keep up a constant knocking—a bid for attention, a reminder of yourself, a spokesman of your message—this by using regularly

The FARMER'S MAGAZINE

No man whose customers and should-be customers are farmers should be absent from their attention. Their will and purpose to buy may mature at any time. The salesman on the spot stands the best chance to get the order.

All this you know, but—do you live up to the behest of your knowledge?

Let us tell you more about **The Farmer's Magazine** in a special letter.

N.B.—Objectionable advertising not accepted. Both editorial and advertising columns are closely censored to keep them clean and decent.

Published by

The MacLean Publishing Co., Limited

143-153 University Avenue, Toronto, Ontario

"Williams" List of Machine Tools

FOR IMMEDIATE SHIPMENT

New Lathes

3—16 x 8 "CISCO"
4—18 x 10 "CISCO"
2—17 x 8 Le BLOND
6—19 x 10 Le BLOND
6—21 x 8 Le BLOND
1—25 x 10 Le BLOND
6—24 x 12 C.M.C.
1—36 x 26 PITTSBURG (triple geared)

Used

3—16 x 6 CINCINNATI Q.C.G.
5—20 x 10 HINDMAN
2—20 x 10 LODGE & SHIPLEY (geared head)
8—22 x 10 PUTNAM
1—24 x 16 BERTRAM
1—27 x 16 REED PRENTICE
6—24" DAVIS Boring Turret Lathes
7—18" LIBBY Turret Lathes
No. 2 WARNER & SWASEY Turret
2 x 24 JONES & LAMSON Turrets

Automatics

2—2 x REED PRENTICE
3—2 x REED PRENTICE
10—2¾ CLEVELAND
18—6A POTTER & JOHNSON

Drills

New 28" BARNES
6—26" BARNES
3—25" SUPERIOR
1—22½" BARNES
1—24" AURORA
1—26" AURORA
2—D 1. COLBURN
3—D 8. COLBURN
1—New BUFFALO Heavy Duty

New Radials

1—4' MUELLER
3—5' REED-PRENTICE (speed box drive)

New Shapers

2—14" SMITH & MILLS
4—16" SMITH & MILLS
2—20" SMITH & MILLS
4—20" GOULD & EBERHARDT
4—24" GOULD & EBERHARDT
1—28" GOULD & EBERHARDT

Millers

New 3 H. Le BLOND UNIVERSAL
New No. 25 BECKER PLAIN
No. 2 CINCINNATI UNIVERSAL
No. 2 KEARNEY & TRECKER

Planers

36 x 36 x 11 INDUSTRIAL
36 x 36 x 12 C.M.C.
52 x 52 x 16 McKECKNIE BERTRAM (two heads)

Slotters

8½" BERTRAM
10" BERTRAM
16" SMITH, PEACOCK & TANNET

Miscellaneous

3000 lb. MORGAN Steam Hammer
BERTRAM Horizontal Boring Machine
32' LONDON Vertical Boring Mill
NEWTON Vertical Miller

This is only a partial list. Write stating your needs.

A. R. WILLIAMS MACHINERY CO., LIMITED

64 Front Street West **Toronto, Ontario**

Polson Iron Works
Limited

TORONTO

Surplus Machinery for Sale

2—3″ Hall Cut-Off Machines
1—Lodge & Shipley Turret Lathe, 22″ x 10′
1—Lodge & Shipley Turret Lathe, 24″ x 10′
2—Libby Turret Lathes, 18″
1—Gisholt Turret Lathe, 18″
2—Gisholt Turret Lathes, 21″
1—Gardner Shell Base Grinder, 4A
1—Ford-Smith Grinder, 20″
2—Landis Traverse Grinders, 4′
1—Symington Band Turn Lathe, 3″
1—Goldie McCullough Band Press and Pump, 3″
1—3″ Stamping Machine
2—Tate-Jones Shell Furnaces
3—Blowers

Rebuilt Machines For Sale

PLANERS

1—Pond 42x42x10.
1—Powell 24x24x6.
5—Sellers 25x25x6′.
2—Sellers 25x25x8′.
1—Putnam 25x24x8′ 6″.
1—Putnam 25x25x10′.
1—Wheeler Heavy 30x30x8′ 6″.
1—Lathe-Morse 24x24x5′ 6″.
1—New Haven 24x24x7′.
1—Wood Light 30x30x8′.
1—Putnam 42x40x12′ 6″.

GRINDERS

1—LeBlond Universal Tool and Cutter, power feed, same as new.
1—Bridgeport Plain Grinder, 16x36.
1—No. 3 Landis Universal Grinder.
2—No. 6X Diamond Double Disc Grinders.
1—Ford Smith Plain Grinder.

AUTOMATICS

1—1″ National Acme Double Belt Type.
1—1⅝″ National Acme Double Belt Type.
1—No. 55 National Acme.
1—1″ National Acme four spindle.
2—No. 54 National Acme four spindle.
3—2″ Cleveland.
1—2¼″ Cleveland.
2—2¼″ Gridley Single Spindle Motors.
1—3¼″ Gridley Single Spindle Motor.

LATHES

1—32x12′ Draper Lathe, C.R., H.S.
1—36x22′ Fitchburg Lathe, C.R., P.C.F.
1—30x8′ Fitchburg, C.R., P.C.F.
3—16x8′ Putnam, C.R., taper.
6—18x6′ Porter, C.R., semi-quick, taper.
2—18x8′ Davis, C.R., pan, pump, taper.
10—16x8′ Graves-Klusman, C.R., pan, pump.
9—10x6′ Perkins Plain Turning, pan, pump.
1—14x6′ Porter, C.R.
1—20x8′ LeBlond, C.R.
14—20x6′ Perkins Lathes, pan bed, chuck, Fay & Scott Turrets.

MISCELLANEOUS

1—16″ Niles B. G. Shaper.
2—310 Baker Drills.
1—9″ Industrial Works Slotter.
1—24″ Aurora Sliding Head Back Geared Drill.
3—Prentice 24″ Sliding Head Drills.
2—Industrial 40″ Drills.
1—Western Hydraulic Banding Machine.
1—Jenckes Band Turning Lathe, with 3″ Universal Chuck.
1—36″ Aurora Drill.
1—12″ Bement Travelling Head Shaper.
1—12″ Juengst Crank Shaper.
1—Sellers Slab Miller, 24x24x12′.
1—No. 21 Lee-Simplex Saw.
1—26x10 Cincinnati Gear Cutter.

This is only partial list—Send for full list

Simmons Machine Company, Inc.

NEW YORK, 1001 Singer Bldg., Telephone Cortlandt 6575
ALBANY, N. Y., 985 Broadway, Telephone 4876 Main

New York's Greatest Stock
(Partial List)

PUNCHES AND SHEARS

Wm. Sellers Punch, 48″ throat, capacity 6″ through 1½″
General Engineering Co., 72″ Multiple Punch, capacity 11-16″ hole in ¼″ Plate; weight about 25,000 lbs.
Reade Multiple Punch, 15″ throat; arranged for motor drive
Hetherington & Berner double geared Beam Punch, 1½″ stroke, 17″ throat
Wm. Sellers double end Punch and Shear, 21″ throats, punch 1½″ through 1″
Bass Machine Co. double end Punch and Shear, 20″ throats, punch 1¼″ in ¾″
No. 4 Industrial double end Punch and Shear, 20″ throats, capacity 1″ in 1″
McDougal double end Punch and Shear, 15″ and 12″ throats, punch 1″ through ¾″
No. 9A Badger double end Punch and Shear, punch ½″ in ½″
No. 0 Royersford double end Punch and Shear, punch ⅝″ through ½″
Perkins single end Punch and Shear, 30″ throat
No. 1 Hilles & Jones single end Punch and Shear, arranged for motor drive, 26″ throat
No. 000 Hilles & Jones single end Punch and Shear, 13½″ throat, punch ¾″ through ⅜″
Kling Bros. Rotary Splitting Shear, arranged for motor drive, capacity ⅝″ plate, will split any width sheet
No. 384A Toledo Rotary Shear, circle cutting attachment, 18″ throat, cut circle to diameter of 82″
No. 17 Niagara Rotary Shear, circle cutting attachment, 28″ throat, cut circle to diameter of 72″
Pels Beam Shear "T-40," capacity to cut to 15″ 60 lb. I beams
Alligator Shear, 12″ blade, 1″ x 6″ flat steel
Bement Plate Iron Shear, 26″ throat
Coping Machine, 3″ stroke

BORING MILLS

10′ J. Morton Poole heavy duty Vertical, two swivel heads, motor driven
52″ Bement-Miles Vertical, two heads, motor driven
Two 34″ Rogers Vertical, single turret head
Five 30′ Bullard Vertical, single turret head
20″ Bullard Vertical Turret Lathe, with side head and turret head
18″ Bullard Vertical Turret Lathe, with side head and turret head
Bement Horizontal, 3¾′ bar
Betts Horizontal, 2¼″ bar
Pratt & Whitney Horizontal, 2¼′ bar

MILLING MACHINES

No. 4B Brown & Sharpe Plain, single pulley drive
No. 4 Cincinnati heavy duty Plain, single pulley drive
No. 4 Brown & Sharpe Plain
No. 2 Hendey-Norton Universal, dividing head, vertical attachment
No. 2 Cincinnati Universal
New No. 1½ American Improved Plain
No. 14A Garvin Plain
No. 1 Kempsmith Plain
No. 1 Pratt & Whitney Plain
Two No. 5 Brown & Sharpe Vertical
Beaman & Smith 2 spindle Vertical Slab, table 24″ x 48″

PLATE PLANERS

25′ Niles heavy duty, open end housings, plane any length at different settings
16′ Dunkirk, plane any length at different settings

New York Machinery Exchange, Inc.

50 Church Street . . New York City

If any advertisement interests you, tear it out now and place with letters to be answered.

IMMEDIATE DELIVERY

DRILLING MACHINES

Leland H.S., B.B., bench type.
No. 1½ Knight Driller and Miller.
14" Rockford Sensitive.
20" Kern, b.g.
22" W. F. & J. Barnes, s.h., b.g., p.f.
No. 25 Foote-Burt 24" drill (new).
32" W. F. & J. Barnes, s.h., b.g., p.f.
32" Hamilton, s.h., b.g., p.f.
No. 30-C Baush, 12 spindle.
20" W. F. & J. Barnes, 4 spindle.
3' W. E. Gang Plain Radial.
3½' W. E. Gang Plain Radial.
Pawling & Harnischfeger Horizontal Driller.
No. 1B Bement Horizontal Driller and Borer.
48" Colburn Mill, 2 swivel heads.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. automatic.
30" x 9" G. & E. auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3—26" B. & S. for spur.
36" Walcott for spur.

GRINDERS

Yankee Drill.
Leland Universal, with power feed.
No. 23 B. & S. Gear Cutter.
8" x 30" Modern Plain (new).
14" x 20" B. & S. Plain.
Garvin hole grinder.
Gisholt tool grinder.
No. 5 Diamond water tool.
No. 16 Gardner disc grinder.
No. 24 Gardner disc grinder.

LATHES

13" x 5' P. & W., c.r., taper.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
18" x 8' L. & S. pat. head, c.r. taper.
18" x 10' Fitchburg, c.r.
18" x 12' Barker, c.r.
20" x 14' Blaisdall, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
32" x 16' Blaisdal, c.r.
36" x 20' American, t.b.g.
36" x 22' New Haven, t.b.g.
3½" x 60" Fitchburg Lo-Swing.

PLANERS

36" x 36" x 16' Sellers, one head.
36" x 36" x 12' Cleveland, open side, 3 heads and arranged for motor drive.
36" x 36" x 12' Detrich & Harvey, open side, 2 heads, one side head.
40" x 38" x 14' Putnam, one head.
40" x 40" x 12' New Haven, one head, one side head.
40" x 48" x 18' New Haven Planer, 2 heads, 2 extension heads.

SCREW MACHINES

1" B. & S. Plain.
16" P. & W. Plain.
No. 2 Foster, plain head.
No. 2 Costello, plain head.
No. 2 P. & W. friction head.
No. 3 Foster, geared head.
No. 4 Pearson, geared head.
No. 3 Bardons & Oliver, plain head.
No. 12½ Garvin, friction head.
⅞" Cleveland, automatic.

TURRET LATHES

16" Lodge & Shipley.
25' Niles.
2 x 24" Jones & Lamson.
3 x 36" Jones & Lamson, chucking equipment.
3 x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt turret lathes, taper attachment.

PUNCHES AND SHEARS

No. 2 L. & A. Angle Iron Shears, 5"x5"x½" (new).
No. 5 L. & A. Double Punch & Shear, ⅝"x⅝", 3"x⅜", 1⅛ rd. (new).
No. 1 L. & A. Multiple Punch (new).
No. 2 L. & A. Multiple Punch (new).
No. 1 L. & A. Horizontal Punch, ½" in 1" (new).

MISCELLANEOUS

No. 2 Kempsmith Universal Miller.
50-lb. Bradley Strap Hammer.
100-lb. Bradley Helve Hammer.
¾" Acme Forging Machine.
52" Niles car wheel boring mill.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-ton Yale Duplex Hoist.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., CHICAGO, ILL.

Let the Boss Know It!

IF you are a reader of Canadian Machinery, go tell your employer about it some convenient time! You couldn't tell the up-to-date manufacturer anything that would please him more. He would know that you are abreast of the times; that you are ambitious and interested in your work; that you are acquainted with methods and machinery which make for greater efficiency. He will say softly to himself: "Here is a live wire,—I'll just keep my eye on that chap."

If you are not a regular reader it will pay you to become one right away—quick.

Subscription price—$3.00 per year. 52 issues.

LOOK—HERE THEY ARE

BORING AND TURNING MACHINES—VERTICAL.

1—30" Flather, one turret head.
1—30" Bullard, 1 turret head.
1—New 34" Rogers, one turret head, Sept. delivery.
2—36" N-B-P, one plain and one swivel head.
2—36" B. & S., one turret head; Dec. delivery.
1—37" Niles, one swivel, one turret head.
1—72" Niles, two swivel heads.
1—80" Niles, two swivel heads, slotting attachment.
1—84" Sellers, one head.
1—New 8' Bickford; December delivery.
1—10' Niles, two swivel heads.

BORING MACHINES—HORIZONTAL.

1—No. 1 Barrett Cylinder Borer, 3¾" bar type.
1—24" Barrett, two side facing heads.
1—Conradson Motor-driven Driller, Borer and Tapper, 5' adjustment of head on column, 2' spindle travel.
1—Lane & Bodley, capacity 68" x 15' floor, plate 19', 8" boring bar, motor-driven.
1—Hoefer Horizontal Driller and Borer, with 1 11-16" spindle, vertical adjustment 40", horizontal adjustment 46", size of table 33" x 48".
1—Lucas, 2¼" bar.

BULLDOZERS.

1—No. 8 Ajax, 20 H.P. motor drive.
1—No. 3 Williams & White Standard.
1—New No. 4 Garrison (same as No. 4 Williams-White).
1—No. 7 Ajax, 20" stroke.
1—No. 7 High-speed Ajax, 16" stroke.

COMPRESSORS—AIR.

1—8" x 8" Curtis, belt-driven.
1—Ingersoll-Sargent Duplex, 8 x 14½ x 8".
1—Cincinnati Cross Compound, two-stage, 790 cu. ft.
1—Ingersoll-Sargent Steam Driven, 345 cu. ft.
1—10" x 12" Chicago Pneumatic, belt-driven.
1—10" x 10" x 10" Single Cylinder Smith-Valle, steam driven.
1—10"-16½" x 13" Peerless, cross compound, steam driven.
1—22"-13" x 16" Ingersoll-Rand, motor driven.

CRANES.

20-ton Alfred Box Electric Traveling Crane, 40' span.
25-ton Browning Electric Traveling Crane, 40' span.
1—Locomotive, 35' boom, standard gaged, steam driven.

CUTTING-OFF MACHINES.

2—No. 00 Brown & Sharpe.
1—2" capacity Warner & Swasey.
4—3½" Hall.
10—4½" Williams.
3—4" Curtis & Curtis.

DRILLING MACHINES—RADIAL.

2—New 2' American, cone drive.
1—3' Bickford, gear drive.
2—4' Mueller, plain, speed box drive.
1—3' Bickford, semi-Universal table.
3—New 3' Americans, sensitive tapping attachment.
4—New 3' Prentice, July delivery.
1—New 3' Mueller, plain speed, box drive.
2—New 3½' American, tapping attachment, Sept. delivery.
1—New 3½' Western Drill, 86" circle.
2—New 4' American, tapping attach.; Sept. del.
1—5' semi-universal American.
1—5' Fosdick Plain, cone drive, tapping attach.
1—5' American, plain, motor drive.
1—6' Baush Plain, cone driven.
10—New 6' Triumph, motor drive; Sept. del.

DRILLING MACHINES—HEAVY DUTY.

3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
2—D-3 Colburn, plain table.
4—No. 310 Baker, single pulley drive, late type.

DRILLING MACHINES—MULTIPLE SPINDLE.

4—New Leland-Gifford, sensitive, four spindle.
1—Gardam, 12 spindle, capacity ⅜" holes, 14" square.
1—No. 24 Baush, 12 spindles.
1—No. 300 Baush, 12 spindle, capacity 1⅛" holes, 30" circle.
1—No. 1 Pratt & Whitney, 16 spindle, capacity 10 spindles, ¼" cap.
1—14-spindle Baush, capacity 1" holes, 36" circle.

GEAR-CUTTING MACHINES.

1—No. 1 Whiton.
1—No. 3 Bickett Gear Rack Planer, delivery 60 days.
1—No. 3 Brown & Sharpe Auto. Gear Cutter, Spur.
1—New 6" Standard Gear Cutter, Spur.
1—12" Gleason Bevel Gear Planer.
1—15" Gleason Bevel Gear Planer.
1—16" Bilgram Bevel Gear Generator.
1—20" Grant-Lee Gear Hobber.
1—No. 1 20" Schuchardt & Schutte Gear Hobber.
1—22 x 8 G. & E. Spur and Bevel Cutter.
1—24" Fellows Gear Shaper.
1—24 x 8" G. & E. for Spur and Bevel.
1—New No. 10 Whiton, Bevel 32", Spur 34".
3—36" Fellows Gear Shapers.

GRINDERS—UNIVERSAL FOR CUTTERS, DRILLS, REAMERS, ETC.

1—LeBlond.
1—No. 1 Cincinnati.
1—New Norton No. 1.
1—New Walker No. 2, outfit K (capacity 9" x 26").
1—New Wilmarth & Morman, style B.K.
8—No. 190 Wells.
1—Gisholt No. 5, 12".

GRINDING MACHINES—CYLINDRICAL—PLAIN.

1—5" x 48" Pratt & Whitney.
1—New No. 12 Brown & Sharpe, 8" x 26", Sept. delivery.
1—New 10 x 36" Landis; immediate.
1—New 16" x 36" Norton, Sept. delivery.
1—10" x 50" Norton.
1—New 16" x 50" Norton, Sept. delivery.
1—10" x 60" Landis.
1—New 10 x 72 Norton, Plain.
20—12" x 24" Modern, self-contained.
1—12" x 32" Landis, rebuilt.
6—12" x 36" Modern, self-contained, motor or belt driven.
6—12" x 48" Modern, self-contained, motor or belt driven.
1—16" x 66" Landis, with crank grinding.
1—18" x 96" Brown & Sharpe.

GRINDING MACHINES—CYLINDRICAL—UNIVERSAL.

1—No. 1½ (10" x 30") Landis.
9—New No. 2 Morse, cap. 12" x 30", Universal, Nov. delivery.
1—New No. 2 Bath.
1—No. 2 New Walker, 9" x 26".
1—No. 2 (9" x 20") Bath.
1—New No. 2½ (10" x 36") Bath.
2—New No. 3 Modern, 13" x 40", Sept. delivery.
1—No. 3 (12" x 40") Brown & Sharpe.
1—Brown & Sharpe No. 13, 8" x 24".
1—10" x 42" Modern.
1—12" x 42" Landis.

GRINDERS—INTERNAL.

1—No. 1½ Landis.
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—CYLINDER.

1—No. 27 Brown & Sharpe.
1—No. 60 Heald, single pulley drive.

GRINDERS—PROFILE.

1—New Cleveland.

GRINDERS—DISC.

1—New No. 17 Gardner (Pattern Makers).

GRINDING MACHINES—RING.

1—New No. 14 Beasley, two-ring chucks.
1—No. 200 Heald.
1—No. 210 Heald.

GRINDING MACHINES—EDGE.

1—No. 374 Safety Emery Wheel Co.

GRINDING MACHINES—SURFACE.

1—New No. 1 Wilmarth & Morman.
1—No. 1 Diamond, capacity 12" x 12" x 24", automatic.
4—New No. 2 Reid (same as B. & S.).
1—New No. 2 Brown & Sharpe.
1—22" x 12" x 60" Springfield, planer type, automatic.

GRINDING MACHINES—DUPLEX.

1—No. 5 Bath, suitable for grinding cylinders, piston rings, etc., 16" feed, swivel table, water pump.

GRINDING MACHINES—FACE.

1—Diamond Face Grinder, 4' travel, 14" wheels.

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1—40-lb. Bradley Helve.
1—150-lb. Bradley Helve, upright.

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1—400-lb. Billings & Spencer.
1—2000-lb. Chambersburg.

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1—3000-lb. Bell; Sept. delivery.

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2—No. 0 Mitts & Merrill.
1—No. 2-Mitts & Merrill.
1—60" stroke Compton Knowles Broacher.

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70—New Simplex, 16" x 8'.
13—No. 3X Reed-Prentice, semi-automatic.
6—14" x 6' Reed Stud and Bolt.
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22—18" x 8' Battle Creek, heavy duty.
5—20" x 8' Merschon.
50—20" x 10' Hindman, high duty.

LATHES—ENGINE.

6—New 12 x 4 Shepard, reverse head.
8—New 12 x 5 Shepard, reverse head.
3—New 12 x 6 Shepard, reverse head.
1—14" x 6' Bradford, taper attachment.
1—New Harding Brothers 15" Precision Lathe, quick-change geared, page 35, third catalogue.
2—16" x 6' LeBlond, pan bed, quick-change gears, taper attachment.
1—18" x 8' Lodge & Shipley, geared head, taper.
3—18" x 9' Chard.
1—18 x 10 Hendey, quick-change gear, 14" chuck.
1—New 19" x 8' LeBlond, heavy duty.
22—20" x 8' Lodge & Shipley, quick-change gear.
7—New 20" x 8' American, heavy duty.
25—New 21" x 10' Porter, single back geared.
5—New 22 x 10' Monarch, double back geared, Q.C.G.
9—22" x 10' Putnam, oil pan turrets.
4—24" x 10' Reed.
2—24" x 12' S. & B.
4—24" x 14' American, quick-change.
1—24" x 14' Lodge & Shipley, patent head.
1—24" x 24' Perkins, single back geared, raising blocks to 40", 18" chuck.
1—24" x 45" x 22' McCabe, double spindle.
1—26" x 24' New Haven.
4—27" x 14' Patent Head Lodge & Shipley, double back geared.
1—28" x 18' New Haven, single back geared.
1—28" x 18' Schumacher & Boye.
3—New 32" x 12' Pittsburg pattern.
9—New 36" x 12' Putnam, geared head; Nov. delivery.
8—New 36" x 24' Putnam, triple geared.
1—38" x 18' American, raising blocks to 63".
1—38 x 19' Steptoe, single back gear.
1—48 x 27'-9" Betts, triple back gear.
1—60 x 27 Betts, triple back gear.
1—New 66" x 30' Putnam; Dec. delivery.
1—71" x 20' Fifield, triple geared.

LATHES—TURRET.

5—2 x 24 Jones & Lamson.
5—3 x 36 Jones & Lamson.
18—6A Potter & Johnson.
1—New 21" Gisholt.

MILLING MACHINES—KNEE TYPE—UNIVERSAL.

1—Kempsmith.
1—No. 1½ Hendey-Norton.
1—No. 2 Kempsmith, back geared.
1—No. 2 New Cincinnati.
2—New No. 2½ LeBlond; Sept. delivery.
1—New No. 3 Kempsmith.
2—No. 3H LeBlond; Sept. delivery.
2—New No. 3 Becker, August delivery.
2—New No. 3 Cincinnati.
1—New No. 4 LeBlond, heavy duty; immediate.

MILLING MACHINES—KNEE TYPE—PLAIN.

1—No. 0 Pratt & Whitney.
1—New No. 1 Brown & Sharpe.
2—New No. 1 Kempsmith.
1—New No. 1½ American.
1—New No. 2 Rockford.
1—New No. 2½ LeBlond, August delivery.
1—No. 3 LeBlond.
1—No. 3 Cincinnati.
1—No. 4 Garvin.

MILLING MACHINES—VERTICAL.

1—New Bickett, No. 0.
4—New No. 4B Becker.
2—No. 5 Becker.

MILLING MACHINES—PLANER TYPE.

1—No. 2 Beaman & Smith.
2—Ingersoll Slab Millers, working surface of table 60" x 20".
1—No. 4 Beaman & Smith, vertical spindle, open side, working surface of table 120" x 24", removable housing on one side.

PLANERS.

1—24" x 24" x 6' Gray, one head on cross rail.
1—30" x 30" x 8" Gale Planer, one head.
1—30" x 30" x 12' Cincinnati, two heads.
1—36" x 30" x 12' New Haven, one head.
1—36" x 36" x 9' Sellers, four heads.
1—36" x 36" x 9' Sellers, two heads.
1—New 36 x 36 x 12' Powell High Speed, one head.
3—New 36" x 36" x 12' Bickett, one head, Nov. delivery, additional heads if desired.
2—New 36" x 36" x 12' Woodward & Powell, two heads on cross rail, one side head; Oct. delivery.
1—36" x 36" x 12' Gray, two heads.
1—36" x 36" x 14' Sellers, four heads.
1—40" x 40" x 11' Niles, four heads.
1—42" x 10' Hews & Phillips, one head on rail, one side head.
1—42" x 14' Pond, two heads.
1—Gray, 42", widened to 56" x 42" x 16, two heads.
1—48" Cleveland Rotary Planer.
3—New 48" x 42" x 16' Bickett, one head, Nov. delivery; additional heads if desired.
1—48" x 48" x 16' Sellers, one rail head, two side heads.
1—50" x 14' Powell, one head.
1—52" x 52" x 16' Betts, two heads, right angle drive.
1—60" x 60" x 18' Woodward-Powell, four heads.
1—72" x 72" x 26' Motor drive, Betts, four heads.

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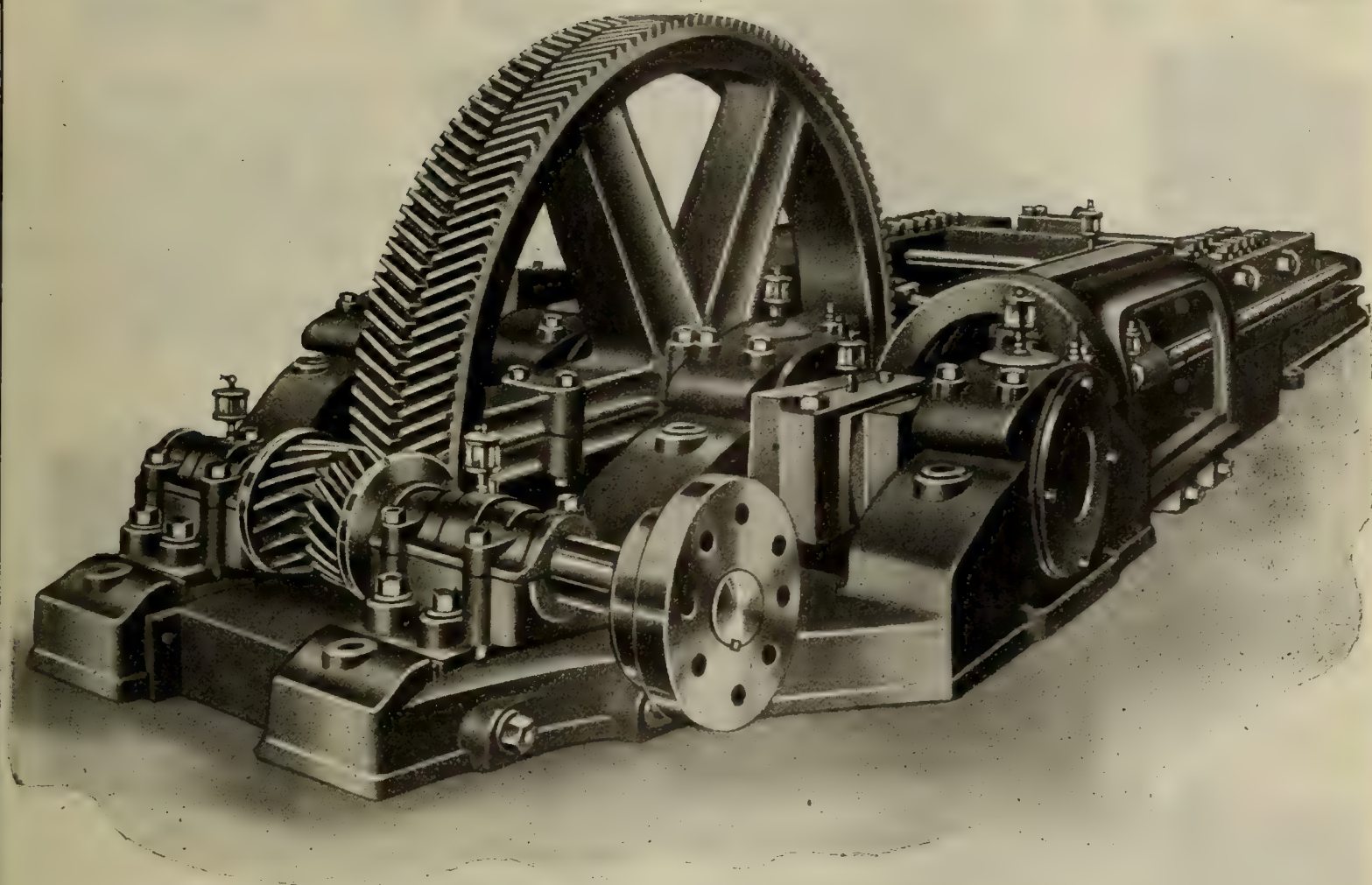

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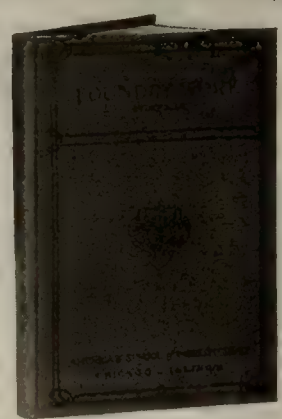

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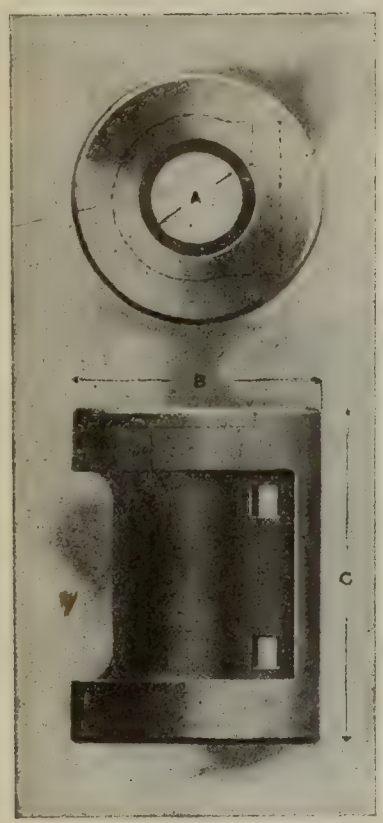

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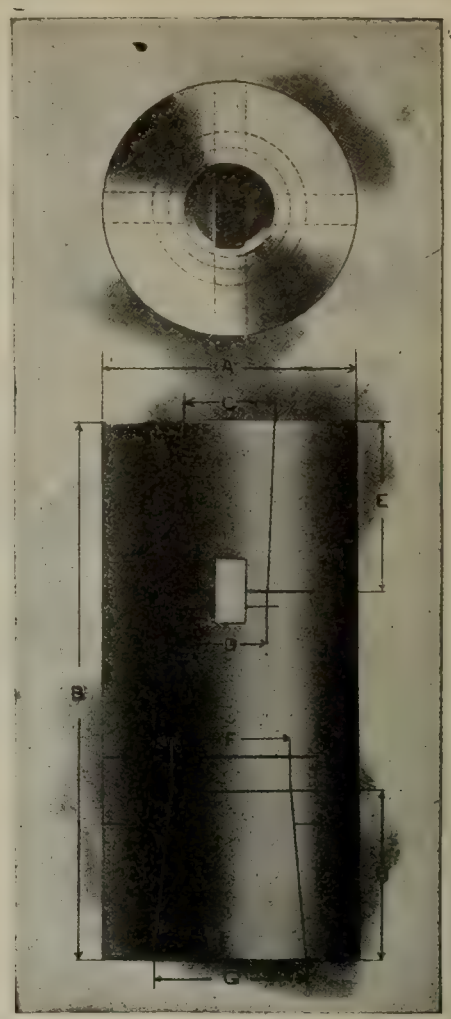

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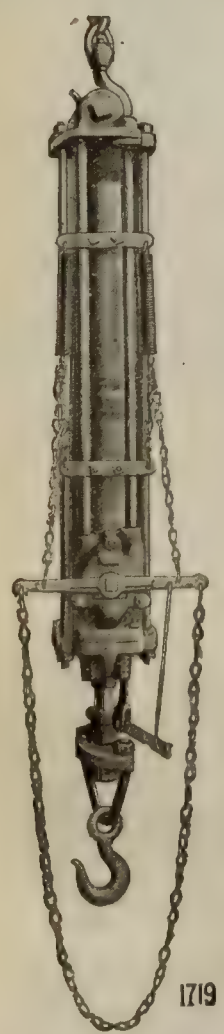

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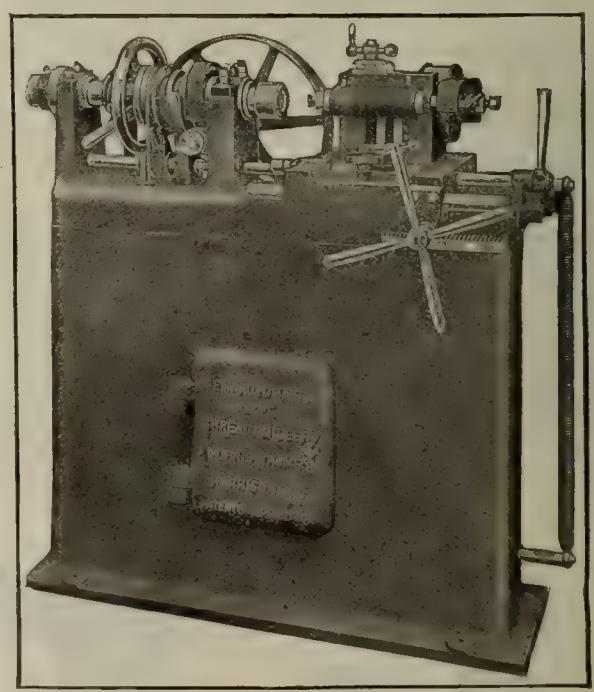

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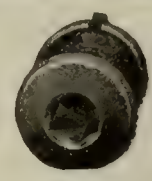

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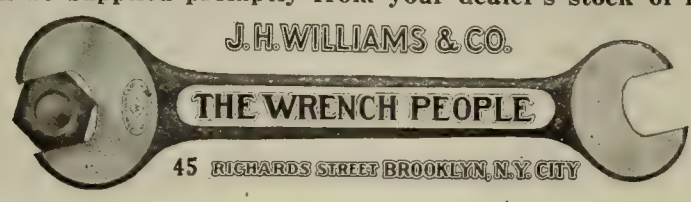

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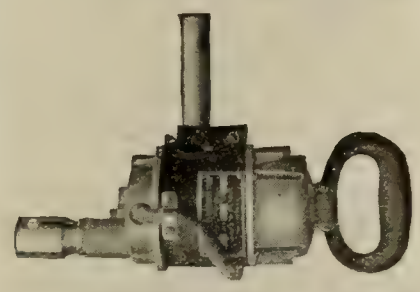
NEW GLASGOW, - - CANADA

Wood or Steel, let Cummings make it.

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

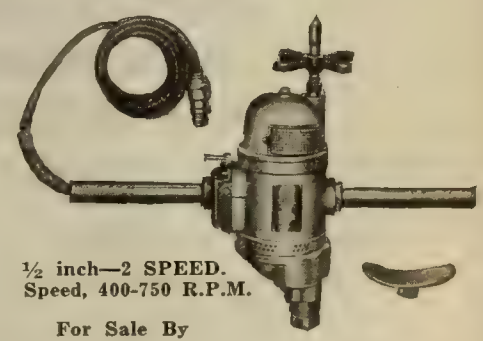
For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



½ inch—2 SPEED.
Speed, 400-750 R.P.M.

For Sale By

The Canadian Fairbanks-Morse Co., Limited

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.
CINCINNATI, OHIO

If any advertisement interests you, tear it out now and place with letters to be answered.

The Munitions Worker's Grinder

The cut illustrates our No. 7 "LITTLE DAVID" Grinder, fitted with 21" Extension Shaft, housing and outer bearing. The grinding wheel is 6" x 1", of composition suited to the work, and its free speed is 3,000 r.p.m. Weight 24 lbs.

This style of Grinder is just what you need for grinding the insides of High Explosive Shells, or any work where grinding, buffing, or touching up is to be done.

They are widely used in munitions plants, because they are **convenient, efficient** and **time-saving.** We use them in our own munitions work, and can tell you how to apply them to the best advantage. Ask our nearest branch for information and prices.

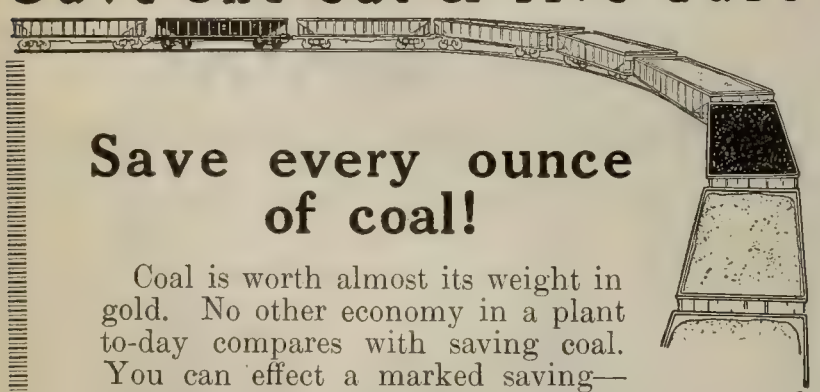
CANADIAN INGERSOLL-RAND CO., LIMITED

COMMERCIAL UNION BUILDING - MONTREAL, CANADA

SYDNEY TORONTO COBALT TIMMINS WINNIPEG NELSON VANCOUVER

Works: Sherbrooke, Que.

Save one out of five cars



Save every ounce of coal!

Coal is worth almost its weight in gold. No other economy in a plant to-day compares with saving coal. You can effect a marked saving—users say 20%—by utilizing every heat unit of your steam with the

Morehead
Back to Boiler
SYSTEM

By getting the value of every heat unit you do not have to use as much coal—and the efficiency of your plant is increased as well.

There is a MOREHEAD SYSTEM that will fit your requirements. Let us give you further information and prices.

Canadian Morehead Mfg. Company
Dept. "L"
Woodstock, Ontario

417

Determine, Measure and Eliminate

LOST TIME and MOTION

Master Chronograph.

The day of advanced prices only for the purpose of advanced profits has now passed.

To "economize" on selling expense may be "to save yourself into bankruptcy."

The one opportunity for the manufacturer to increase his profits is by a reduction of costs.

Labor in America will never sell itself cheaper than to-day, and the cost of materials is increasing yearly.

Therefore, increased profits in your plant are dependent upon just on thing:

You must determine, measure and eliminate lost time and motion.

The Master Chronograph will enable you to determine without further calculation just what a man or machine DOES DO and SHOULD DO in an hour or a minute.

With such information, you may STANDARDIZE the operation—INSTRUCT your men to a more profitable effort and MEASURE their work in terms of the new standard—thus extracting from your present conditions an added profit without the expenditure of an extra dollar.

The Master Chronograph is the one device which will show at a single rating the total of its computation. The only stop watch that will reduce net time to output or production per hour without the use of a pencil. It embodies a 17-jewel time-piece. Write for literature.

MORTIMER J. SILBERBERG **Engineer**
122 So. Michigan Avenue **Chicago, Ill.**

If your work requires quick handling and a rigid-slip grip, the chuck for the job is the "Hannifin" — increases output from 20 to 100 per cent.

Catalog of Air Operated Chucking and Clamping Equipment on request.

At the Worthington Pump and Machinery Corporation's Hazelton, Pa., plant, Hannifin Air Chucks are in sole possession of the field. The machine photographed shows a 3" Russian shell Hannifin-chucked for inside operations.

These chucks do their work under 75 pounds air pressure and "Aid greatly in speeding up production," says the master mechanic; for outside turning, shells are held on Hannifin Air Operated Mandrels with similar results.

In another busy shell department one operator reports an increase of ten 5" shells per day through the change to Hannifin Chucking, and considerably less fatigue when the day's work is done.

Hannifin Chucks are doing important work on every shell making "front" — also in other lines of manufacture.

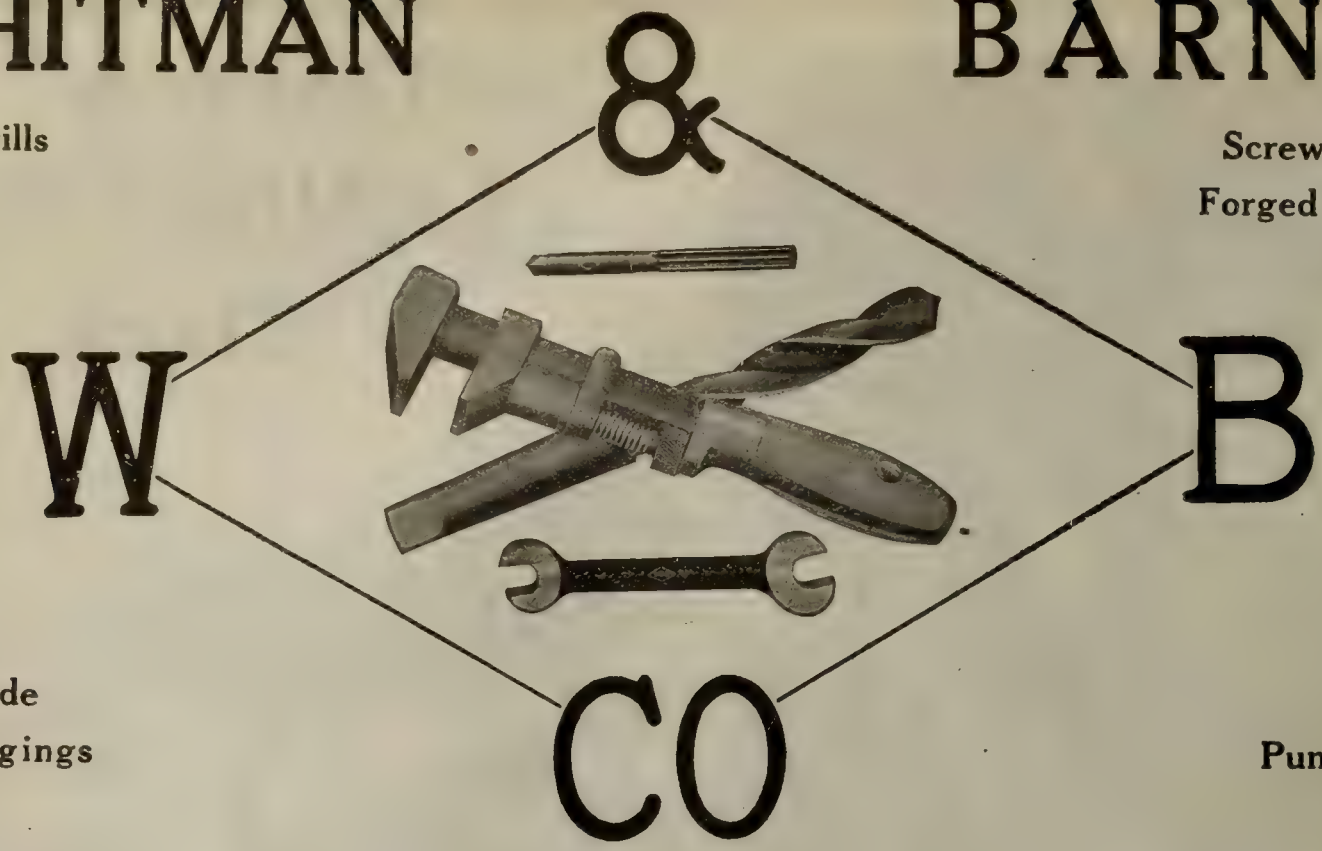
HANNIFIN MFG. COMPANY, Chicago, U.S.A.

R. E. Ellis Engineering Company, Chicago, Ill.; Coats Machine Tool Co., New York City, N.Y.; Naumann-Firman Co., Detroit, Mich.; A. R. Williams Machinery Co., Toronto, Ont., Can.; A. R. Williams Machinery Co., Winnipeg, and St. John, N.B.; Williams & Wilson, Montreal, Quebec, Can.; Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, Glasgow and Newcastle-on-Tyne; Fenwick-Freres Company, 1500 Rue Fenelon, Paris, France; Iznosskoff & Co., Petrograd, Moscow, Ekaterinberg, and Odessa, Russia.

WHITMAN & BARNES

Twist Drills
and
Reamers

Screw and Drop
Forged Wrenches
Hammers



Special
High Grade
Drop Forgings

Cotters
Chisels
Punches, Etc.

Users recognize "W & B" Tool Quality, backed by 62 Years' Uninterrupted Manufacturing Experience. If your Jobbers and Dealers cannot supply, write us and we will see that you are supplied. Send for Catalog No. 86-H.

THE WHITMAN & BARNES MFG. CO.

ESTABLISHED 1854

CANADIAN OFFICE AND FACTORY ∴ ∴ ST. CATHARINES, ONTARIO

IN STOCK READY TO SHIP

"STAR BRAND"
SEAMLESS BRASS

CONDENSER TUBES

TINNED INSIDE AND OUTSIDE

5/8 and 3/4 inch O.D., No. 18 Stubs Gauge—12, 14, 16, 18 and 20 foot lengths

AND

"STAR BRAND" BRASS CONDENSER TUBE FERRULES

Standard 14 Thread for 5/8 and 3/4 in. Tubes

OUR STOCK ON HAND READY FOR IMMEDIATE SHIPMENT ALSO INCLUDES A FULL LINE OF REGULAR STOCK SIZES AND SHAPES OF THE FOLLOWING

"STAR BRAND" SPECIALTIES

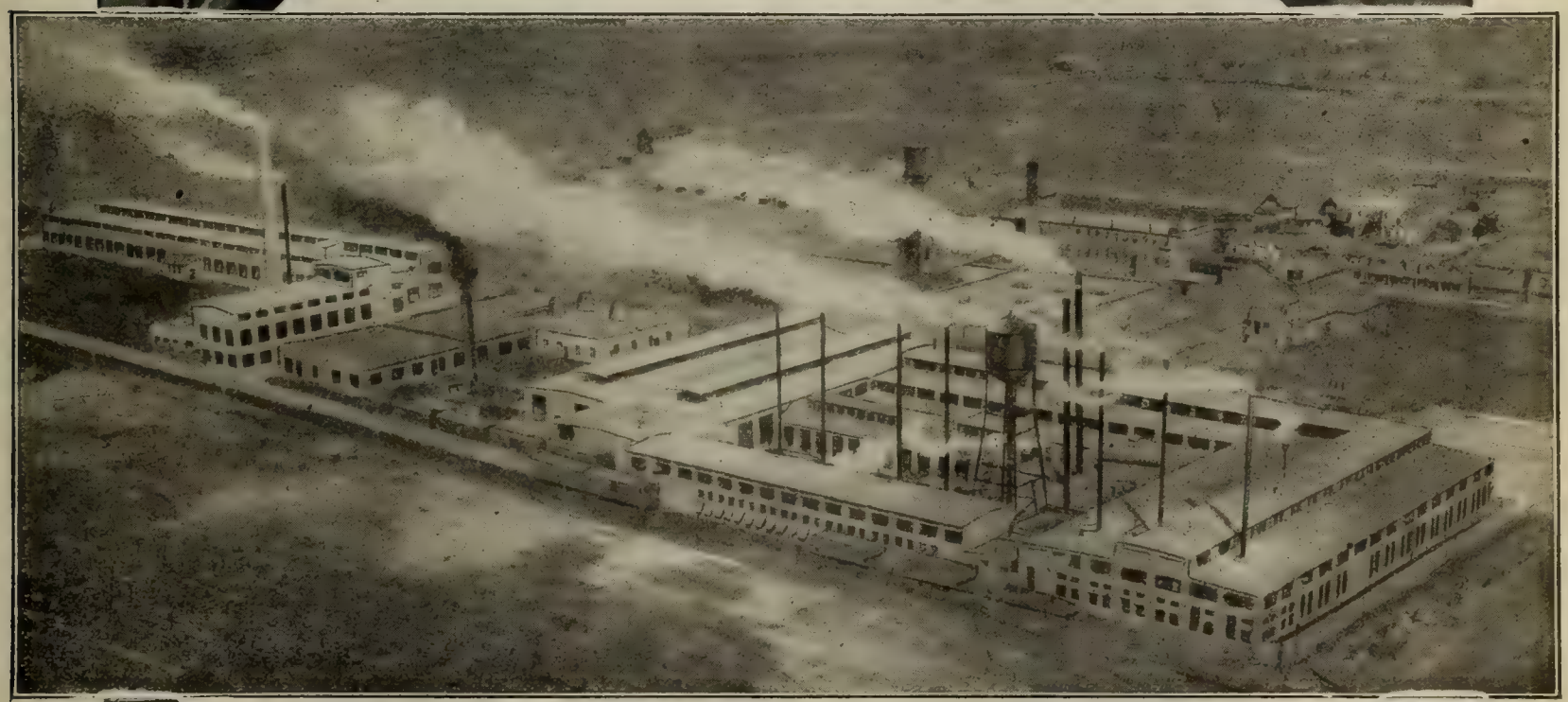
Seamless Brass and Copper Pipe and Tubing, Brass Fittings, Sheet Copper, Copper Bar, Rods and Wire, Copper Nails, Sheet Brass, Brass Rods, Tobin Bronze Rods, Copper Rivets and Burs AND OTHER PRODUCTS IN BRASS, COPPER, PHOSPHOR BRONZE, ARCHITECTURAL BRONZE, ETC., ETC.

U. T. HUNGERFORD BRASS & COPPER CO.

BRANCHES:
BOSTON
BALTIMORE
PHILADELPHIA
SAN FRANCISCO

HUNGERFORD BUILDING
Lafayette, White and Franklin Sts.
NEW YORK, U.S.A.

KINDLY ADDRESS INQUIRIES FOR ATTENTION OF DEPARTMENT D.



Brown's Copper & Brass Rolling Mills, Limited

General Offices and Works:
New Toronto, Ontario, Canada

Barker Wrenchless Chuck

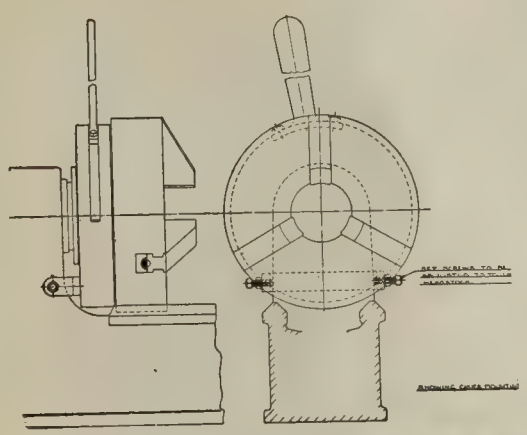
Study the Diagrams

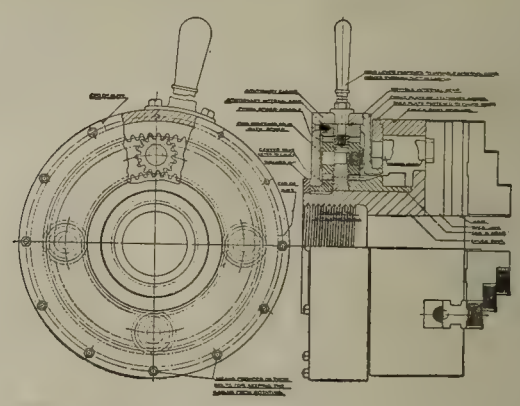
Diagrams can show you inner construction of "Barker" Chuck. The illustration can show it mounted. Look them over. Think them over. Operating mechanism and the chuck form a unit. Operating mechanism is in form of a planetary gear enclosed within a casing which is carried and held central by the hub of the chuck. Find these features in the diagram.

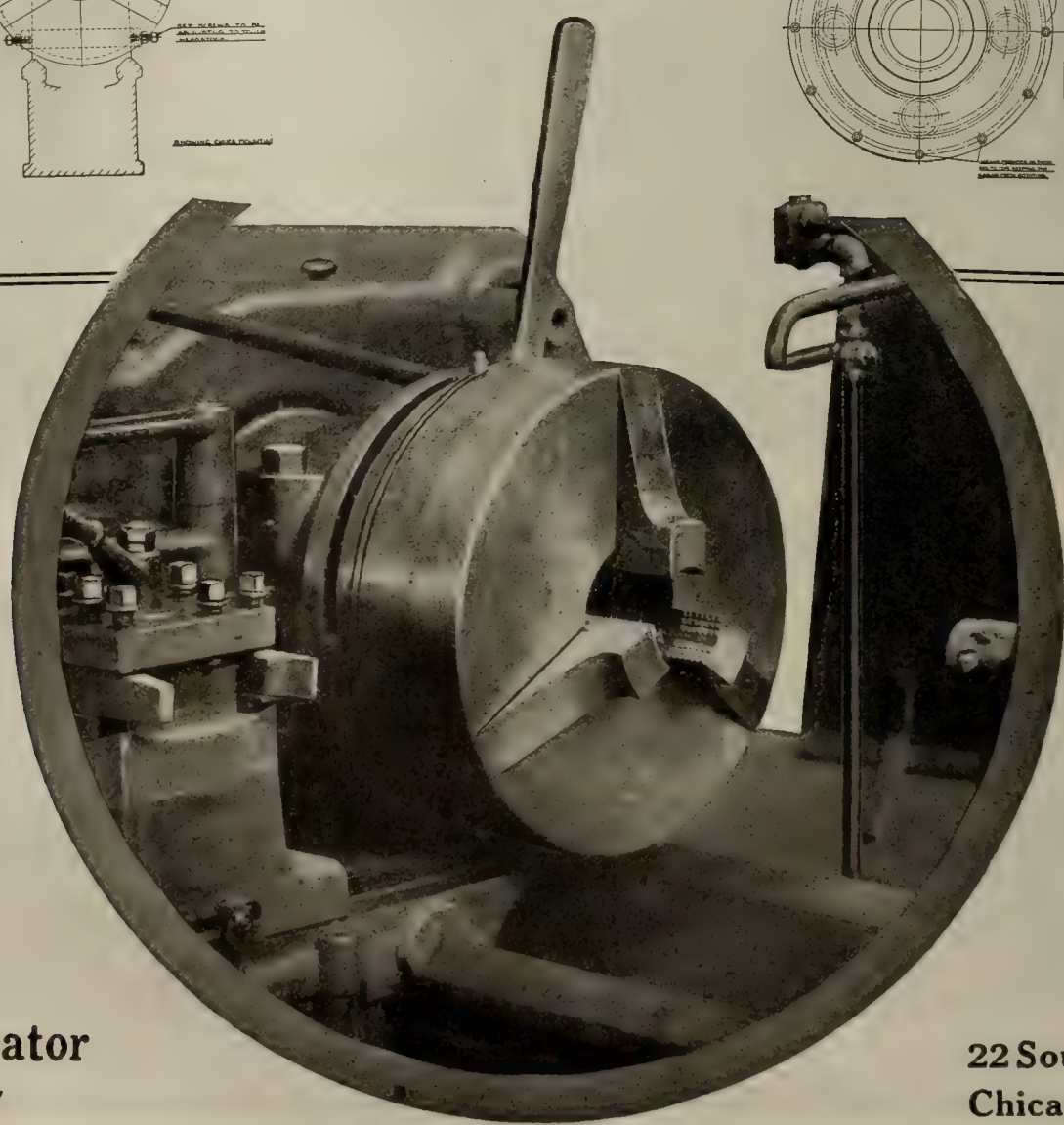
Adjusted Like a Face Plate

Adjusted on the headstock as easily as a face plate. It occupies 1-3 less space than an air operated chuck of like capacity. That lever will release jaws of chuck while machine is at any speed. The principle is correct. Our clients are high in its praise. Let us send you a list of the "Barker" installations near you. See it in operation yourself, then be convinced by practical proof.

Girls and women are successfully operating "Barker" Chucks in many Canadian and British shops. If YOUR agents are NOT carrying "Barker" Chucks write direct to







Thomas Elevator Company

22 South Hoyne Street
Chicago, Ill., U.S.A.

The above illustrates a "Winfield" Butt Welder in the plant of a well known firm manufacturing automobiles

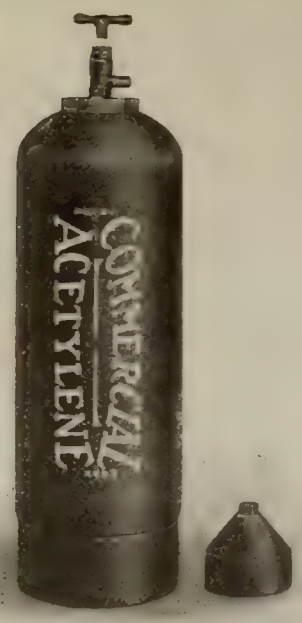
We desire to show you where and how such an installation can and will reduce your shop costs. Send us a few samples of your work, which we will weld and return for your inspection, or a blue print or a sketch will do. This will enable us to submit a detailed report for your consideration.

WE MANUFACTURE A COMPLETE LINE OF ELECTRIC WELDERS, BOTH BUTT AND SPOT TYPES

THE WINFIELD ELECTRIC WELDING MACHINE CO.

WARREN, OHIO, U. S. A.

Electric Welding



Quality Quantity
Guaranteed

Write US About Your Acetylene Supply

Commercial Acetylene Welding Co., Inc.

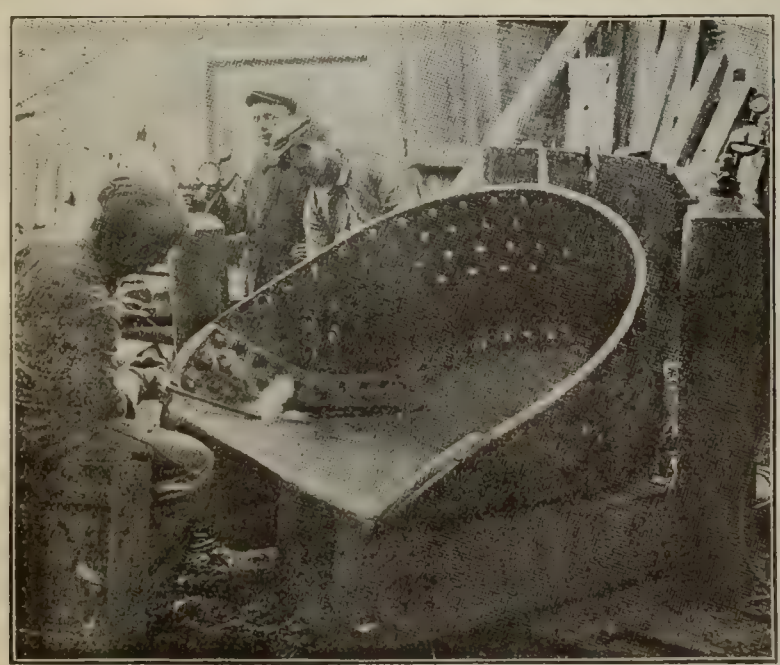
103 Bay Street, Toronto

ATLANTA, GA.
AURORA, ILL.
BOSTON, MASS.
BOUND BROOK, N.J.
EAST DEERFIELD, MASS.

TORONTO, ONT.
SAN FRANCISCO, CALIF.
MOBERLY, MO.
W. BERKELEY, CALIF.

Main Office
80 Broadway, New York

ADDING NEW METAL TO WORN-OUT PARTS BY OXY-ACETYLENE WELDING



Strengthening worn-out dredge bucket by Oxy-Acetylene Welding.

This is an important feature of the process and makes for greater economy. Any part of machinery, etc., that has become unusable by hard wear can be built up and made like new again. For reinforcing gear teeth, rejoining broken parts, castings, etc., its value can hardly be over-estimated.

The Cost of an "A.L.S." Oxy-Acetylene Welding Outfit is Small

It is absolutely indispensable in all Plants where running machinery is employed, and in many manufacturing Industries, or wherever the necessity of joining two pieces of metal for whatever purpose required.

If Efficiency and Economy mean anything to you, investigate to-day.

Catalogue and Data Free on Application.

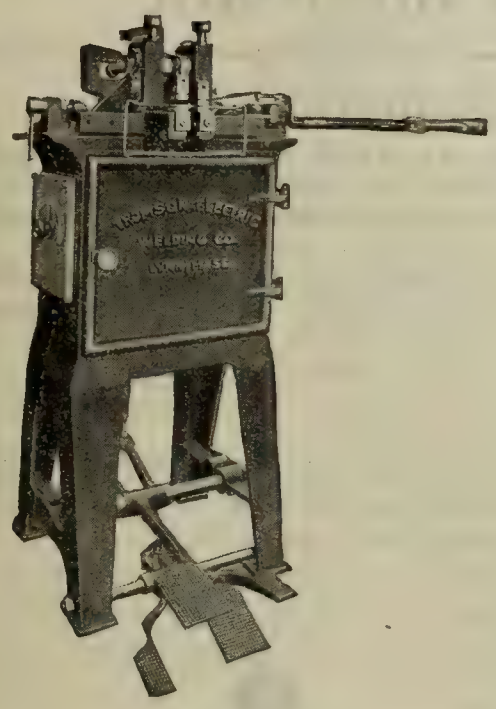
There is no risk in buying an "A.L.S." Welding Outfit. It is the result of years of scientific experiment and practical experience, and is backed by "A.L.S." Service—the best in Canada. A staff of experts and every facility to insure complete satisfaction.

L'AIR LIQUIDE SOCIETY

Pioneers of the Process. Factories the World Over.

TORONTO 16 Boler Street
MONTREAL Cor. 1st Ave. and Ernest
WINNIPEG 1297 Pine

Thomson Process
Electric Welding



Economy—

In these times, when the entire country is endeavoring to conserve its resources to the greatest extent possible, you can eliminate waste in your welding department by installing a Thomson Butt Welder. The saving in six months will more than pay for the initial cost.

Whether you weld automobile rims, brake rods, angle irons, pipe joints, etc., there is a Thomson Butt Welder for YOUR purpose.

Send for Bulletin B-4.

The Thomson Spot Welder Does It Quickly

It has been proved by actual results that one boy and a "Thomson" can do more and better work than five men and any other method.

It is extremely economical—no rivets to buy, no holes to punch. Think for a moment what that means in dollars and cents. It is just as easy to operate as it is economical—no danger, no smoke, no dirt and very little noise.

We have a model for your work.

Send for Bulletin S-4.

Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

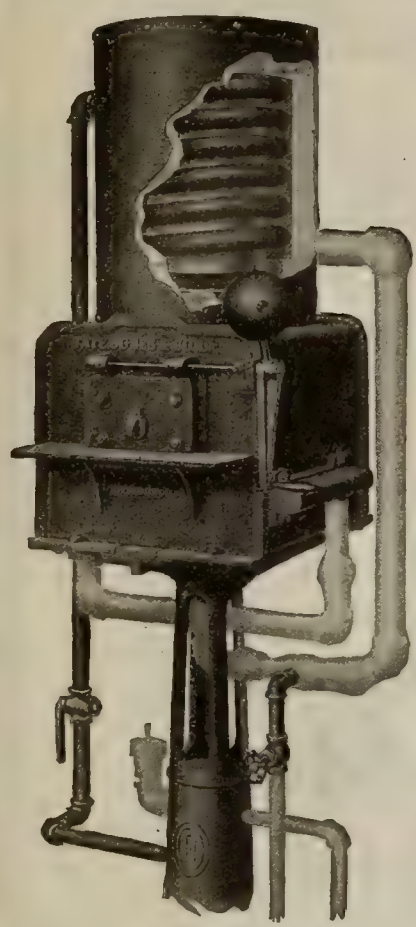
Canadian Sales Office, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

If any advertisement interests you, tear it out now and place with letters to be answered.

These Two **TATE-JONES**

Improved Portable Gas Oven Furnaces will Prove Money Savers in any Plant



Series A--Recuperative

For Temperatures of 900 deg. to 1600 deg. Fahr. Uses Natural or Artificial Gas. Low or positive pressure for Hardening Carbon Steel, preheating or reheating High Speed Steel.

For tool room or manufacturing purposes, this furnace is not only economical in its fuel saving features, but lends itself to various uses up to its temperature capacity.

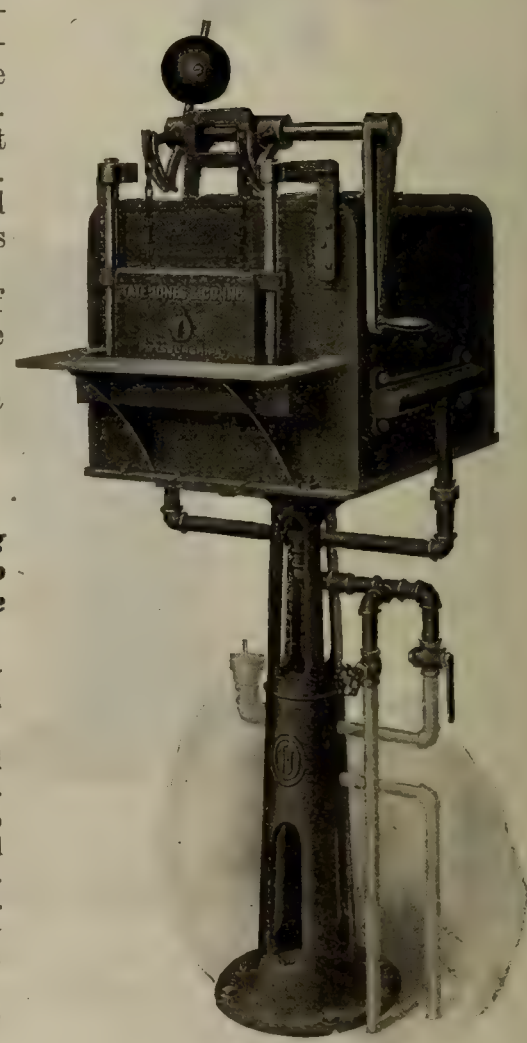
It has been proven by scientific working tests that the recuperative device saves as high as 25% in fuel. It saves time and delivers a better finished product.

The interior of the oven is especially constructed so that 100% of both the radiant and radiated heat is thrown to the work. This is really 50% more than can be obtained from other furnaces.

The fire brick and specially molded tile are the best obtainable for the purpose. We use one inch of a special insulation that is equivalent to nine inches of fire brick in the prevention of heat loss. The outer casing of the oven is made of cast iron and boiler plate. The recuperator is constructed entirely of cast iron, sheet steel and high grade fire brick. The coil is 1¼″ wrought iron pipe, so placed that no direct vent heat can strike it. This assures long life.

This line of furnaces has many points of economy and ease of operation that are more apparent in use than in the illustration.

Sizes and complete specifications upon request. Ask for Bulletin 160-C.



SERIES H.

For temperatures 1600 deg. to 2400 deg. Fahr. For hardening High Speed Steels. Uses Artificial or Natural Gas at 1 1-2 to 2 1-2 lbs. pressure. Especially valuable for hardening fine cutting tools and manufacturing uses.

The loss of heat by radiation is practically negligible because of the high quality as well as the particular kind of linings used. The 1″ of special insulation is equivalent to 9″ of fire brick (same as used in series A furnaces).

Because it requires no live heat to keep it in temperature equilibrium, it makes all the heat delivered, available for work. This, naturally, effects a big saving of fuel.

The outer casing of the furnace is cast iron and boiler plate. The door, owing to the slant construction, is always tight to the fromnt; it overlaps, top, bottom and sides—al lof which prevents leakage. There is no friction in opening the door. Raising it a fraction of an inch frees it from the front—when it rises straight up.

As a Pyrometer is absolutely essential in hardening high speed steels we supply a Pyrometer Bracket esupecially designed for this furnace. For preheating high-speed steels use Tate-Jones Series A Furnace (described on the left).

This Series H furnace can be supplied recuperative also, which means a saving of as much as 25% of fuel.

Sizes and complete specifications upon request. Ask for Bulletin G-7-C.

TATE-JONES & CO., INC., Furnace Engineers

PITTSBURGH, PA., U.S.A.

Where Experience Counts

There is something new to be learned about the intricate problem of heat-treating every day. Over half a century's experience in burning liquid and gaseous fuels for treatment of metals has resulted in the present perfected type of G. & B. Furnaces.

There is a Gilbert & Barker Furnace for every purpose—made in over 100 types and sizes. We are able to make immediate deliveries on nearly all types.

Look over your heat-treating department carefully for leaks. You are almost sure to discover where you can save money on a G. & B. instalment. Take this tip seriously —you'll find it worth while.

Every piece of heat-treated steel you use in your plant should come from your heat-treating department in perfect condition—to absolutely guarantee this G. & B. furnaces should be used.

Gilbert and Barker furnaces installed in your heat-treating department gives you assurance of the most efficient and economical method of production in existence.

Put Your Heat-Treating Problems up to Us.
Write To-day for Stock List 24.

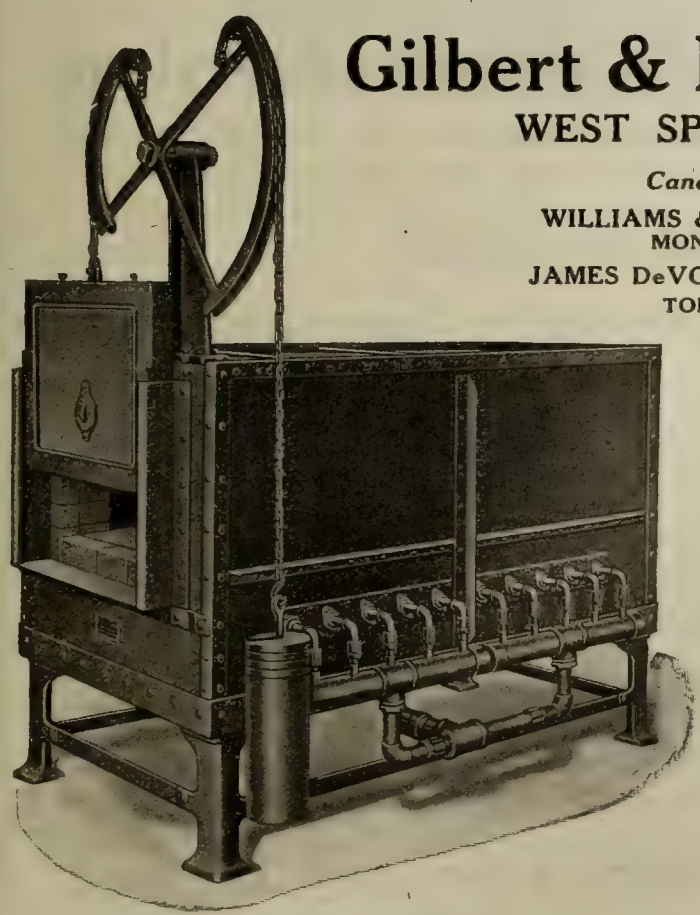
Gilbert & Barker Mfg. Co.

WEST SPRINGFIELD, MASS.

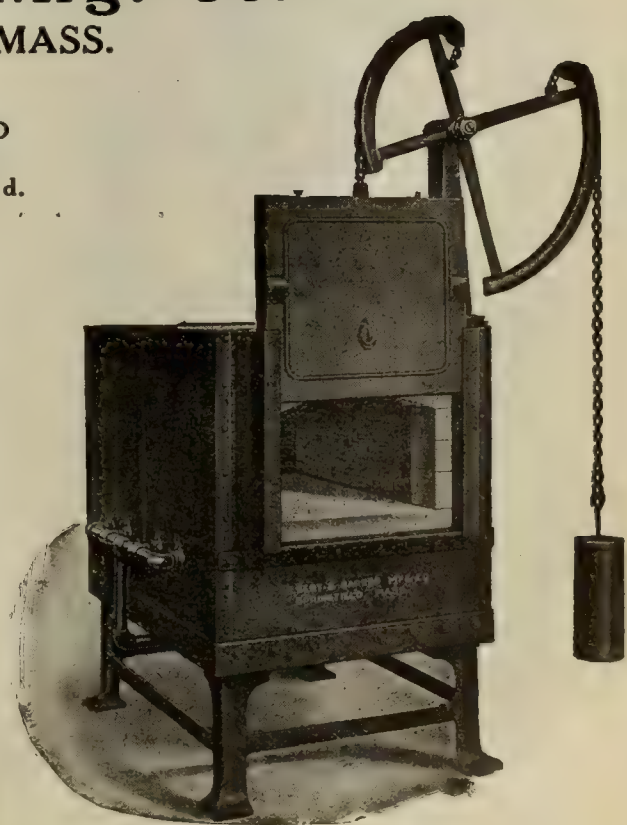
Canadian Agents:

WILLIAMS & WILSON, LIMITED
MONTREAL, QUE.

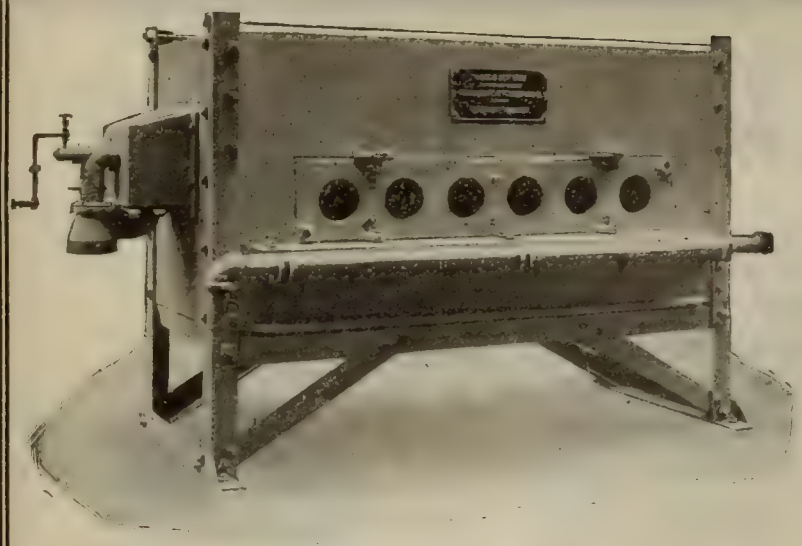
JAMES DeVON, 227 Davenport Rd.
TORONTO, ONT.



TYPE C-25 FURNACE



TYPE C-15



"MECOL"

6'' Shell End Nosing Furnace

We manufacture furnaces for all purposes to be used with any kind of fuel

The Mechanical Engineering Company, Ltd.

THREE RIVERS, QUE., CANADA

Medal of Honor, Highest Award, Panama Exposition. Made in Canada.

Why Use Compressed Acetylene

when you can generate your own acetylene at 50% less cost and always have ample gas on hand?

Davis Acetylene Pressure Generators

Made in three types, the standard pressure generator in five sizes, with capacity of 25 lbs., 50 lbs., 100, 200 and 300 lbs. of carbide at each filling,—the portable pressure generator in 25 lb. and 50 lb. capacity sizes,—and the Navy Type two pressure generator with capacities of 100 lbs., 200 lbs., or 300 lbs. All pressure generators supply acetylene under pressure up to 15 lbs. The Davies acetylene generator is on the approved list of the National Board of Fire Underwriters. Patented.

Generators of all sizes kept in stock.
Prices and Catalog on request.

Carter Welding Company, Limited

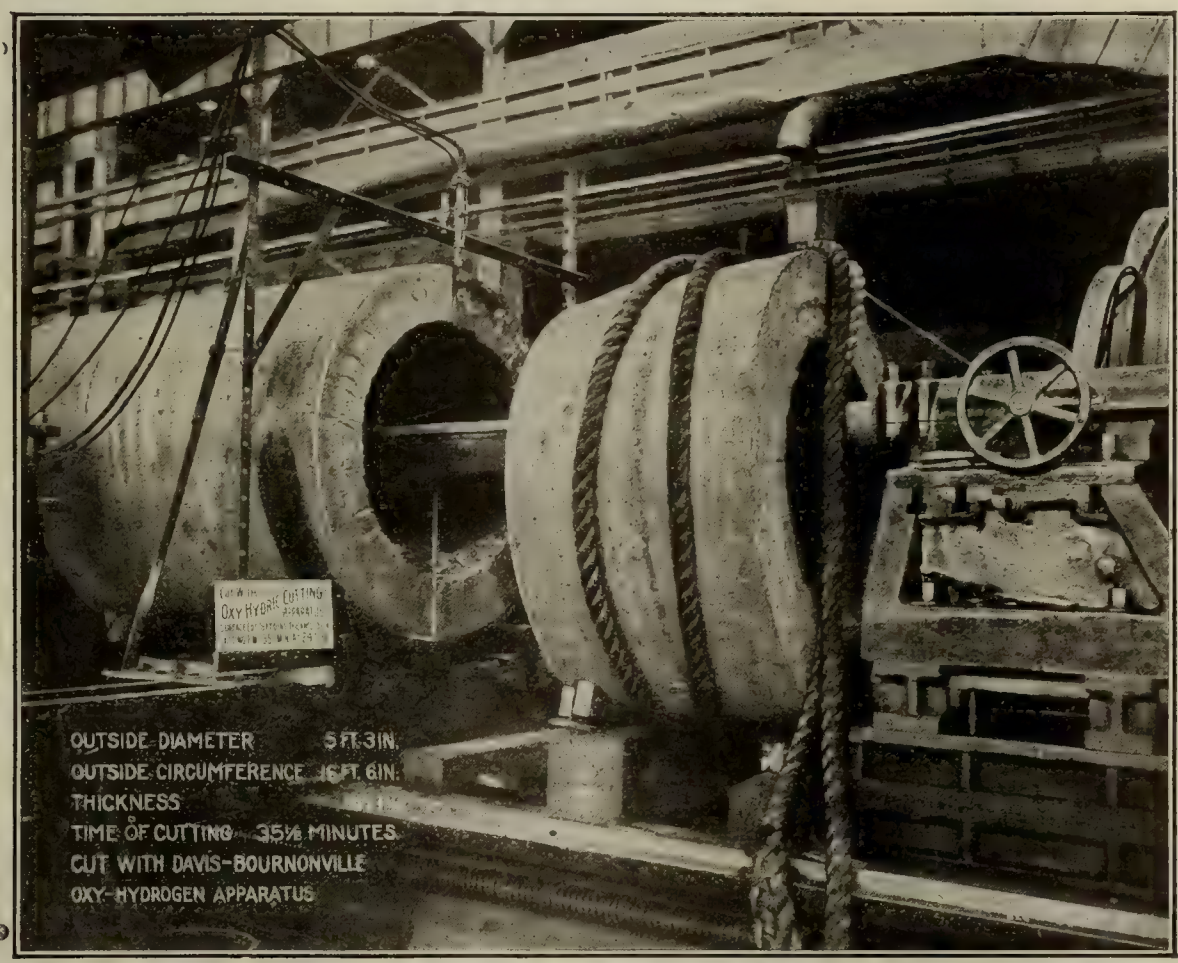
9-11 Sheppard Street **Toronto, Ontario**

Canadian Agents for

THE DAVIS-BOURNONVILLE APPARATUS

50,000 lbs. 5-ft. 3-in. diameter. $9\frac{1}{2}$-in. thick.

How Did They Cut It In $35\frac{1}{2}$ Minutes?



(Photo by New York Shipbuilding Corp.)

It was cut with a torch and gas flame — Davis-Bournonville Oxy-Hydrogen Cutting Apparatus — in the New York Shipbuilding Yards; a cast steel rotor $14\frac{1}{2}$ in. thick at the head, 5 in. thick at the foot, **$9\frac{1}{2}$ in. thick and 5 ft. 3 in. diameter** where it was cut—cut slick and clean, as shown in the illustration, in **$35\frac{1}{2}$ minutes' cutting time.** It would have taken many hours, and been a considerable problem by any other method. Davis-Bournonville Oxy-Acetylene and Oxy-Hydrogen Apparatus is applied successfully to the problems in metal working, and is in use by most of the big metal-working concerns—foundries, steel mills, ship yards, navy yards, locomotive and car shops, munitions plants, sheet metal-working factories, etc. Make inquiry about it, or write us.

"Davis Apparatus" Leads the World in Range, Efficiency and Number of Successful Users.

DAVIS-BOURNONVILLE COMPANY

General Offices and Factory, JERSEY CITY, N.J.

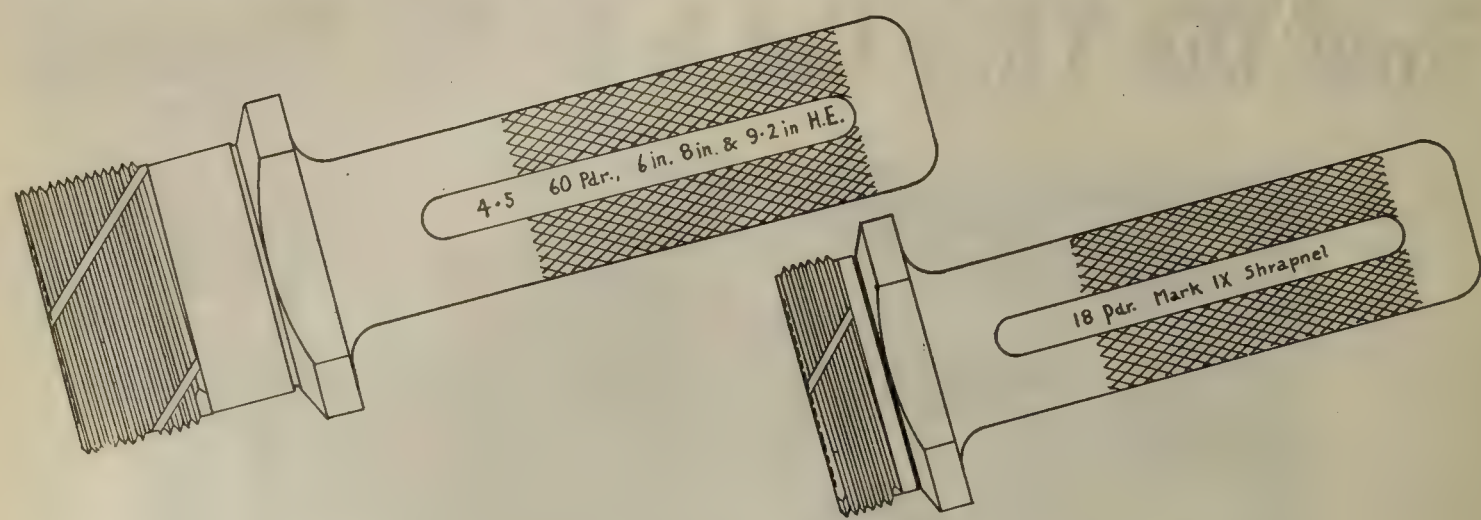
CARTER WELDING COMPANY, *GENERAL DEALERS* TORONTO

Canadian Factory, NIAGARA FALLS, ONTARIO

New York	Boston		Chicago	Detroit
Philadelphia	Pittsburgh		St. Louis	Seattle
Cleveland	Cincinnati.		San Francisco	Toronto.

OXY-ACETYLENE WELDING DAVIS APPARATUS DAVIS-BOURNONVILLE CO. N.Y.

FUSE HOLE GAUGES



Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

SHEET METAL STAMPINGS

Dominion Forge & Stamping Co., Limited

WALKERVILLE ONTARIO

DROP FORGINGS

Our facilities and equipment enable us to give you a top-notch quality at a very reasonable price.

AUTOMOBILE FENDERS, HOODS AND GASOLINE TANKS

The Oven Equipment & Manufacturing Company

NEW HAVEN, CONN.

"CRAWFORD SECTIONAL" OVENS

Heated with our Enclosed Flame Gas Burners, or Electricity

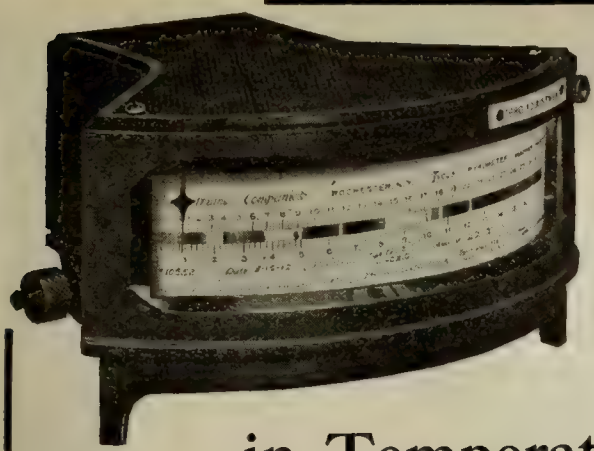
FOR BAKING JAPANS AND OTHER FINISHES ON METAL.

Ovens carried in stock and built to meet requirements of manufacturers.

Builders of All-Steel Oven Trucks with Roller Bearings.

Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.

ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER



If You have a Problem in Temperature

Let us consult with you. Tell us your requirements and let us help with your proposition. We manufacture temperature instruments for all departments of metallurgy and chemistry, standard apparatus of precision, reliability and permanence.

Tycos Fery Radiation Pyrometers.

Rare Metal Thermo-Couples Cover 1000° to 2500°. These instruments have repeatedly proven themselves equal to the most severe conditions. Their ruggedness, sensitiveness and accuracy fit them for any service in range. Send for "Booklet 4000."

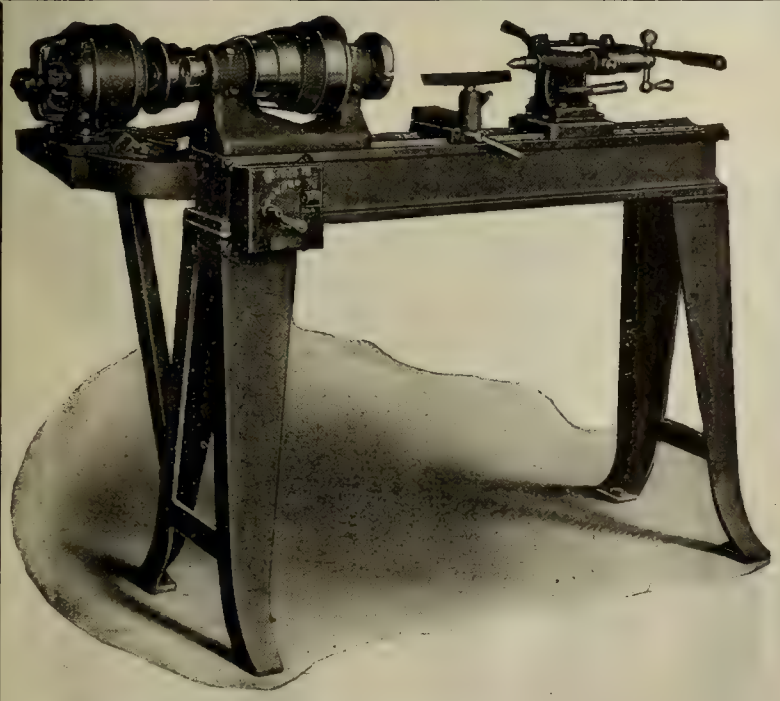
Base Metal Thermo-Couples Ranges from 200° to 1000° and 300° to 1800°. Practical, accurate shop tools requiring no special skill or intelligence in operation. Write for booklet, "*Tycos* Cambridge Pyrometry."

Taylor-Cambridge Division

Taylor Instrument Companies

Rochester, N. Y.

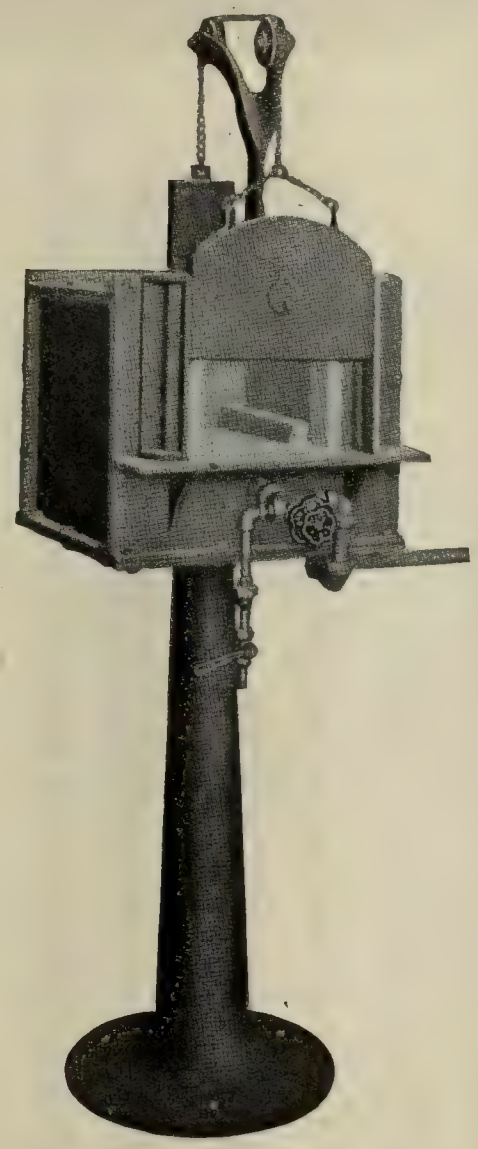
201 Royal Bank Bldg., Toronto, Can.



Built For *Service*

This BLOUNT Motor-driven Lathe is well adapted to all speed lathe uses. It is of late design, and has a number of features in which you will be interested. Provided with constant-speed motor. Lathe spindle made of hollow, high-carbon steel, ground to size and bored for Morse taper. Runs in self-oiling bronze bearings.

J. G. Blount Co., Everett, Mass., U.S.A.



General Tool Work

Built to meet the necessities of the small machine shop, or the plant where the needs of a furnace of this character are limited. Its size does not affect the inherent quality that is embodied in all "Bellevue" Furnaces.

May be operated by oil or gas. The greatest amount of heat is taken from either fuel. This feature is one that has established the "Bellevue" Furnaces "solid" with their users. Combustion is perfect. No flames come in contact with the material.

Our catalogue is at your disposal.

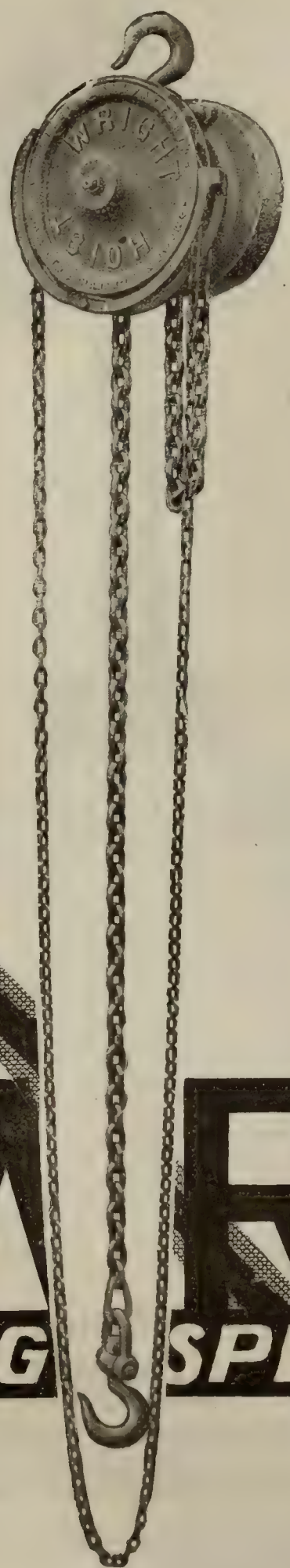
Bellevue Industrial Furnace Company

Julius C. Hinz, President

703 Bellevue Ave., Detroit, Mich.

Canadian Representatives:

H. W. Petrie, Limited, Toronto



TWO distinct features single the Wright High Speed Steel Hoists out as above the average and possessing qualities that promote efficiency and reduce cost and danger.

The Steel and Malleable Iron Construction on points of stress have so eliminated the breaking danger under heavy loads that absolute confidence may be placed in it wherever in use.

The Non-Fouling Chain Guide permits the raising and lowering from any angle and that jerky motion and catching of the chain is entirely eliminated.

In the Canadian munition plants hundreds of Wright Hoists have been installed. This speaks volumes for its ease and efficiency.

The fact that we claim it is a "never-break" hoist speaks for its strength.

"Write Wrights" about your hoisting.

Wright Mfg. Company
LISBON, OHIO, U.S.A.

Canadian Agents: **The A. R. Williams Machinery Co., Limited, Toronto, St. John, N.B., Winnipeg, Vancouver**

WRIGHT
HIGH SPEED STEEL HOISTS

STEEL HOISTS NEVER BREAK

Maximum Power With Minimum Belt Slip

The pulley question is a vital one. Slipping belts and wind-fanning pulleys are responsible for big power losses in many factories and mills.

A steel pulley—an iron pulley—a wooden pulley; that's the way many pulleys are bought. The result is waste of power.

Stop this waste. Specify

AMERICAN STEEL SPLIT PULLEYS

These pulleys save power because their flat A-braced arms minimize wind resistance.

Because the grooved air escape in their face diminishes the air cushion under the belt.

Because they combine lightness with great strength.

Because they require the least amount of time for installation.

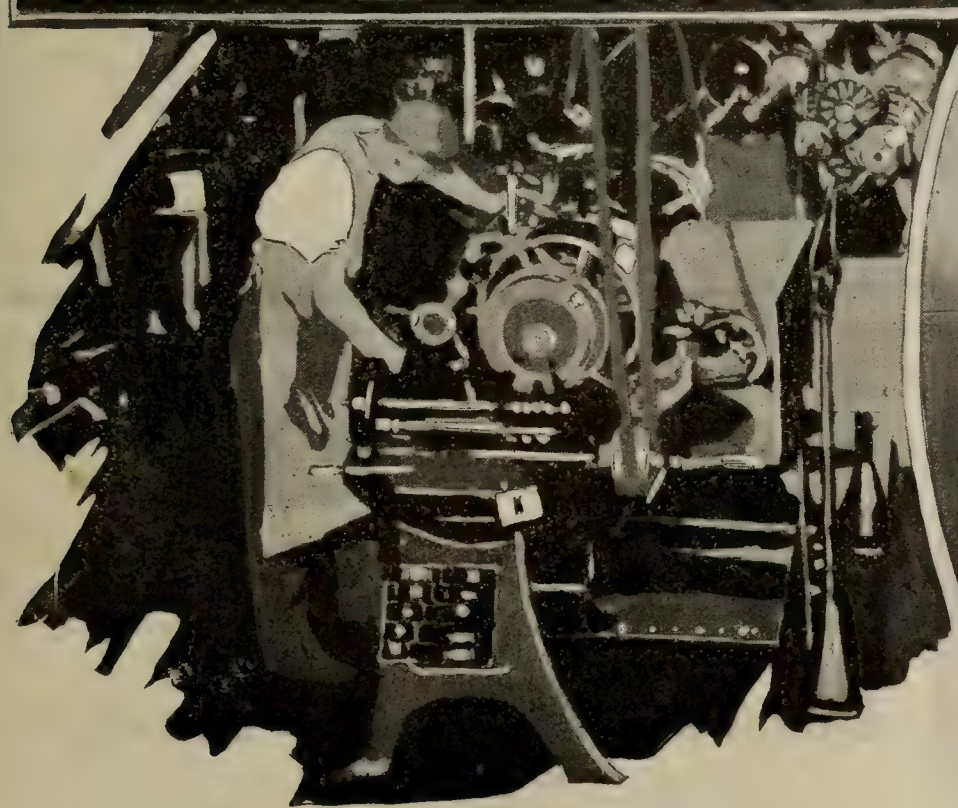
The belt grips the whole face of the pulley except the grooved air escape, and exerts the maximum pull. American Pulleys will not work loose on the shaft under severe intermittent loads—a frequent cause of the belt slip when wood or heavy iron pulleys are used.

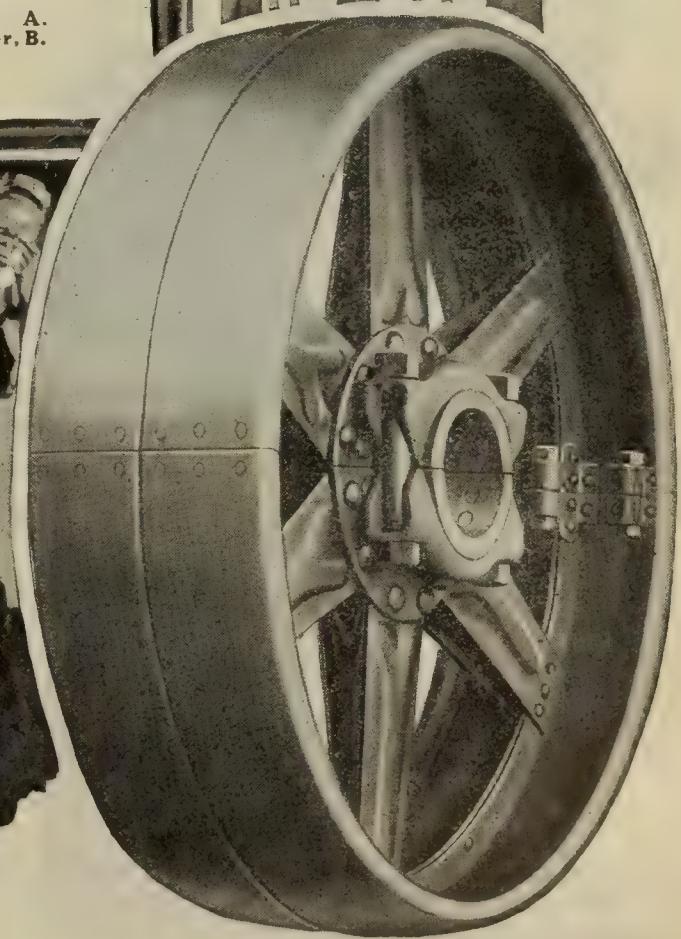
Write for the Free Book "Pulley Efficiency"—a valuable treatise on pulleys.

AMERICAN PULLEY COMPANY

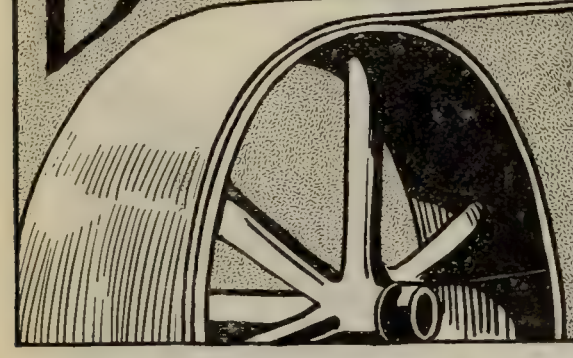
Philadelphia, Pa.

Canadian Distributors: Williams & Wilson, Ltd., Montreal, Que. A. R. Williams Machinery Co., St. John, N.B.; Toronto, Ont.: Vancouver, B. C.; Winnipeg, Man. H. W. Petrie, Ltd., Toronto, Ont.





Scandinavia Belts



Can be used anywhere that leather can be used.

Scandinavia Belting is a solid woven cotton belt, made of long fibre cotton. It is impregnated to give further solidity, and the impregnation also acts as a moisture resistant. For direct drives where atmospheric conditions remain approximately the same, this belt is probably the best on the market to-day.

It stands up well on shifters.

W. P. BENNETT

51 Montfort Street, Montreal, P.Q.

Beltings *Packings* *Asbestos*

Try a Trahern

and be convinced

Our pumps will pump any lubricant that does not contain grit; operate against or without pressure—throwing a uniform stream of coolant free from pulsation, in reality performing the functions of two types of pumps; therefore, they are the logical pumps for your machines.

Write for particulars.

TRAHERN PUMP COMPANY

ROCKFORD, ILLINOIS

Canadian Agents: **A. R. WILLIAMS MACHINERY CO.**
Toronto, Ontario

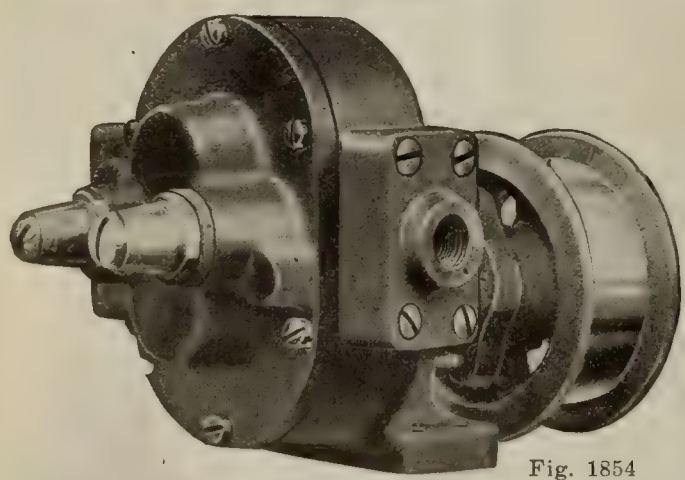


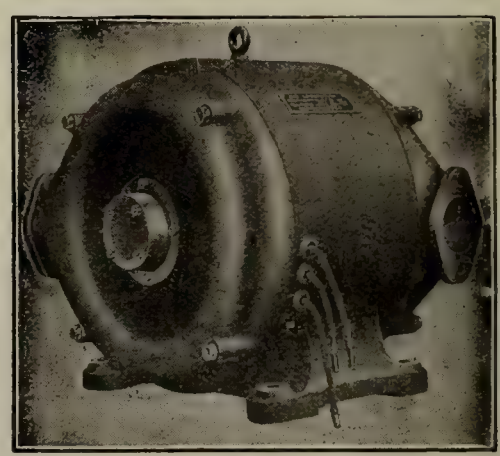
Fig. 1854

The Lancashire Dynamo & Motor Company, of Canada, Limited

107-109 Duke Street, TORONTO

ELECTRICAL MACHINERY for all Purposes.

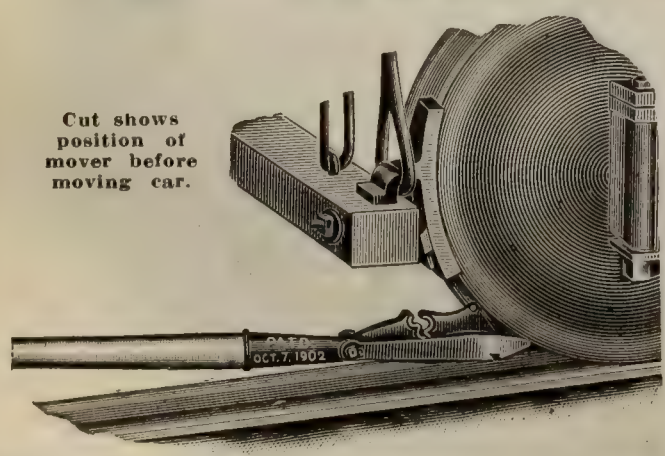
ELLIOTT BROS'. { INSTRUMENTS / RECORDING GAUGES



PIPE VENTILATED A C MOTOR

FOR VERY DIRTY PLACES

THE "SAMSON" RAILWAY CAR MOVER



Cut shows position of mover before moving car.

Every railway siding should be supplied with one of these tools. Takes the place of fifteen men and puts the heaviest loaded car just where you want it. It will pay for itself in 30 days.

It is one of the most simple and powerful devices for moving cars by hand.

It is provided with Never-Slip Spurs, which is the most important feature on a Car Mover.

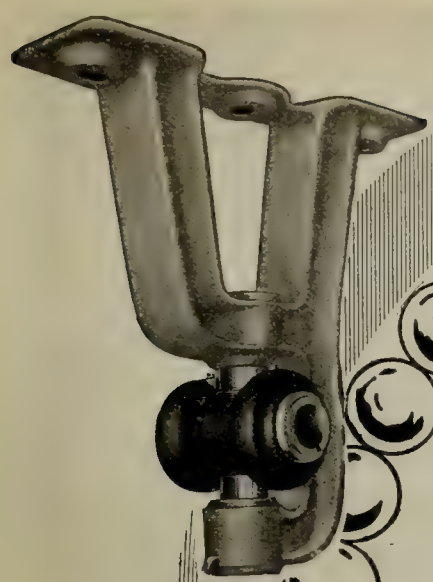
Special attention given to export orders.

Dillon Manufacturing Company

Oshawa, Ontario

Eastern Sales Agent
Alexander Gibb
3 St. Nicholas St., Montreal, Que.

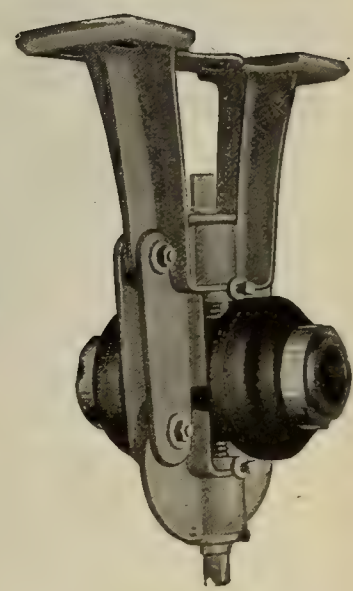
Western Sales Agent
D. Philip
138 Portage Ave., Winnipeg, Man.



Chapman

Double Ball Bearings

Practically Eliminate Friction Loads



CHAPMAN

Double Ball-Bearings effect an average total saving of power 15 per cent. to 30 per cent.

And reduce lubrication 95 per cent.

If you are in need of more power, they will give you 15% to 30% more without adding to your plant.

USED IN OVER 2000 CANADIAN FACTORIES

We recommend that you write some of these factories and find out what they think of our transmission ball-bearing service—we'll gladly furnish the names.

Chapman Double Ball-Bearings fit any adjustable hanger, and the change can be made quickly and with but little delay to you.

THE CHAPMAN DOUBLE BALL BEARING COMPANY OF CANADA
LIMITED

339-351 Sorauren Avenue
TORONTO CANADA

Transmission Ball Bearing Company,
1050 Military Road, Buffalo, N.Y.

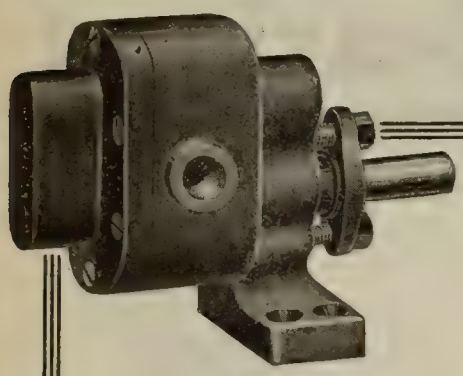
Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send to our nearest factory for a trial box.

Manufactured and guaranteed by

The Canada Metal Company, Limited

Hamilton Montreal TORONTO Winnipeg Vancouver



Speed Up—

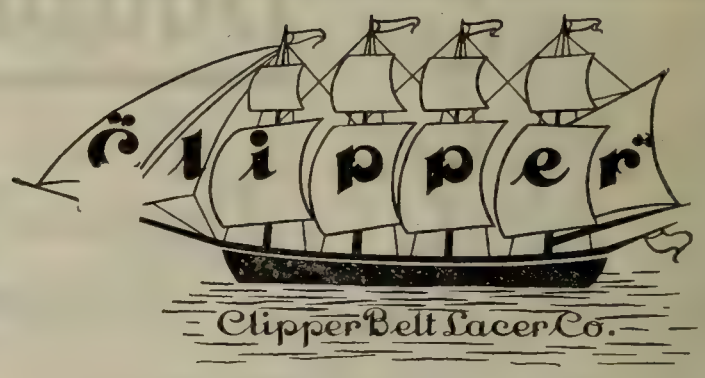
You can speed up that machine to its highest capacity and rest assured that Roper's Circulating Pump will keep the machine well oiled.

The machine is so constructed that the lubricant will flow in a steady stream, no halting, pulsating movement at all. This is a feature well worthy of notice. The circular is made in 6 sizes and will adjust itself to any size machine. The pump shown is a one-way lubricator only. We make the other kind.

Inquire.

C. F. ROPER & CO.

HOPEDALE : MASS. : U.S.A.

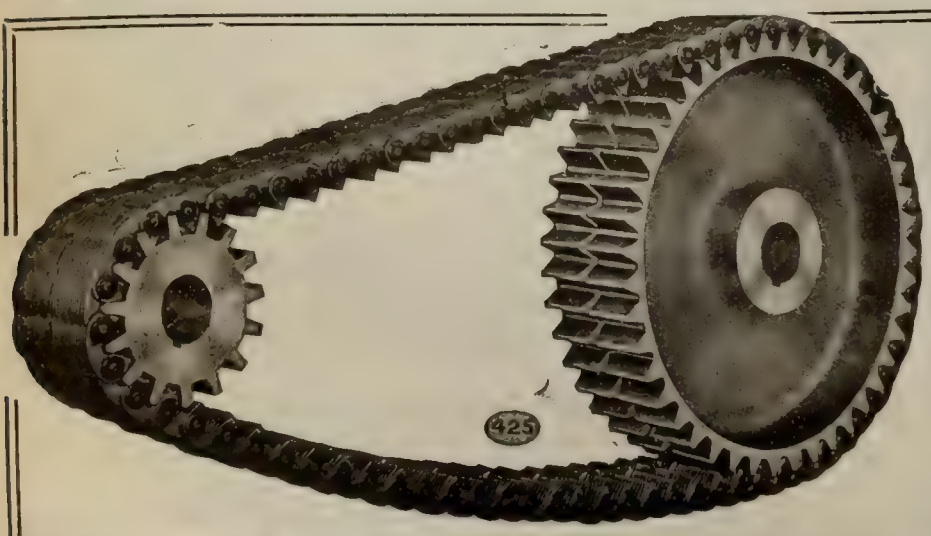


If you would use a stop watch while one of your belt lacing crews were at work you would find that you were paying expert men for a half hour job when any machine operator can lace a belt in THREE minutes with the

CLIPPER BELT LACER

CLIPPER BELT LACER COMPANY

976 Front Ave., N.W. Grand Rapids, Mich.



RENOLD CHAINS

PATENT SILENT

The proven efficient form of Power Transmission.

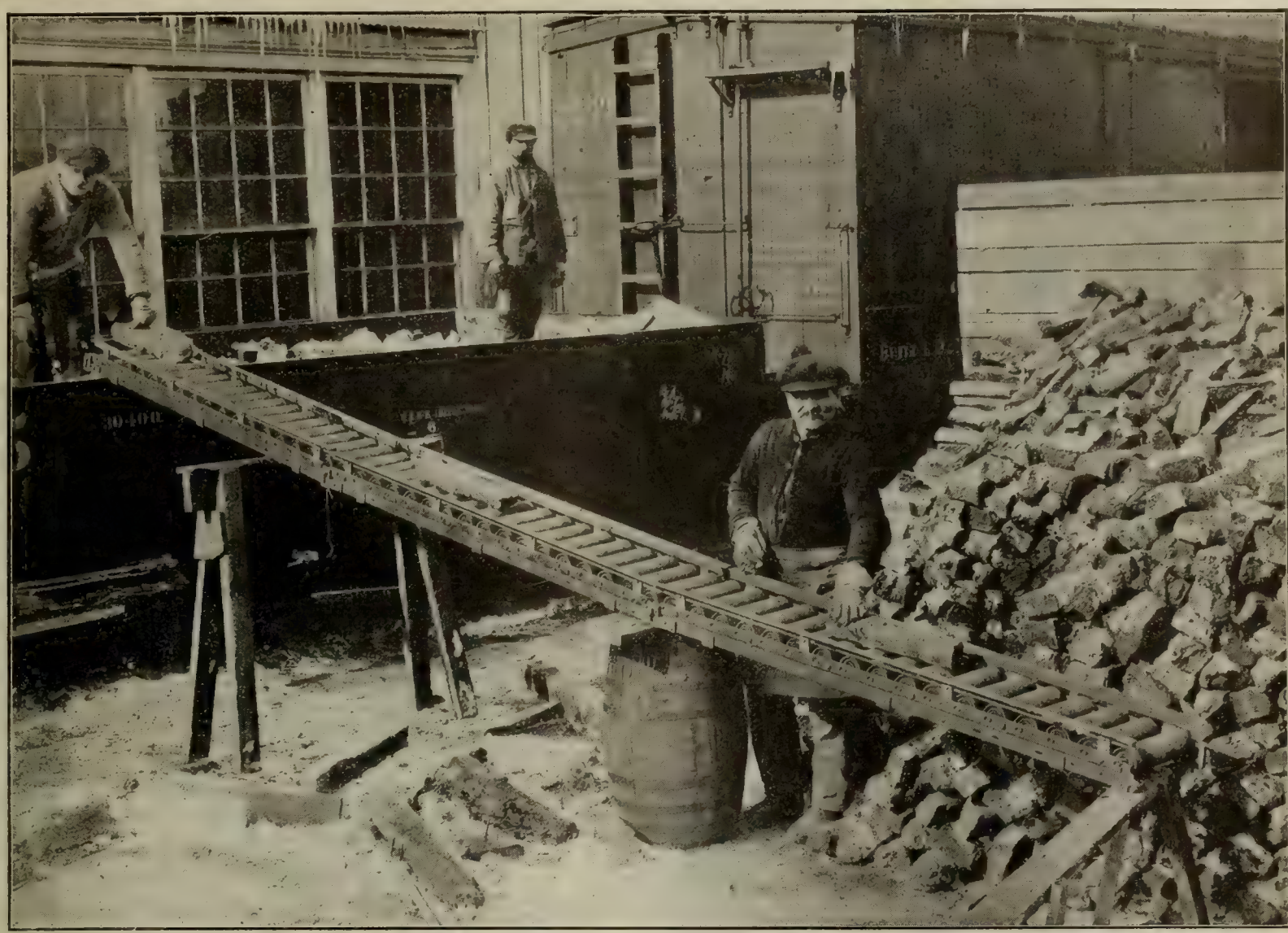
Equally suitable for main shaft or machine drives. Save space and power, increase output and ensure durability.

Chain and Parts Carried in Stock.

Sole Canadian Agents

Jones & Glassco. (Reg'd)

Branch Office: TORONTO, ONT. ENGINEERS St. Nicholas Bldg. MONTREAL, P.Q.



Why pay 50% more than is necessary for unloading your Pig Iron when you can save that percentage by using MATHEWS GRAVITY PIG IRON CONVEYOR? Write for our Bulletin C.

CANADIAN MATHEWS GRAVITY CARRIER CO., Ltd.
484 RICHMOND STREET W., TORONTO

STEEL TUBING

Steel Tubing, Butted and Welded for Bedsteads, Agricultural Implements, Trolley Arms, Fence Posts, Etc.

14 to 20 gauge.

Sizes 3/8" to 2" outside diameter.

Let us send you samp es.

We are equipped with facilities for turning out big orders with the utmost dispatch. Prompt deliveries is one of our specialties.

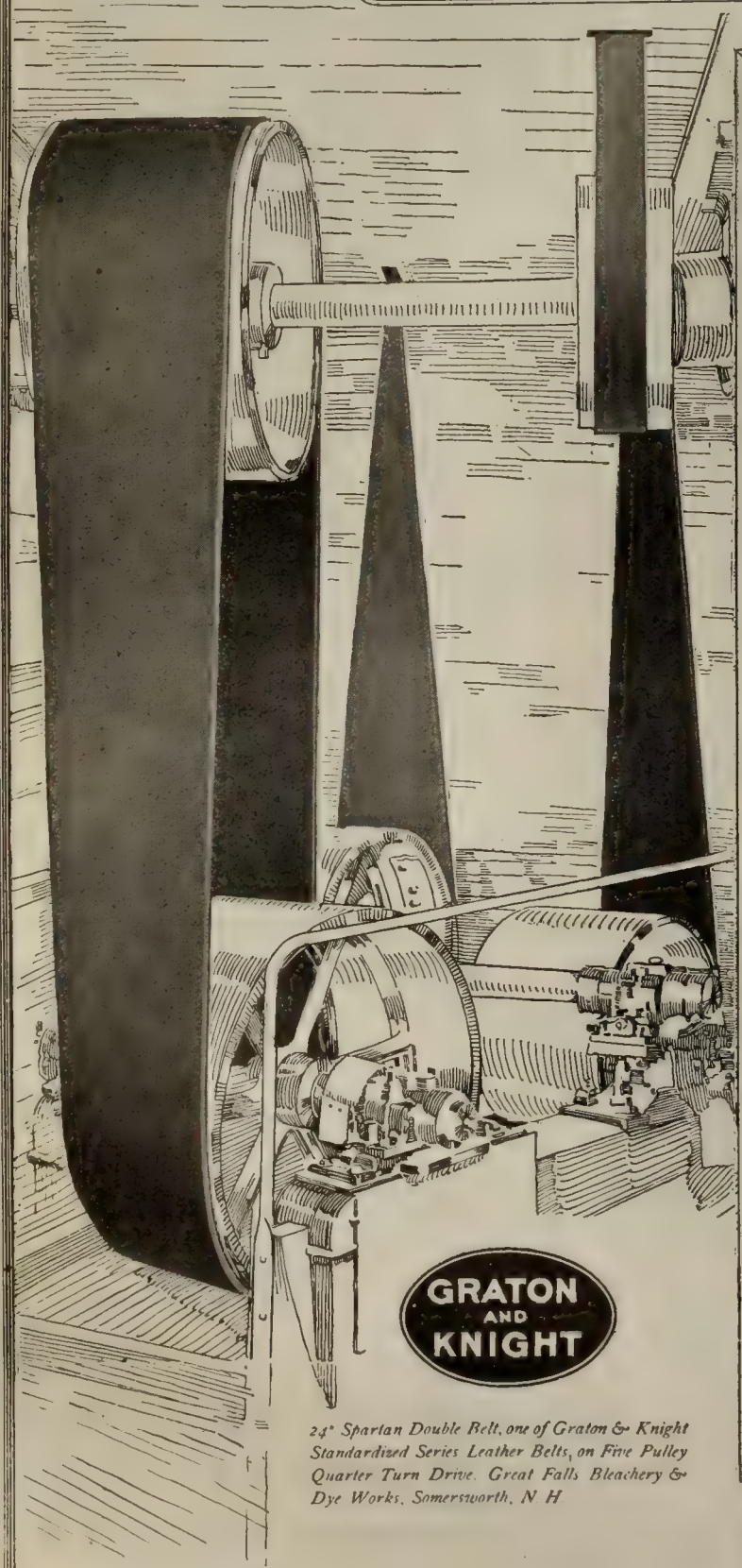
Standard Tube & Fence Co.

Woodstock, Ontario

GRATON & KNIGHT

Standardized Series LEATHER BELTING

Tanned by us for belting use



24" Spartan Double Belt, one of Graton & Knight Standardized Series Leather Belts, on Five Pulley Quarter Turn Drive. Great Falls Bleachery & Dye Works, Somersworth, N. H.

It Begins in the Tannery

Leather is the Standard Belting Material

To us, the largest belting makers in the world, every possible belting material lies open for selection and use. But the belting experience of generations points to the unescapable fact that leather has the properties necessary to make good belting.

Leather that is properly tanned for belting is tough, flexible, durable and prehensile. It preserves the natural softness and mobility of the skin, ensuring an effective grip on the pulley surface.

We have standardized these requirements of perfectly tanned belt leather. The standard in each case is the highest *working* efficiency in the finished belt.

Since the market cannot supply tanned belt leather that continuously measures up to Graton & Knight Standards, we tan our own hides. Last year, we tanned 285,000 of them, in our own tannery. We tanned them for *belts*. We tanned them to definite and uniform standards of belting requirements.

This standardization of material is the foundation of Graton & Knight quality.

It makes the Standardization of Graton & Knight Belts an actual, practical thing.

Think what other standardized products have done for you—and consider the standardization of belting on that basis. Let us send you complete information on the subject.

THE GRATON & KNIGHT MFG. COMPANY

Oak Leather Tanners, and Makers of Leather Belting

Worcester, Massachusetts, U.S.A.

Canadian Representatives: The Canadian Fairbanks-Morse Co., Limited, St. John, Montreal, Ottawa, Toronto, Hamilton, Quebec, Calgary, Saskatoon, Windsor, Vancouver, Winnipeg, Victoria.

When Work Goes Smoothly

BOWSER ESTABLISHED 1885

Oil Storage Systems

assist in many ways to aid production, produce economy and efficiency wherever oil is used.

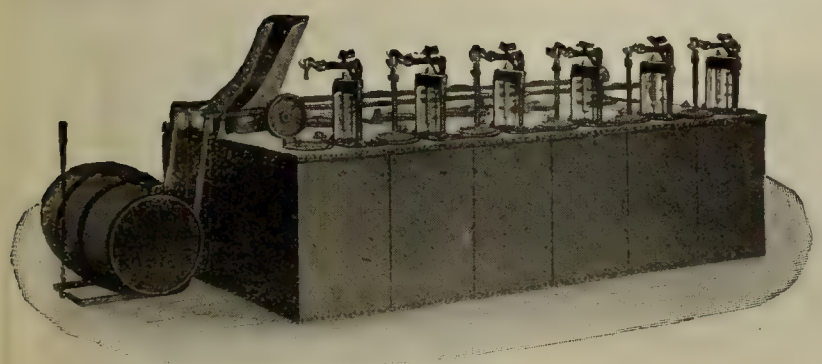
They provide effective storage and handling facilities for all kinds of oils. Keep oil clean, retain its value, prevent waste, and encourage the proper use of oil, which results in better work with less effort.

Outfits can be placed where most convenient, saving time and trouble.

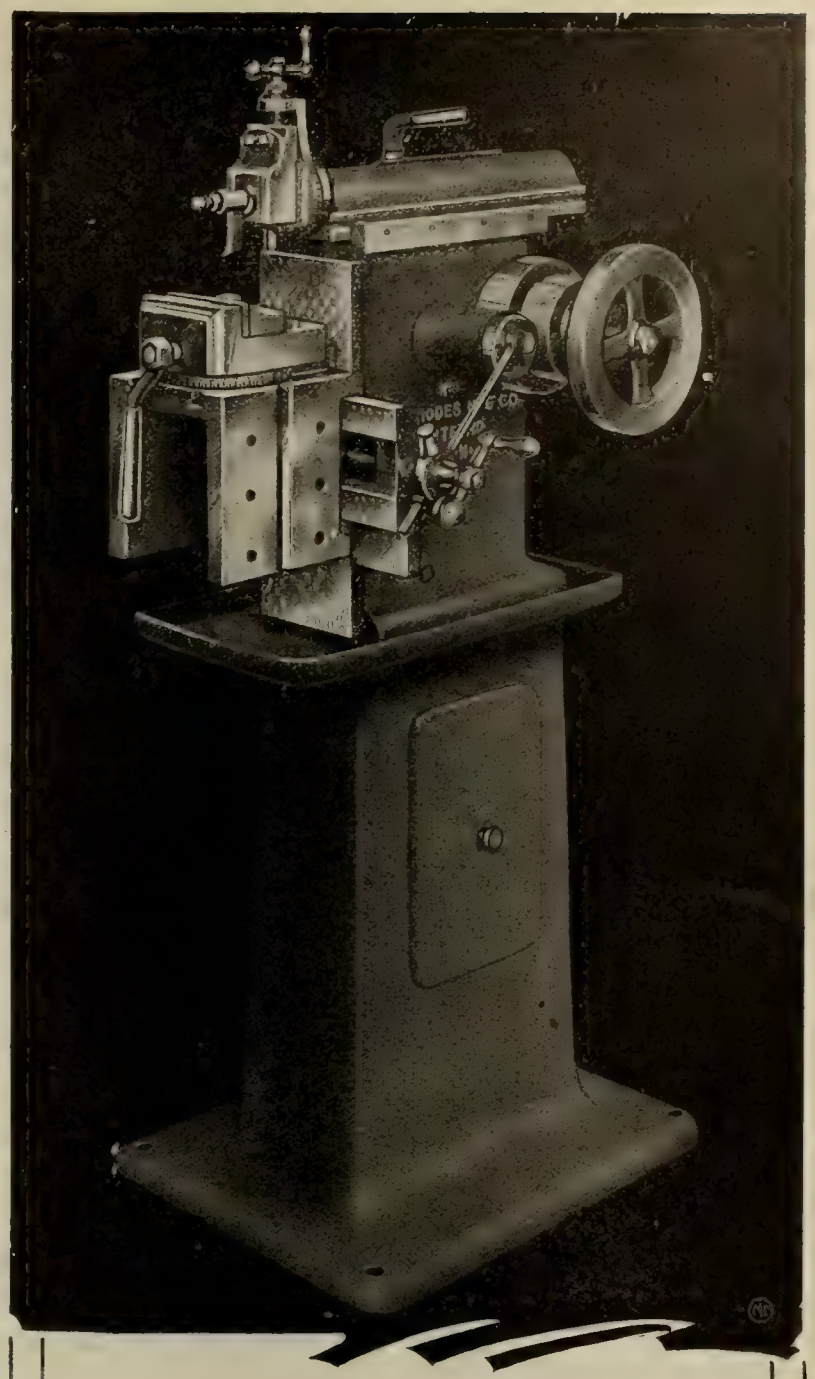
They are accurate, durable and safe; every shop needs the Bowser.

S.F.BOWSER & CO., Inc.

Sales Offices In all Centers **TORONTO, ONT.** Representatives Everywhere



A System For Every Need



"It speaks for itself. A silent story of quality." Vertical or Horizontal Shaper that will undertake to reduce your production costs more than you thought they could be reduced. Shaping, slotting, tool-making, die-making, modeling and other classes of light work that are profit-eaters when done on large machines.

This Rhodes machine will "eat them up," with accuracy, speed and economy. These machines are being established and stamped by foreign opinion as cost-cutting machines.

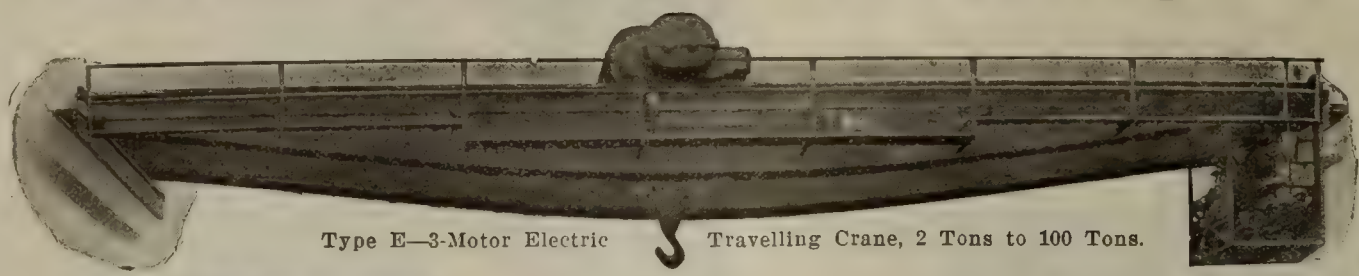
Write us on your letterhead and thus secure immediate information.

The Rhodes Mfg. Co.

Hartford, Conn., U.S.A.

CANADIAN MADE CANADIAN MADE

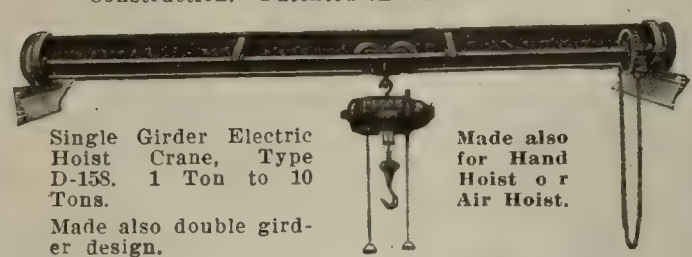
Electric and Hand Traveling Cranes



Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons.

Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons.

Made also double girder design.

Made also for Hand Hoist or Air Hoist.

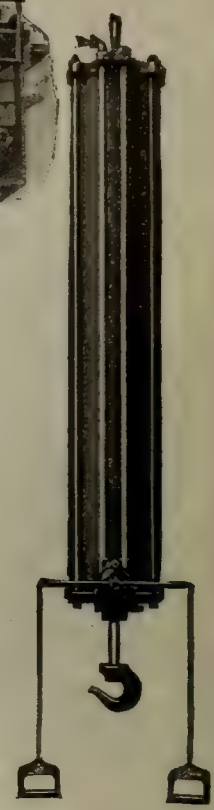
Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

Type D Electric Hoists —½ to 10 Tons.

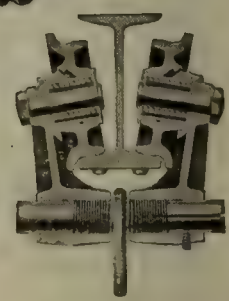
Air Hoists, Trolleys and Tracks.



Type No. 20 Air Hoist.

Northern Crane Works, Limited

Walkerville, Ontario, Canada



CURTIS, St. Louis, U.S.A.

AIR COMPRESSORS — AIR HOISTS — TROLLEYS AND TROLLEY SYSTEMS—SAND BLASTS—PNEUMATIC AND HYDRO-PNEUMATIC ELEVATORS—JIB AND TRAVELING CRANES.

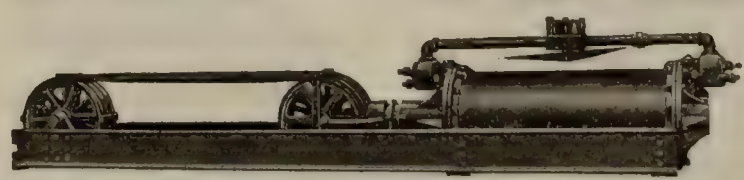
We have specialized for over 22 years on pneumatic machinery. We have developed the simple air cylinder into a straight line motor with wonderful speed control and dependability capable of the widest application to hoisting problems.

Our new controlled-splash oiling system with regulatable sight feed cylinder oiling is something entirely new in air compressor design.

Complete catalogs and descriptive circulars on our entire line furnished on request.

Curtis Pneumatic Machinery Co.

1585 Kienlen Avenue - St. Louis, U.S.A.
New York Office - 532F Hudson Terminal



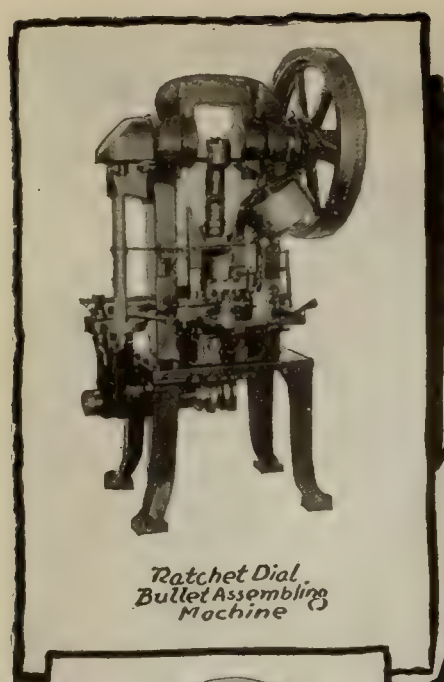
Standard Pressed Steel Company

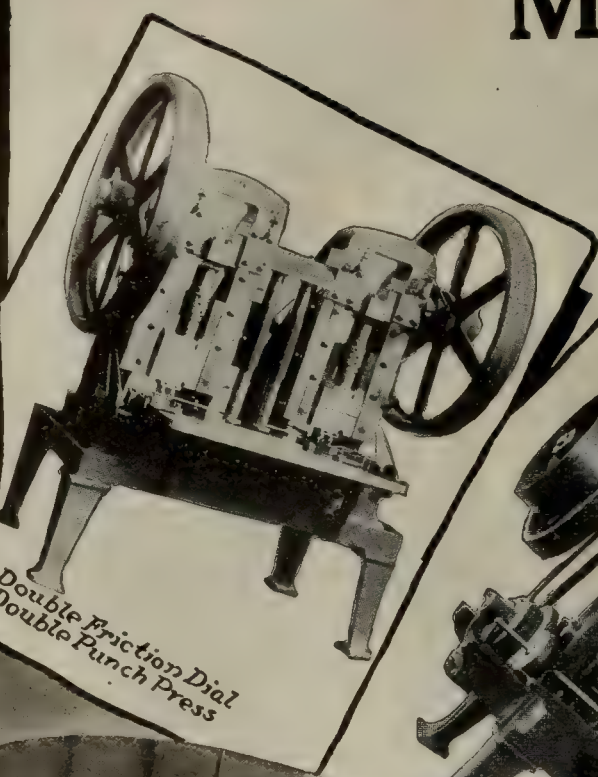
Philadelphia, Pa., U.S.A.

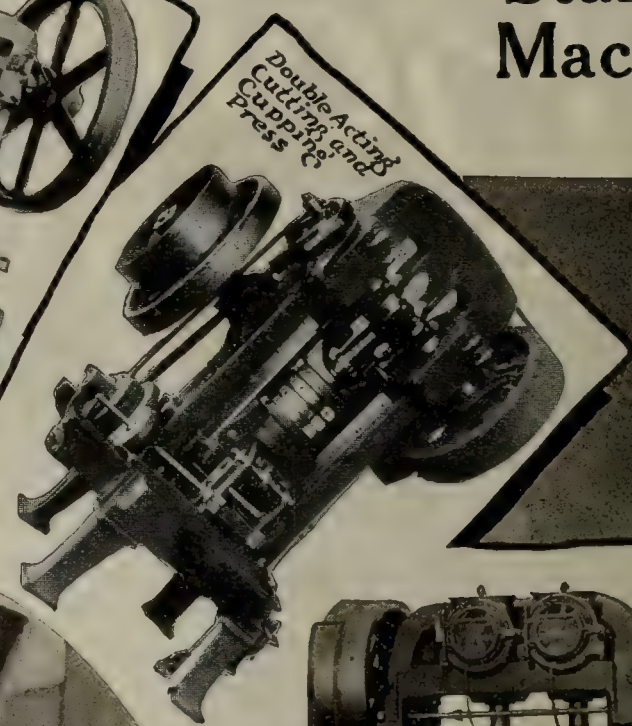
Sole Distributors for Ontario : H. W. Petrie, Ltd., Toronto, Ont.

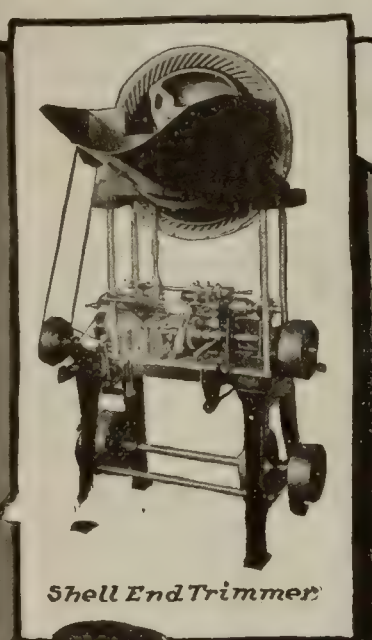
CARTRIDGE MACHINERY

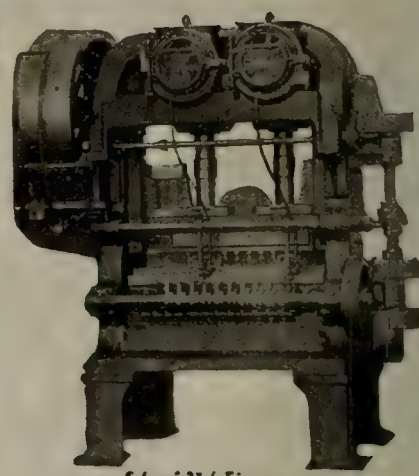
Waterbury Farrel Standard Machines

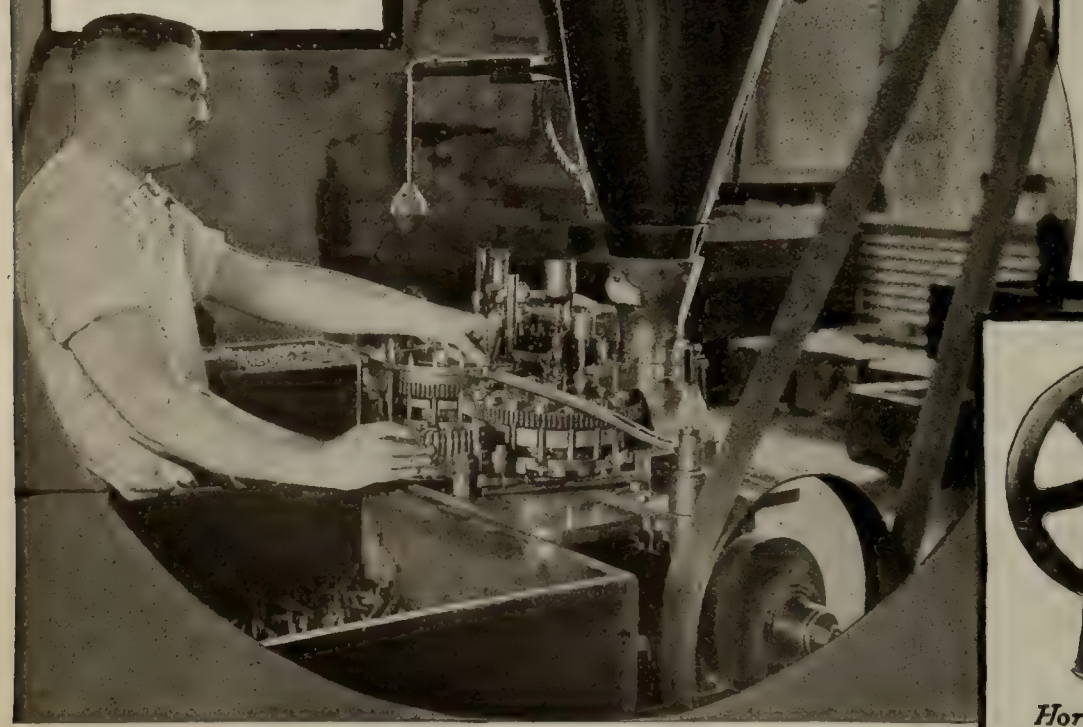

Ratchet Dial Bullet Assembling Machine

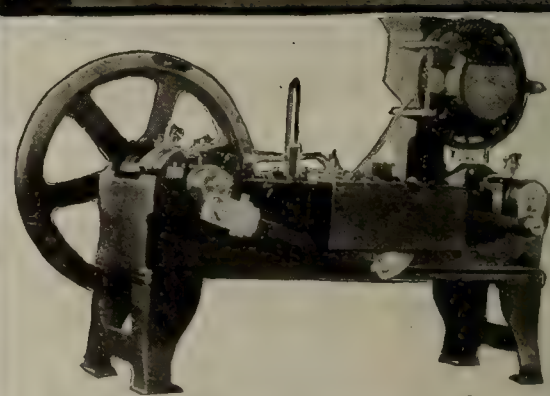

Double Friction Dial Double Punch Press


Double Acting Cutting and Cupping Press


Shell End Trimmer

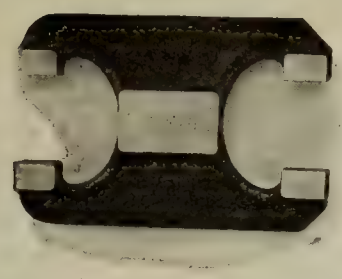

Straight Line Bullet Assembling Machine


Standard Loading Machine in Government Arsenal

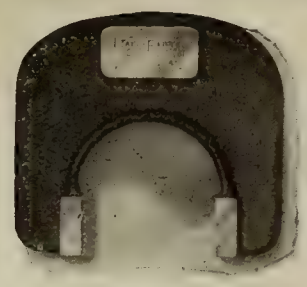

Horizontal Header Hopper Feed

The Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn., U.S.A., has appointed me to be the sole manufacturer for export of their entire line of Cartridge and Shot Shell-Making Machinery. Proposals and Estimates covering complete plants or separate units, required for export will be furnished on request.

FREDERICK S. BLACKALL, Woolworth Tower, New York, U.S.A.



Double-end External Limit Gage



Single-end External Gage

Adjustable Limit Gage

Taft-Peirce Tool Room Specialties

The Taft-Peirce Mfg. Company

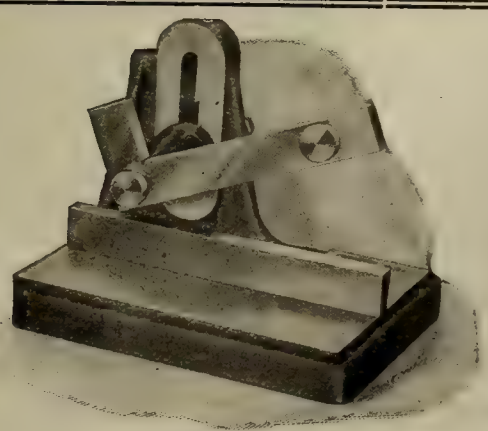
Woonsocket Rhode Island

NEW YORK, 233 Broadway
DETROIT, 1311 Majestic Building

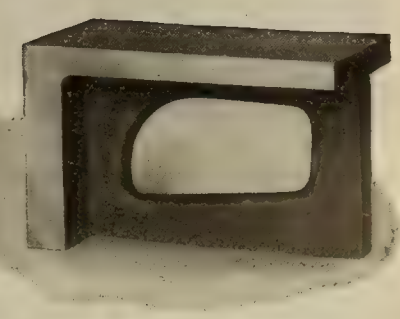
IN Taft-Peirce Tool Room Specialties we offer accessories needed in every tool room where accurate work is performed, devices designed and manufactured to replace those you have heretofore made yourself to facilitate machining or inspecting operations. We have standardized these tools, manufacture in quantities and can sell them at prices much lower than the cost of home-made devices. The line is quite complete also arranged to meet most requirements.

The T-P Double-end and Single-end External Limit Gages are particularly strong and durable and have large wearing surfaces. T-P Angle Plates will be found highly useful in laying out work, irregular shapes in particular. The Sine-bar Fixture shown is arranged with a supported sine-bar which is set on end to obtain the sine of the complement of any required angle between 45 and 90 degrees.

Catalogue "E" shows and describes the complete line. Send for a copy.



Sine-Bar Fixture



Universal Right-angle Irons

If any advertisement interests you, tear it out now and place with letters to be answered.

Consolidated Presses

appeal to discriminating users because of the massive construction of all working parts, the generous crank shaft bearings, the increased diameter of crank pins, liberal crank cheeks, long and carefully fitted slide bearings, abnormally large connection screws, powerful gearing, and above all, the skill and care exercised in their construction.

These are features which should be considered when purchasing.

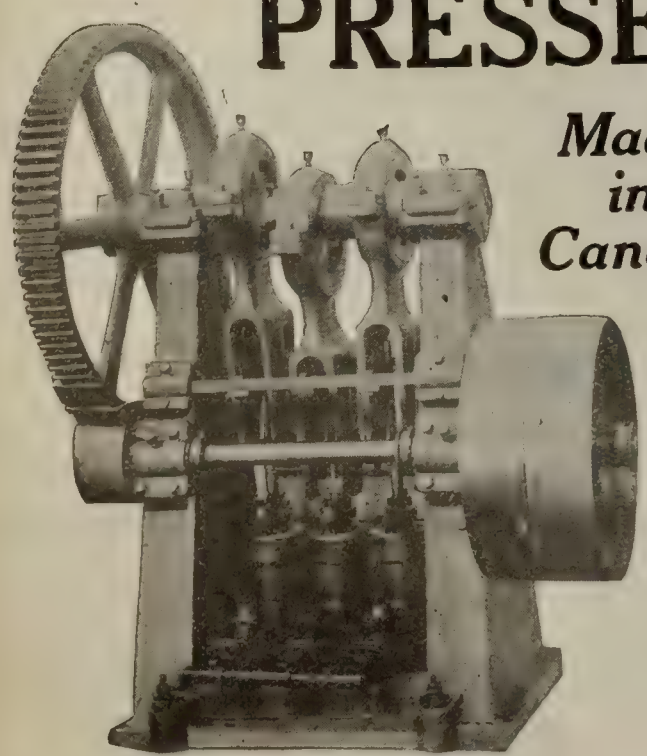
Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

PRESSES

Made in Canada



Hydraulic Presses, Pumps and Accumulators for all purposes

WRITE FOR PRICES AND DELIVERIES

WILLIAM R. PERRIN, Limited

TORONTO, CANADA

Banding 6" to 12" Shells

Its sturdy construction allows it to stand up under severe service. This is the reason for its higher price. Such extra care, better material and expert workmanship are required that the results warrant the high cost.

It has six 11" semi-steel rams which move ½" or more if necessary. All rams returned by levers on plates with heavy Vanadium Steel Springs. Cylinder removable of alloy steel.

Hydraulic inlet to cylinder 1¼ pipe. Distributing ring 2". All pipe of Seamless Steel Tubing. All fittings dropped forged steel. All parts under strain, alloy steel castings and forgings.

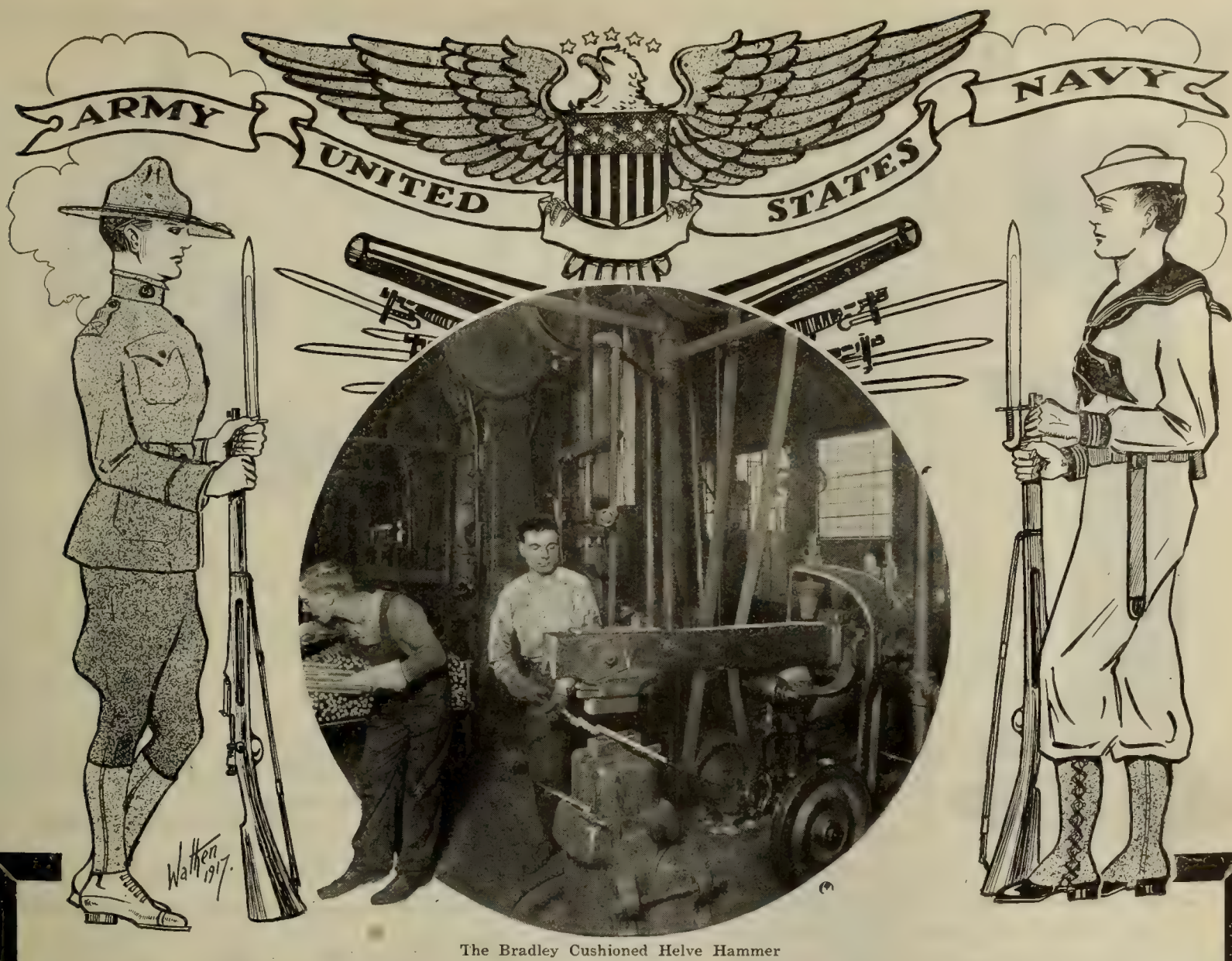
Six dies of forged chrome nickel steel, hardened and removable, without disturbing any part of press, by loosening two nuts. Can be operated either from accumulator or pump.

Built also in smaller size of same type for banding "pounder" to 6" shells.

Metalwood Manufacturing Co.

Leib and Wight Sts. -:- DETROIT, MICH.

For Great Britain and Continent, address Gaston E Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.



The Bradley Cushioned Helve Hammer

Forging Uncle Sam's "Toothpicks"

Interior of a large arms plant somewhere in the "United States," making bayonets destined as the final argument to uphold our national honor and dignity. Work must be both accurate and low-costing.

BRADLEY HAMMERS

are used for many kinds of forging work—for big production on duplicate parts where continuous service is essential.

Bradley hammers are easy on the hammer man and always under ready control. Pressure on the foot treadle, extending around front and both sides of the hammer base, operates an idle pulley against the down-traveling side of a continuous loose belt, and sets the hammer in motion. As treadle is released a brake stops the hammer.

C. C. BRADLEY & SON, Inc., Syracuse, N.Y.

FOREIGN AGENTS: France, Belgium, Switzerland, Spain and Portugal: Fenwick Freres & Co., Paris. Italy, Taddeo Giusti, Modena, Italy. England, Buck & Hickman, Whitechapel Road, London.

Your Riveting?

How is it done? Are you getting the necessary speed? Is the quality of the highest character? How much is it costing you?

The Grant Rivet Machine has established the records of one clean, perfectly finished rivet per second. Is that speedy enough, or is it too speedy? This is the fastest any similar machine will work and if too speedy it could be worked in conjunction with some other work.

Our catalogue is worth writing for. There is one for you.

THE GRANT

Mfg. & Machine Co.
Holland. Ave.
Bridgeport Conn.

HIGH SPEED HAMMERS

For High Speed Work

FEATURES:

Our Bench Hammer can be adjusted high or low, and spells another economy in space and handy utility.

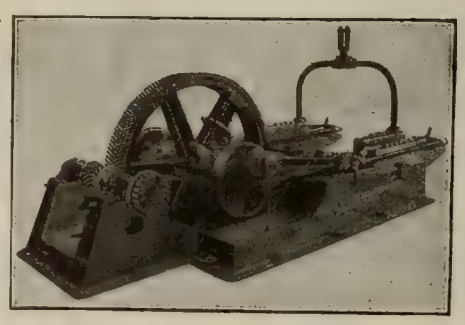
With it you have a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushings are used throughout.

No riveting too intricate for us; no riveting which our machine cannot accomplish.

Send for our **High Speed Hammer Book.**

THE HIGH SPEED HAMMER CO.
Rochester, N.Y.

Sales Agents: The A. R. Williams Machinery Company, Limited, Toronto, Ontario.



ELMES

18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

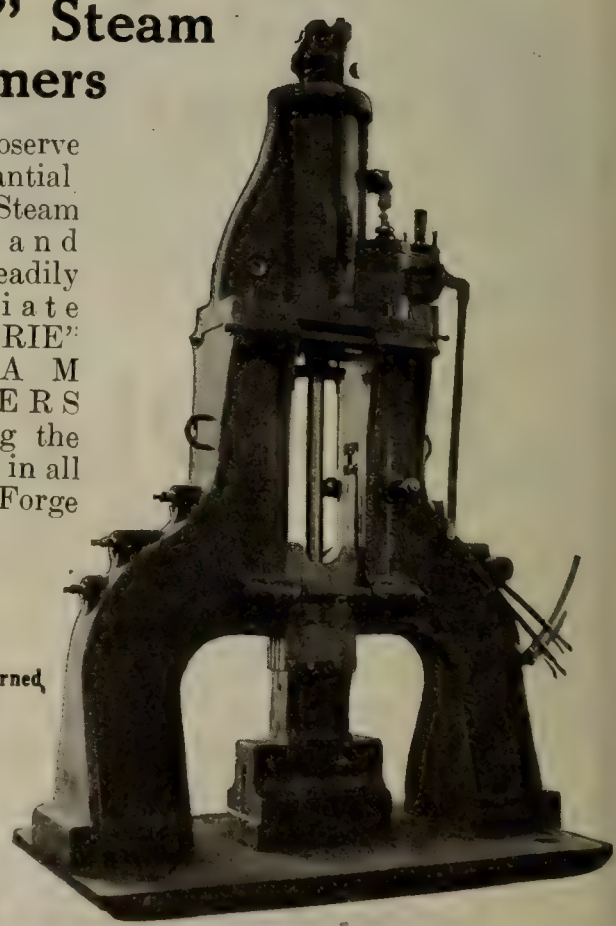
Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217 No. Morgan Street CHICAGO, ILL.

"Erie" Steam Hammers

Closely observe this substantial well built Steam Hammer and you will readily appreciate why "ERIE" STEAM HAMMERS are getting the preference in all modern Forge Shops.

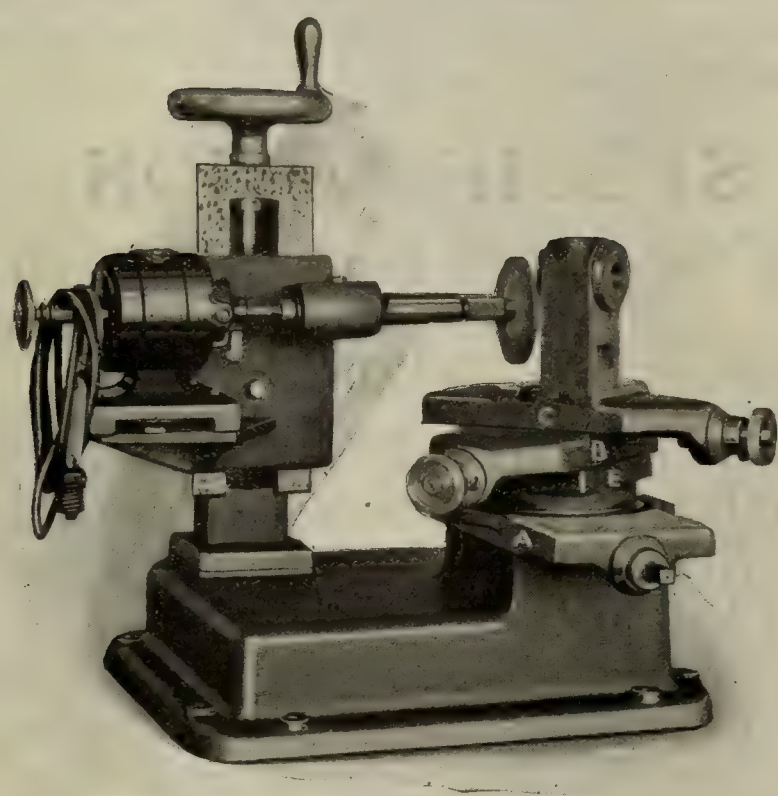


They have earned their enviable reputation.

ERIE FOUNDRY COMPANY
ERIE, PA. U. S. A.

The Cleveland Milling Machine Company

PROFILE GRINDER



Grinds concave and convex milling cutters 12 in. diameter, 3 in. radius, cutters for fluting drills, cutters that are irregular but having a number of true curves, accurately rounding the corners on side mills, face mills, and end mills, formed tools for screw machines and corner rounding tools for the lathe, planer and shaper.

This machine spindle is driven by a Dumore Type D Universal motor, runs on any current. Ten feet of wire with lamp socket and all necessary equipment furnished.

By acting quick you can have immediate delivery.

The Cleveland Milling Machine Co.
18511 Euclid Ave. Cleveland, Ohio

If any advertisement interests you, tear it out now and place with letters to be answered.

UNIVERSAL GEAR HOBBER

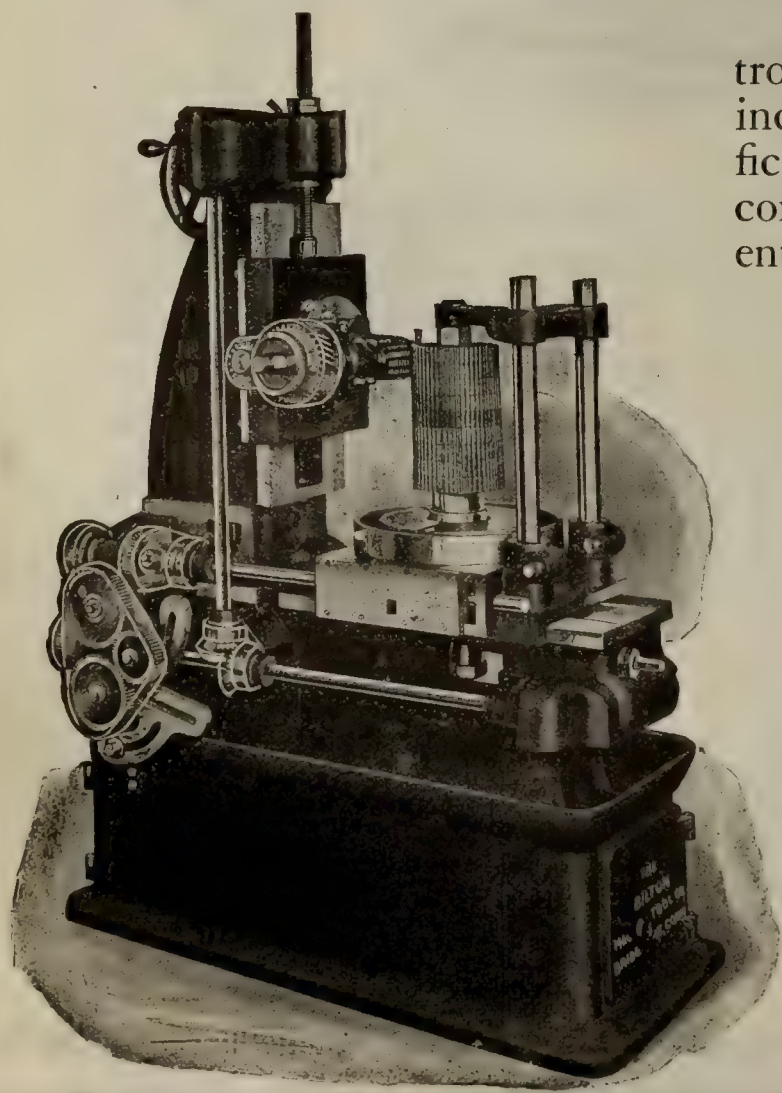
The machine which completes our lines to cut all types of small gears except internal, within 10″ dia. 8 Pitch.

The Bilton Gear Hobber will cut spur spiral gears, worm gears, also various special shapes of teeth. It can cut a spiral tooth on end of a shaft 1⅜″ dia. 24″ long.

SPECIFICATION

Capacity Gears: 10 Diametral Pitch
10 in. Outside Diameter
10 Width of Face

Range of hob feed 50-250 R. P. M.
Range hob feed to each rev. of worm .010 to .125
Drive: 3 Steps Cone Pulley; 2½ in. Belt
Weight 1,100 lbs.



A machine of latest design, introducing new features which increase production without sacrificing accuracy. The hob is cutting continuously; operation of machine entirely automatic.

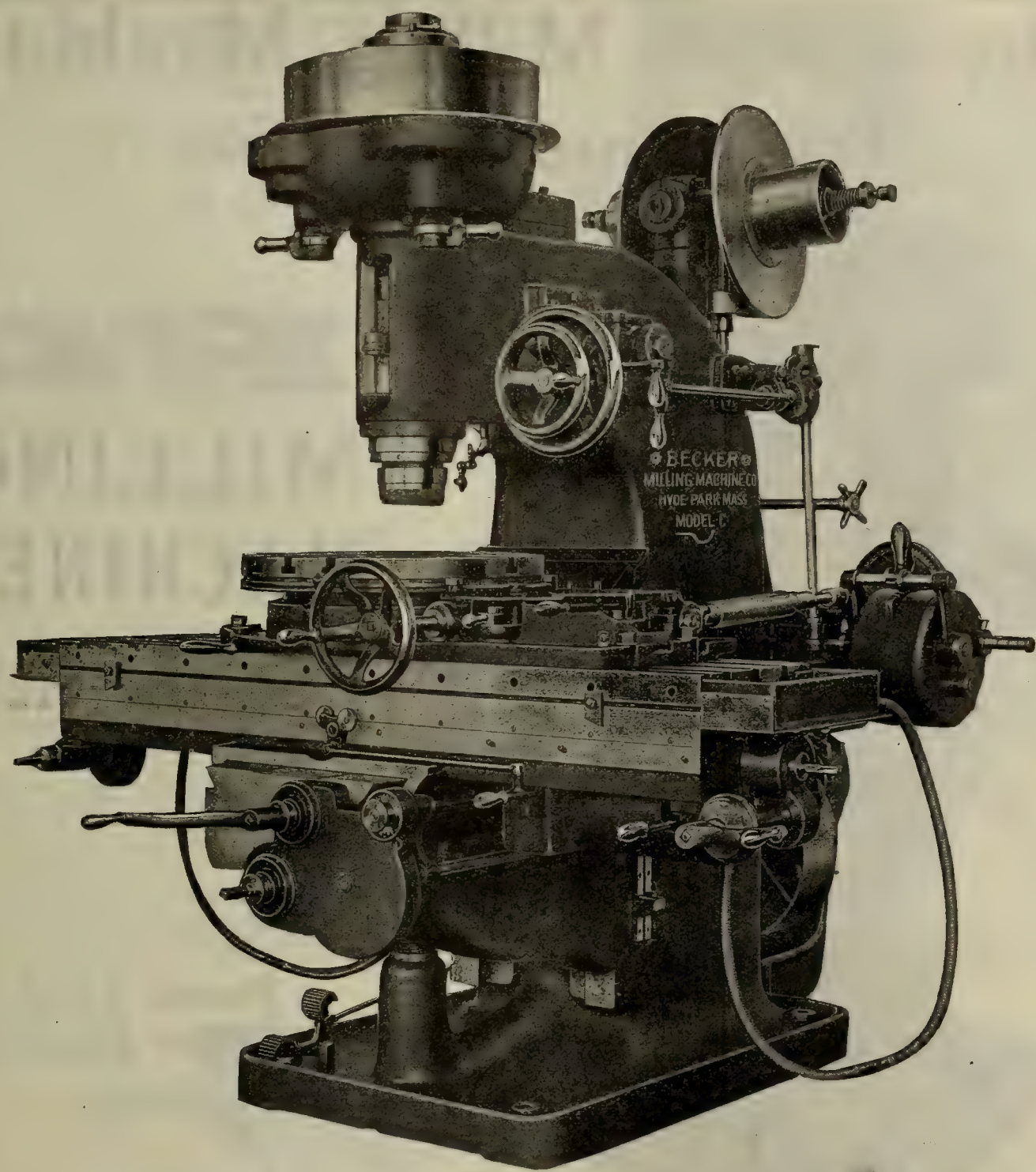
DELIVERY

A few of these machines are now available for September delivery.

Send for copy of new catalog No. 30, and bulletin describing this machine.

THE
Bilton Machine Tool
COMPANY
BRIDGEPORT - CONN.

Foreign Agents:
ALFRED HERBERT LTD.
M. METT ENGINEERING CO.
CHAS. CHURCHILL & CO.



The demand for greater production was met and surpassed by the Becker High Power Vertical Millers, and by virtue of the distinct features it possesses, its superiority over other millers is very pronounced.

The fourteen types and twenty-four sizes from which to choose is one evidence of efficiency. The individual features evident from the illustration are but an inkling of the features constructed *in* the machines that have gone to stamp the Becker as superior.

Your inquiry is sure of receiving prompt and satisfactory attention.

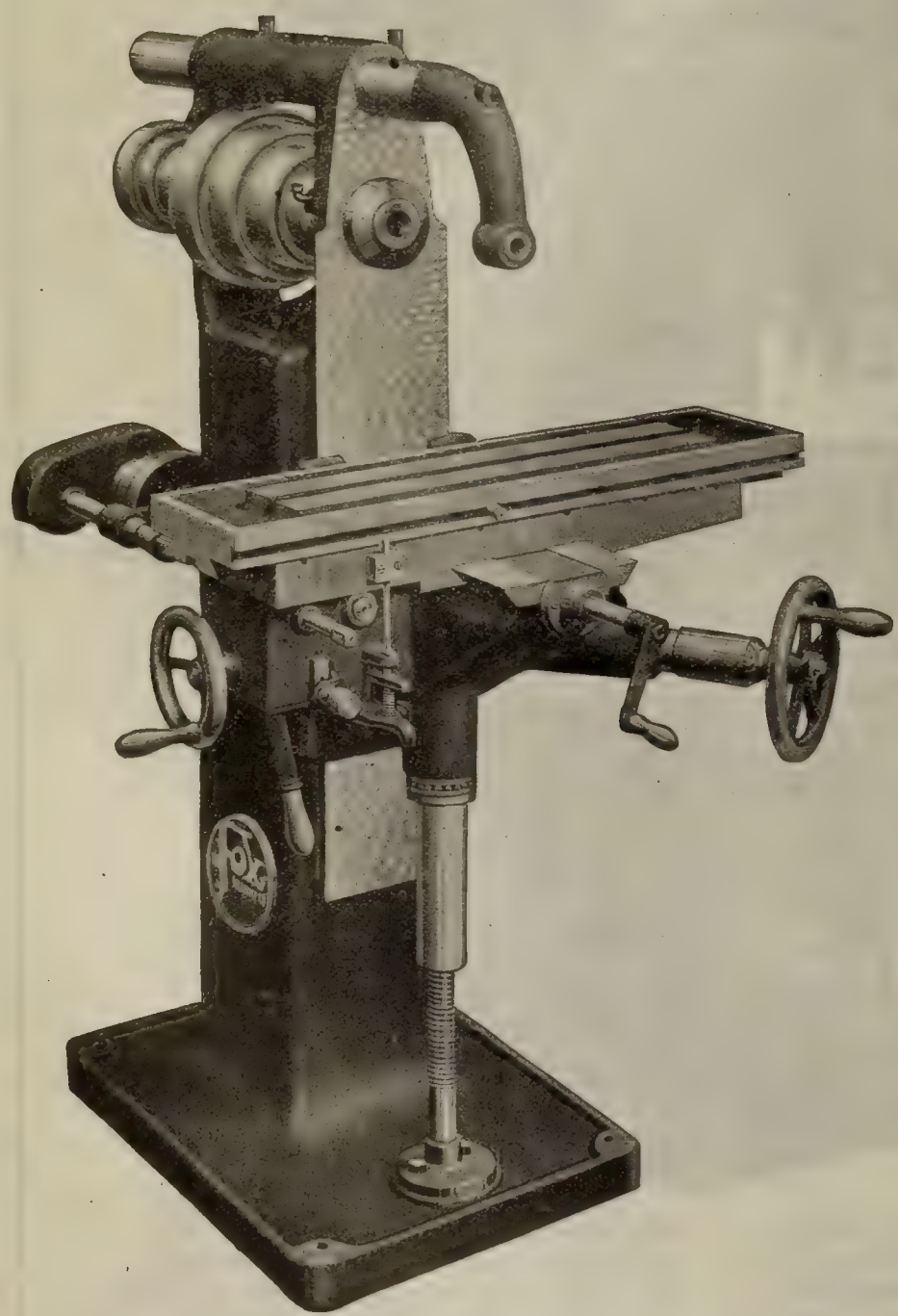
Becker Milling Machine Company

HYDE PARK, BOSTON, MASS., U.S.A.

Agents:
THE A. R. WILLIAMS MACHINERY COMPANY CO., LIMITED
Toronto and Hamilton
Williams & Wilson, Ltd., Montreal, Que.

The FOX Milling Machine

For Intense Production



FOX

MILLING MACHINES

lead the field

Power Feed Miller No. 3

The Fox Milling Machines are ideal, as they are particularly adapted for just that sort of work.

Every machine is provided with micrometer dials on the vertical and transverse movements, thus insuring accuracy in every detail.

Write for full particulars.

FOX MACHINE COMPANY

1047 W. Ganson Street, Jackson, Michigan

KEMPSMITH

UNIVERSAL MILLING MACHINES

Every Kempsmith Milling Machine of whatever size, is provided with a slotted spindle nose for positive drive of arbor and for positive drive of face milling cutter in either direction.

Every machine is equipped with our patented keyed overhanging arm which insures positive alignment of arbor and boring bar and also prevents the cutter being pounded out of line under cut.

Kempsmith machines are heavy, with weight well distributed and their accuracy is guaranteed within very close limits.

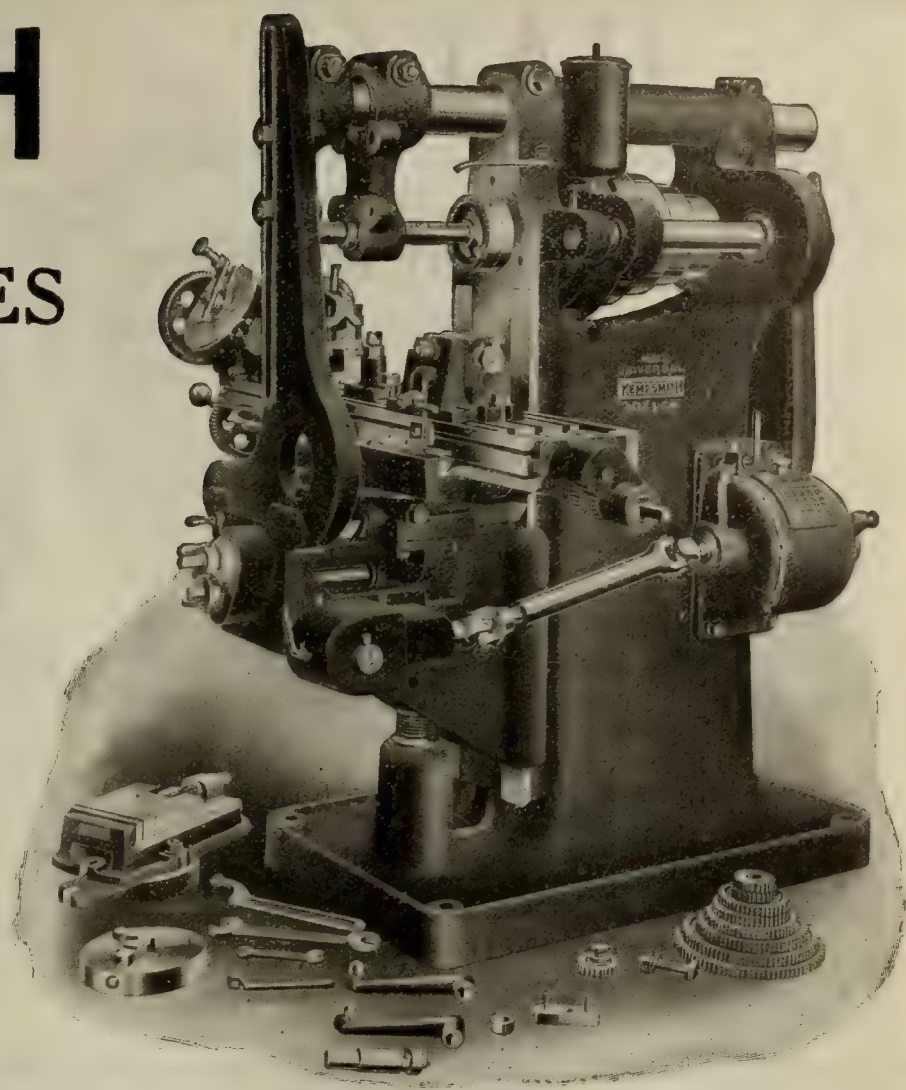
Send for Illustrated Catalogue.

Kempsmith Manufacturing Co.

MILWAUKEE, WIS., U.S.A.

AGENTS:

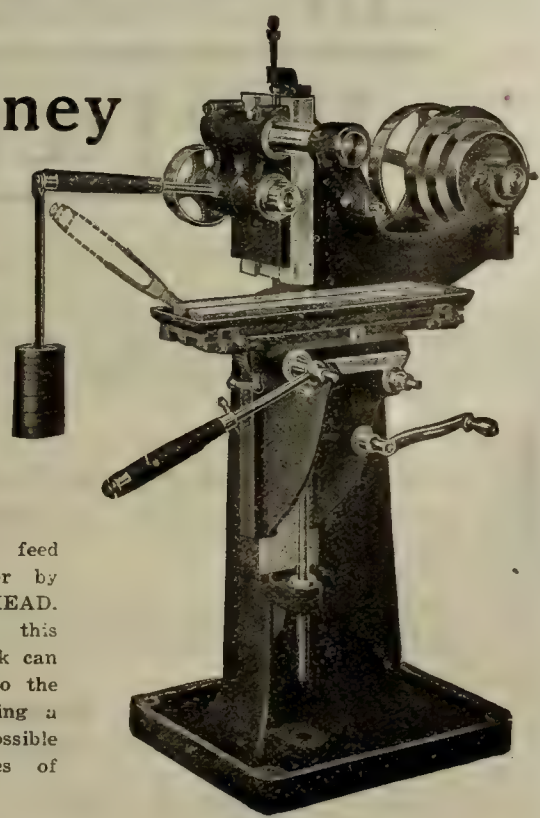
Foss & Hill Machinery Co., Montreal.
General Supply Company, Toronto and Ottawa.
Canadian Western Foundry & Supply Co., Calgary, Alta.



THOUSANDS IN USE

The Whitney

Hand (Feed) Milling Machine



The vertical feed is provided for by the SLIDING HEAD. On account of this feature the work can be held close to the table, thus giving a rigidity not possible on other types of Hand Millers.

Send for Catalogue A.

The Whitney Mfg. Co.

Hartford Conn. U.S.A.

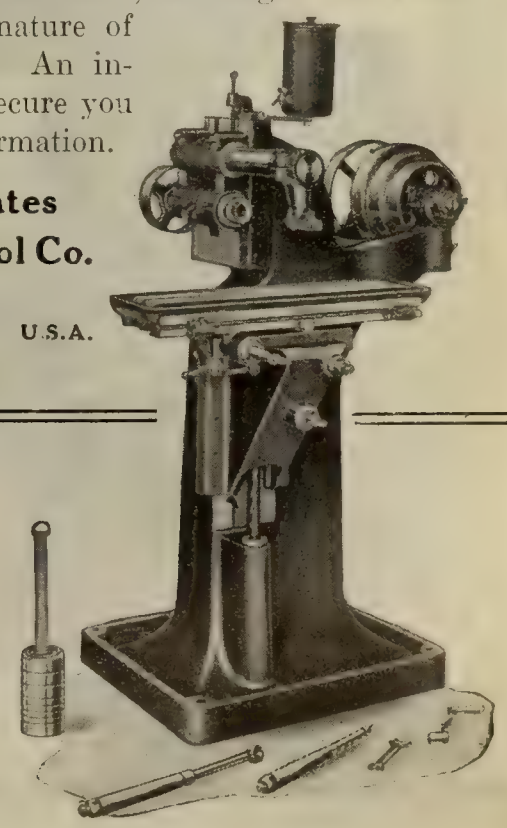
Chains—Keys—Hand Milling Machines.

No. 1 U.S. Milling Machine

Built to take care of the work that it would not pay to put on a larger machine. You would be astonished at the results, the range of work and the compact nature of this machine. An inquiry would secure you complete information.

United States Machine Tool Co.

Cincinnati Ohio U.S.A.



HALL

Pipe Threading Machinery
AND
Shell Cutting-off Machines

This illustration shows the new No. 8 Hall Gear Box Driven Pipe Lathe. Regular Capacity 2½" to 8" inclusive.

The last word in Pipe Machine Construction

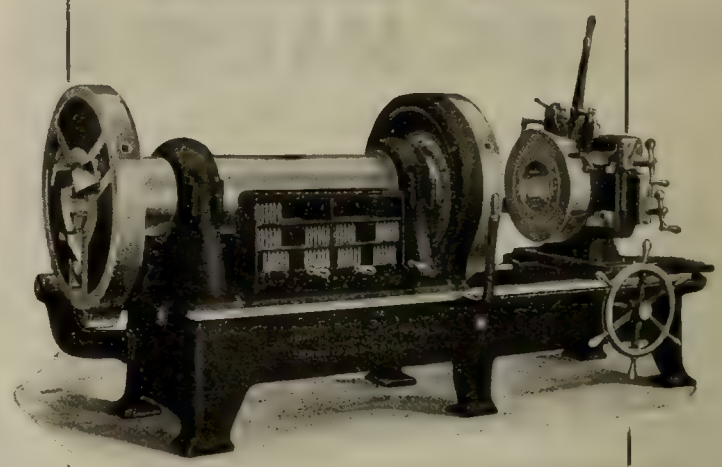
Let us give you full particulars of this machine which is only one of a large number having capacity ⅛" to 18" pipe.

Write us for catalog and prices on:

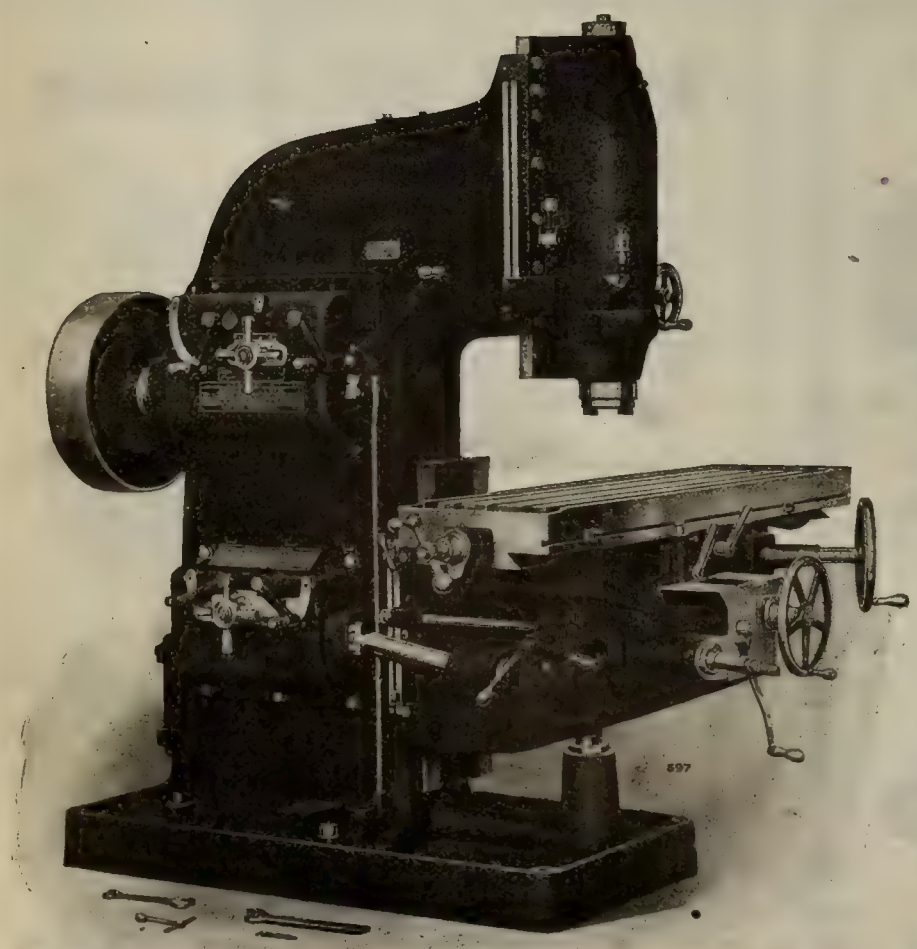
Pipe Threading Machines **Nipple Threading Machines**
Roller Pipe Cutters
or
Cutting-off Machine for shells or bar stock.
Any capacity ⅛" to 18".

John H. Hall & Sons, Ltd.
BRANTFORD, CANADA
EUROPEAN AGENTS:
Universal Machinery Corporation, Limited, London

Made in Canada



Capacity
2½" to 8"
inclusive



CINCINNATI
VERTICALS

UNUSUAL SPINDLE POWER. HEAT TREATED ALLOY STEEL HARDENED GEARING.

MASSIVE SPINDLE HEAD CONSTRUCTION.

HANDY—CAN MILL AROUND A RECTANGLE WITHOUT STOPPING FEED OR SPEED.

These are some reasons why you should use CINCINNATI VERTICALS.

The Cincinnati Milling Machine Company
CINCINNATI, OHIO.

Canadian Agents:

H. W. Petrie, Ltd.	Toronto, Ont.
H. W. Petrie, of Montreal, Ltd.	Montreal, Que.
Taylor Engineering Co., Ltd.	Vancouver, B.C.
General Supply Co., of Canada	Winnipeg, Man

THE SUN NEVER SETS ON QUALITY SAWS

EVERY TOOTH CUTS
ON
EVERY QUALITY SAW
THEY CUT STRAIGHTER AND LAST LONGER
Canadian Representative:
F. Bacon & Company, Montreal, Canada

NAPIER SAW WORKS Inc.
SPRINGFIELD, MASSACHUSETTS U.S.A.

BETHLEHEM CUTS STEEL WITH FASTEST CUTTING HACK SAWS

THAT the Bethlehem Steel Co., uses STAR BLADES is vitally significant for every manufacturer who saws metal. Because every tool the famous Bethlehem plant uses has first had to prove beyond question its ability to help extend their output to the last notch.

You who are buying hack saw blades to-day—whether machine or hand blades—must realize that in last analysis you are not buying blades at all but the output those blades will give you. It is not a question of getting blades at the lowest cost but of getting blades that *will give you the maximum number of cuts at the lowest cost.*

STAR HACK SAW BLADES

Machine and Hand

were the first modern blades ever manufactured and for thirty years they have held their quality supremacy. Hundreds of thousands of tests have been made to determine out of thousands of combinations exactly what relative dimensions, what shape and setting of teeth and what kind and hardness of steel would give the best cutting results.

Our special automatic machinery with its gauges to the finest limits, makes possible a uniform quality of production that ordinary methods could not give and an unbelievable quantity production at a minimum of factory cost. It is significant that the present standard practice with other hack saw makers was abandoned by us more than twenty years ago for more efficient methods.

Flexible and All Hard

The Star line includes machine and hand blades—flexible and all hard for every purpose. Whatever your metal sawing problem, there is a Star Blade that will give you the greatest cutting efficiency at the smallest blade and time cost.

Prove this fact for yourself by making the most drastic tests or place the burden of proof on us and we will demonstrate the greater efficiency in Star Blades to your thorough satisfaction. The more difficult the problem, the more we will welcome the chance to show you.

Address our Engineering Department at 200 River Street, Millers Falls.

$500.00 FOR YOUR EXPERIENCE

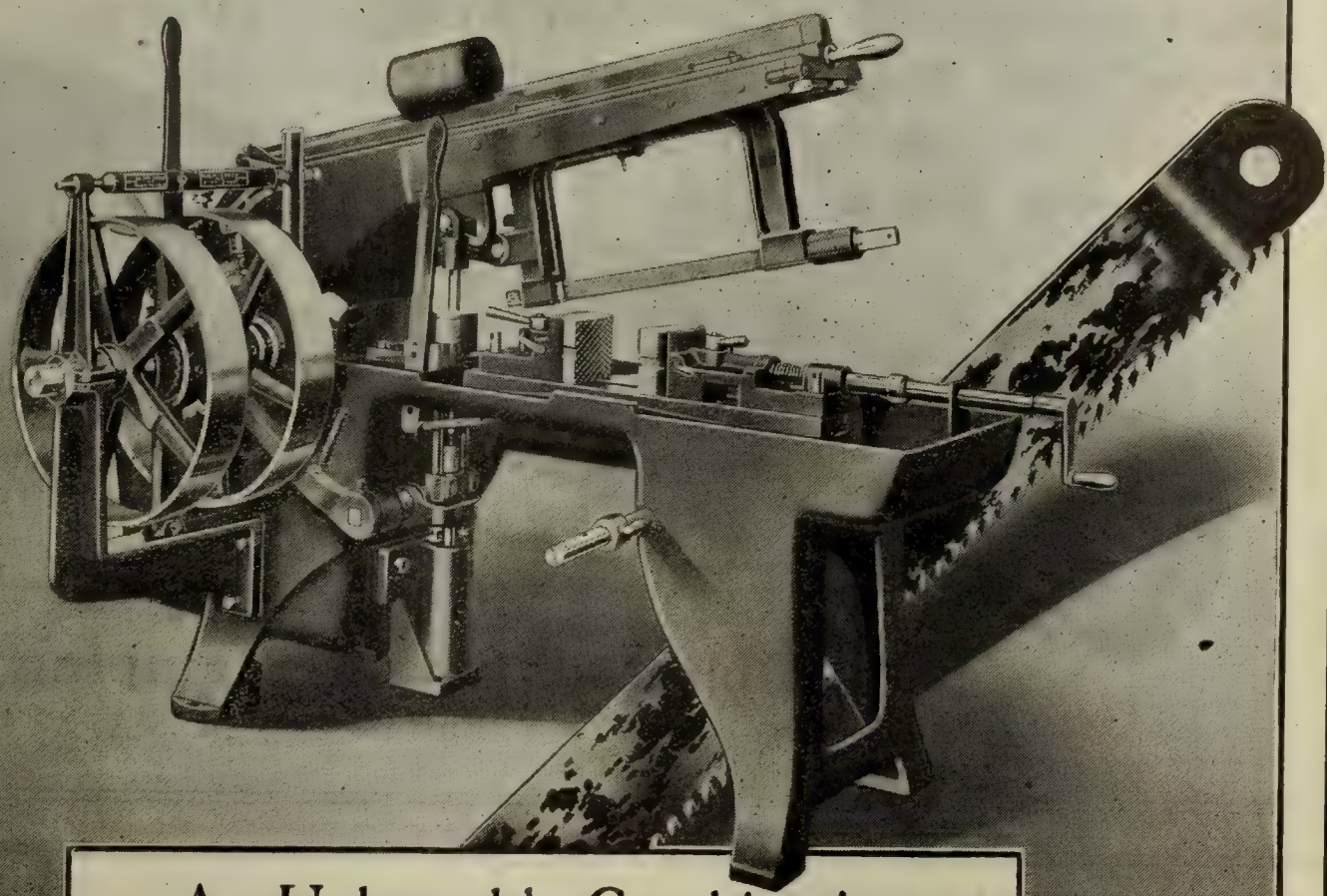
Our position as authorities on metal sawing efficiency has made us a national clearing house of information on the results blade users are getting under all classes and kinds of conditions. To encourage this clearing house idea, we offer $500.00 in gold for the best articles on "How I Test Hack Saws." Tell us your methods in detail (either on machine or hand blades) and give us your conclusions with absolute truth and frankness, including some of the records of your results. It is not necessary to be a Star user to win a place in this prize award. We want your experience whatever it is. Get your reply in as early as possible. The best replies will be published in book form and in our advertising. **CONTEST CLOSES NOVEMBER 30.**

1st Prize	$250.00
2nd Prize	100.00
3rd Prize	50.00
4th Prize	$25.00
5th Prize	15.00
6th to 11th Prizes	$10.00 each

Manufactured by CLEMSON BROS., Middletown, New York

MILLERS FALLS COMPANY, Millers Falls, Mass. ***Sole Distributors***

An Unbeatable Combination



An Unbeatable Combination

Are you a manufacturer of metal products, where accuracy, speed, production and economy count, and which require constant cutting-off of stock.

Here's The Combination You Are Looking For

The V. S. W. No. 5 High Speed Hack Saw Machine equipped with a VICTOR blade is unbeatable when it comes to increased production, and a minimum amount of power blade breakage and consumption.

Why?

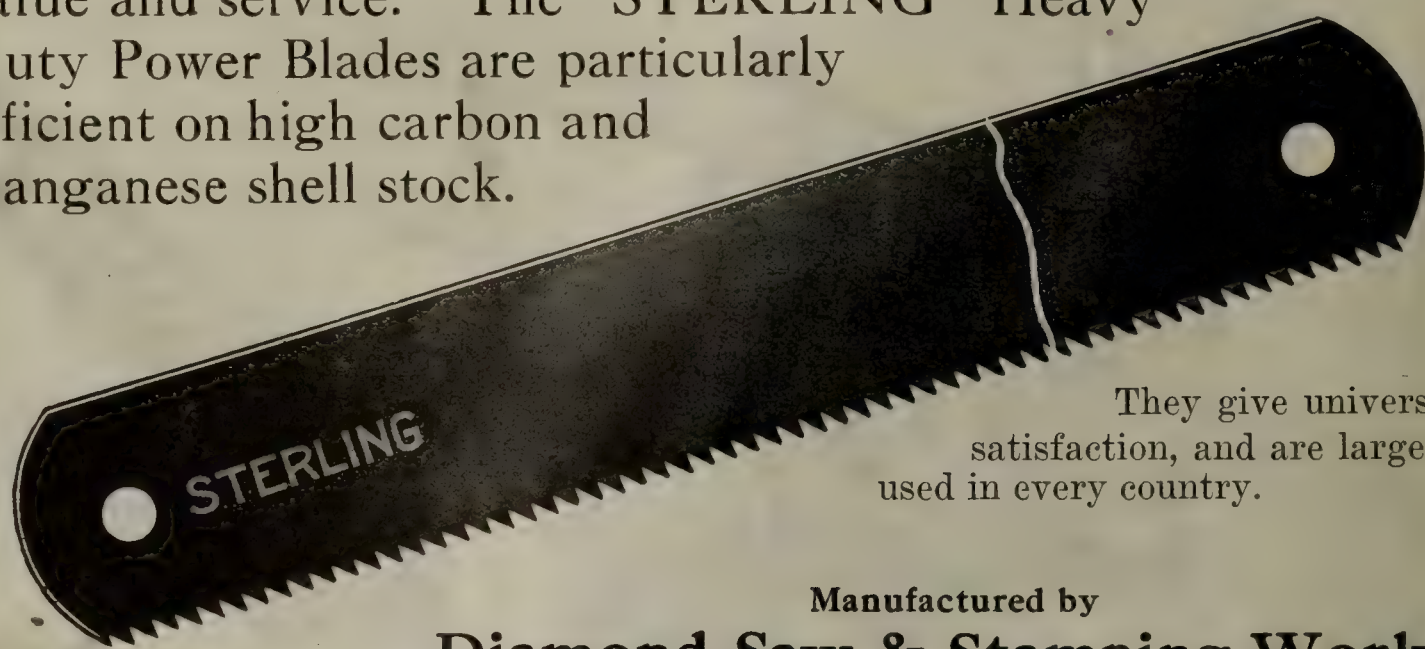
An actual machine and blade operated by one of your own men in you own shop will be the most convincing demonstration we can make.

Let us send you one V. S. W. machine on a thirty days' trial, with enough VICTOR blades to show you why.

VICTOR SAW WORKS LTD - HAMILTON, CANADA

"S-T-E-R-L-I-N-G"

This brand on a HACK SAW BLADE spells good value and service. The "STERLING" Heavy Duty Power Blades are particularly efficient on high carbon and manganese shell stock.



They give universal satisfaction, and are largely used in every country.

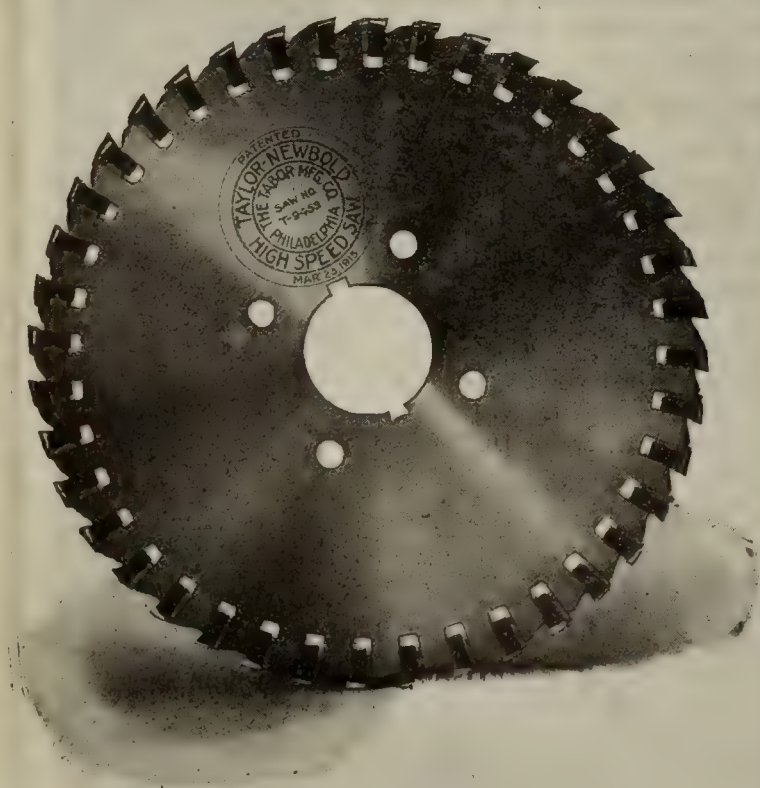
Manufactured by

Diamond Saw & Stamping Works

Buffalo, N.Y., U.S.A.

THE IMPROVED

TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW

WRITE FOR BULLETIN T-S

Tabor Mfg. Co. Philadelphia, U.S.A.

Tel. Main 6755 **Jos. Bickerstaff, Mgr.**

THE ELM CUTTING OIL COMPANY

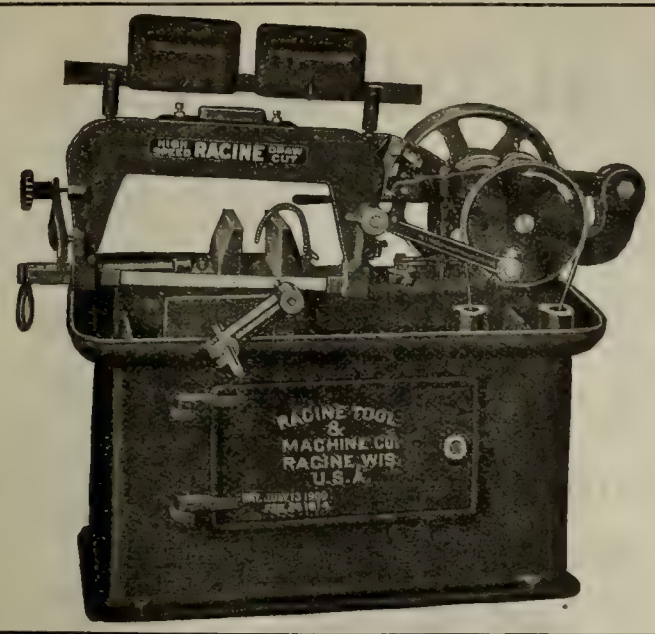
TORONTO

Cutting and Drawing Oils a Specialty

Best for Thread Cutting and Tapping

Our Cutting Oils especially adapted for Automatic Machines, Turret Lathes and Thread Millers.

PRICES ON APPLICATION



The severe tests of shell work, the speed and efficiency required by this kind of work has only added more fame to the already popular Racine. The lack of all superfluous mechanisms. The speed. The clean-cut, positive action of the blade. These all go to make the Racine the machine it is.

An inquiry would secure you all information.

Racine Tool & Machine Company
15 Melbourne Ave., Racine, Wis., U.S.A.

The Reason For So Many Repeat Orders

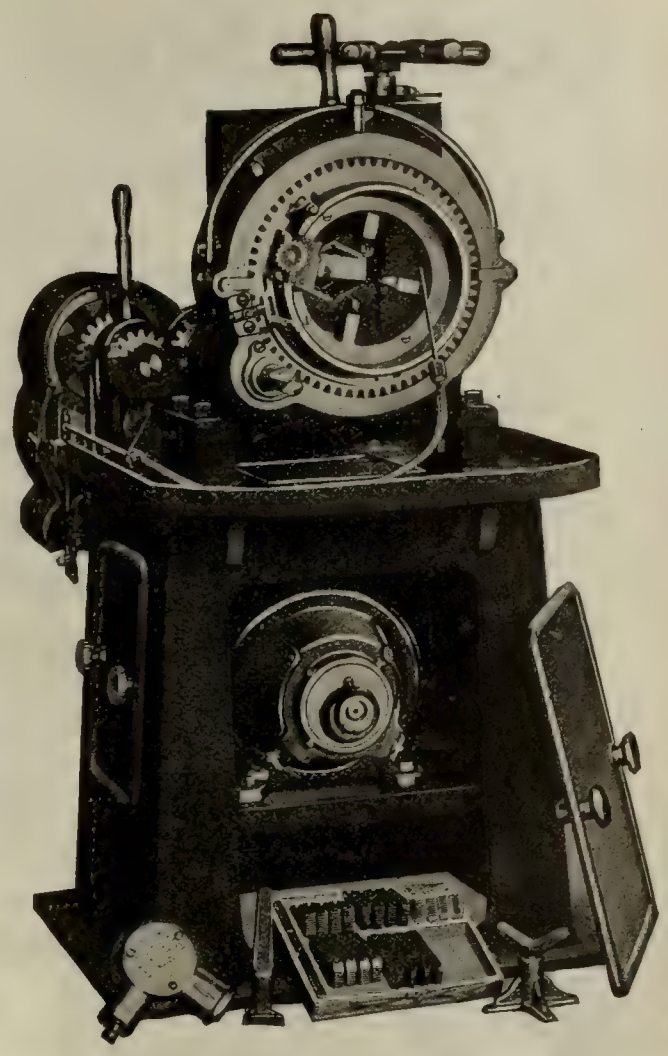
after comparative tests is that no magnifying glass is necessary to distinguish the increased production and the better class of work on the PEERLESS High-Speed Cutting-off Saw.

A third order just came in from one of the largest concerns in the United States, and is it not a fact after a firm has standardized on a certain make of tool that some real results must be produced in order to effect a change?

One of our customers writes: "It takes us only 1-15th of the time to cut our stock on the PEERLESS that it did on our other machine."

If you are open to conviction we have a proposition to offer that no manufacturer can afford to pass up.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.



"Forbes Facts"

1. One man can do the work of six against the old stock and die method of cutting.
2. It is the only machine on the market with receding gear.
3. It is self-contained and motor-driven.
4. It is portable.

These are convincing arguments for the construction and utility of this machine. Thread cutting can be performed fast, clean and true. Equipped with self-centering vise.

The Curtis & Curtis Co.
115 Garden St. Bridgeport, Conn.

CARBORUNDUM AND ALOXITE DISCS

JUST as soon as you begin using ***Carborundum and Aloxite Discs,*** your disc grinder becomes a more efficient and a more profitable machine. ¶Every disc is fast cutting, uniformly coated, long lived. Every disc cuts free and clean without filling—***And the Grain Stays on.***

Made in all sizes and grits.
Samples upon request
any time.

THE CARBORUNDUM COMPANY
NIAGARA FALLS, N. Y.
NEW YORK CHICAGO PHILADELPHIA CLEVELAND CINCINNATI BOSTON PITTSBURGH
MILWAUKEE GRAND RAPIDS

PEXTO TRAVELS MONTREAL

The Home of Williams & Wilson, Limited, and the Pexto Display.

WILLIAMS & WILSON, LTD., of Montreal, hold Pexto Sheet Metal Workers' Machines and Tools in such high regard that the Pexto Display pictured above, is a permanent feature with them.

It is indeed significant when such a well established house expresses its approval of a product in this substantial way. There is no better evidence of Pexto Quality.

You'll find much of practical value in this display. Pexto Sheet Metal Machines and Tools embody many important improvements. They record the rapid advancement made in the Sheet Metal Trades during the past few years. They have more than kept pace.

The great need of trained mechanics in the Sheet Metal Industry gives added importance to Manual Training and Vocational Education. School Officials and School Shop Instructors will appreciate the practical assistance Williams & Wilson, Ltd., can give in the selection of proper school equipment.

Send for the Pexto Pocket Manual. It tells about the new ideas in sheet-metal working machines and contains other valuable information. Free

PEXTO

SHEET METAL WORKERS' MACHINES & TOOLS

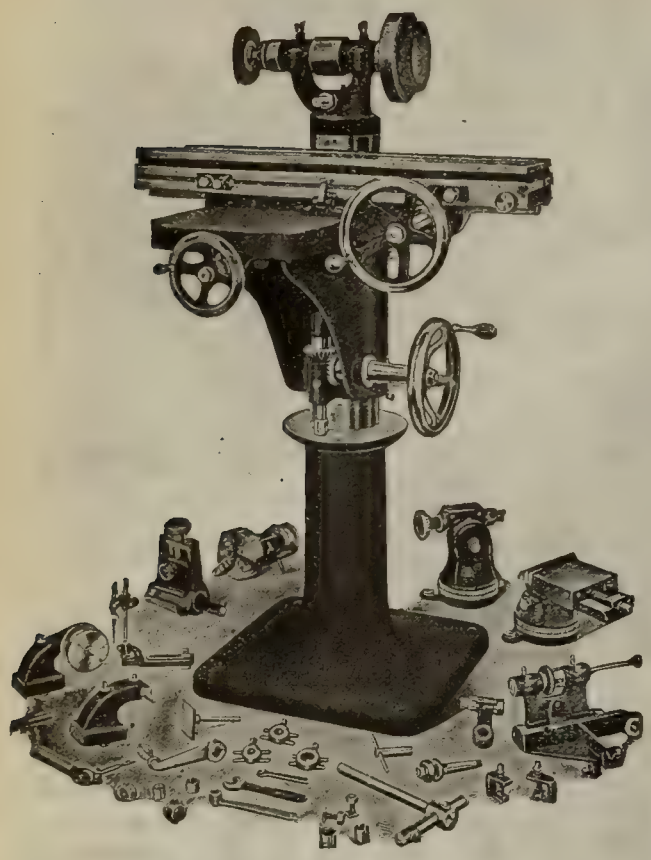
The Peck, Stow & Wilcox Company

MFRS. Mechanics' Hand Tools, Tinsmiths' and Sheet Metal Workers' Tools and Machines, Builders' and General Hardware.

Southington, Conn. **Cleveland, Ohio**

Address correspondence to 205 W. Center Street Southirgton, Conn.

PEXTO



The Greenfield

For General Tool Room Work

This Grinder is furnished with attachments for grinding all kinds of milling cutters, reamers, counterbores, and other machine shop tools.

It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angle can be at once obtained.

The whole machine is thoroughly well built, well finished and will be found a dependable, convenient grinder.

Greenfield Machine Company

GREENFIELD, MASS., U.S.A.

WHY TOLERATE

TROUBLE

in YOUR Grinding Department?

Eliminate all difficulties by using High-Grade Selected

DIAMONDS

Direct from the South African Diamond Fields. All sizes at your command, either unmounted or mounted in any style holder, **MADE IN CANADA.**

Try our **CAST STEEL** mounting for complete satisfaction of performance.

Wheel Trueing Tool Company

88 West Pitt Street **WINDSOR, ONTARIO**

Sturtevant
Trade Mark

Individual Heater Units for Shop Heating

Illustration shows small self-contained heating unit with turbine-driven disc fan. These units diffuse large volumes of warm air along the floor, and are ideal for heating shops, roundhouses, industrial buildings, pump-houses or oil-houses.

Advantages:

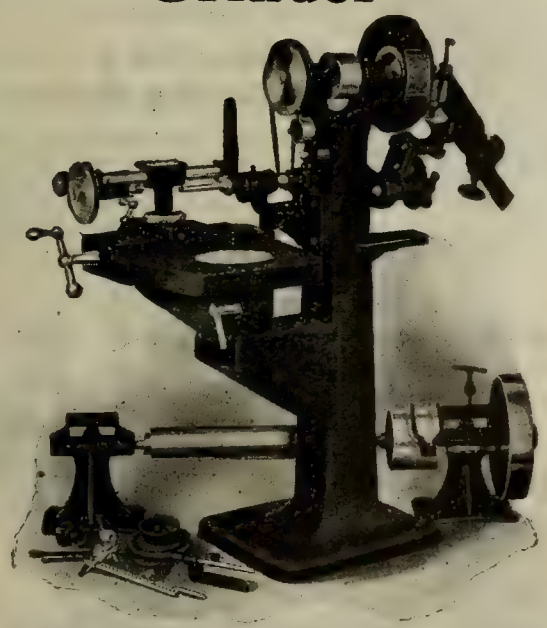
Inexpensive—Self-contained—Require only one steam pipe—Exhaust steam from turbine used in coils—Can be moved by crane or truck to other location or plant—Can be readily sold—Belt-drive or motor-drive is readily possible.

Full information on request.

B. F. Sturtevant Company of Canada, Limited
GALT, ONTARIO

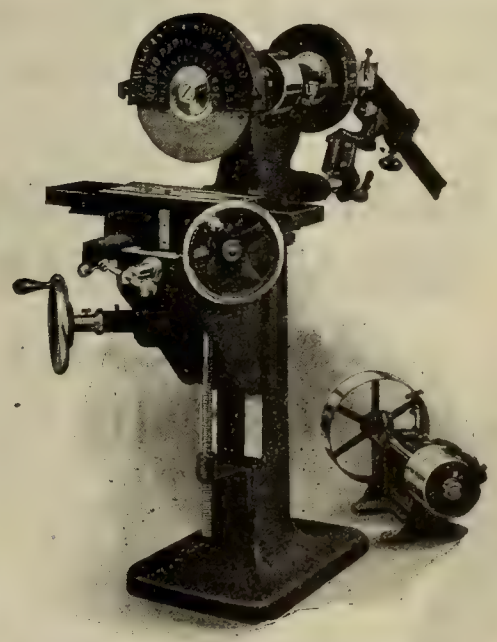
Montreal Toronto Winnipeg Vancouver

W & M Cutter---Reamer---Drill Grinder



When Accuracy and Convenience are Essential Wilmarth & Morman Grinders Are Installed

W & M No. 1 Surface Grinder



When Rapidity and Rigidity Are Desired Wilmarth & Morman Grinders Meet Requirments

WILMARTH & MORMAN COMPANY
Manufacturers of Drill Grinders—Surface Grinders—Universal Grinders
1200 Monroe Ave., N. W., GRAND RAPIDS, MICHIGAN, U.S.A.

The "Feel" of a Good File

Did you ever watch a really capable mechanic test a file? He has a way of passing a sensitive thumb over its teeth. Instinctively, unfailingly, he thereby determines whether it is fit for use.

This man always chooses "FAMOUS FIVE." He never buys blindly. He can "feel" that a "FAMOUS FIVE" is right. He can "feel" its sharp, keen-cutting teeth, arranged in rows of perfect uniformity. There is no doubt in his mind. He buys "FAMOUS FIVE." He makes sure of satisfaction.

Our catalogue and copy of "File Filosophy" will interest you. Write for them to-day.

Stow Shell Grinders Increase Production

Suspended Pedestal Mounted on Truck

Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.

Binghamton, New York, U.S.A.

Oldest Portable Tool Manufacturers in America

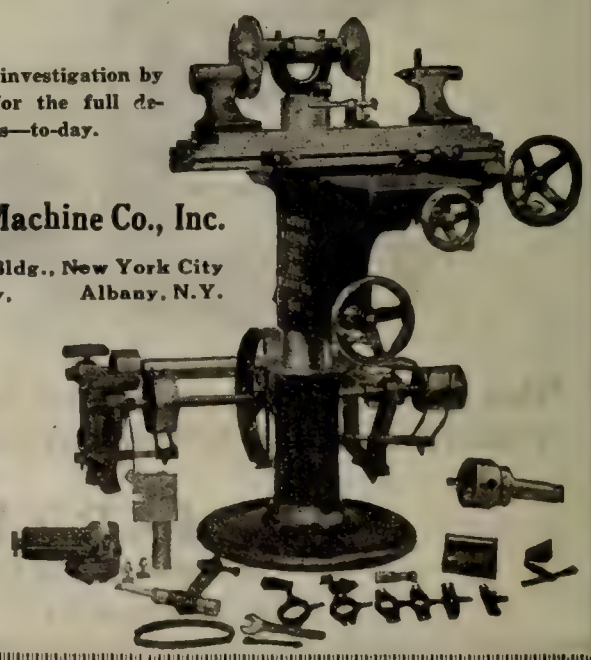
Assuming that you want a grinder that is better than the average—

A grinder with massive table, micrometer adjustments, very long knee and gibs, and extra heavy head and tailstock—it will pay you to investigate the

Standard No. 6 Universal Grinding Machine

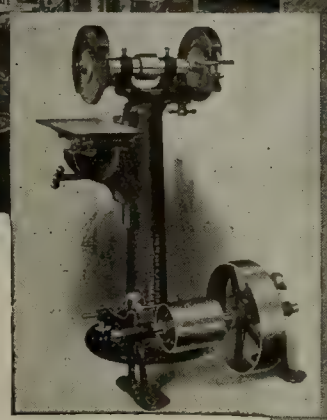
In addition, you'll find that the headstock is fitted with large bearing for chuck spindle and with special bronze bearings of navy specifications, spindle is tapped and tapered, bored to take wheel arbors, and bearings are 1 in. in diam. and 2¾ in. long, and an exceptionally simple and sturdy countershaft with self-lubricating bearings.

Start the investigation by sending for the full details—to-day.



Simmons Machine Co., Inc.

1001 Singer Bldg., New York City
981 Broadway, Albany, N.Y.

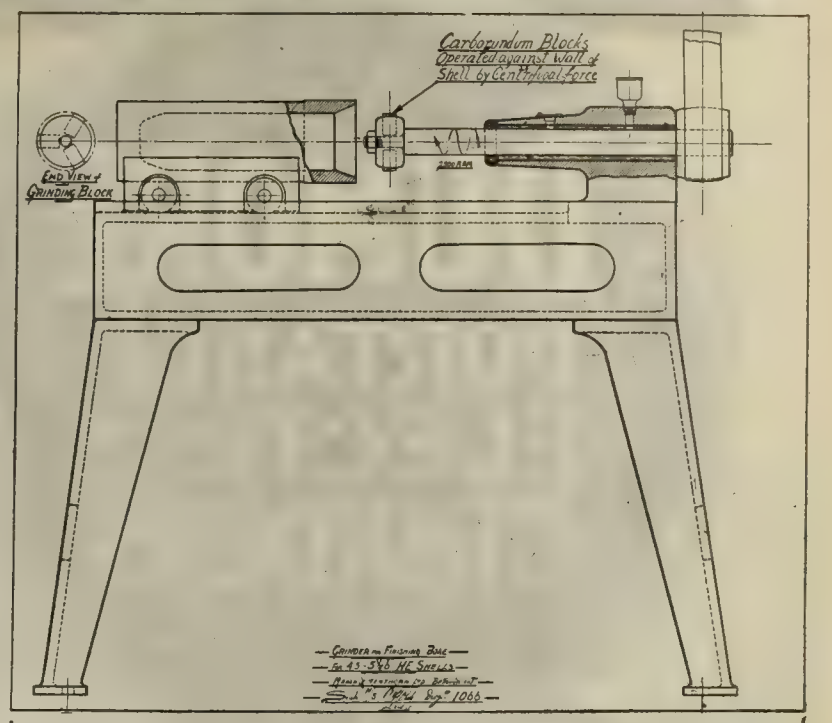


WE BUILD THEM BY HUNDREDS

Standardized Production enables us to offer this powerful **Waterbury Grinder** at such a low price. It grinds rapidly and accurately, all flat surfaces, dies, punches, planer, lathe, and other tools. Has adjustable table and tool rest with large radius of travel. Rigid, 3-point table supports giving great steadiness. A reliable practical grinding outfit.

only $75 Complete

The Blake & Johnson Co., Waterbury, Conn.



Smooth Bores

We have designed for our own use a simple and inexpensive grinder to give the final touch to the bore of our shells.

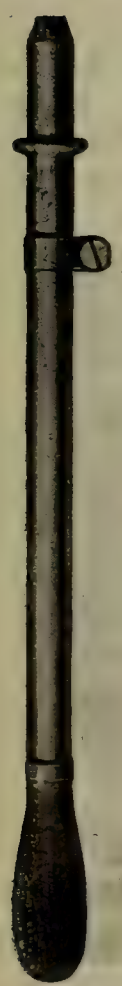
It does the work, and we will have some of these machines on the market shortly.

Write us for our proposition.

Marsh & Henthorn Limited

BELLEVILLE, ONTARIO

Grinding Wheel Dressers

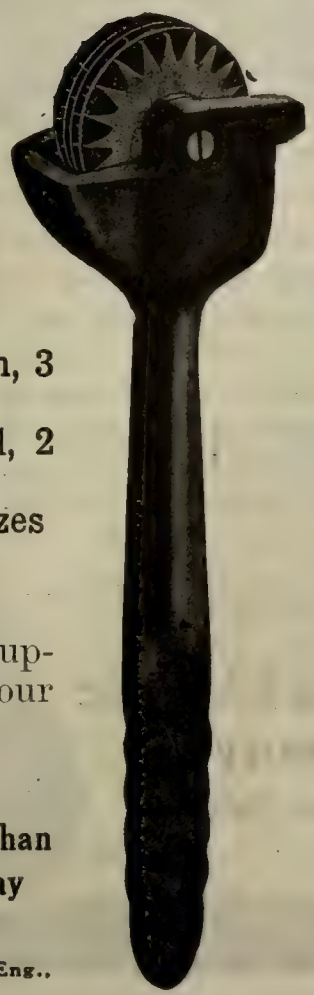


We are specialists in Grinding Wheel Dressers and can recommend the best types for any particular needs.

Our Dressers are:

Diamo-Carbo
Desmond Huntington, 3 sizes
Sherman Corrugated, 2 sizes
Norton Zig-Zaz, 2 sizes
Magazine
Diamonds

We can promptly supply your needs from our stock.

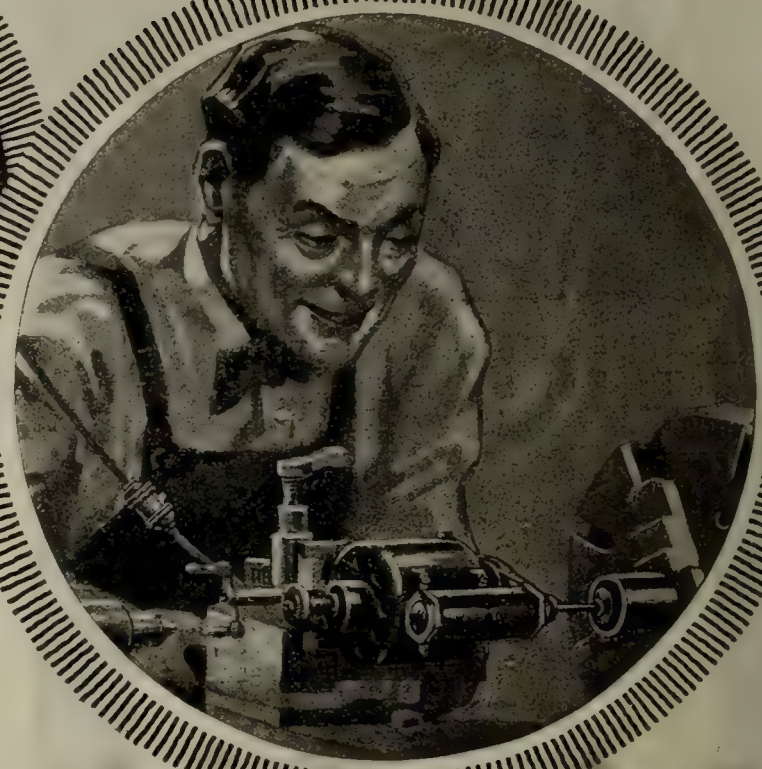


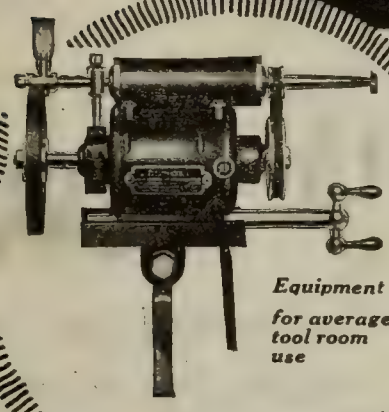
The Canadian Desmond-Stephan Manufacturing Company
HAMILTON, ONTARIO

Alfred Herbert, Ltd., Coventry, Eng., Agent for Great Britain.

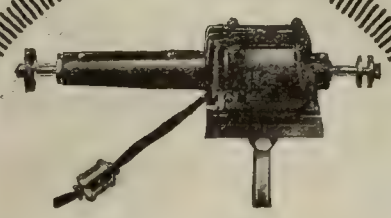
If any advertisement interests you, tear it out now and place with letters to be answered.

DUMORE PORTABLE ELECTRIC GRINDERS

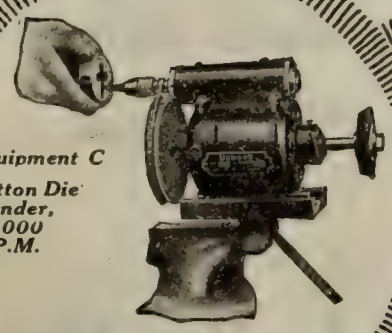




Equipment A
for average tool room use



Equipment B
for deep, internal work

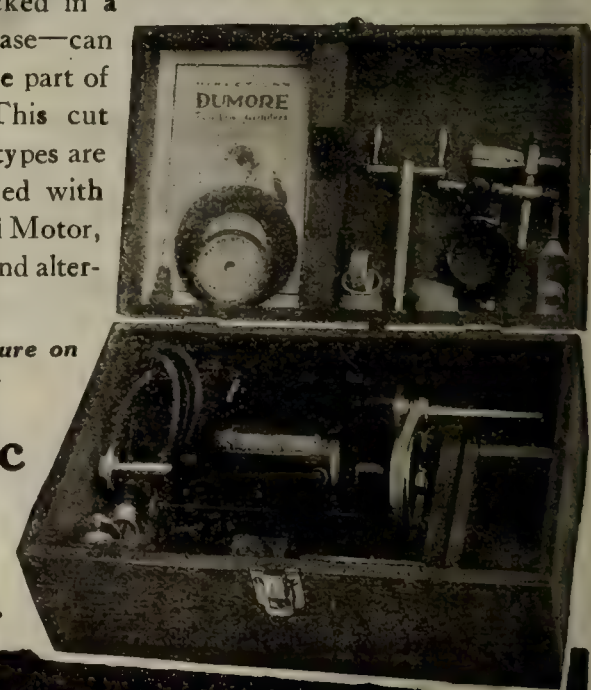


Equipment C
Button Die Grinder, 50,000 R.P.M.

In grinding tools, gauges and dies, there's a big unsolved problem in your shop—unless you use DUMORE Portable Grinders. Thousands of them are in use on various kinds of grinding jobs where extreme accuracy is required. Dynamically balanced armatures mean increased speed, freedom from taper or bell mouth and the elimination of chatter marks.

Three types of equipment. Equipment A, includes 3″ interna. spindle, 30,000 R.P.M.; Motor spindle, 10,000 R.P.M. Equipment B has Extension Arm B, with 10″ reach, speed 10,000 R.P.M. Equipment C has special spindle and chuck, speed 50,000 R.P.M.

Each outfit comes packed in a substantial hardwood case—can be easily carried from one part of the shop to another. This cut shows Equipment A. All types are completely equipped and furnished with well-known DUMORE Universal Motor, operating equally well on direct and alternating current.

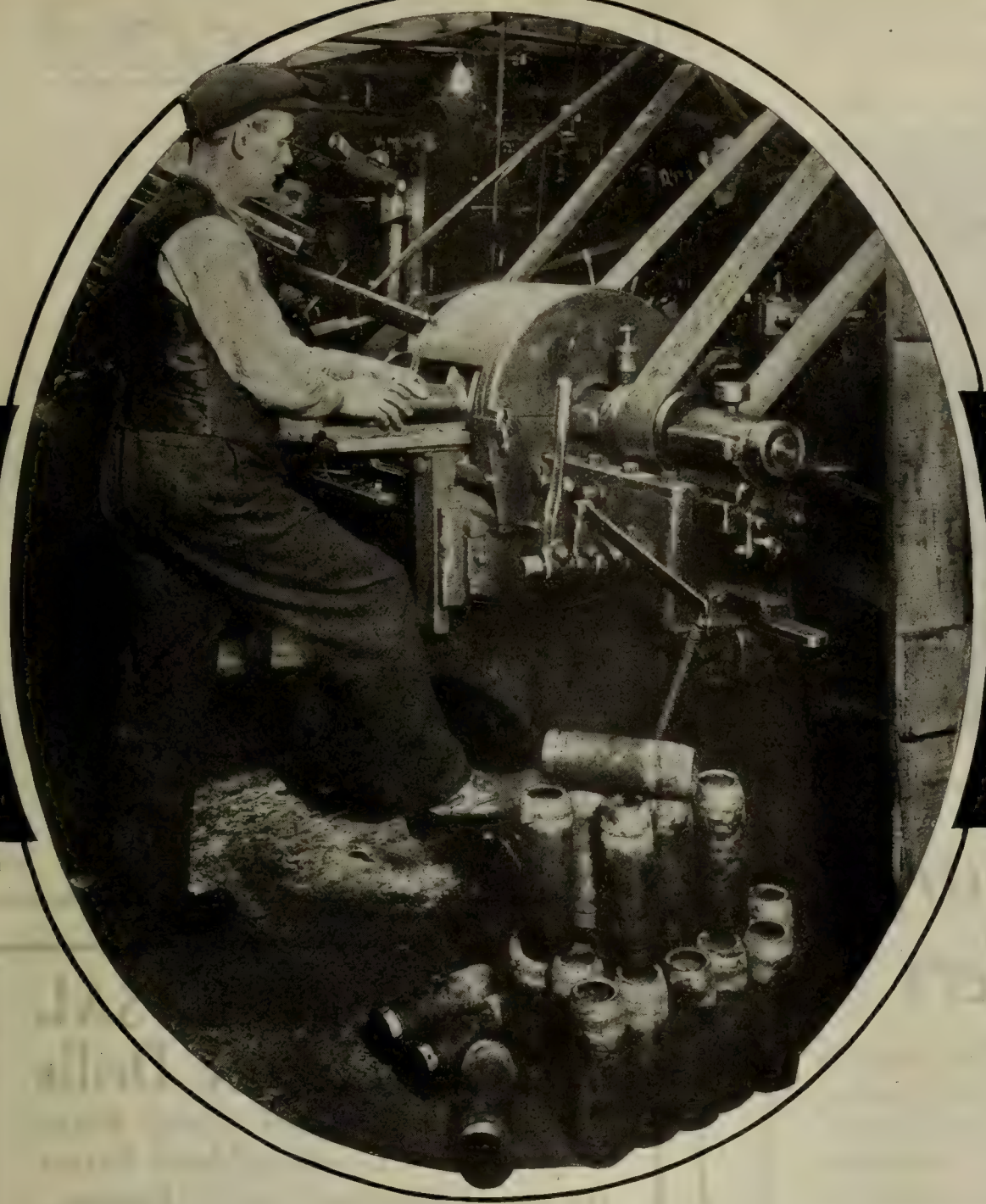


Write today for illustrated literature on type of equipment you need.

Wisconsin Electric Company

1713 Dumore Bldg.

Racine - - Wis.



Gardner Grinders

GRINDING BASE OF 18-pr. SHELL

This No. 14 Double Disc Grinder is used for accurately sizing the bases of these shells after heat treating. The shell is held in a suitable fixture, which allows it to be revolved slowly between the discs which grind the diameter to within 3.28 and 3.29 inches.

The quality and finish of the work is perfect, and steady production can be maintained at an average rate of 5 per minute.

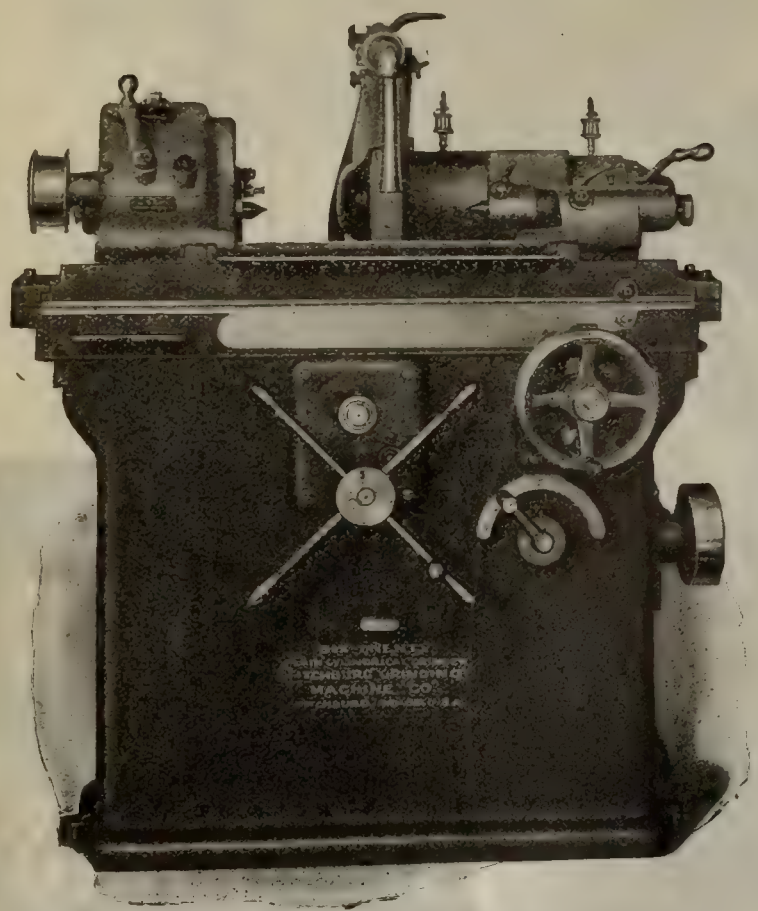
The discs are faced with abrasive at the outer part only, where the work is done.

All that is best in material and workmanship goes into Gardner Grinders. They last long, do the work as it should be done, and do it economically.

Drop a card for full particulars.

The Gardner Machine Company, Beloit, Wis., U.S.A.

Canadian Sales Agents: THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED
St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria



Fitchburg Grinders

Model "A" illustrated here is a machine whose chief feature is its capacity for size, variety and quality of work. Its speed will give you greater production; its size, convenience, increased production, strength and saving in floor space will effect such a saving as to make it preferable over all other machines of similar character.

It is specially adapted for grinding straight or taper shafts.

An inquiry would speedily get you valuable information and data.

Fitchburg Grinding Machine COMPANY

Fitchburg, Mass. U.S.A.

The "FEEL" of a Tool

Every good mechanic knows what the "Feel" of a tool is. The poise, and the balance, the weight, and the shape—all go to make up that elusive Quality.

EACH

P H

TRADE MARK

QUALITY FILE

is made specially for the job for which it is intended. It has that "Feel" which good mechanics know everywhere as the sign-mark of a Fine Tool.

P. H. FILES *CUT*—AND THEY *WEAR*.

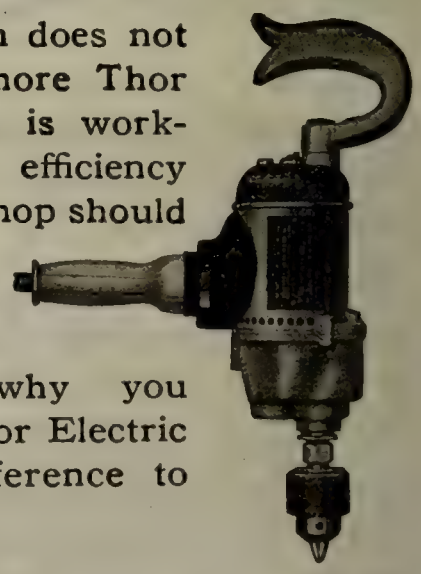
Port Hope File Mfg. Co., Ltd.
Port Hope, Ont.

"ASK YOUR JOBBER"

Thor

UNIVERSAL Electric Drills

Licensed Under Burke Universal Motor Patent



No shop which does not use one or more Thor Electric Drills is working to full efficiency which every shop should do during these critical times. Let us demonstrate why you should use Thor Electric Tools in preference to other makes.

Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.

Toronto: 32 Front St. W; Winnipeg: 123 Bannatyne Ave., E; Vancouver: 1142 Homer Street

CLEVELAND SAND RAMMERS

FOR FLOOR, BENCH, PEIN AND FLASK RAMMING

Cleveland Sand Rammers are made in several sizes and weights, and are adapted for all kinds of Ramming in general foundry service.

The Piston Rods are packed with a resilient packing that conforms to the shape of Rod without retarding its free action, and prevents any dirt from entering piston chamber and working parts—Rammers are fitted with either Round or Flat Rods as required. Cleveland Rammers are light in weight, have high speed and practically no vibration, making them ideal foundry tools.

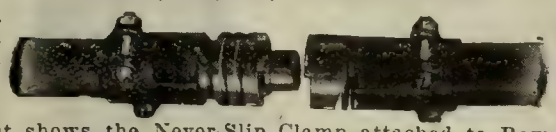
CLEVELAND CHIPPING HAMMERS

For General Foundry Work. Are furnished in any required size or weight for grey iron or steel castings; they have high speed, and are particularly adapted for fast chipping now required by piece-work operators.

BOWES AIR HOSE COUPLINGS

Over 1,000,000, in General Use

Bowes Couplings are instantly connected or disconnected.



Bowes Couplings are absolutely air tight under all pressures.

Above cut shows the Never-Slip Clamp attached to Bowes Coupling.

In Stock :—RIVETING HAMMERS, DRILLS, REAMING, TAPPING AND FLUE-ROLLING MACHINES, CORNER DRILLS, PORTABLE AND BENCH GRINDERS, ETC.

Catalog No. 12 mailed on request.

ADDRESS ALL INQUIRIES TO

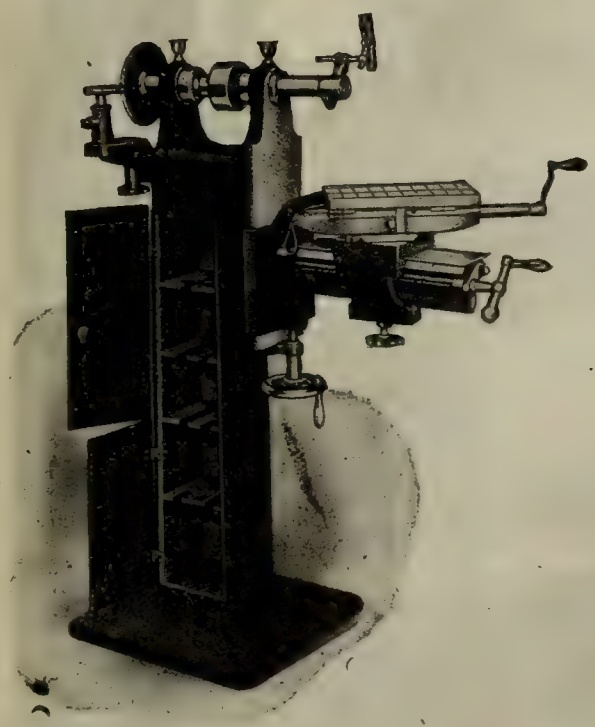
CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED

84 CHESTNUT STREET, TORONTO, ONT.

Agents: A. R. WILLIAMS MACHINERY CO., TORONTO **WILLIAMS & WILSON, MONTREAL**

Sand Rammer in operation.

OBTAIN THE BEST RESULTS



GARVIN No. 3, Universal Cutter and Surface Grinder.
Use Code—Banish.

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL

CUTTER AND SURFACE GRINDERS

Simple **Light Running** **Accurate**

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14 in. x 6 in.; SURFACES, 9½ in. x 6 in.

For Further Information { *ASK YOUR DEALER or WRITE US DIRECT*

IMMEDIATE DELIVERIES

Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (***Visitors Welcome***) **50 Years New York City**

If any advertisement interests you, tear it out now and place with letters to be answered.

MODERN

SELF-OPENING and ADJUSTABLE DIE HEADS

The Die Heads that have made good on every threading operation, and which are constantly meeting the demand where Die Heads are required for accurate thread-cutting.

In purchasing "MODERN" Die Heads you have the assurance that you are getting tools of "quality," mechanically perfect in design and construction and uniformly efficient in all sizes.

Illustration shows an installation of "MODERN" Die Heads threading Shell Ogives, where the requirements are precision and large production.

Complete information regarding the use of "MODERN" Self-Opening Die Heads upon request.

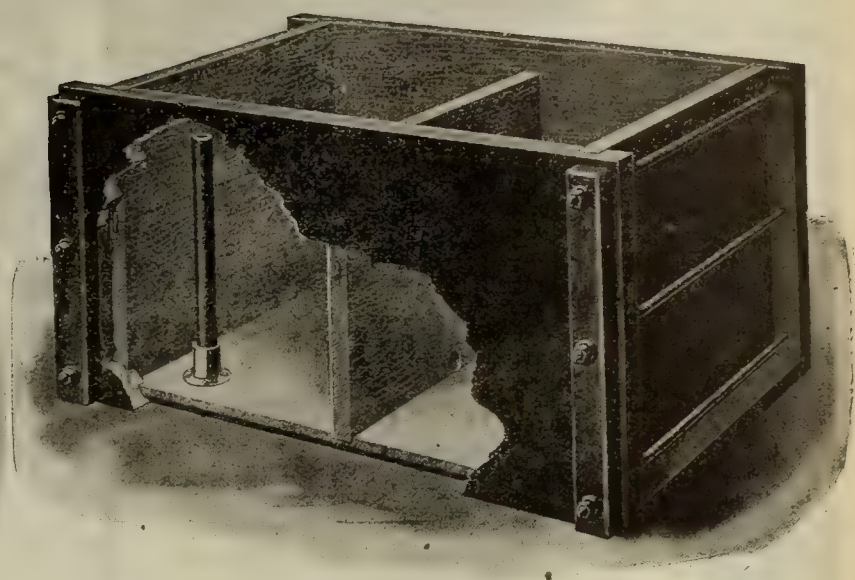
MODERN TOOL COMPANY

Main Office and Works:
State and Peach Sts. - Erie, Pa., U.S.A.

Canadian Agents:
Rudel-Belnap. - Toronto—Montreal

F. WESLEY PARKER
Resident Engineer and Export Agent,
2 Rector Street, New York

WOOD and STEEL TANKS



CYPRESS WOOD TANKS

Plain or Lead Lined

We specialize in making tanks of all kinds, any size to meet requirements. We are prepared to furnish these plain, asphaltum lined or lead lined.

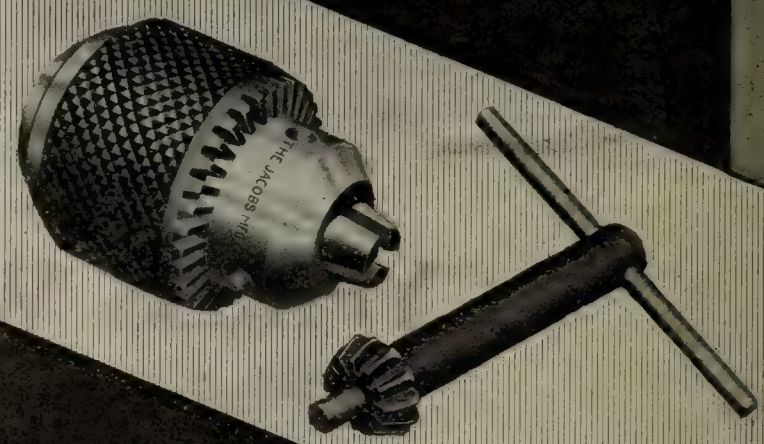
Welded Steel Tanks

Welded or Riveted Steel Tanks all sizes.
Enquiries Solicited.

Canadian Hanson & Van Winkle Co., Ltd.

TORONTO - CANADA

Jacobs
IMPROVED
Drill Chuck



A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.

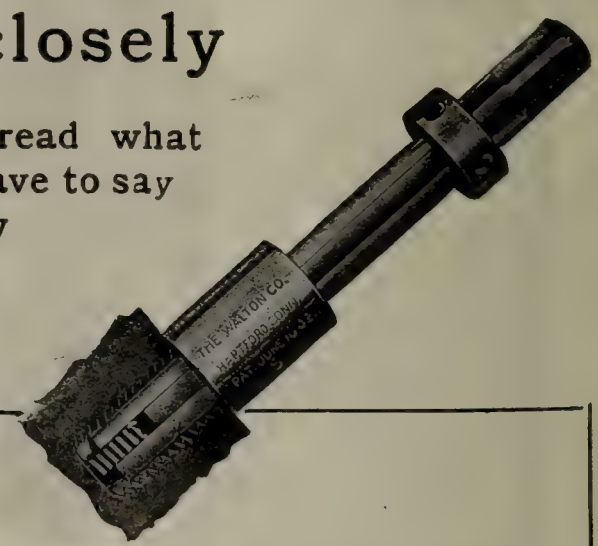
This Point is Valuable

The chasers are set and held in place by a cam. That cam once adjusted, locks; there is no stopping or changing in size. This H. & G. Automatic Self-Opening Die Head has a quick release that not only issues the cutting of the thread to a given point every time, but permits cutting right up to a shoulder when required. Our booklet will tell you more. Write for it.

Eastern Machine Screw Corp.
New Haven, Conn., U.S.A.

Look at this again —closely

and read what we have to say below



WHEN a tap breaks off close or below the surface, you'll find this Walton Tap Extractor will save a great deal of time and trouble. The crucible fingers grasp the flutes of the tap, a twist of the wrench and the piece is out.

Don't you think it would pay to have a few lying around on your benches?

The Walton Company
Hartford, Conn.

Murchey

EQUALS 10 SOLID TAP LIVES

That point alone is sufficient to stamp Murchey adjustable taps as the undisputed leader of its class.

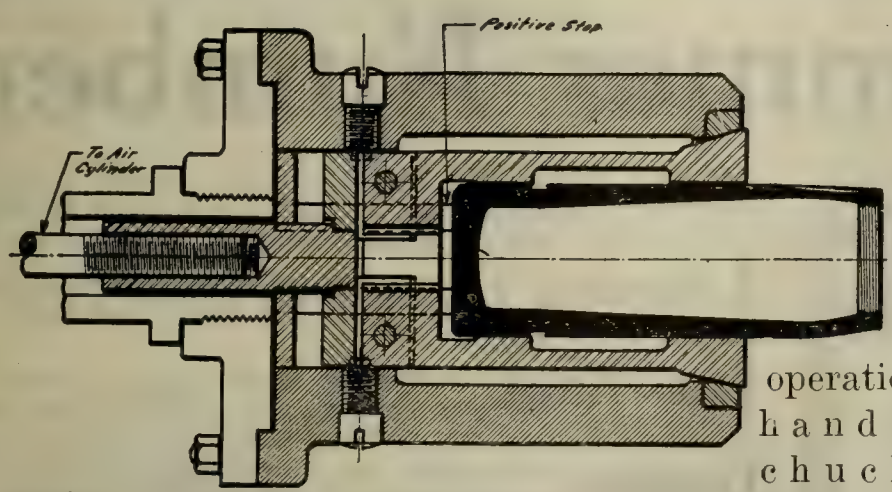
The point is this: when a chaser on a Murchey Tap is ground it can be adjusted to compensate for wear; with a solid tap this cannot be done with the fineness, the finish, the absolute accuracy that characterizes our adjustable taps. A solid tap will lose its accuracy, and the more grindings the greater the inaccuracy. We maintain a special chaser service for our clients.

The Murchey Adjustable Tap has other features which we will gladly furnish upon request.

MURCHEY MACHINE & TOOL CO.

75 Porter St. Detroit, Mich.

The Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, S.W., England
Fenwick Freres & Co. 16 Rue Fenelon Paris, France

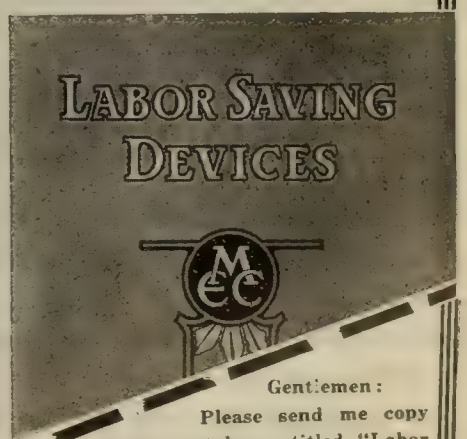


Consider the Saving!

When you stop to consider the fact that M.E.C. air-operated Hinged Collets assure 90% faster operation than hand power chucks and spring collets, you will realize why they are preferred by the shrewd manufacturer.

They are so accurate, reliable and satisfactory that **you can draw up your own guarantee.** Is not this positive proof of their superiority?

Ask for full particulars about this and other M.E.C. Labor Saving Devices—Air Cylinders, Air-operated Expanding Mandrels, Collapsible Taps, etc.



Gentlemen:
Please send me copy of your catalog entitled "Labor Saving Devices," according to your advertisement in Canadian Machinery.

Name .....
Address .....
Position .....
With .....

Manufacturers Equipment Co.

171 N. JEFFERSON ST. CHICAGO, U. S. A.

Agents for Central and Eastern States and Canada---J. R. Stone Tool and Supply Co., Goebel Bldg., Detroit, Mich.

Foreign Agents: C. W. Burton, Griffiths & Co., Ludgate Square, Ludgate Hill, London, Eng.

Col. MacLean was in Germany When War Broke Out

HOW he got out, what he saw, heard, learned and concluded, he tells in the August number of MACLEAN'S MAGAZINE. Colonel MacLean knows Europe thoroughly. He knows high-up men in all the great political and commercial capitals of Europe—diplomats, bankers and great merchants. These men told him freely and plainly many startling things about Germany and her intentions.

In a contribution of truly sensational interest, abounding in most startling facts, Colonel MacLean points out "The Dangers Ahead." His aim is to arouse Canadians out of their unwarranted confidence and out of their content. You will find in this article by Colonel MacLean strange, even shocking revelations, and things hard to believe—and you ought to read "The Dangers Ahead" in order that you may help in their avoidment by Canada and her people.

MacLean's for August Is a Midsummer Number

The August MACLEAN'S is excellently balanced, as you will see from these contents:

CONTENTS

The Dangers Ahead. By John Bayne MacLean.

The Menace of Canadian Titles. By Joseph Martin, M.P.P.

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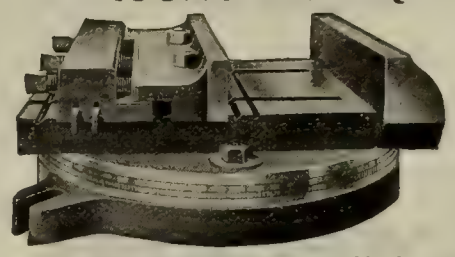

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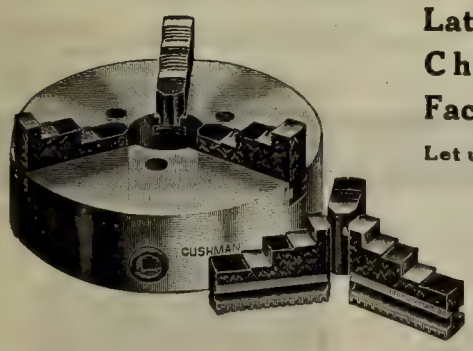

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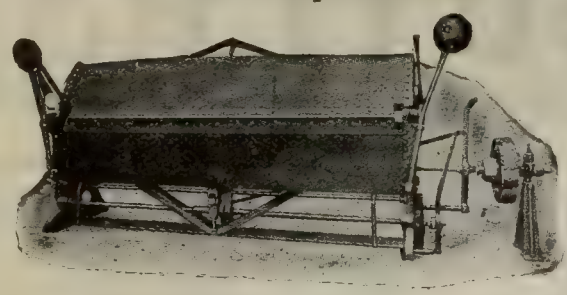

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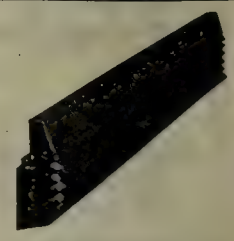

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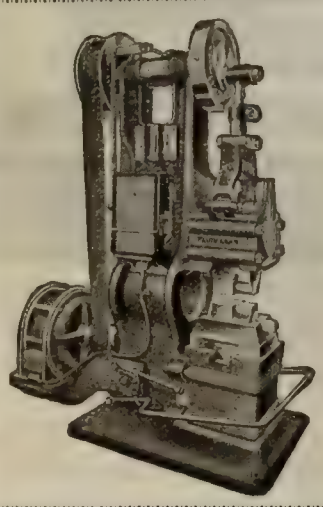

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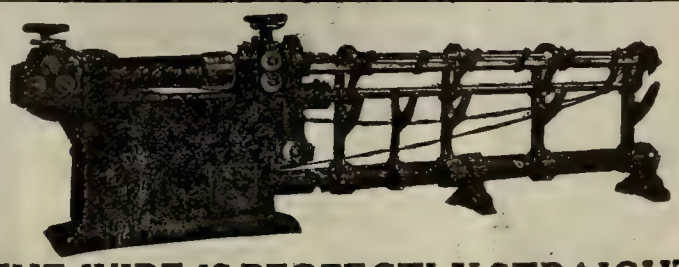

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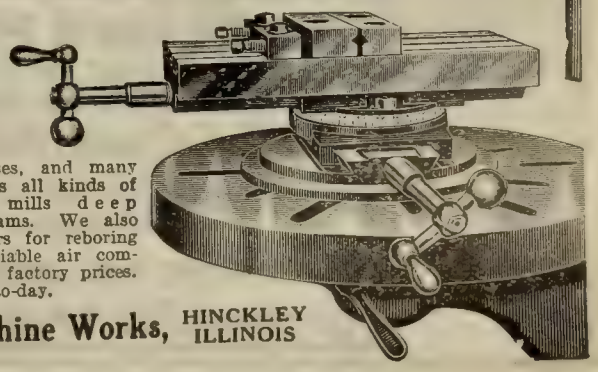

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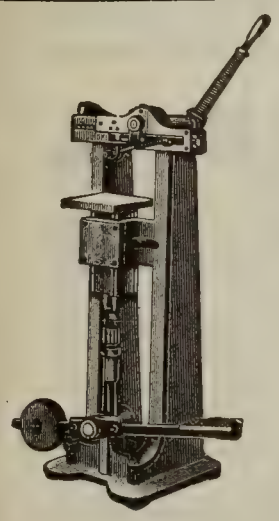

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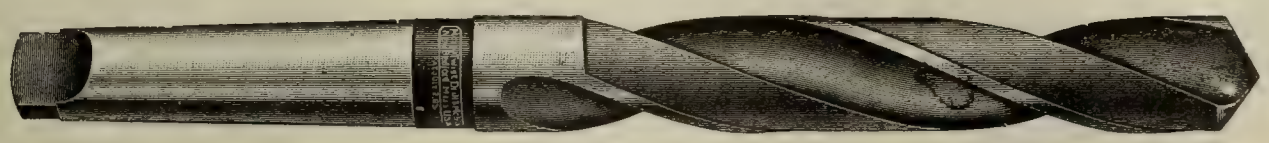

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Independent Pneumatic Tool Co., Chicago, Ill.
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DRILLS, PNEUMATIC CORNER
Independent Pneumatic Tool Co., Chicago, Ill.

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Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
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Millers Falls Co., Millers Falls, Mass.
Morse Twist Drill & Mach. Co., New Bedford.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
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Dominion Machy. Co., Toronto.
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A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
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Foss & Hill Machy. Co., Montreal.
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DRILLS, TWIST
Atkins & Co., Wm., Sheffield, Eng.
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Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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MacKinnon, Holmes & Co., Sherbrooke, Que.

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Sheldons, Ltd., Galt, Ont.

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Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

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Dominion Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Can. Matthews Gravity Carrier Co., Toronto, Ont.

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Stow Mfg. Co., Binghamton, N.Y.

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Garvin Machine Co., New York.
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Ford-Smith Mach. Co., Hamilton, Ont.
Francis & Co., Hartford, Conn.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Standard Machy. & Supplies, Ltd., Montreal, Que.

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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Plessisville Foundry Co., Plessisville, Que.

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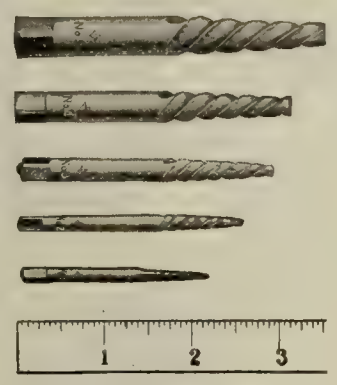

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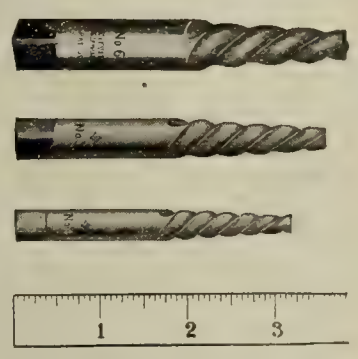

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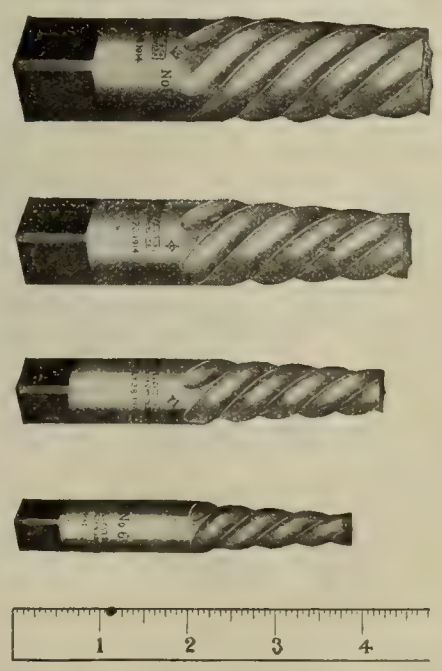

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Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York.
HIGH SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.
HINGE MACHINERY
Baird Machine Co., Bridgeport, Conn.
HINGES
London Bolt & Hinge Works, London, Ont.
HOBS
Illinois Tool Works, Chicago, Ill.
Osborn (Canada, Ltd., Sam'l), Montreal, Que.
HOISTING AND CONVEYING MACHINERY
Can. Matthews Gravity Carrier Co., Toronto, Ont.
Jenckes Mach. Co., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Northern Crane Works, Walkerville, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Whiting Foundry Equipment Co., Harvey, Ill.
HOISTS, CHAIN, ELECTRIC AND PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
Ford Chain Block & Mfg., Philadelphia, Pa.
Independent Pneumatic Tool Co., Chicago, Ill.
Jenckes Mach. Co., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Northern Crane Works, Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Kennedy & Sons, Owen Sound, Ont.
Northern Crane Works, Walkerville, Ont.
Winnipeg Gear & Engrng. Co., Winnipeg, Man.
Wright Mfg. Co., Lisbon, Ohio.
HOLDERS, STEEL DIE FOR MARKING
Matthews, Jas. H. & Co., Pittsburg, Pa.
HOPPERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.
HOSE, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Goodyear Tire & Rubber Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Wells Bros. Co. of Canada, Galt, Ont.
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HYDRAULIC MACHINERY
Dominion Machinery Co., Toronto.
Charles F. Elmes Eng. Works, Chicago.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
H. W. Petrie, Toronto.
West Tire Setter Co., Rochester, N.Y.
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Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Goodell-Pratt, Greenfield, Mass.
L. S. Starrett Co., Athol, Mass.
INDEX CENTRES
Fred C. Dickow, Chicago, Ill.
Garvin Machine Co., New York.
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Taylor Instrument Co., Rochester, N.Y.
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Hanna & Co., M. A., Cleveland, O.
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Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Petrie, H. W., Toronto.
JACKS, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago.
JACKS, PNEUMATIC
Northern Crane Works, Walkerville.
JACKS, PIT AND TRACK
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.

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Homer & Wilson, Hamilton, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Toronto Tool Co., Toronto, Ont.
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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich.
National Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.
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Whitney Mfg. Co., Hartford, Conn.
KILNS
Can. Blower & Forge Co., Kitchener, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Sheldons, Limited, Galt, Ont.
LABELS AND TAGS
Matthews, Jas. H. & Co., Pittsburgh, Pa.
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Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.
LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.
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H. E. Streeter, 523 New Birks Bldg., Montreal, Que.
LATHES, CHUCKING
Acme Machine Tool Co., Cincinnati, Ohio.
Hyde Engineering Works, Montreal.
LATHE CHUCKS (SEE CHUCKS)
LATHE DOGS AND ATTACHMENTS
Armstrong Bros. Tool Co., Chicago.
Curtis & Curtis Co., Bridgeport, Conn.
Hendey Machine Co., Torrington, Conn.
Rivett Lathe & Grinder Co., Boston, Mass.
J. H. Williams & Co., Brooklyn, N.Y.
Winnipeg Gear & Engrng. Co., Winnipeg, Man.
LATHES, AXLE
Bridgeford Mach. Tool Works, Rochester, N.Y.
LATHES, PRECISION, BENCH
W. F. & John Barnes Co., Rockford.
Blount, J. G., & Co., Everett, Mass.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hardinge Bros., Chicago, Ill.
New Britain Mach. Co., New Britain, Conn.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
Walcott Lathe Co., Jackson, Mich.
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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Roelofson Machine & Tool Co., Toronto, Ont.
Warden King Co., Montreal, Que.
LATHES, BRASS
Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Inc., Chicago, Ill.
LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, Ohio.
John Bertram & Sons Co., Dundas.
Bridgeford Mach. Tool Works, Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Iron & Steel Co., Cincinnati, Ohio.
Dominion Machinery Co., Toronto.
Foss & Hill Machy Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Mach. Tool Co., Hamilton, Ohio.
Hendey Machine Co., Torrington, Conn.
Himoff Machine Co., New York.
Houston, Stanwood & Gamble Co., Cincinnati, O.
Hyde Engineering Works, Montreal.
McCabe, J. J., New York, N.Y.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Sebastian Lathe Co., Cincinnati, Ohio.
Walcott Lathe Co., Jackson, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
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Garlock-Walker Machy. Co., Toronto, Ont.
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H. W. Petrie, Ltd., Montreal.
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Garlock-Walker Machinery Co., Toronto, Ont.
Gray Mfg. & Mach. Co., Toronto, Ont.
Hepburn, John T., Ltd., Toronto.
Himoff Machine Co., Inc., New York, N.Y.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McCabe, J. J., New York, N.Y.
Roelofson Mach. & Tool Co., Toronto, Can.
Walcott Lathe Co., Jackson, Mich.
LATHES, SCREW CUTTING
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Dominion Machinery Co., Toronto.
Foss & Hill Machy. Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto, Ont.
McCabe, J. J., New York, N.Y.
Niles-Bement-Bond Co., New York.
H. W. Petrie, Toronto.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

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McCabe, J. J., New York, N.Y.
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Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto, Ont.
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R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
McCabe, J. J., New York, N.Y.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
National-Acme Co., Cleveland, Ohio.
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Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
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Sleeper & Hartley, Inc., Worcester, Mass.
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James Chesterman & Co., Ltd., Sheffield, Eng.
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Toronto Testing Laboratory, Ltd., Toronto.
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MILL MACHINERY
Alexander Fleck, Ltd., Ottawa.
MILLING MACHINES, AUTOMATIC
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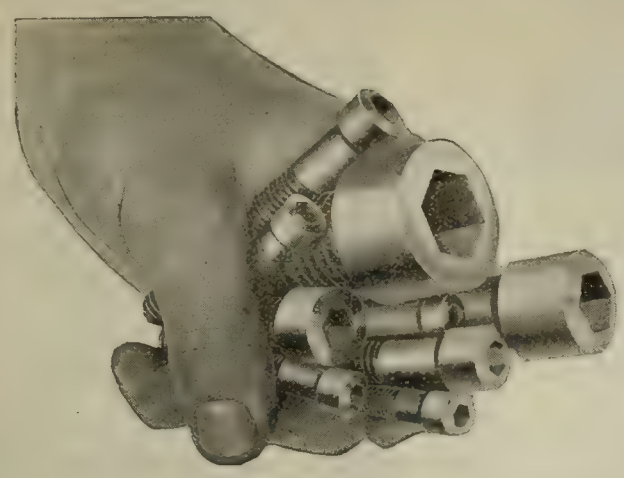

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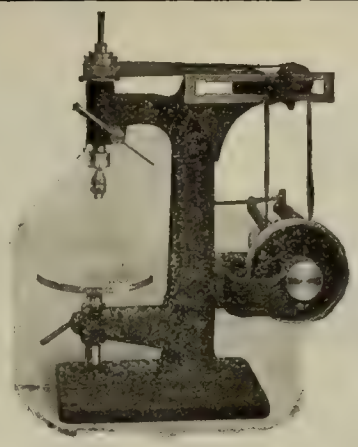

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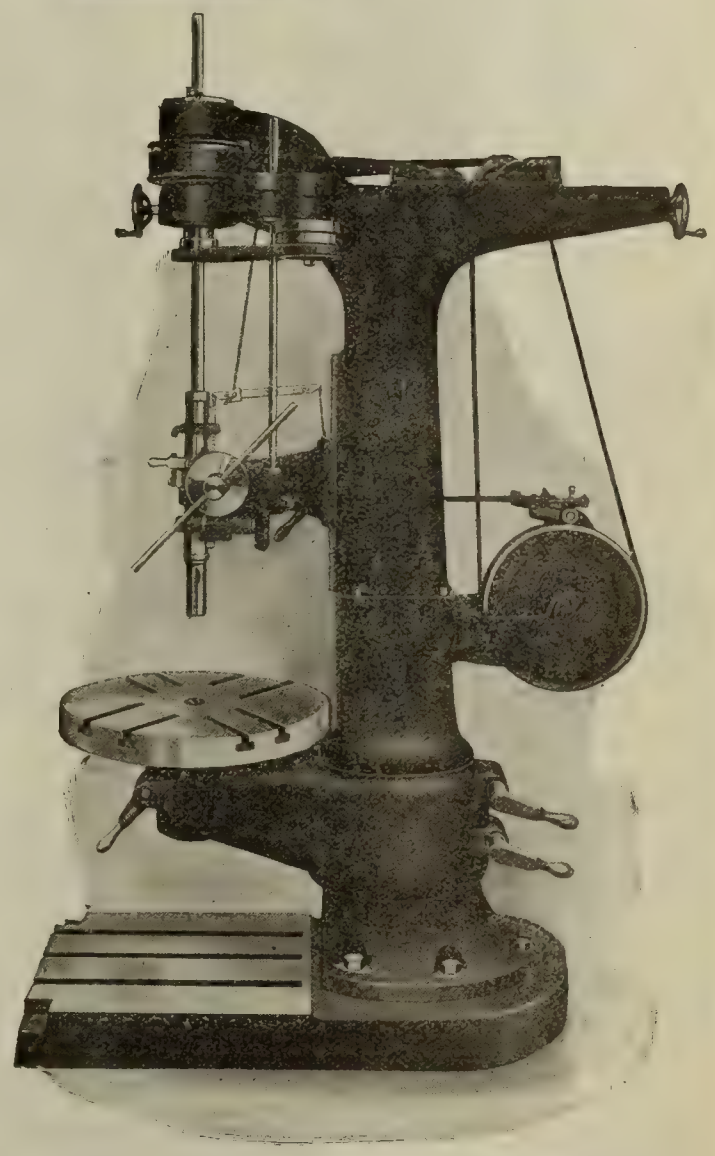

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Fox Machine Co., Jackson, Mich.
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Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
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Niles-Bement-Pond Co., New York.
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Garlock-Walker Machinery Co., Toronto, Ont.

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Pritchard-Andrews Co., Ottawa, Can.

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Landis Machine Co., Waynesboro, Pa.

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L'Air Liquide Society, Montreal, Toronto.

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National-Acme Co., Cleveland, Ohio.

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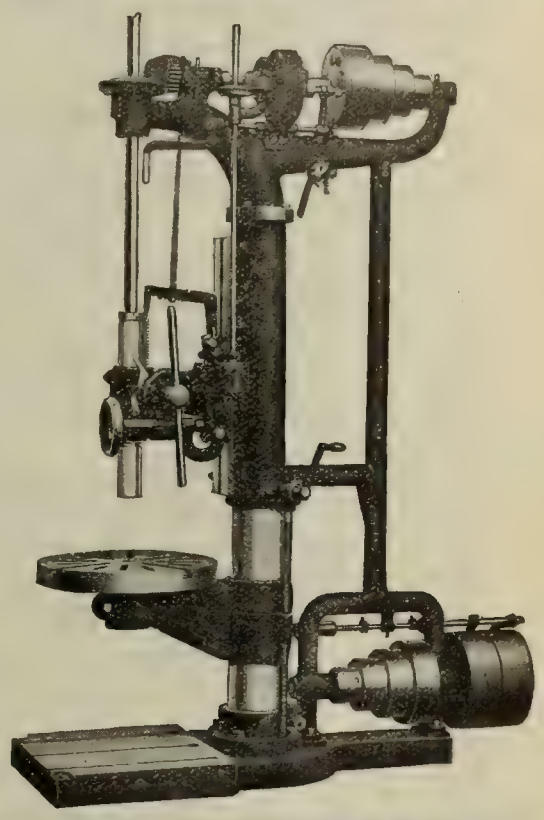

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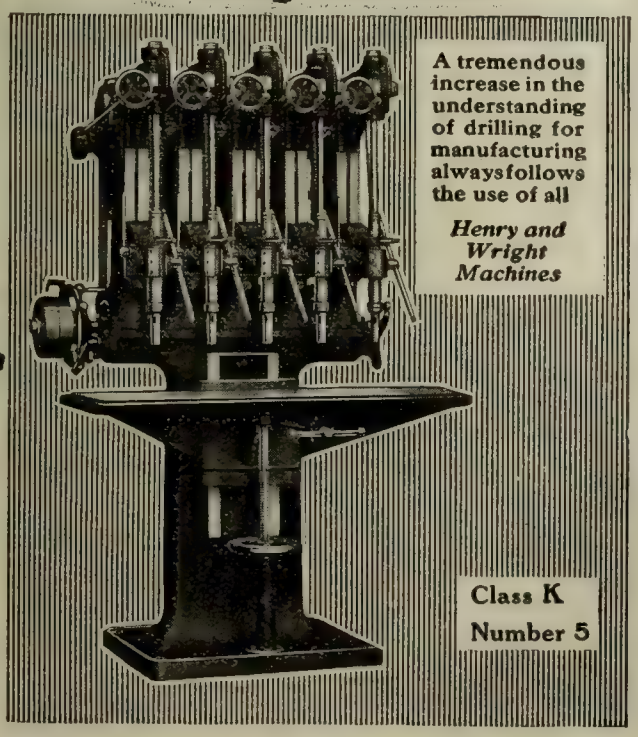

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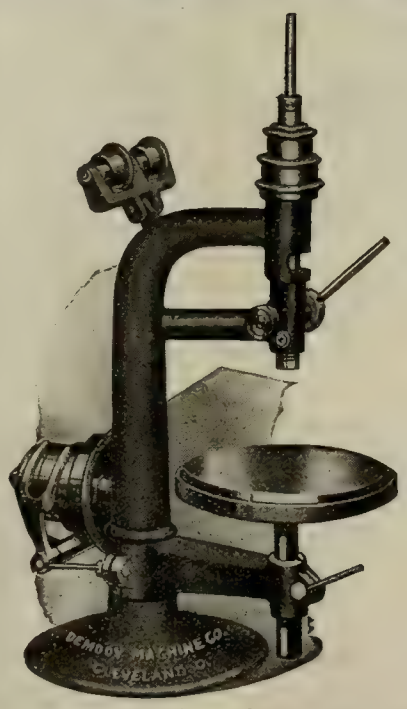

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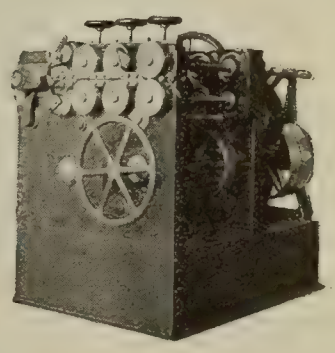

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Grant Mfg. & Machine Co., Bridgeport, Conn.
High Speed Hammer Co., Rochester, N.Y.

SHELL WASHER
Can. Economic Lubricant Co., Montreal, Que.

SHRAPNEL SHELL MARKER
Brown-Boggs Co., Hamilton, Ont.
Noble & Westbrook Mfg. Co., Hartford, Conn.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton, Toronto, Montreal.

SIGNS, ENAMEL
Strong, Kennard & Nutt Co., Cleveland, Ohio.

SILVER SOLDER
Hungerford Brass & Copper Co., U. T., New York.
Geo. H. Lees & Co., Hamilton, Ont.

SKATE SHARPENERS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

SLOTTERS
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Rhodes Mfg. Co., Hartford, Conn.

SMOKESTACKS.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford
J. H. Williams & Co., Brooklyn, N.Y.

SOCKET HEAD CAP SCREWS
Allen Mfg. Co., Hartford, Conn.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Can.

SOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Hungerford Brass & Copper Co., U. T., New York.
Tallman Brass & Metal Co., Hamilton.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Banfield, Edwin J., Toronto.
Banfield, W. H., & Sons, Toronto.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
Grant Mfg. & Machy. Co., Bridgeport, Conn
John H. Hall & Sons, Brantford.
Gray Mfg. & Mach. Co., Toronto, Ont.
Himoff Machine Co., New York, N.Y
Hyde Engineering Works, Montreal, Que.
Jardine, A. B., & Co., Hespeler.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McClean & Son, F. W., Niagara Falls, Ont.
National-Acme Co., Cleveland, Ohio.
D. McKenzie Machinery Co., Guelph, Ont.
Mulliner & Enlund Tool Co., Syracuse, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
T. C. M. Mfg. Co., Harrison, N.J.
Victoria Foundry Co., Ottawa, Ont.
William R. Perrin, Ltd., Toronto.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

SPRINGS, MACHINERY
Barnes, Wallace, Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele, Ltd., Guelph, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn
Sleeper & Hartley, Inc., Worcester, Mass.

SPIRAL CONVEYORS
Can. Matthews Gravity Carrier Co., Toronto, Ont

SPROCKETS, CHAIN
Grant Gear Works, Boston, Mass.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa

SOLDER
Jobborn, Geo. A., Hamilton, Ont.

SPROCKET WHEELS, CAST
Perrin, Wm. R., Toronto.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.

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Dillon Mfg. Co., Oshawa, Ont.
Dom. Forge & Stpg. Co., Walkerville, Ont
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Brown, Boggs & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.
Noble & Westbrook Mfg. Co., Hartford, Conn.

STAMPS STEEL ALPHABET, FIGURES
Matthews, Jas. H. & Co., Pittsburgh, Pa.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

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Can. Fairbanks-Morse Co., Montreal
Can. Morehead Mfg. Co., Woodstock, Ont.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

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STEEL BENDING BRAKES
Steel Bending Brake Works, Ltd., Chatham, Ont.

STEEL FOR AXES, PLOWS, SAWS, DRILLS, ETC.
Colonial Steel Co., Pittsburgh, Pa.

STEEL, CARBON, FERRO-TUNGSTEN
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Comstedt, Josef F. A., 120 Broadway, N.Y.
Latrobe Electric Steel Co., Latrobe, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Zenith Coal & Steel Products, Montreal, Que.

STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

STEEL DRUMS
Smart-Turner Machine Co., Hamilton, Ont.

STEEL PRESSURE BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal.
Can. Fairbanks-Morse Co., Montreal
Can. B. K. Morton, Toronto, Montreal.
Century Steel Co. of America, New York.
Colonial Steel Co., Pittsburgh, Pa.
Comstedt, Josef F. A., 120 Broadway, N.Y.
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Fairley Davidson Steel Co., New York, N.Y.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Geo. A., 70 Lombard, Toronto.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Toronto.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium Alloys Steel Co., Pittsburg, Pa
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.
Zenith Coal & Steel Products, Montreal, Que.

STEELS, HIGH STRENGTH, HOT-WORKING, DIE, MAGNET
Fairley Davidson Steel Co., New York, N.Y.

STEEL VANADIUM
Comstedt, Josef F. A., 120 Broadway, N.Y.
Drury, H. A., Co., Montreal, Que.
Standard Alloys Co., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa.

STELLITE, HIGH-SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.

STOCK RACKS FOR BARS, PIPING, ETC.
New Britain Machine Co., New Britain, Conn.

STOCKS FOR DIES
Wells Bros. Co. of Canada, Galt, Ont.

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Butterfield & Co., Rock Island, Que.

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Dennis Wire & Iron Works, London, Canada.
New Britain Mach. Co., New Britain, Conn.

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Can. Welding Works, Montreal, Que.
Jenckes Mach. Co., Sherbrooke, Que.
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Modern Tool Co., Erie, Pa.
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Hawkridge Bros. Co., Boston, Mass
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Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machinery Co., St. Louis, Mo
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

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Armstrong Bros. Tool Co., Chicago.

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Armstrong, Whitworth of Canada, Ltd., Montreal
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Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Hamilton Gear & Mach. Co., Toronto.
Morse Chain Co., Ithaca, N.Y.
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Canada Machinery Corp., Galt, Ont.
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Sheldons, Ltd., Galt, Ont.
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Hungerford Brass & Copper Co., New York, N.Y.
Standard Tube & Fence Co., Woodstock, Ont.

TUMBLING BARRELS
Baird Machine Co., Bridgeport, Conn.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TUNGSTEN FILAMENT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

TURNBUCKLES
Canadian Billings & Spencer, Ltd., Welland.

TURNTABLES
Whiting Foundry Equipment Co., Harvey, Ill.

TURRET MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
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Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURBINE WATER WHEELS
Jenckes Mach. Co., Sherbrooke, Que.
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Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
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H. W. Petrie, Ltd., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

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Foss & Hill Machy. Co., Montreal.
New Britain Machine Co., New Britain, Conn.
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H. W. Petrie, Toronto.

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Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
J. H. Williams & Co., Brooklyn, N.Y.

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Aikenhead Hardware Co., Toronto, Ont.
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London Bolt & Hinge Works, London, Ont.
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WATER WHEELS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
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Kennedy & Son, Wm., Owen Sound, Ont.
Northern Crane Works, Walkerville.

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Hungerford Brass & Copper Co., U. T., New York.
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Canada Machinery Corp., Galt, Ont.
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R. E. T. Pringle, Ltd., Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machy. Co., Toronto.

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Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

WORKS STANDS, PORTABLE
New Britain Mach. Co., New Britain, Conn.

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Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canadian Billings & Spencer, Ltd., Welland.
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros. Co. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Bemis & Call Hdwe. & Tool Co., Springfield, Mass
Wells Bros. Co. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont

WRENCHES, RATCHET AND BASIN
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Keystone Mfg Co., Buffalo, N.Y.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, SOCKET
Allen Mfg. Co., Hartford, Conn.

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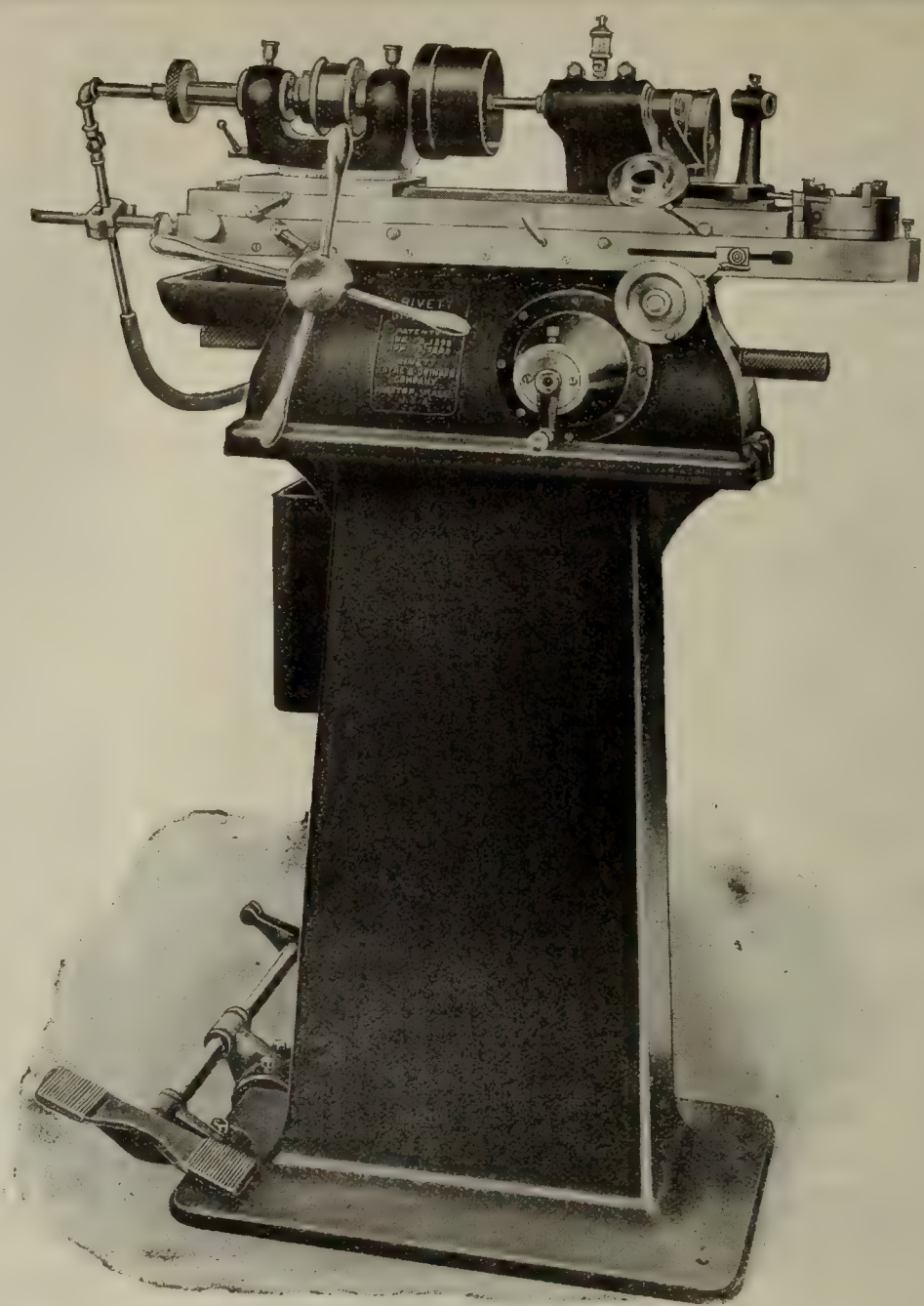

Precision

Precision, so my dictionary tells me, is the quality of being strictly accurate or exact, and that is just the quality of the No. 103 Rivett Internal Grinder. And the work the No. 103 turns out is precise, it is accurate to one ten-thousandth part of an inch.

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Rivett Lathe & Grinder Co.

Brighton District of Boston, Mass.

RIVETT Quality

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XVIII. TORONTO, AUGUST 2, 1917 No. 5

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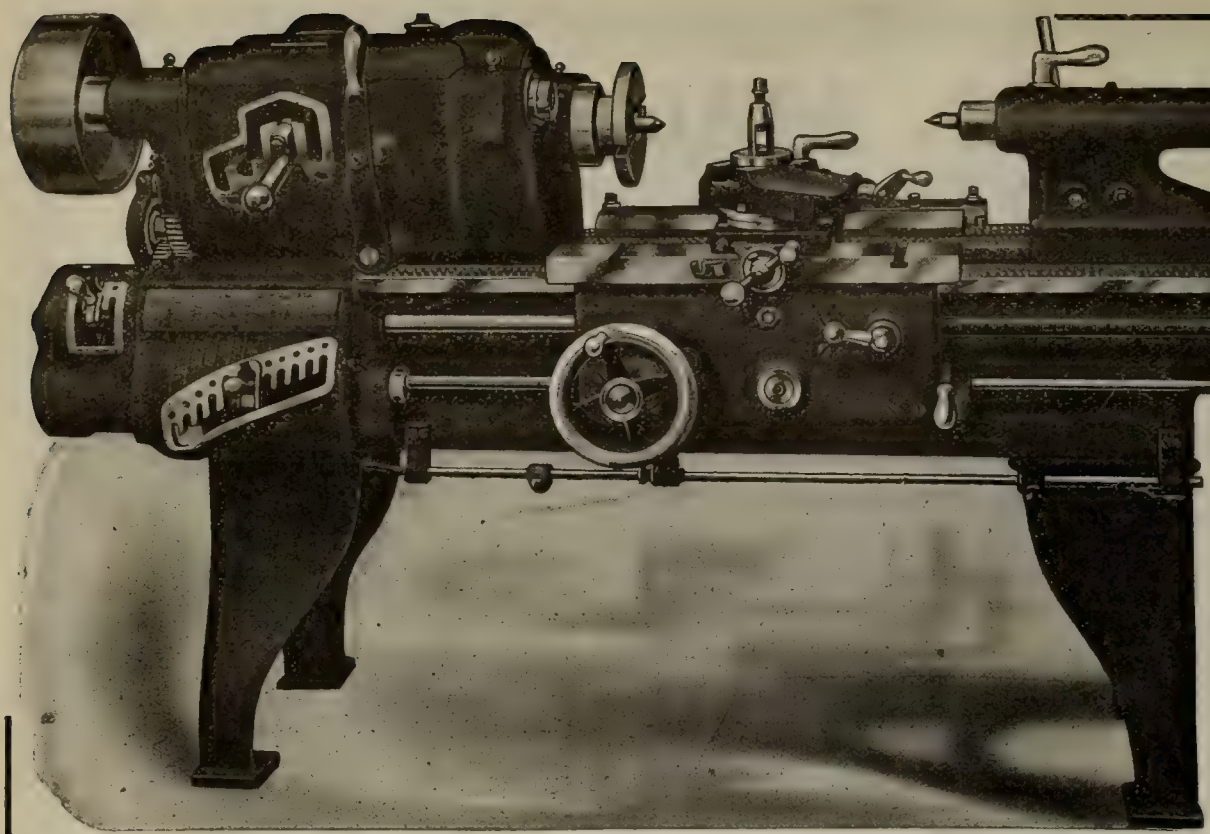

Hendey 18-inch Geared Head Lathe

A good point in this lathe lies in its eight mechanical changes of speed for spindle with driving shaft running at constant speed — four direct and four through back.

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Lathe has automatic stop for stopping carriage in either direction when feeding or screw-cutting—invaluable for internal work to shoulders and for duplicating pieces.

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These are up-to-date Shapers, designed for modern shop production.

They are plain in design, yet embody all essential features necessary for efficient work.

Every adjustment is convenient for the operator and fine for the most accurate work.

Let us have your inquiry.

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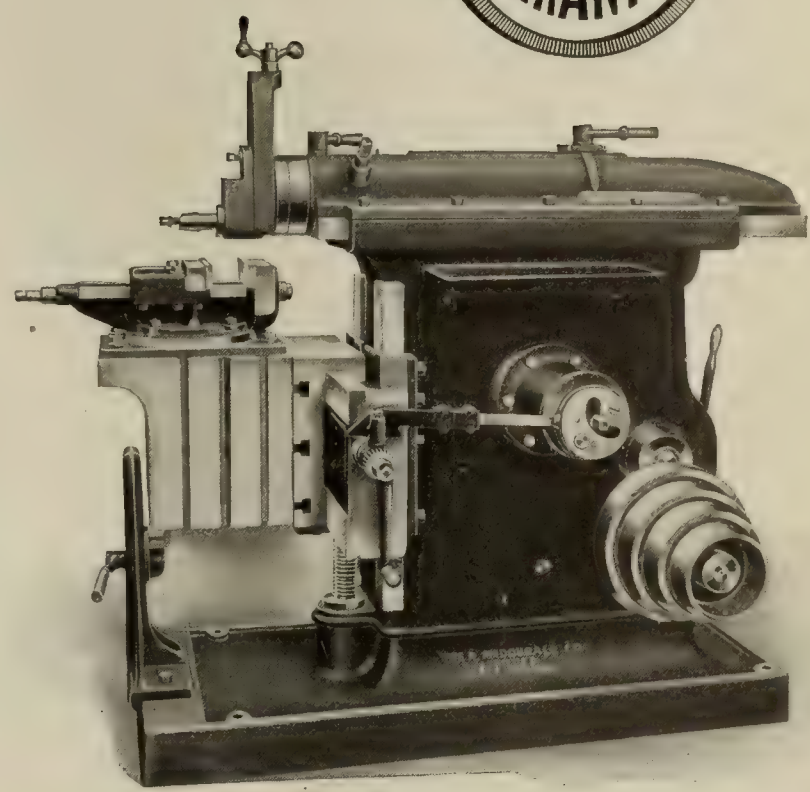

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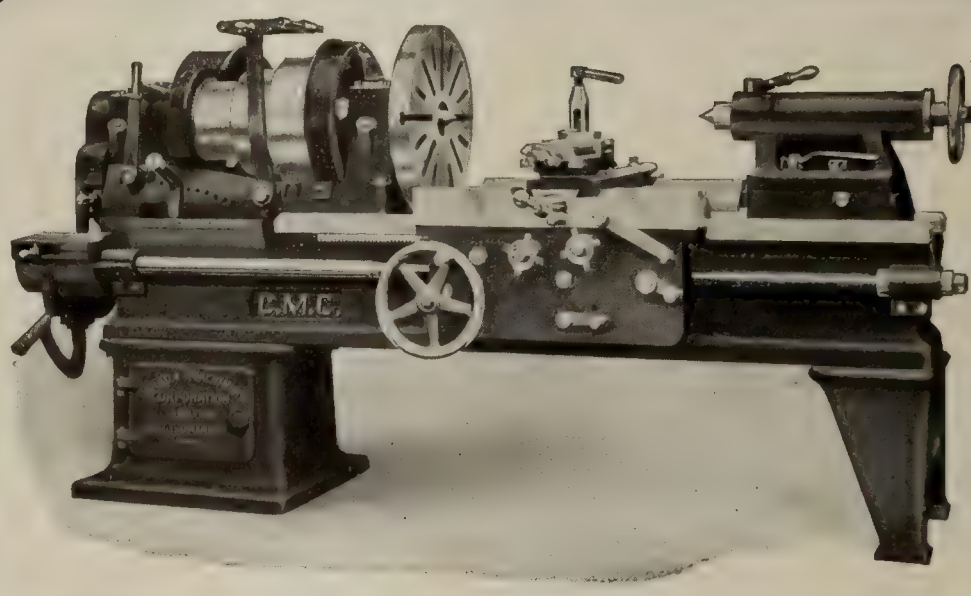

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CANADIAN MACHINERY AND MANUFACTURING NEWS

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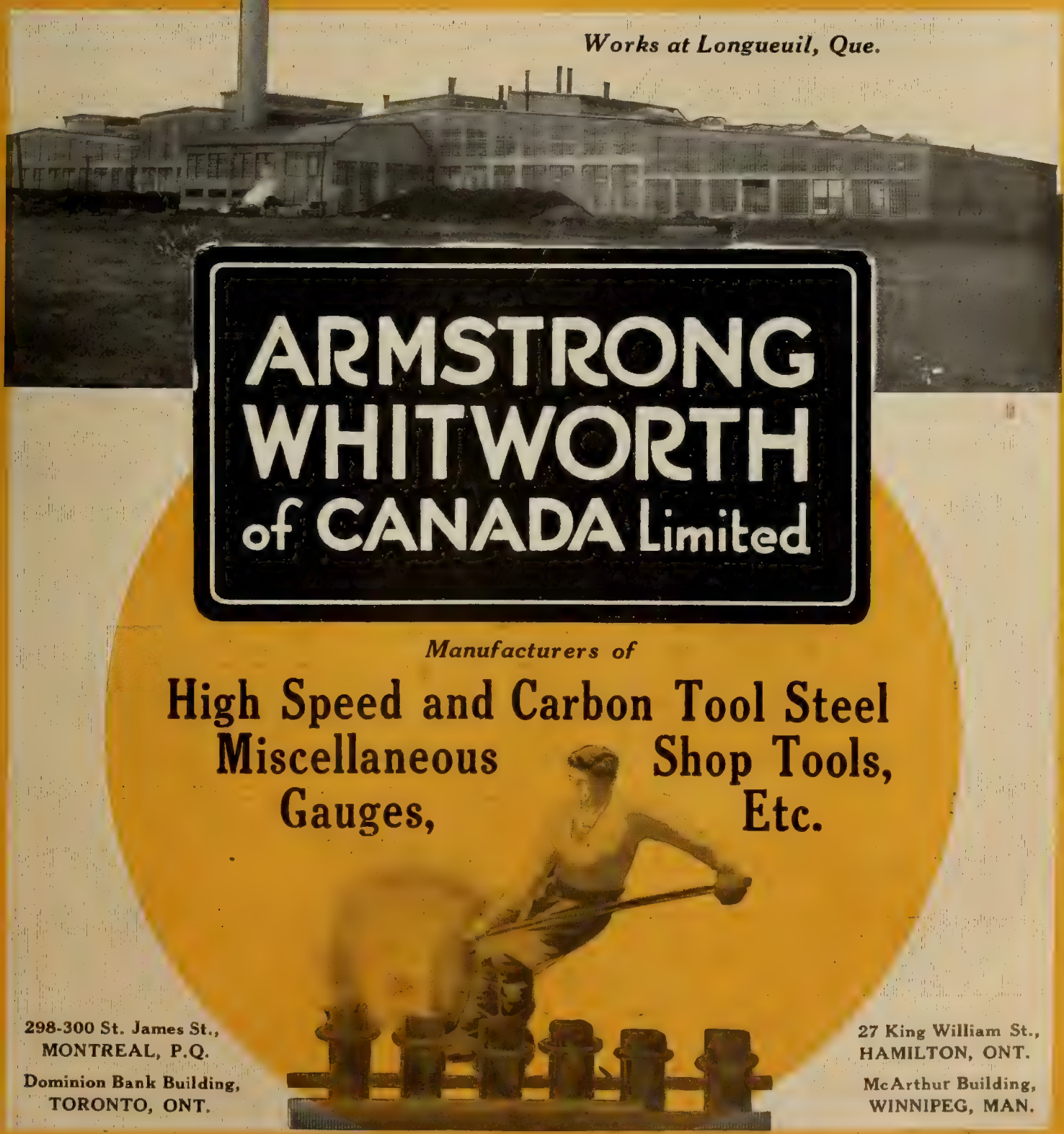

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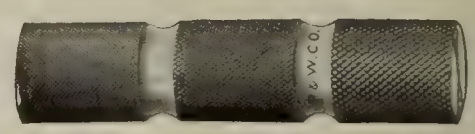
Combines Three Distinct Knurling Tools in One

You will save time by using this three-in-one Lathe Knurling Tool. It carries three pitches of knurls, fine, medium and coarse, as shown in sample. This does away with necessity of having three holders or of changing knurls where but one holder is available. Same knurls can be used in this holder as are used in our regular Lathe Knurling Tool.



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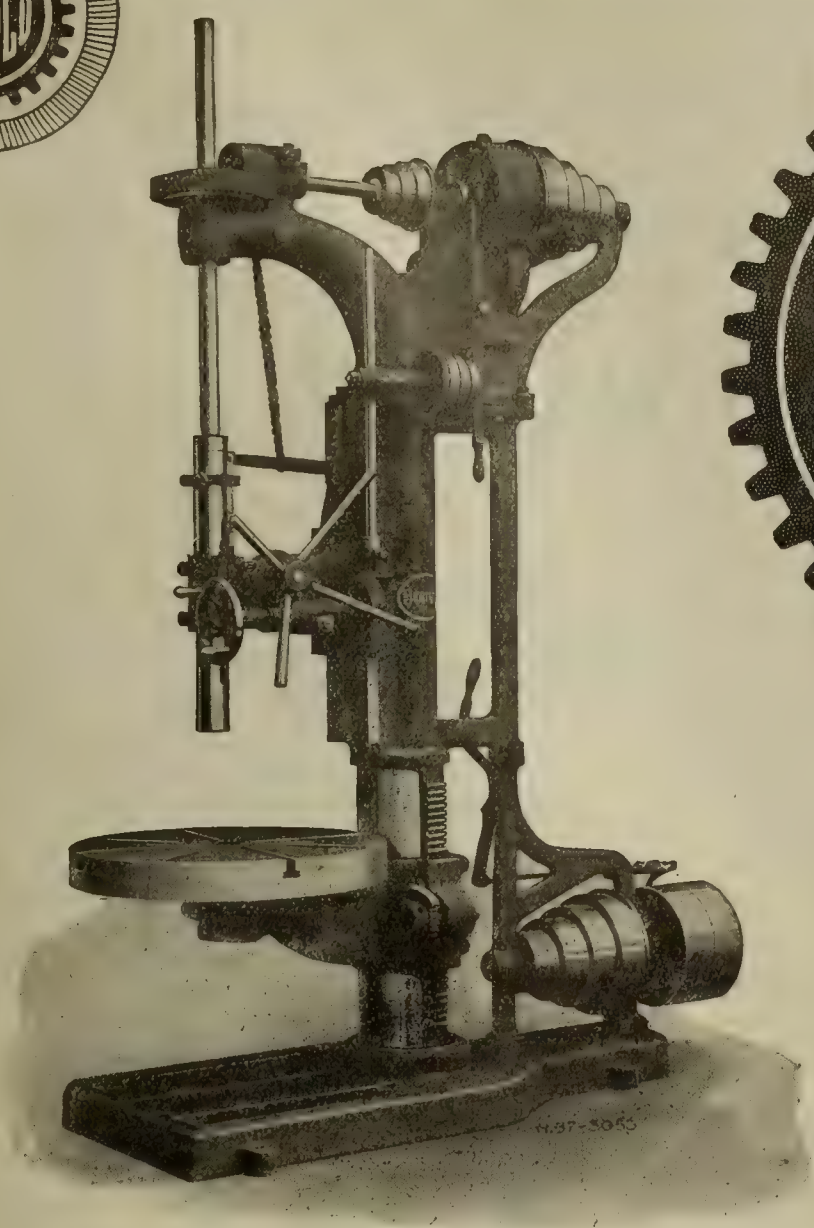

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The Publisher's Page

TORONTO August 9, 1917

ON SERVICE

SERVICE to some means little. Service to others implies a very great deal — everything. To some it is but a glittering cornice-piece, while to others it is the very foundation of business.

It has been truly said that he profits most who serves best. And it has been said, too, that it is more blessed to give than to receive. We are all ready to serve—to a certain extent, and we are all willing to give—to a point where no immediate discomfort or embarassment is caused. But to serve to the limit and to give till it hurts! That's different.

There is an advertiser in CANADIAN MACHINERY, the burden of whose message is "Service" week in and week out—Service, Service, Service. To the uninitiated this constant repetition will not possess the significance it holds for customers who have put our advertiser to the test when real service was needed. The story of service rendered by this very large firm, if it could be told, would open the eyes of some of us, we feel sure, and would give us an idea of what genuine sacrificial service really is. And if the story could be told it would be shown that service really pays and pays big, and that it not only pays once, but **continually.**

In our humble way we, too, have endeavored to render service, and if increased patronage is any proof of success, then we may safely assume that our efforts have not gone unappreciated. Those who believe in the religion of service are usually those who are first to recognize and acknowledge a service rendered, and, because of this, we are glad.

In an effort to make CANADIAN MACHINERY of still greater service we have added to our market section letters from our own correspondents in New York and Pittsburg. We were able, fortunately, to secure the services of men whose records are of the very best, men of long experience in market work, well connected men who have and are still doing market work for some of the top notch American journals and newspapers. Our weekly letters from New York and Pittsburg can therefore be regarded as authoritative and right up to the minute.

This new feature of CANADIAN MACHINERY is but a small part of the service we give, and even smaller fraction of the service we would like to render. We are still young. Let us live in hope.

If any advertisement interests you, tea r it out now and place with letters to be answered.

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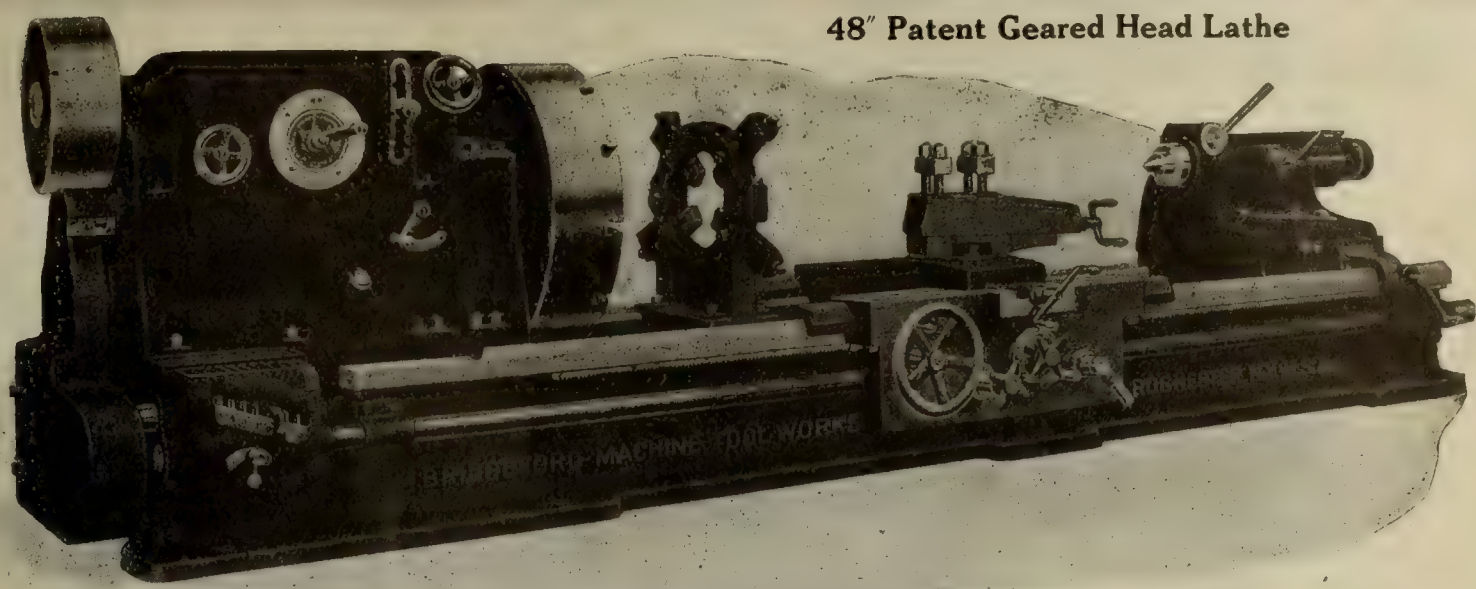
It is clear that S K F Ball Bearings will permit a machine to turn out work of the very highest accuracy. This is what makers desire and users demand. Write us for more information. A thorough investigation will repay you.
CANADIAN SKF COMPANY, LIMITED
TORONTO, CANADA

48″ Patent Geared Head Lathe



The Bridgeford for Big Work

That's what this powerful Bridgeford is built for—big work. Has strength and rigidity sufficient to perform the heaviest kind of jobs with perfect accuracy—and it goes through them in record time. Smooth in action. Strongly constructed. Fifteen cutting speeds all easily changed.

Bridgeford's Lathes give maximum production at minimum cost. We'll be glad to give you a full account of what they will do. Write

Bridgeford Machine Tool Works, Rochester, N.Y.

161 WINTON ROAD

Double-Quick Cutting-Off

THE HURLBUT-ROGERS CUTTING-OFF AND CENTERING MACHINE has the advantage of two cutting tools.

Each tool is rigidly supported in a stationary block at an angle which permits a strong shearing cut.

WITH THIS MACHINE PRODUCTION CAN BE NEARLY DOUBLED, and the utmost accuracy maintained under the hardest of work.

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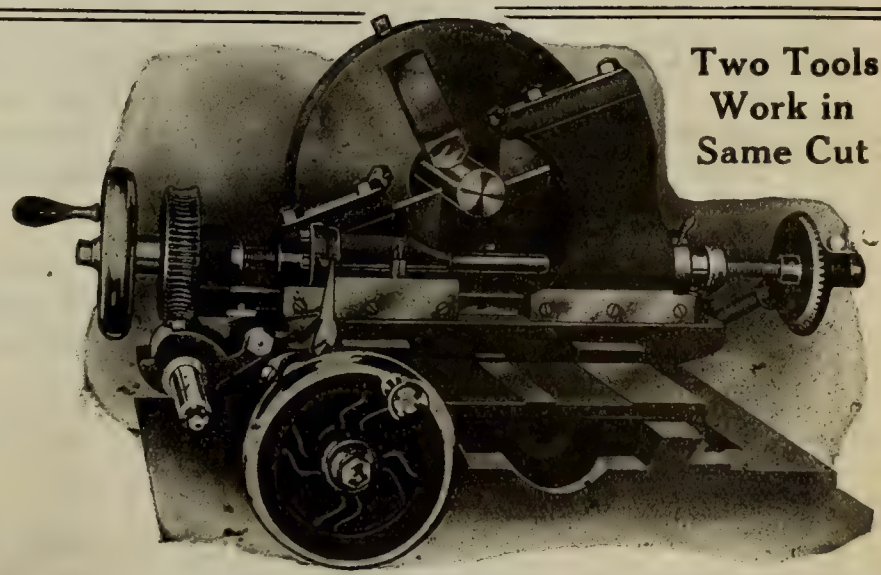
Hurlbut-Rogers Machinery Company

South Sudbury, Mass., U. S. A.

FOREIGN AGENTS—England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow, Newcastle-on-Tyne. H. W. Petrie, Toronto, Canada.



Two Tools Work in Same Cut

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Iron Ore

Pig Iron

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FOUNDRY & MALLEABLE

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M.A. HANNA & Co.

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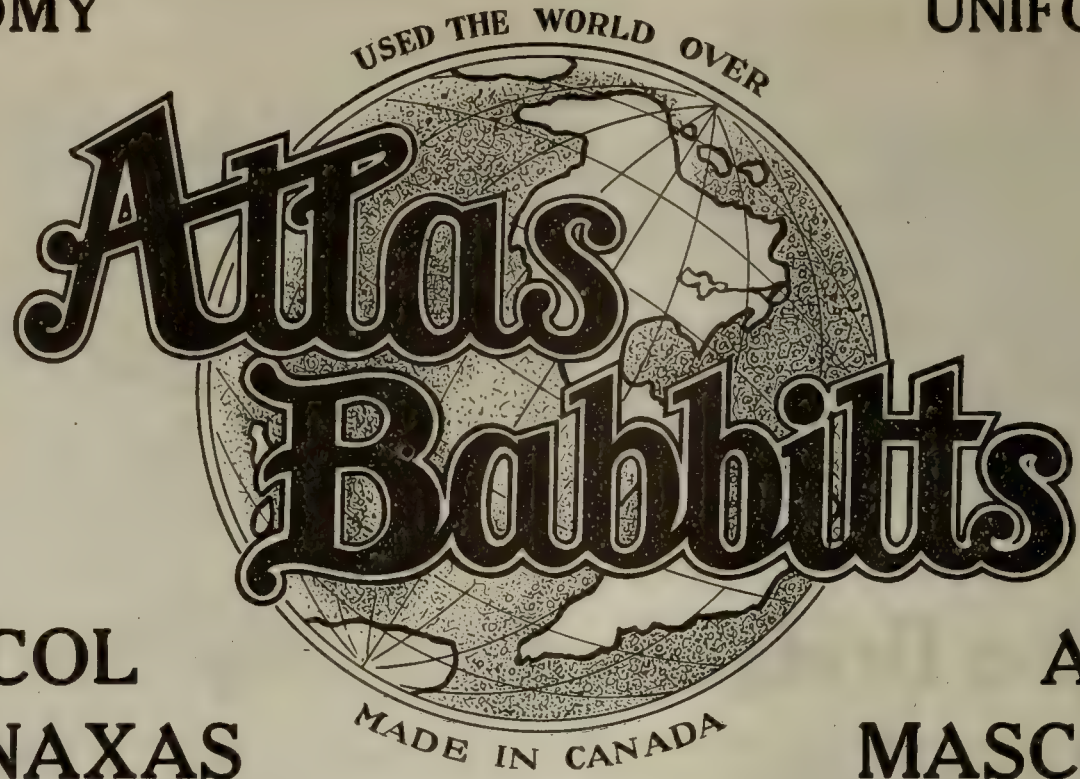

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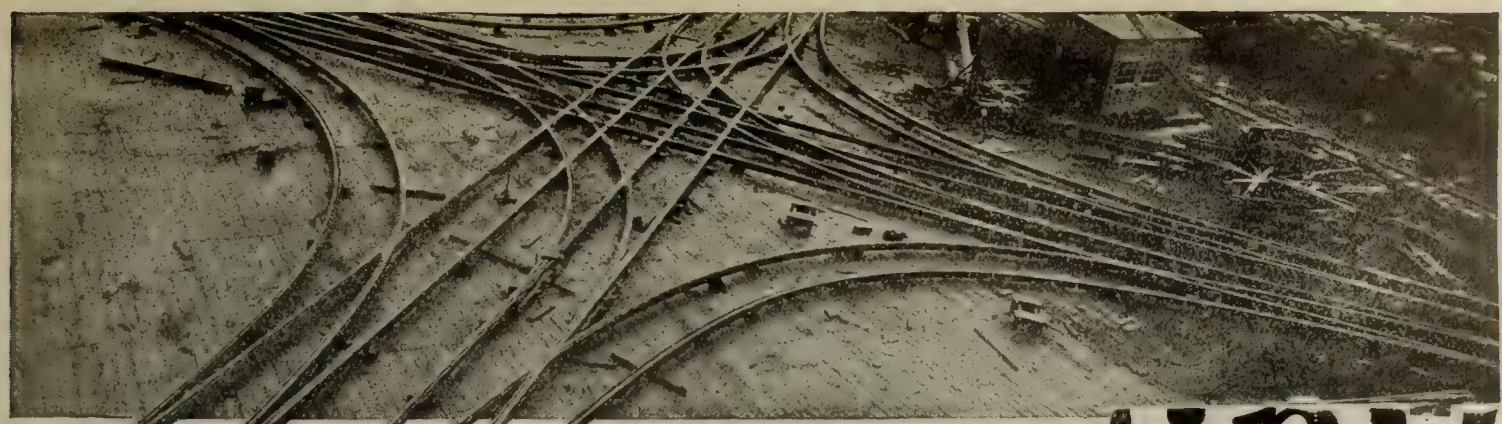


Solid Manganese Steel Intersection for Montreal Tramways Company.

Steel Castings

For Hydraulic, Mill Gear, Locomotive, Rolling Stock, Marine—in fact we make castings of any size and any kind—Manganese, Vanadium, Titanium, Chrome, Nickel, etc. Dependable products always.

Canadian Steel Foundries, LIMITED

MONTREAL WELLAND

SISCO

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" **Tool Steels**

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.

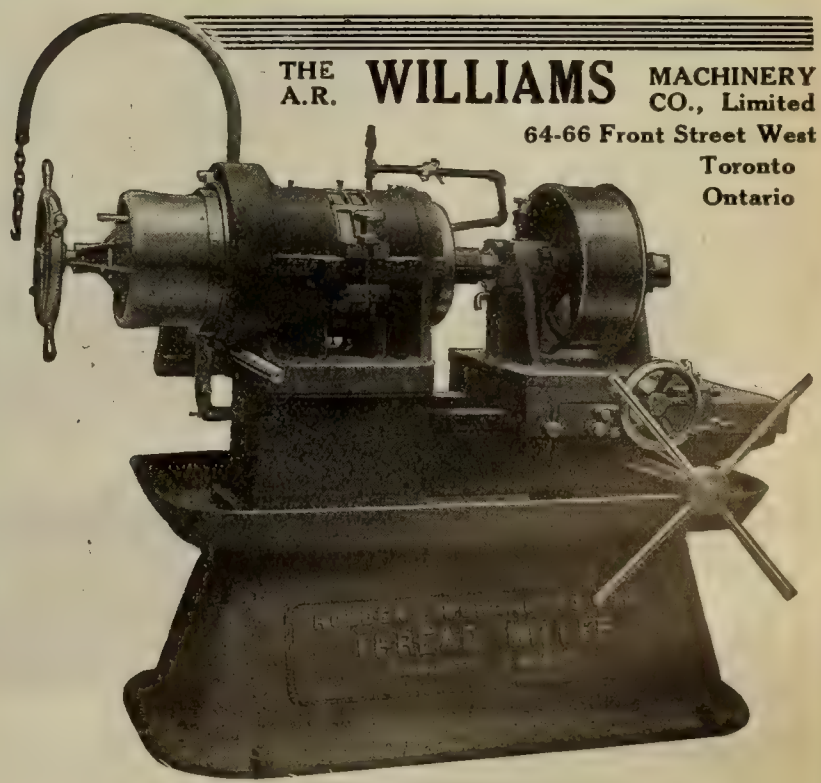
MONTREAL, QUE.

The Life of a Thread Miller

Depends not upon the amount of work it does, but the ease and thoroughness with which the work is done. These Thread Millers are noted for these qualities. Its quality of work is unrivalled. Our Service Department will give you all the particulars. *Write us!*

THE A.R. **WILLIAMS** MACHINERY CO., Limited

64-66 Front Street West
Toronto
Ontario



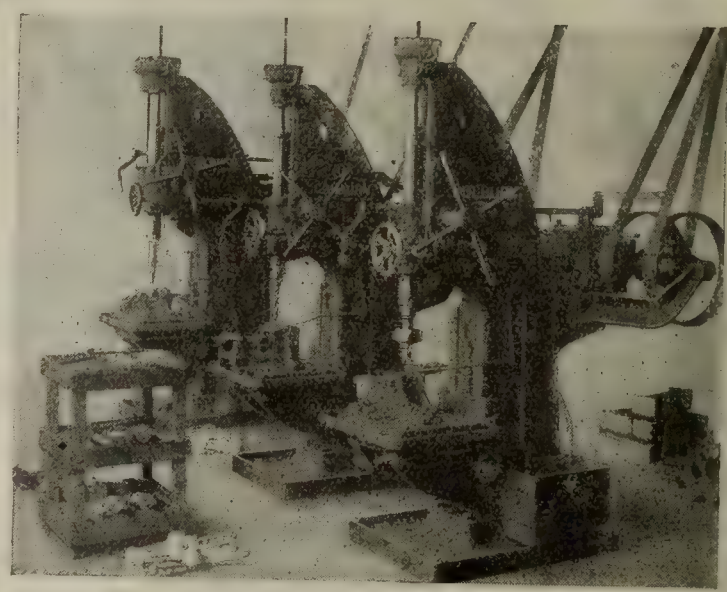
The Johnson Friction Clutch Is Being Used As A Part Of This Machine

In the Tapping Attachment on All Sizes of Colburn Drill Presses

The Levers in front of the Colburn Drill Presses illustrated, start and stop the operations.

"Johnsons" are installed in connection with the tapping attachments of all sizes of Colburn Drill Presses and "Johnson" efficiency maintains the "Colburn" standard of mechanical perfection in drill presses.

JOHNSON FRICTION CLUTCHES are especially well adapted for giving easy control on starting and stopping all kinds of tools, as they are mechanically correct, strongly made and very durable.

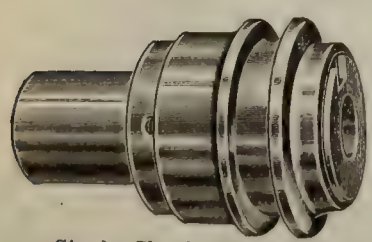


Courtesy Colburn Machine Tool Co., Franklin, Pa.

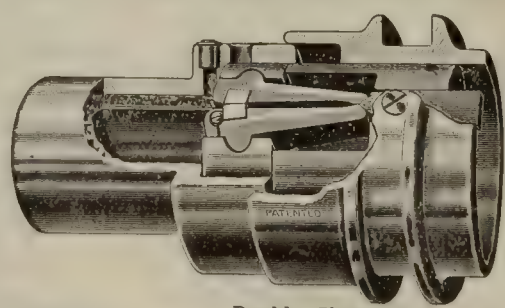
Johnson Friction Clutches Give Easy Control to All Types of Machines

The service of our engineering department is free to anyone for solving everyday or special problems in clutch installations.

Send for a free copy of our booklet entitled "Clutches as Applied in Machine Building" and Yellow Data Sheets.



Single Clutch—Exterior



Double Clutch

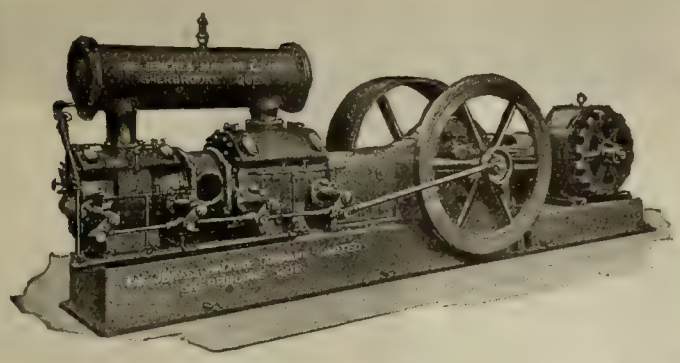
Single Clutch with Pulley Mounted

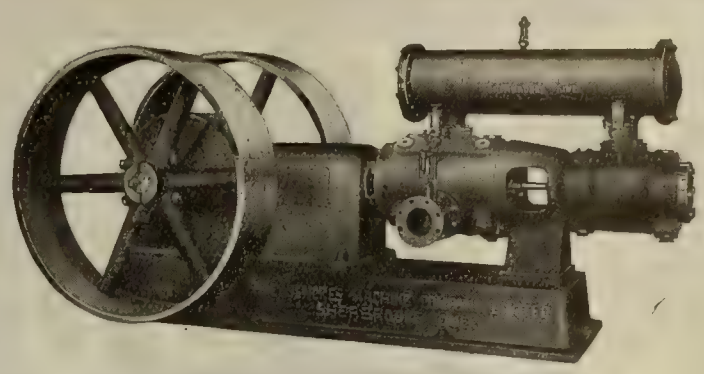
THE CARLYLE JOHNSON MACHINE CO.
MANCHESTER, CONN.

England—The Efandem Co., 159 Gt. Portland St., London, W., England. Sole Agents for the British Isles.

Canada—Williams & Wilson, Ltd., 320 St. James St., Montreal. Canadian Fairbanks-Morse Co., Limited, Toronto.

AUSTRALIA: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.





Compressor Problems Vanish

In a comparative test the quality of a machine will then be judged fairly. We invite your comparison. Our confidence that these machines excel is not only based on our knowledge of their construction, but also because of the manner in which they appeal to our customers. We know they are built right. Our patrons have proved it. Let us get together.

Jenckes Machine Company, Limited

Works: ST. CATHARINES, ONT.
Works: SHERBROOKE, QUE.

Sales Offices:—710 C.P.R. Bldg., Toronto; 908 E. T. Bank Bldg., Montreal; West Chester Ave., St. Catharines; Cobalt, Ont.; Exchange Bldg., Vancouver

DOUBLE

MUSHET

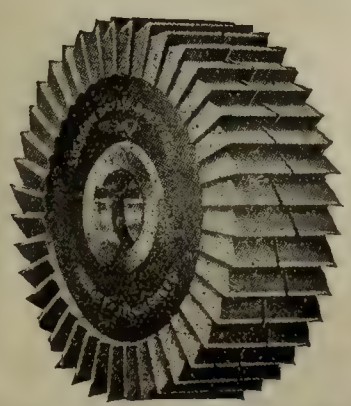
High Speed Steel

Carbon Steel

Gauge Steel

Alloy Steels

SOLE MAKERS
Samuel Osborn & Co. Ltd.
SHEFFIELD



Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)
Limited

Head Office and Works: Montreal, P.Q.
Branch Office: Toronto, Ontario

STEEL

FOR

SHRAPNEL SHELLS

AND SHELL BLANKS

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Company

Limited

Head Office: NEW GLASGOW, N.S.

Western Sales Office:

Room 14, Windsor Hotel, MONTREAL

"Red Cut Superior"

HIGH SPEED STEEL

YOU have thought of many qualities you would like to have in High Speed Steel Tools—such as cutting edges with long life, freedom from brittleness, great reserve strength and toughness to resist shocks and strains, tools that would not require special heat treatment, tools that would take deep roughing cuts or fine smooth finishing cuts, and in addition, could be worked at higher speeds than you ever dreamed of. All these virtues and many more are contained in "Red Cut Superior", a First Quality High Speed Steel. Furnished in Annealed Bar Stock, Discs, and Treated Tool Holder Bits.

Are your tools made of Red Cut?

Send for folder

VANADIUM-ALLOYS STEEL COMPANY

Pittsburgh, Pa.

Works at Latrobe, Pa.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

TRADE MARK

Reliance Steel Works
SHEFFIELD, ENG.

TRADE MARK

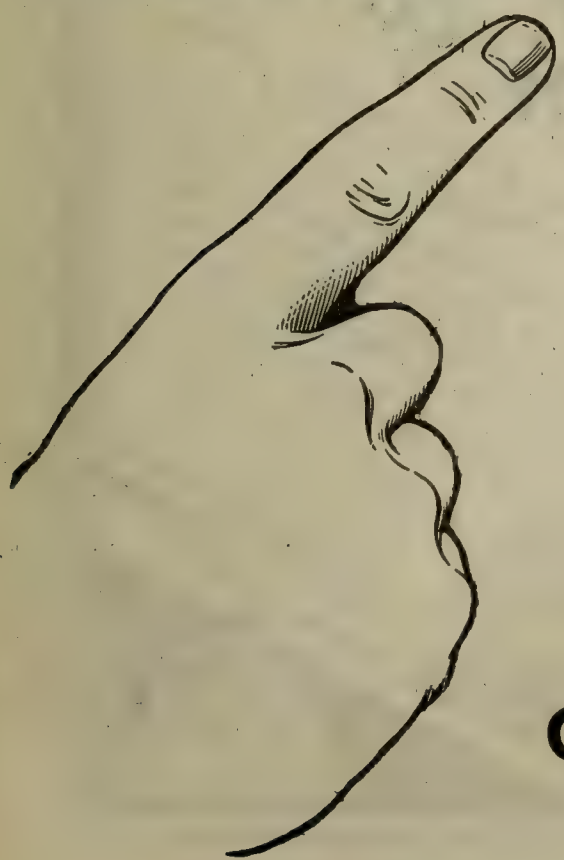
TRADE MARK

of the Famous

"WACO

Brand

High Speed Steel and Twist Drills



"DOUBLE WACO" Quality

Specially Adapted for all kinds of
MUNITION WORK

"Turtle" Brand
High Class Tool Steel, Files, etc.
of all descriptions.

For particulars apply to our
Sole Representatives for Canada

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario

SaBeN ExTrA
HIGH SPEED STEEL

The most Economical and Efficient Steel for Machining Shells

"Extra" Die Steel another good one

Manufactured by
SANDERSON BROTHERS & NEWBOULD, Limited
SHEFFIELD, ENGLAND

H. A. DRURY COMPANY LIMITED
MONTREAL TORONTO NEW YORK

High-Speed STEEL

The tools that are made with "Wolfram" High Speed Steel are warranted to be super-keen at the edge and super-strong at the neck.

WOLFRAM

Embodies a true and permanent alloy of Tungsten, Chrome, Vanadium and Iron. No better High Speed Steel in the world.

VULCAN CRUCIBLE STEEL COMPANY
ESTABLISHED 1900
Aliquippa - Pa., U.S.A.

Represented in Canada by Messrs. Norton, Callard & Company, Montreal.

ELECTRITE-URANIUM
High-Speed Steel

Will amaze you in its ability to remove metal

The introduction of this rare element—"URANIUM"—into the mixture of our already superb cutting product, has supplied the final perfection of the qualities of toughness and durability which has been the hitherto impossible goal of metallurgical hopes.

Electric Furnaces, Automatically regulated, produce inevitably similar results at every melt.

We are ready to assist your inquiry in every way possible.

Write

Latrobe Electric Steel Company
Latrobe, Pennsylvania

LESCO

This Wonderful Metal

is made in different Grades and can be adapted for
A MULTITUDE OF OPERATIONS.

Remarkable Results are Being Obtained

in machining Steel, Iron, Bronze, Brass,
Ivory, Celluloid, etc.

DIES OF ALL DESCRIPTIONS

are cast for hot or cold drawn work.

Write us for particulars, stating the class of work you are on, and what your difficulties are. Our Engineering Staff is at your disposal.

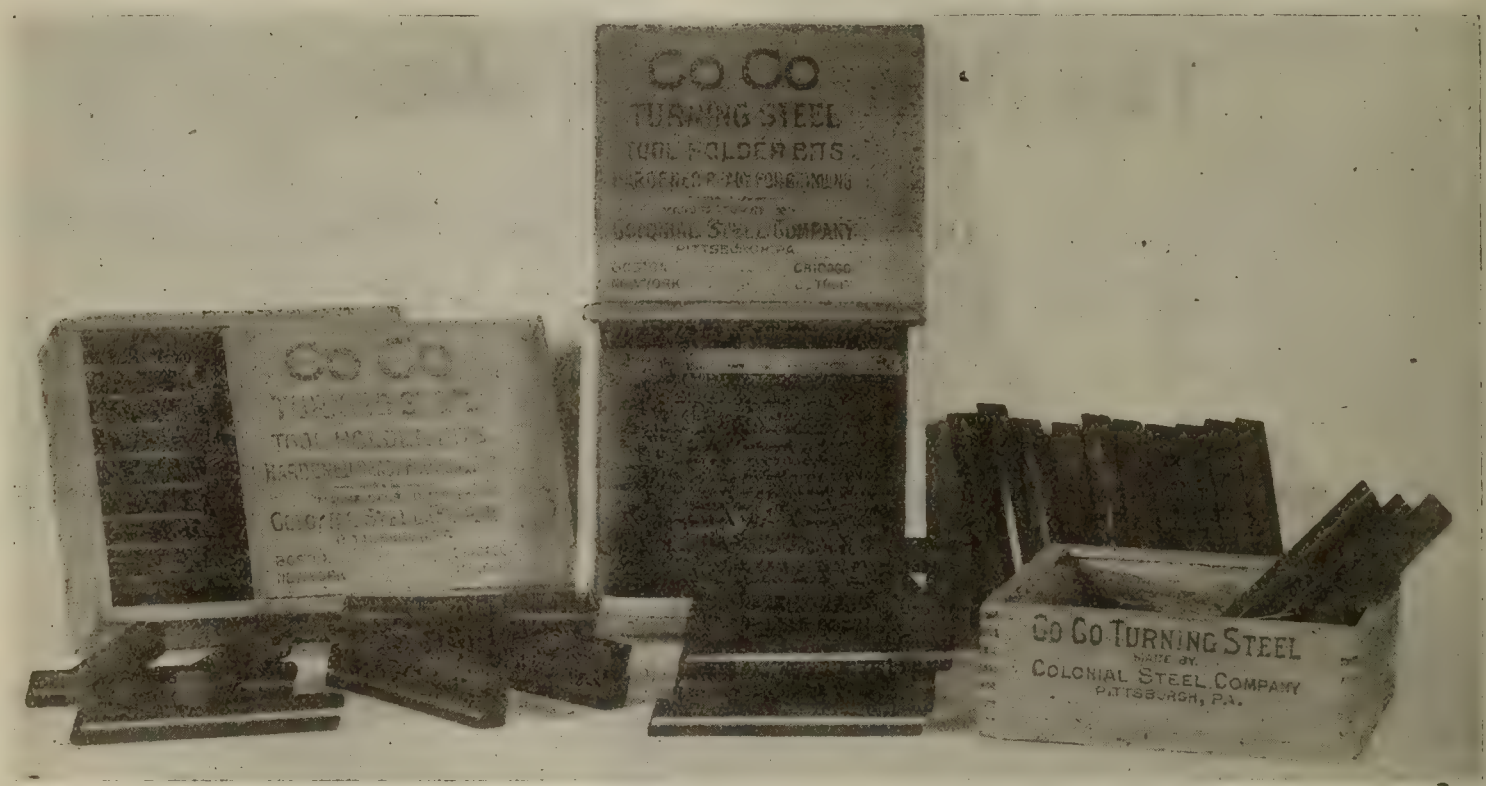
DELORO SMELTING & REFINING CO., LIMITED

Head Office - - DELORO, ONTARIO

TORONTO
200 King Street West

MONTREAL
315 Craig Street West

CO CO
TURNING STEEL
TOOL HOLDER BITS
"THE BIT WITH THE GROOVE"



What CoCo is Doing on Other Jobs

"CoCo" will do the same in your shop,—will cut faster or longer than other steels. Here are some proofs:—

"CoCo" is cutting Semi-steel Castings at 100 ft. per minute, cut ½" deep. 30 hours' continuous service between grinds.

"CoCo" is turning Cast Iron Hydrant Caps at 169 ft. per minute, feed ⅛", cut ⅜" and turns 4 hydrants per grind where less than one per grind used to be standard.

"CoCo" is turning .40 Carbon O. H. Forged Rams at 95 ft. per minute, feed ¼", cut 3/32" turning 3 rams in the same time it formerly took to do one.

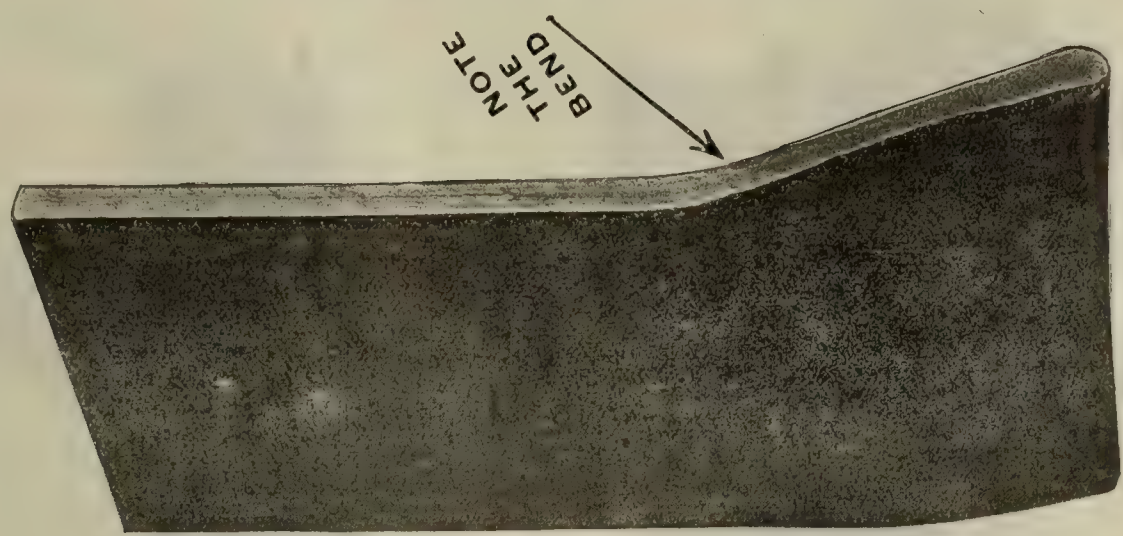
CAN YOU BEAT IT?

CoCo Steel does not do stunts—It does the work. It will do yours as well. Ask us.

COLONIAL STEEL COMPANY

PITTSBURGH BOSTON DETROIT NEW YORK PHILADELPHIA ST. LOUIS CHICAGO

Cutting Off Tool



URANIUM
High Speed Steel

NOTE THE BEND

This tool bent in severe service—the two companion tools which were not Uranium broke. The tool shown above did three times as much work as the regular tool.

"Uranium Tools Stand Up On The Job"

SEE YOUR TOOL STEEL MAN OR WRITE US

Standard Alloys Company

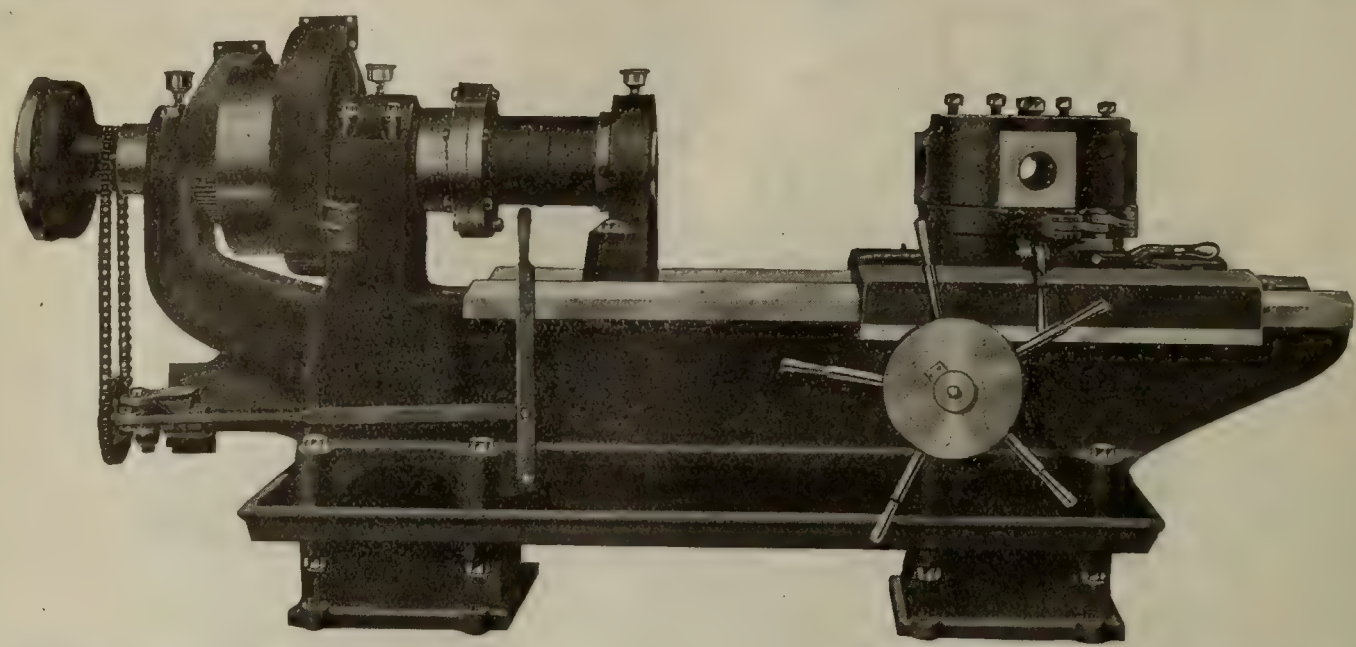
FORBES AND MEYRAN AVENUES

PITTSBURGH -:- -:- -:- PENNA.

IN STOCK—FOR IMMEDIATE SHIPMENT

SUBJECT TO PRIOR SALE

H.E.W. Boring Lathes To Handle Shells Up To 6"



MADE IN CANADA *SPECIFICATIONS ON REQUEST*

HYDE ENGINEERING WORKS

CONSULTING AND MANUFACTURING ENGINEERS

P.O. Box 1185 27 William Street, MONTREAL, P.Q.

IF YOU WANT THE

BEST BASE PLUGS, BUY BANFIELD'S

Have in stock for immediate shipment either threaded or bevel Plugs for 4.5", 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. *Write for prices.*

EDWIN J. BANFIELD

STAIR BLDG. ∴ TORONTO, ONT.

Manufacturer of Plug Milling Machines for above size shells. Prices and deliveries on application.

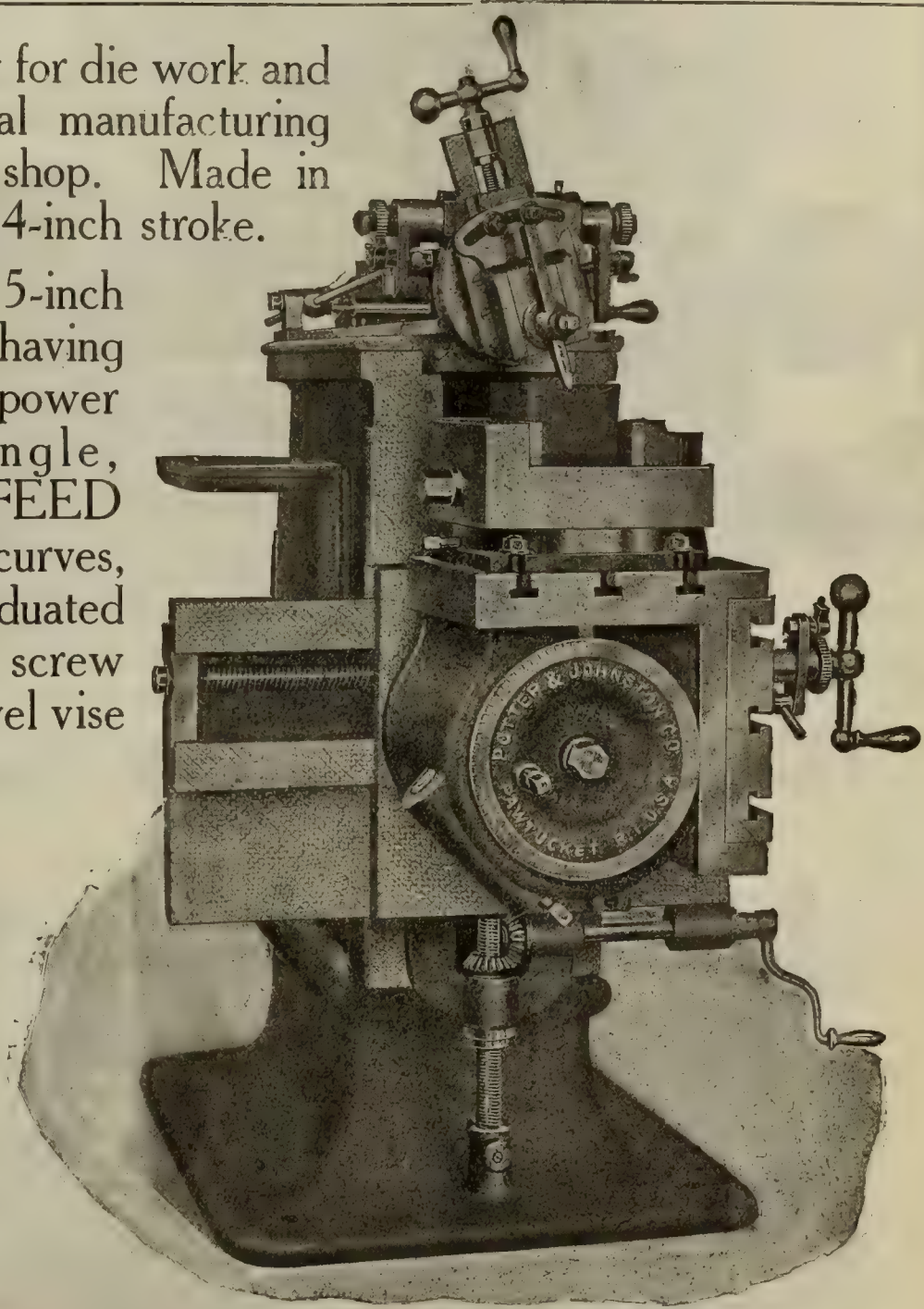
Potter & Johnston 15-inch Universal Shaping Machine

15-inch Stroke — 24-inch Stroke

The standard of efficiency for die work and tool room service, general manufacturing purposes and the repair shop. Made in two sizes—15-inch and 24-inch stroke.

Illustration shows the 15-inch model with swivel table having auxiliary tilting side, power down feed on any angle, POWER ROTARY FEED for planing internal curves, automatic feed stop, graduated collars on tool head feed screw and table feed screw, swivel vise with graduated base.

The simplicity of design, convenience of operation, extreme care exercised in their manufacture, and the many universal features of this machine, combine to make it the most efficient and reliable tool of its type.



WRITE FOR PRICES AND DELIVERIES

Canadian Offices **Potter & Johnston Machine Co.,** Pawtucket, R.I.

ROELOFSON MACHINE & TOOL CO., LTD.

Head Office: 1501 Royal Bank Building, TORONTO, CANADA

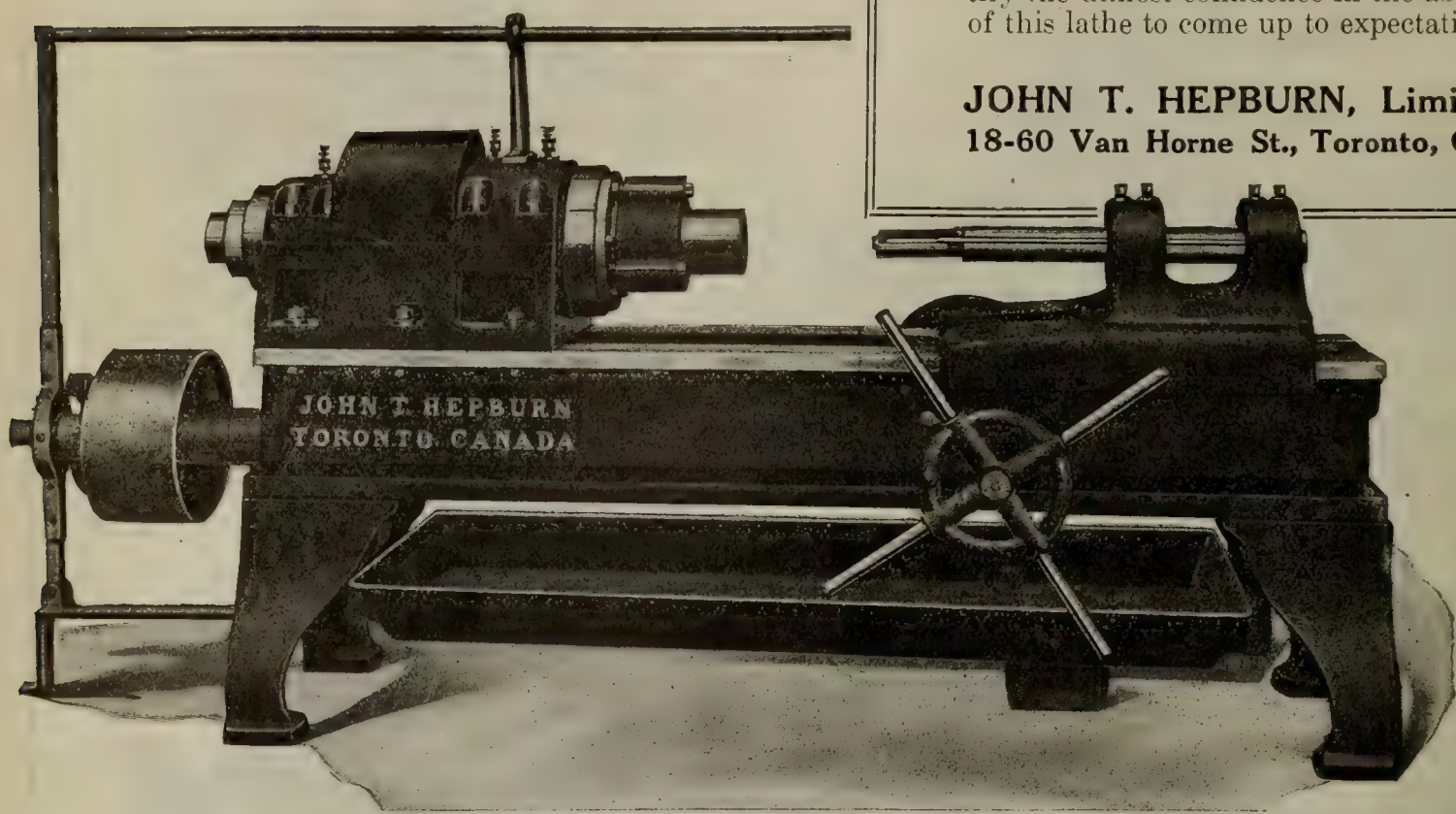
Works and Warehouse: GALT, ONT., CANADA

If any advertisement interests you, tear it out now and place with letters to be answered.

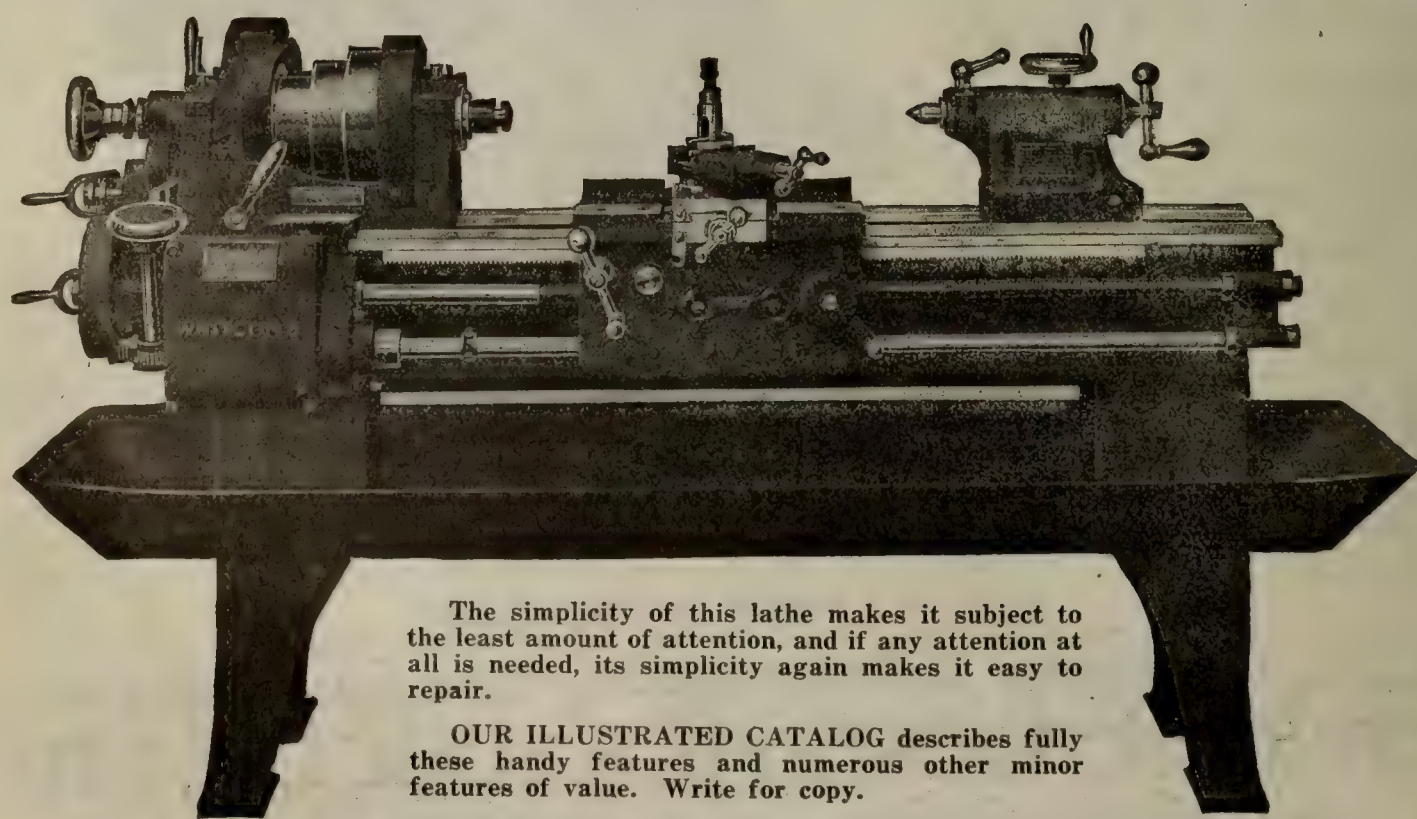
Are You Getting Results ?

Results are dependent upon two things: speed and quality. If you get speed without quality, yours is a losing proposition. This Hepburn 6″ boring lathe gives both speed *and* quality. The results obtained by Canadian users justify the utmost confidence in the ability of this lathe to come up to expectations.

JOHN T. HEPBURN, Limited
18-60 Van Horne St., Toronto, Ont.



The Whitcomb-Blaisdell Tool Room Lathe



The simplicity of this lathe makes it subject to the least amount of attention, and if any attention at all is needed, its simplicity again makes it easy to repair.

OUR ILLUSTRATED CATALOG describes fully these handy features and numerous other minor features of value. Write for copy.

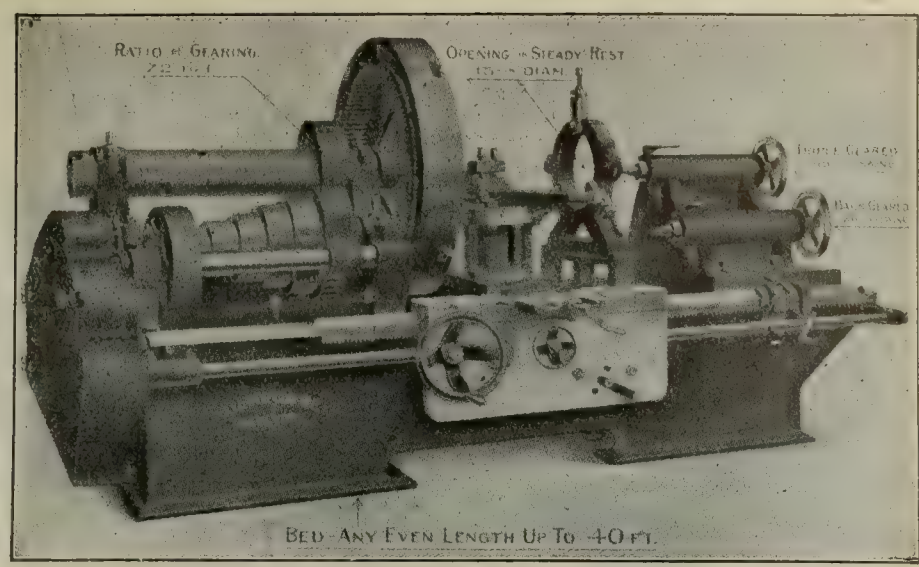
Whitcomb-Blaisdell Machine Tool Co.

Engine Lathes **WORCESTER, MASS.** **Metal Planers**

One Ship-building Plant

wrote to six different Lathe-Builders

and bought McCabe's "2-in-1" Double-spindle Lathe—on a 30-ft. bed—because it was "different" and built especially for such a wide range of work.



McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing As a 48 inch Triple-Geared Lathe

What other big Lathe can you get, and have full use of your Lathe, whether you have big or small work?

What Lathe Manufacturers except McCabe could make such a low price possible?

No other Lathe builder turns out 48-inch Lathes in such big lots at a time, making the parts all duplicate and interchangeable.

And in addition to the 48-inch Triple-geared Lathe, the 26-inch is the "Lathe plus" feature McCabe offers you—at no extra cost.

DOUBLE service—convenience and capacity—all described in Latest Bulletins.

J. J. McCABE, 149 BROADWAY, NEW YORK

Improved Centering Machine

Mr. Shell Manufacturer:

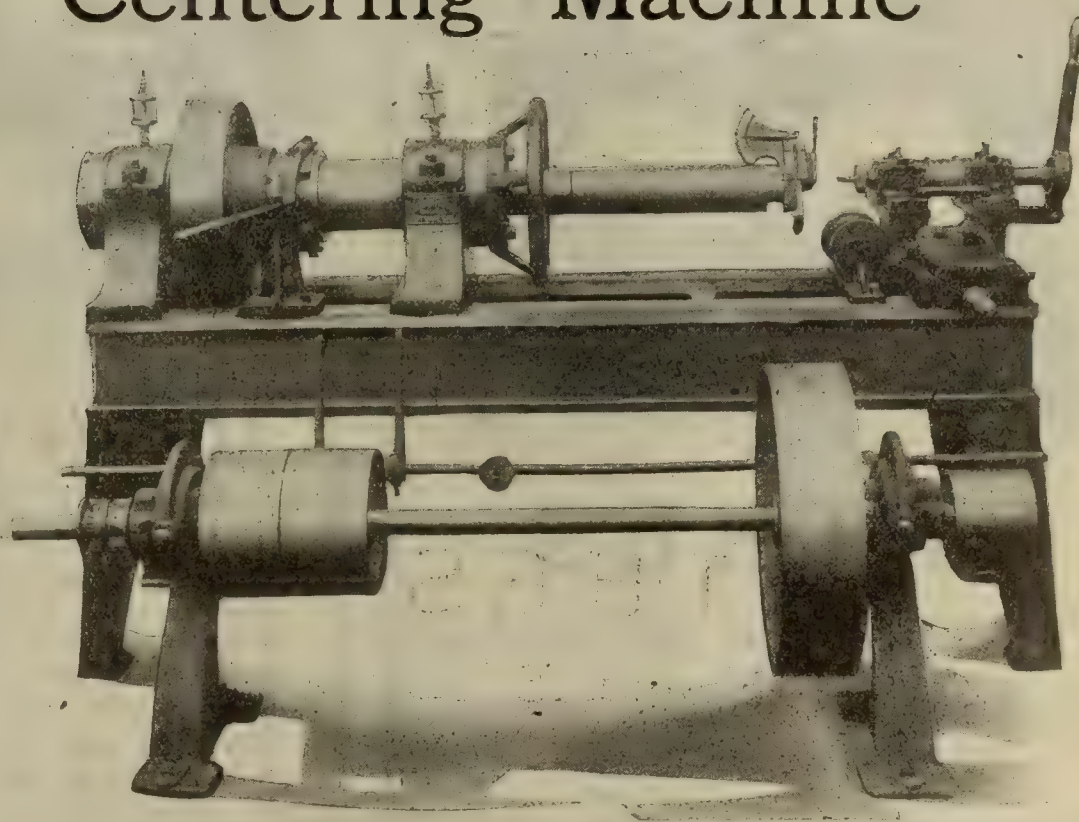
The importance of centering is obvious.

This tool is giving real satisfaction every day and stays on the job.

Write for price and description.

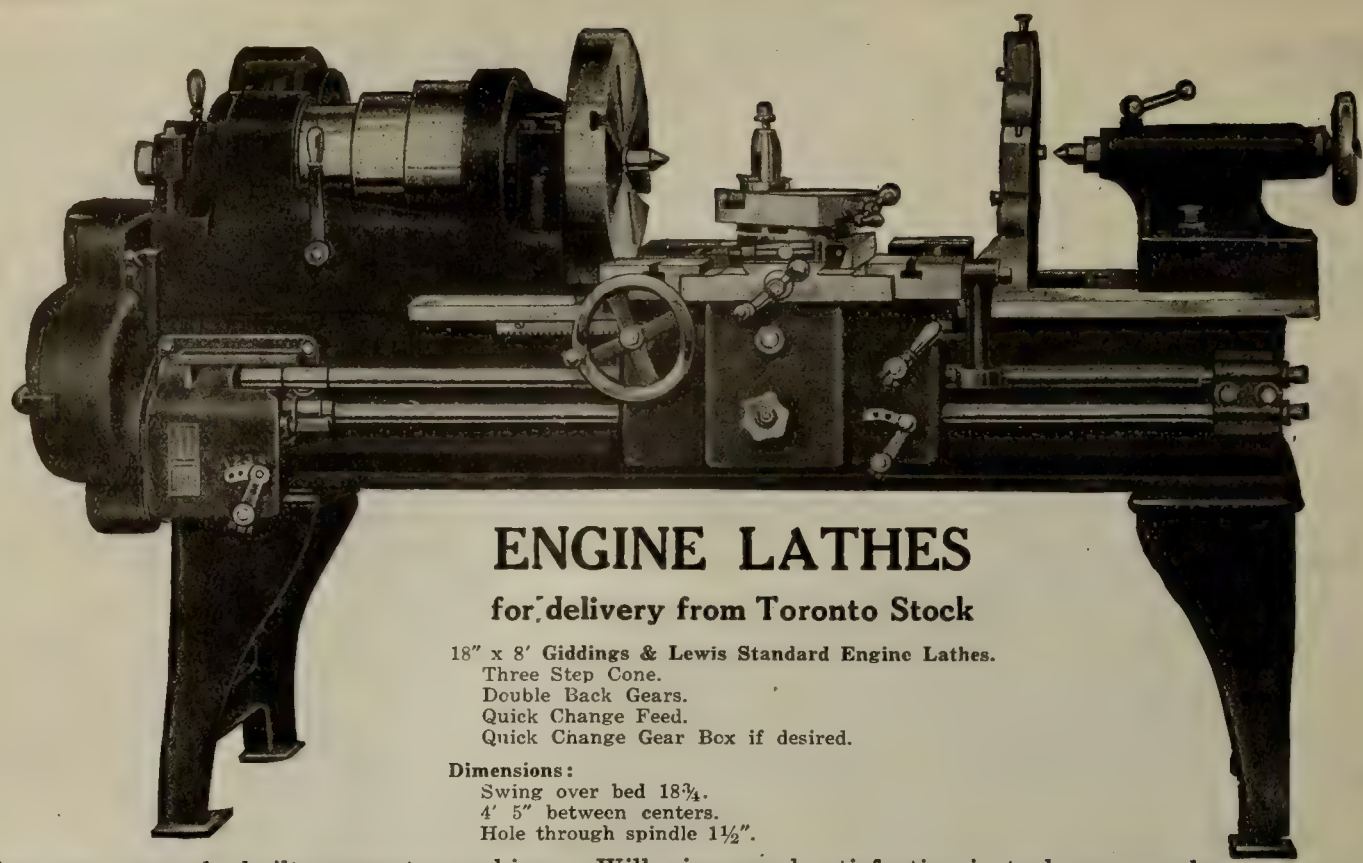
Delivery, ship 10 days after order.

Shipping weight 2040 pounds.



VICTORIA FOUNDRY COMPANY, LIMITED

OTTAWA, ONTARIO



ENGINE LATHES

for delivery from Toronto Stock

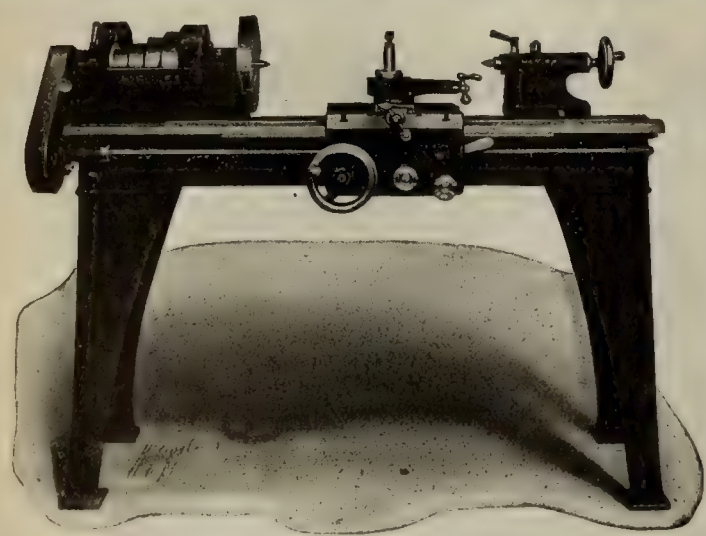
18" x 8' **Giddings & Lewis Standard Engine Lathes.**
Three Step Cone.
Double Back Gears.
Quick Change Feed.
Quick Change Gear Box if desired.

Dimensions:
Swing over bed 18¾.
4' 5" between centers.
Hole through spindle 1½".

These are strongly built, accurate machines. Will give equal satisfaction in tool-room or shop.
The following extras can be furnished if desired: Taper, Relieving or Draw-in attachment, Waving attachment, Hexagon turret on carriage, Pan pump and piping.

Write for full specifications and prices.

Garlock-Walker Machinery Co., Ltd., 32 FRONT ST. WEST, Telephone MAIN 5346 **Toronto**



LATHES

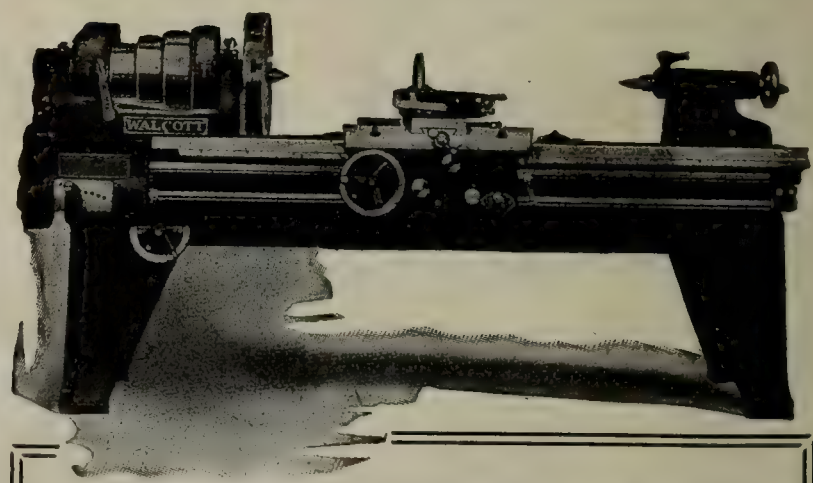
12", 16", 18" and 21" swing

Strictly modern in design, rigidity and accuracy guaranteed.

Himoff Machine Company

45 Mills Street

Astoria, City of New York, N.Y.



THE WALCOTT LATHE

is backed by lathe-building experience extending over 35 years

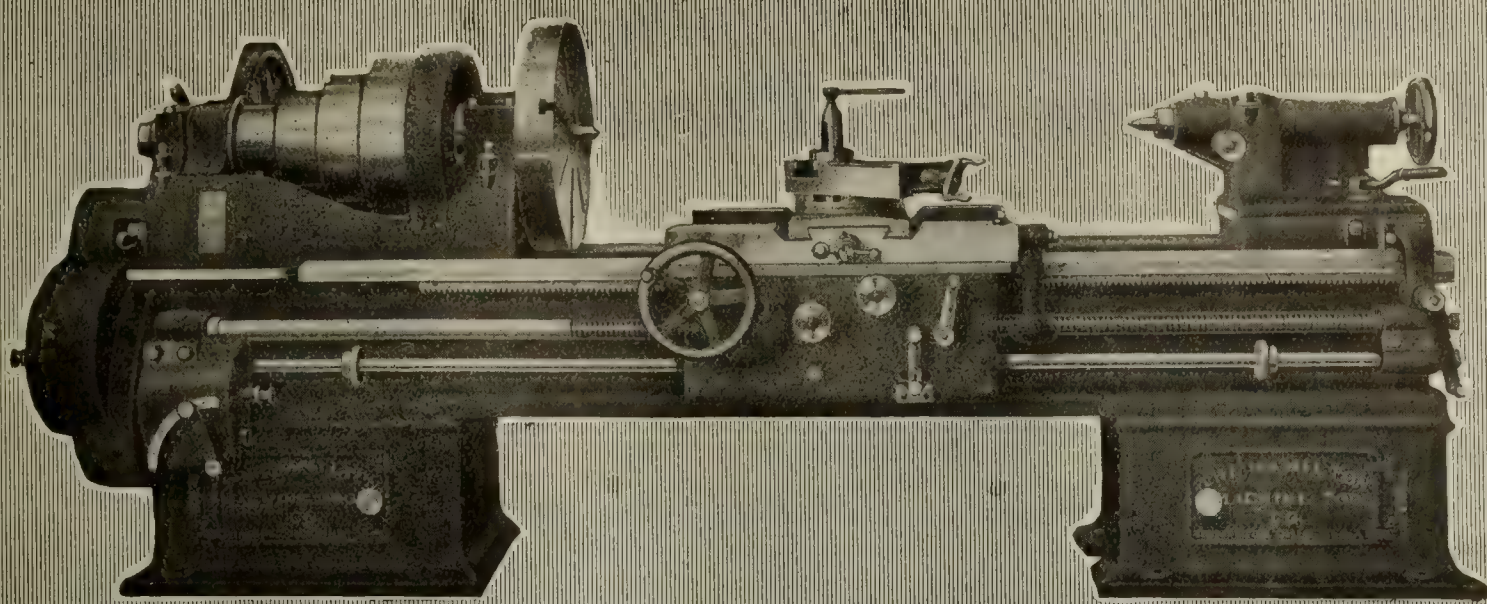
These are features of Walcott Lathes: drop-forged gears in apron; all-steel gears in gear-box; large ways on bed, all gears completely enclosed. Parts are interchangeable. Rigid headstock and tail-stock.

You'll get the full story in our printed matter. Send for it surely if you are about to buy a lathe.

WALCOTT LATHE COMPANY

Successors to

Walcott & Wood Machine Tool Co., Calhoun St., Jackson, Michigan



Hamilton Lathes

For 25 Years Makers of Fine Machine Tools.

Rapid Production HAMILTON Machine Tools

The "Hamilton" Line has a Reputation to Sustain.

THERE are two phases of production that require expert attention; those of *quality* and *quantity*. We have made a study of them for your benefit. The result is that we are able to offer you machine tools that give the highest efficiency and will still keep down the cost of production.

Illustrated here is one of our lathes. A close study on your part will partly reveal the care we have taken to give you a machine that is fitted to the needs of the day—greater production.

The "Hamilton Line" of machine tools is very complete and users are never tired of telling others of their features. A letter will command our immediate attention.

WRITE US TO-DAY.

The Hamilton Machine Tool Co.

HAMILTON *Sole Agents for Ontario:* **OHIO, U.S.A**

H. W. PETRIE, LIMITED, TORONTO, ONT.

The Success Obtained by Consolidated Presses

is due to the generous and correct proportion of the frame, the rigid bed construction, the extra long and wide slideways, the lengthy main bearings, the powerful clutch, large diameter and wide faced gears, steel pinions, the accurate machining and fitting of the various parts.

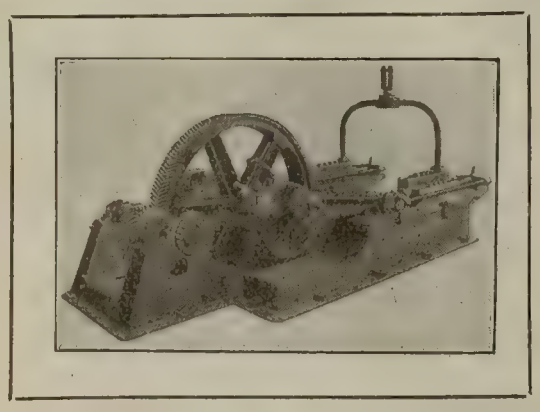
These are all vital points to be considered in buying presses.

Duplicate orders from satisfied Consolidated Press users are an indication that these features count.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver



ELMES

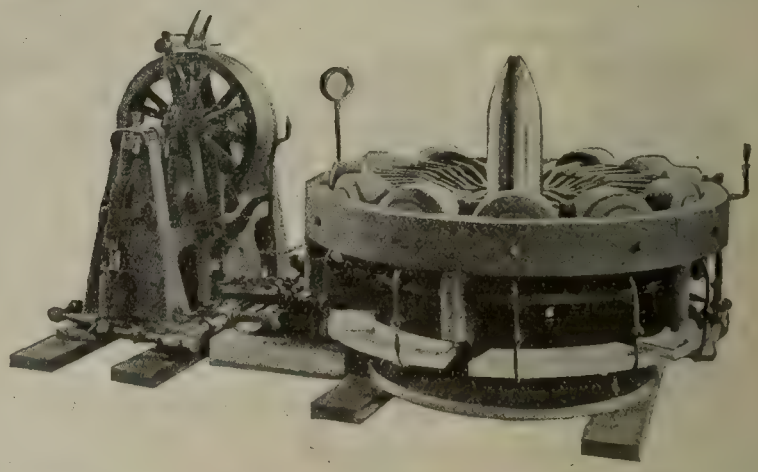
18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217 No. Morgan Street CHICAGO, ILL.



The New "West" Banding Press

For 9.2" and 8" shells

12 Cylinders; Ample Power; Ample Strength; Reasonable Price.

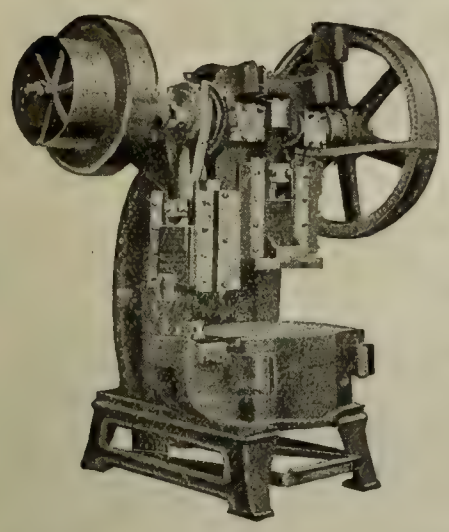
NO ACCUMULATOR REQUIRED.

The West Tire Setter Co.

255 Mill Street, Rochester, N.Y.

THE "TOLEDO"

Trimming Presses for Hot or Cold Drop Forgings



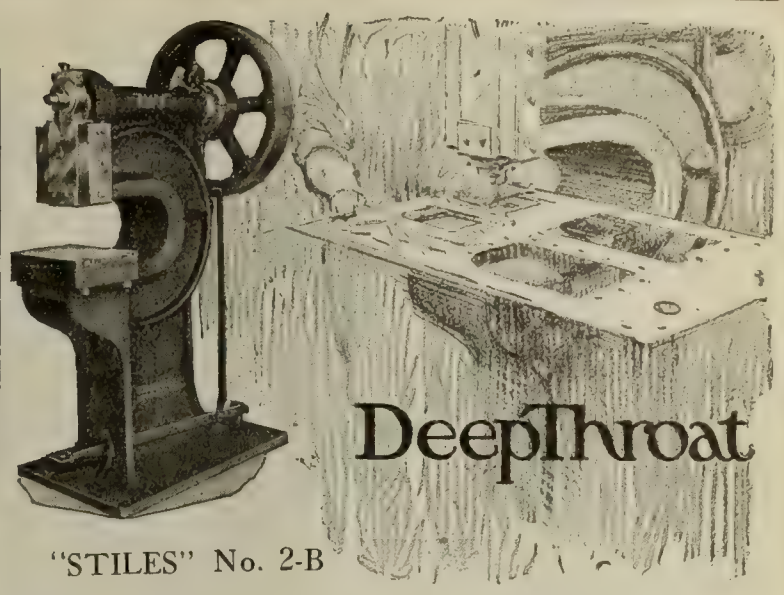
such as crank shafts, gear blanks, wrenches and other tools. A few of their advantages:

Massive slide construction with extra long ways and gibs. Outer slide can be arranged for blanking or punching, the two slides permitting the use, in combination, of a double set of dies for two operations in trimming or punching hot or cold work. Construction of press is very substantial and weight is carefully proportioned.

The

Toledo Machine & Tool Company

Toledo, Ohio



"STILES" No. 2-B

For reaching into the center of large sheets of metal, this model of the "Stiles" type of Press is provided. The massiveness of the frame and its special design make it rigid, even under the most severe punching strains.

E. W. BLISS CO.

Brooklyn, N.Y., U.S.A.

1857 1917

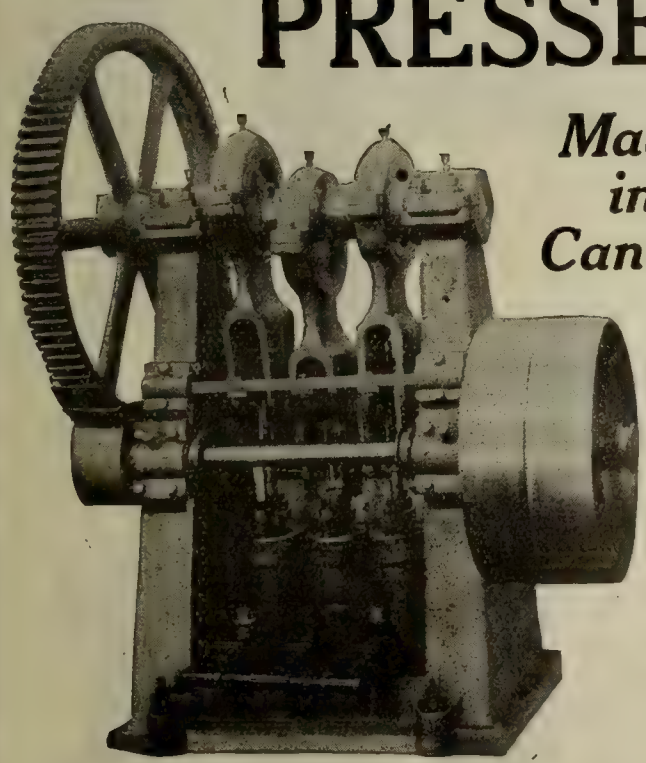
CHICAGO OFFICE People's Gas. Bldg. DETROIT OFFICE Dime Bank Bldg.

CLEVELAND OFFICE - Union Bank Bldg.

LONDON, S. E., ENGLAND Pocock St., Blackfriars Road PARIS, FRANCE 100 Boulevard Victor-Hugo St. Ouen

PRESSES

Made in Canada



Hydraulic Presses, Pumps and Accumulators for all purposes

WRITE FOR PRICES AND DELIVERIES

WILLIAM R. PERRIN, Limited

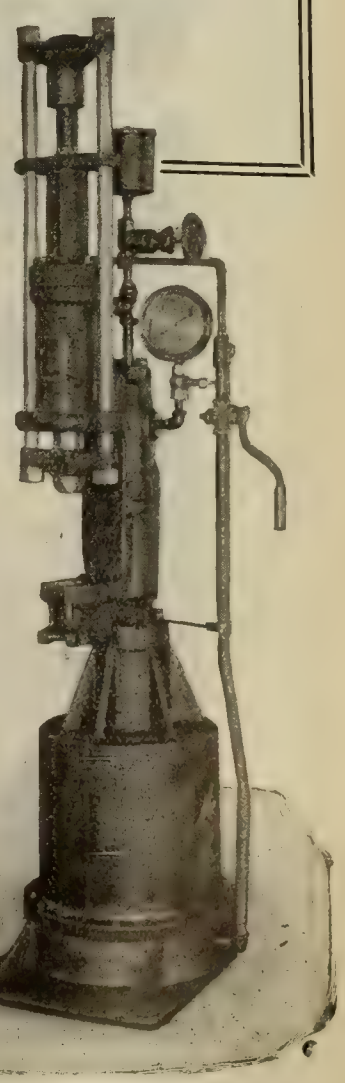
TORONTO, CANADA

Triple Purpose

"METALWOOD" COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.

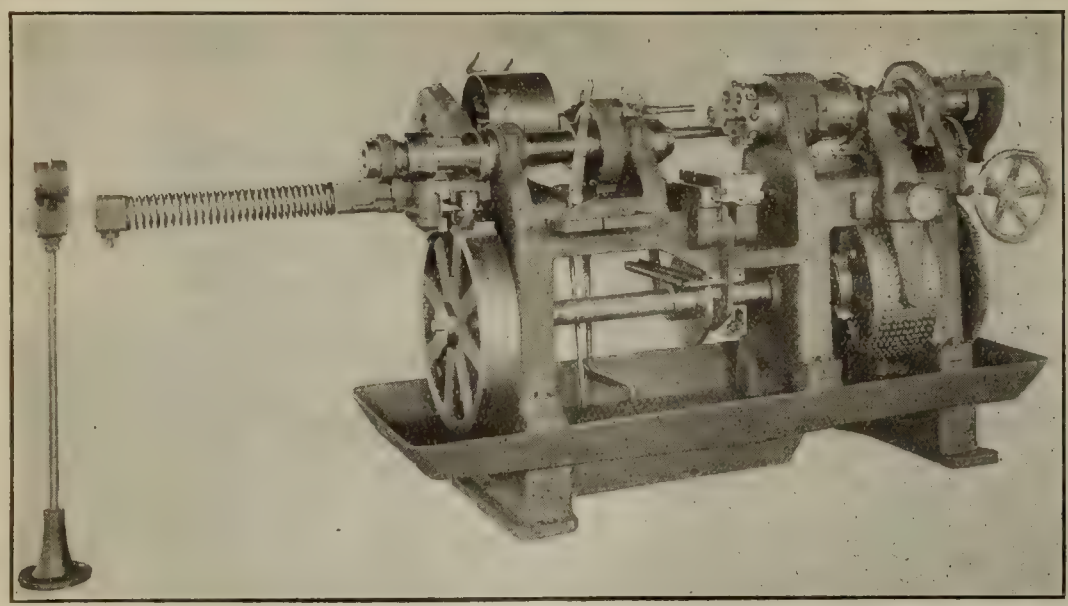


Metalwood Mfg. Co.

Leib & Wight Sts., DETROIT, MICH. U.S.A.

For Great Britain and Continent address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

If any advertisement interests you, tear it out now and place with letters to be answered.

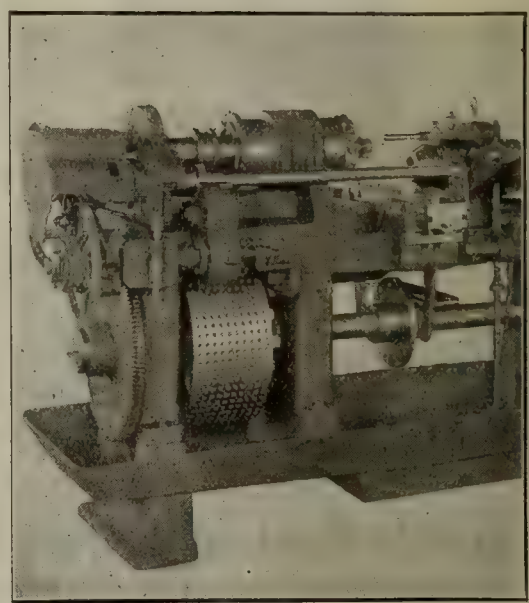


Quick Delivery

In less than six weeks from the time your order reaches us we can place

Chicago Automatic Screw Machines

in your plant ready for operation.



A NEW DEPARTURE IN TURRET INDEXING

By an indexing device—selective in type—one or more idle holes—holes not carrying tools—can be skipped in indexing without pause or loss of time—a feature that makes for increased production.

Chicago Automatics stand up under the strain of day and night service and economically turn out any screw machine product in minimum time. They are the result of 10 years' extensive screw machine manufacture. Drop a card now for details and specifications.

The John MacNab Machinery Co.

90 West Street New York

European Representative—JOHN MACNAB, Hyde, England

1 Second

One completed, perfectly finished rivet per second. That is the Grant speed. Not for a short time or a long time, but all the time. No hammer marks showing. Any degree of tightness or looseness desired. This great speed should materially reduce your operating cost and increase output.

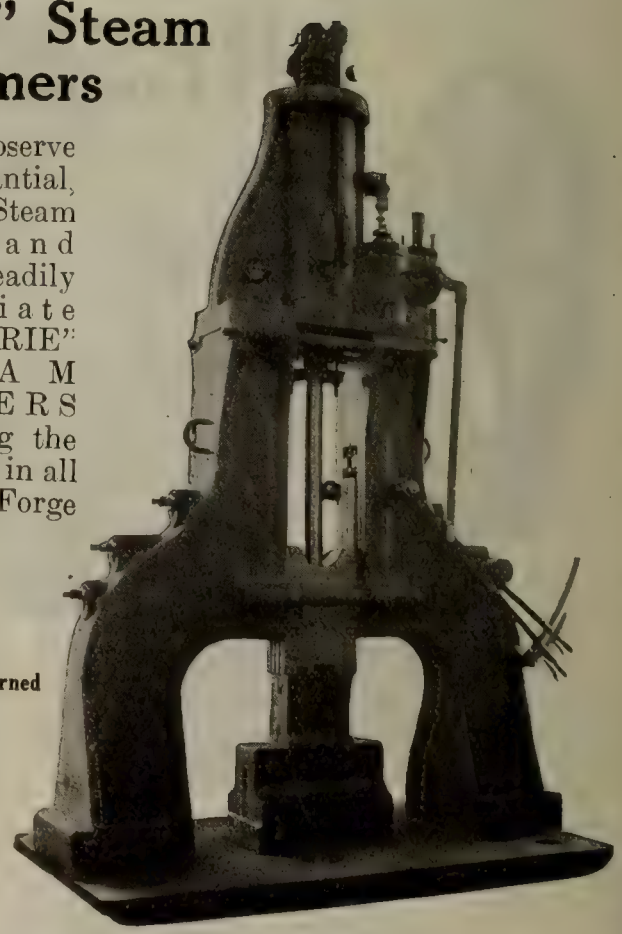
Our catalogue will reveal a great deal more. Write for it.

Grant Mfg. & Machine Co.

HOLLAND AVE. BRIDGEPORT, CONN., U.S.A.

"Erie" Steam Hammers

Closely observe this substantial, well built Steam Hammer and you will readily appreciate why "ERIE" STEAM HAMMERS are getting the preference in all modern Forge Shops.

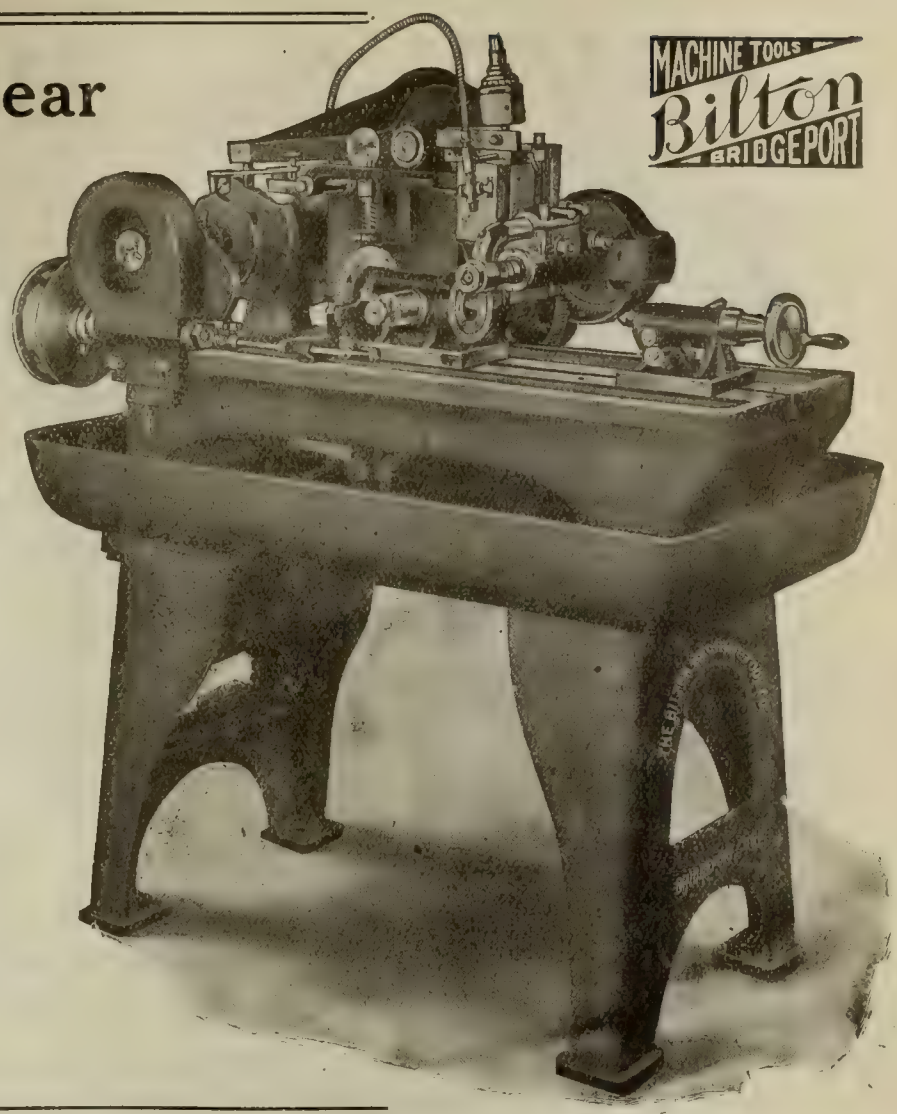


They have earned their enviable reputation.

ERIE FOUNDRY COMPANY

ERIE, PA. U. S. A.

Bilton Automatic Gear Millers—Spur or Bevel Gears



CAPACITY

No. 1 - - 14 Pitch
No. 2 - - 10 Pitch
No. 3 - - 8 Pitch

The Bilton Machine Tool Company

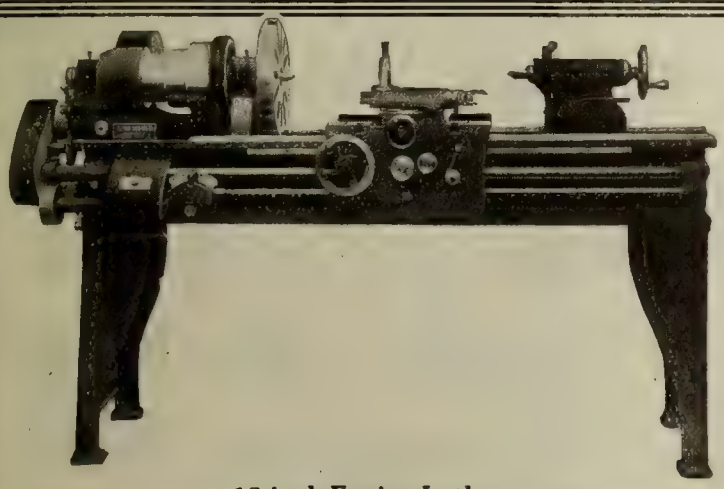
Succeeding The Standard Mfg. Company

Housatonic Ave., Bridgeport, Conn., U.S.A.

Also Manufacturers of —
Plain Horizontal Millers
Automatic Millers
Plain and Ball Bearing
Bench and Column Drills
Riveting Machines
Milling Cutters

Catalog 30 on request.

Foreign Agents:
Alfred Herbert, Limited
M. Mett Engineering Company
Chas. Churchill Company, Limited



13-inch Engine Lathe

The Filsmith Way

This is one way to make a short-cut to greater production and economic operation. With a 13¼" swing and 18 spindle speeds it will take in a great range and variety of work. Guaranteed material and workmanship are two expressions of our confidence in this machine. Write us and let us send you full specifications and information.

THE PHILIP SMITH MFG. CO.
Sidney, Ohio, U.S.A.

For Rapid Production and Accurate Work

USE THE

"BRIGGS"

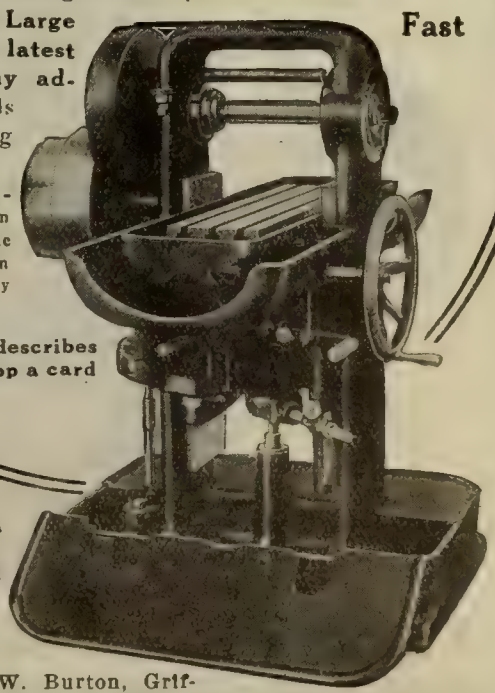
The Briggs Miller handles work no other machine of its size can touch. It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

The Base Tank and Large Gear Pump is the latest addition to its many advantages. Tank holds 20 gallons of cutting lubricant

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

Our booklet describes fully. Drop a card for it.

Fast

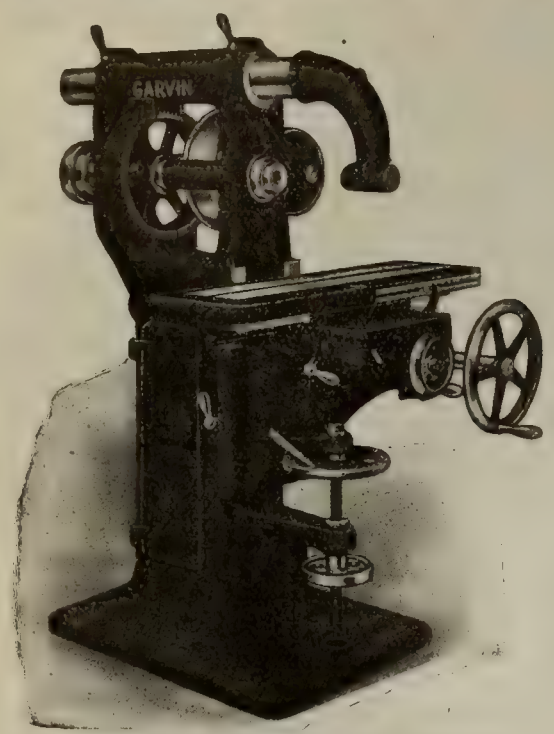


Gooley & Edlund Inc.
Cortland, N.Y., U.S.A

Foreign Agents: Allied America, France, Belgium, Italy, Switzerland, Machinery Company of Russia, Scandinavia, C. W. Burton, Griffiths & Co., London, Manchester and Glasgow, Barandiaran, Metivier, Gazeau & Cia, San Sebastian, Spain.

GARVIN No. 21 Plain Miller

Back Geared



No. 21 B.G. PLAIN MILLING MACHINE
Back Geared
Use Code - Abject

For Plain and Gang Milling for general manufacturing, and is used mostly in gangs of 5 or 6 machines to one operator. Spindle runs in adjustable bronze boxes, and is driven by a 3" belt through back gears (3 to 1).

Knee is our improved solid top design, rigid and stiff to resist side pressure of heavy cuts.

DIMENSIONS:

Automatic Feed of Table	18 in.
Adjustment in line with Spindle	6 in.
Vertical adjustment under Spindle	13 in.
Table, inside Oil Pockets	6 x 30 in.
Changes of Speed	6
Changes of Feed	6
Net Weight, Skidded	1,575 lbs.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

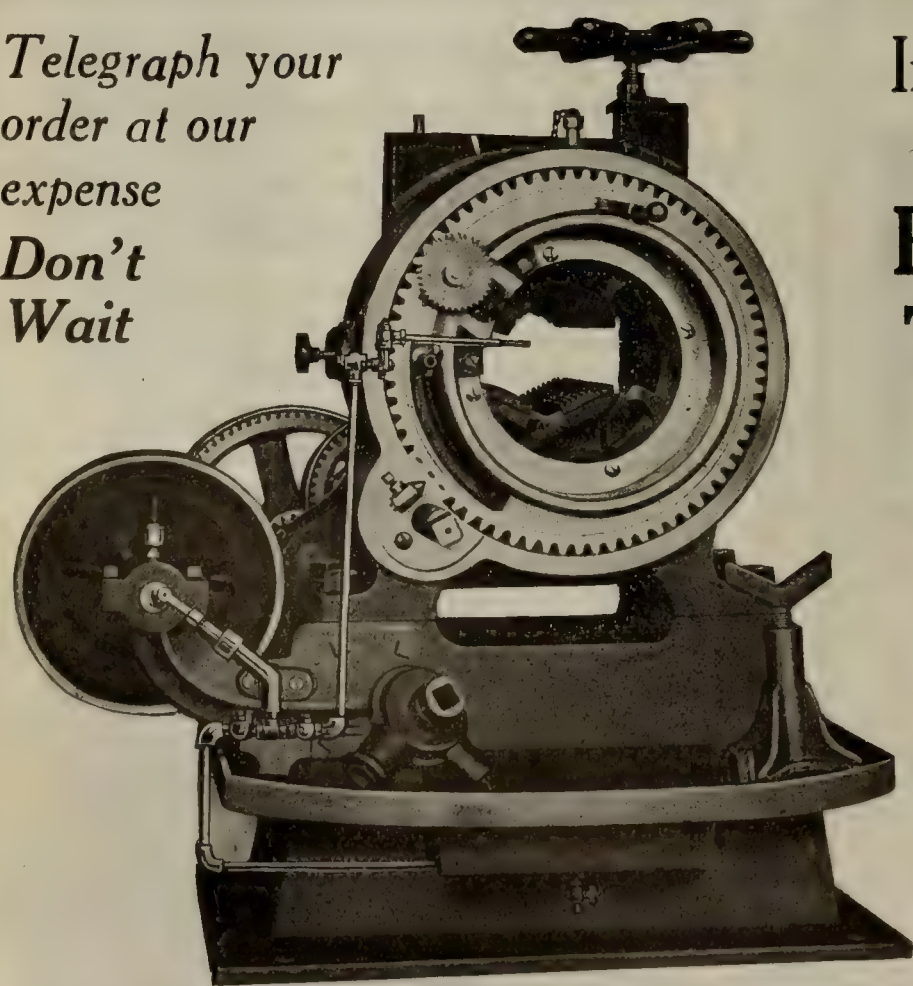
MANUFACTURED BY

THE GARVIN MACHINE COMPANY

Spring and Varick Streets *(Visitors Welcome)* **50 Years New York City**

Telegraph your order at our expense

Don't Wait



In These WAR Times

If you have need of a

Pipe Cutting and Threading Machine

You want to know three things and in this order:

Delivery

All sizes up to 15", for either Hand, Belt or Electric drive, kept in stock for immediate shipment. No waiting.

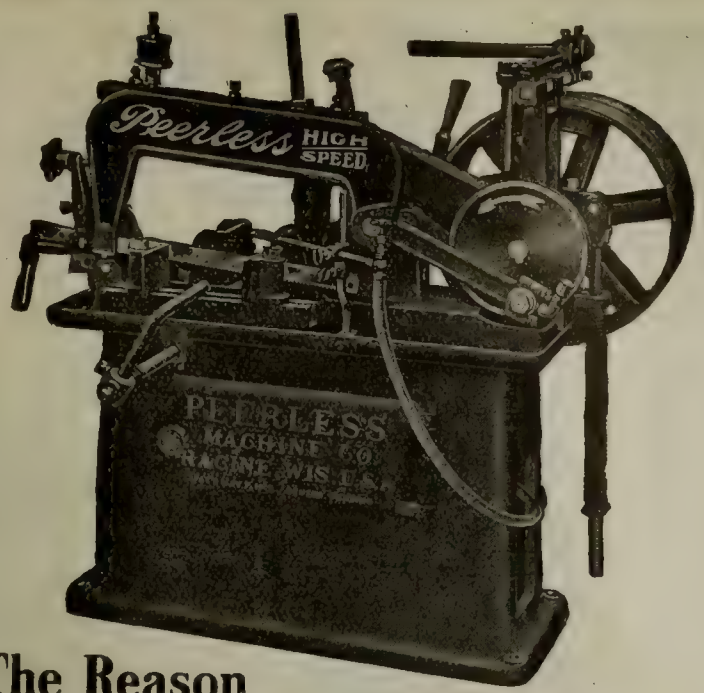
Quality

The original FORBES. Our specialty since 1882. More than 25,000 in use.

Price

Less than any other Standard Machine on the market, and less than half of many. Our system is the reason.

THE CURTIS & CURTIS CO., 115 Garden Street, Bridgeport, Conn.



The Reason For So Many Repeat Orders

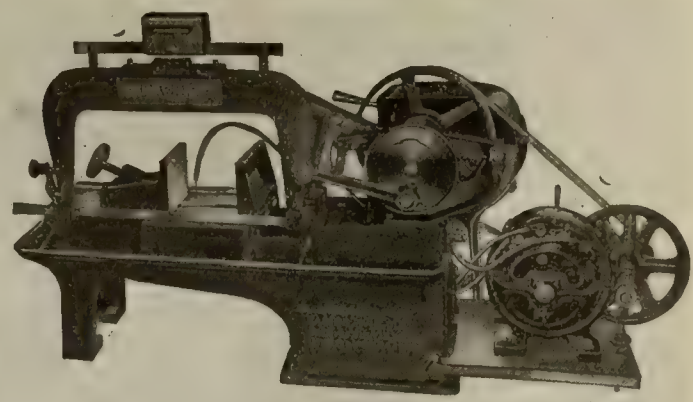
after comparative tests is that no magnifying glass is necessary to distinguish the increased production and the better class of work on the PEERLESS High-Speed Cutting-off Saw.

A third order just came in from one of the largest concerns in the United States, and is it not a fact after a firm has standardized on a certain make of tool that some real results must be produced in order to effect a change?

One of our customers writes: "It takes us only 1-15th of the time to cut our stock on the PEERLESS that it did on our other machine."

If you are open to conviction we have a proposition to offer that no manufacturer can afford to pass up.

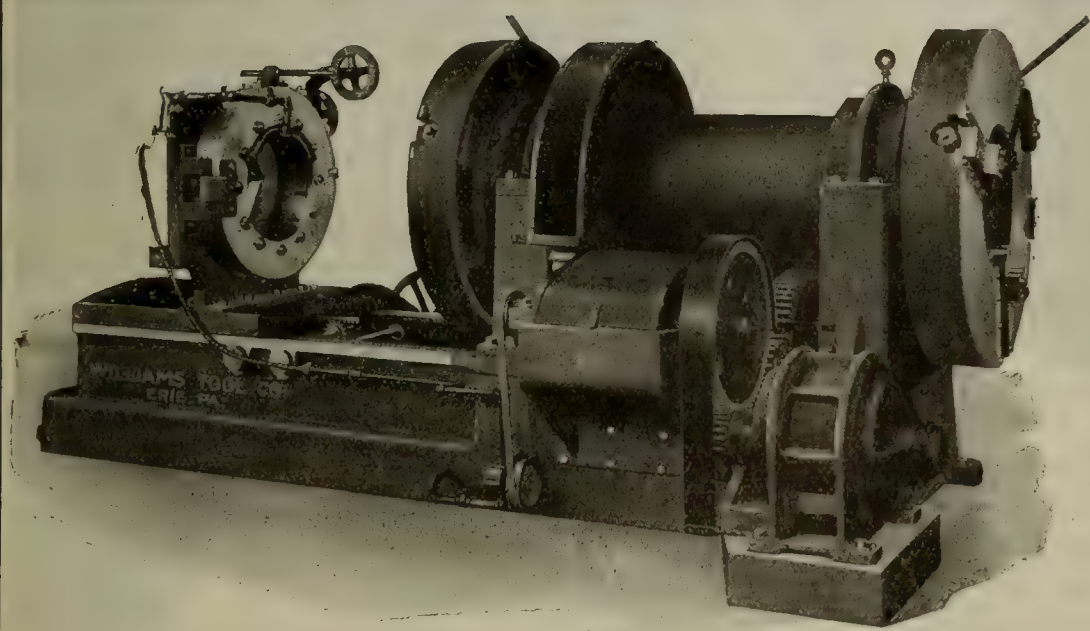
PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.



Your Cutting

How do you do it? Are your methods giving satisfaction? Are you getting the maximum production? With a Racine to compare results with you will get a better idea of the results you should be getting or could get. Metal cutting has been our study. It is the purpose for which our machines are built. We stand ready to co-operate with you in your cutting problems. Write us for information.

Racine Tool & Machine Co.
15 Melbourne Ave., Racine, Wis., U.S.A.



Highest Award Panama Exposition

Williams Tool Company

Erie, Penn., U.S.A.

Canadian Agents:
The A. R. Williams Machinery Co., Ltd., Toronto, Canada

European Agents:
Universal Machinery Corp. London, England

Pipe Machines

Threading
Cutting-off

Quality will tell in every test. At the Panama Exposition the Williams Cutting-off Machine was given the highest award. What does that mean to you?

It means that your pipe-threading and cutting-off operations will cease to give you any cause to worry if you are "Williams" equipped.

Made in 11 different sizes, each machine handling 8 to 10 consecutive sizes of pipe from ¼" to 18" dia.

Williams cutting-off machine is an investment, not an expenditure. It realizes exceptional dividends.

Write us at once!

Starrett
Tools
STARRETT
TOOLS
The Starrett Vernier Height Gage
assures the toolmaker and machinist of accurate guidance in laying out and checking up the progress of work.
Starrett tools are recognized as the standard for fine precision instruments where accuracy and quality of workmanship are essential.
Send for our free catalog No. 213 describing the 2100 styles and sizes of fine measuring instruments.
The L. S. Starrett Co., Athol, Mass.
The World's Greatest Toolmakers
42-617
BY INVITATION MEMBER OF

SMOOTH AS GLASS

That's the kind of grinding you want
That's the kind you get

WITH THE

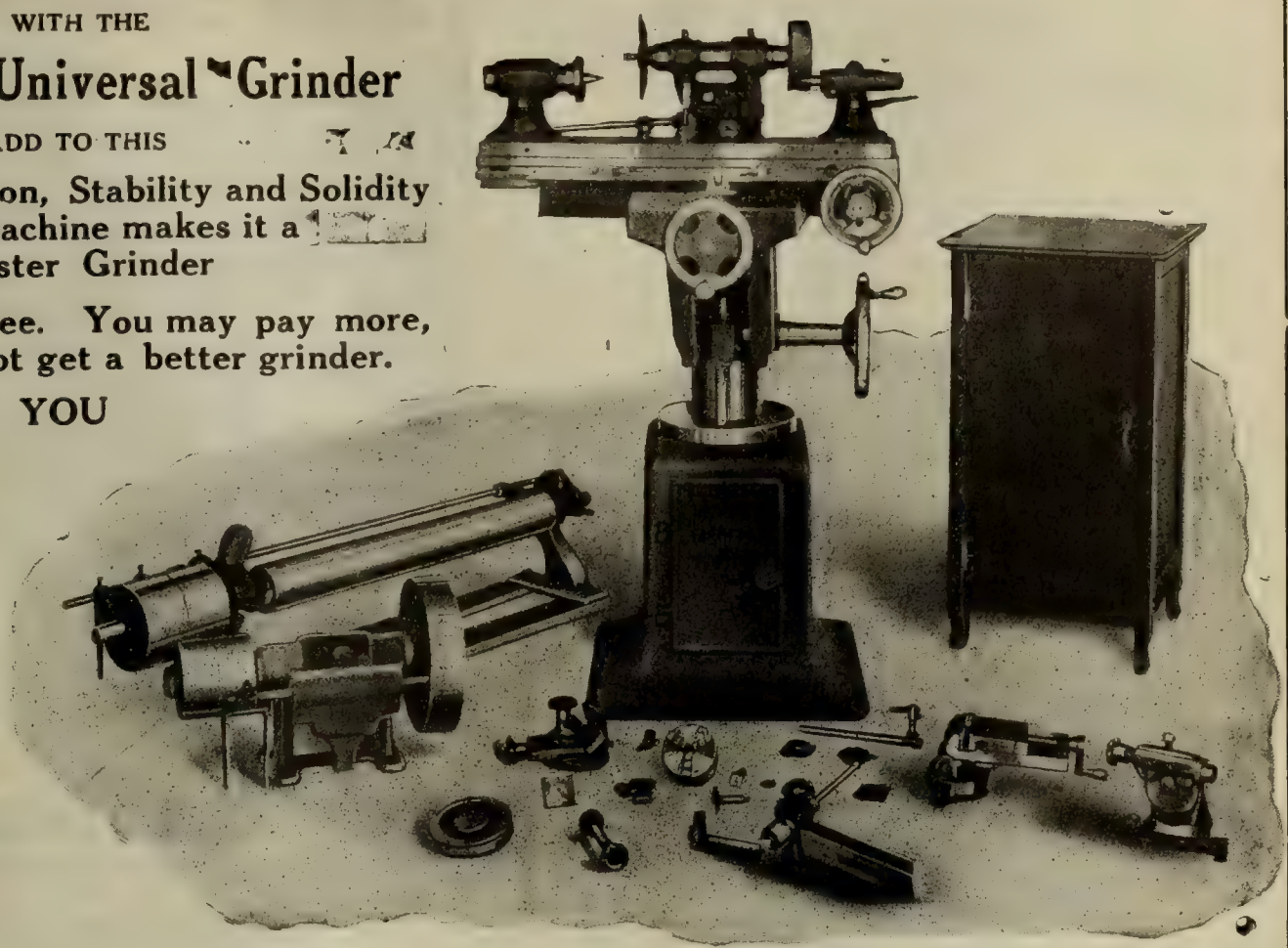
Dominion Universal Grinder

ADD TO THIS

Ease of Operation, Stability and Solidity of the Machine makes it a Master Grinder

Try One and See. You may pay more, but you cannot get a better grinder.

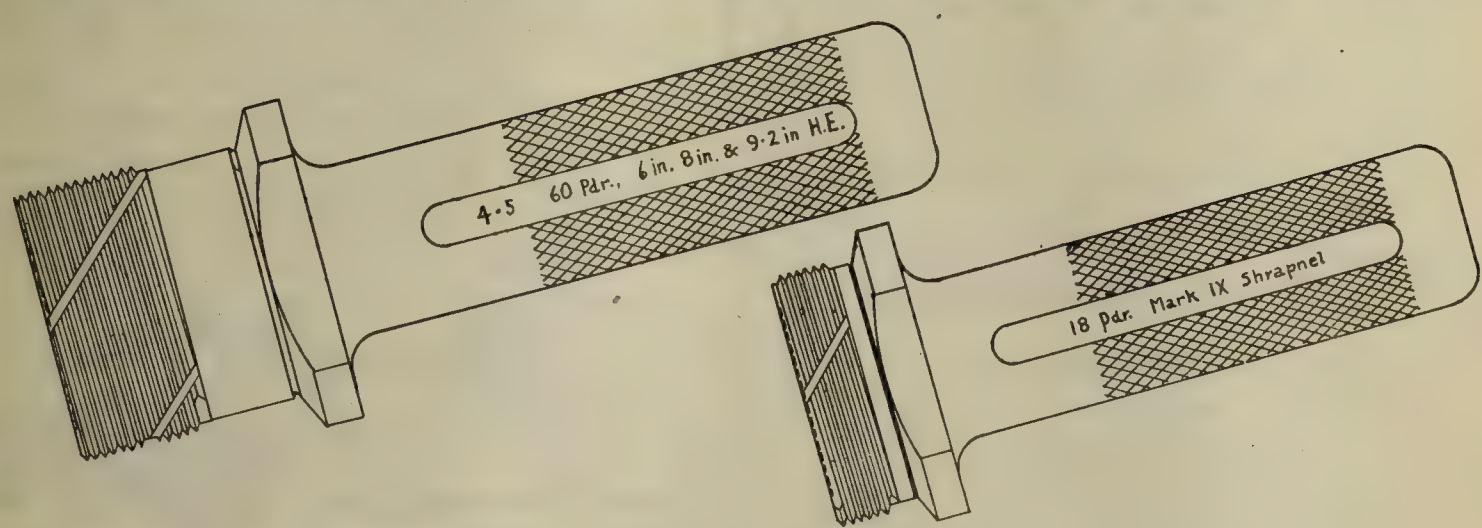
LET US TELL YOU MORE ABOUT IT



Dominion Machinery Company

110 Church St.
Toronto, Ont.
Canada

FUSE HOLE GAUGES

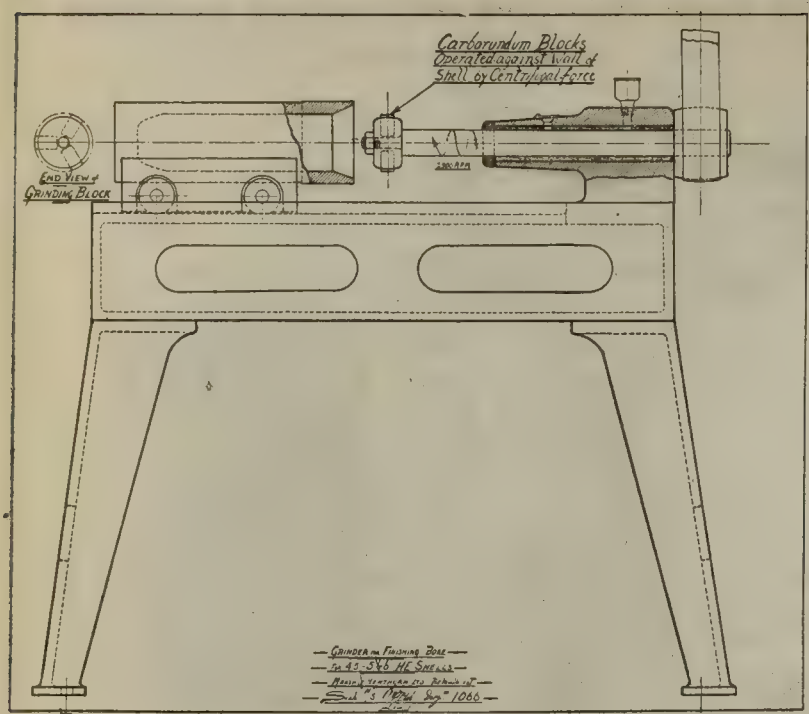


Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

If any advertisement interests you, tear it out now and place with letters to be answered.



Smooth Bores

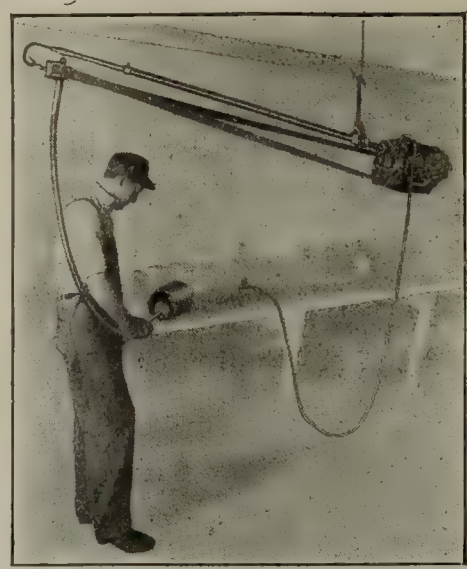
We have designed for our own use a simple and inexpensive grinder to give the final touch to the bore of our shells.

It does the work, and we will have some of these machines on the market shortly.

Write us for our proposition.

Marsh & Henthorn
Limited
BELLEVILLE, ONTARIO

Stow Shell Grinders Increase Production



Suspended Pedestal Mounted on Truck

Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.
Binghamton, New York, U.S.A.
Oldest Portable Tool Manufacturers in America

Assuming that you want a grinder that is better than the average—

A grinder with massive table, micrometer adjustments, very long knee and gibs, and extra heavy head and tailstock—it will pay you to investigate the

Standard No. 6
Universal Grinding Machine

In addition, you'll find that the headstock is fitted with large bearing for chuck spindle and with special bronze bearings of navy specifications, spindle is tapped and tapered, bored to take wheel arbors, and bearings are 1 in. in diam. and 2¾ in. long, and an exceptionally simple and sturdy countershaft with self-lubricating bearings.

Start the investigation by sending for the full details—to-day.

Simmons Machine Co., Inc.

1001 Singer Bldg., New York City
981 Broadway, Albany, N.Y.

Van Dorn
ELECTRIC TOOLS

The utility of a portable drill is best decided when applied to your needs. There are two features of utility that should be seriously considered when installing a portable drill. Range of operations and adaptability. This "Van Dorn" Portable Drill will drill holes in anything from wood to armour plate. Its portable feature makes it adaptable to interior or exterior work. The quality of work is uniform regardless of the angle or position. An actual saving of 20% to 80% is effected. The cost of the drill is not to be compared with the savings resulting from its use. Its substantial and sturdy build will keep it safe from repairs. Write for full particulars.

Install Utility as Well as a Good Tool

R. E. T. PRINGLE, LIMITED

Manufacturers' Agents

OFFICES:

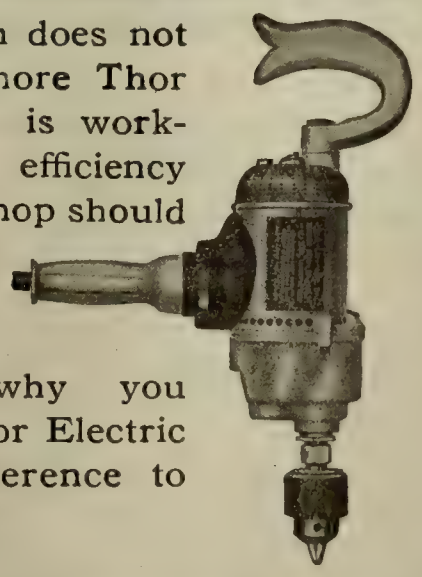
Tyrrell Bldg., 95 King St. E., Toronto

809 UNITY BUILDING - - MONTREAL
3402 OSLER AVE. - VANCOUVER, B.C.
302 DONALDA BLOCK - WINNIPEG, MAN.

Thor

UNIVERSAL Electric Drills

Licensed Under Burke Universal Motor Patent



No shop which does not use one or more Thor Electric Drills is working to full efficiency which every shop should do during these critical times. Let us demonstrate why you should use Thor Electric Tools in preference to other makes.

Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.

Toronto: 32 Front St. W; Winnipeg: 123 Bannatyne Ave., E; Vancouver: 1142 Homer Street

May We Repeat

THAT

P H

TRADE MARK

QUALITY FILES

are the only files made in Canada using BEST CRUCIBLE CAST STEEL exclusively in their manufacture. What does that mean to the user?

IT MEANS a keener cutting edge to the teeth, and longer life to the file. IT MEANS the stock has that "pep" in it so beloved of metal workers. IT MEANS that after a long and honorable career on the bench, there is still fine steel in the file which warrants the user in having it re-cut and put on the job again on less "fussy" work.

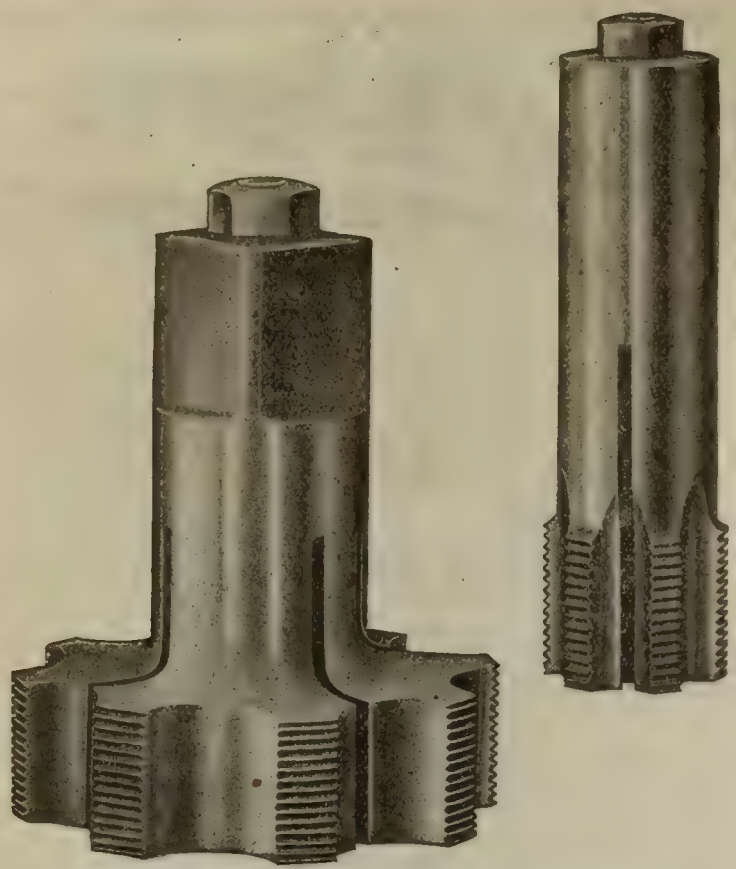
THAT IS TRUE ECONOMY.

Port Hope File Mfg. Co., Limited

Port Hope, Ont.

"Ask your jobber"

If any advertisement interests you, tear it out now and place with letters to be answered.



ADJUSTABLE
FINISHING TAPS

Will they stand up?
Will they produce?

These are questions which are uppermost in the minds of present-day buyers of *Adjustable Finishing Taps.* And they mean a great deal to manufacturers at this time, when deliveries are of such vital importance.

Are your threading jobs moving as fast as you would like to have them?

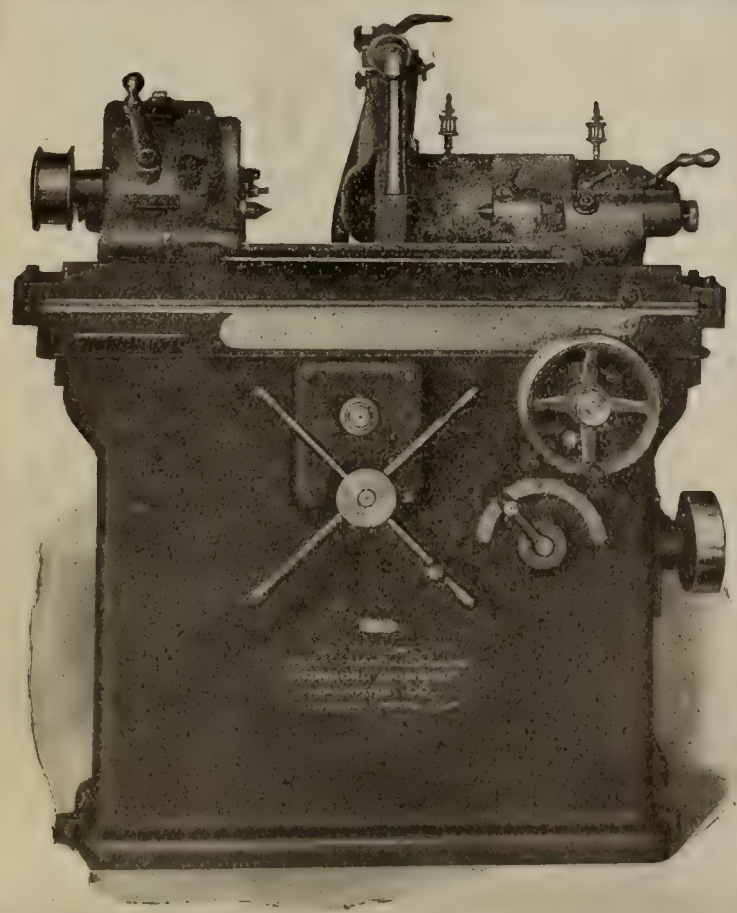
If not, tell us about it. We'll recommend a remedy for your threading troubles. If one of our standard products won't do, we'll prescribe a special tool. Forty years' experience and a factory devoted to specials enable us to give the best of service in screw-cutting problems.

Send for our general catalog. The most complete catalog of its kind published.

Wells Brothers Company of Canada, Limited
GALT, ONTARIO

Sales Agents: The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary.

FITCHBURG 6" x 20"
MANUFACTURING GRINDER



NO doubt if you were to tabulate the parts being ground in your factory, you would find a large percentage being ground on machines of very much larger capacity than the FITCHBURG 6" x 20" and possibly for no other reason than that the smaller machines do not have the required power, rigidity, and the present-day grinding capacity.

The FITCHBURG 6" x 20" is designed and constructed to meet the grinding problems put up to machines of very much larger capacity.

Model "A" power feed No. grinding wheel speeds (3) 1300-1550-1800 R.P.M.

Weight of machine about 4100 lbs.

Floor space 52" x 66".

Fitchburg Grinding Machine Co.
76 Winter Street **Fitchburg, Mass.**

Your Mark

On your product—is it the kind that proves your pride in the product? If your product is good, if its service is likely to recommend it, mark it so any one can easily tell who made it.

We make any form of a steel lettering die or stamp to mark your name, address, trade-mark, or any distinctive mark you desire to show on your product. Sixty-seven years in business as the largest manufacturers of our kind is the record behind Matthews steel lettering dies and stamps.

Our catalogue illustrates and describes a complete line of dies and stamps for every marking purpose. Send for it to-day.

Jas. H. Matthews & Co.

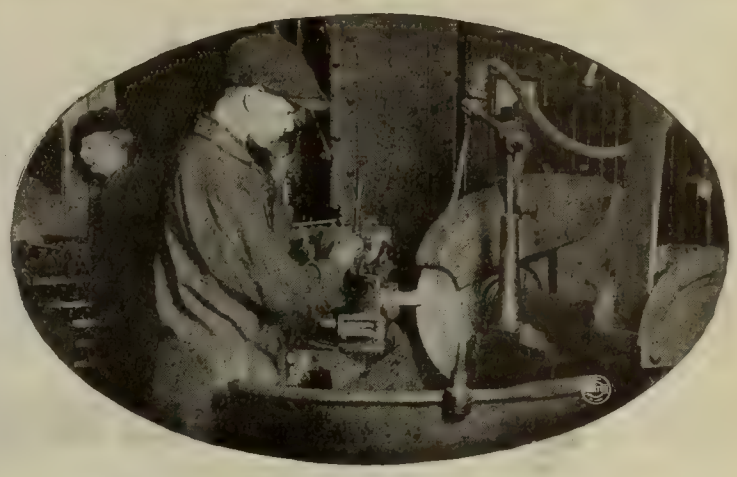
Established 1850

Pittsburgh, Pa.

Distributors for Canada

The CANADIAN FAIRBANKS-MORSE CO.

Montreal, St. John, Toronto, Winnipeg, Calgary, Vancouver, Ottawa, Quebec, Saskatchewan, Victoria



Grinding High Speed Steel Tools With Alundum Wheels

The wheel in use here is a 24 M Alundum made by the silicate process. Wheel selection for high speed steel depends upon the machine and other shop conditions.

The usual grains and grades furnished are as follows:

Gisholt	20 M and N	Alundum	Vitrified
	24 M to P	"	Silicate
Sellers No. 1	20 and 24 L and M	"	Vitrified
	20 and 24 L and M	"	Silicate
Sellers No. 2	36 L	"	Vitrified
	30 and 36 M	"	Silicate
Taylor	24 O	"	Silicate

TRADE MARK NORTON REGISTERED

NORTON COMPANY

WORCESTER, MASS.

Electric Furnace Plants:

Niagara Falls, N.Y. Chippawa, Ont. Can.

Canadian Agents:

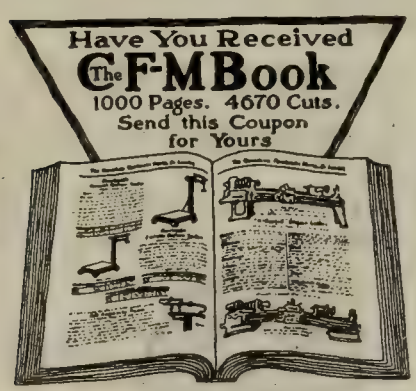
The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John. N.B.; Winnipeg, Calgary, Saskatoon, Vancouver, Victoria; F. H. Andrews & Son, Quebec, Que.

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED.

Manufacturing Plant Equipment

Drills
Reamers
Taps
Dies
Micrometers
Calipers
Rules
Gauges
Chucks
Vises
Lathe Tools
Hammers
Files
Saws
Drills

Blacksmiths
Tools
Anvils
Vises
Forges
Blowers
Wrenches
Grinding Wheels
Oil Stones
Polishing Wheels
Watchman's
Clocks
Bolts
[illegible] etc.,
Metal Stamps



4—Tools and Supplies

Economy of time, labor and materials is the keynote of manufacturing profits.

In the development of power, transmission, selection of machinery, it is of the utmost importance to secure the greatest output of work.

Even in the selection of your small tool equipment, the greatest care must be used. Remember, it is not drills but holes, that you are buying. The same applies to every tool that you buy.

The Fairbanks-Morse line of small tools includes everything necessary to equip the most complete plant.

Every tool has been selected after it has proven its ability to make good.

Secure our prices before placing your order.

The Canadian Fairbanks-Morse Co., Limited

Canada's Departmental House for Mechanical Goods

St. John
Windsor

Montreal
Winnipeg

Quebec
Saskatoon

Ottawa
Calgary

Toronto
Vancouver

Hamilton
Victoria

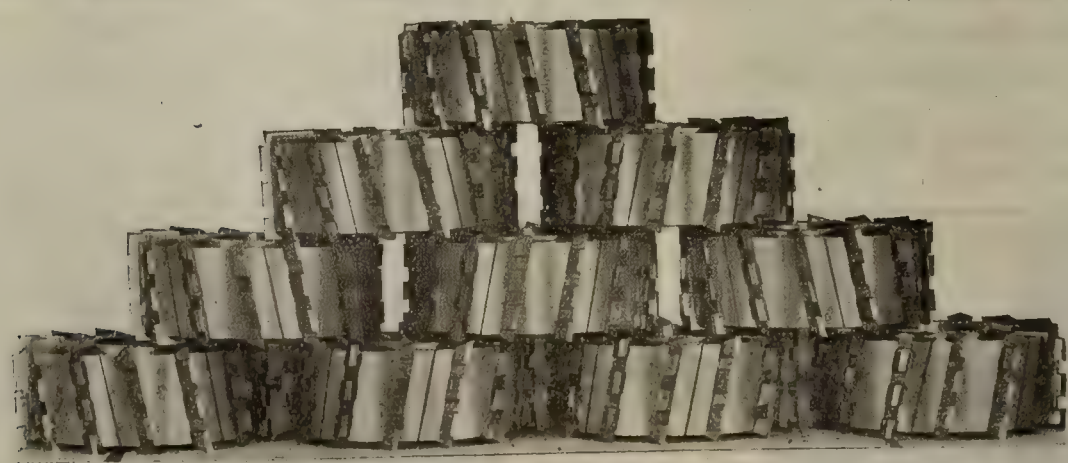


FIG. 1. VIEW OF MAIN BUILDING WITH TOOL ROOM AT LEFT. MACHINE DEPARTMENT IS AT REAR END NEXT STORAGE YARD.

Large Shell Production with Standard Machine Tools

Staff Article

Simplification of operations, their combination where possible and practicable, ample equipment for the required output, and the free use of labor saving appliances such as chucks, hoists, etc., with an equitably devised and sanely administered system of remuneration have all contributed toward the successful results obtained in a plant which in basic principles occupies a unique position in the field of industrial effort in this country.

MUCH has been written, said and done regarding the merits of special purpose versus standard types of machine tools with reference to shell production, and while in many cases the building of single operation machines of specialized design has seemed to be justified by circumstances peculiar to each case, sober reflection and careful consideration enable a strong case to be made out for the adoption of standard types of machines wherever possible. Numerous instances can be brought to mind by most readers where a judicious combination of operations with sensibly designed fixtures has enabled a gratifying output to be obtained from standard tools. Considerable success has been attained in some instances where operations have been based on this principle, and their success is all the more gratifying when it is remembered that special purpose machines have also been special price machines, the value placed on many of these tools being frequently in inverse ration to their cost, a feature which cannot but awaken more or less bitter memories among purchasers when they figure as to what the ultimate post-war, peace-blessed, close competition may have in store for them.

Certain it is that few lines of future work available for the numerous plants in this country will be of such a repetitive nature as shell production, and those plants whose equipment has been based on standard machines, will undoubtedly possess a distinct advantage if they remain in the manufacturing field, while in the event of the disposal of their plant, they will have a much wider field in which to look for purchasers than will be the case with special purpose machines, allowing that the latter could find a market at all.

Standard Equipment Efficient.

That standard machine equipment is little, if any, less efficient than the special purpose variety, is shown by the experience of the plant described herewith. Engaged in the machining of 9.2 in. shells and benefiting by an initial contract for 4.5 in. shells, the management succeeded in equipping their plant with standard machines tooled up in such a manner that the daily output exceeds 1¼ shells per man. The degree to which they have carried their policy will be understood from the fact that 85 per cent. of the machines used are standard lathes and drills, and 90 per cent. of these are by one maker. The ultimate financial aspect is more marked, less than 5 per cent. of the total plant investment is sunk in special purpose tools, which will have little or no applicability after the stoppage of shell production.

The economic value of such a policy becomes apparent when applied to the entire field of munitions manufacture. At the termination of hostilities, thousands of machines will be of scrap value only, not due to their condition, but to their design rendering them unsuited for the work then available. They must then be either broken up and sold as scrap, or, if used at all, may be much less efficient than a standard tool.

In either case, the tool depreciation which must be faced by the industry will reach a

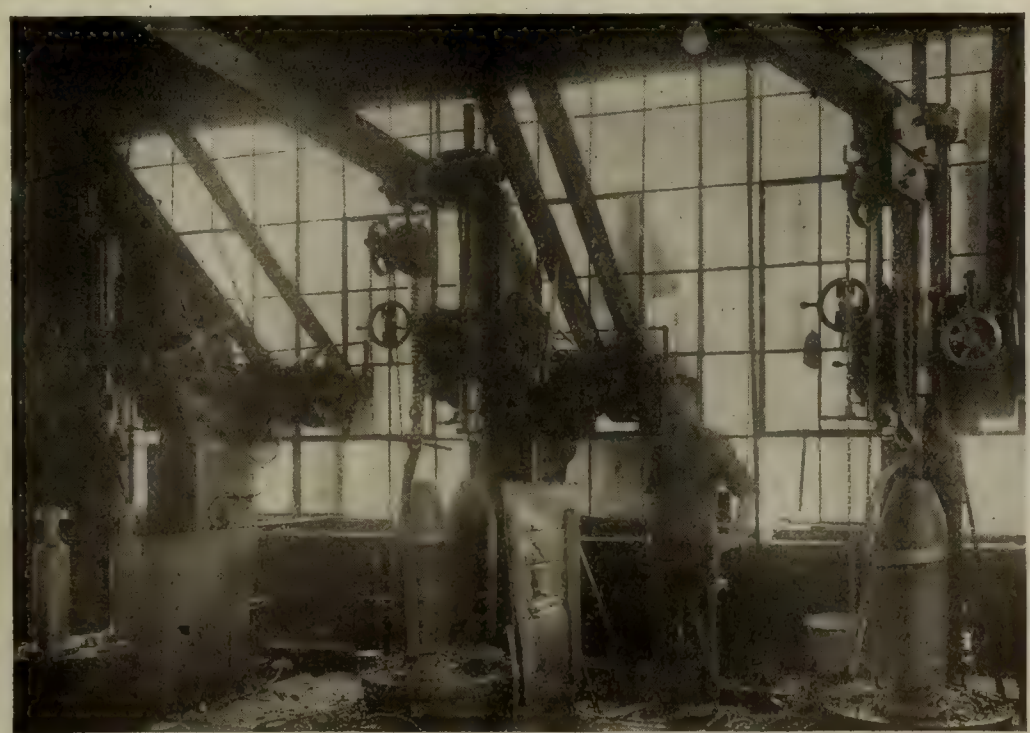


FIG. 2. DRILLING AND FACING NOSE IN HEAVY DUTY DRILLING MACHINES. DUPLEX ARBORS ARE FITTED TO THE REVOLVING TABLES.

figure formidable enough to be ranked as a national loss, which will be still further apparent if a recrudescence of legitimate manufacturing should create an ultimate demand for standard tools.

Its Ultimate Influences.

Such a development would render the present situation doubly regrettable, as the adoption of the standard machine policy would have many potential tool builders in possession of patterns, etc., wherewith to take care of the reconstruction period looked forward to by all the manufacturing nations. Be that as it may, the present instance has fully justified the policy of its sponsors, while from the labor point of view there is quite a lot to be said in its favor. A man who has spent two or three years in a single-purpose shop may be a workman, but is not by any means a mechanic. The same time spent in a standard-tool shop might not make the man a mechanic, but the broad familiarity with general purpose machines would make him a long way more useful and adaptable to later conditions. As far as present conditions are concerned, it can be said that the percentage of spoilt work has reached a minimum for this size of shell, the output per man is close to the maximum, while the earnings per man due to a carefully graded and wisely administered bonus system, are easily the maximum, not only for the class of shell, but for a wide radius from the plant location.

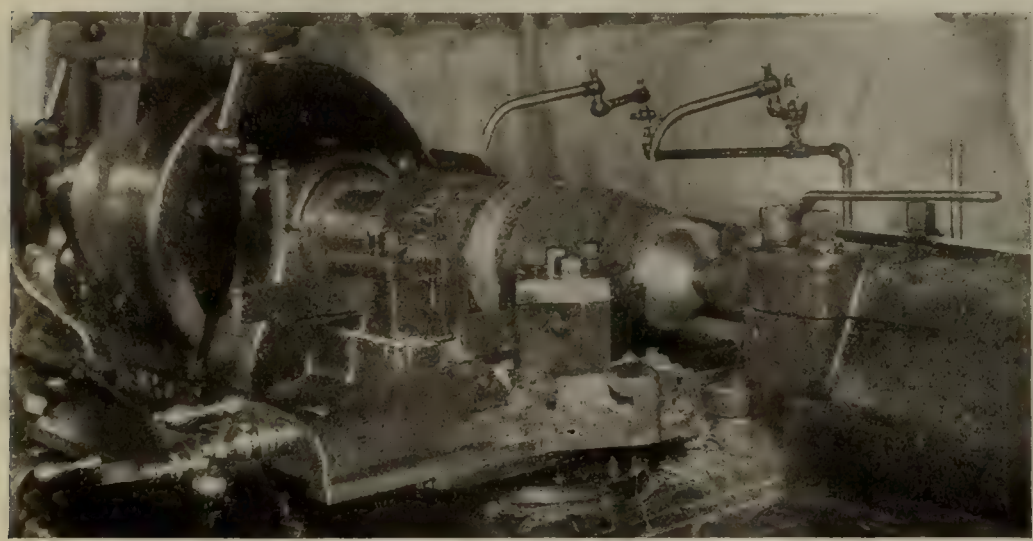


FIG. 4. ROUGH TURNING WITH EXTRA CROSS SLIDE ON REGULAR CARRIAGE. RADIUS LINK USED FOR FORMING PROFILE.

In the actual laying out of the plant, every advantage was taken of free interchange of facilities and methods which had been developed by shellmakers up to that time, the 8 in. contracts, which were already in course of execution at several plants, affording numerous points for consideratinn. Continuous progression was, of course, a prime requisite and its adoption was greatly facilitated by the type of building and track provision. A view of the complete plant, with the exception of the storage yard and railway sidings is shown in Fig. 1, the storage yards for the forged blanks being at the extreme end of the building, while the finished product is passed directly from the bond room into freight cars on the right side of the building along which a track extends nearly the full length.

Standardized Bulidings.

The building itself is of standardized type, being a No. 2 Austin unit, adapted for rapid construction and indefinite extension and duplication, and affording, in its completed state, an abundance of daylight, fresh air, large areas of unobstructed floor space, and adaptability to the installation of shafting and machinery. The front portion is devoted to office accommodation, the overhead space in the monitor roof providing ample space for an upper suite as shown. Fire protection stations consisting of hydrant and hose house are placed at convenient intervals.

The storage yard has space for many tons of raw material, which, on entering the building, turns immediately to the left and thence along the far side for about half the building length, doubles back up the centre aisle and returns by the near side, at which point machine work is completed and the work examined prior to banding and varnishing. These latter operations take place in the forward part of the building, after which the completed work passes through final shop and Government inspection departments towards the shipping point referred to above. The building to the left of Fig. 1 is the tool room, which is separated completely from the manufacturing departments. a desirable feature not always obtainable.

Principle Operations.

In Figs. 2 to 7 are illustrated the principal operations and the type of machines employed thereon. No detailed description of the technical requirements of the shells need be given at this time; the attention of the visitor is more absorbed by the obvious simplicity of the operations, the fewness of their numbers, and the mechanical excellence of such tooling outfits as were required to adapt standard type machine tools to intensive repetition work.

Only nine operations are necessary to bring the shells to that stage where they are ready to receive the adapters and undergo the remaining operations, of which the band turning is the only strict-

FIG. 3. MACHINING THE INTERIOR OF SHELL IN LARGE ENGINE LATHE WITH BORING TAILSTOCK AND SPECIAL CUTTING-OFF TOOL REST.

ly machining operation. Roughly outlined these are: (1), Drilling and facing the nose; (2), boring and cutting off open end; (3), reboring nose true with main bore; (4), turning exterior; (5), final boring and bevel facing of nose; (6), base recessing, etc.; (7), milling nose thread; (8), grooving and waving; (9), threading base.

Operation 1 is illustrated in Fig. 2, three Colburn heavy drills being fitted with revolving tables carrying two arbors each. The forgings are brought to these machines from the storage yard immediately outside, by two wheeled trollies, the shell being clasped round the body by a finger which is automaticallly controlled by the position of the handle. They are lifted onto the arbors by individual quick-acting chain blocks and a simple type of carrier. The upper ends of the arbors are fitted with beveled discs of such a diameter that they support the shell at a predetermined point of the inner nose profile. After drilling the nose, it is machined down to a fixed distance from the arbor disc to provide as far as possible a uniform amount of metal to be removed from the interior. The drill is started directly on the black surface and the facing tool is an ordinary double cutter of square tool steel in a stout arbor with a pilot point. The overhead tracks shown in Fig. 2 converge at the end of a runway bench on which the shells are deposited and on which they travel thereafter up to the preliminary inspection of machining. Each machine has its own chain hoist running on an individual overhead track so that the shells are lifted into and and out of position by each machine operator.

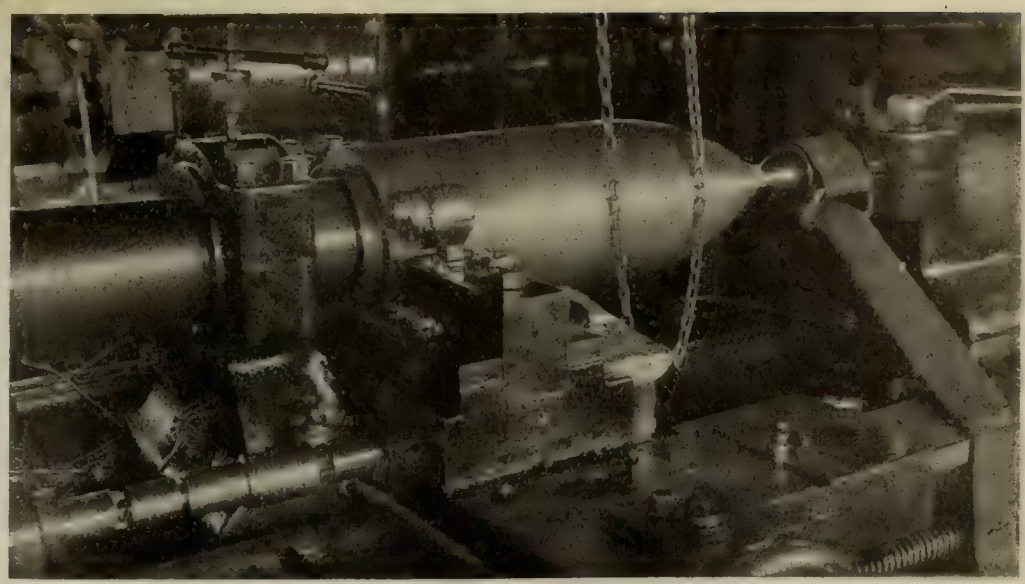


FIG. 6. STANDARD ENGINE LATHE WITH ECCENTRIC DRIVEN WAVING TOOL OPERATED THROUGH GEAR DRIVEN BY SHAFT FROM FACE PLATE.

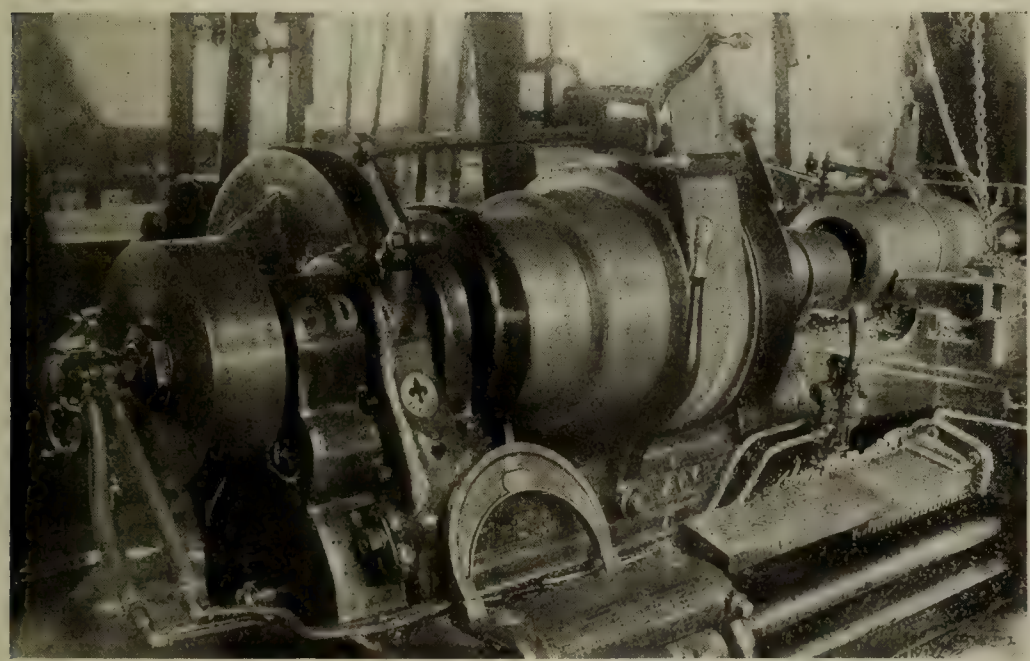


FIG. 5. FINISH TURNING LATHE SIMILARLY EQUIPPED TO FIG. 4, BUT WITH AIR CYLINDER OPERATING SIX-DOG EXPANDING ARBOR.

Importance of Boring.

The boring of the interior is the first major operation and every care has been taken, both in type of machines and tooling outfit, to insure the highest possible degree of accuracy, finish and output. The type of machine employed is shown in Fig. 3. It is a 27 in. heavy duty Le Blond engine lathe with sufficient length of bed to accommodate the special boring tail stock and bar. This tail-stock is clamped to the bed in a suitable position and has geared power feed by a pinion to a rack cut on the underside of the bar. A steady head guides the bar close to the mouth of the shell being rapidly clamped and loosened to either the bed or the bar. The bar also has rapid traverse by hand.

The shell is carried in a pot chuck fastened to the regular faceplate and supported by a heavy split babbitted outer bearing. The nose of the shell centres on a tapered pilot and when being placed in position, the open end of the shell is centred by a tapered plug on the end of the boring bar. While thus held in accurate location, three driving screws are tightened up in the outer end of the pot chuck, thus insuring an even division of metal around the interior and leaving any eccentricity of forging to be removed in turning. Three interchangeable boring heads are used to complete the interior—rough boring parallel with double cutters—rough boring profile with serrated acorn cutter—finish ream complete with smooth edge acorn. Seventeen machines of this type are installed.

The small but important job of reboring the nose hole to insure it being concentric with the main bore, operation 3, is done in a Hamilton 34 in. vertical drilling machine, with duplex arbor equipment on a revolving table similar to operation 1. In this case a pilot bush-

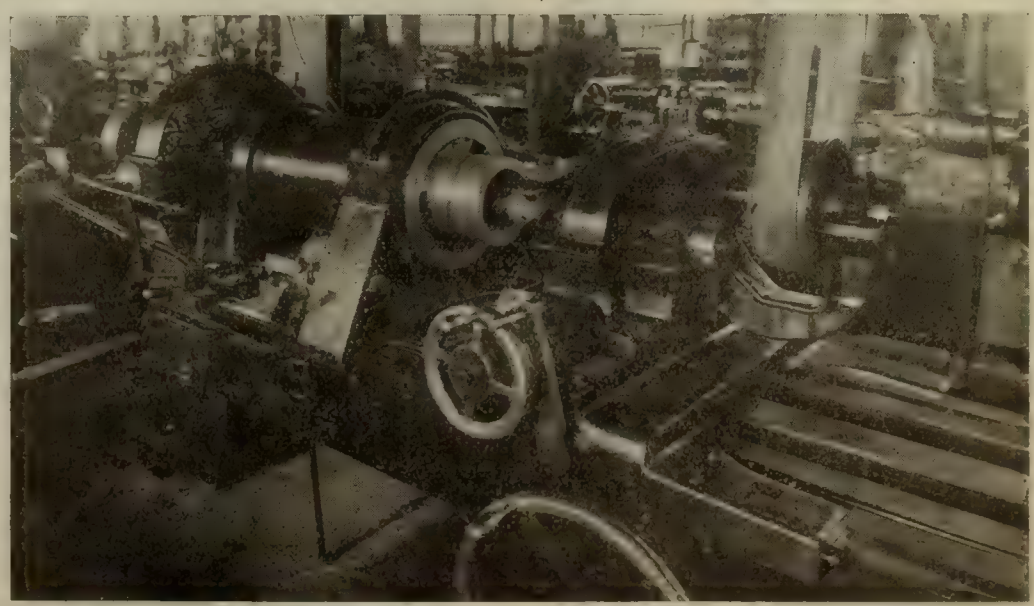


FIG. 7. MILLING THREADS IN BASE OF 9.2 IN. SHELL. MACHINE FITTED WITH AIR CHUCK, TRAVELING CARRIAGE AND TWO SPEEDS.

ing is fitted to the top of the arbor, to guide the lower end of the boring bar which carries a single point tool and takes a comparatively light cut; accuracy is the principal requirement of this operation. To insure this still more, the arbor is made of the plunger type so that as the weight of the shell causes it to descend, three smooth centring dogs are expanded out against the finished surface of the bore near its lower end, making the axes of the two bores truly coincident.

Turning in Two Stages.

The second and last major operation is the turning of the exterior. This is divided over two groups of machines, the first or roughing stage being done on fifteen 33 in. heavy duty Le Blond lathes. The shell is driven by an automatic arbor of the eccentric grooved type expanding against the finished bore. The nose is supported on a pipe centre in the tailstock. It is of interest to note that all the chuck and centre parts are made of casehardened machine steel and have given excellent service under prolonged use.

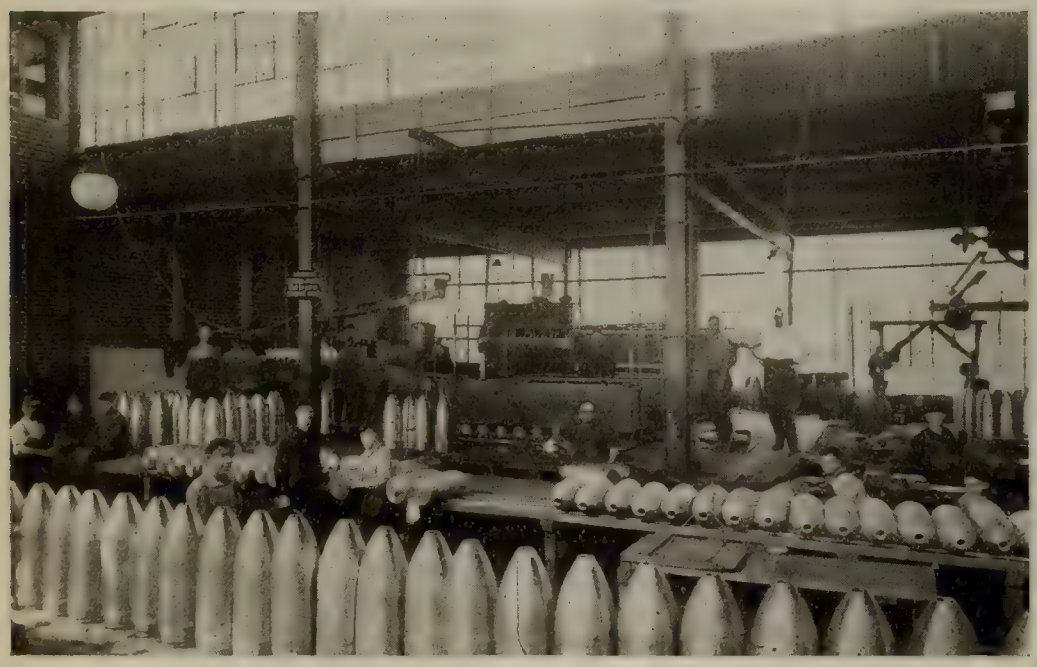


FIG. 8. FINAL OPERATIONS DEPARTMENT WHERE SHELLS ARE VARNISHED, BAKED AND INSPECTED BEFORE ACCEPTANCE BY GOVERNMENT OFFICIALS.

The standard tool slide of the carriage carries a heavy duty type of tool rest and is controlled by a radius link of the conventional type while turning the curve of the nose. An additional tool, for turning the parallel portion, is carried in a special cross-slide attached to the wings of the carriage, as shown in Fig. 4. The heavy duty imposed on these tools may be gathered from the fact that the clamping bolts on the swivel slide were not sufficient to prevent the side pressure on the tool from forcing it out of position, necessitating the fitting of round half and half dowels in the joint between the swivel slide and the cross slide. Positive stops to limit the rough turned diameter are fitted to each cross slide.

The second stage of the turning operation in which the exterior of the shell is finished to accurate size is performed in five 27 in. heavy duty Le Blond engine lathes with carriages similarly equipped to those just described. In Fig 5, which illustrates one of these lathes, the extra cross-slide can be seen on top of the carriage. Special driving equipment, however, is provided in the shape of air operated expanding arbors. This is clearly illustrated in Fig 5, the air cylinder, connections, and controlling valve being of M. E. C. manufacture, while the arbor consists of a special driver secured to the standard spindle nose, and fitted with six smooth driving dogs operated by tapered plug on end of rod from air cylinder. These dogs are staggered and provide the maximum number of contact points necessary to insure accurate centring of the bore, so that the finished exterior will be truly concentric.

Finishing Nose and Base.

In performing this work, operation 5, the bevel seat for fuse is first machined by a double cutter, whose limit of travel is determined by stop pins held in the same fixture as the cutters, and making contact with the curved profile of the nose, thus avoiding any necessity for locating the shell accurately in the chuck lengthwise, a proceeding which would be troublesome in view of possible variations in the overall length of the shell due to the base end being still unfinished.

The nose hole is now bored out to gauge and the countersink at bottom of threads cut by means of the crossfeed on carriage. During this operation the base end is closed with a wooden plug to retain the cutting compound which enters the shell. These machines are 21 in. heavy duty Le Blond lathes with turret rests on the carriage.

The base is now finished, operation 6, on machines similar to those used in operation 5. A tool, arranged to cut on the end of the shell, trims it to exact length, the counterbore formed for adapter flange, rags removed from newly formed edges and the radius formed on outside edge of base, the broad faced cutter used for trimming the base being provided with a filleted part to suit the required radius. Air chucks similar to those already described are fitted, the shell being positioned from the nose and driven by the body in pot chucks with outer steady.

Grooving and Waving.

Two Holden-Morgan thread millers handle the entire nose threading work, the shells then being grooved and waved, operation 8, on three 25 in. Le Blond engine lathes with special tool boxes fitted to the standard cross-slide, see Fig. 6. A right and lefthand thread feed shaft is fitted to the carriage and the rear or under cutting tool rest feeds in simultaneously with the waving tool in front. No attempt is made to form a preliminary groove or remove any metal from the portion on which the threads are formed.

The waving tool is operated by an eccentric to the right of the tool rest, the eccentric shaft being bevel driven through a lay shaft with universal joints, geared up to a rim on the face plate. This lay shaft is seen in the foreground of Fig. 6, as is also the air operated expanding arbor which drives the shell by the base. Threaded centre plugs in the nose engage with the tail centre.

Base Threading.

The equipment for this, the final preliminary operation, consists of three Holden-Morgan and one Smallev-General thread millers, the latter being illustrated in Fig. 7. It is equipped with M. E. C. air-operated chuck and like the others has a quick speed and facing tool for truing up the bottom of the recess to insure accurate seating of the adapter flange.

Concluding Operations.

The remainder of the work is similar to that in the majority of other shops on the same class of work. A Root and Van der Voort adapter driving machine, West Tire Setting Co.'s banding equipment, and Root & Van der Voort band turning machines complete the mechanical equipment. Nine electric ovens bake the varnish with which the interior of the shell is sprayed, after which the necessary inspections, markings, etc., are carried out, followed by boxing and shipping.

Figs. 8 and 9 show general interiors at each end of the building, the former including the spraying and baking ovens, etc., while the latter shows the general style of arrangement, all of the transmission and accessory equipment such as Chapman ball bearings and shafting, and Herbert Morris chain hoists being of Canadian manufacture. These views also give an excellent idea of the interior construction of a modern factory building; large glass area, adaptability of steel framing to shafting and layout, disposition of radiators below side windows, and also on monitor side lights and high-power incandescent lights with diffusing globes.

Reference has been made to the tool room being located in a separate building. Such an arrangement is preferable in a case like this, where the presence of a tool room in the main building interferes to a considerable extent with the layout of the path to be followed by the work. It also reduces the amount of interruption which some tool room executives suffer through being too convenient of access by the shop hands, and in the case of specialized tooling outfits like the present, the shop supplies can be well taken care of by a comparatively small tool crib in the main building. Interior view Fig. 10 shows the tool room —note the individual time clock for the men, also daylight on all sides.

FIG. 10. LARGE, AIRY, WELL-LIGHTED TOOL ROOM ASSISTS IN PRODUCTION OF ACCURATE WORK.

Although tool room work in a shell shop is confined to a few lines of cutters, reamers, bars, etc., the equipment required is quite extensive, and capable of a wide range of jig and fixture production, the absence of a planer being taken care of by a large milling machine. Most of the machines in the following list are shown in the illustration: one 21 in. LeBlond lathe, heavy duty type; one ditto, standard; one 17 in. ditto, standard with taper attachment; one 25 in. C.M.C. standard engine lathe; one No.3 Le Blond heavy duty miller; one No. 2 Cincinatti universal miller; one 26 in. W. F. and J. Barnes vertical drill; one Allen ball bearing sensitive drill; one Leland-Gifford ditto; two No. 1 Le Blond tool room grinders; two 20 in. Bertram shapers; two hack saw machines; all driven by line shafting from one 30 horse-power Westinghouse motor.

FIG. 9. INTERIOR OF MACHINE DEPARTMENT SHOWING SHAFTING ARRANGEMENT, INDIVIDUAL HOIST INSTALLATION AND LIGHTING SYSTEM.

CANADA'S EXPORTS CONTINE TO EXPAND.

EXPORTS of Canadian produce in the first six months of the current year were valued at $620,234,481, an increase of $144,778,000, or about 30 per cent. over the record total reported for the corresponding period of 1916. As compared with the corresponding period of 1914, before war requirements created an insatiable demand for everything that Canada could supply, the increase is $472,004,000, or about 320 per cent.

Taking the preliminary figures as reported month by month from Ottawa, and completed for the half year by the June statement issued the other day, the following comparisons of six months' exports of Canadian produce on the one hand and imports entered for consumption on the other may be made for a period of six years:

6 Months.	Exports	Imports	Balance
1917	$620,234,000	$534,608,000 +	$ 85,625,000
1916	475,456,000	350,104,000 +	125,352,000
1915	216,171,000	205,759,000 +	10,412,000
1914	148,230,000	260,336,000 —	112,106,000
1913	160,621,000	340,266,000 —	179,645,000
1912	139,594,000	291,871,000 —	152,276,000

The figures as given in the foregoing exclude the bullion returns, which are complicated now by special transactions having no bearing on Canadian trade, and also exclude exports of foreign produce through Canadian channels. They deal entirely with what Canada has sold abroad out of her own store and what she has purchased from abroad for her own use.

Imports Rise Sharply.

While the figures are highly satisfactory, it may again be noted that Canada is not doing as well as a year ago in respect to her balance of trade with other countries. The export gain of about 30 per cent. must be considered along with a gain of about 52 per cent. in imports. In the first six months of 1916 we established a favorable balance of about 125 millions; this year it is less by about 40 millions. While we have been speeding up our sales, with considerable benefit from high prices, we have also been buying abroad more heavily.

It is not easy to say how much of the buying has been necessary and how much could be set down to extravagance resulting from the great prosperity of the moment. Heavy buying of raw materials to go into goods which are later exported as manufactures no doubt is a large factor in the expansion of imports, but hardly the only one. It would be a matter of regret if this more rapid expansion in our purchases as compared with our sales should mean that our favorable balance has turned definitely downward for the time being.

The figures of the June statement show a considerable falling off from the high level reached in May. In the latter month there was the usual spring rush of goods which had been waiting on the opening of navigation for shipment. In June, conditions in that respect would naturally be more normal.

As compared with May, there was a falling off of about 33 millions in exports and a falling of of about 10 millions in imports. As compared with June a year ago there was a gain of about 21 millions in exports and a gain of about 31 millions in imports.

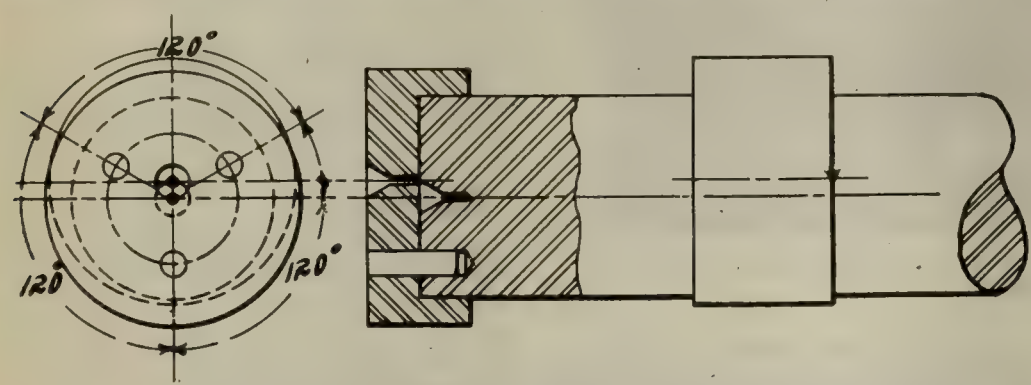
PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

ECCENTRIC TURNING JIG.

By R. Hamilton.

IT IS sometimes required to turn slight eccentric portions on shafts where the small throw will not permit of the two centres being placed in the end of the shaft. A convenient method is to have a cap-piece made as shown in the sketch, the eccentric centre being placed in this in the desired position. To maintain proper alignment, a small locating pin fixed in the jig enters a previously drilled hole in the end of the shaft. When two or more small eccentrics are turned on the same shaft, the jig can be made as indicated in the end sketch, which shows three equi-distant holes, 120 degrees apart. These, when set with the locating pin, produce three uniform and similar eccentrics; the pin being of the slip variety.



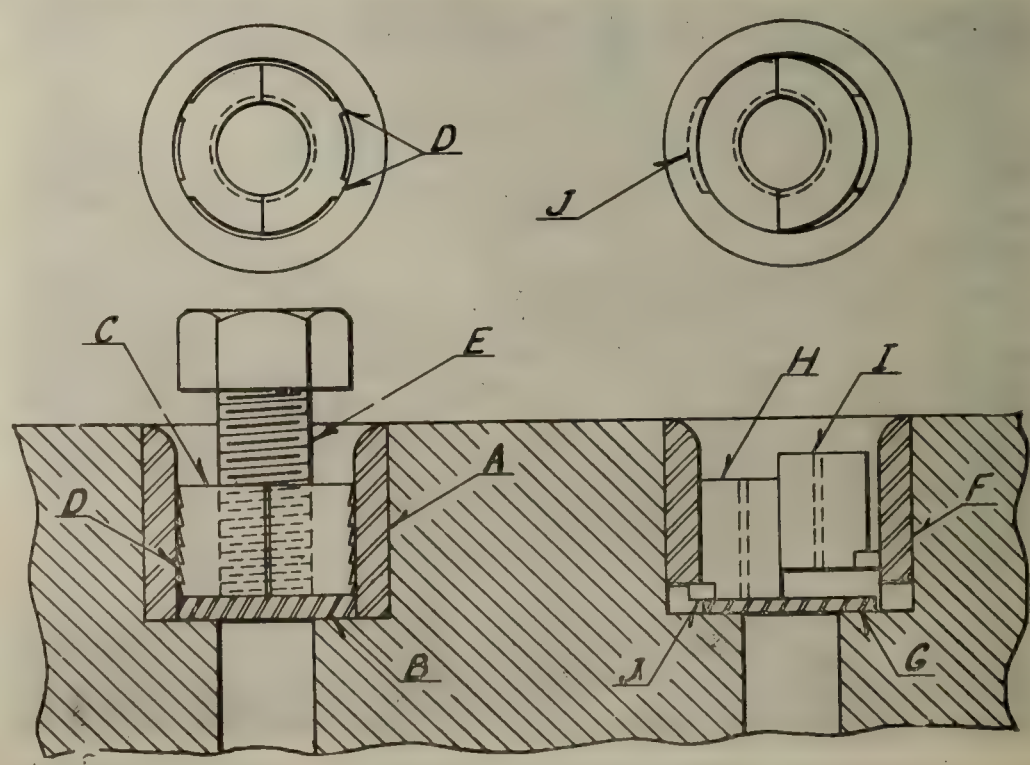
ECCENTRIC TURNING JIG.

REMOVING BLIND BUSHINGS

By S. B.

BUSHINGS are often placed in castings or fixtures in such a position that it becames very difficult to remove them when necessary; no provision being made to back them out if desired. In the sketch herewith are illustrated two methods by which the removal of these bushings can be facilitated. The one to the left bottoms on the containing hole and offers no means of getting below the bush to eject it from its position. The simple device here shown consists of a split bush, a small plate and a suitable cap screw for jacking out the bush A. The small bush C is made of cast steel and turned to a diameter somewhat larger than the bore of the bush A, and through the centre is drilled and tapped a hole suitable to the size of the work in hand. After being tapped, the bush is given a number of serrations on the outer diameter so that the teeth inclined upwards as shown in the sketch. After removal from the lathe, the outer surface is removed with the exception of the four sections shown at D, these providing the grip that extracts the bush. After splitting the bush in two, it is hardened and made ready for use. To remove the bush, the small plate B is first dropped in the centre and then the split bush is placed in, so that, when the cap screw E is forced in, the teeth will be likewise forced into the inner surface of the bush A, and, as the end of the screw pushes the plate B, the bush will be raised from its position.

Where the bush does not extend to the very bottom of the hole as shown to the right, bushes with a small flange can be used for the purpose. For convenience of entering into the hole in the bush F, the flanges only extend for a short distance as shown at J. The extracting bush is made similar to the one abovementioned, but when placing the split bush in position, one of the sections, as at H, is placed in first, so that the shoulder will go under the bottom of bush F, and then the other half is slid down until the flange will enter, after which the cap screw is turned in after the usual manner; the plate G in this instance is placed in prior to the split bush.



REMOVING BLIND BUSHINGS.

DECIMAL THREAD DIMENSIONS.

By J. H. R.

IT is not often that the men in the shop are confronted with a drawing that shows the pitch of a thread to be cut to a dimension of a decimal of an inch, but once and a while the draughtsman, either from lack of forethought or an over-fondness for decimals, will represent the thread dimensions to the nearest decimal equivalent. Just recently I was requested to figure out a set of change gears to cut a thread of .07143 inch pitch, and before asking any questions, resolved this to a common fraction; thus .07143 equals $\frac{7143}{100,000}$ equals 13.9997, or practically 14 threads per inch, which proved to be the size required, the value .07143 being the decimal equivalent for 1/14 of an inch. The calculation for the change gears was then easy, the ration being 4 to 14 on a lathe with a ¼ inch pitch lead screw. The wheels required would then be in the following proportion.

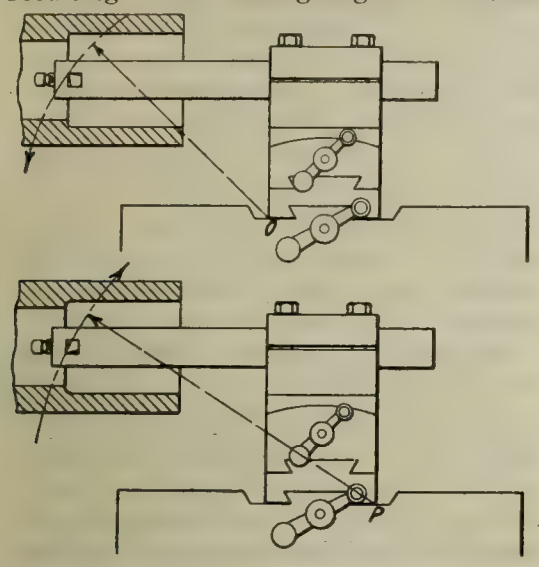
With 28 on the spindle, the lead screw gear would be $\frac{28}{4} \times \frac{14}{1}$ equals 98 teeth.

REVERSING THE TOOL TO ELIMINATE CHATTER.

By J. H. R.

OWING to the excessive overhang that is often required on lathe tools in the operation of boring holes, chatter may prove to be a troublesome feature. This is

largely due to the position of the cutting tool, in relation to the heel of the tool support, or in other words, the fulcrum point upon which the component parts hinge has a tendency to tilt; this action resulting in the cutting edge of the tool



REVERSING TOOL TO ELIMINATE CHATTER.

springing in the path of the arc indicated in the sketch. When the tool is set in the ordinary manner, with the cutting edge upwards, the centre of this arc will be at O in the top sketch, while with the tool reversed, the fulcrum will be on the opposite side as indicated at P in the lower sketch. These changes of position are based on the supposition that with the exception of the cross slide, the bar and post are rigid, therefore, with the cutting edge upwards, the tendency to dig-in is much greater than when the tool is reversed.

Another advantage that may be accorded an inverted boring tool—especially on an old lathe where play may have developed in the front bearing is that the spindle will be held down on the bearing, thus making the cut more steady. When the bearings are a little loose, the tool with the cutting edge upwards often has to support the weight of the work and spindle, in addition to the cutting of the metal. The inverted tool may often be used to advantage on other classes of work where difficulties sometimes arise through unknown or apparently unsolvable causes.

DEVELOPMENTS IN CANAL BARGE PROPULSION IN BRITAIN

CONSIDERABLE interest has been displayed during recent months in an application of detachable motors to canal barges by a firm of English coal dealers. Experiments were commenced about a year ago and results have been so satisfactory that recently a special demonstration was made from Birmingham to London, a distance of 150 miles, with one barge in tow. The two boats carried approximately 25 tons of cargo each, and the trip was made at the rate of 2 miles per gallon, of paraffin. The total time taken was 64¾ hours, which also included passing through 144 locks en route.

The design as shown in Fig 1, is based on the familiar row-boat motor, with certain constructional changes and modifications rendered necessary by the increased power and weight. In this case the motor is carried on a suitable channel iron frame which is permanently attached to the top of the cabin, and is duplicated in all of the barges on which the system is applied. The propellor gear proper is supported by two stout brackets at top and bottom of a tubular casing, these brackets carrying the pintles which fit into sockets in the stern of the boat in the same manner as an ordinary rudder. The upper pintle bracket extends outward to support a wooden socket pin into which the tiller is fitted, so that the propellor and gear are swung round as the tiller is operated to change the course.

Draft Variation

An important modification of the gear rendered necessary by canal freight conditions is the adjustment for variations of draft. As shown in Fig. 1, the decrease in draft when light causes the propellor to be almost out of water and telescopic construction of the vertical shaft is necessary to allow of it being submerged as shown by dotted lines.

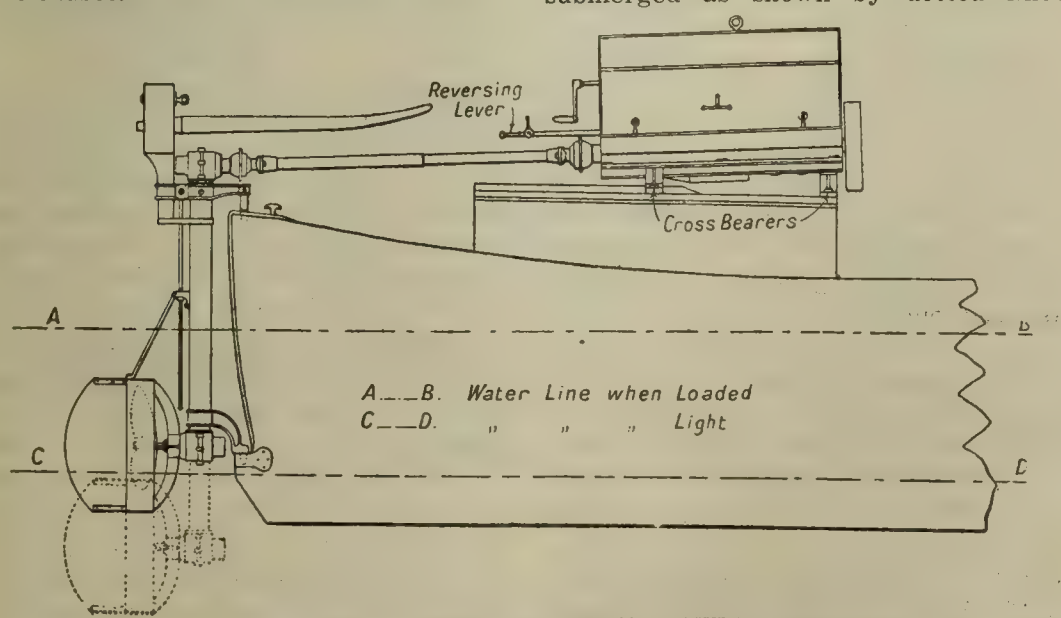


FIG. 1. STERN OF BARGE SHOWING DETACHABLE MOTOR INSTALLATION.

This is done by ataching the propellor shaft bearing bracket to a tube which extends up inside the full length of the tubular casing so that at no time is

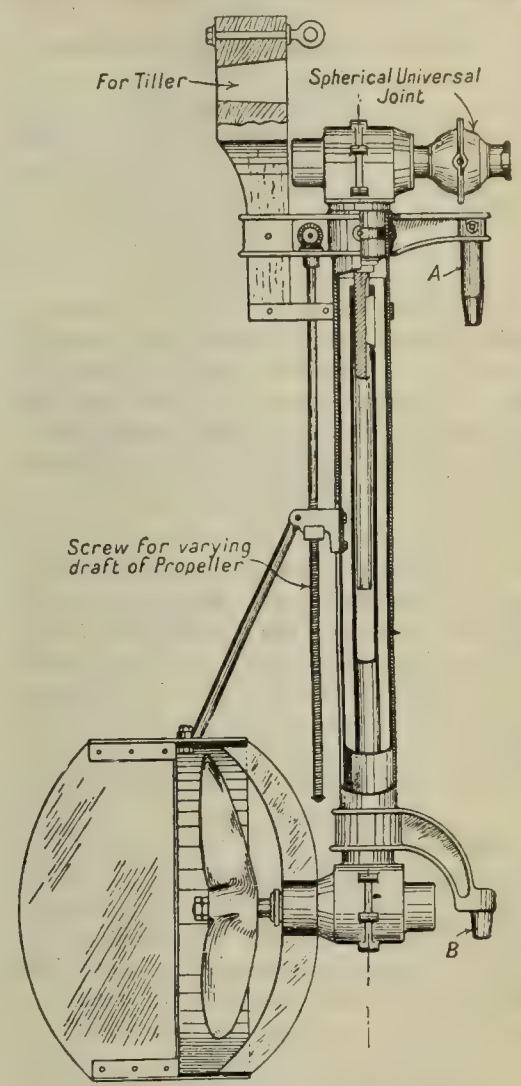


FIG. 2. DETAIL OF PROPELLING GEAR.

its upper end liable to be under water. A slot on the rear side of the casing enables a bracket to be attached to this

FIG. 3. TELESCOPIC DRIVING SHAFT.

inner tube so that by means of a bevel operated screw shaft, the propeller can be adjusted to the desired draft. See Fig. 2.

The propellor is surrounded by a circular casing which is flanked on each side by a rudder blade, this duplex rudder, combined with the swivelling of the propellor, making the barge very sensitive to control. The overhang of the propeller and rudder is supported from the adjusting bracket by a diagonal stay as shown in the illustrations, so that the propellor shaft bearing bracket is relieved from this excess weight. The vertical shaft is of corresponding telescopic construction, the solid member being splined to suit the feather key secured in the hollow member. Bevel gears connect the various shafts, the horizontal shaft in the upper casing being connected to the engine by another telescopic shaft, fitted with a universal joint at each end to allow full play horizontally and vertically to the propellor gear.

Rapid Demountability

By removing four bolts, this drive shaft is removable; other six bolts release the engine from its frame, and the propellor gear lifts clear out of the pintle sockets, enabling the transfer of the entire plant from one barge to another to be effected in less than fifteen minutes. The engine employed in these trials is a Sterling 4-cylinder marine type, developing 17 brake horse-power at 600 revs. per min., reduced to 425 revs. per min. for the three-bladed 22 in. dia. by 18 in. pitch propellor.

The engine, complete with its casing, self-contained fuel tanks, and flexible pipes for circulating water, weighs 672 lbs., and the propellor gear 280 lbs., and are transferred by a small hand derrick which fits into a socket on the side of the cabin on each barge, the derrick accompanying the plant.

It will be noted that the design allows for considerable variation in cabin height and location, depth of hull, etc., the only dimension calling for duplication being the position of the pintle sockets. Apart form these, however, there is sufficient latitude to enable quite a number of different boats being adapted for use with one power plant at a minimum cost.

Efficiency Cost

The total load capacity is 100 tons when towing two barges. The engine is started on gasoline, but is run on paraffin with a slight mixture of spirit substitute, the average cost working out a less than one cent per ton mile.

USES OF CHINA WOOD OIL

By D. Street

The principal use of wood oil in China is for oiling or varnishing the vast number of junks and boats in that country, but apart from that it is universally used to varnish nearly everything of a wooden nature to preserve the wood and to give it a polish. The Tung Tree, which bears the fruit, from the nuts of which the wood oil is produced, grows freely in China in the Provinces of Szechuan, Kweichow, Hunan, and Hupeh, and the percentage which each province contributes to the total production of wood oil in this area, for which Hankow is the final distributing centres is 35, 25, 25, and 15 per cent., repectively. The Tung tree flowers in April and the resultant fruit matures in the middle of October. The external appearance of the fruit resembles that of a large hickory nut. It has a heavy outside shell or husk, measuring from 1½ to 2 in. in diameter, which contains from three to five nuts each of which is covered with a thin shell. The meat in these nuts produces the oil, and it is called wood oil in China, because it is applied to wood.

The oil is used chiefly by paint, varnish and linoleum manufacturers, but it is also extensively replacing linseed oil for other purposes, the extent of its use depending largely upon its market value, compared with that of linseed oil, though in later years it has for certain varnishes and linoleums established an independent position, irrespective of price. Its principal characteristic and value as a commercial product is its high drying properties, and this fact makes it indispensable in certain lines of manufacture and thus its use is constantly increasing.

ONE WORKS ONE PRODUCT

By O. C.

THE movement initiated by the Association of British Machine Tool Makers for a greater degree of specialization among machine tool builders is one that will be followed with the closest attention by all who are interested in the evolution of industry. It is reported that ten machine tool firms have arranged among themselves that each shall devote itself to the production of a single type of machine. One will confine itself to drilling machines, another to planers, another to lathes, another to boring mills, and so on. Beyond all question such an arrangement will prove enormously more economical and efficient than the state of affairs under which each one of a score of firms sets itself out to supply any and every machine in the whole gamut of machine-total production. Besides reducing to manageable proportions the number of patterns and drawings to be kept, such a policy permits of the production of machine tools being placed upon a manufacturing instead of a "jobbing order" basis, and enables the maker to concentrate all his effort and talent upon the improvement of his one line of product.

There is some loss due to the narrowing of experience and practice, which perhaps checks to some degree the application of improved methods or designs arrived at in the making of others, but that can be overcome by specialist makers keeping themselves well informed upon developments in the industry generally, and by the provision of increased facilities for the interchange of ideas among the specializing firms. The arrangement also lends itself to the appointment of group publicity agents and travellers, both at home and abroad. The doing of foreign trade through the medium of independent general agents has on the whole proved far from satisfactory, but hitherto the majority of machine tool-makers have had to rest content with that means for the reason that their turnover was not large enough to bear the expense of sending a special agent to the leading foreign centres, much less of keeping one there permanently; whilst it has not been easy for a group of firms which were all competitors in certain products to combine for the establishment of joint foreign agencies.

Under the system of specialization by group-compact, these difficulties disappear, and it is understod that the better organization of foreign publicity and sale is one of the chief objects of the new profect. The one-product works is by no means unknown in Britain, and is almost a commonplace in America, but this appears to the first time that the policy of one-product specialization has been adopted in concert by a group of firms, for the furtherance of group interests.

FALL IN!

What will you lack, sonny, what will you lack
When the girls line up on the street,
Shouting their love to the lads come back
From the foe they rushed to beat?
Will you send a strangled cheer to the sky
And grin till your cheeks are red?
But what will you lack when your mate goes by
With a girl who cuts you dead?

Where will you look, sonny, where will you look
When your children yet to be
Clamor to learn of the part you took
In the war that kept men free?
Will you say it was naught to you if France
Stood up to learn of her foe or bunked?
But where will you look when they give the glance
That tells you they know you funked?

How will you fare, sonny, how will you fare
In the far-off winter night,
When you sit by the fire in an old man's chair
And your neighbors talk of the fight?
Will you slink away, as it were from a blow,
Your old head shamed and bent?
Or say—"I was not with the first to go,
But I went, thank God, I went"?

Why do they call, sonny, why do they call
For men who are brave and strong?
Is it naught to you if your country fall,
And Right is smashed by Wrong?
Is it football still and the picture show,
The bar and the betting odds,
When your brothers stand to the tyrant's blow
And country's call is God's?

—Harold Begbie.

THERE is a certain steel firm operating on a very large scale where the owner has the habit of sending off his departmental executives for a holiday at a moment's notice. He pays railways fares and full salary whilst these folk are enjoying themselves, but the rigid condition is laid down that the man must go away at once. The object of course is to discover whether the executive head has trained up an efficient understudy, whether he has arranged for open records of his work or has tried to keep affairs to himself. This sudden compulsory holiday brings this and other important facts to light in a very unmistakable fashion.

A GROWING practice is noted in foundries to paint the pattern so as to indicate the parts of a casting which are to be machined and the parts which are to be left rough. The point is that castings are sometimes spoiled because the moulder does not always know which part is to be finished in the machine shop. The parts of a pattern corresponding to parts requiring no machine work are painted grey, whilst the parts which are to be machined are painted yellow, with the parts of the pattern indicating the location of cores in red. Coloured cards are sometimes used for each pattern, for the use of the pattern-makes and sometimes for the moulder, with the result that fewer castings have been ruined on account of their being gated wrong than was formerly the case.

Test Data Relative to Uniflow Steam Traction Engines*

By F. W. Marquis

This paper presents the results of two series of tests of Baker uniflow steam traction engines, many of them being shown graphically in the form of curves. The steam consumption of these engines is compared with those representative of the holder or counterflow type of prime movers, and the conclusion is reached that the simple uniflow engine operating non-condensing with saturated steam has a lower steam consumption than the compound counterflow engine under like conditions and that, when operating non-condensing but with superheated steam, it will have approximately the same steam consumption as a compound counterflow engine when condensing and using saturated steam.

AT FIRST thought it seems strange to find refinements such as the uniflow cylinder and the superheater in connection with traction engines; but when it is remembered that the latter are used extensively in certain districts where fuel is very expensive, and water has to be hauled many miles, the reason for taking advantage of every means for reducing coal and water consumption becomes readily apparent.

Efficiency tests covering uniflow steam traction engines made by the A. D. Baker Co., Swanton, Ohio, have been carried out on two occasions, the first during the year 1915, and the second during 1916. The engine tested in the latter year was almost identical with that tested during 1915, the exceptions being that the 1916 boiler was supplied with a smokebox type of superheater, and its water heating surface was 24½ per cent. greater; in addition the 1916 engine piston displacement showed an increase of 8½ per cent. Both engines were of the makers' standard designs except for the uniflow cylinder and superheater, which were then in process of development. The principal dimensions of both engines are given in Table 1, and besides the uniflow cylinder and the superheater, a feature of particular interest is that of the valve gear, a description of same being included.

Figs. 1 and 2 show cross sections through the uniflow cylinder and valves. As well as triple ported admission valves there is an auxiliary exhaust valve which causes the point of compression to come late in the stroke, instead of at the point where the piston covers the main exhaust ports as is the case with uniflow engines not provided with some form of auxiliary exhaust valve.

Valve Operation

The operation of the valves can best be explained by following their movement as the piston moves through one stroke. Suppose the piston to be moving towards the right and nearing the end of its stroke; that is, that it is just a little to the left of its position in Fig. 1. The admission valves (at the top) will then be a little to the right of the position shown, and moving towards the left. The auxiliary exhaust valve F (at the bottom of the figure) will be at the extreme right end of its travel, and stationary.

When the edge J of the piston uncovers the ports at the centre of the cylinder, exhaust commences. About the same time the cavity A in the admission valve uncovers the port at the end of passage B and allows live steam to flow from E (see Fig. 2), through passage B, cavity A and passage D into chamber N at the end of auxiliary exhaust valve F. This causes valve F to move to the extreme left of its travel, closing the auxiliary exhaust port K and opening the auxiliary exhaust port K^1. Exhaust is then taking place both through the main exhaust ports and through exhaust port K^1. An instant after, the auxiliary exhaust valve moves and just before the piston reaches the end of its stroke, admission takes place through the three ports C.

As the piston starts on the return stroke towards the left, exhaust takes place through the main exhaust ports at the centre of the cylinder until, early in the return stroke, they are covered by the piston. The steam still in the cylinder continues to exhaust through auxiliary exhaust port K, until the piston covers this port, late in the stroke, when compression starts. Meanwhile live steam has been admitted on the other side of the piston until the admission valve has returned and cut-off has occurred. After cut-off and during expansion, the live steam in chamber N, at the head of the auxiliary exhaust valve, is free to expand through passage L and do work on the piston. This passage L enters the auxiliary exhaust valve chamber at such a point that when the valve is thrown some steam is trapped between it and the end of the valve chamber, thus cushioning it and preventing pounding.

The admission valves are driven by a Baker valve gear, which is very similar to the Baker gear now being used extensively in locomotive practice. It is a

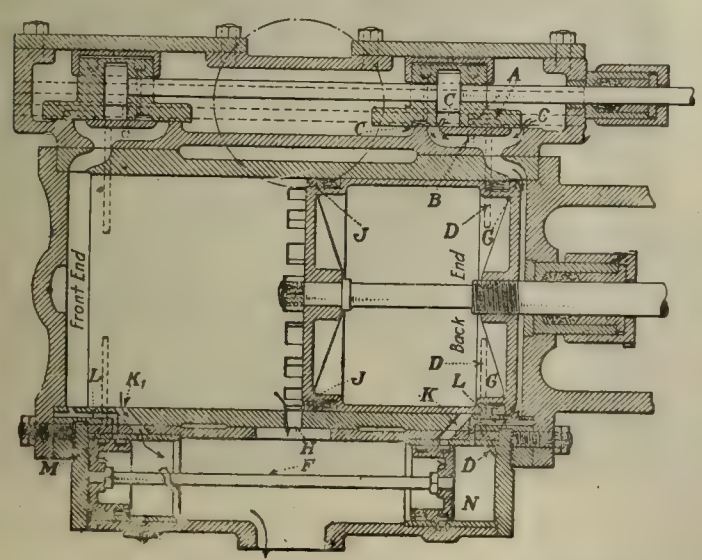


FIG. 1. BAKER UNIFLOW CYLINDER AND VALVES.

	Engine used in 1915	Engine used in 1916
Engine		
Nominal horsepower	16	18
Nominal r.p.m.	240	240
	In.	In.
Diameter of cylinder	8¾	9¼
Stroke	10¼	10
Diameter of piston rod	1¼	1¼
Diameter of flywheel	36	38
Face of flywheel	10	11
Diameter of crankshaft	3	3¼
Length of crankshaft	55½	61½
Diameter of crankpin	2¼	2¼
Boiler		
Number of tubes	40	54
	In.	In.
Outside diameter of barrel	29	32
Length of firebox	36	40
Width of firebox	22¼	25
Diameter of tubes	2	2
Length of tubes	78	72
	Sq. ft.	Sq. ft.
Grate area	5.56	6.94
Firebox heating surface	23.6	29.1
Tube heating surface	123.2	153.6
Total water heating surface	146.8	182.7
Superheater heating surface		47

TABLE 1. PRINCIPAL DIMENSIONS OF BAKER UNIFLOW TRACTION ENGINES.

*From a paper read before the American Society of Mechanical Engineers.

single-eccentric variable cut-off and reversing gear which maintains equal leads for all cut-offs and in both directions of running. It consists of an eccentric arm A (Fig. 3), connected at one end to the eccentric and at the other end

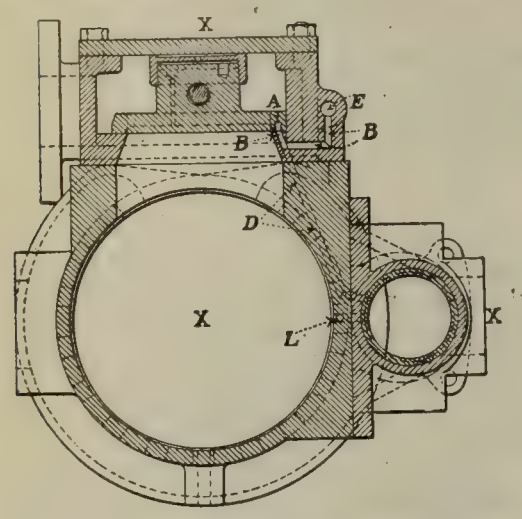


FIG. 2. BAKER UNIFLOW CYLINDER AND VALVES.

to the lower end of radius arm B. This radius arm is supported at the top by a pin C which can be held in place at any point on the arc shown in Fig. 3 by a reverse yoke. The eccentric arm A is connected to the bell crank E by means of the connecting rod F. The valve rod H is attached to the bottom of the bell-crank arm. The eccentric is set exactly 90 degs. ahead of the crank.

When the engine revolves, the eccentric moves one end of the eccentric arm in a circle, and the other end is caused to swing in an arc by the radius arm B. The motion of point P (the point at which the connecting rod F is attached) is then a combination of these two motions. The horizontal arm of bell crank E will then be moved up and down and the vertical arm back and forth, thus driving the valve rod.

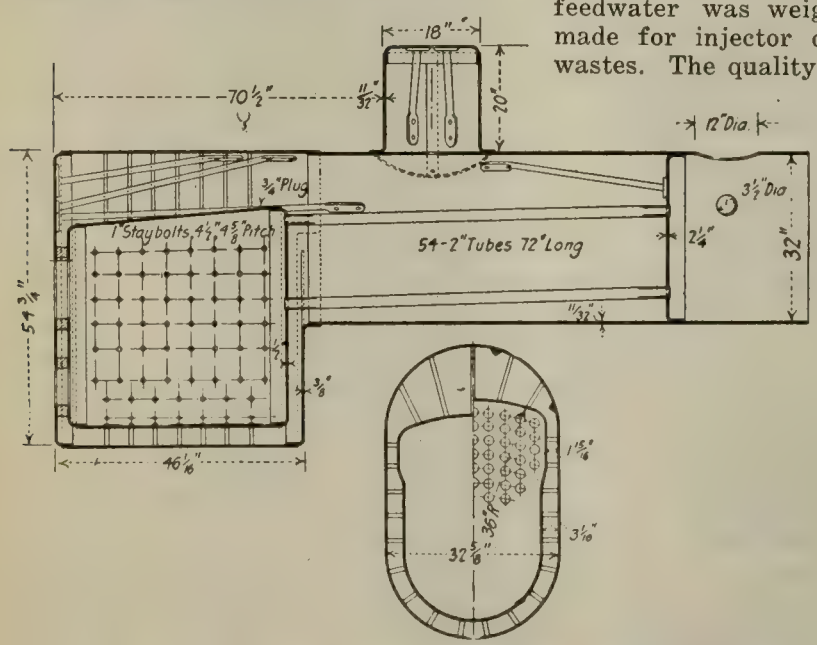


FIG. 4. BOILER OF TRACTION ENGINE.

The point of cut-off is changed and the engine reversed by moving the reverse yoke and thus changing the position of pin C, about which the radius arm B revolves. When the engine is on centre, the end of the eccentric arm and the point of support of the reverse yoke are exactly in line, so there is no motion of the eccentric arm (and valve) when the reverse yoke is moved (engine still on centre). Thus the lead remains constant for all positions of the reverse yoke, i.e., for all cut-offs.

Boiler and Superheater

In Fig. 4 is a drawing of the boiler used in the 1916 tests. It is almost identical with that used in 1915 except that it is a little larger, having 24½ per cent. more heating surface.

In 1916, a superheater was placed in the smoke box. It is shown in place in Fig. 5, and removed in Fig. 6. It consists of a vertical cast-iron header into which tubes are inserted, as shown in Fig. 6. Steam enters through pipe A, Fig. 7, which leads from the steam dome and passes to the front section of the header. It then passes back through the ½-in. pipes and forward through the 1½-in. pipes into the back section of the header. Thence it passes through pipe B to the steam chest.

Test Procedure

The tests were conducted in the Me-

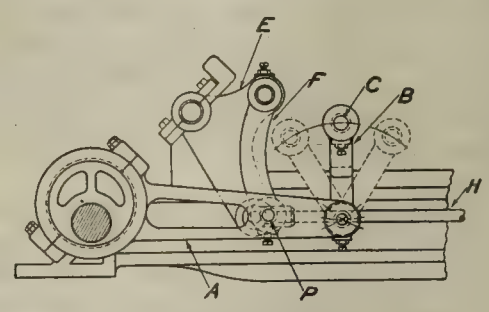


FIG. 3. BAKER VALVE GEAR.

chanical Engineering Laboratory of the Ohio State University and in general the methods recommended in the A.S.M.E. Power Test Code were followed. All coal fired was weighed, sampled, analyzed and the calorific value determined. The feedwater was weighed and correction made for injector overflow and other wastes. The quality of steam was taken by means of a Barrus throttling calorimeter, the sampling pipe being located in the path of the steam as it left the steam dome. Smokebox temperatures were determined by means of a thermocouple and the smokebox gases were sampled continuously and analyzed by means of an Orsat apparatus. Indicated and brake horsepower and revolutions per minute were all carefully determined. All instruments were calibrated and corrections applied where necessary.

The tests were run with the throttle valve wide open, and except where otherwise noted it was attempted to maintain the speed constant at 250 r.p.m. During the preliminary running preceding each test, the brake load was adjusted so that the desired speed was obtained when the throttle valve was wide open. During each run all conditions were maintained as constant as possible.

Programme of Tests

First Series.—The 1915 series consisted of 17 tests with various boiler pressures ranging from 125 lbs. gauge to 175 lbs. gauge, and various cut-offs ranging from 6 per cent. to 49 per cent. of the stroke. Saturated steam was used throughout this series, and the approximate speed was 250 r.p.m. in all tests.

Second Series.—The 1916 series consisted of 17 tests, 13 at 180 lbs. gauge and 4 at 160 lbs. gauge. Nine of the former were with superheated steam, and four with saturated steam. Superheated steam was used for the four latter tests. The cut-off in this series varied from 16 per cent. to 75 per cent. of the stroke. The approximate speed was 240 r.p.m., with the exception of three short runs which were made with variable speed to secure data concerning the relation between speed and power.

Results

A summary of the results having to do with engine performance is given in Table 2, and in Table 3 will be found a summary of results having to do with the boiler, and with the overall performance. Many of these results are also presented graphically in Figs. 9, 10, and 11.

In Fig. 8 are two sample sets of indicator diagrams, one with a rather early and the other with a much later cut-off

FIG. 5. SUPERHEATER IN PLACE IN SMOKEBOX OF BOILER.

They show a remarkable lack of wire-drawing during admission, and sharp cut-off for a slide-valve engine running at such a high speed (250 r.p.m.). The drop in the early part of the expansion line of the diagrams with an early cut-off,

and that in the admission line of the diagrams with the later cut-off, is caused by the steam flowing into the auxiliary exhaust-valve chamber, at the instant the piston uncovers the port leading to this chamber.

The curves in Fig. 9 show the relation between steam consumption in pounds per i. hp-hr. and i.hp. for both the series of 1915 and the series of 1916, under the different conditions of running. Reference to this figure shows that the highest steam consumption obtained was just under 29 lbs., which occurred at 125 lbs. boiler pressure with saturated steam and at approximately 60 i.hp. The lowest steam consumption obtained in any single test was 18.2 lbs. per i. hp-hr., in the series of 1916, with 180 lbs. boiler pressure and 118 degs. superheat, at about 72 i.hp. Reference to the curve shows, however, that this point was abnormally low, the lowest point on the curve being 19.1 lbs. per i.hp. per hour.

The total range of steam consumption, from the most unfavorable conditions of high overload and low boiler pressure (125 lbs.) with saturated steam, to the most favorable conditions of economical load and high boiler pressure (180 lbs.) with superheated steam, was only from 29 to 19 lbs., or 10 lbs.

It will be noticed that at each boiler pressure tests were run with cut-offs considerably later than the most economical. It seems reasonable to assume that the engine should be rated at approximately the point of best economy. On this basis the rating when operating under 125 lbs. boiler pressure would be 45 hp. Tests were run from about 30 to about 60 i.hp. or from about 60 per cent. to 130 per cent. of this rated load, and over this range the variation in steam consumption was from approximately 29 to 26½, or only about 2½ lbs.

If the same reasoning is followed in connection with the tests run at 180 lbs. boiler pressure and with superheated steam, it will be found that tests were run over a range of from approximately 55 per cent. to 145 per cent. of full load, and that the maximum difference in steam consumption over this rather wide range was only from approximately 20½ to 23½ lbs. ,or 3 lbs.

It is interesting to note that the maximum power obtained was 108.7 i.hp. (102.8 b.hp.), which was obtained with 180 lbs. boiler pressure and with 181 degs. Fahr. superheat, and with a steam consumption of only 23.5 lbs. per i.hp. per hour (24.5 lbs. per b.hp. per hour). This becomes particularly interesting when it is remembered that the cylinder diameter and stroke of this engine were only 9¼ in. and 10 in. respectively.

The curves in Fig. 10 show the relation between steam consumption and

TABLE 2. SUMMARY OF ENGINE RESULTS.

Laboratory symbol	Length of test, min.	R.p.m.	Boiler press., lb. per sq. in. gage	Super heat, deg. fahr.	Avg. cut-off, per cent of stroke	I.hp.	B.hp.	Mech. eff'y	Wt. of dry steam per i.hp. per hr., lb.	Wt. of dry steam per b.hp per hr., lb.	Eff'y ratio based on i.hp., per cent
1	2	3	4	5	6	7	8	9	10	11	12
Series of 1915											
1-125-1	300	246.9	125.6	0	15.1	30.75	27.8	90.4	27.65	30.55	55.9
2-125-3	240	252.3	125.2	0	31.7	47.38	42.8	90.4	26.45	29.25	58.3
3-125-5	180	259.3	125.0	0	48.9	59.90	54.3	90.9	28.95	31.92	53.7
4-140-1	240	247.6	141.5	0	15.1	37.58	32.8	87.4	25.45	29.15	58.5
5-140-3	180	269.5	139.5	0	31.7	58.48	52.2	89.4	25.00	28.00	60.0
6-140-2	210	263.6	140.7	0	22.3	47.95	42.0	87.7	24.80	28.25	59.7
7-140-5	180	242.0	140.3	0	49.0	68.01	61.2	90.1	28.55	31.75	51.6
8-155-1[1]	240	258.0	155.6	0	15.1	45.82	37.8	82.6	23.35	28.25	61.3
9-155-3	180	254.6	154.7	0	28.1	64.82	56.7	87.6	24.95	28.50	57.6
10-155-2	240	260.0	155.0	0	20.4	55.63	46.4	83.4	23.72	28.77	60.4
11-165-3	180	253.7	165.2	0	28.1	70.00	61.6	88.0	24.40	27.73	57.3
12-165-1	210	260.5	165.0	0	12.0	45.36	39.0	86.1	25.18	29.24	55.8
13-165-2	180	270.0	165.2	0	20.4	59.04	51.8	87.8	....	.....	.....
14-175-1	210	251.7	176.2	0	12.0	48.83	42.7	87.5	24.40	27.90	56.0
15-175-2	180	256.4	175.5	0	20.4	60.93	54.8	90.1	23.32	25.90	59.1
16-175-3	180	258.7	176.4	0	28.1	74.12	66.6	89.8	23.60	26.25	58.3
17-175-0	60	244.8	176.2	0	6.2	33.98	28.0	82.5	26.95	32.65	51.2
Series of 1916											
1-160-3	180	238.5	160.0	124	30.6	61.60	55.9	90.8	19.6	21.6	66.0
2-160-4	180	226.0	160.0	130	41.8	64.90	60.8	95.2	21.2	22.7	60.0
3-160-2	180	232.1	159.5	115	21.3	46.80	42.8	91.5	20.4	22.4	63.0
4-180-1	240	253.0	180.0	115	16.7	39.30	34.2	87.0	20.4	23.4	61.5
5-180-2	240	243.0	178.5	117	21.3	57.30	53.3	93.1	20.0	21.5	62.7
6-180-3	180	245.0	178.3	123	30.6	71.80	65.9	91.8	19.0	20.6	65.4
7-180-4	180	227.0	179.5	136	41.8	79.20	73.3	92.5	20.1	21.8	61.4
8-160-5	180	240.2	158.3	142	50.8	77.90	74.0	95.0	21.7	22.8	60.0
9-180-5	180	253.8	177.4	157	50.5	94.10	87.0	92.5	20.5	22.2	59.2
10-180-3[2]	60	282.3	178.6	131	30.6	73.40	67.6	92.2	19.6	21.3	62.5
11-180-3[2]	60	230.1	180.0	118	30.6	72.30	68.2	94.3	18.2	19.3	67.6
12-180-3[2]	15	257.0	180.0	127	30.6	71.30	66.1	92.8	.....	.....	.....
13-180-8[2]	30	294.6	181.0	181	74.7	108.70	102.8	94.5	23.5	24.5	58.5
14-180-2	180	240.8	179.3	0	21.3	52.70	49.4	93.7	26.7	28.1	50.9
15-180-3	180	245.0	179.0	0	30.6	67.60	64.7	95.8	24.7	25.6	55.2
16-180-4	120	245.0	178.5	0	41.8	79.00	74.0	93.7	25.7	27.2	50.3
17-180-3	180	238.0	178.7	0	30.6	66.20	62.8	94.8	24.7	25.7	56.6

Column 1: Laboratory Symbol. The first term represents the number of run; the second the approximate boiler pressure and the last the position of the reverse lever upon its quadrant expressed in notches from the center back.

Column 12: Efficiency ratio, based on i.hp. This is the ratio between the thermal efficiency of the engine and the thermal efficiency of a perfect engine operating on the Rankine complete expansion cycle. It is equal to $2545/WH$, where W = actual wt. of steam per i.hp-hr., and H = the adiabatic heat drop from pressure and quality of steam furnished to engine to exhaust pressure.

[1] Valve setting changed between runs No. 8 and No. 9.

[2] Runs No. 10, No. 11, and No. 12 are short variable-speed runs. Run No. 18 is a short maximum-power run.

TABLE 3. SUMMARY OF BOILER AND OVER-ALL RESULTS.

Laboratory symbol	Length of test, min.	Boiler press., lb. per sq. in., gage	Super-heat, deg. fahr.	Pounds of coal fired per sq. ft. of grate surface per hr.	Equiv. evap'n per sq. ft., water-heating surface per hr., lb.	Equiv. evap'n per sq. ft. total (inc. super-heater) heating surface per hr., lb.	Equiv. evap'n per lb., air, dry coal	Efficiency of boiler per cent	Wt. of air-dry coal per b. hp. per hr., lb.	Over-all efficiency, per cent
1	2	4	5	13	14	15	16	17	18	19
Series of 1915										
1-125-1	300	125.6	0	22.2	7.62	.....	8.38	57.1	4.67	3.85
2-125-3	240	125.2	0	32.0	11.00	.....	8.45	57.5	4.35	4.10
3-125-5	180	125.0	0	46.1	15.25	.....	8.11	55.2	4.94	3.63
4-140-1	240	141.5	0	25.1	8.59	.....	8.41	57.4	4.45	4.02
5-140-3	180	139.5	0	39.6	12.97	.....	8.02	54.6	4.41	4.04
6-140-2	210	140.7	0	31.6	10.62	.....	8.26	56.3	4.36	4.11
7-140-5	180	140.3	0	53.6	16.90	.....	7.77	52.8	5.10	3.52
8-155-1	240	155.6	0	27.7	9.63	.....	8.46	57.6	4.28	4.18
9-155-3	180	154.7	0	45.0	14.10	.....	7.83	53.3	4.58	3.92
10-155-2	240	155.0	0	36.2	11.61	.....	7.96	54.4	4.53	3.94
11-165-3	180	165.2	0	48.9	14.89	.....	7.57	51.5	4.58	3.90
12-165-1	210	165.0	0	31.8	10.10	.....	7.84	53.4	4.74	3.77
13-165-2	180	165.2	0	38.1	.....	.....	.....	.....	4.29	4.17
14-175-1	210	176.2	0	33.0	10.50	.....	7.88	53.6	4.51	3.98
15-175-2	180	175.5	0	39.7	12.40	.....	7.74	52.6	4.23	4.25
16-175-3	180	176.4	0	49.6	15.20	.....	7.58	51.7	4.34	4.14
17-175-0	60	176.2	0	21.3	8.72	.....	8.87	60.3	4.44	4.04
Series of 1916										
1-160-3	180	160.0	124	27.1	8.12	6.92	8.43	58.6	3.40	5.38
2-160-4	180	160.0	130	32.6	9.13	7.90	7.95	55.3	3.76	4.80
3-160-2	180	159.5	115	22.1	6.47	5.54	8.34	57.9	3.54	5.14
4-180-1	240	180.0	115	18.5	5.47	4.68	8.47	58.8	3.73	4.90
5-180-2	240	178.5	117	26.6	7.71	6.62	8.36	58.0	3.42	5.32
6-180-3	180	178.3	123	31.3	9.13	7.80	8.45	58.7	3.23	5.65
7-180-4	180	179.5	136	37.2	10.65	9.14	8.16	56.7	3.51	5.19
8-160-5	180	158.3	142	38.8	11.26	9.56	8.27	57.5	3.62	5.04
9-180-5	180	177.4	157	45.1	12.80	11.04	8.18	56.8	3.30	5.11
10-180-3	60	178.6	131	32.8	9.60	8.23	8.35	58.0	3.35	5.45
11-180-3	60	180.0	118	29.4	8.74	7.49	8.48	58.9	2.98	6.13
12-180-3	15	180.0	127	.....	.....	.....	.....	.....	.....	.....
13-180-8	30	181.0	181	62.6	16.77	14.72	7.20	50.0	4.58	3.98
14-180-2	180	179.3	0	26.9	8.71	.....	8.24	57.2	3.83	4.77
15-180-3	180	179.0	0	36.6	11.15	.....	7.97	56.4	3.92	4.64
16-180-4	120	178.5	0	42.8	13.38	.....	7.36	51.4	4.50	4.06
17-180-3	180	178.7	0	35.4	10.80	.....	8.18	56.8	3.86	4.73

Column 1: Laboratory Symbol. The first term represents the number of run; the second the approximate boiler pressure, and the last the position of the reverse lever upon its quadrant expressed in notches from the center back.

Columns 16 and 17: The superheater, when used, is considered to be a part of the boiler.

Column 19: Overall Efficiency. The ratio between the heat equivalent of the work done at the brake pulley per lb. of air-dry coal fired and the heat value per lb. of air-dry coal.

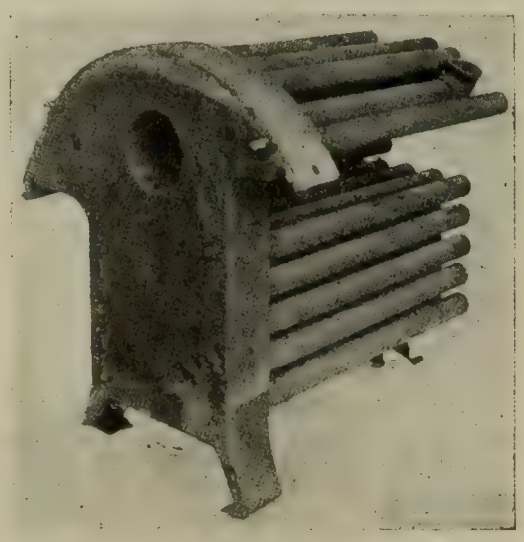


FIG. 6: SUPERHEATER REMOVED FROM BOILER.

boiler pressure. As the boiler pressure increases, not only does the steam consumption decrease, but also the power at any cut-off, and the power at which

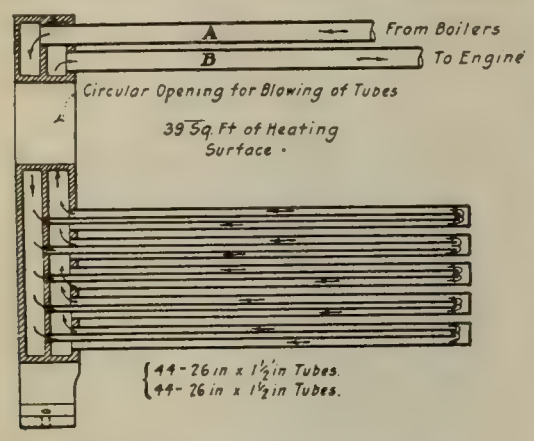
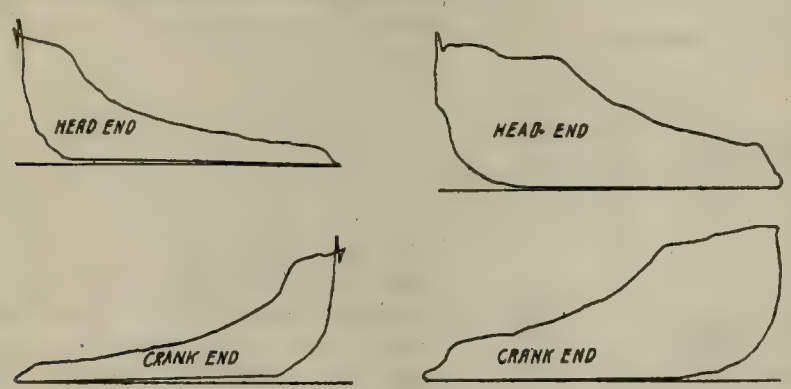


FIG. 7. DIAGRAM OF SUPERHEATER.

the lowest steam consumption occurs in-increases. Curve A shows the decrease in steam consumption with increase of boiler pressure at 50 i.hp., and curve B at 60 i.hp. Curve C shows the relation between the minimum steam consumption at each boiler pressure, and the boiler pressure. The power corresponding to minimum steam consumption at



Run No.1. Series of 1915. 125 lb. Boiler Pressure, Saturated Steam.

Run No.7. Series of 1916. 180 lb. Boiler Pressure, Superheated Steam.

FIG. 8. SAMPLES OF INDICATOR DIAGRAMS.

each pressure is shown by the figure near each point through which this curve is drawn. It will be noticed that, with the exception of one point on this curve, the power of minimum steam consumption increases as the boiler pressure increases.

Curve A shows that at 50 hp. the steam consumption decreases from 29 at 125 lbs. to 23.4 lbs. at 175 lbs. pressure, while curve C shows that, if the point of minimum steam consumption at each boiler pressure is taken, the decrease is only from 26.4 lbs. at 125 lbs. pressure to 23.3 lbs. at 175 lbs. pressure.

The curves of Fig. 11 show the relation between the pounds of coal used per brake horsepower per hour and the brake horsepower developed. These curves are naturally of the same general shape as those given in Fig. 9, showing the relation between steam consumption and indicated horsepower. The inconsistency in results shown by the fact that many points are not located on the curves is caused largely by the facts that it was not possible to maintain uniform conditions of combustion during the different tests, and that it was very difficult to keep the condition of the fuel bed such that there would be the same amount of coal on the grates at the end as at the beginning of a run.

It will be noted that the highest coal consumption was 5.1 lbs. per b.hp-hr., and that this occurred at 140 lbs. boiler pressure and 61 b.h.p., while the lowest coal consumption obtained in any single test was 2.98 lbs. per b.hp-hr., which occurred at 180 lbs. boiler pressure, 118 degs. Fahr. superheat, and 68 b.hp. However, this seems to be an abnormally low value, the lowest point on any curve being 3.27 lbs., corresponding to 180 lbs. boiler pressure with superheated steam and at 67.5 b.hp.

As a matter of interest from a comparative point of view, the steam consumption curves of a number of the ordinary counterflow type of steam engines, both simple and compound, non-condensing and condensing, have been plotted on the same sheet with certain of the steam-consumption curves of the Baker uniflow engine. These curves are given in Fig. 12. Information concerning each of the engines whose steam-consumption curve is given in this figure will be found below:—

Curve A.—Simple, slide-valve engine, cylinder 8 in. by 12 in., initial steam pressure 130 lbs. gauge, non-condensing, and at 200 r.p.m.

Curve B.—Simple, slide-valve engine, cylinder 9 in. by 12 in., initial steam pressure 140 lbs. gauge, non-condensing, and at 290 r.p.m.

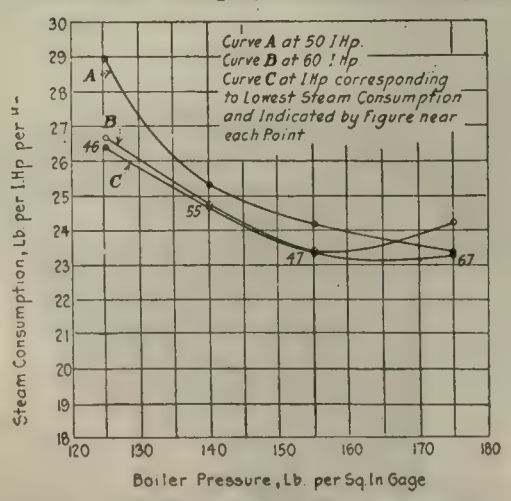


FIG. 10. CURVES SHOWING RELATION BETWEEN STEAM CONSUMPTION AND BOILER PRESSURE, SERIES OF 1915.

Curve C.—Simple, slide-valve engine, cylinder 15 in. by 14 in., initial steam pressure 115 lbs. gauge, non-condensing, and at 225 r.p.m.

Curve D.—Same engine as in case of Curve C, but operating condensing.

Curve E.—Cross-compound, slide-valve engine, cylinders 7 in. and 13 in. by 10 in., initial steam pressure 150 lbs. gauge, non-condensing, and at 310 r.p.m.

Curve F.—Same engine as in case of curve E, but operating condensing.

Curve H.—Tandem-compound, slide-valve engine, cylinders 8¼ in. and 13¼ in. by 12 in., initial steam pressure 115 lbs. gauge, condensing, and at 280 r.p.m.

Curve G.—Simple uniflow engine, cylinder 8¾ in. by 10 ¼ in., initial steam pressure 125 lbs. gauge, non-condensing, and at 250 r.p.m.

Curve I.—Same engine as in case of curve G, but with 175 lbs, gauge boiler pressure.

Curve K.—Simple uniflow engine, cylinder 9¼ in. by 10 in., initial steam pressure 180 lbs. gauge, superheat approximately 130 degs. Fahr., non-condensing, and at approximately 240 r.p.m.

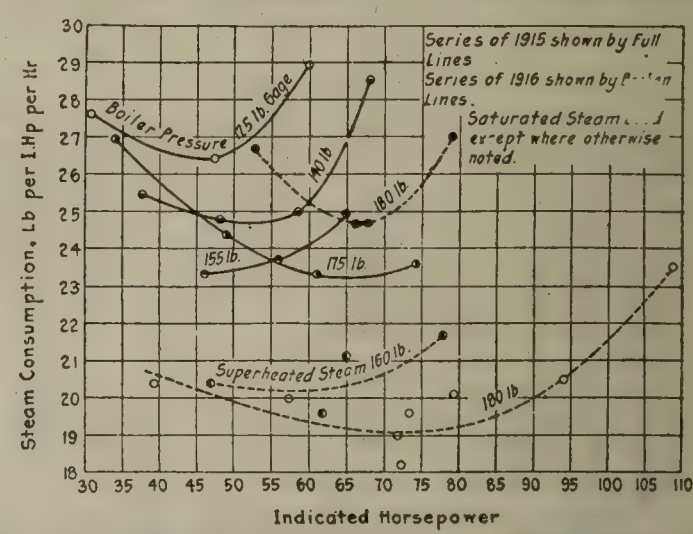


FIG. 9. CURVES SHOWING RELATION BETWEEN STEAM CONSUMPTION AND INDICATED HORSE POWER.

Comparisons and Conclusions

It will be seen that the uniflow-engine curves selected are those representing the poorest and the best results obtained with saturated steam, and the best results obtained with superheated steam. A study of this set of curves (Fig. 12), shows that the poorest results obtained with the uniflow engine, namely, those of curve G, obtained with saturated steam at 125 lbs. pressure, are better than the best results obtained with any of the simple engines, even when operating condensing, and almost the same as those obtained with the compound non-condensing engine shown by curve E. The steam consumption of the uniflow engine at 175 lbs. pressure with saturated steam running non-condensing is lower than that obtained with the compound non-condensing engine at 150 lbs. pressure shown by curve E. Also the steam consumption of the uniflow engine with 180 lbs. steam pressure and 130 degs. superheat, was lower than that of the compound condensing engine with 150 lbs. steam pressure shown by curve F.

Thus it is seen that on the basis of the results of the tests reported in this paper and the information presented by Fig. 12, which is thought to represent fairly the average practice for small, simple and compound engines of the old-er or counterflow type, the simple uniflow engine operating with saturated steam and non-condensing, is able to surpass in economy of steam consumption the compound counterflow engine when operating under similar conditions. Also, that the simple uniflow engine operating non-condensing but with superheated steam will have approximately the same, or slightly less, steam consumption than the compound counterflow engine operating condensing but with saturated steam.

On the basis of these conclusions, it seems probable that the simple uniflow engine will prove a serious competitor of the compound counterflow type, since it is not only more economical in its use of steam, but also simpler in construction, and probably on that account lower in first cost.

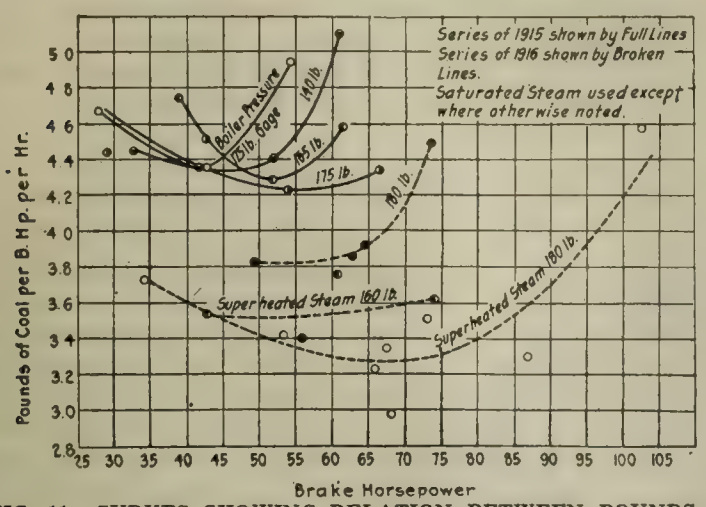


FIG. 11. CURVES SHOWING RELATION BETWEEN POUNDS OF COAL PER B.H.P. PER HOUR AND B.H.P.

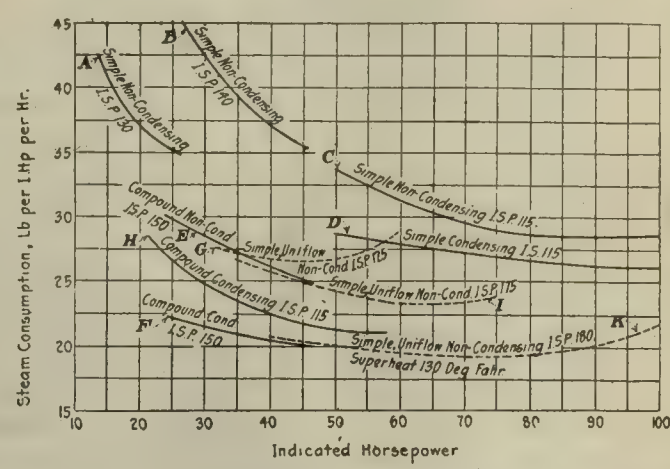


FIG. 12. RELATIVE STEAM CONSUMPTION OF BAKER UNIFLOW ENGINES AND COUNTERFLOW ENGINES.

COBALTCROM, THE NEW STEEL ALLOY.

WIDESPREAD interest has been aroused, says Engineering, by the announcement on behalf of Darwin & Milner of Sheffield, of the discovery of a tool steel stated to be equal in durability and hardness to high-speed steel, yet of which tungsten is not a component. "Cobaltcrom," as the new steel is called, is the outcome of much experiment and labor, extending over many years, on the part of the head of the firm of Darwin & Milner. He had long been experimenting in the direction of finding a steel which could be made without tungsten but would possess the necessary hardness of the so-called "high-speed" steels. About twelve months ago he discovered that by adding cobalt to chromium-carbon steel he converted a steel which had no appreciable red-cutting hardness into one which had this very valuable qualification.

It is a fairly well-known fact that while tungsten high-speed has for some years past been extensively used for turning, planing and slotting tools, it has not been used so largely for milling cutters, taps, reamers, etc. It is estimated by Darwin & Milner that of all the milling cutters, etc., used in the engineering world, at least 90 per cent. are still being manufactured from carbon steel, whereas, on the other hand, the reverse is the case with turning tools, nine-tenths of which are made from tungsten high-speed steel. In the opinion of the firm the reason that high-speed steel has not been applied largely for milling cutters, taps, etc., lies in the difficulty which the tool-maker experiences in hardening such tools having fine edge at the high heat required to secure from tungsten high-speed steels its cutting efficiency. Tungsten high-speed steel requires hardening at from 1,250 deg. to 1,350 deg. C. if the best results are desired. To try and obtain this heat for milling cutters is very risky, and to harden at a lower heat gives less satisfactory results.

When the war broke out Sheffield firms received instructions that they must make milling cutters and taps from the very best high-speed steel, but there was endless trouble through the hardening process alone, with the result that carbon steel was soon substituted. Now it has been found that the maximum heat necessary for the hardening of the new steel is only 1,000 deg. C. As a matter of fact, if this heat is exceeded the tools give adverse results. This temperature allows of the manufacture of fine-edge tools of a perfectly satisfactory character with the red-cutting hardness of the tungsten high-speed steel. Hardening in practically all applications is stated to be satisfactory when the tool is allowed to cool naturally in air free from draughts and currents, whereas with tungsten high-speed steel, hardening from the extreme high heat renders it necessary to quench either with a strong air blast or a sudden immersion in liquid. With the new steel it is claimed to be possible to get absolutely the same standard of hardness throughout.

Samples of the steel have been tested in a large number of works throughout the country, and have shown that the cobaltcrom is specially suitable for milling cutters, twist drills, reamers, taps, automatic forming tools, screw cutting, finishing tools generally, for machining gun-metal and yellow metals, as well as for high-endurance drawing and blanking dies, lathe centres, shear blades, aeroplanes and automobile combustion engine valves, and every description of gauges and instruments which have to resist abrasion. A test has been made showing that, with a carbon steel blade, saws can cut for half a day, with a tungsten high-speed steel blade for two days, but with the new steel four days without the need of grinding.

Patent rights the world over have been applied for, including, by permission of the Patent Office authorities, Germany and Austria. A point which should not be overlooked is that the cutting efficiency of the new steel is quite equal, even in the form of castings, to that of tools made from the forged or rolled bar in which high-speed steel is supplied commercially, and as the material in the molten state is much more liquid than high-speed steel, it lends itself to all forms of tool-form castings.

Moulding Range Top Plate Query — We have experienced considerable trouble in moulding range top plates. The size of these plates is 20 in. by 22 in., weight 47 lbs., thickness of outer edge 3-16 in., inner part ⅜ in., with 1 in. flange on bottom all the way round at about ½ in. from the edge. There are also four braces across the bottom. Our trouble is to get a smooth surface on top for polishing. We have found better satisfaction in moulding it top side down. We pour the metal as hot as possible and at times get a very fair surface. At other times, however, we get a very rough or pebbly surface, and sometimes small slag holes. We are using No. 1 Albany sand and have tried a number of different styles of gates. We have also tried sea coal facing without securing the desired results. Suggestions as to remedy of the trouble are invited.—H. Z. F.

"Willie, against orders, allowed his chum to take him to the river on a fishing trip."

"Then what happened?"

"His father took him to the back yard on a whaling expedition."

Salesmanship Discussed from a New and Sane Viewpoint

At a recent Convention of the Sales Organization of The Steel Company of Canada, an address was given by the Sales Manager of the Company at Hamilton, George A. Simpson, which we take pleasure in presenting to our readers, as it covers a number of points in connection with Salesmanship in such a manner as to develop a new viewpoint on the subject. The address can be read and studied to advantage, especially by those within the profession, in addition, all of us may profitably apply some of the thoughts expressed by the author.

ON previous occasions when it has been my privilege to address you, the conditions confronting us were not such as they are at present. We have been and are passing through a period, the like of which does not appear in history and through this abnormal condition, a prosperity that is, in my judgment, spotted, has sprung up all over the North American Continent and it will come to a temporary end directly the war terminates; in fact, I anticipate a decided change the moment there is any definite indication of peace.

The abnormal conditions produced by the war have created abnormal conditions in every line of industry and, in consequence, the producers of all kinds of material, especially iron and steel products, have increased their output to an enormous and alarming extent. This does not only apply to Canada, but also to the United States. Every blast furnace on the continent to-day is practically in operation and to take care of the increased tonnage of finished product that this abnormal conditions demands, our producing capacity has been largely increased, consequently, when conditions again assume their proper shape we will be confronted with a competitive condition such as the world has never seen before, and this condition will, in a sense, bring into effect the law of the survival of the fittest. Competition, in my judgment, will be fierce, and, in consequence, the burden will fall on the shoulders of the salesmen.

Day of "One Man Business" Gone.

After the war the business that expects to succeed will have to be safeguarded by active, alert, attentive, vigilant men—men of big vision, men who realize that while there can be only one Captain of the Ship, there is captain-material in the crew and as such they must be recognized. The order of the day will be—systematic organization so adjusted as to permit of aggressive, intensified action, all moving in harmony with a determined purpose toward a definite end. The day of the "One Man Business" is gone, just as sure as the day of intoxicated salesmen has passed into the discard. Business to-day is too big for any one man to personally direct and where any man aspires to be "IT" in an organization, that business will only expand or succeed to the extent of his vision and, in consequence, if he persists, the progress will be arrested in proportion to his ability to direct. The expansion and growth of the business will be retarded. The burden of successful business must fall on many shoulders, and salesmen, worthy of the name, will be recognized and in great demand.

Selling Our Product An Essential

It will not be a question of production, as it has been during the past two years; it will be a question of selling the production we are able to produce, and this, in my judgment, is going to be a very serious problem. Every producer of iron and steel products all over this continent has increased his output to such an extent that the market will be flooded with material. To make this argument more specific, we need only refer to our own facilities, which, at the outbreak of the war, were such that we had a certain melting capacity of open hearth steel. This we have increased until today we have facilities to produce more than double the amount, and so all along the line, as a result of the terrific demand on our manufacturing facilities, our output has been speeded up to a greatly increased extent, in consequence of which we will have a very large volume of iron and steel products to sell.

Tuning Up the Sales Organization.

With this condition confronting us, the thought uppermost in my mind is, how we shall best prepare ourselves to successfully cope with it, and I have concluded that considerable work and preparation is necessary for each and every one of us. In past years we have heard a great deal about "getting the name on the dotted line," which, of course, as you all know, means the closing of a contract of sale. While this expression has been made in the spirit of enthusiasm—all of which I recognize is a determining factor in salesmanship, as there has been nothing of any consequence accomplished without enthusiasm—yet, nevertheless, the advice to get the name on the dotted line is merely an expression and an empty phrasing of words, unless it is accompanied with some common sense suggestion as to how to prepare ourselves to bring about this much desired objective. "Getting the name on the dotted line" is usually the final operation; in other words,—it is merely the approval with our signature of the transaction which has been concluded, and, in consequence, the importance does not lie in getting the name on the dotted line, as much as it does in the manner in which we conduct the transaction, as you will readily see from this argument that the name would never be put on the dotted line, unless the transaction had been conducted in a thorough manner and to a successful end. In other words, it should not be necessary for a salesman to urge or use any mysterious tactics or enthusiastic efforts to get the buyers' name on the dotted line; but, on the contrary, he should so present his argument and create in the mind of the buyer such an intense desire to purchase that which the salesman has to sell, that the buyer would really be more anxious to get his name on the dotted line than the salesman would be to have him put it there.

Buying and Selling Are Relative.

It seems to me that salesmen should fully appreciate the fact that it takes two to make a transaction, and that it is just as necessary for the buyer to purchase the material the salesman has to sell, as it is for the salesman to sell it; in fact, he could not run his business without the material, consequently, isn't it reasonable to suppose that if you represent a high-class organization, who manufacture their products with the thought of quality uppermost in their mind and whose very foundations are built on quality and service, fully understanding and appreciating the definitions of these two words, a purchasing agent, representing a company who de-

George A. Simpson was born near Cheltenham, England.. He attended school in Cardiff and Pontypool. At the age of thirteen, after the death of his parents in 1881, he went to sea. Returning to Pontypool he went to work in the puddling department of the Pontypool Iron & Tin Plate Company, and later was associated with the Panteg Steel Works in the machine shops and steel casting department. In 1886 he went to Pittsburgh, going direct to the Sligo Rolling Mills; later he became associated with the Black Diamond Steel Works, which is now a part of the Crucible Steel Company of America. For a number of years he represented The Struthers Furnace Company of Cleveland, with headquarters in Pittsburgh.

Mr. Simpson has been connected with the iron and steel industry in the Pittsburgh District for many years. He has devoted considerable thought and study to efficiency, organization, advertising and sales promotion. For some years previous to becoming associated with the Steel Company of Canada, he was connected with the Berger Interests of Canton, Ohio, as their special representative.

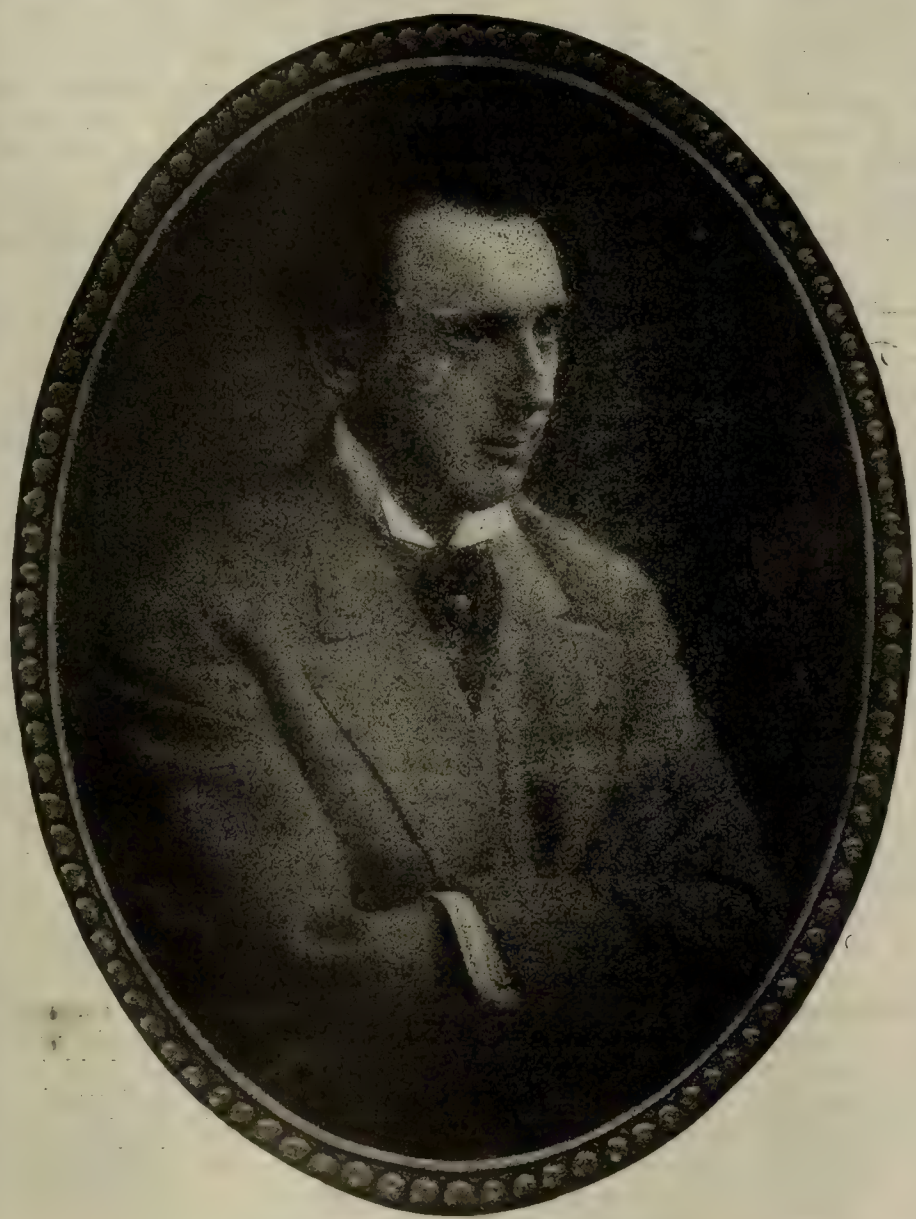
sires the best products that can be purchased, will want to have his name on the dotted line of that company's contract? It seems to me that it is the salesman's mission to so represent the company he works for, and so place before the buyer the articles he has to sell, as to create a desire on the part of the purchaser to want to do business with the company the salesman represents.

There are a number of manufacturing concerns in different parts of the world, who have brought their business up to this very desirable condition, and it is considered a badge of honor or compliment to the good standing of a company when they can state they buy from such a concern. The salesmen, who represent such a concern are imbued with the spirit of the organization of which they are a part, and, in consequence, they convey and impart that feeling to the man they are trying to interest. Again, in proportion to their sincerity of purpose and their belief in the statements they make do they impress and convince, and create in the mind of the buyer a desire to do business with them.

Commerce is no longer exploitation—it is human service; and no business concern or body of men can succeed or exist permanently whose efforts do not meet a human need and add to human happiness, as we succeed only through the good will and good wishes of the people we serve. "Quality" and "Service" to-day correspond with the word "Sterling" on silver. Happiness is the true end and aim of life, the result of all that is truly right and sane; therefore, it is not to urge your getting the name on the dotted line, that I propose to touch on, but to try and put forward what, in my judgment, is necessary for a salesman to understand in order to carry the transaction to a successful issue.

Rendering Service to Salesmen

The subject of "Salesmanship" is one that has been discussed from all angles. We have heard a hundred different views from a hundred different people on the one subject, and I am free to admit that but very few of them analyze the subject to the point of rendering a service to the salesman who hears the discourse. In other words,—they deal with the subject in the abstract, rather than in the concrete. In my judgment, what a salesman ought to know and understand should be the underlying principles pertaining to salesmanship, that is, he should be familiar with the principles which would enable him to take care of all the preliminaries necessary to bringing the transaction up to the point of getting the name on the dotted line. The question of selling is one that requires a great deal of thought and for any man to become proficient in this science, it is as necessary for him to study all the elements that enter into his success, as it is for a surgeon, doctor or lawyer, or any other professional man, to make a study of his profession before he becomes a recognized member.



GEORGE A. SIMPSON

I know of no calling in which it seems to be understood that any one without training may enter, other than the field of sales. It seems to be accepted in a general way, that the constituent parts of a salesman are, ability to talk—irrespective of whether he says anything—to dress well, carry a good-looking grip, and last, but not least, he is always expected to be loaded up and able to tell the latest joke and relate a funny story. This, of course, is looking at salesmanship from a ridiculous standpoint, but it is really the viewpoint from which it is seen by a great number of people.

We have also heard that salesmen are born; and "a born salesman" is a common expression. I am free to admit there are a number of salesmen who are born with certain facilities, essential to successful salesmanship, a little more pronounced, but that a man cannot be trained to become a good salesman—if he will give the right amount of study and desires to be successful in that line, is sheer nonsense. We may just as well say that all men who follow certain professions are born into those professions, or born with certain faculties especially fitted for those professions. In my judgment, this is wrong, and I maintain that any young man, endowed with common sense, fair personality, good health and the love of work fairly pronounced, can, with the right amount of study, become a successful salesman. The truth, as always, lies between the two extremes. There is no salesman so born to his duties that he can dispense with a knowledge of the goods he sells, or so independent of experience that practice teaches him nothing he did not know. You should know what you want to do, then hold the thought firmly and do every day what should be done and every sunset will see you that much nearer to the goal. Now the question is—"What should he study and how can he prepare himself?"

Personality in Salesmanship

Last year I embodied in my discourse the science of thought and the law of attraction, both of which I know are essential factors in the success of a salesman. I will now touch on another vital element, which we will call personality that cannot be explained; it cannot be photographed, neither can the painter or sculptor reproduce it, yet it is one of the most important factors in our success or failure in life. It is this indescribable quality, which some persons have in a remarkable degree, that holds an audience spell-bound and makes people applaud beyond the bounds of enthusiasm.—Charm of personality is a divine gift that will sway the strongest character.—We are unconsciously influenced by people who possess this magnetic power. Of course, that rare charm of manner, which captivates all who come within the sphere of its influence, and that strong personality which inclines all hearts toward its fortunate possessor, are largely natural gifts. We find, however, that the man who practises unselfishness, who is generously interested in the welfare of others, who

feels it a privilege to do a fellow-creature a kindness—even though polished manners and a gracious presence may be conspicuous by their absence, will be an elevating influence wherever he goes. He will bring encouragement to, and uplift every life that touches his. He will be trusted by all who come in contact with him. This type of personality we may all cultivate if we will.

Success From Service

Personality is intangible; this mysterious something which we sometimes call "individuality" is often more powerful than ability that can be measured, or qualities that can be rated, and while it is, like poetry, music or art, a gift of nature, it can be acquired and cultivated to a very great extent. In this connection it is well to cultivate a mild, gentle and sympathetic voice and a sure way to cultivate it is to be mild, gentle and sympathetic yourself. The voice is the sounding board, the index of the soul. It is through the voice we give expression to our thought, therefore, fix your mind on the thought and the voice will follow; and if it is filled with truth, it will vibrate with sincerity, echo with sympathy and so convince your hearers that thoughts in their mind contrary to your own are impossible. It is the man who acts his thoughts and thinks little of the act, who succeeds. Because success is the most natural thing in the world, there is no secret to it.

The man who does not succeed fails because he has placed himself in opposition to the laws of the universe, which is progress. The pathway to success is in serving humanity. By no other means is it possible. Just live your life—work hard—and don't explain. Mind your own business and give others a chance to mind theirs and you can depend upon it great men will appreciate you for this very thing; and while I am not sure that absolute, perfect justice comes to everybody in this world, I do know that a very good way to get a fair slice of justice is not to think of it, or to be too anxious about getting it. The great rewards gravitate to the man who fits himself to receive them. The man who does his work so well that he needs no supervision has already succeeded and the acknowledgement of his success is sure to follow. The work of the world must be done and civilization is simply a search for men who can do it.

Tact, Observation, Good Taste.

Tact is also a very important factor; next to a fine manner, perhaps the most important. One should know what to do and be able to do the right thing at the proper time. Observation, good judgment and common sense are indispensable to those trying to acquire the power of personality. Referring to observation, Herbert Spencer says: "An exhaustive observation is an element of all great success," therefore, there is no position in life where a trained eye and the faculty of observation cannot be made a great success asset. The efficient salesman is always growing; he is always accumulating knowledge of every kind. He does not merely look with his eyes—he sees with them; and he not only uses the optic nerve, but he uses his mind. He keeps his mind open to all that is new and helpful. Careless, indifferent observation does not go back of the eye. If the mind is not focussed, that which we see is not clear cut; we do not carry it with force and distinctness to the brain, and, therefore, we are not able to draw accurate conclusions. The faculty of observation is particularly susceptible of cultivation and is capable of becoming a mighty power and a big asset in the success of a salesman. No matter where you go, study the situation thoroughly; observe, and store your observation away in your mind — some day it will serve you well.

Good taste is also one of the elements of personal charm, as you cannot offend the tastes of others without hurting their sensibilities. The power to please is a tremendous asset. What can be more valuable than a personality which always attracts. It is not only valuable to a salesman, but to every one in every field of life. The ability to bring the best that is in you to the man you are trying to reach, to make a good impression at the first meeting, to approach a prospective customer as though you had known him for years—without offending his taste, without raising the least prejudice, but getting his attention and good will—is a great accomplishment. There is charm in personality from which it is hard to get away. It is difficult to snub the man who possesses it. There is something about him that arrests our prejudice and no matter how busy we may be, or how much we dislike to be interrupted, we rarely turn away a man with a pleasing personality. We must give much in order to get much; the more we radiate the more generous we are, and the more we fling ourselves out to others, the more we get back. The current will not set toward you until it goes out from you. The more generously you give, the more you get in return. In other words—as you pour out your personality, born of courtesy and kindness and the other character-forming virtues, so do you inspire respect and confidence, and invite from others a return of that which you give.

Courtesy and consideration in every walk in life is now the accepted rule. No strong man lowers himself by giving somebody a lift, no matter who that somebody is. It may be an ignorant foreigner, unversed in our ways and language; or it may be an old man or woman, a cripple or a child—it matters not—and no time is lost, for the more people you rightly direct and the more intelligence and consideration you rightly lend, the more valuable will be your life. Many men fail because they do not see the importance of being kind and courteous. Kindness, consideration and courtesy to everybody always pays; and besides, it is a pleasure to be kind. It increases our store of happiness. I have seen men lose important positions and their reputations—which are more important than position—through their lack of courtesy to men to whom they did not think it was worth while to be kind. Beauty of character, charm of manner, attractiveness and power of expression, blended with courtesy, consideration and kindness, will open the door to any proposition, and our sincerity of purpose will clear the path of its many obstructions.

Cultivating One's Better Self

Finally, the thought I wish to convey is, that no investment will give greater returns than cultivating your better self, and thereby developing that indefinable something called personality. There is nothing that pays so well as training our minds and thoughts along the lines of the beautiful and true. It matters not how well we understand the lines we have to sell; we may be experts pertaining to technique or detail in connection with iron and steel products, or any other articles of commerce for that matter, but if we are not in harmony with nature and nature's order of things, we cannot make the success of our lives that we otherwise would. Being in harmony with nature, brings us into harmony with all about us and above all it brings us into harmony with ourselves and when this is so, and the physical is subordinated and ruled by the mental, life becomes full and complete.

I fully realize I am painting an ideal picture, although not an impossible one, and while we may not rise to the height of this ideal, we can, by following it, at least go part of the way, and this part, no matter how small, will take the place of some discordant element, which would retard our success. Therefore, I recommend that you try to open your mind and heart to the wonderful influences of nature—the beautiful and true, Realize your oneness with her and partake of the inspiration and power she imparts. Implant firmly in your mind the successful man you wish to be and so will you become, for it is the vision we hold in our mind—the ideal that is enthroned in our hearts—that we build our lives by. This we will become. It is the beauty of our thought, the quality of our minds and ideals that make the man.

FISHERIES PROTECTION VESSELS LAUNCHED

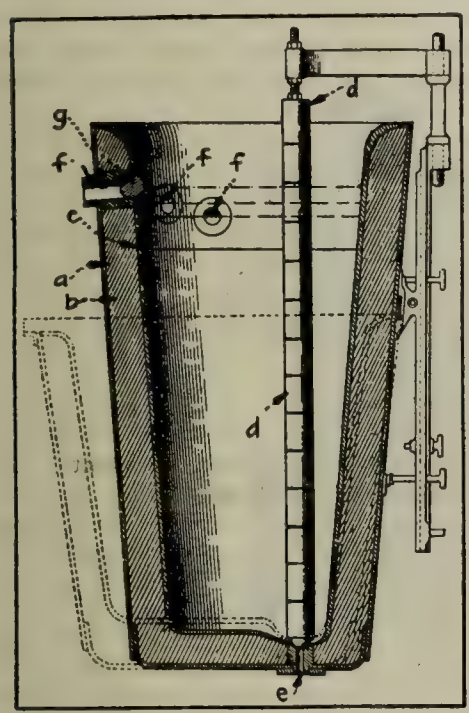
TWO more vessels for fisheries protection service were launched at nine o'clock Thursday morning, August 2, from the Polson Iron Works, Toronto. These two vessels, the St. Eloi and Festubert, are the last of six of the same class, the others launched on June 16 being named respectively the Yypres, Vimy, Messines and St. Julien. The christening ceremonies were performed by Mrs. A. H. Jeffrey, wife of the general manager of Messrs. Polsons, who christened the St. Eloi, and by Mrs. Harry Miller, wife of the vice-president of the company, who christened the Festubert, both of whom were presented with a handsome bouquet of roses.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

SELF-SKIMMING LADLE FOR STEEL FOUNDRIES.

A NEW type of ladle, described in The Iron Age, and known as a self-skimming one, has been invented by J. C. Davis, fourth vice-president of the American Steel Foundries,



NEW TYPE OF LADLE WHICH SKIMS ITSELF OF EXCESS SLAG. THE OLD TYPE IS SHOWN RELATIVELY BY THE DOTTED LINES.

Chicago. It is especially adapted for pouring steel castings and is claimed as making it possible to expose 45 per cent. less area of steel to the detrimental action of the slag than in the case of the old style ladle where basic slags are obliged to remain for a long time in contact with the metal. This is particularly the case in pouring castings, for the chemical reaction between the slag and the steel tends to lower the silicon content of the steel and to add oxygen and phosphorus to it. The new type of ladle has the further advantage, it is claimed, of imparting a greater hydrostatic head to the metal, which the inventor claims has the effect of causing the lighter slag to rise to the top of the steel and remain there while the ladel is being emptied.

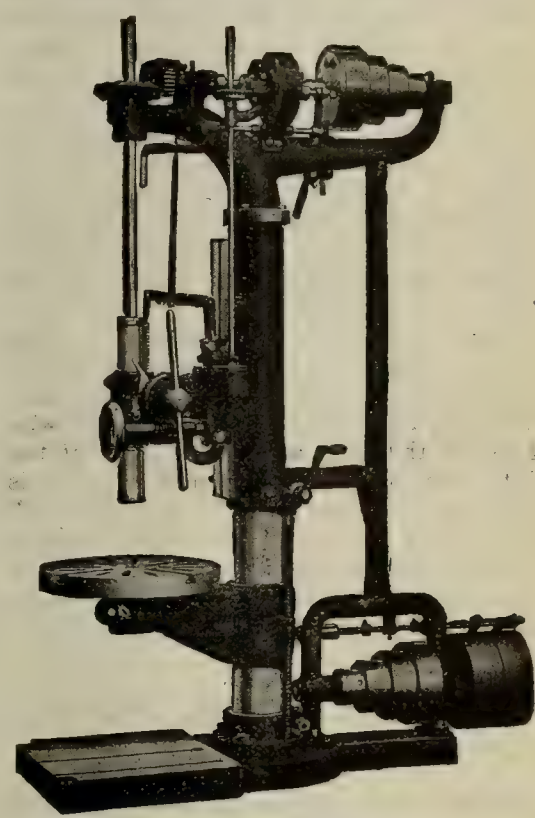
In making open hearth steel, it is almost impossible to produce an exact quantity of steel of the desired composition at one time because owing to various delays more metal than was contemplated in the original charge has to be added. It is, therefore, necessary that the ladle, which is to hold the steel and its slag, be of such ample proportions as to properly receive and contain the original charge and any such additional amounts which have to be added. Normally, therefore, when a heat of steel is discharged into its ladle, there is so much space between the top of the steel and the top of the ladle that the ladle receives an excessive amount of slag, which remains usually in contact with the steel until the ladle is emptied entirely. The greater the volume of slag in the ladle, the greater the hydrostatic head or pressure exerted by the slag, thereby causing the latter to settle more deeply into the steel, increasing the slag's contaminating effect. These conditions are especially true in steel foundries.

As shown in the illustration, the new ladle is of smaller diameter and is much deeper than the type generally employed. It is pierced near the top with several openings which are staggered at different levels, the purpose being to provide outlets for the removal of slag. Before the ladle is filled with steel, the slag openings are closed with a plug, composed mainly of silica sand with a binder of fire clay, and these plugs can be removed as required in order to regulate the height of the slag in the ladle to a proportion just sufficient to serve as a blanket to prevent chilling the steel. The ladle consists of an exterior shell, (a), a brick lining, (b), and a thinner lining(c), of material containing magnesite and dolomite. The stopper is shown at (d), the pouring opening at (e), and the slag holes at (f). How the slag holes are plugged is illustrated at (g).

25-IN. UPRIGHT DRILLING MACHINE

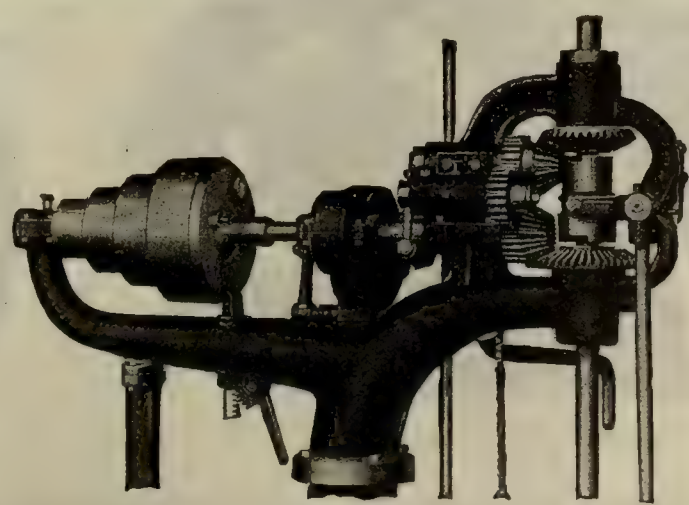
THE machine illustrated in the accompanying engraving has been designed to withstand hard usage, and at the same time maintain a high degree of accuracy. It is provided with eight spindle speeds and six positive geared feeds. The spindle speeds are obtained through a four-stepped cone with back gears enclosed within it, instant operation of the gears being obtained by a rack and sector lever conveniently located in the upper part of the frame.

The high carbon crucible steel spindle and the sleeve are accurately ground, the spindle being provided with an imported



25-IN. UPRIGHT DRILLING MACHINE.

ball thrust bearing. The sliding head, which guides the spindle, is counterbalanced by a chain attached to a notched lever, which is also connected to the spindle, allowing the balance to be adjusted between the two parts to any desired degree by simply varying the position of the chain on the notched lever. The sliding head has a wide bearing on the column, and is easily adjusted.



ARRANGEMENT OF TAPPING ATTACHMENT ON UPRIGHT DRILLING MACHINE.

Two quick return levers are used—the one on the right being slidable in its bearing, so that it can be withdrawn to its full length to facilitate hand drilling in light work.

The six positive geared feeds, from .0056 in. to .031 in., are at the instant command of the operator, any one of them being obtainable while the machine is running. Automatic stop to down feed is set by graduations on the spindle and may be thrown out either by hand or power. Rigid construction and perfect alignment with the spindle and column is a feature of the table; while the supporting arm has a wide bearing on the column.

Ample proportions and symmetry of design characterize the frame, which is securely bolted to the base. When equipped for tapping as shown in the second illustration, the machine is provided with an additional bevel gear and pinion geared to the regular spindle gears by means of an idler eccentrically mounted so as to be thrown out of mesh when not in use. Two positive clutches engage the spindle with either pair of bevels as required.

This machine is manufactured by the Silver Mfg. Co., Salem, O., and has a net weight of 1.650 lbs., the floor space occupied being 22 in. x 62½ in. The distance from column to centre of spindle is 12⅞ in.; traverse of head on column, 22¼ in.; traverse of table on column, 16 in.; dia. of table, 21¼ in.; dia. of spindle, 1⅝ in.; feed of spindle, 9¼ in.; width of cone steps, ⅜ in.; spindle speeds, 14 to 315 rev. per min.

A REMARKABLE OIL ENGINE

By H. P. Hoag

IN the issue of this journal for April 26, the writer described a certain device evolved during his experience in adapting a line of gasoline engines to burn kerosene. The engine illustrated in the accompanying sketch however, is a real kerosene engine that will start and run on kerosene and has neither carburetor nor electrical ignition. It is the invention of a Danish engineer, R. M. Hvid, and is bound to revolutionize the internal combustion engine, giving as it does the same economy as the world famed Diesel engine.

For those unfamiliar with the Diesel engine it might be stated that first, it is a high compression engine, combustion being caused by the heat of compression which is about 500 lbs. per sq. in., (it being an established engineering principle that a high temperature can be attained by air compression) the resulting temperature being about 1000 deg. Fahr. Nothing but pure air is taken into the cylinder during the suction stroke, then when the piston reaches the highest point of compression, fuel is injected into the cylinder by means of air compressed to about 800 lbs. per sq. in., then cooled. Combustion begins the instant the oil meets the hot air in the cylinder and continues through that part of the working stroke during which fuel is introduced. While the Diesel type gives the very highest economy known to the internal combustion engine, it is never built in small units owing to the expensive apparatus necessary to inject the fuel under such high pressures.

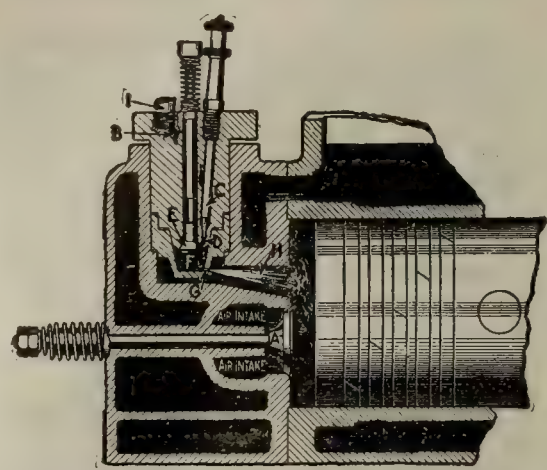


FIG. 2—SECTION OF CYLINDER HEAD SHOWING IGNITION CUP WHICH AUTOMATICALLY FEEDS FUEL TO COMBUSTION CHAMBER.

Wonderful as the reliability and fuel economy of the Diesel engine are, the Hvid principle bids fair to outclass the former owing to its extreme simplicity and ease of starting as well as economy, the fuel consumption being half a pound of fuel oil per horse power hour. Another great point of advantage this new type has over the Diesel is that it can be built in small sizes which of course is out of the question with the Diesel type as explained above. Think of an engine, without carburetor batteries, magneto, spark plug, or wires, or the application of any external heat, that will start and run on most any kind of oil, such as kerosene, distillate, fuel oil, or crude oil, in fact any kind of oil that will flow, machine, fish, lard, linseed, olive or peanut oil. This type of engine is now being built by several firms. It was recently the writer's privilege to investigate several of the Hvid type engines now building in the United States both stationary and marine, which proved very interesting indeed.

In this new principle combustion is obtained by the heat of compression as in the Diesel, but the secret of the new system is in the patented fuel cup which times the ignition and represents the only method by which combustion by compression can be easily controlled.

In the sectional view the burning oil can be seen at H, the principle of operation being as follows. During the suction stroke, pure air only enters the cylinder through the intake valve. Oil is admitted by valve E, the quantity being varied by needle valve C, which is under control of the engine governor. As the piston returns and compresses the air to about 450 lbs. per sq. in. the temperature rises to about 950 deg. Fahr. and heats the small fuel cup red hot which brings about a partial combustion of the fuel oil in the bottom of the cup, causing the pressure in the cup to immediately rise above the air pressure in the cylinder which forces the hot oil out through the small pin holes in the cup into the cylinder when it comes into contact with the heated air in the cylinder and burns as shown at H, forcing the piston forward on its power stroke.

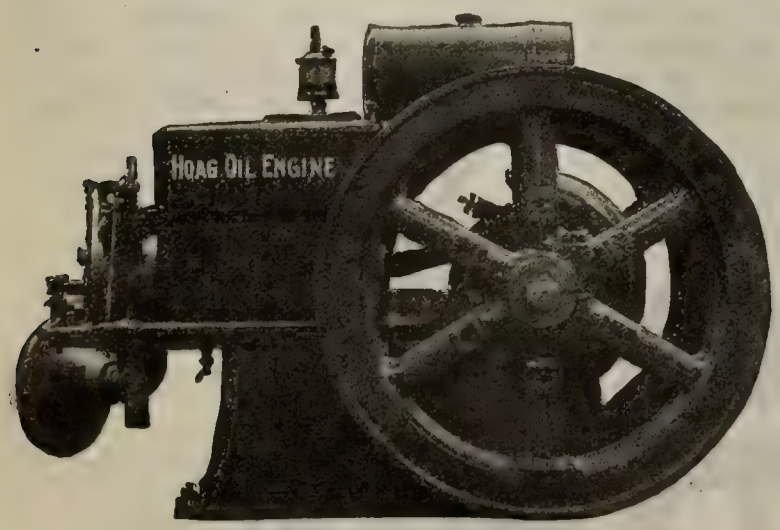


FIG. 1. SIDE VIEW SHOWING CONVENTIONAL APPEARANCE OF ENGINE.

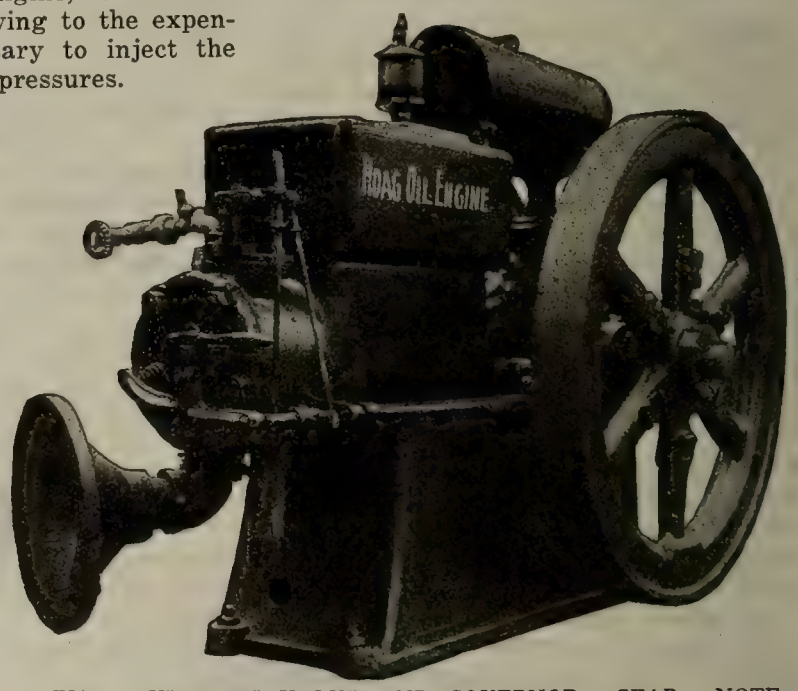
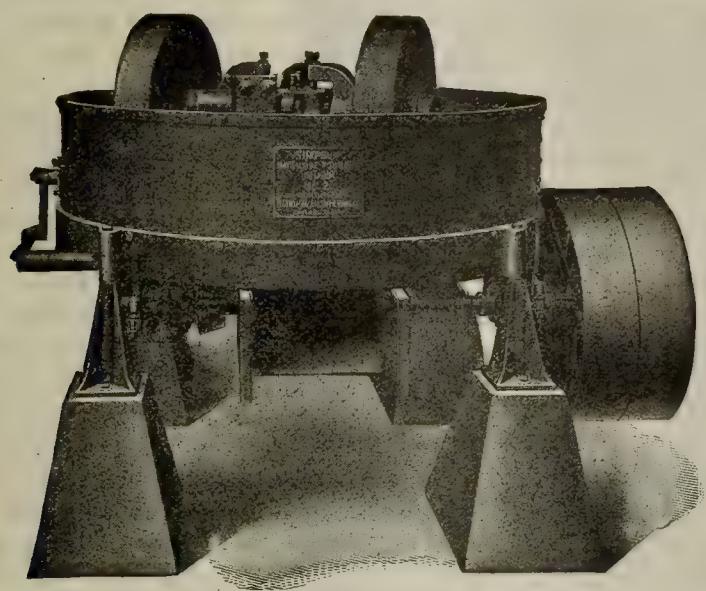


FIG. 3—VIEW OF VALVE AND GOVERNOR GEAR. NOTE ABSENCE OF COMPLICATED MOVING PARTS.

It will be seen that this new principle incorporated into a substantial design, doing away as it does with all electrical aparatus for igniting the charge, must result in simplicity and reliability and in turn supersede the gasoline engine for at least stationary, portable and marine work.

INTENSIVE FOUNDRY MIXER

AN action which squeezes and kneads the grains of each kind of sand through and amongst each other is the underlying principle which is responsible for the efficiency of the foundry mixer illustrated in the accompanying engraving. It is claimed that the squeezing or kneading action imparted by the mechanism gives a degree of mixing impossible to get by hand or from the pugmill type, while the breakage of the sand grains which takes place with excessively heavy mullers is obviated by designing the mullers of just sufficient weight and width of face to mull and knead the sand properly so as to produce the necessary plasticity and toughness without breaking the grain of sand, thereby retaining the original porosity and openness of the mixture.



INTENSIVE FOUNDRY MIXER.

The illustration shows the exterior view of No. 22 mixer having a pan 6 ft. in diameter, with mullers 30 in. dia. by 6 in. face, set at different radii from the centre so as to cover 10½ in. width of track. The pan is stationary and carries a turret on which are bearings for a central supporting casting in which is fastened a vertical drive shaft from the bevel gearing underneath. The central supporting casting carries the plows and the mullers, the function of the plows being to turn over and move the sand mixture alternately inwards and outwards, the outside plows throwing the mass of sand toward the inner muller and the inside plows doing likewise to the outer muller. The mullers revolve on their own axis as they travel around the pan, their paths being at the points where the mixture is heaped up highest by the movement of the plows. The action of the plows, together with the kneading and squeezing action of the mullers results in a thorough incorporation of all the elements of the mixture regardless of its composition.

The builders of this machine are the National Engineering Co., Chicago, who make it in two sizes, the No. 1, or 4 ft. mixer having a capacity of 3½ to 4 cub. ft. per charge, while the No. 2 machine, illustrated, takes 7 to 10 cub. ft., which includes the quota of coal dust when facing sand is being mixed, or binder when core sand is required.

PLUG EXTRACTOR FOR SHELLS

AT a certain stage in the manufacture of shell it is necessary to screw into the nose a temporary wooden plug, which is frequently difficult to remove by ordinary means, especially if the plug has become swollen by damp. Sometimes when the use of levers has failed to effect the removal, a mallet and chisel are used to smash the rims of the plugs, which are then frequently broken into the shell. In order to obviate these troubles, the firm of M. Glover & Co., Holbeck-Lane, Leeds, has designed anl introduced a machine for the effective removal of the plugs with the minimum of exertion. The construction and operation of the machine are shown in the accompanying drawings, from which it will be seen that the shell is first securely gripped. Then, by means of a few turns of a hand wheel, the plug is removed.

The machine can be fixed on a bench or table. The shell is placed in a recess in a vice, in which it is firmly held by means of the band A, which is brought down and tightened by means of the handle B pivoted at C. After this has been accomplished, the depression of the hand lever D against the action of the spring J causes the tongued and spiked clutch E on the end of the spindle F to engage the plug. Then, by turning the hand wheel G, which is geared to the spindle by the bevel wheels H, the plug is unscrewed. On the end of the handle or lever B is a projection or lug, by means of which the gripping band is released after the plug has been withdrawn. The machine can also be adapted for the removal of metal plugs by replacing the tongued and spiked clutch E by an attachment K having a square projection on the bottom for fitting into a corresponding recess in the plug.

We understand that these machines are in use in several shell factories and are giving satisfaction, says The Engineer.

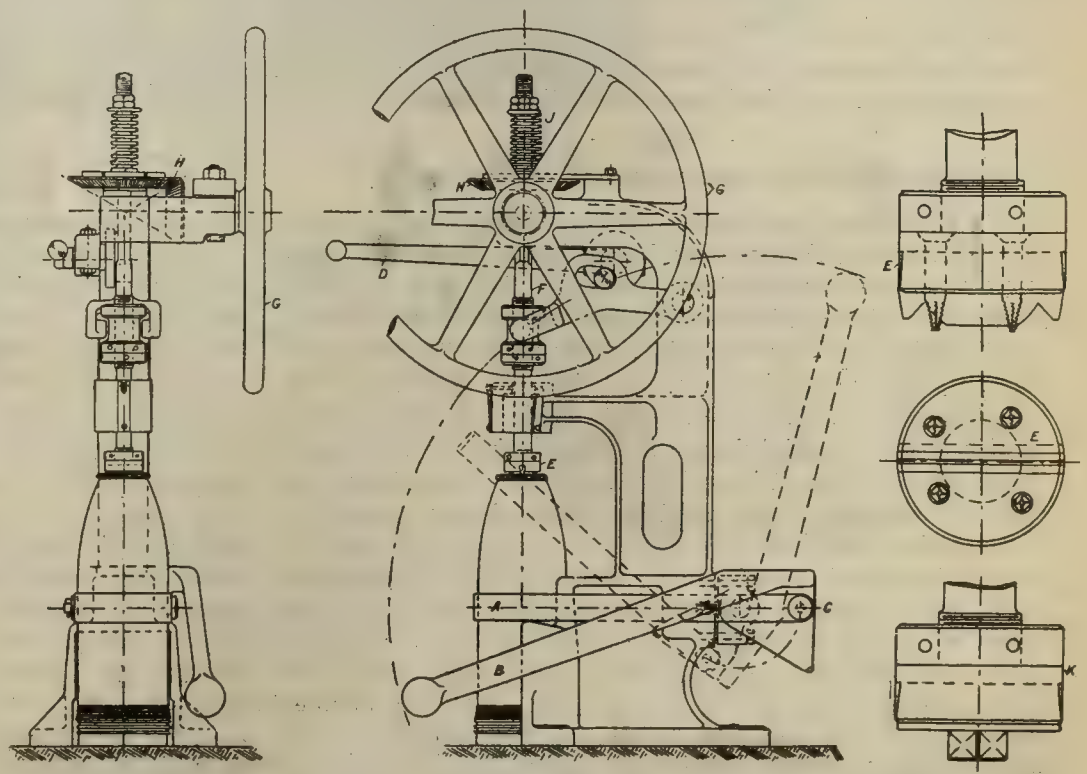
A colored janitor was pressed to tell why he had left the Methodists and joined another church. "Well," he replied, "we is moh oddehly; we has moh style."

"Yes; but what do you do?" he was asked.

"Well, fo' one thing, we has responsible readin's."

"Well, what else?"

"Well, we has Roman candles on the altah, and ther we buhn insec' powdeh."



SHELL PLUG EXTRACTING MACHINE.

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AVOID WASTE.

THE world war has taken so many producers from the sources of food supply that the world's consumption of food is greater than the amount available, and consequently, food reserves are being rapidly depleted. Millions of men are actively engaged in warfare and in the supply of munitions and equipment. They are fighting our battles and we must provide their food. Canada will produce all the food we can consume, but Canadians have never been known as a selfish race. Our Allies, therefore, are depending upon us for help and our people will unquestionably respond with generous hand.

Sir Robert Borden has said that Canada is in the war "to the last man and the last dollar." Canada is also in the war to the last pound of food. Canadians are their brothers' keepers, and will feed them, cost what it may. It is necessary, therefore, that we practise economy of the food supply. It is better to deny ourselves from choice than from necessity. There is no denying that there will be a food shortage, and the present is the time to put into practice thrift and rigid economy in the use of food.

EXERCISING THE MENTAL FACULTIES.

HOW many workmen in the industrial world realize the loss they sustain by failing to make the most of the opportunities that each day has to offer. The vast majority of employees are apparently satisfied to "put in the time" at their daily task without much more than a passing thought as to the "why" or the "how" of its accomplishment. The successful achievement of one's duties is an essential factor in the solution of life's problem, nevertheless, it is equally if not more important that the full faculties of the mind be employed as a co-worker with, and a silent advisor of the eyes, ears and hands, to insure increased confidence in future effort. Many men force their bodies to the physical toils of the day, while their minds are too often dwelling on the night before or the nights that are to come. We call to mind some few years ago, a youth serving his apprenticeship in the same shop as the writer, who for weeks at a time—from his own statements—had not retired to rest before two in the morning, and often as late as three or four, and more than once he remarked that he had just time to change his clothes before coming to work. These conditions were not conducive to improving his engineering ability, inasmuch as his energies were being consumed by what might be termed riotous living, the inevitable result being a failure to concentrate his mind upon the proper performance of his work, often entertaining the other workmen with the exploits of the previous "evening," dancing being his particular failing. This in itself was perhaps not so pernicious, had it not been for the fact that these confidences were often given while individual mechanics were endeavoring to instruct him how to perform a certain piece of work. Even in his fourth year he could not be relied upon to set the change gears on an engine lathe to cut an ordinary thread.

It must not be assumed that conditions such as these are typical of the average mechanic, but they are nevertheless common in probably a modified degree. The characteristic of marked indifference that is often emphasized in the actions of the average workman, is expressive that he is only an employee and that he is paid for what he does and not for what he knows. This in a great measure is undoubtedly true, but it is also true that the more intelligently he does his work, the better he is paid; not alone in monetary remuneration, but in the acquisition of valuable knowledge that eventually forms the most potential assets that one can possess. It is often sufficient, in the eyes of the man's employer, that he successfully perform the work that is intended; however, we should never forget that our future is in our own hands and not in those of our boss. This fact should spur us on to apply ourselves to our work in such a manner that our efforts will not only be appreciated by our superiors but will open the way for greater personal responsibilities and wider opportunities.

One of the fundamental facts that a young man should be early possessed of, is that self-reliance is one of the master keys to success, but it is well to remember that locks will often resist the efforts of a rusty key. It is, therefore, essential that this self-reliance be based on the ability to achieve results, and this ability can only be acquired by the constant and conscientious application of one's faculties to the questions of the moment; studying every detail of the work so that each becomes lessons instead of examples, the latter in many cases being but the forerunner of the automaton.

Physical achievement unaccompanied by mental effort is but so much waste of energy. Thinking of one's work is necessary if the man is to become the master. The reasoning powers of the individual deteriorate more from disuse than overuse. Machinery that is constantly neglected will be ruined more rapidly than that in continual use.

Every person, no matter how insignificant his position, or how apparently unimportant his duties may appear, should strive to master the smallest detail, so as to better fit him for the larger opportunities that are open to all. All positions of responsibility require and demand, ready resource, originality, personal initiative and self-reliance; and the latter can only be acquired when one is amply possessed of the other three. They tell us that hypnotism is the mastery of mind over matter, and present day industrial activity may be likened to this science or practice, where the master mind is in the plant executives and the matter represented by the working masses. While much may be said in favor of this subjective system, it nevertheless has the tendency to instil in the workman the functional elements of mechanical application only, which in turn too often creates a spirit of indifference and may in time eliminate that reasoning power which is so essential to individual advancement.

INDUSTRIAL NOTABILITIES

WALTER HOWARD BURGESS, vice-president and general manager, International Malleable Iron Co., Ltd., Guelph, Ont., was born in Lynn, Mass., Sept. 29, 1879, and received his education in Lynn Public and High Schools and Business College.

He entered the employment of the Laconia Car Mfg. Co., Laconia, N.H., 1900-1905; became assistant general superintendent, Wilmington Malleable Iron Co., Wilmington, Del., 1906; becoming general superintendent, Trenton Malleable Iron Co., Trenton,

WALTER HOWARD BURGESS.

N.J., 1907-1910. At a later date he spent sometime at Chicago with the parent company of the latter concern (Illinois Malleable Iron Co.) preparatory to coming to Canada to establish the present plant of which he was superintendent, becoming vice-president and general manager, August, 1916. The plant now employs some 250 hands and extensive additions are in progress.

Mr. Burgess is a member of Canadian Manufacturers' Association. His society affiliations are confined to A.F. and A.M. (Shriners), while his principal recreation is golf.

In April, 1910, he married Dorothy D. Small, their family consisting of one son and one daughter. Their residence is 10 Edwin Street, Guelph, Ont.

Mr. Burgess subscribes to the Congregational creed, and in politics is Independent.

—Photo, Courtesy British and Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$47 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	55 95
Basic, Valley furnace	53 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	.....

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	12 10
Chequered floor plate, ¼ in.	12 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 50
Tank plates, Pittsburgh	9 00
Structural shapes, Pittsburgh	4 50
Steel hoops, Pittsburgh	5 25
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 50

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$34 00	$35 00
Electro copper	34 00	35 00
Castings, copper	33 00	34 00
Tin	62 00	63 00
Spelter	11 00	11 00
Lead	13 50	13 00
Antimony	20 00	20 00
Aluminum	65 00	64 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$12 00	$12 00
Heads	12 30	12 30
Tank plates, 3-16 in.	12 65	12 25

WROUGHT PIPE.

Effective July 5, 1917.

Size.	Black Per 100 feet	Galvanized Per 100 feet
Standard Buttweld.		
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00
Standard Lapweld.		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$23 00	$22 00
Copper, crucible	26 00	27 00
Copper, heavy	26 00	26 50
Copper wire	26 00	26 50
No. 1 machine composition	20 00	22 00
New brass turnings	16 00	19 00
No. 1 brass turnings	14 00	16 00
Light brass	12 00	10 50
Medium brass	16 00	16 00
Heavy brass	18 00	18 00
Heavy melting steel	21 00	17 00
Steel turnings	11 00	8 00
Shell turnings	12 00	12 00
Boiler plate	18 00	10 50
Axles, wrought iron	25 00	24 00
Rails	20 00	18 00
No. 1 machine cast iron	27 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	19 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	29 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	8 50
Stove plate	19 00	19 00
Scrap zinc	8 00	9 50
Heavy lead	11 00	10 75
Tea lead	7 00	7 00
Aluminum	35 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in. and larger	$7 60
Structural rivets, as above.	7 50
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze.	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$100 00
Open-hearth billets	100 00
O.H. sheet bars	105 00
Forging billets	125 00
Wire rods	95 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS.

Solder, strictly	0 38
Solder, guaranteed	0 41
Babbitt metals	16 to 65
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drum	4 35
White lead, pure, cwt.	19 00
Red dry lead, 100-lb. kegs, per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 60
Linseed oil, raw, single, bbls.	1 27
Linseed oil, boiled, single bbls.	1 30
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery Cloth	list plus 33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.37
British Manila Rope	.31
New Zealand Hemp	.31
Transmission rope, Manila	.43
Drilling cables, Manila	.39
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks	list plus 30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse ..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 50%; headers, 60; flanged unions, 40; malleable bushings, 50; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$11 00	$11 00
Sheets, black, No. 10	11 50	11 50
Canada plates, dull, 52 sheets	11 00	11 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	11 70
Premier, 10¾ oz.	13 85	12 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B	
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$10 90
Connelsville Foundry Coke	..
Steam Lump Coal	8 50
Best Slack	8 05

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$33 00	....
1¼ in.	36 00	....
1½ in.	38 00	32 00
1¾ in.	38 00	32 00
2 in.	45 00	33 00
2¼ in.	48 00	35 00
2½ in.	50 00	38 00
3 in.	58 00	45 00
3¼ in.	....	53 00
3½ in.	70 00	55 00
4 in.	82 00	67 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	13
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	11

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No.1	1 50
Leather in sides	1 35

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THERE has been no material change in the iron and steel situation since last week, the market being a waiting one pending a definite announcement by the American Government with regard to prices. It is believed in some quarters that prices to private consumers will not be controlled, but, of course, nothing is known as to what action the Government is likely to take in this regard. The heat wave caused a considerable reduction in the output of both iron and steel, this, however, is always expected during July and August. Buying has been inactive due to the uncertainty with regard to prices and also on account of the summer dullness in the trade. Prices of steel products are unchanged, although a weaker tendency has developed in some lines. The pig iron situation is unchanged, prices of domestic irons being still withdrawn. Business is practically at a standstill as consumers are keeping out of the market for the present until the situation clears up. Coke prices are showing an easier tendency, but production has been considerably affected by the hot weather. There is some fear of a shortage both in coal and coke, and consumers are stocking up. The scrap market is dull and featureless with quotations unchanged. The non-ferrous metal markets are not as yet showing any marked activity, as consumers continue to hold off pending developments in regard to prices. Copper is a little firmer, due to shortage on account of the strikes.

Montreal, Que., Aug. 6, 1917.—Despite the volume of business that marks the activity of the many industrial interests at the present time, the difficulties of the manufacturers are steadily increasing. The shortage of cars is a factor that prevents the maximum from being accomplished and hinders the free transportation of raw and finished materials to their various destinations. This feature of the situation is likely to become further emphasized in the near future as the volume of rolling stock that will be required for the handling of the crops, and also the transporting of military suplies to the various U.S. training camps will seriously affect the moving of other supplies. A feature of the week has ben the report that the American Government will take over all ships building, and also all shipyards, as a step in faciltating the construction of ship building in U.S. shipyards. This action may precede the acquisition of all ships flying the American flag, as a means of better controlling the shipping of materials to and from Europe and other countries. General activity continues unabated but the situation in the States is to some extent dominating the market here, owing to certain complications that are arising out of current developments.

Pig Iron

The situation is still characterized by the uncertainty incidental to the delayed action of the American Government in announcing the price regulations for this and other commodities. Present conditions are not conducive to active buying and the market in consequence has been rather quiet. In contrast to the strong and upward movement of pig iron during the past year it is interesting to note that the past few weeks of inactivity have been followed by a slight falling off in the price quoted for Bessemer and basic pig; both these grades

having declined $2 during the week, the respective quotations being $55.95 and $52.95 per ton. The local situation is unchanged with Canadian prices still withheld.

Steel

The strong position that steel has maintained for many months appears to have reached its maximum, and in some respects may be even now on the wane. The developments of the past six weeks, in which the American Government has been endeavoring to set prices and regulate the distribution of all classes of war material, has seemed to be the order for the various markets to mark time, the resulting situation having been characterized by a degree of uncertainty and nervousness that has created a reluctance on the part of producers and consumers to take an active interest in the market. The possibility that the government would dominate the situation in the regulation of prices, based on the actual cost of production, had the tendency for a time to disorganize the market, but this feeling has given place to a more encouraging one where the domestic requirements will still figure in the question of supply and demand, although, while an easier market may govern the needs of the Government, the outside situation will experience little relief, at least for the immediate future. Guided by the experience of the past three years, the U.S. Government are going into every detail before announcing a definite policy of market control, and it is the magnitude of the task and the amount of work involved that continues to keep the trade in the dark as to the final decision of the department heads. Under existing conditions it would be impossible to predict what will take place during the coming weeks, and during this interval excessive activity is not expected. Few price changes are reported and the general market conditions are unchanged. The feature continues to be the heavy demands on plate mills for shipbuilding requirements. The Pittsburgh quotation on refined iron bars has been advanced $5 per ton, the price now quoted being 5¼c per lb. A factor that may soon affect steel conditions is the lower price quoted on Bessemer and basic pig, a decline of $2 per ton being reported during the week. Local conditions are relatively the same with prices firm; dealers say that the transportation difficulties have slightly increased owing to the shortage of cars, especially where materials are being shipped from the States.

Metals

The situation is still dominated by uncertain conditions prevailing in the States, as the delay in establishing the price regulations has the tendency to maintain an unsettled market. Buyers are reluctant to cover future requirements under these conditions and trading is consequently affected. Copper is settling down again after a short period of strength. Tin is unsettled but the early future promises a better market. Spelter is uncertain. Lead is firm but inactive. Antimony is firmer on better demand. Aluminum is firm and unchanged.

Copper.—The market is again reacting after a temporary spell of strength, during which however, no marked activity was evident. Consumers are still holding aloof from the market which is marked by the uncertainty prevailing through delayed action of the authorities at Washington. New York quotations on lake and electrolytic are unchanged, but the latter was higher during the earlier part of the week; prices quoted at present being 30c and 28½c respectively. The quotation on casting however, is on a par with electrolytic, on an advance of 2c per lb. The local market is firm and unchanged on a steady demand; dealers' prices are 34c for lake and electro, and 33c for castings.

Tin.—The situation is practically unchanged with New York prices ¾c higher than a week ago but lower than those quoted earlier in the week. The recent rise has resulted from the stronger position of the London tin market. The market has been a little more active of late but is still influenced by the uncertain attitude of the Government in connection with the price regulations. A factor that may tend to facilitate the shipment of tin is the fact that all ocean transportation will soon be in the hands of the Government. Local conditions are unchanged with prices firm at 62c per lb.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

Spelter.—Considerable interest has been created by the recent action of the American Government in connection with the changes that have been made in the method of purchasing spelter for their future requirements. New York continues to quote 8⅝c per lb. The local market is not very active but is comparatively firm at last week's price of 11c per lb.

Lead.—The market is a quiet one but relatively firm. Prices are well maintained on large lots but small quantities are apparently available at prices below the current quotations. The U.S. Government has placed additional orders for lead requirements but it is not definitely known the exact price that has been paid; some reports say that the price has been 8½c but others claim that the price is the same as that paid for the previous supply, 8c per lb. The local market is well maintained on fair demand but with a weak undertone; price is unchanged at 13½c per lb.

Antimony.—The market is not particularly active but maintains its firmness. New York quotations of 15½c are ½c higher than last week. Local conditions are unchanged with prices steady at 20c per lb.

Aluminum.—The market continues to be relatively firm on a steady demand; prices are the same as last week, 65c per lb.

Machine Tools and Supplies

The local situation has not been marked by any pronounced activity in the demand for machine tools, the week having been a very quiet one. Fair inquiry is reported from shipbuilding firms and those contemplating the construction of accessories, but the inability to secure the desired equipment is one of the features of the market. The varied nature of the tools suitable for this class of work eliminates the possibility of utilizing the tools that have done service in the munitions plants, and the surplus of shell machinery, made available by the decline of large munition work, offers little relief to the new industry. Shipping conditions are more acute and delivery to customer is emphasizing the difficulties of the present situation. The demands for all classes of supplies continues heavy and the market is still characterized by advances in price quotations.

Scrap

Influenced by the weaker tendency that appears to be developing in the general iron and steel situation, the scrap market is a little unsettled and an easier tone is apparent. The American market shows a considerable falling off in all scrap iron and steel quotations, and local dealers are inclined to think that the Canadian market will also repond. Prices here are easier, heavy melting steel at $20 per ton shows a decline of $2 per ton. Rails are quoted at $20, machine cast iron at $27, iron car wheels at $26 and steel axles at $29; these representing a decline of $1 per ton. A better tone is evident in old metals, and prices in the States indicate a stronger market; dealers here, however, are quoting last week's prices on a fairly steady market.

Toronto, Ont., Aug. 7.—During the hot weather there was a general falling off in output of the factories but conditions are now more normal in this respect. Workers in the steel mills furnaces and forging plants were the greatest sufferers and output was consequently reduced considerably. In all trades during the summer, particularly during August there is less activity and a general falling off in the consuming demand.

Steel

The situation in the steel market has undergone no material change since last week and the trade continue to await developments in regard to prices. The usual summer dullness prevails and under ordinary conditions business would not be brisk, but there is no doubt that

the cessation of buying is due to the uncertainty over what action will be taken on prices by the American Government. It is unlikely that conditions will improve until this uncertainty is removed which will probably not be for some weeks owing to the complicated nature of the Federal Commission's investigations.

Conditions in Canada are directly affected by the situation in the States owing to the close connection between the two markets. The chief point of interest lies in the position of the private consumer as there is some possibility of the Government price control being extended to include these consumers. The majority of consumers, however, believe that the Government will allow the law of supply and demand to regulate prices to them, in which case it is doubtful if there would be any important decline in values although the impression is generally held that prices have about reached the top. The fact that the steel mills are booked up so far ahead will have a tendency to steady the market and although prices are easier for the time being, there have been no declines. It is a waiting market at present and price movements, in either direction, depend largely on the action of the American Government. In regard to the shortage of iron and steel, there is no improvement in the situation and indications point to a more pronounced scarcity owing to the steady increase in demand for steel for war purposes. The mills are booked up for many months ahead and are unable to take care of all the domestic requirements notwithstanding the falling off in demand. Furthermore during the hot weather, the output of the mills was reduced.

Owing to the intense heat in the United States, the production of sheets has been considerably reduced making it difficult for manufacturers to maintain shipping schedules. The American Government demand for sheets is considerably greater than was anticipated and is absorbing practically the entire output of the mills. Prices on black and blue annealed sheets are nominally unchanged. The Government demand for steel plates for ship construction is so great that the mills are unable to consider any private inquiries. Prices of plates are unchanged and entirely nominal. In the United States market there is a more pronounced tendency towards lower prices although there have been as yet few important declines. Opinions differ as to the ultimate effect on the market of the Government action with regard to price fixing and the trade is awaiting developments. Buying of steel has been in small volume owing to the uncertainty of price fixing and Government needs, etc. On this account another decline in unfilled tonnages is expected when the figures are published.

Pig Iron

The pig iron market in the States continues dull and business is practically at a standstill. Consumers are keeping out of the market for the present until Government policy is known regarding pig iron prices. It is understood that the leading selling interests are holding firmly to prices quoted before the period of intense dullness started, but are not actively seeking business. Prices generally are unchanged and entirely nominal. The local situation is unchanged and no quotations are available.

Scrap

The scrap market is dull and featureless due to a lack of buying activity and general dullness in all metal markets. A resumption of activity is looked for in September which if it materializes may result in an upward movement in prices. There is a shortage in most lines of available scrap which is helping to support the market.

Machine Tools

The market is quiet which is to be expected at this time of the year. The situation in the States continues to occupy the attention of the trade. The export demand in the States is heavy while increasing activity due to the war is noticeable. Prices continue very firm and deliveries backward.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Supplies

Prices of machine shop supplies continue to hold firm with a possibility of advances on some lines. Prices of gasoline and oils are firm and the market strong. The production of crude oil is again falling behind consumption of oil products and a much greater shortage will exist later as the American Government will be a big purchaser of oil supplies. It is inevitable that higher prices will exist sooner or later for oil but at the present time producers are endeavoring to keep prices down.

Metals

Although the metal markets continue dull, a better feeling prevails as it is now believed that the American Government will not be too drastic in regard to fixing prices on its requirements. It is understood that the Federal Commission will avoid doing anything that might hurt the metal industries. Consumers continue to keep out of the market until the situation clears and buying has been of small volume. Copper is firmer as a shortage of metal will likely result from the recent strikes. Prices of all metals are unchanged on the basis of last week's quotations.

Copper.—While copper prices are firm, the market continues dull. The larger producers are not inclined to take contracts at present prices owing to the existing shortage and also because of the uncertainty as to how much more output is to suffer because of the strikes. The intense heat wave has affected both output and consumption. Local prices of copper are unchanged and nominal, lake and electrolytic being quoted at 35c and castings at 34c per pound.

Tin.—The market is dull and prices nominally unchanged. Local quotation on tin is 63c per pound.

Spelter.—The spelter situation is unchanged, the market being dull but firm. Spelter is quoted at 11c per pound.

Lead.—The market is dull but prices are firm. Government buying is a feature of the lead market. Local price 13c per pound.

Antimony.—The market is firmer, especially on future deliveries which are in fair demand from consumers. Antimony is quoted unchanged at 20c per pound.

Aluminum.—Trading in aluminum has been quiet. Consumers are buying sparingly and only for immediate needs. Local price 64c per pound.

Sydney, N.S., Aug. 2.—An explosion which occurred in No. 12 Colliery of the Dominion Coal Company at New Waterford, on the morning of the 25th July, caused the death of 62 of the men who were in the mine, and the death of three members of the rescue parties. The area of the explosion was very restricted, but the destruction within that area was very complete. Only one side of the mine was affected, and the haulage of the main deeps and the east side of the mine were entirely unaffected by the explosion. The colliery is largely in submarine territory, is quite damp and cool, and is not considered to rank as a gassy mine. The ventilation was restored to its normal conditions within ten hours of the explosion, and all the bodies were recovered by the evening of the second day, a fact that reflects much credit on the workmen and officials of the company, who worked with great bravery under conditions of great danger without rest or sleep.

Only one other explosion in Nova Scotia has caused a greater loss of life, namely, the explosion at the Springhill Mines in 1891, where 125 men lost their lives. At the Drummond Colliery in 1873 the loss of life was 55 men. The Dominion Coal Co. have had only one explosion previously, namely, the Caledonia explosion in 1894, which caused the death of 11 men. The Caledonia explosion was really the result of a fire, and can hardly be classed as a gas explosion.

The loss of 65 men, apart from the

tragedy itself, and the loss suffered by the dependents and relatives of the deceased men, is a serious factor in coal production, and will mean a reduction of at least 5,000 tons a month in outputs. There is also a general unsettling of the workmen by such an accident that will for some time reduce production. As a result of the accident the mines were generally idle from the date of the explosion until after the interments, and the production for July is much reduced in consequence.

The Nova Scotia Workmen's Compensation Act makes very full provision for the dependents of the men who have been killed, a widow and children receiving up to a maximum of $40 per month until death or re-marriage, and as modified by the children reaching the age of 16 years. Fortunately, a large proportion of the men killed were unmarried and leave no dependents. The company is relieving all occurrences of distress that financial aid can touch, pending the adjustment of the compensation claims by the Compensation Board.

New York, Aug. 6.—Manufacturing industries throughout the United States are humming with work mainly to satisfy the needs of the home Government. Time is an essential element, where army and navy requirements are concerned, and many commercial orders are being set aside until the war pressure is relieved. Although the Government has not actually commandeered plants of tool makers, the orders placed are so heavy that not a few of the larger concerns are virtually under Government control and everything possible is being done to expedite output and shipments.

The Government has at last turned its attention to the dire need of providing heavy artillery to protect the country, and in anticipation of an appropriation of $2,000,000,000 to secure heavy ordnance, the Government has called upon the Bullard Machine Tool Co. of Bridgeport, Conn., to build a $10,000,000 plant extension for the construction of heavy artillery. The large tools required to be installed in this plant will probably be built by the Bullard Co. itself. One contract calling for the expenditure of $1,500,000 for big machines to be installed in navy yards and arsenals has been placed, and the Ingersoll-Rand Co., manufacturing machine tools, has been awarded a contract for shells and large guns. This company is seeking to sublet a contract for 8-foot guns of four-inch bore.

One of the most interesting developments is the intention of the United States Government to purchase $2,000,000 worth of machine tools and machinery to be installed in railroad repair shops in France. Through the Pennsylvania R.R. Co., the Government has already taken bids on a number of machine tools, which it is proposed to ship to France on the transports which will carry the railroad engineering contingent of the United States army. These tools are urgently needed for prompt delivery and, if necessary, the tools will be commandeered; prices were asked f.o.b. New York, Philadelphia and Newport News.

The Emergency Fleet Corporation, on behalf of the Government, has taken over all of the steel ships of 2,500 tons burden or larger, now building in twenty-five shipyards of the country. The tonnage taken over is reported to be 1,500,000; probably about 600 boats are included, which are under construction mainly for Great Britain and Norway. Work is to be rushed on these vessels through Government power. By commandeering ships on the ways, the Government is placed in a position where it must guard the contractors against loss, which may be involved in the expense incurred by employing extra shifts of workmen and through payment for overtime. The burden and responsibility of securing labor and dealing with labor interests is assumed by the Government. As labor must now deal with one Federal agency, controlling conditions at all shipyards, the danger of complications is avoided.

The Federal Shipbuilding Co., the new subsidiary of the United States Steel Corporation, has already placed contracts for some machinery; has had other tools built at the Pencoyd shops of the American Bridge Co., and is now taking bids on cranes, hoists and machinery for the new plant near Newark, N.J. Fourteen shops will be built at this plant, and $2,000,000 will be expended on machinery alone. The keel for the first boat will probably be laid down early in December. Twenty-eight hoists will be bought for the plate and angle shop alone; most of the boring and punching tools are being built at the Pencoyd shops. Eight other shipyards in the East are placing orders for machine tools and electrical hoists.

In the export field the principal contract closed amounts to several million dollars for tools to be installed at the $20,000,000 plant of the Tata Iron & Steel Co., Sakchi, India. Large orders have also been placed for Russia and Italy, and one $800,000 order for a tube and pipe works in Japan.

Pittsburgh, Pa., Aug. 4.—The market has continued stagnant in all departments. Neither buyers nor sellers evince the least desire to bring matters to a head, and apparently all are content to wait for months, if necessary, until the market shows a disposition to find its level. Everyone admits that prices cannot possibly advance on any product, but no one has any idea when actual declines will begin. Of course, at the height of the summer season there would be little disposition to make engagements in any event.

In the case of steel products the market will presumably readjust itself to a trading basis after the bulk of the present engagements has been filled, provided no extraneous influence, as by action of the Government, interferes. The obligations now on the books of the Steel Corporation are equal to its output for eight and a half months, the bookings, of course, being proportionately heavier in some departments and lighter in others. The large independents as a rule are not booked as heavily, while the small independents have still lighter tonnages. On this basis a readjustment in the general market might not be forced before December. This would be according to precedent, but conditions are quite different from those that have hitherto obtained at the end of a period of price advances, because there is relatively little tonnage on books at the prices lately quoted as the market, the heavy forward buying having stopped about last April, and the buying since then having been chiefly for early deliveries.

Government Orders

The Government has placed orders for 150,000 tons of rails—90,000 tons with the Steel Corporation and 60,000 tons with three independents, all for delivery by October 1 for American railways in France in connection with the military operations. The price is $38 for Bessemer and $40 for open-hearth, at the option of the mills, these being the present official prices, after the two $5 a ton advances made last year. The mills have not been sellers for several months, however. A fortnight ago orders were placed for 300 locomotives to operate on the prospective line, which will involve about 1,200 miles of track, the rails being 80-pound section. Some inquiry is now appearing for cars to operate on the lines, one for 17,000 four-wheel gondolas, 12 metric tons capacity, being mentioned in this connection.

These rails were bought at a fixed price, not subject to revision in future. On the offer of the mills last March to cover some 425,000 tons of steel for the 1917 naval programme—2.90c for plates and 2.50c for shapes and bars—it appears now that about 600,000 tons was allotted. Then there was some 85,000 tons of shell steel rounds placed at 3.75c, and there were also some tonnages of pipe, as well as some early tonnages of sheets, placed at fixed prices. All other steel buying has been either without any price being named or with merely a tentative price named, subject to revision. Eventually President Wilson will fix prices for the steel on which the price has been left open, as well as steel to be ordered in future. Indications are that the cost report of the Federal Trade Commission will be made in a fortnight or so, and the President's action will probably follow promptly.

It is expected that the settlement of Government prices will have an influence in pulling down the general steel market, though perhaps not at the outset. It remains somewhat of a question what prices will be made upon steel required by the European Allies, as the law empowering the Government to fix prices on its own purchases is not entirely specific on that point.

Cars and Locomotives

Freight car orders placed in July totaled about 5,670 cars, when 10,000 to 20,000 may be taken as a fair range in moderately active times. Only 2,325 cars were ordered by the public roads, there having been 1,800 bought by in-

(Continued on page 62.)

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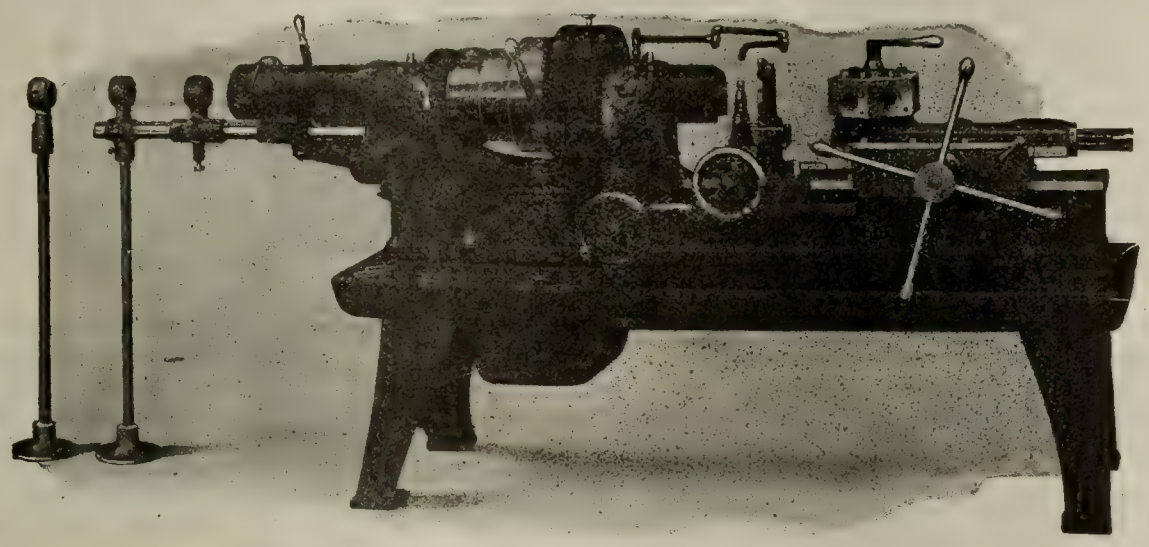

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INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Hamilton, Ont.—The Hamilton Steel Wheel Co. are building an extension to their plant.

Hamilton, Ont.—Fire in the tempering plant of the Dominion Steel Foundry on July 30 did about $2,000 damage, which is covered by insurance.

Toronto, Ont.—British Forgings, Ltd., have taken out a permit to erect a steel and concrete shop, to cost $61,000, and a machine shop to cost $9,000. The plant is located at the foot of Cherry Street, Ashbridge's Bay.

Calgary, Alta.—An engineering department will be added to the Institute of Technology and Arts by the Provincial Government. The Provincial Architect, Parliament Building, Edmonton, has charge of the work.

Hamilton, Ont.—The Semet-Solvay Co., has engineers here reporting on a project to erect a $2,000,000 coke oven plant. The plant will be erected by the Hamilton By-Products Coke Oven, Ltd. It will have a capacity of about 900 tons of coke a day, and seven million feet of gas. Stripes Inlet is the site that has been chosen.

PUMPING EQUIPMENT REQUIRED

Tender forms, specifications and drawings have been received from D. H. Ross, Canadian Trade Commissioner, Melbourne, for the supply and delivery of pumping plant and equipment for the Commonwealth naval dockyard, Cockatoo Island, Sydney, N.S.W., and are open for inspection at the Department of Trade and Commerce, Ottawa (refer to File No. A-1901). Tenders addressed to either the Director of Navy Contracts, Navy Office, Melbourne, or the Director of Naval Contracts, care Commonwealth Naval Dockyard, Cockatoo Island, Sydney, N.S.W., close on October 10, 1917. The particulars are as follows:

Two main dock pumps with vertical spindle motors and control equipments.

One vertical spindle motor and control equipment.

Four sluice valves with four motors and control equipment.

Two drainage pumps with motors and equipment.

Two air exhaust pumps with motors and equipment.

One enclosed motor and equipment for dock caisson.

ELECTRICAL

Kingston, Ont.—The Hydro-Electric engineers have recommended the purchase of a motor-generator set to be installed at the Street Railway Co. plant.

Cobourg, Ont.—Residents of Grafton and of Haldimand Townships are applying through Haldimand Township Council to the Hydro-Electric Commission for light and power. The Council instructed the clerk to forward their request and make enquiries as to cost of construction and rates.

MUNICIPAL

Petrolia, Ont.—The Town Council will build a pumping station at a cost of $15,000.

Winnipeg, Man.—The City Council will build an extension to the power plant at Lac du Bonnet.

Port Hope, Ont.—The by-law to give the Nicholson File Co. a fixed assessment carried by a large majority.

Woodstock, Ont.—The ratepayers will vote on a by-law on August 10 to authorize the installation of a mechanical filtration plant.

Strathroy, Ont.—Tenders have been received for pump houses and a concrete reservoir. Kery & Chace, Ltd. of Toronto are the engineers.

Smith's Falls, Ont.—A by-law will be voted on by the ratepayers on August 22 to decide the question of obtaining power from the Hydro-Electric Commission.

Tottenham, Ont.—A by-law will be submitted to the ratepayers on August 14 to vote on the question of installing a Hydro-Electric system in the village.

Smith's Falls, Ont.—The ratepayers will be asked to vote on a by-law on August 22 to authorize the issue and sale of debentures to raise the sum of $135,000, for the purchase of the plants and businesses of the Citizens' Electric Co. and the Smith's Falls Electric Power Co.

St. Lambert, Que.—The third reading of the by-law granting the Dominion Textile Co. a cash bonus of $95,000 in lieu of a free site, and also an exemption from general taxation for a period of twenty years was unanimously passed by the Town Council. The by-law will be put to the vote of such ratepayers as are proprietors, on August 20. The first building to be erected by the company will, it is understood, cost $2,000,000 .

TENDERS

Strathroy, Ont.—Tenders are requested for direct connected motor-driven

AUXILIARY MACHINERY REQUIRED.

Tender forms and specifications have been received from D. H. Ross, Canadian Trade Commissioner, Melbourne, for supply and delivery of auxiliary machinery for the Flinders naval base, via Melbourne, Victoria, and are open for inspection at the Department of Trade and Commerce, Ottawa (refer to File No. A-1901). Tenders addressed to the Director of Navy Contracts, Navy Office, Melbourne, close on October 24, 1917. The particulars are as follows:

Two electrically-driven air pumps, with complete set spare parts.

One steam driven air pump, with complete set of spare parts.

Two small circulating pumps.

One large circulating pump.

One large feed pump, with complete set of spare parts.

One small feed pump, with complete set of spare parts.

One oil fuel pump with complete set of spare parts.

PITTSBURG MARKETS

(Continued from page 168.)

dustrial roads, some 345 cars by private shippers and 1,200 by foreign buyers. Locomotives ordered in July totaled 448, but 300 were by the United States Government and 100 by the British War Office, leaving only 48 for all other buyers.

Pig and Scrap Declining

Scrap is always much more ready to yield to a declining influence than finished steel products. Heavy melting steel delivered Pittsburgh reached its top point the third week in June at $47, while it is now about $31. Pig iron, while extremely inactive, has had enough action to indicate a general declining tendency, although the declines up to date are very small, A sale of 1,000 tons of basic for prompt shiument has been made at $52, valley, when $53 to $54 was the recognized market at the close of June, and that for extended delivery. Pig iron may be regarded as on the down grade, although moving very sluggishly.

GEOMETRIC

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turbine pump, 80 Imperial gallons capacity, against a head of 20 feet. For full particulars, apply Public Utilities Commission, Strathroy, Ont.

Hartney, Man.—Tenders will be received up to August 13, for electric meters, transformers, wires, generators, switchboards and oil engine for the town of Hartney. Plans and specifications are available at the office of the Public Utilities Commission, 201 Tribune Building, Winnipeg.

Toronto, Ont.—Tenders addressed to the Secretary of the Board of Education, will be received until August, 10, for steam-fitting, plumbing, tinsmith work and other trades required for midsummer repairs. Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, Administration Building, 155 College St., Toronto.

St. John, N.B.—Tenders will be received until August 31, for the construction of an extension of and repairs to the Negro Point breakwater, St. John Harbour, St. John County, N.B. Plans and forms of contract can be seen and specifications and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the District Engineers at St. John, N.B.; Halifax, N.S.; Shaughnessy Building, Montreal, P.Q., and Equity Building, Toronto, Ont.

Ottawa, Ont.—Tenders will be received until August 27 for plumbing pipes and fixtures required in the reconstruction of the Parliament Buildings. All tenders to be based on the execution, erection and completion, including all labor and materials required for the installation of the plumbing s[illegible]m, together with all fixtures, apr[illegible]s and appliances as called for in t[illegible]ns and specifications. Plans, specifications and any other information can be obtained at the office of the general contractor, P. Lyall & Sons, Construction Co., Ottawa.

GENERAL

Kingston, Ont.—Fire on July 31 did $16,000 damage at the W. F. Kelly Oil Co's. plant here.

London, Ont.—The London Art Woodworking Co., will build an addition to its factory and a boiler house at a cost of $15,000. Joseph Keller as manager.

St. Lambert, Que.—It was stated informally at a Council meeting held here recently, that a factory for making rubber tires will be established.

Tilbury, Ont.—It is reported that a company has been formed to establish a factory here for making porcelain goods for electrical purposes.

Glencoe, Ont.—The Woodburn flour mill, with a large stock was burned to the ground on July 31. The loss was $40,000, covered by insurance.

Quebec, Que.—The storm which raged in this district last week did enormous damage which will, it is estimated aggregate over $2,000,000. Losses to lumber corporations alone will probably total $1,000,000, the remainder being made up in damage to the Quebec Central Railway, the Levis-Jackson highway, to bridges and to private property, crops and houses.

INCORPORATIONS

The William Lyall Shipbuilding Co. has been incorporated at Ottawa with a capital of $1,000,000 to build ships of all kinds. The head office is at Montreal, and the incorporators are: E. Languedoc, R. E. Allan and W. Taylor, all of Montreal.

The McKinnon Steel Co., has been incorporated at Ottawa with a capital of $500,000 to take over the business of McKinnon Holmes & Co. of Sehbrooke, Que. The incorporators are G. D. McKinnon, Alex. McKinnon and F. C. Johnson all of Sherbrooke.

Empire Stove & Furnace Co., has been incorporated at Ottawa with a capital of $100,000 to manufacture stores, furnaces and heaters, etc., at Owen Sound, Ont. The incorporators are A. A. Parks, A. J. Creighton and E. W. McQuay all of Oken Sound, Ont.

The Sydney E. Junkins Co., has been incorporated at Ottawa to carry on business as engineers and contractors with head office at Montreal and capital of $400,000. The incorporators are S. E. Junkins, H. R. Drummond-Hay and A. J. Milligan all of Winnipeg.

Quebec Charcoal Co., has been incorporated at Ottawa with a capital of $50,000 to manufacture charcoal and wood alcohol. The head office is at Montreal and the incorporators are A. Wainwright, C. G. Ogden and G. V. Cousins all of Montreal.

The Dominion Carriage Co., has been incorporated at Ottawa with a capital of $500,000 to manufacture carriages and vehicles of all descriptions at Montreal East, Que. The incorporators are P. T. Legare, J. H. Fortier and P. W. Fortier all of Quebec.

PERSONAL

Prof. Brydone-Jack, of Winnipeg, formerly on the staff of the Manitoba University, has been appointed superintendent of engineering for Western Canada, under the Department of Public Works, Ottawa.

C. Royer, for several years manager of the L'Air Liquide Society, Montreal, has severed his connection with the firm. He contemplates starting as a consulting engineer in the oxy-acetylene process of cutting and welding in general engineering practice.

J. A. Hossack, of Toronto, sales manager of the Lufkin Rule Co., Windsor, Ont., has returned home after a trip across Siberia and Russia. Mr. Hossack had the enviable and exciting experience of spending seven weeks in Russia during the most eruptive period of its history.

W. G. Jarman has tendered his resignation as general manager of the Briscoe Motor Co., Brockville, Ont., and expects to leave shortly for the Canadian West.

G. Palmer Howard, manager of the Phoenix Bridge & Iron Works, has left Montreal for Washington. Mr. Howard has been chosen to act on the British Imperial Munitions Board.

C. Wheeler, for the past two years general superintendent of the St. Lawrence Iron Foundry, and also the St. Lawrence Machinery Co., recently incorporated, has resigned his position. The strenuous work of the past year has necessitated Mr. Wheeler taking a well-earned rest.

CONTRACTS

Port Arthur, Ont.—The Canadian General Electric Co. has secured the contract for the sub-station and electrical equipment for the Eastern Terminal Elevator.

Montreal, Que.—The A. B. See Electric Elevator Co. of this city have been awarded a contract for the elevators for an office building for the Norlite Realty Co., Ottawa.

Niagara Falls, Ont.—Plans have been prepared and general contract let for a factory to be erected here for the Herbert Morris Chain & Hoist Co. of Toronto. The Toms Contracting Co. of Toronto are the contractors.

Kingston, Ont.—At a meeting of the Utilities Commissioners the contract for the erection of the new concrete gas holder, which will be located at the corner of King and Place D'Armes Street, was awarded to the Kingston Construction Co. for the sum of $8,999.

BUILDINGS

Toronto, Ont.—S. & L. S. Yolles will erect a five-storey brick warehouse at 443 Wellington Street at a cost of $65.000.

Toronto, Ont.—The Canadian General Electric Co., have obtained a permit to erect a new warehouse on King street, west, at a cost of $100,000. Excavation for the foundations has been started.

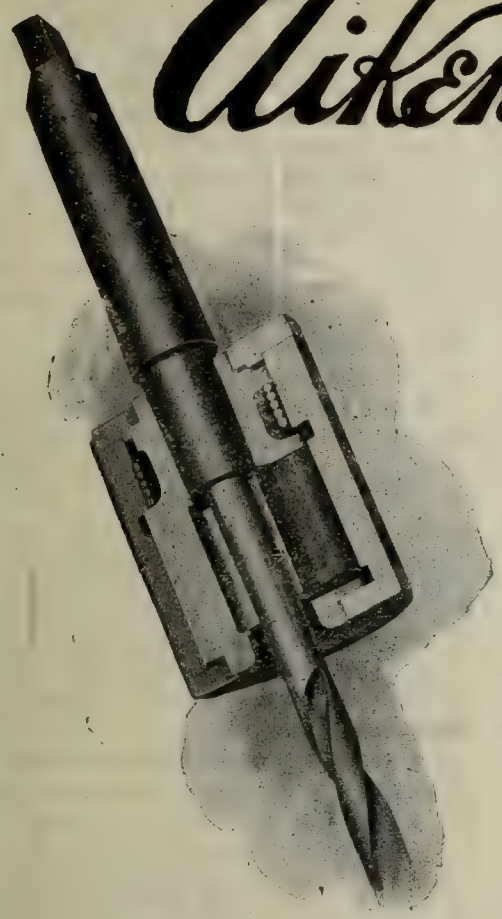
REFRIGERATION

Courtney, B.C.—The new general store of the Comox Co-operative Society has been equipped with a 1-ton "Armstrong" refrigerating plant.

Vancouver, B.C.—Howard's chocolate factory has been equipped with a ½-ton refrigerating machine, furnished by the Armstrong Machinery Co., Spokane, Wash.

McLeod, Alta.—The meat market of P. Burns & Co., at McLeod, has been remodeled and equipped with a 1-ton refrigerating plant, furnished by the Armstrong Machinery Co., Spokane, Wash.

Swanson Bay, B.C.—A 3-ton refrigerating plant, furnished by the Armstrong Machinery Co., Spokane, Wash., has been installed on the premises of the Empire Pulp & Paper Co., at Swanson Bay.



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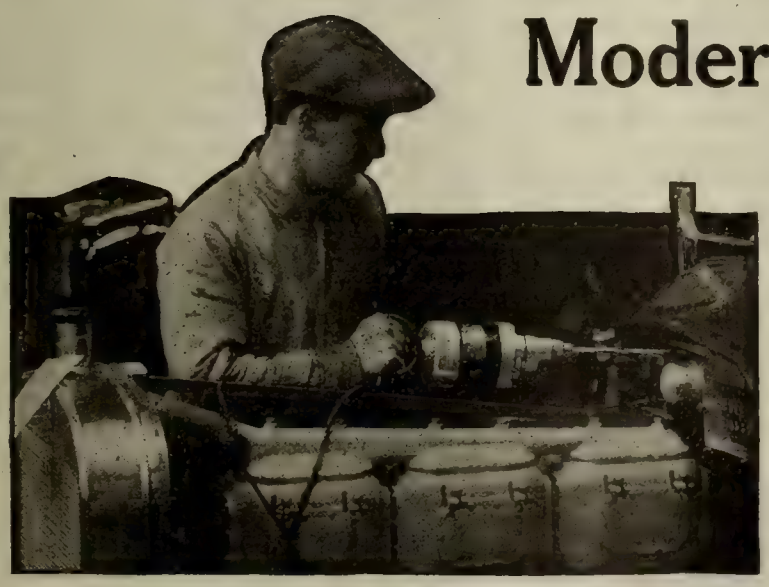

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Brass Castings,
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Machinery
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Order

TRADE GOSSIP

The American Steel Export Co. of New York, has appointed Woodburns, Ltd., of Montreal, exclusive agents for Ontario and Quebec.

The Terminal Warehouse Co. have opened a new storage warehouse at 588 King Street, Toronto, with a floor space of over four thousand feet. C. Vail is the general manager.

Steel Exports Stopped from U. S.—A despatch from Washington states that President Wilson has forbidden export of any iron and steel plate, pig iron, iron and steel scrap, and steel billets from the United States, except such as the Allies need for "actual war purposes." Other iron and steel products are allowed to be freely licensed, but only to the Allies.

The North Shore Ironworks of North Vancouver are putting on the market a ship's winch similar to the type made by Clarke, Chapman & Co., Gateshead, England. The North Shore Ironworks are now under contract with the Imperial Munitions Board for sixty of these winches and eleven windlasses. They are also making winches for Coughlan & Sons, the Wallace Shipyards, and a concern at Portland, Ore.

St. John, N.B.—The Dominion Department of Marine and Fisheries has offer- to arrange for steamers of 2,000 or more tons' capacity to bring anthracite coal here for New Brunswick use, if dealers arrange to have the coal ready at an Atlantic port on certain dates. The question of finding facilities at St. John to handle coal steamers of that size without eating up the expense saved in transportation is now engaging attention.

Customs Revenue Shows Increase.—Customs receipts for the month of the fiscal year, which closed July 31, show substantial increases over the like periods of 1916. The Customs revenues of Canada in the month just ended amounted to $14,269,643.92, or $3,187,749.57 more than in July, 1916. Receipts from the same source during the four months ended July 31st, 1917, aggregated $60,949,847.64, as compared with $46,513,299.22, an increase of $14,436,548.42.

Heavy Fire Losses in Ontario.—The average fire waste in Ontario for the first six months of this year is, according to the Fire Marshal, practically $1,000,000 per month. The insurance on these losses for the six months amounted to $4,518,792, while there was a loss of $1,469,522 not covered by insurance. In June there were 216 fires caused by lightning, and these did $57,466 damage. The greatest loss was experienced in February, when there were 1,020 fires, which did damage to the extent of $1,369,139.

G. T. P. Acquires New Steamship.—The Grand Trunk Pacific has added another ship to its North Pacific Coast fleet. This is the S.S. "Tillamock," which has been placed in service between Prince Rupert, the Western terminal of the G. T. P. line and Ketchikan, Alaska. This vessel is of United States registry, 119 feet in length, 29 feet beam, has a cargo capacity of about 450 tons, and good passenger accommodation. It will meet the growing demands of the Northern trade in handling fresh fish, in handling supplies to canneries, and in looking after general trade.

New Nickel Plant.—President Monell of the International Nickel Co., states that work on the new refinery at Port Colborne, Ont., is progressing rapidly and the new $5,000,000 plant will be ready for production by the beginning of 1918. Initial production of this plant is placed at 20,000,000 pounds a year, which increases the output one-third and brings the total capacity to 80,000,000 per year.

Hydro Commission Takes Over Power Co.—The Hydro-Electric Commission on Aug. 2, formally acquired the plant of the Ontario Power Co., the largest and most efficient developing plant on the Canadian side of the Niagara River. This plant was purchased some months ago by the Commission for $22,000,000, and it will form an important link in the Chippawa Creek development scheme, the ultimate capacity of which will be 900,000 horse-power.

Demurrage Rates Raised.—With the object of speeding up traffic and getting more coal into Canada, a new set of demurrage rates has been drawn up by the Board of Railway Commissioners, as follows: First and second day, free; third day, $1; fourth day, $2; fifth day, $3; sixth day, $4; seventh day and all days thereafter, $5 a day. The present scale allows for a fixed rate of one dollar a day after the expiration of free time, which varies according to the commodity. The railways' proposal was a rate of $3 a day after expiration of free time.

Important Customs Tariff Alteration.—The traffic department of the Canadian Manufacturers' Association has issued the following Order-in-Council: "During the period of the war, until otherwise ordered, Customs duties on imported goods subject to an ad valorem rate may be accepted by collectors of Customs in Canada at fair market value of the goods at the time of purchase in the country whence exported directly to Canada, with an addition to such value of not more than twenty-five per centum when imported within nine months from the date on which such goods have been contracted for or ordered to be shipped to Canada, notwithstanding any greater advance in the value of the goods prior to their exportation to Canada.

MARINE.

Vancouver, B.C.—The Wallace Shipyards, Ltd., on July 27, laid the keel of the second steel steamer, which will be a sister ship to the War Dog, which underwent her trials the previous day. The War Dog is back at the shipyard carrying out the final jobs before proceeding to sea.

Halifax, N.S.—News has been received here of the sinking of the Dominion Iron & Steel Co. steamer Heathcote in the Gulf of St. Lawrence on July

26. She was in collision with a Dutch steamer, which escaped with slight damage, and succeeded in rescuing the entire crew of the Heathcote. The Heathcote was loaded with limestone from Port-Au-Port to Sydney. She was of 2,345 tons gross, registered in Sydney, N.S., and was built in Sunderland in 1898.

WOODWORKING

Three Rivers, Que.—The Three Rivers Box Co. will build a factory here.

Victoria, B.C.—Planing mill and box factory owned by Cameron Lumber Co., have been destroyed by fire. Damage is estimated at $100,000.

Fergus, Ont.—John Watson will erect a saw mill to cost $10,000, to replace the one recently destroyed by fire. New machinery and equipment will be required.

RAILWAYS—BRIDGES

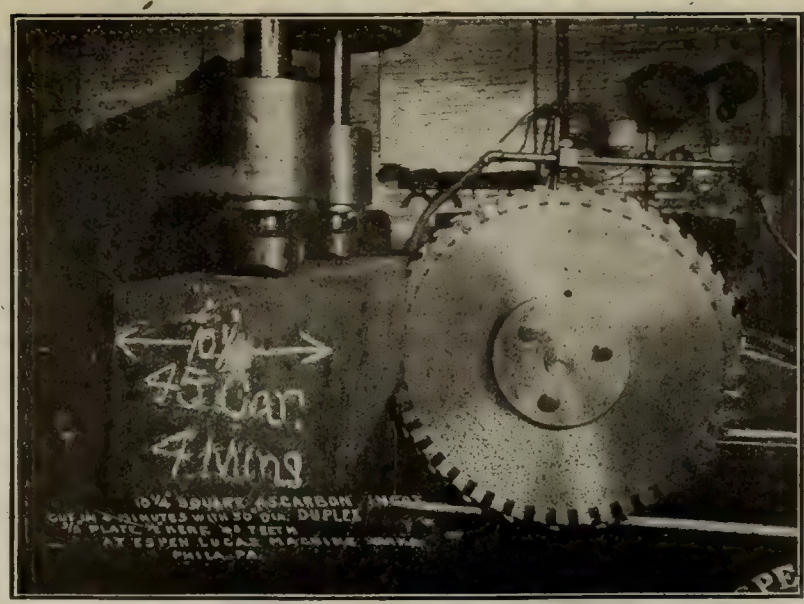
Cobourg, Ont.—The work has been commenced at Campbellford of elevating the G. T. R. bridge sufficiently to permit boats to pass through the canal. Thomas Jarrow, G. T. R. superintendent, is in charge, and the cement work will be done by contract.

CATALOGUES

Air Compressors. — Bulletin K-500-A, illustrating a line of power driven, single stage, straight line air compressers manufactured by the Canadian Ingersoll-Rand Co. of Montreal. These machines are designed for motor or belt drive and are furnished with a special short belt drive where floor space is a consideration. They are intended for use in industrial and mining plants where units of 950 cu. ft. displacement and under per minute are required. Eighteen sizes are built giving a wide range of choice. "Circo" leaf and self-contained construction of this type of compressor are fully described.

Export Engineering and Contracting is the title of a 94 page iron and steel catalogue now being distributed by the American Steel Export Co., New York. This is the English edition but others are being prepared in Russian, Spanish, French, Portuguese and Italian, and will be published shortly. This catalogue contains much information, such as weights, and measures in English and metric tables, and data covering, such products as pig iron, billets, blooms, slabs and sheet bars, plates and shapes, tool steel, merchant bars and agricultural steel, wire products, pipe and tubing, rails and railway supplies, castings and forgings, sheet and tin plate, etc. The object of this catalogue is to inform overseas buyers concerning American sizes, weights, etc., and the booklet also includes specifications covering tolerances and other valuable data.

The "F. M. Book."—Even those best acquainted with the Canadian Fairbanks-Morse Co. will be surprised at the very wide range of goods shown in their new general catalogue, which they have called



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It is, in fact, a key or index to the vast warehouses of "Canada's Departmental House for Mechanical Goods," and contains a very wide selection of "Made in Canada" goods.

Twelve distinct departments are represented, each department covering a line goods which is ordinarily considered a business in itself.

The scale department (52 pages) covers a full line of Fairbanks scales.

The valve and steam goods department (138 pages) contains 42 pages of valves, and 96 pages of pipe, fittings, steam specialties and tools.

The automobile accessory department (140 pages)—here you will find every practical accessory for automobile, Ford and otherwise, besides a complete line of motor boat fittings.

Engine department (16 pages) and electrical department (22 pages). These pages are merely an index of the various styles of Fairbanks-Morse oil and gasoline engines, electrical generators and motors. Complete descriptive bulletins of this apparatus will be sent on request.

Pump department (62 pages). Here is shown a very complete line of steam, power and hand pumps, duplex, triplex and centrifugal, besides a number of pump accessories and windmills.

Machine tool department (110 pages). Nearly every type of machine tool is represented; among them some of the best known machine tools on the continent. Truly, a representative department.

Wood working machinery department (88 pages). As fully representative as the machine tools.

Transmission department (86 pages). Every appliance for transmission of power through belts, ropes, chains, conveyors, etc., is here shown.

Railway and contractors' department (100 pages). Containing railway track tools, motor cars, road machinery, trucks, etc., etc. A very interesting section.

Supply department (138 pages). Representing a line of tools and supplies for equipping any factory.

Safe and vault department (26 pages). Showing a line of high grade fireproof safes and vault fronts.

In addition to all this is a 64-page section, printed on yellow paper, and containing beside, an excellent index, a quantity of tabulated information most commonly used.

A copy of the "F. M. Book" will be sent free to any one interested in mechanical lines, on receipt of their request.

BOOK REVIEW.

War Ships, by Edward L. Attwood, M.I.B.A., 338 pages, 8¾ x 5½ in., 209 illustrations. Published by Longmans, Green & Co., London and New York. Price $4 net. This is the sixth edition of a book on the construction, protection, stability, turning, etc., of war vessels written primarily for naval officers, but it is also a work that will prove a useful introduction to the study of naval architecture for apprentices and students at naval dockyards. To achieve the purpose for which it was written the matter is necessarily technical, but at the same time is presented in a practical and comprehensive manner. The book contains twenty-three chapters and two appendices. Briefly, the chapters deal with the following subjects: The strength of ships, tests of steel, etc.; framing; beams, pillars and decks; plating, watertight doors and bulkheads; stems and sternposts, etc.; steering gears, pumping and drainage; ventilation, corrosion and fouling, armour protection, rules of mensuration, navy list displacement, buoyancy, initial stability, trim, stability at large angles of inclination, rolling and turning of ships, resistance and propulsion of ships, design of war ships. The last chapter contains notes on the loss of H.M.S. Victoria. Appendix A consists of a series of questions, which in many cases are intended to lead to inquiry and discussion, and cannot be directly answered from the text. Appendix B comprises the important 1906 British Admiralty memorandum concerning the design of H.M.S. Dreadnought. A number of blank pages have been inserted at the end of the book to provide space to note particulars and details peculiar to the ship on which the officer is serving, and to note changes of practice which may occur. The book covers the subject thoroughly and contains a fund of valuable information for naval officers. In the chaper on armour and deck protection reference is made to a number of war ships now in commission. The text is printed in clear type, and is illustrated by a large number of carefully drawn diagrams. The book has a copious index, and is bound in substantial cloth covers.

"Well, little miss," said the grocer, "what can I do for you?"

"Please sir, mother wants a bottle of good-natured alcohol."

Inquiring Offspring—"Pa, may I ask just one more question?"

Patient Pa—"Yes, my son, just one more."

Offspring: "Well, then, pa, how is it that when night falls, day breaks?"

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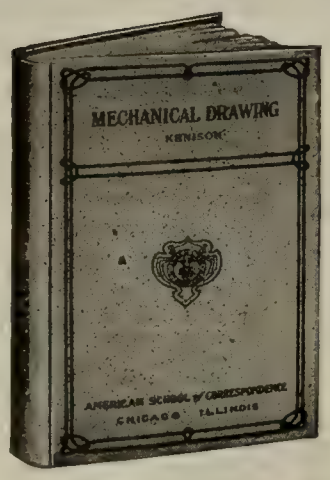
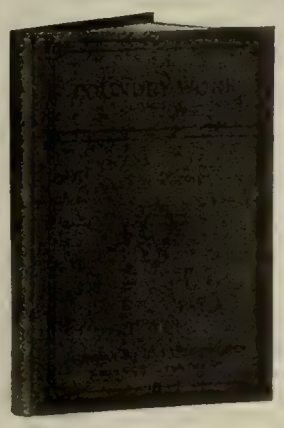
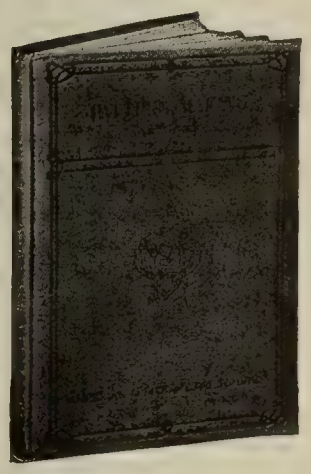
MACHINE-SHOP WORK. By Frederick W. Turner, Instructor in Machine-Shop Work, Mechanics Arts High School, Boston. 208 pp., 241 illus. Cloth binding. The use of various hand tools is explained, followed by a comprehensive discussion of the lathe and lathe tools, with the methods of screw cutting, taper and eccentric turning, etc. The way to figure compound gears for screw cutting; drilling; boring; planers; shapers; slotters; milling machines and cutters; how to cut spirals, gears, cams, etc.; grinding; the operation of automatic machines. Price **$1.50**



MECHANICAL DRAWING. By Ervin Kenison, S.B., Assistant Professor of Mechanical Drawing. Massachusetts Institute of Technology. 176 pp., 120 illus. Cloth binding. Gives a course of practical instruction in the art of Mechanical Drawing, based on methods that have stood the test of years of experience. Includes orthographic, isometric and oblique projections, shade lines, intersections and developments, lettering, etc., with abundant exercises and plates. Price...**$1.00**



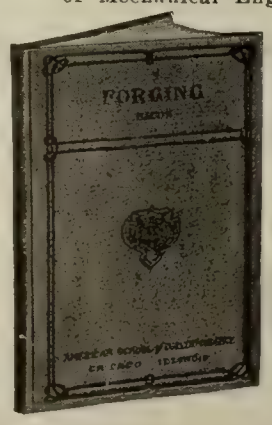
FOUNDRY WORK. By Wm. C. Stimpson, Head Instructor in Foundry Work and Forging, Department of Science and Technology, Pratt Institute. 160 pp., 142 illus. Cloth binding. A practical guide to modern methods of moulding and casting in iron, brass, bronze, steel, and other metals, from simple and complex patterns, including many valuable hints on shop management and equipment, useful tables, etc. Price **$1.00**



PATTERN MAKING. By James Ritchey, Instructor in Wood Working, Armour Institute of Technology. 160 pp., 250 illus. Cloth binding. Shows the reader how to take the blueprint and from it make the pattern for any kind of casting under any condition. The allowances for shrinkage, draft, and finish are explained. Simple and built-up patterns of all kinds are clearly treated. Various special cases are taken up, such as pulleys, cranks, pipe connections, valves, etc. Price **$1.00**

MACHINE DESIGN. By Charles L. Griffin, S.B., Assistant Engineer, the Solvay-Process Co., American Society of Mechanical Engineers. 208 pp., 82 designs. Cloth binding. Explains in detail how to make the entire design of all kinds of machinery, how to lay out gears, etc., with complete specimen designs of numerous machines. Price **$1.50**

TOOL MAKING. By Edward R. Markham, Consulting Mechanical Engineer, formerly Superintendent of the Waltham Watch Tool Co., American Society of Mechanical Engineers, Author of "The American Steel Worker." 224 pp., 325 illus. Cloth binding. Takes up the methods of treating tool steels—annealing, tempering, spring tempering, hardening, case-hardening, etc.; how to make drills and reamers of all kinds; the making of arbors and mandrels, taps, hobs, reamer and tap-holders, jigs, gauges, dies and die-holders of all kinds, counterbores, facing tools, milling cutters, hollow mills, and forming tools. Gives all necessary information for tool making in all its branches. Price ...**$1.50**



FORGING. By John Lord Bacon, Eng. and Supt. of Construction, with R. P. Shields & Son, San Diego, Cal., American Society Mechanical Engineers. Author of "Forge Practice." 128 pp., 180 illus. Cloth binding. A working handbook of practical instruction in hammering, working, forming, and tempering of wrought iron, machine steel, and tool steel, including the important modern development of electric welding. Price **$1.00**

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FOR SALE—THREE 26" x 12' C.M.C. DOUBLE back geared quick change gear engine lathes; never been used. McKinnon Dash Company, St. Catharines, Ont. c2m

FOR SALE — 1 LEES-BRADNER THREAD miller, equipped for threading nose and base of 6" shells. Apply The Hayes Wheel Co., Chatham, Ontario. c9m

ONE ARMINGTON & SIMS 10" x 12" HIGH speed engine, belted to one Westinghouse Electric Mfg. Co. direct current generator, 40 K.W., 550 volts, 75 amps.; speed 910 r.p.m.; also 40' 0"-10" double leather belting; all in good condition. Armstrong, Whitworth of Canada, Limited, Montreal, Que. c6m

FOR SALE—THE TORONTO ELECTRIC COMmissioners have for sale a quantity of second-hand 60-cycle meters and transformers recently in service, also quantity of electrical supplies. List of material and full particulars may be obtained on application to the Purchasing Agent, 15 Wilton Avenue. The quantities are not guaranteed, and all are subject to prior sale. No tender necessarily accepted. Toronto Hydro-Electric System, 226 Yonge St., Toronto. c7m

FOR SALE—3—20" BULLARD PROJECTILE turret lathes, fitted with pot chucks with outside steady heads; also three-jaw universal chucks, turret tool holders, and boring bars for 18-lb. British shrapnel. These lathes can be used for inside boring of 4.5 shells or base plate recess on 6" British high explosive shell. Lathes are in excellent working condition. Immediate shipment. For full particulars apply Edwin J. Banfield, Stair Bldg., Toronto, Ont. c5m

FOR SALE—2—26" x 8' LATHES MADE BY American Tool Works; 5-step cone, 3½" belt, rod and screw feed, taper attachment; in perfect condition. 1—80 H.P. Lennard Self-oiling High-speed Engine, centre crank, 12 x 12, 280 r.p.m. 1—36" x 16' Fifield Screw Cutting Engine Lathe, 5-step cone, 4" belt, screw and rack feeds, compound rest, countershaft. 1—36" x 18' Putnam Screw Cutting Engine Lathe, screw and rack feed, 5-step cone, 4" belt, compound rest. 1—No. 2 Cincinnati Milling Machine, with dividing head. All the above are in splendid condition. Canadian Engineering & Mfg. Co., Red'g., Montreal, Que. c6m

HYDRAULIC EQUIPMENT FOR SALE.—The equipment listed below is in first-class shape having only been used about three months. Blue prints and specifications and foundations drawings will be furnished. 2—14 x 12 x 5" Fairbanks-Morse duplex steam driven high pressure pumps at 80 gals. per minute capacity each against 600 lbs. pressure, steam pressure 150 lbs. 1—Weighted Accumulator good for 1000 lbs. per sq. inch, 16" diameter, plunger 11 ft. stroke with squeezing water cushion and wooden outside bumper blocks. The tank for the weighing material surrounding the cylinder is 10' 7" in diameter and 11' 0" high. 1—Return Suction Tank for above pumps and accumulator. Height, 9' 0", diameter 8' 0". Capacity, 2700 Imperial gallons. This equipment can be shipped immediately and is open for inspection at the company's plant. Prices on application. The Canadian Copper Company, Copper Cliff, Ont. c8m

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WANTED

WANTED—AIR COMPRESSOR — MUST BE in good condition; give full particulars as to make, size and price. Box 324, Canadian Machinery. c27m

WANTED—SECOND-HAND POWER SQUARing shear to cut No. 10 gauge steel up to 24" wide. Must be in good working condition. Packard Electric Company, St. Catharines, Ont. c4m

1 POWER HAMMER, 500 LBS. CAPACITY. Belt driven. 2 24 or 26 x 10 or 12 ft. C.M.C. engine lathes. 1 Pipe Threading Machine with tangent die attachment to cut between ⅜ to 3 inch. 1 Vertical Boring Machine, 42" table, Buller or Niles type. These machines must be in first-class condition and reasonable in price. Apply: P.O. Box 1965, Montreal, P.Q. c4m

What have you to sell?

Have you old or used machinery or any equipment for which you have no further use, or are your services for sale?

If your proposition will interest the men or the firms we reach, the logical place for it to appear is in these columns.

Canadian Machinery

Classified Advertising Section

143 University Ave., Toronto, Ont.

SITUATIONS WANTED

PRACTICAL WORKS MANAGER AND MEchanical expert with years of experience in United States and Canada, a specialist in munition work, open for engagement. Best of references. Apply Box 304, Canadian Machinery. c4m

MACHINE SHOP FOREMAN DESIRES change as shop foreman or master mechanic; acquainted with scientific management; 26 years' experience. Box 322, Canadian Machinery.

ARE YOU LOOKING FOR PRODUCTION IN your tool room? High-grade tool room foreman desires position in a fuse or shell factory where results count. Will be at liberty Aug. 1st. Do not reply if you do not want a man to take full charge. Box 323, Canadian Machinery.

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States will be open for position as superintendent or general foreman, July 15th. A1 references. Address Producer, Box 321, Canadian Machinery. c3m

SITUATIONS VACANT

THOROUGHLY CAPABLE BRASS FOUNDRY Foreman to take charge of small foundry doing a general jobbing business and also munition work. Location Montreal. Address for information, "Brass Foreman," P.O. Box 1934, Montreal. c26m

MECHANICAL DRAFTSMAN WANTED. Experienced on engines or turbines, capable of working out engine details. Apply giving full particulars as to experience, salary required, and enclose references, to Henry Hope & Sons of Canada Limited, Peterborough, Ont. c6m

NIGHT SUPERINTENDENT FOR SHELL MAchinery plant in Western Canada; knowledge of four point five shell and good all-round experience essential. Write, stating qualifications, salary and references, otherwise application will not be considered. Box 325, Canadian Machinery. c6m

WANTED — ASSISTANT SUPERINTENDENT for six-inch shell factory. Must be capable of getting maximum production from an established plant and have good mechanical experience. Duties to consist chiefly in supervising production. Give full particulars in writing of previous experience, age, references, and salary required, to Henry Hope & Sons of Canada, Ltd., Peterboro. All information will be treated in the strictest confidence. c5m

TECHNICAL ADVERTISING MAN — LARGE manufacturing concern near Toronto, building a general line of heavy machinery, requires a young man to take care of its advertising; must be able to prepare machine descriptions from blue prints and to write clear, concise English; advertising experience desirable, but not necessary; please state age, nationality, experience and salary desired, and send samples of your work with first letter. Box 320, Canadian Machinery. c26m

FOR MILL MACHINE SHOP—A COMPETENT foreman with energy and resource, with some knowledge of French; also general machinists for small shop in a modern town with established manufacture. This is an opportunity for family man to locate to permanent benefit. William S. Nish, 53 Maple Avenue, Shawinigan Falls, Quebec. c3m

ASSISTANT SUPERINTENDENT WANTED

Assistant Superintendent wanted for 4.5" shell factory. Must be capable of getting maximum production from established plant, and have good mechanical experience. Duties to consist generally in supervising production. Give full particulars in writing of previous experience, age, references, and salary required. All information will be treated in the strictest confidence.

The McFarlane Engineering Co.
PARIS, ONTARIO c7m

FOR SALE

Five Newton Cold Saws 22" and 26" blades for either Belt or Motor drive, complete, first-class condition.

The Canada Metal Co.
35 Fraser Ave.
TORONTO, ONT.

FOR
IMMEDIATE DELIVERY

No. 28—17" x 96" Brown & Sharpe Plain Grinder.
Pratt & Whitney Vertical Surface Grinder, 36" Table.
No. 1½ Bath Universal Grinder, complete tool room equipment.
No. 1½ Landis Universal Grinder, for Internal and External Grinding.
36 ft. Niles Plate Planer.

Lynd-Farquhar Co.
Boston, Massachusetts

H. W. PETRIE of MONTREAL Limited Montreal, Que.

LIST OF NEW AND USED MACHINERY IN STOCK FOR IMMEDIATE SHIPMENT

ENGINE LATHES

New 13" x 5' Lancaster Sgl. B.G., Geared Feed.
New 15" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
S.H. 15" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 16" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 15" x 7' Oliver Dbl. B.G., Q.C. Gear, Oil Pump and Pan.
New 16" x 24" x 10' South Bend Gap Sgl. B.G., Stan. Change Gears.
S.H. 17" x 8' Greaves Klusman Sgl. B.G., Geared Feed.
New, 18" x 8' Greaves Klusman Dbl. B.G., Geared Feed.
New 18" x 8' Giddings & Lewis Dbl. B.G., Geared Feed.
New 18" x 8' Stevens Sgl. B.G., Standard Change Gears.
New 18" x 8' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 18" x 10' Muller Sgl. B.G., Standard Change Gears.
New 18" x 12' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 20" x 10' Flather Sgl. B.G., Standard Change Gears.
S.H. 36" x 10' Fay & Scott Sgl. B.G., Stand. Change Gears.

HEAVY DUTY MANUFACTURING LATHES

New 20" x 8' Petrie Heavy Duty Manufacturing Lathes.

TURRET, SPEED AND BRASS LATHES SCREW MACHINES

New 13" x 7' Putman Speed Lathe.
S.H. 15" x 5' 6" Fox Brass Lathe with Chasing Attachment.
S.H. 30" x 10' Vilter Lathe, Friction B.G., Geared Feed with 18" Hex. Power Feed Turret.
New No. 0 Foster Plain Head Screw Machine, with wire feed and automatic chuck.

DRILLS

New 3' Dresses Plain Radial, Gear Box Drive.
New 20" Excelsior, Back Geared Wheel Lever, Power Feed.
New 20" Silver, Back Geared Wheel Lever Power Feed.
New 14" Leland Gifford Single Spindle Sensitive.
S.H. 14" Avey Spingle Spindle Sensitive.
S.H. 14" Foote-Burt Four.
New No. 1 Emco Bench Single.

HACK SAW MACHINES

New Peerless High Speed.
New No. 1 Atkins Kwit-Kut.

GRINDING AND BUFFING MACHINES

New 20" Ford Smith Water Tool Grinder.
New 18" Ford Smith S.O. General Purpose Pedestal Grinder.
New 16" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. Combination Grinder and Buffer.
New 12" Ford Smith S.O. Buffing Machine.
New Style B, Point Yankee Twist Drill Grinder.

MISCELLANEOUS

S.H. No. 22 Garvin Vertical Milling Machine.
S.H. No. 0 Burke Hand Milling Machine.
New 1¼" National Bolt Cutter with Lead Screw Attachment.
New No. 1 Grabo Metal Saw Table.
New D4 Rock River Slitting Shear.
New No. 4 Chicago Steel Bending Brake.

Telegraph, Phone or Write for Prices and Further Particulars

H. W. PETRIE of MONTREAL
LIMITED
MONTREAL, QUEBEC

PETRIE'S LIST

Of New and Used Machine Tools Stock for IMMEDIATE DELIVERY

TURRET LATHES AND SCREW MACHINES

12" x 42" Foster, plain head.
15" x 5½' American, fox.
16" x 6' Pratt & Whitney, turret.
18" x 6' Prentice, high speed.
22" x 8' Pratt & Whitney.
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
No. 2 Hercules screw machine.
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

13" x 6' Filssmith, D.B.G.
14" x 6' Lodge & Shipley.
15" x 6' London, back geared.
16" x 8' McDougall, back geared.
17" x 8' Blaisdell, back-geared.
18" x 6" New Haven.
18" x 10' Putnam, back-geared.
20" x 8' Fifield, back geared.
21" x 9' back-geared, single purpose
21" x 8' Bawden, heavy duty.
24" x 11' Pond, back-geared.
30" x 10' Ames, back geared.
31" x 16' Fifield, back-geared.
18" x 32" x 12' C.M.G. gap.
24" x 40" x 20' Dundas, gap.
28" x 50" x 24' Bertram, gap.

DRILLS

13" Perfect, 2-spindle.
14" Excelsior, sensitive.
16" Barr, sliding head.
18" Buffalo, post drill.
20" Perfect, lever feed.
20" Silver, back-geared.
22" Barnes, back-geared.
24" Kerkhoff, sliding head.
40" Bickford, back geared.
64" Canedy-Otto, wall radial.
No. 10a Baush, 16-spindle.
No. ½ Avey, ball-bearing, bench.

GRINDERS

No. 1 Wilmarth & Morman.
No. 1 Cincinnati, universal tool.
No. 2 Landis.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 14 Besly, with shell holder.
26" Gardner, disk.

IRON PLANERS

20" x 20" x 5' Bertram.
24" x 24" x 6½' Bertram.
24" x 34" x 8' Cincinnati, 2 heads.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Sellers, 4 heads.
40" x 40" x 12' New Haven, power feed.

MILLING MACHINES

No. 0 Burke, hand feed.
Bertram, plain.
Brown & Sharpe, power feed, plain.
Fitchburg, geared, plain.
No. 2 Ford-Smith.
No. 6 Whitney, hand feed.

SHAPERS.

16" Canada Mach. Corp.
16" Hendey.
16" Queen City, back geared.
20" Cincinnati, back geared.
24" Gould & Eberhardt.
30" Morton, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6" Robertson Hack Saws.
6" Kennedy Cutting-off Machine.
12" Hall Pipe Machine.
No. 2 Colburn Keyseater.
No. 5 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 2 Bliss Foot-power Press.
Brown-Boggs Punching Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
7' Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.
FRONT STREET WEST, TORONTO

RIVERSIDE Machinery List

We Own Every Tool Offered

ENGINE LATHES

1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—28 x 16 Putnam Standard Engine Lathe.
1—22 x 14 Putnam Standard Engine Lathe.
3—New 18 x 8 Springfield Engine Lathes.
1—New 16 x 8 Springfield Engine Lathe.
1—New 14 x 6 Springfield Engine Lathe.
1—18 x 6 Jones & Lamson Standard Engine Lathe.
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Lodge & Shipley Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.
1—11 x 5 Seneca Falls Engine Lathe.
1—No. 3 Hartiarge Bench Lathe.

TURRET AND SCREW MACHINES

1—2¾ x 24 Jones & Lamson Flat Turret Lathe, S.G.H.
1—2 x 24 Jones & Lamson Flat Turret Lathe, cone head.
2—No. 6-A Potter & Johnson Automatic Lathes.
3—No. 4 Foster F.G.H. Head Screw Machines.
2—No. 3 Foster F.G.H. Hand Screw Machines.
1—No. 5 Pierson F.G.H. Hand Screw Machines.
1—No. 4 Smurr & Kamon Hand Screw Machine.
4—New 14" Pierce Turret Lathes.
2—New 1 x 8 Pierce Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jogger feed.

MILLING MACHINES AND GRINDERS

2—No. 3 Cincinnati Universal, cone type.
5—No. 1½ Knight Milling & Drilling Machines.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
1—No. 1 Cincinnati Plain Milling Machine.
1—No. 13 ½ Garvin Plain Milling Machine.
1—No. 2 Hendey Plain Milling Machine.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
1—No. 2½ Bath Universal Grinder.
1—No. 170 Wells Cutter Grinder.
1—Mina Valley Universal Cutter Grinder.
4—No. 0 Burke Bench Millers (new).

DRILL PRESSES

1—3-spindle 8" overhang Henry & Wright High Speed Drill.
3—12" Leland & Gifford High Speed Bench Drills.
5—20" Buffalo Plain Drill Presses.
4—6-spindle Fox High Speed Drill Presses.
2—4-spindle Fox High Speed Drill Presses.
1—3' Mueller Plain Radial Drill.
1—4' Bickford Radial Drill, with T.A.
1—6' Mueller Plain Radial Drill.
1—16-spindle Natco.

SHAPERS AND PLANERS

1—24" Ohio H.D., B.G. Crank Shaper.
1—24" New Barker Crank Shaper.
1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
1—16" Hendey Geared Shaper.
1—16" Garvin Shaper.
2—16" New Springfield B.G. Crank Shapers.

PRESSES

1—Waterbury-Farrell Straight Sided Geared Press with double cam knock-out.
1—No. 10 Perkins Drawing Press.
5—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—50-lb. Scranton Belt Hammer.
1—25-lb. Bradley Helve Hammer.

AIR COMPRESSORS

1—8 x 6 Westinghouse Steam Air Compressor.
1—16 x 18 x 12 Union Steam Pump Co., steam driven air compressor.
1—10 x 10 Ingersoll Sargent Belt Driven Air Compressor.
1—10 x 10—Clayton Belt Driven Air Compressor.
1—8 x8Fairbanks-Morse Electircal Driven Air Compressor.
1—8 x 8 Gardner Single Belt Driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt Driven Air Compressor.
1—7½ x 6 Chicago Pneumatic Tool Co. Belt Driven Air Compressor.
1—6 x 6 Chicago Pneumatic Tool Co. Belt Driven Air Compressor.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machines tools both large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

GOOD USED EQUIPMENT

ELECTRIC TRAVELING CRANES.

50-Ton, 61' 7" span, four motor, 550 volts, D.C.
25-Ton, 40' 0" span, four motor, 220 volts, D.C.
25-Ton trolley, three motor, 220 volts, D.C.
10-Ton, 40' span, 80' lift, three motor.
21, 14 and 4½ H.P. Shaw crane motors, 220 volts, D.C.
10 H.P. Akron crane motor, 220 volts, D.C.
10-Ton hand crane, 55' 0" span.
20-Ton hand crane, 29' 6" span.
2-Ton hand cranes, 22' span.

PUNCHES AND SHEARS.

Lever Shear (double), cap. 2" sq.
28" throat (single), cap. ⅞x⅞" (belt).
36" throat (single), cap. 1¼x1" (belt).
48" throat (single), cap. 3x1¼" (steam).
16" throat (single), cap. 1½x1½ (belt).
38" throat (single), cap. 1x1" (belt).
36" throat (single), cap. ⅞x⅞" (belt).
17" throat (single), cap. ¾x¾" (belt).
15" throat (single), cap. ¾x½" (hand).
10" throat (double), cap. 1½x1" (belt).
Angle Shear (double), cap. 6x6x⅝" (belt).
Angle Shear (double), cap. 6x6x¾" (belt).
Plate Shear (Univ.), 18" blade, cap. ¾".
Rotary splitting, 30" throat, cap. ½".
Rotary bevel, 5" throat, cap. ½".
Coulter & McKenzie, cap. 3x½", spring steel.
Alligator, 7" blade, cap. 1" squares.
Guillotine, Perkins, No. 6, cap. 2½ sq.

MISCELLANEOUS.

Acme Rivet and Upsetter, 1½" cap.
Bending Roll, 6', drop end, 6½ and 8" rolls.
Bending and Straightening Mch., 24" cap., 1" stroke.
Cold Saw, Newton, 40" blade, two tables.
Grinder, No. 10 B. & S. Plain.
Grinder, No. 13, B. & S. Universal and Tool.
Rotary Planer, 36", Cleveland No. 2.
First-class condition—quick shipments.
Saw, cold, 26" blade, 48" travel.
Press (trimming) No. 11 Perkins, 16,500 lbs.

McCoy-Brandt Machinery Co.
Office and Warehouse:
216-218 Penn Ave., Pittsburgh, Pa.

Federal Machinery Sales Company
18 No. Jefferson St., Chicago, Ill.
Rebuilt Tools—Immediate Shipment

DRILLS.

24" Hoefer, upright, sliding head, b.g., p.f.
25" Hamilton, sliding head, b.g., p.f.
2-spindle 20" Barnes, gang, b.g., p.f.
Silver, 20", wheel and lever feed (15), new.
Silver, 20", b.g., p.f., automatic stop (20), new.

GEAR CUTTERS.

Gould & Eberhardt, 22" x 5" x 6 pitch, auto. spur and bevel.
Whiton 24" Automatic Spur Gear Cutter.

GRINDERS.

No. 2 Oakley Universal Cutter and Tool Grinder, new.
No. 2 American Surface Grinders (2), new.
Landis 8" x 20" Universal.
Landis 16" x 66" Crank Grinder with extra plain heads if desired.

LATHES.

16 and 17" x 8' Engine Lathe (6), Porter, Cincinnati, etc.
16" x 8' South Bend (2), new.
18" x 12' American, c.r., h.s.
17" x 6' National, quick-change gear, c.r., h.s.

MILLING MACHINES.

Pratt & Whitney Lincoln type (2).
No. 1½ American Universal.
No. 3 Aurora, plain, back-geared.
No. 1½ Grand Rapids, back-geared, plain.
No. 13 Brown & Sharpe Mfg., plain.
4-spindle Warner & Swasey Valve Miller, good as new.

PRESSES.

No. 5 Cleveland, open back, inclinable, plain, new.
C1 Ferracute, open back, inclinable, plain, new.

SCREW MACHINES AND TURRET

2¼" Acme, fric. grd. head, p.f. to turret.
Bardons & Oliver No. 1, 13-16" cap.
Hamilton, 20" swing x 8' bed, fric. head, eng. tur. lathe, pan bed, power feed turret on bed.
Pond 21" Heavy Duty Rigid Turret Lathe, geared head.
Jones & Lamson 3" x 36" Grd. Sliding Head Turret Lathe, bar equipment.

SHAPERS.

20" Hendey Friction Shaper.
20" Cincinnati Back-geared Shaper.

MISCELLANEOUS.

High Speed Hammer Co.'s No. 4A Riveting Hammer.
3" Smith & Post Cold Saw.
D14 Rock River Geared Power Splitting Shear.
60" Bertsch Foot Power Gap Squaring Shear.

Send for complete list. c8m

Chas. A. Strelinger Co.,
43-51 E. Larned St.,
DETROIT - MICH.

Machine Tools For Immediate Delivery

DRILLING MACHINES.

No. 3 Barnes Horizontal Radial Drill.
Henry & Wright Sensitive Drilling Machines.
No. I-S Garvin B. G. Horizontal Drill with Pump and Piping.

GRINDERS.

Wells No. 160 Cutter and Reamer Grinder.
Capitol Internal Grinder with water attachment.
No. 2 Diamond Auto. Surface Grinder, belt driven.
No. 3 Wilmarth & Morman Surface Grinder.
No. 3 La Salle Grinder, complete.
Geometric Chaser Grinder, with countershaft.
No. 4 and No. 6 Gardner Pl. Bearing Disc Grinder.
No. 2 Diamond Wet Tool Grinder with wheel truing device.

LATHES.

No. 10-K Seneca Falls 9" x 4' Bench Lathe.
14" x 6' Monarch Q.C., S.B.G. Engine Lathe.
17" x 8' Sidney Q.C., D.B.G. Engine Lathe.
19" x 8' Sidney Q.C., D.B.G., Engine Lathe.
16" x 7' Oliver Q.C., D.B.G. Lathe, with pan and pump.

SCREW MACHINES.

No. 1 New Howe Pl. Hd. Screw Machine, with auto. chuck.
1½" Dreses Screw Machine, F.B.G., Power Feed.

MILLING MACHINES.

Wisconsin Hand Miller on column, complete.
No. 6 Whitney Hand Miller, complete with countershaft.
No. 1 U.S. Hand Miller, complete with cshaft.
H. B. Smith Hand Miller, complete with cshaft.
No. 1 Standard Hand Miller, with oil pump equipment.

PRESSES.

Atlas Presses, No. 0 to No. 5 inclusive.
Greenerd Arbor Presses, No. 1 to No. 5 inclusive.
No. 5 Toledo Geared O.B.I. Power Press.
Manhattan Ratchet Type Screw Press.

THREADING MACHINES.

Geometric ¾" Threading Machine.
No. 38 Curtis & Curtis Hand Power Pipe Machine.
No. 5½ Merrill Comb. Hand and Power Pipe Machine.

C. W. CULLEN
MACHINERY CO.
LEADER-NEWS BUILDING
CLEVELAND, OHIO

Bickford 4½' Plain Radial Drill, cone drive.
No. 3 Lapointe Broaching Machine, new.
2—P. & W. No. 2 Cutting-off Machines.
Bement Miles & Co. 7½" Vertical Spindle Crank Drilling and Boring Mill, 68" swing.
Detroit Japanning Ovens, 8' 10" x 8' x 152".
Pratt & Whitney 48" Gap Lathe.
Hanna 30-ton Riveter, 12" reach.
Pangborn Sand Blast, 90" rotary table, M.D.
3—800-ton Gen. El. Hydraulic Double Action Presses.
3—2¼ Cleveland Automatics; prac. new.
10—¾" B. & S. Automatics.
Allis Chalmers 150 H.P. Corliss Engine, 12' F.W.
Bruce MacBeth 150 H.P. Gas Engine; new.
2—Rathmann Jones Gas Engines, 125 and 225 H.P.
80" Niles Vert. Boring and Turning Mill, 2 heads, slotting attachment.
Ingersoll-Rand Air Comp., 342 cu. ft., steam driven, inter-cooler, complete.
Bertsch Straightening Rolls, 7" x 84"-3" vert. adj. M.D.
Kelly Springfield 10-ton Road Roller, rebuilt.
Vulcan 1 cu. yd. Steam Shovel, traction; weight 35 tons; new flues.
62-ton Baldwin Consolidation Locomotive.
Ajax No. 1 Taper Forging Rolls. 50 strokes.
One No. 5 S-3 Cold Langelier Swadger.
3—No. 7 H.S.-6 Langelier Swadger.
1—Bolt and Rivet Header, hand feed, ⅝" x 3½" rivets.
Bolt and Rivet Header, hand feed, ¾" x 4" rivets.
70-C Bucyrus Steam Shovel, St. G.
R. Is. Locomotive, 45 tons, St. G.

IMMEDIATE DELIVERY

DRILLING MACHINES

Leland H.S., B.B., bench type.
No. 1½ Knight Driller and Miller.
14" Rockford Sensitive.
20" Kern, b.g.
22" W. F. & J. Barnes, s.h., b.g., p.f.
No. 25 Foote-Burt 24" drill (new).
32" W. F. & J. Barnes, s.h., b.g., p.f.
32" Hamilton, s.h., b.g., p.f.
No. 30-C Baush, 12 spindle.
20" W. F. & J. Barnes, 4 spindle.
3' W. E. Gang Plain Radial.
3½' W. E. Gang Plain Radial.
Pawling & Harnischfeger Horizontal Driller.
No. 1B Bement Horizontal Driller and Borer.
48" Colburn Mill, 2 swivel heads.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. automatic.
30" x 9" G. & E. auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3—26" B. & S. for spur.
36" Walcott for spur.

GRINDERS

Yankee Drill.
Leland Universal, with power feed.
No. 23 B. & S. Gear Cutter.
8" x 30" Modern Plain (new).
14" x 20" B. & S. Plain.
Garvin hole grinder.
Gisholt tool grinder.
No. 5 Diamond water tool.
No. 16 Gardner disc grinder.
No. 24 Gardner disc grinder.

LATHES

13" x 5' P. & W., c.r., taper.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
18" x 8' L. & S. pat. head, c.r. taper.
18" x 10' Fitchburg, c.r.
18" x 12' Barker, c.r.
20" x 14' Blaisdall, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
32" x 16' Blaisdal, c.r.
36" x 20' American, t.b.g.
36" x 22' New Haven, t.b.g.
3½" x 60" Fitchburg Lo-Swing.

PLANERS

36" x 36" x 16' Sellers, one head.
36" x 36" x 12' Cleveland, open side, 3 heads and arranged for motor drive.
36" x 36" x 12' Detrich & Harvey, open side, 2 heads, one side head.
40" x 38" x 14' Putnam, one head.
40" x 40" x 12' New Haven, one head, one side head.
40" x 48" x 18' New Haven Planer, 2 heads, 2 extension heads.

SCREW MACHINES

1" B. & S. Plain.
16" P. & W. Plain.
No. 2 Foster, plain head.
No. 2 Costello, plain head.
No. 2 P. & W. friction head.
No. 3 Foster, geared head.
No. 4 Pearson, geared head.
No. 3 Bardons & Oliver, plain head.
No. 12½ Garvin, friction head.
⅞" Cleveland, automatic.

TURRET LATHES

16" Lodge & Shipley.
25' Niles.
2 x 24" Jones & Lamson.
3 x 36" Jones & Lamson, chucking equipment.
3 x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt turret lathes, taper attachment.

PUNCHES AND SHEARS

No. 2 L. & A. Angle Iron Shears, 5"x5"x½" (new).
No. 5 L. & A. Double Punch & Shear, ⅝"x⅝", 3"x⅜", 1⅛ rd. (new).
No. 1 L. & A. Multiple Punch (new).
No. 2 L. & A. Multiple Punch (new).
No. 1 L. & A. Horizontal Punch, ½" in 1" (new).

MISCELLANEOUS

No. 2 Kempsmith Universal Miller.
50-lb. Bradley Strap Hammer.
100-lb. Bradley Helve Hammer.
¾" Acme Forging Machine.
52" Niles car wheel boring mill.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-ton Yale Duplex Hoist.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., CHICAGO, ILL.

Polson Iron Works
Limited
TORONTO

Surplus Machinery for Sale

2—3" Hall Cut-Off Machines
1—Lodge & Shipley Turret Lathe, 22" x 10'
1—Lodge & Shipley Turret Lathe, 24" x 10'
2—Libby Turret Lathes, 18"
1—Gisholt Turret Lathe, 18"
2—Gisholt Turret Lathes, 21"
1—Gardner Shell Base Grinder, 4A
1—Ford-Smith Grinder, 20"
2—Landis Traverse Grinders, 4'
1—Symington Band Turn Lathe, 3"
1—Goldie McCullough Band Press and Pump, 3"
1—3" Stamping Machine
2—Tate-Jones Shell Furnaces
3—Blowers

MACHINE TOOLS IN STOCK

No. 4 Cincinnati Universal Miller with Vertical Attachment and Power Feed Rotary Table.
No. 3 LeBlond Universal Miller.
No. 3 Kempsmith Plain Miller with Index Heads and Vertical Attachment.
4—No. 1½ NEW American Plain Millers.
5—No. 0 NEW Steptoe Hand Millers.
24" x 10' NEW Carroll-Jamieson Heavy Duty Lathe.
6—19" x 8' NEW Sidney, D.B.G., quick change, swing 21" over V's.
3—17" x 8' NEW Sidney, D.B.G., quick change, swing 19" over V's.
1—15" x 6' NEW Sidney, D.B.G., quick change, swing 17" over V's.
12—17" x 8' NEW National, quick change.
1—15" x 6' NEW Carroll-Jamieson, quick change.
48" Harrington Plain Radial Drill.
36" Dreses Plain Radial Drill.
D-4 Colburn High Duty Drills.
3—20" Rockford High Duty Drills.
1—28" NEW Superior Sliding Head Drill.
2—25" NEW Superior Drills, with tapping attachment.
16" Queen City B.G. Shaper.
20" Cincinnati B.G. Shaper.
24" NEW Steptoe B.G. Shaper.
24" Flather B.G. Shaper.

FRANK TOOMEY, INC.
127-131 North Third St., PHILADELPHIA, PA., U.S.A.

If any advertisement interests you, tear it out now and place with letters to be answered.

FOR SALE

Equipment used for making 18-pr. Shells.

1—Warner & Swasey Turret Lathe, 2" x 24", with attachments.

1—Linderman Double Spindle Boring Machine, with attachments for finish boring shrapnel and nose turning H.E.

1—Flather & Co. 14" x 5' 0" Lathe, with chuck and countershaft.

1—Fosdick 16" x 6' 0" Lathe, with collet chuck and countershaft.

1—Braopose 16" x 6' 0" Lathe, collet chuck and taper attachment.

1—Goldie & McCulloch Nosing Press with Dies.

1—Beatty Accumulator.

1—Lees-Bradner Thread Miller, with attachments and countershaft.

1—Jones & Lamson Turret Lathe, 2" x 24".

1—40-gallon Bowser Tank and Pump; good as new.

1—Cold Saw, with variable speed motor, 60 cycle, 220 volt, cuts up to 9" stock, complete with three saws.

1—4-Connection Pyrometer with Rheostat, made by Taylor Instrument Co.

1—Thermo Couples, 39" long, bent 12½" from nose.

1—Thermo Couples, 39" long, straight.

1—One-Connection Tycos Pyrometer, made by Taylor Co.

1—Bertram Band Turning Attachment, for 24" Lathe, Ball-bearing Centre.

All the above located at Welland. Prices, Delivery and full particulars gladly furnished.

M. Beatty & Sons, Limited
Welland, Ont.

FOR SALE

4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 13 B. & S. Automatic Gear Cutter.

1—30" Newark Automatic Gear Cutter.

1—5 x 48 Pratt & Whitney Plain Grinder.

1—No. 2 Bath Universal Grinder.

1—12 x 60 Modern Plain Grinder, new.

2—Lees-Bradner Thread Millers.

1—30 x 30 x 8' Powell Planer, new.

Brownell Machinery Co.
Providence, R. I.

Single Purpose and Shell Lathes

22—18" x 8' Battle Creek Lathes, single back gear, 2-step cone with counter shaft.

6—18" x 9' Chard Lathes, 3-step cone, double back gear, compound rests, semi-quick change with face plates, steady rests and counter shafts.

3—20" x 8' Mershon Lathes, 3-step cone, double back gear, compound rest and counter shafts.

4—20" x 8' Oakley Lathes, 3-step cone, double back gear, compound rests with oil pumps and pan and counter shafts.

1—20" x 10' Oakley Lathe, 3-step cone, double back gear, compound rests with oil pumps and pan and counter shafts.

4—20" x 8' Bullard Projectile Turret Lathes.

If you can use all or a part, we will be pleased to have you communicate with us promptly.

EAST DAYTON MACHINERY COMPANY
Dayton, Ohio

c3m

A MAN

was wanted as Tool-room Foreman. He was found by a condensed ad. in

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Ave., Toronto

"Williams" List of Machine Tools

FOR IMMEDIATE SHIPMENT

New Lathes

3—16 x 8 "CISCO"
4—18 x 10 "CISCO"
2—17 x 8 Le BLOND
6—19 x 10 Le BLOND
6—21 x 8 Le BLOND
1—25 x 10 Le BLOND
6—24 x 12 C.M.C.
1—36 x 26 PITTSBURG (triple geared)

Used

3—16 x 6 CINCINNATI Q.C.G.
5—20 x 10 HINDMAN
2—20 x 10 LODGE & SHIPLEY (geared head)
8—22 x 10 PUTNAM
1—24 x 16 BERTRAM
1—27 x 16 REED PRENTICE
6—24" DAVIS Boring Turret Lathes
7—18" LIBBY Turret Lathes
No. 2 WARNER & SWASEY Turret
2 x 24 JONES & LAMSON Turrets

Automatics

2—2 x REED PRENTICE
3—2 x REED PRENTICE
10—2¾ CLEVELAND
18—6A POTTER & JOHNSON

Drills

New 28" BARNES
6—26" BARNES
3—25" SUPERIOR
1—22½" BARNES
1—24" AURORA
1—26" AURORA
2—D 1. COLBURN
3—D 8. COLBURN
1—New BUFFALO Heavy Duty

New Radials

1—4' MUELLER
3—5' REED-PRENTICE (speed box drive)

New Shapers

2—14" SMITH & MILLS
4—16" SMITH & MILLS
2—20" SMITH & MILLS
4—20" GOULD & EBERHARDT
4—24" GOULD & EBERHARDT
1—28" GOULD & EBERHARDT

Millers

New 3 H. Le BLOND UNIVERSAL
New No. 25 BECKER PLAIN
No. 2 CINCINNATI UNIVERSAL
No. 2 KEARNEY & TRECKER

Planers

36 x 36 x 11 INDUSTRIAL
36 x 36 x 12 C.M.C.
52 x 52 x 16 McKECKNIE BERTRAM (two heads)

Slotters

8½" BERTRAM
10" BERTRAM
16" SMITH, PEACOCK & TANNET

Miscellaneous

3000 lb. MORGAN Steam Hammer
BERTRAM Horizontal Boring Machine
32' LONDON Vertical Boring Mill
NEWTON Vertical Miller

This is only a partial list. Write stating your needs.

A. R. WILLIAMS MACHINERY CO., LIMITED
64 Front Street West Toronto, Ontario

A Salesman Always on the Job

IT is the constant dropping that wears the stone away. It is the constant knocking at the door of attention and favor that in the end gives you ready access to the good-will of buyers of your merchandise.

You can keep up a constant knocking—a bid for attention, a reminder of yourself, a spokesman of your message—this by using regularly

The FARMER'S MAGAZINE

No man whose customers and should-be customers are farmers should be absent from their attention. Their will and purpose to buy may mature at any time. The salesman on the spot stands the best chance to get the order.

All this you know, but—do you live up to the behest of your knowledge?

Let us tell you more about **The Farmer's Magazine** in a special letter.

N.B.—Objectionable advertising not accepted. Both editorial and advertising columns are closely censored to keep them clean and decent.

Published by

The MacLean Publishing Co., Limited
143-153 University Avenue, Toronto, Ontario

LOOK—HERE THEY ARE

BORING AND TURNING MACHINES—VERTICAL.

1—30" Bullard, 1 turret head.
1—30" Flather, one turret head.
1—New 30" Gisholt, September delivery.
1—New 34" Rogers, one turret head, Sept. delivery.
1—New 34"-42" Colburn, single turret head, August delivery.
2—36" B. & S., one turret head; Dec. delivery.
1—37" Niles, one swivel, one turret head.
1—42" N.B.P., two swivel heads, motor drive.
1—72" Niles, two swivel heads.
1—80" Niles, two swivel heads, slotting attachment.
1—84" Sellers, one head.
1—New 8' Bickford; December delivery.

BORING MACHINES—HORIZONTAL.

1—No. 1 Barrett Cylinder Borer, 3¾" bar type.
1—No. 2 24" Barrett, two side facing heads.
1—Conradson Motor-driven Driller, Borer and Tapper, 5' adjustment of head on column, 2' spindle travel.
1—Lane & Bodley, capacity 68" x 15' floor, plate 19', 8" boring bar, motor-driven.
1—Hoefer Horizontal Driller and Borer, with 1 11-16" spindle, vertical adjustment 40", horizontal adjustment 46", size of table 33" x 48".
1—Lucas, 2¼" bar.
1—Newburgh 4" bar, 84" swing, 72" feed.

BULLDOZERS.

1—No. 8 Ajax, 20 H.P. motor drive.
1—New No. 4 Garrison (same as No. 4 Williams-White).
1—No. 7 Ajax, 20" stroke.
1—No. 7 High-speed Ajax, 16" stroke.

COMPRESSORS—AIR.

1—8" x 8" Curtis, belt-driven.
1—Ingersoll-Sargent Duplex, 8 x 14½ x 8".
1—Cincinnati Cross Compound, two-stage, 790 cu. ft.
1—Ingersoll-Sargent Steam Driven, 345 cu. ft.
1—10" x 12" Chicago Pneumatic, belt-driven.
1—10" x 10" x 10" Single Cylinder Smith-Valle, steam driven.
1—10" x 16½" x 13" Peerless, cross compound, steam driven.
1—22"-13" x 16" Ingersoll-Rand, motor driven.

CRANES.

20-ton Alfred Box Electric Traveling Crane, 40' span.
25-ton Browning Electric Traveling Crane, 40' span.
1—Locomotive, 35' boom, standard gaged, steam driven.

CUTTING-OFF MACHINES.

2—No. 00 Brown & Sharpe.
1—2" capacity Warner & Swasey.
4—3½" Hall.
10—4½" Williams.
3—4" Curtis & Curtis.
30—Davis, 4½" capacity.

DRILLING MACHINES—RADIAL.

2—New 2' American, cone drive.
1—3' Bickford, semi-Universal table.
1—3' Bickford, gear drive.
4—New 3' Prentice, July delivery.
1—New 3' Mueller, plain speed, box drive.
2—New 3½' American, tapping attachment, Sept. delivery.
1—New 3½' Western Drill, 86" circle.
2—New 4' American, tapping attach.; Sept. del.
2—4' Mueller, plain, speed box drive.
1—5' semi-universal American.
5—New 5' Baush Plain.
1—6½' American full Universal.
1—6' Baush Plain, cone driven.
10—New 6' Triumph, motor drive; Sept. del.

DRILLING MACHINES—HEAVY DUTY.

2—New No. 2 Colburn.
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
2—D-3 Colburn, plain table.
4—No. 310 Baker, single pulley drive, late type.

DRILLING MACHINES—MULTIPLE SPINDLE.

4—New Leland-Gifford, sensitive, four spindle.
1—No. 24 Baush, 12 spindles.
1—No. 30C Baush, 12 spindle, capacity 1⅛" holes, 30" circle.
1—No. 11 Pratt & Whitney, 16 spindle, capacity 10 spindles, ¼" cap.
1—14-spindle Baush, capacity 1" holes, 36" circle.

GEAR-CUTTING MACHINES.

1—No. 1 Whiton.
1—No. 3 Bickett Gear Rack Planer, delivery 60 days.
1—No. 3 Brown & Sharpe Auto. Gear Cutter, Spur.
1—New 6" Standard Gear Cutter, Spur.
1—12" Gleason Bevel Gear Planer.
1—15" Gleason Bevel Gear Planer.
1—16" Bilgram Bevel Gear Generator.
1—20" Grant-Lee Gear Hobber.
1—No. 1 20" Schuchardt & Schutte Gear Hobber.
1—22 x 8 G. & E. Spur and Bevel Cutter.
1—24" Fellows Gear Shaper.
1—24 x 8" G. & E. for Spur and Bevel.
1—24" Becker Brainard.
1—New No. 10 Whiton, Bevel 32", Spur 34".
3—36" Fellows Gear Shapers.

GRINDERS—UNIVERSAL FOR CUTTERS, DRILLS, REAMERS, ETC.

1—LeBlond Universal, one year old.
1—No. 1 Cincinnati.
1—New Norton No. 1.
1—New Walker No. 2, outfit K (capacity 9" x 26").
1—New Walker No. 1, outfit B.
1—New Wilmarth & Morman, style B.K.
8—No. 190 Wells.
1—Gisholt No. 5, 12".

GRINDING MACHINES—CYLINDRICAL—PLAIN.

1—5" x 48" Pratt & Whitney.
1—New No. 12 Brown & Sharpe, 8" x 26", Sept. delivery.
1—New 10 x 36" Landis; immediate.
1—New 10" x 36" Norton, Sept. delivery.
1—New 10" x 50" Norton, Sept. delivery.
1—10" x 60" Landis.
1—New 10 x 72 Norton, Plain.
20—12" x 24" Modern, self-contained.
1—12" x 32" Landis, rebuilt.
6—12" x 36" Modern, self-contained, motor or belt driven.
2—12 x 42" Landis, self-contained.
6—12" x 48" Modern, self-contained, motor driven.
1—16" x 66" Landis, with crank grinding.
1—18" x 96" Brown & Sharpe.

GRINDING MACHINES—CYLINDRICAL—UNIVERSAL.

1—Brown & Sharpe No. 13, 8" x 24".
1—New No. 2 (9" x 20") Bath.
1—No. 2 New Walker, 9" x 26".
1—No. 1½ (10" x 30") Landis.
1—New No. 2½ (10" x 36") Bath.
1—10" x 42" Modern.
9—New No. 2 Morse, cap. 12" x 30", Universal, Nov. delivery.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis.
2—New No. 3 Modern, 13" x 40". Sept. delivery.

GRINDERS—INTERNAL.

1—No. 1½ Landis.
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—CYLINDER.

1—No. 27 Brown & Sharpe.
1—No. 60 Heald, single pulley drive.

GRINDERS—PROFILE.

1—New Cleveland.

GRINDERS—DISC.

1—New No. 17 Gardner (Pattern Makers).

GRINDING MACHINES—RING.

1—New No. 14 Beasley, two-ring chucks.
1—No. 200 Heald.
1—No. 210 Heald.

GRINDING MACHINES—EDGE.

1—No. 374 Safety Emery Wheel Co.

GRINDING MACHINES—SURFACE.

1—New No. 1 Wilmarth & Morman.
1—No. 1 Diamond, capacity 12" x 12" x 24", automatic.
4—New No. 2 Reid (same as B. & S.).
1—New No. 2 Brown & Sharpe.
2—New No. 1½ Walker's, complete.

GRINDING MACHINES—DUPLEX.

1—No. 5 Bath, suitable for grinding cylinders, piston rings, etc., 16" feed, swivel table, water pump.

GRINDING MACHINES—FACE.

1—Diamond Face Grinder, 4' travel, 14" wheels.

HAMMERS—POWER—FORGING.

1—40-lb. Bradley Helve.
1—150-lb. Bradley Helve, upright.

HAMMERS—BOARD LIFT—DROP.

1—400-lb. Billings & Spencer.
1—2000-lb. Chambersburg.

HAMMERS—STEAM—FORGING.

1—Used 600-lb. Niles Single Frame.
18" Morgan & Williams, 600 to 800 lbs., 21" cap.
1—New 1100-lb. Bell Standard Guide, Single Frame.
1—3000-lb. Bell; Sept. delivery.

KEYSEATERS.

2—No. 0 Mitts & Merrill.
1—No. 2 Mitts & Merrill.
1—60" stroke Compton Knowles Broacher.

LATHES—MANUFACTURING—NOT SCREW CUTTING.

2—New No. 3 Harding Brothers Bench Lathe.
14—Reed-Prentice Shell Lathes, for 4" or 18 lbs. American shells.
70—New Simplex, 16" x 8'.
13—No. 3X Reed-Prentice, semi-automatic.
40—14" x 6' Reed Stud and Bolt.
5—16" x 8' Fairbanks-Morse, heavy duty.
14—16 x 8 Simplex, Single Pulley Drive.
22—18" x 8' Battle Creek, heavy duty.
5—20" x 8' Merschon.
50—20" x 10' Hindman, high duty.

LATHES—ENGINE.

6—New 12 x 4 Shepard, reverse head.
8—New 12 x 5 Shepard, reverse head.
3—New 12 x 6 Shepard, reverse head.
1—14" x 6' Bradford, taper attachment.
1—New Harding Brothers 15" Precision Lathe, quick-change geared, page 35, third catalogue.
3—New 16" x 6' Cleveland Tool Room Lathes, complete equipment.
2—16" x 6' LeBlond, pan bed, quick-change gears, taper attachment.
1—18" x 8' Lodge & Shipley, geared head, taper.
3—18" x 9' Chard.
1—18 x 10 Hendey, quick-change gear, 14" chuck.
1—New 19" x 8' LeBlond, heavy duty.
22—20" x 8' Lodge & Shipley, quick-change gear.
7—New 20" x 8' American, heavy duty.
25—New 21" x 10' Porter, single back geared.
5—New 22 x 10' Monarch, double back geared, Q.C.G.
9—22" x 10' Putnam, oil pan turrets.
3—24" x 10' Reed.
2—24" x 12' S. & B.
4—24" x 14' American, quick-change.
1—24" x 14' Lodge & Shipley, patent head.
1—24" x 24' Perkins, single back geared, raising blocks to 40", 18" chuck.
1—24" x 45" x 22' McCabe, double spindle.
1—26" x 24' New Haven.
4—27" x 14' Patent Head Lodge & Shipley, double back geared.
1—28" x 18' New Haven, single back geared.
1—28" x 18' Schumacher & Boye.
3—New 32" x 12' Pittsburg pattern.
8—New 36" x 24' Putnam, triple geared.
1—38" x 18' American, raising blocks to 63".
1—38 x 19' Steptoe, single back gear.
1—48 x 27'-9" Betts, triple back gear.
1—60 x 27 Betts, triple back gear.
1—New 66" x 30' Putnam; Dec. delivery.
1—71" x 20' Fifield, triple geared.

LATHES—TURRET.

5—2 x 24 Jones & Lamson.
5—3 x 36 Jones & Lamson.
18—6A Potter & Johnson.
1—New 21" Gisholt.

MILLING MACHINES—KNEE TYPE—UNIVERSAL.

1—No. 2 Kempsmith, 13", dividing head.
1—No. 2 Kempsmith, vertical attachment.
1—New Kempsmith.
1—No. 1½ Hendey-Norton.
1—No. 2 Kempsmith, back geared.
1—No. 2 New Cincinnati.
1—New No. 2½ LeBlond, Sept. delivery.
1—New No. 3 Kempsmith.
2—New No. 3 Becker, August delivery.
1—New No. 4 LeBlond, heavy duty; immediate.
1—No. 4 Cincinnati, with vertical attachment.

MILLING MACHINES—KNEE TYPE—PLAIN.

1—No. 0 Pratt & Whitney.
1—New No. 1 Brown & Sharpe.
2—New No. 1 Kempsmith.
2—New No. 1½ American, back gear.
1—New No. 2 Rockford.
1—New No. 2½ LeBlond, August delivery.
1—No. 3 LeBlond.
1—No. 3 Cincinnati.
1—No. 4 Garvin.

MILLING MACHINES—VERTICAL.

1—New Bickett, No. 0.
4—New No. 4B Becker.
2—No. 5 Becker.
1—No. 5 Brown & Sharpe.

MILLING MACHINES—PLANER TYPE.

1—No. 2 Beaman & Smith.
1—No. 4 Beaman & Smith, vertical spindle, open side, working surface of table 120" x 24", removable housing on one side.

PLANERS.

1—24" x 24" x 6' Gray, one head on cross rail.
24" x 24" x 8' Cincinnati, one head; used three months.
1—26" x 26" x 8' Gray, one head on cross rail.
1—30" x 30" x 8' Gale Planer, one head.
1—30" x 30" x 12' Cincinnati, two heads.
1—36" x 30" x 12' New Haven, one head.
3—New 36" x 36" x 12' Bickett, one head, Nov. delivery, additional heads if desired.
2—New 36" x 36" x 12' Woodward & Powell, two heads on cross rail, one side head; Oct. delivery.
1—36" x 36" x 12' Gray, two heads.
1—36" x 36" x 14' Sellers, four heads.
1—40" x 40" x 11' Niles, four heads.
1—Gray, 42", widened to 56" x 42" x 16, two heads.
1—48" Cleveland Rotary Planer.
3—New 48" x 42" x 16' Bickett, one head, Nov. delivery; additional heads if desired.
1—48" x 48" x 16' Sellers, one rail head, two side heads.
1—50" x 14' Powell, one head.
1—52" x 52" x 16' Betts, two heads, right angle drive.
1—32' 6 Niles Plate Planer.

SCREW MACHINES—AUTOMATIC.

3—No. 51 National Acme.
1—No. 515 National Acme.
2—No. 52 National Acme.
2—No. 53 National Acme.

SHAPERS.

1—New 16" Springfield.
1—16" Motor-driven Rockford.
2—New 24" Milwaukee.
1—New Barker, 24".
3—New 24" Steptoe, back gear.
1—30" Walcott, gear drive.
1—Spindle 30" Norton, with 7' Universal Radial Drill on base plate.

SLOTTERS.

1—New 10" Newton.
1—18" Betts, adjustable stroke.
1—120" Vertical Slotter, 10' stroke, two heads.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 549 Washington Bldg. **CINCINNATI, OHIO** 1018 Union Central Life Bldg. **CLEVELAND, OHIO** 508 Leader News Bldg. **NEW YORK CITY** Singer Bldg.

WRITE OR WIRE OUR NEAREST OFFICE FOR QUOTATIONS
THIS IS ONLY A PARTIAL LIST OF AVAILABLE MACHINES

If any advertisement interests you, tear it out now and place with letters to be answered.

STEEL BUILDING CRANES

Can be seen in operation

Steel Building or Coal Shed, 108 ft. x 298 ft., maximum height 40 ft., containing approximately 450 tons of structural steel.

Two Brown Patent Bridge Tramways, hoisting and conveying apparatuses, consisting of a bridge tramway with tracks permitting a movement of 300 ft.; distance between movable piers 180 ft., with end cantilevers 92 ft. and 36 ft. Each bridge has in its house, Brown Patent Hoisting Engine with the most modern operating mechanism, together with all necessary fittings and connections for complete operation, together with six Brown Patent Automatic Self-dumping Coal Tubs of 42 cu. ft. capacity; two single rope buckets of 48 cu. ft. capacity; four skips of 2 ton capacity; and also automatic clam shell bucket. Both these outfits are practically in new condition.

New York Machinery Exchange, Inc.

50 Church Street . . . New York City

We Have for Immediate Delivery the Following Second-hand Machinery in Good Operative Condition

1 Landis No. 3 Universal Grinder 12" x 42", complete equipment, less internal grinding attachment. . $1,500

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $2,200

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $1,800

These machines are particularly good value, and may be seen at our works.

A. B. JARDINE & COMPANY
HESPELER, ONT.

Rebuilt Machines For Sale

PLANERS

1—24x24x6 Powell.
5—Sellers 25x25x6'.
2—Sellers 25x25x8'.
1—Putnam 24x24x8' 6".
1—Wheeler Heavy 30x30x8' 6".
1—Lathe-Morse 24x24x5' 6".
1—New Haven 24x24x7'.
1—Putnam 42x40x12' 6".

GRINDERS

1—LeBlond Universal Tool and Cutter, power feed, same as new.
1—Bridgeport Plain Grinder, 16x36.
1—No. 3 Landis Universal Grinder.
2—No. 6X Diamond Double Disc Grinders.
1—Ford Smith Plain Grinder.

AUTOMATICS

1—1" National Acme Double Belt Type.
1—1⅝" National Acme Double Belt Type.
1—No. 55 National Acme.
1—1" National Acme, four spindle.
2—No. 54 National Acme, four spindle.
3—2" Cleveland.
1—2¼" Cleveland.
2—2¼" Gridley Single Spindle Motors.
1—3¼" Gridley Single Spindle Motor.

LATHES

1—32x12' Draper Lathe, C.R., H.S.
1—30x8' Fitchburg, C.R., P.C.F.
3—16x8' Putnam, C.R., taper.
6—18x8' Porter, C.R., semi-quick, taper.
2—18x8' Davis, C.R., pan, pump, taper.
10—16x8' Greaves-Klusman, C.R., pan, pump.
9—20x6' Perkins Plain Turning, pan, pump.
1—14x6' Porter, C.R.
1—20x8' LeBlond, C.R.
1—13x5' Seneca Falls, C.R., pan.
14—20x6' Perkins Lathes, pan bed, chuck, Fay & Scott Turrets.

MISCELLANEOUS

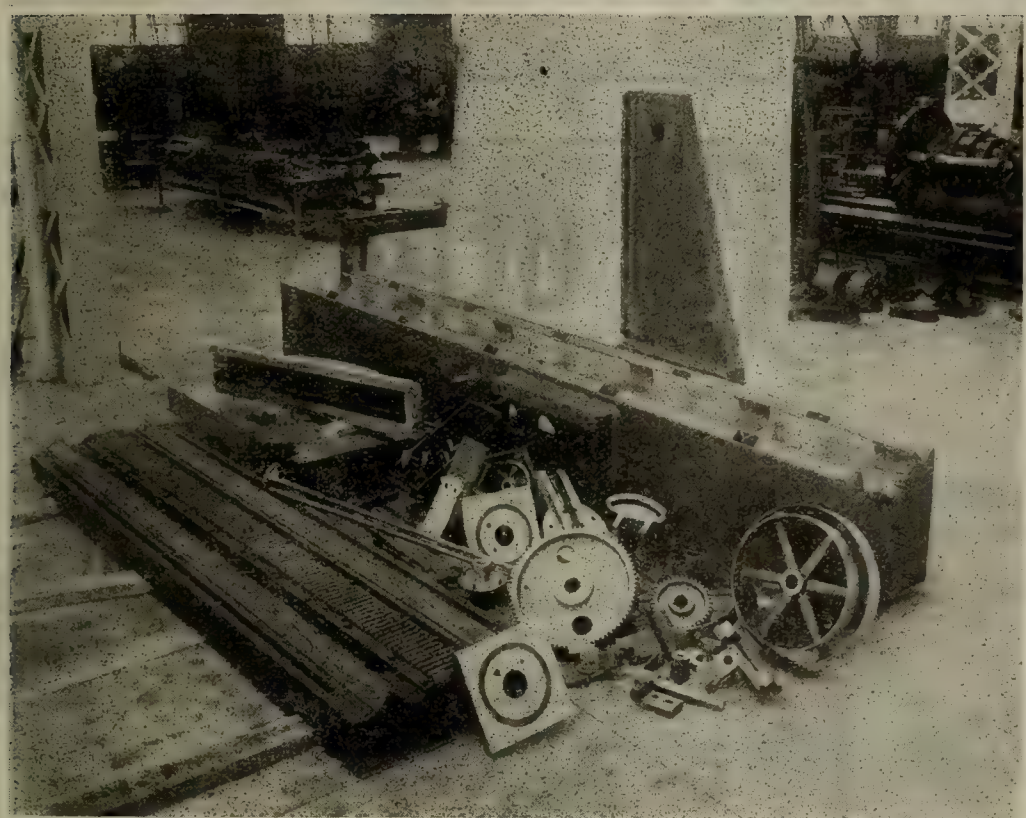
1—No. 5 Becker Vertical Miller.
2—No. 310 Baker Drills.
1—No. 18 Bliss Press.
1—No. 1 Whiton Gear Cutter.
1—No. 4 Garvin Plain Miller.
1—No. 3 Kempsmith Plain Miller, same as new.
1—9" Industrial Works Slotter.
1—24" Aurora Sliding Head Back Geared Drill.
3—Prentice 24" Sliding Head Drills.
2—Industrial 40" Drills.
1—Western Hydraulic Banding Machine.
1—Jenckes Band Turning Lathe, with 3" Universal Chuck.
1—36" Aurora Drill.
1—12" Bement Travelling Head Shaper.
1—Sellers Slab Miller, 24x24x12'.
1—No. 21 Lee-Simplex Saw.
1—26x10 Cincinnati Gear Cutter.

This is only partial list—Send for full list

Simmons Machine Company, Inc.

NEW YORK, 1001 Singer Bldg., Telephone Cortlandt 6575
ALBANY, N. Y., 985 Broadway, Telephone Main 4876

Re MANUFACTURED -(ORIGINATED BY US)- MACHINE TOOLS



Showing a 36" Planer ready for assembly. All flat surfaces have been hand scraped to B. & S. surface plates and straight edges. After assembling the machines will be tested under belt for operation and accuracy.

Very Latest Models—None Over 2 Years Old

ENGINE LATHES

24—22" x 8' Hamilton, D.B.G., C.R., Semi-Q.C.
5—22" x 8' Hamilton, D.B.G., Turret tool post.
4—22" x 8' Davenport, D.B.G., Turret tool post.
7—22" x 10' Hamilton, D.B.G., C.R., Semi-Q.C.G.
2—22" x 10' Hamilton, D.B.G., Turret tool post, Semi-Q.C.G.
20—22" x 10' Davis, D.B.G., C.R., Q.C.G.
8—24" x 10' Lodge & Shipley, D.B.G., C.R., Q.C.G.
8—24" x 10' Lodge & Shipley, Selective Gd. Hd., C.R., Q.C.G.
11—26" x 10' American, D.B.G., C.R., and Carriage Turret, Q.C.G.
2—26" x 10' American, D.B.G., Carriage Turret.
19—26" x 12' Putnam, Carriage Turret, Semi-Q.C.
9—26" x 12' Putnam, C.R., Semi-Q.C.
2—26" x 12' Wickes, D.B.G., C.R., Semi-Q.C.G.
10—28" x 10' Niles, Bement, Pond, D.B.G., Q.C.G.
4—28" x 14' Lodge & Shipley, Selective Gd. Hd., Motor Drive, C.R., Turret and Taper.
3—30" x 16' Lodge & Shipley, D.B.G., C.R., Turret and Taper.
10—40" x 18' Pittsburgh, Triple Geared, Q.C.G.

TURRET MACHINES

25—21" Gisholts, 3½" hole, 2-step, 5" belt.
25—21" Gisholts, 3½" hole, motor arrangement.
13—24" Gisholts, 4¼" hole, 3-step, 4" belt.
38—24" Gisholts, 6" hole, 2-step, 6" belt.
41—24" Gisholts, 6" hole, motor arrangement.
2—2¼" x 26" Greenlee Flat Turrets.
2—2½" x 26" Pratt & Whitney Gd. Hd. Turrets.
4—3-A Warner & Swasey (bar machines).

RADIAL DRILLS

4—2½' Fosdick.
2—2½' Mueller.
1—2½' Dreses.
1—3' Prentice.
1—3' Mueller.
1—3½' Gang.
1—4' Niles Full Universal.
3—5' Niles Semi-Universal.

MILLING MACHINES

2—No. 5 Brainard.
1—No. 3 Brainard Plain.
1—No. 20 Oesterlien Universal.
1—No. 1½ Brown & Sharpe Universal.
1—No. 25 Becker Plain.
1—No. 2 Cincinnati Universal.
1—No. 5 Schuchardt & Schutte Plain.
1—No. 3 Hendey Plain.
4—No. 2 Pratt & Whitney Lincoln.
1—60" x 48" x 8' Ingersoll Slab.
1—Beaman & Smith, 2 vert. hds., 1 hor. cross bor. hd.
1—No. 2 Beaman & Smith Combination horizontal and vertical.

SHAPERS

1—15" Hendey Friction Shaper.
1—16" Perkins Friction Shaper.
2—16" Barker Plain Crank.
1—24" Gould & Eberhardt Back Geared Crank.
1—24" Queen City Back Geared Crank.
1—48" Morton Draw Cut.

PLANERS

1—22" x 22" x 5' Flather.
1—22" x 22" x 6' American.
1—24" x 24" x 4' Gray.
2—24" x 24" x 5' Gray.
1—24" x 24" x 6' Cincinnati.
1—24" x 24" x 10' Lodge & Davis.
1—26" x 26" x 6' American.
1—30" x 30" x 7' Powell, 4 heads.
1—32" x 32" x 8' Gray, 2 heads.
1—32" x 32" x 10' Gray, 2 heads.
1—48" x 48" x 16' Pond, 2 heads.
1—76" x 48" x 18' Woodward & Powell, 3 heads.

PRESSES

1—No. 30 Perkins Inclinable.
1—No. 5 Niagara Inclinable.
1—No. 5 Consolidated Inclinable.
1—No. 20 U. Ryerson Punch.
1—Trimming Press.
3—No. 73½ Niagara Tirimming Presses.
1—No. 23½-B Niagara Toggle Press.
1—Long & Alstater Geared Punch.
1—No. 17 Williams and White Double End Punch.

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Send us your rush orders for Screws and Nuts. We ship from a stock where "Accuracy" is all important.

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GALT MACHINE SCREW CO., LIMITED
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Contract Work Section
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CAN DELIVER FROM STOCK.

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Eliminate all difficulties by using High-Grade Selected

DIAMONDS

Direct from the South African Diamond Fields. All sizes at your command, either unmounted or mounted in any style holder, **MADE IN CANADA.**

Try our **CAST STEEL** mounting for complete satisfaction of performance.

Wheel Trueing Tool Company

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If you have Machinery which your plant has outgrown—advertisell it.
Or if you have a Factory Building which you have outgrown—advertisell it.
That is, advertise it in our Classified Advertising Section and SELL what you have for sale.

CANADIAN MACHINERY
CLASSIFIED ADVERTISING SECTION
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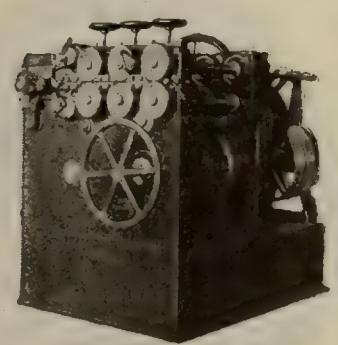
The Machines that put the "Rings" in Springs!

More Than Forty Standard Spring Making Machines.
High-Speed Automatics for Making Fuse and Small Arms Springs.
Flexible Metallic Tube and Casing Coilers.



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5/8 and 3/4 inch O.D., No. 18 Stubs Gauge—12, 14, 16, 18 and 20 foot lengths

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"STAR BRAND" BRASS CONDENSER TUBE FERRULES

Standard 14 Thread for 5/8 and 3/4 in. Tubes

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AND OTHER PRODUCTS IN BRASS, COPPER, PHOSPHOR BRONZE, ARCHITECTURAL BRONZE, ETC., ETC.

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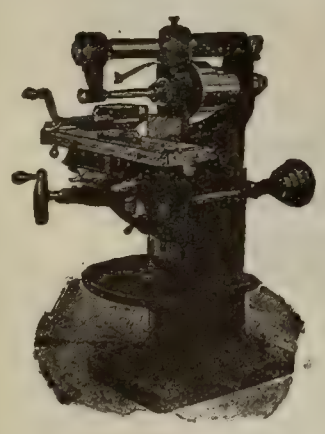
KINDLY ADDRESS INQUIRIES FOR ATTENTION OF DEPARTMENT D.



Don't Crowd Your Large Machines

You cannot manufacture small parts economically on a large machine. Steptoe Small Power Feed Millers and Hand Millers are especially adapted for that kind of work, a stiff, heavy tool that can be quickly handled and crowded to the limit. That is the machine to buy for small parts.

If your Planers are crowded take the small jobs and put them on a Steptoe Shaper and you will do them quicker and you will have less money invested in equipment.

STEPTOE SHAPERS "Just a Little Better."

CIRCULAR ON REQUEST.

John Steptoe Co., Cumminsville, Cincinnati, Ohio, U.S.A.

Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

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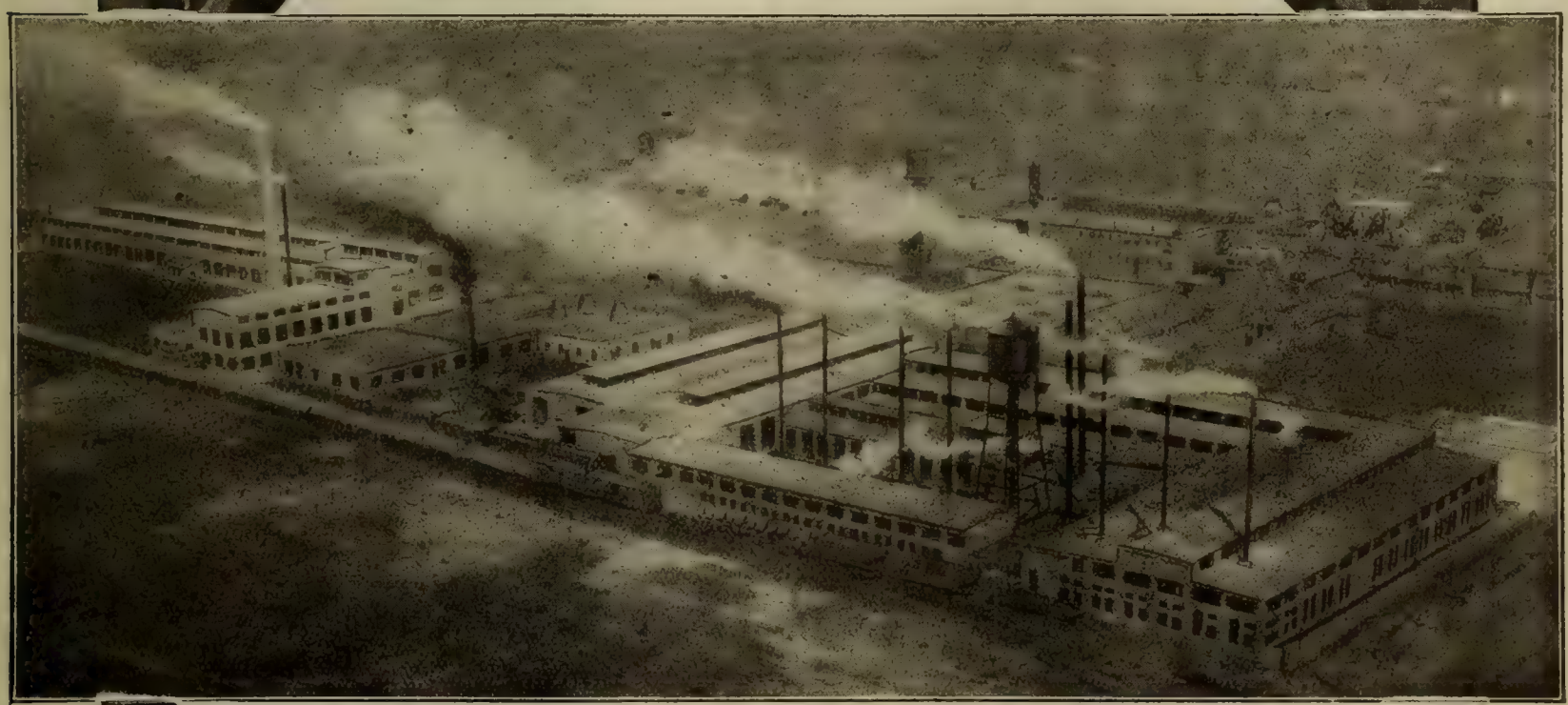
CANADA SILVER and GILDING METAL
In Sheets, Rolls, Plates and Rods



Brown's Copper & Brass Rolling Mills, Limited

General Offices and Works:
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COPPER & BRASS
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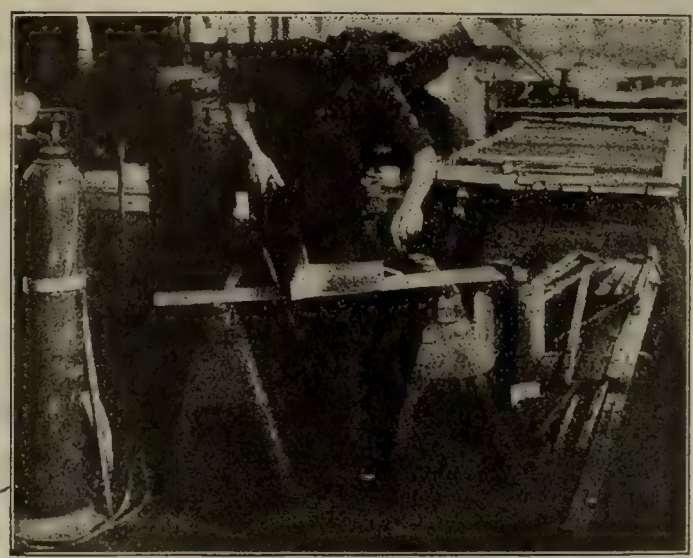
QUALITY
ROLLING MILLS

Oxy-Acetylene Welding and Cutting



Welding two pieces of angle iron by the Prest-O-Lite Process

Sometimes the Only Way--Generally the Best Way--Always a Possible Way.

Wherever two pieces of metal are to be joined, the Prest-O-Lite Process of Oxy-Acetylene Welding provides a simple, low-cost method. It opens the way to metal manufacturing, construction and repair operations which cannot be performed by any other process.

In practically every metal manufacturing industry oyx-acetylene welding is providing better, neater-appearing and more lasting joints than have been hitherto obtainable by rivetting, threading or other methods, and at the same time is lowering production costs. Operations on metal parts, large and small, are handled easily, quickly and economically by this process. Welded joints can be built up to give added strength if desired. The metal is left in satisfactory condition for subsequent machining. For repair work it more than pays its way—preventing costly delays and replacements—handling the jobs "right on the spot" with efficiency and dispatch.

Prest-O-Lite PROCESS

employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene (ready-made carbide gas) is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Apparatus consists of an equal pressure blow pipe, automatic regulators and gauges, and all necessary equipment. Adaptable for oxy-acetylene cutting by the addition of special cutting blow pipe.

This Welding outfit is portable, and handy for use inside or outside the shop. The Prest-O-Lite system of exchanging your empty cylinders for full ones insures perpetual service.

Write for valuable illustrated literature and data on work others are doing by the Prest-O-Lite Welding Process. It may point out ways to solve your problems. Address Dept. C-107.

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In files---give him one or other of the "Famous Five."

They are hard and sharp ---consequently the mechanic does good work with the minimum of labour.

And that's a desirable result for all concerned.

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They are:

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GREAT WESTERN
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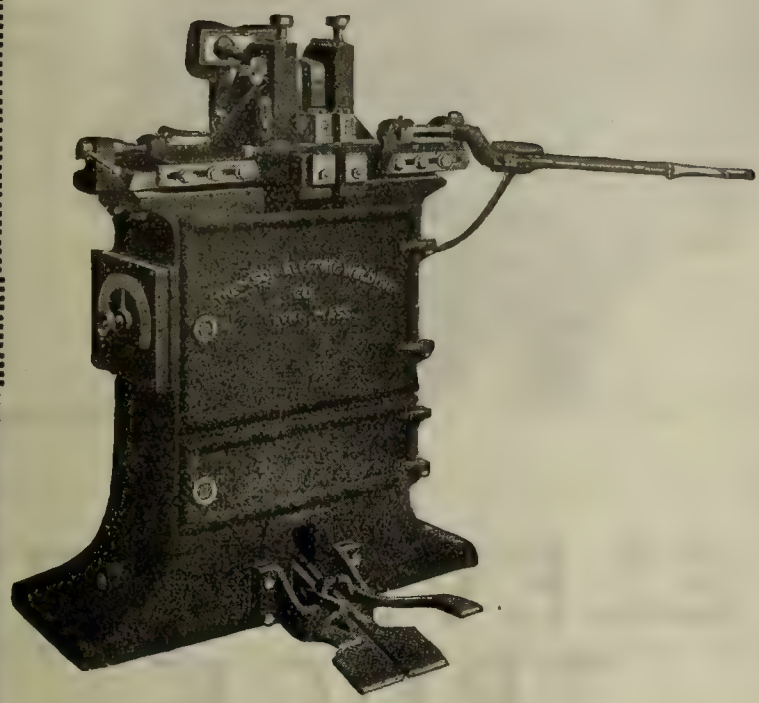
Made in Canada by

Thomson Process
Electric Welding

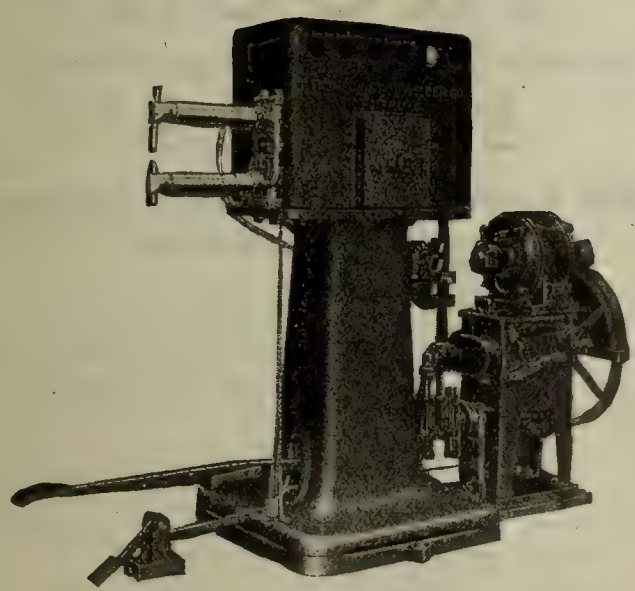
Thomsons Weld Practically Anything



That does seem rather broad — but in reality it isn't. There may be a few metals that won't electric weld—but they are so rare that they aren't commonly used. Such metals as iron, steel, copper, brass, etc., are easy for the Thomson Butt Welder.

Sheets, tubes, bars, pipes, heavy or light work, are all electro-welded by simply pulling a lever.

Send for Bulletin B-4.



We Guarantee Savings With A Thomson Spot Welder

If you have riveting or soldering to do in your plant we will guarantee to save you money by using the Thomson Spot Welder. How could you help saving money — no rivets or solder to buy, no holes to punch, 60 to 90% faster, 60% stronger—you can't help but save a goodly amount and increase your production in the bargain.

Our corps of experts to aid you in selecting the correct machine for your work are at your command.

Send for Bulletin S-4.

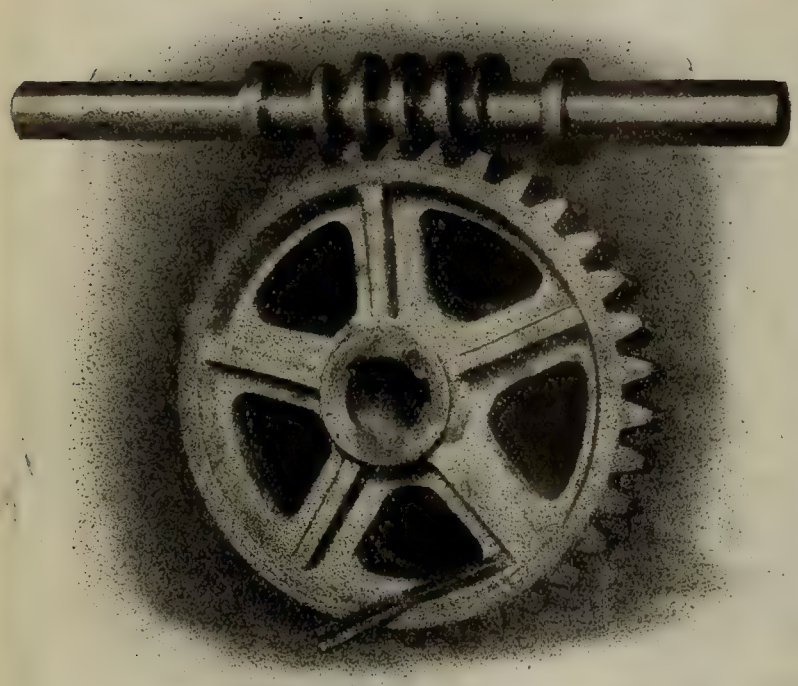
Thomson Electric Welding Co. Thomson Spot Welder Company

Lynn, Mass.

Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

CUT GEARS



Standard or Special Gears
in quantity or singly—
Whatever your requirements
We can serve you well.

Write us for quotations.

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The Labor Saver

Showing Truck in Elevated Position

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ELEVATING TRUCK

greatly reduces cost of producing

SHELLS

or any factory product where numerous operations are required.

All material is stacked on the platforms. To move material the truck is backed under the platform; the handle of the truck is then pushed down, keeping the button depressed, which raises the truck bed, and with it the loaded platform, at the same time automatically locking it in its raised position.

When hauled to the desired position the button is pressed and the handle raised, lowering the platform to the floor. The truck is then drawn from underneath and is ready to move another platform.

Raising and lowering of the truck can be operated with one hand—can be raised or lowered at any angle. Specially designed ball-bearings throughout.

We also manufacture **Loading Funnels, Ball-Bearing Tightening Nuts, Belt-Driven Loading Vibrators, Bench Vises** and PRESSES WITH ATTACHMENTS FOR PRESSING IN BAND—fixtures especially adapted for the manufacture of 18-pr. Shrapnel Shells.

You will profit by getting in touch with us now for prices and full information.

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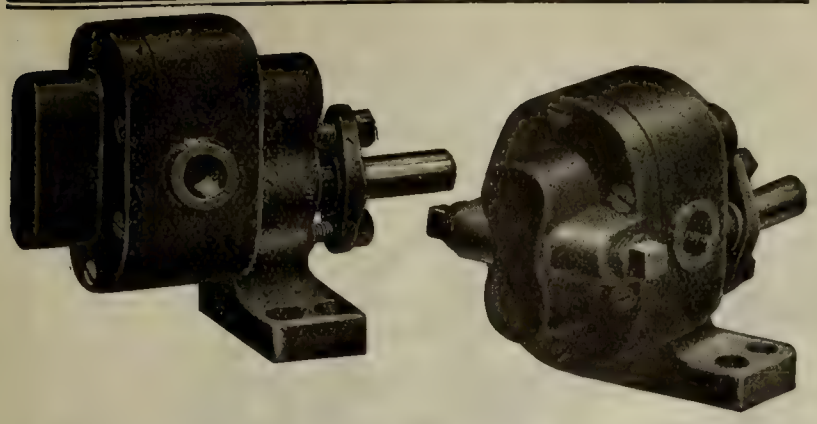


Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.

Hopedale : Mass. : U.S.A.

The Spiro Never Slips

The Spiro Compression Coupling is locked to the shaft by a graduated grip.

The pull of the bolts on the two halves of the coupling acts on the spiral slotted sleeve until it grips the full surface of the shaft with a **never-slip** hold.

Every bolt pulls, and at every pull the grip grows.

And last, but not least, the Spiro can be removed as quickly and easily as it can be applied.

The Bond Booklet describes our complete line of Power Transmission Devices.

Canadian Bond Hanger & Coupling Company, Limited

Alexandria Ontario

Cutting Iron and Steel by Oxy-Acetylene Process

Every "A.L.S." Oxy-Acetylene Welding Outfit is, by the addition of an "A.L.S." Cutting Torch, a complete cutting unit. Iron and Steel up to several inches in thickness may be cut with less labor, in less time and at less expense than by the old methods.

THIS MEANS GETTING MORE DONE FOR LESS MONEY

Cutting 8 discs, 10⅞" in diameter out of steel ⅞" in thickness in 50 minutes by an "A.L.S." Cutting apparatus. Material had a heavy coating of rust on it, having been taken off the scrap heap. 56 cu. ft. of gas used.

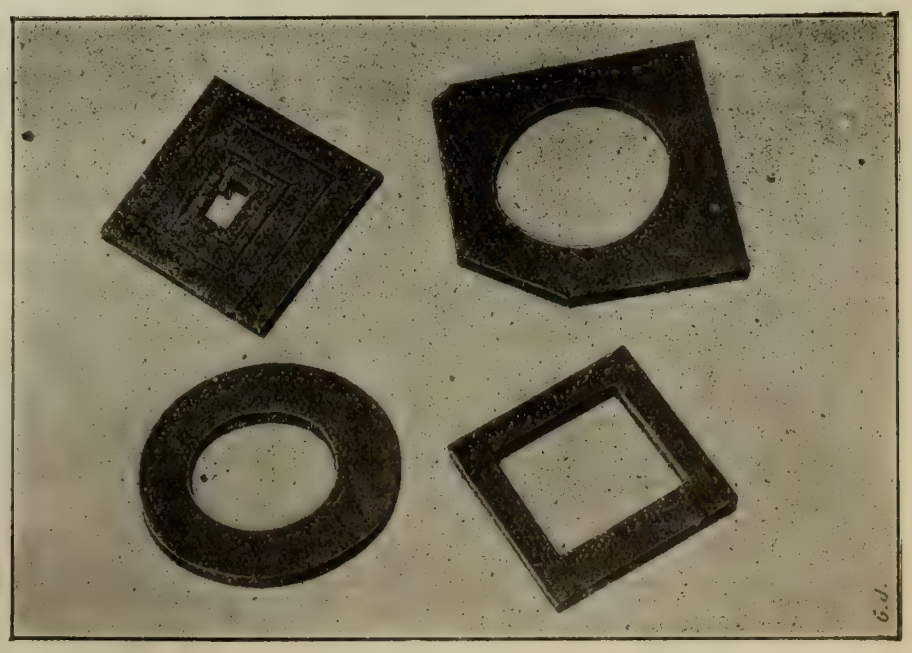
Oxy-Acetylene Process saves Money, however used.

You have an application for the process and it means the saving of time, money and material. Why not write to-day and let us prove it to you. No obligation.

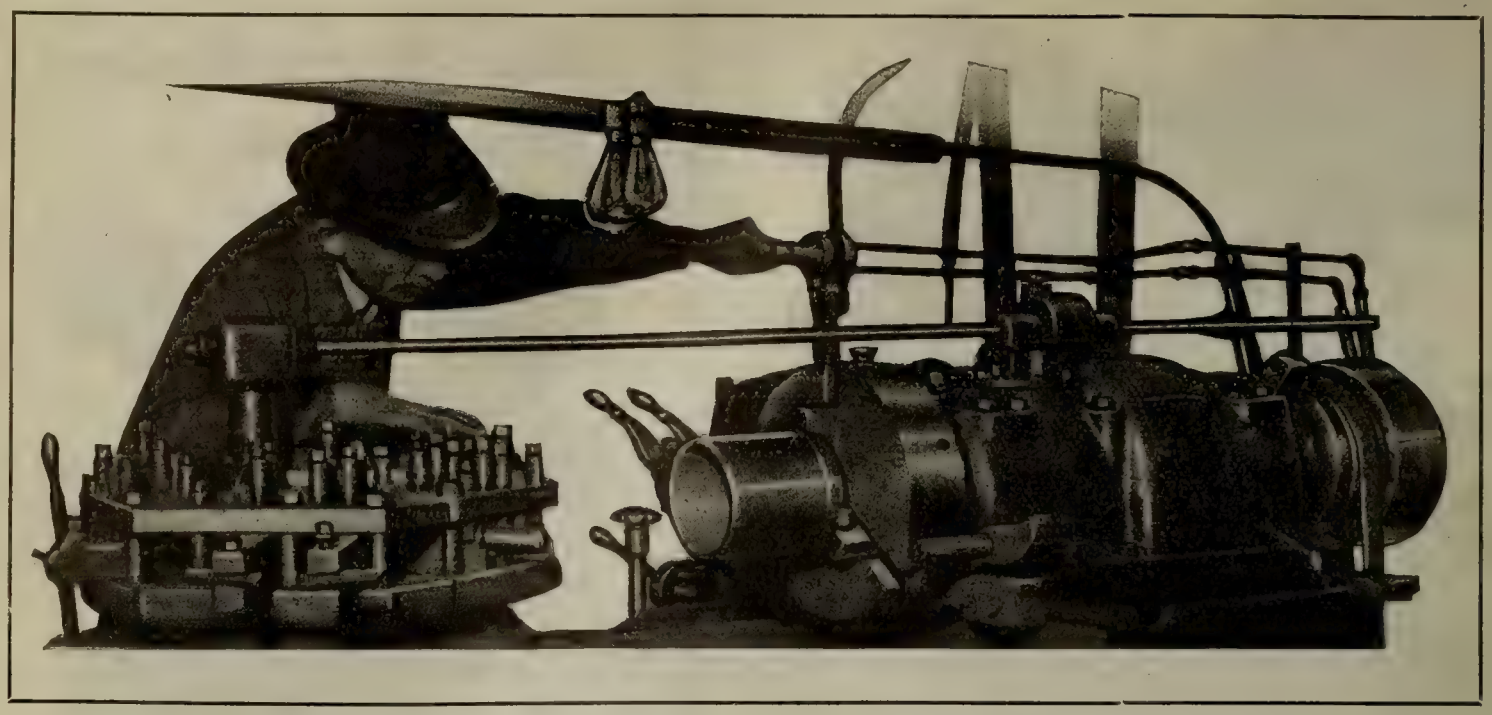
L'Air Liquide Society

Pioneers of the Process — Factories the world over

Montreal	-	Cor. 1st. Ave. and Ernest
Toronto	- - -	16 Boler St.
Winnipeg	- - -	1297 Pine St.
Halifax	-	Factory under construction



Examples of Cutting by an "A. L. S." Oxy-Cutter.



What Is Your Opinion of Air Chucks?

After demonstrating their labor and time-saving features a Canadian firm adopted the Hannifin Air Chucks on their line of lathes. Many Canadian firms where female labor is prevalent have installed the Hannifin Air Chucks because of those same two features—labor and time-saving.

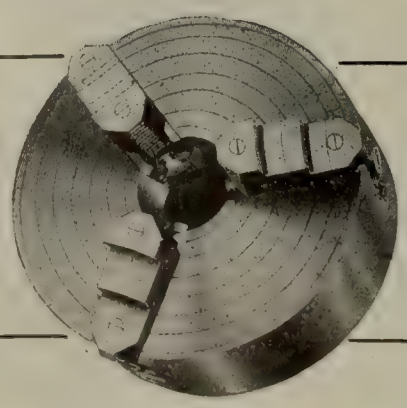
Your needs are those which we wish to fulfill. Your present chucks may be "good enough." Is "good enough" sufficient? Let us send you information and data that will establish in your estimation the superiority of the Hannifin Air Chucks. Wherever records in shell operating have been found you will find Hannifin on that "front." They are in the foreground always.

When writing ask for our catalogue showing our mandrels, countershafts, vises, arbor presses, chucks,—all air operated.

Hannifin Manufacturing Company

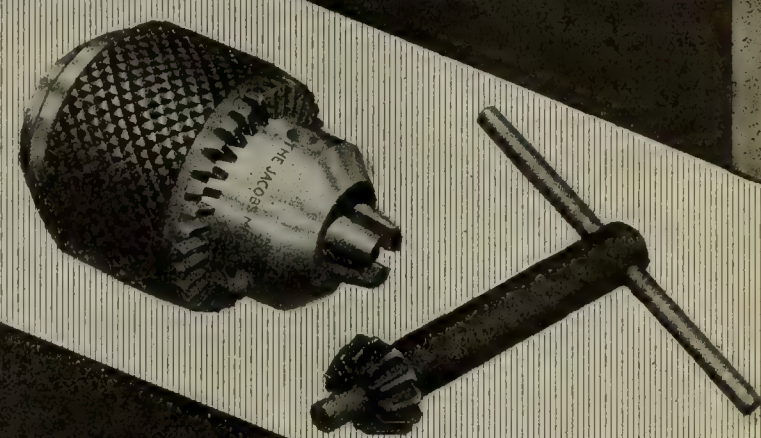
Chicago, Illinois, U.S.A.

Representatives: The Canadian Fairbanks-Morse Co., Montreal. European Representatives: Coats Machine Tool Co., London; Fenwick, Freres & Co., Paris; Iznosskoff & Co., Petrograd.



Representatives: R. E. Ellis Engineering Co., Chicago; Coats Machine Tool Co., New York City; A. R. Williams Machinery Co., Toronto; Williams & Wilson, Montreal.

Jacobs
IMPROVED
Drill Chuck

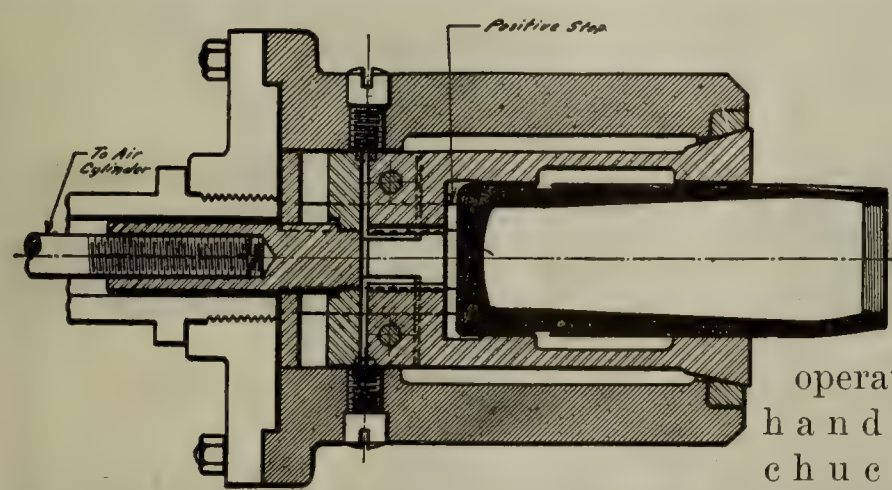


A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.

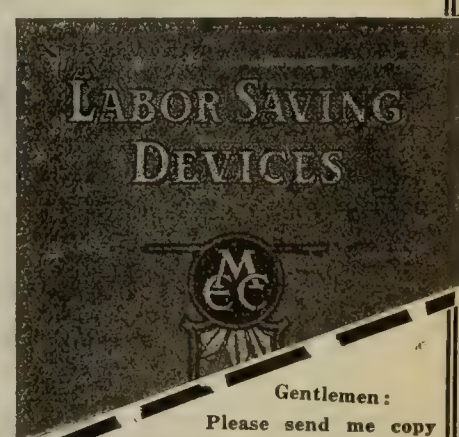


Consider the Saving!

When you stop to consider the fact that M.E.C. air-operated Hinged Collets assure 90% faster operation than hand power chucks and spring collets, you will realize why they are preferred by the shrewd manufacturer.

They are so accurate, reliable and satisfactory that **you can draw up your own guarantee.** Is not this positive proof of their superiority?

Ask for full particulars about this and other M.E.C. Labor Saving Devices—Air Cylinders, Air-operated Expanding Mandrels, Collapsible Taps, etc.



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Agents for Central and Eastern States and Canada---J. R. Stone Tool and Supply Co., Goebel Bldg., Detroit, Mich.

Foreign Agents: C. W. Burton, Griffiths & Co., Ludgate Square, Ludgate Hill, London, Eng.

Gentlemen:
Please send me copy of your catalog entitled "Labor Saving Devices," according to your advertisement in Canadian Machinery.

Name .....
Address .....
Position .....
With .....

Murchey

EQUALS 10 SOLID TAP LIVES

That point alone is sufficient to stamp Murchey adjustable taps as the undisputed leader of its class.

The point is this: when a chaser on a Murchey Tap is ground it can be adjusted to compensate for wear; with a solid tap this cannot be done with the fineness, the finish, the absolute accuracy that characterizes our adjustable taps. A solid tap will lose its accuracy, and the more grindings the greater the inaccuracy. We maintain a special chaser service for our clients.

The Murchey Adjustable Tap has other features which we will gladly furnish upon request.

MURCHEY MACHINE & TOOL CO.

75 Porter St. Detroit, Mich.

The Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, S.W., England
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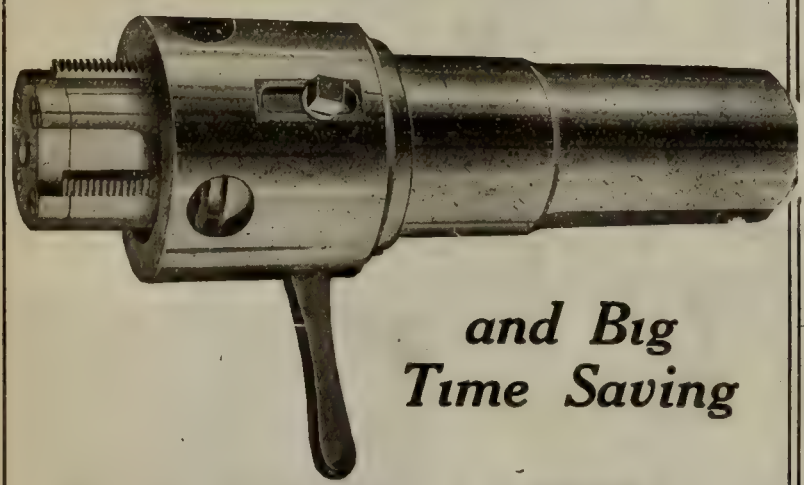
For Positive Accuracy—



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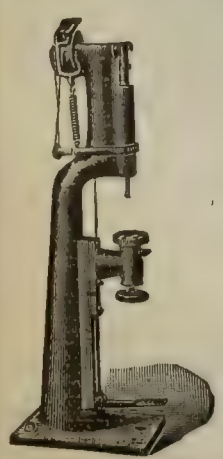

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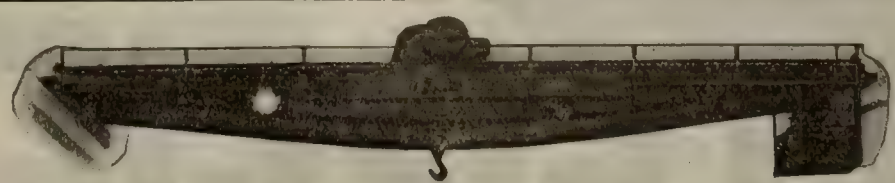

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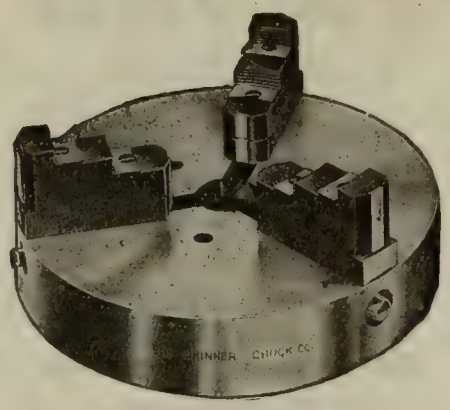

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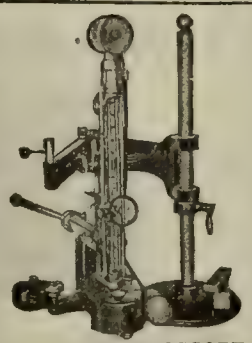

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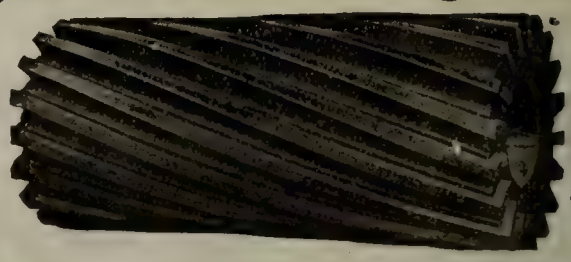

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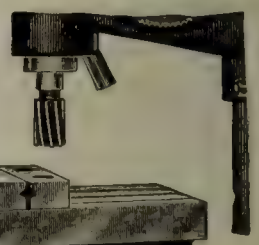

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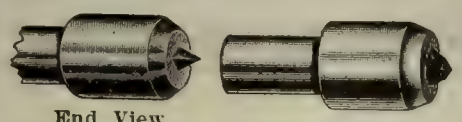
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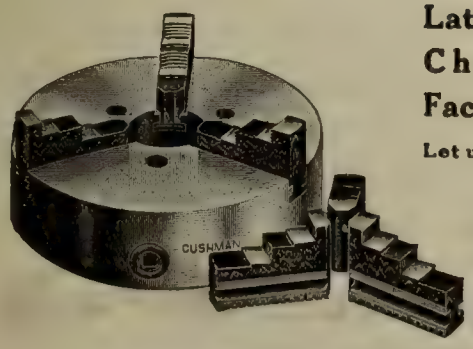

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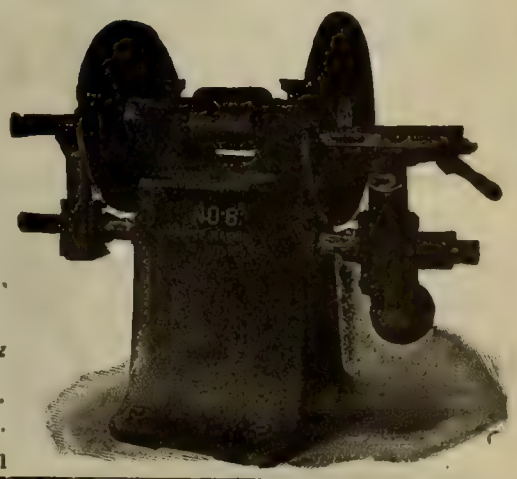

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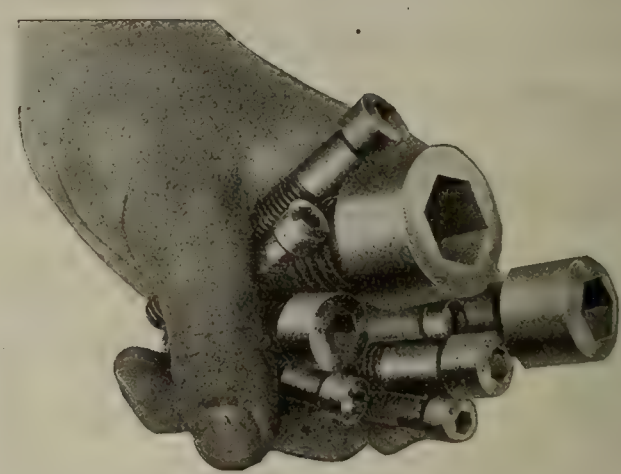

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National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York
H. W. Petrie, Toronto
H. W. Petrie, Ltd., Montreal
Steel Bending Brake Works, Chatham, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

BILLET MARKERS
Matthews, Jas. H., & Co., Pittsburgh, Pa.

BINS, STEEL
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Toronto Iron Works, Ltd., Toronto, Ont.

BLASTING MACHINES, SHOT AND STEEL GRIT
Gray Mfg. & Mach. Co., Toronto, Ont.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal
R. E. T. Pringle, Ltd., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Sturtevant Co., B. F., Galt, Ont.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

BLUE PRINTING MACHINERY
Mulliner-Enlund Tool Co., Syracuse, N.Y.

BOARTZ
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York, N.Y.

BOILERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Riverside Machinery Depot, Detroit, Mich.
Wickes Bros., Saginaw, Mich.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Wells Brothers Co. of Canada, Galt, Ont.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
Cumming & Son, J. W., New Glasgow, Canada
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

BOLT AND NUT MACHINERY
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Dominion Machy. Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machinery Co., Toronto

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Hungerford Brass & Copper Co., New York, N.Y.

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Cook, Asa S., Co., Hartford, Conn.
Victor Tool Co., Waynesboro, Pa.

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Cleveland Pneumatic Tool Co. of Canada, Toronto
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, UPRIGHT AND HORIZONTAL
John Bertram & Sons Co., Dundas
Canada Machinery Corp. Galt, Ont.
Dominion Machinery Co., Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
Roelofson Machine & Tool Co., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, STOVE AND COAL
Cumming & Son, J. W., New Glasgow, Canada

BORING AND TURNING MILLS
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
R. E. T. Pringle, Ltd., Toronto, Ont.

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Cleveland Wire Spring Co., Cleveland
New Britain Mach. Co., New Britain, Conn.

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Brown, Boggs & Co., Hamilton, Can.
Steel Bending Brake Wks., Ltd., Chatham, Ont.

BRASS AND COPPER BARS, RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto
Hungerford Brass & Copper Co., U. T., N.Y.

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Dominion Machy. Co., Toronto, Ont.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto, Ont.
Warner & Swasey Co., Cleveland
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machy. Co., Toronto

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MacKinnon, Holmes Co., Sherbrooke

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Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
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R. E. T. Pringle, Ltd., Toronto, Ont.

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Whiting Foundry Equipment Co., Harvey, Ill.

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Prest-O-Lite Co., Inc., Toronto, Ont.

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Alexander Fleck, Ltd., Ottawa.
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Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.

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Dominion Steel Foundry Co., Ltd., Hamilton, Ont
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
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CASTINGS, NICKEL STEEL
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Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
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Toronto Testing Laboratory, Ltd., Toronto.

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Hannifin Mfg. Co., Chicago, Ill.
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Garlock-Walker Machinery Co., Toronto, Ont.
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Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
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Morse Twist Drill & Machine Co., New Bedford.
Richmond Mfg. Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
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Thomas Elevator Co., Chicago, Ill.
D. E. Whiton Machine Co., New London, Conn.

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Whitney Mfg. Co., Hartford, Conn.
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CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

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New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
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Bernard Industrial Co., A., Fortierville, Que.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.

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MacKinnon, Holmes & Co., Sherbrooke, Que.
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Zenith Steel & Coal Products, Montreal, Que.

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Sheldons, Limited, Galt, Ont.
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Hinckley Machine Co., Hinckley, Ill.
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John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

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Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.

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Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.

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Bernard Industrial Co., The A., Fortierville, Que.

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Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
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CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

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Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

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Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
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Sheldons, Ltd., Galt, Ont.
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Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machinery Co., Montreal.
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Goddard Tool Co., Chicago, Ill.
Illinois Tool Works, Chicago, Ill.
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Osborn (Canada), Ltd., Sam'l, Montreal, Que.
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Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass
John H. Hall & Sons, Brantford, Ont.
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Peerless Machine Co., Racine, Wis.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
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Racine Tool & Machine Co., Racine, Wis.
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CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
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Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
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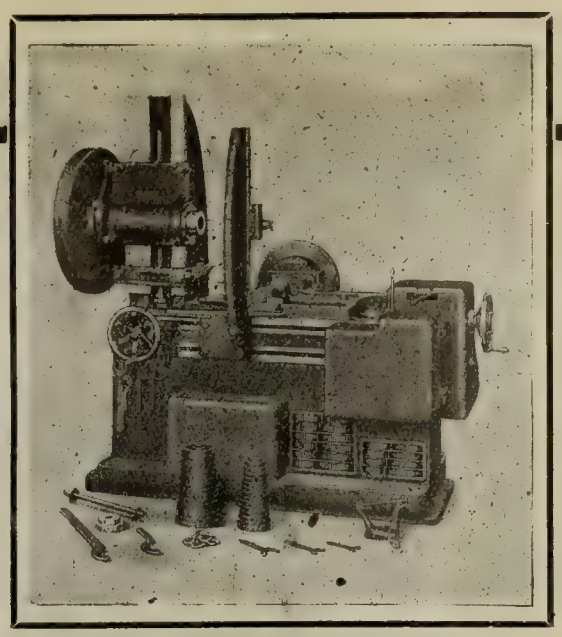

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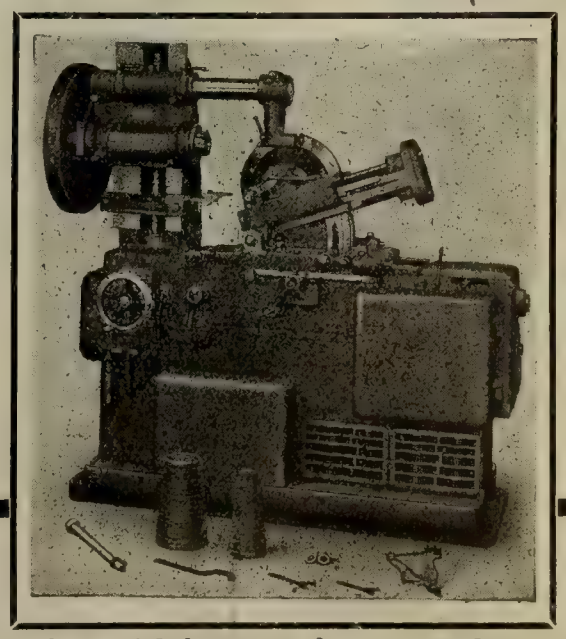
No. 13



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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
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H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal, Que.
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Martin Machine Co., Greenfield, Mass.

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Bilton Mach. Tool Co., Bridgeport, Conn.
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.

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Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Hespeler, Ont.
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H. W. Petrie, Toronto.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
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Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Millers Falls Co., Millers Falls, Mass.
H. W. Petrie, Ltd., Montreal.
Pratt & Whitney Co., Dundas, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
United States Electrical Tool Co., Cincinnati.

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Morse Twist Drill & Machine Co., New Bedford.
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Foss & Hill Machy. Co., Montreal.
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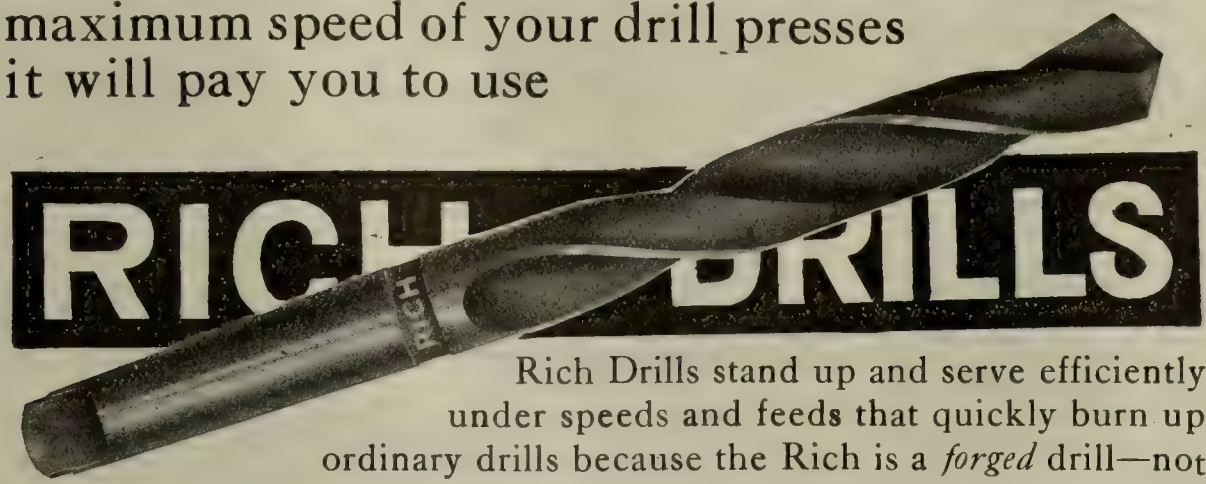

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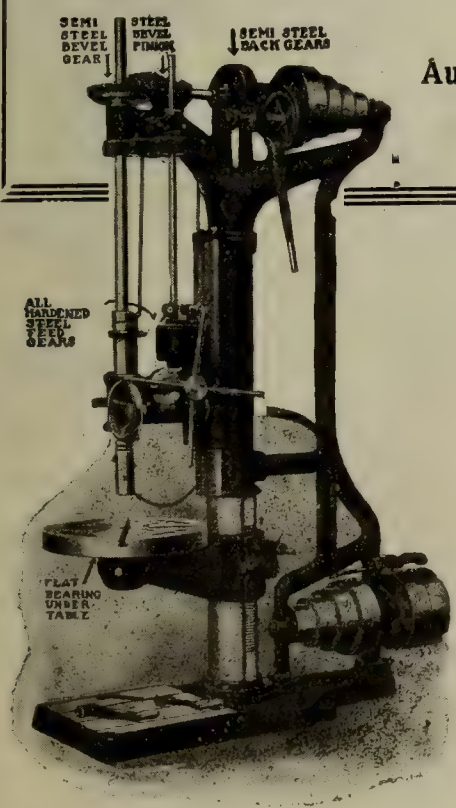

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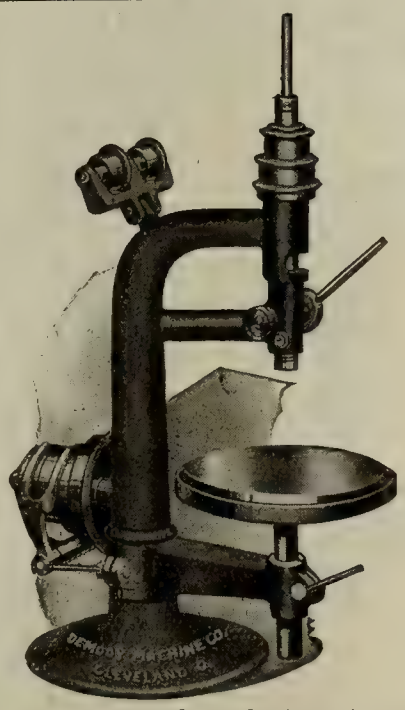

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Petrie of Montreal, Ltd., H. W., Montreal, Que.

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National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

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Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

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Elm Cutting Oil Co., Toronto, Ont.

OIL GROOVING MACHINES
National Mach. Tool Co., Cincinnati, O.

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Smart-Turner Machine Co., The, Hamilton.

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Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

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Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

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MacKinnon, Holmes & Co., Sherbrooke, Que.
Oven Equipment & Mfg. Co., New Haven, Conn.
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Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Toronto Welding Co., Toronto, Ont.

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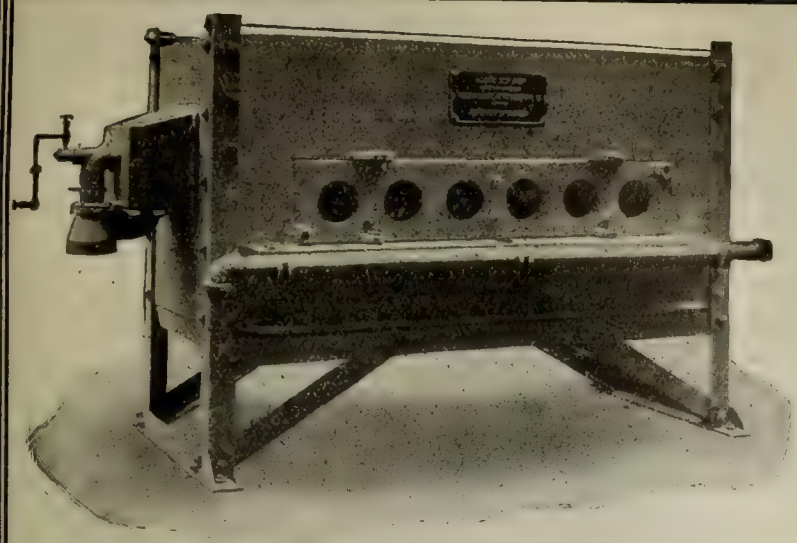

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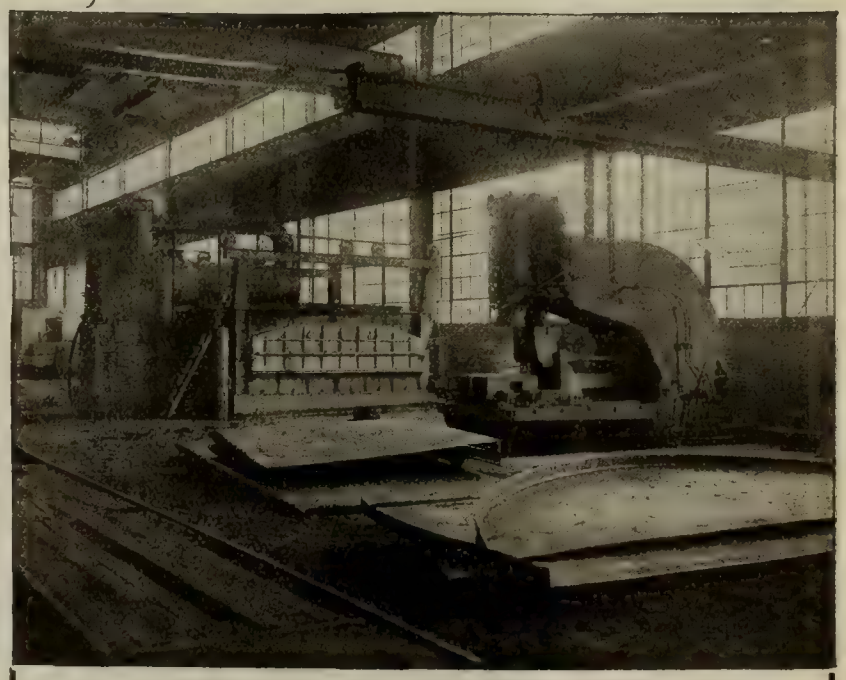

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Sheldons, Ltd., Galt, Ont.
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The Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
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Pratt & Whitney Co., Dundas, Ont.
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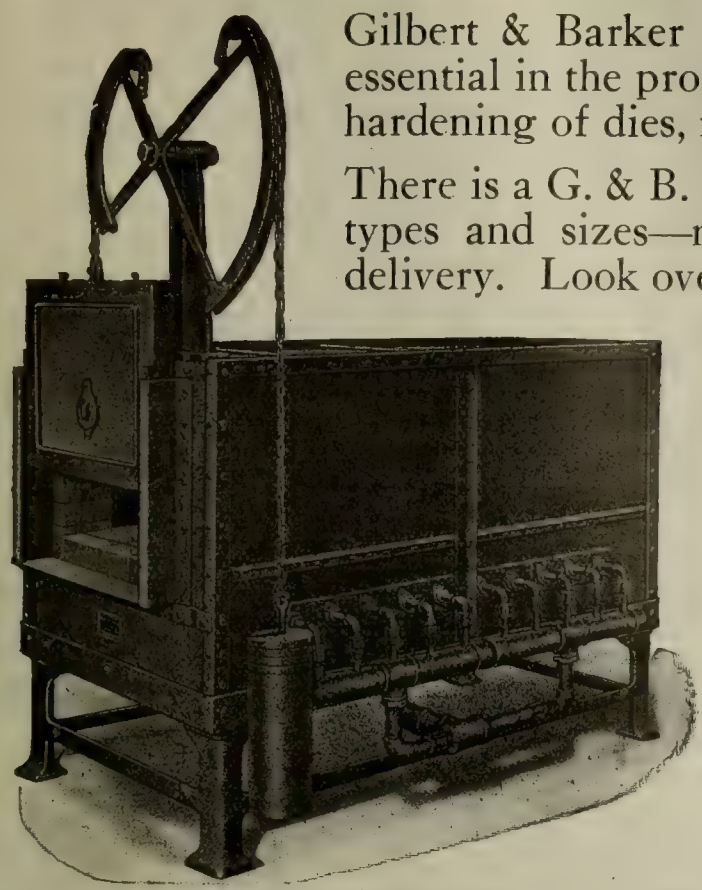

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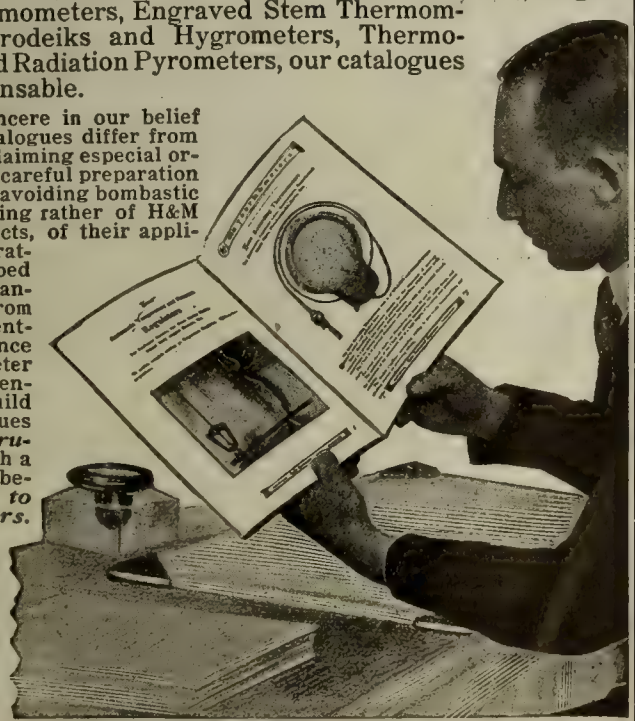

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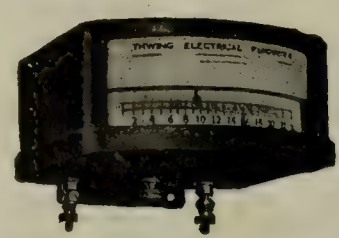

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F. B. Shuster Co., New Haven, Conn.

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Steel Co. of Canada, Ltd., Hamilton, Ont.

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Sleeper & Hartley, Inc., Worcester, Mass.
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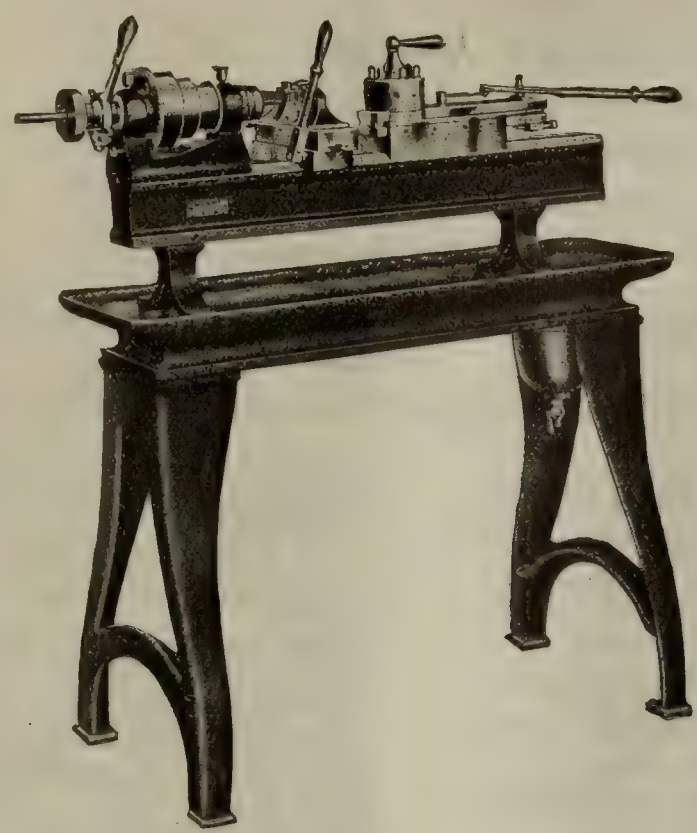

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CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XVIII. TORONTO, AUGUST 9, 1917 No. 6

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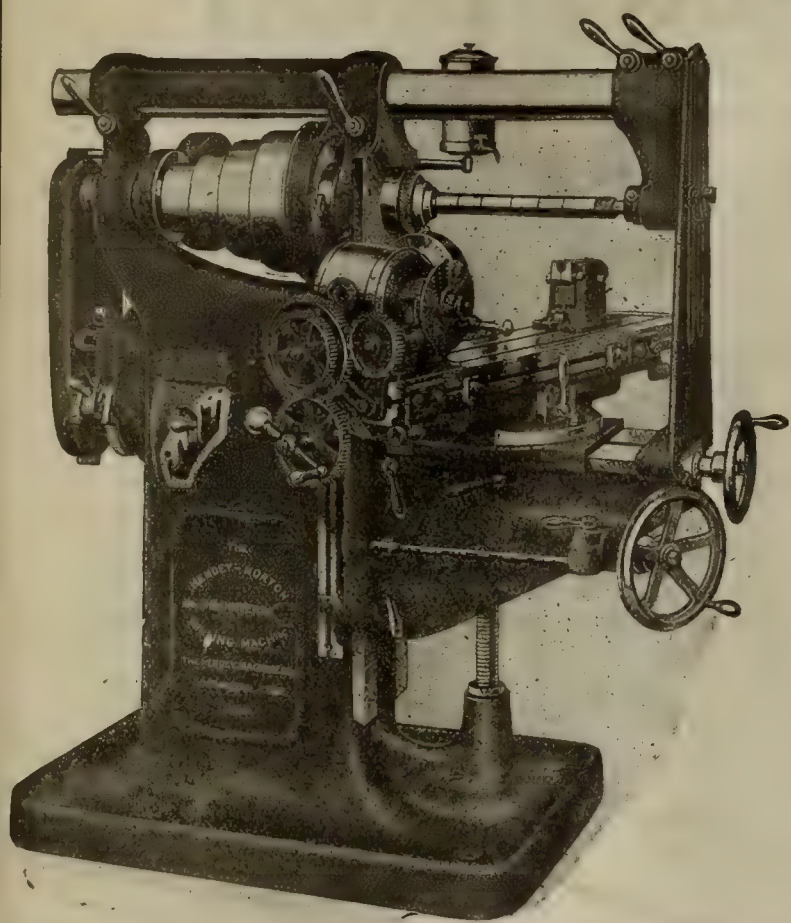

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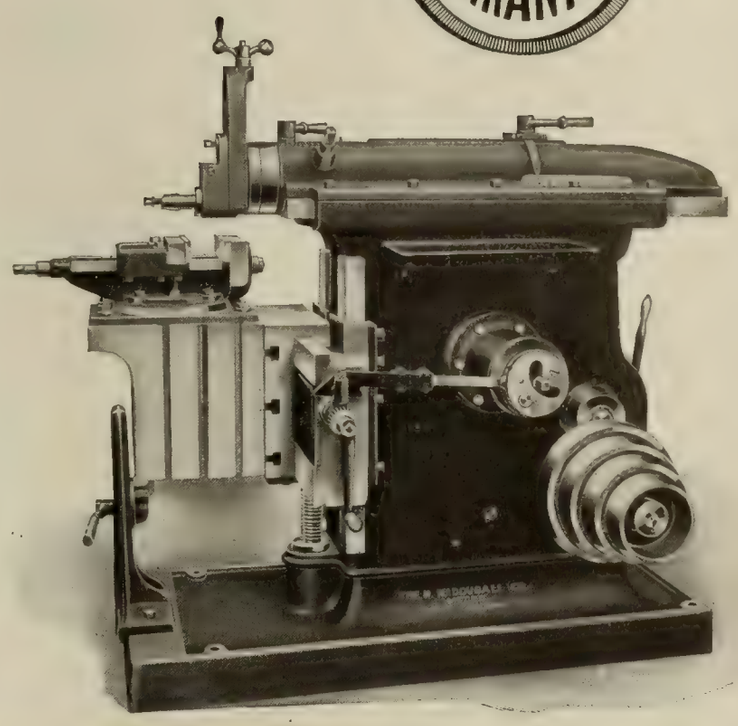

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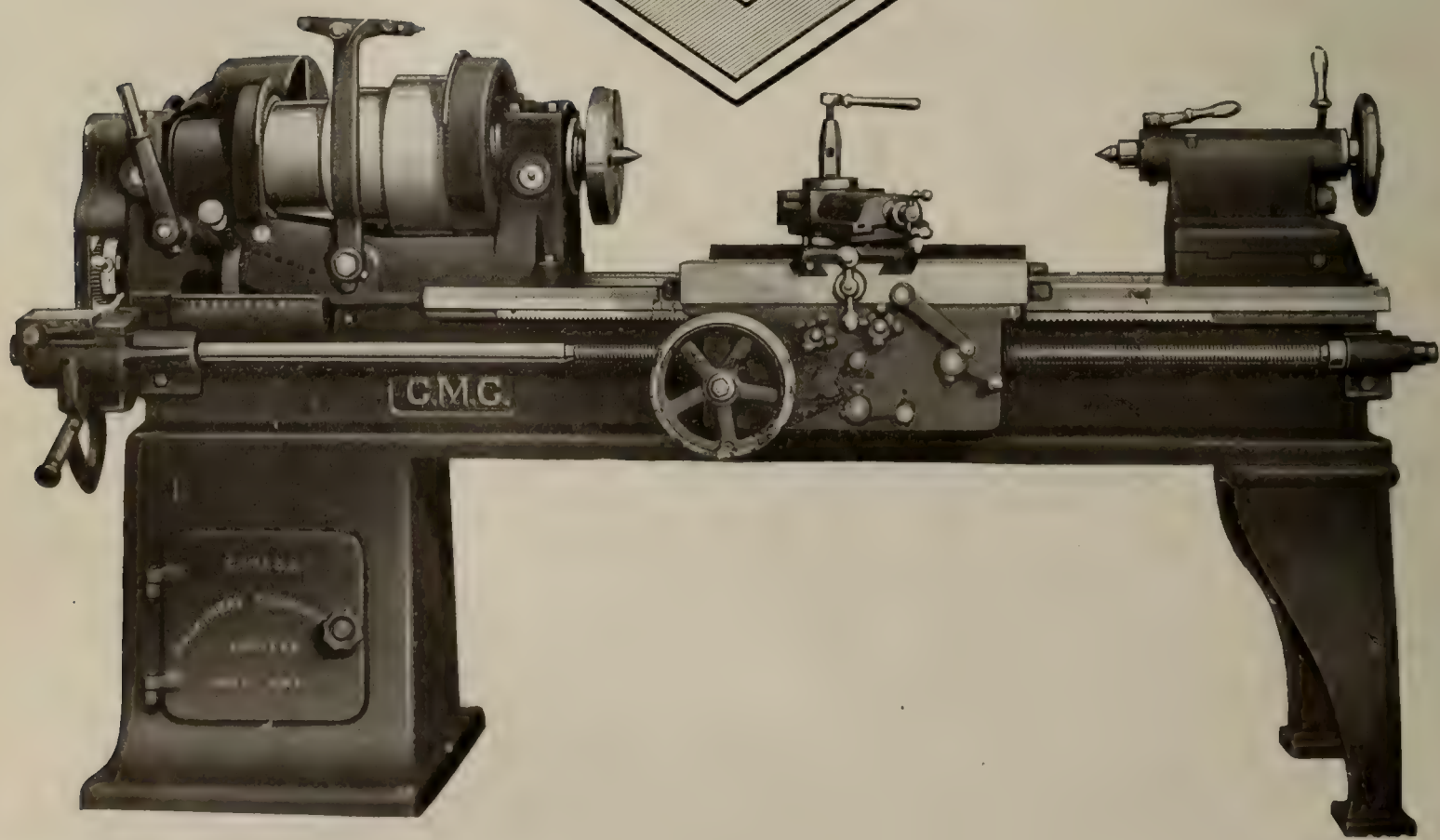

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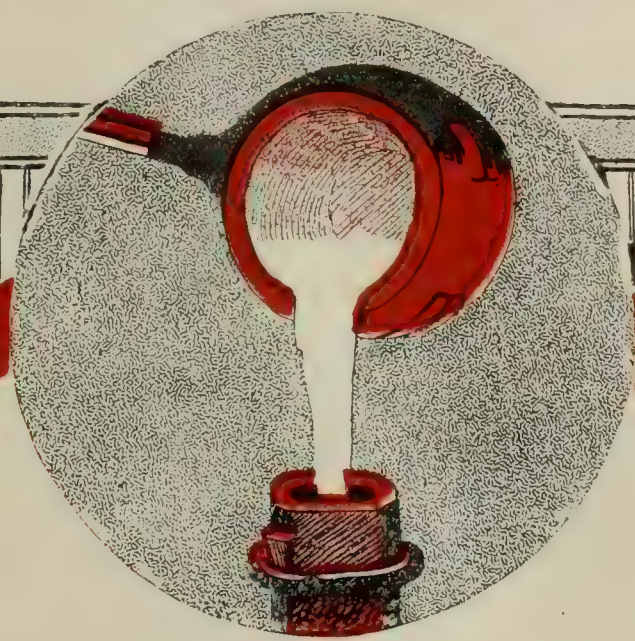

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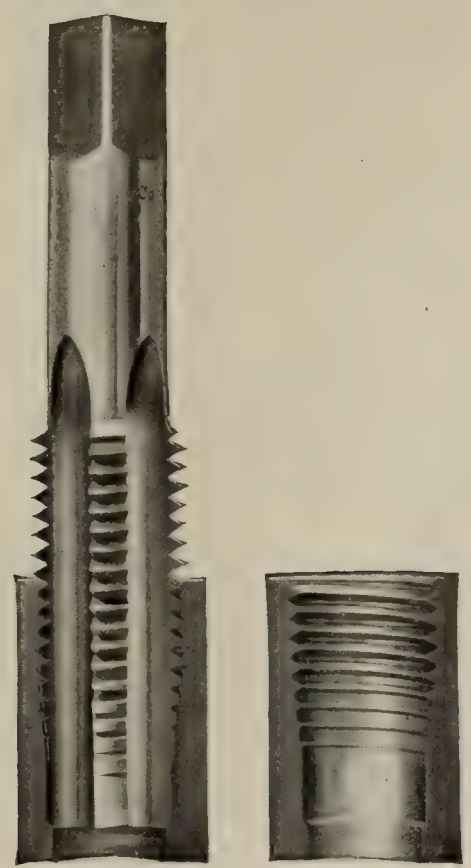

This cut shows a P. & W. Taper Hand Tap, after being forced by power nearly through a nut in which the hole was purposely drilled considerably smaller than the root diameter of the tap. This, of course, left, an excessive amount of work for the tap to do. Yet, owing to the design and construction of the tap (notably the cylindrical pilot with relieved chamfer on the point, and the full relief given to the chamfered portion), there was no evidence of imperfect threading or any indication whatsoever of the hard usage to which the tool had been put.

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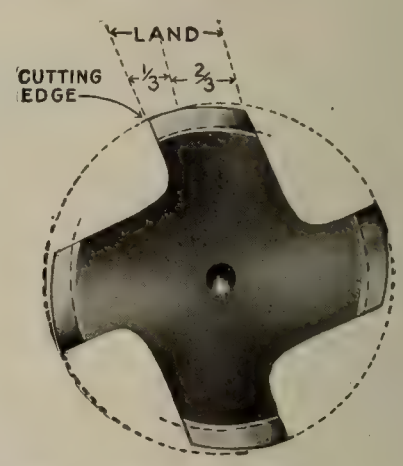

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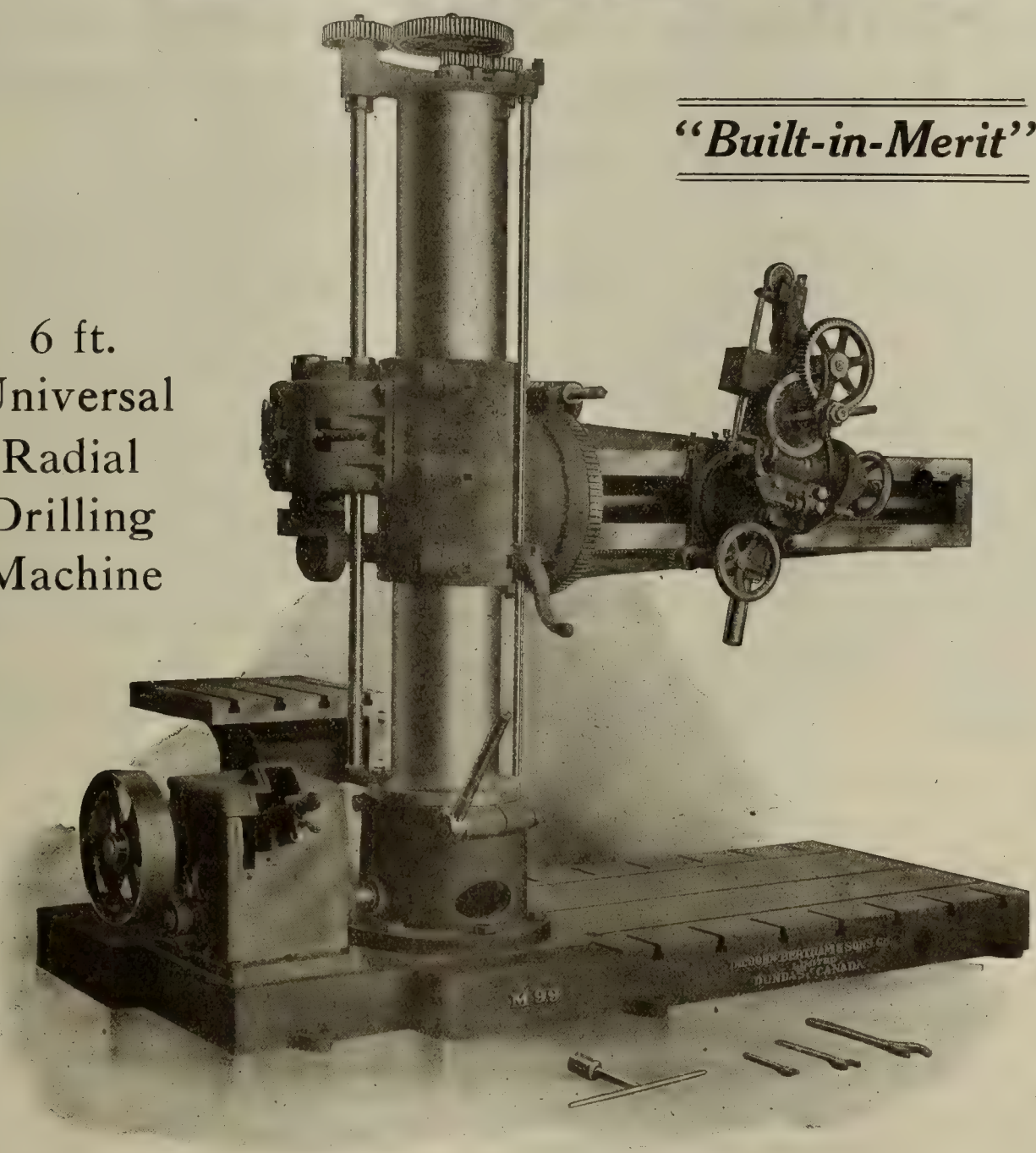

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The Publisher's Page

TORONTO August 16, 1917

Replies from Russia, England, Holland, Australia, India, France, Italy, Norway and Sweden, South America and Africa:

TRANSATLANTIC Mail Service nowadays is slow, but fairly sure judging by our own experience. It is now a little over a year since our first Export Number was mailed to the four corners of the earth. We anticipated and expected that results would be slow in coming. We realized and our advertisers realized that foreign business could not be grabbed off overnight. They and we expected to wait and there was no disappointment when a big volume of replies was not received in a month from the date of our first Export Number.

A year, especially the year of our Lord 1916-1917, is a comparatively short period of time compared with the life of any firm of repute, and yet at the end of a year results are coming home! The seed, carefully planted, is ripening fast. During the past few days several advertisers have gone out of their way to tell us of replies they have received from big importers in other countries. Some of these replies refer to our earlier Export Numbers. Others to more recent issues.

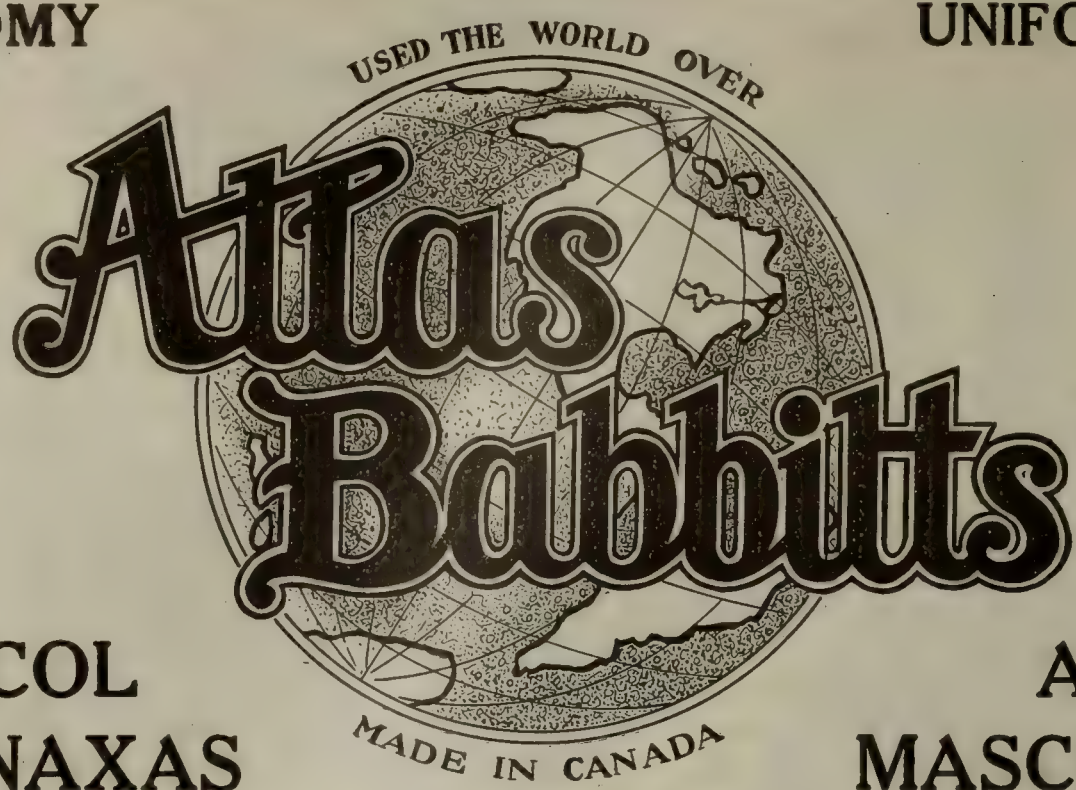
Connections are formed abroad now, more easily perhaps than in normal times. Connections formed now are likely to last when normal times prevail again. "Missionary" work or the process of educating and securing the interest and friendship of foreign buyers takes time. War time pre-occupation and perhaps war time prosperity may be responsible for the failure of some firms to take advantage of the present opportunity of reaching out after export business some time,

Now is the time to start foreign buyers thinking of your products. A year lost *now* may mean much more than you think.

If you are thinking about going after export business sometime, better make the decision and start the machinery now. Let us send particulars of our monthly Export Numbers. Our last Export Number ran 176 pages.

If any advertisement interests you, tear it out now and place with letters to be answered.

ECONOMY UNIFORMITY



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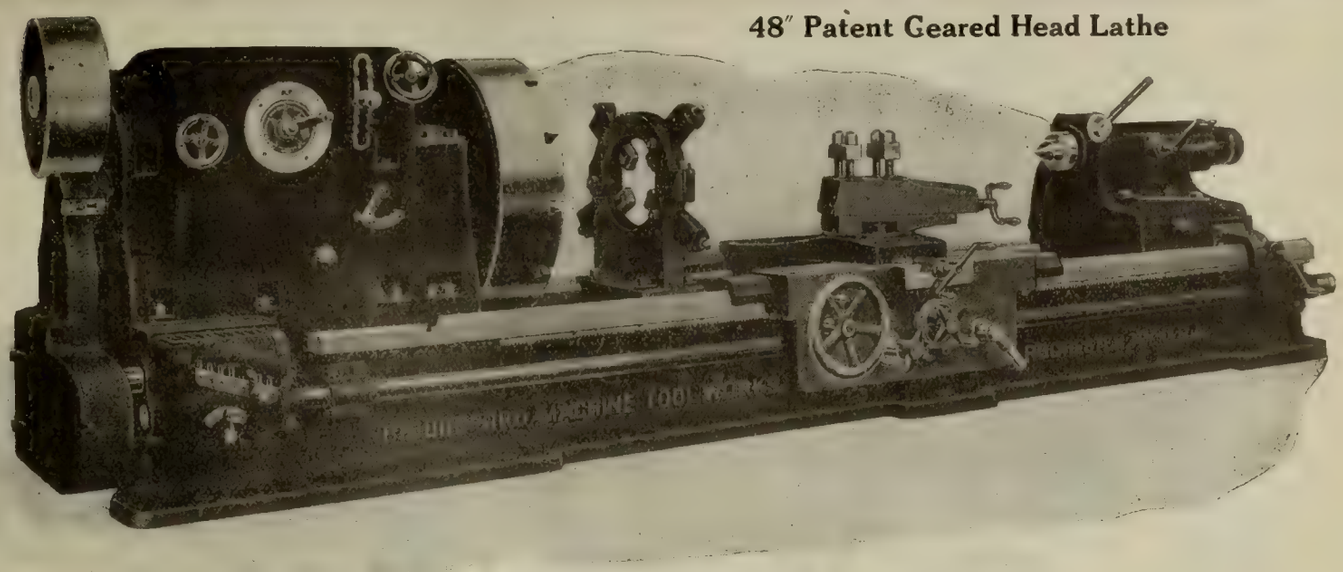


48″ Patent Geared Head Lathe

The Bridgeford for Big Work

That's what this powerful Bridgeford is built for—big work. Has strength and rigidity sufficient to perform the heaviest kind of jobs with perfect accuracy—and it goes through them in record time. Smooth in action. Strongly constructed. Fifteen cutting speeds all easily changed.

Bridgeford's Lathes give maximum production at minimum cost. We'll be glad to give you a full account of what they will do. Write

Bridgeford Machine Tool Works, Rochester, N.Y.

161 WINTON ROAD

Two Cuts at One Time

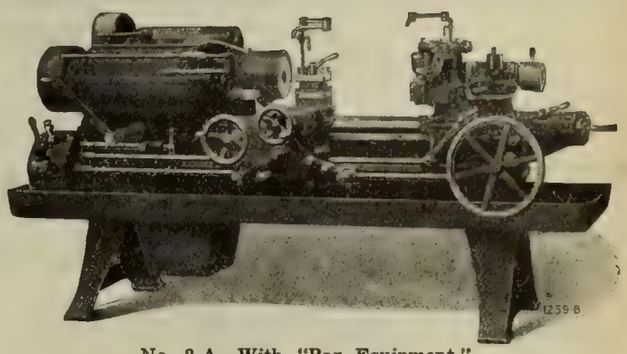
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

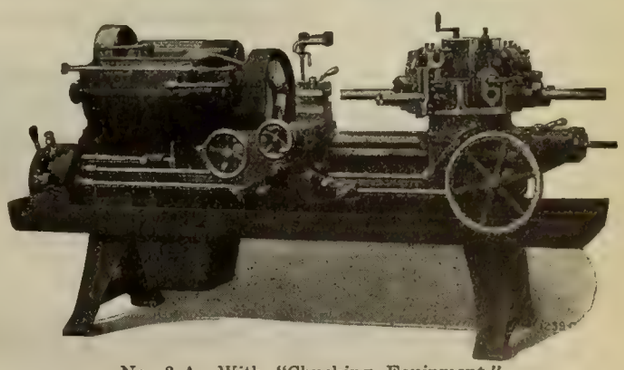
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."



No. 2-A—With "Chucking Equipment."

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

If any advertisement interests you, tear it out now and place with letters to be answered.

This Wonderful Metal

is made in different Grades and can be adapted for
A MULTITUDE OF OPERATIONS.

Remarkable Results are Being Obtained

in machining Steel, Iron, Bronze, Brass,
Ivory, Celluloid, etc.

DIES OF ALL DESCRIPTIONS
are cast for hot or cold drawn work.

Write us for particulars, stating the class of work you are on, and what your difficulties are. Our Engineering Staff is at your disposal.

DELORO SMELTING & REFINING CO., LIMITED

Head Office - - DELORO, ONTARIO

TORONTO
200 King Street West

MONTREAL
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Steel Castings

No castings too small or too large for the capacity of our plant. Manganese, Vanadium, Titanium, Chrome, Nickel, castings for Marine, Railroad, Mill and hydraulic purposes are our specialty. Made true to specifications and pattern.

Illustration above shows Stern casting for Ice-Breaker, "John D. Hazen."

CANADIAN STEEL FOUNDRIES, LIMITED

Montreal, P.Q. Welland, Ont.

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" **Tool Steels**

SISCO

Made in Sweden from selected Dannemora Ore

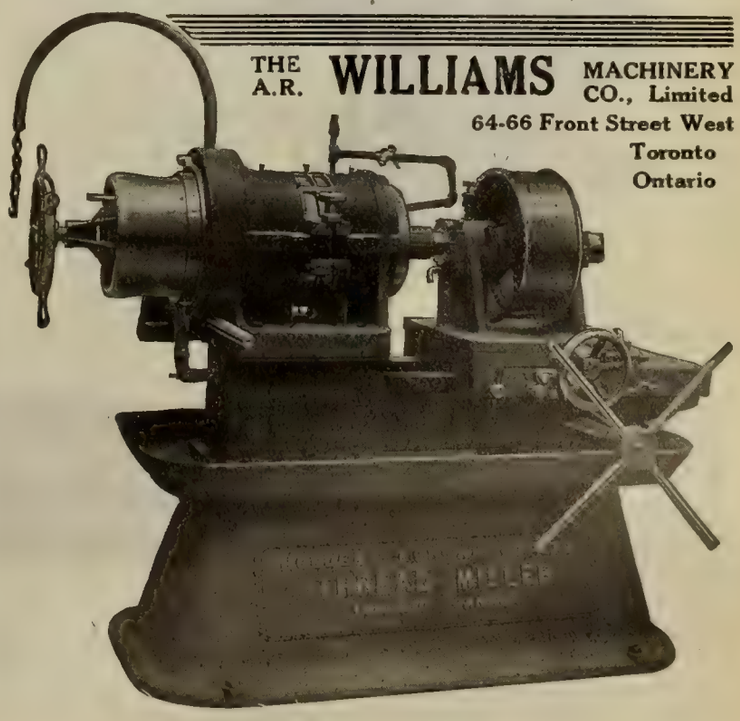
We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

The Life of a Thread Miller

Depends not upon the amount of work it does, but the ease and thoroughness with which the work is done. These Thread Millers are noted for these qualities. Its quality of work is unrivalled. Our Service Department will give you all the particulars. *Write us!*

THE A.R. **WILLIAMS** MACHINERY CO., Limited
64-66 Front Street West
Toronto
Ontario



The Johnson Friction Clutch Is Being Used As A Part Of This Machine

Here

Courtesy of Foote-Burt Co., Cleveland, Ohio.

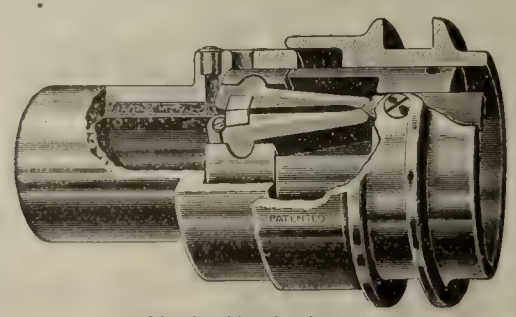
The Johnson Friction Clutch is used in the throw-out back gears in this new 15½ Foote-Burt Multiple-Spindle Machine.

"Records Are Much Better Than Promises"

That is the reason why we run the cut at the top of the page, driving home the record, "the Johnson Friction Clutch is being used as a part of this machine."

Week after week has the evidence been piling up as to the extensive use of the Johnson Friction Clutch in various types of machines.

And this record of wide use is duplicated by another record of satisfactory service.



Single Clutch—Interior.

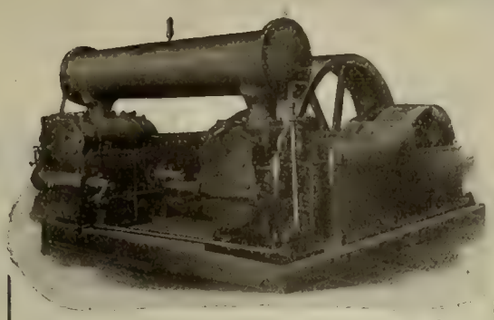
The Johnson Friction Clutch embodies all the principles which make a perfect friction clutch. Our YELLOW DATA SHEETS and Booklet, "Clutches as Applied in Machine Building," explain this fully. Will you have them?

THE CARLYLE JOHNSON MACHINE CO.
MANCHESTER, CONN.

England—The Efandem Co., 159 Gt. Portland St., London, W., England. Sole Agents for the British Isles.

Canada—Williams & Wilson, Ltd., 320 St. James St., Montreal. Canadian Fairbanks-Morse Co., Limited, Toronto.

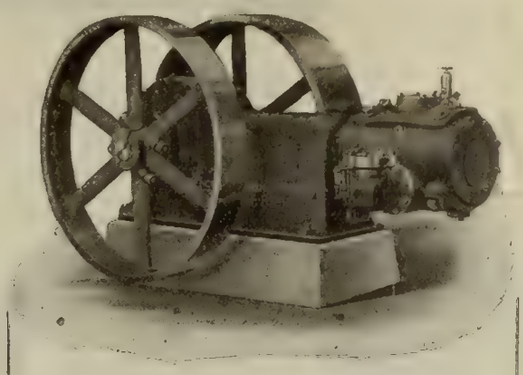
AUSTRALIA: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.



JENCKES CLASS DB-2 AIR COMPRESSOR

If you understand compressors look over the following outline. If you are not acquainted with these machines it would delight us to give you an introduction.

Inlet Valves are of the Corliss type, the outlet valves of the disc type; flood type lubrication, allowing a continuous flood of oil over bearings, crank pins, etc., while in motion. Machine of the enclosed type.



JENCKES CLASS CB-1 AIR COMPRESSOR

If your requirements do not justify either of the above machines, just bear in mind that we have a very comprehensive range that will cover all usual and unusual needs. The above is equipped with inlet and outlet disc valves; splash gravity lubrication system; extra large bearings; machine entirely enclosed.

The Jenckes Machine Company, Limited

Works: St. Catharines, Ont.
Works: Sherbrooke, Que.

SALES OFFICES: 710 C.P.R. Bldg., Toronto; 908 E.T. Bank Bldg., Montreal; West Chester Ave., St. Catharines; Cobalt, Ont.; Exchange Bldg., Vancouver.

Electrite Uranium High Speed Steel

Electric furnaces, automatically regulated, the most modern methods, and **the introduction of Uranium**—make this a steel of truly remarkably cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.

LATROBE, PA.

High-Speed STEEL

The tools that are made with "Wolfram" High Speed Steel are **warranted to be super-keen at the edge and super-strong at the neck.**

WOLFRAM

Embodies a true and permanent alloy of Tungsten, Chrome, Vanadium and Iron. No better High Speed Steel in the world.

VULCAN CRUCIBLE STEEL COMPANY

ESTABLISHED 1900

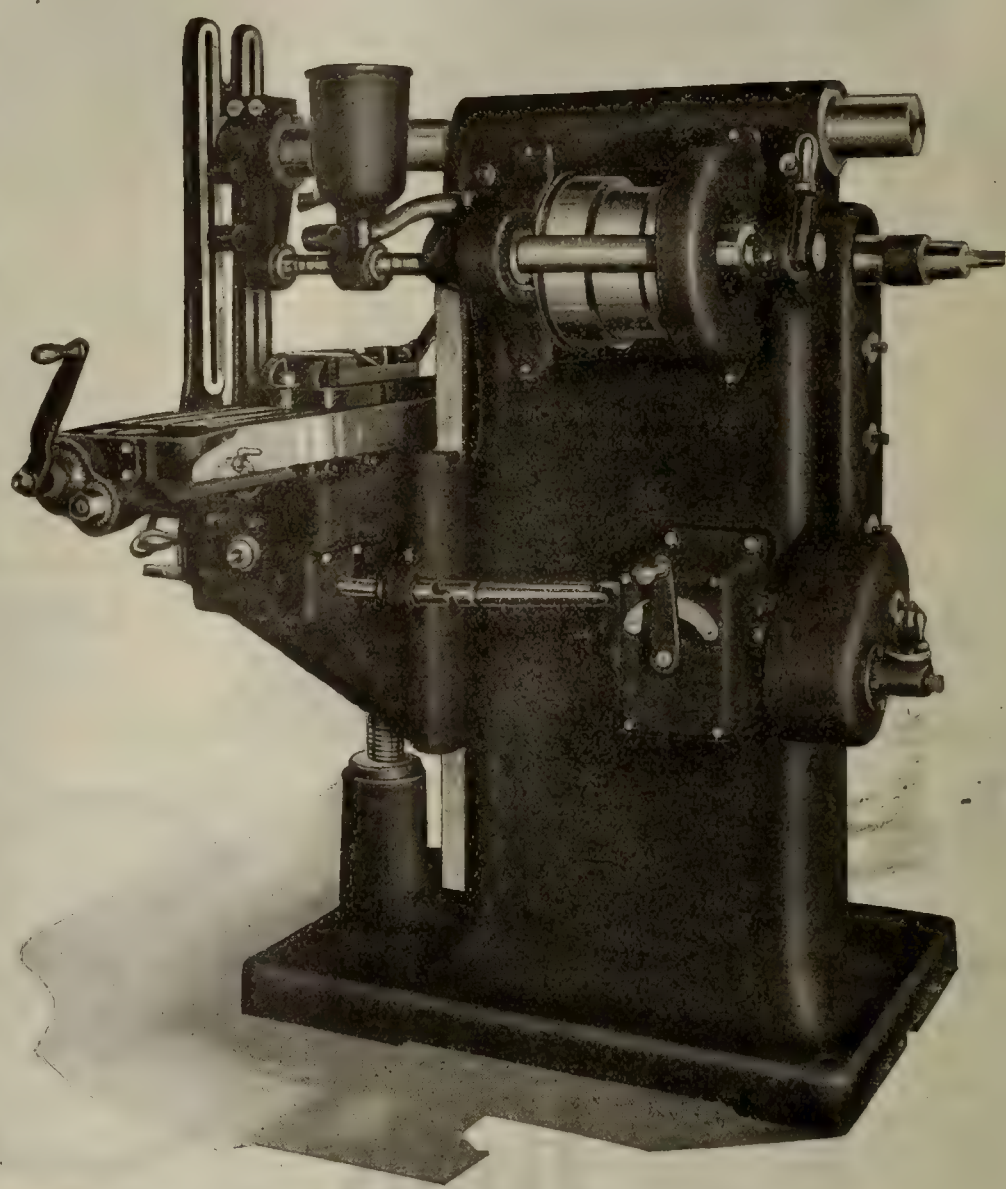
Aliquippa - Pa., U.S.A.

Represented in Canada by Messrs. Norton, Callard & Company, Montreal.

Adv't. No. 2 Miller Series

When Machinery of any kind has to be purchased, naturally the purchaser weighs carefully the respective merits of other manufacturers' products before he spends his money.

We are pleased to say that the number of Millers recently sold show that our machines are proving to be well worth while —otherwise why so many repeat orders?



You will no doubt, by this time, have noted the simplicity of our design—also its strong, rugged appearance. These features alone make this machine ideal for manufacturing work, where speed and accuracy are desired.

We should like you to have our catalogue if it is not already on your desk or file.

The Ford-Smith Machine Company, Limited
HAMILTON ONTARIO CANADA

Sheet Metal Working Machinery of Any Description

B.B. Presses for

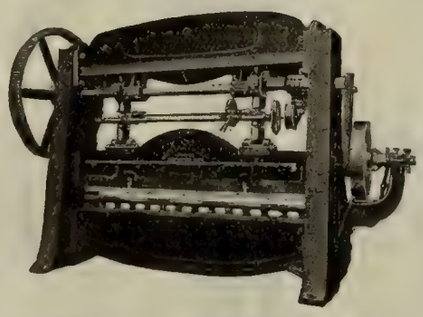
Quality, Efficiency,

Durability, Speed,

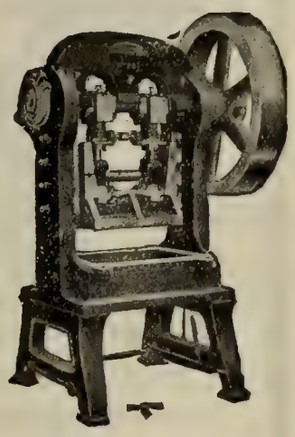
Accurate Production.

No. 2—G.A. Press

No. 126
Deep Throat Power Punch

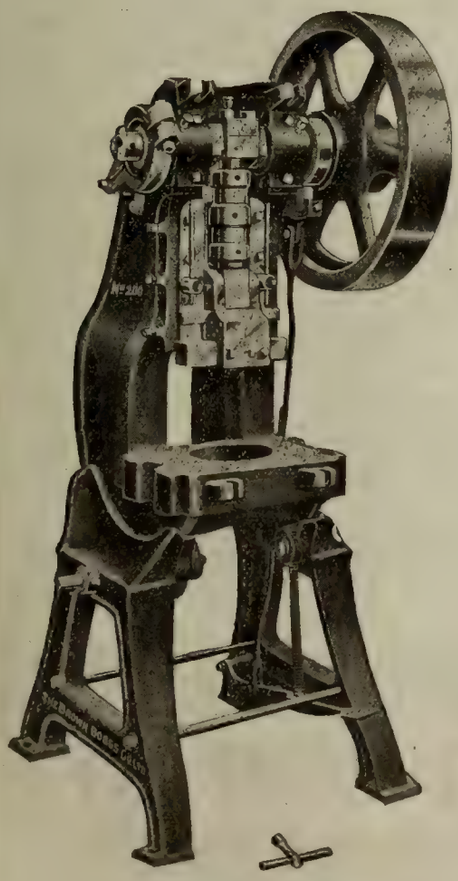


No. 500—Power Brake or Press



No. 20½—Power Press

B.B. Presses embody special features for minimizing maintenance cost of both machines and tools.



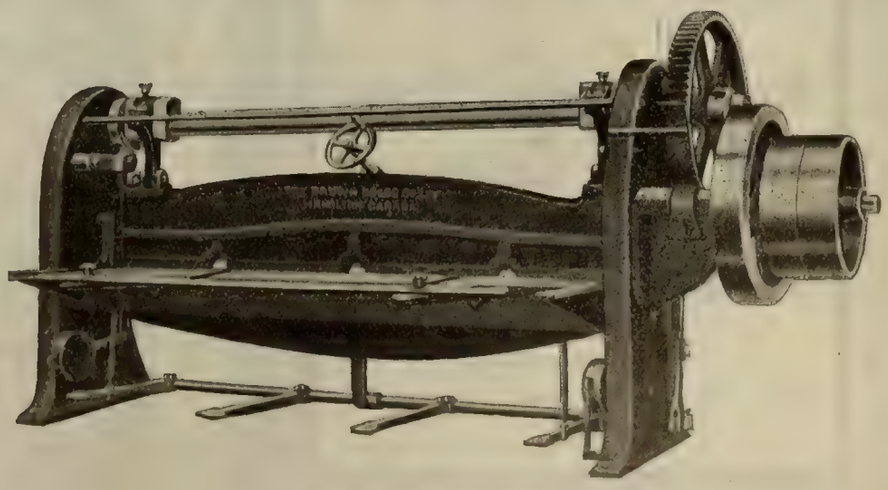
No. 200—Power Press

The Brown, Boggs Company, Limited

HAMILTON ONTARIO

MANUFACTURERS OF

Tinsmiths' Heavy Sheet Metal Working Machinery



No. 960—Overhead Shear

STEEL

FOR

SHRAPNEL SHELLS

AND SHELL BLANKS

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

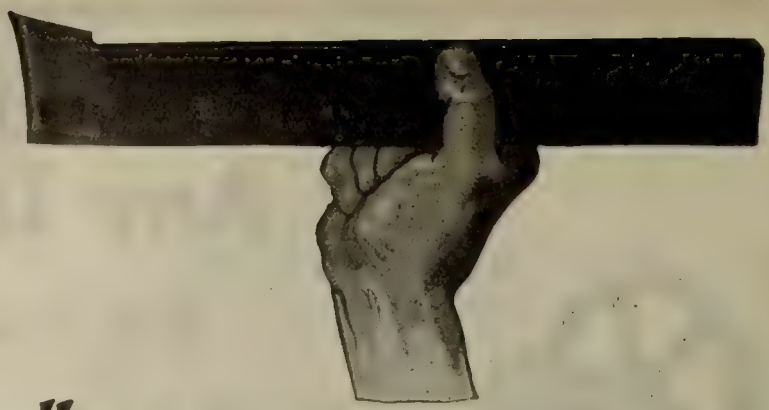
Nova Scotia Steel and Coal Company

Limited

Head Office: NEW GLASGOW, N.S.

Western Sales Office:

Room 14, Windsor Hotel, MONTREAL



"Red Cut Superior"

HIGH SPEED STEEL

YOU have thought of many qualities you would like to have in High Speed Steel Tools—such as cutting edges with long life, freedom from brittleness, great reserve strength and toughness to resist shocks and strains, tools that would not require special heat treatment, tools that would take deep roughing cuts or fine smooth finishing cuts, and in addition, could be worked at higher speeds than you ever dreamed of. All these virtues and many more are contained in "Red Cut Superior", a First Quality High Speed Steel. Furnished in Annealed Bar Stock, Discs, and Treated Tool Holder Bits.

Are your tools made of Red Cut?

Send for folder

VANADIUM-ALLOYS STEEL COMPANY

Pittsburgh, Pa.

Works at Latrobe, Pa.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

TRADE MARK

Reliance Steel Works
SHEFFIELD, ENG.

TRADE MARK:

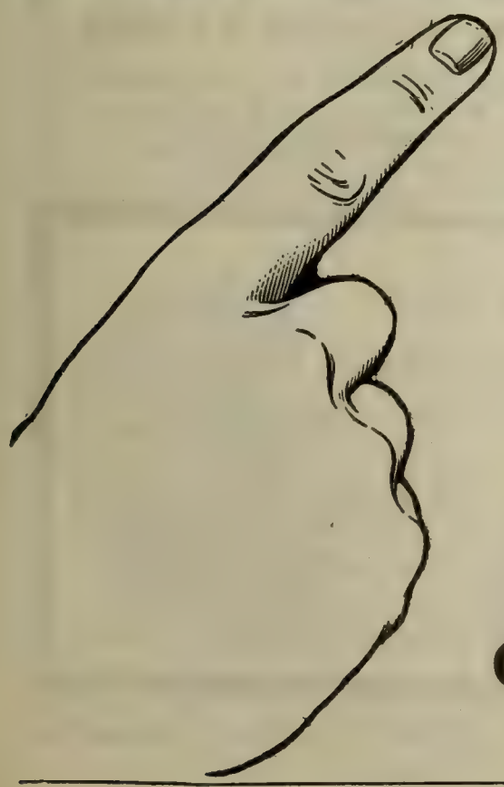
TRADE MARK

of the Famous

"WACO

Brand

High Speed Steel and Twist Drills



"DOUBLE WACO" Quality

Specially Adapted for all kinds of
MUNITION WORK

"Turtle" Brand
High Class Tool Steel, Files, etc.
of all descriptions.

For particulars apply to our
Sole Representatives for Canada

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario

The

Fairley Davidson Steel Co., Inc.

SPECIALISTS

	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
High Strength Steels	"Hehtemnd"
High Speed Steel	RUSHITOFF No. 6
Tool and Die Steels	"Fondwot" and "Giant"
Magnet Steels	Tungsten or Chrome
Non-Changeable Die Steel	Nugget "B" oil hardening

CHROME VANADIUM, oil hardening or case hardening

CHROME NICKEL, oil hardening or case hardening

Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

Canadian Agents:

The Canadian Utilities Steel & Engineering, Limited

149 Craig Street West, Montreal, Canada

We carry a complete stock at our Montreal Warehouse

Works: LONGUEUIL, QUE.

CANADIAN MANUFACTURERS

are you using Steel

MADE IN CANADA?

We are manufacturing at our works at LONGUEUIL, QUE.

SPECIAL HIGH SPEED AND CARBON TOOL STEELS, MISCELLANEOUS SHOP TOOLS, GAUGES, Etc.

ARMSTRONG WHITWORTH of CANADA

LIMITED

HEAD OFFICE: 298-300 St. James St., Montreal

Branches: 27 King William Street, HAMILTON
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Coal
Coke
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Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

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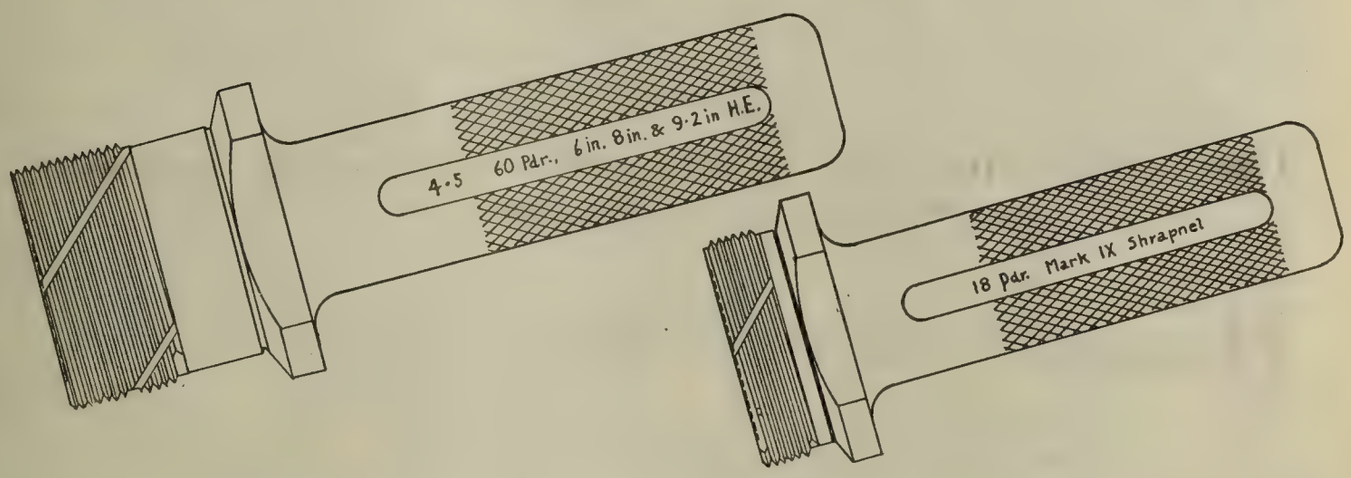
TEXTILE BELTING and PACKINGS

HIGH SPEED TWIST DRILLS

J. R. BAXTER & COMPANY LIMITED, MONTREAL.

and GENERAL MACHINERY SUPPLIES

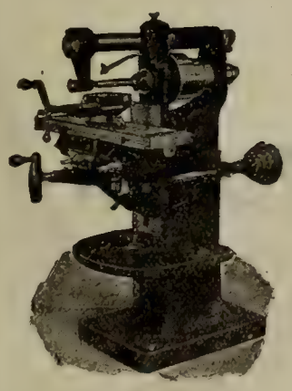
FUSE HOLE GAUGES



Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario



CUT YOUR SHOP COSTS

Nobody would think of putting 16-inch lathe work on a 30-inch lathe, then why leave small parts on a large Milling Machine?

A Steptoe Hand Miller or small power feed can be handled quickly and will cut your production cost. You will have less money invested in your Milling Machines and have more machines to do the work.

That same principle applied to your small planer work will cut the cost of planer work.

A Steptoe Shaper will do the work faster because it can be handled quicker.

The John Steptoe Company, CUMMINSVILLE CINCINNATI, OHIO, U.S.A.

Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.

If any advertisement interests you, tear it out now and place with letters to be answered.

One of the

Steels of the Century

Centurion High-Speed

Made from the **BEST** Materials

Iron, Tungsten, Chrome, Vanadium

Melted by the **BEST** Process

The Crucible Furnace Method

Handled by the **BEST** Workmen

Melters, Forgemen, Annealers, Metallurgists

CONSEQUENTLY

Will do the **BEST** Work

Quality ***Delivery*** ***Service***

We have a catalog waiting for you. Write for it.

THE CENTURY STEEL CO. OF AMERICA

MANUFACTURERS OF HIGH-GRADE CRUCIBLE STEELS

Works:
POUGHKEEPSIE, N.Y.

Sales Offices:
120 BROADWAY, NEW YORK

You must have good steel in your cutting tool where you have turning operations that are severe; the making of rolls for steel mills, for example. The steel used is a very hard, tough metal, and it is necessary to remove this metal to some depth.

The chips tell the story. There are nearly two pounds of them in the man's hands. The roll is thirty inches diameter and the feed is 13/64 inch per revolution, while the depth of cut is over an inch. The cutting speed is about 18 feet per minute. A 50 H.P. motor is required to operate the machine.

Uranium Steel is used for this cutting tool. It is the only steel that several concerns have found can stand the pace. Uranium is an element which gives high-speed steel remarkable toughness and life.

Consult your steel man or write us

Standard Alloys Company

Forbes and Meyran Avenues
PITTSBURGH, PA.
U.S.A.

IF YOU WANT THE

BEST BASE PLUGS, BUY BANFIELD'S

Have in stock for immediate shipment either threaded or bevel Plugs for 4.5", 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. Write for prices.

EDWIN J. BANFIELD

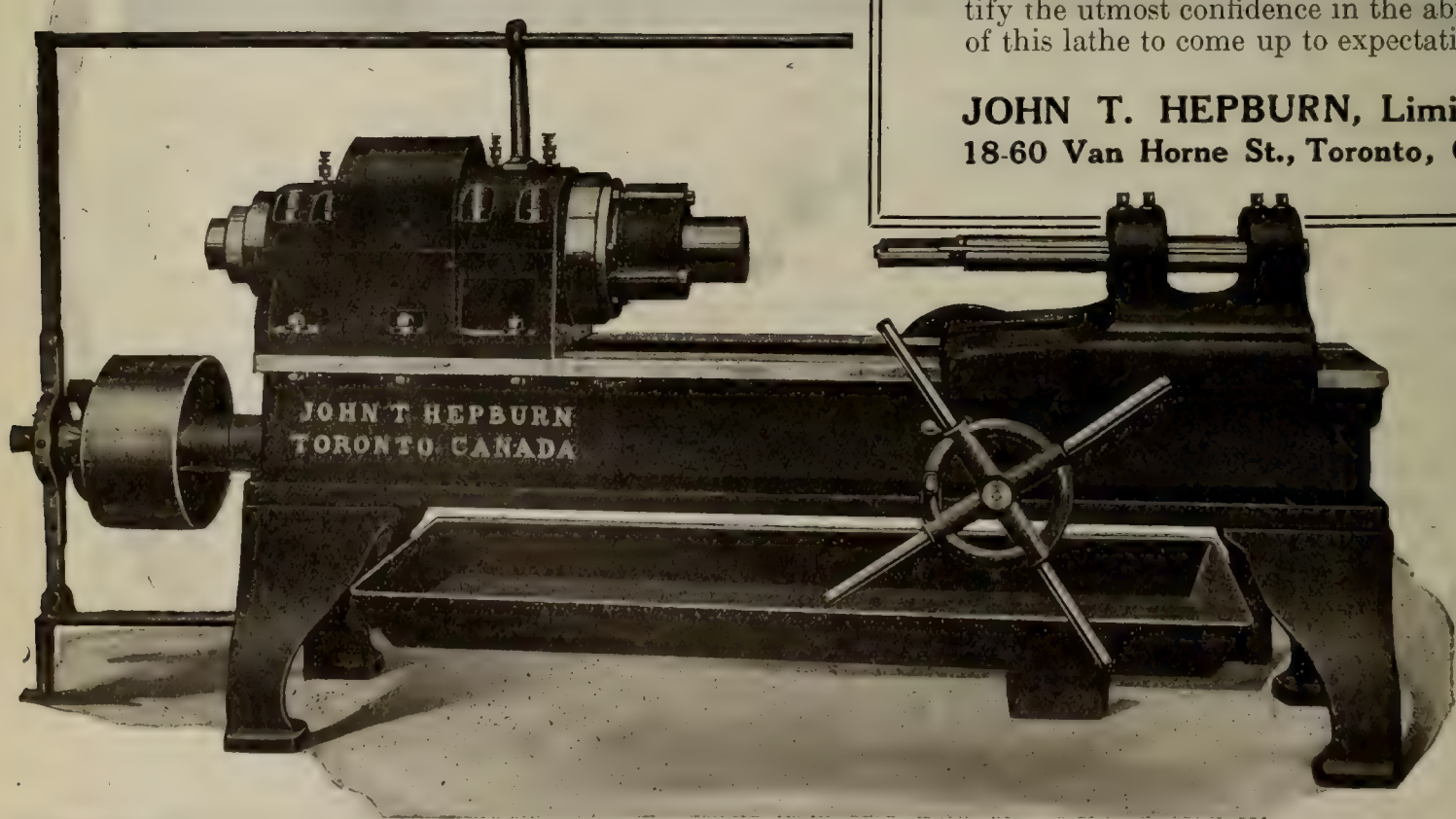
STAIR BLDG. ∴ TORONTO, ONT.

Manufacturer of Plug Milling Machines for above size shells. Prices and deliveries on application.

Are You Getting Results?

Results are dependent upon two things: speed and quality. If you get speed without quality, yours is a losing proposition. This Hepburn 6" boring lathe gives both speed *and* quality. The results obtained by Canadian users justify the utmost confidence in the ability of this lathe to come up to expectations.

JOHN T. HEPBURN, Limited
18-60 Van Horne St., Toronto, Ont.



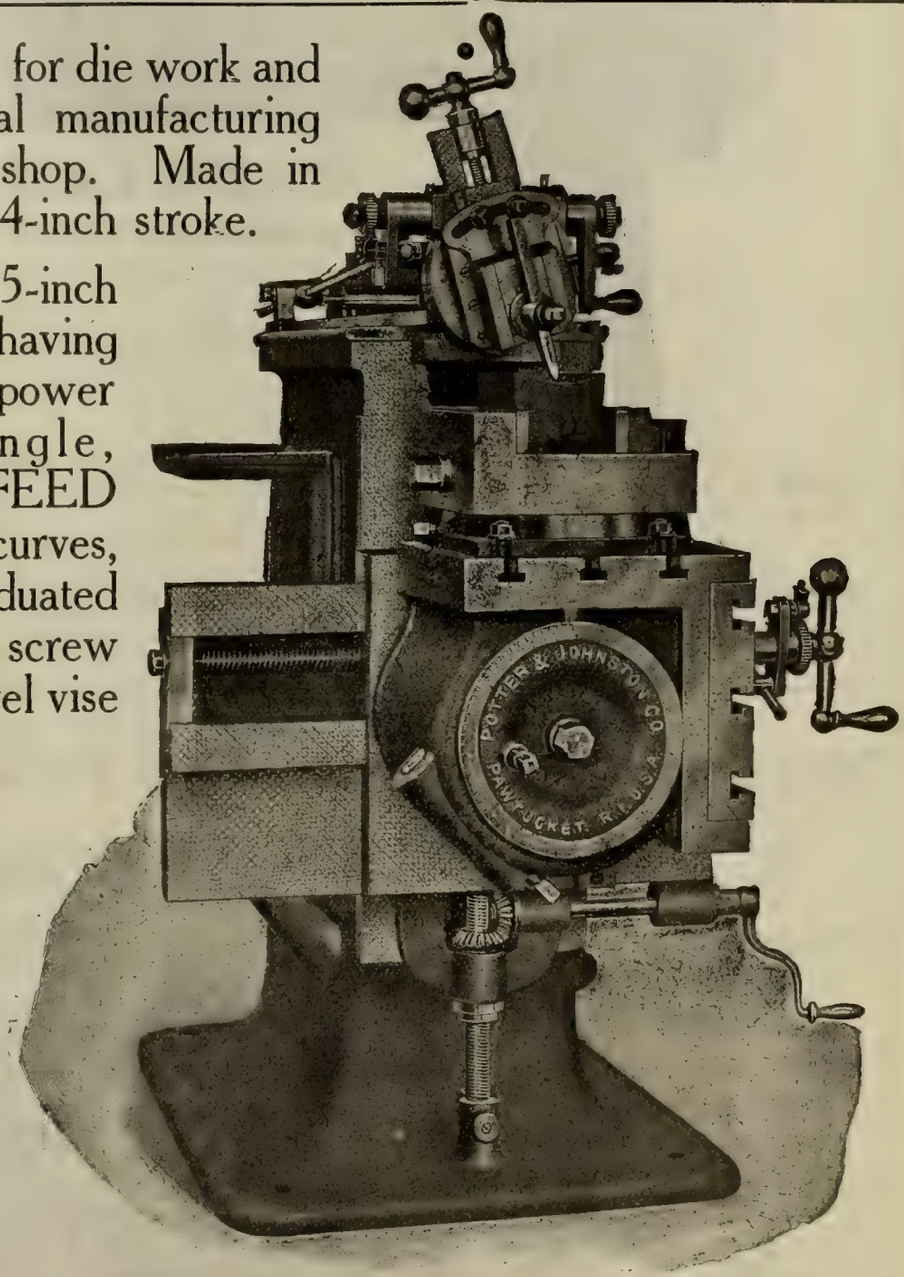
Potter & Johnston 15-inch Universal Shaping Machine

15-inch Stroke — 24-inch Stroke

The standard of efficiency for die work and tool room service, general manufacturing purposes and the repair shop. Made in two sizes—15-inch and 24-inch stroke.

Illustration shows the 15-inch model with swivel table having auxiliary tilting side, power down feed on any angle, POWER ROTARY FEED for planing internal curves, automatic feed stop, graduated collars on tool head feed screw and table feed screw, swivel vise with graduated base.

The simplicity of design, convenience of operation, extreme care exercised in their manufacture, and the many universal features of this machine, combine to make it the most efficient and reliable tool of its type.



WRITE FOR PRICES AND DELIVERIES

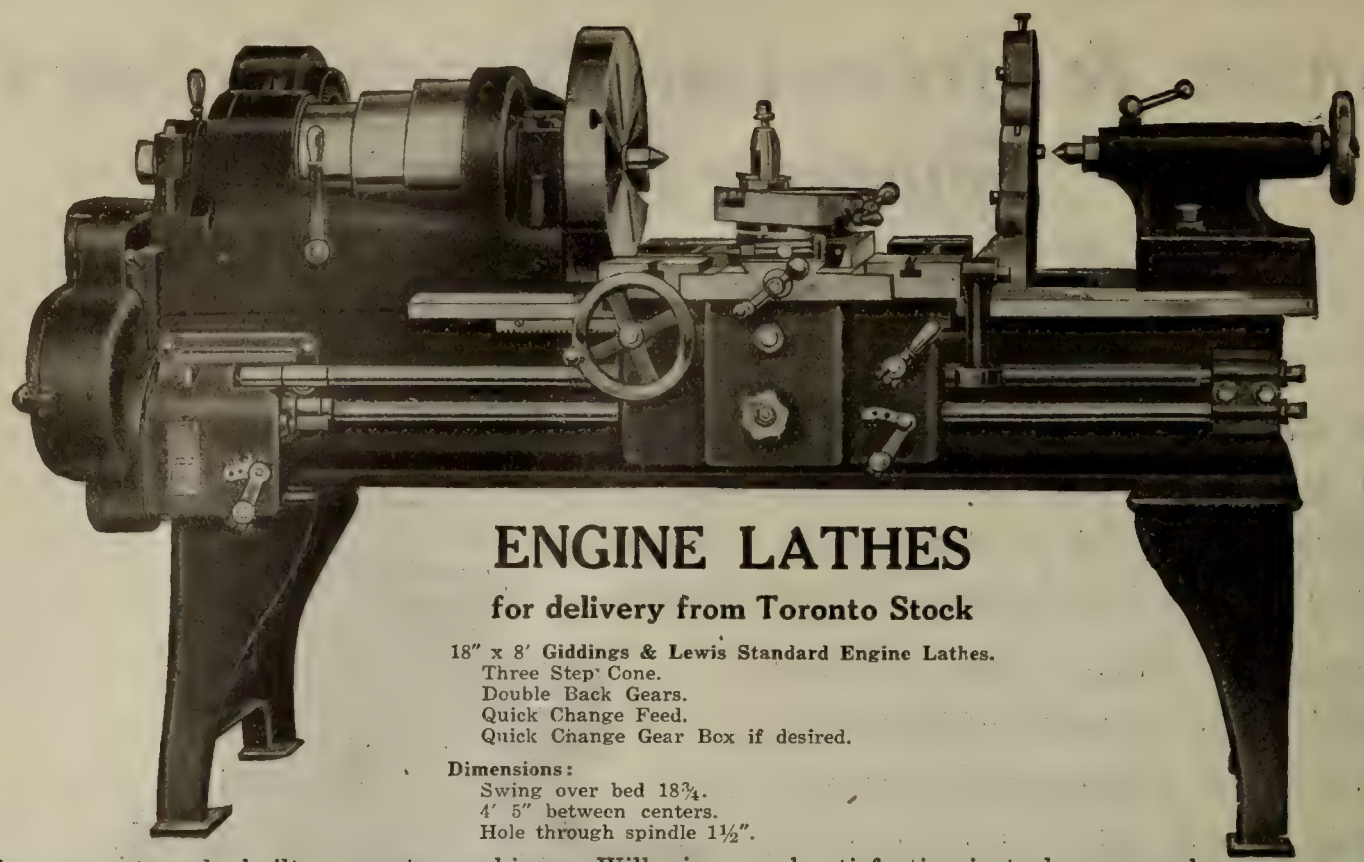
Canadian Offices **Potter & Johnston Machine Co.,** Pawtucket, R.I.

ROELOFSON MACHINE & TOOL CO., LTD.

Head Office: 1501 Royal Bank Building, TORONTO, CANADA

Works and Warehouse: GALT, ONT., CANADA

If any advertisement interests you, tear it out now and place with letters to be answered.



ENGINE LATHES

for delivery from Toronto Stock

18" x 8' Giddings & Lewis Standard Engine Lathes.
Three Step Cone.
Double Back Gears.
Quick Change Feed.
Quick Change Gear Box if desired.

Dimensions:
Swing over bed 18¾.
4' 5" between centers.
Hole through spindle 1½".

These are strongly built, accurate machines. Will give equal satisfaction in tool-room or shop.
The following extras can be furnished if desired: Taper, Relieving or Draw-in attachment, Waving attachment, Hexagon turret on carriage, Pan pump and piping.

Write for full specifications and prices.

Garlock-Walker Machinery Co., Ltd., 32 FRONT ST. WEST, Telephone MAIN 5346 **Toronto**

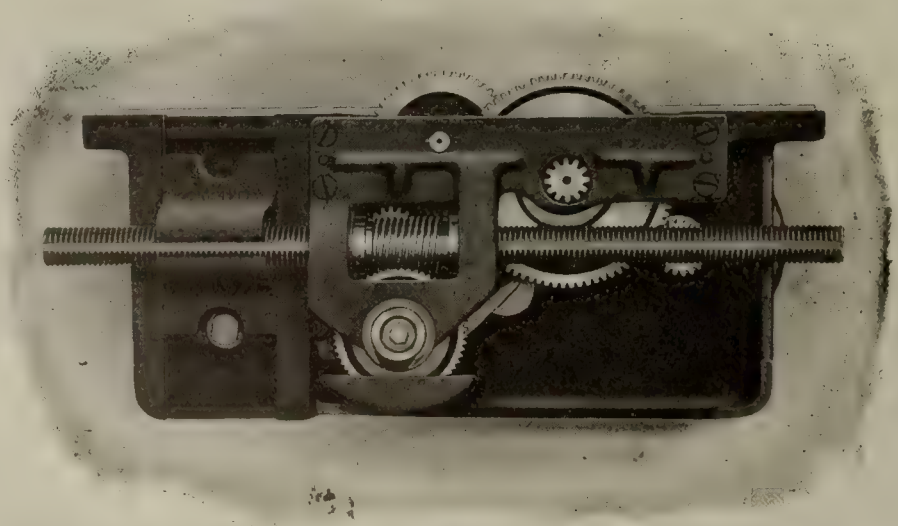
Note the Strength, the Few Working Parts

CISCO APRON

No
Wear or Tear to the Lead Screw

No
Complicated Parts

No
Bevel Gears



No
Worrying About Repairs

No
Give to Any Part

No
Jumble of Levers or Pull Pins

THE LATHE WITH THE PULL

WILL SATISFY EVERY CANADIAN CUSTOMER—THAT'S YOU

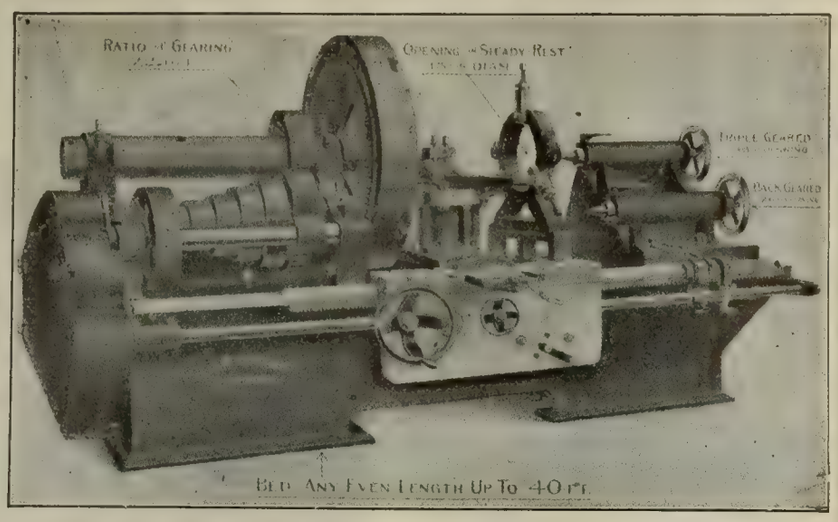
Sold by
The A. R. Williams Machinery Co. Ltd

Made in 14"-16"-18"-24" by
The Cincinnati Iron and Steel Co.

One Ship-building Plant

wrote to six different Lathe-Builders

and bought McCabe's "2-in-1" Double-spindle Lathe—on a 30-ft. bed—because it was "different" and built especially for such a wide range of work.



McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing
As a 48 inch Triple-Geared Lathe

What other big Lathe can you get, and have full use of your Lathe, whether you have big or small work?

What Lathe Manufacturers except McCabe could make such a low price possible?

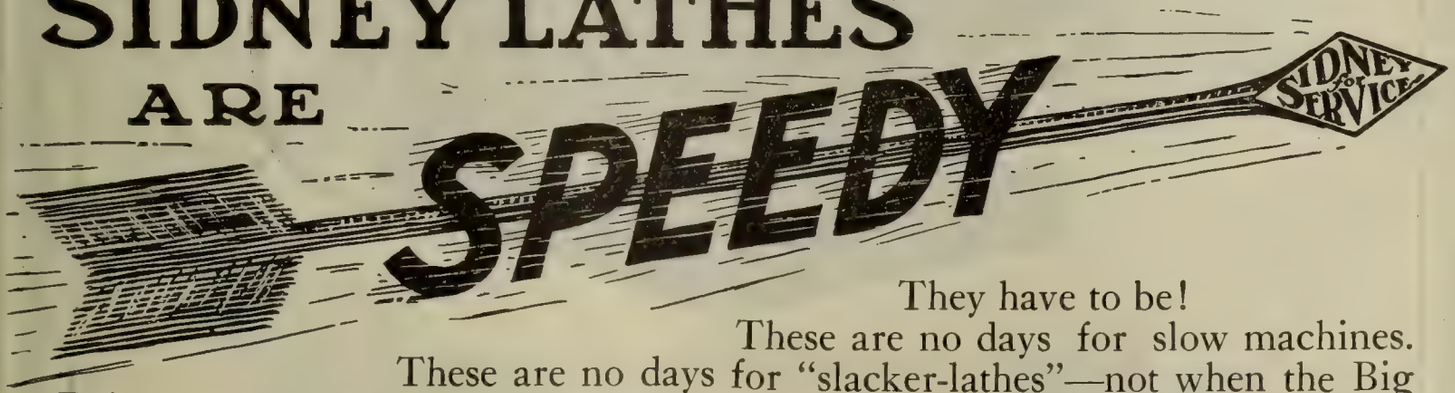
No other Lathe builder turns out 48-inch Lathes in such big lots at a time, making the parts all duplicate and interchangeable.

And in addition to the 48-inch Triple-geared Lathe, the 26-inch is the "Lathe plus" feature McCabe offers you—at no extra cost.

DOUBLE service—convenience and capacity—all described in Latest Bulletins.

J. J. McCABE, 149 BROADWAY, NEW YORK

SIDNEY LATHES ARE SPEEDY



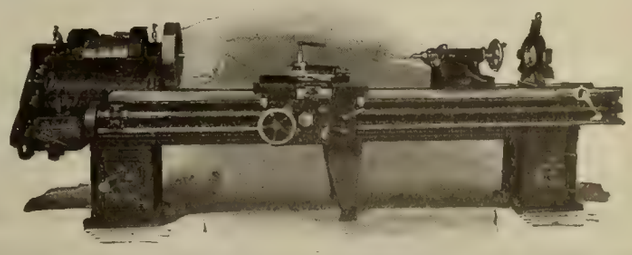
They have to be!

These are no days for slow machines.

These are no days for "slacker-lathes"—not when the Big Drives over in France begin in the splendid factories of North America. Sidney-for-Service Lathes are performing in a wonderful manner—in Canada, in the United States. They are Speedy, Sturdy—and possess Staying qualities.

Get Bulletin 30 from our company, or write to either of our Canadian Agents who will give your inquiries prompt attention.

Foss & Hill Machinery Co., Montreal, Que.
H. W. Petrie, Ltd. - - Toronto, Ont.

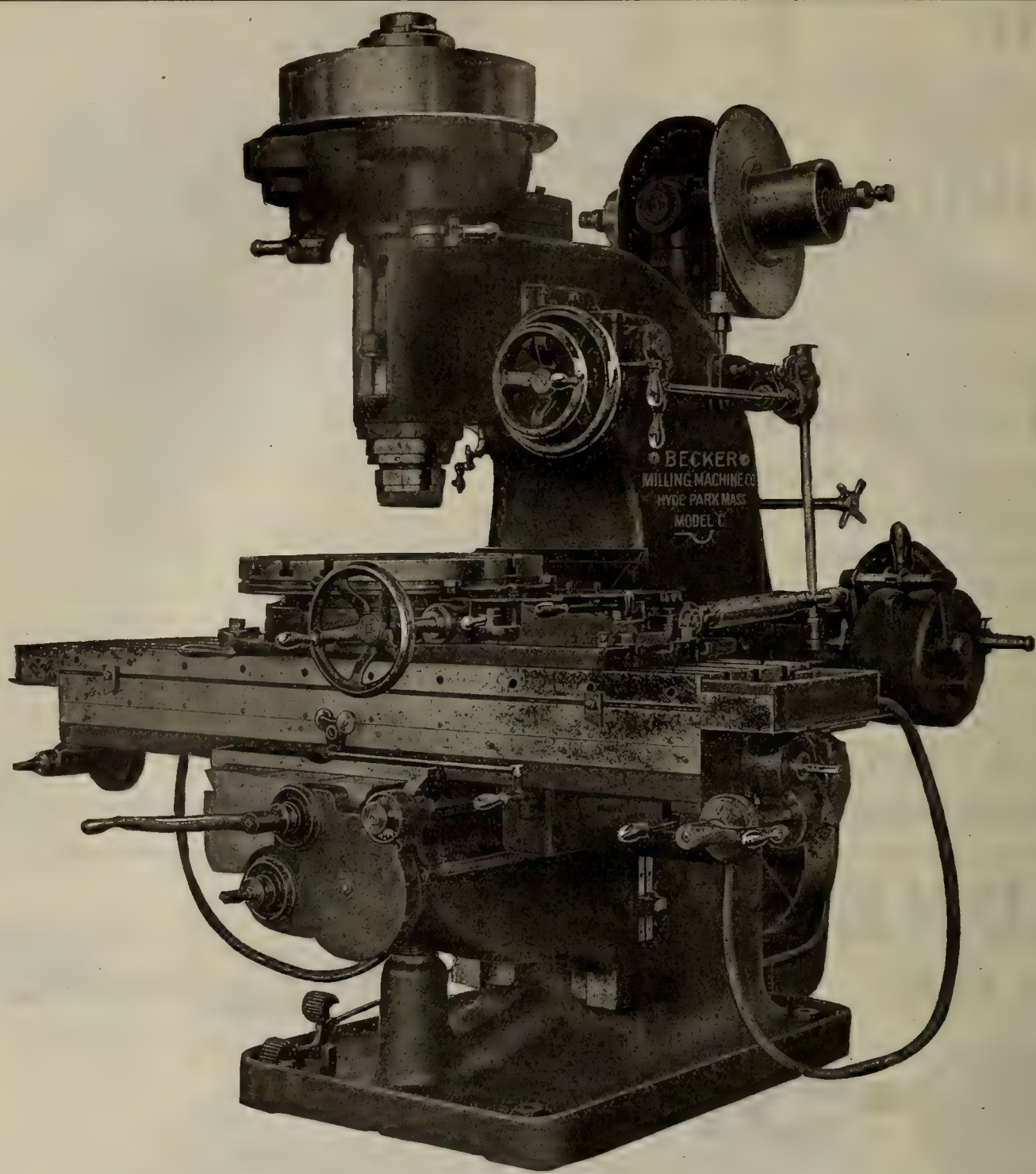


SIDNEY for SERVICE

The Sidney Tool Company

SIDNEY, OHIO, U.S.A.

If any advertisement interests you, tear it out now and place with letters to be answered.



The demand for greater production was met and surpassed by the Becker High Power Vertical Millers, and by virtue of the distinct features they possess. Their superiority over other millers is very pronounced.

The fourteen types and twenty-four sizes from which to choose is one evidence of efficiency. The individual features evident from the illustration are but an inkling of the features constructed *in* the machines that have gone to stamp the Becker as superior.

Your inquiry is sure of receiving prompt and satisfactory attention.

Becker Milling Machine Company

HYDE PARK, BOSTON, MASS., U.S.A.

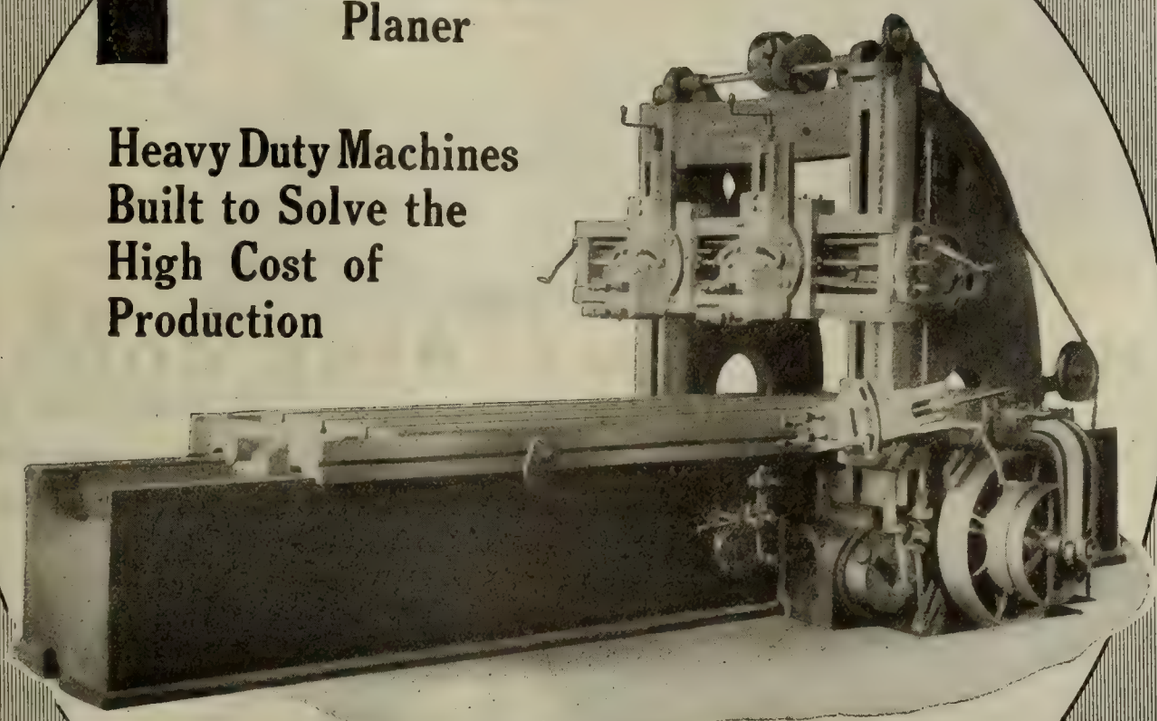
Agents:
THE A. R. WILLIAMS MACHINERY CO., LIMITED
Toronto and Hamilton
Williams & Wilson, Ltd., Montreal, Que.

HAMILTON

PLANERS

Hamilton 36" x 36" Planer

Heavy Duty Machines Built to Solve the High Cost of Production



WEIGHT, RIGIDITY, DIMENSIONS and POWER—these are the combination of assets that give exceptional productive ability to "HAMILTON" PLANERS.

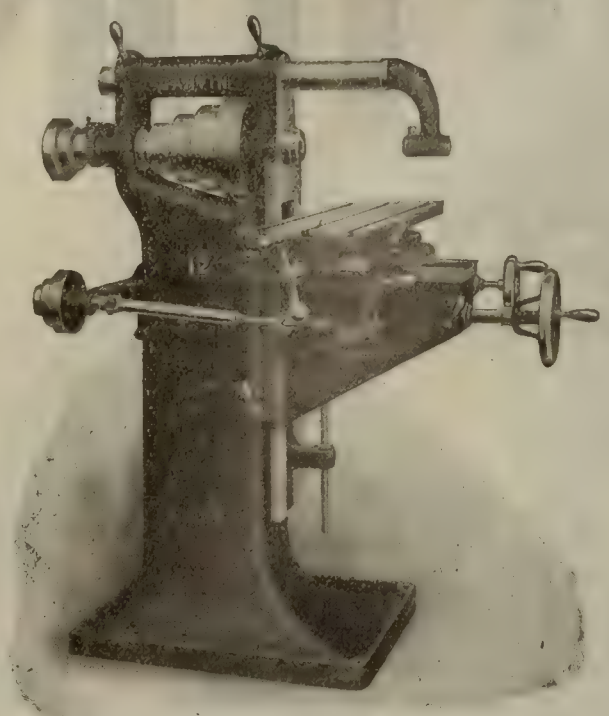
The installation of the "HAMILTON" strikes a crushing blow at the High Cost of Production. They do big work fast and accurately. Sizes from 24" x 24" to 54" x 54".

Our bulletin will tell you all about this planer. Give us your address.

The Hamilton Machine Tool Company, Hamilton, Ohio

H. W. PETRIE, LIMITED, TORONTO, Sole Agents for Ontario.

GARVIN



No. 12 Plain Milling Machine—Use Code Abrade

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rapidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments.....18 x 6 x 15 in.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

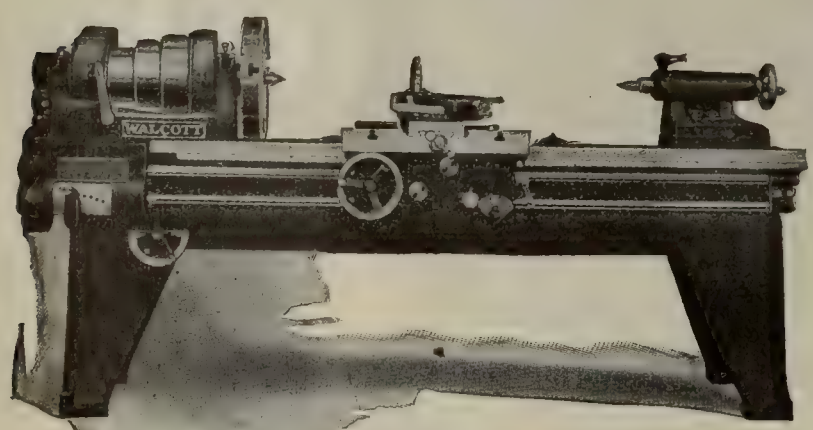
IMMEDIATE DELIVERIES

Send for Complete Catalog

Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City



THE WALCOTT LATHE

is backed by lathe-building experience extending over 35 years

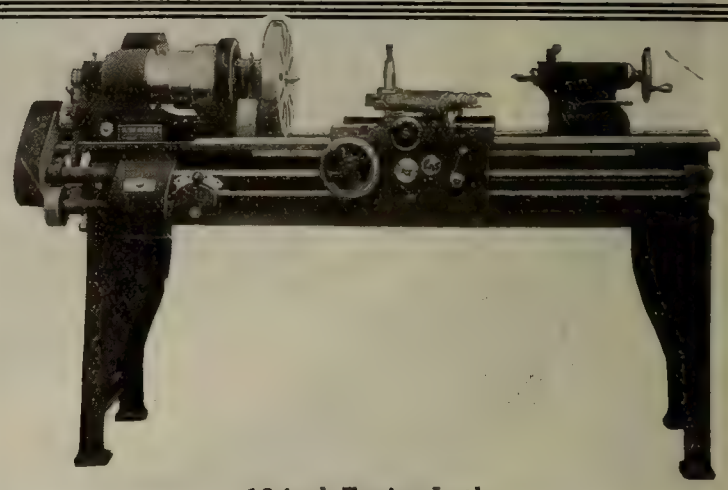
These are features of Walcott Lathes: drop-forged gears in apron; all-steel gears in gear-box; large ways on bed, all gears completely enclosed. Parts are interchangeable. Rigid headstock and tail-stock.

You'll **get the full** story in our printed matter. Send for it surely if you are about to buy a lathe.

WALCOTT LATHE COMPANY

Successors to

Walcott & Wood Machine Tool Co., Calhoun St., Jackson, Michigan



13-inch Engine Lathe

The Filsmith Way

This is one way to make a short-cut to greater production and economic operation. With a 13¼" swing and 18 spindle speeds it will take in a great range and variety of work. Guaranteed material and workmanship are two expressions of our confidence in this machine. Write us and let us send you full specifications and information.

THE PHILIP SMITH MFG. CO.

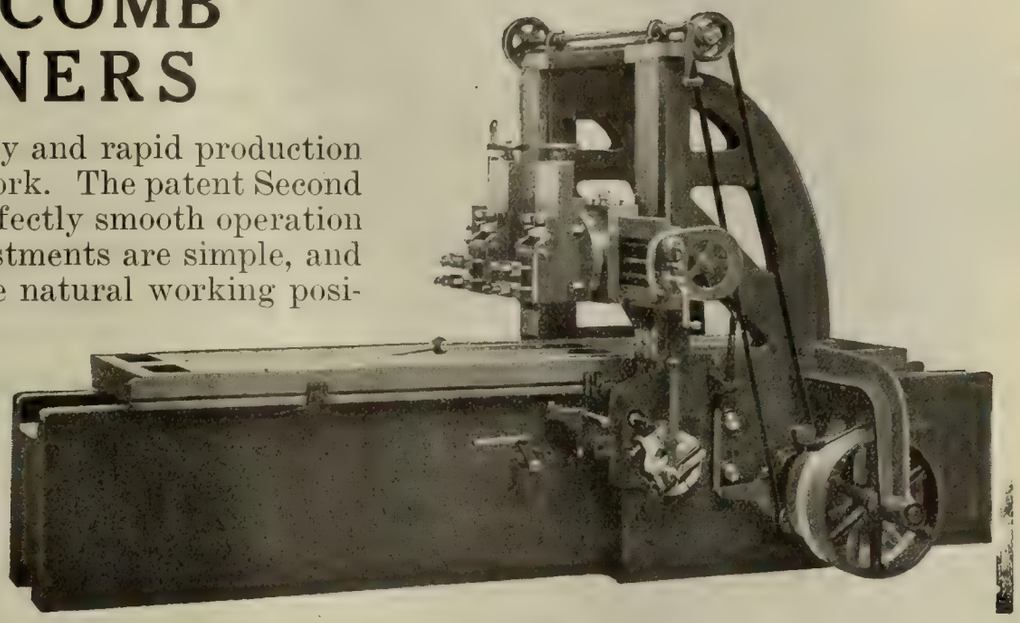
Sidney, Ohio, U.S.A.

Powerful, Sturdy and Productive

The ability to run without shock or injurious vibration under heavy driving has placed

WHITCOMB PLANERS

in the lead for accuracy and rapid production over a wide range of work. The patent Second Belt Drive insures perfectly smooth operation at all times. All adjustments are simple, and quickly made from the natural working position of the operator.



WRITE FOR CATALOG

Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass. *Engine Lathes Metal Planers*

KEMPSMITH

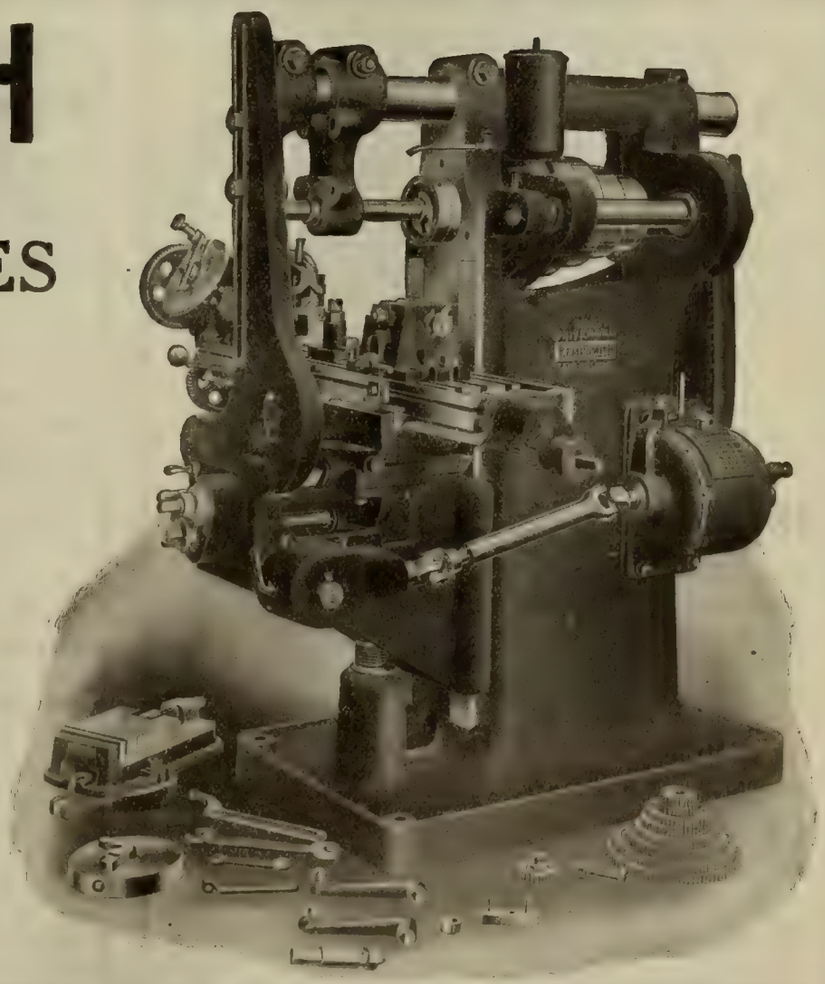
UNIVERSAL MILLING MACHINES

Every Kempsmith Milling Machine of whatever size, is provided with a slotted spindle nose for positive drive of arbor and for positive drive of face milling cutter in either direction.

Every machine is equipped with our patented keyed overhanging arm which insures positive alignment of arbor and boring bar and also prevents the cutter being pounded out of line under cut.

Kempsmith machines are heavy, with weight well distributed and their accuracy is guaranteed within very close limits.

Send for Illustrated Catalogue.



Kempsmith Manufacturing Co.

MILWAUKEE, WIS., U.S.A.

AGENTS:
Foss & Hill Machinery Co., Montreal.
General Supply Company, Toronto and Ottawa.
Canadian Western Foundry & Supply Co., Calgary, Alta.

A time saver
Can you beat it?

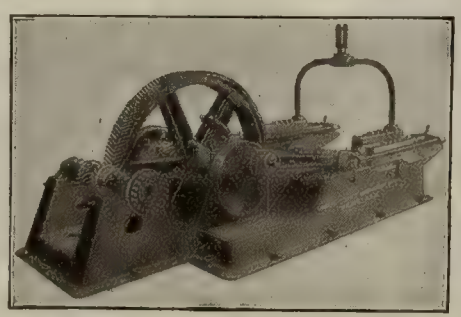
HAVE you noticed the Consolidated Clamp Connection on all Consolidated Presses grips like a vise and stays put, one of the bull-dog kind, which, when properly tightened, will not break away, or slip?

If you break it we will furnish a new one free of charge.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver



ELMES

18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

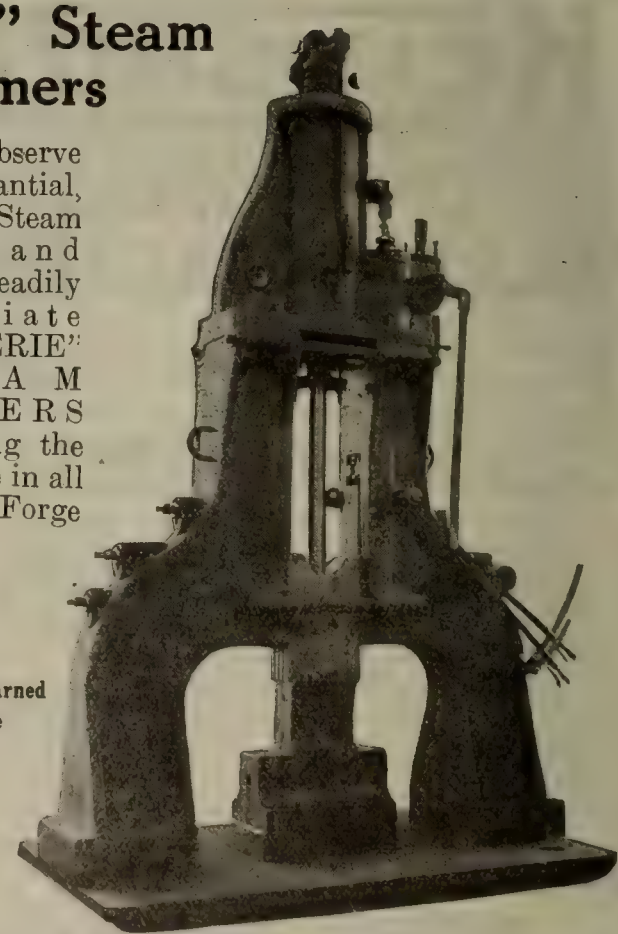
Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217 No. Morgan Street CHICAGO, ILL.

"Erie" Steam Hammers

Closely observe this substantial, well built Steam Hammer and you will readily appreciate why "ERIE" STEAM HAMMERS are getting the preference in all modern Forge Shops.

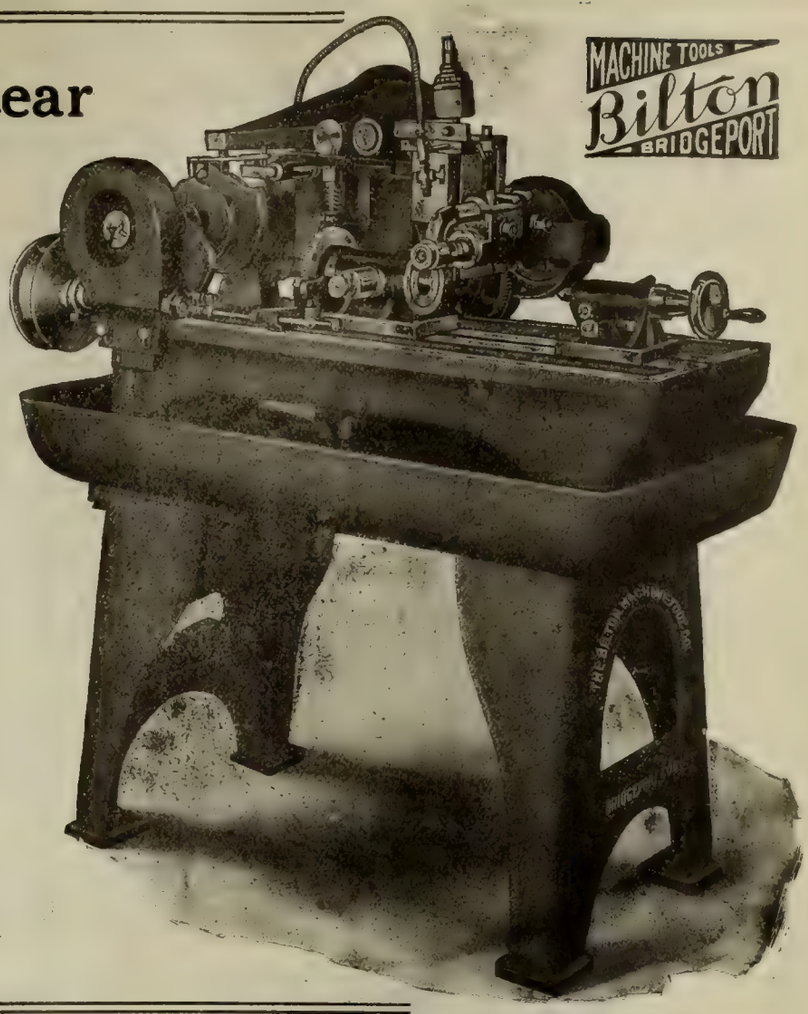


They have earned their enviable reputation.

ERIE FOUNDRY COMPANY

ERIE, PA. U. S. A.

Bilton Automatic Gear Millers—Spur or Bevel Gears



CAPACITY

No. 1 - - 14 Pitch
No. 2 - - 10 Pitch
No. 3 - - 8 Pitch

The Bilton Machine Tool Company

Succeeding The Standard Mfg. Company

Housatonic Ave., Bridgeport, Conn., U.S.A.

Also Manufacturers of—
Plain Horizontal Millers
Automatic Millers
Plain and Ball Bearing
Bench and Column Drills
Milling Cutters
Riveting Machines

Catalog 30 on request

Foreign Agents:
Alfred Herbert, Limited
M. Mett Engineering Company
Chas. Churchill Company, Limited

Banding 6" to 12" Shells

Its sturdy construction allows it to stand up under severe service. This is the reason for its higher price. Such extra care, better material and expert workmanship are required that the results warrant the high cost.

It has six 11" semi-steel rams which move ½" or more if necessary. All rams returned by levers on plates with heavy Vanadium Steel Springs. Cylinder removable of alloy steel.

Hydraulic inlet to cylinder 1¼ pipe. Distributing ring 2". All pipe of Seamless Steel Tubing. All fittings dropped forged steel. All parts under strain, alloy steel castings and forgings.

Six dies of forged chrome nickel steel, hardened and removable, without disturbing any part of press, by loosening two nuts. Can be operated either from accumulator or pump.

Built also in smaller size of same type for banding "pounder" to 6" shells.

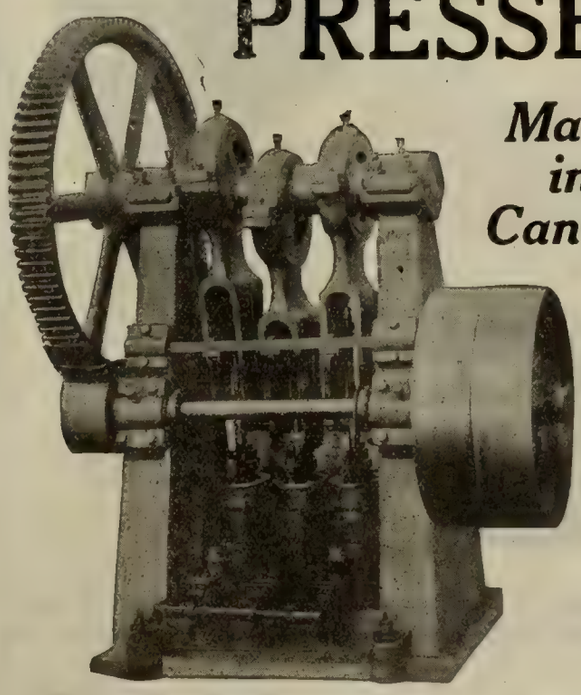
Metalwood Manufacturing Co.

Leib and Wight Sts. -:- DETROIT, MICH.

For Great Britain and Continent, address Gaston E Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

PRESSES

Made in Canada



Hydraulic Presses, Pumps and Accumulators for all purposes

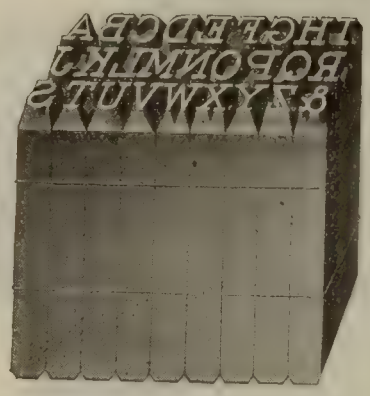
WRITE FOR PRICES AND DELIVERIES

WILLIAM R. PERRIN, Limited

TORONTO, CANADA

If any advertisement interests you, tear it out now and place with letters to be answered.

STEEL LETTERING DIES AND STAMPS



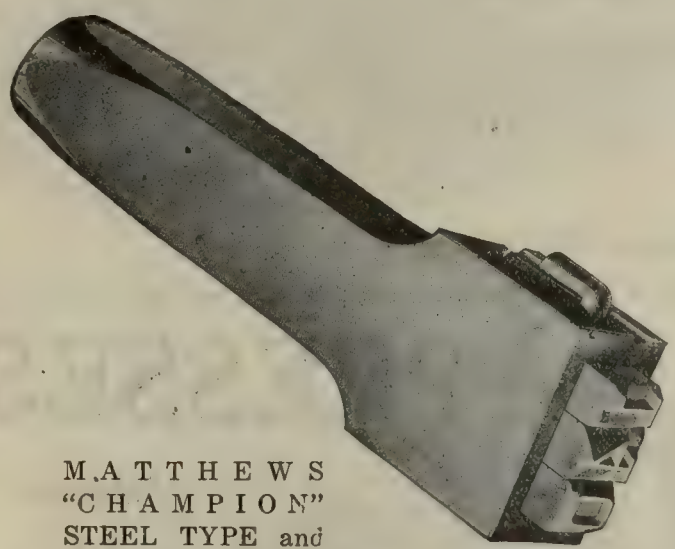
MATTHEWS HAND - MADE STEEL LETTERS. Strictly hand-cut from best tool steel. Furnished individually or in complete sets. Nothing better made in this class of steel stamp.

A product worth marking is worth marking right.

The well-known products of leading manufacturers are stamped with

Matthews Steel Dies and Stamps.

No other form of advertising costs so little.



MATTHEWS "CHAMPION" STEEL TYPE and HOLDER. For rapid, interchangeable marking by hand.

Write for a copy of this catalog. It illustrates the different kind of steel lettering, dies and stamps we are shipping to all parts of the world.

We operate the largest and most modernly equipped shop in the United States for making all classes of steel lettering, dies and stamps.

ESTABLISHED 1850

JAS. H. MATTHEWS & CO.

MARKING DEVICES

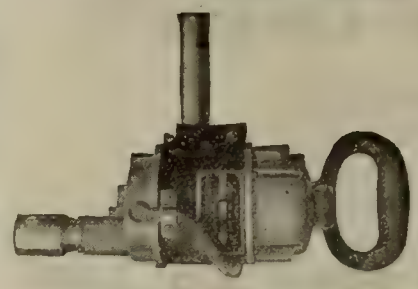
PITTSBURGH - - - PA., U.S.A.

THE CANADIAN FAIRBANKS-MORSE CO., LIMITED

Montreal, Toronto, Quebec, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria.

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

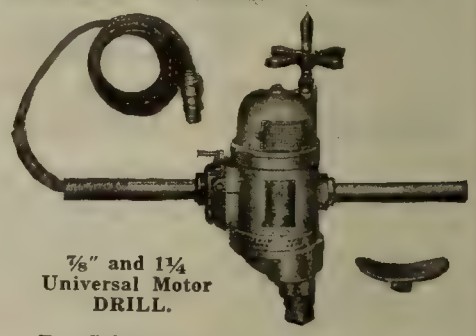
3 SIZES

3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞" and 1¼ Universal Motor DRILL.

For Sale By

The Canadian Fairbanks-Morse Co., Limited

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

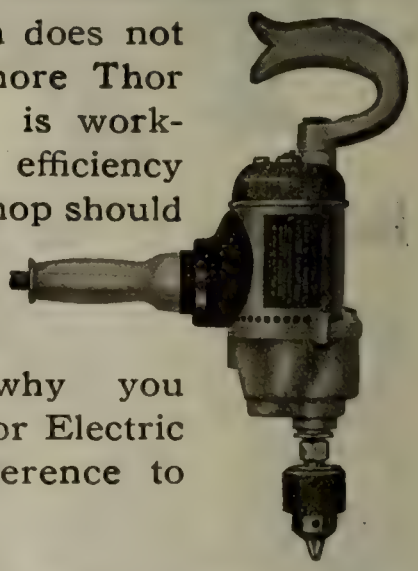
THE UNITED STATES ELECTRICAL TOOL CO.

CINCINNATI, OHIO

Thor UNIVERSAL Electric Drills

Licensed Under Burke Universal Motor Patent

No shop which does not use one or more Thor Electric Drills is working to full efficiency which every shop should do during these critical times. Let us demonstrate why you should use Thor Electric Tools in preference to other makes.



Independent Pneumatic Tool Company

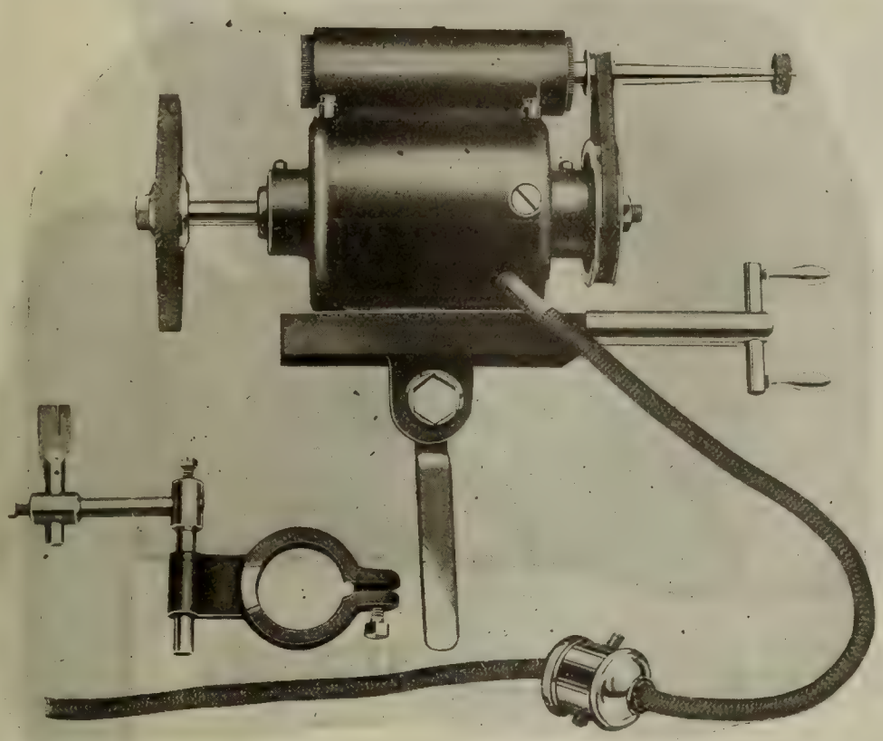
Office: 334 St. James Street, MONTREAL, QUE.

Toronto: 32 Front St. W; Winnipeg: 123 Bannatyne Ave., E; Vancouver: 1142 Homer Street

What do you think of this for speed?

Portable Electric Grinder

ARO 30,000 Revolutions Per Minute



Like all other operations cost of grinding, on account of the war, is hitting the high spots. **But you would never know it if you put in an ARO Grinder.** Has no equal for rapid production and it turns out work in perfect shape. Its ideal construction will convince you of these facts. Armature, internal spindle, pulleys and large emery wheels dynamically balanced. Motor and internal spindle equipped with S.K.F. ball bearings. No end thrust, no side play, no vibration.

Handles all kinds of grinding jobs—internal, external, longitudinal, cylindrical, etc.

Think of its speed, 30.000 R.P.M. That ought to cut your grinding costs.

Write for full details.

R. E. T. Pringle, Ltd.

Manufacturers' Agents

OFFICES:

Tyrrell Bldg. 95 King St. East, TORONTO
809 Unity Bldg., - - Montreal, Que.
3402 Osler Ave. - - Vancouver, B.C.
302 Donalda Block - - Winnipeg, Man.

May We Repeat

THAT

P H

TRADE MARK

QUALITY FILES

are the only files made in Canada using BEST CRUCIBLE CAST STEEL exclusively in their manufacture. What does that mean to the user?

IT MEANS a keener cutting edge to the teeth, and longer life to the file. IT MEANS the stock has that "pep" in it so beloved of metal workers. IT MEANS that after a long and honorable career on the bench, there is still fine steel in the file which warrants the user in having it re-cut and put on the job again on less "fussy" work.

THAT IS TRUE ECONOMY.

Port Hope File Mfg. Co., Limited

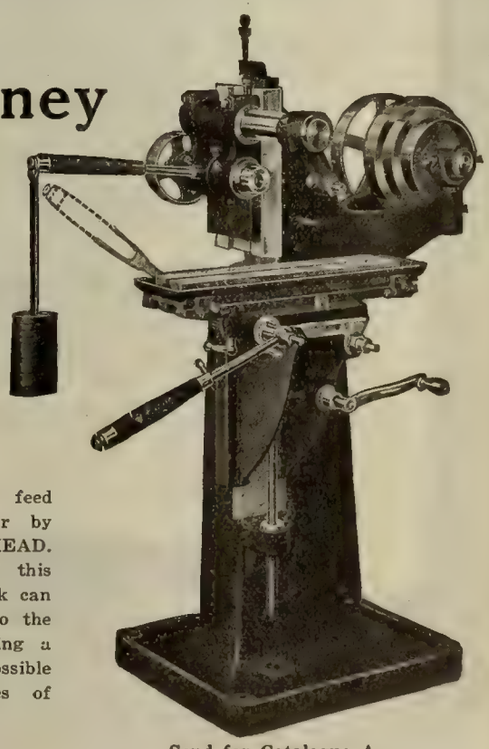
Port Hope, Ont.

"Ask your jobber"

THOUSANDS IN USE

The Whitney

Hand (Feed) Milling Machine



The vertical feed is provided for by the SLIDING HEAD. On account of this feature the work can be held close to the table, thus giving a rigidity not possible on other types of Hand Millers.

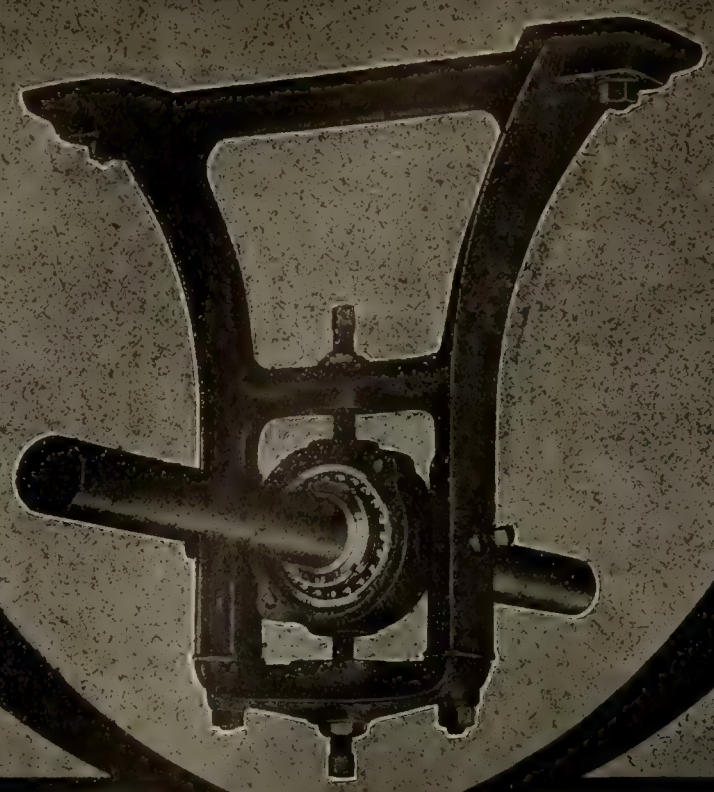
Send for Catalogue A.

The Whitney Mfg. Co.

Hartford Conn. U.S.A.

Chains—Keys—Hand Milling Machines.

If any advertisement interests you, tear it out now and place with letters to be answered.



When You Buy SKF Ball Bearing Hangers

you also buy satisfaction—the satisfaction of real service.

To know that shutdowns and hot bearings are a thing of the past, to wipe out all transmission troubles at one stroke—that is part of the satisfaction SKF Hangers give.

If you do not know this satisfaction, if you are still using the old type plain bearing, then you should investigate SKF Ball Bearings. Learn how others save time, trouble and money by SKF transmission equipment.

You can learn this, without obligation by sending for our Hanger Bulletin.

CANADIAN SKF COMPANY, LIMITED

47 King Street West, Toronto, Ont.

Sole Canadian Agents for SKF Transmission Bearings:

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED

St. John, Windsor, Quebec, Winnipeg, Montreal, Saskatoon, Ottawa, Calgary, Toronto, Vancouver, Hamilton, Victoria

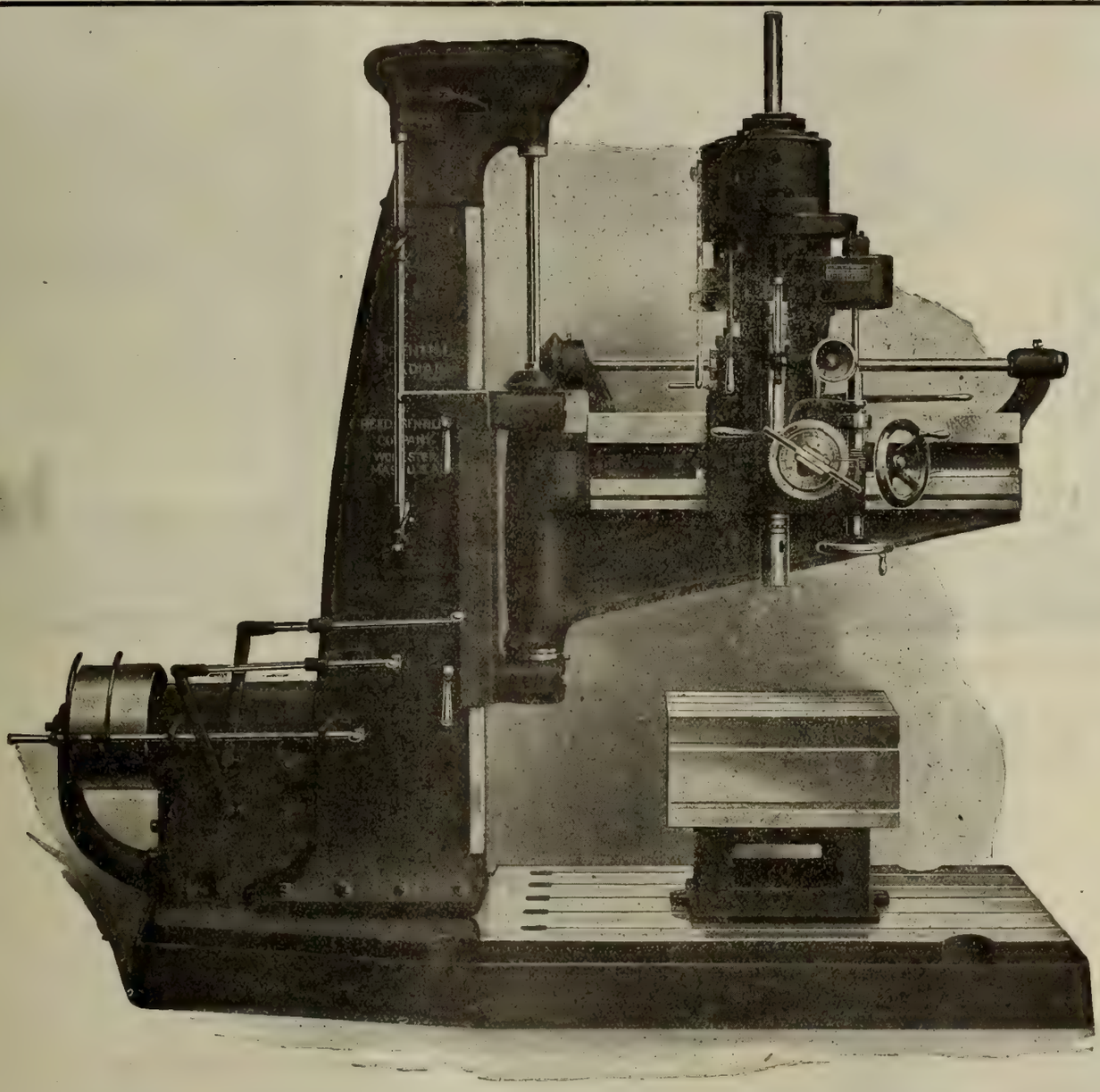
SKF

Self-Aligning Ball Bearing Hangers

REED-PRENTICE COMPANY

R-P

WORCESTER MASS. U.S.A.



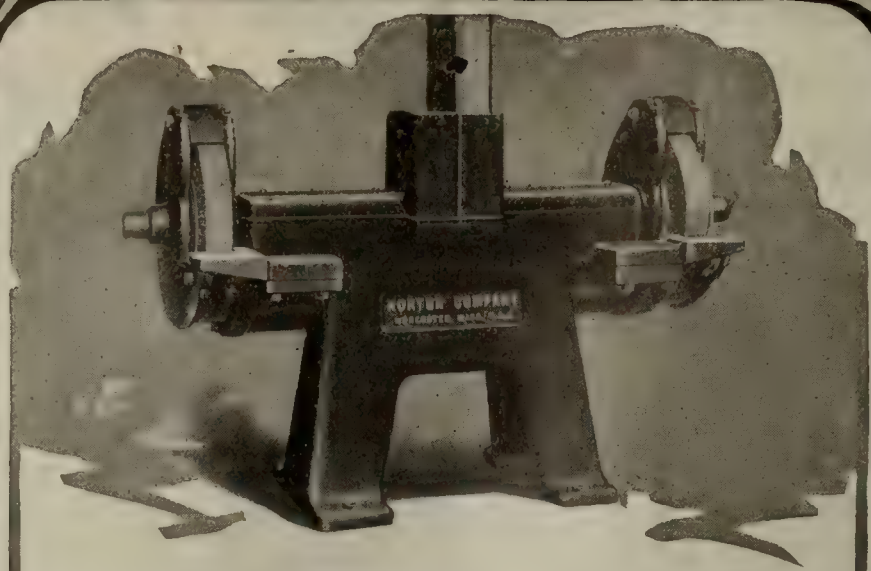
THE FIRST CHANCE YOU HAVE

to watch REED-PRENTICE RADIAL DRILLS at work, stop for just a few minutes and study them. It is likely you will have this opportunity since they are used in all parts of the world.

You can then understand why they are so unfailingly satisfactory. The spirally cut gears flow the power through to the spindle without noise or chatter. The convenience of all operating levers, the many speeds and feeds, and the imposing solidness of the design will suggest to you the worthiness of a REED-PRENTICE for your work.

Send us your name and address and we will gladly send you the catalogue on Light and Heavy Duty Radials.

CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED



NOTE the sturdy construction of this NORTON grinding wheel stand—the large spindle bearings—the strong protection hoods—the exhaust connections for carrying away the dust and chips—the strong "roomy" work rests—the abundance of foot space—all of which enable the operator to handle heavy work economically and without extra strain.

Note also the absence of sharp corners and projecting parts, and recesses where dust might lodge.

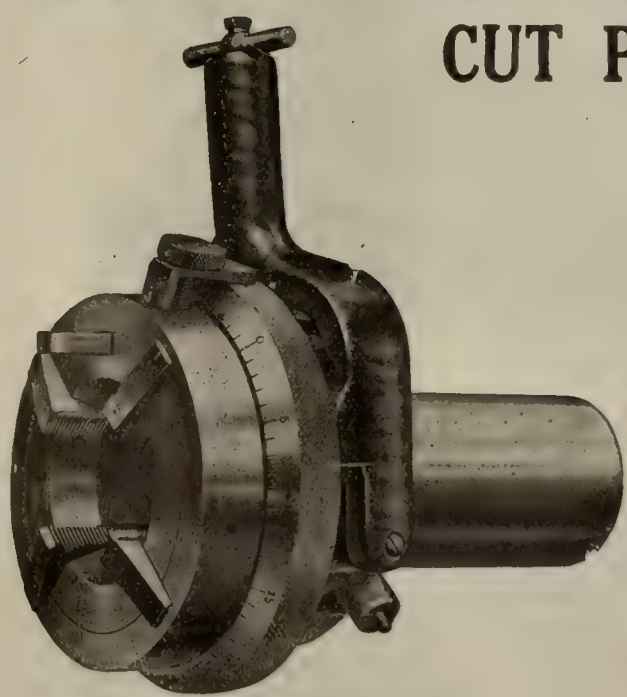
Let us send you our Bulletin on Grinding Wheel Stands and Protection Hoods.

TRADE MARK NORTON REGISTERED

NORTON COMPANY
WORCESTER, MASS.

NEW YORK STORE:
151 Chambers Street
CHICAGO STORE:
11 N. Jefferson Street

WELLS SELF-OPENING DIES
CUT PERFECT SCREW THREADS



WELLS SELF-OPENING DIE has both face and hand trip.

The Wells Self-Opening Die cuts the thread with a fine shearing cut, then opens with a quick, positive snap.

Adaptability

The Wells Self-Opening Die can be used on screw machines, lathes, automatics, drill presses and bolt cutters.

Chaser Principle

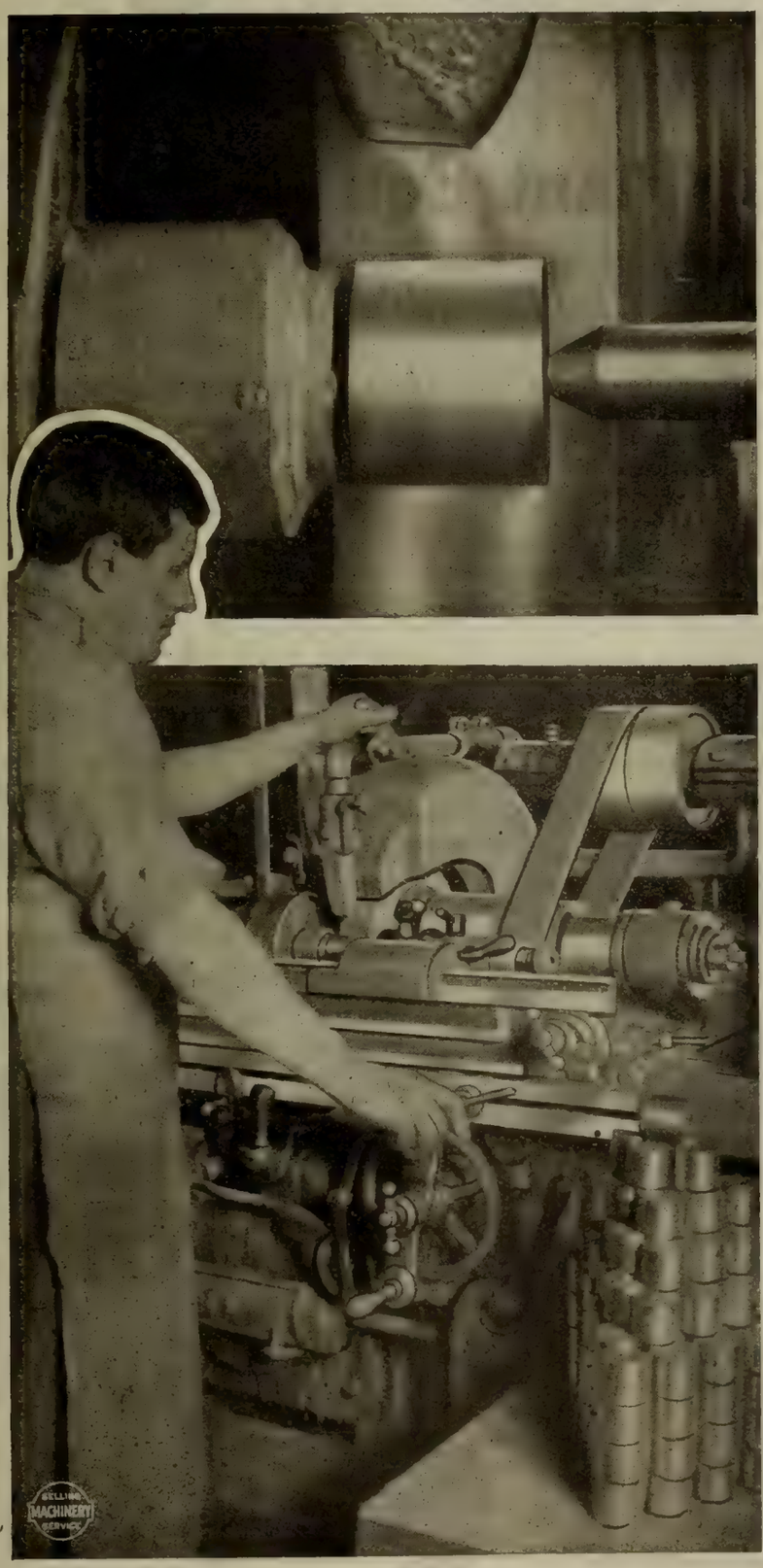
The Wells Self-Opening Die embodies an entirely new principle of design. The chasers are about four times as long as the threaded portions and are supported throughout their entire length and width by the solid sides of the slots in the body. They cannot squirm away from the work. Wear is reduced to a minimum throughout. Adjustment is simple, positive and accurate.

A large number of these Dies in stock for Immediate Shipment.

Wells Brothers Company of Canada, Limited
GALT, ONTARIO

Sales Agents: **The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary**

NORTON GRINDING



"No Trouble" is the Report, and the Machine has been in Operation Since 1910

This Norton Grinding Machine is used almost exclusively for grinding steel rolls for railway roller bearings—the rolls are 1¾″ diameter by 1¼″ long, are carried on centers and driven by a pin that engages a hole in one end. From 0.016″ to 0.018″ of hardened steel is removed from each roll and twenty pieces are ground at each truing of the grinding wheel. The table is not traversed, the wheel being fed straight into the work.

An output of 325 of these rolls in ten hours is average output; when put to the test, as high as forty pieces per hour are ground. This "Norton" has been in operation since 1910. It has been used continuously and has given no trouble whatever.

Install a Norton Grinding Machine to guard against future grinding troubles. What it is doing for others it can do for you if given the chance. Try it.

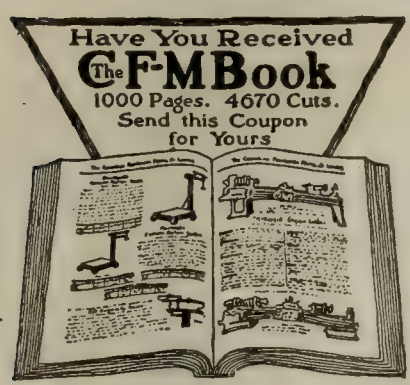
NORTON GRINDING COMPANY
WORCESTER, MASSACHUSETTS, U.S.A.

Canadian Sales Agents: THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED
St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED.

Manufacturing Plant Equipment

Forges	Power Hammers
Blowers	Steam Hammers
Anvils	Drop Hammers
Tongs	Presses
Sledges	Punches
Hammers	Shears
Tools	Wrenches
Chisels	Drills
Headers	Exhausters
Swage Blocks	Motors
Upsetters	Shafting
Benders	Belt
Rolls	Hangers
Trip Hammers	Pulleys



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Electric Steel Furnace Development and Services

By E. Kilburn Scott

In view of the rapidly increasing demand for high grade steels, attention has been forcibly directed to the service which the electric furnace renders in their production. War-stimulated development has nowhere been more marked than in this type equipment, and not a little insight into the progress made and the achievement compassed is made available in the detail of the article with its accompanying illustrations that follows.

ONE of the most striking developments of the steel industry of Great Britain, arising from the war, has been the rapid increase in number of electric steel furnaces, and so successful have they been that the prejudice against them is rapidly disappearing, and the change will probably rank as the most radical one since the time of Bessemer. Amongst factors which have helped to bring the electric furnace into favor are the following:

Electric Furnace Factors

(a)—The war demand for special tool steel for tools, dies, gauges, etc.

(b)—The demand for chrome and other special alloy steels for aircraft tubing, rustless steel, etc.

(c)—The difficulty in obtaining Swedish iron, which besides being scarce, is extremely expensive.

(d)—The difficulty in obtaining skilled labor to work the crucible steel process.

(e)—The necessity of profitably using turnings, millings, ends of tubes, bars, and other scrap steel.

(f)—The ease with which high-class steel can be made from second grade materials in electric furnaces.

Advantages of Electric Steel Treatment

The following are some of the advantages of treating steel in electric furnaces over the older methods by crucibles, and the Bessemer and open-hearth furnaces:

(1)—The charge is not in contact with the products of combustion of carbonaceous fuel.

(2)—The charge is under the absolute control of the operator; the conditions can be made oxidizing, neutral or reducing, as required.

(3)—The melting loss is an absolute minimum as compared with 7 to 15 per cent. in other processes.

(4)—The charge can be made up entirely of very cheap base material such as turnings, borings, millings, light scrap or large rough scrap, and can be easily melted and refined to a steel low in impurities and of exceptional quality.

(5)—The temperature can be controlled almost instantly over a very wide range, which allows a wider range of chemical refinement than is possible by other means.

(6)—Scrap containing valuable elements such as nickel, chromium, vanadium and tungsten can be melted without loss of these elements.

(7)—The steel produced is purer, more free from dissolved gases, slag fibre, etc., and therefore has much better physical properties than that produced by any other method.

(8)—Steels containing any desired percentage of carbon and even carbon-free can be produced.

High Quality Steel Castings

For the manufacture of high quality steel castings, the electric furnace is ideal. The superiority of electric steel castings over those made by any other process has been conclusively proved by the extremely severe conditions to which these castings have been subjected under specialized war conditions. The castings produced can be finished off dead mild and a one inch square bar can be bent double as cast, no expensive annealing operations being necessary. The carbon contents usually vary between .2 per cent. and .25 per cent., while the sulphur and phosphorus are each reduced below .015 per cent., and manganese and silicon are adjusted to suit the work. The tensile properties of ordinary electric cast steel are:

Maximum tensile strength, 35 tons per square inch.

Yield point, 25 tons per square inch.

Reduction of area 50 per cent.

Elongation, 30 per cent., while the maximum tensile stress can be readily increased to even 100 tons per square inch by the introduction of special elements such as nickel, chromium and vanadium.

Many plants that sell their steel swarf and scrap, cast iron borings, etc., at very

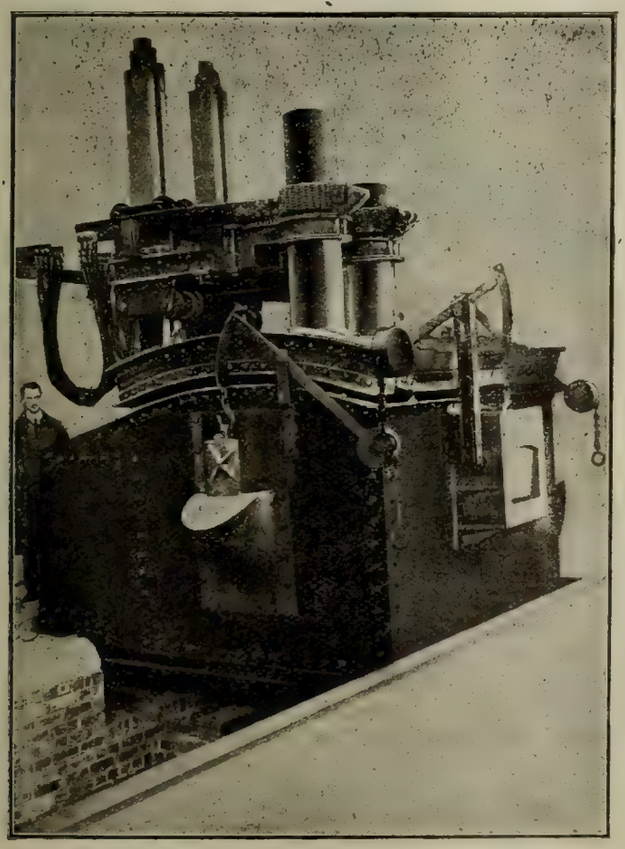

FIG. 1. THREE-TON GREAVES-ETCHELLS FURNACE.

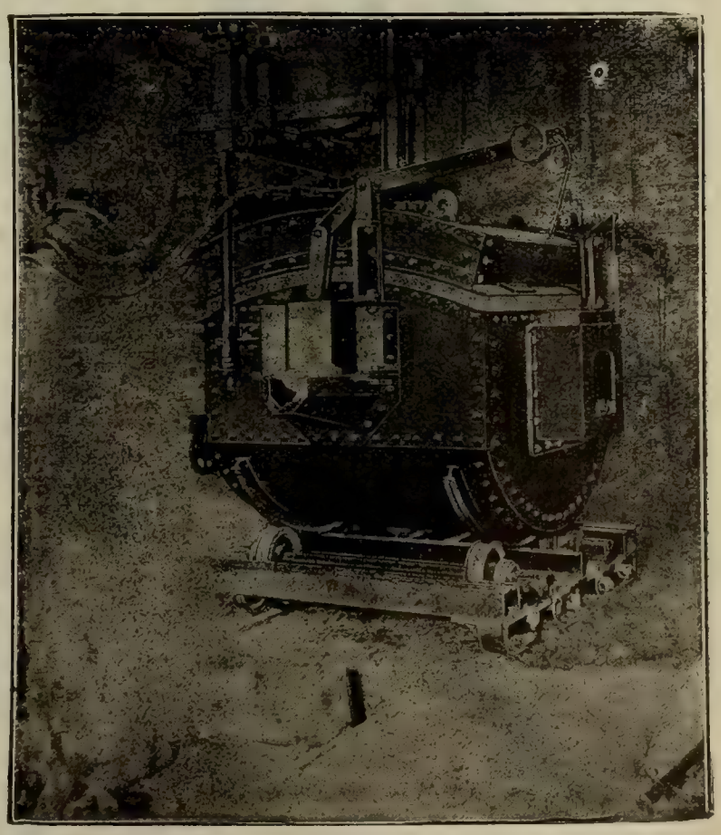

FIG. 2. HALF-TON GREAVES-ETCHELLS FURNACE.

nominal prices and purchase all their steel castings, could very profitably instal an electric furnace and make their own castings from the scrap.

Steel from the electric furnace is finished off under a reducing atmosphere of carbonic oxide and a slag out of which the metallic oxides have been reduced, and is singularly free from blowholes when properly cast. This is due to the elimination of the gases that molten steel usually holds in solution, and the ease with which the steel can be poured into small and intricate castings, flowing smoothly like milk and setting perfectly quietly in the moulds is largely due to its purity.

Small Light Castings

For small, light castings, furnaces of not more than 1½ tons are recommended. Steel of low carbon content has a high melting point and must be cast at a very high temperature, and though the temperature is easily obtainable in the furnace, difficulties occur in handling large quantities of such hot metal in ladels, if a large number of castings are to be made. For small mild steel castings—many of which have proved an excellent substitute for malleable iron castings—smaller furnaces are recommended and several firms have installed furnaces of ½-ton capacity to melt steel for small engine parts of motor cycles and motor cars instead of using stampings.

Where large quantities of good steel are required, "The Hot Metal Process," as it is called, combines cheapness and quality. It has been adopted very extensively in the United States. The metal is first heated in a basic lined tilting open hearth furnace of large capacity, and is then run into a number of electric furnaces for final refining and addition of alloys. The process is continuous, and as the energy for first melting of steel is obtained direct from fuel, the amount of electrical energy is only that required to maintain the temperature during refining and assimilating of the alloys. Steel so produced commands high prices.

Electric furnaces are used for the melting of ferro alloys for open hearth and Bessemer plants, as it is found much more economical to make alloy additions in the molten form.

Types of Furnaces.

As the earlier furnaces were for small outputs, single phase alternating current was used, and to obtain a balance on a multiphase supply, several furnaces had to be worked together. Multiphase furnaces are better than single phase furnaces, because for a given output of steel, one such furnace is cheaper, takes up less room, and requires less attention than several single phase furnaces. With single phase, if one arc fails, the circuit is broken and the load falls to zero. This is liable to happen during the melting down period when the pieces of scrap metal change position under the electrodes. Two distinct types of electric furnaces are used for steel manufacture.

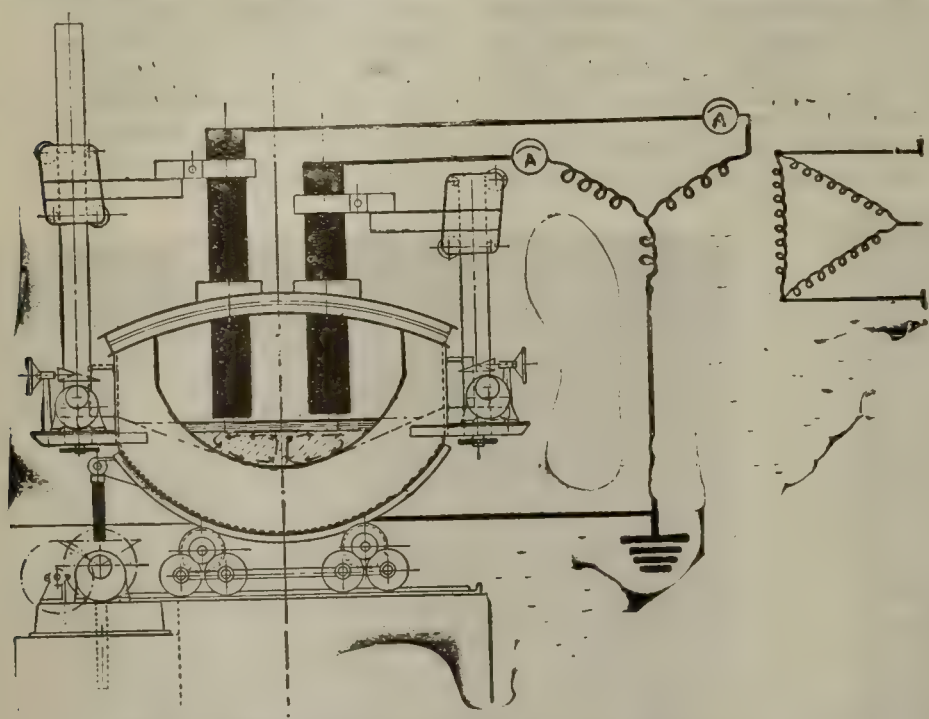

FIG. 3. SECTION THROUGH 6-TON FURNACE SHOWING CIRCULATION OF THE METAL AS IN BOTTOM HEATING.

First, there is the induction type, which acts on the principle of an alternating current transformer, the metal being melted by having very heavy currents induced in it by a single phase or three-phase supply. These furnaces are used to a considerable extent abroad.

Second, there is the arc type of furnace, which has electrodes of carbon or graphite, the metal being melted by arcs formed between the electrodes and the charge, or between the electrodes themselves. Arc furnaces may work with single phase or two or three phases. Some arc furnaces have all the electrodes above the bath of metal, one of this class being the Heroult. As arranged for three phase supply, it has three vertical electrodes through the roof and the arcs are between each electrode and the bath, so that the molten metal forms part of the electrical circuit.

Two furnaces, namely the Girod and the Snyder, employ water-cooled steel studs, which pass right through the bottom or hearth. As the ends of the studs project into the metal of the charge, they burn away and have to be renewed at intervals. There is danger of the metal finding its way through the hearth; and the liability of trouble with water connections.

It will be noted that in all the above-named furnaces the refractory material of the hearth does not require to carry current. The material may be therefore either acid (silica) or basic (magnesite).

The furnaces mentioned below have also bottom electrodes, but come under a different category because the hearth itself conducts electric current. It is, therefore, made of magnesite material as this, when heated, is a fairly good conductor. A furnace of this class is that of Electro-Metals Ltd., which was invented by Gronwall. It works with two phases and has two electrodes above the bath, whilst a third electrode below the hearth acts as a common neutral for the two phases.

Greaves-Etchells Furnace.

Another furnace which has met with considerable success is that of Greaves-Etchells, more than thirty having been installed or put under construction since January, 1916. As this is an all British production, both in inception and manufacture, a detailed description may be of interest. It is designed to operate on a three (or two) phase supply, and has two of the phases connected to electrodes above the bath, the third phase being connected to a copper plate below the electrically conductive hearth of magnesite.

The furnace body consists of a rectangular tank made of boiler plate riveted, and strengthened by angle sections. The bottom is dished and has two steel rails of vignoles section riveted to it. These rest on grooved steel rollers and the whole furnace, with its electrodes, etc., can be tilted backwards and forwards, by means of a screw and gear wheels. In the small furnace, the tilting is effected by a hand wheel and in the larger sizes by means of electric motor.

Each electrode is secured in a holder made of bronze or steel and each holder is attached to, but insulated from a steel jib, projecting from a wheeled carriage. The carriage travels up and down a vertical mast, which is made of two channel sections bolted on to the side of the body. In small furnaces, the electrodes are regulated by a hand wheel, and in large furnaces by a motor through single reduction gearing.

The roof is made of silica bricks, as these are fairly good insulators. They are set in a steel framing which rests on the silica brick walls projecting above the steel body of the furnace. The roof is domed and brought as low as possible so as to reduce the wasting away of the electrode by action of the gases. A roof will last about 100 heats and a duplicate one is provided with each furnace so that the steel melting can be carried on, except for the short time taken to change the roof. In order to obtain an even temperature through the bath of molten steel in the electric fur-

nace, it was realized that heat must be applied below as well as above the bath, and in order to effect this the hearth of the furnace is specially constructed.

Botton Heating Feature

Above 12 per cent. of the total energy of the Greaves-Etchells furnace is used in the hearth, and the "bottom heating" which results, is found to be of great advantage in melting down alloys. The heavier alloys, chrome, tungsten, vanadium and nickel, sink to the bottom of the bath, and if there is no bottom heatinging are apt to remain for a considerable time in a semi-fluid state. The hearth lining is never less than 20 inches thick, and is constructed mainly of dolomite and magnesite, in such a manner that the electrical resistance is high at the inside of the bath in proximity to the charge and decreases rapidly to a negligible quantity at the outside. The current flowing through the hearth generates a considerable amount of heat immediately below the liquid in the most efficient manner possible, while the electric arcs arranged over the bath maintain the slag and surface at the desired temperature.

The effect of this bottom heating is to cause convestion currents in the molten metal, which ensure a constant circulation and a uniform product. The outside of the furnace botom remains cold, little or no heat being lost in this direction. This system of connection at first sight would appear to cause an out of balance load on the primary supply, but the system of transformer ratios is arranged to give a perfect balance when the upper electrodes are in equal adjustment. The high tension electric supply is transformed by means of a delta-star system of connection to low tension, the transformer house being as near as possible to the furnace in order to avoid heavy copper costs and energy losses in the low tension connections.

Transformer Connections and Short Circuiting

The equipment has to be designed to withstand short circuiting of the electrodes, as this occurs in all furnaces during the melting process when pieces of metal fall against the electrodes. The method usually adopted by furnace builders to provide against this is the introduction of considerable reactance in the electrical system, but unfortunately this reduces considerably the energy available in the furnace. Besides increasing the energy losses, it is also very objectionable to the supply authorities.

The Greaves-Etchells system of transformer connections is such that the short circuit current of one electrode must traverse two transformers in series and in different phase, which automatically lowers the power factor momentarily, and has a very strong buffer effect. The fact that there is always a permanent resistance in the path of the current through the hearth also limits very considerably the effects of short circuits. The combination of these factors provides the most effective means yet devised for protecting the supply system from shock, while allowing a high power factor to be obtained on normal load.

In all electric steel furnaces the metal is poured by tilting the furnace, and when this is effected by mounting the furnace on rockers, the end of the spout not only moves downwards, but also away from the ladle. Clearly the only way to keep the spout in one position would be to rotate the furnace round it, but this is out of the question because it would mean lifting the furnace bodily and take too much power. A 10-ton furnace, for example, may weigh as much as 90 tons.

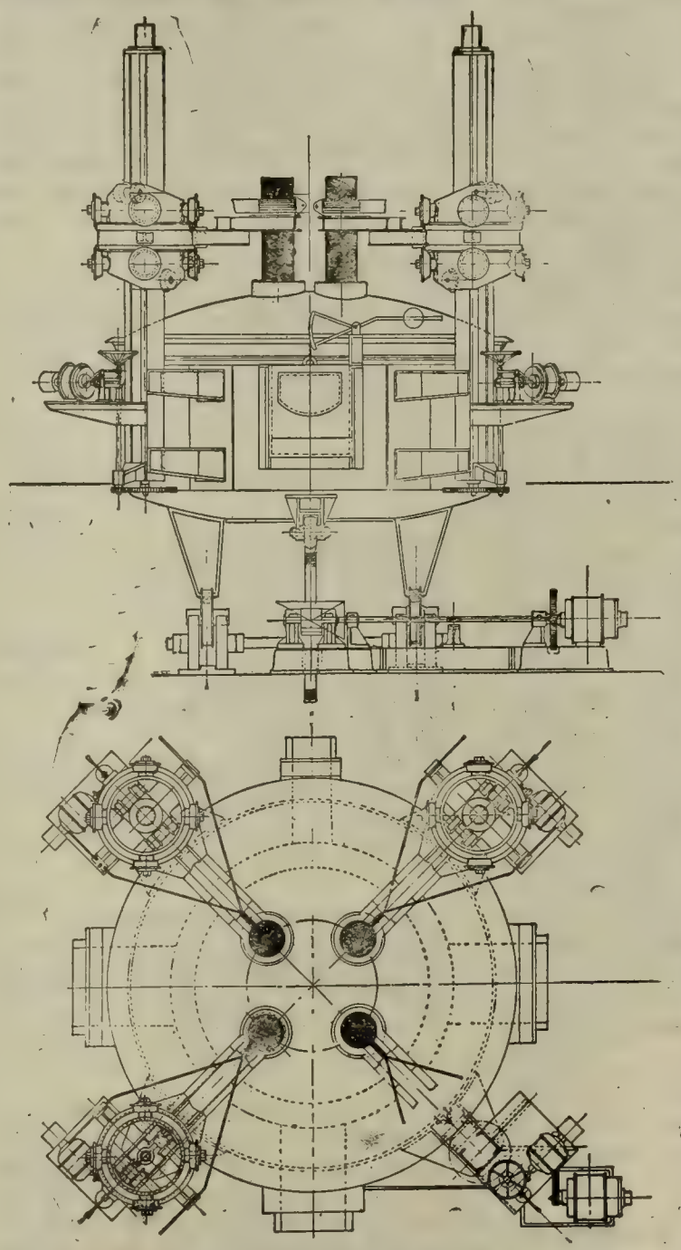

FIG. 4. PLAN AND ELEVATION OF 10-TON FURNACE.

The makers of the Greaves-Etchells furnace have compromised by arranging for the spout to descend in a vertical line so that the furnaceman and craneman have merely to see that the ladle is lowered whilst the metal is running out. This is effected by the system of compensating rollers shown in Fig. 3. The furnace is carried on two sets of rollers, and as it is tilted, it causes the top rollers to rotate the bottom rollers, and this moves the furnace bodily forward. The wheels are so proportioned that the movement forward is just the right amount to keep the end of the spout vertical as it descends. Greaves-Etchells furnaces are made in the following sizes:

Charge.	Kilo-volt Amperes	No. of top Electrodes	Diameter of Graphite Electrodes
½ ton	260	2	4"
1½ ton	520	2	7"
3 ton	800	2	8"
6 ton	1300	4	8"
9 ton	2000	4	9"
12 ton	2600	4	10"

High Speed or Special Alloy Steels

For the manufacture of high-speed steels or special alloy steels, a ½-ton or 1½-ton furnace is usually adopted, and the former can finish a charge from cold material and alloys in 2 to 2½ hours, with an energy consumption of 400 units.

To make up a charge from scrap, it is usual to place steel turnings and millings on the hearth, then pieces of bar and rail ends, tube ends, and finally large pieces of steel. The interstices between the large pieces are filled with turnings, etc., and some ore may be added. The amount of iron ore depends on the amount of iron oxide present in the form of rust on the scrap.

As the charge is melted, a slag of lime and fluorspar is made in order to eliminate the phosphorus as phosphate of lime. After this phosphate slag has been skimmed off, a new slag is made of best Buxton lime, fluorspar and white sand in the proportions of 30, 10, and 5. When this has fluxed, a small quantity of finely-powdered anthracite coal is spread on the slag, and this is continued until the slag is deoxidized. The steel is thus finished off under an atmosphere of carbonic oxide and a slag, out of which the metallic oxides have been reduced. When entirely deoxidized, a sample of slag falls to a fine white powder as it cools. Deoxidization of the slag results in deoxidization of the steel, through the constant reduction of silicon from the slag, and it may be hastened by addition of small quantities of ferro silicon.

Comparison With Crucible Melting

As a comparison with the crucible steel process, it may safely be stated that a ½-ton electric furnace running a charge every 2½ hours, or, say, 9

charges per day, will do as much as 36 crucible furnace holes, each having two 56-lb. pots. The electric furnace is operated by one skilled man, one unskilled man, and one ammeter boy, whereas the crucibles require 15 men, most of whom are skilled, or at any rate classed as indispensable. At two Sheffield works, girls are employed to regulate the electrodes.

Such an electric furnace with its transformers and switch gear will occupy about a quarter of the space occupied by the crucible plant, and the initial cost of the electric furnace will be about half of that of the crucible plant. The charge of the electric furnace can be made entirely from turnings, millings, etc., whereas in the crucible steel process only a very limited quantity of turnings, etc., can be used.

Owing to the low heat efficiency and high cost of labor, crucible steel is much more expensive to manufacture. The cost of renewing crucibles is considerably higher than the renewal of an electric furnace for the same output. Already several steel works have shut down their crucible plant since installing electric furnaces.

The introduction of the Bessemer and open-hearth processes of making steel left crucible steel-makers indifferent owing to the fact that these methods were employed for making ordinary kinds of steel in great quantity for structures, rails, etc. The coming of the electric furnace is a different proposition, as it competes directly and successfully in the special field that the crucible steel process has held so long.

The crucible steel process has been largely responsible for great waste of the nation's resource by reason of the coke having to be made in the Beehive ovens, this quality coke being necessary for the crucible steel process. The introduction of the electric furnace should help to stop this waste in the future. It may be mentioned that very soon there will be 50 electric furnaces at work in the Sheffield district of England, and the output of steel from them will be at the rate of over 200,000 tons per annum. In the United States over 100 electric furnaces are already at work and a single electric steel plant is being erected in South Chicago, which will give an output of 200,000 tons per annum.

THREE YEARS WAR EFFECT ON PRICES

THREE years of war have given a lift to iron and steel prices such as is comparable to no other period in history, says The Iron Trade Review. Full appreciation of the remarkable rise in that period may be grasped only when the market quotations of Aug. 1, 1914, in principal products are measured against those which prevail to-day. This spread in pig iron has amounted to from approximately $37 to $41.50; in semi-finished steel, from $75.75 to $81; in finished rolled steel, from $10 in steel rails to $188 in plates and to approximately $200 in tin plates; and in old material from about $19 to $36.25 per ton.

These advances show that practically all products have been increased in value manyfold. The gross rise has been fairly uniform in different grades of pig iron, semi-finished steel and old materials. In pig iron advances have amounted to practically 250 to 345 per cent.; in billets and sheet bars about 525 per cent.; in wire rods about 400 per cent.; and in heavy melting steel about 210 to 235 per cent. In finished material, however, wide irregularities have been displayed. Here the three year's changes range from $10 per ton or 33 1-3 per cent in rails, a practically closed market, to 800 per cent. in steel plates. Wire products have gone up $49, while wire rods have ascended $75.25. Other important advances are 630 per cent. in No. 10 blue annealed sheets; 500 per cent. in No. 28 black; 260 per cent. in No. 28 galvanized: 400 per cent. in structural shapes; 430 per cent. in steel and iron bars; about 400 per cent. in tin plate and about 260 per cent. in wire nails. The rise in furnace coke has amounted to about 450 per cent. Spot coke at its recent high point, however, was about 840 per cent. above the Aug. 1, 1914, price.

Studying the price evolutions of the past three years, the large part of the advance that has taken place during the past year is striking. It is set forth that fully two-thirds of the total uplift of the market since Aug. 1, 1914, came during the past 12 months. Apparently the cumulative effect of the previous heavy buying then expressed itself. This appears to hold true with substantial uniformity in practically all products. There is, perhaps, some relation between this fact and the general shortage in ingot capacity which made all products similarly scarce.

In 1914 the iron and steel industry produced approximately 23,300,000 tons of pig iron and 18,370,000 tons of finished steel. Prices then were the lowest in several years. To-day with the highest prices by a wide margin ever known, production is running at the rate of about 38,300,000 tons of pig iron, about 45,000,000 tons of ingots, and perhaps 33,000,000 tons of finished steel. The extraordinary expansion of the total monetary turnover is illustrated by this comparison. The tremendous additions to credit accommodation and the general hazard in doing business to-day also are emphasized. At present it is necessary to extend to individual customers a line of credit far beyond that prescribed by good business standards in ordinary times. Without this, however, these buyers would not be able to conduct full operations since it requires a very much greater outlay to purchase a normal quantity of raw material.

Has the crest of prices now been reached? If supply and demand are left to themselves, the answer probably will be in the negative. Demand continues apparently much in excess of supply. The government or rather its attitude toward the market, however, now represents the principal price factor, sentimental or actual. A condition radically different from anything during the past three years now exists and this must be taken into full account in gauging the future of the market.

	1914	1915	1916	1917
PIG IRON.				
Bessemer, Pittsburgh	$14.90	$15.20	$ 21.95	$ 56.95
Basic, Pittsburgh	13.90	14.45	18.95	53.95
Basic, Eastern Pennsylvania	14.00	14.25	19.00	51.00
No. 2 Northern, Chicago	14.00	13.25	19.00	55.00
No. 2X, Philadelphia	14.60	14.50	20.00	54.00
No. 2X, Virginia	12.50	12.50	18.50	52.00
No. 2, Birmingham	13.50	10.50	14.00	47.00
Malleable, Buffalo	13.00	13.00	18.75	55.00
Ferromanganese	38.00	98.00	170.00	400.00
COKE.				
Furnace Coke, Connellsville, Contract	1.85	1.75	2.40	10.00
Foundry Coke, Connellsville	2.40	2.25	3.15	12.50
SEMI-FINISHED.				
Bessemer Billets, Pittsburgh	19.00	22.00	43.00	100.00
Open-hearth Billets, Pittsburgh	19.00	24.00	43.00	100.00
Bessemer Sheet Bars, Pittsburgh	20.00	21.70	43.00	105.00
Open-hearth Sheet Bars, Pittsburgh	20.00	25.00	43.00	105.00
Wire Rods, Pittsburgh	24.75	26.00	60.00	100.00
FINISHED MATERIAL.				
Tank Plates, Pittsburgh	1.10c	1.30c	2.90c	9.00c
Tank Plates, Philadelphia	1.25c	1.359c	3.909c	10.159c
Structural Shapes, Pittsburgh	1.15c	1.30c	2.50c	4.50c
Steel Bars, Pittsburgh	1.15c	1.30c	2.60c	4.909c
Iron Bars, Chicago	1.05c	1.20c	2.35c	4.50c
Tin Plate, Pittsburgh, per box	$ 3.25	$ 3.15	$ 6.00	$ 13.00
Sheets, No. 28 Black, Pittsburgh	1.80c	1.75c	2.95c	9.00c
Sheets, No. 28 Galvanized, Pittsburgh	2.75c	4.25c	4.30c	10.25c
Sheets, No. 10 Blue Annealed, Pittsburgh	1.35c	1.35c	3.00c	8.50c
Wire Nails, Pittsburgh	1.55c	1.60c	2.50c	4.00c
Open-hearth Steel Rails, mill	$30.00	$30.00	$ 35.00	$ 40.00
OLD MATERIAL.				
Heavy Melting Steel, Pittsburgh	11.50	12.00	16.00	36.00
Heavy Melting Steel, Eastern Pennsylvania	10.50	12.50	15.00	35.00
Heavy Melting Steel, Chicago	9.50	11.50	14.25	33.50
No. 1 Railroad Wrought, Eastern Pennsylvania	12.00	13.50	19.75	48.75
No. 1 Railroad Wrought, Chicago	9.00	9.00	14.50	36.75
No. 1 Heavy Cast, Eastern Pennsylvania	12.25	12.50	16.25	35.00
No. 1 Cast, Chicago (net ton)	9.75	9.25	12.25	28.50

PRODUCTION METHODS AND DEVICES

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THREAD CUTTING ON THE LATHE

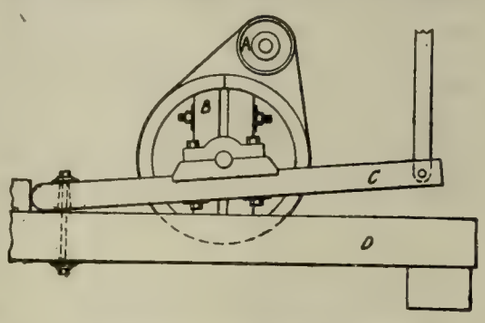
By R. Hamilton.

OWING to the fact—fortunate or otherwise, that many plants are still equipped with a number of old makes of engine lathes, it is still the duty of mechanics to figure out their own gearing for every different thread to be cut; and while in some respects such a circumstance is not conducive to economic operation of machine tools the modern method undoubtedly has a marked tendency to deteriorate the constructive abilities of the average workman. It is well known that many a good mechanic to-day can cut a very accurate thread on a modern engine lathe, fitted with the improved system of rapid change gears, and yet the same man might be unable to calculate the train of gears necessary to cut any particular pitch of thread. The changes that have taken place in the development and improvement of metal working machinery have been of inestimable value when considered from a production standpoint, but the semi-automatic character of up-to-date machine shop equipment has done much to reduce the standard of the old-time mechanic, where his thinking cap was more often used than it is at the present time; not that the opportunities for demonstrating his individual initiative have become less with the advanced state of science, but the adoption of the graduated dial, the simple movement of levers for changing gears, special fixtures and jigs for holding work, and numerous other contrivances of the modern shop, have almost eliminated the necessity for him to use and develop his mental faculties along those lines that would otherwise keep him posted on some of the elementary yet fundamental essentials of his particular calling.

Under the modern method of cutting threads with the single point tool, the operator has only to move one or more levers to indicated positions in order to set the lathe to cut the desired thread. In performing these simple movements he has accomplished in a few seconds what formerly took several minutes and often much figuring. While the man of to-day attains his purpose without any apparent mental effort, it was imperative that the operator on the old style engine lathe should figure out and assemble each train of gears required. Too much cannot be said of the advantages of the modern system of rapid change gearing; but these lathes, as thread-cutting machines, are invariably restricted to the cutting of threads within the range of the assembled gearing. The number and pitch of the various threads that can be cut are sufficient for all ordinary requirements, but there occasionally arises—especially in outlying jobbing shops, work that requires threads not covered by the changes available. Under such conditions it is necessary to dopt other methods, or take the work to a lathe where the change gears are not incorporated with the permanent mechanism.

Underlying Principles of Screw Cutting

Realizing these possibilities, it should be the duty of all machine operators to keep in touch with the principles involved in the calculations for determining the necessary gears to meet any thread cutting requirements. The first and all important factor in connection with screw cutting, using the single point tool, is that the carriage which supports the tool must have a traverse per spindle revolution, equal to the lead of the screw to be cut. To achieve this, it is obvious that the gears selected should be such, when correctly assembled, as to give a certain speed ratio between the producing and the produced thread. The pitch of the lead or producing screw is the basis of calculations, as all engine lathe gear trains, whether of the modern assembled or old demountable type, are determined and arranged to harmonize with the threads on the lead screw.



INTERESTING REVERSING GEAR.

For instance: suppose we have to cut a screw having 14 threads per inch, the lead screw being 4 threads per inch. The ratio in this case would be 4 to 14, or 1 to 3½; that is, the lathe spindle must make 3½ revolutions while the lead screw is making one. This can only be accomplished by a similar ratio in the connecting gearing. The number of teeth in the gears selected—which is the general method of obtaining gears, is dependent on the wheels available on each lathe. Suppose then that the set starts with a pinion of 24 teeth and advances by four teeth for each succeeding gear. Using 24 as one of the required pair (simple gearing), the companion gear must bear the same relation to this as 1 does to 3½, or 24 multiplied by 3½ equals 84 teeth; this gear to be placed on the lead screw and the 24 tooth pinion on the lathe or stud spindle.

Again, suppose a screw of 27 threads per inch is to be cut on the same lathe as above. The ratio would be 4 to 27, or 1 to 6¾. Using the 24 tooth pinion on the spindle stud, the gear required for the lead screw (simple gearing), would be 24 multiplied by 6¾ equals 162 teeth. This, however, is beyond the range of available gears, so it is therefore necessary to calculate the gears and compound the train, by using a coupled pair on the intermediate stud. To obtain these required gears, select at random a gear, say 72, and divide this into 162, obtaining 2¼; then by using 72 on the lead screw and the intermediate couple with a ratio of 2¼ to 1, or 72 to 32, we have the required train; that is, 24 on the spindle, with 72 and 32 on the intermediate stud, the 32 meshing with the second 72 on the lead screw. It may happen, however, that there is only one 72 in the set, which would necessitate a different train. Trying 32 for the stud pinion, the lead screw gear (simple), would be 32 multiplied by 6¾, or 216 teeth; and this divided by say 72 gives 3, which as a ratio to 1, would give wheels of 90 and 30, or other pairs in the same relation for the intermediate couple.

After figuring out a train of gears, it is well to test their accuracy before assembling, which also acts as a guide when placing them in the various positions. In a thread cutting train the product of spindle revolutions and the driving gears must equal that of the lead screw and the driven gears. For instance: in the last example, on the basis of one inch of carriage travel, the threads per inch on the work multiplied by the driving gears on the spindle and intermediate stud, must equal the product of the two driven gears and the threads per inch on the lead screw, or

$$\frac{27 \times 32 \times 30}{90 \times 72 \times 4} = 1$$

thus proving the correctness of the calculations.

INTERESTING REVERSING GEAR

By J. Haliburton.

HAVING occasion to erect a certain mechanism in which the main shaft could be driven in either direction at will, and figuring that the probable outlay, together with the space required for reverse gears and clutches, and friction wheel trains, would entail prohibitive expense, the contrivance shown in the accompanying sketch was designed and constructed with very satisfactory results. The sketch A represents a gasoline engine pulley, while B is a wooden pulley used as a friction wheel when reversing, and as a belt pulley in the forward motion; one of the sills on which the machinery is supported is shown at D, while the beam C carries the end bracket of the driving shaft. The outer

end of the beam C is connected to the operating lever by the link shown, the lever being in a horizontal position. With C raised, reverse motion is obtained, the belt hanging by its own weight on the engine pulley A. When C is lowered, the weight of the shaft and pulley comes upon the belt, and forward or driving motion is obtained. The machinery is only loaded on the forward motion, so that the variation in the shaft alignment necessitated by the reversing operation is not sufficient to materially affect the working conditions. The length of the present shaft is about 5 feet, but a longer one could be used if aligning trouble should develop. By having the axis of B to one side of A, greater friction is obtained between the two pulleys when working in the reverse position. A suitable notch is provided to retain the mechanism in a neutral position when so desired. When operating in the reverse, and also during the accelerating period of the forward movement, a guide is necessary to keep the belt on the engine pulley. This arrangement has given very efficient service, and is as easily controlled as with a friction wheel train.

PORTABLE CRUDE-OIL FURNACE.

By J. Ralph

IN the erection of structural steel works, such as bridges, buildings, ships, etc., is it necessary that some convenient means be provided for the heating of rivets, dressing of tools or similar work, requiring the use of a small furnace, therefore, one that can be easily transferred to different positions, as the work progresses, proves the most efficient. Where the air for combustion is supplied from a central blower or compressor, the supply pipes and flexible hose often entail considerable expense for installation, and sometimes occasion injury to the workmen from their straggling position about the structure. The accompanying cuts illustrate a small crude-oil furnace designed by a structural steel worker, the operation of which has given very good satisfaction. The device is self-contained and can be placed upon the flooring or be readily applied to suitable members of the structure. It is hand operated but so designed that the minimum amount of labor is required in its manipulation.

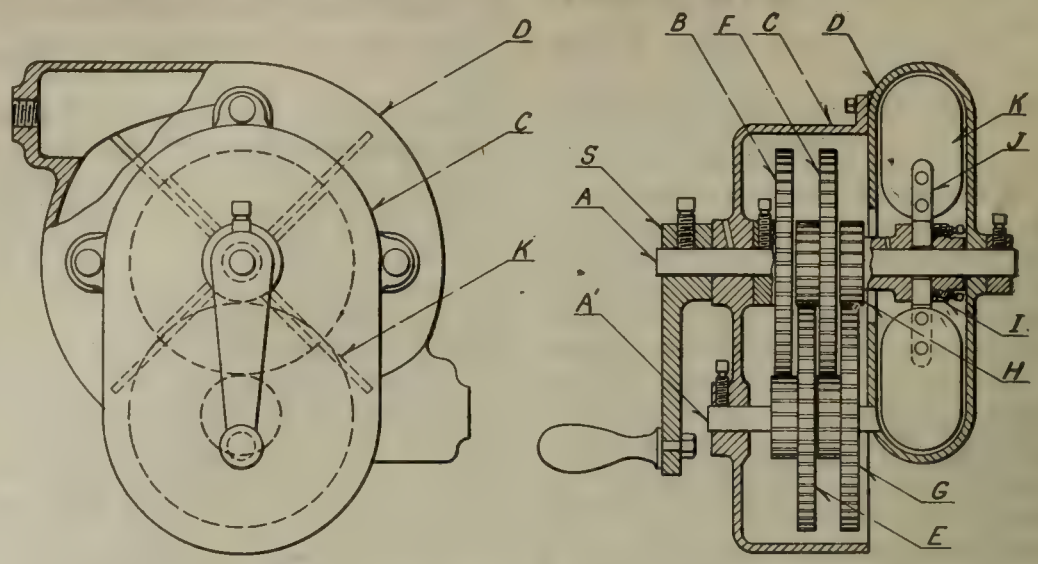


FIG. 2. PORTABLE CRUDE OIL FURNACE.

The sketch Fig. 1 shows a front view of the furnace, while Fig. 2 shows a sectional view of the fan and gearing. As illustrated in the former figure, the base A, made of angle iron, is supported on a central casting B which carries the four legs; the latter of a suitable length to raise the fire chamber to the desired height for convenient operation. The gear casing C, which is bolted to the fan casing, is attached to the frame by the small brackets (d). The fan casing is provided with two openings E and F, the air from the former supplying pressure to feed the oil from the tank, and the lower outlet F feeding directly through the burner to the fire chamber. The oil tank G is supported above the fan by the brackets H secured to the fan casing; while the tank is filled through the small opening 1, which is closed with an air tight cap. Air from the fan passes through the pipe J into the tank and above the oil, the check valve K preventing the return of the air when the fan is shut off. The oil is fed down through the pipe L to the burner M, the flow being regulated by the small pet cock N; this pet cock can be so adjusted that a pilot light will be maintained when the operator requires to leave the furnace, the oil under pressure being gradually forced to the burner. The intensity of the flame can be accurately regulated by the hand wheel O, cutting off or increasing the volume of air. The mixture passes through the opening P into the fire chamber Q, the opening to which can be covered by dropping the door R.

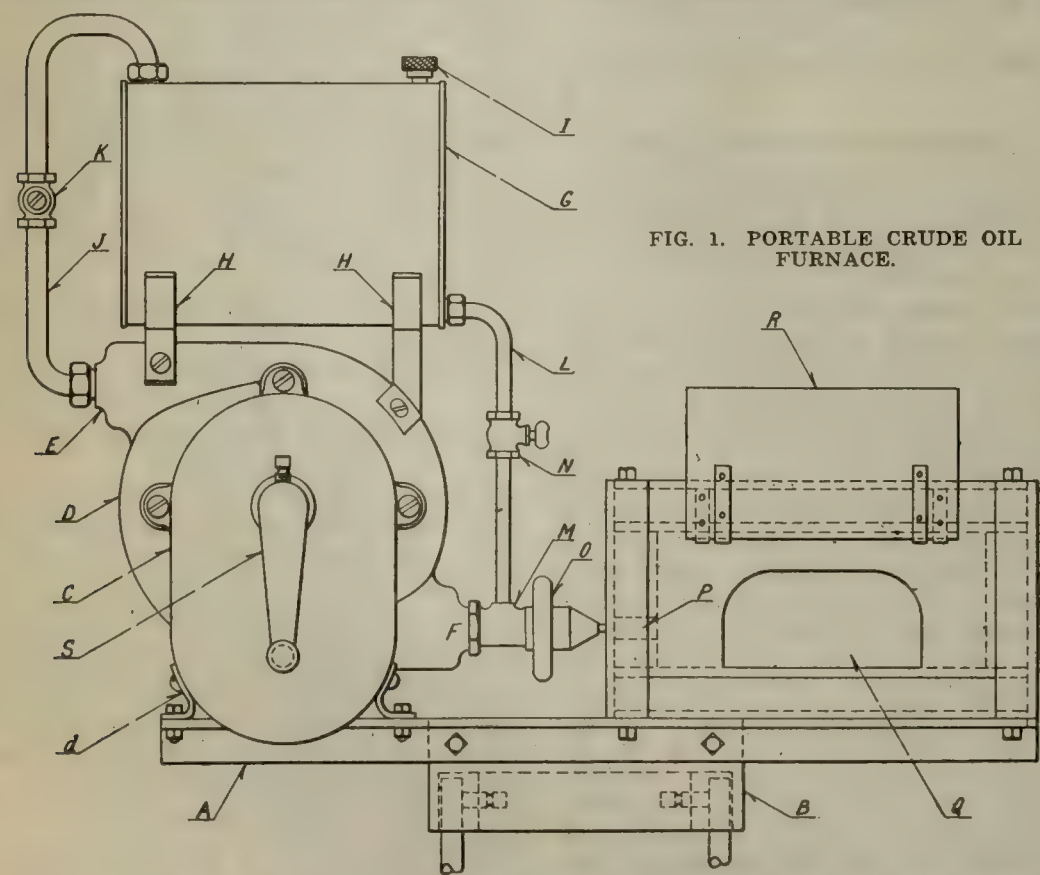


FIG. 1. PORTABLE CRUDE OIL FURNACE.

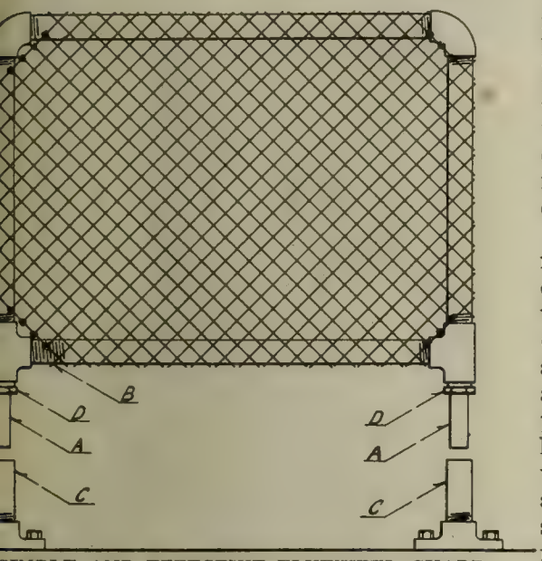
The sectional view of the fan and gear train gives an idea as to how the speed ratio of the fan blades is obtained. Secured to the main shaft A, which is operated by the crank handle S, is the first driving gear B which meshes with the pinion on the compound couple E, the gear on the latter meshing with the pinion of the couple F, which in turn transmits the power to G and thence to the pinion H. this pinion being integral with the hub I carrying the pins J, to which are riveted the blades K. The hub I which supports the fan blades is loose on the shaft A and revolves in the same direction as the operating handle S, but at a speed in relation to the ratio of the final to the primary movement of the gear train. In this instance where the ratio of the gear to the pinion is 3 to 1, the speed of the fan will be 81 revolutions to every turn of the handle S.

SIMPLE AND EFFECTIVE FLY-WHEEL GUARD

J. E. N.

IN addition to the necessity of effective protection from the dangers contingent to machine shop and power house mechanisms, it is often advisable to make ample provision for the temporary re-

moval of guards for repairs, cleaning up, etc. The guard shown herewith was installed to protect workmen from the flywheel on an engine, but same could be applied in any other dangerous location. As shown, the frame consists of 1½-inch pipe connected with standard fittings. Owing to the continuous construction of the frame, the last joint shown at B was made with an extra long thread so as to avoid left-hand fittings. In the outer end of each tee was placed a 1½-inch to 1¼-inch bushing D, into which was secured a short length of 1¼-inch pipe A, previously turned to a diameter that would slip into the short piece of 1½-inch pipe, screwed into the supporting wall or floor flange. The frame is covered by 1¼-inch mesh wire screen, a feature that prevents the hand or arm from being thrust through in case of a fall. A frame of this description can be readily lifted from its position for necessary repairs,



SIMPLE AND EFFECTIVE FLYWHEEL GUARD.

the supports remaining fixed to the wall or floor.

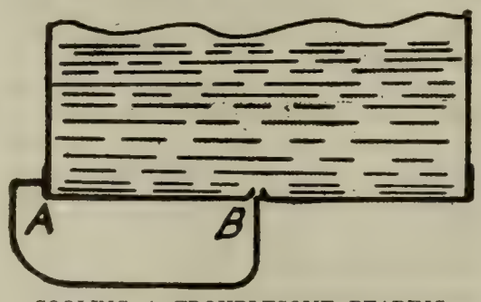
COOLING A TROUBLESOME BEARING

By J. E. McC.

TO aid in keeping a troublesome bearing cool, the oil recesses were capped with a tin cover, and a tomato can with a small hole punched in the centre of its bottom was suspended above the bearing and kept supplied with cold water. A small piece of waste placed on the tin cover was used for the water to drip onto, and from thence flow in different directions, instead of falling on the bare metal and flowing off in a single stream; too much waste is not advisable, as it was found that this would often prevent surface radiation from the metal and do more harm than good. The water kept the bearing cool enough for continuous operation, and having the hole in the centre of the can neutralized all rotary motion of the latter as its suspending cord twisted and untwisted with the changing weight. To open the hole if it became clogged, a wire was bent, as shown in the sketch. The distance from A to B was equal to the radius of the bottom of the can; therefore, with A placed against the side of the can at its bottom edge, the point B had only to swing to find the hole in the centre of same.

STROPPING A RAZOR

AT a meeting of hardwaremen in Melbourne recently, the question of how to strop a razor emerged,says Australasian

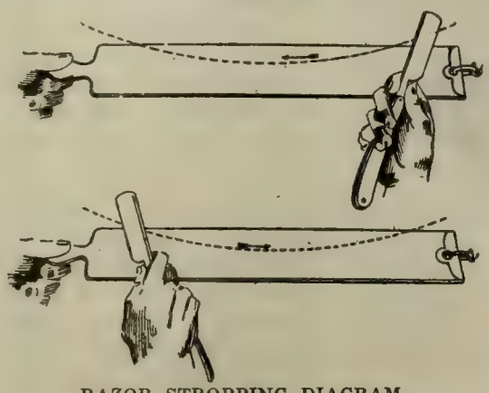


COOLING A TROUBLESOME BEARING.

Hardware and Machinery. One man said he had bought about twenty razors in as many years, some of them expensive knives, and was always having trouble. He had come to the conclusion that he couldn't strop a razor properly. Obviously it would be an advantage if every assistant who sells a razor were in a position to tell or show the purchaser how it should be stropped.

The razor is stropped to give it keenness of edge, in reality to clear of foreign matter the microscopic teeth with which the edge is fringed. Hence the desirability of using a suitable strop, a strop with a surface at once "nappy" and soft or pliable. The occasional application of a little olive oil tends to keep the strop in right condition. Even with a good strop, a man may be unable to get his razor right, because his stropping is faulty. The most common mistakes are stropping too heavily and too long. If the razor is in fair order a few passes on the strop, beginning with a slight presure, and ending with almost none, are all that is needed.

Note the position of the hand in the drawing and the direction of travel. The razor should be firmly held, not moved in the fingers. and should always be turned on its back, never on its edge. A firm hold of strop and razor and a



RAZOR STROPPING DIAGRAM.

wrist action of the stropping hand—such are the methods of the expert. If the razor is gripped as shown there will be little, if any, risk of injury to either strop or blade.

The direction, as well as the weight and frequency of the stroke, is of great importance. "Heel to point," it ought to be, but not in a straight line. The curved stroke, experience shows, gives the best results. Rather difficult to accomplish at first, this semi-circular movement of the hand in stropping soon becomes easy enough. It only needs the practice of a few weeks to make it "second nature."

Another important point to remember is that the razor should be laid flat on the strop. The weight of the hand in stropping should really fall on the back of the razor if the rounding and consequent spoiling of the edge is to be avoided.

Nor is correct and careful stropping all that is required to secure a keen edge and a "close shave." A good strop for the razor and a good lather on the skin, a lather worked in as well as worked up, are essential.

Even with a good strop and good stropping, a time comes when a good shave is found impossible with any particular edge. The steel must be put on the stone.

SAFETY IN THE MACHINE SHOP HAND TOOLS.

ALTHOUGH machines are now employed for a large part of the metal shaping and forming work that was formerly done by hand, there still remain many operations that require the use of hand tools, says The Travelers' Standard. Among these are filing, chipping, benchwork in general, and blacksmithing. The thought of danger is specially associated with moving machines, but although these do cause a great many accidents, a surprisingly large proportion of the injuries received in machine shops results from the use of hand tools.

The possibilities of accidents in connection with machines are easily apparent. The swift, untiring motion, and the grinding, clattering, and whirring sounds, suggest relentless force; and while machines are in motion, contact of any portion of the human anatomy with certain parts of the machines almost inevitably results in personal injury. Carelessness may or may not be an important factor in an accident of this kind.

Hand tools, however, are apparently quite harmless; yet (as stated above), they cause many accidents, and nearly all such accidents may be fairly attributed to personal carelessness or neglect. Mishandling tools, neglecting to keep them in good condition, and leaving them about in dangerous places, are forms of carelessness that cause trouble sooner or later.

Suppose a machinist is about to file a piece of work in a lathe. Handles come off from files quite frequently, and they are not always easily found when wanted. In the hypothetical case that we have in mind, the machinist starts work with a file that is minus a handle. When working close to the lathe dog, the end of the file is struck

by the dog and the pointed tang is forced back into the man's hand, wrist, or possibly into his abdomen if he is standing directly in line with the file. A similar accident may occur while working at the bench if the file breaks, or if it slips in the workman's hand, although the results are usually less serious in a case of this kind. **Never use a file without a handle.**

A painful accident sometimes occurs when a workman, in attempting to drive

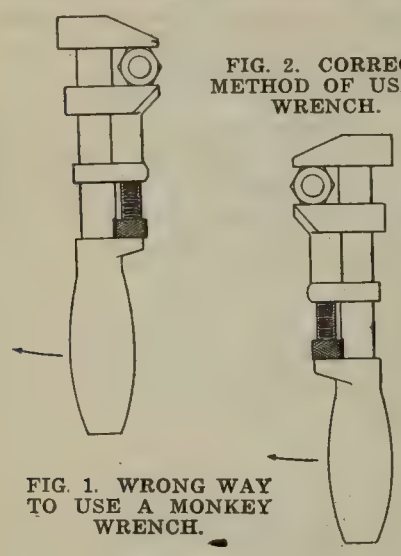


FIG. 2. CORRECT METHOD OF USING WRENCH.

FIG. 1. WRONG WAY TO USE A MONKEY WRENCH.

a file more firmly into its handle, grasps the tool by the handle instead of by the metal part. A heavy file will sometimes drop out in a case of this kind, remaining balanced in a vertical position on the bench for a moment upon the sharp tang. **In tightening a file by pounding on the bench, always grasp it by the metal part, instead of by the handle.** Some shops use safety handles of special design. In one form a hardened steel nut with sharp threads is inserted in the handle, and the handle is twisted on with considerable force. The sharp threads of the nut then cut into the tang and hold it securely in place.

Wrenches.

Another man may be setting up a large nut with an open-end wrench that

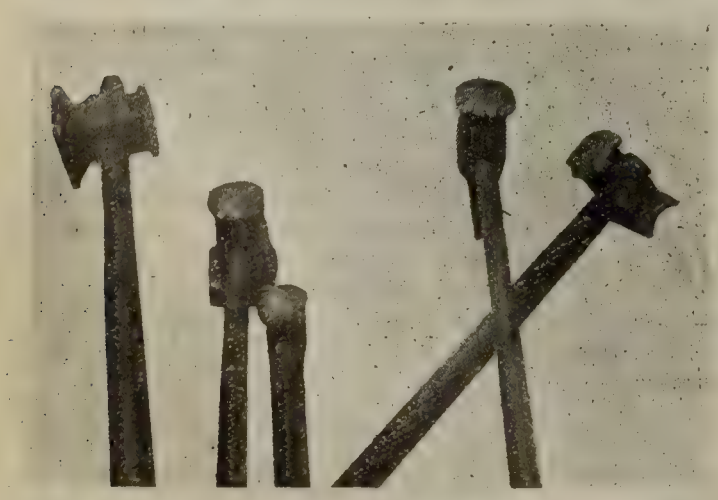


FIG. 3. MISCELLANEOUS TOOLS IN POOR CONDITION.

is a trifle too large for the nut, or the jaws of which have been battered or twisted out of shape by mistreatment. In either case the wrench is likely to slip off the nut, and the workman's knuckles may come in contact with some hard object and be cut and bruised, even if nothing more serious occurs. **Use a wrench that is in good condition and of the proper size.**

Workmen often use monkey-wrenches for hammering, and thus damage the jaws or the adjusting screws, so that when the wrenches are put to their proper use the jaws slip around the nuts and more knuckles are bruised and require attention. **Never hammer with a monkey-wrench.**

Similar bruises often result from applying monkey-wrenches improperly. If the wrench is used in the position shown in Fig. 1, for tightening a nut, the jaws are likely to spread and to slip off the nut when force is exerted upon the wrench handle. The correct method is shown in Fig. 2. When the wrench is used in this way to pull on the handle tends to tighten the jaws, and thus cause them to grip the nut more firmly. As an additional precaution, avoid using a monkey-wrench as a substitute for a socket wrench, whenever possible.

A chipper who fails to wear goggles and to provide a needed screen to protect other persons against lving chips from his work, has only himself to blame if the chips strike his own eyes, or those of some other person, and cause painful injuries.

Miscellaneous Tools.

The danger associated with the use of punches, cold-chisels, hand drills, and other similar tools, when the heads are worn, burred, or "mushroomed," has been pointed out by nearly every writer on safety topics. Men continue to use these defective tools, however, and, as a reresult, from time to time flying burrs or spalls that break off inflict cuts and bruises on the arms or faces of the users, or of persons near by. When the flying fragments of metal strike the eye, the result is likely to be a permanent injury or even a total loss of sight. Furthermore, when the tool being struck has a burred head, the hammer is more likely to slip off and injure the hand that is holding the tool. **Have chisels and other similar tools dressed whenever the heads are burred.**

No workman should knowingly use a sledge hammer that is loose on its handle or that has a split handle, nor any other defective tool. If the tools are the individual property of the workman, he should inspect them frequently and have them put in good condition before using them; and if they belong to his employer he should notify the foreman if they are defective, and insist on having safe implements. A good plan is to have all hand tools, and particularly such tools as sledges and others with wooden handles, kept in the tool room to be checked out only when needed. In this way one man—the tool-room keeper—can be made responsible for seeing that no defective tool reaches the hands of a workman.

Tools left lying in passageways, and near the edges of platforms, benches, racks and shelves, and on step-ladders, are potential accident producers. "A place for everything and everything in its place," is the safe rule for sharp-edged, heavy and otherwise dangerous tools.

Insecurely placed work—perhaps a heavy casting or forging—often falls from the bench, endangering the feet and limbs of the workman. Avoid this danger by keeping such objects in safe positions, and by properly supporting or securing them, whenever necessary.

Every machinist doubtless knows that striking tempered steel with a steel hammer or other steel or iron implement endangers the eyes, but every little

FIG. 4. A BADLY BURRED FULLER.

while somebody tempts Providence by trying the experiment again.

When cutting a short piece from a rod or bar of metal with a sledge and a blacksmith's cutter, the short end, when severed, is likely to fly and injure someone, unless care is used to strike lightly when the rod is nearly cut through. The smith also knows (or should know) that to avoid flying pieces he must stand at one side when doing his work.

Broken and bent tongs and tongs that do not fit the work are unsafe. Repair all broken tongs at once, or put them in a safe place where they will not be used. Don't hang hot tongs in the rack, because someone may grasp them with the intention of using them, and be severely burned.

Contrary to safe practice, pieces of hot metal are often left lying about on anvils, benches and other places, and these may burn any person who attempts to pick them up. Mark hot pieces in some unmistakable way, so that burns from this cause will be avoided.

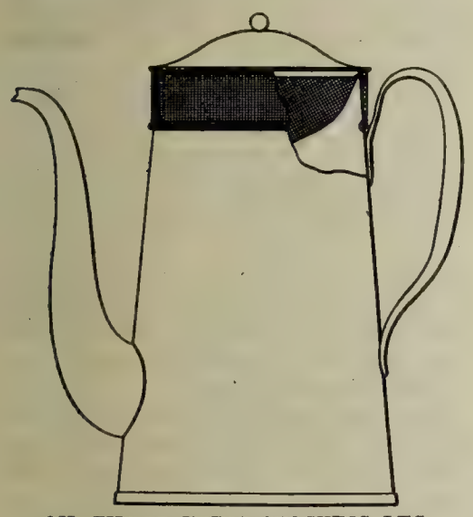
Finally, there is the ever-present danger of infection that is associated with even the slightest wound or abrasion of the skin. Such injuries are daily occur-

ences in machine shops, and are often considered too trivial to require attention. Nevertheless, they frequently lead to serious cases of blood poisoning.

INEXPENSIVE OIL FILTER

By J. Haliburton

CONSERVATION is an essential factor in every line of industry, and nowhere is this more pronounced than in the power plants of the country. Waste under existing conditions is next to criminal, and it is a commendable feature to not only eliminate all waste but to utilize to the utmost all available material so as to maintain the maximum efficiency is service and economy. The accompanying cut illustrates a very serviceable yet inexpensive strainer or filter for cylinder oil. This consists of a discarded teapot fitted with a portion of a close woven stocking leg. The short piece was sewn



OIL FILTER USING STOCKING LEG.

across one end and the open end placed over the top of the teapot body, the end of the fabric being provided with an elastic band or other means of securing it to the outer surface of the vessel; a groove similar to that shown offering an excellent facility for securing same. The loose end of the stocking leg is then allowed to sag down into the teapot to form a filtering pocket into which the oil is poured and thereby strained before it passes into the interior of the teapot, from which it is afterwards used by pouring from the spout in the ordinary manner. To prevent the flange of the lid cutting the fabric, it is either removal or given an inward curl.

STEEL EMBARGO ON AUG. 15

A WASHINGTON despatch to the New York Times says:—The Department of Commerce served notice on Canada on August 8 that the embargo on steel needed for shipbuilding would become effective absolutely on August 15, as announced by the President on Aug. 2, and that after August 15 special licenses must be obtained for all iron and steel products leaving this country. Even steel, iron, and steel products for manufacture of ammunition will not be permitted to cross the border except under a license. The ruling follows:—

"The attention of shippers to Canada is called to the Presidential instructions given to the press on August 2 concerning shipments of iron and steel products covered by the proclamation of July 9, which instructions supersede all previous regulations. Up to the present, shipments of those iron and steel commodities into Canada have been facilitated through the granting of special licenses issued through the collectors of the ports. From this time on, special licenses will be required on all shipments of iron and steel products, in accordance with the President's instructions of August 2. Shippers will, therefore, save themselves annoyance and delay if they will apply for licenses before making shipments to Canada, as otherwise such shipments will be held up at the border."

STEEL SUPPLY LESS THAN DEMAND

REPORTS of a sharp drop in steel prices are characterized as not well founded by one of the leading steel men in the United States. This authority, who is regarded as one of the keenest observers in the industry, says that for every ton of steel made there is a demand for three tons, and as long as this condition exists prices will maintain their levels.

On the question of Government regulation of prices, he suggests that the Government authorities must now be beginning to realize what a tremendous undertaking they had assumed when they determined that a single price for all sales, whether to the United States, to the Allies or to private consumers, be fixed. There was only one way, he declared in which this could be accomplished, and that was for the Government to take over, operate and distribute the mills and their products, a task too gigantic for consideration.

A fair average cost, he said, could not be arrived at, as a level at which the big producers, who are integrated, could sell would often mean bankruptcy for the smaller producers. The quoted levels for certain products, extravagant as they seem, mean only a fair margin of profit for many small mills, although they mean huge profits for the big concerns.

What the Government needs most of all, he says, is production, and then more production. If prices are set at a level where the marginal producer cannot make a profit, he must go out of business. This means reduced output and a shortage of material.

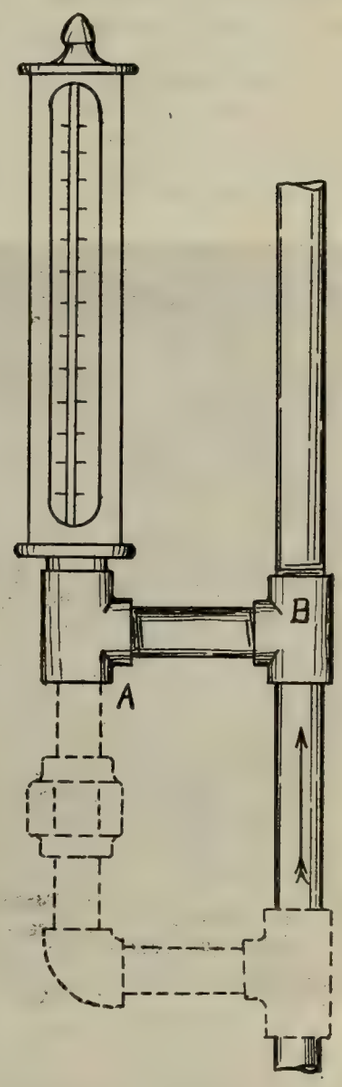
As far as profits of the big producer are concerned, these can be minimized by taxation on excess earnings, and the report of the Steel Corporation, showing nearly $54,000,000 estimated excess profits taxes in a single quarter, indicates what an important source of revenue these excess profits may become.

MAKING THERMOMETER REGISTER CORRECTLY

By K. Noble.

A THERMOMETER connected on a hot water pipe did not register correctly. It was connected as shown in sketch, a plug being in the end of the tee at A.

The plug was removed and a pipe connected as shown by the dotted lines



MAKING THERMOMETER REGISTER CORRECTLY.

and everything was O.K. The flow of the hot water is shown by the arrows. Of course an angle end thermometer could have been secured and connected into tee B. However this would have partly obstructed the upright, but even if this would make no difference it cost less to make the change than it would to buy another thermometer.

For White Metal Patterns.—What is said to be an excellent mixture for white metal patterns is: Tin, 50 per cent., and zinc, 50 per cent. Where the minimum amount of shrinkage is required the formula is modified slightly as follows: Tin, 50 per cent.; zinc, 49 per cent., and bismuth, 1 per cent.

The volume of gas varies inversely as the absolute pressure, and directly as the absolute temperature.

CONTEMPORARY WAR ARTICLES

Embracing Information and Data Drawn from a Variety of Sources Relative to and Arising from the Prosecution of this Many-Sided European War

MACHINES AND APPLIANCES FOR MUNITIONS MAKING

THE text and accompanying illustrations refer to a special Vicker's type lathe manufactured for them at Barrow and elsewhere. Working drawings of it have also been supplied to the Lancester Ordnance Accessories Co., and to the Ministry of Munitions. The main features of the design are simplicity, strength, adaptability and compactness. Figs. 2 to 7, Figs. 8 to 10, and Figs. 11 to 14, show machines respectively arranged for trimming off the rough end, boring and facing the nose, and threading the base of the interior for the adaptors on large shells. A glance at the illustrations will show that the machines for these various and very different operations are in their main features identical.

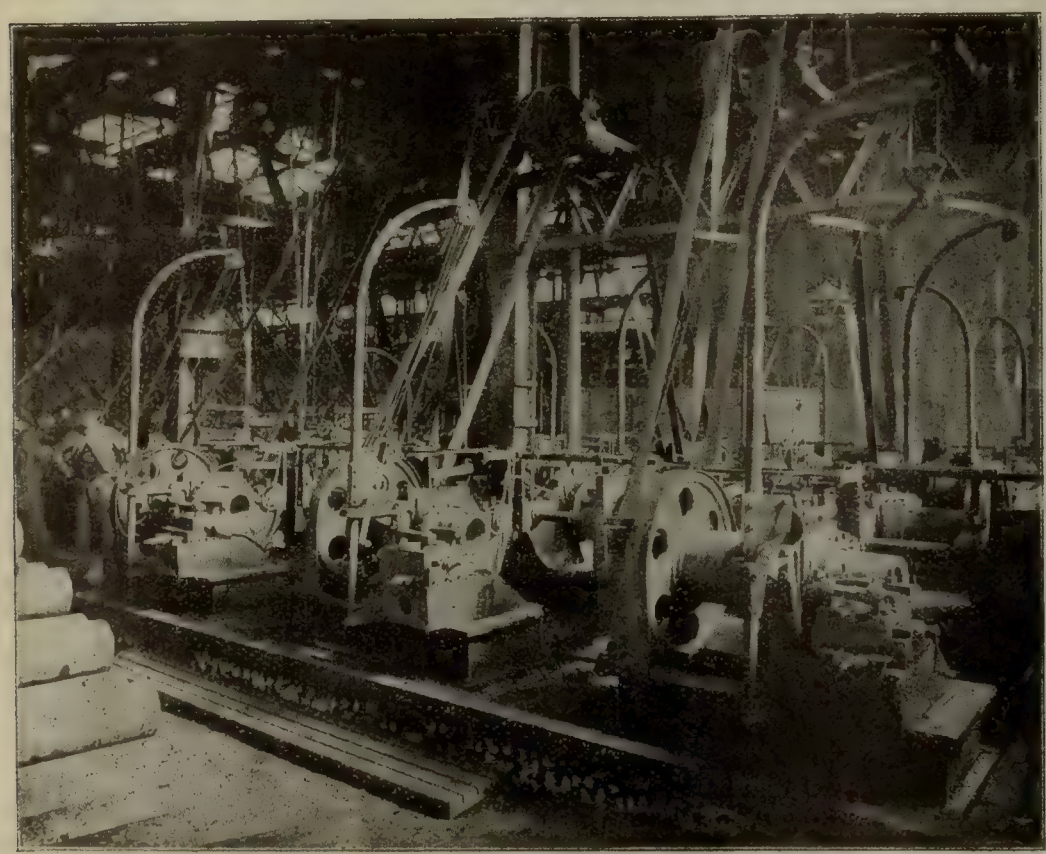


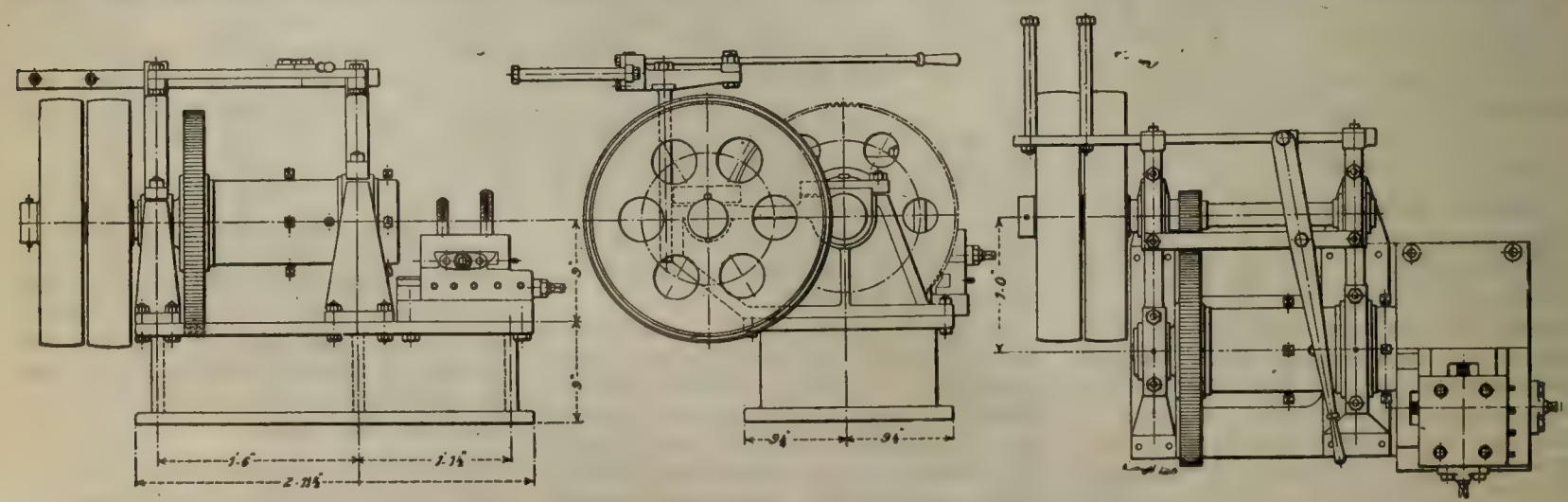
FIG. 1. LAYOUT OF MACHINES FOR TRIMMING MEDIUM SIZE SHELL.

As a characteristic machine we may deal with the simplest form—that illustrated in Fig. 1, and shown in detail in Figs. 5 to 7, and intended for parting the rough end of the shell forging preparatory to turning the outside and boring the interior. It will be seen that the lathe consists of a simple box-bed and two cast-iron side frames which carry the bearings for the main and pulley spindle. The main spindle is of large diameter and hollow, and is driven by a single reduction gearing from the pulley spindle. The latter is fitted with fast and loose pulleys, so that the machine requires no countershaft. The belt control fork is operated from a hand lever mounted on the machine frame. The hollow spindle is of sufficient internal diameter to take the shell forging, and is of such length that when the shell is nested in it the projecting end is in a convenient position for being operated on by a parting tool carried in the rest.

The shell is held in the spindle and driven by pinching screws as shown. As will be seen, the tool rest is carried on a block bolted directly to the box-bed, and is fitted with both cross and longitudinal traverse. The cross traverse, which is, of course, used for parting off, is fitted with a ratchet feed gear, the feed-ratchet pawl being driven from a reciprocating shaft carried on the front of the bed and operated from a crank pin on the outside end of the main spindle. It may be said that experience has shown that the girls who operate these machines prefer to feed by hand. This method of working entails no change in the machine.

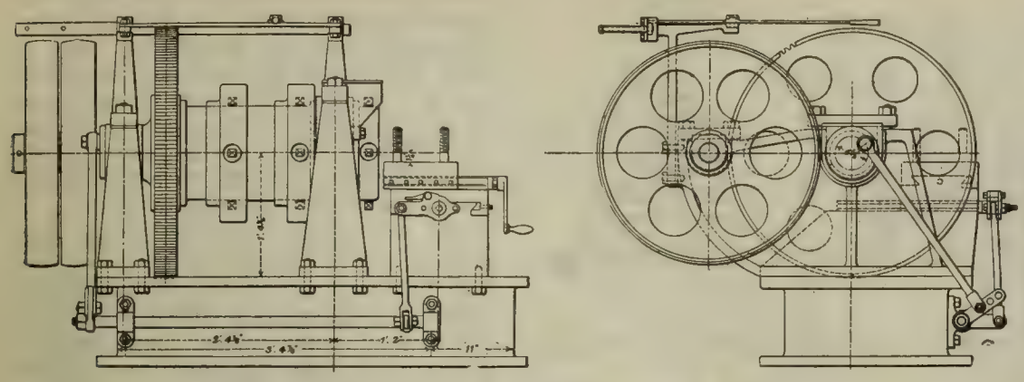
The lathe, exactly as described above, is suitable and is used for facing the base of the shell as well as ripping the open end, while a similar type of machine, built for a smaller class of shell, is illustrated in Figs. 2 to 4. In this case no ratchet feed gear is fitted. When facing the base greater accuracy in setting up is necessary, since the shell is turned and bored before this operation. To facilitate this setting up, a ring hollowed out cone-shaped is fixed at the back end inside the hollow spindle. The nose of the shell fits into the cone and the back end of the shell is thus automatically centred. A drawback screw is used to pull the shell into the cone.

For facing and boring the nose, the



FIGS. 2 TO 4. DETAIL OF MACHINE FOR TRIMMING MEDIUM SIZE SHELL.

machine takes the form illustrated in Figs. 8 to 10. As will be seen, the principal modification introduced is the fitting of the kicker feed gear on to the



FIGS. 5 AND 6. MACHINE FOR TRIMMING LARGE SHELL.

longitudinal traverse instead of the cross traverse. The boring is of course the main part of this operation, the facing being a small job which can easily be carried out with the hand feed. To facilitate centring in this case a cone is fitted inside the hollow spindle, on to which the bored-out open end of the shell fits, so that the back end of the shell is automatically centred.

The lathe for the internal screwing of the base end of base adaptor shells is il-

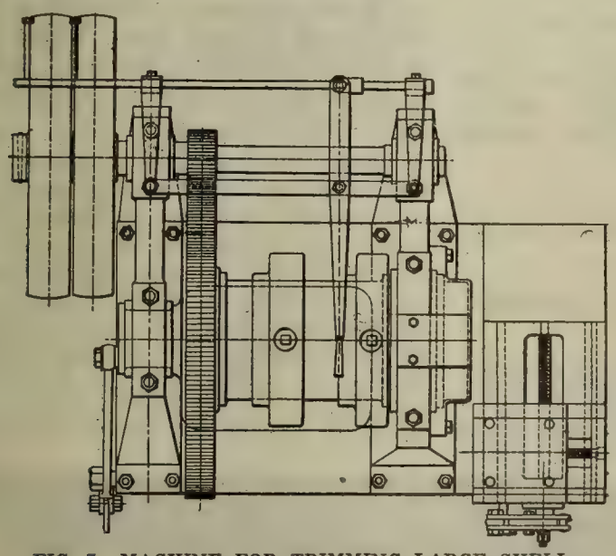


FIG. 7. MACHINE FOR TRIMMING LARGE SHELL.

lustrated in Figs. 11 to 14. The construction in this case is a little more complicated, but the machine in its main lines remains the same. The tool rest, instead of being bolted to the bed, is arranged to slide, and is operated by a leading screw driven by a train of wheels in the usual way. On the pulley spindle there are two pinions of different sizes, one or other of which may be thrown into action by a dog clutch. One of the pinions drives the main spindle through an idle wheel, and the other drives it direct. The result of this is that as the clutch is thrown over the direction of rotation of the main spindle is reversed.

A special feature of the machine is that the nut which traverses the slide rest is solid, and is always in position on the leading screw, so that it is impossible to get the rest out of pitch with the thread which is being cut, as might be possible were a split nut used. This point is an important one, as the lathes are operated entirely by unskilled labor.

If it is desired that the slide should remain at rest, the leading screw-driving train is thrown out of action by a lever, which can be seen at the front of the machine at the left-hand side. A square turret is fitted, and four tools are required to carry out the full operation which the machine has to perform. They consist of recessing at the back end of the thread, counter-boring, screw-cutting and chasing. With the different-sized pinions on the pulley shaft, the machine runs at different speeds in the two directions. The quick speed is used only for traversing the tools into position, and all cutting is done on the slow return. This machine, as well as the others described, has proved very satisfactory in the hands of girls.

Two other details used in connection with this Vickers' lathe are illustrated in Figs. 15 to 17, and Figs 21 to 23. The first of these devices is an ingenious and simple screwing attachment for cutting the thread in the base of shells with screwed baseplates. This appliance is self-contained, and is held in the tool rest. It consists of a pair of levers which can be brought together, or moved apart, by a toggle with a handle. One lever carries a half-nut which gears with a thread cut on the outside of the nose of the main hollow spindle of the lathe, while the other carries a chaser which cuts the thread in the shell base. The whole attachment is arranged to slide on a block attached to the tool rest. To use the device it is placed in position with the levers embracing the shell end; the toggle is then closed so that the half-nut engages with the thread on the spindle and at the same time the chaser comes in contact with the interior of the baseplate recess. The whole arrangement then travels along

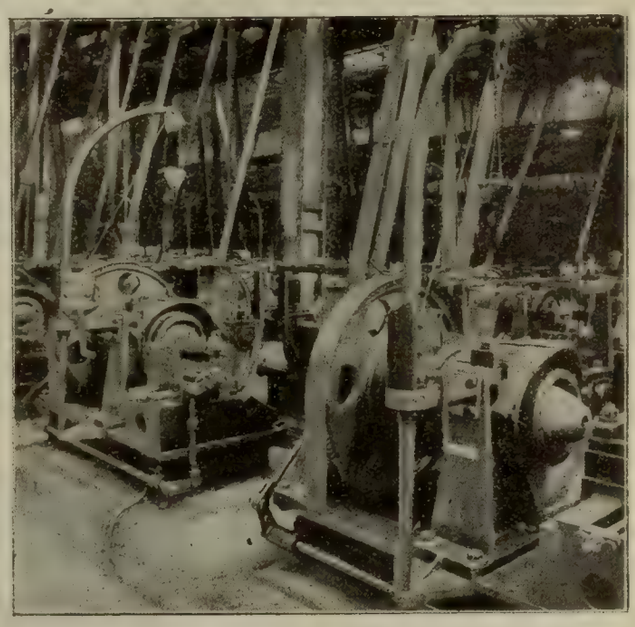
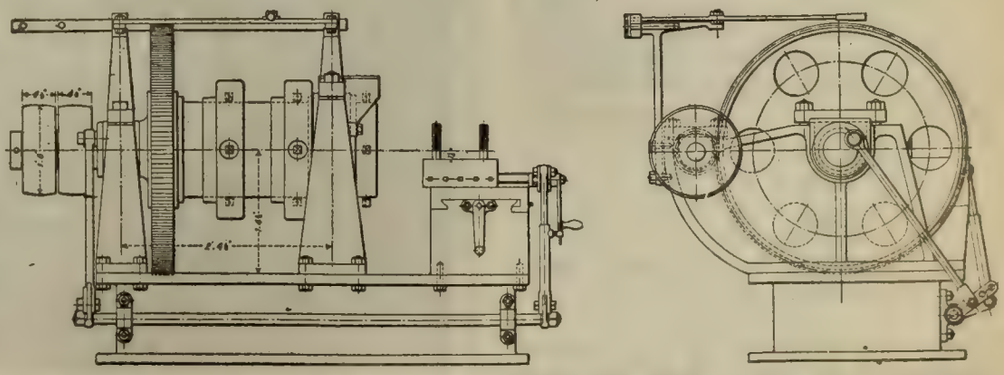
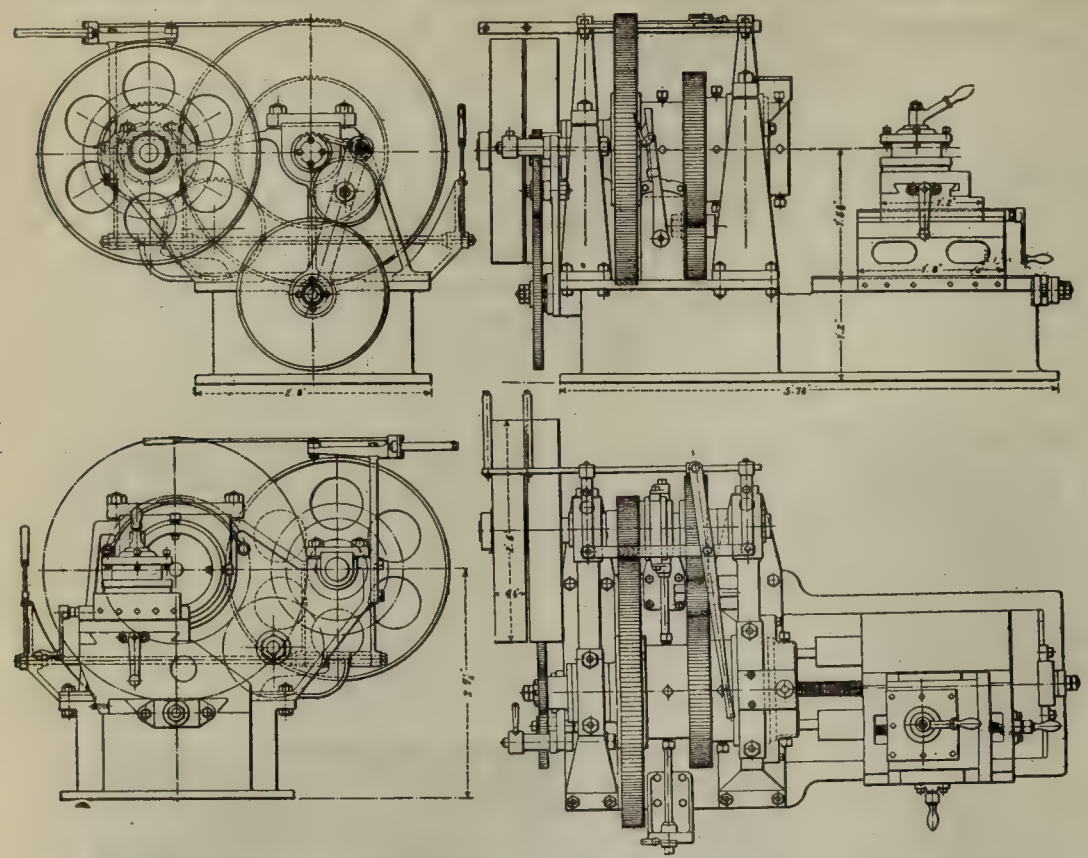


FIG. 8. LAYOUT OF MACHINES FOR FACING AND BORING NOSE OF LARGE SHELL.



FIGS. 9 AND 10. MACHINE EQUIPPED WITH SURFACE FEED GEAR FOR FACING AND BORING NOSE END OF LARGE SHELL.

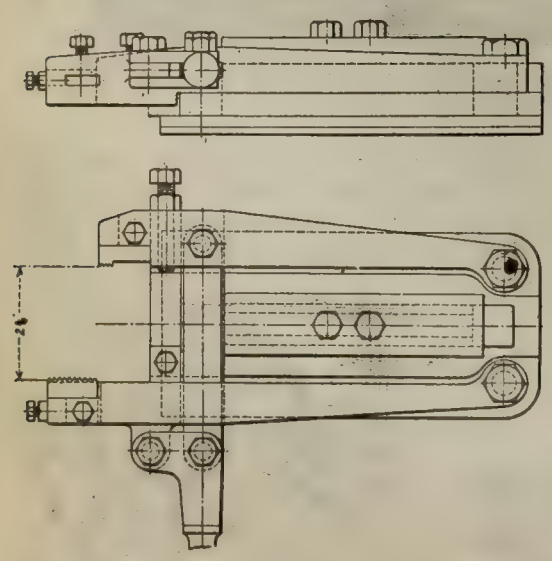
owing to the rotation of the lathe spindle and the engagement between the half-nut and the thread on the spindle nose, with the effect that the chaser produces



FIGS. 11 TO 14. MACHINE FOR INTERNAL THREADING OPEN END OF LARGE SHELL.

a thread of similar pitch on the shell. The depth of thread cut is regulated by the adjusting screw shown in Fig. 16. It will be clear that this device enables the base end of shells to be threaded in a simple non-screw-cutting lathe.

The other detail, Figs. 21 to 23, is a simple davit, which is attached to the front of one of the side frames of the lathe. It is fitted with a lifting drum having a ratchet detent. With this davit a girl can lift a rough 9.2-in. forging into a parting-off machine. These davits have mainly been introduced to reduce the work required from the overhead



FIGS. 15 AND 16. LARGE SHELL BASE THREADING ATTACHMENT.

cranes and to render the lathes largely independent of them. They have done much to increase output. The lathes illustrated in Figs. 1 and 8, are all fitted with them.

A similar device, employed in connection with lathes of a more ordinary type, is shown in Figs. 19 and 20. This is a crane with a swinging jib and fitted with the same type of lifting gear as

FIG. 17. LARGE SHELL BASE THREADING ATTACHMENT.

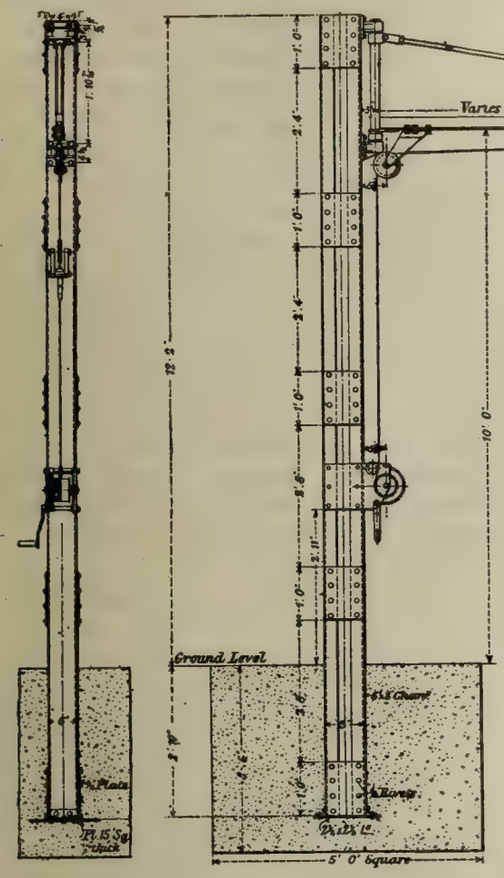
that just described. This crane is usually set to serve two lathes, swinging over one to feed that behind. There is no travelling monkey on the jib, the crane being so set that the shell being lifted swings exactly into the lathe centres, or chuck, as required. The lathes are, of course relatively so placed that the load comes where required for each of them. The crane post is usually set over a little out of the vertical, so that when not in use the jib swings inward and cannot be left standing out into the bay, where it might catch passing loads carried by the overhead travellers. These cranes are easily operated by girls.

Fig. 18, shows another lifting appliance which has proved of great service in handling the heavier classes of shell. As shown, it is fitted to serve a copperband press. The crane consists of a simple radial jib made from a joist. the inner end of the jib is carried by the ram of a vertical hydraulic cylinder. Guides and tension rods, which can be seen in the figure, guide and support the jib. The control is by a single valve, which puts the cylinder either to pressure or exhaust and causes the jib to rise or fall. A diaphragm is fitted in the exhaust to prevent too rapid descent. The monkey on the jib has no travelling gear. It is simply pulled along by pulling on the hanging shell or fall. The crane has proved speedy and convenient entirely in the hands of girls.

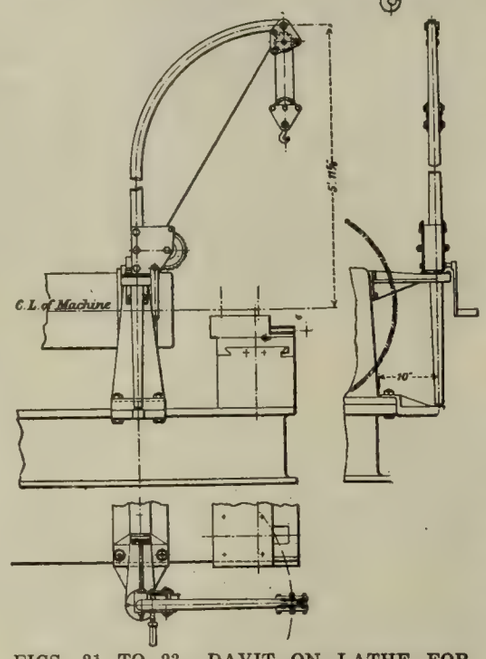
Fig 24, illustrates a vertical drilling machine of ordinary type. It has been introduced because a necessary adjunct to the lathe illustrated in Figs. 8 to 10. When machining the nose end of the shell in this lathe, no attempt is made to thread the hole for the reception of the fuse bush. This is done by tapping in a drilling machine as shown in the figure referred to. The work could be, and frequently is, done by chasing in an engine lathe, in which, of course, the boring and facing can also be done at the same setting. The advantage of the method described, however, is that, in addition to the simplicity of the lathe used, the tapping is a simple and speedy

FIG. 18. LIFTING EQUIPMENT AT COPPER BAND PRESS.

operation, easily carried out by unskilled labor and giving, with no difficulty, a fusebush hole correct to gauge. The amount of scrap made is also very small. —*Engineering.*



FIS. 19 AND 20. JIB CRANE FOR HANDLING LARGE SHELL AT LATHES.



FIGS. 21 TO 23. DAVIT ON LATHE FOR LIFTING SHELL.

BENZOL AND TOLUOL—RECOVERY FROM COAL GAS

BEFORE the war, not even the gas engineer himself realized what a power his industry constituted in the direction of the provision of those ingredients essential to the production of modern explosives. Even now, few beyond the confines of the industry appreciate fully that it is to the gas works and kindred establishments that we owe the unprecedented supplies of benzene and toluene now available, while the strides made in the production of synthetic phenol must not be overlooked nor the more recent call for concentrated ammonia liquor.

The importance of the light hydro-carbon oils obtained from gas (from which oils are, in turn, obtained benzene, toluene, and xylene), may be emphasized by a consideration of the products which may be obtained from or with the aid of the aromatic compounds. For instance, benzene is the source of nitrobenzene, aniline, and a host of drugs, while it is the basis of phenol as produced synthetically by the recently introduced and largely extended process. The phenol thus obtained is, again, the parent substance of the well-known explosive lyddite. Toluene, it need scarcely be pointed out, forms the staple ingredient for the high explosive T.N.T. (tri-nitro-toluene), while for other purposes it provides such substances as saccharin, oil of almonds, and benzoic acid. Xylene, too, is the basis of other forms of explosive.

Motor Spirit and Dyes

It may be questioned to what account these products can be turned when the prodigious demand for explosives has come to an end; but it will not be forgotten that some time before the war certain concerns were in evidence which proposed to treat coal under prescribed methods of low temperature carbonization in order to recover a maximum quantity of those condensable products from which could be obtained a supply of spirit suitable for the petrol engine. Without low-temperature carbonization, the idea of which by no means meets with general approval among gas engineers, the war has solved the question of motor spirit from coal, and it has solved it in such a manner that the gas works can increase (if extreme lengths are gone to), their output of spirit twentyfold without altering in the slightest degree the prevailing systems of carbonization.

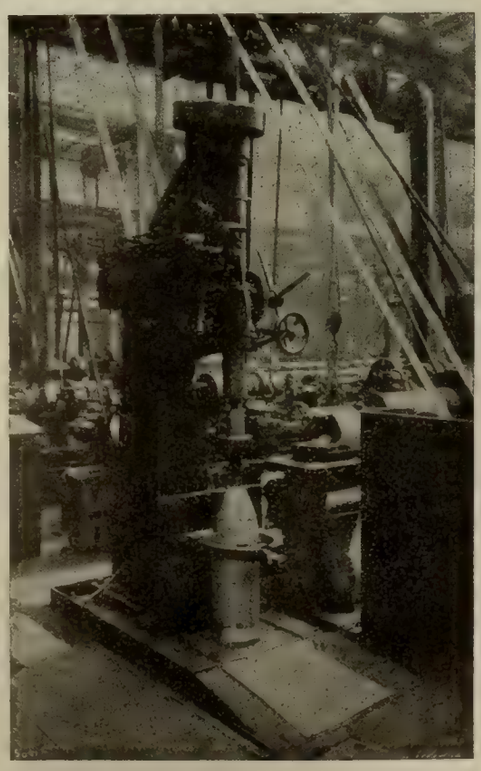


FIG. 24. DRILLING MACHINE FOR TAPPING FUSE BUSH HOLE.

It is only necessary to point out that were the whole of the gas produced in the United Kingdom completely "stripped" of its aromatic hydro-carbons there would result a yield of benzene products equivalent to nearly 40 million gallons per annum, whereas coke-oven establishments, which, by reason of the special purpose for which they exist, can practise the most thorough extraction, would contribute approximately another 60 million gallons. The importance of the whole question is, then, self-evident when it is remembered that after the war the annual consumption of motor spirit is not likely to exceed, at any rate for a time, some 150 to 170 million gallons. Owing to the serious and successful endeavors which are now being made for the recovery of the dye and kindred industries there will, of course, be a growing demand for benzene and toluene which form the basis of many such products.

Modern Gas Works Methods

The question of calorific power has a direct bearing on the ability of the gas works to increase the supply of light spirit. As ordinarily manufactured, coal gas contains from 3½ to 4 per cent. of those hydrocarbons from which luminosity is entirely derived. Of these compounds about one quarter consist of benzene and its homologues, that is to say, the benzene hydrocarbons in the gas amount to about 1 per cent. by volume. Before the introduction of means for recovering the benzene and toluene from the gas, the only available supplies (except in the case of many coke-oven works which have carried on stripping for some years) were those derived from the ordinary fractional distillation of coal and other tars.

In the early days of the war the exigencies of the situation were such that instant measures for increasing the output were demanded; and, as the provision of the necessary apparatus for most effective recovery of crude spirit from the gas would have entailed untold delay, temporary expedients were introduced which, though they could be regarded only as a makeshift, certainly relieved the situation until more productive processes could be installed.

As practised to-day the process of benzol recovery consists in subjecting the gas to thorough scrubbing with an absorptive medium consisting of creosote oil, or, more commonly, a special coal-tar distillate known as green oil, which is allied to ordinary anthracene oils. These oils possess a solvent affinity for benzene, toluene, and certain other low-boiling constituents of the gas, with the result that these hydrocarbons are washed out while the remaining constituents are unchanged. After passing in contact with the gas the oil, charged with the benzene hydrocarbons, is collected for treatment in a special recovery plant.

Recovery by Tar Washing

Fortunately when the demand for benzene and toluene first came to be realized it was found that ordinary gas tar could be employed as a washing agent, although its capabilities as a stripping medium are considerably inferior to those of the recognized green oil. The utilization of tar, however, meant a considerable saving in time, for there were few gas works of any pretension in which it was not found possible to set aside an existing scrubber for the purpose, the benzolized tar being afterwards delivered to the distiller as in the ordinary way. The following figures will prove instructive in that they enable an opinion to be formed as to the extent to which the temporary tar process relieved the situation. But, again, in the light of present-day developments it can be seen that the tar process must be looked upon as little more than an attempt to play with the question of benzol recovery:—

	Benzene	Toluene
	Lb. per ton of coal carbonized	
Originally obtained from tar	0.4	0.13
Recovered by tar-washing process	1.5	0.75
Recov'd by green oil methods	10.0	3.50

The figures for green oil given in the above table do not represent maximum recovery, but are merely indicative of the results which may be expected under normal gas works practice and as a result of which the quality of the gas would undergo no appreciable deterioration as regards calorific power. At the present time green oil extraction has extended to nearly all the larger gas works, and the quantity of crude spirit recovered varies in accordance with the quality of coal gas made and the extent of stripping deemed advisable, to from 1½ to 3 gallons per ton of coal. Thus, it is possible, but not generally expedient, to obtain, not a total of 13½ lbs. of benzene and toluene as shown above, but so much as 20 lbs.

The crude spirit contains on an average from 50 to 70 per cent. of benzol, 10 to 20 per cent. of toluene, and 1 per cent. of xylene, the difference consisting of certain light naphthas, some naphthalene, and tar acids. As the development of the process has progressed it has been found possible not only to increase the efficiency of extraction but to improve the quality of the product obtained, with the result that some of the later forms of plant have succeeded in turning out, with careful regulation, a crude spirit containing nearly 80 per cent. of benzol.

Recovery Plant

Nearly the whole of the plant required for the recovery of benzol and toluol is in connexion not with the washing of the coal gas, but with the treatment of the solvent for the separation of the crude spirit. In this direction the process is certainly economical, for the absorptive oil may be debenzolized and returned again into circulation with little, if any, loss. The benzolized oil, when sufficiently saturated, is passed through a series of heat interchangers, where its temperature is raised to some 55 deg. C. before passing into the preheaters. In these preheaters the oil is raised in temperature to about 115 deg. by means of a dry steam arrangement, and it then passes direct to the still. The still itself most commonly consists of a number of super-imposed cast-iron trays down which the oil splashes and up through which a small and carefully controlled jet of live steam is blown.

It is this steam which expels the light hydrocarbons from the oil, the benzol vapours passing away from a take-off pipe attached to the apex of the still, while the wash oil, freed from the hydrocarbons absorbed during the washing process, runs away from the base of the still, back through the interchangers where it gives up a portion of its heat to the inflowing benzolized oil, and passes finally through a combined atmospheric and water-cooled condenser. The cooled oil is then ready for further use in the absorption scrubber.

So far as the general run of gas works is concerned the operation of benzol and toluol recovery ceases here, and the crude spirit obtained by distillation is disposed of to those larger concerns which possess facilities for rectification. The quantity of wash-oil circulated amounts to anything from 40 to 60 gallons per ton of coal carbonized, but for maximum extraction the latter quantity must be looked upon as the minimum, while for maximum saturation recirculation of the oil in contact with the gas should be arranged.

In a brief review of the process, it is not possible to make mention of the host of practical points which require attention if the process is to run smoothly and with efficiency. The industry has now, however, the benefit of two years' experience, and it may be said that as each additional plant is erected some improvement is introduced. As a general rule it must be recognized that wrought iron or steel should be used very sparingly in the construction of the plant, particularly if the gas dealt with is not entirely freed from its ammonia. The majority of the most successful plants are at the present time almost solely built up from cast-iron, which seems to withstand satisfactorily any of the corrosive influences which are sure to be encountered. Water in the wash-oil is most strongly to be guarded against, for as the percentage of water increases so is there a proportionate loss in the efficiency of extraction. It is generally stipulated that the water content should not exceed 1 per cent.

Effect on the Gas

Gas as now supplied has its critics, but consumers who understand the true facts have no cause for the dissatisfaction. Those who make use of the incandescent burner have more to gain than to lose by the new conditions, for flame temperature—providing the proportion of incombustibles is kept low—is actually higher with partly stripped than with unstripped gas. Practical acquaintance with benzol recovery has shown that it is quite possible to reduce the normal 14-candle gas to eight or even six candles, although the process is never carried so far. The effect on calorific power, however, is comparatively trivial. For instance, recent experiments have indicated that the percentage loss is approximately as follows:—

Crude spirit extracted gas, per ton of coal.	Loss in Calorific Power.
2.1 gallons	4.5%
2.5 gallons	7.0%
3.0 gallons	8.0%

It is evident, then, that with what virtually amounts to complete extraction a normal gas of 550 B. T. U., per cubic foot would, after treatment, still possess a calorific power of well over 500 B. T. U., the standard which has as yet been stipulated for those undertakings operating under the new Calorific Power Act.—Times Engineering Supplement.

FERRO-CONCRETE SHIPS

A GOOD deal has recently been written with regard to the building of ships with ferro-concrete. Unfortunately, the subject has been shrouded in much mystery, and no serious attempts have been made to make a careful comparison between ferro-concrete and steel vessels. The advocates of ferro-concrete construction, whether they believe it or not, try to make it appear that ferro-concrete is a better material for building ships than steel. It undoubtedly has advantages, but it is not reasonable to expect that a material like ferro-concrete which, weight for weight, is much less strong than steel can possibly produce a ship which will carry as much dead weight per ton of its weight as a steel vessel. On the other hand, ferro-concrete is clearly cheaper per ton weight than steel.

Ferro-Concrete Ship Cheaper

As a financial proposition, therefore, the building of ferro-concrete barges reduces itself to this: a certain weight of cargo has to be carried in a ship or a barge, or taking the more elementary consideration, say a barge. It has been very well established that the weight of the ferro-concrete ship will be greater than the steel ship required to carry the same weight of cargo. On the other hand, since ferro-concrete is a cheaper

material than the steel, the ship constructed of the former might still be less expensive to build than the latter. Generally speaking, it may be said that the ferro-concrete ship will be cheaper. This then is a distinct point in favor of the new method of construction.

The Power Feature

There are, however, other things to be considered. Since the weight of cargo is the same in the two ships under comparison, and the weight of the new type of ship is greater, the total displacement of the ferro-concrete ship will be more than that of the steel ship. In consequence, she will require more power to drive her, or if she is towed, more power to tow her. This, however, is not so serious as it at first sight might appear.

It may be taken that the ferro-concrete ship is two-thirds as heavy again as a steel ship. This increase of weight, however, is much less when expressed as a fraction of the total weight of ship and cargo, and generally speaking would only be about 15 to 20 per cent. In towage work this would not be a very serious matter. It would, of course, be of far more importance in self-propelled vessels, especially if high speed was necessary.

It is thought by some that a ferro-concrete vessel could be made to stand up to its work in a seaway. This, however, is purely a matter of design and is entirely decided by the amount of reinforcement that is put into the concrete. All kinds of structures have been built of reinforced concrete, which have to stand stresses and strains, such as bridges, girders, warehouse floors, etc., as well as large water tanks. There are, of course, special things to be thought of in a ferro-concrete ship which do not arise in connection with land structures. Here, again, these are matters of design, and can only be settled by a competent naval architect.

STEEL FREIGHTER "ORLEANS" TAKING THE WATER.

A Practical Proposition

It may be taken that the ferro-concrete ship is a perfectly practical proposition, and one more argument in its favor at the present time is that it will carry a much greater weight of cargo on a given amount of steel than will a steel ship. With the present shortage of steel, this is of first importance. Whether the ferro-concrete ship will continue to be used after the war is over, when it may be assumed that the supply of steel will be more plentiful, is a matter for some speculation, but there would seem to be no reason why it should not.

To sum up, the ferro-concrete vessel costs less to build, and requires much less steel per ton of deadweight carried, and in addition, its cost of upkeep is small.—Liverpool Journal of Commerce.

STEEL FREIGHTER "ORLEANS" ON WAYS JUST PREVIOUS TO LAUNCHING.

FREIGHTER "ORLEANS" LAUNCHED

PUNCTUALLY at noon on August 2, the bulk freighter Orleans was launched from the Thor Iron Works, Toronto, under the direction of Louis Dahlgren, general manager of the plant. The launching was a great success, and was witnessed by a large and appreciative crowd, among whom were many well known marine men, engineers and captains of industry. The christening ceremony was performed by Mrs. Stewart Playfair, who was presented with a bouquet of roses by the builders and a jewelled pendant by James Playfair. Among the guests present at the ceremony were: Mr. and Mrs. James Playfair, Mr. and Mrs. Stewart Playfair, Mr. and Mrs. Louis Dahlgren. Mr. and Mrs. Frank Barber, Col. J. B. Miller, Hugh Calderwood, R. A. Barber, George McKellan, John G. Kent, E. S. Cousins, W. Newman, Capt. Winstrup, Capt. J. B. Foote, Capt. Nillson, H. G. Kelly, Allan Scott, H. Langlois, J. B. Kilgour, Mrs. Charles Lee, Martin McCarron and Miss McCarron, W. W. Watson, John E. Russell, J. W. Woods, Mr. Reid, Col. Duff, F. C. Brunke, Mr. and Mrs. Kendall, Mr. Norman B. Gash, K.C., Harry T. McMillan, A. E. Gilverson, Prof. and Mrs. Treadgold, Mrs. Geo. McLeod, M. R. Gordon, Grant Gordon, Stanley McConnell, Geo. A. Mitchell, Ald. Donald C. MacGregor, John A. Montgomery, D. L. White (Midland), Fred. Hand, Capt. Wm. Evans, E. A. Mathews, Wm. J. Sheppard (Waubaushene), T. B. S. Benson, John G. Gwynne, Lloyd's surveyor; J. M. Wilson, A. G. Webster and many others.

The Orleans was originally ordered for the Great Lakes Transportation Co., of Midland, Ont., but was sold to the Oriental Navigation Co., of New York and Nantes, France, the latter being the port of registration. She has been built under Lloyd's special survey and classed 100A1, with carrying capacity of 4,300 tons. Length o.a. 261 ft.; breadth 43 ft. 6 in.; depth, 28 ft. 2 in.

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COAL VERSUS WOOD FUEL

By D. Street

THE rising cost of coal, as well as of other articles of all kinds necessary to industry has turned the attention of many users of coal to the possibilities of wood, and if the change is made from one class of fuel to the other certain necessary conditions must be carefully observed. The chemical composition of wood, when dried to 140 deg. Fahr. varies very little indeed, and the constituent parts of the various woods are as follows:—

FOR COAL VS. WOOD.

	Carbon	Hydrogen	Oxygen	Nitrogen
Beech	48.98	6.07	43.11	0.93
Oak	50.64	6.03	42.05	1.28
Birch	50.61	6.23	41.04	1.12
Aspen	50.31	6.32	42.39	0.98
Willow	51.75	6.19	10.98	0.98

The first three are hard woods, weighing about 50 lbs. per cubic foot, whilst the latter woods weigh about 35 lbs. so that the reputation of the heavier woods for producing more heat must arise from their greater density and smaller capacity for holding water. Their carbon and hydrogen content, per pound, is very much alike. The ash left by wood when completely burned varies from ½ to over 3 per cent.

Moisture in Wood

Wood, when felled, contains from 20 to 50 per cent. of water, and seldom even after storing has less than 15 per cent. while if brought during the rains it may have very much more. A purchaser should therefore be very careful to ascertain the amount of water in his fuel to adjust the price properly. Wet wood, when burnt by raising half of its weight in steam that passes uselessly into the chimney, may make a very unsatisfactory fuel. The amount of moisture in a supply of wood fuel may be ascertained by splitting several logs through the middle and planing an equal quantity of shavings from each. Mix the shavings and select a one pound sample to be dried in the air until it ceases to lose weight, and another pound to be dried carefully above the boiler, noting the temperature of the air among the shavings and weighing. The experimenter will then be able to ascertain the percentage of moisture in the wood when air-dried and stove-dried. In England dry wood is worth, for the purpose of steam raising, half its weight in English coal having only 5 per cent. of ash, but when the ash in coal amounts to 22 per cent, the ratios of value are considerable altered in favour of wood.

Much depends on the way in which wood is burnt. If used in large pieces there will be considerable spaces between them, and the total amount in the state of combustion will be reduced. There may also be an excess of air drawn through the fire. The fire bed, when wood is used, is more difficult to manage, and for the control of the draught it is well to have a door on the ashpit. When using wood fuel it is desirable to have the means of cutting it up cheaply into pieces of such a size as may be fed easily into the fire and properly managed for burning. A Cornish boiler has a more convenient furnace for wood burning than a Lancashire one on account of the greater size of the furnace flue and greater flame space, but an exterior furnace may be built to greater advantage for room, and is largely used in countries where wood is the only fuel obtainable.

BRIQUETTED COAL AND COKE

By O. C.

THE utilisation of small coal by mixing it with pitch and compressing the mixture into briquette form has been carried on for many years, but not so extensively in this country as on the continent, where much of the surplus pitch from English gas-works was formerly shipped for that especial purpose. In Britain the industry is confined chiefly to the South Wales coalfield, which produced in 1914, 1,600,000 tons, of briquettes out of a total British Production of 1,840,000 tons. Ninety-six per cent. of the coal briquetted was small Welsh steam coal. In briquetting the coarsely ground coal is dried, mixed with 6.5 to 8 per cent., of its weight of pitch, passed through a disintegrator, thence to a heater to soften the binder, and on to the briquetting machine.

Of more recent date is the application of the briquetting process to coke, and more particularly to the small waste which accumulates at gasworks, and is of little value. The method of use is of considerable importance at present, because, with the increased production of tar and the closing of the Continent to the shipments of pitch, this material is accumulating at most works, and the use of a portion to assist in converting the unmarketable coke into a fuel of the selling value of $3.00 per ton is a double economy. In his recent Harvard lecture on "Coal and its Economic Utilization," delivered before the Royal Society of Arts, Professor Brame gave an account of a coke briquetting plant installed at Smethwick Gasworks over a year ago, which has proved very satisfactory. In manufacture the coke dust is graded to pass a ¼-inch mesh sieve, and is mixed with 8 per cent. of pitch, this mixture being fed to the disintegrator. In the heater a little tar is added, and the hot mass briquetted at 6 tons pressure.

At Smethwick the plant relieves the works of about one-sixth of the pitch made. If then coke breeze were also briquetted, one-third of the pitch could be utilised. The briquettes are suitable for closed stoves, ranges, etc., and form the only boiler fuel used at the works. For the usual open grate the draught is insufficient to burn them without a proportion of ordinary coal.

STEEL IN REINFORCED CONCRETE WORK

By L. E.

Since reinforced concrete has been used in the British Isles., it has been customary to employ plain round mild steel bars but in a recent paper on the subject the author endeavoured to prove that plain, mild steel bars are not the best for this purpose. Arguments were brought forward to show that greater efficiency and economy is obtained by physically developing mild steel bars, for the purpose of taking out the first yield in the steel, which is useless and has a detrimental effect on the concrete. When this first yield or stretch is taken out, a higher yield point is obtained without any injury to the steel, so that it is safer to employ a stress of 20,000 lbs. per square inch (which results in a saving of 20 per cent. in the weight of steel required) than it was to employ a stress of 16,000 lbs. per square inch, before the steel was physically developed.

FLOW OF STEAM THROUGH A GIVEN ORIFICE.

By N. G. Near.

NAPIER'S formula is well known the world over in engineering circles as a "pretty good one" for determining the flow of steam through an opening into the atmosphere. It may be applied nicely to finding the weight of steam used by a steam jet blower such as is often used for inducing draft in the chimney or for forcing air through the grates directly. In other words, where the drop in pressure is great, Napier's rule is excellent.

I have often related my experience with Napier's formula, which is sometimes doubted; but it is absolute truth. I measured the diameter of an orifice to to the hundredth of an inch by simply applying this rule, and I had never so much as seen the orifice until after my computations were all made. I weighed the

water condensation from the steam that passed through the orifice and then determined the diameter of the orifice "backwards". The diameter was 0.16 of an inch. This is the formula

$$W = \frac{P\ A}{70}$$, where W=the weight of steam passing through the orifice per second in pounds.

P=the absolute steam pressure in pounds per square inch.

A=the area of the orifice in square inches.

It is therefore evident that it wasn't much of a trick to use the formula backwards after knowing P and W.

This little chart is based on that formula. It gives the weight of steam flowing through the orifice per hour instead of per second (see column B.).

To show how the chart is used let us take an example:—"Where the area of the orifice is .07 sq. in. and the steam pressure is 100 lb. per sq. in., how many pounds of steam flow through per hour?

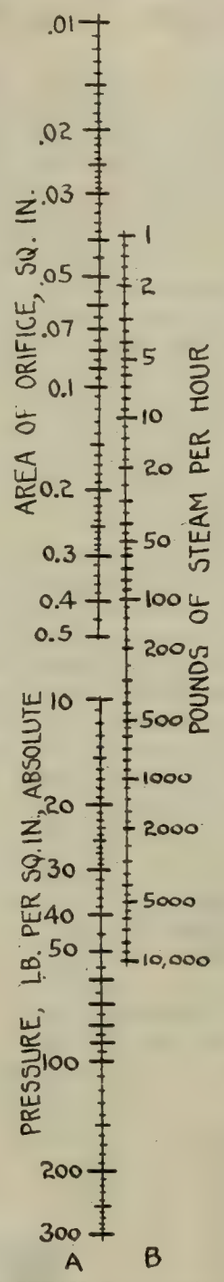
Find the .07 in column A and the 100, also in column A. Then find the point midway these two figures. Directly opposite the mid-point is the answer, 360 pounds per hour.

It is a simple matter to find the mid-point. If you have a slip of paper handy just lay it alongside the scale and double it between the two points. Get the idea? The mid-point is at the crease, exactly. You can't beat the method with the finest pair of proportional dividers made. Of course, if you have a pair of dividers handy, use them, or use a ruler. There are many ways in which a line can be bisected but some of them are easier than others. What we all want, always, is the easiest way.

Again, should it be desired to find the area of orifice necessary to carry away 360 pounds of steam per hour with a steam pressure of 100 lb. per sq. in., you would go at it in the "opposite" manner. Find the distance from the 100 (column A) to the 360 (column B), and then measure upward that self-same distance from the 360. The answer, of course, is .07 sq. inches, pound in column A.

Another application of this rule or chart is to the soot blower. It will tell at a glance the weight of steam used per hour in blowing soot. From the result one can easily compute the cost of steam for soot blowing. That is a subject that has scarcely been discussed, if at all. Have you ever thought of it? Why not use the chart or formula once in a while, here and there, and determine a few of your costs? Maybe they are more than you have estimated off-hand and maybe they are less.

Further, maybe you have a lot of leaky pipes in the plant. Maybe you have some cracked valves here and there which are purposely cracked to carry away the condensed steam. Maybe you feel that cracked valves are cheaper than a good steam trap. There are hundreds of ways, almost, which this chart can be used in and around a steam plant. Steam is expensive these days. It is growing more expensive right along. It should therefore be studied a bit more carefully. No harm can result from knowing the aproximate cost of every little operation where steam is used.



FLOW OF STEAM THROUGH A GIVEN ORIFICE.

BRITAIN'S MUNITIONS SUPPLY

IN the course of a review of the work of the Ministry of Munitions by Dr. Addison in the House of Commons, July 28, it was stated in regard to explosives that the capacity was now four times that of a year ago, and twenty-eight times that of March 1915. The shell supply, both in quantity and quality was adequate—in spite of the enormous expenditure during the last few weeks the stock of filled shell had only been reduced seven per cent., and premature bursts were almost negligible. "Tanks" of various types were under constant construction and development, and motor transport facilities were so great now that considerable help was being extended to the Allies in this respect.

Overseas munitions supplies had been received with gratifying regularity, losses due to submarine activities being only 5.9 per cent. of consignments.

Yearly steel production in Britain is expected to reach 12,000,000 tons by next March—it is now 10,000,000 tons as against 7,000,000 tons three years ago. An interesting point in this respect was the expected increase of 1¾ million tons due to the utilization of home ores in the making of basic steel. Gun ammunition costs had been reduced so as to effect of saving of over $200,000,000 on the year's bill for these supplies alone.

SEPARATING FINE GUN AND WHITE METAL BORINGGS.

A NEW method for separating fine gun metal and white metal borings has been perfected by the chief chemist of New South Wales Railway Department. The old method was by liquation on an iron plate or in a furnace, which was satifactory for coarse borings, but quite useless for fine grades. The problem of the removal of the white metal in the fine borings has been solved. The small borings are passed to a magnetic separator, picked up by a revolving belt fitted with pockets, and conveyed to an overhead bin, whence they gravitate to classifiers and are separated into three grades. From bins 1 and 2, containing the coarser material, the borings gravitate to a short revolving belt, fitted with pockets, and are delivered into a bin above the furnaces. These furnaces are made of iron tubes, one fitted inside the other. The outer one, being several inches larger in diameter than the inner, is supported by means of brackets to the floor and carries in the intervening space between the two tubes a coil of iron pipe, with suitable sized perforations for heating the walls of the inner tube with gas. The inner tube revolves and the hot borings and liquid white metals pass into revolving screens, smaller in mesh than the last classifier, and the liquid white metal escapes through the screen into an outer surrounding vessel, heated by a gas coil. In this way the white metal does not cool, but collects at the bottom and can be run into molds. The clean borings pass along the screen on to a hand truck on wheels and are taken to the foundry, melted, and used for ordinary gun metal castings. Each grade is treated separately.

Good nature will often keep a plant running smoothly and cool when good oil will not.

There is more than one way of getting an education. Preserving and reading catalogues is one way.

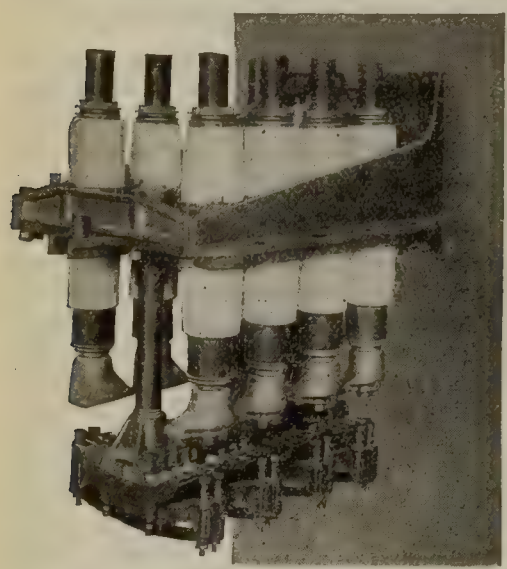
The horsepower of an engine may be increased within the working capacity of the reciprocating parts by increasing the speed or by increasing the steam pressure.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

NEW TYPES OF OIL CIRCUIT BREAKERS

TO its line of type B oil circuit breakers, the Westinghouse Electric & Mfg. Co. of East Pittsburgh, Pa., has added the two types of breakers illustrated. These are designated as type B-2 and B-3; they are for use on alternating current circuits up to 23,000 volts. Type B-2 breakers have a carrying capacity of from 300 to 2,000 amperes; type B-3 of from 300 to 1,200 amperes. Distinctive features of this line are rigidly clamped porcelain pillar bushings, self-cleaning butt brush contacts, auxiliary arcing contacts and spring-accelerated opening. Due to careful design, these are the most compact single-frame breakers produced.

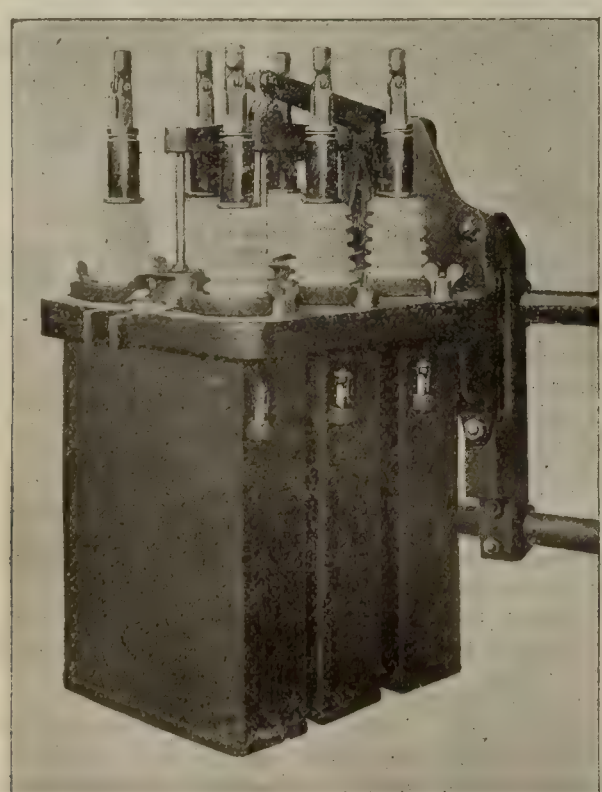


OIL CIRCUIT-BREAKER ARRANGED FOR WALL MOUNTING.

Type B-2 breakers are furnished for panel-mounting, hand operation, or for wall or pipe-frame mounting, electrical operation. Type B-3 breakers are furnished for wall or pipe mounting only, for hand operation through bell cranks, or for electrical operation. For both types, tripping may be either automatic or by hand. Hand-operated breakers are actuated by a handle projecting through a cover-plate on which is mounted the automatic trip coil (if any). When the breaker is electrically operated, the trip coil is mounted on the face of the panel. Remote control breakers operated by bell cranks and rods are provided with a spring to assist the force of gravity in opening. A dashpot brings the moving parts to rest without shock.

When pressure is brought to bear on the main contracts, as the breaker closes, the bent copper leaves of the moving members wipe across the plane stationary contacts, thus ensuring a solid metal-to-metal contact. Arcing contacts consist of a copper-tipped spring plunger mounted on the moving element, which bears on a copper stud on the fixed element. Since this contact is outside the main contacts, the arc is forced away from the latter. Full rated current can be carried by the circuit breakers continuously with a maximum temperature rise of conducting details of 30 deg. C., above atmosphere; of coils, 50 deg. C., and of all other parts not greater than 50 deg. C.

Tanks are of lap-welded sheet steel, lined with micarta and allow ample space for oil and air above the contacts. Type B-3 breakers are provided with specially designed baffled vents. These circuit-breakers are furnished for single-throw service only. Where double-throw service is required, two breakers are arranged to interlock so that they cannot be closed simultaneously.



OIL CIRCUIT-BREAKER ARRANGED FOR PIPE MOUNTING.

The following other auxiliaries can be furnished:

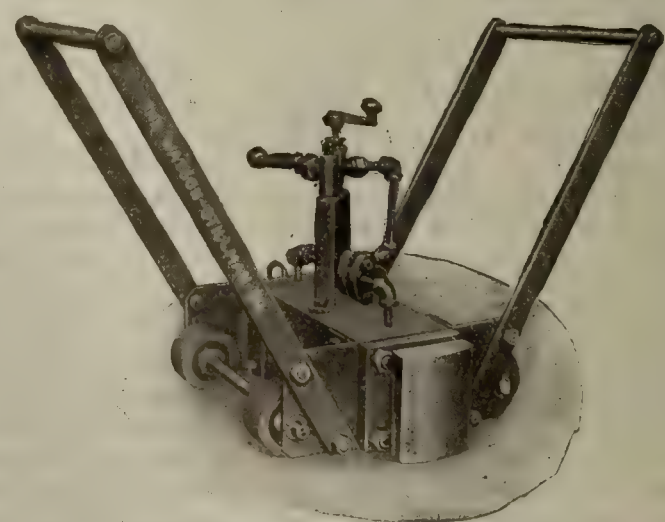
For hand operated breakers, undervoltage trip device of the self-resetting type; underload trip; shunt or overvoltage trip; signal switches for use in connection with signal lamps, bell alarm attachment, mechanical interlocks for interlocking a pair of breakers; and for automatic hand operated breakers, inverse-time element dash pots and direct-trip attachments.

HYDRAULIC BENDER FOR SHIP FRAMES

A NEW design of bender for handling heavy steel shapes for ship frames, deck beams, etc., has just been brought out by the Watson-Stillman Co., New York. It is compactly arranged and is built as light as is consistent with the work it is intended to do.

The machine consists of a cylinder, ram and operating valve, mounted on broad rollers, with a handle on each side so that it can be moved quickly to the required positions on the bending slab, thus making it possible to bend long members to template without reheating and with a minimum of labor.

The necessary resistance of the cylinder is obtained by means of a loose pin which fits into the holes in the bending slabs and serves as an abutment for the machine. The ram is double acting, and its movement is under perfect control at all times, both forward and returning; provision is also made to prevent overstroke.



HYDRAULIC BENDER FOR SHIP FRAMES, BEAMS, ETC.

As illustrated, the machine is equip-

ped with a screw stem stop and release valve; a single lever operating can, however, be furnished if preferred. Any suitable pump can be used as a source of power supply, although accumulator service is preferable. The movement of the machine as shown is at right angles to the axis of the ram, but can also be arranged parallel to it.

The stroke of the ram is 10 in., and with a working pressure of 1,500 lbs. per square inch exerts a force of 18 tons, which can be increased to 20 tons, with 1,750 lbs. per square inch. The weight of the apparatus is 750 lbs.

FOUNDRY AND MACHINE SHOP EQUIPMENT EXHIBITION

THE list of firms who had reserved space up to July 31 for the Foundry and Machine Shop Equipment Exhibition, from September 25 to 28, is both large and important, and gives every indication that when the opening date is reached there will be found in the Mechanics' Building, Boston, Mass., the biggest and most valuable display that has yet taken place in the history of the Institution. The list of reservations follows:—

Abell-Howe Co. .....Chicago
Ajax Metal Co.....Philadelphia, Pa.
Albany Sand & Supply Co.....Albany, N.Y.
American Foundry Equipment Co..Cleveland, Ohio
American Gum Products Co.....New York
American Lighting Co.....Chicago
American Molding Machine Co..Terre Haute, Ind.
American Pipe Bending Mach. Co..Boston, Mass.
Arcade Mfg. Co.....Freeport, Ill.
Armstrong Cork & Insulation Co..Pittsburgh, Pa.
Atkins & Co., E. C. .....Indianapolis, Ind.
Athol Machine Co. .....Athol, Mass.
Ayer & Lord Tie Co.....Chicago

B. & B. Mfg. Co. .....Indianapolis, Ind.
Beaudry & Co., Inc.....Boston, Mass.
Berkshire Mfg. Co. .....Cleveland, Ohio
Besly & Co., Chas. H. .....Chicago
Birkenstein & Sons, S.....Chicago
Blystone Mfg. Co.....Cambridge Springs, Pa.
Brass World Publishing Co.....New York
Bridgeport Safety Emery Wheel Co.
Bridgeport, Conn.
Brown Specialty Machinery Co.....Chicago
Buckeye Products Co.....Cincinnati, Ohio
Bullard Machine Tool Co.....Bridgeport, Conn.

Carborundum Co.....Niagara Falls, N.Y.
Cataract Refining & Mfg. Co.....Buffalo, N.Y.
Chase, Frank D. .....Chicago
Champion Foundry & Machine Co.....Chicago
Chicago Pneumatic Tool Co.....Chicago
Chisholm-Moore Mfg. Co.....Cleveland, Ohio
Cincinnati Pulley Machinery Co..Cincinnati, Ohio
Clark, Charles J. .....Chicago
Cleveland Blow Pipe & Mfg. Co..Cleveland, Ohio
Cleveland Milling Machine Co....Cleveland, Ohio
Cleveland Pneumatic Tool Co.....Cleveland, Ohio
Coale Lumber Co., Thos. E.....Philadelphia, Pa.
Curtis Pneumatic Machinery Co....St. Louis, Mo.
Cutter & Wood Supply Co.....Boston, Mass.

Davis-Bournonville Co. .....Jersey City, N.J.
Debevoise-Anderson Co. .....New York
Dixon Crucible Co., Joseph.....Jersey City, N.J.
Drouve Co., G. .....Bridgeport, Conn.

Federal Foundry Supply Co.....Cleveland, Ohio
Felt & Tarrant Mfg. Co. .....Chicago
Forbes & Myers .....Worcester, Mass.
Foreign Crucibles Corporation.....New York
Foundry Equipment Co.....Cleveland, Ohio

Gardner Machine Co.....Beloit, Wis.
General Electric Co. .....Schenectady, N.Y.
General Fire Extinguisher Co.....Providence, R.I.
Goldschmidt Thermit Co. .....New York
Great Western Mfg. Co.....Leavenworth, Kan.

Harrison Supply Co.....Boston, Mass.
Hauck Mfg. Co.....Brooklyn, N.Y.
Herman Pneumatic Machine Co..Pittsburgh, Pa.
Hill, Clarke & Co.....Boston, Mass.
Hoevel Manufacturing Corporation.....New York
Holz, Herman A. .....New York
International Molding Mach. Co.....Chicago
Iron Age, The .....New York

Jennison-Wright Co. .....Toledo, Ohio

Kellogg, Spencer, & Sons, Inc.....Buffalo, N.Y.
Kelly, T. P., & Co., Inc.....New York
King, Julius, Optical Co.....Chicago
Lees-Bradner Co. .....Cleveland, Ohio
Lupton's Sons Co., David .....Philadelphia, Pa.
Lynd-Farquhar Co. .....Boston, Mass.
McCrosky Reamer Co.....Meadville, Pa.
McLain's System, Inc.....Milwaukee, Wis.
MacLean Publishing Co. .....Toronto, Ont.
Malleable Iron Fittings Co. .....Brantford, Conn.
Metal Industry .....New York
Michigan Smelting & Refining Co..Detroit, Mich.
Midland Machine Co. .....Detroit, Mich.
Moltrup Steel Products Co. ....Beaver Falls, Pa.
Monarch Engineering & Mfg. Co..Baltimore, Md.
Mott Sand Blast Mfg. Co. .....New York
E. H. Mumford Co.....Elizabeth, N.J.
Mumford Molding Machine Co.....Chicago
Mahr Mfg. Co. .....Minneapolis, Minn.

National Engineering Co.....Chicago
New England Coal & Coke Co.....Boston, Mass.
New Haven Sand Blast Co....New Haven, Conn.
Wm. H. Nichols Co.....Brooklyn, N.Y.
Norma Co. of America.....New York
Norton Co. .....Worcester, Mass.

Obermayer Co., S. .....Chicago
Osborn Mfg. Co. .....Cleveland, Ohio
Oxweld Acetylene Co. .....Newark, N.J.

Pangborn Corporation .....Hagerstown, Md.
Paxson Co., J. W.....Philadelphia, Pa.
Penton Publishing Co. .....Cleveland, Ohio
Pickands, Brown & Co. .....Chicago
Pittsburgh Crushed Steel Co.....Pittsburgh, Pa.
Portage Silica Co. .....Youngstown, O.
Pridemore, Henry E., Inc.....Chicago
Quigley Furnace Specialties Co.....New York
Railway Mechanical Engineer .....New York
Richey, Browne & Donald, Inc....Maspeth, N.Y.
Rivett Lathe & Grinder Co. .....
Brighton, Boston, Mass.
Robeson Process Co. .....New York
Rogers, Brown & Co.....Cincinnati, Ohio
Sand Mixing Machine Co.....New York
Shepard Electric Crane & Hoist Co. ..
Montour Falls, N.Y.
Simonds Mfg. Co. .....Fitchburg, Mass.
Sly Mfg. Co., W. W.....Cleveland, Ohio
Smith & Sons Co., R. P. .....Chicago
Smith Co., Warner G. .....Cleveland, Ohio
Standard Equipment Co.....New Haven, Conn.
Sterling Wheelbarrow Co.....West Allis, Wis.
Strong, Kennard & Nutt Co.....Cleveland, Ohio
Sullivan Machinery Co.....Chicago
Thomas Iron Co. .....Boston, Mass.
Titanium Alloy Mfg. Co. ....Niagara Falls, N.Y.
United States Graphite Co.....Saginaw, Mich.
U.S. Molding Machine Co.....Cleveland, Ohio
United States Silica Co. .....Chicago
Wallace & Co., J. D.....Chicago
Warner & Swasey Co.....Cleveland, Ohio
Wheeler & Holcomb Co.....Chicago
White & Bro. .....Philadelphia, Pa.
Whitehead Bros. Co.....Providence, R.I.
Whiting Foundry Equipment Co.....Harvey, Ill.
Woodison, E. J., Co. .....Detroit, Mich.
Wood's Sons Co., T. B. .....Chambersburg, Pa.

Moulding Range Top Plate Query — We have experienced considerable trouble in moulding range top plates. The size of these plates is 20 in. by 22 in., weight 47 lbs., thickness of outer edge 3-16 in., inner part ⅜ in., with 1 in. flange on bottom all the way round at about ½ in. from the edge. There are also four braces across the bottom. Our trouble is to get a smooth surface on top for polishing. We have found better satisfaction in moulding it top side down. We pour the metal as hot as possible and at times get a very fair surface. At other times, however, we get a very rough or pebbly surface, and sometimes small slag holes. We are using No. 1 Albany sand and have tried a number of different styles of gates. We have also tried sea coal facing without securing the desired results. Suggestions as to remedy of the trouble are invited.—H. Z. F.

Screenings

Willis—"Bump has a very up-to-date office."

Gillis—"Yes. He has one of these office systems where you can find just what you want when you don't want it by looking where it wouldn't be if you did want it."

Mrs. Casey—"Me sister writes me that every bottle in that box we sent her was broken. Are ye sure yez printed 'This side up, with care on it!'"

Casey—"Oi am. An' for fear they shouldn't see it on the top. Oi printed on the bottom as well."

Did Not Wish To Offend—"John," said Mrs. Mellen to her man servant, "Can you find out, without asking the cook, whether the tinned salmon was all eaten last night? You see, I don't wish to ask her, because she may have eaten it, and then she would feel uncomfortable."

"If you please, ma'am," replied the man, "the new cook has eaten the tinned salmon, and if you was to say anything to her you couldn't make her feel any more uncomfortable than she is.

Sandy McNab, being a popular and well-known member of the village kirk, was asked by the minister to canvass the other members on behalf of a war charity he was interested in.

Soon afterwards the minister met Sandy walking irresolutely along the road, and at once guessed the cause.

"Man, Sandy," he said earnestly, "I'm sorry to see you in this state."

"Ah, weel, it's for the good of the cause," replied the deliquent quite happily. "You see, meenister, it's through these subscreeptions. I've been down the glen collectin' fun's, an' at every hoose they made me hae a wee drappie."

"Every house! But—but—but surely Sandy, there are some of the kirk members who are teetotallers?"

"Aye, there are; but I wrote tae those."

The man stammered painfully as he stood in the dock at the police court. His name was Sissons, and it was very difficult to pronounce.

He had had the misfortune to stay out late and make an uproar the previous night, so that he had to account for it before the magistrate next morning.

"What is your name?" asked the magistrate.

Sissons began to reply.

"Sss-s--s---s---"——

"Stop that noise and tell me your name," said the magistrate testily.

"Sss-sss-sss-ss"——

"That will do," growled the magistrate severely. "Constable, what is this man charged with?"

"Yer worship, I think he's charged with sodywather," replied the policeman earnestly.

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EFFICIENCY COMPARISON OF INDIVIDUALS.

THE term "efficiency" is becoming so commonplace that it is often difficult to determine whether its application and value are over-estimated or abused. Efficiency can seldom, if ever, be maintained at a certain fixed standard, even where the mechanical factors have an apparently pre-determined and unalterable rating. The useful work of any piece of mechanism must necessarily be of a variable character, dependent upon the changing conditions incidental to its operation and maintenance. In calculating the effective output of any machine, it is necessary to take into account the human factor, and this at best, will vary in different groups of workmen, besides having an individually fluctuating value.

In the manipulation of metal working units, the practice has been to speed up the actual cutting operations, made possible by the increased "efficiency" of the cutting tools and the better adaptation of the equipment upon which the work is performed. Viewed from the mechanical standpoint, this feature of modern engineering practice has more than held its place in the evolution towards maximum efficiency; but while the output of a certain machine may show exceptionally good records under the operation of one workman, the results from another workman, apparently equal in mechanical ability, may show a pronounced decrease. Close observation will possibly detect little difference in the time consumed in the actual machining operation, as once the tools are set and the machine working, the human factor is little more than a spectator; but it is the period of preparation between cuts and the necessary changing and setting of tools, feeds and speeds, that causes the fluctuations in the "efficiency" indicator.

It is often interesting to note the actions of two workmen employed on similar machines and performing the same operation. One man will apparently accomplish his purpose with little or no physical or mental effort, while the other will appear to be nervous and excited, wasting his energies in unnecessary and useless movements, in the hunt for tools and the setting of the same. Carelessness or thoughtlessness, or both, in many instances, is the root cause of the latter's inefficiency, as such workmen are often so occupied with the performance of the machine as to overlook the importance of the time that may be wasted between operations.

The standardizing of efficiency is probably an impossible undertaking but much could undoubtedly be accomplished towards this end by the shop management paying additional attention to such details as the installation of inexpensive accessory equipment, the arrangement of which would facilitate the production of the work by minimizing the time occupied by the unproductive but none-the-less essential preparation requirements. Individual machine tool racks, cupboards, belt shifters, change gear boxes, wrenches, etc., should, wherever possible, be placed in relatively the same position to the operator on each machine. Where no systematic method is adopted, each workman will arrange his surroundings to suit his own convenience, which in a large number of instances are haphazard and, in plants where changes are continually taking place, there develops the tendency to carelessness and untidiness. On the other hand, if the workshop is surrounded and otherwise infused with the atmosphere of neatness and regularity, the employes will naturally be influenced by the uplifting environment, and work in closer harmony with existing conditions. Men will readily adapt themselves to changed conditions especially if these are of a uniformly improving character, and by inaugurating a system that would lessen the tendency to habitual and unnecessary movement on the part of the operators, particularly on groups of similar machines, there would eventually result the establishment of a higher degree of both individual and therefore collective efficiency.

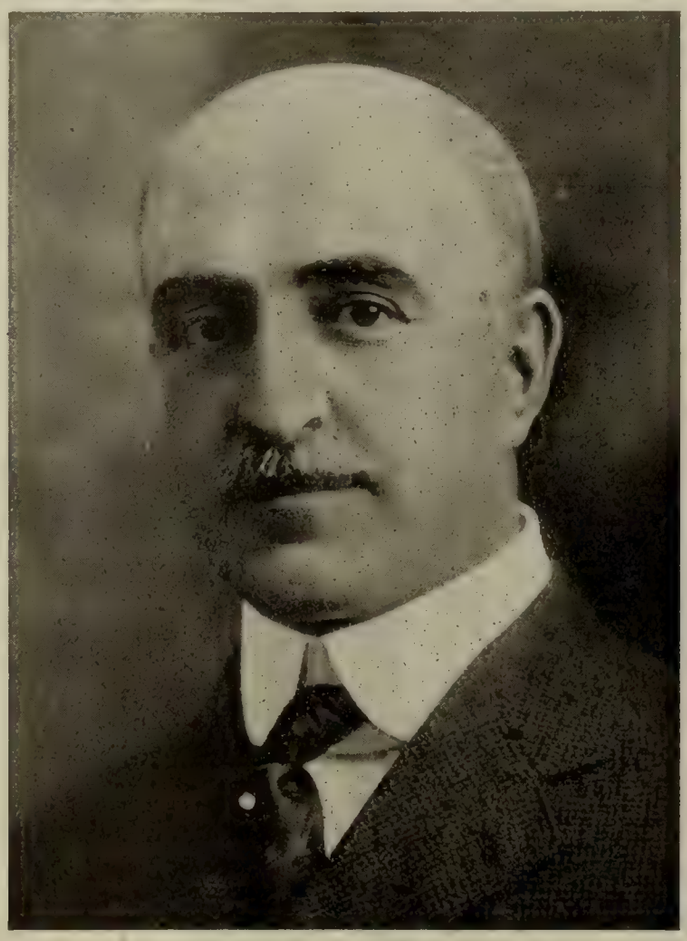
THE U.S. STEEL EMBARGO

ADVICE to the Canadian Government of date August 8, by the Department of Commerce, Washington, states that an embargo on steel for shipbuilding purposes will become absolutely effective on August 15, and that, thereafter, all iron and steel products leaving the United States must do so under special license. While it is not believed that the restraint will militate harshly as regards our munitions requirements, nor too much so against those of our steel shipbuilding programme, there is little doubt but that Canadian consumers of steel for general manufacturing purposes will be more or less hard hit. Due to our steel mills having their capacity output under contract to the Imperial Munitions Board, consumer requirements for other than war needs have for many months been dependent on United States mills.

Whether the very material reduction that has taken place and is still operative relative to the number of plants engaged in the machining of shell will extend to the activities of our steel mills as well at an early date, is not at the moment clear. When account is taken, however, of the fact that the U.S. steel embargo is expressive of that country's determination to utilize her resources to the fullest possible extent in the production of munitions and other war material, and that the enormous expenditure of shell in recent weeks in France and Flanders only reduced Britain's supply of filled shell by some 7 per cent., it is not improbable that at a quite early date not only will our shell industry as regards its machining feature have practically disappeared, but the steel requirements for shipment either as such, or as forgings, may have shrunk to somewhat insignificant proportions. Diagnose the situation as we may, conclusion that the ebbing of our shell industry has been gathering impetus since we drew attention to it three or four months ago, remains, and it will be the part of wisdom of those involved, to keep pace with it in one or other compensating direction. The lack of "bottoms" to carry our steel and finished shell products across the ocean should, in addition, not be overlooked.

INDUSTRIAL NOTABILITIES

THOMAS PALMER HOWARD, managing director, Phoenix Bridge & Iron Works, Ltd., Montreal; vice-president, Structural Engineering Co., Ltd., Montreal; director, Canada Envelope Co., Ltd., Montreal; 2nd vice-president, Canadian Manufacturers' Association, 1917-1918, was born and educated at Montreal, Que. He was born Aug. 17, 1869, son of Capt. Thomas and Gertrude Howard, and received his education in High School and Montreal Business College.



THOMAS PALMER HOWARD.

His business career commenced in 1886 when he entered the service of the Grand Trunk Ry. Co.; at a later date being with the Park Steel Co., Montreal. In 1895 he joined James W. Pyke & Co., and in 1898 organized present Co., and has been in charge of same ever since.

His activities in connection with the Canadian Manufacturers' Association have been featured by membership of Executive Council for Canada since 1909, and was chairman of the Montreal section, 1913-1914.

Mr. Howard holds a lieutenancy in the 1st Regiment Reserve, Montreal Home Guards and his club membership includes—Canada; Engineers'; Manitou; Kaneron Fish and Game; Montreal Curling. He is Independent in politics and is Anglican in creed.

On Nov. 26, 1903, he married E. Daisy Taylor and has two sons, the family residence being at 4189 Avenue Road, Westmount, Que.

—Photo, Courtesy British and Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$47 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	55 95
Basic, Valley furnace	53 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	.....

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	12 10
Chequered floor plate, ¼ in.	12 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 50
Tank plates, Pittsburgh	9 00
Structural shapes, Pittsburgh	4 50
Steel hoops, Pittsburgh	5 25
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 50

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$34 00	$35 00
Electro copper	34 00	35 00
Castings, copper	33 00	34 00
Tin	62 00	63 00
Spelter	11 00	11 00
Lead	13 50	13 00
Antimony	20 00	20 00
Aluminum	65 00	64 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$12 00	$12 00
Heads	12 30	12 30
Tank plates, 3-16 in.	12 65	12 25

WROUGHT PIPE.

Effective July 5, 1917.

Size.	Black	Galvanized
	Per 100 feet	
Standard Buttweld.		
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00
Standard Lapweld.		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$23 00	$22 00
Copper, crucible	26 00	27 00
Copper, heavy	26 00	26 50
Copper wire	26 00	26 50
No. 1 machine composition	20 00	22 00
New brass turnings	16 00	19 00
No. 1 brass turnings	14 00	16 00
Light brass	12 00	10 50
Medium brass	16 00	16 00
Heavy brass	18 00	18 00
Heavy melting steel	21 00	17 00
Steel turnings	11 00	8 00
Shell turnings	12 00	12 00
Boiler plate	18 00	10 50
Axles, wrought iron	25 00	24 00
Rails	20 00	18 00
No. 1 machine cast iron	27 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	19 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	29 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	8 50
Stove plate	19 00	19 00
Scrap zinc	8 00	9 50
Heavy lead	11 00	10 75
Tea lead	7 00	7 00
Aluminum	35 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up.	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less.	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank,	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in. and larger	$7 60
Structural rivets, as above.	7 50
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze.	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	35
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$90 00
Open-hearth billets	90 00
O.H. sheet bars	90 00
Forging billets	125 00
Wire rods	95 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS.

Solder, strictly	0 38
Solder, guaranteed	0 41
Babbitt metals	16 to 65
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drum	4 35
White lead, pure, cwt.	19 00
Red dry lead, 100-lb. kegs, per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 60
Linseed oil, raw, single, bbls.	1 27
Linseed oil, boiled, single bbls.	1 30
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery Cloth	list plus 33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.37
British Manila Rope	.31
New Zealand Hemp	.31
Transmission rope, Manila	.43
Drilling cables, Manila	.39
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks	list plus 30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse ..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 50%; headers, 60; flanged unions, 40; malleable bushings, 50; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$11 00	$11 00
Sheets, black, No. 10	11 50	11 50
Canada plates, dull, 52 sheets	11 00	11 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	12 70
Premier, 10¾ oz.	13 85	13 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

	B
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$10 90
Connelsville Foundry Coke.	...
Steam Lump Coal	8 50
Best Slack	8 05

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$33 00	....
1¼ in.	36 00	....
1½ in.	38 00	32 00
1¾ in.	38 00	32 00
2 in.	45 00	33 00
2¼ in.	48 00	35 00
2½ in.	50 00	38 00
3 in.	58 00	45 00
3¼ in.	....	53 00
3½ in.	70 00	55 00
4 in.	82 00	67 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	13
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	11

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No.1	1 50
Leather in sides	1 35

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars. ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THE steel situation continues full of interest, but considerable uncertainty prevails in the trade regarding the ultimate trend of prices. Indications point to the crest having been reached, but no definite assurance can be made on this point at the present time, although it appears highly probable that such is the case. The embargo which it is announced will be placed on steel exports from the United States will create a somewhat difficult situation for Canadian consumers and will tend to further restrict private enterprise. Although there is an easier tendency for prices there have been no changes made in the meantime. The declines in semi-finished steel in the States seems to indicate a recession in prices on finished steel products, but the embargo will now have to be taken into consideration. A leading domestic producer of pig-iron has issued a price of $60 per ton on foundry grades, but the market is inactive and consumers continue to hold off pending developments in the price-fixing situation at Washington. A shortage of cars is causing considerable uneasiness, while coke continues to advance, creating a complex condition in the market. Although the pig-iron market is at more or less of a standstill, prices are holding firm. The scrap market is dull with consumers showing little or no interest and buying is largely hand-to-mouth. The fact that prices of scrap are still abnormally high is doubtless tending to restrict buying, particularly as there is a prospect of lower prices. The non-ferrous metals are not much in demand at the present time as consumers are expecting lower prices and are keeping out of the market in the meantime. Continued inactivity may be looked for until some definite announcement has been made in regard to prices. The past week has been a quiet one for machinery dealers, the usual summer dullness prevailing in the market.

Montreal, Que., Aug. 13. 1917.—Every phase of industrial activity appears to reflect the uncertainty that accompanies the delayed action of the American Government in connection with the pending regulations that are to follow the investigations now being made by the various committees into the cost of production of the different commodities required for the prosecution of the war. All steel and metal markets are more or less unsettled as a result of these conditions, and buying has been reduced to the minimum during this period of uncertainty. In some respects it is encouraging to note that a spirit of fairness seems to be the keynote of the President's intention in drafting the new regulations, as it is further impressed upon the trade that the "one price to all" will have far reaching possibilities. Conditions here are indirectly affected by the situation in the States, and the Canadian market is anxiously awaiting further developments. The near approach of conscription and its enforcement tends to disturb the normal trend of events, and the many possibilities that are involved appear to make it more difficult to predict early future conditions. The turn of the tide in iron and steel prices seems to be at hand; this being largely due to the attitude of the American Government during the past few months.

Pig Iron.

Want of interest on the part of consumers has resulted in a comparatively dull market from a buying standpoint, but production proceeds unabated, affected slightly by the summer months. The situation is influenced by the delayed action of the Government and in consequence the market has been very much unsettled. In addition to the possibility of price readjustments in the near future, there is the apparent fact that many consumers are well covered for future requirements. Local dealers report unchanged conditions with Canadian producers still out of the market.

Steel.

The magnitude of the task undertaken by the American Government, in connection with the regulation of prices and sales of war materials, is constantly assuming increased proportions with the result that the market is getting more and more unsettled owing to the uncertainty that is inevitable under such conditions. No definite information appears to the available as to the progress being made by the Investigating Committee, and in consequence the market has developed a pronounced inactivity. The possibility that a decline in steel prices will immediately follow concerted action on the part of the adjusting committees, has placed buyers on their guard, and material is being purchased for immediate needs only. The returning rumor that the "one price to all" may become an actual fact, has added to the tension of the situation. While appearances seem to indicate that steel prices are approaching, if not already at the limit of advance, the ever increasing demand for war materials, especially in the States, makes it very uncertain as to what the future may have in store. While the market in certain grades of unfinished steel is undoubtedly easier, other lines are still retaining their strength. In Pittsburgh district, quotations on billets and sheet bars have declined $10 and $20 per ton for each grade. Forging billets at $125 are $10 lower than last week. Wire rods, Pittsburgh, are now quoted at $95, a decline of $5 per ton. Following a heavy demand for steel rails, the Pittsburgh prices have been advanced $15 and $21 for heavy and light respectively, the quotations being $75 and $82 per ton. Railroad spikes have likewise advanced, the prices quoted being $7.50 and $8 per hundred pounds. A further advance of $1.50 has been placed on ⅜ in. proof coil chain, the quotation being $9 per hundred pounds. Owing to the preference that is given to all Government contracts, the demand for plates for domestic purposes has fallen off considerably, and it is expected to be still less when the full shipbuilding program has been announced. The sheet situation is being influenced by the supposition that the top of the market has been reached and consumers are reluctant to buy under the present uncertain conditions. Wire products are comparatively quiet owing to the fact that this is the middle of the usual dull period. Additional pressure is expected on boiler tube plants to cover the requirements of the marine department in the near future. Local conditions are practically unchanged, but certain readjustments are anticipated; difficulty is still experienced in the transportation of material, due to car shortage.

Metals.

Although the trade still looks upon the early future with optimism, there is a growing belief that the new regulations now in preparation will have a wider influence than previously anticipated, with the result that added uncertainty has been placed on the market. This unsettled condition will remain until definite announcement is made by the American Government. Copper is unsteady and weaker than last week. Tin is more settled and firmer. Spelter is very dull, but necessarily firm. Lead is quieter, but relatively firm. Antimony is inactive, but firm. Aluminum is steady and unchanged.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

Coppers.

The market is a fluctuating one, being influenced by conflicting reports as to the possible changes likely to be enforced by the American Government immediately following the finding and report of the Cost Investigating Committee. Under existing conditions, no heavy buying is expected and what business is passing is only for immediate needs or to cover positive requirements. One of the rulings of the forthcoming regulations appears to be the certainty of the "one price to all" policy, and it is this particular detail that has such a bearing on the current market. Additional strength is noted in the London situation, but the New York market is easier, electro having dropped ½c to 28c per lb., and castings one cent to 27½c per lb. Local quotations are unchanged and firm at 34c for lake and electro, and 33c for castings.

Tin.

The situation in the States has been somewhat relieved by the understanding that no duty will be imposed on tin imports, and this has done much to remove the uncertainty that has marked this market for the past several weeks. Other conditions are still pending that may influence the general situation, and for this reason the market will be more or less unsettled during the investigating period. London and New York are both firmer, the latter having advanced ⅛c during the week, the quotation being 63¾c per lb. Tin is firm locally at 62c per lb.

Spelter.

The market is exceptionally dull, but continues firm for the apparent reason that any additional weakness would be impossible under present cost of production. This seems to be the only encouraging factor in the present situation, as price regulations based on production costs could not possibly be made at a lower figure than that at present prevailing, in fact, it is generally expected that any adjustment of prices would be to the advantage of producers. New York remains firm at 8⅝c per lb. Local dealers report a quiet market with prices nominal at 11c per lb.

Lead.

The market continues fairly active, but is quieter than last week; production still proceeds at the maximum, but falling off in the demand would be met with a corresponding decrease in production. This market, like all others, is influenced by the delayed action of the American Government and uncertainty will prevail during this period. All New York quotations are on the nominal level of 11c per lb. Local lead is quoted at 13½c with a weak undertone.

Antimony.

This metal continues very quiet and unchanged with prices firm; New York still quotes 15⅛c, with the local market at last week's level of 20c per lb.

Aluminum.

No material change is noted in the market and the situation is unchanged with prices steady at 65c per lb.

Machine Tools and Supplies.

No new developments have taken place in the machine tool situation and conditions are practically the same as last week. Inquiry has been a little more active, but no improvement has been reported in buying; fair business, however, is noted in general lines, particularly in wood-working machinery and equipment suitable for shipbuilding and accessory manufacture. The American situation is dominated by the war activities, and pressure is being exerted upon certain producers to increase their efforts on behalf of the Government; it is anticipated that the near future may see a material reduction in the building of tools not directly required for essential war requirements. To meet the needs of the situation all arrangements are being made on a co-operative basis, and it is understood that the Government are directly responsible for many of the large additions that are being made to a great number of industries. The market in supplies continues very active, and the situation is marked by firm prices for all commodities; an undertone of uncertainty appears to be

influencing the market as it is anticipated that some readjustment may shortly be made regarding necesary supplies for war requirements.

Scrap.

The market is still unsettled, but a better undertone is apparent. With the attitude of the U. S. Government still a question of uncertainty, the consuming trade has become more active, and this has aided in retaining the market in a comparatively firm position. In the American market the condition of old coppers and brass has shown improvement; aluminum, however, is easier. Local conditions are unchanged, but dealers report more encouraging inquiry; prices are unchanged, but firm.

Toronto, Ont., Aug. 14.—It appears that there is a strong possibility of a shortage of cars in Canada. A large number of foreign cars, which have been for some time in use on Canadian railways, have, it is understood, to be returned to the States. These cars have been largely used for bringing in shipments of coal, with the result that other materials, particularly coke, have been held up. While the coal situation in the meantime has considerably improved, there will have to be a continuation of shipments to keep in the required supply. With fewer cars in service the transportation situation will become more acute. The American Government has not placed an embargo on coal shipments to Canada, as was reported, so there is little fear of trouble on that account. The U. S. Federal Trade Commission is preparing to take over the fuel situation, with power to fix prices and control the trade. This should have a beneficial effect on the Canadian situation.

Steel

Interest in the iron and steel situation continues unabated, and, in fact, has been further intensified by the announcement that an embargo will be placed on the export of steel from the United States to Canada, except on material required for war purposes. While the ultimate effect of this embargo on the situation in Canada is not yet clear, it will no doubt cause considerable inconvenience to the trade, particularly to the merchant and private consumer. The fact that it is unavoidable renders objection to the measure futile, and the consequences will have to be accepted in good grace. Unfortunately for domestic consumers, the mills in this country are filled up with orders, principally for war purposes, for several months, and are thus unable to take care of all the domestic business offering. It remains to be seen if some arrangement cannot be made whereby a proportion of the steel output may be diverted for domestic requirements. The decline in the munitions business may help towards this end. During the past month or so there has been a steady reduction in tonnage of steel imported, due to a falling off in demand occasioned by high prices and difficulty in obtaining material. More recently consumers have been holding off on account of the uncertain outlook created by the American Government price fixing scheme. At the present time the embargo will not affect the situation very seriously, although should prices decline and a buying movement start in, the lack of steel from the States would be felt to greater degree.

There has been no further development in the price fixing situation, and it seems that some weeks may elapse before anything definite materializes. In the meantime the market is at a standstill and the air is full of rumors and predictions regarding the outcome of the Government's deliberations. There is a marked falling off in demand, due partly to the belief that there will be a recession in prices of steel and also because this is a quiet season of the year in the trade. The opinion is gaining ground that only prices on Government requirements will be controlled, and that no attempt will be made to fix prices to the private consumer. There are no price changes to note this week.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

The situation in the black sheet market in the States is unchanged, the Government continuing to dominate the market. New demand from the domestic trade is quiet; the general opinion being that the crest has been reached in prices and that the market will recede before long. Sheet mills are well sold up over the remainder of this year, some having no sheets to offer before next year.

Government action in regard to price fixing continues to dominate the situation in the steel market in the United States, and, while no announcement is expected for some weeks, prices are already showing a tendency to decline. Open-hearth sheet bars have been sold at Pittsburgh at $100 a ton, for rather early delivery, which is $10 below last previous quotation. Bessemer and open-hearth billets have also declined $10, and are now quoted at $190 per ton. The U. S. Steel Corporation unfilled orders on hand July 31 amounted to 10,844,164 tons, a decrease of 539,123 tons, compared with the figures for June. The decline reflects the uncertainty in connection with the proposed price fixing policy of the Government.

Pig Iron

The pig iron market continues quiet and the situation generally unchanged. A price of $60 a ton has been given out for "Victoria" foundry iron, but comparatively little business has been closed at that figure. Consumers are marking time waiting developments at Washington. The outlook in the pig iron market is distinctly unfavorable owing to the hight price of coke and shortage of cars. Connellsville coke is now selling at $16 ovens, or an advance of $6 a ton over last week. Buffalo pig iron prices range around $53 to $55 a ton.

Scrap

The scrap market continues in a weak condition. Consumers are buying from hand-to-mouth just to keep them going until the situation improves. Prices are still abnormally high, and a general recession is not unlikely. There are no price changes to note this week.

Machine Tools

Business has been comparatively quiet during the past week, and there are no developments of importance to note. Deliveries continue backward and the situation in this regard is likely to become more acute partly on account of the increased activity in the United States.

Supplies

The character of business in machine shop supplies is gradually getting back to more normal conditions. There has been a falling off in demand from munitions plants, whereas the demand from manufacturing trades is improving. Prices continue very firm, with an upward tendency on many lines. Bearings and hangers have advanced, the new discount being 40 per cent., as against 50 per cent. formerly.

Metals

The metal markets are dull and featureless and little, if any, improvement in the situation is expected until some more or less definite policy has been decided upon by the American Government. In the meantime the markets are marking time and consumers are waiting developments. Buying consequently is not in large volume and prices are unchanged and largely nominal. Business locally continues very good, with indications of an improving demand for metals for general purposes.

Copper.—It is not expected that there will be any marked activity in the copper market until the situation clears up—that is, when the American Government's attitude with regard to prices is known. In the meantime the market is quiet and prices are nominally unchanged. Lake and electrolytic is quoted at 36c, and castings at 35c per pound.

Tin.—The market is dull, there being a lack of buying interest. Consumers are holding off until it is known what action the American Government will

take in regard to prices. Tin is quoted locally unchanged at 63c per pound.

Spelter.—The market is quiet, with practically no interest shown by either buyers or sellers, and no activity is looked for until the intention of the American Government is known as regards the price to be paid on its requirements. The local situation is unchanged at 11c per pound.

Lead.—The situation in the lead market is unchanged, and producers continue to quote 11c New York, regardless of position. The position of lead is a strong one, but the prevailing uncertainty is affecting the market. Lead is unchanged at 13c per pound.

Antimony.—No improvement is noted in the demand for antimony, which has been quiet for some time. The market, however, shows no signs of weakness, and quotations are unchanged at 20c per pound.

Aluminum.—Little interest is being shown in aluminum, and the market is weaker, although quotations are unchanged at 64c per pound.

New York, Aug. 13.—United States Government war orders are now engaging about one-third of the total capacity of the steel plants of the country; some estimates are as high as 40%, taking into consideration the placing of orders to cover the construction of railroad equipment for France and Russia. With the placing of other large orders for ships, artillery and aeroplanes, fully half of the steel mill capacity will be called into the service of the Government, either directly or indirectly. In a few special lines, Government orders are monopolizing nearly full capacity. Few, if any, American manufacturers of ship plate now have any output available for other than Government orders. The recent embargo against exports has checked shipment of hull plate to the Orient, and most of the Japanese shipyards are reported idle and waiting for steel from the United States.

Exigencies of the war have fallen most heavily upon the machinery industry, it being estimated that 80 to 90% of the productive capacity of the largest machine tool makers is now employed on Government work with the prospect that full capacity will be absorbed within a few weeks. Shipbuilders requiring travelling cranes six weeks ago turned to locomotive cranes, and now with capacity of crane builders sold for one year ahead, almost entirely upon Government contracts, the boat builders are resorting to all sorts of expedients to meet their requirements for transmission and conveying machinery.

One of the most interesting developments of the last past week has been the fuller revelation of the Government program to provide the army and navy with adequate artillery. The official and Congressional procrastination of recent years, which has compelled the United States in humility to order ordnance in France and to adopt the English rifle to equip the American army, is to be atoned for at the eleventh hour, in the feverish building of ordnance factories. One contract for three thousand 6-inch guns has been placed with the American Brake Shoe & Foundry Co., to be manufactured at a plant now under construction at Erie, Penn. Four or five similar contracts are virtually understood to have been closed. It is believed that not far from $1,000,000,000 will be spent in the manufacture of heavy artillery.

With Government assistance, new plants will be built by the Niles-Bement-Pond Co., of New York, and by the Gisholt Machine Co., of Madison, Wisconsin, as well as by the Bullard Machine Tool Co., of Bridgeport, Conn., in which to manufacture artillery. The Otis Elevator Co., too, will utilize one of its present factories to build big guns for the army and navy. All of these plants will need machinery. Out of the pressing war needs, too, has been born the Wisconsin Gun Co., which has been formed by five metal-working machinery makers of Milwaukee. The Northwestern Ordnance Co. is the name of the concern organized by the Gisholt Machine Co., to comply with Government request to manufacture artillery.

The Pennsylvania R. R. Co. has issued an additional list of tools to be bought for the United States Army Engineers, who will work upon the railroad system of France. Westinghouse, Church, Kerr & Co. have placed orders for machine tools to be installed at the shell-loading plant of the Rock Island Arsenal; a large percentage of the orders were for wood-working machinery.

The Army Department has placed additional orders for motor trucks, calling for the expenditure of $21,000,000. The contracts include 3,000 Packards, 1,250 Locomobiles and 1,500 Pierce-Arrow trucks. Government motor truck contracts placed thus far amount to $44,000,000, and the Quartermaster at Chicago is now buying 192 light trucks to serve army cantonments, 12 being allotted to each camp.

Airplane manufacturers, because of the difficulty in securing deliveries on machine tools, are utilizing as far as possible the machine shops of the automobile manufacturers which are exceptionally well equipped.

Pittsburgh, Pa., Aug. 11.—The readjustment in prices in the iron and steel market is now fully under way, although it has made little progress as yet. The new development in the past week was a break of $10 to $15 a ton in billet and sheet bar prices, this being the first yielding in unfinished steel prices, while scrap had rounded the turn in June and pig iron in July. Finished steel products are still to be heard from. There is no quotable decline thus far.

The War Industries Board, constituted within the past few days as a subsidiary to the Council of National Defense, will act as purchasing agent for the Government and also for its Allies across the water. The board has made a public statement, expressing allegiance to the principles laid down by President Wilson in his statement published July 12, that there should be no "unusual profits" and that there should be "'one price for all," i.e., the Government, its Allies, and the ordinary domestic buyer. How the board will carry out its program remains to be seen. There is a dark hint in its statement that it is not politic to divulge all its plans. Thus, to the natural tendency of the iron and steel market to readjust itself to a lower and less unreasonable level there is strong pressure from Washington in the direction of lower prices. It is only a question of how soon the readjustment will be completed and how far it will extend.

Decline in Unfinished Steel

The particularly sharp advance in billets and sheet bars occurred in May. The buying of sheet bars was chiefly by sheet consumers who had the bars converted into sheets at mills that had more rolling capacity than steel. Purchases were made up to $105, and $110 was paid in one or two cases, while billets were bought at $95 and $100. In the past week there have been offerings, chiefly by consumers who now have a surplus, of billets at $85, which were not taken, of sheet bars at $90, which were not taken, and of slabs at $90, which were absorbed in small quantities. As scrap started declining in June, pig iron in July and unfinished steel in the past week, finished steel products are next in order. It is the usual sequence when the market begins declining after a great advance.

A Stagnant Market

The stagnation in the market has now lasted about six weeks and there is not the slightest sign of any increase in activity. Scrap is dead, and on account of uncertainties in transportation, freight congestion, embargoes and other deterrent influences, scrap dealers are unwilling to trade even when they have a chance to match sales and purchases. In pig iron there is nothing being done except in very small lots for immediate shipment, at prices a shade lower than formerly ruling. Several lots of Bessemer that had been shipped to seaboard for export have been resold at substantial cuts. Until recently consumers were clamoring for better deliveries on contracts but now it seems to be the other way, some sellers having asked permision to anticipate and being refused.

Stocks and Specifications

Stocks of steel in the hands of jobbers and manufacturing consumers are proving larger than would have been estimated 60 days ago. Jobbers are endeavoring to dispose of surplus stocks, even going out of their regular trade in the effort to do so. The stocks are, of course, poorly distributed. There being plenty of butt weld pipe, for instance, and very little lap weld. Manufacturing consumers as a rule appear to be well provided, although until recently

they were urging mills to make heavier shipments. Some buyers began to curtail their specifications early in June and this curtailment has continued until now, the specifications, against contracts, on the whole, are much less than the shipments. In most lines, however, the mills have specifications enough to run them for many weeks.

Government Control

The Food Control bill was put into final shape last week and has gone through certain formalities this week, being ready to-day for the President's signature. Apart from food it gives the President power to fix prices on coal and coke, either by taking over plants and operating them, decreeing at what prices they shall sell to the public, or establishing a Government agency to handle the material. What course will be followed remains to be seen. One report has it that the moment the President signs the food bill he will sign an order for the Federal Trade Commission to fix prices, but the Commission is on record to the effect that it expects only to make reports as to costs, not to fix any prices at all. Last June the coal operators met in Washington and agreed to limit prices, the schedule being generally $3 per net ton at mine. It is claimed that the operators have been selling at higher prices, while advices from Washington are that $3 is there considered too high. This would suggest that if a price is fixed for coke it will not be over about $5 a ton. The market has been advancing sharply again, and in the past few days some lots of Connellsville furnace coke have sold at as high as $15 per net ton at ovens. Fixing of coke prices would of course tend to soften pig iron.

MARKET FOR OUTPUT OF B.C. MILLS

THE three years of war have witnessed a remarkable development in the pulp and paper manufacturing industry of British Columbia. In 1915, 50,000 tons of paper and 13,000 tons of pulp were produced, and this increased last year to 65,000 tons of paper and 15,000 tons of pulp. These figures will be greatly advanced this year and 1918 will show another increase. The development, however, has all been of recent growth, but appears permanently established. In 1901 the Government commenced granting twenty-one year leases in order to encourage a paper-making industry, with an annual rent of two cents per cord of wood cut. The lessees were bound to build and operate a paper mill of specified capacity. Four companies availed themselves of the provisions and three of these have passed from the hands of the original owners.

The largest corporation is now the Whalen Pulp & Paper Mills, a consolidation of the B. C. Sulphite Fibre Co., the Empire Pulp & Paper Mills, and the Colonial Lumber & Paper Mills. The B. C. Sulphite Fibre Co. has a mill about 25 miles from Vancouver, at Howe Creek, producing about 70 tons of sulphite fibre and employing 300 men. More machinery will presently bring the company's output to 85 tons daily. The Empire Pulp & Paper Mills plant at Swanson Bay is a continuation of the Swanson Bay Forest, Wood Pulp & Lumber Mills, Ltd., and has a capacity of thirty tons of pulp per day. The Colonial Pulp & Paper Mills at Quatsino Sound is having machinery installed for an initial output of sixty tons daily of sulphite fibre.

The Pacific Mills, Ltd., Vancouver, was incorporated in 1915 with a capital of $9,500,000, and took over the defunct Ocean Falls Co. The new company have practically reconstructed the plant and commenced turning out 75 tons of news print daily in May last. By the end of the year the total output will be increased to 195 tons daily.

The Powell River Co. was incorporated in 1911 with a capital of $5,000,000. The mills are at Powell River, and have a daily output of 225 tons of news print, giving employment to 600 men. The Rainy River Pulp & Paper Co. was incorporated this year, taking over a plant previously owned by a company of the same name on Howe Sound. The paid-up capital is $1,000,000. The plant is equipped for the manufacture of Kraft pulp, about twelve tons daily, which will be increased immediately to twenty tons.

The only problem before the British Columbia pulp and paper trade is the obtaining of markets, and this will be considerably solved by the certain depletion of Eastern pulp wood forests and the opening of foreign connections. The local British Columbia market for news print paper amounts to about $250,000 yearly, while a good deal of paper is sent to prairie customers. The United States must continue to be the main market, although an increasing quantity of paper is being sent to Australia, which is depleted of pulp forests, and has relatively poor water powers. Other developing markets for British Columbia paper products are Japan, China, New Zealand, Hawaii, the Philippines, west coast of South America, west coast of Mexico, and Asiatic Russia. Of these Japan is a particularly attractive field, as its yearly imports of paper are over $2,000.000, with about $6,000,000 worth of pulp.

The shearing strength of metals is usually expressed as a percentage of the tensile strength and varies from 38 per cent. for cast iron, to about 84 per cent. for best quality of wrought iron or mild steel, probably a little more in the latter case.

THE scarcity of fuel in Europe has made it commercially feasible to recover coal from the wreck of the English steamer Dorka which went to the bottom off the Danish coast in 1882 with a cargo of coal. So far, 1,000 tons of the mineral have been recovered with considerable profit at present price of coal in Denmark.

DOMINION GOVERNMENT ACQUIRES C.N.R.

THE Canadian Northern Railway System which has been acquired by the Dominion Government will, when cooperating with other Government Systems, materially improve transportation facilities. It is understood that, shortly, a connecting link, 16 miles long, between the Canadian Northern and the National Transcontinental will be built at Long Lake, north-east of Port Arthur, and, when completed, will make the Government System the shortest line between Montreal and Winnipeg. It will also eliminate the back haul in the winter grain trade from the head of the lakes to the Atlantic. It is also expected to have a stimulating effect on wheat, fish and lumber transportation and to aid greatly in keeping Canadian traffic east and west, instead of being diverted south, and lost to the Dominion. The new system to be taken over comprises 9,513 miles under operation, located as follows: In Nova Scotia, 370 miles; in Quebec, 685; in Ontario, 2,022; in Minesota, 215; in Manitoba, 1,995; in Saskatchewan, 2,220; Alberta, 1,266; British Columbia, 540.

Financial Condition

In the latest financial statement of the affairs of the Canadian Northern Railway Co. the surplus of assets over liabilities is given at $39,800,000. Outstanding securities guaranteed by the Dominion Government amount to $104,000,000; those guaranteed by the Provinces to $107,000,000, and those not guaranteed, $147,000,000, a total of $358,000,000. On these the annual interest charges are $14,405,000. Of these interest charges for some years the Dominion Government is directly responsible for $3,000,000 a year and the Provinces for $1,500,000.

The business of the company has shown a remarkable increase during the past three years. For its business year ending June, 1915, the gross earnings were $25,900,000; for 1916, $35,476,000; and for 1917, $42,319,000. For the same years the net earnings were $6,623,000, $9,373,000 and $11,525,000. The Canadian Northern has purchased equipment to the amount of $61,300,000 and paid $46,500,000 leaving a balance owing of $14,800,000. This equipment was estimated by the recent investigating commission to have been worth $56,000,000 and on this depreciation was allowed of $11,000,000, making the value of equipment at pre-war prices, $45,000,000 and estimated at present prices at $85,000,000.

In acquiring the Canadian Northern Railway system the Dominion Government becomes the owner of the largest telegraph company in Canada, the combined Canadian Northern Telegraph Co. and Great North-Western Telegraph Co. There is also added to the Dominion Government's terminal elevator system the largest grain elevator in the world, the Canadian Northern elevator of Port Arthur, with 10,000,000 bushels capacity.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Hamilton, Ont.—F. W. Fearman & Co. will build a cold storage plant to cost $15,000.

Shawinigan Falls, Que.—The Belgo-Canadian Pulp & Paper Co. will probably erect a mill.

Montreal, Que.—Simonds Canada Saw Co. will build an extension to their factory on St. Remi Street.

Ingersoll, Ont.—Fire on August 6 destroyed the hardening department of the Ingersoll Machine Co.'s plant, causing damage estimated at about $2,000. The loss is covered by insurance.

Morrisburg, Ont.—Preparations have already been started on the removal of the machinery at the Morrisburg Tin Plate Works, to Hamilton. The buildings are being demolished.

Port Arthur, Ont.—Good progress is being made with the construction of the Port Arthur Pulp & Paper Co.'s new plant and it is expected that it will be completed by about Sept. 15.

Sault Ste. Marie, Ont.—The International Paper Co., a subsidiary of the Lake Superior Corporation, contemplates erecting a pulp mill on a site adjoining the Algoma Steel Co.'s plant.

Vancouver, B.C.—The Taylor Engineering have been granted a permit to make an addition to the boilerhouse at the B. C. Sugar Refinery. The building will be of reinforced steel and concrete and will cost $9,000.

Vancouver, B.C.—There is a possibility of a galvanizing plant being established here in connection with the wooden shipbuilding industry. A plant is needed to galvanize such materials as boat spikes, drift bolts, etc., used in the construction of wooden ships.

Princeton, B.C.—A large copper company is being financed to build a concentrating mill with three thousand tons daily capacity, at an approximate cost of $2,000,000. The decision to build the mill was encouraged by the results of the flotation test by a mill of fifty tons daily capacity on Copper Mountain. The general manager estimates that the mine contains ten billion tons of reasonably assured ore.

Hamilton, Ont.—Alex. M. Snyder, a former well-known Hamilton man, has returned from Detroit to organize a $5,000,000 corporation, to be known as the Canadian Hession Tiller and Tractors, Ltd. The new company will manufacture a rotary tiller which will be attached to an especially constructed gasoline tractor. The head office of the concern will be located in Toronto, temporarily, with Mr. Snyder as general manager. Mr. Snyder states that Hamilton is being considered as a location for the factory.

ELECTRICAL

London, Ont.—The Public Utilities Commission has purchased a site for the new hydro substation.

Cookstown, Ont.—On August 20 a by-law will be voted on to provide $9,500 for the transmission and supply of electrical power.

Moorefield, Ont.—By-law has been passed and tenders will likely be called shortly for the installation of a hydro electric system.

Cookstown, Ont.—A by-law will be voted on by the ratepayers on Aug. 20, to authorize an expenditure of $9,500 for the transmission and supply of electrical power.

Port Colborne, Ont.—The Board of Trade has set a movement on foot for establishing the Hydro-Electric in Port Colborne. The plan discussed is to have Port Colborne and Humberstone unite unite under one commission and one plant jointly.

MUNICIPAL

Wilkie, Sask.—Improvements to the waterworks system are contemplated by the Town Council.

Swift Current, Sask.—The City Council have passed by-laws for the issuing of debentures for $30,000 and $25,000 for necessary improvements to the electric light and power plant.

Toronto, Ont.—The Ontario Railway Board has decided that the city of Ottawa cannot have a municipal fuel depot, and has refused to approve the by-law discussed at a hearing of Ottawa officials recently.

Windsor, Ont.—By large majorities Windsor ratepayers last Friday defeated two by-laws to authorize debenture issues of $30,000 and $17,000, respectively, to cover the cost of building an Isolation Hospital and a municipal garage.

Winnipeg, Man.—Tenders will be called by the city for a mechanical grate stoker, designed to burn fine dust coal, to be fitted to the 50 horse-power Babcock Wilcox boiler at the municipal power house. It will cost about $1,000.

Smith's Falls, Ont.—A by-law will be submitted to the ratepayers on Aug. 22 to raise $135,000 for the purchase of the electric plants of the Citizen's Electric Co. and the Smith's Fall Electric Power Co., and $67,000 bonus to the Exclusive Ladies' Wear, Ltd., of Montreal.

Winnipeg, Man.—The Auto Parts Co of Milwaukee, Wis., has written to the Board of Trade, stating its desire to open a factory in Winnipeg and asking for particulars regarding power and sites. The communication has been forwarder to the Industrial Bureau.

Hamilton, Ont.—The Civic Board of Works have recommended that the City Council endorse the report of Engineers W. F. Tye and N. Couchon with reference to a common entrance for all railways into the city and that a copy of the report be forwarded to the Dominion Railway Commission as representing the views of the city in the matter of the railway situation in Hamilton.

AUXILIARY MACHINERY REQUIRED.

Tender forms and specifications have been received from D. H. Ross, Canadian Trade Commissioner, Melbourne, for supply and delivery of auxiliary machinery for the Flinders naval base, via Melbourne, Victoria, and are open for inspection at the Department of Trade and Commerce, Ottawa (refer to File No. A-1901). Tenders addressed to the Director of Navy Contracts, Navy Office, Melbourne, close on October 24, 1917. The particulars are as follows:

Two electrically-driven air pumps, with complete set spare parts.

One steam driven air pump, with complete set of spare parts.

Two small circulating pumps.

One large circulating pump.

One large feed pump, with complete set of spare parts.

One small feed pump, with complete set of spare parts.

One oil fuel pump with complete set of spare parts.

GENERAL

Brantford, Ont.—The Kitchen Overall & Shirt Co., Ltd., contemplate the erection of a factory here.

St. Jerome, Que.—The Dominion Rubber Co. will build an extension to their factory here.

Redcliff, Alta.—It is reported that two new industries will probably be established here if the co-operation of the farmers in this district can be obtained.

Hamilton, Ont.—It has been announced that the Canadian branch of the Teguffin Chemical and Manufacturing Co., of Rochester, N.Y., will be located in Hamilton, the old armory rink having been secured for that purpose. The principal product of the company is boiler preservative.

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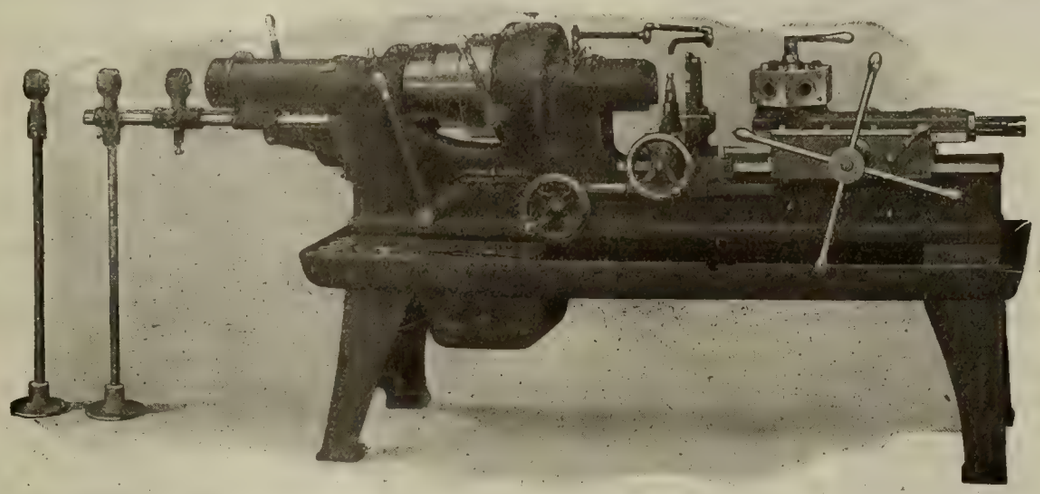

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HIGH SPEED HAMMERS

For High Speed Work

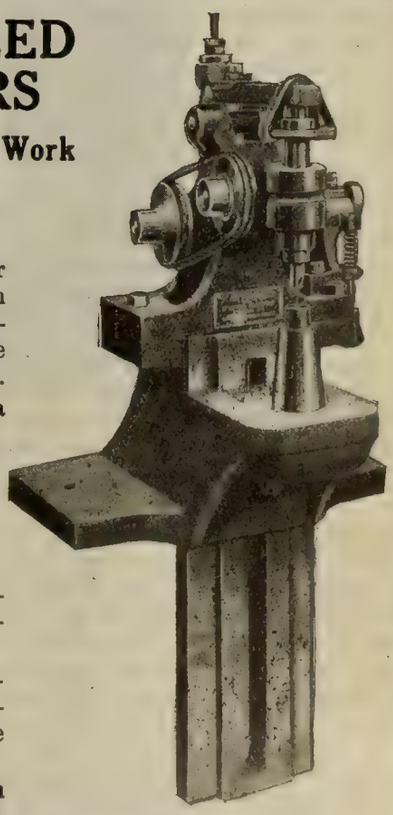
FEATURES:

Our Bench Hammer can be adjusted high or low, and spells another economy in space and handy utility.

With it you have a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushings are used throughout.

No riveting too intricate for us; no riveting which our machine cannot accomplish.

Send for our **High Speed Hammer Book.**



THE HIGH SPEED HAMMER CO.

Rochester, N.Y.

Sales Agents: The A. R. Williams Machinery Company, Limited, Toronto, Ontario.

If any advertisement interests you, tear it out now and place with letters to be answered.

TENDERS

Hamilton, Ont.—Tenders are being received until September 4 by the engineer, E. R. Gray, for pumping equipment for Beach pumping station. The cost is estimated at $130,000.

Toronto, Ont.—Tenders will be received, addressed to the Chairman, Board of Control, City Hall, Toronto, up to noon on Tuesday, August 28, 1917, for the supply and installation of mechanical stokers, at the Main Pumping Station. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Winnipeg, Man.—Tenders, addressed to the Chairman, Board of Control, will be received up to Friday, August 24, 1917, for the supply and complete installation of one mechanical chain grate stoker for the Municipal Hospital Power House, Morley Avenue. Specification and form of tender may be obtained at the office of the City Engineer, 223 James Avenue.

Ottawa, Ont.—Tenders for tungsten lamps for the Departmental Buildings, Ottawa, Ont., will be received until Friday, August 17, 1917. Specification to be seen on application to the Clerk of Works, Postal Station "F," Toronto, to the Overseer, Dom. Bldgs., Central Post Office, Montreal and to the Chief Architect, Department of Public Works, Ottawa.

Toronto, Ont.—Tenders addressed to the Secretary-Treasurer of the Board of Education, will be received until Aug. 24, for completion of carpentry work in Park School New Building, local telephones, cabinet work, repair work in various trades. Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, 155 College Street.

Winnipeg, Man.—Tenders, addressed to the Chairman, Board of Control, will be received up to Wednesday, August 22, 1917, for the following supplies for the Fire Department, namely, 3,000 feet 3½ inch cotton, rubber-lined fire hose, 221 (more or less) pairs rubber boots, 221 (more or less) waterproof coats. Specifications and forms of tender may be obtained at the office of the Chief of the Fire Department, Central Fire Station.

Quebec, Que.—Tenders will be received until Tuesday, August 28, 1917, for the construction of a steel bridge (two spans), over sluice ways in St. Charles River, at Quebec, P.Q. Plans and forms of contract can be seen and specification and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the District Engineers, Shaughnessy Building, Montreal, P.Q., Post Office Building, Quebec, P.Q., and Equity Building, Toronto, Ont.

St. John, N.B.—Tenders will be received until August 31, for the construction of an extension of and repairs to the Negro Point breakwater, St. John Harbour, St. John County, N.B. Plans and forms of contract can be seen and specifications and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the District Engineers at St. John, N.B.; Halifax, N. S.; Shaughnessy Building, Montreal, P.Q., and Equity Building, Toronto, Ont.

Ottawa, Ont.—Tenders will be received until August 27 for plumbing pipes and fixtures required in the reconstruction of the Parliament Buildings. All tenders to be based on the execution, erection and completion, including all labor and materials required for the installation of the plumbing system, together with all fixtures, apparatus and appliances as called for in the plans and specifications. Plans, specifications and any other information can be obtained at the office of the general contractor, P. Lyall & Sons, Construction Co., Ottawa.

Ottawa, Ont.—By direction of the Hon. the Minister of Militia and Defence, the following Old Stores are for sale by public tender: Leather, old miscellaneous, 5,719 lbs.; rubber, old, 127 lbs.; metal, old brass miscellaneous, 419 lbs.; metal, old, steel, files only, 25 lbs.; metal, old, steel scrap, 339 lbs.; metal, old nickel, 27 lbs.; metal old iron cast, 570 lbs; metal, old iron, wrought, 1,532 lbs.; metal, old copper, 10 lbs.; rags, old linen and cotton, 1.971 lbs.; rags, woollen of sorts, 3 lbs.; rope or cordage, old, 38 lbs.; sheets, ground, 8,500 lbs. These articles may be seen on application to the Senior Ordnance Officer, Toronto, Ont. Sealed tenders for the purchase of all or any of these lots, each addressed to the above-mentioned Officer, the enenvelop to be marked "Tender," will be received until 12 o'clock noon Aug. 17, 1917.

PUMPING EQUIPMENT REQUIRED

Tender forms, specifications and drawings have been received from D. H. Ross, Canadian Trade Commissioner, Melbourne, for the supply and delivery of pumping plant and equipment for the Commonwealth naval dockyard, Cockatoo Island, Sydney, N.S.W., and are open for inspection at the Department of Trade and Commerce, Ottawa (refer to File No. A-1901). Tenders addressed to either the Director of Navy Contracts, Navy Office, Melbourne, or the Director of Naval Contracts, care Commonwealth Naval Dockyard, Cockatoo Island, Sydney, N.S.W., close on October 10, 1917. The particulars are as follows:

Two main dock pumps with vertical spindle motors and control equipments.

One vertical spindle motor and control equipment.

Four sluice valves with four motors and control equipment.

Two drainage pumps with motors and equipment.

Two air exhaust pumps with motors and equipment.

One enclosed motor and equipment for dock caisson.

CONTRACTS

Orillia, Ont.—It is proposed to build an addition to the Orillia Hospital to cost $25,000. A by-law will be submitted to the ratepayers at an early date.

The Laurin & Leitch Construction Co., Montreal, Que., has been awarded the general contract for the erection of a pumping and filtration plant at St. John's, Que.

Port Hope, Ont. — Wells & Gray of Toronto, have been awarded the contract for the erection of $40,000 addition to the plant of the Nicholson File Co., of this town.

London, Ont.—The tender of Noble & Rich has been accepted by the Public Utilities Commission for installing a hot water heating system in the Utilities Building. The contract price is $5,490.

Pointe Claire, Que.—The Town Council have awarded a contract for water filtration plant and lift pumps to Arsenault & Plamondon, Montreal. The contract price was $38,500.

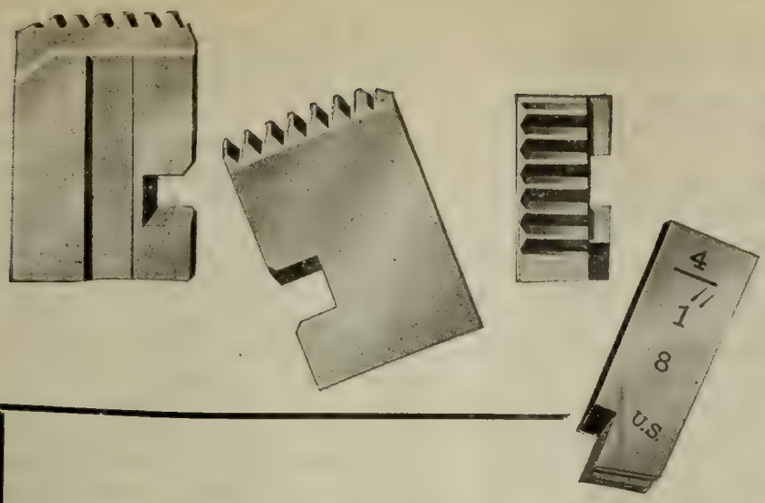
The York Manufacturing Co., York, Pa., have been awarded a contract for a 500 ton ice-making plant and large cold storage for the Americn Army in France. This is probably the largest single contract of this kind ever let.

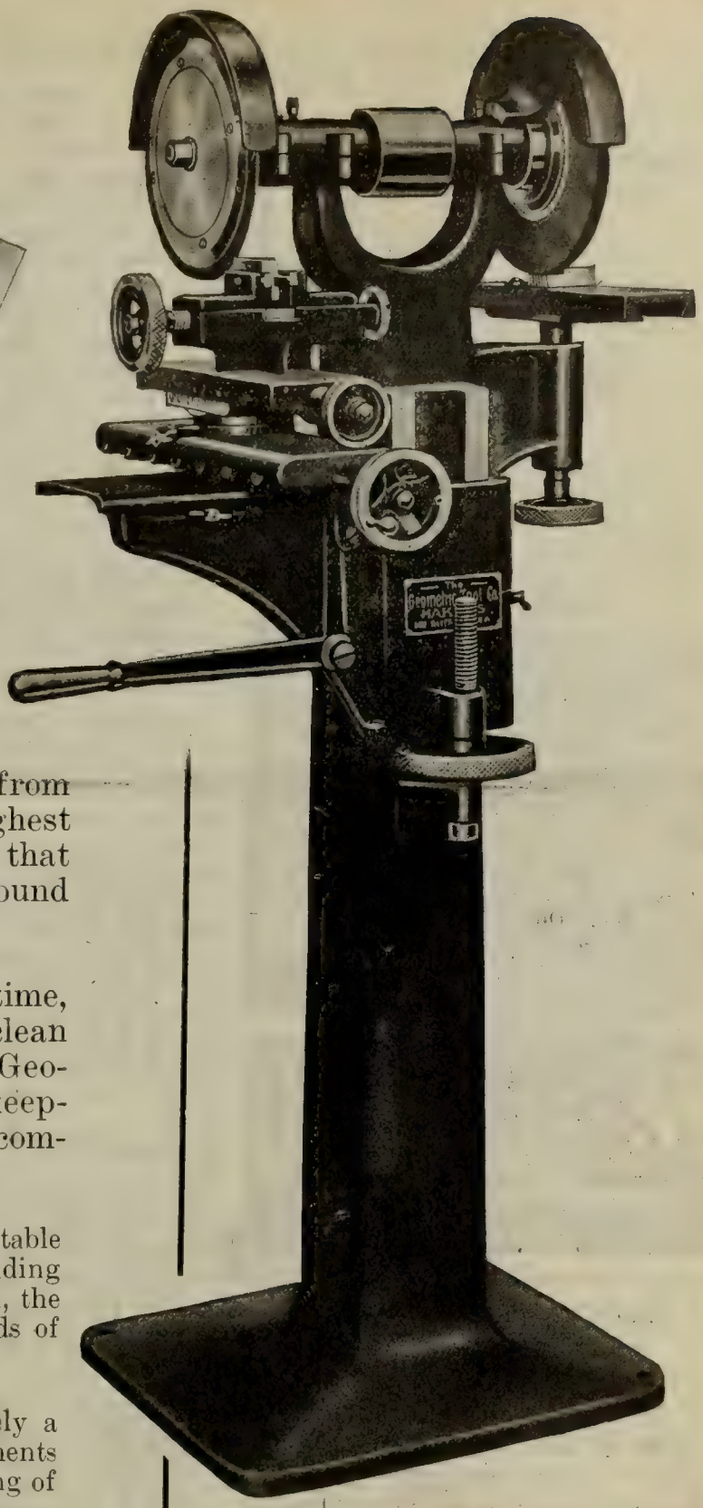
Montreal South, Que.—Julien Toussaint & Cie, of Montreal, has the contract for water mains, valves, hydrants, sewers, and manholes, and the Chicago Bridge and Iron Works, Bridgeburg, Ont., the contract for elevated steel tanks for waterworks, etc., costing $180,000.

Toronto, Ont.—Contracts have been let by the Hydro-Electric Power Commission of Ontario covering the installation of a 4,000 horse-power generator and turbine at the Eugenia Falls development. The installation of this unit will double the present capacity of the plant.

Brantford, Ont.—The firm of P. H. Secord & Son of this city, which has been in charge of the construction of so many schools and other new public buildings in various districts of Northern Ontario, has been awarded the contract for the erection of a new brick school at Dome Mines, Porcupine.

Toronto, Ont.—The Finance Committee of the Board of Education has decided to accept the following tenders: Plumbing at the Duke of Connaught School, L. Legrow, $177; heating at Fern Avenue School, Johnson Heat and Regulation Co., $773; electric wiring at Brown School, Fred Armstrong, $130; electric wiring at Kew Beach School, Canada Electric Co., $631; electric wiring at Duke Street School, A. B. Rice, $437.





Sharp Chasers Cut Clean Threads

Accurate, uniform threads result only from dies which are maintained in the highest state of cutting efficiency. This means that chasers must be kept sharp, and ground uniformly.

Even if just touched up from time to time, the chasers respond splendidly, with clean threads. And with this machine—the Geometric Chaser Grinder—the matter of keeping threading tools up to scratch is a comparatively simple matter.

Any make of chaser can be ground on this adaptable machine. The two wheels permit the easy grinding of both milled and tapped chasers. In addition, the plain wheel lends itself readily to various kinds of tool grinding.

Uniform grinding of a set of chasers is purely a mechanical matter through the use of adjustments which can be accurately set to govern the grinding of an entire set of chasers.

The Catalog describing this machine is a mine of information on chaser grinding. Write for it.

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NEW HAVEN CONNECTICUT

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FIGHT WORK & PAY
NATIONAL SERVICE

After the War--
WHAT?

Few can predict—yet all can prepare! Our present prosperity rests in part on an artificial basis which peace must remove. Now is the time to consolidate your position by regulating your expenditures—by husbanding the surplus—and by investing to the limit in Canadian War Loans, that help so much to maintain present prosperity.

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Enameling and Varnishing Ovens heated by Gas, Electricity, Steam or Coal.
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TRADE GOSSIP

Sterling Irons and Metal, Ltd., has changed its name to that of the Canada Iron and Metals, Ltd.

The Richmond Mfg. Co., Toronto, chuck manufacturers, contemplate removing their business from Toronto and are looking for a suitable location for a factory. W. McNight is manager of the concern.

U. S. Steel Unfilled Tonnage Decrease. The unfilled tonnage of the United States Steel Corporation decreased by 539,123 tons, the monthly report showed. Unfilled orders on hand July 31 totalled 10,844,164 tons, compared with 11,383,287 tons on June 30. The tonnage of unfilled orders was 11,886,591 on May 30; 12,183,083 on April 30, and 9,593,592 on July 31 a year ago.

Tungsten Market Stronger.—While the market for Tungsten has not advanced, the general tone is stronger and the tendency is towards higher prices. Wolframite tungsten is quoted at $23 and upawrds, and Scheelite at $26, New York; acording to quality. Imports into the U. S. have been heavier than expected ,but have been readily absorbed.

Crude Oil at Record Price.—Pennsylvania crude oil on Aug. 13, reached the highest price in more than twenty years when the South Pennsylvania Oil Co. announced an advance of 15 cents, making the quotation for that grade $3.25. Other grades of crude oil were advanced to the following quotations: Mercer Black, $2.23; Corning, $2.50; Cabell, $2.47; Somerset, $2.30; and Ragland, $1.10.

Foreign Trade Inquiry.—An agency is desired by a man in France for the sale of bar iron for all purposes, steel wire and wire nails, tool steel, black and galvanized steel sheets, open-hearth and mild steel bars, mild steel plates, spikes, rivets, bolts, pig iron, and copper and brass wire. Interested parties should communicate with the Bureau of Foreign and Domestic Commerce, Washington, D.C., regarding inquiry No. 25123.

Canada Favored in Coal Shipments.—Shipments of soft coal from Pennsylvania to Canada have caused a considerable increase in price. Although the stipulated price of $3.25 a net ton is supposed to prevail many industrial concerns have been compelled to pay as high as $4.15 a gross ton at the mines. Shipments to Canada are reported to be prompt while there is frequent delay in shipments to Philadelphia.

The Allen General Supplies, Ltd., Toronto, have sold to the United Gas & Fuel Co., Hamilton, a 16-in. Venturi gas meter, made by the Builders' Iron Foundry, Providence, R.I. This meter is a type, Q.S. register, indicator, recorder, capable of metering from 50,000 to 200,000 cub. ft. gas per 24 hours at 60 degrees Fahr., and .6 specific gravity. This meter gives the rate of flow, total flow, and a chart showing conditions for the day. This is the first Venturi gas meter installed in Canada.

British Steel Output.—The production of finished steel in Great Britain in 1916 is reported by the Iron and Steel Federation as follows:—Bloom, billets and rods, 1,945,000; sheet bars, 1,272,000; rails, 271,000; plates, 1,153,000; sheets, 78,000; shapes and angles, 757,000; beams and girders, 346,000; galvanized sheets, 132,000; tin plates, 577,000; total, 6,531,000 gross tons. The production of steel castings was 207,000 tons, of which 18,000 tons were made in electric furnaces. The production of wrought iron (puddled bars) was 960,000 tons.

Durham, Ont.—The National Portland Cement Co.'s plant here, one of the largest industries of its kind in Ontario, which has been idle for the past year, will commence operations next week. Workmen have been busy during the past few months repairing the buildings and installing new and up-to-date machinery.

Jones & Laughlin Plate Mill Starts.—The Jones & Laughlin Steel Co. have started up the 128-in. 3-high plate mill, which the company bought late last year from the Dominion Iron & Steel Co., Sydney, N.S. This mill will roll sheared plates up to 120 in. wide, and will have a capacity of 15,000 to 18,000 tons of plates per month.

Asbestos Development in Northern Ontario.—The Slade-Forbes Mining Co. is re-opening its asbestos property in Deloro township this week. The owners of this property expect to resume the shipments of the high grade asbestos at once, and another 100 ton shipment will go forward at an early date. The erection of a small mill will take place in the near future. A number of excellent samples of asbestos were brought in recently by prospectors from the northern part of Quebec Province where a number of veins of the mineral are in evidence, some of which are four feet in width—high grade asbestos.

No Embargo on U. S. Coal for Canada. Reports that the United States would embargo coal shipments to Canada were denied officially at Washington recently. Canada has been receiving large quantities of coal from the U.S. country recently because of the Dominion's reduced production, but coal experts now connected with the American Government say United States is producing enough coal for both countries, and that the problem is solely one of equitable distribution. New England users have complained that while coal is scarce in the north-eastern States, great shipments are going through to Canadian consumers.

Steel in New Zealand.—A company has recently been formed in New Zealand, with a capital of $340,000, with the object of producing iron and steel from magnetic titaniferous iron sand, of which there is a large deposit on the coast at Taranaki, near New Plymouth, where the works are to be erected. The initial plant will be capable of dealing with 70 tons of iron sand weekly, but plans have been drawn up for the installation at a later rate of an additional furnace capable of dealing with 200 tons weekly. The production of steel is also

contemplated, and it is intended later to form a new company to carry out this development.

To Standardize Aircraft Metal Parts.—An international committee, formed to standardize aircraft metal parts, with a view of finding production on a large scale, held its first meeting in New York on Aug. 8, with representatives of England, France, Italy, Canada and the United States present. As an example of the kind of work the committee will have to do, it was pointed out that the average aeroplane has thousands of metal parts, one item alone being 248 turnbuckles. Heretofore these have been made in innumerable sizes and an effort will be made to reduce these to as few standard shapes and sizes as practicable to fit all aeroplanes.

Steel-making in Chili.—A steel industry has recently been inaugurated in Chili, a plant, on a small scale, having been put down at Santiago for the purpose of making steel from the old iron formerly exported to Europe, the high price of steel, since the war broke out, being the real cause of the new enterprise. At first great difficulty was experienced in finding workmen, but eventually Spaniards were imported from Bilbao, who instructed the Chilian apprentices under them. There are now over 100 workers employed, and Chilian coal, another form of economy, is used. The products of the mill include bars, plates, tees and angle iron, and there is an immediate market for all that can be produced.

Lake Superior Iron Ore.—Lake Superior iron ore shipments in July totaled 10,241,633 tons, exceeding the best previous month's record, in August, 1916, by 391,493 tons. On account of very late opening of navigation on account of the ice, the April and May shipments were less than those of a year earlier, but June and July have made up part of the deficit, and with 26,376,768 tons shipped to August 1st the deficit as compared with last year is only 2,988,956 tons. It is possible that half of this can be made up in the remainder of the season, which would make the year's shipment by water and all-rail about 65,000.000 tons. Recent studies of the situation made in ore and furnace circles indicate that a movement of 60,000,000 tons would probably carry the furnaces safely to the opening of navigation in 1918.

To Build Concrete Vessels.—A syndicate has been formed in Montreal and plans are about completed for the building of concrete steamships on the local water front. The Atlas Construction Co. of Montreal are the prime movers in this enterprise, and the members of the syndicate which will provide the initial working capital are well known business men of Montreal. Ships of this character have already been built in France and Italy, and are giving entire satisfaction. The first vessel of the kind to be constructed in Montreal will be 200 feet in length and the thickness of the hull will be from three to five inches. The cost of the vessel will be well within $100,000. The engines for this vessel

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METAL STAMPINGS
We are manufacturers of stamped parts for other manufacturers.
We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.
We can finish steel stamping in Nickel, Brass or Copper.
Send us a sample order.
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are the result of over sixty years' experience in spring making, combined with unsurpassed equipment and the workmanship of men who have been with us, ten, twenty and in some cases thirty years.
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Established 1857.
THE WALLACE BARNES COMPANY
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Man'frs of "Barnes-made" Products
Springs, Screw Machine Products, Cold Rolled Steel and Wire

"HAWK"D CHROME VANADIUM STEEL
Will Give You Exceptional
Shell Forging Production
WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.
Comes to you heat-treated and ready for use.
It does not stick to the work.
There are many cases where each punch has turned out over 2,000 shells.
It means more shells, per machine per day.
STEEL OF EVERY DESCRIPTION.
Hawkridge Brothers Company
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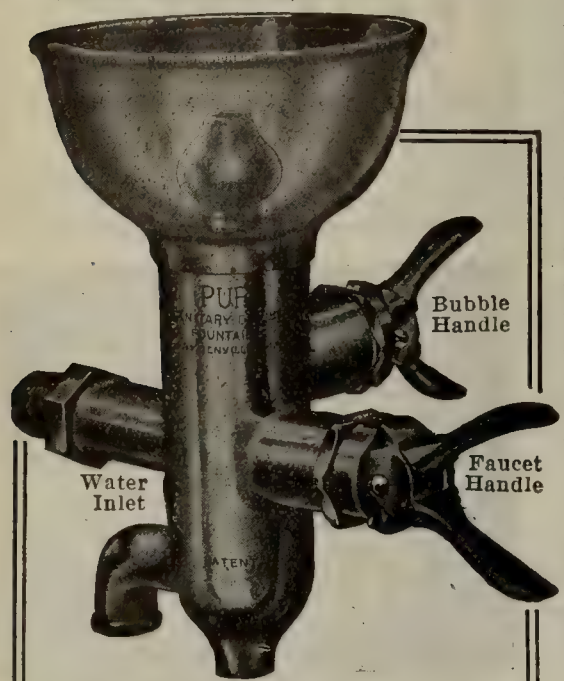
I BELIEVE

In Safety First and always.
In providing for the Health of my Fellow Workmen.
In Light and Air and sanitary Working Conditions.
In clean, fresh drinking water for everybody.
In the Safety, Economy and Man-betterment.

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)



The loss of a man through impure drinking water is a crime that "the front office" must bear.

An ugly statement, isn't it? But true, absolutely.

When a man comes to work in your factory he puts his health in your keeping.

Are you willing to take chances on such a trust?

Impure drinking conditions are responsible for more tragedies than any machine ever built.

Apply the "Safety First" Principles to your water supply; don't deny your men a clean, fresh drink of water.

Conserve their health and they will improve your profits; make yourself as worthy of the name of "employer."

Install the Gold Medal winner Puro in your plant, office and shop alike.

The only Sanitary Drinking Fountain that is safe, sanitary, simple, automatic in control and easily attached.

Let us tell you just what it will cost you to

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YOUR WATER SUPPLY

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Owen Sound Iron Works
Owen Sound, Ont.

Engineers
Boiler-makers
Founders
Machinists

Tank Work
Smoke Stacks,
Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order

have been contracted for, and it is expected that the vessel will be launched before October 1. It is stated these vessels can be turned out more rapidly than steel vessels and at much less cost. The first vessel is more or less of an experiment, but if it is successful an aggressive shipbuilding programme by several Canadian firms will be the result.

Steel Imports Into Canada from U.S.—It is interesting to note the importations of various steel and iron products into Canada from the United States, and their relative values as compared with last year. The importation of steel billets and ingots was nearly twice as much this year as last, but the value of this year's importations was over three times as much as those last year. The importations of wire goods was nearly twenty million pounds less this year than last, but owing to the higher price obtainable, the value of the importations was actually more this year than last, as can be seen in the following comparisons:

	1917.	1916.
Tin plates, tern plates and taggers, tin, lbs..	135,622,492	117,364,108
Value	$7,718,619	$3,979,069
Wire and wire goods, lbs.	109,212,971	129,894,358
Value	$3,925,421	$3,674,850
Steel billets, ingots, etc. tons	183,161	92,257
Value	$13,499,356	$3,733,393
Steel rails for railways, tons	72,547	11,106
Value	$2,725,475	$369,650
Sheets and plates, lb....	561,088,568	518,710,230
Value	$ 21,026,003	$ 11,423,948

Commission to Control U. S. Coal Situation.—Armed with authority to fix coal prices from the mouth of mines to the consumer, the Federal Trade Commission is preparing to take charge of the fuel situation, hoping to solve much of the industrial troubles of the country. Under the Pomerene amendment to the Food Bill, the President may fix prices and rules of practice of all coal men, miner and middleman, and if he sees fit, take over the business. The amendment establishes absolute government control of what experts believe is the biggest factor in war preparation. Federal trade officials—expecting the President immediately to turn over to them the task of coal control, are speeding their investigation to fix costs from the mine to the consumer. A report of the commission to be published shortly is expected to put the blame for a coal "shortage," declared to be artificial, jointly on coal producers and railroads. Huge exports of coal are being made to Canada, it is charged. in order to create a shortage that will result in higher prices here.

PERSONAL

N. F. La Sauvage, traffic manager at the Montreal office of the Steel Company of Canada has been in Toronto for several days on a business visit.

Alexander Gillespie, for twelve years past resident engineer at the Waterworks Department at Brantford, Ont., has tendered his resignation, to take effect on September 1.

Fraser S. Keith, secretary of the Canadian Society of Civil Engineers, has left on a tour of the western branches of the society. He will go as far west as Prince Rupert and Victoria, B.C.

Charles G. Knott, manager screw department Toronto office, Steel Company of Canada, is spending his vacation on a motoring trip in the Eastern States.

Messrs. George Wedlake, of the Cockshutt Plow Co., and **F. W. Nichols,** both of Brantford, Ont., have been appointed by the joint committee on Technical Organization, district representatives in the industrial research census to be taken of all the industries of the Dominion.

Captain Kay has been appointed the master of the steamer War Dog, the first steel ocean-going vessel to be built in Vancouver, B.C. Captain Kay has been in the employ of Chambers & Co. of Liverpool for many years and since war broke out has been doing transport work. The War Dog will shortly leave Vancouver on her first voyage.

Henry Croft, a resident of Victoria, B.C., for the past thirty-two years, and recognized as one of the most widely versed authorities on mining in British Columbia, died suddenly on July 28, at his residence, "Mount Adelaide," Esquimalt, B.C. Mr. Croft was 61 years of age, having been born on January 15, 1856, at Mount Adelaide, Sydney, Australia.

W. P. Hinton, traffic manager of the Grand Trunk Pacific, has been appointed vice-president and general manager of the G.T.P. and G.T.P. Coast Steamship Co., with headquarters at Winnipeg. Mr. Hinton who was born at Ottawa in 1871 has been engaged in railway work for the past thirty years and was at one time connected with the old Canada Atlantic, which was absorbed by the Grand Trunk in 1905. Mr. Hinton succeeds **Morley Donaldson** who has resigned on account of ill health.

Morley Donaldson who is retiring from the Grand Trunk Railway was born in Edinburgh, Scotland, on May 1, 1851. He was for some time in the engine works of E. Gilbert & Co., Montreal, and in 1881 entered the service of the Canada Atlantic Railway as chief draughtsman. He became successively mechanical superintendent, superintendent of traffic and mechanical departments; general superintendent, until the road was merged with the G.T.R. System, 1905. He has been vice-president and general manager, G.T.P. since 1912.

MARINE

Victoria, B.C.—The fourth auxiliary schooner Malahat now being built for the Canada West Coast Navigation Co., will soon be ready for launching.

Victoria, B.C.—The auxiliary schooner Margaret Haney, Capt. Boyd, reached Bombay after an 86-day voyage which covered 1,200 miles.

Victoria, B.C.—The auxiliary schooner Esquimalt, the third of the vessels built at yards of the Cameron-Genoa Shipbuilders will leave shortly for chemainus to load lumber for Australia.

Port Dover, Ont.—A movement has been inaugurated to develop the harbor here in order to secure a shorter route for the haulage of coal to points in Central Ontario.

Victoria, B.C.—The Janet Carruthers,

which was launched at North Vancouver on June 28, has gone up to Ioco to take on bunker fuel and to commence loading lumber for Port Adelaide, Australia.

New Westminster, B.C.—The New Westminster Construction & Engineering Co. have laid the keels of two vessels being built here for the Imperial Munitions Board. The concern is building four vessels for the Government at its Poplar Island plant.

Fort William, Ont.—James Whalen, president of the Port Arthur Shipbuilding Co., stated in an interview recently that his company has just secured additional contracts involving the expenditure of $2,000,000, which will keep the docks working to full capacity until far into 1919, summer and winter.

New Lighthouse Installations. — The Lake Carriers' Association of Detroit, Mich., has received notice from the Department of Marine and Fisheries of Canada, that a flashing white catoptric light at the west end of Long Point, on the neck, between the lake and inner bay, is still in operation and that its maintenance has not been discontinued. The Kincardine back range lighthouse, Lake Huron, has been painted white. Announcement is made by the United States Bureau of Lighthouses that light near the outer end of the west pier at Charlotte, Lake Ontario, is being changed from a fixed red to an occulting white light, of 4,000 candle-power, showing illumination of six seconds alternating with eclipse of four seconds.

INCORPORATIONS

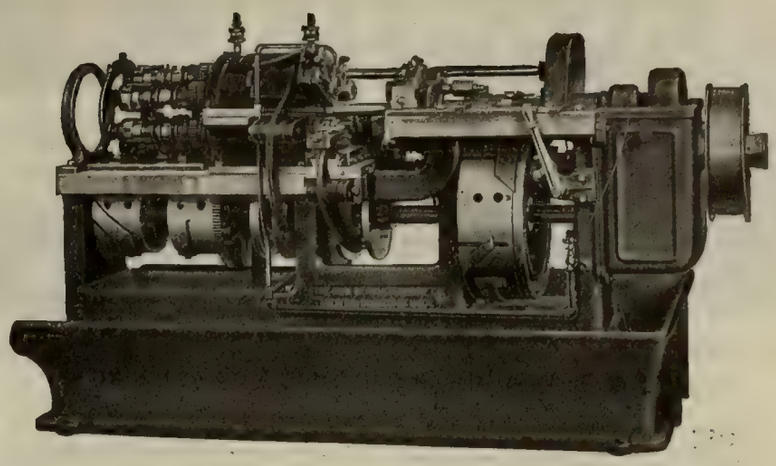
Montreal Machine Shop, Ltd., has been incorporated at Ottawa, by G. Mayrand, H. Hardy and L. Guilbault of Montreal, to operate machine shop and manufacture engines and motors of all kinds at Montreal, with a capital of $100,000.

Dominion Molybdenite Co. has been incorporated at Ottawa by S. G. Metcalf, Charles Murphy and A. C. Craig of Montreal, to carry on a mining, milling and smelting business, with head office at Ottawa, and a capital of $5,000,000.

The Toronto Shipbuilding Co., has been incorporated at Toronto with a capital of $100,000 to build steam ships and vessels of all kinds at Toronto. The provisional directors are J. E. Russell, J. J. Manley and S. W. McKeown, all of Toronto.

Toronto Dry Dock Co. has been incorporated at Toronto with a capital of $100,000 to operate a dry dock and to build and repair ships of all kinds at Toronto. The provisional directors are John E. Russell, H. Cresswell and S. W. McKeown all of Toronto.

S. & F. Motors Corporation, Ltd., has been incorporated at Ottawa with a capital of $46,000, to manufacture motor cars, motorcycles and motorboats at Montreal. The incorporators are Mitchel Freund, M. Mackay of Montreal, and A. N. Dufresne of St. Cesaire, Que.



Screw Machine Queries:

"WHAT ABOUT POWER CONSUMPTION?"

POWER CONSUMPTION, while not a decisive factor in the choice of a multiple-spindle automatic, is a matter of more dollars and cents importance than is commonly attached to it by prospective purchasers.

Cutting Tools are, of course, responsible for the bulk of the power consumed. Generally speaking, there is little chance for economy here, assuming proper care and lubrication.

Spindle Bearing Design, however, has a very material influence on the amount of power required to drive the machine.

The New Britain's chrome-nickel steel spindles are hardened and ground and run in straight bronze bearings. The use of the straight bearing is made possible by the employment of ball thrust bearings on the spindles.

The resultant advantages over the taper type of bearing formerly used are—a larger bearing surface, freedom from spindles sticking, and a 30% reduction in power required to drive them.

The complete elimination of spiral gearing and chains in the NEW BRITAIN'S design in the use of spur gearing throughout, constitute an added power-saving factor.

The "NEW BRITAIN" S-I-X possesses other features productive of still greater economies. Send for descriptive bulletin.

The New Britain Machine Company

—Automatic Screw and Chucking Machines—

New Britain, Conn., U.S.A.

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for that position you have open, don't you? Then why not advertise for him in the paper he reads? Only the mechanics who are ambitious and who are capable of filling the responsible positions subscribe to CANADIAN MACHINERY. Your "Help Wanted" ad. in CANADIAN MACHINERY will bring responses from this class.

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FOR SALE

A PAYING PROPOSITION FOR RAILROADS or manufacturers. Wish to sell our Canadian rights with fixtures. Address Frank Bayless, 311 Fair Street, Springfield, Ohio. c9m

FOR SALE — 1 LEES-BRADNER THREAD miller, equipped for threading nose and base of 6" shells. Apply The Hayes Wheel Co., Chatham, Ontario. c9m

ONE ARMINGTON & SIMS 10" x 12" HIGH speed engine, belted to one Westinghouse Electric Mfg. Co. direct current generator, 40 K.W., 550 volts, 75 amps.; speed 910 r.p.m.; also 40' 0"-10" double leather belting; all in good condition. Armstrong, Whitworth of Canada, Limited, Montreal, Que. c6m

FOR SALE—THE TORONTO ELECTRIC COMmissioners have for sale a quantity of second-hand 60-cycle meters and transformers recently in service, also quantity of electrical supplies. List of material and full particulars may be obtained on application to the Purchasing Agent, 15 Wilton Avenue. The quantities are not guaranteed, and all are subject to prior sale. No tender necessarily accepted. Toronto Hydro-Electric System, 226 Yonge St., Toronto. c7m

HYDRAULIC EQUIPMENT FOR SALE.—The equipment listed below is in first-class shape having only been used about three months. Blue prints and specifications and foundations drawings will be furnished. 2—14 x 12 x 5" Fairbanks-Morse duplex steam driven high pressure pumps at 80 gals. per minute capacity each against 600 lbs. pressure, steam pressure 150 lbs. 1—Weighted Accumulator good for 1000 lbs. per sq. inch, 16" diameter, plunger 11 ft. stroke with squeezing water cushion and wooden outside bumper blocks. The tank for the weighing material surrounding the cylinder is 10' 7" in diameter and 11' 0" high. 1—Return Suction Tank for above pumps and accumulator. Height, 9' 0", diameter 8' 0". Capacity, 2700 Imperial gallons. This equipment can be shipped immediately and is open for inspection at the company's plant. Prices on application. The Canadian Copper Company, Copper Cliff, Ont. c8m

SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto.

PATENTS

THE PROPRIETOR OF LETTERS PATENT M. R. Matti No. 137,772, "Arrangement for changing the moment of fuel injection into the combustion chamber during the run of the motor and for regulating the quantity of fuel," desires to dispose of the patent or to grant license to interested parties at reasonable terms, with a view to the adequate working of the patent in Canada. Inquiries to be addressed to the patentees, Stora Kopparbergs Bergslags Aktiebolag, Falun, Sweden. c7m

WANTED

WANTED—AIR COMPRESSOR — MUST BE in good condition: give full particulars as to make, size and price. Box 324, Canadian Machinery. c27m

WANTED—SECOND-HAND POWER SQUARing shear to cut No. 10 gauge steel up to 24" wide. Must be in good working condition. Packard Electric Company, St. Catharines, Ont. c4m

1 POWER HAMMER, 500 LBS. CAPACITY. Belt driven. 2 24 or 26 x 10 or 12 ft. C.M.C. engine lathes. 1 Pipe Threading Machine with tangent die attachment to cut between ⅜ to 3 inch. 1 Vertical Boring Machine, 42" table, Buller or Niles type. These machines must be in first-class condition and reasonable in price. Apply: P.O. Box 1965, Montreal, P.Q. c4m

SITUATIONS WANTED

PRACTICAL WORKS MANAGER AND MEchanical expert with years of experience in United States and Canada, a specialist in munition work, open for engagement. Best of references. Apply Box 304, Canadian Machinery. c4m

MACHINE SHOP FOREMAN DESIRES change as shop foreman or master mechanic; acquainted with scientific management; 26 years' experience. Box 322, Canadian Machinery.

ARE YOU LOOKING FOR PRODUCTION IN your tool room? High-grade tool room foreman desires position in a fuse or shell factory where results count. Will be at liberty Aug. 1st. Do not reply if you do not want a man to take full charge. Box 323, Canadian Machinery.

FOR

IMMEDIATE DELIVERY

No. 28—17" x 96" Brown & Sharpe Plain Grinder.

Pratt & Whitney Vertical Surface Grinder, 36" Table.

No. 1½ Bath Universal Grinder, complete tool room equipment.

No. 1½ Landis Universal Grinder, for Internal and External Grinding.

36 ft. Niles Plate Planer.

Lynd-Farquhar Co.

Boston, Massachusetts

SITUATIONS WANTED

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States will be open for position as superintendent or general foreman, July 15th. A1 references. Address Producer, Box 321, Canadian Machinery. c3m

SITUATIONS VACANT

THOROUGHLY CAPABLE BRASS FOUNDRY Foreman to take charge of small foundry doing a general jobbing business and also munition work. Location Montreal. Address for information, "Brass Foreman," P.O. Box 1934, Montreal. c26m

MECHANICAL DRAFTSMAN WANTED. Experienced on engines or turbines, capable of working out engine details. Apply giving full particulars as to experience, salary required, and enclose references, to Henry Hope & Sons of Canada Limited, Peterborough, Ont. c6m

NIGHT SUPERINTENDENT FOR SHELL MAchinery plant in Western Canada; knowledge of four point five shell and good all-round experience essential. Write, stating qualifications, salary and references, otherwise application will not be considered. Box 325, Canadian Machinery. c6m

FOREMAN WANTED—FOR SHOP IN CENtre of Toronto, with up-to-date equipment, employing about thirty men, doing jobbing business and making fine special machinery and tools. When applying state experience and give references, also wages expected. Only first-class men need apply. Box 326, Canadian Machinery. c8m

WANTED — ASSISTANT SUPERINTENDENT for six-inch shell factory. Must be capable of getting maximum production from an established plant and have good mechanical experience. Duties to consist chiefly in supervising production. Give full particulars in writing of previous experience, age, references, and salary required, to Henry Hope & Sons of Canada, Ltd., Peterboro. All information will be treated in the strictest confidence. c5m

2 New No. 2 Cincinnati Full Universal Millers

1 No. 3 LeBlond Universal Miller, Double Back Geared, Motor Drive

1 No. 2 Kempsmith Universal Miller

1 Smith & Mills 16" Back Geared Shaper

1 Smith & Mills 16" Crank Shaper

1 No. 30 Bliss Arch Press

1 Pratt & Whitney 2¼ x 26 Turret Lathe, Pan Bed, Friction Back Geared Head

J. GELB & CO.

203 Centre St., New York City

ASSISTANT SUPERINTENDENT WANTED

Assistant Superintendent wanted for 4.5" shell factory. Must be capable of getting maximum production from established plant, and have good mechanical experience. Duties to consist generally in supervising production. Give full particulars in writing of previous experience, age, references, and salary required. All information will be treated in the strictest confidence.

The McFarlane Engineering Co.
PARIS, ONTARIO c7m

FOR SALE

4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 13 B. & S. Automatic Gear Cutter.

1—30" Newark Automatic Gear Cutter.

1—5 x 48 Pratt & Whitney Plain Grinder.

1—No. 2 Bath Universal Grinder.

1—12 x 60 Modern Plain Grinder, new.

2—Lees-Bradner Thread Millers.

1—30 x 30 x 8' Powell Planer, new.

Brownell Machinery Co.
Providence, R. I.

PRESS EQUIPMENT FOR SALE

50—No. 18 Bliss Type Inclinable Presses.
6—No. 19 Bliss Type Inclinable Presses, with roll feeds.
1—Double Acting (Michigan) Press.
1—Double Acting (Rhodes England) Press.
1—Brown-Boggs Multiple Power Shears.

A large number of these presses are equipped with Dial Feeds. Have only been used for a few months—good as new. Will be sold at a bargain if purchased at once.

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TORONTO
c10m

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New 13" x 5' Lancaster Sgl. B.G., Geared Feed.
New 15" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
S.H. 15" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 16" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 15" x 7' Oliver Dbl. B.G., Q.C. Gear, Oil Pump and Pan.
New 16" x 24" x 10' South Bend Gap Sgl. B.G., Stan. Change Gears.
S.H. 17" x 8' Greaves Klusman Sgl. B.G., Geared Feed.
New, 18" x 8' Greaves Klusman Dbl. B.G., Geared Feed.
New 18" x 8' Giddings & Lewis Dbl. B.G., Geared Feed.
New 18" x 8' Stevens Sgl. B.G., Standard Change Gears.
New 18" x 8' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 18" x 10' Muller Sgl. B.G., Standard Change Gears.
New 18" x 12' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 20" x 10' Flather Sgl. B.G., Standard Change Gears.
S.H. 36" x 10' Fay & Scott Sgl. B.G., Stand. Change Gears.

HEAVY DUTY MANUFACTURING LATHES

New 20" x 8' Petrie Heavy Duty Manufacturing Lathes.

TURRET, SPEED AND BRASS LATHES SCREW MACHINES

New 13" x 7' Putman Speed Lathe.
S.H. 15" x 5' 6" Fox Brass Lathe with Chasing Attachment.
S.H. 30" x 10' Vilter Lathe, Friction B.G., Geared Feed with 13" Hex. Power Feed Turret.
New No. 0 Foster Plain Head Screw Machine, with wire feed and automatic chuck.

DRILLS

New 3' Dresses Plain Radial, Gear Box Drive.
New 20" Excelsior, Back Geared Wheel Lever, Power Feed.
New 20" Silver, Back Geared Wheel Lever Power Feed.
New 14" Leland Gifford Single Spindle Sensitive.
S.H. 14" Avey Spingle Spindle Sensitive.
S.H. 14" Foote-Burt Four.
New No. 1 Emco Bench Single.

HACK SAW MACHINES

New Peerless High Speed.
New No. 1 Atkins Kwit-Kut.

GRINDING AND BUFFING MACHINES

New 20" Ford Smith Water Tool Grinder.
New 18" Ford Smith S.O. General Purpose Pedestal Grinder.
New 16" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. Combination Grinder and Buffer.
New 12" Ford Smith S.O. Buffing Machine.
New Style B, Point Yankee Twist Drill Grinder.

MISCELLANEOUS

S.H. No. 22 Garvin Vertical Milling Machine.
S.H. No. 0 Burke Hand Milling Machine.
New 1¼" National Bolt Cutter with Lead Screw Attachment.
New No. 1 Grabo Metal Saw Table.
New D4 Rock River Slitting Shear.
New No. 4 Chicago Steel Bending Brake.

Telegraph, Phone or Write for Prices and Further Particulars

H. W. PETRIE of MONTREAL
LIMITED
MONTREAL, QUEBEC

PETRIE'S LIST

Of New and Used Machine Tools Stock for IMMEDIATE DELIVERY

TURRET LATHES AND SCREW MACHINES

12" x 42" Foster, plain head.
15" x 5½' American, fox.
16" x 6' Pratt & Whitney, turret.
18" x 6' Prentice, high speed.
22" x 8' Pratt & Whitney.
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
No. 2 Hercules screw machine.
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

13" x 6' Filssmith, D.B.G.
14" x 6' Lodge & Shipley.
15" x 6' London, back geared.
16" x 8' McDougall, back geared.
17" x 8' Blaisdell, back-geared.
18" x 6" New Haven.
18" x 10' Putnam, back-geared.
20" x 8' Fifield, back geared.
21" x 9' back-geared, single purpose
21" x 8' Bawden, heavy duty.
24" x 11' Pond, back-geared.
30" x 10' Ames, back geared.
31" x 16' Fifield, back-geared.
18" x 32" x 12' C.M.G. gap.
24" x 40" x 20' Dundas, gap.
28" x 50" x 24' Bertram, gap.

DRILLS

13" Perfect, 2-spindle.
14" Excelsior, sensitive.
16" Barr, sliding head.
18" Buffalo, post drill.
20" Perfect, lever feed.
20" Silver, back-geared.
22" Barnes, back-geared.
24" Kerkhoff, sliding head.
40" Bickford, back geared.
64" Canedy-Otto, wall radial.
No. 10a Baush, 16-spindle.
No. ½ Avey, ball-bearing, bench.

GRINDERS

No. 1 Wilmarth & Morman.
No. 1 Cincinnati, universal tool.
No. 2 Landis.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 14 Besly, with shell holder.
26" Gardner, disk.

IRON PLANERS

20" x 20" x 5' Bertram.
24" x 24" x 6½' Bertram.
24" x 34" x 8' Cincinnati, 2 heads.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Sellers, 4 heads.
40" x 40" x 12' New Haven, power feed.

MILLING MACHINES

No. 0 Burke, hand feed.
Bertram, plain.
Brown & Sharpe, power feed, plain.
Fitchburg, geared, plain.
No. 2 Ford-Smith.
No. 6 Whitney, hand feed.

SHAPERS.

16" Canada Mach. Corp.
16" Hendey.
16" Queen City, back geared.
20" Cincinnati, back geared.
24" Gould & Eberhardt.
30" Morton, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6" Robertson Hack Saws.
6" Kennedy Cutting-off Machine.
12" Hall Pipe Machine.
No. 2 Colburn Keyseater.
No. 5 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 2 Bliss Foot-power Press.
Brown-Boggs Punching Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
7' Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

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We Own Every Tool Offered

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1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—28 x 15 Putnam Standard Engine Lathe.
1—22 x 14 Putnam Standard Engine Lathe.
3—New 18 x 8 Springfield Engine Lathes.
1—New 16 x 8 Springfield Engine Lathe.
1—New 14 x 6 Springfield Engine Lathe.
1—18 x 6 Jones & Lamson Standard Engine Lathe.
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Lodge & Shipley Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.
1—11 x 5 Seneca Falls Engine Lathe.
1—No. 3 Hartiarge Bench Lathe.

TURRET AND SCREW MACHINES

1—2¼ x 24 Jones & Lamson Flat Turret Lathe, S.G.H.
1—2 x 24 Jones & Lamson Flat Turret Lathe, cone head.
2—No. 6-A Potter & Johnson Automatic Lathes.
3—No. 4 Foster F.G.H. Head Screw Machines.
2—No. 3 Foster F.G.H. Hand Screw Machines.
1—No. 5 Pierson F.G.H. Hand Screw Machines.
1—No. 4 Smurr & Kamon Hand Screw Machine.
4—New 14" Pierce Turret Lathes.
2—New 1 x 8 Pierce Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jogger feed.

MILLING MACHINES AND GRINDERS

2—No. 3 Cincinnati Universal, cone type.
5—No. 1½ Knight Milling & Drilling Machines.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
1—No. 1 Cincinnati Plain Milling Machine.
1—No. 13 ½ Garvin Plain Milling Machine.
1—No. 2 Hendey Plain Milling Machine.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
1—No. 2½ Bath Universal Grinder.
1—No. 170 Wells Cutter Grinder.
1—Mina Valley Universal Cutter Grinder.
4—No. 0 Burke Bench Millers (new).

DRILL PRESSES

1—3-spindle 8" overhang Henry & Wright High Speed Drill.
3—12" Leland & Gifford High Speed Bench Drills.
5—20" Buffalo Plain Drill Presses.
4—6-spindle Fox High Speed Drill Presses.
2—4-spindle Fox High Speed Drill Presses.
1—3' Mueller Plain Radial Drill.
1—4' Bickford Radial Drill, with T.A.
1—6' Mueller Plain Radial Drill.
1—16-spindle Natco.

SHAPERS AND PLANERS

1—24" Ohio H.D., B.G. Crank Shaper.
1—24" New Barker Crank Shaper.
1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
1—16" Hendey Geared Shaper.
1—16" Garvin Shaper.
2—16" New Springfield B.G. Crank Shapers.

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1—Waterbury-Farrell Straight Sided Geared Press with double cam knock-out.
1—No. 10 Perkins Drawing Press.
5—No. 2-W Bliss Wiring Presses.
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1—800-lb. P. & W. Roll Board Hammer.
1—50-lb. Scranton Belt Hammer.
1—25-lb. Bradley Helve Hammer.

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1—8 x 6 Westinghouse Steam Air Compressor.
1—16 x 18 x 12 Union Steam Pump Co., steam driven air compressor.
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1—10 x 10—Clayton Belt Driven Air Compressor.
1—8 x8Fairbanks-Morse Electircal Driven Air Compressor.
1—8 x 8 Gardner Single Belt Driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt Driven Air Compressor.
1—7½ x 6 Chicago Pneumatic Tool Co. Belt Driven Air Compressor.
1—6 x 6 Chicago Pneumatic Tool Co. Belt Driven Air Compressor.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machines tools both large and small.

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ELECTRIC TRAVELING CRANES.

50-Ton, 61' 7" span, four motor, 550 volts, D.C.
25-Ton trolley, three motor, 220 volts, D.C.
10-Ton, 40' span, 80' lift, three motor.
5-Ton, 47' 0" span, three motor, 110 V., D.C.
21, 14 and 4½ H.P. Shaw crane motors, 220 volts, D.C.
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10-Ton hand crane, 55' 0" span.
20-Ton hand crane, 29' 6" span.
2-Ton hand cranes, 22' span.

PUNCHES AND SHEARS.

Lever Shear (double), cap. 2" sq.
28" throat (single), cap. ⅞x⅞" (belt).
36" throat (single), cap. 1¼x1" (belt).
48" throat (single), cap. 3x1¼" (steam).
16" throat (single), cap. 1½x1½ (belt).
38" throat (single), cap. 1x1" (belt).
36" throat (single), cap. ⅞x⅞" (belt).
17" throat (single), cap. ¾x¾" (belt).
15" throat (single), cap. ¾x½" (hand).
10" throat (double), cap. 1½x1" (belt).
Angle Shear (double), cap. 6x6x⅝" (belt).
Angle Shear (double), cap. 6x6x¾" (belt).
Plate Shear (Univ.), 18" blade, cap. ½".
Rotary splitting, 30" throat, cap. ½".
Rotary bevel, 5" throat, cap. ½".
Coulter & McKenzie, cap. 3x½", spring steel.
Guillotine, Perkins, No. 6, cap. 2½" sq.

MISCELLANEOUS.

Acme Rivet and Upsetter, 1½" cap.
Bending Roll, 6', drop end, 6½ and 8" rolls.
Bending and Straightening Mch., 24" cap., 1" stroke.
Grinder, No. 10 B. & S. Plain.
Grinder, No. 13, B. & S. Universal and Tool.
Rotary Planer, 36", Cleveland No. 2.
First-class condition—quick shipments.
Saw, cold, 28" blade, 48" travel.
Press (trimming) No. 11 Perkins, 16,500 lbs.

McCoy-Brandt Machinery Co.
Office and Warehouse:
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Federal Machinery Sales Company
18 No. Jefferson St., Chicago, Ill.
Rebuilt Tools—Immediate Shipment

DRILLS.

24" Hoefer, upright, sliding head, b.g., p.f.
25" Hamilton, sliding head, b.g., p.f.
2-spindle 20" Barnes, gang, b.g., p.f.
Silver, 20", wheel and lever feed (15), new.
Silver, 20", b.g., p.f., automatic stop (20), new.

GEAR CUTTERS.

Gould & Eberhardt, 22" x 5" x 6 pitch, auto. spur and bevel.
Whiton 24" Automatic Spur Gear Cutter.

GRINDERS.

No. 2 Oakley Universal Cutter and Tool Grinder, new.
No. 2 American Surface Grinders (2), new.
Landis 8" x 20" Universal.
Landis 16" x 66" Crank Grinder with extra plain heads if desired.

LATHES.

16 and 17" x 8' Engine Lathe (6), Porter, Cincinnati, etc.
16" x 8' South Bend (2), new.
18" x 12' American, c.r., h.s.
17" x 6' National, quick-change gear, c.r., h.s.

MILLING MACHINES.

Pratt & Whitney Lincoln type (2).
No. 1½ American Universal.
No. 3 Aurora, plain, back-geared.
No. 1½ Grand Rapids, back-geared, plain.
No. 13 Brown & Sharpe Mfg., plain.
4-spindle Warner & Swasey Valve Miller, good as new.

PRESSES.

No. 5 Cleveland, open back, inclinable, plain, new.
C1 Ferracute, open back, inclinable, plain, new.

SCREW MACHINES AND TURRET

2¼" Acme, fric. grd. head, p.f. to turret.
Bardons & Oliver No. 1, 13-16" cap.
Hamilton, 20" swing x 8' bed, fric. head, eng. tur. lathe, pan bed, power feed turret on bed.
Pond 21" Heavy Duty Rigid Turret Lathe, geared head.
Jones & Lamson 3" x 36" Grd. Sliding Head Turret Lathe, bar equipment.

SHAPERS.

20" Hendey Friction Shaper.
20" Cincinnati Back-geared Shaper.

MISCELLANEOUS.

High Speed Hammer Co.'s No. 4A Riveting Hammer.
3" Smith & Post Cold Saw.
D14 Rock River Geared Power Splitting Shear.
60" Bertsch Foot Power Gap Squaring Shear.

Send for complete list. c8m

Chas. A. Strelinger Co.,
43-51 E. Larned St.,
DETROIT - MICH.
Machine Tools For Immediate Delivery

DRILLING MACHINES.

No. 3 Barnes Horizontal Radial Drill.
Henry & Wright Sensitive Drilling Machines.
No. I-S Garvin B. G. Horizontal Drill with Pump and Piping.

GRINDERS.

Wells No. 160 Cutter and Reamer Grinder.
Capitol Internal Grinder with water attachment.
No. 2 Diamond Auto. Surface Grinder, belt driven.
No. 3 Wilmarth & Morman Surface Grinder.
No. 3 La Salle Grinder, complete.
Geometric Chaser Grinder, with countershaft.
No. 4 and No. 6 Gardner Pl. Bearing Disc Grinder.
No. 2 Diamond Wet Tool Grinder with wheel truing device.

LATHES.

No. 10-K Seneca Falls 9" x 4' Bench Lathe.
14" x 6' Monarch Q.C., S.B.G. Engine Lathe.
17" x 8' Sidney Q.C., D.B.G. Engine Lathe.
19" x 8' Sidney Q.C., D.B.G., Engine Lathe.
16" x 7' Oliver Q.C., D.B.G. Lathe, with pan and pump.

SCREW MACHINES.

No. 1 New Howe Pl. Hd. Screw Machine, with auto. chuck.
1½" Dreses Screw Machine, F.B.G., Power Feed.

MILLING MACHINES.

Wisconsin Hand Miller on column, complete.
No. 6 Whitney Hand Miller, complete with countershaft.
No. 1 U.S. Hand Miller, complete with cshaft.
H. B. Smith Hand Miller, complete with cshaft.
No. 1 Standard Hand Miller, with oil pump equipment.

PRESSES.

Atlas Presses, No. 0 to No. 5 inclusive.
Greenerd Arbor Presses, No. 1 to No. 5 inclusive.
No. 5 Toledo Geared O.B.I. Power Press.
Manhattan Ratchet Type Screw Press.

THREADING MACHINES.

Geometric ¾" Threading Machine.
No. 38 Curtis & Curtis Hand Power Pipe Machine.
No. 5½ Merrill Comb. Hand and Power Pipe Machine.

C. W. CULLEN
MACHINERY CO.
LEADER-NEWS BUILDING
CLEVELAND, OHIO

Bickford 4½' Plain Radial Drill, cone drive.
No. 3 Lapointe Broaching Machine, new.
2—P. & W. No. 2 Cutting-off Machines.
Bement Miles & Co. 7½" Vertical Spindle Crank Drilling and Boring Mill, 68" swing.
Detroit Japanning Ovens, 8' 10" x 8' x 152".
Pratt & Whitney 48" Gap Lathe.
Hanna 30-ton Riveter, 12" reach.
Pangborn Sand Blast, 90" rotary table, M.D.
3—800-ton Gen. El. Hydraulic Double Action Presses.
3—2¼ Cleveland Automatics; prac. new.
10—¾" B. & S. Automatics.
Allis Chalmers 150 H.P. Corliss Engine, 12' F.W.
Bruce MacBeth 150 H.P. Gas Engine; new.
2—Rathmann Jones Gas Engines, 125 and 225 H.P.
80" Niles Vert. Boring and Turning Mill, 2 heads, slotting attachment.
Ingersoll-Rand Air Comp., 342 cu. ft., steam driven, inter-cooler, complete.
Bertsch Straightening Rolls, 7" x 84"-3" vert. adj. M.D.
Kelly Springfield 10-ton Road Roller, rebuilt.
Vulcan 1 cu. yd. Steam Shovel, traction; weight 35 tons; new flues.
62-ton Baldwin Consolidation Locomotive.
Ajax No. 1 Taper Forging Rolls, 50 strokes.
One No. 5 S-3 Cold Langelier Swadger.
3—No. 7 H.S.-6 Langelier Swadger.
1—Bolt and Rivet Header, hand feed, ⅝" x 3½" rivets.
Bolt and Rivet Header, hand feed, ¾" x 4" rivets.
70-C Bucyrus Steam Shovel, St. G.
R. Is. Locomotive, 45 tons, St. G.

IMMEDIATE DELIVERY

DRILLING MACHINES

Leland H.S., B.B., bench type.
No. 1½ Knight Driller and Miller.
14" Rockford Sensitive.
20" Kern, b.g.
22" W. F. & J. Barnes, s.h., b.g., p.f.
No. 25 Foote-Burt 24" drill (new).
32" W. F. & J. Barnes, s.h., b.g., p.f.
32" Hamilton, s.h., b.g., p.f.
No. 30-C Baush, 12 spindle.
20" W. F. & J. Barnes, 4 spindle.
3' W. E. Gang Plain Radial.
3½' W. E. Gang Plain Radial.
Pawling & Harnischfeger Horizontal Driller.
No. 1B Bement Horizontal Driller and Borer.
48" Colburn Mill, 2 swivel heads.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. automatic.
30" x 9" G. & E. auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3—26" B. & S. for spur.
36" Walcott for spur.

GRINDERS

Yankee Drill.
Leland Universal, with power feed.
No. 23 B. & S. Gear Cutter.
8" x 30" Modern Plain (new).
14" x 20" B. & S. Plain.
Garvin hole grinder.
Gisholt tool grinder.
No. 5 Diamond water tool.
No. 16 Gardner disc grinder.
No. 24 Gardner disc grinder.

LATHES

13" x 5' P. & W., c.r., taper.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
18" x 8' L. & S. pat. head, c.r. taper.
18" x 10' Fitchburg, c.r.
18" x 12' Barker, c.r.
20" x 14' Blaisdall, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
32" x 16' Blaisdal, c.r.
36" x 20' American, t.b.g.
36" x 22' New Haven, t.b.g.
3½" x 60" Fitchburg Lo-Swing.

PLANERS

36" x 36" x 16' Sellers, one head.
36" x 36" x 12' Cleveland, open side, 3 heads and arranged for motor drive.
36" x 36" x 12' Detrich & Harvey, open side, 2 heads, one side head.
40" x 38" x 14' Putnam, one head.
40" x 40" x 12' New Haven, one head, one side head.
40" x 48" x 18' New Haven Planer, 2 heads, 2 extension heads.

SCREW MACHINES

1" B. & S. Plain.
16" P. & W. Plain.
No. 2 Foster, plain head.
No. 2 Costello, plain head.
No. 2 P. & W. friction head.
No. 3 Foster, geared head.
No. 4 Pearson, geared head.
No. 3 Bardons & Oliver, plain head.
No. 12½ Garvin, friction head.
⅞" Cleveland, automatic.

TURRET LATHES

16" Lodge & Shipley.
25' Niles.
2 x 24" Jones & Lamson.
3 x 36" Jones & Lamson, chucking equipment.
3 x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt turret lathes, taper attachment.

PUNCHES AND SHEARS

No. 2 L. & A. Angle Iron Shears, 5"x5"x½" (new).
No. 5 L. & A. Double Punch & Shear, ⅝"x⅝", 3"x⅜", 1⅛ rd. (new).
No. 1 L. & A. Multiple Punch (new).
No. 2 L. & A. Multiple Punch (new).
No. 1 L. & A. Horizontal Punch, ½" in 1" (new).

MISCELLANEOUS

No. 2 Kempsmith Universal Miller.
50-lb. Bradley Strap Hammer.
100-lb. Bradley Helve Hammer.
¾" Acme Forging Machine.
52" Niles car wheel boring mill.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-ton Yale Duplex Hoist.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., CHICAGO, ILL.

UNRESTRICTED PUBLIC SALE—BROOKLYN, N. Y., THE VALUABLE

Machinery and Equipment

OF THE

"Automatic Machine Products Co."

LOCATED IN THE

BUSH TERMINAL BUILDING No. 5

(Fifth and Sixth Floors) Entrance Thirty Fifth Street and Third Avenue

Tuesday, August 28th, 1917, commencing at 10.30 a.m.

COMPRISING

Power Punch Presses (59 in all) including V. and O. Model Nos. 2, 2½, 3, 4, 12½ and 24. Bliss make Nos. 16, 21, 21B, 34 and 52. Adriance Nos. 5, 24 and 223. Consolidated Nos. 4 and 35. Consolidated Nos. 4 and 35. Waterbury Nos. 370 and 373. Rockford, Erie, Ferracute, and Pineer special presses and Mossberg screw press.

Cleveland Automatics (108 in all) Model A, two-inch capacity, latest type.

Milling Machines. (30 in all), Kempsmith No. 2 Universal Mills, Becker-Brainard No. 2 Plain Miller, Van Norman No. 0, Burke No. 3, Bristol No. 0 and Lees-Bradner Thread Miller.

Lathes. (40 in all), Le Blond 18", Pratt & Whitney 16", Garvin 12", Prentiss 12", Chard 16", Davis various sizes, Davis & Egan 18", Blount, Prentiss and A.M.F. & Co. Speed Lathes.

Screw Machines (70 in all). Garvin make, Nos. 2, 2½ and No. 22½ wire feed and turret types.

Tapping Machines. (77 in all), Garvin No. 3, Harvey, Hubbel, Hercules, Richard & Shafer, Halstrom and Special Tappers.

Drill Presses (23 in all), Rockford, Prentiss, Barr 2, 3 and 4 spindle type, Fairbanks 4 spindle, Burnham 1 and 2 spindle, Siguerney 2 and 4 spindle.

Miscellaneous. 26 polishing machines, 5 W. & T. gauging machines, Dewitt graduating machine, exhaust and blower fans, tumbling barrels American pressure blowers, American Gas Co. annealing furnaces, Fairbanks scales, 13 Dey time clocks.

Electric Motors. 100 horsepower Milwaukee, 8 and 50 horsepower General Electric, Eddy, Crocker and Wheeler, and Sprague. 25 horsepower General Electric, 4 and 55 horsepower General Electric, 2 and 10 horsepower Westinghouse, 1 and 2 horsepower Westinghouse & Diehl, Boissier Electric Co. generator 2 K.W.

10,000 lbs. fine leather belting, 2,000 ft. various size shafting, steel split pulleys, hangers, and large quantity small tools, etc.

Plant open for inspection week days until date of sale.

Directions to reach plant—Take 4th Ave. Brooklyn Subway express from Municipal Building, N.Y., get off at 36th St., Brooklyn, walk one block west. Descriptive catalogue mailed upon application to

HIRAM H. PARKE, Auctioneer, Offices and Salesrooms, 924-926 Broadway, New York City

If any advertisement interests you, tear it out now and place with letters to be answered.

STEEL BUILDING CRANES

Can be seen in operation

Steel Building or Coal Shed, 108 ft. x 298 ft., maximum height 40 ft., containing approximately 450 tons of structural steel.

Two Brown Patent Bridge Tramways, hoisting and conveying apparatuses, consisting of a bridge tramway with tracks permitting a movement of 300 ft.; distance between movable piers 180 ft., with end cantilevers 92 ft. and 36 ft. Each bridge has in its house, Brown Patent Hoisting Engine with the most modern operating mechanism, together with all necessary fittings and connections for complete operation, together with six Brown Patent Automatic Self-dumping Coal Tubs of 42 cu. ft. capacity; two single rope buckets of 48 cu. ft. capacity; four skips of 2 ton capacity; and also automatic clam shell bucket. Both these outfits are practically in new condition.

New York Machinery Exchange, Inc.

50 Church Street . · . New York City

Rebuilt Machines For Sale

PLANERS

1—24x24x6 Powell.
5—Sellers 25x25x6'.
2—Sellers 25x25x8'.
1—Putnam 24x24x8' 6".
1—Wheeler Heavy 30x30x8' 6".
1—Lathe-Morse 24x24x5' 6".
1—New Haven 24x24x7'.
1—Putnam 42x40x12' 6".

GRINDERS

1—LeBlond Universal Tool and Cutter, power feed, same as new.
1—Bridgeport Plain Grinder, 16x36.
1—No. 3 Landis Universal Grinder.
2—No. 6X Diamond Double Disc Grinders.
1—Ford Smith Plain Grinder.

AUTOMATICS

1—1" National Acme Double Belt Type.
1—1⅝" National Acme Double Belt Type.
1—No. 55 National Acme.
1—1" National Acme, four spindle.
2—No. 54 National Acme, four spindle.
3—2" Cleveland.
1—2¼" Cleveland.
2—2¼" Gridley Single Spindle Motors.
1—3¼" Gridley Single Spindle Motor.

LATHES

1—32x12' Draper Lathe, C.R., H.S.
1—30x8' Fitchburg, C.R., P.C.F.
3—16x8' Putnam, C.R., taper.
6—18x8' Porter, C.R., semi-quick, taper.
2—18x8' Davis, C.R., pan, pump, taper.
10—16x8' Greaves-Klusman, C.R., pan, pump.
9—20x6' Perkins Plain Turning, pan, pump.
1—14x6' Porter, C.R.
1—20x8' LeBlond, C.R.
1—13x5' Seneca Falls, C.R., pan.
14—20x6' Perkins Lathes, pan bed, chuck, Fay & Scott Turrets.

MISCELLANEOUS

1—No. 5 Becker Vertical Miller.
2—No. 310 Baker Drills.
1—No. 18 Bliss Press.
1—No. 1 Whiton Gear Cutter.
1—No. 4 Garvin Plain Miller.
1—No. 3 Kempsmith Plain Miller, same as new.
1—9" Industrial Works Slotter.
1—24" Aurora Sliding Head Back Geared Drill.
3—Prentice 24" Sliding Head Drills.
2—Industrial 40" Drills.
1—Western Hydraulic Banding Machine.
1—Jenckes Band Turning Lathe, with 3" Universal Chuck.
1—36" Aurora Drill.
1—12" Bement Travelling Head Shaper.
1—Sellers Slab Miller, 24x21x12'.
1—No. 21 Lee-Simplex Saw.
1—26x10 Cincinnati Gear Cutter.

This is only partial list—Send for full list

Simmons Machine Company, Inc.

NEW YORK, 1001 Singer Bldg., Telephone Cortlandt 6575
ALBANY, N. Y., 985 Broadway, Telephone Main 4876

Single Purpose and Shell Lathes

22—18" x 8' Battle Creek Lathes, single back gear, 2-step cone with counter shaft.
6—18" x 9' Chard Lathes, 3-step cone, double back gear, compound rests, semi-quick change with face plates, steady rests and counter shafts.
3—20" x 8' Mershon Lathes, 3-step cone, double back gear, compound rest and counter shafts.
4—20" x 8' Oakley Lathes, 3-step cone, double back gear, compound rests with oil pumps and pan and counter shafts.
1—20" x 10' Oakley Lathe, 3-step cone, double back gear, compound rests with oil pumps and pan and counter shafts.
4—20" x 8' Bullard Projectile Turret Lathes.

If you can use all or a part, we will be pleased to have you communicate with us promptly.

EAST DAYTON MACHINERY COMPANY
Dayton, Ohio

c8m

Long Distance is Calling!

Telegrams and Long Distance Telephone Messages are not uncommon among the replies to ads in our Classified Advertising Section.

LOOK—HERE THEY ARE

BORING AND TURNING MACHINES—VERTICAL.

1—30" Bullard, 1 turret head.
1—30" Flather, one turret head.
1—New 30" Gisholt, September delivery.
1—New 34" Rogers, one turret head, Sept. delivery.
2—36" Brown & Sharpe, one turret head; Dec. delivery.
1—37" Niles, one swivel, one turret head.
1—42" N.B.P., two swivel heads, motor drive.
1—72" Niles, two swivel heads.
1—80" Niles, two swivel heads, slotting attachment.
1—84" Sellers, one head.
1—New 8' Bickford: December delivery.
10' Niles, 2 heads; December delivery.

BORING MACHINES—HORIZONTAL.

1—No. 1 Barrett Cylinder Borer, 3¾" bar type.
1—No. 2 24" Barrett, two side facing heads.
1—Hoefer Horizontal Driller and Borer, with 1 11-16" spindle, vertical adjustment 40", horizontal adjustment 46", size of table 33" x 48".
1—Lucas, 2¼" bar.
1—Newburgh 4" bar, 84" swing, 72" feed.

BULLDOZERS.

1—No. 8 Ajax, 20 H.P. motor drive.
1—New No. 4 Garrison (same as No. 4 Williams-White).
1—No. 7 High-speed Ajax, 16" stroke.

COMPRESSORS—AIR.

1—8" x 8" Curtis, belt-driven.
1—Ingersoll-Sargent Duplex, 8 x 14½ x 8".
1—Cincinnati Cross Compound, two-stage, 790 cu. ft.
1—10" x 12" Chicago Pneumatic, belt-driven.
1—10" x 10" x 10" Single Cylinder Smith-Valle, steam driven.
1—22" x 13" x 16" Ingersoll-Rand, motor driven.

CRANES.

20-ton Alfred Box Electric Traveling Crane, 40' span.
25-ton Browning Electric Traveling Crane, 40' span
1—Locomotive, 35' boom, standard gaged, steam driven.

CUTTING-OFF MACHINES.

2—No. 00 Brown & Sharpe.
1—2" capacity Warner & Swasey.
4—3½" Hall.
10—4½" Williams.
3—4" Curtis & Curtis.

DRILLING MACHINES—RADIAL.

2—New 2' American, cone drive.
1—3' Bickford, semi-Universal table.
1—3' Bickford, gear drive.
3—New 3' Americans, sensitive tapping attach.
4—New 3' Prentice, July delivery.
1—New 3' Mueller, plain speed, box drive.
1—New 3½' Western Drill, 86" circle.
2—4' Mueller, plain, speed box drive.
1—5' semi-universal American.
5—New 5' Baush Plain.
1—6½' American full Universal.
1—6' Baush Plain, cone driven.
10—New 6' Triumph, motor drive; Sept. del.

DRILLING MACHINES—HEAVY DUTY.

2—New No. 2 Colburn.
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
2—D-3 Colburn, plain table.
4—No. 310 Baker, single pulley drive, late type.

DRILLING MACHINES—MULTIPLE SPINDLE.

4—New Leland-Gifford, sensitive, four spindle.
1—No. 30C Baush, 12 spindle, capacity 1⅛" holes, 30" circle.
1—14-spindle Baush, capacity 1" holes, 36" circle.

GEAR-CUTTING MACHINES.

1—No. 1 Whiton.
1—No. 3 Bickett Gear Rack Planer, delivery 60 days.
1—No. 3 Brown & Sharpe Auto. Gear Cutter, Spur.
1—New 6" Standard Gear Cutter, Spur.
1—12" Gleason Bevel Gear Planer.
1—16" Gleason Bevel Gear Planer.
1—16" Bilgram Bevel Gear Generator.
1—20" Grant-Lee Gear Hobber.
1—No. 1 20" Schuchardt & Schutte Gear Hobber.
1—22 x 8 G. & E. Spur and Bevel Cutter.
1—24" Fellows Gear Shaper.
1—24 x 8" G. & E. for Spur and Bevel.
1—24" Becker Brainard.
1—New No. 10 Whiton, Bevel 32", Spur 34".
3—36" Fellows Gear Shapers.

GRINDERS—UNIVERSAL FOR CUTTERS, DRILLS, REAMERS, ETC.

1—LeBlond Universal, one year old.
1—No. 1 Cincinnati.
1—New Norton No. 1.
1—New Walker No. 1, outfit B.
1—New Walker No. 2, outfit K (capacity 9" x 26").
1—New Wilmarth & Morman, style B.K.
8—No. 190 Wells.
1—Gisholt No. 5, 12".

GRINDING MACHINES—CYLINDRICAL—PLAIN.

1—6" x 48" Pratt & Whitney.
1—New No. 12 Brown & Sharpe, 8" x 26", Sept. delivery.
1—New 10 x 36" Landis; immediate.
1—New 10" x 36" Norton, Sept. delivery.
1—New 10" x 50" Norton, Sept. delivery.
1—10" x 60" Landis.
1—New 10 x 72 Norton, Plain.
20—12" x 24" Modern, self-contained.
1—12" x 32" Landis, rebuilt.
6—12" x 36" Modern, self-contained, motor or belt driven.
2—12 x 42" Landis, self-contained.
6—12" x 48" Modern, self-contained, motor driven.
1—16" x 66" Landis, with crank grinding.
1—18" x 96" Brown & Sharpe.

GRINDING MACHINES—CYLINDRICAL—UNIVERSAL.

1—Brown & Sharpe No. 13, 8" x 24".
1—New No. 2 Bath, 9" x 20".
1—No. 2 New Walker, 9" x 26".
1—No. 1½ (10" x 30") Landis.
1—New No. 2½ (10" x 36") Bath.
1—10" x 42" Modern.
9—New No. 2 Morse, cap. 12" x 30", Universal, Nov. delivery.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis.
2—New No. 3 Modern, 13" x 40", Sept. delivery.

GRINDERS—INTERNAL.

1—No. 1½ Landis.
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—CYLINDER.

1—No. 27 Brown & Sharpe.
1—No. 60 Heald, single pulley drive.

GRINDERS—PROFILE.

1—New Cleveland.

GRINDING MACHINES—RING.

1—New No. 14 Beasley, two-ring chucks.
1—No. 200 Heald.
1—No. 210 Heald.

GRINDING MACHINES—SURFACE.

1—New No. 1 Wilmarth & Morman.
1—No. 1 Diamond, capacity 12" x 12" x 24", automatic.
2—New No. 1½ Walker's, complete.
4—New No. 2 Reid (same as B. & S.).
1—New No. 2 Brown & Sharpe.

HAMMERS—POWER—FORGING.

1—40-lb. Bradley Helve.
1—150-lb. Bradley Helve, upright.

HAMMERS—BOARD LIFT—DROP.

1—400-lb. Billings & Spencer.
1—2,000-lb. Chambersburg.

HAMMERS—STEAM—FORGING.

1—Used 600-lb. Niles Single Frame.
18" Morgan & Williams, 600 to 800 lbs., 21" gap.
1—New 1100-lb. Bell Standard Guide, Single Frame.
1—3000-lb. Bell; Sept. delivery.

KEYSEATERS.

2—No. 0 Mitts & Merrill.
1—No. 2 Mitts & Merrill.
1—60" stroke Compton Knowles Broacher.

LATHES—MANUFACTURING—NOT SCREW CUTTING.

2—New No. 3 Harding Brothers Bench Lathe.
14—Reed-Prentice Shell Lathes, for 4" or 18 lbs. American shells.
70—New Simplex, 16" x 8'.
13—No. 3X Reed-Prentice, semi-automatic.
40—14" x 6' Reed Stud and Bolt.
5—16" x 8' Fairbanks-Morse, heavy duty.
14—16 x 8 Simplex, Single Pulley Drive.
22—18" x 8' Battle Creek, heavy duty.
5—20" x 8' Merschon.
50—20" x 10' Hindman, high duty.

LATHES—ENGINE.

8" Wade Precision; September delivery.
6—New 12 x 4 Shepard, reverse head.
8—New 12 x 5 Shepard, reverse head.
3—New 12 x 6 Shepard, reverse head.
1—14" x 6' Bradford, taper attachment.
1—New Harding Brothers 15" Precision Lathe, quick-change gear, page 35, third catalogue.
3—New 16" x 6' Cleveland Tool Room Lathes, complete equipment.
2—16" x 6' LeBlond, pan bed, quick-change gears, taper attachment.
1—18" x 8' Lodge & Shipley, geared head, taper.
3—18" x 9' Chard.
1—18 x 10 Hendey, quick-change gear, 14" chuck.
1—New 19" x 8' LeBlond, heavy duty.
22—20" x 8' Lodge & Shipley, quick-change gear.
7—New 20" x 8' American, heavy duty.
25—New 21" x 10' Porter, single back geared.
5—New 22 x 10' Monarch, double back geared, Q.C.G.
9—22" x 10' Putnam, oil pan turrets.
3—24" x 10' Reed.
2—24" x 12' S. & B.
4—24" x 14' American, quick-change.
1—24" x 14' Lodge & Shipley, patent head.
1—24" x 24' Perkins, single back geared, raising blocks to 40", 18" chuck.
1—24" x 45" x 22' McCabe, double spindle.
1—26" x 24' New Haven.
4—27" x 14' Patent Head Lodge & Shipley, double back geared.
1—28" x 18' New Haven, single back geared.
1—28" x 18' Schumacher & Boye.
3—New 32" x 12' Pittsburg pattern.
8—New 36" x 24' Putnam, triple geared.
1—38" x 18' American, raising blocks to 63".
1—38 x 19' Steptoe, single back gear.
1—48 x 27'-9" Betts, triple back gear.
1—60 x 27 Betts, triple back gear.
1—New 66" x 30' Putnam; Dec. delivery.
1—71" x 20' Fifield, triple geared.

LATHES—TURRET.

5—2 x 24 Jones & Lamson.
5—3 x 36 Jones & Lamson.
18—6A Potter & Johnson.
1—New 21" Gisholt.

MILLING MACHINES—KNEE TYPE—UNIVERSAL.

1—No. 2 Kempsmith, 13", dividing head.
1—No. 2 Kempsmith, vertical attachment.
1—New Kempsmith.
1—No. 1½ Hendey-Norton.
1—No. 2 Kempsmith, back geared.
1—No. 2 New Cincinnati.
1—New No. 2½ LeBlond, Sept. delivery.
1—New No. 3 Kempsmith.
2—New No. 3 Becker, August delivery.
1—New No. 4 LeBlond, heavy duty; immediate.
1—No. 4 Cincinnati, with vertical attachment.

MILLING MACHINES—KNEE TYPE—PLAIN.

1—No. 0 Pratt & Whitney.
1—New No. 1 Brown & Sharpe.
2—New No. 1 Kempsmith.
2—New No. 1½ American, back gear.
1—New No. 2 Rockford.
1—New No. 2½ LeBlond, August delivery.
1—No. 3 LeBlond.
1—No. 3 Cincinnati.
1—No. 4 Garvin.

MILLING MACHINES—VERTICAL.

1—New Bickett, No. 0.
4—New No. 4B Becker.
2—No. 5 Becker.
1—No. 5 Brown & Sharpe.

MILLING MACHINES—PLANER TYPE.

1—No. 2 Beaman & Smith, vertical spindle, open side.
2—Ingersoll Slab Millers, working surface of table 60" x 20".
1—No. 4 Beaman & Smith, vertical spindle, open side, working surface of table 120" x 24", removable housing on one side.

PLANERS.

1—24" x 24" x 6' Gray, one head on cross rail.
24" x 24" x 8' Cincinnati, one head; used three months.
1—26" x 26" x 8' Gray, one head on cross rail.
1—30" x 30" x 8' Gale Planer, one head.
1—30" x 30" x 12' Cincinnati, two heads.
1—36" x 30" x 12' New Haven, one head.
3—New 36" x 36" x 12' Bickett, one head, Nov. delivery, additional heads if desired.
2—New 36" x 36" x 12' Woodward & Powell, two heads on cross rail, one side head; Oct. delivery.
1—36" x 36" x 12' Gray, two heads.
1—36" x 36" x 14' Sellers, four heads.
1—40" x 40" x 11' Niles, four heads.
1—Gray, 42", widened to 56" x 42" x 16, two heads.
1—48" Cleveland Rotary Planer.
3—New 47" x 42" x 16' Bickett, one head; Nov. delivery; additional heads if desired.
1—48" x 48" x 16' Sellers, one rail head, two side heads.
1—50" x 14' Powell, one head.
1—52" x 52" x 16' Betts, two heads, right angle drive.
56" x 42" x 16' Graves, two heads.
60" x 60" x 18' Niles, two heads.
96" x 96" x 16' Betts.
1—32' 6 Niles Plate Planer.

SCREW MACHINES—AUTOMATIC.

3—No. 51 National Acme.
1—No. 515 National Acme.
2—No. 52 National Acme.
2—No. 53 National Acme.

SHAPERS.

1—New 16" Springfield.
1—16" Motor-driven Rockford.
2—New 24" Milwaukee.
1—New Barker, 24".
3—New 24" Steptoe, back gear.
1—30" Walcott, gear drive.
1—Spindle 30" Norton, with 7' Universal Radial Drill on base plate.

SLOTTERS.

1—New 10" Newton.
1—18" Betts, adjustable stroke.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 549 Washington Bldg. **CINCINNATI, OHIO** 1018 Union Central Life Bldg. **CLEVELAND, OHIO** 508 Leader News Bldg. **NEW YORK CITY** Singer Bldg.

WRITE OR WIRE OUR NEAREST OFFICE FOR QUOTATIONS
THIS IS ONLY A PARTIAL LIST OF AVAILABLE MACHINES

If any advertisement interests you, tear it out now and place with letters to be answered.

ReMANUFACTURED
—(ORIGINATED BY US)—
MACHINE TOOLS

You Can't Buy Them Elsewhere

Very Latest Models—None Over 2 Years Old

TURRET MACHINES

25—21″ Gisholts, 3½″ hole, 2-step, 5″ belt,
20—21″ Gisholts, 3½″ hole, motor arrangement,
13—24″ Gisholts, 4¼″ hole, 3-step, 4″ belt,
38—24″ Gisholts, 6″ hole, 2-step, 6″ belt,
41—24″ Gisholts, 6″ hole, motor arrangement,
2—2¼″ x 26″ Greenlee Flat Turrets,
2—2½″ x 26″ Pratt & Whitney Gd. Hd. Turrets,
4—3-A Warner & Swasey (bar machines).

ENGINE LATHES

24—22″ x 8′ Hamilton, D.B.G., C.R., Semi-Q.C.,
5—22″ x 8′ Hamilton, D.B.G., Turret tool post,
4—22″ x 8′ Davenport, D.B.G., Turret tool post,
7—22″ x 10′ Hamilton, D.B.G., C.R., Semi-Q.C.G.,
2—22″ x 10′ Hamilton, D.B.G., turret tool post, Semi-Q.C.G.,
20—22″ x 10′ Davis, D.B.G., C.R., Q.C.G.,
8—24″ x 10′ Lodge & Shipley, D.B.G., C.R., Q.C.G.,
8—24″ x 10′ Lodge & Shipley, Selective Gd., Hd., C.R., Q.C.G.,
11—26″ x 10′ American, D.B.G., C.R., and carriage turret,
2—26″ x 10′ American, D.B.G., carriage turret,
19—26″ x 12′ Putnam, carriage turret, semi-Q.C.,
9—26″ x 12′ Putnam, C.R., Semi-Q.C.,
2—26″ x 12′ Wickes, D.B.G., C.R., Semi-Q.C.G.,
10—28″ x 10′ Niles, Bement, Pond, D.B.G., Q.C.G.,
4—28″ x 14′ Lodge & Shipley, Select. Gd. Hd., motor drive, C.R., turret and taper.
3—30″ x 16′ Lodge & Shipley, D.B.G., C.R., turret and taper,
10—40″ x 18′ Pittsburgh, triple geared, Q.C.G.

PLANERS

1—76″ x 48″ x 18′ Woodward & Powell, 3 hds.
1—48″ x 48″ x 16′ Pond, 2 hds.
1—32″ x 32″ x 10′ Gray, 2 hds.
1—32″ x 32″ x 8′ Gray, 2 hds.
1—30″ x 30″ x 7′ Powell, 4 hds.
1—26″ x 26″ x 7′ Gray, 1 hd.
1—26″ x 26″ x 6′ American.
1—24″ x 24″ x 10′ Lodge & Davis.
1—24″ x 24″ x 6′ Cincinnati.
2—24″ x 24″ x 5′ Gray.
1—24″ x 24″ x 4′ Gray.
1—22″ x 22″ x 6′ American.
1—22″ x 22″ x 5′ Flather.

HORIZONTAL BORING MACHINES

4—P. & W. 2-spindle Rifle Barrel Drilling.
1—2-spindle Beaman & Smith Cylinder Boring.
1—No. 4 Newton 2-spindle, 4″.
1—Betts, 2⅞″ bar.
1—Bement, 2⅞″ bar.
1—Beaman & Smith, 2⅛″ bar.

VERTICAL BORING MACHINES

1—42″ Colburn.
2—34″ swing Colburn.
1—32″ swing Rogers.
1—30″ swing Baush.

RADIAL DRILLS

1—4′ Niles Full Universal.
1—3½′ Gang.
1—3′ Mueller.
1—3′ Prentice.
1—2½′ Dreses.
2—2½′ Mueller.
4—2½′ Fosdick.

MILLING MACHINES

1—No. 2 Beaman & Smith Combination Horizontal and Vertical.
1—Beaman & Smith, 2 vertical hds., 1-hor. cross bor. hd.
1—60″ x 48″ x 8′ Ingersoll Slab.
4—No. 2 Pratt & Whitney Lincoln.
1—No. 3 Hendey Plain.
1—No. 5 Schuchardt & Schutte Plain.
1—No. 2 Cincinnati Universal.
1—No. 25 Becker Plain.
1—No. 1½ Brown & Sharpe Universal.
1—No. 20 Oesterlein Universal.
1—No. 3 Brainard Plain.
2—No. 5 Brainard.

PRESSES

1—No. 17 Williams & White Double End Punch.
1—Long & Allstater Geared Punch.
1—No. 23½-B Niagara Toggle Press.
3—No. 73½ Niagara Trimming Presses.
1—Trimming Press.
1—No. 20-U Ryerson Punch.
1—No. 5 Consolidated Inclinable.
1—No. 5 Niagara Inclinable.
1—No. 30 Perkins Inclinable.

MISCELLANEOUS

1—No. 15 Garvin Profiler.
1—15″ Betts Slotter.
1—10″ Bement Slotter.
1—6-spindle National Nut Tapper.
1—3″ Bignall & Keeler Pipe Machine.
1—No. 3 LaPointe Broaching Machine.
1—No. 2 LaPointe Broaching Machine.
1—No. 1½″ Morton Keyseater.
1—No. 1 Baker Bros. Keyseater.
1—No. 1 Davis Keyseater.
5—LaPointe Keyseaters.

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HILL, CLARKE & CO. OF CHICAGO

625 WASHINGTON BLVD., CHICAGO, ILL.

SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

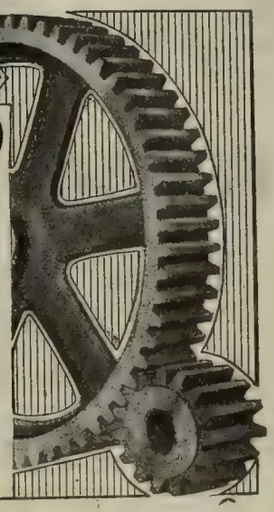
We Make GAUGES and TOOLS

All Work Executed Promptly and Guaranteed

THE MONARCH BRASS MFG.
COMPANY, LIMITED

71 BROWNS AVE. - - TORONTO, ONT.

CUT GEARS



Rawhide — Steel — Brass — Cast Iron

Try our W-G Rawhide Silent Gear. Designers and Builders of Special Machinery.

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QUICK DELIVERIES—ACCURATE WORK
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AUTOMATIC MACHINERY FOR MUNITIONS

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TORONTO, ONT.

516 Richmond St. West **Phone A. 1181**

If any advertisement interests you, tear it out now and place with letters to be answered.

Col. MacLean was in Germany When War Broke Out

HOW he got out, what he saw, heard, learned and concluded, he tells in the August number of MACLEAN'S MAGAZINE. Colonel MacLean knows Europe thoroughly. He knows high-up men in all the great political and commercial capitals of Europe—diplomats, bankers and great merchants. These men told him freely and plainly many startling things about Germany and her intentions.

In a contribution of truly sensational interest, abounding in most startling facts, Colonel MacLean points out "The Dangers Ahead." His aim is to arouse Canadians out of their unwarranted confidence and out of their content. You will find in this article by Colonel MacLean strange, even shocking revelations, and things hard to believe—and you ought to read "The Dangers Ahead" in order that you may help in their avoidment by Canada and her people.

MacLean's for August Is a Midsummer Number

The August MACLEAN'S is excellently balanced, as you will see from these contents:

CONTENTS

The Dangers Ahead. By John Bayne MacLean.

The Menace of Canadian Titles. By Joseph Martin, M.P.P.

Rev. C. A. Eaton—A Canadian Who Speaks Out. By Beatrice Redpath.

Frenzied Fiction for the Dog Days—(Done by the Dipperful.) By Stephen Leacock.

The Human Side of Conscription. By H. F. Gadsby.

Winning the War in the Air. By Agnes C. Laut.

A Circus Story. By L. B. Yates.

Mam'selle Butterfly. By Arthur Beverly Baxter.

The Captain of the Susan Drew. By Jack London.

An Andy Doolin Yarn. By Hopkins Moorhouse.

A Detective Story. By Robert E. Pinkerton.

The Gun Brand. By Jas. B. Hendryx.

Canada's First Woman Member.

Economy in Preserving and Canning.

Women and Their Work—A New Department. Review of Reviews—Regular Department.

Yates who writes the Circus Story, was born in Hamilton. He wrote those stories about Paragon Pete and The Singin' Kid in the **Saturday Evening Post.**

Leacock is excessively humorous in his Dog Days Sketch, in which he talks about summering and simmering.

Miss Laut fancies that the war may be won by the birdmen, and if Uncle Sam produces 100,000 planes, she may be right.

Gadsby sits in the Press Gallery at Ottawa, and writes brilliantly always. His "Conscription" article is in order.

Pinkerton who writes the detective story, "Old Twilight," knows how to write this class of story.

By the way, Lord Northcliffe has promised an article for the September MACLEAN'S.

You can see that MACLEAN'S for August is just the right type for August.

At All News-Dealers 15 cents

If any advertisement interests you, tear it out now and place with letters to be answered.

Starrett Tools

The Starrett Vernier Height Gage
assures the toolmaker and machinist of accurate guidance in laying out and checking up the progress of work.

Starrett tools are recognized as the standard for fine precision instruments where accuracy and quality of workmanship are essential.

Send for our free catalog No. 213 describing the 2100 styles and sizes of fine measuring instruments.

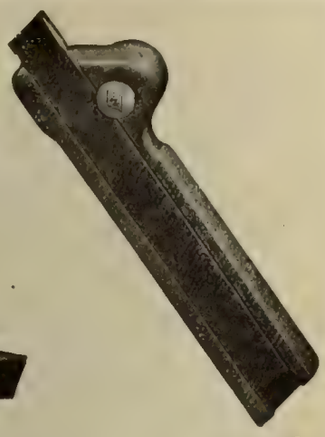
The L. S. Starrett Co., Athol, Mass.

The World's Greatest Toolmakers
42-617

BY INVITATION MEMBER OF
NEW YORK U.S.A.

Williams' "AGRIPPA" Tool Holders

"THE HOLDERS THAT HOLD"



The Threading Tool Holder with Lockable-Spring Head does roughing, finishing and threading at one setting in the tool-post and uses cam-locked square cutter.

We will ship all "AGRIPPAS" promptly if your dealer can't supply you from stock.

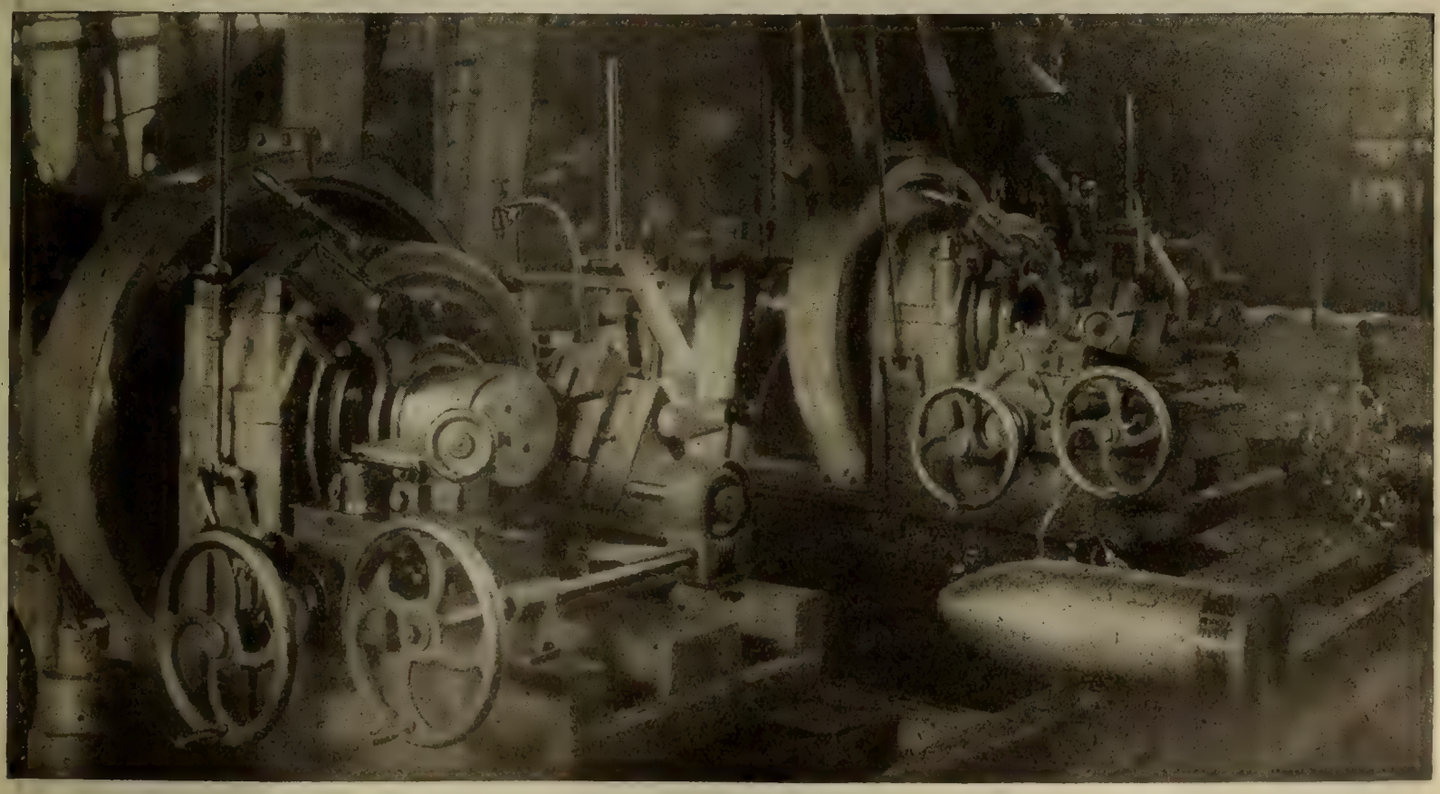
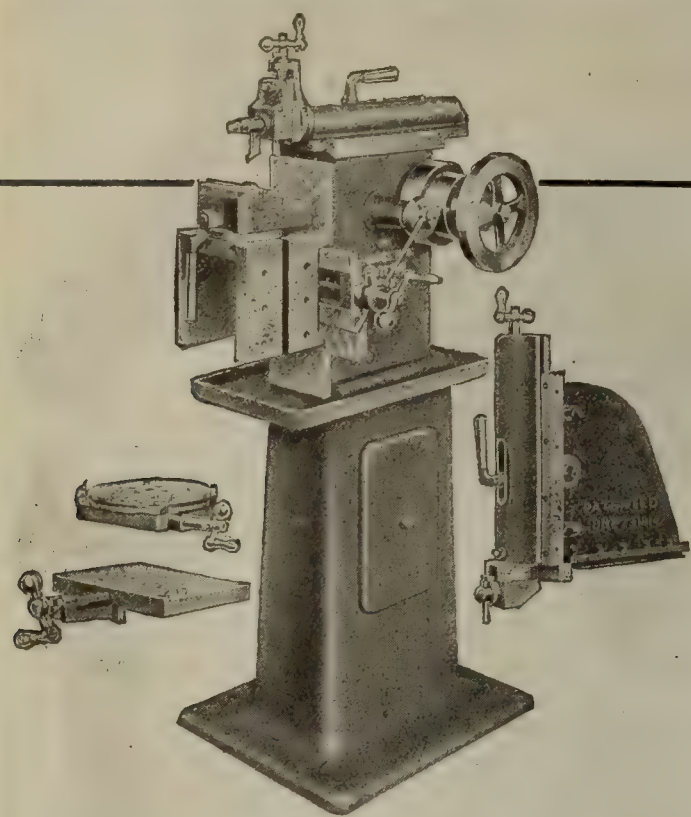


Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

These machines are built for turning bands on 8", 9.2" and 12" shells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. Write for full particulars and price.

Bennett Ave. **Warden King Limited** **Maisonneuve, P.Q.**



Patented—June 23, 1914

The Complete Machine

A machine whose efficiency can be added to by the quick and convenient changes shown here. Nothing cumbersome. A clean-cut machine that answers the most modern requirements in efficiency.

Designed especially for making tools, dies, models, and for slotting and shaping all classes of work.

Increased efficiency gives increased production which offsets increased costs and gives increased profits. A short but vital lesson on "increase." Think it over and write us.

The Rhodes Manufacturing Company, Hartford, Conn., U.S.A.

Column Type Horizontal Tapper

Tap Breakage Troubles Solved

More Speed—Less Breakage—and Efficient Work.

These are the results obtained from the use of *R. & S. Tappers.* We have a range of tappers for tapping of all kinds—from 3-16" to 5/8". Our range includes the Bench, Vertical and Horizontal types. They are built in exact proportion to give greater speed, increased output and longer life.

Let us send you detailed particulars—write.

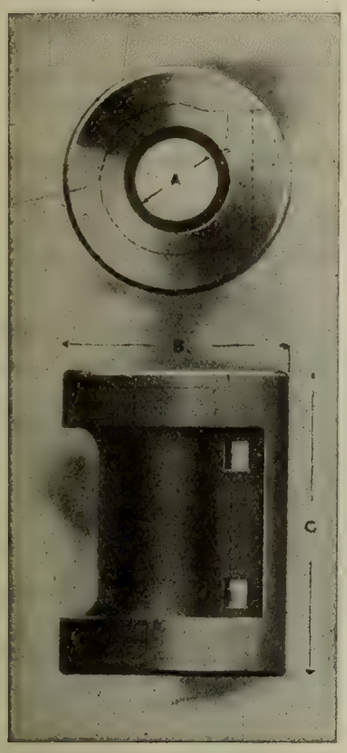
RICKERT - SHAFER COMPANY

ERIE, PA., U. S. A.

This is Our Address—How Can We Serve You?

1/4-in. Vertical Tapper

Mining Machinery Parts



Two-key Tappet

Shoes and Dies, Tappets, Bosses, Cams and Stamp Heads

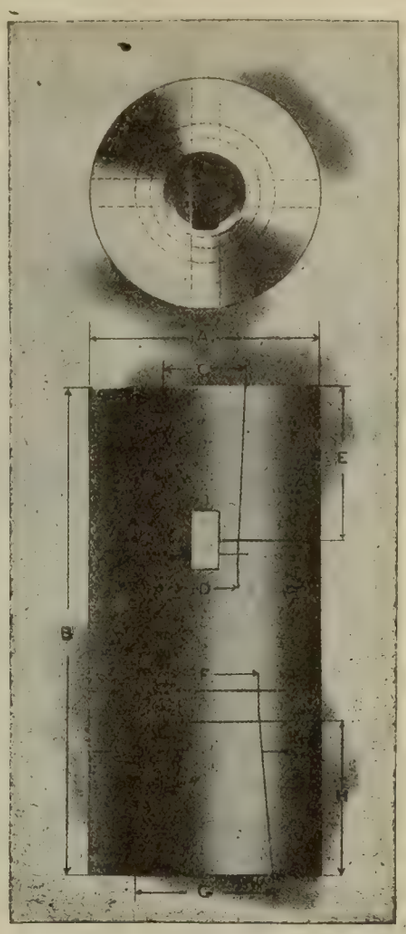
Also Manufacturers of Lining Plates for Ball and Tube Mills Concaves and Heads for Gyratory Crushers.

Machine Moulded Gears

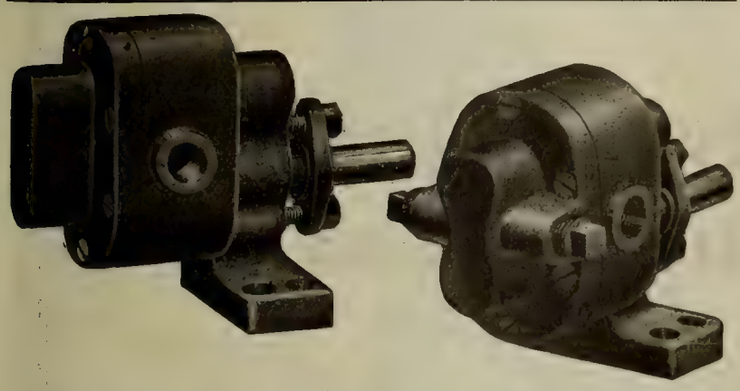
Any size up to 18 feet in diameter. No patterns needed.

Send Us Your Specifications, We Do the Rest. Write—

Hull Iron & Steel Foundries, Limited
HULL, P.Q.



Stamp Head



Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.

Tel. Main 6755 Jos. Bickerstaff, Mgr.

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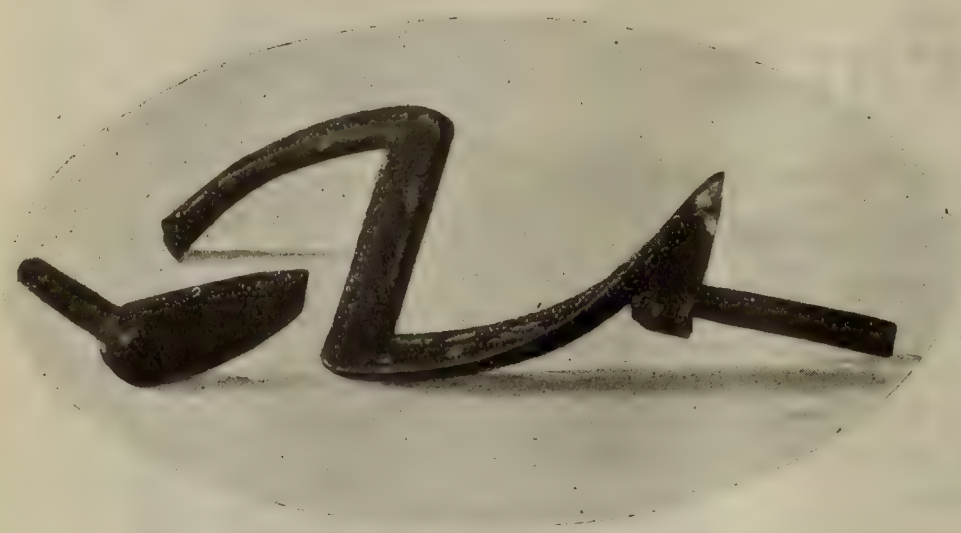
Cutting and Drawing Oils a Specialty

Best for Thread Cutting and Tapping

Our Cutting Oils especially adapted for Automatic Machines, Turret Lathes and Thread Millers.

PRICES ON APPLICATION

When a Break of This Kind Happens in Your Plant



CONCRETE MIXING SHAFT

What do you do? Do you wait several days for a new part, or do you weld the break permanently in two or three hours at a fraction of the cost?

THE DIFFERENCE BETWEEN PROFIT AND LOSS is in the methods you employ. Losses caused by "break-downs," time waiting for, and heavy cost of replacements are avoidable.

AN OXY-ACETYLENE WELDING OUTFIT will prevent these losses and pay its cost many times over during a year. Oxy-Acetylene Welding and Cutting is an indispensable factor in the factory or workshop. It will pay you to investigate.

Write to-day for particulars—while you think of it.

"Efficiency"
We are the Pioneers of the Oxy-Acetylene Welding Process. Factories the world over.
TORONTO, 16 Boler St.

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MONTREAL
Cor. 1st Ave. and Ernest

"Service"
We have three factories in Canada, manufacturing the Purest and Best Oxygen and Dissolved Acetylene Gases.
WINNIPEG, 1297 Pine

Quality Quantity
Guaranteed

Write US About Your Acetylene Supply

Commercial Acetylene Welding Co., Inc.

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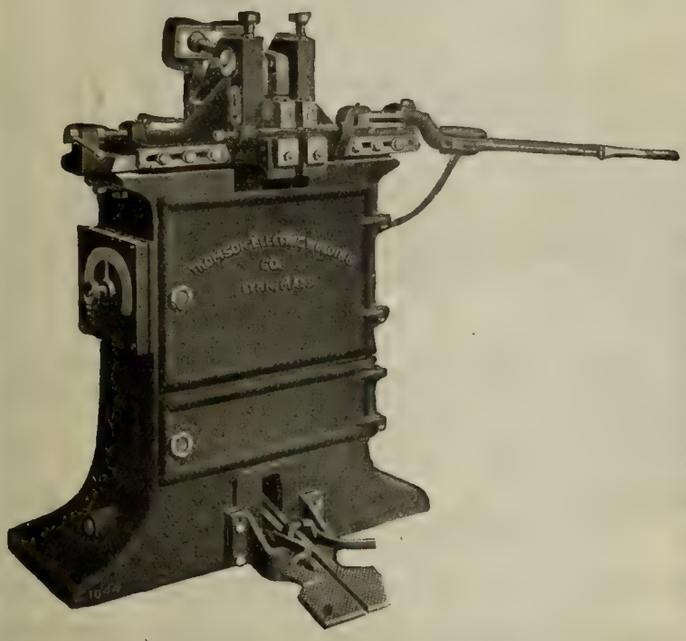
MOBERLY, MO.
W. BERKELEY, CALIF.

Main Office
80 Broadway, New York

Thomson Process
Electric Welding

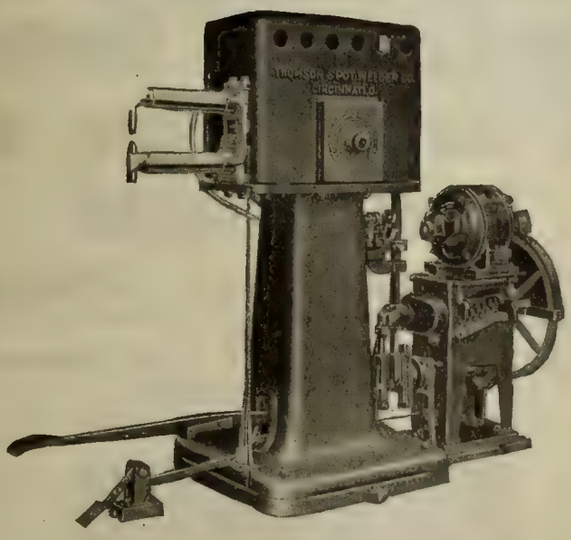
Thomsons Weld Practically Anything



That does seem rather broad — but in reality it isn't. There may be a few metals that won't electric weld—but they are so rare that they aren't commonly used. Such metals as iron, steel, copper, brass, etc., are easy for the Thomson Butt Welder.

Sheets, tubes, bars, pipes, heavy or light work, are all electro-welded by simply pulling a lever.

Send for Bulletin B-4.



We Guarantee Savings With A Thomson Spot Welder

If you have riveting or soldering to do in your plant we will guarantee to save you money by using the Thomson Spot Welder. How could you help saving money — no rivets or solder to buy, no holes to punch, 60 to 90% faster, 60% stronger—you can't help but save a goodly amount and increase your production in the bargain.

Our corps of experts to aid you in selecting the correct machine for your work are at your command.

Send for Bulletin S-4.

Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

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LOOK AT YOUR FILES

Test the balance of them. See how hard they are. Run your finger over the teeth and note their sharpness and regularity.

These qualities of the "Famous Five" Files were not arrived at by accident.

They are the result of expert knowledge of the exact needs of every trade. This knowledge has helped us to standardize the merits of "Famous Five" Files in the minds of every user.

Specify them when ordering.

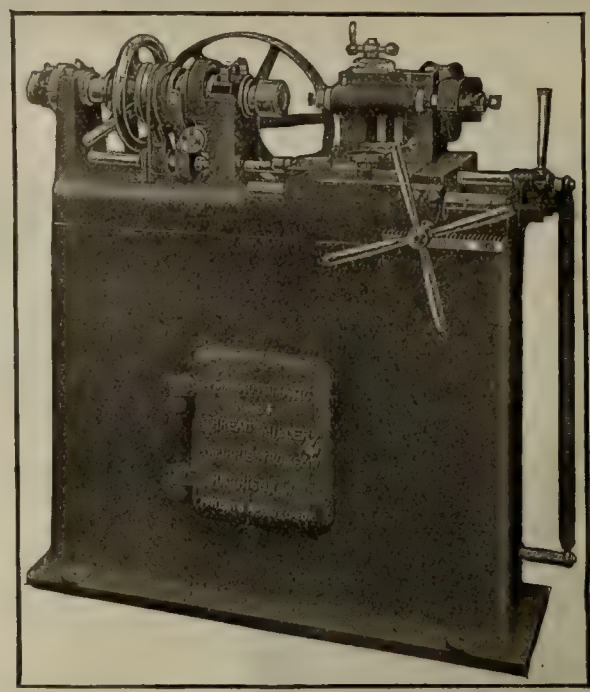
They are:

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

Made in Canada by

NICHOLSON FILE Co.
PORT HOPE
ONTARIO

The Morris Thomson Semi-Automatic Thread Miller



Simplest, fastest and most accurate for Primers, Fuse Bodies, Watch Cases and such pieces. Capacity 3-inch internal or external 10 pitch.

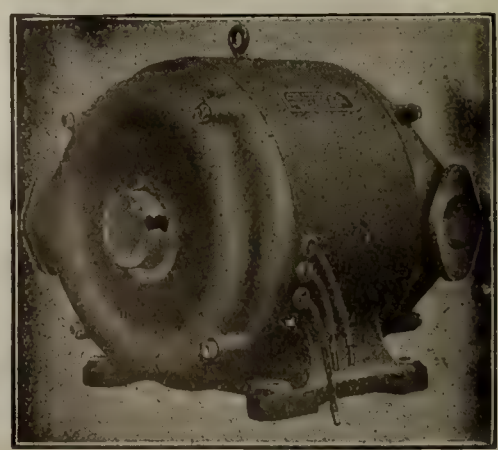
Quick Deliveries. Hundreds in Use.

T.C.M. Mfg. Co., Harrison, N.J.
U. S. A.

The Lancashire Dynamo & Motor Company, of Canada, Limited

107-109 Duke Street, TORONTO

ELECTRICAL MACHINERY for all Purposes.
ELLIOTT BROS'. { INSTRUMENTS / RECORDING GAUGES

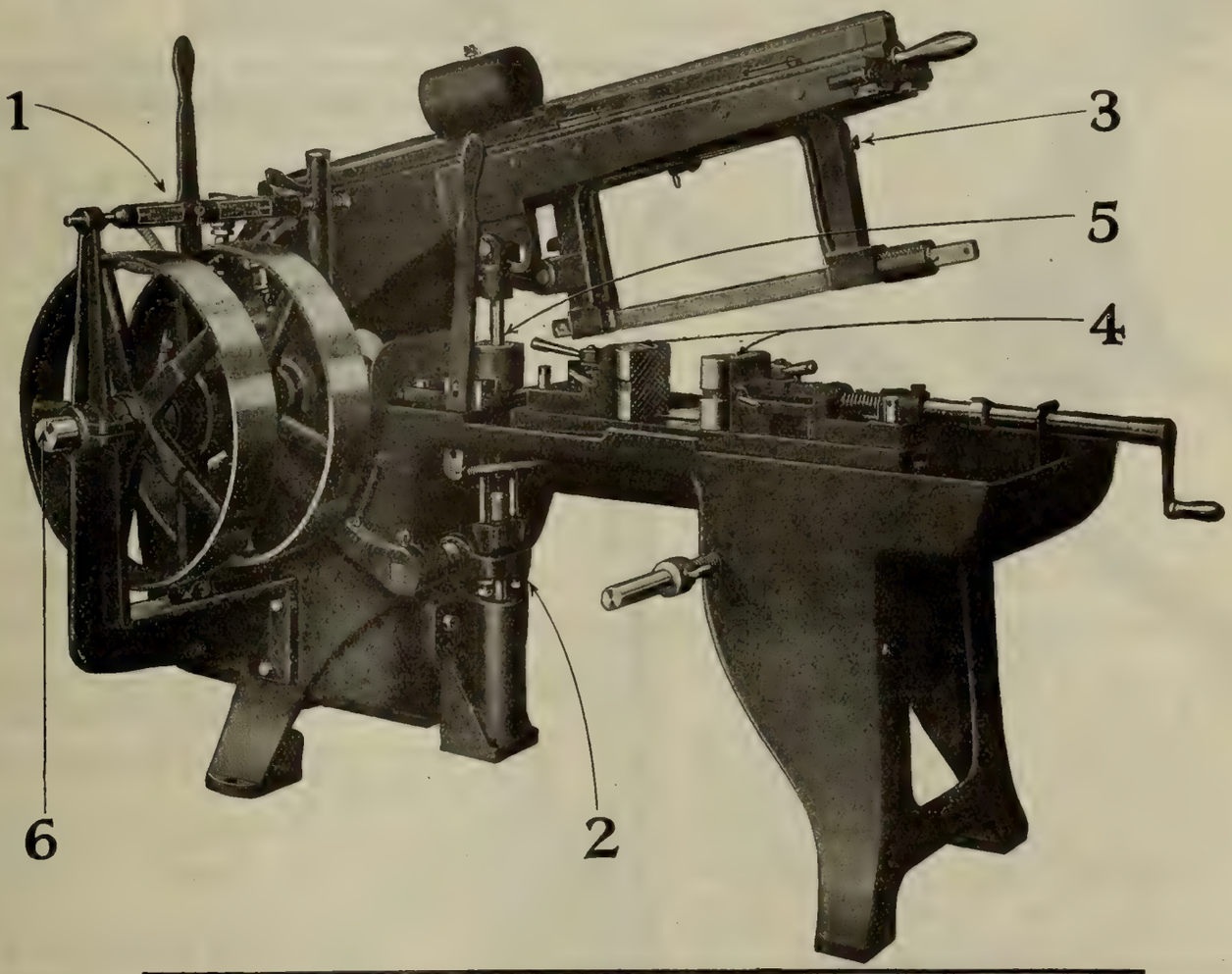


PIPE VENTILATED A C MOTOR
FOR VERY DIRTY PLACES

Distinctive Features

of the V.S.W. No. 5

High Speed Hack Saw Machine



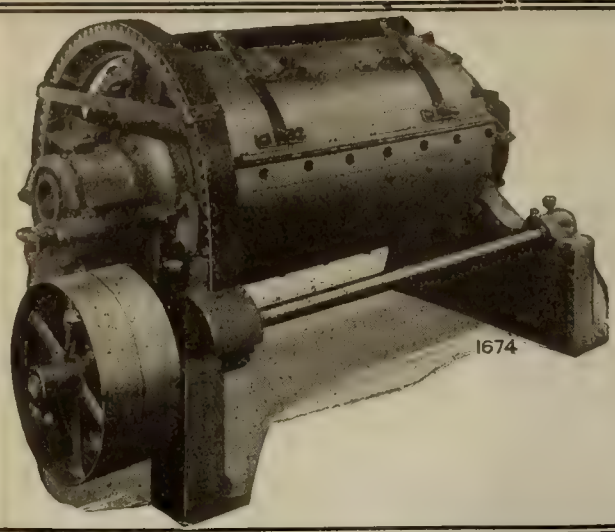
DISTINCTIVE FEATURES

1. Two Speeds.
2. Shock Absorber.
3. Extension Frame.
4. Patent Swivel-Jawed Vise.
5. Automatic Patent Lift.
6. Frame Swings on Shaft Center.
7. Rotary Pump.
8. Knock-off.
9. Frame Bearings.
10. Tank.
11. Perfect Blade Alignment.
12. Lubricating System.
13. Draw-Cut.

For Explanation of these and other features send for Circular

VICTOR SAW WORKS LIMITED

HAMILTON, CANADA



WHITING TUMBLERS

Correct design and heavy construction enable Whiting Tumblers to last for years under the daily grind of the cleaning room.

All wearing parts quickly replaced at small expense.

No studs used. Removable trunnions.

Write for Catalog No. 120.

Complete Foundry Plants

WHITING FOUNDRY EQUIPMENT CO. HARVEY-ILL. U.S.A. CHICAGO STERLING

Cranes of all Types

Keep Your Grinding Wheels in Trim---

The Diamo-Carbo Emery Wheel Dressers

The Diamo-Carbo Dresser is being very generally adopted as a substitute for the expensive diamonds. Diamonds are becoming more scarce and quality is deteriorating. The quality of the Diamo-Carbo is uniform and in most places will do the same work as a diamond. They can be tried at our expense.

The Desmond Huntington No. 2 is the best dresser ever devised for use on large and coarse wheels.

We can make prompt deliveries of any type of Dresser desired.

THE CANADIAN DESMOND-STEPHAN MFG. CO.
HAMILTON, ONTARIO
Alfred Herbert, Limited, Coventry, Eng.
Agent for Great Britain

PRACTICALITY

AFTER fifteen years' study of the Miner's and Lumberman's wants, we know just what is and what is not required in tools for them.

Practicality has been the keynote of our organization. Experience has aided us in eliminating all unnecessary parts and in perfecting the design of our tools.

The use of best material and finest workmanship enable us to manufacture tools that are unexcelled.

We make a complete line.

Write us for prices.

J. W. CUMMING & SON, LTD.
NEW GLASGOW, - - CANADA
Wood or Steel, let Cummings make it.

SHEET METAL STAMPINGS

Dominion Forge & Stamping Co., Limited

WALKERVILLE ONTARIO

DROP FORGINGS

Our facilities and equipment enable us to give you a top-notch quality at a very reasonable price.

AUTOMOBILE FENDERS, HOODS AND GASOLINE TANKS

DOUBLE SAVINGS

in cutting on PEERLESS HIGH SP ED METAL SAWS; they save both Time and Material.

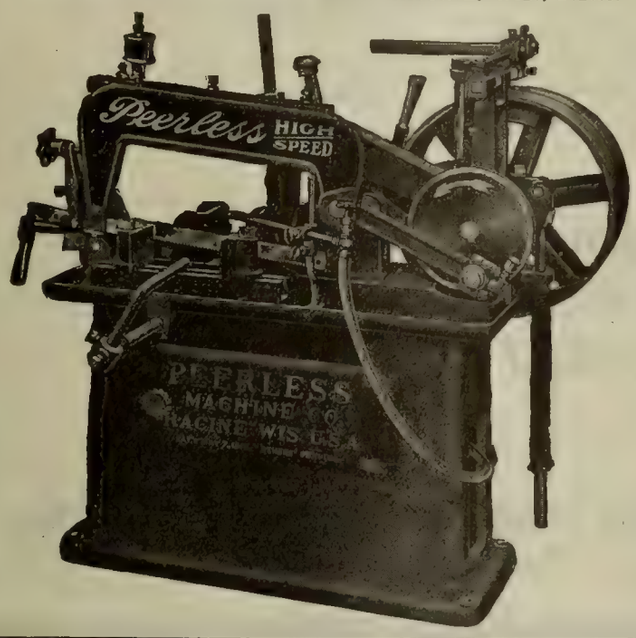
Supposing you save only 1/16 on each cut, 200 lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

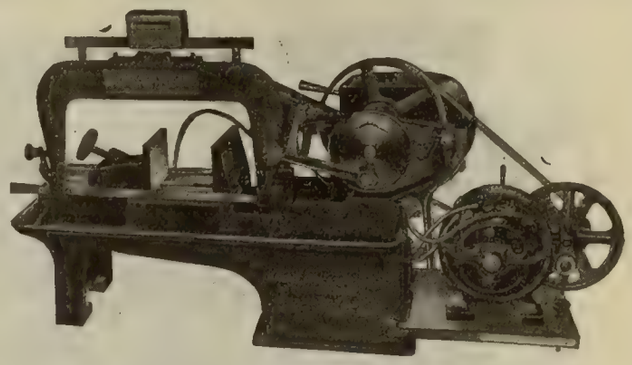
Have you ever stopped to consider the waste of material in wide cuts, especially at the present high cost, will pay for a PEERLESS in a remarkably short time.

This is only one of the reasons for so many repeated orders and large concerns having standardized the PEERLESS. The many other reasons can only be fully appreciated after comparative test.

Write for a list of users; some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.





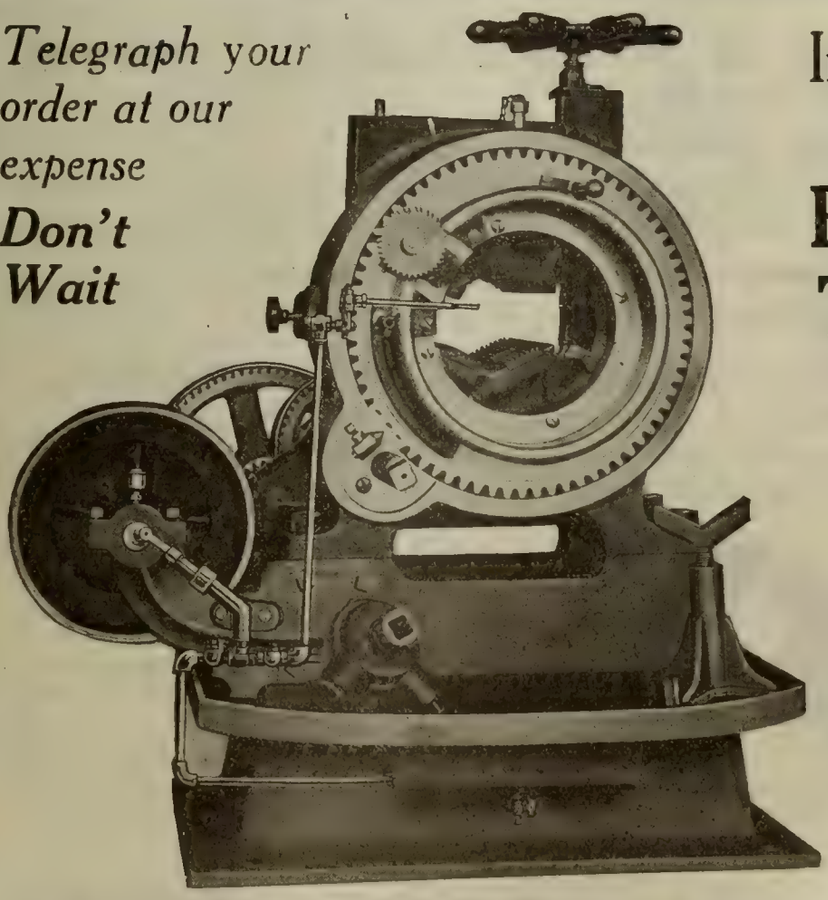
Your Cutting

How do you do it? Are your methods giving satisfaction? Are you getting the maximum production? With a Racine to compare results with you will get a better idea of the results you should be getting or could get. Metal cutting has been our study. It is the purpose for which our machines are built. We stand ready to co-operate with you in your cutting problems. Write us for information.

Racine Tool & Machine Co.
15 Melbourne Ave., Racine, Wis., U.S.A.

Telegraph your order at our expense

Don't Wait



In These WAR Times

If you have need of a

Pipe Cutting and Threading Machine

You want to know three things and in this order:

Delivery

All sizes up to 15", for either Hand, Belt or Electric drive, kept in stock for immediate shipment. No waiting.

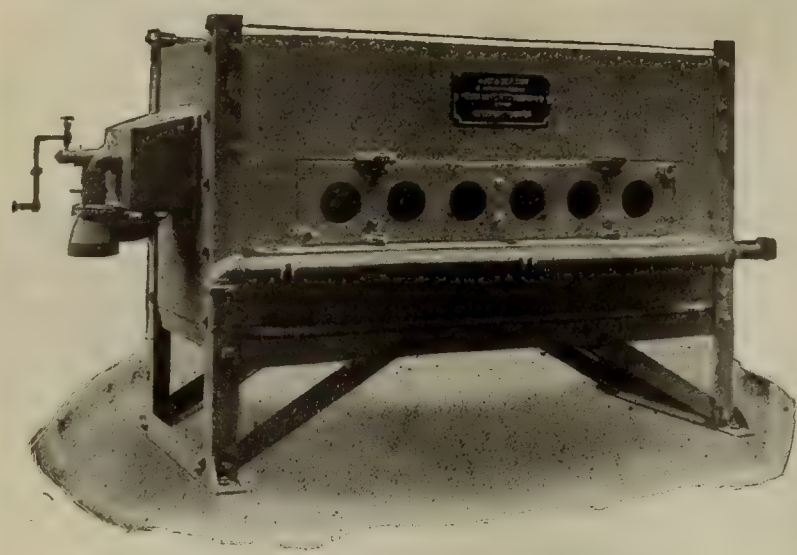
Quality

The original FORBES. Our specialty since 1882. More than 25,000 in use.

Price

Less than any other Standard Machine on the market, and less than half of many. Our system is the reason.

THE CURTIS & CURTIS CO., 115 Garden Street, Bridgeport, Conn.



"MECOL"

6" Shell End Nosing Furnace

We manufacture furnaces for all purposes to be used with any kind of fuel

The Mechanical Engineering Company, Ltd.
THREE RIVERS, QUE., CANADA

The Oven Equipment & Manufacturing Company
NEW HAVEN, CONN.
"CRAWFORD SECTIONAL" OVENS
Heated with our Enclosed Flame Gas Burners, or Electricity
FOR BAKING JAPANS AND OTHER FINISHES ON METAL.
Ovens carried in stock and built to meet requirements of manufacturers.
Builders of All-Steel Oven Trucks with Roller Bearings.

Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.
ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

How Many of Your Shells Are Being Rejected ?

Water Jacket for Nosing Furnace

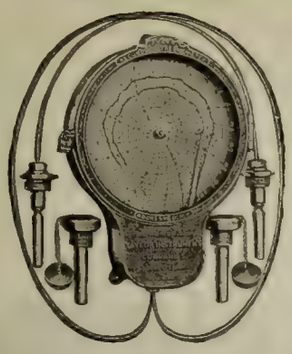
This STEEL jacket holds a large amount of water, which keeps the body of shell cold, and permits of proper heating of the nose for nosing operations. Being made of steel, it stands contraction and expansion—not possible with cast iron.
It is indestructible and fool-proof. Made for all sizes of shells. We can make this jacket to any special dimensions, with any desired attachments. No patterns are required—specifications all that are necessary.

Tested and Guaranteed.

IMMEDIATE DELIVERY.

Canadian Welding Works, Ltd., 51 Montfort Street **Montreal, P. Q.**

H&M Thermometers



Temperature Difference

of the entering and leaving feed water in heaters or economizers; the outgoing and incoming brine; the condenser intake and discharge; the steam or hot water heating system supply and returns or wherever heat transfer between two mediums is to be measured is most accurately and conveniently obtained by means of

H&M *Tycos*

Bi-Record Recording Thermometers

They trace two distinct records of the temperature changes and the time at which they occurred upon a calibrated rotating chart.

Consider the valuable information given by the instant comparison of the readings. Let us send you full details.

We are manufacturers of H&M Type Angle and Straight Stem Thermometers, Automatic Temperature and Pressure Regulators, Mercury Vacuum and Absolute Pressure Gauges, Engraved Stem Thermometers, Hydrometers, Hygrometers, Thermo-Electric and Radiation Pyrometers.

The H&M Division
Taylor Instrument Companies
Rochester, N.Y.
201 Royal Bank Bldg., Toronto, Ont., Canada.

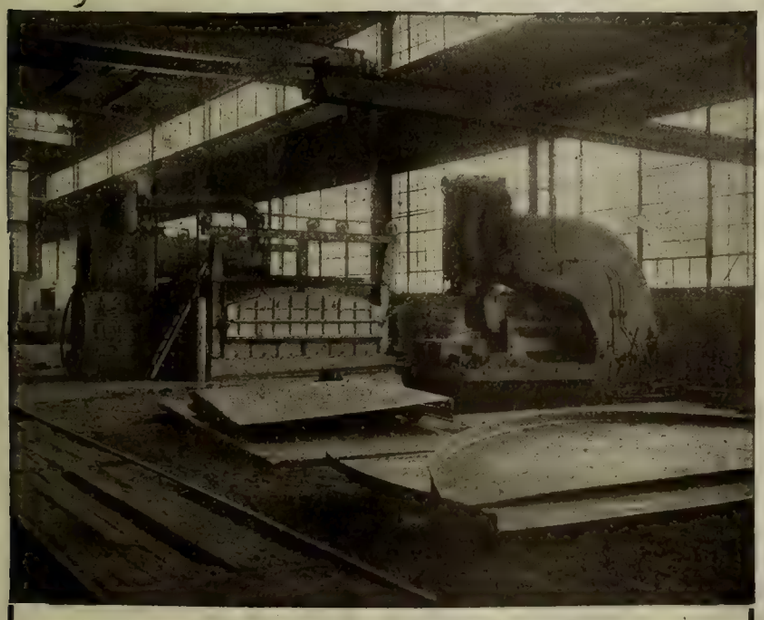


PLATE AND ANGLE HEATING FURNACES OF THE TATE-JONES MAKE EXCEL

A poor or antiquated furnace in your shop is a mistake that needs rectifying. It wastes time and turns out unsatisfactory work.. To be certain of HIGH-GRADE AND RAPID PRODUCTION you can't do better than instal a Plate and Angle Heating Furnace of the Tate-Jones make.

They excel for heating plates for flanging or annealing, for angles, for bending or forming, and for rods for continuous bolt or rivet machines.

We also build furnaces for forging, nosing, banding, baking lyddite, and continuous furnaces for heat-treating rough finished shells, annealing cases and furnaces for all classes of forging and heat-treating work.

Write for Bulletin No. 153-C.

TATE-JONES & COMPANY, Inc.
Pittsburgh, Pa. **Furnace Engineers**

TYPE E-4

Two G. & B. Furnaces

from a stock of over 100 types and sizes —a furnace for every purpose. And at present we are making immediate deliveries on nearly all types.

With a Gilbert & Barker furnace you are assured of efficient and economical heat-treating, annealing, hardening, etc. Our half century of experience with liquid and gaseous fuels for heat treatment of metals makes us confident of our ability to solve your heat-treating problems. Put them up to us.

Catalog 24 describes the complete line.

Gilbert & Barker Mfg. Co.

West Springfield, Mass.

Canadian Agents:
WILLIAMS & WILSON, LIMITED, MONTREAL, QUE.
JAMES DeVON, 227 Davenport Rd., TORONTO, ONT.

TYPE C-15

If any advertisement interests you, tear it out now and place with letters to be answered.

Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send to our nearest factory for a trial box.

Manufactured and guaranteed by

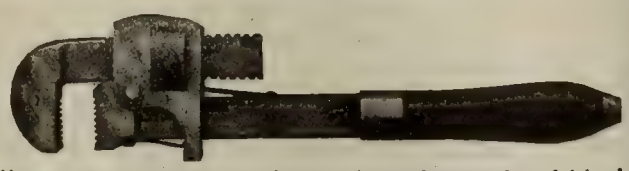
The Canada Metal Company, Limited

Hamilton Montreal TORONTO Winnipeg Vancouver

"W & B" Pipe Wrenches the Only Pipe Wrenches

MADE IN CANADA

The line comprises all sizes from 6 to 48 inches



"W & B" Wood Handle Grips. Length open 6 to 14 inches

"W & B" STEEL Handle Grips. Length open 18 to 48 inches

These Wrenches are extra strong frames well proportioned.

The Jaws are Drop Forged and tempered, giving them strength to resist the most severe strains.

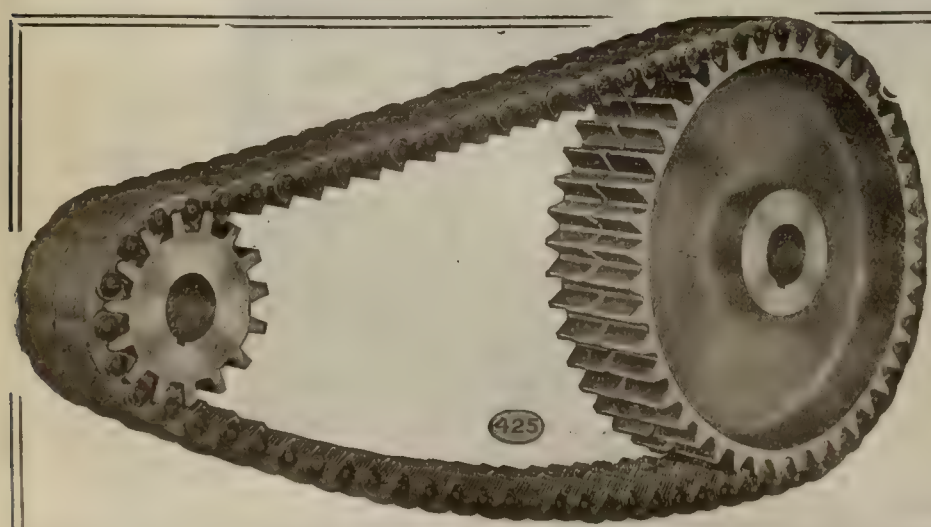
Other patterns of "W & B" SCREW WRENCHES MADE IN CANADA at our St. Catharines factory, are our Machinists' Knife Handle, "Railroad Special," Regular (Agricultural Pattern). Adopt this established line as your standard CANADIAN-MADE WRENCHES.

Complete information and catalog No. 90 on request.

The Whitman & Barnes Manufacturing Company

ESTABLISHED 64 YEARS

ST. CATHARINES, ONT.



RENOLD CHAINS

PATENT SILENT

The proven efficient form of Power Transmission.

Equally suitable for main shaft or machine drives. Save space and power, increase output and ensure durability.

Chain and Parts Carried in Stock.

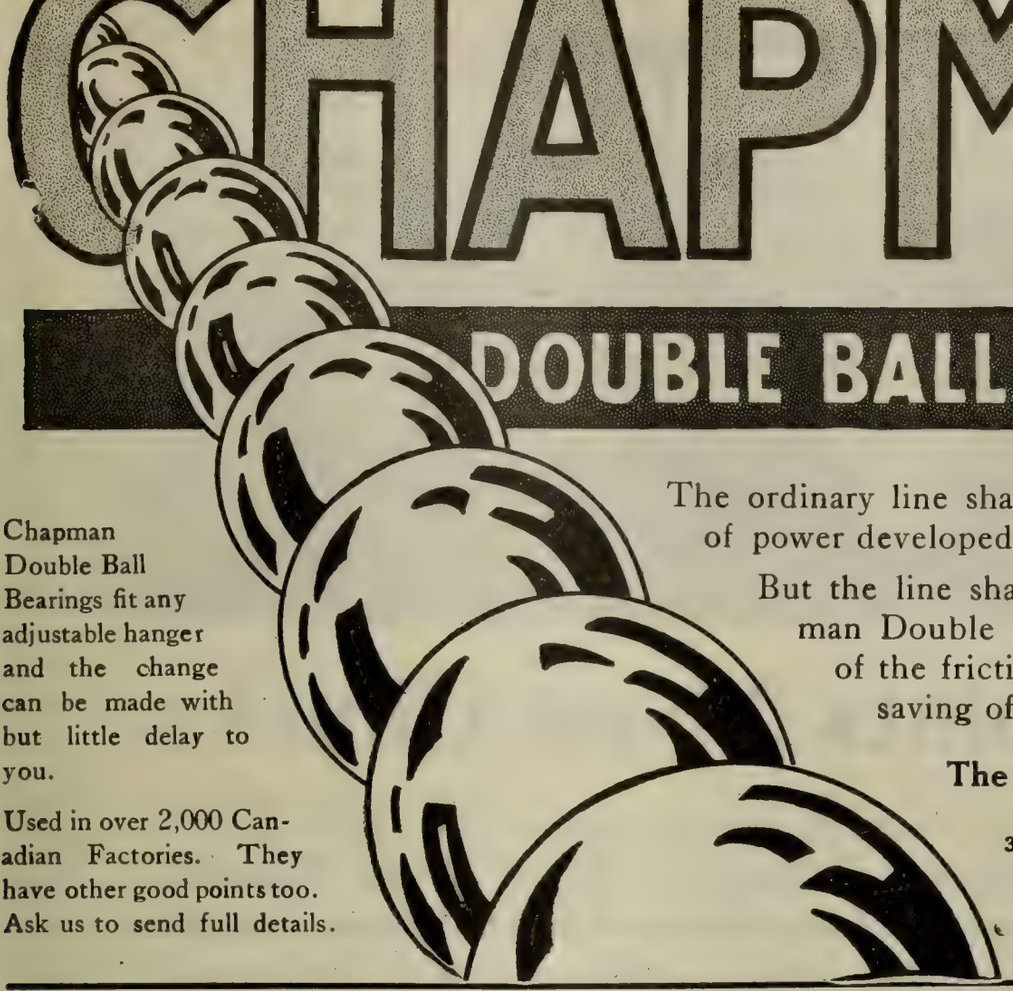
Sole Canadian Agents

Jones & Glassco. (Reg'd)

Branch Office: TORONTO, ONT. ENGINEERS St. Nicholas Bldg. MONTREAL, P.Q.

CHAPMAN

DOUBLE BALL BEARINGS



Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

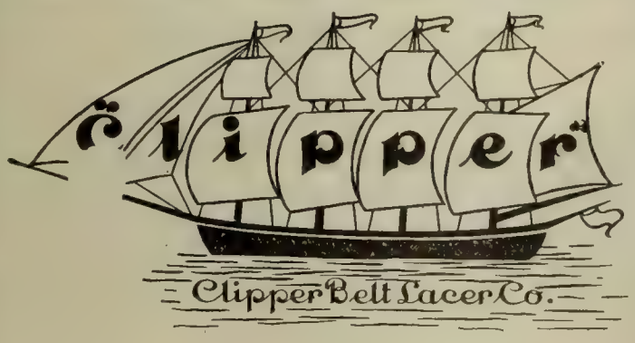
Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.

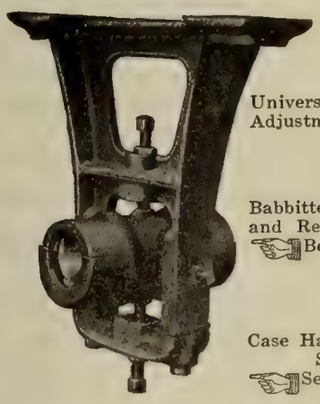


If you would use a stop watch while one of your belt lacing crews were at work you would find that you were paying expert men for a half hour job when any machine operator can lace a belt in THREE minutes with the

CLIPPER BELT LACER

CLIPPER BELT LACER COMPANY
976 Front Ave., N.W. Grand Rapids, Mich.

Speed Up—



IN War Times you should get all the speed out of your machines possible.

You can do this by using BOND Hangers. From the day you put a BOND Hanger on the job it starts saving your oil, your power, and your patience.

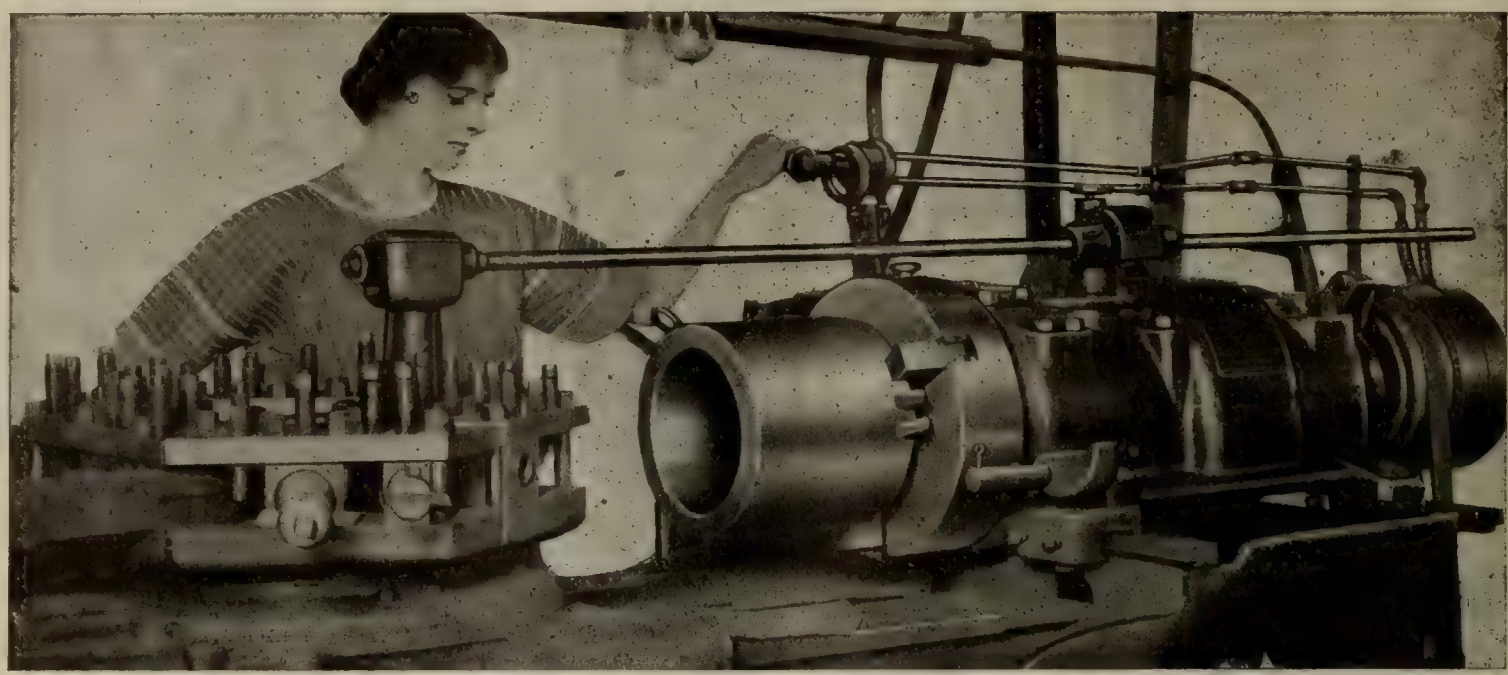
It is an investment that yields a steady return with every revolution of your shafting.

The sturdy, braced construction makes for smooth running without vibration. Its design permits full accessibility for adjustments or erection.

The Bond Hanger Book tells about everything we make in the line of power appliances.

Your files are not complete without it.

CANADIAN BOND HANGER & COUPLING CO.
Limited
ALEXANDRIA ONTARIO



Some Points About Chucks

STRENGTH and quality are points possessed by most chucks probably not in such a pronounced degree as the Hannifin, but these qualities are generally found. They form some chuck's only argument. With the Hannifin these points are important, yet not the most important. Convenience, utility and life are additional points that decide the profit or loss in the use of a chuck.

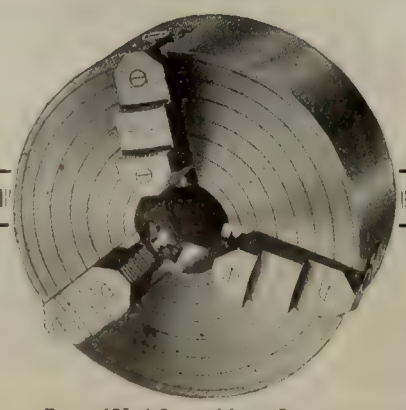
The advent of women into the mechanical field was viewed with an easy mind by those who had the Hannifin Chucks installed. Their labor and time-saving devices greatly aided the novice.

Your chucking needs will be amply taken care of. Your production will show a marked increase. Your product show a marked improvement. Our catalogue will show you how this chuck affects these changes.

Hannifin Manufacturing Company

Chicago, Illinois, U.S.A.

Representatives: The Canadian Fairbanks-Morse Co., Montreal. European Representatives: Coats Machine Tool Co., London; Fenwick, Freres & Co., Paris; Iznosskoff & Co., Petrograd.



Representatives: R. E. Ellis Engineering Co., Chicago; Coats Machine Tool Co., New York City; A. R. Williams Machinery Co., Toronto; Williams & Wilson, Montreal.

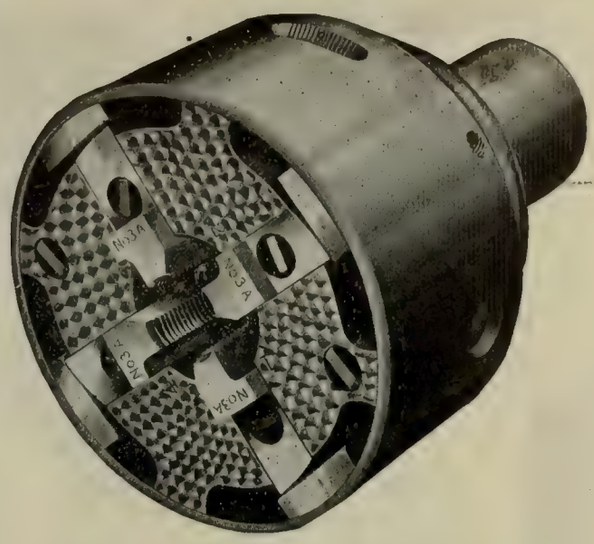
CUTTING THREADS AUTOMATICALLY

The NAMCO Self-Opening Die, illustrated, is an example of up-to-the-minute tool equipment which is putting thread-cutting on a better and more profitable basis.

This Die is designed for work on machines where the tool revolves. It is fully automatic and is built to stand the heavy cutting strains imposed by automatic machinery without injury to either the tool or the work.

NAMCO Dies are threading thousands of parts daily in our factory. Let us show you what they can do for you.

Ask for Thread-Cutting Book "M."

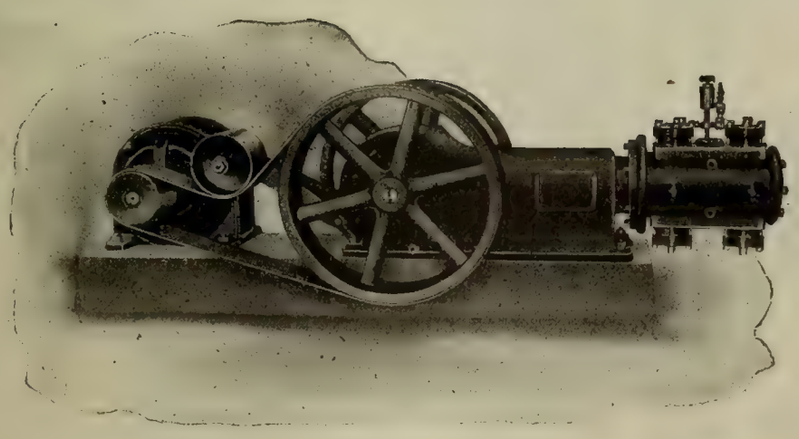


The National Acme Company

New England Plant Windsor, Vermont — **Cleveland, Ohio** — Canadian Plant Montreal, P. Q.

BRANCH OFFICES:—
NEW YORK, BOSTON, CHICAGO, DETROIT, ATLANTA, SAN FRANCISCO, Representatives in FOREIGN COUNTRIES

Makers of Gridley Single and Multiple Spindle Automatics at Windsor, Vermont; and Acme Automatics, Threading Dies, and Screw Machine Products at Cleveland, Ohio



Power-driven, Straight Line, Single Stage Air Compressor. Bulletin K-300-A.

If interested in Steam-driven Machines, convertible to belt-drive when required, ask for Bulletin K-302.

"Time is of the Essence of the Contract"

as a rule, in these days of intensified production.

Compressed Air Appliances are, beyond question, among the greatest time-savers of the period, and modern workshops, however small, cannot afford to be without them.

The Compressor shown in the cut is particularly adapted to the needs of the small or medium size foundry or machine shop.

Note the simple design, and dust-proof construction. The machine is fitted with "Circo" leaf valves and automatic splash lubrication. These mean efficiency, economy and the minimum of attention while running.

Bulletin K-300-A will tell you why. Please use the coupon.

CANADIAN INGERSOLL-RAND CO.
LIMITED
Commercial Union Building, Montreal, Canada

Branches:
Sydney Toronto Cobalt Timmin Winnipeg Nelson Vancouver

Works: SHERBROOKE QUE.

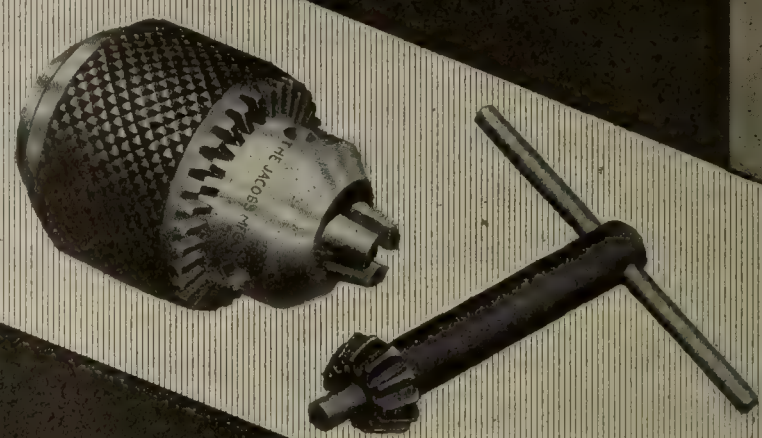
Compressed Air Machinery and Appliances

Canadian Ingersoll-Rand Co., Ltd., C.M.
MONTREAL.

Gentlemen:—Please send, without obligation on our part, Bulletin K-300-A.

Name .....
Address .....
Province ..... Date .....
Business .....

Jacobs
IMPROVED
Drill Chuck

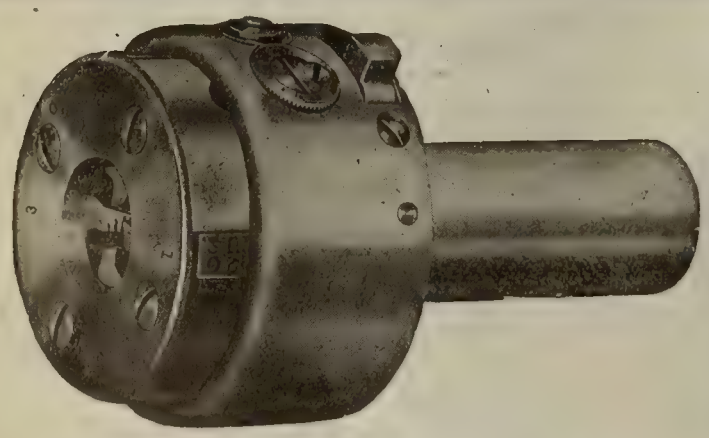


A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.



Automatic Die Heads

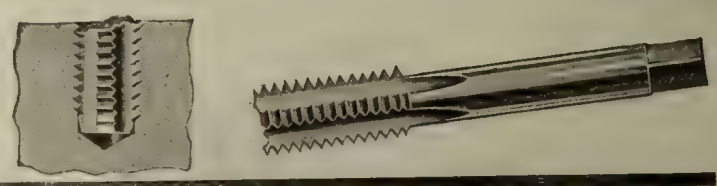
The chasers are set and held in place by a steel cam which, when adjusted, locks, no stopping or changing necessary.

The quick release will allow cutting right up to a shoulder when necessary.

These features are distinctly an H. & G. Automatic Self-Opening Die Head quality that makes it desired among other tools of similar nature.

We will gladly furnish you with our booklet.

Eastern Machine Screw Corp.
New Haven, Conn., U.S.A.



Has This Happened to You?

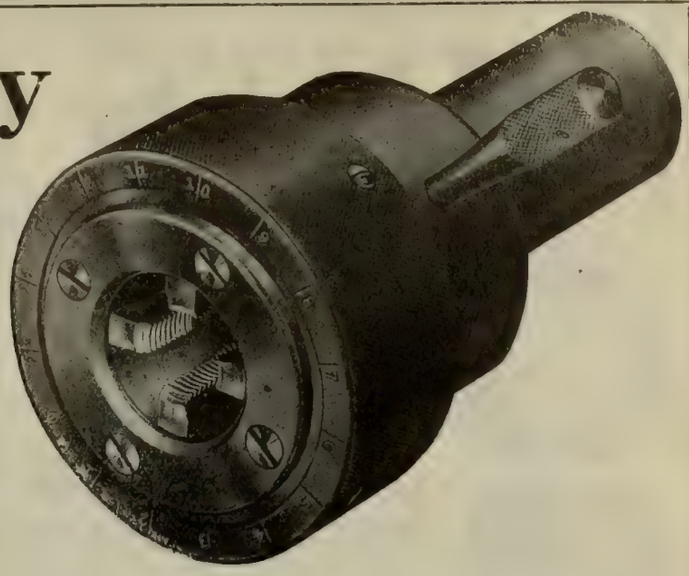
More than likely it has—often. And when it does do you fuss around trying to get hold of the broken pieces, injuring the threads, wasting time and temper?

If you do, the Walton Tap Extractor will be a welcome addition in your tool chest. With it a broken tap presents no difficulties and makes little lost time. The crucible steel fingers of this strong device go down into the flutes and it is then a simple matter to back the tap out by applying a wrench to the squared outer end of the tool. The thread is uninjured in the process, the casting or forging is saved and an otherwise nasty job has been handled without trouble or loss of time.

The Walton Company
Hartford, Conn.

Rapid Delivery

Users of Murchey Tools Get Chasers Without Delay



Lightning deliveries—that is a big advantage of using Murchey Tools. No work held up for chasers. We get your order, fill it, and it's on the way back to you just as quickly as the most rapid means of transportation can bring it to you.

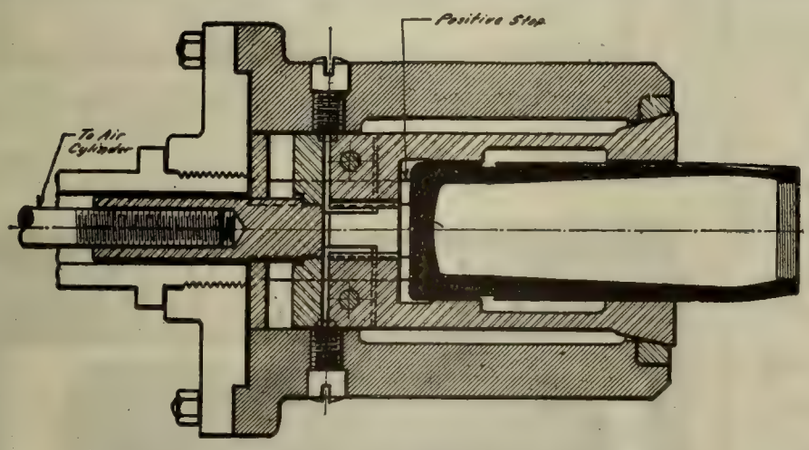
There is no service like the Murchey service, and there are no tools like the Murchey Tools. Send blueprints for estimates.

MURCHEY TAPS are accurate and simple and can be worked with great speed. On 4.5 Mark VII shells Murchey tapping time is just ONE MINUTE.

Murchey Machine & Tool Company

75 PORTER STREET - - DETROIT, MICHIGAN

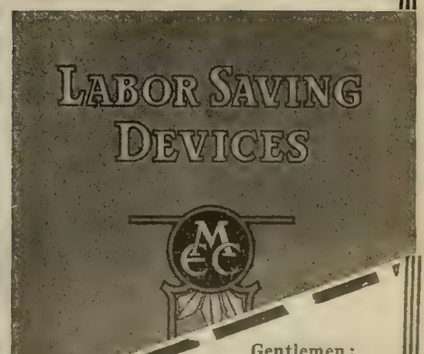
The Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, S.W., England, Glasgow, Newcastle-on-Tyne, and Fenwick Freres & Company, 15 Rue Fenelon, Paris, France.



Consider Just This One Feature of M.E.C. Air-operated Hinged Collets

They save from 50 per cent. to 90 per cent. of the time usually required to do the same work by an ordinary chuck. While they **possess many** other points of superiority, the above feature alone is one that should appeal to users of chucks.

May we send full particulars? Just fill in coupon.



Manufacturers Equipment Co.

175-179 N. JEFFERSON ST. CHICAGO, U. S. A.

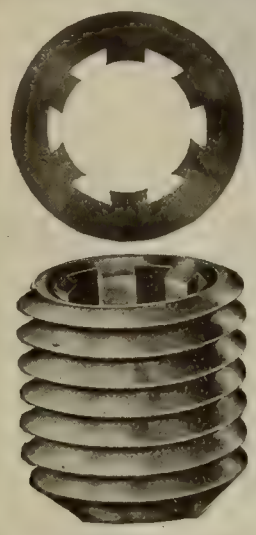
Canadian Agents:
J. R. Stone Tool and Supply Co., Goebel Bldg., Detroit, Mich.

Gentlemen:
Please send me copy of your catalog entitled "Labor Saving Devices," according to your advertisement in Canadian Machinery.

Name .....
Address .....
Position .....
With .....

If any advertisement interests you, tear it out now and place with letters to be answered.

HINTS TO BUYERS



Eliminate Danger

Accidents break down the efficiency of your organization, lead to legal troubles, loss of time and money.

TRADE MARK

BRISTO

REG. U. S. PAT. OFFICE

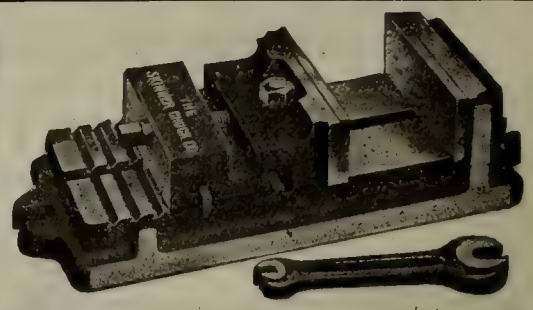
SAFETY SET SCREWS

insure safety. They also protect themselves because of their patented construction. The dove-tailed design of wrench and screw contracts the metal under pressure. The harder you twist the wrench the more the metal of the screw is compressed.

Write for BULLETIN I-809

THE BRISTOL COMPANY
Waterbury, Conn., U.S.A.

SKINNER DRILL PRESS VISE



A substantial, durable tool which will pay for itself in short order in any machine shop. Four sizes to accommodate a wide range of work. Try one and you'll buy more.

Printed matter promptly mailed on request.

THE SKINNER CHUCK COMPANY

New York Office, 94 Reade Street — London Office 149 Queen Victoria St. — San Francisco Office Rialto Bldg.
Factory and Main Office, New Britain, Conn., U.S.A.

Uncertainty becomes Certainty when you have your material and apparatus tested and inspected by us.

Get the benefit of many years of service.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED

Head Office and Main Laboratories—MONTREAL

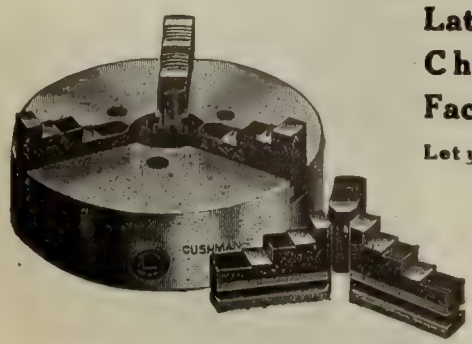
Branch Offices and Laboratories:
TORONTO, WINNIPEG, EDMONTON, VANCOUVER, NEW GLASGOW.

STEEL CASTINGS

We are well equipped to make all kinds of steel castings, 100 lbs. to 50,000 lbs.

Dominion Steel Foundry Co.
Hamilton LIMITED Ontario

Cushman Chucks



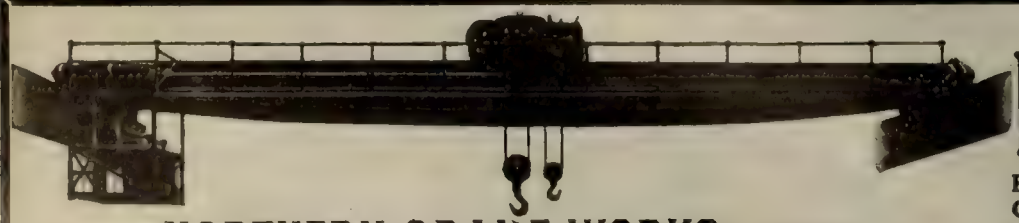
Lathe Chucks, Drill Chucks, Portable Face Plate Jaws.

Let us send you our catalog.

The Cushman Chuck Co.
Hartford, Conn., U.S.A.

RIVETED STEEL TANKS FOR EVERY PURPOSE

OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
PNEUMATIC WATER SUPPLY TANKS - SMOKE STACKS
BOILER BREECHING - RIVETED STEEL PIPE - BINS & HOPPERS



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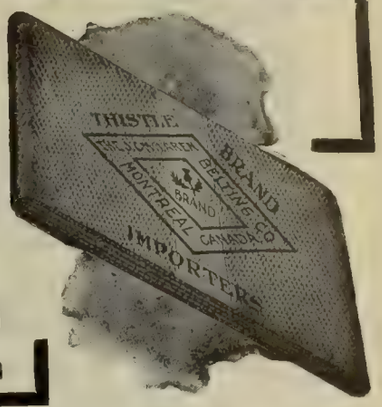

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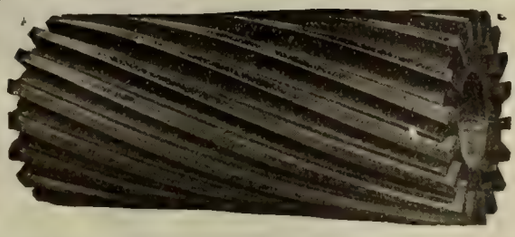

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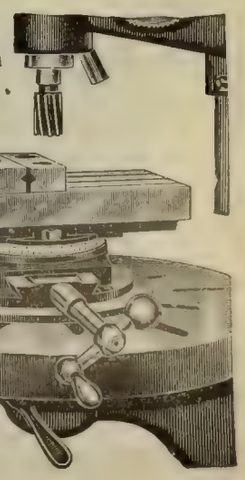

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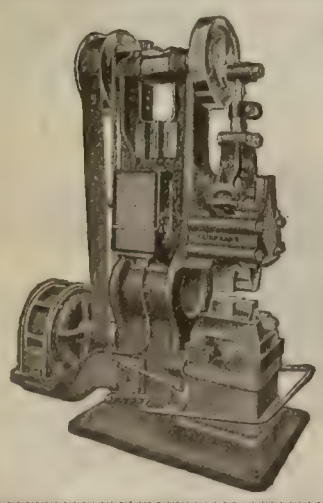

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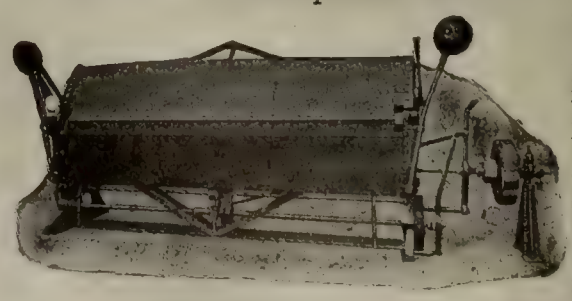

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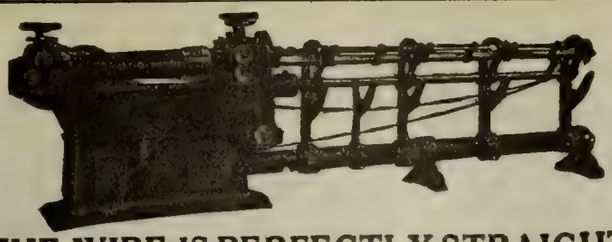

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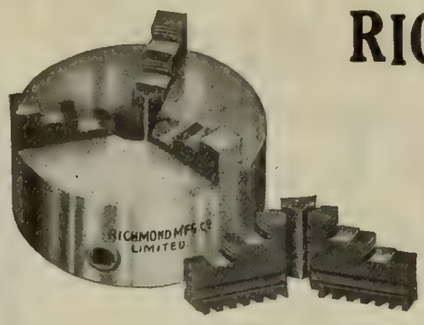

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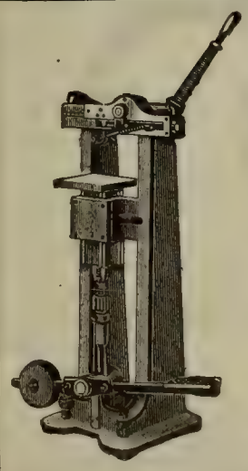

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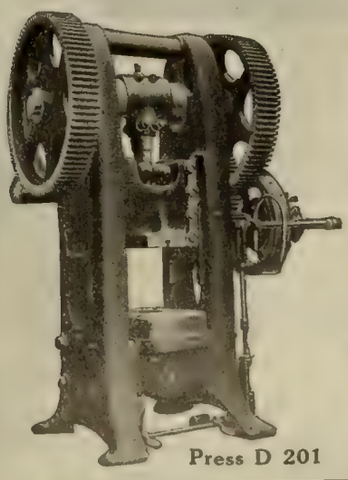

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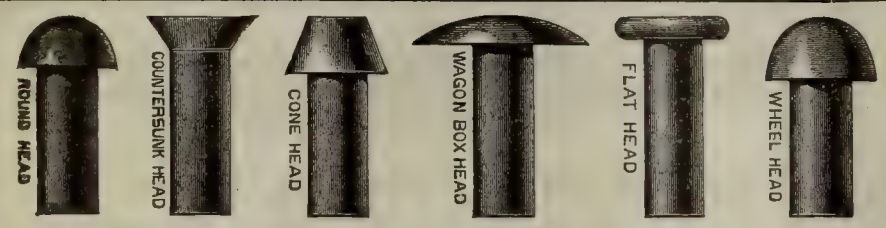

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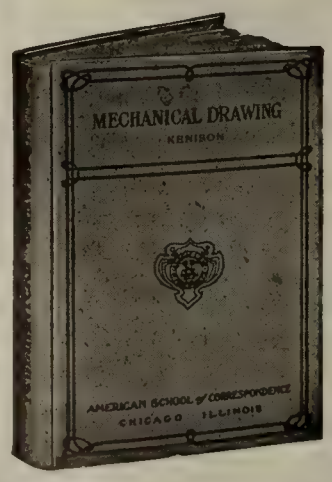

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H. W. Petrie, Toronto
R. E. T. Pringle, Ltd., Toronto, Ont.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland
New Britain Mach. Co., New Britain, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Steel Bending Brake Wks., Ltd., Chatham, Ont.

BRASS AND COPPER BARS, RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto

BRASS WORKING MACHINERY
Dominion Machy. Co., Toronto, Ont.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto, Ont.
Warner & Swasey Co., Cleveland
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machy. Co., Toronto

BRIDGES, RAILWAY AND HIGHWAY
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke

BRONZE RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto

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Puro Sanitary Dk'g Fountain Co., Haydenville, Mass.

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Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Ltd., Montreal
R. E. T. Pringle, Ltd., Toronto, Ont.

BUCKETS, CLAM SHELL, CRAB, DUMP
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

BUCKETS, ELEVATING AND HOISTING
Banfield, Edwin J., Toronto.

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John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.

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Bellevue Industrial Furnace Co., Detroit, Mich.
Gray Mfg. & Mach. Co., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.

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BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque.

BUTTERISERS
Wells Bros. Co. of Canada, Galt, Ont.

CANNERS' MACHINERY
Bliss, E. W., Co., Brooklyn, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
Brown, Boggs & Co., Hamilton, Can.
Prest-O-Lite Co., Inc., Toronto, Ont.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Can.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CAR MOVERS
Dillon Mfg. Co., Oshawa, Ont.

CARTRIDGE MAKING MACHINERY
Blackall, Fred. S., Woolworth Tower, New York.
Prest-O-Lite Co., Inc., Toronto, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER
Cumming & Son, J. W., New Glasgow, Canada.
Alexander Fleck, Ltd., Ottawa.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, GRAY IRON
Bernard Industrial Co., The A., Fortierville, Que.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Steel Foundries, Ltd., Montreal, Que.
Alexander Fleck, Ltd., Ottawa.
Gardner, Robt., & Son, Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Can. Steel Foundries, Ltd., Montreal, Que.
Dominion Steel Foundry Co., Ltd., Hamilton, Ont
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
Can. Steel Foundries, Ltd., Montreal, Que.
Cumming & Son, J. W., New Glasgow, Canada.

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.

CEMENT MACHINERY
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.
H. W. Petrie, Toronto.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Wells Brothers Co., Greenfield, Mass.
John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.

CHEMISTS
Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

CHESTS, TOOL
Union Tool Chest Works, Rochester, N.Y.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
John Bertram & Sons Co., Dundas, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Millers Falls Co., Millers Falls, Mass.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Richmond Mfg. Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Skinner Chuck Co., New Britain, Conn.
Thomas Elevator Co., Chicago, Ill.
D. E. Whiton Machine Co., New London, Conn.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.
Richmond Mfg. Co., Toronto, Ont.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, GEARED SCROLL
Richmond Mfg. Co., Toronto, Ont.

CHUCKS, MAGNETIC
H. E. Streeter, 523 New Birks Bldg., Montreal.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

CHUCKING MACHINES
Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

CLOCKS, WATCHMAN, PORTABLE
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Que.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.

COAL HANDLING MACHINERY
MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

COLLARS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.
Stone Tool & Supply Co., J. R., Detroit, Mich.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

CONTROLLERS AND STARTERS, ELECTRIC MOTORS
Dominion Machy. Co., Toronto, Ont.
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, STEEL SLIDE-BLOW
Whiting Foundry Equipment Co., Harvey, Ill.

COPING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.

COUNTERSHAFTS
Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.

COUPLINGS, PLAIN AND FLEXIBLE
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES, LOCOMOTIVE
Northern Crane Works, Walkerille.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.

CUTTER GRINDERS AND ATTACHMENTS
Cincinnati Milling Machine Co., Cincinnati.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
H. W. Petrie, Ltd., Montreal.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Goddard Tool Co., Chicago, Ill.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

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Cataract Refining & Mfg. Co., Toronto.
Elm Cutting Oil Co., Toronto.
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Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
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Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machinery Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Peerless Machine Co., Racine, Wis.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Mach. & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

CYLINDERS, AIR
Manufacturers Equip. Co., Chicago, Ill.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.

DAMPER REGULATORS
Canadian Fairbanks-Morse Co., Ltd., Montreal.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

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Geo. A. Joyce Co., Ltd., New York.

DIAMOND TOOLS
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York.
Wheel Trueing Tool Co., Windsor, Ont.

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Matthews, Jas. H., & Co., Pittsburgh, Pa.

DIES AND DIE STOCKS
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Banfield, W. H., & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Ltd., Montreal.
Wells Brothers of Canada, Galt, Ont.

DIES FOR BIT BRACE USE
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DIES, NOSING
Marsh & Henthorn, Ltd., Belleville, Ont.

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Garvin Machine Co., New York.
H. W. Petrie, Ltd., Montreal.

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Wells Brothers Co. of Canada, Galt, Ont.

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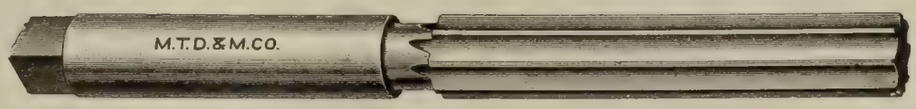

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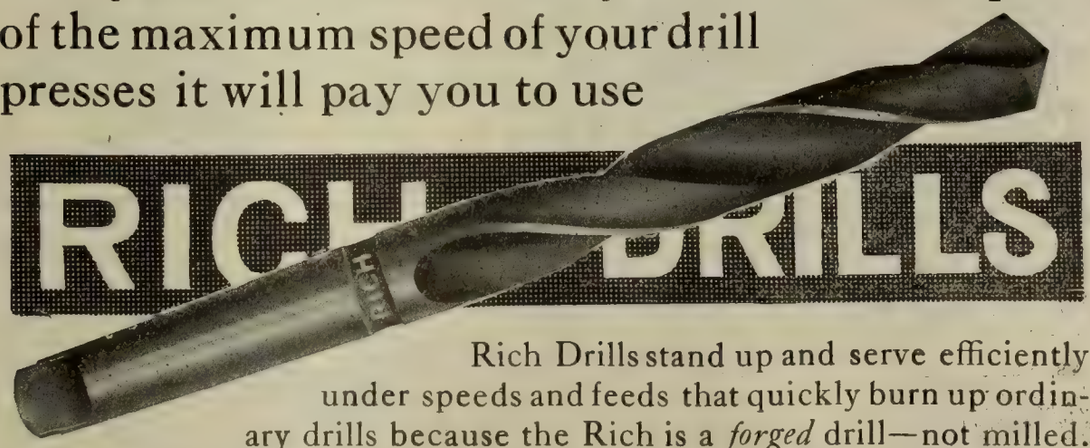

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Murchey Machine & Tool Co., Detroit, Mich.
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Wells Brothers Co. of Canada, Galt, Ont.

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Can. Blower & Forge Co., Kitchener, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

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Graton & Knight Mfg. Co., Montreal.

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Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
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H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
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Standard Machy. & Supplies, Ltd., Montreal.
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A. R. Williams Machinery Co., Toronto.

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Martin Machine Co., Greenfield, Mass.

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Barnes, W. F. & John, Co., Rockford, Ill.
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Canada Machinery Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Hespeler, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Rockford Drilling Mach. Co., Rockford, Ill.

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Canada Machinery Corp., Galt, Ont.
Dominion Machy. Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
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Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

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Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
De Mooy Machine Co., Cleveland, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
D. McKenzie Machinery Co., Guelph, Ont.
Niles-Bement-Pond Co., New York.
R. E. T. Pringle, Ltd., Toronto, Ont.
United States Mach. Tool Co., Cincinnati, Ohio.

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John Bertram & Sons Co., Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Dominion Machy. Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.

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Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto, Ont.
W. F. & John Barnes Co., Rockford, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Millers Falls Co., Millers Falls, Mass.
H. W. Petrie, Ltd., Montreal.
Pratt & Whitney Co., Dundas, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
United States Electrical Tool Co., Cincinnati.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.

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Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.

DRILLS, HIGH SPEED
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
H. A. Drury Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Marshall, Geo. A., 70 Lombard St., Toronto.
McKenna Brothers, Pittsburgh, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
W. F. & John Barnes Co., Rockford, Ill.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

DRILLS, MULTIPLE SPINDLE
Henry & Wright Mfg. Co., Hartford, Conn.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Ltd., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.

DRILLS, PNEUMATIC
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Armstrong Bros. Tool Co., Chicago.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
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Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
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Millers Falls Co., Millers Falls, Mass.
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H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
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Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
Morse Twist Drill & Mach. Co., New Bedford.

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Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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Puro Sanitary Dk'g. Fountain Co., Haydenville, Mass.

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Sturtevant Co., B. F., Galt, Ont.

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Sheldons, Ltd., Galt, Ont.
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Lancashire Dynamo & Motor Co., Ltd., Toronto.
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Standard Machy. & Supplies, Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
A. R. Williams Machy. Co., Toronto.

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Canada Wire & Iron Goods Co., Hamilton, Ont.

ELEVATORS AND BUCKETS
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Norton Co., Worcester, Mass.
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H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
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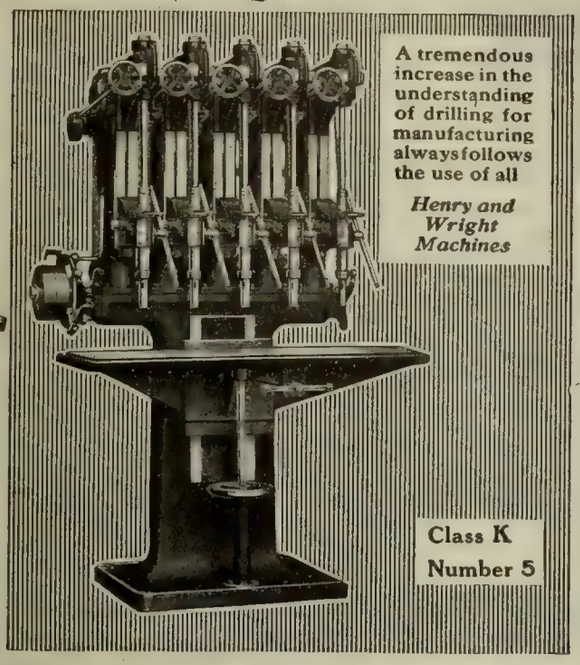

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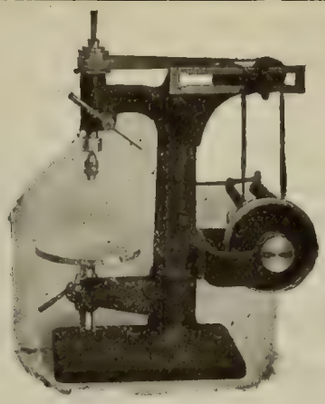

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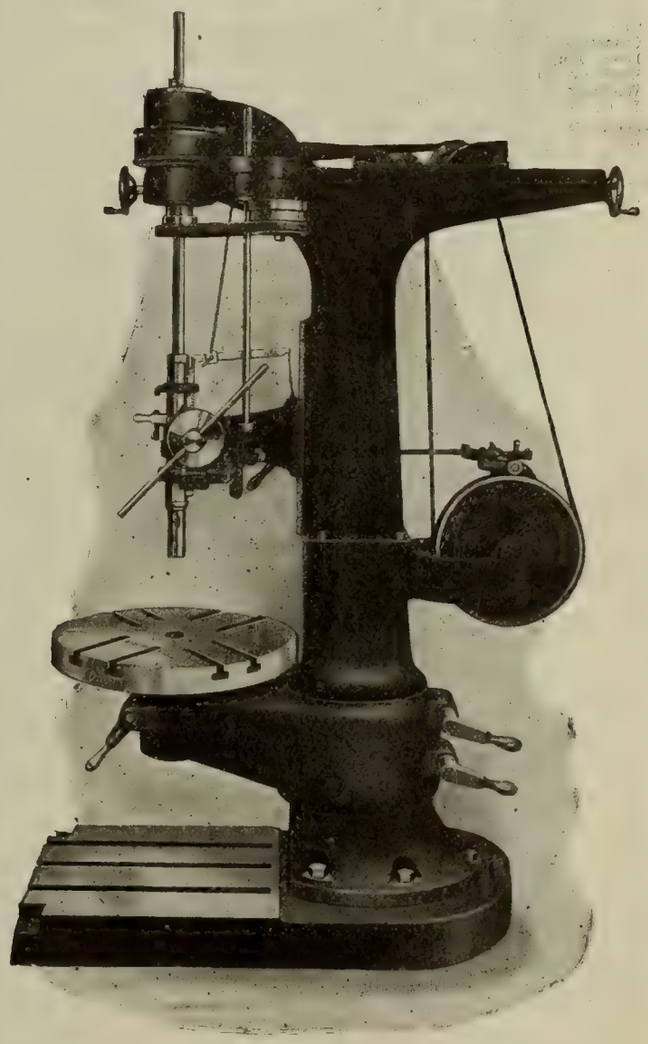

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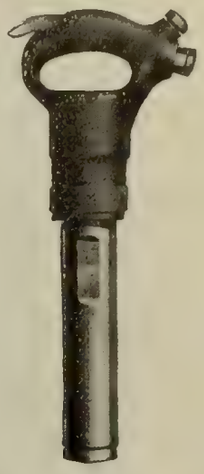

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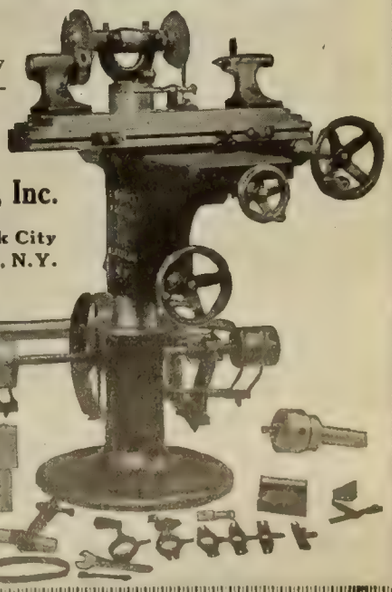

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Gardner, Robt., & Son, Montreal.
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Garvin Machine Co., New York.
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Morton Mfg. Co., Muskegon Heights, Mich.
Niles-Bement-Pond Co., New York.
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H. W. Petrie, Toronto.
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Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Riverside Machinery Depot, Detroit, Mich.
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A. R. Williams Machy. Co., Toronto.

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Hannifin Mfg. Co., Chicago, Ill.
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Metalwood Mfg. Co., Detroit, Mich.
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Consolidated Press Co., Hastings, Mich.
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Ferracute Machine Co., Bridgeton, N.J.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
West Tire Setter Co., Rochester, N.Y.

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Niles-Bement-Pond Co., New York.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Toledo Machine & Tool Co., Toledo.
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Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
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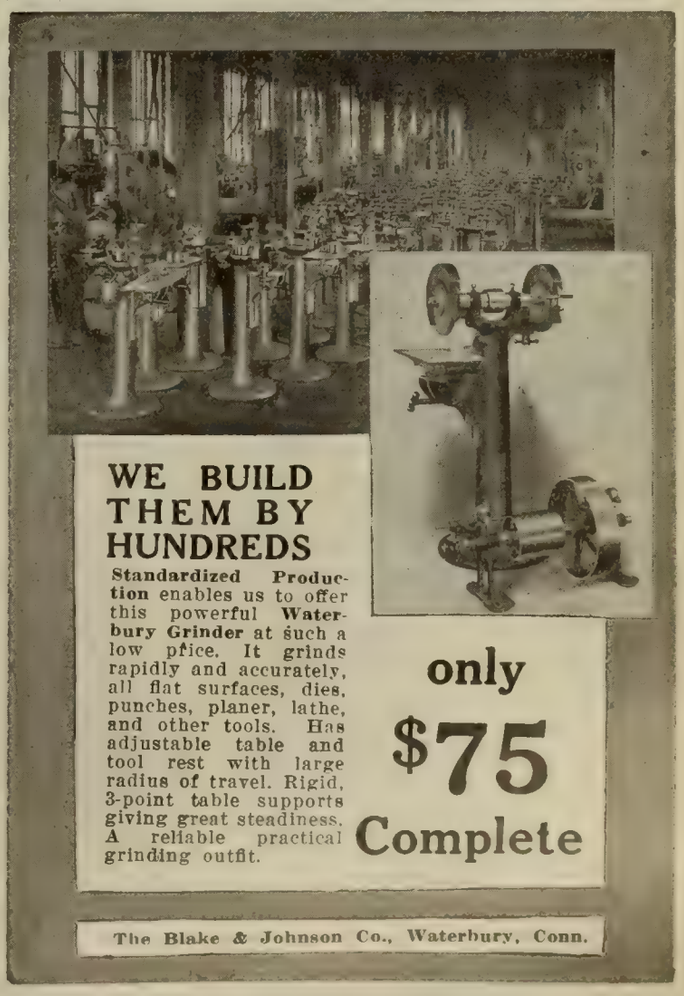

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Pratt & Whitney Co., Dundas, Ont.
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Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.
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Napier Saw Works, Springfield, Mass.
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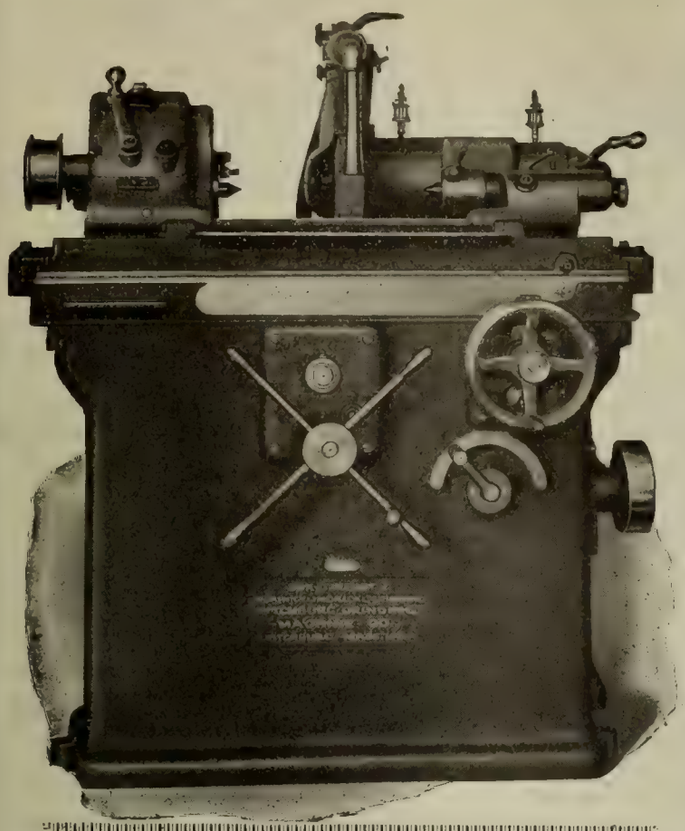

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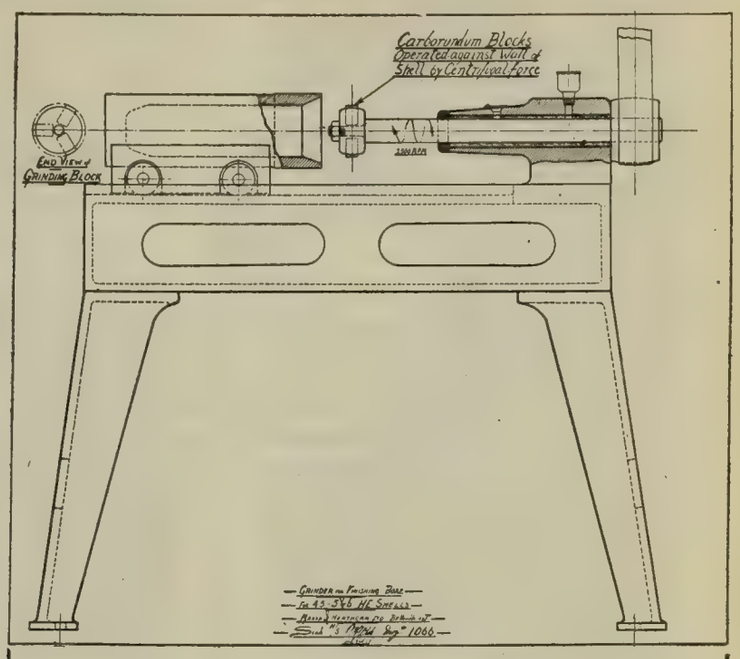

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Ferracute Machine Co., Bridgeton, N.J.
National Machy. Co., Tiffin, Ohio.
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H. W. Petrie, Toronto.
Toledo Machine & Tool Co., Toledo.

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Niles-Bement-Pond Co., New York.
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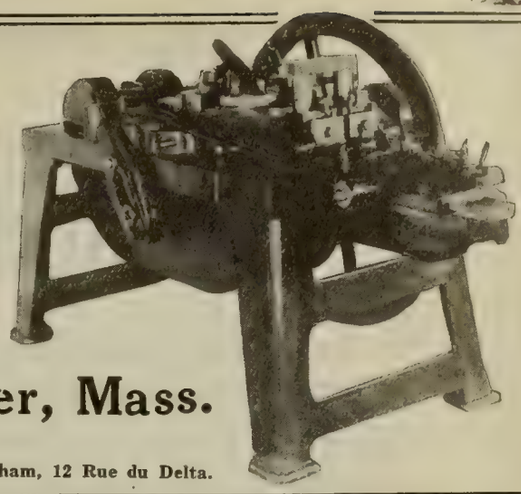

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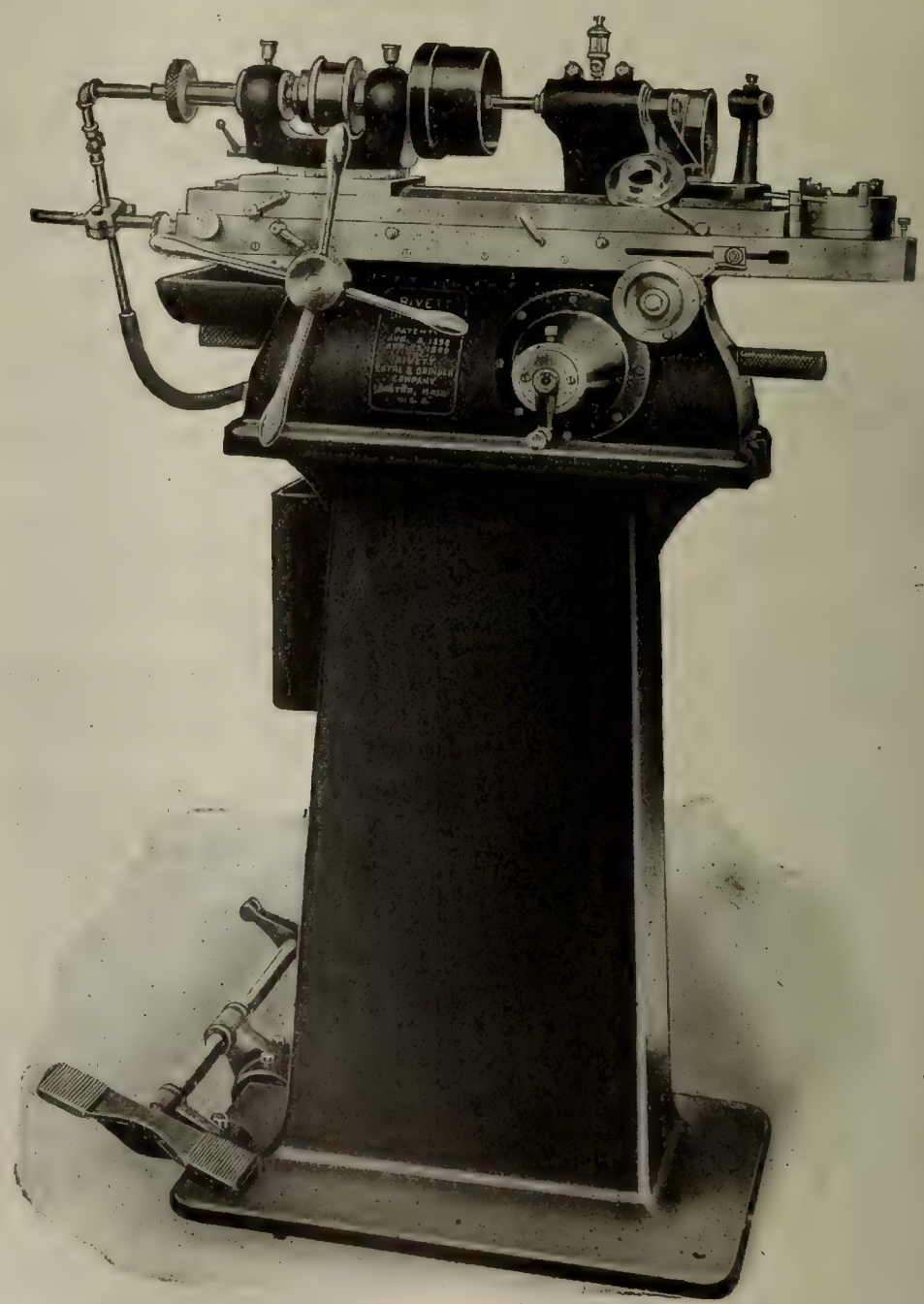

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CANADIAN MACHINERY

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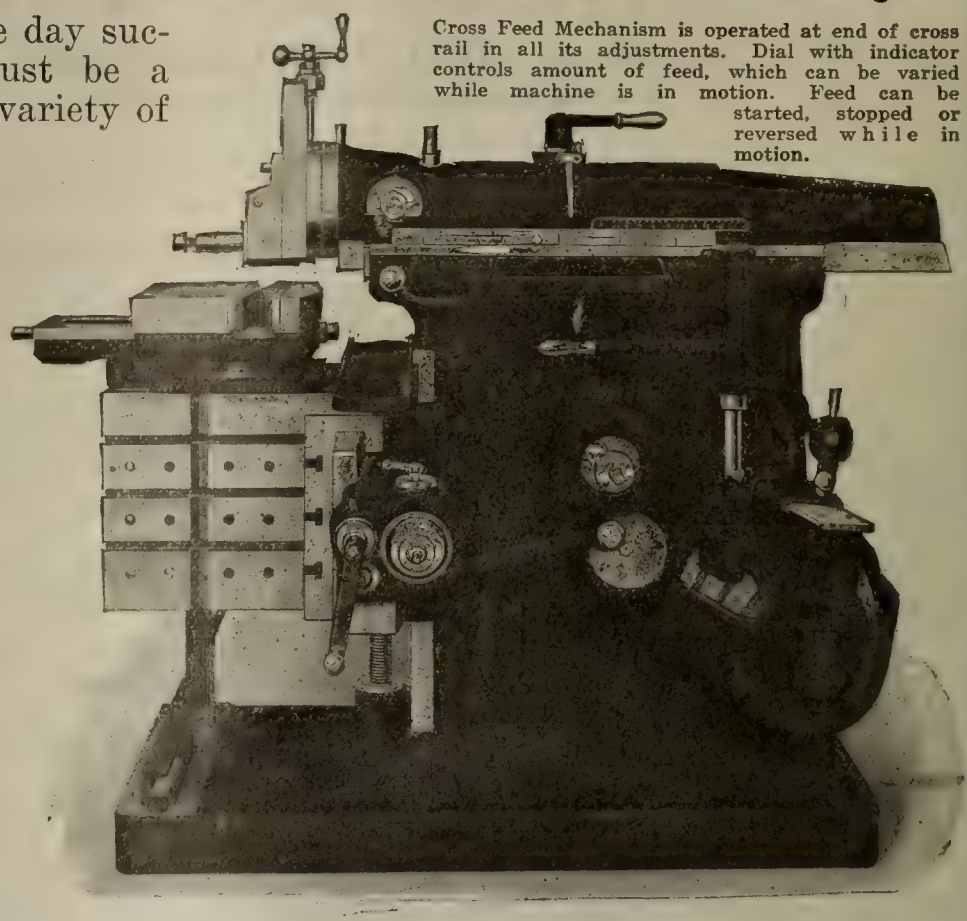

Cross Feed Mechanism is operated at end of cross rail in all its adjustments. Dial with indicator controls amount of feed, which can be varied while machine is in motion. Feed can be started, stopped or reversed while in motion.

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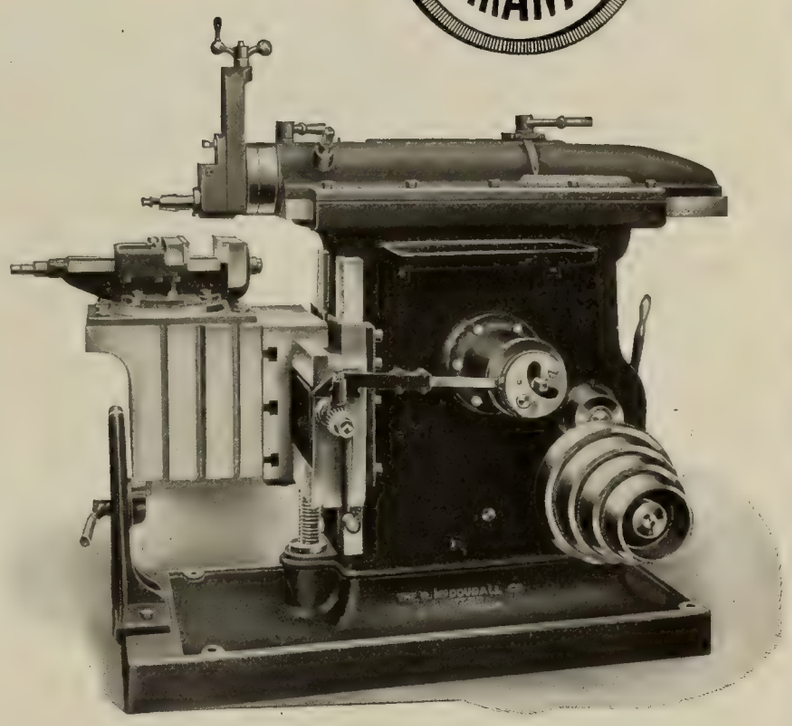

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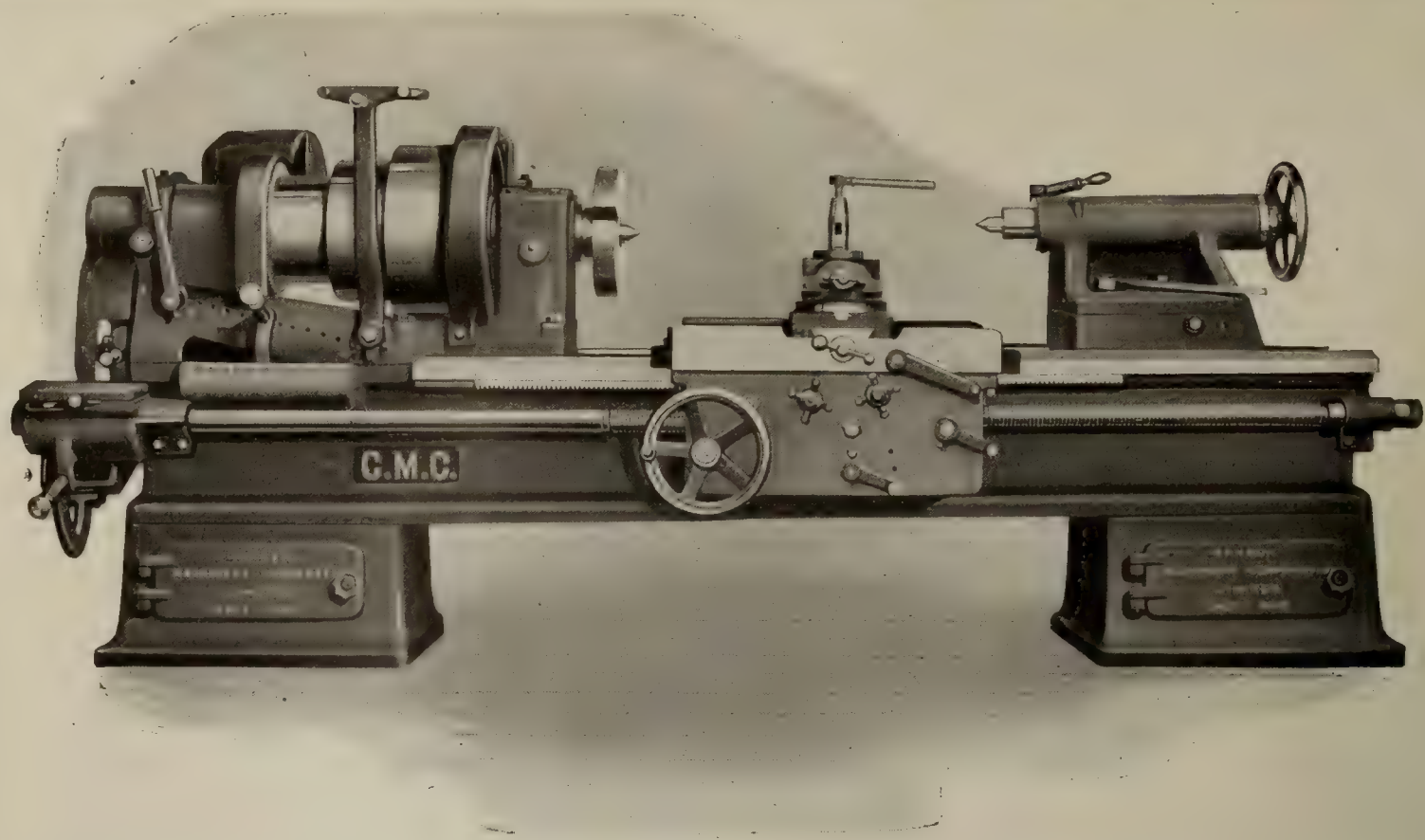

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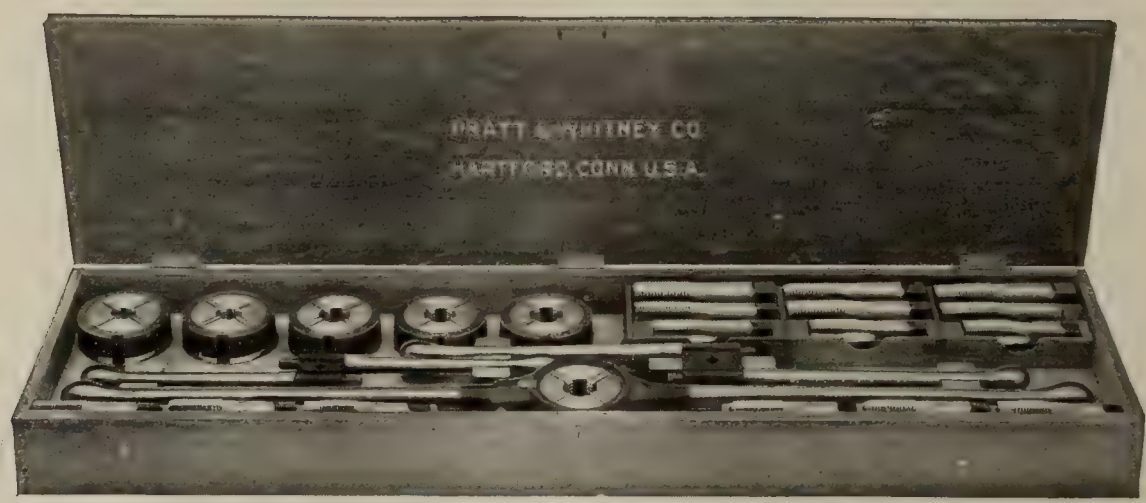

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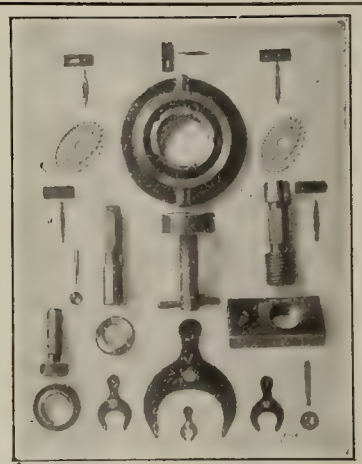

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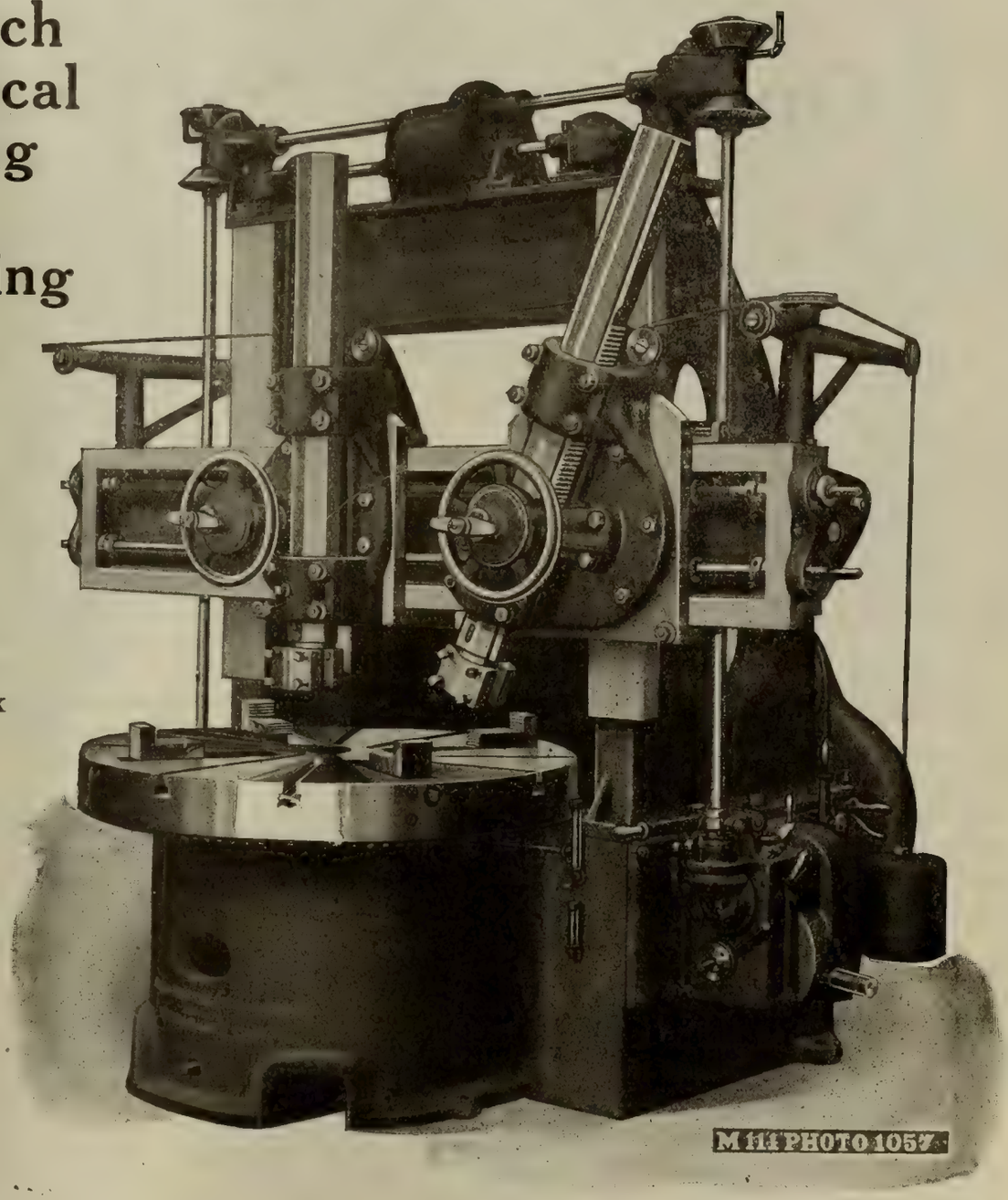

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The Publisher's Page

TORONTO August 23, 1917

On Personal Service

WE cannot all wear uniforms and go overseas to fight with the gallant fellows who have voluntarily sacrificed so much for the sake of freedom and civilization.

We cannot all be soldiers, but we all can be servers. A crisis stares us in the face, clearly discernible in the mists of the future, receding day by day, it is true, but ever present—ever threatening. There is a need for individual response to the call for greater service. We who are not in khaki are apt to feel that after all the efforts of a single individual will not affect the world situation in the slightest. It is this attitude of mind in the individual that retards the progress of the whole. Let us first realize this and the seriousness of it and then go to it with a vigor and a will!

The force of example is strong, and just as our failure to render the very best that is in us has influenced others in hanging back, so will our response to the call for greater service result in speeding up others who look to us for guidance and advice.

The effect of greater individual effort will be tremendous. Let us practise it and preach it, and practise it more than we preach it.

Greater efficiency on the part of the individual will not only help the allied cause, but it will help the individual. We plead for not only greater effort but for effort better directed, and to this end recommend an even closer study of CANADIAN MACHINERY and other technical journals, because they make for greater efficiency and better workmanship, and more of it. We would suggest that each copy of CANADIAN MACHINERY be passed on to mechanics who are not already subscribers, first marking any special articles and items of interest. Do everything you can to encourage study on the part of the carefree and careless. The time may come when they will have occasion to be less indifferent as regards their efficiency; the seriousness of the present situation demands that they be made to shake off this indifference **now.** Pass the good word along. Make CANADIAN MACHINERY 100% efficient by bringing to the attention of the greatest possible number the valuable information it contains.

And if **you** have an idea which can be made to contribute to the general plan of efficiency and greater production, do not keep it to yourself! Send it to us for publication. This will multiply the value of your idea several thousand fold.

Let us forget petty selfishness when so great sacrifices are being made. Let us sink individual concerns and pool our interests for the common good. Let us really live and work with the fulness which brings satisfaction and which leaves no regrets or room for reproach. Let us serve, and serve with sacrifice.

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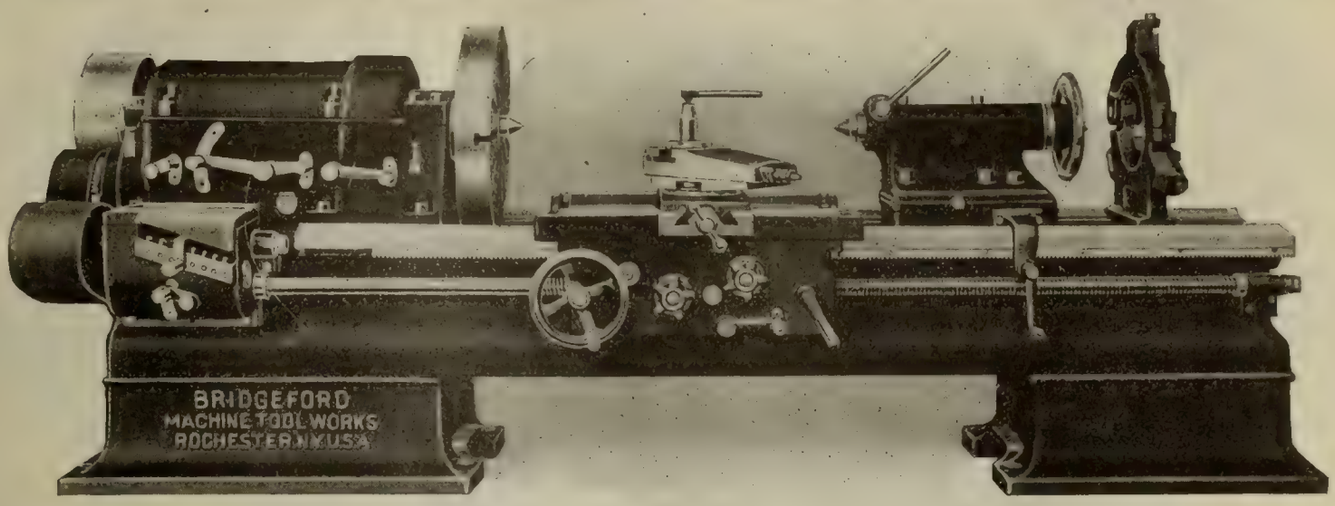

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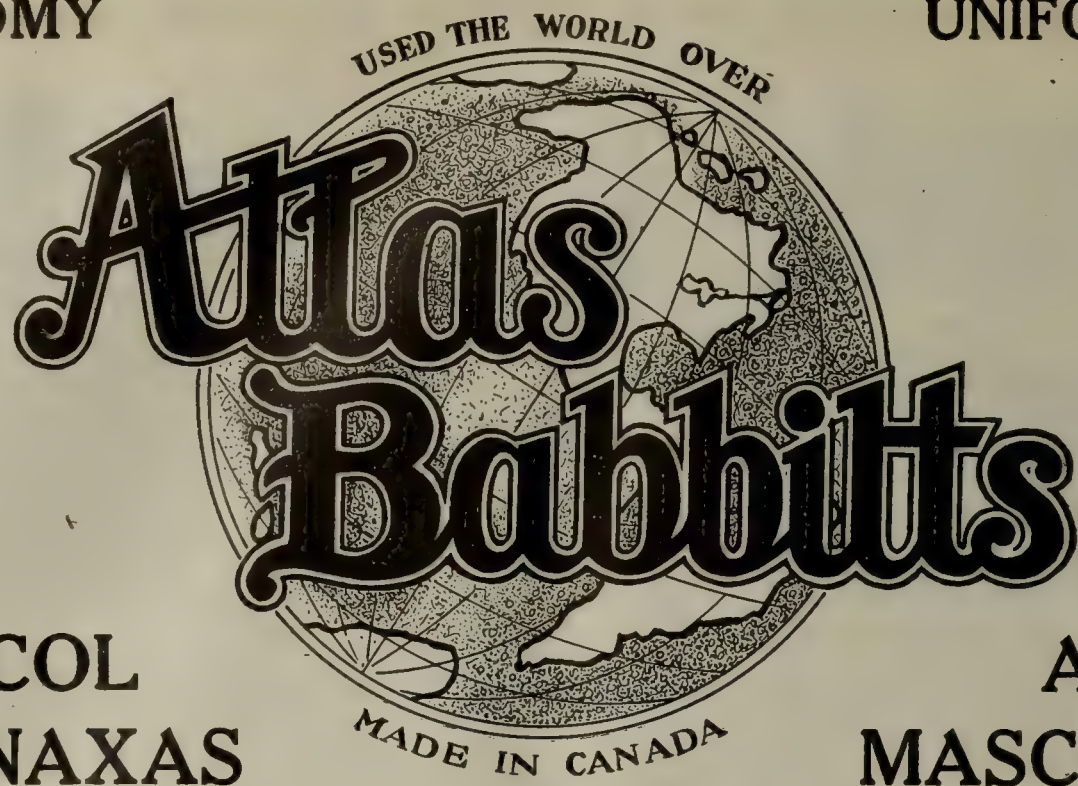

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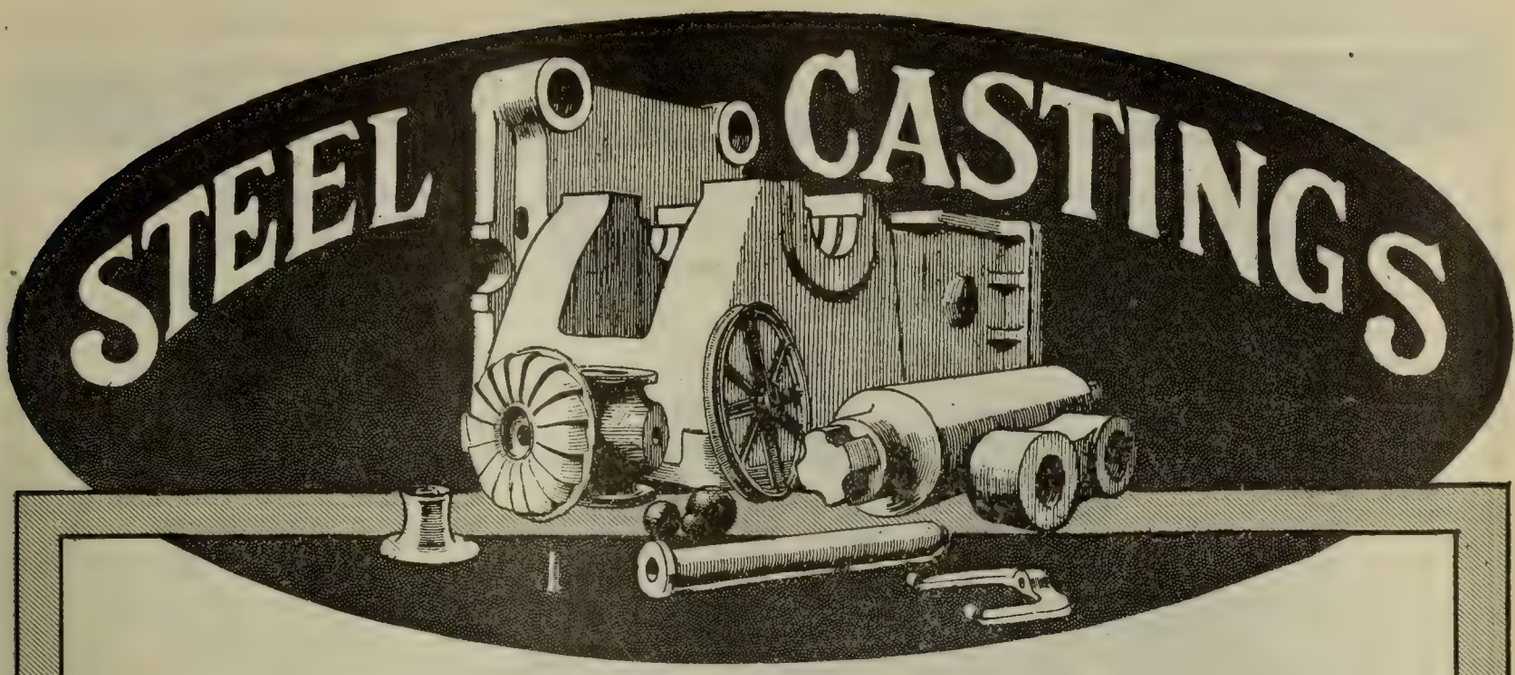

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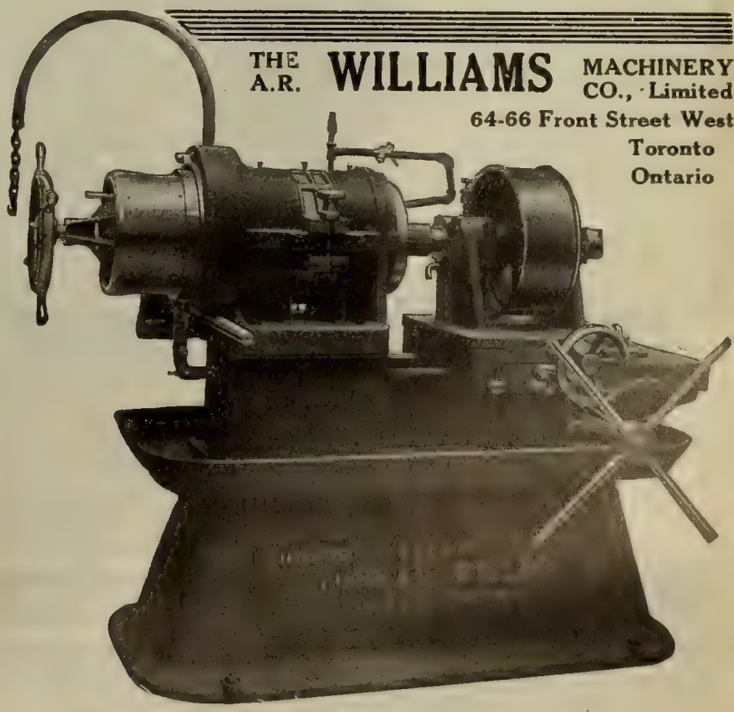

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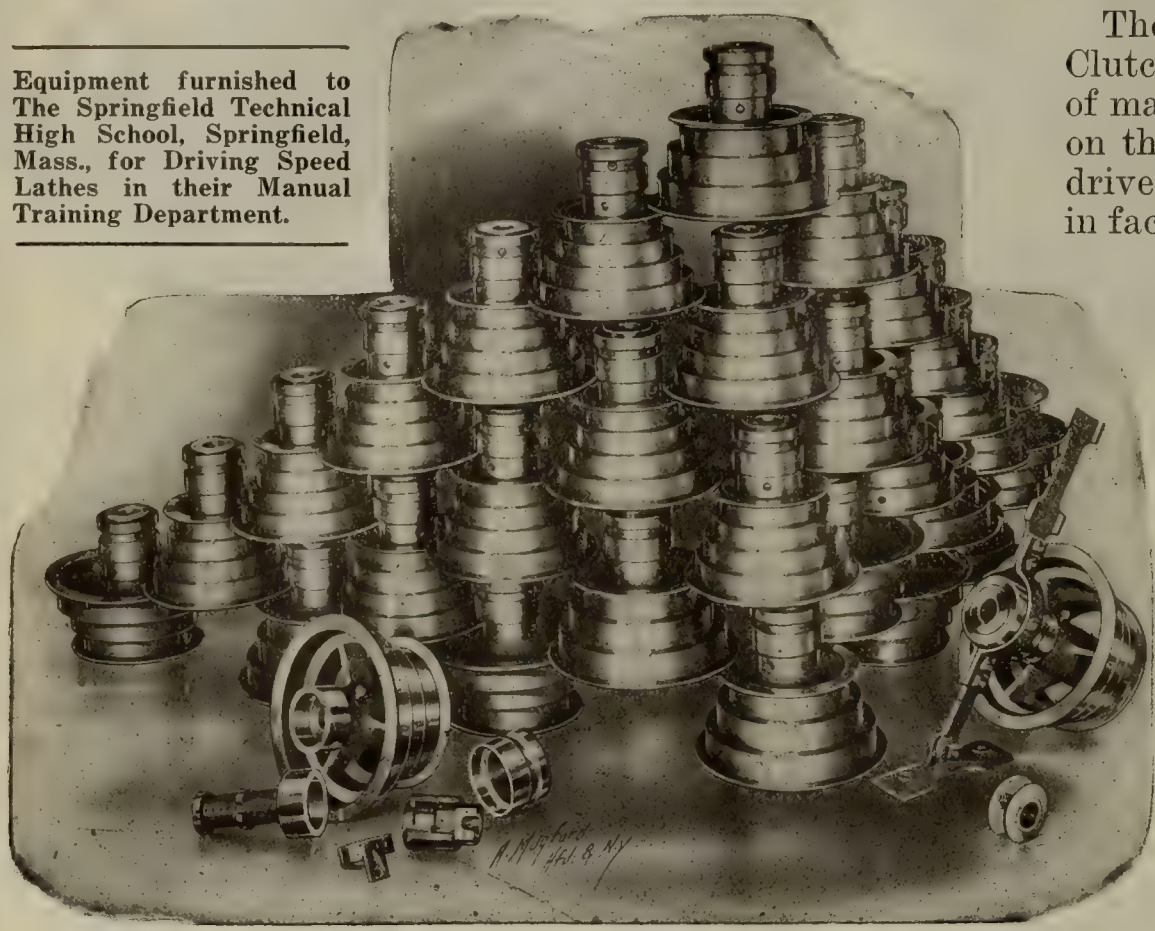
Is particularly adapted for use in Manual Training Department of Technical High Schools or Universities and so easily lends itself for use with cone pulleys that it makes an ideal drive for speed lathes.

Equipment furnished to The Springfield Technical High School, Springfield, Mass., for Driving Speed Lathes in their Manual Training Department.



The Johnson Friction Clutch can be used as a part of machinery of all kinds, or on the overhead shafting to drive such machinery with, in factories or in the Manual Training Departments of Technical High Schools or Universities. Write for list of Schools and Factories we have equipped with our Direct Line Shaft Drive. It may lead you to save considerable in power.

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THE SPRINGFIELD TECHNICAL HIGH SCHOOL, SPRINGFIELD, MASS.
THE FAIRHAVEN HIGH SCHOOL, FAIRHAVEN, MASS.
THE MINNEAPOLIS SCHOOLS (Manual Training Dep't), MINNEAPOLIS, MINN.
THE YONKERS HIGH SCHOOL, YONKERS, N.Y.
THE CENTRAL HIGH SCHOOL, GRAND RAPIDS, MICH.
THE BUSHWICK HIGH SCHOOL, BROOKLYN, N.Y.

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THE UNIVERSITY OF TENNESSEE, KNOXVILLE, TENNESSEE.
THE UNIVERSITY OF MINNESOTA, MINNEAPOLIS, MINN.
MONTANA AGRICULTURAL COLLEGE, BOZEMAN, MONTANA.
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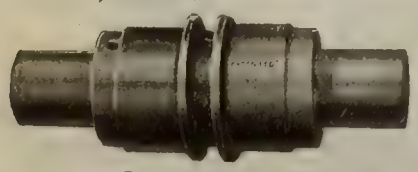
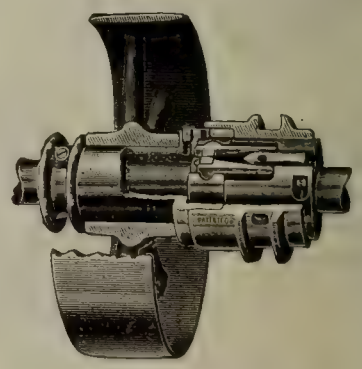
WEST VIRGINIA UNIVERSITY, MORGANTOWN, W. VA.

Our most recent shipment of clutches with coney pulleys was to the Pembroke Iron Works, Pembroke, Ontario, Canada.



The Advantages of the Johnson Clutch are found in its Great Power, Compactness, Light Weight, Smooth Surface and Simple Adjustment.

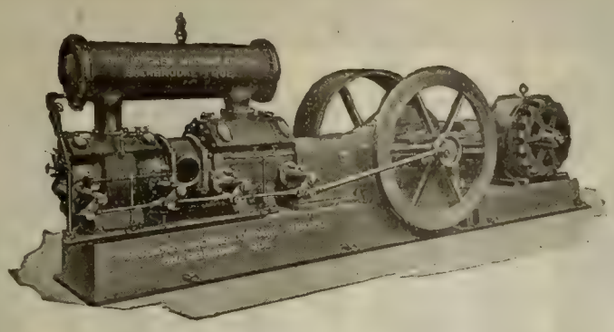


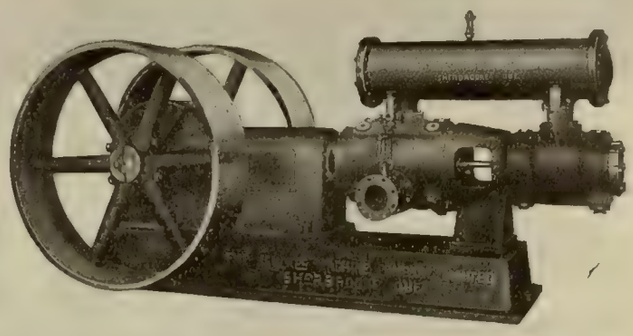
Let us figure on your requirements. Johnson Clutches will save you money.

Send for our YELLOW DATA SHEETS.

Canada— Williams & Wilson, 320 St. James Street, Montreal; The Canadian Fairbanks-Morse Co., Ltd., Toronto.
England— The Efandem Co., Ltd., 150 Gt. Portland St., London, W., Sole Agents for British Isles.
Australia— Edwin Wood, Pty., Hardware Chambers, 231 Eli zabeth St., Melbourne, Victoria.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.





Compressor Problems Vanish

In a comparative test the quality of a machine will then be judged fairly. We invite your comparison. Our confidence that these machines excel is not only based on our knowledge of their construction, but also because of the manner in which they appeal to our customers. We know they are built right. Our patrons have proved it. Let us get together.

Jenckes Machine Company, Limited

Works: ST. CATHARINES, ONT.
Works: SHERBROOKE, QUE.

Sales Offices:—710 C.P.R. Bldg., Toronto: 908 E. T. Bank Bldg., Montreal: West Chester Ave., St. Catha

DOUBLE MUSHET

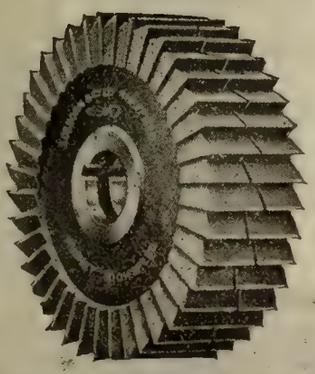
High Speed Steel

Carbon Steel

Gauge Steel

Alloy Steels

SOLE MAKERS
Samuel Osborn & Co. Ltd.
SHEFFIELD



Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)
Limited
Head Office and Works: Montreal, P.Q.
Branch Office: Toronto, Ontario

"Red Cut Superior"

HIGH SPEED STEEL

YOU have thought of many qualities you would like to have in High Speed Steel Tools—such as cutting edges with long life, freedom from brittleness, great reserve strength and toughness to resist shocks and strains, tools that would not require special heat treatment, tools that would take deep roughing cuts or fine smooth finishing cuts, and in addition, could be worked at higher speeds than you ever dreamed of. All these virtues and many more are contained in "Red Cut Superior", a First Quality High Speed Steel. Furnished in Annealed Bar Stock, Discs, and Treated Tool Holder Bits.

Are your tools made of Red Cut?

Send for folder

VANADIUM-ALLOYS STEEL COMPANY

Pittsburgh, Pa.

Works at Latrobe, Pa.

STEEL

FOR SHRAPNEL SHELLS AND SHELL BLANKS

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Company

Limited

Head Office: NEW GLASGOW, N.S.

Western Sales Office:

Room 14, Windsor Hotel, MONTREAL

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

TRADE MARK "WACO"

Reliance Steel Works
SHEFFIELD, ENG.

TRADE MARK:

TRADE MARK

of the Famous

"WACO

Brand

High Speed Steel and Twist Drills

"DOUBLE WACO" Quality

Specially Adapted for all kinds of
MUNITION WORK

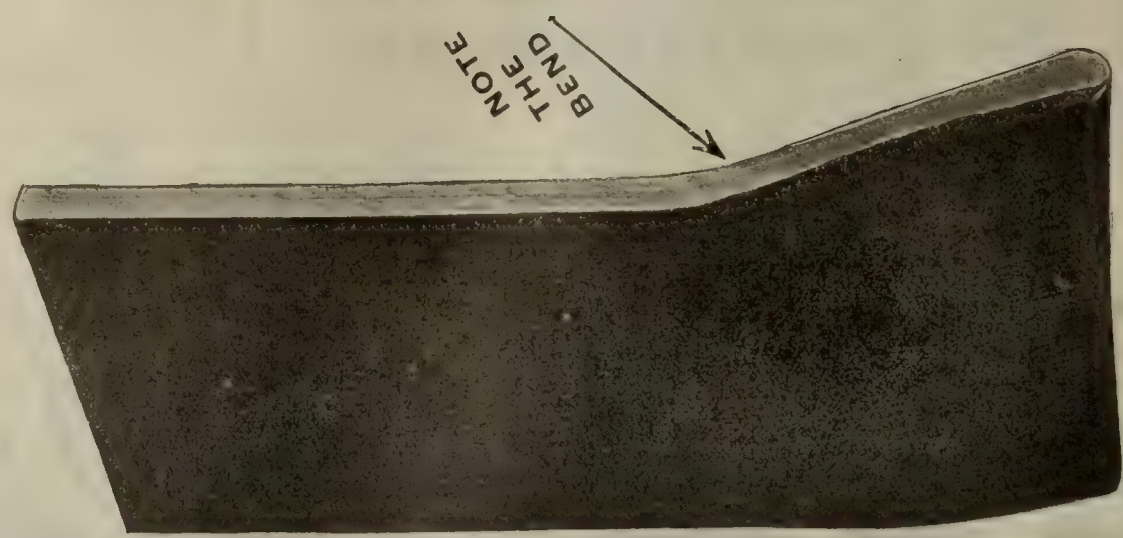
"Turtle" Brand
High Class Tool Steel, Files, etc.
of all descriptions.

For particulars apply to our
Sole Representatives for Canada

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario

Cutting Off Tool



URANIUM
High Speed Steel

NOTE THE BEND

This tool bent in severe service—the two companion tools which were not Uranium broke. The tool shown above did three times as much work as the regular tool.

"Uranium Tools Stand Up On The Job"

SEE YOUR TOOL STEEL MAN OR WRITE US

Standard Alloys Company

FORBES AND MEYRAN AVENUES

PITTSBURGH -:- -:- -:- PENNA.

STELLITE

Canadian National Exhibition

"Meet Me at Machinery Hall Opposite Stellite Booth"

The greatest annual fall fair in the world has this year an added attraction in a unique display of "Stellite," under actual working conditions, as well as a display of the various uses to which it can be put, its adaptability to welding by the oxy-acetylene torch and by brazing.

Be sure and look us up

DELORO SMELTING & REFINING CO., LIMITED

Head Office - - DELORO, ONTARIO

TORONTO
200 King Street West

MONTREAL
315 Craig Street West

IF YOU WANT THE

BEST BASE PLUGS, BUY BANFIELD'S

Have in stock for immediate shipment either threaded or bevel Plugs for 4.5", 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. Write for prices.

EDWIN J. BANFIELD

STAIR BLDG. ∴ TORONTO, ONT.

Manufacturer of Plug Milling Machines for above size shells. Prices and deliveries on application.

High-Speed STEEL

The tools that are made with "Wolfram" High Speed Steel are **warranted to be super-keen at the edge and super-strong at the neck.**

WOLFRAM

Embodies a true and permanent alloy of Tungsten, Chrome, Vanadium and Iron. No better High Speed Steel in the world.

VULCAN CRUCIBLE STEEL COMPANY

ESTABLISHED 1900

Aliquippa - Pa., U.S.A.

Represented in Canada by Messrs. Norton, Callard & Company, Montreal.

ELECTRITE-URANIUM

High-Speed Steel

Will amaze you in its ability to remove metal

The introduction of this rare element—"URANIUM"—into the mixture of our already superb cutting product, has supplied the final perfection of the qualities of toughness and durability which has been the hitherto impossible goal of metallurgical hopes.

Electric Furnaces, Automatically regulated, produce inevitably similar results at every melt.

We are ready to assist your inquiry in every way possible.

Write

Latrobe Electric Steel Company
Latrobe, Pennsylvania

LESCO

If your work can be best done with

Non-Changing Tool Steel

try

Colonial No. 6

Oil Hardening Tool Steel

This test piece shown was 6 in. long and 1¾ in. wide; ⅛ in. thick on left side; ¼ in. thick on right, and $^{3}/_{16}$ in. thick on top.

The average **change in hardening,** taking all dimensions, was **.0015.**

Buy **Colonial No. 6** for difficult hardening jobs.

Stock carried in New York and Pittsburgh.

Colonial Steel Co.

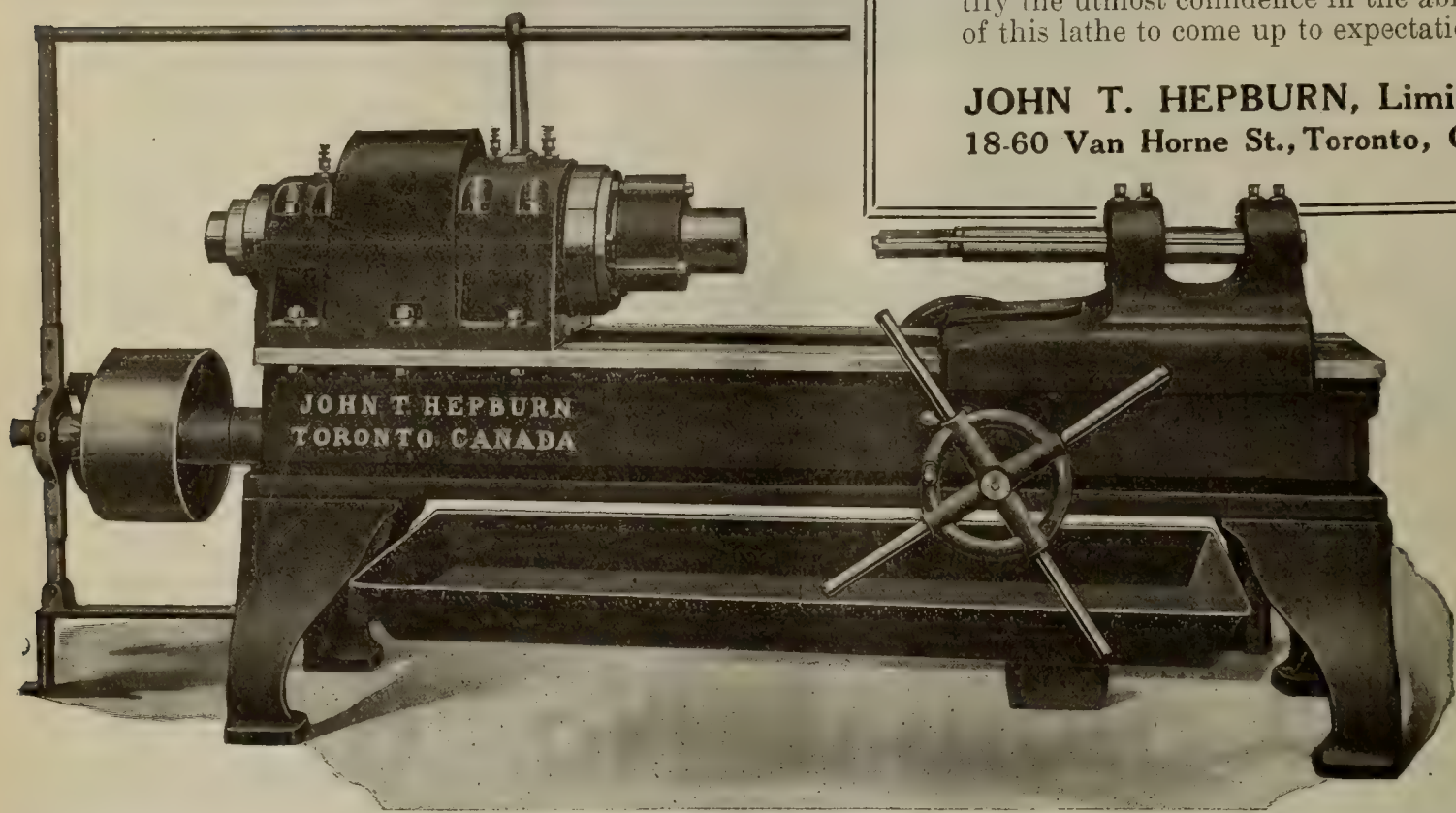
PITTSBURGH

New York Boston Chicago
Detroit St. Louis Denver

Are You Getting Results?

Results are dependent upon two things: speed and quality. If you get speed without quality, yours is a losing proposition. This Hepburn 6" boring lathe gives both speed *and* quality. The results obtained by Canadian users justify the utmost confidence in the ability of this lathe to come up to expectations.

JOHN T. HEPBURN, Limited
18-60 Van Horne St., Toronto, Ont.



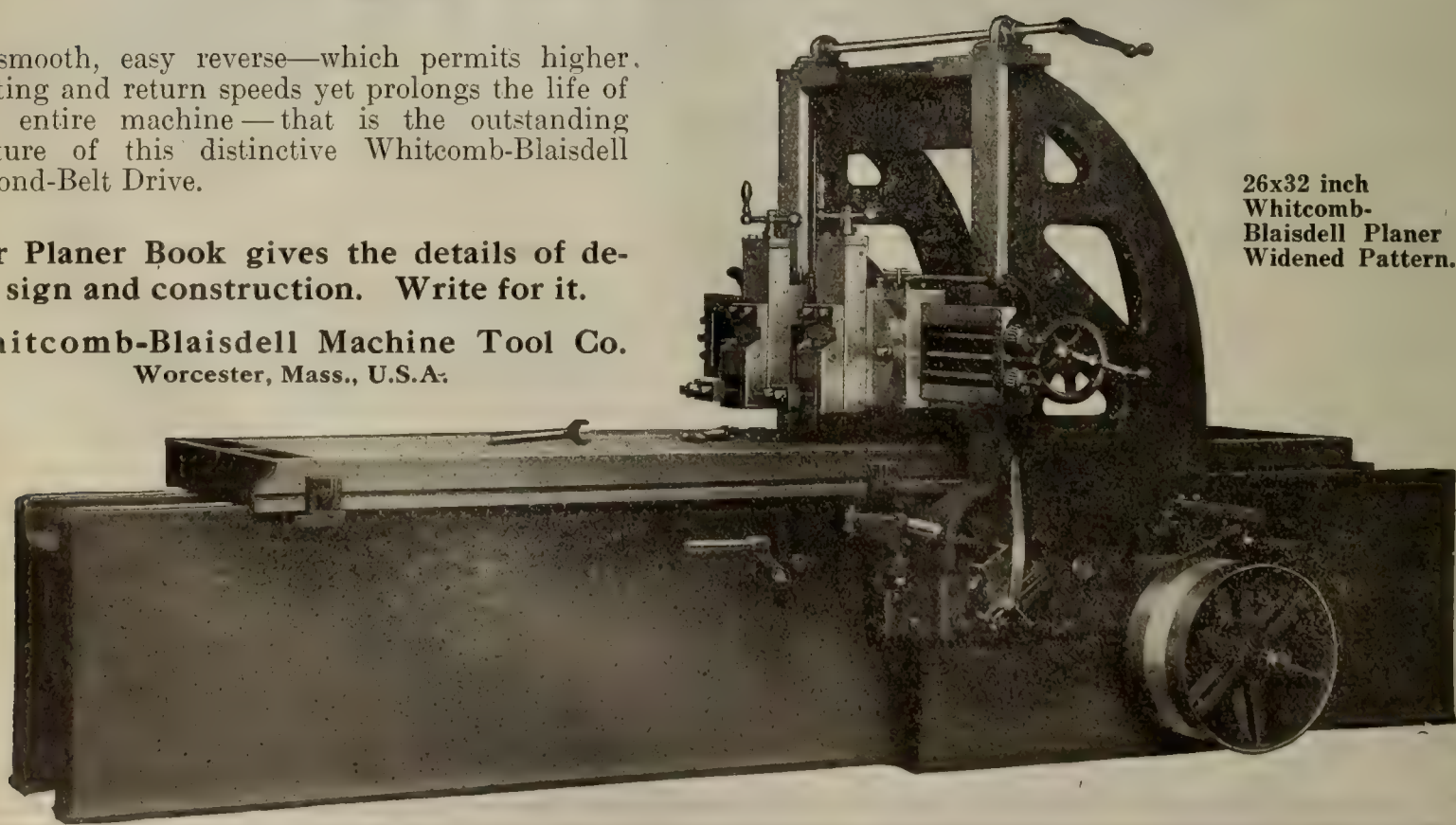
WHITCOMB-BLAISDELL

The Planer Wit hthe Second-Belt Drive

A smooth, easy reverse—which permits higher cutting and return speeds yet prolongs the life of the entire machine — that is the outstanding feature of this distinctive Whitcomb-Blaisdell Second-Belt Drive.

Our Planer Book gives the details of design and construction. Write for it.

Whitcomb-Blaisdell Machine Tool Co.
Worcester, Mass., U.S.A.

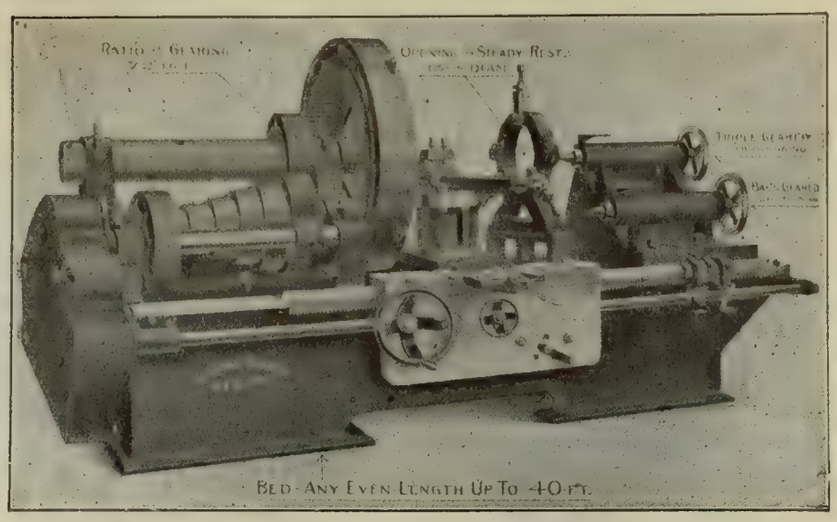


26x32 inch Whitcomb-Blaisdell Planer Widened Pattern.

One Ship-building Plant

wrote to six different Lathe-Builders

and bought McCabe's "2-in-1" Double-spindle Lathe—on a 30-ft. bed—because it was "different" and built especially for such a wide range of work.



McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing
As a 48 inch Triple-Geared Lathe

What other big Lathe can you get, and have full use of your Lathe, whether you have big or small work?

What Lathe Manufacturers except McCabe could make such a low price possible?

No other Lathe builder turns out 48-inch Lathes in such big lots at a time, making the parts all duplicate and interchangeable.

And in addition to the 48-inch Triple-geared Lathe, the 26-inch is the "Lathe plus" feature McCabe offers you—at no extra cost.

DOUBLE service—convenience and capacity—all described in Latest Bulletins.

J. J. McCABE, 149 BROADWAY, NEW YORK

Improved Centering Machine

Mr. Shell Manufacturer:

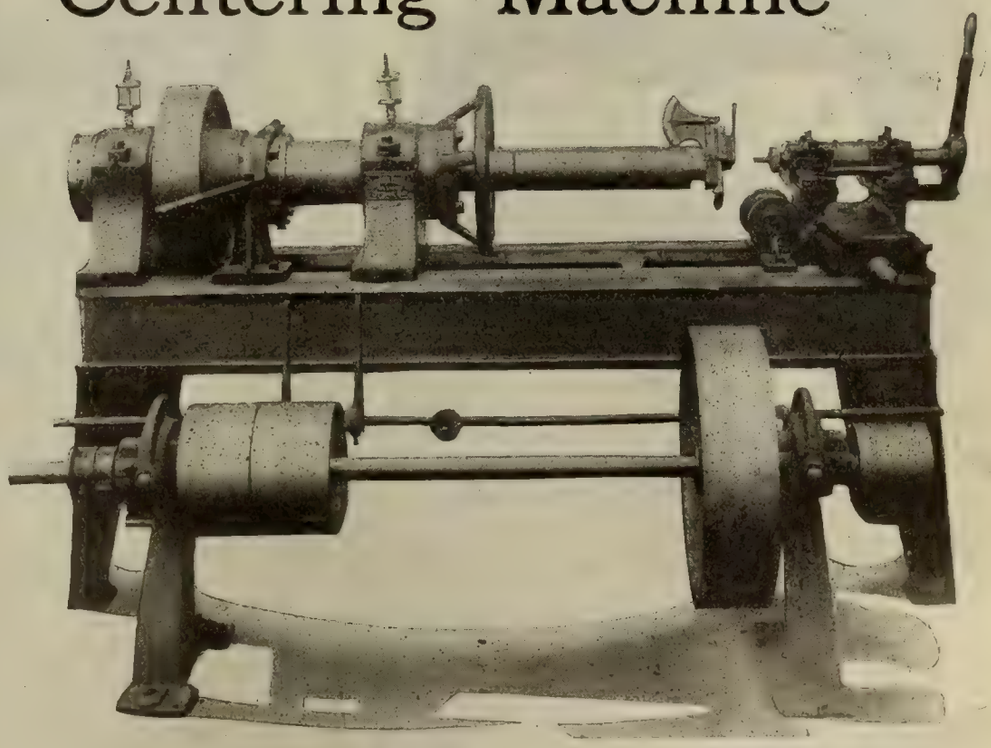
The importance of centering is obvious.

This tool is giving real satisfaction every day and stays on the job.

Write for price and description.

Delivery, ship 10 days after order.

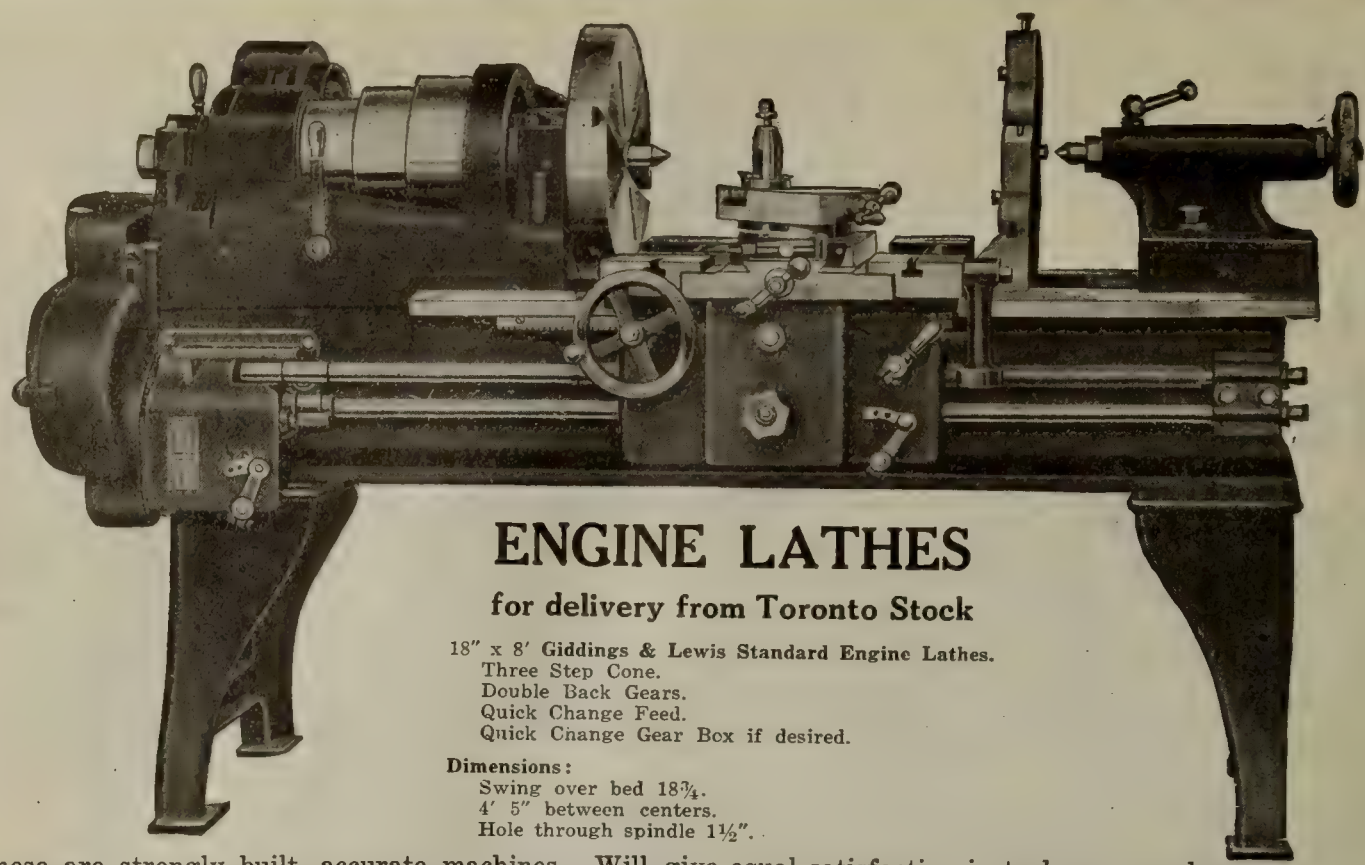
Shipping weight 2040 pounds.



VICTORIA FOUNDRY COMPANY, LIMITED

OTTAWA, ONTARIO

If any advertisement interests you, tear it out now and place with letters to be answered.



ENGINE LATHES

for delivery from Toronto Stock

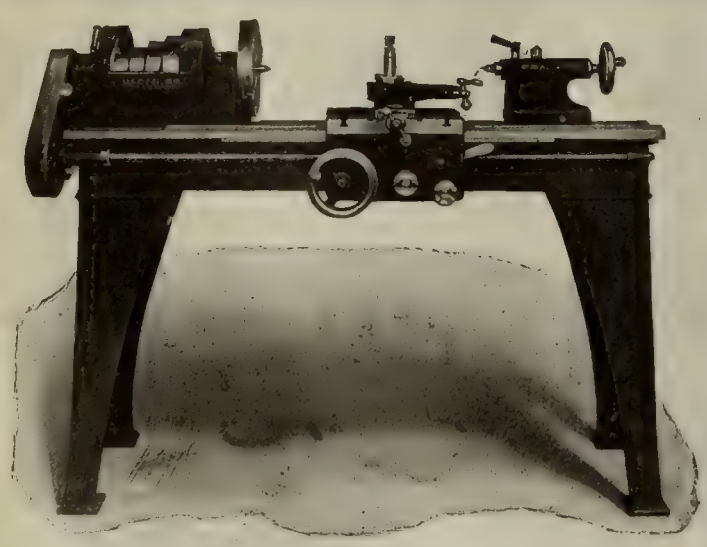
18" x 8' **Giddings & Lewis Standard Engine Lathes.**
Three Step Cone.
Double Back Gears.
Quick Change Feed.
Quick Change Gear Box if desired.

Dimensions:
Swing over bed 18¾.
4' 5" between centers.
Hole through spindle 1½".

These are strongly built, accurate machines. Will give equal satisfaction in tool-room or shop. The following extras can be furnished if desired: Taper, Relieving or Draw-in attachment, Waving attachment, Hexagon turret on carriage, Pan pump and piping.

Write for full specifications and prices.

Garlock-Walker Machinery Co., Ltd., 32 FRONT ST. WEST, Telephone MAIN 5346 **Toronto**



LATHES

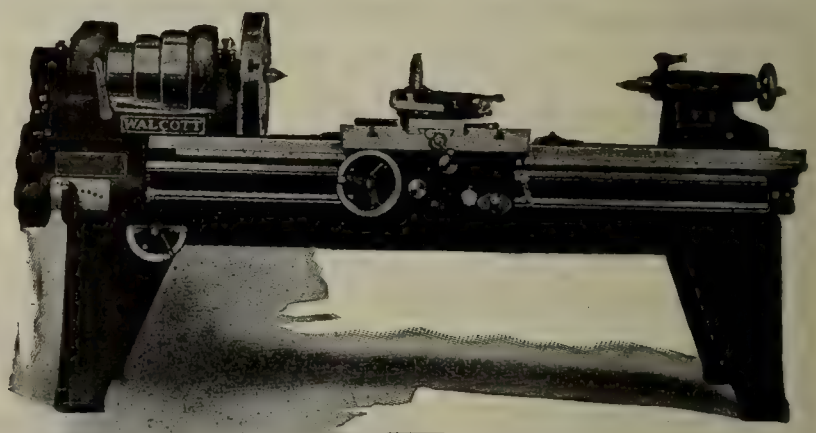
12", 16", 18" and 21" swing

Strictly modern in design, rigidity and accuracy guaranteed.

Himoff Machine Company

45 Mills Street

Astoria, City of New York, N.Y.



THE WALCOTT LATHE

is backed by lathe-building experience extending over 35 years

These are features of Walcott Lathes: drop-forged gears in apron; all-steel gears in gear-box; large ways on bed, all gears completely enclosed. Parts are interchangeable. Rigid headstock and tail-stock.

You'll get the full story in our printed matter. Send for it surely if you are about to buy a lathe.

WALCOTT LATHE COMPANY

Successors to

Walcott & Wood Machine Tool Co., Calhoun St., Jackson, Michigan

Do It Automatically!

With labor so scarce and expensive, can you afford to jog along with the old "one machine to a man" method when one man can do the work of six with Potter & Johnston Automatics?

By practically eliminating the labor problem, P. & J. Automatics reduce production costs amazingly. One attendant can readily operate from two to six machines.

SPECIFICATIONS

Geared head, having three automatic changes of spindle speeds.
Geared feed.
Auxiliary reaming and threading feed.
Cross slide.
Automatic back facer bar through spindle.
16-inch convertible two and three-jaw scroll chuck.
Spindle 5¾ inches diameter, hole 3½ inches diameter.

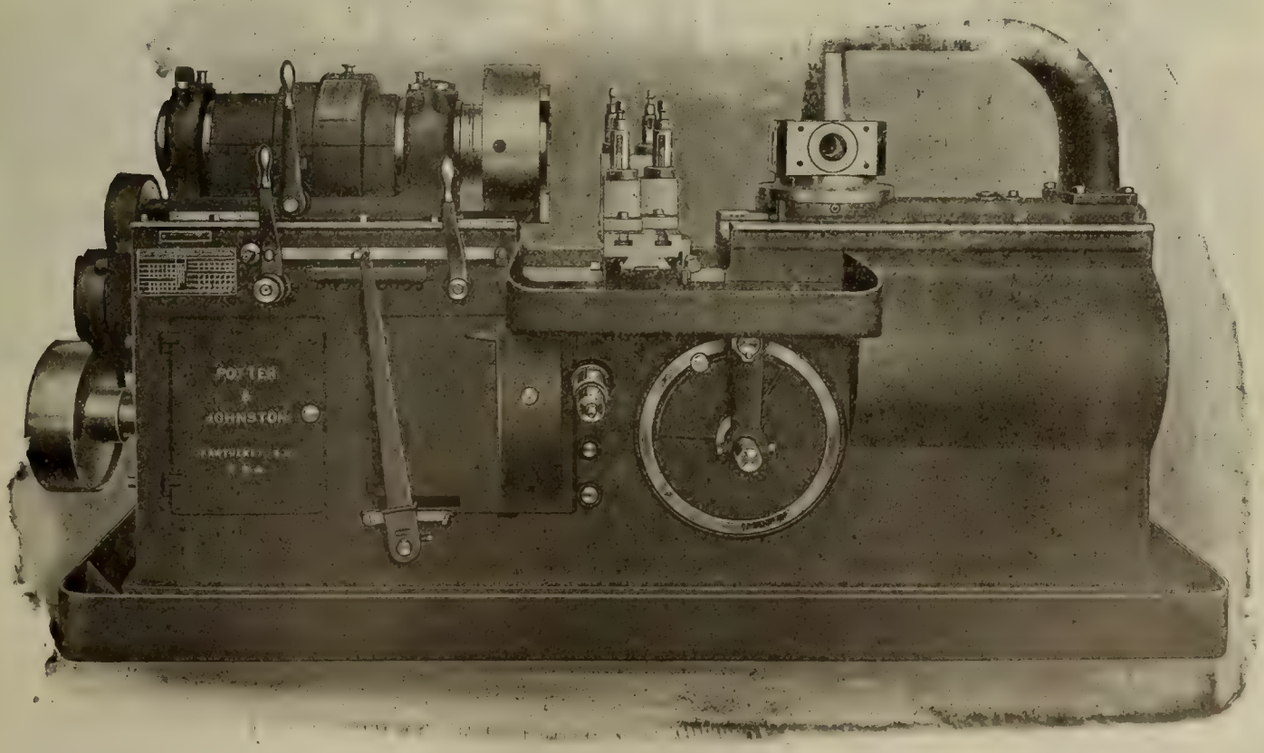
And production! A study of your problems will result in some surprising information for you. We have shown many firms the way to greater and more accurate production. Let us study your blue-prints.

If you machine iron, bronze or steel castings or forgings; if you manufacture gear blanks, bushings, etc., let us tell you how P. & J. automatics will increase your production.

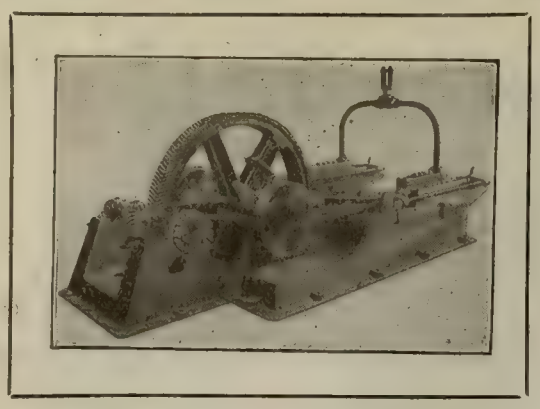
Canadian Offices Potter & Johnston Machine Co., Pawtucket, R.I.

Roelofson Machine & Tool Co., Ltd.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada



6-A Potter & Johnston Automatic Chucking and Turning Machine



ELMES

18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

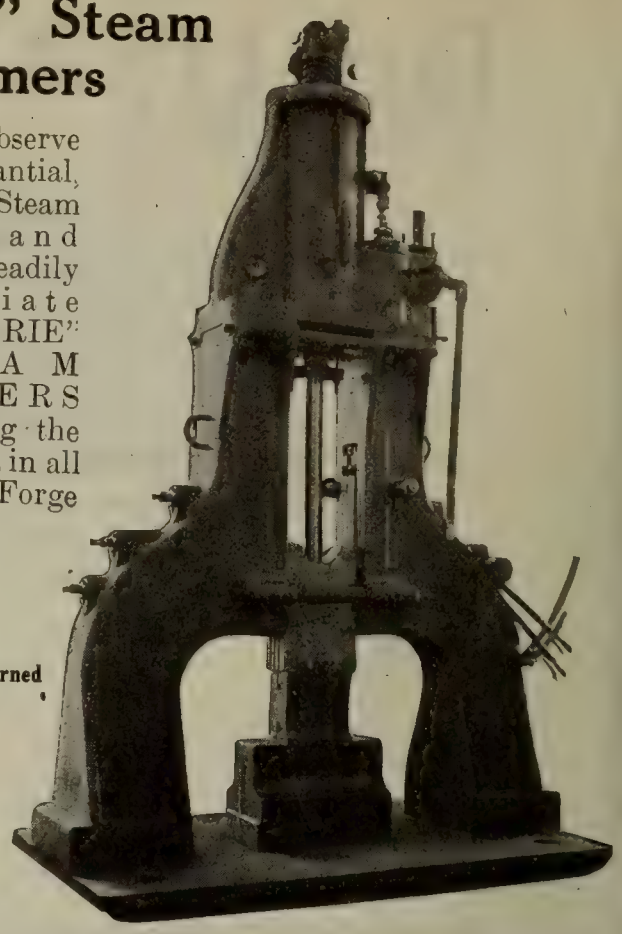
Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217 No. Morgan Street CHICAGO, ILL.

"Erie" Steam Hammers

Closely observe this substantial, well built Steam Hammer and you will readily appreciate why "ERIE" STEAM HAMMERS are getting the preference in all modern Forge Shops.

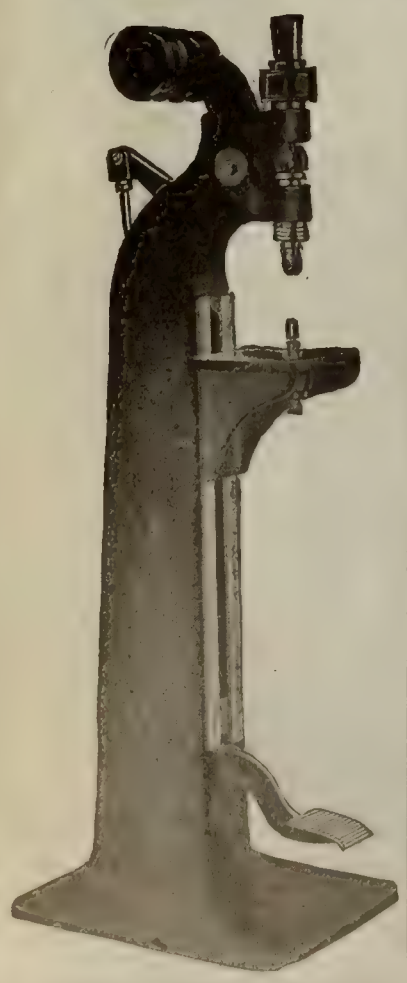


They have earned their enviable reputation.

ERIE FOUNDRY COMPANY

ERIE, PA. U. S. A.

Your Riveting?



How is it done? Are you getting the necessary speed? Is the quality of the highest character? How much is it costing you?

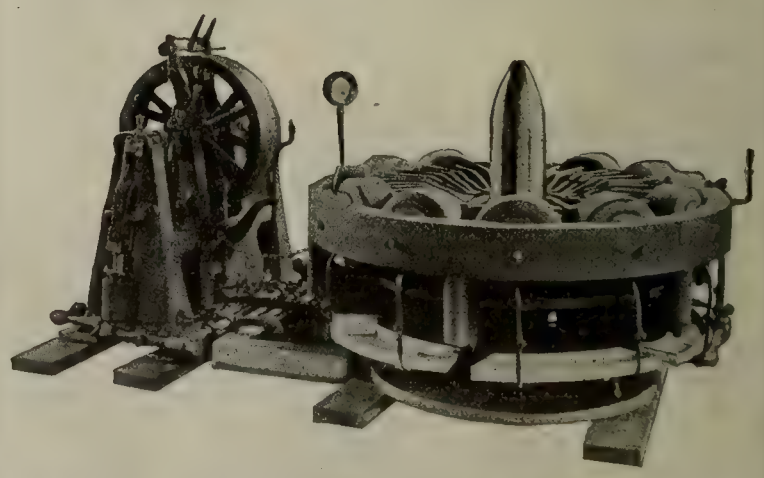
The Grant Rivet Machine has established the records of one clean, perfectly finished rivet per second. Is that speedy enough, or is it too speedy? This is the fastest any similar machine will work and if too speedy it could be worked in conjunction with some other work. Our catalogue is worth writing for. There is one for you.

THE GRANT

Mfg. & Machine Co.

Holland Ave.

Bridgeport, Conn.



The New "West" Banding Press

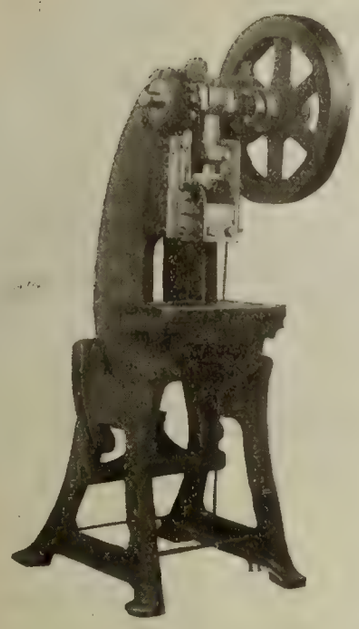
For 9.2" and 8" shells

12 Cylinders; Ample Power; Ample Strength; Reasonable Price.

NO ACCUMULATOR REQUIRED.

The West Tire Setter Co.

255 Mill Street, Rochester, N.Y.



A time saver
Can you beat it?

HAVE you noticed the Consolidated Clamp Connection on all Consolidated Presses, grips like a vise and stays put, one of the bull-dog kind, which, when properly tightened, will not break away, or slip?

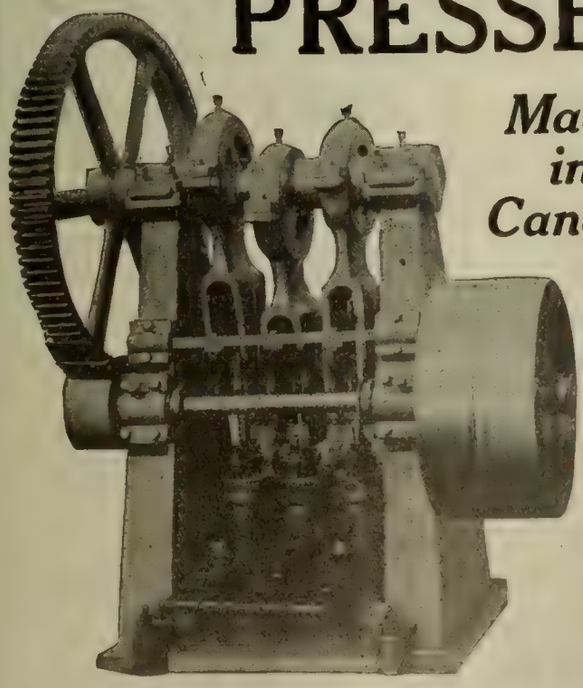
If you break it we will furnish a new one free of charge.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* **MICHIGAN**

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

PRESSES



Made in Canada

Hydraulic Presses, Pumps and Accumulators for all purposes

WRITE FOR PRICES AND DELIVERIES

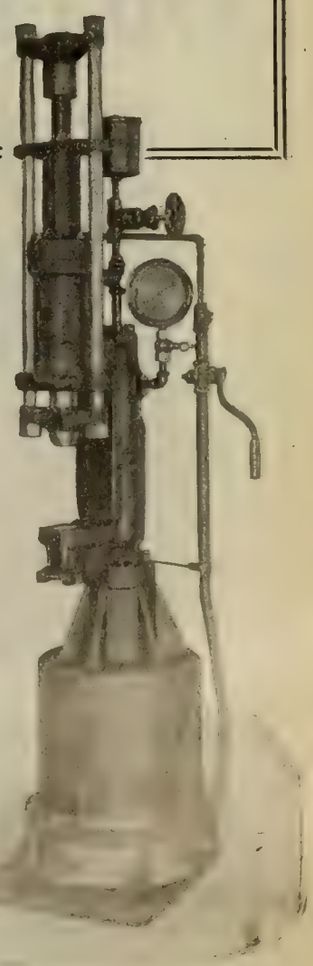
WILLIAM R. PERRIN, Limited
TORONTO, CANADA

Triple Purpose

"METALWOOD" COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.



Metalwood Mfg. Co.

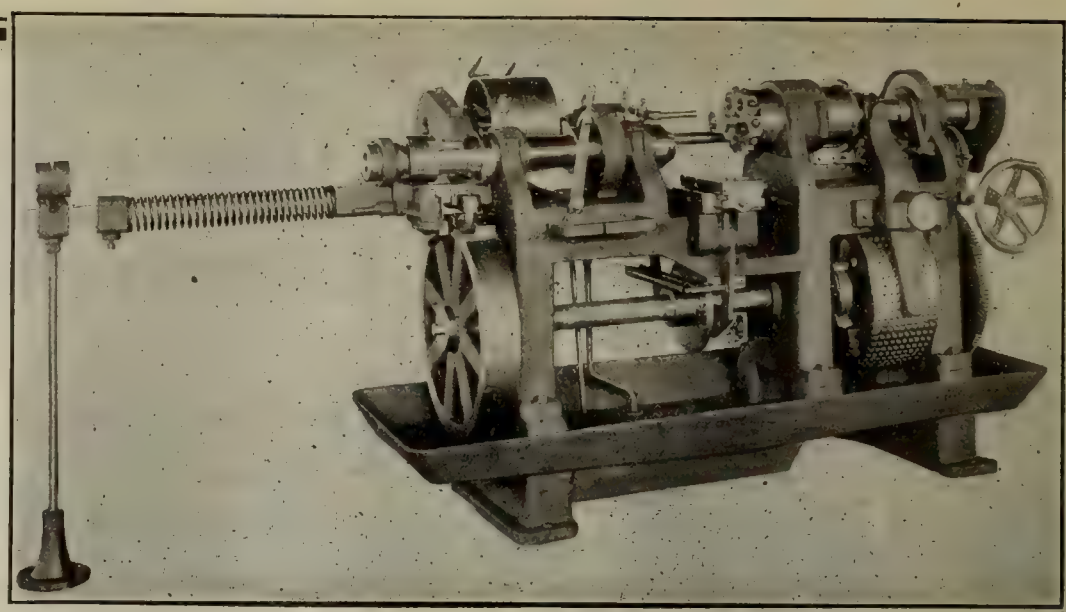
Leib & Wight Sts., DETROIT, MICH. U.S.A.

For Great Britain and Continent address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

The Chicago Automatic Screw Machine

TEN YEARS OF EXTENSIVE MANUFACTURE OF ONE PRODUCT — AUTOMATICS — STAND BEHIND EVERY MACHINE.

No complicated mechanism or a system of cams that are difficult to determine and arrange on this machine.



The rigidity of the machine has not been sacrificed for the flexible features which are embodied in the Chicago Automatic. Alignment is correct and there are no parts where excessive wear takes place—therefore, accurate production is assured during the long life of the machine.

Spindle speeds suitable to different sizes and kinds of stock within the capacity of the machine are obtained by changing two gears on the spindle head.

In less than six weeks we can place Chicagos in your plant ready for production.

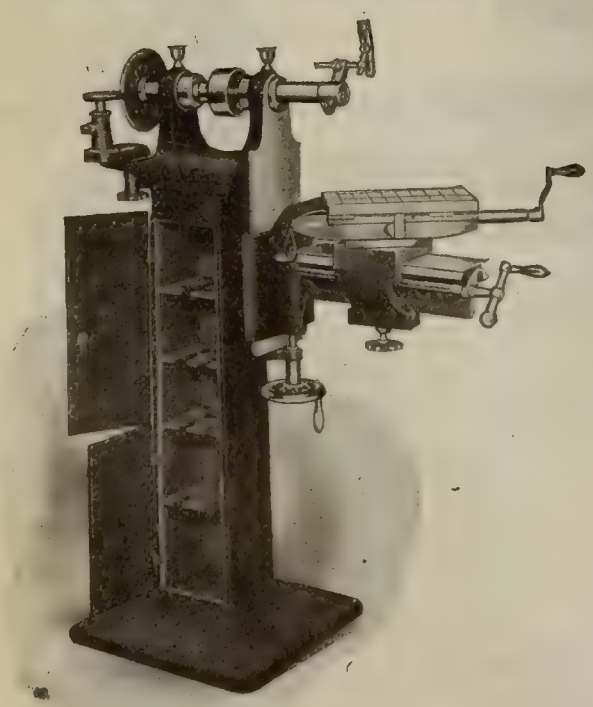
They must satisfy you before we consider them sold. Write us about all the features now.

THE JOHN MACNAB MACHINERY COMPANY

NEW YORK CITY, U.S.A.

European Representatives: John Macnab, Hyde, England

OBTAIN THE BEST RESULTS



GARVIN No. 3, Universal Cutter and Surface Grinder.
Use Code—Banish.

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL

CUTTER AND SURFACE GRINDERS

Simple Light Running Accurate

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14 in. x 6 in.; SURFACES, 9½ in. x 6 in.

For Further Information { *ASK YOUR DEALER or WRITE US DIRECT*

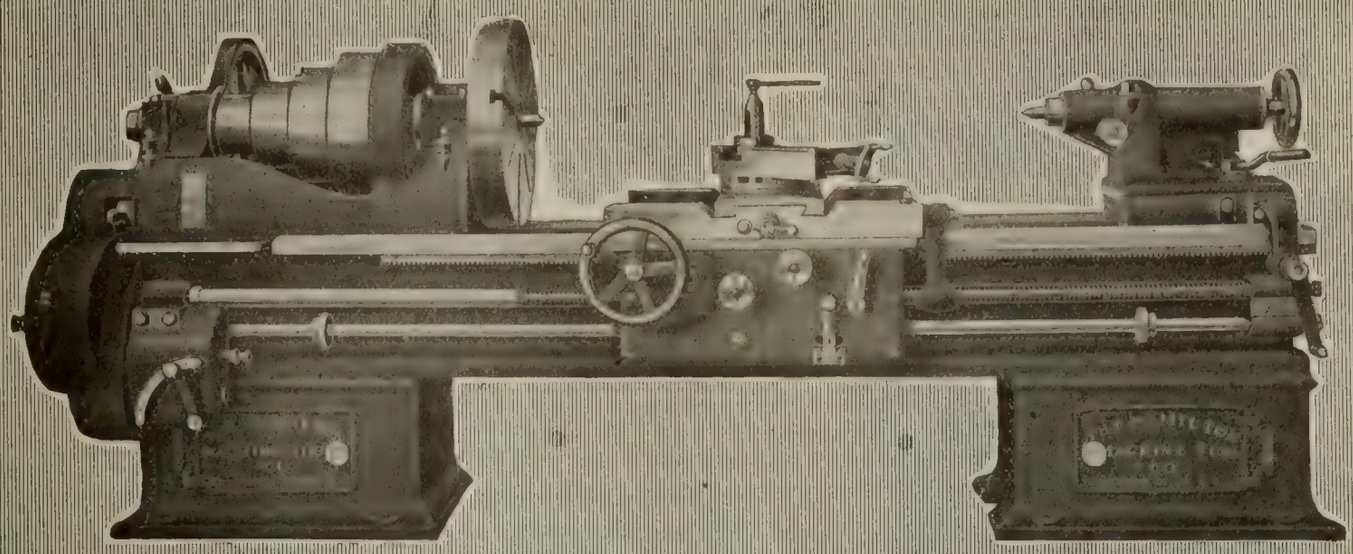
IMMEDIATE DELIVERIES

Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (***Visitors Welcome***) **50 Years New York City**



Hamilton Lathes

For 25 Years Makers of Fine Machine Tools.

Rapid Production HAMILTON Machine Tools

The "Hamilton" Line has a Reputation to Sustain.

THERE are two phases of production that require expert attention; those of *quality* and *quantity*. We have made a study of them for your benefit. The result is that we are able to offer you machine tools that give the highest efficiency and will still keep down the cost of production.

Illustrated here is one of our lathes. A close study on your part will partly reveal the care we have taken to give you a machine that is fitted to the needs of the day—greater production.

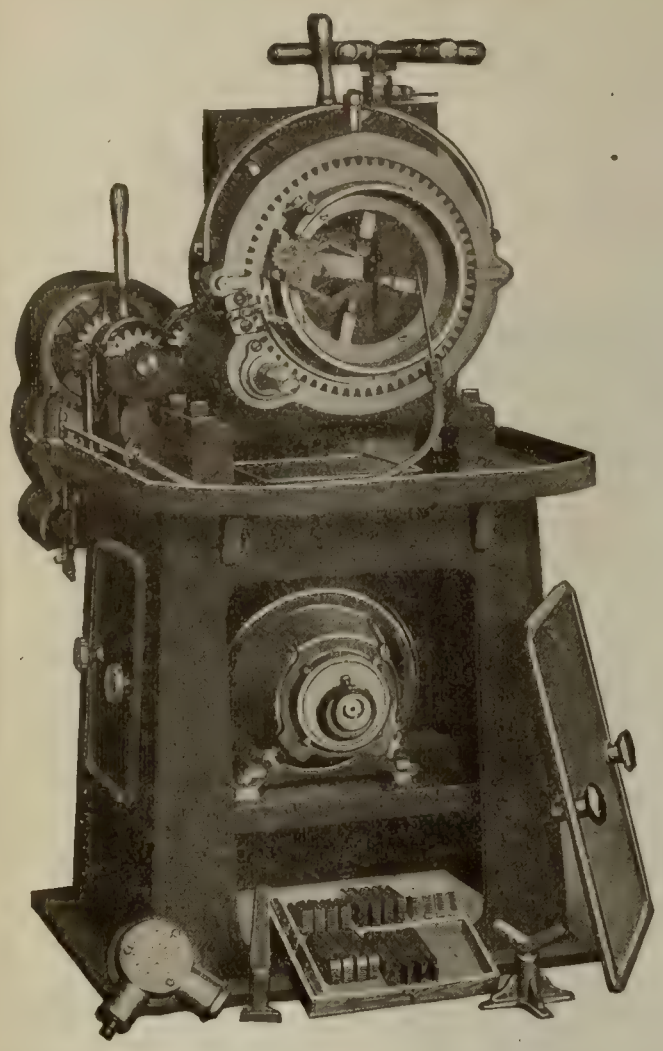
The "Hamilton Line" of machine tools is very complete and users are never tired of telling others of their features. A letter will command our immediate attention.

WRITE US TO-DAY.

The Hamilton Machine Tool Co.

HAMILTON *Sole Agents for Ontario:* **OHIO, U.S.A.**

H. W. PETRIE, LIMITED, TORONTO, ONT.

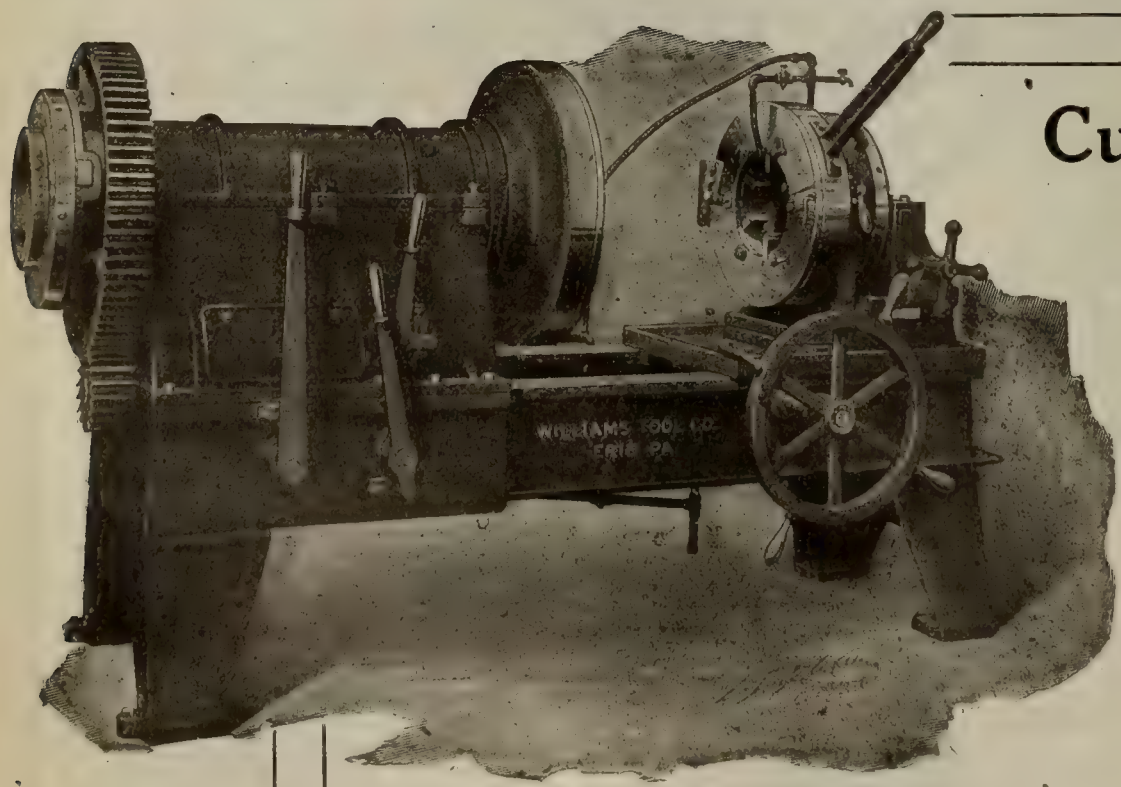


Take It To The Job

ONE man with a Forbes can do more than six men using the old stock and die method of cutting. The Forbes is easily portable and can be carried right to the job. Saves time and labor by eliminating the carrying to and fro of heavy pieces of pipe. Is operated by a self-contained motor, or can be easily operated by hand where no power is available. There are no belts, no countershafts—it is a compact and sturdy machine built to do all kinds of pipe-cutting and threading and do it well.

It has many features that will interest you. Our catalog explains them all. Write for your copy to-day.

The Curtis & Curtis Company
115 Garden Street, Bridgeport, Conn.



Cutting-off and Threading

By the decree of expert judges Williams Cutting-off Machine has been declared the most **efficient.**

We have made this claim all along and this judgment only verifies it.

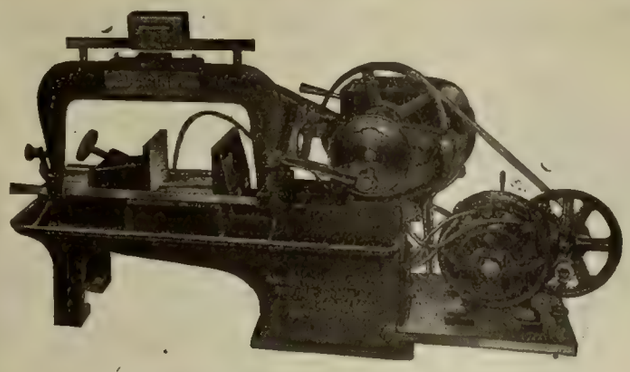
Made in 11 sizes and each size has a range of 8 to 10 consecutive sizes between 1/4" and 18" diameter.

Write us about them. They will save you money, time, and increase the quality of your product.

Williams Tool Company
Erie, Penn., U.S.A.

Canadian Agents:
The A. R. Williams Machinery Co., Ltd., Toronto, Canada

European Agents:
Universal Machinery Corp. London, England



Your Cutting

How do you do it? Are your methods giving satisfaction? Are you getting the maximum production? With a Racine to compare results with you will get a better idea of the results you should be getting or could get. Metal cutting has been our study. It is the purpose for which our machines are built. We stand ready to co-operate with you in your cutting problems. Write us for information.

Racine Tool & Machine Co.
15 Melbourne Ave., Racine, Wis., U.S.A.

DOUBLE SAVINGS

in cutting on PEERLESS HIGH SPEED METAL SAWS; they save both Time and Material.

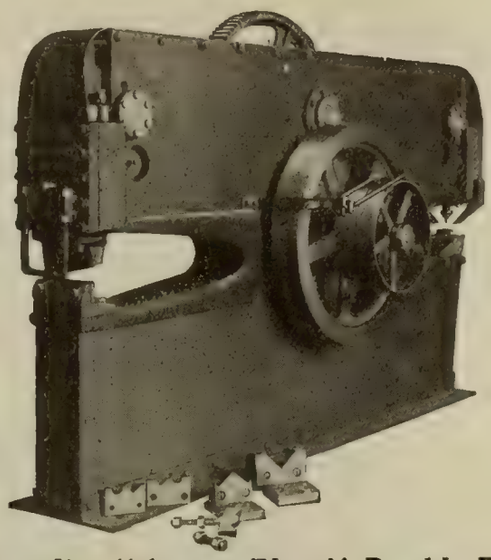
Supposing you save only 1/16 on each cut, 200 lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

Have you ever stopped to consider the waste of material in wide cuts, especially at the present high cost, will pay for a PEERLESS in a remarkably short time.

This is only one of the reasons for so many repeated orders and large concerns having standardized the PEERLESS. The many other reasons can only be fully appreciated after comparative test.

Write for a list of users; some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.



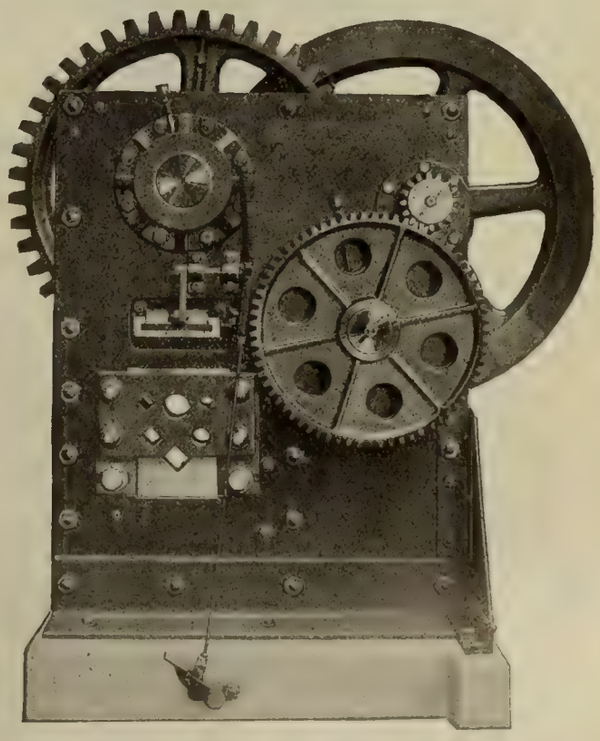
Canadian "Armor Plate" Double End Punch and Shear.

"CANADIAN" Armor Plate

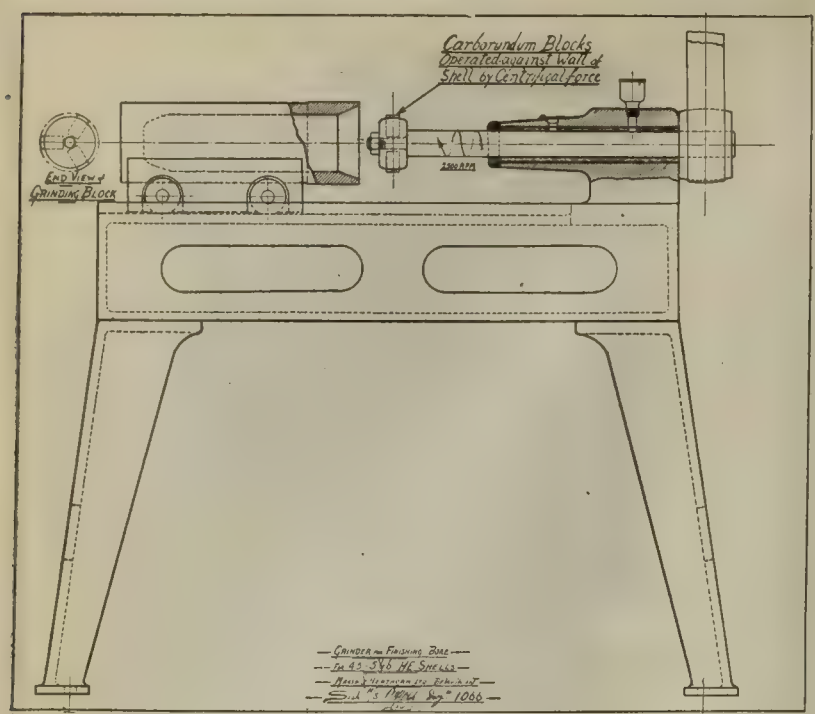
Punches, shears and bar cutters are powerful, dependable machines—7½ times as strong as cast iron machines of equal capacity and less than one-half as heavy.
They are built to last.

Ask us to mail you a copy of Catalog P/S-16.

Canadian Blower & Forge Co., Ltd.
KITCHENER, ONTARIO



Canadian "Armor Plate" Power Bar Cutter.



Smooth Bores

We have designed for our own use a simple and inexpensive grinder to give the final touch to the bore of our shells.

It does the work, and we will have some of these machines on the market shortly.

Write us for our proposition.

Marsh & Henthorn
Limited
BELLEVILLE, ONTARIO

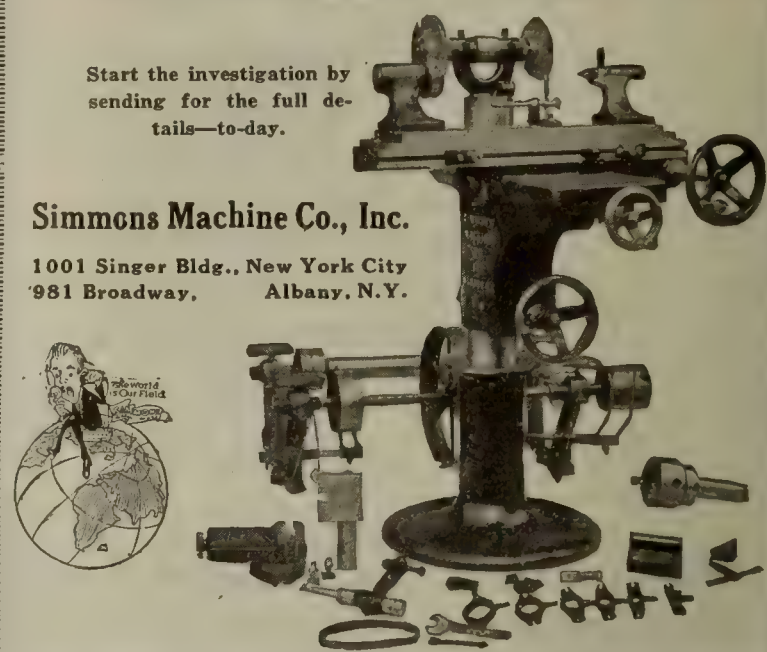
Assuming that you want a grinder that is better than the average—

A grinder with massive table, micrometer adjustments, very long knee and gibs, and extra heavy head and tailstock—it will pay you to investigate the

Standard No. 6
Universal Grinding Machine

In addition, you'll find that the headstock is fitted with large bearing for chuck spindle and with special bronze bearings of navy specifications, spindle is tapped and tapered, bored to take wheel arbors, and bearings are 1 in. in diam. and 2¾ in. long, and an exceptionally simple and sturdy countershaft with self-lubricating bearings.

Start the investigation by sending for the full details—to-day.



Simmons Machine Co., Inc.

1001 Singer Bldg., New York City
981 Broadway, Albany, N.Y.

Stow Shell Grinders Increase Production

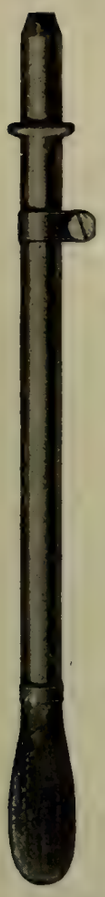
Suspended Pedestal Mounted on Truck

Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.
Binghamton, New York, U.S.A.
Oldest Portable Tool Manufacturers in America

Grinding Wheel Dressers

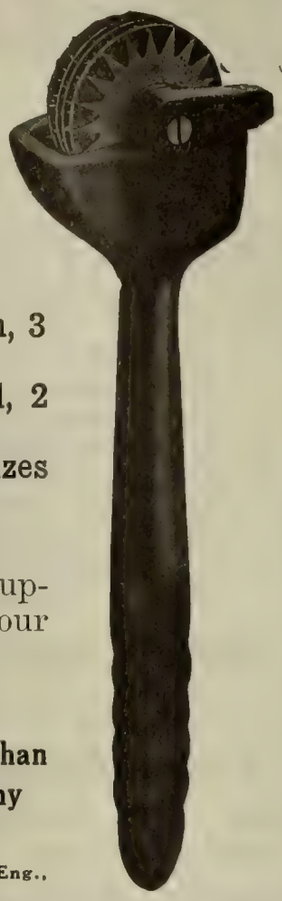


We are specialists in Grinding Wheel Dressers and can recommend the best types for any particular needs.

Our Dressers are:

Diamo-Carbo
Desmond Huntington, 3 sizes
Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

We can promptly supply your needs from our stock.



The Canadian Desmond-Stephan Manufacturing Company
HAMILTON, ONTARIO

Alfred Herbert, Ltd., Coventry, Eng., Agent for Great Britain.

Universal Gear Hobber

The machine which completes our lines to cut all types of small gears except internal, within 10″ dia. 8 Pitch.

The Bilton Gear Hobber will cut spur spiral gears, worm gears, also various special shapes of teeth. It can cut a spiral gear on end of a shaft 1⅜″ diam. 24″ long.

SPECIFICATIONS

Capacity Gears: 10 Diametral Pitch
10 in. Outside Diameter
10 in. Width of Face
Range of hob feed 50-250 R.P.M.
Range hob feed to each rev. of worm .010 to .125
Drive: 3 Steps Cone Pulley; 2½ in. Belt
Weight 2,100 lbs.

A machine of latest design, introducing new features which increase production without sacrificing accuracy. The hob is cutting continuously; operation of machine entirely automatic.

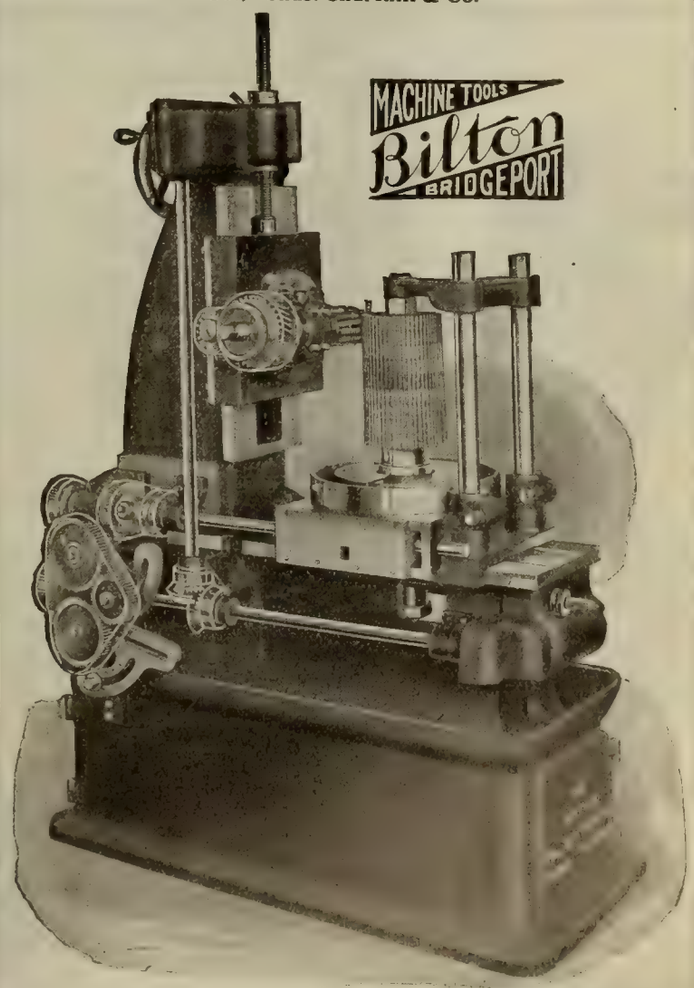
DELIVERY

Ae few of these machines are now available for October delivery.

Send for copy of new catalog No. 30, and bulletin describing this machine.

The Bilton Machine Tool Co.
Bridgeport, Conn.

Foreign Agents: Alfred Herbert Ltd., M. Mett Engineering Co., Chas. Churchill & Co.



For Rapid Production and Accurate Work

USE THE

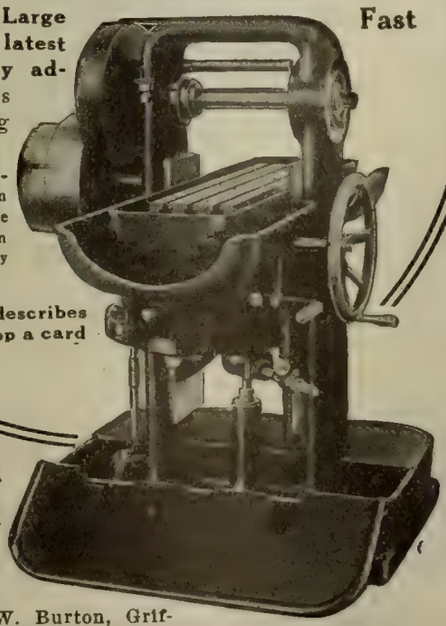
"BRIGGS"

The Briggs Miller handles work no other machine of its size can touch. It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

The Base Tank and Large Gear Pump is the latest addition to its many advantages. Tank holds 20 gallons of cutting **lubricant**

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

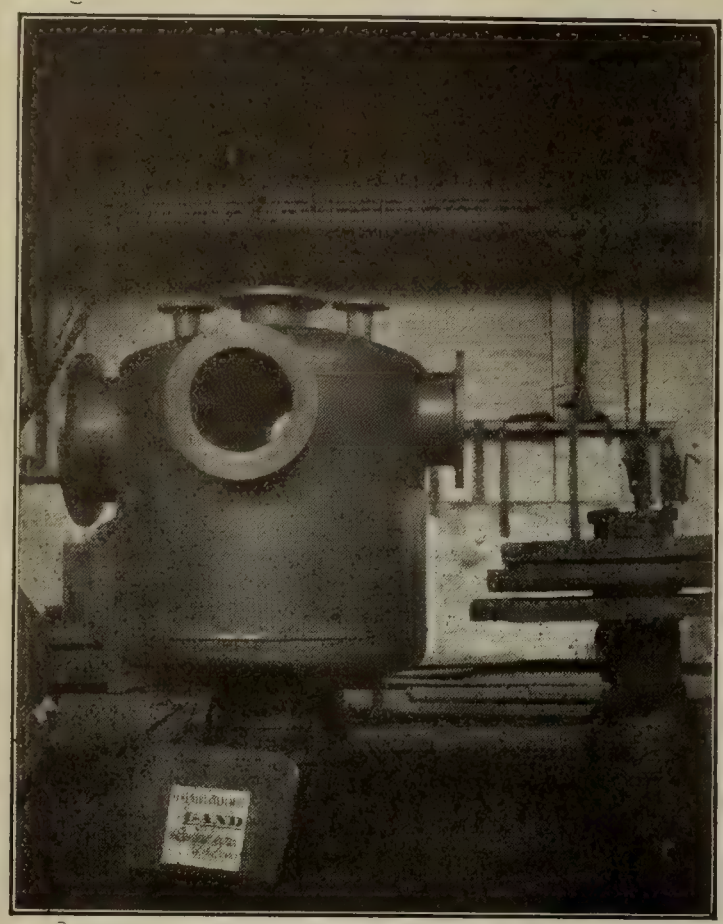
Our booklet describes fully. Drop a card for it.



Gooley & Edlund Inc.
Cortland, N.Y., U.S.A

Foreign Agents: Allied America, France, Belgium, Italy, Switzerland, Machinery Company of Russia, Scandinavia, C. W. Burton, Griffiths & Co., London, Manchester and Glasgow, Barandiaran, Metivier, Gazeau & Cia, San Sebastian, Spain.

EFFICIENCY AND ECONOMY OF OXY-ACETYLENE WELDING



Firms all over the world are specifying WELDED seams instead of riveted because they know that a Welded Seam is more efficient and economical. Illustration shows a Welded Tank with flanges and connections, and is a fair example of a more efficient article produced at less cost.

The Application of the process
in your plant is unlimited

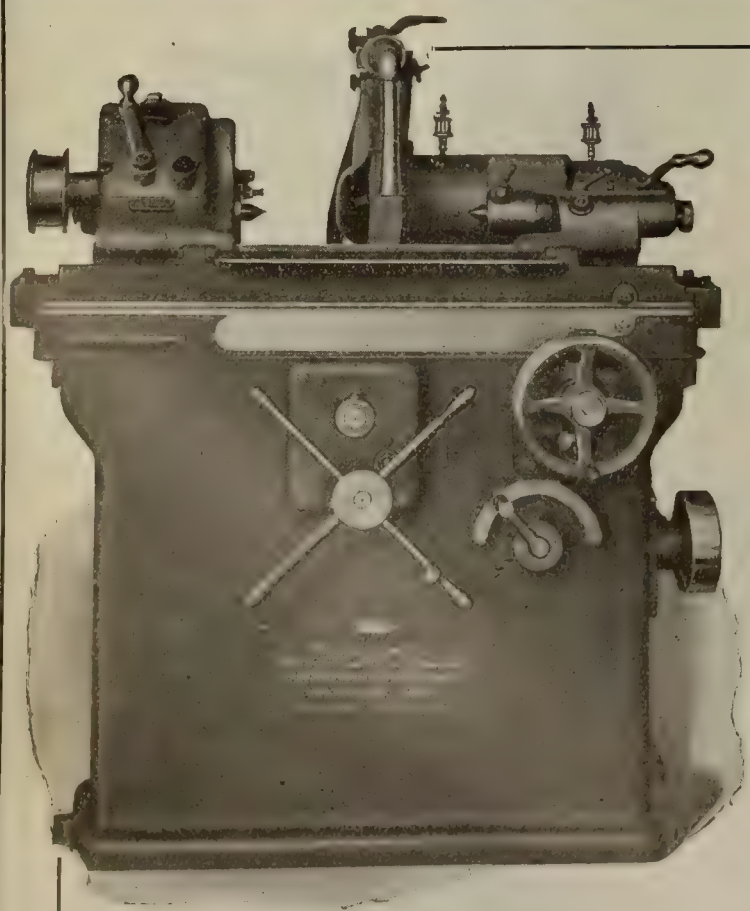
For Prevention of Loss by "Break-downs,"
For Prevention of Wasted Material,
For Reclamation of Broken Machine Parts,
For Reclamation of Broken Castings,
For Increase in your Production,
For Simplifying your Manufacturing Process,
For Improving the Article Produced,
For Reducing the Cost.
And other advantages equally important.

It means increasing Profits

Will you have us prove it to you? we can tell you how and why. Full particulars sent on request without obligation.

L'AIR LIQUIDE SOCIETY

Toronto Montreal Winnipeg
Halifax: Factory under construction



MODEL "B"

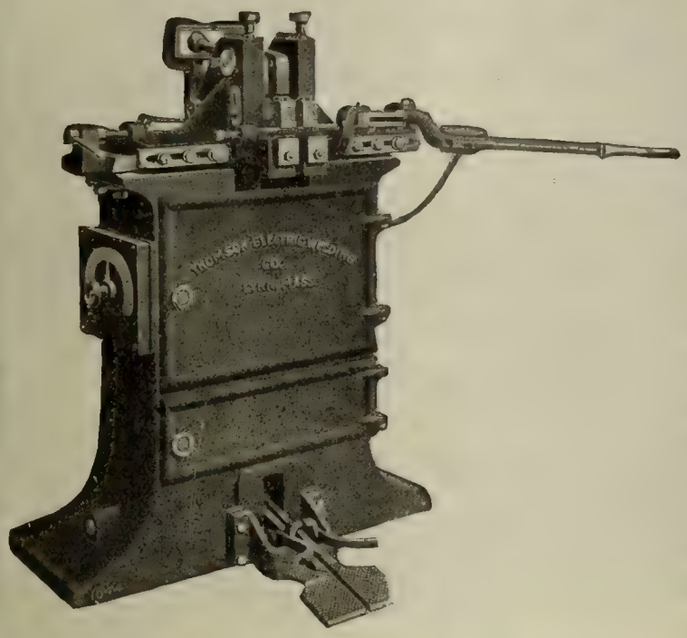
Six x Twenty Grinder
A Fitchburg Model

Equally as efficient on small work as on that of larger dimensions. Therein lies its value. It is a compact, energetic worker that will do more for its size than any machine of similar wheel dimensions. It is saving in floor space. Its speed will give you greater production. Investigation or trial will impress you. 1300 to 1800 R.P.M. 16 x 3 grinding wheel. 6 x 4 pulleys. 7 horsepower required. Floor space 52 x 66. Send for complete specifications.

Fitchburg Grinding Machine Co.
FITCHBURG MASS. U.S.A.

Thomson Process
Electric Welding

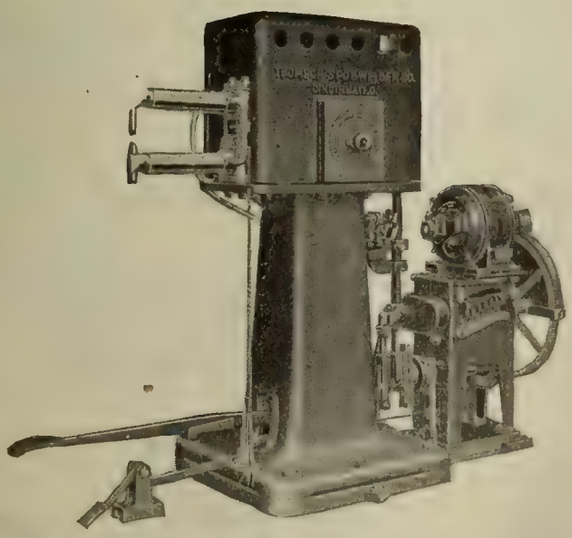
Thomsons Weld Practically Anything



That does seem rather broad — but in reality it isn't. There may be a few metals that won't electric weld—but they are so rare that they aren't commonly used. Such metals as iron, steel, copper, brass, etc., are easy for the Thomson Butt Welder.

Sheets, tubes, bars, pipes, heavy or light work, are all electro-welded by simply pulling a lever.

Send for Bulletin B-4.



We Guarantee Savings With A Thomson Spot Welder

If you have riveting or soldering to do in your plant we will guarantee to save you money by using the Thomson Spot Welder. How could you help saving money — no rivets or solder to buy, no holes to punch, 60 to 90% faster, 60% stronger—you can't help but save a goodly amount and increase your production in the bargain.

Our corps of experts to aid you in selecting the correct machine for your work are at your command.

Send for Bulletin S-4.

Thomson Electric Welding Co. Thomson Spot Welder Company

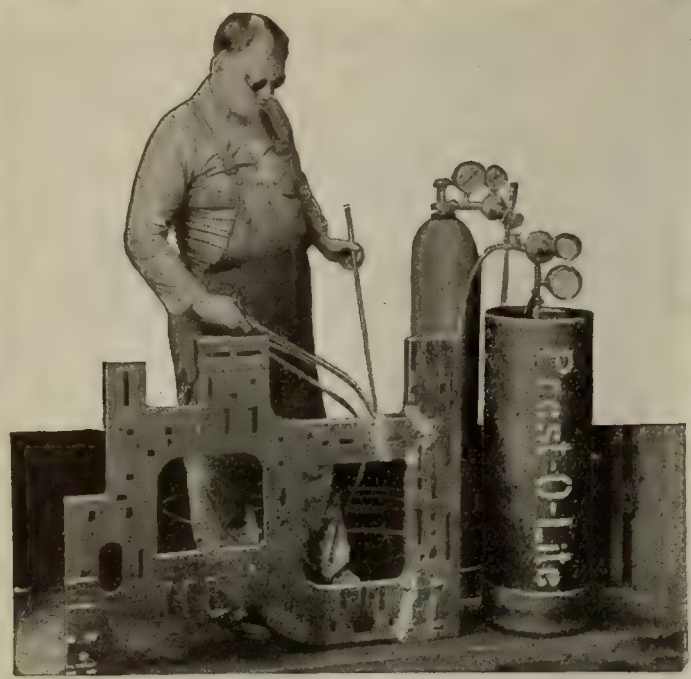
Lynn, Mass.

Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

If any advertisement interests you, tear it out now and place with letters to be answered.

Oxy-Acetylene Welding and Cutting



Operator repairing broken loom by the Prest-O-Lite Process of Oxy-Acetylene Welding.

This One Repair Saved the Cost of a Welding Outfit

This loom frame was badly broken in three places. Important textile machinery lay idle awaiting repair or replacement.
A portable Prest-O-Lite welding outfit was rushed to the scene and the repairs were effected "on the spot" at a total cost of but $2.25.
This one saving of time, material and replacement expense more than paid for the Prest-O-Lite welding outfit.
Let Oxy-Acetylene welding help **you**—investigate NOW.

Prest-O-Lite PROCESS

employs both gases (acetylene and oxygen), in portable cylinders. Prest-O-Lite Dissolved Acetylene (ready made carbide gas) is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better weids, quicker work and lower operating cost.

Apparatus consists of an equal pressure blow pipe, automatic regulators and gauges, and all necessary equipment. Adaptable for oxy-acetylene cutting by the addition of special cutting blow pipe.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

Write for valuable illustrated literature and data on work others are doing by the Prest-O-Lite Welding Process. It may point out ways to solve your problems. Address Dept. C-107.

THE PREST-O-LITE COMPANY, INC.

CANADIAN GENERAL OFFICES:
913-14 C.P.R. Building TORONTO

Direct Factory Branches: Toronto, Ont: Montreal, Que.; Merritton, Ont.: Winnipeg, Man.
Canadian Plants: Toronto, Ont.: Merritton, Ont.: Winnipeg, Man.; Shawinigan Falls, Que. (under construction.)

World's Largest Makers of Dissolved Acetylene

STANDARDIZED CUTTING QUALITIES

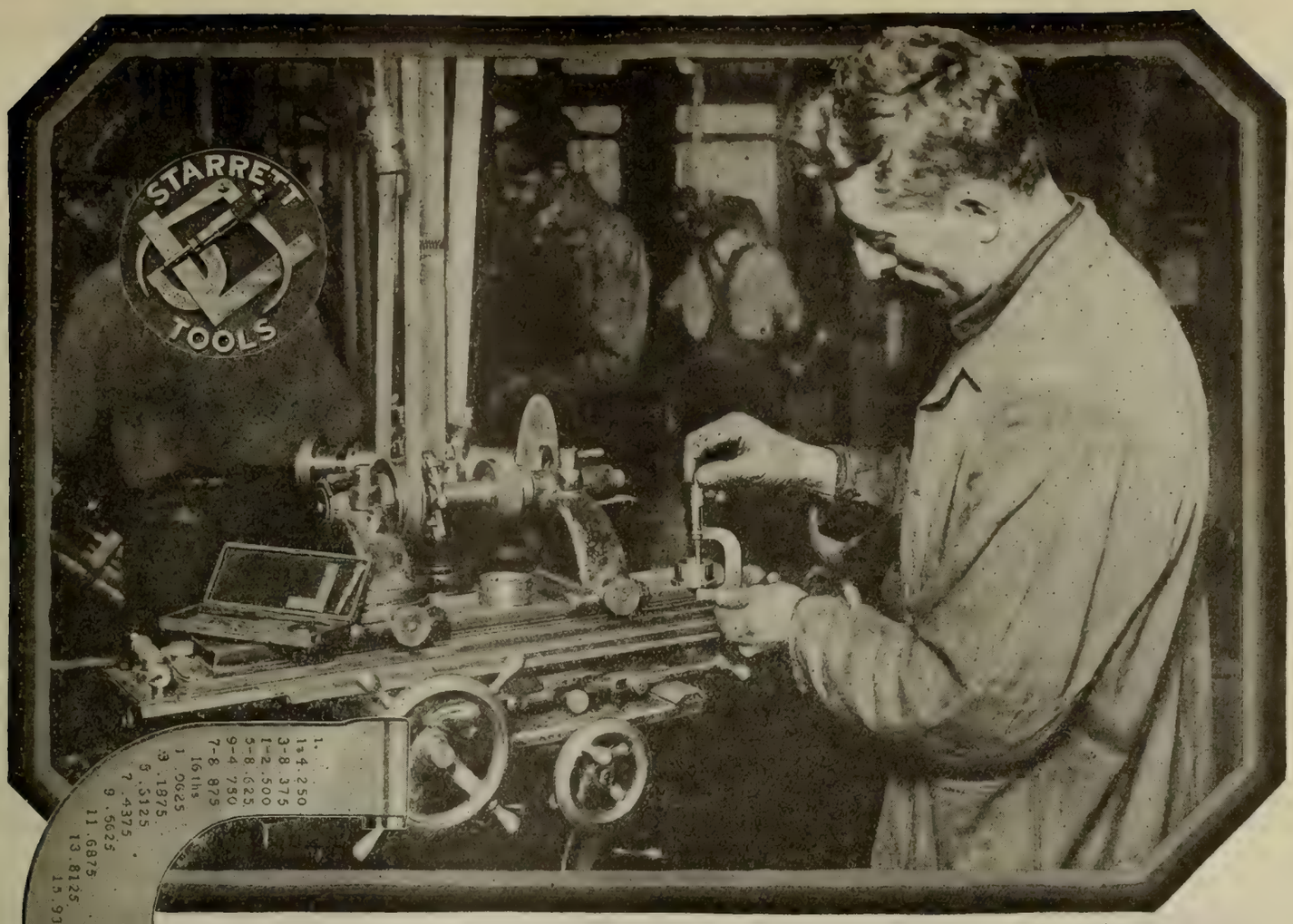
Since the one purpose of a file is to cut, the toughness, regularity and sharpness of the teeth are all important.

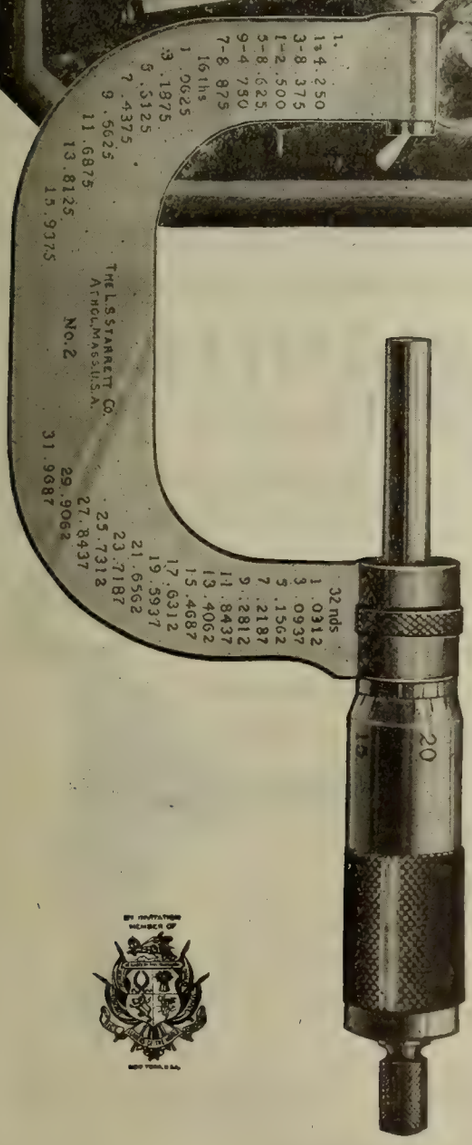
A capable mechanic can positively "feel" these qualities in a "Famous Five" file.

The sharp, keen-edged teeth arranged in uniform rows—plus the even balance—tells him at once the file is a good serviceable tool.

It is these qualities that have made "Famous Five" Files Standard Grade tools everywhere.

Specify them when ordering.





Where Quality Comes First

Where quality must be made certain, you use tools of known accuracy. You are also very careful to use the tools especially adapted to the work in hand.

It makes little difference what sort of work it is, if accuracy is the first thing, you can be sure of it with

TRADE MARK Starrett Tools REG. U.S. PAT. OFF.

There are 2100 styles and sizes of these fine tools. One or more of them matches every demand for the fine work needed in a well-made product.

There are micrometers, vernier height and depth gages, vernier calipers, caliper squares, rules, levels, surface indicators and many other instruments of precision.

Catalog No. 213 on request.

The L. S. Starrett Company

THE WORLD'S GREATEST TOOL MAKERS

Athol, Massachusetts

42-703

If any advertisement interests you, tear it out now and place with letters to be answered.

There's a Matthews Steel Lettering Die or Stamp for Marking Your Product

Whatever you manufacture we have a steel lettering die or stamp that will mark clearly your name, address, trade-mark or any distinctive mark you wish to show. Place a lasting advertisement or identification on your product —show the user what to ask for when again in the market.

For marking sizes, weights, etc., use these Matthews hand-made steel figures. They are hand-cut from the best tool steel and are furnished individually or in complete sets.

There are many forms of lettering dies and stamps. Some are illustrated and described in this catalogue. It is yours for the asking. Want a copy?

JAS. H. MATTHEWS & CO.

ESTABLISHED 1850

PITTSBURGH - - - PA., U.S.A.

Distributors for Canada

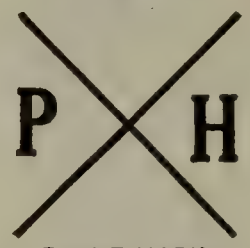
THE CANADIAN FAIRBANKS-MORSE CO., LIMITED

Montreal, Toronto, Quebec, Ottawa, St. John, N. B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria.

Matthews' "Champion" Steel Holder for rapid interchangeable marking. Hundreds in use throughout Canada.

May We Repeat

THAT



TRADE MARK

QUALITY FILES

are the only files made in Canada using BEST CRUCIBLE CAST STEEL exclusively in their manufacture. What does that mean to the user?

IT MEANS a keener cutting edge to the teeth, and longer life to the file. IT MEANS the stock has that "pep" in it so beloved of metal workers. IT MEANS that after a long and honorable career on the bench, there is still fine steel in the file which warrants the user in having it re-cut and put on the job again on less "fussy" work.

THAT IS TRUE ECONOMY.

Port Hope File Mfg. Co., Limited

Port Hope, Ont.

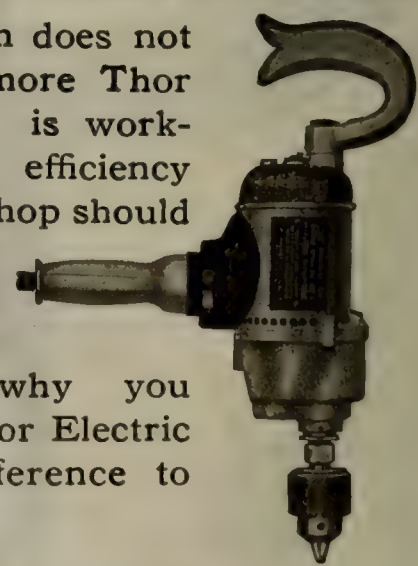
"Ask your jobber"

Thor

UNIVERSAL Electric Drills

Licensed Under Burke Universal Motor Patent

No shop which does not use one or more Thor Electric Drills is working to full efficiency which every shop should do during these critical times. Let us demonstrate why you should use Thor Electric Tools in preference to other makes.



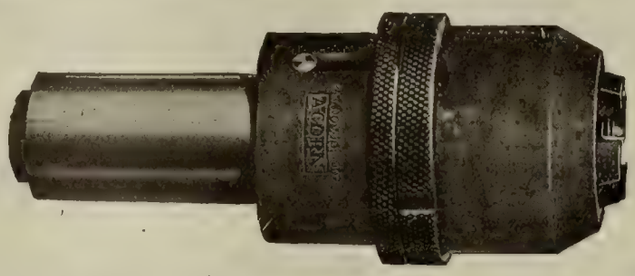
Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.

Toronto: 32 Front St. W; Winnipeg: 123 Bannatyne Ave., E; Vancouver: 1142 Homer Street

Economical Screw Threads

—The producing of them is the problem of thousands of manufacturers. We took a long step toward the solving of the problem in producing the



ACORN DIE AND HOLDER

It has so many advantages over the old style spring die and various other forms of dies and holders for machine use that it is difficult to enumerate them all.

A demonstration of the Acorn Die and Holder on your own work and on one of your own machines will give you a new standard for economy in screw threads.

Wells Brothers Company of Canada, Limited

GALT, ONTARIO

Sales Agents: The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary

For Polishing Stove Tops

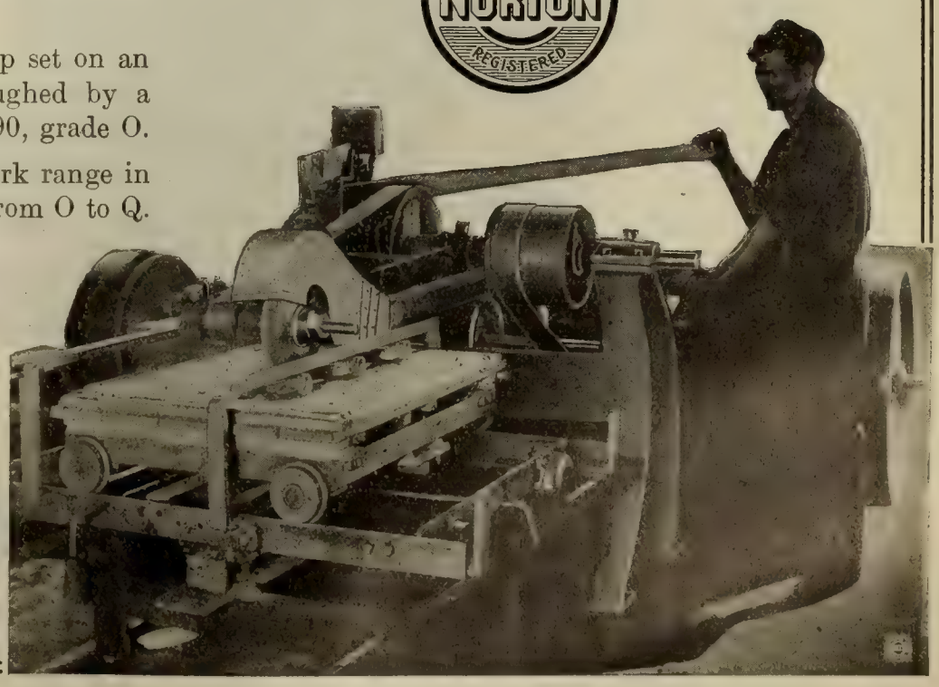
The polishing of stove tops on automatic machines is an interesting operation, and one where the quality of the work done depends largely upon the selection of the grinding wheels and abrasives.

The photograph shows a stove top set on an automatic machine and being roughed by a 10 x 2 x 1 Crystolon wheel, grain 90, grade O.

The wheels usually sold for this work range in grain from 60 to 90 and in grade from O to Q.

Crystolon grain is the abrasive used for the final polishing operation.

TRADE MARK NORTON REGISTERED



Norton Company

Worcester, Mass.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que.

ELECTRIC FURNACE PLANTS

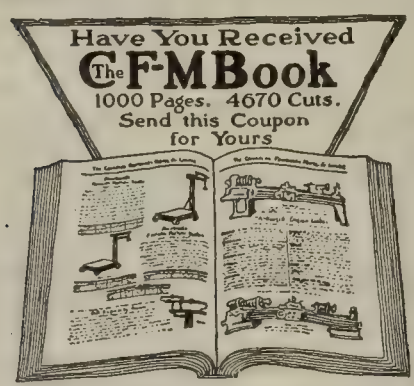
Niagara Falls, N.Y. Chippawa, Ont., Canada

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED.

Manufacturing Plant Equipment

Exhausters
Sand Paper
Benches
Vises
Hammers
Mallets
Rules
Gauges
Saw Sharpening Machines
Saw Anvils
Saw Tools
Glue Pots
Brazing Tools
Hangers
Pulleys
Shafting
Belt
Motors
Ball-Bearing
Trucks

Lathes
Planers
Band Saws
Saw Tables
Mitre Machines
Shapers
Moulders
Mortisers
Tenoner
Grinders
Universal Woodworker
Sawmills
Clamps
Chisels
Saws (Circular)
" (Band)
" (Hand)
Bits
Mortise Bits



6—Woodworking Shop

Pattern-making—the main feature of this shop—calls for the highest grade and most reliable machinery and tools. Manufacturers realize that their pattern-making equipment will either make or mar their reputation.

The regular carpenter's shop also requires the best of Machinery in order to ensure the maximum of production.

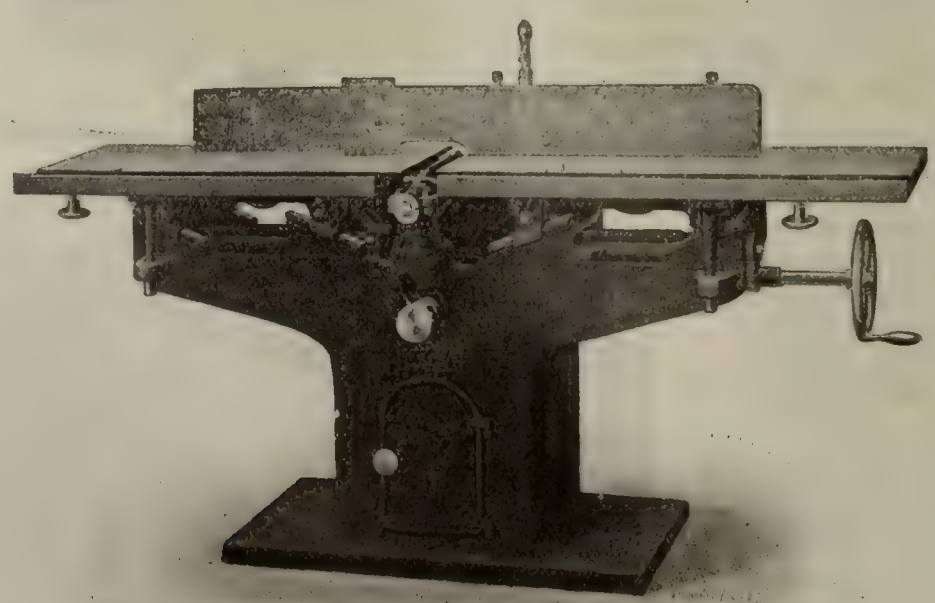
The Fairbanks-Morse lines of machines and tools includes everything necessary to equip the most up-to-date plant.

Your enquiries will receive prompt attention, and we can assure you the best deliveries.

The Canadian Fairbanks-Morse Co., Limited

Canada's Departmental House for Mechanical Goods

St. John, N.B. Montreal Quebec Ottawa Toronto Hamilton
Windsor Winnipeg Saskatoon Calgary Vancouver Victoria



Brief Historical Sketch of Steam Boilermaking in Canada

By D. M. Medcalf *

The development taking place in our shipbuilding industry, more particularly that of steel construction, and the intimate relationship that exists between it and steam boiler building, make a retrospect of the associated crafts' achievement in Canada peculiarly opportune and interesting meantime. The article embodies the substance of an address delivered before the American Boilermakers' Association at their recent Annual Convention.

WHEN choosing this subject, I hoped to be able to obtain some assistance from the compilations of historians who have linked together the memories of past and present industries in Canada, but have been disappointed because they have overlooked the existence of the black squad who toiled in an unpretentious way, building steam boilers for our early industries. These horny-handed sons of toil appear to have passed away unhonoured and unsung, and their memories have been almost forgotten, save by a few of our old boilermakers and engineers. I have, therefore, decided that, rather than go into the details of construction in this paper, to treat the subject more in a general way.

Doubtless, the first boilermakers in Canada were located around the eastern seaboard. In the early part of the eighteenth century, settlements clung close to river, lake and sea, and the St. Lawrence, the St. John, and their tributaries, besides other lesser rivers, provided inevitably the points of settlement and the lines of travel. The development of water transport in Canada is interesting and furnishes a record of need, invention and enterprise, and not the least among these was the advent of commercially successful steam navigation.

Advent of Steam Navigation

First came the bark canoe, large enough to hold a few voyagers and peltry, and for a long time it held its place for the far journeys. For shorter travels, the canoe was superseded by the larger, but clumsier, bateau. In later years, the increase in river freight led to the introduction of the still larger Durham boats, whilst along the coast and on the great lakes the sailing schooner long filled a notable place. Finally the steamboat came in 1839. Only one year after the Clermont had begun its regular trips on the Hudson, there was built at Montreal the forty-ton steamer Accommodation, and seven years later the Frontenac, of about seven hundred and forty tons displacement, was launched.

It is noteworthy that the first steamship to cross the Atlantic without auxiliary aid was built in Montreal. This vessel was called the Royal William, and left Canada on the 5th August, 1833, for London, and arrived there about one month later. Our early Canadian boilermakers were, therefore, amongst those pioneers who not only developed water transport in Canada, but inaugurated ocean steam navigation. Marine boilers at that period were built rectangular in form of the marine flue type, carrying from 10 to 20 lbs. pressure. Boilers of this type, with certain modifications in design, were in vogue for a considerable time, and gradually developed into the Scotch marine type, with which we are all familiar. The development of these boilers was, of course, due to the efforts of Scotch engineers on the Clyde.

Boiler Types

With regard to the manufacture of boilers in Canada, around 1850, there were quite a few of the old pioneers engaged in this work. A list of names would perhaps be of little interest now,

D. M. MEDCALF.

but I mention the following firms who are still extant:—

E. Leonard & Sons, London, Ont., established 1839.

Waterous Engine Works Co., Brantford, Ont., established 1840.

John Inglis Co., Toronto, Ont., established 1859.

John McDougall, Caledonian Iron Works, Montreal, established 1858.

Goldie & McCulloch Co., Galt, Ont., established 1844.

Besides these, there was a large number of thriving little boiler businesses, long since petered out, like the Dicky Neal and John Perkins boiler works of Toronto, Joseph Hall, Oshawa, etc.

Pioneers in the Craft

In those early days, that is, sixty or seventy years ago, the types of boilers generally in use were externally fired with three to five flues, 8 to 10-in. diameter. There has been little development in this type of boiler, and the H. R. T. in use to-day is typical of the boiler used then. The diameter of these boilers seldom exceeded 54 inches, but what they lacked in girth, they made up in length, as twenty to twenty-five feet was no uncommon stretch for those old stagers. The seams were all of single-riveted, lap construction, and the plates ranged in thickness from ¼ in. to ⅜ in. The shell rings and also the tube rings were telescoped one into the other, like stove piping. They were very strong on domes at that time, and I believe a boilermaker then did not think he was building a boiler at all, unless he had a huge dome on the outfit. Most of these early domes were cast iron, and some of our manufacturers adhered to this style of dome until as late as 1890, in which connection I venture to say a good many explosions have resulted from these castings fracturing, two accidents of recent date coming under my own personal notice.

Materials of Construction

With the exception of the domes of some of these boilers, wrought iron was the material almost exclusively used in their construction. The brands of iron were Lowmoor, Yorkshire, Bowling, Thornycroft, etc., all imported from the British Isles. As a rule, the plates were short and measured about 4 ft. 6 in. square. These sheets were soft and ductile, but blisters or laminations were not infrequently met with, which caused considerable loss and inconvenience. Another imperfection was that of spongey parts, generally due to imperfect puddling, but, notwithstanding these defects, the old iron boilers gave good service, and we have many still in service, after thirty or forty years of general wear and tear. The majority of the boilers then were used in saw mills and flour mills, and were often employed to augment the power of a water wheel. The steam pressures carried were low, and forty to fifty pounds was looked upon as a very high pressure indeed. Fuel was cheap, as wood was plentiful, but coal was very scarce and seldom used, except by the blacksmith in the smithy fire, and the moulder in his cupola.

Our plate rolls were originally made of wood and were operated by hand. This, of course, was only made possible by the size and thickness of the sheets

*Chief Inspector of Steam Boilers, Province of Ontario.

used at that time. Punching was done by hand with a screw or bear punch, and sometimes as many as four men were employed at a time to pull on the punch lever. All holes were punched full size, and those that did not come fair enough were usually persuaded into alignment by the gentle assistance of drifts and sledges. Sometimes a taper reamer was used, but this was the exception, rather than the rule, and any holes which could not be reached with the punch were cut with a round-nosed chisel. The head plates were flanged with large wooden mauls over cast iron flange blocks of the required size. It was customary to make the heads a little undersize, so that they could be drawn out gradually to the exact diameter.

Heads were dished in a very crude manner by digging a hole in the ground, somewhat resembling the desired curvature of the head. The circular plate was then heated and beaten down into this hole with wooden mallets, the finishing process being accomplished by flatteners and sledge hammers. It sometimes happened in the case of heads dished to a deep camber that the work could not be done in this way, and a large cast-iron ball was often used to advantage. This ball was hoisted a certain distance, then dropped on the red-hot plate in much the same way as a pile driver.

These—what now appear to us—crude methods of the early boilermakers have undergone a vast change in the last fifty years. The up-to-date machinery now in use for every branch of this industry has almost entirely superseded hand work, and there is just reason to be proud of the modern steam boiler which our manufacturers are turning out to-day in large quantities. We must not, however, despise the useful work of our predecessors, for they built many good boilers in those good old days.

Boiler Inspection Feature

We have a large number of boilers in Ontario that were constructed before the present Act governing the construction of boilers came into force and took effect, which were built in a thorough workmanlike manner. We also have some that are not so good, and they were not all built in Canada, but since the enactment of the present law, we are quite satisfied that better boilers are now being turned out, and the purchaser is safeguarded as far as workmanship and material is concerned.

No matter how rigid the inspection, it is not a guarantee that the boiler will not explode, because it largely depends upon the care and attention the unit receives when in operation, how long it will remain in useful service. Quite recently, I was requested to make a personal examination of two 66 in. x 16 ft. H. R. T. boilers that had been seriously damaged. The boilers referred to were built from an approved design and inspected during construction; the shell plates were fabricated by one of the largest plate manufacturers in the United States, and were carefully examined before any work had commenced, the heat numbers and tensile strength recorded and passed as being suitable for a steam boiler. The workmanship was also examined during the entire construction, and upon completion, the boiler was passed, and certificates issued in the regular way. After these boilers had been in service six months, they each developed bags on the sheets directly over the fire, extending four inches down, three feet wide and five feet long, and on account of their being practically new, the owner claimed that the cause was poor material and workmanship, and I personally acted as a referee in the settlement.

When I visited the plant, and when trying to squeeze into the regulation inspector's outfit—which is now too small for me—I requested the owners to have the manhead under the tubes removed. The manhole in top of shell was open and ready for the inspector. Immediately the light was flashed on, the interior of the boiler, it was quite apparent what caused the trouble. The water that lay in the depression was covered with black spots, and the tubes and shell, as far as could be seen, were coated with oil.

It was at first a difficult matter to convince the owners that oil had caused the trouble; it was a new plant, and oil they claimed could not get into the boiler because they had installed an expensive oil separator in the exhaust line from the feed pump, which was the only steam line returning its condensation to the boilers. A further examination was made by disconnecting the oil separator, which was found quite clean, but beyond the outlet a full handful of grease was collected and shown to them, with the result that they were quite satisfied that they themselves were to blame, and not the poor manufacturer, who made the boilers to comply fully with the requirements of the Province of Ontario. The necessary repairs cost about $2,500 and considerable inconvenience to the operation of the plant.

I could cite a number of cases very similar to this one, but believe there is "nuf sed," and my object in mentioning this fact is because frequently when trouble develops, and the cause of same is not known, it is blamed on the rotten old boiler made by so and so, who is really blameless.

War Effect on Canadian Boiler Making.

Now, in regard to the effect of the war on the boiler-making industry in Canada, I might say that its penetrating influence has affected almost every industry we possess, either directly or indirectly, and the most seriously swayed of these have been engineering and allied trades. Almost since the beginning of the war, or, to be correct, since the Governments of the Allies began to place orders abroad for the supply of munitions, most of our boiler shops have been partly converted into munitions factories, whilst our machine shops are similarly engaged, running night and day.

Besides making shells, however, our boiler shops are turning out boilers in fairly large numbers, not only for domestic use, but for export trade, chiefly to the Allies, and we have orders for many more which cannot be supplied by reason of our inability to obtain the necessary material. It is true, therefore, that the war has increased the output of our boiler works, and it is also true that the war is retarding that output, owing to the scarcity of steel, or, to be correct, owing to this merchandise finding a more ready outlet in another channel; a large number of the mills, I believe, who are working on metals have sold their full production one year in advance for war purposes.

Dearth and Cost of Steel

The dearth of steel, however, is not the only obstacle. The price of steel, as you all know, has been going up with leaps and bounds since the war began. Labour conditions are also very bad, and good boiler makers to-day cannot be had in anything like sufficient numbers to cope with the increase in business. From the beginnig of 1915 to the present time, but more especially in 1915 and 1916, a large number of munition factories and like industries, which were urgently required to meet the existing crisis suddenly sprung into being, and consequently more boilers were required. Our manufacturers having only their usual stock of plates and tubes on hand were very soon unable to supply the goods until more material was forthcoming, and this occasioned much delay. Those factories, therefore, which urgently required boilers turned their attention to the second-hand market, and used boilers were largely sought after. Old boilers of all descriptions were painted up and offered for sale as good boilers, and, needless to say, many were condemned by our department. These scrap boilers have in turn found their way to the furnaces to be melted into shell billets, and latterly shipped to Germany via France. Perhaps a part of one of our old boilers, after undergoing this transformation, may yet find a resting place in the Kaiser or the Crown Prince.

The demand of late has not been so much for stationary boilers, as for marine boilers, and our manufacturers are harder pressed now than ever for steel plates and tubes, and, although they are turning out a lot of work, the demand by far exceeds the supply. If we only had steel plate mills of our own in Ontario, it would have been of great assistance at this period, but unfortunately we are not sufficiently advanced along those lines, and have to depend entirely on imported material.

Instead of Babbit Metals.—As a substitute for babbit metals an inventor proposes to use mixtures of metallic sulphides in widely varying proportions. He considers that the sulphides of copper, lead, tin and antimony make good babbitt substitutes. Metallic sodium is used to improve their casting properties.

It is not commercially possible to burn more than 99 per cent. of bituminous coal fed to the furnace.

PRODUCTION METHODS AND DEVICES

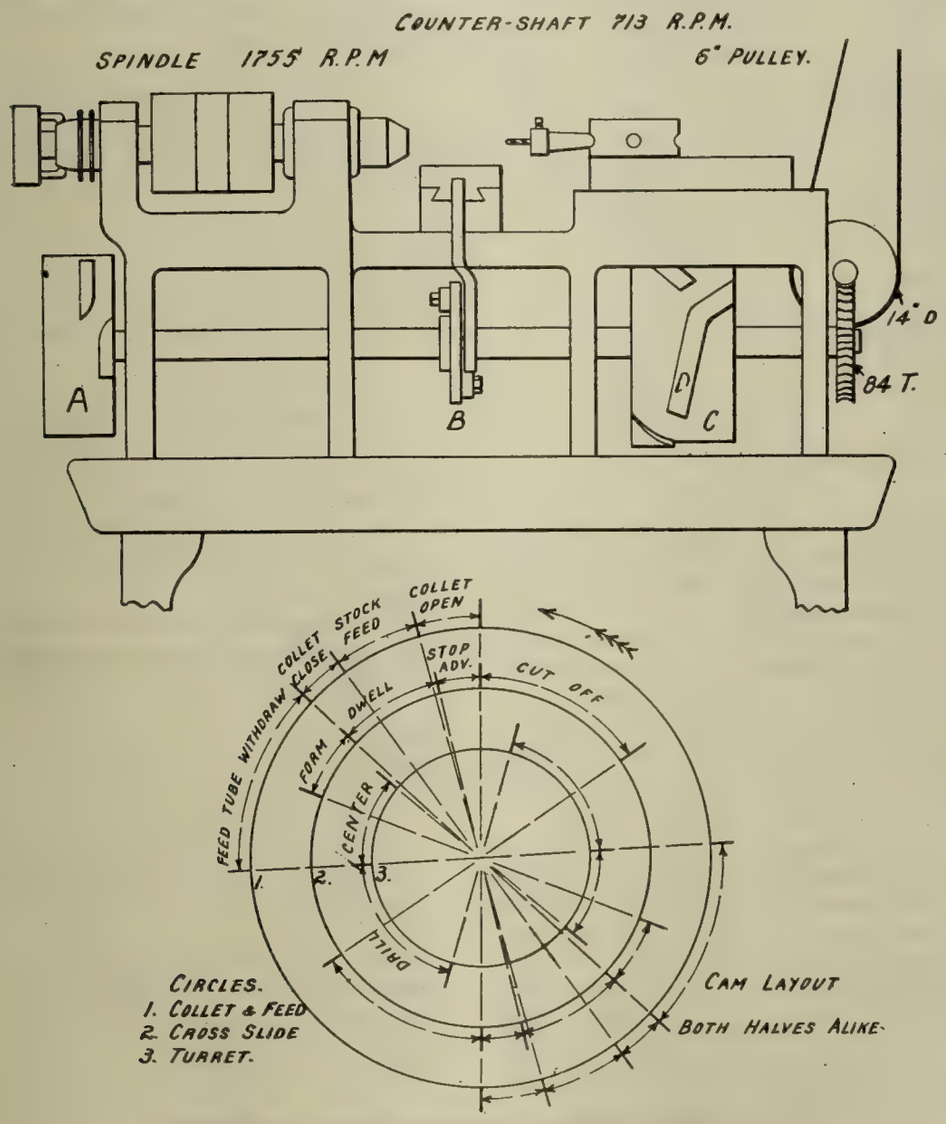
A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

AUTOMATIC SCREW MACHINE LAYOUTS

By D. A. Hampson

THE automatic screw machine is found in so few shops outside of the manufacturing centres that men familiar with them are in the great minority. In times like the present, when vast quantities of turned parts are required in a hurry, the automatic screw machine is a most important tool for the production of small parts, such as small arms ammunition components, and other similar equipment. The demand for operators and set-up men has exceeded the visible supply, and, as usual, manufacturers have turned to the country towns for workmen, but this time they found there were practically no men available with screw machine experience—in fact, a goodly proportion of both country and city mechanics had never even seen the machine at all. It, therefore, became a problem of training men, and in this, as always, the man with education gets ahead faster than his brother who has passed up the opportunities so frequent to-day; the most convenient of which is the trade paper.

Given a shop training on the common machine tools, any man should master the operation of automatic screw machines in a short time. That doesn't mean that he would become an expert, but he should be able to handle any plain work and do simple setting up. A person, quick to learn, who has been simply a machine hand should likewise make rapid progress. The automatic screw machine, in its plainest form, is shown by the drawing: with the exception of the Brown & Sharpe, all the principal makes embody the same principles—single cam shaft carrying drums upon which are fastened the cams for opening and closing the collet, feeding the stock, operating the cross slide, feeding and revolving the turret. Threading involves another movement not to be considered here. Study will reveal that the more complicated looking machines are made so by the addition of more spindles and their indexing devices, feed change gearing, and threading and other attachments, but that the operating principles are the same as in our simple machine.



AUTOMATIC SCREW MACHINE LAYOUT FEATURES.

Even though it may not be a part of his work to design cam layouts, the ambitious man will find it to his advantage to make a study of them. Normally the cam shaft makes one complete revolution for every piece made. Thus, if that revolution were plotted as a circle, every movement produced by the cams can be located exactly. But as cams on different drums are in action at the same time, the circle becomes crowded and the arrangement shown by the drawing gives more room.

With this layout, each drum has a circle of its own. It is possible by laying out a diameter at any point to tell just what each drum is doing at that time. The outer circle is the drum for the spindle mechanicism, the middle one for the cross slide tools, and the inner one for the turret. The larger the scale used in laying out, the easier the work can be done. The cams on the spindle drum (the drum A in the drawing) always are set close together, so the time spent in opening and closing the collet and feeding the stock—non-working movements—will be as little as possible.

Double Feed

Regardless of the number of holes in the turret, there are often one or more idle ones. When the work can be arranged so but half the turret holes are occupied, it is possible to double the production from the machine by "double feeding," that is, feeding twice for every revolution of the cam shaft and having the otherwise idle turret holes carry another set of tools. The layout shown is for such a job.

The piece to be made on the machine has to be drilled, corners rounded, and cut off, but, owing to conditions of accuracy, a centering tool has to be used, and this is put in one turret hole. The corners are rounded by the back tool on the cross slide and the cross slide carries, besides the tool, a stop to feed the bar of stock against. This combination can be traced on the middle circle, which shows that the cross slide advances, waits for the stock to feed (dwell), and then further advances to round corner (form). The movements for each piece are the same, and consequently both halves of the layout are alike.

An example of the help that a man gets from a working knowledge of even arithmetic, as applied to shop problems —applications such as appeared in the instruction articles in this journal, may be found in the screw machine job under consideration. A cam (D) is on hand,

and it is desired to know if it is suitable for use in feeding the drill. The drill is a small one, and it is known that it will not stand a feed of over .004 in. per revolution of the stock. Whether or not this is too fast is the question. Of course, it is possible to put it on the machine and try it, but the machine has to be set up to try it and if then the drill breaks, it is not known positively that the cam is the cause of it. All this takes time, and is an uncertain, slow, way of doing. Ten minutes spent in collecting the data required—if it is not already known—and in making the computations, will give a definite answer without any experimenting.

In this particular case, the data obtained by measuring and counting have been put on the drawing. Also it was noted that the cam gave an advance of 7-16 in. in one quarter of a revolution. Figuring speeds we get—

Cam shaft makes 3.63 r.p.m.—1 rev. in 16 sec.

Cam advances 7-16 in. in ¼ of above, or 4 sec.

Spindle makes 117 rev. in 4 sec.

Then the feed per rev. of stock is .437 in.

$\frac{\quad}{117} = .0037$ in., which is well inside our limit.

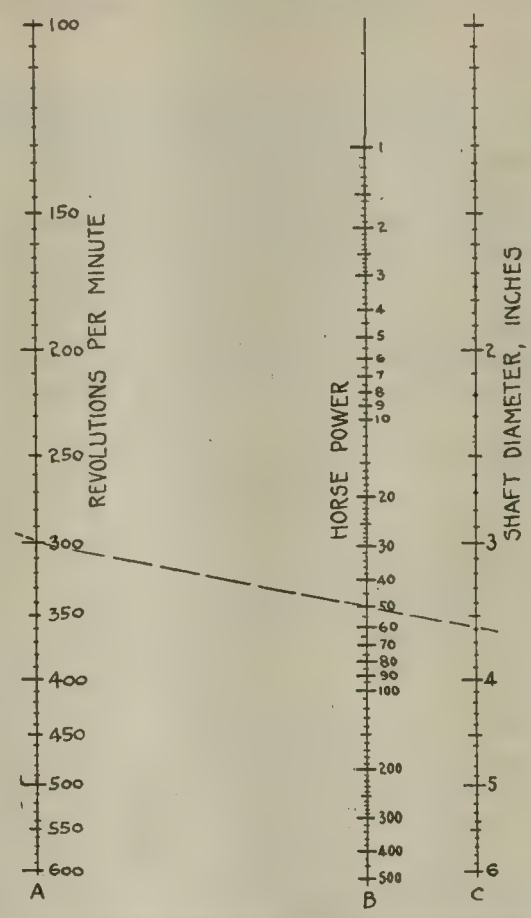
The layout of the cam circles is most readily done by calculating the movements in degrees. This is done directly on new work: for existing cams, they are measured in inches around the drum and this reduced to degrees by making it a proportion of the whole circumference—the value in degrees being used in plotting.

SHAFT DIAMETERS OF HIGH SPEED ENGINES.

By N. G. Near.

A RATHER peculiar thing about steam engines is the varying designs and sizes adopted by the different manufacturers. One manufacturer will use a 3½ inch shaft for a 50 h.p. engine running 300 r.p.m., whereas another manufacturer will use a 4 inch shaft at the same speed. There is no good reason why there should be this difference in size, aside from the fact that one might prefer to use a greater factor of safety than the other. Since the cost of an engine is proportional to the weight, it is evident that the engine having the larger shaft is liable to weigh more than the engine having the lighter shaft and as a result the maker of the light engine can undersell the maker of the other. Inasmuch as both these engines give good dependable service when in actual use, however, it is difficult to tell which engine is "best." Perhaps the heavier engine will last longer, and perhaps not, in spite of its higher cost.

O. N. Trooien of the University of Wisconsin has studied steam engine design pretty thoroughly and has tabulated most of the common dimensions used in current steam engine design. Based on these tabulations he has developed curves or formulas which represent the average practice. It is allowable for us to use curves and formulas of this kind because we can rest assured that they



HIGH-SPEED ENGINE SHAFT DIAMETER CHART.

will "work." They will give us engines and parts of engines that will be heavier than the lightest, and lighter than the heaviest. Mr. Trooien's study covered the best known engines only—not those that give trouble or are doomed to failure. As a result of this investigation, an "average" formula was developed for the shaft diameter of high speed centre crank engines. This is the formula:

$$d = 6.6 \sqrt[3]{(h.p. \div N)}$$

where d = diameter of the shaft in in.
h.p = the horse power of the engine
N = the revolutions per min. on the shaft.

Based on this formula, I have developed the chart herewith which will be found handy for determining any shaft diameter for any ordinary high speed engine. All that is necessary is to lay a straight-edge across as indicated by the dotted line drawn across the chart and the intersection with the "unknown column" gives the desired result. For example: What should be the diameter of a shaft for a 50 h.p. engine whose speed is 300 r.p.m.?

Connect the 300 (column A), with the 50 (column B), and continue the line until it cuts column C. The intersection with column C shows that the shaft diameter should be 3.6 inches. Should it be desired to make the diameter larger, of course, that could be done, at the same time, it would not be good policy to make the diameter smaller.

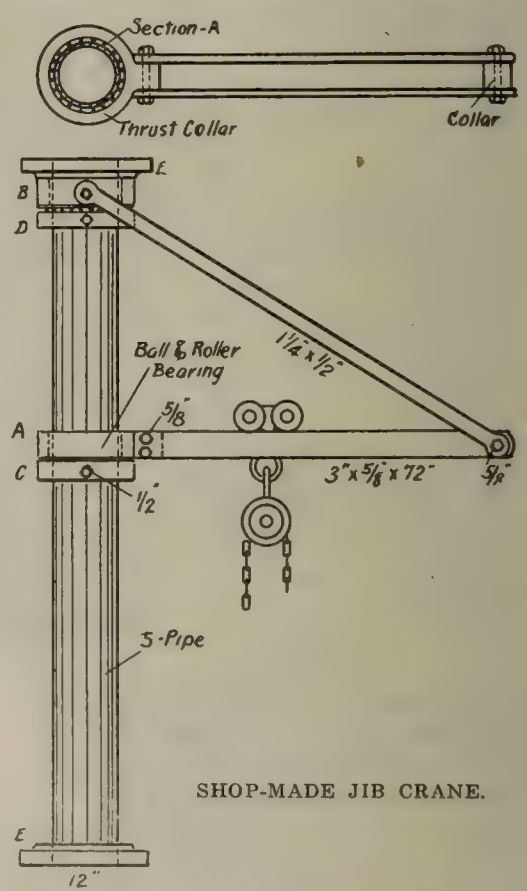
The chart will also be found useful for determining the safe load that can be imposed on your engine. Let us suppose, for instance, that the shaft in your engine is larger than necessary for carrying normal load, and this you can easily find out by using this chart. Thus if your shaft diameter is 3.6 inches, whereas it should be only 3 inches according to this chart, it is evident that little danger will result from increasing the pressure on the piston as far as the shaft itself is concerned. To be sure the other parts of the engine must be considered also before increasing the pressure or endeavoring to make a high-powered engine of it. One must be careful of the piston rod, the keys, the cylinder walls themselves, the head and crank end of the cylinder, etc. Every part that will be subjected to a greater stress must be given a proper examination and reckoning.

The range of this chart, it will be noted, is wide enough to care for almost any high speed engine, delivering all the way from 1 to 500 h.p. and covering all speeds from 100 to 600 r.p.m. It is very seldom that we see an engine with a shaft smaller than 1 inch or larger than 6 inches, and that is why, altogether, the chart can be considered complete and should be handy to keep on tap by engineers, students, designers, etc.

A SHOP MADE JIB-CRANE

By J. E. Cooley

IN the accompanying sketch is shown a shop made jib-crane. It was made for the purpose for handling work such as



SHOP-MADE JIB CRANE.

frames, beds, and other heavy castings on a milling machine, and was placed in the floor space center of four large milling machines facing each other, so that

for the different milling operations on a piece, the work could be swung on the crane and transferred from one machine to another without the aid of a helper.

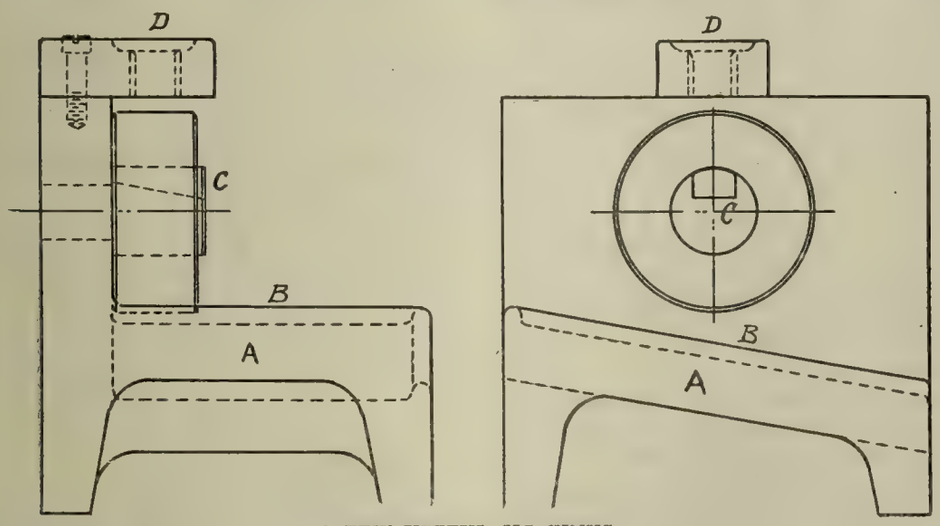
The column is made from 5-inch pipe, fastened to the floor and ceiling by flanges E, which are tight fitting in the pipe. Two thrust collars A, and B, are bored out to take roller bearings, and these rest on fixed collars C, and D, which contain ball bearings. The swing arms holding the trolley wheels are bolted to the thrust-collar A, and are 6 feet long.

This type of crane is easily constructed, and is an economical apparatus for the purpose; it eliminates the need of a helper, and the operator can keep his machines running while removing a piece.

A FEW USEFUL JIG KINKS

By J. E. Cooley

A GREAT many jigs used for drilling purposes are made from standard size knees or angle plates. These, as a rule, entail considerable loss of time in handling, such as putting on and taking off work; cleaning off chips and oil and other operations that necessarily follow in jig work.



A FEW USEFUL JIG KINKS.

In the accompanying sketch, is shown a few useful kinks applied to a jig for drilling collars for set screws, which may be found suggestive when designing jigs for other purposes. Referring to the sketch, the shelf A, on the angle-plate is cast on an angle instead of horizontally as is the usual method, having a rib B, along the upper and front edge, as seen. This is done for the purpose of allowing the chips and oil to fall away on one side of the drill-press table, making less space to clean or brush away, than is now the case where oil and chips fall from all sides.

Another kink is shown in the plug which holds the collar. It is well-known that the burr left in the hole after drilling, causes the collar to stick to the plug, necessitating the use of a screw-driver or similar tool to pry it off. The plug shown here has a deep angular spline C, which allows the collar to slip off easily, and besides, aids the chips that come through the hole to fall downward.

Considerable oil is unnecessarily wasted in drilling. In one particular instance, when this is squirted on the drill, a certain amount of this gets on the piece that holds the drill bushing, and falls away on the sides without being used. If a small well or chamber as D, is cut out, and the top of the bushing is made flush with this, it will catch all surplus oil and fall in the bushing.

SPECIAL VISE JAWS FOR ANGULAR MILLING.

By F. H. M.

A RATHER difficult job of milling to accomplish economically is illustrated by Figs. 1 and 2. The job, as completed, is shown at A Fig. 1, while the appearance of the part after the first operation is shown at B. Both of these operations are accomplished simultaneously on two different parts by gang milling using four cutters and a vise equipped with special jaws, as shown by Fig. 2.

Referring to the illustration Fig. 2, the gang of cutters, consisting of a pair of straddle mills A in the centre and two surface mills B and C, machine the work which is curved and must be held on a 45-degree angle. The work is located by means of two pins D and the vise jaws are shaped to the curvature of the inside and outside of the work. These jaws present the work at the correct angle for milling radial, while the jaw on the moveable part of the vise B is made floating to accommodate slight inaccuracies in the thickness of the work.

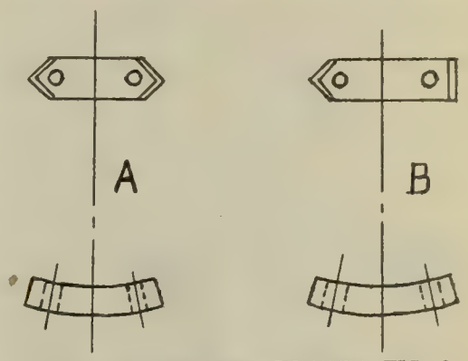


FIG. 1—SHOE MILLED IN VISE, FIG. 2. "A," AFTER MILLING BOTH ENDS. "B," AFTER MILLING ONE END.

In operation, two parts are placed on the pins in the manner shown, and after tightening the vise, the ends are milled in the usual manner by means of the longitudinal feed of the table.

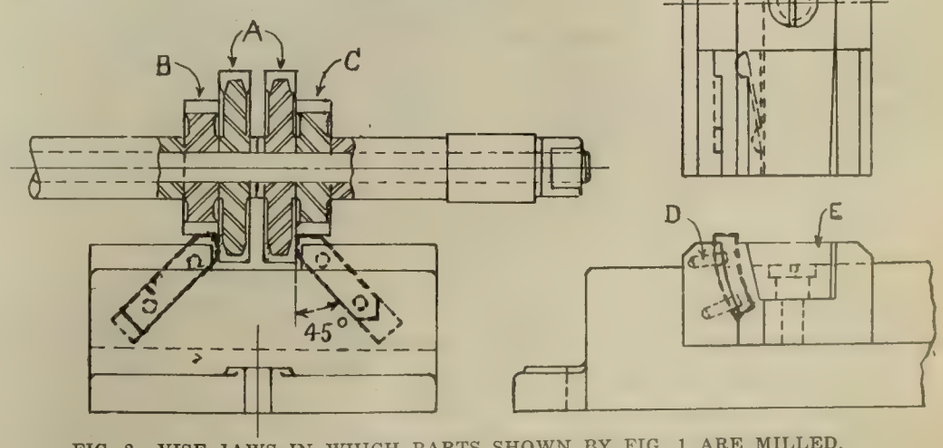


FIG. 2. VISE JAWS IN WHICH PARTS SHOWN BY FIG. 1 ARE MILLED.

ACCURATE DRILLING AND REAMING

By F. Scriber

MACHINING holes may be just plain drilling and reaming, or it may be getting results on particular work economically, and, while most any old type of drill will cut, there are a good many ways of improving the cut and getting more accurate holes both for size and alignment. It is well known that a drill will not cut true and to size unless ground correctly, although by drilling a small hole and following this with a drill of the right size, a fair hole close to size may be had. The illustrations and description in this article are intended to show how combinations of plain drills and reamers are used to get the desired result when jig drilling.

Referring to Fig. 1, there is shown a

twist drill and bushing for short holes up to about ⅞ in. dia., and also a reamer for machine reaming the same. The bushing is held in a jig in the usual

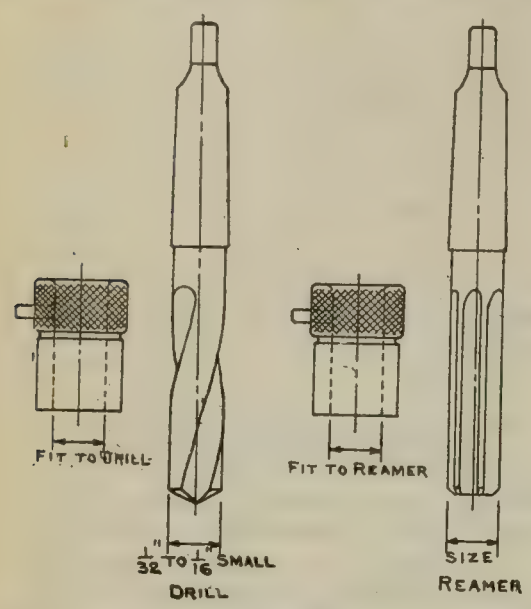


FIG. 1. BUSHINGS AND TOOLS FOR SHORT DRILLING.

manner, while the drill is 1/32 in. to 1/16 in. smaller than the reamer. The bushings are known as the slip type, inasmuch as the bushing which guides the drill is removed from the jig after drill-

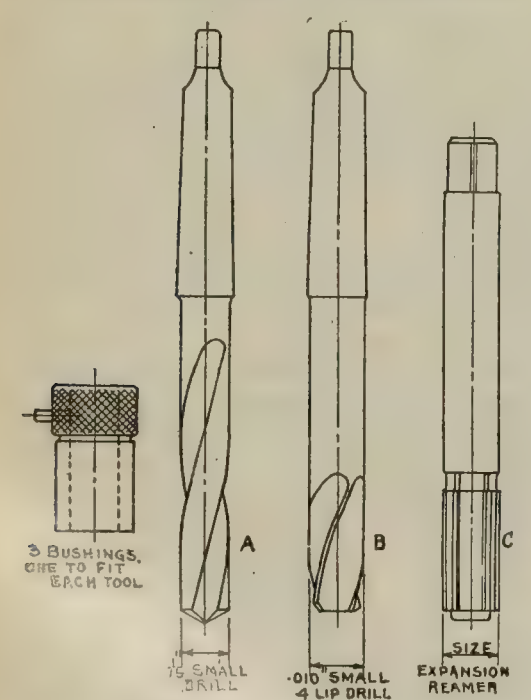


FIG. 2. TOOLS FOR DRILLING LONG OR LARGE HOLES.

ing and the reamer bushing is then slipped in its place.

The foregoing method of guiding or piloting drills is in quite general use, but for long holes under ⅞ in. dia. and large holes of any length where accuracy is required a much better method is that shown in Fig. 2.

With this combination three slip bushings are used, and three cutting tools, namely, a two-lip twist drill, a three or more lip core drill and a plain, an expansion, or a shell reamer as desired. In making the cut drill A, which is about 1/16 in, small, starts the hole with the proper bushing in place; following this, drill B, .010 in. small, with short flutes, is used, which makes the hole quite true for its entire length. Reamer C is used for finishing the hole.

For drilling long holes where extreme accuracy is required, resource may be had to a combination of tools, such as are shown by Fig. 3.

In using this combination the part held in the jig is first drilled in the usual manner with twist drill A guided by bushing B. In line with the main guide bushing C a pilot bushing D is placed in the jig, as illustrated by Fig. 4. The purpose of this pilot bushing will be better understood from Fig. 4, as the four-lipped drill is thus supported above and below the cut. The drill used is E, Fig. 3, and this is followed by a reamer in like manner.

Drilling and reaming in this manner is a very accurate method, provided the two bushings are in line, and the tools are not cramped in any manner. For this reason it is a good plan to have the line boring and reaming tools driven by a holder in which the shank or driving end of the tool is able to float and a good example of this type of holder is shown by Fig. 5.

Referring to the illustration, A is the reamer and B the holder, the reamer shown being of the shell type mounted on a shank. As will be noticed, the main hole through the holder is bored out slightly large to allow the reamer to float, while a pin C driven into the holder drives the reamer. The hole through the shank of the reamer is opened out, tapering at both ends from the centre, so as not to interfere with the float of the reamer. The floating holder itself is, of course, made in many shapes to fit the particular machines, the type shown being adapted for use in a turret.

IN spite of the various difficulties French shipbuilders are faced with, there were 140,000 tons of new construction on hand in that country at the end of 1916.

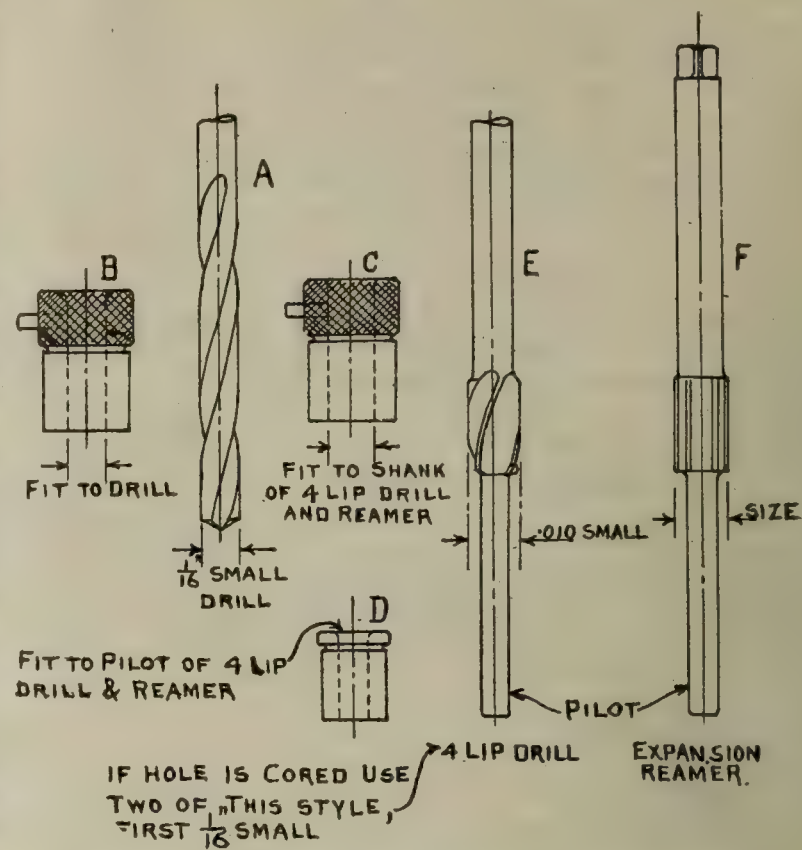


FIG. 3. TOOLS FOR LINE DRILLING AND REAMING.

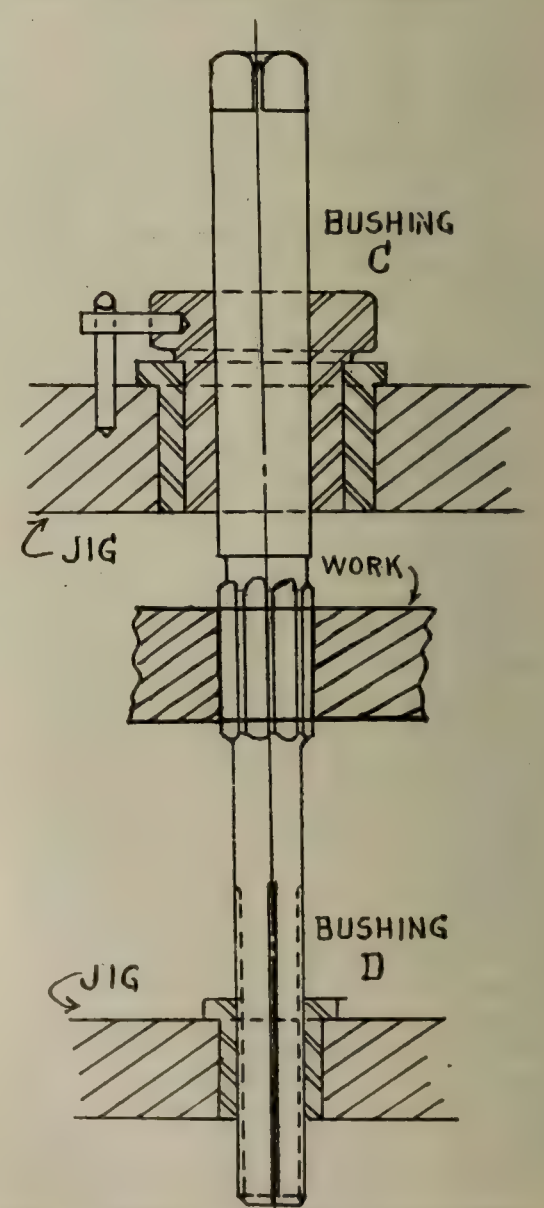


FIG. 4. METHOD OF USING LINE REAMER.

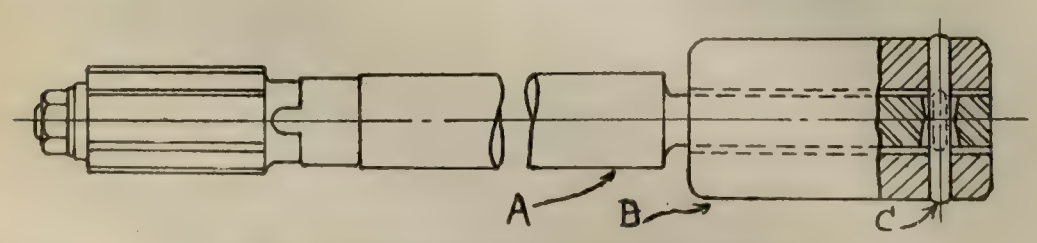


FIG. 5. HOLDER SUITABLE FOR LINE REAMING.

READERS' QUERIES AND ANSWERS

WANTED an alloy for making white metal hollow-ware, such as is used in casting portable reading-lamp stands.—N. A. G.

If the casting is required to be of good colour, strong enough to withstand accidental rough use, and finish to a durable surface chiefly, try the following:—

Copper	49 lbs.
Zinc	36 lbs.
Nickel	15 lbs.
Aluminum	2 oz.

Melt the copper and nickel first with a borax flux, then add the aluminum, and then the zinc. By remelting from ingots, you will obtain better results than otherwise. May be used with heated iron moulds or for sand castings.

If the casting is not required to be stiff and resistant to possibly injury from sudden contact with hard objects, either of the following may answer your purpose.

Lead	75 per cent.
Antimony	10 " "
Tin	15 " "

Tin	91 parts
Antimony	9 "
Copper	2 "

The latter makes a very strong, tough alloy, which is very fluid when melted.

A mold, the composition of which we believe is patented, and which would no doubt serve your purpose for casting the latter alloy is made as follows: Mix 11 parts powdered soapstone with 1 part Portland cement, then wet the mixture with a solution of 2 parts water and 1 part sodium silicate. Form a mixture of the consistency of moulding sand and employ in the same manner. Remove the pattern and heat the mold to 300 or 400 degrees Fah. until well dried. It is then ready for use.

CHART FOR DETERMINING LENGTH OF ROLLED-UP AND BALED STRAP IRON, ETC.

By N. G. Near.

THIS chart, plus a ruler and a pair of scales, will enable you to measure the length of rolled-up strap iron, flat iron, odd lengths in bales, etc. Even though the roll is not uniform, or if there are a number of rolls, or if the material is "all balled up," as the expression goes, it makes no difference to this chart, so long as the thickness and width are uniform. It is obvious that a chart of this kind is possible because the weight of wrought-iron and mild steel per cubic inch is a fairly constant quantity.

For example, if you find that a roll of your strap iron measures .03 inch in thickness and one inch in width and the weight is 22 pounds, what is the length of the roll in feet?

Very simple. Run a line through the .03 (left side of column A), and the 22 (column B), and locate the intersection with column C. Then through that intersection and the 1 (column A, right side), run another straight line and the final intersection with column D gives the answer as 200 feet, which you will find to be pretty accurate. The dotted lines drawn across this chart show how the above problem is solved via the chart. Solve your problem in the same way and it will come out OK.

This method is surely much simpler than to unwind a long roll of metal and measure it and then have to roll it up again. All you have to do here is to lay a straight edge across the c hart twice and the answer is found immediately.

To find the thickness of the metal accurately, if you have no micrometer caliper, measure the total thickness of ten layers, one on top of the other. Then divide by 10. It is always easy to divide

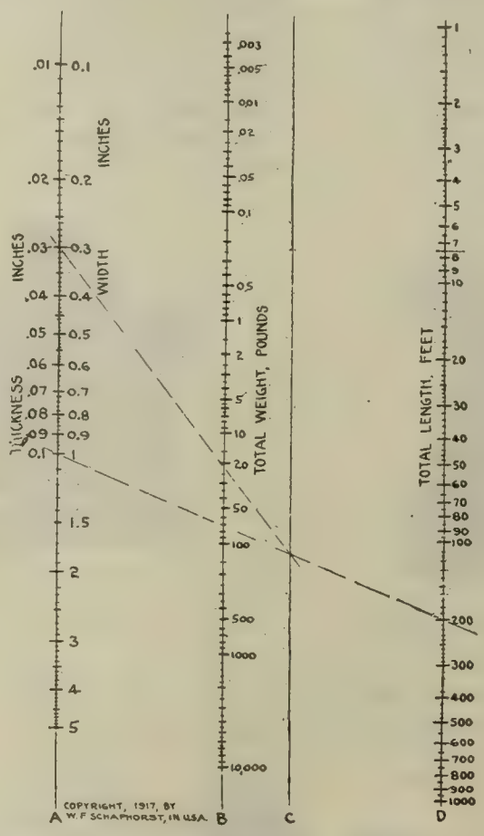


CHART FOR DETERMINING LENGTH OF ROLLED-UP STRAP IRON, BALES OF STRAP IRON, ETC., BY WEIGHING.

by 10. For example, if you find that with any ordinary rule the total thickness of ten layers is ⅜ inch, which is equal to .375 inch expressed decimally, it is a simple matter to point off one place to the left, which makes the thickness .0375 inch. Isn't that easy enough? Your answer is about as accurate as though you had used a pair of micrometer calipers.

The range of this chart, it will be noted, is wide enough to care for any ordinary roll of metal running up to a total length of 1,000 feet.

UTILIZING WASTE HEAT IN BRITAIN

MILLIONS of units of electricity, generated in waste-heat stations in connection with coke ovens and blast furnace plants is the result of developments in the South Durham coal field in the north of England. In 1907 a corporation was formed under the title of The Waste Heat & Gas Electrical Generating Stations, Ltd., to promote the use of waste heat for power purposes, and the problem of using the waste heat from iron and coke oven plants has been solved to the extent where savings estimated at 150,000 tons of fuel per annum are now being effected.

Two of the leading power companies operate in conjunction with the waste-heat stations, supplying a combined total energy of 343,000 horse-power over an area of 1,400 square miles. The waste heat stations are placed close to the larger coke ovens and blast-furnace plants, and operate in parallel with the five main stations of the power companies. They are run at their maximum capacity, and all regulation of the power is effected by the main supply stations.

The main distribution and transmission system is three-phase, and the working pressure is 20,000 volts. The power is utilized chiefly in the engineering shops and shipbuilding yards situated on the Tyne and Wear, and as the purchasing companies have a market for their current many times greater than the output of any individual waste heat station, it is possible to run these stations continuously at their full capacity, and to utilize to the best possible extent the machinery installed in them. Unfortunately for scientific purposes, no figures have been published, or can be obtained, for the thermal or working efficiency of these North-East Coast waste heat stations, and therefore it is impossible to say how the system adopted compares in practical value and economy with the waste heat stations situated in other countries.

FOR PIN HOLES IN BRASS

PIN holes in brass castings may be caused by pouring very hot metal into poorly vented molds, molds rammed too hard, or molds made of sand that is too close which will not allow the vents to come off freely. To avoid them, do not pour any hotter than necessary to run the castings, vent the molds with a fine knitting needle and do not ram them very hard.

If the metal contains no aluminum, try the addition of 2 ounces per 100 pounds, pouring when the metal no longer smokes. If aluminum cannot be used, pour the molds with sufficient force to keep the pouring heads full, even if some of the metal spills when they are filled. Exercise care to have the molds so well vented that when the gases come off, they will explode when the red-hot skimmer is inserted underneath the bottom boards.

Big-head keeps more men from succeeding in this world than lack of education was ever accused of doing.

A monthly mechanical paper is not what one would call a newspaper, yet there is lots of news in the "ad" pages.

The Development and Application of Centrifugal Pumps

By H. S. Budd *

Centrifugal pumps by reason of their compactness of design, smoothness of operation, few constituent parts all of which are of comparatively simple and rugged construction, and freedom from shock and water hammer, make a powerful appeal to users of pumping machinery generally; and that their adoption to a wide range of service has in the past been productive of good results, is shown by the growing tendency to broaden their application scope still further, while intensifying their installation where already operative.

CONTRARY to the belief held by some that the centrifugal pump is a modern invention, it is in fact quite an old one and of obscure origin. One authority informs us as follows:—

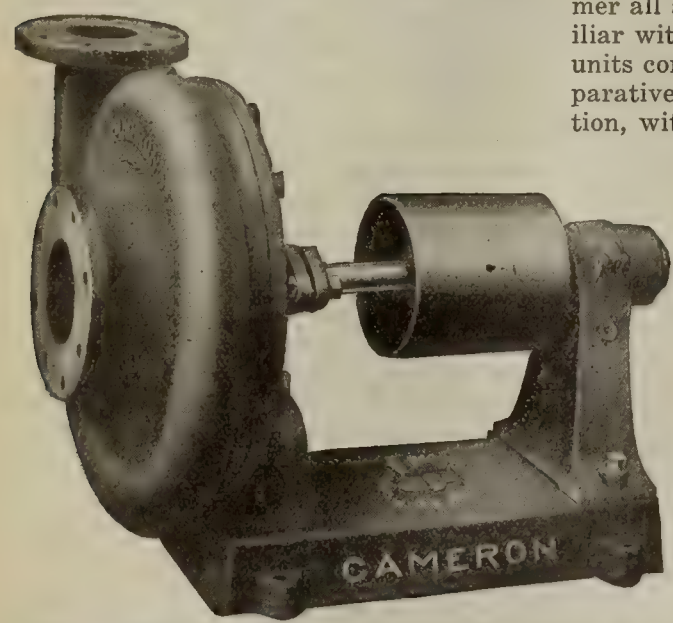


FIG. 1. BELT-DRIVEN, SINGLE SUCTION, OPEN IMPELLER PUMP.

"The first pump of this kind which attracted notice was one exhibited by J. P. Appold in 1851, and its special features have been retained in the best pumps since constructed. Appold's pump raised continuously a volume of water equal to 1,400 times its own capacity per minute. It had no valve and it permitted the passage of solid bodies, such as walnuts and oranges, without obstructing its working. Its efficiency was also found to be good."

For many years the centrifugal pump was considered useful only for handling large quantities of water at low heads and was uneconomical to operate. The development of the steam engine and its application to direct acting steam pumps kept the centrifugal in the back ground where it remained almost forgotten for many years. With the introduction of electricity and motor drives and, later on, steam turbines, however, there arose a demand for a pump that could be direct driven at comparatively high speeds, and the centrifugal pump has been improved and refined to meet this requirement. This development has been along purely scientific lines with quite wonderful results, until these pumps now operate with surprisingly good performance and economy on nearly all classes of both high and low head service for which only reciprocating pumps had formerly been used.

The simplicity and compactness of construction, smoothness of operation and freedom from shock and water hammer all appeal immediately to those familiar with pumping machinery. As these units consist of but few parts, all of comparatively simple and rugged construction, with total absence of reciprocating parts, water valves, etc., they present quite a contrast to recriprocating pumps, both in attendance required and cost of repairs, and in most cases will operate with a considerable saving in power consumed.

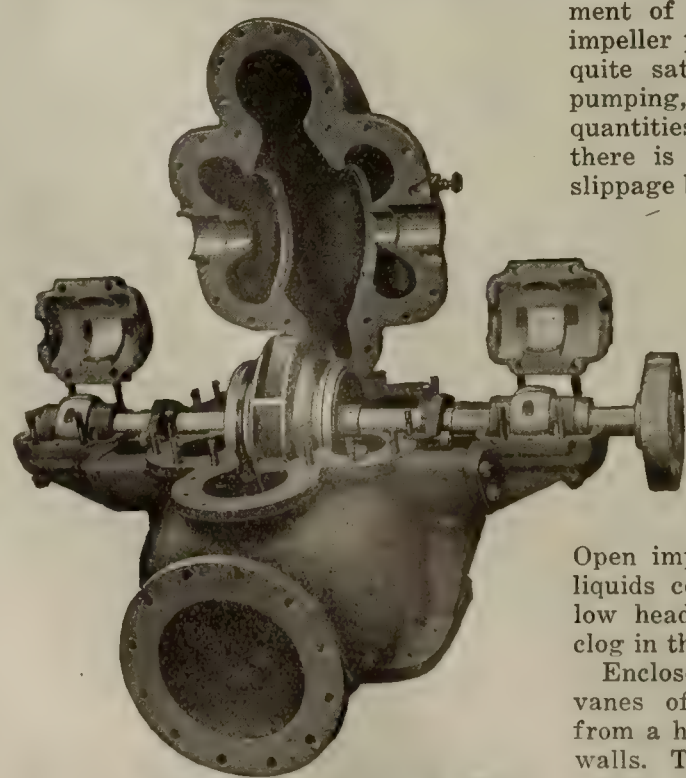


FIG. 2. DOUBLE SUCTION VOLUTE PUMP WITH CASING OPEN TO SHOW ACCESSIBILITY.

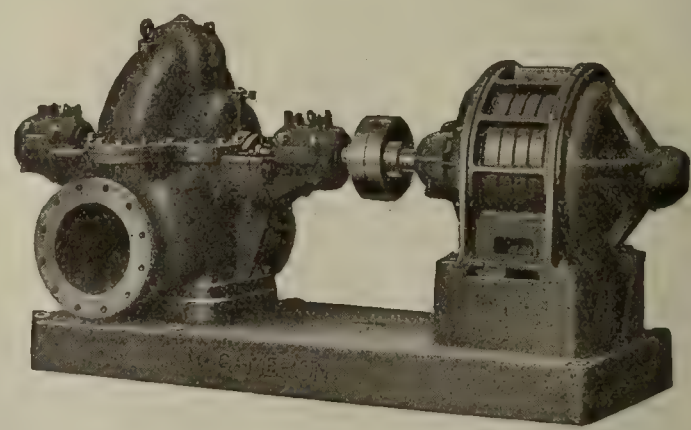


FIG. 3. MOTOR DRIVEN DOUBLE SUCTION VOLUTE PUMP.

Centrifugal Pump Types

Centrifugal pumps as built to-day are of two general classes, namely, open and enclosed impeller types, depending on the type of impeller used.

Open impellers consist of a number of arms or vanes radiating from a hub in the manner of an ordinary centrifugal blower. The sides of the vanes are usually faced off and run close to the walls of the casting on both sides in order to prevent, as far as possible, the slippage of the liquid being pumped. By refinement of design and construction, open impeller pumps have been made to show quite satisfactory results on low head pumping, especially in delivering large quantities at a head of a few feet, but there is always a large percentage of slippage between the impeller and casing, as well as excessive skin friction and internal disturbance which becomes more pronounced as the operating head is increased. These losses are variable quantities and make high efficiency impossible; the designer cannot, therefore, predict with any great degree of accuracy the ultimate performance of the pump. Open impellers are adapted to handling liquids containing some solid matter on low heads that would tend to hand or clog in the inclosed impeller types.

Enclosed impellers consist of blades or vanes of suitable currature radiating from a hub and enclosed by two discs or walls. The liquid to be pumped enters at centre or eye of the impeller around the shaft on either one or both sides, pending on whether it is of single or double suction type, and passes through the wheel in channels formed by the walls and vanes. Double suction impellers which

*Sales Engineer, the A. S. Cameron Steam Pump Works, Chicago, Ill.

are subjected to the same pressure conditions on either side, are automatically balanced against thrust along the line of the shaft for all ordinarly operating heads. Single suction impellers are not so comparatively balanced an dtherefore require end thrust bearings.

As the enclosed impeller handles the liquid being pumped through confined passages or channels of definite form with a limited amount of disturbance or leakage, a capable designer can quite accurately control the performance of the pump over a broad range of operation. For this reason the enclosed impellers are used for all medium and high head pumping equipment and when high efficiency is desirable.

Single Stage Pumps

A single stage pump contains one impeller and can be built for almost any capacity and reasonably high head with efficiency results, the larger sizes being more economical, of course, than the smaller. The greater the head created by a single impeller, the greater will be the difference in pressure between the suction and discharge chambers of the pump. This is accompanied by a greater internal slippage and leakage and more rapid destruction of the internal parts, and, therefore, is one of the factors that determine the greatest pressure or head allowable per impeller or stage.

Multi-Stage Pumps

For higher heads, multi-stage or turbine pumps are used. These consist of two or more enclosed impellers on the same shaft, running in a casing with passages so arranged as to lead the liquid through the several impellers in succession, each one adding its equal share of the total pressure desired. By this means, pressures of several hundred pounds may be obtained from a single pump, the limit depending on the mechanical limitations of design, strength of materials used and their resistance to abrasions by the liquid at high velocity. In multi-stage pumps the liquid discharged at high velocity from all, but the last impeller must be abruptly turned through 180 degs. to enter the eye of the succeeding one, and suitable vanes known as diffusers are provided to reduce the speed of this water as far as possible, and convert it into pressure as soon as it leaves the impeller, so that it may be conducted into the succeeding one with the least disturbance and impact on the walls of the casing.

All multi-stage pumps require some means of maintaining correct alignment of the rotating element with the passages in the casing and of equalizing any end thrust that may be present. In pumps handling clean fresh water, this is best accomplished by means of an internal hydraulic device in which the thrust is carried on a body of water confined by a suitable piston or diaphragm mounted on the shaft. This device is quite simple in construction, yet it automatically and promptly adjusts itself to varying load conditions, and being a water bearing with no metal to metal contact, operates with practically no loss of power. Where the liquid being pumped carries grit or solid matter that would tend to wear the parts of the hydraulic balancing device rapidly, a step bearing of the Kingsbury or marine thrust type external to the casing should be substituted.

Design and Construction

The requisites of a centrifugal pump are, first, that it shall be well and suitably constructed mechanically, and secondly, that its performance shall comply with all the service requirements and show the highest efficiency possible on that service. The pump should be of strong and substantial construction in all parts, free from vibration of the rotating elements with large and well oiled and close fitting bearings, both to insure continuous operation and to preserve the fine running clearness within the casing which serve to prevent internal leakage from the spaces of higher to lower pressures. The material of which the various parts are made should be well selected for the duty to be performed, and the general design thoroughly accessible for inspection of the interior and renewal of parts.

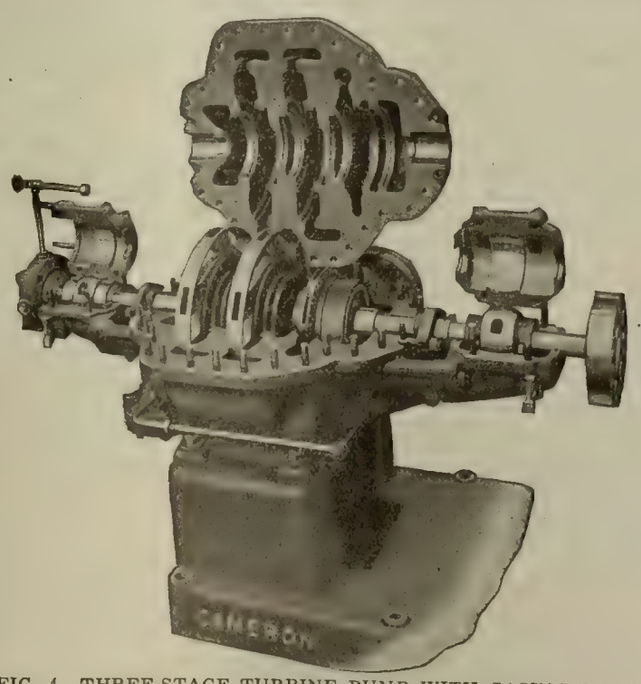


FIG. 4. THREE-STAGE TURBINE PUMP WITH CASING OPEN TO SHOW ACCESSIBILITY.

The operating principle of a centrifugal pump is quite simple. The liquid pumped is accelerated by passing it through a revolving impeller, creating both pressure and velocity, the velocity being then converted into pressure in the stationary discharge passages. However, it becomes a very complex problem to design and build a pump to deliver a given quantity of liquid against a specific head at a definite fixed speed and to accomplish same at the highest efficiency. A capable designer can predict within a small percentage of error both the performance and the brake horsepower required not only at the normal operating point, but over a range, from a condition of free discharge against no head, to a closed discharge and no liquid flowing. The solution of these problems requires a thorough knowledge of the theory of centrifugal pumps and an analysis of a very great amount of accurate data obtained experimentally from pumps of similar characteristics.

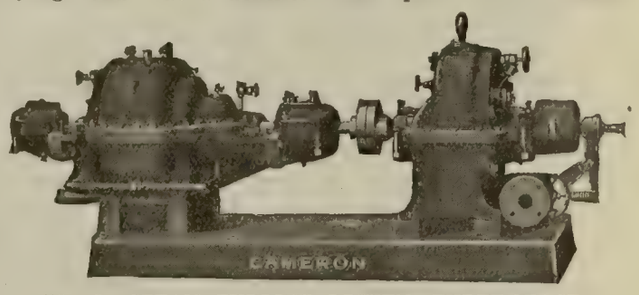


FIG. 5. STEAM TURBINE DRIVEN, THREE-STAGE TURBINE PUMP.

The production of an efficient and altogether satisfactory pump involves not only a correctly designed impeller, but the casing also must be of such mould and cross-section that changes in velocity of the liquid will take place gradually and without shock and disturbance. It requires very careful and accurate shop work to put into effect all these details so carefully worked out by the designer, in order that the finished pump may fulfill all the requirements specified, and it is, therefore, very essential that each pump be subjected to a performance test after completion, in order that any discrepancies may be detected and properly corrected. Each installation is a problem by itself and must be treated as such, if definite results and highest efficiency are to be realized.

Application and Uses

Centrifugal pumps may be driven direct or through belt or gear from electric motor, steam turbine or engine, or other source of power, as best suits the requirements of the particular installation. Direct connected to steam turbines they make highly satisfactory steam operated units. They operate on less steam and require less lubricating oil than ordinary steam pumps. They occupy small space, and their advantages in freedom from valves, valve motion, and rubbing parts are all too evident to need further comment.

Water Works Service.

Motor driven centrifugal pumps have met with great favor on water works service in small towns and villages. When operated in connection with stand pipe or

elevated tank, they may be arranged to be automatically started and stopped by means of a pressure regulator or float switch. When used with a direct pressure system, the pump or pumps may be run continuously maintaining the pressure and delivering only such water as is drawn from the mains. In localities where a part of the district supplied is on a higher elevation or some distance away requiring an excess pressure, it is found expedient to maintain a domestic pressure at the pumping station suitable for the greatest demand and to insert a centrifugal in the main that supplies the higher pressure. Such an installation is known as a booster pump and it may float on the line continuously adding a fairly constant net pressure irrespective of the amount drawn from that line. It is often the practice to use a moderate pressure in water mains for domestic service and to increase it materially in case of fire. As motor driven centrifugal pumps are preferably constant speed machines and, therefore, suitable for one pressure only, it is quite common in cases of this kind to install two or three duplicate pumps designed for domestic service and operating two in series to obtain increased pressure for fire service.

Quite a large number of turbine driven centrifugal pumps, running condensing, have been installed where in former years only crank and flywheel pumps would have been considered, and the improvement both as to reliability and economy has been so marked that at present their performance rivals the best triple expansion crank and flywheel pumping engines in total yearly operating cost, when due allowance is made for all interest and standing charges on the capital involved. These charges, of course, greatly favor the centrifugal unit on account of its comparative low first cost, together with that of the smaller building, lighter foundation, etc.

Boiler Feeding

Among the many uses of the centrifugal pump, boiler feeding is a service for which it is ideally suited. The pump is usually driven electrically or by steam turbine, whichever is best suited to the particular installation. In operation the motor-driven boiler feeder is generally allowed to run continuously at full speed, maintaining a fairly constant pressure on the feed line for a considerable range of capacity. The amount of water fed to the boiler may be controlled by a throttle valve in the feed line without danger of creating a dangerous increase in the latter, as the centrifugal will not build up a pressure exceeding 15% to 20% above normal pressure, even when the discharge is entirely closed.

Steam turbine driven boiler feeders are sometimes operated in this manner also, but they are more often equipped with pressure regulators of a type similar to those used on ordinary steam pumps to maintain a constant differential between the steam and the feed line water pressures, especially where the variation in steam pressure is considerable. Whether driven by electric motors or turbines, the feed water to the boiler can be regulated without reference to the pump, and further, there are no valves or large packings to be maintained, nor is there danger of water hammer and breakage in case of loss of suction as with reciprocating pumps.

Efficiency.

The efficiency of any centrifugal pump is highest at only one combination of head and capacity for each change of speed, and, therefore, if a pump is operated on a head or at a speed other than that for which it is designed, the amount of delivery and power required can be only approximately predicted. At the same time, the efficiency would likely be very low, making the installation quite unsatisfactory for the work it was intended to do, as well as expensive in cost of power for driving.

Low pump efficiency means increased power required, and even though it be but a few per cent. it must be borne in mind that this excess horsepower is consumed continuously while the pump is in operation and will total up to a considerable sum in a year's time, representing in dollars and cents more than the difference in cost of a well designed as against an inferior pump, or equalling the interest and depreciation on the entire installation for the same period. In like manner, the saving made by the better pump when compared with the common type, will invariably pay back its entire cost in a comparatively short time.

Wearing Parts

There are a few parts of the enclosed impeller type of pump that are subject to wear, namely, that part of the casing which makes a running joint with the impelled, and the sections of the shaft within the stuffing boxes and the bearings. If these wearing surfaces are provided with renewable parts that can be replaced at small expense, the main and more costly parts, being protected, will last almost indefinitely, ensuring a low cost of maintenance. Wearing rings secured in the casing around the impeller inlet protect the case from wear at this point, and a similar pair of rings made of bronze and secured on the impeller protect it from wear also. Bronze sleeves secured on the shaft and passing out through the stuffing boxes relieve it entirely from scoring by the jacking, or rusting. By supplying the bearings with removable ring-oiled split babbitt-lined shells of spherically seated type which may be easily slipped out when worn, and either rebabbitted or replaced by a new set, the alignment of the rotating element will not be disturbed, and the close fit between the impeller and case so necessary to prevent internal leakage, will be preserved. These features will be clearly illustrated by the views that will be shown on the screen a little later on.

Operating Conditions

It will be readily appreciated from the foregoing that in building a centrifugal pump for a particular installation, it is essential that the conditions of head, capacity and speed be accurately determined and furnished to the designer, together with any special requirements involved, especially if the highest efficiency is expected. It is not to be understood from this that the centrifugal pump is an extremely sensitive affair that will be efficient at one particular combination of head and capacity only, and of low economy when these ideal conditions do not obtain. The efficiency will remain nearly constant for a small variation in head both above and below the normal, the capacity varying inversely as the head, consequently it is usually safer to figure the total head a trifle high and design the pump accordingly, and then if the head is actually less, a slight increased capacity will result, which is not usually objectionable. Very often two or more conditions of head or capacity can be obtained from a pump of special design running at constant speed with a satisfactory balance of efficiency, and with provision for some speed variation the possibilities of designing for varying service are greatly increased.

Total Head

The total head on which a pump has to operate is made up as follows: Vertical static suction lift from the level of the liquid in the well or sump to the centre of the pump; static discharge head measured vertically from the centre of the pump to the point of discharge; friction in the piping, valves and elbows of both suction and discharge lines, velocity head, and entrance head. In addition the pump must overcome the loss of head within itself, but the builder only is concerned in this, and the efficiency of the pump is the ratio of the theoretical power required in raising the given quantity of liquid against the total head, to the sum of this power plus the hydraulic losses in the pump, and the friction in bearings and stuffing boxes. This sum is known as pump horsepower.

Effect of Speed Variation.

Both the total head and the capacity of a centrifugal pump are quite sensitive to speed variation, therefore great care must be exercised in determining the speed at which a pump is to operate in order that it may be designed accordingly. This is particularly essential when the pump is to be direct connected to a constant speed afternating current motor of which the speed at full load is several per cent. lower than at no load, and there is no convenient way of altering the speed of such a motor.

Priming

A centrifugal pump cannot raise a liquid to itself from a lower level without first being primed, because it possesses no positive displacement feature and, therefore, both the pump case and suction piping must be entirely filled before starting. Priming may be accomplished either by providing a good valve on the lower end of the suction line and filling the pump and suction piping from the discharge line or other source, or by drawing the liquid up into the pump

through the suction pipe by exhausting the air from the top of the pump case. With this latter method, the discharge must be closed off by means of a gate-valve, and the foot valve may be dispensed with if desired, provided the pump is started while it is primed. The air may be withdrawn from the pump by means of a suction pump, steam injector, or other means of creating sufficient vacuum to entirely fill the pump case.

Suction Lift.

Once in operation, a centrifugal pump will handle water or other liquid of the same specific gravity and character at ordinary temperature on as great a suction life as a reciprocating pump, namely, about 26 feet at or near sea level, and provided the suction piping and pump are entirely free from air and air leaks. Because of the difficulty sometimes encountered in maintaining air-tight suction glands and piping, 18 feet is, however, usually considered the maximum commercial suction lift, and even less is advisable whenever possible.

The limit of suction lift decreases with the rise in temperature of the liquid on account of the increased vapor tension, and it is not advisable to undertake any suction lift with water at a temperature exceeding about 150 deg. Fah., but rather have the pump so located that the water will flow into it by gravity. When handling water at or near the boiling point, as in boiler feeding, the water should flow to the pump under a head of from 6 to 10 feet, and the suction piping should be as direct as possible and of large diameter to eliminate the formation of vapor. Vapor or air or other gas in the pump in considerable quantity will collect within the suction opening of the impeller, being the point of least pressure, and impede the passage of the liquid, reducing the capacity of the pump, and at times causing it to lose its suction entirely.

Size of Piping

Bearing in mind the marked advantage of small suction lift, the intake pipe should be as short and direct as possible, with absolutely tight joints. It is usual to make the intake pipe and foot valve at least one size larger than the pump inlet to reduce friction, which, of course, adds to the suction lift. As the basic principles of the centrifugal pump require the liquid to be handled at high velocity, the suction and discharge openings are much smaller than are usual in reciprocating pumps of equal capacity, and the sizes of both the intake and discharge pipe lines should be determined from the amount of friction in the required length, which can be learned by referring to standard published friction tables.

Installation.

Centrifugal pump installations are usually provided with a gate valve in the discharge to shut the pump off from the line when not in use, or when open for inspection. There is nothing in a centrifugal to hinder the liquid flowing backward through it from the discharge line when not in operation, and consequently in case of a sudden shutting-off of the power, the impeller acting as a water turbine, may be revolved backward at a speed dangerous to both the pump and prime mover. A foot valve on the intake pipe will prevent this occurrence, or if this is not provided, a check valve should be located in the discharge. Where the operating pressure is great and a foot valve is employed, there should also be a check in the discharge to reduce the shock on the pump case when the foot valve seats. The check valve should be provided with a by-pass in order to prime the pump should the foot valve leak.

In placing suction and discharge pipe lines they should be free from high spots or loops forming pockets in which entrained air may accumulate, as the air bubbles thus formed will offer considerable resistance to the movement of the liquid by obstructing its passage, and in case of the suction pipe they are liable to enter the pump in such quantity as to cause loss of suction entirely.

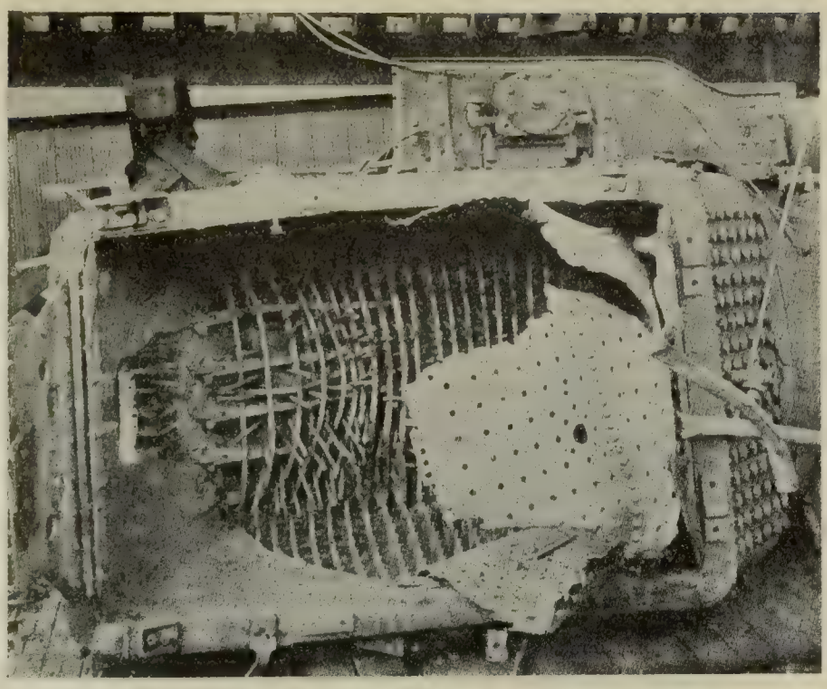


FIG. 1. SHOWING THE FURNACE AND CROWN SHEET.

LOCO. BOILER EXPLOSION

A RAILROAD locomotive boiler exploded recently and caused the death of five men and the injury of another. It will be seen that the crown sheet failed, which is a common method of failure with boilers of this type. The explosion is said to have been due to low water, which caused the crown sheet to become overheated. It is reported that the locomotive had been overhauled not long before, and that it had been in service but a day or two before the explosion occurred.

The boiler was built in 1905. The waist or shell was 69½ inches in diameter, and there were 273 tubes, each 2 inches in diameter and 162½ inches in length. The working pressure was 205

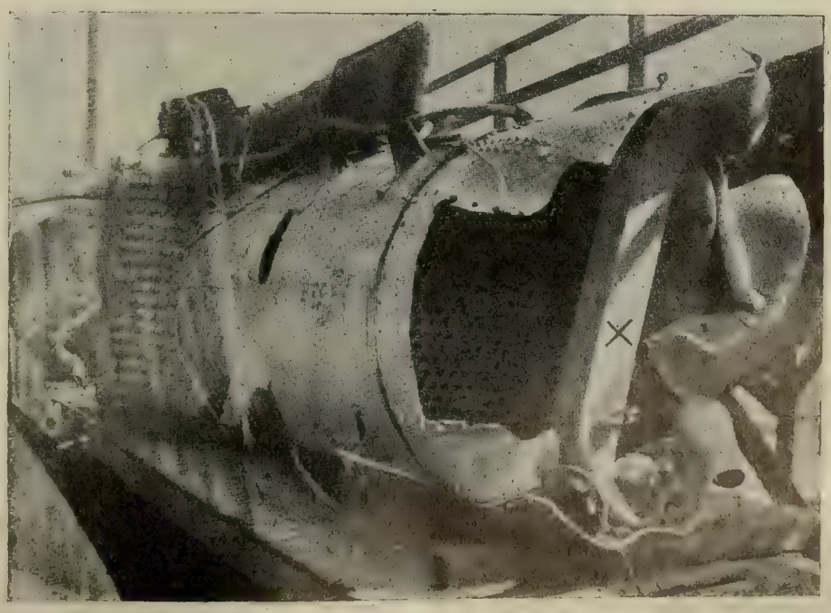


FIG. 2. FRONT END OF BOILER. NOTE RAILROAD TIE X WEDGED INTO SMOKEBOX.

pounds. We are informed says the Travelers Standard, that when the explosion occurred the boiler was torn from the locomotive trucks and was blown over a signal tower about 50 feet distant. It turned over twice during its flight, and landed about 124 feet from the spot where it started. At some time during its journey the front end of the boiler fell upon the right of way and cut off a railroad tie, which is shown wedged between the opposite sides of the front course of the boiler in Fig. 2. It is easy to imagine the extreme havoc that would have been wrought by the explosion if this had been a stationary boiler located in the boiler house of a power plant.

UNITED STATES TO LEAD IN SHIPBUILDING?

IN the recent purchase of 60,000 tons of steel ship plate by the French Commission, through J. P. Morgan & Co., at 6c a pound for hull plate and 8½c to 9c a pound for marine boiler plate, the attitude of the U. S. Government towards its Allies is clearly shown. Washington authorities were not satisfied with charges for plate over these prices, and the mills that have named minimum prices of 7c a pound for hull plate and 13c a pound for marine boiler plate to the Allies, were constrained to accept the Washington view, says the Wall Street Journal.

Plate mills could readily sell maximum capacity for another year on the basis of 12c to 12½c a pound for hull plate and at 10c to 11c for tank plate, so great is the demand at home and abroad; while marine boiler plate for forward shipment would readily command 16c to 17c a pound in the open market. Some mills have asked 20c a pound for boiler plates.

It will be recalled that the Navy Department secured a price of 2.90c a pound for ship plate from the steel manufacturers virtually under duress. The agreement was made between Secretary Daniels and President Farrell of the Steel Corporation, representing the steel makers; but some of the plate manufacturers declared at the time that they could not produce plate at that price and come out even, while others had only a small profit. Since that time, the productive cost has increased. It is claimed that even the Steel Corporation to-day has a profit of only $4 a ton in ship plate at 2.90c a pound. It is estimated that the cost of producing hull plate under present conditions is $60 a ton for some large mills and probably $70 a ton for mills that are dependent upon the open market for raw material.

Labor Cost at Steel Mills

A large percentage of the cost of producing iron and steel at any time is due to labor. Since the first of this year, the wage scale has been increased 40% to 50%, and labor efficiency has decreased 20% to 30% during the same time. Steel companies that have their own supplies of raw material, of course, have a lower cost than plants that must depend on the open market for their pig iron and other raw material. In ordinary times, the cost of converting pig iron into steel ingots ranges from $4 to $10 a ton. The cost is least where molten instead of cold pig iron is used. To-day the minimum cost of conversion is several dollars a ton higher; one authority places the minimum to-day at $7 a ton. To convert ingots into billets, the cost varies from $4 to $16 a ton; the minimum to-day is believed to be not far from $7.50 a ton. Cost of rolling steel varies according to the amount of gas consumed in the reheating furnaces and also depends upon whether gas or oil fuel is used.

Steel plates are rolled from slabs—where the rolling is not direct from ingots—and slabs are made from ingots. There is a loss of 20% to 25% from the ingot to the plate due to the necessary cropping of the ingot. Ship plate costs more than tank plate because of the additional physical and chemical tests that ship plate must meet. The minimum cost of converting ingots into finished plate to-day is fully $20 a ton for ordinary plate and may be as high as $30 a ton for ship plate.

U. S. Plate Mill Outputs

Output of the plate mills to-day is at the maximum in the history of the industry, and more new capacity will soon be active. Jones & Laughlin Steel Co. has just started a new 128 inch mill at the Soho Works with a rated capacity of 15,000 tons of plate a month. Bethlehem Steel Co. will start new mills with a capacity of about 10,000 tons a month, probably in September. The new plate mill of the Carnegie Steel Co. at Homestead is expected to be ready to roll in November, but the two new mills of the Brier Hill Steel Co. and the 84 inch mill of the Youngstown Sheet & Tube Co. will not be ready for 12 to 15 months. Illinois Steel Co., Worth Brothers, Corrigan & McKinney Co. and the Ashland plant also are building new mills. When all of these mills are in operation, it is estimated that the United States will have a capacity to roll 430,000 tons of plate a month, of which about 230,000 tons will be ship plate. To-day the monthly rolling of ship plate is about 150,000 tons, or approximately 42% of the total output.

In recent weeks the United States Government has been receiving about 50,000 tons of plate a month from the Carnegie Steel Co., and with the Allies has been getting about 40% of the entire capacity of all of the plate mills. The embargo declared by the President against export of ship plate to become effective August 15, of course, is a step to husband plate resources for Government needs.

It is an interesting fact that some of the ship plate bought by the French Commission about two weeks ago, to be used to build war ships and barges to carry supplies on rivers and canals in France, have already been shipped, and the balance will be exported in September or October. It is stipulated in the Morgan contract that if for any reason exports are held up, and it becomes necessary to store the plate, that the mills will receive 90% of the purchase price. One of the mills has asked for an additional payment of $2 a ton a month for storage if warehousing becomes necessary. There are many thousand tons of plate already sold for export that remain at the mills or at the seaboard waiting Government licenses, but shipments to England France, Italy and Russia have gone forward without much delay. New inquiries from Japan and Italy, however, are still going begging.

It should be recognized that the plate mills have taken relatively few orders at the high prices current in the open market recently, but that the bulk of the merchant business has been booked at prices ranging from 4c to 5c a pound, and the large tonnage for the United States Government will be furnished probably between 2.90c and 3.50c a pound. Some mills contend that 4½c would be a fair price for government work.

When the plate mills now building are in commission, the United States will have capacity to produce 230,000 tons of ship plates a month or 2,760,000 tons per annum. This will be sufficient to permit the building of 690,000 tons of shipping a month, or 8,280,000 tons a year. In an emergency, tank plates can be used for the building of small boats, so achievements may be even greater than anticipated. The total capacity to produce all kinds of plate in another year will be 5,150,000 tons per annum. The United States will emerge from the war as the greatest shipbuilding country in the world; not even second to Great Britain, and if the success of the war depends upon ships—as it seems—the fate of the Teuton is sealed.

ADDITIONAL AIR OVER FUEL BED

ADMISSION of air into the boiler furnace through leaks in the furnace wall is undesirable and should be avoided.

The ideal way to supply additional air over the fuel bed is to introduce it as close to the latter and in as large a number of small streams as possible. The nearer the air is introduced to the surface of the fuel bed, the more combustion space is utilized for mixing air with the combustible gases and for burning the mixture. A large number of small streams of air entering the furnace facilitates mixing the air with the combustible gases, particularly if it is forced in at high velocity. When the air is introduced in one large stream at low velocity it tends to flow parallel to the stream of combustible gases without mixing with them, thus causing slow combustion. The rate of mixing determines the rapidity of combustion of the combustible gases. With a perfect mixture and the usual furnace temperature, the velocity of combustion is very great indeed, so that the combustion is almost of the nature of an explosion.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

ENGINE-HOUSE EFFICIENCY

By L. E.

AN important difference is to be observed between the boiler house and the engine house as regards the securing of maximum efficiency. In the boiler house, once the design of the plant is satisfactorily settled, everything depends upon the operator. In the hands of a skilful fireman an ill-designed plant may be made to give quite passable results; in the hands of an unskilful fireman the best plants may show a deplorably poor efficiency. Even with mechanical stokers the personal factor is important; with hand firing it is also important. But when one passes from the boiler-house to the engine-house the order is reversed; the determining factor is here the machine rather than the man. If the engine is well designed for the load, and conditions which it has to meet, if the loads on the cylinder are well proportioned, and the valves correctly set, then the engine when set to work will give of its best without any large amount of supervision or alteration by the engineer. Care must, of course, be exercised in seeing that lubrication is perfect, the cylinder must be indicated regularly, to see that the valves are in correct adjustment, and slight alterations made accordingly; the valves and piston must also be tested regularly for steam tightness.

Generally speaking, however, the operations going on in the engine are entirely automatic, and do not require the constant control of the engineer. The normal operation of the engine on which the steam consumption depends is out of the control of the engineer after he has correctly adjusted the parts. For these reasons, power plant owners, while taking care to have good design and skilled operation in both departments, should give especial attention to the machine in the engine room and to the man in the boiler-house.

Engine Losses.

The efficiency problem in the engine-room is mainly one of installing machinery so designed and constructed as to convert the energy in the steam received from the boiler-house into the greatest measure of mechanical power, which means the least losses of heat between the steam inlet valve and the rim of the flywheel.

It has been determined that of the total heat in the fuel, something like 41 per cent. is lost in the engine. This loss is comprised, as to a very small part, of engine friction and radiation; the bulk of it is accounted for by the heat that passes away in the exhaust steam to the condenser. This latter loss is for the most part unavoidable, being due to the limited range of temperature within in which it is possible to work without resorting to expedients more costly than any economies to be effected. With an average modern engine working under good conditions, using steam at 100 deg. superheat and discharging into an efficient condenser, something like 11½ lb. of steam per indicated horse-power will be used, which means that only 25 per cent. of the heat in the steam is turned to account as mechanical power. But between the absolute minimum of loss necessitated by the nature of the case and the loss which may occur in an engine which is badly designed, constructed and maintained a considerable margin exists, and it is for the power user to reduce this margin to the lowest figure attainable. In a paper read by Mr. John Ingham before the Yorkshire Association of Textile Managers, reducible heat losses in the engine-house were classified under the following heads:

(a) Leakage of steam past valve and pistons.

(b) Cylinder condensation.

(c) Loss due to large clearance.

(d) Loss of heat between the cylinders.

Valve Leakage.

Take first the loss due to leakage past the valve. Theoretically, when the valve has closed on its seating, no steam should enter the cylinder. Practically there is great difficulty in obtaining and maintaining a steam-tight valve. Whether the valve employed be a slide, Corliss, piston, or drop valve, some leakage takes place. Further, whilst the valve might be steam-tight when tested under pressure when stationary, slight distortions are possible when working, which will cause leakage. With well-bedded valve faces in good condition, the loss will not be much, but periodical tests should be made to ensure that all valves are reasonably steam-tight. Some leakage will similarly occur past the piston. Piston rings and cylinder liners will wear, and although many ingenious devices are in use for maintaining steam-tightness under difficult conditions, tests should be made and the parts examined regularly to make sure that the steam does its work without taking a short cut past badly fitting piston rings.

The loss due to cylinder condensation depends on the range of temperature in the cylinder, or the difference between admission and exhaust, and upon the time the cylinder surfaces are subjected to the lower temperature. Consider for a moment what happens in, say, a Corliss cylinder. Steam is admitted to the cylinder, and fills the cylinder up to say, 25 per cent. of the stroke with steam at, say 480 deg. Cut-off takes place, and steam is expanded down, and, at, say ⅞ of the stroke the exhaust valve opens, and the steam passes away to the low-pressure cylinder at a reduced temperature. During the rest of the forward stroke, and up to almost the end of the return stroke, the exhaust valve remains open, and the cylinder walls are subject to the cooling effect of the low-temperature steam. Consequently on the next admission of steam a certain proportion of the heat in the steam is expended in heating up the cylinder walls. The remedy for this is to reduce the temperature range in any one cylinder or to reduce the time during which the cylinder walls are exposed to the lower temperature.

Clearance.

Another factor to which loss may be due is large clearance spaces. The most economical engines, other things being equal, are those with the least clearance. With the piston at one end of the cylinder closed, the space between the back of the pistons and the cylinder cover, and the passages from the valves to the cylinder, must be filled with steam every stroke, and although cushioning after the exhaust valve closes partly affects this, yet much new steam is wasted every stroke from this cause. Any design of cylinder which reduces the clearance space makes for steam economy.

There is, finally, the loss of heat which takes place between the cylinders in compound or triple-expansion engines. An examination of the combined diagrams from such engines reveals that material loss does occur at this stage. It can be reduced considerably by good design and care in covering, and by properly draining the connection between any two cylinders, but it can only be eliminated by allowing the whole of the expansion to take place in one cylinder. In all types of steam engines greater efficiency can be secured by close attention to these four principal sources of heat loss, but in what may be called the standard types of engine there are limiting conditions which prevent improvement beyond a certain point.

Uniflow Efficiency.

There is a type of machine, however, in which piston leakage, cylinder condensation, and clearance losses are reduced to a minimum, and between-cylinder losses are eliminated. This type, known as the uniflow type, was introduced into this country some six years ago, and has won steadily increasing recognition. Instead of exhaust valves, it has a ring of exhaust ports round the cylinder midway in its length, and as the piston reaches the end of its stroke it uncovers the port automatically, and

allows a free escape of steam to the exhaust. The cylinder is much larger than in the standard design of engine, and the piston is about three times as deep as the ordinary piston . The steam cycle in the uniflow cylinder is fairly generally understood. The steam valve opens and admits steam expands in the cylinder as the piston moves formard. At a pre-determined point cut-off takes place, and the steam expands in the cylinder as the piston moves forward. When the stroke is nearly completed, the circular exhaust ports surrounding the cylinder are uncovered and the steam escapes to an annular chamber, which is cast round the cylinder ,and thence direct to the condenser. The area of the exhaust ports thus uncovered is many times greater than could be provided by any exhaust valve, and consequently the exhaust steam can be got away to the condenser rapidly. As a matter of fact, the piston only just uncovers the openings, and then closes them on its return stroke.

The period during which the cool temperature of the condenser is in touch with the cylinder walls is consequently about ⅛ of the stroke, as against ⅞ of a stroke in the ordinary form of cylinder. Compression, of course, commences immediately the ports are closed again, and is carried up to almost the initial pressure.

The heat economies in this type of cylinder are due mainly to two things; first, to reduced cylinder condensation resulting from the diminished time during which the cylinder walls are exposed to the condenser temperature, and second, to the elimination of exhaust valves and the clearance spaces which they entail.

High Vacuum Effective.

A further gain, however, results from the fact that the large area of the exhaust ports permits the bringing of a high vacuum into effective use on the cylinder. To make the most of this factor, special condensing plant must be employed. Where an adequate water supply is available, and a suitable type of condenser is used, it is possible to maintain an effective vacuum of 28 in. and even 29 in., on the piston. The uniflow type of engine has also mechanical advantages. It is simpler in construction and has fewer parts. The working friction is, consequently, less than with a cross compound engine, and a mechanical efficiency as high as 94 per cent. can be obtained. The costs of attendance, oil, repairs and insurance are correspondingly reduced; and the first cost of building and foundations is much smaller. Because of its moderate speed the engine is particularly suitable for weaving sheds, since it can be coupled direct to the main line shaft without the interposition of ropes, belts or gears. Mr. Ingham places the overall economy of such an engine and drive at from 5 to 7 per cent. higher than that obtainable from a cross compound engine.

The engine has also the same rate of steam consumption per horse-power over a fairly wide range of load, which is important in the case of mills where the load is variable or in new mills where it is necesary to have a margin of power available against future extensions. As to speed regulations, a maximum variation of 1½ per cent. has been obtained in everyday practice. This tained with first-class cross compound engines, but is quite satisfactory.

ACCURATE MEASUREMENT OF WORK

By Mark Meredith.

IT has been said, and few would be bold enough to deny the substantial accuracy of the statement, that it was not until shortly after the outbreak of the war that the British manufacturer got his first chance of manufacturing parts in large quantities. He was then placed at the additional advantage that he was working in conjunction with those who, under normal circumstances, would have been his competitors,but even so he found himself hampered by a want of knowledge regarding standards and the methods by which interchangeable parts, such as screws, could be produced quickly, accurately, and efficiently. The manufacturer, however rose quickly to the occasion, and, assisted by the skilled workman, placed the production of small parts on a sound footing. It is only fair to admit that a large share of the credit due has to be given to the manufacturers of the light, high speed machinery which has been imported into the country in such quantities since the outbreak of the war.

Previously, most of the work done in that country was carried out by home-produced tools, and as there was comparatively little repetition work there was no inducement for any engineering firm to provide special equipment and appliances. Only a few, highly specialised on account of the nature of their work, paid serious attention to accuracy of measurement and interchangeability of parts. Of these, some even had their own individual standards, which were not in accord with those of other firms producing similar articles. Numerous instances of this will occur to the mind of the mechanical engineer, and the electrical engineer will remember how, a few years ago, lamp holders for incandescent, electric lamps, and lamp tops, both of which parts were being turned out by the hundreds of thousands, were not standardised, and were not interchangeable.

These facts are all the more curious in that it is an admitted fact that forty or fifty years ago Britain held the premier position as regards the production of accurate work, and apparatus by which it could be produced. An instance of this was recently given in connection with screw thread work. eighty or ninety years ago, when screws were used in comparatively small quantities, every maker was a law unto himself over such details as diameter of screw, shape of thread, and number of threads to the inch. With a curious lack of foresight many makers went out of their way to produce screws and other small parts which were out of accord with those made by other firms in order that no parts could be used on his machines other than those which were manufactured at his own works. Whitworth was the first to see the folly of this course of action, and he made a strenuous effort to remedy the state of affairs. Even his great efforts took some time before they met with any marked success, and it may be said that the success reached was only attained because he not only set higher standards, but provided the means by which they could be attained.

It is interesting to note that of the measuring equipment now used in the average British workshop about 90 per cent. is of American make, and almost all the remainder has been produced on the continent, and it is said that not only are very few machines in this country capable of cutting an accurate screw thread, but there is no British-made apparatus available and within the reach of the ordinary manufacturer whereby he can precisely measure the result, and much special apparatus cannot be produced without the use of American-made micrometer heads.

SAFETY IN PIT SINKING

By D. Street

SOME highly interesting evidence as to the value of the cementation process in mining has been adduced by the Midland Institute of Mining, civil, and Mechanical engineers. Among the cases in which the Francois System of cementation had been successfully applied are shaft-sinking, or level driving, underground dams, underground fires, defective boreholes, and defective shaft-lining. Cementation as applied to shaft sinking consists of thorough treatment of the measures through which it is desired to sink, thus rendering them practically watertight by the injection of cement into all the existing fissures or cracks in the ground previous to the commencement of actual sinking operations.

Among various instances of the application of the process, is that at Hatfield Main Colliery, and here cementing was decided upon for sinking through the heavily watered porous new red sandstone, and was commenced on the lands which had so far proved successful in ordinary stratified measures. In this case, however, it was soon discovered that in these measures the ordinary cementation process, alone, was of no service, it being found practically impossible to introduce cement into the ground to any useful purpose, as it was washed out by the pressure of the water. Instead, however, of discarding the process altogether, the work was persevered with, until finally, all difficulties were overcome by the introduction of the mechanical process of precipitation which facilitated the introduction of the

cement into the ground. Two chemical solutions were employed, the properties of which produced, when mixed, the formation of the gelatinous precipitate, which, by sealing the pores of the sandstones in the walls of the fissures and the loose material in the fissures, permitted the introduction of the cement. The chemicals used in this instance were silicate of soda and sulphate of alumina and the most efficient precipitation effect was obtained, by experience, in the degree of concentration of the respective solution. The lining of the two shafts consisted throughout of ferro-concrete.

At Rossington Colliery, cementation was effectively applied during the sinking through water-bearing limestone. A claim which might be justly made for the cementation process was its comparative safety. It made the work of the pit-sinker more secure, and reduced the liability to shaft accident due to a fall of bad ground. The chemical solutions which were employed at Hatfield Main had the effect of lubricating the fissures and allowing the introduction of the cement. In many cases the quantity of water in pit shafts, especially in North Wales was accepted as a necessary evil, but not to a necessity. If colliery managers knew what could be done by the cementation process, they would make efforts to get their mines dry. Very great benefits could be secured, which took a great load off the shoulders of the manager. At Vimy, near where British troops have been fighting, two shafts were sunk through chalk. The ground was very wet, but was cemented to a depth of 130 yards, and they had not one bucket of water.

LOST OUTPUT FROM COAL MINES

THE present wastage of man-power, with a corresponding loss in the national output of fuel, is of such importance as to call for the introduction of measures which will ensure to the nation the full-time service and labor of every mine worker. Thousands of miners have during this year worked only part time, the districts which have suffered most being perhaps the North of England, South Wales, and Monmouthshire and Scotland. It has been stated that the miners in Fifeshire and other districts have had just three days' work per week since the beginning of the present year, and that shortage of trucks has been responsible for laying several pits idle many days recently in the eastern valleys of Monmouthshire. For this state of things there is a remedy, which, though not altogether a profitable one from a pre-war point of view, has much to commend it in present circumstances. This remedy would be secured by giving effect to the following:—

1.—Every working colliery, irrespective of the general demand for coal, should bring to bank the largest possible amount of coal—that is, every mine worker should have whole-time employment.

2.—In the case of transport difficulties or irregular demand for coal, the surplus output should be stored; at some collieries the small coal could be converted into briquettes and stored in this form for future use.

3.—If the stores of coal were likely to become too large (the nation would be the better for having a reserve store of some millions of tons) short time should not be introduced, but specially selected collieries should be closed down and the labor thus released transferred to the ironstone mines or to other industries or works of national importance.

Handling and Weathering

The disadvantages of coal storage are: —(a)—Loss due to cost of handling; (b) —loss due to weathering; and (c)—possibility of spontaneous ignition.

The cost of storing the coal and then removing it from the stock ground will, of course, depend on the facilities provided for handling; but the amount spent in this way will only be a very small fraction of the present national loss due to capital, labor, and plant being employed only part time. Stock grounds or coal stores would be so situated as to suit the requirements of each particular colliery or group of collieries. The coal in most cases would be stored at or near the pit mouth—i.e., at the point of production; but it might also be stored in some cases at or near the docks, and if transport facilities allowed consumers might be given the option of storing against their future demands.

The loss due to weathering need not cause much concern, since it would not be large from the pecuniary point of view. Colliery owners could in many cases select for storage the coals which, owing to their physical properties and chemical composition, are most immune from the effects of weathering or storage. Some tests on the effect of exposure on certain coals yielded the following results:—

Description of Coal	Storage Condition.	Effect on Calorific Power.
Bengal coal, India	Large stocks exposed for 12 months in the open.	Depth of stock, 4 ft. Average loss, 7.6%.
*Scotch anthracite cobbles	Sample exposed to all weathers in England for 2¼ years.	Loss 3.3%
*Scotch house coal	Sample exposed as above for 2¼ years	Loss 8.4%

*These coals, if stored in large quantities, would not show such a loss, as the coal which is covered by the overlying layers would be protected from the effects of the weather.

Spontaneous Ignition

Under reasonable conditions of storage, any loss due to spontaneous ignition will be infinitesimal. Coals which are specially susceptible to spontaneous firing are in most cases well known and comparatively few in number. The stocks under the scheme proposed would be accessible to complete supervision, and as a precaution the following points should be observed:—

1.—The depth of the stacks should be kept within the safe limit; a large mass of coal is more likely to heat than a mass or stack of moderate depth.

2.—The presence of sulphur in the form of iron pyrites may be a source of heat owing to the reaction between the sulphur and oxygen. Thus the coal stacked should be as free from iron pyrites or brasses as is practicable.—Times Engineering Supplement.

LARGE TRADE INCREASE

CANADA'S trade, exclusive of imports and exports of coin and bullion and of foreign merchandise shipped through, increased, according to a statement by Hon. J. D. Reid, Minister of Customs, by almost one hundred million dollars in July last, as compared with July, 1916, and by nearly $290,000,000 in the four months ended July 31, in comparison with the like period last year. The value of merchandise entered for consumption in July, 1917, was $90,181,595, and in July, 1916, was $63,622,687. Goods entered for consumption in the four months of the present fiscal year amounted to $382,100,850, as against $249,867,867 in the like period of 1916. Exports of domestic goods reached $177,366,148 in July last and $507,854, 674 in the four months' period. They were $104,964,270 in July, 1916, and $350,345,305 in the first four months of the last fiscal year.

Exports of foreign merchandise have shown a decided falling off. They were in July only $2,850,372 and in the four months $11,604,620, while in the same periods of 1916 they reached $55,637,340 and $122,627,072 respectively.

Of the imports for consumption, $49,442,400 in July were dutiable and $40,739,195 were on the free list. During the month Customs duties were collected to the amount of $14,241,047, as compared with $11,071,100 in July, 1916. Of the imports in the four months' period $202,470,345 were dutiable, and the duties collected totalled $60,528,738, as compared with $46,063,507 in 1916.

There was a decided increase in exports of animals and their products in the periods covered by the statement. Exports of agricultural products in July about equalled those of July, 1916, but there was an increase of $34,000,000 in the exports of these goods in the four months of the present year as compared with the like period of last year. The greatest increase was in manufactures. Manufactured goods to the amount of 104,649,862 were sent out of the country in July, and to the amount of $237,480,303 in the four months of this year.

In July, 1916, exports of manufactures were valued at $38,264,136, and during the first four months of that year they were $119,824,138.

The truly big man does not take advantage of his fellows nor take offence at trifles.

He who helps, gets helped. That is simply another, as well as homely, way of expressing the golden rule.

STEEL INDUSTRY DEVELOPMENTS

The War-Created Stimulus given the Steel Industry is Reflected alike in the Nature and Application of New and Improved Equipment being Installed and Developed.

TURBO-BLOWERS FOR BLAST FURNACES—II.*

By R. H. Rice and S. A. Ross.

UNTIL recently there has been a considerable difference in the efficiency of utilization of blast furnace gas as between the steam engine and the gas engine, but the latest types of steam turbines permit a steam plant to be operated with the same output of electric power to the mill, while also furnishing sufficient gas for blowing purposes, as plants containing gas engines, by the use of a very reasonable amount of make-up coal, as will be seen in the accompanying table, under Charges, Dollars per year. Therefore, the cost of fuel is one of the smaller considerations in judging the relative merits of these two types of installation; whether the price of coal is high or low, the comparison rests on other grounds.

Even with less efficient turbines the cost of coal for make-up is only one of the items which enter into the complete cost of operation, and we can make up a proper comparison of gas engine and steam turbine plants by adding both the fixed charges and the running charges in each case, and adding the excess cost of coal in the turbine plant, if any; and that plant which gives the least total with these figures is the better, regardless of its thermal efficiency.

Blast Furnace Cost Accounting

Blast furnace and steel mill plants have established certain arbitrary subdivisions for convenience in cost accounting; blast furnace cost, gas purifying cost, gas power station costs, etc., being kept as independent groups and charges being made from one department to another. These sub-divisions are not used here. The gas from the furnaces is used for the following purposes: Blowing the furnaces, pumping the necessary water for use about the blast furnace and in steel mills, and generating electricity for driving the steel mill and all auxiliary apparatus about the blast furnace plant.

On this basis complete plants have been laid out for a steel mill as an adjunct to four blast furnaces, one of these plants operated by gas engines and the other by steam turbines. These have been called "Typical Gas Plant," and "Typical Steam Plant," respectively. These plants include a blast furnace blowing station, an electric generating station and a pumping station. The figures used for operation, including the amount of carbon burned in the furnaces, gas supplied, electric power produced, water pumped, etc., are all representative of actual blast furnace and mill conditions. The costs have been carefully collected and adjusted to represent prices ruling in November, 1916.

Gas Plant Constituent

In the four-furnace gas engine plant there is included a gas-electric and gas blowing station with the necessary steam spares for emergencies. It also includes a boiler house supplying steam for various purposes and fired by gas when it is sufficient, and by coal when it is not. There are also proper gas washing and pumping stations.

The plant will be of proper size to supply all the blast furnace demands of air, water, steam and electricity. In addition it will supply during week day working hours, 5,000 kilowatts per furnace, and 4,450 gallons of water per minute per furnace for steel mills. During the time when gas is insufficient to enable the full output of the steel mills to be produced, coal will be used for make-up, the cost of which is included in the figures.

The carbon burned or gasified in the furnace is taken at 12.835 short tons per furnace per month. This corresponds to 400 tons of pig per day, with a coke rate of 2,100 pounds per long ton, or 500 tons per day with a coke rate of 1,700 pounds per long ton.

Typical Turbine Plant

The four-furnace steam turbine plant contains boilers and turbo-generators of sufficient capacity to make the output to steel mills of water and electric power equal to that of the typical four-furnace gas plant previously given. The power house will contain six turbo-blowers and three 12,000 kilowatt turbo-generators with the necessary auxiliaries including pumps for supplying all of the water used about the plant, boiler feed pumps, feed water heater, etc.

The steam conditions will be such as are used in modern electric stations, 235 pounds per square inch gauge, 200 degrees superheat and 28.5 inch vacuum. It turns out that no coal is needed on the average, but to equalize poor gas supply and excess power demands, an amount is used to bring the operation on a par with that of the gas engine plant.

It is to be noted, however, that even with 150 pounds and 28 inches vacuum, a steam plant would make a good showing, of course including the cost of the coal, which would then be greater.

Cost Comparisons

Comparisons have been made by others between gas engine and turbine plants using estimated figures for the most part. Such figures started out with an assumed amount of blast furnace gas produced per ton of iron and with a full load test figure for gas engine efficiencies; and practically 100 per cent. volumetric efficiency of reciprocating blowing tubs. All such suppositions are avoided in the present comparison. All of the

COMPARATIVE COSTS FOR TYPICAL FOUR-FURNACE PLANTS

First Costs

	Gas engine	Steam turbine
Primary washers	$ 131,250	$131,250
Secondary washing station	300,000	.....
Gas pipe from boiler house	212,500	.....
Boiler and piping	167,500	609,200
Boiler house	41,250	123,750
Electric station apparatus	3,250,000	745,600
Electric station house	250,000	69,200
Blowers, etc.	1,812,500	726,416
Blowing station house	237,500	69,200
Pumping station, standpipe, conduits	787,500	293,484
	$7,190,000	$2,768,100

Charges—Dollars Per Year

	Gas engine	Steam turbine
Running charges:—		
Primary gas washers	$ 2,100	$ 2,100
Secondary gas washers	42,000	.....
Boilers	12,000	52,750
Electric station	90,000	68,250
Blowing station	49,500	42,000
Pumping station	6,000	4,000
Running charges, total	$201.600	$169,100
Fixed charges at 13 per cent.	934,500	359,800
Coal	21,652	78,352
Total charges	$1,157,752	$607,252

*From a paper read before the Engineers' Society of Western Pennsylvania.

**Of the Engineering and Turbine Research Departments, General Electric Co., Lynn, Mass.

data is secured from plants in actual operation, and this information is used in such a way as to avoid assumptions of fundamental values.

Taxes, interest and obsolescence or amortization are included under the head of fixed charges. (Depreciation is supposed to be divided between repairs, maintenance and obsolescence). Fixed charges are taken throughout at 13 per cent. This is a customary figure for gas engine plants. Steam turbine electric stations often use a lower figure in the neighborhood of 11 per cent.; therefore, the use of a figure 13 per cent. throughout is relatively favorable to the gas engine case. The fixed charges include the following items:—

	Per cent.
Interest (on bonds or capital invested)	5
Taxes	1
Insurance	1
Obsolescence (amount laid by as a sinking fund to retire or amortize the plant)	6
	13

The running charges include operating charges and also charges for maintenance and repairs, so as to keep the plant in first class condition up to the time it is fully amortized. Total charges are found by adding fixed charges, running charges and cost of coal. Make-up coal is used under emergency conditions and the cost of it is included in the total charges mentioned. Coal is taken at $2 per long ton delivered at the fireroom door, with 13,500 British thermal units per pound.

The running charges of the turbo-blowing apparatus are taken from the actual figures of cost of a turbo-blowing station which had been in use seven years —but adjusted by increasing them 25 per cent. to represent November, 1916, conditions. The running charges for the turbo-generating apparatus are representative figures from central power stations, similarly adjusted.

Heat balances of furnace during average week day working hours are given below. There is a margin on the average for fluctuation of gas and load. The figures are as follows:—

Gas Engine Plant

	Million B. T. U. per hr.	Per cent.
Boilers	62	5.8
Electric station	380	35.3
Blowing station	88	8.2
Stoves	323	30.0
Margin	223	20.7
	1,076	100.0

The figures for British thermal units for the turbine plant are divided proportionally to the steam consumption, allowing 70 per cent. boiler efficiency. These sub-divisions are nearly, but not exactly, comparable with the gas plant, the internal gas washing, electric and steam distribution being different. The figures are as follows:—

Steam Turbine Plant

	Million B. T. U. per hr.	Per cent.
Pumps and miscellaneous	81	7.5
Turbo generators	420	39.0
Turbo-blowers	148	13.8
Stoves	323	30.0
Margin	223	20.7
	1,195	111.0
Deduct heat from coal	119	11.0
Heat from gas	1,076	100.0

This comparison is based on the best gas engine figures for actual performance which have come to the authors' attention. The use of the figures from another and larger installation would render the use of make-up coal unnecessary except under circumstances which require its use in either plant.

The results show that, in the plants under discussion, the gas engine plant will cost nearly $4,500,000 in excess of the steam turbine plant. The operating cost, it is believed, will be about $550,500 per year more in case of the gas plant.

On the usual basis of computation employed in considering the advisability of installing more economical units in our central power stations, the saving to be realized by the use of the steam plant would justify an excess first cost of $5,505,000, whereas the steam plant actually costs $4,422,000 less. No matter what differences of opinion or of fact due to locality or type of installation may be applied to these figures, it may be accepted as certain that wherever fixed charges are assessed against the power plant, the steam turbine will show a balance in its favor.

CANADA'S SUGAR BEET INDUSTRY PROMISING

THE sugar beet is one of the best crops in Western Canada. With the necessary labor and capital, it is stated a most successful industry could be built up.

In Southern Alberta the area suited to the growth of sugar beets is greater in extent than any two of the largest producing districts in the United States. That more has not been heard of the possibilities of this crop in Alberta is due to the success of the farmer in grain growing and stock raising. But, just as a higher quality of grain with larger yields, is produced in Western Canada than in the older districts, so beets grown here generally contain a higher percentage of sugar and yield a greater tonnage to the acre than those grown elsewhere. Beets with a sugar content of 20 per cent. have been grown in successive years, and growers are confident that this percentage can be maintained with large crops.

In 1915 the consumption of sugar in Alberta was approximately 42,000,000 pounds; in British Columbia, 33,000,000; in Saskatchewan, 50,000,000, and in Manitoba, 43,000,000 pounds, making a total for the western provincec alone of 168,000,000 pounds. The total production of sugar in the whole of the Dominion amounted to 37,000,000 pounds. A large market is therefore, right at the door. Alberta alone has an area sufficiently large to produce sugar for the needs of Western Canada, and also to export large quantities.

CANADA'S PULP INDUSTRY

THE progress that Canada is making toward becoming the world's centre for the manufacture of pulp and paper is indicated in figures recently published by the Department of Trade and Commerce. For the year ended July, 1916, the exports of paper amounted to $21,678,868, of which 88 per cent. went to the United States and 5.2 per cent. to the United Kingdom. This total is an increase of 31 per cent. over the figures for the year previous. The first export shipment of paper from Canada was made in 1892. The total exports for 1902 were but $24,000 and for 1913 only $6,327,000.

The total exports of paper, pulp, and pulpwood for the year ended July, 1916, were $40,865,266, of which the United States received 87 per cent. and the United Kingdom 6 per cent. The increase over the previous year was 27 per cent. On the other hand, Canada imported, during the year ended July, 1916, $6,327,398 worth of paper and manufactures of paper.

The foregoing facts, in conjunction with the use by Canadian pulp and paper mills of nearly $9,500,000 worth of pulpwood, indicate the tremendous drain upon Canadian pulpwood resources, according to a statement issued by the conservation commission. This drain is likely to increase rather than diminish, in view of the rapid depletion of accessible supplies of timber suitable for pulpwood in the United States.

If this great source of national wealth is to be perpetuated, much more stringent measures than in the past must be taken to prevent destruction by fire and to insure the restocking to valuable species of cut-over and burned-over areas.—"Monetary Times."

MOVING A BLAST FURNACE.

MOVING a blast furnace is something new in the iron and steel industry, but this has been undertaken by the Algoma Steel Co., which has purchased the No. 2 furnace of the former Canada Iron Corporation, Midland, Ont., and is now moving the entire furnace, including stoves, boilers and buildings, in fact everything but the foundations, from Midland to Sault Ste. Marie, a distance of about 400 miles. The steel company purchased this unused furnace because it expected that it could dismantle the plant and re-erect it in much quicker time than a new furnace could be built under the present conditions. This is a 275-ton stack. The contract for moving material required for its re-erection and enlargement has been placed with Arthur G. McKee & Co., consulting and contracting engineers, Cleveland.

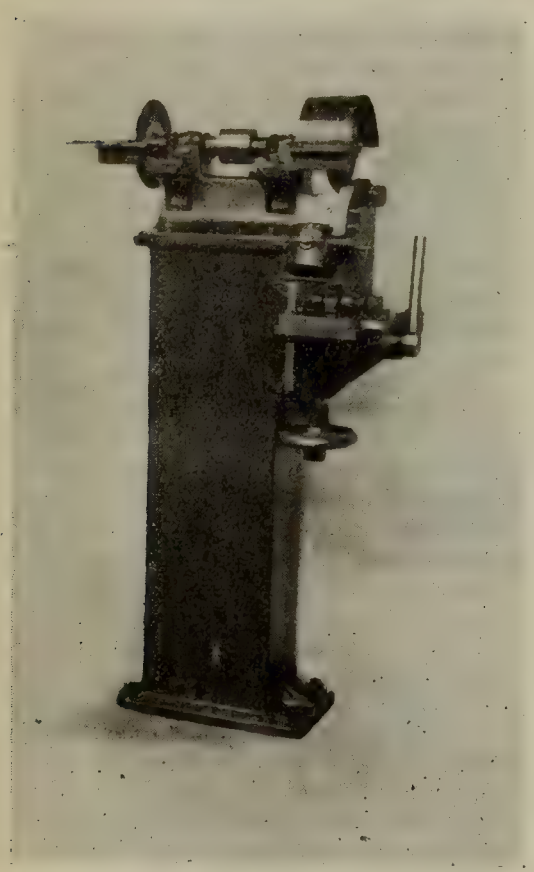
PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

NAIL DIE GRINDING MACHINE

THE rapid and accurate grinding of nail machine dies, is a pre-requisite in the economical operation of nail machines. In connection with their line of nail machines, sleeper & Hartley, Inc., Coaticook, P.Q., have designed the die grinding machine illustrated herewith, and are now marketing it for use with dies of all kinds.

The machine is provided with two wheels, mounted on a double-ended spindle. One of these wheels is for squaring



NAIL DIE GRINDING MACHINE.

the dies, and guides for this purpose are provided upon the work rest,—the other wheel has a V-shaped, formed edge, and is intended for grinding the pointed dies. Below this wheel a table is mounted on the machine frame for vertical travel, and is adjustable to and from the wheel by a screw and hand wheel. This table carries a support adapted to receive the holder in which the die is mounted for grinding, the support being adjustable laterally, so as to bring the dies into line with the wheel.

The die holder itself may be rotated in the support so as to locate the die at will in any one of three grinding positions. When positioned, the die (together with its holder and support) is reciprocated to and fro past the wheel, while the whole table may be fed to or from the wheel as desired.

Operation of the machine is easily acquired by unskilled labor and accurately and uniformly ground dies can be produced without the aid of a skilled mechanic.

Normal equipment of the machine consists of one die holder to customer's specification, an additional die holder being required for each section of die stock. The machine is furnished with countershaft, weighs 350 lbs. net, and occupies a floor space of 16 in. by 22 in.

OFFSET DRILLING ATTACHMENT

INCREASED refinements in nearly every branch of machine construction and design have made corresponding demands on machine tool designers. One result of this has been to stimulate to the production of subsidiary devices and apparatus whereby not only is the handicap of deficient equipment removed from the designer, but the producer in the shop receives additional facilities, so that many hitherto impossible or troublesome operations are performed conveniently.

A device of this nature is illustrated herewith, the two operations shown demonstrating its applicability to work of a widely varying character not commercially feasible hitherto. The drilling of a hole in a high speed pulley rim in order to fix an oil tube will throw the pulley seriously out of balance. As shown in Fig. 1, the offset drilling attachment enables this objection to be overcome. Numerous applications of a

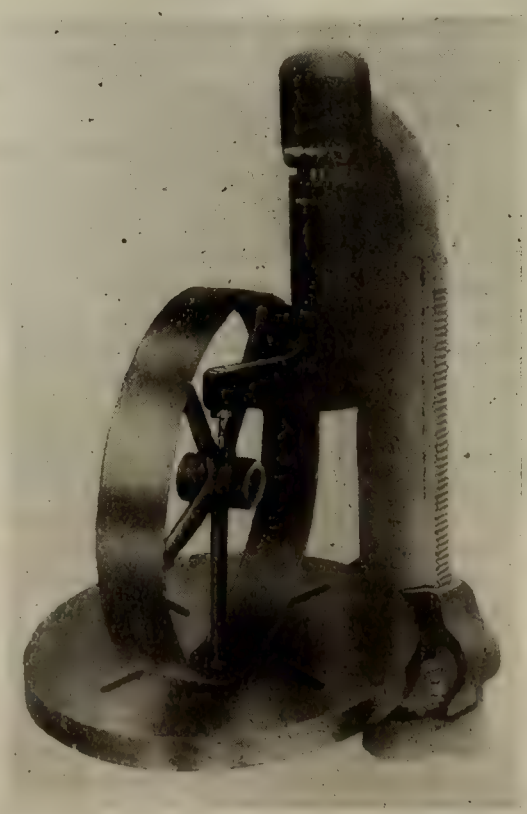


FIG. 1. DRILLING OIL HOLE IN PULLEY WITH OFFSET DRILLING ATTACHMENT.

like nature will suggest themselves such as drilling holes in engine crank shafts for balancing purposes, or for distribution of lubricant. It further enables designing engineers to embody in their designs ideas which are avoided at the present time due to lack of proper means for drilling in out of the way places.

The method of using shown in Fig. 2 is practically useful in jig and fixture work as well as in straight manufacturing. By using a counterbore or end mill of suitable dimensions, internal bosses

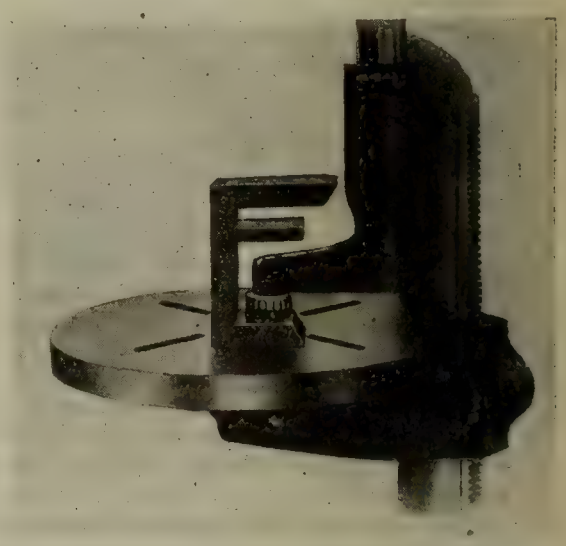


FIG. 2—OFFSET DRILLING ATTACHMENT FACING INTERNAL BOSS ON FIXTURE.

on castings, automobile parts, etc., may be faced off with ease and accuracy, this field of application being greatly widened by the use of a compound slide mounted on the drill press table by which end milling can be down in otherwise inaccessible positions.

This device is built by the H. E. Harris Engineering Co., Bridgeport, Conn., in eight sizes to fit every standard make and size of drill press or similar machine. The entire mechanism is contained in a single casting which is clamped to the lower end of the spindle sleeve by which it is fed down to the work while the spindle imparts motion to the drill through a train of heat treated vanadium steel gears. The attachment can therefore be swiveled among the centre of the drill press spindle to the position which is most convenient for the operator.

One holder is furnished with each attachment and the tool or drill is fitted to this holder, which has a positive drive and means for holding the tool central. Tools are readily changed without disturbing the set up of the attachment in the drill press.

MECHANICALLY-OPERATED LADLE STOPPER

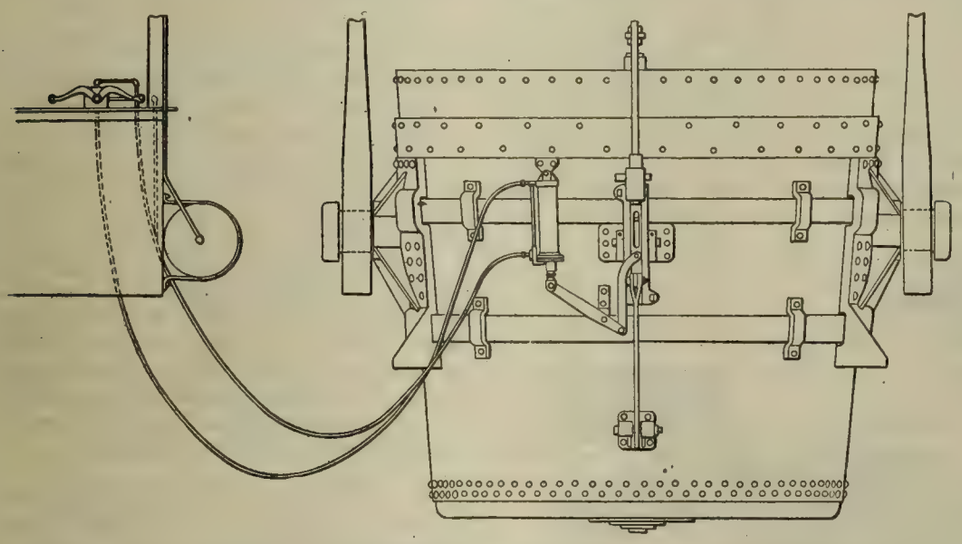
THE disadvantages of operating a ladle stopper in the usual manner in present practice are numerous, owing to the extreme heat of the molten metal, its liability to scatter over the operators and other causes, says the Iron Age. It is apparent that the ladleman and his helper standing on the platform adjacent to the molds, occupy dangerous positions, because the gases escaping, while the mold is filling, keep the metal in motion and eruption, frequently causing some to fall on the operators. Again, the operators are sometimes fatally burned by the metal escaping from a ladle overturning when a rope, chain, hook, or other part of the hoisting mechanism breaks, which is liable to occur at any time. It also occasionally happens after partly emptying the ladle, that the metal violently reacts, the escaping gas throwing the liquid metal to the roof of the building and rendering it extremely dangerous for the operators.

A further serious objection is that not infrequently the stopper will only partially close the nozzle opening, due to imperfect construction, thereby allowing a stream of metal to escape when the nozzle is supposed to have been closed. The nozzle also occasionally breaks, owing to sudden expansion when the hot metal strikes it, causing a leak, so that while the ladle is being conveyed from mold to mold, the metal from a leaky nozzle striking the top edges of the molds, splashes upon the operators and frequently burns seriously.

To overcome these objections and obviate the necessity of employing ladlemen, George A. Wettengel has devised an improved stopper operating mechanism in which the operation of the stopper is entirely under the control of the cranemen or the pusher, who is always a sufficient distance away to insure his safety.

According to U.S. patent No. 1,207,251, it consists of a mechanical means of raising and lowering the ladle stopper. Secured to the ladle and to one side of the usual stopper mechanism is an air cylinder, as shown by the illustration, the piston rod of which is connected to the sliding plate by means of a link and lever. Mounted in the crane cage is an air valve similar to those used on pneumatic hoists having flexible tube connections to the cylinder and to the air tank. The ends of the tubes have quick detachable hose connections. A tank is attached to the crane and is supplied with air from a motor-driven compressor. The operation of the device is as follows:

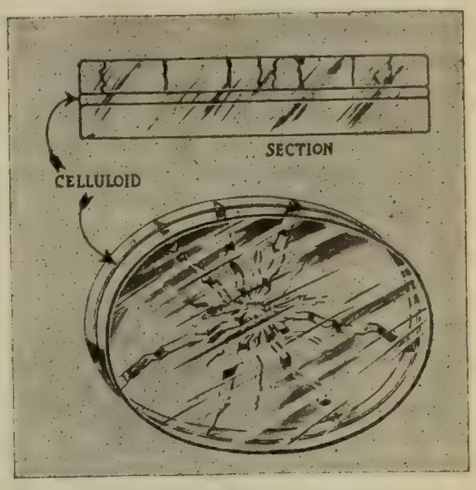
After the ladle full of molten metal is in place over a mold, the cranemen raises the lever of the air valve admitting air under pressure to the cylinder which raises the stopper thus admitting the metal to flow through the nozzle into the mold. When the mold is full, the lever is lowered so as to admit air into the opposite end of the cylinder, which lowers the stopper and stops the flow of metal. This is not only a safety device, but it is also a labour saver, no ladleman being required.



PNEUMATIC APPARATUS FOR MECHANICALLY OPERATING THE LADLE STOPPER WHEN POURING STEEL.

UNBREAKABLE GOGGLE GLASSES

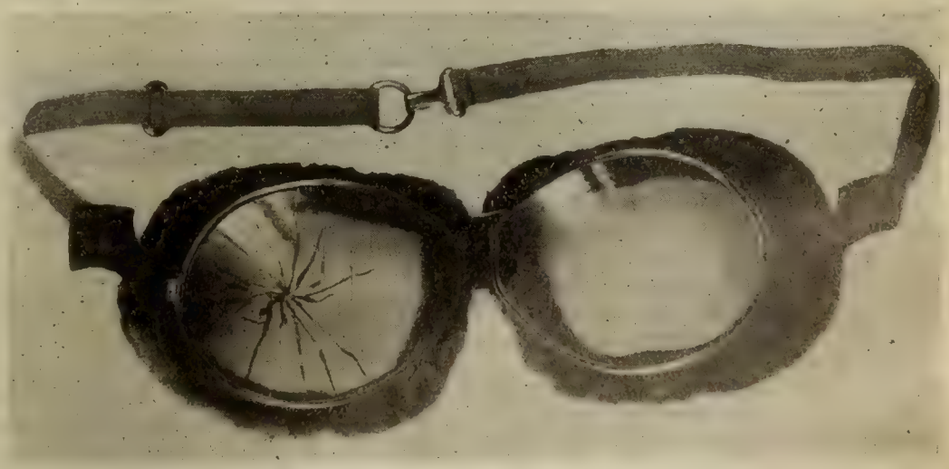
A SAFETY glass, which has a wide scope of applicability in connection with protective goggles and masks used by workmen where flying chips, the presence of gas, dust or unbearable light constitute a hazard to the eyesight, has been developed by an optical firm. That it will appeal to machinists, foundry men, welders, sand blast operators, etc., can be gathered from the fact that, although the glass can be cracked, it cannot be actually broken even by a hammer blow, while in cracking there is no flying of splinters to jeopardize the eyesight of the wearer.



SKETCH SHOWING CONSTRUCTION OF UNBREAKABLE LENS.

"Resistal" is the trade name of the glass used in the manufacture of these safety goggles and masks, and its construction is made plain by the accompanying sketch. It comprises two layers of perfect optical glass, which may be plain or curved, with a layer of celluloid interposed, the whole being welded—not cemented—into a solid mass. The result is a crystal that has every virtue of the ordinary glass, with none of its dangers and drawbacks; it has at the same time all of the strength and safety features of the celluloid "light," but, unlike celluloid, it is unscratchable, is rigid, and absolutely fireproof. Neither is it affected by water, heat or cold, and the celluloid layer provides a heat-insulating medium which effectively prevents clouding up, due to moisture condensation.

Goggles fitted with these crystals are being offered in a variety of styles to suit individual tastes and needs, and in either clear, amber or euphos colors,



GOGGLES MAY HAVE THE OUTER GLASS CRACKED AND STILL THE LENS REMAINS INTACT WITH THIS PECULIAR METHOD OF LENS CONSTRUCTION.

by Strauss & Buegeleisen, 37 Warren Street, New York City. The firm also supplies the crystals in special forms for use in industrial masks. It is stated that these goggles have been adopted for the needs of the Aviation Corps, U. S. Army, while from the same quarter the makers have received orders for a large number of crystals for military gas mask purposes. The fact that the glass remains perfectly gas and water-tight even when badly cracked, makes it ideal for use in the latter application.

THE HYDRAULIC RAM

IN response to an inquiry from one of our readers concerning the operation, etc., of the hydraulic ram, we have pleasure in reproducing an article covering same which appeared in our columns some years ago, believing that by doing so the information will be appreciated by others as well.

The principles underlying the construction and operation of the hydraulic ram were recognized as early as 1775 by John Whitehurst, who in that year communicated to the Royal Society a paper describing a machine of a similar type in which the overflow or waste valve was operated by hand. The next improvement was made by a Frenchman, Joseph Michael de Montgolfier. He was the first to see that the variable pressure, produced by changing the velocity of a column of water, could be utilized to operate the valve. Since that time, although numerous improvements have been made in the way of securing quick action of valves by aid of springs and weighted levers, the ram is essentially the same as in its earliest form.

A drive pipe A, Fig. 1, takes water from a source of supply H, to a chamber which contains the valve V. This valve, which opens inwardly, is called the waste or overflow valve. In another part of the same, or communicating chamber, is a check valve V_2 which leads to the tank into which water is being forced and which has a water level considerably above that of the supply tank. When V_1 is opened, the column of water in the drive pipe is set in motion, and will finally attain a velocity which builds up a pressure under V_1 sufficient to close the waste valve. The energy of the moving mass in the drive pipe cannot immediately be dissipated, therefore, the pressure in the chamber rises and lifts the check valve, allowing some of the water to enter the air chamber W, compressing the air and forcing an equal amount of water into the tank C. When the water in the drive pipe comes to rest, V_2 closes, V_1 opens, and the cycle is repeated. The pressure may for an instant be slightly less than atmospheric, and advantage is taken of this to introduce a small amount of air through an air valve. This air replenishes any part of the supply in the air chamber which may be carried out with the water.

Although the ram may have a high efficiency, it is wasteful of water, and the form shown in section in Fig. 2 has been devised to pump pure water with a minimum of waste. Connection is made at A to the source of waste water, which may be any polluted water available. The connection to the potable water should preferably come from a source under slightly greater head than the impure water. In this ram the waste water consists mainly of that entering at A but, in part from that entering at I and, if the capacity of the space between the waste valve B and the check valve C is greater than the amount of water delivered per pulse, no impure water can enter the chamber D. In this ram the air valve is placed at E.

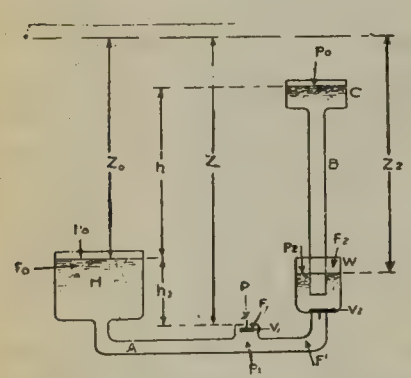


FIG. 1.—DIAGRAM OF OPERATION OF HYDRAULIC RAM.

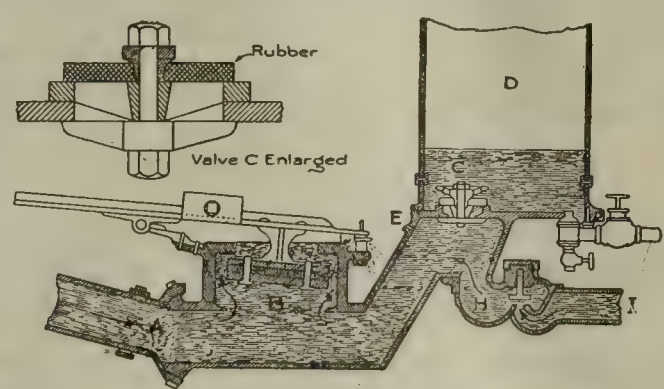


FIG. 2.—SECTION OF DOUBLE SUPPLY HYDRAULIC RAM.

The hydraulic ram lends itself readily to variable demand, which can be met by either changing the weight of the waste valve or adjusting its stroke. Its greatest field is in the water supply for small towns where the cost of maintenance and attendance must be kept as low as possible.

Screenings

They Took Him.—John Humphries is telling this one in his "Home From the Front" scene: "Fellow appealed at the tribunal 'cos he 'ad one foot shorter than the other. They passed 'im for general service abroad. The ground's very uneven in France."

A popular archdeacon whilst out one day with his dog and gun met a parishioner.

"I hope," said the archdeacon, "you attend church regularly and read your Bible?"

"I do read my Bible," replied the parishioner, and added, in a severe tone, "but I nowhere find that the Apostles went out shooting."

"No," said the archreacon, "the shooting was very bad in Palestine, so they went fishing instead."

A man living in a quiet country place invited a neighbor to dine and spend the evening with him. The night being dark, when it was time to go, the guest, who had done himself very well, begged to be allowed to borrow a large lantern in the hall to light him on his way. The next day the host sent his servant round with the following note: "Dear old chap, I shall be glad to have back my parrot and cage if you have finished with it."

"Have you taken anything for your complaint?" asked the doctor of a long, lank, hungry-looking man, who came to him complaining of being "all run down," his appearance verifying his words.

"Well, I ain't been taking much of anything, Doc—that is, nothing to speak of. I tuk a couple o' bottles o' Pinkham's bitters awhile back, an' a bottle of Quackham's invigorator, with a couple o' boxes o' Curem's pills, and a lot o' quinine, and some dandelion tea my old woman made. I've got a mustard plaster on my back, an' a liver pad on, an' I'm wearing an 'lectric belt, an' takin' cod liver oil four times a day, with a dose or two of ginger ev'ry other day; 'ceptin' for that I ain't takin' nothin."

The Theatre Habit.—Two girlhood friends were exchanging confidence over their afternoon tea.

"I saw you in church, dear, yesterday," murmured the younger one.

"Oh, you were there? I didn't see you," gurgled the other.

"Yes. And I was so glad to see that you finally induced your husband to accompany you to divine worship."

"Yes, Frank came along with me. He'd much rather go to the threatre, but the theatres are not showing anything on Sundays now. But he disgraced me."

"Really? In church? How, pray?"

"The minister read four chapters from The Acts of the Apostles, and my husband insisted on going out after every act."

Kind-Hearted Rena.—The wife of a successful young literary man had hired a buxom Dutch girl to do the housework. Several weeks passed and from seeing her master constantly about the house, the girl received an erroneous impression.

"Ogscuse me, Mrs. Blank," she said to her mistress one day, "but I like to say somedings."

"Well, Rena?"

The girl blushed, fumbled with her apron and then replied, "Vell, you pay me four tollars a veek—"

"Yes, and I really can't pay you any more."

"It's not dot," responded the girl: "but I be villing to take tree tollars till—till your hunsband gets vork."

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OUR METAL-WORKING PLANT OUTLOOK CONTINUES BRIGHT

AN interesting feature of the Canadian steel situation during the present week has been the intimation by the Imperial Munitions Board to producers that for the present month shipments to the trade must be of secondary consideration because those of shell steel are running behind schedule. The latter circumstance is of course due to the prevailing hot weather at this season of the year, which militates against maximum output on the part of the men employed in the mills. Taken in conjunction with the U.S. steel embargo, which went into effect on the 15th of the month, the position of domestic consumers requiring more or less immediate delivery, is by no means an enviable one.

Price fixing by the American Government is still under consideration, and, judging by appearances, the undertaking is becoming all the time more impossible. Something approaching two months has now elapsed since the propaganda was inaugurated, and the principal result to date has been the dislocation of the market. In the latter, the tendency has been towards a downward readjustment of prices, and doubtless this will be so accentuated in the near future that the much talked of "fixing" will be forestalled and therefore unnecessary.

The curtailment of finished shell production in Canada has so far had but little effect on the labor situation, which goes to show that a great majority of the metal-working plants have been taking time by the forelock in the introduction of other lines of product. It has always been our view that a grossly exaggerated estimate of the number of men employed in munitions making existed, and does still exist, and that meantime it would be more correct to rate the operator constituent in terms of thousands instead of by hundreds of thousands as seems to be the rule.

The impetus given steel shipbuilding in Canada has been the means of absorbing much of the overflow help from munitions-making, besides creating new opportunities for craftsmen who have not been directly involved in that industry. We do not look to see unemployment develop to any great extent as a result of even the complete cessation of munitions machining, steel shipbuilding and its allied industries for the next five years at least, being of such gigantic proportions as to need all the help—skilled and otherwise that may be procurable.

To what extent Canadian metal-working plants are likely to participate in U.S. Government contracts is meantime problematical, however, private advices from Washington, D.C., indicate that contracts covering a miscellaneous assortment of ship and munitions production equipment are likely to be procurable. Ships' anchors, to mention one line for which contracts are pending, are called for in quantity up to 20,000,000 pounds, and difficulty is anticipated in placing the complete order in the States, plants engaged in the manufacture of these products in the past being under somewhat of a handicap because of each anchor unit being a departure from former practice.

It is understood that some Canadian metal-working interests have already taken action as regards securing American Government war business, with what success, however, we are not at the moment in a position to say. Others are doubtless anxious to bear a part in the work, if they can get opportunity; to which end, information available to this journal is at their disposal.

ACCIDENT PREVENTION

CONSERVATION of life and energy has probably never before been so deeply impressed upon our minds as now. The need of preserving and protecting humanity from the risks of permanent or temporary disablement, arising from industrial activity, has been much emphasized by the knowledge that the past three years has shorn us of much of that man power which is so indispensable to our national development in the arts, crafts and manufactures. What may tend to increase the possibilities of accident, and likewise the responsibilities of the employer and the employed, is the advent of woman labor into the ranks of metal-working plant operators. While the likelihood of accident may be no greater in one case or the other—the female than the male, the fact that the so-called weaker sex must inevitably take a prominent part in post-war development, should be a stimulus to those concerned, to eliminate, or at least constrict the opportunities for injury that have ever been incidental to most phases of manufacture.

While safe-guarding methods and devices are deserving of just commendation they should never be wholly relied upon as an infallible proof of non-liability to injury. No proposed or adopted method of operating or guarding machine mechanisms should be termed fool-proof, even though it has been amply demonstrated that it is practically impossible to tamper with or destroy its intended purpose. The mere statement that a thing is fool-proof implies that it is proof against a fool's meddling, and any fair-minded person would or should resent the implication. It is invariably within the power of the workman to "make" or "mar" any new innovation—providing its effectiveness is being tried for the first time.

It does not pay to "force" protection on factory employees, but it does pay to have them realize the many advantages that are to be derived by adapting themselves to the changed conditions. Some men unfortunately become easily prejudiced, and will for a time do all in their power to deter rather than assist such methods as are advanced for their own welfare and protection. No safety or protective device can be entirely successful without the absolute co-operation of the employees it is intended to serve. If a safety method has any outstanding advantages—and few have not a fair proportion, it should be the duty of the workman to adapt himself as rapidly as possible to the conditions which it imposes, because eventually he will be the chief beneficiary.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$47 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	55 95
Basic, Valley furnace	53 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	60 00

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 50
Tank plates, Pittsburgh	9 00
Structural shapes, Pittsburgh	4 50
Steel hoops, Pittsburgh	5 25
F.O.B. Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 50

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22 1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$34 00	$35 00
Electro copper	34 00	35 00
Castings, copper	33 00	34 00
Tin	62 00	64 00
Spelter	11 00	11 00
Lead	13 50	13 50
Antimony	20 00	20 00
Aluminum	65 00	64 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$12 00	$12 00
Heads	12 30	12 30
Tank plates, 3-16 in.	12 65	12 25

WROUGHT PIPE.

Effective July 5, 1917.

Standard	Black Buttweld. Per 100 feet	Galvanized Lapweld. Per 100 feet
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$23 00	$22 00
Copper, crucible	26 00	27 00
Copper, heavy	26 00	25 50
Copper wire	26 00	25 50
No. 1 machine composition	20 00	22 00
New brass cuttings	16 00	19 00
No. 1 brass turnings	14 00	16 00
Light brass	12 00	10 50
Medium brass	16 00	16 00
Heavy brass	18 00	18 00
Heavy melting steel	21 00	17 00
Steel turnings	11 00	8 00
Shell turnings	12 00	12 00
Boiler plate	18 00	10 50
Axles, wrought iron	25 00	24 00
Rails	20 00	18 00
No. 1 machine cast iron	27 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	19 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	29 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	8 50
Stove plate	19 00	19 00
Scrap zinc	8 00	9 50
Heavy lead	11 00	10 75
Tea lead	7 00	7 00
Aluminum	35 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up	net
Coach and lag screws	25
Stove bolts	55
Plate washers ..... List plus	10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in. and larger	$7 50
Structural rivets, as above	7 50
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	35
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws ..... list plus	20
Collar screws ..... list plus	30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts ..... add	40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$90 00
Open-hearth billets	00 00
O.H. sheet bars	95 00
Forging billets	125 00
Wire rods	95 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS.

Solder, strictly	0 38
Solder, guaranteed	0 41
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 16
Putty, 100-lb. drum	4 35
White lead, pure, cwt.	19 00
Red dry lead, 100-lb. kegs, per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 05
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 60
Linseed oil, raw, single, bbls.	1 27
Linseed oil, boiled, single bbls.	1 30
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. ..list plus	20
Emery Cloth ..... list plus	33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.37
British Manila Rope	.31
New Zealand Hemp	.31
Transmission rope, Manila	.43
Drilling cables, Manila	.39
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks	list plus 30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse ..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 50%; headers, 60; flanged unions, 40; malleable bushings, 50; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$11 00	$11 00
Sheets, black, No. 10	11 50	11 50
Canada plates, dull, 52 sheets	11 00	11 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	12 70
Premier, 10¾ oz.	13 85	13 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B	
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$13 05
Connelsville Foundry Coke	14 00
Steam Lump Coal	7 25
Best Slack	6 50

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$33 00	....
1¼ in.	36 00	....
1½ in.	38 00	32 00
1¾ in.	38 00	32 00
2 in.	45 00	33 00
2¼ in.	48 00	35 00
2½ in.	50 00	38 00
3 in.	58 00	45 00
3¼ in.	....	53 00
3½ in.	70 00	55 00
4 in.	82 00	67 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 75
Leather in sides	1 60

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bullneck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

NO official announcement has as yet been made at Washington regarding prices of steel, although a report is current that the American Government and the Allies will pay $65 a ton for their requirements. While this is not official, it may prove to be correct, at the same time there may be provisos added to change the character of decision. Questions arising out of the embargo on steel from the United States are under consideration by the leading steel interests in Canada with a view to relieving the somewhat acute situation created. Certain trades, it is hoped, will obtain better treatment than was anticipated in the first instance. With the exception of billets, prices on steel products continue stationary, but with a weaker tendency. The continuance of present price conditions depends largely upon what action the U.S. Government will take in regard to its price-fixing policy. Until something definite is known no material change in the situation may be expected. Pig-iron prices are firm and unchanged. The market continues dull and unsettled, the embargo on iron from the States having caused considerable inconvenience to consumers. Coke prices are still advancing, due to shortage of labor and high cost of coal. The scrap metal market is dull, but prices are stationary with a weaker tendency. Consumers are keeping out of the market expecting lower prices, while sellers are looking for an advance. Non-ferrous metals are firmer and the outlook in the market is brighter. Considerable uncertainty, however, still prevails regarding developments in prices. Tin has advanced one cent, this being the only change to note this week. The machine tool market is a little more active, the demand being principally for tools for general purposes, replacing the former demand for equipment for munitions plants. A number of machine shops are now engaged upon building marine engines and auxiliary equipment for ships.

Montreal, Que., Aug. 20, 1917.—The industrial situation has developed no features of interest during the past week, and the markets are still awaiting the announcement of the American Government regarding the finding of the various investigations that have been progressing with a view to adjusting the prices to meet the requirements of the present situation. That these adjustments will affect the present standing of the market is generally understood, but the uncertainty as to actual price figures tends to maintain the market in a very unsettled state. Owing to transportation requirements in America, the recall of rolling stock now on the various Canadian roads, has somewhat disorganized railroad facilities here in Canada, and shippers and consumers are experiencing some difficulty in the delivery of material.

Pig Iron

While any falling off in actual production may be due to weather conditions, the market is otherwise exceptionally quiet; this is largely as a result of present political conditions and the possible effect the Government policy may have on early future conditions. The demoralized condition of the situation is reflected in the attitude of the consumers and their reluctance to take an active interest in the market, until a definite announcement is made by the American Government as to their contemplated action on the price fixing and

control of raw and semi-finished materials. While there is an undoubted undertone of weakness, the present market continues comparatively firm with all quotations nominal and unchanged. Conditions here are still the same with Canadian quotations withheld.

Steel.

Added to the seasonal dulness, the general market continues to reflect the uncertainty that prevails in all quarters owing to the price fixing plans of the American Government. It is reported unofficially that a flat rate of $65 per ton is likely to be decided on, as the figure at which steel for war purposes will be supplied to all the Allies, but the impression of the trade appears to be that any adjustment that the Government may make will not be a satisfactory solution to the present situation, as the many plants now working on the production of steel are doing so under greatly varied conditions, which make it very difficult to set a fixed price for steel and iron on the actual cost of production. However, with the steel makers and the Government working hand in hand for the same end, it is possible that some decision will be arrived at that will be agreeable to all concerned. The excessive requirements that have been created by the United States war program have necessitated a partial embargo on shipments of steel into Canada, other than that required for war materials, resulting in a further handicap to the domestic consumer. The demand for steel in Canada for munitions purposes shows a slight falling off and in addition to the stoppage of large shell manufacture, there is a rumor that the production on the 4.5 inch high explosive will shortly be cut, so as to provide increased material and funds for shipbuilding purposes. While the general activity remains the same, the situation is affected by the delay on the part of the U. S. Government in the adoption of the policy that is to control the future sale and distribution of all war materials. The restrictions that have been placed upon the export of steel have recently resulted in an over supply of billets and sheet bars on the American market, and the situation in these commodities has developed an easier tone, aided also by the prevailing uncertainty; the Pittsburgh quotation of $85 shows a decline of $5 per ton. A similar decline is noted in rolling and forging billets, the respective quotations being $100 and $125 per ton. With the exception of Government work, or that authorized by the Government, structural material is almost at a standstill; the Canadian situation is relatively quiet, but that in the States is very active, more particularly on new plants for munitions or ship building. The plate situation is not so active, but continues to be the feature of the market. The wire market, including rods and wire products, is fairly active, but these, like other commodities, are passing through an unsettled period, during the investigation into labor and production costs. The local situation shows little change as the trade is still awaiting the outcome of present developments, both on this and the other side of the line. Transportation difficulties continue to be a feature of the existing conditions.

High Speed Steel.—Nothing of importance has developed to alter the situation in the high speed steel market, although the demand is not as brisk as a few months back; the price is nominally unchanged owing largely to the high cost of all raw materials and the higher expense entailed in manufacture.

Metals.

The metal situation is still influenced by the attitude of the United States Government in connection with the setting of prices on the various metals and the control of the sale and delivery to the many consumers. It is not definitely known whether the prices will be the same to all, but it is anticipated that just consideration will be given to maintain harmony in all directions. Copper is inactive and showing a weaker tone. Tin is also quiet, being affected by the uncertainty of general conditions. Spelter is easing off as a result of increased supply. Lead is a little quieter, but is continuing firm. Antimony and aluminum are both quiet and unchanged.

Copper.—It is anticipated that the American Government will shortly be in a position to announce the prices to be paid for copper and other metals, based on the investigation that has been taking place into the actual cost of production. The near approach to definite action in this direction has left the market in a pronounced state of inactivity, as few are anxious to buy under the present unsettled condition. Nothing is apparently known as to the price set by the Government, but that a figure lower than the present market will prevail seems to be indicated by the weaker tone of the New York market; a decline of ½c being reported on lake, ¾c on electro, and 1c on castings. American quotations are 29½c, 27¼c and 26½c respectively. On a quiet market, prices are unchanged at 34c for lake and electrolytic, and 33c for castings.

Tin.—This market, while not directly in the control of the American Government, has experienced much of the unsettlement that has been so marked in other directions. No active buying has taken place of late as consumers are awaiting developments. It is anticipated and furthermore hoped, that the British Government will reciprocate in connection with tin transactions, in return for the attitude that the American authorities contemplate in the prices that will be set for steel and metals for delivery to the Allies. This uncertainty, however, places the trade in a position where reluctance is one of the features of the present market. Local tin is not active, but quotations are firm at last week's price of 62c per lb.

Spelter—The market is still reflecting the secrecy of the American Government in connection with the announcement of prices paid for recent purchases and those that are expected to be paid for early future requirements. The accumulation of stocks has made the spot price easier, but the future quotations are strong. New York quotations on spelter have declined ⅛c during the week, the price being now a little better than 8½c per lb. Dealers here report a quiet market with a weak undertone; present prices are, however, the same as last week, 11c per lb.

Lead.—The situation is undoubtedly easier, but the apparent absence of heavy supplies continues to retain a relatively firm market. Despite the fact that independents are quoting ⅛c lower than last week, the market has remained inactive; this being accounted for by the general uncertainty of the present situation. Local dealers are quoting last week's price of 13½c on a quiet market.

Antimony.—The market is quiet and inactive and is also developing a weak undertone as a result of a falling off in the demand. The New York market is easier, and has declined ⅛c to the nominal figure of 15⅜c per lb. The situation here is quiet and unchanged with prices steady at 20c per lb.

Aluminum.—The situation in aluminum is undoubtedly easier, but no marked change is reported in current quota-

PUMPING EQUIPMENT REQUIRED

Tender forms, specifications and drawings have been received from D. H. Ross, Canadian Trade Commissioner, Melbourne, for the supply and delivery of pumping plant and equipment for the Commonwealth naval dockyard, Cockatoo Island, Sydney, N.S.W., and are open for inspection at the Department of Trade and Commerce, Ottawa (refer to File No. A-1901). Tenders addressed to either the Director of Navy Contracts, Navy Office, Melbourne, or the Director of Naval Contracts, care Commonwealth Naval Dockyard, Cockatoo Island, Sydney, N.S.W., close on October 10, 1917. The particulars are as follows:

Two main dock pumps with vertical spindle motors and control equipments.

One vertical spindle motor and control equipment.

Four sluice valves with four motors and control equipment.

Two drainage pumps with motors and equipment.

Two air exhaust pumps with motors and equipment.

One enclosed motor and equipment for dock caisson.

tions. Local dealers continue to quote 65c per lb.

Machine Tools and Supplies.

No features have developed in the machine tool situation and dealers report the market much the same as last week, with considerable inquiry still coming in for general equipment suitable for marine work and ship repair. The demand for munitions machinery is almost at a standstill, but the requirements in this direction necessitate a constant demand for all classes of machine shop supplies and small tool accessories; and the prices of such supplies continue very firm and in some instances are still advancing.

Scrap.

The situation has shown little improvement, being still affected by conditions that prevail throughout the general market. No active buying is apparent, the tendency being to await the outcome of pending developments; in the meantime consumers are only buying for their immediate needs. With the exception of heavy melting steel scrap—which is stronger—the trend of American iron and steel scrap is downward. Old metals are comparatively firm. Local dealers report a week of slight fluctuations, but prices at time of writing are relatively the same as last week.

Toronto, Ont., Aug. 21.—There is a decided falling off in activity in the munitions industry. Fewer contracts for shells are being placed, and the output has declined. Machine shops in some cases are turning their attention to other classes of work, with considerable success. Aeroplane motors, marine engines, ship deck machinery, etc., are now being manufactured by several firms, while others are engaged upon general lines. It is possible that Canadian engineering concerns may ultimately obtain orders for work from the U. S. Government. This, however, is not likely to happen except in isolated cases until the plants in the States are filled up with business, which will not be for some time yet.

Steel

According to a report from Washington, a price of $65 a ton has been fixed on the steel required by the American Government and the Allies. Not being official, details are lacking, but the figure is probably pretty near the mark. Until the official announcement is made, no marked change in the market is anticipated, as nothing is known regarding the position of the ordinary consumer, which is perhaps the most uncertain feature of the whole situation. It is taken for granted that prices of all steel for war purposes will be controlled, but how this will affect the domestic consumer is problematical. It appears to be more than likely that prices of steel other than for war purposes will be allowed to find their own level. At the present time the market is stationary. Although prices have a weaker tendency for some steel products, no marked recession is looked for in the meantime. The enormous demand for steel, which is world-wide, will likely tend to prevent any important decline in prices except for Government requirements. Conditions in the iron and steel trade in Canada are undergoing some adjustment.. The effect of the embargo on steel from the States is not yet clear, and its operation is now the subject of considerable discussion among the leading interests concerned. It appears likely that some exception may be made in the case of steel required for specific purposes other than munitions. It is understood that steps are being taken to facilitate the operation of the embargo, so that it will cause a minimum amount of inconvenience to the trade in Canada. Manufacturing users, however, are bound to suffer to a greater or less degree, as little help can be expected from Canadian mills in the meantime. Our mills will have to concentrate on the production of shell steel for an indefinite period and are unable for this reason to look after their old customers except to the extent of comparatively small tonnages.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

The sheet market remains in a sold-up condition, and there is little new business being accepted. Government requirements are getting heavier, and the available supply for the ordinary consumer is correspondingly less. The latter are holding off placing orders, as there is an impression that prices have reached the top, and that they will be able to buy lower than obtains at present. This seems to be highly probable, as sheet bars have again declined, although recovering part of the loss, and are now being quoted at $95 Pittsburgh. This material was as high as $105 less than four weeks ago.

A temporary decline in semi-finished steel seems to foreshadow a recession in prices of steel products at no distant date. Bessemer and O.H. billets declined $5 early in the week, but have since recovered, and are now quoted at $90 a ton Pittsburgh. This may be connected in some way with the price fixing investigation now being held at Washington, and may be anticipating Government action. However, no official information has been given out, and the possible effect of the price control is mere guesswork. Prices generally in the meantime are stationary and the market continues unsettled.

Pig Iron

There is no change in the pig iron situation; the market continues dull and prices stationary. "Victoria" foundry iron is still quoted at $60, being both scarce and firm at that figure. The embargo on pig iron from the United States will inconvenience Canadian consumers, as domestic furnaces are booked up for the remainder of this year. Connellsville coke output gains slightly, but is restricted sharply by labor shortage; the price of prompt furnace fuel continues to range from $15 to $16, ovens.

Scrap

The scrap market continues dull and stagnant. Prices are stationary, and have a weaker tendency, but no declines have been made except in heavy copper and copper wire. These materials have dropped one cent, and are now quoted at 25½c a pound. The new steel plant at Ashbridge's Bay is buying steel and shell turnings, and the market for these materials is consequently easier. The cause of the quietness in the market is that consumers expect a fall in prices and sellers anticipate an advance, thus comparatively little business is being transacted.

Machine Tools

The feature of the machine tool market now is an increasing demand for tools for general purposes, which is replacing the former activity in equipment for munitions. The output of shells has fallen off considerably, and the engineering plants are turning their attention to other classes of work. The building of marine engines and auxiliary equipment for ships is developing steadily and promises to form an important feature. A local machinery house reports a big demand for tractors and farm oil engines, due largely to the scarcity of labor, but also to the increased efficiency obtained by using power on the farm. The Willys-Overland Co. are equipping a factory for building aeroplane motors, and have already purchased a large number of machine tools. The situation in regard to deliveries is practically unchanged, tool room equipment being particularly difficult to obtain.

Supplies

Prices of machine shop supplies are for the present largely stationary, but quite firm. It is anticipated that supplies from the States will be very difficult to obtain owing to the increasing demand in that market. An advance has been made in the price of wood pulleys, the new discount being 20 per cent., as against 40 per cent. formerly. New list prices have been issued on bit stock and straight shank drills. The discount remains at 40 per cent., but the new list prices provide for increases. Grindstones

have advanced 10c per 100 lbs. For those over 40 pounds and 2-inch thick, the price is now $1.90, while those under 40 pounds are quoted at $2 per 100 lbs. Pennsylvania crude oil continues to advance on account of the constantly growing demand for light grade crude oil and increased cost of production. Producers are unable to keep up with the present demand.

Metals

The metal markets continue to be dominated by the attitude of the American Government in regard to its price fixing policy. Although, on this account the markets have been quiet, prices are exhibiting a higher tendency, and the outlook in the trade generally is brighter. The war demand for metals continues very strong, and will be greatly increased as the American Government requirements become heavier. This in itself will tend to stiffen the market in spite of the present high level of prices. There is considerable secrecy regarding the prices the Government are paying for its requirements, which introduces an element of uncertainty into the situation. A recent report states that the Government is willing to pay 22½c for copper, which is about 4c over a tentative price previously fixed. This seems to indicate that the Government action in regard to prices will not be as drastic as was anticipated. The local market is firm, and business continues active. Tin is a shade higher, otherwise prices are unchanged. Babbitt metals now range in price from 18c to 70c.

Copper.—The market continues unsettled, and must remain so until some definite knowledge is obtained as to what the Government intentions are as to price and volume of future purchases. The position of copper, however, is favorable, as the consumption of the red metal for war purposes continues enormous, and is on the increase. The rumor that the American Government has advanced its prices on its purchases of copper to 22½c has improved the outlook in the market, but quotations are unchanged and nominal. Lake and electro are quoted at 35c and castings at 34c per pound.

Tin.—Although prices are firmer, the market continues unsettled owing to the uncertainty regarding future developments in their effect on prices. Because of this, business is light, and little interest is being shown in the market by consumers. Tin has advanced one cent locally, being quoted at 64c per pound.

Spelter.—There is no change in the situation in regard to spelter, and the market is stagnant. Developments in regard to prices are being followed closely by the trade, but no hint has as yet been given out as to what the Government will pay on its latest purchase of spelter. Local quotation unchanged at 11c per pound.

Lead.—The market is a shade easier on account of the continued indifference on the part of consumers, but prices are unchanged. The U. S. Government is not saying what it is paying for lead, which keeps the market unsettled, and consumers consequently are not showing much interest. Local quotation, 13c per pound.

Antimony.—No improvement is noted in the demand for antimony, which has been quiet for some time. The market, however, shows no sign of weakness, and quotations are unchanged at 20c per pound.

Aluminum.—Little interest is being shown in the market, which is a shade weaker, although quotations are unchanged at 64c per pound.

New York, Aug. 20.—Vitality surging through the machinery industry as a result of the gigantic war preparations is expressed in further large purchases of machine tools by shipbuilders, by ordnance and ammunition manufacturers, by airplane and engine builders, and by makers of tractors and of other agricultural implements.

In response to United States Government appeals, several additional steel-working manufacturers have entered the ordnance field, and one of the new concerns—the Symington-Anderson Co., of Rochester, N.Y.—has been awarded a contract for three thousand 6-inch guns; each piece of ordnance will cost $8,000 to $10,000. This company recently purchased $1,000,000 worth of shop equipment. The War Department has awarded a contract for 20,000 Browning machine guns to the Colt Patent Firearms Co. of Hartford, Conn. The contract price is upward of $15,000,000. The War Department is also giving active support to another new manufacturer of big guns—the Tacony Ordnance Co. of Tacony, Pa., in the purchase of forge and machine shop equipment for installation in the new $1,500,000 plant now undergoing construction at Tacony.

In the Central West, two ordnance makers, the Inland Ordnance Co., Cleveland, O., and the Root & Van Dervoot Engine Co., East Moline, Ill., are sounding the market for machinery, and are making imperative calls upon manufacturers of machine tools.

The Federal Shipbuilding Co., the new subsidiary of the U. S. Steel Corporation, has awarded contracts for dredging, pile driving, building of ship ways and construction of shops and other buildings, to cost about $4,000,000, and is now buying $1,000,000 worth of tools for a huge plate and angle shop. The plate mill will be 1,000 feet in length. Inquiries are also out for yard and shop cranes and for machine shop tools that are needed in addition to the tools now being built at the shops of the American Bridge Co. The buildings now under contract will cover ten acres. It is designed to make this plant on Newark Bay the largest shipbuilding plant in the world. Some of the shipways now being constructed—450 to 500 feet in length—will be extended later to 1,000 feet to build the largest craft afloat.

The Foundation Co. which, in conjunction with the Liberty Steel Products Co., is building and equipping a large number of boats, including mine sweepers, for the United States and French Governments, is in the market for $100,000 worth of machinery for a plate shop, and will also buy cranes and machine shop equipment. The Harriman interests, that control the shipyards at Chester and Bristol, Pa., have reorganized the Chester Shipbuilding Co., and organized the Merchants' Shipping Corporation to operate the Bristol yards: Cranes and other machinery are wanted for both of these plants. Twelve shipways are being built at Bristol and six additional ways at Chester. The Newburgh Shipyards, Inc., Newburgh, N.Y., and the American U-Boat & Arms Corporation, which is equipping a yard at City Island, are placing contracts for machinery.

Manning, Maxwell & Moore, Inc., have received a contract from the Curtiss Aeroplane & Motors Corporation for equipment for the new plant now being built at Buffalo. The U. S. Government is reported to have placed a contract for 10,000 airplane engines with Henry M. Leland, who is equipping a plant at Detroit. The Dayton-Wright Aeroplane Co. has given a large order to Cincinnati manufacturers for drilling machines. The Nordyke-Marmon Co., Indianapolis, has an order to build 1,000 airplane engines for training machines for the Government.

Tractor manufacturers are overwhelmed with business and are extending plants and buying machine tools constantly. Henry Ford & Son, with an order for 7,000 tractors for the British Isles, is building an addition to its Dearborn, Mich., plant, as the Cork Island plant construction has been delayed.

AUXILIARY MACHINERY REQUIRED.

Tender forms and specifications have been received from D. H. Ross, Canadian Trade Commissioner, Melbourne, for supply and delivery of auxiliary machinery for the Flinders naval base, via Melbourne, Victoria, and are open for inspection at the Department of Trade and Commerce, Ottawa (refer to File No. A-1901). Tenders addressed to the Director of Navy Contracts, Navy Office, Melbourne, close on October 24, 1917. The particulars are as follows:

Two electrically-driven air pumps, with complete set spare parts.

One steam driven air pump, with complete set of spare parts.

Two small circulating pumps.

One large circulating pump.

One large feed pump, with complete set of spare parts.

One small feed pump, with complete set of spare parts.

One oil fuel pump with complete set of spare parts.

Pittsburgh, Aug. 18.—The week has been singularly devoid of concrete developments suggestive of the future of steel demand and prices. The only definite and important item of news is that since the enactment of the Food Control Law, which was signed by the President on August 10, the coke producers have been required by the Federal Trade Commission to furnish statements of their cost of production, both for the year 1916 and for the month of June last. This is taken to indicate that the Administration intends shortly to fix the price of coke, the food bill giving it authority over prices of coal, coke, petroleum and gasoline. The reports are now being compiled, and preliminary figures indicate costs averaging about $4 per net ton for the Connellsville region. The average of spot sales in May and June, 1915, was $1.50. They were below cost, and costs are higher now. The common idea is that if the Government fixes a price it will be about $4.50 or $5. In the past week the spot market has gone up to $15.

The question is what good the fixing of prices on coke will do the ultimate consumer, for about 81 per cent. of the coke produced is used in the manufacture of pig iron, and the pig iron is sold far ahead, practically all the prospective make for the balance of this year and from 35 to 60 per cent. of the make in the first half of next year, the pig iron contracts on books ranging from $25 to over $50. Doubtless the pig iron market would eventually decline, and that would help some.

The Export Embargo

The export embargo covers scrap, pig iron, billets and sheet bars, structural shapes and plates, and became effective July 15. From then until August 15 it was merely necessary to secure a license to export, but from August 15 the licenses will not be granted unless it can be shown that the material is directly intended for prosecuting the war. This prevents exports of plates and other shipbuilding material to Japan, a large tonnage being under order. The Japanese mission is in Washington, and an arrangement may be concluded whereby the steel will be allowed to go forward in return for Japan diverting a number of ships to the trans-Atlantic trade. The plate mills are in a quandary, as they do not know whether to continue rolling export material or resell it. There have been some offerings of plates in the past week at lower prices than formerly quoted, but not enough to establish a new market level.

Iron and steel exports in June totalled 631,712 gross tons, against 588,515 tons in May, and 643,767 tons last September, the record month for exports. July exports will probably prove to have been nearly, if not quite, as large, but on account of the enforcement of the embargo August will doubtless show a material falling off.

Scrap

Last week the Pennsylvania Railroad System placed an embargo against all movement of scrap on its rails in open top cars, except under special permit, the permit to be applied for by the prospective consignee. There is very little scrap movement in this district that does not involve travelling part of the journey over Pennsylvania rails and permits do not seem to be obtainable easily. The scrap market has been made still quieter, but prices have not declined, and heavy melting steel is higher, with one or two sales reported at $37 and a number of dealers readily bidding $34, these limits comparing with $32 to $33 quotable as the market ten days ago.

Pig Iron

The pig iron market is absolutely stagnant, there being scarcely any inquiry, and then only for very small lots for prompt shipment. When the market once stopped advancing, about the close of June, prices yielded a trifle from the extreme, but have since held steady, so far as furnace quotations are concerned, at $55 for Bessemer, $52 for basic, and $53 for No. 2 foundry and malleable, f.o.b. Valley furnaces. These, however, can hardly be called even asking prices when there is no inquiry. Some resale lots have been offered for less, particularly in the case of Bessemer.

While production has been curtailed in the past few weeks on account of high humidity, there is less rather than greater pressure for deliveries on contract, and consumers are evidently better supplied than was assumed. Buyers are evidently expecting a very considerable drop in the market, before they have occasion to make further purchases.

Unfinished Steel

A week ago a decline in unfinished steel was recorded, and in the past week there has been a further softening. A lot of 1,000 tons of open-hearth sheet bars has been sold at $85, the top of the market having been $105 to $110. The ordinary market price is paid only on odd lots purchased by mills, or by sheet consumers who wish to have the steel converted. The deliveries to sheet mills, on long term contracts, are at about $60. Wire rods have sold in the past week at $90, a price practically impossible a fortnight ago. There are further offerings of billets at $85, and $83 is rumored. Until recently the market was all of $95.

Finished Steel

While there have been declines in succession in scrap, pig iron, and unfinished steel, the declining tendency has not yet reached finished steel products, and this is in accordance with precedent. The mills fully expect declines, but know that they could not force sales by cutting prices, and are interested in maintaining same as long as possible so as to stimulate specifications on existing contracts. There is no buying in the open market to speak of.

Notes

Production of pig iron in the United States is officially reported at 19,258,235 tons in the first half of this year, against 19,815,275 tons in the second half of last year, and 19,619,522 tons in the first half. The decline is in the face of a material increase in capacity, and is due to shortage of coke.

Production of coke in the United States in 1916 is officially reported by the Geological Survey at 35,464,224 short tons of beehive and 19,069,261 tons of by-product, a total of 54,533,585 tons, representing increases over the 1915 production of 29 per cent. in beehive, 35½ per cent. in by-product, and 31 per cent. in the total.

Production of iron ore in the United States in 1916 is reported by the Survey at 63,735,088 gross tons from the Lake Superior region, and 11,432,584 tons for all other districts, a total of 75,167,672 tons, against 55,526,490 tons in 1915, and 61,980,437 tons in 1913, hitherto the record year.

The Bridge Builders' and Structural Society report fabricated steel contracts let in July equal to 41½ per cent. of a month's frabricating capacity, against 47½ per cent. for June and 57½ per cent. for May.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

SUPPLEMENTARY ESTIMATES TABLED IN HOUSE

SUPPLEMENTARY estimates for the fiscal year ending March 31 next, to the amount of $50,542,472.35, were tabled in the Commons, Ottawa, by Sir Thomas White on August 17. They bring the total amount of appropriations for the fiscal year up to $178,824,236.99, exclusive of statutory expenditures aggregating $74,691,001.24. Of the supplementary votes now brought before Parliament, $18,361,930 is chargeable to income and $32,180,542 is chargeable to capital account.

Among the items is $7,500,000 to be loaned to the G.T.P. Railway to meet interest charges and deficit in operation of the Grand Trunk Pacific Railway and Grand Trunk Pacific branch lines and to provide for betterments and rolling stock. To purchase rolling stock for the Canadian Government's Railways, $25,000,000 is to be voted. To pay for the steamers McKee and Drummond, acquired by the Government, and now engaged in transporting coal from Nova Scotia to St. Lawrence River ports, $1,020,000 is required, and to provide for the building of two wooden ships for use

in connection with the Government Railways system, $600,000 is asked. Among the sums voted at a previous session and now to be revoted are $1,020,000 for the construction of the Quebec, Montmorency and Charlevoix Railway, the Quebec and Saguenay Railway and the Lotbiniere and Megantic Railway.

THE SUBMARINE LOSSES

BELOW will be found the official weekly returns issued by the Press Bureau and compiled by the Liverpool "Journal of Commerce," relating to the war losses of British merchant shipping, and the arrivals and sailings of merchant vessels of all nationalities (over 100 tons net), at and from United Kingdom ports. Fishing and local craft are excluded from the sailings and arrivals. This return invariably includes all mercantile tonnage known to have been sunk by mine or submarine either employed on Government service or otherwise:—

Week ending	All Nationalities Arrivals	Sailings	British Merchant Ships Sunk by Mine or Submarine 1,600 tons gross or over	Under 1,600 tons gross	Unsuccessfully attacked	Fishing Vessels Sunk
Feb. 24	2,280	2,261	16	6	16	5
Mar. 4	2,528	2,477	15	8	15	2
" 11	1,985	1,959	12	4	12	3
" 18	2,528	2,554	18	8	20	21
" 25	2,314	2,433	20	7	12	18
April 1	2,281	2,399	17	14	20	3
" 8	2,406	2,367	17	2	13	7
" 15	2,379	2,331	19	9	13	11
" 22	2,585	2,621	41	15	27	10
" 29	2,716	2,690	39	12	27	7
May 6	2,374	2,499	19	22	30	15
" 13	2,568	2,552	17	5	15	3
" 20	2,664	2,759	19	9	12	3
" 27	2,719	2,768	18	2	22	2
June 3	2,693	2,642	15	3	15	5
" 10	2,767	2,822	24	10	20	6
" 17	2,897	2,993	25	5	37	..
" 24	2,876	2,923	21	6	19	..
July 1	2,745	2,846	15	5	13	12
" 8	2,898	2,798	14	3	13	6
" 15	2,828	2,920	15	4	15	8
" 22	2,791	2,791	19	3	12	1
" 29	2,747	2,776	18	3	*9	..

*Including three attacked during week ended July 22.

Italian Losses

The following are the figures of the movements of merchant vessels of all nationalities in Italian ports during the week ending Sunday, July 29:—

Arrivals	810	412,045
Departures	536	401,168

This is exclusive of fishing boats and coasting vessels.

Losses of Italian ships on all seas were:—Four sailing vessels, only one over 250 tons. One steamer was attacked and damaged, but was able to be saved.

TRAFFIC THROUGH CANADIAN CANALS

J. L. PAYNE, comptroller of statistics, reports that the traffic through the canals of Canada in 1916 showed an increase of 8,384,688 tons. The total volume was 23,583,491 tons, though this tonnage includes duplication, which means that the same cargo quite frequently passes through two or three separate canal systems. After eliminating all duplication, the net tonnage is given as 21,011,905 tons. The distribution of gross traffic in tons was as follows: Sault Ste. Marie, 16,813,649; Welland, 2,544,964; St. Lawrence, 3,368,064; Chambly, 398,977; St. Peter's, 9,629; Murray, 46,680; Ottawa, 237,651; Rideau, 105,430; Trent, 45,000; St. Andrew's, 13,438.

The traffic as analyzed is as follows:

	Tons.
Agricultural products	5,178,806
Animal products	11,342
Manufactured products	834,266
Forest products	1,388,873
Mine products	16,170,204

The total volume of Canadian wheat moved through the canals of Canada and the United States at Sault Ste. Marie in 1916 was 185,003,667 bushels. Of this quantity, 82,807,342 bushels passed through the Canadian canal. Larger accommodation on the American side of the St. Mary's river probably accounts for the preference given that channel.

The growth since 1895 in the volume of Canadian wheat annually carried through the Canadian canal at Sault Ste. Marie is seen from these figures: 1895, 1,087,800 bushels; 1900, 5,573,267 bushels; 1910, 51,774,833 bushels; 1913, 101,066,133 bushels; 1916, 82,807,342 bushels.

Then comparison of 1915 and 1916 is as follows:—

Through the	1915 Bus.	1916 Bus.
Can. canal	48,727,911	82,807,342
Am. canal	121,389,950	102,196,325
Totals	170,117,861	185,003,667

Canadian wheat moved in the form of flour must also be brought into the account. The total quantity brought down in 1916 was 3,805,384 barrels, as compared with 2,215,098 barrels in 1915. At 4½ bushels to the barrel, this would represent 17,124,228 bushels of wheat.

The total volume of water-borne wheat in 1916 would thus be made up as follows:—

Through the Can. canal	82,807,342
Through the Am. canal	102,196,325
In the form of flour	17,124,228
Total	202,127,895

The distribution of Canadian wheat moved through the Canadian and American canals at Sault Ste. Marie from Port Arthur-Fort William in 1916 was as follows:—

To Montreal, 1,233,982 bushels; to Georgian Bay ports, 46,406,749 bushels; to other Canadian ports, 28,029,847 bushels; to Buffalo, 106,349,943 bushels; total, 182,020,521 bushels.

To account for all the Canadian wheat shipped eastward by water in 1916 there must be added the quantity passed through Duluth in bond. The complete statement would, therefore, be as follows:—

From Port Arthur-Fort William and Duluth, to Montreal, 1,686,482 bushels; to Georgian Bay ports, 48,007,361 bushels; to other Canadian ports, 28,029,847 bushels; to Buffalo, 107,279,977 bushels; total, 185,003,667 bushels.

STEEL PRICES FIXED AT $65

A REPORT from Washington states that an agreement between the War Industries Board and the steel interests as to the price of steel for the United States and her allies will be arranged shortly, according to an authoritative source. The terms of the agreement likely will be:

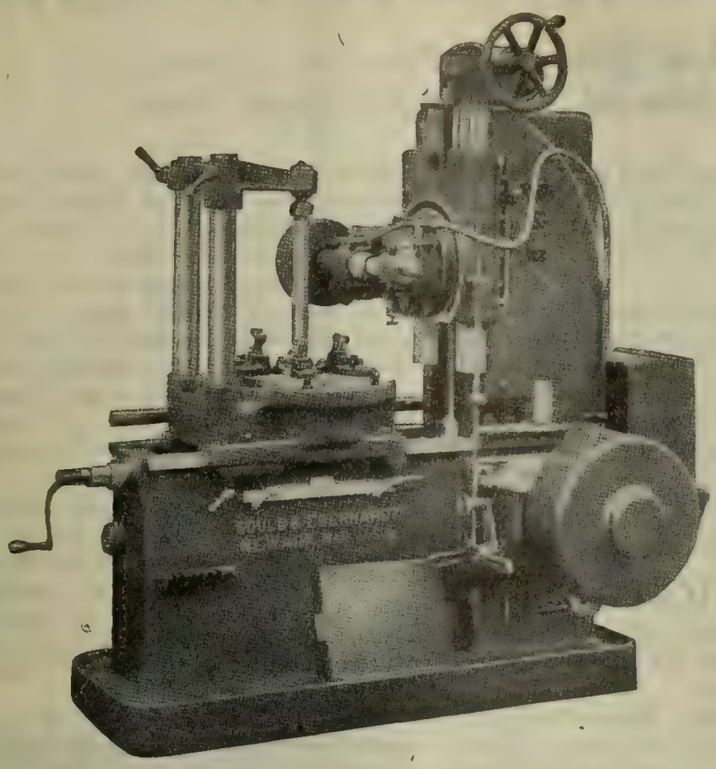
1. The price of steel will be fixed at approximately $65 a ton.
2. The steel interests will agree to furnish material to this Government and the allies for the same price.
3. An informal agreement will be made that, if the steel men furnish their product at the agreed upon price, the excess profits tax will be modified.
4. The steel interests shall retain the right to collect bonuses from allied Governments for early delivery of contracts.

COAL CONTROL PLAN TO BE ANNOUNCED

PRESIDENT WILSON will announce formally in a few days the plan under which the American Government will take over control of the coal supply of the country, fix prices and regulate production and distribution under the powers contained in the food control law.

It is said that the Trade Commission, while not advocating the requisition and operation of mines as an immediate step, believes that the price of $3 a ton at the mouth of the mine for bituminous coal is radically high, and that production and distribution systems are faulty. A system of commandeering and pooling the output for distribution by a Government agency is said to have been recommended.

In connection with anthracite coal, the commission in former reports has indicated that in its belief the price at the mouth of the mine agreed to by operators was not exorbitant, and some of the officials have intimated that high prices to the consuming public were due largely to the middlemen and faults of distribution.



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Automatic** therefore **Economical

If you cut gears in quantities they can be cut with advantage on G. & E. Gear Cutting Machinery.

For gears up to 120" diameter.

Catalogue describing full line of Gear-cutting, Hobbing, and Rack-cutting machines on request.

Write for prices and deliveries

The A. R. Williams Machinery Company, Limited

ST. JOHN, N. B.
WINNIPEG, VANCOUVER

"If It's Machinery, Write Williams"

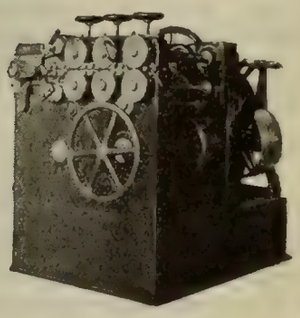
64 Front Street West
TORONTO

The Machines that put the "Rings" in Springs!

More Than Forty Standard Spring Making Machines.

High-Speed Automatics for Making Fuse and Small Arms Springs.

Flexible Metallic Tube and Casing Coilers.



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INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Elmira, Ont.—The Elmira Transmission Co. will build an extension to their foundry.

Sidney, N.S.—A report is current here that the steel plant at Trenton, N.S., will be moved to Sidney.

Chicoutimi, Que.—The Chicoutimi Pulp Co. will build an extension to their mill, which will include a machine shop.

Tillsonburg, Ont.—The Maple Leaf Harvest Tool Co. propose building a factory here to cost approximately $50,000.

Toronto, Ont.—The Cluff Ammunition Co. are rebuilding their plant on Sterling Road, which was destroyed by fire some time ago.

Oshawa, Ont.—The Richmond Mfg. Co., of Toronto, have written the Council regarding a proposal to establish a factory here.

Blenheim, Ont.—Five acres of land have been purchased by the Pere Marquette Railway for a reservoir. A new pumphouse will be erected and new equipment installed, and a tank built.

New Westminster, B.C.—H. A. Bayfield, formerly superintendent of dredges here, was in the city recently inspecting possible sites for the assembling shop which the Imperial Munitions Board will probably establish somewhere on the Coast to assemble machinery and engines for the vessels now being built at various shipyards. Sites will also be inspected at Victoria and Vancouver.

Rigaud, Que.—A violent explosion at the powder factory of Curtis & Harvey Co., on Aug. 18, destroyed the entire plant. The monetary loss is placed at $2,000,000. The plant was comprised of a large number of small buildings and the structures alone cost several million dollars. The stock of raw material for making explosive was also particularly expensive. The plant, with adjacent grounds, covered five miles square.

Windsor, Ont.—Plans have been filed with the Canadian Government by a local law firm, acting for the Canadian Steel Corporation, for docks at Ojibway to cost $250,000. It is stated that the plans include a marine slip, harbor, docks, and wharves. A canal running through the corporation's property for 2,500 feet, which will be 200 feet wide and 25 feet deep, will be dredged to accommodate boats. It is proposed to build docks on the banks of the canal, while another dock a thousand feet long is planned for the river front.

ELECTRICAL

Bloomfield, Ont.—A by-law passed recently authorized an expenditure of $8,000 on the development of electric power.

Cookstown, Ont.—The Hydro by-law was passed here Monday by a majority of 91. The enabling by-law was also passed on the same vote.

Toronto, Ont.—The Hydro-Electric Commission have been granted a permit to build an addition to the terminal station on Strachan Avenue, to cost $1,100.

Wellington, Ont.—A by-law will be submitted to the ratepayers on Aug. 31 to authorize the expenditure of $10,000 for the purpose of development, transmission and distribution of electrical power and energy.

MUNICIPAL

Lawrencetown, N.S.—The Town Council are considering installing a hydro-electric power plant.

Portage la Prairie, Man.—The Town Council contemplate installation of one 100-h.-p. boiler with mechanical stoker, costing about $5,000, for the electric station.

Stratford, Ont.—At a meeting of the Public Utilities Commission, it was recommended, in Mr. Mason's report, that estimates for the proposed storage basin for surplus artesian well water be asked for.

Stratford, Ont.—The Public Utilities Commission have decided to accept the quotation of Petrie's, Ltd., of Toronto, for an air compressor at a cost of $415, and a 15 h.p. gasoline engine at a cost of $400, to be installed in the pump house as soon as possible.

Montreal, Que.—The Board of Engineers, composed of H. E. Vautelet, Arthur St. Laurent and T. B. McRae, have prepared a supplementary report on the aqueduct scheme, in which they recommend that the waterworks improvement be continued along new lines. Upwards of $3,000,000 has already been spent on the aqueduct.

TENDERS

Winnipeg, Man.—The Board of Control are receiving tenders up to August 22 for 3,000 feet of 3½ inch cotton rubber-lined fire hose.

Sherbrooke, Que.—Tenders will be received until August 22 for high-tension line and equipment, costing $150,000, from Weedon to Sherbrooke, for the Gas and Electric Department, City Council.

Hamilton, Ont.—Tenders are being received until September 4 by the engineer, E. R. Gray, for pumping equipment for Beach pumping station. The cost is estimated at $130,000.

Oakshella, Sask.—Tenders are required for the supply of material and constructing thirteen miles of bracket line, also placing two circuits on the Government lead on six-pin crossarms. For plans and specifications, apply to James Wiggins, secretary-treasurer, Last Chance Telephone Co., Oakshella, Sask.

Cobalt, Ont.—Tenders will be received up to Sept. 18, for the supplying of material and labor necessary in the installation of a complete telephone system in the Town of Cobalt, and in part of the adjoining Township of Coleman. Further particulars will be furnished by R. L. O'Gorman, Town Clerk.

Winnipeg, Man.—Tenders, addressed to the Chairman, Board of Control, will be received up to August 28 for the supply of 2,400 feet of 6-in. cast iron water pipe, class "C," delivered f.o.b. cars, city yards. Specification and form of tender may be obtained at the office of the City Engineer, 223 James Avenue.

Toronto, Ont.—Tenders will be received, addressed the Chairman, Board of Control, City Hall, Toronto, up to August 28, for the supply and installation of mechanical stokers, at the Main Pumping Station. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Winnipeg, Man.—Tenders, addressed to the Chairman, Board of Control, will be received up to August 24, for the supply and complete installation of one mechanical chain grate stoker for the Municipal Hospital Power House, Morley Avenue. Specification and form of tender may be obtained at the office of the City Engineer, 223 James Avenue.

Toronto, Ont.—Tenders addressed to the Secretary-Treasurer of the Board of Education will be received until August 24, for completion of carpentry work in Park School New Building, local telephones, cabinet work, repair work in various trades. Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, 155 College Street.

Monteith, Ont.—Tenders will be received until August 27 for heating and plumbing in the men's residence in connection with the Training School, Experimental Farm, Monteith. Plans and specifications can be seen at the office of the Director of Agriculture, New Liskeard, and at the Department of Public Works, Toronto, Ont.

Winnipeg, Man.—Tenders, addressed to the Chairman, Board of Control, will be received up to August 28 for the supply and delivery of one set high efficiency street lighting equipment. Instructions to bidders, specification and form of tender may be obtained at the office of the City Light and Power Department, 54 King Street.

Toronto, Ont.—By direction of the Hon. the Minister of Militia and Defence, the following Old Stores are for sale by Public Tender at Toronto:

ECONOMY

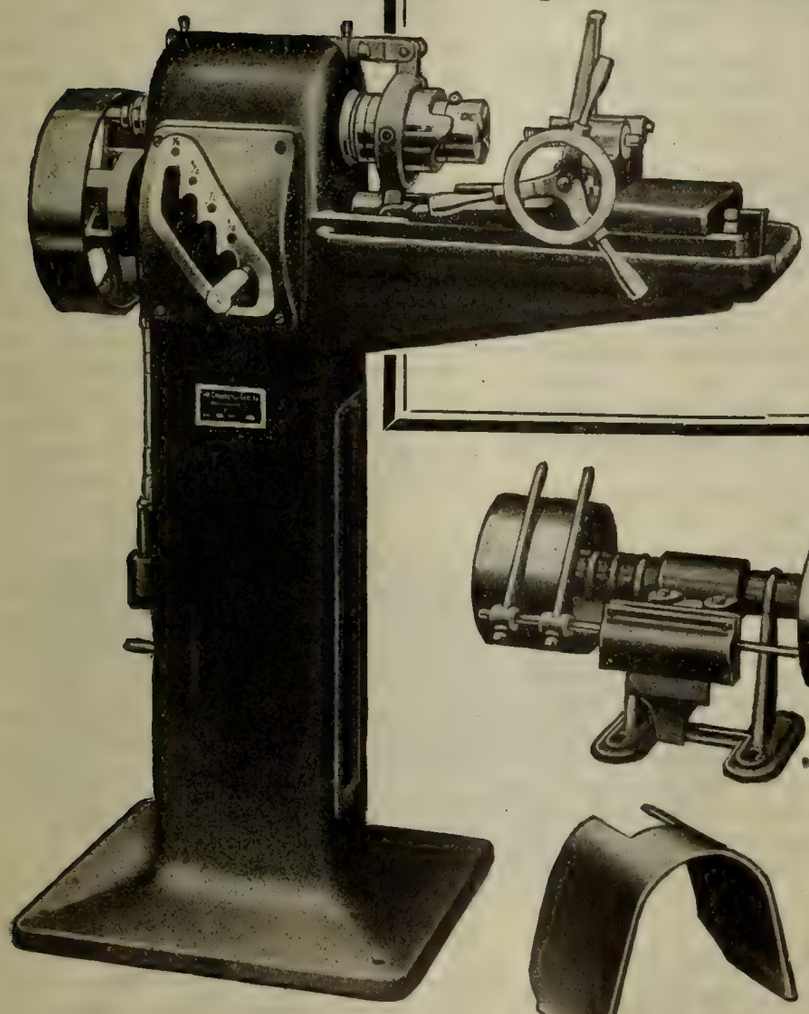
That is the lesson we are slowly learning

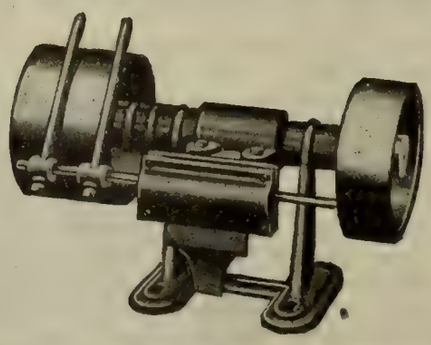
Here is a machine—the Geometric Threading Machine—which has been economizing in screw thread production for a number of years. Busy automatic screw machines cannot profitably be slowed down to cut threads when there is a Geometric Threading Machine at hand. Especially since a Geometric Threading Machine costs one-tenth the price of automatics.

Geometric Threading Machines are employed on a large class of small threaded parts that cannot be produced economically on the ordinary screw machine.

Made in three sizes—to cut 1/8 to 1/2 inch, 1/4 to 3/4 inch, and 3/4 to 1 1/2 inch diameter threads. The carriage is mounted on slides and on the largest size machine is moved back and forth by rack and pinion, and in the smaller sizes by hand.

Spindle speed changes readily made, adapting the machine to the diameter and material of the work. An adjustable stop assures accurate length of thread, and automatically opens the die head, permitting of drawing the work straight back.





A line from you brings full details regarding this machine. Tell us your threading requirements — let us recommend the proper Geometric Collapsing Tap or Self-Opening Die.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

Canadian Agents: Williams & Wilson, Limited, Montreal; The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg and St. John, N.B.

Leather, old, 21,271 lbs; brass, old, 25,977 lbs. This produce may be seen on application to the Senior Ordnance Officer, Toronto, Ont. Tenders for the purchase of all or any of these lots will be received until Aug. 25.

Winnipeg, Man.—Tenders, addressed to the Chairman, Board of Control, will be received up to August 22, for the following supplies for the Fire Department, namely, 3,000 feet 3½ inch cotton, rubber-lined fire hose, 221 (more or less) pairs rubber boots, 221 (more or less) waterproof coats. Specifications and forms of tender may be obtained at the office of the Chief of the Fire Department, Central Fire Station.

Quebec, Que.—Tenders will be received until August 28, for the construction of a steel bridge (two spans), over sluice ways in St. Charles River, at Quebec, P.Q. Plans and forms of contract can be seen and specification and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the District Engineers, Shaughnessy Buildings, Montreal, P.Q., Post Office Building, Quebec, P.Q., and Equity Building, Toronto, Ont.

St. John, N.B.—Tenders will be received until August 31, for the construction of an extension of and repairs to the Negro Point breakwater, St. John Harbor, St. John County, N.B. Plans and forms of contract can be seen and specifications and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the District Engineers at St. John, N.B.; Halifax, N.S.; Shaughnessy Building, Montreal, P.Q., and Equity Building, Toronto, Ont.

Woodstock, N.B.—Tenders will be received until August 28 for the following improvements to the water system:—Mechanical gravity filter plant. Additions and alterations to the pumping station, new boiler, steam turbine-driven centrifugal pumps, gasoline engine-driven centrifugal pump, and sundry machinery and appurtenances. Plans and specifications may be obtained from J. C. Hartley, Town Clerk, Woodstock, N.B., or R. S. & W. S. Lea, 809 New Birks Building, Montreal, or A. K. Grimmer, St. Andrews, N.B.

Ottawa, Ont.—Tenders will be received until August 27 for plumbing pipes and fixtures required in the reconstruction of the Parliament Buildings. All tenders to be based on the execution, erection and completion, including all labor and materials required for the installation of the plumbing system, together with all fixtures, apparatus and appliances as called for in the plans and specifications. Plans, specifications and any other information can be obtained at the office of the general contractor, P. Lyall & Sons, Construction Co., Ottawa.

GENERAL

Gravenhurst, Ont.—The National Potash Co., Toronto, will build a plant here.

Toronto, Ont.—The Canadian National Carbon Co. will build a power house at their factory here.

Hudson, Que.—The Canadian Ice Co. will rebuild their plant, which was destroyed by fire a few weeks ago.

Orangeville, Ont.—Fire last Monday destroyed the Alton Knitting Mills, owned by J. M. Dods. The building and machinery were valued at $110,000 and were fully insured. The mill will be rebuilt as soon as possible.

INCORPORATIONS

The St. Maurice Foundries, Ltd., has been incorporated with a capital of $49,000 to carry on a foundry business at Three Rivers, Que.

Murray Engines, Ltd., has been incorporated at Victoria, B.C., to carry on the business of machinists and engineers at Vancouver, with a capital of $25,000.

The Merchants Shipbuilding Corporation has been incorporated at Victoria, B.C., to carry on a shipbuilding business at Vancouver, with a capital of $500,000.

PERSONAL

John Lang has been appointed superintendent of the factory at Oshawa, Ont., recently taken over by the McClary Mfg. Co., of London, Ont .

W. G. Ross, Chairman Montreal Harbour Commission, has been presented with a special decoration by the Navy League in recognition of valuable services on behalf of the naval service and Navy League.

J. E. McAllister has been appointed vice-president and general manager of the National Street Car Co., Hamilton, Ont., succeeding Basil Magor, who has held the position for several years. Mr. McAllister was born in Hamilton.

A. T. Perrin, assistant chief draughtsman of the Dominion Bridge Co., of Lachine, P.Q., has resigned his position to become manager of the Iberville, P.Q., plant of the Rapid Tool & Machine Co., the head offices of which are located at Lachine, P.Q.

Maj. R. Falshaw Morkill, signal engineer of the Grand Trunk Railway System, and now serving overseas in the British army, has been appointed by the Director-General of Transportation, to take over all signaling work in the area occupied in France and Belgium by the British forces, and is now at general headquarters.

CONTRACTS

Walkerville, Ont.—The Maxwell Motor Car Co., of Detroit, have let the contract for steel work for their new factory here to the Canadian Bridge Co., of Walkerville.

Fort William, Ont.—George McLeod of Winnipeg has been awarded the contract for the new C. N. R. station here. The contract price is in the neighborhood of $50,000. J. Scholfield of Winnipeg is the company's architect.

Brampton, Ont.—The High School Board have accepted the tender of C. M. Sackrider, of Brampton, to erect a new school building at a cost of $65,921. The board has decided to build the school at the south end of the present grounds.

BUILDINGS

Toronto, Ont.—The Swift Canadian Co. have taken out a permit for the erection at the corner of Keele Street and St. Clair Avenue of a reinforced brick and concrete cooling building to cost $120,000.

Ottawa, Ont.—The votes for public buildings in Quebec are: Farnham public building, addition, $5,000; Grosse Isle, quarantine station, $148,000; Three Rivers, new public building, $20,000; Quebec Post Office, $15,000.

TRADE GOSSIP

Oshawa, Ont.—The Canada Malleable Steel Range Co., has been purchased by the McClary Mfg., Co., London, Ont.

The Globe Engineering Co. has been incorporated, with a capital of $100,000, and will take over as a going concern the assets and liabilities of the Globe Electric Machine Co., of Hamilton, Ont.

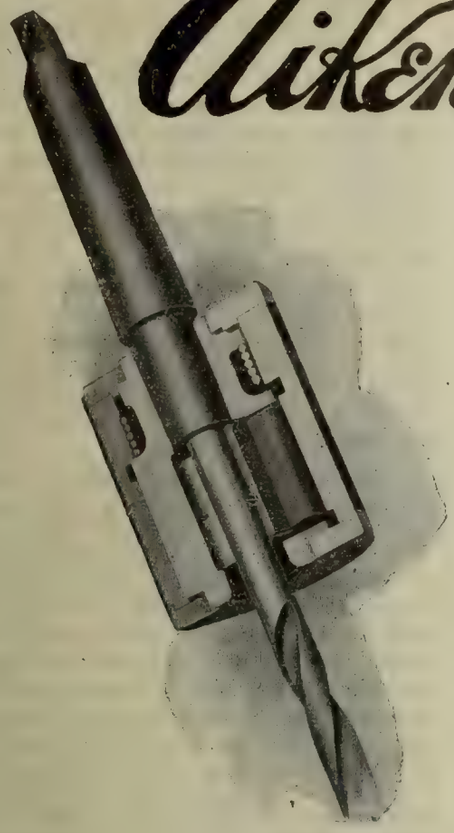
Hardwood of Canada.—Generally speaking, the hardwoods are produced in the eastern provinces of Canada, Ontario and Quebec being the main sources of supply. The four leading hardwoods—birch, maple, basswood, and elm, have occupied their relative positions for several years, but in the 1916 list poplar replaces ash in fifth plice.

Hamilton, Ont.,—It is reported here that the National Steel Car Co., have recently received substantial orders from the French and United States Governments. The French orders are chiefly for regulation army wagons, while the U. S. orders include freight cars as well as other army equipment.

Appropriation for Industrial Research.—The Dominion Government has appropriated the sum of $91,600 for the Bureau of Industrial Research, to be expended as follows: Salaries and expenses, collection and distribution of information, $43,600; studentships to be established, $12,000; fellowships, $5,000; special problems, $25,000, and forestry studies, $6,000. There is an appropriation of $24,620.

Lower Marine Rates.—It is reported from New York that in spite of the rather less favorable report of the British Admiralty there are indications of lower rates even to Europe. Some houses have lowered their schedules to Spain, Denmark, Norway, Sweden and Holland for neutral steamers by 1 per cent. Rates on off-submarine routes continue to be easier without marked changes. To Great Britain 8 per cent. on outward cargoes remain the general minimum.

Russian Car Order for Canada—The Canadian Car & Foundry Co., Montreal, are negotiating with the Russian authorities for a large proportion of the big Russian order which will soon be distributed to the Canadian companies, to-



Aikenhead's New Chuck

Will stop you losing your drilling profits

Minutes mean profit—are you losing minutes? There is no loss of time in tool changes when you use a

WAHLSTROM CHUCK

It is entirely automatic in its action — tool changes may be made without stopping the spindle—just grasp the shell of the chuck with one hand and make the tool change with the other. The change is made in a tenth of the time required with the ordinary chuck—and the tool automatically centers itself.

The Wahlstrom comes in two types—one for straight shank tools —the other for Nos. 1, 2 and 3 M.T. shank tools—they are both "Production Increasers," which demands your attention. Write for information now.

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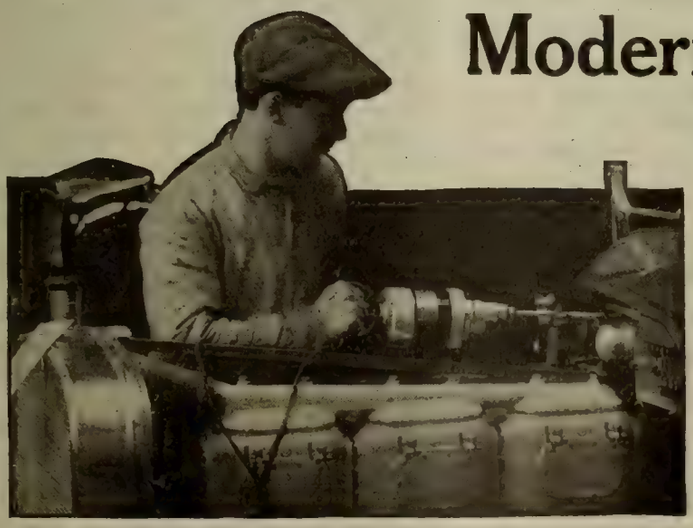
Modern Drilling Methods



By constructing the "Van Dorn" Portable Drill 100% overstrength, we have made great strides in promoting the efficiency and utility of a shop.

The "Van Dorn" Universal Portable Drills consume power only when in operation, and may be attached to any lamp socket.

The special fan-cooled "Van Dorn" motor is capable of 100% overload.

The switch is quick acting.

Sticking and fusing of contacts practically eliminated.

Phosphor bronze and ball bearings. Hardened gears.

We will gladly forward any information you may desire regarding portable drills, grinders, blowers, die filers, riveters, etc. Write us to-day.

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TORONTO, ONTARIO, CANADA

Canada's Leading Tool House

"HAWK" D CHROME VANADIUM STEEL

Will Give You Exceptional

Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

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THE IRON WORKS LIMITED

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Owen Sound, Ont.

Engineers

Boiler-makers

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Machinists

Tank Work
Smoke Stacks,
Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order

talling, it is said, 10,000 freight cars. The Canadian Car Co. is now working on an order for 2,000 Russian freight cars, which will be ready for delivery in October, and the order will be a big help in keeping up the present working capacity of the Canadian Car plants.

Ottawa, Ont.—The appropriations for public works in Ontario include: Elmira, public building, $2,000; Galt, drill hall, grading, paving, etc., $8,000; Kingston, R.M.C., enlargement of educational block, $150,000; Kingston, R.M.C., to complete new dormitory by adding two wings, $100,000; Palmerston, public building, $2,500; Prescott, public buildings, repairs and renewals, $3,000; Stayner, public building, $10,000; Whitby public building, to pay Government's share of cost of local improvements, $2,165.38; Windsor, public building, repairs and improvements, $4,500.

Coal Embargo Now Removed.—Fears of a coal shortage have been dispelled by the announcement that the Lehigh Valley Railroad Company has lifted the embargo against coal cars for Canadian points. The removal of this embargo is of the greatest importance to the City of Toronto generally, and to the Province at large, and was aided by the coal section of the Retail Merchants' Association and the Toronto press, which had fought hard to bring about an understanding whereby coal shipments into Canada could be continued. The embargo was due to the fact that cars were being held for unduly long periods at Canadian points.

Marine Machinery Contracts in B.C.—That since the letting of the winch contracts, nothing definite had been done toward arranging for the manufacture of engines, auxiliary machinery and ships' fittings for the 27 vessels being built in British Columbia for the Imperial Munitions Board, was the news given out on his arrival in Vancouver by Mr. George Bushby, president of the British Columbia Metal Trades' Association, who has been in Victoria for the past two weeks in conference with the British Columbia representatives of the Board, R. P. Butchart and Capt. J. W. Troup. It appears unlikely that any main engines will be built on the coast owing to the high cost of production.

MARINE

British Mercantile Marine Losses.—Since the outbreak of the war, 6,627 officers and men of the British mercantile marine, exclusive of those in the pay of the Admiralty, have lost their lives, according to a statement made in the British House of Commons on August 20 by Sir Albert Stanley, President of the Board of Trade.

St. John, N.B.—J. M. Smith, engineer for the St. John Shipbuilding Co., was in the city recently and surveyed the site for the proposed shipyards. He expressed himself as well satisfied with that chosen, and left for Montreal, where he will prepare blueprints for laying out the yards. In a week or so tenders will be called for the erection of buildings, grading, etc., and the work of getting the yards ready will be rushed as rapidly as possible.

Lake Shipping for Atlantic in Winter.—A report from Washington, D.C., states that the use of 1,000,000 tons of Great Lakes shipping in the Atlantic during the lakes' closed season is under consideration by the Shipping Board. It is planned to cut the larger lake vessels in two, and tow the parts through the Welland Canal, re-assembilng them on the seaboard. The size of the canal locks forbids passing of larger ships through whole. Cutting the big steel freighters has proved practicable in several cases. To replace the tonnage, the Board plans to expedite shipbuilding on the lakes to be ready for use there when the season opens next year.

Concrete Ships Being Built in Montreal.—Concrete shipbuilding has begun in Montreal under auspices which are likely to bring it to a successful issue, if the scheme proves at all practicable. The work of construction is being carried out by the Atlas Construction Co., which has had a great deal of experience in the handling of cement and reinforced steel from which the hulls of the boats will be made. One boat is now under construction at the Montreal Dry Dock Co.'s plant, and will be ready to travel under her own steam about the 15th of October. She is about 200 feet long, the hull having a thickness of 3 to 5 inches.

Port Authorities' Convention Plans.—The annual convention of the American Association of Port Authorities will be held at Cleveland, Ohio, from September 11 to 14. Delegates will attend from every important port and terminal in the United States and Canada. The meeting is regarded as especially important, because it will be devoted almost exclusively to considering definite recommendations for legislation, requiring common carriers to separate their terminal and through charges, and also to require common carriers and steamship lines to use their terminal facilities in such joint manner as will promote the utmost efficiency in the handling of all commodities.

Harbour Appropriations for Ontario.—The Dominion Government appropriations for harbours and rivers in Ontario include: Bayfield, repairs to piers, $10,700; Bruce Mines, dredging, $21,000; Burlington Channel, in full and final settlement of all claims of D. G. Stewart in connection with his contract for construction of revetment wall, $10,441.59; Burlington Channel, repairs to pier, $1,050; Collingwood, harbour improvements, re-vote $72,600, $75.000; Goderich, harbour improvements, $51,000; Kingston, dry dock, renewal of revetment walls, $33,000; Oshawa, repairs to pier, $2,100; Owen Sound, repairs to wharf, $4,000; Port Colborne, repairs to east breakwater, $1,750; Port Dover, repairs to piers, $6,000; Port Hope, harbour improvements, $13,500; Sault Ste. Marie, wharf improvements, $1,500; Thornbury, repairs to pier, $2,000.

Eighty Lake Boats Will Go to Atlantic. A representative of the United States Shipping Board was in Cleveland recently definitely initiating Government plans to commandeer lake freighters for coastwise and trans-oceanic war trade. Figures tabulated by the Government agent, in conference with local shipping experts, owners, builders and tugmen, show that upward of 80 lake boats can be taken to salt water. The Shipping Board's decision will rest upon the report to be made by its representative. The plan is to take every boat posible of passing through the Welland Canal, and thence through the St. Lawrence River to the Atlantic before lake traffic is icebound. The Shipping Board is now making a list of boats under 260 feet length and 43 feet beam, which can pass through the Welland Canal without alteration. Boats up to 520 feet length and not more than 43 feet beam will be cut in two, bulkheaded and towed by tugs through the canal and river.

Harbour Appropriations for Quebec.—The Dominion Government appropriations for harbours and rivers in Quebec include the following: Anse-aux-Gascons, repairs to wharf, $5,000; Anse-aux-Griffon, repairs to piers, $1,500; Baracnois de Malbaie, repairs to approach to the training pier, $1,200; Cap Chat River, improvements, $5,000; Cape Cove, repairs to pier, $500; Cascades Rapids, reconstruction of anchor pier, $1,500; Chaplain, repairs to wharf, $4,500; Chicoutimi, repairs to wharf, $2,500; Cross Point, repairs to wharf, $1,000; Graham, reconstruction of wharf, $3,500; Grindstone, M. I., repairs to wharf, $2,600; Grosse Isle, quarantine station, repairs to wharf, $4,000; Grosse Isle, quarantine station, extension of wharf, $50,000; Isle-aux-Coudres, wharf improvements, $1,200; Laprairie, repairs to wharf and completion of approach, $4,000; Malbaie, repairs to pier, $900; Newport, repairs to breakwater, $1,500; Norway Bay, to repair and improve wharf, $5,000; Point Shea, M.I., repairs in the wharf, $1,500; Riviere-a-la-Pipe, reconstruction of wharf, $5,000; Sabre-vois, repairs to wharf, $1,460; St. Anne de Beaupre, repairs to wharf, $600; Ste. Anne de Chicoutimi, repairs to wharf, $2,800; St. Charles de Caplan,, removing debris and rebuilding outer end of wharf, $2,500; St. Jerome, repairs to wharf, $2,500; St. Ulrich, repairs to wharf, $1,200; St. Zotique, reconstruction of wharf, $2,000; Three Rivers, repairs to wharf, $9,500; Vercheres, partial reconstruction of wharf, $4,700; Woburn, repairs to wharf, $1,500; Yamaska, reconstruction of dam, $1,500; Yamaska, repairs to dam across Little Channel, $750.

RAILWAYS—BRIDGES

Victoria, B.C.—The C. P. R. has asked the Board of Railway Commissioners to approve of the company's plans for the proposed bridge across the harbor. The bridge will cost about $30,000.

St. John, N.B.—Announcement that the Provincial Government has cancelled the contract for the construction of the northern section of the Valley Railway,

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Catalogues offered to Purchasers.

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We Make Nothing Else
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TRADE MARK LANCO BALATA BELTING
FOR BIG SERVICE
Lanco Balata is as nearly stretchless as it is possible to have a good belt and is really waterproof.
Have you our Belting Book? Sent free on request.
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We are manufacturers of stamped parts for other manufacturers.
We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.
We can finish steel stamping in Nickel, Brass or Copper.
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(MADE IN CANADA)

THE American Museum of Safety conferred a Gold Medal Award upon the Puro Sanitary Drinking Fountain at the First International Exposition of Safety and Sanitation.
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Safe Simple
SANITARY Economical
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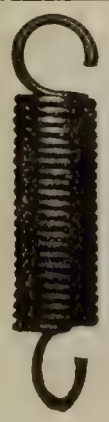
These are the qualities that forced the leading safety and sanitary engineers to pick Puro in preference to all others.
No device can be as efficient that does not contain all these qualifications; and Puro was not tied for first place; Puro was first.
Don't be satisfied with half-way goodness, or makeshift drinking arrangements for your employees.
If the men in your factory must drink, give them a clean drink.
Puro is clean—it does not rust or corrode.
Puro is economical. It allows just the proper amount of cool, clean, fresh water to come through the bubbler. No spurting, no overflowing, no loss. Puro regulates itself. You can attach it in five minutes.
Tell us how many men in your factory and your water pressure in pounds—
We'll tell you just what it will cost to "PURO-FY" YOUR WATER SUPPLY.

PURO SANITARY DRINKING FOUNTAIN
TRADE MARK
147 University Ave. TORONTO, ONT.



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SPRINGS

are the result of over sixty years' experience in spring making, combined with unsurpassed equipment and the workmanship of men who have been with us, ten, twenty and in some cases thirty years.

Write for booklet No. 7-T.

Established 1857.
THE WALLACE BARNES COMPANY
218 South St., Bristol, Ct., U.S.A.
Man'frs of "Barnes-made" Products
Springs, Screw Machine Products, Cold Rolled Steel and Wire

was made by F. B. Carvell, K.C., at the Valley Railway enquiry. The contract was made by the late Government after the last general elections were announced and provided for an increase in the cost of the work of about $76,000.

CATALOGUES

The Canadian S K F Ball Bearing Co., Toronto, have for distribution among their friends a handy pocket rule in English and metric measurements. The rule is 6¼ inches long and will be gladly mailed to anyone interested in ball bearings.

The S. K. F. Ball Bearing Co., Hartford, Conn., have issued a folder containing photographs and statements from a number of prominent machine tool manufacturers giving their opinion concerning the use of S K F ball bearings on the machines which they make.

Feed Water Treatment.—The Dearborn Chemical Co., of Canada ,Ltd., Toronto, are distributing a bulletin describing the Dearborn scientific treatmen of boiling feed waters. The bulletin gives a list of the substances commonly held in solution in feed waters and describes their action either in the formation of scale or corrosion of the boiler plates. The bulletin also deals with the Dearborn method and boiler preparations.

Darling Bros., Ltd., of Montreal, Que., manufacturers of steam appliances, have recently issued a special catalogue for distribution abroad. This booklet is 6 by 9 in. in size, containing 24 pages, and printed in French on high-quality calendered stock. Many of the lines manufactured and handled by this firm are profusely illustrated and described, with the data and prices arranged and compiled to meet the requirements of foreign countries familiar with the French language.

Electric Lamps.—Bulletin No. 78 describes the Cooper Hewitt electric lamps for photographic purposes. The bulletin gives full particulars and prices of the various outfits and different apparatus used in connection, accompanied by illustrations. The bulletin also contains suggestions as to the proper outfit to be used for various purposes in photography with illustrations showing studio arrangements. Copies of the bulletin may be obtained from The Cooper Hewitt Electric Co., Hoboken, N.J.

Steam Specialties—The V. D. Anderson Co., Cleveland, Ohio, have issued a new and well gotten up catalogue entitled "Anderson Steam Specialties," which include steam and air traps, steam and oil separators, water columns, pressure oil filters, copper floats, etc. The construction and operation of each product is fully described, accompanied by illustrations showing exterior and cross sectional views. Tables are also included giving the principal dimensions and other data for each size of trap or separator, etc. The catalogue also contains plates showing three arrangements of the Anderson oiling system.

Mechanical Rubber Goods, Valves.—Catalogue and price list No. 8 deals with an interesting line of valves, packings, and mechanical rubber goods manufactured by Jenkins Bros., Ltd., Montreal. This is a useful catalogue to have on file for reference, as it covers a full line of the above products and contains considerable descriptive matter about each in addition to the price lists. The catalogue is fully illustrated, while the concluding section No. 8, contains a price list of parts, tables of weights, and dimensions, together with diagrams, and also provincial registration numbers for the various types of valve. In this section is also included diagrams in connection with the dimension tables. The catalogue contains 252 pages, including a complete index and is bound in substantial cloth covers.

BOOK REVIEW.

Cold Storage Architecture.—To meet an ever-increasing demand for information respecting the construction of ice-houses and small cold storage systems for farmers, country storekeepers, milk producers, hotel-keepers, owners of country homes and others, the Dominion Department of Agriculture has issued Bulletin No. 49, of the Dairy and Cold Storage Branch, entitled "Small Cold Storages and Dairy Buildings," the immediate sponsors for which are J. A. Ruddick, Dairy and Cold Storage Commissioner, and Joseph Burgess, Cold Storage Inspector. The bulletin is a complete handbook on cold storge construction of a comparatively simple and inexpensive kind. Besides minute explanatory details of plans and material required for construction of ice houses and refrigerators, a series of drawings prepared by the Architect's Branch of the Department of Public Works is presented, of which blue prints on a scale of one inch to two feet can be had free on application to the Dairy and Cold Storage Commissioner, while the bulletin itself can be had, also free, by writing to the Publications Branch, Department of Agriculture, Ottawa. If the information herein contained were extensively made use of, not only would much waste be avoided and financial profit accrue, but considerable benefit would be derived in health and the enjoyment of life enhanced. Five different plans are given in the bulletin quantities with complete specifications for each and a statement of quantities of ice that can be stored.

A little Irishman in a state of great excitement and dishabille ran into the lobby of the hotel.

"I want a room," he said to the clerk, "and I want it quick."

"What room do you want?" inquired the clerk politely.

"I want 37."

"But 37 is already occupied—Mulligan has that room."

"I know he has," responded the little Irishman. "I'm Mulligan, and I just fell out of the window."

Our Market Service

A SHORT time ago we arranged with two of the best market editors in the United States—one in Pittsburg and the other in New York—for weekly letters on the market situation across the line.

With this addition to our market section we are able to give our readers a market service second to none.

We now publish reports from Montreal, Toronto, Sydney, New York and Pittsburg, with current prices and price predictions, on all steel products, metals and supplies.

Every man with buying responsibility should take advantage of our improved market service.

CANADIAN MACHINERY
153 University Ave., Toronto, Ont.

CLASSIFIED ADVERTISING SECTION

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

FOR SALE

A PAYING PROPOSITION FOR RAILROADS or manufacturers. Wish to sell our Canadian rights with fixtures. Address Frank Bayless, 311 Fair Street, Springfield, Ohio. c9m

FOR SALE — 1 LEES-BRADNER THREAD miller, equipped for threading nose and base of 6" shells. Apply The Hayes Wheel Co., Chatham, Ontario. c9m

ONE ARMINGTON & SIMS 10" x 12" HIGH speed engine, belted to one Westinghouse Electric Mfg. Co. direct current generator, 40 K.W., 550 volts, 75 amps.; speed 910 r.p.m.; also 40' 0"-10" double leather belting; all in good condition. Armstrong, Whitworth of Canada, Limited, Montreal, Que. c6m

FOR SALE—THE TORONTO ELECTRIC COMmissioners have for sale a quantity of second-hand 60-cycle meters and transformers recently in service, also quantity of electrical supplies. List of material and full particulars may be obtained on application to the Purchasing Agent, 15 Wilton Avenue. The quantities are not guaranteed, and all are subject to prior sale. No tender necessarily accepted. Toronto Hydro-Electric System, 226 Yonge St., Toronto. c7m

HYDRAULIC EQUIPMENT FOR SALE.—The equipment listed below is in first-class shape having only been used about three months. Blue prints and specifications and foundations drawings will be furnished. 2—14 x 12 x 5" Fairbanks-Morse duplex steam driven high pressure pumps at 80 gals. per minute capacity each against 600 lbs. pressure, steam pressure 150 lbs. 1—Weighted Accumulator good for 1000 lbs. per sq. inch, 16" diameter, plunger 11 ft. stroke with squeezing water cushion and wooden outside bumper blocks. The tank for the weighing material surrounding the cylinder is 10' 7" in diameter and 11' 0" high. 1—Return Suction Tank for above pumps and accumulator. Height, 9' 0", diameter 8' 0". Capacity, 2700 Imperial gallons. This equipment can be shipped immediately and is open for inspection at the company's plant. Prices on application. The Canadian Copper Company, Copper Cliff, Ont. c8m

SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto.

PATENTS

THE PROPRIETOR OF LETTERS PATENT M. R. Matti No. 137,772, "Arrangement for changing the moment of fuel injection into the combustion chamber during the run of the motor and for regulating the quantity of fuel," desires to dispose of the patent or to grant license to interested parties at reasonable terms, with a view to the adequate working of the patent in Canada. Inquiries to be addressed to the patentees, Stora Kopparbergs Bergslags Aktiebolag, Falun, Sweden. c7m

WANTED

WANTED—AIR COMPRESSOR — MUST BE in good condition: give full particulars as to make, size and price. Box 324, Canadian Machinery. c27m

WANTED—SECOND-HAND POWER SQUARing shear to cut No. 10 gauge steel up to 24" wide. Must be in good working condition. Packard Electric Company, St. Catharines, Ont. c4m

SITUATIONS WANTED

PRACTICAL WORKS MANAGER AND MEchanical expert with years of experience in United States and Canada, a specialist in munition work, open for engagement. Best of references. Apply Box 304, Canadian Machinery. c4m

MACHINE SHOP FOREMAN DESIRES change as shop foreman or master mechanic. Acquainted with scientific management; 26 years' experience. Box 328 Canadian Machinery. c11m

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States wants position as superintendent or general foreman. Large or small shop on ammunition or machinery; A1 references. Address Box 327, Canadian Machinery. c9m

EMPLOYMENT AGENT OR EMPLOYEEinterviewer position. Lady, middle-aged, possessing keen discernment, educated above the average, good correspondent (shorthand writer, typist), desires position as above with large firm of engineers or any factory, to interview employees and referees. Moderate salary desired. Toronto Engineering Agency, 57 Queen W., Toronto.

FOR

IMMEDIATE DELIVERY

No. 28—17" x 96" Brown & Sharpe Plain Grinder.

Pratt & Whitney Vertical Surface Grinder, 36" Table.

No. 1½ Bath Universal Grinder, complete tool room equipment.

No. 1½ Landis Universal Grinder, for Internal and External Grinding.

36 ft. Niles Plate Planer.

Lynd-Farquhar Co.

Boston, Massachusetts

SITUATIONS WANTED

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States will be open for position as superintendent or general foreman, July 15th. A1 references. Address Producer, Box 321, Canadian Machinery. c3m

SITUATIONS VACANT

THOROUGHLY CAPABLE BRASS FOUNDRY Foreman to take charge of small foundry doing a general jobbing business and also munition work. Location Montreal. Address for information, "Brass Foreman," P.O. Box 1934, Montreal. c26m

MECHANICAL DRAFTSMAN WANTED. Experienced on engines or turbines, capable of working out engine details. Apply giving full particulars as to experience, salary required, and enclose references, to Henry Hope & Sons of Canada Limited, Peterborough, Ont. c6m

NIGHT SUPERINTENDENT FOR SHELL MAchinery plant in Western Canada; knowledge of four point five shell and good all-round experience essential. Write, stating qualifications, salary and references, otherwise application will not be considered. Box 325, Canadian Machinery. c6m

FOREMAN WANTED—FOR SHOP IN CENtre of Toronto, with up-to-date equipment, employing about thirty men, doing jobbing business and making fine special machinery and tools. When applying state experience and give references, also wages expected. Only first-class men need apply. Box 326, Canadian Machinery. c8m

WANTED — ASSISTANT SUPERINTENDENT for six-inch shell factory. Must be capable of getting maximum production from an established plant and have good mechanical experience. Duties to consist chiefly in supervising production. Give full particulars in writing of previous experience, age, references, and salary required, to Henry Hope & Sons of Canada, Ltd., Peterboro. All information will be treated in the strictest confidence. c6m

2 New No. 2 Cincinnati Full Universal Millers

1 No. 3 LeBlond Universal Miller, Double Back Geared, Motor Drive

1 No. 2 Kempsmith Universal Miller

1 Smith & Mills 16" Back Geared Shaper

1 Smith & Mills 16" Crank Shaper

1 No. 30 Bliss Arch Press

1 Pratt & Whitney 2¼ x 26 Turret Lathe, Pan Bed, Friction Back Geared Head

J. GELB & CO.

203 Centre St., New York City

FOR SALE

4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 13 B. & S. Automatic Gear Cutter.

1—30" Newark Automatic Gear Cutter.

1—5 x 48 Pratt & Whitney Plain Grinder.

1—No. 2 Bath Universal Grinder.

1—12 x 60 Modern Plain Grinder, new.

2—Lees-Bradner Thread Millers.

1—30 x 30 x 8' Powell Planer, new.

Brownell Machinery Co.
Providence, R. I.

FOR SALE

Equipment used for making 18-pr. Shells.

1—Warner & Swasey Turret Lathe, 2" x 24", with attachments.

1—Lindermân Double Spindle Boring Machine, with attachments for finish boring shrapnel and nose turning H.E.

1—Flather & Co. 14" x 5' 0" Lathe, with chuck and countershaft.

1—Fosdick 16" x 6' 0" Lathe, with collet chuck and countershaft.

1—Braopose 16" x 6' 0" Lathe, collet chuck and taper attachment.

1—Goldie & McCulloch Nosing Press with Dies.

1—Beatty Accumulator.

1—Lees-Bradner Thread Miller, with attachments and countershaft.

1—Jones & Lamson Turret Lathe, 2" x 24".

1—40-gallon Bowser Tank and Pump; good as new.

1—Cold Saw, with variable speed motor, 60 cycle, 220 volt, cuts up to 9" stock, complete with three saws.

1—4-Connection Pyrometer with Rheostat, made by Taylor Instrument Co.

1—Thermo Couples, 39" long, bent 12½" from nose.

1—Thermo Couples, 39" long, straight.

1—One-Connection Tycos Pyrometer, made by Taylor Co.

1—Bertram Band Turning Attachment, for 24" Lathe, Ball-bearing Centre.

All the above located at Welland. Prices, Delivery and full particulars gladly furnished.

M. Beatty & Sons, Limited
Welland, Ont.

c11m

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CANADIAN MACHINERY
Classified Advertising Section
143-153 University Ave. Toronto

H. W. PETRIE of MONTREAL Limited Montreal, Que.

LIST OF NEW AND USED MACHINERY IN STOCK FOR IMMEDIATE SHIPMENT

ENGINE LATHES

New 13" x 5' Lancaster Sgl. B.G., Geared Feed.
New 15" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 16" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 15" x 7' Oliver Dbl. B.G., Q.C. Gear, Oil Pump and Pan.
New 16" x 24" x 10' South Bend Gap Sgl. B.G., Stan. Change Gears.
S.H. 17" x 8' Greaves Klusman Sgl. B.G., Geared Feed.
New, 18" x 8' Greaves Klusman Dbl. B.G., Geared Feed.
New 18" x 8' Giddings & Lewis Dbl. B.G., Geared Feed.
New 16" x 8' Stevens Sgl. B.G., Standard Change Gears.
New 18" x 8' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 18" x 10' Muller Sgl. B.G., Standard Change Gears.
New 18" x 12' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 20" x 10' Flather Sgl. B.G., Standard Change Gears.
S.H. 36" x 10' Fay & Scott Sgl. B.G., Stand. Change Gears.

HEAVY DUTY MANUFACTURING LATHES

New 20" x 8' Petrie Heavy Duty Manufacturing Lathes.

TURRET, SPEED AND BRASS LATHES SCREW MACHINES

New 13" x 7' Putman Speed Lathe.
S.H. 15" x 5' 6" Fox Brass Lathe with Chasing Attachment.
S.H. 30" x 10' Vilter Lathe, Friction B.G., Geared Feed with 18" Hex. Power Feed Turret.

DRILLS

New 20" Excelsior, Back Geared Wheel Lever, Power Feed.
New 20" Silver, Back Geared Wheel Lever Power Feed.
New 14" Leland Gifford Single Spindle Sensitive.
S.H. 14" Avey Spingle Spindle Sensitive.
S.H. 14" Foote-Burt Four.
New No. 1 Emco Bench Single.

HACK SAW MACHINES

New Peerless High Speed.
New No. 1 Rapid.

GRINDING AND BUFFING MACHINES

New 20" Ford Smith Water Tool Grinder.
New 18" Ford Smith S.O. General Purpose Pedestal Grinder.
New 16" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. Combination Grinder and Buffer.
New 12" Ford Smith S.O. Buffing Machine.

MISCELLANEOUS

S.H. No. 22 Garvin Vertical Milling Machine.
S.H. No. 0 Burke Hand Milling Machine.
New 1¼" National Bolt Cutter with Lead Screw Attachment.
New No. 1 Grabo Metal Saw Table.
New D4 Rock River Slitting Shear.
New No. 4 Chicago Steel Bending Brake.

Telegraph, Phone or Write for Prices and Further Particulars

H. W. PETRIE of MONTREAL
LIMITED
MONTREAL, QUEBEC

PETRIE'S LIST

Of New and Used Machine Tools Stock for IMMEDIATE DELIVERY

TURRET LATHES AND SCREW MACHINES

2" x 24" Stevens, flat type.
12" x 42" Foster, plain head.
15" x 5½' American, fox.
16" x 6' Pratt & Whitney, turret.
18" x 6' Prentice, high speed.
22" x 8' Pratt & Whitney.
24" x 10' Conradson, D.B.G.
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

13" x 6' Filssmith, D.B.G.
14" x 6' Lodge & Shipley.
15" x 8' Sebastian, back geared.
16" x 8' McDougall, back geared.
17" x 8' Blaisdell, back-geared.
18" x 6" New Haven.
18" x 10' Putnam, back-geared.
20" x 8' Fifield, back geared.
21" x 8' Bawden, heavy duty.
24" x 11' Pond, back-geared.
30" x 10' Ames, back geared.
31" x 16' Fifield, back-geared.
18" x 32" x 12' C.M.G. gap.
24" x 40" x 20' Dundas, gap.
28" x 50" x 24' Bertram, gap.

DRILLS

13" Perfect, 2-spindle.
14" Excelsior, sensitive.
16" Barr, sliding head.
18" Buffalo, post drill.
20" Perfect, lever feed.
20" Silver, back-geared.
22" Barnes, back-geared.
24" Kerkhoff, sliding head.
40" Bickford, back geared.
64" Canedy-Otto, wall radial.
No. 10a Baush, 16-spindle.
No. ½ Avey, ball-bearing, bench.

GRINDERS

No. 1 Wilmarth & Morman.
No. 1 Cincinnati, universal tool.
No. 2 Landis.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 14 Besly, with shell holder.
26" Gardner, disk.

IRON PLANERS

20" x 20" x 5' Bertram.
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Sellers, 4 heads.
40" x 40" x 12' New Haven, power feed.

MILLING MACHINES

No. 0 Burke, hand feed.
Bertram, plain.
Brown & Sharpe, power feed, plain.
Fitchburg, geared, plain.
No. 2 Ford-Smith.
No. 6 Whitney, hand feed.

SHAPERS.

16" Canada Mach. Corp.
16" Hendey.
16" Queen City, back geared.
20" Cincinnati, back geared.
24" Gould & Eberhardt.
30" Morton, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6" Robertson Hack Saws.
6" Kennedy Cutting-off Machine.
12" Hall Pipe Machine.
No. 2 Colburn Keyseater.
No. 5 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 2 Bliss Foot-power Press.
No. 3 West Tire Setter Banding Press.
Brown-Boggs Punching Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
7' Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.
FRONT STREET WEST, TORONTO

If any advertisement interests you, tear it out now and place with letters to be answered.

RIVERSIDE Machinery List

We Own Every Tool Offered

ENGINE LATHES

1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—28 x 15 Putnam Standard Engine Lathe.
1—22 x 14 Putnam Standard Engine Lathe.
1—22 x 10 Reed Standard Engine Lathe.
1—22 x 8 Reed Standard Engine Lathe.
3—New 18 x 8 Springfield Engine Lathes.
1—New 16 x 8 Springfield Engine Lathe.
1—New 14 x 6 Springfield Engine Lathe.
1—18 x 6 Jones & Lamson Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—16 x 8 Porter Standard Engine Lathe.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.
1—No. 3 Hartiarge Bench Lathe.

TURRET AND SCREW MACHINES

1—24" Gisholt Turret Lathe.
2—No. 6-A Potter & Johnson Automatic Lathes.
1—2¼ x 24 Jones & Lamson Flat Turret Lathe, S.G.H.
1—2 x 24 Jones & Lamson Flat Turret Lathe, cone head.
3—No. 4 Foster F.G.H. Hand Screw Machines.
1—No. 4 Smurr & Kamon Hand Screw Machine.
1—No. 5 Pierson F.G.H. Hand Screw Machine.
4—New 14" Pierce Turret Lathes.
2—New 1 x 8 Pierce Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND GRINDERS

1—No. 2 Hendey Plain Milling Machine.
3—New No. 1½ American Plain Milling Machines.
1—No. 13½ Garvin Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling & Drilling Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
4—No. 0 Burke Bench Millers (new).
1—No. 2½ Bath Universal Grinder.
1—No. 2 Wilmarth & Morman Surface Grinder.
1—No. 3 Wilmarth & Morman Surface Grinder.
1—Mina Valley Universal Cutter Grinder.
1—No. 170 Wells Cutter Grinder.

DRILL PRESSES

1—3' Mueller Plain Radial Drill.
1—6' Mueller Plain Radial Drill, old type.
1—20" Baker H.D. Drill.
5—20" Buffalo Plain Drill Presses.
1—3-spindle 8" overhang Henry & Wright High Speed Drill.
4—6-spindle Fox High Speed Drill Presses.
2—4-spindle Fox High Speed Drill Presses.
1—16-spindle Natco Drill.
3—12" Leland & Gifford High Speed Bench Drills.

SHAPERS AND PLANERS

1—24" Ohio H.D., B.G. Crank Shaper.
1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
2—16" New Springfield B.G. Crank Shapers.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS.

1—Waterbury-Farrell O.B.I. Press, geared.
1—No. 10 Perkins Drawing Press.
5—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—50-lb. Scranton Belt Hammer.
1—25-lb. Bradley Helve Hammer.

AIR COMPRESSORS

1—16 x 18 x 12 Union Steam Pump Co., steam driven air compressor.
1—8 x 6 Westinghouse Steam Air Compressor.
1—10 x 10 Clayton Belt Driven Air Compressor.
1—8 x 8 Fairbanks-Morse Electrical Driven Air Compressor.
1—8 x 8 Gardner Single Belt Driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt Driven Air Compressor.
1—7½ x 6 Chicago Pneumatic Tool Co. Belt Driven Air Compressor.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machines tools both large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

GOOD USED EQUIPMENT

ELECTRIC TRAVELING CRANES.

20-Ton, 56' 3" span, three motor, 110 volts, D.C.
25-Ton trolley, three motor, 220 volts, D.C.
10-Ton, 40' span, 80' lift, three motor.
5-Ton, 47' 0" span, three motor, 110 V., D.C.
21, 14 and 4½ H.P. Shaw crane motors, 220 volts, D.C.
10 H.P. Akron crane motor, 220 volts, D.C.
10-Ton hand crane, 55' 0" span.
20-Ton hand crane, 29' 6" span.
2-Ton hand cranes, 22' span.

PUNCHES AND SHEARS.

Lever Shear (double), cap. 2" sq.
28" throat (single), cap. ⅞x⅞" (belt).
36" throat (single), cap. 1¼x1" (belt).
48" throat (single), cap. 3x1¼" (steam).
16" throat (single), cap. 1½x1½ (belt).
38" throat (single), cap. 1x1" (belt).
36" throat (single), cap. ⅞x⅞" (belt).
17" throat (single), cap. ¾x¾" (belt).
15" throat (single), cap. ¾x½" (hand).
10" throat (double), cap. 1½x1" (belt).
Squaring Shear, 53" cap., 14 gauge.
Angle Shear (double), cap. 6x6x¾" (belt).
Plate Shear (Univ.), 18" blade, cap. ½".
Rotary splitting, 30" throat, cap. ½".
Rotary bevel, 5" throat, cap. ½".
Coulter & McKenzie, cap. 3x½", spring steel.
Guillotine, Perkins, No. 6, cap. 2½" sq.

MISCELLANEOUS.

Bulldozer, No. 12 Ajax, 30" stroke.
Bending Roll, 6', drop end, 6½ and 8" rolls.
Lathe, 24" x 10' American, latest.
Grinder, No. 10 B. & S. Plain.
Grinder, No. 13, B. & S. Universal and Tool.
Rotary Planer, 36", Cleveland No. 2.
First-class condition—quick shipments.
Saw, cold, 26" blade, 48" travel.
Press (trimming) No. 11 Perkins, 16,500 lbs.

McCoy-Brandt Machinery Co.
Office and Warehouse:
216-218 Penn Ave., Pittsburgh, Pa.

Federal Machinery Sales Company

18 No. Jefferson St., Chicago, Ill.

Rebuilt Tools—Immediate Shipment

DRILLS.

24" Hoefer, upright, sliding head, b.g., p.f.
25" Hamilton, sliding head, b.g., p.f.
2-spindle 20" Barnes, gang, b.g., p.f.
Silver, 20", wheel and lever feed (15), new.
Silver, 20", b.g., p.f., automatic stop (20), new.

GEAR CUTTERS.

Gould & Eberhardt, 22" x 5" x 6 pitch, auto. spur and bevel.
Whiton 24" Automatic Spur Gear Cutter.

GRINDERS.

No. 2 Oakley Universal Cutter and Tool Grinder, new.
No. 2 American Surface Grinders (2), new.
Landis 8" x 20" Universal.
Landis 16" x 66" Crank Grinder with extra plain heads if desired.

LATHES.

16 and 17" x 8' Engine Lathe (6), Porter, Cincinnati, etc.
16" x 8' South Bend (2), new.
18" x 12' American, c.r., h.s.
17" x 6' National, quick-change gear, c.r., h.s.

MILLING MACHINES.

Pratt & Whitney Lincoln type (2).
No. 1½ American Universal.
No. 3 Aurora, plain, back-geared.
No. 1½ Grand Rapids, back-geared, plain.
No. 13 Brown & Sharpe Mfg., plain.
4-spindle Warner & Swasey Valve Miller, good as new.

PRESSES.

No. 5 Cleveland, open back, inclinable, plain, new.
C1 Ferracute, open back, inclinable, plain, new.

SCREW MACHINES AND TURRET

2¼" Acme, fric. grd. head, p.f. to turret.
Bardons & Oliver No. 1, 13-16" cap.
Hamilton, 20" swing x 8' bed, fric. head, eng. tur. lathe, pan bed, power feed turret on bed.
Pond 21" Heavy Duty Rigid Turret Lathe, geared head.
Jones & Lamson 3" x 36" Grd. Sliding Head Turret Lathe, bar equipment.

SHAPERS.

20" Hendey Friction Shaper.
20" Cincinnati Back-geared Shaper.

MISCELLANEOUS.

High Speed Hammer Co.'s No. 4A Riveting Hammer.
3" Smith & Post Cold Saw.
D14 Rock River Geared Power Splitting Shear.
60" Bertsch Foot Power Gap Squaring Shear.

Send for complete list. c8m

Chas. A. Strelinger Co.,

43-51 E. Larned St.,
DETROIT - MICH.

Machine Tools For Immediate Delivery

DRILLING MACHINES.

No. 3 Barnes Horizontal Radial Drill.
Henry & Wright Sensitive Drilling Machines.
No. 1-S Garvin B. G. Horizontal Drill with Pump and Piping.

GRINDERS.

Wells No. 160 Cutter and Reamer Grinder.
Capitol Internal Grinder with water attachment.
No. 2 Diamond Auto. Surface Grinder, belt driven.
No. 3 Wilmarth & Morman Surface Grinder.
No. 3 La Salle Grinder, complete.
Geometric Chaser Grinder, with countershaft.
No. 4 and No. 6 Gardner Pl. Bearing Disc Grinder.
No. 2 Diamond Wet Tool Grinder with wheel truing device.

LATHES.

No. 10-K Seneca Falls 9" x 4' Bench Lathe.
14" x 6' Monarch Q.C., S.B.G. Engine Lathe.
17" x 8' Sidney Q.C., D.B.G. Engine Lathe.
19" x 8' Sidney Q.C., D.B.G., Engine Lathe.
16" x 7' Oliver Q.C., D.B.G. Lathe, with pan and pump.

SCREW MACHINES.

No. 1 New Howe Pl. Hd. Screw Machine, with auto. chuck.
1½" Dreses Screw Machine, F.B.G., Power Feed.

MILLING MACHINES.

Wisconsin Hand Miller on column, complete.
No. 6 Whitney Hand Miller, complete with countershaft.
No. 1 U.S. Hand Miller, complete with cshaft.
H. B. Smith Hand Miller, complete with cshaft.
No. 1 Standard Hand Miller, with oil pump equipment.

PRESSES.

Atlas Presses, No. 0 to No. 5 inclusive.
Greenerd Arbor Presses, No. 1 to No. 5 inclusive.
No. 5 Toledo Geared O.B.I. Power Press.
Manhattan Ratchet Type Screw Press.

THREADING MACHINES.

Geometric ¾" Threading Machine.
No. 38 Curtis & Curtis Hand Power Pipe Machine.
No. 5½ Merrill Comb. Hand and Power Pipe Machine.

C. W. CULLEN MACHINERY CO.

LEADER-NEWS BUILDING

CLEVELAND, OHIO

Bickford 4½' Plain Radial Drill, cone drive.
No. 3 Lapointe Broaching Machine, new.
2—P. & W. No. 2 Cutting-off Machines.
Bement Miles & Co. 7½" Vertical Spindle Crank Drilling and Boring Mill, 68" swing.
Detroit Japanning Ovens, 8' 10" x 8' x 152".
Pratt & Whitney 48" Gap Lathe.
Hanna 30-ton Riveter, 12" reach.
Pangborn Sand Blast, 90" rotary table, M.D.
3—800-ton Gen. El. Hydraulic Double Action Presses.
3—2¼ Cleveland Automatics; prac. new.
10—¾" B. & S. Automatics.
Allis Chalmers 150 H.P. Corliss Engine, 12' F.W.
Bruce MacBeth 150 H.P. Gas Engine; new.
2—Rathmann Jones Gas Engines, 125 and 225 H.P.
80" Niles Vert. Boring and Turning Mill, 2 heads, slotting attachment.
Ingersoll-Rand Air Comp., 342 cu. ft., steam driven, inter-cooler, complete.
Bertsch Straightening Rolls, 7" x 84"-3" vert. adj. M.D.
Kelly Springfield 10-ton Road Roller, rebuilt.
Vulcan 1 cu. yd. Steam Shovel, traction; weight 35 tons: new flues.
62-ton Baldwin Consolidation Locomotive.
Ajax No. 1 Taper Forging Rolls, 50 strokes.
One No. 5 S-3 Cold Langelier Swadger.
3—No. 7 H.S.-6 Langelier Swadger.
1—Bolt and Rivet Header, hand feed, ⅝" x 3½" rivets.
Bolt and Rivet Header, hand feed, ¾" x 4" rivets.
70-C Bucyrus Steam Shovel, St. G.
R. Is. Locomotive, 45 tons, St. G.

IMMEDIATE DELIVERY

DRILLING MACHINES

Leland H.S., B.B., bench type.
No. 1½ Knight Driller and Miller.
14" Rockford Sensitive.
22" W. F. & J. Barnes, s.h., b.g., p.f.
32" Hamilton, s.h., b.g., p.f.
32" W. F. & J. Barnes, s.h., b.g., p.f.
20" W. F. & J. Barnes, 4 spindle.
3' W. E. Gang Plain Radial.
3½' W. E. Gang Plain Radial.
Pawling & Harnischfeger Horizontal Driller.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. automatic.
30" x 9" G. & E. auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3—26" B. & S. for spur.
36" Walcott for spur.

GRINDERS

Leland Universal, with power feed.
No. 23 B. & S. Gear Cutter.
8" x 30" Modern Plain (new).
14" x 20" B. & S. Plain.
Garvin hole grinder.
Gisholt tool grinder.
No. 5 Diamond water tool.
No. 16 Gardner disc grinder.
No. 24 Gardner disc grinder.

LATHES

13" x 5' P. & W., c.r., taper.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
18" x 8' L. & S. pat. head, c.r. taper.
18" x 10' Fitchburg, c.r.
18" x 12' Barker, c.r.
20" x 14' Blaisdall, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
36" x 20' American, t.b.g.
36" x 22' New Haven, t.b.g.
3½" x 60" Fitchburg Lo-Swing.

PLANERS

24" x 24" x 4' Gray, one head.
24" x 24" x 8' Cincinnati, one head.
30" x 30" x 8' Woodward & Powell, one head.
30" x 30" x 8' Cincinnati, two heads.
36" x 36" x 14' Sellers, one head.
40" x 38" x 14' Putnam, one head.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES

1" B. & S. Plain.
16" P. & W. Plain.
No. 2 Costello, plain head.
No. 2 P. & W. friction head.
No. 4 Pearson, geared head.
No. 3 Bardons & Oliver, plain head.
⅞" Cleveland, automatic.

TURRET LATHES

16" Lodge & Shipley.
25' Niles.
2 x 24" Jones & Lamson.
3 x 36" Jones & Lamson, chucking equipment.
3 x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt turret lathes, taper attachment.

PUNCHES AND SHEARS

No. 3 Bauroth, O.B.I.
No. 5 Bauroth Geared, O.B.I.
No. 6 N. American Can.
No. 2 L. & A. Angle Iron Shears, 5"x5"x½" (new).
No. 5 L. & A. Double Punch & Shear, ⅝"x⅝", 3"x⅝", 1⅛ rd. (new).
No. 1 L. & A. Multiple Punch (new).
No. 2 L. & A. Multiple Punch (new).
No. 1 L. & A. Horizontal Punch, ½" in 1" (new).

MISCELLANEOUS

No. 2 Kempsmith Universal Miller.
50-lb. Bradley Strap Hammer.
¾" Acme Forging Machine.
52" Niles car wheel boring mill.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-ton Yale Duplex Hoist.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., CHICAGO, ILL.

List of Machinery in Stock for Sale

FOR 60-PDR. SHELLS

28—No. 180 Brown & Boggs, Dial Feed. Without Dial Feed.
6—No. 190 Brown & Boggs, with Dial Feed.
3—No. 1 Toledo, with Dial Feed.
2—No. 01 V. & O. Presses with Roll Feed.
1—No. 18 Perkins Press, Plain.
2—No. 31C McDonald Double Acting Can Press with Magnet Stock Lifter and Auto. Feed.
1—No. 216B Niagara Tool Works Co. Slitting Machine.
2—Holden & Morgan Thread Millers for base end.
1—Bertram Duplex Thread Miller for nose end.
1—Bertram Copper Band Lathe.
1—Perrin Band Press with Pump.
1—Base Plug Twister (home made).
1—Roll Riveter (home made).
1—6" Shell Vise (home made).
1—5" Marking Head (home made).
1—5" Hand Tapping Vise home made).
1—Waterous Special Rough Turning and Cutting-off Lathe.
1—Jenckes Band Turner.

MISCELLANEOUS

4—Errington Collapsible Taps, 2". Chasers for above.
1—1¼" Automatic Hartford Screw Machine; in first-class condition.
1—Noble & Westbrooke Marking Machine, only used to mark 200,000 gaines; good as new.
1—P. & W. ⅝" Screw Machine.

FOR 6" SHELLS

3—500-lb. Beaudry Champion Hammers.
4—Sets 6" Shell Nosing Dies for above.
2—De Vilbiss Varnish Sprayers 1 quart size). Transformer set for above.
1—No. 3 West Banding Press for 6" shell.
4—Greensboro Turret, 24".
2—C.M.C., 26" x 12", Double Back Geared.

All the above are in good condition and only ran six months.

McKinnon Dash Company
St. Catharines, Ont.

c11m

MACHINE TOOLS IN STOCK

No. 4 Cincinnati Universal Miller with Vertical Attachment and Power Feed Rotary Table.
No. 3 LeBlond Universal Miller.
No. 3 Kempsmith Plain Miller with Index Heads and Vertical Attachment.
4—No. 1½ NEW American Plain Millers.
5—No. 0 NEW Steptoe Hand Millers.
24" x 10' NEW Carroll-Jamieson Heavy Duty Lathe.
6—19" x 8' NEW Sidney, D.B.G., quick change, swing 21" over V's.
3—17" x 8' NEW Sidney, D.B.G., quick change, swing 19" over V's.
1—15" x 6' NEW Sidney, D.B.G., quick change, swing 17" over V's.
12—17" x 8' NEW National, quick change.
1—15" x 6' NEW Carroll-Jamieson, quick change.
48" Harrington Plain Radial Drill.
36" Dreses Plain Radial Drill.
D-4 Colburn High Duty Drills.
3—20" Rockford High Duty Drills.
1—28" NEW Superior Sliding Head Drill.
2—25" NEW Superior Drills, with tapping attachment.
16" Queen City B.G. Shaper.
20" Cincinnati B.G. Shaper.
24" NEW Steptoe B.G. Shaper.
24" Flather B.G. Shaper.

FRANK TOOMEY, INC.
127-131 North Third St., PHILADELPHIA, PA., U.S.A.

Eastern Machinery & Equipment Co., Inc.

319 COMMERCIAL TRUST BUILDING - PHILADELPHIA, PA.

NEW TOOLS FOR IMMEDIATE DELIVERY
1—No. 662" Becker Vertical Miller.
4—12" x 36" Bridgeport Grinders.
1—2½ x 2" Wm. Sellers Tool Grinder.
30—18" x 9' Turning and Boring Lathes.
3—Double head Sullivan Grinders.
1—32" x 12' Pittsburgh Engine Lathe.
1—20" Ohio Shaper.
3—26 x 14' Am. Patt. Eng. Lathe.

USED MACHINERY

ENGINE LATHES
8—30" x 10' American Gear head A-1.
5—20" x 8' Lodge & Shipley, geared head, q.c.g.
2—20" x 10' Bullard.
1—24" x 6' Bullard.
3—24" x 14' American.

TURRET LATHES
3—3 x 36 Jones & Lamson Flat Turret.
2—2¾" x 24" Jones & Lamson Flat Turret, bar equipment. Full set Turret Tools.
9—25" Gisholt 12" Collet chuck 6½" hole in spindle threading lathe.
8—26" Putnam heavy duty lathe.
—14" x 6' Lodge & Shipley Turret. Backgeared.

BORING MILLS
6—66" swing Bement-Miles Tire Turning Mills, two swivel heads—15½" under rail.
1—37" Baush Boring Mill, 2 heads, good as new.
3—24" Bullard Vertical Turret Lathe.
1—Cylinder boring mill, capacity of 24" diam. to 96" diam. 10' long.
Tool equipment included, good as new.
1—42" Bullard Boring Mill (2) heads.

PLANERS
1—48" x 12' Pedrick open side.
1—20" x 36" Pedrick, open side.
1—36 x 36 x 10 Ohio, 2 heads.

GEAR CUTTERS
1—24" Fellows Gear Shaper.
1—24" Brainard automatic Gear Cutter.
1—30" NEW Flather, latest pattern automatic gear cutting machine.
2—36" Fellows Gear Shapers.

SCREW CUTTING MACHINES
1—2" Cleveland automatic.
1—No. 55 National Acme 4 spindle, good as new.
1—No. 54 National Acme 4 spindle, good as new.

SLOTTERS AND SHAPERS
1—9" Bement Slotter.
1—12" Bement Slotter.
1—20" Wharton Slotter.
1—20" Gould & Eberhardt Shaper. B.G. Vise. C.S.

FOX LATHES
1—16" Dresser friction clutch back gear.
2—18" American Monitor back gear carriage and control.
2—14" L. E. Hall Turret Monitors, back gear.

DRILL PRESSES
1—24" Bickford Upright back gear sliding head lever and wheel feed drill.
1—4' Bickford Radial, with Tapping attachment, motor drive, with motor.
1—5' Bickford Radial Drill, complete with gear box, single pulley drive, plain box table machine, in first-class condition.
1—5' Niles Radial Drill Press, geared for motor drive, but no motor, in first-class condition.

FOUNDRY EQUIPMENT
4—Foundry Ladles, 4 to 10 ton.
10—Foundry Core Cars 10 and 15 ton.

MISCELLANEOUS
10—Special Steel Shafting.
—Hollow Boring Lathes 26" x 72" capacity.
4—Automatic Tube Grinding and Polishing Machines.
2—Bement Miles Axle Turning Machines, motor drive.

PRESS EQUIPMENT FOR SALE

50—No. 18 Bliss Type Inclinable Presses.
6—No. 19 Bliss Type Inclinable Presses, with roll feeds.
1—Double Acting (Michigan) Press.
1—Double Acting (Rhodes England) Press.
1—Brown-Boggs Multiple Power Shears.

A large number of these presses are equipped with Dial Feeds. Have only been used for a few months—good as new. Will be sold at a bargain if purchased at once.

Apply 702 Excelsior Life Building TORONTO

c10m

Single Purpose and Shell Lathes

22—18" x 8' Battle Creek Lathes, single back gear, 2-step cone with counter shaft.
6—18" x 9' Chard Lathes, 3-step cone, double back gear, compound rests, semi-quick change with face plates, steady rests and counter shafts.
3—20" x 8' Mershon Lathes, 3-step cone, double back gear, compound rest and counter shafts.
4—20" x 8' Oakley Lathes, 3-step cone, double back gear, compound rests with oil pumps and pan and counter shafts.
1—20" x 10' Oakley Lathe, 3-step cone, double back gear, compound rests with oil pumps and pan and counter shafts.
4—20" x 8' Bullard Projectile Turret Lathes.

If you can use all or a part, we will be pleased to have you communicate with us promptly.

EAST DAYTON MACHINERY COMPANY
Dayton, Ohio

c8m

You Want A Good Man

for that position you have open, don't you? Then why not advertise for him in the paper he reads? Only the mechanics who are ambitious and who are capable of filling the responsible positions subscribe to CANADIAN MACHINERY. Your "Help Wanted" ad. in CANADIAN MACHINERY will bring responses from this class.

Prove it to your satisfaction and benefit

Canadian Machinery
Classified Advertising Section
143 University Ave., Toronto

Form the habit of using this section

When you want to buy or sell new or used equipment, use this section.

If you need machinery in a hurry, here is where you will find the names of firms equipped to supply your needs. And if you have old machinery which has outgrown its usefulness to you, tell Canadian Machinery readers about it in these pages.

That the same firms advertise here week after week is pretty good evidence that they are getting business. That you have looked over these ads. for equipment is evidence that others will do the same thing.

Get the habit of looking over this section every week. The bargains you will pick up by being first on the job will pay you for the time you spend each week.

Canadian Machinery
Classified Advertising Section
143 University Ave. - Toronto

LOOK—HERE THEY ARE

BORING AND TURNING MACHINES—VERTICAL.

1—30" Bullard, 1 turret head.
1—30" Flather, one turret head.
1—New 30" Gisholt, September delivery.
2—36" Brown & Sharpe, one turret head; Dec. delivery.
1—37" Niles, one swivel, one turret head.
1—42" N.B.P., two swivel heads, motor drive.
1—72" Niles, two swivel heads.
1—80" Niles, two swivel heads, slotting attachment.
1—84" Sellers, one head.
1—New 8' Bickford; December delivery.
10' Niles, 2 heads; December delivery.

BORING MACHINES—HORIZONTAL.

1—No. 1 Barrett Cylinder Borer, 3¾" bar type.
1—No. 2 24" Barrett, two side facing heads.
1—Hoefer Horizontal Driller and Borer, with 1 11-16" spindle, vertical adjustment 40", horizontal adjustment 46", size of table 33" x 48".
1—Lucas, 2¼" bar.
1—Newburgh 4" bar, 84" swing, 72" feed.

BULLDOZERS.

1—No. 8 Ajax, 20 H.P. motor drive.
1—New No. 4 Garrison (same as No. 4 Williams-White).
1—No. 7 High-speed Ajax, 16" stroke.

COMPRESSORS—AIR.

1—Ingersoll-Sargent Duplex, 8 x 14½ x 8".
1—Cincinnati Cross Compound, two-stage, 790 cu. ft.
1—10" x 12" Chicago Pneumatic, belt-driven.
1—10" x 10" x 10" Single Cylinder Smith-Valle, steam driven.
1—22" x 13" x 16" Ingersoll-Rand, motor driven.

CRANES.

20-ton Alfred Box Electric Traveling Crane, 40' span.
25-ton Browning Electric Traveling Crane, 40' span.
1—Locomotive, 35' boom, standard gaged, steam driven.

CUTTING-OFF MACHINES.

2—No. 00 Brown & Sharpe.
1—2" capacity Warner & Swasey.
4—3½" Hall.
10—4½" Williams.
3—4" Curtis & Curtis.

DRILLING MACHINES—RADIAL.

2—New 2' American, cone drive.
1—3' Bickford, semi-Universal table.
1—3' Bickford, gear drive.
3—New 3' Americans, sensitive tapping attach.
4—New 3' Prentice, July delivery.
1—New 3' Mueller, plain speed, box drive.
1—New 3½' Western Drill, 86" circle.
2—4' Mueller, plain, speed box drive.
1—5' semi-universal American.
5—New 5' Baush Plain.
1—5½' American full Universal.
1—6' Baush Plain, cone driver.
10—New 6' Triumph, motor drive; Sept. del.

DRILLING MACHINES—HEAVY DUTY.

2—New No. 2 Colburn.
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
2—D-3 Colburn, plain table.
4—No. 310 Baker, single pulley drive, late type.

DRILLING MACHINES—MULTIPLE SPINDLE.

4—New Leland-Gifford, sensitive, four spindle.
1—No. 30C Baush, 12 spindle, capacity 1⅛" holes, 30" circle.
1—14-spindle Baush, capacity 1" holes, 36" circle.

GEAR-CUTTING MACHINES.

1—No. 1 Whiton.
1—No. 3 Bickett Gear Rack Planer, delivery 60 days.
1—No. 3 Brown & Sharpe Auto. Gear Cutter, Spur.
1—New 6" Standard Gear Cutter, Spur.
1—12" Gleason Bevel Gear Planer.
1—15" Gleason Bevel Gear Planer.
1—16" Bilgram Bevel Gear Generator.
1—20" Grant-Lee Gear Hobber.
1—No. 1 20" Schuchardt & Schutte Gear Hobber.
1—22 x 8 G. & E. Spur and Bevel Cutter.
1—24" Fellows Gear Shaper.
1—24 x 8" G. & E. for Spur and Bevel.
1—24" Becker Brainard.
1—New No. 10 Whiton, Bevel 32", Spur 34".
3—36" Fellows Gear Shapers.

GRINDERS—UNIVERSAL FOR CUTTERS, DRILLS, REAMERS, ETC.

1—LeBlond Universal, one year old.
1—No. 1 Cincinnati.
1—New Norton No. 1.
1—New Walker No. 1, outfit B.
1—New Walker No. 2, outfit K (capacity 9" x 26").
1—New Wilmarth & Morman, style B.K.
8—No. 190 Wells.
1—Gisholt No. 5, 12".

GRINDING MACHINES—CYLINDRICAL—PLAIN.

1—5" x 48" Pratt & Whitney.
1—New No. 12 Brown & Sharpe, 8" x 26", Sept. delivery.
1—New 10 x 36" Landis; immediate.
1—New 10" x 36" Norton, Sept. delivery.
1—New 10" x 50" Norton, Sept. delivery.
1—10" x 60" Landis.
1—New 10 x 72 Norton, Plain.
20—12" x 24" Modern, self-contained.
1—12" x 32" Landis, rebuilt.
6—12" x 36" Modern, self-contained, motor or belt driven.
2—12 x 42" Landis, self-contained.
6—12" x 48" Modern, self-contained, motor driven.
1—16" x 66" Landis, with crank grinding.
1—18" x 96" Brown & Sharpe.

GRINDING MACHINES—CYLINDRICAL—UNIVERSAL.

1—Brown & Sharpe No. 13, 8" x 24".
1—New No. 2 Bath, 9" x 20".
1—No. 2 New Walker, 9" x 26".
1—No. 1½ (10" x 30") Landis.
1—New No. 2½ (10" x 36") Bath.
1—10" x 42" Modern.
9—New No. 2 Morse, cap. 12" x 30", Universal, Nov. delivery.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis.
2—New No. 3 Modern, 13" x 40", Sept. delivery.

GRINDERS—INTERNAL.

1—No. 1½ Landis.
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—CYLINDER.

1—No. 27 Brown & Sharpe.
1—No. 60 Heald, single pulley drive.

GRINDERS—PROFILE.

1—New Cleveland.

GRINDING MACHINES—RING.

1—New No. 14 Beasley, two-ring chucks.
1—No. 200 Heald.
1—No. 210 Heald.

GRINDING MACHINES—SURFACE.

1—New No. 1 Wilmarth & Morman.
1—No. 1 Diamond, capacity 12" x 12" x 24", automatic.
2—New No. 1½ Walker's, complete.
4—New No. 2 Reid (same as B. & S.).
1—New No. 2 Brown & Sharpe.

HAMMERS—POWER—FORGING.

1—40-lb. Bradley Helve.
1—150-lb. Bradley Helve, upright.

HAMMERS—BOARD LIFT—DROP.

1—400-lb. Billings & Spencer.
1—2,000-lb. Chambersburg.

HAMMERS—STEAM—FORGING.

1—Used 600-lb. Niles Single Frame.
18" Morgan & Williams, 600 to 800 lbs., 21" gap.
1—New 1100-lb. Bell Standard Guide, Single Frame.
1—3000-lb. Bell; Sept. delivery.

KEYSEATERS.

2—No. 0 Mitts & Merrill.
1—No. 2 Mitts & Merrill.
1—60" stroke Compton Knowles Broacher.

LATHES—MANUFACTURING—NOT SCREW CUTTING.

2—New No. 3 Harding Brothers Bench Lathe.
14—Reed-Prentice Shell Lathes, for 4" or 18 lbs. American shells.
70—New Simplex, 16" x 8'.
13—No. 3X Reed-Prentice, semi-automatic.
40—14" x 6' Reed Stud and Bolt.
5—16" x 8' Fairbanks-Morse, heavy duty.
14—16 x 8 Simplex, Single Pulley Drive.
22—18" x 8' Battle Creek, heavy duty.
5—20" x 8' Merschon.
50—20" x 10' Hindman, high duty.

LATHES—ENGINE.

8" Wade Precision; September delivery.
1—14" x 6' Bradford, taper attachment.
1—New Harding Brothers 15" Precision Lathe, quick-change gear, page 35, third catalogue.
3—New 16" x 6' Cleveland Tool Room Lathes, complete equipment.
2—16" x 6' LeBlond, pan bed, quick-change gears, taper attachment.
1—New 17" x 8' National, quick-change gears.
1—18" x 8' Lodge & Shipley, geared head, taper.
3—18" x 9' Chard.
1—18 x 10 Hendey, quick-change gear, 14" chuck.
1—New 19" x 8' LeBlond, heavy duty.
22—20" x 8' Lodge & Shipley, quick-change gear.
7—New 20" x 8' American, heavy duty.
1—New 20" x 10' Cleveland, geared head.
25—New 21" x 10' Porter, single back geared.
5—New 22 x 10' Monarch, double back geared, Q.C.G.
9—22" x 10' Putnam, oil pan turrets.
3—24" x 10' Reed.
2—24" x 12' S. & B.
4—24" x 14' American, quick-change.
1—24" x 14' Lodge & Shipley, patent head.
1—24" x 24' Perkins, single back geared, raising blocks to 40", 18" chuck.
1—24" x 45" x 22' McCabe, double spindle.
1—26" x 24' New Haven.
4—27" x 14' Patent Head Lodge & Shipley, double back geared.
1—28" x 18' New Haven, single back geared.
1—28" x 18' Schumacher & Boye.
3—New 32" x 12' Pittsburg pattern.
8—New 36" x 24' Putnam, triple geared.
1—38" x 18' American, raising blocks to 63".
1—38 x 19' Steptoe, single back gear.
1—48 x 27'-9" Betts, triple back gear.
1—60 x 27 Betts, triple back gear.
1—New 66" x 30' Putnam; Dec. delivery.
1—71" x 20' Fifield, triple geared.

LATHES—TURRET.

5—2 x 24 Jones & Lamson.
5—3 x 36 Jones & Lamson.
18—6A Potter & Johnson.
1—New 21" Gisholt.

MILLING MACHINES—KNEE TYPE—UNIVERSAL.

1—No. 2 Kempsmith, 13", dividing head.
1—No. 2 Kempsmith, vertical attachment.
1—New Kempsmith.
1—No. 1½ Hendey-Norton.
1—No. 2 Kempsmith, back geared.
1—No. 2 New Cincinnati.
1—New No. 2½ LeBlond, Sept. delivery.
1—New No. 3 Kempsmith.
2—New No. 3 Becker, August delivery.
1—New No. 4 LeBlond, heavy duty; immediate.
1—No. 4 Cincinnati, with vertical attachment.

MILLING MACHINES—KNEE TYPE—PLAIN.

1—No. 0 Pratt & Whitney.
1—New No. 1 Brown & Sharpe.
2—New No. 1 Kempsmith.
2—New No. 1½ American, back gear.
1—New No. 2 Rockford.
1—New No. 2½ LeBlond, August delivery.
1—No. 3 LeBlond.
1—No. 3 Cincinnati.
1—No. 4 Garvin.

MILLING MACHINES—VERTICAL.

1—New Bickett, No. 0.
4—New No. 4B Becker.
2—No. 5 Becker.
1—No. 5 Brown & Sharpe.

MILLING MACHINES—PLANER TYPE.

1—No. 2 Beaman & Smith, vertical spindle, open side.
2—Ingersoll Slab Millers, working surface of table 60" x 20".
1—No. 4 Beaman & Smith, vertical spindle, open side, working surface of table 120" x 24", removable housing on one side.

PLANERS.

1—24" x 24" x 6' Gray, one head on cross rail.
24" x 24" x 8' Cincinnati, one head; used three months.
1—26" x 26" x 8' Gray, one head on cross rail.
1—30" x 30" x 8' Gale Planer, one head.
1—30" x 30" x 12' Cincinnati, two heads.
1—36" x 30" x 12' New Haven, one head.
3—New 36" x 36" x 12' Bickett, one head, Nov. delivery, additional heads if desired.
2—New 36" x 36" x 12' Woodward & Powell, two heads on cross rail, one side head; Oct. delivery.
1—36" x 36" x 12' Gray, two heads.
1—36" x 36" x 14' Sellers, four heads.
1—40" x 40" x 11' Niles, four heads.
1—Gray, 42", widened to 56" x 42" x 16, two heads.
1—48" Cleveland Rotary Planer.
3—New 48" x 42" x 16' Bickett, one head; Nov. delivery; additional heads if desired.
1—48" x 48" x 16' Sellers, one rail, head, two side heads.
1—50" x 14' Powell, one head.
1—52" x 52" x 16' Betts, two heads, right angle drive.
56" x 42" x 16' Graves, two heads.
60" x 60" x 18' Niles, two heads.
1—72" x 72" x 20' Pond, three heads.
1—32' 6 Niles Plate Planer.

SCREW MACHINES—AUTOMATIC.

3—No. 51 National Acme.
1—No. 515 National Acme.
2—No. 52 National Acme.
2—No. 53 National Acme.

SHAPERS.

1—New 16" Springfield.
1—16" Motor-driven Rockford.
2—New 24" Milwaukee.
1—New Barker, 24".
3—New 24" Steptoe, back gear.
1—30" Walcott, gear drive.
1—Spindle 30" Norton, with 7' Universal Radial Drill on base plate.

SLOTTERS.

1—New 10" Newton.
1—18" Betts, adjustable stroke.

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We Have for Immediate Delivery the Following Second-hand Machinery in Good Operative Condition

1 Landis No. 3 Universal Grinder 12" x 42", complete equipment, less internal grinding attachment. . $1,500

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $2,200

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $1,800

These machines are particularly good value, and may be seen at our works.

A. B. JARDINE & COMPANY
HESPELER, ONT.

Rebuilt Machines For Sale

PLANERS

1—24x24x6 Powell.
1—42x42x10' Pond.
5—Sellers 25x25x6'.
1—Sellers, 25x25x8'.
1—Putnam 24x24x8' 6".
1—Wheeler Heavy 30x30x8' 6".
1—Lathe Morse 24x24x5' 6".
1—New Haven 24x24x7'.
1—Putnam 42x40x12' 6".

GRINDERS

1—Miami Universal Tool and Cutter Grinder.
1—LeBlond Universal Tool and Cutter, power feed, same as new.
1—Bridgeport Plain Grinder, 16x36.
1—No. 3 Landis Universal Grinder.
2—No. 6X Diamond Double Disc Grinders.
1—Ford Smith Plain Grinder.

AUTOMATICS

1—2½" Gridley, Belt Drive.
1—1⅝" National Acme Double Belt Type.
1—No. 55 National Acme.
1—1" National Acme, four spindle.
2—No. 54 National Acme, four spindle.
3—2" Cleveland.
1—2¼" Cleveland.
2—2¼" Gridley Single Spindle Motors.
1—3¼" Gridley Single Spindle Motor.

LATHES

1—32x12' Draper Lathe, C.R., H.S.
3—16x8' Putnam, C.R., taper.
6—18x8' Porter, C.R., semi-quick, taper.
2—18x8' Davis, C.R., pan, pump, taper.
5—16x8' Greaves-Klusman, C.R., pan, pump.
9—20x6' Perkins Plain Turning, pan, pump.
1—14x6' Porter, C.R.
1—20x8' LeBlond, C.R.
14—20x6' Perkins Lathes, pan bed, chuck, Fay & Scott Turrets.

MISCELLANEOUS

1—No. 2 Barrett Horizontal Cylinder Boring Machine, 5" bar.
1—5' Cincinnati Bickford Plain Radial, single pulley.
1—No. 5 Becker Vertical Miller.
2—No. 310 Baker Drills.
1—No. 18 Bliss Press.
1—No. 4 Garvin Plain Miller.
1—9" Industrial Works Slotter.
1—24" Aurora Sliding Head Back Geared Drill.
3—Prentice 24" Sliding Head Drills.
2—Industrial 40" Drills.
1—Western Hydraulic Banding Machine.
1—Jenckes Band Turning Lathe, with 3" Universal Chuck.
1—36" Aurora Drill.
1—12" Bement Travelling Head Shaper.
1—Sellers Slab Miller, 24x21x12'.
1—No. 21 Lee-Simplex Saw.

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Showing part of a lot of 24-in. Giseolts, as listed below

Very Latest Models—None Over 2 Years Old

TURRET MACHINES

25—21″ Gisholts, 3½″ hole, 2-step, 5″ belt,
20—21″ Gisholts, 3½″ hole, motor arrangement,
13—24″ Gisholts, 4¼″ hole, 3-step, 4″ belt,
38—24″ Gisholts, 6″ hole, 2-step, 6″ belt,
41—24″ Gisholts, 6″ hole, motor arrangement,
2—2¼″ x 26″ Greenlee Flat Turrets,
2—2½″ x 26″ Pratt & Whitney Gd. Hd. Turrets,
4—3-A Warner & Swasey (bar machines).

ENGINE LATHES

24—22″ x 8′ Hamilton, D.B.G., C.R., Semi-Q.C.,
5—22″ x 8′ Hamilton, D.B.G., Turret tool post,
4—22″ x 8′ Davenport, D.B.G., Turret tool post,
7—22″ x 10′ Hamilton, D.B.G., C.R., Semi-Q.C.G.,
2—22″ x 10′ Hamilton, D.B.G., turret tool post, Semi-Q.C.G.,
20—22″ x 10′ Davis, D.B.G., C.R., Q.C.G.,
8—24″ x 10′ Lodge & Shipley, D.B.G., C.R., Q.C.G.,
8—24″ x 10′ Lodge & Shipley, Selective Gd., Hd., C.R., Q.C.G.,
11—26″ x 10′ American, D.B.G., C.R., and carriage turret,
2—26″ x 10′ American, D.B.G., carriage turret,
19—26″ x 12′ Putnam, carriage turret, semi-Q.C.,
9—26″ x 12′ Putnam, C.R., Semi-Q.C.,
2—26″ x 12′ Wickes, D.B.G., C.R., Semi-Q.C.G.,
10—28″ x 10′ Niles, Bement, Pond, D.B.G., Q.C.G.,
4—28″ x 14′ Lodge & Shipley, Select. Gd. Hd., motor drive, C.R., turret and taper.
3—30″ x 16′ Lodge & Shipley, D.B.G., C.R., turret and taper,
10—40″ x 18′ Pittsburgh, triple geared, Q.C.G.

Our Guarantee

Your money back if you return a machine within 30 days from date of shipment, freight prepaid. **No Excuses Necessary.**

PLANERS

1—76″ x 48″ x 18′ Woodward & Powell, 3 hds.
1—48″ x 48″ x 16′ Pond, 2 hds.
1—32″ x 32″ x 10′ Gray, 2 hds.
1—32″ x 32″ x 8′ Gray, 2 hds.
1—30″ x 30″ x 7′ Powell, 4 hds.
1—26″ x 26″ x 7′ Gray, 1 hd.
1—26″ x 26″ x 6′ American.
1—24″ x 24″ x 10′ Lodge & Davis.
1—24″ x 24″ x 6′ Cincinnati.
2—24″ x 24″ x 5′ Gray.
1—24″ x 24″ x 4′ Gray.
1—22″ x 22″ x 6′ American.
1—22″ x 22″ x 5′ Flather.

HORIZONTAL BORING MACHINES

4—P. & W. 2-spindle Rifle Barrel Drilling.
1—2-spindle Beaman & Smith Cylinder Boring.
1—No. 4 Newton 2-spindle, 4″.
1—Betts, 2⅞″ bar.
1—Bement, 2⅞″ bar.
1—Beaman & Smith, 2⅛″ bar.

VERTICAL BORING MACHINES

1—42″ Colburn.
2—34″ swing Colburn.
1—32″ swing Rogers.
1—30″ swing Baush.

RADIAL DRILLS

1—4′ Niles Full Universal.
1—3½′ Gang.
1—3′ Mueller.
1—3′ Prentice.
1—2½′ Dreses.
2—2½′ Mueller.
4—2½′ Fosdick.

MILLING MACHINES

1—No. 2 Beaman & Smith Combination Horizontal and Vertical.
1—Beaman & Smith, 2 vertical hds., 1-hor. cross bor. hd.
1—60″ x 48″ x 8′ Ingersoll Slab.
4—No. 2 Pratt & Whitney Lincoln.
1—No. 3 Hendey Plain.
1—No. 5 Schuchardt & Schutte Plain.
1—No. 2 Cincinnati Universal.
1—No. 25 Becker Plain.
1—No. 1½ Brown & Sharpe Universal.
1—No. 20 Oesterlein Universal.
1—No. 3 Brainard Plain.
2—No. 5 Brainard.

PRESSES

1—No. 17 Williams & White Double End Punch.
1—Long & Allstater Geared Punch.
1—No. 23½-B Niagara Toggle Press.
3—No. 73½ Niagara Trimming Presses.
1—Trimming Press.
1—No. 20-U Ryerson Punch.
1—No. 5 Consolidated Inclinable.
1—No. 5 Niagara Inclinable.
1—No. 30 Perkins Inclinable.

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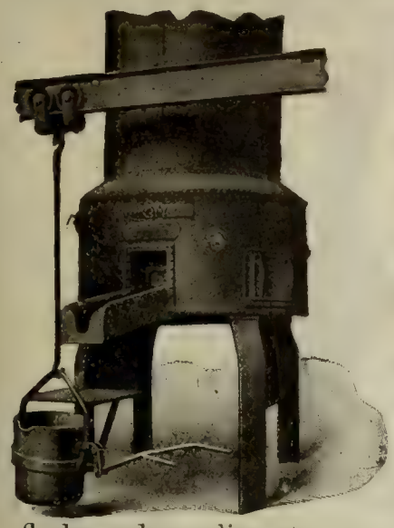

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are invaluable in light work foundries for delivering molten metal, collecting and delivering castings, and distributing flasks and supplies, etc.

Any point in foundry or shop is easily reached, even remote corners. Extensions readily made.

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Cranes of all kinds

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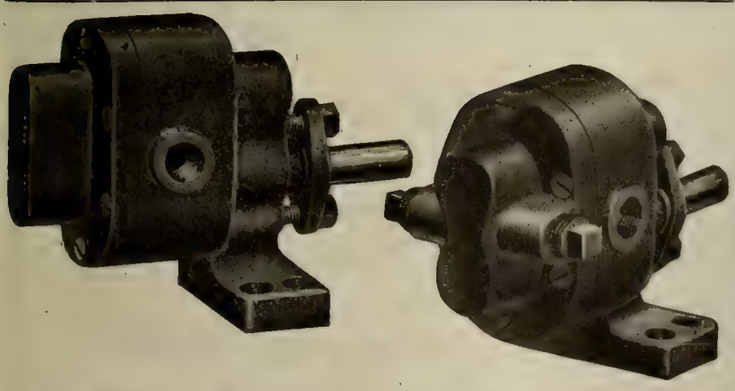

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Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

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Would successful manufacturers squander time and money introducing a new line of tool holders for the dealers and consumers who market and use their older products if uncertain of superior mechanical design?

Unless convinced of increased future demand would the competition for the small volume of tool holder renewals warrant such effort?

Would you afterwards demand other Williams' tools if the tool holders they endorsed failed to succeed?

Do stable companies risk their past reputation and their future prospects on untried or unproven innovations?

No, there is a reason, and their trial proves

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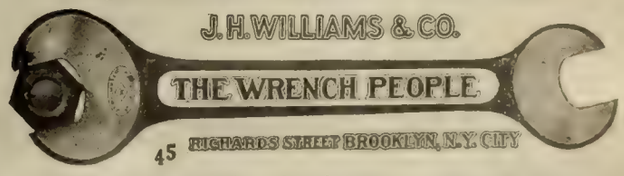
"THE HOLDERS THAT HOLD"

excel and endure

We guarantee all "AGRIPPA" Tool Holders



Descriptive circulars upon request

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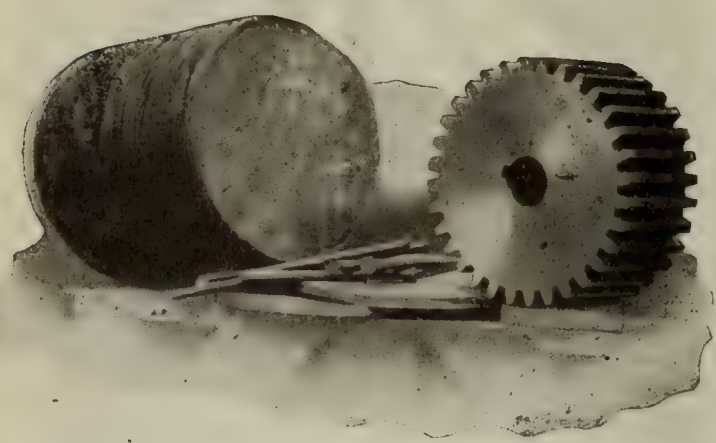
Use Quiet Rawhide Pinions for Motor Drives



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IN War Times you should get all the speed out of your machines possible.

You can do this by using BOND Hangers. From the day you put a BOND Hanger on the job it starts saving your oil, your power, and your patience.

It is an investment that yields a steady return with every revolution of your shafting.

The sturdy, braced construction makes for smooth running without vibration. Its design permits full accessibility for adjustments or erection.

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There's a man

advertising on page 72 for a position.

Have you a position open that he could profitably fill? If you have, write him. If you have the position and don't think he can fill it, advertise for one who can.

Canadian Machinery
Classified Advertising Section
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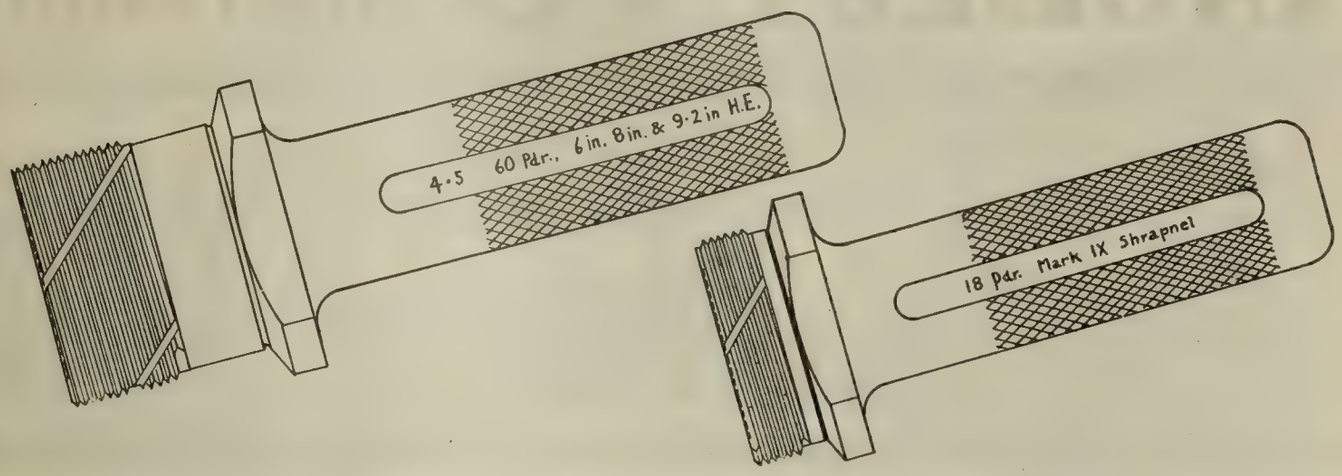

Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

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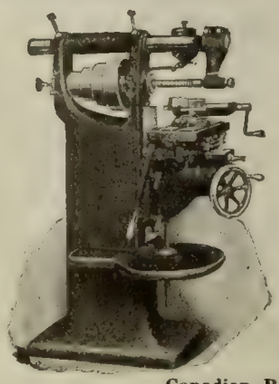
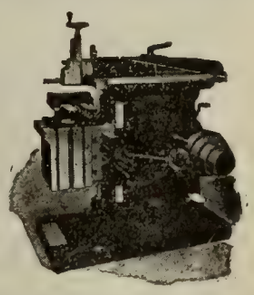
Large Millers for large work —STEPTOE MILLERS for small work.



Large Planers for large work —STEPTOE SHAPERS for small work.



Will result in increased production; less money invested in machinery, and increased profits.

THE JOHN STEPTOE COMPANY

CUMMINSVILLE, CINCINNATI, OHIO, U.S.A.

Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.

Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send to our nearest factory for a trial box.

Manufactured and guaranteed by

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MacLEAN'S FOR SEPTEMBER

is a magazine of the very best type and rank. It is made for Canadians, and so has a value and appeal to Canadians possessed by no other magazine in the world. MACLEAN'S circulation is getting greater each month. It is now 50% larger than a year ago. The inference is inevitable.

Northcliffe

Lord Northcliffe will be a contributor to the September MACLEAN'S. The general theme of his article will be Canada's position at the present time in relation to the war and to the Empire afterwards. Be sure to read what the brilliant and dominant man has to say about our country. Get an outsider's viewpoint.

MacLean

John Bayne MacLean, publisher, editor, publicist, clear-seeing and far-seeing, has another strong article in the September MACLEAN'S. Colonel MacLean has proved himself to be as clear-sighted as Kitchener in many matters pertaining to the present war; and he is doing a needed work now in THE FINANCIAL POST and other newspapers, to arouse Canadians to a proper sense of the perils that lie ahead.

Ronald

Another smuggling revelation!

A certain Canadian town offered a big bonus to a factory. An American supplied the desired factory, smuggled into Canada the whole plant required,—and was afterwards found out and brought to book. J. D. Ronald tells the whole amazing story in the September MACLEAN'S. Mr. Ronald is contributing to MACLEAN'S a series of Canadian "inside" smuggling stories—true ones. This is great stuff.

Leacock and Laut

Stephen Leacock and Miss Agnes C. Laut are contributors as usual to the September MACLEAN'S. Leacock's humor is bubbling, sparkling and refreshing—like spring water. Miss Laut provides another of her well-informed vigorous, and revealing articles on a phase of the war in relation to Canada and the United States. Miss Laut makes us think and wonder!

Jacobs and McGrath

W. W. Jacobs contributes one of his inimitable short stories to the September MACLEAN'S. "Their Wives Went Along." Harold McGrath, world famous story-writer, who wrote "The Man on the Box," provides a complete novelette. It is a story of adventure and mystery.

Allenson and Moorhouse

A. C. Allenson contributes a short story, "A Flutter in Diamonds;" and Hopkins Moorhouse, "Their Tents like the Arabs." These two men are Canadians—winning fame, and adding lustre to Canada's record for producing short story writers of the first-class.

Hendryx

James B. Hendryx's serial, "The Gun Brand," continues in the September MACLEAN'S. A great story of the Canadian Northwest. The Movie-makers are filming Hendryx's work. So you can be sure that he's writing the right sort of stuff.

Women and Their Work

This is the title of a new department in MACLEAN'S. In the September issue, this department will contain:

Reducing my household cost.

The Care of the Child—an article by Dr. George E. Smith.

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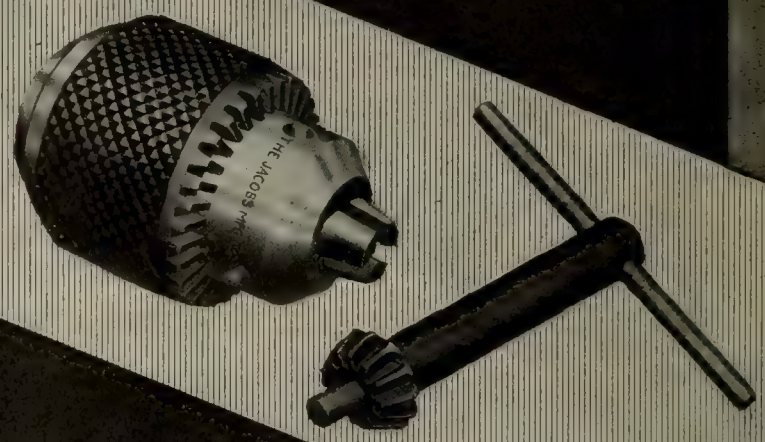

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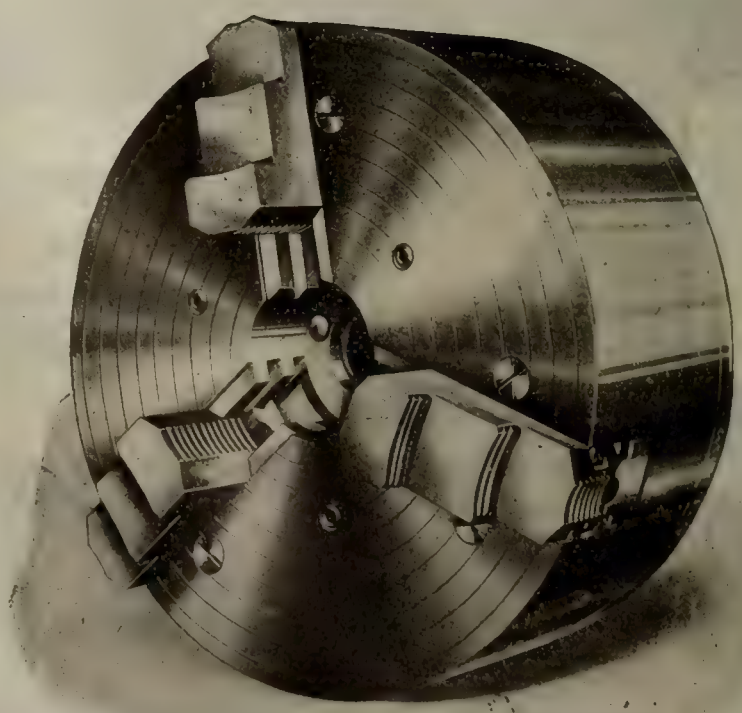

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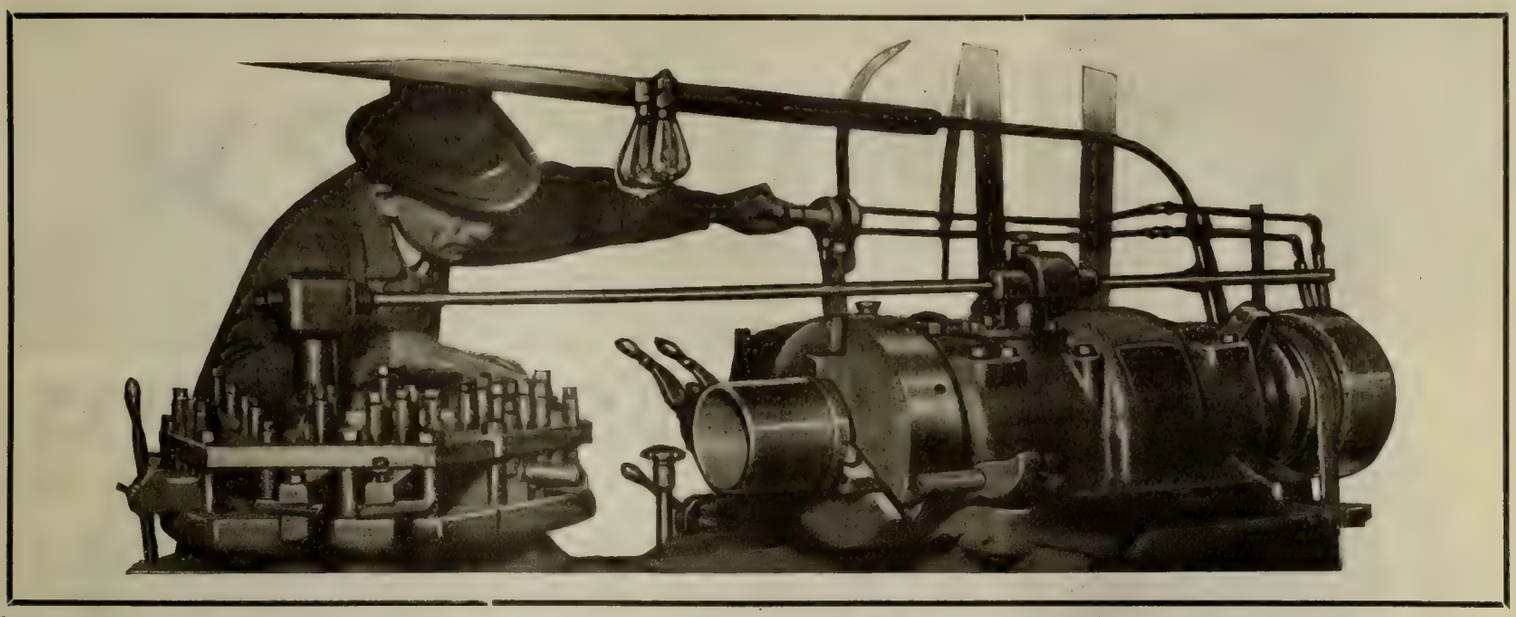

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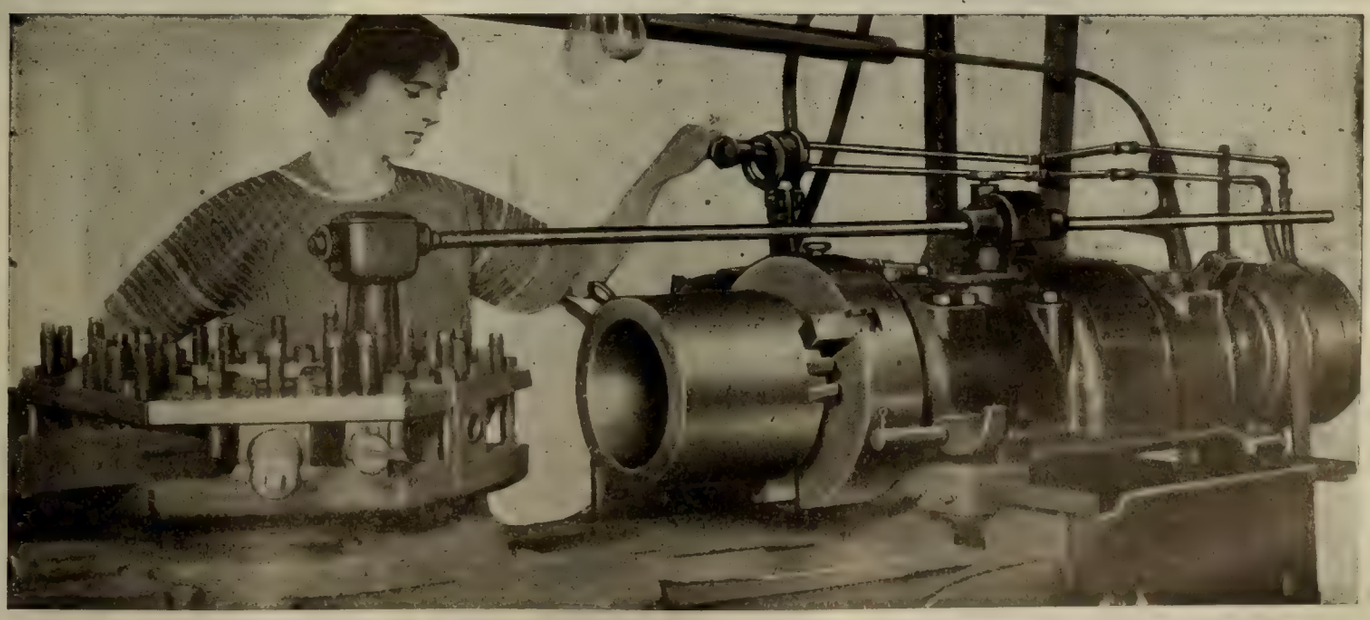

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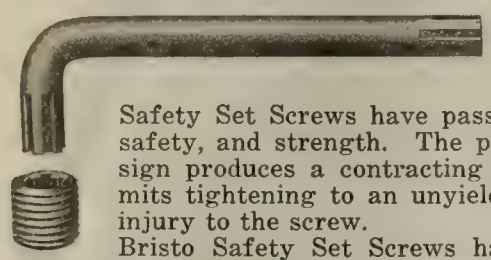

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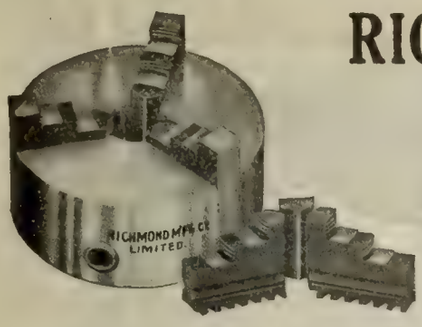

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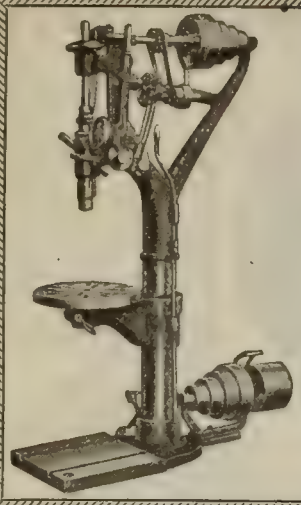

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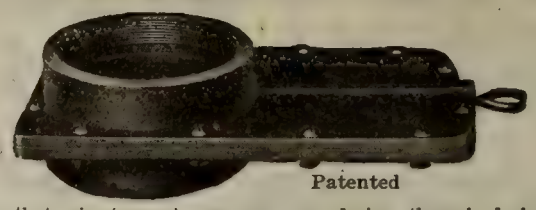

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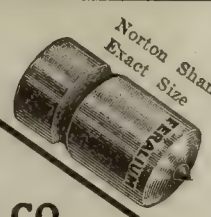

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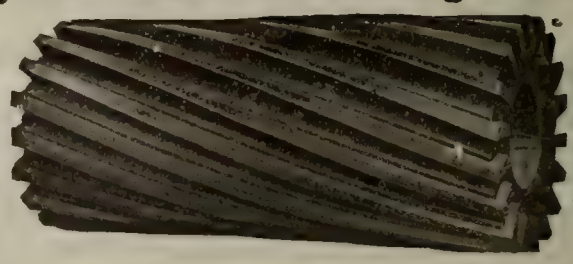

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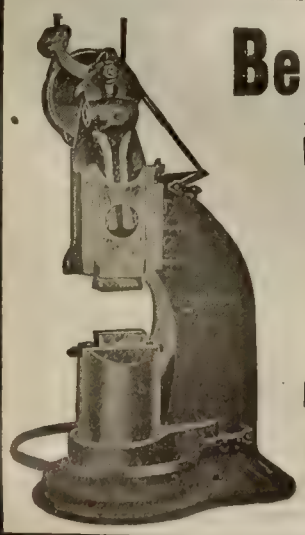

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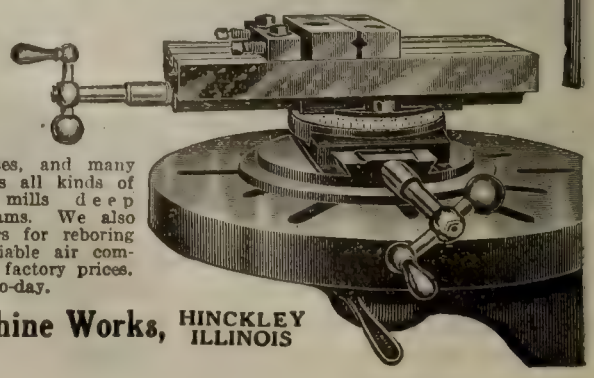

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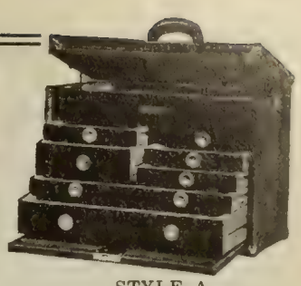

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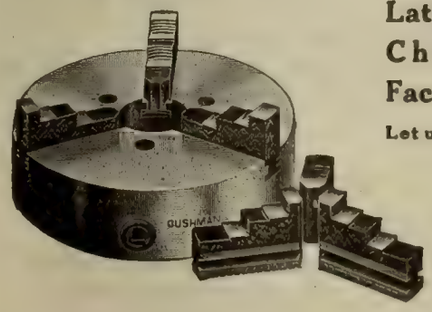

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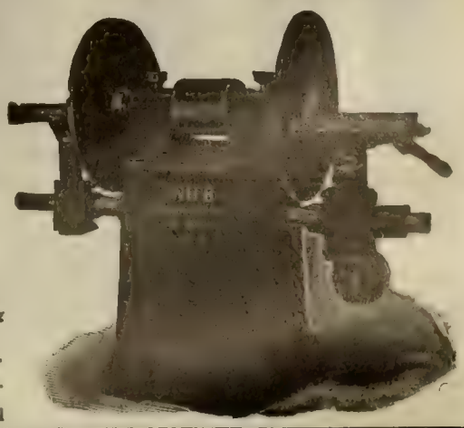

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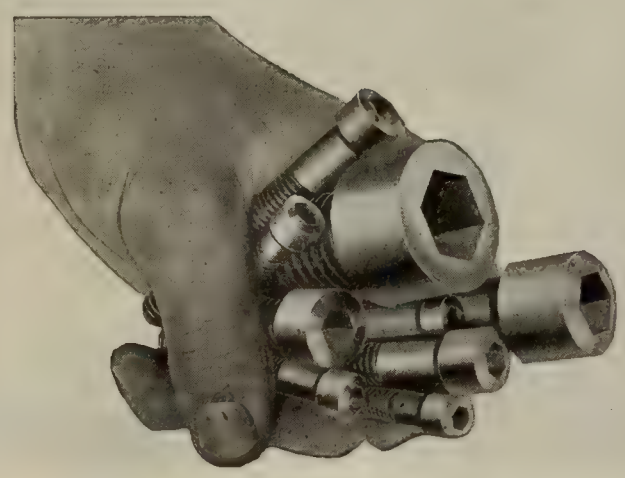

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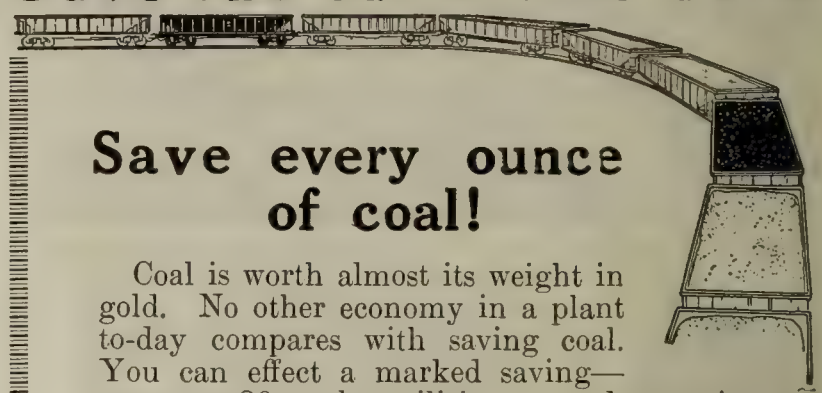

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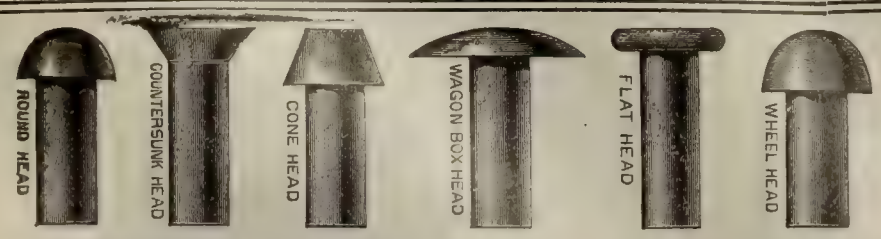

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Canadian Machinery BUYERS DIRECTORY

If what you want is not here, wrte us, anid we will tell you where to get it. Let us suggest that you consult also the advertisers' index facing the inside back cover, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

ABRASIVE MATERIALS
Aikenhead Hardware Co., Toronto, Ont.
Baxter Co., Ltd., J. R., Montreal, Que.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Montreal, Que.
Carborundum Co., Niagara Falls, N.Y.
Foss & Hill Machy. Co., Montreal.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
Norton Co., Worcester, Mass.
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H. W. Petrie, of Montreal, Ltd., Montreal.

ACETYLENE
Carter Welding Co., Toronto, Ont.
Commercial Acetylene Welding Co., Inc., Toronto
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

ACETYLENE GENERATORS
Commercial Acetylene Welding Co., Inc., Toronto
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

ACCUMULATORS, HYDRAULIC
Canadian Fairbanks-Morse Co., Montreal
Charles F. Elmes Eng. Works, Chicago
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York
Smart-Turner Mach. Co., Hamilton, Ont.
William R. Perrin, Ltd., Toronto

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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.

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Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

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Canada Metal Co., Toronto
Tallman Brass & Metal Co., Hamilton

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Can. B. K. Morton, Toronto, Montreal
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Vanadium Alloys Steel Co., Pittsburg, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

ARBORS
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Cleveland Twist Drill Co., Cleveland
Garlock-Walker Machinery Co., Toronto, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
H. W. Petrie, Toronto
H. W. Petrie, Ltd., Montreal
Pratt & Whitney Co., Dundas, Ont.

AUTOGENOUS WELDING AND CUTTING PLANTS
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Prest-O-Lite Co., Inc., Toronto, Ont.

AUTOMATIC MACHINERY
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Dominion Machinery Co., Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
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McClean & Son, F. W., Niagara Falls, Ont.
Riverside Machinery Depot, Detroit, Mich.
H. W. Petrie, Toronto
H. W. Petrie, Ltd., Montreal
Pratt & Whitney Co., Dundas, Ont.
Roelofson Machine & Tool Co., Toronto, Can.
A. R. Williams Machy. Co., Toronto

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Aikenhead Hardware Co., Toronto, Ont.
Baxter Co., Ltd., J. R., Montreal, Que.
Canadian Fairbanks-Morse Co., Montreal
Canada Metal Co., Ltd., Toronto
Can. B. K. Morton, Toronto, Montreal
Foss & Hill Machy. Co., Montreal.
Hoyt Metal Co., Toronto
Jobborn, Geo. A., Hamilton, Ont.
Magnolia Metal Co., Montreal
H. W. Petrie, Toronto
Tallman Brass & Metal Co., Hamilton

BALL BEARINGS
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Can. S K F Co., Toronto, Ont.
Chapman Double Ball Bearing Company, Toronto
R. E. T. Pringle, Ltd., Toronto, Ont.

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Cleveland Wire Spring Co., Cleveland

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Victoria Foundry Co., Ottawa, Ont.

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Monarch Brass Mfg. Co., Toronto, Ont.
Niles-Bement-Pond Co., New York

BELT LACERS
Clipper Belt Lacer Co., Grand Rapids, Mich.

BELT DRESSING AND CEMENT
Baxter Co., Ltd., J. R., Montreal, Que.

BELT LACING LEATHER
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Foss & Hill Machy. Co., Montreal
Graton & Knight Mfg. Co., Worcester, Mass.

BELTING, BALATA
Baxter Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton, Toronto, Montreal
Federal Engineering Co., Toronto, Ont.

BELTING, CHAIN
Canadian Fairbanks-Morse Co., Montreal
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Toronto
H. W. Petrie, Ltd., Montreal
Whitney Mfg. Co., Hartford, Conn.

BELTING, CONVEYOR
Goodyear Tire & Rubber Co., Toronto, Ont.

BELTING, LEATHER
Canadian Fairbanks-Morse Co., Montreal
Can. B. K. Morton, Toronto, Montreal
Dominion Machinery Co., Toronto
Graton & Knight Mfg. Co., Worcester, Mass.
Goodyear Tire & Rubber Co., Toronto, Ont.
McLaren, J. C., Belting Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Ltd., Montreal
Standard Machy. & Supplies, Ltd., Montreal, Que.

BELTING, STITCHED COTTON DUCK
Baxter Co., Ltd., J. R., Montreal, Que.
Bennett, W. P., 51 Montford St., Montreal, Que.
Dominion Belting Co., Hamilton, Ont.
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto

BENCH LEGS, STEEL
New Britain Mach. Co., New Britain, Conn.

BENCH DRAWERS, FRICTIONLESS
New Britain Mach. Co., New Britain, Conn.

BENDING MACHINERY
John Bertram & Sons Co., Dundas
Bertrams, Limited, Edinburgh, Scotland
Bliss, E. W., Co., Brooklyn, N.Y.
Brown-Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Canada
Dominion Machinery Co., Toronto
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
Charles F. Elmes Eng. Works, Chicago
Jardine, A. B., & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York
H. W. Petrie, Toronto
H. W. Petrie, Ltd., Montreal
Steel Bending Brake Works, Chatham, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

BILLET MARKERS
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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Toronto Iron Works, Ltd., Toronto, Ont.

BLASTING MACHINES, SHOT AND STEEL GRIT
Gray Mfg. & Mach. Co., Toronto, Ont.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal
R. E. T. Pringle, Ltd., Toronto, Ont
Riverside Machinery Depot, Detroit, Mich.
Sturtevant Co., B. F., Galt, Ont.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

BLUE PRINTING MACHINERY
Mulliner-Enlund Tool Co., Syracuse, N.Y.

BOARTZ
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York, N.Y.

BOILERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Riverside Machinery Depot, Detroit, Mich.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Wells Brothers Co. of Canada, Galt, Ont.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
Cumming & Son, J. W., New Glasgow, Canada
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

BOLT AND NUT MACHINERY
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Dominion Machy. Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machinery Co., Toronto

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Victor Tool Co., Waynesboro, Pa.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co. of Canada, Toronto
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, UPRIGHT AND HORIZONTAL
John Bertram & Sons Co., Dundas
Canada Machinery Corp. Galt, Ont.
Dominion Machinery Co., Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
Roelofson Machine & Tool Co., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, STOVE AND COAL
Cumming & Son, J. W., New Glasgow, Canada

BORING AND TURNING MILLS
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
R. E. T. Pringle, Ltd., Toronto, Ont.

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Cleveland Wire Spring Co., Cleveland
New Britain Mach. Co., New Britain, Conn.

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Brown, Boggs & Co., Hamilton, Can.
Steel Bending Brake Wks., Ltd., Chatham, Ont.

BRASS AND COPPER BARS, RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto

BRASS WORKING MACHINERY
Dominion Machy. Co., Toronto, Ont.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto, Ont.
Warner & Swasey Co., Cleveland
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machy. Co., Toronto

BRIDGES, RAILWAY AND HIGHWAY
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke

BRONZE RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto

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Puro Sanitary Dk'g Fountain Co., Haydenville, Mass.

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Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Ltd., Montreal
R. E. T. Pringle, Ltd., Toronto, Ont.

BUCKETS, CLAM SHELL, CRAB, DUMP
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

BUCKETS, ELEVATING AND HOISTING
Banfield, Edwin J., Toronto.

BULLDOZERS
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.

BURNERS, OIL AND NATURAL GAS
Bellevue Industrial Furnace Co., Detroit, Mich.
Gray Mfg. & Mach. Co., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.

BURRING REAMERS
Wells Bros. Co. of Canada, Galt, Ont.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque.

BUTTERISERS
Wells Bros. Co. of Canada, Galt, Ont.

CANNERS' MACHINERY
Bliss, E. W., Co., Brooklyn, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
Brown, Boggs & Co., Hamilton, Can.
Prest-O-Lite Co., Inc., Toronto, Ont.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Can.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CAR MOVERS
Dillon Mfg. Co., Oshawa, Ont.

CARTRIDGE MAKING MACHINERY
Blackall, Fred. S., Woolworth Tower, New York.
Prest-O-Lite Co., Inc., Toronto, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER
Cumming & Son, J. W., New Glasgow, Canada.
Alexander Fleck, Ltd., Ottawa.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, GRAY IRON
Bernard Industrial Co., The A., Fortierville, Que.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Steel Foundries, Ltd., Montreal, Que.
Alexander Fleck, Ltd., Ottawa.
Gardner, Robt., & Son, Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Can. Steel Foundries, Ltd., Montreal, Que.
Dominion Steel Foundry Co., Ltd., Hamilton, Ont
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
Can. Steel Foundries, Ltd., Montreal, Que.
Cumming & Son, J. W., New Glasgow, Canada.

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.

CEMENT MACHINERY
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.
H. W. Petrie, Toronto.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Wells Brothers Co., Greenfield, Mass.
John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Wright Mfg. Co., Lisbon, Ohio.

CHEMISTS
Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

CHESTS, TOOL
Union Tool Chest Works, Rochester, N.Y.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
John Bertram & Sons Co., Dundas, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Millers Falls Co., Millers Falls, Mass.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Richmond Mfg. Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Skinner Chuck Co., New Britain, Conn.
Thomas Elevator Co., Chicago, Ill.
D. E. Whiton Machine Co., New London, Conn.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.
Richmond Mfg. Co., Toronto, Ont.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, GEARED SCROLL
Richmond Mfg. Co., Toronto, Ont.

CHUCKS, MAGNETIC
H. E. Streeter, 523 New Birks Bldg., Montreal.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

CHUCKING MACHINES
Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

CLOCKS, WATCHMAN, PORTABLE
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Que.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.

COAL HANDLING MACHINERY
MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

COILING MACHINERY, WIRE AND SPRING
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

COLLARS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.
Stone Tool & Supply Co., J. R., Detroit, Mich.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

CONTROLLERS AND STARTERS, ELECTRIC MOTORS
Dominion Machy. Co., Toronto, Ont.
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, STEEL SLIDE-BLOW
Whiting Foundry Equipment Co., Harvey, Ill.

COPING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Lundas, Ont.

COUNTERSHAFTS
Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.

COUPLINGS, PLAIN AND FLEXIBLE
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES, LOCOMOTIVE
Northern Crane Works, Walkerille.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.

CUTTER GRINDERS AND ATTACHMENTS
Cincinnati Milling Machine Co., Cincinnati.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
H. W. Petrie, Ltd., Montreal.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Goddard Tool Co., Chicago, Ill.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining & Mfg. Co., Toronto.
Elm Cutting Oil Co., Toronto.
Racine Tool & Machine Co., Racine, Wis.

CUTTING-OFF MACHINES
Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machinery Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Peerless Machine Co., Racine, Wis.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Mchy. & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

CYLINDERS, AIR
Manufacturers Equipment Co., Chicago, Ill.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.

DAMPER REGULATORS
Canadian Fairbanks-Morse Co., Ltd., Montreal.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Winnipeg Gear & Engr. Co., Wipnipeg, Man.

DIAMONDS, BLACK AND ROUGH
Geo. A. Joyce Co., Ltd., New York.

DIAMOND TOOLS
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Banfield, W. H., & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
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LARGEST
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Sensitive Drilling
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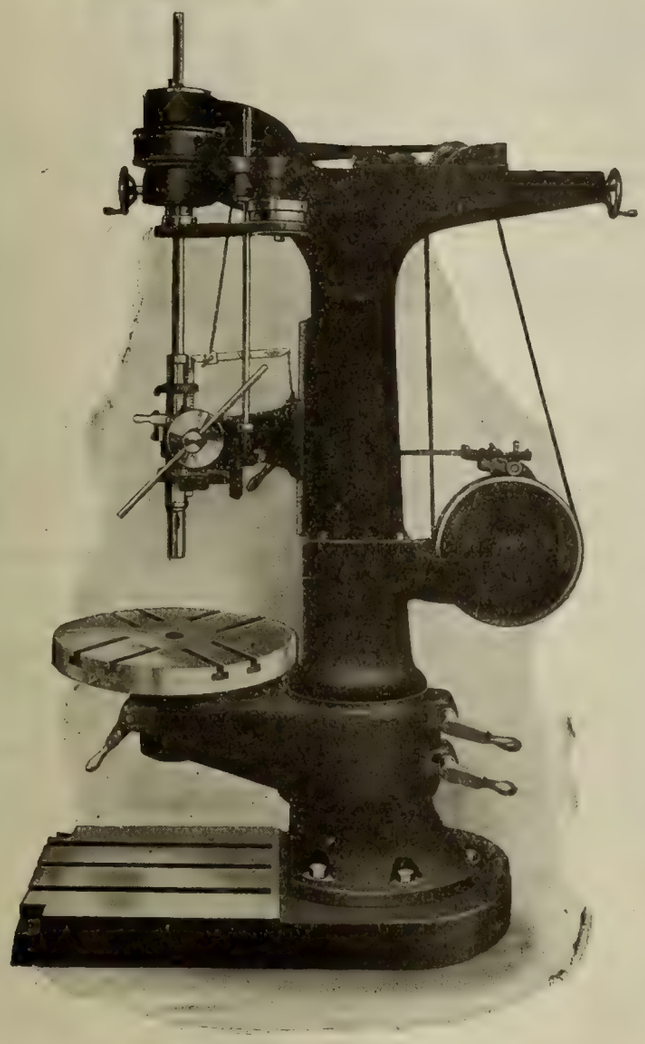

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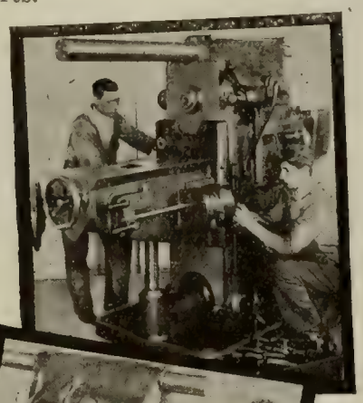
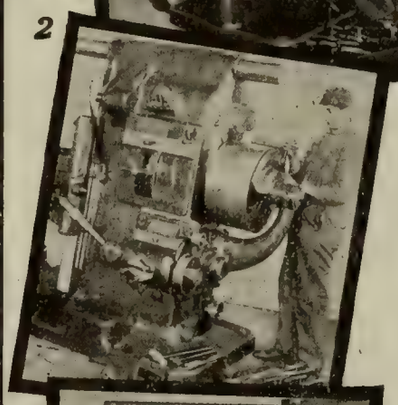
1



Note the rigid design of the knee with its ample vertical depth and long bearing surfaces for both column and saddle, also the liberal extension at top of knee—the point of greatest stress.

2



Observe the proportions of the driving pulley and the extra wide face—one of the chief elements that provide for a powerful drive.

Consider the width of the table bearing surfaces of the saddle—long in proportion to length of table to fully resist the severe stresses when table is heavily loaded and at end of its traverse.

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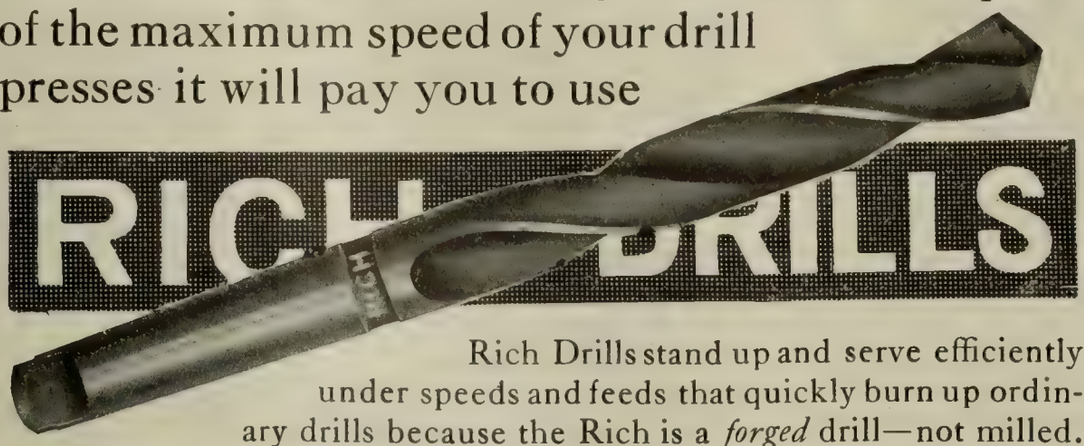

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GRAIN FOR POLISHING
Norton Co., Worcester, Mass.

GRAPHITE
Aikenhead Hardware Co., Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

GLOVES, LEATHER AND RUBBER
Hickory Steel-Grip Glove Co., Chicago, Ill.

GLOVES, STEEL GRIP, SAND BLAST
Hickory Steel Grip Glove Co., Chicago, Ill.

GRAVITY CARRIERS
Can. Matthews Gravity Carrier Co., Toronto, Ont.

GREASES (SEE LUBRICANTS)

GRINDER ATTACHMENTS
Rivett Lathe & Grinder Co., Boston, Mass.
Wilmarth & Morman, Grand Rapids, Mich.

GRINDERS, AUTOMATIC KNIFE
W. H. Banfield & Son, Toronto.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH
Blake & Johnson Co., Waterbury, Conn.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Dominion Machy. Co., Toronto, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati, O.

GRINDERS, CUTTER
Brown & Sharpe Mfg. Co., Providence, R.I.
Foss & Hill Machy. Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
LeBlond Mach. Tool Co., R. K., Cincinnati, O.
Norton Grinding Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilmarth & Morman, Grand Rapids, Mich.

GRINDERS, DIE AND CHASER
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

GRINDERS, DRILL
Aikenhead Hardware Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
United States Electrical Tool Co., Cincinnati, O.
Wilmarth & Morman, Grand Rapids, Mich.

GRINDERS, CYLINDER, INTERNAL
Brown & Sharpe Mfg. Co., Providence, R.I.
Fitchburg Grinding Mach. Co., Fitchburg, Mass.
Foss & Hill Machy. Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
R. E. T. Pringle, Ltd., Toronto, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.

GRINDERS, NAIL DIE

GRINDERS, PNEUMATIC
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Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

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Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Dominion Machy. Co., Toronto, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago.
Norton Co., Worcester, Mass.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
United States Electrical Tool Co., Cincinnati, O.
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Rivett Lathe & Grinder Co., Brighton, Mass.

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W. F. & John Barnes Co., Rockford, Ill.
Blake & Johnson Co., Waterbury, Conn.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
National-Acme Co., Cleveland, Ohio.
H. W. Petrie, Ltd., Montreal.
Tabor Mfg. Co., Philadelphia, Pa.
Wing & Son, J. E., Hamilton, Ont.

GRINDERS, UNIVERSAL, PLAIN
Fitchburg Grinding Machine Co., Fitchburg, Mass.
Modern Tool Co., Erie, Pa.
Wilmarth & Morman, Grand Rapids, Mich.

GRINDERS, VERTICAL SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.
H. E. Streeter, 523 New Birks Bldg., Montreal, Que.
Wilmarth & Morman, Grand Rapids, Mich.
Wing & Son, J. E., Hamilton, Ont.

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Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
LeBlond Mach. Tool Co., R. K., Cincinnati.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Wilmarth & Morman, Grand Rapids, Mich.
Stow Mfg. Co., Binghampton, N.Y.

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Baxter Co., Ltd., J. R., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Carborundum Co., Niagara Falls.
Ford-Smith Mach Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.

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Ford-Smith Machine Co., Hamilton, Ont.
New Britain Mach. Co., New Britain, Conn.

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Ford-Smith Machine Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Millers Falls Co., Millers Falls, Mass.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Montreal.
Racine Tool & Machine Co., Racine, Wis.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Victor Saw Works, Ltd., Hamilton, Canada.
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Millers Falls Co., Millers Falls, Mass.

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Erie Foundry Co., Erie, Pa.

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Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canadian Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
Erie Foundry Co., Erie, Pa.
High Speed Hammer Co., Rochester, N.Y.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Plessisville Foundry Co., Plessisville, Que.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.

HAMMERS, HELVE POWER
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HAMMERS, POWER
Beaudry & Co., Boston, Mass.
Erie Foundry Co., Erie, Pa.
United Hammer Co., Boston, Mass.

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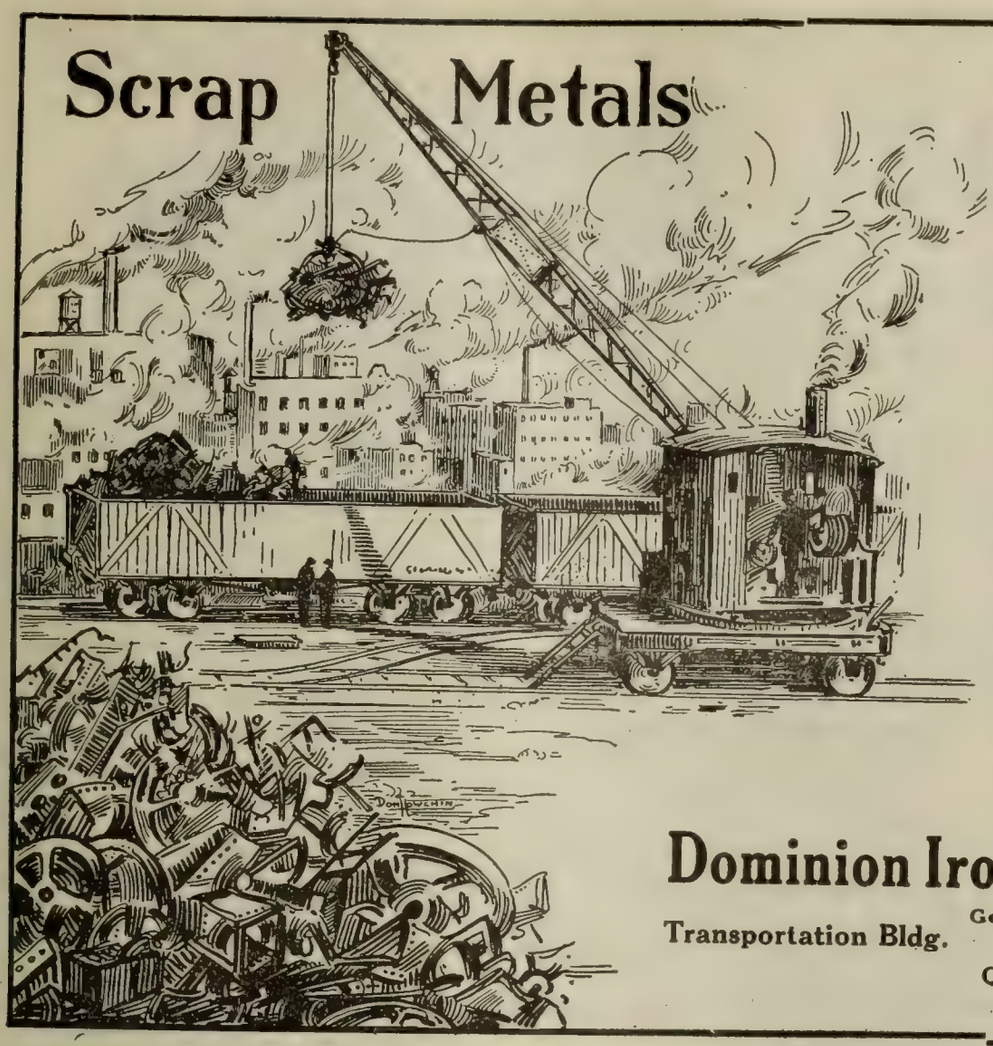
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
R. E. T. Pringle, Ltd., Toronto, Ont.

HAMMERS, MARKING
Matthews, Jas. H. & Co., Pittsburgh, Pa.



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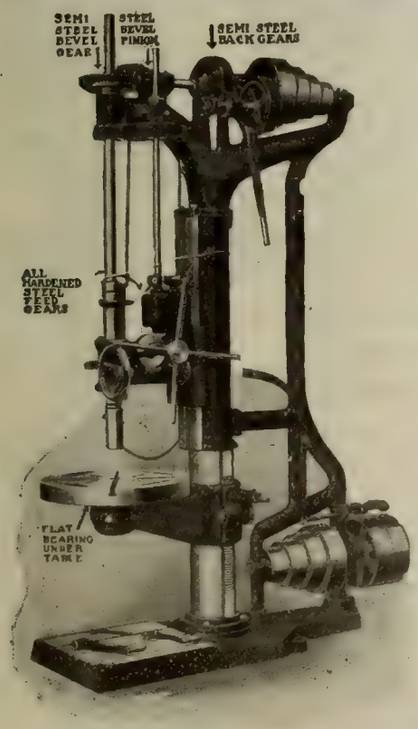

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Can. S K F Co., Toronto, Ont.
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H. W. Petrie, Toronto.
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Sturtevant Co., B. F., Galt, Ont.

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Sheldons, Ltd., Galt, Ont.

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Jenckes Mach. Co., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
Whiting Foundry Equipment Co., Harvey, Ill.

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Garlock-Walker Machinery Co., Toronto, Ont.
Ford Chain Block & Mfg., Philadelphia, Pa.
Independent Pneumatic Tool Co., Chicago, Ill.
Jenckes Mach. Co., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Northern Crane Works, Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
Wright Mfg. Co., Lisbon, Ohio.

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Kennedy & Sons, Owen Sound, Ont.
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Winnipeg Gear & Engrng Co., Winnipeg, Man.

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Toronto Iron Works, Ltd., Toronto, Ont.

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Goodyear Tire & Rubber Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Wells Bros. Co. of Canada, Galt, Ont.

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H. W. Petrie, Toronto.
West Tire Setter Co., Rochester, N.Y.

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Brown & Sharpe Mfg. Co., Providence, R.I.
L. S. Starrett Co., Athol, Mass.

INDEX CENTRES
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Garvin Machine Co., New York.

INDICATING INSTRUMENTS
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Hanna & Co., M. A., Cleveland, O.

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Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Petrie, H. W., Toronto.

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JACKS, PNEUMATIC
Northen Crane Works, Walkerville.

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A. R. Williams Machy. Co., Toronto.

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Whitney Mfg. Co., Hartford, Conn.

KILNS
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Sheldons, Limited, Galt, Ont.

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LATHE CHUCKS (SEE CHUCKS)
LATHE DOGS AND ATTACHMENTS
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Hendey Machine Co., Torrington, Conn.
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J. H. Williams & Co., Brooklyn, N.Y.
Winnipeg Gear & Engrng Co., Winnipeg, Man.

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Bridgeford Mach. Tool Works, Rochester, N.Y.

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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hardinge Bros., Chicago, Ill.
New Britain Mach. Co., New Britain, Conn.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.
Walcott Lathe Co., Jackson, Mich.

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Roelofson Machine & Tool Co., Toronto, Ont.
Warden King Co., Montreal, Que.

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Hardinge Bros., Inc., Chicago, Ill.

LATHES, ENGINE
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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
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Garlock-Walker Machy. Co., Toronto, Ont.
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Himoff Machine Co., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McCabe, J. J., New York, N.Y.
Roelofson Mach. & Tool Co., Toronto, Can.
Walcott Lathe Co., Jackson, Mich.

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Dominion Machinery Co., Toronto.
Foss & Hill Machy. Co., Montreal.
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Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto.
McCabe, J. J., New York, N.Y.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rivett Lathe & Grinder Co., Boston, Mass.
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A. R. Williams Machy. Co., Toronto.

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Foss & Hill Machy. Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
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Foss & Hill Machy. Co., Montreal.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

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Manufacturers Equip. Co., Chicago, Ill.
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Morse Twist Drill & Mach. Co., New Bedford, Mass.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
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Stone Tool & Supply Co., J. R., Detroit, Mich.

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Alexander Fleck, Ltd., Ottawa.

MILLING MACHINES, AUTOMATIC
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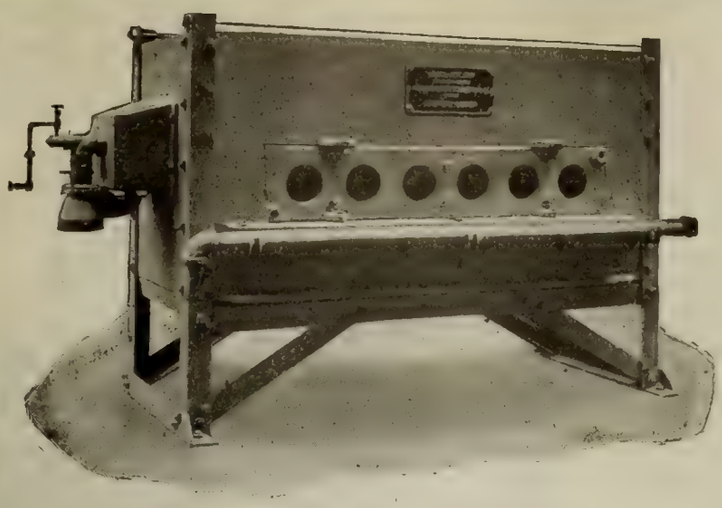

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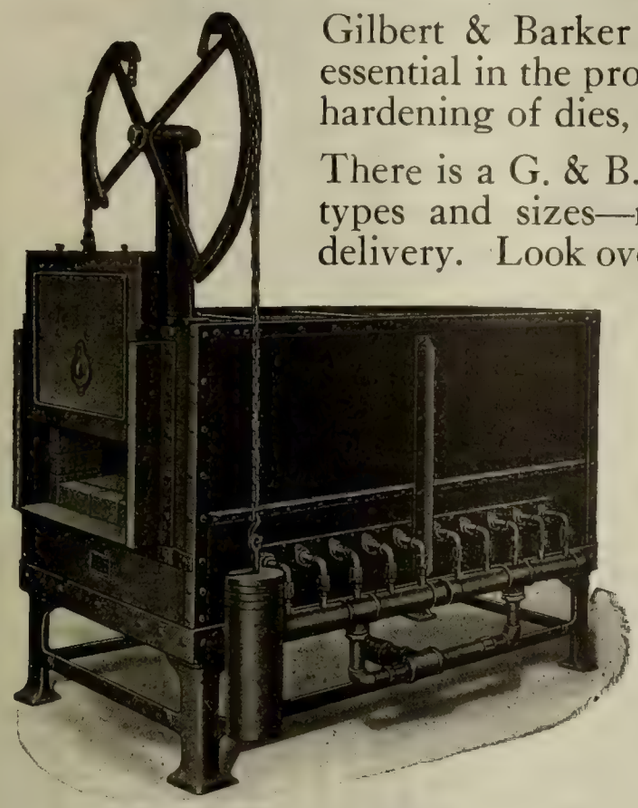

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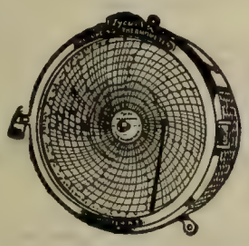

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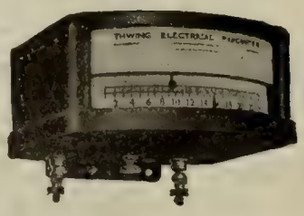

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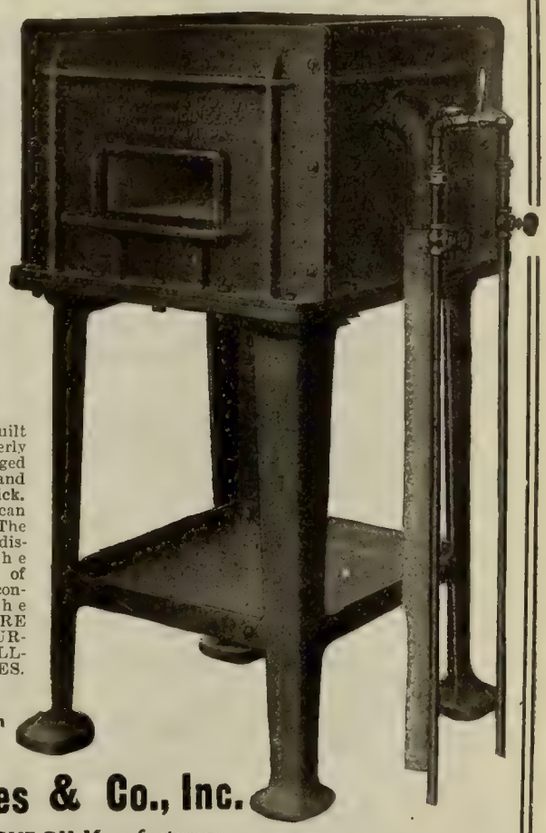

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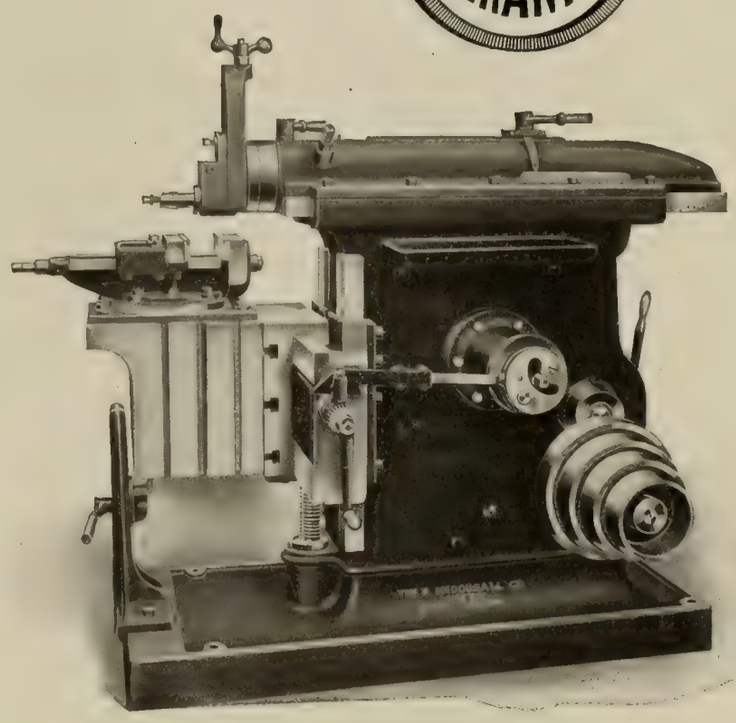

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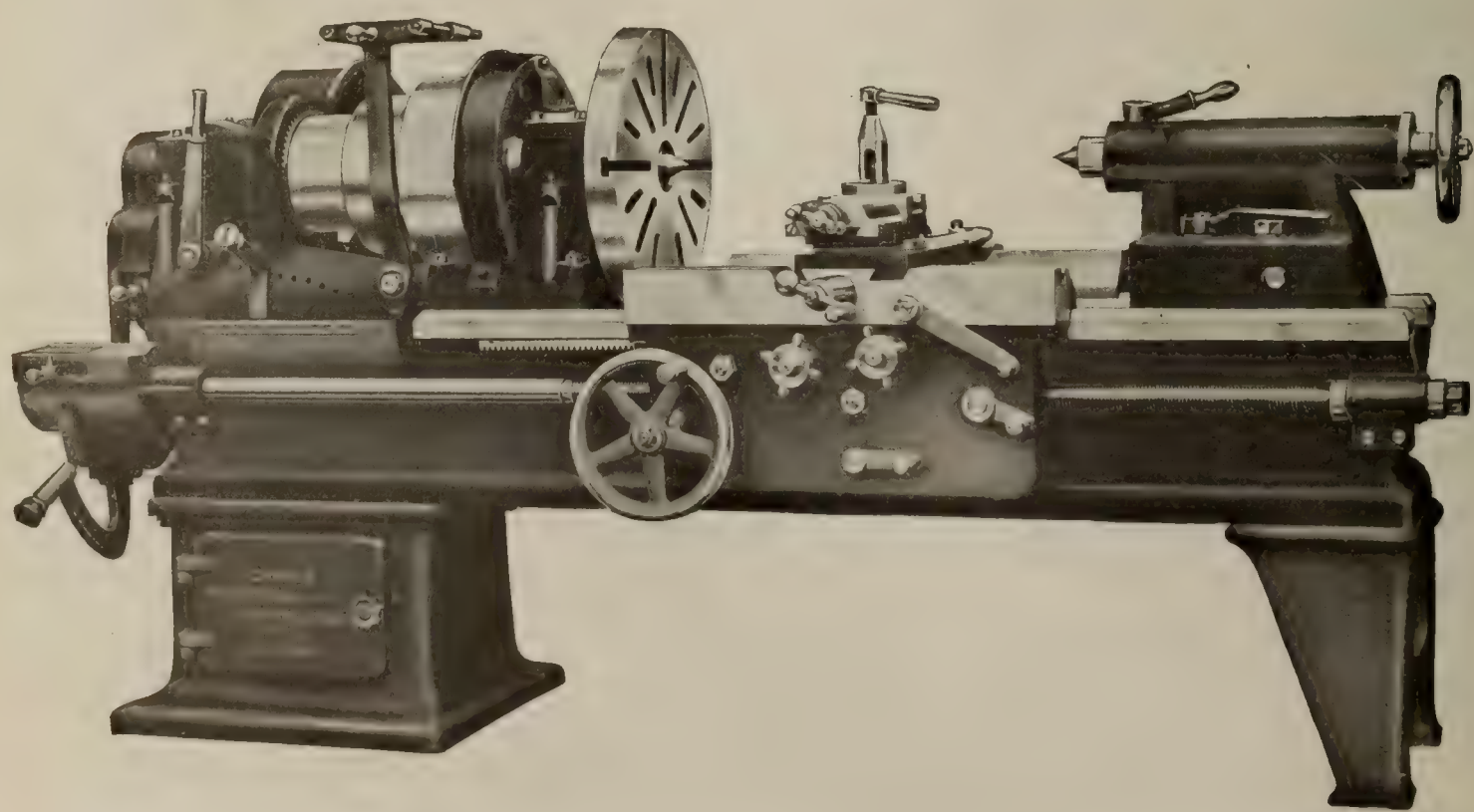

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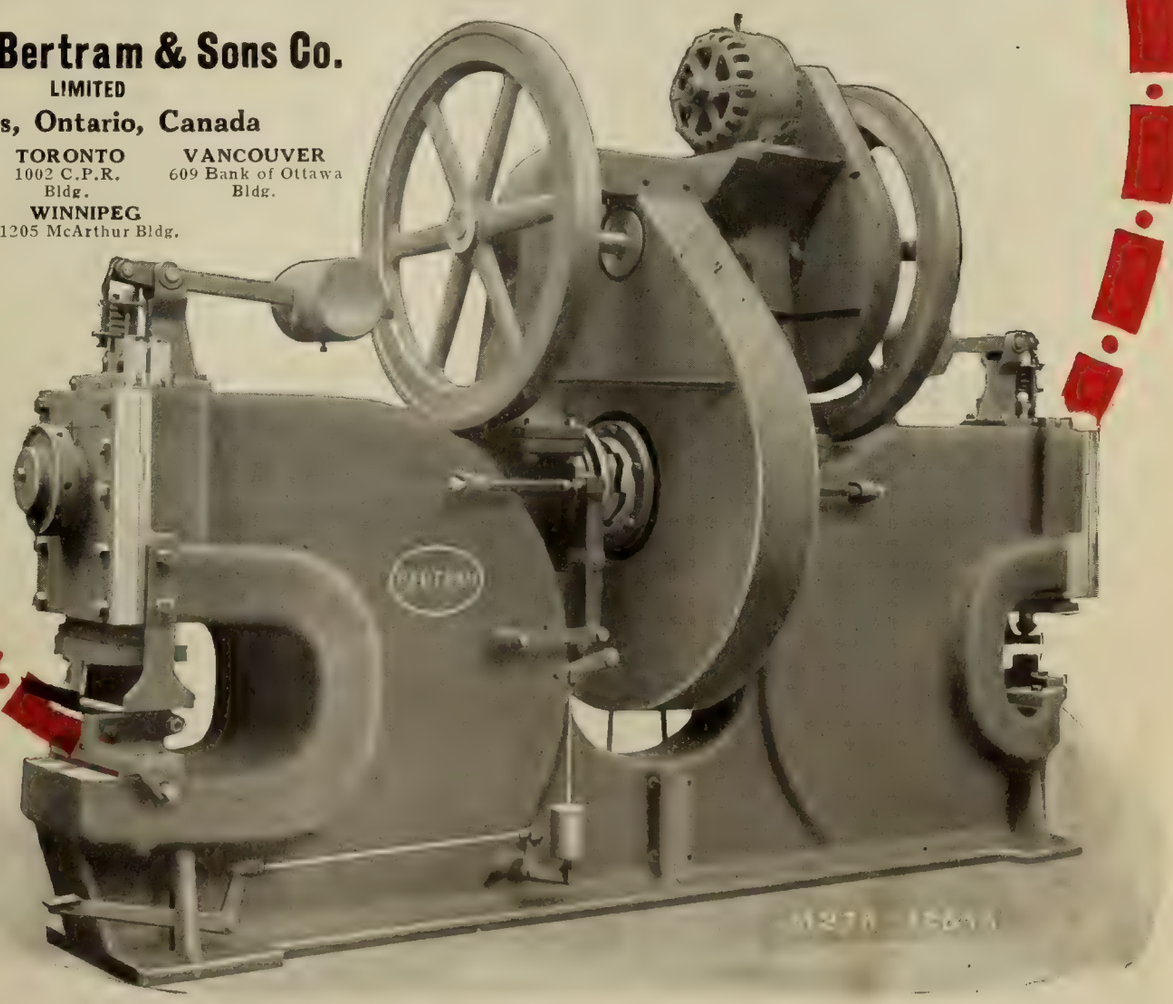

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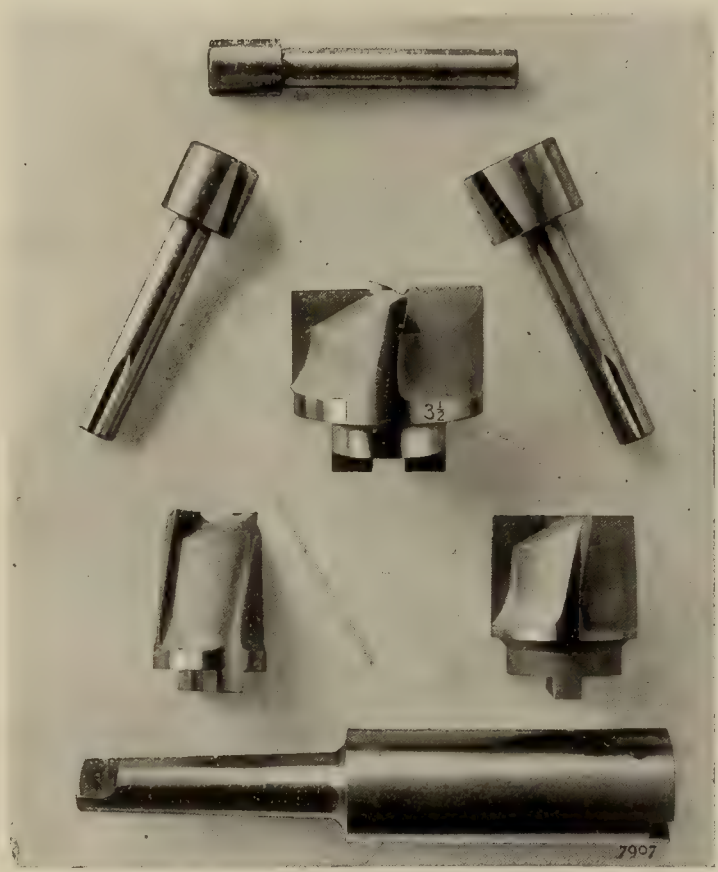

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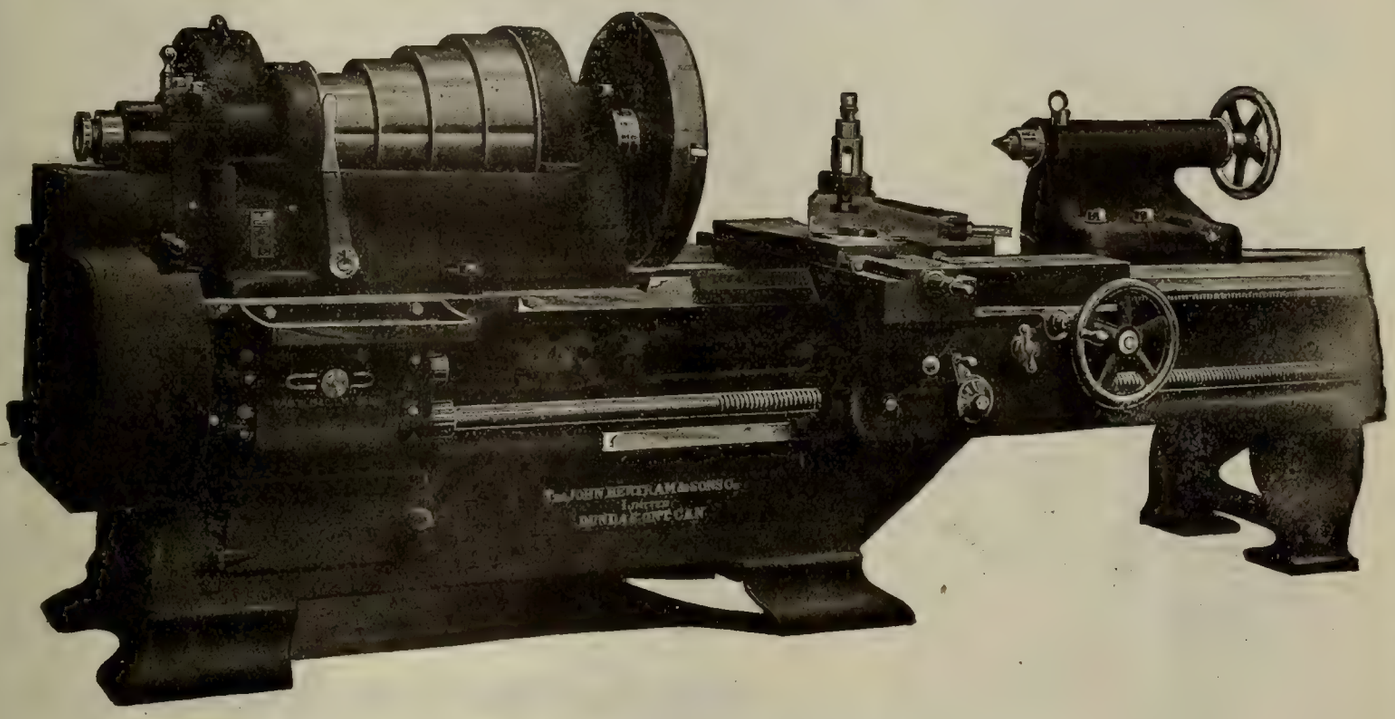
723 Drummond Bldg.	1002 C.P.R. Bldg.	1205 McArthur Bldg.	B.C. Equipment Co.

BERTRAM MACHINE TOOLS



Double Back Geared Gap Lathe

26-inch x 42-inch Swing

Bertram Machine Tools are built for safety and service, and are backed by a concern with sixty years' experience and the largest of its kind in Canada.

The John Bertram & Sons Co., Limited

Dundas, Ontario, Canada

MONTREAL
723 Drummond Bldg:

TORONTO
1002 C.P.R. Bldg.

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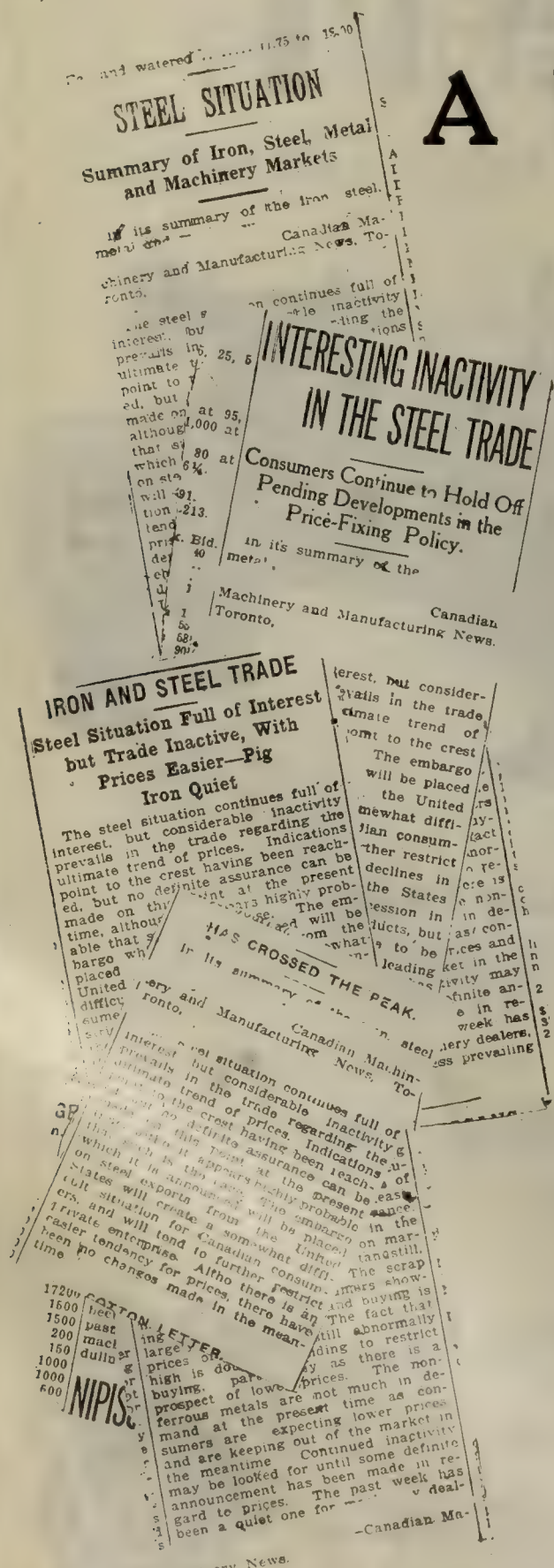
609 Bank of Ottawa Bldg.

WINNIPEG
1205 McArthur Bldg.

If any advertisement interests you, tear it out now and place with letters to be answered.

The Publisher's Page

TORONTO August 30, 1917


STEEL SITUATION
Summary of Iron, Steel, Metal and Machinery Markets

INTERESTING INACTIVITY IN THE STEEL TRADE
Consumers Continue to Hold Off Pending Developments in the Price-Fixing Policy.

IRON AND STEEL TRADE
Steel Situation Full of Interest but Trade Inactive, With Prices Easier—Pig Iron Quiet

The steel situation continues full of interest, but considerable inactivity prevails in the trade regarding the ultimate trend of prices. Indications point to the crest having been reached, but no definite assurance can be made on this point at the present time, although it appears highly probable that the embargo will be placed on the United States will create a somewhat difficult situation for Canadian consumers, and will tend to further restrict private enterprise. Altho there is an easier tendency for prices, there have been no changes made in the meantime. The fact that buying is still abnormally large, and tending to restrict prices on as there is a high is down prices. The non-ferrous metals are not much in demand at the present time as consumers are expecting lower prices and are keeping out of the market in the meantime. Continued inactivity may be looked for until some definite announcement has been made in regard to prices. The past week has been a quiet one for deal-

HAS CROSSED THE PEAK.

COTTON LETTER

Canadian Machinery and Manufacturing News, Toronto.

Reproductions of clippings from recent issues of four leading Canadian dailies.

A Market Authority

Canadian Machinery

is now generally recognized as the leading market authority in this country. The recent addition of regular weekly letters from two of the best market men in the United States puts **Canadian Machinery** market service in a class by itself.

The leading daily newspapers quote **Canadian Machinery,** frequently giving full credit to this journal.

Are you taking full advantage of this service?

If any advertisement interests you, tear it out now and place with letters to be answered.

ECONOMY UNIFORMITY

USED THE WORLD OVER

Atlas Babbitts

MADE IN CANADA

AMACOL ATLAS
TENAXAS MASCOT
TIN TOUGHENED W. E. W. BABBITT

HAVE A WORLD-WIDE REPUTATION FOR UNIFORMITY

ATLAS Alloys are scientific products—the result of much patient research and long years of experience. They are manufactured under the most modern scientific conditions, thereby eliminating any element of chance in their composition and ensuring a standard maintenance of quality and uniformity.

ATLAS Brands are not alloys that *sometimes* give *satisfaction.* They are alloys that can be implicitly relied upon *always.* They are alloys with our *prestige* and *reputation* always behind them.

DO not let prejudice stand between *you* and *profit.* You can obtain the *maximum efficiency* from your plant at a *minimum of cost* by using ATLAS BABBITTS.

THERE IS AN ATLAS BRAND TO MEET ANY NEED

NO SHOCK TOO SEVERE NO WEIGHT TOO HEAVY NO SPEED TOO GREAT

Atlas Metal and Alloys Company of Canada, Limited

MONTREAL

Sales Agents:

The Canadian B. K. Morton Co., Limited

MONTREAL
49 Common Street
Phone M. 3206

TORONTO
86 Richmond Street East
Phones M. 1472-1473

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

TRADE MARK "WACO"

Reliance Steel Works
SHEFFIELD, ENG.

TRADE MARK

TRADE MARK

of the Famous

"WACO

Brand

High Speed Steel and Twist Drills

"DOUBLE WACO" Quality

Specially Adapted for all kinds of
MUNITION WORK

"Turtle" Brand
High Class Tool Steel, Files, etc.
of all descriptions.

For particulars apply to our
Sole Representatives for Canada

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario

STELLITE

Canadian National Exhibition

"Meet Me at Machinery Hall Opposite Stellite Booth"

The greatest annual fall fair in the world has this year an added attraction in a unique display of "Stellite," under actual working conditions, as well as a display of the various uses to which it can be put, its adaptability to welding by the oxy-acetylene torch and by brazing.

Be sure and look us up

DELORO SMELTING & REFINING CO., LIMITED

Head Office - - DELORO, ONTARIO

TORONTO
200 King Street West

MONTREAL
315 Craig Street West

Steel Castings

Our lengthy and varied experience in making Manganese, Vanadium, Titanium castings assures you of getting the best of products.

Anything in castings from 1 lb. to 50 tons is right in our line. Ships' castings our specialty.

Castings made true to specifications and patterns.

Propeller shaft Bearing for Ice-Breaker "John D. Hazen."

Canadian Steel Foundries
Limited

GENERAL OFFICE: Transportation Bldg., Montreal, Canada.

LONDON (England) OFFICE: Trafalgar House, Waterloo Place

WORKS: Welland, Ont.; Point St. Charles, Montreal; Longue Pointe, Montreal.

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" **Tool Steels**

SISCO

Made in Sweden from selected Dannemora Ore

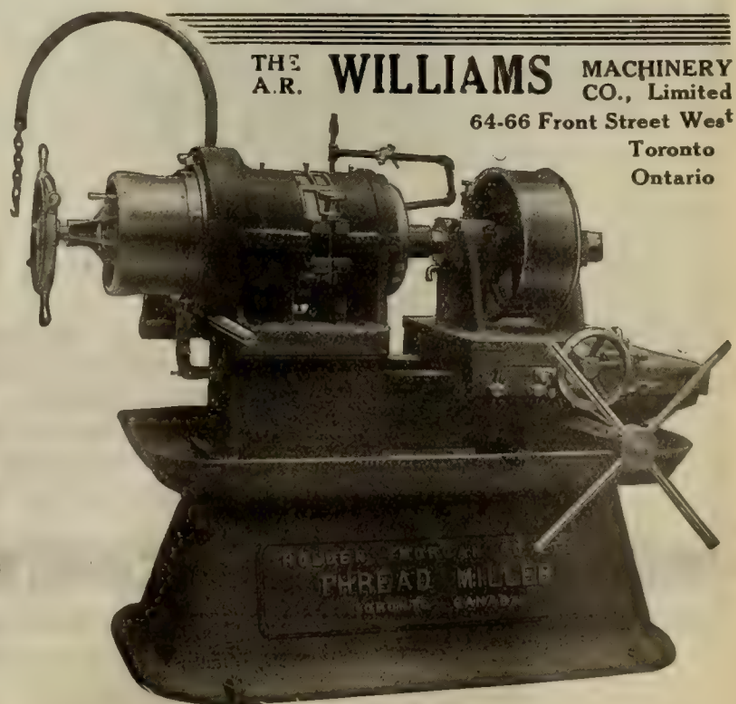
We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

The Life of a Thread Miller

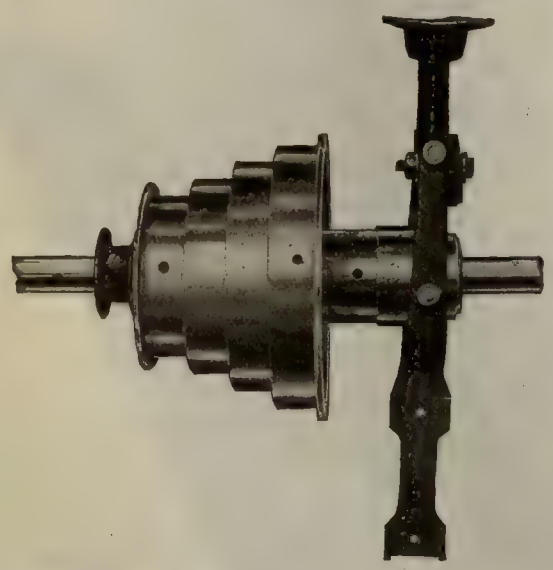
Depends not upon the amount of work it does, but the ease and thoroughness with which the work is done. These Thread Millers are noted for these qualities. Its quality of work is unrivalled. Our Service Department will give you all the particulars. *Write us!*

THE A.R. **WILLIAMS** MACHINERY CO., Limited
64-66 Front Street West
Toronto
Ontario

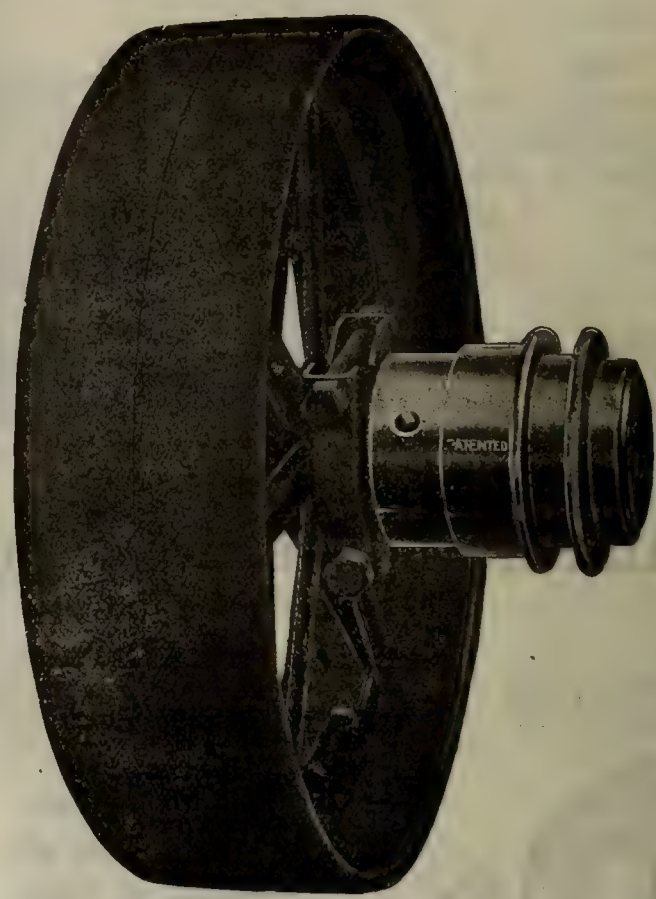


THE JOHNSON FRICTION CLUTCH

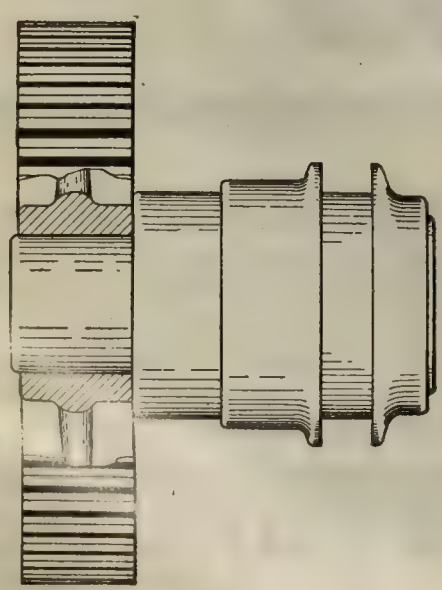
can be used with pulleys of all kinds, gears or sprockets. Look at the illustrations herewith. You have use for a good clutch. Why not try the JOHNSON?



Cone Mounted upon the Clutch Hub, for Line Shaft



The JOHNSON FRICTION CLUTCH Mounted with an American Steel Split Pulley



Gear Mounted on Clutch Hub

The clutch that is used by the men who know.

Equip your machines with **JOHNSON FRICTION CLUTCHES.**

Canada: WILLIAMS & WILSON, 320 St. James Street, Montreal.
THE CANADIAN FAIRBANKS-MORSE CO., LTD., Toronto.

England: THE EFANDEM CO., 159 Great Portland St., London, W.,
Sole Agents British Isles.

Australia: EDWIN WOOD, Pty., Hardware Chambers, 231 Elizabeth Street, Melbourne, Victoria.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

We will Fill Your Requirements *Send us Your Inquiries*

Air Compressor Evidence

The greatest evidence of the value of any article is the demand for it after investigation and trial. Below are four carloads of our compressors which fills one order to a large concern in Canada. Our line of compressors is very large.

Write us and explain your requirements.

The Jenckes Machine Company, Limited

CANADIAN SALES OFFICES:
Sherbrooke, Montreal St. Catharines, Toronto
Cobalt, South Porcupine, Vancouver.

WORKS: Sherbrooke, Que.

WORKS: St. Catharines, Ont.

Electrite

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium—make this a steel of truly remarkably cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.

LATROBE, PA.

High Speed Steel

Uranium

High-Speed STEEL

The tools that are made with "Wolfram" High Speed Steel are warranted to be super-keen at the edge and super-strong at the neck.

WOLFRAM

Embodies a true and permanent alloy of Tungsten, Chrome, Vanadium and Iron. No better High Speed Steel in the world.

VULCAN CRUCIBLE STEEL COMPANY

ESTABLISHED 1900

Aliquippa - Pa., U.S.A.

Represented in Canada by Messrs. Norton, Callard & Company, Montreal.

STEEL

FOR
SHRAPNEL
SHELLS
AND SHELL BLANKS

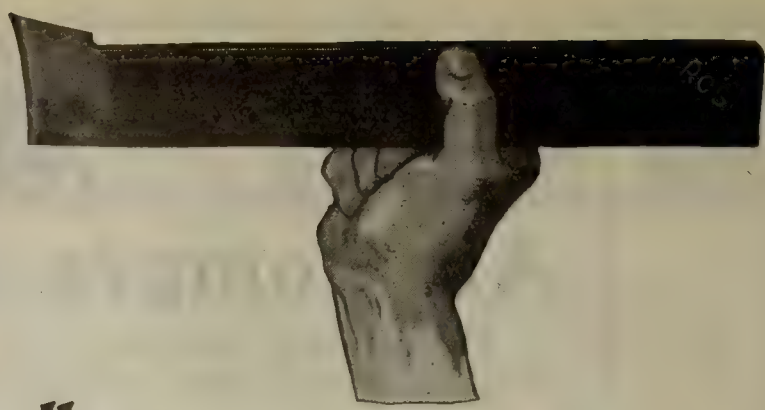
We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.'

Nova Scotia Steel and Coal Company
Limited

Head Office: NEW GLASGOW, N.S.

Western Sales Office:
Room 14, Windsor Hotel, MONTREAL



"Red Cut Superior"

HIGH SPEED STEEL

YOU have thought of many qualities you would like to have in High Speed Steel Tools—such as cutting edges with long life, freedom from brittleness, great reserve strength and toughness to resist shocks and strains, tools that would not require special heat treatment, tools that would take deep roughing cuts or fine smooth finishing cuts, and in addition, could be worked at higher speeds than you ever dreamed of. All these virtues and many more are contained in "Red Cut Superior", a First Quality High Speed Steel. Furnished in Annealed Bar Stock, Discs, and Treated Tool Holder Bits.

Are your tools made of Red Cut?

Send for folder

VANADIUM-ALLOYS STEEL COMPANY
Pittsburgh, Pa.
Works at Latrobe, Pa.

GARLOCK-WALKER MACHINERY CO. LIMITED

32 FRONT ST. WEST, TORONTO TELEPHONE MAIN 5346

You are invited

to attend the showing of a series of educational slides depicting the manufacture of machine tools of quality from the mine to the finished product.

The different processes of manufacture are all shown, the smelting and refining of the ore, the pouring, the casting and the extraordinary care in finishing the parts; the assembling and minute inspection and numerous tests of the complete machine—a vivid story in picture of one of the world's greatest industries.

We are showing these pictures every day during the Exhibition at our booth in the eastern end of Machinery Hall.

You are cordially invited. Meet us there and see this interesting exhibit.

METAL and WOODWORKING MACHINERY of all Kinds

"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

MANUFACTURED BY

Arthur Balfour & Co., Limited
Dannemora Steel Works,
Sheffield, England.

The Eagle & Globe Steel Company, Limited

Head Office, Canada and U.S. 128 Craig Street West, Montreal
Ontario Office and Warehouse 36 Colborne Street, Toronto
Winnipeg Stock Dominion Equipment & Supply Co. Limited
Vancouver Stock Frank Darling & Co.

W. A. BRADBURY, Agent, 128 Craig Street West, Montreal

The

Fairley Davidson Steel Co., Inc.

SPECIALISTS

	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
High Strength Steels	"Hehtemnd"
High Speed Steel	RUSHITOFF No. 6
Tool and Die Steels	"Fondwot" and "Giant"
Magnet Steels	Tungsten or Chrome
Non-Changeable Die Steel	Nugget "B" oil hardening

CHROME VANADIUM, oil hardening or case hardening

CHROME NICKEL, oil hardening or case hardening

Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

Canadian Agents:

The Canadian Utilities Steel & Engineering, Limited

149 Craig Street West, Montreal, Canada

We carry a complete stock at our Montreal Warehouse

Works: LONGUEUIL, QUE.

CANADIAN MANUFACTURERS

are you using Steel

MADE IN CANADA?

We are manufacturing at our works at LONGUEUIL, QUE.

SPECIAL HIGH SPEED AND CARBON TOOL STEELS, MISCELLANEOUS SHOP TOOLS, GAUGES, Etc.

ARMSTRONG WHITWORTH of CANADA
LIMITED

HEAD OFFICE: 298-300 St. James St., Montreal

Branches: 27 King William Street, HAMILTON
Dominion Bank Bldg., TORONTO
McArthur Bldg., WINNIPEG, MAN.

Coal
Coke
Iron Ore

Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

M.A. HANNA & Co.

Sales Agents, CLEVELAND

Canadian Office:

703 C.P.R. Bldg., Toronto

You must have good steel in your cutting tool where you have turning operations that are severe; the making of rolls for steel mills, for example. The steel used is a very hard, tough metal, and it is necessary to remove this metal to some depth.

The chips tell the story. There are nearly two pounds of them in the man's hands. The roll is thirty inches diameter and the feed is 13/64 inch per revolution, while the depth of cut is over an inch. The cutting speed is about 18 feet per minute. A 50 H.P. motor is required to operate the machine.

Uranium Steel is used for this cutting tool. It is the only steel that several concerns have found can stand the pace. Uranium is an element which gives high-speed steel remarkable toughness and life.

Consult your steel man or write us

Standard Alloys Company

Forbes and Meyran Avenues
PITTSBURGH, PA.
U.S.A.

IF YOU WANT THE

BEST BASE PLUGS, BUY BANFIELD'S

Have in stock for immediate shipment either threaded or bevel Plugs for 4.5", 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. Write for prices.

EDWIN J. BANFIELD

STAIR BLDG. ∴ TORONTO, ONT.

Manufacturer of Plug Milling Machines for above size shells. Prices and deliveries on application.

The Lathe that Stands the Test

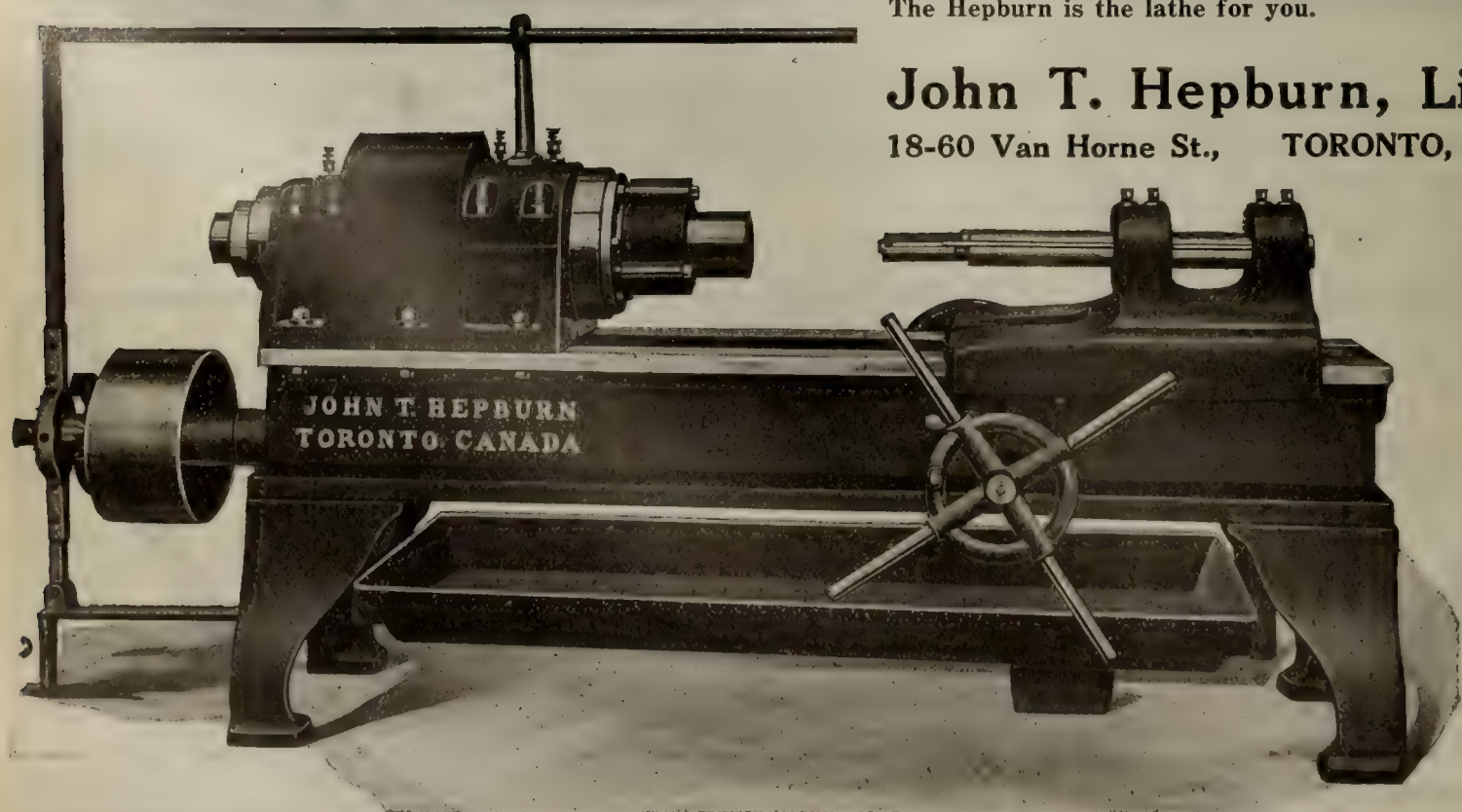
Hepburn

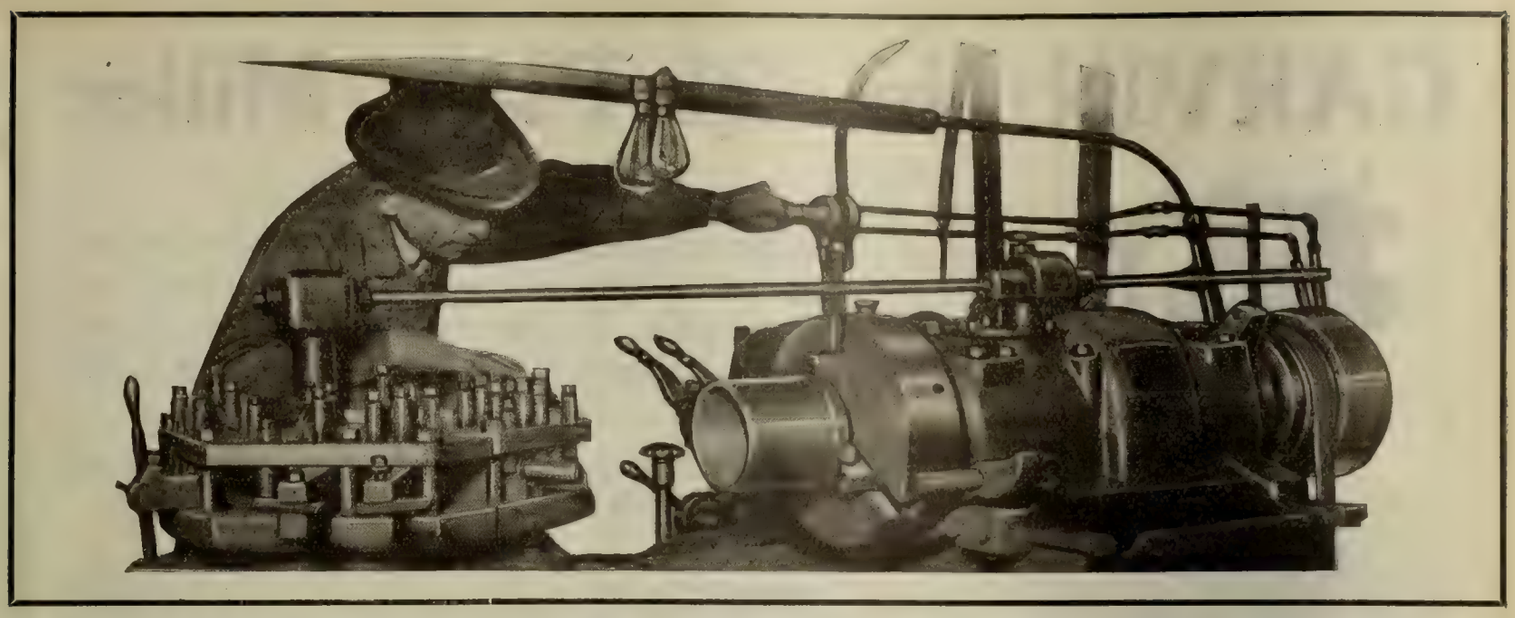
Shell work thoroughly tests the ability of a lathe. The **Hepburn Lathe** is making a wonderful record in the munition plants of Canada in boring up to 6" shells. It has shown superior speed and superior quality of work and keeps right at it day in and day out. We also rebuild lathes embodying in them all latest improvements.

The Hepburn is the lathe for you.

John T. Hepburn, Limited

18-60 Van Horne St., TORONTO, ONTARIO





The Woman in the Shop Has Come to Stay

Thrust into the industrial field by unprecedented world conditions, women have more than made good. Lacking masculine brawn, they have by instinct the deft, sure touch and quick perceptions that go to make a highly skilled operator; aided by modern labor-saving devices they equal, and in many cases surpass, the output of the expert workman.

One of the woman machinist's chief helps is the Hannifin Air Chuck, by means of which work is chucked and rigidly gripped by simply turning a lever. Another turn effects the release. The Hannifin Chuck is almost instantaneous in action, holds securely, cannot slip, saves labor, and saves time to the extent of increasing output 20 to 100 per cent.

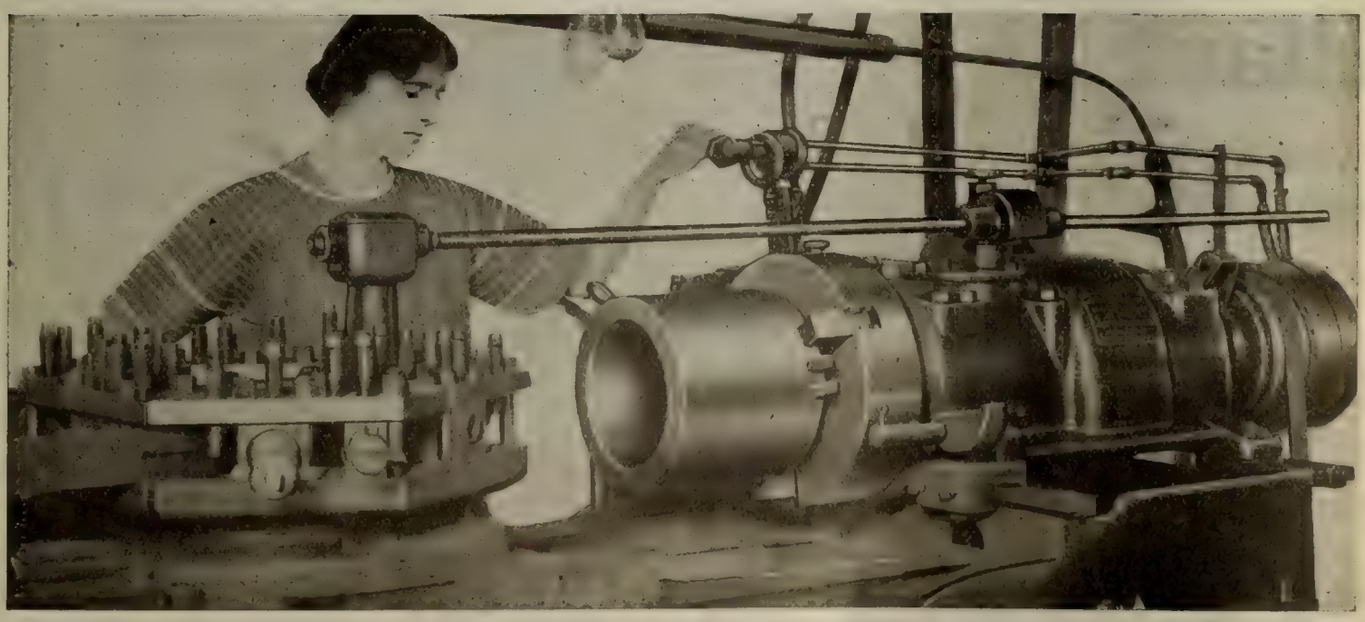
Every argument is in favor of the Hannifin Air Chuck. Order one on trial and let it prove its own case.

HANNIFIN Air Chucks

Write for catalogue covering Air Operated Chucking and Clamping Equipment.

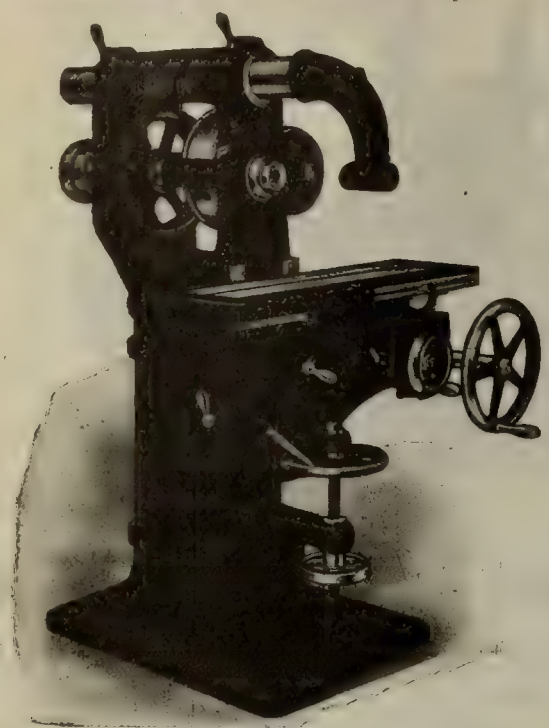
HANNIFIN MFG. COMPANY, Chicago, U.S.A.

REPRESENTATIVES:—R. E. Ellis Engineering Co., Chicago; Coats Machine Tool Co., New York City; A. R. Williams Machinery Co., Toronto; Williams & Wilson, Montreal; The Canadian Fairbanks-Morse Co., Montreal. EUROPEAN REPRESENTATIVES:—Coats Machine Tool Co., Ltd., London; Fenwick Freres & Co., Paris; Iznosskoff & Co., Petrograd.



GARVIN No. 21 Plain Miller

Back Geared



No. 21 B.G. PLAIN MILLING MACHINE
Back Geared
Use Code - Abject

For Plain and Gang Milling for general manufacturing, and is used mostly in gangs of 5 or 6 machines to one operator. Spindle runs in adjustable bronze boxes, and is driven by a 3″ belt through back gears (3 to 1).

Knee is our improved solid top design, rigid and stiff to resist side pressure of heavy cuts.

DIMENSIONS:

Automatic Feed of Table	18 in.
Adjustment in line with Spindle	6 in.
Vertical adjustment under Spindle	13 in.
Table, inside Oil Pockets	6 x 30 in.
Changes of Speed	6
Changes of Feed	6
Net Weight, Skidded	1,575 lbs.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

MANUFACTURED BY

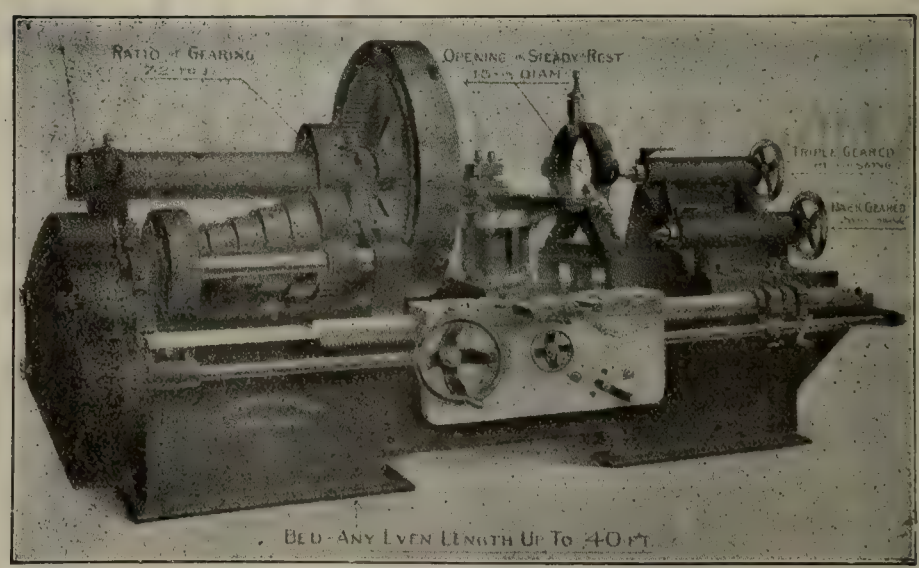
THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) **50 Years New York City**

One Ship-building Plant

wrote to six different Lathe-Builders

and bought McCabe's "2-in-1" Double-spindle Lathe—on a 30-ft. bed—because it was "different" and built especially for such a wide range of work.



McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing As a 48 inch Triple-Geared Lathe

What other big Lathe can you get, and have full use of your Lathe, whether you have big or small work?

What Lathe Manufacturers except McCabe could make such a low price possible?

No other Lathe builder turns out 48-inch Lathes in such big lots at a time, making the parts all duplicate and interchangeable.

And in addition to the 48-inch Triple-geared Lathe, the 26-inch is the "Lathe plus" feature McCabe offers you—at no extra cost.

DOUBLE service—convenience and capacity—all described in Latest Bulletins.

J. J. McCABE, 149 BROADWAY, NEW YORK

Do It Automatically!

With labor so scarce and expensive, can you afford to jog along with the old "one machine to a man" method when one man can do the work of six with Potter & Johnston Automatics?

By practically eliminating the labor problem, P. & J. Automatics reduce production costs amazingly. One attendant can readily operate from two to six machines.

SPECIFICATIONS

Geared head, having three automatic changes of spindle speeds.
Geared feed.
Auxiliary reaming and threading feed.
Cross slide.
Automatic back facer bar through spindle.
16-inch convertible two and three-jaw scroll chuck.
Spindle 5¾ inches diameter, hole 3½ inches diameter.

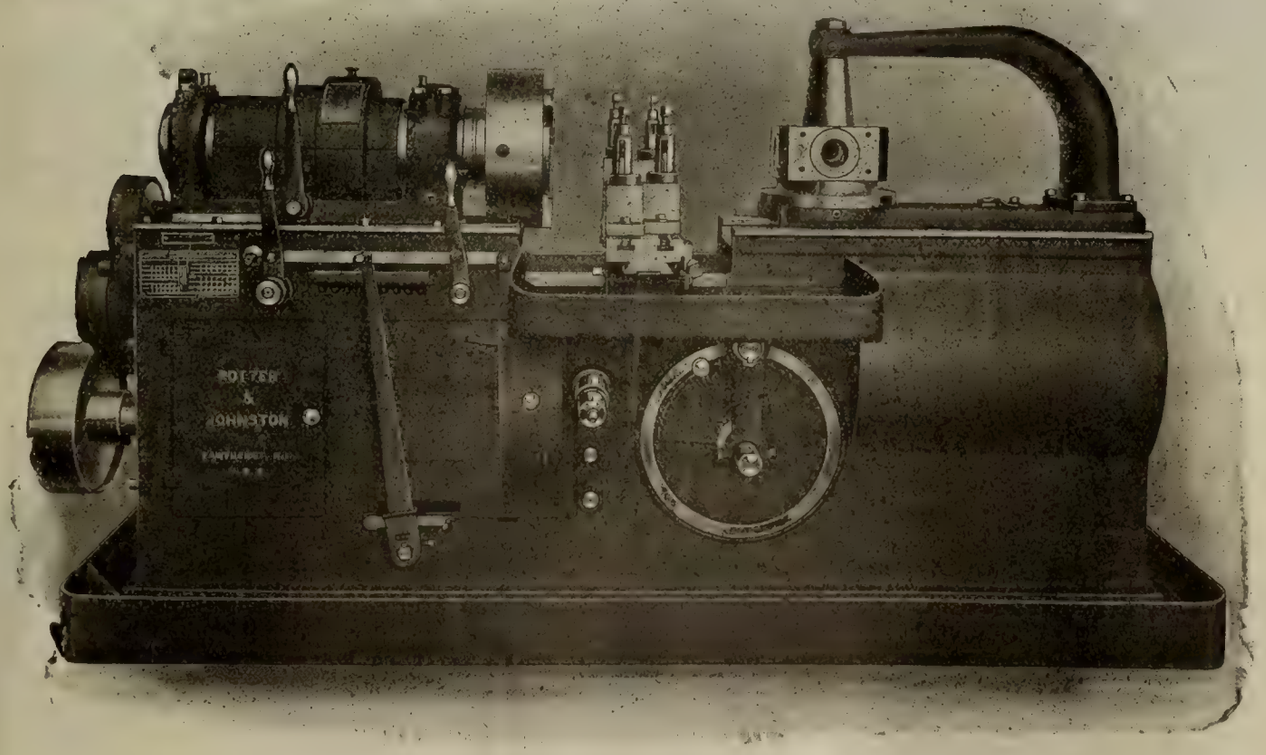
And production! A study of your problems will result in some surprising information for you. We have shown many firms the way to greater and more accurate production. Let us study your blue-prints.

If you machine iron, bronze or steel castings or forgings; if you manufacture gear blanks, bushings, etc., let us tell you how P. & J. automatics will increase your production.

Canadian Offices Potter & Johnston Machine Co., Pawtucket, R.I.

Roelofson Machine & Tool Co., Ltd.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada



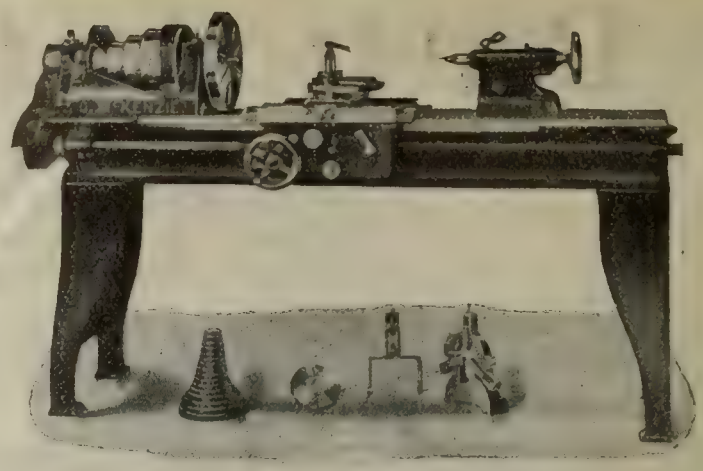
6-A Potter & Johnston Automatic Chucking and Turning Machine

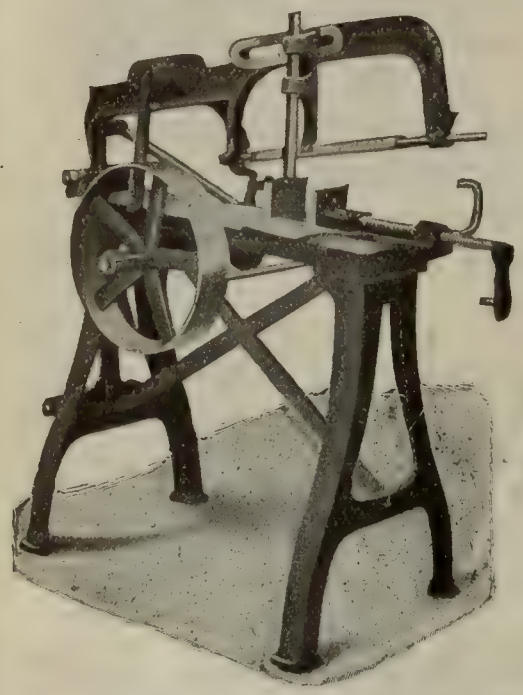
The "McKenzie" Engine Lathe

The Standard of Accuracy

Made from new patterns, of improved design, and constructed of the very best material by expert workmen. Every part is mechanically perfect and excellently finished. Its accuracy and durability mean a big saving of money to you.

Let us put full details before you. Write!





The Improved Power Hack Saw

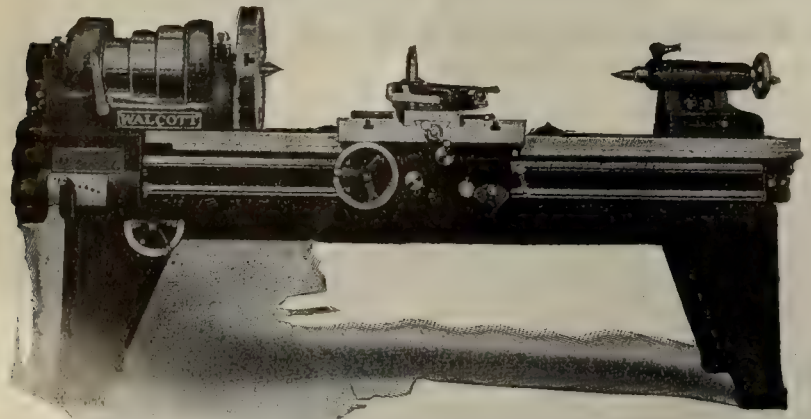
will cover its cost many times over with the money it saves through long, efficient service.

Saws bars 6 x 6 in., either round or square, and is so constructed as to require no attention after work is put in vise, and stops automatically when piece is cut off.

The improved Saw Guide is a Special Feature—it keeps the saw perfectly in line at all times.

The D. McKenzie Machinery Company

Guelph, Ontario



THE WALCOTT LATHE

is backed by lathe-building experience extending over 36 years

These are features of Walcott Lathes: drop-forged gears in apron; all-steel gears in gear-box; large ways on bed, all gears completely enclosed. Parts are interchangeable. Rigid headstock and tailstock.

You'll get the full story in our printed matter. Send for it surely if you are about to buy a lathe.

WALCOTT LATHE COMPANY

Successors to

Walcott & Wood Machine Tool Co., Calhoun St., Jackson, Michigan

Decidedly Quality

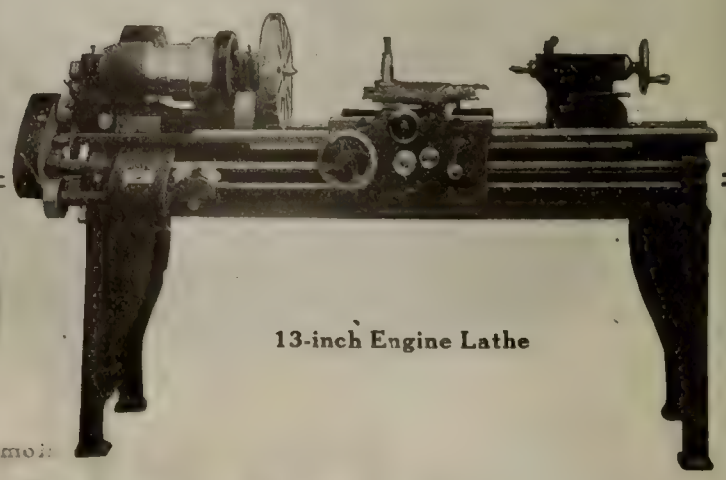
That is the verdict of our clients.

In construction, operation and results, quality is evident. That is the reason why Filsmith has occupied the foreground in lathedom. In Canada and United States you will find Filsmith quality is based on what it is now doing, not on history. Full webbed headstock, 50-point carbon steel spindle, and rigidly clamped tailstock.

An enquiry will secure you full information.

The Philip Smith Mfg. Co.

Sidney, Ohio, U.S.A.



13-inch Engine Lathe

Two Cuts at One Time

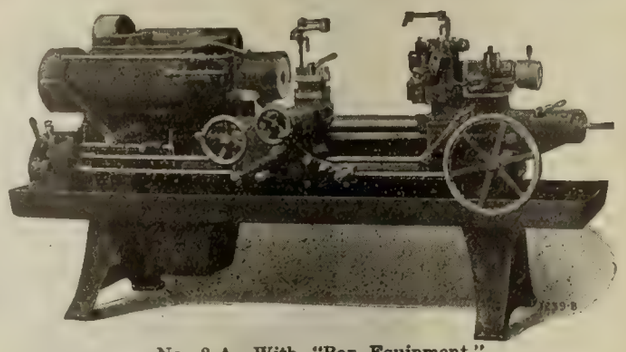
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

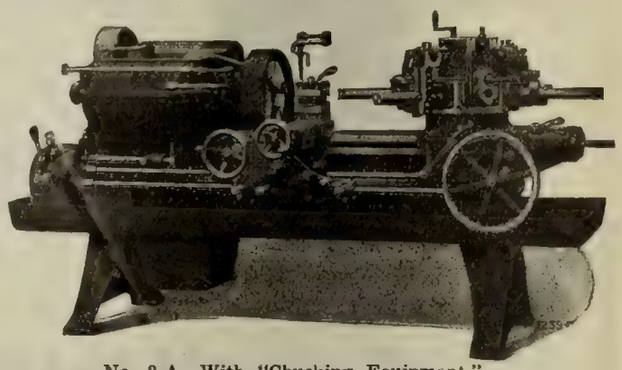
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."



No. 2-A—With "Chucking Equipment."

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal, Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

To Realize the Full Cutting Power Of High Speed Steel

That is the specific purpose for which Whitcomb-Blaisdell Planers have been designed.

They are well-proportioned, extra heavy and embody many exclusive features for driving a cut at the limit of endurance of high-speed steel. The patented Second-Belt Drive cushions the quick reverse and also imparts to the table a smooth, powerful drive. The actual production records in many plants show Whitcomb-Blaisdell Planers operating at extremely high cutting and return speeds.

The Whitcomb-Blaisdell will put new speed into your Planer Production.

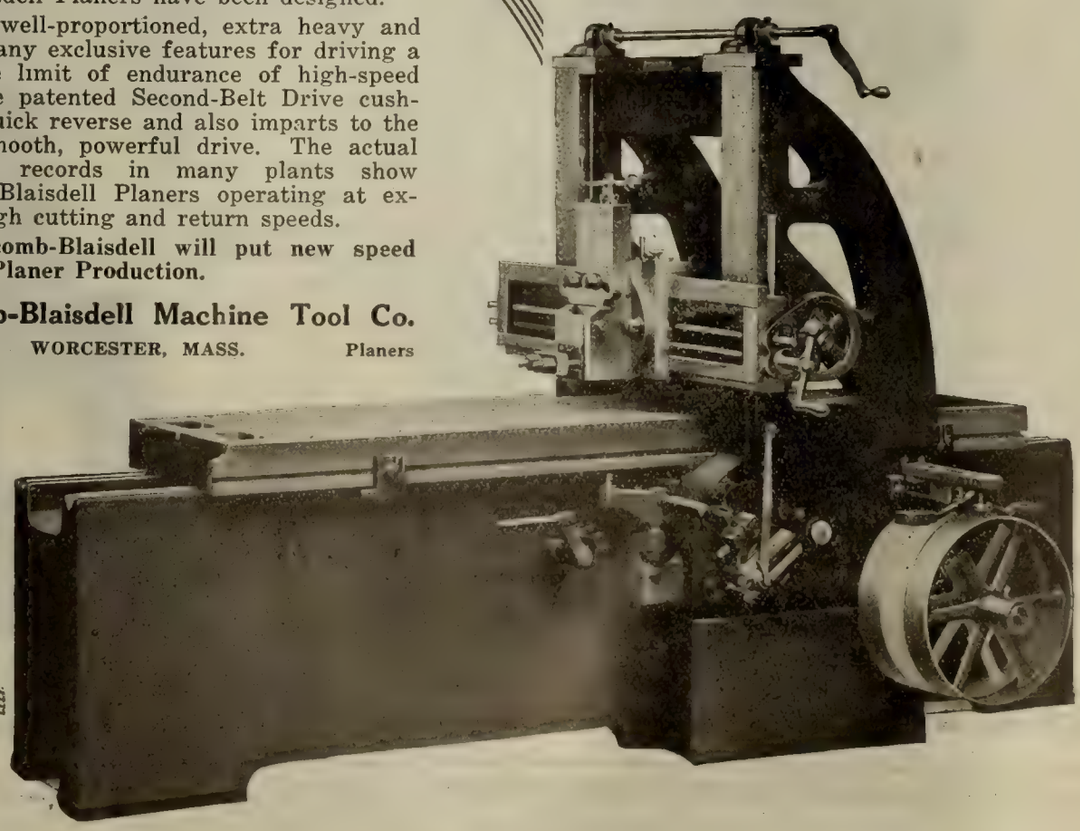
Whitcomb-Blaisdell Machine Tool Co.

Lathes WORCESTER, MASS. Planers

The Planer Book tells the concrete reasons for Whitcomb - Blaisdell Speed. Write for your copy.

Whitcomb-Blaisdell

The Planer with the Second-Belt Drive.



THE Crank Shafts of all Consolidated Presses are made from .50 to .60 carbon steel hydraulic forgings, accurately machined and ground to size. The body bearings are carefully scraped to fit, thus insuring a perfect bearing.

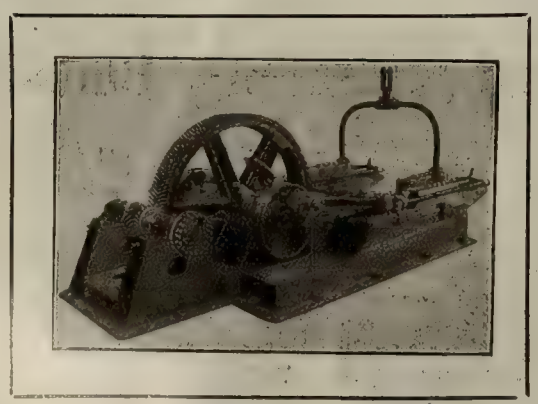
The Crank Pins are larger in diameter than the main bearings. This has always been a Consolidated feature. Crank cheeks are liberal and guarantee strength and rigidity in the shaft; this, together with the enlarged crank pin, materially resist torsion when the press is in operation.

You cannot ignore these features.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver



ELMES

18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

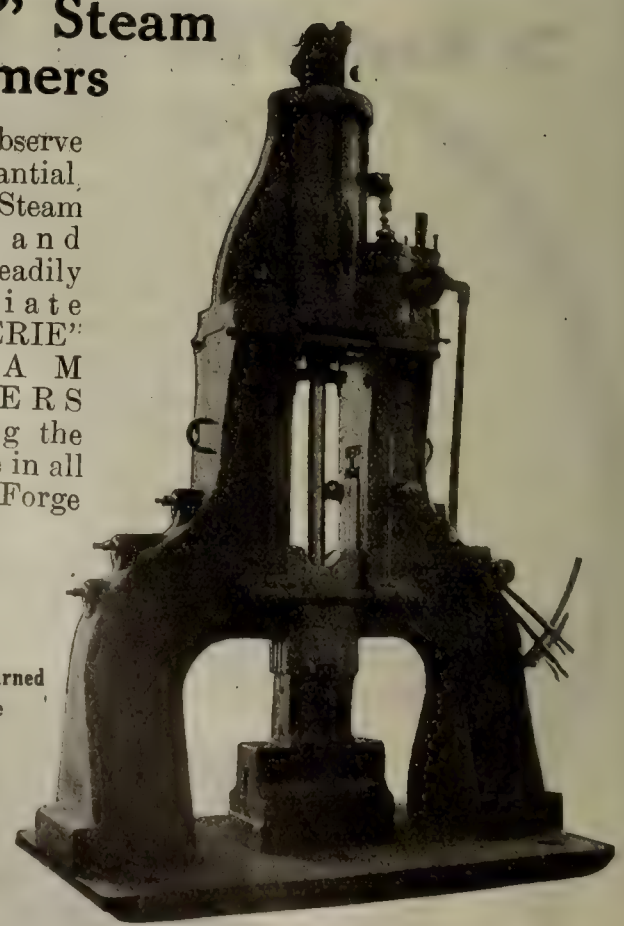
Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217 No. Morgan Street CHICAGO, ILL.

"Erie" Steam Hammers

Closely observe this substantial, well built Steam Hammer and you will readily appreciate why "ERIE" STEAM HAMMERS are getting the preference in all modern Forge Shops.



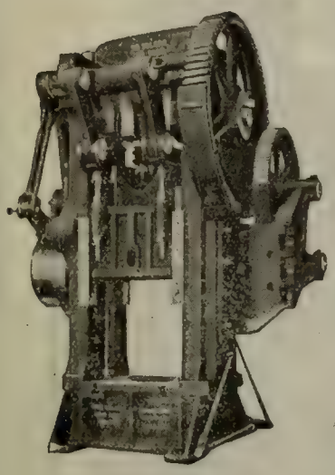
They have earned their enviable reputation.

ERIE FOUNDRY COMPANY

ERIE, PA. U. S. A.

THE "TOLEDO"

Toggle Drawing and Deep Stamping Presses



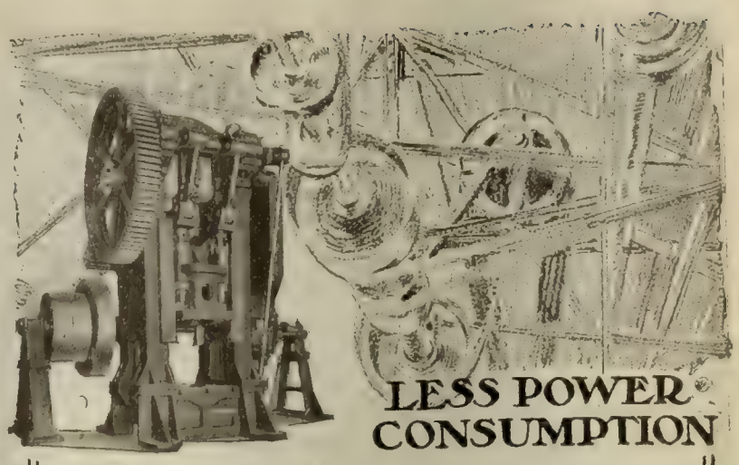
A few of the advantages: Perfect dwell of blank holder during entire drawing operation; the exertion of all the required power; elimination of wasters due to undulation of the blank holder pressure; perfect timing feed consequent effective balancing of entire machine assuring smooth, silent running and safety for operator.

Toggle arms, rocker arms and yokes are made throughout of steel with inserted bronze bushings at each bearing.

Built in all sizes for work from tin cups to road scrapers.

The Toledo Machine & Tool Co.

TOLEDO, OHIO



LESS POWER CONSUMPTION

"Bliss" Patent Toggle Drawing Presses require less power in performing a given operation than many other types of press. Smoothness of action, perfect dwell of the blank-holder and minimum of wearing stresses contribute to this end. Adapted to drawing a large variety of heavy sheet metal work, including many automobile parts.

"BLISS" TOGGLE DRAWING PRESS NO. 15-A.

E. W. BLISS CO.

Brooklyn, N.Y., U.S.A.

1857 1917

CHICAGO OFFICE People's Gas. Bldg.
DETROIT OFFICE Dime Bank Bldg.
CLEVELAND OFFICE - Union Bank Bldg.
LONDON, S. E., ENGLAND Pocock St., Blackfriars Road
PARIS, FRANCE 100 Blvd. Victor-Hugo St. Ouen

Banding 6" to 12" Shells

Its sturdy construction allows it to stand up under severe service. This is the reason for its higher price. Such extra care, better material and expert workmanship are required that the results warrant the high cost.

It has six 11" semi-steel rams which move ½" or more if necessary. All rams returned by levers on plates with heavy Vanadium Steel Springs. Cylinder removable of alloy steel.

Hydraulic inlet to cylinder 1¼ pipe. Distributing ring 2". All pipe of Seamless Steel Tubing. All fittings dropped forged steel. All parts under strain, alloy steel castings and forgings.

Six dies of forged chrome nickel steel, hardened and removable, without disturbing any part of press, by loosening two nuts. Can be operated either from accumulator or pump.

Built also in smaller size of same type for banding "pounder" to 6" shells.

Metalwood Manufacturing Co.

Leib and Wight Sts. -:- DETROIT, MICH.

For Great Britain and Continent, address Gaston E Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

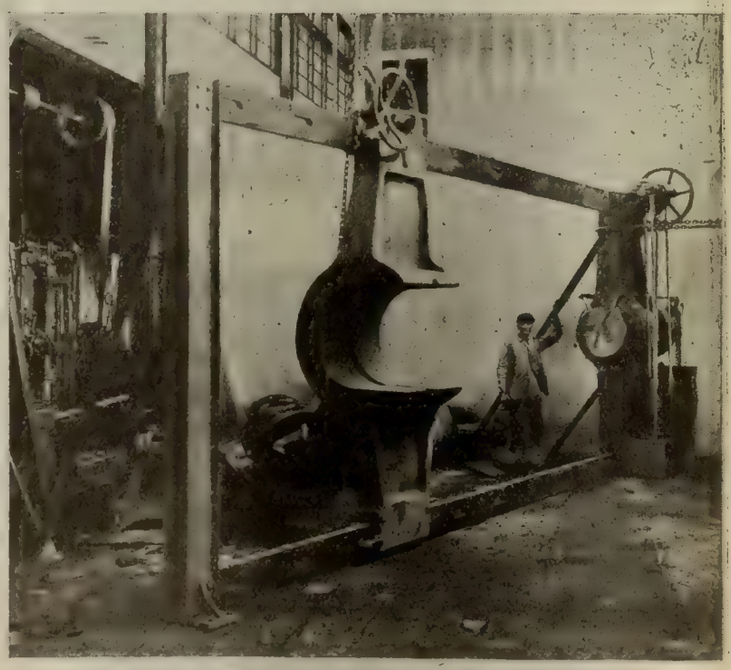


Illustration shows Hydraulic Press for Government Shipbuilding Plant, Sorel, Que.

Hydraulic Presses, Pumps and Accumulators for all Purposes.

Write for Prices and Deliveries.

WM. R. PERRIN, LIMITED

TORONTO, CANADA.

If any advertisement interests you, tear it out now and place with letters to be answered.

Universal Gear Hobber

The machine which completes our lines to cut all types of small gears except internal, within 10″ dia. 8 Pitch.

The Bilton Gear Hobber will cut spur spiral gears, worm gears, also various special shapes of teeth. It can cut a spiral gear on end of a shaft 1⅜″ diam. 24″ long.

SPECIFICATIONS

Capacity Gears: 10 Diametral Pitch
10 in. Outside Diameter
10 in. Width of Face
Range of hob feed 50-250 R.P.M.
Range hob feed to each rev. of worm .010 to .125
Drive: 3 Steps Cone Pulley; 2½ in. Belt
Weight 2,100 lbs.

A machine of latest design, introducing new features which increase production without sacrificing accuracy. The hob is cutting continuously; operation of machine entirely automatic.

DELIVERY

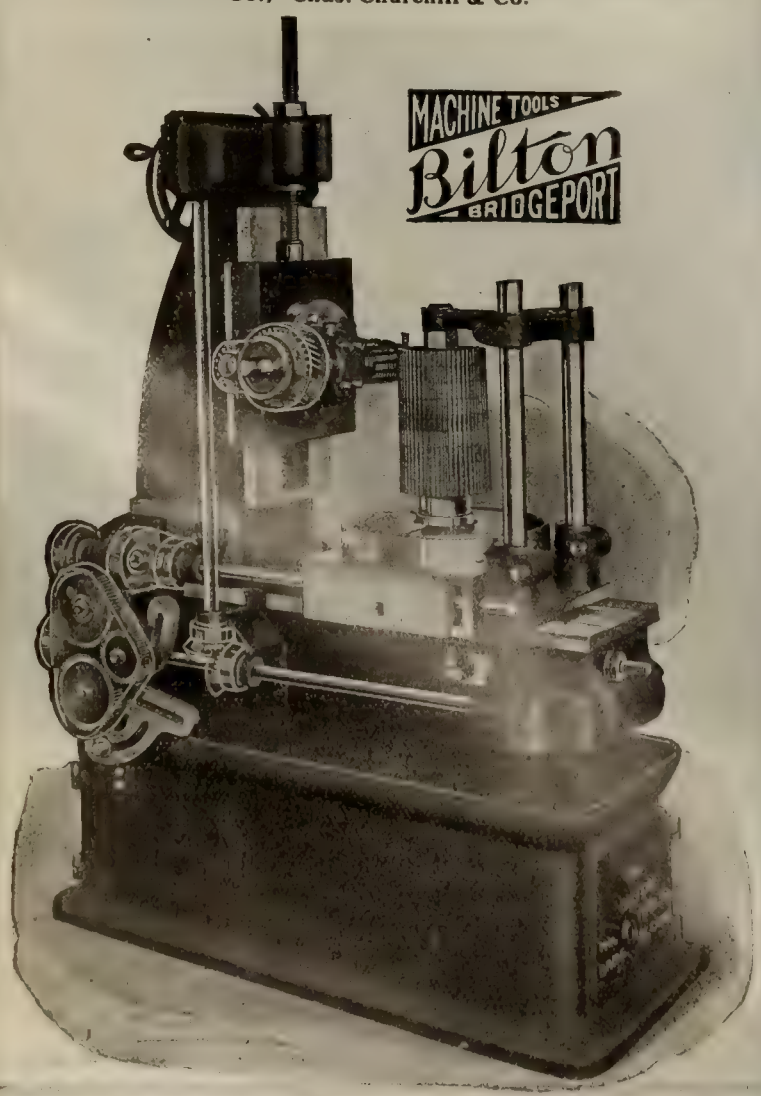
Ae few of these machines are now available for October delivery.

Send for copy of new catalog No. 30, and bulletin describing this machine.

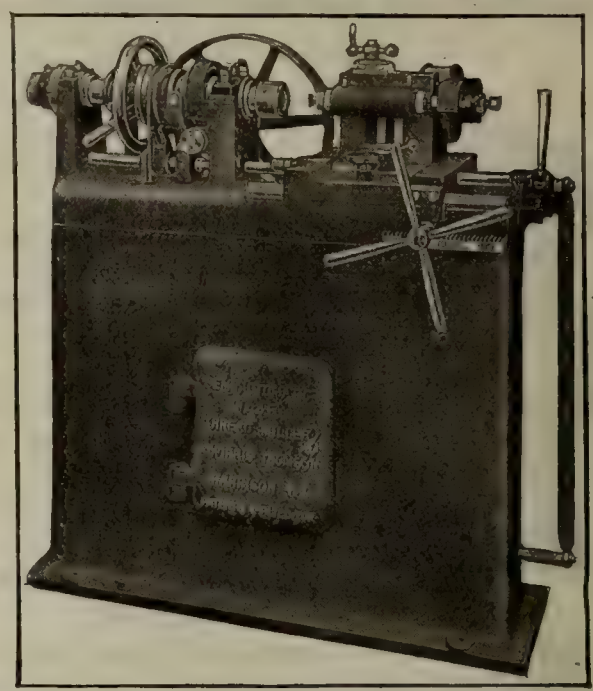
The Bilton Machine Tool Co.

Bridgeport, Conn.

Foreign Agents: **Alfred Herbert Ltd., M. Mett Engineering Co., Chas. Churchill & Co.**



The Morris Thomson Semi-Automatic Thread Miller



Simplest, fastest and most accurate for Primers, Fuse Bodies, Watch Cases and such pieces. Capacity 3-inch internal or external 10 pitch.

Quick Deliveries. Hundreds in Use.

T.C.M. Mfg. Co., Harrison, N.J.

U. S. A.

PRACTICALITY

AFTER fifteen years' study of the Miner's and Lumberman's wants, we know just what is and what is not required in tools for them.

Practicality has been the keynote of our organization. Experience has aided us in eliminating all unnecessary parts and in perfecting the design of our tools.

The use of best material and finest workmanship enable us to manufacture tools that are unexcelled.

We make a complete line.

Write us for prices.

J. W. CUMMING & SON, LTD.

NEW GLASGOW, - - CANADA

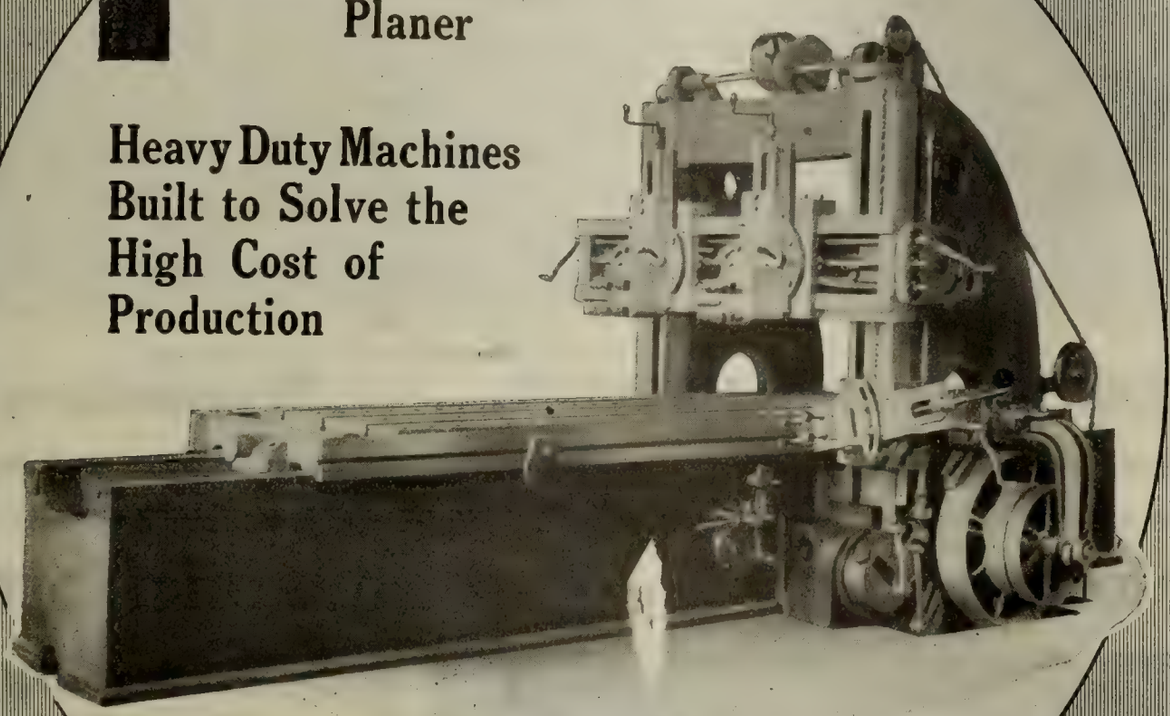
Wood or Steel, let Cummings make it.

HAMILTON

PLANERS

Hamilton 36" x 36" Planer

Heavy Duty Machines Built to Solve the High Cost of Production



WEIGHT, RIGIDITY, DIMENSIONS and POWER—these are the combination of assets that give exceptional productive ability to "HAMILTON" PLANERS.

The installation of the "HAMILTON" strikes a crushing blow at the High Cost of Production. They do big work fast and accurately. Sizes from 24" x 24" to 54" x 54".

Our bulletin will tell you all about this planer. Give us your address.

The Hamilton Machine Tool Company, Hamilton, Ohio

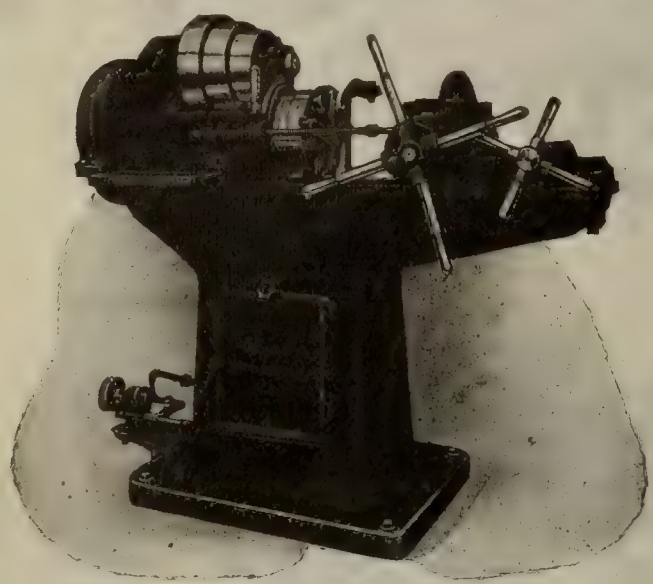
H. W. PETRIE, LIMITED, TORONTO, Sole Agents for Ontario.

If any advertisement interests you, tear it out now and place with letters to be answered.

EVERY THREAD A PROFIT MAKER

This is readily possible by using the Landis which insures a high production of clean-cut, well-formed threads at a minimum cost of die maintenance.

These results are due in part to the *Landis Chaser* which embodies the following features:



The line contact between chaser and stock which reduces friction and permits of high cutting speeds.

The rake or cutting angle of the chaser is controllable and may be ground to suit the nature of the material to be threaded.

The length of the chaser is such as to give a life at least twenty times that of other dies.

The chasers never require annealing, hobbing or retempering, but when dull are merely given a slight grinding at the cutting edge and advanced in the holders.

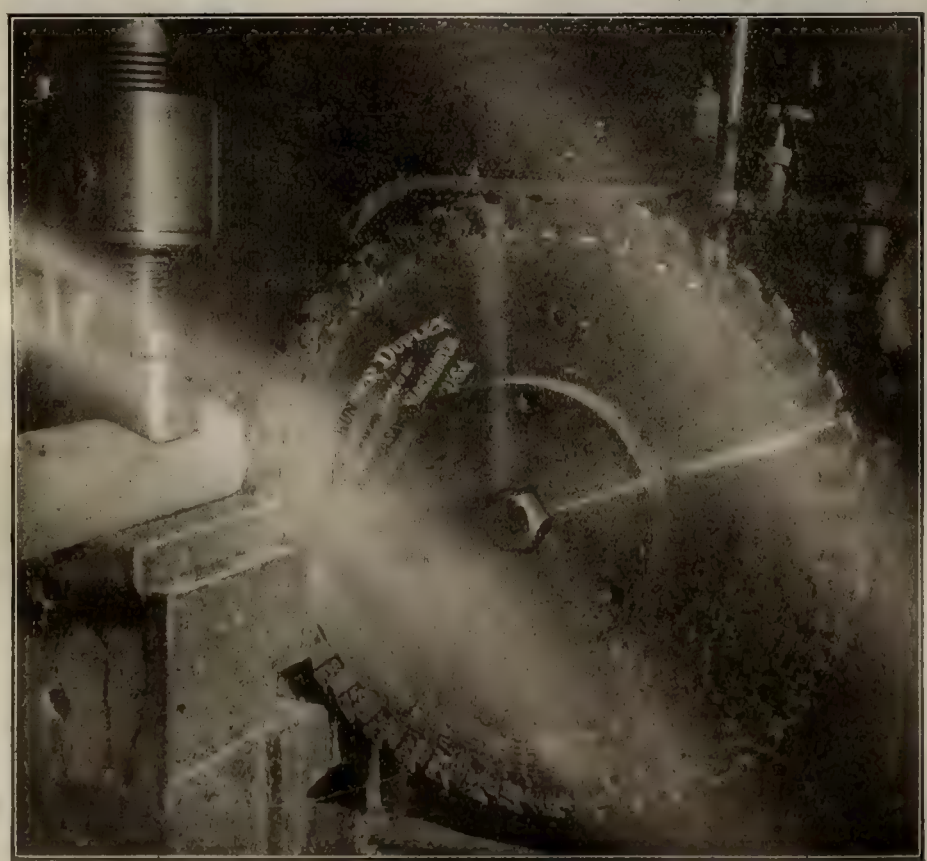
The chasers are interchangeable, which means that one or more of a set can be replaced without renewing the entire die.

There are still other features which with those above mentioned are absolutely essential to profitable threading.

Write for details.

LANDIS MACHINE COMPANY, Waynesboro, Pa.

A Hunter "Duplex" on Shrapnel Stock



FAST GOING
on Newton Machine

Through 3½" round 60 Carbon, 70 Manganese Shrapnel Stock every

2 MINUTES

The secret of Hunter "Duplex" Saw speed is the method of holding the high speed teeth.

You can use this speed profitably — on shrapnel or any other stock.

Let us send full Particulars.

HUNTER SAW & MACHINE COMPANY, Pittsburg, Pa.

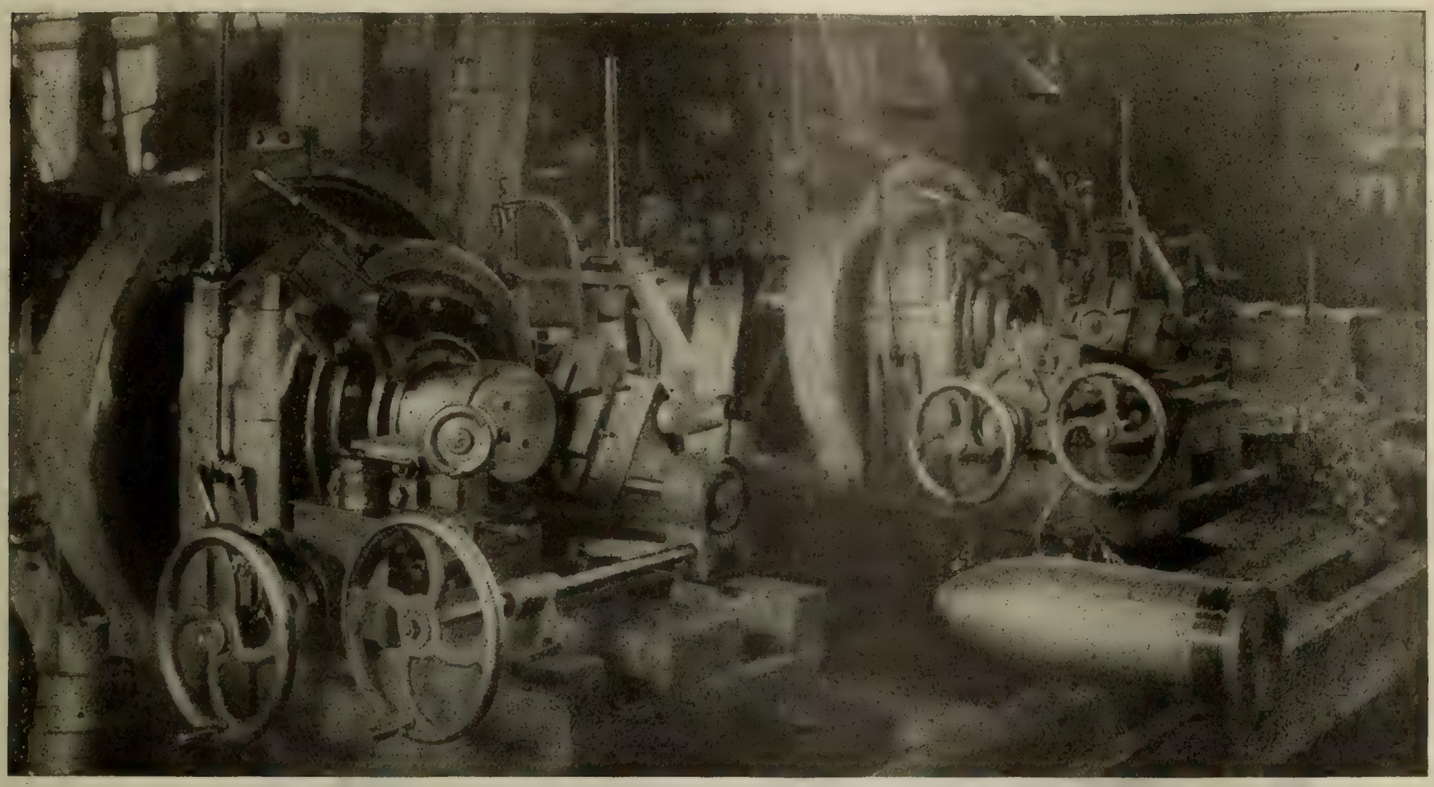


Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

These machines are built for turning bands on 8", 9.2" and 12" shells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. Write for full particulars and price.

Bennett Ave. **Warden King Limited** Maisonneuve, P.Q.

Two Cuts

Simultaneously

One up, the other down. This is what makes the **Hurlbut-Rogers Cutting-Off and Centering Machine** virtually double the output and reduce the cost per piece about one-half.

The Hurlbut-Rogers Machine gives you capacity of two machines at the expense and in the floor space of one machine.

We build them for hard work and the utmost in accuracy—and their **GREAT SUCCESS ON SHELLS** shows it.

Cutting-off Economy

5-inch Cone-Driven Machine

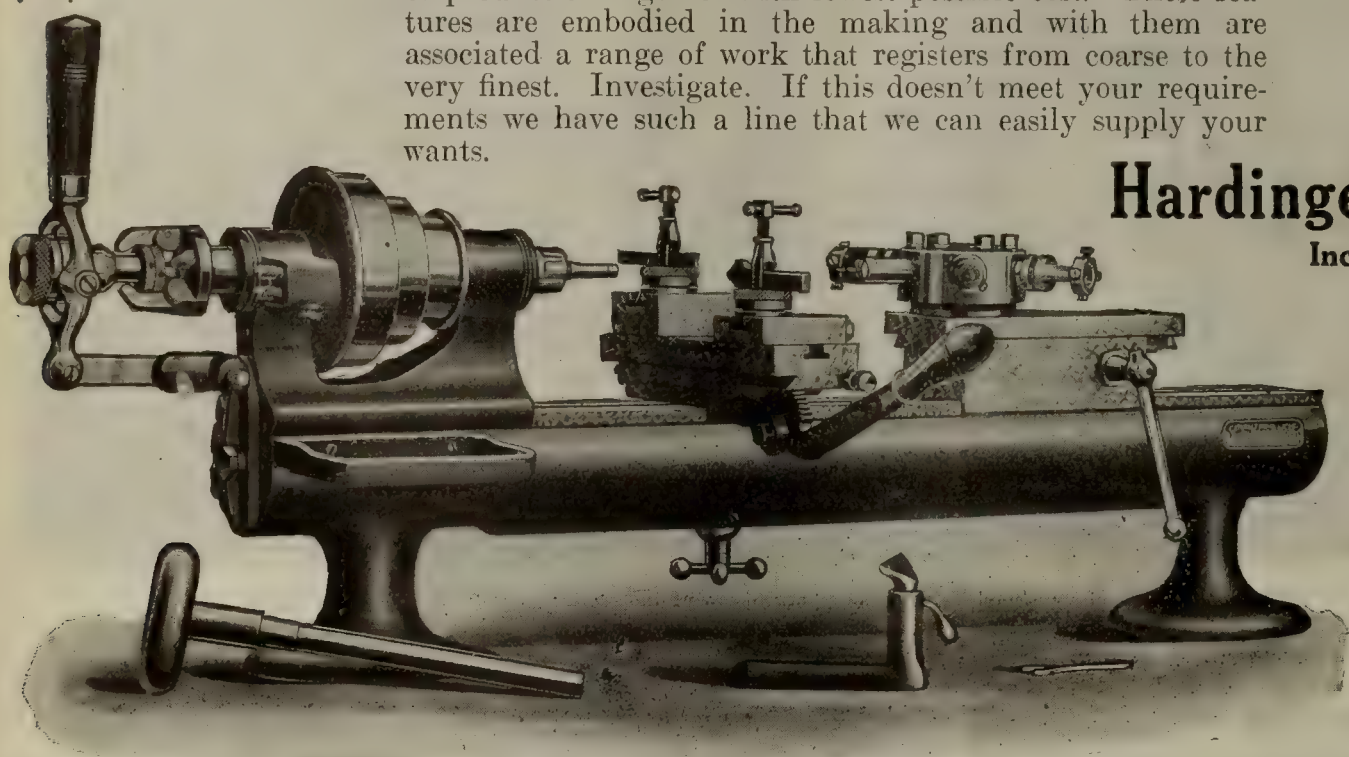
Let us go into details.

HURLBUT-ROGERS MACHINERY CO., South Sudbury, Mass.

FOREIGN AGENTS—England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow and Newcastle-on-Tyne. H. W. PETRIE, TORONTO, CANADA.

If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.



Hardinge Bros.
Inc.

1770 Berteau Avenue,
CHICAGO, ILL., U.S.A.

KEMPSMITH

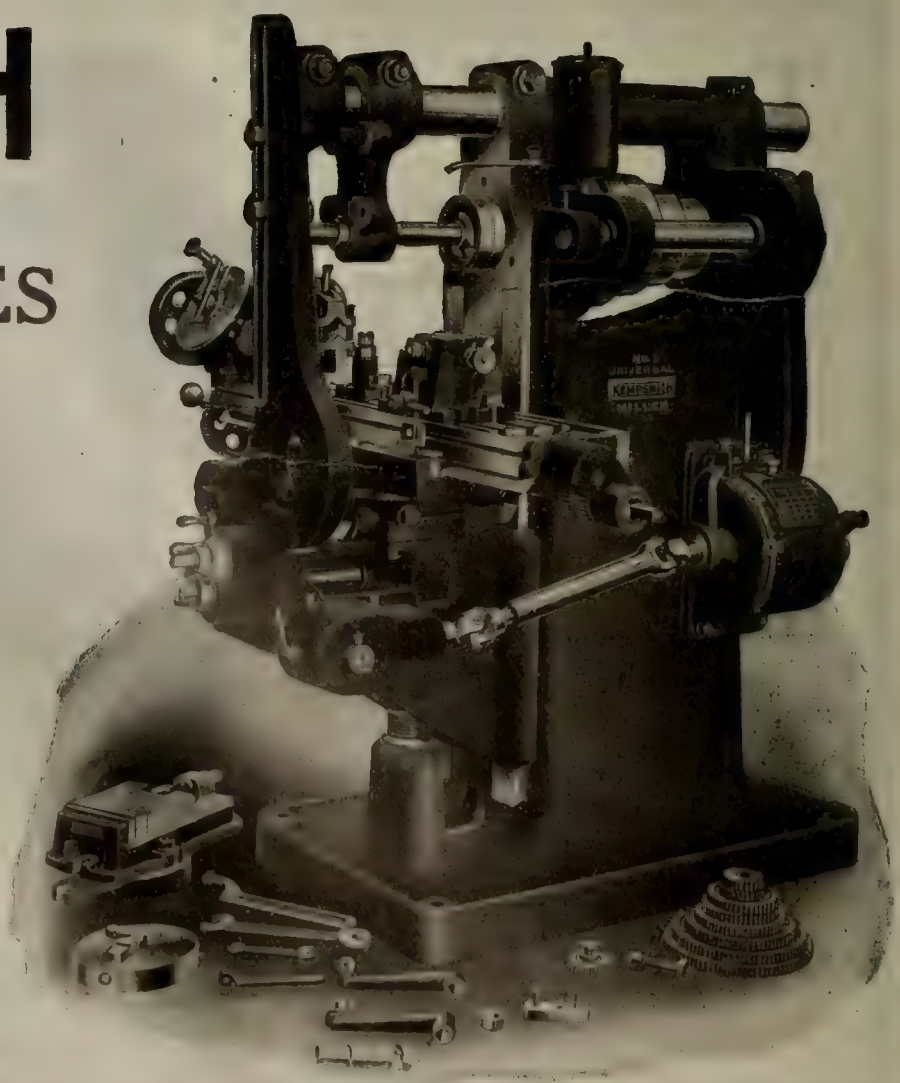
UNIVERSAL MILLING MACHINES

Every Kempsmith Milling Machine of whatever size, is provided with a slotted spindle nose for positive drive of arbor and for positive drive of face milling cutter in either direction.

Every machine is equipped with our patented keyed overhanging arm which insures positive alignment of arbor and boring bar and also prevents the cutter being pounded out of line under cut.

Kempsmith machines are heavy, with weight well distributed and their accuracy is guaranteed within very close limits.

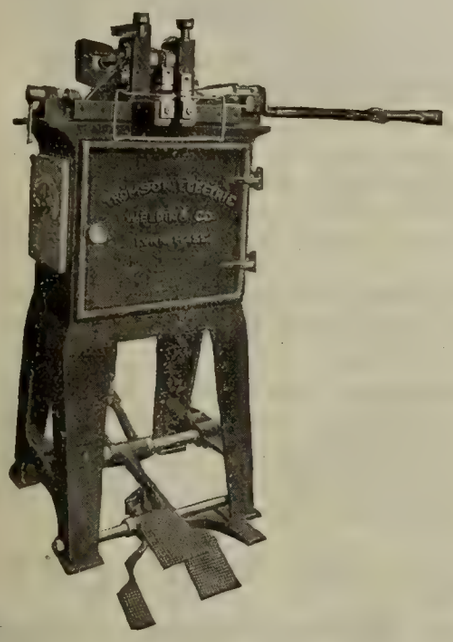
Send for Illustrated Catalogue.



Kempsmith Manufacturing Co.
MILWAUKEE, WIS., U.S.A.

AGENTS:
Foss & Hill Machinery Co., Montreal.
General Supply Company, Toronto and Ottawa.
Canadian Western Foundry & Supply Co., Calgary, Alta.

Thomson Process
Electric Welding

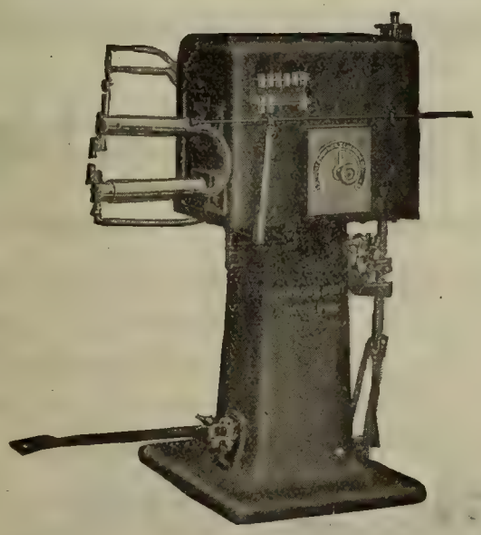


Economy—

In these times, when the entire country is endeavoring to conserve its resources to the greatest extent possible, you can eliminate waste in your welding department by installing a Thomson Butt Welder. The saving in six months will more than pay for the initial cost.

Whether you weld automobile rims, brake rods, angle irons, pipe joints, etc., there is a Thomson Butt Welder for YOUR purpose.

Send for Bulletin B-4.



The Thomson Spot Welder Does It Quickly

It has been proved by actual results that one boy and a "Thomson" can do more and better work than five men and any other method.

It is extremely economical—no rivets to buy, no holes to punch. Think for a moment what that means in dollars and cents. It is just as easy to operate as it is economical—no danger, no smoke, no dirt and very little noise.

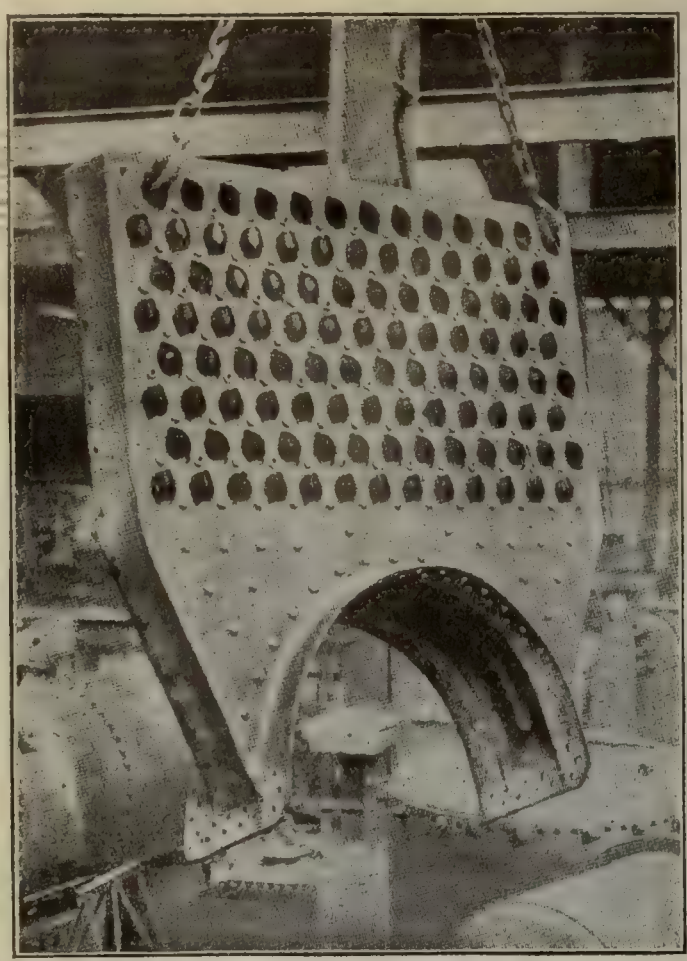
We have a model for your work.

Send for Bulletin S-4.

Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding



Part of Water Tube Boiler
Made by Oxy-Acetylene Welding.

The Importance of Oxy-Acetylene Welding

for joining metals, has been overwhelmingly proven. In many cases it is absolutely indispensable, certain classes of work being done that were otherwise impossible. Even though you may not think you have an application for it you would do well to investigate, its possibilities may surprise you.

Are you continuing the old wasteful and inefficient methods?

Replacing broken parts instead of welding them,
Piling up scrap instead of using it as good material,
Your machinery idle when it might be earning,
Labor standing idle when it might be producing,
Making leaky joints instead of permanently welding them,
Doing less in more time, than welding does in less time,
And many other disadvantages that inefficiency means.

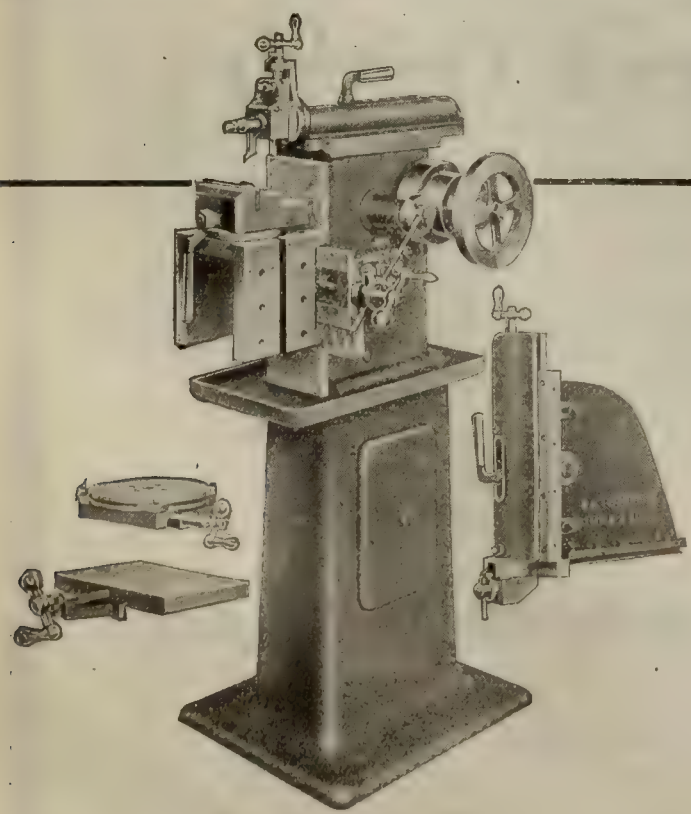
IF SO,—

Will you have us tell you what Oxy-Acetylene Welding and Cutting is doing for others? We are the Pioneers of the Process and are in the best position to serve you: manufacturing in Canada, Oxygen and Dissolved Acetylene, Apparatus and Supplies requisite for the Process. Write to-day, your interest will be appreciated.

L'AIR LIQUIDE SOCIETY

Canadian Factories: Montreal, Winnipeg, Toronto
Halifax: Factory under construction

The Complete Machine



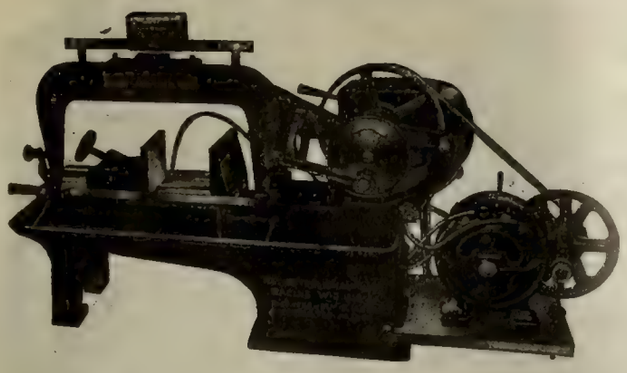
Patented—June 23, 1914

A machine whose efficiency can be added to by the quick and convenient changes shown here. Nothing cumbersome. A clean-cut machine that answers the most modern requirements in efficiency.

Designed especially for making tools, dies, models, and for slotting and shaping all classes of work.

Increased efficiency gives increased production which offsets increased costs and gives increased profits. A short but vital lesson on "increase." Think it over and write us.

The Rhodes Manufacturing Company, Hartford, Conn., U.S.A.



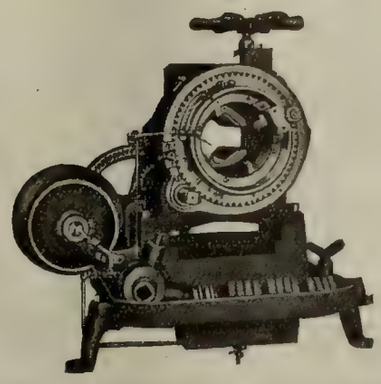
Your Cutting

How do you do it? Are your methods giving satisfaction? Are you getting the maximum production? With a Racine to compare results with you will get a better idea of the results you should be getting or could get. Metal cutting has been our study. It is the purpose for which our machines are built. We stand ready to co-operate with you in your cutting problems. Write us for information.

Racine Tool & Machine Co.
15 Melbourne Ave., Racine, Wis., U.S.A.

No Leaky Joints

when the Forbes does the threading



FORBES Pipe Cutter and Threader is the machine you take right to job and save carrying heavy pipe to and fro. Powerful and compact. Saves labor of 2 and 6 men over old stock and die method.

The Forbes is the only machine equipped with receding gears carrying the dies on to the pipe; and also with shell adjustable, to compensate for wear. And instead of turning the heavy length of pipe in the dies, as is usual, it turns the comparatively light dies around the pipe.

The Curtis & Curtis Co.
Garden Street, Bridgeport, Conn.

DOUBLE SAVINGS

in cutting on PEERLESS HIGH SPEED METAL SAWS; they save both Time and Material.

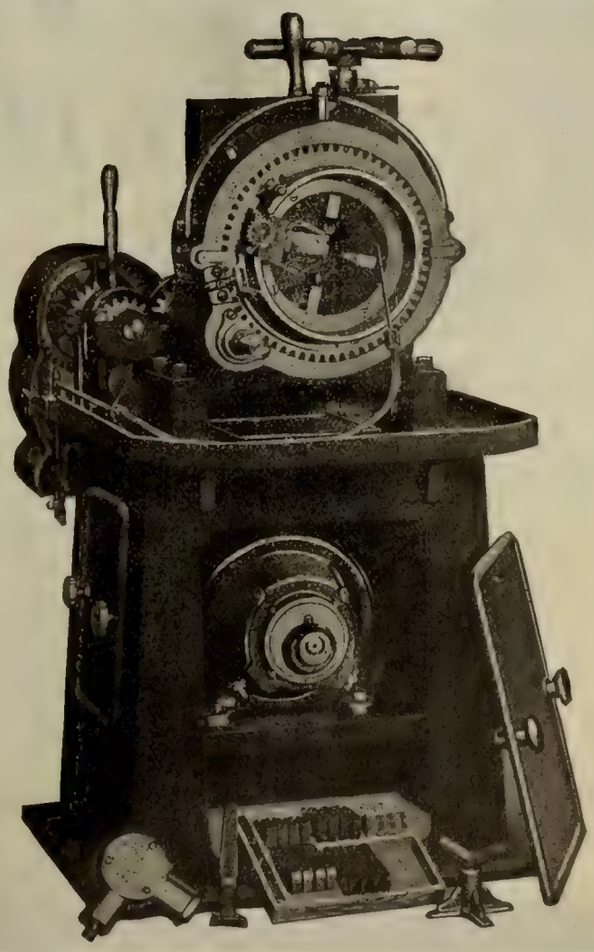
Supposing you save only 1/16 on each cut, 200 lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

Have you ever stopped to consider the waste of material in wide cuts, especially at the present high cost, will pay for a PEERLESS in a remarkably short time.

This is only one of the reasons for so many repeated orders and large concerns having standardized the PEERLESS. The many other reasons can only be fully appreciated after comparative test.

Write for a list of users; some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.



If any advertisement interests you, tear it out now and place with letters to be answered.

Where Quality Comes First

Where quality must be made certain, you use tools of known accuracy. You are also very careful to use the tools especially adapted to the work in hand.

It makes little difference what sort of work it is, if accuracy is the first thing, you can be sure of it with

TRADE MARK

Starrett Tools

REG. U.S. PAT. OFF.

There are 2100 styles and sizes of these fine tools. One or more of them matches every demand for the fine work needed in a well-made product.

There are micrometers, vernier height and depth gages, vernier calipers, caliper squares, rules, levels, surface indicators and many other instruments of precision.

Catalog No. 213 on request.

The L. S. Starrett Company

THE WORLD'S GREATEST TOOL MAKERS

Athol, Massachusetts

42-703

PROVE YOUR PRIDE IN YOUR PRODUCT

Mark it, and mark it clearly. You can do it with a Matthews die or stamp. We make them for marking all products. Our letters and figures are hand cut from the best tool steel.

Matthews stamps are extensively used for marking shells. Many Canadian munition plants have complete Matthews equipment, including holders, type, separate stamps, inspectors' hammers, etc.

Catalog gives complete description of our exte-sive line, send for a copy

Special "Champion" holder with type chamber curved radially for marking base of shells.

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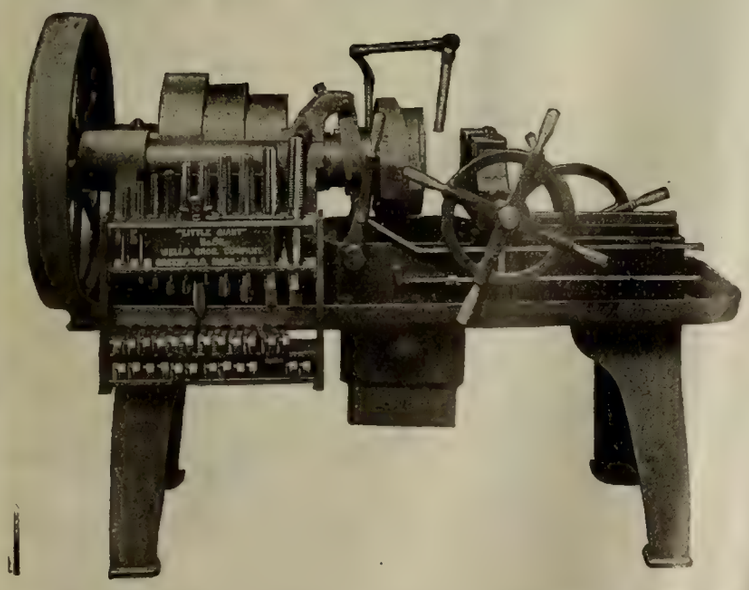

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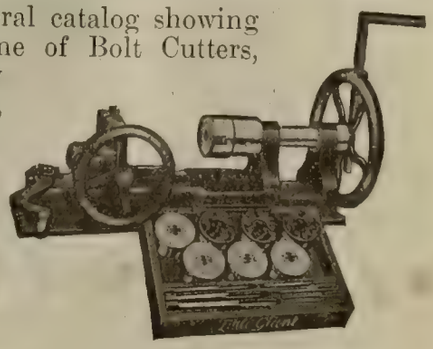

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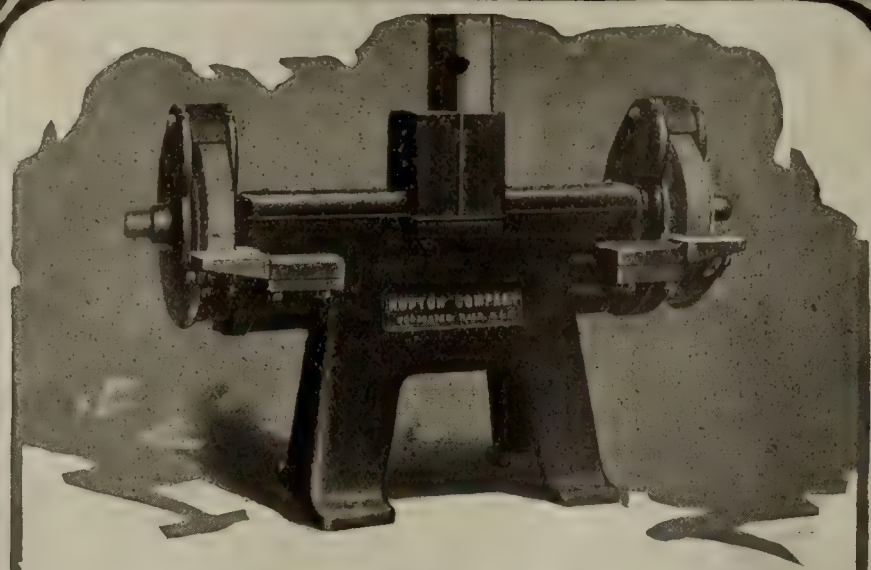

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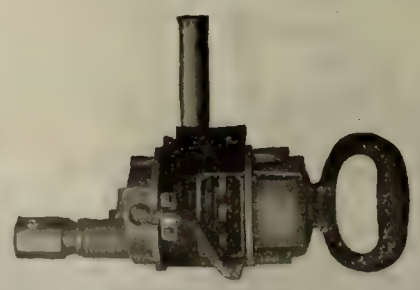

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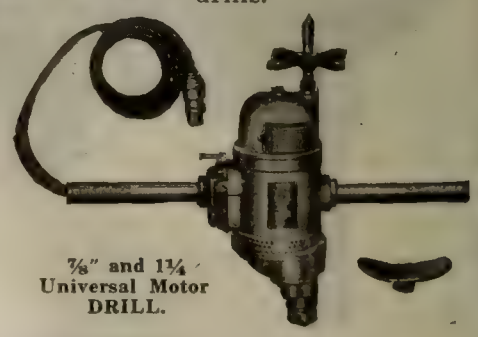

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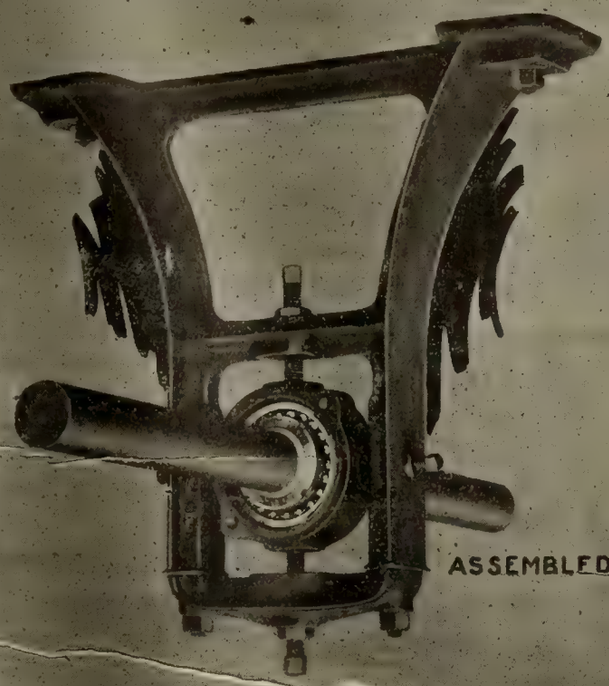

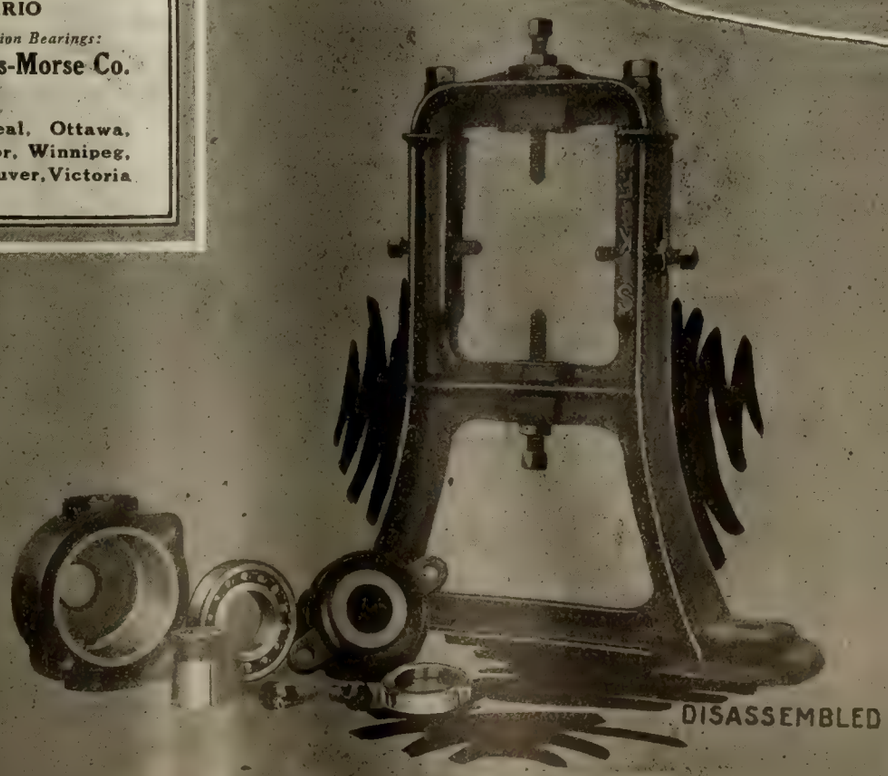

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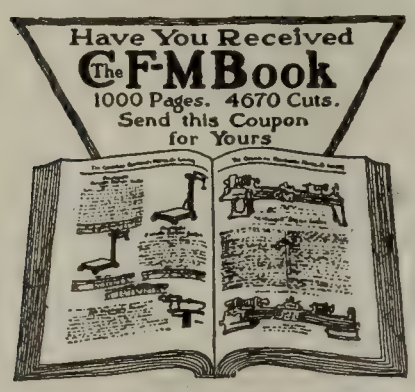

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The Expanding Arbor as a Factor of Production

Staff Article

Quantity production on an efficiency basis is dependent upon the facilities provided for the handling of the product, so that the minimum amount of time is consumed between actual machining operation. Special effort has been centered upon the design and construction of operating appliances for the rapid and economical manufacture of all classes of shells, and some observations of driving appliances form the basis of the accompanying article.

SUITABLE equipment is undoubtedly the chief factor in the production of any manufactured article on a repetition basis. Unprovided with such essentials maximum efficiency is impossible of attainment. In so far as the actual machining operations on a certain piece of work is concerned, the end desired is a question of secondary importance, the principal feature being to minimize the unproductive period that is necessarily incidental to the achievement of any purpose. It was due largely to the design, construction and adoption of special fixtures and attachments upon existing machinery that provided a foundation for the special machine, the effectiveness of which has been amply demonstrated during the past three years. In many respects, however, the life of the special machine will terminate with that of the shell industry, but it is not going too far to predict that many of the primary devices, and their subsequent developments, will find and fill useful roles in the ordinary department of engineering practice.

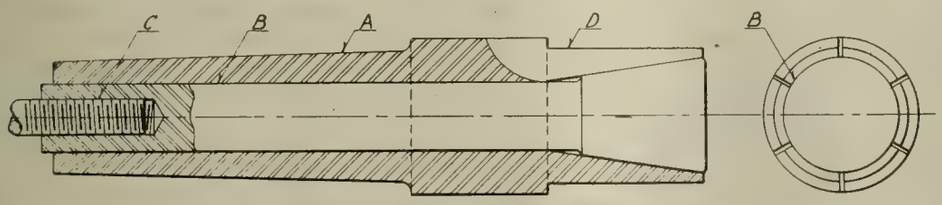


FIG. 1. PLAIN COLLET ARBOR.

Driving Appliances.

The detail in shell making that has contributed largely to the rapid and effective handling during machining operations, has been the facilities provided for holding and driving the shells for both interior and exterior machining. The advantages to be derived by the removal of the outside metal with one or a series of continuous cuts made it almost imperative that the shell be driven from the rough and afterwards the finished bore. Owing to the greater difficulty of interior machining, the general practice on rough foregoings was to use the bore as a base from which to commence operations; the significance of this being further pronounced by the eccentricity of wall thickness due to faulty forging. Under these conditions the uneven cut is taken by the turning tools, which are always in a better position to withstand the variation in stress caused by the irregular forging. Irrespective of the condition of the forging, however, it is necessary that the driving medium be capable of performing its functions under the heaviest of cuts, and experience has been the means of developing and improving on the methods adopted at the inception of the industry. While many of these devices, even at the height of perfection, may find a place only for specific purposes, the principles, while not entirely new, may be economically adapted for general purpose equipment.

Plain Cone Drive

Probably the most common driver used for roughing off the outer surface of the smaller shells, particularly during the experimental stages of munitions manufacture, was the ordinary cone shaped type of solid driver with inserted serrated teeth. Many of these are still in operation, but unless they are properly made and handled, they are a source of inconvenience and annoyance. Slippage, under heavy or irregular cuts, causes the teeth of the driver to chew away the mouth of the shell bore, thus destroying the effective drive and forcing the work away from the tail centre; the latter occurrence requiring the operator to give constant attention to this troublesome detail. Another feature in connection with slippage of work under a heavy cut is that of the tool action. When the force applied by the depth of cut is greater than the driving power of the arbor, the work will invariably slip; that is, the lathe spindle and work arbor will continue to revolve while the work will remain stationary until the cutting pressure is relieved. In the case of the serrated cone, any tendency to slip results in a certain amount of metal being reamed from the mouth of the bore, causing the work to advance slightly, which partly removes the pressure of the cut from the tool, but has the objectionable feature of loosening the work from the tail centre. If, however, the work does not advance, the cutting tool will still be forced into the work in such a manner that, should the driver suddenly resume its duties, there is the probability that the tool will be destroyed under the additional cut. It is, therefore, advisable to so adjust the driver and the depth of cut that slippage will be reduced to a minimum.

Plain Collet Arbor

The drive that has been most extensively used has been the expanding arbor, and the engineering initiative of the country has been reflected in the wide range of design in the arbors that are now in general use. One of the simplest forms of expanding arbors is that illustrated in Fig. 1, where the collet is integral with the body of the arbor. In this particular one the chucking portion is made to fit the nose of the shell after it has been closed and bored. The shank A is turned to ft the taper in the nose of the spindle, and the collet D is expanded by the bolt B, which in turn is operated by the draw rod C that passes through the hollow spindle and controlled by a suitable hand wheel or air operated cylinder attached to the rear.

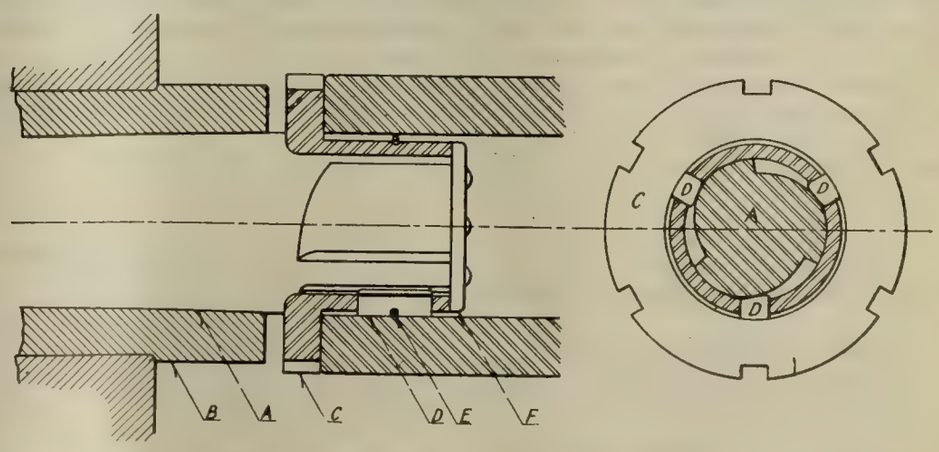


FIG. 2. PLAIN TYPE OF TRIPLEX CAM ARBOR.

The repair upkeep on the arbor shown in Fig. 1 was, however, a factor that worked to its disadvantage, for the constant and heavy service required of it for shell making. It was this feature that was the primary cause of developing

an expanding arbor where the various operating parts could be replaced at little loss of time or expense, and also facilitate the handling of the shells.

Cam Operated Arbor

The arbor shown in Fig. 2 is semi-automatic in its action, inasmuch as any tendency to slip causes the jaws to take a firmer hold upon the work. The operation of this arbor is dependent upon the central triplex cam and the corresponding jaws. Like the one previously described this is constructed upon the shank that fits the spindle nose. The hardened steel blocks D are fitted in slots cut in the cylindrical section of the cage C, the flange of which is provided with six notches for operating, this being done with a hook spanner. The blocks are kept in contact with the cams by the action of a single coil spring E, placed in a groove cut in the centre of the block and also in the cage; the whole being retained in position by the plate F. It might be well to draw attention to the fact that the inner surface of the jaws should not conform to the arc of the cam upon which they move, owing to the radial movement of the jaws and the eccentric movement of the cam.

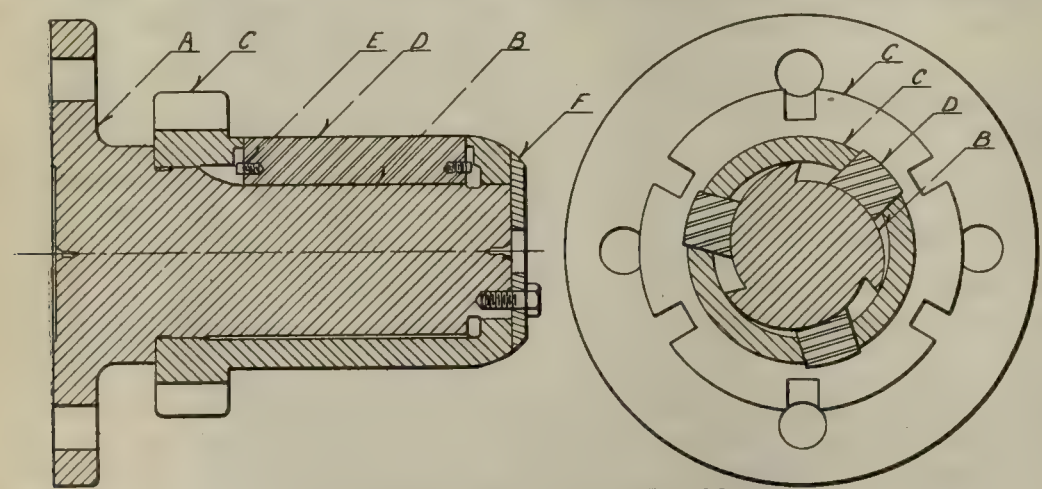


FIG. 3. CAM WITH PLAIN SLIDE BLOCKS.

The bearing surface of the jaws should be reduced so as to bring the thrust as near the centre of the jaw as possible and thus avoid the tendency of the jaws to tilt to one side under the pressure.

The arbor illustrated in Fig. 3 is similar in its action to that shown in Fig. 2, but the central cam is milled upon a piece which has a flange, bolted to the face plate of the lathe, and instead of the jaws being held to their seat by means of a central spring, they are collapsed by two springs that fit over the small pins E, fitted in either end of each jaw.

Arbor With Swivel Block

The expanding arbor shown in Fig. 4 has several points of similarity to the others just described and in addition has a feature that almost eliminates any tendency of side thrust upon the three jaws during the movement of the cam. This attachment is fitted to a lathe having a solid spindle, the cam spindle being screwed to a small chuck that is likewise screwed to the nose of the lathe spindle. When assembled, the cage containing the three jaws is free to move, but without lateral play. The feature of this particular design is the semi-circular block placed beneath each jaw which allows of a rocking motion during the cam action. This permits of a wider bearing surface on the cam and added stability to the entire device.

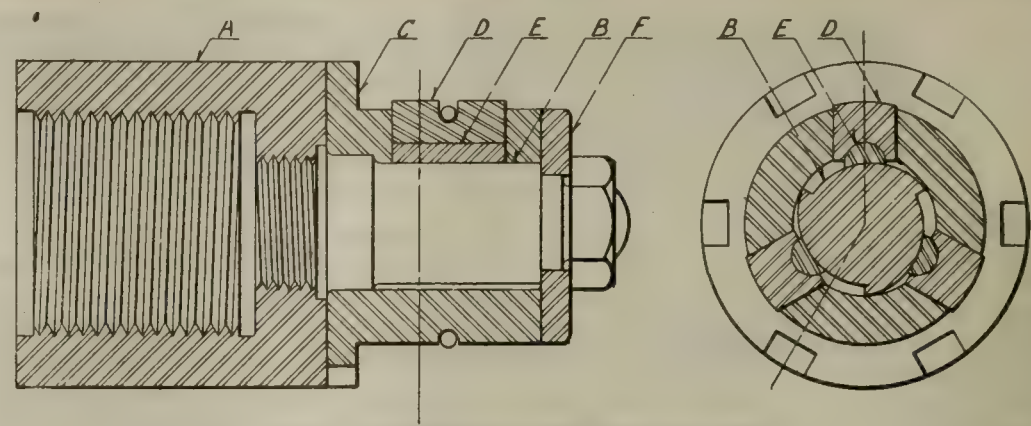


FIG. 4. ROCKING BLOCKS UNDER JAWS.

Arbor With Cams and Rollers

A design that greatly reduces the friction of the operating parts and also the effort required to release the chuck after the work has been performed, is that illustrated in Fig. 5, where the sliding blocks are replaced by rollers. In the particular chuck here shown, the roller cage C has three equi-distant slots for the rollers D, the initial pressure being obtained by means of a suitable wrench in the notches on the roller cage flange, this flange in all cases being slightly below the size of the shell upon which it is being used. The stud G is kept locked in position by the reaction of the spring washer F. To eliminate the necessity of squaring out the slots for the rollers, one firm adopted the design shown in Fig. 6, the sectional view being that drawn through two of the slots in a three slot cage. It was found that much time and labor was saved by leaving the round ends in the slots and turning the rollers as shown at B. This rounding of the corners also assisted in the hardening of the rollers and avoided the chipping of the corners when in operation.

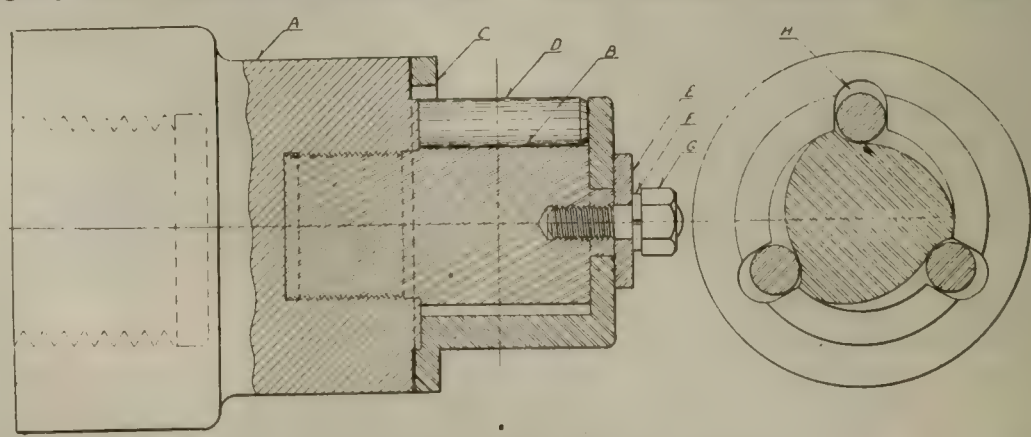


FIG. 5. SLIDE BLOCKS REPLACED BY ROLLERS.

Where the expansion of the arbor was controlled by means of a hand wheel located at the rear of the lathe spindle, it was often found that the semi-revolving cam device had the disadvantage of irregular control owing to the torsion of the operating rod due to its length, which, in the case of the smaller sizes of shells, or arbors operating on the closed nose was often a feature of considerable annoyance to the operators. A design that overcomes this objection to some extent is illustrated in the sketch Fig. 7. The spindle in this case carries on its forward end the usual face plate, to which is fitted the flange cage C, slotted in the usual manner to receive the three jaws D. The radial movement of these blocks is derived by the axial movement of the rod E that passes through the hollow spindle and is operated by the hand wheel at the rear; this wheel may be of any suitable design, the one shown being a hub fitted with four short handles. In some of the elementary applications of this particular design it was necessary to release the grip of the jaws by hammering the rear end of the draw rod, after the hand wheel had been backed off. In the appliance here shown, the hand wheel is fitted with an inner collar that revolves in a space provided on the rear support so that when the wheel is backed off,

the centre rod is pushed forward and allows the jaws, D, to collapse under action of the spring. By placing a solid ring over the jaws in place of the small spring, and using the bush in the nose

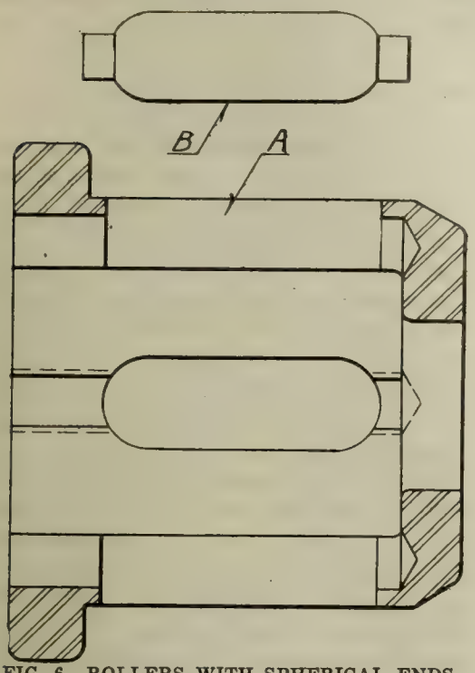


FIG. 6. ROLLERS WITH SPHERICAL ENDS.

of the arbor, the blocks can be turned or reground while in position.

Arbor Operated by Knock Pawl

An arbor that embodies many of the features described in the foregoing, and yet has several additional ones, is illustrated in Fig. 8. The operation of this is also controlled from the rear of the spindle, but a special design of hand

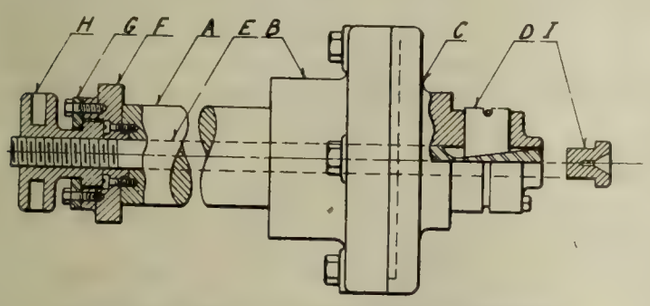


FIG. 7. EXPANDING BLOCKS WITH DRAW-ROD.

wheel is used for tightening and releasing the forward mechanism. The wheel here shown is a development of the notched flange and the spanner wrench, as it was discovered that it was much better to leave the "wrench" always in position than to be continually lifting and laying down the same. The steel hub B is keyed to the end of the operating rod A, and is provided with two notches as shown in the centre section. The hand wheel C is bored out a free fit for the collar B, and through the webs of the centre portion two pins F are placed, these pins supporting two pawls E, located in the central cored portion of the hand wheel, the pawls being forced against the outer surface of the hub by the springs G. Several knocks in either direction are sufficient to tighten or release the jaws of the arbor, which are operated by means of a short cone on the block K; this block being keyed to the forward end of the operating rod. The jaws are kept in contact with the inner bevel by the ordinary ring spring, but have a frictional action on the shell bore due to their movement

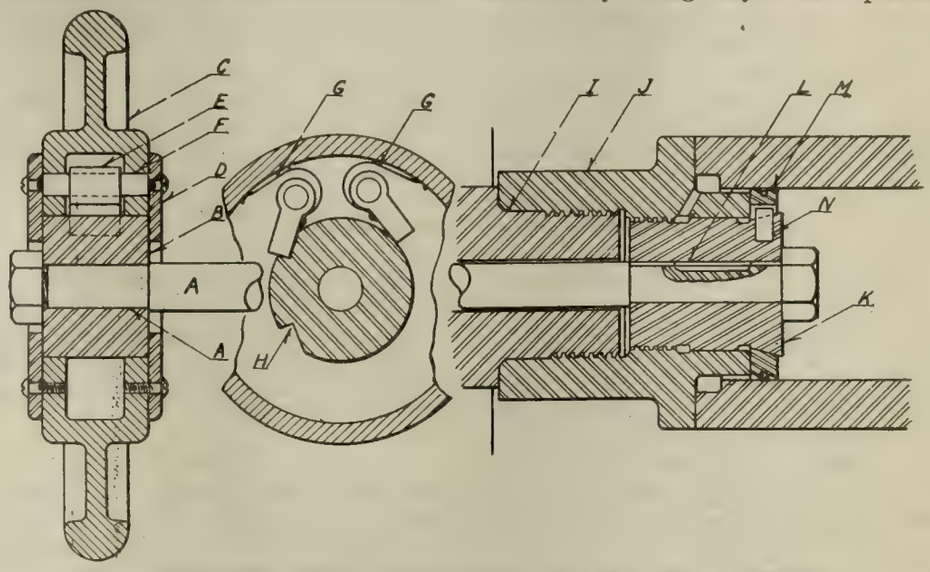


FIG. 8. HANDWHEEL WITH TWO PAWLS FOR RELEASING DRAW-ROD.

about the axis. This is caused by the parts being relatively connected to the central block K, the lateral movement of which is controlled by the threaded portion at the inner end. This style of chuck is not satisfactory for use on the shells when cutting the waving ribs in the copper band groove, as any shippage would alter the track of the tool and possibly destroys the waves.

Double Expanding Arbor

Where the shells are held entirely upon the arbor, such as for boring and threading of the nose, it was necessary to provide increased support for the shell; this being done by extending the length of arbor and using two separate sets of jaws, located at either end of the parallel portion. Some of these, during the experimental stages of shell making, were designed with a cam action, but owing to the excessive torsion, they did not give the best of satisfaction, and this style of double arbor is generally constructed along the lines of the sliding block principle, similar to that shown in Fig. 9; the accepted method in nearly every case being to

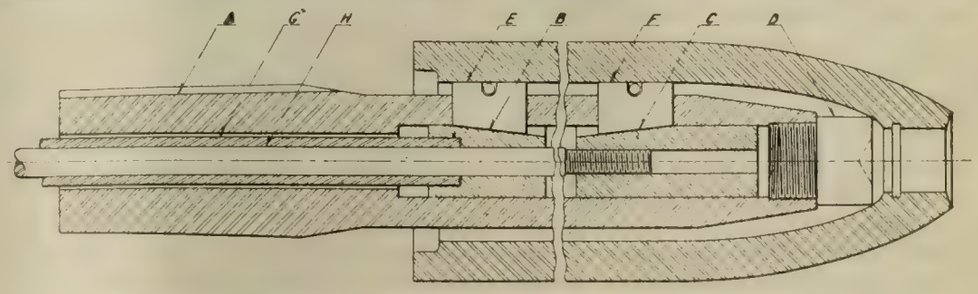


FIG. 9. EXPANDING ARBOR WITH DOUBLE CAM ARRANGEMENT.

design such arbors with three equi-distant jaws, as it is next to impossible to obtain a central control with any other than a three point bearing. In the sketch here illustrated, the cage that carries the sliding blocks E and F, is integral with the portion that fits into the nose of the spindle, and is further secured by being keyed into position. In order to obtain satisfactory operation, it is advisable to operate the two sets of jaws by separate sliding blocks B and C, the former being secured to the tube G for operating the rear set, and the latter secured to the central rod H for controlling the movement of the forward set. Where the arbor is operated by hand, it is necessary to have the rod and the tube secured to different rear supports, and in the case of an air operated fixture, the tube is secured to the cylinder and the central rod to the piston. The plug D is inserted in the nose of the arbor to protect the sliding blocks from the dirt and cuttings.

BRITISH CONTROL RARE METAL DEPOSITS IN QUEENSLAND

RECENT advices from Australia are to the effect that practically all the big wolfram and molybdenite properties in North Queensland have been sold to the Thermo Electric Ore Reduction Corporation Ltd., whose registered offices are in London and works at Luton. By means of the latest machinery and appliances the new owners propose to work the mines to their utmost capacity. Four 250-h.p. Diesel oil engines and a complete electrical installation will form part of the new equipment, while the present 10 head of stamps will be increased to 40 head. By these means the annual output is to be multiplied several times. The company are also ne-

gotiating for the purchase of the Mount Carbine Wolfram Mines, which, with proper appliances, are estimated to yield 500 tons yearly, or half as much as the properties already acquired. The mines bought by the British company are expected to give 1,000 tons of wolfram per annum instead of 200 tons, as at present, with a corresponding increase of molybdenite and bismuth. During the war all of these rare ores and metals obtained in Australia are sold under agreement to the Imperial authorities.

Wolfram and scheelite are the principal ores of tungsten, and the metal tungsten is chiefly used in the manufacture of high-grade steel, such as is required for lathes and for inner tubes of big guns. It imparts to the steel great density, toughness, and hardness. Molybdenum, the metal derived from the ore molybdenite, is also used for hardening steel as well as for other purposes. All these steel hardening materials have commanded exceptionally high prices since the outbreak of war. As much as £2,000 per ton has been paid by Germany for molybdenite, so it is said, but the British Government fixed the price delivered in London at £525. For wolfram up to £1,000 per ton has been paid in the United States, but the price is now about £200.

SCHEME TO CONTROL FACTORIES AFTER WAR IS AUSTRALIAN PLAN

THE Australian Commonwealth Government is engaged in drawing up a scheme for controlling national industries after the war along the lines of Socialism. It is intended as a first contribution to spend $50,000,000 in the establishment of certain factories under the joint control of private and Government supervision.

A national industrial department is to be created, which shall be in close contact with the Commonwealth Bank, and a specially selected group of "experts," upon whose advice the operations of the department will very largely depend. This department will have very wide powers with respect to the investigation, creation and maintenance of new or expended industries. If a proposition is made to the Government, the experts of the Government would advise as to capitalization, tariff, aid required and the best technical methods of organization. The industry established, they would report from time to time upon its progress. Assisted industries would be required to provide for the presence of a Government representative upon the board of directors and to agree to a limitation of profits.

The shareholders' proportion of the profits would not be permitted in any given year to exceed 7 per cent. on the capital. If the profits went beyond this, the success would go into the Government revenue funds or be used to finance a reduction of the commodity to the public. If the promoters of the new industries agreed to the scheme of control and profit limitation, they would obtain advances from the Government to 75 per cent. of the capitalization value, at 5 per cent. interest for the loan moneys. If the industry's operations resulted in a loss after a reasonable and fair trial, and the loss was found to be due to inadequate tariff protection, the industrial department would advise the Government at once to raise the duties. If the industry was really vital to the nation's safety and well-being, the loss would fall on the Government until such times as the new higher duties had enabled the industry profitably to secure complete home market.

It is thought that the first experiments in this direction will be made as follows: $5,000,000 in the development of the wool industry, $2,500,000 each in the chemical and tin-plate industries, $500,000 in glass works, and $5,000,000 in special iron and steel process works.

BRITISH FIRM BUILDS MAGNETOS

THE dependence of Britain on foreign manufacturers for the supply of magnetos is now definitely a thing of the past. Several firms have been producing this apparatus for some time and the latest addition to their ranks is the British Lighting & Ignition Co., Ltd., formed by Vickers, Ltd., to produce articles of the very highest grade. The name chosen for the new magnetos is "B.L.I.C." from the initials of the Co. Hundreds of magnetos are at present being produced weekly to meet the needs of the authorities, and all possible preparations are being made to meet the large demand expected after the war. The address of the new company is 204 Tottenham Court-road, London, W.C.

BRITAIN COMMANDEERS IRON ORE

AN order issued by the British Minister of Munitions went into effect July 24, under which he takes possession of all iron ore mines in the counties of Cumberland and Lancaster, all mines and quarries to which the regulation applies passing into the possession of the Minister of Munitions. The owner, agent, and manager of every such mine or quarry, and every officer thereof, and, where the owner of the mine is a company, every director of the company must comply with the directions of the Minister of Munitions as to the management and use of the mine or quarry, and if he fails to do so will be guilty of a summary offence against the Defence of the Realm Regulations.

CONCRETE SHIP SHOWS LONG SERVICE

THE first reinforced vessel was in the form of a small boat built in 1849 by a Frenchman named Lambot, at Miravel, and the boat is still in service after a practical test of 68 years. Toward the end of last century the possibilities of reinforced concrete for all kinds of structural work began to be more widely recognized and the material was applied to the construction of vessels of various classes in different parts of the world.

One of the first examples was a floating chalet supported by a reinforced concrete pontoon, measuring 67 feet long by 21 feet wide, built in Rome in 1897. Other barges, lighters and pontoons followed in fairly rapid succession, a Roman firm being most enterprising in the new branch of the work. By the end of 1912, they had constructed at least 20 vessels of the lighter class and over 60 pontoons for floating bridges. In Germany reinforced concrete vessels of the motor launch and barge types have been constructed. In North and South America, a good many barges and pontoons have been made in reinforced concrete during the last ten years. Typical examples are furnished by a barge in Ontario, 81 feet long by 24 feet beam by 7 feet deep; a fleet of lighters, 100 feet long by 30 feet beam, built at San Francisco for the coasting trade; several lighters and pontoons on the Panama Canal; and some scows 112 feet long by 28 feet beam built at Farrfield.

From the examples cited it is evident that reinforced concrete has earned a definite claim to be regarded as a real shipbuilding material, particularly for vessels of moderate size. The material possesses obvious advantages for the building of many useful types of craft. Apart from ships, barges and pontoons, there are other types of floating structures in which reinforced concrete can be employed with advantage. The most interesting example of the caisson class is furnished by the "Batterie des Maures," a torpedo testing station which at present forms a kind of artificial island in the Mediterranean. The structure was built partly in a dry dock, and completed at moorings outside the dock. The battery was then towed by a couple of steam tugs for a distance of some 30 miles through the sea and sunk upon a prepared bed in deep water. When in readiness for its voyage across the sea, the battery had a displacement of 2,600 tons and drew 26 feet of water.

While of less striking character than this structure, reinforced concrete caissons for pier and jetty construction are of practical interest.

It is frequently contended that saline substances in solution damage the concrete. Authorities state, however, that while badly made concrete has suffered deterioration in a few cases, there is ample evidence of the fact that correctly proportioned and carefully prepared concrete is not injured by prolonged immersion in sea water.

THE first artesian well to be bored in Europe, of which data are available, is the tube well at Grenelle in France, which was sunk by the French Government between 1834 and 1841 in the hope of obtaining a sufficient supply of water for Paris. The depth is 179 ft., at which level a prolific supply of water was reached, giving an overflow at the surface of 600 gallons per minute. In Upper Silesia there is a bore-hole 6,572 ft. deep.

PRODUCTION METHODS AND DEVICES

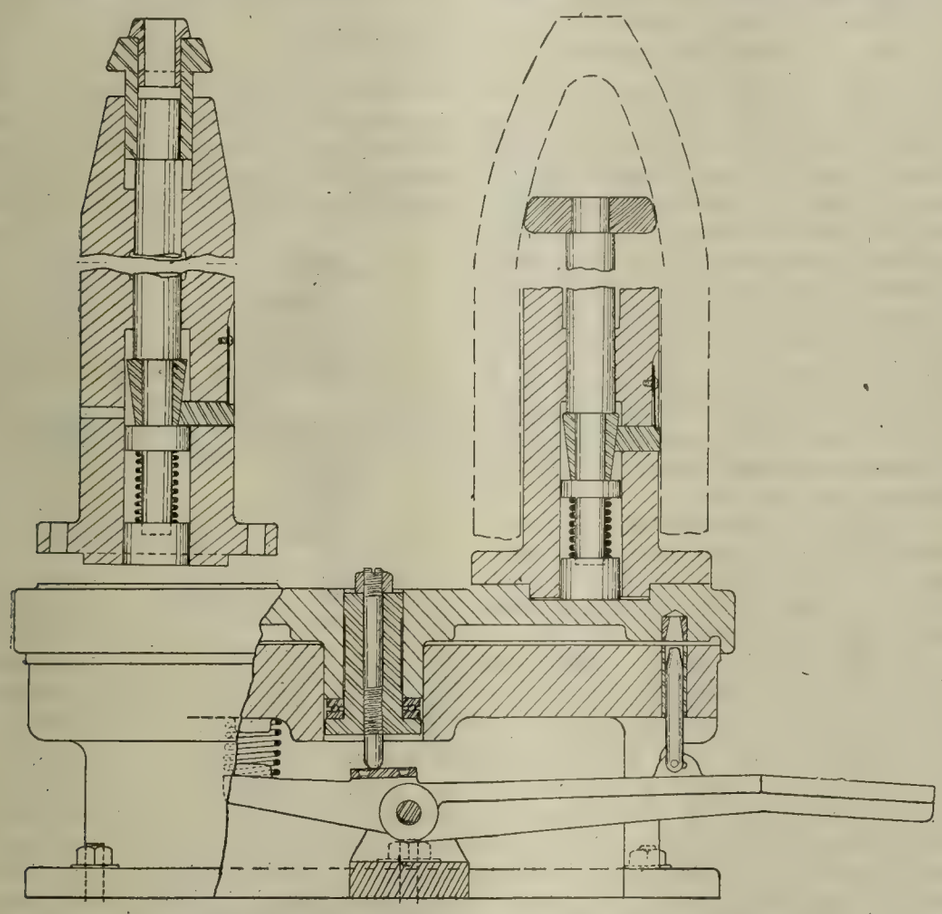
A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

AUTOMATIC ARBOR FOR SHELL NOSE DRILLING

By W. D. Powell.

THE accompanying sketch shows two interesting applications of an automatic self-centring arbor for accurately locating shell forgings and similar work in a vertical position so as to insure that nose operations will concentrate with the main bore within a high degree of accuracy.

The main part of sketch shows the device as used on the revolving table of a drilling machine in which the nose of the rough forging was drilled and faced. The arbor column is of cast iron, recessed and bolted in place. The arbor spindle is of machine steel, fitted with a hardened steel disc on its upper end, and of such a diameter that it makes contact with the inner surface of the nose about midway down the tapered portion. The lower end carried a hardened tapered cone, which contacts with three hardened steel dogs, and as the arbor descends under the weight of the forging the dogs expand equally and locate the main body of the forging centrally from the inside. Small plate springs return the dogs, as the arbor spindle rises when the work is lifted off, this movement of the spindle being caused by a heavy coil spring at its lower end pressing against a collar as shown. The upward movement is limited to that point where the cone comes in contact with the lower spindle bearing.



AUTOMATIC SHELL DRILLING ARBORS SHOWING ARRANGEMENT OR REVOLVING TABLE.

Duplex Arrangement

Two arbors are fitted to the one table, so that unloading and loading proceeds simultaneously with the work. The table is located in the two positions by a tapered locking pin situated below, and operated by a foot lever, which is also arranged to lift the revolving table clear off the base so as to allow easy turning. In order to do this, the foot lever is provided with a flat cam plate at its fulcrum end, which operates against a ball pointed stud carried in the bushing which supports the ball thrust bearing. The stud extends up to the top of the bushing so that adjustment can be made to allow of the locking pin being drawn down clear of the table before the latter is lifted clear off the base.

The locking of the pin is insured by providing a compression spring on the other side of the lever fulcrum from the pedal.

Truing Application

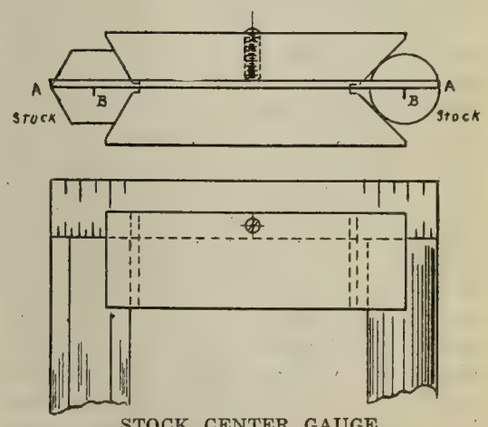
The small sketch to the left shows the same arbor with a special drill bushing in the end. In this case the locating disc is replaced by a hardened bushing with a formed flange to fit the finished interior of the nose near the point. This bushing is pressed in place as shown. arbor column, and is pressed on a shouldered diameter of the spindle. Drill bushing E is pressed in place as shown. The other details of the arbor are identical with that already described.

The second arbor is also revolvably mounted in a vertical drill press, which takes a light boring cut out of the nose hole after the main bore has been finished, and thus makes the two bores truly concentric, so that the shell may be supported by the internal surfaces at either end in order to turn the outside true with the bore.

STOCK CENTER-GAUGE

By E. Bailey

IN the enclosed sketch is shown an interesting gauge for finding the center of stock to be center punched previous to its being centered. It consists of a piece of square stock beveled vee-shaped on each end, 30 deg. and 45 deg., respectively. A narrow slot is milled along its length into which can be placed a steel scale. The method for using it, is to place the gauge against the stock, then the scale is moved so that its outer end coincides with the edge of the stock. It is then fastened with the headless screw. A line is then scratched in the direction of A, A, along the edge of the scale across the stock. A short scratch as B, is next made just half way or half the diameter of the stock measured on the scale. The exact center being where line B meets line A. The gauge is serviceable both for round, square, and hexagon stock.



STOCK CENTER GAUGE.

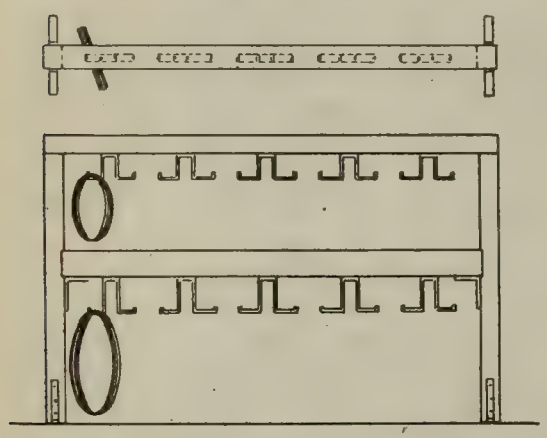
A WIRE HANGER RACK

By A. M. Y.

WIRE that is used for making springs and rivets, etc., usually comes wound in coils of various diameters. Bessemer spring wire coils being considerably larger of course than music wire. It is the usual practice to store these coils either on top of one another, or stand them endwise one against the other near a wall. In this manner they are hard

to get at, besides, the ends become entangled with other coils and considerable difficulty is experienced in trying to separate them.

In the accompanying sketch is shown a wire hanger rack which is a very neat and convenient arrangement for hanging wire separately on books, whereby the coils are kept free from each other and are easily accessible when wanted. The rack is made from two by four lumber about 10 feet long, and 5 feet high. The lower rail is supported on the end by a forged bracket, and also four brackets support and hold the two uprights to the floor. The top rail is used for holding coils of small diameters, and the lower rail for larger diameters. The rack occupies very little space. The coils when placed on the hooks are turned slightly inward as shown in the top view of the sketch.



A WIRE HANGER RACK.

PRACTICAL GRINDING HINTS

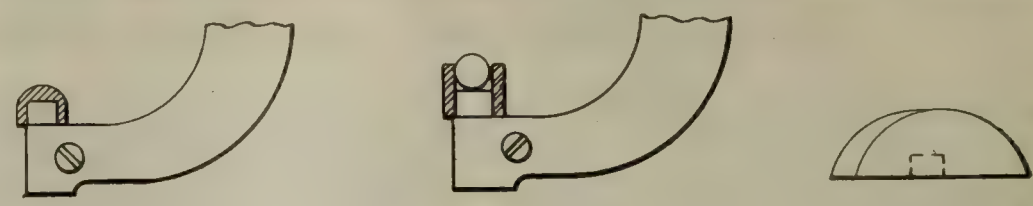
By J. Davies.

IN repetition cylindrical grinding, that is grinding plain round pieces, first rough out the work within 2/1000 of an inch of size with a coarse wheel, taking light cuts with a quick feed. Let the pieces cool down and then put back and finish with a fine soft wheel, still maintaining a rapid feed. A small wheel must not be expected to do the same amount of work as a large wheel in the same time; finer feeds and slower table speeds must be employed for smaller wheels. The faster the emery wheel runs the less it wears; a glazed or a filled wheel can often be remedied by slowing down the speed and thus causing it to wear away more rapidly.

Avoid heating the work as much as possible, don't have your centers too tight, and be sure there is no looseness or end motion, but at the same time leave the job free to revolve. All grinding wheels heat more or less and it is uneven distribution of heat that causes the trouble. Water is only used on grinding wheels for its cooling qualities; therefore to distribute the heat quickly, employ coarse feeds and light cuts; above all you must have a free cutting wheel for satisfactory grinding. Driving belts should be treated with neat's-foot oil and kept soft and pliable.

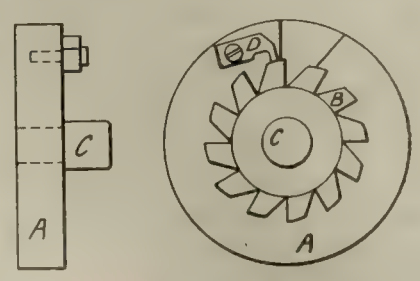
Grinding a Gear Cutter By Hand

In many small shops there is no universal grinder, or if there is one it may be occupied with another job, hence it becomes necessary to grind gear cutters by hand. While it is no easy matter to grind a gear cutter correctly by this method, in the hands of a competent mechanic a satisfactory job can often be obtained and much time saved. The main thing to keep in mind is to have the tops of the teeth all an equal distance from the center of the cutter. This can be done by measuring the distance from the edge of the hole to the top of the teeth with a micrometer; this however, has its disadvantages owing to the fact that, the anvil of the micrometer touches the hole at two points. This may be overcome by boring a piece of round stock to fit the anvil, and rounding the piece at the end where it comes in contact with the inside of the hole, or cutting a piece off the end of a round bar and attaching to anvil block as shown in sketch; or by boring a piece of stock to fit the anvil and drop in a small steel ball such as is used in common ball bearings.



METHODS OF ADAPTING MICROMETER ANVIL TO MEASUREMENT OF CUTTER TEETH.

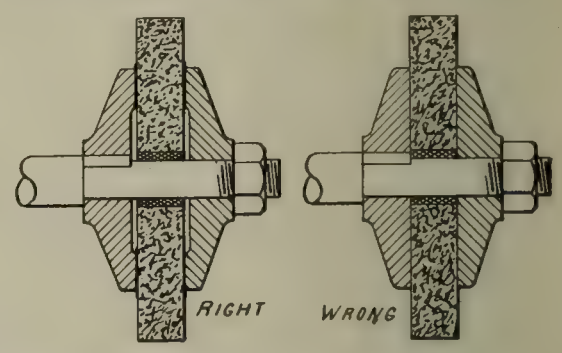
A simple and efficient hand grinding device is made and operated as follows: Take a piece of round plate, or a slab cut off the end of a round ball, a little larger than the cutters to be ground; cut or grind a notch in it to allow the emery wheel to reach the face of the cutter, put a stud in the center to suit the hole in the cutter and clamp an index finger on the side of the plate near the edge; a glance at sketch will show how it works. A is the plate, B is the cutter, C the pin upon which it is mounted and D the index finger held to the plate by a small screw. To operate, place the cutter upon stud C and grind one tooth in the usual way, selecting the tooth that is worn most or requires the most grinding; adjust the index finger D so that it will just touch the ground tooth as it passes. Clamp the index finger in position, then continue to grind the face of all the rest of the teeth until they will pass in the same manner.



SIMPLE AND EFFICIENT HAND GRINDING DEVICE.

Care in Wheel Mounting

Keep a record of your jobs and the kind of wheel that give the best satisfaction; it only takes a little time and it may be of inestimable value on future occasions. You would not expect to do all your lathe work with tools of one size and shape. The grinding wheel is a cutting tool; different shapes of works and different kinds of material require different grades and grains of wheels. Never mount the wheels without flanges. The size of the flanges should not be less than 1-3 the diameter of the wheel. Washers made of some compressible material such as rubber or paper slightly larger than the flanges should be used between the flanges and the wheel; these distribute the pressure evenly when tightened up and overcome any slight imperfections in the wheel or flanges. The hole in the wheel bushing should be large enough to permit the wheel to slide on the spindle freely, to ensure a good fit against the inside flanges. Clamping nut should be tightened only enough to hold wheel firmly.



THE RIGHT AND WRONG OF WHEEL MOUNTING.

Flanges should always be relieved. The sketch shows the wrong and the right method of mounting emery wheels. When the inside of the flanges are not relieved and the nut is tightened on the spindle, it causes the flanges to become slightly convex and instead of the pressure being distributed evenly over the entire bearing surface of the flanges, it is greatest near the hole, causing a dangerous condition. The inner flange should not be loose on the spindle but should be shrunk, pressed or keyed on. Sound wheels before mounting to detect any possible defect or injury. Don't start to work with a new wheel until you know that it runs true; to grind cylindrical work true, the face of the wheel must be true. Always true up with a diamond if one is available.

Minor Troubles

Speed is an important factor; speed up the spindle as the diameter of the

wheel is decreased. To increase the speed of a grinding wheel gives the effect of a softer wheel. Wheels are run in actual practice at from four thousand to six thousand feet per minute. Transferring worm wheels from one machine to another helps to maintain the speed, as in most shops the grinder has one speed only. Don't use the wrong wheel on the job because you are too lazy to change it and humor yourself that you are saving time. Make the feed as nearly the width of the wheel as practicable. There are three grinding troubles:—the operator, the wheel and the machine, but the greatest of these is the operator. An unbalanced grinding wheel often causes chatter marks in the work. White lead makes a good lubricant for work centres. If you want the best results true the wheel between the roughing and finishing operations. It is false economy to use a hand wheel because it doesn't wear out so fast. Sometimes the glazing of a wheel can be remedied by simply reversing the wheel, so that the work will come against the opposite side of the cutting grains.

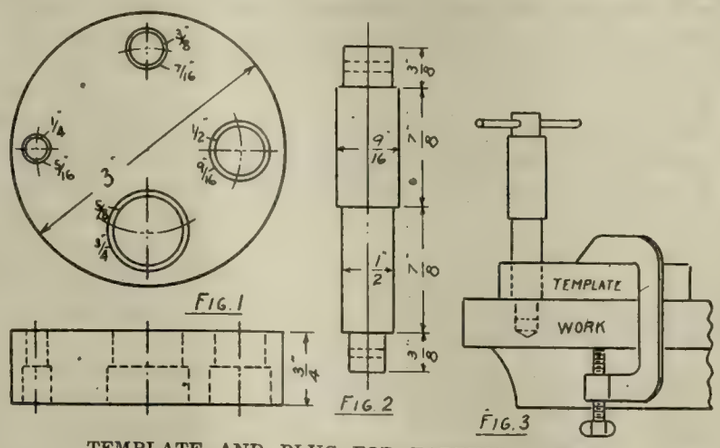
To examine the condition of a ground hole don't look through; let the light shine into it and look down at the hole as near right angle as possible. The use of the lubricating compound improves the cutting and prolongs the life of the wheel. A modern grinding wheel used on an up-to-date machine by a skilled operator is just as surely a milling cutter as if it were made of steel. Its cutting edges consist of millions of sharp cutting teeth, and each tooth as it comes in contact with the work cuts off a chip in the same manner as the tooth of a milling cutter. The chips are very small but when they are cut off at the rate of some millions per minute they soon begin to amount to something.

TEMPLATE AND PLUGS FOR TAPPING HOLES.

By J. WRIGHT.

WHEN tapping out holes in a vise or otherwise than with a tapping fixture, it is necessary to use a plug and template over the work in order to guide the tap straight. The template used for this purpose is generally made from a long piece of square stock, having several holes drilled in a line for the different taps used. The plugs are made in various lengths, the end being made tap-size to fit the work, and the shoulder end full-size.

A more compact arrangement, eliminating the need of a long template and several plugs for each size tap, is shown in the accompanying sketch. In Fig. 1, is seen a round disk in which are full-size holes drilled on each side, half the thickness of the template; these range



TEMPLATE AND PLUG FOR TAPPING HOLES.

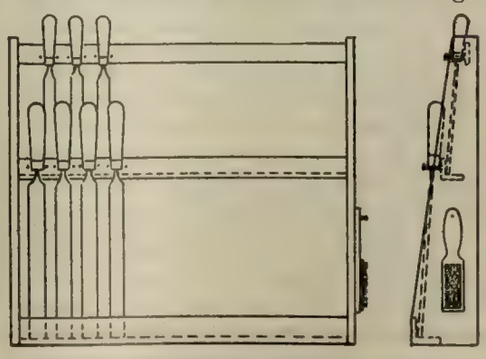
from ¼ in. up to ¾ in. dia. The full-size ¼ in. and 5/16 in. holes are together, as are ⅜ in. and 7/16 in., etc. The template takes up less room than the kind generally used. The plug, Fig. 2, is turned so that both ends can be used for two size taps; in this case the shoulder ends are ½ in. and 9/16 in. respectively. Where eight plugs formerly were used, only four are required of this type.

A small hole is drilled in each end of the plug for inserting a piece of 1/16 in. stubs steel wire, to be used for a handle to draw out the plug with, as seen in Fig 3.

A VERTICAL FILE RACK

By G. Elliot.

IT is seldom one sees files arranged in any proper order on a workman's bench. This is because that there is no way that they may be kept so, for the reason that they require considerable room, and it is necessary to stack them together in order to save space. When they are arranged lengthwise with ends resting on the back partition of the work-bench, they become knocked down by jarring such as hammering work in a vise, etc. In the enclosed sketch is shown a file rack that can be easily constructed of light wood, in which the files are placed vertically and rested on the cross-piece as shown. The larger



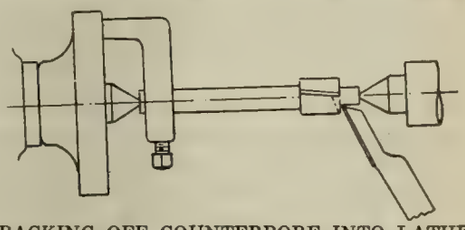
CONVENIENT FILE RACK FOR BENCH.

files are placed below and the smaller files above. Nails are driven in the cross-pieces for the handles to fit into and to prevent the files falling sideways.

BACKING OFF COUNTERBORES

By J. E. C.

AN accurate and quick method for backing off for the clearance on a counterbore is shown in the enclosed illustration. The usual method in doing this is to file the flutes in a vise, which is generally guesswork, as it is not possible to file them alike. As shown, the counterbore is placed on centres in a lathe. The lathe is then geared up to cut 1/16 in. or ⅛ in. pitch, or whatever clearance is desired. The edge of the flutes are first squared off, then the gears thrown in. The side tool as shown is set on an angle against the back edge of the flute; then, taking hold the belt with the hand, the spindle is turned sufficient to remove a chip from the back of the flute. This is repeated till the necessary stock is removed to the extreme cutting edge. The tool moves inward at each operation, cutting the edge off evenly around the guide. Each flute edge is cut separately. By this method the clearance on several counter-



BACKING OFF COUNTERBORE INTO LATHE.

bores can be backed off in the time formerly required in filing one in a vise.

THE SCREW MACHINE FEED

By D. A. Hampson.

"JUST how does that feed work?" That is the invariable question asked by new men when they go to work on an automatic screw machine and by persons watching the operation of the machine. The drawings show the construction of the parts and their relation.

The operation may be explained in brief as follows:—The bar of stock is controlled in its movements by a feed tube, at the inner end of which is screwed a feed finger or shell which grips the bar tight enough to move it under any ordinary circumstances, but not so tight that it will fail to slip if the bar is held in a more vise-like grip, and the feed tube pulled along. This tighter grip is furnished by the chuck, of collet type. When the chuck is opened the feed tube is given a forward movement, and the bar goes with it because there is no resistance beyond the friction of the bar. After the chuck is closed and the tools have begun their work, the feed tube is drawn back and the finger simply slides along to a position further back on the bar ready for the next feeding.

Fig. 1 shows a section of the spindle of an automatic with the above parts in place. The collet is operated by a tube that surrounds the feed tube; both of these tubes have grooved collars at their outer ends and movement is imparted through forks working in the grooves. The collet is forced into the hardened nose piece which, being tapered, causes it to close when moved forward (in one type of chuck, the collet itself is sta-

tionary and the movement of a surrounding piece causes it to close). Cams on drums or arms mounted on the cam shaft engage the forks that work in the grooved collars and impart movement to the tubes.

The two tubes are a regular part of the machine; the collets and feed fingers are equipment, and have to be purchased or made. On larger machines, one collet and one feed finger, or shell, is made to answer for several sizes of stock by the insertion of jaws which reduce the bore at the working point; aside from this, each size and shape of bar requires a collet and feed finger—always the pair together.

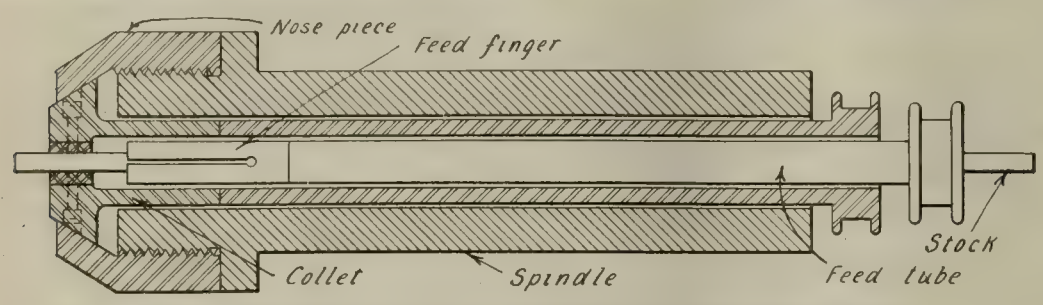


FIG. 1. SECTION OF SPINDLE SHOWING COLLET AND TUBE.

If these parts are to be made in the shop, they should be carefully made and hardened. A crooked hole in either piece will result in trouble in feeding the stock. Poorly tempered parts will be an endless source of trouble and delay. After turning in the lathe, both collet and feed finger have to be split as shown in the drawing. The collet should be sawed to make a three-pronged or four-pronged end and the finger the same, though the latter will work just as well if it is divided by a single saw cut as shown.

The same size hole is put in both collet and shell, but the hardening is so done that their final size differs. The feed finger is sprung together and wired so while being hardened, the idea being to so give that spring tension on the jaws that grips the stock. The collet, on the contrary, is wedged apart and wired so, and is then hardened, leaving the working hole so much oversize that the bar of stock passes very freely through it. The outside tapered part of the collet and the inside that works on the bar should be almost glass hard—the rest a spring temper. The working surface of the nose piece must also be very hard. Properly hardened and smooth these two pieces slide with practically no friction and the spring of the collet is sufficient to open it against the weight of the tube. The feed finger should be spring tempered with a hard end.

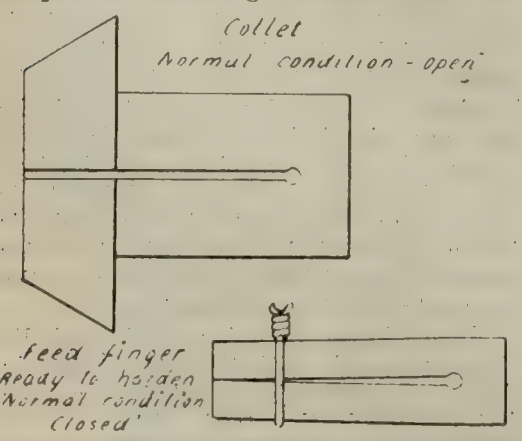


FIG. 2. NORMAL CONDITIONS OF COLLET AND FEED FINGER.

The nominal size of the machine is the size bar that will go through the feed tube and finger. No part of the feed tube should be a tight fit in the collet closing tube or the feed will not work or it will feed short. It will be noticed that the feed finger is partly within the collet; by making it this way, a minimum of stock is wasted. A short piece—about 1½ in.—cannot be fed up, and is always wasted.

Mention has been made of the hardened nose piece. Because it and the collet are hard and smooth, they are "slippery" and the collet opens readily. Anything that interferes with this condition is detrimental to free action—a little rust formed over Sunday has been the cause of the chuck not opening properly, and much time was spent in going over a machine in otherwise perfect shape until this was discovered as the only trouble.

TURBINE SPEEDS AND APPLICATIONS

By T. J.

IN the earlier stages of its development the steam turbine was considered in many quarters to hold great possibilities, not so much from high epxectations of thermal efficiency, as by reason of an assumption that it must prove an ideal prime mover for coupling to electric generators in power stations and propeller shafts in steamships. But mechanical arrangements seldom work out in practice along the line of the ideally simple and direct; and the speed of the large turbine units now in use has proved to be too high to permit of the satisfactory direct coupling of turbines either to propeller shafts or to generators.

Turbine speeds can, of course, be reduced by increasing the size of the motor, but only at the price of greater weight, higher initial cost and reduced efficiency; and consequently the present trend in both electrical and marine engineering is all in the direction of introducing some form of reduction gear between the turbine and the propeller shaft or generator.

The difficulty confronting the marine engineer is that the most efficient speed for a screw propeller is only about a quarter or a fifth of the most efficient speed of a steam turbine, and if he decides upon reduction gear his choice is between helical gearing, electric reduction drive and hydraulic reduction drive. The power station engineer is up against the fact that a direct-current generator running at 2,500 or 3,000 rev. per min. is subject to commutator troubles which, in spite of many ingenious devices, such as the radial commutator, are not easily overcome; so that a 5,000 kilowatt set in a single machine appears to be the limit for safe and efficient operation with a direct coupled turbo-generator.

If a larger power from one set is required, resort must be made to one of two alternatives. The first is to use a turbo-alternator, running at 3,000 or 3,600 revolutions per minute, in conjunction with a rotary converter. This forms a combination which, in certain cases, has distinct advantages.

Advantages of Turbo-Alternator

This combination is particularly suitable when direct-current power must be supplied to several points some distant apart, when the transmission losses and cost of mains can be kept to a minimum by generating at a moderate or high voltage, and transforming down at the sub-station where the rotaries are installed. In many instances direct current is essential for a part of the system only, while the remainder can be served more efficiently by an alternating supply, a case for which the rotary converter plant is peculiarly suitable. With such a mixed system of distribution the rotary has the further advantage that it can be inverted, taking direct current from sets with which it works in parallel, or from a battery, and supplying alternating current into the mains, thus helping out the alternating current sets in case of a breakdown. A further advantage arises if there is a linking up of several generating stations, because small direct current stations will receive alternating current from the trunk mains and convert it into direct current by means of a rotary, thus having their main-turbo-alternator sets as a stand-by; whereas, in the case of either the direct connected or geared direct-current generator, it will be necessary to use rotaries.

The other alternative is to use double helical turbine gearing to reduce the speed of the turbine to that most suitable for an engine type direct-current generator; the speed of the former is usually between 3,000 and 4,000 revolutions per minute for units of moderate size. The turbo-alternator rotary plant does not suffer from the limitation in desirable size which applies to direct coupling, and also, to a lesser degree, to the use of mechanical reducing gears.

THE first submarine boat of which history makes any record was built by a Dutchman, named van Driebel, in 1640. The boat was built in England with money said to have been advanced by King James I. According to reports the vessel had a unique ballasting system. There was a number of goatskin bags placed under the deck between two large planks. These bags, when filled with water, caused the vessel to sink. To cause it to rise again the bags were pressed together again with a windlass arrangement, forcing the water out, and thus giving the boat reserve buoyancy.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

REFLECTIONS FROM THE FETTLING SHOP OF A STEEL FOUNDRY*

By John Watson.**

IT is important at the outset to note that I am speaking from the standpoint of a jobbing steel foundry using open-hearth acid steel, for although first principles remain the same in jobbing as in repetition shops, cause and effect vary. For instance, we all recognize that one of the factors in foundry efficiency is a regular daily cast of a certain tonnage of castings. In a repetition shop this is a comparatively easy matter, as charges can be made up easily and small melting units are usually employed. In a jobbing shop the run of work may involve a variety of test specifications with their corresponding variety of analyses, and often it is a matter of great difficulty to assemble a daily cast to take the output of the large furnaces working in a jobbing foundry using acid open-hearth steel. This is a point on which close collaboration between the selling and manufacturing sides can greatly help the foundry efficiency.

Fettling Shop in Cinderella Role

The fettling shop in the Cinderella to its more favored sister, the moulding shop, and its open face is the mirror that reflects all the blemishes of that sister's vaunted superiority. I once heard a fettler say that if it wasn't for fettlers half the moulders would be out of a job. He did not mean the ordinary dresser, but the super-dresser, who, in Sheffield, is paid 18 cents per hour, plus extras, and is known by the euphonious name of the "knocker-up." This particular gentleman, coupled with the electric welder, is a standing monument to the inefficiency of the moulding shop.

Most of you will have heard of Euclid's famous axiom, "A straight line is the shortest distance between two points." Now in a steel foundry we have two such points—the order book and the loading bank—and the efficiency of our foundry depends on how near we can approximate to that straight line between these two points; but as we are not crows we have to modify our axiom by the consideration that the shortest distance may be round a corner, and to keep that curve efficient we must always keep before us the factor of continuity of direction—there must be no doubling back over the first track. Just as in our argument a straight line may be a curve, so a curve may be a straight line, and the application of the straight line curve is, in my opinion, the basis of success in manufacturing.

Value of Production Curves

It is surprising that the plotting of curves, and the correct solution of their meaning, is not more studied by managers than it is. I know of nothing more illuminating. Take, for instance, the curve of daily production plotted out, say, in tons delivered for each day worked; if you plot such a simple curve you will most probably get something like Fig. 1. Here is a curve showing the fluctuation of daily output, and the problem is to find out why the curve looks like a contour of the Himalaya Mountains, and how it can be made a straight line showing an equal daily distribution of output, as shown by the line A.

Suppose we have a fettling shop designed to finish and deliver 55 tons per week, then on an evenly-balanced output we should deliver 10 tons per day for five days, and five tons on Saturday, and our theoretical full efficiency line will be the line A. Our actual deliveries, however, are:—Monday, 5 tons; Tuesday, 7 tons; Wednesday, 0 tons; Thursday, 10 tons; Friday, 3 tons; Saturday, 8 tons. We get, on plotting, the shaded line or curve of actual output.

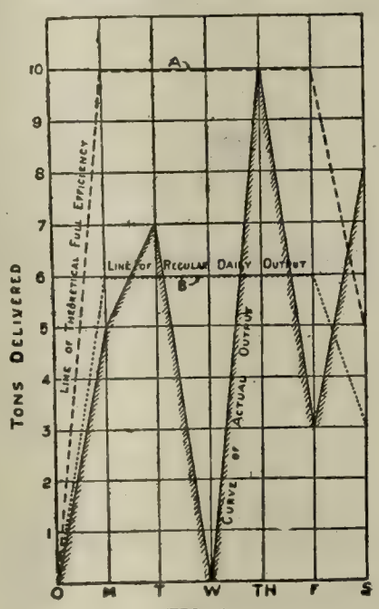


FIG. 1.

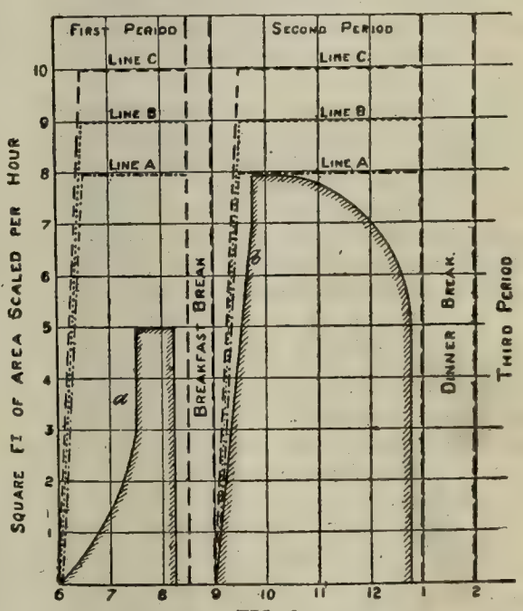


FIG. 2.

The manager's first problem is to reduce this irregular line to the line B showing regular daily output, and his next to make the line B coincide with the line A; that is what is meant by "push and go" in a steel foundry. An excellent education lies before the man who has never tried to solve this problem.

Let us see how in the solution of this simple curve we can utilize another not quite so simple, but vastly more illuminating. Let us try to find out what is happening between two points on our curve, say, during Tuesday's working hours, by plotting down a curve of the human effort expended in that day's production. In other words, we take the straight line M.T. and diagnose it. You will find great difficulty in plotting this curve, but assuming that we have succeeded, in our datal work jobbing foundry, it will appear like Fig. 2. Here is plotted down the curve of daily effort expended by a hand fettler scaling an annealed steel casting. We will assume that his maximum effort is at the rate of 8 sq. ft. per hour, then his theoretical line will be the line A. His actual effort, however, only produces the shaded lines shown on each period, and this curve is worth studying.

Factors in the Varying Daily Output

Let us follow it from 6 o'clock and trace its teaching. The straight line A is the theoretical full efficiency. It is a winter's morning, and the worker moves sluggishly; he is cold and most probably hungry, and his effort curve crawls slowly up to the point *a* about 7.30, when a sharp rise takes place in a few minutes. You will find that at this point the foreman has emerged from the warmth of his cabin, and the solace of his morning pipe and paper, and work goes on steadily with a straight curve to, say, 8.15, when the foreman goes back to his warm cabin and our curve drops sharply to the base line as our worker wanders off to warm his tea can. Then the breakfast break intervenes, and now see the change. The man is fed, he is warm with his hot tea and a smoke in front of the furnace, and his efficiency curve rises sharply to its maximum at about 9.45 a.m., and continues for an hour or so while he is feeling the benefit of his meal. His curve then droops, and again sharply drops when he wanders off to look for his dinner basket. The afternoon curve is a reproduction of the after-

*From a paper read before the Sheffield Branch of the British Foundrymen's Association.
**Steel Foundry Manager, Cammell, Laird & Co., Sheffield.

breakfast curve, except that it droops earlier and faster as the operator tires. The point *b* where there is a short, sharp rise about 9.45 o'clock, marks the manager's advent in the shop.

It needs no very hard thinking to read the lesson of this curve. The section No. 1 is absolutely inefficient and wants cutting out, so that our 6 o'clock start is damned to commence with. I consider it a relic of barbarism, and is, I believe, at the root of a great deal of bad timekeeping. In the man's most efficient stage covered by sections 2 and 3 of the curve, there is only one break in a period of 7½ hours. This curve then shows that a one-break day, allowing the operator to start warm and well fed and to finish without exhaustion, is the correct system.

If we are to give practical effect to a lot of the loose talk that goes on about educating the operators, then the question of physical exhaustion due to early starting and long hours must be considered. You cannot get good results from a tired body. I have taken it out, and I find the average hours worked apart from overtime are not more than 49 per week, so that you are really working a very badly balanced 48-hour week, and by readjusting the distribution of that time on the one-break system you must, in my opinion, get more efficient working.

It is often remarked that men lose very little time when they are on night shift because they are paid more money. I do not agree with that reason. I believe that it is mostly due to the fact that a man's household have time to prepare a decent hot meal for him and get him away in good time for his night's work. I find that men work on the night shift not from a love of it, but because it enables them to average up their wages which are low on the day shift through the often intolerable conditions of our six o'clock start. The great majority of men who lose time on the day shift are not slackers.

We have seen that efficiency rises when the foreman gets going—we have seen that efficiency rises when the manager gets going—and from this we reflect that the highest efficiency will be obtained by making this working period common to all who have anything to do with the business, i.e., manager, clerks and operators should start at the same time.

Efficiency Curve for Managers and Foremen

Before I pass from this curve I would suggest that it would make a bit of useful education to any foreman or manager to plot out this curve of his own efficiency. If he has the usual amount of self-conceit prevalent in foundries, he will get his curve away up above the theoretical maximum line (as shown by line C in Fig. 2). Of course, as the manager or foreman is supposed to be on top of his job, his theoretical efficiency line will be above the operator's line, as shown by line B. Now, if he is an honest thinker he will quickly recognize that the super-height of his curve is the measure of his amount of swelled head, and when he examines the same period of time on the production curve he will most likely find a V-shaped depression as we have on the first curve at W—the rut that the moulder is in. This curve of swelled head is one of the contributory causes to the rut. Erode the peak, and the rut will begin to fill up. By efficiency I mean a high rate of production of good quality castings, at a relatively low cost rate, from a body of well-paid, contented operators and staff.

Proper Sequence of Operations

I mentioned that we must always keep before us the factor of continuity of direction. How rarely one finds this in a jobbing steel foundry. There is rarely any idea of a proper sequence of operations. The furnace is often in the wrong place, drying stoves in the wrong place, making it incumbent on the travelling cranes to be continually shifting moulds backwards and forwards. If the furnace is at one end of the shop and the drying stoves at the other, you

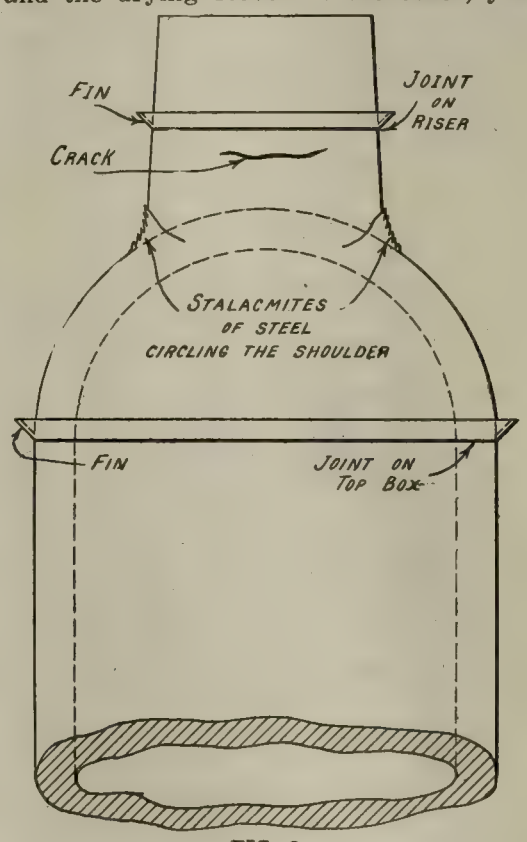


FIG. 3.

close and set the moulds at the stove end, the steel has to travel over the moulding area to the pit, and the moulders for an hour, say, are left craneless. That interferes with output.

Let us look at the sequence of operations in the foundry:—Moulding, core-making, drying, closing, casting, knocking out, sand blasting, riser removal, annealing, fettling, testing, finishing, loading. I have left out pattern-making, for in jobbing-shops most of the patterns are sent in and the pattern-maker's chief business is to keep the moulder right (if he can), in his closing. With the exception of hand moulding, core making and melting, the whole business is purely mechanical, and the speed of production largely depends on the balance of output from each operation, the perfection of the means of transit from one operation to another, and the efficacy of the machinery for performing each operation.

What a misnomer the term moulding shop often is in the jobbing foundry. How often one finds it a conglomeration of moulding area, box park, knocking-out shop, fettling shop, scrap-heap, and goodness knows what. The moulding shop should be a place to mould in; the dirty work should be done in other shops fitted for the purpose. Then a bit more of the valleys in the first curve will be found filling up.

There is no secret in a steel foundry; there is plenty of delusion, and the whole question of "quantity" resolves itself into an engineering problem of the application of the straight line. It is, however, when we come to consider quality in a steel foundry that we are confronted with the real problem. Quality is that condition in a casting that enables it to pass through all the successive stages from the casting pit to the loading bank with a minimum of trouble and cost and strengthens the salesman's hand by making the buyer (like Oliver Twist), ask for more.

Factors in Quality Output

Quality depends primarily on two factors:—1—The foreman moulder; 2—the molten steel. I put the steel last, because, in my experience, it is the least important of the two. The instructions given to the operating moulder by the foreman, such as the position to place the runner, the right way to mould the job, the position and size of risers, the use or abuse of core irons, and the putting on of brackets in 99 cases out of a 100 determine whether the job will be good or not, and it is in these points that the weak spot in our steel foundries lies. The great majority of foremen moulders are not properly trained.

It is a most melancholy reflection that such a fine body of men should be handicapped by what is a serious defect in our shop training. I mean that education of foremen to think on correct scientific lines, enabling them to rise above the "hit and miss" methods so prevalent in our shops. Employers of labor will have to face this question, and its solution starts with the apprentice moulder. A foreman must come from the operating moulders; he must go through the mill of the apprenticeship drudgery, but employers must insist that mental training proceeds with the manual training, and part of that mental training should, I think, be carried out in the works, so that lads can be taught to appreciate the co-ordination between manual effort and technical training, not as a thing apart from their daily toil, but as a powerful weapon to enable them to make that toil more productive in earning capacity for themselves, and for the man or corporation that employs them.

The excessive use of brackets, core irons and risers are, in my opinion, the distress signals of the foreman moulder. He is too often so obsessed by the fear of what the steel-maker is going to give

him that his mind is incapable of analysing his difficulties correctly. It is always good policy for a manager when the foreman tells him that last night's charge was like "bull muck" to examine the charge sheet, and get busy in the fettling shop. He won't take long to find which casting has worried the foreman. You'll usually find it by the number of brackets on it—a kind of steel hedgehog. Tell a foreman a casting is a "ship casting," and he'll go bracket mad. Tell him it's a furnace door, and you'll get a better casting with no brackets on it at all. I firmly believe that the blaming of the steel-maker for bad or cracked castings is the greatest piece of bluff ever put up in a workshop. For many years now I have never failed to get correct test results from the steel supplied, except where it has been contaminated in the mould or spoilt by mechanical action in the mould. I do not think it reasonable to suggest that 30-ton steel, giving an elongation of 30 per cent. on 2 in. and 180 deg. bend (a steel being made daily in our Sheffield foundries), is a bad steel or a steel responsible for the cracks in castings.

Critical Period of Steel Castings

Foreman moulders do not fully recognise or believe that the critical period of a steel casting is just at the point of change from the liquid to the solid state, not only because the metal is then in a pasty condition, but because the main contraction comes on that moment, and the casting will crack if the mould and cores are not sufficiently friable to allow that sudden movement to be unrestricted. This contraction is so fast that in a job cast vertically you will frequently find that part of the steel near the base of the riser has lagged behind the mass and appears as a row of small stalagmites on the cold casting. I have repeatedly found them 5-16-in. long on the top end of a cylinder whose contracting length was 4 ft.

Fig. 3 illustrates the point. A dome-ended cylinder was cast with the dome end up and the feeding riser placed as shown. The joint of the top box and the riser box are shown. In cases where no fin formed at these joints the stalagmites of steel were much in evidence, but when fin did occur through bad jointing the stalagmites were absent, and the fins were bent almost vertical, and in one case, although the fin o nthe riser was only ¾ in. wide by 1/16 in. thick, a crack 9 in. long occurred on the riser just below the fin. Examples such as this show the speed of contraction, and the danger of cracking through even a very slight resistance to contraction at the critical point of solidification.

You can always tell whether a foreman grasps this question of contraction by watching if he slackens a job after it is cast. All slackening should be done when the mould and cores are being made and dried, and with the exception of easing round a riser the casting should not be disturbed until it is cold enough to lift, and I want to see foreman moulders so trained that, without a thought to the steel, they can produce a sound steel casting by scientific moulding methods.

A great deal has been talked about the excellence of German steel castings. I have examined every German casting I could get hold of, and I have not found one made of better steel than we are daily supplied with in our Sheffield foundries, but I believe I am right in saying their methods of moulding were superior. I have seen a German 12-ton ship casting, and it had been made with only eight brackets on it. I have seen a similar British casting made of better steel with 200 brackets on it, and the German casting was the more saleable article—"it had quality." My experience forces me to the conclusion that method of manufacture in the moulding shop and not the steel is the main factor in securing quality in steel castings.

FOUNDRYMEN'S CONVENTION AND EXHIBITION

THE success of the exhibition of foundry supplies and equipment, machine tools and accessories, to be held in Boston, Mass., during the week of September 24, concurrently with the annual conventions of the American Foundrymen's Association and American Institute of Metals, is already assured, since nearly 150 manufacturers have made reservation of 45,000 square feet of floor space, an amount well in excess of that occupied at Cleveland a year ago. Judging from the convention programme scope as regards subjects to be discussed, it is quite apparent that the development of foundry practice along right lines continues to expand and grow in importance. Program details follow:—

A. F. A. Programme, Monday, Sept. 24

10 a.m.—Registration, Mechanics' Building.

1 p.m.—Opening of Exhibition, Mechanics' Building.

3 p.m.—Joint opening session, American Foundrymen's Association and American Institute of Metals, Paul Revere Hall, Mechanics' Building.

Address of welcome, by Hon. James M. Curley, Mayor of the City of Boston.

Response to the address of welcome, by R. A. Bull, Duquesne Steel Foundry Co., Coreopolis, Pa.

Annual address by J. P. Pero, Missouri Malleable Iron Co., East St. Louis, Ill., president, American Foundrymen's Association.

Annual address by James L. Jones, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., president American Institute of Metals.

Report of Executive Board of the American Foundrymen's Association.

Report of the Secretary-Treasurer of the American Foundrymen's Association, by A. O. Backert, Cleveland.

"Fire Prevention in Large Industrial Establishments," by C. Johnson, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.

Appointment of Nominating Committee and Committee on Resolutions.

Tuesday, Sept. 25, 10 a.m.—Paul Revere Hall

"The Foundry from the Viewpoint of the Sales Engineer," by H. R. Atwater, Osborne Mfg. Co., Cleveland.

"The Relationship of the Engineering Department to the Pattern Shop and Foundry," by F. J. McGrail, Struthers-Wells Co., Warren, Pa.

"How Character Analysis Solves the Men Problem," by William Judson Kibby, Employment Specialist, Cleveland.

Report of A. F. A. Committee Advisory to the U. S. Bureau of Standards, by Richard Moldenke, Chairman, Watchung, N.J.

"Efficiency in the Foundry," by James A. Fitzgerald, Reno, Pa.

"Co-operative Shop Training," by W. B. Hunter, Fitchburg, High School, Fitchburg, Mass.

1.30 p.m.—Boat ride in and about Boston Harbor. Luncheon will be served on board.

Wednesday, Sept. 26, 10 a.m., Paul Revere Hall

"Improving the Relationship Between Employer and Employee," by J. F. Kent, American Cast Iron Pipe Co., Birmingham, Ala.

Report of A. F. A. Committee on Safety, Sanitation and Fire Prevention, by Victor T. Noonan, Chairman, Industrial Commission of Ohio, Columbus, O.

Report of A. F. A. Committee on Foundry costs, by B. D. Fuller, Chairman, Westinghouse Electric and Mfg. Co., Cleveland.

Report of A. F. A. representatives on the Conference Board on Training of Apprentices, by Frank M. Leavitt, Chairman, University of Illinois, Chicago.

"The Labor Situation as Relating to Co-operation Between the Employer and Employee," by G. B. MacIlwain, Babaon's Statistical Organization, Wellesley, Mass.

"Micro-Metallography for the Foundry," by Robert J. Anderson, Cleveland Metal Products Co., Cleveland.

Report of nominating committee and election of directors.

Malleable Session, 10 a.m., Mechanics' Building

"The Theory of the Modern Waste-Heat Boiler and Possible Application of Such Boilers to the Malleable Melting Furnace," by A. D. Pratt, The Babcock & Wilcox Co., New York.

"Application of Waste-Heat Boilers to the Malleable Melting Furnace," by C. D. Townsend, Danville Malleable Iron Co., Danville, Ill.

"Application of Pulverized Coal to the Air Furnace," by W. R. Bean, Naugatuck Malleable Iron Works, Naugatuck, Conn.

"The Application of Pulverized Coal to Malleable Melting Furnaces," by Joseph Harrington, Advisory Engineer, Chicago.

"How Malleable Iron Has Improved," by Enrique Touceda, Consulting Engineer, Albany, N.Y.

"Troubles Encountered in Machining Malleable Iron: Causes and Remedies," by A. T. Jeffery, Dayton Malleable Iron Co., Dayton, O.

"Comparative Carbon Losses in Malleable Iron Annealing by Muffle and Pot Oven Methods," by Joseph B. Deisher," The T. H. Symington Co., Rochester, N. Y.

The Effect of Iron Oxide in Moulding Sand," by W. R. Bean, Naugatuck Malleable Iron Works, Naugatuck, Conn.

3 p.m.—Baseball game, Fenway Park, Boston and Cleveland American League Teams.

8.15 p.m.—Theatre party.

Thursday, Sept. 27, 10 a.m., Paul Revere Hall—Gray Iron Session

"Note on Fine Molding Sands," by C. P. Karr, Associated Physicist, U.S. Bureau of Standards, Washington, D.C.

Report of A. F. A. Committee on General Specifications for Gray Iron Castings," by W. P. Putnam, Chairman, Detroit Testing Laboratory, Detroit.

"Briquetting Foundry Borings," by A. L. Stillman, General Briquetting Co., New York.

"Cast Iron Shells in Permanent Molds," by Edgar Allen Custer, Consulting Engineer, Philadelphia, Pa.

"The Seasoning of Gray Iron Castings," by L. M. Sherwin, Brown & Sharpe Mfg. Co., Providence, R.I.

"Factors in the Economical Production of Small Cores in Large Quantities," by R. E. Kennedy, University of Illinois, Urbana, Ill.

"Modern Centrifugal Cupola Blowers," by J. W. Shugg, General Electric Co., Schenectady, N.Y.

"The Effect of High Sulphur in Gray Iron Castings," by T. Mauland, International Harvester Co., Chicago.

Steel Session, 10 a.m., Mechanics' Building

"Molding and Casting Large Slag Pots," by C. J. McMahon, Illinois Steel Co., Chicago.

"A description of a Small Open-Hearth Furnace," by David McLain, McLain's Systems, Milwaukee.

"Small Steel Castings for Ordnance Purposes," by Major C. M. Wesson, Watertown Arsenal, Watertown, Mass.

"A New System of Burning Crude Oil," by W. A. Janssen, Chairman, Davenport, Iowa.

"The Use of Vanadium in Steel Castings," by J. Lloyd Uhler, Union Steel Castings Co., Pittsburgh.

Report of A. F. A. Committee on Steel Foundry Standards, by W. A. Janssen, Chairman, Davenport, Iowa.

12.00 noon—Luncheon for the ladies followed by an automobile trip.

12.30 p.m.—Visit to the West Lynn Plant of the General Electric Co. Luncheon will be served at the works.

7.00 p.m.—Annual banquet, Copley-Plaza Hotel.

Friday, Sept. 28, 10 a.m., Paul Revere Hall

"Solution of Foundry Transportation and Conveying Problems," by Robert E. Newcomb, Deane Works, Worthington Pump and Machinery Co., Holyoke, Mass.

"Sand-Blasting in the Foundry," by H. L. Wadsworth, Sand Mixing Machine Co., Cleveland.

"Results of Tests in Blending and Mixing Sand by Means of Mullers," by R. F. Harrington, Hunt-Spiller Mfg. Co., Worcester, Mass.

"Factors Contributing to the Economical Use of Grinding Wheels in the Foundry," by Wallace T. Montague, Norton Co., Worcester, Mass.

"Refractory Materials Employed in the Metallurgical Industries," by H. C. Arnold, University of Illinois, Urbana, Ill.

Steel Session 10 a.m., Mechanics' Bldg.

"Electric Furnace Design," by John A. Crowley, John A. Crowley Co., Detroit.

"Recent Developments in the Application of the Electric Furnace to the Melting Problem," by Douglas Walker, Booth-Hall Co., Chicago.

"Comparison of Electric Furnace and Steel Converter for the Manufacture of Small Steel Castings," by C. R. Messinger, Sivyer Steel Casting Co., Milwaukee.

"The Electric Furnace From the Central Station Standpoint," by E. L. Crosby, Detroit Edison Co., Detroit.

"The Electric Furnace in the Iron and Steel Foundry," by Max Trembour, Metallurgical Engineer, Ludlum Steel Co., Watervelt, N.Y.

Plant visitation.

Program American Institute of Metals Monday, Sept. 24

10 a.m. — Registration, Mechanics' Building.

3 p.m.—Joint opening session American Foundrymen's Association and American Institute of Metals, Paul Revere Hall, Mechanics' Building.

Tuesday, Sept.25

9.30 a.m.—Hotel Somerset. Melting and Casting Nonferrous Metals.

"Raw Materials Used for Crucibles," by Prof. A. V. Bleininger, Bureau of Standards, Washington, D.C.

"Melting Yellow Brass in New Form of Induction Furnace," by G. H. Clamer, Ajax Metal Co., Philadelphia.

"Casting Bearings in Sand and Metal Molds," by R. R. Clarke, Pennsylvania Lines West of Pittsburgh, Pittsburgh.

"Negative Experiments on Waste Core Sand," by Dr. H. W. Gillett, Bureau of Mines, Ithaca, N.Y.

"The Crucible Situation." by M. McNaughton, Jos. Dixon Crucible Co., Jersey City, N.J.

"The Electric Furnace, and Nonferrous Metals," by Dwight D. Miller, The Society for Electric Development, New York City.

"My Experience with Metal Melting Furnaces," by W. H. Parry, National Meter Co., Brooklyn, N.Y.

"The Briquetting of Nonferrous Light Metal Scrap," by A. L. Stillman, General Briquetting Co., New York City.

1.30 p.m.—Boat ride in and about Boston Harbor. Luncheon will be served on board.

Wednesday, Sept. 26, 9.30 a.m., Hotel Somerset—Uses of Nonferrous Metals for Munitions, Etc.

"The Present Status of Tin Fusible Plug Manufacture and Properties," by Dr. George K. Burgess, Bureau of Standards, Washington, D.C.

"Stellite," by Elwood Haynes, Haynes Stellite Works, Kokomo, Ind.

"The Use of Die Castings in Munitions," by Chas. Pack, Doehler Die Casting Co., Brooklyn, N.Y.

"Shrapnel Bullets," by Harold J. Roast, The Jas. Robertson Co., Ltd., Montreal, P.Q.

"A Few Points on Alloy Patents,'" by Wm. J. Rich, Patent Office, Washington, D.C.

Address by a representative of the United States Tariff Commission.

"The Use of Bronzes in Railroad Turntables and Movable Bridges," by O. E. Selby, Big Four Railroad, Cincinnati.

"Recent Industrial Uses of Aluminum," by F. G. Shull, Aluminum Co. of America, Boston.

"The Consumption of Copper and Its Varied Uses," by H. D. Hawks, United Metals Selling Co., New York City.

3 p.m.—Baseball game, Fenway Park, Boston and Cleveland American League teams.

8.15 p.m.—Theatre party.

Thursday, Sept. 27, 9.30 a.m., Hotel Somset—Testing of Nonferrous Metals.

"Comparative Tests on Test Bars and Actual Castings," by W. M. Corse, Titanium Bronze Co., Niagara Falls, N.Y.

"Analysis of Babbitts and Brasses," by E. W. Hagmaier, Buffalo.

"Standard Test Bars of 88-10-2 and 88-8-4, Being the Result of Co-operative Work of Six Foundries; a new series of Tests," by C. P. Karr, Bureau of Standards, Washington, D.C.

"The Expansion of Co-efficients of Alpha and Beta Brass," and "The Corrosion of Manganese Bronze Under Stress," by Dr. Paul D. Merica, Bureau of Standards, Washington, D.C.

"Corrosion of Brasses of the Muntz Metal type," by H. S. Rawdon, Bureau of Standards, Washington, D.C.

Address by Richard C. Maclaurin, President, League to Enforce Peace.

"The School End of the Job in Training Foundrymen," by Dean C. B. Connelley, Carnegie Institute of Technology, Pittsburgh.

"The Flux and Cleaner Question of Brass," by E. D. Frohman, S. Obermayer Co., Pittsburgh.

"Pyrometers—Their Construction and Application," by John P. Goheen, Brown Instrument Co., Philadelphia.

"Electrically-heated Core Ovens," by Dr. C. F. Hirshfeld, Edison Illuminating Co., Detroit.

"Brass Rolling Mill Alloys," by Roy A. Wood, Cheshire, Conn.

12 m.—Luncheon for the ladies, followed by an automobile sight-seeing tour.

12.30 p.m.—Visit to the West Lynn plant of the General Electric Co. Luncheon will be served at the works.

7 p.m.—Annual banquet, Copley-Plaza Hotel.

Friday, Sept. 28, 9.30 a.m., Hotel Somerset—Metallurgy and Metallography

"The Electrolytic Production of Antimony," by Prof. D. J. Demorest, Ohio State University, Columbus.

"The Electrical Properties of Some High Resistance Alloys," by Prof. M. A.

Hunter, Rensselaer Polytechnic Institute, and F. M. Sebast, Troy, N.Y.

"The Amorphous Theory in Metals," by Zay Jeffries, Aluminum Castings Co., Cleveland.

"The Volatility of Zinc and Cadmium," by John Johnston and Edward Schramm, American Zinc, Lead and Smelting Co., St. Louis.

"Surface Tension and Deoxidizing of Metals," by W. J. Knox, Metals Deoxidizing and Refining Co., New York City.

"Antimony—Its Metallurgy and Uses," by K. C. Li, Wah Chang Mining and Smelting Co., Inc., New York City.

"Development and Reabsorption of the Beta Constituent in Alloys Which Are Normally of the Alpha Type," by Prof. C. H. Mathewson, Department of Mining and Metallurgy, Yale University, and Philip Davidson, New Haven, Conn.

"The Swelling of Zinc Base Die Castings," by H. M. Williams, National Cash Register Co., Dayton, O.

Plant visitation.

IS THERE A SUBSTITUTE FOR IRON FOR PERMANENT MOULDS?

IT IS generally acknowledged that the labor costs on sand and other moulds run up the prices of castings to what is often nearly a prohibitive figure, and for this reason iron moulds are used for many things which have to be made in large numbers, and while these iron moulds are good up to a certain point, they still leave much to be desired. For instance, they are not in any way porous, and for this reason gases can only escape at points specially arranged instead of from any part of the casting (by absorption) as in sand moulds. This renders special care in dealing with the metal in very many cases, while in some instances it is not safe to attempt casting in iron moulds. Naturally, iron moulds in suitable cases prove economical, but in such instances as they are unsuitable they are merely a waste. What is wanted is a refractory material which can be made up into porous moulds having a capacity of holding up to 100 or more castings without alteration, and which can be recovered for remanufacture into moulds. Costs being a very important item, and the total expenditure having to be less than that of sand moulding, probably the matter is one that offers many difficulties, but such that probably could be overcome with patience and practical experimental work. For instance, grained emery or corundum would probably stand the wear incidental to casting; but could they be cemented in such a way as to remain porous, and be capable of being broken down and remain in good condition for making other moulds; and could this be done in a way that could be used in ordinary foundry practice? If this or a similar material could be adapted for the work, and show a saving of, say, 10 per cent. reduction in the cost of actual moulding, there would be from 15 per cent. to 20 per cent. savings to be made in the melting and pouring of the metal, the saving in time in dealing with the moulds after they are made being an important item. There is a good opening for inventiveness in the direction pointed out.—The "Practical Engineer."

PROFITABLE DISPOSAL OF METAL CUTTINGS

By D. Street.

METAL chips, in the shape of borings, turnings and planing scrap, often amount to 10 per cent. of the total production of the machine shops, and it is not altogether an easy matter to dispose of this waste material to advantage. It is apparent that the most economical way to deal with it is to use it in place of other materials in furnace mixing, but here there is a difficulty in charging a furnace with loose chips. The forced draught blows a large proportion away, and a further big percentage is subjected to violent combustion and goes at once into slag as ferric oxide. When loose chips are charged into a furnace it is safe to say that at least one-half of the total weight is wasted and the large amount of viscid slag that is produced seriously interferes with the efficient working of the furnace.

Proposed Methods

Some years ago it was suggested that the metal chips might be packed in wooden or cast metal cases before they were added to the furnace mixture, but, taking everything into consideration, this method is far from economical. Another method which was advocated was that the chips should be exposed in large volume to the atmosphere, so that they might rust into a solid form; but here again the method in practice is expensive. The proposal to feed the chips into the furnace with a low power blast has also been found to work unsatisfactorily. Some engineers have added binding material to the chips and pressed the mixture into bricks, but in almost every case it has been found that the binder disintegrated the moment it was exposed to heat and the briquettes simply broke into free metal dust. There was not only a great loss, due to oxidation under the action of the binder, but the furnace loss had also to be taken into account.

For many years past German engineers have done their utmost to develop the use of low-grade ore and waste metal in their country. They have been the largest users of waste steel plate, and the problem of utilizing metal chipings to the best advantage was tackled some little time ago with almost complete success.

Present Practice

In all German metal workshops the chips are saved and sheltered as far as possible from atmospheric influence. If the shop has not the necessary facilities for dealing with the chips itself, storage of them is made until a sufficient quantity has accumulated to justify despatching them to works which can deal with them efficiently. The method adopted is to load the metal scrap into a press and subject it to a very high pressure. The chips are thus compressed into briquette form without the aid of any binding material. The blocks can be loaded into the furnaces and practically no loss results through burning or through particles being blown away, and these blocks are used as a substitute for expensive grades of pig iron in the production of high-grade cast metal.

In steel foundries it has been pointed out that these briquettes might serve as a substitute for the low phosphorous white iron that is now in such demand. In fact, they can be economically used in any place where steel scrap is used, whether it be in the foundry or the steel mill, as briquettes of steel or wrought iron are a good charging material.

Chips from hard rolls, projectiles, and the like, may be mixed with grey iron chips, so as to make a uniform charging material. Chips from copper, brass, bronze and white metal have also been pressed into briquettes, and a considerable saving in cost has been effected. This is due to the fact that the cost of pressing the chips is much less than the value of the savings that are effected in other ways, such as in the oxidation of the metal in remelting, the easier methods employed in handling the chips and the less space that is required in which to store them.

BLOW AND GAS-HOLES IN IRON CASTINGS

By L. E.

IT sometimes happens in places where really good iron and coke are used in cupola melting, that holes under the skin of the castings cause trouble, and it may very well happen that the cause cannot be found by analysis of the metal and fuel. At the same time, it usually happens that the furnace man complains that his furnace burns away at points opposite the tuyeres, while the machinemen grumble at the hardness of the mettle, the whole thing appears somewhat incomprehensible on account of the good quality of the material used. In reality the fault is caused by the air blast being too high in pressure and too low in volume, there not being sufficient oxygen supplied to melt the iron rapidly by the high rate of combustion of the fuel. So long as the air pressure is enough to enable the whole of the fuel to get its supply of oxygen it is ample, but the quantity of air supplied must also be ample, and in all cases at least 6½ lbs. of air—roughly, 85½ cubic feet of air—is needed for each pound of coke used in the cupola if the best results are to be secured. To get this air the propeller, whether called a fan or blower, must be of sufficient size, there must be as nearly a straight passage for the air from the propeller to cupola, and this passage must be free from angles and sharp bends, and, last of all, the tuyeres must be of sufficient area.

The main air passage from the propeller apparatus should be larger than the exit orifice of the fan or propeller, owing to the friction of the walls considerably reducing its effective area, and the shorter the distance from the propeller to the cupola, the more efficient will be the work done.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

SWEDISH IRON AND STEEL INDUSTRY

FROM time immemorial mining and the manufacture of iron have been industries of very great importance. The principal reason for this is that Sweden possesses one of the greatest supplies of iron-ore in Europe. According to a valuation of the supplies of iron-ore of the world at present known, which was published at the International Geological Congress of 1910, Germany's supply was reckoned at 3,607 million tons of iron-ore, France 3,300 million tons, and England 1,300 million tons, while the Swedish deposits of iron-ore are calculated at 1,150 million tons. It must also be observed that Swedish iron-ore is unusually rich. According to the above-mentioned extensive international investigation it is calculated that the whole world possesses 1,300 million tons of iron-ore which has 60% or more of iron; of this quantity Sweden owns no less than 1,035 million tons. The Swedish iron-ore supplies are found in two separate districts, one in the midlands, north and west of Lake Malar, and another in the far north of Sweden, a little beyond the Polar circle.

Increased Production

According to figures published by "Swedish Export," the total annual production of iron-ore in Sweden first exceeded one million tons during the period 1891-95 when the average annual output was 1,519,325 tons, rising in 1912 to 6,699,226 tons, the increase being very marked from 1910 on. In the year 1911 the whole world produced 136 million tons of iron ore, Sweden, with 6,150,718 tons occupying seventh position. Since 1871, Sweden and the United States have increased their production of ore almost ten-fold, Great Britain remaining almost stationary in this respect until recently.

The great bulk of the ore is exported, Germany taking by far the greater portion, followed by Britain, Belgium, France, and America in the order named. The chief reason for such exportation is the fact that Sweden lacks a natural supply of fuel.

High Quality Ore

As regards the quality of Swedish iron-ore it has been shown that no other country possesses a similar supply of ore with such a high percentage of iron; besides which the greater part of the ore mined in the midlands is unusually free from phosphor and sulphur, and consequently is an excellent material for the production of steel of the highest quality. Statistics show that the average quality of ore from the midlands contains 0.005—0.020% phosphor and 0.007—0.050% sulphur. During recent years the Swedish iron manufacture has obtained a further addition of ore free from phosphor and sulphur since the magnetic concentration of low grade ores has become more general, and as a consequence the production of briquettes. The development of the manufacture of concentrates and briquettes is shown by the following figures:

Year	Concentrates, Tons	Birquettes, Tons
1906	131,407	78,205
1907	178,567	88,532
1908	296,400	193,216
1909	225,983	148,380
1910	365,985	247,946
1911	381,190	255,948
1912	520,710	288,553

The total quantity of concentrates, which is manufactured according to the methods invented by Mr. Grondal, a Swedish engineer, has a percentage of iron of 50—70, and the percentage of phosphor only exceptionally exceeds 0.010%, although the raw ore which is refined has in certain cases contained more than 1% of phosphor. With the object of making the concentrates in piece-form and at the same time reducing its percentage of sulphur it is briquetted according to the Grondal method by heating up to 1,200—1,400 degrees C. without the addition of any binding substance, whereby the concentrate is softened by the heat and becomes a coherent mass. The briquettes thus obtained seldom have a percentage of sulphur of more than 0.010%. In 1912 the Swedish iron-ore mines employed 10,500 workmen and the value of the iron-ore produced was 49.6 million Kr.

Manufacture of Iron and Steel

The Swedish iron industry is of very ancient origin. According to the authority already quoted, as early as prehistoric times iron was manufactured in Sweden from hydrated ores, collected at the bottom of the lakes and marshes. The smelting was done by means of holes made in the ground and with the aid of wood as fuel. These holes were lined with slabs of stone. The inhabitants soon learned how to use the rich metals found in the ore, and small iron-works began to appear near the water-courses. Our ancient documents bear witness of a considerable mining industry. In a deed of exchange dated 1288 Stora Kopparberget is already mentioned and a deed of sale concerning certain interests in the Norberg mining fields bears the date 1303. In 1347 Stora Kopparbergs Bergslag obtained their first royal privileges. Several of our steel works still in existence were founded in the sixteenth and seventeenth centuries. An abundant supply of rich and pure ores, wealth of charcoal and more than sufficient water-power soon enabled Sweden to play an important part in the international iron market, and at the commencement of the eighteenth century Sweden was the country that produced the largest annual supply of pig-iron. At that time, however, several metallurgical inventions were made which very greatly neutralized the aforementioned advantages regarding the natural supplies upon which Sweden based her pre-eminence as an iron-manufacturing country. In the year 1730 cokes replaced charcoal as fuel for blast-furnaces in England, and very soon afterwards manufacturers learned how to eliminate phosphor from highly phosphoric pig-iron by means of puddling. Thus as soon as the discovery of the extraction of iron suitable for ordinary purposes from low quality ores with the aid of coal was made, the extent of the manufacture of iron in England, Germany and France soon exceeded that of Sweden.

Charcoal Versus Coke

The supply of very high quality ores and first class fuel in the form of charcoal has enabled Sweden to maintain her prominent position as the producer of the finest quality of steel in the world. As regards the manufacture of Swedish pig-iron it is, as has already been mentioned, chiefly based upon ores containing a minimum of phosphor, and charcoal as fuel. The supply of ore free from phosphorus can nowadays, especially through the introduction of Grondal's method, be said to be unlimited and the price of pig-iron is determined in the first place by the price of charcoal. Since, however, the waste wood obtained from the forests and saw-mills is becoming more and more used for the manufacture of cellulose, the supply of charcoal is being reduced and consequently its price has risen. The charcoal question is therefore of the greatest importance to the iron industry, and the most energetic efforts are being made to reduce the price of charcoal on the one side and to spare its consumption in the blast furnaces on the other. The coaling of the waste wood in furnaces instead of producing charcoal in heaps may be mentioned as an effort in the former direction. Charcoal heaps produce less coal than furnaces, besides which furnaces enable one to collect the by-products of tar, methylated spirits, wood-vinegar, etc.

On the other hand, as has already been mentioned, efforts are being made to reduce the consumption of charcoal at the iron works. Previous to the year 1900 all steel, even the simplest implements for home use, was produced from charcoal pig-iron whereas nowadays coke is beginning to be used as fuel at iron-works that manufacture steel for the Swedish market only. Thus in the

year 1912, 86,000 tons of coke pig-iron were manufactured.

Electrical Developments

The most important step taken for the reduction of the consumption of charcoal dates, however, from the year 1910 when the electric blast-furnace, invented by three Swedes, Messrs. Lindblad, Stalhane, and Gronwall, was technically worked out at the expense of "Jarnkontoret", (The Institute for the advancement of the Swedish Iron Industry) so that it was then possible to introduce it into several Swedish ironworks. In this furnace only so much charcoal is consumed as is necessary for the reduction of the ore, while all the heat essential for smelting is supplied by electric power. About 1-3 h.p. is used per ton of pig-iron with an electrode consumption of 3 kg.

The consumption of charcoal at Swedish iron-works has, owing to the aforementioned measures, been constant during the last few years, while the manufacture of pig-iron has rapidly increased. The pig-iron, which is of the highest quality guaranteed to contain a maximum percentage of 0.020 phosphor and 0.010 sulphur, is used as raw material for tool-steel and especially for war-material (armor-plate, guns, etc.). Of the export of 1912 103,348 tons were shipped to England, 41,818 tons to Germany and 20,698 tons to France. Smaller quantities were exported to The United State of America, Italy, and Japan. As charcoal pig-iron of such an excellent quality cannot be produced in any other country, Sweden enjoys a certain monopoly of this special branch of the iron market.

Production of Wrought Iron and Steel

In Sweden, as in other countries, the production of wrought iron has for ages only been carried on in hearths with charcoal as fuel. The metal was prepared according to old German and Belgian principles after a system which is still to be found in Dannemora, where the world-renowned so-called Walloon iron, the purest wrought iron in the world, is manufactured. But at the commencement of the nineteenth century a new kind of blooming was introduced into Sweden from England, called the Lancashire hearth process, which compared with the Walloon process was characterized by a considerable reduction in the consumption of charcoal. These two processes are still used in Sweden for the production of large quantities of wrought iron known for its toughness, malleableness, and, in general, for its unusual low percentage of phosphor and sulphur. This wrought iron is chiefly sold for export, partly in the form of blooms, and partly in the form of rolled or forged bars. The highest qualities are used in England and Germany as raw material for the production of finest tool-steels.

KEROSENE AS MOTOR FUEL

By C. T.

IT is evident that the day is not far distant when kerosene will be as commonly used in engines of motor cars and tractors as gasoline is at present. The search for another substitute than that of some petroleum product has been an utter failure. It began with the high price of gasoline some four years ago, and has been continued ever since. Various suggestions have been made and numerous times it has been reported that a substitute had been found which would furnish cars with a cheap fuel and drive gasoline out of business. It will be remembered that English inventors were sure a few years ago that they could substitute benzol for the American article, but they never carried the demonstration beyond a few cars, because the article was too scarce and too costly. An American inventor drove cars round the race track in Indianapolis for several weeks with a fluid that could be produced at the small cost of a few cents a gallon. It was a failure in the end. Last year a Long Island chemist had a green fluid, which, added to water produced at any pump or creek, promised relief from high-priced gasoline. He drove cars with it, or with something, and even deceived several noted inventors. The green fluid suddenly disappeared from public prints, and the auto owners waited for some other inspired article.

Meanwhile inventors turned their attention to the use of the cheaper kerosene as a substitute. Engines have since then been run on kerosenes with the introduction of small amounts of water in the cylinders. This has been practically demonstrated in a factory in Allegany County, New York, and two years ago a car crossed the Continent with no other motive power than kerosene. A few months ago a car was taken from Warren, Pa., to New York over heavy roads and through bad weather, and with no other fluid than was obtained from the kerosene stores along the route. The facts prove the possibility of the use of the heavier article for autocars and other engines.

It is now recognized that only slight changes are needed in the carburetter to make the use of kerosene as common as that of gasoline. This is also proved by the fact that much of the gasoline now used in the same specific gravity as the lighter grades of kerosene of the past years. The gravity of gasoline has been gradually lowered to meet the demand for more motive power for automobiles, aeroplanes and motor boats, and the engines built at present handle it freely. Necessity has brought this about, and with the awakened interest in the heavier article the demand will be met.

MARINE DIESEL ENGINE PROBLEMS

THAT some departure of a radical nature in type or arrangement of marine diesel engines is necessary if maximum powers are to be profitably increased above the present figures is the opinion of a writer in The Engineer.

Success is one of those human qualities to which it is rarely possible to assign an absolute value, and in engineering progress one might almost say that there are no such things as failure and success, but only stepping stones. When, therefore, we speak of the relative failure of the marine Diesel engine, it will be understood that the phrase "relative success" would be almost as appropriate. We have to look at the matter from the point of view of how much was expected from the Diesel type in the past; how few, comparatively speaking, of those expectations have been realized, and try and imagine what progress is to be expected in the future.

We can recall the time when the Disel engine first came to be talked about; when it was anticipated by some that its progress would be so rapid as to leave no room for any other type. And truly, if the overwhelming superiority in fuel economy had not been attended by corresponding disadvantages, there was no reason why these high expectations should not have been realized. It took about a decade for the land type Diesel to get through the period of its infantile troubles, and this type naturally had to be perfected before attention could be turned to the marine type. We do not propose now to enter upon the history of the marine Diesel engine—the various "stepping stones" in the development of the type have been from time to time described and illustrated in our pages—but rapidly casting our mind's eye over the experience gained in the last ten years, we are forced to the conclusion that the progress has been in the direction of perfection of detail and increase of reliability, rather than in any big advance in the sphere of its application.

Two Types Only

Broadly speaking, the marine Diesel is limited to two types—the high speed, which has its main application in submarines, and the low speed, which has been successfully applied to the ocean tramp. Of the former type it would be inadvisable to speak at length, but the limitations of the size of the high-speed Diesel were pointed out in a paper read by Lieut.-Commander Anstey at the Institution of Naval Architects eight years ago, and experience since has confirmed the conclusions arrived at in that paper. Speed of revolution, on which low weight per horsepower mainly depends, cannot be maintained as the size of the cylinder is increased, with the result that bigger powered units must be heavier, or else the increase of power must be obtained by the multiplication of cylinders.

In the type which has been developed for the tramp, weight is not a primary consideration, and here the limiting condition has been the size of cylinder. We have heard of experiments being made with very large cylinders of the order of 1,000 horsepower, but so far the results have been maintained in reserve. We are not handling an ordinary engineering problem when we come to deal with Diesel engine cylinders of, say, 50-inch diameter, which may be exposed to a pressure of anything up to 900 pounds or 1,000 pounds per square inch.

The problem is more one for a gun designer than a marine engineer, and one begins to wonder whether the game is worth the candle. If we arrived at such dimensions, it is fairly obvious that the weight of the installation would probably exceed that of a steam set of equal power. Not that that would be a great consideration if counterbalancing gains could be proved, but experience has shown that the larger the unit the less the balance of advantage of the Diesel engine over steam, and there must be some point at which the credit balance disappears entirely.

Nature of Present Limitations

An argument with some who have not studied the question is that improvements are daily being made, and will still further be made, which will make further progress possible. The answer is, of course, that it is not a question of making improvements; it is that we are up against mechanical principles and laws which cannot be altered. In all questions of engineering progress similar conditions may arise. Take, for example, the question of obtaining a high speed in a vessel of a given size. Imagine that we had got to the point of progress in the design of the hulls represented, say, by an old-type, 30-knot destroyer, but imagine at the same time that our steam machinery was at the stage represented by the compound engine at 90 pounds pressure, and that the lightest form of boiler known was the locomotive type. Imagine such machinery installed in our boat, and we might probably reach 20 knots. We trace our steam machinery through its subsequent development, changing it from time to time in accordance with the improvements, but keeping the boat the same. Through all these changes we will suppose we have had an ideal in view, to obtain, say 33 knots. We arrive eventually at the highest power we can possibly cram into the boat, and we find we can just reach 30 knots, and it has been the last two knots which have taken all the trouble to get. Probably, by making supreme sacrifices in weight, we could even get another knot, but is it worth it? The time has now come when it is necessary to abandon an unpractical though possible solution, and to find a way round it. We have imagined the hull unchanged through all this previous development; now we turn our attention to it and we find that, by lengthening the ship and increasing the displacement, we can practically begin in speed where we left off in the old type. The curve of horsepower and speed which was getting so steep as to be almost vertical at the top has, under the newer conditions, a reasonable slope, and shows us that we can still get an increase of speed with a reasonable addition of horse-power. This question of the relation of speed of vessel and power required to produce it, is a parable of a large number of problems of engineering progress. Development begins on certain lines and proceeds satisfactorily up to a certain point; beyond that progress becomes increasingly difficult, until at last the advance made is not commensurate with the expenditure of energy required.

The Diesel Situation

Some such situation has now arrived with the marine Diesel engine. Engines up to 250 horsepower per cylinder, and up to eight cylinders on one shaft, are now fairly common. The difficulties increase progressively as we pass the 250 horsepower mark, and at some point—we hesitate to give an exact figure—it will not be worth while to attempt more power per cylinder. The system then breaks down unless a larger number of cylinders is accepted, and shipowners and engineers will be reluctant to accept this solution, the former on account of cost and space, and the latter on account of complication. The problem of complication is one that has to be got round if further advance is to be made. Now, it is well to fix in our minds what we mean by complication. Multiplication of parts does not in itself constitute complication. The steam turbine, for example, has an enormously larger number of parts than a reciprocating engine, considering each blade as a separate part. It is when those parts are dependent upon one another, or form working "pairs" liable to get out of adjustment, that the objection arises to their multiplication. If it were possible to simplify valves and their gears, which are the principal sources of trouble and anxiety, we could go on multiplying small cylinders almost indefinitely to obtain the desired power. In any case, some break from the reciprocating type is necessary if we are to see high speed, or even moderate speed, vessels propelled by internal combustion engines.

PAINTING STEEL CEILINGS

By O. C.

THE manufacturers of steel ceilings prepare the sheets with a gloss as follows: After the sheets are stamped, they are dipped in a thin liquid, composed of a little zinc white and varnish, thinned down with benzine. Not enough zinc white is added to make the finish opaque, though this is hardly material, since the finish is applied by a painter, who would much prefer a different prime coat, one quite dead or flat; a coat of two of this will make a finish. If the steel sheet has not been primed or coated in the factory, it is for the painter to cleanse it of grease and dirt with benzine, or with some alkaline solution. When dry, there should be a coat of raw or boiled oil given, adding a little drier to the raw oil. While the makers of steel ceilings who prime the sheets use a primer with a pigment base, zinc as a rule, it is yet true that the best primer is the simple pure oil, raw or boiled. After priming with the oil, and after it has become dry, any desired paint may be applied; although a gloss paint is given preference, many prefer a soft rather flattish effect.

Galvanized iron should not be painted until it has stood to the weather for a year or so, or before it has been treated with a liquid to cut the so-called grease or galvanizing. In many instances galvanized work looks well enough without paint, and in such cases it is a waste of time and money to apply paint to it. But when the finish demands the painting of the galvanized work it may be prepared with this formula: Take 2 ozs. each of copper chloride, copper nitrate, and sal ammoniac, all to be dissolved in one gallon of soft water, preferably. Then add 2 ozs. of muriatic acid. Mix in a wooden vessel and apply with a broad bristle brush one coat. When dry, it may be painted.

GRAVITY vs. FORCE-FEED LUBRICATION

By R. Wood.

IN A recent issue of an American engineering journal, a correspondent recommends the old style gravity feed lubricator in preference to the oil pump. The writer presumes he refers to the automatic oil pumps which are stated to be wasteful.

Considerable experience with modern automatic force feed lubricators has shown them the exact opposite of wasteful and in my opinion they possess many points of superiority over the gravity lubricator. Some of these points are as follows:—

It it is desired to introduce a quantity of oil prior to starting a unit, all the operator has to do is to give the ratchet wheel a few turns by the handle placed on the wheel for this purpose.

The oil chamber can be filled and refilled while the unit to which it is attached is in operation and while the pump itself is in operation. If a small piece of sediment finds its way into the oil passage it can be forced out by giving the ratchet wheel a few quick turns.

When the unit is started the pump starts feeding. When the unit stops the oil flow stops; there are no valves to open or close, no water to be drawn from the oil chamber.

The pump can be set to feed one drop a second or one drop a minute, that is, any speed of flow desired by the operator, and to regulate this flow all that is required is a turn or two on a regulating screw. This screw is the only thing the operator has to move. It requires about the same amount of work to install an automatic oil pump as it does to connect up a gravity automatic lubricator.

A messenger from the stores which held a Government contract hailed a vessel in dock at Liverpool.

"What do you want?" growled the surly mate.

"Got some vegetables for the ship," was the reply.

"All right. You needn't come aboard. Throw them up one at a time," said the mate, as he stood ready to receive the vegetables.

"Ahoy there, look out!" shouted the lad as he threw a small dried pea towards the mate. "I've got a hundredweight of these!"

PROGRESS IN NEW EQUIPMENT

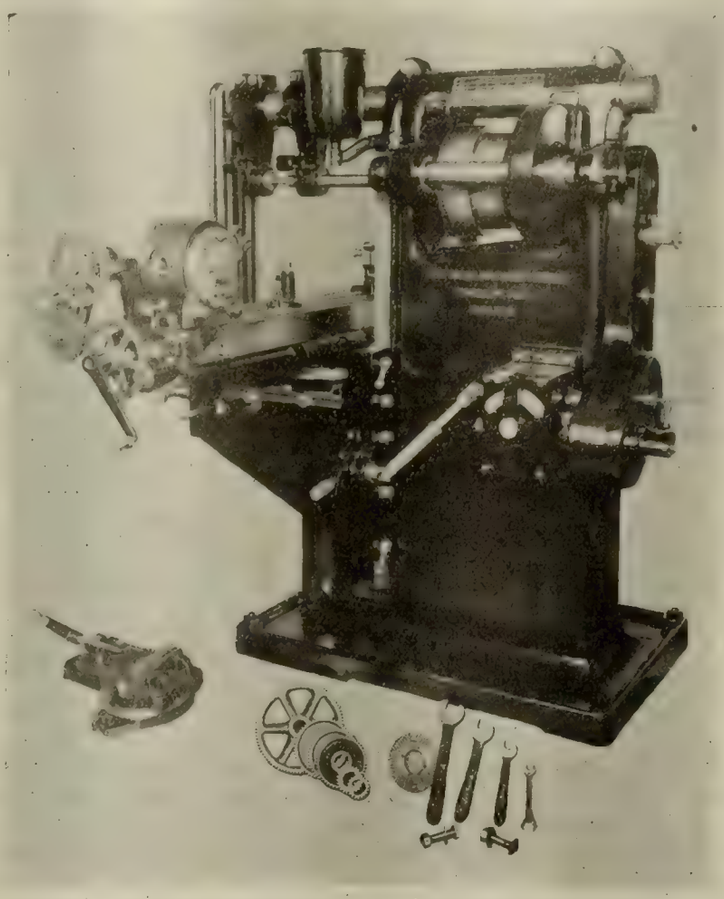
A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

UNIVERSAL MILLING MACHINE

THE accompanying illustration shows a universal milling machine which is a recent addition to the line of milling machines built by the Ford-Smith Machine Co., Hamilton, Ont.

The capacity of the machine is 25 in. by 8 in. by 17 in. Longitudinal, cross and vertical power feeds are provided, all feeds being direct gear-driven from the back of the machine. Special attention has been given to the convenient arrangement of feed levers within easy reach of the operator.

Circular movement of the table extends through 50 degs. to either side, which enables all operations to be performed as are usually undertaken in milling machines. Every care is exercised during manufacture to insure accuracy in all vital features, while ample rigidity and strength are insured through the adoption of liberal proportions throughout.



25 x 8 x 17 IN. UNIVERSAL MILLING MACHINE.

MOTOR-DRIVEN WIRE POINTERS

FOR those wire-drawing shops which prefer individual motor drive, the Morgan Construction Company of Worcester, Mass., has arranged to supply its wire-pointing rolls with Westinghouse motors mounted on the frame. This makes the unit very compact, since there is no external apparatus and no overhead connections. It is also easy to start and stop by means of the conveniently located starting-box handle.

The wire-pointer consists simply of a pair of rolls revolving so as to feed material toward the operator. There are a number of grooves to care for various sizes of wire. The cross-section of these grooves diminishes around the circumference, so that the end of a wire placed in the open part of a groove is pushed back by the rolls and reduced into a tapering end. This pointed end is then threaded through the die in which the wire is to be drawn down.

The motor illustrated is a type CS induction motor of 3 h.p., 1,700 r.p.m. It is made by the Westinghouse Electric & Mfg. Company of East Pittsburgh, Pa.

MOTOR-DRIVEN BULL FRAME

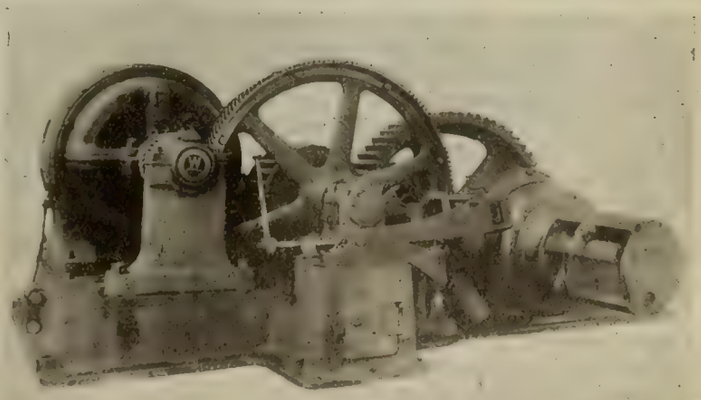
FOR drawing wire of sizes from 7/16 in. to 1 in. diameter, the two-block horizontal spindle bull frame shown in the accompanying illustration is made by the Morgan Construction Company of Worcester, Mass. It will handle square, hexagonal, and round sections, with pull at the die of from 10,000 lbs. to 20,000

A special feature of this line of machines is a winding block so arranged that, while the pull is always close to the main bearing, the coiled wire moves out to the end of the block in a regular helix without bunching or crowding. In addition to the safety afforded by quick stopping characteristic of individual drive, a friction clutch is contained in each block, which instantly disengages the block from the mechanism. Thus by the movement of the clutch lever, the drawing may be stopped at any time regardless of the strain on the block.

This machine, which is intended for heavy work at high speeds, is equipped with a 150 h.p. type CS induction motor made by the Westinghouse Electric & Mfg. Company at East Pittsburgh, Pa. Other sizes are driven by motors down to 50 h.p.

Fundamental principles are the foundation of an engineering education. Surprising what costly structures some men build on flimsy foundations.

MOTOR-DRIVEN POINTERS FOR WIRE-DRAWING SHOPS.



MOTOR-DRIVEN, WIRE-DRAWING BULL FRAME.

SHELL HANDLING EQUIPMENT AT A BRITISH NATIONAL FACTORY

THE text and illustrations refer to a plant for handling heavy shells, the equipment specially featured being supplied to an important national shell factory by Messrs. Babcock & Wilcox, London, E.C. The machine shop, to which the figures refer, consists of two bays, each about 50 ft. wide and 400 ft. long. In each bay there are two rows of machines and two sets of gantries, carrying the travelling cranes by which the shells and billets are lifted and transported. These cranes are of the so-called single-rail type, the whole of the weight being, as shown in Fig. 1 and 2, transmitted to a single rail riveted to the I-beam which forms the top bar of the gantry. Tipping over is prevented by two pairs of rollers at the top of the crane post which abut against one side or the other of a rolled joist secured to the roof of the shop. The whole arrangement is clearly shown in Fig. 2. The top of the gantry is about 7 ft. above floor-level, and the space underneath is utilized for storing shells and blanks. Each crane has a jib of 10 ft. 6 in. radius, which is sufficient to extend to the centre of each line of machines served, and the cranes pass between the driving shafting and pulleys. The maximum load they are designed to lift is 1,680 pounds.

As will be seen from Fig. 1 and 2, the cranes are electrically driven, separate and independent motors being provided for the three operations of lifting, slewing and travelling. The controls are arranged so as to be operated from the attendant's platform shown to the right in Fig. 2. The motors are of the slip-ring type, designed to operate with three-phase current supplied at 440 volts, the periodicity being 25 cycles per second. The hoisting and travelling motions are transmitted by ordinary spur gearing, and are fitted with the usual magnetic brakes. For the slewing motion, worm reduction gearing is used, the worm running in an oil bath and a slipping clutch fitted to take up any shock due to sudden starting or stopping.

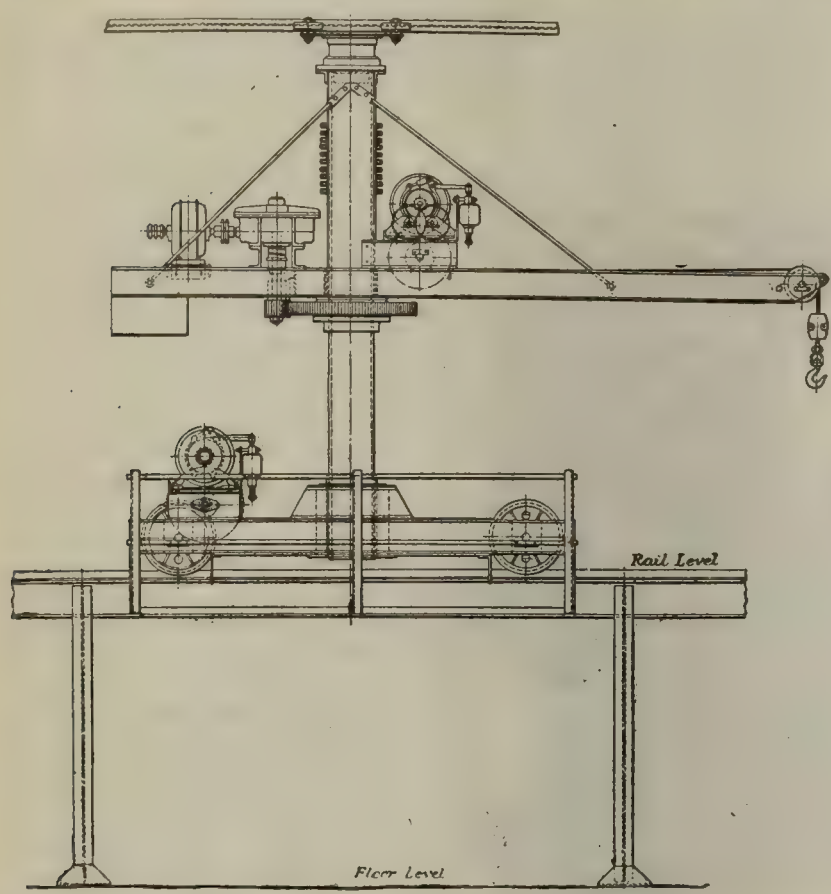


FIG. 1.

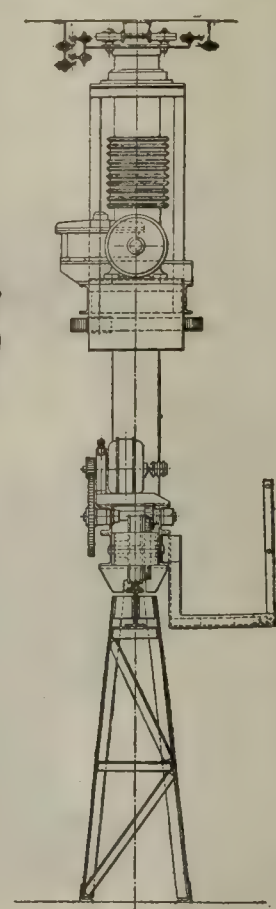


FIG. 2.

In view of the special character of the materials to be handled, various lifting tackle mechanisms have been designed and installed. In Fig. 3 and 4, there is illustrated a cradle built up of inverted channel irons and fitted with slings, and designed to carry eleven 12-in. shells.

A gripper for lifting the unforged billets is illustrated in Figs. 5 and 6, whilst another type, intended for lifting heavy shells from the floor and turning them into a vertical position, is represented in Figs. 9 and 10. This consists of two heavy crossheads fitted with levers, which give a very powerful grip on the shell. The gripping parts are pivoted on the ends of the levers, thus allowing the shell to swing into the vertical position. The grips are lined with ferodo, to reduce the liability to slip.

An apparatus designed to lift from the floor four finished shells is illustrated in Figs. 7 and 8. The prongs are shaped to pass between an adjoining pair of shells, each of which is thus supported by two prongs. For lifting the billets after forging, the apparatus illustrated in Figs. 11 and 12 is employed. Its method of use is obvious. A similar system is used for handling shells at other stages of manufacture, as shown in Figs. 13 and 14. The tongs illustrated in Figs. 15 and 16 are suitable for lifting short shells up to 8 in. in diameter, whilst for larger shells the double tongs represented in Figs. 17 and 18 are employed.—*Engineering.*

FIG. 3. FIG. 4. FIG. 9. FIG. 10.

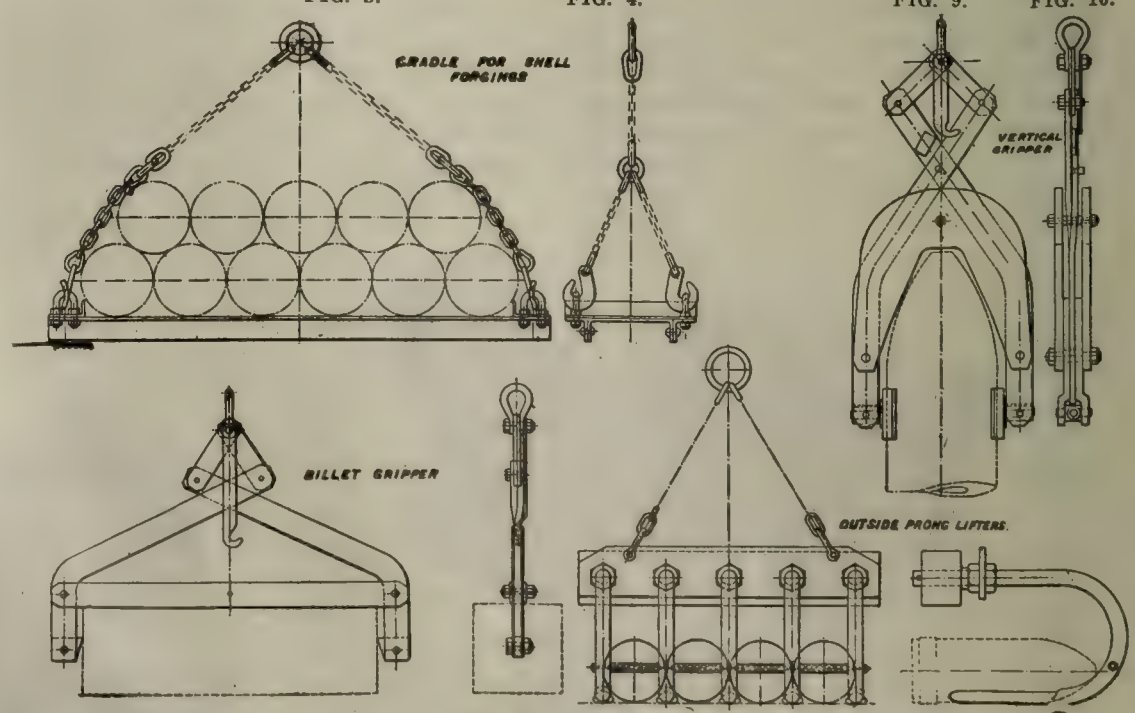


FIG. 5. FIG. 6. FIG. 7. FIG. 8.

ADVANCES IN FRENCH INDUSTRIAL PRACTICE

RECENT improvements in French industrial establishments have been very marked according to "La Metallurgie." The ingenuity of each and every one has had free scope, old traditions have been set aside, and the collective effort of all has yielded new processes of particular interest. Improvements cover every branch of industry, but are more striking in metallurgy and engineering. Scientific processes are now in constant use in place of empirical methods which

hitherto were held in honor. The smallest factory now owns a testing machine, generally a Brinell machine. No steel bar is now taken for the manufacture of a piece of some importance without being submitted first to a Brinell test. The same applies to the heat treatment of steel, and every operative who has charge of quenching and annealing now carries out the work with the aid of an optical or a thermo-electrical pyrometer.

FIG. 11. FIG. 12. FIG. 13.

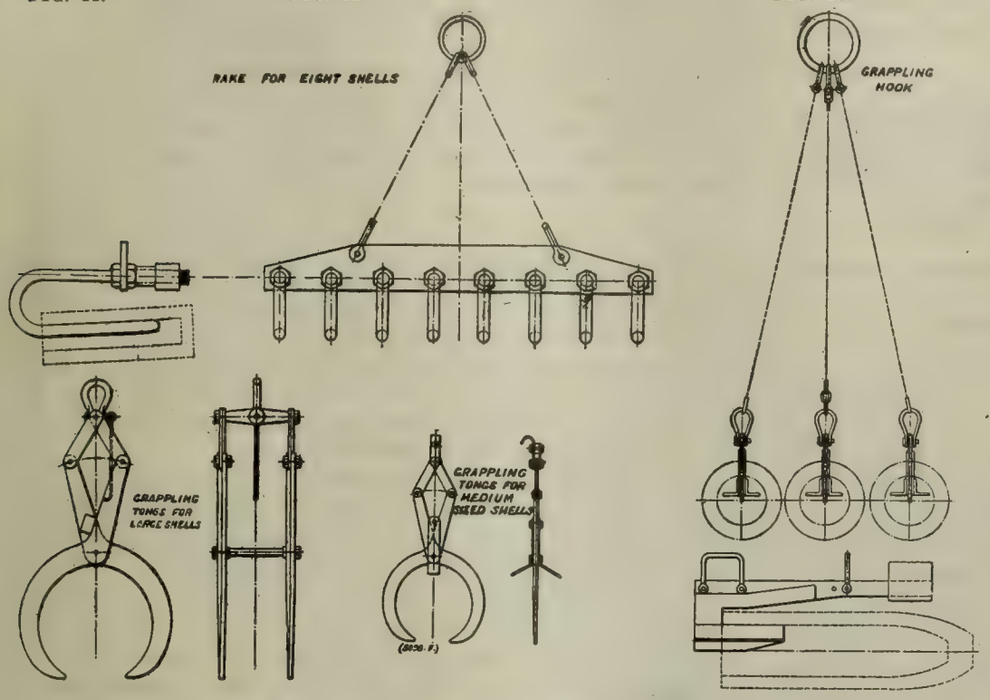


FIG. 15. FIG. 16. FIG. 17. FIG. 18. FIG. 14.

MACHINERY HALL EXHIBITS AT CANADIAN NATIONAL EXHIBITION, 1917.

INDUSTRIAL tendencies are noticeably evident in the character of the exhibits displayed. Established manufacturers and dealers in machine tools are ably represented, while the development of efficiency and scientific equipment, as represented by anti-friction devices, heat treating apparatus, and small tools is well sustained by the displays arranged by the exhibitors in these lines. More detailed descriptions of outstanding exhibits will appear in due course.

L'Air Liquide Society, Toronto.—Exhibit of liquid air, transformer casing of welded sheet steel construction, oxy-acetylene welding apparatus and welded gas containers. Representative, A. M. McDougall.

Boiler Repair & Grate Bar Co., Toronto.—Firebrick linings and furnace equipment. Representatives, C. W. Andrews, A. H. Hetts.

Baines & Peckover, Toronto.—Display of high-speed steel, crucible, vanadium and cold rolled steel. Exhibit of concrete reinforcing material in course of application, and Feralun non-slipping stair treads. Representatives, C. R. Peckover, W. M. David, J. A. Steven, D. J. McSweeney, W. Goodwill, W. Miller.

Canada Machinery Corporation, Galt, Ont.—Comprehensive exhibit of machine tools and wood-working machines: 16-in. tool-room lathe, 18 in. and 32 in. by 12 ft. gapped lathe, 26 in. new type shaper, 42 in. revolving bed, 3 drum sander, No. 611 straight edging and jointing machine, No. 110 planer and matcher, No. 504 single end tenoning machine, No. 617 variety saw bench, No. 636 double mitre saw. Representatives, D. King, P. D. Burton, W. J. Irving, M. Preston, M. Blain.

Canadian Hoskins Co., Walkerville, Ont.—Special exhibit of Chromel heat-resisting castings; standard lines of electric, gas and oil furnaces, and Hoskin pyrometers. Representatives, Messrs. Freeman and Cunningham.

Canadian Ice Machine Co., Toronto.—Full line of refrigerating machinery and supplies. Representatives, C. H. Bower, C. E. Allison, C. M. Kirby, H. Diemler.

Carter Welding Co., Toronto.—Complete exhibit of Davis-Bournonville oxy-acetylene welding and cutting apparatus and machines, emergency outfits and supplies. Demonstrations of equipment in use. Representatives, H. W. Carter, P. Sorley, C. Steadman.

Chapman Double Ball Bearing Co., Toronto.—Transmission equipment, ball bearings and transfer trucks. Representatives, W. J. Murray, W. C. J. Hockin.

Cleveland Pneumatic Tool Co., Toronto. — In addition to display of Cleveland apparatus, hammers, drills, grinders, riveters, couplings, etc., show pneumatically operated wood-boring machinery for shipyard use. Representatives, C. D. Garner, H. F. Olrich, K. R. Friedley, Geo. W. Hall.

Climax Baler Co., Hamilton.—Waste paper baling machine. Representatives, H. Robinson, Melville Moore.

Geo. W. Cole Co., Toronto.—Steam specialties, including Cole boiler feeders, heaters, etc. Representative, Geo. W. Cole.

Cowan & Co., Galt, Ont.—Selected types of modern wood-working machinery. Representatives, W. Cowan, S. F. Barrows, W. C. Clark.

Canadian Automatic Wrench Co., Toronto.—Pipe wrenches, etc.

Consumers' Gas Co., Toronto.—Display of gas-fired furnaces and industrial equipment of all kinds.

Canadian S K F Co., Ltd.—Ball bearing transmission equipment, with demonstration line shaft in operation, showing self-aligning features of product. Representatives, Gordon Janes, Toronto, and A. G. Norris, transmission expert from Hartford, U.S.A., factory.

Dominion Belting Co., Hamilton, Ont.—Display of stitched cotton duck belting, Maple Leaf brand, for power transmission and conveyor equipment. Belt dressing and accessories. Representative, J. Scott.

Dodge Mfg. Co., Toronto.—Dodge wood pulleys, shaftings, bearings, hangers, and other transmission equipment. Representatives, T. F. Gary, J. F. Haas.

Elliot Wood Worker, Toronto.—Elliot combination woodworker, floor sander, scroll saw and shaper. Representatives, W. A. Elliot, Frank Elliot.

Deloro Smelting and Refining Co., Toronto.—Exhibit of Stellite cutting tools and Champion tool holders, expanding mandrils, vises and shop equipment. Representatives, H. Southworth, W. Kitts, and J. Z. Wells, of Western Tool & Mfg. Co., Springfield.

Foster, W. L., Toronto.—Carbonic system of oxy-acetylene lighting. Representatives, A. E. Haigh, M. V. O'Neill.

Garlock-Walker Machinery Co., Toronto.—Special lanter slide display of machine tool manufacture; 18 in. by 8 ft. Garlock-Walker lathe, Hepburn single bar shell boring lathe, Leisy-Patton screw machine, Racine hack saw, Thor pneumatic tools, and Falls feeding attachment for buzz planers. Machinery in operation. Representatives, W. Garlock, Jr., A. B. Walker.

Gravege Mfg. Co., Toronto.—Boiler cleaner, cutting compounds, belt dressings and engine room supplies. Representatives, W. J. Sanderson, John Morris.

Goodyear Tire & Rubber Co., Toronto.—Heavy duty belting for power transmission and conveyor purposes, extra service air hose, packing and similar supplies. Representatives, W. H. C. Crosby, R. F. Fox.

Hutchinson Woodworking and Contracting Co., Toronto.—Hutchinson woodworker in operation. Representative, A. D. Matthew.

Jones & Moore Electric Co., Toronto.—Electric motors and generators.

McLaren, D. K., Ltd., Montreal. — Leather, balata and canvas belting for transmission and conveyor purposes, woolen and knitting mill supplies. Representative, W. S. Hamilton.

Main Belting Co. of Canada.—Leviathan and Anaconda belting for transmission, conveyor and elevator work. Representatives, S. R. Walsh, B. Vogel.

Morrison, J. L., Toronto.—Bookbinders' and paper machinery. Representatives, D. Brown, W. Duncan, C. Leake.

Positive Clutch & Pulley Works, Aurora, Ont.—Power transmission equipment. Representatives, R. A. Fraser, Norman Beard, W. Crawford.

Pratt & Whitney Co., Toronto.—Display of Canadian-made fine tools, cutters, taps, shell tools and gauges. Representatives, J. Ferguson, J. T. Crowley, H. C. Thomas.

Shell-Bar, Boico Supply, Ltd., Toronto.—Boiler grates, gaskets, packing and engine room supplies. Representative, Mr. Downes.

Small Bros., Smith's Falls, Ont.—Evaporators and supplies for the maple sugar industry. Representative, Len Edmonds.

Phillips, V. O., & Sons.—Measuring pumps, feed crushers.

Toledo Scale Co., Toledo.—Scales.

United Shoe Machinery Co., Toronto.—Shoe machinery in operation.

Williams Machinery Co., A. R., Toronto.—Machine tools and shop equipment are displayed on a wide scale. Stationary and marine gasoline engines are also exhibited, while a special demonstration of Stellite tools is made on LeBlond lathes. Representatives, W. Branscombe, W. Hunter, E. Cronk.

Mrs. Exe.—Do you mind when your husband brings a friend home to dinner?

Mrs. Wye—No: what I mind is having a friend bring him home after dinner.

The temperance reformer was justly proud of having converted the biggest drunkard in the little town of P——, and induced him—he was the local grave-digger—to get on the platform and testify. This is how he did it: "My friends," he said. "I never thocht to stand upon this platform with the Provost on one side of me and Toon Clerk on th' ither side of me. I never thocht to tell ye that for a whole month I havena touched a drop of anything. I've saved enough to buy me a braw oak coffin wi' brass handles and brass nails, an' if I'm a teetotaller for anither month, I shall be wantin' it."

A Scotchman born and bred, Sir Henry Oliver, the new Deputy-Chief of the recently reorganized Admiralty, has a rare fund of Scotch stories.

One of the best concerns a certain beadle whose duty it was to show visitors over the remains of an old abbey, "somewhere beyond the Tweed."

On one occasion he had performed this service for a lady who, on leaving him at the churchyard gate, rewarded him only with barren thanks.

Whereupon the canny Scot remarked:

"Weel, my leddy, when ye gang hame, if ye fin' out that ye have lost your purse, ye maun recollect that ye hav'na had it oot here."

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Vol. XVIII. AUGUST 30, 1917 No. 9

RESTORING THE WORLD'S SHIPPING

IT has been said that we will win the war if we can successfully combat the submarine menace, but the latter, to all appearance, will only be accomplished by concentration on merchant shipbuilding. Without doubt a fair percentage of enemy submarines have been destroyed, trapped and captured, but these when assessed at their proper value are little more than incidentals in the whole big struggle for ultimate supremacy. The weekly report of vessel sinkings indicates only too clearly to which side the mass of the victims belong, and bears witness to the fact that nothing of worth-while effect has been devised, or at least is yet operative, that will deal the death-blow to the undersea boat activity.

Among men who have been watching the shipping situation closely, there is a disposition to believe that we are not keeping pace with Germany's submarine construction and equipment development as we ought, particularly in the arming of our merchantmen. The steadiness or even lowering of the weekly sinking record is not in their estimation the real criterion; rather is it the apparent paucity in number of vessels that successfully resist submarine attack. It is believed that the power of offensive of Germany's U-boats has been materially increased as regards their gun equipment over that of our armed merchantmen; in consequence, not a little concern is evident lest the destruction waged by these pirate craft become immediately or in the early future still more intensified.

There is to-day less disposition to talk of shipbuilding achievement than there was a few months ago, it having been realized in the interval that suiting action to words is less easy than at first sight appears. It is estimated that the Allies began this year with 20,000,000 gross tons of merchant shipping. Britain's losses for the period elapsed are believed to be at the rate of 5,000,000 tons per annum, against which the total of 2,000,000 tons for the last completed year of the world's shipbuilding makes a rather unfavorable comparison, and seems to dispose of the possibility of the immense new construction programmes launched a while ago reaching anything like the figures aimed at.

Britain's best shipbuilding performance in pre-war days was around 2,000,000 tons per annum; nevertheless, Premier Lloyd George has promised that 4,000,000 tons will be produced this year. Again, stupendous figures of tonnage output are being credited as likely to come from the United States. In the minds of those in close touch with the shipbuilding industry, irrespective of its nationality location, and who are able to gauge with a substantial degree of accuracy the whole situation with its myriad accessory disabilities, the opinion exists that in the coming year a deficit of 5,000,000 tons of shipping will have to be made good, and that its detail participation by the Allies will call for 2,000,000 tons from Great Britain, 1,500,000 tons from the United States, and a like total from France, Italy, and Japan combined. We consider even the foregoing a pretty tall order, and shall look forward expectantly to its fulfillment.

It is a good idea, however, to set a figure of achievement, if same be reasonably and judiciously determined, and be made the absolute minimum. Britain's four million tons for this year is to our mind a particularly rash estimate of her shipyard capacity, aside altogether from its being war-time; yet there is no disposition to believe that, although her achievement for the period is likely to be much under the figure quoted, her safety and that of the world's civilization will be jeopardized.

The transfer of skilled, semi-skilled, and unskilled labor, from munitions making, should both stimulate and accelerate new tonnage output in Canada, besides enabling metal-working plant executives to concentrate their attention more on what gives promise of being an industry both substantial as well as permanent in character. There is reason to believe that plans are being developed for a much enlarged shipbuilding effort in Eastern Canada in the coming months, the relief from shell-making admitting now of greater freedom of action. If we choose, shipbuilding, with its accessory industries, for the next decade in this Dominion may readily surpass in proportions the munitions activity of these past thirty months or more.

MUNITIONS MAKING FURTHER RESTRICTED

CURTAILMENT of Canada's shell industry is being accepted as immediately probable, although it would perhaps be more correct to say that its further enlarged restriction has become quite imminent. Needless to say, the conditions which have operated to bring about this latest development in our metal-working plant activities are in every sense satisfactory, thereby eliminating all opportunity to cavil at the action taken by the Imperial Munitions Board.

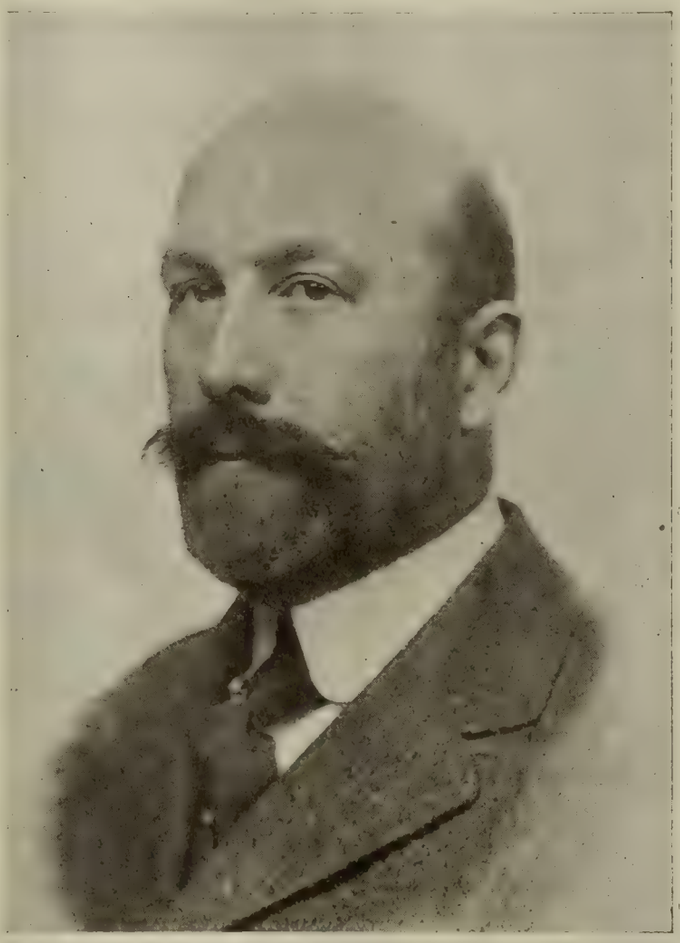
That the initiation and development of munitions making in Canada required the display of much administrative tact and foresight, and that each was forthcoming in generous measure, few will be found to dispute; but what of the final passing of the industry? It seems to us that to a still greater degree will the executive ability of our Munitions Board be taxed if our industries generally and our metal-working plants particularly are to be spared a succession of jars and jolts, and their operators be immune from even a moderately extended period of unemployment.

It is worth while noting that the inception of our shell industry was accomplished in the most unspectacular manner, and its subsequent growth to immense proportions was also so realized. Why not let its decline be equally unspectacular, and its final passing out of the least possible moment. Judging by the procedure being adopted by the Imperial Munitions Board, and the efforts of our manufacturers to co-operate with them as regards stopping the gaps created by taking hold of other lines of product, we are constrained to believe that the absolute minimum of business dislocation will ensue as shell-making disappears; in a word, it is more than possible that there will be no dislocation at all.

INDUSTRIAL NOTABILITIES

GEORGE DUNCAN DAVIE, general manager Davie Shipbuilding & Repairing Co., Ltd., Lauzon, Levis, Quebec, was born at Levis, August 19, 1873, son of George Taylor and Mary Elizabeth (Patton) Davie.

After being educated at Berthier Grammar School, Eleco, and Quebec High School, Mr. Davie started in 1890 with Carrier, Laine & Co., shipbuilders and engineers, of Levis, Que., where he learned the business and developed into



GEORGE DUNCAN DAVIE.

mechanical and salvage engineer, ultimately occupying the position of general manager to the Quebec Salvage & Wreckage Co., Ltd. In 1913, Geo. T. Davie & Sons sold their shipbuilding and repairing plant at Lauzon to the Davie Shipbuilding & Repairing Co., Mr. Davie continuing as general manager of that firm, which position he had previously with his own firm. Mr. Davie's ability is indicated by the fact that he was the recipient, in December, 1916, of a gold watch bearing the following inscription: "Presented by the Directors of the Submarine Boat Corporation, U.S.A., as a token of appreciation for the great energy shown by him in the construction of 325 80-foot motor launches for the British Admiralty at Lauzon, Levis, Que., during 1915 and 1916.

A study of shipbuilding methods on the Clyde and also in American yards has enabled Mr. Davie to impart a high degree of efficiency to his plant and practice, he being further a member of the Naval Architects' Institute of Great Britain.

Protestant in religion, Mr. Davie's society affiliations include I.O.O.F. and Royal Arcanum. His residence is Lauzon, Levis, Quebec.

—Photo, courtesy *International Press.*

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$46 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	53 95
Basic, Valley furnace	52 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	60 00

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 00
Tank plates, Pittsburgh	9 00
Structural shapes, Pittsburgh	4 00
Steel hoops, Pittsburgh	5 25
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 50

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22 1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$34 00	$34 00
Electro copper	34 00	34 00
Castings, copper	33 00	33 00
Tin	61 50	64 00
Spelter	10 50	11 00
Lead	13 50	13 00
Antimony	20 00	20 00
Aluminum	65 00	64 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$12 00	$12 00
Heads	12 30	12 30
Tank plates, 3-16 in.	12 65	12 25

WROUGHT PIPE.

Effective July 5, 1917.

Standard Buttweld. Size.	Black Per 100 feet	Galvanized Per 100 feet
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00

Standard Lapweld.		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$22 00	$22 00
Copper, crucible	25 00	27 00
Copper, heavy	25 00	25 50
Copper wire	25 00	25 50
No. 1 machine composition	20 00	22 00
New brass cuttings	16 00	19 00
No. 1 brass turnings	14 00	16 00
Light brass	12 00	10 50
Medium brass	16 00	16 00
Heavy brass	18 00	18 00
Heavy melting steel	21 00	17 00
Steel turnings	11 00	8 00
Shell turnings	12 00	12 00
Boiler plate	18 00	10 50
Axles, wrought iron	25 00	24 00
Rails	20 00	18 00
No. 1 machine cast iron	27 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	19 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	29 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	8 50
Stove plate	19 00	19 00
Scrap zinc	8 00	9 50
Heavy lead	11 00	10 75
Tea lead	7 00	7 00
Aluminum	35 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank,	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in and larger	$7 60
Structural rivets, as above.	7 50
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze.	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$ 80 00
Open-hearth billets	80 00
O.H. sheet bars	85 00
Forging billets	115 00
Wire rods	90 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS.

Solder, strictly	0 37
Solder, guaranteed	0 40
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 16
Putty, 100-lb. drum	4 35
White lead, pure, cwt.	19 00
Red dry lead, 100-lb. kegs, per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 61
Linseed oil, raw, single, bbls.	1 49
Linseed oil, boiled, single bbls.	1 52
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery Cloth	list plus 33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.37
British Manila Rope	.31
New Zealand Hemp	.31
Transmission rope, Manila	.43
Drilling cables, Manila	.39
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks	list plus 30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse ..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 50%; headers, 60; flanged unions, 40; malleable bushings, 50; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$11 00	$11 00
Sheets, black, No. 10	11 50	11 50
Canada plates, dull, 52 sheets	11 00	11 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	12 70
Premier, 10¾ oz.	13 85	13 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B	
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$13 05
Connelsville Foundry Coke	14 00
Steam Lump Coal	7 25
Best Slack	6 50

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$33 00	....
1¼ in.	36 00	....
1½ in.	38 00	32 00
1¾ in.	38 00	32 00
2 in.	45 00	33 00
2¼ in.	48 00	35 00
2½ in.	50 00	38 00
3 in.	58 00	45 00
3¼ in.	....	53 00
3½ in.	70 00	55 00
4 in.	82 00	67 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 75
Leather in sides	1 60

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x2S in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THE outstanding feature this week is the official announcement that the production of munitions will be considerably reduced. For some time past there has been a steady reduction in output, but now a further restriction is advised. Such a situation was expected and an effort will doubtless be made by the firms affected to readjust their affairs to meet the new conditions. One beneficial result will be to increase the tonnage of steel available for domestic purposes and thereby help to relieve the shortage which has prevailed for some time. On account of the embargo on steel from the United States the situation has become serious, but hopes are entertained that some way out of the difficulty will be found. The matter is at present engaging the attention of the authorities at Ottawa and Washington. Prices of steel products continue stationary, but the market has a weaker tendency and some shading of prices is possible in the near future. A pronounced recession in prices, however, is not likely in the meantime. The pig-iron market continues firm at unchanged prices. Business is quiet as consumers are holding off pending developments in the price-fixing situation. The output of coke continues limited, owing to labor shortage, and prices are still high as a result. The non-ferrous metal markets continue quiet and prices have a weaker tendency, copper and lead having declined. There is no change in the scrap metal market and prices continue stationary with a tendency to weakness. There is no change in the machine tool situation except that deliveries are getting more backward. There have been a number of advances in prices of machine shop supplies.

Montreal, Que., Aug. 27, 1917.—It is now almost a certainty that future operations in the production of all classes of munitions will shortly be curtailed in Canada, if this condition has not already developed. The recent announcement that the manufacture of the large shells would be discontinued was expected to be followed by a similar action in connection with the smaller sizes but it was not anticipated that this would materialize so soon. The action has been deemed advisable for two possible reasons, that of Britain being able to cope with the present requirements, and the necessity of Canadian funds to maintain the maximum activity in the new industry of shipbuilding. With the new developments will come a surplus of labor for the time being, at least, this is however, expected to be quickly taken care of by the necessities of shipbuilding.

Pig Iron

Like other markets, that of pig iron is unsettled owing to the uncertainty that dominates the situation due to the delayed announcement of the American authorities in connection with what the future war policy will be. regarding the price regulation and distribution of such materials as are now in urgent demand. It is interesting to note that after a considerable period in a stationary position, the tendency of this market is to lower levels, as indicated in the composite price of pig iron being now $51.86 per ton, a decline of $1 per ton on the high price of a few weeks ago. Canadian pig is very scarce and few quotations are available.

Steel

No material change is reported in the

general situation, as much uncertainty is still prevalent in all circles regarding the early future. In addition to the unsettled conditions arising out of the proposed adjustment of prices and the control of production and distribution, the market has been somewhat affected by the recent overtures for peace originating from Rome. No early negotiations are expected but the market is nevertheless influenced by these and other developments. Here in Canada the situation has taken a turn that will no doubt add to the past nervousness of the market, as it is almost certain that the production of munitions will be further curtailed, resulting eventually in placing on the market a number of men who have been employed in this industry. It is more than probable, however, that many of these will be quickly absorbed in other lines of activity, particularly that of shipbuilding and companion industries.

While the present announcement appears to indicate only a partial further reduction in the shell requirements it is at the moment uncertain to what extent this will be increased in he near future. It has been reported that the reason, or one of them, is that additional funds are necessary to finance the construction of the shipping that is and will be required. The production of small forgings has already been discontinued in some sections and this will shortly be followed by a corresponding decline in the manufacture of the finished product. This development in the steel situation will not however have much effect on price conditions as little of the present output can be changed over to other requirements. The bar and small shape market may experience some relief owing to the change, as the mills in Canada may be able to increase production on these lines.

The position in the States is becoming more acute as the demand for steel increases, but the market is still influenced by the uncertainty as to what the attitude of the Government will be in connection with the regulation of prices on the various materials. This adjustment may not be made on a basis of present production costs, as there is a possibility that some change may be made in the wages of labor before a decision is arrived at, as in some respects these are lower than living conditions warrant. The Pittsburgh quotations on billets and wire rods has been subjected to a decline of $5 per ton, the present prices being $80 and $90 respectively. The base price on refined iron rods has been reduced to 4¾ cents per lb., a decline on the week of $10 per ton. In some of the American markets the quotation on iron and steel bars has been advanced approximately 50 cents per ton. All markets are generally unchanged with a steady demand. The Canadian situation is virtually the same with the exception of the shell industry which is undoubtedly declining. One local dealer is figuring on an order for 2000 tons of plates for the Imperial Munitions Board for the construction of boilers for wooden vessels now under construction and others are contemplated. Local conditions are unchanged with prices comparatively firm.

Metals

The metal market is still affected by the political situation in the States and active buying is practically at a standstill with the exception of what may be required for immediate needs. Investigation is still proceeding into the cost of production but no definite announcement has been made as to the possible prices that will be set for the various commodities. This inaction is having the tendency to create or rather maintain an uncertainty that is reflected in a general dullness throughout the markets. Copper is quieter and also easier. Tin is in less demand and weaker. Spelter is very dull and lower. Lead is firm but with an undertone of weakness. Antimony and aluminum are both comparatively quiet and unchanged.

Copper.—Nothing has as yet developed to relieve the tension of the market and provide a basis on which the trade can resume normal activity. Many rumors are current as to what the intentions of the American Government are in connection with the setting of prices but nothing definite has been officially announced and the entire situation is one of decided uncertainty. Under these conditions consumers are taking no active interest in the market and buying is only for immediate requirements. Responding to rumors that the regulation price would be lower than previously anticipated, the American market weakened during the week, the decline being 1½ cents on lake, ¾ cent on electro and ½ cent on castings, the quotations being 28 cents, 26½ cents and 26 cents respectively. The London market is easier by £5 per ton. The local situation is featureless with quotations firm at 34 cents for lake and electro, and 33 cents for castings.

Tin.—The tin situation has been more or less affected by delayed cable reports, but the present tendency appears to be towards a weaker market. Buying is close to normal but no special activity is reported or expected until some announcement is made regarding the price that the American Government may fix for fixture trading. The latest reports from London indicate an easier situation and New York has declined ⅞ cent during the week. The local market is not active but business is steady. Prices however are easier on a decline of ½ cent per lb., the week's quotation being 61½ cents per lb.

Spelter.—The market in this metal is comparatively speaking unchanged, and no immediate prospect of improvement is looked for. The feature of the situation, which has been the influencing factor for several months, has been the total absence of export demand, and it is not thought that any material change will be noted in the situation in the States or Canada until this demand is resumed. Following the continued dullness, the situation in the New York market has developed an easier tone, a decline of ¼ cent placing the nominal quotation at 8¼ cents per lb. Dealers here report a dull market with prices easier, on a decline of ½ cent, quotations are 10½ cents per lb.

Lead.—This market is still influenced by the political situation and the delay in the action of the American Government in fixing and announcing their decision regarding the price regulations that are expected to control future business. Producers are content to await developments before further adjustment of prices as their present output is well taken care of. Under these conditions the New York market is relatively steady with prices quoted at 11 cents per pound. Independents are however, endeavoring to increase the demand and have lowered their prices ¼ cent per lb., the present quotation being 10⅝ cents per lb. Prices are firm locally but with an undertone of weakness.

Antimony. — No improvement has developed in this market and the absence of any marked demand has created an easier tendency which is reflected in a drop on the New York quotation of ⅛ cent per lb., the prices this week being 15¼ cents per lb. The local market is steady and unchanged at 20 cents per lb.

Aluminum.—The demand continues steady with an undertone of weakness. The situation here is quiet with prices firm at 65 cents per lb.

Machine Tools and Supplies

The situation this week has been the quietest that the market has experienced for some time and with the exception of light inquiry for general equipment the demand is very listless. The possibility that munitions manufacture is nearing the closing stages, or at least is showing a great falling off in general production, makes it very unlikely that much additional equipment will be required for shell making purposes. What little business is passing is generally for such machinery as will be used for ship and accessory construction, and additions to repair plants. The activity in the States continues to be the feature of present situation, as every plant is working to near capacity in

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

meeting the requirements of the abnormal situation. No appreciable decline is noted in the demand for supplies, but it is anticipated that the near future may see a falling off in this connection. Prices continue to hold firm despite the future prospect.

Scrap

Activity in old metals has been somewhat halted by the United States embargo which has had the tendency to create easier prices but to increase the difficulty of securing material. The New York situation has experienced a set-back owing to recent developments, and the market is weaker in nearly all lines. Iron and steel scraps in the Pittsburgh district are from $2 to $5 lower per ton; heavy melting steel and No. 1 wrought iron being featured at the latter figure. The local situation has not yet been seriously affected by the recent developments but dealers are anxiously watching the trend of the market; with the exception of coppers, the market here is well maintained. Old coppers have declined one cent on the week, the local prices being 22 cents for light and 25 cents for crucible and heavy.

Toronto, Ont., August 28.—Although the decline in activity in the munitions industry has been obvious for some weeks the official statement recently issued has brought the matter to a climax. The fact that production has been steadily declining for some time, and that there are still some contracts to complete, will not disorganize conditions in the industry to the some extent as if the stoppage had been more sudden. Some firms have already turned their attention to other classes of work which will help to relieve the situation. Such a situation as now prevails has been anticipated and there has been time to make such preparations to meet the new conditions. It is understood that the Dominion Government is making advances at the rate of $35,000,000 a month for munitions which will be continued until the end of the year, so the activity has not entirely ceased. An enormous sum of money has been expended in Canada in munitions. To date the Dominion Government has advanced to the Imperial Munitions Board for the purpose of munitions in Canada $285,000,000. In addition to this the chartered banks of Canada have advanced $100,000,000. For many months past the Government has been making advances at the rate of $25,000,000 monthly, and during July and August this has been increased to $35,000,000. The arrangement will be continued to the end of the year.

While strict economy in the use of coal has been advocated so that there will be less chance of a shortage this winter, there is some hope that prices will be kept within reasonable limits. The United States Government has fixed a price of $2 a ton on soft coal at the mines, which it is hoped will be reflected in lower prices in Canada. It is understood that prices of anthracite coal have also been fixed. The coal situation is thus improved and the outlook is brighter.

Steel

No definite progress has been made so far in regard to the adjustment of the embargo on steel from the United States. The matter has been taken up with the authorities at Ottawa, who in turn are negotiating with Washington, and it is hoped that some relief will be obtained. As the matter stands at present, a license has to be obtained from Washington for each shipment, which entails a great deal of trouble and delay, and even then a permit may not be issued. The steel merchants are in a difficult position at present, for when booking an order they never know whether they can obtain the material or not, which often results in disappointment to customers. The decline in the production of shells will likely release considerable steel for other purposes for domestic use, although no official statement has as yet been made in regard to this matter. It is possible that some shell steel will still be exported, but even if this is the case there is little doubt but that there will be a considerable increase in available tonnage for domestic purposes. The marked increase in business of a general nature during the past year has resulted in a material improvement in demand for steel. Considerable of this demand has not been filled as the steel companies have been too busy on war orders.

With the decline in the munitions orders the mills will be in a better position to look after their domestic business and a much easier situation should result. The Steel Company of Canada have already closed down their bar mill at Hamilton, which had been rolling shrapnel bars, and the Nova Scotia Steel & Coal Co., have discontinued making shrapnel forgings. The increase in tonnage now available will help to relieve the shortage in some steel products such as bars and small shapes rendered more acute by the embargo on steel from the United States. The supply of plates, sheets and large structural shapes will, however, not be increased and semi-finished material such as billets and wire rods will still be in short supply. There have been no further developments in regard to prices and the market continues stationary. Recent developments in the trade will tend, however, to further weaken prices, although no pronounced recession is likely in the meantime. The situation is intensely interesting and it is difficult to tell what will happen with any degree of certainty. Developments at Washington are being followed closely, no official statement having as yet been issued with regard to prices of steel.

Prices of black sheets are showing a weaker tendency, although no changes have as yet been made from current quotations. The market is dull as consumers are not placing orders to any important extent as they are looking for lower prices. Nearly all the new business in the U.S. is coming from the Government, leaving comparatively little tonnage available for private consumers.

In the United States, Government buying continues to dominate the market. There is very little new demand for finished steel of any kind because of the uncertainty as to what action the authorities will take in regard to steel prices. It is generally expected that another big loss in unfilled tonnages will be shown for August owing to the tendency of consumers to hold off on their orders. An improvement in the market is expected as soon as the Government price-fixing has been settled. Prices continue to show a weak tendency, billets have again declined while steel bars and shapes are a shade lower at Pittsburgh.

Pig Iron

Locally there is no material change in the pig iron situation, although the embargo on American iron is causing considerable inconvenience and is tending to stiffen prices. There is very little domestic foundry iron available except on contracts, as the furnaces are booked up for the remainder of this year. In the States the market is quiet, but increased activity is looked for as soon as the policy of the government with regard to price fixing is determined.

Scrap

The market continues dull and prices generally are weaker in sympathy with the declining tendency of the new metals. There have been no price changes this week, although a decline in copper and brass scrap is anticipated. Cast iron scrap continues firm at unchanged prices, while steel scrap is also holding steady. The reduction in output of munitions means a falling off in supply of shell turnings which will tend to stiffen prices on this material. Consumers continue to keep out of the market in anticipation of lower prices.

Machine Tools

The reduction in munitions orders will not materially affect the machine tool trade, any more than was anticipated, as buying of this class of equipment has for some time been comparatively negli-

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MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

gible. There will be considerable second hand equipment thrown on the market, but this was expected and is the natural result of conditions surrounding the industry. Some of this equipment, except special tools will doubtless be utilized for other purposes, but even so there will be no scarcity of second-hand tools for some time to come. Those firms who have turned their attention to other forms of activity will help in the general readjustment and so relieve the labor situation. The principal demand now is for a heavier class of tool and a fair business is being done. The increased activity in the States is making it more difficult to obtain equipment from that country and deliveries are consequently getting more backward.

Supplies

Notwithstanding the fact that prices of iron, steel and metals are weaker, machine shop and mill supplies continue to show an upward tendency. The reason is doubtless due to the fact that there is still a shortage of raw materials and that supplies and small tools, etc., are still being made from high priced materials. The market is unsettled owing to the uncertain situation resulting from the falling off of munitions contracts. There has been during the past few weeks a decline in the volume of business as a result of decreased activity in munition plants. All transmission equipment has advanced in price; the change in discount on wood pulleys was mentioned last week. The Fairbanks Co. have withdrawn all prices on brass and iron valves. Wire rope thimbles have advanced 10 per cent. Higher prices have been made effective on malleable fittings and bushings. New prices that have been issued on plunger leathers, valve leathers and cup plungers provide for an increase of 12½ per cent. No. 1 plunger leathers are now quoted at $1.45 per doz., No. 2 at $1.65 per doz., and No. 3 at $2 per doz. In valve leathers No. 1 is quoted at $1.45 per doz., No. 2 at $1.65, and No. 3 at $2 per doz. Cup plunger leathers, 2½ in., are quoted at $1.85 per doz.; 3 in., at $2.35, and 3½ in. at $2.70 per doz. Solders have declined one cent a pound. Turpentine is up one cent a gallon, while linseed oil is also higher at $1.49 for raw and $1.52 for boiled oil.

Metals

The announcement relative to the falling off of munition contracts has created an unsettled feeling in the metal markets and the outlook consequently is somewhat uncertain. The effect of the decline in shell orders will not be serious, however, as general business has for some time been gradually increasing in volume and readjustment taking place more or less gradually. In spite of this it is hardly likely that business will be as active in the future as during the past two years or so, but if it does not go below the level of normal years it is as much as can be expected. Prices have a weak tendency and the outlook in this regard continues unsettled owing to lack of information as to what the American Government intends to do in regard to its price-fixing policy. Copper and lead have declined, otherwise prices are unchanged.

Copper.—The market is unsettled, and weaker owing to the uncertainty regarding the action of the U.S. Government. Consumers continue to show a lack of interest in the market and buying is in light volume in the meantime. Copper prices continue nominal and are quoted locally one cent lower than last week. Lake and electrolytic are now 34c. and castings 33c. per pound.

Tin.—There is nothing of interest to note in the tin market, which continues dull at unchanged prices. The tin committee at Washington have not yet made any announcement as to progress of plans for adjusting distribution of tin in the U.S. Local price, 64c. per pound.

AUXILIARY MACHINERY REQUIRED.

Tender forms and specifications have been received from D. H. Ross, Canadian Trade Commissioner, Melbourne, for supply and delivery of auxiliary machinery for the Flinders naval base, via Melbourne, Victoria, and are open for inspection at the Department of Trade and Commerce, Ottawa (refer to File No. A-1901). Tenders addressed to the Director of Navy Contracts, Navy Office, Melbourne, close on October 24, 1917. The particulars are as follows:

Two electrically-driven air pumps, with complete set spare parts.

One steam driven air pump, with complete set of spare parts.

Two small circulating pumps.

One large circulating pump.

One large feed pump, with complete set of spare parts.

One small feed pump, with complete set of spare parts.

One oil fuel pump with complete set of spare parts.

Lead.—The situation in the lead market is unchanged and business is held back by the general feeling of uncertainty in regard to prices. The fact that American Government purchases for the last two months have been at 8c. a pound, while the outside market has ranged around 11c., has a deterring effect. Those consumers who can hold off are doing so, and those who must buy limit their requirements to the barest necessities. Lead has declined locally and is now being quoted at 13c. per pound.

Antimony.—No improvement is noted in the demand for antimony, which has been quiet for some time. The market, however, shows no sign of weakness and quotations are unchanged at 20c. per pound.

Aluminum.—Little interest is being shown in the market which has weakened although quotations are unchanged at 60c. per pound.

Spelter.—The market is a little firmer owing to some improvement in demand, but prices are unchanged at 11c. per pound.

New York, Aug. 27.—Manufacturers of machinery have received contracts, amounting to several million dollars, from concerns that have been awarded additional orders for war munitions by the United States Government. Additional contracts for machine tools and for cranes calling for the expenditure of $3,000,000 are pending, most of which will probably be closed before Sept. 1.

The Ordnance Bureau of the War Department, which has been quietly perfecting plans for the rapid building of big guns in the United States outside of the plants of the Bethlehem and Midvale Steel companies, which have long manufactured heavy ordnance, has completed satisfactory arrangements by which large forgings will be made by forging and casting shops at Columbus and Cleveland, Ohio, and at Pittsburgh, Pa., as well as at Tacony, Pa. These forge shops have been installing additional machinery and work on Government contracts will begin early in September. The plan is to have the gun forgings machined at various plants, the selection of which was noted last week. The American Radiator Co., which is now equipping a plant at Bayonne, New Jersey, has been added to the list previously given. The 3, 6 and 9.5-inch guns to be manufactured are designed for equipping the United States army in France. The Bullard Machine Tool Co., which will machine some of these forgings, has just placed a contract for ten 10-ton cranes, and the American Radiator Co. has ordered several hundred thousand dollars worth of shop equipment.

Other manufacturers who have received Government contracts are buying machinery as rapidly as the present condition of the market permits. Walter Scott & Co., of Plainfield, New Jersey, is receiving bids on 200 machines needed to manufacture gun carriages. The Wagner Electric Mfg. Co., St. Louis, and the American Car & Foundry Co., who will manufacture hubs for caisson and gun carriages, are buying shop equipment to execute these orders. The Wagner Co. is also to manufacture $3,000,000 worth of 8-inch shells and one thousand 4-inch guns for the Government. The Goss Printing Co. of Chicago has bought equipment in that market to manufacture sights for 4-inch guns. Stone & Webster are now buying $1,500,000 worth of tools through its Boston office, to equip the machine shop at the Rock Island Arsenal. The Poole Engineering & Machine Co., of Baltimore, and the Worcester Mfg. Co., of Worcester, Mass., are to manufacture one pound projectiles for the Navy Department. The Government has also placed orders with the Bausch & Lomb Optical Co. for periscopes and gun-sights, and with the Sperry Gyroscope Co., of Brooklyn, for

compasses, searchlights, and airplane apparatus. Both of these companies are now purchasing tools to execute Government contracts.

Increased activity is evident in the airplane industry. The Curtiss Aeroplane & Motor Corporation is buying $1,000,000 worth of machine tools for its Buffalo plant. This corporation is said to have orders for airplanes from the Government, amounting to $200,000,000. The Simplex Automobile Co., New Brunswick, New Jersey, a branch of the Wright-Martin Aircraft Corporation, has issued a list for 100 machines, and will probably buy 200 tools to manufacture airplane engines for the Government; the order received calls for the delivery of 50 engines per day.

The Quartermaster-General of the army has purchased a number of machine tools, including belt-driven hammers, forging and bolt machines, to equip motor and tractor repair shops in France. The Government is still buying travelling cranes for railroad shops and locomotive cranes for railroad construction in France through the Pennsylvania Co. and machine tools through the Phoenix Construction Co. French railroads also are buying 50 locomotive cranes. Agents of Australian manufacturing plants are placing orders for power and shop equipment.

Pittsburgh, Aug. 25.—It has been a week of rather interesting developments pertaining to the iron and steel trade, but unfortunately the developments are only interesting rather than conclusive. They do not tend to clarify the prospects of the market. Foremost was the fixing of coal prices by the Government at 50 cents a ton less than had been expected, and thus indicating that the Government has ideas of lower prices in general than had been surmised. Then there were declines of $5 a ton in billets and $2 a ton in Bessemer pig iron, maintaining the general declining tendency in raw and intermediate products. Offerings of plates appeared at lower prices and for earlier deliveries than formerly, while otherwise finished steel showed no distinct change. Finally, statistics leaked out indicating that the production of steel ingots in July was 6 per cent. greater than the average output in 1916, yet 11 per cent. under the capacity, as lately increased. The developments served to make the prospect still clearer that there is to be a general decline in the finished steel market, and perhaps a greater decline than had been expected; but there is no light on the question when the readjustment is to occur or how far it is to extend.

The Coal Price

The schedule of coal prices was announced August 22, prices varying in different districts, but except for the higher prices assigned to some far western districts, averaging approximately the Pittsburgh district prices, which are: $1.75 for slack, $2 for mine-run, and $2.25 for screened coal, per net ton at mine. The lowest forecast had been $2.50 for mine-run. The coal operators now speak as if they would have been content with a $2.50 price; but as it is, they have called a general meeting of soft coal operators all over the country, to be held in Pittsburgh August 27, evidently for the purpose of making representations to the Government that the price is too low. They are justified in this by the observation in the price announcement that the prices were tentative.

It is expected that coke prices will be announced shortly, perhaps within a fortnight, and if $2 stands as the Pittsburgh district coal price, the Connellsville coke price can hardly be over $4, as with their lower mining costs the Connellsville operators would fare well to be allowed $3 for the ton and a half of coal required to make a ton of coke, with $1 for conversion.

Pig Iron and Steel Easier

Resale offerings of Bessemer pig iron, arising chiefly from the export embargo, resulted in sales at not over $53, valley, when the furnace quotations, although practically nominal, had been $55. Billets that had been offered freely in the market were marked down $5 a ton, resulting in small sales of both Bessemer and open-hearth at $80, the top price last June having been $95 to $100. Sheet bars offered at $85 find no takers, although last June $105 was pair in several instances.

The blast furnaces have not marked down their quotations, chiefly because it would not help them to do so, as there is no disposition to buy at any price. They no longer advise their customers to purchase, and frankly admit that all the indications are for a decline.

The continued decline in billets and sheet bars is important only as illustrating a general trend in values, for at prices above $60 to $70 there have been no purchases except in small lots, by consumers peculiarly situated. The regular consumers receive their steel on long term contracts, the settling price at present being probably in the neighborhood of $60.

Finished Steel

There are reports of several offerings of plate down to 8.00c, and for earlier deliveries than mills formerly admitted were possible, while until now the plate market has been described strong at 9.00c to 10.00c. Doubtless the offerings arose through the shutting off of exports by the embargo. The common report has been that the embargo on shipbuilding material was established for the purpose of making an arrangement with Japan whereby that country would receive material already ordered in return for sending some ships to engage in the transatlantic trade, but whether designedly or otherwise, the embargo is softening the market.

A curious fact is that while domestic demand for sheets has dropped to almost nothing, buyers being committed to a policy of waiting for lower prices, foreign buyers are bidding as eagerly as ever, and sales have been made for both Japan and South America at 9.25c, and perhaps even higher. Some of the mills have two months or more of unsold capacity to the end of the year, but they are not reducing quotations.

Government Buying

A fortnight ago the Government distributed orders for 6,000 standard gauge freight cars, and 2,997 narrow gauge cars for its operations in France, and 3,000 standard gauge cars have now been added to the orders, while 5,000 more are under advisement. The interesting statement is made by steel producers that an absolute price has been agreed upon for the steel involved, but no information is vouchsafed as to what the price is, apart from the observation that it is "satisfactory." Prices on steel for the merchant ships are still to be arranged. The mills are less opposed than formerly to the Government's proposal of 2.90c for plates, and 2.50c for shapes and bars.

A careful summary indicates that the Government purchases up to date do not indicate that as much as 15 per cent. of the capacity will be engaged at any time, but when the shipbuilding program is in full operation the total may possibly be a trifle more than 15 per cent., and any large buying of shell would effect a slight further increase. The increase in capacity over the average of last year is more than 15 per cent. Accordingly, the statement may be made that the full steel making capacity will be engaged next year provided domestic consumption is as great as in 1916, that the Government absorbs steel equal to the increase in capacity, and that the purchases of the European Allies are as great as they were in 1916. As to the last named item, there has been practically no buying at all to date, while as to the first, it seems altogether improbable that domestic consumption will not decrease.

FLAX INDUSTRY HAS BEEN REVIVED

Dominion Government officials report a great revival in the industry throughout Canada. Fifty years ago flax was a very important crop on many farms and there were about 100 mills in Ontario turning the plant into articles of commerce.

The new generation of farmers drifted into other lines of production when foreign competition became too keen and when war was declared three years ago there were at best six or seven mills in Ontario. War, however, has put the industry back on its feet in Canada and in addition to a tremendous acreage in the West Ontario farmers have planted 8,000 acres to the crop this year. As a result it is expected that there will be between thirty and forty flax mills in operation in this province next winter.

In order to give both the agricultural and industrial side of the industry every encouragement the Government has established an experimental flax mill at Ottawa, where experts are testing it.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Swift Current, Sask.—The Imperial Oil Co., will erect a distributing plant here.

Toronto, Ont.—The Cluff Mfg. Co., are rebuilding their factory on Sterling road.

Toronto, Ont.—The Willys-Overland Co., will build a new machine shop at their factory on Weston Road.

Vancouver, B.C.—The Pacific Metal & Galvanizing Co., Seattle, Wash., proposes to establish a plant at Vancouver, B.C., to cost $35,000. Henry Gray is secretary.

Toronto, Ont.—Gunns Ltd., will make alterations to their abattoir at West Toronto, at a cost of $12,000. The John V. Gray Construction Co., of Toronto are the general contractors.

Shawinigan Falls, Que.—The Shawinigan Water & Power Co. is preparing designs for a 5000 ft. clear conductor span for the transmission of electric energy over the St. Lawrence River at Three Rivers, Que., which will supplement the submarine cable transmission line already installed. Each of the steel towers on which the line will rest at the extreme ends of this long span will have a concrete base, set some little distance from the bank of the river. The towers will be 350 ft. high, so as to provide a clearance of 160 ft. in the centre of the span. The three conductors will be placed approximately 50 ft. apart. The transmission line will not be anchored to but merely supported by the towers and anchored to concrete blocks situated some distance to the rear of the towers.

ELECTRICAL

Waterloo, Ont.—Representatives of the Hydro-Electric Commission have been in this district inspecting electric threshing outfits on three farms in Waterloo County. Steps will be taken to develop hydro power more extensively for this purpose.

MUNICIPAL

Kingsville, Ont.—The Town Council contemplated installing a pumping plant.

London, Ont.—The Board of Control will call tenders shortly for sludge pumps for East End sewage disposal works.

Portage la Prairie, Man.—The Town Council contemplates installation of one 100 h.p. boiler with mechanical stoker costing about $5,000, for electric station.

Winnipeg, Man.—Tenders for rubber boots and rubber hose for the fire department have been opened by the Board of Control and referred to J. E. Buchanan, Fire Chief, for tabulation and report.

Woodstock, Ont.—The Town Council will install a filtration plant and build an addition to the pumping station. Tenders have been called for the above and also for a boiler and pumping equipment.

Rosthern, Sask.—The Town Council will build an electric light plant and will instal oil engines and electrical equipment. Tenders must be in by Sept. 1. Full particulars may be obtained from K. A. Reeder, town clerk.

London, Ont.—The Board of Control decided not to purchase a motor fire engine, as suggested by the Underwriters' Association, owing to the cost ($8,000) being too high. The city will retain the present fire engine and buy a motor ladder truck.

Winnipeg, Man.—One hundred and fifty tons of reinforcing steel is to be purchased by the city for the big extension being carried out at its electric plant at Point du Bois. On account of the embargo on steel by the United States, the Board of Control, on the recommendation of J. G. Glassco, have decided to call for tenders returnable in one week.

Montreal, Que.—In a report signed by Messrs. H. E. Vautelet and A. St. Laurent, consulting enginers, the Board of Control is advised that the city proceed with the hydraulic development of the aqueduct along the lines suggested by them in Scheme 2 of their original report; they also recommend that the foundation of the power house be built as early as possible to insure the water supply of the city, while it is also suggested that the balance of the work be proceeded with along the lines recommended by them as circumstances will allow.

GENERAL

Hamilton, Ont.—The American Can Co., will build an addition to their factory here to cost $125,000.

Guelph, Ont.—It is reported that a prominent oil concern have leased an extensive tract of land at Rockwood, near here, and that drilling will be commenced at once.

Montreal, Que.—Damage to to the extent of about $50,000 was done by fire on Aug. 20, in the establishment of H. Gray & Co., cotton waste and wipers, 25 Common street, the top floor being completely burned out.

Woodstock, Ont.—This city is to have a new factory before the winter. Ground has been broken adjoining the textile works and a factory to cost $40,000 will be erected, and when completed will be occupied by the Woodstock Cotton Spinning Co.

St. Lambert, Que.—The by-law covering the agreement between the town of St. Lambert and the Dominion Textile Co., providing for the establishment of a large manufacturing plant in that town has become operative without the necessity of a poll of the ratepayers. Under the terms of the agreement the town provides bonds to the amount of $95,000 which are to become the property of the company on the expiration of ten years if the company has carried out its agreement with the town. The company is also granted exemption from taxation on its works for a period of twenty years. The company is not compelled to begin construction for some time after the end of the war but there is a feeling that it will not wait long before taking some steps.

TENDERS

Hamilton, Ont.—Tenders are being received until September 4 by the engineer, E. R. Gray, for pumping equipment for Beach pumping station. The cost is estimated at $130,000.

Cobalt, Ont.—Tenders will be received up to Sept. 18, for the supply of material and labor necessary in the installation of a complete telephone system in the Town of Cobalt, and in part of the adjoining Township of Coleman. Further particulars will be furnished by R. L. O'Gorman, Town Clerk.

Sudbury, Ont.—Tenders will be receivde until noon September 4, for supplying material and constructing a reinforced concrete bridge in the Town of Sudbury. Approximately 470 cubic yards. Plans, specifications and other information may be obtained at the Town Clerk's office, Sudbury. W. J. Ross, Town Clerk.

Oakshella, Sask.—Tenders are required for the supply of material and constructing thirteen miles of bracket line, also placing two circuits on the Government lead on six-pin crossarms. For plans and specifications, apply to James Wiggins, secretary-treasurer, Last Chance Telephone Co., Oakshella, Sask.

Vancouver, B.C.—Tenders will be received by James Stuart, City Purchasing Agent, until September 4, for one automobile combination hose wagon and gasoline pump, with a capacity of not less than 750 gallons per minute at 120 pounds pump pressure. Parties tendering to supply their own specifications, blue prints or photographs.

Hatley Center, Que.—Tenders for the construction of a concrete bridge and making the necessary grade and fills at the Lowery Brook, 1½ miles east of North Hatley, on the Capelton Road,

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The Entire Plant, Power, Equipment and Buildings of THE NOVA SCOTIA CAR WORKS, Halifax, N.S.

PARTIAL LIST IRON TOOLS

1—8 Spindle Bertram Arch Bar Drill.
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2—No. 3 Bertram Double Axle Lathes.
1—42" Bertram Car Wheel Borer with Hub facing attachment and Crane.
1—1" Acme Triple Head Bolt Cutter.
1—1½" Acme 6 Spindle Nut Tapper.
2—Bertram Punches 30" throat capacity ¾" in ¾".
1—Bertram Punch 24" throat capacity 1" in 1".
1—Bertram Punch 18" throat capacity 1½" in 1".
1—C. M. C. Double End Punch and Shear, 18" throat, capacity 1" in 1" and shear 4" x 1".
2—C. M. C. Punches 18" throat capacity 1" in 1".
1 each 1", 1½" and 3" Ajax Bolt Headers.
1—1½" Acme Bolt Header.
1—No. 2 Williams & White Eye Bender.
1—3,000 lb. Morgan Double Frame Steam Hammer.
2—No. 23, 1 No. 26 and 1 No. 9 Williams & White Bulldozers.
40—Canadian Westinghouse Motors, from 3 to 75 H.P. for 3/60/550 V. Service.
Also Woodworking Machinery and a Steel Building, 300' long by 100' wide.
3—10 ton, 47 ft. Span, 3 Motor Electric Travelling Cranes for 3/60/550 V. Service.

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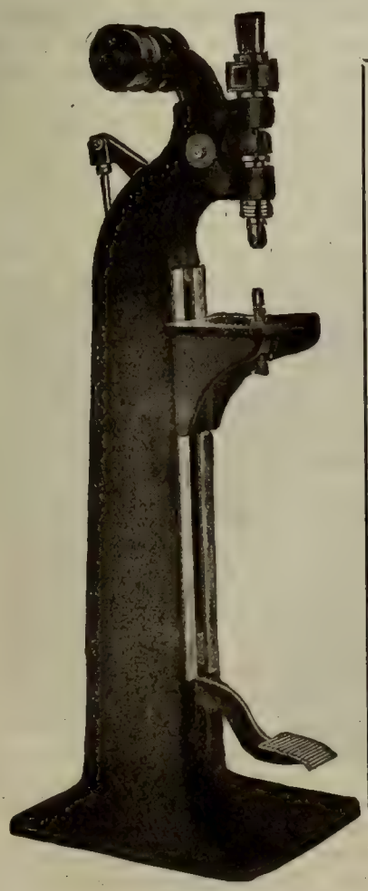

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One completed, perfectly finished rivet per second. That is the Grant speed. Not for a short time or a long time, but all the time. No hammer marks showing. Any degree of tightness or looseness desired. This great speed should materially reduce your operating cost and increase output.

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HIGH SPEED HAMMERS

For High Speed Work

FEATURES:

Our Bench Hammer can be adjusted high or low, and spells another economy in space and handy utility. With it you have a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushings are used throughout.

No riveting too intricate for us; no riveting which our machine cannot accomplish.

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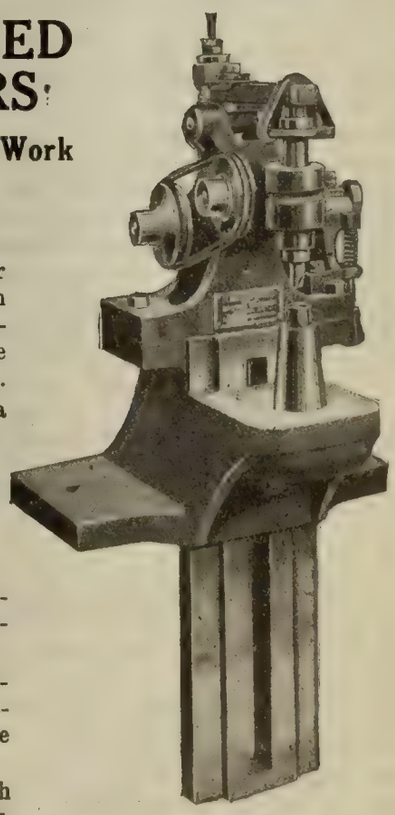

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will be received up to Sept. 4. Plans and specifications of this work may be seen at the office of the W. E. Greer, Secretary-Treasurer, Hatley Center, Que.

PERSONAL

Prof. J. C. McLennan of Toronto University, has been created an officer of the newly instituted Order of the British Empire.

George M. McLeod, one of the best known men in railway circles throughout Eastern Canada, died at St. John, N.B., on Aug. 21 aged 65 years.

Harry S. Burrell, owner and manager of the Burrell Rockdrill industry, Belleville, Ont., died last Sunday, after a brief illness. Deceased was 48 years of age.

E. C. Richardson, who has been connected with the St. Lawrence Welding Co., Montreal, has resigned from his position to join the United States forces for overseas service.

Dr. J. O. Orr, manager of the Canadian National Exhibition since 1903, died on Aug. 21 at his residence, 83 Spadina road, Toronto, of heart trouble. He had been in failing health for a long time.

Geo. A. Kingston, of Toronto, Ont., was elected vice-president of the International Association of Industrial Accident Boards and Commissions at the fourth annual convention held in Boston, Mass., last week.

Percy Wilkins, formerly chief inspector with the St. Lawrence Machinery Co., Montreal, has accepted a position with the St. Lawrence Welding Co., Montreal, and has been appointed secretary-treasurer of the company.

Charles Blair Gordon, Montreal, business man, former vice-president of the Imperial Munitions Board, and now representing the Imperial Munitions Ministry in the United States, has been made Knight Commander of the newly created Order of the British Empire.

Professor K. Birkeland of the University of Christiania, Norway, who died recently at Tokyo, Japan was the originator of the first successful process for the oxidation of atmospheric nitrogen by electric discharges. He was a member of the British Association and vice-president of the Faraday Society.

TRADE GOSSIP

To Promote Trade.—The British Government has appointed a Belgian Trade Committee to investigate the means of promoting trade and commerce between the British Empire and Belgium.

The Damp Bros. Welding Co., 848 Dupont street have established a plant for welding and cutting all kinds of metal by the oxy-acetylene process. This concern will specialize in welding broken parts of machinery and automobiles.

Potash From Waste.—The Curtis Bay Distilling Co., a Baltimore, Md., concern, is preparing to manufacture potash from waste material, and will utilize one of its recently closed down plants for that purpose. The company has developed a method of turning waste from the distillery into potash.

Rock Island, Que.—The board of directors of the Union Twist Drill Co. of Athol, Mass., were in town recently to visit their plant here. W. Putnam, Manchester, Mass., J. A. McGregor, L. L. Starrett and Simon Mackay of Athol, Mass., W. B. McKinnon, Arlin Ward and J. A. Druary of Boston constitute the board of Directors, and these gentlemen spent the day looking over the plant.

Ottawa, Ont.—Potash has been discovered at Muskoka Lake, Ont., and the Salts and Potash Co. of Canada (of Toronto) have been granted permission on the application of J. Ogle Carss, to divert water from the lake to extract the potash, and also to lease vacant Dominion lands abutting on Muskoka Lake in connection with the recovery and utilization of the potash and other minerals.

Acquire New Plant.—Owing to the increasing volume of business, the St. Lawrence Welding Co., of 138 Inspector Street, Montreal, have acquired a new plant at 39 Olier Street, where they intend to handle all their heavy work, a feature that is now a large portion of their general output. The shop at 138 Inspector Street will be retained to take care of small welding repairs. In addition to the new plant of 100 by 24 feet, a new section, 25 by 40 feet, has been built, to be used as a brass foundry, work in this portion to be commenced in the near future.

U. S. Shipbuilding Programme.—The United States Government's shipbuilding programme calls for a total of 1,270 ships of 7,968,000 tonnage, it was revealed last Friday in estimates the Shipbuilding Board has sent to Secretary of the Treasury McAdoo, on which to base a request for a new billion-dollar appropriation. This is in addition to nearly two million tons of shipping now building in American yards, which has been commandeered by the Emergency Fleet Corporation. A large part of the Government fleet and of the commandeered fleet will have been completed by the end of the fiscal year, June 30, 1918. Building, commandeering and purchase of vessels will total about two billion dollars.

Allies Purchasing Committee in U.S.—A report from Washington, D.C., states that the Allied purchasing committee in the United States is now a fact. The Allies have signed an agreement to make their purchases through the new war industries board. America's loans to the Allies will be protected against huge prices which heretofore, the Allies have been willing to pay with Uncle Sam's money in order to get badly-needed war materials. B. M. Barcus, Robert S. Lovett and R. S. Brookings of the war board will be actively in charge of the Allied purchases. Barcus and Brookings will handle raw material and finished supplies, respectively, while Lovatt will decide priority questions between the Allies.

Standard Wooden Ship Dimensions.—The wooden standard ship as adopted by the Canadian Government and of which a considerable number have been contracted for in British Columbia yards is dimensioned as follows: Length 250 feet, beam 43 feet 6 inches and depth 25 feet, with a deadweight capacity of 2,800 tons on a 21-foot draft. The vessels are considerably heavier in construction than the United States Shipping Board's standard wooden hull. They will be fitted with box girder keelsons, have a deep tank forward for water ballast and be propelled by triple expansion engines of about 950 horsepower. They will be constructed of Douglas fir and built to Lloyds' requirements for A1 classification.

Embargo on Sulphur by U. S. Government.—A report from Washington, D.C., states that sulphur classified with explosives is included in the list of commodities for which export licenses are required. No shipments will be licensed, officials said to-day, until Canada has presented complete estimates of the requirements of Dominion newsprint makers and of the needs of explosive factories. The impression was given by officials at Washington that while there is every desire that the newspaper industry suffer no embarrassments, war needs will be given first consideration and it was suggested that sulphur may be permitted to go to Canada in limited quantities only even after the issuing of licenses is resumed.

Dominion Government Orders Cars.—Hon. Frank Cochrane announced in the House, that the orders for rolling stock would include six thousand cars, four thousand of which would be required for the Government system. The remaining two thousand would be needed by the C.N.R., the Grand Trunk, and other companies. Coal shippers in the United States were now anxious to have their cars returned immediately, which meant they could not be used in Canada for carrying sand and gravel. The Minister said four thousand of the cars would be supplied by the Canada Car Company, one thousand by the Eastern Car Company, and one thousand by the National Car Company. Deliveries were to be made between October 1 and February 1.

Marine Insurance Increase.—In connection with increase in Washington insurance rates on estimate of ship values at $1,000 to $2.000 a ton gained currency in many newspapers. It is difficult to establish a foundation for such high estimates. The highest price paid for a vessel was $310 a deadweight ton. This vessel had oil-burning equipment and refrigerators, was modern in every respect and delivery was prompt. Average price at present is $250 a deadweight ton. Before the war a good price would have been about $65 a deadweight ton. The present market is considered enormous. and intimation that Washington is valuing ships at $2.000 a ton is regarded as absurd. At least, New York shipping men do not pay such

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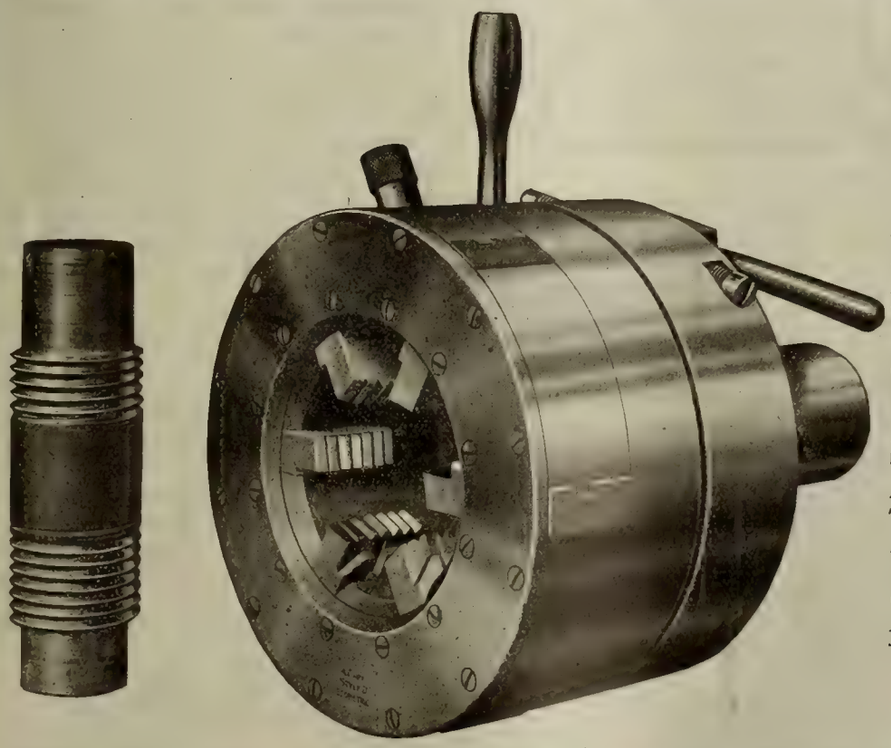
That is what it amounts to. Time is not the only thing saved, either. Geometrics are a saving proposition all around.

This Geometric Collapsing Tap is specially arranged for deep tapping in Projectile Caps.

All classes of thread tapping above ¾-inch diameter are taken care of by Geometric Collapsing Taps.

Twenty-five years of specializing in Screw Thread Cutting Tools has made the name GEOMETRIC stand for all that could be asked in Screw Thread Production.



When it is an outside thread, Geometric Die Heads cut every style from 1-16-inch size up to greatest required diameter.

A U.S. Navy Yard is using this 4½-inch size Style "D" Geometric Die Head. United States Navy Yards accept no second quality.

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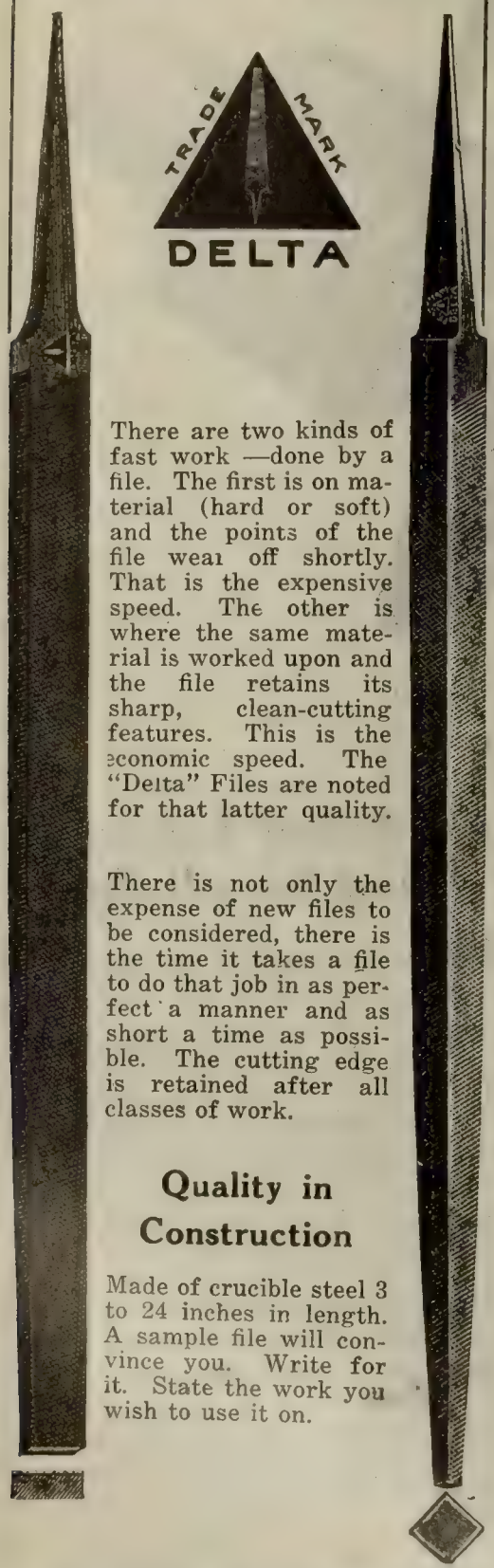

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There is not only the expense of new files to be considered, there is the time it takes a file to do that job in as perfect a manner and as short a time as possible. The cutting edge is retained after all classes of work.

Quality in Construction

Made of crucible steel 3 to 24 inches in length. A sample file will convince you. Write for it. State the work you wish to use it on.

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Wm. Stairs, Son & Morrow, Halifax
Merrick-Anderson Co., Winnipeg

Concrete Ship Built in Norway.—The first Norwegian iron and concrete boat has been launched at the Porsgrund Cement Works, Christiania in the presence of Prime Minister Knudsen. The boat is built entirely on a new system, with the bottom up, from which extraordinary position the launching took place. The underlying sledges glided out with the ship. When the water was reached the hull was detached from the sledges. It gradually sank to a certain point and slowly righted itself. This ship of 200 tons was built in three weeks, but the next will only require about half that time. The frame can be used with each subsequent ship of the same size. It is intended to start wholesale building of iron and concrete boats of from 200 to 500 to 1,000 tons. The last can be completed in six weeks.

Asbestos in Northern Quebec.—What promises to be more or less important discovery of high-grade asbestos has been made in the unsurveyed portion of Quebec, about twenty-five miles north east of Ville Marie, on the shores of Mackenzie Lake. A number of veins which are said to average about four feet in width, have been traced for a considerable distance, and have been found to contain asbestos of a similar grade to that which is being worked at the Slade Forbes property in the Porcupine district. The discovery was made in the latter part of June and efforts are being made by prominent citizens of Ville Marie to induce the Government to build a road into the district which at the present time is reached only by trail from Ville Marie via Lorraineville, from which point it is about eighteen miles to the scene of the discovery. Upwards of a dozen claims have been already staked, on all which it is said the showings on the mineral are very encouraging.

U. S. Company for Greaves-Etchells Furnace.—T. H. Watson & Co., Sheffield, England, who control the patents of the Greaves-Etchells Electric Furnace, announce the formation of an American company to handle the furnace business in the United States and Canada. The new company will be known as the Electric Furnace Construction Co., with head offices in the Finance Building, Philadelphia. The Greaves-Etchells furnace is well known in the Sheffield district, and other parts of England, and over thirty furnaces ranging in size from ¼ ton to 12 ½ tons capacity have been contracted for, including special Government equipments. Frank Hodson, a partner of the T. H. Watson & Co., is now in the United States arranging the details of the new company, and will act as its president. F. J. Ryan, who resigned as Eastern manager of the Snyder Electric Furnace Co. on June 1, will be general manager. The two inventors, Mr. Greaves and Mr. Etchells, will act in associate capacity to the company's technical staff and when necessary will take charge of actual installation.

BUILDING

Toronto, Ont.—The City Architect has issued to the Harris Abattoir Co. a permit for an addition to their cattle pens on St. Clair avenue, near Symes road, $15,000.

Kingston, Ont.—In the supplementary estimates recently tabled in the House at Ottawa $150,000 is included for the enlargement of the Educational Block of the Royal Military College, and $100,000 to complete the new dormitory at the R.M.C., by adding two wings.

New Toronto, Ont.—The town is to have an up-to-date moving picture theatre, which will accommodate 400 people, at a cost of $20,000, at the corner of Fifth street and Lake Shore road. C. J. Peart is the builder, and it is expected that the theatre will be opened before Christmas.

CONTRACTS

Toronto, Ont.—Wells & Newton of New York, have been awarded the plumbing and heating contract for the new Union Station.

Shawinigan Falls, Que.—Church, Ross & Co. of Montreal, have been awarded the contract for erecting a factory for the Canadian Aloxite Co., F. T. Tone is manager of this concern.

Pointe Claire, Que.—The Town Council have awarded a contract to the Turbine Equipment Co., Toronto, Ont. 2-motor driven De Laval single stage pumps, for the municipal filtration plant.

Weston, Ont.—A special meeting of the Town Council was held last Monday to open tenders for the heating of the Town Hall. There were four tenders, and the contract was awarded to George Keyes, of Weston, at a price of $1,795.

Oshawa, Ont.—The Turbine Equipment Co., Toronto, have secured a contract from the Town of Oshawa, for 2-De Laval single stage, motor driven centrifugal pumps, for the new filtration plant which is being constructed here.

Toronto, Ont.—A contract for the completion of the carpentry work at the new Park School was awarded by the Board of Education recently to William Williamson, whose tender was for $19,950. The work is to be completed by Jan. 10.

Dundas, Ont.—The Canadian Engineering & Contracting Co. of Hamilton has been awarded the contract for repairing the waterworks reservoir. The tender was $2,808, the lowest received. The work will be commenced in two weeks' time.

Brantford, Ont.—The City Council have awarded a contract to the Turbine Equipment Co., Toronto, for 2-De Laval single stage, motor driven pumps, for the booster pumping station. This is the second order within the last three years for De Laval pumps for this city.

Toronto, Ont.—The Board of Education has let the contracts for inter-departmental phones for the Regal Road and Strathcona Schools. The Regal

Road contract goes to the Canadian Electric Company at $896, and A. Rice, tendering at $620 was the successful bidder for the Strathcona School contract.

The Turbine Equipment Co., Toronto, have received an order for a 125 h.p. motor driven De Laval 2 stage pump, from the city of Belleville, Ont. This is the fourth De Laval unit purchased by this city.

Quebec, Que.—The C. P. R. has let contracts for additions to the Palais Station at Quebec, which will cost $50,000. The contractors are the Deakin Construction Co., and E. T. Byers, both of Montreal. It is the intention of the company to increase the terminal trackage very materially; but for immediate betterment the addition mentioned is to be undertaken at once.

John Watson & Son of Montreal, Ltd., Montreal, Que., have recently secured contracts for metal and architectural iron work for the following buildings. The new Toronto Terminal station; C.N.R. station at Montreal; American Can Co.'s factory, Montreal; Power house at Lennoxville, Que.; John Aird's bakery at Montreal; Consumers Cordage Co., Montreal, and the new office building for the greater Montreal Land & Investment Co.

The Turbine Equipment Co., Toronto, have recently secured the following contracts. One motor driven Multistage De Laval pump for operating against 400 feet head, for the mining corporation of Canada, Cobalt, Ont. A similar unit for operating against 450 feet head for the Casey-Cobalt Silver Mining Co., New Liskeard, Ont. Two De Laval steam turbine driven centrifugal pumps for the new Union Station, Toronto.

MARINE.

Kingston, Ont.—The Dominion Government has made an appropriation of $33,000 for the Kingston dry-dock for renewal of the revetment wall.

North Vancouver, B.C.—The Janet Carruthers, the fifth auxiliary schooner built in this province will leave soon on her maiden voyage to Australia with a cargo of lumber.

Port Arthur, Ont.—Private advices are that the Government has appropriated $130,000 for dredging at the new Saskatchewan Co-operative and Richardson elevators on the north water-front.

Cobourg, Ont.—It is understood that the Grand Trunk ferry dock here is to be rebuilt and that plans are already on hand for a covered dock to replace the one built here twelve years ago.

Three Rivers, Que.—Contracts for the building of two wooden ships have been given by the British Admiralty to the Three Rivers Shipyard, Ltd., at a cost of $900,000. It is expected that further contracts will be obtained for the company, and will provide a new industry for this city.

Victoria, B.C.—The Foundation Co. of British Columbia, Ltd., who have contracts from the Imperial Government for

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five wooden steamers, have completed all their preliminary work in the way of laying down their plant, and of the four keels already in place, one has a number of square frames set up.

Victoria, B.C.—The Whalen Pulp & Paper Co., which is engaged in establishing the largest industrial plant on Vancouver Island at the new town of Port Alice, near the head of the Southeast Arm of Quatsino Sound, will lay down two keels at a time and will keep on building ships until it has enough of them to handle its export trade.

Ottawa, Ont.—In the House on Saturday, a vote of $600,000 was discussed for two wooden ships of 3,500 tons each, to be built by the firms of Wallace & Harrison of Vancouver, at a cost of $230,000 each, the vessels to be equipped with Diesel oil engines. The item was allowed to stand over, because the shipbuilding firms had cancelled their tenders, and had offered to go ahead on a cost plus ten per cent. basis.

Vancouver, B.C. — The twin-screw motor vessel Chiralite built by the Taylor Engineering Co., for the International Petroleum Co., for service in Talara, Peru, was launched on Aug. 15. It is the present intention of the owners to have the Chiralite proceed to Peru under her own power, in charge of Captain Jones. The Chiralite was christened by Mrs. M. Rolston daughter of C. M. Rolston local manager of the Imperial Oil Co.

Midland, Ont. — Contracts for the buildings in connection with the McDougall-Smith Shipbuilding Co.'s plant in which Capt. Alex. McDougall, is interested will be let shortly. The size of the buildings are as follows. The carpentry shop will be 50 by 200 feet, two storeys in height. There will be two one-storey workshops, each 32 by 300 feet; a two-storey office building, 65 by 50 feet; a building in which will be rest rooms and other conveniences for the men, and a boiler house and oil house. All the structures will be of frame. It is intended to rush construction and have the plant ready for operation by late fall.

Vancouver, B.C.—The Canadian Fishing Co.'s newest vessel, the Tartoo, ran her trials on Aug. 16. This concern now has three boats, the Nesto, Tasso and the Tartoo, the last-named being the most modern and up-to-date type of seine craft. The Tartoo is 60 feet long, 15 feet beam and 5½ feet draft. A 50-horsepower gas engine gives the vessel a speed of ten miles per hour. The hold has a capacity of 10,000 sockeye salmon or its equivalent, 72,000 pounds. The boat was built by Ferrier & Lucas, costing about $9,200. The plans for this new vessel were furnished to the Royal Commission on Fisheries, which has suggested them for a standard seine craft.

Victoria, B.C.—With the launching of the Malahat, the fourth schooner to take the water from the Cameron-Genoa Mills Shipyard, Victoria, and the schooner Mabel Stewart from the Wallace Shipyard No. 2, North Vancouver, the fifth schooner to be launched for the latter concern, only three more vessels of this type remain to be launched by these yards under the present programme, two of which are nearing completion at the plant of the Cameron-Genoa Shipbuilders, Ltd., and the other being well along at the Wallace yard. After completing the fleet of twelve ships, all of which are of the auxiliary schooner class, and half of which were ordered here and half in North Vancouver, both of the yards mentioned will give all of their attention to the building of wooden steamers for the Imperial Munitions Board.

INCORPORATIONS

British Dyes, Ltd., have obtained an Ontario provincial license to carry on business as dyers and manufacturers of dyes and chemicals, with capital not to exceed $40,000. G. G. Thwaites, of Toronto, is the company's attorney.

The Smith Motor Truck Corporation has obtained an Ontario provincial license to manufacture motor cars and trucks in this province, with a capital not exceeding $40,000. M. A. Stratton, of Toronto, is the company's attorney.

The Three Rivers Shipyards, Ltd., has been incorporated at Ottawa, with a capital of $49,000, to build ships of all kinds at Three Rivers, Que. The incorporators are: T. M. Kirkwood, of Toronto, also A. Chouinard and L. Heyman, of Montreal.

Canadian Hession Tillers & Tractors, Ltd., has been incorporated at Ottawa by H. D. Petrie, T. Crompton and F. C. Petrie, all of Hamilton, to manufacture tillers, tractors and farm implements, at Hamilton, Ont., with a capital of $5,000,000.

Midland Shipbuilding Co. has been incorporated at Ottawa by Norman L. Playfair, Marcus Smith, and Thomas C. Luke, all of Midland, Ont., to carry on the business of shipbuilders in all its branches at Midland, Ont., with a capital of $1,000,000.

The Yamachiche Electric Light Co. has been incorporated at Ottawa with a capital of $100,000, to operate an electric light and power plant at Three Rivers, Que. The incorporators are: J. E. Marier, J. E. Cadotte and E. Cherette, all of Montreal.

Fruit Machinery Co. has been incorporated at Ottawa, with a capital of $40,000, to carry on the business of machinists and iron founders, and to build special machinery at Belleville, Ont. The incorporators are : R. J. Graham, of Sidney, Ont.; also G. K. Graham and J. Bone, both of Belleville, Ont.

The Graham Development & Contracting Co. is the name of a new company which has just been incorporated with a capitalization of $100,000, the head office to be situated in Fort William, Ont., the provisional directors being W. A. Dowler, K.C., A. H. Dowler and Edith Brown. This company has been organized for the purpose of conducting a general lumbering, mining, contracting, and prospecting business.

RAILWAYS—BRIDGES

Kincardine, Ont.—The Town Council have decided to call for new tenders for three bridges on Broadway and Durham streets.

Kincardine, Ont. — The Township Council of Kincardine will be put to an expense of about $14,000 this year for new bridges and culverts, to replace those washed out. It means an assessment of about $12 extra on every 100-acre farm. The Council will put it in this year's taxes.

BOOK REVIEW

Pulpwood Production. — One of the Canadian industries which has gone on increasing rapidly during war time is the production of pulpwood and the manufacture of pulp. The total quantity of wood manufactured into pulpwood in Canada in 1916 was over a million and three-quarter cords, as compared with one million four hundred thousand cords in 1915. The value of the pulpwood made into pulp in Canada and exported for making pulp abroad was nearly twenty million dollars. Very much more wood is now manufactured into pulp in Canada than is exported in the log form to be manufactured in other countries. A few years ago the reverse was the case. All the essential facts about the pulpwood and pulp industry in Canada in 1916 are shown in a bulletin issued by the Forestry Branch of the Department of the Interior. Copies of the same may be had free upon application for the "Pulpwood Bulletin for 1916" to the Director of Forestry, Ottawa.

CATALOGUES

Electric Travelers.—Catalogue No. 130, issued by the Whiting Foundry Equipment Co., Harvey, Ill., describes the various types of cranes built by this firm, showing the latest improved construction. While this catalogue deals chiefly with electric traveling cranes, a variety of other types are also featured, which includes cranes for every service. Crane trolleys, bridge trucks and other parts of the electric traveller are illustrated and described covering the principal features while details of other types of crane are also dealt with. A large number of excellent half tones show the several types of crane in operation featuring the wide field of application for this company's products. The concluding pages 74 to 79 are devoted to the Whiting line of foundry equipment and railroad specialties. The catalogue contains 81 pages and includes a list of some recent users of Whiting equipment.

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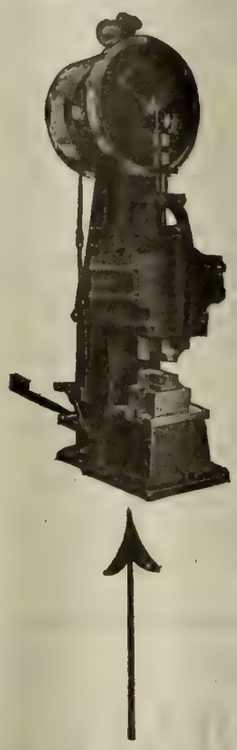
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FOR SALE—THE TORONTO ELECTRIC COMmissioners have for sale a quantity of second-hand 60-cycle meters and transformers recently in service, also quantity of electrical supplies. List of material and full particulars may be obtained on application to the Purchasing Agent, 15 Wilton Avenue. The quantities are not guaranteed, and all are subject to prior sale. No tender necessarily accepted. Toronto Hydro-Electric System, 226 Yonge St., Toronto. c7m

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New 16" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 15" x 7' Oliver Dbl. B.G., Q.C. Gear, Oil Pump and Pan.
New 16" x 24" x 10' South Bend Gap Sgl. B.G., Stan. Change Gears.
S.H. 17" x 8' Greaves Klusman Sgl. B.G., Geared Feed.
New, 18" x 8' Greaves Klusman Dbl. B.G., Geared Feed.
New 18" x 8' Giddings & Lewis Dbl. B.G., Geared Feed.
New 18" x 8' Stevens Sgl. B.G., Standard Change Gears.
New 18" x 8' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 18" x 10' Muller Sgl. B.G., Standard Change Gears.
New 18" x 12' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 20" x 10' Flather Sgl. B.G., Standard Change Gears.
S.H. 36" x 10' Fay & Scott Sgl. B.G., Stand. Change Gears.

HEAVY DUTY MANUFACTURING LATHES

New 20" x 8' Petrie Heavy Duty Manufacturing Lathes.

TURRET, SPEED AND BRASS LATHES SCREW MACHINES

New 13" x 7' Putman Speed Lathe.
S.H. 15" x 5' 6" Fox Brass Lathe with Chasing Attachment.
S.H. 30" x 10' Vilter Lathe, Friction B.G., Geared Feed with 18" Hex. Power Feed Turret.

DRILLS

New 20" Excelsior, Back Geared Wheel Lever, Power Feed.
New 20" Silver, Back Geared Wheel Lever Power Feed.
New 14" Leland Gifford Single Spindle Sensitive.
S.H. 14" Avey Spingle Spindle Sensitive.
S.H. 14" Foote-Burt Four.
New No. 1 Emco Bench Single.

HACK SAW MACHINES

New Peerless High Speed.
New No. 1 Rapid.

GRINDING AND BUFFING MACHINES

New 20" Ford Smith Water Tool Grinder.
New 18" Ford Smith S.O. General Purpose Pedestal Grinder.
New 16" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. Combination Grinder and Buffer.
New 12" Ford Smith S.O. Buffing Machine.

MISCELLANEOUS

S.H. No. 22 Garvin Vertical Milling Machine.
S.H. No. 0 Burke Hand Milling Machine.
New 1¼" National Bolt Cutter with Lead Screw Attachment.
New No. 1 Grabo Metal Saw Table.
New D4 Rock River Slitting Shear.
New No. 4 Chicago Steel Bending Brake.

Telegraph, Phone or Write for Prices and Further Particulars

H. W. PETRIE of MONTREAL
LIMITED
MONTREAL, QUEBEC

PETRIE'S LIST

Of New and Used Machine Tools Stock for IMMEDIATE DELIVERY

TURRET LATHES AND SCREW MACHINES

2" x 24" Stevens, flat type.
12" x 42" Foster, plain head.
15" x 5½' American, fox.
16" x 6' Pratt & Whitney, turret.
18" x 6' Prentice, high speed.
22" x 8' Pratt & Whitney.
24" x 10' Conradson, D.B.G.
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

13" x 6' Filssmith, D.B.G.
14" x 6' Lodge & Shipley.
15" x 8' Sebastian, back geared.
16" x 8' McDougall, back geared.
17" x 8' Blaisdell, back-geared.
18" x 6" New Haven.
18" x 10' Putnam, back-geared.
20" x 8' Fifield, back geared.
21" x 8' Bawden, heavy duty.
24" x 11' Pond, back-geared.
30" x 10' Ames, back geared.
31" x 16' Fifield, back-geared.
18" x 32" x 12' C.M.G. gap.
24" x 40" x 20' Dundas, gap.
28" x 50" x 24' Bertram, gap.

DRILLS

13" Perfect, 2-spindle.
14" Excelsior, sensitive.
16" Barr, sliding head.
18" Buffalo, post drill.
20" Perfect, lever feed.
20" Silver, back-geared.
22" Barnes, back-geared.
24" Kerkhoff, sliding head.
40" Bickford, back geared.
64" Canedy-Otto, wall radial.
No. 10a Baush, 16-spindle.
No. ½ Avey, ball-bearing, bench.

GRINDERS

No. 1 Wilmarth & Morman.
No. 1 Cincinnati, universal tool.
No. 2 Landis.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 14 Besly, with shell holder.
26" Gardner, disk.

IRON PLANERS

20" x 20" x 5' Bertram.
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Sellers, 4 heads.
40" x 40" x 12' New Haven, power feed.

MILLING MACHINES

No. 0 Burke, hand feed.
Bertram, plain.
Brown & Sharpe, power feed, plain.
Fitchburg, geared, plain.
No. 2 Ford-Smith.
No. 6 Whitney, hand feed.

SHAPERS.

16" Canada Mach. Corp.
16" Hendey.
16" Queen City, back geared.
20" Cincinnati, back geared.
24" Gould & Eberhardt.
30" Morton, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6" Robertson Hack Saws.
6" Kennedy Cutting-off Machine.
12" Hall Pipe Machine.
No. 2 Colburn Keyseater.
No. 5 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 2 Bliss Foot-power Press.
No. 3 West Tire Setter Banding Press.
Brown-Boggs Punching Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
7' Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.
FRONT STREET WEST, TORONTO

RIVERSIDE Machinery List

We Own Every Tool Offered

ENGINE LATHES

1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—28 x 15 Putnam Standard Engine Lathe.
1—22 x 14 Putnam Standard Engine Lathe.
1—22 x 10 Reed Standard Engine Lathe.
1—22 x 8 Reed Standard Engine Lathe.
3—New 18 x 8 Springfield Engine Lathes.
1—New 16 x 8 Springfield Engine Lathe.
1—New 14 x 6 Springfield Engine Lathe.
1—18 x 6 Jones & Lamson Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—16 x 8 Porter Standard Engine Lathe.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.
1—No. 3 Hartiarge Bench Lathe.

TURRET AND SCREW MACHINES

1—24" Gisholt Turret Lathe.
2—No. 6-A Potter & Johnson Automatic Lathes.
1—2¼ x 24 Jones & Lamson Flat Turret Lathe, S.G.H.
1—2 x 24 Jones & Lamson Flat Turret Lathe, cone head.
3—No. 4 Foster F.G.H. Hand Screw Machines.
1—No. 4 Smurr & Kamon Hand Screw Machine.
1—No. 5 Pierson F.G.H. Hand Screw Machine.
4—New 14" Pierce Turret Lathes.
2—New 1 x 8 Pierce Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND GRINDERS

1—No. 2 Hendey Plain Milling Machine.
3—New No. 1½ American Plain Milling Machines.
1—No. 13½ Garvin Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling & Drilling Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
4—No. 0 Burke Bench Millers (new).
1—No. 2½ Bath Universal Grinder.
1—No. 2 Wilmarth & Morman Surface Grinder.
1—No. 3 Wilmarth & Morman Surface Grinder.
1—Mina Valley Universal Cutter Grinder.
1—No. 170 Wells Cutter Grinder.

DRILL PRESSES

1—3' Mueller Plain Radial Drill.
1—6' Mueller Plain Radial Drill, old type.
1—20" Baker H.D. Drill.
5—20" Buffalo Plain Drill Presses.
1—3-spindle 8" overhang Henry & Wright High Speed Drill.
4—6-spindle Fox High Speed Drill Presses.
2—4-spindle Fox High Speed Drill Presses.
1—16-spindle Natco Drill.
3—12" Leland & Gifford High Speed Bench Drills.

SHAPERS AND PLANERS

1—24" Ohio H.D., B.G. Crank Shaper.
1—24" Lodge & Davis Geared Shaper.
1—24" Hendey Geared Shaper.
2—16" New Springfield B.G. Crank Shapers.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS.

1—Waterbury-Farrell O.B.I. Press, geared.
1—No. 10 Perkins Drawing Press.
5—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—50-lb. Scranton Belt Hammer.
1—25-lb. Pradley Helve Hammer.

AIR COMPRESSORS

1—16 x 18 x 12 Union Steam Pump Co., steam driven air compressor.
1—8 x 6 Westinghouse Steam Air Compressor.
1—10 x 10 Clayton Belt Driven Air Compressor.
1—8 x 8 Fairbanks-Morse Electrical Driven Air Compressor.
1—8 x 8 Gardner Single Belt Driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt Driven Air Compressor.
1—7½ x 6 Chicago Pneumatic Tool Co. Belt Driven Air Compressor.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machines tools both large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

Eastern Machinery & Equipment Co., Inc.

319 COMMERCIAL TRUST BUILDING - PHILADELPHIA, PA.

NEW TOOLS FOR IMMEDIATE DELIVERY

4—12" x 36" Bridgeport Grinders.
1—2½ x 2" Wm. Sellers Tool Grinder.
30—18" x 9' Turning and Boring Lathes.
3—26 x 14' Am. Patt. Eng. Lathe.
3—Double head Sullivan Grinders.
1—32" x 12' Pittsburgh Engine Lathe.
1—20" Ohio Shaper.

USED MACHINERY

ENGINE LATHES

8—30" x 10' American Gear head A-1.
5—20" x 8' Lodge & Shipley, geared head, q.c.g.
1—20" x 10' Bullard.
1—24" x 6' Bullard.
3—24" x 14' American.

TURRET LATHES

3—3 x 36 Jones & Lamson Flat Turret.
2—2¼" x 24" Jones & Lamson Flat Turret, bar equipment. Full set Turret Tools.
9—25" Gisholt 12" Collet chuck 6½" hole in spindle threading lathe.
3—26" Putnam heavy duty lathe.
—14" x 6' Lodge & Shipley Turret. Backgeared.
5—24" Gisholt 2-step cone, 6¼ H.S.

BORING MILLS

6—66" swing Bement-Miles Tire Turning Mills, two swivel heads—15½" under rail.
1—37" Baush Boring Mill, 2 heads, good as new.
1—Cylinder boring mill, capacity of 24" diam. to 96" diam. 10' long.
Tool equipment included, good as new.
1—42" Bullard Boring Mill (2) heads.

PLANERS

1—48" x 12' Pedrick open side.
1—20" x 36" Pedrick, open side.
1—36 x 36 x 10 Ohio, 2 heads.

MILLING MACHINES.

1—No. 3 LeBlond Plain Miller, table 13½ x 58¼.
1—No. 2 Kempsmith, table 10' x 45".
1—24" x 8' Beaman & Smith Open Side Slab Miller, with two vertical spindles.
1—No. 1½ Universal Milling Machine.

GEAR CUUTTERS

1—24" Fellows Gear Shaper.
2—36" Fellows Gear Shapers.

SCREW CUTTING MACHINES

1—2" Cleveland automatic.
1—No. 55 National Acme 4 spindle, good as new.
1—No. 54 National Acme 4 spindle, good as new.

SLOTTERS AND SHAPERS

1—9" Bement Slotter.
1—12" Bement Slotter.
1—20" Wharton Slotter.
1—20" Gould & Eberhardt Shaper. B.G. Vise. C.S.
1—16" Steptoe Shaper.

GRINDERS.

8—12" x 36" Bridgeport.
1—1½" Full Universal Landis Machine.
1—No. 13 Brown & Sharpe Universal and Tool Grinder. Full equipment.
No. 1½ Universal Cutter and Reamer Grinder.
1—28" Bridgeport Face Grinder, with magnetic chuck.
5—Fisher Profile Grinders for Cutters.
1—No. 28 Brown & Sharpe Plain Grinder, 17" x 96".
5—No. 6 Std. Universal Tool & Cutter Grinders.

FOX LATHES

1—16" Dresser friction clutch back gear.
2—18" American Monitor back gear carriage and control.
2—14" L. E. Hall Turret Monitors, back gear.

DRILL PRESSES

1—24" Bickford Upright back gear sliding head lever and wheel feed drill.
1—4' Bickford Radial, with Tapping attachment, motor drive, with motor.

GOOD USED EQUIPMENT

ELECTRIC TRAVELING CRANES.

20-Ton, 56' 3" span, three motor, 110 volts, D.C.
25-Ton trolley, three motor, 220 volts, D.C.
10-Ton, 40' span, 80' lift, three motor.
5-Ton, 47' 0" span, three motor, 220 V., D.C.
Crane Motors, 10 and 4½ H.P., 220 V., D.C.
10-Ton hand crane, 55' 0" span.
20-Ton hand crane, 29' 6" span.
2-Ton hand cranes, 22' span.

PUNCHES AND SHEARS.

Lever Shear (double), cap. 2" sq.
28" throat (single), cap. ⅞x⅞" (belt).
36" throat (single), cap. 1¼x1" (belt).
48" throat (single), cap. 3x1¼" (steam).
16" throat (single), cap. 1½x1½ (belt).
36" throat (single), cap. ⅞x⅞" (belt).
17" throat (single), cap. ¾x¾" (belt).
15" throat (single), cap. ¾x½" (hand).
10" throat (double), cap. 1½x1" (belt).
Squaring Shear, 53" cap., 14 gauge.
Angle Shear (double), cap. 6x6x¾" (belt).
Plate Shear (Univ.), 18" blade, cap. ½".
Rotary splitting, 30" throat, cap. ½".
Rotary bevel, 5" throat, cap. ½".
Coulter & McKenzie, cap. 3x½", spring steel.
Guillotine, Perkins, No. 6, cap. 2½" sq.

MISCELLANEOUS.

Acme Bolt and Upsetter, 1½" cap.
Bulldozer, No. 12 Ajax, 30" stroke.
Bending Roll, 6', drop end, 6½ and 8" rolls.
Lathe, 24" x 10' American, latest.
Grinder, No. 10 B. & S. Plain.
Grinder, No. 13, B. & S. Universal and Tool.
Rotary Planer, 36", Cleveland No. 2.
Saw, cold, 26" blade, 48" travel.
Press (trimming) No. 11 Perkins, 16,500 lbs.
Rolling Mill, 1 stand, 2 high, 30" bet. housings.
First-class condition—quick shipments.

McCoy-Brandt Machinery Co.
Office and Warehouse:
216-218 Penn Ave., Pittsburgh, Pa.

C. W. CULLEN MACHINERY CO.

LEADER-NEWS BUILDING

CLEVELAND, OHIO

Bickford 4½' Plain Radial Drill, cone drive.
No. 3 Lapointe Broaching Machine, new.
2—P. & W. No. 2 Cutting-off Machines.
Bement Miles & Co. 7½" Vertical Spindle Crank Drilling and Boring Mill, 68" swing.
Detroit Japanning Ovens, 8' 10" x 8' x 152".
Pratt & Whitney 48" Gap Lathe.
Hanna 30-ton Riveter, 12" reach.
Pangborn Sand Blast, 90" rotary table, M.D.
8—800-ton Gen. El. Hydraulic Double Action Presses.
3—2¼ Cleveland Automatics; prac. new.
10—¾" B. & S. Automatics.
Allis Chalmers 150 H.P. Corliss Engine, 12' F.W.
Bruce MacBeth 150 H.P. Gas Engine; new.
2—Rathmann Jones Gas Engines, 125 and 225 H.P.
80" Niles Vert. Boring and Turning Mill, 2 heads, slotting attachment.
Ingersoll-Rand Air Comp., 342 cu. ft., steam driven, inter-cooler, complete.
Bertsch Straightening Rolls, 7" x 84"-3" vert. adj. M.D.
Kelly Springfield 10-ton Road Roller, rebuilt.
Vulcan 1 cu. yd. Steam Shovel, traction; weight 35 tons; new flues.
62-ton Baldwin Consolidation Locomotive.
Ajax No. 1 Taper Forging Rolls, 50 strokes.
One No. 5 S-3 Cold Langelier Swadger.
3—No. 7 H.S.-6 Langelier Swadger.
1—Bolt and Rivet Header, hand feed, ⅝" x 3½" rivets.
Bolt and Rivet Header, hand feed, ¾" x 4" rivets.
70-C Bucyrus Steam Shovel, St. G.
R. Is. Locomotive, 45 tons, St. G.

A MAN

was wanted as Tool-room Foreman. He was found by a condensed ad. in

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Ave., Toronto

List of Machinery in Stock for Sale

FOR 60-PDR. SHELLS

28—No. 180 Brown & Boggs, Dial Feed.
Without Dial Feed.
6—No. 190 Brown & Boggs, with Dial Feed.
3—No. 1 Toledo, with Dial Feed.
2—No. 01 V. & O. Presses with Roll Feed.
1—No. 18 Perkins Press, Plain.
2—No. 31C McDonald Double Acting Can Press with Magnet Stock Lifter and Auto. Feed.
1—No. 216B Niagara Tool Works Co. Slitting Machine.
2—Holden & Morgan Thread Millers for base end.
1—Bertram Duplex Thread Miller for nose end.
1—Bertram Copper Band Lathe.
1—Perrin Band Press with Pump.
1—Base Plug Twister (home made).
1—Roll Riveter (home made).
1—5" Shell Vise (home made).
1—5" Marking Head (home made).
1—5" Hand Tapping Vise home made).
1—Waterous Special Rough Turning and Cutting-off Lathe.
1—Jenckes Band Turner.

MISCELLANEOUS

4—Errington Collapsible Taps, 2".
Chasers for above.
1—1¼" Automatic Hartford Screw Machine; in first-class condition.
1—Noble & Westbrooke Marking Machine, only used to mark 200,000 gaines; good as new.
1—P. & W. ⅝" Screw Machine.

FOR 6" SHELLS

3—500-lb. Beaudry Champion Hammers.
4—Sets 6" Shell Nosing Dies for above.
2—De Vilbiss Varnish Sprayers 1 quart size).
Transformer set for above.
1—No. 3 West Banding Press for 6" shell.
4—Greensboro Turret, 24".
2—C.M.C., 26" x 12", Double Back Geared.

All the above are in good condition and only ran six months.

McKinnon Dash Company

St. Catharines, Ont.

c11m

Don't Keep It--Sell It!

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor

or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

CANADIAN MACHINERY

Classified Advertising Section

143-153 University Avenue TORONTO, ONT.

STEEL BUILDING CRANES

STEEL Building or Coal Shed, 108 ft. by 298 ft., maximum height 40 ft., containing approximately 450 tons of structural steel.

Two Brown Patent Bridge Tramways, hoisting and conveying apparatuses consisting of a bridge tramway with tracks permitting a movement of 300 ft., distance between movable piers 180 ft., with end cantilevers 92 ft. and 36 ft. Each bridge has in its house, Brown Patent Hoisting Engine with the most modern operating mechanism, together with all necessary fittings and connections for complete operation, together with six Brown Patent Automatic Self-Dumping Coal Tubs of 42 cu. ft. capacity; two single rope buckets of 48 cu. ft. capacity; four skips of 2 ton capacity; and also automatic clam shell bucket. Both these outfits are practically in new condition.

New York Machinery Exchange, Inc.

50 Church Street . . New York City

If any advertisement interests you, tear it out now and place with letters to be answered.

IMMEDIATE DELIVERY

DRILLING MACHINES

Leland H.S., B.B., bench type.
No. 1½ Knight Driller and Miller.
14" Rockford Sensitive.
22" W. F. & J. Barnes, s.h., b.g., p.f.
32" Hamilton, s.h., b.g., p.f.
32" W. F. & J. Barnes, s.h., b.g., p.f.
20" W. F. & J. Barnes, 4 spindle.
3' W. E. Gang Plain Radial.
3½' W. E. Gang Plain Radial.
Pawling & Harnischfeger Horizontal Driller.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. automatic.
30" x 9" G. & E. auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3—26" B. & S. for spur.
36" Walcott for spur.

GRINDERS

Leland Universal, with power feed.
No. 23 B. & S. Gear Cutter.
8" x 30" Modern Plain (new).
14" x 20" B. & S. Plain.
Garvin hole grinder.
Gisholt tool grinder.
No. 5 Diamond water tool.
No. 16 Gardner disc grinder.
No. 24 Gardner disc grinder.

LATHES

13" x 5' P. & W., c.r., taper.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
18" x 8' L. & S. pat. head, c.r. taper.
18" x 10' Fitchburg, c.r.
18" x 12' Barker, c.r.
20" x 14' Blaisdall, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
36" x 20' American, t.b.g.
36" x 22' New Haven, t.b.g.
3½" x 60" Fitchburg Lo-Swing.

PLANERS

24" x 24" x 4' Gray, one head.
24" x 24" x 8' Cincinnati, one head.
30" x 30" x 8' Woodward & Powell, one head.
30" x 30" x 8' Cincinnati, two heads.
36" x 36" x 14' Sellers, one head.
40" x 38" x 14' Putnam, one head.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES

1" B. & S. Plain.
16" P. & W. Plain.
No. 2 Costello, plain head.
No. 2 P. & W. friction head.
No. 4 Pearson, geared head.
No. 3 Bardons & Oliver, plain head.
⅞" Cleveland, automatic.

TURRET LATHES

16" Lodge & Shipley.
25' Niles.
2 x 24" Jones & Lamson.
3 x 36" Jones & Lamson, chucking equipment.
3 x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt turret lathes, taper attachment.

PUNCHES AND SHEARS

No. 3 Bauroth, O.B.I.
No. 5 Bauroth Geared, O.B.I.
No. 6 N. American Can.
No. 2 L. & A. Angle Iron Shears, 5"x5"x½" (new).
No. 5 L. & A. Double Punch & Shear, ⅝"x⅝", 3"x⅝", 1⅛ rd. (new).
No. 1 L. & A. Multiple Punch (new).
No. 2 L. & A. Multiple Punch (new).
No. 1 L. & A. Horizontal Punch, ½" in 1" (new).

MISCELLANEOUS

No. 2 Kempsmith Universal Miller.
50-lb. Bradley Strap Hammer.
¾" Acme Forging Machine.
52" Niles car wheel boring mill.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-ton Yale Duplex Hoist.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., CHICAGO, ILL.

Let the Boss Know It!

IF you are a reader of Canadian Machinery, go tell your employer about it some convenient time! You couldn't tell the up-to-date manufacturer anything that would please him more. He would know that you are abreast of the times; that you are ambitious and interested in your work; that you are acquainted with methods and machinery which make for greater efficiency. He will say softly to himself: "Here is a live wire,—I'll just keep my eye on that chap."

If you are not a regular reader it will pay you to become one right away—quick.

Subscription price—$3.00 per year. 52 issues.

LOOK—HERE THEY ARE

BORING AND TURNING MACHINES—VERTICAL.

1—30" Bullard, 1 turret head.
1—30" Flather, one turret head.
1—36" Bausch, 2 swivel heads.
2—36" Brown & Sharpe, one turret head; Dec delivery.
1—42" Niles, two swivel heads, motor drive.
1—New 42" Gisholt, 2 heads.
1—72" Niles, two swivel heads.
1—80" Niles, two swivel heads, slotting attachment.
1—84" Sellers, one head.
1—90" Vertical Cylinder.
1—New 8' Bickford; December delivery.
10' Niles, 2 heads; December delivery.

BORING MACHINES—HORIZONTAL.

1—Lucas, 2¼" bar.
1—No. 1 Barrett Cylinder Borer, 3¾" bar type.
1—Newburgh 4" bar, 84" swing, 72" feed.
1—No. 2 20" Barrett, 2 facing heads.
1—Betts Table Type, 4" bar, 8' spindle to bearing.

BULLDOZERS.

1—New No. 4 Garrison (same as No. 4 Williams-White).
1—No. 7 High-speed Ajax, 16" stroke.
1—No. 9 Williams & White, belt drive.
2—No. 23 Williams & White, belt drive.
1—No. 26 Williams & White, belt drive.

COMPRESSORS—AIR.

1—Ingersoll-Sargent Duplex, 8 x 14½ x 8".
1—Cincinnati Cross Compound, two-stage, 790 cu. ft.
1—10" x 12" Chicago Pneumatic, belt-driven.
1—10" x 10" x 10" Single Cylinder Smith-Valle, steam driven.
1—22" x 13" x 16" Ingersoll-Rand, motor driven.

CRANES.

2—10-ton Electric, 47' span.
1—50-ton Nile, 61' span.
1—Locomotive, 35' boom, standard gaged, steam driven.

CUTTING-OFF MACHINES.

2—No. 00 Brown & Sharpe.
1—2" capacity Warner & Swasey.
4—3½" Hall.
10—4½" Williams.
3—4" Curtis & Curtis.

DRILLING MACHINES—RADIAL.

2—New 2' American, cone drive.
1—3' Bickford, semi-Universal table.
1—3' Bickford, gear drive.
3—New 3' Americans, sensitive tapping attach.
1—New 3' Mueller, plain speed, box drive.
1—New 3½' Western Drill, 86" circle.
2—4' Mueller, plain, speed box drive.
1—5' semi-universal American.
1—5½' American full Universal.
1—6' Baush Plain, cone driver.
New 6' Triumph, motor drive; September delivery.

DRILLING MACHINES—HEAVY DUTY.

2—New No. 2 Colburn.
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
2—D3 Colburn, plain table.
4—No. 310 Baker, single pulley drive, late type.

DRILLING MACHINES—MULTIPLE SPINDLE.

4—New Leland-Gifford, sensitive, four spindle.
1—No. 30C Baush, 12 spindle, capacity 1⅛" holes, 30" circle.
1—14-spindle Baush, capacity 1" holes, 36" circle.

GEAR-CUTTING MACHINES.

1—No. 1 Whiton.
1—No. 3 Bickett Gear Rack Planer, delivery 60 days.
1—No. 3 Brown & Sharpe Auto. Gear Cutter, Spur.
1—New 6" Standard Gear Cutter, Spur.
1—12" Gleason Bevel Gear Planer.
1—16" Gleason Bevel Gear Planer.
1—16" Bilgram Bevel Gear Generator.
1—20" Grant-Lee Gear Hobber.
1—No. 1 20" Schuchardt & Schutte Gear Hobber.
1—22 x 8 G. & E. Spur and Bevel Cutter.
1—24" Fellows Gear Shaper.
1—24 x 8" G. & E. for Spur and Bevel.
1—24" Becker Brainard.
1—New No. 10 Whiton, Bevel 32", Spur 34".
3—36" Fellows Gear Shapers.

GRINDERS—UNIVERSAL FOR CUTTERS, DRILLS, REAMERS, ETC.

1—No. 1 Cincinnati.
1—New Norton No. 1.
1—New Walker No. 1, outfit B.
1—New Walker No. 2, outfit K (capacity 9" x 26").
1—New Wilmarth & Morman, style B.K.
8—No. 190 Wells.
1—Gisholt No. 5, 12".

GRINDING MACHINES—CYLINDRICAL—PLAIN.

1—New No. 12 Brown & Sharpe, 8" x 26", Sept. delivery.
1—New 10 x 36" Landis; immediate.
1—New 10" x 36" Norton, Sept. delivery.
1—New 10" x 50" Norton, Sept. delivery.
1—10" x 60" Landis.
1—New 10 x 72 Norton, Plain.
20—12" x 24" Modern, self-contained.
1—12" x 32" Landis, rebuilt.
6—12" x 36" Modern, self-contained, motor or belt driven.
2—12 x 42" Landis, self-contained.
6—12" x 48" Modern, self-contained, motor driven.
1—16" x 66" Landis, with crank grinding.
1—18" x 96" Brown & Sharpe.

GRINDING MACHINES—CYLINDRICAL—UNIVERSAL.

1—Brown & Sharpe No. 13, 8" x 24".
1—New No. 2 Bath, 9" x 20".
1—No. 2 New Walker, 9" x 26".
1—No. 1½ (10" x 30") Landis.
1—New No. 2½ (10" x 36") Bath.
1—10" x 42" Modern.
9—New No. 2 Morse, cap. 12" x 30", Universal, Nov. delivery.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis.
2—New No. 3 Modern, 13" x 40", Sept. delivery.

GRINDERS—INTERNAL.

1—No. 1½ Landis.
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—CYLINDER.

1—No. 27 Brown & Sharpe.
1—No. 60 Heald, single pulley drive.

GRINDERS—PROFILE.

1—New Cleveland.

GRINDING MACHINES—RING.

1—New No. 14 Beasley, two-ring chucks.
1—No. 200 Heald.
1—No. 210 Heald.

GRINDING MACHINES—SURFACE.

1—New No. 1 Wilmarth & Morman.
1—No. 1 Diamond, capacity 12" x 12" x 24", automatic.
2—New No. 1½ Walker's, complete.
4—New No. 2 Reid (same as B. & S.).
1—New No. 2 Brown & Sharpe.

HAMMERS—POWER—FORGING.

1—40-lb. Bradley Helve.
1—150-lb. Bradley Helve, upright.

HAMMERS—BOARD LIFT—DROP.

1—400-lb. Billings & Spencer.
1—2,000-lb. Chambersburg.

HAMMERS—STEAM—FORGING.

1—Used 600-lb. Niles Single Frame.
1—18" Morgan & Williams, 600 to 800 lbs., 21" gap.
1—New 2,000 lbs. Morgan Single Frame.
1—3,000 lbs. Morgan Double Frame.

KEYSEATERS.

2—No. 0 Mitts & Merrill.
1—No. 2 Mitts & Merrill.
1—60" stroke Compton Knowles Broacher.

LATHES—MANUFACTURING—NOT SCREW CUTTING.

2—New No. 3 Harding Brothers Bench Lathe.
14—Reed-Prentice Shell Lathes, for 4" or 18 lbs. American shells.
70—New Simplex, 16" x 8'.
13—No. 3X Reed-Prentice, semi-automatic.
40—14" x 6' Reed Stud and Bolt.
5—16" x 8' Fairbanks-Morse, heavy duty.
14—16 x 8 Simplex, Single Pulley Drive.
22—18" x 8' Battle Creek, heavy duty.
5—20" x 8' Merschon.
50—20" x 10' Hindman, high duty.

LATHES—ENGINE.

1—8" Wade Precision; September delivery.
1—14" x 6' Bradford, taper attachment.
1—New Harding Brothers 15" Precision Lathe, quick-change gear, page 35, third catalogue.
3—New 16" x 6' Cleveland Tool Room Lathes, complete equipment.
2—16" x 6' LeBlond, pan bed, quick-change gears, taper attachment.
1—New 17" x 8' National, quick-change gears.
1—18" x 8' Lodge & Shipley, geared head, taper.
3—18" x 9' Chard.
1—18 x 10 Hendey, quick-change gear, 14" chuck.
1—New 19" x 8' LeBlond, heavy duty.
22—20" x 8' Lodge & Shipley, quick-change gear.
7—New 20" x 8' American, heavy duty.
1—New 20" x 10' Cleveland, geared head.
25—New 21" x 10' Porter, single back geared.
5—New 22 x 10' Monarch, double back geared, Q.C.G.
9—22" x 10' Putnam, oil pan turrets.
3—24" x 10' Reed.
2—24" x 12' S. & B.
4—24" x 14' American, quick-change.
1—24" x 14' Lodge & Shipley, patent head.
1—24" x 24' Perkins, single back geared, raising blocks to 40", 18" chuck.
1—24" x 45" x 22' McCabe, double spindle.
1—26" x 24' New Haven.
4—27" x 14' Patent Head Lodge & Shipley, double back geared.
1—28" x 18' New Haven, single back geared.
1—28" x 18' Schumacher & Boye.
3—New 32" x 12' Pittsburg pattern.
8—New 36" x 24' Putnam, triple geared.
1—38 x 19' Steptoe, single back gear.
1—71" x 20' Fifield, triple geared.

LATHES—TURRET.

1—3" x 36" Jones & Lamson, geared sliding head.
5—2 x 24 Jones & Lamson.
18—6A Potter & Johnson.
1—New 21" Gisholt.

MILLING MACHINES—KNEE TYPE—UNIVERSAL.

1—No. 2 Kempsmith, 13", dividing head.
1—No. 2 Kempsmith, vertical attachment.
1—New Kempsmith.
1—No. 2 Kempsmith, back geared.
1—No. 2 Cincinnati.
2—No. 3 Cincinnati, late model; almost new.
1—New No. 3 Kempsmith.
2—New No. 3 Becker, August delivery.
1—New No. 4 LeBlond, heavy duty; immediate.
1—No. 4 Cincinnati, with vertical attachment.

MILLING MACHINES—KNEE TYPE—PLAIN.

1—No. 0 Pratt & Whitney.
1—New No. 1 Brown & Sharpe.
2—New No. 1 Kempsmith.
2—New No. 1½ American, back gear.
1—New No. 2 Rockford.
2—New No. 3 Kempsmith.
1—No. 3 LeBlond.
1—No. 3 Cincinnati.
1—No. 4 Garvin.

MILLING MACHINES—VERTICAL.

1—New Bickett, No. 0.
4—New No. 4B Becker.
2—No. 5 Becker.
1—New No. 6 Becker.

MILLING MACHINES—PLANER TYPE.

1—No. 2 Beaman & Smith, vertical spindle, open side.
2—Ingersoll Slab Millers, working surface of table 60" x 20".
1—No. 4 Beaman & Smith, vertical spindle, open side, working surface of table 120" x 24", removable housing on one side.

PLANERS.

1—24" x 24" x 6' Gray, one head on cross rail.
24" x 24" x 8' Cincinnati, one head; used three months.
1—26" x 26" x 8' Gray, one head on cross rail.
1—30" x 30" x 8' Gale Planer, one head.
1—30" x 30" x 12' Cincinnati, two heads.
1—36" x 30" x 12' New Haven, one head.
New 36" x 36" x 12' Bickett, one head; January del.; additional heads if desired.
2—New 36" x 36" x 12' Woodward & Powell, two heads on cross rail, one side head; Oct. delivery.
1—36" x 36" x 12' Gray, two heads.
1—36" x 36" x 14' Sellers, four heads.
1—40" x 40" x 11' Niles, four heads.
1—Gray, 42", widened to 56" x 42" x 16, two heads.
New 48" x 42" x 16' Bickett, one head; January delivery; additional heads if desired.
1—48" x 48" x 16' Sellers, one rail head, two side heads.
1—50" x 14' Powell, one head.
1—52" x 52" x 16' Betts, two heads, right angle drive.
1—54" x 42" x 16' Woodward-Powell, 2 heads.
1—56" x 42" x 16' Graves, two heads.
1—60" x 60" x 18' Niles, two heads.
1—32' 6 Niles Plate Planer.

SCREW MACHINES—AUTOMATIC.

3—No. 51 National Acme.
1—No. 515 National Acme.
2—No. 52 National Acme.
2—No. 53 National Acme.

SHAPERS.

1—New 16" Springfield.
1—16" Motor-driven Rockford.
2—New 24" Milwaukee.
1—New Barker, 24".
1—30" Walcott, gear drive.

SLOTTERS.

1—18" Betts, adjustable stroke.
1—12" Bement Gear.
1—36" Bement Gears.

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We Want Your Business Now and We Want It After the War

A RE-MANUFACTURED MACHINE WILL MAKE OUR RELATIONS PERMANENT

300 Machines—Latest Models. Over 300 Others But Slightly Older

The Only Re-MANUFACTURING Plant in the World.

OUR GUARANTEE

Your money back if you return a machine within 30 days from date of shipment, freight prepaid.

NO EXCUSES NECESSARY.

ENGINE LATHES—Latest Models

24—22" x 8' Hamilton, D.B.G., C.R., semi-Q.C.
5—22" x 8' Hamilton, D.B.G., turret tool post.
4—22" x 8' Davenport, D.B.G., tur. tool post.
7—22" x 10' Hamilton, D.B.G., C.R., semi-Q.C.G.
2—22" x 10' Hamilton, D.B.G., turret tool post, semi-Q.C.G.
20—22" x 10' Davis, D.B.G., C.R., Q.C.G.
8—24" x 10' Lodge & Shipley, D.B.G., C.R., Q.C.G.
8—24" x 10' Lodge & Shipley, selective gd. hd., C.R., Q.C.G.
11—26" x 10' American, D.B.G., C.R., and carriage turret, Q.C.G.
2—26" x 10' American, D.B.G., carriage turret.
19—26" x 12' Putnam, carriage turret, semi-Q.C.
9—26" x 12' Putnam, C.R., semi-Q.C.
2—26" x 12' Wickes, D.B.G., C.R., semi-Q.C.G.
10—28" x 10' Niles, Bement, Pond, C.B.G., Q.C.G.
4—28" x 14' Lodge & Shipley, select gd. hd., motor drive, C.R., turret and taper.
3—30" x 16' Lodge & Shipley, D.B.G., C.R., turret and taper.
10—40" x 18' Pittsburgh, triple geared, Q.C.G.

TURRET MACHINES—Latest Models

25—21" Gisholts, 3½" hole, 2-step, 5" belt.
20—21" Gisholts, 3½" hole, motor arrangement.
13—24" Gisholts, 4¼" hole, 3-step, 4" belt.
38—24" Gisholts, 6" hole, 2-step, 6" belt.
41—24" Gisholts, 6" hole, motor arrangement.
2—2¼" x 26" Greenlee Flat Turrets.
2—2½ x 26" Pratt & Whitney Gd. Hd. turrets.
4—3-A Warner & Swasey (bar machines).

RADIAL DRILLS

4—2½' Fosdick.
2—2½' Mueller.
1—2½' Dreses.
1—3' Prentice
1—3' Mueller.
1—3½' Gang.
1—4' Niles Full Univ.
3—5' Niles Semi-Univ.

DRILLING MACHINES

1—24" Baker High Duty.
1—2-spindle Foote-Burt.
4—2-spindle Baker Vert. Cyl. Bor. Mch., adj. spindle.
1—4-spindle Foote-Burt Rail Drill.
1—10-spindle Foote-Burt Rail Drill.
1—12-spindle Moline Rail Drill.

SHAPERS

1—15" Hendey Friction Shaper.
1—16" Perkins Friction Shaper.
2—16" Barker Plain Crank.
1—24" Gould & Eberhardt Back Geared Crank.
1—24" Queen City Back Geared Crank.
1—48" Morton Draw Cut.

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Will Give You Exceptional

Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

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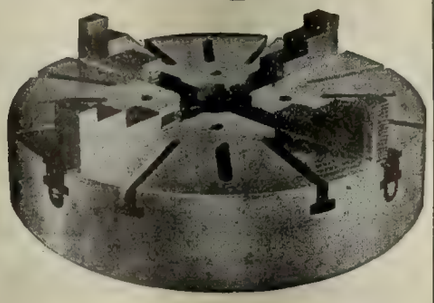

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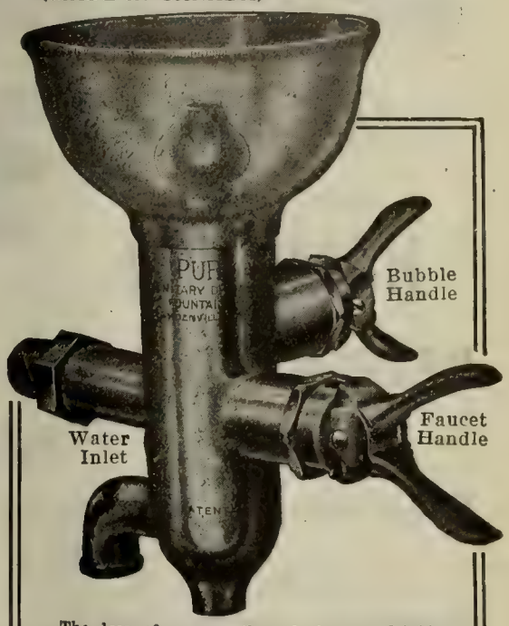
In Safety First and always.
In providing for the Health of my Fellow Workmen.
In Light and Air and sanitary Working Conditions.
In clean, fresh drinking water for everybody.
In the Safety, Economy and Man-betterment.

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)



The loss of a man through impure drinking water is a crime that "the front office" must bear.

An ugly statement, isn't it? But true, absolutely.

When a man comes to work in your factory he puts his health in your keeping.

Are you willing to take chances on such a trust?

Impure drinking conditions are responsible for more tragedies than any machine ever built.

Apply the "Safety First" Principles to your water supply; don't deny your men a clean, fresh drink of water.

Conserve their health and they will improve your profits; make yourself as worthy of the name of "employer."

Install the Gold Medal winner Puro in your plant, office and shop alike.

The only Sanitary Drinking Fountain that is safe, sanitary, simple, automatic in control and easily attached.

Let us tell you just what it will cost you to

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YOUR WATER SUPPLY

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Safety Set Screws
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Safety Set Screws
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Bevel Gears cut theoretically and practically correct on Gear Shaper

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Try our W-G Rawhide Silent Gear. Designers and Builders of Special Machinery.

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Right now is the time to prepare for peace-time. If you have, or will have facilities for the manufacture of Special Machinery, Gears, Jigs, Punches, Gauges, Small Tools, etc., get your name before the buyers of these products *now*. Connections made now through this section will aid you in keeping things going after the war.

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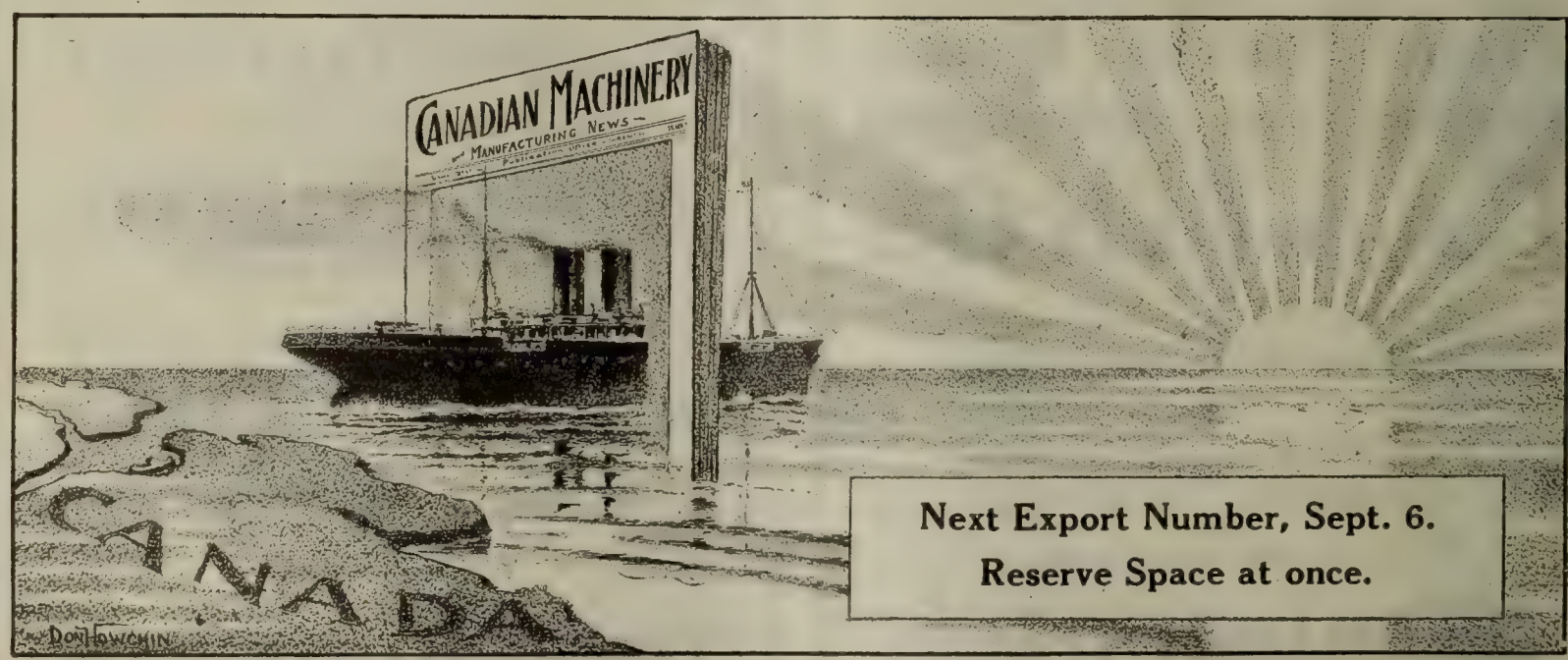

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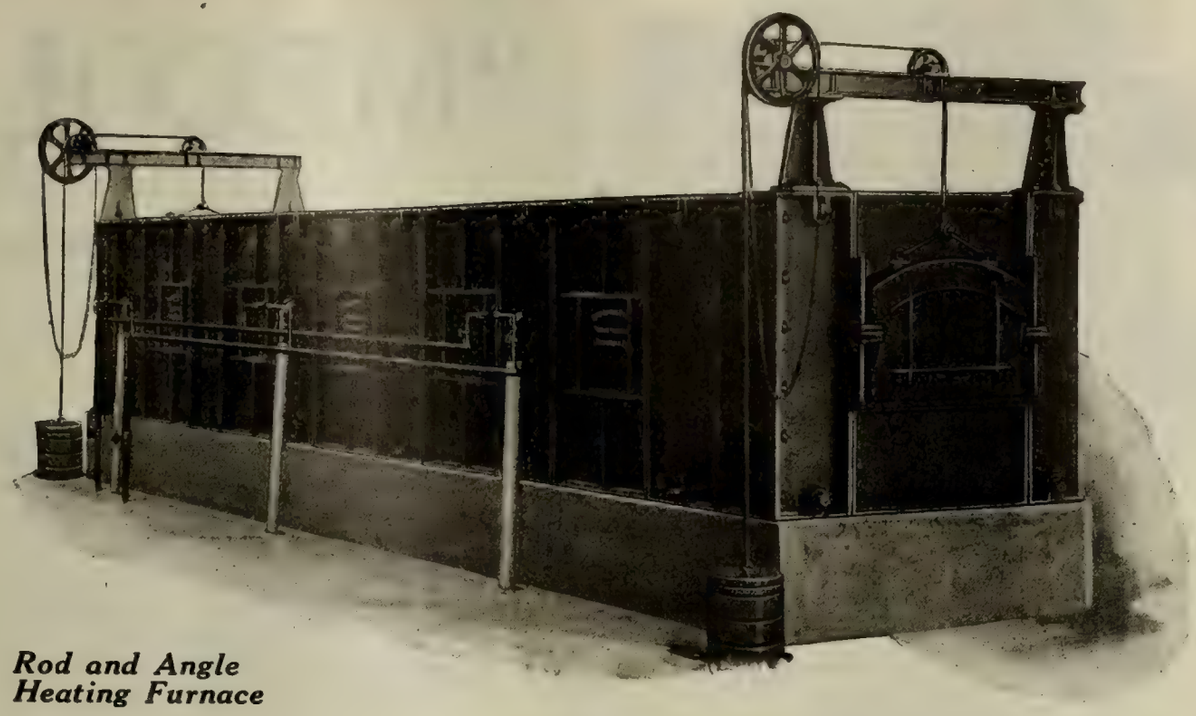

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Rapid Heats—Uniform Temperatures

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Rod and Angle Heating Furnace

"Rapid heats" means a saving in time—but not at the expense of the work.
"Uniform temperatures" means a uniform finished product.

In these days, where every minute and every ounce of material must be utilized to the fullest, the two facts mentioned above prove of vital importance.

Some of the Other Features of this Tate-Jones Furnace

This furnace can be fired with either oil or gas and can be operated on high or low pressure system. A very economical and convenient burner is our combination oil and gas burner which permits the use of either fuel at the will of the operator. This is especially valuable in districts where the fuel supply is likely to be delayed or discontinued from any cause, or where fluctuations in price of either fuel have to be considered.

Different temperatures in the heating chamber can be produced at the same time. Where a long furnace is used on short work, the short section needed can be used instead of firing up the whole length. This is especially valuable when heating angles for bending, etc.

The burners fire on both sides of the furnace and are placed in staggered positions. Baffles distribute the heat uniformly over the arch and radiate it uniformly on to the hearth.

By arrangement of vents and flues, a considerable portion of the heat is recovered and utilized in heating the hearth from below.

If the work your plant is engaged in consists of any of the following or similar operations, it will prove decidedly to your advantage to write for Bulletin—giving further particulars.

For heating angles, bending and forming work in shipyards and structural shops. Also for heating rods for continuous bolt, rivet and spike machinery.

We make furnaces of all types and kinds for the heat treatment of metals.
In making requests for information, mention the particular work so that the proper literature can be sent.

TATE-JONES & CO., INC. *FURNACE ENGINEERS* **PITTSBURGH, PA.**

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6" Shell End Nosing Furnace

We manufacture furnaces for all purposes to be used with any kind of fuel

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The Oven Equipment & Manufacturing Company
NEW HAVEN, CONN.
"CRAWFORD SECTIONAL" OVENS
Heated with our Enclosed Flame Gas Burners, or Electricity
FOR BAKING JAPANS AND OTHER FINISHES ON METAL.
Ovens carried in stock and built to meet requirements of manufacturers.
Builders of All-Steel Oven Trucks with Roller Bearings.

Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.
ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

CUT YOUR SHOP COSTS

Nobody would think of putting 16-inch lathe work on a 30-inch lathe, then why leave small parts on a large Milling Machine?

A Steptoe Hand Miller or small power feed can be handled quickly and will cut your production cost. You will have less money invested in your Milling Machines and have more machines to do the work.

That same principle applied to your small planer work will cut the cost of planer work.

A Steptoe Shaper will do the work faster because it can be handled quicker.

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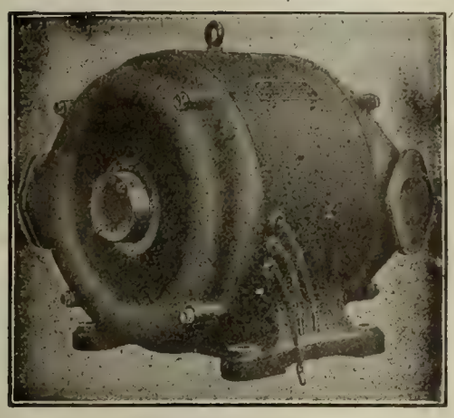

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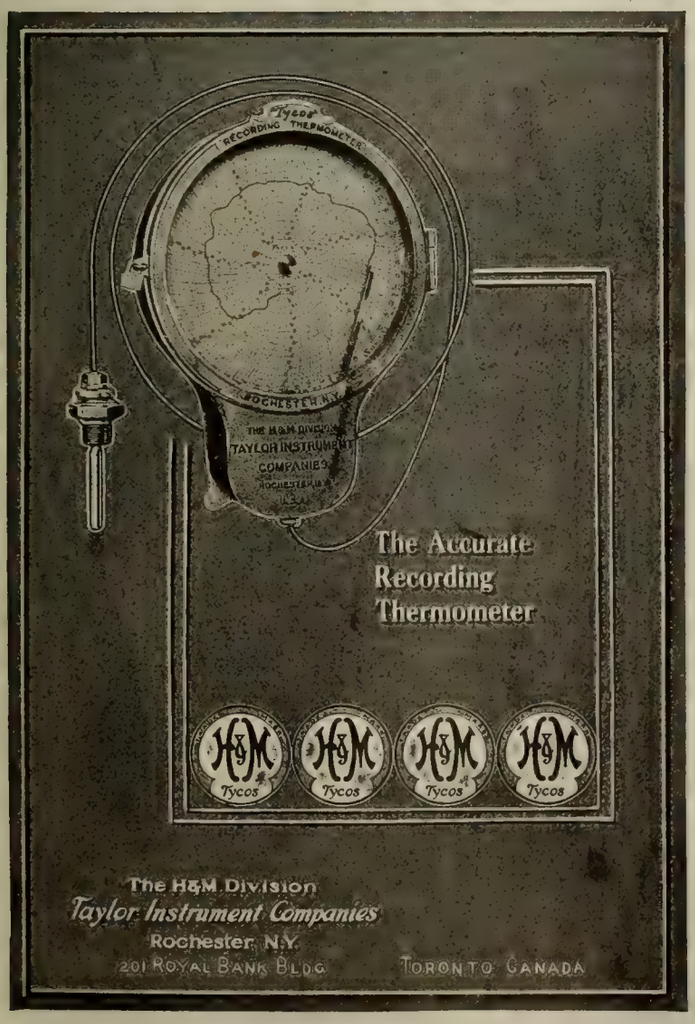

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Two G. & B. Furnaces

from a stock of over 100 types and sizes —a furnace for every purpose. And at present we are making immediate deliveries on nearly all types.

With a Gilbert & Barker furnace you are assured of efficient and economical heat-treating, annealing, hardening, etc. Our half century of experience with liquid and gaseous fuels for heat treatment of metals makes us confident of our ability to solve your heat-treating problems. Put them up to us.

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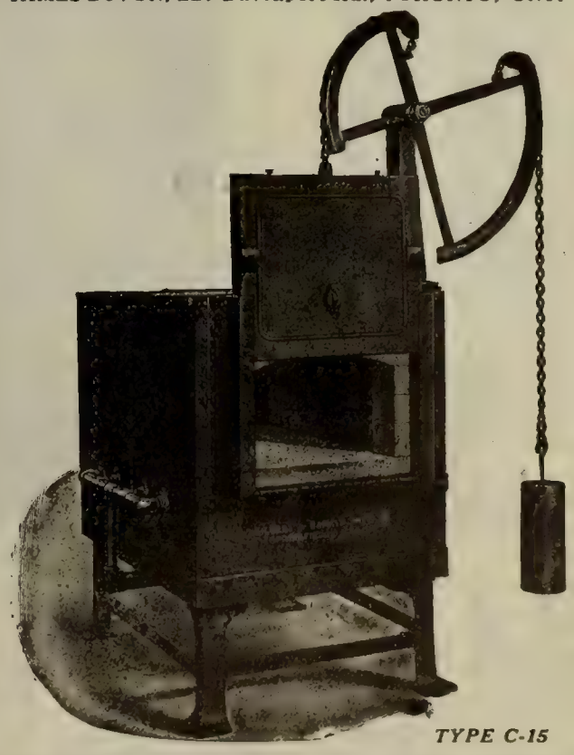
JAMES DeVON, 227 Davenport Rd., TORONTO, ONT.



TYPE C-15

If any advertisement interests you, tear it out now and place with letters to be answered.

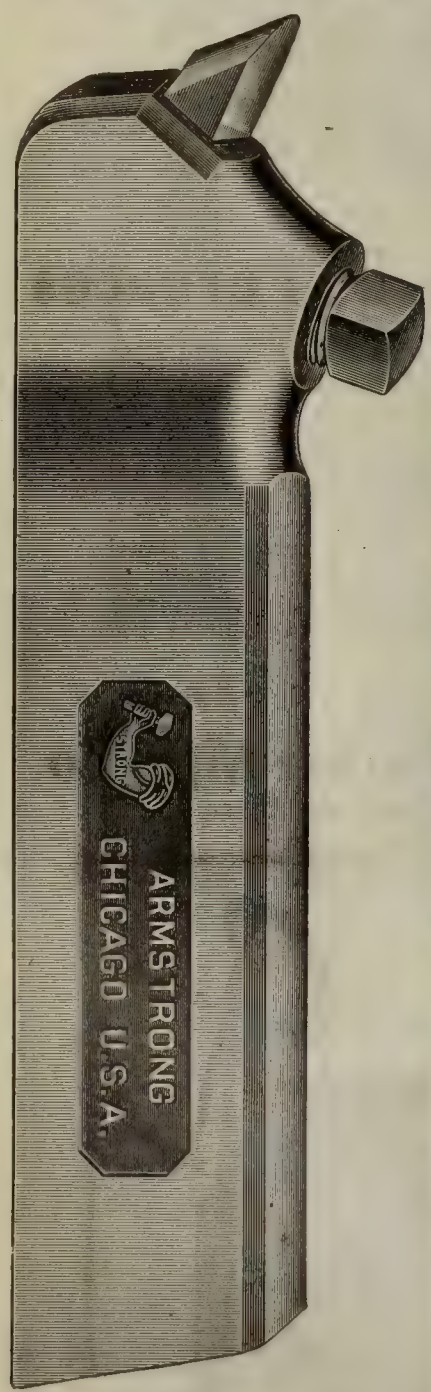
The Only Grand Prize for TOOL HOLDERS

Awarded separately and independent of other lines exhibited at the

PANAMA-PACIFIC EXPOSITION

WAS WON BY

ARMSTRONG TOOL HOLDERS



HIGHEST AWARD

at 4 World's Expositon

Paris - - - 1900
St. Louis - 1905
Liege - - - 1904
San Francisco 1915

THEY ALWAYS MAKE GOOD

They Are Saving Millions of Dollars in High Speed Steel

CATALOG FREE

Armstrong Bros. Tool Co.
"The Tool Holder People"
306 N. Francisco Ave., CHICAGO, U.S.A.

The Panama-Pacific MEDAL OF HONOR was also won by ARMSTRONG Drop Forged Wrenches, Ratchets, Clamps, Lathe Dogs, Etc.

THE BASIS OF A GOOD FILE IS THE STEEL

Unless the steel is such that the tool will stay hard for a reasonable length of time, the file will not give good results—neither will it be economical to use.

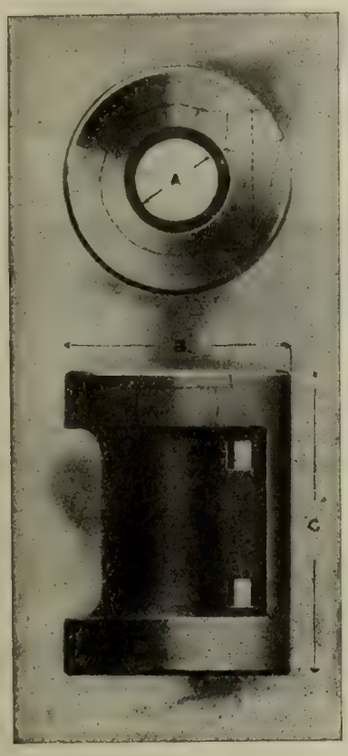
The steel from which the "Famous Five" files are cut is a high carbon steel made from our own formulas —which have proven satisfactory after years of practical experience.

This, plus the sharpness and regularity of the teeth, ensures a tool that will stay hard and sharp for a long time. Consequently the "Famous Five" are the most economical Files to buy.

And that's why it pays Dealers to sell them.

Specify them when ordering.

Mining Machinery Parts



Two-key Tappet

Shoes and Dies, Tappets, Bosses, Cams and Stamp Heads

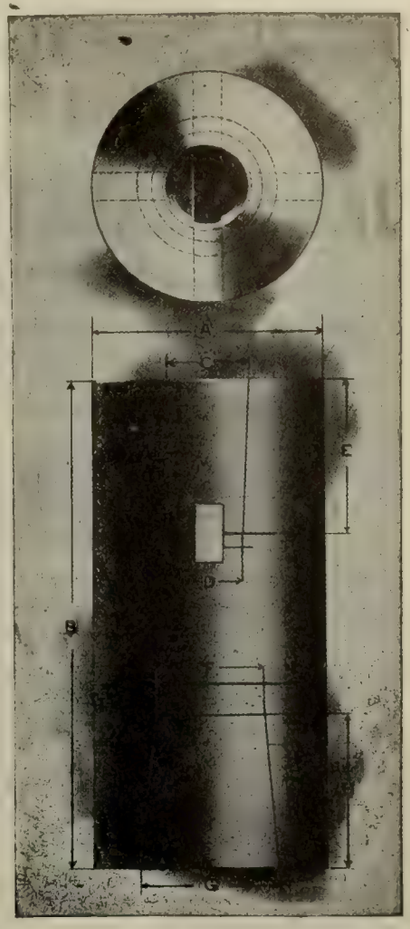
Also Manufacturers of Lining Plates for Ball and Tube Mills Concaves and Heads for Gyratory Crushers.

Machine Moulded Gears

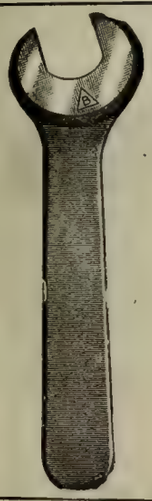
Any size up to 18 feet in diameter. No patterns needed.

Send Us Your Specifications, We Do the Rest. Write—

Hull Iron & Steel Foundries, Limited
HULL, P.Q.



Stamp Head



Plyers, Structural Wrenches, Track Wrenches, Machine Wrenches, Eye Bolts, Lathe Dogs, Journal Box Wedges, Etc.

B
TRADE MARK

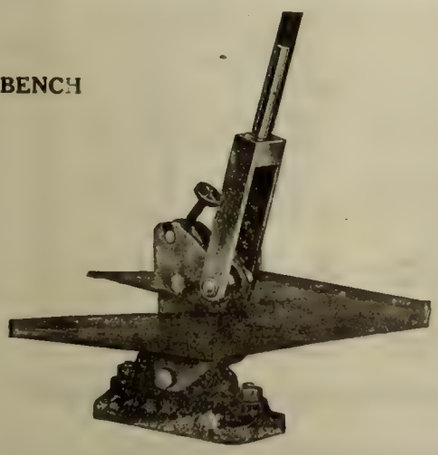
All Kinds Of Special Drop Forgings

Send Models or Blue Prints for Estimates

WRITE FOR CATALOG

Canadian Billings & Spencer, Limited, Welland, Ontario

BENCH



'TANGENT'

Can. Pat. COMBINED No. 167666
PORTABLE AND BENCH
HAND
SHEARING TOOL.
FOR FLAT SHEETS.

Is Self-Feeding. Gives beautifully clean cuts. Fast, easy cutting

Capacity: 3-32 in. Steel. 1-8 in. Softer Metals.

WRITE FOR DESCRIPTIVE PAMPHLET.

Montgomery, Smith & Co., Limited
Patentees and Manufacturers
Tangent Works, Keynsham, Som., Eng.

Applications for selling agencies or rights to manufacture under license will be considered.

PORTABLE

Measuring Tapes, Steel Rules, Straight Edges, Surveyors' Band Chains, Engineers' Tools

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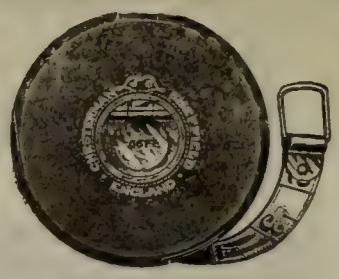
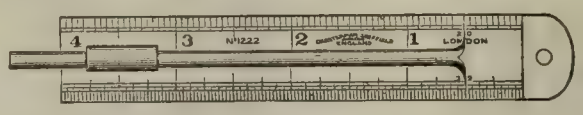
JAMES CHESTERMAN & CO., Limited

SHEFFIELD, - ENGLAND

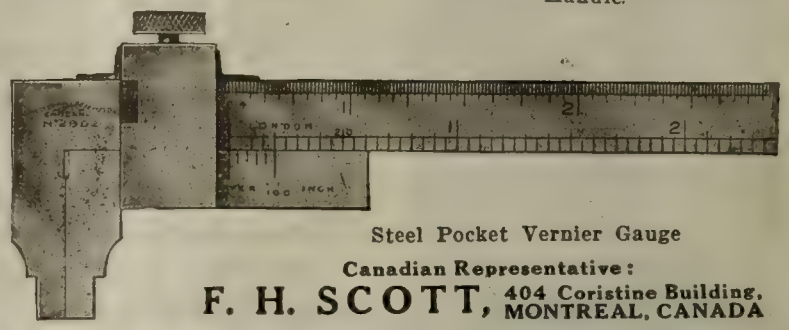


Wind-up Measures, Steel, Linen and Metallic. With Improved Patent Flush Handle.

Chesterman tools are the highest standard of accuracy in the British Empire, and the quality of steel and substantial build guarantee a maximum of service and economy.



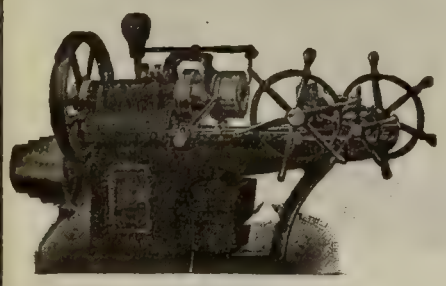
Steel Depth Gauge



Steel Pocket Vernier Gauge

Canadian Representative:

F. H. SCOTT, 404 Coristine Building, MONTREAL, CANADA



BOLT, NUT, FORGING AND WIRE NAIL MACHINERY

"National" Bolt Cutters, "Wedge Grip" Bolt and Rivet Headers, Forging Machines, Nut Machines, Roll Threaders and Wire Nail Machines are used by leading Railroads and Industrials.

THE NATIONAL MACHINERY CO. TIFFIN, OHIO, U.S.A.

CANADIAN AGENT:

H. W. PETRIE, Ltd.

TORONTO, ONT.
MONTREAL, QUE.
VANCOUVER, B.C.

SMOOTH-ON

TRADE MARK-REG.U.S. PAT.OFF.

Iron Cements

Positively stop all leaks of steam, water, fire or oil in iron or steel. Unequalled for smoothing over rough and defective castings.

Smooth-On Cements are easy to apply, harden quickly and make permanent repairs.

Every Engineer should have a copy of our new instruction book.

Smooth-On Iron Cements are sold by supply houses.

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JERSEY CITY, N.J. U.S.A.

Send for New No.16 Illustrated Instruction Book

TRADE B&C MARK

Convenience

This wrench will conveniently get at that nut "just around the corner" or in other inconvenient places where a straight handled wrench would be awkward. Easily operated and handled by one hand. We can give you service and good prices.

BEMIS & CALL

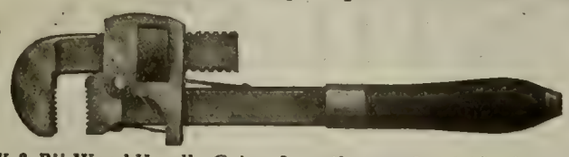
Hardware & Tool Company

Springfield Mass., U.S.A.

THE "W & B" LINE OF SCREW WRENCHES

MADE IN CANADA

The only Pipe Wrenches made EXCLUSIVELY IN CANADA

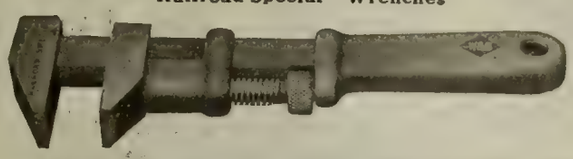


"W & B" Wood Handle Grips, Length open 6 to 14 inches.

"W & B" STEEL Handle Grips, Length open 10 to 48 inches.

"W & B" SCREW WRENCHES MADE IN CANADA

"Railroad Special" Wrenches



This is the strongest and best HEAVY DUTY Wrench made. Head and Bar Drop Forged in one piece from selected steel. Extra heavy jaws thoroughly case-hardened. Indestructible iron handle. FITTED WITH "W. & B." EASY ACTING SCREW.

Machinists' Knife Handle Wrenches

This is the best wrench of its type on the market. With the exception of the difference in the handle it is practically the same as the "Railroad Special" Wrench. FITTED WITH "W. & B." EASY ACTING SCREW.

Adopt this established line as your standard CANADIAN MADE WRENCHES.

Complete information and catalog No. 90 on request.

Regular Wrenches

Head and Bar Drop Forged in one piece. FITTED WITH "W. & B." EASY ACTING SCREW and thoroughly seasoned handle.

The Whitman & Barnes Manufacturing Company

ST. CATHARINES, ESTABLISHED 64 YEARS ONTARIO

Convenience Quality

Keystone tools bear the stamp of quality that makes them to be desired because they are made in the most convenient shapes and give the maximum in service and economy.

Our ratchets and adjustable wrench illustrated here are samples of our line. The Keystone brand are carried by the best houses. Inquire of your dealer.

The Keystone Mfg. Co.

BUFFALO N.Y. U.S.A.

If any advertisement interests you, tear it out now and place with letters to be answered.

HEATING and VENTILATING

"Keith" Fans will be found more economical and have a greater efficiency where conditions are unusually severe, because they possess advantages over other Fans used for the same purpose.

The "Keith" Fan is the one that will give you continued and unqualified satisfaction.

Our New Catalogue No. 55 has just come from the Press. Tell us where to address it and you will receive one by first mail.

SHELDONS LIMITED, Galt, Ont., Canada

Toronto (Canada) Office: 609 Kent Building.

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The Threaded Tool, with lockable spring head, will do roughing, finishing and threading at one setting in the tool post.

Williams' "AGRIPPA" Tool Holders

"THE HOLDERS THAT HOLD"

save the most time and need the least shifting.

We will ship them promptly if your dealer can't supply you from stock.

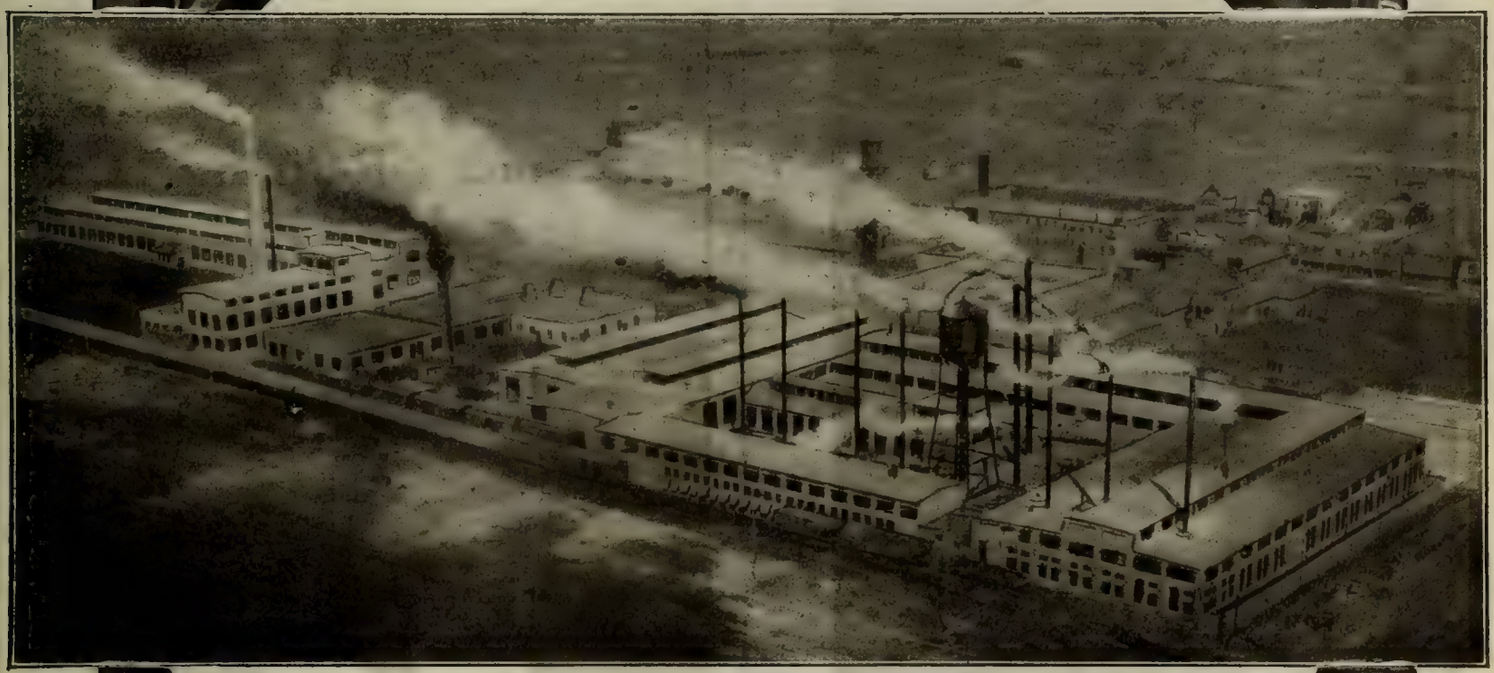
J. H. WILLIAMS & CO.
THE WRENCH PEOPLE
45 RICHARDS STREET BROOKLYN, N.Y. CITY

A tool that performs both cutting-off and side work by the mere substitution of suitable cutters tells its own story of economy.

BROWN'S

BEAVER BRAND METALS

BRASS, BRONZE,
CANADA SILVER and GILDING METAL
In Sheets, Rolls, Plates and Rods



Brown's Copper & Brass Rolling Mills, Limited

General Offices and Works:
New Toronto, Ontario, Canada

COPPER & BRASS
BROWN'S
QUALITY
ROLLING MILLS

FORD TRIBLOC

High Calibre Chain Hoist

For manufacturers of practically anything from munitions to ploughshares Ford Tribloc Chain Hoists are unsurpassed for lifting service.

Reason 1—Steel working parts. Reason 2—Planetary type spur gearing for greater efficiency. Reason 3—Factor of safety of 3½ to 1. Reason 4—Loop Hand Chain Guide that prevents "gagging." Five additional reasons in the five-year guarantee.

Ask for Catalog.

FORD CHAIN BLOCK & MFG. CO.
139-41 OXFORD STREET, 2093-D PHILADELPHIA, PA

Mystic Cutting Compound

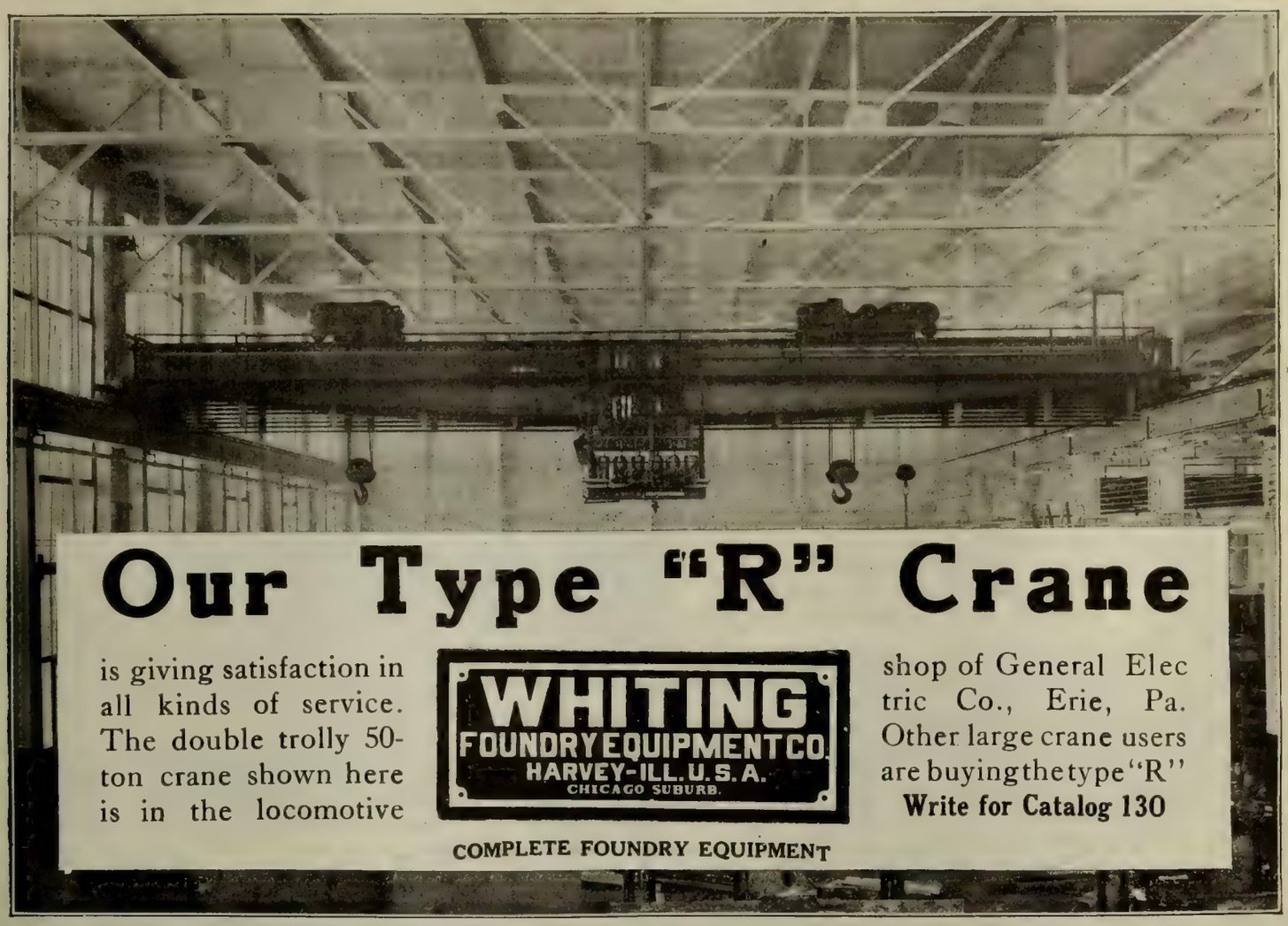
INCREASES production because it keeps tools in proper condition and enables them to work at their maximum efficiency.

It is far more efficient than any oil. The ideal lubricant for shell work.

Let us demonstrate its merits in your plant, free of cost, in order to show what a really remarkable cutting compound it is.

Cataract Refining Co. Limited

Toronto - Ontario



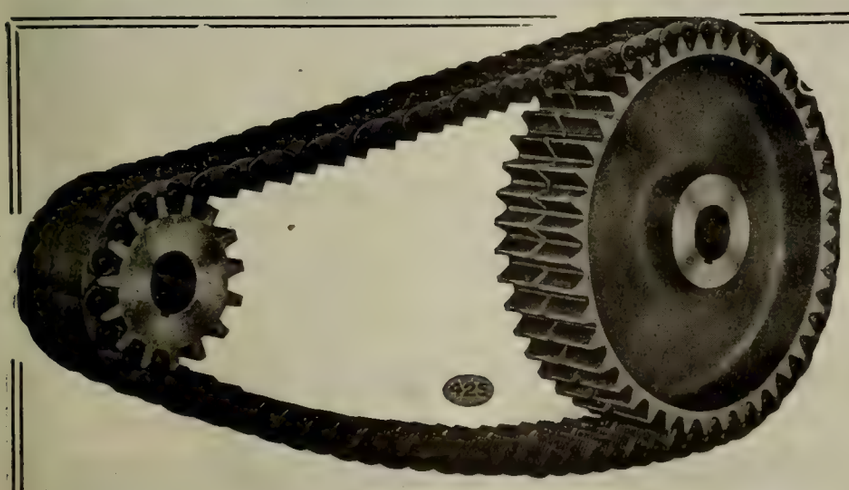
Our Type "R" Crane

is giving satisfaction in all kinds of service. The double trolly 50-ton crane shown here is in the locomotive shop of General Electric Co., Erie, Pa. Other large crane users are buying the type "R"

WHITING FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U. S. A.
CHICAGO SUBURB.

Write for Catalog 130

COMPLETE FOUNDRY EQUIPMENT



RENOLD CHAINS

The proven efficient form of Power Transmission.

PATENT SILENT

Equally suitable for main shaft or machine drives. Save space and power, increase output and ensure durability.

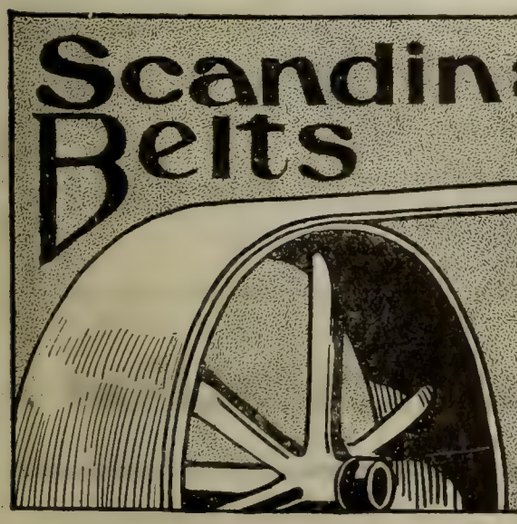
Chain and Parts Carried in Stock.

Sole Canadian Agents

Jones & Glassco. (Reg'd)

Branch Office: TORONTO, ONT. ENGINEERS St. Nicholas Bldg. MONTREAL, P.Q.

Scandinavia Belts



Can be used anywhere that leather can be used.

Scandinavia Belting is a solid woven cotton belt, made of long fibre cotton. It is impregnated to give further solidity, and the impregnation also acts as a moisture resistant. For direct drives where atmospheric conditions remain approximately the same, this belt is probably the best on the market to-day.

It stands up well on shifters.

W. P. BENNETT
51 Montfort Street, Montreal, P.Q.

Beltings *Packings* *Asbestos*

FOR ELECTRIC RAILWAYS

LONDON & LAKE ERIE RAILWAY.

The Magnolia Metal Company. London, Ont., Oct. 6th, 1916.

Gentlemen:—

It affords me much pleasure to testify to the merits of your product.

Have used it continually for four years, and, as stated to your Mr. Peck, found it most satisfactory, both as to quality and service.

We have not in the period named had a single hot journal or bearing, and as our cars run at times over 40 miles per hour, we think this is a record.

One thing is certain, if the man who uses the metal does his work properly, no fear may be entertained that it will fail.

I have no hesitation in giving you this testimonial, which is deserved.

Yours truly,
W. N. WARBURTON,
General Manager.

PRACTICAL ENGINEER POCKET BOOK:
Over 600 pages. A valuable reference work imported from England and sold as an advertising medium at the low price of 40c post paid.
Address Montreal Office.

SOLD BY LEADING DEALERS EVERYWHERE OR BY
MAGNOLIA METAL CO.
OFFICE AND FACTORY:
225 St. Ambroise St. MONTREAL

Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send to our nearest factory for a trial box.

Manufactured and guaranteed by

The Canada Metal Company, Limited
Hamilton Montreal TORONTO Winnipeg Vancouver

Electric Travelling Cranes
(Direct or Alternating Current)

Steam and Electric Derricks
(Stationary or Travelling)

Up-to-date design. Built for fast, continuous service.
ACCESSIBILITY—DURABILITY.

Dominion Bridge Company, Limited
MONTREAL

The "Rocker-Joint"
Depends Upon Its Construction,
not Upon Lubricant,
for Its Life and Efficiency

Power Transmission

What does she know about it? Not a thing! But she knows that he knows, and that's the point. He is a long-time user of silent chains and what he says about them counts.

This is what he says: "There is *only one Silent Chain* with a properly designed joint, and that is the MORSE. The 'ROCKER-JOINT,' the exclusive, patented feature of the MORSE, eliminates all power losses because it permits *no destructive sliding friction*, as do all other joints. There is only the simple movement of the rocking-chair."

Flexible *Positive* *Efficient*

MORSE CHAIN CO. Ithaca, N.Y.

Largest Manufacturers of Silent Chains in the World

MORSE
Silent Chains

CHAPMAN

DOUBLE BALL BEARINGS

Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

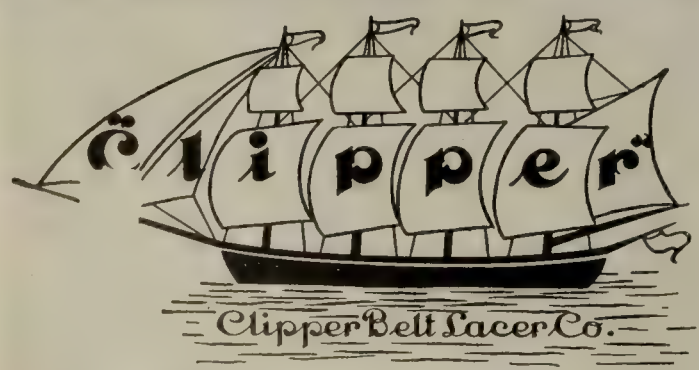
Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

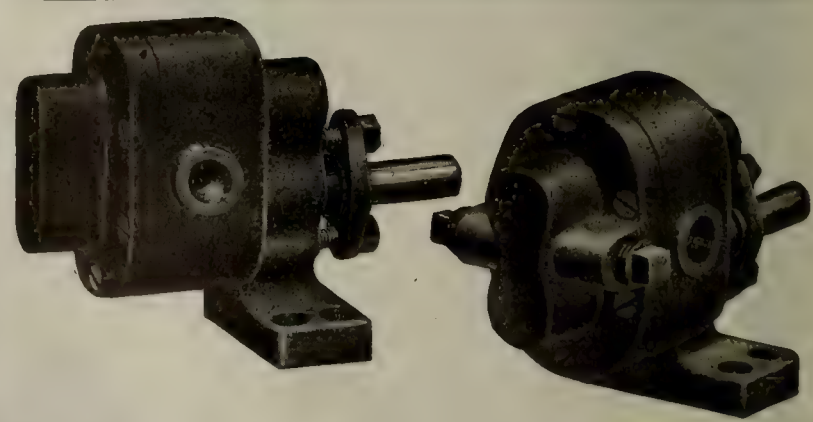
TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.



If you would use a stop watch while one of your belt lacing crews were at work you would find that you were paying expert men for a half hour job when any machine operator can lace a belt in THREE minutes with the

CLIPPER BELT LACER

CLIPPER BELT LACER COMPANY
976 Front Ave., N.W. Grand Rapids, Mich.

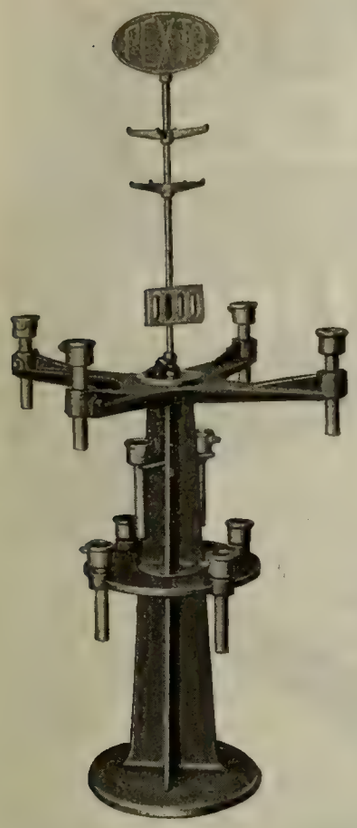


Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.



Holdall Revolving Machine Standard, No. 969 (Without Machines).

Every Machine Right at Hand

Another Pexto innovation! This time it's a handy, revolving standard that swings every machine into the right position at a moment's notice. A time-saver, a labor-saver and a space-saver, all in one.

Holdall Revolving Machine Standard

The illustrations on this page will tell you this interesting and practical story—the first one shows the standard with the machines. The revolving turret will carry four machines on strong, adjustable machine holders. It swings quickly to any position and easily locks with a handy lever. Can you imagine an easier way of handling successive sheet metal operations? Then, too, look at the six additional machine holders and you'll appreciate how this handy Pexto Standard will save valuable bench space and still keep your equipment within easy reach.

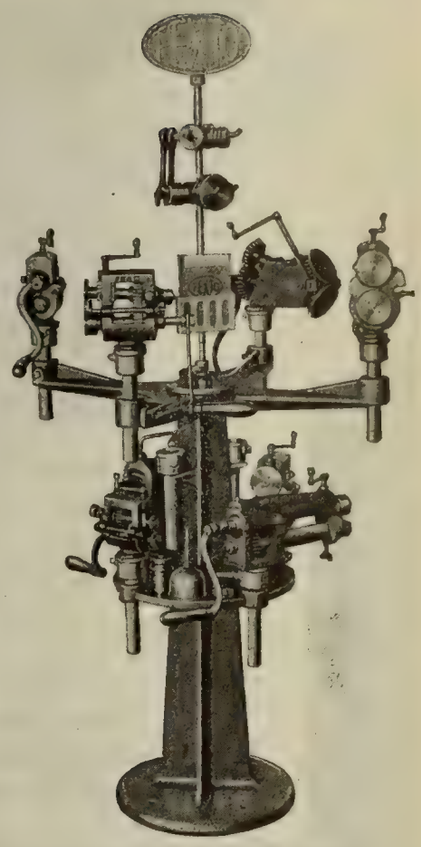
A new book which illustrates this practical device will be sent on request.

The Peck, Stow & Wilcox Co.

Mfrs. Mechanics' Hand Tools, Tinsmiths' and Sheet Metal Workers' Tools and Machines, Builders' and General Hardware.

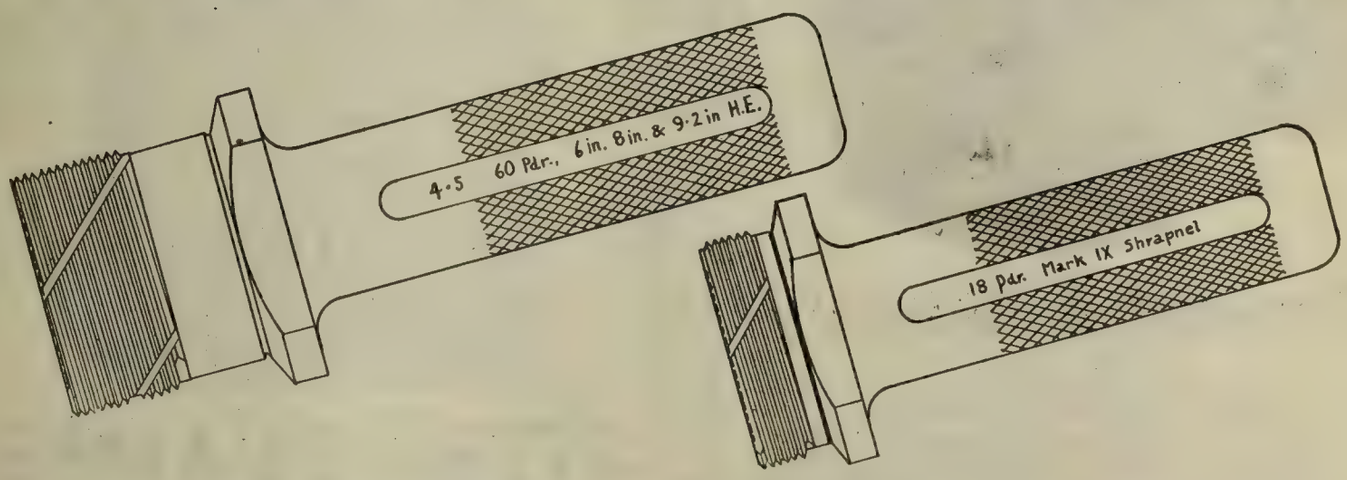
Address correspondence to 205 W. Center Street

SOUTHINGTON, CONN. CLEVELAND, O.



Holdall Revolving Machine Standard, No. 969 (With Machines).

FUSE HOLE GAUGES

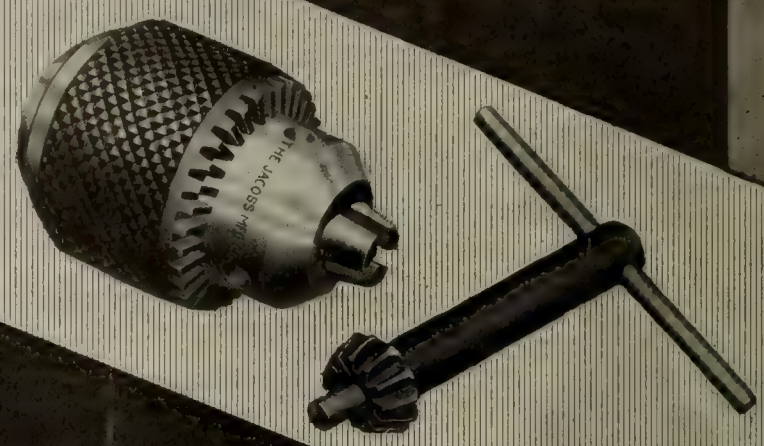


Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

Jacobs
IMPROVED
Drill Chuck

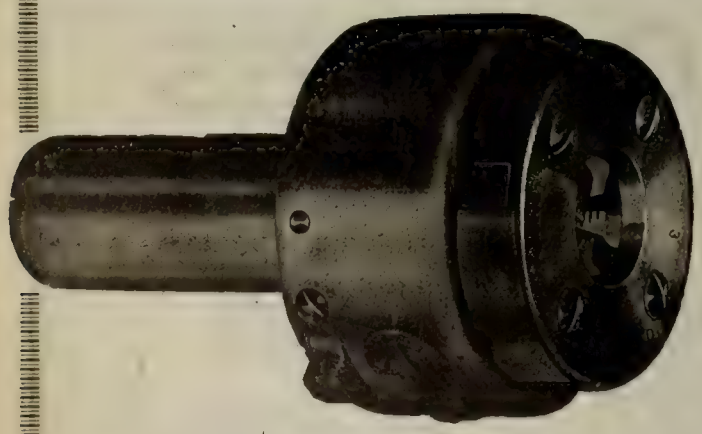


A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.

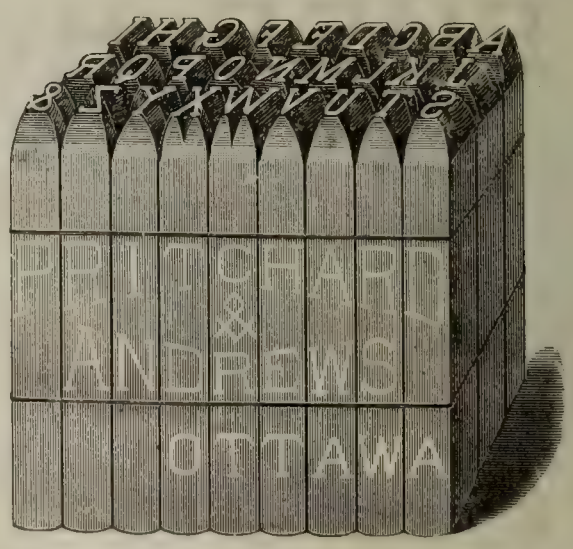


Thread Accuracy

Are you satisfied with your threads? Are they all you desire? Do you wish to get better results? That last question interests us vitally. Our Self-Opening Automatic Die Head will chase your troubles. Its quick release feature not only insures the cutting of the thread to a given point every time, but permits cutting right to the shoulder where required.

Our booklet will tell you about other features.

Eastern Machine Screw Corp.
NEW HAVEN, CONN., U.S.A.
H & G



STEEL STAMPS
FOR MARKING SHELLS, ETC.

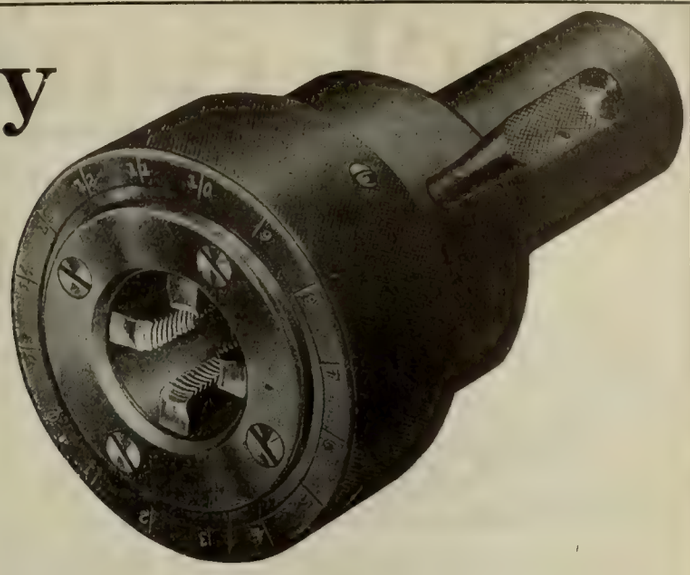
We will Give You Satisfaction on All Work of this Kind

SEND FOR PRICES

Pritchard-Andrews Co., of Ottawa
General Engravers and Die Sinkers
264 SPARKS ST. OTTAWA, CANADA

Rapid Delivery

Users of Murchey Tools Get Chasers Without Delay



Lightning deliveries—that is a big advantage of using Murchey Tools. No work held up for chasers. We get your order, fill it, and it's on the way back to you just as quickly as the most rapid means of transportation can bring it to you.

There is no service like the Murchey service, and there are no tools like the Murchey Tools. Send blueprints for estimates.

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Because of their money-saving service. They improve and increase your output and decrease your operating costs. They are lighter than others, yet are more durable and compact.

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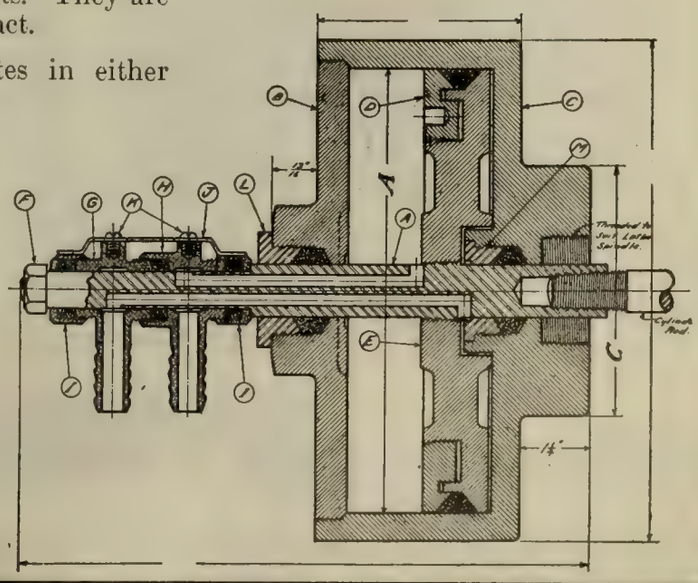

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MacLean's Magazine

for September

Northcliffe

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MacLean

COLONEL JOHN BAYNE MACLEAN is a notable contributor, writing of the causes of the war, and of the post-war reconstruction as it relates to Canada.

Colonel MacLean discusses the steps that should be taken to win the war, and deals with the financial measures that Canada must consider for the after-the-war period.

Colonel MacLean is pre-eminently well-informed, and his long and intimate connection with International and Domestic financial affairs makes what he writes challenging and illuminating.

Harold McGrath's Great Story of Adventure and Mystery

This world-famous fiction-writer contributes a complete novelette—"The Rubies of Perak."

Other notable contributors are Stephen Leacock, Miss Laut, W. W. Jacobs, Allenson, Moorhouse, and J. D. Ronald, who tells of a smuggling enterprise by an American who temporarily fooled the Customs Department when he imported the plant for a new factory in a Canadian City.

"The Gun Brand," by Hendryx, a great story of the Canadian Northwest, is a feature of the September *MacLean's.*

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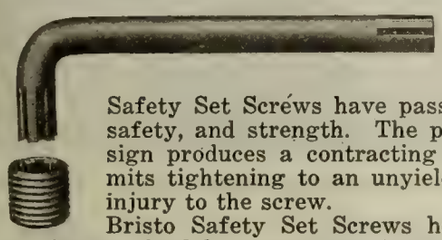

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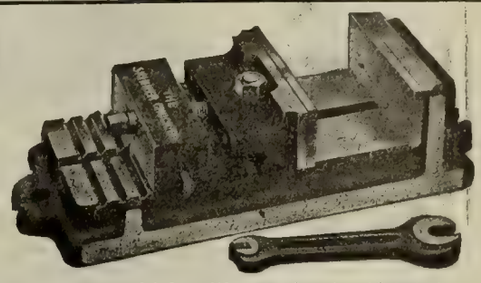

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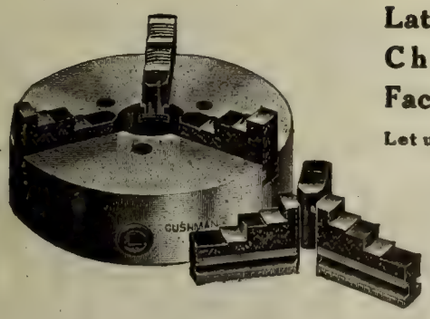

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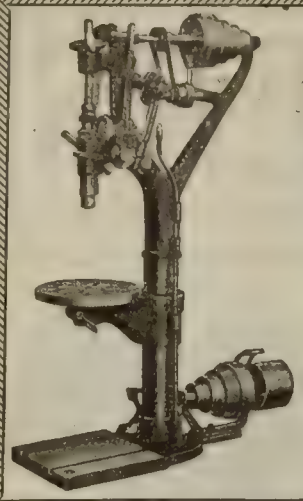

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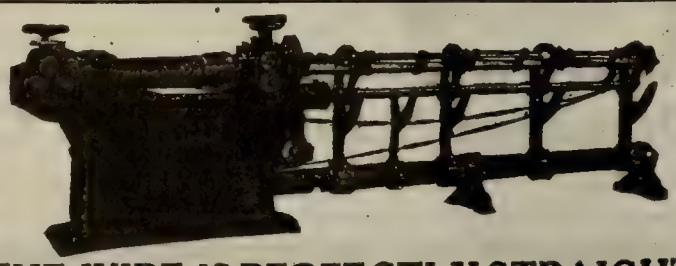

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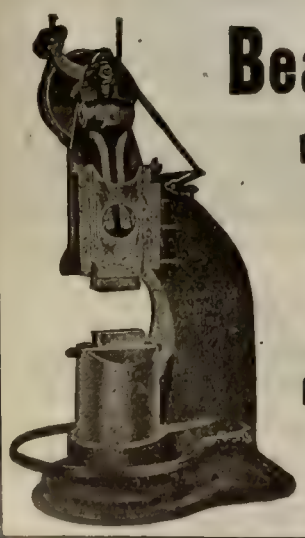

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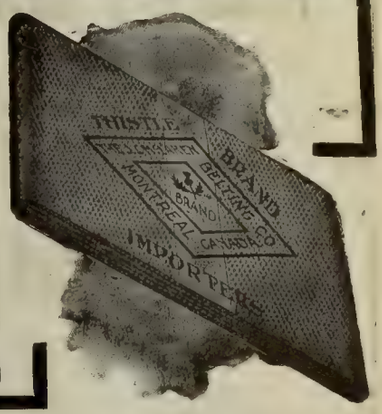

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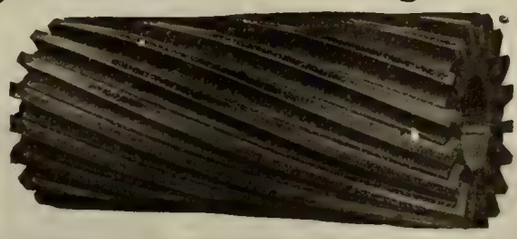

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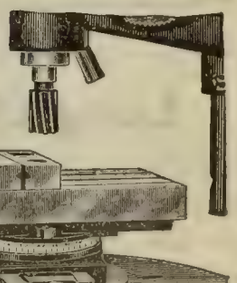

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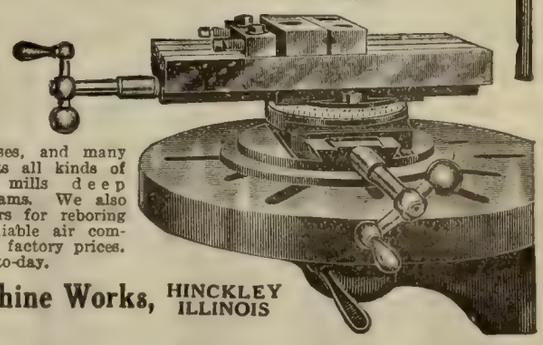

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Prest-O-Lite Co., Inc., Toronto, Ont.

BLUE PRINTING MACHINERY
Mulliner-Enlund Tool Co., Syracuse, N.Y.

BOARTZ
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York, N.Y.

BOILERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Riverside Machinery Depot, Detroit, Mich.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
Cumming & Son, J. W., New Glasgow, Canada
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

BOLT AND NUT MACHINERY
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Dominion Machy. Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machinery Co., Toronto

BOLT THREADING MACHINERY
Landis Machine Co., Waynesboro, Pa.
Victor Tool Co., Waynesboro, Pa.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co. of Canada, Toronto
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, UPRIGHT AND HORIZONTAL
John Bertram & Sons Co., Dundas
Canada Machinery Corp. Galt, Ont.
Dominion Machinery Co., Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Hill, Clarke & Co., Chicago, Ill.
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
Roelofson Machine & Tool Co., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, STOVE AND COAL
Cumming & Son, J. W., New Glasgow, Canada

BORING AND TURNING MILLS
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
R. E. T. Pringle, Ltd., Toronto, Ont.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland
New Britain Mach. Co., New Britain, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.

BRASS AND COPPER BARS, RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto

BRASS WORKING MACHINERY
Dominion Machy. Co., Toronto, Ont.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto, Ont.
Warner & Swasey Co., Cleveland
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machy. Co., Toronto

BRIDGES, RAILWAY AND HIGHWAY
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke

BRONZE RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto

BUBBLERS
Puro Sanitary Dk'g Fountain Co., Haydenville, Mass.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Ltd., Montreal
R. E. T. Pringle, Ltd., Toronto, Ont.

BUCKETS, CLAM SHELL, CRAB, DUMP
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

BUCKETS, ELEVATING AND HOISTING
Banfield, Edwin J., Toronto.

BULLDOZERS
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.

BURNERS, OIL AND NATURAL GAS
Bellevue Industrial Furnace Co., Detroit, Mich.
Gray Mfg. & Mach. Co., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.

BURRING REAMERS
Wells Bros. Co. of Canada, Galt, Ont.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque.

CANNERS' MACHINERY
Bliss, E. W., Co., Brooklyn, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
Brown, Boggs & Co., Hamilton, Can.
Prest-O-Lite Co., Inc., Toronto, Ont.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Can.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CAR MOVERS
Dillon Mfg. Co., Oshawa, Ont.

CARTRIDGE MAKING MACHINERY
Blackall, Fred. S., Woolworth Tower, New York.
Prest-O-Lite Co., Inc., Toronto, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER
Cumming & Son, J. W., New Glasgow, Canada.
Alexander Fleck, Ltd., Ottawa.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, GRAY IRON
Bernard Industrial Co., The A., Fortierville, Que.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Steel Foundries, Ltd., Montreal, Que.
Alexander Fleck, Ltd., Ottawa.
Gardner, Robt., & Son, Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Can. Steel Foundries, Ltd., Montreal, Que.
Dominion Steel Foundry Co., Ltd., Hamilton, Ont
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
Can. Steel Foundries, Ltd., Montreal, Que.
Cumming & Son, J. W., New Glasgow, Canada.

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.

CEMENT MACHINERY
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.
H. W. Petrie, Toronto.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Wright Mfg. Co., Lisbon, Ohio.

CHEMISTS
Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

CHESTS, TOOL
Union Tool Chest Works, Rochester, N.Y.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
John Bertram & Sons Co., Dundas, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Millers Falls Co., Millers Falls, Mass.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Richmond Mfg. Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Skinner Chuck Co., New Britain, Conn.
Thomas Elevator Co., Chicago, Ill.
D. E. Whiton Machine Co., New London, Conn.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.
Richmond Mfg. Co., Toronto, Ont.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, GEARED SCROLL
Richmond Mfg. Co., Toronto, Ont.

CHUCKS, MAGNETIC
H. E. Streeter, 523 New Birks Bldg., Montreal.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

CHUCKING MACHINES
Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

CLOCKS, WATCHMAN, PORTABLE
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Que.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.

COAL HANDLING MACHINERY
MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

COILING MACHINERY, WIRE AND SPRING
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

COLLARS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.
Stone Tool & Supply Co., J. R., Detroit, Mich.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

CONTROLLERS AND STARTERS, ELECTRIC MOTORS
Dominion Machy. Co., Toronto, Ont.
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, STEEL SLIDE-BLOW
Whiting Foundry Equipment Co., Harvey, Ill.

COPING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Lundas, Ont.

COUNTERSHAFTS
Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.

COUPLINGS, PLAIN AND FLEXIBLE
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES, LOCOMOTIVE
Northern Crane Works, Walkerille.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.

CUTTER GRINDERS AND ATTACHMENTS
Cincinnati Milling Machine Co., Cincinnati.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
H. W. Petrie, Ltd., Montreal.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Goddard Tool Co., Chicago, Ill.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining & Mfg. Co., Toronto.
Elm Cutting Oil Co., Toronto.
Racine Tool & Machine Co., Racine, Wis.

CUTTING-OFF MACHINES
Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machinery Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Peerless Machine Co., Racine, Wis.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Mchy. & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

CYLINDERS, AIR
Manufacturers Equipment Co., Chicago, Ill.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.

DAMPER REGULATORS
Canadian Fairbanks-Morse Co., Ltd., Montreal.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

DIAMONDS, BLACK AND ROUGH
Geo. A. Joyce Co., Ltd., New York.

DIAMOND TOOLS
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Banfield, W. H., & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Ltd., Montreal.
Wells Brothers of Canada, Galt, Ont.

DIES FOR BIT BRACE USE
Wells Brothers Co. of Canada, Galt, Ont.

DIES, NOSING
Marsh & Henthorn, Ltd., Belleville, Ont.

DIES, PIPE THREADING
Landis Machine Co., Waynesboro, Pa.

DIE SINKERS
Becker Milling Machine Co., Boston, Mass.
Garvin Machine Co., New York.
H. W. Petrie, Ltd., Montreal.

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Geometric Tool Co., New Haven.
Ideal Tool & Mfg. Co., Beaver Falls, Pa.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
Wells Brothers Co. of Canada, Galt, Ont.

DIES FOR SCREW PLATES
Wells Brothers Co. of Canada, Galt, Ont.

DIES, SHEET METAL WORKING
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Worth Engineering Co., Toronto, Ont.

DISCS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass

DIES, SCREW AND THREAD
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National-Acme Co., Cleveland, Ohio.
Wells Brothers Co. of Canada, Galt, Ont.

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W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

DISCS, LEATHER
Graton & Knight Mfg. Co., Montreal.

DRESSERS, GRINDING AND EMERY WHEEL
Can. Desmond-Stephan Mfg. Co., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, O.
A. R. Williams Machinery Co., Toronto.

DRILLING MACHINES, BENCH
Bilton Mach. Tool Co., Bridgeport, Conn.
Martin Machine Co., Greenfield, Mass.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Hespeler, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Rockford Drilling Mach. Co., Rockford, Ill.

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Dominion Machy. Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Hill, Clarke & Co., Chicago, Ill.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

DRILLING MACHINES, SENSITIVE
Aikenhead Hardware Co., Toronto, Ont.
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
De Mooy Machine Co., Cleveland, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
D. McKenzie Machinery Co., Guelph, Ont.
Niles-Bement-Pond Co., New York.
R. E. T. Pringle, Ltd., Toronto, Ont.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, Ohio.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Dominion Machy. Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto, Ont.
W. F. & John Barnes Co., Rockford, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Millers Falls Co., Millers Falls, Mass.
H. W. Petrie, Ltd., Montreal.
Pratt & Whitney Co., Dundas, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
United States Electrical Tool Co., Cincinnati.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.

DRILLS, CORNER (PNEUMATIC)
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

DRILLS, ELECTRIC AND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.

DRILLS, HIGH SPEED
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Can. B. K. Morton, Toronto, Montreal.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Foss & Hill Machy. Co., Montreal.
Marshall & Co., Geo. A., Toronto, Ont.
McKenna Brothers, Pittsburgh, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
W. F. & John Barnes Co., Rockford, Ill.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

DRILLS, MULTIPLE SPINDLE
Henry & Wright Mfg. Co., Hartford, Conn.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Ltd., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Niles-Bement-Pond Co., New York.
R. E. T. Pringle, Ltd., Toronto, Ont.

DRILLS, PNEUMATIC CORNER
Independent Pneumatic Tool Co., Chicago, Ill.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Millers Falls Co., Millers Falls, Mass.
Morse Twist Drill & Mach. Co., New Bedford.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Dominion Machy. Co., Toronto.
Foss & Hill Machy. Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Cleveland Twist Drill Co., Cleveland
Clark Equipment Co., Buchanan, Mich.
Foss & Hill Machy. Co., Montreal.
Morse Twist Drill & Mach. Co., New Bedford.

DRILLS, TWIST
Atkins & Co., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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Puro Sanitary Dk'g. Fountain Co., Haydenville, Mass.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sheldons, Ltd., Galt, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

DUST ARRESTERS (FOR TUMBLING MILLS)
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Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

DYNAMOS AND ELECTRICAL SUPPLIES
Canadian Fairbanks-Morse Co., Montreal.
Dominion Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
A. R. Williams Machy. Co., Toronto.

ELEVATOR ENCLOSURES
Canada Wire & Iron Goods Co., Hamilton, Ont.

ELEVATORS AND BUCKETS
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Whiting Foundry Equipment Co., Harvey, Ill.

ELEVATING AND CONVEYING MACHINERY
Banfield, Edwin J., Toronto.
Can. Matthews Gravity Carrier Co., Toronto, Ont.

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Cleveland Pneumatic Tool Co. of Canada, Toronto.
Stow Mfg. Co., Binghamton, N.Y.

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Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Ford-Smith Mach. Co., Hamilton, Ont.
Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Plessisville Foundry Co., Plessisville, Que.

ENGINES, STEAM, GAS, GASOLINE
Canadian Fairbanks-Morse Co., Montreal.
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H. W. Petrie, Toronto.
Riverside Machinery Depot, Detroit, Mich.

ENGINES, HORIZONTAL AND VERTICAL
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Johnson Mach. Co., Carlyle, Manchester, Conn.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
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Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
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Canadian Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

EXHAUSTERS
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H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

FANS
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Can. Blower & Forge Co., Kitchener, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

FAUCETS
Puro Sanitary Dk'g. Fountain Co., Haydenville, Mass.

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Canada Wire & Iron Goods Co., Hamilton, Ont.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

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Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Can. B. K. Morton Co., Toronto, Ont.
Delta File Works, Philadelphia, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Port Hope File Mfg. Co., Port Hope, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

FILING MACHINES
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Bowser & Co., Inc., S. F., Toronto, Ont.

FILTERS, WATER
W. B. Scaife & Sons, Pittsburgh, Pa.

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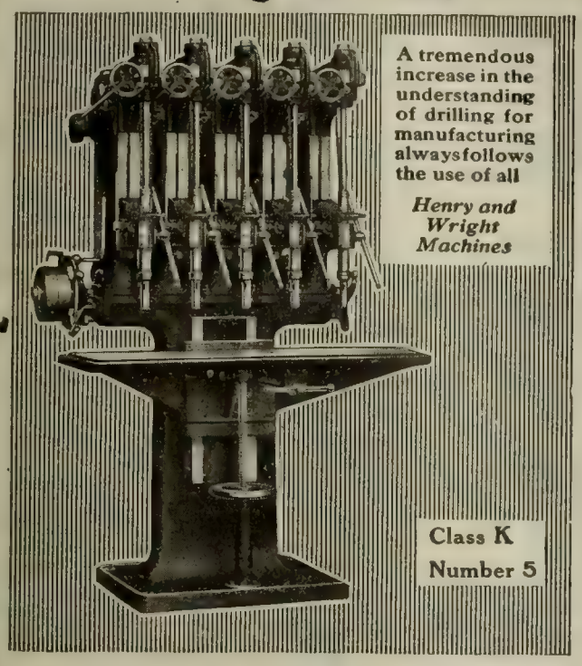

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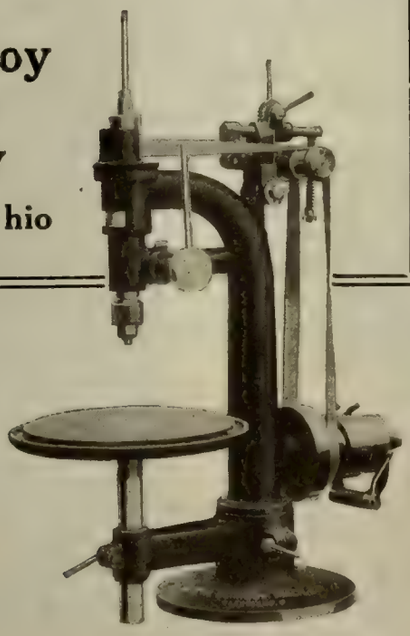

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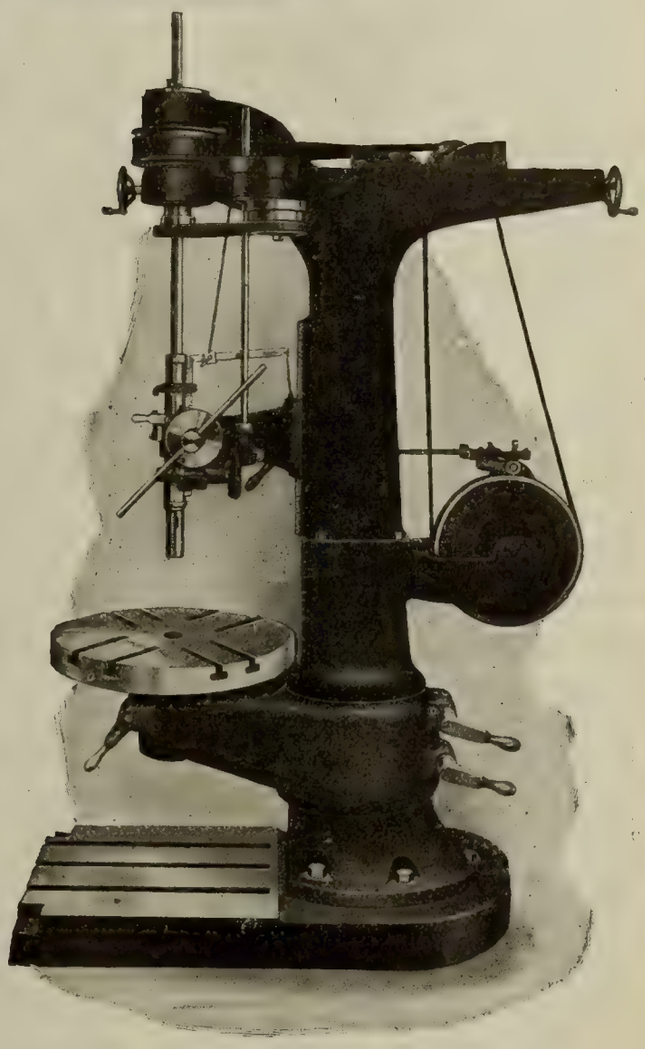

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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Hull Iron & Steel Foundries, Ltd., Hull, Que.
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Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
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Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
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Ford-Smith Mach. Co., Hamilton, Ont.
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Garlock-Walker Machinery Co., Toronto, Ont.
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Modern Tool Co., Erie, Pa.
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Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago.
Norton Co., Worcester, Mass.
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Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
LeBlond Mach. Tool Co., R. K., Cincinnati.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Wilmarth & Morman, Grand Rapids, Mich.
Stow Mfg. Co., Binghampton, N.Y.

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Baxter Co., Ltd., J. R., Montreal, Que.
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Can. B. K. Morton, Toronto, Montreal.
Carborundum Co., Niagara Falls.
Ford-Smith Mach Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.

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Stow Mfg. Co., Binghampton, N.Y.

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Baxter Co., Ltd., J. R., Montreal, Que.
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Ford-Smith Machine Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Millers Falls Co., Millers Falls, Mass.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Montreal.
Racine Tool & Machine Co., Racine, Wis.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Ltd., Montreal, Que.
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Millers Falls Co., Millers Falls, Mass.

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Bliss, E. W., Co., Brooklyn, N.Y.
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Canadian Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
Erie Foundry Co., Erie, Pa.
High Speed Hammer Co., Rochester, N.Y.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Plessisville Foundry Co., Plessisville, Que.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.

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Canada Machinery Corp., Galt, Ont.
West Tire Setter Co., Rochester, N.Y.

HAMMERS, POWER
Beaudry & Co., Boston, Mass.
Erie Foundry Co., Erie, Pa.
United Hammer Co., Boston, Mass.

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Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
R. E. T. Pringle, Ltd., Toronto, Ont.

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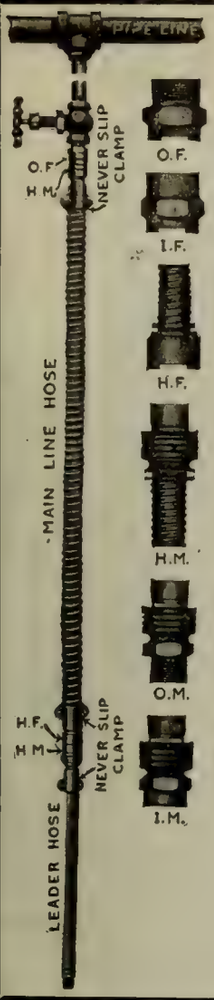

CLEVELAND HOSE SPECIALTIES

Bowes Automatic Air Hose Couplings

Over 1,000,000 in general use

STYLE O.F. is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.

STYLE I.F. is an inside Thread Female Pipe End. Made in sizes ¼-in. to 1½-in.

STYLE H.F. is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.

STYLE H.M. is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.

STYLE O.M. is an Outside Thread Male Pipe End. Made in sizes ⅜-in. to 1½-in.

STYLE I.M. is an Inside Thread Male Pipe End. Made in sizes ¼-in. to 1½-in.

The Male and Female Ends of Bowes Couplings interchange in sizes, ¼-in. to ¾-in. Sizes 1-in. and 1¼-in. interchange. The 1½-in. ends interchange only with themselves.

BOWES COUPLINGS

Are instantly connected or disconnected.

They are absolutely air-tight under all pressures.

They quickly pay for themselves by stopping costly leaks.

They interchange in sizes most commonly used.

They have no loose parts to be mislaid or lost.

They are made of brass and will not rust.

The U-shaped Gasket interchanges in couplings ¼-in. to ¾-in.

The Cleveland Never Slip Hose Clamp

Made in same sizes as Bowes Couplings

The adjoining cut of Never Slip Hose Clamp shows the "Flanges" which engage the groove provided in all hose ends of Bowes Couplings. The "Model Hose Line" illustrated shows correct styles of couplings to use and proper way to attach the clamps.

CLEVELAND GROOVED HOSE NIPPLE

Grooved Nipples when attached to hose with the wire clamp cannot "blow-out," as one-half of the Wire Clamp lies in Nipple Groove, and the other half on the hose, uniting nipple and hose permanently. "Blow-outs" are expensive, as one to five men are idle while new connection is being made; time wasted, ten to thirty minutes. Can you afford it?

WIRE CLAMP TOOL

To apply Wire Clamps to Grooved Hose Nipples you need the Wire Clamp Tool illustrated, a small hand-operated tool at moderate cost which we carry in stock for immediate delivery. In Stock: Riveting and Chipping Hammers, Four-piston Air Drills, Corner Drills, Emery Grinders, Sand Rammers, Holder Ons, Etc.

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IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and stop costly leaks.

Write for Catalog No. 12, which Illustrates our complete line of Air Tools.

Address all inquiries to

CLEVELAND PNEUMATIC TOOL CO. OF CANADA LTD., 84 Chestnut St., TORONTO

A. R. WILLIAMS MACHINERY CO., TORONTO. WILLIAMS AND WILSON, MONTREAL

Greater and Better Production

One way is to install two machines. Another way is to install a Blount Grinder. Cut shows a machine for 16" x 2½" x 1¼" wheels. Self-oiled, line-reamed, babbitted bearings. Milled caps to lock on to boxes. High grade steel spindle interchangeable.

J. G. BLOUNT
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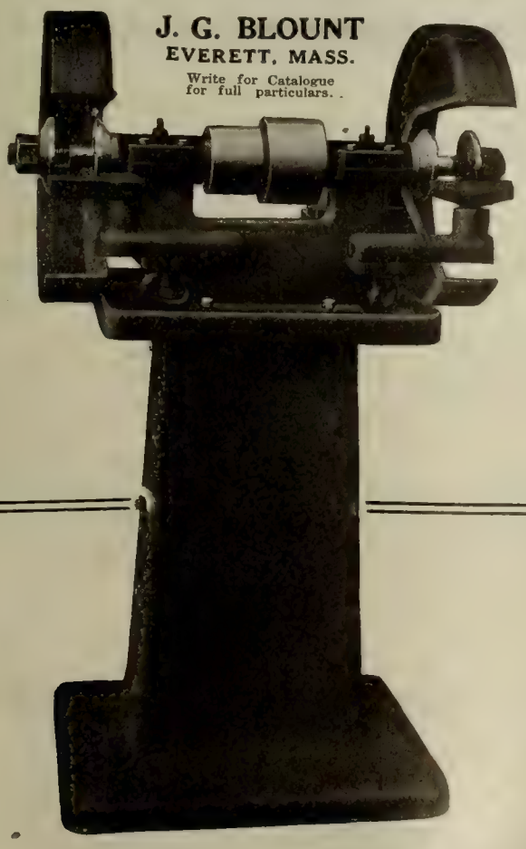

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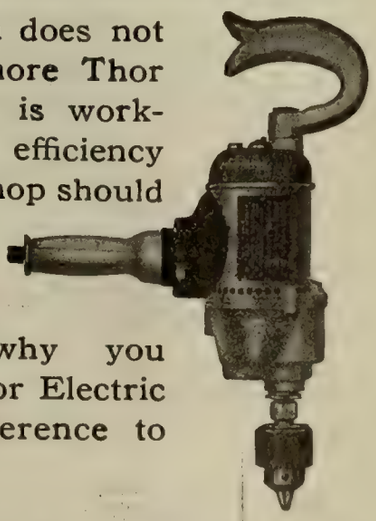
Licensed Under Burke Universal Motor Patent



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National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

OIL, DRAWING
Elm Cutting Oil Co., Toronto, Ont.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Machine Co., The, Hamilton.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
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Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford, Ont.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVENS FOR DRYING, TEMPER AND UNDER TRUCKS
Brantford Oven & Rack Co., Brantford, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.

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Can. Welding Works, Montreal, Que.
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Toronto Welding Co., Toronto, Ont.

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L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

OXYGEN (SEE ACETYLENE)

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Bennett, W. P., 51 Montford St., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
New Britain Mach. Co., New Britain, Conn.

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William R. Perrin, Ltd., Toronto.
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MacKinnon, Holmes & Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

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Garlock-Walker Machinery Co., Toronto, Ont.

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Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
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Williams Tool Co., Erie, Pa.
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Toronto Iron Works, Ltd., Toronto.

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Wells Bros. Co. of Canada, Galt, Ont.

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Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
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Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Sheldons, Ltd., Galt, Ont.
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Canadian Billings & Spencer, Ltd., Welland.

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Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

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Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.

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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
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Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
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Metalwood Mfg. Co., Detroit, Mich.
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William R. Perrin, Ltd., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
H. W. Petrie, Toronto.
Toledo Machine & Tool Co., Toledo.
West Tire Setter Co., Rochester, N.Y.
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Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Charles F. Elmes Eng. Works, Chicago.
Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
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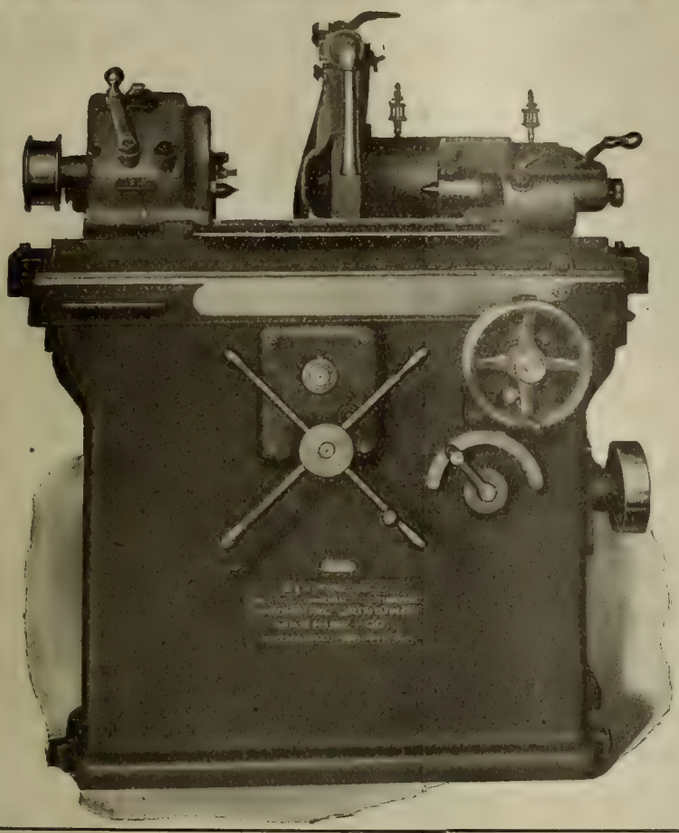
FITCHBURG 6" x 20"
MANUFACTURING GRINDER



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The FITCHBURG 6" x 20" is designed and constructed to meet the grinding problems put up to machines of very much larger capacity.

Model "A" power feed No. grinding wheel speeds (3) 1300-1550-1800 R.P.M.

Weight of machine about 4100 lbs.

Floor space 52" x 66".

Fitchburg Grinding Machine Co.

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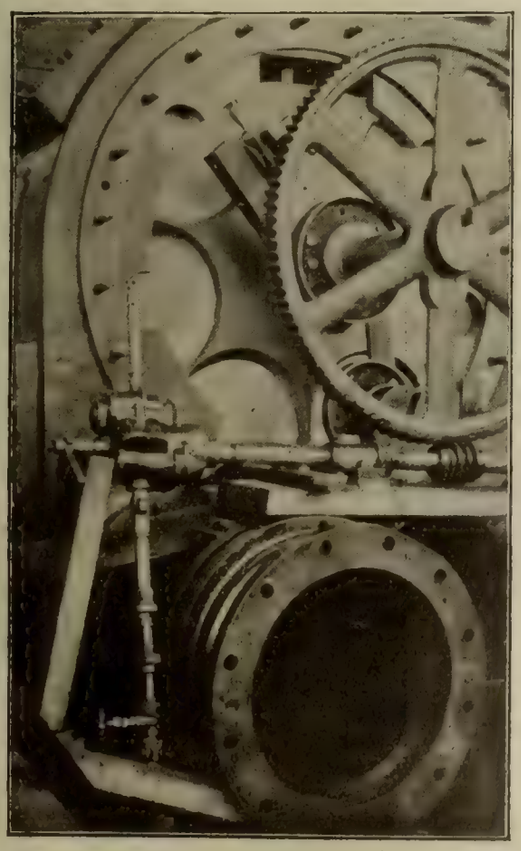

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National-Acme Co., Cleveland, Ohio
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Foss & Hill Machy. Co., Montreal
Gardner, Robt., & Son, Montreal
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton, Ohio
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto
Rhodes Mfg. Co., Hartford, Conn.
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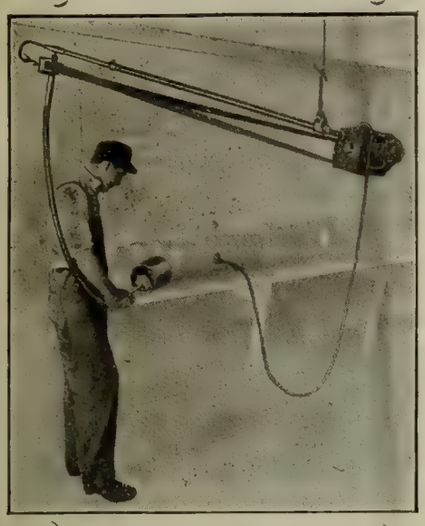

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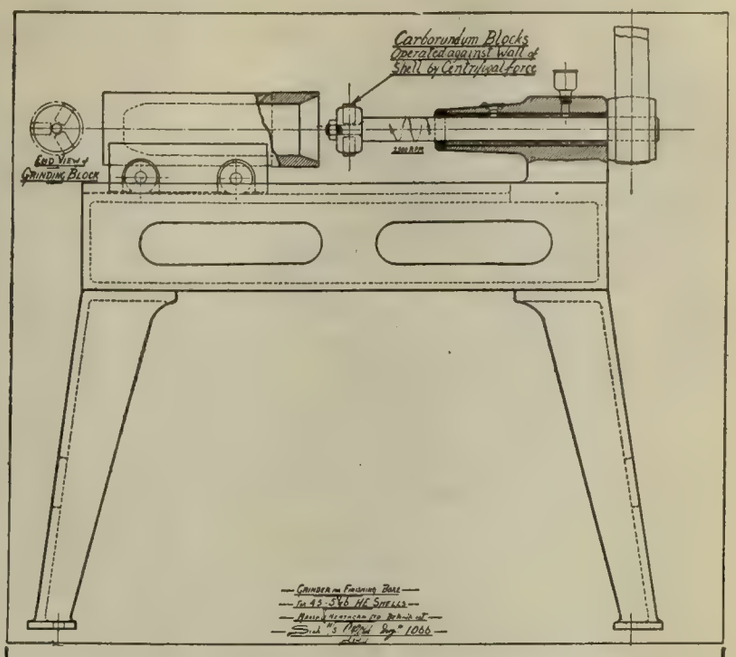

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Landis Machine Co., Waynesboro, Pa.
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Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York
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Landis Machine Co., Waynesboro, Pa.
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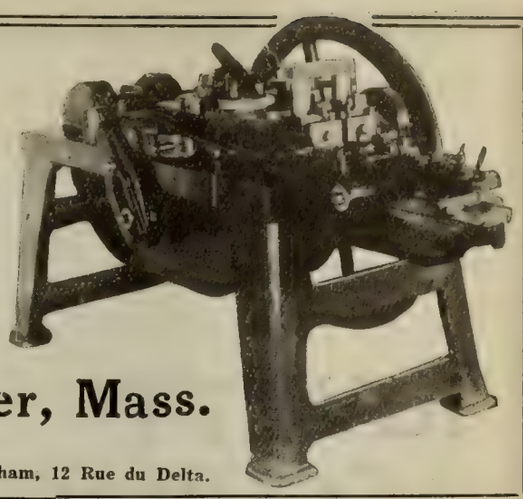

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Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Jenckes Mach. Co., Sherbrooke, Que.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Ltd., Toronto, Ont.
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Foss & Hill Machy. Co., Montreal.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.

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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
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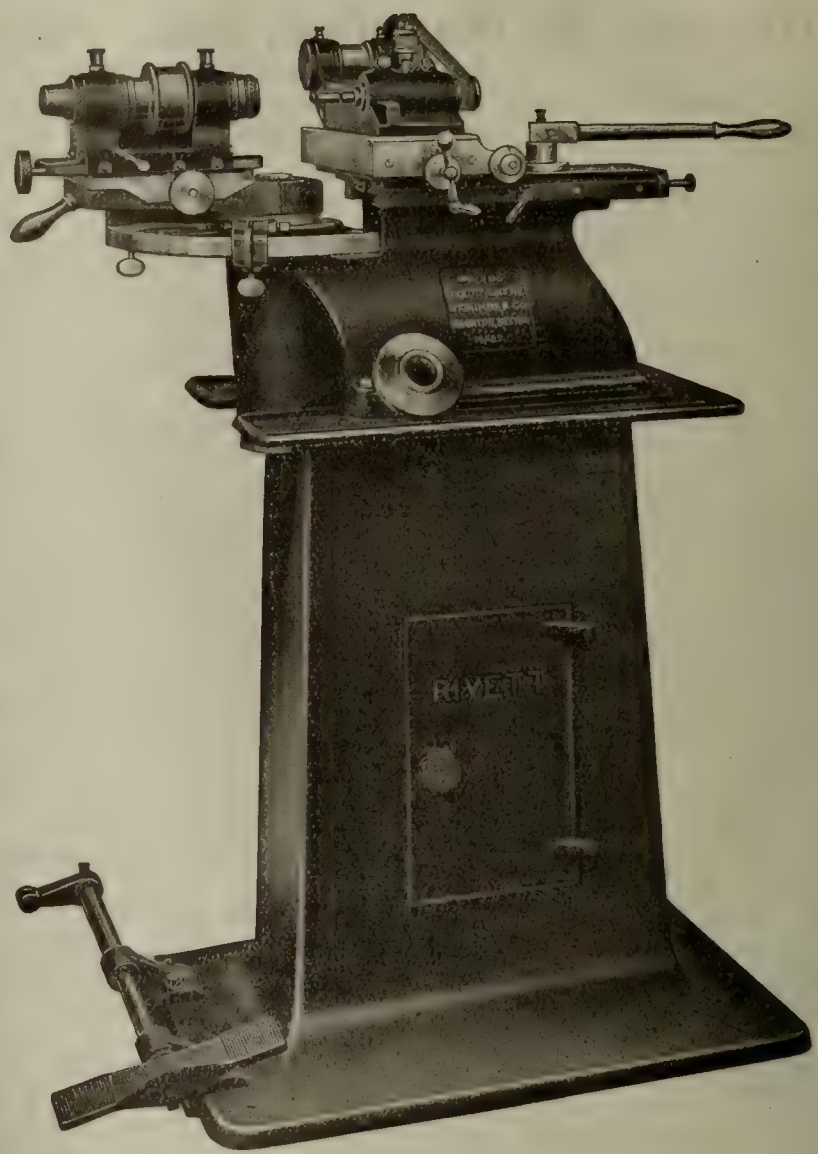

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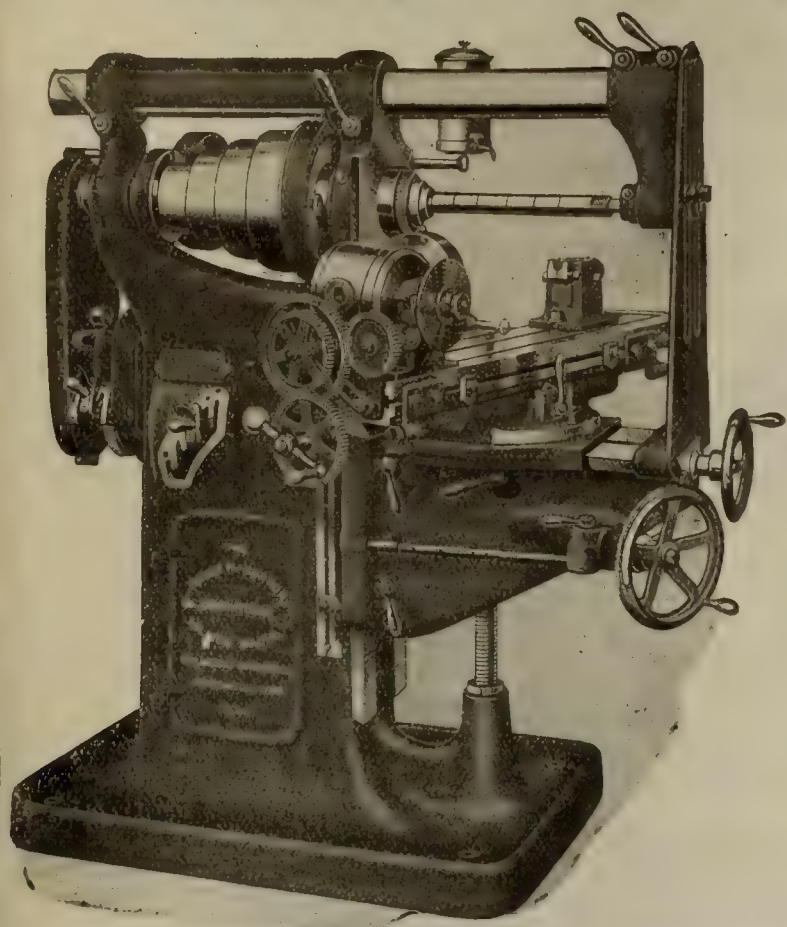

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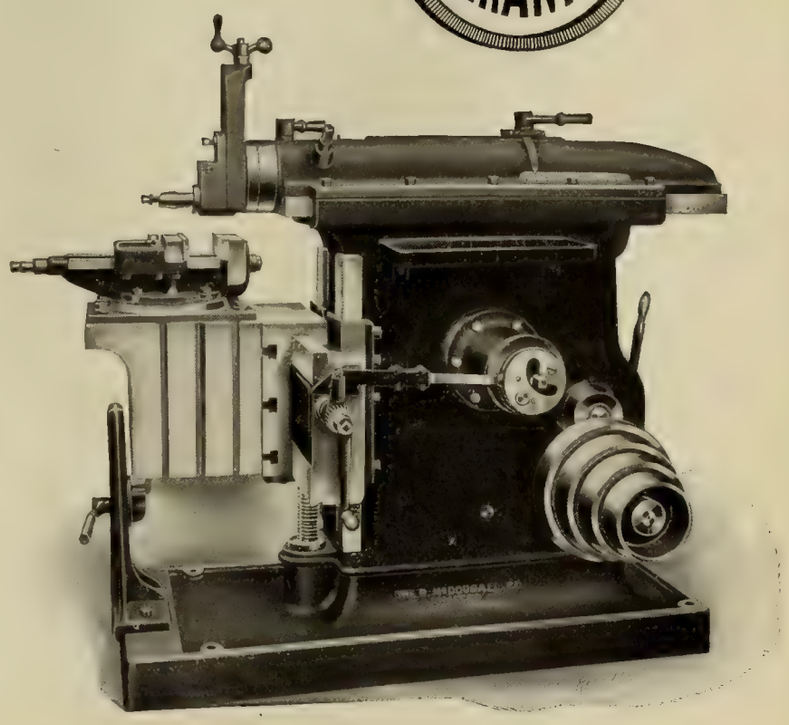

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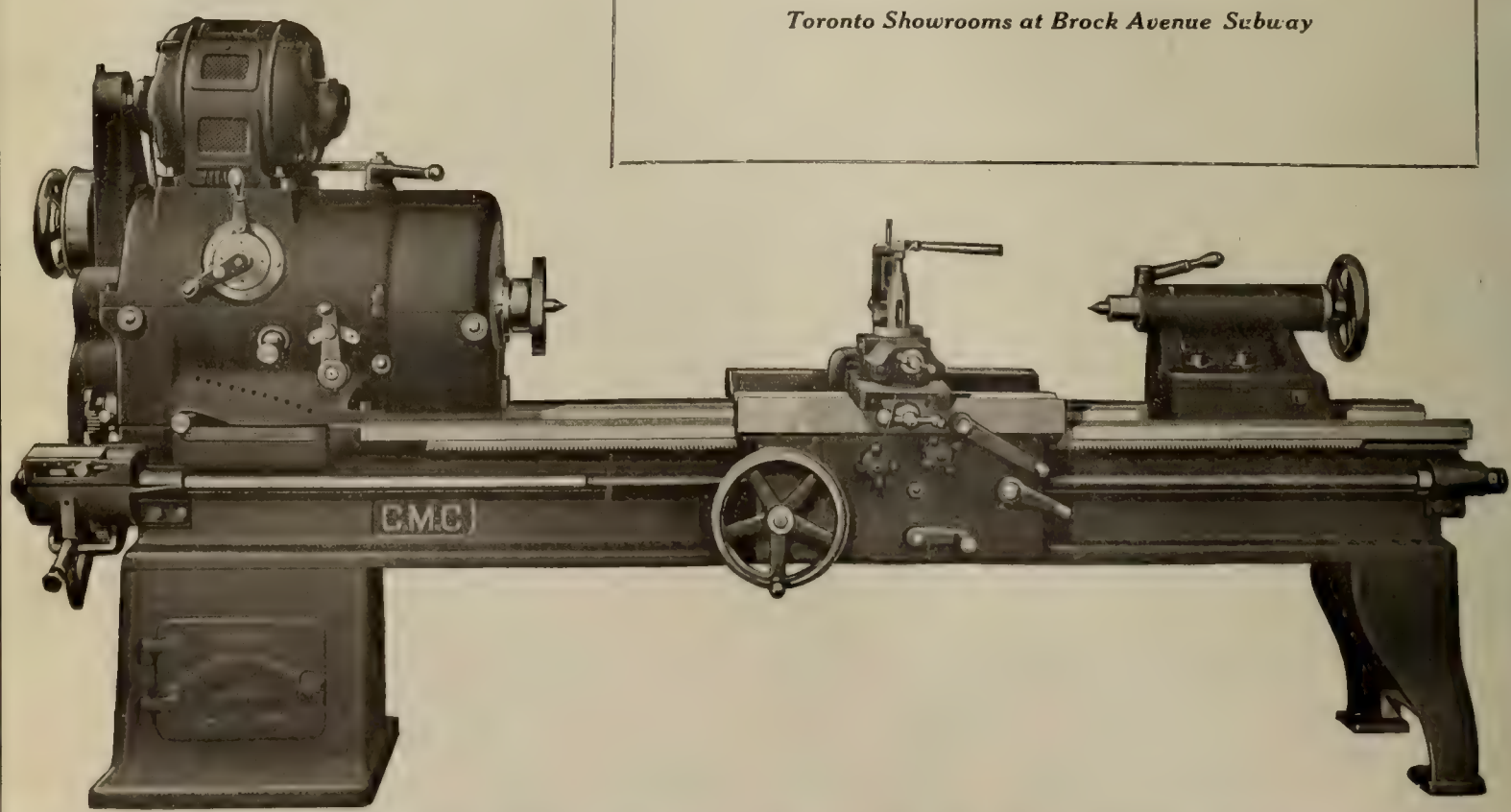

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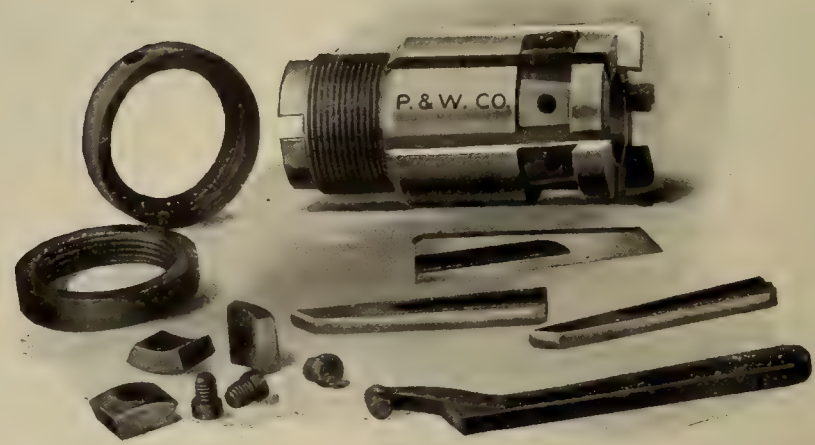

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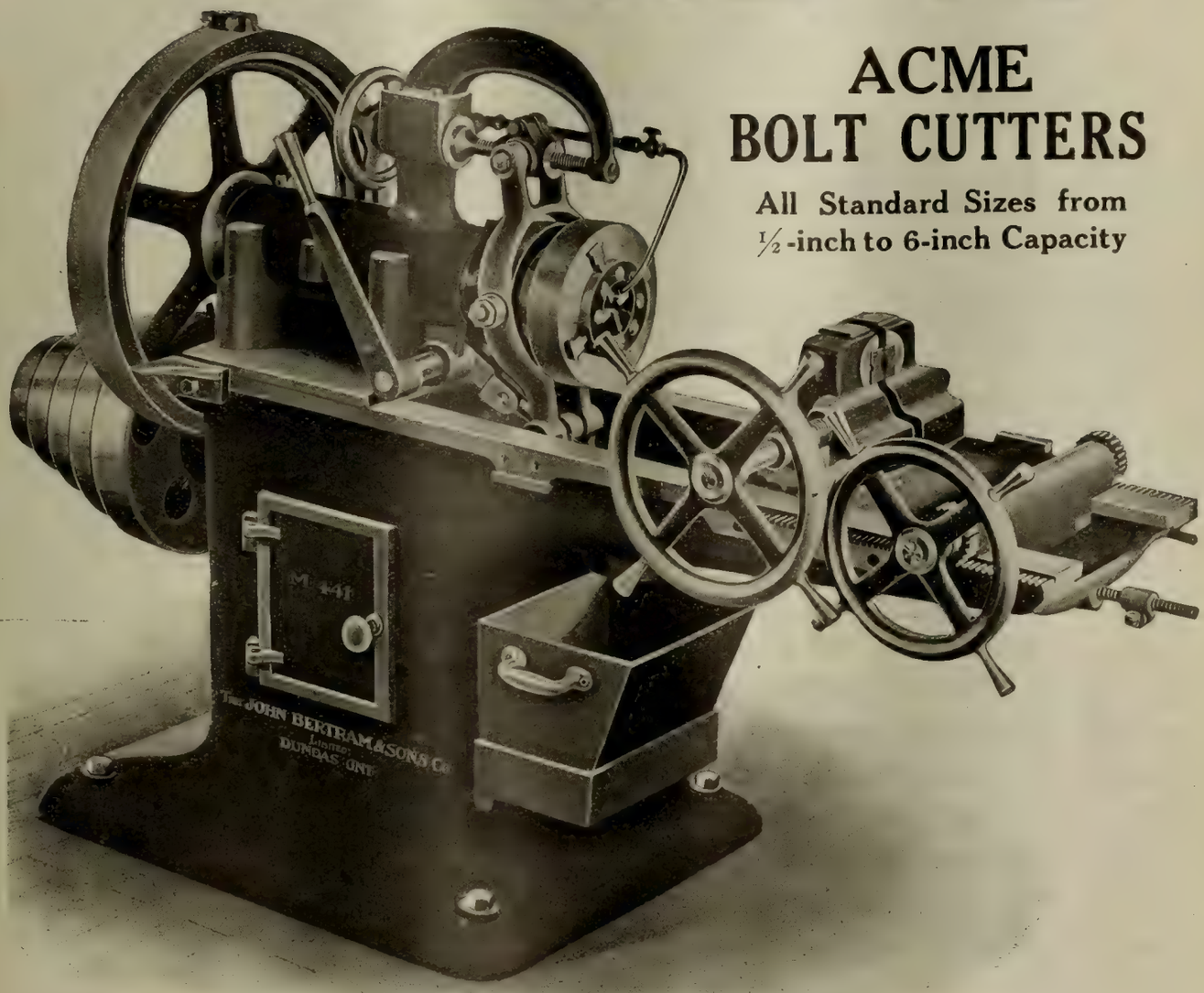

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The Publisher's Page

TORONTO September 6, 1917

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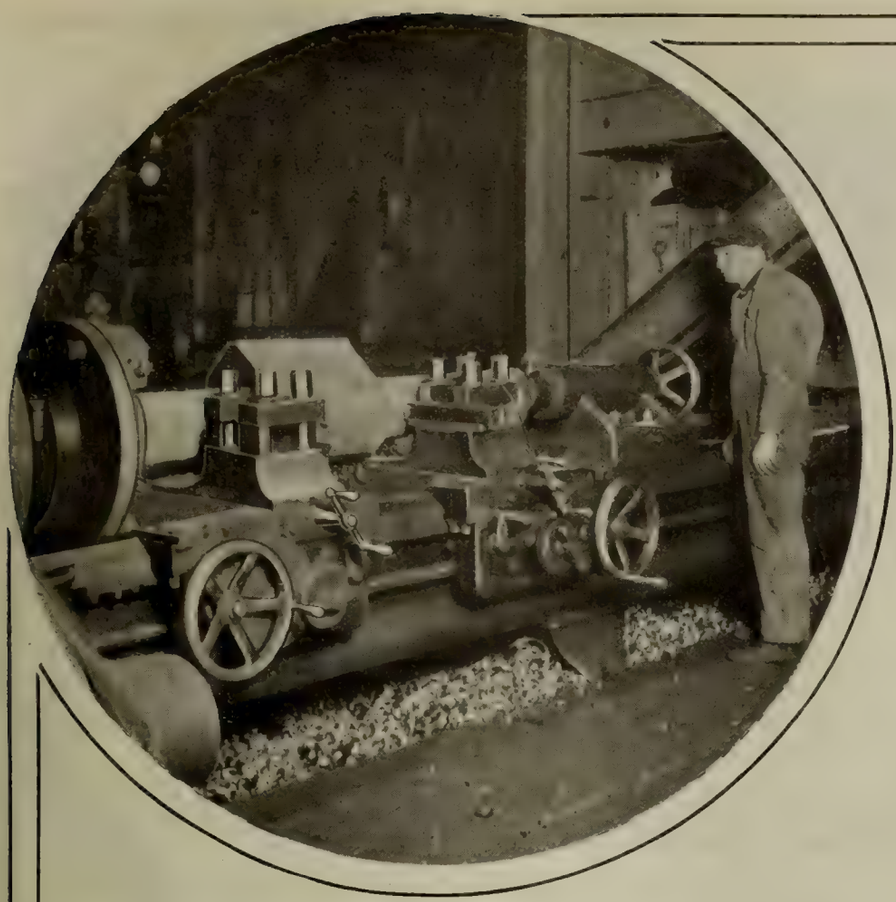

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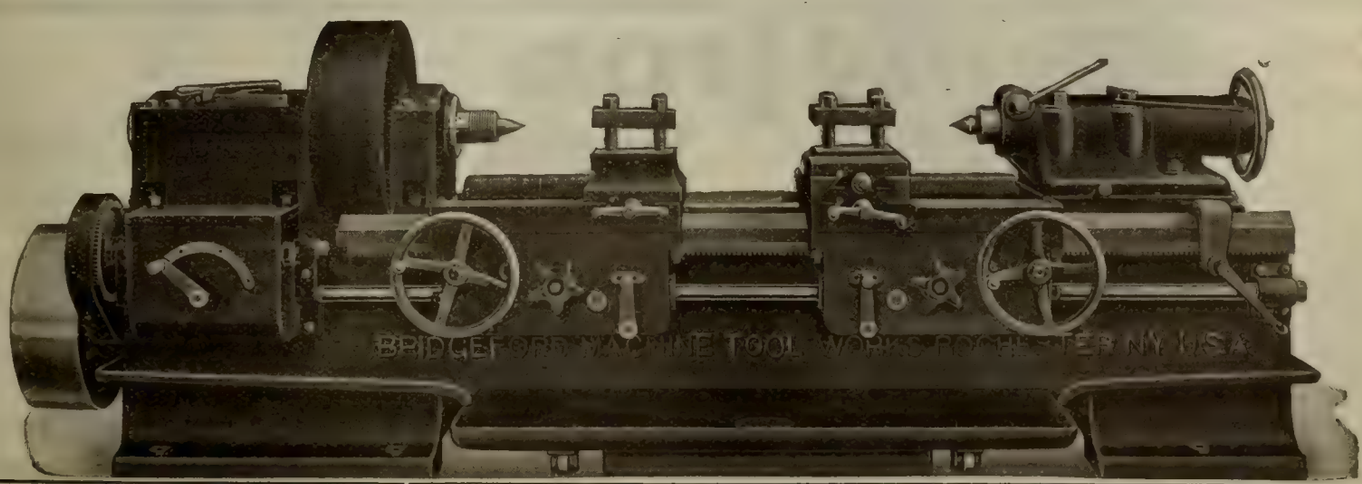
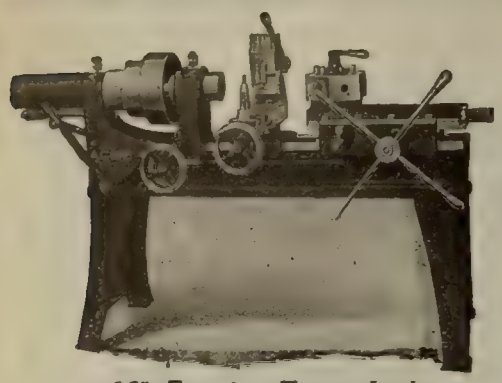
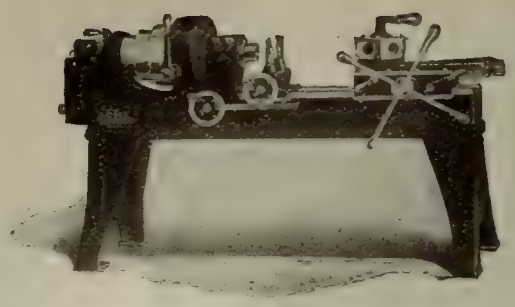
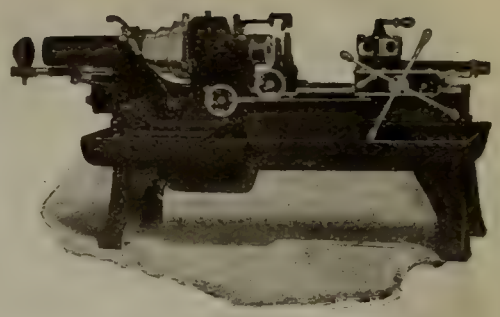




16" Forming Turret Lathe



18" Turret Lathe



2¼" x 11" Screw Machine

Meet War Time Demands

For fast and accurate work that conditions now demand, **Cincinnati Acme Screw Machines and Turret Lathes** are right up in the front rank. Used in the best shops of the world, and give the best of satisfaction in efficiency and economy in production.

The Screw Machines are made in five sizes, 11" to 20" swing, ⅝" to 2¼" capacity. The Turret Lathes are made in four sizes, 14" to 20" swing.

It will pay you to investigate the possibilities of the *Cincinnati Acme* in your shop.

Write to-day.

The Acme Machine Tool Co.
Cincinnati, Ohio, U.S.A.
Code Word: ACME

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Works: LONGUEUIL, QUE.

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The Life of a Thread Miller

Depends not upon the amount of work it does, but the ease and thoroughness with which the work is done. These Thread Millers are noted for these qualities. Its quality of work is unrivalled. Our Service Department will give you all the particulars. *Write us!*

THE A.R. **WILLIAMS** MACHINERY CO., Limited
64-66 Front Street West
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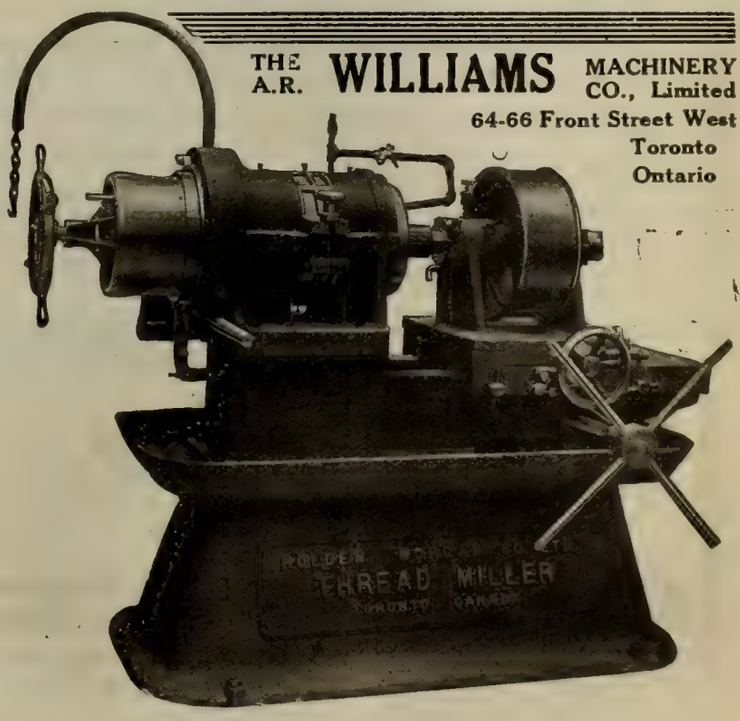
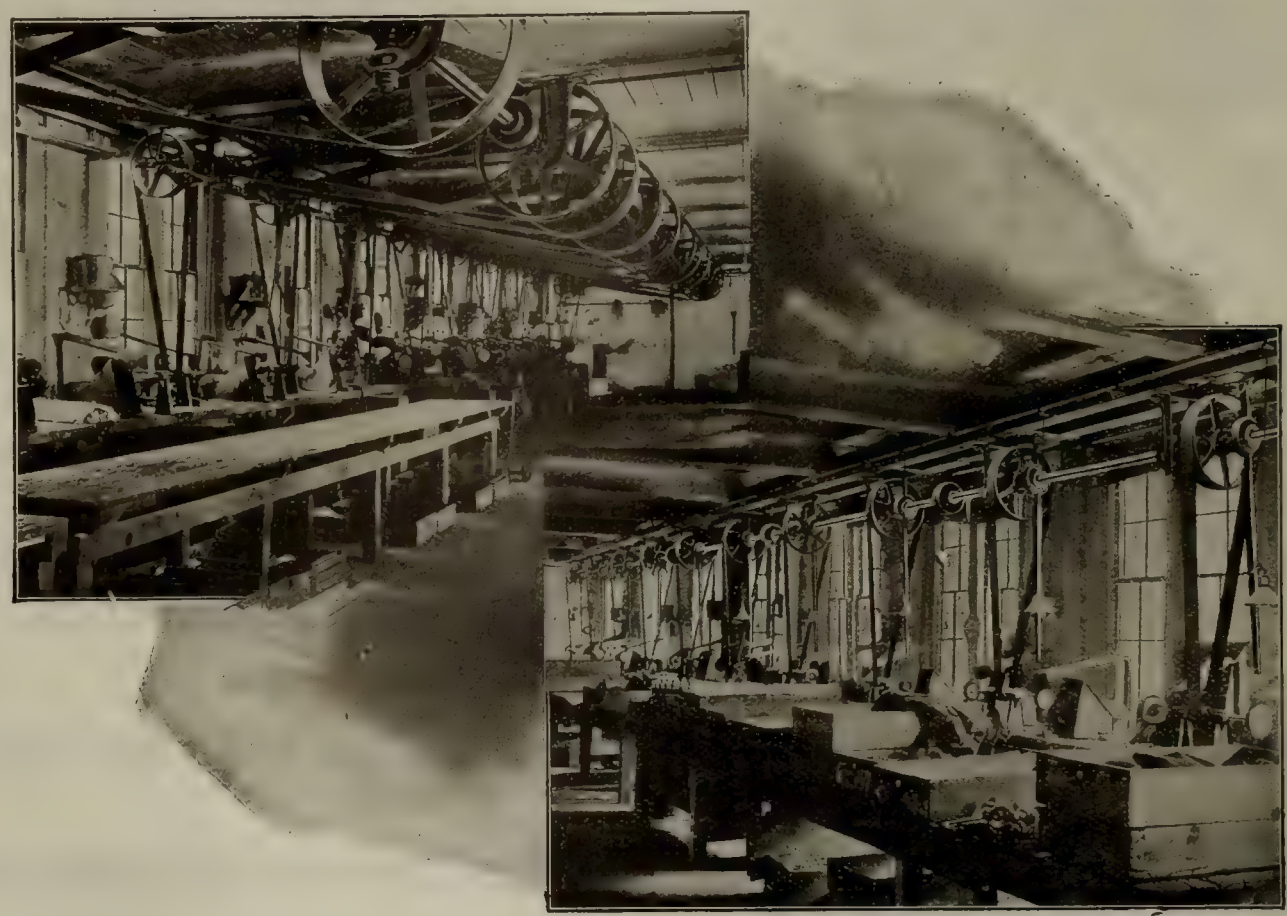
Ontario



THE JOHNSON FRICTION CLUTCH

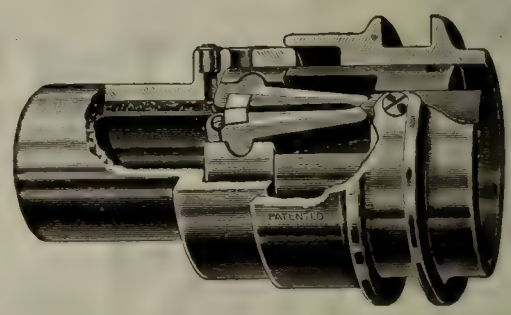
HAS CHANGED POWER TRANSMISSION

The Old Way →



← *The New Way*

"Johnsons" Drive Direct from Line Shafting



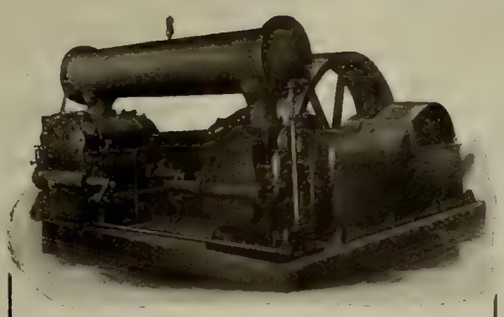
Single Clutch—Interior

Johnson Friction Clutches mounted over every machine allows any machine to be stopped or started at the will of the operator while the others are still running. This method eliminates the cross belting from the regular line shaft to the counter-shafting and consumes a great deal less power. There is only one-half the transmission equipment necessary when the countershafting is eliminated, which means one-half less initial cost, one-half less friction, one-half less trouble and repair, one-half less space occupied, and a cleaner, neater and lighter machine room. Although small in size the Johnson Friction Clutch is designed to drive considerable power at high speeds. It works in a field of its own, as we do not build a clutch to handle more than 40 H.P. at 1,000 R.P.M.

It is the clutch the conservative engineers specify. Let us help you derive clutch satisfaction. We have the clutch for your requirements. Write for our booklet, "Clutches as applied in Machine Building," and our yellow data sheets.

Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal; Can. Fairbanks-Morse Co., Ltd., Toronto.
England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.

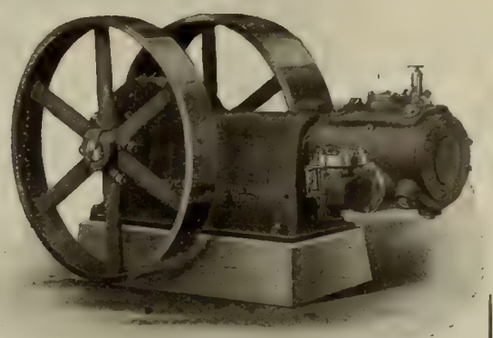
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



JENCKES CLASS DB-2 AIR COMPRESSOR

If you understand compressors look over the following outline. If you are not acquainted with these machines it would delight us to give you an introduction.

Inlet Valves are of the Corliss type, the outlet valves of the disc type; flood type lubrication, allowing a continuous flood of oil over bearings, crank pins, etc., while in motion. Machine of the enclosed type.



JENCKES CLASS CB-1 AIR COMPRESSOR

If your requirements do not justify either of the above machines, just bear in mind that we have a very comprehensive range that will cover all usual and unusual needs. The above is equipped with inlet and outlet disc valves; splash gravity lubrication system; extra large bearings; machine entirely enclosed.

Jenckes Machine The **Company, Limited**

Works: St. Catharines, Ont.
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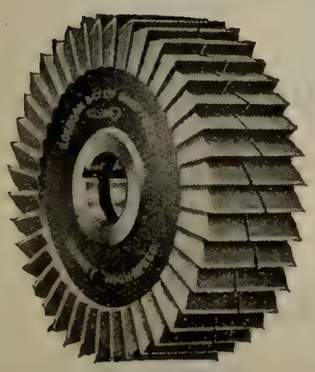

Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)
Limited
Head Office and Works: Montreal, P.Q.
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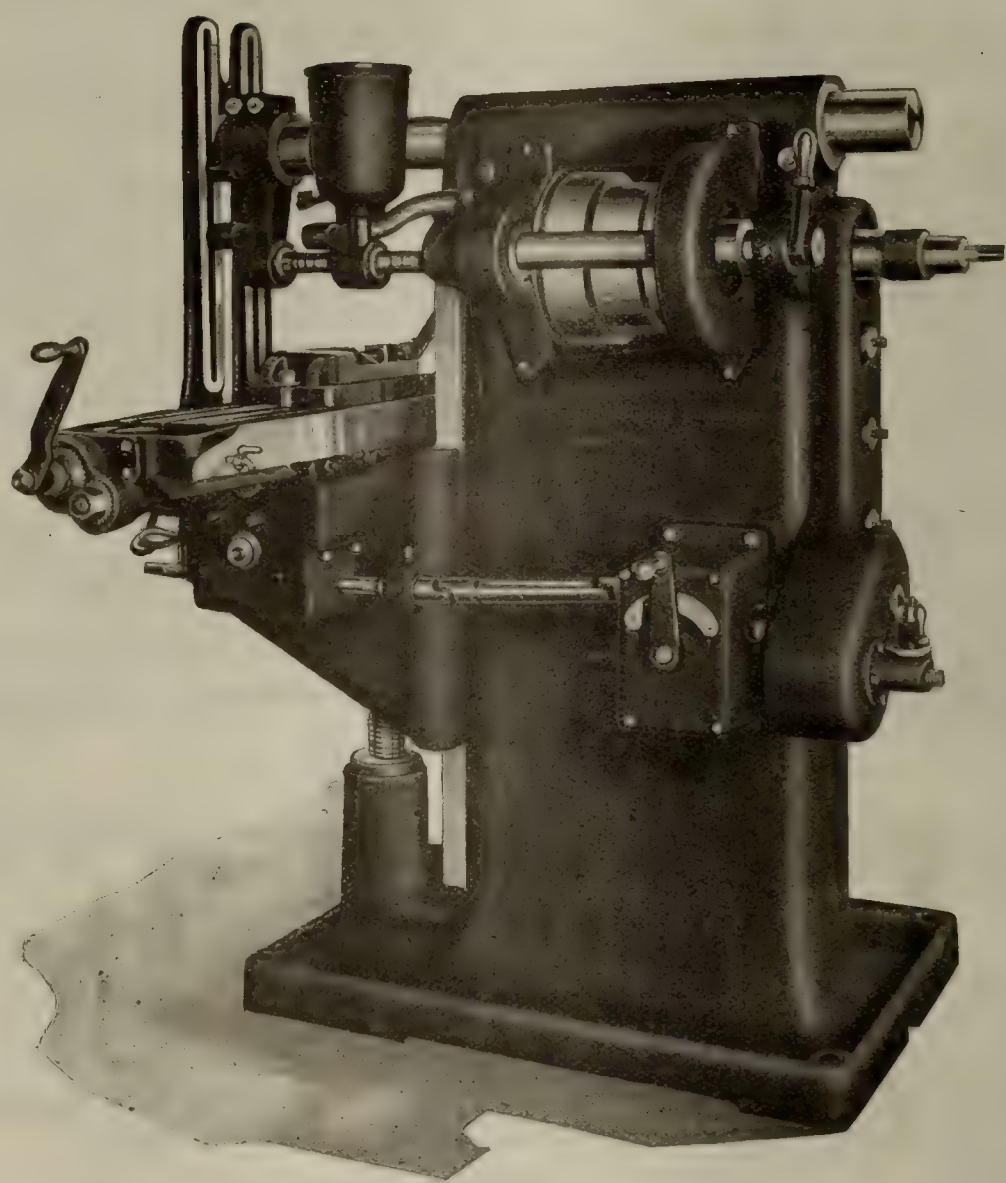
The Ford-Smith Machine Company

Adv't. No. 3 Miller Series

JUST A FEW REASONS WHY OUR MILLERS ARE PROVING BOTH SERVICEABLE AND PROFITABLE



Reason No. 1. Large amount of Power delivered to Cutter.
Reason No. 2. Ease of Feed and Cutting Speed Changes.
Reason No. 3. Centralized Control of Machine.
Reason No. 4. Large capacity of Table and Vise.

THERE ARE OTHER REASONS, WHICH WE HAVE NO CHANCE TO TELL YOU OF HERE—SUPPOSE YOU DROP US A POST CARD FOR OUR CATALOG—IT TELLS THE DETAILS.

The Ford-Smith Machine Company, Limited
HAMILTON ONTARIO CANADA

Sheet Metal Working Machinery

of any description

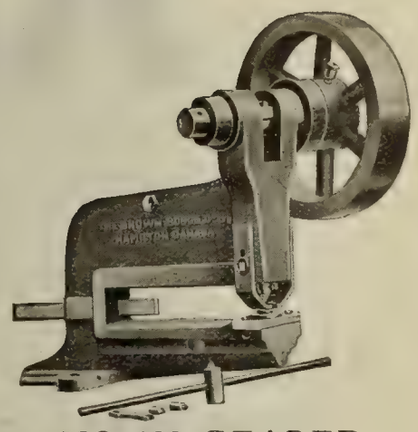
NO 7 SCREW PRESS

For

Quality Efficiency

Durability Speed

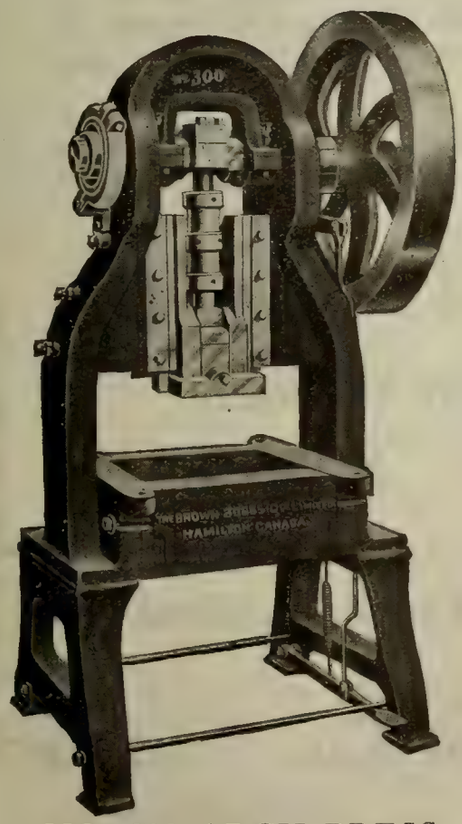
they are unsurpassed.



NO 100 GEARED POWER PUNCH

The Brown, Boggs Company, Limited

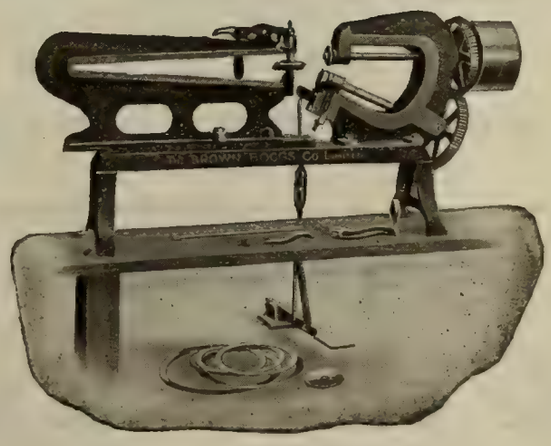
Hamilton, Ont.



NO. 300 ARCH PRESS

Manufacturers:

Tinsmiths', Heavy Sheet Metal Working Machinery, Canners' and Evaporating Machinery.



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ATLAS Alloys are scientific products—the result of much patient research and long years of experience. They are manufactured under the most modern scientific conditions, thereby eliminating any element of chance in their composition and ensuring a standard maintenance of quality and uniformity.

ATLAS Brands are not alloys that *sometimes* give *satisfaction.* They are alloys that can be implicitly relied upon *always.* They are alloys with our *prestige* and *reputation* always behind them.

DO not let prejudice stand between *you* and *profit.* You can obtain the *maximum efficiency* from your plant at a *minimum of cost* by using ATLAS BABBITTS.

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Sales Agents:

The Canadian B. K. Morton Co., Limited

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49 Common Street
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86 Richmond Street East
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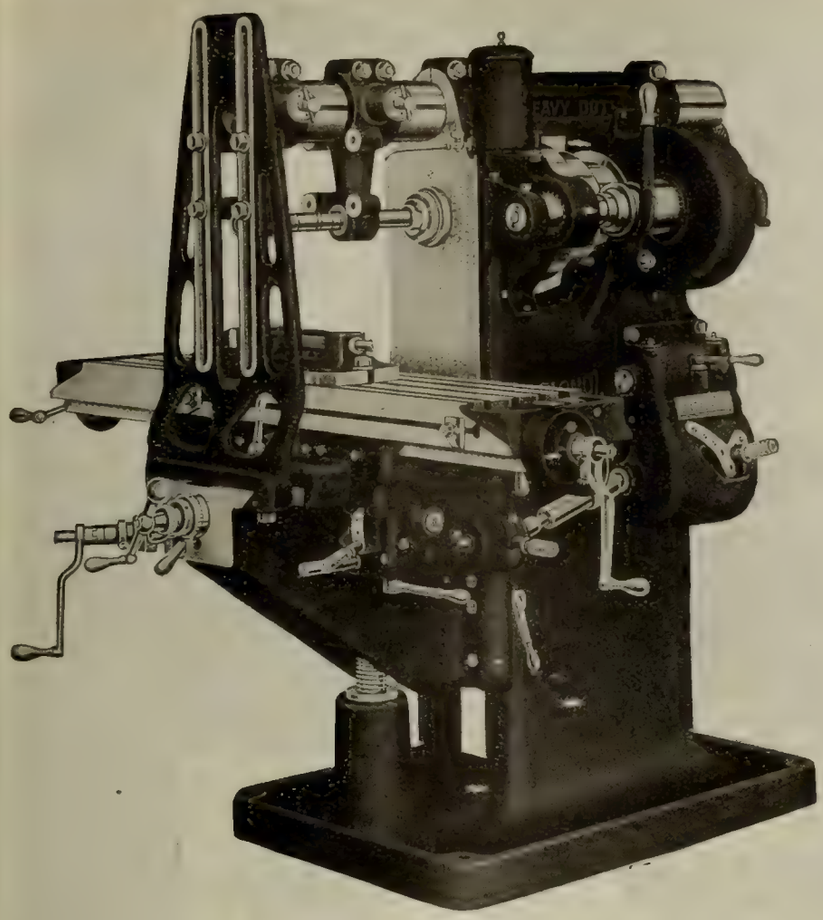

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Heavy Duty Milling Machines

Plain or Universal Types—Cone or Gear Drive. All commercial sizes No 0 to No. 5.

Adapted for the Heaviest Manufacturing or the most exacting tool room service. A suitable Range and Capacity for every class of milling.

Patent Self-Aligning Arbor Supports—Hardened Steel Spindle Bearings—Double-Friction Back Gears—and the simplest type of right-hand control, contribute to an increased production and longer life as a precision machine.

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Balfour's Tool Steel
"CAPITAL" HIGH SPEED TWIST DRILLS

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HIGH-SPEED STEEL IN EXISTENCE

By using Uranium in our process of steel making, we have produced a truly remarkable combination of those two most desirable qualities, toughness and strength.

Through the consistent maintenance of quality, workmanship, and the exclusive use of automatically regulated furnaces, which eliminate all possible chance of human fallibility, we are able to produce a very high grade of High-Speed Steel.

"Electrite-Uranium" has an exceptional cutting ability. It is increasing the users' output everywhere. Give it a trial.

We can make immediate deliveries on bars of regular sizes.

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Made from the **BEST** Materials

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SPECIMEN CUTTINGS MADE WITH

URANIUM

HIGH SPEED TOOLS

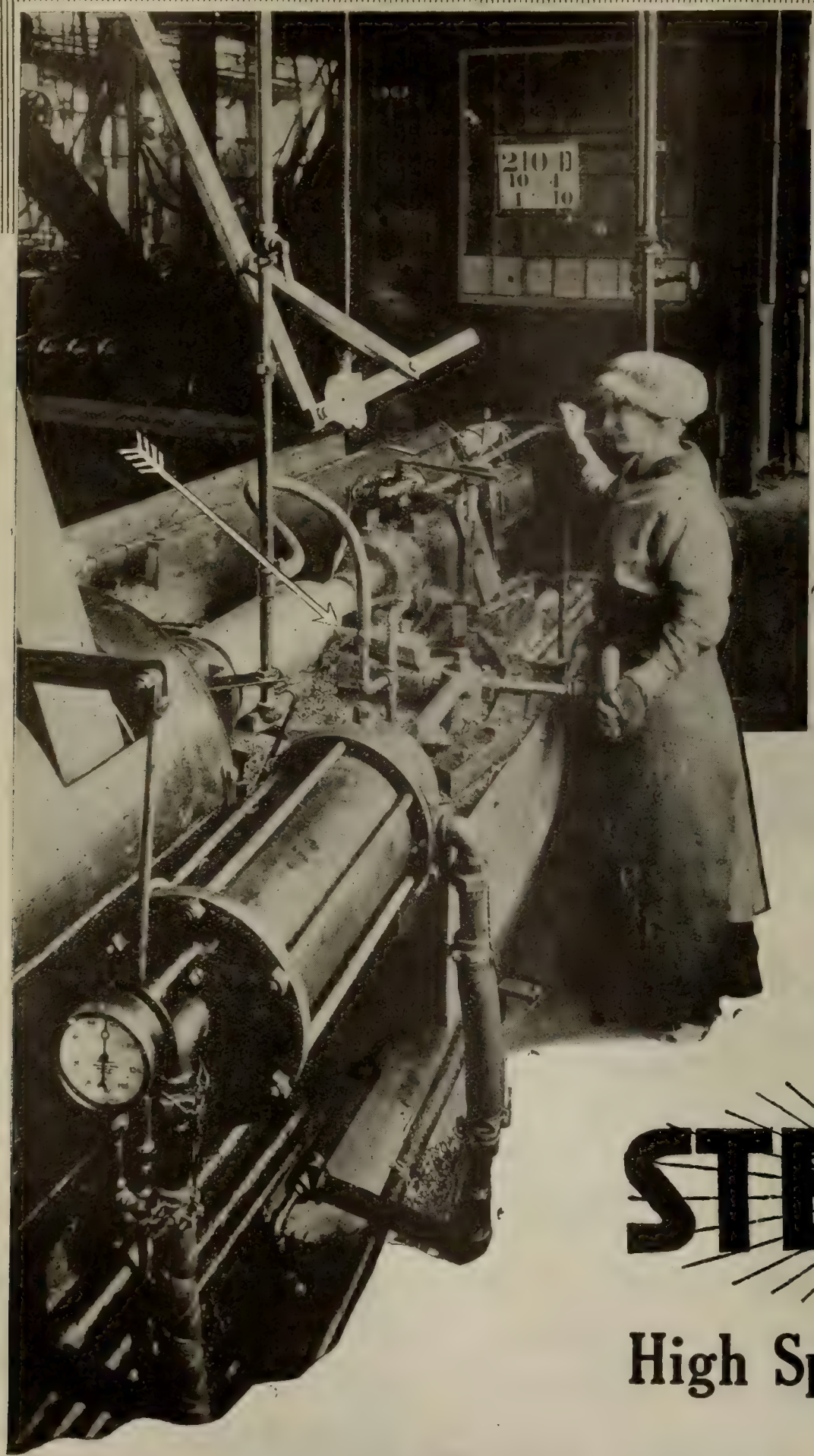
Note Depth of Cut on the Tests Below

Tool—	Feed	Speed Ft. Per Minute	Depth of Cut	Material cut before grinding.
U-8.....	1/16"	45	5/8" to 3/4"	Ran 87" most of time the nose of tool was on scale.
U-8.....	1/16" to 1/10"	38	15/16"	Ran 127". Time 3 hr. Speed increased to 65 ft. p. m. after tool had gone 105".
U-8.....	1/16"	60	1 1/16"	Ran 12".

See your tool steel man or write us

STANDARD ALLOYS COMPANY

Forbes and Meyran Aves. PITTSBURGH, PA.



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FINISHING the profile of 8-in. Howitzer shells made from rolled steel forgings.

The cut starts at a speed exceeding 200 ft. per min. and machines the surface 9 in. long in 1 min. 24 sec.

The tool is given a feed of ⅛ in. per revolution and imparts a highly finished surface to the work.

An output of 55 shells per grinding is maintained easily.

An instance of extreme conditions which Stellite is meeting successfully every day.

Stellite is harder and tougher than steel. Cuts longer and 25 to 300% faster. Requires no forging, and cuts as well when running at red heat as when cold—does not lose its temper. Convince yourself that STELLITE stands behind bigger production and tool economy by giving it a try-out.

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High Speed Tool Metal

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Toronto, 200 King St., West **Montreal, 315 Craig Street, West**

Nova Scotia Steel & Coal Company Limited

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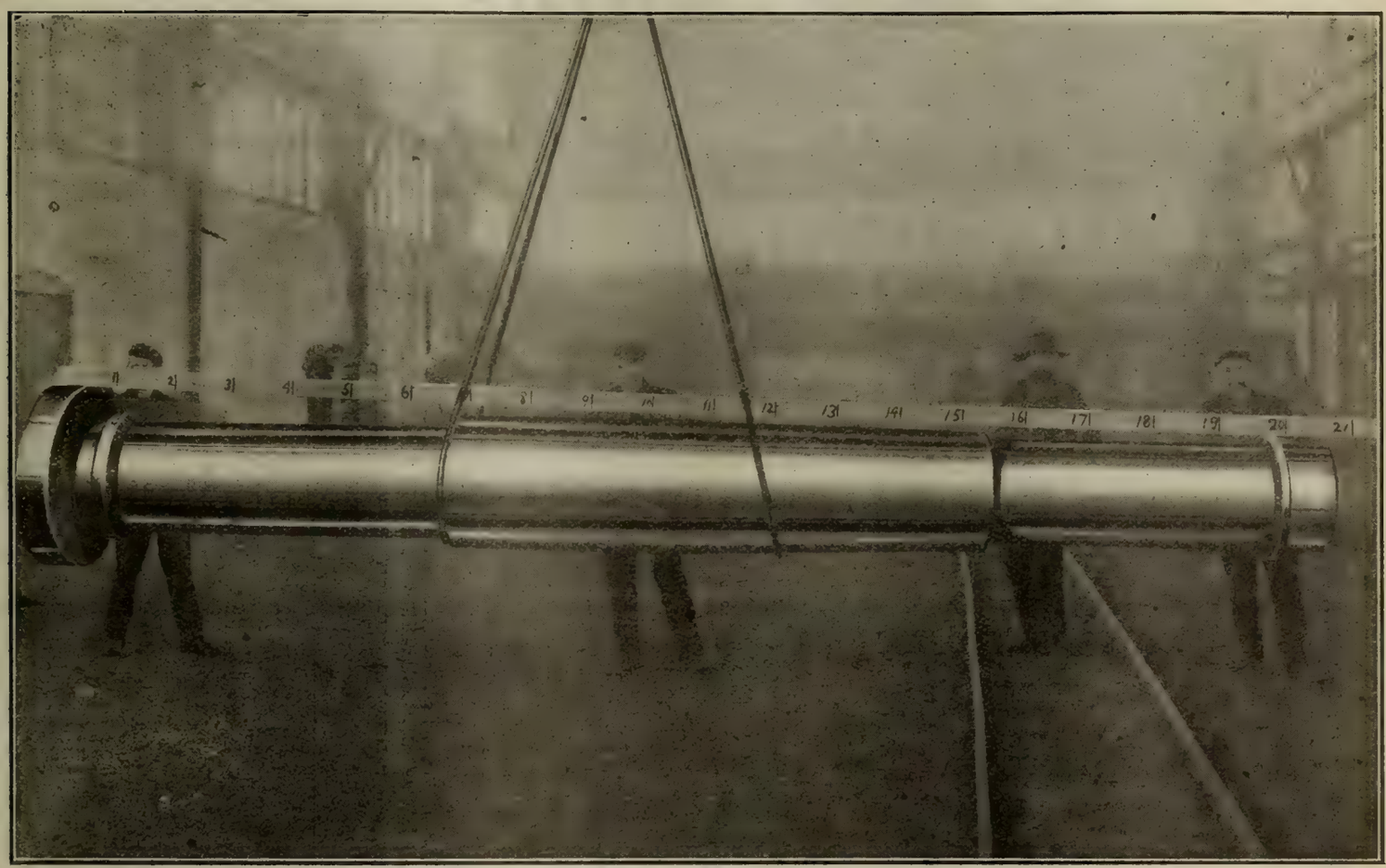

FINISHED COUPLING SHAFT, 18 IN. DIAMETER BY 21 FT. LONG.

Heavy Marine Engine Forgings in the Rough or Finish Machined

Our Steel Plant at Sydney Mines, N.S., together with our Steam Hydraulic Forge Shop and modernly equipped Machine Shop at New Glasgow, N.S., place us in position to supply promptly Marine Engine Crank and Propeller Shafting, Piston and Connecting Rods; also Marine and Stationary Steam Turbine Shafting of all diameters and lengths, either as forgings or complete ready for installation, and equal to the best on the American Continent.

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BEST BASE PLUGS, BUY BANFIELD'S

Have in stock for immediate shipment either threaded or bevel Plugs for 4.5," 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. Write for prices.

EDWIN J. BANFIELD

STAIR BLDG. ∴ TORONTO, ONT.

Manufacturer of Plug Milling Machines for above size shells. Prices and deliveries on application.

The Lathe that Stands the Test

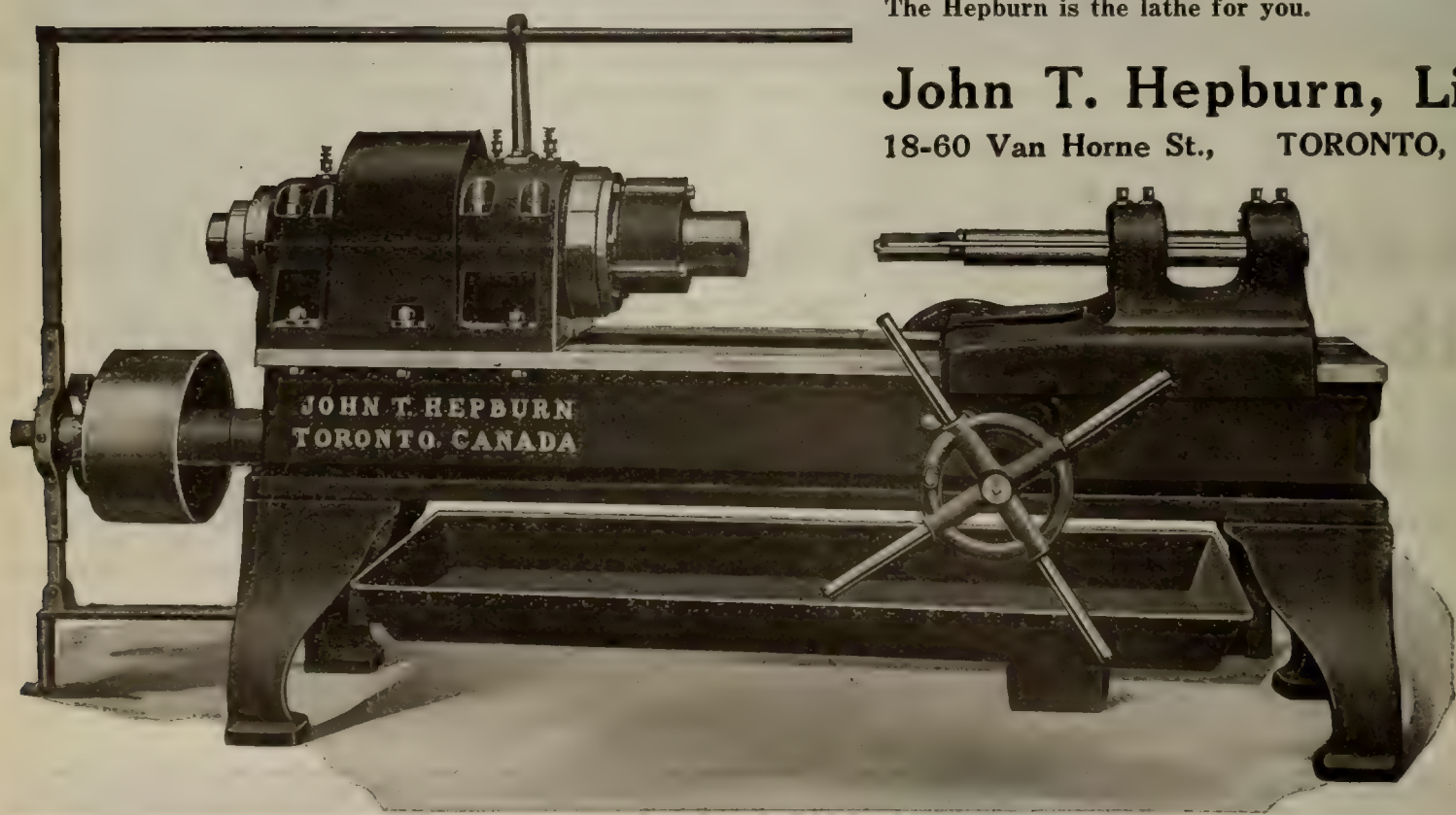
Hepburn

Shell work thoroughly tests the ability of a lathe. The **Hepburn Lathe** is making a wonderful record in the munition plants of Canada in boring up to 6" shells. It has shown superior speed and superior quality of work and keeps right at it day in and day out. We also rebuild lathes embodying in them all latest improvements.

The Hepburn is the lathe for you.

John T. Hepburn, Limited

18-60 Van Horne St., TORONTO, ONTARIO



GARLOCK-WALKER MACHINERY CO. LIMITED

G&W MACHINERY

32 FRONT ST. WEST, **TORONTO** TELEPHONE MAIN 5346

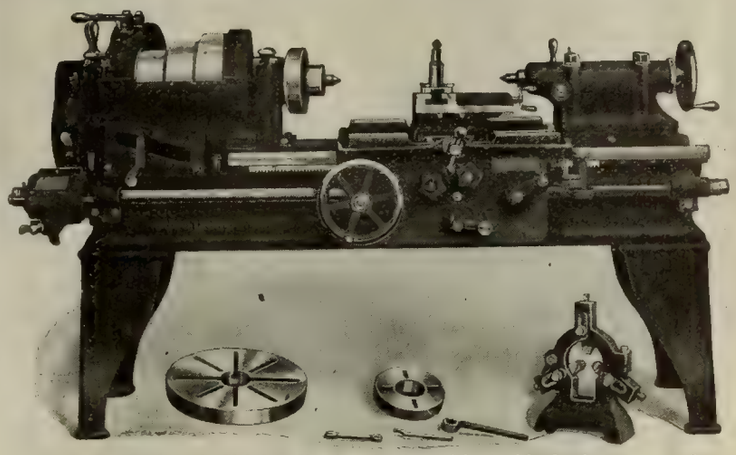
LODGE & SHIPLEY ENGINE LATHES

EQUIPMENT

Lathes, unless otherwise specified, are regularly furnished with large and small face plates, quick-change gears, power cross feed, steady rest, countershaft, and necessary wrenches.

FOR THREAD CUTTING

For convenience of operation while thread-cutting a chasing dial is furnished, so that operator can catch the thread at the commencement of each successive cut.



Lodge & Shipley Engine Lathe with double back gears and quick-change gears.

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Powerful, Fast, Efficient

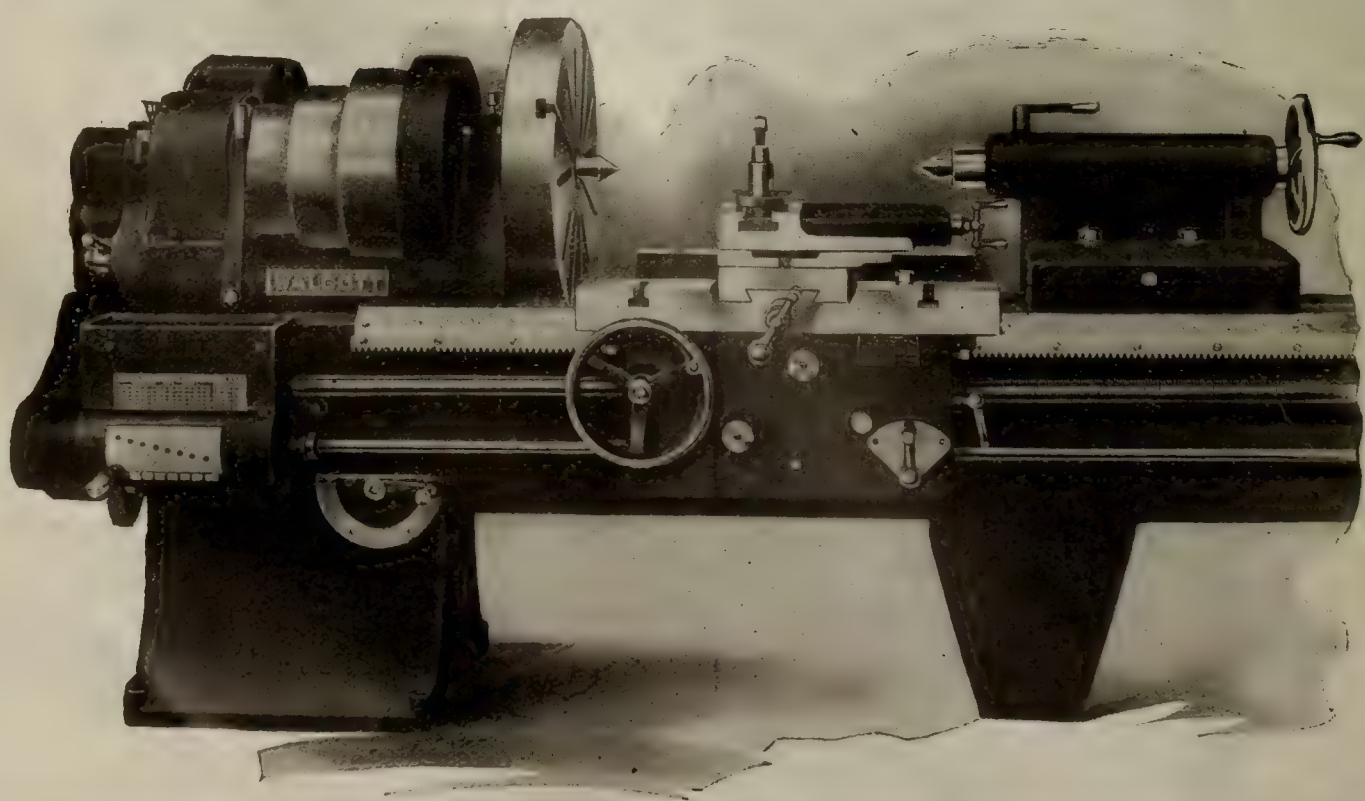
Lathes are our specialty and all our designs reflect the most modern ideas of construction, but this type of Engine Lathe herewith illustrated represents a masterpiece of Walcott ingenuity. A combination of power, speed and accuracy are welded together in it in such a manner as to guarantee maximum results every minute of the day.

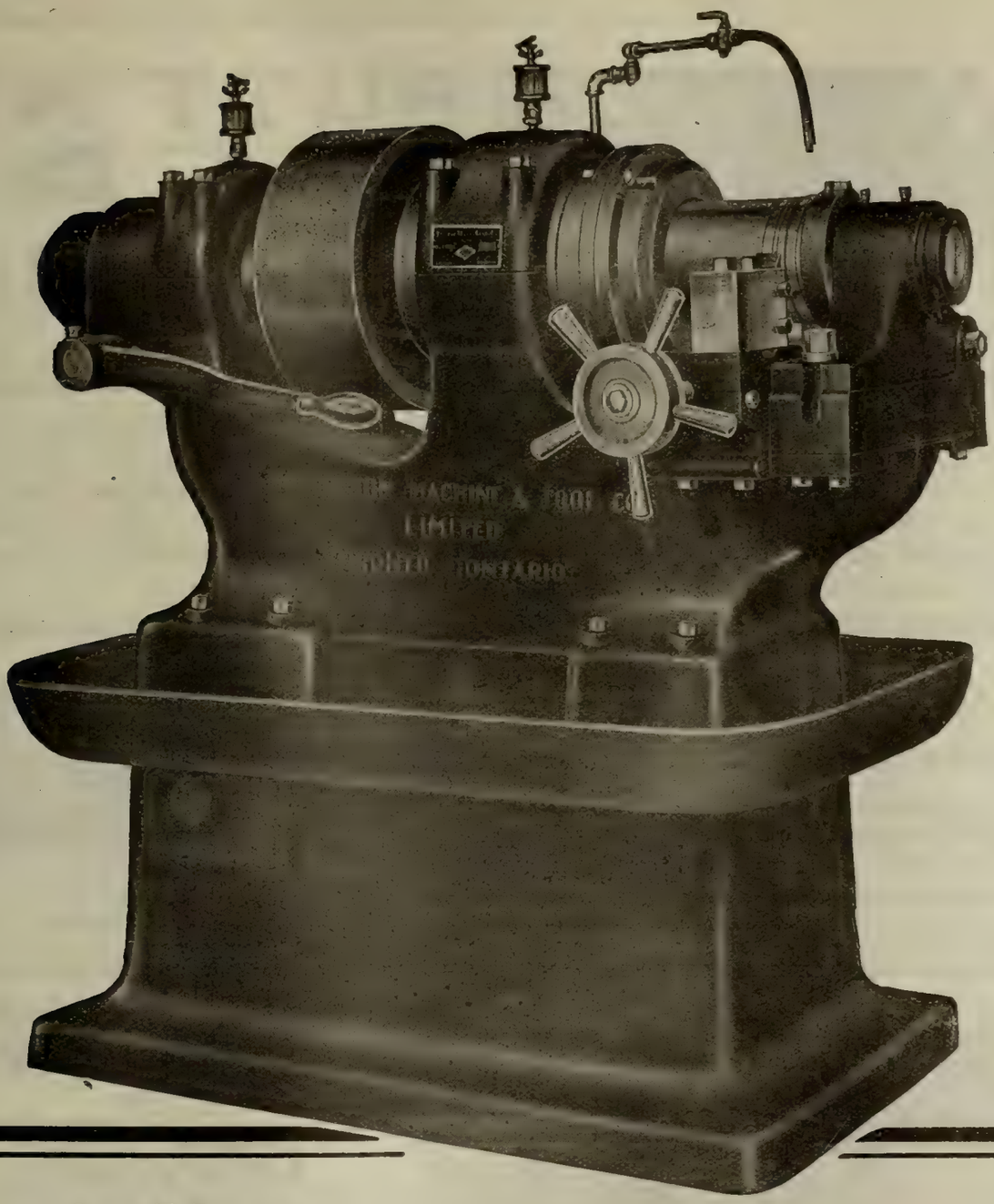
A few points of its ideal construction: Has double apron plate, drop forged gear in apron; rigid compound rest; back gear arm reinforced by one-piece gear guard and headstock, not a single tooth exposed; feed gears run in oil; large frontway on bed; rod and screw feed, and quick-change gear box.

Made in 14″, 16″, 18″, 20″, 26″ and 28″ sizes

Let Walcott Engineers advise you. Thirty-six years' experience.

Walcott Lathe Company Calhoun Street Jackson, Mich.





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we have two 4.5 machines ready for immediate delivery

THIS Band Turning Machine, by its ability to perform efficiently month after month under exceptional production strains, has proved its worth to munition makers. It is being used by many Canadian munition plants, where it is giving absolute satisfaction.

A glance over some of the features will interest you.

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

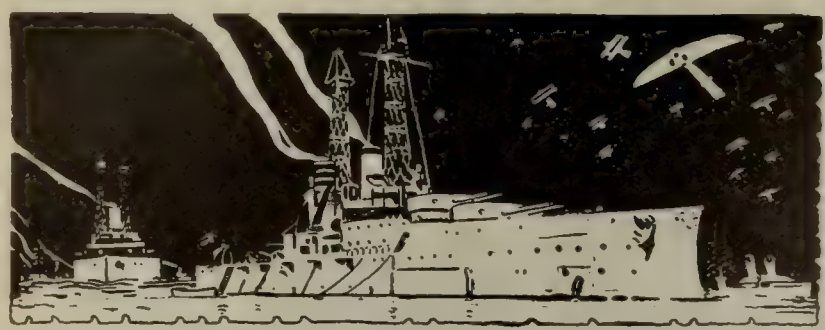
Chucking with spring collet chuck insures accurate and speedy chucking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are also built for 15, 18, 60-pdr. and 6" shells.

ROELOFSON MACHINE & TOOL COMPANY, LIMITED

Head Offices: 1501 Royal Bank Bldg., Toronto, Canada. Works: Galt, Canada



PUTTING "PEP" IN PREPAREDNESS

Preparedness is a continual process. It doesn't stop with the shipment of the first ammunition abroad. It involves "getting ready" for whatever the future may contain. Just now it is preparing for MORE war and the peace that will follow. "Sidney for Service" Lathes put "pep" in preparedness. They speed production. They minimize spoiled products. They permit men to do maximum duty. They put zip and go into industrial plants. Write for Bulletin 30.

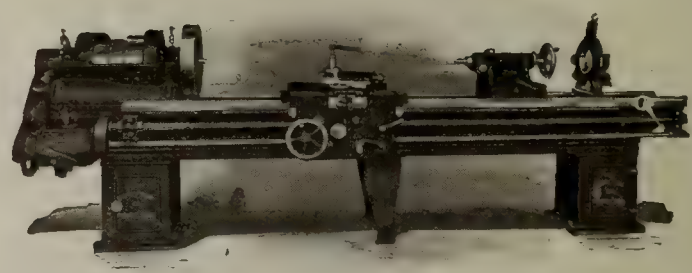
The Sidney Tool Co.

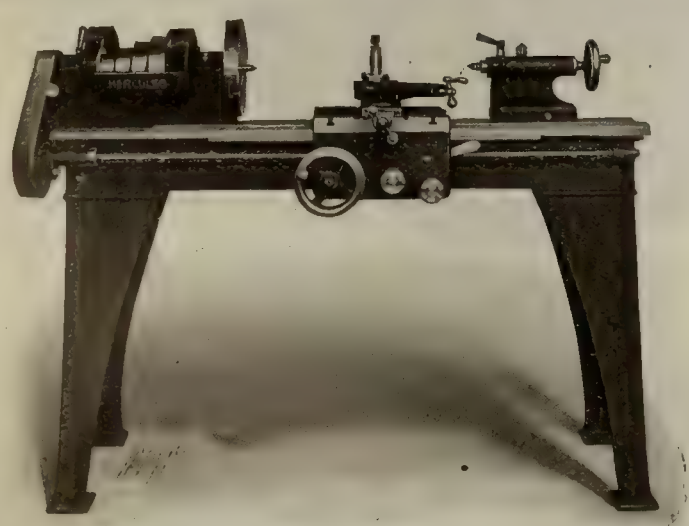
SIDNEY, OHIO, U.S.A.

Represented in Canada by:

Foss & Hill Machinery Co., Montreal, Que.

H. W. Petrie, Ltd. - Toronto, Ont.





LATHES

12", 16", 18" and 21" swing

Strictly modern in design, rigidity and accuracy guaranteed.

Himoff Machine Company

45 Mills Street

Astoria, City of New York, N.Y.

For Rapid Production and Accurate Work

USE THE

"BRIGGS"

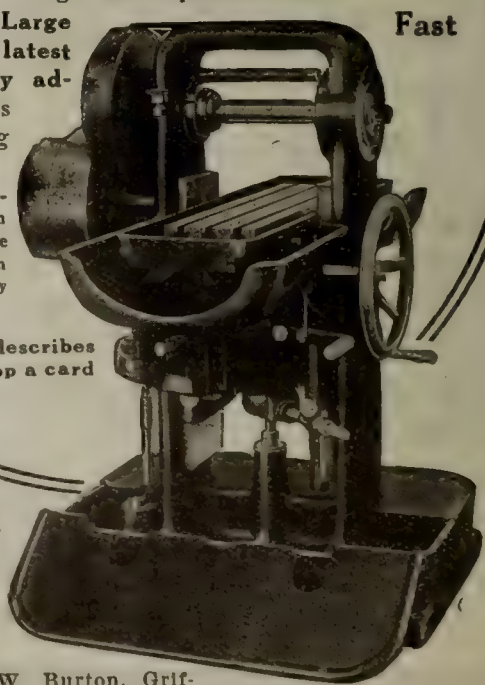
The Briggs Miller handles work no other machine of its size can touch. It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

The Base Tank and Large Gear Pump is the latest addition to its many advantages. Tank holds 20 gallons of cutting lubricant

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

Our booklet describes fully. Drop a card for it.

Fast



Gooley & Edlund Inc.

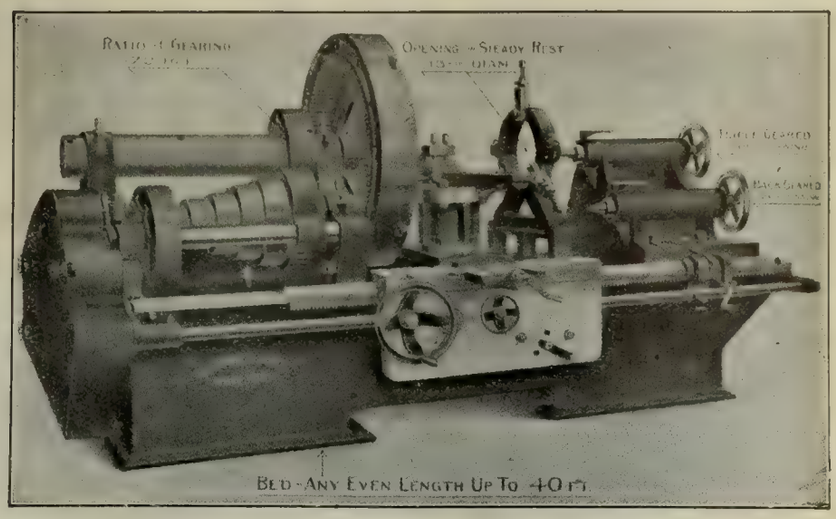
Cortland, N.Y., U.S.A

Foreign Agents: Allied America, France, Belgium, Italy, Switzerland, Machinery Company of Russia, Scandinavia, C. W. Burton, Griffiths & Co., London, Manchester and Glasgow, Barandiaran, Metivier, Gazeau & Cia, San Sebastian, Spain.

One Ship-building Plant

wrote to six different Lathe-Builders

and bought McCabe's "2-in-1" Double-spindle Lathe—on a 30-ft. bed—because it was "different" and built especially for such a wide range of work.



McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing As a 48 inch Triple-Geared Lathe

What other big Lathe can you get, and have full use of your Lathe, whether you have big or small work?

What Lathe Manufacturers except McCabe could make such a low price possible?

No other Lathe builder turns out 48-inch Lathes in such big lots at a time, making the parts all duplicate and interchangeable.

And in addition to the 48-inch Triple-geared Lathe, the 26-inch is the "Lathe plus" feature McCabe offers you—at no extra cost.

DOUBLE service—convenience and capacity—all described in Latest Bulletins.

J. J. McCABE, 149 BROADWAY, NEW YORK

Improved Centering Machine

Mr. Shell Manufacturer:

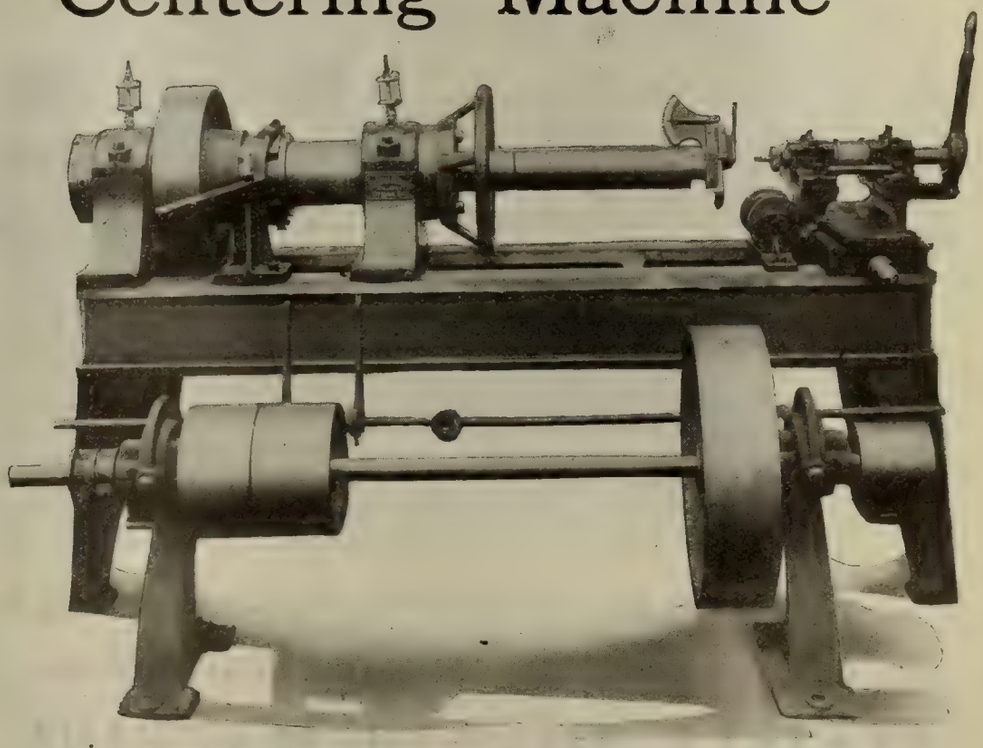
The importance of centering is obvious.

This tool is giving real satisfaction every day and stays on the job.

Write for price and description.

Delivery, ship 10 days after order.

Shipping weight 2040 pounds.

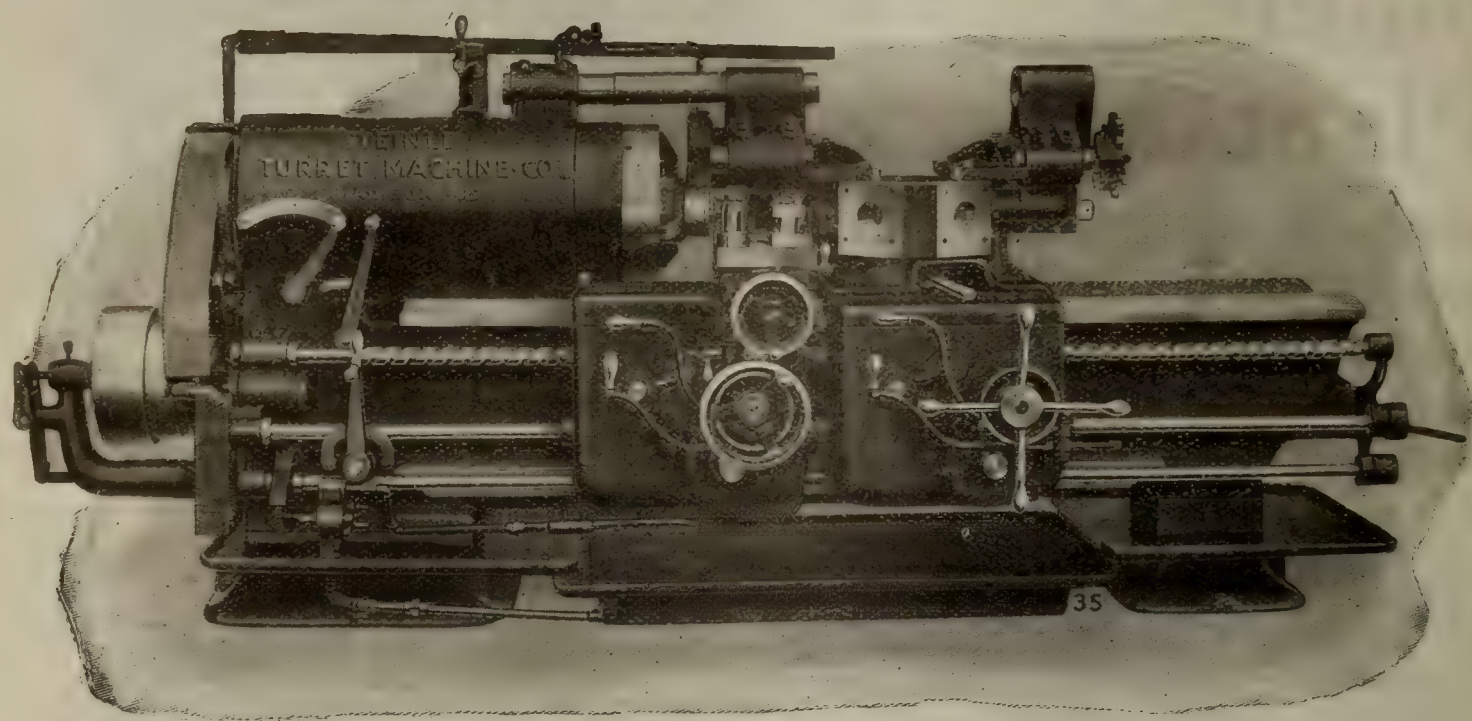


VICTORIA FOUNDRY COMPANY, LIMITED

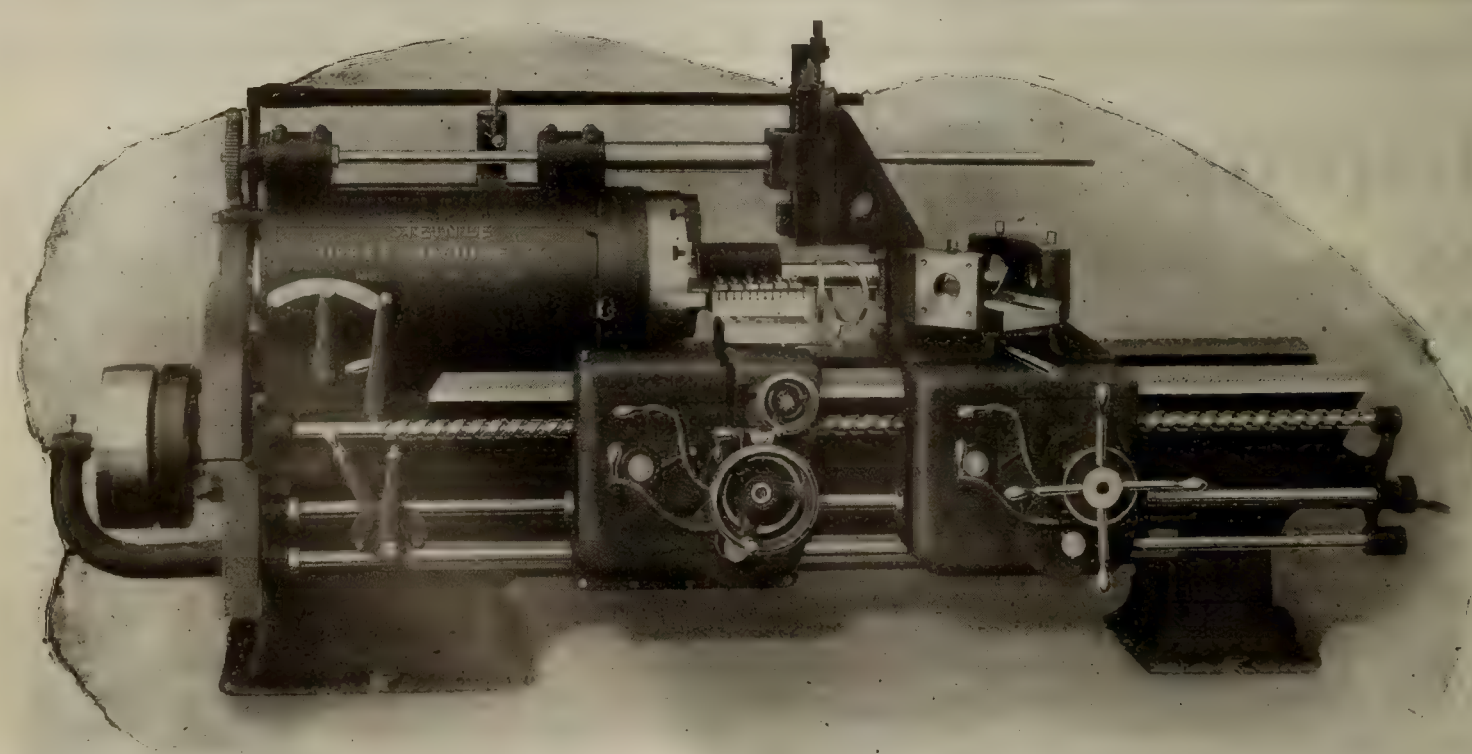
OTTAWA, ONTARIO

A GENERAL PURPOSE HEAVY DUTY TURRET LATHE

Adapted to a Wide Range of Work



Standard Machine Equipped with Tools for Munition Work



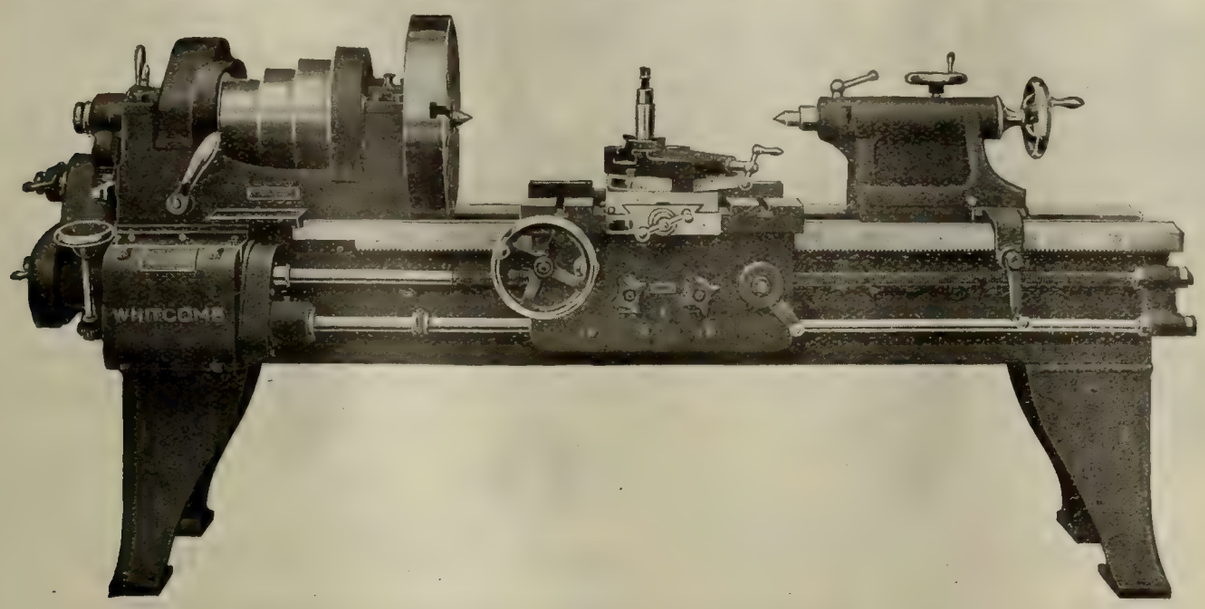
Same Machine Tooled Up for Manufacturing Piston Rings

WRITE FOR INFORMATION

STEINLE TURRET MACHINE COMPANY

MADISON, WISCONSIN, U.S.A.

Whitcomb-Blaisdell Lathes



With Ample Power for the Heaviest Cuts

In the Whitcomb-Blaisdell Lathe *increased power* is obtained by the use of double-back gears and a three-step-cone driving pulley carrying an extra wide belt.

Nine changes of spindle speed are readily obtainable. Ratios of gearing are unusually large. The smallest step of cone is of sufficient diameter to give ample belt contact.

So throughout the transmission—from the pulley to cutting tool—the Whitcomb-Blaisdell has an excess of power. No cut that high speed steel can take is too heavy for the Whitcomb-Blaisdell.

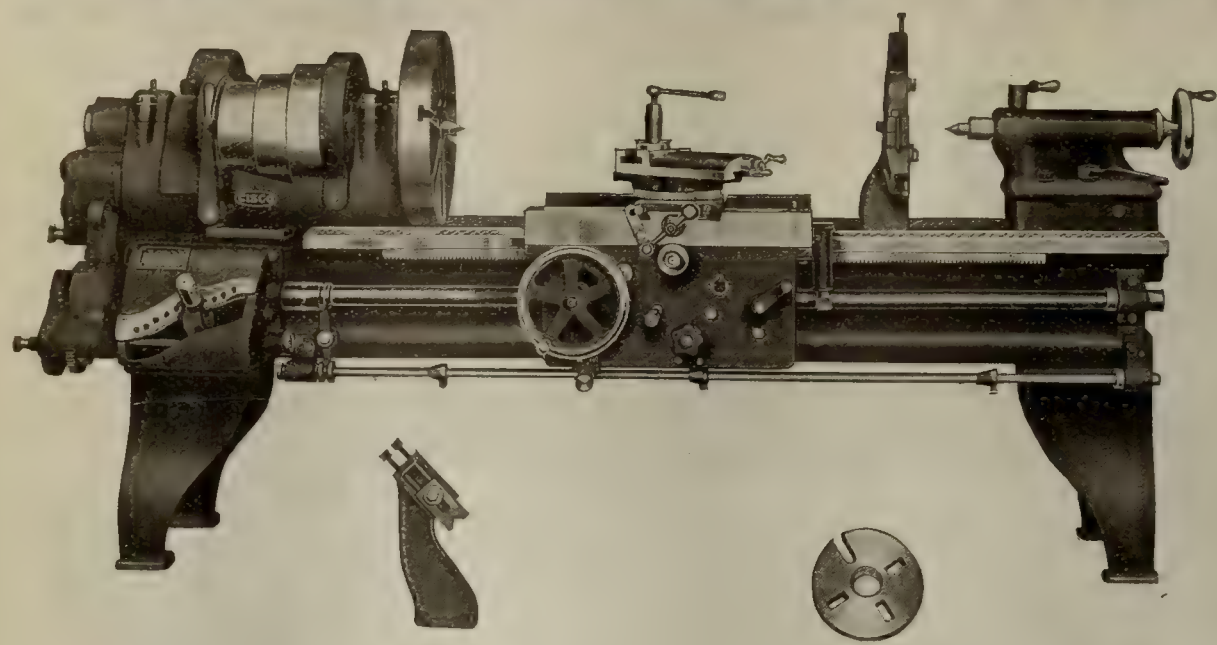
Write for catalog giving complete details and specifications of Whitcomb-Blaisdell Lathes.

LATHES From 14" to 30" SWING

WHITCOMB-BLAISDELL MACHINE TOOL CO.
WORCESTER, MASS., U.S.A.

PLANERS From 17" to 48" WIDE

THE LATHE WITH THE PULL



is made in
14", 16". 18", 24"
sizes

It is made as good as any machine can be.

It is Simple, yet Efficient.

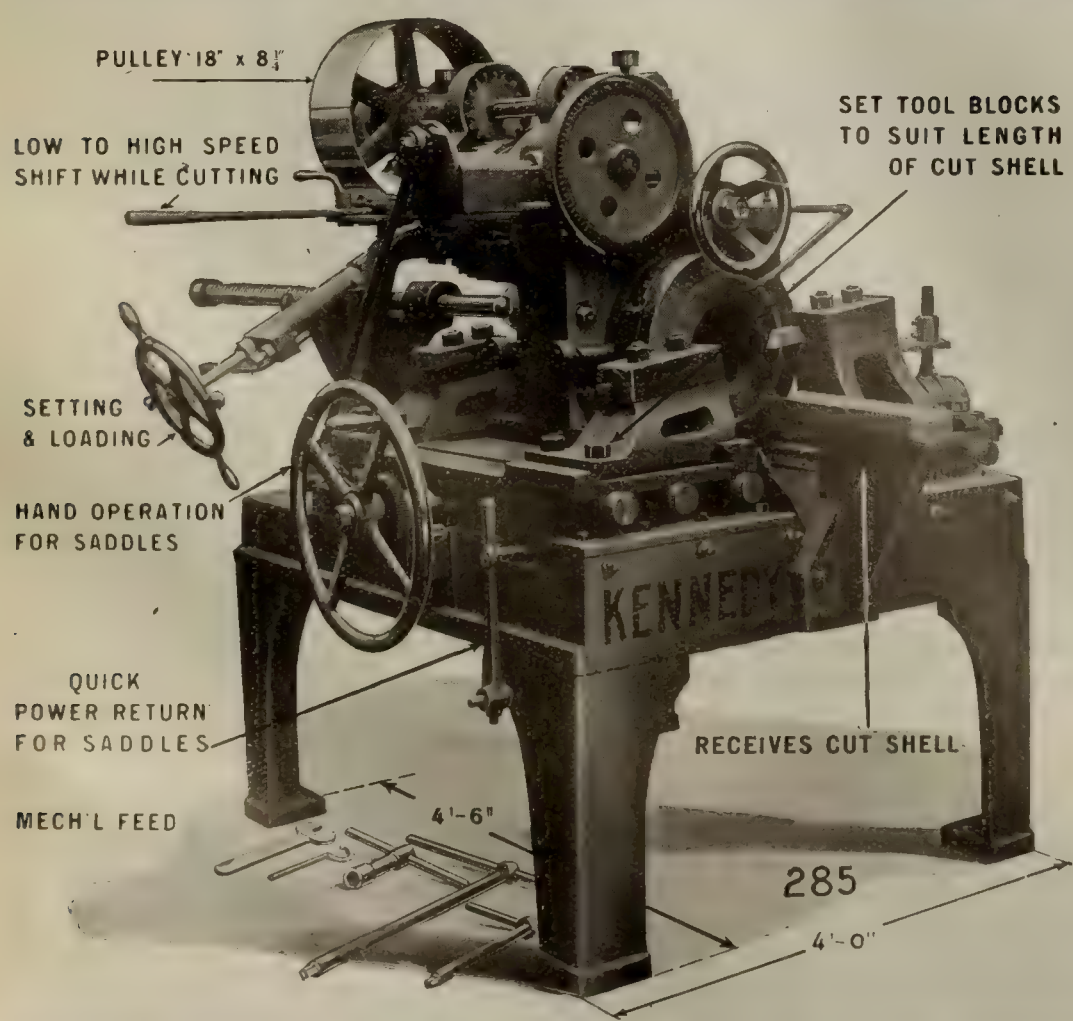
It is Strong, yet Accurate.

And it is Economical.

A CISCO bought to-day means a CISCO running in 1925; means few repairs, means dollars earned, means worry lessened, means shop saving.

Sold in Canada Exclusively by
The A. R. Williams Machinery Co., Ltd.

Manufactured in Cincinnati, U.S.A., by
The Cincinnati Iron & Steel Co.



CUTTING-OFF MACHINES

Cuts both ends at once

except 8 in. and 9 in. sizes which cut one end only

Forgings load in one end and discharge out the other when cut

A Girl can operate it

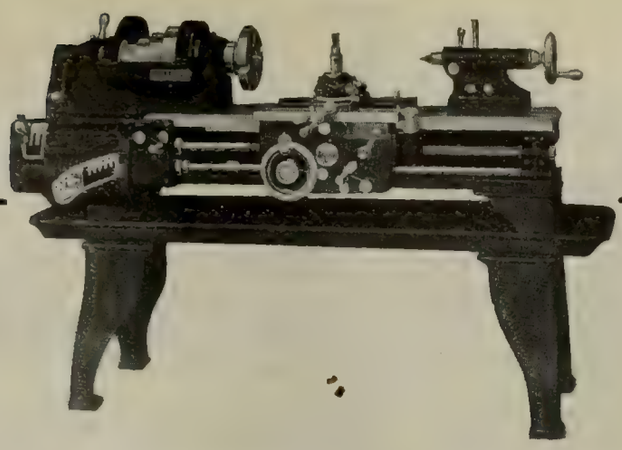
- New quick power return for saddles

DELIVERIES REASONABLE

The
Wm. Kennedy & Sons,
Limited
Owen Sound

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Two Facts



37 Feeds

$1\frac{1}{2}$ to 80 Threads = 1-inch

Utility is amply proven in these two facts —37 feeds—$1\frac{1}{2}$ to 80 threads per inch. This range is obtainable by a quick-change mechanism mounted on the form of the lathe. The feeds are illustrated on a chart on the lathe. Cone gears are cut with 20 degree pressure angle cutters forming a pointed tooth slightly rounded at the top. This permits engaging of the gears without any clash, and in this manner promoting the speed of the machine and lengthening its life.

These are a few of the points that single this lathe out as distinctly a quality lathe.

Our agents will furnish you immediately with data and specifications. Inquire of them.

Mulliner-Enlund Tool Co. Inc.

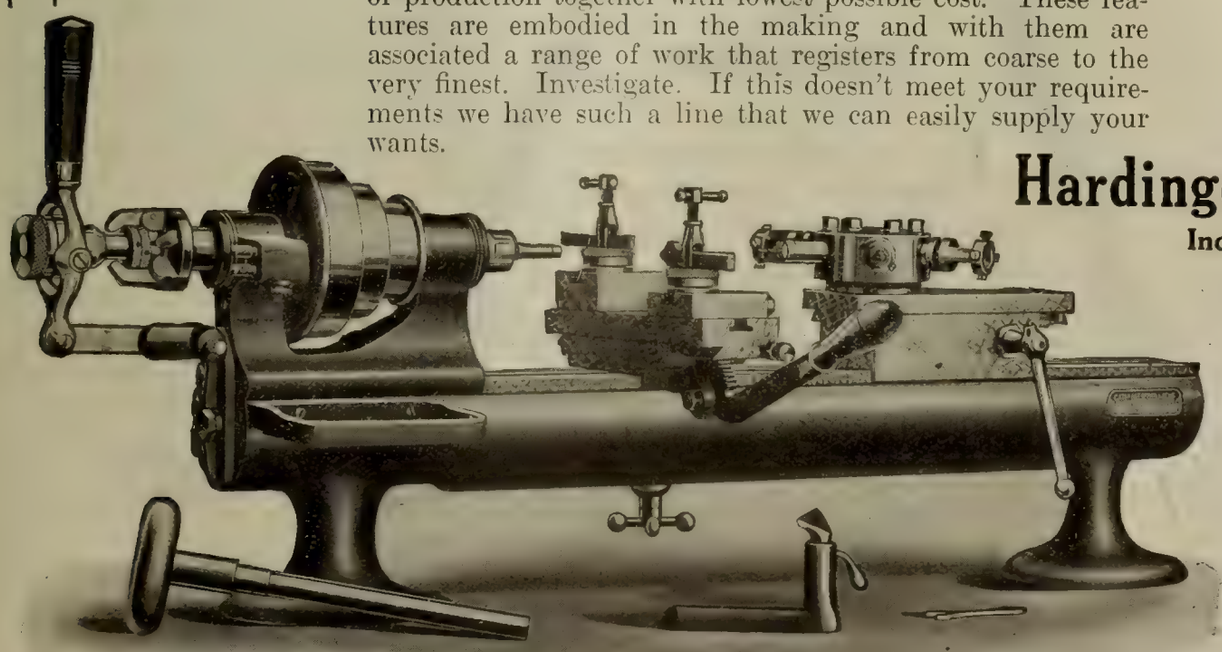
Syracuse, N.Y., U.S.A.

Representative:
H. W. PETRIE, LTD.
Toronto, Ont.

Representative:
FOSS & HILL MACHINERY CO.
Montreal, Que.

If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.

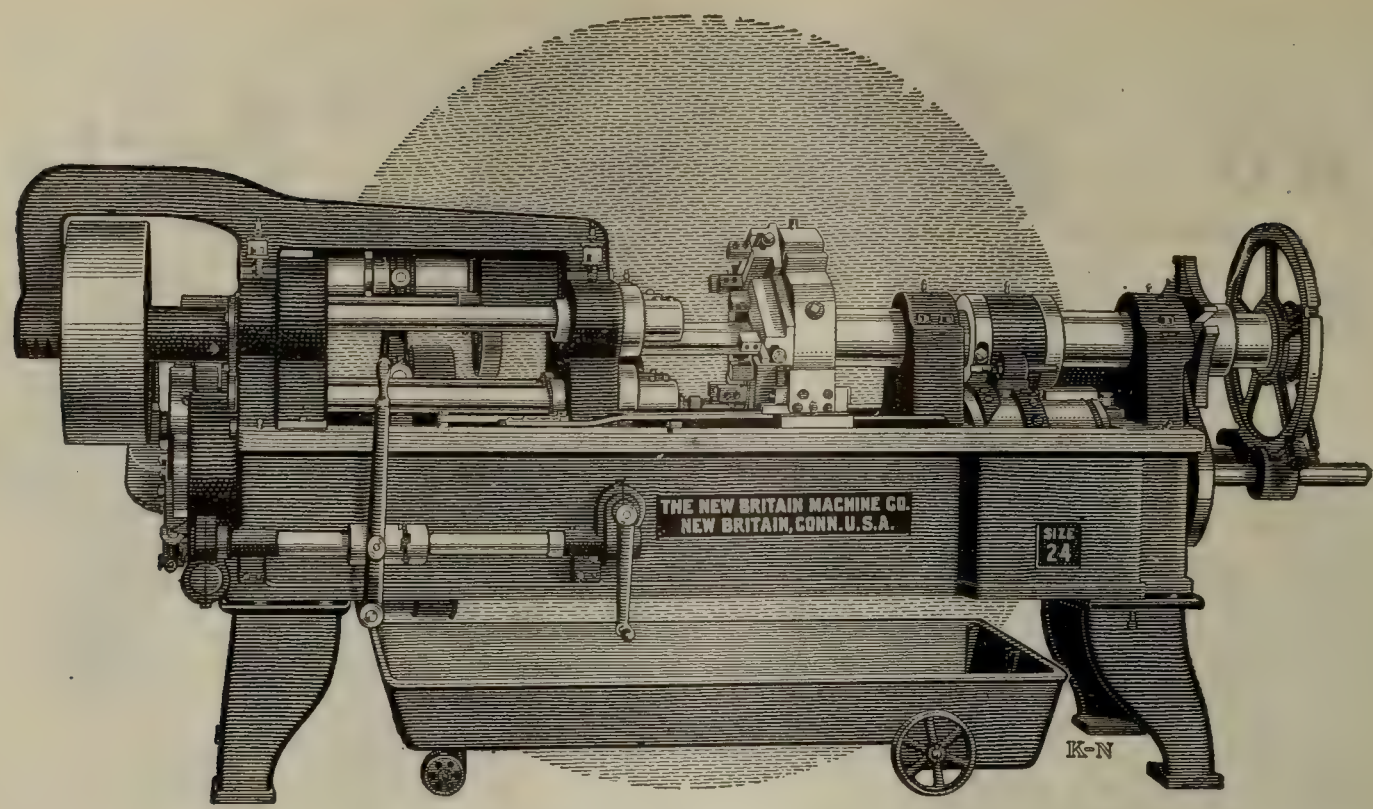


Hardinge Bros.

Inc.

1770 Berteau Avenue,

CHICAGO, ILL., U.S.A.



The Pinnacle of Production

IN the field of chucked work the "New Britain" Multiple-Spindle Automatic Chucking Machine occupies a position of unquestioned supremacy.

Its ability to perform all operations simultaneously and automatically gives it a production capacity three to five times that of other machines designed for handling similar work.

Have you considered its possibilities for cutting your costs and relieving your labor stringency? We are prepared for the demonstration.

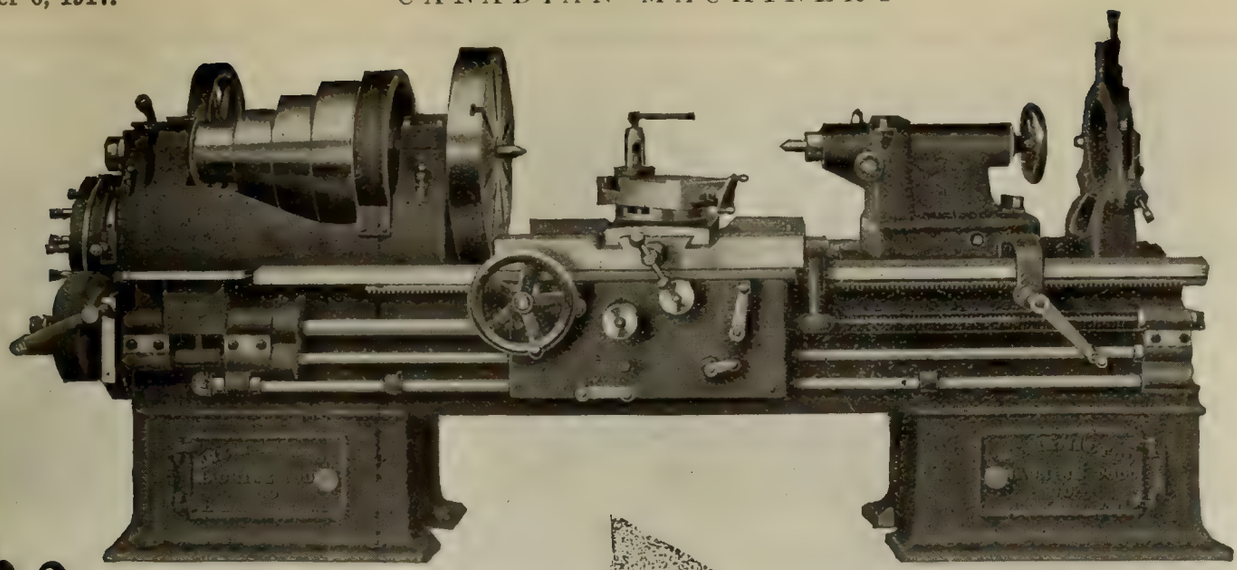
SCREW MACHINES NB

THE NEW BRITAIN MACHINE CO.

NEW BRITAIN CONN. U.S.A.

CHUCKING MACHINES NB

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



The "HAMIL TON"

Speeds Production

INSTALL the most modern machinery in your plant to meet the new conditions of to-day. You get it in Hamilton Lathes.

We are living in the greatest speed-up, cut-the-cost-of-production period of modern times. War time conditions demand speed and economy in the machine shop as well as in other institutions of commerce. Shops everywhere are now producing more work with the same force of men than before the war. The war has created a demand for the utmost efficiency and brought out the resourcefulness of the country in new machinery.

Hamilton Lathes represent the conditions in the machine shop and the spirit of the times with their speed, durability and accuracy.

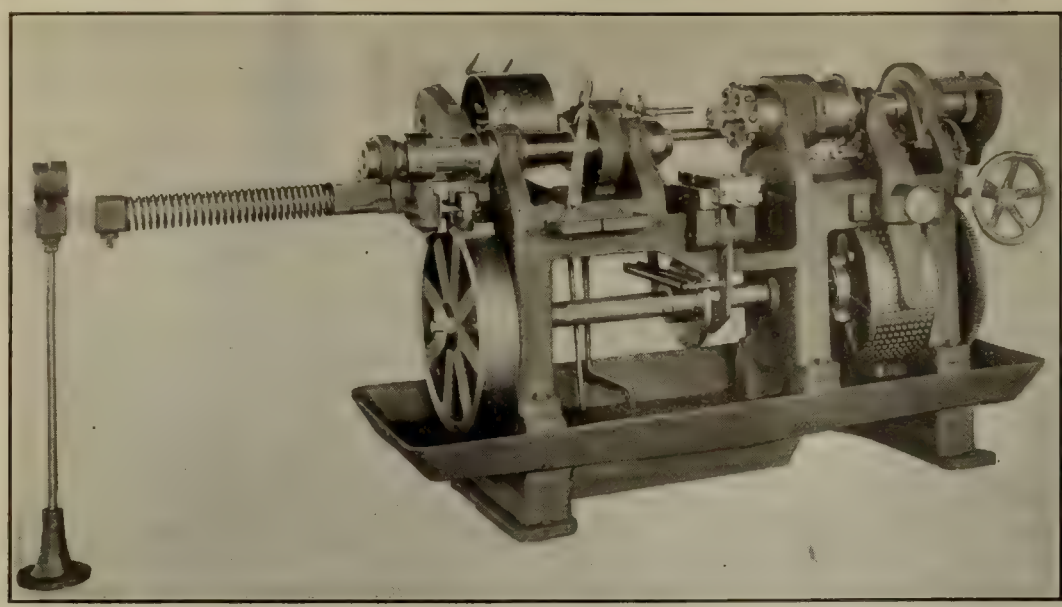
Write now for Bulletins—yours for asking.

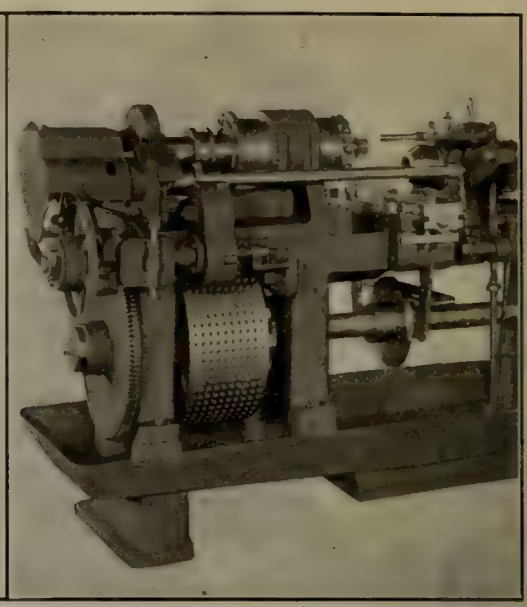
The Hamilton Machine Tool Co.

HAMILTON, OHIO

Sole Agents for Ontario:

H. W. PETRIE, Limited - TORONTO, ONT.





The Chicago Automatic Screw Machine

The result of 10 years' extensive and intensive screw machine manufacture. By an indexing device one or more idle holes not carrying tools may be skipped in indexing without pause or loss of time—you know the value of that feature.

The amount of usage does not affect its efficiency. The longer it is used the more you benefit. In six weeks we can have a "Chicago" in your plant ready to give you the same economical and exceptional service it has rendered to many other Canadian plants.

The John MacNab Machinery Company

90 West Street
New York City

European Representative
John MacNab, Hyde, England

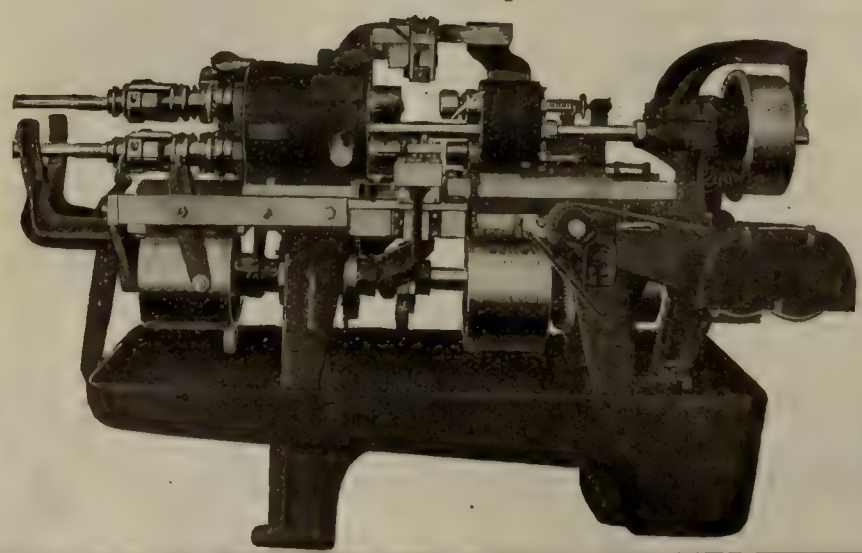
The Man Who Uses ACME Automatics

The ACME Automatic Multiple Spindle Screw Machine, Capacities Up to 3¾" Diameter

Ask him why he uses them?

He will tell you that better finish, greater production and lower cost per piece were his reasons for specifying Acmes.

Moreover, the Acme Adaptability to such operations as cross milling, drilling, slabbing and slotting before the work leaves the machine means a saving in the cost per piece which in many cases has paid for the machine.



Let us show you the true economy of the Acme Way Send a sample or blue print.

The National Acme Co.

Cleveland Ohio

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BRANCH OFFICES: **NEW YORK, BOSTON, CHICAGO, DETROIT, ATLANTA, SAN FRANCISCO**
REPRESENTATIVES IN FOREIGN COUNTRIES

Makers of Gridley Single and Multiple Spindle Automatics at Windsor, Vermont; and Acme Automatics, Threading Dies, and Screw Machine Products at Cleveland, Ohio.

HIGHEST IN QUALITY NATIONALLY KNOWN

Our Country requires the extreme limit of production from every lathe, planer, miller or other machine tool

BE PATRIOTIC

"Red Cut Superior"

The Nationally Known First Quality

HIGH SPEED STEEL

Will enable you greatly to increase your output

"IT'S THE BEST FOR ALL MACHINE WORK"

VANADIUM-ALLOYS STEEL CO.

PITTSBURGH, PA. Works at LATROBE, PA.

CARRIED IN STOCK AT THESE WAREHOUSES:

E. T. WARD'S SONS
44 FARNSWORTH ST.
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GEO. NASH CO.
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VANADIUM-ALLOYS STEEL CO.
PITTSBURGH, PA., AND
LATROBE, PA.

GEO. NASH CO.
646 WASHINGTON BLV'D.
CHICAGO, ILL

The Vulcan Crucible Steel Company wishes to announce that Wolfram will continue to be a standard Tungsten High Speed Steel.

This Company is progressive, and is entirely familiar with the effects of the various alloys that may be used in steel, but until it is convinced of the superiority of any element over Tungsten, Wolfram High Speed Steel will continue to be a standard Tungsten Steel.

Vulcan Crucible Steel Co.

Aliquippa *Established 1900* **Pa., U.S.A.**

Represented in Canada by

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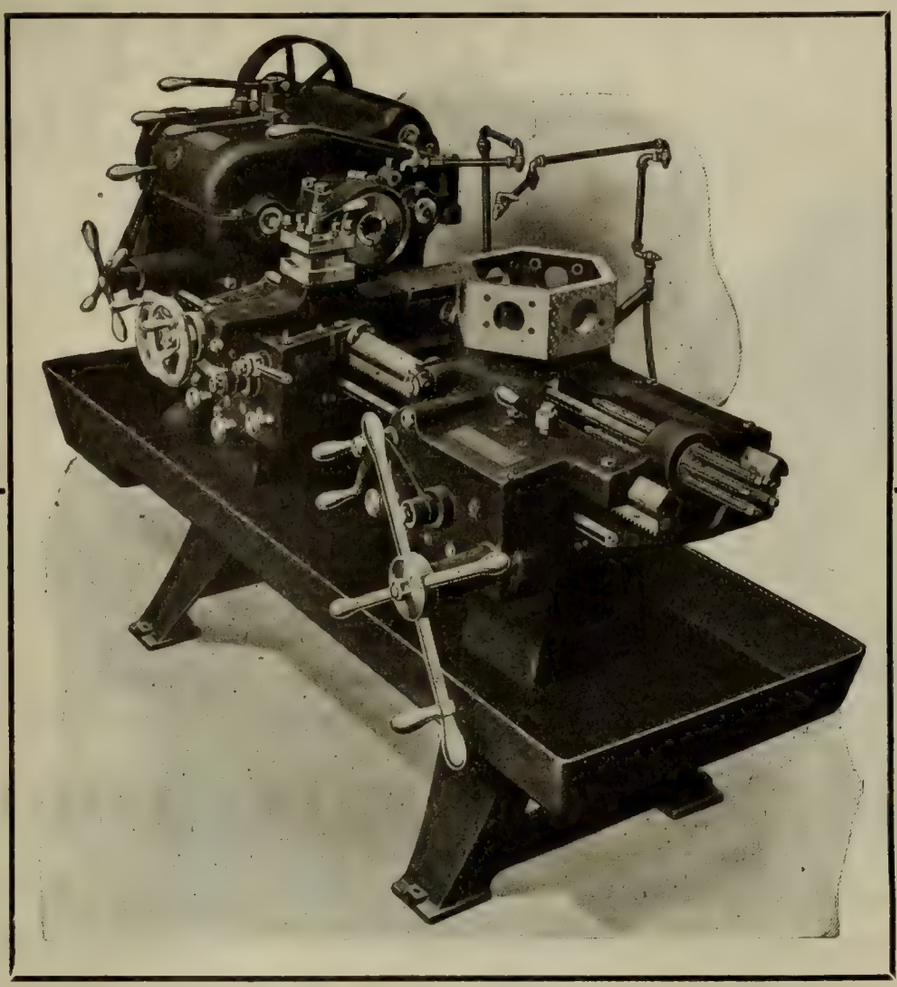
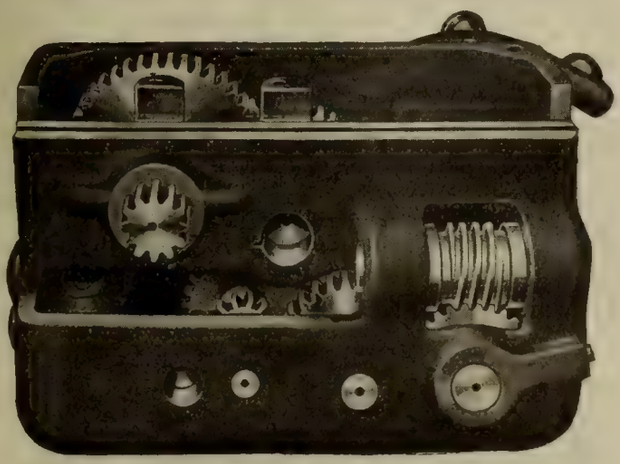


QUALITY

The rack pinion and all sliding gears and other gears subjected to heavy strain or wear are made of chrome-nickel steel. But this is not all. Behind the quality steel is our new modern and strictly up to the hour heat treating department, and behind this is the knowledge of how to treat the steel to get the result.



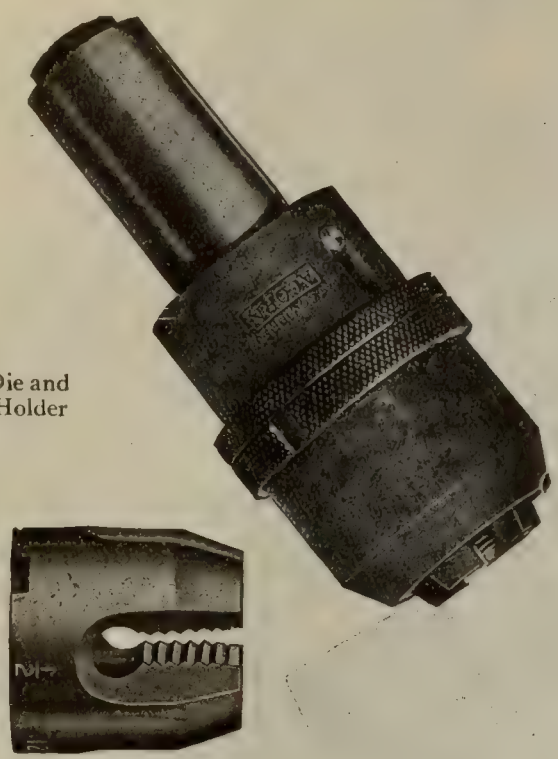
Saddle Apron

Please note, however, that this applies to all of the several sizes of machines built by the

FOSTER MACHINE COMPANY

ELKHART, INDIANA

Let the ACORN DIE Cut Your Threads



Die and Holder

THE DIE

The adjustment is mechanically perfect — simply turn the cap and all the prongs of the die converge equally — a great advantage over the spring die.

The Acorn Die Holder is smaller in diameter than any other die holder of equal cutting size.

The float permits the die to follow its own lead.

The die projects slightly beyond the adjusting cap, making it admirably adapted for shoulder work—and the chips are thrown ahead of the work, so the die does not clog.

Will you try the Acorn Die on your own work—under your own conditions?

WELLS BROTHERS COMPANY OF CANADA, Limited

GALT - ONTARIO

SALES AGENTS: The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary

May We Repeat

THAT

P H

TRADE MARK

QUALITY FILES

are the only files made in Canada using BEST CRUCIBLE CAST STEEL exclusively in their manufacture. What does that mean to the user?

IT MEANS a keener cutting edge to the teeth, and longer life to the file. IT MEANS the stock has that "pep" in it so beloved of metal workers. IT MEANS that after a long and honorable career on the bench, there is still fine steel in the file which warrants the user in having it re-cut and put on the job again on less "fussy" work.

THAT IS TRUE ECONOMY.

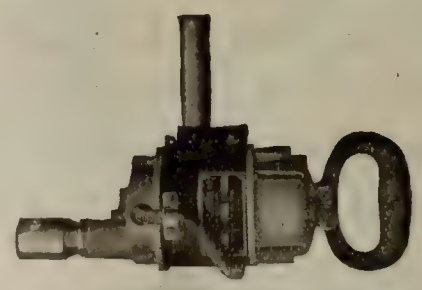
Port Hope File Mfg. Co., Limited

Port Hope, Ont.

"Ask your jobber"

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

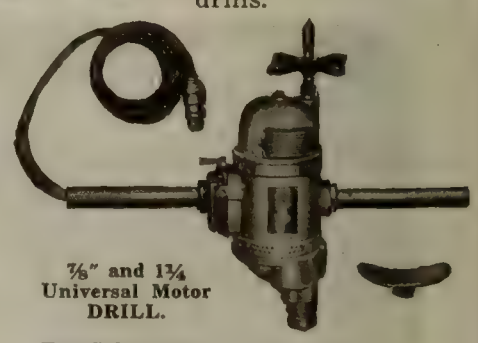
3 SIZES

3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞" and 1¼ Universal Motor DRILL.

For Sale By

The Canadian Fairbanks-Morse Co., Limited

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.

CINCINNATI, OHIO

REED-PRENTICE COMPANY

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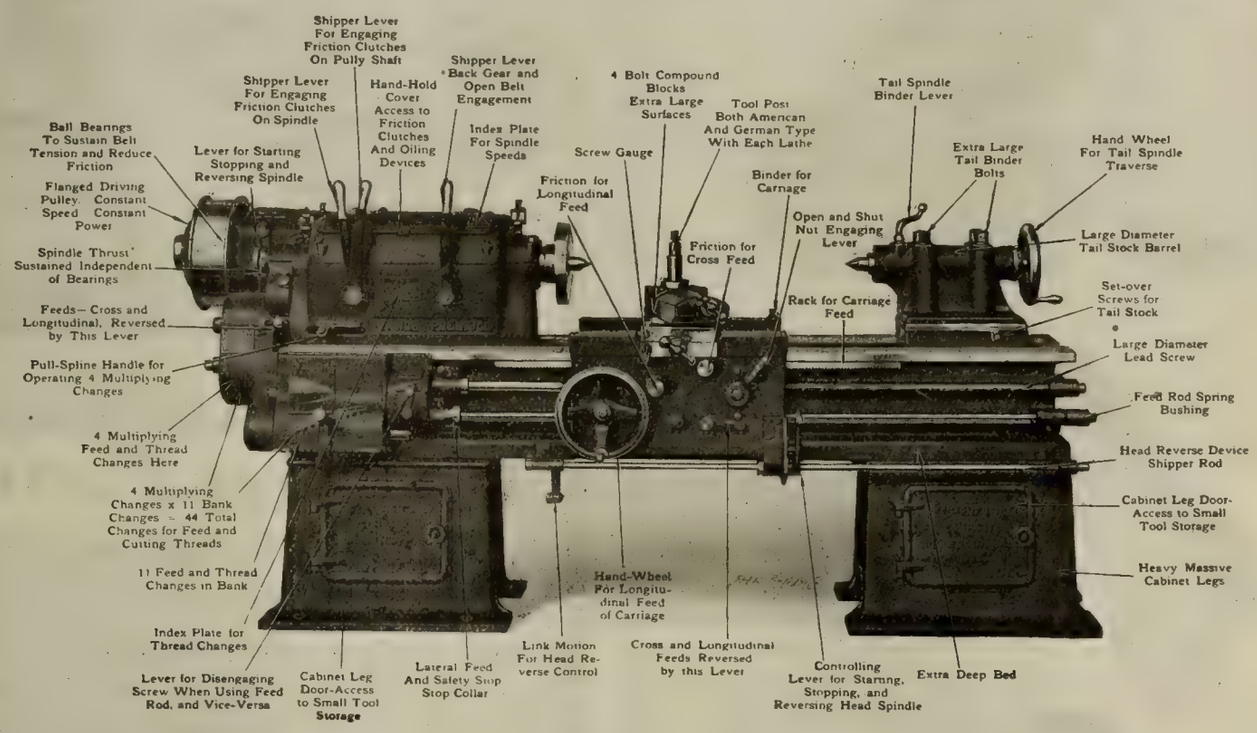
WORCESTER MASS. U.S.A.



WHY USE A BLUNDERBUSS?

THERE IS AS MUCH USE TRYING TO KEEP UP TO THE PACE SET BY MODERN METHODS WITH OUT-OF-DATE MACHINE TOOLS AS THERE IS OF AN "OLD ONE-CYLINDER" TRYING TO WIN A RACE AGAINST MODERN CARS.

CONSIDER THE ADVANCEMENT MADE IN CUTTING TOOL MATERIALS AND HOW LABOR VALUES HAVE CHANGED—WHY EVEN OUR CONCEPTION OF THE WORD "PRODUCTION" HAS TAKEN ON A NEW MEANING.

DON'T GO AFTER PROFITS WITH A BLUNDERBUSS,
USE MODERN ARTILLERY.

REED-PRENTICE MACHINE TOOLS HAVE BEEN MADE INCREASINGLY EFFECTIVE FROM YEAR TO YEAR, MAINTAINING THEIR PRE-EMINENCE AS THE MACHINES WHICH GIVE THE GREATEST OUTPUT WITH LEAST EFFORT.

REPRESENTED BY
THE CANADIAN FAIRBANKS-MORSE CO., LIMITED

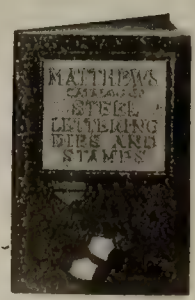
The Proper Marking Tools

for Heat, Test and Inspection Marking of Shells

Special Champion Holders concave on face for marking sides of shells.

Special Holder shown, with the type chamber curved radially for marking the base of shells. Small illustration shows style of type used in these holders.

For Full Particulars Write Now For This Book



Est. 1850

Jas. H. Matthews & Co.

MARKING DEVICES
Forbes Field
Pittsburgh, Pa.

The CANADIAN FAIRBANKS-MORSE CO., Ltd.,
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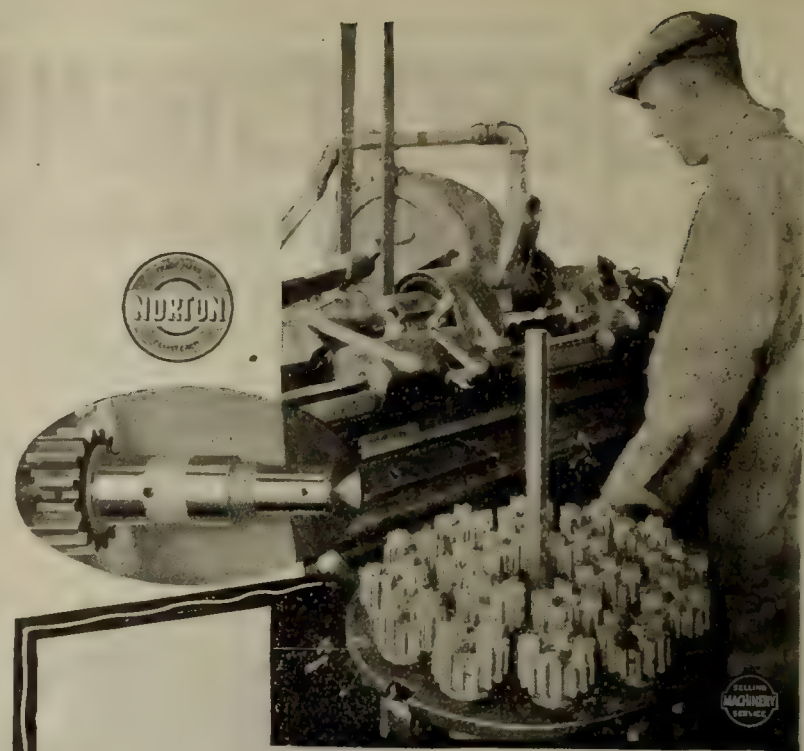

Where Accuracy is a Large Factor

the choice of the right wheel is of vital importance.

An exceedingly accurate job is grinding the main drive gear stem, made of steel—case-hardened. There are two diameters, one 1.575" and the other 1.125". The larger diameter is 3 1-16" long, and is held to 0.0001" over size and 0.0003" under size. The small recess at the center is not ground. Stock removed is 0.010" from both diameters. In spite of these close limits the number of pieces produced in nine hours is 265.

A very satisfactory wheel for work of this kind is a 3824 combination K or L, Alundum.

Norton Company

Worcester, Mass.

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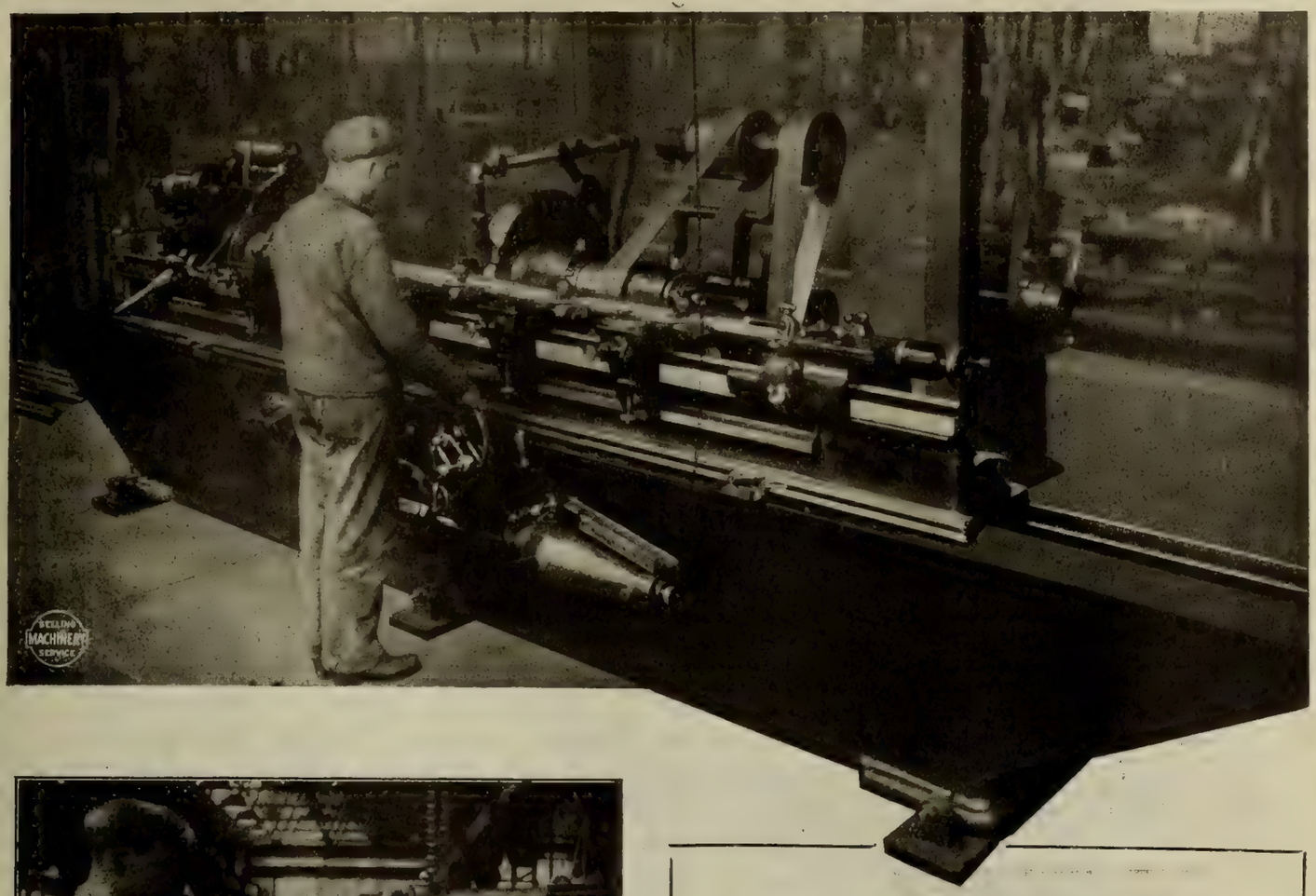
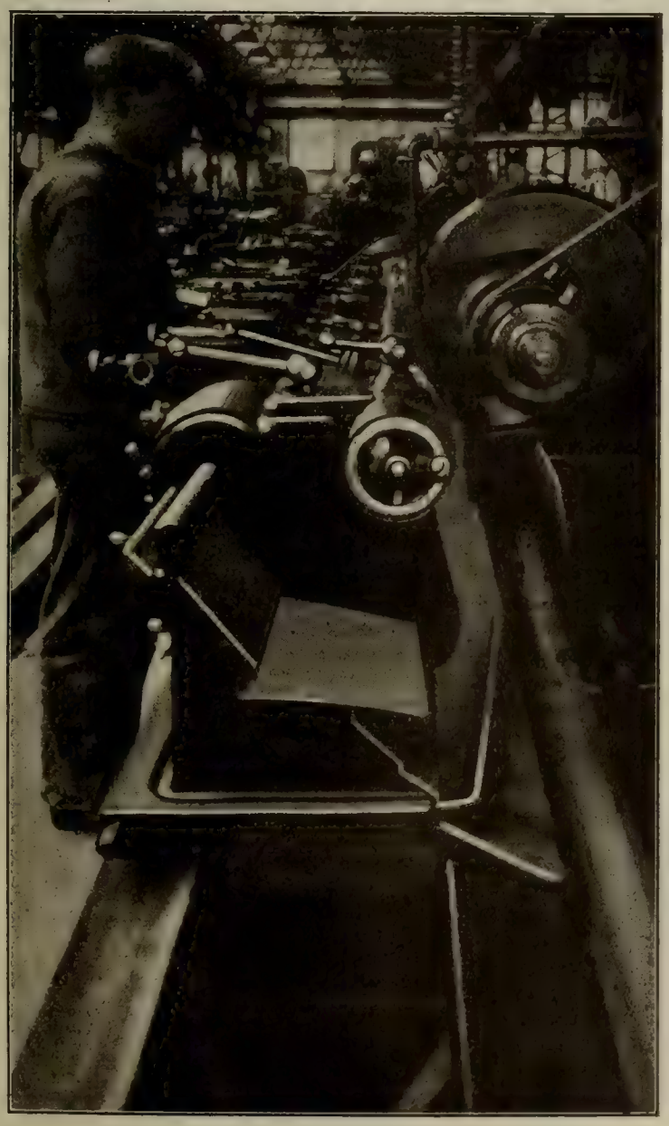
ELECTRIC FURNACE PLANTS
Niagara Falls, N.Y. 846 Chippawa, Ont., Canada





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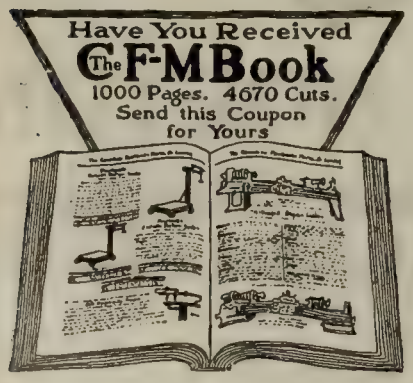

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Recent Developments in Chucking Appliances

Staff Article

Quantity production on an efficiency basis is dependent upon the facilities provided for the handling of the product, so that the minimum amount of time is consumed between actual machining operation. Special effort has been centered upon the design and construction of operating appliances for the rapid and economical manufacture of all classes of shells, and some observations of driving appliances form the basis of the accompanying article.

IN a previous issue we described at some length, a few of the developments that have taken place in the adaptation of the expanding arbor to to the manufacture of shells, and the advantages to be derived by cutting down the unproductive factor of repetition production. Where articles are to be made in large, or comparatively large quantities, it is very desirable if not absolutely necessary, that accessory equipment such as special chucks, jigs or fixtures, be provided to handle the work more accurately and rapidly, and consequently with increased efficiency and economy. What was true in the case of the expanding arbor for exterior machining, is equally true in the development of equipment, either as special machines or attachments, for holding the work while metal is being removed from the bore. While the expanding arbor is essentially an attachment to machine tool equipment, and offers little opportunity for incorporation in special machinery of the unit type, the collet or split ring compression chuck has many features that provide ideal conditions for the single purpose machines; so much so, that the developments in this class of equipment, while highly desirable for shell making purposes, will leave an excess of "ornamental" tools on the market at the close of the munitions activity. It is very unlikely that any line of domestic enterprise will attain the magnitude of recent shell making, and there will be little need for the bulk of the existing equipment of a special character, but the varied experience of the past three years may enable the different engineers to adapt many of the designs to a wider use in ordinary machine shop practice.

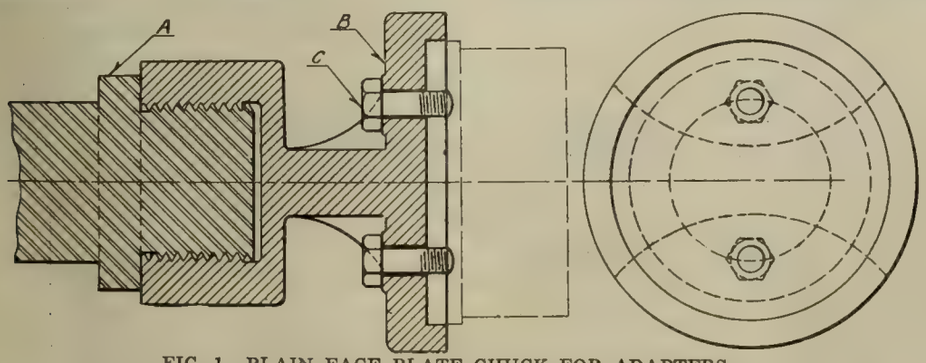


FIG. 1. PLAIN FACE PLATE CHUCK FOR ADAPTERS.

Chucks for Adapters

Before going into the chucks that have been developed for the shells proper, we will just touch on two that have done effective work on the large size adapters. Fig 1 illustrates a plain solid face-plate chuck for finishing adapters. The adapter is first held in an independent jaw chuck and the large diameter turned to fit the recess in the solid chuck B; the diameter of this recess corresponding to that of the counterbore of the shell base. After facing the back, the adapter is placed in chuck and secured by the cap screws C, holes having been previously drilled and tapped in the proper position. This method is very satisfactory for machining, but has the disadvantage that considerable time is required for placing in and removing the work from position; this being the chief reason against its general adoption.

The chuck shown in Fig. 2 does not offer any better machining facilities than that of Fig. 1, but has the distinct advantage of rapid operation, a feature that is all essential in this particular class of work. It will be seen from its construction that it is a unit in itself and with a few modifications could be readily adapted for certain classes of general chucking work. In the design here shown, the steel piece B was shrunk on the end of the lathe spindle A, but for ordinary purposes these could be made of one piece and secured to the spindle or face-plate by any convenient method. The steel bush C, that controls the radial movement of the sectional ring I, is threaded to the piece B. Fitted to the outer diameter of the bush C, is the hand wheel D, cored out to receive the two pawls, F and F_1; the former being the releasing and the latter the tightening pawl, the springs being provided to insure the pawls entering their respective notches.

Shell Chucks

During the incipient stages of munitions manufacture, considerable experimenting was necessary before equipping the various machines with such attachments as are now in general practice. Before shell making could be proceeded with in any large quantities, it was very essential that the different machining operations be given a try-out on a few shells so that some basis could be arrived at for series production. The chuck illustrated in Fig 3 is one that was designed primarily for experimental work, but several of these are still in active service. The greater number of the machines in the plant where these chucks are used, were of the standard type of engine lathe, and owing to the fact that the firm was one of the first to engage in the industry,much of the auxiliary equipment was of home-made design and construction. In the plain pot chuck shown, B is the portion bolted to a special face plate on the lathe. The outer portion of the body is turned in position and is afterwards supported by a steady head located between the clamping screws; these are six in number, four at D being set permanently to a certain position for a forging or rough turned shell, the two screws E-E being used for locking the shell in the chuck. When facing the base end the gage rod C is secured centrally to the rear end of the chuck.

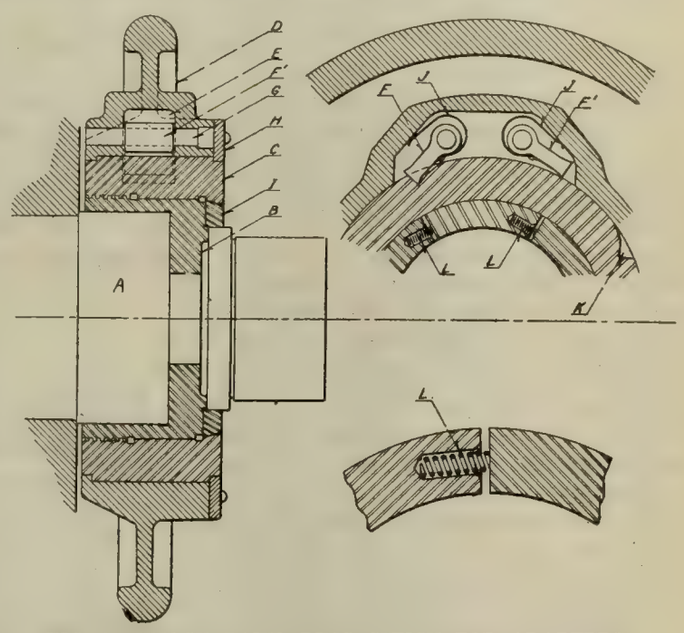


FIG. 2. KNOCK PAWL RING CHUCK FOR ADAPTERS.

A knock pawl type of split ring chuck designed for gripping the base end of

the shrapnel shells, is shown in Fig 4. This is of the unit design; that is, it can be removed from its position without dismantling any of the parts. The central

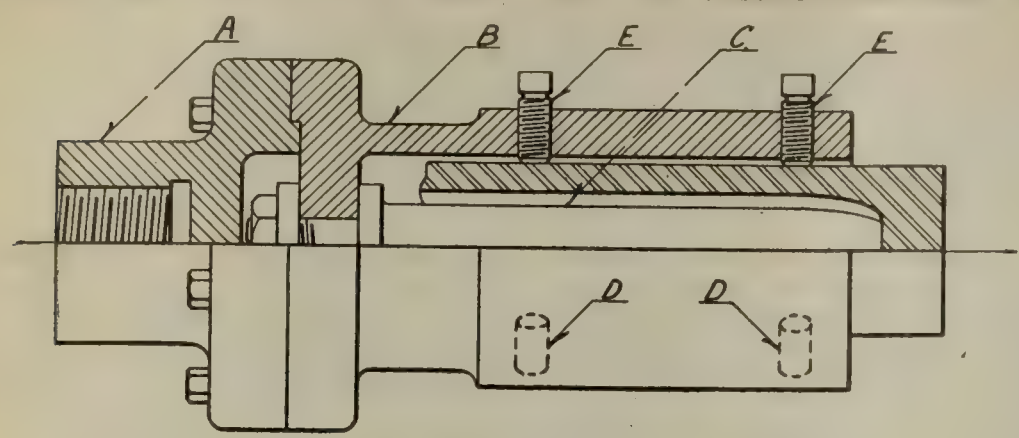


FIG. 3. PLAIN POT CHUCK.

portion A, that carries the chuck proper, is made with a shank that fits into the nose of the hollow spindle B. Fitted to the outer diameter of A is the steel bush C, that controls the radial movement of the hardened steel split ring D, the ring spring keeping the sections in contact with the conical bearing. On the outer surface of the piece C, the operating hand wheel E, is fitted freely and locked in a lateral position by means of the ring H; this ring is of the piston type and sprung over the shoulder shown. The pawl G is fitted in the body of the hand wheel and operates the ring C by its action against the notch shown. To prevent the fixture from turning in the spindle, the pin I is driven in the shank and locks the same in slot J. An interesting feature of these chucks, especially on light work, is their semi-automatic action; as the shell can be placed in the chuck so that the starting of the machine causes the inertia of the heavy hand wheel to close the chuck, and when stopping the opposite effect takes place, as the momentum of the wheel is sufficient to release the chuck when hand or mechanical friction is applied to the shell or the cone pulleys.

A special compression chuck having the controlling hand wheel fixed to the operating cam, is illustrated in Fig. 5. In this device, the body or containing

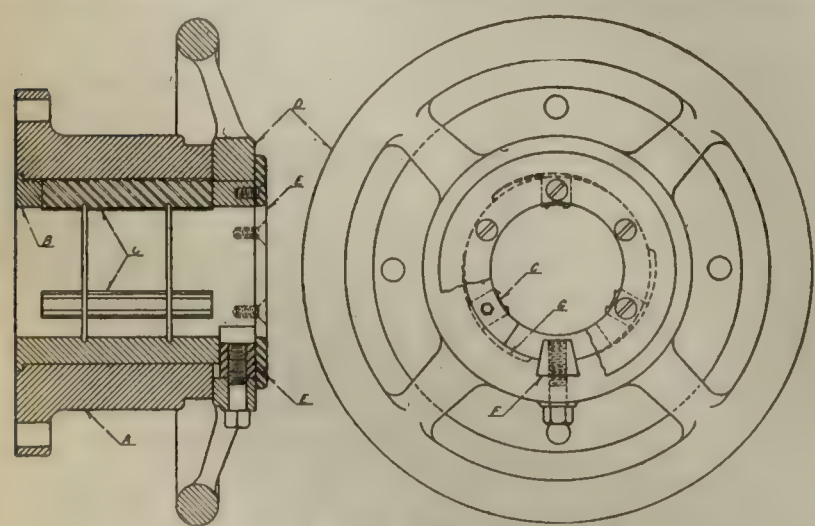


FIG. 5. CAM OPERATED CHUCK.

ring A is bolted to the face plate and encloses the cage B that retains the three jaws C in their respective positions, 120 degrees apart. The hand wheel D is locked to the cage ring by the tapered key F. The jaws, as illustrated, have teeth for gripping the forging, but where a turned shell is being held, these can be replaced by others having smooth surfaces.

The heavy collet chuck shown in Fig. 7 is somewhat cumbersome, but very efficient. The main casing of the chuck is a large casting cored out as shown in

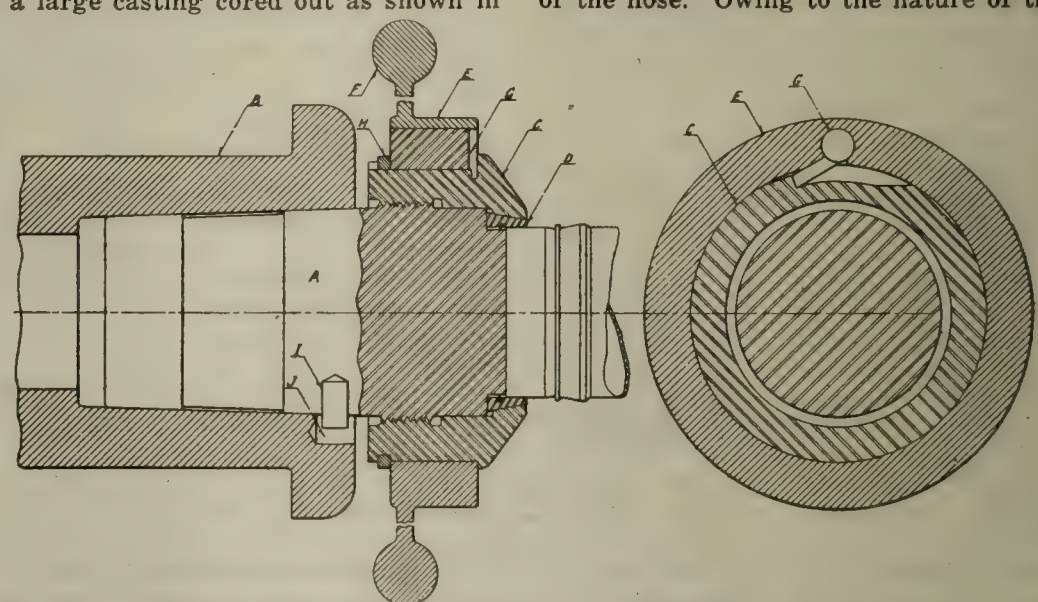


FIG. 4. KNOCK PAWL RING CHUCK WITH SHORT GRIP.

order to provide lightness with size. The casing A is secured direct to the nose of the spindle and locked in a permanent position by means of the key C, the front end of the chuck being supported in the steady rest D; this support is secured to the lathe bed and is fitted with three adjustable blocks E that can be accurately secured to a central position by means of the screws F, two retaining screws being used in the top block to prevent the same from falling out of position when assembling the head. The three blocks H that control the radial movement of the jaws J, are secured to the centre spider of the head by the screws shown. The gripping jaws are relieved in the centre as shown at K, to provide a better means of holding the shell. The forked collar L which is connected to the draw rod M, engages with the offset on the end of the three jaws. The operation of the device can either be obtained by hand wheel or pneumatic appliance, suitably located at the rear of the lathe spindle. No springs are required to control the release of jaws after the pressure has been removed, as the jaws are positively controlled in a radial direction by the dove-tailed connection shown.

Chucking Shells for Thread Milling

Some interesting attachments have been developed for regulating the lead of the chuck and likewise the shell, while the threads are being milled in the base or the nose. Owing to the nature of the machining operation, it is necessary to advance either the work or the milling cutter while the thread is being cut. A general arrangement of one of these devices showing the chuck and also the operating mechanism is illustrated in Fig. 8. While the attachment shown is not directly a chucking proposition, a de-

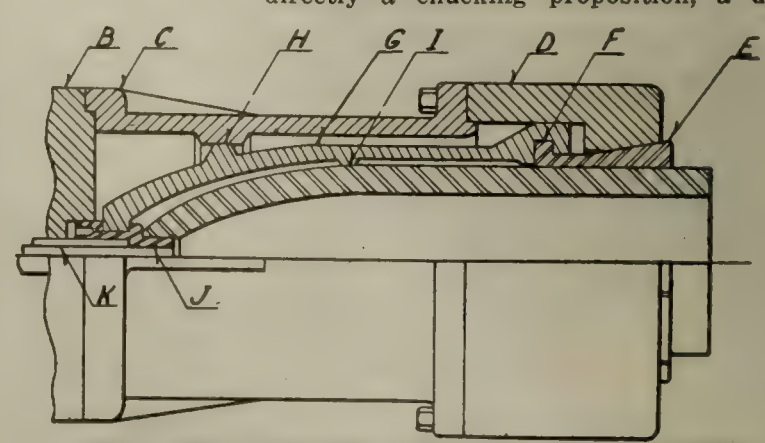


FIG. 6. HEAVY COLLET CHUCK FOR BASE AND BORE OPERATIONS.

scription of its construction and operation may be of considerable interest. The machining of the base is entirely ac-

complished by the milling process, the spindle and the shell being revolved at a constant speed by means of a train of gears. The pulley A, which is driven from an overhead shaft, is keyed to a worm shaft, the worm of which is held in the casing B, and engages with the worm wheel C, the latter being secured to the shaft of which D is an integral pinion; this pinion engages the intermediate gear E, which in turn drives the main spindle in the centre of which the gear G forms an integral part. Secured to the forward portion of the spindle is the chuck support I, upon which is mounted the chuck mechanism. The ring J that controls the split ring K, is operated by tightening and releasing pawls located in the web of the hand wheel L. When in a working position, the inner or nose end of the shell is centrally supported on the bush O, fitted to the stud P, that is threaded to the rear spindle C_1 which is firmly pinned to the back support of the main spindle. The idea of the bush O is to accommodate the two different sizes of nose threads.

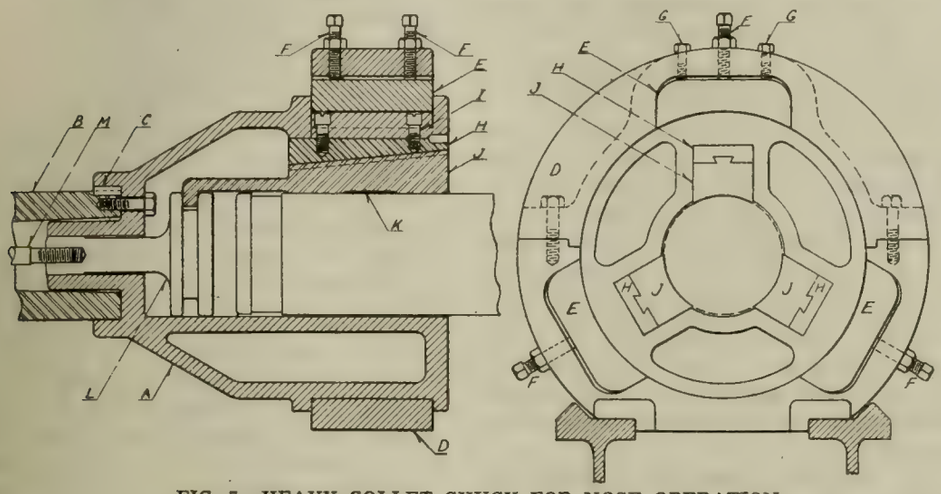


FIG. 7. HEAVY COLLET CHUCK FOR NOSE OPERATION.

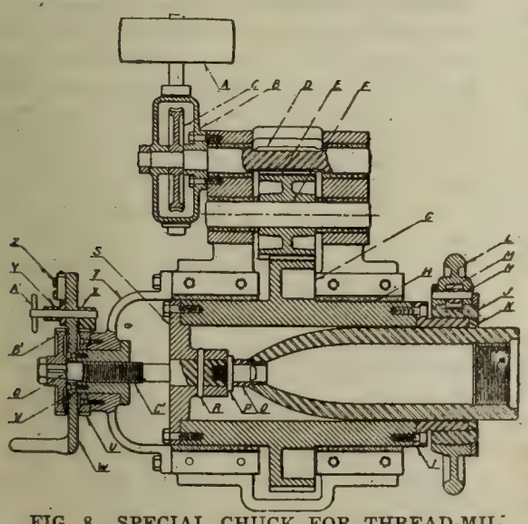


FIG. 8. SPECIAL CHUCK FOR THREAD-MILLING OPERATIONS.

The mechanism that controls the advance of the work is shown to the extreme left of the cut. Fitted to the rear housing is the bracket T that supports the lateral feed shaft Q, and the operating gearing. The ratchet wheel U is bolted to the bracket T, and always remains stationary in relation to the machine frame. Bolted to the nut V is the arm W, one end carrying the two pawls X and Y, the other provided with a handle for returning to the initial position. The pocket Z contains the spring that keeps the pawls to their respective positions, these being set by the handle A_1. The ratchet wheel B, is keyed to the end of the shaft Q, the threaded portion C, fitting the nut V, which is of the same pitch as the thread to be cut. When the counterbore and recess are being milled, the pawl Y is engaged with the wheel B_1 causing the shaft and the nut to revolve together, with no lateral movement in shell position.

After the base is prepared for the thread, and the thread milling cutter brought into working position, the handle A_1 is moved to disengage pawl Y and engage pawl X with wheel U; this keeps the arm W and the nut Y stationary, resulting in the shaft Q revolving in the nut, thus slowly drawing the spindle and shell backwards equal to the pitch on the thread C_1 during the milling of the work thread. On this particular machine a warning bell is attached to warn the operator of too much over travel of the mechanism.

PRECAUTIONS IN PICRIC ACID WORKS

IN the hospital attached to the works of the New England Manufacturing Co., Woburn, Mass., the following routine treatment is carried out in all cases of gassing with nitric fumes, and it has given so far the best results. Foremen are instructed to send their men at once to the hospital even in the slightest case of gassing. The patient is then at once treated by the inhalation of ammonia, by means of a modified lung motor, the air used being passed over aromatic spirit of ammonia. This air may, if needful, be forced into the lungs without causing a great deal of inconvenience to the patient—the relief given being immediate. When cough and substernal distress are relieved, the patient is kept under observation; sal volatile and occasional inhalation of smelling salts is the treatment, with the saline purgative. Bed treatment is insisted upon in all severe cases. No deaths have been recorded out of 398 cases treated, although twenty-nine were serious. Acid burns in the eye are treated with prompt first-aid washing with lime water. At the hospital the eye is irrigated with 16 oz. of lime water and then with warm boric acid solution. Hot compresses of boric acid are applied until the inflammation subsides. After this treatment only one case of permanent injury to sight has been recorded.

WELDED SHIPS

By T. J.

WELDING cast steel sections together into ships is one of the latest propositions for speeding up shipbuilding. Briefly the idea is to build a hull in sections, each a casting as large as the conditions will allow, and to weld the castings together electrically by an arc method. One casting might constitute the bottom of the vessel for a section eight feet in the dimension lengthwise of the ship; another casting would form practically one side of the hull for that section, and a third the corresponding side opposite; a fourth casting would form part of the deck framework or the stiffening between the upper parts of the sides. The scheme is thus to build a large number of substantially identical sections, so that the work may be carried out in duplication in many centres and at the same time it is intended to afford a means of adding rapidly to shipbuilding capacity without depending upon the rolling mills, which are already fully engaged. Midship sections would, of course, be duplicated to a large extent, and then for the corresponding parts of standardized ships the identical castings would be used.

The abutting edges of castings would be bevelled to form the V-shaped grooves used in electric welding, and by means of interlocking lugs and overhanging ends the cast sections would be drawn together to bring the edges into exact registration, to be welded electrically. In the size of the castings section 8 ft. by 30ft. might be used or even larger if the plant permitted it. The grooves are on the inside of the hull, leaving the outside of the ship without projections other than the minute ones corresponding to the surface of a steel casting untouched from the sand. The only work contemplated necessary on the outside would be the removal of chipping of the steel fins following the use of built-up forms of mould, which may be used for the large castings.

The inner skins of the vessel to form bulkheads, ranks and bunkers, may be composed of rolled-sheet metal welded to the decks, beams, frames and plating. There would be the necessity in this type of construction for the castings to be reinforced to secure strength to the hull itself as well as to provide for satisfactory casting results. On a close examination of this method it cannot be said that there is a great likelihood of its having much success, as the work involved might very possibly be lengthened through broken castings, and riveting by pneumatic power is not yet out of date or superseded by any more successful method.

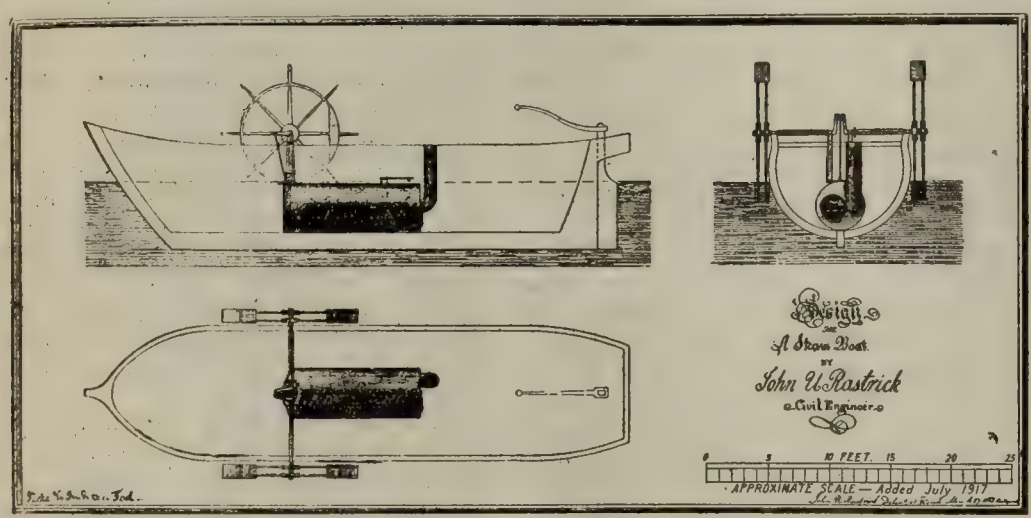
AN EARLY STEAMBOAT

THE present advanced state of marine engineering causes peculiar interest to attach to the accompanying illustration of a design for a steamboat by John U. Rastrick, who built engines for Richard Trevithick in the beginning of the 19th century. The illustration, signed by John U. Rastrick, March 27, 1813, Bridgnorth, is reproduced by courtesy of our contemporary *The Engineer* which publishes the following letter from the owner, Arthur L. Johnson, Limited, of Middlesborough, England, who wrote: "I picked up at a country book-shop the large folio volume of plates to Tredgold's Works, dated 1839, London, John Weale, which contained, stuck in a back page, a drawing which must surely be of interest to all engineers, as it is signed by John U. Rastrick, March 27, 1813, Bridgnorth, and is a plan, sectional elevation and end elevation of a design for a steamboat. The engine is set in the end of the boiler, and is high-pressure, and directly connected to the crank shaft, on which are mounted a pair of paddle-wheels. The workmanship of the draughtsman is admirable, and the shading would probably not be worth the trouble to-day. The picture is of interest, as Rastrick was the founder who built the engines of Richard Trevithick, and it would please me to know if Trevithick ever had such a ship constructed, and if he planned it himself. The scale of the drawing is ¼-in. to a foot, and the ship was intended to be about 40 ft. long, 11 ft. 6 in. beam, and 5 ft. 6 in. draught."

Commenting on the picture our contemporary says: "Simple as it is, it is an extraordinarily interesting link in the history of steam navigation. The Trevithick influence is obvious. The engine is a high-pressure one—there is no condenser—and all the complication of side-levers or overhead beams is avoided. The whole design is as direct and simple as could be desired. The cylinder is apparently single acting, and we gather that a trunk piston, with the connecting-rod coupled to a gudgeon pin, was proposed. It is almost buried in the domed end of boiler, which has a fire-flue at one side and a return flue at the other. The counterbalance weights in the paddles will be observed. The whole thing is excellent in its simplicity and directness of purpose."

"We are quite unable to say whether this "ship," as Mr. Johnson calls it, though pinnace is probably a better name, was ever constructed, and if any of our readers can give any clue to it, we engineers would be greatly indebted to them. Trevithick, as readers of his "Life" know, was deeply interested in steamboats, and in Vol. I, page 352 of his "Life," a letter by him to Hazeldine, Rastrick and Co., Bridgnorth, dated November 13, 1815, Penzance, may be found. In it he says, "Enclosed you have a drawing for the towing engine for London, which you will execute as soon as possible." It is clear from the context that the engine in question was meant to drive a screw propeller, so that even if it were not two years later than the Rastrick drawing, it would be obvious that the same vessel is not referred to."

"It may be of interest to recall that Fulton's steamboat, the Clermont, was completed in 1807, and that John Robertson's "Comet" was built in 1812. Hence Rastrick—or Trevithick—could not be regarded as a pioneer; but it must, at the same time, be admitted that the simplicity of the design, and the obvious intention to use high-pressure steam, are matters of the highest interest."



EARLY DRAWING OF STEAMBOAT DESIGNED BY JOHN U. RASTRICK IN 1813.

SOME NEW AND GROWING BRITISH INDUSTRIES

By Mark Meredith.

SINCE the struggle between Britain and Germany for military supremacy began, British industrial concerns have been by no means idle, and quite a number of new industries have been started, and there is very reason to hope that they will continue long after the clash of arms has ceased. One of the most important steps in the struggle for wresting the supremacy from Germany in many important trades was the exhibition of Austrian and German goods exhibited in the Midlands, for at this collection of samples it was possible for manufacturers to examine and handle the actual products of the central empires. It is no use laying down rules and regulations and giving all manner of hints to a manufacturer, for he wants to see the actual article and take it to pieces and reconstruct it his own way. Until he has done that he has not much knowledge.

Municipal Encouragement

One immediate outcome of the Exhibition held under the auspices of the Board of Trade was that the Chambers of Commerce of Birmingham and Wolverhampton adopted a forward policy and a scheme involving research work has been inaugurated, and several municipalities and local authorities have set themselves the task of attracting new industries within their borders. A new factory will shortly be completed at Wolverhampton for the manufacture on a large scale of wrought enamelled hollowware, and a factory is to be built within the borough for the manufacture of artificial silk. In another part of the Midlands a brush-making machine, made formerly in Germany, is being manufactured, and a welcome stimulus has been given to the flint-glass industry and other departments of the glass trade. Considerable developments have been made in the Sheffield district with the heavy steel industry, and electrically melted steel is likely to play an important part in the future struggle for industrial supremacy. At the present moment a large number of electric furnaces are in use and are used chiefly for the production of alloy steels for constructional purposes, and to an increasing extent they are replacing the crucible for carbon and high-speed tool steel. For a number of purposes electrically melted steel is proving an efficient substitute for the scarce and more expensive Swedish brands.

The war produced a boom in high-speed tool steel which would appal the imagination if the figures relating to the value of the material produced and sold could be given. Every crucible furnace in Sheffield has been given up to its manufacture, and there has been no pause in the consumption or the demand. Yet at the beginning of the war the steel trade had no source for the supplies of tungsten metal, without which high-speed steel cannot be made—than Germany. It was no light task to set about creating a home supply, as the making of tungsten involves intricate chemical processes, accompanied by much patient research and experiment, and it must be taken into account that the German makers had passed the experimental stage years ago. Here again Britain rose triumphantly to the occasion, and at the present time there is an ample supply for home needs and for export as well. At least half of the ores are found in the British Dominions and the whole of this will doubtless be reserved in the future for British makers.

Dyes and Optical Goods

Again, in the dye industry great progress has been made and the British chemist has succeeded in producing what is known as indanthrene blue, a dye which the Germans declared could never be produced by any one but themselves; but not only has the firm of British Dyes, Ltd.,

produced this useful color, but a Carlisle firm has done so as well.

Users of gelatine in sheets were often of the opinion that Germany was the only source of supply for this, but for many years a Belfast firm has made sheet gelatine, and in addition made great use of it for enamelling and imparting a washable surface to showcards.

Although German opticians have obtained a high reputation for their goods, and this reputation has been considerably helped by the fact that photographers and others thought that a lens of German design and make was ipso facto better than anything which the British optician could turn out—actually that belief, as the more expert photographers know, will not bear examination. The two factors which determine the quality of a photographic lens are: first, its optical formula, and second, the perfection of workmanship by which the curves, etc., prescribed in the scientific formula are given to the separate glasses and the latter polished and centred in their metal mounts. It was a British optician, Mr. H. Dennis Taylor, who in the early 'nineties of last century first showed in the "Cooke" lenses that the very highest optical qualities could be obtained with very simple glasses by means of suitable air spaces between them, a principle which the Germans, in common with opticians in other countries, adopted, with variation. In workmanship, too, official tests in Great Britain by the National Physical Laboratory, constantly made in pre-war days, have shown that of two lenses made according to the same German formula, one in Germany by the parent firm and the other in London by the workmen of a licensee, the British-made objective was optically the better of the two. Again, the British have succeeded in evolving an improved type of lens for the special work of photographing from aircraft, which has enabled observers of the Royal Flying Corps to obtain photographs which were superior to any work which the Germans could execute.

THE ENGINEERING COUNCIL OF AMERICAN ENGINEERING SOCIETIES

THE formation of Engineering Council is the outgrowth of a real need for proper consideration of questions of general interest to engineers and to the public, and to provide the means for united action upon questions of common concern. Many such questions have come up in the past and will arise in greater number in the future. This war has brought out very impressively the actual need for united action of some kind. At present the Council is concerned only with four societies because that seemed the most practical way of getting a group of men together to answer the immediate needs, but these societies do not assume to speak for all engineering societies in the country. Criticism that they are exclusive in any way is utterly mistaken. There is the hope that such a council by proving itself effectively may lead to much wider co-operation in a strictly representative body for all engineers, and thus pave the way for a very much larger union in the future.

How can the council be enlarged? By a union of all societies either as the outgrowth of the present council or by a congress of engineers leading to united action by all societies. The first method will be the most natural one because many local societies and national societies also have a large membership in the four societies at present concerned. We have three classes of engineers to reach: first, those who are members of local societies and not members of national societies; second, those who are members of national societies and not members of local societies; and third, those who are members of no society. The last named class constitutes a very large number in our profession. We are almost as mixed as American citizenship and we suffer therefrom just as much as America with a population representing every race and every people in Europe. There can be no question of the enormous advantage of union. That union should be completed by strengthening the existing agencies and not by the formation of new societies. The national societies are thoroughly national notwithstanding an occasional complaint that they are run by New York. If they have not been able to express the democratic spirit of our country as fully as might be desired it is the fault of the members in all the states and not of the city in which the principal offices are located.

The four societies concerned at present are the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers. They have come together in pairs from time to time in the past for special purposes and there have been general conferences on subjects requiring immediate settlement, but until the council was definitely organized in June there was no permanent body to advise all the societies. We have had many fruitful discussions in the past leading to useful action. The Standardization Committee which has been organized to represent five societies has passed upon commercial standards of all kinds. This committee has great possibilities and it should be enlarged enough so that its influence may become very widespread.

Many problems have already been presented before the council. Its personal made up of twenty-four men representing equally the four societies is well balanced and judicial. The first duty was necessarily the organization and appointment of standing committees which have already been reported in the press.

Certain questions relate, however, to the war and the assistance that engineers can render. A committee to be called the American Engineering Service Committee was appointed with instructions to invite the co-operation of all engineering societies. Its present duty is the tabulation and listing of the members of the five societies represented, in order that we as a profession may be in a position to take a larger part in the industries after peace is declared. This tabulation has already in part been done, but in a rather unsystematic and unequal way. It is hoped that the new committee by having additions from other societies may make a final and lasting tabulation of all the engineers in the United States. The list is to be kept in the Engineering Building for general use in Government problems and in the industries. At present the committee is devoting its attention to the immediate need of the hour, namely, the procurement of men for special service in the Government. A list of specialists in the societies has already been completed. There are three methods by which engineers may enter United States Service: first, through some organization; second, through individual application to a department of the Government; and third, through selection by the Conscription Law. But this is War Service wholly and not Civil Service which is the same now as it has always been. As a matter of fact a great many engineers have already entered through the engineering societies, through colleges and through various special boards in Washington.

Another committee is called the War Committee of Technical Societies. It was appointed to assist any organization in Washington, such as for instance, the Council of National Defense, the National Research Council and the Naval Consulting Board, in any way in which it can bring to the attention of the engineers of the country the necessity for thought and help in the numerous problems that arise.

A council organized by the enlargement of the present Engineering Council can be very effective in many ways, without interfering with the autonomy of any individual society. Every society has some definite purpose of its own and also some which it holds in common with all other societies. One of the latter purposes relates to public service and to co-operation. To the end that all societies may understand full their opportunity, communications will be sent out inviting co-operation and it is hoped that the council may be successful in arousing sufficient interest to bring about a larger and better council for all engineers.

In organizing the council provision was made for the election to membership of other national engineering and technical societies. There is no doubt that rules can be made which these societies may become members. This will involve consultation and discussion in the future. The office of the council will be in the Engineering Building, 29 West 39th Street, New York City.

PROCESSES IN MANUFACTURE

Inventive Genius and Research Operate to a Dual End — They Aim to Improve What We Now Possess and Bring to Our Service Commodities Before Unknown

WELDING WITH APPLICATION TO AUTOMOBILE ENGINEERING

By Herbert L. Towns.

THE evolution of the methods employed by manufacturers in the industrial world is undoubtedly a source of wonder, and probably one of the greatest advances is that of welding. Along with welding has come the cutting of metals by the application of heat, and so great has been the development of these means of manufacture, that the welding and cutting apparatus has become an ideal and absolute necessity to the engineering trade. In dealing with this subject it will be advisable to make some classification, and the best method to adopt will be to deal with the process of welding in a general sense, and then consider the possible applications to automobile industry.

Welding is the process of joining two pieces of metal by melting the adjacent edges of the metal together, and the methods of producing the necessary heat have varied; among them are the oxy-hydrogen, the oxy-acetylene, and the electric arc methods. The oxy-hydrogen flame is very rarely, if ever, used, as the heat produced by this flame is not nearly so intense as the heat produced by the oxy-acetylene flame or the electric arc, and as the oxy-acetylene flame is more extensively used, it will be as well to confine all consideration to this method in order to devote the limited time at our disposal to a single subject.

Oxy-acetylene welding is classed as an autogenous welding process in which two parts of the same metal, or different metals, are joined by the melting of the adjacent edges of the two parts and causing them to become joined without the use of hammers or any form of compression the melting of the edges of the pieces of metal being performed by the heat produced by an oxy-acetylene flame. It may be well to mention that the term "autogenous welding" is often used as being the method of welding performed by the heat of the flame produced by the combustion of a mixture of gases, but the correct meaning of "autogenous welding" is the joining of pieces of metal without the aid of any foreign material.

The oxy-acetylene flame is very small in size, and results from the combustion of a mixture of oxygen and aceytlene, which mixture has been made in a special burning torch or blowpipe.

Acetylene

Acetylene is a gas, and may be quoted approximately as 92½ per cent. of carbon and the balance hydrogen, this only being approximate on account of certain small percentages of impurities that may exist; for instance, a certain proportion of the hydrogen may be phosphuretted and sulphuretted.

The presence of hydrogen retards the

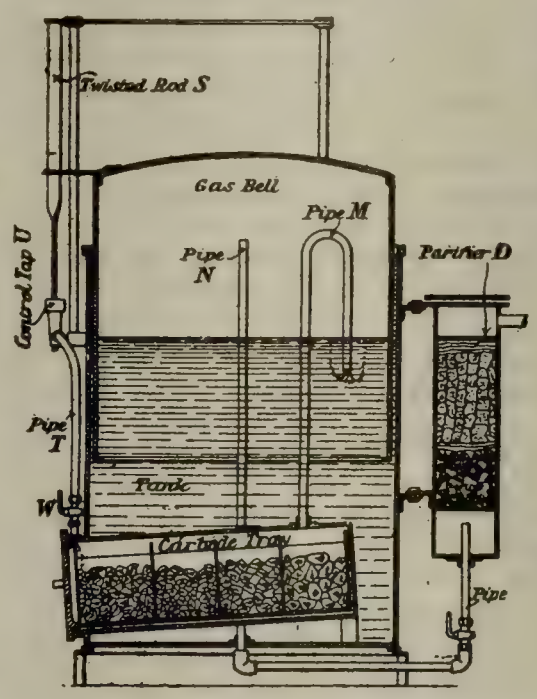


FIG. 1. PORTABLE ACETYLENE GENERATING PLANT.

combustion of carbon in oxygen, so in order to get a more rapid combustion, oxygen is mixed with acetylene, which mixture generates the hottest flame for welding, a heat of up to about 7,000 deg. F. being obtainable. This heat is greatly in excess of the heat produced by the oxy-hydrogen flame, the heat generated by the oxy-hydrogen flame being only about 4,000 deg. F.

Two important methods of supplying acetylene to a shop in which the welding of metals is performed are largely adopted these being either to have portable welding outfits which include the generator, oxygen cylinder, flexible pipes, blowpipe, etc., or to have the generator fitted in a special shed or house built outside of the shop. In the case of the portable outfit each operator has one of these appliances, which can be moved to any part of the shop as required. It will be seen that this method is most useful in shops where welding is not too frequently to be done. In the case of the fixed generator the whole supply of acetylene for the use in the shop can be produced and led into the shop through pipes, the size of the generator being arranged to suit the size and requirements of the shop.

Acetylene Generators

There are various types and makes of generators now on the market, and it will be very interesting and I hope instructive to devote some attention to one or two of these types. A type of generator suitable for attaching to a portable welding plant is shown in Fig. 1. This generator is very compact, light in weight, and has the advantage of being adaptable to almost any portable framework, as it requires no fixing. Adjustable chains can be fitted to the side of the tank for the purpose of carrying the oxygen cylinder, in which case it is unnecessary for the generator to be fitted on a framework; it can stand on the floor and be moved from place to place as required. The following table shows the size of the generator in comparison with the output of acetylene.

Table I.

Height		Weight			Output of Acetylene per Hour	Charge of Carbide
Ft.	In.	Cwt.	Qr.	Lb.	Ft.	Lb.
4	9½	3	2	0	50	20
6	6	4	1	14	70	30
7	3	4	3	0	100	50
7	9	6	2	0	150	75

A generator of this description is automatically controlled, and, therefore, requires little or no attention save the charging of the carbide tray and the filling of the water tank. It will be seen

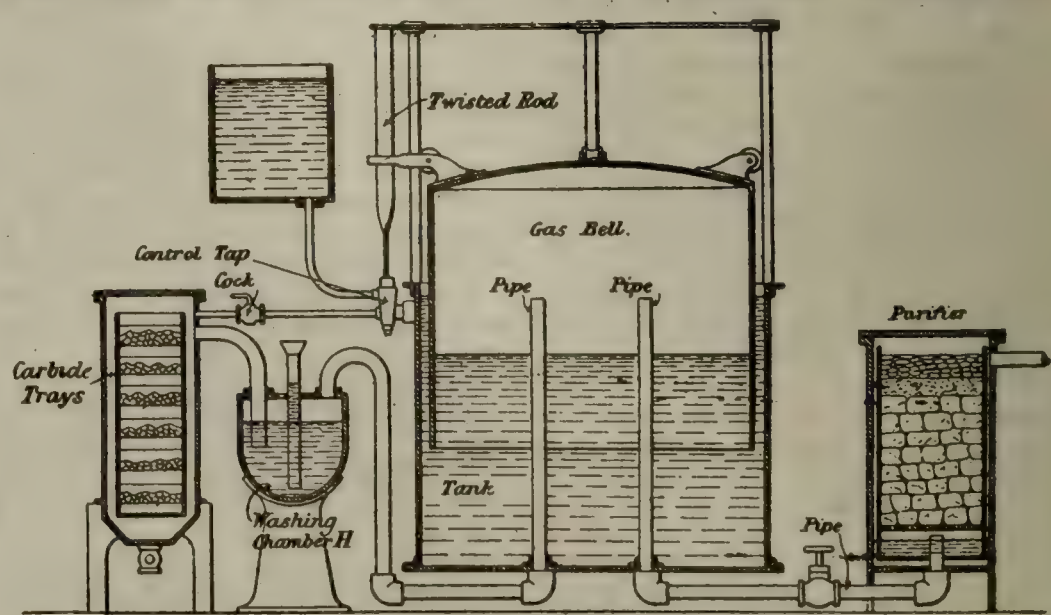


FIG. 2. FIXED ACETYLENE GENERATING PLANT.

*From paper read before the Coventry (England) Branch of the Institution of Automobile Engineers.

from Fig. 1 that the carbide chambers are actually contained in the water tank, which makes the generator very compact. The plant is worked as follows: Carbide is placed in the carbide trays or generators (the sketch only shows one, but two are fitted side by side) and the tank is filled with water. The cock W, which is fitted to the pipe T, connecting the water tank with the generators is then opened, and water flows from the water tank to the generator; acetylene is then produced, and passed through the pipe M into the water, through which it bubbles into the gas bell; as the gas bell fills with acetylene it rises, being steadied by guide and pillars. One of the guides on the gas bell has an extension fitted, which engages with a twisted vertical bar S, this bar controlling the water cock U. Now, as the gas bell fills and rises the bar S is automatically operated to shut off the water cock U, this preventing further flow of water from the tank into the generator. The acetylene is taken from the gas bell through the pipe N and is passed through the purifier D to the burner. It should be noted that the acetylene is first purified by being passed through the water, from the pipe M into the gas bell. As the acetylene is used, the gas bell falls, and the cock U is again opened to allow water to pass into the generator, and the process repeats itself.

Table II.

Height		Weight			Output of Acetylene per Hour	Charge of Carbide
Ft.	In.	Cwt.	Qr.	Lb.	Ft.	Lb.
6	8	13	2	0	100	36
[illegible]	[illegible]	16	3	0	140	50
6	8	19	0	0	160	60
9	3	22	2	0	175	75
9	3	27	0	0	250	100

A type of fixed generator is shown in Fig. 2, which type of plant does not differ in principle from that shown in Fig. 1. In this type of plant the generators and the purifying chambers are independent of the gasholder. It will be noticed that a special washing chamber H is provided through which the acetylene is passed from the generators to the gasholder. The table in the preceding column shows a comparison of the size and output of these types of plant.

In each of these types of plant the generators can be recharged with carbide without in any way disturbing the supply of acetylene, as the gas cannot get back from the holder into the generators. These types of generating plants are manufactured as standard articles in various sizes.

A method of supplying acetylene to the welding torch, which is not commonly used in practice, is that of having the gas stored in tanks or cylinders, instead of generating it. The acetylene contained in these tanks or cylinders is dissolved in a liquid called acetone, this being the only known liquid that will dissolve acetylene to any appreciable extent. Acetone will dissolve 24 times its own bulk of acetylene at ordinary atmospheric pressure, and also possesses the strange feature of destroying the highly explosive nature of acetylene while they are mixed together. This feature has the extreme advantage of rendering cylinders of dissolved acetylene safe for handling and transporting, an advantage which is worth consideration. Acetylene is probably more useful in this form for purposes other than welding, for instance, the lighting of automobiles and ships, where generators would be a more dangerous fitment. Also there is the possibility of drawing the acetone out of the cylinder with the gas, if the rate of discharge of the gas becomes excessive, the result of this would be a reduction in heat of the flame.

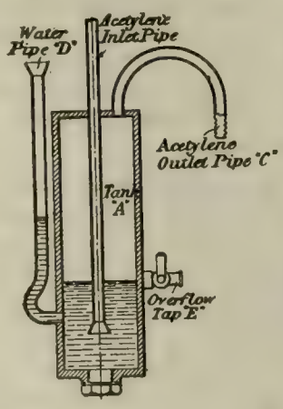


FIG. 3. BACK PRESSURE SAFETY VALVE.

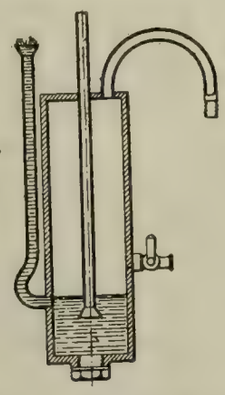


FIG. 4. B.P. SAFETY VALVE SHOWING WATER UNDER PRESSURE.

Oxygen

The oxygen which is used to support the rapid combustion of the acetylene is not as a rule manufactured by the consumer, and there is actually only one firm in this country at present which manufactures this gas in any appreciable quantities. The supply of oxygen is by no means adequate enough to meet the demand for industrial purposes, and some idea of the demand can be gathered from the fact that the British Oxygen Company alone, who are at present making additions to the oxygen-producing plant, hope when this is completed to have an output of approximately 375,000,000 cub. ft. per annum, or about 1,250,000 cub. ft. daily.

The pressure and consumption of oxygen is governed by the size of the blowpipe used to suit various thicknesses of metals, as will be seen from Table III.

Table III.

Thickness of Metals to be Welded In.	Approximate Oxygen Pressure Required Lb.	Approximate Consumption per Hour Oxygen Cub. ft.	Acetylene Cub. ft.
1–32 to 1–20	5	2	1½
1–20 to 1–16	6 to 7	3½	3
1–16 to 3–16	7 to 8	8	6
3–16 to 5–16	13 to 14	14	11
⅜ to ½	21 to 22	35	28
⅝ to ¾	27	55	42
¾ to 1	30	78	63
1¼ to 1½	37	100	80
1½ to 2	40	125	100

Oxygen cylinders are made in sizes varying to contain from 10 to 200 cub. ft. of the gas, the size most commonly used being the 100 cubic feet. If the welder knows the actual or water capacity of the cylinder, he can determine the approximate volume of gas remaining in a cylinder. This information is very useful, and in reality essential, in the case where a welder has a partly spent oxygen cylinder and a somewhat lengthy piece of welding to do, in order that it may be ascertained if sufficient oxygen is available to complete the work. As an example the following may be taken. Say a piece of welding work is required on metal of ⅝ in to ¾ in. thick, for a length of, say, 2 feet. This will necessitate the use of a blowpipe, which will consume 42 cub. ft. of acetylene per hour, and the work would require about half an hour in which to be completed, as will be seen from Tables III. and IV.

FIG. 5. FLAME SHOWING EXCESS ACETYLENE.

The consumption of oxygen for this work would be approximately 27½ cub. ft. Now if we assume that the welder has one 100 cub. ft. cylinder, which is indicating a pressure of 36 atmospheres, would it be possible to execute the work? The welder, knowing the actual or water capacity of 100 cub. ft. cylinder, say, 0.833 cub. ft., can easily estimate the possibilities of being able to complete the work with the use of this cylinder. Knowing the pressure of gas in cylinder (36 atmospheres) and the capacity of the cylinder (0.833 cub. ft.) the volume of gas at his disposal is equal to $36 \times 0.833 = 30$ cub. ft. (approximately). If we deduct, say, 2 cub. ft. or 3 cub. ft, which remain in the cylinder when the pressure has fallen to about 2 atmospheres, and allow for the possibility of a slightly larger consumption of oxygen by the blowpipe, we are left with approximately 26 cub. ft. or 27 cub. ft. of oxygen, and it would probably be possible to finish the work if it were done rapidly.

Installation

Having considered the production of the necessary gases for oxy-acetylene welding, the next point to note is the carrying of the gases to the place for burning. Where a fixed generator is used it is necessary to have fixed pipes for the service of the acetylene to the place (or places where more than one blowpipe is being served) of welding, and the gas fed to the blowpipe by a flexible tube connection from the service pipe. Just as the use of copper is prohibited in the manufacture of acetylene generators, the use of copper tubes is prohibited for serving the gas to the blowpipe; therefore, iron pipes should be used for this purpose, and these should preferably be galvanized, as the presence of any moisture in the gas would tend to form iron oxide, which may leave the pipe and accumulate in some more vital part of the installation. These fixed pipes should be fitted to the wall of the shop, and should be arranged with a slight upward run, so that any moisture forming in the pipe would tend to run back to the generator.

The size of the pipes fitted depends entirely on the number and size of the blowpipes to be used, and this should receive careful consideration in arranging for the fitting of an oxy-acetylene welding installation in any establishment. There is a danger of the pipes being too small in size, which results in the acetylene arriving at the blowpipe in insufficient quantities and probably at a considerably re-

duced pressure, hence the welder may have to increase the pressure of the oxygen he is using, with more or less disastrous results, as will be seen later in the consideration of the proportions of the gas mixture. It should be remembered that the length of the piping should be taken into account, as well as the size of the blowpipes to be used, when fixing the diameter of the piping, in order that the loss of pressure of the acetylene may not be excessive.

The Safety Valve

There is an apparatus that is absolutely

FIG. 6. NORMAL FLAME.

indispensable in the welding installation, this being the safety valve. As a matter of fact each blowpipe must have a safety valve which, in the case where a portable acetylene generator is used, is fitted to the generator, and where a fixed generator is used the valves are fitted to the fixed service pipes, in each case the acetylene passing through the valve, which is also connected to the blowpipe by flexible tubing. A type of safety valve is shown in Fig. 3, a description of which is as follows: The apparatus consists of a chamber or tank A, which is fitted with a filling pipe D, by which the tank is partly filled with water, the level of the water being regulated by the drain cock E. The pipe B is connected to the acetylene service pipe, and an outlet pipe C, to which the flexible tube is connected, is provided.

The object of fitting this safety valve is to prevent any oxygen from getting into the acetylene pipes, as would happen in the case of the blowpipe becoming temporarily choked up due to the splashing of molten metal or other causes, if a device of this description were not fitted, as the oxygen is always fed at a greater pressure than the acetylene; hence this safety valve prevents the formation in the pipes of a mixture of the two gases,

FIG. 7. FLAME SHOWING EXCESS OXYGEN.

which would be of an explosible nature, and consequently dangerous in case of the flame back-firing.

The acetylene is passed from the service pipe into the water, through which it bubbles, and passes through the outlet pipe to the blowpipe. In case of a stoppage in the blowpipe the oxygen passes through the flexible tube into the tank A, and as the pressure in the tank is increased due to the oxygen not being able to gain an outlet, the water-level in the tank becomes lower, by the water passing into the filling pipe and the acetylene pipe, until the level of the opening into the filling pipe is reached, then the oxygen bubbles up through the water in the filling pipe and escapes into the air, as shown in Fig. 4. These valves require very little attention, save the checking of the water-level by the drain cock when the system is in use, this being preferable to getting the correct level under working pressure.

The feeding of the oxygen to the blowpipe is done through flexible tubing of three-ply rubber, which is preferable to metallic flexible tubing, owing to the increased danger arising from the deterioration of metallic tubing not being so noticeable as that of the rubber tubing.

Blowpipe

The blowpipe is an instrument requiring careful consideration and thought from first to last, in the first place in the designing and lastly in the handling during operation—the consideration in design being partly to make the instrument absolutely safe in case of careless handling on the part of the welder, and consideration on the part of the welder partly to allow for bad design. The blowpipe, if properly designed, built up and handled, is an instrument of simplicity and safety, being light, compact, and easy to handle. The work to be performed by the blowpipe, namely, that of mixing the two gases, is of extreme importance, as the obtaining of a good sound weld to a great extent depends on the mixture of the gases.

In theory, for the total combustion of one volume of acetylene 2½ volumes of oxygen are required, but in actual practice the proportion of acetylene to oxygen varies between 1 to 1¼ and 1 to 1¾. The result of a weld obtained by the use of a mixture of gases in incorrect proportions, may be of a very unsatisfactory nature, as if a superabundance of oxygen be admitted the flame produced will have oxidizing effects, whereas if a superabundance of acetylene be introduced the flame produced will have a carbonizing effect, in which case a hardening of the metal in the immediate vicinity of the weld will result, and the finished work will, consequently, be of a brittle nature.

The correct flame for welding is, therefore, half-way between an oxidizing and a carbonizing one. An experienced welder can readily estimate the proportions of the mixture of gases he is using by a glance at the flame produced. Some idea of the flames produced by different mixtures is given in Figs. 5, 6 and 7. Fig. 5 shows the flame produced by a mixture having an excess of acetylene, and all blowpipes should be able to produce such a flame by having the oxygen admitted at normal pressure and the acetylene at full pressure, although this flame should not be used. If a blowpipe is not capable of producing a flame of this description, either it is faulty, or the system for carrying the acetylene from the generator is in some way out of order, causing the passage of the acetylene to be obstructed.

When a blowpipe is producing this type of flame the acetylene cock on it, or the outlet cock on the safety valve, should be partly closed, till a flame similar to that shown in Fig. 6 is produced, which is the correct flame to use. The centre white light which appears in Fig. 5, as a some-

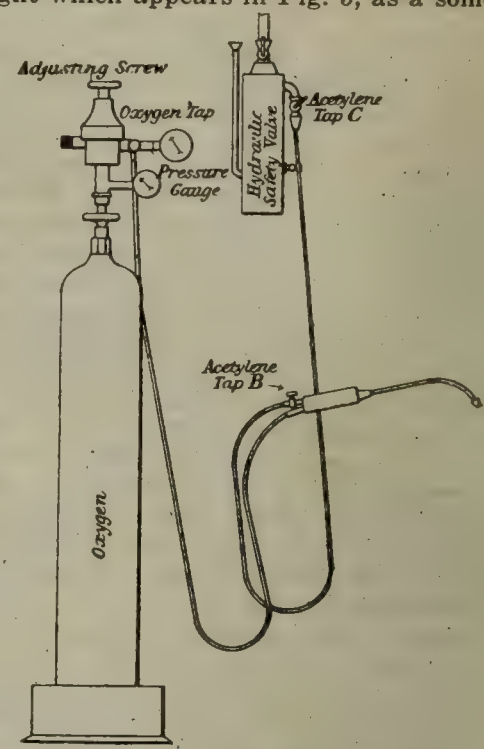


FIG. 9. INSTALLATION CLOSE TO OPERATOR.

what indefinite form has now become smaller and more definite. If a further reduction in the supply of acetylene be made by closing either of the cocks in the acetylene system already mentioned the centre white light becomes much smaller, as shown in Fig. 7, which is an oxidizing flame, produced by a mixture of gases having an excess of oxygen.

There are many different forms of blowpipes in use, but the general principle is the same in each case, and they vary in length from about 1 ft. to 2 ft. The blowpipe as shown by the outline sketch, Fig. 8, consists of a handle through which pass two tubes, each fitted with a regulating cock. These tubes carry the gases to a mixing chamber, from which the mixture is passed to the nozzle. In the design of a blowpipe an essential point for the consideration is the distribution of weight, as the instrument should as nearly as possible balance when held by the operator, for ease of manipulation.

Blowpipes are divided into three distinct classes, which are named according to the pressure at which the acetylene is being used, namely: (1) low pressure, (2) medium pressure, (3) high pressure. The pressures at which the acetylene is used are approximately: (1) for low pressure, 0.1 to 0.25 lb. per square inch, which is the pressure at which the acety-

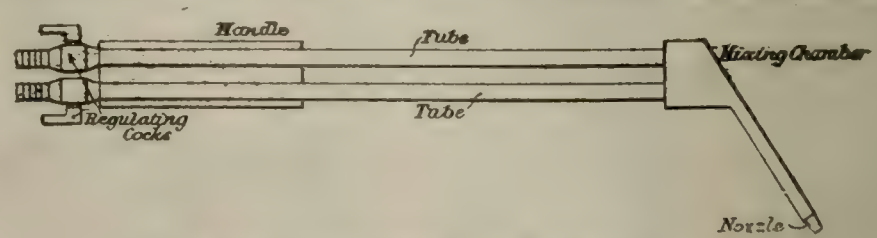


FIG. 8. OUTLINE SKETCH OF BLOW-PIPE.

lene is generated; (2) for medium pressure, 1.5 lb. to 5.5 lb. per square inch; (3) for high pressure, 4.5 to 7 lb. per square inch.

High-pressure blowpipes are not commonly used in practice, in consequence of which blowpipes are often referred to as being of two classes, high pressure and low pressure, the high pressure class being what in reality is the medium-pressure class. The real high-pressure blowpipe is only adaptable in cases where dissolved or compressed acetylene is being used, all other forms of acetylene having insufficient pressure for the mixing of

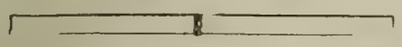


FIG. 10. WELD FOR METAL LESS THAN 1-16" THICK.

the gases. Low-pressure blowpipes are also uncommon as far as being used is concerned. In this type of blowpipe the gases flow at a very low speed, and back-firing is experienced, however, safety devices are usually fitted, which render them safe to handle. The medium-pressure blowpipe is the type that is most commonly used, and has very few disadvantages. In this type of blowpipe back-firing is very unlikely, due to the pressure of the gases, which keeps the speed high.

The only real danger experienced in the use of the blowpipe is due to back-firing, and this is provided for by the fitting of safety devices. Attempts have been made to cut out this small piece of the installation, but the results have been far from satisfactory.

The blow-pipe is usually made of brass, and is constructed in such a way that it is impossible for the gases to mix before they reach the welding head or mixing chamber. The nozzle is usually a detachable piece, so that the size of the orifice can be varied to suit the consumption of gases required for different classes of work. Blowpipes are usually supplied with a series of nozzles, which vary according to the consumption of the gases required for the different classes of work to be done. The size of the nozzle is determined by the consumption of acetylene per hour, and the sizes have a large range, being made to use acetelyne at rates varying from 1 cub. ft. to 100 cub. ft. per hour. These nozzles are made of copper, which metal withstands the heat much better than other less suitable metals. The size of nozzle suitable for welding various thicknesses of metal may vary slightly

FIG. 11. WELD FOR METAL BETWEEN 1-16" AND 3-16" THICK.

according to the make of blowpipe used, but some idea of the consumption of acetylene can be gathered from Table III. and the approximate rate at which the various thicknesses of metals can be welded by using nozzles to give the consumptions shown therein is given in Table IV.

Table IV.

Thickness of Metals to be Welded. Inches	Approximate run per Hour. Feet.
1-32 to 1-20	39
1-20 to 1-16	38
1-16 to 3-16	20
3-16 to 5-16	10
⅜ to ½	6
⅝ to ¾	4
¾ to 1	3
1¼ to 1½	2
1½ to 2	1

Some idea of the variation in costs of welding various thicknesses of metals can be gathered from Tables III and IV. To take a comparison, say 1 ft. of welding is to be done on a metal having a thickness of 1/20 in., and also a similar length on a similar metal having a thickness of 2 in. In the first case the consumption of oxygen and acetylene is 0.051 cub. ft. and 0.038 cub. ft. respectively, while in the second case the consumption of oxygen and acetylene is 125 cub. ft. and 100 cub. ft. respectively. Hence, the proportion for the costs of the gas alone is as 1 to 2,500; on top of this the time taken for the operation is 39 times greater in the second case than in the first case.

It has already been mentioned that the blowpipe is an instrument of simplicity and easy to handle, but also being an instrument of precision, very great care is called for in its maintenance if a perfect and economical working is to be experienced. The cleaning of the nozzles should be attended to at regular intervals, and great care is required here, as the size and shape of the orifice should not be altered, because any change in this direction will cause more or less serious results when used again. Any increase in the size of the orifice of a nozzle would tend to decrease the velocity of the mixture at the exit, and the tendency to back-fire would be increased. It is, therefore, advisable in cleaning a nozzle to use some instrument which is not harder than the material of which the nozzle is made, and a suggested suitable instrument is a piece of brass wire, which should be run through the opening.

In order to ensure that the interior of the blowpipe is kept free from any obstruction, the blowpipe should be disconnected from the feeding tubes and the nozzles connected up to the oxygen tube, then the opening for feeding oxygen into the instrument should be temporarily closed, and a current of oxygen blown through the acetylene passage. By playing on the end of the acetylene passage with the finger a fluctuation in the exhaust of the oxygen is caused, and the clearing of the interior of the blowpipe is accomplished.

It is advisable to avoid the dismantling of a blowpipe by any except persons thoroughly experienced in this class of work, as the putting together of the parts requires a certain amount of skill, the accuracy of which governs the correct working of the instrument.

The starting up and stopping of the working of blowpipe should be done in a methodical manner, and the following are suggestions for doing this, references being made to Fig. 9 which shows an outline of the apparatus in the vicinity of the operator. First, the checking of the hydraulic safety valve for water-level should be done, by opening the overflow cock, and recharging with water if necessary, and the overflow cock closed. Now, with the lower acetylene tap B closed, the tap C should be opened, then the oxygen valve should be closed and the cylinder opened by means of the key. The adjusting screw should then be adjusted so the required working pressure is registered by the gauge. The tap B should be

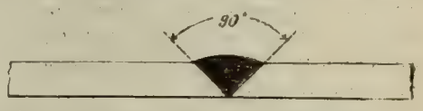


FIG. 12. WELD FOR METAL BETWEEN 3-16" AND ⅝".

opened, and when the acetylene is smelt at the nozzle it should be ignited, then the oxygen tap should be opened to admit the oxygen to the blowpipe. It will be necessary to correct the oxygen pressure, which will have dropped, as will be seen by the gauge, due to the opening of the tap. By means of the tap B the acetylene should be shut down until the flame is normal as shown in Fig. 6. On stopping work the acetylene tap C should be closed first, then the oxygen tap D, and in case of work being completely stopped the oxygen cylinder should also be shut off and the pressure released from the regulator.

In case of a back-fire the tap C should be immediately shut off, and the blowpipe should not be relighted for a few seconds. Before the lighting up of the blowpipe, in the morning, it may be necessary to disconnect the acetylene pipe from the blowpipe, in order to drain out any accumulated moisture.

Properties and Welding of Different Metals

The use of welding instruments is a comparatively simple task which can be easily acquired by very short tuition or practice, but to become an expert welder is something much more difficult. In order to be able to execute welding in a manner worthy of the term welding it is necessary for the executant to have some knowledge of the properties of the metals which are to be welded. The knowledge of the properties of metals is useful in the preparation of parts to be welded, and

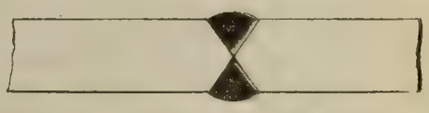


FIG. 13. WELD FOR METAL OVER ⅝" THICK.

it is often due to the lack of adequate preparation that comparatively simple operations in welding prove to be failures. The metals commonly used in the engineering industry are the only ones we need consider, these being: cast-iron, malleable iron, wrought iron, steels, copper, brass and aluminum.

Welding Rods

Welding rods are used to replace any metal that has been taken away, either due to damage or due to preparation of the article to be welded. Welding rods should be used, except in cases where very thin metal, say less than 16 gauge, is being welded. Care should be taken in the use of welding rods that no impurities are introduced into the weld—for instance, the rods should be kept free from dirt or rust. Rods having rust on them are oxidised, and it has already been stated that an oxidised weld is not satisfactory. It is advisable to use welding rods supplied by firms who specialise in the manufacture of this class of goods.

In welding cast-iron work a welding rod of alloy iron should be used, known as silicated cast-iron rod. These rods have a fair percentage of silicon in them, which tends to take the brittleness out of a weld by reacting with the carbon in the iron.

In welding steels a rod of Swedish iron is almost invariably used, which, on account of its purity makes a weld of very even grain, and easily machinable. In cases where special classes of steels are being welded, such as "high carbon steel," "nickel steel," etc., rods of special composition should be used—for instance in high carbon steel there is the possibility of the carbon burning when the metal is being fused, and the welding rod should contain an excess of carbon in order to replace that which is burnt, so that the finished weld will be as nearly as posible similar to the metal being welded.

Rods of phosphor-copper are used for adding to welds made in copper, while for brass a rod of brass is used. In the case of these metals being welded in the form of sheets, the welding rod is really in the form of a wire. In welding aluminium a rod of aluminium should be used. These rods are specially alloyed, in order to give the necessary even flow of metal.

In all cases the welding rod should not be added until the metal being welded is melted, and for this reason the rods are alloyed to give them a lower melting-point than the metals being welded, so that the filling rods can be added without allowing the metal to cool down, for if molten metal comes in contact with cooler metal the result is simply an adhesion, and not a weld.

Fluxes

Flux is used in welding as a cleansing agent, and is usually in the form of a powder. In the melting of metals it often happens that impurities will be left solid after the metal has reached fusing-point, also it often happens that oxides form which have a higher melting-point than the actual metal—for instance, in aluminium, as already mentioned, alumina forms, which has a melting-point much in excess of the melting-point of the aluminium (about 5,000 deg. F.). The purpose of using flux is to float off these impurities, or to produce a deoxidising effect which will retard the forming of oxides, and therefore keep the metals clean for welding together. These fluxes, like welding rods, form a speciality in manufacture, and include various mixtures. Samples of flux for iron and flux for copper and brass are here shown. Fluxes should not be used by spreading on the weld, but should be used by dipping the welding rods into them and transferring to the weld.

Preparation of Parts to be Welded

It is important to make some preparation to the pieces to be welded, and in this, there is a certain amount of scope for sound judgment on the part of the welder to make the most suitable preparation for the nature of the weld to be made. However, for straightforward work there are one or two points which apply generally. Plate work of a thickness of less than 1/16 in. can be welded with straight edges (Fig. 10); then for thicknesses between 1/16 in. and 3/16 in. the edges of the pieces should be bevelled slightly (Fig. 11). With plates or pieces of thicknesses between 3/16 in. and ⅝ in. the angle of the bevel should be increased (Fig. 12.) and for thicknesses exceeding ⅝ in. the pieces should be double-bevelled (Fig. 13). In all cases the bevelled edges should be cleaned to remove any oxide that may exist. This bevelling is necessary so that the operator can reach the far side with the flame and welding rod, as in cases where attempts have been made to weld pieces of metal of a reasonable thickness without first bevelling the edges the metal has melted throughout the whole thickness at the same time, and the small white flame has swept the molten metal away on the near side, thus spoiling the weld.

Incidentally it may be worth mentioning here that the small white portion of the flame should never come into contact with the metal.

Preheating

One of the sources of trouble in welding is the liability to develop cracks, which result in a broken weld, but this liability can be greatly reduced by the practice of preheating. In the welding of metal it is necessary to raise the temperature of the metal from that of the surrounding air to the melting-point of the metal, and one of the advantages of preheating is that whole piece of metal to be welded can be expanded, so that after the weld has been made a uniform contraction will take place, and prevent breakage of the weld. It is not the expanding of the metal that is the cause of damage so much as the contracting, for a weld may appear to be good and satisfactory after completion, but unless some allowance has been made for the contraction, a break is more likely than not to occur.

Applications to Automobile Engineering

Welding is not a practice that is adopted to any great extent in the production of automobile parts. One of the outstanding features of welded parts is the fact that comparative lightness can be obtained, where the part is not subject to much stress, by the use of thin metal. This fact should be taken advantage of in the manufacture of light cars as much as ever possible. Of course without considering light car design it is impossible definitely to state which parts should be built up and welded. In general automobile practice the extreme lightness which is characteristic of the light car is not required, hence, the practice of welding is not adopted to so great an extent as would be done in case of necessity; however, cases of necessity do occur.

Rear axles can be built up of steel tubes, with a central bronze casting, by welding, this being the only method of making a sound permanent joint. Parts such as water pipes should be built up by welding, all flanges being welded to the pipes, and branch pipes welded to the main pipe. Flanges can be welded to exhaust pipes, and silencers can be completely built up by welding, but this is not altogether practicable, on account of the difficulty of dismantling if it becomes necessary for cleaning inside. Brackets of various description can be built up by welding, but where thin metal is required pressings become a reasonable competitive proposition; however, where different thicknesses are required on a part pressings are impossible for the complete part. Radiators made up of pressings welded together are quite a commercial proposition, especially for commercial vehicle work, and can be turned out in quantities quite easily by an intelligent operator. For touring car work cast radiator tanks and brackets are preferable on account of a better appearance being obtainable.

In the experimental department of an automobile manufacturing works welding can be applied with some advantage, for the cost of patterns for castings might be eliminated to a great extent. Alterations to the compression of an engine can be carried out by cutting the connecting rod and welding up to make it either longer or shorter as required. Lugs or bosses can be welded to castings or other existing parts; in fact the practical use of welding in the experimental department is almost unlimited.

In foundry work the practice of welding is also applicable, as in the trimming of castings slight breakage frequently occurs, and repair by welding is preferable to scrapping the casting.

Repair Work

Breakages are more or less frequent in almost every detail used in the construction of automobile work, and previous to the adoption of oxyacetylene welding for the repair of such breakages the parts had to be replaced at some considerable expense to the owner. Now that the art of repair to breakages has become a satisfactory proposition, the parts thrown over to the scrap heap by the automobile owner are less numerous. However, to the automobile manufacturer, the carrying out of repairs is a much more satisfactory

proposition by replacement than by patching up the existing part, as regards both finance and labour, except in cases where the part is of ancient design and some difficulty would be experienced in getting a single part through the works.

A common breakage in cylinders is in the water jacket, often caused by the freezing of the water, and such breakages can be repaired satisfactorily by welding. One point worth noting is that all damaged metal should be cut away in order to make a clean surface for welding.

Base chambers and gear cases are among the parts requiring careful handling and preparation in repair work, the main difficulty in these parts being the liability for error in the alignment of the bearing. However, by careful preparation in the way of adjusting the broken parts and preheating, this difficulty should be overcome. Where the metal is damaged, the damaged parts should be cut away and a new piece welded in. No satisfactory result can be obtained by pouring molten metal into a crevice, as adhesion takes place instead of the new and old metals becoming joined as one piece, with the result that when the new metal cools down, cracks are almost certain to appear. Parts such as base chambers and gear cases are mostly made in aluminium, and in repairing aluminium the work should invariably be preheated to about 600 deg. F.

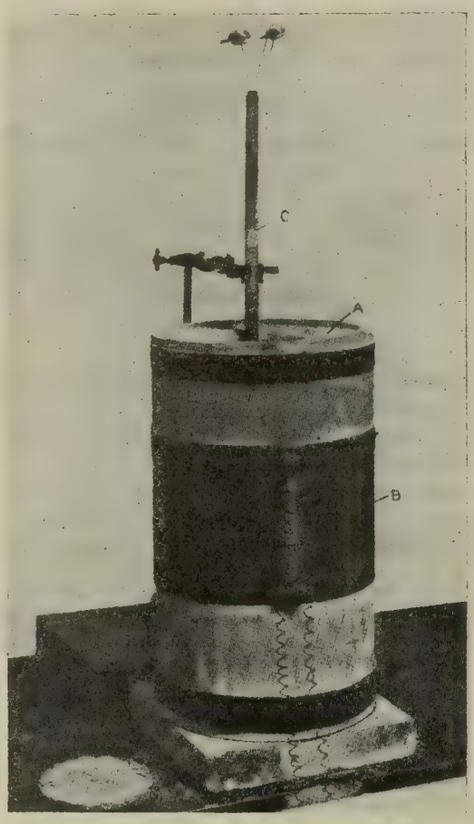
Breakages in frames can be satisfactorily repaired by welding, but as a rule it is advisable to back up the portion of the frame in the vicinity of the repair with a plate, because a breakage in a frame is a sign of weakness due more often than not to unfair distribution of the load on the part of the owner or owner's representatives.

Teeth can be welded to broken gear wheels, but this work should be carefully adjusted and clamped, then preheated before actually welding. The tooth or teeth to be welded in should be positioned by a plate, having slots cut in at the correct pitch of the teeth, so that the plate fits to portions of each of the two pieces to be welded together.

ELECTRIC STEEL-HARDENING PROCESS

THERE has been recently patented and developed a method of hardening steel by means of electricity known as the Wild-Barfield process, which, while following recognized practice in the fact that the steel is hardened by heating and quenching, exhibits its principal departure from customary practice in the manner in which the correct temperature of the steel is determined.

The process is carried out by means of the electrical furnace, shown in the accompanying engraving, which contains an electrical heating coil embedded in the lining A; the cylindrical shell is of suitable heat insulating material. The actual furnace temperature is measured by a thermo-couple in the usual way, being maintained above the decalescent point of the steel to be hardened. The manner in which it is ascertained when the steel has reached this point involves recognition of the phenomenon that steel loses its magnetic properties when its



SELF-INDICATING ELECTRIC FURNACE FOR HARDENING STEEL.

temperature reaches the decalescent point.

Solenoid Principle

The heating coil when in use, acts in a similar manner to a solenoid coil, radiating magnetic flux which is increased when a core of magnetic material, i.e., the gauge or other steel body to be hardened, is inserted. The presence of liquid salt as a heating medium in the furnace slightly reduces the influence of the core on action of the coil.

On the exterior surface of the furnace is wound a coil of insulated wire B, connected to a reflecting galvanometer, whose spot of light is arranged to move on a scale in the usual way. When the piece of work is being inserted in the furnace, the increase of the magnetic flux from the heating coil induces a current in coil B and deflects the light spot. As soon as the piece of work is in position, the magnetic flux from the solenoid remains steady at the increased value so that the external current in coil B ceases and the light spot goes back to zero. These actions however are meanwhile irrelevant to the final determination of temperature.

The influence of the work during heating on the magnetic flux from the solenoid coil is stationary, until the temperature is reached at which the steel becomes non-magnetic, i.e., the decalescent point. The loss of magnetism by the work takes place in a comparatively short space of time, and affects the flux of the solenoid coil in a manner equivalent to withdrawing the core when magnetised. The decreasing magnetic flux of the solenoid coil brought about by this state of the work induces an external current in coil B in the opposite direction to that previously induced, deflecting the light spot accordingly, and if the work remained in place in this demagnetized condition the spot of light would return to zero when conditions became constant again. This second movement of the light spot is therefore the indication that the magnetism of the work is vanishing due to its assuming that condition which will enable it to harden when suddenly quenched.

Rapid Operation

Rapidity of operation is a feature of the apparatus, a 1 in. plug screw gauge being raised to quenching temperature in 1½ minutes, the use of a salt bath being also conducive to uniformity of results. Results of tests carried out at National Physical Laboratory, London, for the Hardness Tests Research Committee are given below. The steel experimented with was ordinary tool steel, containing 1.5 per cent. carbon. Two specimens were hardened in the usual way by quenching in water, and two others were treated by the Wild-Barfield process, as applied to screw gauges. The scleroscope and resistance-to-abrasion figures for these four specimens were as follows:—

	Scleroscope	abrasion
Water quenched	81-110	560, 560
Water quenched	78-112	420, 530
Wild-Barfield	68	710, 710
Wild-Barfield	70	710, 560

In connection with these figures it is to be noted that in the opinion of most the scleroscope, whatever property or combination of properties it may precisely measure, does not give a figure which is a just measure of that property which it is desired to confer on steel by "hardening" it. It does not necessarily follow, therefore, that the scleroscope figures quoted above imply that the Wild-Barfield process yields a softer material than the water quenched. On the other hand, the scleroscope figures do establish the fact that water quenching does not give a uniformly treated product; the figure obtained varies, it will be senn, over a wide range for different parts of the same specimen. Methods of directly testing resistance to abrasion are not yet wholly satisfactory, and it is quite probable that the figures 420 for the water quenched specimen and 560 for the Wild-Barfield are due to irregularities in the testing machine.

COAL DUST IN MOULDING SAND

By F. J.

THE inclusion of coal dust as an ingredient in moulding sand has three main objects: first the heat of the molten metal carbonises the coal dust and so makes the mould porus to the gases given off by the metal; second, the gas

from the coal dust prevents in some measure the fusion of the sand by the iron, and thereby results in a casting with a much smoother face than would otherwise be the case; and, thirdly, the effect of the carbon in the coal is to make the skin of the casting soft and dark in color. Opinion and practice with regard to the selection, grading and proportioning of coal dust in moulding sand varies widely and though the subject of coal-dust has been by no means neglected, there is still room for a comprehensive study of the whole question, one embracing not only experimental research but also the gathering of information in regard to current practice in the best foundries.

In selecting a suitable quality of coal four points have to be watched: the bituminous quality of the coal, the ash content, the volatile content, and the proportion of fixed carbon. Hitherto, too much importance has been attached to low ash content and high percentage of carbon, without due regard for the fact that such a coal must necessarily prove low in bituminous qualities, and be altogether of too refractory a character to fulfil the four ideals. A good working coal dust for general foundry use should show about 12 per cent. ash, 37 of volatiles and 51 per cent. of fixed carbon. This ash allowance will seem high, but the volatiles have to be taken into consideration, and it has, in fact, been found that scabbed castings with harsh, uneven skin, have resulted from the use of coal dust in which the ash content was much lower. Especially was this the case in some experiments made with good class anthracite, in which the percentage of ash was under 4, and the conclusion arrived at was that the coal dust had resisted the heat so much, owing to the presence of a high percentage of carbon, that it had acted as a refractory, and actually prevented the escape of gases from the mould by closing up the pores. As regards the fineness of the coal dust, the grade must, of course, vary according to the class of work and the grade of the sand.

For very light castings a coal dust of exceedingly fine grade must be used, especially if the sand has an open tendency, while a slightly coarser, though still fine grade should be used for less light work. For the larger class of castings, in which it is necessary for a considerable volume of gases to escape quickly, the medium and coarse grades of coal dust are more appropriate, blackings or facings being used to secure a smooth, even skin on the casting. Where coal dust of too coarse a grade for the size of the casting is being used, the error is often evinced by the appearance of small pits on the face of the casting, which are easily distinguishable by their formation from the indentations caused by the presence of coarse grains in the sand, and are caused by gas from the carbonized coal grains pressing into the molten metal instead of escaping through the sand. As to the proportions, much depends upon local circumstances—class of casting, sand used, thoroughness of mixing and quality of coal dust, etc., but two mixtures which have been used with excellent results are as follows:—one, 55 parts old sand, 30 parts new sand and 15 parts coal dust. This is for heavy castings, and the other, which is suitable for light work is 70 parts old sand, 25 parts new and 5 parts coal dust.

A HANDY SAFETY VALVE CHART

By N. G. Near

A FORMULA which I believe is worthy of working into chart form is presented herewith. This is the formula:

$$A = \frac{0.2074\ W\ G}{P}$$

Where A=the area of the safety valve in square inches;

P=the absolute pressure in pounds per square inch;

W=pounds of water evaporated per square foot of grate surface per hour;

G=the grate area in square feet.

To use the chart simply lay a straight edge across the chart twice as shown by means of the dotted lines drawn across this chart and the area is immediately found in column C without doing any pencil or mental figuring at all.

First connect the evaporation per sq. ft. of grate surface per hour (column A) with the grate area (column D) and locate the intersection with column B. Then run a line through the absolute pressure (also in column A) and the intersection which has already been located and the intersection of this line with column C gives the area.

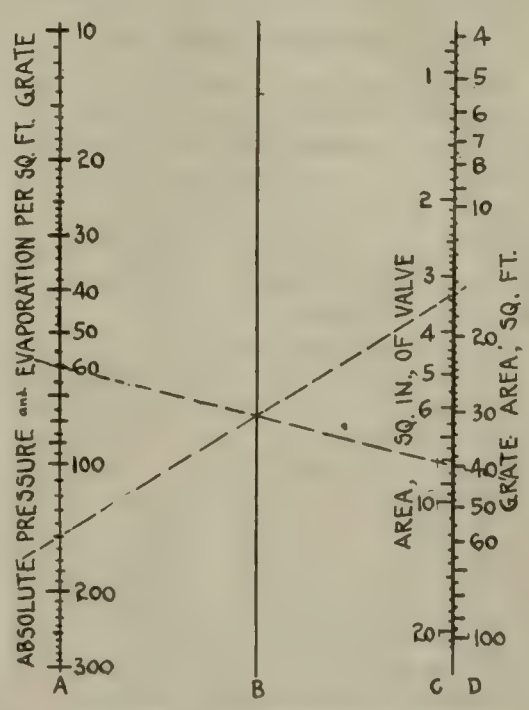


CHART FOR ASCERTAINING SAFETY VALVE RATIOS.

For example, what area of safety valve is required where 60 pounds of steam are evaporated per square foot of grate per hour, where the grate area is 40 square feet, and where the steam pressure is 150 pounds absolute?

The dotted lines show how this particular problem is solved. Connect the 60 (column A) with the 40 (column D) and locate the point where the line cuts column B. Then run a line through this point and the 150 (column A) and an extension of this line cuts column C at the point 3.3. The area of the safety valve should therefore be at least 3.3 square inches.

I believe this method of making double use of column A will interest readers. It serves both for the pressure and the evaporation. The first line connecting the 60 and 40 represents a multiplication as is evident by inspection of the formula. The second line performs the division.

TESTS FOR OILS AND VARNISHES

By C. T.

ONE of the most reliable tests for raw and boiled oils is the flash test, the temperature at which linseed oils usually flash being 470 deg. Fahr., whilst mineral oil, which is the chief adulterant of linseed oil flashes at about 400 deg. F., and resin oil still lower, so that the flash test is a simple method of detecting adulterants.

If the amount of the adulterant in the oil is to ascertained weigh a portion and place it in a beaker or any suitable vessel, and add a small quantity of caustic soda, alcohol, and a little water. The contents of the vessel should be then boiled for some time, with constant stirring, after which the oil will be found to be saponified, whilst the adulterants will be unchanged. The mass is then poured into a separating vessel, and agitated with benzine until it takes up the mineral oil, which afterwards comes to the surface of the vessel. The bottom layer is then run off and the top portion is well washed with warm water until all traces of the saponified oil have disappeared. The residue, which is mineral oil, is placed in a vessel and weighed.

Common resin is also used as an adulterant, and may be easily detected, if in any considerable quantities, by painting some of the oil on any glass surface, and when, it is thoroughly dry, rubbing well with the finger. If the oil contains much resin the film will leave the glass and crumble, whilst a good oil will not be affected.

The only reliable test for turpentine is distillation. The chief adulterants are shale spirits, Russian turpentine, resin spirit and coal-tar naphtha. The determination of the proportion of the adulterant would require special chemical apparatus, but a simple method is to warm a sample of the suspected turpentine and a sample of pure American turpentine. Should the suspected turpentine contain any of the above adulterants they may be easily detected by the odor, which is entirely different from the pure American turpentine.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

CO-PARTNERSHIP

By Mark Meredith.

THE great war in which the world is now engaged has brought about the solution of many interesting and serious problems in British national, business and social life; but there are numerous others which call for grave consideration, amongst the most important of which is what is generally termed the labor problem. That this problem will become more acute so long as the war continues and that it will undoubtedly attain its climax when the war is over and millions of men are relieved from military service, are conclusions to which the most intelligent and shrewd business men are being forced.

From a close study of the relations of capital and labor from within, many authorities are agreed, from a study of the abilities, habits, intelligence and prejudices of working men as a class, that co-partnership is the one means of bringing capital and labor into more friendly and satisfactory relationship, and whilst it also affords a practical solution of the labor problem, it ensures a return to the supremacy in the industrial world which Britain once held.

No Universal Scheme

Whilst this may be accepted as the verdict of expert judges and practical business men there is no universal scheme of co-partnership which is applicable to all industries, for each scheme should be the result of careful and serious consideration, and may conceivably differ very definitely, both in detail and administration from some of those in operation in many works that recognize the stimulus the sharing of profits gives to the workpeople. There are, of course, certain broad principles which must be kept in view in this endeavor to secure a higher efficiency in the worker, of all business men who have studied this, Lord Leverhulme (till recently Sir William Lever) has given it most careful thought and consideration, and the following principles have been evolved from his experiences and also many others, based upon actual experience.

Co-partnership, or profit-sharing, must be kept from degenerating into charity or philanthropy, and its object must be increased efficiency of the undertaking adopting it, with increased prosperity of all connected therewith. It must not place management in the position of servant to labor, but it must ensure absolute freedom to labor from interference of managements in the enjoyment of the benefits to be derived from profit-sharing. There must be greater stability than a mere cash payment bonus system, and there must be an elevating tendency on management and labor, raising them in the social and industrial scale, and increasing their power of enjoyment and happiness, as well as their power of usefulness. It is eminently desirable that the workers' wives and families should feel the benefits of the system, but that system must be such that it is not antagonistic to the legitimate rights and privileges of the working man, whether the brain or the hands are the means of work. It is advisable that control remain with those who find the cash capital.

In considering the adoption of the principles of co-partnership every firm must carefully consider the scheme which it proposes to adopt, in relation to the class of workmen who form the majority of the employees, and careful study will have to be given to the calibre of work, *i.e.*, whether skilled, unskilled or semi-skilled, and schemes must be thought out which will fit in with all the conditions obtaining in any works. As a matter of fact very few co-partnership schemes have been found to be successful, and those that have been have been governed by special circumstances, as in the case of the Port Sunlight Works. The trade unions may be taken for granted as opposing—at least at first—any scheme of co-partnership, because it would seem that their attitude does not aim at efficiency and increased production on the part of their members, but it may be well that, if a proposal is made, which is manifestly an honest attempt to improve the status and earning capacity of the workman, by dividing fairly with him the products of his labor, the whole view of trade unionism may change in regard to this question after it has been convinced that the proposal is genuinely in the actual interests of capital and labor.

Labor More Than a Tool

Further, capital must be educated to understand and to admit that labor is something more than merely its paid tool; and it must also be recognized that capital, as represented by a large body of shareholders, is no longer any more of a partner in production than is labor, but is merely an investor, or, in other words, a money lender. Capital, as such, is dependent on labor and management for its results, and has no right under present day conditions to allocate to itself all the gain that may accrue from intelligent and shrewd management and efficient labor. Whole-hearted loyalty in the efficient production of his work by the intelligent and industrious worker can never be obtained from the mere drawer of wages. It is equally necessary that labor be educated in connection with its new responsibilities in relation to a sound co-partnership scheme which is based on business principles and not on philanthropy. No profit-sharing scheme will be of any use if the workman does not feel that he is interested in the losses of the business as well as the profits.

No co-partnership scheme can hope for success which attempts to interfere with standard wages. The latter must in all cases be at least as high as they would be in works where ordinary conditions prevail, whilst alterations must only follow the customs and necessities of the trades, so that the co-partners may receive real pecuniary benefits promised, which is their full share of the profits over and above the standard wages of the district. On the other hand, if there be no profits, the partners will receive nothing but their wages.

WOMEN BUILDING AEROPLANE WINGS IN A BRITISH FACTORY.
Illustration, Courtesy Engineering.

MANAGEMENT EFFICIENCY AND CAPACITY LOSSES

By O. C.

AN interesting method of forcing upon the notice of managements the losses occasioned by working plant at less than full capacity has recently been evolved in one industrial concern and it consists of a monthly chart, upon which is marked diagramatically the percentage of maximum output achieved in each department, with a series of columns for inscribing the total cost to the firm of the idle plant and for allocating that cost under the several heads of lack of orders, lack of material, bad material, breakdowns and poor planning. The regular presentation of such a chart constitutes a recurrent challenge to the management. If the cause of particular or general idleness of plant is lack of orders, either the selling department is at fault, and needs waking up, or the plant is larger than it should be, and the excess should be disposed or distributed to better advantage.

If heavy losses appear as due to lack of labor, their magnitude will indicate the amount of effort to be directed towards remedying that deficiency. If lack of material is the assigned cause of undue expense, something is wrong at the purchasing end or in the material store. If in any case the expense of idleness is greater than can be attributed to all these causes together, then the balance must go down to bad planning or defective management in general. It may be said that any manager worthy of the name knows without telling what plant is standing idle, and why; but it is very easy for a busy manager to overlook the fact and the significance of idle plant, until something happens to bring it sharply under his notice, and very few managers have any but the vaguest notion of the actual cost in cash incurred when machinery is not working at its full capacity.

The data used in constructing the chart is based on the fact that simple ownership of a machine costs money, inasmuch as it takes away from available assets. For instance, if a machine costs $500, the interest on that money, say at 5 per cent. per annum, is lost: then there are taxes on the machine at say 2 per cent., and insurance at 1 per cent. Further the machine probably depreciates at a rate of 20 per cent. per annum, and perhaps $25 per year or more must be paid for the rent of the space it occupies. All these expenses, say $100, go on whether the machine is used or not. Thus the simple fact of having bought this machine and kept it takes from the firm's assets practically 25 cents a day. The chart gives an indication of the efficiency of the management as distinct from the efficiency of the workmen.

Charts of this nature cannot but have a very educational influence on the managers of those plants. They show that idle machinery which cannot be used should be disposed of, and the money received and the space occupied put to some useful purpose. In several cases the issue of the first of such charts resulted in the scrapping of machinery which had been idle for years. The space thus saved was used for a purpose for which the superintendent had felt needed a new building. In another case it resulted in the renting of temporarily idle machinery at a rate which went far towards covering the expense of carrying that machinery.

WOMEN WORKERS MAKING CORES IN A FOUNDRY.
Illustration, Courtesy Engineering.

METRIC SYSTEM PROS AND CON

THE persistency with which pro-metric enthusiasts advocate the adoption of that system throughout the world is apt to be overlooked or not recognized by the great body of engineering manufacturers who, because of the fact that such a change would affect them financially in a markedly adverse degree, should be fully aware of just what such a revolution would mean to them, necessitating a re-education of the rising and risen generation of technical men. Mr. W. R. Ingalls, president of the American Society of Weights and Measures, recently submitted a paper to the Institution of Mining and Metallurgy in London, entitled "Shall Great Britain and the United States adopt the Metric System?"

The author, who is also editor of the Engineering and Mining Journal, and president of the Mining and Metallurgical Society of America, said the subject was of vastly greater importance than was commonly comprehended and the people of Great Britain, her colonies and the United States should be roused to the importance of preserving their interests.

Metric Not the Only Decimal System.

The advantages of the decimal system are so manifest in many cases that the pro-metric party is wont to cloud the issue by making it appear as if the metric system were the only decimal system, Really, there is the fundamental difference that the decimal system per se is merely arithmeic, while the metric system involves the basic units of weights and measures. Another source of confusion will be dispelled if we can eradicate the chimerical idea of establishing uniformity. From a project that would manifestly put the weights and measures of the greatest industrial nations of the world at sixes and sevens it must be evident that the result would be more discord instead of more uniformity. The substitution of metric weights for English weights would create relatively light disturbance. Of course, the changing of all our weighing scales would cost a huge sum, and the recalculation of schedules—such as railway rates—must come to something like the ransom of an empire, but after these were done, we might get on pretty well.

Let us consider the conditions that have been established in the railway business. The tracks are marked with mile posts. The railway gauge is 4 ft. 8½ in. We might in course of time get in the habit of thinking of the latter as 1,435 mm., but manifestly it would never be convenient to refer to the mile posts as being 1.60935 km. apart, and either we should have to continue to think of miles, or else pull up the posts and replant them at km. intervals, which would be something of a job. Incidentally, our posting of highways would have to be revised, and the automobilist would mourn the day when metric legislation was enacted.

Question of Gauges and Standards

In machine shops the measures would be done with the aid of standard gages, conforming to the requirements of practice and convention. These gages are based on the inch. If the metric system were made compulsory, it is obvious that there would be but two alternatives, viz., to restamp the gages with strange and unhandy figures, and wait until people became accustomed to them as, for example, to ask for a 6.35 mm. rod when they wanted a 1-4 in. rod; or else to change the standards so as to make them

conform to metric units. Either horn of the dilemma is bad, but the second one—the changing of gages—would be calamitous. Some large American manufacturers have estimated that such a change would cost them individually from $500,000 to $750,000. So it is with all our affairs. Our entire system of manufacturing, of building and of doing things is based on standard units, which cannot be changed except under conditions that would mean nothing less than calamity.

Does anybody imagine that a 2x4-in. joist could be anything else but a 2x4, although it might be called a 50.8x101.6 mm.; and after we were given specifications in metric measures, should we not have to translate them back into English measures, in order to make use of our tables of board measure for easy computation? Of course, we all know that a 2x4 is seldom of those exact dimensions, and we should probably call it a 50x100 mm. after we had learned the rules of the new game. But sometimes it is necessary to figure closely in connection with joists S4S, and then we know that the 2x4 is reduced to 1¾x3¾ in. How we should conveniently arrive at the exact dimensions of a nominal 50x100 mm. joist deponent sayeth not.

Benefits Not Commensurate With Inconvenience

Any change of standards in either metric or non-metric countries is preposterous, unthinkable. We have all gone too far. Besides the colossal expense of substituting gauges the result could not be anything but a mixture. The man who needed some ½-in. bolts for the repair of his automobile would not relish the information that they were no longer made, but that he could have 10 mm. or 15 mm. bolts.

Non-Metric Tables

We have volumes of tables of figures devoted to the properties of structural steel. Similarly as to mechanics, hydraulics, surveying in brief all the branches of engineering. With the metric system these would be all but useless. The compulsory adoption of the metric system would be no less preposterous than an edict that after a certain date all business in the United States—all buying and selling, all engineering, all figures—would be illegal unless done in French.

English Foot Greatest World Standard

The prime argument advanced for the metric system is to have international uniformity. It is stated that a long list of the countries of the world have adopted the metric system, **only** the United States, Great Britain and her **Colonies**, and Russia (of the Indo-European nations) having failed to do so. I have emphasized the words **only** and **Colonies**, for therein is concealed the speciousness of this argument. If with "Colonies" we equate Canada, Australia, New Zealand, Tasmania and South Africa, we have a longer list of non-metric countries, and it comprises not only the most populous, but also the most industrial nations of the world. A correct statement of this theorem would be: Considering the Indo-European race alone, there is a much larger population that does not use the metric system than does; and their nations are far superior in industrial development, measured by iron production, let us say, to all other nations combined. The foisting of the metric system upon them would be, therefore, like letting the tail wag the dog.

If uniformity be the objective, it would be better to institute a propaganda to induce Germany, France, and the Latin countries to adopt the English system. In this connection is may be remarked that, although Russia has a system different from either, the fundamental Russian measure of length, which is the most important of all measures, is the foot, and the Russian foot is the same as the English.

Present Tendency Toward Uniformity

Another argument on the ground of uniformity relates to the confusion existing in the English system owing to the different kinds of tons, pounds, gallons, etc. That there is such confusion, with its inherent dangers, is true; but it is also true that the confusion is much less now than it was twenty years ago, that it is bound to experience further reduction, and that it may be eliminated entirely in a way far easier than by the introduction of the metric system. In Great Britain there is but one kind of ton, viz., that of 2,240 lbs. In the United States the English, or long ton, is employed to far less extent than formerly, and in the main we have standardized the ton of 2,000 lbs. That we should have two pounds—the avoirdupois and the troy—is annoying, but the annoyance is now more academic than practical, for the troy pound is seldom used. Similarly have the differences among gallons, bushels, etc., lapsed in the main into innocuous desuetude. But with respect to confusion, the skirts of the metric system are not clean. As a statistician of nearly thirty years' experience I may say that I have fallen into more errors over the zentners and doppel-zentners of metric Germany, and the quintals and metric-quintals of Chile, than I have over the pounds of England and America and the poods of Russia.

The third metric argument is the ease of the calculations, especially the correlation among measures of length, volume and weight. It may freely be admitted that there is some merit in this, but the English system is not quite helpless in this respect; and the superior merit of the metric system is far short of being a determining factor, quite apart from its calamitous effect in overthrowing existing standards and upsetting the mode of thought of the people, which, of course, are the major considerations.

HEAT TREATMENT OF STEEL FORGINGS

By T. E.

HEAVY steel forgings are supposed to undergo a "normalizing" heat process after suffering the drastic treatment involved in bringing them to the desired shape; but in fact the annualing temperatures to which they are subjected vary greatly, being as low as 650 deg. C., and in others as high as 927 deg. C., and the results obtained from the forging naturally vary accordingly. Some authorities question these temperatures and one is told that there is little need to trouble, as the forgings as a rule pass test, but unfortunately forgings, machine parts of all descriptions, break down prematurely, due to fatigue, and it is possible to locate fatigue failures at the manufacturer's works before such forgings are put into service.

Unless the critical temperature of 650 deg. C., is exceeded comparatively little change is effected in the structural condition. A forging which has been finished at a high temperature, or parts which have been raised to a forging heat and have received little or no subsequent work, on cooling retain a very coarse structure. As an example of what may occur if such forgings are not properly annealed it may be mentioned

TUBING A MARINE ENGINE CONDENSER.
Illustration, Courtesy Engineering.

that quite recently a double intermediate shaft actually cracked in the lathe during the turning operation. The shaft in question was cut through the defective area and subjected to microscopic examination, which revealed a structural condition not unlike that of an unannealed steel casting. The shaft was then subjected to a prescribed heat treatment, after which it was again examined, and showed the entirely different structure of a properly annealed forging with nearly double the elongation, whilst physical tests showed more than double the area of reduction and bending angle than were shown by the metal in its badly annealed condition. Such cases of inadequate annealing are found not only in large forgings but equally the whole way down the scale, even to drop stampings.

As an example of the same thing in smaller forgings a case may be mentioned of a heavy bolt which was of a special type and made by heating to forging temperature for the full length pieces of round bars and "upsetting" a portion at one end to form the head. These forgings were subsequently normalized in heat at 677 deg. C., but when they were subjected to a shock, it was by no means uncommon for the head to come off. The reason for this will be readily understood when one examines what had taken place in the forging operation; the only portion which had received any work was the material forming the head, and where this adjoined the body one had two entirely different structures. After these forgings received a proper heat treatment a uniformity in structure was obtained together with the disappearance of any further shelling of the head when subjected to the same repeated shock stress.

A misconception more or less common in heat treatment of steels is that full advantage can be taken of the initial forging heat and that forgings or stampings finished at a high temperature will on cooling regain a fine structural condition. This is entirely wrong, and if it is desired to obtain the best normal structural condition, the heat in such forgings must be allowed first to fall below its recalescence temperature and then reheated somewhat above its calescence temperature, and preferably cooled in air.

CONSTRUCTING AEROPLANE NOSES WITH WOMEN WORKERS.
Illustration, Courtesy Engineering.

DEVELOPMENTS IN HEATING AND BOILER FURNACES

By D. Street.

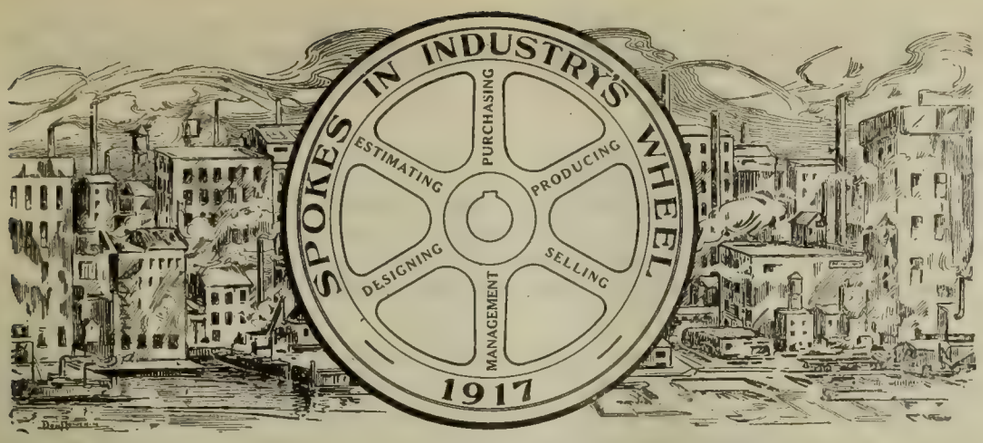
A GOOD deal of attention is being directed at the present time to the securing of fuel economy in reheating furnaces at steel works and for the elimination of smoke from their operation. For the secondary reheating of some slabs, blooms and billets some four or five times more fuel is required than for the preparation of an ingot from hot-open-hearth steel, and the operation, in the case of large steel works, affords scope for some very considerable saving. By-product gas from blast furnaces and coke ovens is coming into increasing use for the purpose; producer gas is in some cases being substituted for coal; and experiments are going forward in some quarters with tar and powdered coal as fuel and with crude oil.

Even where there is no departure from the use of coal for heating the furnaces much experimental work is being done with mechanical stokers, with a view to securing economical heating and smokelessness. At one of the Carnegie works a great improvement has been made by substituting air for water as the cooling medium for the pipes of a flat-roofed continuous furnace and carrying the heated steam to the combustion chamber. The cooling of the roof, though much reduced, is still sufficient, and the pre-heated chamber for combustion is a great advantage.

The performances of different heating furnaces as recorded over the past five years at another works have yielded some very interesting data. With coal fuel the efficiency of the furnaces (percentage of heat in fuel actually absorbed by the steel) ranged between 13 and 15 per cent.; with natural gas average efficiencies of 20, 27, 35, 40 and 42 per cent., were obtained; and there were individual furnaces that averaged month in and month out between 60 and 70 per cent. At Clairton, near Pittsburg, Pa., the Carnegie Steel Company is now building what will be the largest plant of by-product ovens in the world, producing 65,000,000 cubic feet of surplus gas per day. This will be used for furnace heating, and will give the equivalent of 1,600 tons of coal per day. Coke-oven gas, after being scrubbed and freed of its tar and light-oil vapors is a clean fuel, and can be burned more easily without smoke than either raw coal or any other gas and will furnish a higher surface temperature than producer gas. Where producer gas is used for heating billets or small slabs in the continuous type of furnace, two points in particular have to be watched—the gas must be supplied regularly to the furnace, and air must be supplied at a high temperature.

If hand-fired, hand-poked producers are used, the gas goes to the furnace irregularly, and at times there will be a large surplus of gas which chokes the furnace and makes excessive smoke. These defects are overcome by using a modern-type mechanically-fired and mechanically-poked producer; and if the secondary air be sufficiently pre-heated, quick and complete combustion is secured in the furnace. There are regenerative types of continuous heating furnaces, in which the air is preheated to 1,000 or 1,200 deg. Fahr., and in these all combustion takes place in the first third of the furnace, the remaining two-thirds being almost as clear as the outside air. Under such conditions there is, of course no smoke whatever. The elimination of smoke from coal-fired furnaces has been secured by applying to furnace heating the knowledge gained in the study of highly efficient boiler firing. Mechanical under-feed stokers are used in conjunction with forced draught, and furnaces 70 ft. long by 20 ft. wide are being operated by these means without smoke. In records taken of five plate-heating furnaces and two billet-heating furnaces equipped with underfeed stokers, all of which were practically smokeless some facts were gleaned of interest.

From the billet furnaces about three tons per hour were obtained. These furnaces were 26 ft. long by 7 ft. wide. The five plate furnaces averaged 18 ft. by 7 ft. hearth surface, and were used for heating plates and shapes such as were required in car construction. Smoke rarely issued from the chimney stacks of those seven furnaces for more than five minutes at a time, and that very rarely, and a uniform temperature of 2,300 deg. F., is possible at all times.



The constitution of industrial enterprise is largely departmental—"spokes in a wheel." This series of articles has for its object the featuring in a racy, interesting and instructive fashion, the training, experience and achievement of those who to-day are transmitting, effectively, energy in their capacity as "spokes in the wheels" of our metal-working establishments.

CHAS. W. A. MOORE.

THE successful achievement that Canadian manufactures have attained in the production of all classes of munitions, would never have been possible but for the able co-operation of the machine tool builder, and those associated with that branch of the industry that supplies the link between the producer and the consumer; namely, the distributors or machine tool agencies. Prominen among those whose efforts have been a pillar of support to many shell plant executives, and upon whom much reliance has been placed for the selection of suitable equipment, has been the subject of this sketch, Charles W. A. Moore, assistant manager of Foss & Hill Machinery Co., of Montreal, Que.

Charlie, as he is generally called by his more intimate friends, is a Canadian by birth, having been born at Toronto, Ontario, on Oct. 17, 1880, of Irish-Canadian parentage. When Charles was only two years old the family removed to Lachute, where the boy received his early training, and what little education he could acquire when not at work on the farm. At the age of sixteen, our "Spoke" started on his engineering career, entering the plant of the Canadian Linotype Co., of Montreal, as an apprentice machinist. After serving most of his time with this firm, he engaged himself as an improver with James Cooper, machinist; Cooper's shop, at that time, making the machinery required for the Canadian trade of the Ingersoll-Rand Co. From this time until the year 1906, he was employed in various capacities with different engineering firms in Montreal and vicinity. For the next three years he was foreman at the Allis-Chalmers-Bullock plant, following which he accepted the position of superintendent of the International Steel Co., of Montreal. In 1911, he went with the Canadian Buffalo Forge Co. as superintendent, remaining there until 1913, afterwards becoming associated, in a similar capacity, with the Hall Engineering Co., of Montreal. In 1915, he accepted a position as salesman with the Foss & Hill Machinery Co., and his present position is ample proof of his ability and success in the selling end.

In 1906, Mr. Moore married Maud Earle, daughter of the late William James Earle, of Valleyfield, P.Q. The

CHAS. W. A. MOORE.

union having been blessed with four children, two daughters and one son living, and one son deceased.

The activities of the past few years have confined our "Spoke" closely to his task and little opportunity has been available for relaxation. Hours of recreation, however, are necessary, and these are generally spent in lawn bowling, he being an ardent supporter of the Outremont Bowling Club. Mr. Moore is a member of the A. F. & A. M., and although his business activities occupy the greater portion of his time, he still finds it possible to take an active interest in the Ancient Craft, and is associated with the Blue, the Chapter, the Preceptory and the Shrine.

Mr. Moore attributes much of his success to the fact that he has devoted considerable time to study. "Unless a young man endeavors to acquire a wider knowledge than that of actual contact with his daily labor, he must of necessity drift along with the tide; the great need of the present day is for men who are not only capable of successfully accomplishing what is required of them, but who are willing (by hard work) to cultivate that faculty of observation and application, that will better fit them for the larger opportunities that arise daily. They should keep in close touch with their particular line of business, making themselves conversant by practical observation or by published mediums, of the many developments that are continually taking place throughout the trade. Big things are only possible by those who are ready to accept and able to fulfil the larger responsibilities."

DEVELOP BRITISH MINES

THE development of the mineral resources of Great Britain and Ireland, now being undertaken by a department of the Ministry of Munitions, under the direction of Sir Lionel Phillips, is likely to lead to far-reaching results. Sir Lionel Phillips is well known for his life's work in developing the mineral resources of South Africa, and is bringing his knowledge and experience to his task. A number of engineers of outstanding ability and position are also assisting the efforts of the department, and already considerable work has been done in furthering war purposes.

Control Wolfram Mines

Steps are being taken to control and expand wolfram mines, from which it is expected to produce a home supply of tungsten powder, an essential ingredient in the manufacture of high-speed steel. A complete survey of the lead resources of the country is also being carried out; new sources of supply being investigated and old working reopened. In one instance steps have been taken to assist in the drainage and development of an important lead mine from which there is a prospect of an immediate increased output.

Other Developments

Action is also being taken with regard to the production of zinc. A sulphur pyrites mine has been acquired, and certain low-grade copper deposits of considerable extent and promise are being carefully watched with a view to giving assistance in their working.

In the course of its immediate operations the department is gaining valuable information which will allow it to offer future suggestions as to the prospect of the normal base metal industry of the United Kingdom. It will also be enabled to report on the relative cost of home production against importation, and to advise as to the placing of the industry in the best position to meet emergencies.

William H. Cunningham, a member of the firm of Kurtz Bros., bankers, Philadelphia, Pa., has been elected president of the Lake Superior Corporation, Sault Ste. Marie, Ont.

Influence of Recent Developments on Apprenticeship Training*

By Neil J. Maclean

The apprenticeship question is a live issue in British Industrial circles at all times, and while it has long been a subject of controversy between employers and employees, indications abound, in view of the utterances of numerous important officials, that the apprentice of the future will be trained and appreciated as an essential factor towards national industrial success. Plans for future activity in Canada must include a consideration of this subject.

AMONG the many problems connected with the engineering industry upon which experience gained during the war has shed fresh light, is that of the workshop training of apprentices, and with a view to promoting a clearer understanding of its different aspects I set forth my views below in a series of axioms, supported by some notes on the application of these axioms to a system of apprentice training, as worked out in detail in the factory with which I am connected. The more advanced training, which should include a university engineering course, is not dealt with, as this must necessarily be planned on different lines throughout; only the regular workshop training which will enable a man to qualify as a skilled workman, a draughtsman, or a junior shop executive—foreman, underforeman, inspector, etc.—is under consideration.

It will make a good starting-point in trying to sort out one's thoughts on this subject, to remember that the raw material in question, when we begin work with him, is the boy, a wayward, unstable, light-hearted, elder child, a dreamer of dreams, eager, easily interested and easily tired; that during his period of training he passes through the critical point of development from boy to man, at about the age of eighteen; that we are dealing with man in his seedtime, and, hence, largely according to our sowing so shall the reaping be; and that the habits that are formed during this period will have a determining influence on the character developed during later years.

Among the habits that will most surely promote his success later on is the habit of industry, of steady, constant and intelligent labour, and this brings me to the statement of my first axiom: **The aprentice must be always busy.** It sounds simple and looks obvious, but in practice it is a condition neither easy to bring about nor to maintain. To begin with, the boy altogether lacks skill and must be shown how to do his work; this occupies the time and attention of a trained man; work suitable to his inexperience must be found for him; his interest in this work, easily roused, is easily tired, while his ingenuity—when tired of the job—in escaping from control is ever alert and watchful of its opportunity. And yet if, during his training, there are frequent spells of idle time, the habit of industry has but a poor chance to form itself, and if not formed then, permanent harm to the boy's character must surely result.

The requirements of industry are growing more exacting, more complex; there is more ground to cover before one can be considered trained, even in a single department of the many trades comprehended within the term "engineering;" for the apprentice there is, therefore, much to learn, a wide country to explore. This brings me to my second axiom: **The apprentice must be always learning.**. He must be taught to do a certain thing properly and must then be moved on to a different kind of work. The thing he is given to do first must be easier to learn than what follows. In this way confidence in his ability to perform specified tasks will gradually be acquired, whilst the range of the different kinds of work with which he is intimately familiar will be steadily widened. At the same time, by ensuring a sufficient variety in the work, attention and interest are maintained; for it must be repeated with insistence, a boy's interest is easily tired, and if lost, mischief is an inevitable result.

The engineer of a century ago was an empiricist, a cut-and-try man. He depended almost entirely on his previous practical experience; he worked to sketches, simple drawings, or models. If his first attempt to get a certain result did not succeed, he felt his way forward gropingly by practical experiments to a more successful conclusion. It is different to-day. Now he must appreciate exactness in size; he must easily read complicated drawings; he must be able to think in three dimensions, and have some knowledge of physics and chemistry; which brings me to my third axiom: **Engineering is an exact science, and the apprentice must develop the scientific mind.**

I use the term "engineer" in its broadest sense throughout, not limiting it to the director of great enterprises, the executive in charge of factories, or the workman actually carrying out a given task. Of course the training given to a group of boys in any workshop will vary individually to suit their prospective positions, but the fundamental principles are common to all, and if these are not understood and observed, successful results cannot be expected.

During apprenticeship the schoolboy of from fifteen to seventeen years of age must be turned into a young man able to think exactly, to observe accurately, and to note down clearly his results. He must develop the quantitative sense, the ability to appreciate instantly and without conscious effort the magnitude of the quantities he is at the moment dealing with. To obtain such a result the training must involve an intimate mingling of practical and theoretical work, of shop experience and study, of things seen and done, things noted and written down.

Now, it must never be lost sight of that since an apprentice is trained in a workshop or factory whose business it is to make things for sale, he is hedged round with commercial conditions and considerations which may conflict with the requirements of his training. A nice balance must be struck between interests which will not always or obviously work together for a common end; and long views of what will ultimately benefit the firm, or the trade, or the nation, must be considered along with the more immediate needs of factory output and organisation; in view of which we arrive at my fourth axiom: **The apprentice's course of training must not be determined by the shop foreman or manager responsible for output.** If it is, then considerations of output will weigh too heavily and the apprentice will not get the variety of experience which is essential to fulfil axioms (2) and (3). A member of the firm having authority must determine the course of training of each apprentice in detail and must ruthlessly override any objection to necessary changes advanced by department foremen on the grounds of interference with output. This condition is more imperative as industry becomes specialised and departments more highly organised, so that variety of experience within any one department is more and more curtailed.

We have heard and read much recently of the ca' canny policy, of its mistaken basis and its harmful results. It is chiefly founded upon the idea that there is not enough work to go round. The trade unionist knows that fellow-members are out of work; therefore, says he, "I will do a little less and some of them will get a job." But this line of reasoning is not confined to the trade unionist; it crops up in other forms among other classes. The educated man says to himself, if too many highly educated men are turned out, there won't be enough comfortable berths for us all. Ergo, says he, put the brake on the education wheel; avast there, turning out too many B. Sc.'s. I think I have even read leading articles in the engineering journals voicing this view in more polished phrases. Now, the prinicple on which this conclusion

*Contributed to a recent number of "Engineering," London.

is based has been thrown on the scrap heap. Let us make sure that the different conclusions themselves find their way to the same well-merited destination; which leads me to my fifth axiom: **There cannot be too many highly trained apprentices.**

There must always be forces at work that will keep back some of the starters from being finishers; ill-health, family trouble interfering with apprenticeship, decay of ambition, these will interfere with the successful completion of training courses in many cases. Against these, employers must always pit all the forces and influences at their command to turn out as many highly trained, highly educated apprentices as they possibly can, confident that the supply cannot outrun the demand. The more that are turned out, the more useful energy and creative force has been added to the nation's stock.

The industrial lesson of the past two years that has bitten most deeply into thoughtful minds, I think, is this—that, given good executive direction, high-class work can be turned out by comparatively untrained labor. But the executives must be good, very good. Now, the training that is required by a good engineering executive is so elaborate, thorough and comprehensive, that it cannot begin too early, or be too carefully planned and directed; which enables me to state my sixth and last axiom: **Special training must be given to those apprentices who show marked ability.**

A reasonable time after starting work must elapse before selection is possible; then some form of thorough test should be applied to divide the apprentices into those who can be expected only to turn into competent workers and those who may one day take the lead and rise to responsible positions. Opportunities of specially varied training and of higher study in connection with it can then be provided for the selected boys, with confidence that such facilities will not be wasted.

Having examined some of the fundamental principles that must underlie any system of training for apprentices to the mechanical trades and reduced these to simple axiomatic form, it may be of interest if their working out, as applied to a particular factory, is described in some detail. Such a system of apprenticeship has been under trial in the works of Barr and Stroud, Limited, Glasgow, for the past 12 years, a period long enough to enable an opinion to be formed of its results. A large number of apprentices have graduated under it and have proved themselves able to do good work in other factories in this country and abroad, while the junior executive positions throughout the factory are now in many cases filled by men trained under the system.

At the present time over 300 apprentices are employed, engaged in all branches of the fine mechanical trades, fitting, machining, tool-making, electrical engineering, pattern-making, moulding, joiner-work, instrument-making, and optical prism polishing. Apprenticeship is for five years, commencing at fiftten or sixteen years of age. The boys are not indentured, but they are expected to spend the full training period with the firm. No boys not apprenticed are employed.

Considering the axioms in order, the first—that an apprentice must always be busy—is not easily reduced to any definite rules; it depends largely on the general atmosphere throughout the shops. The pratice is closely followed that at each stage of training, a boy is under the supervision of a man expert in his own branch of the trade, whose duty it is definitely to show the boy how to do the work, and also to see that he is kept constantly employed. Where difficulty is met with in developing in a boy a habit of steady work, special steps to overcome it are taken. He is put on to work in which the day's task can be very exactly measured and his performance closely watched. This is not done only in a disciplinary spirit, as it must be clearly recognised that if a worker in the mechanical trades fails to acquire habits of regular industry, he can never earn any useful place for himself in organised industrial work.

The second axiom—that an apprentice must always be learning—is applied by arranging in sequence a series of different kinds of operations which he successively undertakes, commencing with the simplest. A change of work is arranged for about once every six months. During the first half of apprenticeship the training for most of the trades follows the same general lines, including fitting and machining; during the second half of the training each apprentice specialises in his own particular craft. Pattern-makers spend some months in the foundry, opticians some months in the machine shop, and so on. A special feature is made of the fourth-year training for instrument-makers, which is carried on under a qualified instructor, the work consisting as far as possible of the building of complete instruments of odd types.

The fourth year of any system of training is, I think, the critical period. It coincides with that difficult age when a boy is unsettled, whimsical, discontented, groping about uncertainly in search of the larger powers and responsibilities of manhood. It often happens, too, to be the time at home when the difficulty which his parents find in supporting him at a comparatively low wage presses hardest; he is still earning little and the end of his training period seems a long way off. His early interest in the work may have flagged, while he is still not master enough of his trade to find pleasure in working at it. For these reasons I think the fourth-year apprentice should receive particular attention. Care should be taken to make the work as interesting as possible, to appeal to his growing sense of craftsmanship by varied and carefully selected work, to see that he works under a wise and competent guide who will watch for signs of insubordination and deal with these in a proper and understanding spirit.

The third axiom—that engineering is an exact science—is applied by bringing all possible pressure to bear on the boys to attend regularly suitable technical classes in the evenings. As the day's work does not begin till eight o'clock there is less objection—if, indeed, there is any at all—to the boys being expected to study at night than in cases where the work starts at six or six-thirty. Each apprentice is interviewed by the manager at the beginning of the evening class session, and the classes he decides to attend are entered on a card. The school is notified, and if he fails to enrol the matter is dealt with as a breach of condition of apprenticeship. An increase of pay from 6d. to 2s. per week is granted for evening class attendance, graduated in accordance with the record of work done. Early leave to attend classes is arranged for when necessary, and in no case is an apprentice allowed to work late in the factory on one of his class nights. It has not been found possible even with this considerable amount of persuasion and insistence to induce more than about 70 per cent. of the number of apprentices in the factory each year to attend evening classes regularly. Sickness, home disabilities, and temperamental repugnance to any form of book-work prove too great obstacles to the remaining 30 per cent.

The fourth axiom—that the apprentice's training must not be determined by the foreman—is met by all changes of apprentices from one stage to the next being arranged for by the works manager. A list of these changes is sent to the department foremen about once a fortnight, and must be given effect to forthwith, no matter at what inconvenience to the work in hand. It is necessary to be explicit on this point, as otherwise the competent boy will be kept on one kind of work, to the detriment of his all-round training. In arranging for a change of work regard is had, of course, to the boy's special aptitude, more particularly in the later stages of training; and there is no objection to the foreman giving boys special experience of particular machines or processes when opportunity offers, without receiving instructions to do so. The danger to guard against and overcome is the reluctance of those in charge of the work to make changes which advance the boy's training, but at a temporary cost in output. This reluctance can only be overcome by the issue of definite instructions from headquarters.

The fifth axiom—that there cannot be too many highly-trained apprentices—is certainly true in my experience. The tendency to settle down, to give up any definite attempt to make progress, manifests itself early in the life of very many young men, and I do not thing that the most strenuous efforts to persuade larger numbers to steadily advance themselves in knowledge and experience

will ever produce more than—or even as many as—there are vacancies waiting for them to fill. It may happen at times that a number of ambitious and capable young men finish their training together, and they may think themselves that there is not a good prospect of their finding scope for their abilities, but it is a temporary effect, and the average over a period of years certainly proves, I think, that the demand for highly trained men is well ahead of the supply.

The sixth axiom—that special training must be given to the more able—is, I think, worth particularly careful study. It is met in the factory by a selective annual examination in subjects relating to shop practice, the result of which is combined with the result of evening class attendance, with timekeeping in the works, and with a report on conduct submitted by the shop foreman. Every quality of the boy's ability and character is therefore included in determining his place in the list which is prepared of those having the promise of executive ability. Apprentices who win a place on this list are promoted to the drawing office, are given four hours' day tuition during working hours in the winter months, and are put through a wider practical training in the factory. In certain cases they receive a set of tools, which becomes their own on completion of apprenticeship. Since it is felt that to take full advantage of this training a good day-school education is essential to start with, the firm have recently instituted scholarships to enable boys to attend a suitable course of instruction for one year at a secondary school before starting their workshop training. It is hoped that by this means it will be possible to ensure that every boy will have spent at least one year in a secondary school before commencing his apprenticeship.

In conclusion I may express the hope that these propositions and the short description of their application to one particular factory may be of use to those who just now are considering the question of the higher training of their apprentices, a question among the most important in relation to that general industrial betterment which we hope may result from the many changes of these troubled times.

TURBINE SPEEDS AND APPLICATIONS

By T. J.

IN the earlier stages of its development the steam turbine was considered in many quarters to hold great possibilities, not so much from high epxectations of thermal efficiency, as by reason of an assumption that it must prove an ideal prime mover for coupling to electric generators in power stations and propeller shafts in steamships. But mechanical arrangements seldom work out in practice along the line of the ideally simple and direct; and the speed of the large turbine units now in use has proved to be too high to permit of the satisfactory direct coupling of turbines either to propeller shafts or to generators.

Turbine speeds can, of course, be reduced by increasing the size of the motor, but only at the price of greater weight, higher initial cost and reduced efficiency; and consequently the present trend in both electrical and marine engineering is all in the direction of introducing some form of reduction gear between the turbine and the propeller shaft or generator.

The difficulty confronting the marine engineer is that the most efficient speed for a screw propeller is only about a quarter or a fifth of the most efficient speed of a steam turbine, and if he decides upon reduction gear his choice is between helical gearing, electric reduction drive and hydraulic reduction drive. The power station engineer is up against the fact that a direct-current generator running at 2,500 or 3,000 rev. per min. is subject to commutator troubles which, in spite of many ingenious devices, such as the radial commutator, are not easily overcome; so that a 5,000 kilowatt set in a single machine appears to be the limit for safe and efficient operation with a direct coupled turbo-generator.

If a larger power from one set is required, resort must be made to one of two alternatives. The first is to use a turbo-alternator, running at 3,000 or 3,600 revolutions per minute, in conjunction with a rotary converter. This forms a combination which, in certain cases, has distinct advantages.

This combination is particularly suitable when direct-current power must be supplied to several points some distant apart, when the transmission losses and cost of mains can be kept to a minimum by generating at a moderate or high voltage, and transforming down at the sub-station where the rotaries are installed. In many instances direct current is essential for a part of the system only, while the remainder can be served more efficiently by an alternating supply, a case for which the rotary converter plant is peculiarly suitable. With such a mixed system of distribution the rotary has the further advantage that it can be inverted, taking direct current from sets with which it works in parallel, or from a battery, and supplying alternating current into the mains, thus helping out the alternating current sets in case of a breakdown. A further advantage arises if there is a linking up of several generating stations, because small direct current stations will receive alternating current from the trunk mains and convert it into direct current by means of a rotary, thus having their main-turbo-alternator sets as a stand-by; whereas, in the case of either the direct connected or geared direct-current generator, it will be necessary to use rotaries.

The other alternative is to use double helical turbine gearing to reduce the speed of the turbine to that most suitable for an engine type direct-current generator; the speed of the former is usually between 3,000 and 4,000 revolutions per minute for units of moderate size. The turbo-alternator rotary plant does not suffer from the limitation in desirable size which applies to direct coupling, and also, to a lesser degree, to the use of mechanical reducing gears.

SEEKING to imitate klingerite, a German packing for steam-pipe joints, French chemists have found a specimen of the material about a sixth of an inch thick to consist of fifteen thicknesses of thin asbestos, says the Chemical Trade Journal. These layers were a compact felting of the best long fibres, mixed with 2 per cent. of flax threads to give strength and pliability, and each side was coated with an agglutinant containing sulphur, designed; it is supposed to increase impermeability and resistance by slow vulcanisation. Analysis showed 80.5 per cent. of asbestos, 2.2 of cellulose (flax), and 17 of rubber and balata, with a small proportion of sulphur.

IN his annual report on the trade of Denmark, the U. S. Consul-General remarks that the chief hindrance to the industrial development of that country has been the lack of coal deposits. Denmark produces no coal, and is, therefore, placed at a competitive disadvantage. The country's industries and railways consume annually about 3,000,000 tons, most of which comes from England and Germany. A Danish syndicate was formed in 1916 to investigate and exploit the coalfields of Iceland, a report of which has already appeared in The Syren and Shipping. During the past two years it was hoped to purchase coal from the United States, but freight rates prevented this being done.—*Syren and Shipping.*

THE demonstrated advantages of electric motor drive as applied to steel mill service are rapidly making its use universal in rolling mill work, while as regards reversing mills, substantial evidence of the exceptional superiority of electric drive has been given during the past two years. Less than two years ago there were two electrically-driven reversing mills operating in the United States and one in Canada. In November-1916, there were fifteen mills of this type either in operation or being constructed, whilst in Britain, according to the "British Westinghouse Gazette," there were two.

VERY good results are said to have been attained in the experimental manufacture of square and bar steel, etc., at the Kawasaki Dockyard Company's branch factory at Hyogo, where two 15-ton smelting furnaces were installed last year. Encouraged by these results, the company has decided to establish a steel works on an extensive scale for the manufacture of steel plates and rails. According to "Eastern Engineering," a suitable site is being sought in Fukuoka Prefecture, Kyushu. When the site is fixed, a large works, with five 30-ton smelting furnaces to begin with, will be erected on a capital of 5,000,000 yen, for manufacturing steel plates, rails, square and bar steel, etc., the same as the Government Steel Works at Edamitsu.

Engineering Exhibits at the Canadian National Exhibition

Staff Article

The value of Canada's premier annual affair as an occasion on which to gain publicity is again justified by a visit to the Machinery Hall, while any doubts regarding the mechanification of the farmer are instantly dispelled by an examination of tractors, electric light plants, and other aids toward a labor-saving and luxurious existence for sons of the soil.

DESPITE the absence of a few notable exhibitors of former years, the engineering features of the exhibition, both in the Machinery Hall and elsewhere, have aroused probably a more wide-spread interest than for many years past. The fact that many people, brought in contact with engineering practice through the temporary activity of munitions production, are now earnestly endeavoring to find a permanent outlet for their efforts is one, if not the main reason for the great general interest displayed by visitors this year.

PART OF PRATT & WHITNEY 'S EXHIBIT OF SMALL TOOLS.

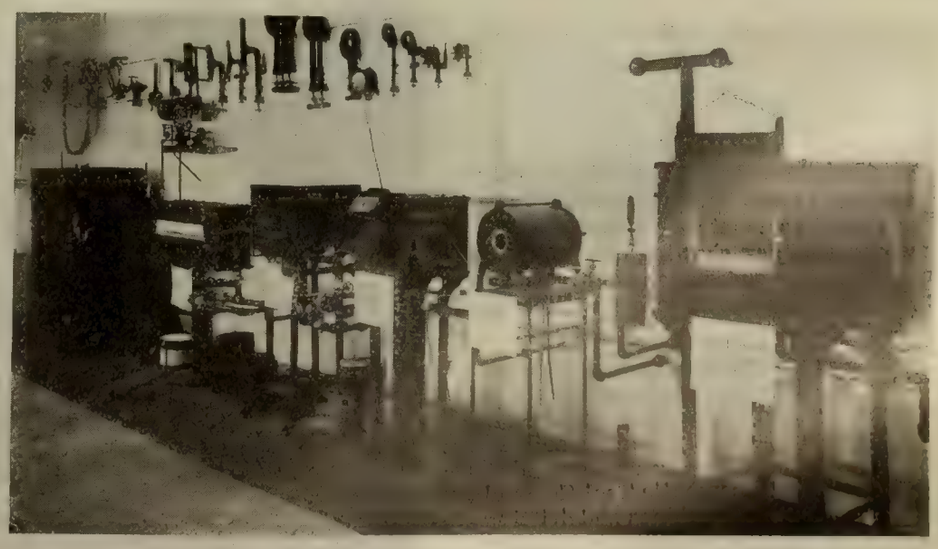
Present conditions, of course, have postponed any improvement in the facilities afforded exhibi o s but had proper and deserved encouragement been given in a timely manner, the machinery display would not be handicapped by comparison with certain annual events in the States, which are noted for the facilities offered exhibitors in such important matters as steam, gas, air and electricity supply, especially in the matter of reasonable charges for the latter service. As matters are now, it is only through the loyalty and patriotism of exhibitors, who annually face the expense and inconvenience of two weeks' dislocation of regular business, that the standard of the show has been maintained at its present level. In view of the services rendered to the Empire, and the great degree of confidence with which the industry is regarded as a mainstay of the country in the future, no excuse short of absolute lack of funds can justify a continuance of the present lukewarm attitude of the authorities toward engineering exhibitors. The thanks of the industry are indeed due to those who continue to "carry on."

The general state of affairs is indicated by one noticeable change in the aspect of the show—munitions have disappeared and manufactures are returning. Machine tools are the heavyweights, as always, but developments largely due to the recent munitions activity are indicated by several of the exhibits. One of these is the increasing appreciation of the benefits of heat treatment in certain classes of work, and in this field much initiative has been displayed by the Canadian Hoskins Co., the well known pioneers in electrical furnace and pyrometer development. Their product now includes also gas-fired furnaces, ovens for enamelling, etc., and a unique product in the shape of Chromel, a non-ferrous alloy, which possesses marked non-corrosive properties, especially under the influence of heat. These properties are due to the high melting point of chromium combined with the great resistance of nickel to oxidization. This metal does not soften appreciably under heat like iron and has a life approximately 40 times as long. Applications already proven include carbonizing boxes, cyanide crucibles, lead pots, barium pots, pyrometer protecting tubes, etc.

It is of especial interest at this time to know that this alloy is made in Canada in the Hoskins factory, an important part of the process being played by a special type of carbon resistance furnace which is also exhibited. Its simplicity of construction and efficiency of operation render it particularly useful in high temperature work.

Further interest in the combustion field is stimulated by the extensive display of manufacturers furnaces exhibited by the Consumers' Gas Co. of Toronto. Apparatus and equipment for the convenient use of gas as a heat-producing agent in many lines of industry are shown in operation, gas and air being piped to most of the exhibits. High temperature furnaces for special steel hardening, tool room furnaces, ovens, brazing benches and blow pipes demonstrate clearly the adaptability of gas to many processes. The effect of several furnaces at white heat is very marked from a display viewpoint, the entire exhibited being markedly effective.

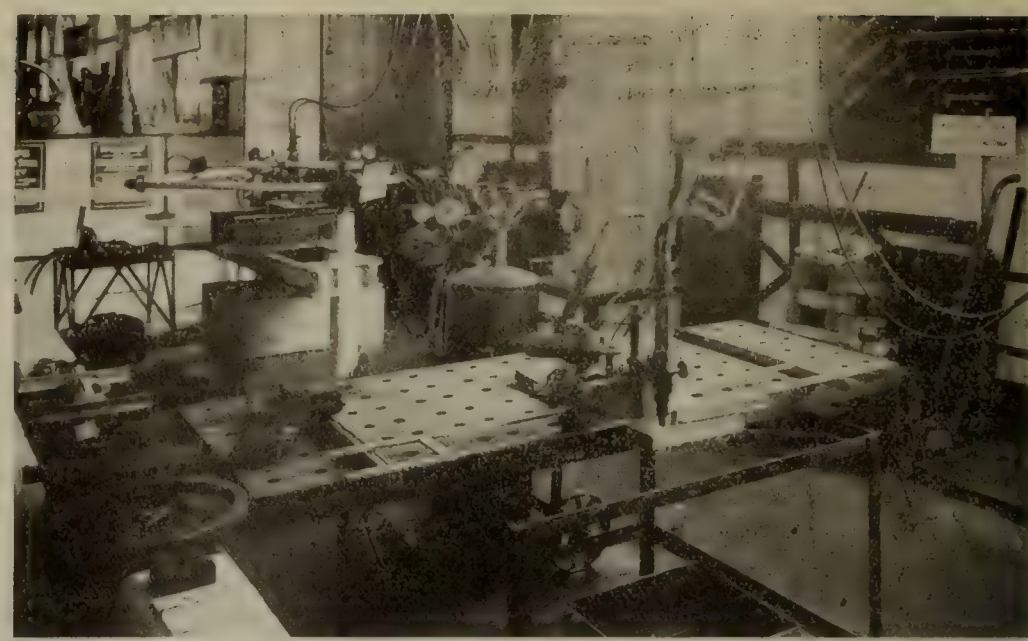
Of similar interest to visitors is the demonstrations of oxy-acetylene welding work. L'Air Liquide Society show the use of their apparatus in the manufacture of storage tanks for acetylene gas, to withstand 975 lbs. pressure per sq. in. A sample of liquid air, which is produced during the manufacture of oxygen was an item of more than ordinary interest, in which one could test the effects of 350 deg. below zero on the human flesh. Mechanical apparatus for the application of the oxy-acetylene flame to manufacturing operations were featured by the Carter Welding Co., who showed the well known Davis-Bournonville apparatus cutting steel plates of any thickness and shape. The radiograph is an ingeniously arranged machine on the pantograph principle, which enables patterns to be copied



THE CONSUMERS' GAS CO. EXHIBIT ED GAS FURNACES IN OPERATION.

on large or small scales, the flame cutting the outline as determined by the master design; the roughing out of dies and similar work is a particularly useful field for this device.

Special appeal is made to the skilled mechanic and fine tool maker by the Pratt & Whitney exhibit of Canadian-made cutters, reamers, taps, drills, shell tools and special articles of a similar nature. The prestige attached to the name is well upheld by this exhibit, which is convincing evidence of the possibility of producing such goods on a commercial scale within the Dominion. Complementary to the foregoing are the machine tool exhibits of Canada Machinery Corporation, Garlock-Walker Machinery Co. and A. R. Williams Co. Both wood and metal-working machines are displayed on a large scale by the former, whose annual appearance is looked forward to with interest by a wide circle of acquaintances. A feature of Garlock-Walker is the showing of numerous views in lantern slide form, illustrating iron machinery from the raw state to the finished product. The entire history of iron is shown from the blasting of the rock by the miners, through railroad yards, ore docks, blast furnaces, steel mills and foundries, pattern shops and machine shops till it assumes the form of a lathe, shaper or other machine tool, and demonstrates most convincingly the absolute dependability of modern manufacturing on this one metal more than any other. Suitable types of modern tools are on view to complete the exhibit.



THE CARTER WELDING CO. SHOWED MECHANICAL APPARATUS FOR CUTTING AND SHAPING PLATES WITH OXY-ACETYLENE FLAME.

CLEVELAND PNEUMATIC TOOLS INCLUDED SPECIAL DESIGNS FOR WOOD SHIPBUILDING.

A feature of the Williams exhibit is the demonstration of Stellite cutting tools on heavy forging machining. This wonderful alloy depends for its existence entirely on the Canadian deposits of cobalt, and during recent times has earned a wonderful reputation as a metal-cutting material. Numerous samples showing its application to tools for a wide range of operations are displayed by the Deloro Smelting & Refining Co.

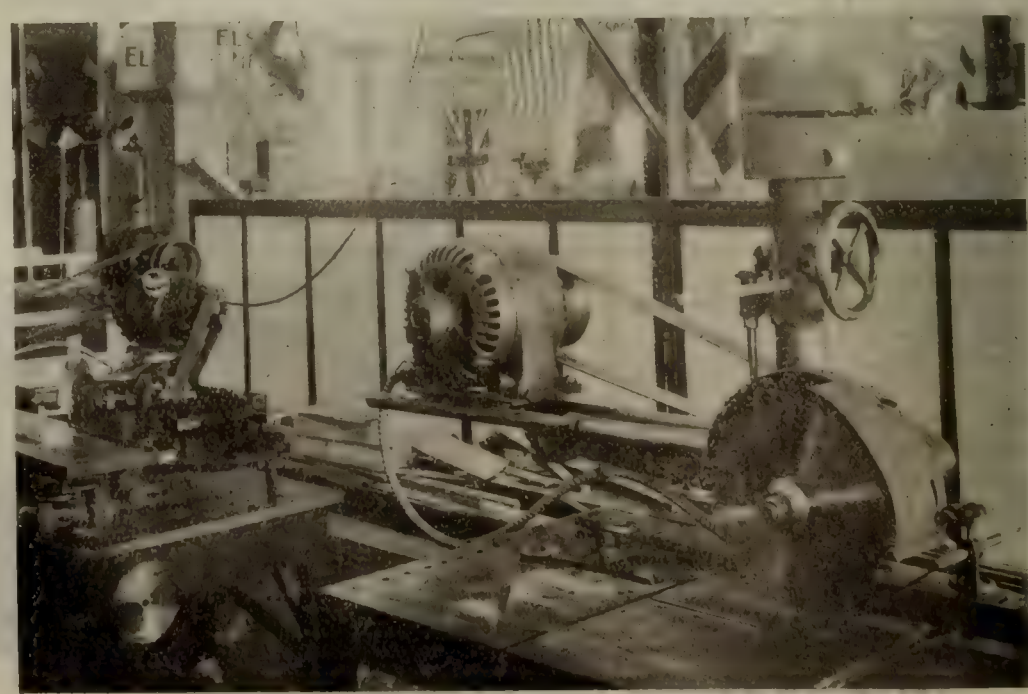
Pneumatic tools and accessories possess considerable interest in view of their labor-saving and cost-reducing ability. The development of shipbuilding both in wood and steel has been carefully studied by the Cleveland Pneumatic Tool Co., and special wood-boring machines and drifting hammers are featured by them in addition to their latest types of regular hammers and accessories.

Transmission equipment and apparatus is featured by the Dodge line, one of the items of interest being an exhibit showing their wood pulley in different stages of construction, from the plain board of selected lumber to the perfectly finished wood-split pulley seen on the shafting. Ball bearing developments are also well shown, the increasing recognition of this apparatus as an efficiency factor being evidenced by the presence of the Canadian SKF Co., Ltd., which makes a convincing demonstration of the extreme accuracy and high grade of workmanship in their product. The exclusive feature of self-alignment which is an inherent part of the design is shown by means of bent shafts, which revolve as freely in a fan draft as if they were straight and true. The Chapman Co. makes an effective display

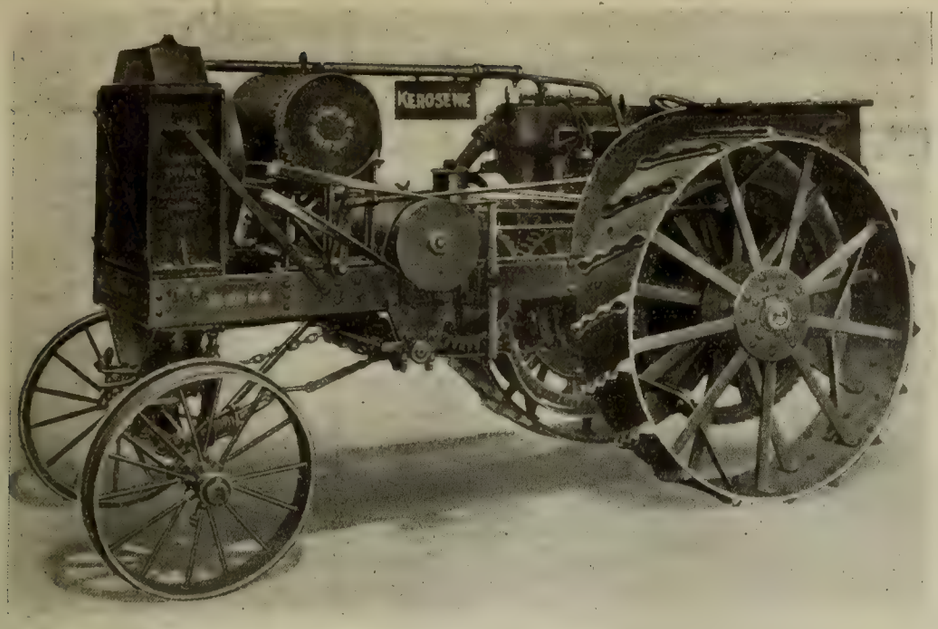
Belting exhibits are quite noticeable especially as most of the displays represent made in Canada goods. Of the four firms showing, each makes a distinctive type of product. Leather, rubber, and two varieties of stitched belting are available in weights, strengths, and finish for any kind of industrial need. Considerable local interest attaches to the two displays of that modern development of the saw bench known as the combination woodworker, one firm in particular having developed considerable business across the line.

Agricultural Enginering

Either engineers or farmers desirous of investingating farm apparatus which is the direct product of the machine shop find more than ample opportunity in the section devoted to this display. The present question of food control has thrown the production end further into the spotlight than might have happened in years, and the fierce blaze of criticism is turned loose on the numerous specimens of tractors, oil engines, pumps, electric lighting plants, along with other quasi-machine shop products such as



THE HUTCHINSON WOOD-WORKER PERFORMS LARGE VARIETY OF OPERATIONS.



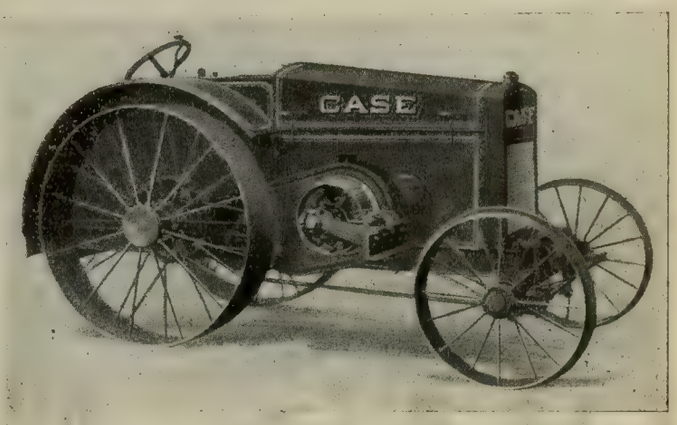
SAWYER-MASSEY 12-22, 4 CYLINDER, KEROSENE DRIVEN TRACTOR.

milking machines, and similar products.

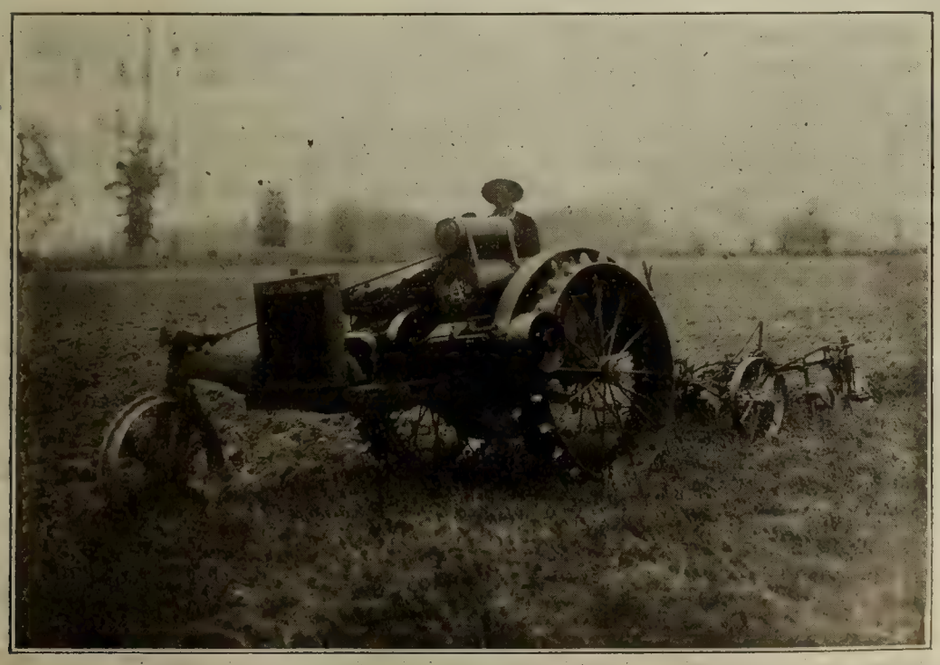
As a Canadian built product, the Sawyer-Massey line of tractors makes a special appeal. Simplicity of construction has been combined with convenience and efficiency of operation in a markedly successful degree. The 4 cyl. vertical automobile type of motor is placed near the rear axle to give maximum adhesion, and allows the transmission case and jack-shaft to be placed amidship in a most accessible position. The clutch likewise benefits thereby, while the train of reducing gears to the driving wheels is also made very accessible. Approved design of steering gear with spring buffers is fitted to front wheels. Water cooling with fan radiator is incorporated in the design in a suitable manner the radiator construction being exceptionally robust. The motor is 4 in. bore by 6 in. stroke running 700 to 1,000 rev. per min., and gives 22 horse power at the belt pulley and 12 at the draw bar. Two speeds of 2¼ and 3½ miles per hour are provided, while weight of 5,200 lbs. enables three to four plows to be operated.

Allis-Chalmers are showing a 10-18 horsepower machine of the three wheeled type, the single front wheel following the furrow automatically and relieving the operator of much of the steering effort. It is operated by a 2 cyl. opposed type motor, 5¼ by 7 inch at 720 rev. per min. and weighs 4,800 lbs. The frame is a one-piece steel casting, heat treated, while the radiator is of the automobile type with centrifugal pump.

The 9-18 lease tractor was shown by the Fairbanks-Morse Co., and attracted attention through its compact design and wonderful hill climbing ability demonstrated on a 35 deg. incline. As illustrated the motor which is 8 cyl. vertical, is placed athwartships so as to obtain straight spur drive to rear axle. The front axle is pivoted vertically at the centre, with steering knuckles on the wheels. A truck type of radiator is fitted in conventional manner and has gear driven fan, and centrifugal pump circulation. Heavy duty roller bearings are used wherever desirable, including the transmission, and rear axle, and an oil tight housing encloses the bull pinion and gear. Two speeds are obtainable, along with ample power to pull two 14 in. plows.



CASE 9-18 AUTOMOBILE TYPE TRACTOR WITH 4-CYLINDER MOTOR PLACED TRANSVERSELY.



ALLIS-CHALMERS THREE-WHEELED TRACTOR IN OPERATION ON A FARM.

PASSING IT ALONG

"The neat and even elegant appearance of the American soldier isn't maintained," said United States War Secretary Baker in an address, "without hard work. Yes, the work is hard, but doesn't the result more than justify it?

"On the train the other day a private sat with his tunic unbuttoned, for the temperature was high. A sergeant strode up to him and said:

" 'Button up that tunic! Did you never hear of by-law 217, sub-section D? I'm Sergt. Jabez Winterbottom!'

"A gentleman in the seat behind tapped the sergeant sternly on the shoulder. " 'How dare you issue orders with a pipe in your mouth?" he asked 'Go home and read paragraph 174, section M, part IX. I'm Major Eustee Carroll.'

"Here a gentleman with a drooping white moustache interposed from the other side of the aisle:

" 'If Major Carrol,' he said coldly, 'will consult by-law 31 of section K, he will learn that to reprimand a sergeant in the presence of a private is an offence not lightly to be overlooked."

GOT HIM INTO A ROW

Foreman (to workman whom he has "sacked" on Saturday and then finds him at his job again on Monday)—Hey, young fellow-me-lad, I thought I sacked you on Saturday.

Workman—So you did. An' a nice blinkin' row you got me inter wi' the missus, too.

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SKILLED MECHANICS A POST-WAR NECESSITY

THERE is a growing disposition to recognize that the peace-time essential of this or any other manufacturing country will be its muster of skilled mechanics. Shell-making has not, as is perhaps too generally believed, contributed materially to Canada's pre-war quota of the latter for, with the exception of a fair percentage increase, comparatively, in the ranks of her tool-makers and equipment designers, the abnormal activity of the past thirty months has done little more than demonstrate the possibility of rapidly training as attendants men who to all intents and purposes were in the rough so far as machine tool operating knowledge was concerned.

Shell manufacture was highly specialized, but in the nature of things was quite temporary in character. Urgency of production by the most direct means available was the keynote of the whole enterprise, as a consequence little opportunity was afforded for a widespread development in the training of expert mechanics, men who in the coming time would give our metal-working industries the degree of backbone and vigor which will undoubtedly be required if we are to procure and maintain a foothold in the world's markets. With the cessation of shell-making, attention is naturally being focussed on lines of product that will provide capacity activity for our now enlarged plant establishment, while giving at the same time assurance of there being retained in steady and continuous employment the skilled men now possessed, as well as providing opportunity for materially supplementing their numbers.

It should be borne in mind that, despite the war activities now so pronounced in the United States, and those no less in evidence in Great Britain and elsewhere, the keenest interest is being displayed in the matter of post-war trade preparedness, and that recognition as never before is being taken of the thoroughly trained and expert mechanic as the principal factor in the conditions with which we will be confronted. As an indication of how the subject is viewed in the Old Country, the following paragraphs culled from a recent editorial in our contemporary, *Engineering*, may not be without interest to our metal-working plant executives:

The deficient supply of skilled men is acutely realized and is exercising the minds of all who employ mechanics.

A man having the mentality, dexterity and character taken for granted or implied in the term skilled mechanic, or competent all-round craftsman, is prima facie a competent individual in a much wider manner than in a purely trade sense.

Natural aptitude, large mentality, resource, initiative, grit, character—all matters which make a man worthy of respect—are the inalienable possession of the man who becomes an expert mechanic.

Good mechanics were never plentiful, but present-day conditions have separated all men into two classes, those having skill and those without. Consequently, there has been a remarkable appreciation in value, the intrinsic worth of real skill has never been so realized as now. It is contended that, unless steps are taken to enable men to acquire real skill, invention will be paralyzed, improvement will be forfeited, and business some time or other will have to be rebuilt upon its old foundations.

How can we have mechanics unless we deliberately set out to produce them. Modern tendency is to commit industrial suicide. There are two outputs going on simultaneously from any business, products and men; the former earns profits, the latter serve a national as well as an industrial end. Plant can be extemporized more rapidly than skill, but if the result is to materially reduce the production of skilled craftsmen, then the industry must ultimately be penalized.

Academic training alone is no substitute, since it cannot produce the practical man of experience nor can it give manual dexterity of a high order. If the industry takes no steps to foster one of the most inherent of human desires—skill in the use of tools—it is going to decay and not to progress. Moreover, the nation which does not produce skilled craftsmen is going to forfeit industrial pre-eminence.

CONSTRUCTIVE DISCONTENT

PROGRESS is only possible where the spirit of dissatisfaction prevails; not the dissatisfaction that tends to indifference to or breeds irritation with conditions or environment, but that feeling of discontent that haunts and impresses the mind with the thought that one is not living up to and making the most of the opportunities that arise from day to day. Knowledge is acquired when we begin to study the why and the wherefore of our surroundings. Gravitation was realized long before Newton appeared on the scene, but it was to the fact that he was not content to take the falling of an apple as a mere incident that resulted in the establishment of the law which defines to us the attraction of the earth for other and smaller bodies.

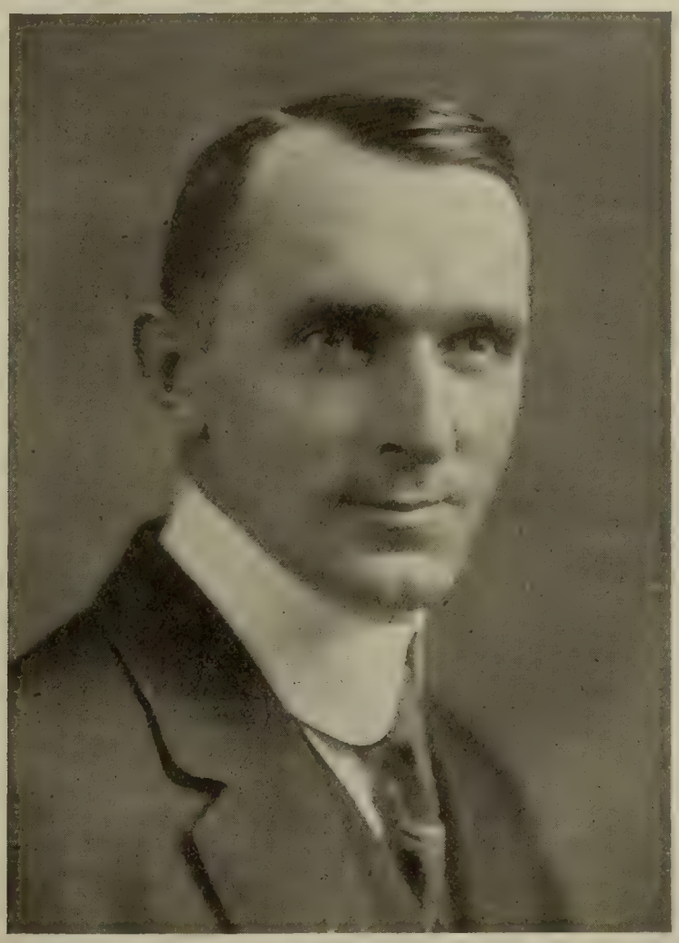
Discoveries are seldom a matter of chance; they are more often the culmination of many weary hours, or perhaps days and weeks of ceaseless thought and observation. It is unquestionably true that worth-while achievements are the work of a few individuals; these and these only being responsible for the various departures from time-worn precedents.

Despite the fact that all are endowed with the same faculties, the great majority are content and willing that a few only shall develop these faculties to the point where an enlarged imagination becomes the source of dissatisfaction that eventually results in the attainment of ideals which are the foundation stones of success. The man who is content with his present condition has lost all initiative. Breaking new ground, as it were, is expressive of discontent with things as they are. When uneasiness of mind is of a constructive nature, the consequence cannot be other than progressive; on the other hand, dissatisfaction that hinges on indifference is destructive and an obstacle to progress rather than otherwise.

INDUSTRIAL NOTABILITIES

LAWFORD GRANT, C.E., manging director and treasurer, Eugene F. Phillips Electrical Works, Ltd., electric wire and cable manufacturers; director, E. M. Sellon & Co., Ltd., was born in Swansea, Eng., Aug. 30, 1878, son of Alexander and Eunice Maria Grant.

After completing his education at Winchester House, Clifton, Eng., he was an articled pupil with Arthur Powell, M.I.C.E., Bristol, 1895-1899; civil



LAWFORD GRANT, C.E.

engineer with T. J. Scoones, Bristol, 1899-1901; superintendent engineer and agent for British Insulated & Helsby Cables, Ltd., at H.M. Dockyard, Malta, 1905-1907; came to Canada in 1907 as president and managing director of the Canadian British Insulated Co., Ltd.; became assistant manager of the Eugene F. Phillips Electrical Works, Ltd., Montreal, 1913; appointed president, May, 1917.

Mr. Grant is a member of Montreal Board of Trade; member of Canadian Manufacturers' Association; Honorary Secretary for Canada, Institution of Electrical Engineers (London); his technical attainments being indicated by membership of the latter body, as well as M.A.I.E.E.

On Nov. 4, 1905, he married Nancy Nelmes Grant, daughter of John Grant, England, their family consisting of three sons and three daughters. Mr. Grant is Protestant in religion and Liberal-Conservative in politics.

His clubs include: Montreal; Engineers'; Royal Montreal Golf; Automobile Club of Canada. Golf is his principal recreation.

Mr. Grant's residence is 593 St. Joseph Street, Lachine, Que.

Photo, Courtesy British & Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$46 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	51 95
Basic, Valley furnace	48 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	60 00

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 00
Tank plates, Pittsburgh	9 00
Structural shapes, Pittsburgh	4 00
Steel hoops, Pittsburgh	5 25
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 00

FREIGHT RATES.

Pittsburgh to Following Points	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$33 00	$34 00
Electro copper	33 00	34 00
Castings, copper	32 00	33 00
Tin	61 50	64 00
Spelter	10 50	11 00
Lead	13 00	13 00
Antimony	20 00	20 00
Aluminum	67 00	64 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$12 00	$12 00
Heads	12 30	12 30
Tank plates, 3-16 in.	12 65	12 25

WROUGHT PIPE.

Effective July 5, 1917.

Standard Buttweld. Size.	Black Per 100 feet	Galvanized Per 100 feet
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00

Standard Lapweld.		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$20 00	$22 00
Copper, crucible	23 00	27 00
Copper, heavy	23 00	25 50
Copper wire	22 00	25 50
No. 1 machine composition	20 00	22 00
New brass cuttings	16 00	19 00
No. 1 brass turnings	14.00	16 00
Light brass	12 00	10 50
Medium brass	16 00	16 00
Heavy brass	16 00	18 00
Heavy melting steel	21 00	17 00
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	22 00	10 50
Axles, wrought iron.	30 00	24 00
Rails	25 00	18 00
No. 1 machine cast iron	25 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	19 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	29 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	8 50
Stove plate	19 00	19 00
Scrap zinc	6 50	9 50
Heavy lead	10 00	10 75
Tea lead	7 00	7 00
Aluminum	30 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up	net
Coach and lag screws	25
Stove bolts	55
Plate washers ..... List plus	10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank,	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in. and larger	$7 60
Structural rivets, as above.	7 50
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze.	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	35
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws...list plus	20
Collar screws ....list plus 30,	10
Thumb screws	20
Thumb nuts	65
Patch bolts ..... add 40,	10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$ 75 00
Open-hearth billets	95 00
O.H. sheet bars	80 00
Forging billets	100 00
Wire rods	90 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS.

Solder, strictly	0 37
Solder, guaranteed	0 40
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 16
Putty, 100-lb. drum	4 35
White lead, pure, cwt.	19 00
Red dry lead, 100-lb. kegs, per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 61
Linseed oil, raw, single, bbls.	1 49
Linseed oil, boiled, single bbls.	1 52
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. ..list plus	20
Emery Cloth .....list plus	33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.37
British Manila Rope	.31
New Zealand Hemp	.31
Transmission rope, Manila	.43
Drilling cables, Manila	.39
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks	list plus 30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 50%; headers, 60; flanged unions, 40; malleable bushings, 50; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$11 00	$11 00
Sheets, black, No. 10.	11 50	11 50
Canada plates, dull, 52 sheets	11 00	11 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	12 70
Premier, 10¾ oz.	13 85	13 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B	
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$13 05
Connelsville Foundry Coke	14 00
Steam Lump Coal	7 25
Best Slack	6 50

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$33 00	....
1¼ in.	36 00	....
1½ in.	38 00	32 00
1¾ in.	38 00	32 00
2 in.	45 00	33 00
2¼ in.	48 00	35 00
2½ in.	50 00	38 00
3 in.	58 00	45 00
3¼ in.	....	53 00
3½ in.	70 00	55 00
4 in.	82 00	67 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 75
Leather in sides	1 60

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .50
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.06

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

NOW that the munitions industry is definitely coming to an end, the engineering trade enters on a period of readjustment. Concerns hitherto engaged in manufacturing munitions are turning their attention to other work and in some cases have already been successful, particularly in the introduction of marine engines. This field of activity is necessarily limited, but will serve to relieve the situation to some extent. No developments have materialized in the iron and steel trade and the outlook continues somewhat unsettled on account of the embargo and also because of the uncertainty surrounding the price-fixing policy of the United States Government. It is believed that an announcement will be made at Washington in the near future. Prices of steel products are showing a weaker tendency, although the only important decline so far has been in semi-finished material. This, however, foreshadows recessions in other lines. The domestic pig-iron situation continues unchanged, the market still being unsettled and quotations practically nominal. In the States the pig-iron market is somewhat easier in spite of the continued heavy demand. The coke market is unsettled, owing to the possibility of Government control. Prices in the meantime are holding firm and the output is increasing in volume. The non-ferrous metal markets are dull and featureless, due to the uncertain outlook. Consumers continue to show lack of interest in the market in view of possible price recessions. There is nothing of particular importance to note in regard to machine tools, the situation being unchanged.

Montreal, Que., Sept. 1, 1917.—The chief topic of interest of the past week has been the total closing of certain munition plants and the partial closing of others, owing to the recent orders issued from the Imperial Munitions Board to the effect that the production of shell would in future be greatly curtailed. Many of the smaller plants have already discontinued operations while some of the larger establishments have released large numbers of their employees, with the prospect in the near future of letting out many more. Numbers of these will undoubtedly be absorbed in other lines of activity. Many firms are now working on their pre-war activity while others are contemplating engaging in other lines of domestic enterprise. Certain sections of the country are more or less disturbed owing to the near approach of conscription, but this is expected to have slight effect upon the enforcement of the Act. The general activity in this territory is well maintained and with the exception of the munition output no appreciable difference is as yet pronounced.

Pig Iron

The greater difficulty in obtaining raw material from the United States is partly offset by the falling off in the requirements owing to the curtailment necessary resulting from the recent developments in the Canadian shell producing activity. Domestic conditions, however, are still comparatively unchanged, as Canadian producers are still able to consume the bulk of their own production. Quotations on Canadian iron may again be available in the near future.

Steel

What effect the recent developments will have upon the steel situation here in Canada is at present problematical, as conditions are such that it is very diffi-

cult to foretell what may take place in the near future. The curtailment in the production of the various classes of munitions will undoubtedly result in a falling off in the output of such steel as has been required to maintain this industry at the abnormal activity of the past years. No doubt considerable raw material will still be produced and exported for shell-making purposes abroad but the bulk of previous activity will be largely discontinued. Owing however, to the demand in other directions, it is not thought likely that the market in general will be much affected. The American situation continues more or less unsettled due to the fact that no definite understanding has yet been arrived at in connection with a stated price that will regulate early market conditions. The decline in the production of steel billets and bars that have been used for the manufacture of shells may relieve to some extent the domestic situation in small bars and shapes, as the mills in this country will be in a position to handle this class of material, but as regards plate work of every description it is not likely that recent developments will have a bearing on this commodity, owing to the inability of the local mills to roll the necessary material. Under these conditions there is a possibility that a certain proportion of structural work may be resumed, but ship building and car interests will reap little benefit from the change, in so far as the production of material is concerned. The American situation is still dominated by the uncertain attitude of the Government in the delayed announcement of a definite policy regarding the action they propose taking in connection with the regulation of prices. Price changes on the American market are very few, those noted showing a slightly weaker tendency. Local dealers report unchanged conditions with quotations well maintained. Much difficulty is still experienced in getting delivery from points in the States.

Metals

With the decline in the production of munitions, it is expected that the metal market, especially in Canada, will experience a period of readjustment as far as war requirements are concerned; no sharp decline is looked for in prices as conditions in the States will more than balance the absence of activity in this particular direction. Copper is easier. Tin has a firmer tendency on better demand. Spelter is steadier but quiet. Lead is fairly active but easier. Antimony and aluminum are both steady and unchanged.

Copper.—Developments in the States have shown no material improvement and general conditions are still more or less unsettled. Strikes at some of the mines have disturbed the American market and consumers still show a reluctance to active interest under existing conditions. With the exception of electro, which has declined ½ cent per lb., the American market has remained firm. The local market on a lighter demand has declined 1 cent per lb., the current quotations being 33 cents for lake and electrolytic, and 32 cents for castings.

Tin.—The market is firm on better demand and inquiries seem to indicate that consumers are taking a more active interest in the situation. These conditions have had the effect of steadying the market and prices have been well maintained. The New York market is stronger with prices ⅛ cent higher than last week. Local dealers report a featureless situation with prices firm and unchanged at 61½ cents per lb.

Spelter.—Unsettled conditions continue to influence the spelter situation and dullness is still a factor of the present market: The American market is quiet and dealers here report unchanged conditions at last week's price of 10½ cents per lb.

Lead.—With the prospect of a better supply, products are satisfied that the time has arrived for some readjustment of the market, and this has been reflected in the announcement of the leading interests to lower their quotation to 10½ cents per lb.; on a quiet market dealers here have declined their prices to 13 cents, this being ½ cent lower than last week.

Antimony.—The situation is dominated by pending developments and absence of demand, but prices continue firm; 15 cents is quoted in New York, a decline on the week of ¼ cent. Locally the market quiet with prices firm at 20 cents per lb.

Aluminum.—Despite an easier market in the States the local situation is firm and unchanged with quotations ranging from 65 to 67 cents per lb.

Machine Tools and Supplies

The machine tool market has experienced another week of comparative inactivity with a slight improvement over the business of last week. Inquiries are still coming in for general line of equipment but the sales are not heavy. With the falling off in munitions it might be expected that considerable second hand machinery would be placed on the market, but in view of the unsettled condition of the industrial situation it is not likely that this will be effected for some little time. The feature of the present market is the marked decline in the demand for supplies, particularly such requirements as were necessary for carrying on the extensive shellmaking operations of recent months. The market in these accessories is however comparatively quiet, no appreciable decline having as yet been reported in price conditions.

Scrap

Owing to the prevailing conditions in the industrial field at the present time the market in old metals is very unsettled and prices are correspondingly uncertain. The tendency in the old metals is towards lower levels, but the situation in iron and steel scrap is well maintained in spite of the decline in shell requirements. American iron and steel markets are very firm while metal scrap is weaker. The local situation is featured by a certain nervousness as a result of recent developments; old coppers are easier on a decline of 2 cents, the quotation this week ranging from 20 cents for light to 23½ for heavy and crucible. Heavy brass is 2 cents weaker at 16 cents. Steel turnings are stronger, having advanced one cent. Five cents per lb. records, the advance on boiler plate, W. I. axles and rails, and also malleable scrap, the present quotations being 22 cents, 30 cents, 25 cents and 25 cents respectively. Scrap zinc has declined 1½ cents per lb., the prince quoted being 6½ cents per lb. Heavy lead is one cent lower at 10 cents per lb. Aluminum at 30 cents shows a decline of 5 cents per lb.

Toronto, Ont., Sept. 4.—The machinery exhibit at the Canadian National Exhibition, now being held here, is in general character similar to that of pre-war years. There are no exhibits showing munitions machinery or equipment exclusively, and in this respect it is in line with the last developments in the machine tool business. An interesting feature, and one showing possibilities of considerable development, is the exhibition of farm tractors. These are being used extensively now, and are bound to become more popular as they improve in design and workmanship.

Steel

The situation in the iron and steel trade is practically unchanged from last week, and prices continue stationary, with a weaker tendency. It is understood that some progress is being made in regard to the adjustment of the embargo on steel from the United States, but no announcement has been made regarding the progress of negotiations. No official statement has been given out from Washington concerning the U.S. Government price fixing policy, although a public announcement of maximum prices for various grades of steel from certain mills is expected shortly. It is believed that steel prices will be fixed by the War In-

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MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

dustries Board on a cost-plus-profit basis, but whether or not this will be extended to include steel for private consumers is not known. In the meantime the market is unsettled, with new business almost at a standstill. Consumers are buying as little material as possible in the hope of lower prices, and are waiting until the situation clears up. There is still a shortage of steel, but some relief is looked for now that the mills have more tonnage available for domestic requirements. This will also to some extent relieve the tight situation caused by the embargo. The Canadian mills with their increased capacity will be in a better position than ever before to supply the demands of the home market. Production has shown an increase lately on account of the cooler weather, but the coke situation continues to cause considerable anxiety and the steel output may be curtailed because of this unless supplies of coke can be steadily maintained, which at the present moment appears rather doubtful.

In the United States market, demands for war purposes, and particularly for shipbuilding, are more than sufficient to keep all steel producers working at the limit of capacity. There is not enough steel to meet all demands, and with Government and Allies requirements having to be filled before the private consumer can participate, the latter has to take what he can get. Private enterprise is consequently considerably restricted. For this reason, and because of the prevailing high prices, domestic business is slow. The trade is waiting developments at Washington, and until the price fixing policy is settled no important change in the situation is anticipated. Prices continue to show an easier tendency, particularly on semi-finished material, and further declines are looked for. Production is being curtailed because of lack of men and shortage of raw materials. There is a serious deficiency in supplies of pig iron and semi-finished steel at some important plants. The sheet market continues active, with buying principally for U. S. Government account. Prices in the home market are unchanged.

Pig Iron

The situation in the domestic pig iron market is unchanged, and prices of foundry iron continue nominal at $60 a ton. Considerable difficulty is being experienced in getting coke in sufficient quantities owing to the scarcity of cars. On the other side of the line there is a heavy demand for pig iron, and the furnaces are having difficulty in completing contracts. Deliveries are somewhat delayed, but production is improving with cooler weather. Coke production is increasing, but shortage of cars is holding prices firm. The trade is expecting an announcement from Washington within a short time as to the price at which coke is to be sold. In view of possible Government control of the coke market, lower prices are anticipated.

Scrap

The market for old materials continues quiet at unchanged prices, but a moderate recession in values is likely, particularly in copper and brass. Steel and cast iron scrap are in good demand and the prices have been well maintained on the basis of last week's quotations. Supplies of shell steel turnings now considerably reduced in volume are being readily absorbed with prices showing a firmer tendency. The new steel plant at Ashbridge's Bay is using considerable of this material and dealers' stocks are not by any means, as heavy as they were a few months ago.

Machine Tools

The past week has been fairly quiet in the machine tool trade in regard to sales, although the Machinery Hall at the local exhibition has been the centre of considerable activity. The trend of events in the trade is reflected in the exhibits as there is comparatively little machinery or equipment being shown that would be required exclusively in the manufacture of shells. In this respect the exhibits follow more along the lines of pre-war times than last year.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

Supplies

Although there has been lately some falling off in demand for machine shop supplies, business continues in steady volume. The difficulty now is to obtain goods promptly and dealers are obliged to place their orders well ahead which means carrying considerable stocks. Prices on all lines are holding very firm with advances on some goods. Due to recent advances in the price of Mid-Continent oil to $2.00 a barrel, there is a firm situation in the refined products such as gasoline, benzine, and coal oil. The heavy consumption is an additional factor that is giving firmness to the market. Prices of gasoline and benzine are unchanged.

Metals

Comparatively little interest is being displayed by consumers in metals and the markets are quiet. The reason for the lack of interest is the uncertainty surrounding the United States Government's attitude with regard to prices. There is some apprehension in the trade in regard to future developments and the markets are consequently easier although prices are unchanged in the meantime. The local situation is unchanged from last week and the market continues somewhat unsettled.

Copper.—The market is neglected and no business of consequence is now offering. Production is the U.S. is being seriously interfered with by labor troubles at the mines, some of which are said to have closed down. The larger producers are practically out of the market and there is some fear that the supply will be insufficient to permit copper to be used for any purpose other than for munitions and war equipment. Prices are entirely nominal and unchanged, lake and electrolytic being quoted at 34c and castings at 33c per pound.

Tin.—The market is quiet with no feature of particular interest to note. Business is dull owing to uncertainty in the situation in London, where the market has been subject to considerable fluctuation. Local price 64c per pound.

Spelter.—The spelter situation continues unsettled and the market has an easier tendency. It is said that production has fallen off considerably on account of the inability of producers to sell spelter at a profit at current prices. Local price 11c per pound.

Lead.—The market is very quiet but has a fairly strong undertone and prices are holding steady. Consumers are keeping out of the market pending developments at Washington. Local situation at 13c per pound.

Antimony.—The market is still quiet and prospects are not too bright for immediate improvement. Prices are unchanged at 20c per pound.

Aluminum.—Little interest is shown in aluminum and the market is rather unsettled with an easier undertone. Price 64c per pound.

Sydney, N.S., Aug. 31.—The coal production at the Glace Bay collieries of the Dominion Coal Company during August reached only 296,000 tons, this being the smallest tonnage recorded in August since 1904, with the exception of August, 1909, when the output was reduced by the U.M.W. strike. Indications are that the Dominion Coal Co. production for the whole year 1917 will not exceed 3,950,000 tons, which will compare with 4,440,000 tons in 1916, and is at least 1,500,000 tons below the capacity of the collieries for output with a full working force. This is the chief reason for the shortage of soft coal deliveries in Montreal. It is true that great, almost insuperable, difficulties have been encountered in transporting to Montreal even the negligible quantity of Cape Breton coal that has gone up the river this season, but presumably, if the coal had been available, it would have been carried to Montreal by one means or another. As some indication of transportation conditions, it may be mentioned that coal is being sent in cars by rail from Cape Breton to St. John, N.B.

The slackening in munitions manufacture has affected Nova Scotia. The stoppage of orders is chiefly for shrapnel steel and forgings for shrapnel shells. The Nova Scotia Steel & Coal Co. laid off some one thousand men on this account at New Glasgow, although it is understood that most of them can be given work of a different class at lower wages. The Dominion Iron & Steel Co. have temporarily discontinued work at the sixteen

inch mill, where shrapnel steel was rolled, and orders are slack in other departments. It is evident that a readjustment period has been entered upon. Under present conditions there will be no difficulty in finding employment for all the workmen in Nova Scotia, but they will have to be prepared to take other work and usually at much lower wages than the high rates that have been paid during the past year and a half. There seems to be no doubt that the Admiralty is concentrating its energies on supplying foodstuffs to Britain and her Allies, and the necessity for munitions now takes second place. The control of shipping by the Admiralty prevents the export of munitions if foodstuffs are to be given preference, and this seems to be the real explanation of the slackening in munitions orders.

The rules recently promulgated by the United States requiring licenses for all exported materials is temporarily rendering difficult construction work in Canada, which depends on the supplying of material from the United States, and this is affecting the extension plans of the steel companies. It is rumored the Nova Scotia Steel Company intends to enlarge its coke-oven plant at Sydney Mines. The coke-oven plant now under erection at the works of the Dominion Iron & Steel Co. is making fair progress.

New York, Sept. 3.—Business in the steel industry continues to be confined mainly to the filling of Government contracts. Thus far the steel mills have received orders amounting to 3,200,000 tons from the Government either directly or indirectly; approximately 75 per cent. of this tonnage has been accepted by the United States Steel Corporation. The subsidiary companies of the Corporation will furnish the steel for 11,000 cars to be built in this country for the double track railroad in France which is being built and equipped in the interest of the United States army. The Corporation is also rolling 90,000 tons steel rails for this road and 10,000 of light sections of the 20,000 tons purchased for portable tracks in France. The corporation will also furnish 800,000 tons of the steel to be used in the construction of war ships by the United States Navy and by merchant yards.

The United States Government is also endeavoring to place steel orders for 10,000 additional cars to be built here and exported to France, most of the material for which will be distributed among independent steel companies that thus far have not accepted their full share of Government work. Several independent mills in the past few days have received orders for a large tonnage of steel plates and shapes required in the building of cargo boats by the Emergency Fleet Corporation and this steel will be shipped to the plants of the American International Corporation who will build 200 steel ships; to the Submarine Boat Corporation who will build 28 standardized steel ships, and to the plants of the Chester Shipbuilding Co. and to the Merchants Shipbuilding Corporation. The building of these boats will require 432,000 tons of plates and shapes. Only a portion of this tonnage has been placed; but the balance will probably be distributed early next year.

The United States Shipping Board has now closed contracts for 701 ships—steel, wood, and composite. The Emergency Fleet Corporation of the Board now has ships of 3,250,000 tons burden either building or under contract, which will call for the expenditure of nearly $600,000,000, and additional contracts for 571 ships are under negotiation. As noted early last month, the full program of the Emergency Fleet Corporation calls for the building of 1,727 ships of 7,968,200 tons displacement to cost $1,234,500,000. The Shipping Board's commandeering program of ships already on the ways at merchant yards, calls for the expenditure of $515,000,000. Ships bought or to be purchased call for the expenditure of $150,000,000. Shipyards to be built by or for the Government in which to build standardized ships will require the expenditure of $35,000,000. Congress thus far has appropriated $800,000,000 for the use of the Shipping Board, but as nearly $2,000,000,000 will be needed, the Board has now asked for an additional appropriation of $1,134,500,000 of which $915,000,000 is to become available this year.

The various shipyards that received contracts from the Government on the last day of August have been anticipating this work by the purchase of cranes and machine tools in the last few weeks. The Federal Shipbuilding Co. has also made additional tool purchases, and the Pusey & Jones Co. is about to issue a list of tools for a new machine shop to be built at Wilmington, Delaware.

Orders for about one million dollars worth of machinery have been placed in the last week in the New York market, and lists have been put out by various manufacturers of airplanes and airplane engines calling for the expenditure of $3,000,000 including $1,000,000 worth of tools for the Inter-Continental Machinery Corporation. The Standard Aero Corporation, Plainfield, N.J., is in the market for $300,000 worth of metal and wood-working machinery to be used in equipping an airplane factory. The Simplex-Automobile Co., is closing for 100 machine tools to be used on Government work. Several manufacturers of automobiles who have accepted contracts for aviation motors have been buying tools in the New York, Chicago, Detroit, and Cleveland markets. The United States Aircraft Production Board and the French and Russian Governments are also buying tools to build airplane engines.

Pittsburgh, Sept. 1.—Further progress towards a general readjustment in iron and steel prices has been made in the past week, although the surface evidences are not spectacular in character. Billets are off another $5 a ton, Bessemer iron is down, say, $1 a ton and basic iron is lower by about $4 a ton, while plates have been eased off by about a cent a pound, other finished steel products not being quotably changed. Under the surface, however, the forces are working out, the mills having filled additional obligations and having so much less ahead of them, while the export embargo is making steel more plentiful and there is constant sentimental pressure from Washington in the direction of lower prices.

The New Export Embargo

The first export embargo, which became effective July 15, applied to all countries and included, as to iron and steel, the following items; scrap, pig iron and ferromanganese, billets, ship plates and structural steel. The new embargo, dated Augst 27, to become effective August 30, is in two sections, the first applying to the Central Powers and the countries adjacent, the latter to the rest of the world, including the Entente Allies and their dependencies, protectorates, etc., and the neutrals not contiguous to the Central Powers. The list as to the former includes practically everything, certainly all iron and steel, there being the comprehensive wording, metals and their derivatives and manufacturers. The list as to the latter includes scrap, pig iron, ferrosilicon, spiegeleisen, ferromanganese, ingots, blooms, billets, slabs and sheet bars, plates, structural shapes, tool steel, alloy steel and machine tools." This would apply to Canada, of course. The important omissions are wire products, pipe, sheets, tin plates and merchant bars. The Exports Administrative Board has been organized to grant licenses, licensing under the former embargo having been in charge of the Department of Commerce.

The object of the first part of the embargo is, of course, to prevent any material going, directly or indirectly, from the United States to the Central Powers. The object of the second is to conserve the supplies of the United States, permitting material to go out only in case it is to be used directly in prosecuting the war.

The Coal Situation

As noted in last report, the bituminous coal operators were much dissatisfied with the schedule of prices fixed by President Wilson on August 21, and had called a general meeting of operators to be held in Pittsburgh August 29. Evidently they concluded on second thought that a general meeting, at which there would probably be explosive utterances, would not be a good path into the good graces of the Government, hence the meeting was called off and the executive officials of the recently formed Coal Producers' Association have been meeting in Washington to formulate plans for making representations to the Government.

No announcement has yet been made regarding the fixing of coke prices. Connellsville furnace coke for spot shipment is strong to-day at $13.50 per net ton at ovens.

Pig Iron

A pig iron producer has bought several odd lots of Bessemer iron at $50 and $52, valley, the market a week ago having been quotable at $53. Basic iron, which was quotable at $52, valley, can probably be

secured without difficulty at $48. Foundry grades are nominally unchanged. In other districts there is a generally softer tone, but as a rule there is not enough doing to place actual declines on record.

Billets Decline Again

This week billets were offered at $75, finding few, if any, takers, and it is thought that a firm bid of $70 would bring out some material. Last week's market was $80, while the top, reached at the beginning of June, was $95 to $100. The decline is likely to go farther, but it can hardly continue long at the rate of $5 a week, because it is now approaching the level at which large contracts are being filled, say, $50 to $60. These are long-term contracts, with a quarterly fixing of prices. Rods are easier at $90 and forging billets can be had at $95, whereas a few weeks ago they were strong at $125.

A Decline in Plates

While scrap started to decline late in June, pig iron softened a trifle in July and billets began declining in August, there has been no quotable decline in any finished steel product until this week, when the distinction can be accorded to plates. Until very lately it has been difficult to buy even ordinary tank plate at 9c., the more common quotation being 10c., Lloyds' specifications commanding about 12c. In the past week there have been rather free offerings of tank plate at 8c., and in a few instances at a shade less. Thus an eastern mill sold 400 tons, ⅜-inch and heavier, 60 to 80 inches wide, at a delivered price equal to 7.85c., Pittsburgh, but as the freight was against the mill the price realized at mill was only 7.70c.

The softening in plates is commonly ascribed to the export embargo, which has shut in some large tonnages, particularly in the case of Japanese orders. However, there is probably a contributory influence, in that mills can now make a better appraisal of how much plate tonnage the shipbuilding program will absorb. The requirements of the next few months are much smaller than those expected when various shipyards have been completed. At that time there will be additional plate rolling capacity. Then there is a new element in the situation, the Secretary of the Navy insisting upon the building of 150 destroyers as quickly as possible, even to the detriment of the merchant shipbuilding programme. It is stated this is on the advice of Admiral Simms, in charge of United States naval operations abroad, and in considerable measure it would serve to reduce the consumption of plates for a time.

Government Price Fixing

Another week has passed without the Government fixing the prices it is to pay for steel, but an early announcement is promised with more assurance than formerly. Then there will be the question of prices to be accorded the Entente Allies, on which matter the steel makers have not yet formally yielded. When the prices are fixed, it may prove to be the signal for the beginning of a general decline in finished steel prices for the ordinary trade. While the steel makers have never subscribed to the "one price for all" doctrine enunci-

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

ated by President Wilson, the steel buyers think the idea is an excellent one and will be disposed to bide their time awaiting the market to carry it into effect.

YEAR'S WORK OF LAKE SUPERIOR CORPORATION

THE net earnings from operations of all of the subsidiary companies of the Lake Superior Corporation for the year ended June 30th last were $5,323,004.86, compared with $3,503,471.18 in the previous year, an increase of $1,819,533.68. To the net earnings mentioned there was added a balance of $340,087.33 brought forward from 1916, giving $5,663,092.19 available for distribution. Interest on bonds of subsidiary companies took $1,419,071.20. An amount of $586,485.12 was set aside for Magpie Mine Reserve and for sinking fund payments in respect of Helen, Carmelton, Lake Superior Mines, Fiborn quarries, etc. The losses and expenses in connection with the sale of miscellaneous assets reached the sum of $145,036.-01. The amount of $1,243,155.14 was appropriated as reserves for depreciation, renewals, etc., of special assets (including renewal of coke ovens and docks, as also abnormal capital cost of construction and equipment), and $1,500,000 was set aside for general depreciation. These items totalled $4,893,747.77, and left the sum of $769,344.42 to be carried forward by all companies.

The Algoma Steel Company showed an increase both in the production of pig iron and unfinished steel as follows:

	1916-17	1915-16
Pig iron	348,519	258,504
Finished steel	280,296	215,466

The output consisted of shell steel together with rails and merchant bars.

The Algoma Steel Corporation has completed the two 75-ton open hearth furnaces which it had under way at the opening of the year and has carried through a third furnace of the same size. With a possible production of about 50,-000 tons ingots per month, the directors consider that they have provided all the steel making capacity necessary for some time to come, and that subject to certain modernizing of the older furnaces, they will have a satisfactory open hearth plant.

Opportunity was taken to acquire the modern blast furnace built at Midland, Ont., a few years ago, by the Canada Iron Corporation. This furnace has been already moved to Sault Ste. Marie and when erected and improved will have an approximate capacity of 400 tons per day. With the addition of the blast furnace plant and with the ultimate possibility of operating four blast furnaces, the Algoma Steel Corporation should have a well balanced plant as between its pig iron and steel producing possibilities.

Satisfactory progress is being made with the development of the water power by the Great Lakes Power Company and the supply of power, which will be greatly helpful to the steel plant, is expected to commence about 1st January next.

Mr. Wilfrid H. Cunningham, the president, says in the course of his report:

"So far as the finances of the Algoma Steel Corporation are concerned, it is gratifying to be able to report that the position of the company has been much improved, especially through its having pair off, in March, its three-year note obligations ($2,432,000). A satisfactory sale was made during the year, of the steamship J. A. McKee, and of certain office buildings and adjoining lands. The price realized for steamship and lands approximated $750,000, all of which is or will be deposited with the trustees and will be available for further capital expenditure.

"Favorable reports have been received as to the coal mines. In view of the growing importance of these, the Lake Superior and Cannelton Coal Companies have opened an office in Cleveland, from which Mr. W. C. Franz, the president of those companies, will conduct operations.

"The present Helen Iron Mine is still producing, but the operation cannot be prolonged much further on account of the exhaustion of the Hematite ore. A considerable amount of diamond drilling has been done on the property during the year, with the result that a substantial tonnage of Siderite has been proved up. There are no further developments at Magpie Mine. Labor conditions have been unsatisfactory.

"Beyond progressing with their plans the Algoma Steel Corporation directors have not yet committed the company to construction work in connection with either structural or other mills. They consider that prices and deliveries are adverse to such work at present. The necessity for further mill development is, however, again very strongly emphasized.

"In the disposition of earnings for the year, the board of the Algoma Steel Corporation has deemed it wise, especially under the present conditions, to pursue a thoroughly conservative policy. In addition to the necessary sinking funds, care has been taken to provide for such as the inevitable rebuilding of the bi-product coke ovens, the extra depreciation caused to rolling mills through the class of material now being rolled, part of the abnormal cost of new construction, as well as further provision for Magpie Mine, general depreciation, etc."

CANADIAN CONCERN SHARES IN AEROPLANE ORDER

AN agreement has been reached between the British and American Governments by which half the capacity of the Curtiss plants will be devoted to aeroplane requirements of our European Allies. This agreement applies no matter how great capacity the Curtiss Company finally attains.

The Curtiss Company will complete an order within the next two weeks for 200 biplanes for Great Britain, work on which was started last year. These biplanes are of the training variety and the cost to Great Britain is $30,000 each. In other words, the order amounted to $6 000,000.

The Willys-Overland Automobile Co., which now controls the Curtiss concern, has received some large orders for aeroplane parts. These include bolts, nuts, turnbuckles, etc. These orders for the Willys Company will be manufactured at the Willys Morrow plant in Elmira. The orders aggregate probably close to $25,-000,000, and must be completed within 28 weeks. These large orders are over and above an order for 1,000 of the Sunbeam motors, now being manufactured by the Canadian subsidiary of the Willy-Overland Company.

NEW PROCESS OF SULPHUR PRODUCTION

THE drain on the world's sulphur supply for the manufacture of munitions and fertilizers has prompted the United States Government Bureau of Mines to make an investigation of various processes for recovering sulphur from the sulphur dioxide in smelter gases. A report just issued by the bureau states that sulphur has been produced in extensive experiments with a new process, and that it can be produced on a commercial basis for $12 to $13 a ton. Crude sulphur is now selling in this country for $55 a ton, and refined sulphur for about $80.

An increase in the sulphur supply of the world would tend to lower the cost of munitions, fertilizer, commercial sulphuric acid, and newsprint paper, in the manufacture of which sulphur is an important agent.

ALLIES BUY HEAVILY IN U. S.

WHETHER or not the Allies who are now purchasing various supplies in the United States in enormous quantities will be gratified if the Government fixes the prices at which American commodities are to be sold, is a question yet to be determined.

For one of the reasons why high prices for commodities of all kinds have been established and a tendency to an increase in prices has been noticed is to be found in the imperative pressure which the representatives of the Allies who are now in the United States have brought to bear upon manufacturers and others so that they can secure their supplies and get them as rapidly as possible.

Upon excellent authority it can be stated that there are now in the United States several thousand representatives of Great Britain and France as well as representatives of other Allied nations seeking to secure commodities, although some of them are occupied with inspection of commodities already purchased. There is, therefore, intense competition in American markets between representatives of other nations who are here for the purpose of buying American products.

On excellent authority it is reported that representatives of Great Britain who are now in the United States are purchasing commodities the aggregate money value of which each week is from $18,000,000 to $20,000,000. The money by mean of which payment for these commodities will be made will be obtained by loans made by the Government of the United States.

For Sale—A Modern Steel Building

300 ft. x 120 ft. wide with 3 10-ton 47-ft. span
Electric Travelling Cranes for 3/60/550 volt service, or cranes will be sold separately
THIS BUILDING WAS NEW IN 1913

Contains the following Machine Tools—Practically new

1—8 Spindle Bertram Arch Bar Drill.
1—26—48" x 20' McCabe Double Spindle Lathe.
2—No. 3 Bertram Double Axle Lathes.
1—42" Bertram Car Wheel Borer with Hub facing attachment and Crane.
1—1" Acme Triple Head Bolt Cutter.
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1 each 1", 1½" and 3" Ajax Bolt Headers.
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2—No. 23, 1 No. 26 and 1 No. 9 Williams & White Bulldozers.
40—Canadian Westinghouse Motors, from 3 to 75 H.P. for 3/60/550 V. Service.

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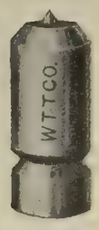

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ALL SIZES, FINEST QUALITY,
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either unmounted or mounted. Our improved (any style) CAST STEEL MOUNTING.

GUARANTEED TO BRING RESULTS.

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INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Thre Rivers, Que.—The Three Rivers Shipyard Co. are buying equipment for their new plant here.

Hamilton, Ont.—The Acme Stamping & Tool Co. are building an addition to their factory on Sidney Street.

Niagara Falls, Ont.—Work is progressing satisfactorily on the new factory for the Herbert Morris Crane & Hoist Co. of Toronto.

Toronto, Ont.—The directors of the Canadian National Exhibition may decide to build an auxiliary electrical power plant of their own in the near future.

Kingston, Ont.—It is reported here that the making of shells at the Canadian Locomotive Works will be continued for the next six months, or until the present order is completed.

Copper Cliff, Ont.—The Canadian Copper Corporation will increase its capital stock to $10,000,000. The new capital will be used to develop the property, and will include the erection of a 3,000-ton mill.

Sarnia, Ont.—It is reported that a new concern to manufacture automobile parts in Sarnia will start building operations in a few days on a site in the North Ward. The main promoter of the plant is Senator Lyman Holmes of Michigan.

Regina, Sask.—The Canadian Nu-Fuel Co. has been recently formed here to manufacture a high-grade fuel out of garbage and waste rags, etc. The process of manufacture is the secret of Edgar L. Culver, of Chicago, who has been manufacturing fuel at Austin and San Antonio, Texas.

Nelson, B.C.—A new light and power corporation has been organized known as the Northport Power and Light Co., to supply light and power to this district. Its principal place of business will be Northport, and branch offices will be maintained both in the United States and Canada. One of the directors is Lorne A. Campbell, of the West Kootenay Light and Power Co.

St. John's, Nfld.—R. H. Reid, vice-president of the Labrador Pulp and Paper Co., is credited with saying that the undertaking would mean the development of one of the most important water powers in the country, the falls on the Hamilton River are second to those of Nagara. The bonds of the company will not be placed on the market, and the increased capitalization will all be met by private subscription.

Flesherton, Ont.—The oil prospects here are improving and continue to attract oil men. A company from Midland delivered four carloads of machinery last week, and will commence drilling in a few days on Reeve McTavish's farm adjoining the town. On the Lever farm drilling is down over one thousand feet, going through Hudson shale with oil signs increasing. In the Karstedt well experts from Detroit are pleased with the prospects.

Rigaud, Que.—It is reported that the Curtis & Harvey trinitrotoluol plant at Dragon, destroyed by an explosion on August 18, will not be rebuilt on the same scale as before. Negotiations are still under way with the American Government regarding contracts which would have kept the plant destroyed busy for months to come. These contracts cannot be carried out under present conditions, and it has not yet been agreed whether they shall be carried out in part.

ELECTRICAL

Picton, Ont.—The Town Council contemplates installing hydro-electric system. A by-law will be voted on.

Thorold, Ont.—The Town Council are considering the advisability of installing hydro-electric system here.

Picton, Ont.—The Hydro by-laws voted on last Friday by the municipalities of Picton, Wellington and Bloomfield were carried by a large majority.

Thessalon, Ont.—The Hydro-Electric Power Commission of Ontario are investigating the possibilities of power development in the vicinity of Thessalon, Ont.

St. Thomas, Ont.—The Hydro-Electric Commission and the Council have reached a tentative arrangement for the improvement of the lighting system on Ross Street, St. Catherine Street and Wilson Avenue. The cost of the change from the old plan will reach some thousands of dollars, and will be borne by the commission.

Toronto, Ont.—The Ontario Hydro-Electric Commission is about to demand for use of municipalities and industrial establishments on this side of the international boundary, 80,000 horse-power of electric energy which private companies at Niagara Falls have been exporting to the United States. The Ontario Government has passed an Order-in-Council authorizing the commission to expropriate the power now exported.

Sarnia, Ont.—The motor generator purchased by the Sarnia Street Railway Co., to generate the power for the line has arrived in the city, and is being installed at the hydro-electric plant in the North End. The outside construction in connection with the installation of hydro in this city is about completed. The work on the line, which will serve the South End manufacturing concerns, the Imperial Oil Co., the Mueller Mfg. Co., the Perfection Co., and other industries, will be commenced shortly.

GENERAL

Elmira, Ont.—The Great West Felt Co. will build a factory here to cost $5,000.

Fort William, Ont.—The N. M. Patterson Co. are building a reinforced concrete elevator to cost $200,000. The Fegles Bellows Co. have the contract.

Montreal, Que.—Twenty thousand dollars damage was done last Friday by fire and water to the plant of Holmes, Hogue & Co., box manufacturers, 235 Chatham Street.

Moosomin, Sask.—The Saskatchewan Co-operative Elevator Co. have purchased from J. Sharpe, Moosomin, his large elevator. The elevator is being remodelled, relined, and made ready for business October 1.

MUNICIPAL

Rosthern, Sask.—The town will instal a 50-k.w. gas engine and generator, and switchboard, etc.

Mitchell, Ont.—The electric light plant at Brussels has been purchased by S. Wilton for $3,500.

Port Dover, Ont.—The waterworks by-law, voted on here was carried by a large majority. The figures were: For, 151; against 74.

Owen Sound, Ont.—At the regular meeting the Town Council unanimously endorsed the new steel industry by-law after several amendments had been proposed. It was also decided to hold the election on the by-law on Sept. 15.

Tilbury, Ont.—The ratepayers voted almost unanimously on Aug. 27, to endorse the by-law agreement with the Hessco Electric Co., the vote standing 209 for and 8 against. The town will furnish a free site of five acres to the company, will exempt them from all taxes except school and local improvements for ten years, and will furnish free water for ten years, and will guarantee the company's bonds for $35,000 for 15 years.

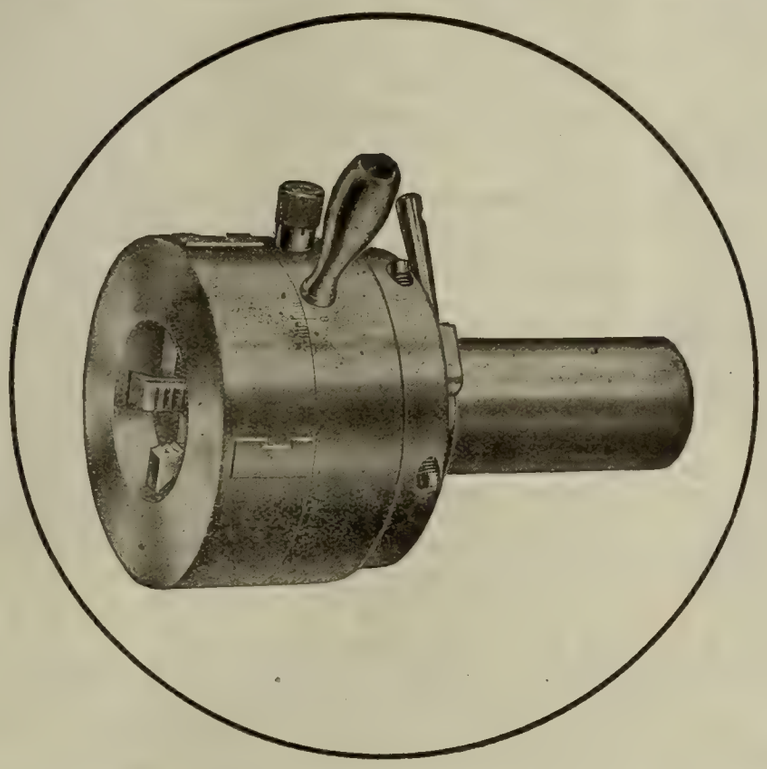
TENDERS

Cobalt, Ont.—Tenders will be received until September 18 for installing a complete telephone system. R. L. O'Gorman, town clerk.

Cobalt, Ont.—Tenders will be received up to Sept. 18, for the supply of material and labor necessary in the installation of a complete telephone system in the Town of Cobalt, and in part of the adjoining Township of Coleman. Further particulars will be furnished by R. L. O'Gorman, Town Clerk.

Toronto, Ont.—Tenders will be received, addressed to the Chairman, Board of Control, City Hall, Toronto, up to Tuesday, October 2nd, 1917, for the construction and delivery of stop valves, valve operating pump and special cast-

GEOMETRIC



"Around the Geometric Die Head we draw a circle and claim that no other can touch it for quality and quantity production."

That is the claim of the Manufacturer.

This is the claim of the User:

"We purchased four sets 9/16"-18 chasers from you four months ago, and are pleased to state that the first set is still in use and doing perfect work, although it has been used almost daily since purchased, and threading better than a thousand pieces per day."

From 1,000 to 4,000 threaded pieces, according to work conditions, is the reputation of Geometric Die Heads. Unless you know what GEOMETRIC experience is, you have yet to learn what can be accomplished in the production of screw threads.

We are ready to help you. Ask us about it.

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NEW HAVEN, CONN., U.S.A.

Canadian Agents:

Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, and St. John, N.B.

ings, for main pumping station. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

London, Ont.—Tenders will be received by the City Clerk until September 7th, 1917, for the following:—(a) One sludge pump, 100 gallons per minute capacity, head 30 feet, with valves and connections; (b) one single phase motor to operate pump. For specification and further information address the engineers, Chipman & Power, Mail Building, Toronto.

Ottawa, Ont.—Tenders will be received by the undersigned until Sept. 10, 1917, for ribbed corrugated or dovetailed plate and expanded metal concrete reinforcing steel. All tenders to be based on one hundred thousand (100,000) square feet (more or less) of 24" gauge expanded metal with combined reinforcing and centering properties: and fifty-seven thousand (57,000) square feet (more or less) of 24 in. gauge ribbed expanded metal as above, or 24 in. gauge ribbed, corrugated or dovetailed steel plate, delivered on the site, to be in conformity with the samples submitted, and to comply in physical properties and tests with the specifications of the American Society for Testing Materials. Deliveries to commence on or before Oct. 1, 1917, and to continue as directed in such quantities as to ensure complete delivery by Dec. 31, 1917. John A. Pearson and J. O. Marchand, Architects, Central Block, Parliament Buildings, Ottawa.

TRADE GOSSIP

The Canadian Cartridge Co., of Hamilton, Ont., has increased its capital stock from $750,000 to $1,000,000.

L'Air Liquide Society Toronto has presented to the Toronto Technical School a complete oxy-actelyene welding outfit.

Montreal Customs Receipts.—Montreal August Customs receipts were 3,320,000 for August, an increase of $504,319 over the corresponding month of last year. Inland revenue receipts were $1,361,260, an increase of $190,000.

Sault Ste. Marie, Ont.—The blast furnace which the Algoma Steel Co. have removed from Midland, will when erected have an approximate capacity of 400 tons of pig iron per day. The company have recently installed a 75-ton open-hearth furnace, which will bring the steel making capacity of the plant up to 50,000 tons of billets per month.

Motor Car Merger Announced.—It is announced that the plan of consolidation of the Maxwell Motor Car Co. and the Chalmers Motor Corporation provided for a lease of the Chalmers plant, equipment and facilities for five years on a basis of 50 per cent. of the net profits, the Maxwell Co. guaranteeing upkeep and preservation of good-will, while the Chalmers Co. provides $3,000,000 of new capital.

Staff Changes in G. T. Motive Power Dept.—Roy Battley, formerly of Stratford, becomes master mechanic of the eastern lines. George Wilson becomes master mechanic in the Montreal shops, instead of Mr. Maver. Alex. McDonald, assistant master mechanic at Stratford becomes ssistant master mechanic in the Montreal shops. W. C. Seeley is made foreman of the erecting shops at Stratford.

Where Sulphuric Comes From.—The Bureau of Mines at Washington has compiled some interesting statistics regarding the sulphuric acid situation. Of the 6,250,000 tons of 50 per cent. acid used last year, 2,500,000 tons, or 40 per cent., came from Spanish pyrites; 350,000 tons, of 5.6 per cent., came from Canadian pyrites; 800,000 tons, or 12.8 per cent., came from smelter acid, and 1,200,000 tons, or 19.2 per cent., came from sulphur.

Big Destroyer Fleet for U.S.—Secretary of the Navy Daniels expects to submit to Congress shortly estimates of $350,000,000 for a great fleet of destroyers. The money will be used to expand existing shipbuilding plants and also to build additional engine and boiler factories, as the destroyer programme upon which shipbuilding industry is now engaged, represents the full capacity of the industry.

Marine Insurance Risks Easier.—Marine war risk insurance in New York has a lower tendency. Rates to South America have been reduced from 1¼ to 1 per cent. for River Plate and Buenos Ayres, and from 1 per cent. to ¾ per cent. for Brazil. United Kingdom rates in many cases are easier than a week ago. The minimum on eastbound armed passenger ships is 6 per cent. Rates to France are also down to 6 per cent.

First Standard Ship Commissioned.—The first of the British Government's standardized merchant steamers to replace tonnage lost through submarines, has been commissioned after completing most successful trials. The keel was laid down in February and the hull was launched in June. It is understood that six different types of vessels, varying in size from 8,000 tons downward are being built. Many hundreds of such ships will be constructed.

The Canadian Fairbanks-Morse Co. are showing at the old stand this year at the Canadian National Exhibition, Toronto. A new feature this year is a demonstration of "Chase" farm tractors. A 50-barrel "Midget" mill is in operation and also several gas and oil engines of various sizes. The company are also showing a "Redden" truck attachment for Ford cars. The representatives include G. B. Wheeler, G. Robson, R. M. Wenger and R. Rogers.

August Increase in Customs Revenue.—A report from Ottawa states that complete returns for August are not yet available, but the increase over the corresponding month of last year will be considerably over $3,000,000. For the first five months of the present fiscal year the increase will be over $17,000,000 over the same period of last year. At this rate, the customs revenue should show a $40,000,000 increase over the returns for the previous fiscal year.

Aluminum Pistons for Gas Engines.—On the subject of aluminum pistons for internal combustion engines, Joseph Leopold, an American engineer with much experience of this class of work, advocates a plain-sided piston of normal length, with circumferential grooves in the skirt, as distinct from the hour-glass or narrow-waisted type. It has only two rings above the gudgeon pin, the lower one having its groove bevelled and the bevel drilled through to the interior. A third ring is provided at the bottom end of the skirt.

Contracts to Build 40 Steel Freighters.—W. Averill Harriman, through the Merchants Shipbuilding Coroporation, of New York, which he organized and controls, has signed contracts for construction of the largest amount of steel shipping tonnage so far ordered by the Emergency Fleet Corporation from any single concern. The Merchant Shipbuilding Corporation operates Harriman's new shipyard at Bristol, Penn., and this yard is to construct for the Government forty 9,000 ton fabricated steel freight steamers.

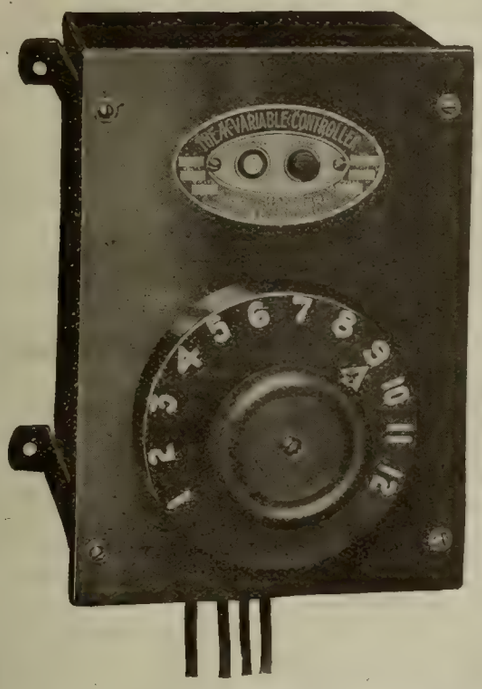
Ore Carriers in Demand.—According to reports from the Northwest, it will be Sept. 15 or 20 when the movement of the new crop gets started, and it will probably be a week or ten days later before the demand for tonnage is very active. Small carriers and line boats will be able to take care of the movement during the first ten days. The market at Cleveland, O., in other lines is without change. Ore carriers are in good demand and some business is being done, but the supply of coal tonnage is in excess of the demand and chartering is light.

Big Demand for Rails.—A despatch from New York states that users of light rails are continuing to call for much tonnage, but the mills are unable to meet their demands and many of them are being disappointed. It is expected that considerable difficulty will be met with in filling the Government's inquiry for 25,000 to 30,000 tons of light rails for France, which has been in the market for several weeks. It is probable that to supply this tonnage some buyers now on the books may be displaced. A 25,000 to 30,000 ton lot for the French Government direct also remains up for consideration.

Sulphur Shipments Require License.—The Trade and Commerce Department, Ottawa, has been notified from Washington that the Burea of Export Licenses has authorized the United States customs collector to pass sulphur shipments to Canada which were already en route on or before Aug. 27, and prior to the coming into effect of the new American export regulations. After Aug. 27, however, all sulphur shipments to Canada will require special licenses. Applications for such licenses must go to the Deputy Minister of Trade and Commerce at Ottawa, who will pass upon them, and, if they are satisfactory, he will send them on to Washington.

Electrical Experts Conclude Conference.—The Ontario Municipal Electrical Association concluded a two-days' session in conference at the Chemistry and Mining Building of the University of Toronto, on Aug. 29. Delegates from all

Aikenhead's A.K.



The A.K. Motors are built for high efficiency and long durability.

Single Phase, Variable Speed Type will run on 110 or 220 volts, 25 or 60 cycle.

These come in sizes from ¼ to 1½ H.P. and are stocked, complete with a 12-speed Controller, in Toronto.

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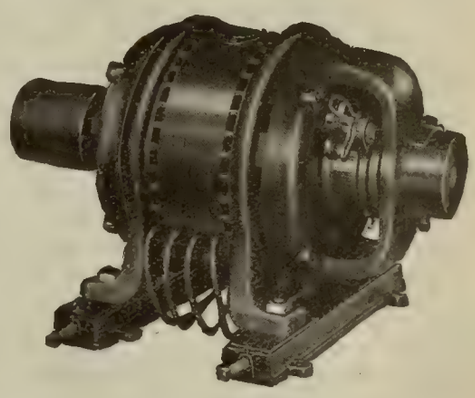
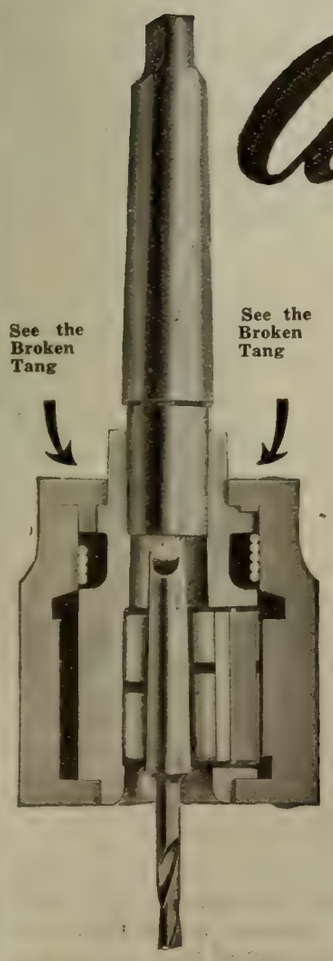


Aikenhead Hardware Limited, 17, 19, 21, Temperance St., Toronto, Can.

Aikenhead's New Chuck



Don't Throw Away Broken Tang Drills

Perhaps you are about to discard some taper shank drills because the tangs are broken off—DON'T DO IT—they are worth their weight in gold. You can use them just as they are with a

Wahlstrom Automatic Chuck

One chuck holds drills from 1/16" to 1¼"

and you won't have to take time from your production to repair them.

Tool changes are made in two seconds—just grasp the shell of the chuck with one hand and put in or remove the tool with the other—no collets—no lost time, for the spindle never stops. The jaws grip NOT BY THE TANG, BUT ON THE SIDE OF THE TAPER—there's no chance for slippage—a Wahlstrom won't even mar the shanks.

AIKENHEAD HARDWARE LIMITED

17, 19, 21 Temperance Street - Toronto, Canada

If any advertisement interests you, tear it out now and place with letters to be answered.

parts of the province were present for a discussion of matters connected with Hydro engineering plans. W. P. Dobson, Chief Engineer of the Labatory Department of the Hydro-Electric Commission read an interesting paper on "Demand Meters." A motion picture demonstration was also given by E. H. Porte, showing the systems in Ontario supplied with power by the Hydro-Electric Commission throughout the province.

Hydro May Expropriate Power.—Within a month or so the Ontario Hydro-Electric Commission will take steps to expropriate the power which is being exported by the Canadian Niagara Co. and the Electrical Development Co., if the developing companies refuse to supply the Hydro Commission with the amount of power they require. By this means 83,000 h.p. will be available to make up the shortage of power in the province. The Electrical Development Co. is exporting 50,000 of its horsepower, and the Canadian Niagara Co. is exporting 30,000 horsepower. The old Ontario Power Co., which the Hydro Commission purchased and took over a month ago, was exporting something like 40,000 horsepower. Now there is said to be 83,000 horsepower wanted by the Hydro Commission to make up the shortage of power, and this will have to be supplied by the two first companies.

New U. S. Shipyards.—Contracts for construction of three U. S. Government owned shipyards for building fabricated steel merchant vessels have been awarded at Washington by the Shipping Board's Emergency Fleet Corporation. They went to the Submarine Boat Corporation for a plant at Newark, N.J.; the American International Corporation, for one at Hog Island, Pa., and the Merchants Shipbuilding Company, for one at Chester, Pa. The yards will cost $35,000,000, and the builders of the yards are given contracts for building in them two hundred ships. The prospects are that contracts for many more vessels will be let when these are completeed. The Submarine Corporation will lay ways for building twenty-eight ships simultaneously and will have facilities and equipment to turn out one 5,000-ton ship every two days after the first vessel is completed.

Algoma Steel Co.'s Output.—The output of the Algoma Steel Corporation, Sault Ste. Marie, Ont., for the year ending June 30, was 348,519 tons of pig iron and 280,296 tons of finished steel. The output consisted of shell steel, together with rails and merchant bars. Operations have been largely governed by the requirements of the Imperial Munitions Board, which has regulated the distribution of the company's product. Throughout the twelve months somewhat difficult conditions have prevailed, especially as regards labor and materials, the deliveries of the latter having been seriously hampered. Especially was this the case with coal, the bringing in of which on account of car shortage necessitated continued and expensive importation throughout the winter months after the close of lake navigation. Conditions have improved somewhat, but materials are generally and necessarily more difficult to obtain, whilst deliveries are only obtainable far ahead.

Canadian Steel Corporation Plans.—Plans for the erection of the United States Steel Corporation's $20,000,000 plant at Ojibway, Ont., will now be carried forward, according to a statement of Ward B. Perley, vice-president and general manager of the Canadian Steel Corporation, the Canadian subsidiary of the big United States concern. This company was incorporated some three years ago. A tract of land on the St. Clair River, north of Windsor, was purchased, a separate municipality was established, streets were laid out for an ideal town, such as the United States Steel Corporation has at its American plants. Then the war put a temporary stop to construction. The bid for tenders for the construction of a slip and huge concrete and steel docks for the Ojibway Company was the sign for a renewal of construction and further plans of the company will now be proceeded with. The plant is well situated, being on the direct water route from the Lake Superior iron mines to the ocean. Hydro-Electric power will be available from Niagara. The operations of the plant, as outlined by Judge E. H. Gary, chairman of the Board of Directors of the United States Steel Corporation, will include some blast furnaces and mills for the manufacture of wire, rails and bars and perhaps other steel products.

PERSONAL

Paul G. Chase, vice-president of the Port Arthur Shipbuilding Co., has returned from a business trip to New York.

W. H. Sample has been appointed superintendent of motive power of the Grand Trunk Railway, with headquarters at Montreal, in succession to W. D. Robb.

Martin N. Todd, president of the G. P. and H. Railway and general manager of the L. E. & N. Railway, died suddenly at his home in Galt, Ont., on Aug 29, aged 58.

A. M. Barry, who for the past six years has been general superintendent of the St. Lawrence Welding Co., Montreal, has been promoted to the position of manager of the above company.

N. E. Gillen, general superintendent of the G. T. R., at Chicago, Ill., has been appointed vice-president, with headquarters at Montreal, in charge of the operating department. Mr. Gillen entered the service of the G. T. R. in 1901.

Wallace Millichamp, a retired manufacturer of Toronto, died on Aug. 28, at his residence, 237 Poplar Plains Road, after an illness of several months. He was born in Birmingham, England, in 1839, and came to Canada when he was 14 years of age.

W. D. Robb, superintendent of motive power of the Grand Trunk Railway, has been appointed vice-president in charge of motive power, car equipment and machinery, with headquarters at Montreal. Mr. Robb has been in the service of the G. T. R. since 1871, and for the last 15 years has occupied the position which he has relinquished.

Frank H. Crockard, the new president and general manager of Nova Scotia Steel and Coal Co., is in New York, after having spent some time in the Pittsburg district. He went there after a conference with departmental heads in Nova Scotia, and is understood to have framed up a comprehensive plan for the development of the company.

George C. Jones has assumed his new duties as assistant to the president Grand Trunk Railway System, with headquarters in Toronto. Until 1905 Mr. Jones was for many years superintendent of the Toronto terminals for the G. T. R., and left only to go with the Central Vermont Railway as vice-president and general manager.

Alexander Wilson Crouch, vice-president and general manager of the Dearborn Chemical Co. of Canada, Toronto, sailed last Saturday on the S.S. Makura from Vancouver, on a year's trade expansion trip to the Orient, Australia, Korea and India. Mr. Crouch came to Toronto from Pittsburgh six years ago.

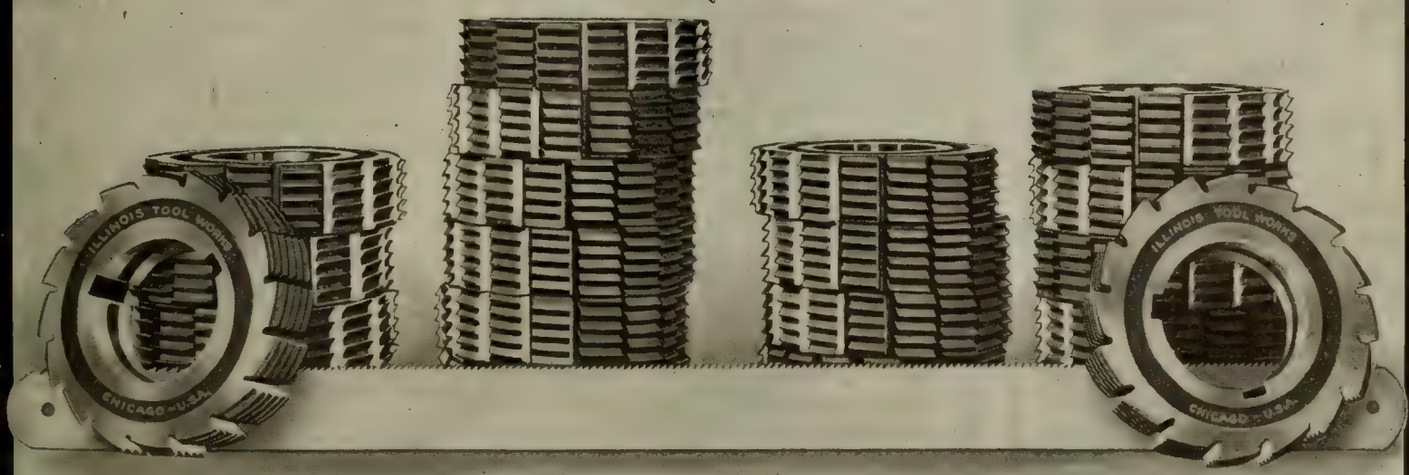
George F. Steele, formerly secretary of the American Newsprint Manufacturers' Association, has been appointed general manager of the Canadian Export Paper Co., Ltd., with headquarters at Montreal. The Canadian Export Paper Co., Ltd., was formed by a number of the leading newsprint manufacturers about a year ago to forward the interests of the industry in foreign markets.

William Johnston, head of the Johnston Steamship Co., Liverpool, England, died recently at his home in Woodslee, Cheshire. With his brother Edmund, Mr. Johnston started in the steamship business nearly forty years ago, and they eventually became owners of one of the largest steamship concerns in the world. The company operated a line of steamers betwen Baltimore, Md., and Liverpool, and also in the Black Sea trade and ports in the Mediterranean.

E. J. Chamberlin, who has retired from the position of president of the Grand Trunk Railway, was appointed to that position in the spring of 1912, on the death of the late Charles M. Hays, who lost his life on the Titanic. Previous to that time Mr. Chamberlin was vice-president and general manager of the company, which position he held for two years. In 1896 he came to Canada as general manager of the Canada Atlantic Railway. Mr. Chamberlin was born in Lancaster, New Hampshire.

Howard G. Kelley, vice-president of the Grand Trunk Railway, has been appointed president and general manager, in succession to F. J. Chamberlin, who has retired. Mr. Kelley was born in Philadelphia in 1858, and occupied important positions at different times on several roads in the United States. In 1907 he became chief engineer of the Grand Trunk Railway System, and was appointed vice-president of the road in 1911. Mr. Kelley is a member of several engineering institutes and associations in England, the United States, and Canada, and has held the office of president in two of these societies.

ILLINOIS *Hack Saw* CUTTERS



The high standard of accuracy which is gaining preference for "Illinois Tools" in manufacturing plants all over the country is exemplified in our new Hack Saw Cutters.

When you require accurate, durable cutters it is well to remember "Illinois Tools"

ILLINOIS TOOL WORKS Chicago, U.S.A.

Manufacturers and Designers of Cutters—Hobs—Reamers

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"HAWK'D CHROME VANADIUM STEEL

Will Give You Exceptional

Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

Hawkridge Brothers Company

303 Congress St., BOSTON, MASS. U. S. A.

THE IRON WORKS LIMITED

Successors to

Owen Sound Iron Works

Owen Sound, Ont.

Engineers

Boiler-makers

Founders

Machinists

Tank Work
Smoke Stacks,
Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order

MARINE

Sault Ste. Marie, Ont.—The red lights on spar buoys 4A and 4B marking the channel in the vicinity of the wreck of the steamers Pentecost, Mitchell and Saxona have been discontinued. The unlighted buoys will be continued in commission near Pipe Island.

Halifax, N.S.—The Quebec Salvage & Wrecking Co.'s steamer Strathcona, which arrived here a few days ago with the big steamer which had been ashore on Bryon Island in the Magdelens, has left to make an attempt to salvage the lumber steamer which went on the rocks in the fog on Aug. 26.

Ottawa, Ont.—The S.S. W. H. Dwyer, owned by Forwarders, Ltd., of Ottawa, was sunk by a mine or torpedo on Aug. 26. This steamer was built for the Upper Lake grain trade in Sunderland, England, in 1913, and went overseas September, 1915, and was since engaged in carrying coal from England to France. She had a carrying capacity of 2,500 tons.

Halifax, N.S.—Adam B. McKay of Hamilton, Ont., will be present at the launching of the second large schooner he has had built here this year and will make a contract for the building of a third. The first schooner, the Letitia B. McKay, he has already sold at a profit over the contract price of $70,000. The next one to be launched at Port Greville will be named the Adam B. McKay, the first one being named after his wife.

Collingwood, Ont.—The wooden steamer Windsor was successfully launched at Robert Morrill's shipyard here recently. The ship is being built for the Ontario Gravel & Freighting Co., Windsor, Ont., and has the following dimensions: Length, 105 feet; breadth, 23 feet, and depth 12 feet, while the motive power is fore and aft compound engines, supplied with steam from a Scotch boiler 12 feet by 13 feet, and carrying a working pressure of 155 pounds per sq. inch.

Vancouver, B.C.—J. J. Coughlan & Sons have received the names of five of the six 8,800-ton steel boats they are building for the British Government. Boat No. 2 is to be known as the "War Camp." No. 3 is to go by the name of "War Charger." "War Chariot" is the name to be applied to the fourth boat. "War Chief" is the title assigned to the fifth boat, while the sixth will go by the name of "War Noble." The first boat has not been named yet. Splendid progress is being made at the Coughlan yards, and it is expected that the first vessel will be launched in November. The boats will be the largest ever built in British Columbia, being 100 feet longer than the Princess boats of the C. P. R., and with ten feet more beam.

To Prevent Seamen Deserting.—An Order-in-Council, providing for the apprehension of seamen who desert from any vessel owned or chartered by the British or Canadian Government, or carrying cargo or passengers for any British or Allied Government, has been passed by the Government. The Order authorizes any owner, master, mate, naval or military officer or superintendent to convey such a seaman on board his ship or have him detained in custody until he can be taken back to the vessel. Police officers are required to render such assistance as may be needed to convey men, absent without leave, to their ships. A further section of the Order provides that seamen shall not leave vessels in the classes mentioned without a pass signed by the master, mate, purser or first engineer.

BUILDING

Toronto, Ont.—A building permit has been issued to Drummond McCall Co. for an addition to warehouse, 373 Front Street East, to cost $10,000.

Toronto, Ont.—Work has commenced on the foundations for a new warehouse on King Street for the Canadian General Electric Co. The building will be of mill construction, six storeys high, with a frontage of 47 feet and 185 feet deep.

Dundas, Ont.—Secord & Sons, of Brantford, have secured the contract for the new factory to be built for Pratt & Whitney. Work has already been commenced and it is expected that February will see its completion. The site is on Hatt Street. The building will be 176 by 75 feet, three storeys and basement, of fireproof construction.

CONTRACTS

Drummondville, Que.—The Southern Canada Power Co. have awarded a contract for a 400-h.p. single vertical turbine to the S. Morgan Smith Co.

Dorval, Que.—The Norwood Engineering Co., Cowansville, Que., have been awarded the contract for filtration plant to be installed here at a cost of $35,300.

Fort William, Ont.—Barnett & McQueen have been awarded the general contract for a one-storey, reinforced concrete construction elevator for Davidson Smith Co., to cost $100,000.

Oakville, Ont.—The contract for building the Tansley bridge has been given to Norman McLeod of Toronto at $60,000. The bridge will be over 600 feet long, and the floor 18 feet wide. A. W. Connor of Toronto is the engineer.

RAILWAYS—BRIDGES

Saskatoon, Sask.—Definite plans toward the erection of a union depot in Saskatoon will be made shortly, when H. A. K. Drury and prominent railway officials come to this city for a conference with civic authorities.

INCORPORATIONS

Montreal Motors, Ltd., has been incorporated at Toronto with a capital of $25,000 to manufacture and deal in motor cars, trucks and bicycles, etc., at Hamilton, Ont. The provincial directors are J. M. McGill, H. E. Phillips and W. F. Roney all of Hamilton, Ont.

Bennet Martin Asbestos & Chrome Mines, Ltd., has been incorporated at Ottawa by A. R. Martin, B. J. Bennett and F. Bennett of Thetford Mines, Que., to carry on the business of mining and

manufacturing asbestos at Thetford Mines, Que., with a capital of $1,500,000.

The Collingwood Steamship Co., has been incorporated at Toronto with a capital of $40,000 to build and operate steam and wooden ships of all kinds at Collingwood, Ont. The provincial directors are George C. Coles, Fred G. Moles and M. P. Byrnes all of Collingwood, Ont.

WOODWORKING

Goderich, Ont.—Fire on August 29 destroyed the Goderich Mfg. Co.'s woodworking plant, owned by J. B. Baechler. The loss is estimated at $50,000, including buildings and machinery.

REFRIGERATION

St. John's, Nfld.—The Newfoundland Cold Storage Fish Corporation has completed the installation of a complete 300-h.p. steam-driven refrigerating plant purchased from the Reinhardt Brewery, Toronto.

CATALOGUES

The Vanadium-Alloys Steel Co., Pittsburgh, Pa., have distributed a stock list of "Red Cut Superior" and "Red Cut Cobalt" high-speed steels in stock in their Pittsburgh warehouse, and also at the works at Latrobe, Pa.

The Webster and Perks Tool Co., Springfield, Ohio, have for distribution in the trade a useful pocket calculator for use in connection with grinding operations. The calculator is a celluloid device containing a sliding card with tables on each side. On one side of the calculator is a table of circumferences and a rule for obtaining surface speeds of abrasive wheels. While on the other side is a table of grinding wheel speeds with rule for finding revolutions at a given surface speed.

The Bilton Machine Tool Co., Bridgeport, Conn., have issued a set of loose leaf bulletins dealing with an interesting and varied line of machine tools which they manufacture. The product includes principally automatic gear milling machines, gear hobbing machines, automatic milling machines, drill presses, and riveting machines. The various types of machine are illustrated and described together with specifications giving the principal dimensions. The bulletins are numbered 203 to 221 inclusive and are gotten up in attractive style.

Engine Room Supplies is the title of a booklet recently issued by the Quaker City Rubber Co., Philadelphia, Pa. This booklet is exceptionally complete and comprehensive, and will serve as a useful guide to the engineer in selecting packings, hose and other necessary engine room requirements. The principal lines described include Daniels', P. P. P., rod packing, Ebonite sheet packing, gaskets and steam hose. "Crown" and "Quaker City" packings. The booklet is

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pocket size and contains 63 pages with index.

A Chain of Evidence is the title of publication No. 14, dealing with large power drives manufactured by the Morse Chain Co., Ithaca, N.Y. The bulletin illustrates and describes a number of important Morse chain installations in various plants showing the wide field of application for transmitting large powers. The bulletin also deals with the construction of the Morse chain and the advantages obtained by its use for large power drives. Copies of this publication may be obtained from the Canadian agents Jones & Glassco, Montreal.

BOOK REVIEW.

Foreign Commerce and Navigation of the United States for the year ending June 30, 1916; 950 pages, 9 x 11½ in., cloth covers. This publication, compiled by the Bureau of Foreign and Domestic Commerce, Washington, contains statistics covering exports and imports of merchandise of all kinds. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D.C., price $1.50 per copy.

The Canadian Mining Manual 1916-17. by Reginald E. Hore, Editor of the *Canadian Mining Journal*, 448 pages 6 in. x 8¾ in. Published by The Canadian Mining Journal, Toronto. This is the third volume of the new series of this useful and popular handbook of information concerning the minerals and mines of Canada. The publication of the handbook was delayed in order to deal more fully with developments in 1916. Reports covering this period were not available until some months after the close of the year and advantage was taken of this delay to incorporate considerable information covering the early months of 1917. The information contained in the manual will doubtless appeal, to those interested in the subject, more at this period than formerlly owing to the greater interest that is being taken in the minerals of Canada as a result of the war. The need of developing our mineral resources is becoming more apparent and any literature that will assist towards this end will be received with greater interest on this account. The publishers have, as in former years, freely used extracts from government publications, company reports and technical journals, etc., which fact guarantees the accuracy of the data contained in the volume. The manual covers all the various phases of mining activity in Canada and contains much useful information on the various minerals found in this country, including location of the mines, physical properties of the minerals and methods of mining, etc. The sections covering coal, copper and nickel are of particular interest at this time. A list of mining companies and their product is a useful feature of this publication. The manual is fully illustrated and is bound in attractive red cloth covers.

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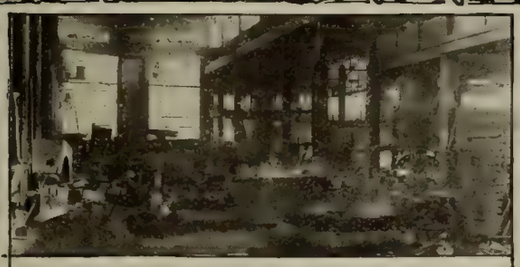

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FOR SALE—THE TORONTO ELECTRIC COMmissioners have for sale a quantity of second-hand 60-cycle meters and transformers recently in service, also quantity of electrical supplies. List of material and full particulars may be obtained on application to the Purchasing Agent, 15 Wilton Avenue. The quantities are not guaranteed, and all are subject to prior sale. No tender necessarily accepted. Toronto Hydro-Electric System, 226 Yonge St., Toronto. c7m

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No. 5 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 2 Bliss Foot-power Press.
No. 3 West Tire Setter Banding Press.
Brown-Boggs Punching Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
7' Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.
FRONT STREET WEST, TORONTO

GOOD USED EQUIPMENT

ELECTRIC TRAVELING CRANES.

20-Ton, 56′ 3″ span, three motor, 110 volts, D.C.
25-Ton trolley, three motor, 220 volts, D.C.
10-Ton, 40′ span, 80′ lift, three motor.
5-Ton, 47′ 0″ span, three motor, 220 V., D.C.
Crane Motors, 10 and 4½ H.P., 220 V., D.C.
10-Ton hand crane, 55′ 0″ span.
20-Ton hand crane, 29′ 6″ span.
2-Ton hand cranes, 22′ span.

PUNCHES AND SHEARS.

Lever Shear (double), cap. 2″ sq.
28″ throat (single), cap. ⅞x⅞″ (belt).
48″ throat (single), cap. 3x1¼″ (steam).
16″ throat (single), cap. 1½x1½ (belt).
36″ throat (single), cap. ⅞x⅞″ (belt).
15″ throat (single), cap. ¾x½″ (hand).
10″ throat (double), cap. 1½x1″ (belt).
Squaring Shear, 53″ cap., 14 gauge.
Angle Shear (double), cap. 6x6x¾″ (belt).
Plate Shear (Univ.), 18″ blade, cap. ½″.
Rotary splitting, 30″ throat, cap. ½″.
Rotary bevel, 5″ throat, cap. ½″.
Coulter & McKenzie, cap. 3x½″, spring steel.
Guillotine, Perkins, No. 6, cap. 2½″ sq.

MISCELLANEOUS.

Ajax Bolt Header and Upsetter, 2½″ cap.
Acme Bolt Header and Upsetter, 1½″ cap.
Bulldozer, No. 12 Ajax, 30″ stroke.
Bending Roll, 6′, drop end, 6½ and 8″ rolls.
Lathe, 24″ x 10′ American, latest.
Grinder, No. 10 B. & S. Plain.
Grinder, No. 13, B. & S. Universal and Tool.
Rotary Planer, 36″, Cleveland No. 2.
Saw, cold, 26″ blade, 48″ travel.
Press (trimming) No. 11 Perkins, 16,500 lbs.
Rolling Mill, 1 stand, 2 high, 30″ bet. housings.
First-class condition—quick shipments.

McCoy-Brandt Machinery Co.
Office and Warehouse:
216-218 Penn Ave., Pittsburgh, Pa.

Eastern Machinery & Equipment Co., Inc.

319 COMMERCIAL TRUST BUILDING PHILADELPHIA, PA.

NEW TOOLS FOR IMMEDIATE DELIVERY.

4—12″ x 36″ Bridgeport Grinders.
1—2½ x 2″ Wm. Sellers Tool Grinder.
30—18″ x 9′ Turning and Boring Lathes.
3—26 x 14′ Am. Patt. Eng. Lathe.
3—Double head Sullivan Grinders.
1—32″ x 12′ Pittsburgh Engine Lathe.
1—20″ Ohio Shaper.

USED MACHINERY
ENGINE LATHES.

4—New 36″ x 25′ Wickes Engine Lathes, quick-change gear, double back gear.
8—30″ x 10′ American Gear head A-1.
5—20″ x 8′ Lodge & Shipley, geared head, q.c.g.
1—20″ x 10′ Bullard.
1—24″ x 6′ Bullard.
3—24″ x 14′ American.

TURRET LATHES.

9—18″ x 6′ Warner & Swasey Hexagon Turret, geared friction head.
36—Potter & Johnson 6A Automatic Turret Machines.
3—3 x 36 Jones & Lamson Flat Turret.
2—2¼″ x 24″ Jones & Lamson Flat Turret, bar equipment. Full set Turret Tools.
9—25″ Gisholt 12″ Collet chuck 6½″ hole in spindle threading lathe.
3—26″ Putnam heavy duty lathe.
—14″ x 6′ Lodge & Shipley Turret. Backgeared.
5—24″ Gisholt 2-step cone, 6¼ H.S.

BORING MILLS.

1—Binsse Horizontal Boring Mill, 3″ bar.
6—66″ swing Bement-Miles Tire Turning Mills, two swivel heads—15½″ under rail.
1—37″ Baush Boring Mill, 2 heads, good as new.
1—Cylinder boring mill, capacity of 24″ diam. to 96″ diam. 10′ long.
Tool equipment included, good as new.
1—42″ Bullard Boring Mill (2) heads.

MILLING MACHINES.

1—No. 3 LeBlond Plain Miller, table 13½ x 58¼.
1—No. 2 Kempsmith, table 10′ x 45″.
1—24″ x 8′ Beaman & Smith Open Side Slab Miller, with two vertical spindles.
1—No. 1½ Universal Milling Machine.

GEAR CUTTERS.

1—24″ Fellows Gear Shaper.
2—36″ Fellows Gear Shapers.

SCREW CUTTING MACHINES.

1—2″ Cleveland automatic.
1—No. 55 National Acme 4 spindle, good as new.
1—No. 54 National Acme 4 spindle, good as new.

SLOTTERS AND SHAPERS.

1—9″ Bement Slotter.
1—12″ Bement Slotter.
1—20″ Wharton Slotter.
1—20″ Gould & Eberhardt Shaper. B.G. Vise. C.S.
1—16″ Steptoe Shaper.

GRINDERS.

8—12″ x 36″ Bridgeport.
1—1½″ Full Universal Landis Machine.
1—No. 13 Brown & Sharpe Universal and Tool Grinder. Full equipment.
No. 1½ Universal Cutter and Reamer Grinder.
1—28″ Bridgeport Face Grinder, with magnetic chuck.
5—Fisher Profile Grinders for Cutters.
1—No. 28 Brown & Sharpe Plain Grinder, 17″ x 96″.
5—No. 6 Std. Universal Tool & Cutter Grinders.

DRILL PRESSES.

1—24″ Bickford Upright back gear sliding head lever and wheel feed drill.
1—4′ Bickford Radial, with Tapping attachment, motor drive, with motor.

C. W. CULLEN MACHINERY CO.

LEADER-NEWS BUILDING
CLEVELAND, OHIO

Bickford 4½′ Plain Radial Drill, cone drive.
No. 3 Lapointe Broaching Machine, new.
2—P. & W. No. 2 Cutting-off Machines.
Bement Miles & Co. 7½″ Vertical Spindle Crank Drilling and Boring Mill, 68″ swing.
Detroit Japanning Ovens, 8′ 10″ x 8′ x 152″.
Pratt & Whitney 48″ Gap Lathe.
Hanna 30-ton Riveter, 12″ reach.
Pangborn Sand Blast, 90″ rotary table, M.D.
3—800-ton Gen. El. Hydraulic Double Action Presses.
3—2¼ Cleveland Automatics; prac. new.
10—¾″ B. & S. Automatics.
Allis Chalmers 150 H.P. Corliss Engine, 12′ F.W.
Bruce MacBeth 150 H.P. Gas Engine; new.
2—Rathmann Jones Gas Engines, 125 and 225 H.P.
80″ Niles Vert. Boring and Turning Mill, 2 heads, slotting attachment.
Ingersoll-Rand Air Comp., 342 cu. ft., steam driven, inter-cooler, complete.
Bertsch Straightening Rolls, 7″ x 84″-3″ vert. adj. M.D.
Kelly Springfield 10-ton Road Roller, rebuilt.
Vulcan 1 cu. yd. Steam Shovel, traction; weight 35 tons; new flues.
62-ton Baldwin Consolidation Locomotive.
Ajax No. 1 Taper Forging Rolls, 50 strokes.
One No. 5 S-3 Cold Langelier Swadger.
3—No. 7 H.S.-6 Langelier Swadger.
1—Bolt and Rivet Header, hand feed, ⅝″ x 3½″ rivets.
Bolt and Rivet Header, hand feed, ¾″ x 4″ rivets.
70-C Bucyrus Steam Shovel, St. G.
R. Is. Locomotive, 45 tons, St. G.

FOR SALE

MOTORS
GENERATORS
TRANSFORMERS
25 and 60 Cycle

If You Have Electrical Equipment For Sale

Send Particulars to

E. A. LOWRY
209 King St., Guelph, Ontario

Watch These Pages!

EVERY week new propositions are offered here. Look them all over, you may find at least one to interest you.

If you don't find what you want, insert a "liner" ad describing your needs.

Canadian Machinery
Classified Advertising Section
143 University Ave. - Toronto

The Great Business of Selling

MULTIPLYING users of your product, commodity or service—this is your great business. The more, the merrier.

The factor of multiplication is advertising. Nothing else can get you new users in the shortest possible time at lowest cost.

Use magazines for long-living publicity effects.

Use them for Economy's sake.

Use them for Prestige.

In Canada, the one conspicuous magazine is

MACLEAN'S MAGAZINE

It is an all-the-family magazine of the highest class—clean, esteemed, established. Can you name a better?
The conclusion is plain.

Published by
The MacLean Publishing Co., Limited
143-153 University Avenue, Toronto, Ontario

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

"Williams" List of Machine Tools

FOR IMMEDIATE SHIPMENT

New Lathes

3—16 x 8 "CISCO"
4—18 x 10 "CISCO"
2—17 x 8 Le BLOND
6—19 x 10 Le BLOND
6—21 x 8 Le BLOND
1—25 x 10 Le BLOND
6—24 x 12 C.M.C.

Used

3—16 x 6 CINCINNATI Q.C.G.
5—20 x 10 HINDMAN
2—20 x 10 LODGE & SHIPLEY (geared head)
8—22 x 10 PUTNAM
1—24 x 16 BERTRAM
1—27 x 16 REED PRENTICE
6—24" DAVIS Boring Turret Lathes
7—18" LIBBY Turret Lathes
No. 2 WARNER & SWASEY Turret
2 x 24 JONES & LAMSON Turrets

Automatics

2—2 x REED PRENTICE
3—2 x REED PRENTICE
10—2¾ CLEVELAND
18—6A POTTER & JOHNSON

Drills

New 28" BARNES
6—26" BARNES
3—25" SUPERIOR
1—22½" BARNES
1—24" AURORA
1—26" AURORA
2—D 1. COLBURN
3—D 8. COLBURN
1—New BUFFALO Heavy Duty

New Radials

1—2½' FOSDICK CONE TYPE.
1—4' MUELLER HEAVY DUTY (speed box drive).
1—5' REED-PRENTICE (speed box drive).

New Shapers

1—14" SMITH & MILLS
4—16" SMITH & MILLS
2—20" SMITH & MILLS
3—20" GOULD & EBERHARDT
2—24" GOULD & EBERHARDT
1—28" GOULD & EBERHARDT.

Millers

New 2H Le BLOND UNIVERSAL.
New 3 H. Le BLOND UNIVERSAL
New No. 25 BECKER PLAIN
No. 2 CINCINNATI UNIVERSAL
No. 2 KEARNEY & TRECKER

Planers

36 x 36 x 11 INDUSTRIAL
36 x 36 x 12 C.M.C.
52 x 52 x 16 McKECKNIE BERTRAM (two heads)

Slotters

8½" BERTRAM
10" BERTRAM
16" SMITH, PEACOCK & TANNET

Miscellaneous

3000 lb. MORGAN Steam Hammer
BERTRAM Horizontal Boring Machine
32' LONDON Vertical Boring Mill
NEWTON Vertical Miller

This is only a partial list.
Write stating your needs.

A. R. WILLIAMS MACHINERY CO., LIMITED

64 Front Street West **Toronto, Ontario**

RIVERSIDE Machinery List

We Own Every Tool Offered

ENGINE LATHES

1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—28 x 15 Putnam Standard Engine Lathe.
1—22 x 14 Putnam Standard Engine Lathe.
1—22 x 10 Reed Standard Engine Lathe.
1—22 x 8 Reed Standard Engine Lathe.
5—New 18 x 8 Springfield Engine Lathes.
1—New 16 x 8 Springfield Engine Lathe.
1—New 14 x 6 Springfield Engine Lathe.
1—18 x 6 Jones & Lamson Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—16 x 8 Porter Standard Engine Lathe.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.
1—No. 3 Hartiarge Bench Lathe.

TURRET AND SCREW MACHINES

1—24" Gisholt Turret Lathe.
2—No. 6-A Potter & Johnson Automatic Lathes.
1—2¼ x 24 Jones & Lamson Flat Turret Lathe, S.G.H.
1—2 x 24 Jones & Lamson Flat Turret Lathe, cone head.
3—No. 4 Foster F.G.H. Hand Screw Machines.
1—No. 4 Smurr & Kamon Hand Screw Machine.
1—No. 5 Pierson F.G.H. Hand Screw Machine.
4—New 14" Pierce Turret Lathes.
2—New 1 x 8 Pierce Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND GRINDERS

1—No. 2 Hendey Plain Milling Machine.
3—New No. 1½ American Plain Milling Machines.
1—No. 13½ Garvin Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling & Drilling Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
4—No. 0 Burke Bench Millers (new).
1—No. 2½ Bath Universal Grinder.
1—No. 2 Wilmarth & Morman Surface Grinder.
1—No. 3 Wilmarth & Morman Surface Grinder.
1—Mina Valley Universal Cutter Grinder.
1—No. 170 Wells Cutter Grinder.

DRILL PRESSES

1—3' Mueller Plain Radial Drill.
1—6' Mueller Plain Radial Drill, old type.
1—20" Baker H.D. Drill.
5—20" Buffalo Plain Drill Presses.
1—3-spindle 8" overhang Henry & Wright High Speed Drill.
4—6-spindle Fox High Speed Drill Presses.
2—4-spindle Fox High Speed Drill Presses.
1—16-spindle Natco Drill.
3—12" Leland & Gifford High Speed Bench Drills.

SHAPERS AND PLANERS

1—24" Ohio H.D., B.G. Crank Shaper.
1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
2—16" New Springfield B.G. Crank Shapers.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS.

1—Waterbury-Farrell O.B.I. Press, geared.
1—No. 10 Perkins Drawing Press.
5—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—50-lb. Scranton Belt Hammer.
1—25-lb. Bradley Helve Hammer.

AIR COMPRESSORS

1—16 x 16 x 12 Union Steam Pump Co., steam driven air compressor.
1—8 x 6 Westinghouse Steam Air Compressor.
1—10 x 10 Clayton Belt Driven Air Compressor.
1—8 x 8 Fairbanks-Morse Electrical Driven Air Compressor.
1—8 x 8 Gardner Single Belt Driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt Driven Air Compressor.
1—7½ x 6 Chicago Pneumatic Tool Co. Belt Driven Air Compressor.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machines tools both large and small.

RIVERSIDE MACHINERY DEPOT

17-29 St. Aubin Avenue
DETROIT, MICH.

Chas. A. Strelinger Co.,

43-51 E. Larned St.,
DETROIT - MICH.

Machine Tools For Immediate Delivery

DRILLING MACHINES

Burke Bench Sensitive Drills.
Henry & Wright High Speed B.B. Drills.
No. 3 Barnes Horizontal Radial Drill.
20" Silver Stationary Head Drills, sq. base, W. & L. Feed.
No. 1-S Garvin B.G. Horiz. Drill with pump and piping.
No. 102 Harrington S.S. Drill, belt drive, elev. table.

GRINDERS

No. 3 Gardner B.B. Polishing Lathes.
Diamond Emery Grinders, 10", 12", 16", 24".
Model "B" Fitchburg Hand Feed Grinders.
No. 2 Diamond Aut. Surface Grinders (36x12x12) belt driven.
No. 3 Wilmarth & Morman Surface Grinders.
No. 2 Oakley Universal Cutter and Tool Grinders.
Blount 14" Wet Tool Grinders.

LATHES

Dalton 6" x 30" Lathe, Type B-4 with c. shaft.
No. 5½ Sloane & Chase Bench Lathe with c. shaft.
18" x 8' Monarch Q.C., D.B.G. Engine Lathe.
17" x 8' Sidney Q.C., 3-step cone, D.B.G. Engine Lathes.
No. 65-E 13" x 6' Seneca Falls Lathe with c. shaft.
No. 34C 13" x 6' South Bend Screw Cutting Lathe.

SCREW MACHINES

No. 2 and No. 3 Foster pl. hd. Screw Machines with Aut. Chuck and Wire Feed.
No. 1-B Foster Un. Turret Lathe with 3-jaw Scroll Chuck, splash guards, belt drive.
No. 3 Foster Friction Hd. Un. Turret Lathe with Aut. Chuck, Wire Feed, and Chasing Bar.
No. 4 Foster Friction Hd. Screw Machine with Aut. Chuck, Wire Feed, and Power Feed to Turret Slide.
No. 1 New Howe Pl. Hd. Screw Machine with Aut. Chuck and Wire Feed.

MILLING MACHINES

No. 38-B Chicago Machine Tool Co. Small Milling Machine with Universal Centers.
No. 1 Standard Hand Millers with c. shaft.
H. B. Smith Hand Miller countershaft.
Wisconsin Hand Miller with vise, arbor and countershaft.

Machinery, Bar Stock, Twist Drills, Dies & Taps For Sale

MACHINE TOOLS.

5—Rickert-Shafer Vertical Tapping Machines (used).
1—Power Hack Saw (used).
1—No. 1 Sheldons Exhauster.
1—Stewart Gas Furnace (used).
1—No. 200 Oil Extractor (new).
6—No. 4 Smurr & Kamen Screw Machines, Auto. Chuck, W.F., B.G. (used).

BAR STOCK.

33,000 lbs. 1⅜" Round C.D. Screw Stock.
1,500 lbs. ¼" Round C.D. Screw Stock.

TWIST DRILLS (Straight Shank)

48—13/16" Left-hand, high speed steel.
18—21/32" Right hand, high speed steel.
36—41/64" Left hand, high speed steel.
12—17/32" Right hand, high speed steel.
108—33/64" Right hand, high speed steel.
84—33/64" Right hand, carbon steel.
191—13/32" Right hand, carbon steel.
59—¼" Left hand, carbon steel.
36—B Right hand, carbon steel.
71—No. 1 Left hand, carbon steel.
48—No. 4 Right hand, carbon steel.
161—No. 6 Right hand, high speed steel.
61—No. 25 Left hand, carbon steel.
50—No. 26 Right hand, high speed steel.
200—No. 27 Right hand, carbon steel.
240—No. 45 Right hand, high speed steel.

DIES AND TAPS.

13—No. 5B Modern Opening Dies (used).
16—Set 1.998"-14 Whitworth Chasers for above heads (new).
4—No. 4B Modern Opening Dies (used).
12—Set 1⅜"-14 Whitworth Chasers for above.
10—No. 4 Manufacturers Equipment Co. Collapsible Taps (used).
15—Set 1.378"-14 Whitworth Chasers for above taps.

The Packard Fuse Co., Ltd.
St. Catharines, Ont. c 13m

If any advertisement interests you, tear it out now and place with letters to be answered.

STEEL BUILDING CRANES

STEEL Building or Coal Shed, 108 ft. by 298 ft., maximum height 40 ft., containing approximately 450 tons of structural steel.

Two Brown Patent Bridge Tramways, hoisting and conveying apparatuses consisting of a bridge tramway with tracks permitting a movement of 300 ft., distance between movable piers 180 ft., with end cantilevers 92 ft. and 36 ft. Each bridge has in its house, Brown Patent Hoisting Engine with the most modern operating mechanism, together with all necessary fittings and connections for complete operation, together with six Brown Patent Automatic Self-Dumping Coal Tubs of 42 cu. ft. capacity; two single rope buckets of 48 cu. ft. capacity; four skips of 2 ton capacity; and also automatic clam shell bucket. Both these outfits are practically in new condition.

New York Machinery Exchange, Inc.

50 Church Street . · . New York City

List of Machinery in Stock for Sale

PRESSES

28—No. 180 Brown & Boggs, Dial Feed.
Without Dial Feed.
6—No. 190 Brown & Boggs, with Dial Feed.
3—No. 1 Toledo, with Dial Feed.
2—No. 01 V. & O. Presses with Roll Feed.
1—No. 18 Perkins Press, Plain.
2—No. 31C McDonald Double Acting Can Press with Magnet Stock Lifter and Auto. Feed.
1—No. 216B Niagara Tool Works Co. Slitting Machine.

FOR 60-PDR. SHELLS

2—Holden & Morgan Thread Millers for base end.
1—Bertram Duplex Thread Miller for nose end.
1—Bertram Copper Band Lathe.
1—Perrin Band Press with Pump.
1—Base Plug Twister (home made).
1—Roll Riveter (home made).
1—5" Shell Vise (home made).
1—5" Marking Head (home made).
1—5" Hand Tapping Vise home made).
1—Waterous Special Rough Turning and Cutting-off Lathe.
1—Jenckes Band Turner.

MISCELLANEOUS

4—Errington Collapsible Taps, 2".
Chasers for above.
1—1¼" Automatic Hartford Screw Machine; in first-class condition.
1—Noble & Westbrooke Marking Machine, only used to mark 200,000 gaines; good as new.
1—P. & W. ⅝" Screw Machine.

FOR 6" SHELLS

3—500-lb. Beaudry Champion Hammers.
4—Sets 6" Shell Nosing Dies for above.
2—De Vilbiss Varnish Sprayers 1 quart size).
Transformer set for above.
1—No. 3 West Banding Press for 6" shell.
4—Greensboro Turret, 24".

All the above are in good condition

McKinnon Dash Company
St. Catharines, Ont.

c11m

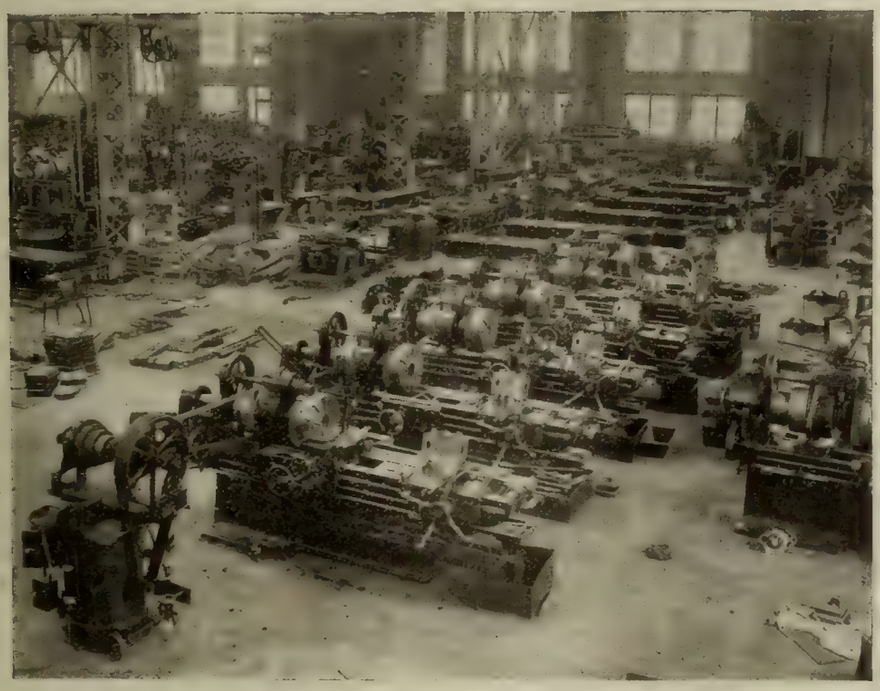
SURPLUS MACHINERY FOR SALE

2—3" Hall cut-off machines
1—Lodge & Shipley Turret Lathe, 22" x 10'
1—Lodge & Shipley Turret Lathe, 24" x 10'
2—Libby Turret Lathes, 18"
1—Gisholt Turret Lathe, 18"
2—Gisholt Turret Lathes, 21"
1—Gardner Shell Base Grinder, 4A
1—Ford-Smith Grinder, 20"
2—Landis Traverse Grinders, No. 4 and 12 x 66
1—Symington Band Turn Lathe, 3"
1—3" Stamping Machine
2—Tate-Jones Shell Furnaces
1—16' Rushwarth Plate Planer
1—16' Bertram Plate Planer
1—Coping Machine

Polson Iron Works, Ltd.
TORONTO, ONTARIO

Re MANUFACTURED
-(ORIGINATED BY US)-
MACHINE TOOLS

Tested Under Belt for Operation and Accuracy and Guaranteed



Showing a "lot" of 24" Gisholts which have been Re-manufactured and are ready for the testing operation. They are tested both for operation and accuracy.

ENGINE LATHES—Latest Models.

24—22" x 8' Hamilton, D.B.G., C.R., Semi-Q.C.
5—22" x 8' Hamilton, D.B.G., Turret tool post,
4—22" x 8' Davenport, D.B.G., Turret tool post,
7—22" x 10' Hamilton, D.B.G., C.R., Semi-Q.C.G.,
2—22" x 10' Hamilton, D. B. G., turret tool post, Semi-Q.C.G.,
20—22" x 10' Davis, D.B.G., C.R., Q.C.G.,
6—24" x 10' Lodge & Shipley, D.B.G., C.R., Q.C.G.,
8—24" x 10' Lodge & Shipley, Selective Gd. Hd., C.R., Q.C.G.,
11—26" x 10' American, D.B.G., C.R., and carriage turret, Q.C.G.,
2—26" x 10' American, D.B.G., Carriage turret,
19—26" x 12' Putnam, carriage turret, semi-Q.C.
9—26" x 12' Putnam, C.R., Semi-Q.C.,
2—26" x 12' Wickes, D.B.G., C.R., Semi-Q.C.G.,
10—28" x 10' Niles, Bement, Pond, D.B.G., Q.C.G.
4—28" x 14' Lodge & Shipley, Select. Gd. Hd., motor drive, C.R., turret and taper.
3—30" x 16' Lodge & Shipley, D.B.G., C.R., turret and taper,
10—40" x 18' Pittsburgh, triple geared, Q.C.G.,

TURRET MACHINES—Latest Models.

18—21" Gisholts, 3½" hole, 2-step, 5" belt.
25—21" Gisholts, 3½" hole, for motor.
13—24" Gisholts, 4¼" hole, 3-step, 4" belt.
38—24" Gisholts, 6" hole, 2-step, 6" belt.
37—24" Gisholts, 6" hole for motor.
2—2¼" x 26" Greenlee Flat Turrets.
2—2½" x 26" Pratt & Whitney Gd. Hd. Turrets,
4—3-A Warner & Swasey (bar machines).

OUR GUARANTEE

Your money back if you return a machine within 30 days from date of shipment, freight prepaid.

NO EXCUSES NECESSARY.

RADIAL DRILLS

3—2½' Fosdick.
2—2½' Mueller.
1—2½' Dreses.
1—3' Prentice.
1—3' Mueller.
1—3½' Gang.
1—4' Niles Full Univ.
3—5' Niles Semi-Univ.

MULTIPLE DRILLS.

1—8-spindle Valley City.
1—12-spindle Baush.
1—24-spindle P. & W.

SHAPERS

1—15" Hendey Friction Shaper.
1—16" Perkins Friction Shaper.
2—16" Barker Plain Crank.
1—24" Gould & Eberhardt Back Geared Crank.
1—24" Queen City Back Geared Crank.
1—48" Morton Draw Cut.

PLANERS

1—22" x 22" x 5' Flather.
1—22" x 22" x 6' American.
1—24" x 24" x 4' Gray.
2—24" x 24" x 5' Gray.
1—24" x 24" x 6' Cincinnati.
1—24" x 24" x 10' Lodge & Davis.
1—26" x 26" x 6' American.
1—26" x 26" x 7' Gray.
1—26" x 26" x 7' Gray, 1 head.
1—30" x 30" x 7' Powell, 4 heads.
1—32" x 32" x 8' Gray, 2 heads.
1—32" x 32" x 10' Gray, 2 heads.
1—48" x 48" x 16' Pond, 2 heads.

MILLING MACHINES

2—No. 5 Brainard.
1—No. 3 Brainard Plain.
1—No. 20 Oesterlein Universal.
1—No. 1½ Brown & Sharpe Universal.
1—No. 25 Becker Plain.
1—No. 2 Cincinnati Universal.
1—No. 5 Schuchardt & Schutte Plain.
1—No. 3 Hendey Plain.
4—No. 2 Pratt & Whitney Lincoln.
1—60" x 48" x 8' Ingersoll Slab.
1—Beaman & Smith, 2 vert. hds., 1 hor. cross bor. hd.
1—No. 2 Beaman & Smith Combination Hor. and Vert.

HILL, CLARKE & CO. OF CHICAGO

625 WASHINGTON BLVD., CHICAGO, ILL.

If any advertisement interests you, tear it out now and place with letters to be answered.

IMMEDIATE DELIVERY

DRILLING MACHINES

Leland H.S., B.B., bench type.
No. 1½ Knight Driller and Miller.
32" Hamilton, s.h., b.g., p.f.
32" W. F. & J. Barnes, s.h., b.g., p.f.
20" W. F. & J. Barnes, 4 spindle.
No. 11 P. & W. Multiple, 10 spindles.
3' W. E. Gang Plain Radial.
3½' W. E. Gang Plain Radial.
4' Mueller Plain Radial.
Pawling & Harnischfeger Horizontal Driller.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. automatic.
30" x 9" G. & E. auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3—26" B. & S. for spur.
36" Walcott for spur.

GRINDERS

Yankee Drill.
No. 1-½ Cincinnati Cutter and Tool.
No. 2 Woods Universal Cutter and Tool.
No. 23 B. & S. Gear Cutter.
No. 1 Brown & Sharpe Universal.
14" x 20" B. & S. Plain.
Garvin hole grinder.
Gisholt tool grinder.
No. 5 Diamond water tool.
No. 16 Gardner disc grinder.
No. 24 Gardner disc grinder.

LATHES

13" x 5' P. & W., c.r., taper.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
18" x 8' L. & S. pat. head, c.r. taper.
18" x 10' Fitchburg, c.r.
18" x 12' Barker, c.r.
20" x 14' Blaisdall, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
36" x 20' American, t.b.g.
36" x 22' New Haven, t.b.g.

PLANERS

24" x 24" x 4' Gray, one head.
24" x 24" x 8' Cincinnati, one head.
26" x 26" x 8' Pease, one head.
30" x 30" x 8' Woodward & Powell, one head.
30" x 30" x 8' Cincinnati, two heads.
36" x 36" x 14' Sellers, one head.
40" x 38" x 14' Putnam, one head.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES

No. 1 Foster, Plain, A.C. and W.F.
1" B. & S. Plain.
16" P. & W. Plain.
No. 2 Costello, plain head.
No. 2 P. & W. friction head.
No. 4 Pearson, geared head.
No. 3 Bardons & Oliver, plain head.
⅞" Cleveland, automatic.

TURRET LATHES

No. 22 Garvin.
16" Lodge & Shipley.
25' Niles.
2 x 24" Jones & Lamson.
3 x 36" Jones & Lamson, chucking equipment.
3 x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt turret lathes, taper attachment.

PUNCHES AND SHEARS

No. 3 American Can.
No. 3 Bauroth, O.B.I.
No. 5 Bauroth Geared, O.B.I.
No. 6 N. American Can.
No. 2 L. & A. Angle Iron Shears, 5"x5"x½" (new).
No. 5 L. & A. Double Punch & Shear, ⅝"x⅝", 3"x⅝", 1⅛ rd. (new).
No. 1 L. & A. Multiple Punch (new).
No. 1 L. & A. Horizontal Punch, ½" in 1" (new).

MISCELLANEOUS

No. 0 Mitts & Merrill Keyseater.
50-lb. Bradley Strap Hammer.
¾" Acme Forging Machine.
52" Niles car wheel boring mill.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-ton Yale Duplex Hoist.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., CHICAGO, ILL.

We Have for Immediate Delivery the Following Second-hand Machinery in Good Operative Condition

1 Landis No. 3 Universal Grinder 12" x 42", complete equipment, less internal grinding attachment. . $1,500

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $2,200

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $1,800

These machines are particularly good value, and may be seen at our works.

A. B. JARDINE & COMPANY
HESPELER, ONT.

MACHINE TOOLS IN STOCK

No. 4 Cincinnati Universal Miller with Vertical Attachment and Power Feed Rotary Table.
No. 3 LeBlond Universal Miller.
No. 3 Kempsmith Plain Miller with Index Heads and Vertical Attachment.
4—No. 1½ NEW American Plain Millers.
5—No. 0 NEW Steptoe Hand Millers.
24" x 10' NEW Carroll-Jamieson Heavy Duty Lathe.
6—19" x 8' NEW Sidney, D.B.G., quick change, swing 21" over V's.
3—17" x 8' NEW Sidney, D.B.G., quick change, swing 19" over V's.
1—15" x 6' NEW Sidney, D.B.G., quick change, swing 17" over V's.
12—17" x 8' NEW National, quick change.
1—15" x 6' NEW Carroll-Jamieson, quick change.
48" Harrington Plain Radial Drill.
36" Dreses Plain Radial Drill.
D-4 Colburn High Duty Drills.
3—20" Rockford High Duty Drills.
1—28" NEW Superior Sliding Head Drill.
2—25" NEW Superior Drills, with tapping attachment.
16" Queen City B.G. Shaper.
20" Cincinnati B.G. Shaper.
24" NEW Steptoe B.G. Shaper.
24" Flather B.G. Shaper.

FRANK TOOMEY, INC.
127-131 North Third St., PHILADELPHIA, PA., U.S.A.

LOOK—HERE THEY ARE

BORING AND TURNING MACHINES—VERTICAL.

1—30" Bullard, 1 turret head.
1—30" Flather, one turret head.
1—36" Bausch, 2 swivel heads.
2—36" Brown & Sharpe, one turret head; Dec. delivery.
1—42" N.B.P., two swivel heads, motor drive.
1—New 42" Gisholt, 2 heads.
1—54" Colburn, two swivel heads.
1—72" Niles, two swivel heads.
1—72" Bickford, two swivel heads.
1—80" Niles, two swivel heads, slotting attachment.
1—84" Sellers, one head.
1—90" Vertical Cylinder.
1—New 8' Bickford; December delivery.
10' Niles, 2 heads; December delivery.

BORING MACHINES—HORIZONTAL.

1—Lucas, 2¼" bar.
1—No. 1 Barrett Cylinder Borer, 3¾" bar type.
1—Newburgh 4" bar, 84" swing, 72" feed.
1—No. 2 20" Barrett, 2 facing heads.

BULLDOZERS.

1—New No. 4 Garrison (same as No. 4 Williams-White).
1—No. 7 High-speed Ajax, 16" stroke.
1—No. 9 Williams & White, belt drive.
2—No. 23 Williams & White, belt drive.
1—No. 26 Williams & White, belt drive.

COMPRESSORS—AIR.

1—Ingersoll-Sargent Duplex, 8 x 14½ x 8".
1—Cincinnati Cross Compound, two-stage, 790 cu. ft.
1—10" x 12" Chicago Pneumatic, belt-driven.
1—10" x 10" x 10" Single Cylinder Smith-Valle, steam-driven.
1—22" x 13" x 16" Ingersoll-Rand, motor driven.

CRANES.

2—10-ton Electric, 47' span.
1—50-ton Nile, 61' span.
1—Locomotive, 35' boom, standard gaged, steam driven.

CUTTING-OFF MACHINES.

2—No. 00 Brown & Sharpe.
1—2" capacity Warner & Swasey.
4—3½" Hall.
10—4½" Williams.
3—4" Curtis & Curtis.

DRILLING MACHINES—RADIAL.

2—New 2' American, cone drive.
1—3' Bickford, semi-Universal table.
1—3' Bickford, gear drive.
3—New 3' Americans, sensitive tapping attach.
1—New 3' Mueller, plain speed, box drive.
1—New 3½' Western Drill, 86" circle.
2—4' Mueller, plain, speed box drive.
1—5' semi-universal American.
1—6½' American full Universal.
1—6' Baush Plain, cone driver.
New 6' Triumph, motor drive; September delivery.

DRILLING MACHINES—HEAVY DUTY.

4—No. 310 Baker Brothers.
2—New No. 2 Colburn.
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
2—D3 Colburn, plain table.
4—No. 310 Baker, single pulley drive, late type.

DRILLING MACHINES—MULTIPLE SPINDLE.

4—New Leland-Gifford, sensitive, four spindle.
1—No. 30C Baush, 12 spindle, capacity 1⅛" holes, 30" circle.
1—14-spindle Baush, capacity 1" holes, 36" circle.

GEAR-CUTTING MACHINES.

1—No. 1 Whiton.
1—No. 3 Barber-Colman Hobber.
1—No. 3 Bickett Gear Rack Planer, delivery 60 days.
1—No. 3 Brown & Sharpe Auto. Gear Cutter, Spur.
1—New 6" Standard Gear Cutter, Spur.
1—12" Gleason Bevel Gear Planer.
1—16" Gleason Bevel Gear Planer.
1—16" Bilgram Bevel Gear Generator.
1—20" Grant-Lee Gear Hobber.
1—No. 1 20" Schuchardt & Schutte Gear Hobber.
1—22 x 8 G. & E. Spur and Bevel Cutter.
1—24" Fellows Gear Shaper.
1—24 x 8" G. & E. for Spur and Bevel.
1—24" Becker Brainard.
1—New Flather, solid pattern, 30" Automatic Gear Cutter.
1—New No. 10 Whiton, Bevel 32", Spur 34".
3—36" Fellows Gear Shapers.

GRINDERS—UNIVERSAL FOR CUTTERS, DRILLS, REAMERS, ETC.

1—No. 1 Cincinnati.
1—New Norton No. 1.
1—New Walker No. 1, outfit B.
1—New Walker No. 2, outfit K (capacity 9" x 26").
1—New Wilmarth & Morman, style B.K.
8—No. 190 Wells.
1—Gisholt No. 5, 12".

GRINDING MACHINES—CYLINDRICAL—PLAIN.

1—New No. 12 Brown & Sharpe, 8" x 26", Sept. delivery.
1—New 10 x 36" Landis; immediate.
1—New 10" x 36" Norton, Sept. delivery.
1—New 10" x 50" Norton, Sept. delivery.
1—10" x 60" Landis.
1—New 10 x 72 Norton, Plain.
20—12" x 24" Modern, self-contained.
1—12" x 32" Landis, rebuilt.
6—12" x 36" Modern, self-contained, motor or belt driven.
2—12 x 42" Landis, self-contained.
6—12" x 48" Modern, self-contained, motor driven.
1—16" x 66" Landis, with crank grinding.
1—18" x 96" Brown & Sharpe.

GRINDING MACHINES—CYLINDRICAL—UNIVERSAL.

1—Brown & Sharpe No. 13, 8" x 24".
1—New No. 2 Bath, 9" x 20".
1—No. 2 New Walker, 9" x 26".
1—No. 1½ (10" x 30") Landis.
1—New No. 2½ (10" x 36") Bath.
1—10" x 42" Modern.
9—New No. 2 Morse, cap. 12" x 30", Universal, Nov. delivery.
1—No. 3 (12" x 40") Brown & Sharpe.
1—10" x 42" Landis.
2—New No. 3 Modern, 13" x 40", Sept. delivery.

GRINDERS—INTERNAL.

1—No. 1½ Landis.
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—CYLINDER.

1—No. 27 Brown & Sharpe.
1—No. 60 Heald, single pulley drive.

GRINDERS—PROFILE.

1—New Cleveland.

GRINDERS—RING.

1—New No. 14 Beasley, two-ring chucks.
1—No. 200 Heald.
1—No. 210 Heald.

GRINDERS—SURFACE.

1—New No. 1 Wilmarth & Morman.
1—No. 1 Diamond, capacity 12" x 12" x 24", automatic.
2—New No. 1½ Walker's, complete.
4—New No. 2 Reid (same as B. & S.).
1—New No. 2 Brown & Sharpe.

HAMMERS—POWER—FORGING.

1—40-lb. Bradley Helve.
1—150-lb. Bradley Helve, upright.

HAMMERS—BOARD LIFT—DROP.

1—400-lb. Billings & Spencer.
1—2,000-lb. Chambersburg.

HAMMERS—STEAM—FORGING.

1—Used 600-lb. Niles Single Frame.
1—350-lb. Bell Single Frame Hammer.
1—18" Morgan & Williams, 600 to 800 lbs., 21" cap.
1—New 2,000 lbs. Morgan Single Frame.
1—3,000 lbs. Morgan Double Frame.

KEYSEATERS.

2—No. 0 Mitts & Merrill.
1—No. 2 Mitts & Merrill.
1—60" stroke Compton Knowles Broacher.

LATHES—MANUFACTURING—NOT SCREW CUTTING.

2—New No. 3 Harding Brothers Bench Lathe.
14—Reed-Prentice Shell Lathes, for 4" or 18 lbs. American shells.
70—New Simplex, 15" x 8'.
13—No. 3X Reed-Prentice, semi-automatic.
40—14" x 6' Reed Stud and Bolt.
5—16" x 8' Fairbanks-Morse, heavy duty.
14—16 x 8 Simplex, Single Pulley Drive.
22—18" x 8' Battle Creek, heavy duty.
5—20" x 8' Merschon.
50—20" x 10' Hindman, high duty.

LATHES—ENGINE.

1—8" Wade Precision; September delivery.
1—14" x 6' Bradford, taper attachment.
1—New Harding Brothers 15" Precision Lathe, quick-change gear, page 35, third catalogue.
3—New 16" x 6' Cleveland Tool Room Lathes, complete equipment.
2—16" x 6' LeBlond, pan bed, quick-change gears, taper attachment.
1—New 17" x 8' National, quick-change gears.
1—18" x 8' Lodge & Shipley, geared head, taper.
3—18" x 9' Chard.
1—18 x 10 Hendey, quick-change gear, 14" chuck.
1—New 19" x 8' LeBlond, heavy duty.
22—20" x 8' Lodge & Shipley, quick-change gear.
7—New 20" x 8' American, heavy duty.
1—New 20" x 10' Cleveland, geared head.
25—New 21" x 10' Porter, single back geared.
5—New 22 x 10' Monarch, double back geared, Q.C.G.
9—22" x 10' Putnam, oil pan turrets.
3—24" x 10' Reed.
2—24" x 12' S. & B.
4—24" x 14' American, quick-change.
1—24" x 14' Lodge & Shipley, patent head.
1—24" x 24' Perkins, single back geared, raising blocks to 40", 18" chuck.
1—24" x 45" x 22' McCabe, double spindle.
1—26" x 24' New Haven.
4—27" x 14' Patent Head Lodge & Shipley, double back geared.
1—28" x 18' New Haven, single back geared.
1—28" x 18' Schumacher & Boye.
1—New 30" x 14' American, Double Back Geared, Quick Change.
3—New 32" x 12' Pittsburg pattern.
8—New 36" x 24' Putnam, triple geared.
1—38 x 19' Steptoe, single back gear.
1—50" x 12' American, Gear Head, Quick Change.
1—71" x 20' Fifield, triple geared.

LATHES—TURRET.

1—3" x 36" Jones & Lamson, geared sliding head.
5—2 x 24 Jones & Lamson.
18—6A Potter & Johnson.
1—New 21" Gisholt.
1—New 24" Gisholt.
1—24" Sibley.

MILLING MACHINES—KNEE TYPE—UNIVERSAL.

1—No. 2 Kempsmith, 13", dividing head.
1—No. 2 Kempsmith, vertical attachment.
1—New Kempsmith.
1—No. 2 Kempsmith, back geared.
2—No. 3 Cincinnati, late model; almost new.
1—New No. 3 Kempsmith.
2—New No. 3 Becker, August delivery.
1—New No. 4 LeBlond, heavy duty; immediate.

MILLING MACHINES—KNEE TYPE—PLAIN.

1—No. 0 Pratt & Whitney.
1—New No. 1 Brown & Sharpe.
2—New No. 1 Kempsmith.
2—New No. 1½ American, back gear.
1—New No. 2 Rockford.
2—New No. 3 Kempsmith.
1—No. 3 LeBlond.
1—No. 3 Cincinnati.
1—No. 4 Garvin.
1—Used No. 4 Brown & Sharpe.

MILLING MACHINES—VERTICAL.

1—New Bickett, No. 0.
4—New No. 4B Becker.
2—No. 5 Becker.

MILLING MACHINES—PLANER TYPE.

1—No. 2 Beaman & Smith, vertical spindle, open side.
2—Ingersoll Slab Millers, working surface of table 60" x 20".
1—No. 4 Beaman & Smith, vertical spindle, open side, working surface of table 120" x 24", removable housing on one side.

PLANERS.

1—24" x 24" x 6' Gray, one head on cross rail.
24" x 24" x 8' Cincinnati, one head; used three months.
1—26" x 26" x 8' Gray, one head on cross rail.
1—30" x 30" x 8' Gale Planer, one head.
1—30" x 30" x 12' Cincinnati, two heads.
1—36" x 30" x 12' New Haven, one head.
New 36" x 36" x 12' Bickett, one head; January del.; additional heads if desired.
2—New 36" x 36" x 12' Woodward & Powell, two heads on cross rail, one side head; Oct. delivery.
1—36" x 36" x 12' Gray, two heads.
1—36" x 36" x 14' Sellers, four heads.
1—40" x 40" x 11' Niles, four heads.
1—Gray, 42", widened to 56" x 42" x 16, two heads.
New 48" x 42" x 16' Bickett, one head; January delivery; additional heads if desired.
1—48" x 48" x 16' Sellers, one rail head, two side heads.
1—50" x 14' Powell, one head.
1—50" x 52" x 16' Betts, two heads, right angle drive.
1—54" x 42" x 16' Woodward-Powell, 2 heads.
1—56" x 42" x 16' Graves, two heads.
1—32' 6 Niles Plate Planer.

SCREW MACHINES—AUTOMATIC.

3—No. 51 National Acme.
1—No. 515 National Acme.
2—No. 52 National Acme.
2—No. 53 National Acme.

SHAPERS.

1—New 16" Springfield.
1—16" Motor-driven Rockford.
2—New 24" Milwaukee.
1—New Barker, 24".
1—30" Walcott, gear drive.

SLOTTERS.

1—12" Bement Gear.
1—18" Betts, Adjustable Stroke.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 549 Washington Blvd. **CINCINNATI, OHIO** 1018 Union Central Life Bldg. **CLEVELAND, OHIO** 508 Leader News Bldg. **NEW YORK CITY** Singer Bldg.

WRITE OR WIRE OUR NEAREST OFFICE FOR QUOTATIONS
THIS IS ONLY A PARTIAL LIST OF AVAILABLE MACHINES

MacLEAN'S FOR SEPTEMBER

is a magazine of the very best type and rank. It is made for Canadians, and so has a value and appeal to Canadians possessed by no other magazine in the world. MACLEAN'S circulation is getting greater each month. It is now 50% larger than a year ago. The inference is inevitable.

Northcliffe

Lord Northcliffe will be a contributor to the September MACLEAN'S. The general theme of his article will be Canada's position at the present time in relation to the war and to the Empire afterwards. Be sure to read what the brilliant and dominant man has to say about our country. Get an outsider's viewpoint.

MacLean

John Bayne MacLean, publisher, editor, publicist, clear-seeing and far-seeing, has another strong article in the September MACLEAN'S. Colonel MacLean has proved himself to be as clear-sighted as Kitchener in many matters pertaining to the present war; and he is doing a needed work now in THE FINANCIAL POST and other newspapers, to arouse Canadians to a proper sense of the perils that lie ahead.

Ronald

Another smuggling revelation!

A certain Canadian town offered a big bonus to a factory. An American supplied the desired factory, smuggled into Canada the whole plant required,—and was afterwards found out and brought to book. J. D. Ronald tells the whole amazing story in the September MACLEAN'S. Mr. Ronald is contributing to MACLEAN'S a series of Canadian "inside" smuggling stories—true ones. This is great stuff.

Leacock and Laut

Stephen Leacock and Miss Agnes C. Laut are contributors as usual to the September MACLEAN'S. Leacock's humor is bubbling, sparkling and refreshing—like spring water. Miss Laut provides another of her well-informed vigorous, and revealing articles on a phase of the war in relation to Canada and the United States. Miss Laut makes us think and wonder!

Jacobs and McGrath

W. W. Jacobs contributes one of his inimitable short stories to the September MACLEAN'S. "Their Wives Went Along." Harold McGrath, world famous story-writer, who wrote "The Man on the Box," provides a complete novelette. It is a story of adventure and mystery.

Allenson and Moorhouse

A. C. Allenson contributes a short story, "A Flutter in Diamonds;" and Hopkins Moorhouse, "Their Tents like the Arabs." These two men are Canadians—winning fame, and adding lustre to Canada's record for producing short story writers of the first-class.

Hendryx

James B. Hendryx's serial, "The Gun Brand," continues in the September MACLEAN'S. A great story of the Canadian Northwest. The Movie-makers are filming Hendryx's work. So you can be sure that he's writing the right sort of stuff.

Women and Their Work

This is the title of a new department in MACLEAN'S. In the September issue, this department will contain:

Reducing my household cost.

The Care of the Child—an article by Dr. George E. Smith.

A sketch of Mrs. W. M. Davidson, a prominent Western woman, engaged with her husband in editing the Calgary Albertan.

Cooking the Cheaper Cuts,—an article on economy in the kitchen.

This new department will prove of first-class interest to all women.

Review of Reviews

One of the best liked and most valuable features of MACLEAN'S MAGAZINE is its Review of Reviews Department where the best and most significant articles appearing in current literature are condensed for the busy reader, and for the one who wants to know what other magazines are printing. Here one gets a cross-section of the world's best thought.

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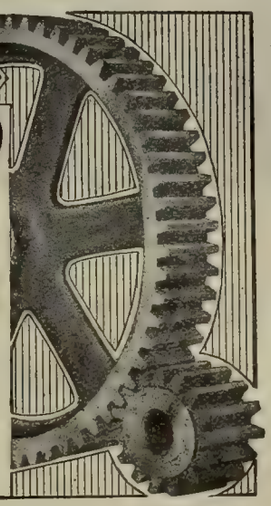
Hamilton, Ontario

CUT GEARS

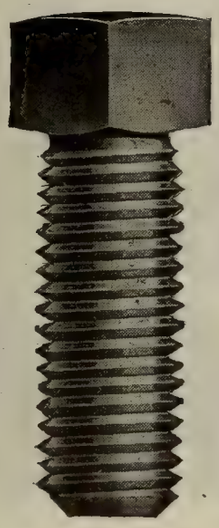


Rawhide — Steel — Brass — Cast Iron

Try our W-G Rawhide Silent Gear. Designers and Builders of Special Machinery.

Winnipeg Gear & Engineering Co.
197-199 Princess St., Winnipeg, Man.

ACCURACY



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Prompt service and "G A L T" quality goods only.

Specialists in Gap and Set Screws.

THE
GALT MACHINE SCREW CO., LIMITED
GALT, ONTARIO

Eastern Representatives: The Canadian B. K. Morton Company, Limited, 49 Common St., Montreal, Que.

We Make GAUGES and TOOLS

All Work Executed Promptly and Guaranteed

THE MONARCH BRASS MFG. COMPANY, LIMITED

71 BROWNS AVE. - - TORONTO, ONT.

An Interesting Installation of Chapman Double Ball Bearing Transmission

Illustration shows a portion of the installation at the new Dominion Steel Products plant at Brantford, Ontario, where the entire transmission equipment—shafting, hangers and ball bearings—is Chapman Double Ball Bearing Transmission.

This plant was laid down for special war-time manufacturing, but the entire equipment was installed with a view to ultimate economical and efficient production in the general manufacturing field.

That this was an important factor in choosing Chapman Double Ball Bearing Transmission gives us no small amount of satisfaction.

That Dominion Steel Products should instal Chapman Transmission because they were convinced of its efficiency is one reason why you, too, should investigate. We have on file many similar reasons.

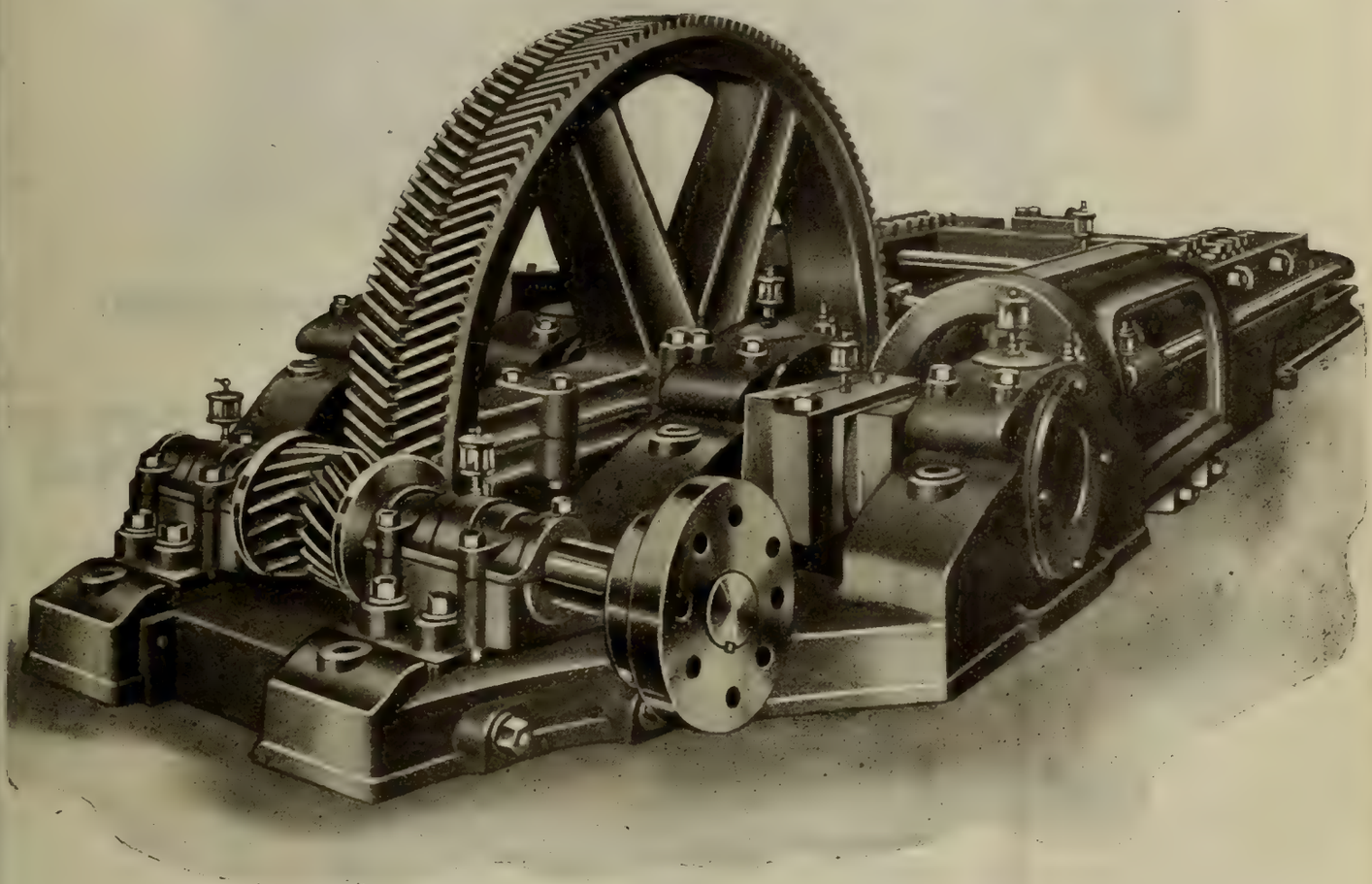
The Chapman Double Ball Bearing Company, Limited

339-351 Sorauren Ave., Toronto, Ont.

TRANSMISSION BALL BEARING CO., Inc.

1050 Military Road, Buffalo, N.Y.

Hydraulic Pumps



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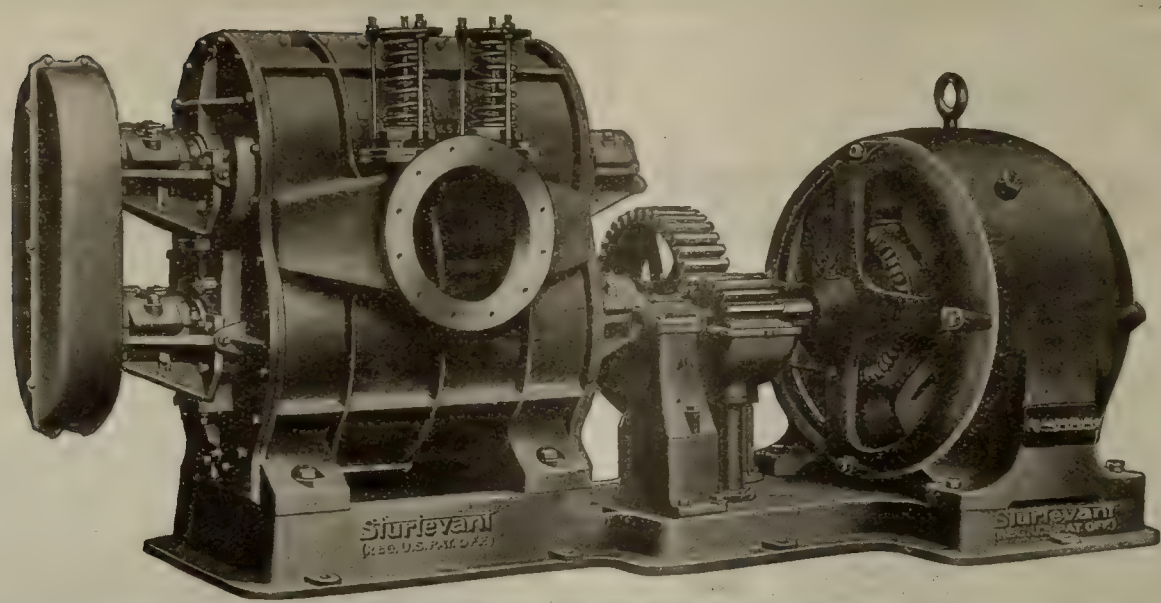
Standard Machinery & Supplies, Ltd., 260 St. James Street, Montreal, Canada

Representatives for the Province of Quebec.

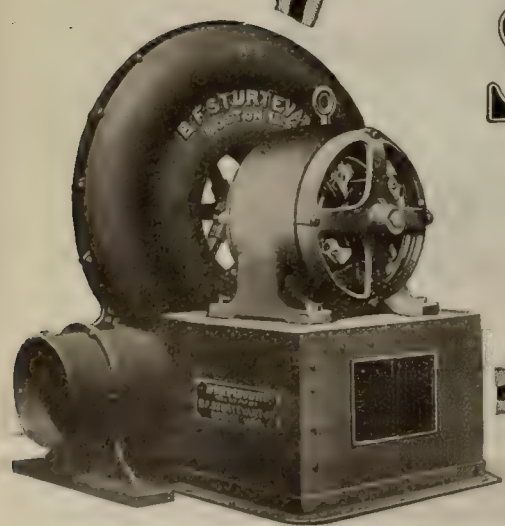


FOUNDRY BLOWERS

What Type Shall I Install?

THE particular blower to meet the conditions in your own foundry can be furnished by Sturtevant. We do not make just one type of blower and recommend it for any or all conditions. On the other hand, we have a complete line which comprises various types of High Pressure Positive Blowers and Centrifugal Steel Pressure Blowers. For this reason we can make recommendations without prejudice.

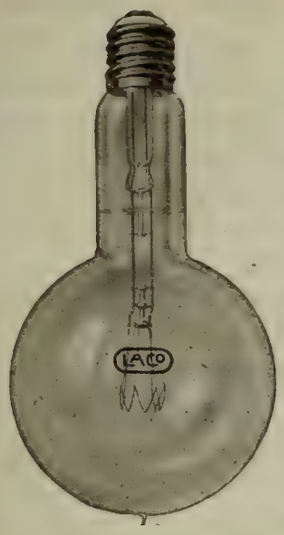
Why not dictate a letter now to our engineering department, giving details of your conditions.



Sturtevant

(TRADE MARK)

B. F. STURTEVANT COMPANY
of Canada Limited
GALT, ONTARIO
Montreal, Toronto, Winnipeg, Vancouver



Wherever Wheels are Turning or Machines are Operating—

THE output during the short fall and winter days—and during the night-shifts—depends largely upon proper lighting.

Twenty-four hours of daylight would certainly increase your output, consequently, securing a clear, white light, one most closely approximating daylight—one that does not cause eye strain—one that will tend to develop all-around efficiency—one that gives greatest candle power with least current consumption—**the life of which is insured**—Such is the light you want in your plant.

"The Light That Gives More Light"—

THE LACO-NITRO LAMP

is the ONE light that meets ALL these requirements.

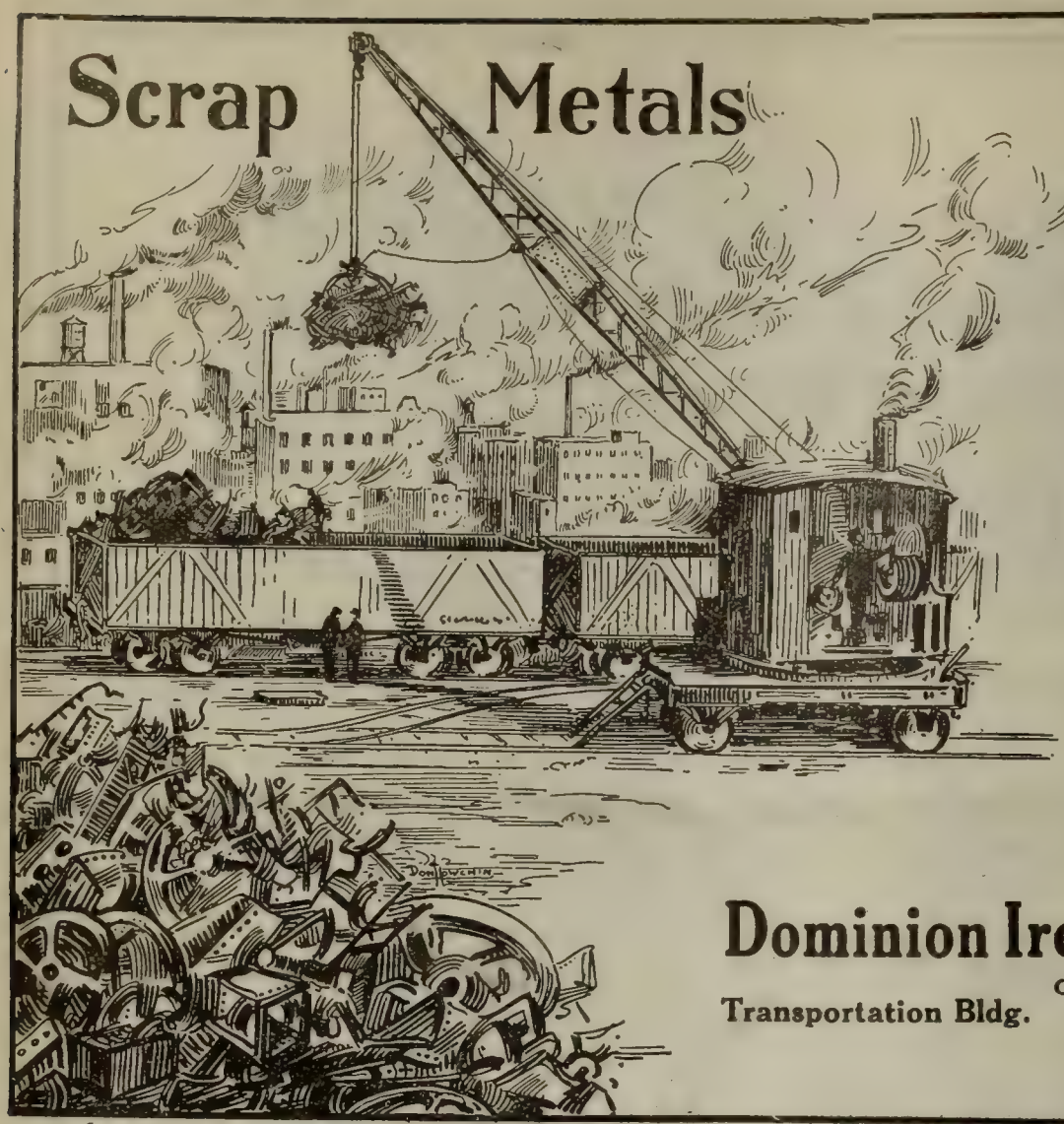
We offer in the Laco-Nitro Lamp a tungsten filament in a nitrogen gas filled bulb. This lamp represents the highest development of the tungsten lamp. The tungsten filament in the nitrogen filled bulb gives a clearer, whiter light and greater candle power per watt than any other type lamp.

Inquire from your local dealer.

Stocks available at Montreal, Toronto, Winnipeg, Vancouver Warehouses.

THE CANADIAN LACO-PHILIPS CO., Limited

MONTREAL TORONTO WINNIPEG VANCOUVER



Scrap Iron, Steel and Metals

No undertaking is too large for us. We are Scrap Metal Specialists, and can co-operate with you in the dismantling of railway equipment, bridges, plants, steamers, mills and will take your rails and machinery.

Shell Makers. We can take care of all your scrap materials, at highest prices.

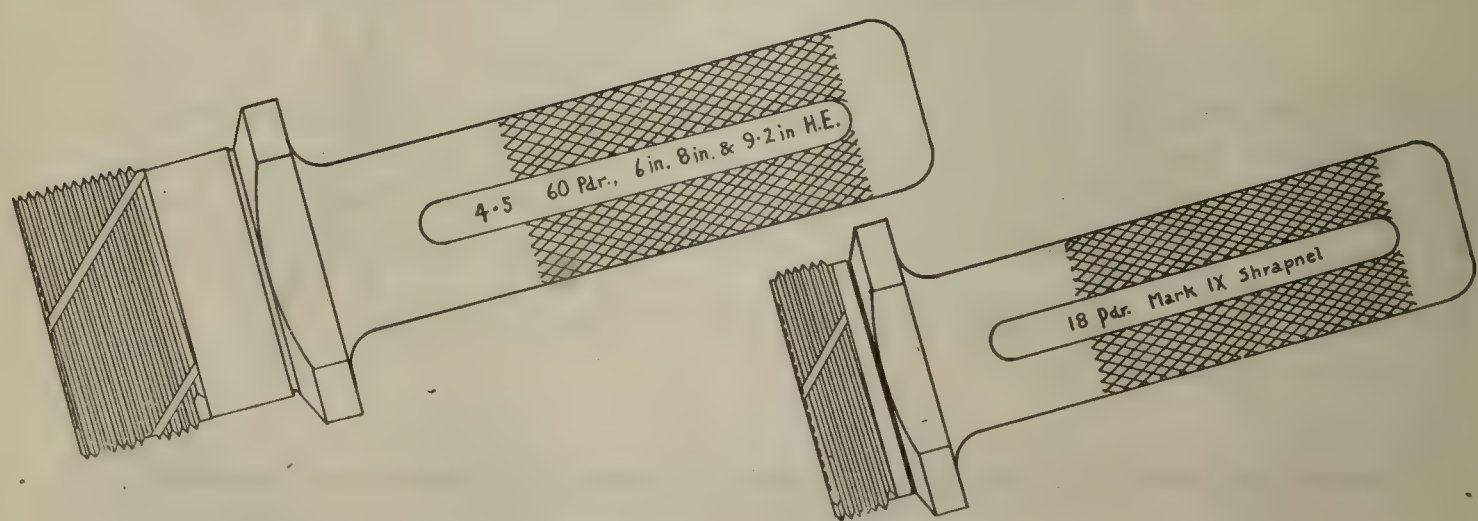
Give us particulars and we will relieve you of all worry.

Dominion Iron & Wrecking Co.

LIMITED

Transportation Bldg. General Offices: Quebec, Que. Montreal, Quebec

FUSE HOLE GAUGES



Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

BUY A **UNION** TOOL CHEST

and be assured of a place for every tool. You know immediately if one is misplaced or borrowed. Keeps tools clean, safe, free from moisture.

Plain or quartered oak, or leatherette covered, correctly designed, drawers perfectly fitted.

Write for Catalog and Prices

UNION TOOL CHEST WORKS
28 Railroad Street, Rochester, N. Y.

Style A

The comfortable kind. For shell work and military service

The Albex Eye Protector (Style A1), is widely used by munition machinists and grinders in the United States. It is also accepted and authorized by the United States War Department and British War Office for protecting the eyes of troops from dust, glare, sun, wind, etc.

Specifications: Rustproof metal construction, adjustable bridge, detachable elastic headband or flexible cable earbows, ventilated leather sideguards, and 1⅞-inch (micoquille) lenses in amber, fieuzal, smoke, or clear. Can be worn over other glasses. Look for the name WILLSON stamped on inside of bridge. Per pair, $1.25; per dozen, $9.60, including strong metal cases. Details for the asking.

T. A. Willson & Company., Inc., 23 Scott Street, Toronto
Factory and Main Offices, Reading, Pa., U.S.A.

Chicago	San Francisco	London
Mallers Building	Head Building	9 Hatton Garden

VENUS 10¢ PENCIL

TODAY the first thought of the engineering world is the VENUS Pencil.

Before new factories can be started, before the making of munitions can begin, before the wheels of any industry can turn—designs and drawings must be made, and for this exacting service VENUS PERFECT PENCILS are supreme, being world renowned for smoothness, uniformity and durability.

You have 17 VENUS black degrees to choose from, ranging from 6B softest to 9H hardest, *and hard and medium copying.*

For satisfaction be sure to specify VENUS, look for the VENUS watermark finish, and accept no substitutes.

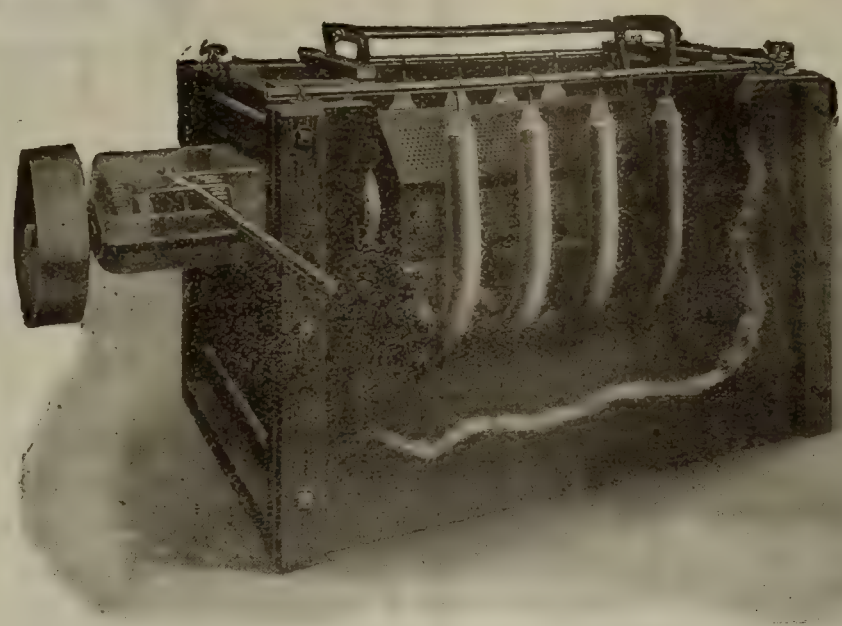
VENUS ERASER *Superfine Quality* *Rubs out Cleanly and Easily*
Will not soil or streak. 12 SIZES, FROM 100 TO BOX, TO 4 TO BOX. BOX PRICE $2.00

FREE

This trial box with five VENUS Drawing Pencils, Holder and VENUS Eraser sent *free.* Write for it.

American Lead Pencil Co.
238 Fifth Avenue New York
and Clapton, London, England

Mechanical Electro-Plating Apparatus



The C. H. & V. W. Mechanica Electro-Plating Apparatus Type B. Gear Drive.

Modern in every detail, particularly adapted for electro-plating quantities of small work in bulk. Saves time, labor and material. Write for Bulletin No. 113.

Oblique Plating Barrel Apparatus

These machines are made in four sizes; they are smaller and less expensive than the Type B. A wonderful aid in plating screws and other small articles. Write for Bulletin No. 116.

We manufacture everything for *Polishing and Plating of Metals.*

CONSULT US AND REDUCE YOUR COSTS

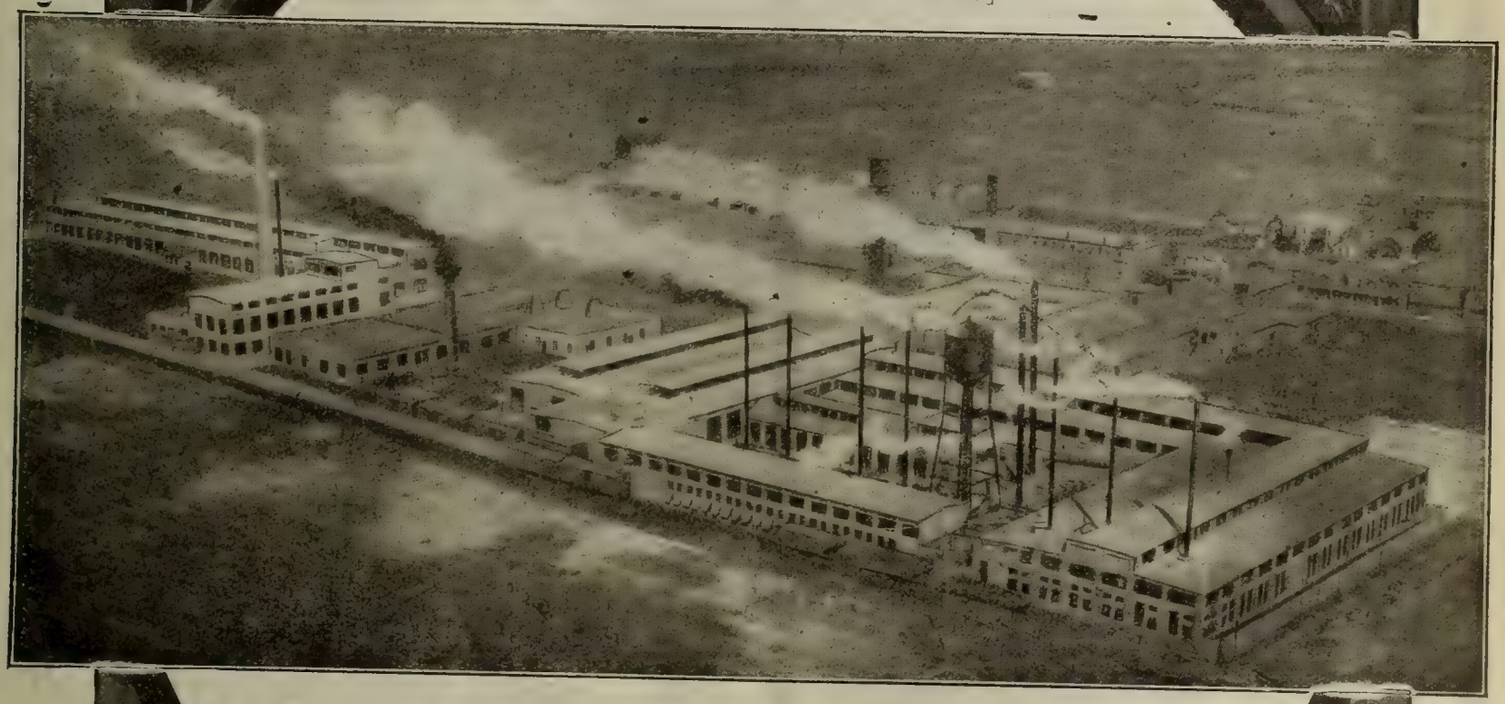
CANADIAN HANSON & VAN WINKLE COMPANY, LIMITED

TORONTO - - CANADA

BROWN'S

BEAVER BRAND METALS

BRASS, BRONZE,
CANADA SILVER and GILDING METAL
In Sheets, Rolls, Plates and Rods

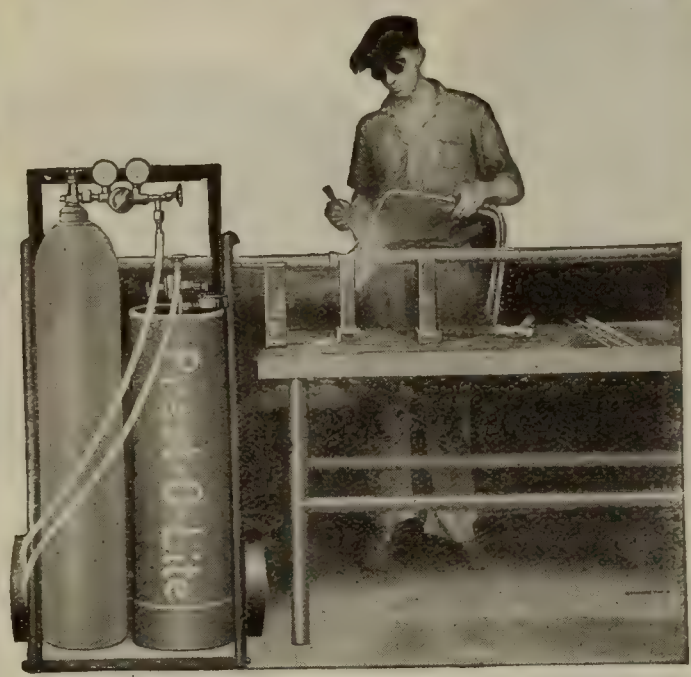


Brown's Copper & Brass Rolling Mills, Limited

General Offices and Works:
New Toronto, Ontario, Canada

COPPER & BRASS
BROWN'S
QUALITY
ROLLING MILLS

Oxy-Acetylene Welding and Cutting



Operator welding a broken crank shaft "on the spot," at a cost of only 50c by the Prest-O-Lite process, preventing a serious loss of time and production.

Offset the High Cost of Materials by Speeding Up Your Output and Avoiding Waste

The Prest-O-Lite welding process is now profitably used by thousands of factories, machine shops, mines, railroads—in fact wherever metal or machinery is produced, moulded, shaped or used.

If you are interested in making your plant more profitable—reducing operating costs and effecting economies that will offset the high cost of materials and enable you to speed up, investigate **now** what the Prest-O-Lite Process of Oxy-acetylene welding will do for you.

For repair work alone, it more than pays its way, and in many lines of manufacture it has become firmly established as standard routine method.

Prest-O-Lite PROCESS

employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene (ready made carbide gas) is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker [illegible] and lower operating cost.

Apparatus consists of an equal pressure blow pipe, automatic regulators and gauges, and all necessary equipment. Adaptable for oxy-acetylene cutting by the addition of special cutting blow pipe.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

Write for valuable illustrated literature and data on work others are doing by the Prest-O-Lite Welding Process. It may point out ways to solve your problems. Address Dept C-107.

THE PREST-O-LITE COMPANY, INC.
CANADIAN GENERAL OFFICES:
913-14 C.P.R. Building TORONTO

Direct Factory Branches: Toronto, Ont: Montreal, Que.; Merritton, Ont.: Winnipeg, Man.
Canadian Plants: Toronto, Ont.: Merritton, Ont.: Winnipeg, Man.; Shawinigan Falls, Que. (under construction.)

World's Largest Makers of Dissolved Acetylene

Are Your Men Filing Away Time?

You pay for and expect to get results—with men as well as with tools.

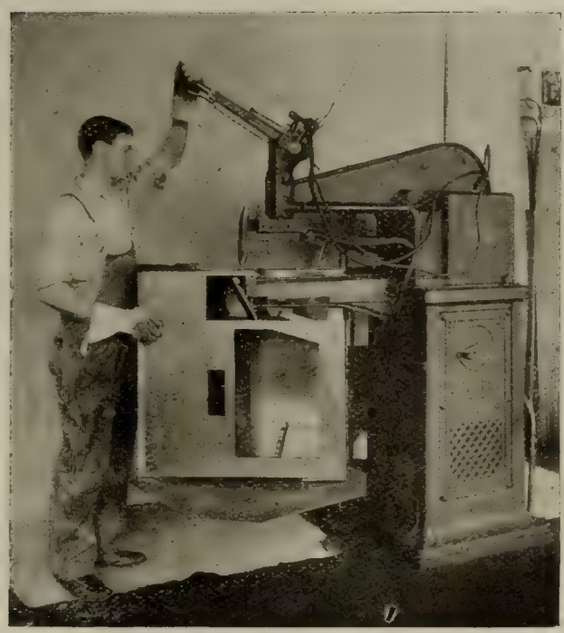
A good mechanic working with a "Famous Five" file is the unbeatable combination for filing

The file is hard, and sharp, and will last for a long time. The mechanic knows this and is encouraged to do his best because he has a good tool.

Almost all purchasing agents now specify "Famous Five" Files when ordering. They are Standard quality tools.

Electric Spot Welding

WINFIELD Welding has taken the place of riveting in a large number of shops. It is electric welding developed to top-notch efficiency, made applicable to all classes of work, and lowered to rock-bottom costs.



Makes Riveting a "Back Number"

ONE man can spot weld more than ten men can rivet, and do it better, too.

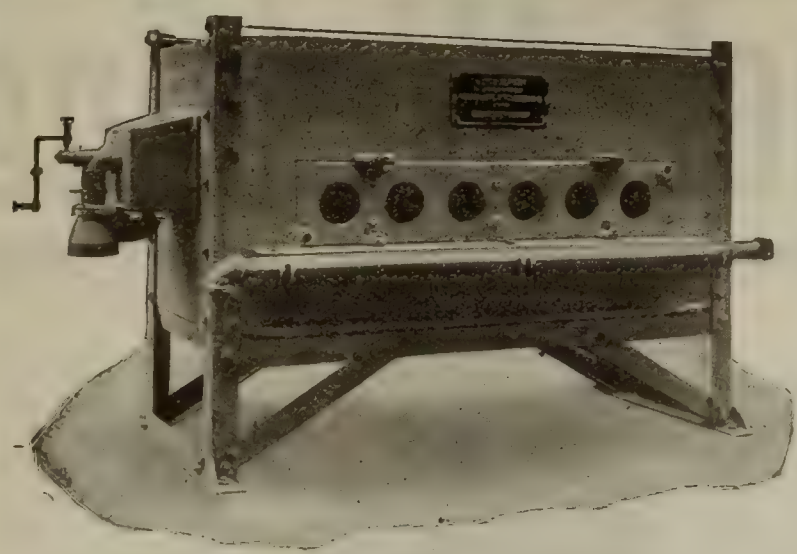
We want the opportunity to show you how it can be done. Send us a blueprint or a sketch of what you make and you'll quickly receive our proposition with facts and figures that convince.

The Winfield Electric Welding Machine Co.

WARREN, OHIO -:- -:- U.S.A.

31 Ottawa Bank Building, Montreal, Que.

If any advertisement interests you, tear it out now and place with letters to be answered.



"MECOL"

6" Shell End Nosing Furnace

We manufacture furnaces for all purposes to be used with any kind of fuel

The Mechanical Engineering Company, Ltd.

THREE RIVERS, QUE., CANADA

Welding Outfits —— Cutting Outfits

OXY-ACETYLENE WELDING
DAVIS
APPARATUS
DAVIS-BOURNONVILLE CO. N.Y.

Leads the world for range, efficiency and volume of apparatus in successful use.

"Davis Apparatus" offers the widest range of equipment made for employing to its greatest value the oxy-acetylene process of welding and cutting—backed by the longest service, the most extensive experience, and the greatest development in apparatus and in application.

It is employed by the most prominent concerns in the iron and steel and metal working industries, and was awarded the highest honors at the Panama-Pacific International Exposition—two Medals of Honor (higher award than the Gold Medal) and a Gold Medal.

To Obtain the Best Results Use "D-B" Welding Supplies with "D-B" Equipment.

To make a successful weld, it is as necessary to have high-grade welding supplies as it is to have efficient apparatus and competent labor. To obtain the best materials, buy them from concerns known to be familiar with these requirements.

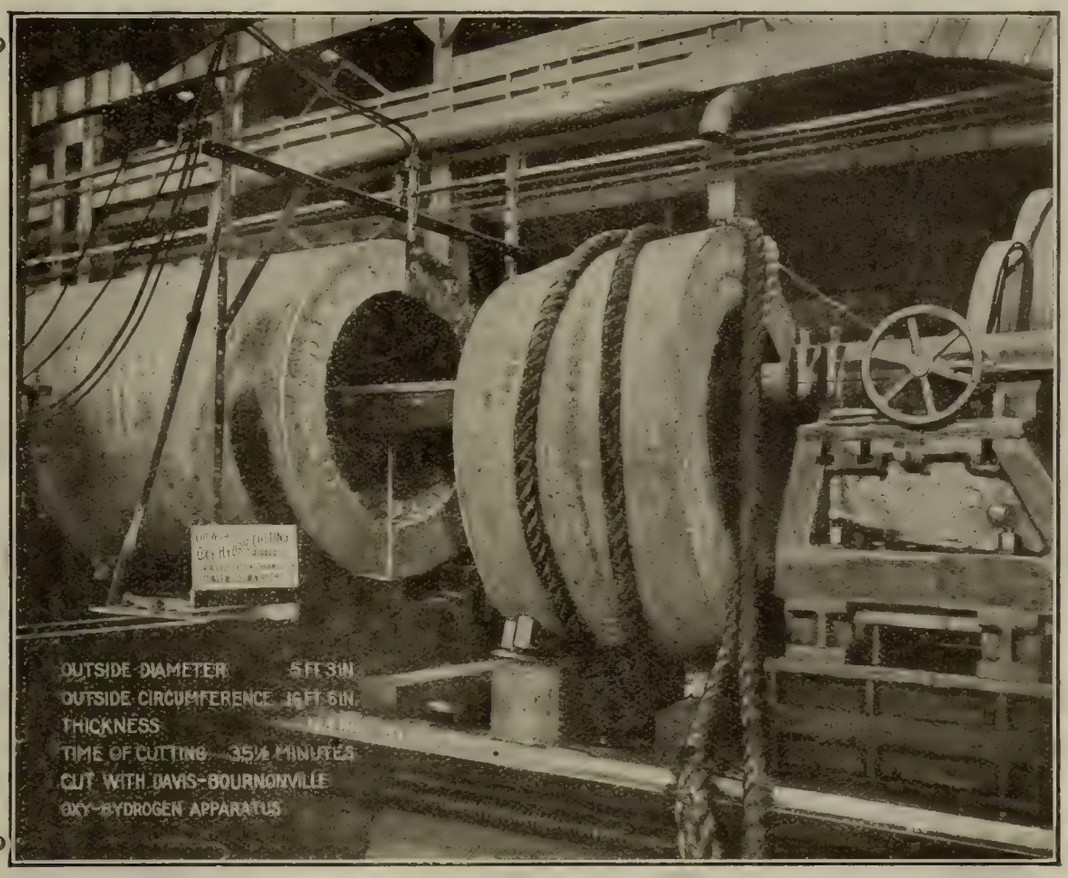
Davis-Bournonville oxy-acetylene welding rods and fluxes are manufactured after our own analyses and specifications—the result of many years of experience in this field.

Carter Welding Company of Toronto, Ltd.

Canadian Agents
9 Sheppard St., Toronto

50,000 lbs. 5-ft. 3-in. diameter. 9½-in. thick.

How Did They Cut It In 35½ Minutes?



(Photo by New York Shipbuilding Corp.)

It was cut with a torch and gas flame — Davis - Bournonville Oxy-Hydrogen Cutting Apparatus—in the New York Shipbuilding Yards; a cast steel rotor 14½ in. thick at the head, 5 in. thick at the foot, **9½ in thick and 5 ft. 3 in. diameter** where it was cut —cut slick and clean, as shown in the illustration, in **35½ minutes' cutting time.** It would have taken many hours, and been a considerable problem by any other method. Davis-Bournonville Oxy-Acetylene and Oxy-Hydrogen Apparatus is applied successfully to the problems in metal working, and is in use by most of the big metal-working concerns—foundries, steel mills, ship yards, navy yards, locomotive and car shops, munitions plants, sheet metal-working factories, etc. Make inquiry about it, or write us.

"Davis Apparatus" Leads the World in Range, Efficiency and Number of Successful Users.

DAVIS-BOURNONVILLE COMPANY

General Offices and Factory, JERSEY CITY, N.J.

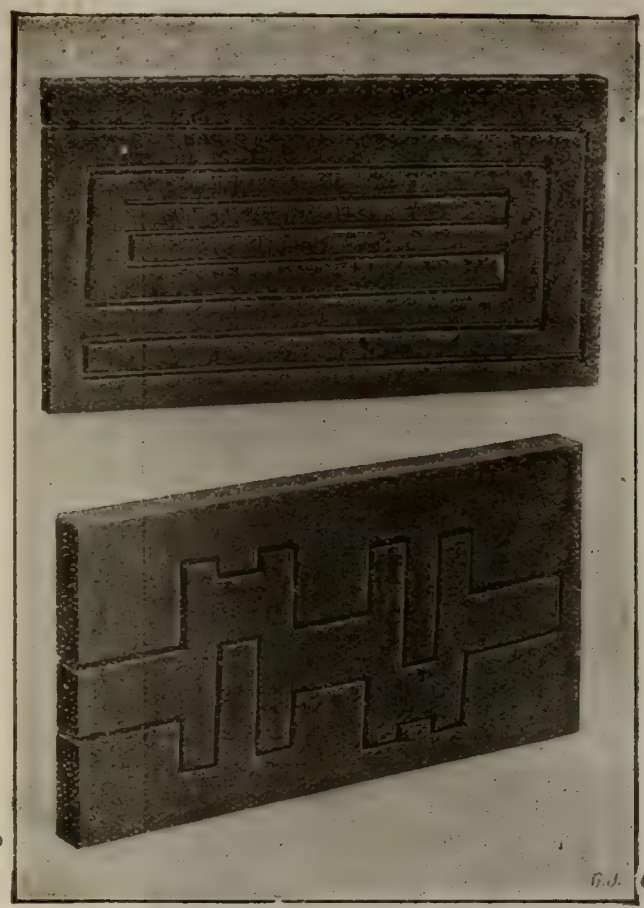
CARTER WELDING COMPANY, *GENERAL DEALERS* TORONTO

Canadian Factory, NIAGARA FALLS, ONTARIO

New York Boston Chicago Detroit
Philadelphia Pittsburgh St. Louis Seattle
Cleveland Cincinnati San Francisco Toronto

OXY-ACETYLENE WELDING DAVIS APPARATUS DAVIS-BOURNONVILLE CO. N.Y.

Cutting Iron and Steel by Oxy-Acetylene Process



Examples of Cutting by an "A.L.S." Oxycutter.

Wherever the Cutting of Iron and Steel is necessary, this method is universally adopted, with a **Saving of Time, Money and Labor.** An "A.L.S." Oxy-Acetylene Welding Outfit may be instantly converted into a complete cutting unit by the addition of an "A.L.S." Oxycutter.

For Cutting manholes and portholes in Steel Plates; Burning off rivet heads before driving out rivets; and hundreds of other similar purposes, the Oxy-Acetylene Process is more economical and efficient than any other method, and sometimes performing work otherwise impossible.

WHY NOT LET US TELL YOU HOW MUCH YOU CAN SAVE?

Many firms have not yet realized all that Oxy-Acetylene Welding and Cutting will do for them. You may be one of them. If so, write to-day, we shall be pleased to give you all the information necessary to enable YOU to judge how much YOU may benefit by the Process. An ordinary purchaser of an Outfit saves the cost many times over during a year, many save the cost on the first job. Is this not worth investigation?

A few minutes of your time will enable us to put before you the result of years of experience.

L'AIR LIQUIDE SOCIETY

Canadian Factories:

MONTREAL **TORONTO** **WINNIPEG**

HALIFAX (under construction)

Quality Quantity *Guaranteed*

Write US About Your Acetylene Supply

Commercial Acetylene Welding Co., Inc.

ATLANTA, GA.
AURORA, ILL.
BOSTON, MASS.
BOUND BROOK, N.J.
EAST DEERFIELD, MASS.

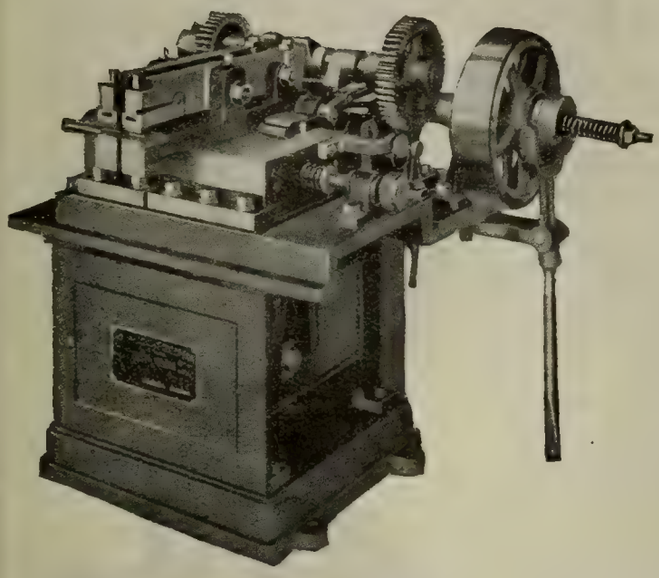
103 Bay Street, Toronto

Main Office
80 Broadway, New York

TORONTO, ONT.
SAN FRANCISCO, CALIF.
MOBERLY, MO.
W. BERKELEY, CALIF.

Thomson Process
Electric Welding

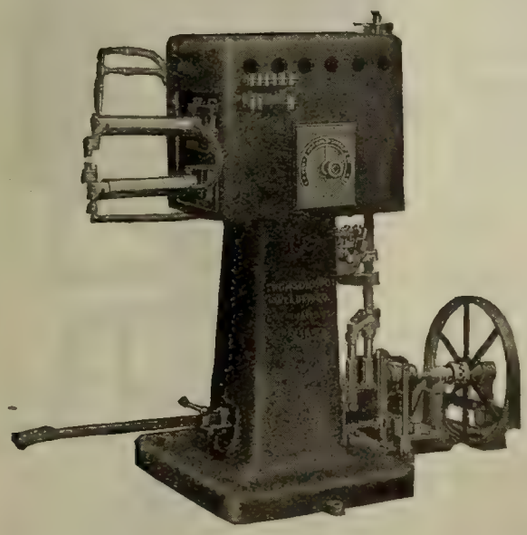
One Operator Merely Feeds



This Machine

This type of Thomson Electric Butt Welding Machine takes care of welding of small duplicate pieces, such as rings, buckles, etc., from the moment the operator places the piece in the clamping die until after the weld is made. A power-driven cam shaft tightens the clamps, turns on the current, applies the welding pressure, cuts off the current and releases the clamps after the weld is made. It can turn out 900 to 1000 welds per hour.

Send for Bulletin B-4



Noise Doesn't Always Mean Speed

When you hear the rattle and bang of a riveting shop—you think it means speed—but does it? Notice carefully how long it takes to rivet a small section—then go into a shop using the Thomson Spot Welder—no noise, no dirt, no danger, just quiet, efficient work that means speed. You will see one man at a Thomson Spot Welder doing five times as much work as by the old method, and the welds hold better than the rivets.

We will prove the efficiency and speed of our machines any time you say. Our catalog fully describes our entire line of spot welding machines. Where shall we send YOUR copy?

Send for Bulletin S-4

Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

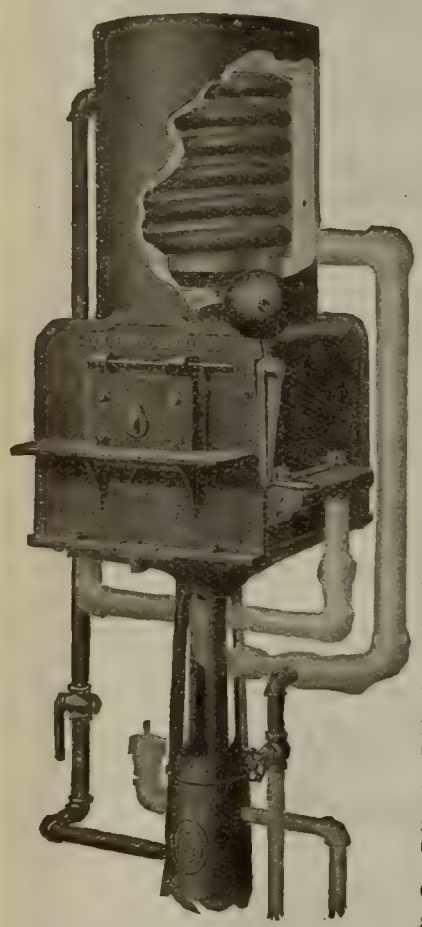
Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

If any advertisement interests you, tear it out now and place with letters to be answered.

These Two **TATE-JONES**

Improved Portable Gas Oven Furnaces will Prove Money Savers in any Plant



Series A--Recuperative

For Temperatures of 900 deg. to 1600 deg. Fahr. Uses Natural or Artificial Gas. Low or positive pressure for Hardening Carbon Steel, preheating or reheating High Speed Steel.

For tool room or manufacturing purposes, this furnace is not only economical in its fuel saving features, but lends itself to various uses up to its temperature capacity.

It has been proven by scientific working tests that the recuperative device saves as high as 25% in fuel. It saves time and delivers a better finished product.

The interior of the oven is especially constructed so that 100% of both the radiant and radiated heat is thrown to the work. This is really 50% more than can be obtained from other furnaces.

The fire brick and specially molded tile are the best obtainable for the purpose. We use one inch of a special insulation that is equivalent to nine inches of fire brick in the prevention of heat loss. The outer casing of the oven is made of cast iron and boiler plate. The recuperator is constructed entirely of cast iron, sheet steel and high grade fire brick. The coil is 1¼" wrought iron pipe, so placed that no direct vent heat can strike it. This assures long life.

This line of furnaces has many points of economy and ease of operation that are more apparent in use than in the illustration.

Sizes and complete specifications upon request. Ask for Bulletin 160-C.

SERIES H.

For temperatures 1600 deg. to 2400 deg. Fahr. For hardening High Speed Steels. Uses Artificial or Natural Gas at 1 1-2 to 2 1-2 lbs. pressure. Especially valuable for hardening fine cutting tools and manufacturing uses.

The loss of heat by radiation is practically negligible because of the high quality as well as the particular kind of linings used. The 1" of special insulation is equivalent to 9" of fire brick (same as used in series A furnaces).

Because it requires no live heat to keep it in temperature equilibrium, it makes all the heat delivered, available for work. This, naturally, effects a big saving of fuel.

The outer casing of the furnace is cast iron and boiler plate. The door, owing to the slant construction, is always tight to the front; it overlaps, top, bottom and sides—all of which prevents leakage. There is no friction in opening the door. Raising it a fraction of an inch frees it from the front—when it rises straight up.

As a Pyrometer is absolutely essential in hardening high speed steels we supply A Pyrometer Bracket especially designed for this furnace. For preheating high-speed steels use Tate-Jones Series A Furnace (described on the left).

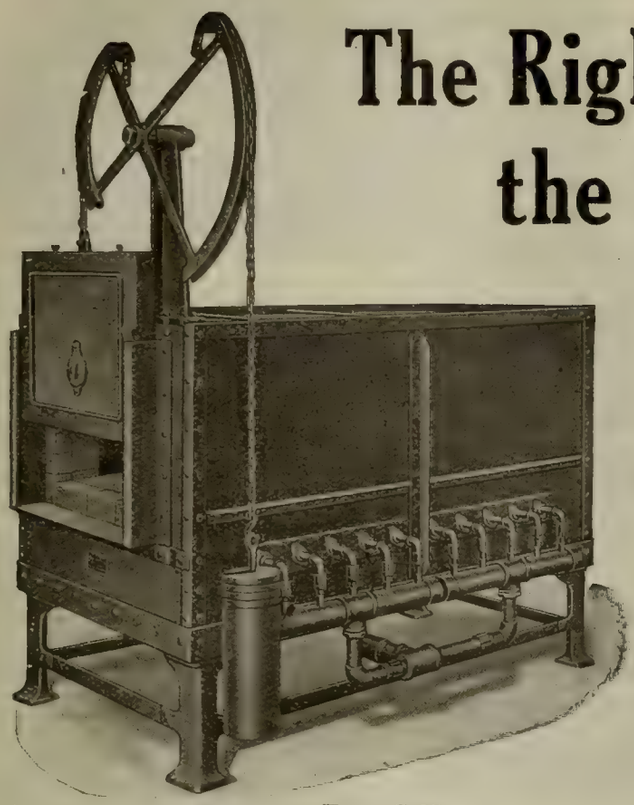
This Series H furnace can be supplied recuperative also, which means a saving of as much as 25% of fuel.

Sizes and complete specifications upon request. Ask for Bulletin G-7-C.

TATE-JONES & CO., INC., Furnace Engineers

PITTSBURGH, PA., U.S.A.

The Right Heat is Easy with the Right Furnaces



Type C-25

Gilbert & Barker Furnaces are the right furnaces. Over half a century's experience in burning liquid and gaseous fuels for treatment of metals gives us the confidence to make this statement.

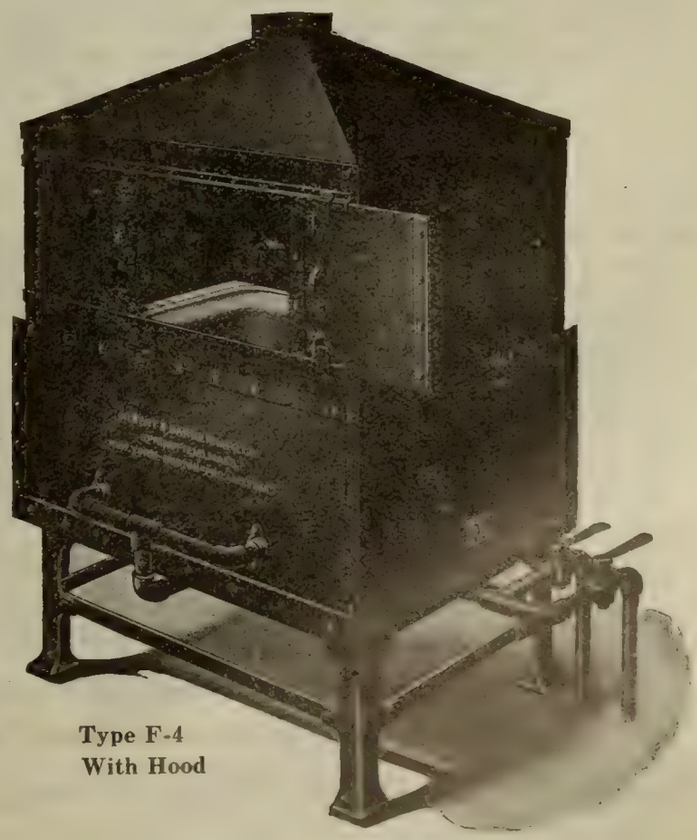
We maintain an engineering department through which we will be pleased to offer you the benefit of these years of experience. Its service is free to you. Our business is to increase the efficiency of your forging and tempering rooms—put your heat-treating problems up to us.

Gilbert & Barker Gas and Oil Fuel Furnaces

are made in over a hundred different styles and sizes. There is one type that will meet your conditions *better* than any other—and we make it.

No matter how exacting your work may be, if you have tempering, hardening, annealing, case-hardening, etc., to do, there is a type and size of G. & B. furnace to *best* meet your conditions.

Get catalog 24 which gives details.



Type F-4
With Hood

Gilbert & Barker Mfg. Co.

West Springfield, Mass.

Canadian Agents:

WILLIAMS & WILSON, Limited, Montreal, Que.
JAMES DeVON 227 Davenport Rd., Toronto, Ont.

The St. Lawrence Welding Company, Ltd., Montreal, P.Q.

Office: 138 Inspector Street Works: 59 Olier Street Telephone: Office, Main 5779, Manager's Res., Westmount 3483

Consulting Engineers on all kinds of welding. Breakdown repairs handled at once, just 'phone us and we will be on the job by next train.

Oxy-Acetylene Welding of heavy cast iron frames, cylinders, gears, water wheels, etc.

Steel, any kind of welding on parts of large or small machines, tanks, digesters, boilers, shafts, brackets, etc., can be welded in place when necessary.

Electric welding on boilers, digesters, leaking tanks, etc.

Marine repairs undertaken by our Marine Welding Tug which is equipped with Electric and Oxy-Acetylene Welding Apparatus with Compressed Air Plant complete.

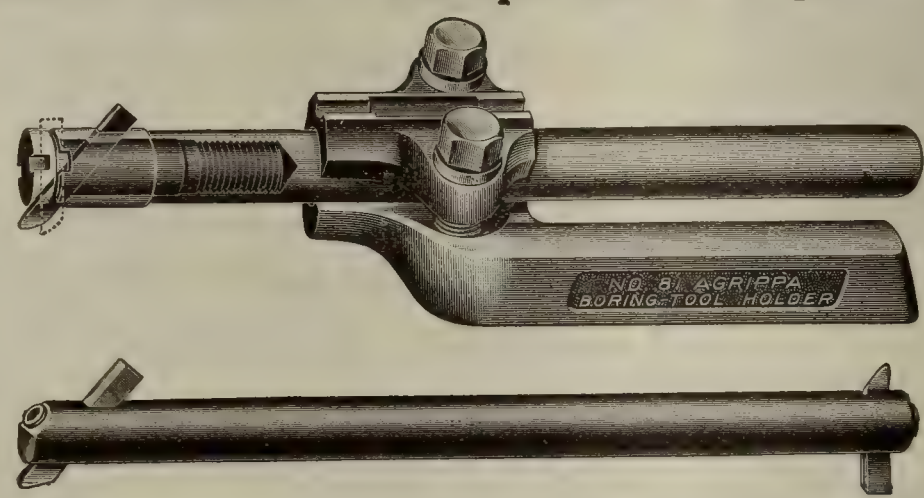
Oxy-Acetylene cutting of any kind of steel construction.

Portable Welding Apparatus of all kinds with trained operators always available to repair your breakdown at once.

THE ST. LAWRENCE WELDING COMPANY, LTD., MONTREAL

Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, Etc. Electric Welders, Oxy-Acetylene Welders. Boiler Repairs. Lead Burning and Brass Foundry Work.

Williams' "AGRIPPA" Multiple Bar Boring-Tool Holder Stops Waste



ALL "AGRIPPA" TOOL HOLDERS CAN BE SHIPPED PROMPTLY

ITS sleeve bar cap admits a straight or angular cutter; and you can quickly insert either at the business end of the bar without removing the cap or disturbing the setting of either the bar or the holder.

You need neither make nor buy any bushings hereafter, for the "twin screw" fastenings of "AGRIPPAS" within their range accommodate any bar section you may have handy.

Now's the time to begin saving—caps, bushings and time!

Procure your tool holder text book here or from your dealer and learn the many other economies afforded by

Williams' Grand Prize "AGRIPPA" Tool Holders

"THE HOLDERS THAT HOLD"

Western Office and Warehouse
40 S. Clinton Street
Chicago, Ill.

J. H. WILLIAMS & CO.
THE WRENCH PEOPLE
45 RICHARDS STREET BROOKLYN, N.Y. CITY

Quality alone is our measure of "AGRIPPA" Tool Holder Value

The Oven Equipment & Manufacturing Company

NEW HAVEN, CONN.

"CRAWFORD SECTIONAL" OVENS

Heated with our Enclosed Flame Gas Burners, or Electricity

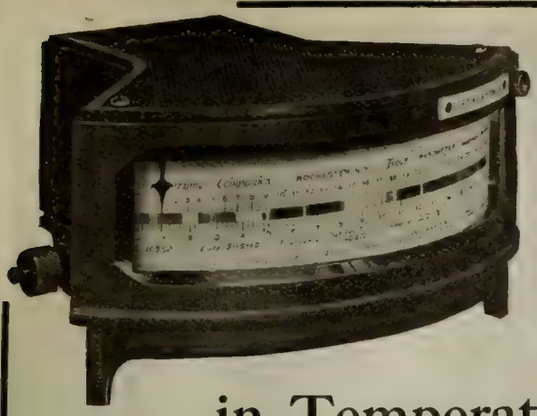
FOR BAKING JAPANS AND OTHER FINISHES ON METAL.

Ovens carried in stock and built to meet requirements of manufacturers.

Builders of All-Steel Oven Trucks with Roller Bearings.

Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.

ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER



If You have a Problem in Temperature

Let us consult with you. Tell us your requirements and let us help with your proposition. We manufacture temperature instruments for all departments of metallurgy and chemistry, standard apparatus of precision, reliability and permanence.

Tycos Fery Radiation Pyrometers.

Rare Metal Thermo-Couples Cover 1000° to 2500°. These instruments have repeatedly proven themselves equal to the most severe conditions. Their ruggedness, sensitiveness and accuracy fit them for any service in range. Send for "**Booklet 4000.**"

Base Metal Thermo-Couples Ranges from 200° to 1000° and 300° to 1800°. Practical, accurate shop tools requiring no special skill or intelligence in operation. Write for booklet, "*Tycos* Cambridge Pyrometry."

Taylor-Cambridge Division

Taylor Instrument Companies

Rochester, N. Y.

201 Royal Bank Bldg., Toronto, Can.

TESTED

There are many conditions to consider when installing a furnace. Among these there are two that stand out prominently at the present time: The cost of operating the furnace and the cost and scarcity of fuel.

The semi-muffled furnace illustrated here is the best solution we know to the problem. Its cost in operating is greatly reduced because of the small amount of fuel required. Among the many other features are: Perfect combustion, no formation of any oxidizing elements, the flame is not visible in muffle and does not come in contact with material; retains heat for a long period.

Our line of furnaces is complete. We would be pleased to send you our catalogue and full information upon request.

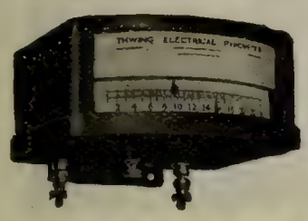
JULIUS C. HINZ, President

Bellevue Industrial Furnace COMPANY

703 Bellevue Ave. Detroit, Mich.

Canadian Representative:

H. W. PETRIE LTD. - Toronto, Canada



Insuring Accurate Temperature Measurements

THWING

HIGH RESISTANCE MULTIPLE RECORD

PYROMETERS

are instruments of exact precision. Yet they have the rugged durability to withstand hard usage in the toolroom, the steel mill, and similar places.

Thwing Instruments are furnished in either the Indicating or Recording style, giving as many as twelve readings on a single recorder.

Our New Catalog No. 8 covers the entire line. Send for copy.

Canadian Representative:
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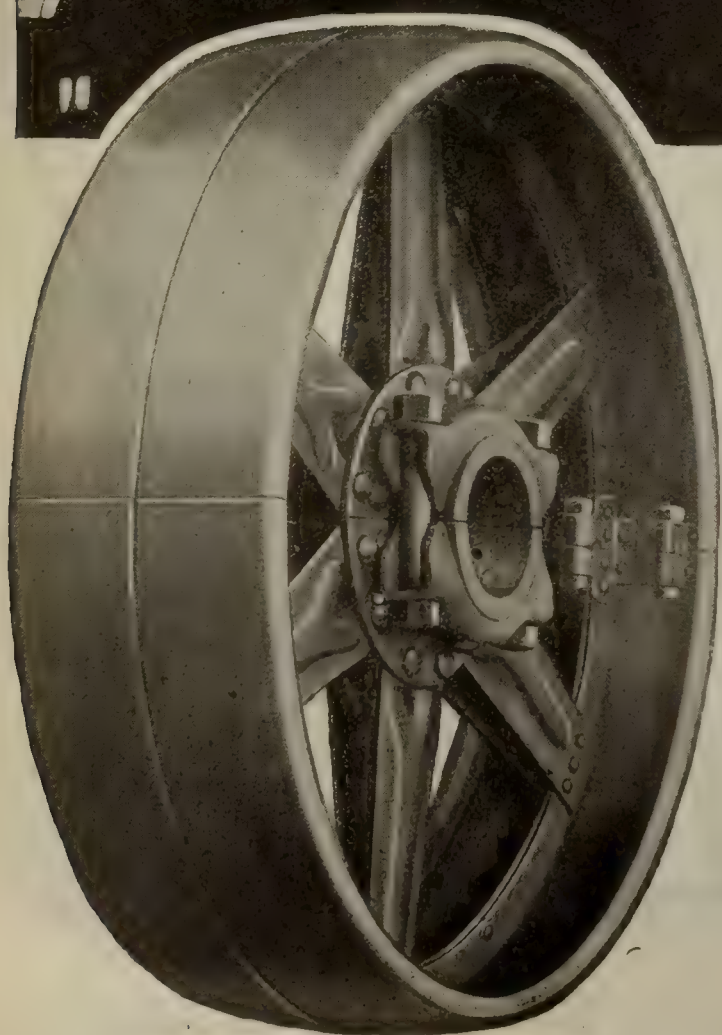
Thwing Instrument Co.

34th Street and Lancaster Ave., PHILADELPHIA, PA.



Idle Machines — and Men

Pulley breakdowns are costly—men and machines idle during replacements. You can't afford to use pulleys that break down.

But belt slip frequently eats up more power and money than a manufacturer dreams of. It not only eats up power but produces heat that takes the oil out of the belts and shortens their life.

AMERICAN STEEL SPLIT PULLEYS

The most economical and efficient pulleys you can buy are "American" Steel Split Pulleys. They combine great strength with light weight and transmit maximum power with minimum belt slip.

They save belts. They reduce air resistance to a minimum. They are capable of enduring higher speeds than any other standard metal pulley. and are guaranteed to perform double belt duty under all conditions not demanding a special pulley. Over 3,500,000 sold.

Valuable book, "Pulley Efficiency," FREE on request.

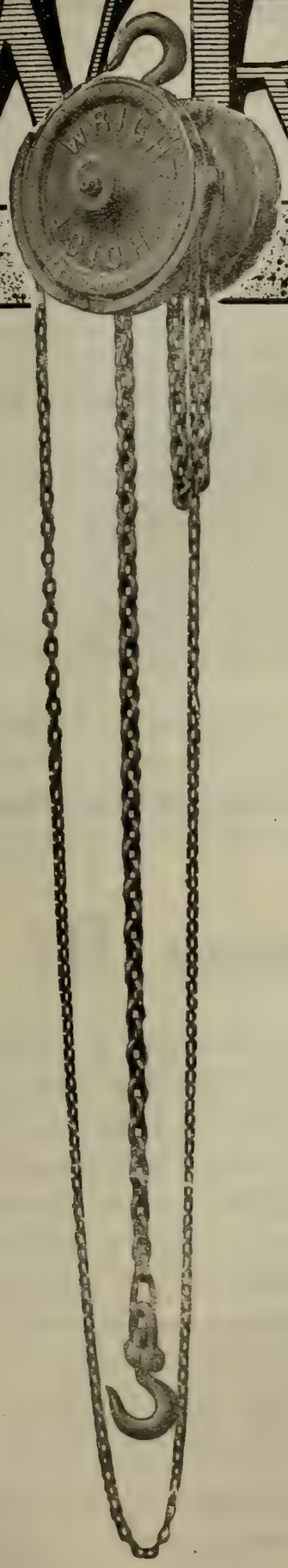
American Pulley Company, Philadelphia, Pa.

Canadian Distributors:

Williams & Wilson, Ltd., Montreal, Quebec; A. R. Williams Machinery Company, St. John, N.B.; A. R. Williams Machinery Company, Toronto, Ontario; A. R. Williams Machinery Company, Vancouver, B.C.; A. R. Williams Machinery Company, Winnipeg, Manitoba; H. W. Petrie, Ltd., Toronto, Ontario.

WRIGHT

High Speed Steel Hoists



CONSTRUCTION, convenience, strength and speed are all vital points about a hoist and decide the value it will have in a shop where constant and heavy use is the rule rather than the exception.

The Wright Hoists are constructed of steel and malleable iron and with the non-fouling chain guide gives them the qualities that in a shop where conditions are excessive would tend to only strengthen confidence in its quality.

On munition work on shells of the larger size *where strength and speed* were required the Wright Hoists were adopted by some of the largest plants in the Dominion. For smaller work they are also ideal.

You should write if you contemplate installing one or more hoists. Write us for complete information.

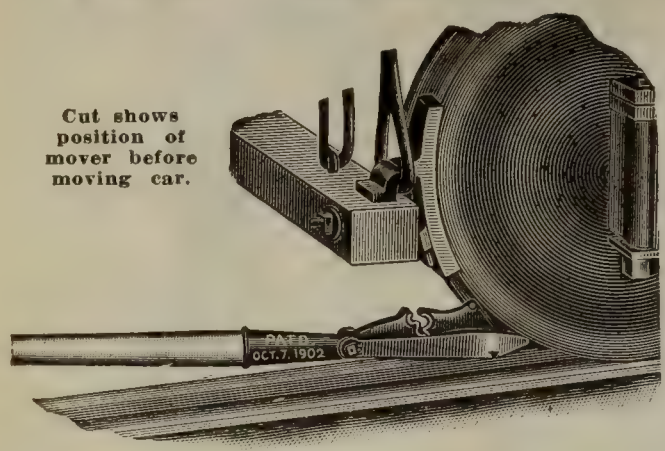
Wright Mfg. Company

LISBON :: OHIO :: U.S.A.

Canadian Agents:

The A. R. WILLIAMS MACHINERY CO., Ltd.
Toronto Winnipeg Vancouver St. John, N.B.

THE "SAMSON" RAILWAY CAR MOVER



Cut shows position of mover before moving car.

Every railway siding should be supplied with one of these tools. Takes the place of fifteen men and puts the heaviest loaded car just where you want it. It will pay for itself in 30 days.

It is one of the most simple and powerful devices for moving cars by hand.

It is provided with Never-Slip Spurs, which is the most important feature on a Car Mover.

Special attention given to export orders.

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Oshawa, Ontario

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Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send to our nearest factory for a trial box.

Manufactured and guaranteed by

The Canada Metal Company, Limited

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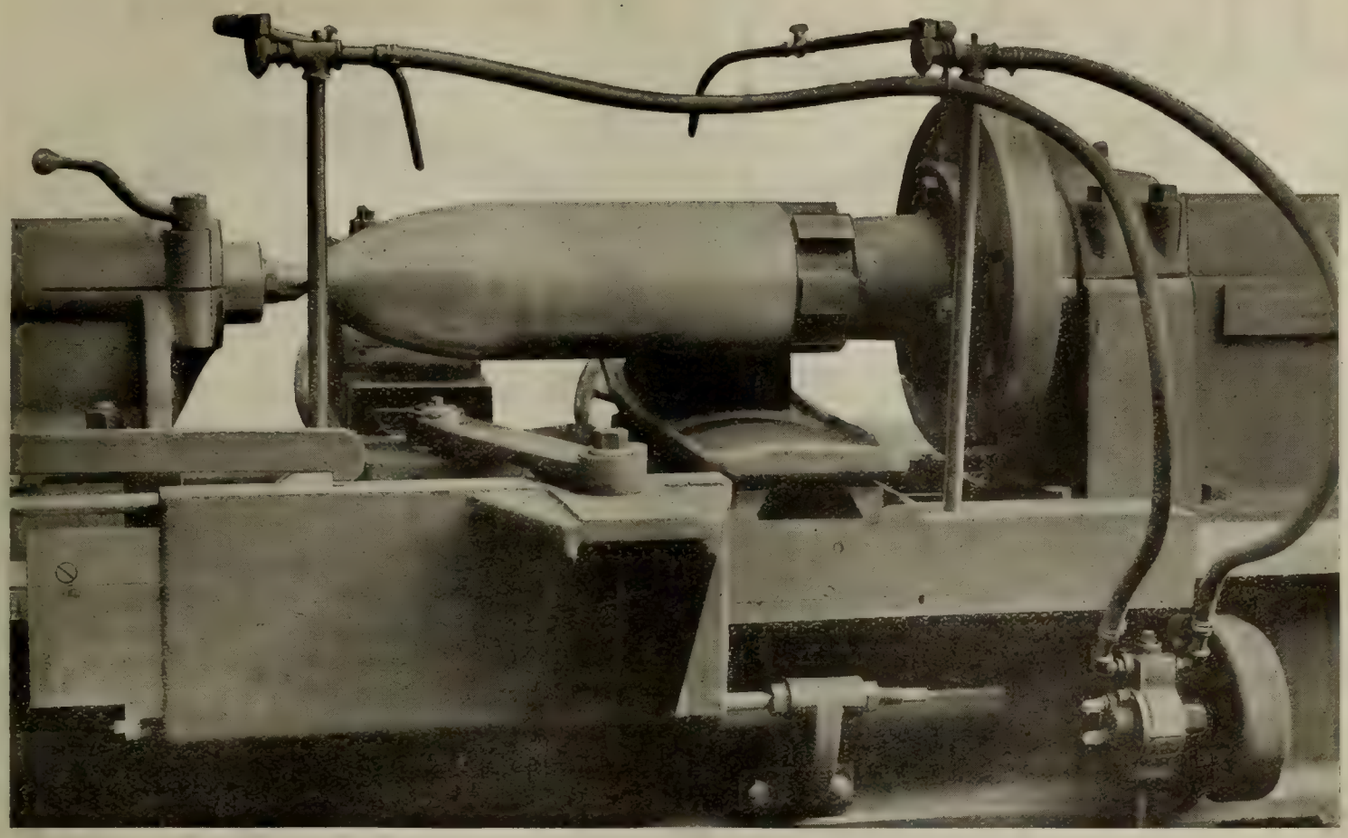
Let the Boss Know It!

IF you are a reader of Canadian Machinery, go tell your employer about it some convenient time! You couldn't tell the up-to-date manufacturer anything that would please him more. He would know that you are abreast of the times; that you are ambitious and interested in your work; that you are acquainted with methods and machinery which make for greater efficiency. He will say softly to himself: "Here is a live wire,—I'll just keep my eye on that chap."

If you are not a regular reader it will pay you to become one right away—quick.

Subscription price—$3.00 per year. 52 issues.



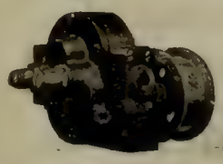
Bertram Plays Safe By Using Trahern Rotary Geared Pumps

Shell production requires uniform efficiency from operator to lathe—and thence down to the accessories with which the machine is equipped. Bertram uses TRAHERN PUMPS because they will supply a variable stream of coolant ranging from 1½ gallons to 16 gallons per minute. Any amount you require is at your disposal—the Special TRAHERN relief valve permitting shutting off at discharge without stopping pump.

The slow speed at which the pumps can be run, varying from 300 to 500 R.P.M. in accordance with your requirements, conserves the life of the pumps. This is not true of the centrifugal pump, which must be operated at maximum speed to obtain the capacity desired. The accurate machining and assembling of TRAHERN PUMPS renders the danger of loss of prime a negligible factor. The drive shaft is of high grade, cold rolled steel. The Pumps are constructed to prevent excessive wear at stuffing box, a distinctive point of superiority over the centrifugal type.

TRAHERN ROTARY GEARED PUMPS will increase the volume of production from your present equipment—write for particulars.

TRAHERN PUMP COMPANY



Rockford, Illinois

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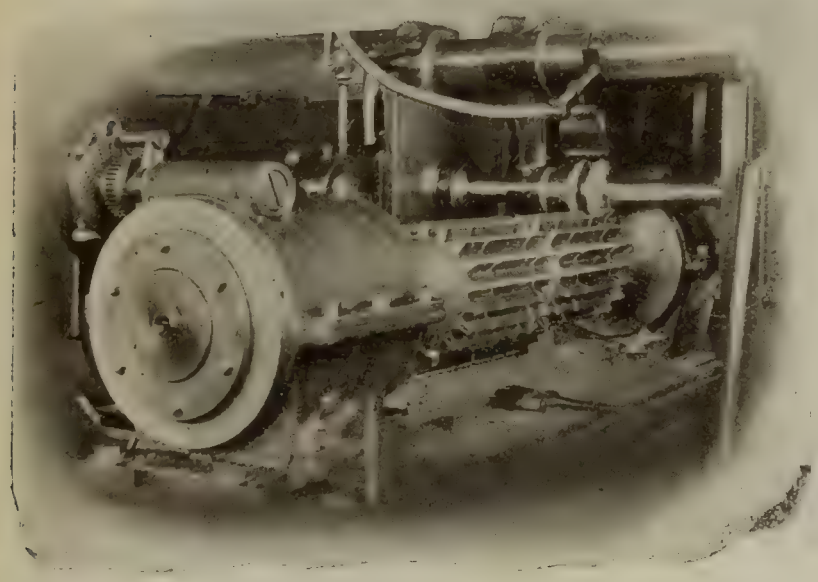
CUT GEARS

CUT GEARS



Silent Chain Sprockets

Illustration showing cutting of Teeth in Forged Steel Pinion.

17 T., 175" C.P., 26" F., 9.665" O.D.

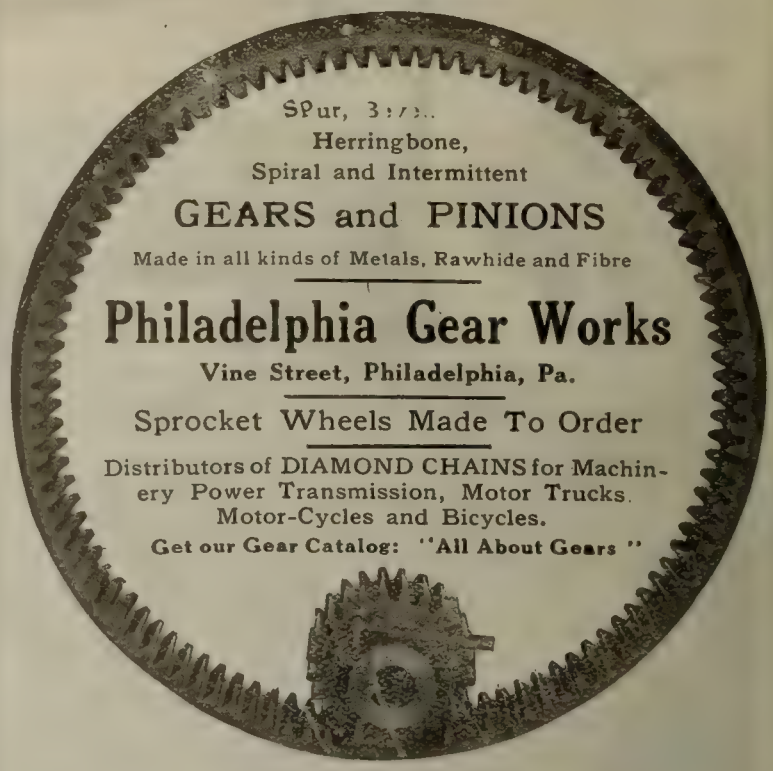
Solid on shafts 7' 11½" lg. over all.

Write for quotations.

Hamilton Gear & Machine Co.

Van Horne Street - TORONTO

We Ship Gears to All Parts of Canada



Write us when you want good gears, good service, good prices

THE BERNARD Wood Split Pulley

When it comes to a question of value, we lead.

Special proposition to Dealers in all cities, where not represented.

Applications will be considered in the order they are received.

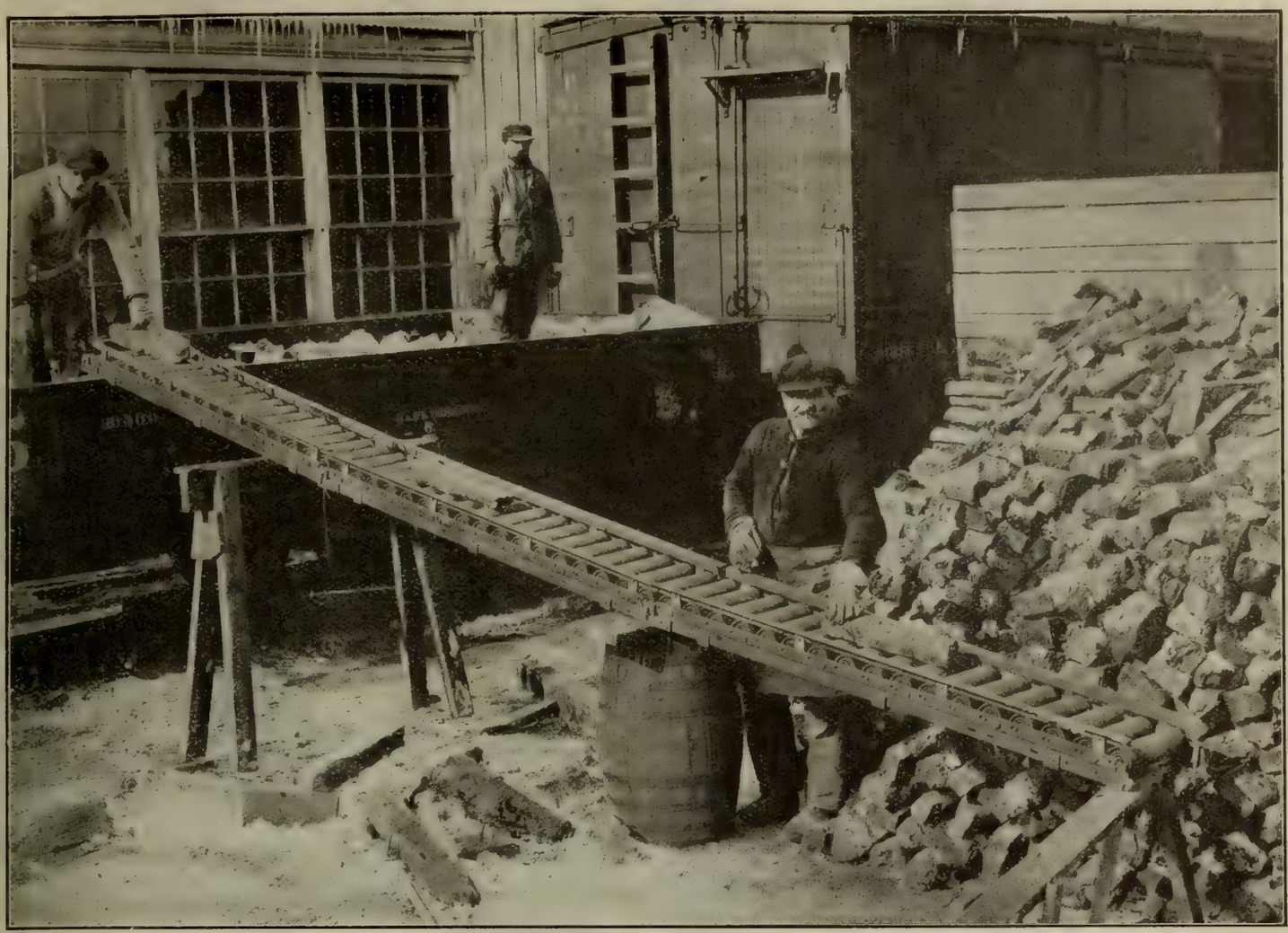
Write now, our stock is complete, our price low, and quality unsurpassed.

It is worth your consideration

The A. Bernard Industrial Co.

Manufacturers of High Grade Power Transmission Appliances

Office and Works: FORTIERVILLE, QUE., CANADA



Why pay 50% more than is necessary for unloading your Pig Iron when you can save that percentage by using MATHEWS GRAVITY PIG IRON CONVEYOR? Write for our Bulletin C.

CANADIAN MATHEWS GRAVITY CARRIER CO., Ltd.
484 RICHMOND STREET W., TORONTO

STEEL TUBING

BUTT JOINT and WELDED

14 to 20 gauge, sizes 3/8 in. to 2 in. Outside Diameter

For all kinds of manufacturing purposes

Dependable Quality

Uniform in Size

Standard Tube & Fence Co.
Limited
Woodstock, Ontario

Manufacturers of
Tubing, Steel Fence Posts, Wire Fencing, Wire, Farm Gates, Etc.

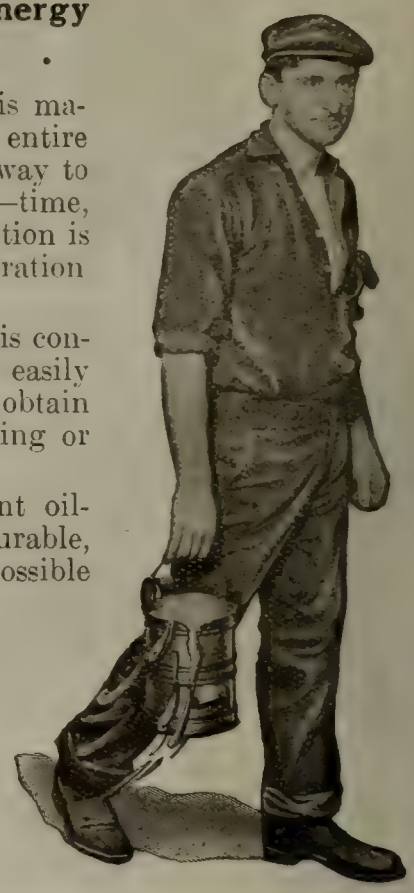
How Many Trips For Oil?

A Problem dealing with human energy and the cost of Production . . .

If the workman is required to stop his machine, or leave his bench, travel the entire length of the shop—or perhaps find his way to another building to renew his oil supply—time, energy and ability are wasted. His attention is diverted from important work to an operation of no consequence.

Bowser Oil Storage Systems remove this condition—the oil supply is placed where easily accessible—only a moment is required to obtain a fresh supply of pure oil without spilling or dripping.

Bowser Systems are fire-proof; prevent oil-soaked floors; suggest cleanliness; are durable, accurate; an investment that makes possible better work with less effort.



The **BOWSER** ESTABLISHED 1885

Oil Storage System

Provides safe storage facilities for all oils. Oil is kept where easily reached, in a moment. Saves steps—time—energy.

Every shop needs the Bowser—Write Today.

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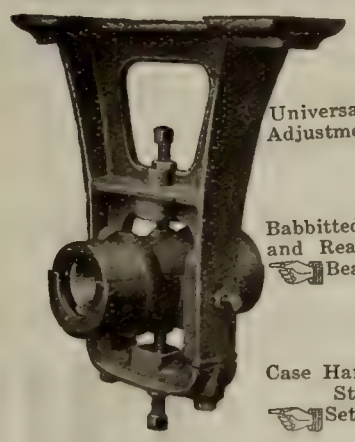
Sales Offices in All Centers **Representatives Everywhere**

Speed Up—



IN War Times you should get all the speed out of your machines possible.

You can do this by using BOND Hangers. From the day you put a BOND Hanger on the job it starts saving your oil, your power, and your patience.

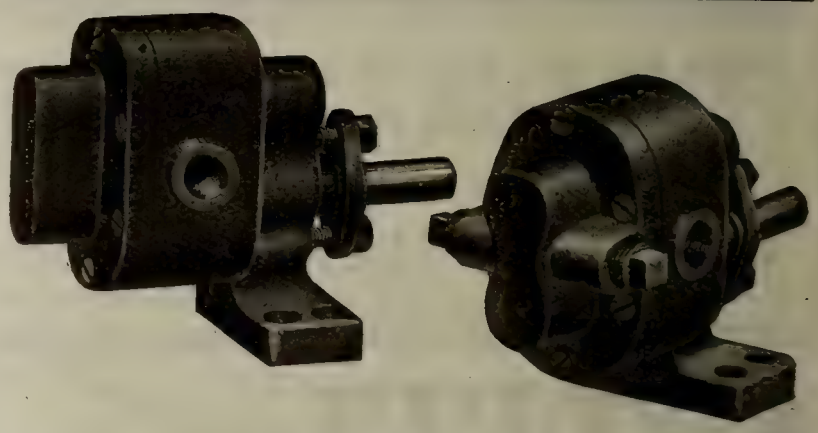
It is an investment that yields a steady return with every revolution of your shafting.

The sturdy, braced construction makes for smooth running without vibration. Its design permits full accessibility for adjustments or erection.

The Bond Hanger Book tells about everything we make in the line of power appliances.

Your files are not complete without it.

CANADIAN BOND HANGER & COUPLING CO.
Limited
ALEXANDRIA ONTARIO



Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.

Hopedale : Mass. : U.S.A.

GRATON & KNIGHT

Standardized Series

LEATHER BELTING

Tanned by us for belting use

GRATON & KNIGHT

Common Sense in the Standardization of Belting

You have standardized your signature.

You buy standardized tools, standard printing paper and a hundred other standardized things, instead of having them made to order. It is safer for you — easier and more economical.

Why don't you standardize your belting?

Consider what standardization has done for your own product; for other products you use.

Translate these advantages into terms of belting.

Analyze belt installations. You find the requirements of power transmission fall into a small number of sharply defined classes — about a dozen if you define them scientifically.

Standardized Belting offers you a standard belt that is exactly suited to each one of these classes. You adopt the one that is fitted to the needs of your own work. That is standardization—just plain common sense applied to power transmission.

There are Graton & Knight Heart, GraKnight, GraKnight Dynamo, Spartan, Neptune and other Standard Brands—all standardized on the basis of work to be done and conditions to be met.

Standardize your belts. Consult our representatives. Submit your power transmission problems to our mechanical laboratory—get *expert* advice.

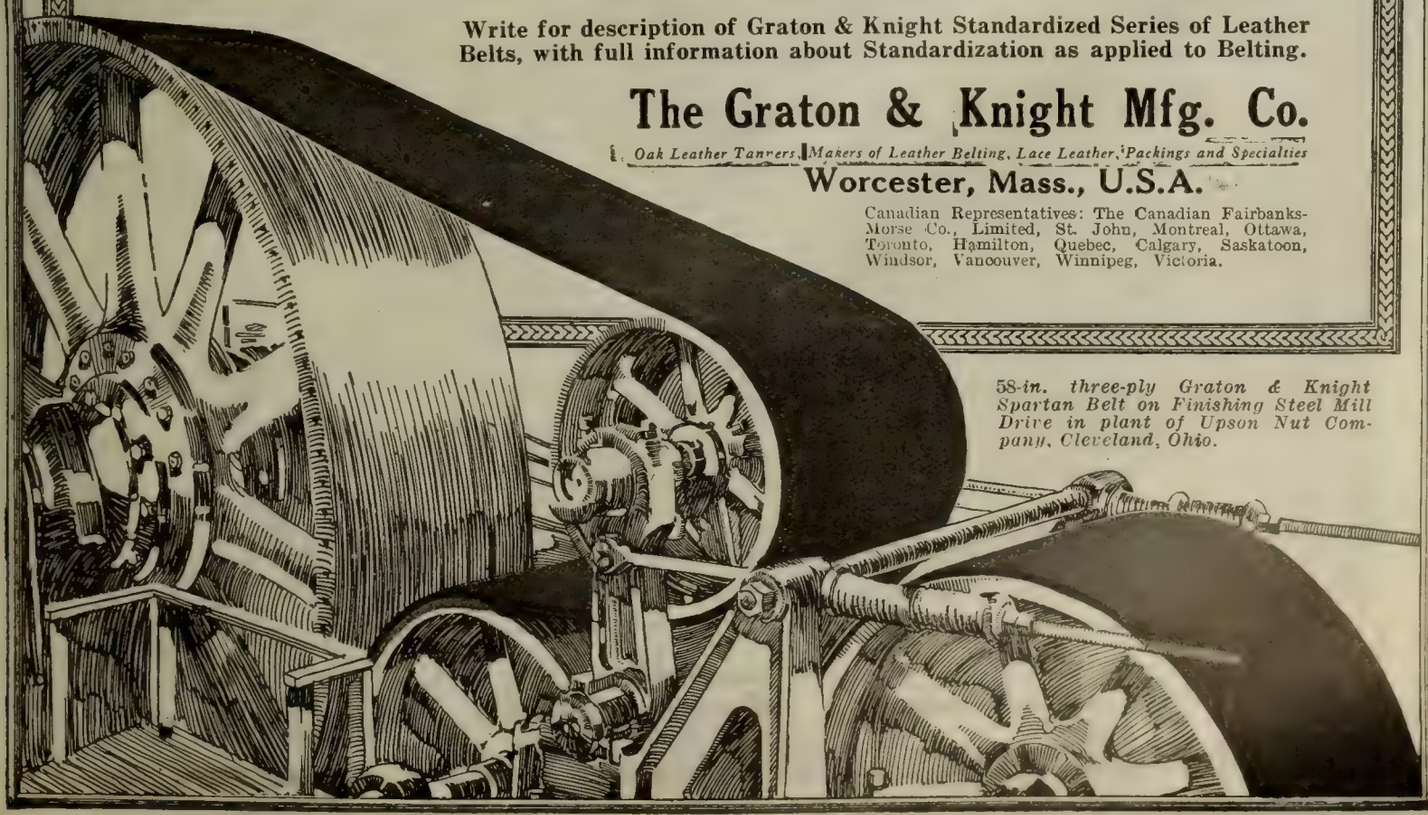
Write for description of Graton & Knight Standardized Series of Leather Belts, with full information about Standardization as applied to Belting.

The Graton & Knight Mfg. Co.

Oak Leather Tanners Makers of Leather Belting, Lace Leather, Packings and Specialties

Worcester, Mass., U.S.A.

Canadian Representatives: The Canadian Fairbanks-Morse Co., Limited, St. John, Montreal, Ottawa, Toronto, Hamilton, Quebec, Calgary, Saskatoon, Windsor, Vancouver, Winnipeg, Victoria.



58-in. three-ply Graton & Knight Spartan Belt on Finishing Steel Mill Drive in plant of Upson Nut Company, Cleveland, Ohio.

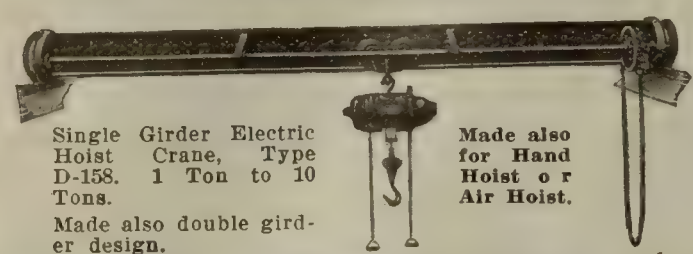
CANADIAN MADE CANADIAN MADE

Electric and Hand Traveling Cranes

Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons.

Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons.

Made also double girder design.

Made also for Hand Hoist or Air Hoist.

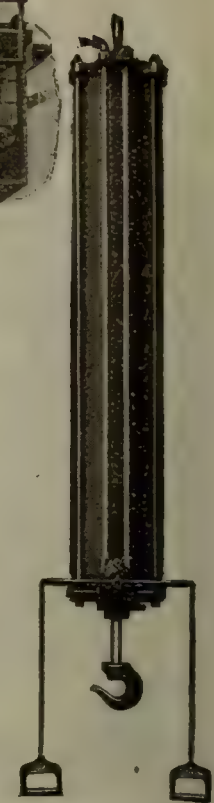
Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

Type D Electric Hoists —½ to 10 Tons.

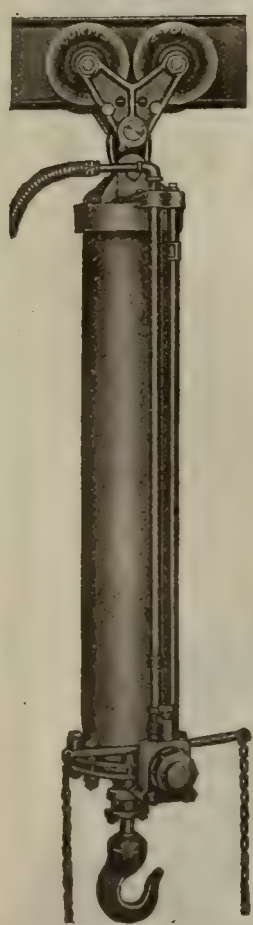
Air Hoists, Trolleys and Tracks.



Type No. 20 Air Hoist.

Northern Crane Works, Limited

Walkerville, Ontario, Canada



CURTIS, St. Louis, U.S.A.

AIR COMPRESSORS — AIR HOISTS — TROLLEYS AND TROLLEY SYSTEMS—SAND BLASTS—PNEUMATIC AND HYDRO-PNEUMATIC ELEVATORS—JIB AND TRAVELING CRANES.

We have specialized for over 22 years on pneumatic machinery. We have developed the simple air cylinder into a straight line motor with wonderful speed control and dependability capable of the widest application to hoisting problems.

Our new controlled-splash oiling system with regulatable sight feed cylinder oiling is something entirely new in air compressor design.

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"I've handled all kinds of hangers since I started millwrighting; but these 'Pioneer' Steel Hangers are my choice. Why? The answer's easy. I can hang them all day and alone if necessary. These old-fashioned cast-iron hangers seemed to weigh a ton around three o'clock in the afternoon. It took three of us to handle them, too. It's different now; the boss uses 'Pioneer' altogether. They're safe; and I never yet heard of a 'Pioneer' coming down — and that's a mighty good point. The difference in first cost is in favor of the 'Pioneer,' so they are preferable every way you look at them."

Ask for our booklet "Transmission Data." It's worth reading.

"I'll Take the Steel Hanger Every Time"

Standard Pressed Steel Co., Philadelphia, Pa., U.S.A.

Sole Distributors for Ontario:
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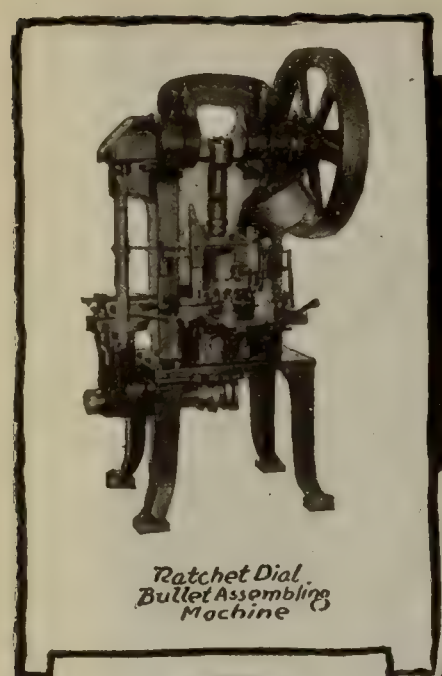
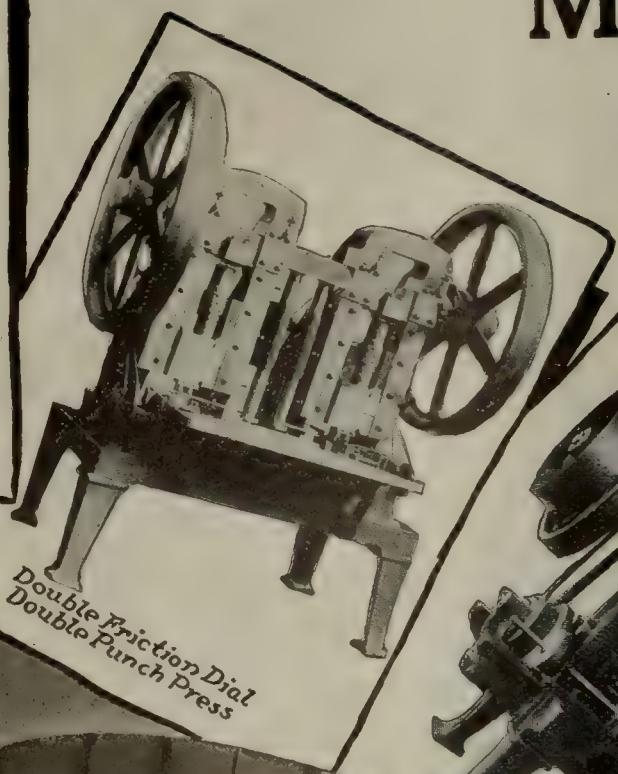
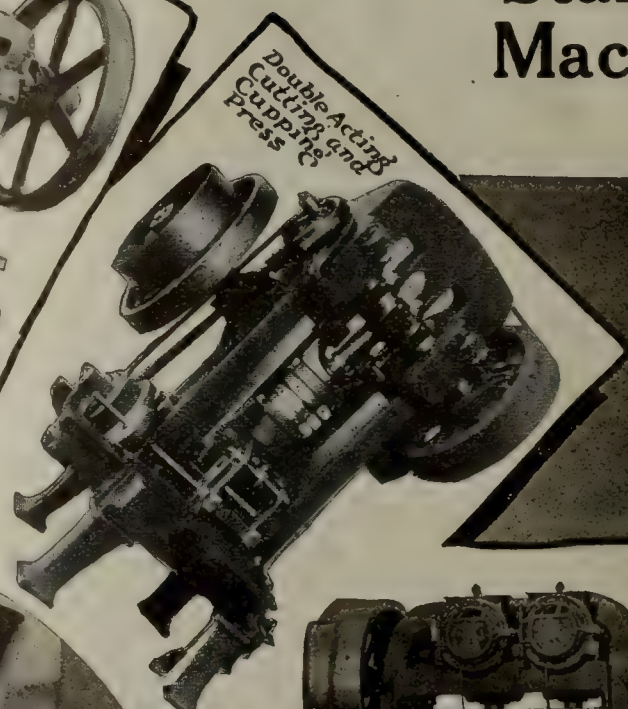
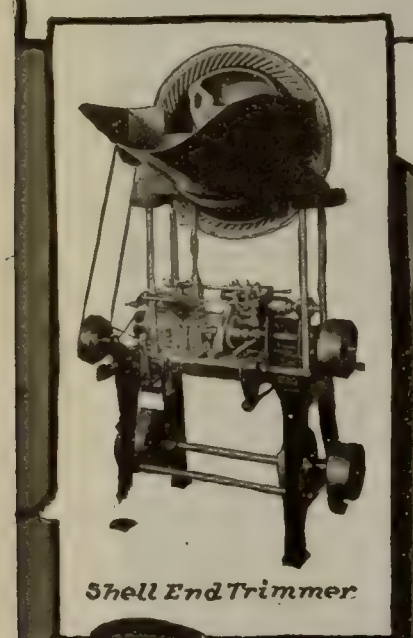
CARTRIDGE MACHINERY

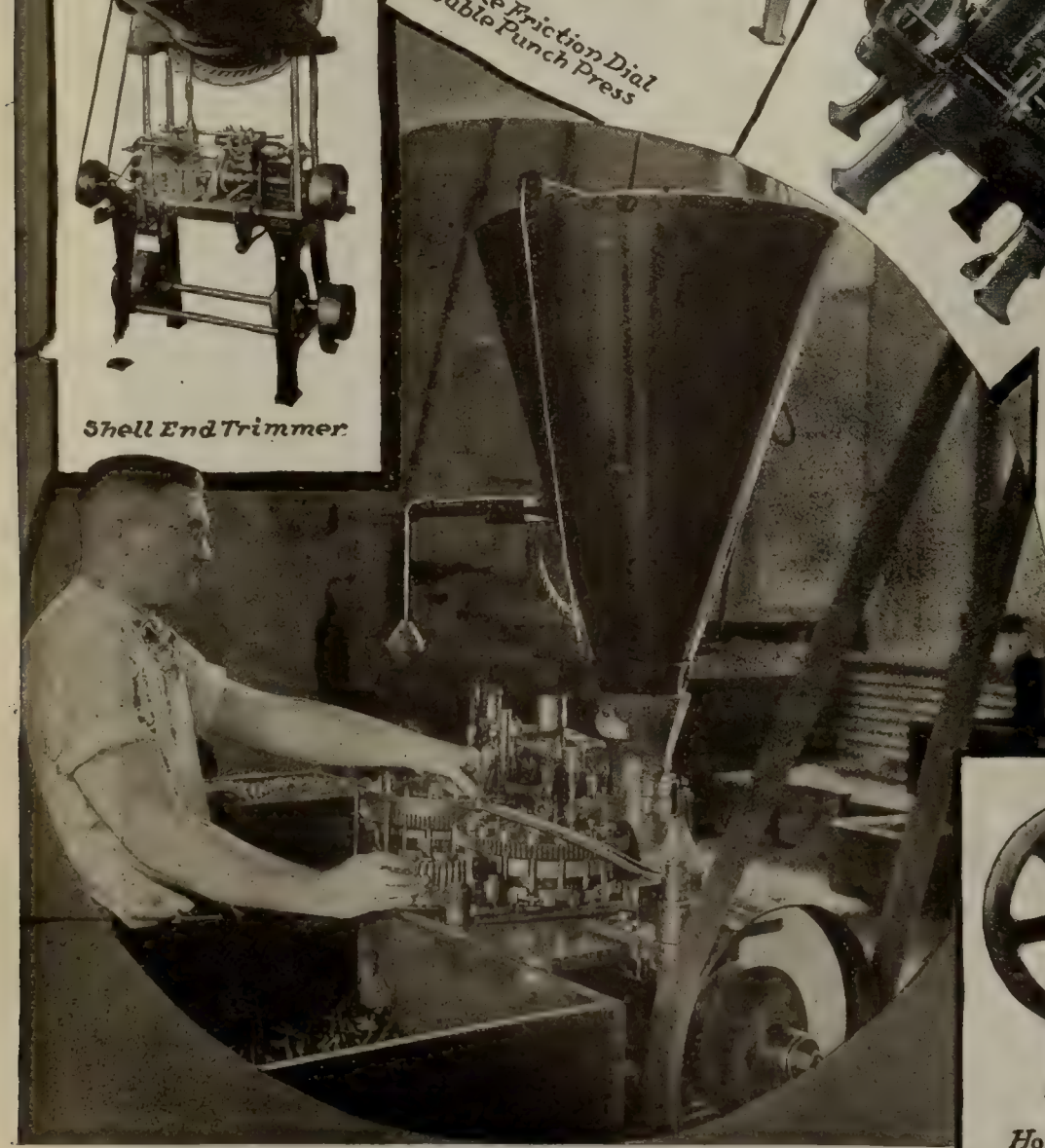
Waterbury Farrel Standard Machines

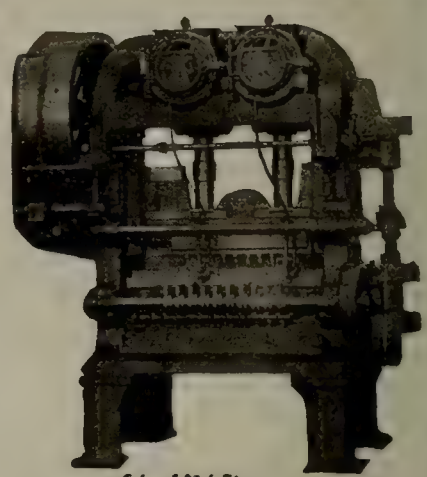

Ratchet Dial Bullet Assembling Machine


Double Friction Dial Double Punch Press


Double Acting Cutting and Cupping Press


Shell End Trimmer


Standard Loading Machine in Government Arsenal


Straight Line Bullet Assembling Machine

Horizontal Header Hopper Feed

The Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn., U.S.A., has appointed me to be the sole manufacturer for export of their entire line of Cartridge and Shot Shell-Making Machinery. Proposals and Estimates covering complete plants or separate units, required for export will be furnished on request.

FREDERICK S. BLACKALL, Woolworth Tower, New York, U.S.A.

Men can't be standardized

Work must be

It is natural for men to be different—to be original. It is natural that each machinist should want to work in the way he thinks best. And it doesn't matter much how he works so long as results are the same. But that's just it—results must be the same. Parts must fit. Any differences are costly. Accurate standardization demands accurate tools. That's why machinists everywhere use

Starrett Tools

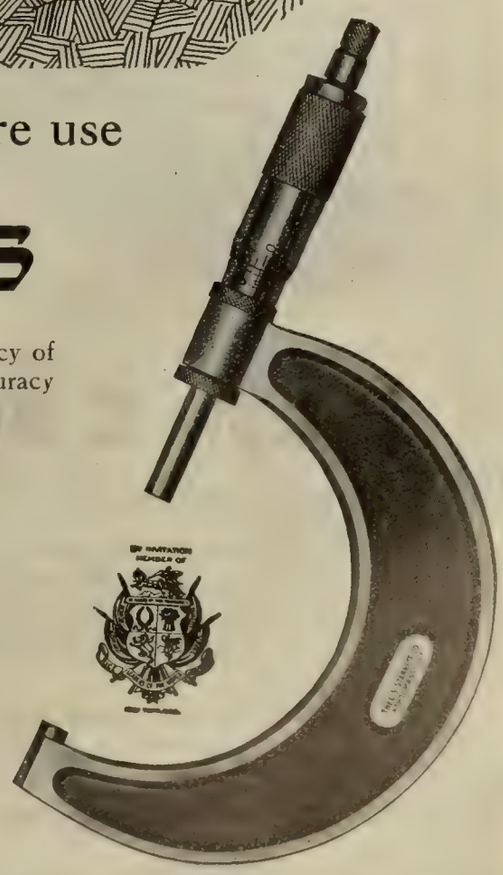
TRADE MARK

REG. U.S. PAT. OFF.

They know they are dependable. They may doubt the accuracy of the layout, or even of their touch, but they never doubt the accuracy of Starrett Tools.

In buying your micrometers, calipers, gages, combination sets, caliper squares, tapes, straight edges and other tools make your choice from the 2,100 styles and sizes of the Starrett line.

Send for Catalog No. 213



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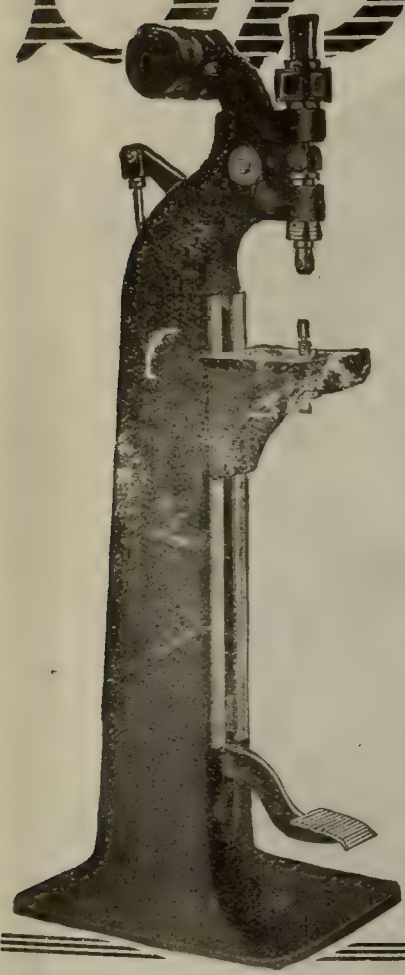
New York **London** **Chicago**

42-714

Speed



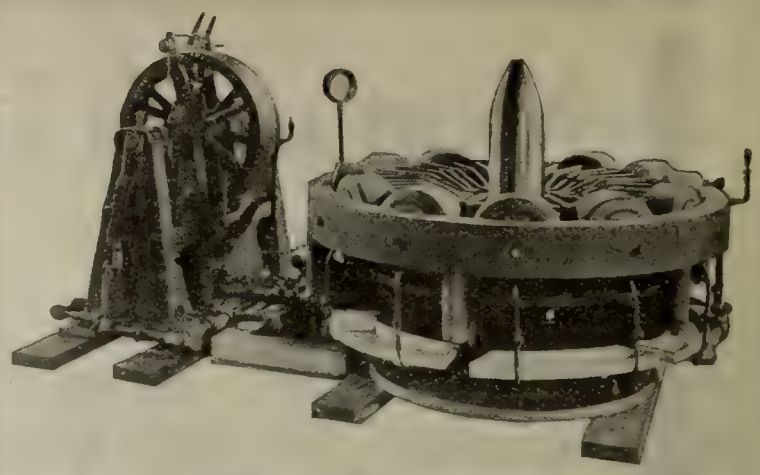
When the quality of the work is the best obtainable, the next item is speed. For upon speed depends your costs.

One rivet per second is the speed this machine will maintain indefinitely. Adapt that speed to your requirements and find out the value the Grant Riveter would be to you.

Write for our catalogue. It will give you complete information.

Grant Mfg. & Machine Company

Bridgeport, Conn., U.S.A.



The New "West" Banding Press

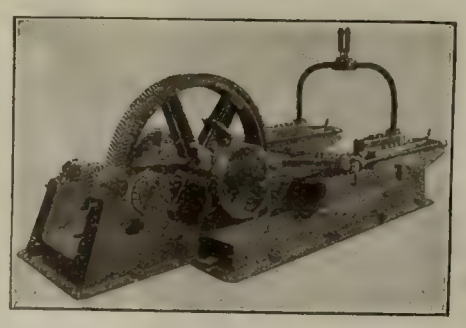
For 9.2" and 8" shells

12 Cylinders; Ample Power; Ample Strength; Reasonable Price.

NO ACCUMULATOR REQUIRED.

The West Tire Setter Co.

255 Mill Street, Rochester, N.Y.



ELMES

18" Stroke Hydraulic Pump

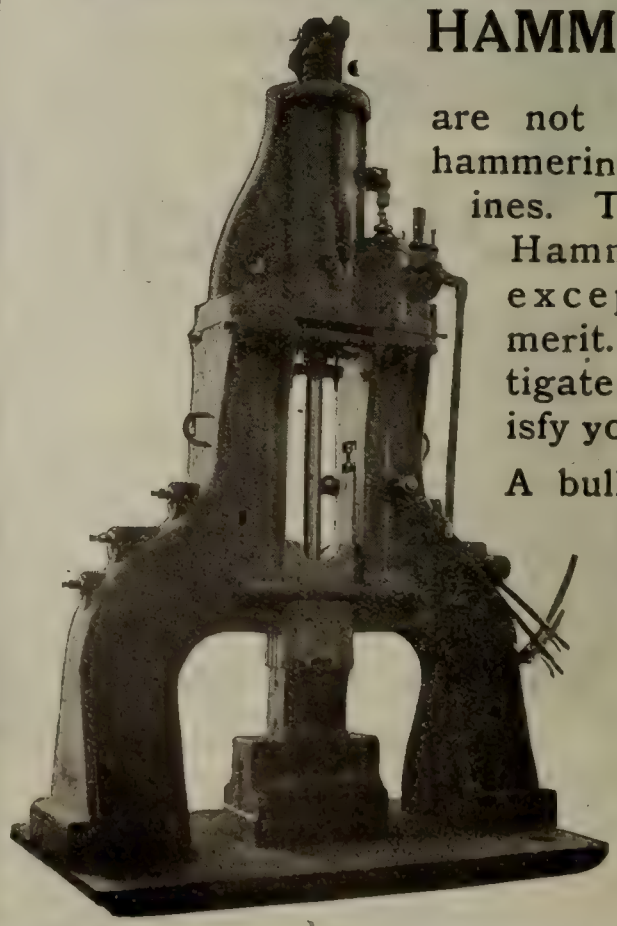
for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217 No. Morgan Street CHICAGO, ILL.

"ERIE" STEAM FORGING HAMMERS



are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

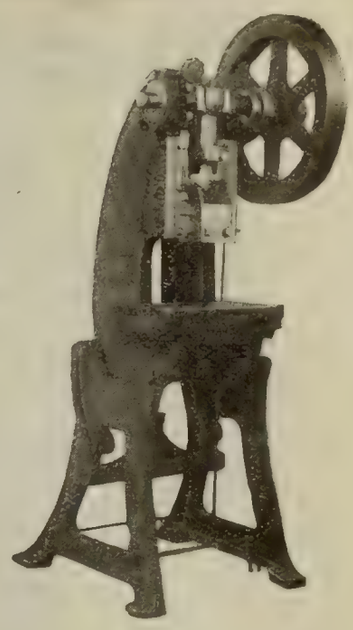
ERIE FOUNDRY COMPANY

ERIE, PENNSYLVANIA, U. S. A.

HAVE you examined the patented Ball Joint Connection on the smaller Consolidated Presses? This ball joint is instantly adjustable for wear, all lost motion can be eliminated by loosening the locking screws and adjusting the ball cap downward—no machining or filing required.

There is another important feature in considering this connection. The ball cap and adjustable split bushings can be removed from the connection screw without removing the screw from the connection or disassembling any other parts.

That is economy that cannot be overlooked.



Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* **MICHIGAN**

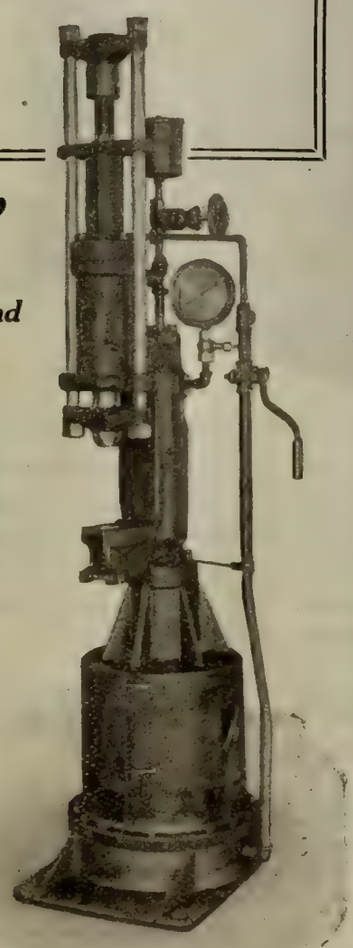
Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

Triple Purpose

"METALWOOD" COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.



Metalwood Mfg. Co.

Leib & Wight Sts., DETROIT, MICH. U.S.A.

For Great Britain and Continent address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

PRESSES

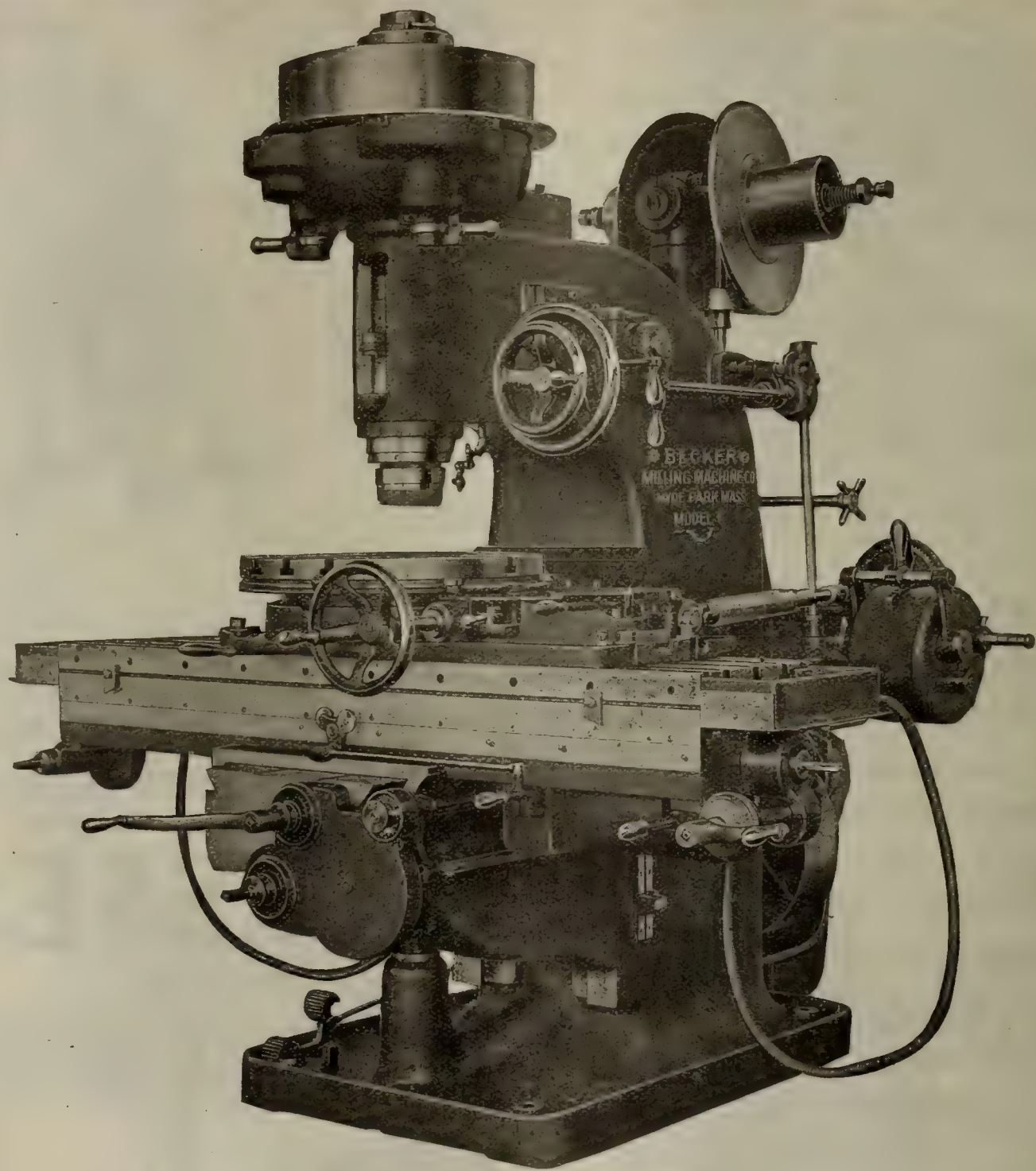
Pumps and Accumulators

FOR ALL PURPOSES

Made in Canada

NOSING PRESS

WILLIAM R. PERRIN, Limited
TORONTO



THE strength, evident in the construction, is but one feature that goes to stamp this Model C Becker High Power Vertical Miller as the superior machine of its class. Its quantity production, of course, is its chief feature (increasing production 40 to 360%), but strength and quality form two arguments that back up its production and are convincing. It has proved a decided asset to many. It is one of our 14 types and 24 sizes to suit your needs. Let us co-operate with you.

Becker Milling Machine Company

HYDE PARK, BOSTON, MASS., U.S.A.

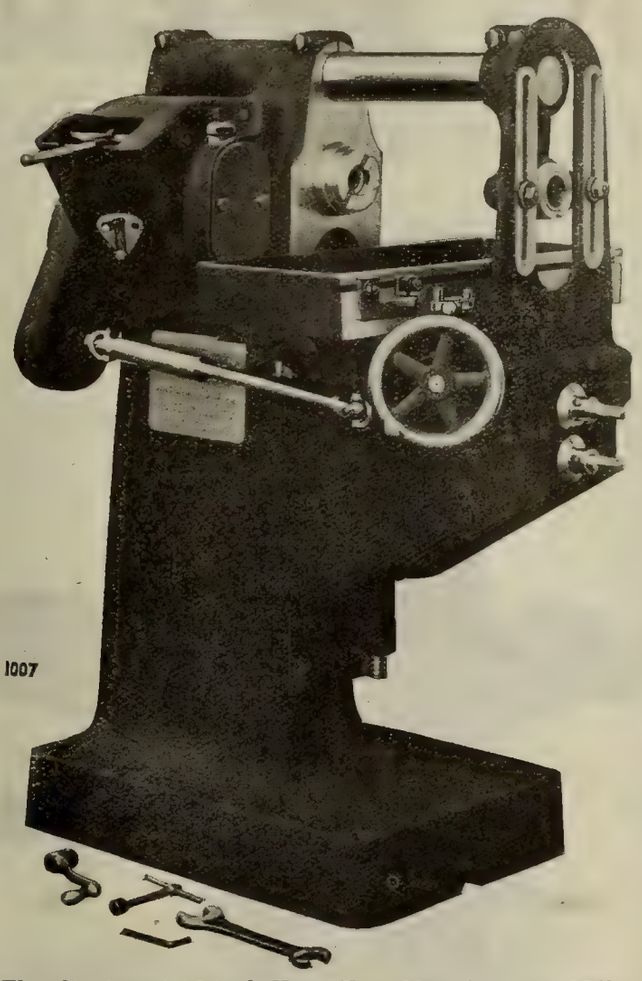
Agents:

The A. R. Williams Machinery Company, Limited
Toronto and Hamilton

Williams & Wilson, Limited, Montreal, Que.

The New Cincinnati 12" Knee Type Manufacturing Miller for Repetition Work

Arms manufacturing plants and any other shops turning out great quantities of small parts will find this machine intensely profitable. Capable of standing up to the drive of twenty-four hours a day service, and giving maximum production at all times. It is compact, having only 12" table travel. It is powerful —4 h.p. at the spindle. The drive is by constant speed belt, with a commercial range of feeds and speeds, and for the sake of simplicity, quick change mechanisms have been avoided, the change in feed or speed being made by interposing change gears.



The Cincinnati 12-inch Knee Type Manufacturing Miller
(Patent Rights Fully Reserved)
Single Pulley Drive—4 H.P.—Twelve speeds—Four feeds

It Is Handy

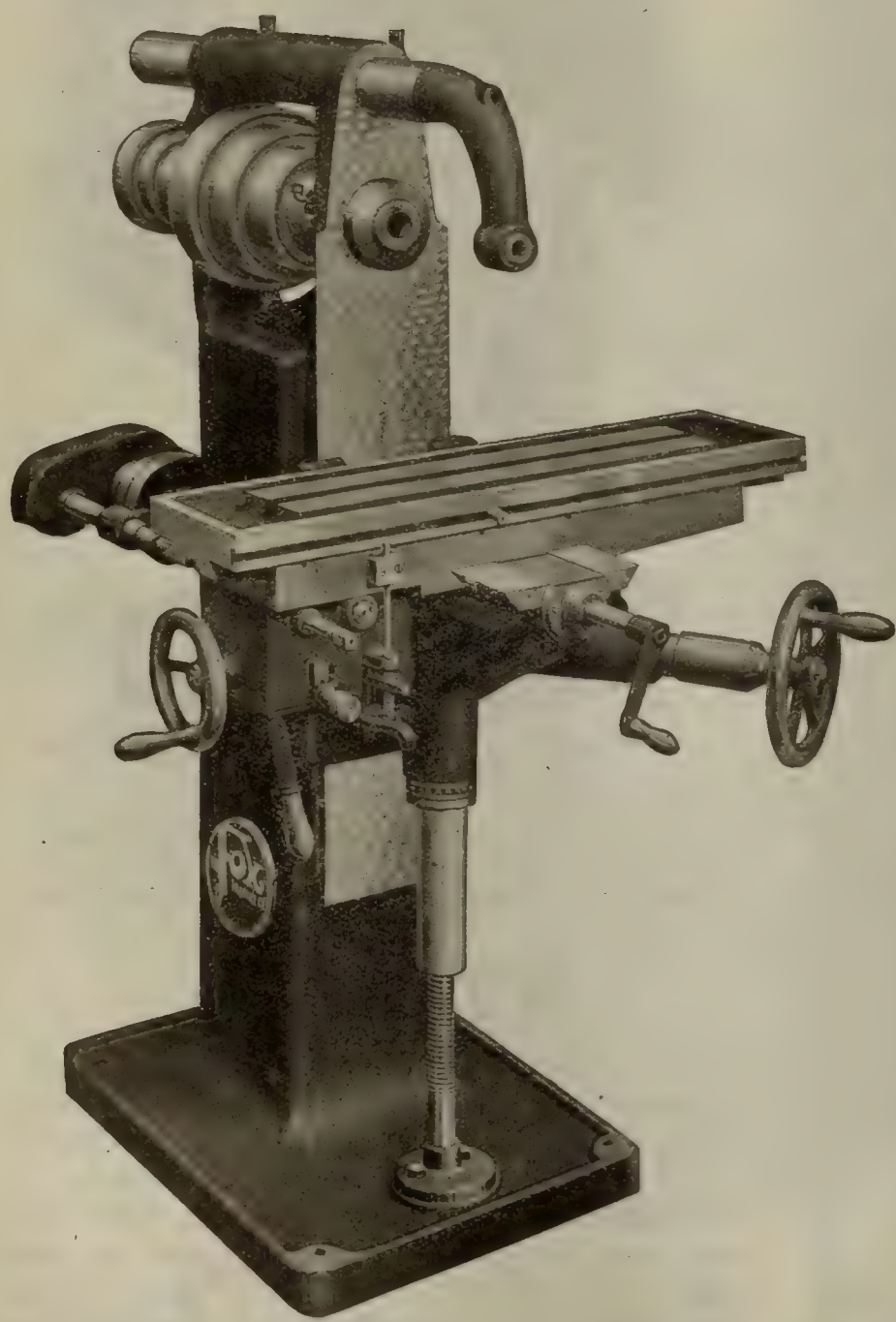
The operator stands at the end of the table. Assume that a new piece has been chucked: He runs the table forward with his right hand at 2¾" per turn of the hand wheel. A dog hits the trip, which automatically disengages the hand movement, and at the same time throws in the power feed. When the piece has been milled, another dog disengages the power feed, and the operator brings the table back by hand, ready to chuck a new piece. *This is quick action. The operator can slam the table forward as fast as he pleases without danger of jamming the work into the cutter.* The trip dog takes care of that, and it can be set so that the work will be close up to the cutter before the power feed engages, thus reducing the power travel of the work to a minimum.

Ask for complete specifications.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI, OHIO, U.S.A.

The FOX Milling Machine
For Intense Production



FOX
MILLING
MACHINES
lead the field

Power Feed Milling No. 3

The Fox Milling Machines are ideal, as they are particularly adapted for just that sort of work.

Every machine is provided with micrometer dials on the vertical and transverse movements, thus insuring accuracy in every detail.

Write for full particulars.

FOX MACHINE COMPANY
1047 W. Ganson Street, Jackson, Michigan

A Real Achievement in Special Cutter Making

The most modern manufacturing facilities enable us to produce special cutters accurately and within short order.

The quality of material is backed up by skilled workmanship, expert supervision and service.

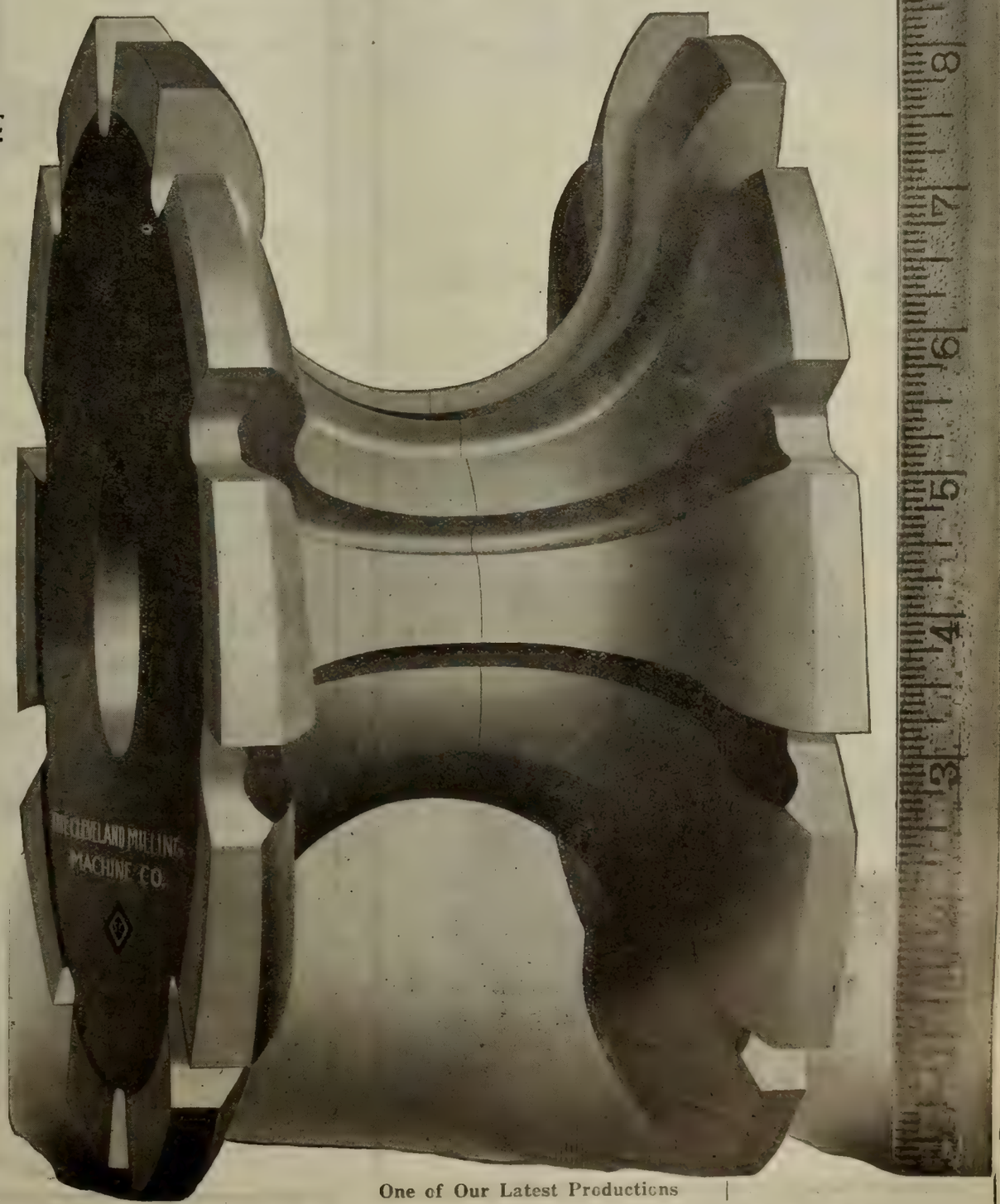
The Cleveland Milling Machine Company

CLEVELAND, OHIO

A COMPLETE STOCK ON HAND

Plain Milling Cutters
Side Milling Cutters
Angular Cutters
Metal Slitting Saws
Shell End Mills
End Mills
Woodruff Keyway Cutters
Counterbores
Gear Cutters
Collets and Arbors
Convex Cutters
Concave Cutters
Corner Rounding Cutters
In fact a full line of Standard Cutters.

IMMEDIATE DELIVERY



One of Our Latest Productions

If any advertisement interests you, tear it out now and place with letters to be answered.

Universal Gear Hobber

The machine which completes our lines to cut all types of small gears except internal, within 10″ dia. 8 Pitch.

The Bilton Gear Hobber will cut spur spiral gears, worm gears, also various special shapes of teeth. It can cut a spiral gear on end of a shaft 1⅜″ diam. 24″ long.

SPECIFICATIONS

Capacity Gears: 10 Diametral Pitch
10 in. Outside Diameter
10 in. Width of Face
Range of hob feed 50-250 R.P.M.
Range hob feed to each rev. of worm .010 to .125
Drive: 3 Steps Cone Pulley; 2½ in. Belt
Weight 2,100 lbs.

A machine of latest design, introducing new features which increase production without sacrificing accuracy. The hob is cutting continuously; operation of machine entirely automatic.

DELIVERY

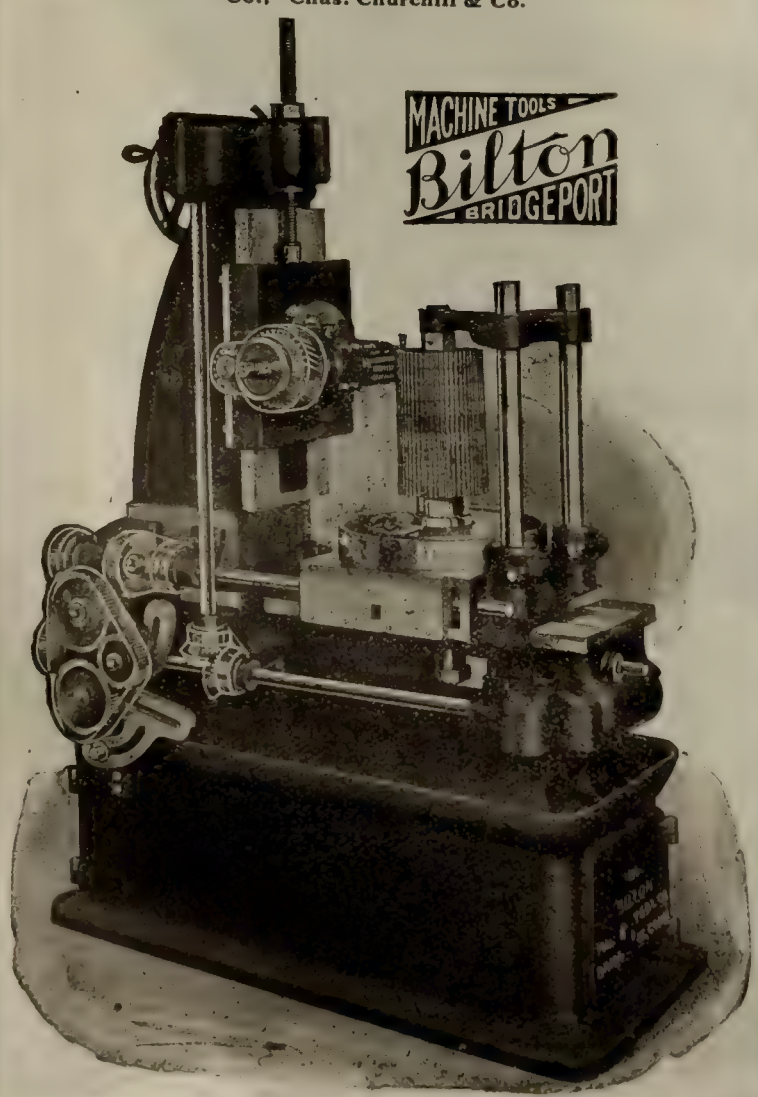
A few of these machines are now available for October delivery.

Send for copy of new catalog No. 30, and bulletin describing this machine.

The Bilton Machine Tool Co.

Bridgeport, Conn.

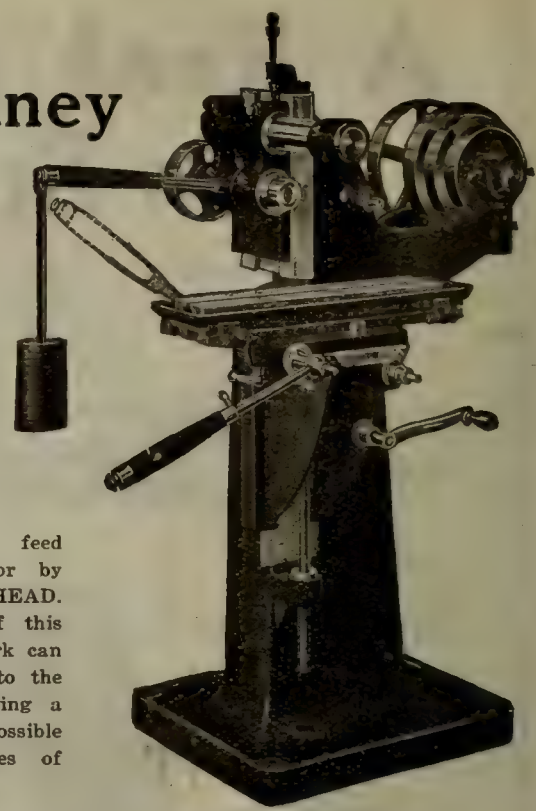
Foreign Agents: **Alfred Herbert Ltd., M. Mett Engineering Co., Chas. Churchill & Co.**



THOUSANDS IN USE

The Whitney

Hand (Feed) Milling Machine



The vertical feed is provided for by the SLIDING HEAD. On account of this feature the work can be held close to the table, thus giving a rigidity not possible on other types of Hand Millers.

Send for Catalogue A.

The Whitney Mfg. Co.

Hartford Conn. U.S.A.

Chains—Keys—Hand Milling Machines.

CONDENSED IN SIZE BUT OF GREAT CAPACITY

A great deal of work is being done in shops on large milling machines that could be done more rapidly, more efficiently and cheaper with our

No. 1 U. S. Improved Hand and Weight Feed Milling Machine

It takes up little room and though small it has a marvellous capacity for work—HAS MORE POWER THAN ANY SIMILAR MACHINE ON THE MARKET.

We will be pleased to give you the full details of its value.

United States Machine Tool Company

Cincinnati, Ohio U. S. A.

HALL

Pipe Threading Machinery
AND
Shell Cutting-off Machines

This illustration shows the new No. 8 Hall Gear Box Driven Pipe Lathe. Regular Capacity 2½" to 8" inclusive.

The last word in Pipe Machine Construction

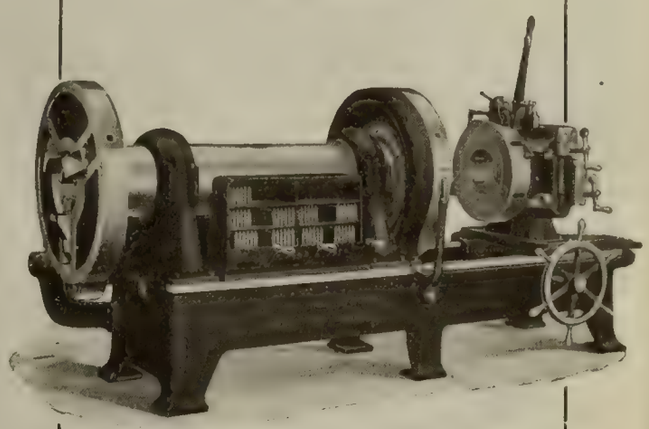
Let us give you full particulars of this machine which is only one of a large number having capacity ⅛" to 18" pipe.

Write us for catalog and prices on:

Pipe Threading Machines Nipple Threading Machines
Roller Pipe Cutters
or
Cutting-off Machine for shells or bar stock.
Any capacity ⅛" to 18".

John H. Hall & Sons, Ltd.
BRANTFORD, CANADA
EUROPEAN AGENTS:
Universal Machinery Corporation, Limited, London

Made in Canada



Capacity
2½" to 8"
inclusive

GARVIN

No. 12 Plain Milling Machine—Use Code Abrade

NO. 12 PLAIN MILLING MACHINE
FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rapidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments.....18 x 6 x 15 in.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (***Visitors Welcome***) **50 Years New York City**

THOMAS A. EDISON INC. KNOWS HACK SAWS

SO thoroughly is the name of Edison associated with the scientific knowledge that comes from exhaustive research and positive proof, it goes without saying that the Edison organization is buying STAR BLADES on facts and not on faith.

If you as a manufacturer lack the Edison research facilities, you can't do better than follow the Edison example and use STAR BLADES.

Remember, it's not the cost of the blades, but the cost of the cuts that counts. The factory that is considering blade efficiency as blade cost or number of cuts or speed of cuts alone is figuring with only part of the facts.

Make a scientific efficiency test on hand or machine blades, that covers all your cost items and you are sure to standardize on

STAR HACK SAW BLADES

Machine and Hand — *Flexible and All Hard*

Star Blades were the first modern blades ever manufactured and the very idea of renewable metal-cutting blades originated in this factory.

Our thirty-year quality supremacy has been maintained at the cost of constant metal-cutting research. Hundreds of thousands of tests have been made to determine exactly what thickness, width and length; what shape and setting of teeth, and what steel composition and tempering would give the best metal-cutting results under all kinds of conditions.

These standards of quality never vary because our blades are manufactured by special automatic machinery to gauges of the finest limits. And this machinery makes possible an enormous quantity production at a minimum of factory cost.

Star Blade quality with all it has meant in the past is higher to-day than ever before. It is an important fact that the standard methods of manufacture used by all the other hack-saw makers were abandoned by us more than twenty years ago for our more efficient methods. The Star line includes blades for every purpose—machine and hand—flexible and all hard.

Whatever metals you are cutting, there is a Star Blade that will give you the greatest cutting efficiency at the smallest cutting cost. Make your own drastic tests to prove this or place the burden of proof on us and we will demonstrate it for you beyond all doubt. Put your cutting problems up to us and we will welcome a chance to help you solve them.

Address Engineering Department, Millers Falls Company, 230 River Street, Millers Falls, Mass.

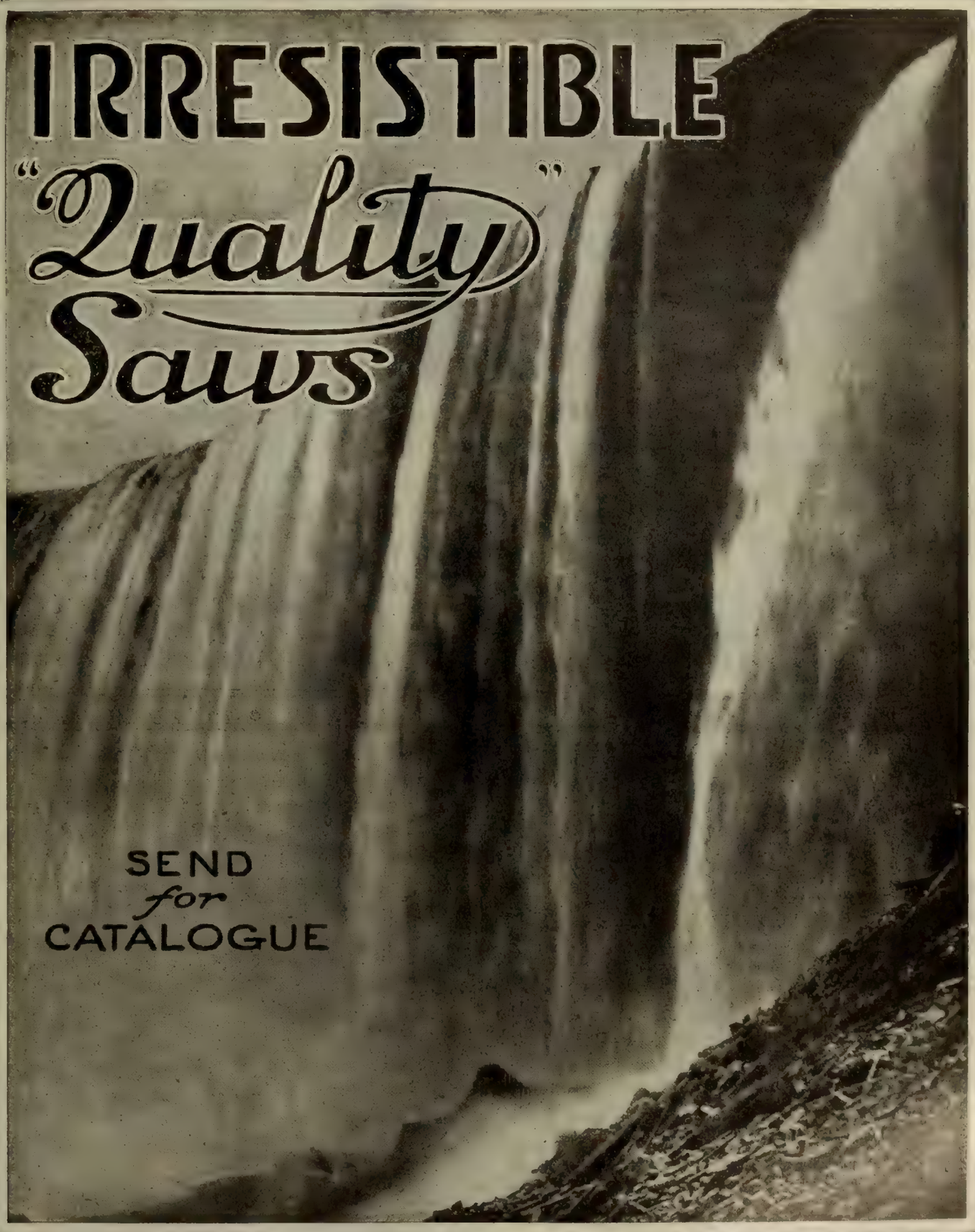
$500.00 FOR YOUR EXPERIENCE

Our position as authorities on metal sawing efficiency has made us a national clearing house of information on the results blade users are getting under all classes and kinds of conditions. To encourage this clearing house idea, we offer $500.00 in gold for the best articles on "How I Test Hack Saws." Tell us your methods in detail (either on machine or hand blades) and give us your conclusions with absolute truth and frankness, including some of the records of your results. It is not necessary to be a Star user to win a place in this prize award. We want your experience whatever it is. Get your reply in as early as possible. Contest closes November 30th. The best replies will be published in book form and in our advertising

1st Prize	$250.00	3rd Prize	$50.00	5th Prize	$15.00
2nd Prize	100.00	4th Prize	25.00	6th to 11th Prizes	$10.00 each

Manufactured By
CLEMSON BROS.
MIDDLETOWN, NEW YORK

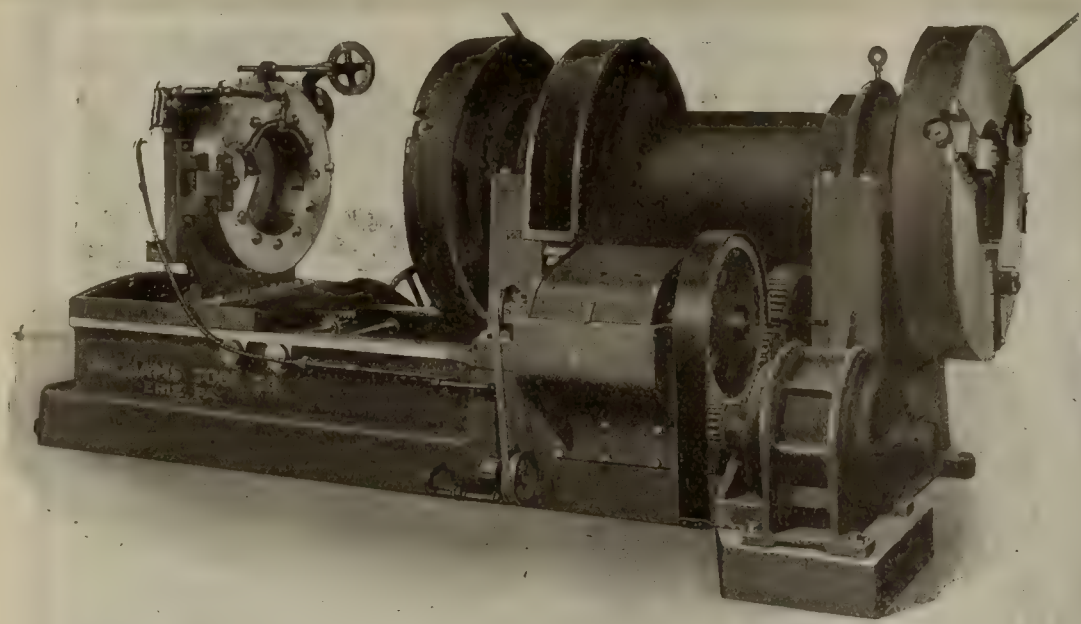
Sole Distributors
MILLERS FALLS CO.
MILLERS FALLS, MASS.



NAPIER SAW WORKS, INC.

SPRINGFIELD, MASS., U.S.A.

Manufacturers of the "QUALITY" BRAND
HACK SAWS BAND SAWS



Highest Award Panama Exposition

Williams Tool Company

Erie, Penn., U.S.A.

Canadian Agents:
The A. R. Williams Machinery Co., Ltd., Toronto, Canada

European Agents:
Universal Machinery Corp. London, England

Pipe Machines

Threading
Cutting-off

Quality will tell in every test. At the Panama Exposition the Williams Cutting-off Machine was given the highest award. What does that mean to you?

It means that your pipe-threading and cutting-off operations will cease to give you any cause to worry if you are "Williams" equipped.

Made in 11 different sizes, each machine handling 8 to 10 consecutive sizes of pipe from ¼" to 18" dia.

Williams cutting-off machine is an investment, not an expenditure. It realizes exceptional dividends.

Write us at once!

Tel. Main 6755 Jos. Bickerstaff, Mgr.

THE ELM CUTTING OIL COMPANY

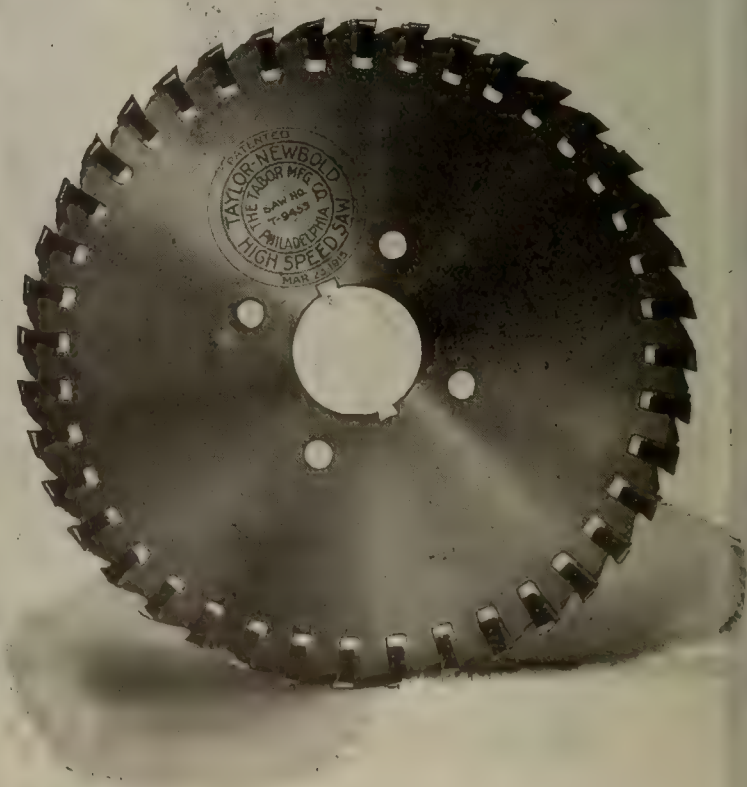
645 East King Street
TORONTO

You have tried the rest. Now use the best for screw cutting and threading.

Our standard is uniformity at all times and a guarantee of quality with every barrel of oil produced.

PRICES ON APPLICATION

THE IMPROVED
TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW

WRITE FOR BULLETIN T-S

Tabor Mfg. Co. Philadelphia, U.S.A.

DOUBLE SAVINGS

in cutting on PEERLESS HIGH SPEEDMETAL SAWS; they save both Time and Material.

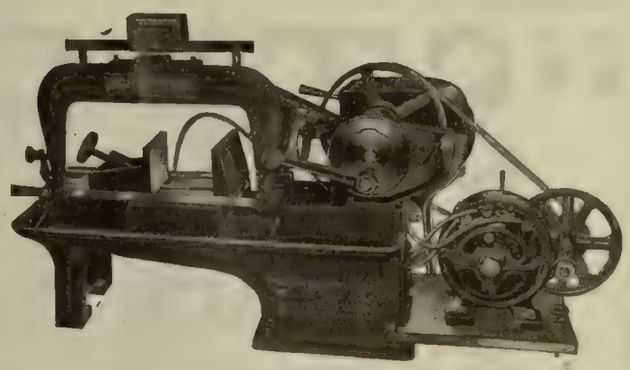
Supposing you save only 1/16 on each cut, 200 lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

Have you ever stopped to consider the waste of material in wide cuts, especially at the present high cost, will pay for a PEERLESS in a remarkably short time.

This is only one of the reasons for so many repeated orders and large concerns having standardized the PEERLESS. The many other reasons can only be fully appreciated after comparative test.

Write for a list of users; some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.



Your Cutting

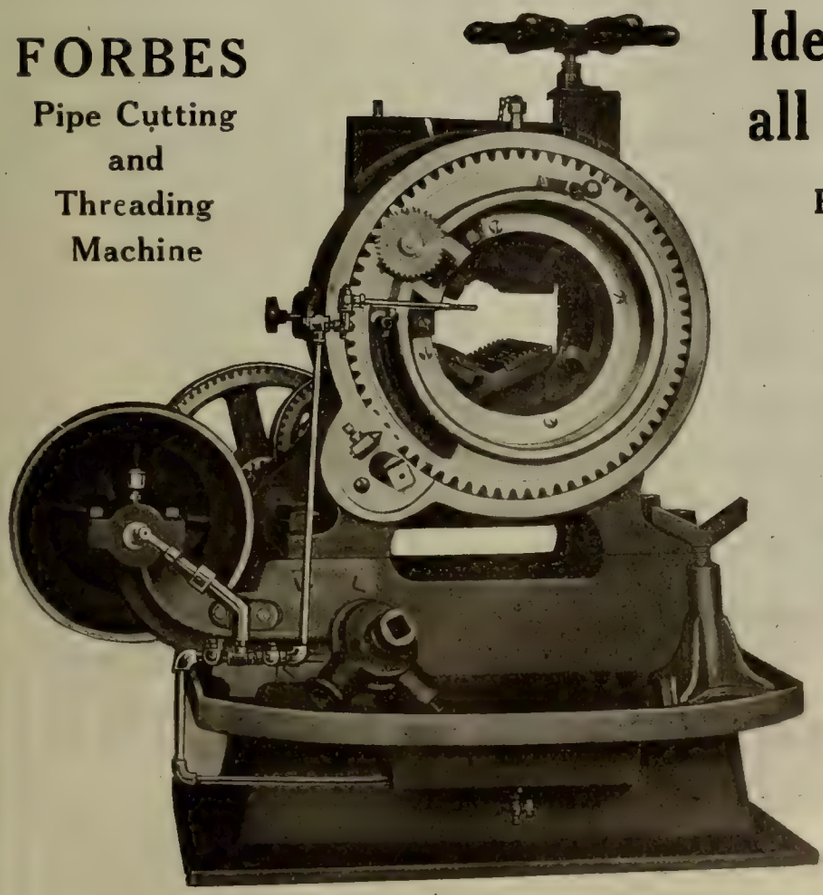
How do you do it? Are your methods giving satisfaction? Are you getting the maximum production? With a Racine to compare results with you will get a better idea of the results you should be getting or could get. Metal cutting has been our study. It is the purpose for which our machines are built. We stand ready to co-operate with you in your cutting problems. Write us for information.

Racine Tool & Machine Co.

15 Melbourne Ave., Racine, Wis., U.S.A.

FORBES

Pipe Cutting and Threading Machine



Ideal Machine for all Kinds of Work

Especially Fine Work

The "Forbes" is the ideal Pipe Cutting and Threading Machine for any job, but it is especially essential where the work in hand is of a high class order—where the reputation of your firm is at stake. Joints threaded by the Forbes Machines will bear the most critical inspection. They never leak.

It is the only machine on the market with receding gear which carries the dies into the pipe. It is also entirely self-contained, motor-driven and can be easily carried to its work.

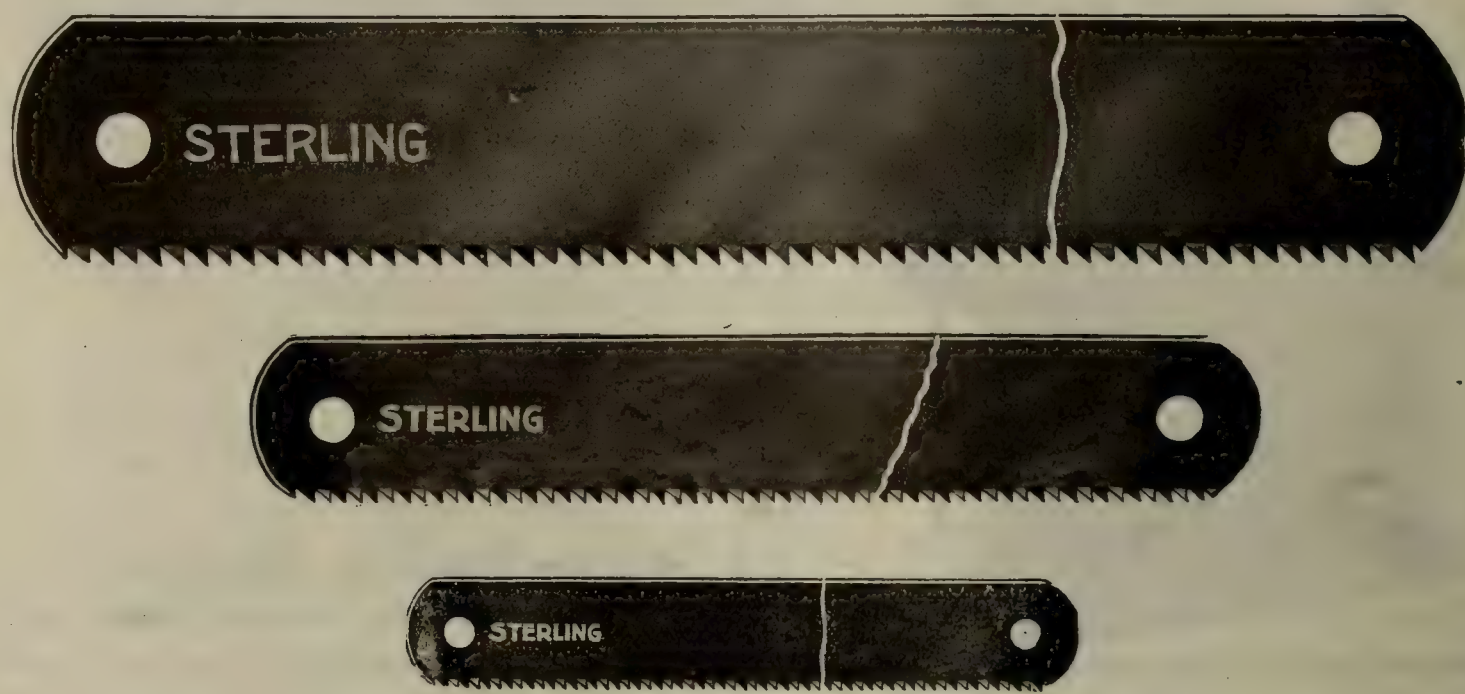
Catalog on Request

Curtis & Curtis Co.

Garden St. Bridgeport, Conn.

"STERLING"

Hack Saw Blades



Made in lengths from 6 in. to 36 in., and in widths from ½ in. to 2 in., for all sizes of power hack saw machines, also hand frames, and in gauges and pitches suitable for cutting all kinds of metal.

The material in these blades is the very last word in the steel makers' craft; added to this, the correct mechanical construction, also very special heat treatment given to the steel, go to make up the highest efficiency in a hack saw blade.

Regular "STERLING" Blades, in both power machine and hand frame sizes, are hardened throughout, and drawn to a degree to combine toughness with hardness.

"STERLING" Blades for hand frames are also made with a double hard edge, the greater part of centre being left soft, making them strong and rigid as well as flexible.

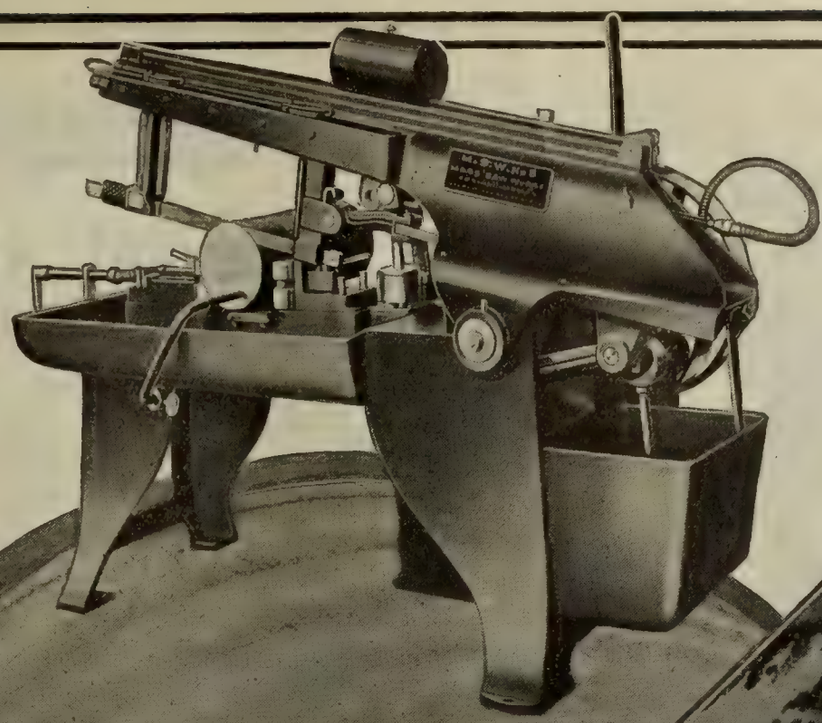
Manufactured By

Diamond Saw & Stamping Works

357-361 SEVENTH ST.

Buffalo, N.Y., U.S.A.

Nine Inches of Solid Steel



V. S. W. No. 5
High Speed Hack Saw Machine

A high grade machine tool in design construction, and workmanship—for the economical cutting of all metals up to 9" x 9"

Built heavier and stronger than actually necessary to stand the modern tendency to over crowd and over speed without unnatural wear or getting out of order.

We cannot emphasize too strongly its high grade construction, the simplicity of its devices, its silence and smoothness in operation, and its rigidity and strength.

You should have a **V. S. W.** machine.

Plus **VICTOR** blades, of course.

Write us for complete description.

VICTOR

VICTOR HACK SAWS

VICTOR SAW WORKS LIMITED

HAMILTON, CANADA

The Greenfield

Universal Grinder

For General Tool Room Work

This Grinder is furnished with attachments for grinding all sorts of milling cutters, reamers, counterbores, and other machine shop tools.

It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angles can be at once obtained.

The whole machine is thoroughly well built, well finished, and will be found a dependable, convenient grinder.

Greenfield Machine Company
Greenfield, Mass., U.S.A.

A Matchless Machine for its Size

The

Fitchburg Grinder

Model A

This Fitchburg Model A is doing a class of work formerly done on bigger, slower, and more expensive class of machines. *So it is a big and genuine cost cutter.*

It was built for *speed, capacity* and *accuracy,* and is filling the bill. It is doing a varied class of work impossible on any other grinder.

Get the full details of our Model A and other types.

Fitchburg Grinding Machine Co.
Fitchburg, Mass., U.S.A.

Which Equipment Do You Need?

WHEN the Dumore Portable Grinder first came on the market a few years ago, hardly anybody would believe us when we said it made 30,000 R.P.M. "It can't be done," they said—until we took the little grinder right out in the shop and proved that it could and that it turned out work with the finest degree of accuracy.

Now, the Dumore is being used in thousands of manufacturing plants and machine shops, grinding tools, gages, dies and similar work. And the same men who once said this high speed was not practical, now say they can't get along without the Dumore.

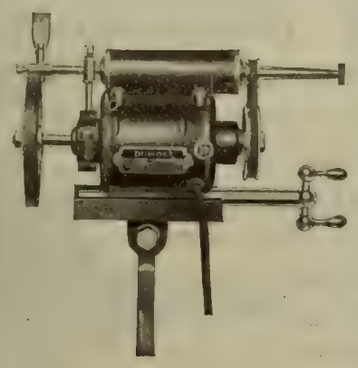
Three types of equipment are shown below. All armatures are dynamically balanced. All types are equipped with S K F Ball Bearings and the well-known Dumore Universal Motor, operating on either direct or alternating current.

Which equipment do you need?

Let us send you a Dumore Grinder on approval. Be sure to state your voltage. Literature on request.

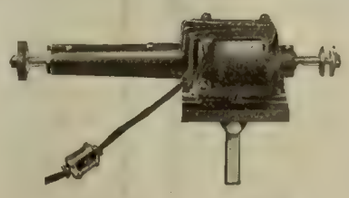
WISCONSIN ELECTRIC COMPANY
1714 Dumore Building
RACINE, WIS.
Sold in England by Canadian-American Machinery Co., Ltd.
8 Bouverie Street
London, E.C.
England

DUMORE PORTABLE ELECTRIC GRINDERS



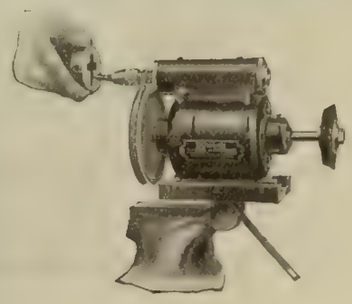
EQUIPMENT A
For General Tool Room Use

Includes High Speed Internal Spindle A, reach, 3", speed, 30,000 R.P.M., motor spindle speed, 10,000 R.P.M. Set of seven wheels, 3/8", 7/16", 9/16", 11/16", 13/16" (for internal work), 2½" and 4" (for external work). Six rubber belts. Cutter grinder rest. Cross feed lever. Cord and plug. Hardwood carrying case. Net weight, 17 lbs. Shipping weight, 30 lbs.



EQUIPMENT B
For Deep Internal Work

Includes Extension Arm B; reach, 10", speed, 10,000 R.P.M. The Extension Arm B is interchangeable with Internal Spindle shown in Equipment A. Two elastic wheels, 2½" and 4". Cutter grinder rest. Cross Feed lever. Cord and plug. Hardwood carrying case. Net weight, 19 lbs. Shipping weight, 32 lbs.

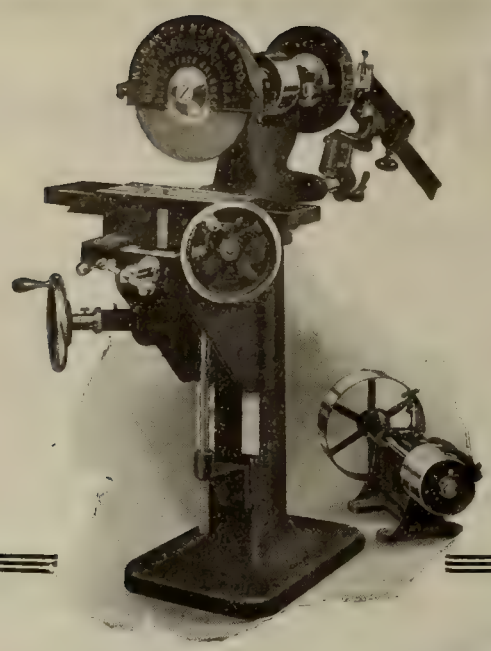


EQUIPMENT C
Button Die Grinder
50,000 R.P.M.

Grinder complete with special spindle and chuck for grinding button dies. Speed, 50,000 R.P.M. This special spindle can be furnished to manufacturers who already have Equipment A or B.

Outfit also includes: 3/8" rd. emery pencil, 2½" and 4" elastic wheels. Cutter grinder rest. Cross feed lever. Cord and plug packed in substantial carrying case. Net weight, 17 lbs. shipping weight, 30 lbs.

If any advertisement interests you, tear it out now and place with letters to be answered.



Wilmarth & Morman No. 1

Big Production Surface Grinder

for

Immediate Delivery

Rigid—Accurate
Convenient

Capacity 6 in. x 14 in. x 10 in.

Circular on Request.

Wilmarth & Morman Co.

Makers of
DRILL GRINDERS—SURFACE GRINDERS
UNIVERSAL GRINDERS

1200 Monroe Ave., N. W.

Grand Rapids, Mich., U.S.A.

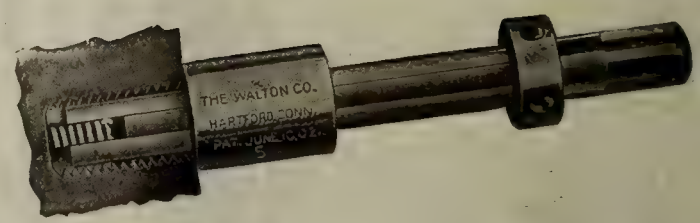
Has This Happened to You?

More than likely it has—often. And when it does do you fuss around trying to get hold of the broken pieces, injuring the threads, wasting time and temper?

If you do, the Walton Tap Extractor will be a welcome addition in your tool chest. With it a broken tap presents no difficulties and makes little lost time. The crucible steel fingers of this strong device go down into the flutes and it is then a simple matter to back the tap out by applying a wrench to the squared outer end of the tool. The thread is uninjured in the process, the casting or forging is saved and an otherwise nasty job has been handled without trouble or loss of time.

The Walton Company

Hartford, Conn.

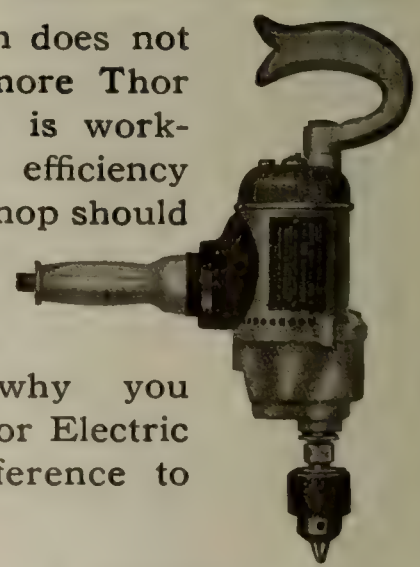


Thor

UNIVERSAL Electric Drills

Licensed Under Burke Universal Motor Patent

No shop which does not use one or more Thor Electric Drills is working to full efficiency which every shop should do during these critical times. Let us demonstrate why you should use Thor Electric Tools in preference to other makes.

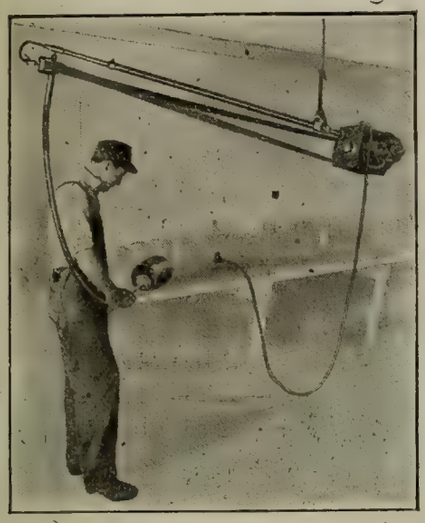


Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.

Toronto: 32 Front St. W; Winnipeg: 123 Bannatyne Ave., E; Vancouver: 1142 Homer Street

Stow Shell Grinders Increase Production



Suspended Pedestal Mounted on Truck

Any Size Any Current

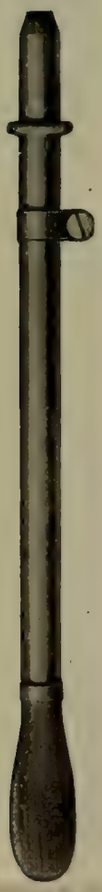
Immediate Shipment

Stow Manufacturing Co.

Binghamton, New York, U.S.A.

Oldest Portable Tool Manufacturers in America

Grinding Wheel Dressers

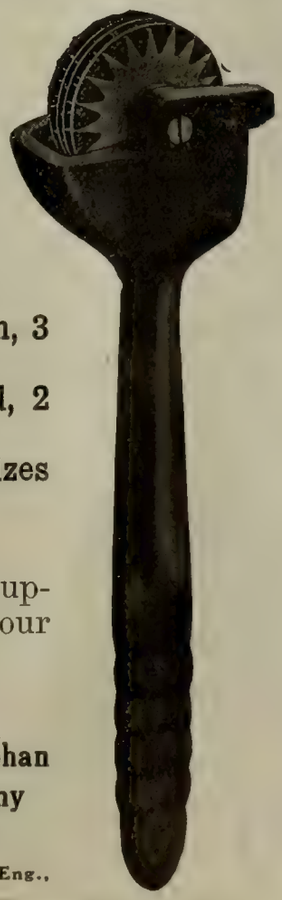


We are specialists in Grinding Wheel Dressers and can recommend the best types for any particular needs.

Our Dressers are:

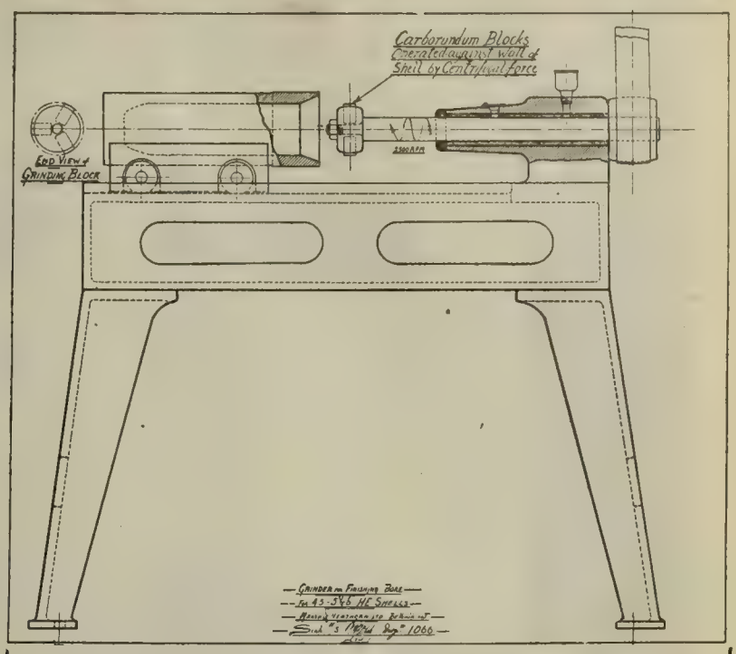
Diamo-Carbo
Desmond Huntington, 3 sizes
Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

We can promptly supply your needs from our stock.



The Canadian Desmond-Stephan Manufacturing Company
HAMILTON, ONTARIO

Alfred Herbert, Ltd., Coventry, Eng., Agent for Great Britain.



Smooth Bores

We have designed for our own use a simple and inexpensive grinder to give the final touch to the bore of our shells.

It does the work, and we will have some of these machines on the market shortly.

Write us for our proposition.

Marsh & Henthorn Limited

BELLEVILLE, ONTARIO

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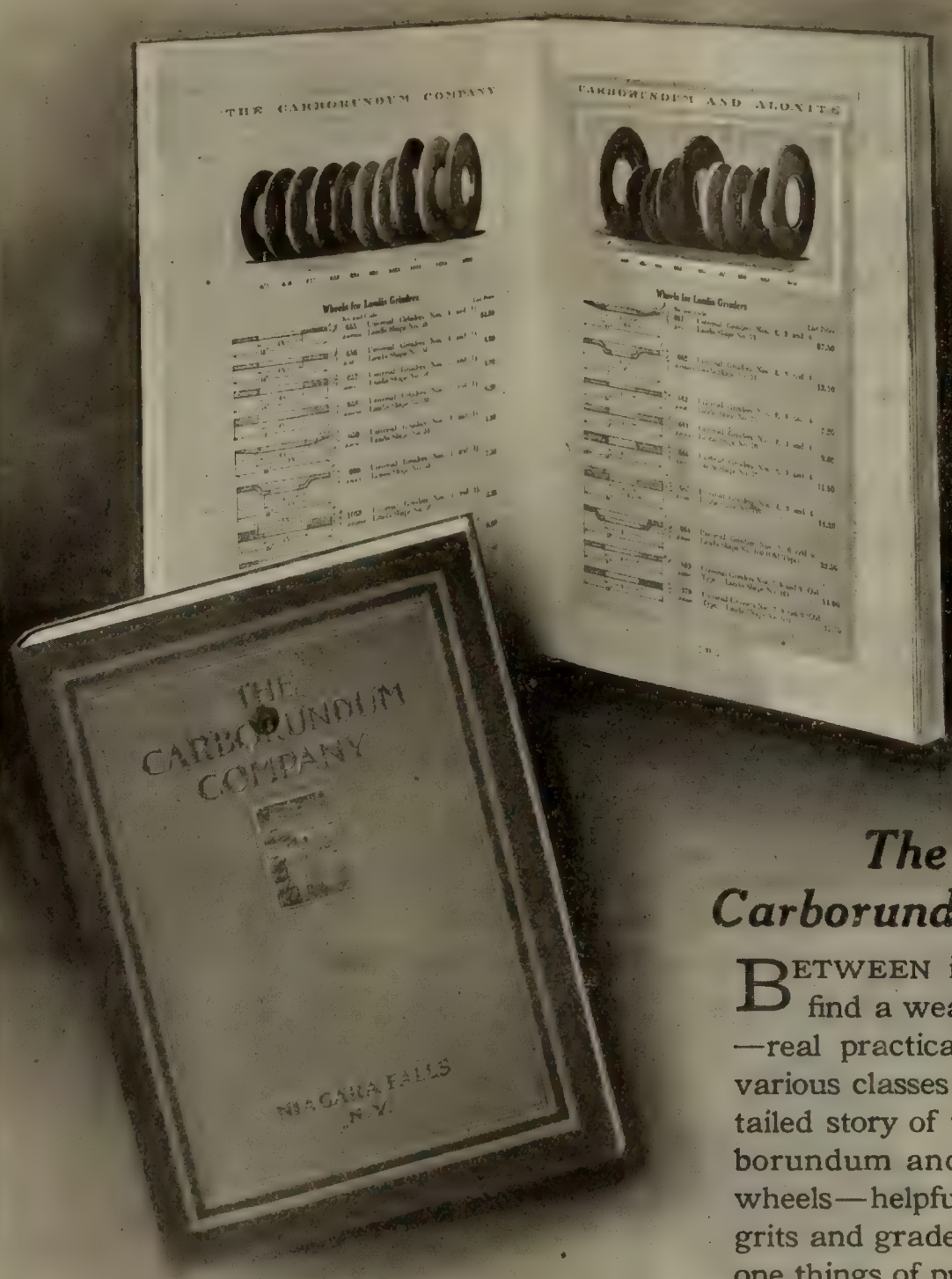


Just Off the Press

The New Carborundum Catalog

BETWEEN its covers you will find a wealth of information—real practical, helpful, data on various classes of grinding—a detailed story of the making of Carborundum and Aloxite grinding wheels—helpful tables on speeds, grits and grades,—a hundred and one things of practical value to all wheel users—and the book shows

A Working Drawing and a Photographic Reproduction of Every Shape and Size Wheel Used on all Standard Machines

At the top of each page is a photographic reproduction of the wheels—below is a detailed cross section drawing showing every dimension—as readable as a blue print. It is a simple, practical, entirely new method. The Carborundum Catalog should be in every plant where grinding wheels are used.

A handy miniature copy for shop use can be had upon request.

CARBORUNDUM NIAGARA FALLS

THE CARBORUNDUM COMPANY
NIAGARA FALLS, N. Y.

ALOXITE NIAGARA FALLS

NEW YORK CHICAGO PHILADELPHIA CLEVELAND CINCINNATI BOSTON
PITTSBURGH MILWAUKEE GRAND RAPIDS

MODERN

SELF-OPENING and ADJUSTABLE DIE HEADS

The Die Heads that have made good on every threading operation, and which are constantly meeting the demand where Die Heads are required for accurate thread-cutting.

In purchasing "MODERN" Die Heads you have the assurance that you are getting tools of "quality," mechanically perfect in design and construction and uniformly efficient in all sizes.

Illustration shows an installation of "MODERN" Die Heads threading Shell Ogives, where the requirements are precision and large production.

Complete information regarding the use of "MODERN" Self-Opening Die Heads upon request.

MODERN TOOL COMPANY

Main Office and Works:
State and Peach Sts. - Erie, Pa., U.S.A.

Canadian Agents:
Rudel-Beinap. - Toronto—Montreal

F. WESLEY PARKER
Resident Engineer and Export Agent,
2 Rector Street, New York

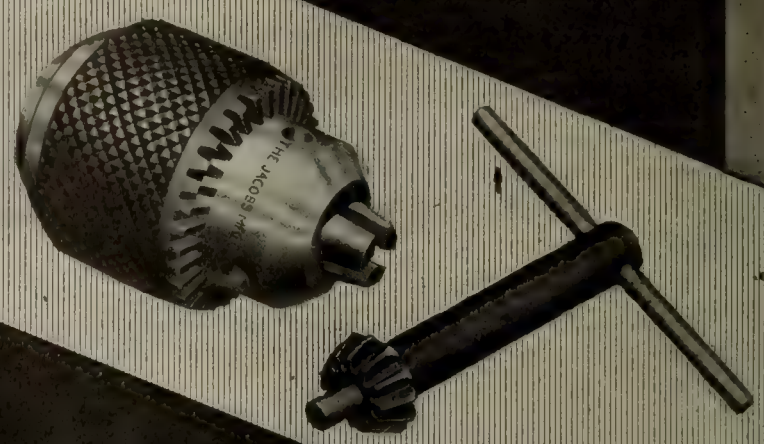
Jacobs
IMPROVED
Drill Chuck

A
Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.



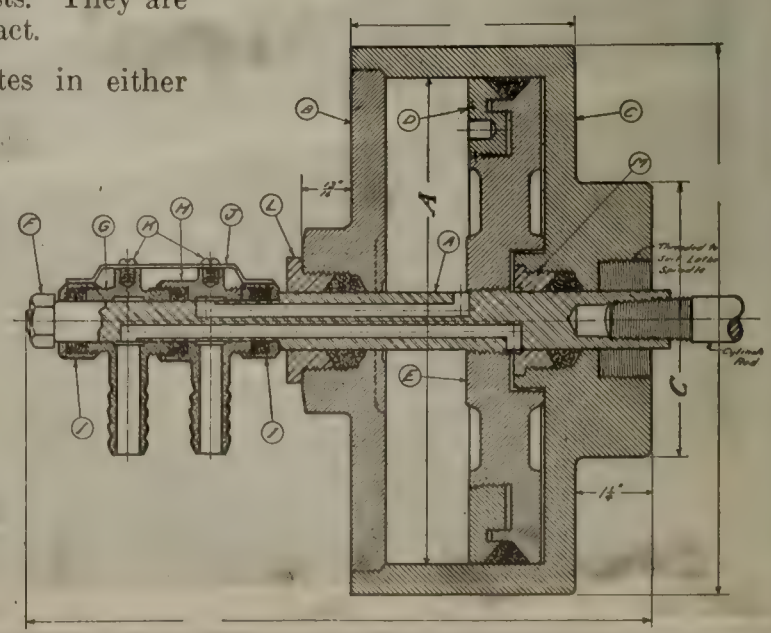
It's Mighty Good Business Management To Install M. E. C. Air Cylinders

Ask for literature about M.E.C. air-operated two and three-jaw chucks, air-operated hinge collets, expanding mandrels and collapsible taps.

Because of their money-saving service. They improve and increase your output and decrease your operating costs. They are lighter than others, yet are more durable and compact.

Style "D" shown above is double acting; operates in either direction.

The pistons are packed with high-grade twist lubricated packing supported by a tapered, adjustable piston ring. In the application of power to chucks, the M.E.C. Air Cylinder will be found ideal. End thrust in air supply connection has been eliminated and a minimum number of parts assured, because of careful design. It is as near leak-proof as is possible to make an air cylinder.



Manufacturers Equipment Co.
171 North Jefferson St., Chicago, Ill., U.S.A.

Agents for Canada
J. R. STONE TOOL & SUPPLY COMPANY
Goebel Building, Detroit, Mich.

HANNIFIN

Air Chucks on 6" Shells

Our catalog will tell you some very interesting facts about these chucks. Send for it to-day.

On munition work Hannifin chucks have demonstrated their time and labor-saving features in a marked manner. The photograph shows one of a long line of lathes boring six-inch shells—all equipped with Hannifins.

In your own plant—whether you are making shells or whether you are doing general manufacturing, Hannifin Air-Operated Chucks will aid you to speed up production.

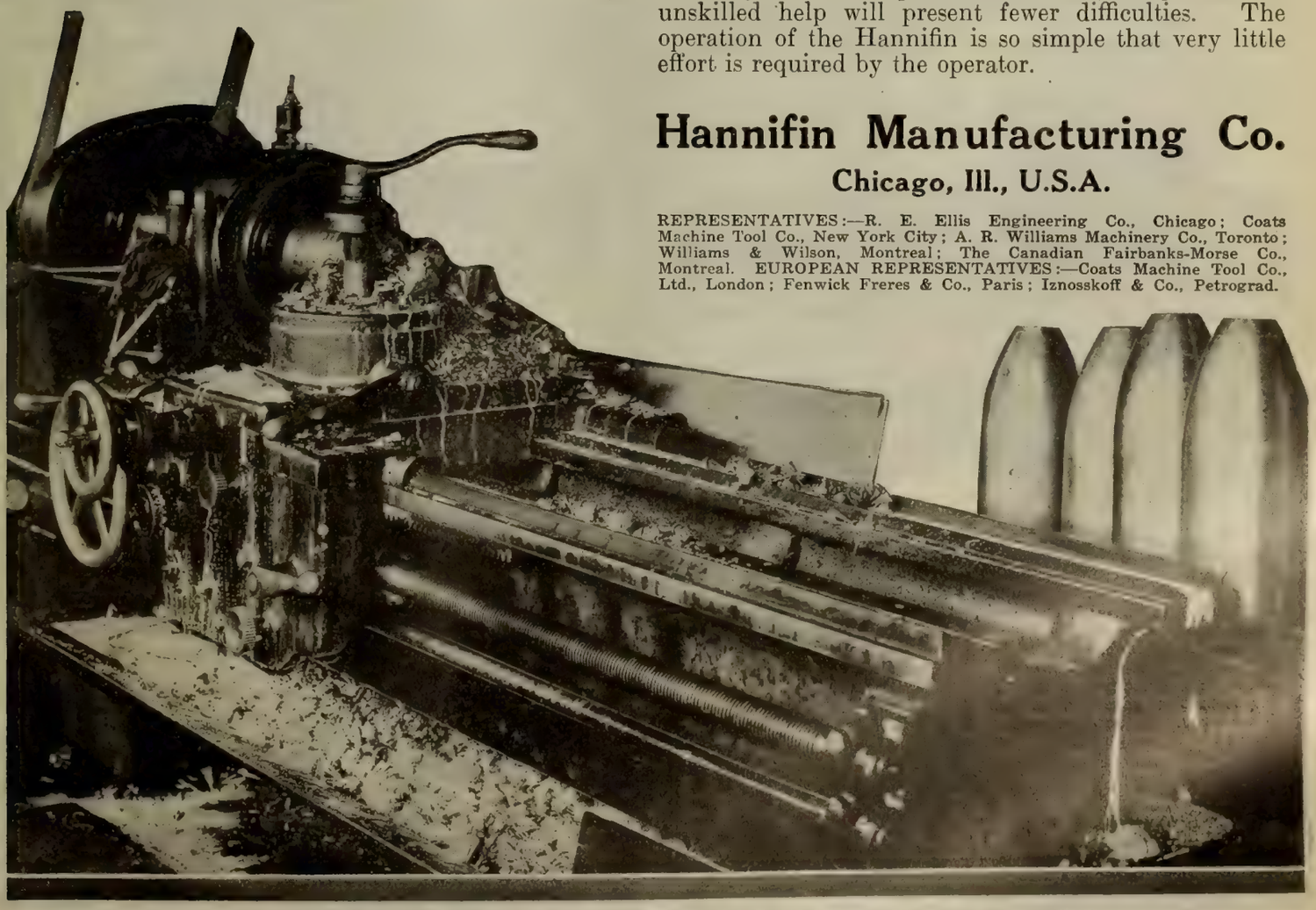
Their instantaneous action, positive grip and ease of operation will save time to the extent of increasing output 20 to 100 per cent.

And if you have adopted female labor, the problem of unskilled help will present fewer difficulties. The operation of the Hannifin is so simple that very little effort is required by the operator.

Hannifin Manufacturing Co.

Chicago, Ill., U.S.A.

REPRESENTATIVES:—R. E. Ellis Engineering Co., Chicago; Coats Machine Tool Co., New York City; A. R. Williams Machinery Co., Toronto; Williams & Wilson, Montreal; The Canadian Fairbanks-Morse Co., Montreal. EUROPEAN REPRESENTATIVES:—Coats Machine Tool Co., Ltd., London; Fenwick Freres & Co., Paris; Iznosskoff & Co., Petrograd.



You Should Know Its Points

Among its many distinct features is one that is the most convincing argument and the reason why you should be "Murchey" equipped. That is—its adjustable feature. For comparative purposes we will take a solid tap. When the first grinding on a solid tap is made, the original accuracy is at once lost. The more grindings the greater the inaccuracy. With the Murchey Adjustable Tap, when the first grinding is made the adjustable feature allows for absolute accuracy. The chaser may be adjusted to compensate for wear. This gives the Murchey Tap the life of ten solid taps. Think that over. One tap will take several sizes. Taps cover a range of 1¼" to 12".

An inquiry would secure our immediate co-operation.

Murchey Machine & Tool Company

75 Porter Street - - Detroit, Mich.

The Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, S.W., England, Glasgow, Newcastle-on-Tyne, and Fenwick Freres & Company, 15 Rue Fenelon, Paris, France.

For Positive Accuracy—

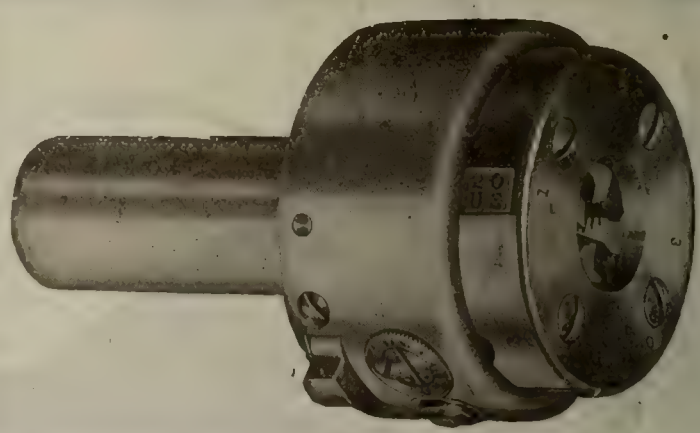
and Big Time Saving

VICTOR Collapsible TAPS

"Victor" Collapsible Taps are simple in construction; the few parts can be made large and strong; the body is machine steel, and the chasers are high-speed; screw adjustment from front end makes it easy to maintain close accuracy; trip is automatic; reset by means of lever. The above features—and others—make the "Victor" a time and money saver for severe service. It is being used by many shell manufacturers.

Victor Tool Company

Waynesboro, Pa., U.S.A.



H & G

Your Threads

Will they stand improvement? If they will and you want the best results—H. & G. Automatic Self-Opening Die Heads will do the trick.

The Chasers are set and held in place by a steel cam, which, once adjusted, locks; there is no stoppage or changing in size. The **quick release** not only insures the cutting of the thread to a given point every time, but permits cutting right up to a shoulder when necessary.

Write for our booklet!

Eastern Machine Screw Corp.

NEW HAVEN, CONN., U. S. A.

Every Butterfield Tap comes to you ready for long, hard service.

It is made by expert workmen—from the finest materials obtainable—and thoroughly tested before shipment.

For the tap that is uniformly dependable in service — specify Butterfield.

Butterfield & Co., Inc.
Rock Island :: Quebec

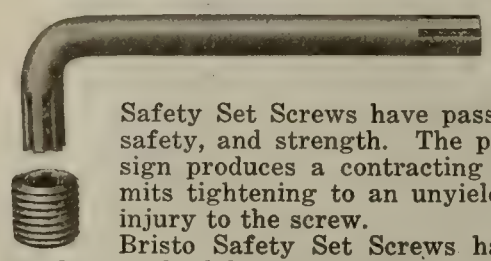
Toronto Office:
1505 Traders Bank Building :: Phone Main 1382
H. A. HARRISON, Manager

Catalog No. 14 containing the complete line of Butterfield Tools, sent on your request.

BUTTERFIELD

HINTS TO BUYERS

BUILDERS OF MACHINERY WHAT SET SCREWS DO YOU USE?



TRADE MARK
BRISTO
REG. U. S. PAT. OFF.

Safety Set Screws have passed every test for safety, and strength. The patented fluted design produces a contracting effect which permits tightening to an unyielding grip without injury to the screw.

Bristo Safety Set Screws have been adopted as the standard by many prominent machine builders. Ask for free samples and Bulletin I-809.

THE BRISTOL CO., Waterbury, Conn.
U. S. A

We guard your purchases and tell you if you are getting what you are supposed to get.

Once you have formed the habit of consulting us for expert advice you wonder how you got along without our service.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED

Head Office and Main Laboratories—MONTREAL

Branch Offices and Laboratories:
TORONTO, WINNIPEG, EDMONTON, VANCOUVER, NEW GLASGOW

"THISTLE" BRAND RUBBER BELTING

"Maintenance of Quality"
is our motto, and our experience in the manufacture of belting since the year 1856 should be invaluable to you. Let us tell you all about this friction faced belting. The price will appeal to you.
Write to-day.

J. C. McLAREN BELTING CO., LTD.
TORONTO, MONTREAL, WINNIPEG

STEEL CASTINGS

We are well equipped to make all kinds of steel castings, 100 lbs. to 50,000 lbs.

Dominion Steel Foundry Co.
Hamilton LIMITED Ontario

IS YOUR RIVETING PROFITABLY DONE?

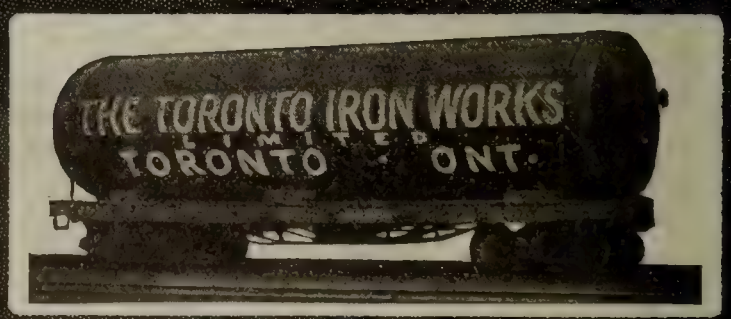
Our Elastic Rotary Blow Riveting Machine does profitable work, because one machine will do the work of several hand riveters, and do it better.

Every head is perfectly formed, any shape, round, flat, oval, rectangular, etc.

Catalogue C tells more about it.

The F. B. SHUSTER COMPANY
New Haven, Conn.
Formerly John Adt & Son. Established 1866.
Also makers of Wire Straighteners and Cutter, Cotter Pin Machines, etc.

RIVETED STEEL TANKS FOR EVERY PURPOSE



OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
PNEUMATIC WATER SUPPLY TANKS - SMOKE STACKS
BOILER BREECHING - RIVETED STEEL PIPE - BINS & HOPPERS

WE MANUFACTURE RIVETS of every description, ½ inch. dia. and smaller

PARMENTER & BULLOCH CO., LTD.
GANANOQUE, ONT.

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RICHMOND ® CHUCKS

Universal Geared Scroll Type with either one or two sets Jaws.

Richmond Mfg. Co., Ltd.

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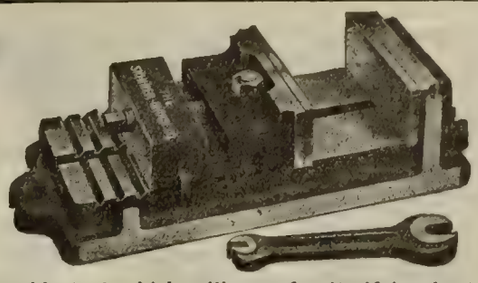
SKINNER DRILL PRESS VISE



A substantial, durable tool which will pay for itself in short order in any machine shop. Four sizes to accommodate a wide range of work. Try one and you'll buy more.

Printed matter promptly mailed on request.

THE SKINNER CHUCK COMPANY

New York Office, 94 Reade Street — London Office 149 Queen Victoria St. — San Francisco Office Rialto Bldg.

Factory and Main Office, New Britain, Conn., U.S.A.

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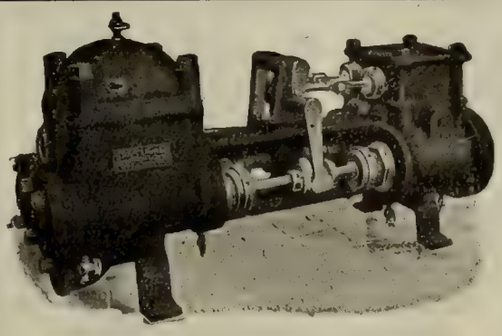
COAL COKE HACK SAW BLADES
CARBON STEEL MACHINERY STEEL
HIGH SPEED STEEL

Royal Bank Bldg., Toronto; McGill Bldg., Montreal, Que.



High-Class **Pumps** for every service

The Smart-Turner Machine Co. Limited

Hamilton Canada

Adjustoglas TRADE MARK REGISTERED

lenses will not break into the eye.

THE STRONG, KENNARD & NUTT CO.
511 Schofield Bldg. Cleveland, Ohio

For Hardness Testing

THE PYROSCOPE

in shop and laboratory use the

Standard Scleroscope

Universally adopted; direct reading; inexpensive, and the only instrument that agrees with others of its kind in all parts of the world, thus solving problems of ordering materials to specification.

BOOKLET FREE.

THE SCLEROSCOPE (Set)

Heat Indication

by optical means is fast becoming the correct thing. The PYROSCOPE has solved the problem. Perfect constancy, inexpensive, no electricity used. Built to stand rough usage and upon common-sense lines. Used by the Government and best firms.

Shore Instrument & Mfg. Co. 555-7 W. 22nd St. New York

Agents for Canada: A. R. Williams Machy. Co., Ltd., Toronto, Can.

CLUTCHES

Combined Jaw and Friction. Friction only
Gas Engine Clutches. Jaw Clutches.

Write for interesting printed matter.

The Positive Clutch & Pulley Works, Ltd., Canada

MONTREAL Factory: Aurora, Ont. TORONTO

LANDIS MACHINE CO., INC.
WAYNESBORO, PENNA.

Manufacturers of BOLT and PIPE THREADING MACHINERY

Exclusive Canadian Agents:
Williams & Wilson, MONTREAL, CAN.

Write for Catalogue No. 22

You want Tool Holders that have made good

ARMSTRONG TOOL HOLDERS

Won The

GRAND PRIZE

THE HIGHEST POSSIBLE AWARD AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

THEY ALWAYS MAKE GOOD

Write for Catalog.

Armstrong Bros. Tool Co.

"The Tool Holder People"

306 N. Francisco Ave., CHICAGO, U.S.A.

SHAFTING

Cold Drawn, Turned and Polished Steel, Rounds, Squares, Hexagons and Flats, Steel Piston Rods, Pump Rods.

Special facilities for Keyseating up to 6 in. diameter.

THE **Canadian Drawn Steel Co.** Limited

HAMILTON CANADA

Metal Testing Instruments

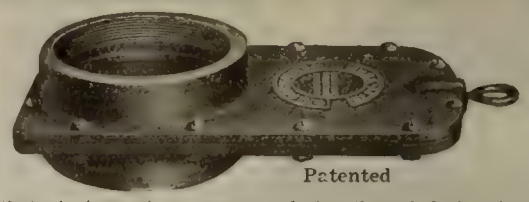
The Brinell Meter
for determining the hardness of metals and metal products.

The Erichsen Machine
for testing metal sheets and strips.

— WRITE FOR CATALOGUES —

Herman A. Holz, 1 Madison Ave. N.Y.

NEW AIR-TIGHT BLAST GRATE
FOR LOW AND MODERATE PRESSURE AIR



Save that air (money) you are now losing through leaky blast gates. Our NEW AIR-TIGHT BLAST GATE stops this loss.

Circular 123-B explains its many other advantages, outlining clearly its all-round superiority over the ordinary light, flimsy, cheap, leaky and unreliable blast gates, and the heavy, cumbersome, expensive and slow-acting gate valves and stop cocks.

Ask for circular and list of users.

W. S. ROCKWELL COMPANY
FURNACE ENGINEERS AND CONTRACTORS
50 Church St. (Hudson Terminal Building) New York

NORTON JACKS
FOR ALL KINDS OF HEAVY LIFTING
Send for complete catalogue showing 50 styles 10 to 100 tons capacity.
Made only by
A. O. NORTON, LIMITED
Coaticook, Prov. Quebec - - Canada

SENT ON TRIAL

Hand or Breast Drills, 12 sizes, sizes fitted with ¾ to 2½ in. cap. Ball bearing throughout. Larger screw feed.

We make complete line of Portable Electric Drills and Grinders for all purposes. Especially built to withstand hard usage. For all currents and voltages.

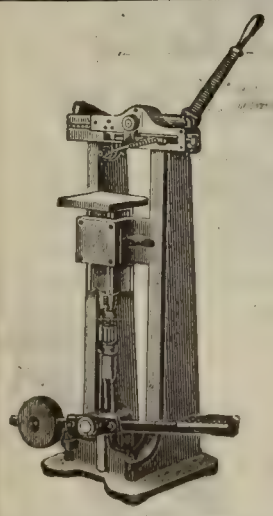
Catalog?

Cincinnati Electrical Tool Co., Cincinnati, Ohio
New York Office: 50 Church Street

GEARS AND GEAR CUTTING SPROCKETS AND CHAINS

In stock and to order any size from one-quarter inch to six-foot in diameter, any material. Estimates and gear advice cheerfully furnished.

Grant Gear Works, Inc., 151 Pearl St. Boston, Mass.
G. B. GRANT U.S.A.



DWIGHT SLATE MARKING MACHINE
TRADE MARK

For Marking Shrapnel Shells

or they will mark any article, either round or flat. Power or Hand Machines recommended.

Steel Stamp and Die Cutting by expert engravers.

Send for Catalogue.

Noble & Westbrook Mfg. Co.
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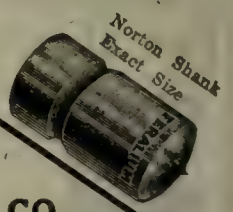

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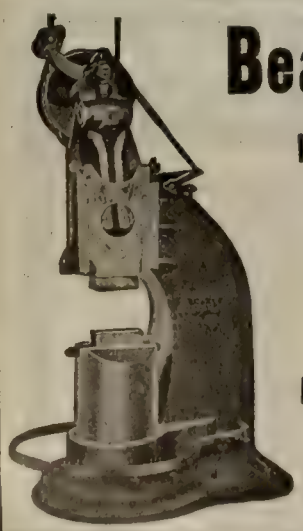

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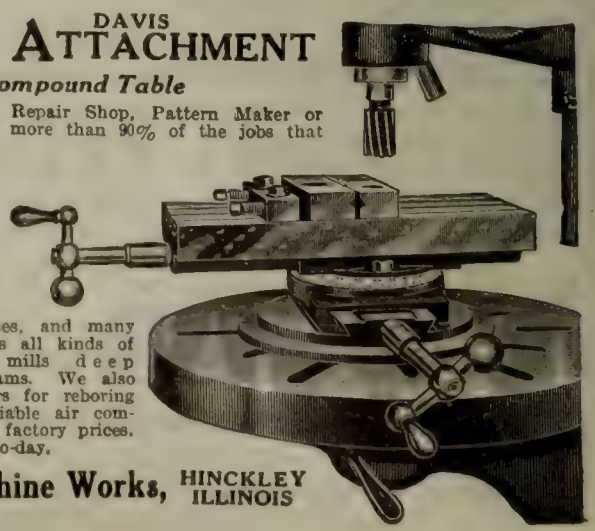

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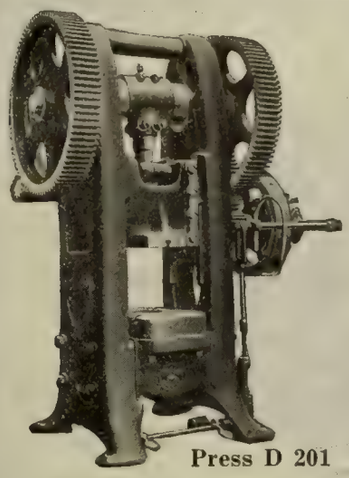

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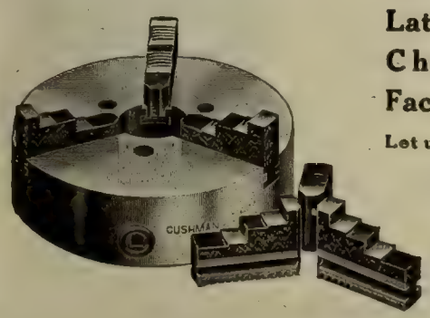

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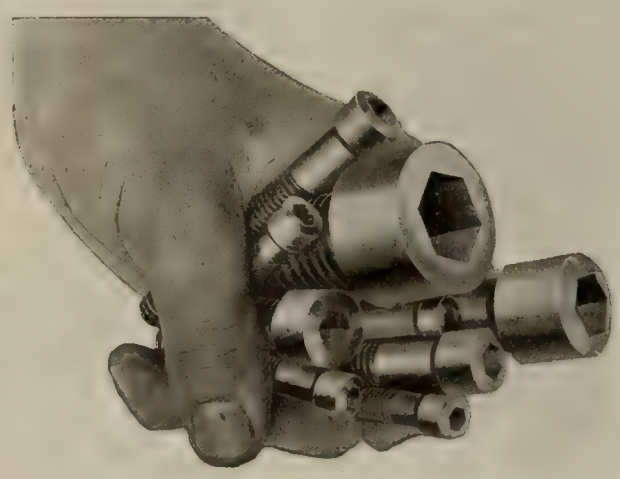

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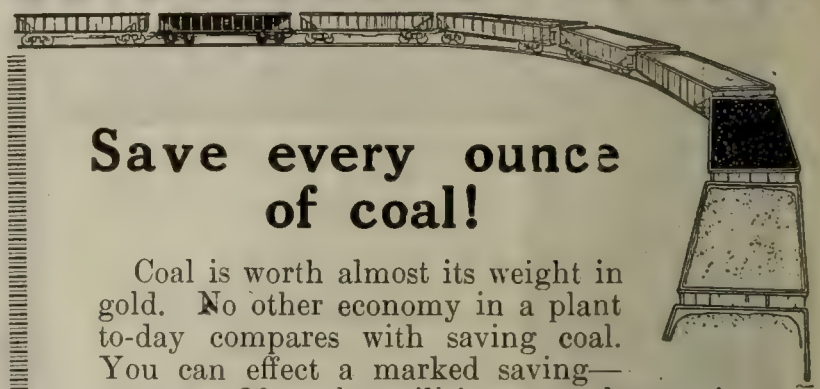

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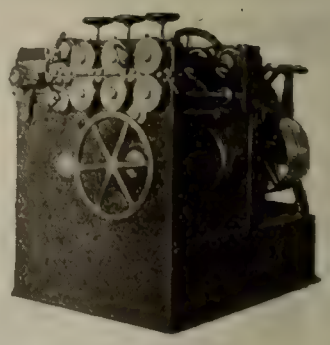

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CHUCKS, MAGNETIC
H. E. Streeter, 523 New Birks Bldg., Montreal.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

CHUCKING MACHINES
Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

CLOCKS, WATCHMAN, PORTABLE
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Que.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.

COAL HANDLING MACHINERY
MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

COILING MACHINERY, WIRE AND SPRING
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

COLLARS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.
Stone Tool & Supply Co., J. R., Detroit, Mich.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

CONTROLLERS AND STARTERS, ELECTRIC MOTORS
Dominion Machy. Co., Toronto, Ont.
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, STEEL SLIDE-BLOW
Whiting Foundry Equipment Co., Harvey, Ill.

COPING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Lundas, Ont.

COUNTERSHAFTS
Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.

COUPLINGS, PLAIN AND FLEXIBLE
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES, LOCOMOTIVE
Northern Crane Works, Walkerille.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.

CUTTER GRINDERS AND ATTACHMENTS
Cincinnati Milling Machine Co., Cincinnati.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
H. W. Petrie, Ltd., Montreal.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Goddard Tool Co., Chicago, Ill.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining & Mfg. Co., Toronto.
Elm Cutting Oil Co., Toronto.
Racine Tool & Machine Co., Racine, Wis.

CUTTING-OFF MACHINES
Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machinery Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Peerless Machine Co., Racine, Wis.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Mchy. & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

CYLINDERS, AIR
Manufacturers Equipment Co., Chicago, Ill.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.

DAMPER REGULATORS
Canadian Fairbanks-Morse Co., Ltd., Montreal.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

DIAMONDS, BLACK AND ROUGH
Geo. A. Joyce Co., Ltd., New York.

DIAMOND TOOLS
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Banfield, W. H., & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Ltd., Montreal.
Wells Brothers of Canada, Galt, Ont.

DIES FOR BIT BRACE USE
Wells Brothers Co. of Canada, Galt, Ont.

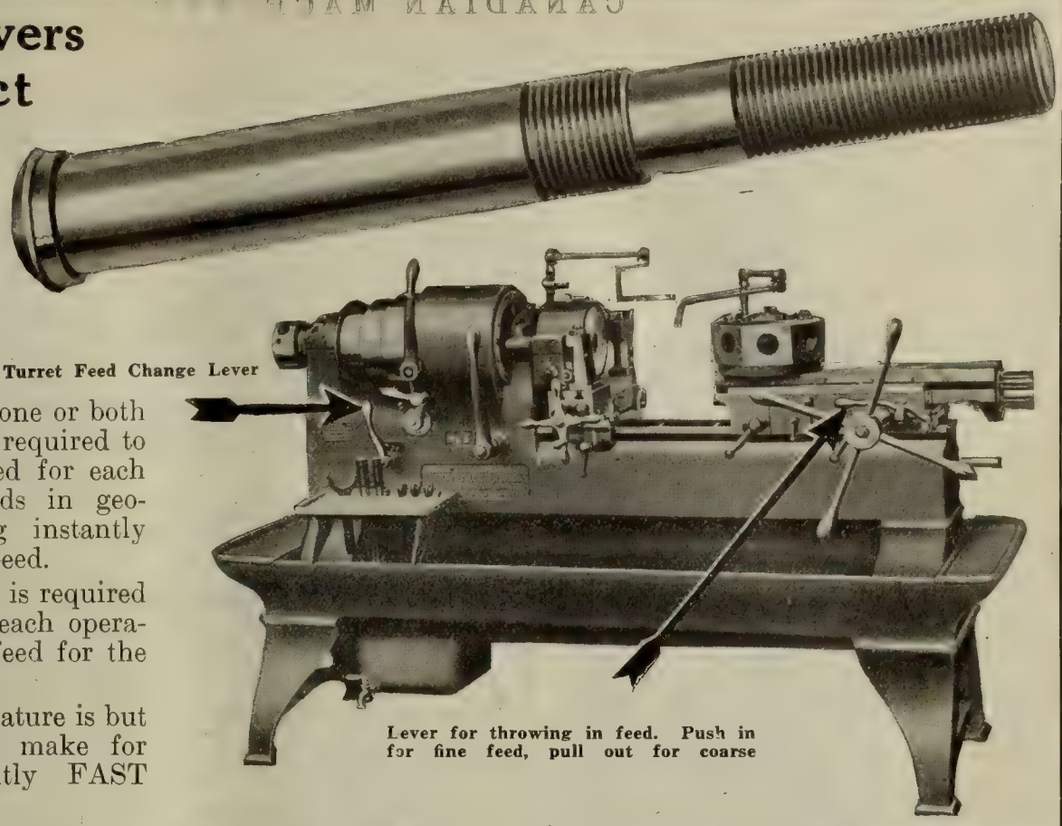
DIES, NOSING
Marsh & Henthorn, Ltd., Belleville, Ont.

DIES, PIPE THREADING
Landis Machine Co., Waynesboro, Pa.

DIE SINKERS
Becker Milling Machine Co., Boston, Mass.
Garvin Machine Co., New York.
H. W. Petrie, Ltd., Montreal.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

Two Handy Levers Give the Correct Turret Feed for Each Operation on this Piece.



The simple movement of one or both of these levers is all that is required to get the most productive feed for each turret operation, eight feeds in geometrical progression being instantly available for each spindle speed.

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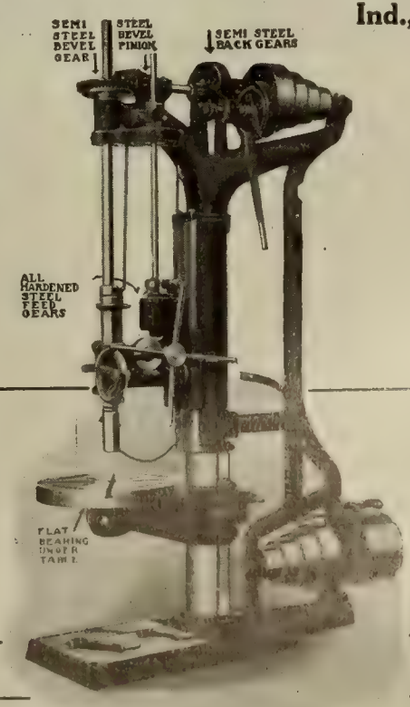

If any advertisement interests you, tear it out now and place with letters to be answered.

DIE SINKING PRESSES, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago.

DIES, SELF-OPENING
Eastern Mach. Screw Corp., New Haven, Conn.
Geometric Tool Co., New Haven.
Ideal Tool & Mfg. Co., Beaver Falls, Pa.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
Wells Brothers Co. of Canada, Galt, Ont.

DIES FOR SCREW PLATES
Wells Brothers Co. of Canada, Galt, Ont.

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Brown, Boggs & Co., Hamilton, Canada.
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Graton & Knight Mfg. Co., Worcester, Mass.

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Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National-Acme Co., Cleveland, Ohio.
Wells Brothers Co. of Canada, Galt, Ont.

DRAFT, MECHANICAL
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

DISCS, LEATHER
Graton & Knight Mfg. Co., Montreal.

DRESSERS, GRINDING AND EMERY WHEEL
Can. Desmond-Stephan Mfg. Co., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, O.
A. R. Williams Machinery Co., Toronto.

DRILLING MACHINES, BENCH
Bilton Mach. Tool Co., Bridgeport, Conn.
Martin Machine Co., Greenfield, Mass.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Hespeler, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Rockford Drilling Mach. Co., Rockford, Ill.

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Dominion Machy. Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Hill, Clarke & Co., Chicago, Ill.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

DRILLING MACHINES, SENSITIVE
Aikenhead Hardware Co., Toronto, Ont.
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
De Mooy Machine Co., Cleveland, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
D. McKenzie Machinery Co., Guelph, Ont.
Niles-Bement-Pond Co., New York.
R. E. T. Pringle, Ltd., Toronto, Ont.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, Ohio.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Dominion Machy. Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto, Ont.
W. F. & John Barnes Co., Rockford, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Millers Falls Co., Millers Falls, Mass.
H. W. Petrie, Ltd., Montreal.
Pratt & Whitney Co., Dundas, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
United States Electrical Tool Co., Cincinnati.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.

DRILLS, ELECTRIC AND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Dominion Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.

DRILLS, HIGH SPEED
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Can. B. K. Morton, Toronto, Montreal.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Foss & Hill Machy. Co., Montreal.
Marshall & Co., Geo. A., Toronto, Ont.
McKenna Brothers, Pittsburgh, Pa.,
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
W. F. & John Barnes Co., Rockford, Ill.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

DRILLS, MULTIPLE SPINDLE
Henry & Wright Mfg. Co., Hartford, Conn.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Ltd., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Niles-Bement-Pond Co., New York.
R. E. T. Pringle, Ltd., Toronto, Ont.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Millers Falls Co., Millers Falls, Mass.
Morse Twist Drill & Mach. Co., New Bedford.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Dominion Machy. Co., Toronto.
Foss & Hill Machy. Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Cleveland Twist Drill Co., Cleveland.
Clark Equipment Co., Buchanan, Mich.
Foss & Hill Machy. Co., Montreal.
Morse Twist Drill & Mach. Co., New Bedford.

DRILLS, TWIST
Atkins & Co., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

DRINKING FOUNTAINS
Puro Sanitary Dk'g. Fountain Co., Haydenville, Mass.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sheldons, Ltd., Galt, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

DUST ARRESTERS (FOR TUMBLING MILLS)
Northern Crane Works, Walkerville.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

DYNAMOS AND ELECTRICAL SUPPLIES
Canadian Fairbanks-Morse Co., Montreal.
Dominion Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
A. R. Williams Machy. Co., Toronto.

ELEVATOR ENCLOSURES
Canada Wire & Iron Goods Co., Hamilton, Ont.

ELEVATORS AND BUCKETS
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Whiting Foundry Equipment Co., Harvey, Ill.

ELEVATING AND CONVEYING MACHINERY
Banfield, Edwin J., Toronto.
Can. Matthews Gravity Carrier Co., Toronto, Ont.

EMERY GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Stow Mfg. Co., Binghamton, N.Y.

EMERY AND EMERY WHEELS
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Ford-Smith Mach. Co., Hamilton, Ont.
Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

ENGINES, BALANCED VALVE
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Plessisville Foundry Co., Plessisville, Que.

ENGINES, STEAM, GAS, GASOLINE
Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
H. W. Petrie, Toronto.
Riverside Machinery Depot, Detroit, Mich.

ENGINES, HORIZONTAL AND VERTICAL
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Johnson Mach. Co., Carlyle, Manchester, Conn.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
A. R. Williams Machy. Co., Toronto.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Parmenter & Bulloch Co., Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

FAUCETS
Puro Sanitary Dk'g. Fountain Co., Haydenville, Mass.

FENCE, IRON AND FACTORY
Canada Wire & Iron Goods Co., Hamilton, Ont.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
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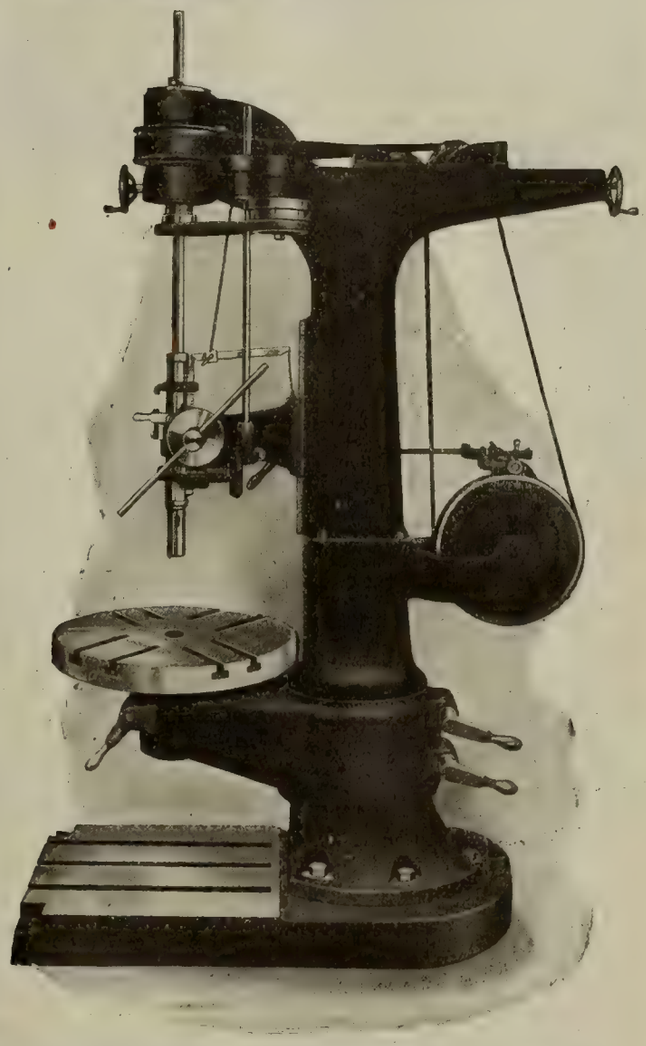

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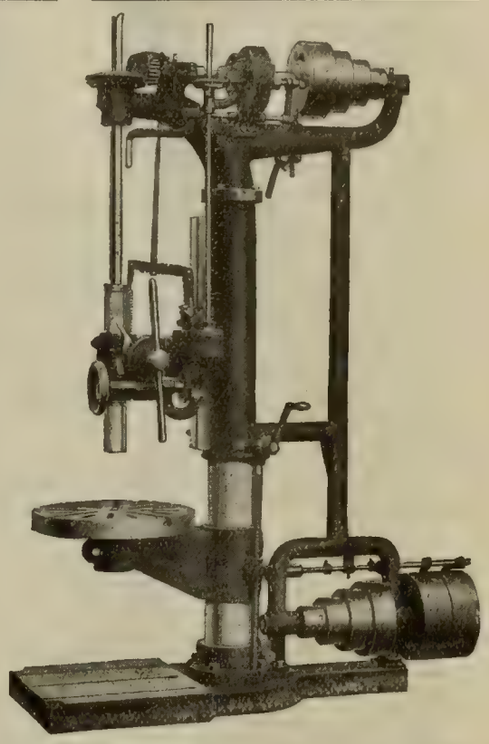

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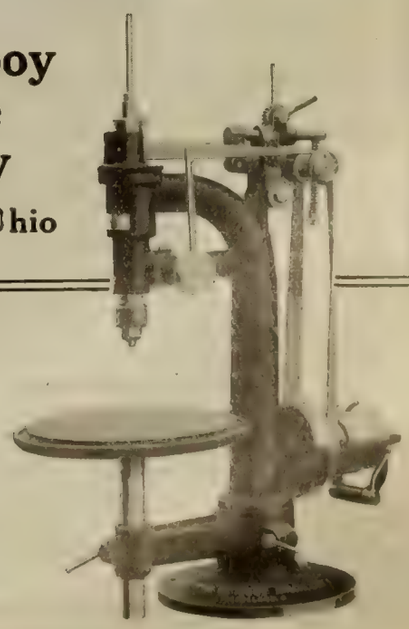

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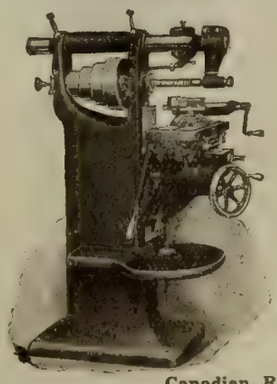

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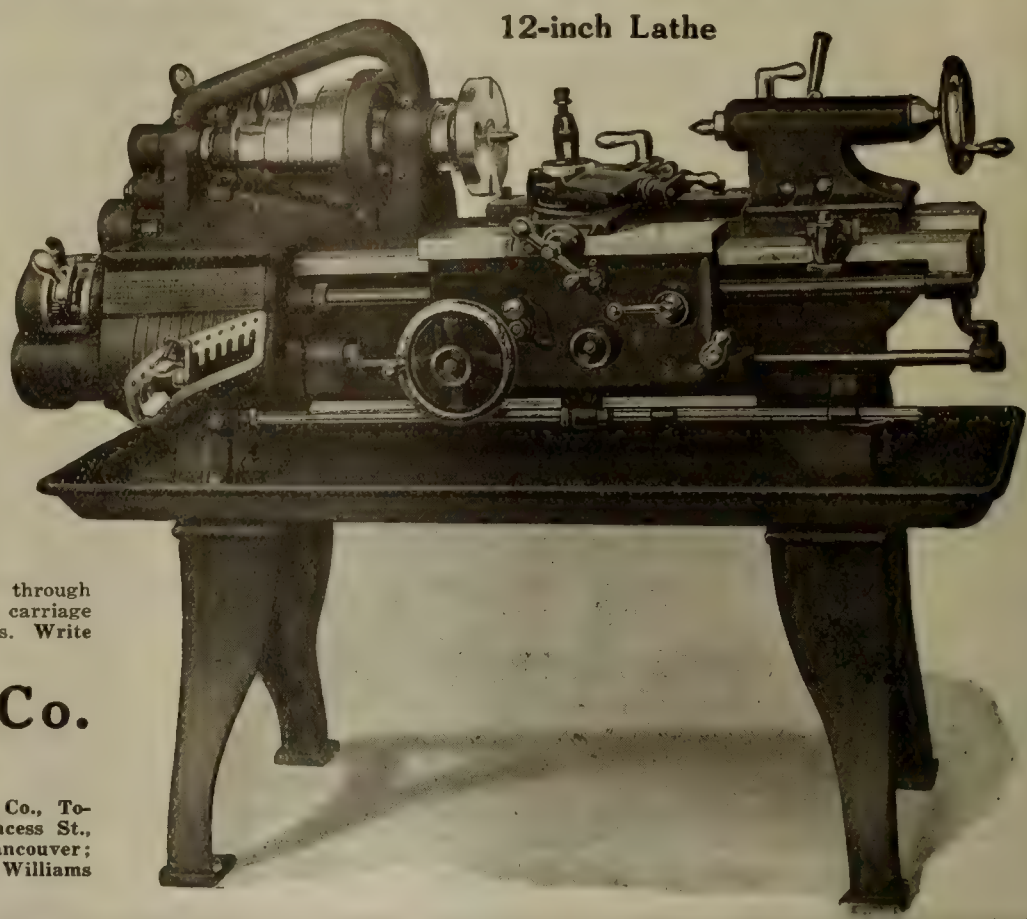

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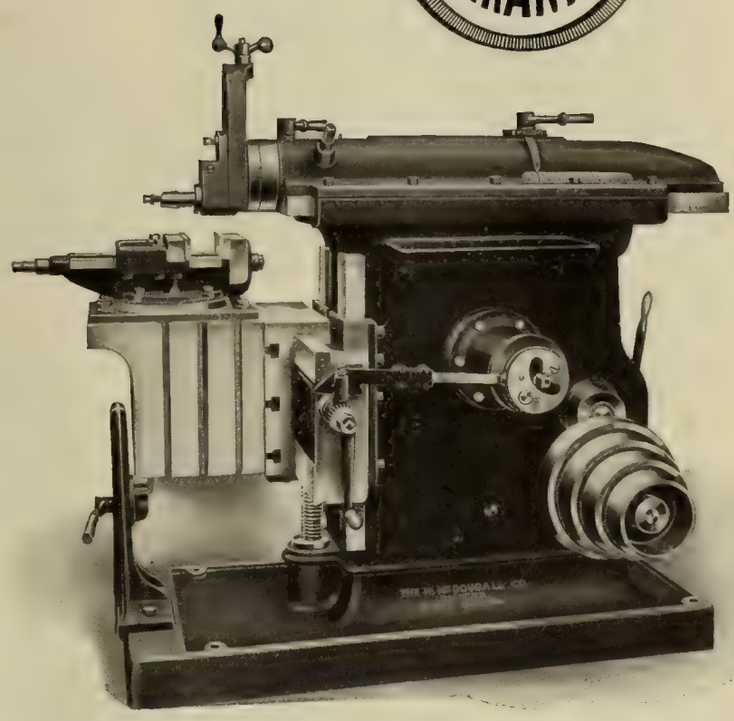

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1—Dominion Universal Cutter and Tool
1—16 x 2 Ford-Smith Wet Tool Grinder

MISCELLANEOUS

1—2″ Universal bolt cutter
1—6″ Foster screw machine, power feed, to cut off slide and carriage, complete with oil pan and pump
1—No. 4 Foster screw machine, complete with oil pan and pump
1—1″ Hercules Screw Machine
1—2″ Brown & Sharpe vertical chucking machine
1—48″ Bickford vertical boring mill, 2 swivel heads
1—Double spindle wood shaper
1—American Gas Furnace with blower
1—4½″ Davies cutting-off machine
1—36″ Preston band saw

MILLING MACHINES

1—No. 1 Standard hand miller
1—No. 2 Ford-Smith plain miller
1—No. 2 Kempsmith full universal miller
1—No. 0 Kempsmith full universal miller
1—No. 25 Ohio Heavy Duty Universal
1—No. 2 Brown & Sharpe heavy duty plain miller
1—No. 1 Bertram back-geared miller

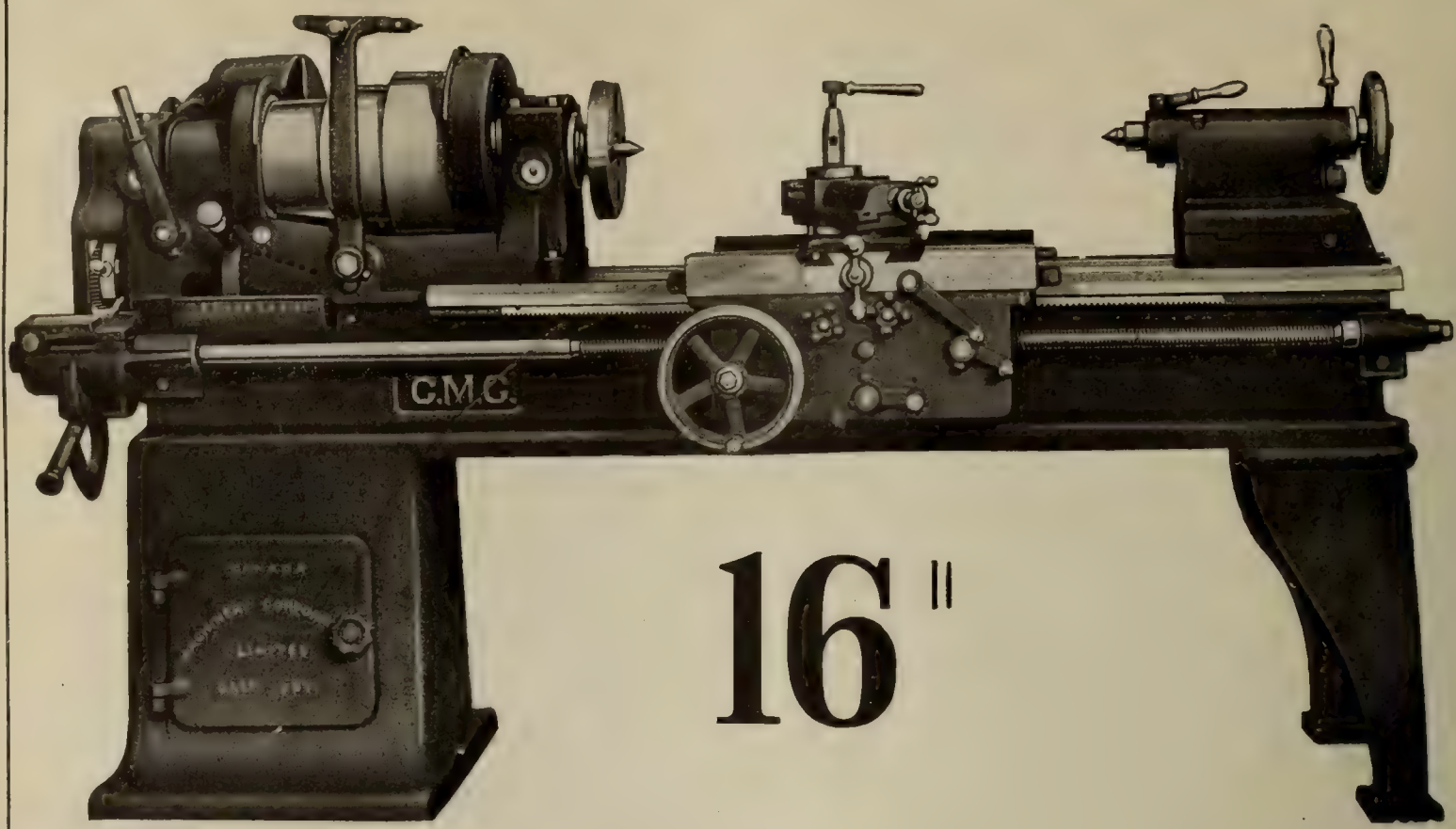
SHAPERS

1—16″ Ohio Heavy Duty
1—20″ Queen City back-geared
1—20″ Ohio Standard Shaper
1—20″ Ohio Heavy Duty
1—20″ Smith & Mills back-geared

If you have not received our new Stock List just issued, please advise us.

The Foss & Hill Machinery Company

305 ST. JAMES ST., MONTREAL, QUE.

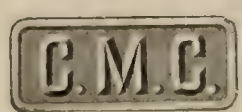


The Guardians of Quality

Our trade-mark "C.M.C." stands for efficiency throughout our entire organization and forms a policy of Quality insurance for our customers. The stamp C.M.C. is on all our machines.

Insure satisfactory machine tool performance by insisting on C.M.C. tools.

Details on request.



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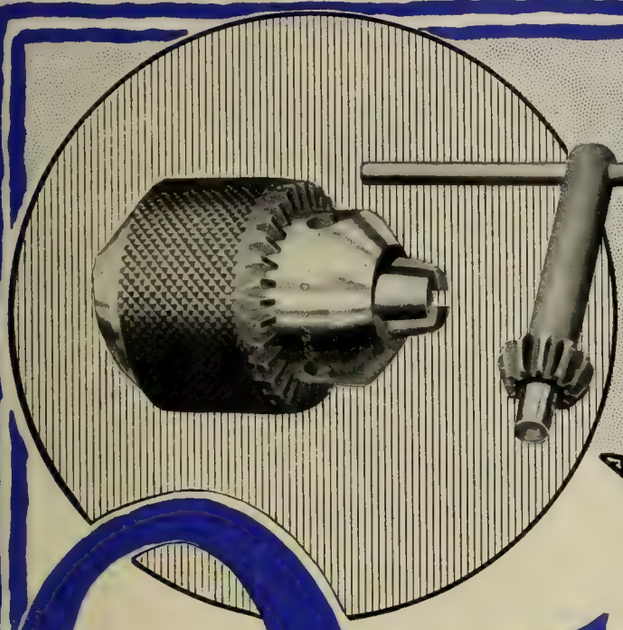
Vol. XVIII—No. 11 Publication Office: Toronto, September 13, 1917 Subscription Price $3.00 per Year



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Improved Drill Chuck

has convenience, efficiency, accuracy and durability that makes it a valuable asset to business.

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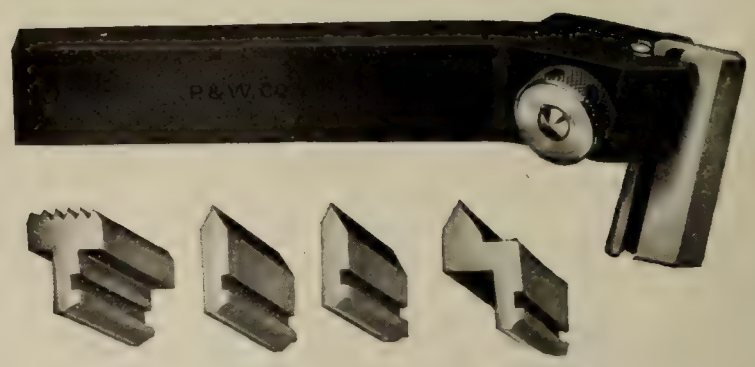

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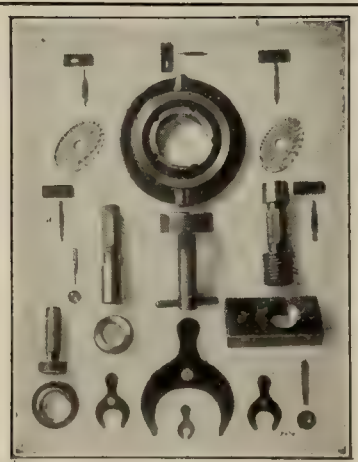

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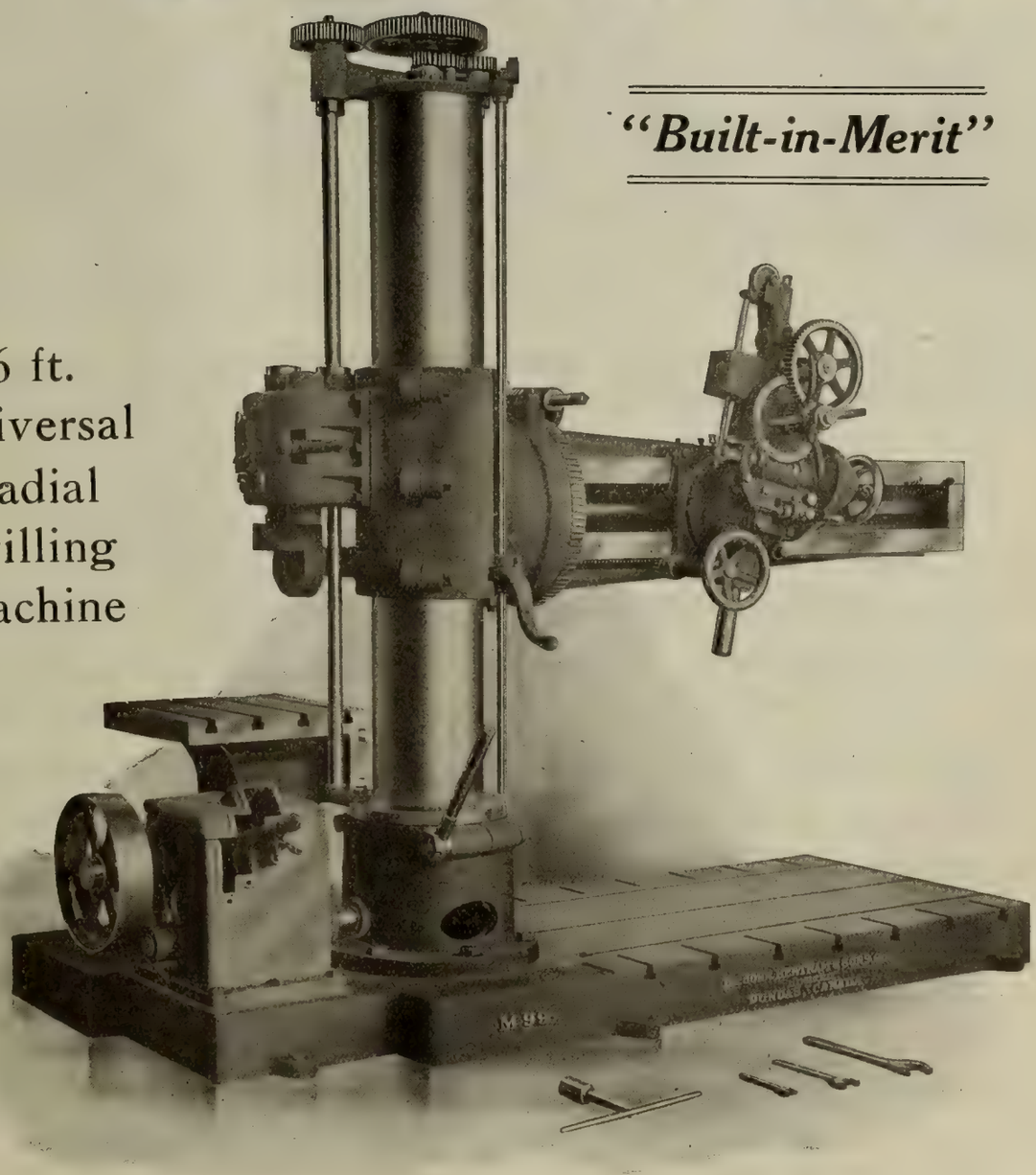

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on any machine or machines in which you are interested

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The Publisher's Page

TORONTO September 13, 1917

What of the Future?

Probably at no time in our past history as a nation has there been so clear cut a mile post on the road of events as the situation that now presents itself to Canadian manufacturers.

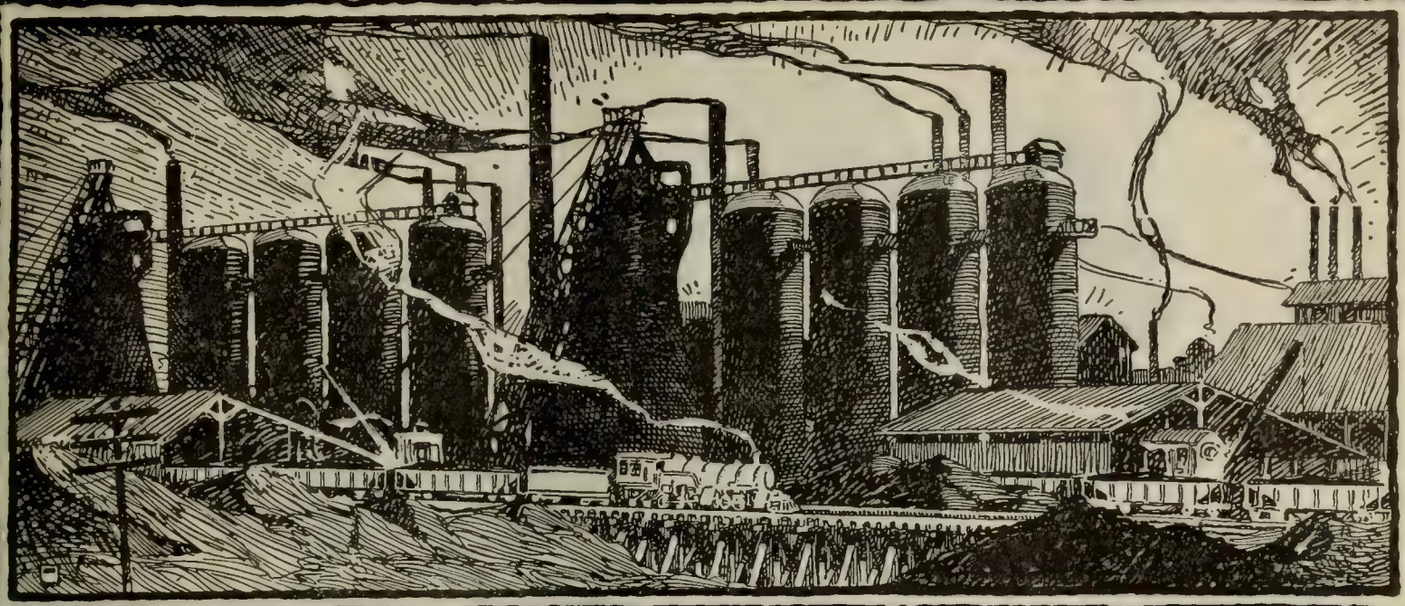
That first period of a hasty grabbing of any business offering has passed. Things are again on a settled basis—one that will, with changes corresponding to the developing situation, rule for many years to come.

The plans laid now will bind the manufacturer for an indefinite period. It behooves him to select wisely and well—whether he sticks to his old lines or embarks on new ones. The main essential is the choosing of a line that not only includes a present demand, but that promises one for the future.

The selection and manufacturing of a line, as every wide-awake manufacturer knows, is not the greatest problem confronting him. That is the distribution, the marketing, the selling of his finished product, and is a point which must have serious consideration. To that end it is to be hoped that all manufacturers develop their sales end on the broad lines advocated by the head of the great Selfridge Stores in London. In an interview in last week's issue of the *Saturday Evening Post*, referring to American manufacturers and which is equally applicable to Canadians, he says: "Merchants must be prepared to advertise extensively."

The history of the war has proven to the hilt all the more reasonable claims ever made for advertising by its friends. Every government has used it successfully to recruit soldiers, finance loans, encourage thrift and to gain other vital ends.

May we hope that this great lesson of the war will not be lost on us in planning our newer future.



LITTLE WORDS WITH BIG MEANING

Quality

According to "Webster," Quality is "an excellence of character; natural superiority."

Service

Webster's definition of "Service" is; "The performance of labor for the benefit of another."

We use these words advisedly—fully understanding their definitions—and realizing the obligation we place upon ourselves by their continued use in connection with our products of Iron and Steel, and our attitude to the people we serve.

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Pig Iron,
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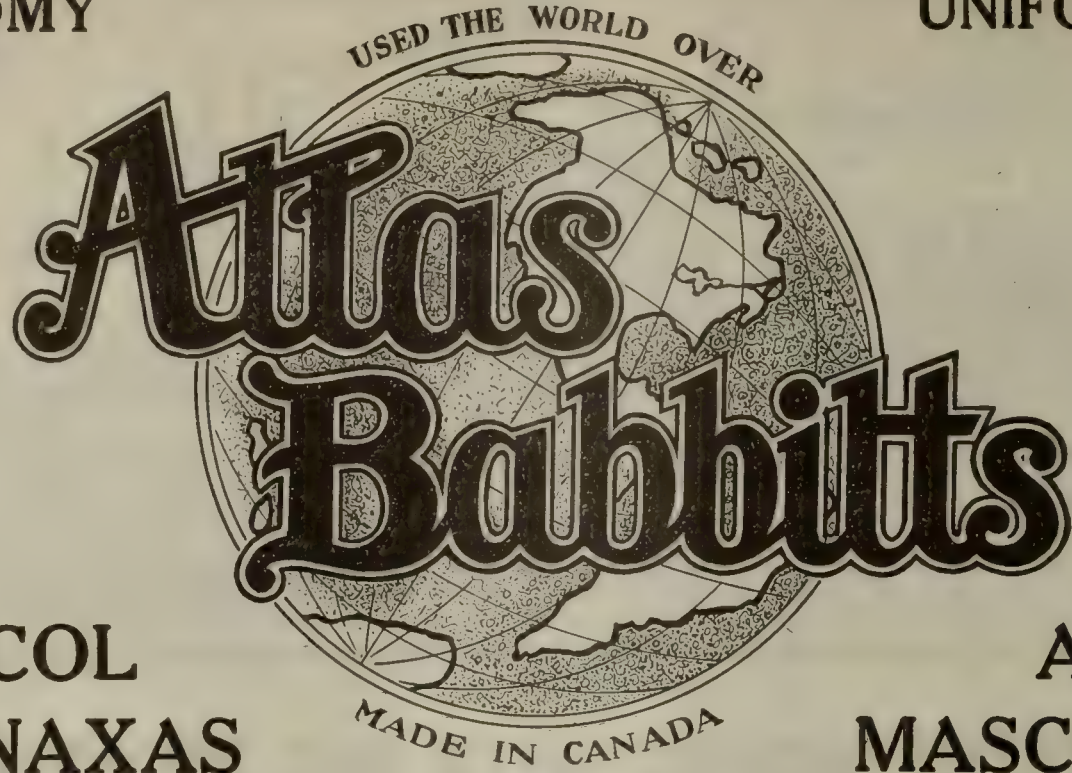
Bolts, Forgings, Wire
of every description.

ECONOMY UNIFORMITY



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TENAXAS MASCOT
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ATLAS Alloys are scientific products—the result of much patient research and long years of experience. They are manufactured under the most modern scientific conditions, thereby eliminating any element of chance in their composition and ensuring a standard maintenance of quality and uniformity.

ATLAS Brands are not alloys that *sometimes* give *satisfaction.* They are alloys that can be implicitly relied upon *always.* They are alloys with our *prestige* and *reputation* always behind them.

DO not let prejudice stand between *you* and *profit.* You can obtain the *maximum efficiency* from your plant at a *minimum of cost* by using ATLAS BABBITTS.

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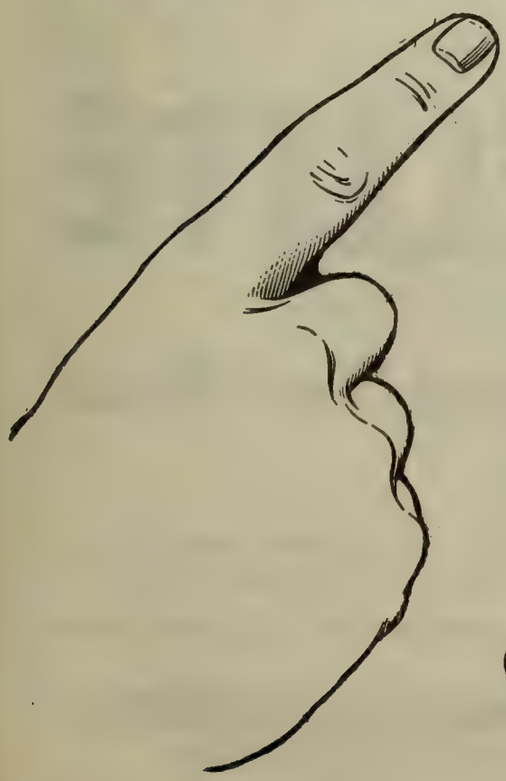

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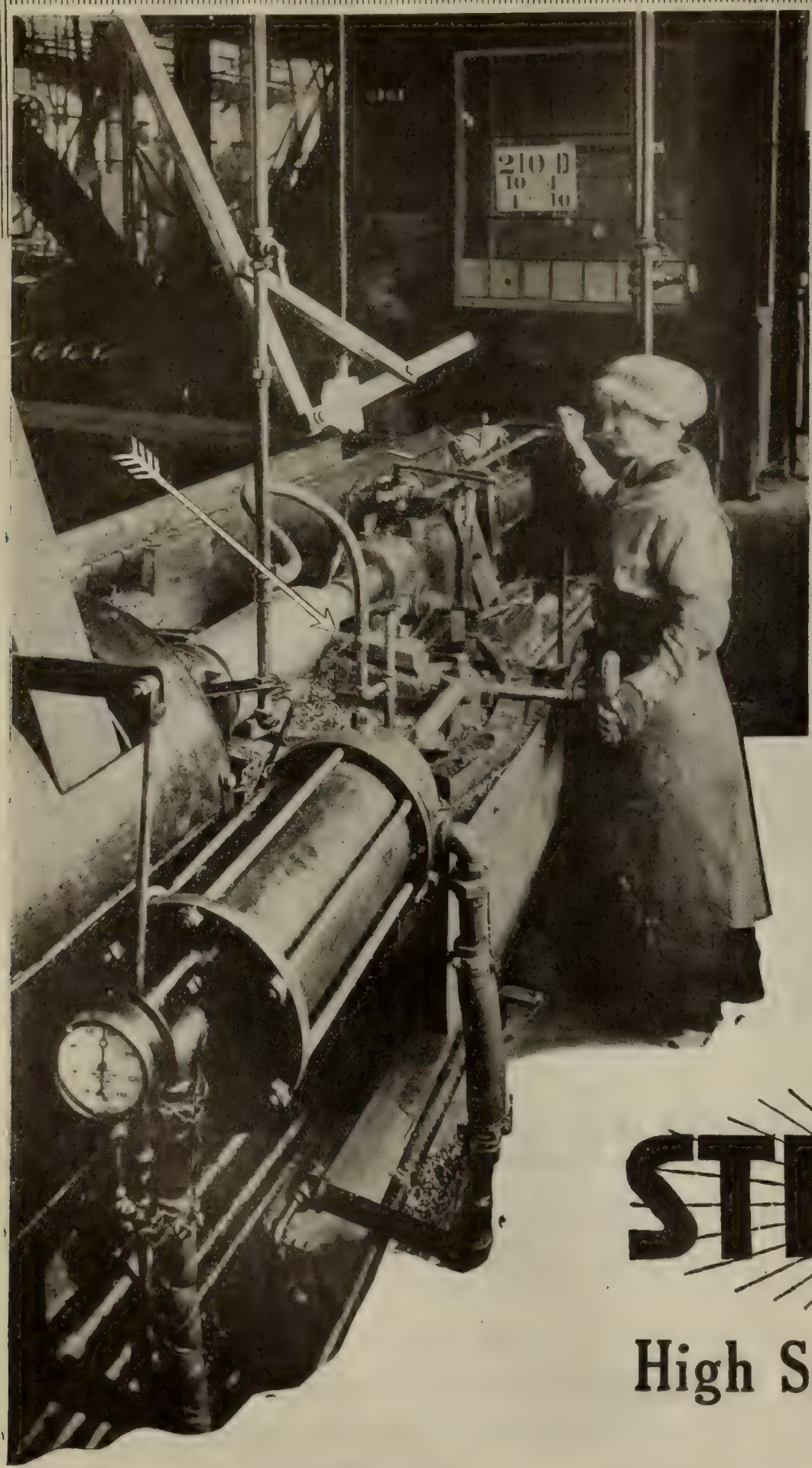

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FINISHING the profile of 8-in. Howitzer shells made from rolled steel forgings.

The cut starts at a speed exceeding 200 ft. per min. and machines the surface 9 in. long in 1 min. 24 sec.

The tool is given a feed of ⅛ in. per revolution and imparts a highly finished surface to the work.

An output of 55 shells per grinding is maintained easily.

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Stellite is harder and tougher than steel. Cuts longer and 25 to 300% faster. Requires no forging, and cuts as well when running at red heat as when cold—does not lose its temper. Convince yourself that STELLITE stands behind bigger production and tool economy by giving it a try-out.

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We guarantee shipment within 24 hours of receipt of order

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Made in Sweden from selected Dannemora Ore

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Depends not upon the amount of work it does, but the ease and thoroughness with which the work is done. These Thread Millers are noted for these qualities. Its quality of work is unrivalled. Our Service Department will give you all the particulars. *Write us!*

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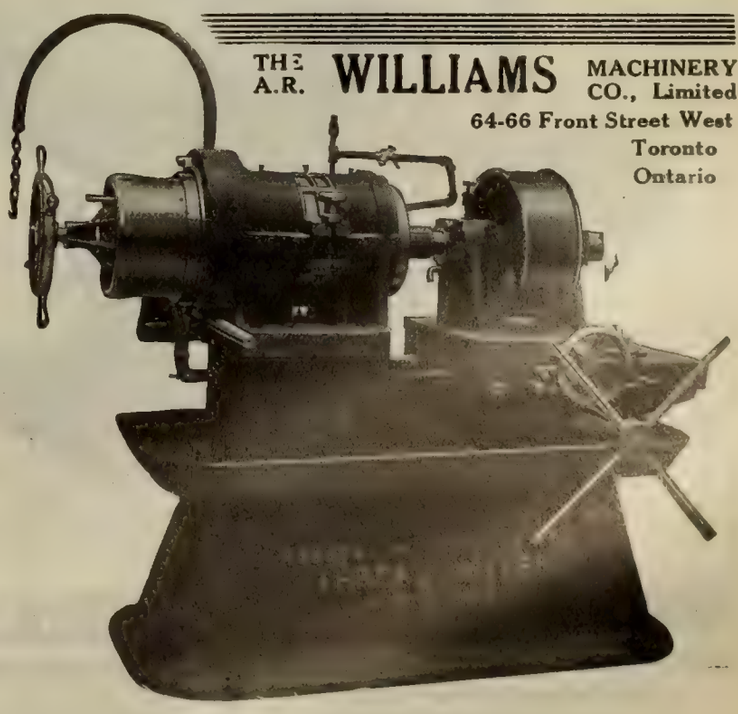
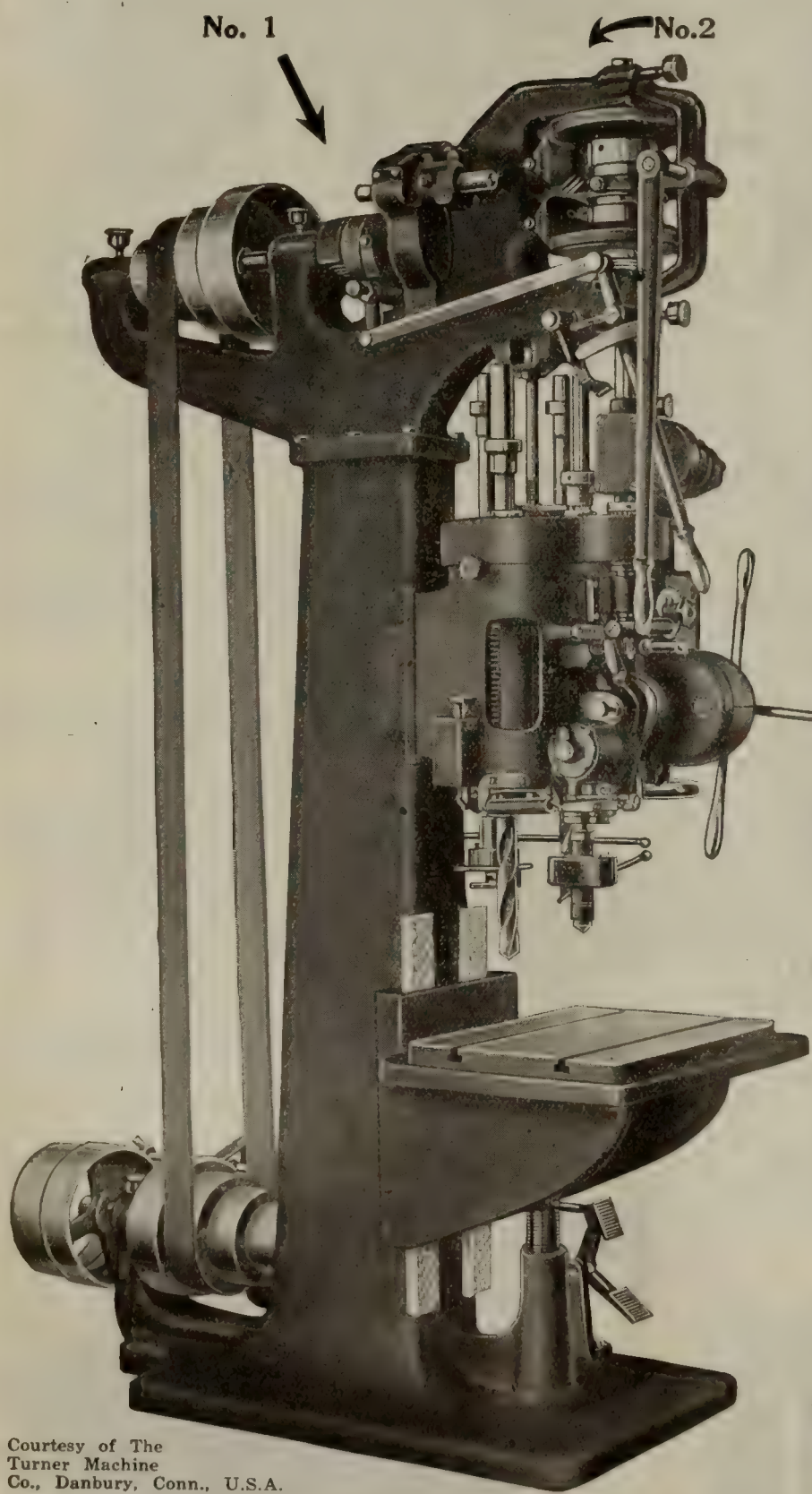


THE JOHNSON FRICTION CLUTCH

Used on the Semi-Automatic Turret Machines Recently Put on the Market by the Turner Machine Co., Danbury, Conn.



Courtesy of The Turner Machine Co., Danbury, Conn., U.S.A.

The back gears on the New Turner Turret Machine, which may be thrown out of engagement like the back gears of a lathe when not in use, are operated by a No. 5 Double Johnson Friction Clutch as shown by arrow No. 1.

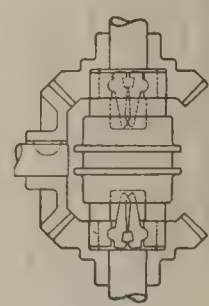
Another Double Johnson Friction Clutch No. 5 operates the forward and reverse of the spindles as shown by arrow No. 2.

The latest and most up-to-date machines are equipped with Johnson Friction Clutches.

Why?

Because the "Johnson" is the smallest and most compact clutch and because it is more easily made to meet modern conditions and because it is the most powerful clutch of its size. It's the clutch with a reputation.

Standard Double Clutch—Exterior



Double Clutch in Nest of Gears

Write for Yellow Data Sheets and booklet *"Clutches as Applied in Machine Building."*

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ENGLAND—The Efandem Co., Ltd., 159 Gt. Portland St., London, W., Sole Agents for British Isles.
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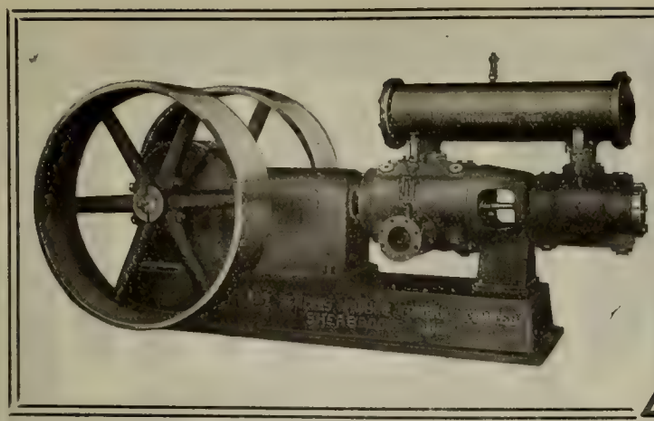
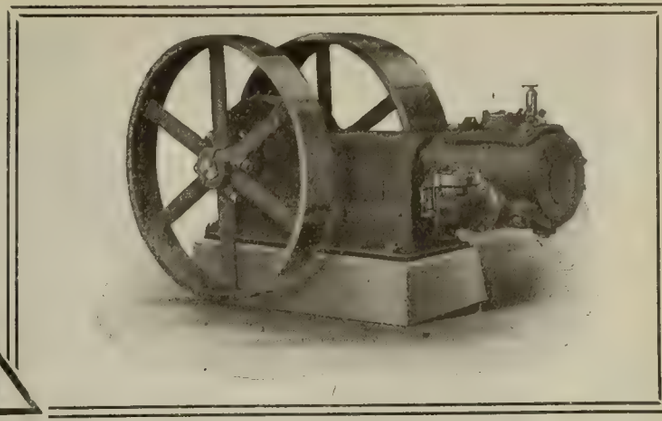
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



C B-1

C B-2



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HIGHEST IN QUALITY

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OUR Country requires the extreme limit of production from every lathe, planer, miller or other machine tool.

BE PATRIOTIC

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The Nationally Known First Quality

HIGH SPEED STEEL

Will enable you greatly to increase your output

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FOR SHRAPNEL SHELLS AND SHELL BLANKS

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High Speed Steel

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High-Speed STEEL

The tools that are made with "Wolfram" High Speed Steel are warranted to be super-keen at the edge and super-strong at the neck.

WOLFRAM

Embodies a true and permanent alloy of Tungsten, Chrome, Vanadium and Iron. No better High Speed Steel in the world.

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	Brand Name:
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High Speed Steel	RUSHITOFF No. 6
Tool and Die Steels	"Fondwot" and "Giant"
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CHROME VANADIUM, oil hardening or case hardening

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Steam Hammer Forgings to Sketch

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We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

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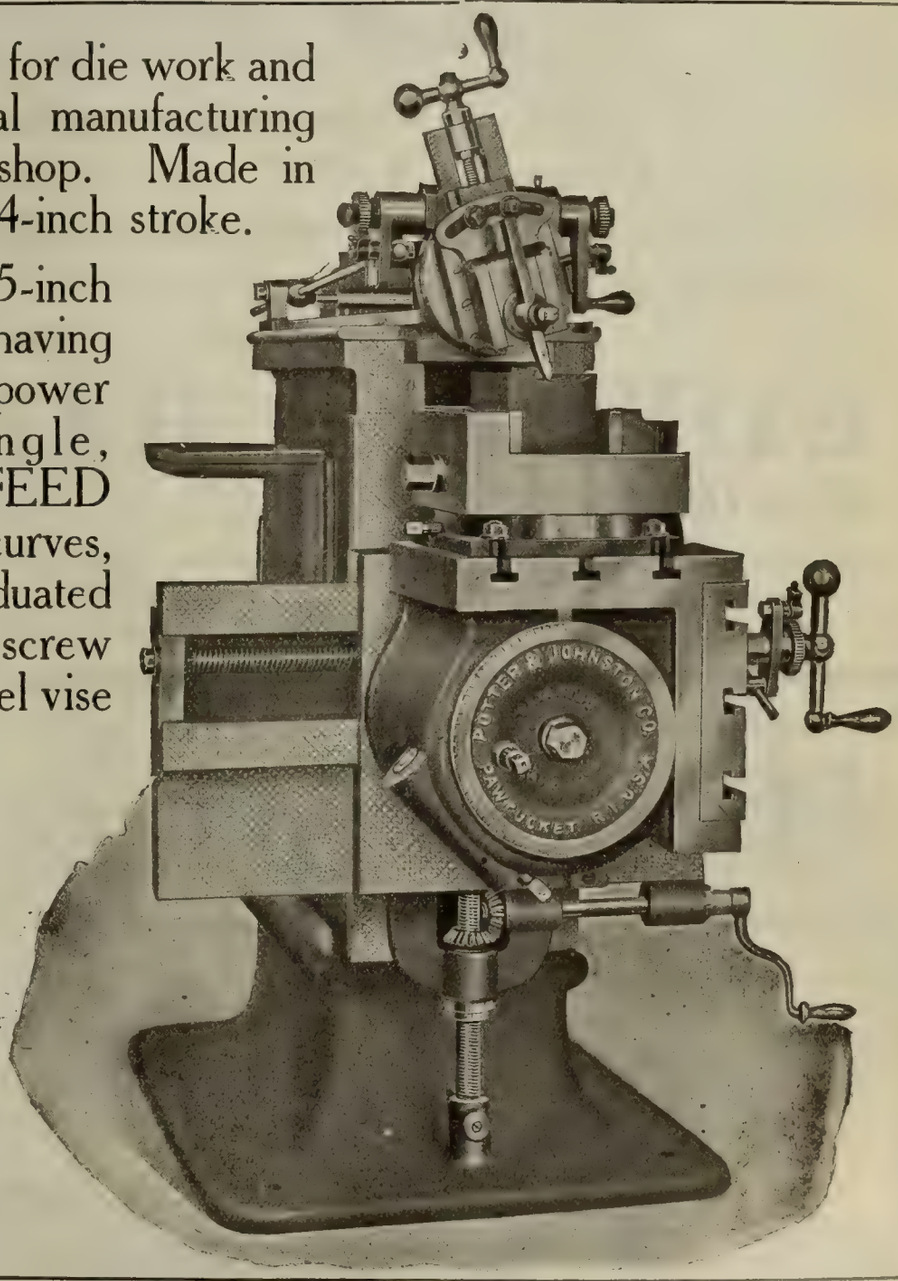
Potter & Johnston 15-inch Universal Shaping Machine

15-inch Stroke — 24-inch Stroke

The standard of efficiency for die work and tool room service, general manufacturing purposes and the repair shop. Made in two sizes—15-inch and 24-inch stroke.

Illustration shows the 15-inch model with swivel table having auxiliary tilting side, power down feed on any angle, POWER ROTARY FEED for planing internal curves, automatic feed stop, graduated collars on tool head feed screw and table feed screw, swivel vise with graduated base.

The simplicity of design, convenience of operation, extreme care exercised in their manufacture, and the many universal features of this machine, combine to make it the most efficient and reliable tool of its type.



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BEST BASE PLUGS, BUY BANFIELD'S

Have in stock for immediate shipment either threaded or bevel Plugs for 4.5," 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. Write for prices.

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Hepburn

Shell work thoroughly tests the ability of a lathe. The Hepburn Lathe is making a wonderful record in the munition plants of Canada in boring up to 6" shells. It has shown superior speed and superior quality of work and keeps right at it day in and day out. We also rebuild lathes embodying in them all latest improvements.

The Hepburn is the lathe for you.

John T. Hepburn, Limited

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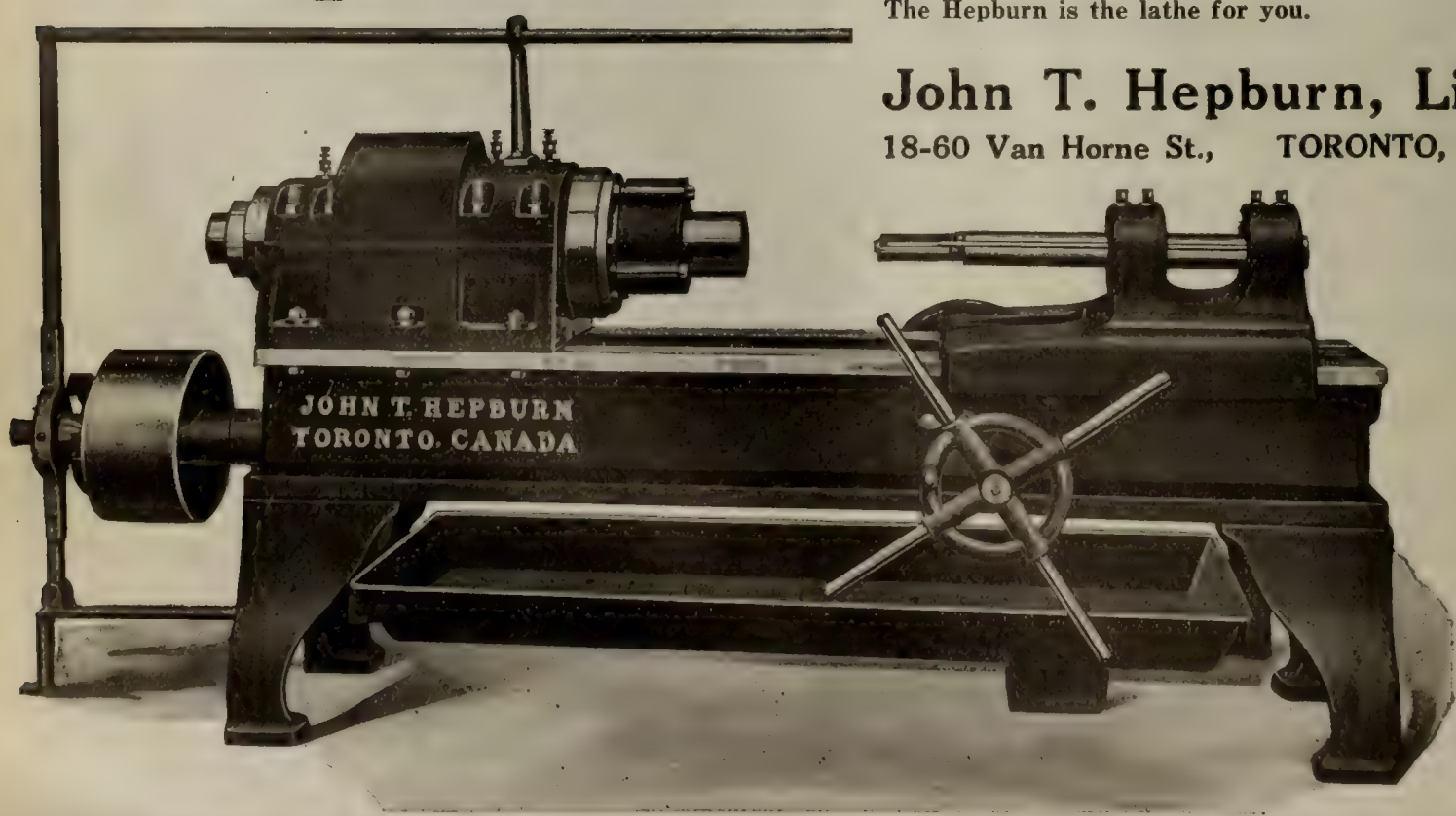

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HIGH SPEED TWIST DRILLS

J.R. BAXTER & COMPANY LIMITED, MONTREAL.

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To Realize the Full Cutting Power Of High Speed Steel

Whitcomb-Blaisdell

The Planer with the Second-Belt Drive.

That is the specific purpose for which Whitcomb-Blaisdell Planers have been designed.

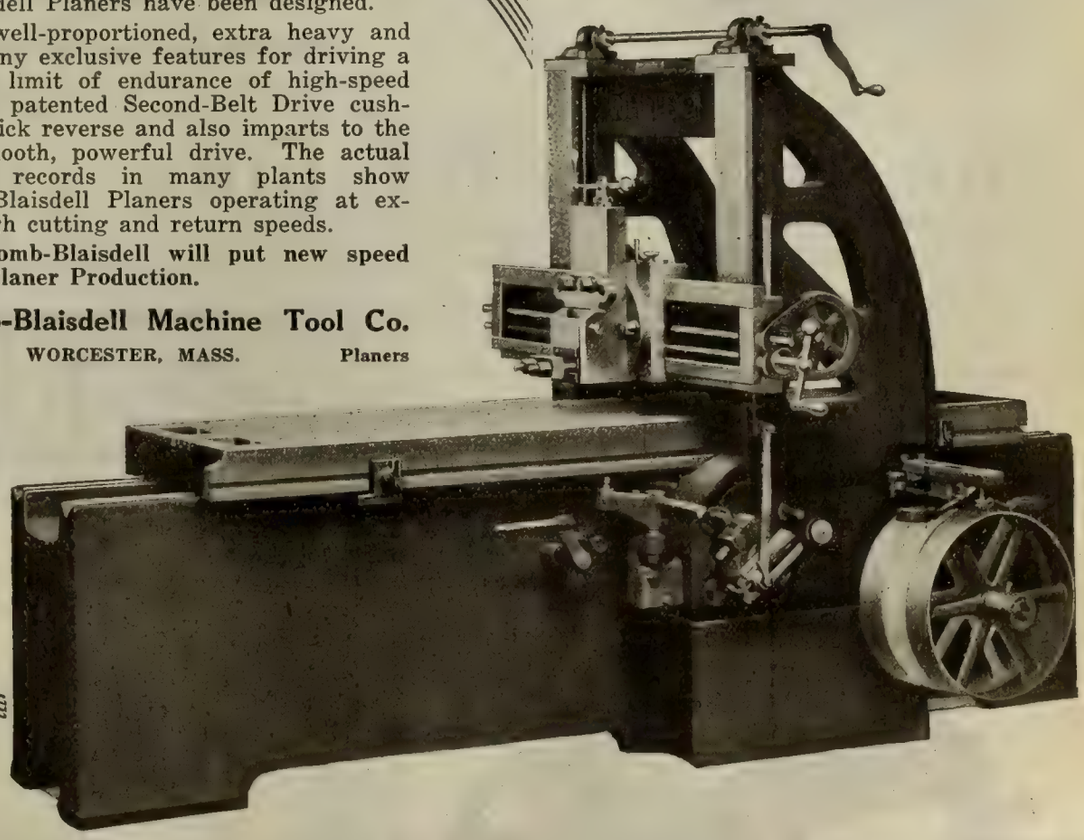
They are well-proportioned, extra heavy and embody many exclusive features for driving a cut at the limit of endurance of high-speed steel. The patented Second-Belt Drive cushions the quick reverse and also imparts to the table a smooth, powerful drive. The actual production records in many plants show Whitcomb-Blaisdell Planers operating at extremely high cutting and return speeds.

The Whitcomb-Blaisdell will put new speed into your Planer Production.

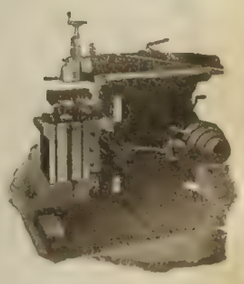
Whitcomb-Blaisdell Machine Tool Co.

Lathes WORCESTER, MASS. Planers

The Planer Book tells the concrete reasons for Whitcomb - Blaisdell Speed. Write for your copy.



CUT YOUR SHOP COSTS



Nobody would think of putting 16-inch lathe work on a 30-inch lathe, then why leave small parts on a large Milling Machine?

A Steptoe Hand Miller or small power feed can be handled quickly and will cut your production cost. You will have less money invested in your Milling Machines and have more machines to do the work.

That same principle applied to your small planer work will cut the cost of planer work.

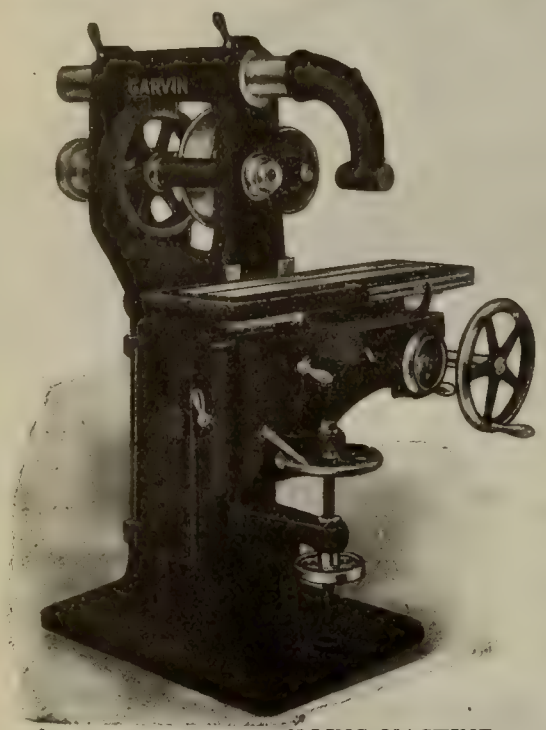
A Steptoe Shaper will do the work faster because it can be handled quicker.

The John Steptoe Company, CUMMINSVILLE CINCINNATI, OHIO, U.S.A.

Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.

GARVIN No. 21 Plain Miller

Back Geared



No. 21 B.G. PLAIN MILLING MACHINE
Back Geared
Use Code - Abject

For Plain and Gang Milling for general manufacturing, and is used mostly in gangs of 5 or 6 machines to one operator. Spindle runs in adjustable bronze boxes, and is driven by a 3″ belt through back gears (3 to 1).

Knee is our improved solid top design, rigid and stiff to resist side pressure of heavy cuts.

DIMENSIONS:

Automatic Feed of Table	18 in.
Adjustment in line with Spindle	6 in.
Vertical adjustment under Spindle	13 in.
Table, inside Oil Pockets	6 x 30 in.
Changes of Speed	6
Changes of Feed	6
Net Weight, Skidded	1,575 lbs.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) **50 Years New York City**

DOUBLE SAVINGS

in cutting on PEERLESS HIGH SPEEDMETAL SAWS; they save both Time and Material.

Supposing you save only 1/16 on each cut, 200 lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

Have you ever stopped to consider the waste of material in wide cuts, especially at the present high cost, will pay for a PEERLESS in a remarkably short time.

This is only one of the reasons for so many repeated orders and large concerns having standardized the PEERLESS. The many other reasons can only be fully appreciated after comparative test.

Write for a list of users; some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

SHEET METAL STAMPINGS

The quality of our production is one grade — THE BEST. Our facilities and equipment enable us to give a very attractive price and prompt service.

Dominion Forge and Stamping Co., Limited

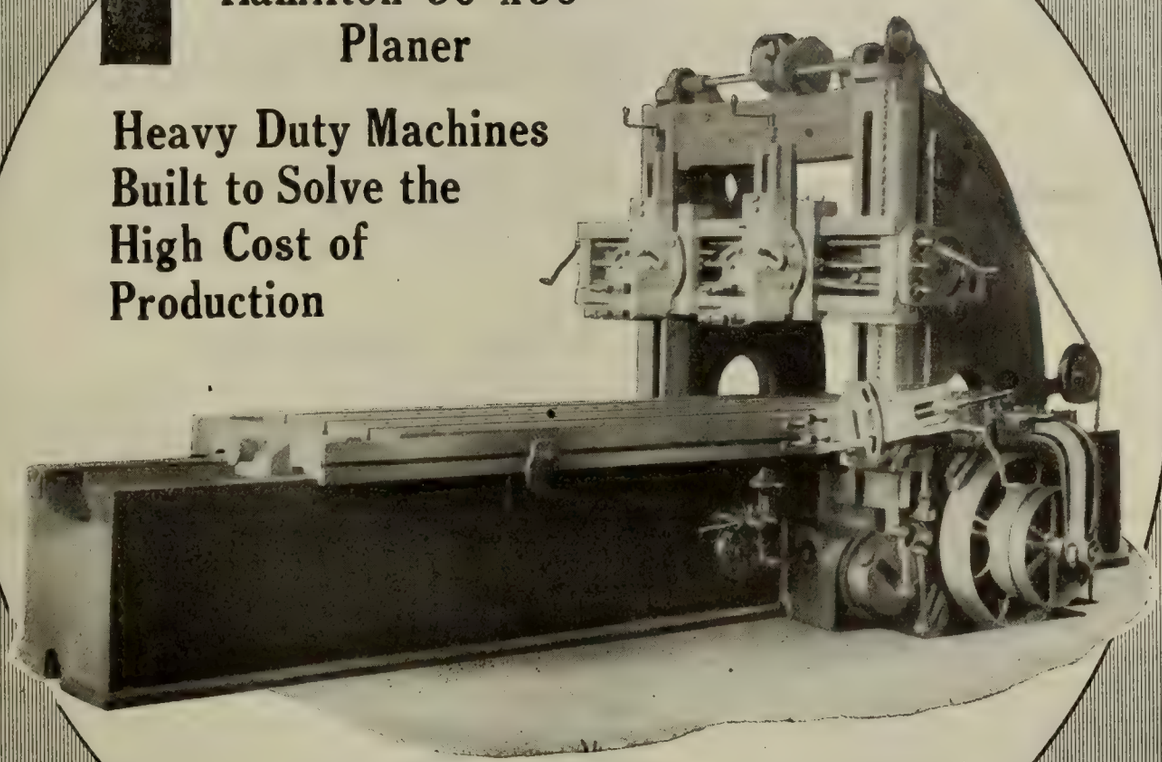
WALKERVILLE, ONTARIO

DROP FORGINGS

HAMILTON PLANERS

Hamilton 36"x36" Planer

Heavy Duty Machines Built to Solve the High Cost of Production



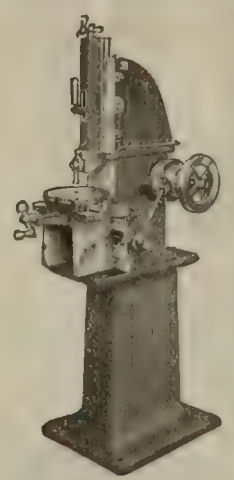
WEIGHT, RIGIDITY, DIMENSIONS and POWER—these are the combination of assets that give exceptional productive ability to "HAMILTON" PLANERS.

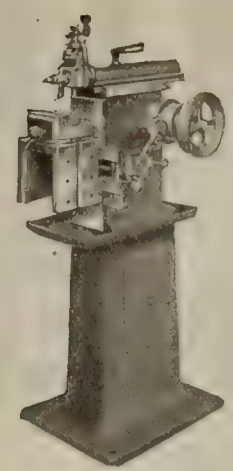
The installation of the "HAMILTON" strikes a crushing blow at the High Cost of Production. They do big work fast and accurately. Sizes from 24" x 24" to 54" x 54".

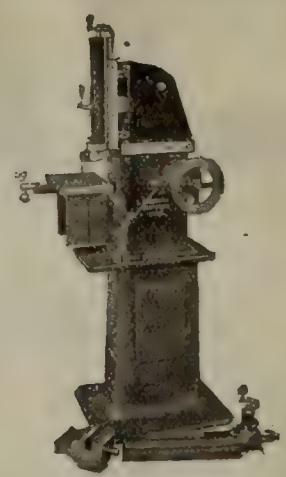
Our bulletin will tell you all about this planer. Give us your address.

The Hamilton Machine Tool Company, Hamilton, Ohio

H. W. PETRIE, LIMITED, TORONTO, Sole Agents for Ontario.


3½-inch


7-inch


Combination

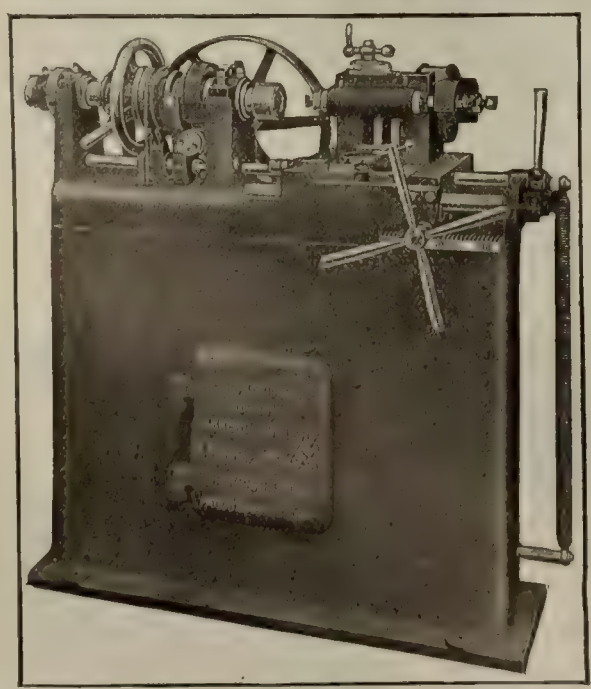
Three of the machines that by their cost-reducing features have established themselves "solid" with the home users and by these same merits are reaching out in foreign countries. A silent, but powerful message of the Rhodes efficiency.

Their capacity is greatly promoted by the adjustments which may easily and quickly be attached. For shaping, slotting, die making, tool making, etc., these machines stand paramount. An inquiry on your stationery will receive prompt attention.

The Rhodes Mfg. Company

Hartford, Conn.. U. S. A.

The Morris Thomson Semi-Automatic Thread Miller



Simplest, fastest and most accurate for Primers, Fuse Bodies, Watch Cases and such pieces. Capacity 3-inch internal or external 10 pitch.

Quick Deliveries. Hundreds in Use.

T.C.M. Mfg. Co., Harrison, N.J.

U. S. A.

Decidedly Quality

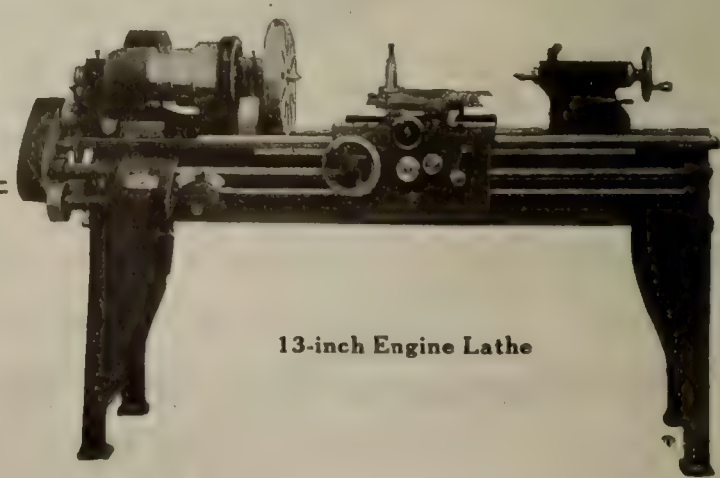
That is the verdict of our clients.

In construction, operation and results, quality is evident. That is the reason why Filsmith has occupied the foreground in lathedom. In Canada and United States you will find Filsmith quality is based on what it is now doing, not on history. Full webbed headstock, 50-point carbon steel spindle, and rigidly clamped tailstock.

An enquiry will secure you full information.

The Philip Smith Mfg. Co.

Sidney, Ohio, U.S.A.


13-inch Engine Lathe

GARLOCK-WALKER MACHINERY CO. LIMITED

32 FRONT ST. WEST, **TORONTO** TELEPHONE MAIN 5346

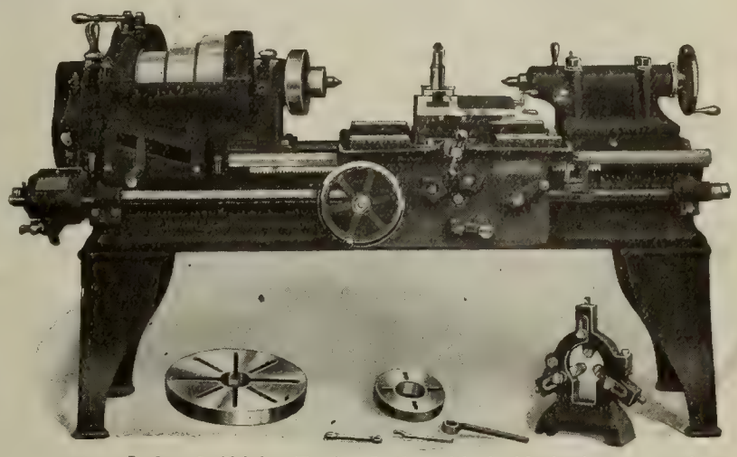
LODGE & SHIPLEY ENGINE LATHES

EQUIPMENT

Lathes, unless otherwise specified, are regularly furnished with large and small face plates, quick-change gears, power cross feed, steady rest, countershaft, and necessary wrenches.

FOR THREAD CUTTING

For convenience of operation while thread-cutting a chasing dial is furnished, so that operator can catch the thread at the commencement of each successive cut.



Lodge & Shipley Engine Lathe with double back gears and quick-change gears.

Write us for prices and illustrations

METAL and WOODWORKING MACHINERY of all Kinds

Two Cuts at One Time

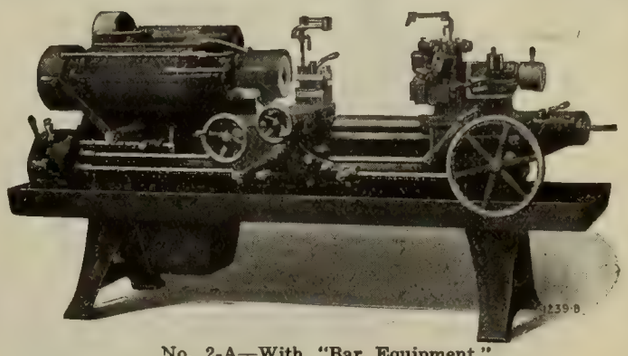
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

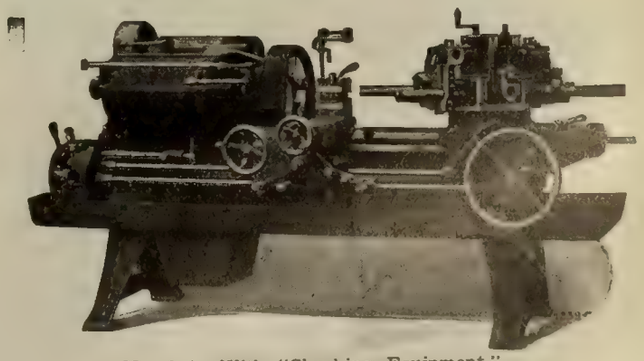
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."



No. 2-A—With "Chucking Equipment."

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal, Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

Universal Gear Hobber

The machine which completes our lines to cut all types of small gears except internal, within 10″ dia. 8 Pitch.

The Bilton Gear Hobber will cut spur spiral gears, worm gears, also various special shapes of teeth. It can cut a spiral gear on end of a shaft 1⅜″ diam. 24″ long.

SPECIFICATIONS

Capacity Gears: 10 Diametral Pitch
10 in. Outside Diameter
10 in. Width of Face
Range of hob feed 50-250 R.P.M.
Range hob feed to each rev. of worm .010 to .125
Drive: 3 Steps Cone Pulley; 2½ in. Belt
Weight 2,100 lbs.

A machine of latest design, introducing new features which increase production without sacrificing accuracy. The hob is cutting continuously; operation of machine entirely automatic.

DELIVERY

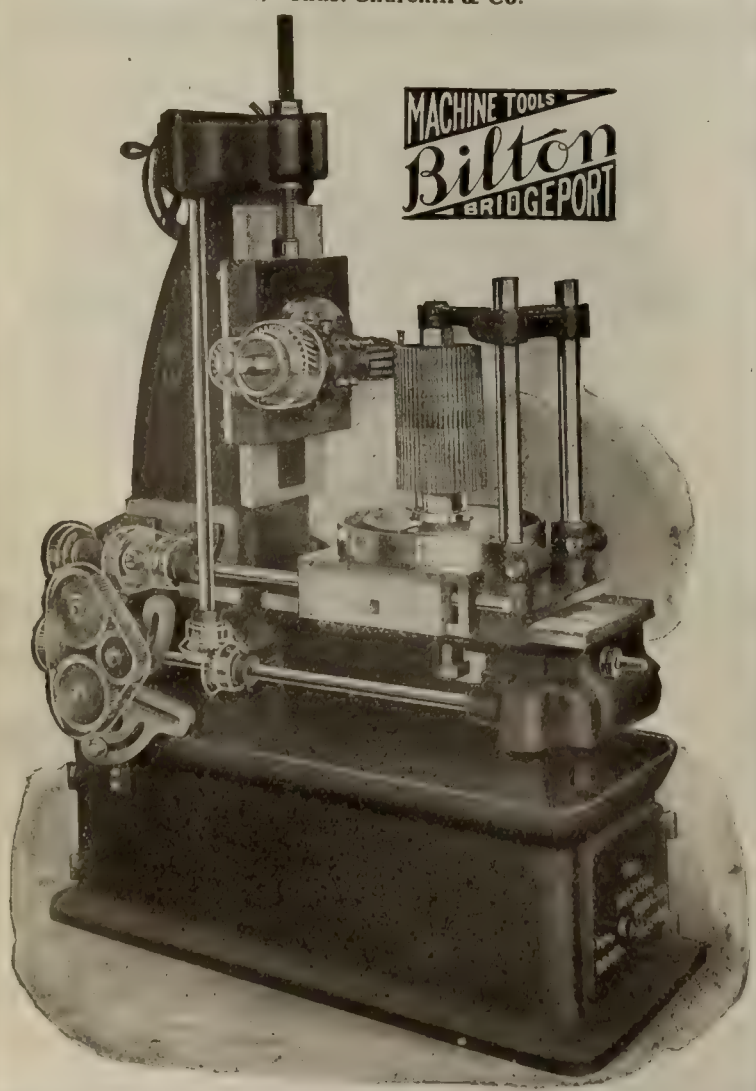
A few of these machines are now available for October delivery.

Send for copy of new catalog No. 30, and bulletin describing this machine.

The Bilton Machine Tool Co.

Bridgeport, Conn.

Foreign Agents: **Alfred Herbert Ltd., M. Mett Engineering Co., Chas. Churchill & Co.**



PRACTICALITY

AFTER fifteen years' study of the Miner's and Lumberman's wants, we know just what is and what is not required in tools for them.

Practicality has been the keynote of our organization. Experience has aided us in eliminating all unnecessary parts and in perfecting the design of our tools.

The use of best material and finest workmanship enable us to manufacture tools that are unexcelled.

We make a complete line.

Write us for prices.

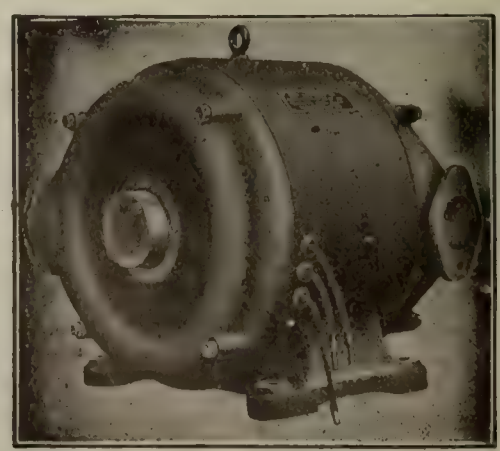
J. W. CUMMING & SON, LTD.
NEW GLASGOW, - - CANADA

Wood or Steel, let Cummings make it.

The Lancashire Dynamo & Motor Company, of Canada, Limited

107-109 Duke Street, TORONTO

ELECTRICAL MACHINERY for all Purposes.
ELLIOTT BROS'. { INSTRUMENTS / RECORDING GAUGES



PIPE VENTILATED A C MOTOR
FOR VERY DIRTY PLACES

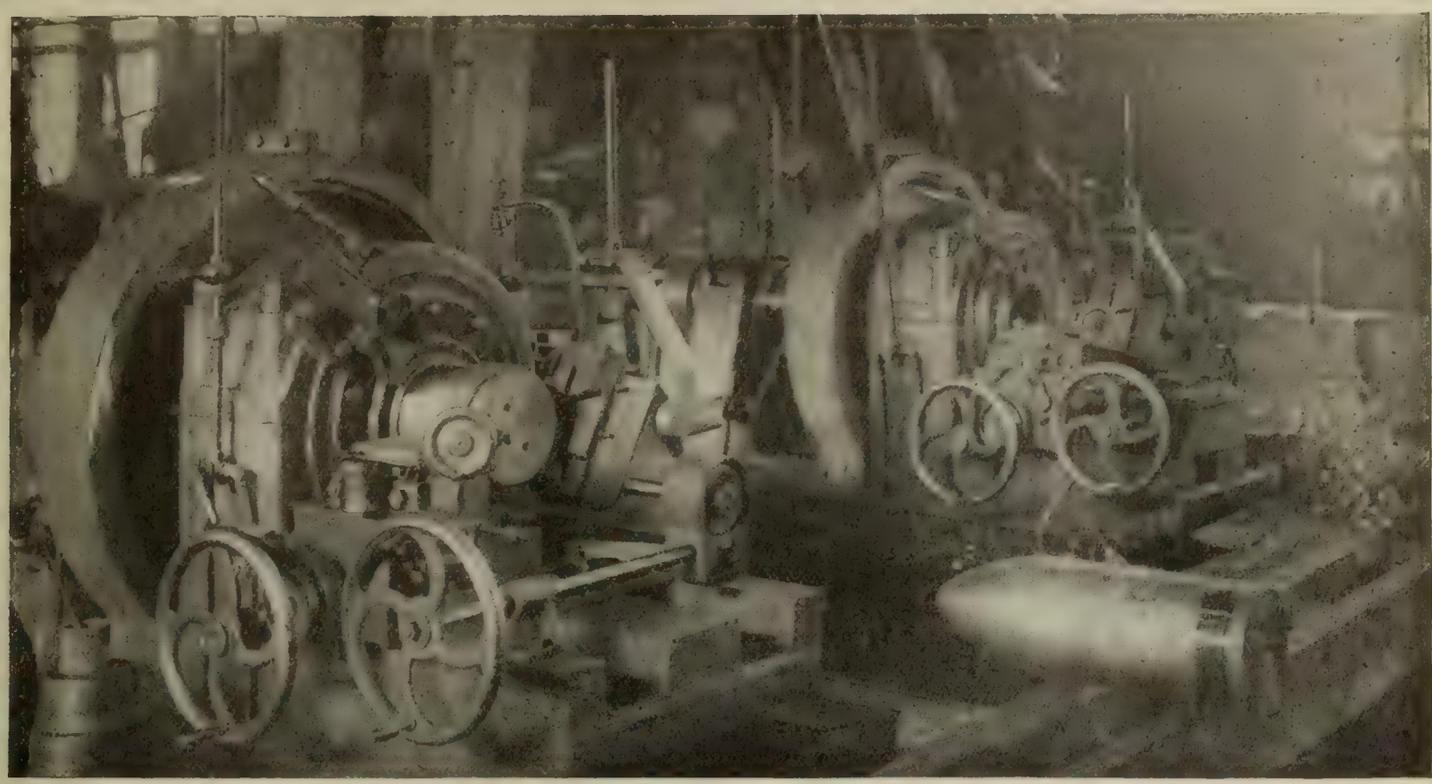


Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

These machines are built for turning bands on 8", 9.2" and 12" shells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. **Write for full particulars and price.**

Bennett Ave. **Warden King Limited** **Maisonneuve, P.Q.**

KEMPSMITH

UNIVERSAL MILLING MACHINES

Are built in three standard sizes. They embody every worth-while feature to be found on a tool room Milling Machine.

We call especial attention to the Dividing Head which is part of the regular equipment of every Universal Miller.

The Kempsmith Dividing Head is compact and rigid, unusually convenient in operation and so constructed as to maintain its accuracy under heavy service.

We publish a thirty-two page book elaborately illustrating and describing this Dividing Head. A copy will be sent free on request. Just ask for "Dividing Head Book."

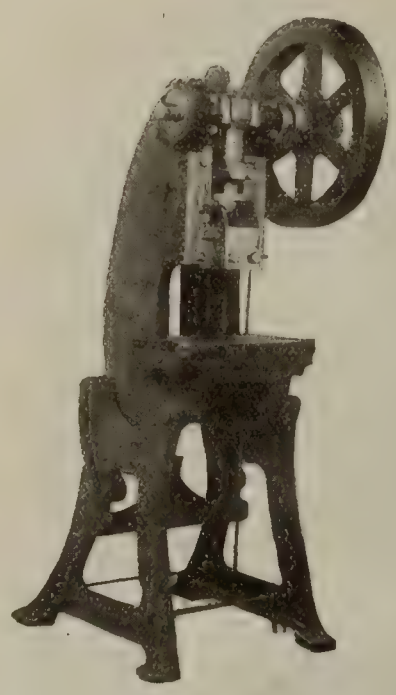
Kempsmith Manufacturing Co.

MILWAUKEE, WIS., U.S.A.

AGENTS:

Foss & Hill Machinery Co., Montreal.
General Supply Company, Toronto and Ottawa.
Canadian Western Foundry & Supply Co., Calgary, Alta.

If any advertisement interests you, tear it out now and place with letters to be answered.



THE Self-Oiling Bearings on all Consolidated Presses are another source of satisfaction to Consolidated Press users. A constant supply of lubricant is furnished to the main bearings, the crankshaft revolving on a film of oil, automatically applied.

Provision is made for draining off the oil to be renewed from time to time.

This is a feature you cannot conscientiously overlook.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* **MICHIGAN**

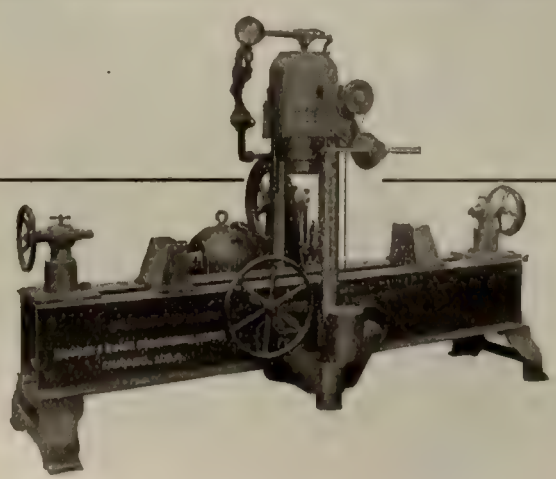
Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

ELMES

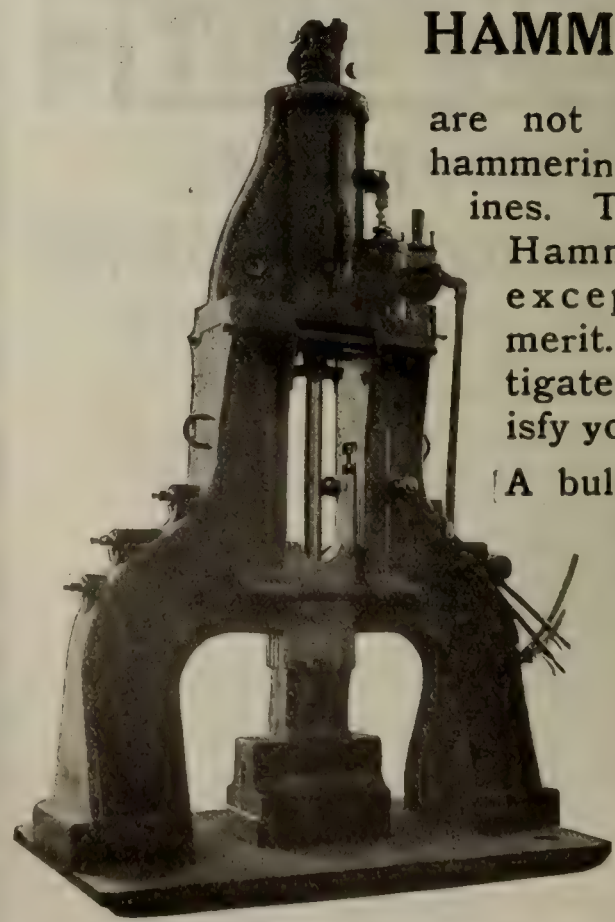
Motor Driven Straightening Press for shafts up to 5 in. Movable head, height adjustable, close regulation of action, strong screw centre parts. One of our many types.

Charles F. Elmes Engineering Works.

217 N. Morgan St. Chicago, U.S.A.



"ERIE" STEAM FORGING HAMMERS



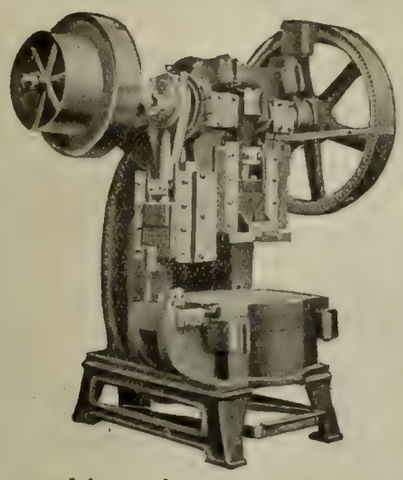
are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

ERIE FOUNDRY COMPANY

ERIE, PENNSYLVANIA, U. S. A.

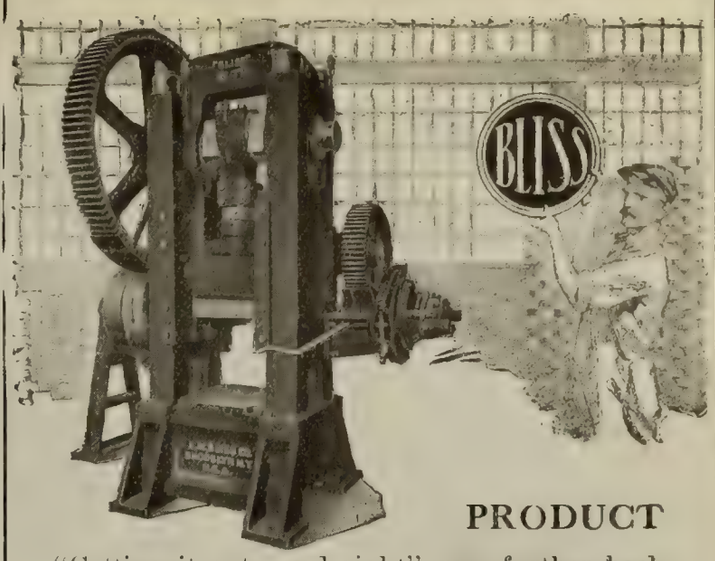
The "TOLEDO" Trimming Presses



Strong, safe and serviceable for use in drop forging plants for trimming drop forgings, either hot or cold, such as crank shafts, gear blanks, wrenches and other tools.

Slides are massive, with extra long ways and gibs. Outer slide can be arranged for blanking or punching, the two slides permitting the use, in combination, of a double set of dies for performing two operations in the trimming and punching of hot or cold work.

The Toledo Machine & Tool Co.
Toledo, Ohio



PRODUCT

"Getting it out—and right" goes further back than the selection of the machine. It may go back 10 or 20 or 40 years to some point or problem solved in our 60 years' development of Presses that produce.

If you want machines with production capacity based on *longest* practical experience, buy "Bliss."

E. W. BLISS CO.
Brooklyn, N.Y., U.S.A.
1857 1917

CHICAGO OFFICE People's Gas. Bldg.
DETROIT OFFICE Dime Bank Bldg.
CLEVELAND OFFICE - Union Bank Bldg.
LONDON, S. E., ENGLAND Pocock St., Blackfriars Road
PARIS, FRANCE 100 Blvd. Victor-Hugo St. Ouen

Banding 6" to 12" Shells

Its sturdy construction allows it to stand up under severe service. This is the reason for its higher price. Such extra care, better material and expert workmanship are required that the results warrant the high cost.

It has six 11" semi-steel rams which move ½" or more if necessary. All rams returned by levers on plates with heavy Vanadium Steel Springs. Cylinder removable of alloy steel.

Hydraulic inlet to cylinder 1¼ pipe. Distributing ring 2". All pipe of Seamless Steel Tubing. All fittings dropped forged steel. All parts under strain, alloy steel castings and forgings.

Six dies of forged chrome nickel steel, hardened and removable, without disturbing any part of press, by loosening two nuts. Can be operated either from accumulator or pump.

Built also in smaller size of same type for banding "pounder" to 6" shells.

Metalwood Manufacturing Co.
Leib and Wight Sts. -:- DETROIT, MICH.

For Great Britain and Continent, address Gaston E Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

PRESSES

Made in Canada

Hydraulic Presses, Pumps and Accumulators for all purposes

WRITE FOR PRICES AND DELIVERIES

WILLIAM R. PERRIN, Limited
TORONTO, CANADA

STEEL TANK 35ft. x 15ft. ALL WELDED

BY

OXY-ACETYLENE PROCESS

Courtesy, Jenckes Machine Co., St. Catharines, Ont.

The innumerable uses to which the Oxy-Acetylene Process may be profitably applied render it absolutely necessary in all Metal Working Industries and wherever running machinery is employed. All over the world Oxy-Acetylene Welding is rapidly superseding riveting, overlapping, brazing and threaded unions because of its greater Efficiency, Economy and Durability.

THE PROCESS HAS THE SAME ADVANTAGES FOR YOU

If you have any doubt on the subject, ask us for further information and proof. We are in the very best position to tell you of its benefits to **You**, and give efficient Service after you are convinced.

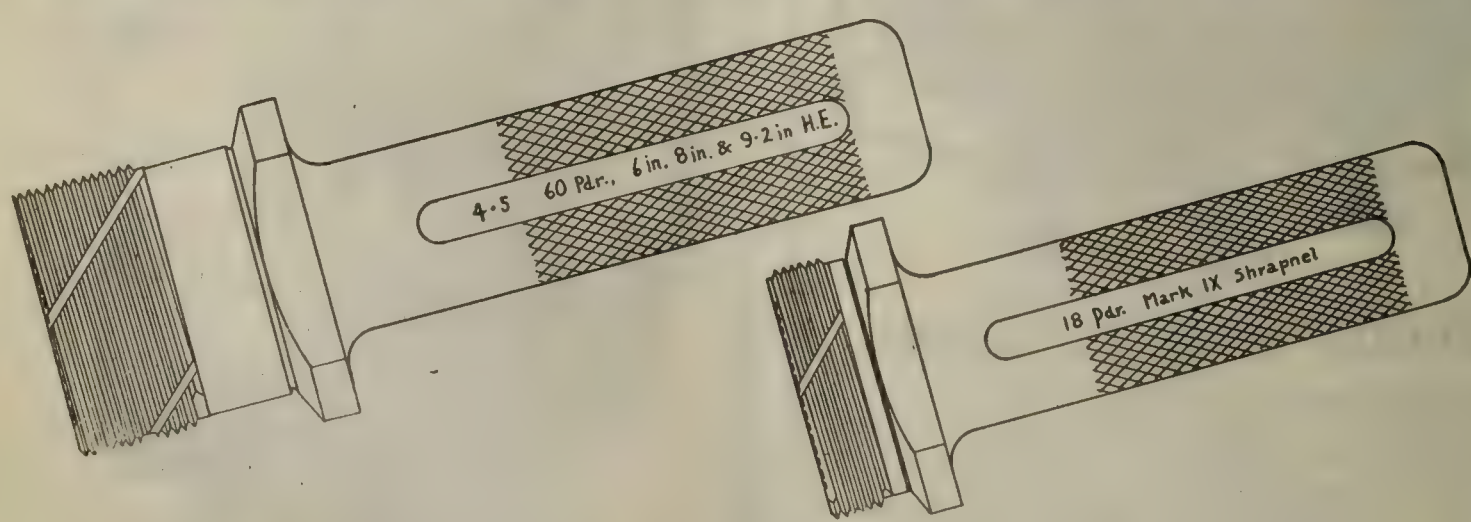
The savings effected are incomparably greater than its cost.

For the reclamation of broken machinery parts and castings, an Oxy-Acetylene Welding Outfit is an indispensable adjunct to every well equipped Plant, often saving its total cost the first time it is used.
Write to-day for particulars—your interest will be appreciated.

L'AIR LIQUIDE SOCIETY

Canadian Factories: **MONTREAL** **TORONTO** **WINNIPEG** **HALIFAX: Factory under construction**

FUSE HOLE GAUGES



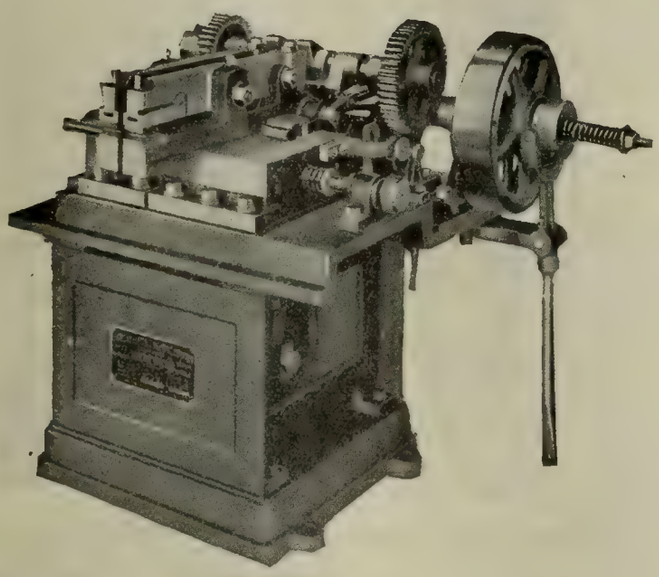
Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

Thomson Process
Electric Welding

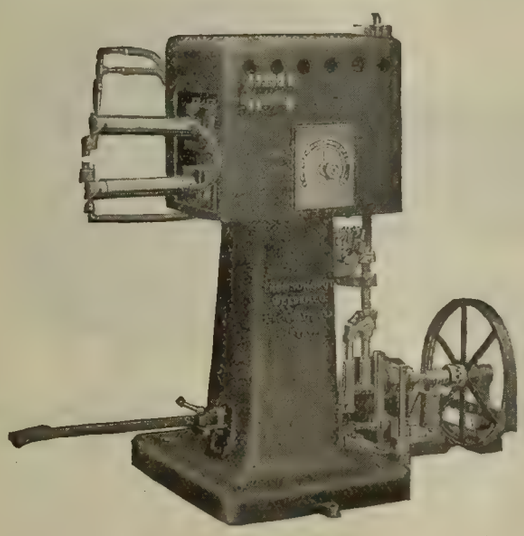
One Operator Merely Feeds



This Machine

This type of Thomson Electric Butt Welding Machine takes care of welding of small duplicate pieces, such as rings, buckles, etc., from the moment the operator places the piece in the clamping die until after the weld is made. A power-driven cam shaft tightens the clamps, turns on the current, applies the welding pressure, cuts off the current and releases the clamps after the weld is made. It can turn out 900 to 1000 welds per hour.

Send for Bulletin B-4



Noise Doesn't Always Mean Speed

When you hear the rattle and bang of a riveting shop—you think it means speed—but does it? Notice carefully how long it takes to rivet a small section—then go into a shop using the Thomson Spot Welder—no noise, no dirt, no danger, just quiet, efficient work that means speed. You will see one man at a Thomson Spot Welder doing five times as much work as by the old method, and the welds hold better than the rivets.

We will prove the efficiency and speed of our machines any time you say. Our catalog fully describes our entire line of spot welding machines. Where shall we send YOUR copy?

Send for Bulletin S-4

Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

If any advertisement interests you, tear it out now and place with letters to be answered.

High Carbon Steel

Scientifically "heat treated"—

Cut with mathematical accuracy as to depth, number and position of teeth—

Make the

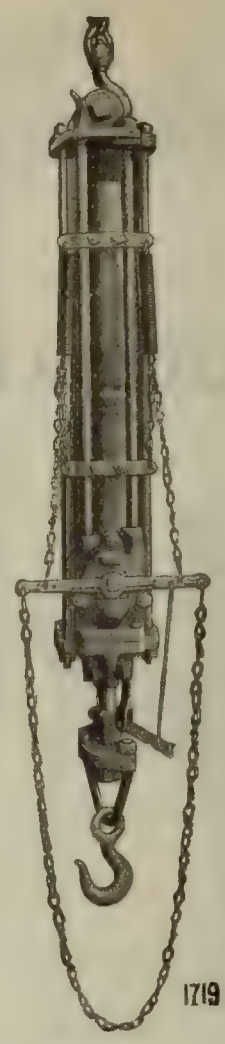
"Famous Five" Files

the standard tools of their class.

It is a pleasure for a mechanic to work with them—

Consequently they give good results economically.

Always specify them when ordering.



WHITING AIR HOISTS

Most convenient for the many quick, short lifts about the average shop.

Valve stem does not pass through air chambers, and therefore no packings are required.

Automatic cutoff guards against waste of air.

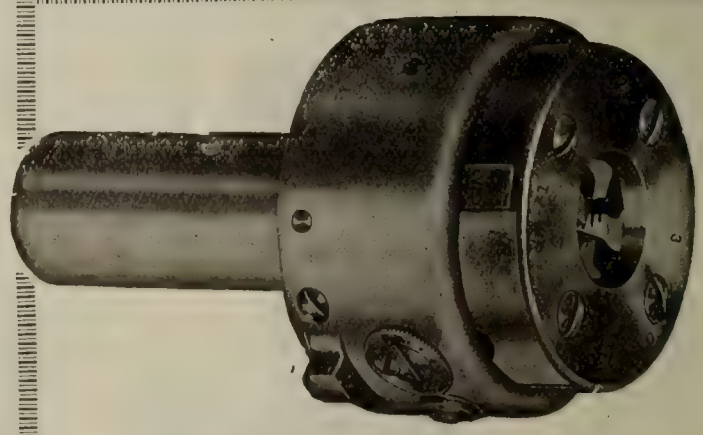
All details the result of many years' study in manufacturing and operating cranes and hoists of all kinds.

Send for catalog 119

Complete Foundry Equipments.

Cranes of all Types.

WHITING FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB.



Thread Accuracy

Are you satisfied with your threads? Are they all you desire? Do you wish to get better results?

That last question interests us vitally.

Our Self-Opening Automatic Die Head will chase your troubles. Its quick release feature not only insures the cutting of the thread to a given point every time, but permits cutting right to the shoulder where required.

Our booklet will tell you about other features.

Eastern Machine Screw Corp.

H & G

New Haven, Conn., U.S.A.

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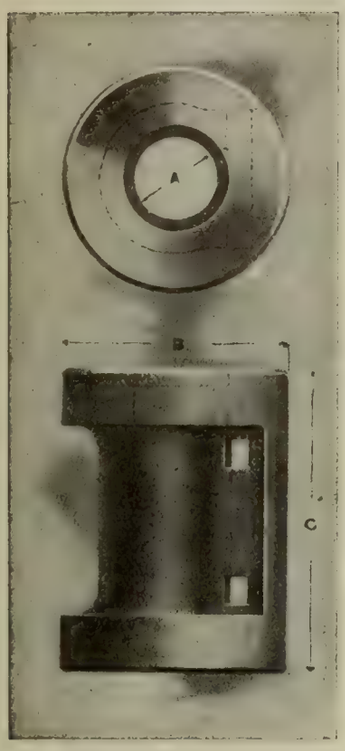

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Shoes and Dies, Tappets, Bosses, Cams and Stamp Heads

Also Manufacturers of Lining Plates for Ball and Tube Mills Concaves and Heads for Gyratory Crushers.

Machine Moulded Gears

Any size up to 18 feet in diameter. No patterns needed.

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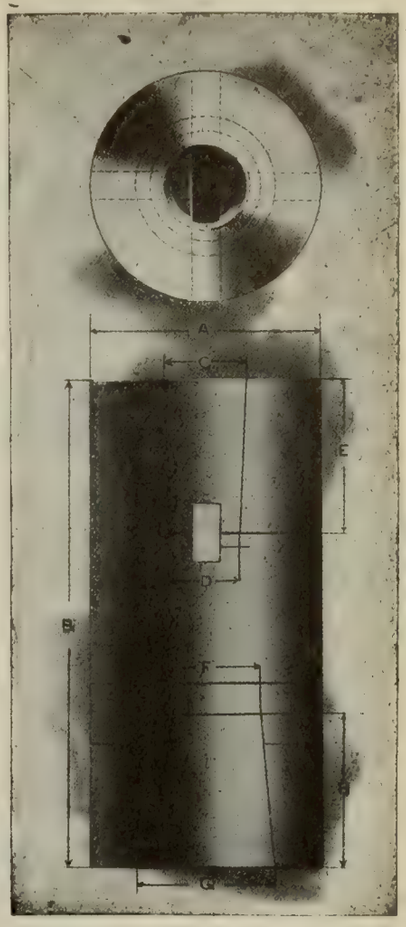

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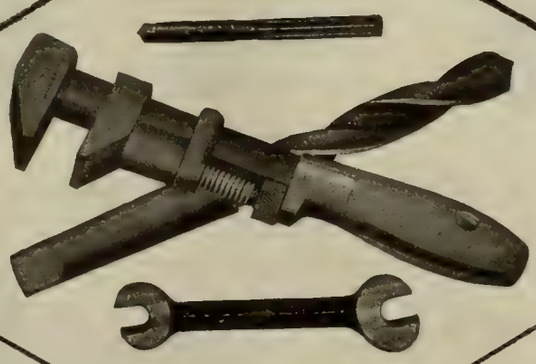

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Users recognize "W & B" Tool Quality, backed by 64 Years' Uninterrupted Experience. If your Jobbers and Dealers cannot supply, write us and we will see that you are supplied. Send for Catalog No. 90.

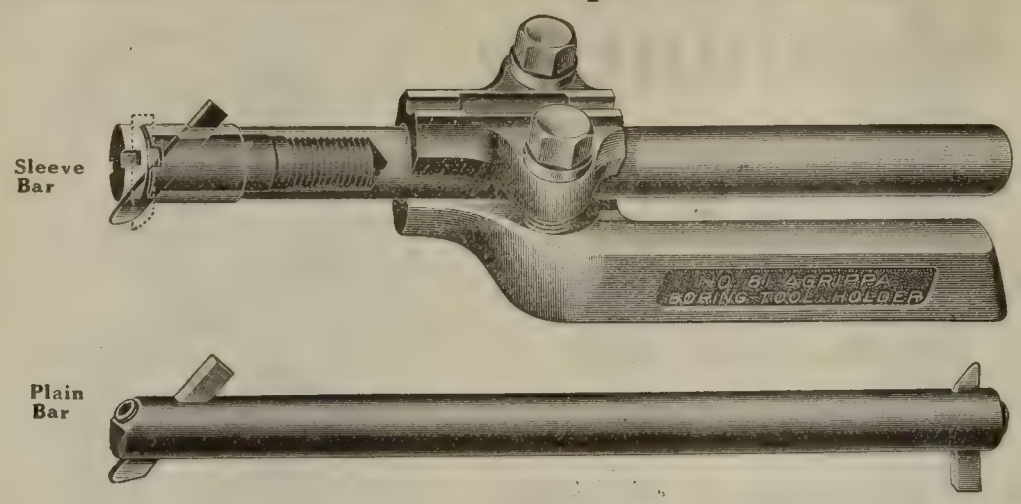
THE WHITMAN & BARNES MFG. CO.

ESTABLISHED 1854

CANADIAN OFFICE AND FACTORY ∴ ∴ ST. CATHARINES, ONTARIO

If any advertisement interests you, tear it out now and place with letters to be answered.

Williams' "AGRIPPA" Multiple Bar Boring-Tool Holder Stops Waste



ALL "AGRIPPA" TOOL HOLDERS CAN BE SHIPPED PROMPTLY

ITS sleeve bar cap admits a straight or angular cutter; and you can quickly insert either at the business end of the bar without removing the cap or disturbing the setting of either the bar or the holder.

You need neither make nor buy any bushings hereafter, for the "twin screw" fastenings of "AGRIPPAS" within their range accommodate any bar section you may have handy.

Now's the time to begin saving—caps, bushings and time!

Procure your tool holder text book here or from your dealer and learn the many other economies afforded by

Williams' Grand Prize "AGRIPPA" Tool Holders

"THE HOLDERS THAT HOLD"

Western Office and Warehouse
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J. H. WILLIAMS & CO.
THE WRENCH PEOPLE
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Quality alone is our measure of "AGRIPPA" Tool Holder Value

Safety Set Screws
Tap Extensions

Socket Head
Cap Screws

Safety Set Screws
Socket Wrenches

MANUFACTURED BY

135 Sheldon Street **The Allen Manufacturing Co.** Hartford, Conn.

Double-Quick Cutting-Off

THE HURLBUT-ROGERS CUTTING-OFF AND CENTERING MACHINE has the advantage of two cutting tools.

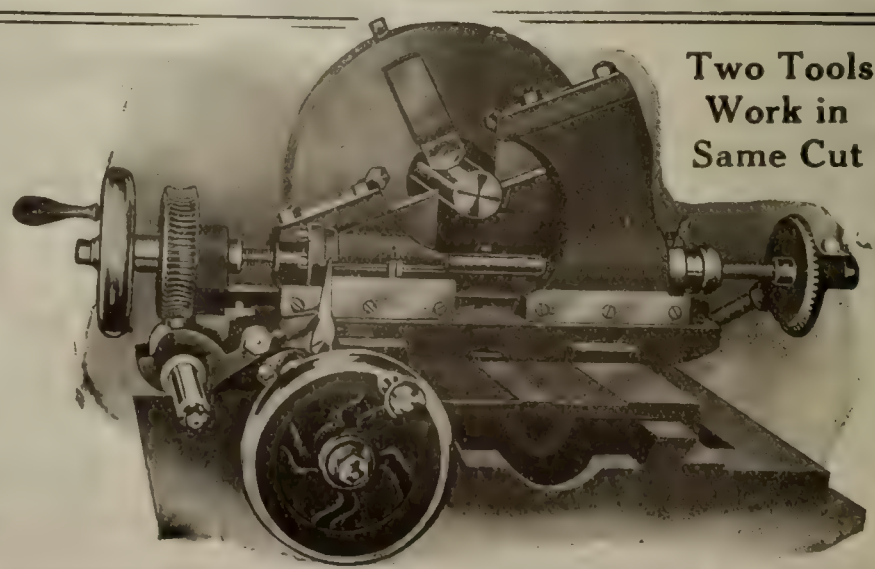
Each tool is rigidly supported in a stationary block at an angle which permits a strong shearing cut.

WITH THIS MACHINE PRODUCTION CAN BE NEARLY DOUBLED, and the utmost accuracy maintained under the hardest of work.

Read full details. Write for catalogue.

Hurlbut-Rogers Machinery Company
South Sudbury, Mass., U. S. A.

FOREIGN AGENTS—England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow, Newcastle-on-Tyne H. W. Petrie, Toronto, Canada.



Two Tools Work in Same Cut

FLINT SHOT ENLISTS!

AS A HELPER IN SHELL-MAKING

"SOMEWHERE IN MICHIGAN" The Flint Shot Man visited a plant that has recently completed a big order of 6-inch shells for one of the Allies.

At a certain point in the early part of of the operation the shell is a cylinder closed at one end.

To give this cylinder the proper conical taper, the open end is heated in an oil furnace, and the end is compressed in a hydraulic press, a mandrel keeping the top open.

The oil flame leaves an incrustation of scale on the inside of the shell. This scale must be removed—absolutely.

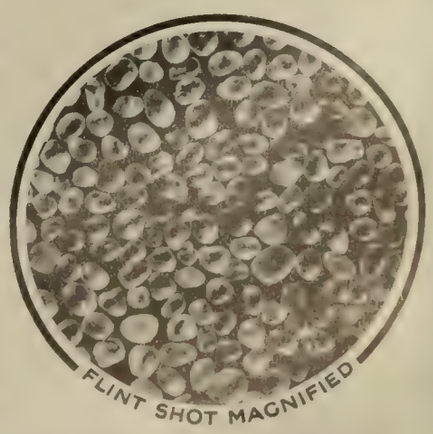
Flint Shot did it. We are not permitted to publish details, but it is violating no confidence to say that the shell is inverted and revolved, while the nozzle of the Mott machine discharges its fusilade of Flint Shot at a glancing angle inside the shell, each nodule of flint, taking several "bites" before its power is spent and it sifts out through the inverted opening.

A blast of clean air is then used to remove adhering dust.

The general superintendent said that lake or ocean sand was found to be too soft for this work and that steel grits were too violent in their action—Flint Shot occupying the happy medium between the two.

Flint Shot, therefore, hereby enlists as a private in Liberty's industrial army, ready for duty in shell work or any other kind of metal cleaning.

If you have a shell contract or expect to get one, better look into this. Send for further particulars.



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SOLE PRODUCERS OF FLINT SHOT

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Work must be

It is natural for men to be different—to be original. It is natural that each machinist should want to work in the way he thinks best. And it doesn't matter much how he works so long as results are the same. But that's just it—results must be the same. Parts must fit. Any differences are costly. Accurate standardization demands accurate tools. That's why machinists everywhere use

TRADE MARK

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They know they are dependable. They may doubt the accuracy of the layout, or even of their touch, but they never doubt the accuracy of Starrett Tools.

In buying your micrometers, calipers, gages, combination sets, caliper squares, tapes, straight edges and other tools make your choice from the 2,100 styles and sizes of the Starrett line.

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The L. S. Starrett Co.

The World's Greatest Tool Makers

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Mark it, and mark it clearly. You can do it with a Matthews die or stamp. We make them for marking all products. Our letters and figures are hand cut from the best tool steel.

Matthews stamps are extensively used for marking shells. Many Canadian munition plants have complete Matthews equipment, including holders, type, separate stamps, inspectors' hammers, etc.

Catalog gives complete description of our extensive line, send for a copy

Special "Champion" holder with type chamber curved radially for marking base of shells.

Special "Champion" holders with type chamber curved on face for marking sides of shells.

JAS. H. MATTHEWS & COMPANY

ESTABLISHED 1850

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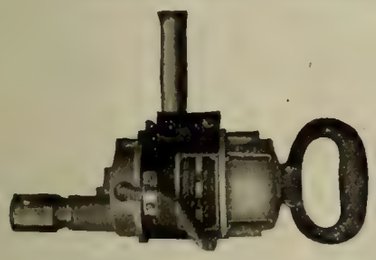
Distributors for Canada The Canadian Fairbanks-Morse Company

Montreal, Toronto, Quebec, Ottawa, St. John, N. B.; Winnipeg, Calgary, Saskatoon Vancouver, Victoria.

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

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3 SIZES

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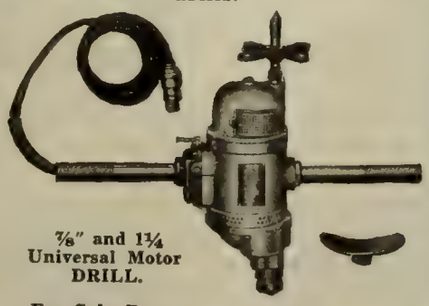
All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞" and 1¼ Universal Motor DRILL.

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THE UNITED STATES ELECTRICAL TOOL CO.

CINCINNATI, OHIO

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P H

TRADE MARK

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A mechanic doesn't want a file to just look like a pearl-grey nocturne—he wants it to WORK. He doesn't want a brittle, ultra-sharp tooth that will break off after a few rubs,—he wants a tooth that cuts and WEARS.

He wants a tool that will stay on the job, not a highly sharpened horror that has as much temperament as a Prima-Donna.

P. H. FILES are FILES WITHOUT FRILLS

They are rugged tools made to do the hardest kind of work, and to stand up under it.

Made just a little better than seems necessary

PORT HOPE FILE MFG. CO., LTD.

Port Hope, Ontario

Ask Your Jobber

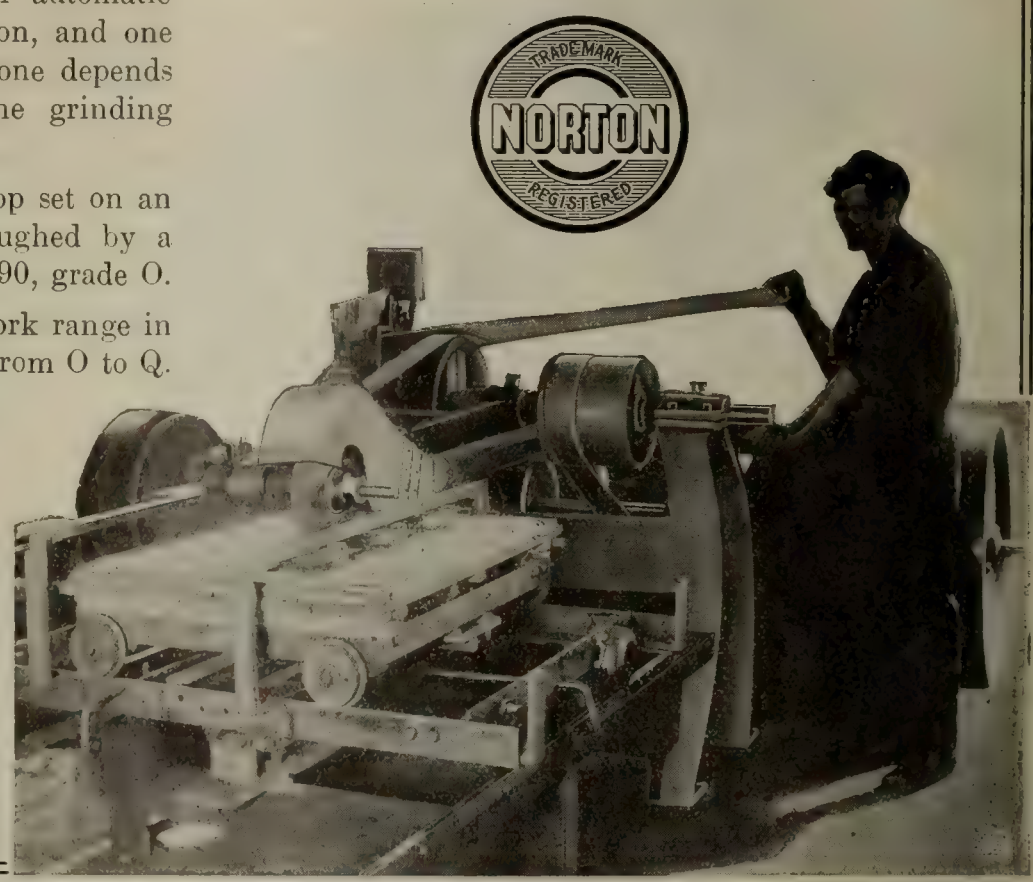
For Polishing Stove Tops

The polishing of stove tops on automatic machines is an interesting operation, and one where the quality of the work done depends largely upon the selection of the grinding wheels and abrasives.

The photograph shows a stove top set on an automatic machine and being roughed by a 10 x 2 x 1 Crystolon wheel, grain 90, grade O.

The wheels usually sold for this work range in grain from 60 to 90 and in grade from O to Q.

Crystolon grain is the abrasive used for the final polishing operation.



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Worcester, Mass.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que.

ELECTRIC FURNACE PLANTS

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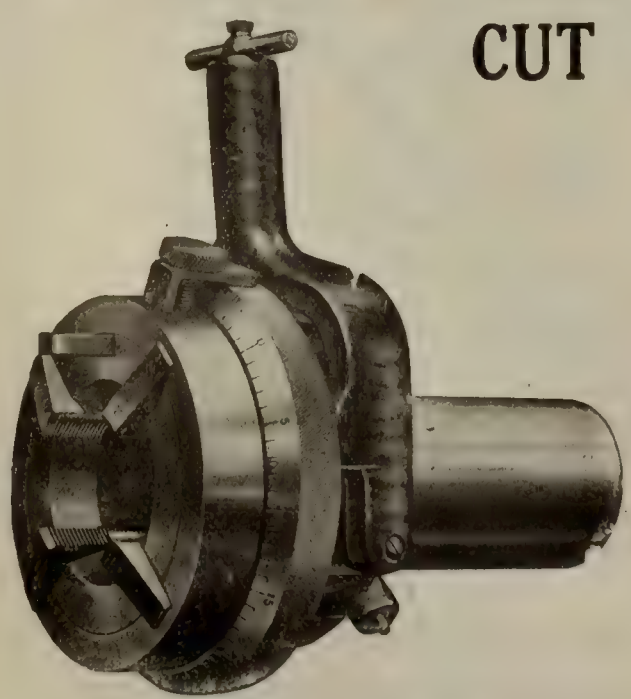
WELLS SELF-OPENING DIES

CUT PERFECT SCREW THREADS



WELLS SELF-OPENING DIE has both face and hand trip

The Wells Self-Opening Die cuts the thread with a fine shearing cut, then opens with a quick, positive snap.

Adaptability

The Wells Self-Opening Die embodies an entirely new machines, lathes, automatics, drill presses and bolt cutters.

Chaser Principle

The Wells Self-Opening Die embodies a nentirely new principle of design. The chasers are about four times as long as the threaded portions and are supported throughout their entire length and width by the solid sides of the slots in the body. They cannot squirm away from the work. Wear is reduced to a minimum throughout. Adjustment is simple, positive and accurate.

A large number of these Dies in stock for Immediate Shipment.

WELLS BROTHERS COMPANY OF CANADA, LIMITED

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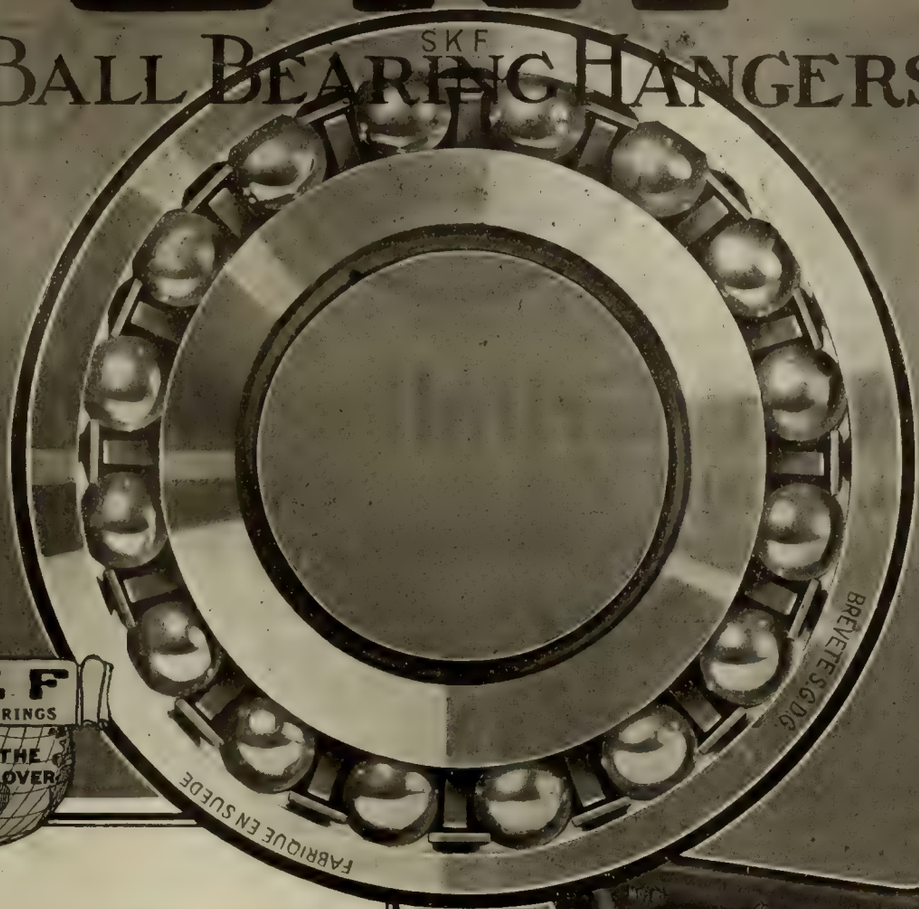
SKF

BALL BEARING HANGERS



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BALL BEARINGS
USED THE WORLD OVER

THE fundamental merits of SKF Self-Aligning Ball Bearings have been testified to by many of the largest industrial plants.

If you are interested, ask us to substantiate these claims.

Canadian SKF Co., Limited
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ALUNDUM CRYSTOLON

to grind anything

From the roughest grinding to the most precise finishing.

Investigate Norton Grinding Wheels on the basis of a ton of metal removed and quality of work produced, and you will always specify Norton Wheels on your orders.

We study our customers' requirements, and always have in stock some wheels to suit individual needs.

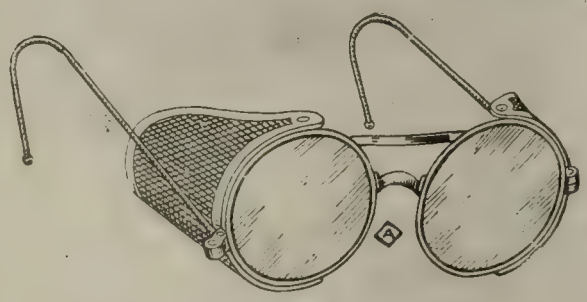
A large stock of these wheels is carried in all of our Main Branch Houses. Our stock in Montreal and Toronto alone consists of over

5000 Wheels

Norton Wheels are made in the largest abrasives and grinding wheel plant in the world.

Norton Wheels come nearest to being absolutely uniform in grain and grade. They retain their cutting qualities from wheel to wheel, and give the greatest satisfaction in the long run.

"Canada's Departmental House for Mechanical Goods"



YOUR EYES

are the most valuable possession next to your life.

A pair of these goggles will insure them against any possible injury from flying particles.

The added confidence gained by their use will materially increase your earning capacity.

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED.

St. John, Windsor, Quebec, Winnipeg, Montreal, Saskatoon, Ottawa, Calgary, Toronto, Vancouver, Hamilton, Victoria

Saving Money Studying Materials and Watching Scrap Heap

By Wilfrid G. Astle

The flow of raw materials into any factory, public service plant, railway system, or, in fact, any kind of a business, is bound to be continuous and will go on as long as the business runs at all. When these materials begin to flow out, as finished products or service, there may be a notable shrinkage, a large proportion of which can be traced to lack of efficiency in studying materials combined with neglect of scrap heap and general lack of interest.

BUSINESS has now entered upon a new era of economy, and every item is being subjected to a thorough examination by the modern business manager for the purpose of detecting and abolishing any waste. The four big groups under which this problem is being studied are Burden, Materials, Labor and Management. The greatest possibilities for saving are found in the item of materials, because out of the twenty billion dollars' worth of goods manufactured yearly, more than twelve billion dollars of this is cost of materials—the raw stuff out of which product is made, with tools to make it. That is three times the cost of labor and supervision.

After the efficiency man has come another specialist, who is known as the economy man, whose duties are to browse around the plant to see what is being used; how it is being handled; what is spoiled, thrown away through ignorance, carelessness and use of wrong materials. His supervision begins with the raw materials coming into the plant, with authority to change these if he can effect sane economies by substitution and improvement. His supervision then extends through the works, with its countless opportunities for leaks and extravagance, out to the scrap heap, where he often finds suggestions that, in turn, help him to develop better standards in the purchase of more material.

Street Railway Methods

One of the largest street railway systems in Canada has a system of concentrating at their main shops all responsibility for life of material. The car maintenance department is held responsible for all supplies from the time that they leave the storekeeper on requisition indorsed by the master mechanic, until he returns them back to the storekeeper as scrap. The question as to what is scrap is not left to the foremen for determination, but to two specialists. These men divide all return material into three heaps, the first is called "good for repair," the second "doubtful," and the third "rejected." The master mechanic has the last word as to what doubtful pieces shall be repaired. The scrap is carefully weighed and turned over for formal receipt by the storekeeper. Allowance is then made to each carhouse under the proper account number, and finally the auditing department assigns the credits on a money basis. The manifest which accompanies the material returned by any of the carhouses is regarded as an order for substitute material. The sub-stores at the carhouses can order as new only such material which is not subject to repair, but even these orders must be approved by the master mechanic before going to the storekeeper. No carhouse receives substitute parts unless it returns an equivalent number of old parts. The necessary adjustments for lost material are made monthly.

This system has been in use for some time and has proved very successful, especially in avoiding the unnecessary scrapping which arises when carhouse men are too eager to get rid of material which, while old, is still capable of repair and perfectly safe for re-use.

Economy of materials in designing and buying is very largely a technical matter, and there is plenty of room for technical improvements in methods when materials pass out of the storeroom into the works. More often, however, the problem is a human one; and the economy man cannot go very far until he has enlisted the co-operation of all the employees by pointing out to them waste, has developed better methods, has made clear the reasons for carefulness with materials, and has roused an economical spirit in the whole organization.

Electrical Concern's Operations

In handling its scrap, a large electrical company in New York holds the supply department responsible, as they are more familiar with the materials and the best methods of handling and disposing of them. The scrap material when received by the stores department follows the same routine as new material; that is, the weights are taken gross, by the receiving clerk, after which it is delivered to the yard foreman, who is in charge of the scrap shed. It is then separated and the weight of each class of bare metal, brass, copper, lead, etc., is taken separately before it is put into its respective bin. A credit slip itemizing the material is then issued to the job, and sent to the clerk in charge of the scrap ledger, who prices it at the value of the last scrap sale, posts the items in the scrap ledger, and forwards the original copy to the credit slip to the accounting department, where it eventually becomes part of the job order system.

Leaded and braided cables and underground tubes are put into ovens and redeemed as pig lead and bare copper. The loss resulting from this process is deducted from the gross figures, the net amount only being credited to the job. The iron piping from the underground tubes is redeemed where possible and returned to stock for further use. Short or crooked lengths are scrapped. A reduction oven is used in withdrawing the copper from these underground tubes. The oven is fitted with bars at intervals, each bar being higher than the preceding one, so that when the tubes are inserted, the rear end is about three feet higher than the end at the oven door. A fire is built under the tubes from the side of the oven and this becomes sufficiently hot to melt the compound, which flows from the tubes by gravity and feeds the flames. After the compound has run out, the copper is easily withdrawn as clean copper, and the tubes are either repainted or sold for scrap, depending upon their condition. The copper withdrawn from the tubes is cut up into small pieces and put into hogsheads and shipped monthly.

Another style of oven as used by this company is for burning the compound out of old junction coupling and elbow boxes. The compound is melted and burned out, and the iron is for the most part repainted and used over again. Such material as cannot be thus treated, is sold for scrap. Into still another oven all the short pieces of braided and leaded cables returned from jobs, and the insulated wire of all kinds are thrown. The bed of this oven is of concrete and is sloped toward the rear right-hand corner, so that the molten lead will run by gravity into a pot outside the oven. Here the dirt is skimmed off and the lead is taken up in ladles and cast into pigs, in which condition it is sold. The insulation having been entirely burned and the lead having run off, clean copper remains, and this is removed and packed into hogsheads for shipment as stated above.

Economy Every Employees' Concern

The cost of raw material has been steadily rising, wages have been increased, and prices have not been able, in a great many lines, to keep pace with this increased cost. Profits have shrunk everywhere, and to-day the business man must run his business on a much smaller margin than was common five or ten years ago. As practically everybody connected with the business organization is doing something with materials, the tracking down of waste and leakage is one of the big problems of modern management.

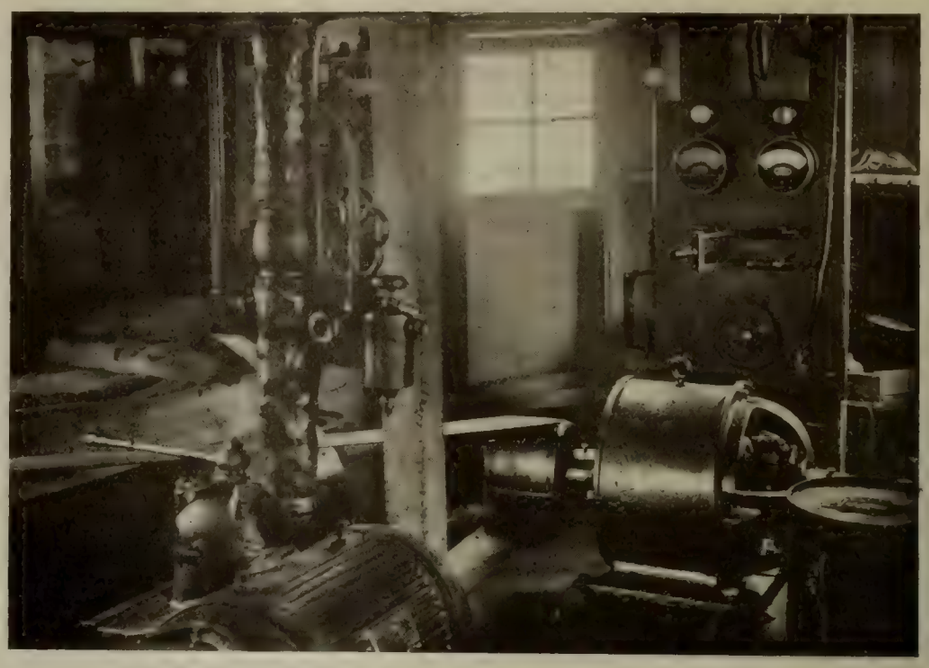
A large railway system, which used to collect its scrap material and junk at a central point and sell it to the junk dealers when it had accumulated, now has a large shop fitted up with machinery for working over each class of material and testing its output. New tires are put on car wheels formerly sold for a cent a pound, and they give years of additional service. Old rails are re-rolled and redrilled and sold, to smaller roads. Old springs are retempered and the babbitt metal is melted out of old journals. A magnetic separator winnows iron and steel from brass in mixed scrap, nuts and bolts are rethreaded; thrack spikes

are cleaned of rust and resharpened; tie plates, car wheels and car couplers are reclaimed. A vast assortment of crippled tools are made serviceable and sent back, such as shovels, tamping picks, track drills and jacks.

Then again, another firm of machinery manufacturers which uses large amounts of cotton waste in its factory, has been accustomed to throwing it in a corner when it became well soaked with oil. Each day it was gathered and burned up in the furnaces, as is quite customary the world over. But one day a man came to the manager and asked permission to periodically gather up the oil-soaked waste and replace it with clean material. The manager told him to go ahead provided money could be saved on the purchase of new waste; then he asked how much the service would cost per pound waste. He was surprised when the man replied that the new waste would not cost him a cent—that the oil-soaked waste would be gathered up and replaced with the same amount of new waste without charge. On investigation, it was found that this man had a little plant on the outskirts of the city where he gathered oil-soaked waste from nearly all industries in that entire section of the city. There he put the oil-soaked waste through a pressing and washing process by which it was cleaned so wel' that it looked like new. When the oil he pressed out was cleansed and filtered, he got three or four different grades, which he sold for approximately five times his cost of producing it. Many industries clean their own waste and make a good profit over the cost of cleaning it for re-use. The oil, which is easily drained off the top of the wash, is readily marketable at a price that much more than pays for the process.

The bonus idea has been applied to the saving of material as well as the saving of time, and employees share in economies; but, even without bonuses, there is little difficulty in showing men how economies benefit them by making it easier for their employers to meet competition, extending the business, and providing steadier work and higher wages.

The careful scrutiny of the scrap heap will bring about better standards in the purchase of new materials, because defects in the design and workmanship will be discovered, and then again, instances have been known where manufacturers have replaced articles when the defects have been called to their attention. Under the old scheme of selling scrap there would have been no claim for replacement.



INTERIOR OF TUG "ALBERT" SHOWING ELECTRIC GENERATING PLANT FOR SUPPLYING CURRENT FOR WELDING.

MARINE REPAIR TUG WITH WELDING EQUIPMENT

THE characteristic activities that have marked the recent developments in the marine and shipbuilding industry have also necessitated the utilization of every available resource to meet the increasing requirements for additional lake and ocean tonnage. Every conceivable method that would assist in this essential need, has been adopted and pressed into service, to the extent that remarkable results have already been achieved, with still greater ones to follow. A very important factor in maintaining maximum facilities for water transportation is the rapidity with which repairs or alterations can be accomplished upon vessels in transit or in harbor, or such other marine work that requires immediate attention.

The art or science of welding, particularly by the electrical and oxy-acetylene processes, has rapidly advanced to a leading position in engineering practice, both for repairs and general construction work, the marine field being not the least of its many activities. The illustration herewith show the tug Albert, now in the service of the St. Lawrence Welding Co., of Montreal, which has been in operation for several years on the Great Lakes and the River St. Lawrence from Quebec to Fort William. The boat is equipped with a 60 h.p. Fitzgibbon boiler and is operated by a 10 x 10 inch single cylinder high pressure marine engine, providing a maximum running speed of 12 miles an hour. To meet the requirements of general welding practice, the boat has been fully equipped for welding operations, by either the electric or oxy-acetylene process. The installation for the former consists of a 35 horse-power Robb Armstrong horizontal high speed engine, belted to a British Westinghouse 300 ampere generator, complete with switchboard and resistance. For electric welding, 700 feet of insulated cable is carried in reinforced rubber hose, thus providing facilities for effective operation at a considerable distance from the tug.

For the operation of pneumatic tools, compressed air is supplied by a 12x11x12 inch Westinghouse locomotive type air pump, which with receiver, has ample capacity for the operation of three sets of tools. In addition to the working equipment, the vessel is provided with a duplex fire pump and efficient life saving apparatus.

During winter this company operates portable Electric and Oxyacetylene welding apparatus, principally on marine boilers of the several lake vessels that are tied up, and also executes a large amount of digester repair work in connection with pulp and paper industries.

TUG "ALBERT" EQUIPPED WITH ELECTRIC WELDING OXY-ACETYLENE AND PNEUMATIC TOOL PLANTS FOR SHIP REPAIR WORK AFLOAT.

PAPER IS MADE OF RICE STRAW

THE first unit of a factory to make news print paper from rice straw and from bagasse—the waste of sugar mills —has been installed and is in successful operation at New Iberia, La. To all appearances, and according to statements mde by the management of the mill, the paper produced from these two products, hitherto regarded practically as waste, is as good as that made from wood pulp in northern paper mills.

The corporation that is making the paper first purchased an old shingle mill and 18 acres of land extending from the Bayou Teche, across the heart of New Iberia, to the Southern Pacific Railroad. This gives excellent manufacturing and distributing conditions, for power boats and barges bring the rice straw and the bagasse from fields within a radius of 200 miles along the Bayou Teche and tributary streams, while the finished product of paper goes out at the other side of the plant directly to the cars of the Southern Pacific for distribution to northern and eastern markets.

A wharf, spur tracks, "digesting building" and warehouses have been built, and the first ton of paper has been made. The Bayou Teche is the central waterway of the picturesque Louisiana section immortalized by Longfellow, and known even to its own inhabitants as "Evangeline's Land." It comprises the largest rice belt in the world, and produces hundreds of thousands of tons of sugar as well. From the immediate neighborhood of New Iberia the output of rice straw is 20,000 tons yearly, while beyond Iberia Parish, but tributary to it by navigable waterways, lie the rice-growing parishes of Vermillion, Lafayette, Acadia, Allen, Beauregard, Jefferson Davis Calcasieu, which produce hundreds of thousands of tons of rice straw annually, all of it being wasted.

MALLEABLE CAST-IRON

WITH the object of bringing before the attention of local manufacturers modern practice and investigation bearing upon malleable cast-iron in order, if possible, to obtain increased production, and at the same time to utilize some materials which have not yet been adopted in this country, Professor T. Turner of the University of Birmingham, has recently delivered lectures on the subject, under the auspices of the Ministry of Munitions.

In the course of these, he explained the practice of melting followed in the United States, where, he said, crucibles are seldom used, and cupolas are regarded as obsolete. Air furnaces, or open hearth gas furnaces, up to 25 ton capacity, are employed, with large annealing furnaces, charged through the roof, which is arranged so as to be removed in sections. The great difference in composition of the iron used relates to the sulphur which for the "black heart" process must be low, and usually does not exceed 0.08 per cent., while in the European process three times this quantity can be present without injury.

In each case it is now generally recognized that phosphorus up to 0.25 per cent. may be permitted, and even more is present in many good castings. The combination of mechanical tests with chemical and microscopical examination has led to a great imporvement in the trustworthiness of the material from good makers. A standard wedge test was formerly regarded as satisfactory if the stample stood seven blows with a hammer, but there is now no difficulty in guaranteeing 35 blows, and over 100 have been recorded.

TRANSPLANTING INDUSTRIES

A RECENT number of *The Iron Age* has a remarkable story which shows what business enterprise can do under the stimulus of war necessities. Nothing less than a world war, probably, would have made it profitable to pack up an entire blast furnace plant and all its machinery, and ship it bodily as far as India. This is precisely what is being done with the Battle furnace plant at Battelle, Alabama. The furnace, 85 feet high, with hoist, power plant, stoves, boiler plant, etc., is being dismantled, and in 60 days from the time the work was started will be on the seas, bound for Tata, India, where it will be erected again and set to work. If one could endow a blast furnace with a personality, as Kipling has endowed locomotives, this one may well be imagined to be somewhat amazed at its own adventures.

B.C. COPPER OUTPUT INCREASE

THE amount of copper produced by smelting in the Province of British Columbia in 1916 was 65,379,364 pounds fine copper, valued at the average New York market price for copper at $17,784,494. These figures represent the amount of copper actually recovered, as nearly as it is possible to ascertain; the amount of copper really in the ore mined would be approximately twenty-five per cent. greater. This is the largest copper output in the history of the Province.

As compared with the year 1915, these figures show an increased production in amount of 8,460,959 pounds, or about 14.80 per cent., and in value the increase is $7,948,994, or 55.3 per cent.

The amount of copper produced during the year 1916 is the largest in the history of copper mining in the Province; the highest previous production, made in 1912, was 51,456,537 pounds, valued at $8,408,513.

The apparently abnormal increase in the value of the production this year is partly due to the high average market value of the metal for the past year, due to the phenomenal demand for munitions of war.

Owing to this heavy demand for war purposes, principally for brass to be used in shells, the market price of copper increased steadily during the year. The year opened with copper at about 22.5 cents a pound in the New York market, and at the end of December it was 29 cents; the average price for the year was 27.202 cents, as compared with an average price of 17.275 cents in 1915. This higher market value of the metal assisted materially in raising the value of the copper produced, thereby greatly stimulating production.

The large increase in quantity of copper produced this year is due to a greatly increased production from the coast district of some 7,000,000 pounds, largely from the Britannia mine, while the Granby Company's Hidden Creek mine, at Anyox, on Observatory Inlet, increased its production by about 2,000,000 pounds, says the B. C. Financial Times. The output from the Rocher Deboule mine, in the Omineca Division, was rather less than last year. The Trail Creek Mining Division and the Boundary District made very nearly the same production as last year; the output from Kamloops was greater, chiefly due to increased production from the Iron Mask.

ALLIES' WAR PURCHASES AND AMOUNT OF LOANS

A DESPATCH from Washington, D.C., states that all of the first Liberty loan of two billion dollars has been loaned to the Allies. This makes an expenditure of this amount within the past four months on account of England, France, Italy, Russia, Belgium and Serbia in the American markets for munitions and other supplies needed on account of the war.

Congress has authorized the issue of but one billion more bonds with which to make credit loans to the Allies, and judging from the rapidity with which the first loan was spent, this will be but enough to last during the next two months.

The total expenditures by the Allies in the American markets for supplies are at the rate of three billion dollars a half year or probably more. It is estimated that probably four billions more will be spent by the Allies within the succeeding six months, making a total of such expenditures of seven billion dollars for the current fiscal year.

These expenditures are entirely separate from those which are made by the United States for war purposes. As a practical financial proposition these credit loans should be calculated as part of the war obligations of the Allies inasmuch as these Governments are liable for the interest and principal. The United States as a matter of fact merely lends her credit to raise the money for these Governments.

THE amount of carbon dioxide produced by the complete combustion of mixtures of gasoline vapor and air reaches a maximum of 2.5 per cent. of gasoline vapor, according to an investigation made by the Bureau of Mines, which showed that the range of complete combustion was limited to mixtures containing only between 1.5 and 2.5 per cent. Carbon monoxide begins to form above 2.5 per cent., and at 4.1 per cent. of gasoline vapor there is produced 14.0 per cent. of this gas.

NOTES ON SHELL INSPECTION

By Chief Examiner

SHELL making from a manufacturers' point of view, and shell-making from an inspector's—a government inspector's point of view, are often very different. The manufacturer, in the general run of things, has one end in sight, i.e. that of dollars and cents. There are, of course, a number who desire to make, if not the best article, certainly a good one, but others again, unfortunately, never forget the "profit" side of the question. These manufacturers necessarily influence their employees, and by means of piecework bonuses, and various methods of speeding up the operations, endeavor to hasten production at the expense of quality.

The government inspector on the job sometimes finds himself forced into arguments, which, if he is wise, he will side track. A good inspector must be a man with a large amount of common sense and diplomacy. The foreman in the shop sometimes finds himself facing problems in the manufacture of the shell, and if he is unscrupulous and cannot immediately see a way out of his diffculty, falls back upon the questionable practices, hoping that the inspector or his assistants may either not notice them, or, if the relationship between the inspection room and the firm is good—may overlook them. Again, questionable practices are sometimes resorted to, to save a little trouble or a little expense in an operation.

Instructions Numerous

The numerous circulars of instruction supplied to the chief examiner by his superiors, makes it necessary that he should possess a good memory, coupled with firmness in enforcing the execution of them, without antagonizing the firm, the foremen or the operators. Suppose, for instance, that owing to some carelessness on the shop inspection bench, a larger number of shells have to be sent out from the government room for "rectification," than is usual. This means that the government men have double work, that production is interfered with, and arguments arise which are sure to cause annoyance to both parties. What, then, is the best way to deal with this question, at the particular plant where it takes place? If the chief examiner holds strictly to the specifications of contract, he is at liberty to suspend inspection if there are over 5% of the shells in one series, not made according to blueprint,—in other words—"rectifications." To hold strictly to this, would, however, be as bad as holding a match to a can of gasoline, and would cause immediate unpleasantness. On the other hand, rectifications must be brought down to the minimum. A method which the writer has found very satisfactory, and which is fair, and just, is to warn the firm on the first occasion, threaten them with the consequences, on the second, and on the third occasion, act, and send out the whole series for shop reinspection, and once the action has been taken, hold firm and yield nothing—not even if a report from the firm to head office ensues. This should only be done, however, if say 20 or 25 per cent. excess rectifications are submitted. This method is almost a sure cure, and the chief examiner is able to say that he has treated the firm fairly by giving them three chances.

Production No Concern

A chief examiner must always bear in mind that production is no concern of his, if it interferes with quality, but he must never overlook the fact that the shells are needed at the front, and while strictly adhering to his instructions, he must not be fussy in his judgment, and must be broad-minded and ever ready to give allowance within his limits if he sees that the firm and the operators are trying to please him, but "are up against it." If, however, he finds that things—minor or important—are being put over him, he must take a firm stand, and never waver, no matter how unpleasant the consequences may be for him. He must, however, only go to the length he is permitted by his instructions—these may be, and sometimes are, of great latitude, and an inefficient examiner often has it in his power to cause an immense amount of unnecessary expense to the firm, therefore he must on no account be vindictive nor allow any personalities to enter into his actions. He is wise, therefore, if he is in the slightest doubt, to refer the matter to the head office, where it will be dealt with by those who are better qualified to judge.

It is very important that the chief examiner should thoroughly understand every operation which the shell he is working on goes through. This is, of course, much easier for him at the present day, owing to the instruction classes which every examiner—chief or assistant— must attend, and at which he must qualify before he is allowed to use a work-stamp. This work stamp is his signature and must be used by him only, and not lent to other examiners to use.

In the earlier days, when shell making was in its infancy, in this country, the chief examiner's position was quite different. There was not the work nor were there the responsibilities attached quite as much as there are now, when so many new methods, new instructions, new "marks" of shell, etc., have come into force. He is, however, just as responsible as he ever was for the quality of each individual shell that leaves the factory, but with the difference that his assistants are more qualified men than in the earlier days, when every new man was a "greenhorn."

The writer well remembers his first chief's job and the bunch of trouble he landed amongst. He made many mistakes which he did not recognize as such, and, in course of time, and after an immense amount of worry, he learned lessons which he will never forget. But he was always strengthened by the knowledge that in all he did, he was guided, first, by his instructions, and secondly, by his conscience, and he always tried to be just in his decisions.

Although there are very few cases of inducements being offered, and still fewer cases of them being accepted, still there are instances where this has been discovered and all I can say, is, that the chief examiner or assistnat, who would stoop to receive any favor, however small, to enable any firm or man to get away with bad work—I say such man is far worse than the poor soldier who, tired and weary, falls asleep at his post, and should be shot with far less compunction.

What He Must Know

He must never forget that he is at the particular plant to see that each, and every shell is correctly and perfectly made in every detail, and that the man whose duty to fire that shell has to rely absolutely and blindly on him.

He should know the composition of it, although steel examination only slightly enters into his province. He must watch any operation where the shell has to be heated—such as the nosing press—or hammer, and if the heat is allowed to travel too far down the shell, he must hold it in the inspection room until a tensile test has been taken from a batch of similar defectives The chief examiner must know sufficient of the entire manufacture so that if any foreman puts up an argument or excuse, he will be able to judge at once, if such has any real foundation, or is merely dust thrown in his eyes.

Ideal Conditions

To look at the other side of the question—when a chief examiner is at a plant where everybody is working harmoniously, then it is a real pleasure to be there. The trust that can be placed in the operators and foremen is bound to keep up good feeling all round. I do not say, however, that vigilance must be relaxed, because there is always a black sheep in every fold, and in nine cases out of ten, if the examiner gives an inch, a foot will be taken, and if there were any laxity in the inspection room, the foot would very soon develop into five yards, therefore, following the rule of three, as the system in the inspection room is to the work, so will the effect be felt in the shop.

A rigid inspection, coupled with broad-mindedness, firmness, civility and a little obligingness will naturally and automatically work towards the best of quality and the largest amount of production, always provided that the firm and its employees try to please the inspection department and do not attempt to kick over the traces, or break the harness which it is absolutely necessary to put on them.

EXPORTS PROHIBITED

A cable was received recently by H. M. Trade Commissioner in Canada from the Board of Trade, London, stating that the exportation of the following articles from the United Kingdom had been prohibited from August 14:— Lasts, shoemakers' machines and tools, various; malleable iron castings, ethylic alcohol, zinc oxide, and sulphide, metal cylinders, shark oil, rapeseed oil, vegetable seeds, tanning extracts.

Some Present Day Problems in Railway Maintenance Work*

By F. B. Tapley **

Railway maintenance as carried out by the department organized for the purpose is a constant building up of the breaking down process caused by traffic tear and wear, effects of elements and time. It covers a broad field, embracing in its scope the roadbed, track, bridges, waterways, fences, buildings, water supply and kindred work. The track structure, as it is called, embraces the roadbed as well as the rails and ties, necessitating variety equipment.

THE roadbed and track of a railway is one of the most important parts of the complete railway structure, and may, on account of its importance, be called the backbone of the system. To keep it in good condition, the railway must provide a certain sum of money each year, have a stock of material, and a trained organization of men.

The present day tendency in Canadian railway practice is toward the large car and the long train, and, as Canada is a country of long distances, this tendency will grow. Large cars and long trains require big engines to haul them, and big engines mean more wear and tear on the track. This condition is manifesting itself at a time when material is high in price and hard to get hold of; when labor is scarce and independent in attitude; when operating costs are growing in volume; while rates, both freight and passenger, remain almost stationary. Yet the Canadian railways must have and maintain good tracks if passengers and freight are to be carried safely and expeditiously.

The railway maintenance men of Canada, in common with those of the rest of the continent of North America, are to-day facing three important problems. They are—

First.—Stronger and more permanent track.

Second.—The obtaining and holding of labor.

Third.—The more economic use of material and labor.

The first may be maintained in a degree by better drainage, both of the surface and under type; ballast of a better grade, and more of it; heavier tie plates of the shoulder type, and the more extensive use of treated ties.

The Track Feature

Should you ask a maintenance man what he thinks of the importance of track drainage, he will concede you right off that it is one of the most important matters there is, and nine times out of ten he will tell you that the farther you keep the water away from the sub-grade the better the track will be. He generally recognizes water as an enemy to be feared and guarded against, all as a matter of theory. As a matter of practice, track drainage gets secondary consideration. There are a good many reasons for this. When the extra forces are put on in the spring there is great anxiety to get the ties in, the new rail laid, and the track surfaced, because the men higher up know about these things, and take a natural interest in their completion. The side ditches and other drainage work, instead of receiving first attention in the spring, are left until the last. We go into the winter with nice clean side ditches, when there is little or no water running, and through the spring and summer with dirty ditches, when it rains the greater part of the time. All this time the drains are working the moisture down into the subgrade, and storing up trouble and extra expense for cold weather. My own opinion is that we should start in the first thing in the spring and carry the ditching work through the season until it freezes up, even if it is necessary to put one or two extra men on the section solely for this purpose.

A Special Machine

We could accomplish a lot more by designing special machines for this work. I have in mind a machine which should prove very useful, and save a lot of time and money as well as relieving the regular forces of this part of the work, and giving them additional time to devote to other work. The machine I have in mind is to be patterned in the lines of a trench excavator, so designed to cut a ditch to line and grade. The excavated material would be raised by the bucket belt and conveyed by another belt conveyor to an air dump car for easy dumping on the banks. Such a machine should be built under ten thousand dollars, and could be run by four or five men besides the train crew. It should prove a money and time saver, and would insure clean ditches and free drainage.

Mostly all Canadian railways have ditching machines, but they are of the heavy type, and are designed for the removal of solid material. Whatever work they do has to be supplemented by a certain amount of hand labor in cutting and sloping the side ditches after the ditching machine has finished working.

Ballast pits in the past have, in the majority of cases, been chosen more with a view to short haul and low cost in handling rather than to the desirability of the ballast. The result has been that a lot of fine dusty ballast has been put out, which has given us dusty track, and the money put into the venture has not proved a good investment. In the future we shall have to make a closer study of these things, and when it is not possible to obtain bank gravel of the right quality, resort to the use of broken stone or washed gravel. Ballast of this kind is bound to be high in cost, so that more care will have to be given to the stripping off of the dead material from the roadbed, so that there will be no chance of mixing it with the new ballast.

Shoulder tie plates have proved a money saver in lessening labor in holding track to gauge; and those with the canted rail seat have helped to prolong the life of the rails by adjusting the wearing surface of the railhead to conform more closely with the coning of the wheels. My own opinion is that we should lengthen the outside margin of the plate an extra inch to get more bearing on the outside, and to prevent the plate being shoved down into the tie by the crushing force of the loaded rails. This feature should prove a help on the inside of curves. The extra margin would, of course, increase the weight of the plate about three-quarters of a pound, and, no doubt, it would have to be thickened slightly to make it stiffer, on account of the increased length, making the increase in weight around a full pound. The extra cost at ordinary prices would amount to about two cents each, and at present prices about four cents each. Personally, I would favor a tie plate with shallow, blunt ribs, or a smooth bottom, rather than those with deep sharp ribs, as there is less danger of the wood fibre being cut into and destroyed by rot. With a more extensive use of treated ties, which must surely take place in the future, this feature will require close attention.

Treated Tie Superior

Time was when the cedar tie occupied the first place in Canadian railway tracks. It was chosen because it was low in price, easy to manufacture, and resisted rot for a longer time than other woods. Under heavy loads it has not lived up to the first impression it gave, and has given out in other ways. Time has shown that it is not so good as the harder woods for curved track, and without tie plate equipment it was very easily cut by the rail bases. This led the railways to cast around for a harder tie, and the result has been that you will see the harder woods, such as jack pine, tamarack and hemlock favored to-day, although the life in some respects is shorter. Oak ties are nearly out of the question in Canada, as the supply of native timber is too small, and the cost of importing too high. With the treated tie we can increase the lifetime to about 12 years, and bring into use varieties of wood which to-day cannot be used in the untreated state. The argument has been set forth that the treated tie showed such a small margin in saving over the untreated article that a drop of a cent or two in the price of a tie would wipe the saving out. This argument carries a

*Paper read before Canadian Railway Club, Montreal, September 11, 1917.

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good deal of weight with the "powers" that hand over the money, but my prediction is that the prospective future supply of ties will alter this viewpoint.

The Labor Problem

The second problem which is staring us in the face is the obtaining of labor; and the retention of it after it has been obtained is becoming a still more serious matter. It is the opinion in some quarters that wages may remain high after the war, and that there will be a scarcity of good labor. This is a reasonable view, and the prophets may be right. Be that as it may, we are sure to face a labor shortage for the next three or four years. The solution of the problem would, at the first glance, appear to be to go into the market and bid up to the price the other employees of labor are offering, and take our chance of getting men. However, there are some sceptical people who will tell you that you cannot make bricks without straw, that men are scarce, and that the few who are available are offered more attractive living conditions by other branches of industry. It is true that the manufacturer and the contractor have offered higher wages and more attractive living quarters to the men than the railways have, but we can overcome this in a degree by providing better living accommodation.

Railways with their commissary departments for the supply of their dining car services should be in a position to feed their men in a more substantial way and at a lower relative cost than they can do it themselves, or have it done for them by contractors. Better and more sanitary living quarters, combined with good food, will increase the efficiency of the worker and go a long way toward establishing a contented body of men willing to stay on the job until the work is finished. Railway maintenance work should appeal to the laborer on account of its variety and its outdoor environment.

In respect to labor, the railways should be as keen to obtain and hold men as the contractor or manufacturer. Railway maintenance work has not in the past been regarded with favor by the better class of men. If a quick improvement in the housing and feeding conditions can be effected, then a little work by the publicity department of the railways setting forth the attractions of railway maintenance work might work wonders. Railways buy a lot of advertising space in the daily papers, and a live advertisement once in a while, appealing to labor, would undoubtedly help. If we give our track laborers as good quarters as are enjoyed by the bridge and building men, we will have taken a long step in the right direction.

Conservation of Construction Material

So much has been said about the vast amount of money to be saved by the care, rehabilitation and the re-use of old material, especially by the magazine writers, that one is prone to approach the subject with fear and trembling. We can, however, by a freer use of the rail saw, treat our released rails to advantage and prolong their life in branch line service. My idea would be to do the sawing work in the winter season when the work is slack, maintaining a small gang for this purpose, or the work might be carried on throughout the entire year, if there were enough of it to justify it.

Take a year when main rail renewals were fairly heavy. The released rail could be sorted over, and after the main line repair rail had been set aside, the remainder could be gathered up and hauled in to the saw, there to be treated and laid in a branch track the next season. In this way we would get a pretty fair sample of branch line rail, and one calculated to last a good many years under light power. All bolts should be carefully wrenched off, oiled, packed in boxes, and set aside in the store's yard until the rail goes out to be laid. Angle bars and old tie plates should be similarly reserved to accompany the rail when laid.

A process for re-rolling worn rails into rails of slightly lighter section, with heads of an altered shape, both symmetrical and unsymmetrical, for use on branch lines, has been patented in the United States, and several of the prominent railways over there have had some of their rails treated in this manner. In the majority of cases the alteration to the rail is so slight that the old fastenings can be re-used. Briefly, the process consists of a re-shaping of the worn head. This process is worth looking into.

We can make better use of our engine cinders than we have in the past, by spreading them on the sides of new cuts and banks, where vegetation is slow to start, and the material slides. Cinders will prevent sliding to a considerable extent, and are useful in keeping down the dust. They make good ballast in rock cuts, and in other places where rails batter because of a hard unyielding sub-grade.

There is an extensive field for the introduction of motor-driven section cars to convey section crews to and from their work. The time saved in pumping a hand car will, under the right kind of foreman, be used to the railway's advantage in increasing the day's output of work. Having employed the man, it is essential that he be kept working profitably and effectively during the hours of work. If a gain of one hour per day can be made in the time of each man employed on track, there will be a gain of about 10 per cent. in the amount of work performed, which will benefit the track to that extent.

The future will see a more extended use of labor saving machinery in all branches of maintenance-of-way work.

MUST ECONOMIZE IN COAL

AN intimation that both Canada and the United States might have to be placed on "coal rations" was contained in a statement upon the fuel situation which Sir George Foster made in the House of Commons at Ottawa on Aug. 22, in reply to a question by W. E. Knowles, of Moose Jaw. This course might be necessary, the Minister of Trade and Commerce said, so as to distinguish between absolute necessary services and those not so necessary. Further, he stated a distinct call would have to be made to all interests to save coal just as food was being saved.

The Minister of Trade and Commerce said the production of non-anthracite coal in Canada last year was 13,800,000 tons. Of this over 6,000,000 tons came from the Maritime Provinces, chiefly Nova Scotia; 2,800,000 tons from British Columbia, 4,600,000 tons from Alberta, and a small quantity from Saskatchewan. This was not sufficient to meet the country's needs, and about 13,000,000 tons of bituminous coal had been imported from the United States. This represented the consumption with the exception of some 1,800,000 tons exported as bunker coal.

Import All Anthracite

As regards anthracite, Canada was entirely dependent upon the United States. Last year 4,500,000 tons of anthracite had been imported into Canada, 250,000 to the Maritime Provinces, 2,000,000 to Quebec, 2,000,000 to Ontario, and about half a million to Manitoba.

The total importation of fuel coal for domestic and industrial purposes was 17,500,000 tons, but stocks of anthracite in Canada were down about a million tons, which meant that for next year we were dependent upon the United States for 18,000,000 tons of coal.

As to the Canadian coal situation, Sir George could see no possibility of increasing the amount mined. There had been strikes and delays in the West, which had decreased the possible output, while in Nova Scotia the output had been decreased by shortage of labor due to enlistment and other causes. On the other hand, the war caused a very great increase in consumption in the Maritime Provinces. As a result coal which would in the ordinary way have gone to Quebec Province, from the Maritime Provinces would now be used there, and Quebec Province would have to import from the United States.

U. S. Coal Production

In the United States the normal production was 67,000,000 tons of anthracite, and last year the production was 509,000,000 tons of bituminous. As to the high prices and fear of shortage, Sir George said the war had caused a vast increase in coal consumption for industrial purposes, steel alone accounting for 40,000,000 tons. This had reacted on the railways, which were requiring 30 per cent. more for haulage than last year, which meant another 40,000,000 tons. In addition there had been a shortage of land haulage, while there was a shortage of water transport on the lakes due to the fact that war conditions had caused vessels to turn to more lucrative traffic.

There was need for co-ordinating the coal dealers and jobbers in Canada with a view to quick distribution of the coal when it arrived in Canada, and making arrangements for the supply, while on

the other side the work of the Fuel Controller was to keep in touch with miners, transportation and so on, so as to secure adequate production.

"With present activities," said Sir George, "it is not impossible that both the United States and Canada will have to be put on coal rations so as to distinguish between absolutely necessary services and those not so necessary.

GAS EXPLOSIONS IN BOILER FURNACES.

WHEN certain conditions are fulfilled in a boiler furnace, a gas explosion of greater or less intensity will occur. For every explosion of this kind that causes material damage, there is doubtless a large number that are so unimportant that they entirely escape notice; but the fact that they do occur is well known to all persons who are familiar with the operation of steam boilers. These explosions are common to all types of boilers, and the method of setting the boilers over their furnaces appears to have little to do with the frequency or severity of them. In a general way it may be said, also, that the kind of fuel used is not the determining factor. Explosions of the gases distilled off from coal are frequent, and accidents of the same kind are far from uncommon in connection with the use of oil and natural gas for fuel. Occasionally, too, wood waste or other similarly bulky fuel which is likely to gasify rapidly is known to produce explosive gas. These explosions are likely to continue so long as fuel is burned in confined spaces such as boiler furnaces, as it is practically impossible to eliminate them entirely. It is feasible, however, to minimize the danger from them to a large extent.

Coal Burning Furnaces.

Coal being the most commonly used fuel, it follows that the greater number of explosions occur in coal-burning furnaces. The furnaces of heating apparatus are practically immune from such accidents, however, because the conditions under which they are operated are usually quite different from those that obtain in power-generating equipment, and for the further reason that, except perhaps in installations of large size, it is common to use anthracite for heating purposes, and this produces little gas as compared with bituminous coal. We recall one case, however, in which serious damage was done to a cast-iron sectional heating boiler and to the surrounding property by a gas explosion in the furnace. In this particular instance coke was the fuel used, and the explosion was so violent that the boiler was almost totally demolished, and serious personal injury would certainly have resulted also, if anybody had been in the vicinity at the time.

Gas explosions in coal-burning furnaces are chiefly due to the incomplete combustion of the fuel on the grates and of the gases in the combustion chamber, owing to an insufficient air supply. In the combustion of coal, carbon—its chief constituent — combines with the oxygen of the air which is drawn up through the grates, with the ultimate formation of a considerable quantity of carbon monoxide gas, CO, and this, when sufficiently heated, has a strong affinity for additional oxygen. Under proper operating conditions, and with an adequate supply of air, the carbon monoxide is quietly burned to carbon dioxide CO_2 in the combustion chamber, and the danger of explosion is then past. If the air is not provided in sufficient quantity, however, there will not be enough oxygen to convert the monoxide immediately into carbon dioxide; and when this condition prevails, the unconsumed but inflammable monoxide gas passes along through the furnace, combustion chamber, and tubes, and eventually up the stack still unburned.

If a considerable amount of air is admitted through the fire-doors or elsewhere above the level of the fuel bed in the furnace, the carbon monoxide in the furnace will burn quietly if the proper temperature prevails in the furnace. If, on the other hand, the temperature in the furnace is low and the fuel bed is covered with fresh coal so that immediate ignition of the gas is not assured as the air enters the furnace, then the entering air will mix with the inflammable monoxide gas, and what happens after this depends upon a number of factors. If the mixture so produced is such that the proportion of carbon monoxide to oxygen is greater or less than certain limiting percentages, then no explosion, in the true sense of the word, can occur, even upon the application of flame. There is, however, a certain critical range of proportions that the mixture may have, such that a quite serious explosion may occur if the gas is present in any considerable amount, and is fired in any way. The firing may be accomplished by stirring up the fuel bed on the grates, or by a tongue of flame coming up through black coal by which the incandescent part of the fire has been blanketed or smothered, or in other ways.

If the circulation of gases through the furnace is brisk, there is little or no chance of a gas explosion; but when the circulation has been checked by closing the damper, or throwing on large quantities of fresh coal, or in any other way, pockets of explosive gas may accumulate in the setting, and these may later give rise to an accident.

In the event of a serious explosion, the least that can be expected is that the fire-doors will be blown open and the burning fuel thrown out into the boiler-room, with the possibility of setting fire to the building. In addition, any person who may be in front of the boiler at the time is likely to be severely and perhaps fatally injured. The probability of more extensive property damage is not remote, and the boiler front and setting, and parts of the building, may show the effects of the explosion. In severe cases, too, the shock produced by the gas explosion may cause one or more of the boilers to burst. Many of the "mysterious" explosions that have occurred have very likely been due to such a cause, and in some cases it has been demonstrated that exceedingly serious explosions have been produced in this way.

Precautions Against Explosions.

To prevent such explosions, or to minimize the danger from them, it is important to regulate the air supply in such a way that complete combustion of the fuel and of the gases derived from it will take place when operating conditions are normal, and to assist the combustion or to remove the gases in a safe manner when unusual conditions prevail.

Normally, with a well-designed boiler installation, the draft, either natural or artificial, prevents the accumulation of pockets of explosive gases, but the danger arises when this circulation is checked by banking the fires, or by running them low when only a small amount of steam is required. At such times, therefore, special caution is necessary. Careful preparation of the fires is important, before banking them. Clean the fires and remove the ashes a short time before shutting down the boilers, and then allow the fires to burn up evenly over the entire surface of the grates, seeing that the fuel bed is leveled to an approximately uniform thickness. Next apply the banking fuel, taking care that this is also spread on uniformly and in sufficient quantity.

As a rule, the dampers in the uptakes of boilers are perforated or slotted so that there will be a slight draft through them even when they are in the "fully-closed" position. If such provision is lacking, however, the dampers should be left partly open, and usually the explosive gases will then pass out through the chimney, because they are somewhat lighter than the air, and are first to feel the influence of the draft. Under certain conditions, these gases may be by-passed to the stack, and if the by-passes are correctly proportioned the loss in boiler efficiency, even under operating conditions, will be inconsequential. A by-pass of this kind is particularly important in connection with a boiler in which the gases between the combustion chamber and the stack follow a downward direction during any part of their travel.

As a further safety measure, the dampers and fire-doors should be opened in the morning before the fires are broken up, so that any gases that may have accumulated during the night will be swept out of the setting and into the chimney.

Safety fire-doors have been designed for the protection of the firemen and others against the showers of burning fuel that are sometimes projected from the furnaces by gas explosions. In some types the doors slide in guides, sidewise or vertically, instead of swinging on hinges. Sometimes, too, the doors are hinged so that they swing into the furnace, instead of outwardly into the fire-room; and in other cases ordinary doors are provided with special safety catches.

A practical device of some one of these types is recommended for use in cases where gas explosions are common.

Oil or Gas Fuel Furnaces

The likelihood of having gas explosions is especially pronounced when either oil or gas is used for fuel, unless the fireman is an exceedingly careful person. In lighting the fire in such cases, burning cotton waste or a burning torch or some other kind should be placed in the furnace before the fuel-supply valve is opened. In this way the fuel will be ignited at once, and before any explosive vapors or gases can accumulate in the furnace. If a burner should become extinguished (or "snap out"), while the boiler is in operation, because of water in the oil, or on account of temporary stoppage of the fuel supply, or for any other reason the supply valve should be closed at once; and the furnace and all of the gas passages should be ventilated thoroughly before again lighting the fire.

Various special precautions against gas explosions may be required when forced or induced draft is employed, and in such cases the judgment and skill of the engineer in charge may be severely taxed to provide a remedy without sacrificing something of the efficiency of the boiler, because in boilers of ordinary design the maximum efficiency is usually obtained with a comparatively low velocity of the products of combustion, while the prevention of gas explosions depends largely upon maintaining a fairly rapid circulation. A way may usually be found to overcome these difficulties, however, and safety demands that earnest and consistent efforts be made to arrive at a proper solution of the problem.

USE OF DISTILLED WATER IN ACCUMULATORS

By L. E.

FROM the first days when accumulators were first invented there have been many scientists who have devoted their attention to the liquids to be used when recharging, and needless to say in those days many combinations of chemicals were used. and with more or less good effect. Of course, when first charging an accumulator sulphuric acid of special purity and made from Sicilian brimstone and of about 1190 specific gravity is used, and after discharging has reached the amperage capacity of the cells that the engineer in charge considers they should be reduced to, they need recharging.

The combination of acids for recharging was not altogether satisfactory in the early days of electrical storage batteries, and the happy idea of filling up with water was hit upon, with much better results, but later scientific practice has recommended—almost insisted upon—the use of distilled water, and for this purpose, the distillation must be thoroughly done. It is used after practically every charge for "topping up," i.e., the covering of the plates in the accumulator to a certain height in the cell specified by the makers of the battery installed, and whose directions should in every case be followed,—in order to take the place of the acid evaporated and gassing of cells when fully charged. Distilled water materially assists in bringing up the specific gravity of the liquid in which the plates are immersed to the proper working standard, and further, as is well known, the ordinary water which is available from the public supply is by no means pure. It contains not only impurities of a chemical nature, such as lime and other salts, but of a mineral nature as well, and owing to the formation of the earth geologically, the greater part of the mineral in the water is iron, and even that is not in a strictly pure state. In fact it is in a very impure state and almost as soon as this ordinary water, with its tendency to impurities enters the accumulater chemical reaction is set up, and as the iron is in the predominant position, the action on the lead plates leads to sulphuration, which immediately impairs their working capacity and later on ruins them. Often enough there are impurities in the sulphuric acid is impure unless it is purchased under a guarantee.

Distillation Avoids Buckling

Distillation of the water extracts the iron properties from it and thus the life of the accumulator is lengthened and to a certain extent the tendency, which is always present in the plates to "buckle" is considerably minimized. This liability to buckle, and which is assisted in every way by the "sulphating" caused by the public water supply, is one of the most serious happenings to an accumulator should there be a sudden demand upon it, or should the load be suddenly increased. In fact the consequences of using ordinary water, as supplied from the main, are serious and in many cases where a worker has not wished to be bothered with the trouble of distilling the supply, accidents, which could have been avoided have occurred, and, in many cases, with disastrous consequences. Distilled water considerably minimizes the risk of "sulphuretting" though it does not entirely cure it . A flexible rubber tube or special acid proof pump should be kept in the accumulator room for filling and emptying the cells.

The first charge of an accumulator will last for from 40 to 50 hours and the recharging with distilled water raises the specific gravity up to the proper working amount, when fully charged of about 1208.

A practical man, mindful of the life of the accumulator and the service he can get out of it will not hesitate to doubly distill the water he proposes to use, and in some cases of supercarefulness some resident engineers demand a chemical and mineral analysis of the water before they proceed to distillation, so that as much of the harmful impurities can be eliminated as possible. Carelessness, in this, as in other engineering work, only leads to trouble and expense, and if an accumulator is valued, it should be properly taken care of, and given the correct materials on which it can perform its work efficiently and for a proper length of time.

THE COST AND USES OF MAGNESIUM

By C. I.

PRIOR to the war only small quantities of magnesium had been manufactured, mainly for the purpose of flash-light photography and fireworks, but also, to a small extent, for use as a deoxidiser in the casting of monel metal, nickel and steel, but with the war an unprecedented demand sprang up. Magnesium does not enter into explosives nor into arms as an integral part, but small quantities are put into shrapnel shells so that observers and gunners may know exactly where the shells are bursting. By day the burning magnesium gives a pure white cloud of magnesium oxide that can readily be seen, and at night it gives a dazzling white light. Larger quantities are used in aerial bombs and rockets used for lighting up the country at night. During 1915 the manufacture of magnesium was begun by five American and one Canadian firms.

The magnesium is collected from the electrolyte, remelted and moulded into both round and square sticks, from five-eighths of an inch to 2 in. thick, and from 14 in. to 18 in. long. Some of the product is sold as powder for flashlights and some in the form of a coarser powder for use in shells. Magnesium for flashlights must be very pure and processes have been devised giving a purity of 99.5 per cent. or more. Before the war magnesium was quoted at about $1.62 per pound in England for the imported material, and after the cutting off of the last foreign supply the price rose to considerably over $5 or even $6 per pound for sticks and of course prices are still soaring. So far as can be seen any increase in the magnesium industry will depend mostly on the discovery of new profitable or desirable uses to which it may be put, but it is generally recognized that prices must decrease to about $1 per pound before peaceful uses will greatly increase.

The properties of magnesium and especially of its alloys are not yet well enough known to say for what purposes it may prove useful. It has not been found of such use as a direct metal, but magnalium — an alloy of aluminum, containing 2 per cent. or less of magnesium and small percentages of other metals—is said to be used in automobiles and in aeroplanes.

"I spent the first part of my vacation on a motorcycle."

"And in what hospital did you spend the last part?"

High Pressure Air Compressor Design and Application*

By Joseph M. Ford

Compressed air at high pressure is becoming an increasingly important medium in modern engineering practice and in naval warfare. The accompanying paper deals with the machines which produce high pressure air, leaving on one side the question of power transmission by compressed air. In passing, the principal advantages of this system are referred to, and will be seen to be of considerable value. They consist of the facility with which energy can be stored; the unlimited rate at which accumulated energy may be converted into useful work; and, apart from loss of efficiency, leakage cannot cause any awkward consequences.

TESTING MULTI-STAGE COMPRESSORS

ALTHOUGH extremely interesting results can be obtained from scientific tests of air-compressors, the manufacturer is usually content with tests for the efficiency of the machine. A purchaser requires to know the power required per cubic foot of air actually delivered, since this is the basis of comparison for compressors. The problem, then, is to determine exactly how much air is being delivered. The two methods usually adopted are: the "pumping-up" method and the orifice test. In the former the compressor is run at its full pressure, pumping into a reservoir, and from this latter the air is led to a receiver of known capacity. The details of the method are well known, being exactly the same in principle as used on tests of ordinary compressors for pneumatic tools. The orifice test is now being largely adopted, on account of the possibilities of error with the "pumping-up" method due to inaccurate temperature readings, oil and water in the bottles, etc. The orifice test method is also well known in connection with ordinary compressor work and need not be described.

Useful information as to the condition of piston rings and valves may be obtained from indicator cards, which also show to some extent the efficiency of the cooling. If, on applying Brauer's construction to the diagram, the compression line is found to be almost isothermal, it does not necessarily indicate that the cooling is almost perfect, as is sometimes stated. The line may indeed appear to be the isothermal, due almost certainly to leaky piston rings or suction valves. Lines giving an exponent value in PVn of less than 1.26 should be looked upon with suspicion.

If any stage pressure is very much above that estimated, the trouble will likely be due to the valves of the next higher stage leaking, or to its own delivery valve not being tight. Judicious use of the cylinder drain cocks, and the behavior of the stage pressure gauges immediately on shutting down, enables conclusions to be drawn as to the source of trouble without the necessity of taking indicator cards.

Maintenance of Compressors

The usual practices of engine maintenance apply to compressors, but unfortunately the care and attention given to these machines is frequently less than that necessary. Particularly is this the case in some Diesel engine plants, where the compressor, until it gives trouble, is looked upon as an engine detail. The lubricating system, above all, must be kept in the highest state of efficiency, as failure in, say, the high-pressure stage, where these is usually considerable ring friction, generally leads to a cracked

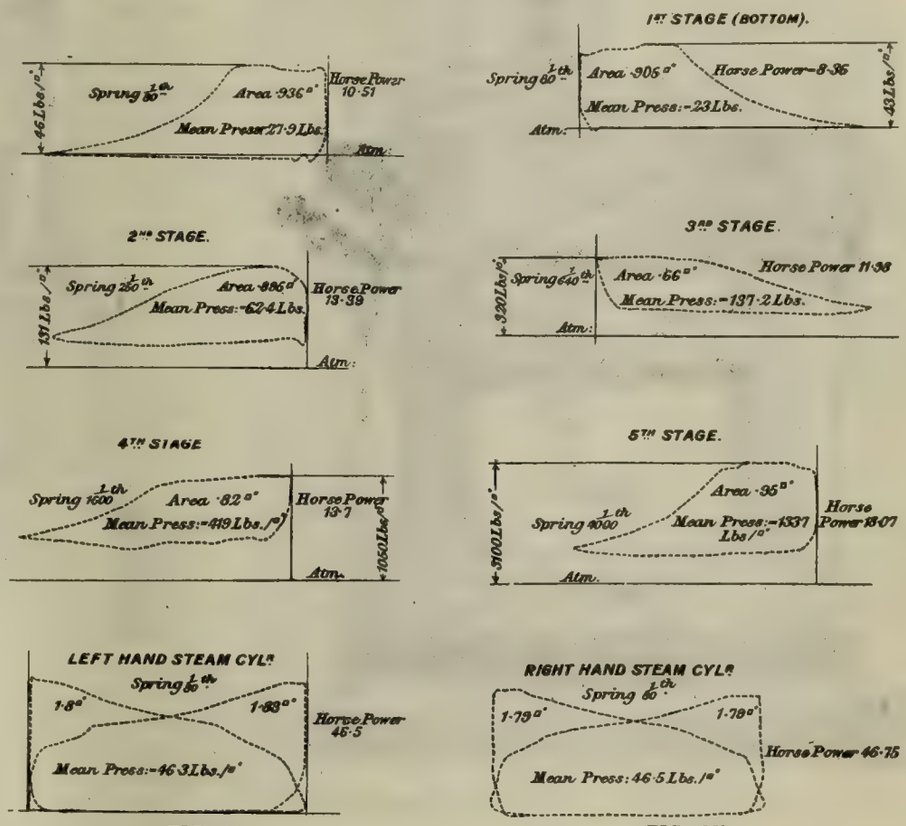


FIG. 32a. FIG. 32b.

*Conclusion of paper read before the Greenock (Scotland) Association of Shipbuilders and Engineers. See issues of May 31 and 28 for previous instalments.

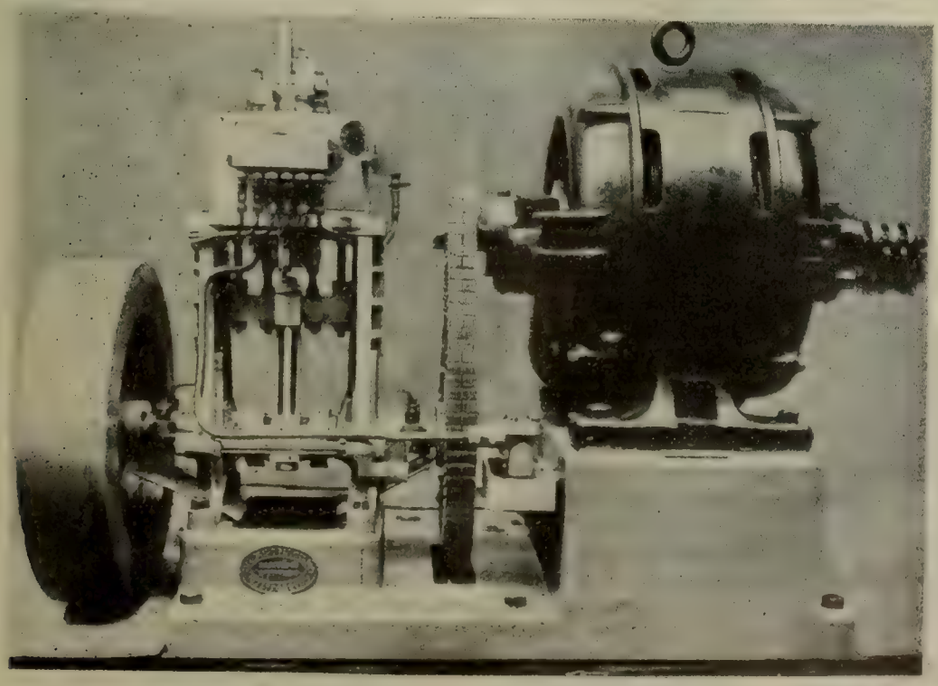


FIG. 30. "BROTHERHOOD" THREE-STAGE COMPRESSOR, 600 CU. FT. CAPACITY.

cylinder, which may not be the limit of the damage.

When the circulating water is chalky or muddy, the cooling system must be periodically cleaned if the highest efficiency is to be maintained. Valves should be examined from time to time for cracks. It is of the utmost importance that relief valves should be in perfect order, for these are in every way as important as a boiler safety valve, and under no conditions whatever should the valves be wedged or otherwise put out of operation to stop a leak. They should be tested for blowing off at frequent intervals. If stage pressures are rather higher than normal, it means probably, as previously explained, that valves are leaking.

Provided the pressures are not excessive, no trouble will result from running in this condition, but matters should be put right at the first opportunity. In justice to Diesel engine air-compressors, it must be stated that the frequency with which the engine log book records "compressor trouble" is due in many cases to negligence. There is still a big scope for improvement in the design of multi-stage compressors.

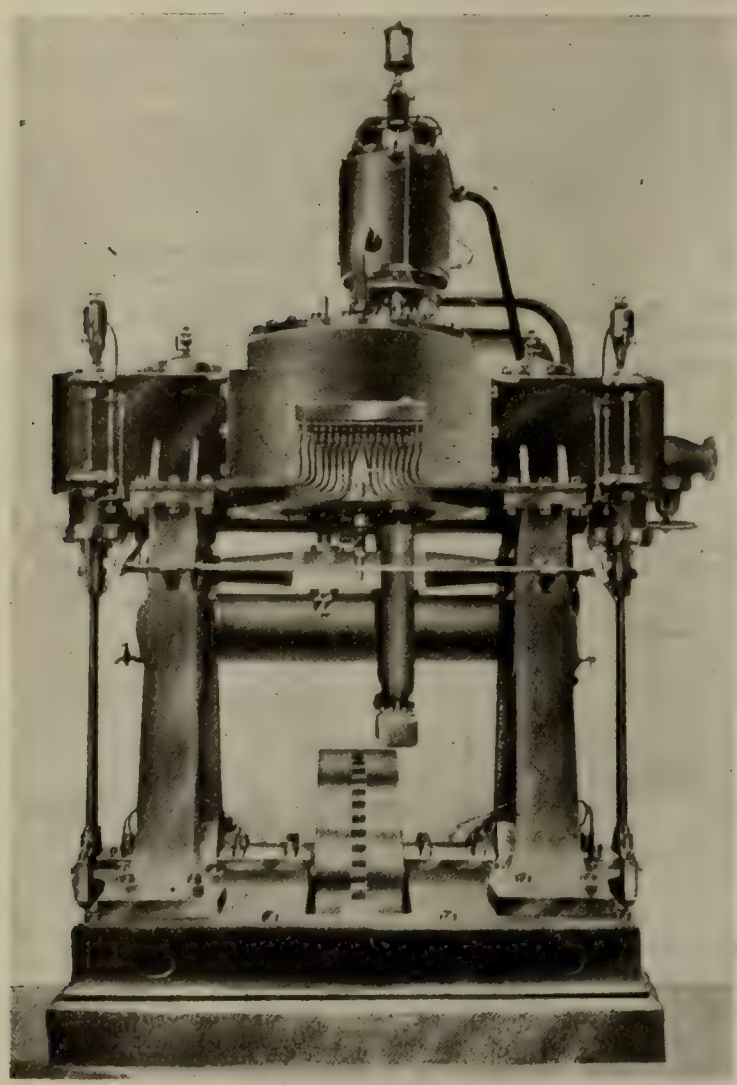


FIG. 31. "BROTHERHOOD" FIVE-STAGE COMPRESSOR, 10,000 CU. FT. CAPACITY.

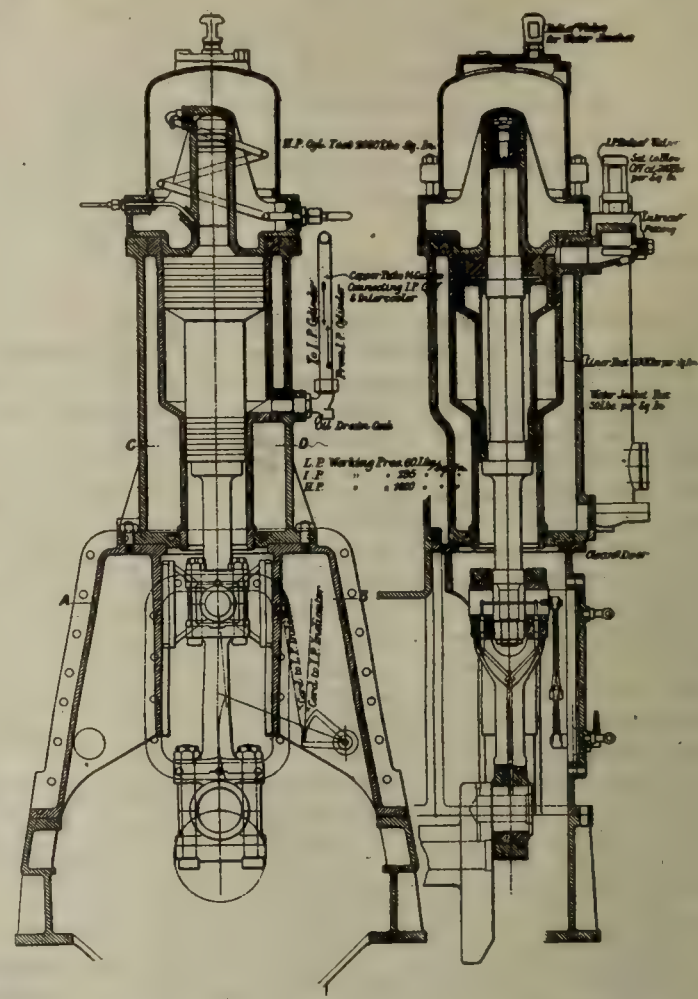


FIG. 35.

FIG. 36.

Modern Machines

Through the courtesy of various makers it has been possible to reproduce several photographs and drawings of some of the latest high-pressure air-compressors, and a glance at these will show at once the divergence which exists in design.

Fig. 30 shows a small three-stage compressor, chain-driven, and having a capacity of 600 cubic feet of free air per hour, compressed to 3,000 lb. per square inch. As has been already explained, in small machines the tendency is to reduce the number of stages of compression for a given final pressure, and this statement is borne out by a comparison between this machine and that shown in Fig. 31. Although the working pressure of this latter is the same, viz., 3,000 lb. per sq. inch, the capacity is 10,000 cub. ft. free air per hour, or more than 16 times as great as that of the small machine, and in this case the compression is divided into five stages. The machine is steam-driven, two double-acting steam cylinders being at the ends and the air cylinders in the centre, while the air piston rods are coupled side by side to the horizontal bridle which is attached at its extremi- to the steam line crossheads.

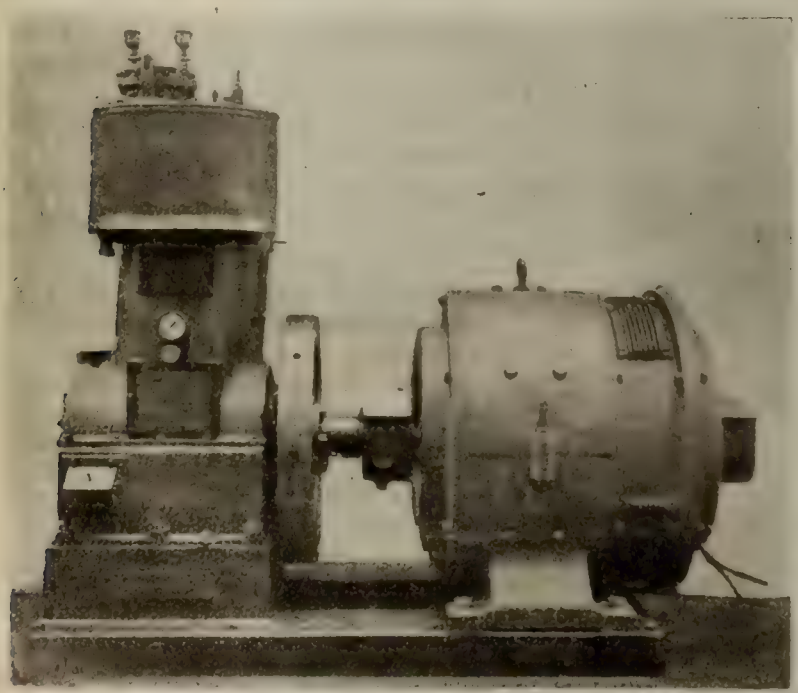


FIG. 33. "BROTHERHOOD" FOUR-STAGE COMPRESSOR.

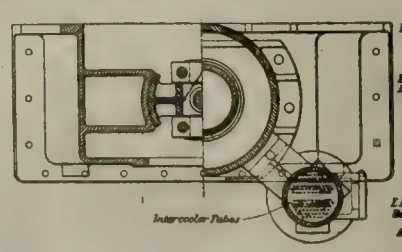


FIG. 37

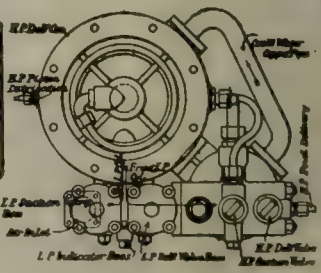


FIG. 38.

A complete set of indicator diagrams from this machine is given in Figs. 32 A and B. It may be mentioned that the shape of the suction lines in the cards from the fourth and fifth stages results from the fact that the cylinder volumes are fairly large compared with the cubical contents of the intercoolers, the lowest point on the line indicating the commencement of transfer. The comparatively small clearance volume in the first stage cylinders, shown by the rapid drop in pressure on the back stroke, is also worthy of note, the reasons for the small volume having previously been discussed.

Fig. 33 shows a four-stage direct-coupled machine by the same builders, capable of charging a 45 cub. ft. reservoir to 2,000 lb. per sq. inch in 80 minutes when running at 250 r.p.m., whilst the five-stage direct-coupled machine shown in Fig. 34, charges a 40 cub. ft. receiver to 3,000 lb. per sq. inch in one hour at 350 r.p.m.

A point to which attention may be directed is that the intercoolers on these machines are generally of the submerged type, that is, the cooler consists of a copper or steel pipe coiled round the cylinders in the tank. This tank construction simplifies very considerably the cylinder castings, and the cooling effect is probably enhanced due to the whole of the connections being submerged, but of course this method is not always admissible. The cooling is still further improved by water injection, the water in the case of a steam-driven machine being obtained by condensation, and therefore quite free from foreign matter.

The piston packing in these compressors is of the fibre-ring type, the high-pressure gland fibres being fitted in removable boxes, which can be repacked at the bench—an obvious advantage. All valves, which are mainly of the thimble type, have removable seatings, so that a replacement is readily effected.

An unusual feature is the provision of an indicator to show that the circulating water is flowing through the casing, which in many cases is very convenient, as it is not always easy to arrange for the water to be discharged into a funnel. The importance of maintaining the circulation will be readily understood from a study of the temperature charts previously given.

Diesel Engine Compressors

Special attention has been devoted to the design of air-compressors for Diesel engines; product of one firm ranging from small hand-driven machines for charging starting bottles in case of emergency, to those used on some of the largest machines yet constructed. A patented design of three-stage compressor for 1,000 lb. per sq. in. working pressure, which has given very satisfactory results from marine work, is shown in Figs. 35 to 38, a special feature of this machine being the arrangement of the second or intermediate stage. By suitably proportioning the cylinder and intercooler dimensions it is possible to dispense entirely with valves in this stage, which means that the intercooler volume is part of the intermediate pressure cylinder clearance.

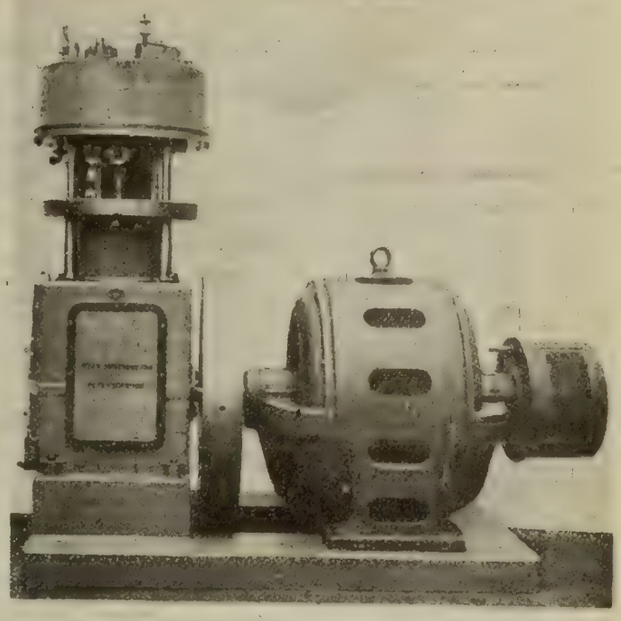


FIG. 34. "BROTHERHOOD" FIVE-STAGE COMPRESSOR.

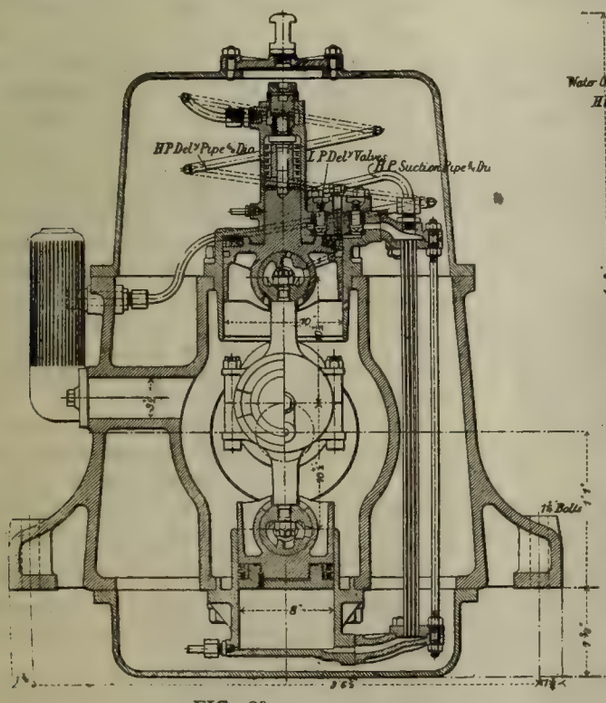


FIG. 39.

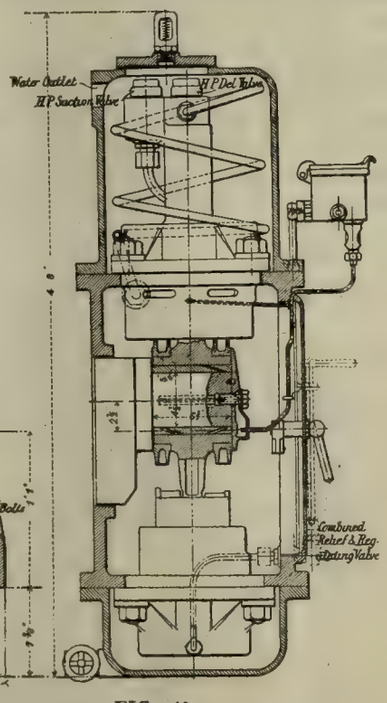


FIG. 40.

The principle will perhaps be better understood by reference to Figs. 39 and 40, which shows the "Reavell" patent V class duplex compressor. The air is delivered from the low-pressure stage down through the intercooler to the second stage cylinder, and on the down stroke it is compressed, and again passes up through the same intercooler on its way to the high-pressure cylinder—the high-pressure suction pipe being in direct connection with the low-pressure delivery passage. The only modification to the low-pressure valves which this entails is that the valve cover must be arranged to withstand the intermediate pressure delivery pressure instead of the low-pressure as is usual.

Since the air passes through the same intercooler twice, only one of these is required, instead of two as with other designs, and apart from the simplicity of construction resulting therefrom, the efficiency is considerably increased owing to the fact that the second stage of compression is effected in the cylinder and cooler itself—the reasons for improved efficiency having already been dealt with. The marine compressor under consideration is exactly the same in principle, only a single intercooler being provided.

In the remarks on cylinder clearance volume, it was pointed out that in a Diesel engine compressor it is sometimes advantageous to have considerable cylinder clearances, and this is borne out by a study of this machine. The clearance volume in the low-pressure stage is, of course, reduced as far as possible, the method of securing the piston to the rod being such that the clearance space is the minimum. The intermediate-pressure clearance, however, is very large, being, in fact, the whole volume of the intercooler tubes and connecting pipe; whilst the high-pressure clearance is also very large, being the volume of the coiled aftercooler in the jacket. Apart from the features which have already been dealt with in the notes on clearance, this arrangement allows the high-pressure valves to be located outside the water jacket—a distinct advantage—but, further, the air is cooled to a large extent after compression before it cooled to a large extent after compression before it reaches the delivery valve, which cooling undoubtedly lengthens the life of the

latter and reduces carbonization troubles. The theoretical indicator diagram which results from these large clearances and "valveless intermediate" construction is given in Fig. 54, annexed, and applies to all machines of this type.

As far as the actual construction of the machine is concerned, attention may be called to the very effective cylinder jacketing, especially at the breech end of the low-pressure cylinder; also the simplicity of the high-pressure cylinder casting, with its absence of valve pockets, should be noted. It might be noted that one small point which is open to criticism is the method of making the air connection between the jacket and the liner —viz., by the forced-in sleeves, for should a liner by any chance become scored or cracked, it might prove a little difficult to remove the sleeves so as to permit the withdrawal of the liner. This compressor is driven from the forward end of the engine crank shaft, and the stage pressures adopted in this case are: low pressure 60 lb. per sq. inch, and intermediate pressure 295 lb. per sq. inch, when working at its full capacity against a final delivery pressure of 1,000 lb. per sq. inch.

In modern high-power marine Diesel engines of the two-cycle slow-running type, it has become usual, for various reasons, to drive the scavenging pumps by means of levers, in accordance with the well-known marine practice, and in many cases the compressor drive can conveniently be arranged in conjunction therewith.

Figs. 41 to 44 show the compressor arrangement which has been successfully adopted on a large British marine engine, whilst sections of the machine itself are given in Figs. 45 to 47. This compressor also embodies the Reavell "Valveless intermediate" patents, the direct passage between the intermediate-pressure cylinder and the intercooler being clearly shown in Fig. 46. The simple construction of the intercooler is worth noticing, the tubes, which are usually of copper, being expanded into the steel tube plates. When the thickness of the latter, gauge of the tubes, and method of expanding are carefully chosen, this system leaves little to be desired, and, further, it permits of a greater cooling surface being obtained, for the same overall dimensions, than would be the case were the usual ferrule system adopted. However, the tubes must be of the highest quality material and must be thoroughly tested before use, for should a tube failure occur, it would be more difficult to repair than in the case of a cooler with ferrules.

The valve arrangements are seen in Figs. 45 and 47, the low-pressure suction and delivery valves being interchangeable, whilst the high-pressure valves, which have removable seats, are also interchangeable. This, of course, reduces the number of spares which have to be carried, in addition to obviating the possibility of mistakes when reassembling after an overhaul.

To minimize the danger, should the high-pressure cooling pipe or any other part under pressure give out, three large bursting diaphragms are provided on the water jacket (two being on the high-pressure bonnet, and one on the opposite side of the low-pressure valve box); these are ruptured, thus giving free egress to the water and air, when the pressure in the jacket exceeds a pre-determined figure. It may be remarked that the arrangement of this compressor, with the high-pressure cylinder at the bottom, is unusual, and to avoid difficulties which might otherwise result from accumu-

FIG. 42.

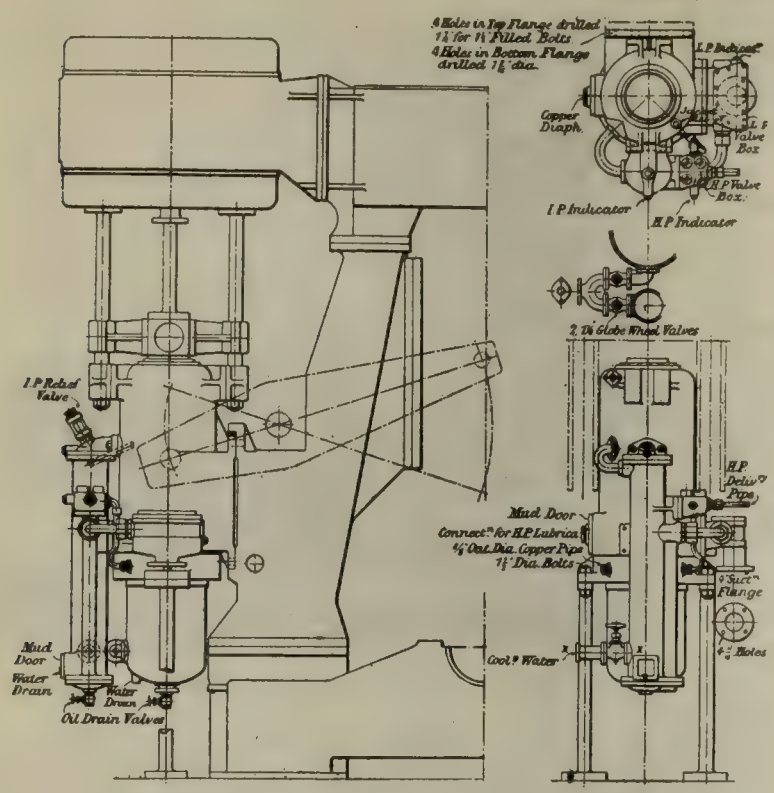


FIG. 41. FIG. 43.

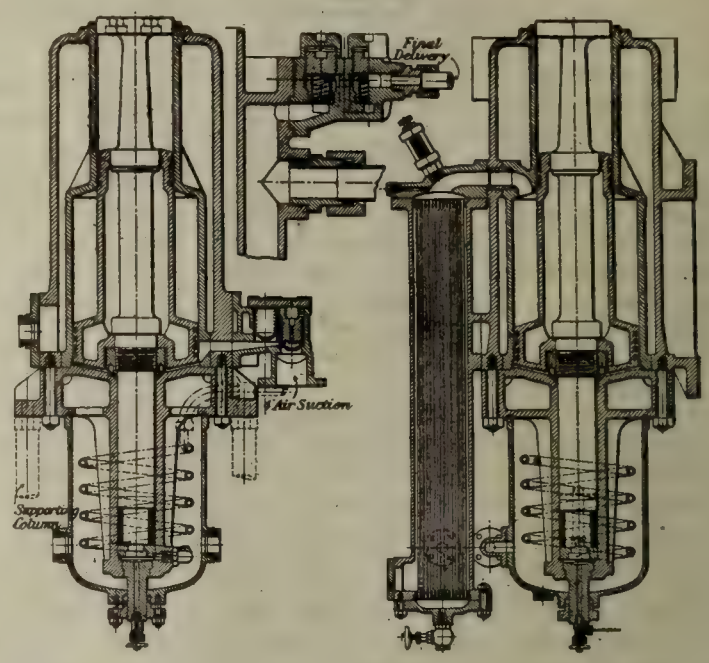


FIG. 45. FIG. 47.

FIG. 48. FIG. 49. FIG. 52. FIG. 53.

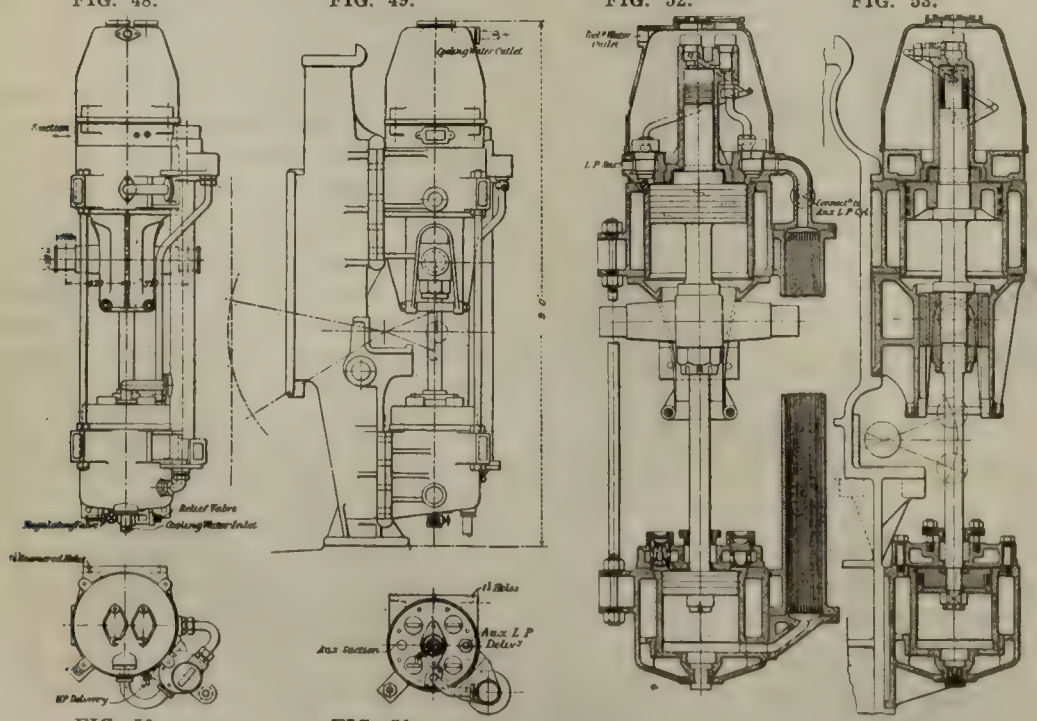


FIG. 50. FIG. 51.

lated oil in the latter, special provision is made for draining.

Another lever-driven compressor as used on engines of continental design, is shown in Figs. 48 to 53, and, as in the previous machines, there are no valves in the second stage. In this case the intermediate-pressure cylinder is located below the crosshead, and a patented

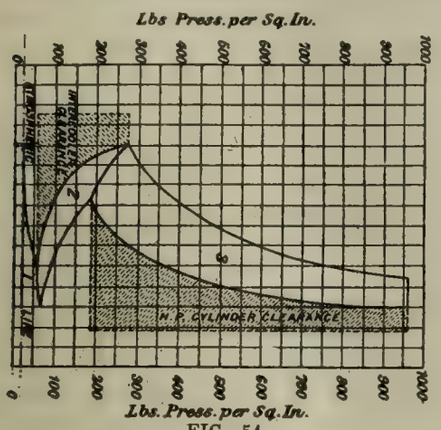


FIG. 54.

feature is the utilization of the end of this cylinder as an auxiliary low-pressure cylinder. Normally the valves in the cover of this cylinder are inoperative, but when there is considerable manoeuvring, and in consequence a big demand for air, such as obtains on entering port, they can be brought into action, either automatically or by hand, when, as will be seen from the sections, this cylinder delivers air into the top of the intercooler at the same time as the main low-pressure cylinder, the whole then passing to the intermediate cylinder in the usual way. By this simple means, the capacity of the compressor can temporarily be increased by about 30 per cent., which means that it will not be necessary to keep such a large auxiliary machine running as would otherwise be the case. As would be expected, very special attention has to be paid to the proportioning of such a machine, on account of the alteration to the distribution of the total work which results from such a device. In this particular machine the high-pressure valves are arranged directly in the cylinder head, access to them being obtained from the engine upper platform through the small covers on the bonnet.

Fig. 55 shows a well-designed machine of a type similar to those used for torpedo work, for a delivery pressure of 3,500 lb. per sq. inch. The capacity at this pressure and 340 r.p.m. is 30 cub. ft. of free air per hour. The machine is a four-stage steam-driven type and is a self-contained unit, the inverted steam cylinder, as will be seen, being placed beneath the air cylinders. Apart from the very compact arrangement which is thus obtained, the drive is direct, so that the stresses in the connecting rods, for example, are much less than they would be with the "side-by-side" arrangement. Another noteworthy feature in the design is the provision of a separate cylinder for each stage of compression, instead of having recourse to differential pistons, which latter arrangement, although possessing many advantages, is decidedly inferior from a thermal point

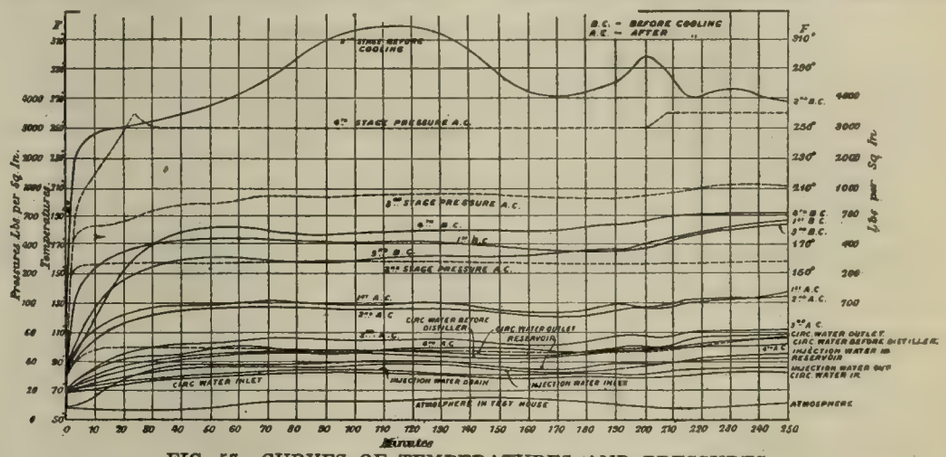


FIG. 57. CURVES OF TEMPERATURES AND PRESSURES.

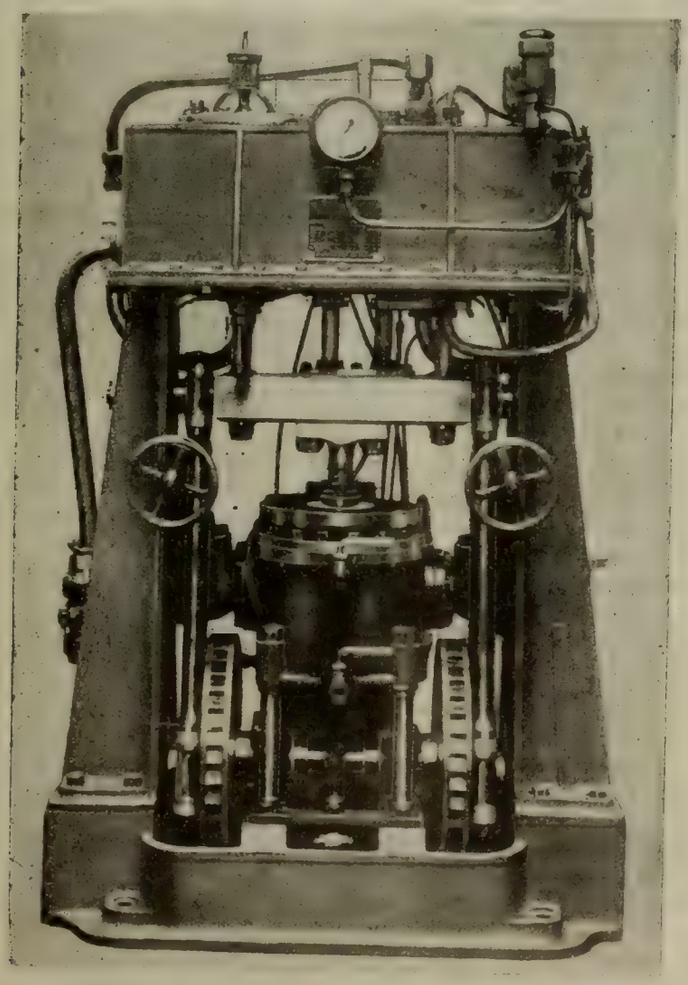


FIG. 55. "GENERAL" FOUR-STAGE COMPRESSOR.

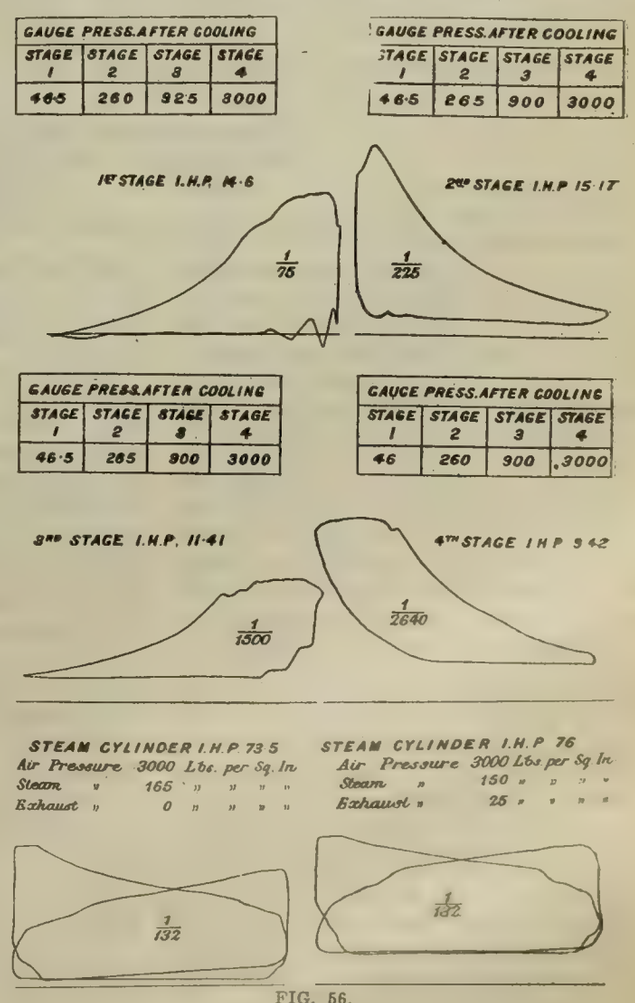


FIG. 56.

of view, on account of the reduced cooling surface per unit of heat generated. In addition to the effective cooling resulting from the arrangement adopted, intercoolers are provided, and, further, a distiller is fitted which provides pure water for injection into the air cylinderss.

Figs. 56 and 57 and the table show the results of an exhaustive trial carried out by the builders on one of these machines. The curves reveal many points of interest, whilst an idea of the distribution of work through the machine can be obtained from the cards, which show a mechanical efficiency of about 68 per cent.—a very satisfactory result considering the large amount of piston friction and the two connecting rods, etc. The card from the fourth stage would seem to indicate a large cylinder clearance, but it may be pointed out that sometimes the indicator itself adds quite a large percentage clearance to a small high-pressure cylinder—especially when connections are long, due to the necessity of passing through a water jacket. Regaring the intercooling effect as shown by the curves, it might be thought that improvement could be effected. In practice, however, a long continuous run at full pressure is very seldom required of compressors of the charging type—therefore the intercoolers need not be of such dimensions as those required for a continuous duty machine. Again, the question of economy is of less importance.

With the increasing number of applications of high-pressure air, and especially with the growth of the Diesel engine industry, more attention is being paid to the design of high-pressure machines, and in view of the scarcity of trustworthy literature on the subject, the foregoing brief outline of some of the points which arise may serve a useful purpose.

AIR-COMPRESSOR TRIAL, JANUARY 11, 1915; ENGINE No. 539. BY THE GENERAL ENGINE AND BOILER CO. NEW CROSS, LONDON

Gauge Pressures after Cooling. Stage 1	Stage 2	Stage 3	Stage 4	Boiler Pressure.	Back Pressure.	Counter. Revs.	Counter. Time, Mins.	Air Inlet Atmosphere.	First Stage Cooling before.	First Stage After	Second Stage Before.	Second Stage After.	Third Stage Before.	Third Stage After	Fourth Stage Before.	Fourth Stage After.	Circulating Water Inlet	Circulating water before Distiller.	Circulating Water Outlet.	Injection Water Inlet.	Injection Water Drain	Pressure.
								Pump Up.														
								deg. F.	deg. F.	deg. F.	deg. F.	deg. F.	deg. F.	deg. F.	deg. F.	deg. F.	deg. F.	deg. F.	deg. F.	deg. F.	deg. F.	deg. F.
42	248	500	500	155	6	1,020	3-0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
46	252	580	1,000	150	7.5	2,380	7-0	57	156	109	250	101	122	83	95	78	68	81	82	78	78	60
46	260	580	1,500	150	8	3,680	11-0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
46	262	581	2,000	150	8	4,850	14-25	56	162	116	250	104	135	88	130	81	74	82	86	78	78	73
48	270	600	2,500	150	9	5,980	17-45	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
49	280	640	3,000	155	10	7,040	20-45	56	165	124	150	116	150	91	152	82	76	86	93	78	78	79
								Three Hours' Run.														
49	280	700	3,500	127	10	8,030	23-40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
49	270	800	3,000	140	9.5	14,050	40-0	58	172	128	260	127	157	101	178	92	75	92	94	87	78	87
48	280	826	3,000	140	9.5	18,080	53-0	58	172	128	260	125	157	101	178	92	80	96	99	88	80	85
48	280	910	3,000	135	9	23,600	70-0	61	173	131	310	129	160	106	180	97	81	97	99	87	81	88
48	280	902	3,000	135	9	27,900	83-0	62	172	127	300	125	152	101	175	93	78	93	95	88	84	87
48	285	910	3,000	135	9	33,050	98-0	62	172	128	320	127	162	104	177	97	80	96	96	90	82	88
48	285	925	3,000	137	9	38,170	113-0	63	171	128	320	128	163	104	178	96	81	96	98	90	84	88
48	285	925	3,000	137	9	42,800	128-0	64	171	128	320	129	163	105	180	95	81	97	99	90	81	85
46	285	925	3,000	150	9	53,781	161-0	62	167	120	270	122	163	101	179	92	81	93	99	84	79	87
47	285	920	3,000	125	9	58,664	176-0	62	166	124	270	123	161	101	180	94	82	95	95	85	81	88
47	280	910	3,000	140	9	63,701	191-0	60	168	129	280	130	170	109	185	100	80	99	100	90	83	89
47	275	900	3,000	135	9	67,360	202-0	60	168	127	300	128	163	104	180	98	78	97	98	88	81	89
50	285	920	3,500	150	10	72,306	217-0	62	175	131	270	134	173	110	189	101	79	102	105	95	85	92
55	320	1,050	3,500	155	10	77,276	232-0	64	182	135	275	136	178	112	192	101	81	105	108	97	86	94
58	330	1,040	3,500	195	10	82,256	247-0	66	183	138	265	135	177	113	191	102	82	106	109	98	87	95

Capacity of Machine—30 Cub. Ft. of Air per Hour at 3,000 lb. per Sq. In.

	Average Revolutions per Minute	Circulating Water lb. per Min.	Injection Water. lb. per Min.	Average Steam Pressure lb. per sq. in.	Average Exhaust Pressure lb. per sq. in.
Pump up	338	244	0.6	151	8
Three hours' run	331	248	0.56	146	9

EXPLOSIVES FROM THE ATMOSPHERE

GERMAN scientists are now producing nitric acid from the air. This has been done in Norway and Switzerland for some years, and it is proposed to establish a factory in Manchester for the same purpose.

Glycerin is one of the main articles in the manufacture of a universally used explosive; and as glycerin is obtained entirely from oils and fats, of which articles Germany must now be entirely devoid, this fact will perhaps throw some light on the fact that the Germans are looking after their dead very well.

A well-known professor of chemistry stated last year that if Germany had not been so well equipped for the manufacture of aniline dyes the Allies would have won the war long ago.

One of the most powerful high explosives we have in use to-day is an aniline dye. Picric acid, which is a beautiful yellow crystalline body, has been used for many years for dyeing clear shades of yellow on silks and woollens, and through an accidental explosion occurring in a dye works where picric acid was stocked it was investigated as to its use as an explosive. The result of this was that the French, who were the first to use this high-shattering explosive, simply ran the fused acid into shells, thus forming their famous explosive, melinite, while in Britain the same substance goes under the name of lyddite.

Nearly all the other explosives, if not highly colored bodies, like picric acid, are closely related to dye-stuffs and their intermediate compounds, and are made mostly in the same plants as the dye-stuffs themselves.

An explosive is a substance which, when its physical surroundings are suddenly changed, as by heat, or a sudden shock or blow, undergoes chemical changes in itself, and this chemical change takes place so rapidly and with the production of so much gas, that obstructions in the way of gases produced are simply forced out of the way and we get what we call an explosion.

Some substances are much more powerful explosives than others, and some are so explosive that they cannot even be touched with a feather. Under these limitations we use those which we can handle and harness up for use with safety to ourselves.

There are three great classes of explosives used in warfare—high explosives, propellants, detonators.

High explosives or "shattering" explosives are used, as their name indicates, to do as much damage as possible. Picric acid, and more especially when mixed with other substances like lead salts, forms an exceedingly explosive substance when suddenly heated or exploded by a detonator.

Another high explosive in great use at present is the famous T.N.T. Who would associate tri-nitro-toluol, this most widely used high explosive, with gasoline? Yet this motor petrol, called toluol, which is a liquid resembling water in appearance, and greatly used by dry cleaners to clean suits and dresses, is the parent substance of T.N.T.

RECENT activities of the Society for the Promotion of Engineering Education included the publication of an article on "Technical Book Writing," by J. A. L. Waddell, consulting engineer, Kansas City, Mo., which points out some of the major details to be considered by the authors of scientific articles. The discussion covers the mechanics of technical writing and indicates the procedure of preparing data for writing.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

THE MODERN USES OF RUBBER

By D. Street

A STOCK phrase is that "there is nothing like leather" but at the present day this should be changed into "there is nothing like india-rubber," as never at any time has its use been so varied and its commercial demand so great. One sure sign of an article's utility is the number of substitutes placed upon the market, and of substitutes for rubber there have been scores, not one of which possessed all the qualities of the genuine article, and although very many nearly approached it yet they were short of one essential feature. Rubber is a curious substance, much more so when manufactured than in the raw state, the quality which so far renders it unique being its high degree of elasticity, which it shows to the best advantage in the rubber threads used for those textiles, known as elastic. Motor tires, waterproof fabrics, hose piping, tobacco puches, surgical tissues are all dependent on that elastic quality of the rubber, which causes it to spring back to its original state, whilst a host of other articles, no less useful, are made from the hard form of it commonly termed vulcanite. Owing to the many uses to which rubber is now put, there is a considerable demand for old rubber materials, such as worn-out motor tires, door mats, tubing, etc., all of which are utilised again into something after the style of working up shoddy, etc., into fresh material.

Origin and Composition

Existing as a natural gum in the stem or trunk of a large number of tropical plants, rubber in the natural state forms a thick milky fluid which oozes out from cuts made in the bark of the growing tree, and is collected in small tin cups which are cemented to the trunk with clay. On emerging the juice is whitish, but darkens and coagulates with time and exposure into a dingy brown mass. The shape in which it is imported varies largely according to the collector, some being in the form of round balls, known as nigger heads, and others in blocks, thimbles, cakes and bottle-shaped masses. Chemically, rubber or caoutchouc is a complex hydrocarbon and consists of several different gums, or bodies which have varving degrees of solubility. Water, of course, has no action upon raw rubber, but it dissolves in a mixture of carbon bisulphide, benzol and naphtha. No single solvent will dissolve it entirely, some of its constituents being acted upon quicker than others by the various solvents used, and the raw substance seems to consist of a highly porous network of cells having different sums in their interstices. At a temperature of ten degrees Centigrade raw rubber is a solid body with very little elasticity, while at 36 degrees it is soft and elastic to a high point, and is capable of being stretched to sixteen times its length. Further increase of temperature lessens these elastic qualities and at 120 degrees Centigrade it melts. In the raw state rubber has several peculiar properties one of which is that after stretching and cooling suddenly in the stretched condition it retains its new form, and only regains its former shape on being warmed. Another striking feature is its strong adhesive capacity; that is so powerful that the raw substance cannot be cut with a knife unless the blade is wet, and freshly cut portions if pressed together form a homogeneous mass.

Early Applications

The first use of rubber gum was for waterproofing fabrics and in 1823 a solvent was found by Charles Mackintosh which allowed a thin coating to be applied like paint. Owing, however, to its sticky nature, it made very little headway for waterproofing purposes, until in 1839 an American, named Goodyear, found that a mixture of rubber and sulphur heated together produced a body very different from the raw gum—being elastic at low temperatures and free from stickiness right up to its melting point. This discovery, known now as vucanizing, opened up an important future for rubber, and by varying the amount of sulphur together with the heat and duration of the process, products are obtained which range from the softest flexible tubing up to the material used for making the barrels of fountain pens and the mouth pieces of pipes. On broad lines the outline of the vulcanising process is as follows:—The raw material is well masticated between hot rollers and is incorporated with the necessary amount of sulphur, it is then pressed into moulds which clamp together and prevent any loss of shape by the rubber contracting. Heat is now applied, and, when the process is over, the rubber will be found to have taken the shape of the mould permanently, being now much more elastic than the raw gum and perfectly insoluble in all solvents.

Rubber possesses great adaptability for mixing with other bodies—which manufacturers are perfectly aware of, and articles solely of the pure vulcanised gum are only made for special purposes. Among the many substances which lend themselves to combination with rubber are, zinc sulphide, white lead, asbestos, barytes, litharge, chalk, hemp and boiled linseed oil. By means of judicious admixtures of these rubber can be brought to any degree of hardness, and the cost can be manipulated to the makers', if not the users's satisfaction. Low-prices rubber articles which are required to have the life and elasticity of good rubber cannot be recommended for the very good reason that good material is expensive and all makers must have a profit.

Non Reclaimable

A popular but utterly erroneous impression is that old articles of rubber, like old brass and copper can be "melted again." The only possible way of melting rubber is to heat it, and this entails absolute destruction, leaving only a sticky evil-smelling oil behind it, which never again sets into the old solid form. Of course, second hand rubber is put to many purposes, but this can only be done by rasping it into fine particles and cementing these together into a solid form with either boiled linseed oil or a little new rubber solution. Once vulcanised, rubber is proof against all known solvents; many will soften it and cause it to swell up in size but none will bring it back to a workable form, and although thousands of attempts have been made to bring it back into the same condition as before the heating with sulphur took place, they have all failed.

Buyers of rubber articles will have noticed a big difference in the durability between low-priced,—not cheap,—goods and the standard makes, which is easily accounted for by the following facts. An unscrupulous manufacturer will buy up old used scrap, for example only, at 5c per pound, grind it up and mix it intimately with oxidised linseed oil, or make a better quality by substituting a small portion of new material for the oil. This gives him a material which he is able to put on the market much below the price of the genuine stuff, leaving him in addition a very handsome profit. Provided the shoddy rubber and the binding material are both of the same quality of rubber, chemical analysis will not detect the sophistication; the only test is by actual wear in which the difference is very speedily found. The reason why remanufactured rubber will not stand hard wear is the lack of coherence between the particles of old material, these being only held together by the merest film of new rubber, so that instead of a tough homogeneous substance which new rubber consists of, the particles readily crumble and break away. When such a binding substance as linseed oil is used, the strength is much less than rubber solution, and owing to this oil setting into a flexible substance very like rubber in appear-

ance, it is a favorite constituent of rubber compositions.

For such purposes as door mats, cheap shoes, rubber heels, toys, etc., the use of the resuscitated material is legitimate; but when applied to such purposes as rings for the packing of high pressure steam pipes, it cannot be so looked upon, since in this case it constitutes a serious danger. Hard vulcanised rubber was formerly much used for insulating purposes in electrical trades, and for such purposes many of the compositions made from old or reclaimed rubber are quite effective enough, provided they do not deteriorate with time and lose their insulating property. At the present day, however, rubber for electrical purposes has been largely replaced by paper, cotton, mica glass, etc., so that its importance to this industry has grown very much less.

Causes of Decay

Like water, rubber is "incompressible," that is to say its form is readily modified by pressing or pulling, but the actual bulk remains the same, and if compressed in one direction it expands equally in another. Oil or grease of any kind is a deadly enemy to rubber, which softens under its action and quickly loses its elasticity and strength. Sunlight is also destructive to it and sets up a gradual decomposition which nothing can prevent; in fact rubber articles of every kind seem to undergo a slow change in their composition, becoming more brittle with age, and with mackintoshes the protective layers become friable and fall away. Immersion under water is the best preservative for rubber, and as most people are aware one day's exposure to sunlight works more mischief with a rubber-proofed garment than three months' wear in wet weather. What the chemical combination between sulphur and raw rubber is, no one as yet knows; but once vulcanised the sulphur is held tenaciously so that it cannot be eliminated by any of the agents so far available, and the reactions between the two seem to be deep seated and difficult to follow.

A fortune awaits the man lucky enough to invent a method of reclaiming old rubber or to find a substitute having all the properties of natural caoutchouc. This field of research has engaged the intellects of many distinguished chemists in the past and is still doing so to-day. Some time ago a patent for obtaining a rubberlike body from cereals was brought out; this was based upon the chewing of corn into a sticky gum which many of us are familiar with as children, and the process was very similar to that of mastication—namely washing away all the starchy granules until nothing was left but a grey glutinous substance. This, like many other ideas, does not appear to have met with success, as nothing further has been heard about it. Substitutes for rubber have been exemplified for years in the case of the composition used for printers' rollers; this used to be a mixture of glue and treacle which set into an elastic rubber-like substance; to-day the treacle has been replaced by glycerine but the properties are much the same. Rubber, one way or another, accompanies man throughout his earthly pilgrimage. As an infant his soother is composed of it, later on, if successful, the tires of his motor are shod with it, and by means of a vulcanite pen he signs his cheques and other papers with it, while after nature has failed him the foundation of his latest teeth is ubiquitous rubber.

SEWAGE PURIFICATION BY ELECTRICITY

By C. T.

THE uses of electrical energy are so vast that it is little wonder that attention is now being paid to its employment for sewage purification. A process has recently been invented by which crude sewage is passed through a trough, partially fitted with electrodes placed at right angles to the line of flow and connected in parallel with a current of low voltage. The system is based on the theory that sewage containing table salt and other electro is rapidly decomposed by the passage of the current and that caustic soda, nascent chlorine, hydrogen and oxygen are thus evolved. Part of the freed chloride combines with the soda, lime and iron thrown off by the electrodes, and hypochlorites are thus formed, which attack and break up the organic matter. Experimental plants on this system have been provided in several small communities with varying success. Another method has been tried in the borough of Queen, New York, and at the stockyards in Chicago. This system differs from the former by the provision of a paddle between each electrode, the rapid motion thus engendered keeping the sewage constantly agitated and the face of the electrode well secured. To obtain the requisite standard of purification, quantities of lime are added, and engineers are by no means in perfect agreement as to whether it is the lime or the electrolysis which performs the more efficient work of purification. The cost of working this system is unattractive, but it is interesting to learn that steps are being taken to harness electricity for the purpose of sewage disposal, as the subject is one of increasing importance and has not yet been perfectly solved.

PATTERNMAKING NOTES

By J. W. Broadbent.

DURING a wide experience of pattern making, the writer has had numerous opportunities for observing the varied success attending the use of nearly every kind of wood used in the construction of patterns. Perhaps it has been the amateur, who, making his own simple pattern out of a packing case, has sent it to the foundry, and, outside a few strong words by the moulder has had produced for a few cents what would have cost as many dollars if placed in the hands of a competent pattern-maker supplied with the best of materials.

Wood Not Perfect

Until some material is produced which

FIG. 1.

is less sensitive to atmospheric changes than wood, we must still use this material for patterns, and it is only by the skill and judgment of the pattern-makers that the tendency to warp and twist can be overcome.

For general use, white pine is the wood which alone has stood the practical test and granted that good sound boards are obtainable, no better material could be desired.

It is soft, easy to work with, cutting tools, and comparatively free from liability to warp, and then again it is

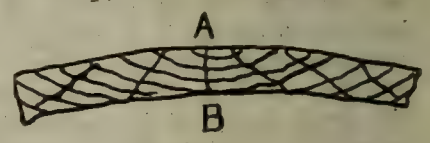


FIG. 2.

cheaper than the majority of woods. Boards under 12 or 14 inches in width should be discarded for pattern work, as narrow boards are hard and heavy, and more difficult to work, wherever wide boards are from trees of mature growth and farther away from the outside sap.

One of the first things to consider is that the wood must be perfectly dry and thoroughly seasoned, and the natural process of air drying is recommended in preference to kiln dried stock, provided that the wood is sheltered from the weather and that the air has free access to all parts of the plank. It naturally follows that in kiln dried wood the outside surfaces and ends of the board are dried more rapidly than the inside, producing a state that when the pattern is being worked and fresh surfaces are brought into contact with the atmos-

FIG. 3.

phere, the wood—released from the stresses of the outside surfaces—warps.

Cause of Warping

All timber is porous and in the living tree these pores which run lengthwise of the log, are filled with liquid; it is the evaporation of this liquid which sea-

sons or dries the timber, consequently the ends of a board alwoys dry first, which causes the ends to crack or check. For small and delicate patterns, a close grained wood, such as mahogany, should be used, for in a close grained wood the pores are smaller and moisture cannot enter so freely as in an open grained wood, and therefore is not so susceptible to the changes of temperature and humidity.

Mahogany is an excellent wood to use for patterns provided a good quality is obtainable, it is easy to work, is hard and strong, and takes glue and varnish nicely.

FIG. 4.

Most people, including many patternmakers, seem to connect quarter sawed lumber with hard woods, and look on it only as a means of showing the beautiful markings on the face of the board. This is not so, for we may get quarter sawed pine, which may be used to advantage in many patterns where there are no ribs or supporting pieces to hold the pattern straight.

Quarter Sawed Lumber

A quarter sawed board is cut from the log radially as in Fig. 1, and can be easily distinguished by looking at the grain on the end of the board.

There is considerable waste in cutting quarter sawed stock, which naturally makes the lumber more expensive, as only a few boards are sawed radially from each log, but when we consider the convenience of having a pattern keep its shape and stay practically straight during many changes of temperature or humidity, it is surely worth the little extra expense.

Under the best of conditions, a board will have a tendency to warp, as in Fig. 2, and unless one side is damp, the board will always curl away from the part nearest the heart of the tree, the reason being the side A is of older growth, and the cells are more compact than the side B, which is nearer the sap wood. As the wood seasons, it naturally follows that the newer growth with the more open cells, will dry and shrink faster than the side A, thus causing the board to warp in the manner shown.

Gluing Boards

When gluing two or more boards together they should be gluel as shown in Fig. 3, by placing two outsides or two insides together so that the tendency of one piece to warp will counteract that of the other.

Gluing boards together with the grain of one board at right angles to the other always proves unsatisfactory and should never be attempted with less than four pieces, for if the joints do not split altogether, the shrinking of the boards in opposite directions warps the whole in such a manner as to be practically useless for a pattern which is required to keep its original shape.

Fig. 4 shows a method often used where a fairly large flat surface is needed in a pattern where there are no ribs or other means of helping to keep the wood straight. A wide board is cut into narrow pieces and the pieces reversed and glued togteher as shown, the warping of the narrow pieces in opposite directions is so insignifiicant as to have very little effect on the shope of the whole.

USE AND ABUSE OF TAPS

By L. E.

IT IS by no means uncommon for a careful machinist to use small taps, such as ⅛ in., 3/16 in., ¼ in., 5/16 in. and ⅜ in. thread taps for months, and even years without a single casualty by breakage. It is much more common to witness a careless smashing up of such useful accessories by not only boys but by men who ought to know better. It is suggested that this proves that there is a way that right and a way that is wrong respecting the use of small hand taps. Many workers break taps as a result of sheer crelessness and culpable neglet of care of the employer's goods, instead of being as careful of the employers good as their own.

There are however many cases of taps being broken as a result of sheer ignorance of the manner in which such should be used. For this class of individual a few hints may not be out of place. In respect of most sizes of taps there are three to a set. With special types there are sometimes only two to a set, and the reason for this is perhaps that some of them are, size for size, stronger as a result of the comparatively larger core. The set of three is more preferable for use, for economy lies that way, whilst it is believed that the saving of one tap in a set ensures early disaster, especially in the hands of the careless. With the sets of three, which are called by various names by different operators in the mechanical trades, such as 1st, 2nd and 3rd, taper, second and plug and taper, intermediate and bottoming; it will be found that the taper tap of a set is reduced down from full diameter to just under the core diameter in about 50 per cent. of its length. The second tap is tapered up just a thread or two, whilst the third tap for bottoming purposes, is full diameter for the whole of its length.

Now, to tap a hole in a piece of mild steel, say ⅛ in. or 3/16 in. thick, even by a novice, is a comparatively easy job: but to tap a hole with similar taps in a piece of similar material 2 in. thick, or a hole 2 in. deep in a piece of say, 2½ in. thick, is quite a different matter, as may be easily proved. If one tries to "push" the first tap through the whole of the 2 in. or 2 in. deep in the 2½ in. material, both the operator and the tap will experience trouble. The experienced man will first use the taper tap, and carefully send it as far as he can with force guided by expert judgment. When he finds it goes too hard, and that the pressure he is applying will probably smash up the tap, he turns it back a turn, and goes on again, going ahead and coming back, until he has got the first tap in as far as, in his judgment, it is safe to go. He then withdraws that tap and introduces the second tap, and this he "plays" in a precisely similar manner as with the first or taper tap. Next he uses the third tap, and obviously if the second tap has gone through all right, the third or sizing tap, will surely follow.

Purchasers of taps will be well advised if, when inspecting a delivery of taps, especially of the lower varieties, they reject all plug taps that have countersunk or drilled centres at the entrance ends. Such taps break like a carrot as soon as the operation of "bottoming" is attempted.

PATTERN FOR LARGE MAIN CIRCULATING INLET VALVE

By James Edgar

IN view of the fact that shipbuilding and marine engineering have recently come to the front as important Canadian industries, the article which follows, taken from the columns of our contemporary, the *Foundry Trade Journal*, will doubtless have more or less interest for those of our readers who are directly or indirectly concerned with the production of patterns and casting for marine engines and their accessory equipment.

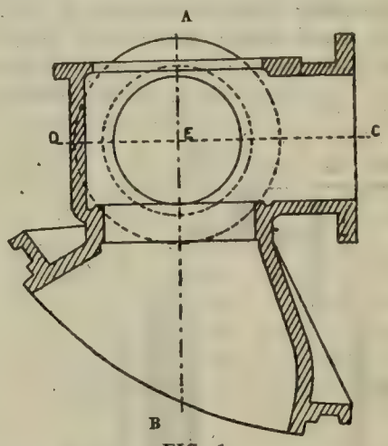


FIG. 1.

The first thing to be decided when making a circulating inlet valve of the type shown in Fig. 1 is whether the square chest shall be made in the form of

FIG. 2.

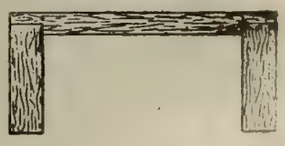


FIG. 3.

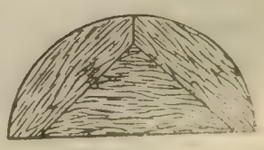


FIG. 4.

a shell pattern, leaving the moulder to cut a print in the sand and use the inside as a corebox, or whether a block pattern shall be used with a corebox. Both methods of construction have advant-

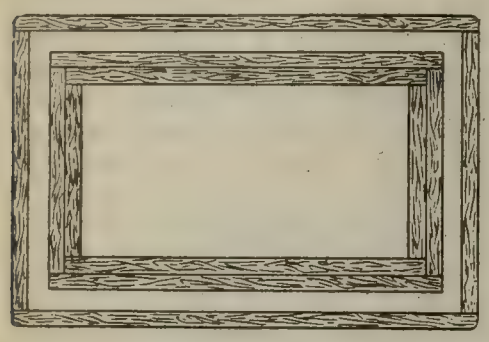


FIG. 5.

ages. The shell pattern is certainly more economical, as it takes much less timber, and the expense of making a corebox is saved. It is also much lighter, and this is a very distinct advantage if the pattern has to be tried to place in the ship.

On the other hand, a blocked-up pattern will stand much longer, and prove cheaper in the end, if many castings are wanted. However, it is very seldom that more than two or four castings of such a chest are wanted. It is usually necessary to "hand" this job, as there

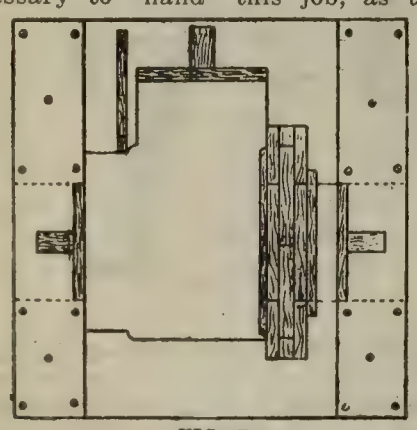


FIG. 7.

are almost certain to be cross angles on the flange of the square chest. This flange fits against the shell of the ship, and the position is usually marked on the drawing, the numbered frames being given. Occasionally approximate distances are given on the drawing, and after the pattern is made, it is checked at the ship, but more often moulds or templets are supplied by the mould lift from which the pattern is made, and sent off to the foundry. If the pattern-maker has to try it to place, a distance will be given from the line A B to a datum line, and, of course, the top flange must be level.

Two half-lapped frames should be first got out to make the joint of the pattern. They are dowelled together, and should be made of 1¼ in. or 1½ in. stock. It will be noticed in Fig. 6 that the frames

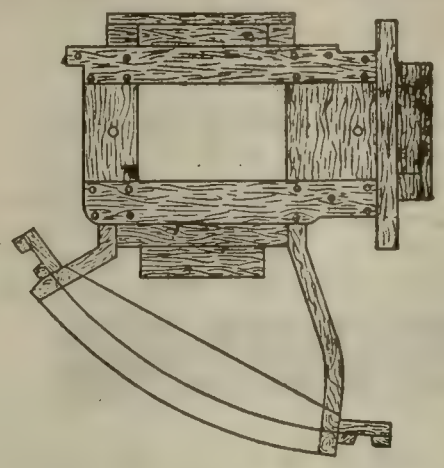


FIG. 6.

include the branch C. It makes a much stronger job to bring the frames to the face of the flange than to fit the branches quite separately. It is also well to make the main body D with grounds and staves carrying it out to the face of the cover flange. The cover flange, not being thick, can be screwed on top. A really strong job can be made of the staved-up body by fitting three stays about 3 in. broad by 1½ in. thick, and letting them into the grounds as shown in Fig. 2.

When the body has been fixed in position, the branch can be got out. It should be blocked up solid, and if a templet is stitched to it and a block screwed on the face to keep it square on the table, it can be cut at the bandsaw. The arrangement is illustrated in plan in Fig. 3, A being the templet, B the branch, and C the squaring block. The flange can be screwed on to the face. The prints for the branch C, Fig. 1, which would be 16 for the end of the chest, which will be still larger, had better be made with a 1 in. plate thicknessed with 2 in. timber on the back, as seen in Fig. 4. The top branch E, Fig. 1, unless it is very shallow, will be better built with segments. If it is very deep it can be staved, but staves have the disadvantage that they cannot be fitted and screwed as well as segments. The flange for this top branch must, of course, be dowelled on.

The square chest ought to be made and finished quite separately from the valve body and screwed on afterwards. It should be made to a line sufficiently far back from the face to clear the angles, the handling being done by alteration strips. Two plates have to be made for the top and bottom, and they can be temporarily battened together. Two ends can likewise be got out. The side pieces must be very carefully drawn off and dowelled together on edge. To build this chest one of the end squares should be first screwed to the bottom plate and two sides screwed on. The top end piece can now be laid on top of the other, the two temporary battens screwed on the outside. The dowelled sides can now be put in position, and temporary battens likewise screwed on to them. The top plate can next be put on.

The method of building one half on top of the other has obvious advantages. If care has been exercised in squaring and dowelling the sides, the top should lift "sweetly" from the bottom and without any drag. When the corners of the chest have been rounded off, the battens can be removed, and each half screwed to the valve body. A print will have to be screwed inside this chest to carry the body core. It will be observed that the print is smaller than the core for the valve seat, to allow sand around it.

The flange and the fitting strips on the face can now be attended to. Pieces ought to be screwed on, carrying the body to the face of the flange. It is usually possible to change the chest from port to starboard, by bringing the top piece to the bottom and the bottom piece to the top. The side pieces can also be turned upside down. The flange will have to be screwed on, taking care that the flange on the moulder's bottom half is screwed from the inside of the chest and on the top half from the outside. It is not necessary to explain the making of the fitting strips and spigot, which are screwed on the face. The moulder, of course, will have to loosen off these strips and also the supporting ribs on the sides. A view of the face is shown in Fig. 5. The joint of the finished pattern is shown in Fig. 6.

In a valve as large as this, a plate or an open frame would be quite satisfactory for the body core. Some foundries prefer a plate, others prefer a frame. From the pattern-maker's point of view the work is the same, except that if a plate is made the end grounds for strickling the core will be a half diameter, whereas if a frame is used they will be a half diameter less the thickness of the frame. A plan of the frame with the grounds on is shown in Fig. 7.

A bridge piece should be made to carry the valve seat. It can be built in two or three thicknesses, and should be about 3 in. broad. A runner is screwed on each face of this ring, and the strickles will work on this runner with a semi-circular strickle, guided by a strip on the frame.

There is still a top branch core to be made. It is 16 ins. in diameter, and might be made with a pin board, as shown in Fig. 8. It may be that the moulder will prefer a box, and one can be made almost as cheaply as the pin board. An end view of a suitable box is shown in Fig. 9 and a plan in Fig. 10. It is simply a square frame with mitred skeleton pieces nailed inside. A skeleton box made in halves would be almost as expensive as a solid box, and this style is as convenient for the moulder, as it can be taken apart like any ordinary frame corebox.

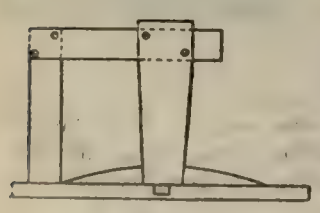


FIG. 8.

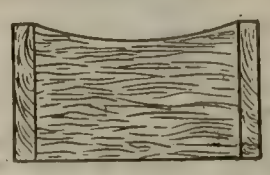


FIG. 9.

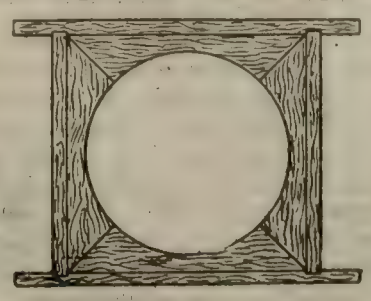


FIG. 10.

Development of Ocean Service Shipbuilding in Canada--VII.

By C. T. R.

In addition to the widespread requisitioning of vessels for transportation purposes by the Allies, the war attendant and normal merchant ship losses and the many months' almost complete cessation of new construction on the part of the latter, the merchant marine of the world has had the misfortune to become to a large extent the target for enemy submarine activity. All nations have suffered in this respect, hence the almost feverish anxiety being displayed by shipping interests to have the losses made good at the earliest possible moment.

SHIPBUILDING on Canada's Great Lakes and on the St. Lawrence is particularly active at the present time in view of the approach of the close of navigation for another season, and the necessity there is that as many completed ships as possible reach the sea before our waterways become ice-bound. That the Port Arthur Shipbuilding Co. is making good headway in their deliveries is evidenced by the fact that the Ugelstad, launched on June 23, is now in the service of her owners, and the War Fish, launched on August 4, is scheduled to follow suit this month. Both vessels were originally ordered by Jas. Playfair, of Midland, Ont., but during construction other interests purchased them. Constructional, equipment, and machinery installation features are as follows:—

Features and Dimensions

The hull has the following principal dimensions:—Length over all, 261 ft.; length between perpendiculars, 251 ft.; breadth moulded, 43½ ft.; depth moulded, 28 ft. 2 in. It is of the single deck type, with poop bridge and forecastle, steel deck house on bridge, and deck and chart room on top of deck houses, with navigating bridge. The hull is built on the transverse system, with the propelling machinery amidships, and the coal bunkers in wings. There are two cargo holds, with two hatches to each, one hold extending from the collision bulkhead to the boiler room bulkhead, and the other from the engine room bulkhead to the after-peak bulkhead. A water bottom, 2 ft. 9 in. deep, extends from the collision bulkhead to the after-peak bulkhead. The construction is for the highest class of Lloyd's ocean service, and in accordance with the British Board of Trade requirements. The size of the machinery space has been arranged to approximate 13 per cent. of the gross tonnage, thus attaining a reduction of 32 per cent. from capacity tonnage.

The hull is built with flat plate keel and bilge keels, the latter, extending for about 100 ft. amidships, being of plate 9 in. deep, connected to the shell with angle bars fitted on short lengths, extending from butt to button shell, the plate being continuous. Each vessel has a straight stem and elliptic stern. Channel frames are fitted and extend from tank margin to main deck, and alternately to bridge deck, without hold stringers or 'tween deck beams. Plate floors are fitted on every third frame, except in engine and boiler space and forward of three-fifths length, which are 24 in. centres. The propeller frame is according to Lloyd's requirements, with rudder post extending to main deck, to which it is attached by angles and deep transom plates. The rudder is of the single plate type, with arms alternately on the port and starboard side. The hull is divided by four watertight bulkheads, and a watertight sliding door is fitted in the engine room bulkhead, to give access to the tunnel. There is a screen bulkhead between the boiler and engine rooms, with door and portable plate for drawing the condenser tubes.

The engine foundation is built up of plate and angles, with girders underneath, to line up with the fore and aft girders on the water bottom. The boiler foundations are of longitudinal plate girders, with large double angles on top edge and connected to tank top with double angles at bottom. The deck house on the bridge is of steel, 7 ft. high, of plating, 12.2, stiffened with 3x3x6.1 angles, as are also the engine and boiler castings. The flying bridge is built from the roof of the chart house to the ship's sides, and is 4 ft. wide, carried on angle iron framing supported on angle iron stanchions.

Auxiliary Equipment

A steam windlass 8 x 8 in., is fitted with hand attachment and friction brakes. The steam steering engine, 6 x 6 in., is placed in the after end of the engine casings, with the horizonal shaft protruding through the after side, with the bracket and chain drum on deck. Two 22 ft. lifeboats, and one 18 ft. working boat, are provided, together with life belts and life buoys as required by law. The bridge deck provides the captain's, first and second officers' quarters, which, with the accommodation for the crew, are complete with every modern convenience. The electrical installation includes one 7½ k.w. generator, with equipment for lighting the whole vessel, the sidelights being fitted for electric light as well as for oil.

Engine Data

The propelling machinery, also built by the Port Arthur Shipbuilding Co. consists of engines of the single screw, 3 cylinder, 3 crank type, with cylinders 20, 33½ and 55 in. diam. by 40 in. stroke, developing about 1,400 i.h.p. at 80 r.p.m. Steam is supplied by two boilers, each 14 ft. diam. by 12 ft. long, built for natural draught, at 185 lb. pressure. The boilers are equipped with corrugated furnaces, 42 in. inside diam., with separate combustion chamber for each furnace.

S.S. UGELSTAD ON THE WAYS READY FOR LAUNCHING.

OUR LATEST CRAFT—THE AUXILIARY SCHOONER

By Capt. Geo. S. Laing.

THE seas and oceans are now graced with a strange craft called the auxiliary schooner. Our Canadian and American shipyards are turning them out in considerable numbers. These vessels could be well termed half-breeds, in the sense that they have both the steamer and the windjammer embodied in their architecture. It is certainly something to be thankful for in these war days with its shortage of iron and steel products and dearth of ships to see this wooden vessel with her forest grown hull, and her internal combustion engines come among us.

For over a decade now we have been accustomed sighting the auxiliary schooner in the shape of fishing craft and a few coasters, but this article is concerned only with the up-to-date foreign trading auxiliary schooner which sets out for any part of the world, and has a carrying capacity similar to the great bulk of small steam tramps.

As one who has been employed both in sailing ships and steamers, the writer will attempt to show that the auxiliary schooner possesses many attractions and should have a bright future ahead of her.

Handiness in Port

In many harbors it is customary to make two or three shifts from one dock to another in the loading or discharging of a cargo. In the old style sailing ship this meant towage. In the ordinary tramp steamer it either means towage or getting up steam at a time when the steam engineer wants to see the inside of his boilers. With the auxiliary schooner, especially of the twin-screw type, this shifting around in port would be no trouble whatever. It only takes minutes in the motor engine room to start up, where it takes hours in a steam propelled ship.

Dry Dock Troubles

With the ordinary tramp steamer or steel sailing-ship, the matter of a foul bottom is ever present and in both these craft a visit to the graving dock every year is essential. The reduction in speed caused by barnacles and grass growing on iron or steel vessels, runs as high as 40 per cent. after a year's absence from a dry dock. This is appalling, but it is true of all tropical traders, for it is in tropical or sub-tropical waters that the most of animal and vegetable life attaches itself to a ship's bottom—there to mature and flourish.

The auxiliary schooner protected with yellow metal may run afloat for two or three years without going into dry dock as far as a foul bottom is concerned. Dry dock dues are among the heaviest of the ship owners outlays.

On Ocean Routes

The auxiliary schooner has great advantage over the ordinary steamer by way of drawing power from the heavens, utilizing her white wings in favorable trade winds, monsoons, or the prevalent westerlies in the high latitudes of both hemispheres. During such times, the engineer will be able to throttle her a little and still make 10 to 12 miles an hour. Take for instance the run from Cape of Good Hope to Australia or New Zealand, and again from the Antipodes to Chili and Peru. On these routes the chances are that in many cases a vessel is simply chased with fair wind and following sea, if a proper course is taken according to the season.

WOOD SHIP CONSTRUCTION IN BRITISH COLUMBIA.

In Very Heavy Weather

The most helpless craft afloat in very heavy weather is the low-powered steam tramp. A few will shoulder the sea,

AUXILIARY POWER SCHOONER "MABEL BROWN." FIRST OF ITS TYPE BUILT IN CANADA.

but the majority of them flounder around in a radius of six or eight points and frequently do big damage while in this intoxicated state. The reasons for this bad behaviour are due mainly to lack of steam power to hold steerage way in the sea, the lack of canvas to aid the helm, in keeping their heads in one position, and the heavy rolling and diving motions that greatly reduce the work of a propeller, by keeping it too often in the air and too little in the water.

An auxiliary schooner with her two-fold means of propulsion should be able to "heave to" and stay there with as much grace as a Grimsby smack or an Aberdeen trawler—two classes of craft that contribute to expert seamanship qualifications. A power schooner that is forced to "heave to," or "head reach" should be comfortable and reasonably quiet with a leg o'mutton spanker aft and a storm tri-sail forward, either on the inner bowsprit or foremast. Then with the starboard engine at half-speed for the port tack or the port engine at half-speed for the starboard tack, her movements should be that of a stately craft. Where this method works, one engine is stopped.

Her head should keep pretty steady at about 4½ points from the wind, thus taking the heavy sea on the bluff of the bow and at the same time making enough leeway to bring into play the valuable turbulent eddies from under her keel that help so much in staying the poundage waves on vessels "hove to."

To those who have not studied the wonderful effect of a ships "dead water"

eddies in a sea-way, just look astern at a ship's track in a moderate breeze and you will notice that a comparatively smooth streak holds out against the surrounding waves for quite a distance. The same thing happens when a vessel drifts bodily to leeward, leaving thus a broadside wake up to windward. The use of heavy oils on high seas is another eye-opener. This again is beautifully demonstrated by watching the calm streak that the engine-room bilge water discharge causes through its oily nature.

Towage Elimination

Coastal or river towage, which was so damaging to sailing ship earnings, disappears altogether with the auxiliary schooner. There is little doubt that she will also create a new class of seamen and officers. Again, as owners and builders have given more attention to the comforts of the A. B's. and apprentices than has previously been done, the manning of these vessels will proportionately become easier, for you can still invite decent folks to sea if you treat them right in matters of food and quarters, two main items that the old windjammer and a considerable number of steam tramps never knew the meaning of.

As regards the apprentice system which is one of the finest points about the schooners, these youngsters will soon spread the sea fever amongst the boys of their acquaintance, and so the ball will begin to roll for a growing fleet of Canadian manned merchant ships—the foremost national asset of any country lucky enough to have a seaboard.

Compass Installation

From a navigational point of view, the new schooners ought to be good vessels for compass work. A liquid compass is undoubtedly the best for steering purposes but a dry card is the most efficient instrument for a standard or navigating compass. Here too, is a chance for our old friend—the pole compass—coming back to life on these wooden lowermast schooners. The wily deviation that haunts the compasses of iron and steel ships should be very much modified on our forest product which claims no magnetic attraction either in hull or superstructure. Of course to be absolutely non-magnetic, these vessels would require to be made entirely of wood with brass or copper fastenings. Small compass errors mean less risk of making fatal mistakes in course plotting and cross bearing work on the chart, especially in reef-strewn waters or foggy weather near a coast.

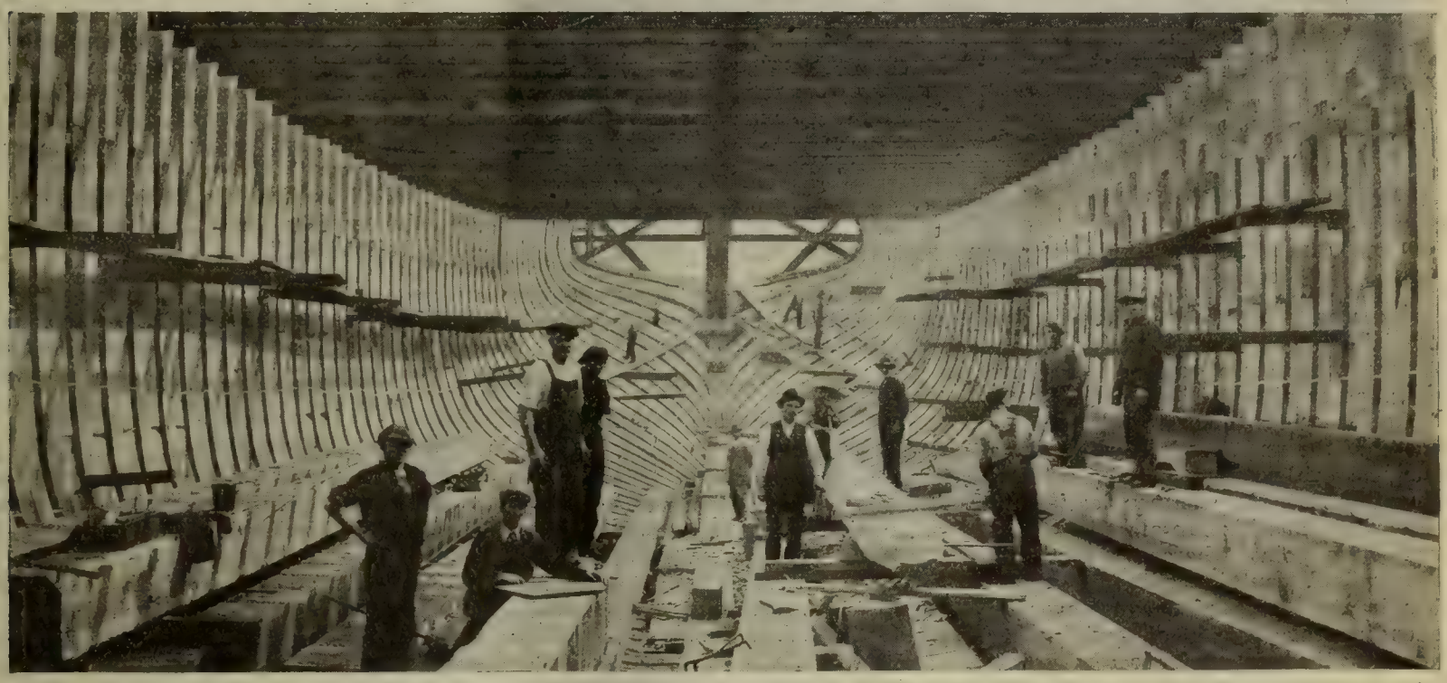
Regarding Breakdowns

The auxiliary schooner has one of her finest qualities ever ready, that of changing her status from a power craft, to a sailing ship or vice versa, and it would indeed be a most un-usual disaster that could deprive her of both her engines and sails. There is a point however that could be more assured in this connection. The sail area on the vessels having "bald" or "stump" lower masts might be enlarged to enhance the speed where fuel shortage or more unfortunate happenings came along.

The writer's suggestion is to fit these craft with lower-mast caps and trestle-trees which could be called on to support jury top-masts in time of dire necessity. The ship could spread three, four, or five gaff top-sails which would often mean fifty miles a day on her speed.

Take a five master with a fore, main, mizzen, jigger and aftermast, even if the above plan was only adopted on the main, mizzen and jiggermast it wouldn't be a bad investment. With hollow steel spars, a telescope arrangement would be the most popular plan of "housing" the jury masts that would play a part in the augmentation of sail area. On the other hand the schooner captains may be glad to carry spare masts on deck to lash alongside the two or three hatches that are in the waist of the vessel, and practically under water in gales. Spars lashed alongside of exposed hatches act as breakwaters and take the sledge-hammer knock out of the waves that might otherwise stave in a midship hatch.

The Mabel Brown has a yard forward for use in "running," and although this class of foresail has to be lowered—owing to its peculiar gear—long before a square-rigger's foresail would be put in the gaskets, the sail is a very useful one where moderate winds are concerned. Again, this fore yard makes a nice boat boom in anchorages, and is also handy for guys and tackles that may be in use at that end of the ship.



INTERIOR OF HULL UNDER CONSTRUCTION, AUXILIARY POWER SCHOONER "MARGARET HANEY."

Choice of Rig

As regards the choice of fore and aft rig for these interesting vessels, it might have been worth a trial to rig a few out as barquentines, with double top-gallant sails the highest canvas on the foremast. The other masts would then stand larger spacing, a three masted barquentine taking the place of a four masted schooner. Even with less engine power the barquentine might prove the better vessel for long voyages.

Rigs and Nations

The Russians and Americans have always taken to the all fore and aft rig in canvas, whilst the Norwegians, Italians and Nova Scotians have favored the three masted barque. There was a saying in sailor circles that no matter what foreign port one entered, there was sure to be found one or all of the following four things:—A British tramp steamer, a Norwegian barque, Swedish matches, and German musical instruments.

Good luck to the Canadian auxiliary schooner, may she break into the same category of popularity and usefulness. Her earning power and record for time on passages must not be too severely criticized at first, for the craft are in their experimental stage, and the men who engineer and sail and navigate them cannot be experts at the dual game in an instant. The captains of these schooners will act very differently on their initial long distance trips in accordance with the experience they have had on other vessels.

AUXILIARY POWER SCHOONER "MARGARET HANEY" READY FOR SEA.

Take a windjammer man for instance. If the schooner is bowling along under the dual system and the wind is inclined to lift the weather leaches, it is probable that this captain will let his vessel off a point, whereas a cast iron steam raised captain will furl everything in the shape of canvas, even to the engine room wind-sail, and let her plug into the sea under screw power only.

In the end, who will make the smartest runs in these vessels, the man who has had to rely on wind only, or the man whose chart room is generally above a coal bunker? It is natural to assume that the master, who has both sailing ship and tramp steamer experience will do the best. With the apprentice system a new breed of seamen and navigators will grow up with the auxiliary schooners.

Friction Elimination

The freeing clutch that allows the propellers to revolve when under sail only, is a grand device, as some trouble may be experienced in finding real helmsmen for these schooners—men who can steer anything and who understand the principles of steering. With the screws going round in their out-board motions, the vessel is more easily balanced with the rudder, and dead water under the counter causes less friction when the propelling screws are turning over.

It is to be hoped that in the official log of the new schooners such entries as this may be found under remarks:

"Strong wind with quarterly sea, all sails drawing. Hove hand log in several squalls and found vessel making fourteen miles an hour."

"Passed a tramp steamer, going the same way, in the second dogwatch. Vessel behaving well. Gripping to windward easily controlled by careful steering. Shipping very little dangerous water, hatches in the waist under special observation after dark."

PAPER FROM CANADA

A RECENT report indicates how rapid Canada's paper-making industry is expanding. Here are some rather interesting figures of her exports of paper:

1892	$91
1902	$24,780
1912	$3,881,063
1913	$6,327,774
1914	$12,686,896
1915	$15,509,582

But it is not much consolation to those of us who are experiencing a semi-famine of paper in this country to know that more than 80 per cent. of Canada's output goes to the United States. There is no doubt that Canada has in her hands an enormous industry in the provision of pulp and the making of paper.

COPPER IN INDIA

INDIA imported large quantities of copper from Germany before the war, although she has quite extensive copper deposits of her own. More or less rich deposits are said to exist in Southern India, Rajputana, Chota Nagpur and various places along the outer Himalayas. Various companies have exploited the copper ores of India during the last 50 years, but until quite recently the results have been anything but successful—due apparently to unscientific methods. The Indian Munitions Board has engaged experts in England to go out to India with the view to developing the industry on scientific lines.

Screenings

Three young fellows were strolling along a country lane, and saw approaching them a very patriarchal-looking old man. Thinking to take a rise out of him, they accosted him thus: "Hail, Father Abraham, Father Isaac or Father Jacob." "Nay, my sons," the old man replied, "I am none of these, but rather Saul seeking his father's asses, and lo! here have I found them."

An old hen was pecking at some stray carpet-tacks in the yard. "Now, what do you suppose that hen is eating those tacks for?" said Henry. "Perhaps," rejoined his little sister, "she's going to lay a carpet."

During the voyage of a great liner, a waggish Welshman was approached by a fellow-passenger, who said:

"We are getting up a tug-of-war between a team of married men and a team of single men; you are married, aren't you?"

"No," replied the Welshman, "I am only seasick; that is what makes me look like this."

For the first three years of their married life the wife's mother had lived with the young couple. Then, one morning, without even stopping to pack, hubby fled.

The young wife rushed upstairs and told the news to her mother. "I suppose some nasty low woman is responsible for his leaving you," said the latter.

"Yes, mother," said the sorrowing wife, "there was a woman in it."

"Her name?" demanded the good lady, palpitating like an enraged motor-omnibus.

"You, mother," came the whispered reply.

"Me? Well, I'm sure I never gave him any encouragement.

First Alderman—"Here's a fine looking street."

Second Ditto—"You're right; what's the best thing to do with it?"

"Let's have it dug up for a sewer."

"But wouldn't it be proper to have it paved first?"

"Of course; I thought you would understand that. Then, after it is paved and a drain put in, we'll have it repaved."

"All in readiness to be dug up again for the gas-pipe? I see you understand the principles of municipal economy. And after we have it repaved for the second time, then what?"

"Well, then it will be ready for widening. There's nothing I admire so much as system in the care and improvement of our roadways."

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FOUNDRY TRADE OUTLOOK ENCOURAGING

MORE than ordinary interest should be displayed by Canadian foundrymen in the coming conventions of the American Foundrymen's Association and American Institute of Metals, with their accompanying exhibition of foundry and machine shop equipment and supplies. The outbreak of war just over three years ago found the machinery business in its various spheres of activity in a somewhat sickly condition, and while a revival, probably unprecedented in its history followed and is still largely being maintained, it cannot be said that foundry work has cut a leading figure. It is of course true that machine tool castings were in large demand, and such products as cast steel shell billets were no insignificant requirement. Gray iron castings are the backbone of the foundry industry of any country, and while these were the constituent of machine tool equipment to an abnormal extent, the fact remains that the call for such castings as the constituent of a myriad miscellaneous line of products was materially restricted.

In recent months metal-working industries in both Canada and the United States have been passing through a series of readjustments, the extent of which is not perhaps meantime realized, and probably will not be for some considerable time yet, as the transition period is still far from being over. The advent of the United States into the war for one thing, and the slowing-down of shell-making in Canada for another, furnish the solution of the why and wherefore of the conditions as we find them to-day.

Shell-making, to meet both its own requirements and those of its Allies does not begin to tax America's steel-making and machining capacity as it has done in the case of this Dominion. There are other directions, however, where the excess capacities can find an outlet, and while gun-making can lay fair claim to a share of the latter, it goes without saying that the realms of shipbuilding and marine engineering are quite broad enough to include a multiplicity of enterprise in their construction programmes. Both gray iron and steel castings are essentials of the twin industries, that of marine engineering more than shipbuilding, and in spite of the fact that general mechanical engineering, stationary steam and railroad engineering require castings—gray iron and steel, of exceptional quality, size and weight, it may be said that each of the latter features enters into ship and marine engine construction to much greater degree, besides having the accompaniment of casting requirements, where quality, size and weight are not necessarily so important from a manufacturing standpoint.

Shell-making so far as Canada is concerned is being rapidly displaced by other, more substantial and permanent industries, and judging by conditions as we find them, little regret is being expressed; rather is there considerable satisfaction in evidence that so little dislocation of plant activity has been caused and in its train so little extended unemployment of operators. Shipbuilding and marine engineering may be said to have filled in Canada the gap that otherwise would have been left by the petering out of shell-making, and in so doing have awakened from their war overborne inactivity the manufacture of iron and steel castings to form the constituents of completed products hitherto much limited in quantity and commercial value.

Shipbuilding and marine engineering so far as Canada is concerned are but in their infancy, but we should not lose sight of the fact that the prospects and possibilities are such as to transcend those of shell-making, and with the achievement of the latter still fresh in our minds, is there any reason why we should not only equal its accomplishment but go one better. The past thirty months has been largely in the nature of a machine shop display, and while for the next handful of years at least, this departmental feature is likely to lose little by way of comparison, let us not forget that the foundry is going to have its innings and must needs measure up to its confrere.

The men charged with the administration of the Foundrymen's Convention and Exhibition to be held in Boston, Mass., during the week of September 24, realize that the field of effort is bigger this year than it has been since the outbreak of war, or for that matter at any time in the past, and that the atmosphere is clearer, so to speak, for real forward progress. It is not presuming too much to affirm that the accession of the United States to the Allied ranks has, in view of developments taking place and in progress there done for the foundry industry on this continent a service towards efficiency that a decade of peace-time or normal years would scarcely have begun to accomplish.

The production of marine engine and ship equipment castings is to a large extent new to foundrymen, both here and in the United States, under which circumstances there is all the more reason why the interchange of views made possible by such meetings and the Exhibition as are about to be held should be heartily welcomed. Canadian foundrymen have not participated as largely by personal representation in past years as they should, aside altogether from the period of the war. Now, however, being allied in a common cause, and filling, in addition, a common need, is there any good reason why aloofness should not be less marked on the coming occasion and for all time?

More than usually interesting business and social sessions and outings have been arranged by the Executive Council of the Associations, which taken in conjunction with the comprehensive display of foundry and machine shop equipment and supplies to be staged in the Mechanics' Hall, make it, from all angles, incumbent that every foundryman who can be spared from our shops, should make his headquarters in Boston for the week of September 24.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$46 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	51 95
Basic, Valley furnace	48 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	60 00

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 00
Tank plates, Pittsburgh	9 00
Structural shapes, Pittsburgh	4 00
Steel hoops, Pittsburgh	5 25
F.O.B. Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 00

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22 1
London	18.9	22 1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$33 00	$34 00
Electro copper	33 00	34 00
Castings, copper	32 00	33 00
Tin	61 50	64 00
Spelter	10 50	11 00
Lead	13 00	13 00
Antimony	20 00	20 00
Aluminum	67 00	64 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$12 00	$12 00
Heads	12 30	12 30
Tank plates, 3-16 in.	12 65	12 25

WROUGHT PIPE.

Effective July 5, 1917.

Size.	Black Per 100 feet	Galvanized Per 100 feet
Standard Buttweld.		
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 [illegible]4	103 00
Standard Lapweld.		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$20 00	$22 00
Copper, crucible	23 00	27 00
Copper, heavy	23 00	25 50
Copper wire	22 00	25 50
No. 1 machine composition	20 00	22 00
New brass cuttings	16 00	19 00
No. 1 brass turnings	14 00	16 00
Light brass	12 00	10 50
Medium brass	16 00	16 00
Heavy brass	16 00	18 00
Heavy melting steel	21 00	17 00
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	22 00	10 50
Axles, wrought iron	30 00	24 00
Rails	25 00	18 00
No. 1 machine cast iron	25 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	19 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	29 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	8 50
Stove plate	19 00	19 00
Scrap zinc	6 50	9 50
Heavy lead	10 00	10 75
Tea lead	7 00	7 00
Aluminum	30 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up..	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less..	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd.. steel	10
Machine screws, fl. and rd. hd.. brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank,	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in and larger	$7 60
Structural rivets, as above.	7 50
Wood screws, flat, bright..	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass..	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze.	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$ 75 00
Open-hearth billets	95 00
O.H. sheet bars	80 00
Forging billets	100 00
Wire rods	90 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS.

Solder, strictly	0 37
Solder, guaranteed	0 40
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 16
Putty, 100-lb. drum	4 35
White lead, pure, cwt.	19 00
Red dry lead, 100-lb. kegs. per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 61
Linseed oil, raw, single, bbls.	1 49
Linseed oil, boiled, single bbls.	1 52
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery Cloth	list plus 33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon..	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.37
British Manila Rope	.31
New Zealand Hemp	.31
Transmission rope, Manila	.43
Drilling cables, Manila	.39
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks	list plus 30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 50%; headers, 60; flanged unions, 40; malleable bushings, 50; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$11 00	$11 00
Sheets, black, No. 10.	11 50	11 50
Canada plates, dull, 52 sheets	11 00	11 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	12 70
Premier, 10¾ oz.	13 85	13 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

	B
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$13 05
Connelsville Foundry Coke	14 00
Steam Lump Coal	7 25
Best Slack	6 50

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$33 00	....
1¼ in.	36 00	....
1½ in.	38 00	32 00
1¾ in.	38 00	32 00
2 in.	45 00	33 00
2¼ in.	48 00	35 00
2½ in.	50 00	38 00
3 in.	58 00	45 00
3¼ in.	....	53 00
3½ in.	70 00	55 00
4 in.	82 00	67 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 75
Leather in sides	1 60

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

BUSINESS in the engineering and steel trade is fairly quiet just now, due to the unsettled conditions in the raw material markets and also on account of the curtailing of munition orders. Iron and steel merchants report business as being dull, and attribute it to the uncertainty prevailing with regard to prices. The trend of prices to lower levels is more pronounced, although the downward movement has not started yet, except in semi-finished steel which has declined. The opinion is generally held that the crest of steel prices has been reached and that recessions may be expected almost any time. It is not likely, however, that there will be any marked change in the situation until some definite announcement has been made at Washington regarding the Government's price-fixing policy. The situation in the pig-iron market is practically unchanged. The output of pig-iron has declined, but the demand is as insistent as ever. There is, however, very little new business, as consumers are expecting lower prices and on account of unsettled conditions are keeping out of the market. Coke prices are holding firm, but the shortage of cars is holding up shipments. The price on soft coal recently fixed by the United States Government may be advanced owing to the opposition on the part of the mine owners. The scrap markets are dull and featureless, while prices have a weaker tendency. The scrap business is dull at the present time, as consumers are not buying. The non-ferrous metal markets are dull and prices for the most part are largely nominal. The price-fixing policy hangs like a cloud over the market and consumers are showing practically no interest in current quotations.

Montreal, Que., Sept. 10, 1917.—A condition that is causing considerable uneasiness among Canadian manufacturers is the restriction that has recently been placed upon the shipment of steel from the United States. The inability to obtain supplies other than those required for war purposes only has created a situation that may seriously affect the early future outlook for domestic enterprise. Owing to the impossibility of obtaining certain classes of finished steel from Canadian mills, it is imperative that we secure these from American sources, and present conditions are not conducive to that end.

Pig Iron

Little change is noted in the pig iron situation, as the market is still unsettled pending developments in United States Government circles. The American market appears to be developing an easier tendency, as reflected in current quotations; Pittsburgh prices on basic, foundry and malleable showing a decline for the week of $2 per ton. The composite price on pig iron is now $50.96, this being a decline of 40c per ton on last week's quotation. Owing to the inability of getting shipments of coke, furnaces are somewhat handicapped; quotations on Connellsville coke are now $14.50 for prompt furnace, and $15 for foundry. Canadian producers are not yet in a position to place pig iron on the market, and consequently prices are still unavailable.

Steel

An atmosphere of uncertainty still dominates the entire steel situation, as no definite decision has been arrived at with respect to the final fixing of prices and regulation of supplies. It is now expected that the price fixed for steel and other war materials will be on a higher scale than previously supposed, owing to

the fact that a price fixed on a cost-plus-profit basis would practically eliminate the revenue derived from tax placed upon the surplus profits. The present market is one of apparent indifference, as the trade is still undecided as to the future outlook; such activity as is reported seems to be to let things drift rather than open the way for additional business, the disposition being to mark time until the Government takes further action. The situation in the States has shown a downward tendency, which has been reflected in the easier quotations on certain commodities, chiefly on steel bars and tank plates, the Pittsburgh price on the latter having declined over $30 per ton.

The outstanding feature in connection with the Canadian situation is the effect the steel embargo has had upon general conditions and the possibilities that may arise should present restrictions continue. It is not only difficult, but almost impossible to obtain delivery on any other material than that required expressly for war purposes; this is the result of the regulations issued by the American Government whereby a license to ship will only be issued when the material ordered is to be used exclusively for war purposes. While the curtailment in the production of munitions will tend to decrease the steel requirement, this condition will offer little release, as this class of steel has been produced largely at home, and such material as has been required for general domestic purposes has been and will continue to be shipped in from the States; the mills in this country not being in a position to produce the necessary grade. Price quotations in the States indicate an easier market, but local quotations are comparatively unchanged, with prices very firm.

Metals

The general market continues to be more or less unsettled owing to the delayed action on the part of the American authorities respecting an announcement in relation to the fixing of prices and other regulations. When this uncertainty is finally removed it is expected that heavy buying will result, as stocks in many instances are becoming depleted. Copper is affected by speculative rumors. Tin is steady at lower prices. Spelter is unsettled and easier. Lead is easier in New York, but firm here. Antimony and aluminum are inactive and weaker.

Copper.—As the time approaches when an announcement is expected by the American Government respecting the price that will govern the production and sale of copper, the uncertainty of the past few weeks, while none the less pronounced, appears to be changing into an attitude of feverish anxiety respecting the official statement of the authorities. Many conflicting rumors are abroad as to the price to be fixed, and it is the wide variation in these reports that has produced such a nervous condition. While the market is not an active one, there is a certain feeling that heavy buying will be announced as soon as price regulations are definitely set and the period of uncertainty is removed. Firmness is maintained on the New York market with an advance of ½c on electrolytic and castings, the quotations being 28c for lake and 26½c for electro and castings. On a steady but uninteresting market the dealers here report no features, and quotations have remained unchanged; lake and electro are quoted at 33c, and castings at 32c per lb.

Tin.—The market has been of a fluctuating nature during the past week, but has steadied in the last few days, and is now in a firm position. The situation is still influenced by the political uncertainty in the States, as the findings of the various committees will to some extent affect conditions in the tin market. Although the American situation is firm, the New York price of 60¾c is 1⅛c lower than that of last week. The situation here has followed the New York market to some extent, but prices are well maintained at 61½c per lb.

Spelter.—Conditions in the spelter situation are not improving, as producers are apparently reluctant to meet the requirements of the American Government inrespect to their request for supplies, the price for which does not compare favorably with that formerly paid. While surplus stocks are undoubtedly plentiful, these conditions are likely to be affected by the closing down of certain smelters that have been operating at a loss at the present price of spelter. The price of 12c and 12½c announced as the figure to be paid by the Government is 1c lower than that paid for the previous requirements, and it is expected that producers will not respond freely under these conditions. The New York quotation on the open market is slightly over 8c, this being ¼c lower than last week. The market here is not active, but quotations have remained unchanged at 10½c per lb.

Lead.—The market seems to have been influenced by rumors circulated by some selling interests to the effect that futures are much easier; this has somewhat depressed the spot price on the New York market, both the trust and independent price having declined ½c during the week, the base price for both being 10c per lb. Local dealers report steady business, with prices comparatively firm at 13c, but the undertone is easier.

Antimony.—The situation has developed additional weakness owing to the arrival of supplies and the recent inactivity of the market; the latter as a result of the deferred action of the American Government as to the regulation of price and distribution. New York shows a further decline of ⅝c per lb., the current quotation being 14⅜c per lb. On a quiet market prices are inclined to weaken locally, but last week's price of 20c is still maintained.

Aluminum.—The market is rather unsettled and quiet, with a weak undertone developing. New York prices are a little easier, but local dealers report little change and firm prices; local quotations 65c to 67c per lb.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

Machine Tools and Supplies

The almost total absence of inquiry for munition making machinery would seem to indicate that the activity of shell-making has been reduced to a minimum, those plants that are still so engaged being well supplied with all necessary equipment. The present demand, which is not very brisk, appears to be confined to such machinery as would be used for general engineering purposes, largely for use in shipbuilding plants or marine repair shops. Machine tool activity at the present time is more of a pre-war nature than has been experienced in the past three years; a notable feature being the pronounced falling off in the selling of special machinery for shell-making purposes. This condition, however, does not prevail across the line, as the machine tool industry in the States is at present closely allied to the abnormal activity of two years ago.

Canadian tool builders are having some difficulty in securing delivery of material from the States, as nothing is permitted to be shipped from there in the nature of industrial requirements, unless it is specified that the same is to be used exclusively for war purposes. Despite the decline in the demand for supplies that has naturally followed the curtailment of shell production, activity continues to be of a steady and encouraging character. The easier tendency in the price of raw materials has created a steadier tone in the price of supplies, although some difficulty is still experienced in securing delivery, especially from points in the States.

Scrap

The market in old materials has shown little or no improvement, and may be said to be almost stagnant in respect to actual business; this is due largely to the unsettled condition of other markets as a result of pending developments, the uncertainty of which has seriously affected active trading. The American market in heavy melting steel and low phosphorus scrap is stronger, also borings and turnings, but the general situation in respect to old metals has developed a weaker tendency. Local conditions have a fluctuating tendency, but dealers' prices are practically unchanged, last week's quotations still prevailing.

Toronto, Ont., Sept. 11.—There is less activity so far this month in the iron and steel market than in August, due largely to the unsettled conditions existing in the

trade. Consumers are only buying what they are in urgent need of as they anticipate a general recession in prices. Deliveries are also very slow as it will be some weeks before the Canadian mills can take care of the consuming demand and, on imported steel, licenses have to be obtained, which causes considerable delay. Prospects for cheaper coal are not so bright. The mine owners in the States are protesting against the prices fixed by the U.S. Government recently and it appears highly probable that the prices at the mines will be advanced at least 50c. a ton on soft coal.

Steel

The market continues unsettled owing principally to the U.S. Government's delay in fixing prices. The steel industry is anxiously awaiting an announcement of the Government price-fixing policy. Although rumors are plentiful, no official statement has yet been made to throw any light on the situation. The task is difficult and complicated, which accounts for the delay in arriving at a satisfactory conclusion. In the meantime, however, the market is unsettled and the outlook in the trade uncertain. Business so far this month has been unusually quiet and the former activity in the steel industry seems to have come to a temporary standstill. Consumers are keeping out of the market until the situation becomes more settled and are only buying from hand-to-mouth to satisfy more urgent requirements. Some adjustment has been made in connection with the embargo on importations of steel from the States, and it is likely that the modifications in the original order will materially benefit the trade. Considerable delay and trouble, however, is caused by having to obtain a license on each shipment. There is every indication that prices will likely begin to decline in the near future.

There is no doubt that the crest has been reached and the market cannot stand still for long. Consumers are not now so anxious to place orders as they were at one time and the principal reason for high prices has thus been eliminated. The falling off in demand for steel for munitions has also tended to make the market easier while the price-fixing policy of the U.S. Government is having a similar effect in both the States and Canada. Although deliveries from domestic mills have not yet improved to any material extent, it appears likely that during the coming month or so they will be able to look after their customers better in this respect. The decline in demand for shell steel will release more tonnage for domestic purposes and relieve the shortage which has existed for some time. There are no price changes on domestic products to note this week, although the market is distinctly easier.

The general price level of steel products in the United States continues to tend downwards, but there has been no marked decline as yet except on semi-finished material. The situation in other respects is practically unchanged and the steel industry is waiting for developments in the price-fixing situation at Washington. In the meantime the market is marking time until some definite decision has been made. Government requirements are constantly increasing and, having preference over all other business, private consumers have to get steel when and where they can. The result is that private enterprise is being considerably restricted and only the more urgent work is being put through. Billets are unchanged at last week's levels. The market for black sheets is quiet and unchanged with prices tending downwards. A decline in prices of galvanized sheets is also expected in the near future. The big demand for ship and boiler plate is holding the market firm, but prices are largely nominal. The big demand in prospect for ship plates will keep the mills operating at capacity for a long time to come. The unfilled tonnage of the U.S. Steel Corporation on August 31 was 10,407,049 tons, being a decrease of 437,115 tons over the preceding month.

Pig Iron

The market continues in a very unsettled condition owing to the fear that the price-fixing policy will include pig iron. Apart from this the situation in the market is unchanged. Production is declining owing to shortage of labor and inadequate supply of coke while the furnaces, being behind on deliveries, are being pushed to the limit to fill orders on the books. There is, however, very little new business, as consumers are waiting developments at Washington. The local situation is unchanged, but car shortage is causing considerable uneasiness. The coke market is holding firm with prices practically unchanged.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Scrap

The market continues stagnant with very little new business being reported. Consumers are still awaiting developments in the situation and there is a general feeling that the market is due for a decline, particularly in copper, brass and lead scrap. Scrap steels and machinery cast iron are holding steady at unchanged prices.

Machine Tools

Another quiet week in the machine tool trade leaves little of importance to be recorded. The machine tool business is undergoing a period of readjustment and the absence of activity is only what might have been expected. The Canadian Car & Foundry Co. are in the market for woodworking and metal working tools for their car plant at Fort William, Ont. What demand there is at the present time is principally for heavier tools. The machine tool market in the States is very active, the dominating feature being Government requirements for shipyards and engine-building plants.

Supplies

The market for machine shop supplies continues fairly active, although business has been affected by the falling off in munitions orders. The demand now is largely for supplies of a general character. Prices are still holding firm and deliveries are as backward as ever.

Metals

Extreme dullnes still characterizes the metal markets. Prices are unchanged at the level prevailing last week, but are largely nominal. The present condition seems likely to exist until some definite announcement is made by the U.S. Government with regard to its price-fixing policy. Until this question is settled there will be no activity in the markets, as consumers will hold off in anticipation of lower prices and only buy to fill urgent requirements.

Copper. — Although there is some scarcity of copper, the market continues easy in spite of large purchases by the U.S. Government. Prices are weak, though it is believed that only a little metal could be bought at prevailing quotations. Local prices are unchanged as follows: Lake and electrolytic 34c and castings 33c per pound.

Tin.—Very little interest is being shown in the tin market at the present time and the market is quiet. Local quotations are unchanged at 64c per pound.

Spelter.—The market continues very unsettled due to the possibility of Government control and prices have a weaker tendency. Spelter is quoted locally at 11c per pound.

Lead.—The Trust have made a new price on lead of 10c New York, the outside market being also at the same figure. This reduction has not had the effect of stimulating business and the market is dull and unsettled. Local price is unchanged at 13c per pound.

Antimony.—The demand for antimony is very light and the market is weaker, although quotations are unchanged in the meantime at 20c per pound.

Aluminum.—The market continues quiet and is weaker through lack of demand. Local price is unchanged at 64c per pound.

New York, Sept. 10.—The urgent demand for high grade shell steel has intensified the demand for electric furnaces. Manufacturers of ammunition and of ordnance who are able to place contracts for such furnaces for deliveries within eight months are particularly fortunate. The Greer interests at Baltimore, who

have recently received large munitions contracts from the United States Government, have placed orders for four 6-ton Heroult electric furnaces with the American Bridge Co. Each furnace will turn out about 30 tons electric steel per day, running 5 heats, making a total of 120 tons per day for the four furnaces.

Manufacturers of airplane engines continue actively in the market for shop equipment to fill additional large orders for both the United States and Allied Governments. The General Vehicle Co., of Long Island City, N.Y., with an exceptionally large contract for airplane engines from the British Government, has put out a sensational inquiry for 900 machine tools, which will cost in the neighborhood of $2,000,000; early deliveries are wanted, specifications calling in some instances for shipments on Nov. 1. The Tregor Motors Corporation has contracts calling for five engines per day. The Simplex Automobile Co.'s list is still pending, with purchases expected at any time and the Standard Aero Corporation of Elizabeth, N.J., will place orders very soon. The General Electric Co.. Schenectady, N.Y.. is still buying. Walter Scott & Co., holding a gun carriage contract, is still placing orders on its recent list of 200 machines.

The Emergency Fleet Corporation having finally authorized the building of ship plants at Hog Island, Philadelphia and on the Newark (N.J.) Meadows, the American International Corporation and the Submarine Boat Co., who have the ship and yard contracts are on the point of closing contracts for equipment which was practically arranged for several weeks ago. The American Merchants' Shipbuilding Corporation has closed contracts for 24 overhead electric traveling cranes for the equipment of its yards at Bristol, Pa., costing $1,125,000. The Federal Shipbuilding Co. is still placing orders for machinery for its great plant on the Hackensack Meadows. The Newport News Shipbuilding & Drydock Co., and the Lake Torpedo Boat Co., are in the market for machine tools for shipment to Norfolk, Va., and to Bridgeport, Connecticut, respectively. The American Chain Co. will more than double the capacity of its plant at York, Pa. The Standard Steel Works, of Philadelphia, is placing equipment orders for recent additions made to its Burnham plant to provide capacity for the forging and rough-machining of 6-inch howitzers.

The United States Steel Corporation has placed a contract for the building of a huge ingot mold foundry to be built in the Pittsburg district, which will make the Corporation entirely independent of outside sources of supplies. The plant will have a capacity of 80,000 to 100,000 tons of molds per year. With the completion of this foundry, the Corporation will have an annual output of between 300,000 and 400,000 tons of molds. Heretofore, the Carnegie Steel Co. has bought nearly all of the molds it required from independent foundries in the central West, but the Illinois Steel Co. has been casting molds at South Chicago; the Tennesse Coal. Iron & Railroad Co., at Ensley, Ala., and the American Steel & Wire Co., at Cleveland, for years, the output, however, was entirely inadequate to meet the needs of other subsidiary companies. It is the policy of the Steel Corporation to be entirely self-contained in all the numerous branches of the industry, and further heavy expenditures for extensions and improvements may be expected until the organization is fully rounded and entirely independent of outside sources of supply.

Pittsburgh, Sept. 8.—The iron and steel trade, buyers and sellers alike, are disposed to assert that they are waiting upon action by Washington in the matter of price fixing. The quieting down in the market, which began last April, developed into stagnation by the end of June, and lately intensified, is attributed to the waiting attitude. This is merely psychological. It is human nature to pick on one thing as the excuse when a certain line of conduct is followed. Rumors in the past few days have been to the effect that the Government's steel price decision would be announced within a week, but it is quite safe to predict that when the announcement is made the steel market will still halt. There are very few who think the Government has authority to fix steel prices for the general trade, and even if it did, the mills would probably refuse to sell until they ran out of orders. If prices are fixed with respect to Government purchases only, then the trade will wait to see how closely the open market will approach to the Government schedule. While there is a fresh rumor nearly every day, a rough guess would be that the Government prices for the descriptions of steel it needs in largest tonnages will be between one-half and two-thirds of the present quoted market, and thus the market will have a great deal of adjusting to do.

Price Declines

There have been some further declines in the past week, all a part, but probably a very small part, of the general readjustment that has been in progress, in its modest way, for weeks past. Bessemer pig iron became readily available at $50, valley furnaces, and basic iron at $48, representing further declines of $2 a ton and total declines to date of $6. While billet offerings at $75 continued it became the common opinion that on a firm bid some could be had at $70.

The decline in plates, reported a week ago, has not proceeded farther, but instead of 8.00c being now regarded as a cut price, it is rather regarded as the top of the market, except for very small lots.

Merchant steel bars have hitherto been quoted at 4.50c, Pittsburgh, as minimum, but there are rumors of offerings at 3.50c on first quarter contracts, and it is well authenticated that 4.00c can be done on contract, possibly even for the fourth quarter of this year, and a decline of $10 a ton in bars is, therefore, to be placed in the record.

Some of the sheet mills are now able to promise deliveries on new business in about three weeks' time. Roughly speaking, this compares with an offer of six weeks' delivery three weeks ago, which in general would indicate that the mills have been booking very little business meanwhile. It seems certain that some of the mills will have to cut prices within 30 to 60 days in order to maintain operations.

The Export Embargo

Very stringent regulations are being formulated in connection with the granting of licenses for iron and steel exports, and a great deal of business will doubtless be shut off. While tin plate is included in the embargo, as to all countries, it is reported that this does not apply to Canada, on the ground that Canada has an export embargo. There is no authentic news of the progress of diplomatic negotiations with Japan, on which hinge exports of plates, etc., to that country.

Coal and Coke

It remains the case that there are no sales of coal to speak of at the prices fixed by the Government, on the general basis of $2 per net ton at mine for mine-run. The operators state their output is fully taken up by shipments on contract. Some critics express the view that the price fixing is a failure because coal cannot be bought, ignoring the fact that consumers having contracts are receiving shipments on these contracts, which are at much lower prices than the former spot market, which ranged generally from $5 to $6 a ton during the first half of this year, and thus consumers as a class are getting their coal cheaper, although there are some who cannot, perhaps, get coal at all.

The Government has not fixed a general price on coke yet, as it is empowered to do by the Food Control law approved four weeks ago. The trade expects daily that an announcement will be made. Meanwhile, the Government has just alloted 16,000 tons of coke at $3 for furnace or heating grade and $3.50 for foundry grade, for use in the arsenals. The coke operators are accepting their orders without demur, although they consider the price quite low. The open market for prompt shipment is now $13.50 to $14.50 for furnace and $14 to $15 for foundry. There are a number of contracts in force calling for regular deliveries of furnace coke, the price to be adjusted weekly or monthly, according to the spot market, and one such contract for furnace coke was adjusted at $13.50 for the month of August.

Market Prospects

It is generally admitted throughout the trade that iron and steel prices are to decline, and very materially. The blast furnaces admit, as a rule, that they cannot hope any longer to obtain the prices recently charged and which, with some exceptions, still represent the quotable market, although it has become practically nominal. In billets there has already been a decline from $95 to $75, or possibly $70.

How far the readjustment will extend, and when it will be completed, are the uncertain things, and no one ventures to express any definite opinion. As usual when the market has become stagnant

after an extended rise with heavy buying, the steel mills are interested in having their customers continue to take material on contract, and specifications against contracts are stimulated by maintaining high prices as the nominal market even if sales are not affected. When the mills have squeezed out of their contracts all the tonnage they can, they will have to turn their attention to making fresh sales. With some mills this condition may be reached soon. In other cases the mills appear to be sold up tight to the end of the year.

The level to be finally reached for finished steel prices, at which trading can be resumed, will, of course, depend upon the relation between supply and requirements. Productive capacity has been increasing steadily, but is not fully employed on account of coke and labor shortage. Requirements of the ordinary domestic trade are bound to decrease steadily as the country becomes more fully engaged in war work. The tremendous expenditures of the Government are certain to make much business, but the extra work will involve labor and plant facilities hitherto engaged in the fabrication and consumption of steel, and the general industrial activity is likely to impair the country's ability to consume steel more than its ability to produce steel.

TRADE INQUIRIES

TRADE inquiries at the Inquiries Branch Department of Trade and Commerce, Ottawa, include the following:

Ebonite or vulcanite.—A Birmingham firm is open to purchase ebonite (vulcanite) in rods and tubes, 3 foot lengths. Also sheets 48-inch by 20-inch and 24-inch by 20-inch.

Asbestos manufactures.—A Birmingham firm wishes to be put in touch with manufacturers of asbestos goods.

Sheet asbestos.—A Birmingham firm inquires for quotations and samples of sheet asbestos.

Millboard.—A Birmingham firm would like to hear from manufacturers of millboard.

Knitting machinery.—A Leicester firm would like to receive catalogues from any manufacturers of up-to-date knitting machines.

Machinery.—A Leicester firm wishes to hear from manufacturers of brush-making machines and laundry machinery, with a view to representation.

Machine tools.—A Leicester firm is open to represent a Canadian manufacturer of machine tools.

A HIGH speed steel alloy recently patented in Great Britain has the following composition: Carbon, 0.5 to 0.8 per cent.; molybdenum, from 6 to 10 per cent.; chromium, from 3 to 6 per cent.; vanadium, 0.15 to 2 per cent.; manganese, 0.2 to 0.4 per cent., and silicon, 0.2 to 0.4 per cent. The amount of vanadium may be lowered and partly replaced by cobalt, of which latter element from 0.5 to 3.5 per cent. may be incorporated.

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—H. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Walkerville, Ont.—Fred F. Ferguson, of St. Thomas, Ont., will establish a grey iron foundry here.

Ladysmith, B.C. — The Ladysmith Smelting Corporation will instal a converting plant for treating copper ore.

Quebec, Que.—On September 17 another attempt will be made to complete the famous Quebec bridge on the transcontinental railway by hoisting the centre span into place.

Quebec, Que.—One of the large hoisters for the centre span of the Quebec bridge, slipped from the cantilever arms on Sept. 5, and is now at the bottom of the river with the mass of wreckage from the two previous disasters.

Victoria, B.C.—As a war measure, the Trades and Labor Council meeting here last Thursday endorsed a resolution of the Kamloops Chamber of Commerce asking the Canadian Government to establish plants for handling iron deposits and for their conversion into steel.

Princeton, B.C.—The Canada Copper Co. contemplate opening up a large mine near here. Power to operate the mine will be supplied by the West Kootenay Power and Light Co., while the copper and other products will be smelted and refined by the Consolidated Mining and Smelting Co. at Trail.

Cedars, Que.—The Unit Construction Co., contracting engineers, St. Louis, Mo., will design and construct an addition 600 x 130 x 70 ft. to the power house of the Cedars Rapids hydro-electric development. The construction will be of structural steel and reinforced concrete, and will cost approximately $250,000.

ELECTRICAL

Stratford, Ont.—Work will commence shortly on installing equipment in the hydro sub-station here.

New Toronto, Ont.—The Power & Water Commission has sanctioned the Hydro-Electric Commission's move in changing the distribution system, so that the township and New Toronto would each have a separate sub-station.

MUNICIPAL

Blenheim, Ont.—The Town Council has decided that it will dispose of the former electric power house and contents.

Woodstock, N.B.—The Town Council will instal a filtration plant and improve the pumping plant at a cost of $60,000.

Port Dover, Ont.—The Town Council will proceed with the installation of a waterworks system now that the by-law has carried.

Portage la Prairie, Man.—The Town Council will install a 100 h.p. boiler with mechanical stoker in its electric station at a cost of $5,000.

Welland, Ont.—The Crowland Township Council propose extending the waterworks system, which includes laying water mains.

Melita, Man.—A by-law will be submitted to the ratepayers on September 15 to authorize an issue of debentures for $10,000 for a street lighting system.

New Toronto, Ont.—James, Loudon, & Hertzberg, the town's consulting engineers, have recommended the purchase of a small motor-driven centrifugal pump.

Toronto, Ont.—The Ontario and Municipal Board have approved of plans for the proposed extension of the Bloor Street civic car line from Quebec Avenue to Runnymede.

BUILDING

Montreal, Que.—A permit has been granted William Rutherford & Sons to build a warehouse on Charlevoix Street to cost $6,000.

Montreal, Que.—The Canadian Vickers, Ltd., have taken out a permit for the construction of a reinforced concrete warehouse, 159 x 67 feet, to cost $48,000.

Montreal, Que. — A building permit has been granted J. A. Coulombe for the construction of a factory on Demontigny and Visitation Streets, to cost $9,700.

Toronto, Ont.—The Matthews-Blackwell Co., have received a permit for alterations to their packing plant at the foot of Bathurst street to cost $4,000.

London, Ont.—Negotiations with the Canadian Ajax Co. have been called off and no by-law will be submitted to the citizens. The company proposed to establish a factory for making rubber goods.

Toronto, Ont.—The Toronto Board of Harbor Commissioners have taken out a permit for the erection on Harbor square of an office building. It will be six storeys high and built of reinforced concrete.

TENDERS

Cobalt, Ont.—Tenders will be received until September 18 for installing a complete telephone system. R. L. O'Gorman, town clerk.

Ottawa, Ont.—A. Johnston, Deputy Minister of Marine, is receiving tenders until Sept. 20 for the construction of a fog alarm building at Little Metis Light Station, County of Rimouski, Que. Plans, etc., with Department of Marine, Ottawa.

Charleswood, Man.—Tenders will be received by the undersigned up to Saturday, September 22, 1917, for the drilling of one 5-inch well, and equipping same with pump and platform, on the Arboro Street, West Winnipeg. A. B. Blakely, secretary-treasurer.

Cobalt, Ont.—Tenders will be received up to Sept. 18, for the supply of material and labor necessary in the installation of a complete telephone system in the Town of Cobalt, and in part of the adjoining Township of Coleman. Further particulars will be furnished by R. L. O'Gorman, Town Clerk.

Ottawa, Ont.—Tenders will be received until September 20, for the roofing and sheet metal work required in the reconstruction of the Parliament Buildings. Plans, specifications and any other information required can be obtained at the office of the general contractor, P. Lyall & Sons Construction Co., Ottawa.

Toronto, Ont.—Tenders will be received, addressed to the Chairman, Board of Control, City Hall, Toronto, up to October 2, for the construction and delivery of stop valves, valve operating pump and special castings, for main pumping station. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Moncton, N.B.—Tenders will be received up to Saturday, September 22, for the construction of the substructure of a three-track subway at Trenton, N.S., under the tracks of the Intercolonial Railway. Plans and specifications may be seen at the following locations:—Office of the chief engineer, Department of Railways and Canals, Ottawa, Ont.; office of the chief engineer, Canadian Government Railways, Moncton, N.B.; office of the resident engineer, Canadian Government Railways, New Glasgow. N.S.

Wallaceburgh, Ont.—Tenders will be received up to September 15, for the construction of pump house and dash wheel also installation of engine boiler, etc., and construction of bridges, etc. Tenders will also be received for transformers, motors, poles, line and wiring necessary to drive dash wheel by Hydro. Plans and specifications and all particulars may be obtained by applying to W. G. McGeorge, C.E., Chatham; Archibald McArthur, Tupperville, or William Biden, Wallaceburg, R. R. No. 3.

PERSONAL

R. B. Bennetts, of Tacoma, Wash., has been appointed consulting engineer for the Ladysmith Smelting Corporation, Ladysmith, B.C.

Lieut. H. W. Morris, M. C., at one time chief electrical engineer of the Grand Trunk Railway, Montreal has been killed in action.

Wallace Downey, president of the Downey Shipbuilding Co., New York. and a native of Nova Scotia, was in Sydney, C.B., recently.

F. W. Darby, formerly advertising manager for Beattie Bros., Fergus, Ont.,

For Sale—A Modern Steel Building

300 ft. x 120 ft. wide with 2 10-ton 47-ft. span
Electric Travelling Cranes for 3/60/550 volt service, or cranes will be sold separately
THIS BUILDING WAS NEW IN 1913

Contains the following Machine Tools—Practically new

1—8 Spindle Bertram Arch Bar Drill.
1—26—48" x 20' McCabe Double Spindle Lathe.
2—No. 3 Bertram Double Axle Lathes.
1—42" Bertram Car Wheel Borer with Hub facing attachment and Crane.
1—1" Acme Triple Head Bolt Cutter.
1—1½" Acme 6 Spindle Nut Tapper.
2—Bertram Punches 30" throat capacity ¾" in ¾".
1—Bertram Punch 24" throat capacity 1" in 1".
1—Bertram Punch 18" throat capacity 1½" in 1".
1—C. M. C. Double End Punch and Shear, 18" throat, capacity 1" in 1" and shear 4" x 1".
2—C. M. C. Punches 18" throat capacity 1" in 1".
1 each 1", and 3" Ajax Bolt Headers.
1—No. 2 Williams & White Eye Bender.
1—3,000 lb. Morgan Double Frame Steam Hammer.
2—No. 23, 1 No. 26 and 1 No. 9 Williams & White Bulldozers.
40—Canadian Westinghouse Motors, from 3 to 75 H.P. for 3/60/550 V. Service.

ALSO LARGE QUANTITY OF WOODWORKING MACHINES

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A. R. WILLIAMS MACHINERY CO., LTD.
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Try It Out on Your Work on Our Trial Basis

By us sending you this machine for a 30-day free trial we express confidence that this machine will perform to advantage regardless of the test you may subject it to. We know the amount of care and work taken to give the machine the most perfect mechanical motion possible, with the least possible wear to the moving parts. These are points that you are not acquainted with. This trial will enable you to make a close study and decide its value to you on your work. We invite your inquiries.

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We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.

We can finish steel stamping in Nickel, Brass or Copper.

Send us a sample order.

W. H. BANFIELD & SONS
372 Pape Avenue, Toronto, Can.

Hamilton Anti-Friction
BABBITT
A Dependable Metal for Speed and Pressure.
Geo. E. Jobborn, Hamilton, Ont.

After the war—What?

Few can predict—yet all can prepare! Our present prosperity rests in part on an artificial basis which peace must remove. Now is the time to consolidate your position by regulating your expenditures—by husbanding the surplus—and by investing to the limit in Canadian War Loans, that help so much to maintain present prosperity.

The National Service Board of Canada

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has been appointed to a similar position with the Waterous Engine Works, Brantford, Ont.

J. K. McNeillie, general superintendent of the Canadian Government Railways, has resigned, having accepted a position on the Delaware and Hudson Railway, under F. P. Gutelius, formerly manager of the C. G. R.

Thomas Peck president of the Peck Rolling Mills, Montreal, died at Kennebunk Beach, Me., on Sept. 5, aged 75. Mr. Peck had been associated with the steel business all his life and had been president of the concern for the last five years.

H. A. Woods, assistant chief engineer of the Grand Trunk Pacific Railway, has resigned. Mr. Woods was 15 years in the Grand Trunk and Grand Trunk Pacific service, and he was associated with H. H. Kelliher in the construction of the latter railroad.

Capt. Henry Oldenburg, who for almost half a century has sailed the waters of Detroit River, and for the past twenty years has been in command of the Grand Trunk car ferry Lansdowne, died at his home in Windsor, Ont., on September 4. He was sixty-eight years of age.

W. E. Duperow, assistant general passenger agent, Grand Trunk Pacific Railway, Winnipeg, has been made general passenger agent of the G.T.P. and the Canadian Government Railways with headquarters at Winnipeg. Mr. Duperow was born in 1872 at Stratford, Ont., and entered the Grand Trunk service in 1893.

Fred S. Ferguson, manager, and **Thomas Charlton**, foundry superintendent of the Canada Iron Corporation, St. Thomas, Ont., have resigned, and will open the new plant of the Standard Foundry & Supply Co., at Walkerville, Ont. They were each presented with a club bag by the employees of the Canada Iron Corporation last Saturday as a token of regard.

TRADE GOSSIP

U. S. Steel Corporation Tonnage.—Unfilled orders of the United States Steel Corporation on August 31 were 10,407,049 tons, according to the recent monthly statement isued. This is a decrease of 437,115 tons, compared with the orders on July 31.

Ore Movement on Great Lakes.—According to figures issued on September 4 by M. A. Hanna & Co., of Cleveland, Ohio, 10,156,786 tons of ore were carried on the Great Lakes last month. This does not quite equal the record of 10,341,633 made in July.

Victoria, B.C.—To take over and operate the property and plant of the company by which they have been employed, and by which they are still owed $7,000 in wages, is the suggestion made to Hon. Wm. Sloan, Minister of Mines, by the workmen of the Island Coal and Coke Co., of Nicola Valley.

G. T. R. Officials Visit West.—A. W. Smithers, chairman of the Grand Trunk Board of Directors; Howard G. Kelly, general manager; J. E. Dalrymple, vice-president in charge of traffic; and N. H. Macpherson, left Montreal last Tuesday for a tour of inspection of the Grand Trunk Pacific, going out as far as the terminus, Prince Rupert, B.C.

Car Builders Face Steel Problem.—It is understood that the Canadian car builders who have recently obtained orders for 6,000 cars from the Dominion Government may have some difficulty in obtaining the necessary steel, which will have to come from the United States. The companies concerned are the Canadian Car Co., the Eastern Car Co., and the National Steel Car Co.

Biggest Locomotive Completed.—The biggest locomotive in the world has been completed by the Baldwin Locomotive Works, Eddystone plant, Pa. The engine is for the Virginian Railroad, and has 24 driving wheels and six double cylinders. Its weight is 844,000 pounds, with a tractive power of 160,000. The previous largest locomotive was turned out in March for the Erie Railroad, and weighed 612,000 pounds, with a tractive power of 160,000 pounds.

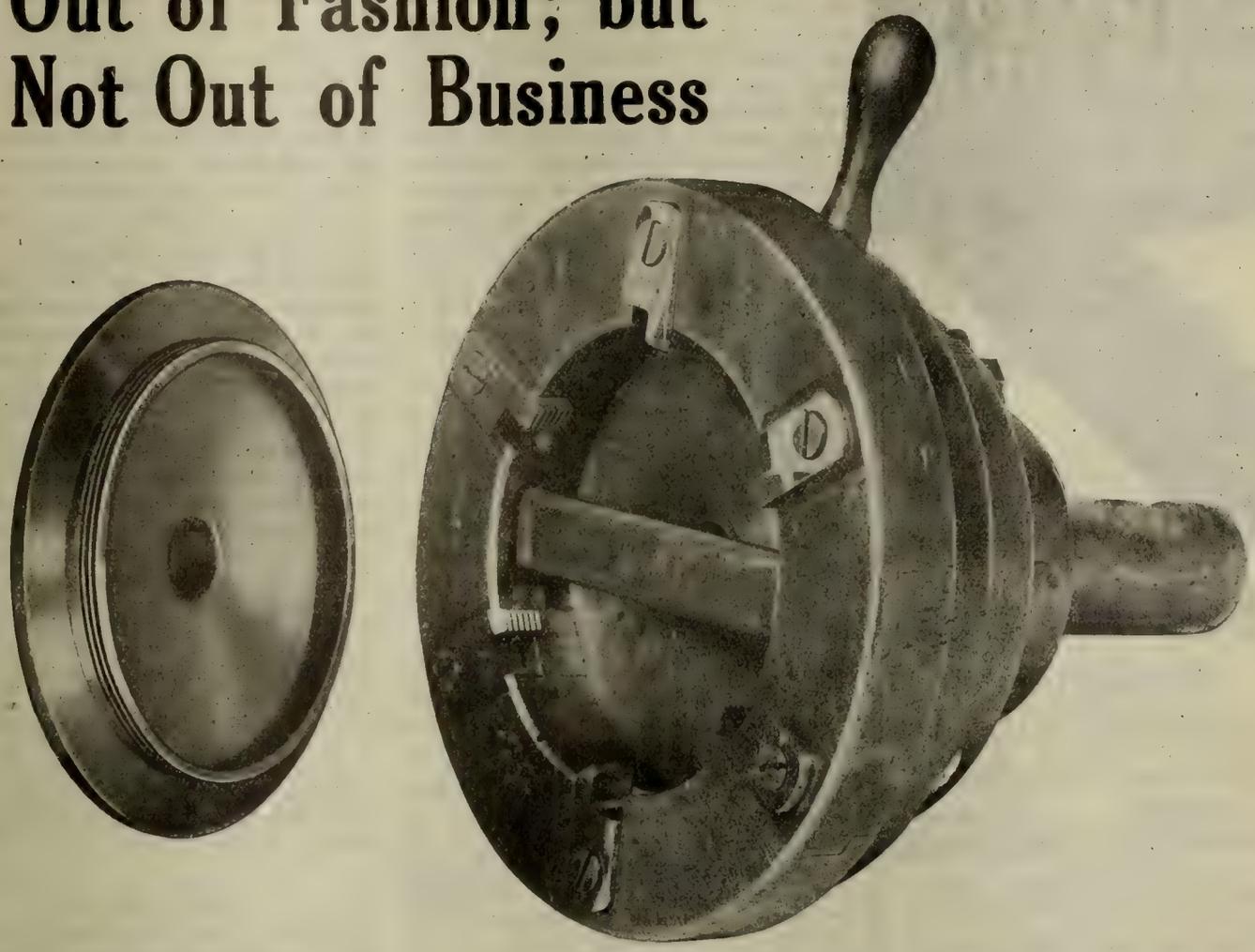
Toronto, Ont.—A new treaty between Canada and the United States regarding the amount of water each side can take from the Niagara River may be drawn up to overcome the difficulty of the serious shortage of power which is being experienced at present. The provincial Hydro-Electric Commission is contemplating the taking of action soon to stop the exporting of power from the Canadian side of the river, but even this will not make up for the shortage.

British Shipbuilding Increase.—Commenting on the rapid increase in shipbuilding to offset losses from the submarine campaign, the Cardiff, Wales, correspondent of the Exchange Telegraph Co., says that two supplements published by Lloyds Shipping Register show that between June 8 and July 17 more than 100 steamers, of which 63 are British, were added to the register. Most of these vessels are of large tonnage. The rate of construction is understood to be increasing rapidly.

U. S. Will Build Large Fleet of Steamers.—A report from Washington, D.C., states that the United States Government will build a great fleet of merchant vessels, from 10,000 to 12,000 tons, capable of attaining a speed of sixteen knots or better. Not less than 150 cargo ships, aggregating from 1,500,000 to 2,000,000 tons, will be built under the new Shipping Board plan, and not one of them will make less than 16 knots an hour, while many of them will be capable of 18 knots or more. Diesel engines will be used as far as is possible.

Halifax, N.S.—The report of Hiram Donkin, Inspector of Mines, and those associated with him in the formal investigation into the cause of the disastrous explosion at No. 2 colliery at New Waterford, N.S., on July 25, in which 65 miners and boys lost their lives has been made public. The disaster, the report says, was due to the escape of an explosive fixed to bring down coal. The explosive escaped as flame down a cleavage and out throughout the mine,

Out of Fashion; but Not Out of Business



This old "war horse" of a Geometric Die Head has been cutting Screw Threads for a Chicago concern for seventeen years. It was recently sent back to the Geometric Factory for overhauling, and has gone again to Chicago, for possibly seventeen years more of duty.

A Geometric Collapsing Tap, purchased by the same people seventeen years ago, is still cutting the inside threads to match. Can you match that?

Geometric Thread Cutting Tools of to-day can surpass it. What thread cutting method are you using? Learn the Geometric way. It is a path others have trod for the past twenty-five years. Geometric experience has smoothed the path of thread cutting for many. What will you let it do for you?

We could help you—let us.

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"HAWK"D CHROME VANADIUM STEEL

Will Give You Exceptional

Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

Hawkridge Brothers Company

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THE IRON WORKS LIMITED

Successors to Owen Sound Iron Works

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Engineers Boiler-makers Founders Machinists

Tank Work Smoke Stacks, Grey Iron and Brass Castings, Special Machinery Made to Order

carrying with it matter in a state of ignition, promoting a gas or gases and dust explosion.

Hydro Export Not to be Stopped.—It is understood that the authorities at Ottawa will not permit a complete stoppage of hydro power to the United States as authorized by the Ontario Government. The Dominion Government controls the export licenses and realizes the delicacy of the situation. It will probably be necessary for Great Britain and the United States to revise the treaty now regulating diversion of water from the Niagara river at the Falls. This would eliminate the possibility of reprisals. The U.S. is now allowed to use 20,000 cubic feet a second and Canada 36,000. The U.S. is using its full allotment, while Canada is using about 29,000 cubic feet.

Canadian Vessels in American Trade.—It is figured that Canadian vessels that have entered the trade between American ports on the Great Lakes will move more than half a million tons of ore before their charters expire late this month. The season has been brief but prosperous for Canadian traders who entered American trade. Canadian vessel-owners plan to take early advantage next season of the opportunity offered by the American Government to engage in trade between American ports. Both American and Canadian vessel-owners expect to continue operating late this season, owing to the demand for carriers to move war supplies and foodstuffs.

May Not Move Lake Ships by Welland Canal. — It is reported that the United States Shipping Board's plan to move lake tonnage through the Welland Canal to the seaboard may be abandoned owing, it is stated, to the absence of dock facilities, in which the vessels could be reconstructed after coming through the canal. It will be necessary to cut many of them into sections in order to navigate the locks of the canal. The Shipping Board has communicated with shipping officials at both Montreal and Quebec regarding dock facilities at these ports. Unless docks can be secured in Canada, it is probable that only about twenty steel tugs will be brought to the seaboard from the locks. These vessels can navigate the canal.

MARINE

Toronto, Ont. — The Toronto Ship Building Co., has been given a permit to erect a mill and mould-loft on their property at the foot of Cherry street, at a cost of $8,000.

Halifax, N.S.—The lumber laden steamer from a St. Lawrence River port, which went ashore on Amherst Island, in the Magdalens, on August 27, has been successfully floated, and arrived at Halifax under her own steam.

Ottawa, Ont.—A vote has passed in the House to appropriate $600,000 for the construction of wooden ships in British Columbia. When completed they will trade between Pacific coast ports and Atlantic coast ports.

Liverpool, N.S.—The auxiliary tern schooner Bianca, built by the Gardner Co. of this port, has been placed in commission. The new vessel is 129 feet long, 33 feet beam, and 408 tons gross. She is fitted with a 100 h.p. Fairbanks crude oil engine, and has a speed of 6¼ knots. Capt. Mark Burke, of Carbonear, is in command. The Bianca was built for Bowling Bros., of St. John's, Nfld.

Vancouver, B.C.—This port will have one of the most up-to-date docks on the Pacific Coast when the construction of the new shed at the Government wharf, tenders for which, it is said, will be called for within a few days, is completed. The building of the new shed will be effected from the $110,000 which has been apportioned a few days ago for harbor improvements, and will be 1,000 feet long by 110 feet wide. The plans call for the construction of a five-ton portal pier crane on the west side of the new shed.

Vancouver, B.C.—That Government stores and supply depots are to be soon established on the four-acre tract on Industrial Island, False Creek, Vancouver, which was apportioned to it by the Board of Harbor Commissioners has been reported to the board. One half of the site will be for the Department of Public Works and the other half for the Department of Marine and Fisheries, Government dredges, tugs and other craft will be loaded at the island in future, it is expected. The acquisition of the tract by the Government places Vancouver on a par with New Westminster and Victoria in this respect, as before the plot had been donated the Government had not a foot of land in the city on which to build a supply depot.

GENERAL

Calgary, Alta.—The Alberta Flour Mills Co. will build a large mill here, to cost approximately $1,500,000.

Montreal, Que.—The Tetrault Shoe Mfg. Co. will build a shoe factory at Maisonneuve at a cost of $150,000.

Peterborough, Ont.—A by-law granting a fixed assessment of municipal and business taxes to B. F. Ackerman, Son & Co. was carried on Thursday by a majority of 580 votes. A shoe factory will be established by the company. For some years past the company has carried on an extensive harness manufacturing business.

CONTRACTS

Oshawa, Ont.—A contract has been awarded to the Chapman Valve Mfg. Co., Toronto, for the valves required for the filtration plant being built here.

Tilsonburg, Ont.—The gentral contract for the construction of the Maple Leaf Harvester and Tool Co. factory has been let to A. F. Ponsford, Ltd., of St. Thomas, Ont. The contract price is $50,000.

Hamilton, Ont.—General contract for the Steel Company of Canada's coke oven plant to be erected here has been awarded to the Wilpute Coke Oven Corporation, New York. The cost will be about $1,500,000.

Yorkton, Sask.—The Siemens Co. of Canada, Ltd., Montreal, have been awarded a contract for a generator to be direct

connected to a Diesel engine. The generator will be 400 k.v.a., 60-cycle, 3-phase, 220 volt. A direct connected exciter is also included in the contract.

WOODWORKING

St. Mary's, Ont.—The St. Mary's Wood Specialty Co., propose installing an additional steam unit in their power plant.

Port Colborne, Ont.—Augustine & Son's planing mill was destroyed by fire recently, the loss being estimated at $10,000.

REFRIGERATION

Toronto, Ont.—Hon. F. G. Macdiarmid, Minister of Public Works, announced the other day that a beginning had been made on construction of the necessary plant at Lakes Nipissing and Nepigon for the handling of fish caught in those waters under the new fisheries plan of the province. Mr. Macdiarmid expects that fishing operations will start before the end of the present month, or as soon as the facilities for storage are completed.

INCORPORATIONS

The Murray Engines, Ltd., Vancouver, B.C., has been incorporated with a capital stock of $25,000 to manufacture machinery, tools, etc.

The Merchants' Shipbuilding Corporation, Ltd., has been incorporated with a capital stock of $500,000, and will establish a shipbuilding plant at Vancouver, B.C.

The Shaft & Tunnel Contract Co. has been incorporated at Toronto with a capital of $40,000 to carry on the business of engineers and contractors at Toronto. The provisional directors are: E. L. Middleton, T. L. Monahan, and A. E. Knox, all of Toronto.

Canadian Coil Co. has been incorporated at Toronto, with a capital of $40,000, to manufacture spark and ignition coils and electrical goods at Walkerville, Ont. The provisional directors are: C. C. Cleverdon, H. E. Westerdale, of Detroit, Mich., and J. R. Cleverdon, of Windsor, Ont.

RAILWAYS—BRIDGES

Ottawa, Ont.—The purchase by the Dominion Government of the Quebec and Saguenay Railway for the Megantic and Lotbiniere, and the Charlevoix and Montmorency Railway has been decided upon. The total cost will be $3,600,000.

CATALOGUES

Machine Tools.—Leaflet showing three types of lathe built by the Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.

Skinner Chucks is the title of catalogue and price list No. 30, recently issued by the Skinner Chuck Co., New Britain, Conn. to supersede all previous catalogues and price lists. The catalogue illustrates and describes an interesting and complete line of chucks which embody changes and improvements

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Enameling and Varnishing Ovens heated by Gas, Electricity, Steam or Coal.
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Scandinavia Belting
The Original Solid Woven Cotton Belt
IT CAN BE USED on all Direct Drives, whether straight or crossed.
On Shifters
On Hot Places
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WRITE FOR OUR FREE BELTING BOOK.
It will help you end your belting troubles.
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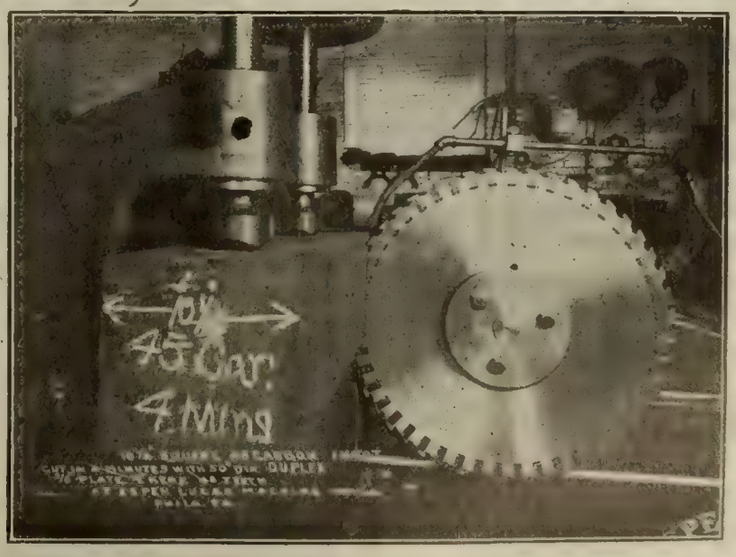

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Write for information
HUNTER SAW & MACHINE CO., Pittsburgh, Pa., U.S.A.

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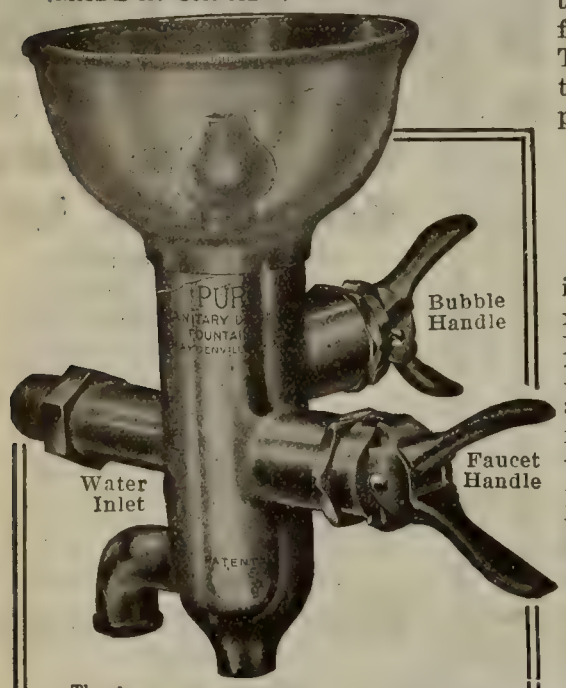
In Safety First and always.
In providing for the Health of my Fellow Workmen.
In Light and Air and sanitary Working Conditions.
In clean, fresh drinking water for everybody.
In the Safety, Economy and Man-betterment.

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)



The loss of a man through impure drinking water is a crime that "the front office" must bear.

An ugly statement, isn't it? But true, absolutely.

When a man comes to work in your factory he puts his health in your keeping.

Are you willing to take chances on such a trust?

Impure drinking conditions are responsible for more tragedies than any machine ever built.

Apply the "Safety First" Principles to your water supply; don't deny your men a clean, fresh drink of water.

Conserve their health and they will improve your profits; make yourself as worthy of the name of "employer."

Install the Gold Medal winner Puro in your plant, office and shop alike.

The only Sanitary Drinking Fountain that is safe, sanitary, simple, automatic in control and easily attached.

Let us tell you just what it will cost you to

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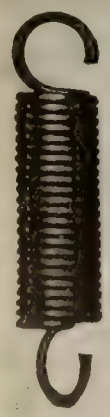
YOUR WATER SUPPLY

Puro Sanitary Drinking Fountain Company
147 University Ave., Toronto, Canada



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are the result of over sixty years' experience in spring making, combined with unsurpassed equipment and the workmanship of men who have been with us, ten, twenty and in some cases thirty years.

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Established 1857.
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Manfrs of "Barnes-made" Products
Springs, Screw Machine Products, Cold Rolled Steel and Wire

made to meet the present day requirements of the trade.

Steam Pumps.—A 90 page catalogue No. 12, issued by the Smart-Turner Machine Co., Hamilton, Ont., is devoted to steam pumps and covers only the designs and sizes ordinarily called for. The catalogue, however, deals with a varied line and includes pumps for practically all purposes. Each type is illustrated, while tables are included, giving sizes and capacities, etc. The concluding pages contain useful hydraulic tables, directions for installing and operating Smart-Turner pumps, and also directions for setting steam slide valves of the duplex pumps.

BOOK REVIEW

Blast-Furnace Construction in America, by J. E. Johnson, Jr., 415 pages, 9½ x 6 in., 247 illustrations. Published by McGraw-Hill Book Co., Inc., New York. Price $4 net. In view of the immense and ever increasing importance of the iron and steel industry, the great activity in blast-furnace work during the past three years, and the problems which still face the blast-furnace operator, a work of the nature of this volume is of very timely occurrence to the trade in particular and the engineering world in general. The author justifies his action by the fact that in nearly half a century no comprehensive book on this subject has appeared in any language. As indicated by the title, the book deals exclusively with American practice, the author acknowledging that his limited acquaintance with foreign practice did not permit him to treat such work from the personal standpoint desired. In the ten chapters which constitute the volume, the subject matter follows the lines indicated by the title, preceded by a brief introduction which clarifies the viewpoint from which the author has handled the subject. The classification of furnaces according to fuels used, and the definition of essential plant features are dealt with, following which the regular chapters take up the problems of handling material, power plants, stoves, stacks and gas plant, followed by plant auxiliaries and a discussion of the dry blast. The text is illustrated by numerous scale drawings and half tone engravings. As a book of reference the volume should be of considerable value to blast-furnace operators and equipment engineers; the question of principle, operation and products are reserved, however, for a second volume which is promised at an early date.

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MACHINE TOOLS for IRON WORKERS
Catalogues offered to Purchasers.

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1—16" x 8' Hendey Engine Lathe.
1—18" x 10' Cisco Engine Lathe.
2—LeBlond Heavy Duty 19" x 8' Engine Lathes.
1—Fay Scott Engine Lathe, 24" x 8', with extra turret.
1—LeBlond Engine Lathe, 17" x 6'.
2—Oliver 16" x 7' Double Back-geared Engine Lathes.
1—14" x 7' Niles Engine Lathe.
1—16" x 8' Butler Engine Lathe.
1—Boring Lathe for 9.2 or 12" shells.
1—Turning Lathe for 9.2 or 12" shells.
19—Jones & Lamson 3 x 36 Flat Harkness Turret Lathes.
2—No. 50 Foster Turret Lathes, 16" swing.
4—John Hall & Sons No. 4 Cutting-off Machines.
5—10" x 36" Norton Grinding Machines.
1—6" x 32" Norton Grinding Machine.
1—Wilmarth & Morman Wet Tool and Twist Drill Grinder.
1—Banfield Plug Milling Machine.
2—Otis-Fensom Bench Thread Millers.
1—Cincinnati Universal Milling Machine, No. 3.
1—Brown & Sharpe Milling Machine, No. 1B.
1—Surface Grinder.
1—Gardner Grinder, No. 4, complete with discs.
1—No. 1 Racine Rapid Hack Saw.
1—Gould Triplex Hydraulic Pump, Fig. 997, single acting, 1¼" x 6".
1—Jno. Steptoe Shaper, 20" x 24" travelling head.
1—Cincinnati Bickford Drill.
1—Holden-Morgan Marking Machine.
2—Northern Electric Co.'s Electric Soldering Irons.
1—1/15 H.P. General Electric Motor.
1—Brown-Boggs Nosing Press, No. 320.
1—Hisey Wolff Grinder, Portable Electric.
1—Dumore Grinder, Portable Electric.
8—Mech. Engr. Co. Fuel Oil Burners.
4—Mech. Engr. Co. Fuel Oil Burning Furnaces, 24" x 16".
1—Gilbert & Barker Fuel Oil Burning Furnace, 24" x 16", C-15.
6—Gilbert & Barker Fuel Oil Burners, 2".
2—Gilbert & Barker Positive Pressure Blowers, 3".
2—Canadian Buffalo Forge Co. Blowers, No. 6, 30".
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1—Circular Banding Press, suitable for 18-pdr. shells.
4—Shore Instrument Co.'s Scleroscopes.
3—Resin Pots, Simplex Electric Co.'s make.
3—Chapman Double Ball-bearing Trucks.
2—Oil Quenching Tanks, 8' long x 3' 4" wide x 2' 6" deep.
1—Bury Air Compressor, 6 x 8.
2—Brown Instrument Co.'s Pyrometers.
1—Thwing Pyrometer.
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1—International Time Clock for 200 men, with racks for tickets.
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FOR SALE — 1 LEES-BRADNER THREAD miller, equipped for threading nose and base of 6" shells. Apply The Hayes Wheel Co., Chatham, Ontario. c9m

SECOND-HAND 26" NEWTON TYPE COLD saw cutting-off machine, arranged for motor belt drive and complete, with or without motor. Price $600.00, cars Sherbrooke. MacKinnon, Holmes & Co., Limited, Sherbrooke, Quebec. c10m

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FOR SALE—THE TORONTO ELECTRIC COMmissioners have for sale a quantity of second-hand 60-cycle meters and transformers recently in service, also quantity of electrical supplies. List of material and full particulars may be obtained on application to the Purchasing Agent, 15 Wilton Avenue. The quantities are not guaranteed, and all are subject to prior sale. No tender necessarily accepted. Toronto Hydro-Electric System, 226 Yonge St., Toronto. c7m

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TOOL MAKER — ACCURATE, GOOD draughtsman desires responsible position. Box 330, Canadian Machinery. c14m

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WANTED—SMALL SECOND-HAND POWER press, in good condition. Hosmer Stamping & Die Works, Ltd., 831 Dundas St., Toronto, Ont. c13m

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4—No. 2 Foster Plain Head Screw Machines and 2—No. 3 Foster Friction Head Screw Machines all completely equipped with air cylinders and air chucks suitable for use on No. 80 Time Fuse Bodies. These machines have never been used. Also one Graduating Machine made by the American Ammunition Co.

For full particulars apply the

Holden Morgan Thread Miller Limited

Toronto, Ontario

c14m

FOR SALE

4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 13 B. & S. Automatic Gear Cutter.

1—30" Newark Automatic Gear Cutter.

1—5 x 48 Pratt & Whitney Plain Grinder.

1—No. 2 Bath Universal Grinder.

1—12 x 60 Modern Plain Grinder, new.

2—Lees-Bradner Thread Millers.

1—30 x 30 x 8' Powell Planer, new.

Brownell Machinery Co.
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FOR SALE

Equipment used for making 18-pr. Shells.

1—Warner & Swasey Turret Lathe, 2" x 24", with attachments.
1—Linderman Double Spindle Boring Machine, with attachments for finish boring shrapnel and nose turning H.E.
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1—Fosdick 16" x 6' 0" Lathe, with collet chuck and countershaft.
1—Braopose 16" x 6' 0" Lathe, collet chuck and taper attachment.
1—Goldie & McCulloch Nosing Press with Dies.
1—Beatty Accumulator.
1—Lees-Bradner Thread Miller, with attachments and countershaft.
1—Jones & Lamson Turret Lathe, 2" x 24".
1—40-gallon Bowser Tank and Pump; good as new.
1—Cold Saw, with variable speed motor, 60 cycle, 220 volt, cuts up to 9" stock, complete with three saws.
1—4-Connection Pyrometer with Rheostat, made by Taylor Instrument Co.
1—Thermo Couples, 39" long, bent 12½" from nose.
1—Thermo Couples, 39" long, straight.
1—One-Connection Tycos Pyrometer, made by Taylor Co.
1—Bertram Band Turning Attachment, for 24" Lathe, Ball-bearing Centre.

All the above located at Welland. Prices, Delivery and full particulars gladly furnished.

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c11m

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15" three-jawed chuck.
1—Lathe, 28" swing, 8' bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22" Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15" three-jawed chuck.
1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 24" wheel.
1—Lathe, 14" swing, 6' bed.
2—Ford Smith Shell Grinders, complete.
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1—16" Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
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1—Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
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1—5 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
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H. W. PETRIE of MONTREAL Limited Montreal, Que.

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New 13" x 5' Lancaster Sgl. B.G., Geared Feed.
New 15" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 15" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 15" x 7' Oliver Dbl. B.G., Q.C. Gear, Oil Pump and Pan.
New 16" x 24" x 10' South Bend Gap Sgl. B.G., Stan. Change Gears.
S.H. 17" x 8' Greaves Klusman Sgl. B.G., Geared Feed.
New, 18" x 8' Greaves Klusman Dbl. B.G., Geared Feed.
New 18" x 8' Giddings & Lewis Dbl. B.G., Geared Feed.
New 18" x 8' Stevens Sgl. B.G., Standard Change Gears.
New 18" x 8' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 18" x 10' Muller Sgl. B.G., Standard Change Gears.
New 18" x 12' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 20" x 10' Flather Sgl. B.G., Standard Change Gears.
S.H. 36" x 10' Fay & Scott Sgl. B.G., Stand. Change Gears.

HEAVY DUTY MANUFACTURING LATHES

New 20" x 8' Petrie Heavy Duty Manufacturing Lathes.

TURRET, SPEED AND BRASS LATHES SCREW MACHINES

New 13" x 7' Putman Speed Lathe.
S.H. 15" x 5' 6" Fox Brass Lathe with Chasing Attachment.
S.H. 30" x 10' Vilter Lathe, Friction B.G., Geared Feed with 18" Hex. Power Feed Turret.

DRILLS

New 20" Excelsior, Back Geared Wheel Lever, Power Feed.
New 20" Silver, Back Geared Wheel Lever Power Feed.
New 14" Leland Gifford Single Spindle Sensitive.
S.H. 14" Avey Spingle Spindle Sensitive.
S.H. 14" Foote-Burt Four.
New No. 1 Emco Bench Single.

HACK SAW MACHINES

New Peerless High Speed.
New No. 1 Rapid.

GRINDING A ND BUFFING MACHINES

New 20" Ford Smith Water Tool Grinder.
New 18" Ford Smith S.O. General Purpose Pedestal Grinder.
New 16" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. Combination Grinder and Buffer.
New 12" Ford Smith S.O. Buffing Machine.

MISCELLANEOUS

S.H. No. 22 Garvin Vertical Milling Machine.
S.H. No. 0 Burke Hand Milling Machine.
New 1¼" National Bolt Cutter with Lead Screw Attachment.
New No. 1 Grabo Metal Saw Table.
New D4 Rock River Slitting Shear.
New No. 4 Chicago Steel Bending Brake.

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H. W. PETRIE of MONTREAL
LIMITED
MONTREAL, QUEBEC

PETRIE'S LIST

Of New and Used Machine Tools Stock for IMMEDIATE DELIVERY

TURRET LATHES AND SCREW MACHINES.

15" x 5½' American, fox.
16" x 5½' MacGregor, D.B.G. (3)
16" x 6' Pratt & Whitney, turret.
20" x 7' Fay & Scott.
22" x 8' Pratt & Whitney.
24" x 10' Conradson, D.B.G.
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
2" x 24" Stevens Screw Machines (2).
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES.

13" x 6' Filsmith, D.B.G.
14" x 6' Lodge & Shipley.
15" x 8' Sebastian, back geared (2).
16" x 8' McDougall, back geared.
18" x 6" New Haven.
18" x 8' C.M.C., double back geared.
18" x 10' Putnam, back geared.
20" x 8' Fifield, back geared.
21" x 8' Bawden, heavy duty (3).
24" x 11' Pond, back geared.
30" x 10' Ames, back geared.
31" x 16' Fifield, back geared.
18" x 32" x 12' C.M.C. gap.
24" x 40" x 20' Dundas, gap.
28" x 50" x 24' Bertram, gap.

DRILLS.

13" Perfect, 2-spindle.
16" Barr, sliding head.
18" Buffalo, post drill.
20" Perfect, lever feed.
20" Silver, back geared.
22" Barnes, back geared.
24" Kerkhoff, sliding head.
40" Bickford, back geared.
46" Allfree, upright.
64" Canedy-Otto, wall radial.
No. 10a Baush, 16-spindle.
D-1 Colburn, heavy duty.

GRINDERS.

No. 1 Cincinnati, universal tool.
No. 2 Landis.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
24" Barnes, wet tool.
20" Gardner, disk.

IRON PLANERS.

20" x 20" x 5' Bertram.
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Sellers, 4 heads.
40" x 40" x 12' New Haven, power feed.

MILLING MACHINES.

Bertram, plain.
Brown & Sharpe, power feed, plain.
Van Norman, bench.
No. 2 Ford-Smith.
No. 4 Fox, universal.
No. 6 Whitney, hand feed.

SHAPERS.

16" Canada Mach. Corp.
16" Queen City, back geared.
24" Bertram, back geared.
24" Gould & Eberhardt.
30" Morton, draw cut.

MISCELLANEOUS.

6" and 12" Racine Hack Saws.
4" and 6" Robertson Hack Saws.
6" Kennedy Cutting-off Machine.
12" Hall Pipe Machine.
No. 2 Colburn Keyseater.
No. 5 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 2 Bliss Foot-power Press.
No. 3 West Tire Setter Banding Press.
No. 3 Goldie & McCulloch Banding Press.
Brown-Boggs Punching Press.
Bertram Single-end Punch and Shear..
No. 3 Dundas Double-end Punch and Shear.
7' Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

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FRONT STREET WEST, TORONTO

RIVERSIDE Machinery List

We Own Every Tool Offered

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1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—28 x 15 Putnam Standard Engine Lathe.
1—22 x 14 Putnam Standard Engine Lathe.
1—22 x 10 Reed Standard Engine Lathe.
1—22 x 8 Reed Standard Engine Lathe.
3—New 18 x 8 Springfield Engine Lathes.
1—New 16 x 8 Springfield Engine Lathe.
1—New 14 x 6 Springfield Engine Lathe.
1—18 x 6 Jones & Lamson Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—16 x 8 Porter Standard Engine Lathe.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.
1—No. 3 Hartiarge Bench Lathe.

TURRET AND SCREW MACHINES

1—24" Gisholt Turret Lathe.
2—No. 6-A Potter & Johnson Automatic Lathes.
1—2¼ x 24 Jones & Lamson Flat Turret Lathe, S.G.H.
1—2 x 24 Jones & Lamson Flat Turret Lathe, cone head.
3—No. 4 Foster F.G.H. Hand Screw Machines.
1—No. 4 Smurr & Kamon Hand Screw Machine.
1—No. 5 Pierson F.G.H. Hand Screw Machine.
4—New 14" Pierce Turret Lathes.
2—New 1 x 8 Pierce Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND GRINDERS

1—No. 2 Hendey Plain Milling Machine.
3—New No. 1½ American Plain Milling Machines.
1—No. 13½ Garvin Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling & Drilling Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
4—No. 0 Burke Bench Millers (new).
1—No. 2½ Bath Universal Grinder.
1—No. 2 Wilmarth & Morman Surface Grinder.
1—No. 3 Wilmarth & Morman Surface Grinder.
1—Mina Valley Universal Cutter Grinder.
1—No. 170 Wells Cutter Grinder.

DRILL PRESSES

1—3' Mueller Plain Radial Drill.
1—6' Mueller Plain Radial Drill, old type.
1—20" Baker H.D. Drill.
5—20" Buffalo Plain Drill Presses.
1—3-spindle 8" overhang Henry & Wright High Speed Drill.
4—6-spindle Fox High Speed Drill Presses.
2—4-spindle Fox High Speed Drill Presses.
1—16-spindle Natco Drill.
3—12" Leland & Gifford High Speed Bench Drills.

SHAPERS AND PLANERS

1—24" Ohio H.D., B.G. Crank Shaper.
1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
2—16" New Springfield B.G. Crank Shapers.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS.

1—Waterbury-Farrell O.B.I. Press, geared.
1—No. 10 Perkins Drawing Press.
5—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—50-lb. Scranton Belt Hammer.
1—25-lb. Bradley Helve Hammer.

AIR COMPRESSORS

1—16 x 16 x 12 Union Steam Pump Co., steam driven air compressor.
1—8 x 6 Westinghouse Steam Air Compressor.
1—10 x 10 Clayton Belt Driven Air Compressor.
1—8 x 8 Fairbanks-Morse Electrical Driven Air Compressor.
1—8 x 8 Gardner Single Belt Driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt Driven Air Compressor.
1—7½ x 6 Chicago Pneumatic Tool Co. Belt Driven Air Compressor.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

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Eastern Machinery & Equipment Co., Inc.

319 COMMERCIAL TRUST BUILDING PHILADELPHIA, PA.

NEW TOOLS FOR IMMEDIATE DELIVERY.

4—12" x 36" Bridgeport Grinders.
1—2½ x 2" Wm. Sellers Tool Grinder.
30—18" x 9' Turning and Boring Lathes.
3—26 x 14' Am. Patt. Eng. Lathe.
3—Double head Sullivan Grinders.
1—32" x 12' Pittsburgh Engine Lathe.
1—20" Ohio Shaper.

USED MACHINERY
ENGINE LATHES.

4—New 36" x 25' Wickes Engine Lathes, quick-change gear, double back gear.
8—30" x 10' American Gear head A-1.
5—20" x 8' Lodge & Shipley, geared head, q.c.g.
1—20" x 10' Bullard.
1—24" x 6' Bullard.
3—24" x 14' American.

TURRET LATHES.

9—18" x 6' Warner & Swasey Hexagon Turret, geared friction head.
36—Potter & Johnson 6A Automatic Turret Machines.
3—3 x 36 Jones & Lamson Flat Turret.
2—2¼" x 24" Jones & Lamson Flat Turret, bar equipment. Full set Turret Tools.
9—25" Gisholt 12" Collet chuck 6½" hole in spindle threading lathe.
3—26" Putnam heavy duty lathe.
—14" x 6' Lodge & Shipley Turret. Backgeared.
5—24" Gisholt 2-step cone, 6¼ H.S.

BORING MILLS.

1—Binsse Horizontal Boring Mill, 3" bar.
6—66" swing Bement-Miles Tire Turning Mills, two swivel heads—15½" under rail.
1—37" Baush Boring Mill, 2 heads, good as new.
1—Cylinder boring mill, capacity of 24" diam. to 96" diam. 10' long.

Tool equipment included, good as new.
1—42" Bullard Boring Mill (2) heads.

MILLING MACHINES.

1—No. 3 LeBlond Plain Miller, table 13½ x 58¼.
1—No. 2 Kempsmith, table 10' x 45".
1—24" x 8' Beaman & Smith Open Side Slab Miller, with two vertical spindles.
1—No. 1½ Universal Milling Machine.

GEAR CUTTERS.

1—24" Fellows Gear Shaper.
2—36" Fellows Gear Shapers.

SCREW CUTTING MACHINES.

1—2" Cleveland automatic.
1—No. 55 National Acme 4 spindle, good as new.
1—No. 54 National Acme 4 spindle, good as new.

SLOTTERS AND SHAPERS.

1—9" Bement Slotter.
1—12" Bement Slotter.
1—20" Wharton Slotter.
1—20" Gould & Eberhardt Shaper. B.G. Vise. C.S.
1—16" Steptoe Shaper.

GRINDERS.

8—12" x 36" Bridgeport.
1—1½" Full Universal Landis Machine.
1—No. 13 Brown & Sharpe Universal and Tool Grinder. Full equipment.
No. 1½ Universal Cutter and Reamer Grinder.
1—28" Bridgeport Face Grinder, with magnetic chuck.
5—Fisher Profile Grinders for Cutters.
1—No. 28 Brown & Sharpe Plain Grinder, 17" x 96".
5—No. 6 Std. Universal Tool & Cutter Grinders.

DRILL PRESSES.

1—24" Bickford Upright back gear sliding head lever and wheel feed drill.
1—4' Bickford Radial, with Tapping attachment, motor drive, with motor.

Power Equipment

Norwalk Compound Steam-driven Air Compressor, slide valve pattern, capacity 707 cu. ft.
McKiernan Steam-driven Cross Compound Duplex Air Compressor, capacity 425 cu. ft.
Clayton Steam-driven Cross Compound Duplex Air Compressor, capacity 425 cu. ft.
Bury Belt-driven Double Acting Air Compressor, 8" x 8", capacity 87½ cu. ft.
8" x 8" Donegan & Swift Engine.
10 H.P. White & Middleton Gas Engine.
60 H.P. Wooley Horizontal Gas Engine.
12" x 12" Ames Automatic Center Crank Engine.
15" x 14" Ames Automatic Center Crank Engine.
10" x 10" Ames Automatic Center Crank Engine.
Worthington Duplex Compound Double Action Pump, 12" x 18½" x 8½" x 10", plunger and ring type.
Buffalo Duplex Feed Pump, 12" x 7" x 12", brass fitted.
Three Worthington Duplex Pumps, 6" x 4" x 6", brass fitted.
Worthington Duplex Pump, 4½" x 2¾" x 4" automatic trap attached to pump, brass fitted.
Marsh Steam Pump, 8" x 12" x 12", brass fitted.
Dean Single Steam Pump, 6" x 4" x 6", brass fitted.
Lidgerwood Motor-driven Hoist, 42" drum, 38 H.P. General Electric Motor, D.C., 240 volts, new controllers.
Lidgerwood Double Cylinder Hoisting Engine.
Rawson & Morrison 1¼ yd. Clam Shell Bucket.
Thames 1½ yd. Clam Shell Bucket.
Raymond & Company Pug Mill.
Open Iron Tank, 6' x 10' x 4' 10", 5-16" metal.
70 H.P. Erie City Boiler Works Locomotive Boiler, 100 lb. steam pressure.
Allis-Chalmers style "K" Gates Works Rock Crusher, size 4K receiving, opening about 10" x 30", discharge 18" x 24", weight 22,000 lbs.

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OVERHEAD TRAVELING CRANES

20-Ton, 56' 3" span, three motor, 110 volts, D.C.
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10-Ton, 40' span, 80' lift, three motor.
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20-Ton hand crane, 29' 6" span.
2-Ton hand cranes, 22' span.

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Lever Shear (double), cap. 2" sq.
28" throat (single), cap. ⅞x⅞" (belt).
48" throat (single), cap. 3x1¼" (steam).
16" throat (single), cap. 1½x1½ (belt).
36" throat (single), cap. ⅞x⅞" (belt).
15" throat (single), cap. ¾x½" (hand).
10" throat (double), cap. 1½x1" (belt).
Squaring Shear, 53" cap., 14 gauge.
Angle Shear (double), cap. 6x6x¾" (belt).
Plate Shear (Univ.), 18" blade, cap. ¾".
Rotary splitting, 36" throat, cap. ½".
Rotary bevel, 5" throat, cap. ½".
Coulter & McKenzie, cap. 3x½", spring steel.
Guillotine, Perkins, No. 6, cap. 2½" sq.
Butterfly shear for light scrap.

MISCELLANEOUS.

Ajax Bolt Header and Upsetter, 2½" cap.
Acme Bolt Header and Upsetter, 1½" cap.
Bulldozer, No. 12 Ajax, 30" stroke.
Bending Roll, 6', drop end, 6½ and 8" rolls.
Lathe, 24"x10' American, latest.
Grinder, No. 10 B. & S. Plain.
Grinder, No. 13, B. & S. Universal and Tool.
Rotary Planer, 36", Cleveland No. 2.
Saw, cold, 26" blade, 48" travel.
Press (trimming) No. 11 Perkins, 16,500 lbs.
Rolling Mill, 1 stand, 2 high, 30" bet. housings.
First-class condition—quick shipments.

McCoy-Brandt Machinery Co.
Office and Warehouse:
216-218 Penn Ave., Pittsburgh, Pa.

KINDLY MENTION THIS PAPER WHEN WRITING ADVERTISERS

LOOK—HERE THEY ARE

BORING AND TURNING MACHINES—VERTICAL.

1—30" Bullard, 1 turret head.
1—30" Flather, one turret head.
1—36" Bausch, 2 swivel heads.
2—36" Brown & Sharpe, one turret head; Dec. delivery.
1—42" N.B.P., two swivel heads, motor drive.
1—New 42" Gisholt, 2 heads.
1—54" Colburn, two swivel heads.
1—72" Niles, two swivel heads.
1—72" Bickford, two swivel heads.
1—80" Niles, two swivel heads, slotting attachment.
1—84" Sellers, one head.
1—90" Vertical Cylinder.

BORING MACHINES—HORIZONTAL.

1—Lucas, 2¾" bar.
1—No. 1 Barrett Cylinder Borer, 3¾" bar type.
1—No. 2 20" Barrett, 2 facing heads.
1—24" Cleveland 2½ bar takes 4' 6", compound table.

BULLDOZERS.

1—New No. 4 Garrison (same as No. 4 Williams-White).
1—No. 7 High-speed Ajax, 16" stroke.
1—No. 9 Williams & White, belt drive.
2—No. 23 Williams & White, belt drive.
1—No. 26 Williams & White, belt drive.

COMPRESSORS—AIR.

1—Ingersoll-Sargent Duplex, 8 x 14½ x 8".
1—Cincinnati Cross Compound, two-stage, 790 cu. ft.
1—10" x 12" Chicago Pneumatic, belt-driven.
1—10" x 10" x 10" Single Cylinder Smith-Valle, steam driven.
1—22" x 13" x 16" Ingersoll-Rand, motor driven.

CRANES.

2—10-ton Electric, 47' span.
1—50-ton Nile, 51' span.
1—Locomotive, 35' boom, standard gaged, steam driven.

CUTTING-OFF MACHINES.

2—No. 00 Brown & Sharpe.
1—2" capacity Warner & Swasey.
4—3½" Hall.
10—4½" Williams.
3—4" Curtis & Curtis.

DRILLING MACHINES—RADIAL.

2—New 2' American, cone drive.
1—3' Bickford, semi-Universal table.
1—3' Bickford, gear drive.
3—New 3' Americans, sensitive tapping attach.
1—New 3' Mueller, plain speed, box drive.
1—New 3½' Western Drill, 86" circle.
2—4' Mueller, plain, speed box drive.
1—6' semi-universal American.
1—6½' American full Universal.
1—New 6' Triumph, motor drive, Sept. del.

DRILLING MACHINES—HEAVY DUTY.

4—No. 310 Baker Brothers.
2—New No. 2 Colburn.
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
2—D3 Colburn, plain table.
4—No. 310 Baker, single pulley drive, late type.

DRILLING MACHINES—MULTIPLE SPINDLE.

4—New Leland-Gifford, sensitive, four spindle.
1—No. 30C Baush, 12 spindle, capacity 1½" holes, 30" circle.
1—14-spindle Baush, capacity 1" holes, 36" circle.

GEAR-CUTTING MACHINES.

1—No. 1 Whiton.
1—No. 3 Barber-Colman Hobber.
1—No. 3 Bickett Gear Rack Planer, delivery 60 days.
1—No. 3 Brown & Sharpe Auto. Gear Cutter, Spur.
1—New 6" Standard Gear Cutter, Spur.
1—12" Gleason Bevel Gear Cutter.
1—16" Gleason Bevel Gear Planer.
1—16" Bilgram Bevel Gear Generator.
1—20" Grant-Lee Gear Hobber.
1—No. 1 20" Schuchardt & Schutte Gear Hobber.
1—22 x 8 G. & E. Spur and Bevel Cutter.
1—24" Fellows Gear Shaper.
1—24 x 8" G. & E. for Spur and Bevel.
1—24" Becker Brainard.
1—New Flather, solid pattern, 30" Automatic Gear Cutter.
1—New No. 10 Whiton, Bevel 32", Spur 34".
3—36" Fellows Gear Shapers.

GRINDERS—UNIVERSAL FOR CUTTERS, DRILLS, REAMERS, ETC.

1—No. 1 Cincinnati.
1—New Norton No. 1.
1—New Walker No. 1, outfit B.
1—New Walker No. 2, outfit K (capacity 9" x 26").
1—New Wilmarth & Morman, style B.K.
8—No. 190 Wells.
1—Gisholt No. 5, 12".

GRINDING MACHINES—CYLINDRICAL—PLAIN.

1—New No. 12 Brown & Sharpe, 8" x 26", Sept. delivery.
1—New 10 x 36" Landis; immediate.
1—New 10" x 36" Norton, Sept. delivery.
1—New 10" x 50" Norton, Sept. delivery.
1—10" x 60" Landis.
1—New 10 x 72 Norton, Plain.
20—12" x 24" Modern, self-contained.
1—12" x 32" Landis, rebuilt.
6—12" x 36" Modern, self-contained, motor or belt driven.
2—12 x 42" Landis, self-contained.
6—12" x 48" Modern, self-contained, motor driven.
1—16" x 66" Landis, with crank grinding.
1—18" x 96" Brown & Sharpe.

GRINDING MACHINES—CYLINDRICAL—UNIVERSAL.

1—Brown & Sharpe No. 13, 8" x 24".
1—New No. 2 Bath, 9" x 20".
1—No. 2 New Walker, 9" x 26".
1—No. 1½ (10" x 30") Landis.
1—New No. 2½ (10" x 36") Bath.
1—10" x 42" Modern.
9—New No. 2 Morse, cap. 12" x 30", Universal, Nov. delivery.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis.
2—New No. 3 Modern, 13" x 40", Sept. delivery.

GRINDERS—INTERNAL.

1—No. 1½ Landis.
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—CYLINDER.

1—No. 27 Brown & Sharpe.
1—No. 60 Heald, single pulley drive.

GRINDERS—PROFILE.

1—New Cleveland.

GRINDERS—RING.

1—New No. 14 Beasley, two-ring chucks.
1—No. 200 Heald.
1—No. 210 Heald.

GRINDERS—SURFACE.

1—New No. 1 Wilmarth & Morman.
1—No. 1 Diamond, capacity 12" x 12" x 24", automatic.
2—New No. 1½ Walker's, complete.
4—New No. 2 Reid (same as B. & S.).
1—New No. 2 Brown & Sharpe.

HAMMERS—POWER—FORGING.

1—40-lb. Bradley Helve.
1—150-lb. Bradley Helve, upright.

HAMMERS—BOARD LIFT—DROP.

1—400-lb. Billings & Spencer.
1—2,000-lb. Chambersburg.

HAMMERS—STEAM—FORGING.

1—Used 600-lb. Niles Single Frame.
1—350-lb. Bell Single Frame Hammer.
1—18" Morgan & Williams, 600 to 800 lbs., 21" cap.
1—New 2,000 lbs. Morgan Single Frame.
1—3,000 lbs. Morgan Double Frame.

KEYSEATERS.

2—No. 0 Mitts & Merrill.
1—No. 2 Mitts & Merrill.
1—60" stroke Compton Knowles Broacher.

LATHES—MANUFACTURING—NOT SCREW CUTTING.

2—New No. 3 Harding Brothers Bench Lathes.
14—Reed-Prentice Shell Lathes, for 4" or 18 lbs. American shells.
70—New Simplex, 16" x 8'.
13—No. 3X Reed-Prentice, semi-automatic.
40—14" x 6' Reed Stud and Bolt.
5—16" x 8' Fairbanks-Morse, heavy duty.
14—16 x 8 Simplex, Single Pulley Drive.
22—18" x 8' Battle Creek, heavy duty.
5—20" x 8' Merschon.
50—20" x 10' Hindman, high duty.

LATHES—ENGINE.

1—8" Wade Precision; September delivery.
1—14" x 6' Bradford, taper attachment.
1—New Harding Brothers 15" Precision Lathe, quick-change gear, page 35, third catalogue.
3—New 16" x 6' Cleveland Tool Room Lathes, complete equipment.
2—16" x 6' LeBlond, pan bed, quick-change gears, taper attachment.
1—New 17" x 8' National, quick-change gears.
1—18" x 8' Lodge & Shipley, geared head, taper.
3—18" x 9' Chard.
1—18 x 10 Hendey, quick-change gear, 14" chuck.
1—New 19" x 8' LeBlond, heavy duty.
22—20" x 8' Lodge & Shipley, quick-change gear.
7—New 20" x 8' American, heavy duty.
1—New 20" x 10' Cleveland, geared head.
25—New 21" x 10' Porter, single back geared.
5—New 22 x 10' Monarch, double back geared, Q.C.G.
9—22" x 10' Putnam, oil pan turrets.
3—24" x 10' Reed.
2—24" x 12' S. & B.
4—24" x 14' American, quick-change.
1—24" x 14' Lodge & Shipley, patent head.
1—24" x 24' Perkins, single back geared, raising blocks to 40", 18" chuck.
1—24" x 45" x 22' McCabe, double spindle.
1—26" x 24' New Haven.
4—27" x 14' Patent Head Lodge & Shipley, double back geared.
1—28" x 18' New Haven, single back geared.
1—28" x 18' Schumacher & Boye.
1—New 30" x 14' American, Double Back Geared, Quick Change.
3—New 32" x 12' Pittsburg pattern.
8—New 36" x 24' Putnam, triple geared.
1—50" x 12' American, Gear Head, Quick Change.
1—71" x 20' Fifield, triple geared.

LATHES—TURRET.

1—3" x 36" Jones & Lamson, geared sliding head.
5—2 x 24 Jones & Lamson.
18—6A Potter & Johnson.
1—New 21" Gisholt.
1—New 24" Gisholt.
1—24" Sibley.

MILLING MACHINES—KNEE TYPE—UNIVERSAL.

1—No. 2 Kempsmith, 13", dividing head.
1—No. 2 Kempsmith, vertical attachment.
1—New Kempsmith.
1—No. 2 Kempsmith, back geared.
2—No. 3 Cincinnati, late model; almost new.
1—New No. 3 Kempsmith.
2—New No. 3 Becker, August delivery.
1—New No. 4 LeBlond, heavy duty; immediate.

MILLING MACHINES—KNEE TYPE—PLAIN.

1—No. 0 Pratt & Whitney.
1—New No. 1 Brown & Sharpe.
2—New No. 1 Kempsmith.
2—New No. 1½ American, back gear.
1—New No. 2 Rockford.
2—New No. 3 Kempsmith.
1—No. 3 LeBlond.
1—No. 4 Brown & Sharpe.
1—No. 4 Garvin.

MILLING MACHINES—VERTICAL.

1—New Bickett, No. 0.
4—New No. 4B Becker.
2—No. 5 Becker.

MILLING MACHINES—PLANER TYPE.

1—Ingersoll Slab 16" x 48" cap.
1—Bement-Miles heavy duty planer type 20"x24"x12'.
1—No. 2 Beaman & Smith Vertical Spindle Open-side.
2—Ingersoll Slab Millers, working surface of table 60" x 20".
1—No. 4 Beaman & Smith, vertical spindle, open side, working surface of table 120" x 24", removable housing on one side.

PLANERS.

1—24" x 24" x 6' Gray, one head on cross rail.
1—24" x 24" x 8' Cincinnati, one head; used three months.
1—26" x 26" x 8' Gray, one head on cross rail.
1—30" x 30" x 8' Gale Planer, one head.
1—30" x 30" x 12' Cincinnati, two heads.
1—36" x 30" x 12' New Haven, one head.
New 36" x 36" x 12' Bickett, one head; January delivery; additional heads if desired.
2—New 36" x 36" x 12' Woodward & Powell, two heads on cross rail, one side head; Oct. delivery.
1—36" x 36" x 12' Gray, two heads.
1—36" x 36" x 14' Sellers, four heads.
1—40" x 40" x 11' Niles, four heads.
1—Gray, 42", widened to 56" x 42" x 16, two heads.
1—44" x 44" x 10' L. W. Pond, swivel heads.
New 48" x 42" x 16' Bickett one head, January delivery. Additional heads if desired.
1—50" x 14' Powell, on head.
1—52" x 52" x 16' Betts, two heads, right angle drive.
1—54" x 42" x 16' Woodward-Powell, 2 heads.
56" x 42" x 16' Graves, two heads.
1—32' 6 Niles Plate Planer.

SCREW MACHINES—AUTOMATIC.

3—No. 51 National Acme.
1—No. 515 National Acme.
2—No. 52 National Acme.
2—No. 53 National Acme.

SHAPERS.

1—New 16" Springfield.
1—16" Motor-driven Rockford.
2—New 24" Milwaukee.
1—New Barker, 24".
2—25" Smith & Mills Back Geared.
1—28" Smith & Mills Triple Geared.
1—30" Walcott Gear Drive.

SLOTTERS.

1—12" Bement Gear.
1—New 12" Betts Belt Driven.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 549 Washington Blvd. **CINCINNATI, OHIO** 1018 Union Central Life Bldg. **CLEVELAND, OHIO** 508 Leader News Bldg. **NEW YORK CITY** Singer Bldg.

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IMMEDIATE DELIVERY

DRILLING MACHINES

Leland H.S., B.B., bench type.
No. 1½ Knight Driller and Miller.
32" Hamilton, s.h., b.g., p.f.
32" W. F. & J. Barnes, s.h., b.g., p.f.
20" W. F. & J. Barnes, 4 spindle.
No. 11 P. & W. Multiple, 10 spindles.
3' W. E. Gang Plain Radial.
3½' W. E. Gang Plain Radial.
4' Mueller Plain Radial.
Pawling & Harnischfeger Horizontal Driller.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. automatic.
30" x 9" G. & E. auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3—26" B. & S. for spur.
36" Walcott for spur.

GRINDERS

Yankee Drill.
No. 1-½ Cincinnati Cutter and Tool.
No. 2 Woods Universal Cutter and Tool.
No. 23 B. & S. Gear Cutter.
No. 1 Brown & Sharpe Universal.
14" x 20" B. & S. Plain.
Garvin hole grinder.
Gisholt tool grinder.
No. 5 Diamond water tool.
No. 16 Gardner disc grinder.
No. 24 Gardner disc grinder.

LATHES

13" x 5' P. & W., c.r., taper.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
18" x 8' L. & S. pat. head, c.r. taper.
18" x 10' Fitchburg, c.r.
18" x 12' Barker, c.r.
20" x 14' Blaisdall, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
36" x 20' American, t.b.g.
36" x 22' New Haven, t.b.g.

PLANERS

24" x 24" x 4' Gray, one head.
24" x 24" x 8' Cincinnati, one head.
26" x 26" x 8' Pease, one head.
30" x 30" x 8' Woodward & Powell, one head.
30" x 30" x 8' Cincinnati, two heads.
36" x 36" x 14' Sellers, one head.
40" x 38" x 14' Putnam, one head.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES

No. 1 Foster, Plain, A.C. and W.F.
1" B. & S. Plain.
16" P. & W. Plain.
No. 2 Costello, plain head.
No. 2 P. & W. friction head.
No. 4 Pearson, geared head.
No. 3 Bardons & Oliver, plain head.
⅞" Cleveland, automatic.

TURRET LATHES

No. 22 Garvin.
16" Lodge & Shipley.
25' Niles.
2 x 24" Jones & Lamson.
3 x 36" Jones & Lamson, chucking equipment.
3 x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt turret lathes, taper attachment.

PUNCHES AND SHEARS

No. 3 American Can.
No. 3 Bauroth, O.B.I.
No. 5 Bauroth Geared, O.B.I.
No. 6 N. American Can.
No. 2 L. & A. Angle Iron Shears, 5"x5"x½" (new).
No. 5 L. & A. Double Punch & Shear, ⅝"x⅝", 3"x⅝", 1⅛ rd. (new).
No. 1 L. & A. Multiple Punch (new).
No. 1 L. & A. Horizontal Punch, ½" in 1" (new).

MISCELLANEOUS

No. 0 Mitts & Merrill Keyseater.
50-lb. Bradley Strap Hammer.
¾" Acme Forging Machine.
52" Niles car wheel boring mill.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-ton Yale Duplex Hoist.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., CHICAGO, ILL.

For Quick Sale

PLANERS.

50" x 50" x 18' NEW HAVEN, two heads on cross rail, one extension head.

36 x 36 x 14' POND, two heads.

36 x 36 x 12' GRAY Planer.

30 x 30 x 8' CINCINNATI, two heads.

30 x 30 x 8' OHIO, one head.

24 x 24 x 6' LODGE & DAVIS.

36 x 36 x 12' DETRICK & HARVEY Open Side Planer, one head on cross rail, one side head.

LATHES.

New 24" STEINLE, turret chucking equipment.

New 36" x 24' BRADFORD, triple geared.

38" x 14' FAY & SCOTT, triple geared, quick-change gear.

40" x 18' PITTSBURGH, triple geared, quick change.

36" x 22' NEW HAVEN, triple geared.

MISCELLANEOUS.

84" BICKFORD Vertical Boring Mill, two swivel heads.

42" NILES Boring Mill, single pulley drive, two swivel heads.

No. 3 ROCHESTER Horizontal Boring, Drilling and Milling Machine, 3½" bar.

New NATCO Multiple Spindle Drill, eight 1¼" spindles.

2—48" x 10" GOULD & EBERHARDT Automatic Gear Cutters, practically new.

No. 2 LAPOINTE Broaching Machine.

New No. 3H LEBLOND Universal Miller, heavy duty, cone type.

New No. 2H LEBLOND Universal Miller, heavy duty, cone type.

New GOULD & EBERHARDT Continuous Vertical Milling Machine.

A. R. WILLIAMS MACHINERY CO., LIMITED
64 Front Street West **Toronto, Ontario**

Machinery, Bar Stock, Twist Drills, Dies & Taps For Sale

MACHINE TOOLS.

5—Rickert-Shafer Vertical Tapping Machines (used).
1—Power Hack Saw (used).
1—No. 1 Sheldons Exhauster.
1—Stewart Gas Furnace (used).
1—No. 200 Oil Extractor (new).
6—No. 4 Smurr & Kamen Screw Machines, Auto. Chuck, W.F., B.G. (used).

BAR STOCK.

33,000 lbs. 1⅜" Round C.D. Screw Stock.
1,500 lbs. ¼" Round C.D. Screw Stock.

TWIST DRILLS (Straight Shank)

48—13/16" Left-hand, high speed steel.
18—21/32" Right hand, high speed steel.
36—41/64" Left hand, high speed steel.
12—17/32" Right hand, high speed steel.
108—33/64" Right hand, high speed steel.
84—33/64" Right hand, carbon steel.
191—13/32" Right hand, carbon steel.
59—¼" Left hand, carbon steel.
36—B Right hand, carbon steel.
71—No. 1 Left hand, carbon steel.
48—No. 4 Right hand, carbon steel.
161—No. 6 Right hand, high speed steel.
61—No. 25 Left hand, carbon steel.
50—No. 26 Right hand, high speed steel.
200—No. 27 Right hand, carbon steel.
240—No. 45 Right hand, high speed steel.

DIES AND TAPS.

13—No. 5B Modern Opening Dies (used).
16—Set 1.998"-14 Whitworth Chasers for above heads (new).
4—No. 4B Modern Opening Dies (used).
12—Set 1⅜"-14 Whitworth Chasers for above.
10—No. 4 Manufacturers Equipment Co. Collapsible Taps (used).
15—Set 1.378"-14 Whitworth Chasers for above taps.

The Packard Fuse Co., Ltd.
St. Catharines, Ont. c 13m

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MACHINE TOOLS

THE LARGEST STOCK OF GOOD TOOLS IN THIS COUNTRY

300 MACHINES LATEST MODELS--OVER 300 OTHERS BUT SLIGHTLY OLDER

90% of these machines are very latest models and can be inspected at our plant at Chicago. Photo taken Aug. 25.

ENGINE LATHES—Latest Models.

24—22" x 8' Hamilton, D.B.G., C.R., Semi-Q.C.
5—22" x 8' Hamilton, D.B.G., Turret tool post,
4—22" x 8' Davenport, D.B.G., Turret tool post,
7—22" x 10' Hamilton, D.B.G., C.R., Semi-Q.C.G.,
2—22" x 10' Hamilton, D. B. G., turret tool post, Semi-Q.C.G.,
20—22" x 10' Davis, D.B.G., C.R., Q.C.G.,
6—24" x 10' Lodge & Shipley, D.B.G., C.R., Q.C.G.,
8—24" x 10' Lodge & Shipley, Selective Gd. Hd., C.R., Q.C.G.,
11—26" x 10' American, D.B.G., C.R., and carriage turret, Q.C.G.,
2—26" x 10' American, D.B.G., Carriage turret,
19—26" x 12' Putnam, carriage turret. semi-Q.C.
9—26" x 12' Putnam, C.R., Semi-Q.C.,
2—26" x 12' Wickes, D.B.G., C.R., Semi-Q.C.G.,
10—28" x 10' Niles, Bement, Pond, D.B.G., Q.C.G.
4—28" x 14' Lodge & Shipley, Select. Gd. Hd., motor drive, C.R., turret and taper.
3—30" x 16' Lodge & Shipley, D.B.G., C.R., turret and taper,
10—40" x 18' Pittsburgh, triple geared, Q.C.G.,

TURRET MACHINES—Latest Models.

18—21" Gisholts, 3½" hole, 2-step, 5" belt.
25—21" Gisholts, 3½" hole, for motor.
13—24" Gisholts, 4¼" hole, 3-step, 4" belt.
38—24" Gisholts, 6" hole, 2-step, 6" belt.
37—24" Gisholts, 6" hole for motor.
2—2¼" x 26" Greenlee Flat Turrets.
2—2½" x 26" Pratt & Whitney Gd. Hd. Turrets.
4—3-A Warner & Swasey (bar machines).

OUR GUARANTEE

Your money back if you return a machine within 30 days from date of shipment, freight prepaid.

NO EXCUSES NECESSARY.

PRESSES.

1—No. 30 Perkins Inclinable.
1—No. 5 Niagara Inclinable.
1—No. 5 Consolidated Inclinable.
1—No. 20-U Ryerson Punch.
1—Trimming Press.
2—No. 73½ Niagara Trimming Presses.
1—No. 23½-B Niagara Toggle Press.
1—No. 17 Williams & White Double End Punch.

GEAR CUTTERS.

1—Schuchardt & Schutte Spiral.
1—No. 12 Brown & Sharpe Spur and Bevel.
1—No. 13 Brown & Sharpe Spur and Bevel.
1—24" Fellows Shaper.
2—No. 3 26" Cincinnati Spur.
1—36" Fellows Shaper.
1—36" Gleason Spur and Bevel Gear Former.
1—84"-96" Gleason Spur and Bevel.

MILLING MACHINES

2—No. 5 Brainard.
1—No. 3 Brainard Plain.
1—No. 20 Oesterlein Universal.
1—No. 1½ Brown & Sharpe Universal.
1—No. 25 Becker Plain.
1—No. 2 Cincinnati Universal.
1—No. 5 Schuchardt & Schutte Plain.
4—No. 2 Pratt & Whitney Lincoln.
1—60" x 48" x 8' Ingersoll Slab.
1—Beaman & Smith, 2 vert. hds., 1 hor. cross bor. hd.
1—No. 2 Beaman & Smith Combination Hor. and Vert.

PLANERS

1—22" x 22" x 5' Flather.
1—22" x 22" x 6' American.
1—24" x 24" x 4' Gray.
2—24" x 24" x 5' Gray.
1—24" x 24" x 6' Cincinnati.
1—24" x 24" x 10' Lodge & Davis.
1—26" x 26" x 6' American.
1—26" x 26" x 7' Gray.
1—26" x 26" x 7' Gray, 1 head.
1—30" x 30" x 7' Powell, 4 heads.
1—32" x 32" x 8' Gray, 2 heads.
1—32" x 32" x 10' Gray, 2 heads.
1—48" x 48" x 16' Pond, 2 heads.

HILL, CLARKE & CO. OF CHICAGO

625 WASHINGTON BLVD., CHICAGO, ILL.

If any advertisement interests you, tear it out now and place with letters to be answered.

STEEL BUILDING CRANES

STEEL Building or Coal Shed, 108 ft. by 298 ft., maximum height 40 ft., containing approximately 450 tons of structural steel.

Two Brown Patent Bridge Tramways, hoisting and conveying apparatuses consisting of a bridge tramway with tracks permitting a movement of 300 ft., distance between movable piers 180 ft., with end cantilevers 92 ft. and 36 ft. Each bridge has in its house, Brown Patent Hoisting Engine with the most modern operating mechanism, together with all necessary fittings and connections for complete operation, together with six Brown Patent Automatic Self-Dumping Coal Tubs of 42 cu. ft. capacity; two single rope buckets of 48 cu. ft. capacity; four skips of 2 ton capacity; and also automatic clam shell bucket. Both these outfits are practically in new condition.

New York Machinery Exchange, Inc.

50 Church Street . . . New York City

List of Machinery in Stock for Sale

PRESSES

28—No. 180 Brown & Boggs, Dial Feed. Without Dial Feed.
6—No. 190 Brown & Boggs, with Dial Feed.
3—No. 1 Toledo, with Dial Feed.
2—No. 01 V. & O. Presses with Roll Feed.
1—No. 18 Perkins Press, Plain.
2—No. 31C McDonald Double Acting Can Press with Magnet Stock Lifter and Auto. Feed.
1—No. 216B Niagara Tool Works Co. Slitting Machine.

FOR 60-PDR. SHELLS

2—Holden & Morgan Thread Millers for base end.
1—Bertram Duplex Thread Miller for nose end.
1—Bertram Copper Band Lathe.
1—Perrin Band Press with Pump.
1—Base Plug Twister (home made).
1—Roll Riveter (home made).
1—5" Shell Vise (home made).
1—5" Marking Head (home made).
1—5" Hand Tapping Vise home made).
1—Waterous Special Rough Turning and Cutting-off Lathe.
1—Jenckes Band Turner.

MISCELLANEOUS

4—Errington Collapsible Taps, 2". Chasers for above.
1—1¼" Automatic Hartford Screw Machine; in first-class condition.
1—Noble & Westbrooke Marking Machine, only used to mark 200,000 gaines; good as new.
1—P. & W. ⅝" Screw Machine.

FOR 6" SHELLS

3—500-lb. Beaudry Champion Hammers.
4—Sets 6" Shell Nosing Dies for above.
2—De Vilbiss Varnish Sprayers 1 quart size). Transformer set for above.
1—No. 3 West Banding Press for 6" shell.
4—Greensboro Turret, 24".

All the above are in good condition

McKinnon Dash Company
St. Catharines, Ont.

c11m

SURPLUS MACHINERY FOR SALE

2—3" Hall cut-off machines
1—Lodge & Shipley Turret Lathe, 22" x 10'
1—Lodge & Shipley Turret Lathe, 24" x 10'
2—Libby Turret Lathes, 18"
1—Gisholt Turret Lathe, 18"
2—Gisholt Turret Lathes, 21"
1—Gardner Shell Base Grinder, 4A
1—Ford-Smith Grinder, 20"
2—Landis Traverse Grinders, No. 4 and 12 x 66
1—Symington Band Turn Lathe, 3"
1—3" Stamping Machine
2—Tate-Jones Shell Furnaces
1—16' Rushwarth Plate Planer
1—16' Bertram Plate Planer
1—Coping Machine

Polson Iron Works, Ltd.
TORONTO, ONTARIO

"New York's Greatest Clearing House—New York's Lowest Prices—J. J. McCabe"

You cannot get anything better—

For Immediate Shipment

NEW LATHES

2—16 x 6 Quick Change
2—16 x 8 Quick Change
8—18 x 8 Quick Change
9—18 x 10 Quick Change
12—18 x 12 Quick Change
7—21 x 10 Quick Change
4—21 x 10 Quick Change
1—24 x 10 Semi-Quick Change
8—24 x 12 Semi-Quick Change
1—24 x 14 Semi-Quick Change
2—24 x 16 Semi-Quick Change
2—26 x 14 Quick Change
1—26 x 16 Quick Change
4—26-48 x 12 McCabe Dble. Spdl.
1—26-48 x 16 McCabe Dble. Spdl.
1—26-48 x 22 McCabe Dble. Spdl.

NEW SHAPERS

4—12-in. Plain.
2—16-in. Plain
2—16-in. Back Geared
2—20-in. Back Geared
3—25-in. Back Geared
1—28-in. Back Geared
2—32-in. Back Geared

NEW RADIAL DRILLS

4—2½-ft. Arm Speed Box
2—3½-ft. Arm Speed Box
3—4-ft. Arm Speed Box

USED LATHES

16" x 6-ft. Reed
18" x 6-ft. Seneca Falls (For Tool Room)
18" x 8-ft. LeBlond
18" x 10-ft. Porter
20" x 14-ft. Hamilton, Quick Change
24" x 15-ft. Bement
26" x 15-ft. Ridgeford Dble. Axle
32" x 12-ft. Schumacher & Boye
36" x 16-ft. Putnam
37" x 21-ft. Putnam
48" Pulley Lathe, Dble. Tool, Niles
52" x 11-ft. Putnam
102" x 30-ft. Bement

TURRET LATHES

2 x 24 Jones & Lamson—Sliding Head
20" Swing, Potter & Johnston
21" Swing, Gisholt—Gap Style
40" Swing, American—3¾" Hollow Spdl.

The Largest Slotter ON THE MARKET

AWAITS YOUR CRITICAL INSPECTION

Heavy Standard Pattern Thoroughly Accurate Powerful and Convenient Machine

120" Stroke, Double Head, Maximum Stroke of carriage up and down of 120". Cross movement of heads on Cross Rail about 5 ft. Main feed forward and backward is by movement of entire column. This is provided not only with a power feed, but also with quick return. Auxiliary Base Plate, 14 x 20 ft. This machine is still set up in a prominent plant that used it on large steam engine work in the way of vertical planing, keyseating, slotting, etc.

Great Big LATHE

Bement (Philadelphia) Standard Heavy Pattern Triple-Geared Engine Lathe

102" Swing, 30-ft. Bed, with Internal Geared Face Plate, Compound Rest, Power Cross Feed, C-Shaft and full regular equipment, in good running condition, adapted for the heaviest classes of work. (Handling a 20-ton Crank Shaft is one of the last jobs done on the Lathe.)

PLANERS

120" Stroke Combination Planer and Slotter—Bed Plate 14 x 20'
62" x 62" x 9-ft. Bement—3 Hds.
36" x 36" x 8-ft. Whitcomb—1 Hd.
30" x 30" x 6-ft. Pond—1 Hd.
24" x 24" x 6-ft. Gray—1 Hd.

SLOTTERS

30" Stroke, Baker Bros. Slotter and Keyseater
12" Stroke, Bement
10" Stroke, Newton

PLANER TYPE MILLERS

24" x 12-ft. Horiz. Spdl., Bement-Miles
24" x 8-ft. Horiz. Spdl., Bement-Miles

SHAPERS

12" Stroke Sellers Travelling Head
16" Stroke Cincinnati, Back-grd.
20" Stroke Gould & Eberhardt Bk.-grd.
24" Stroke Gould & Eberhardt Bk.-grd.

VERTICAL BORING MILLS

10-ft. SWG. Sellers Dble. hd.
3-ft. SWG. Brown & Sharpe—turret hd.

RADIAL & MULTIPLE DRILLS

2-2½-ft. Dreses—Simplex
3½-ft. Bement—Heavy
5-ft. Niles—Half Universal
6-ft. Pond—Heavy Pattern
8 Spindle Baush Speed Box
18 Spindle Baush Speed Box

STEAM HAMMERS

2500 lb. Bement-Miles Single
250 lb. Bell Single

DROP HAMMERS

1200 lb. Miner & Peck
900 lb. Williams & White

OTHER TOOLS

Baker No. 2 Keyseater, 20" Stroke
10" Bement-Miles Dble. End Cutting-off Machines
6" Espen Lucas Cold Saw
36" Fellows Gear Shaper

LINCOLN TYPE MILLING MACHINES

J. J. McCABE—149 Broadway—NEW YORK

If any advertisement interests you, tear it out now and place with letters to be answered.

4.5 H.E. Shell Plant FOR SALE

We offer the following Used Machinery and Equipment, subject to prior sale:

2—Hall Cutting-off Machines.
1—24″ x 8′ Bertram Engine Lathes, B.G., with plain saddle and tool post and arbor for rough turning.
1—20″ x 16′ Bertram Engine Lathe, B.G., with two head stocks, plain saddles with tool posts and arbors for rough turning.
1—20″ x 10′ Bertram Engine Lathe, B.G., with 3-jaw scroll chuck and Bertram waving attachment. Tooled for Mark VII. wave rib.
1—18″ x 12′ Engine Lathe, B.G., with 3-jaw scroll chuck and Bertram waving attachment. Tooled for Mark VII. wave rib.
1—Newton 2-spindle Boring Machine, fitted with tool holders and chucks for boring fuse hole.
1—Brown, Boggs Marking Machine, converted for finished tapping fuse hole, with tap holder and sliding chuck.
1—Special 3-spindle Finished Turning Machine, complete with tool holders and profile cam.
1—18″ x 6′ Draper Engine Lathe, with split chuck and steady rest. Equipped with boring bar for inside profile.
1—Holden-Morgan Thread Milling Machine for Base Recess Thread, with attachment for threading base plates.
3—18″ Single Drive Head Stocks, with hinged chucks, suitable for repair work on shells.
1—18″ Single Drive Head Stock, with 3-jaw scroll chuck, steady rest and saddle. Suitable for correcting weight, etc.
1—3-Spindle Drill Press for Drills No. 0 to ¼″.
1—Steel Ring Banding Press, complete with Lymburner belt-driven power pump, tank, piping and valves.
1—Copper Band Turning Machine, with friction clutch on countershaft. Tooled for Mark VII. band.
1—7-hole Tate-Jones Nose Heating Furnace, oil fired. Equipped with high and low pressure burner. Complete with Root L.P. blower and piping.
1—80-shell capacity Varnish Baking Oven.
1—Fixture for Nicking Nose.
1—Single Spindle, Motor-driven Paint Table, 250 volts, D.C.
1—Single Spindle, Motor-driven Varnish Table, 250 volts, D.C.
1—Paasche Air Varnishing Outfit.
4—4-Jaw Screwed Ring Type Chucks, with babbitted steady rests.
2—4-Jaw Hand-operated Draw Chucks, with steady rests.
5—Hinged Vices, for hand tapping or rivetting base.
1—3-Jaw Scroll Chuck, with extension and steady rest.
4—Finished Turning Profile Attachments.
22—Drip Pans with 18″ legs and C.I. settling tanks.
2—38 lbs. capacity Fairbanks Scales, with weights.
Assorted Gauges, Boring Bars, Tool Holder Sets.

READY FOR SHIPMENT. CAN BE EXAMINED AT ANY TIME AT OUR PLANT.

JENKINS BROS., LIMITED

103 ST. REMI STREET MONTREAL, QUE.

SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

GEARS

HAMILTON

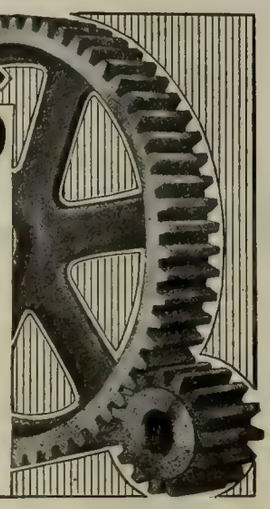
GEAR & MACHINE CO.

Cor. Concord & Van Horne

TORONTO

The only real Gear Shop in Canada for specialized work in a large range of sizes.

CUT GEARS



Rawhide — Steel — Brass — Cast Iron

Try our W-G Rawhide Silent Gear. Designers and Builders of Special Machinery.

Winnipeg Gear & Engineering Co.
197-199 Princess St., Winnipeg, Man.

TORONTO TOOL CO. TORONTO TOOL CO.

SPECIAL TOOLS

Gauges Taps Jigs

AUTOMATIC MACHINERY FOR MUNITIONS

4.5 Mark VII Shell Milling Machines

TORONTO TOOL CO.
TORONTO, ONT.

516 Richmond St. West Phone A. 1181

We Make GAUGES and TOOLS

All Work Executed Promptly and Guaranteed

THE MONARCH BRASS MFG.
COMPANY, LIMITED

71 BROWNS AVE. - - TORONTO, ONT.

TYPE E-4

Two G. & B. Furnaces

from a stock of over 100 types and sizes —a furnace for every purpose. And at present we are making immediate deliveries on nearly all types.

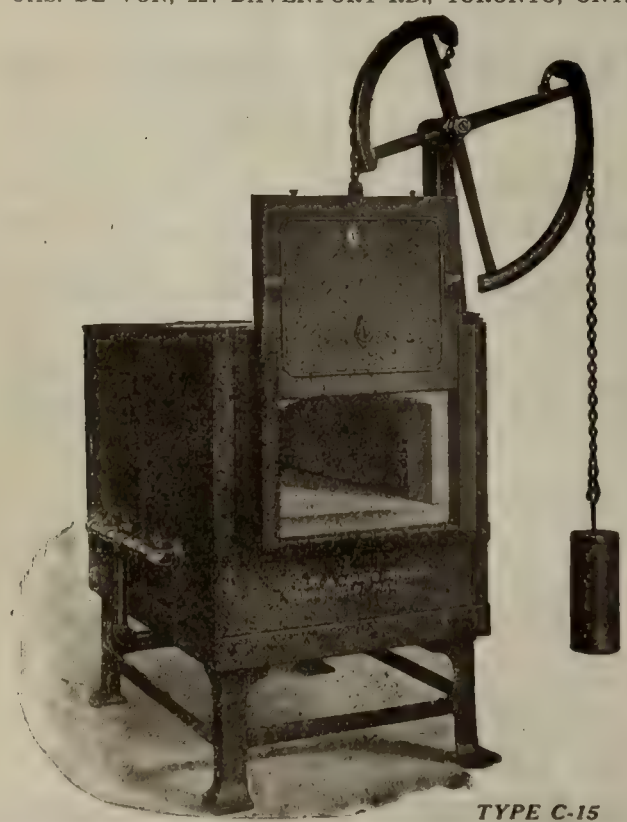
With a Gilbert & Barker furnace you are assured of efficient and economical heat-treating, annealing, hardening, etc. Our half century of experience with liquid and gaseous fuels for heat treatment of metals makes us confident of our ability to solve your heat-treating problems. Put them up to us.

Catalog 24 describes the complete line.

Gilbert & Barker Mfg. Co.

West Springfield, Mass.

Canadian Agents:
WILLIAMS & WILSON, LTD., MONTREAL, QUE.
JAS. DE VON, 227 DAVENPORT RD., TORONTO, ONT.

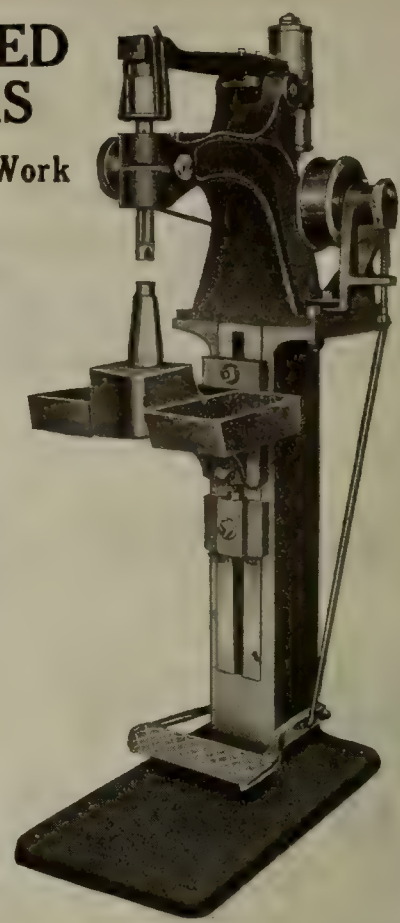


TYPE C-15

HIGH SPEED HAMMERS

For High Speed Work

FEATURES:



Economy in floor space, elimination of weight and a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushings are used throughout.

No riveting too intricate for us; no riveting which our machine cannot accomplish.

Send for our **High Speed Hammer Book.**

THE HIGH SPEED HAMMER CO.

Rochester, N.Y.

Sales Agents : The A. R. Williams Machinery Company, Limited, Toronto, Ontario.

Speed

When the quality of the work is the best obtainable, the next item is speed. For upon speed depends your costs.

One rivet per second is the speed this machine will maintain indefinitely. Adapt that speed to your requirements and find out the value the Grant Riveter would be to you.

Write for our catalogue. It will give you complete information.

Grant Mfg. & Machine Company

Bridgeport, Conn., U.S.A.

BROWN'S
BEAVER BRAND METALS
BRASS, BRONZE,
CANADA SILVER and GILDING METAL
In Sheets, Rolls, Plates and Rods
Brown's Copper & Brass Rolling Mills, Limited
General Offices and Works:
New Toronto, Ontario, Canada
COPPER & BRASS
BROWN'S
QUALITY
ROLLING MILLS

The Oven Equipment & Manufacturing Company

NEW HAVEN, CONN.

"CRAWFORD SECTIONAL" OVENS

Heated with our Enclosed Flame Gas Burners, or Electricity

FOR BAKING JAPANS AND OTHER FINISHES ON METAL.

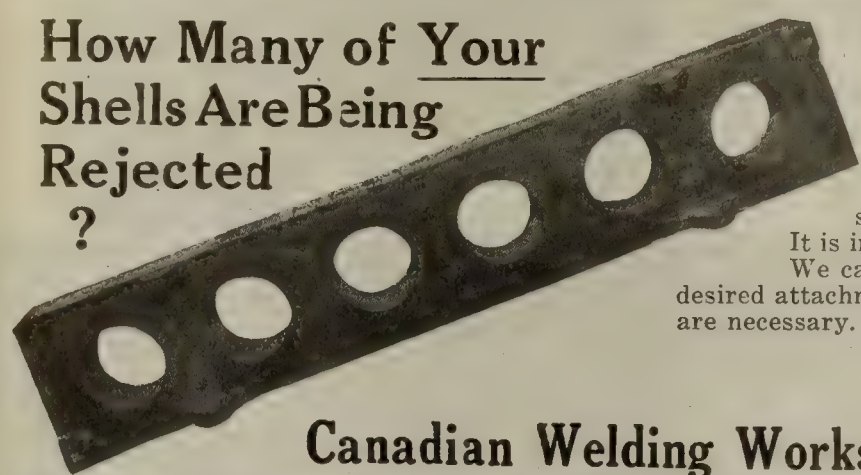
Ovens carried in stock and built to meet requirements of manufacturers.

Builders of All-Steel Oven Trucks with Roller Bearings.

Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.

ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

How Many of Your Shells Are Being Rejected ?



Water Jacket for Nosing Furnace

This STEEL jacket holds a large amount of water, which keeps the body of shell cold, and permits of proper heating of the nose for nosing operations. Being made of steel, it stands contraction and expansion—not possible with cast iron.

It is indestructible and fool-proof. Made for all sizes of shells. We can make this jacket to any special dimensions, with any desired attachments. No patterns are required—specifications all that are necessary.

Tested and Guaranteed.

IMMEDIATE DELIVERY.

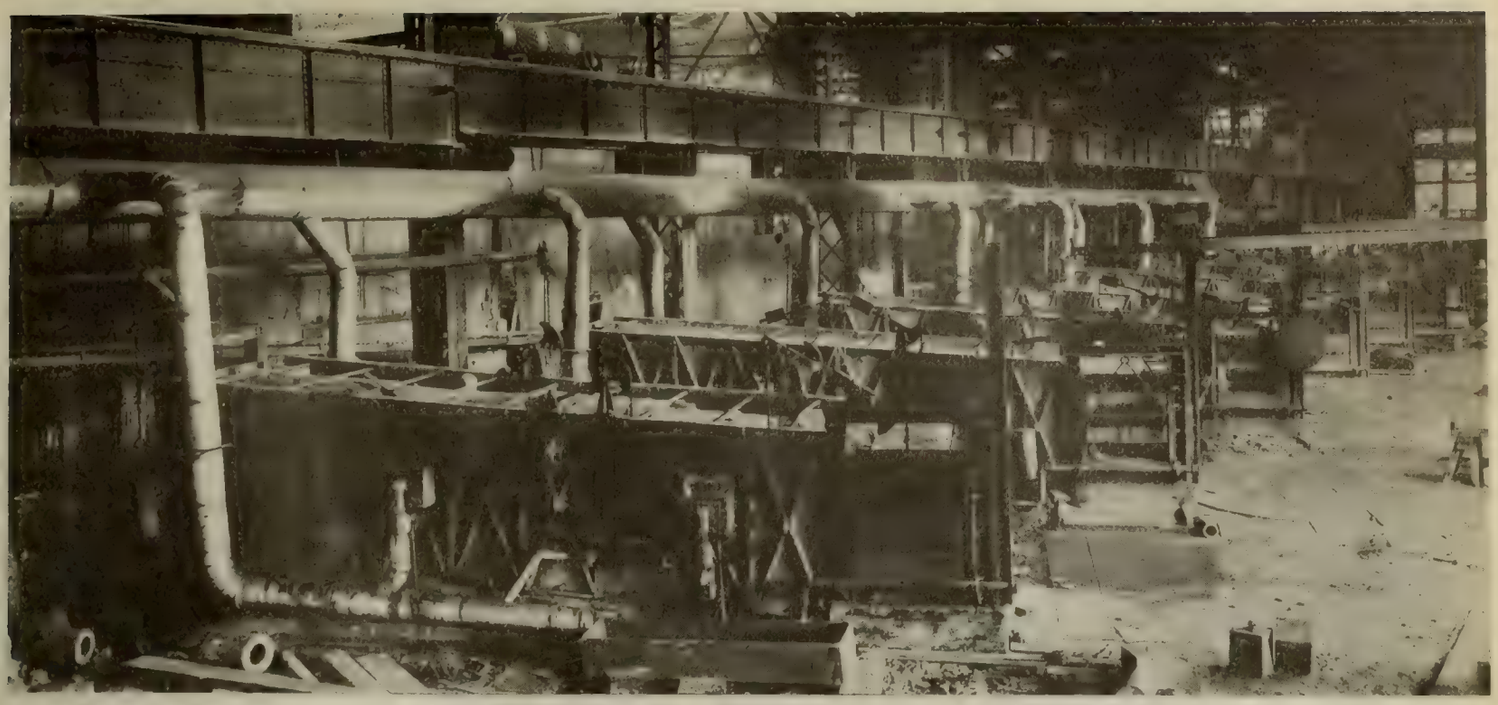
Canadian Welding Works, Ltd., 51 Montfort Street Montreal, P. Q.

Let the Boss Know It!

IF you are a reader of Canadian Machinery, go tell your employer about it some convenient time! You couldn't tell the up-to-date manufacturer anything that would please him more. He would know that you are abreast of the times; that you are ambitious and interested in your work; that you are acquainted with methods and machinery which make for greater efficiency. He will say softly to himself: "Here is a live wire,—I'll just keep my eye on that chap."

If you are not a regular reader it will pay you to become one right away—quick.

Subscription price—$3.00 per year. 52 issues.



Battery of Continuous Billet Heating Furnaces

Installed in the Plant of Canadian Steel Foundries, Limited, Pointe St. Charles, Montreal.

There's a MECOL Furnace for every purpose, for every kind of fuel. They give the service that only a well-designed furnace can give. Tell us your requirements—we'll gladly send particulars.

Mechanical Engineering Company, Ltd., Three Rivers, Que.

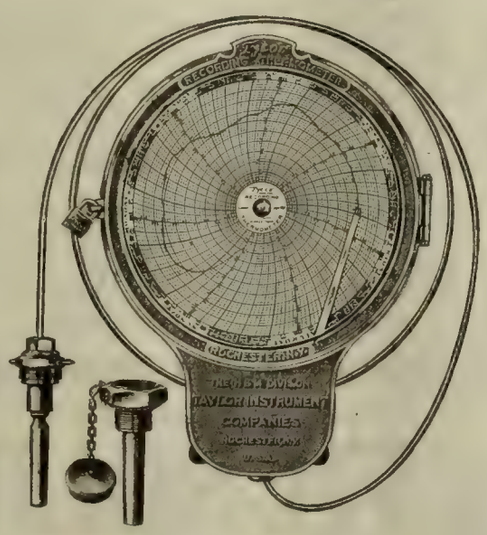
H&M Thermometers

6 Reasons Why

Your plant should be fitted with

Tycos

RECORDING THERMO-METERS



1. Rugged Construction.
2. Tamper Proof.
3. Uniform Scale.
4. Guaranteed Accurate.
5. Permanently Reliable.
6. Mercury Operated.

They are used by leading operating men everywhere.

Our engineers are ready to analyze your needs and to offer valuable suggestions without obligation.

We make every type of prevision indexing and recording thermometers, mercury columns, pyrometers, etc. Write for Catalog to-day.

Taylor Instrument Companies

ROCHESTER, N.Y.

Toronto, 201 Royal Bank Building

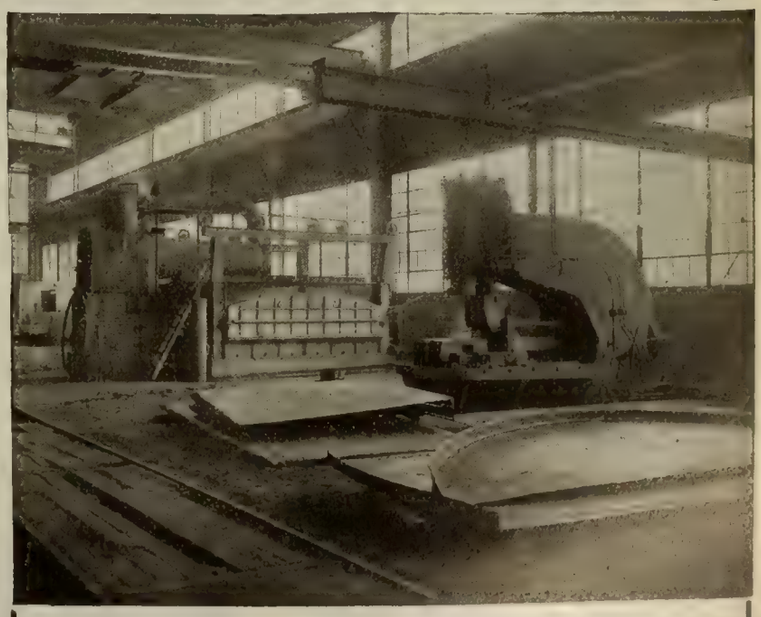


PLATE AND ANGLE HEATING FURNACES OF THE TATE-JONES MAKE EXCEL

A poor or antiquated furnace in your shop is a mistake that needs rectifying. It wastes time and turns out unsatisfactory work.. To be certain of HIGH-GRADE AND RAPID PRODUCTION you can't do better than instal a Plate and Angle Heating Furnace of the Tate-Jones make.

They excel for heating plates for flanging or annealing, for angles, for bending or forming, and for rods for continuous bolt or rivet machines.

We also build furnaces for forging, nosing, banding, baking lyddite, and continuous furnaces for heat-treating rough finished shells, annealing cases and furnaces for all classes of forging and heat-treating work.

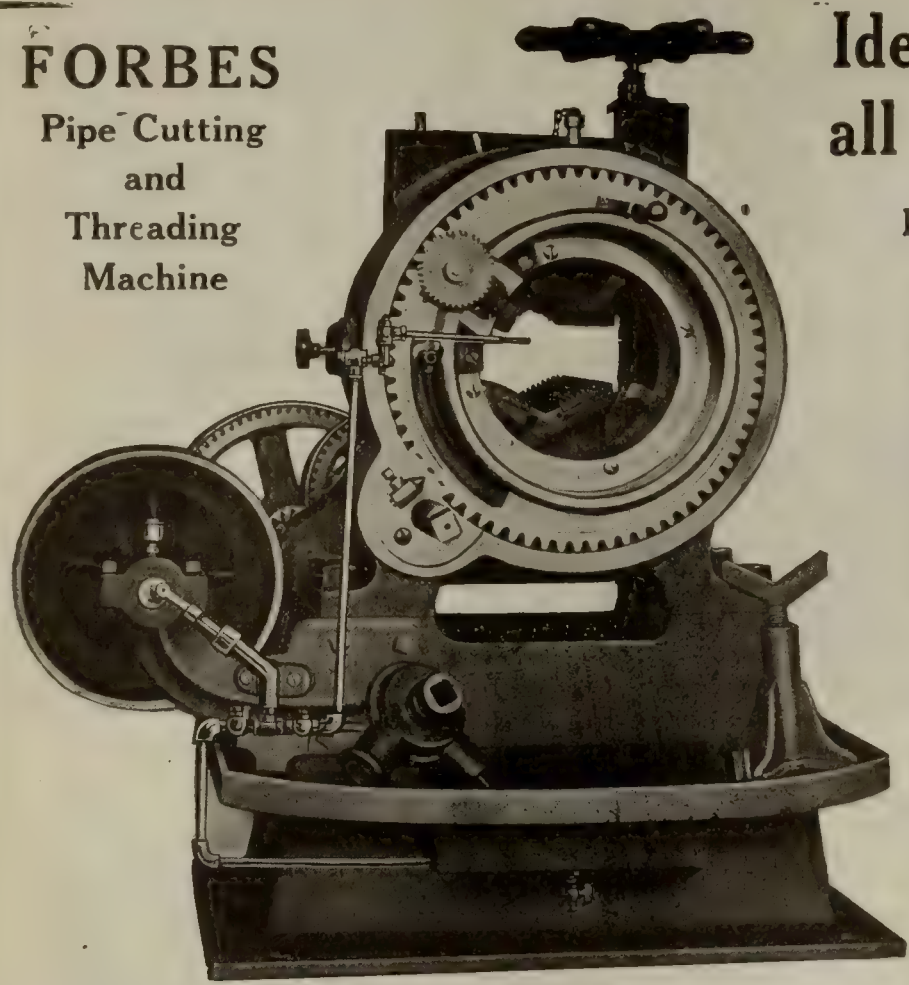
Write for Bulletin No. 153-C.

TATE-JONES & COMPANY, Inc.

Pittsburgh, Pa. **Furnace Engineers**

FORBES

Pipe Cutting and Threading Machine

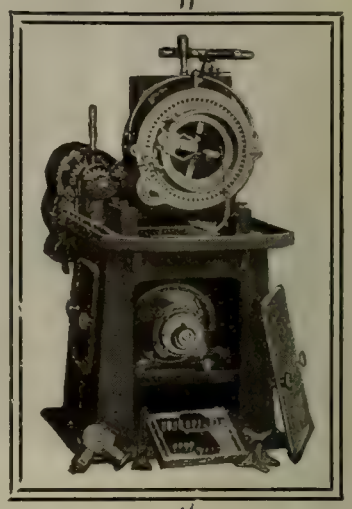


Ideal Machine for all Kinds of Work

Especially Fine Work

The "Forbes" is the ideal Pipe Cutting and Threading Machine for any job, but it is especially essential where the work in hand is of a high class order—where the reputation of your firm is at stake. Joints threaded by the Forbes Machines will bear the most critical inspection. They never leak.

It is the only machine on the market with receding gear which carries the dies into the pipe. It is also entirely self-contained, motor-driven and can be easily carried to its work.



Catalog on Request

Curtis & Curtis Co.

Garden St. Bridgeport, Conn.

Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send to our nearest factory for a trial box.

Manufactured and guaranteed by

The Canada Metal Company, Limited

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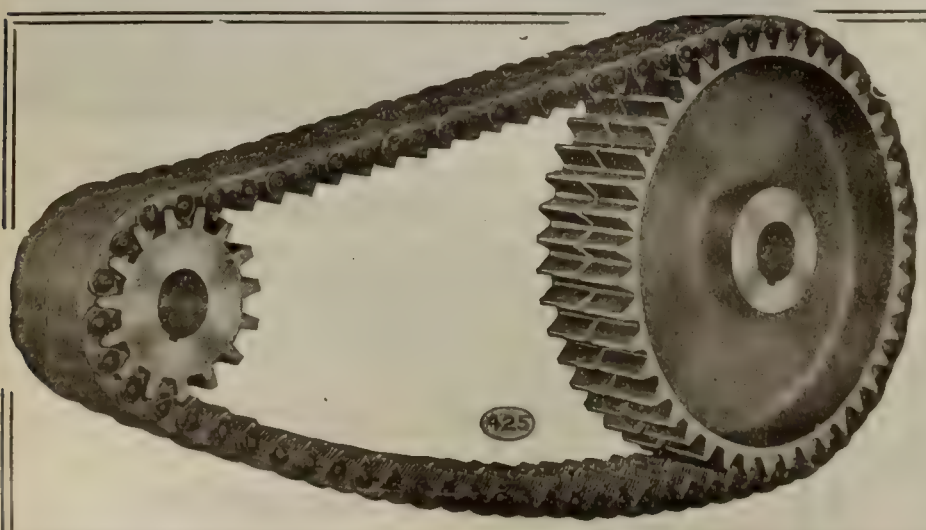


RENOLD CHAINS

PATENT SILENT

The proven efficient form of Power Transmission.

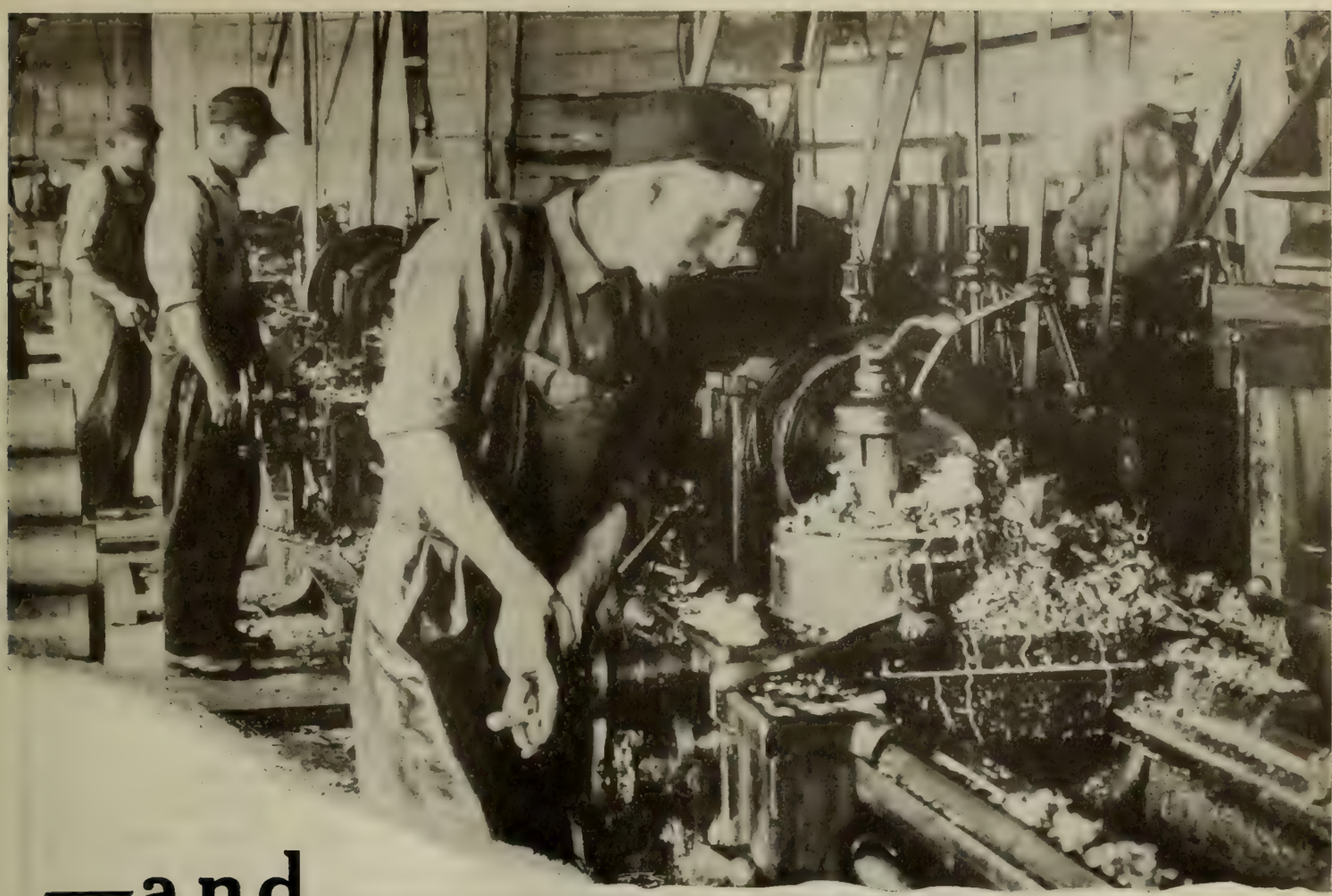
Equally suitable for main shaft or machine drives. Save space and power, increase output and ensure durability.

Chain and Parts Carried in Stock.

Sole Canadian Agents

Jones & Glassco. (Reg'd)

Branch Office: TORONTO, ONT. ENGINEERS **St. Nicholas Bldg. MONTREAL, P.Q.**



—and Every Chuck a Hannifin!

PHOTO shows a long line of lathes on six-inch shells —all equipped with Hannifin Air Chucks. This plant has been turning out more shells per machine than any other in its vicinity, and the fact that Hannifin chucks have been used exclusively gives us a certain degree of justifiable pride.

That our claims for increased production with a Hannifin have been substantiated by the records of many Canadian munition plants is good reason why you should investigate them.

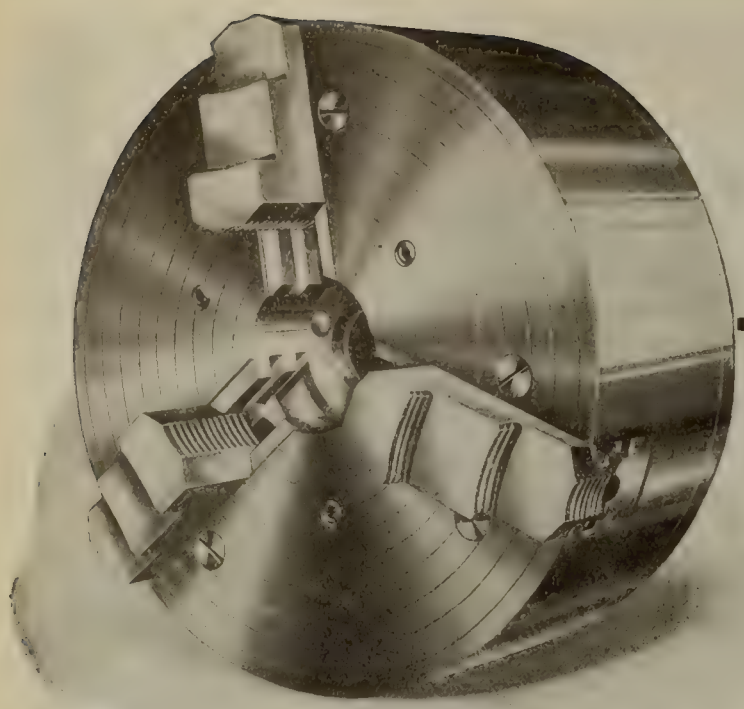
The Hannifin Chuck is almost instantaneous in action, holds securely, cannot slip, saves time and labor. The work is chucked and rigidly gripped by simply turning a lever. Another turn effects the release. With the introduction of female labor and skilled male help almost unobtainable, Hannifin chucks will save delays and make-overs by means of these time and labor-saving features.

Our catalog will tell you more about this chuck. Send for it to-day.

Hannifin Manufacturing Co.

CHICAGO, ILL., U.S.A.

REPRESENTATIVES:—R. E. Ellis Engineering Co., Chicago; Coats Machine Tool Co., New York City; A. R. Williams Machinery Co., Toronto; Williams & Wilson, Montreal; The Canadian Fairbanks-Morse Co., Montreal. EUROPEAN REPRESENTATIVES:—Coats Machine Tool Co., Ltd., London; Fenwick Freres & Co., Paris; Iznosskoff & Co., Petrograd.



Indispensable Where Rapid Manufacturing Methods Prevail

The M. E. C. Three-Jaw Air-Operated Chuck (steel body) eliminates the troublesome time-losing, hand-operated chuck. Operating on tests of long periods it will show an increase in production of from 25 to 90 per cent. Once chucked, the work stays chucked. Vibration doesn't affect it—it holds tight regardless of cutting strain. Saves energy and time. Most of the work of medium diameter is chucked and released without stopping machine spindle.

Ask for full details. By all means get our interesting catalog on Labor-Saving Devices. Write for it NOW, it's **free.**

By All Means Get Our Interesting Catalog on Labor Saving Devices

MANUFACTURERS EQUIPMENT COMPANY

171 N. JEFFERSON AVENUE **CHICAGO, U.S.A.**

Agents for Central and Eastern States and Canada: J. R. Stone Tool & Supply Co., Goebel Bldg., Detroit, Mich.

Foreign Agents: C. W. Burton. Griffiths & Co., Ludgate, Ludgate Square, London, England.

We will give you an estimate from your blueprints.

ONE minute to tap a 4.5 mark VII shell. Five minutes to tap a 9.2 shell. Compare this speed with your rate. 800 to 1,000 9.2 shells tapped with one set of chasers, so along with speed you can add endurance. Uniformity is another feature. When a chaser wears down it can easily be adjusted to compensate for wear. A solid tap loses its accuracy with first grinding. Adjustments are convenient and quick-acting.

We can give you excellent service. We also maintain a special chaser service for our clients. Get in touch with us immediately.

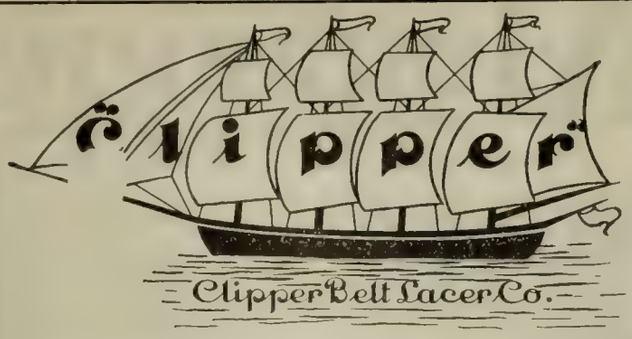
The Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, S.W., England.

Fenwick Freres & Co., 16 Rue Fenelon, Paris, France.

Murchey

Machine & Tool Co.

75 Porter Street, Detroit, Mich.



The Cost of Delay

IF a thing is worth having, it is worth having now. The present moment is worth more to all of us than all the tomorrows in the calendar.

Each day you put off sending for the "Clipper" Belt Lacer for 20 days' trial, you are running the risk of an expensive shut down.

Three minutes is the maximum time required to lace a broken belt with the "Clipper" Belt Lacer.

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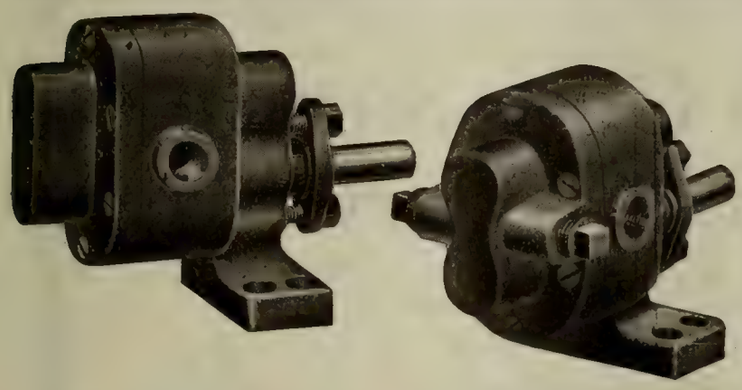

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for September

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Colonel MacLean discusses the steps that should be taken to win the war, and deals with the financial measures that Canada must consider for the after-the-war period.

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This world-famous fiction-writer contributes a complete novelette—"The Rubies of Perak."

Other notable contributors are Stephen Leacock, Miss Laut, W. W. Jacobs, Allenson, Moorhouse, and J. D. Ronald, who tells of a smuggling enterprise by an American who temporarily fooled the Customs Department when he imported the plant for a new factory in a Canadian City.

"The Gun Brand," by Hendryx, a great story of the Canadian Northwest, is a feature of the September *MacLean's.*

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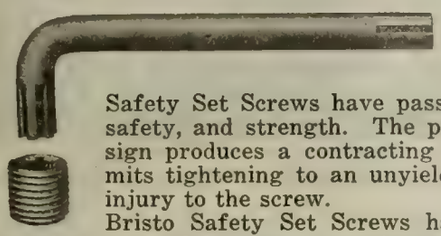

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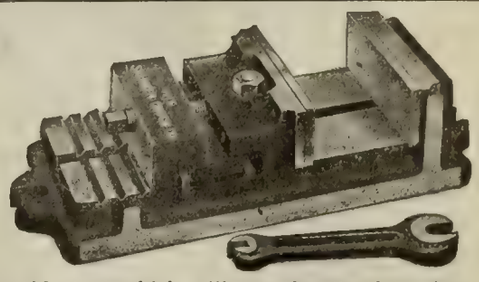

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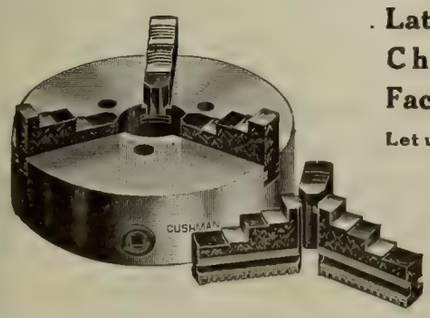

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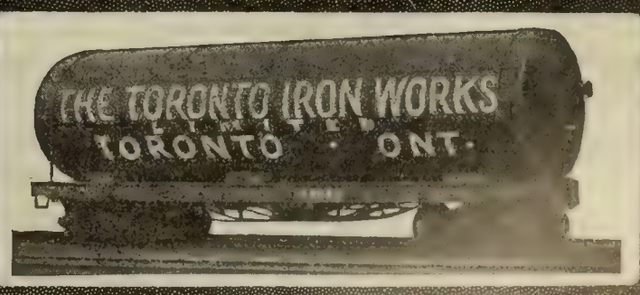

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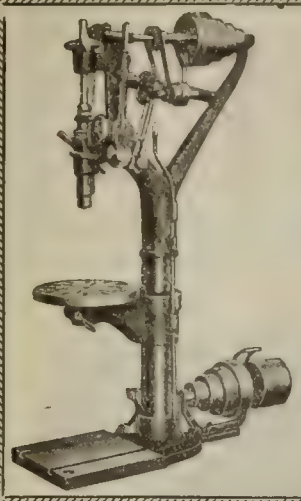

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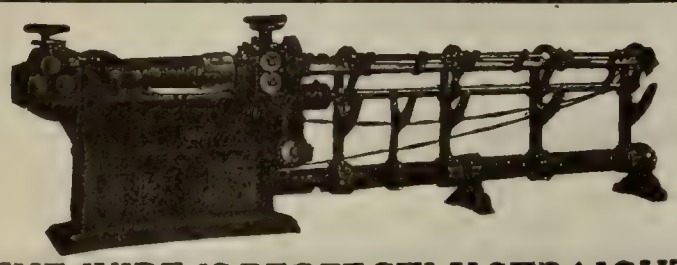

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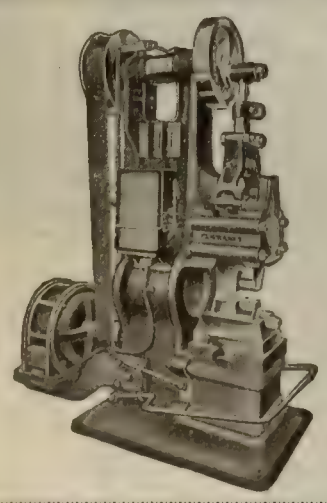

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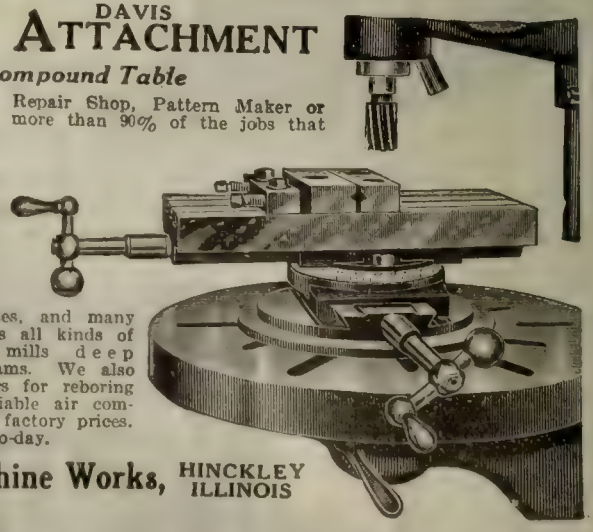

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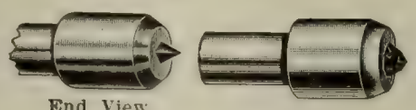
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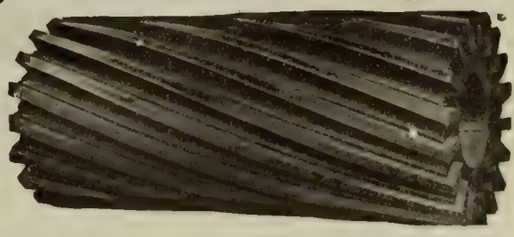

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H. W. Petrie, Toronto
Riverside Machinery Depot, Detroit, Mich.

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Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
Cumming & Son, J. W., New Glasgow, Canada
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

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John Bertram & Sons Co., Dundas
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Garlock-Walker Machinery Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machinery Co., Toronto

BOLT THREADING MACHINERY
Landis Machine Co., Waynesboro, Pa.
Victor Tool Co., Waynesboro, Pa.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co. of Canada, Toronto
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, UPRIGHT AND HORIZONTAL
John Bertram & Sons Co., Dundas
Canada Machinery Corp. Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Hill, Clarke & Co., Chicago, Ill.
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
Roelofson Machine & Tool Co., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, STOVE AND COAL
Cumming & Son, J. W., New Glasgow, Canada

BORING AND TURNING MILLS
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
R. E. T. Pringle, Ltd., Toronto, Ont.

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H. W. Petrie, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.
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A. R. Williams Machy. Co., Toronto

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Garlock-Walker Machinery Co., Toronto, Ont.
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Marsh & Henthorn, Belleville, Ont.
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Alexander Fleck, Ltd., Ottawa.
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Can. Steel Foundries, Ltd., Montreal, Que.
Alexander Fleck, Ltd., Ottawa.
Gardner, Robt., & Son, Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
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Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.
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Wells Bros. Co. of Canada, Galt, Ont.

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H. W. Petrie, Toronto.
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CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.

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Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Richmond Mfg. Co., Toronto, Ont.
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H. W. Petrie, Toronto.
Skinner Chuck Co., New Britain, Conn.
Thomas Elevator Co., Chicago, Ill.
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Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.
Richmond Mfg. Co., Toronto, Ont.

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Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, GEARED SCROLL
Richmond Mfg. Co., Toronto, Ont.

CHUCKS, MAGNETIC
H. E. Streeter, 523 New Birks Bldg., Montreal.

CHUCKS, RING WHEEL
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Gardner Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

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Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

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Hardinge Bros., Inc., Chicago, Ill.

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Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.

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Zenith Steel & Coal Products, Montreal, Que.

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Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

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Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.

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Northern Crane Works, Walkerville.
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Whiting Foundry Equipment Co., Harvey, Ill.

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Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

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Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

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Norton Grinding Co., Worcester, Mass.
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Pratt & Whitney Co., Dundas, Ont.

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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
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Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
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Landis Machine Co., Waynesboro, Pa.
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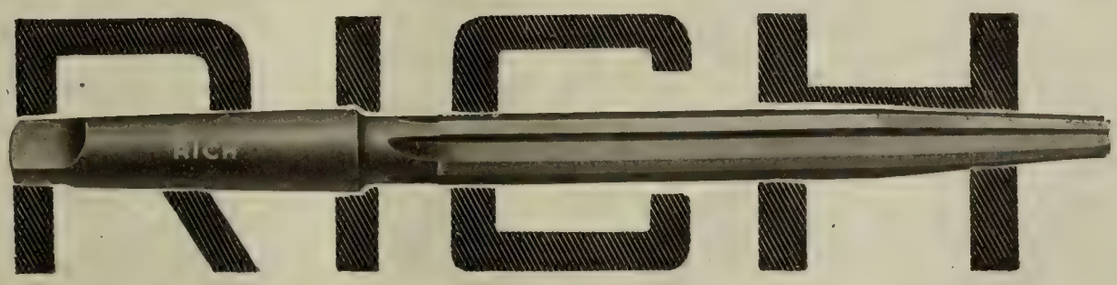

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National-Acme Co., Cleveland, Ohio.
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Pratt & Whitney Co., Dundas, Ont.
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Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, Ohio.

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Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Garlock-Walker Machinery Co., Toronto, Ont.
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H. W. Petrie, Toronto.
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A. R. Williams Machinery Co., Toronto.

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Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Millers Falls Co., Millers Falls, Mass.
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Pratt & Whitney Co., Dundas, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
United States Electrical Tool Co., Cincinnati.

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Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.

DRILLS, ELECTRIC AND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.

DRILLS, HIGH SPEED
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Can. B. K. Morton, Toronto, Montreal.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Foss & Hill Machy. Co., Montreal.
Marshall & Co., Geo. A., Toronto, Ont.
McKenna Brothers, Pittsburgh, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
W. F. & John Barnes Co., Rockford, Ill.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

DRILLS, MULTIPLE SPINDLE
Henry & Wright Mfg. Co., Hartford, Conn.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Ltd., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Niles-Bement-Pond Co., New York.
R. E. T. Pringle, Ltd., Toronto, Ont.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Millers Falls Co., Millers Falls, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Dominion Machy. Co., Toronto.
Foss & Hill Machy. Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Cleveland Twist Drill Co., Cleveland.
Clark Equipment Co., Buchanan, Mich.
Foss & Hill Machy. Co., Montreal.
Morse Twist Drill & Mach. Co., New Bedford.

DRILLS, TWIST
Atkins & Co., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

DRINKING FOUNTAINS
Puro Sanitary Dk'g. Fountain Co., Haydenville, Mass.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sheldons, Ltd., Galt, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.

DUST SEPARATORS
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Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

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Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

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Lancashire Dynamo & Motor Co., Ltd., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
A. R. Williams Machy. Co., Toronto.

ELEVATOR ENCLOSURES
Canada Wire & Iron Goods Co., Hamilton, Ont.

ELEVATORS AND BUCKETS
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Whiting Foundry Equipment Co., Harvey, Ill.

ELEVATING AND CONVEYING MACHINERY
Can. Matthews Gravity Carrier Co., Toronto, Ont.

EMERY GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Stow Mfg. Co., Binghamton, N.Y.

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Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Ford-Smith Mach. Co., Hamilton, Ont.
Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Plessisville Foundry Co., Plessisville, Que.

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Johnson Mach. Co., Carlyle, Manchester, Conn.
H. W. Petrie, Toronto.
Riverside Machinery Depot, Detroit, Mich.

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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Johnson Mach. Co., Carlyle, Manchester, Conn.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
A. R. Williams Machy. Co., Toronto.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Parmenter & Bulloch Co., Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

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Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

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Puro Sanitary Dk'g. Fountain Co., Haydenville, Mass.

FENCE, IRON AND FACTORY
Canada Wire & Iron Goods Co., Hamilton, Ont.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

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Atkins & Co., Wm., Sheffield, Eng.
Can. B. K. Morton Co., Toronto, Ont.
Delta File Works, Philadelphia, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Port Hope File Mfg. Co., Port Hope, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

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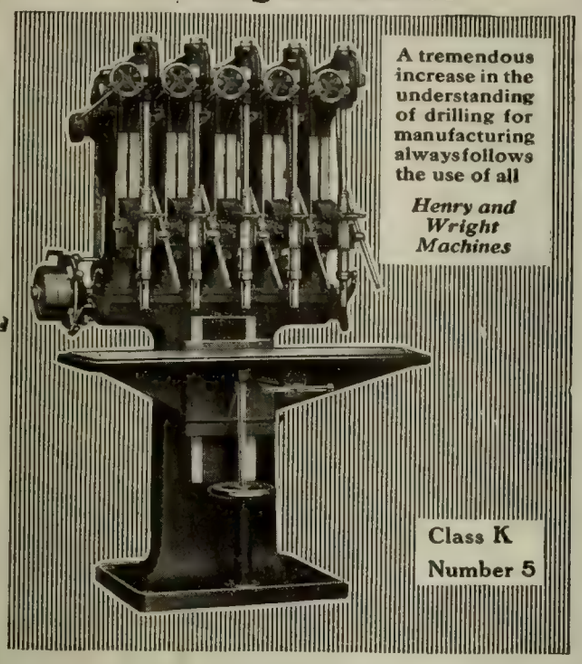

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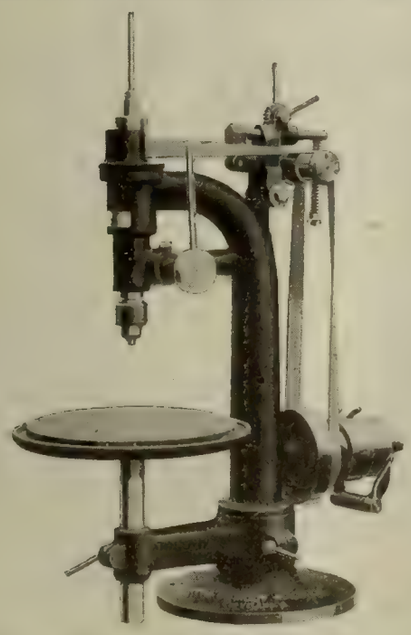

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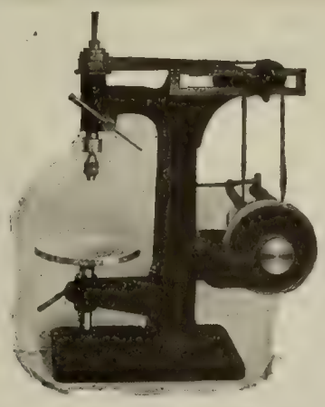

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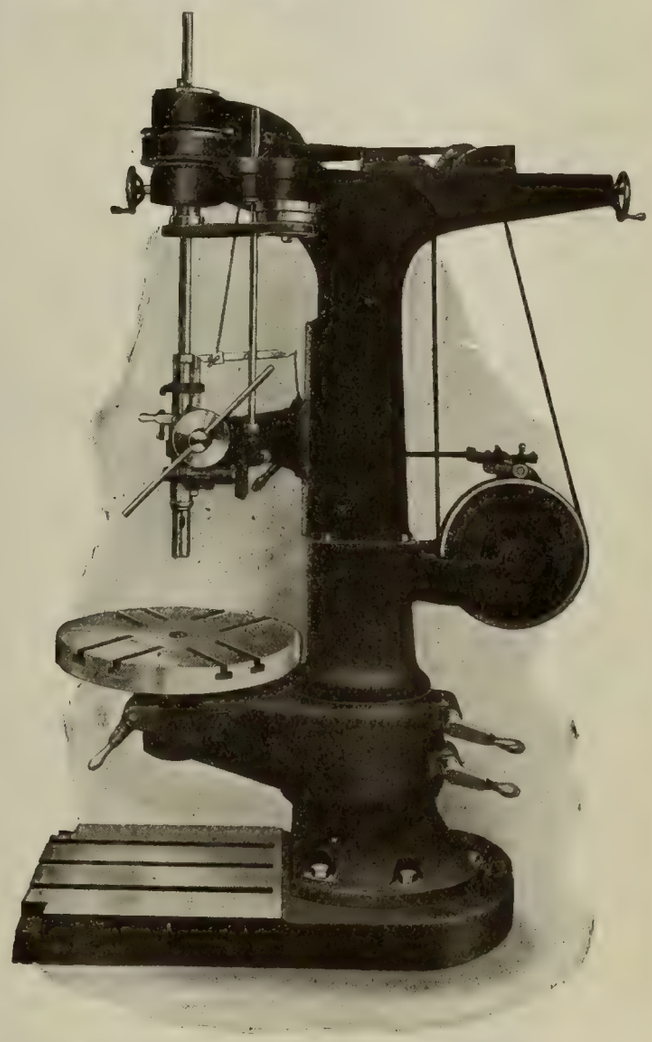

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Pratt & Whitney Co., Hartford, Conn.
Toronto Tool Works, Toronto, Ont.
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Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Foundries, Ltd., Hull, Que.
Illinois Tool Works, Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
The Smart-Turner Machine Co., Hamilton.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

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Hamilton Gear & Machine Co., Toronto.
Gardner, Robt., & Son, Montreal.
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Philadelphia Gear Works, Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.
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Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Modern Tool Co., Erie, Pa.
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New Britain Machine Co., New Britain, Conn.
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Greenfield Machine Co., Greenfield, Mass.
Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
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Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago.
Norton Co., Worcester, Mass.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
United States Electrical Tool Co., Cincinnati, O.
A. R. Williams Machy. Co., Toronto.

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Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
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Tabor Mfg. Co., Philadelphia, Pa.
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Modern Tool Co., Erie, Pa.
Wilmarth & Morman, Grand Rapids, Mich.

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Pratt & Whitney Co., Dundas, Ont.
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Garvin Machine Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
LeBlond Mach. Tool Co., R. K., Cincinnati.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Wilmarth & Morman, Grand Rapids, Mich.
Stow Mfg. Co., Binghampton, N.Y.

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Aikenhead Hardware Co., Toronto, Ont.
Baxter Co., Ltd., J. R., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Carborundum Co., Niagara Falls.
Ford-Smith Mach Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.

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Ford-Smith Machine Co., Hamilton, Ont.
New Britain Mach. Co., New Britain, Conn.
Stow Mfg. Co., Binghampton, N.Y.

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Baxter Co., Ltd., J. R., Montreal, Que.
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Ford-Smith Machine Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Millers Falls Co., Millers Falls, Mass.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Montreal.
Racine Tool & Machine Co., Racine, Wis.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Victor Saw Works, Ltd., Hamilton, Canada.
Zenith Coal & Steel Products, Montreal, Que.

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Aikenhead Hardware Co., Toronto, Ont.
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Millers Falls Co., Millers Falls, Mass.

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Erie Foundry Co., Erie, Pa.

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Bliss, E. W., Co., Brooklyn, N.Y.
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Canadian Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
Erie Foundry Co., Erie, Pa.
High Speed Hammer Co., Rochester, N.Y.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Plessisville Foundry Co., Plessisville, Que.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.

HAMMERS, HELVE POWER
Canada Machinery Corp., Galt, Ont.
West Tire Setter Co., Rochester, N.Y.

HAMMERS, POWER
Beaudry & Co., Boston, Mass.
Erie Foundry Co., Erie, Pa.
United Hammer Co., Boston, Mass.

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Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
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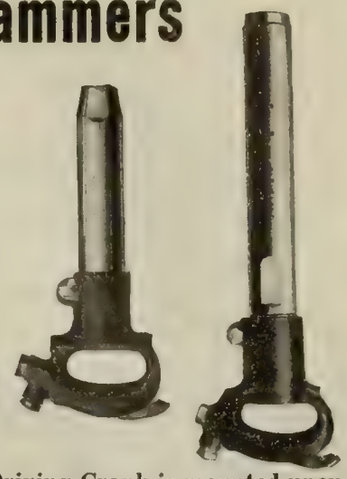
CLEVELAND CORNER DRILL For Close Quarter Drilling



The Body of the Cleveland Corner Drill is in one piece with cylinders and valve chambers cast integral which insures absolute alignment of working parts.

The Driving Crank is mounted upon Annular Ball Bearings which reduce friction to a minimum. Made in two sizes, Nos. 38 and 49, with Nos. 3 and 4 Morse Taper Sockets.

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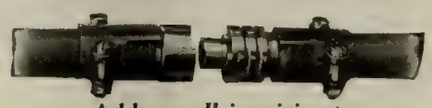
¶ They are instantly connected or disconnected.

¶ They are absolutely tight under all pressures.



¶ They are interchangeable in all sizes commonly used.

¶ They quickly pay for themselves by stopping costly leaks.

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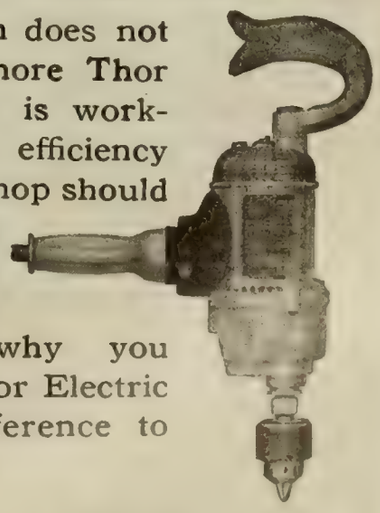
Licensed Under Burke Universal Motor Patent

No shop which does not use one or more Thor Electric Drills is working to full efficiency which every shop should do during these critical times. Let us demonstrate why you should use Thor Electric Tools in preference to other makes.



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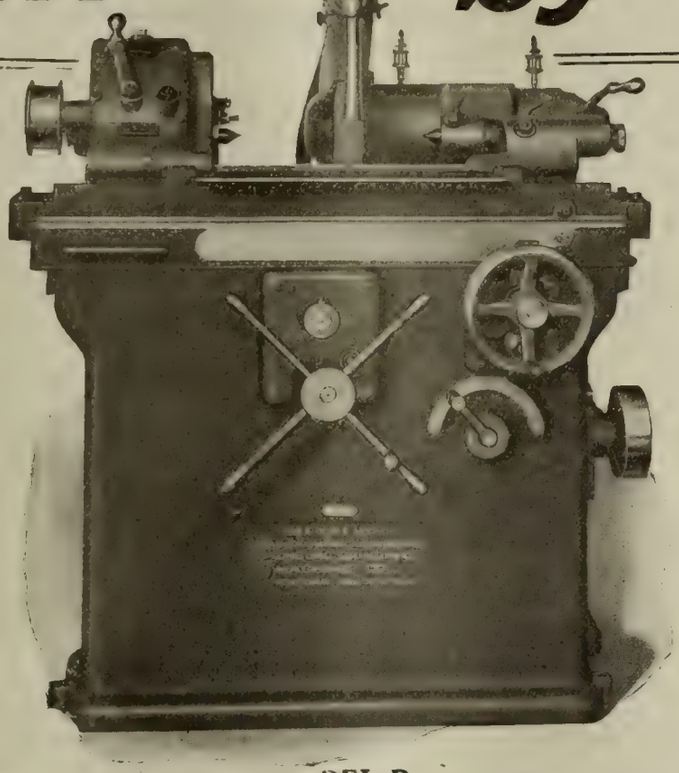

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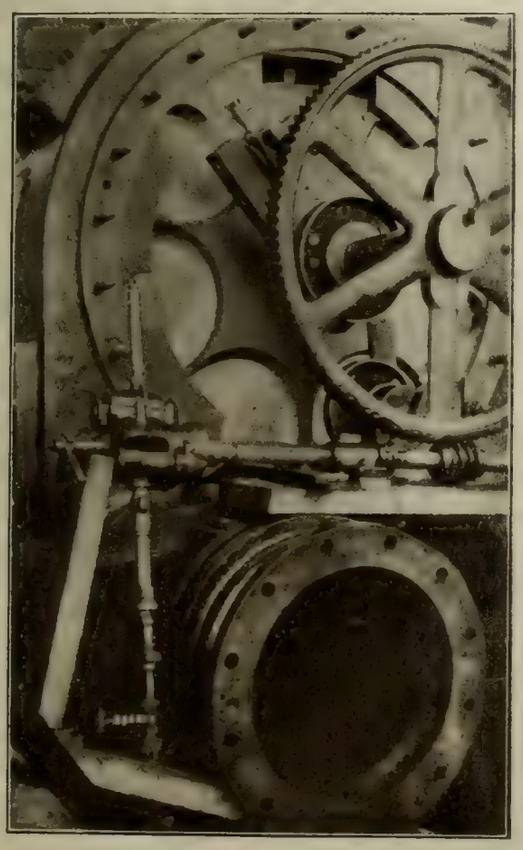

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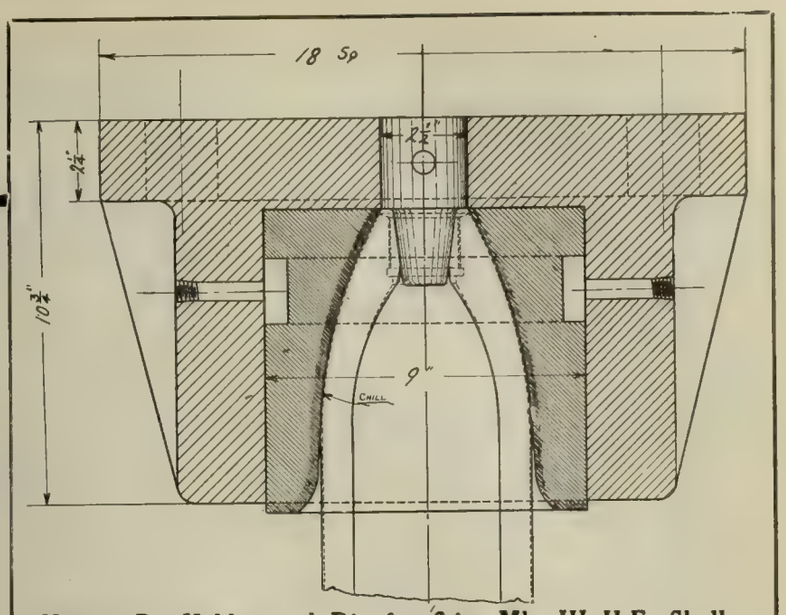

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Binghamton, New York, U.S.A.

Oldest Portable Tool Manufacturers in America

Bertrams, Ltd., Edinburgh, Scotland
Canada Machinery Corp., Galt, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Montgomery, Smith & Co., Keynsham, Somerset, Eng.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo

SHEARS, POWER
John Bertram & Sons Co., Dundas
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Ferrachute Machine Co., Bridgeton, N.J.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Toledo Machine & Tool Co., Toledo

SHEARS, PNEUUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Canada

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Peck, Stow & Wilcox, Cleveland, O.
Steel Bending Brake Works, Ltd., Chatham, Ont.

SHEET METAL STAMPINGS
Dominion Forge & Stpg. Co., Walkerville, Ont.

SHELL BANDING MACHINES, HYDRAULIC
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., W. R., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

SHELL PAINTING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

SHELL RIVETERS
Grant Mfg. & Machine Co., Bridgeport, Conn.
High Speed Hammer Co., Rochester, N.Y.

SHRAPNEL SHELL MARKER
Brown, Boggs & Co., Hamilton, Canada
Noble & Westbrook Mfg. Co., Hartford, Conn.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton. Toronto, Montreal.

SIGNS, ENAMEL
Strong, Kennard & Nutt Co., Cleveland, Ohio.

SILVER SOLDER
Geo. H. Lees & Co., Hamilton, Ont.

SKATE SHARPENERS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

SLOTTERS
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York
Rhodes Mfg. Co., Hartford, Conn.

SMOKESTACKS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
J. H. Williams & Co., Brooklyn, N.Y.

SOCKET HEAD CAP SCREWS
Allen Mfg. Co., Hartford, Conn.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Canada

SOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Banfield, W. H., & Sons, Toronto.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
Grant Mfg. & Machy. Co., Bridgeport, Conn.
John H. Hall & Sons, Brantford.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
Hyde Engineering Works, Montreal, Que.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McClean & Son, F. W., Niagara Falls, Ont.
National-Acme Co., Cleveland, Ohio.
D. McKenzie Machinery Co., Guelph, Ont.
Mulliner & Enlund Tool Co., Syracuse, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Sleeper & Hartley, Inc., Worcester, Mass.
Smart-Turner Machine Co., Hamilton, Ont.
T. C. M. Mfg. Co., Harrison, N.J.
Victoria Foundry Co., Ottawa, Ont.
William R. Perrin, Ltd., Toronto.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

SPRINGS, MACHINERY
Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele, Ltd., Guelph, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

SPIRAL CONVEYORS
Can. Matthews Gravity Carrier Co., Toronto, Ont.

SPROCKETS, CHAIN
Grant Gear Works, Boston, Mass.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

SOLDER
Jobborn, Geo. A., Hamilton, Ont.

SPROCKET WHEELS, CAST
Perrin, Wm. R., Toronto.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS
Dillon Mfg. Co., Oshawa, Ont.
Dom. Forge & Stamping Co., Walkerville, Ont.
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Canada Machinery Corp., Galt, Ont.
Ferracute Mach. Co., Bridgton, N.J.
Noble & Westbrook Mfg. Co., Hartford, Conn.

STAMPS, STEEL ALPHABET, FIGURES
Matthews, Jas. H. & Co., Hartford, Conn.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.
Can. Morehead Mfg. Co., Woodstock, Ont.
H. W. Petrie, Toronto
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.
Sturtevant Co., B. F., Galt, Ont.

STEEL ALLOY (SEE ALLOY STEEL)

STEEL BENDING BRAKES
Steel Bending Brake Works, Ltd., Chatham, Ont.

STEEL FOR AXES, PLOWS, SAWS, DRILLS, ETC.
Colonial Steel Co., Pittsburgh, Pa.

STEEL, CARBON, FERRO-TUNGSTEN
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Zenith Coal & Steel Products, Montreal, Que.

STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

STEEL DRUMS
Smart-Turner Machine Co., Hamilton, Ont.

STEEL PRESSURE BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Century Steel Co. of America, New York
Colonial Steel Co., Pittsburgh, Pa.
H. A. Drury Co., Ltd., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Fairley Davidson Steel Co., New York, N.Y.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Toronto
Standard Alloys Company, Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.
Zenith Coal & Steel Products, Montreal, Que.

STEELS, HIGH STRENGTH, HOT-WORKING, DIE, MAGNET
Fairley Davidson Steel Co., New York, N.Y.

STEEL, VANADIUM
Drury, H. A., Co., Montreal, Que.
Standard Alloys Co., Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STELLITE, HIGH-SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.

STOCK RACKS FOR BARS, PIPING, ETC.
New Britain Machine Co., New Britain, Conn.

STOCKS, PIPE
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.

STOOLS, STEEL, SHOP
New Britain Machine Co., New Britain, Conn.

STRAIGHTENING MACHINERY
Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

TACK (DOUBLE POINT) MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

TANKS, GASOLINE AND OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Dominion Forge & Stamping Co., Walkerville.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.

TANKS, STEEL, WATER PRESSURE
Bowser & Co., Inc., S. F., Toronto, Ont.
Can. Welding Works, Montreal, Que.
Jenckes Machine Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TANK WAGONS
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.

TAPPING MACHINES (PENUMATIC)
Cleveland Pneumatic Tool Co. of Can., Toronto.

TAPPING MACHINES AND ATTACHMENTS
Bertram, John, & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto
Rickert-Shafer Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.

TAPS, ADJUSTABLE
Baxter Co., Ltd., J. R., Montreal, Que.
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.

TAPS, COLLAPSIBLE
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

TAPS, DIES AND WRENCHES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wells Bros. Co. of Canada, Galt, Ont.

TAP EXTENSIONS
Allen Mfg. Co., Hartford, Conn.

TESTING INSTRUMENTS METALLURGICAL
Shore Instrument & Mfg. Co., New York City.

THERMOMETERS, ALL KINDS
Taylor Instrument Co., Rochester, N.Y.
Bellevue Industrial Furnace Co., Detroit, Mich.

TESTING LABORATORIES
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

THREADING TOOLS
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.

THREAD MILLING MACHINES
Taft-Pierce Co., New York, N.Y.
T. C. M. Mfg. Co., Harrison, N.J.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Peck, Stow & Wilcox, Cleveland, Ohio.

TIRE SETTING MACHINES, HYDRAULIC
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES
Union Tool Chest Works, Rochester, N.Y.

TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Armstrong Bros. Tool Co., Chicago.
Can. B. K. Morton, Toronto, Montreal.
Deloro Smelting & Refining Co., Toronto, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
J. H. Williams Co., Brooklyn, N.Y.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOL STEEL
Atkins & Co., Wm., Sheffield, Eng.
Armstrong, Whitworth, Ltd. of Canada, Montreal.
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Deloro Smelting & Refining Co., Toronto, Ont.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.

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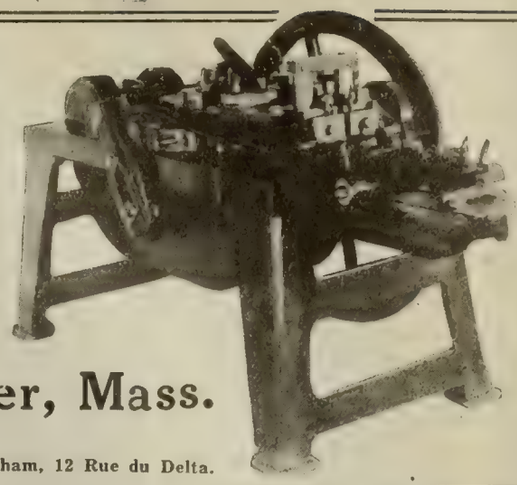

Sleeper & Hartley, Inc., Worcester, Mass.

CANADIAN BRANCH, COATICOOK, P.Q.

London, England, F. A. Perry, 63 Queen Victoria Street, E.C. 4. Paris, France, Edgar Bloxham, 12 Rue du Delta.

Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Toronto, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.
Swedish Steel & Importing Co., Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago, Ill.
H. W. Petrie, Ltd., Montreal.
R. E. T. Pringle, Ltd., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
A. R. Williams Machinery Co., Toronto.
United States Elec. Tool Co., Cincinnati, O.

TOOLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

TORCHES, STEEL
Armstrong, Whitworth of Canada, Ltd., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.

TRACK SYSTEMS
Dillon Mfg. Co., Oshawa, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
A. R. Williams Machinery Co., Toronto.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto.
Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Ltd., Toronto, Ont.
The Smart-Turner Machine Co., Hamilton.

TRANSMISSION TOWERS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TROLLEYS
Wright Mfg. Co., Lisbon, Ohio.

TRUCKS, FACTORY, FREIGHT, ETC.
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

TRUCKS, LUMBER AND KILN
Sheldons, Ltd., Galt, Ont.
Northern Crane Works, Walkerville.

TUBING, SEAMLESS, BRASS & COPPER
Standard Tube & Fence Co., Woodstock, Ont.

TUBING COILERS, FLEXIBLE METAL
Sleeper & Hartley, Inc., Worcester, Mass.

TUMBLING BARRELS
Baird Machine Co., Bridgeport, Conn.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TUNGSTEN FILAMENT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

TURNBUCKLES
Canadian Billings & Spencer, Ltd., Welland.

TURNTABLES
Whiting Foundry Equipment Co., Harvey, Ill.

TURRET MACHINES
Brown & Sharpe Mfg. Co., Providence
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Ltd., Toronto, Ont.
Pratt & Whitney, Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURBINE WATER WHEELS
Jenckes Mach. Co., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.

UPSETTING AND BENDING MACHINERY
John Bertram & Sons Co., Dundas
Brown, Boggs Co., Ltd., Hamilton, Canada.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Jenckes Mach. Co., Sherbrooke, Que.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Ltd., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

VACUUM PUMPS
Can. Blower & Forge Co., Kitchener, Ont.
Smart-Turner Machine Co., Hamilton, Ont.

VALVE LEATHERS
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Montreal.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

VALVES, FOOT
Smart-Turner Machine Co., Hamilton, Ont.

VALVES, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

VALVES, BACK PRESSURE, STEAM
Sheldons, Limited, Galt, Ont.

VENTILATING APPARATUS
Brantford Oven & Rack Co., Brantford, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
H. W. Petrie, Toronto.
Sturtevant Co., B. F., Galt, Ont.
A. R. Williams Machy. Co., Toronto.

VISES, AIR OPERATED
Hannifin Mfg. Co., Chicago, Ill.

VISE STANDS, PORTABLE
New Britain Machine Co., New Britain, Conn.

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Foss & Hill Machy. Co., Montreal.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.

VISES, PIPE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.
J. H. Williams & Co., Brooklyn, N.Y.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Barnes, Wallace, Co., Bristol, Conn.
Dillon Mfg. Co., Oshawa, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WATER PURIFYING AND SOFTENING APPARATUS
Wm. B. Scaife & Sons Co., Pittsburgh, Pa.

WATER CINDER MILLS
Whiting Foundry Equipment Co., Harvey, Ill.

WATER JACKETS
Can. Welding Works, Montreal, Que.

WATER TOWERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

WATER WHEELS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.

WELDING, ELECTRIC, SPOT, BUTT, ETC.
St. Lawrence Welding Co., Montreal, Que.

WELDING MASKS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

WELDERS, ELECTRIC, SPOT, BUTT, ETC.
National Electric Welder Co., Warren, O.
Tabor Mfg. Co., Philadelphia, Pa.
Thomson Electric Welding Co., Lynn, Mass.
Winfield Electric Welder Co., Warren, Ohio.

WELDING, WORK AND SUPPLIES (Autogenous and Oxy-Acetylene) see OXY-ACETYLENE

WINCHES
John H. Hall & Sons, Brantford.
Kennedy & Son, Wm., Owen Sound, Ont.
Northern Crane Works, Walkerville.

WIRE COILING AND POINTING MACHINERY
Baird Machine Co., Bridgeport, Conn.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE CLOTH AND PERFORATED METALS
Canada Wire & Iron Goods Co., Hamilton.

WIRE FORMING AND STAMPING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
McClean & Son, F. W., Niagara Falls, Ont.
F. B. Shuster Co., New Haven, Conn.

WIRE NAILS
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

WIRE STEEL, BRASS, COPPER, BRONZE
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE RAILS
Sleeper & Hartley, Inc., Worcester, Mass.

WOOD BORING MACHINES
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.

WIRE STRAIGHTENERS AND CUTTERS
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WOODWORKING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
R. E. T. Pringle, Ltd., Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machy. Co., Toronto.

WOOD LATHES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

WORKS STANDS, PORTABLE
New Britain Mach. Co., New Britain, Conn.

WRENCHES
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canadian Billings & Spencer, Ltd., Welland.
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, AUTOMOBILE NARROW JAW AND MONKEY
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, PIPE, MONKEY, TAP
Aikenhead Hardware Co., Toronto, Ont.
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, RATCHET AND BASIN
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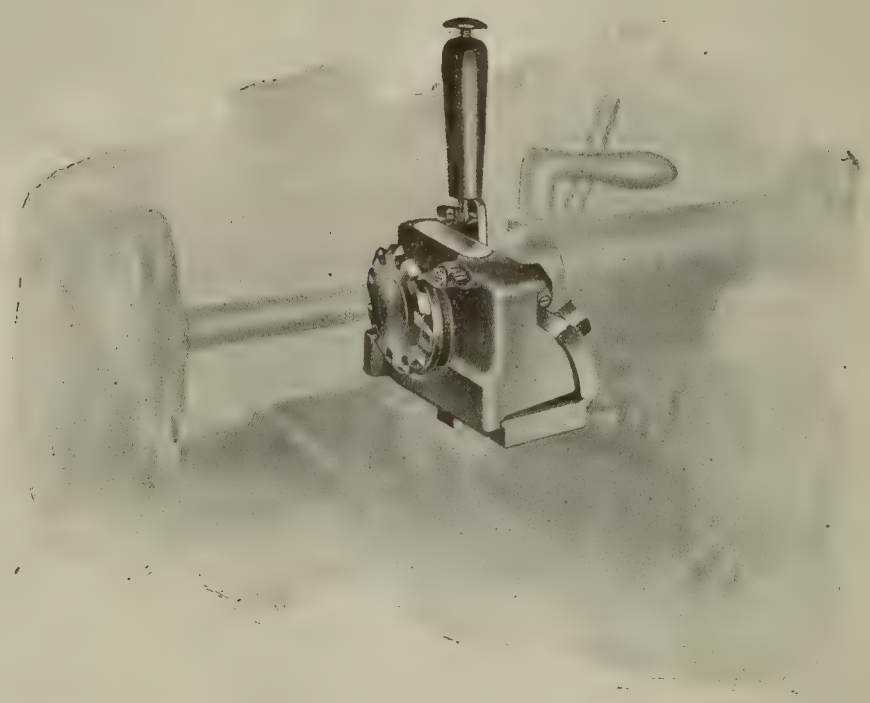

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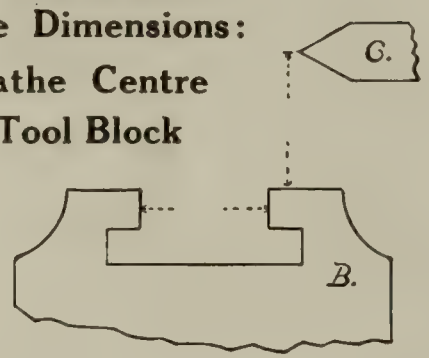

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A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XVIII. TORONTO, SEPTEMBER 13, 1917 No. 11

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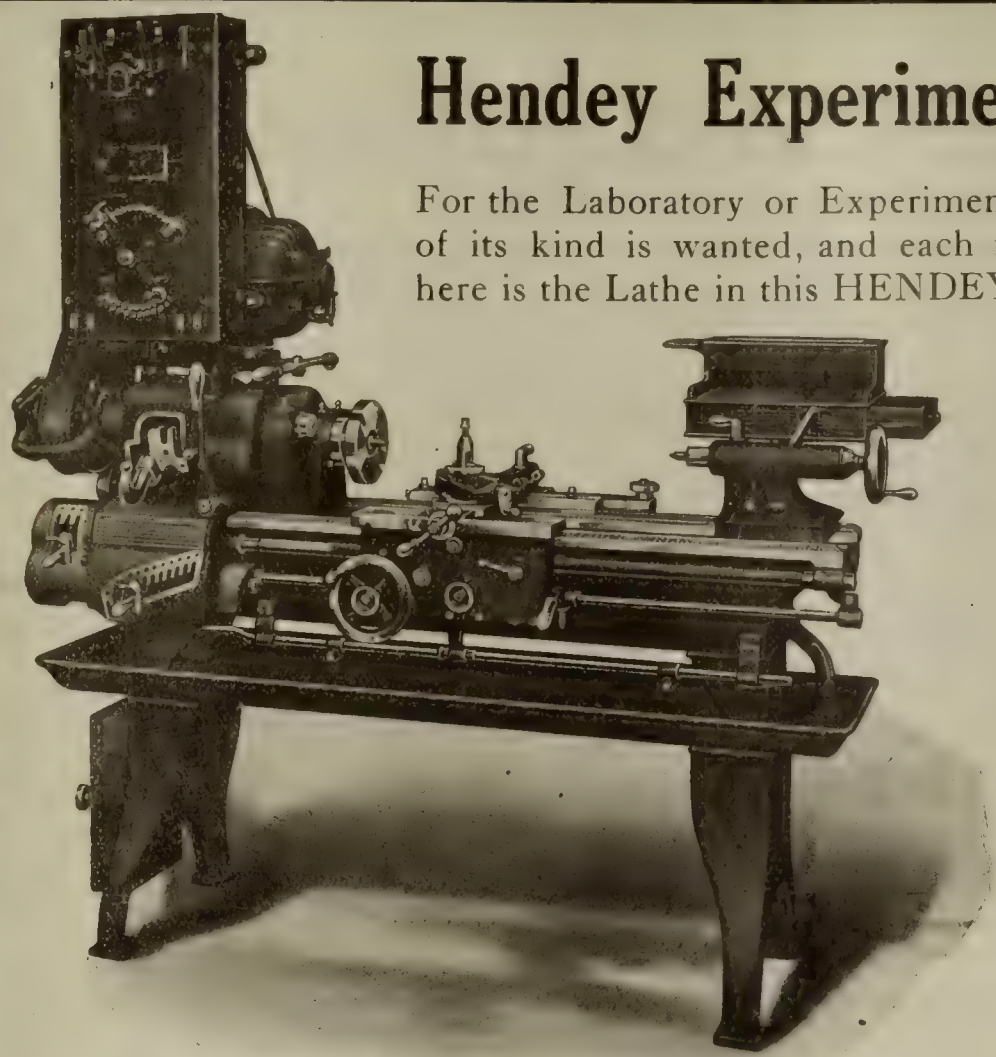

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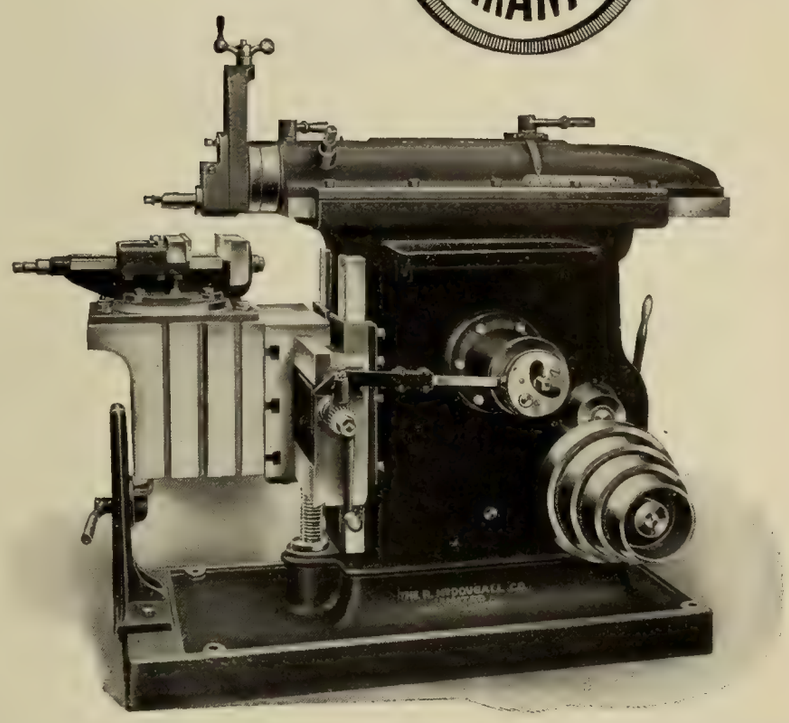

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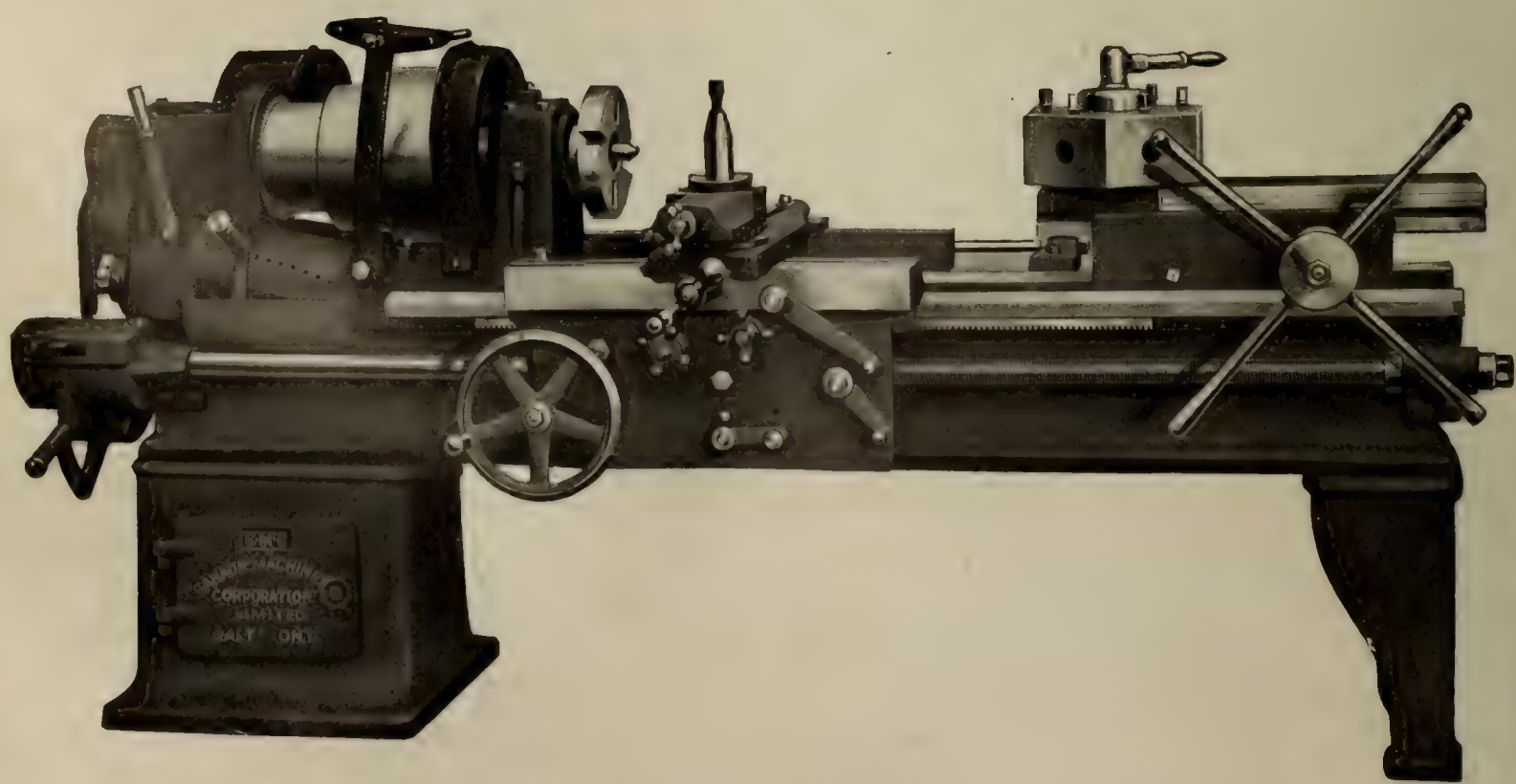

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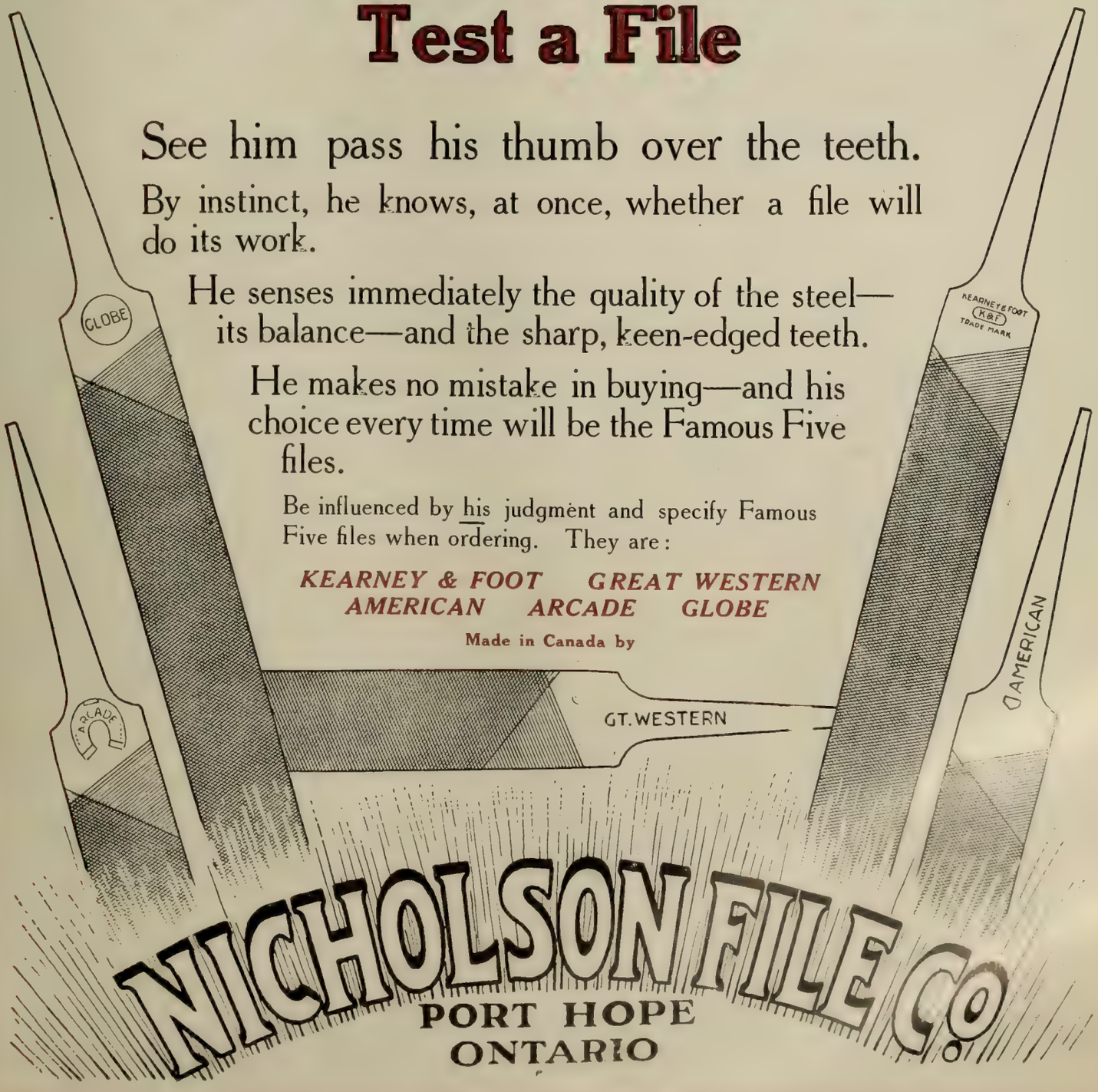

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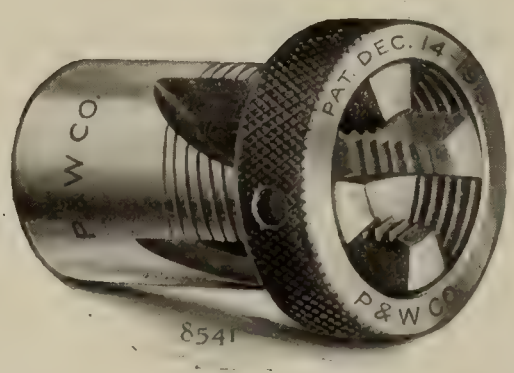

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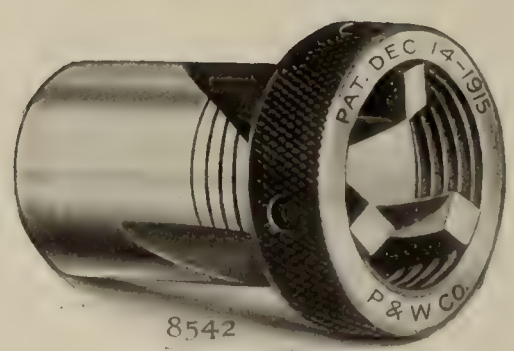

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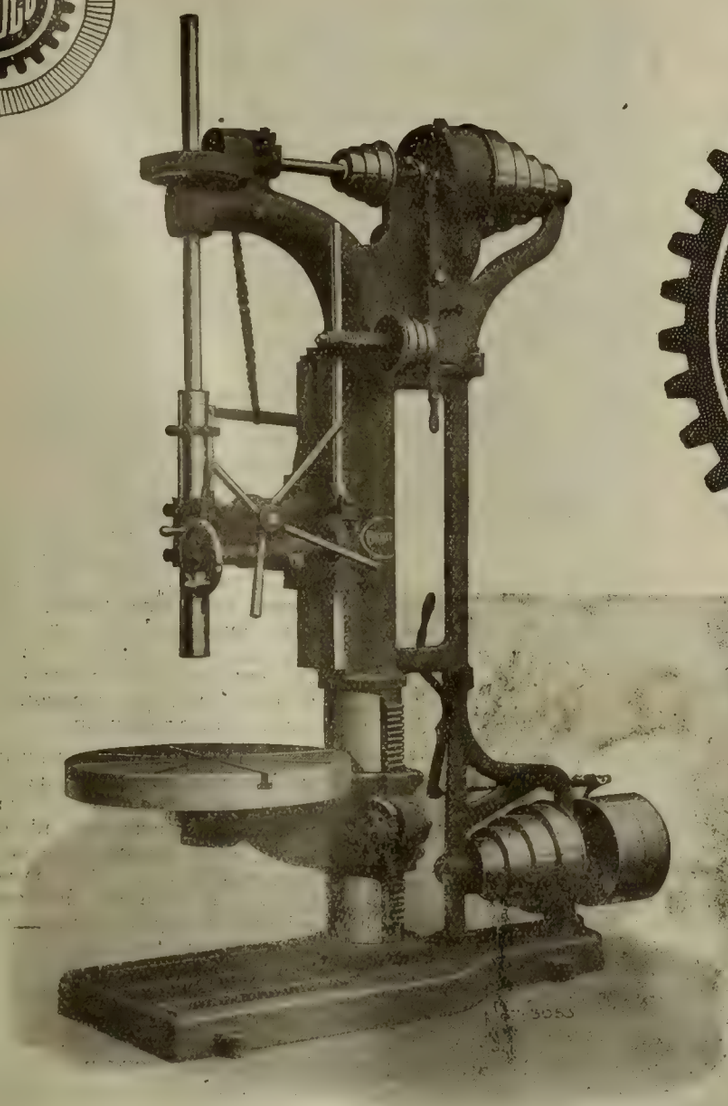

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The Publisher's Page

TORONTO September 20, 1917

IN a recent issue of *Printers' Ink,* that splendid weekly journal for advertisers, there appeared an authorized interview with Lord Northcliffe, head of the British War Mission to the United States, in which "Business in War Time" is discussed. We would like to quote briefly from the article which is of considerable length, believing many of our readers will be interested in what this great business man, organizer and statesman has to say:

THE question of reconstructing markets after the close of the war is not, in Lord Northcliffe's opinion, one to be viewed with apprehension. There will be so much work needing to be done that it will not be a question of how to find a market for the goods made, but how to get goods made fast enough to fill the demand.

"Disbanding the army at the close of the war will be a slow process," he remarked. "It will be at least a year after peace is declared before the last troops are returned to civil life, and there will be little disturbance of the social structure in so gradual a step. Factories are, after all, surprisingly adaptable. Machines which are making war supplies now will not be hard to turn to peace channels. The government will take an active hand in finding places for the soldiers in the civil scheme of things and will itself be a tremendous purchaser of supplies needed in the work of reconstruction. England has in fact an official Reconstruction Department at work now on these after-the-war problems.

LORD NORTHCLIFFE

"It is foolish to suppose that the soldiers who have spent years at the front, living a man's life out in the open with the thrill of mortal danger in it, and knowing the pleasure of comradeships with men whom they have seen tested when the air swarmed with bullets, will be willing to return tamely to doing such 'womanish work' as clerking in department stores, acting as flunkies, or doing purely routine tasks in offices. The returned soldier will want a man's-size job, and we're going to see to it that he gets one. In England companies are being formed to buy agricultural land belonging to the great estates and sell this land in small parcels of a few acres to soldiers on the instalment plan, taking back a mortgage to secure the investment. A similar plan will be used in Canada. Army transport vessels can be kept in service to bring the soldiers overseas.

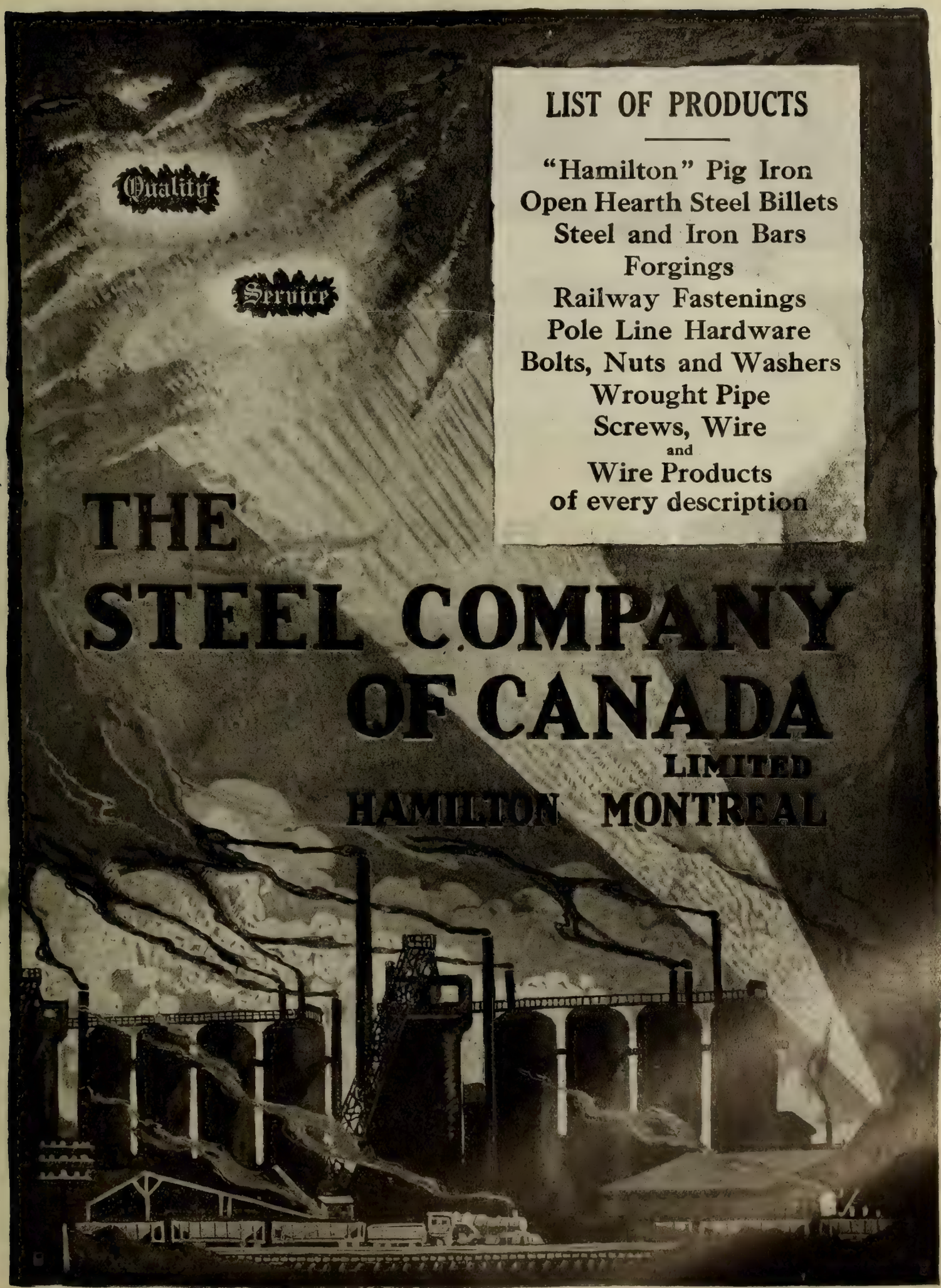
"The apprehension which is sometimes expressed as to the 'woman problem' after the war is not, I think, well founded. It is argued that the women naturally will not want to give up to returning soldiers the positions they have taken up in commerce and industry while the men have been away, and that trouble will therefore ensue. I do not agree. So much will need to be done that with intelligent government supervision there should be plenty of work for all. Also, there are very many women usefully employed to-day who are working for patriotic motives, and who will be glad to stop and return to the care of their homes when the country no longer needs them. In any event, the more people you have employed, the greater the national income; hence, the greater the consumption of goods and the consequent demand on production.

"Some British manufacturers are protecting themselves in regard to the after-the-war market by continuous advertising, even though they have no goods to sell. This is certainly a sound business policy. I believe there will be work enough for everybody—if we win. In building alone there will be employment for vast numbers of men and great quantities of materials. At present, no one is allowed to spend more than a small sum on building without a permit, and that is granted only when it is shown that the proposed building is vitally necessary. Even repairs are not permitted unless they are really needed."

During the war, many types of industry in England have been partly or entirely socialized. Whether these will be restored to private control after peace comes is an interesting question.

"In a good many cases, government control will undoubtedly be continued," his Lordship admitted. "However, industries which were efficiently managed under private control before the war will doubtless go back to their owners. For instance, English railways were, on the whole, well and efficiently handled before the war by the railway companies, and will doubtless go back to them at the conclusion of hostilities. Their greatest weakness, in ante-bellum days, was in their handling of freight, and the government has taught them a lesson of expedition and foresight during the war conditions of complete government control, which they will not soon forget."

As I rose to go, says the author of the article, his Lordship gave me this final message for the business men who read PRINTER'S INK: "This war can only be won as it must be won, by going at the job of winning it hard. The man who hesitates over a question of personal profit or personal inconvenience is simply helping the Germans by so doing. If we get in and help to put the thing through, the after-war problems will, as I said, largely take care of themselves. While the war is on, it is the only real business that any of us have, and we must subordinate everything else to it. Smash the Germans first, and then talk about what's to be done next."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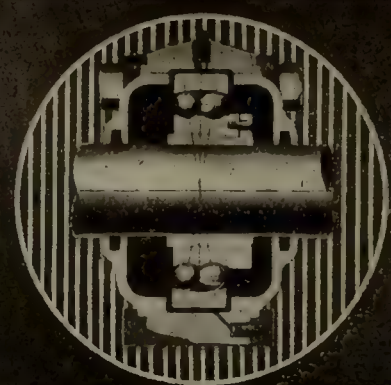

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TORONTO - - ONTARIO
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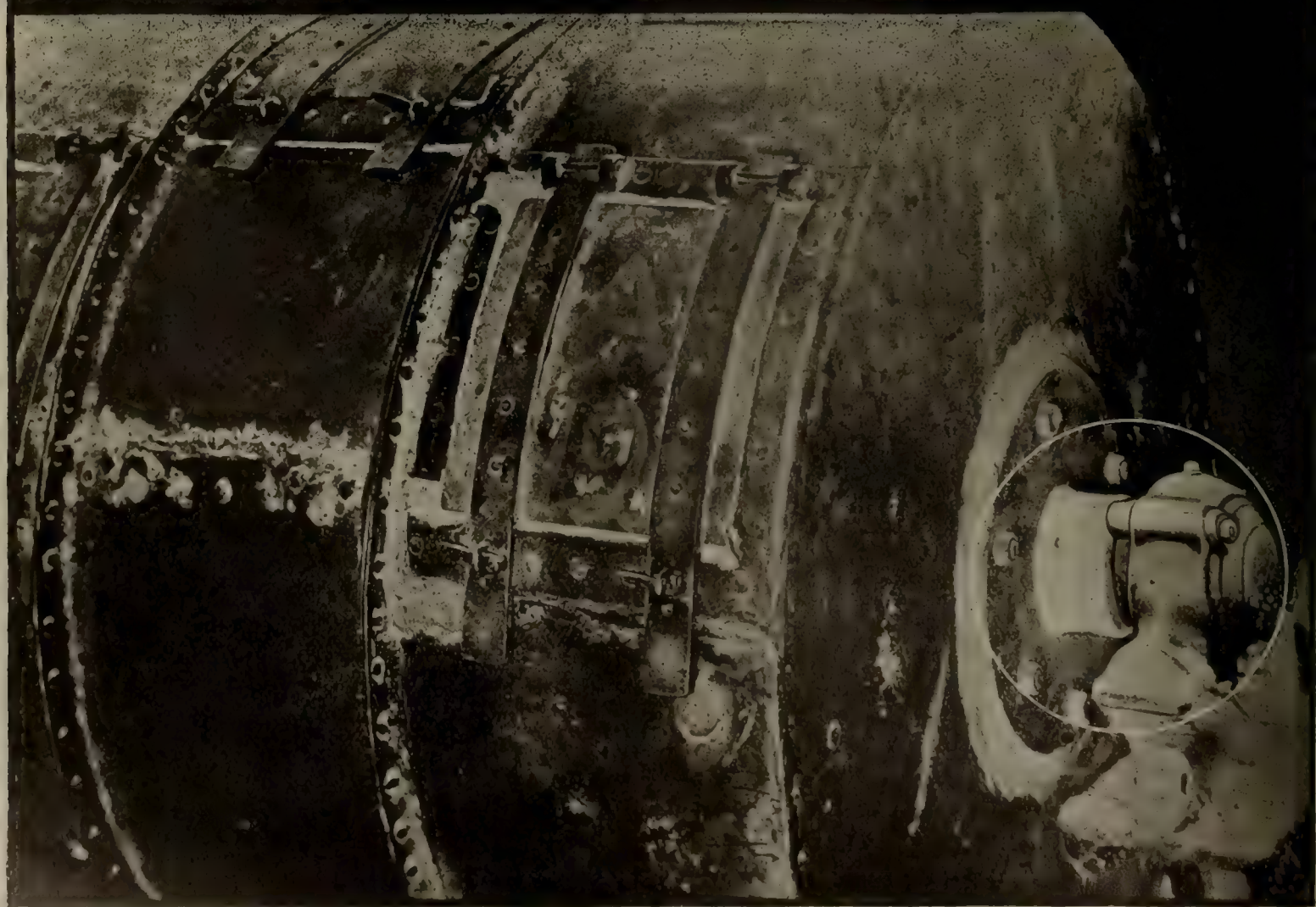

DIAMONDS

LANDIS NORTON

All sizes, finest quality, awaiting your command, stones

"THAT SUIT"

either unmounted or mounted in our improved (any style) CAST STEEL MOUNTING;

GUARANTEED TO BRING RESULTS.

"MADE IN CANADA"

WHEEL TRUEING TOOL CO.

88 WEST PITT STREET WINDSOR, ONTARIO

Works: LONGUEUIL, QUE.

CANADIAN MANUFACTURERS
are you using Steel
MADE IN CANADA?

We are manufacturing at our works at LONGUEUIL, QUE.

SPECIAL HIGH SPEED AND CARBON TOOL STEELS, MISCELLANEOUS SHOP TOOLS, GAUGES, Etc.

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Made by The Canadian Furnace Co.
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M.A. HANNA & CO.

Sales Agents, CLEVELAND

Canadian Office:
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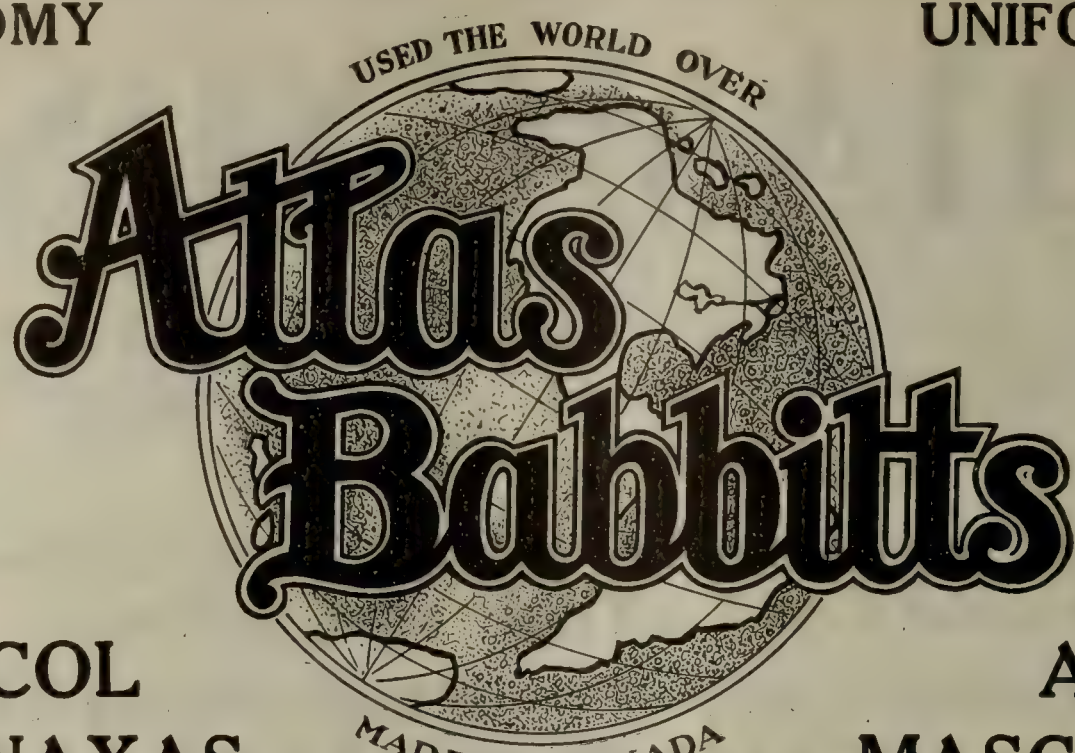
ECONOMY UNIFORMITY



AMACOL ATLAS
TENAXAS MASCOT
TIN TOUGHENED W. E. W. BABBITT

HAVE A WORLD-WIDE REPUTATION FOR UNIFORMITY

ATLAS Alloys are scientific products—the result of much patient research and long years of experience. They are manufactured under the most modern scientific conditions, thereby eliminating any element of chance in their composition and ensuring a standard maintenance of quality and uniformity.

ATLAS Brands are not alloys that *sometimes* give *satisfaction.* They are alloys that can be implicitly relied upon *always.* They are alloys with our *prestige* and *reputation* always behind them.

DO not let prejudice stand between *you* and *profit.* You can obtain the *maximum efficiency* from your plant at a *minimum of cost* by using ATLAS BABBITTS.

THERE IS AN ATLAS BRAND TO MEET ANY NEED

NO SHOCK TOO SEVERE NO WEIGHT TOO HEAVY NO SPEED TOO GREAT

Atlas Metal and Alloys Company of Canada, Limited
MONTREAL

Sales Agents:

The Canadian B. K. Morton Co., Limited

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Phone M. 3206

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Steel Castings

No castings too small or too large for the capacity of our plant. Manganese, Vanadium, Titanium, Chrome, Nickel, castings for Marine, Railroad, Mill and hydraulic purposes are our specialty. Made true to specifications and pattern.

Illustration above shows Stern casting for Ice-Breaker, "John D. Hazen."

CANADIAN STEEL FOUNDRIES, LIMITED

Montreal, P.Q. Welland, Ont.

SISCO

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" **Tool Steels**

Made in Sweden from selected Dannemora Ore

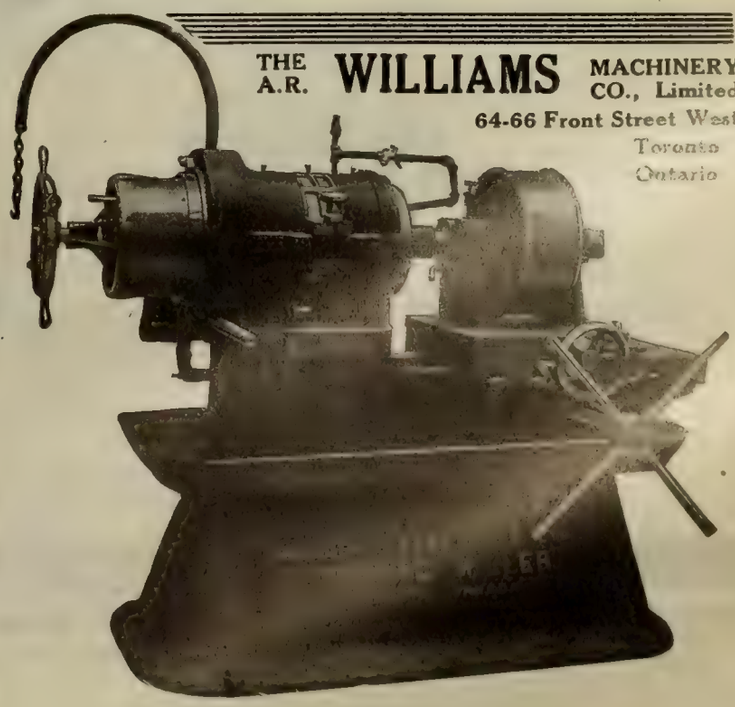
We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SIS-CO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

The Life of a Thread Miller

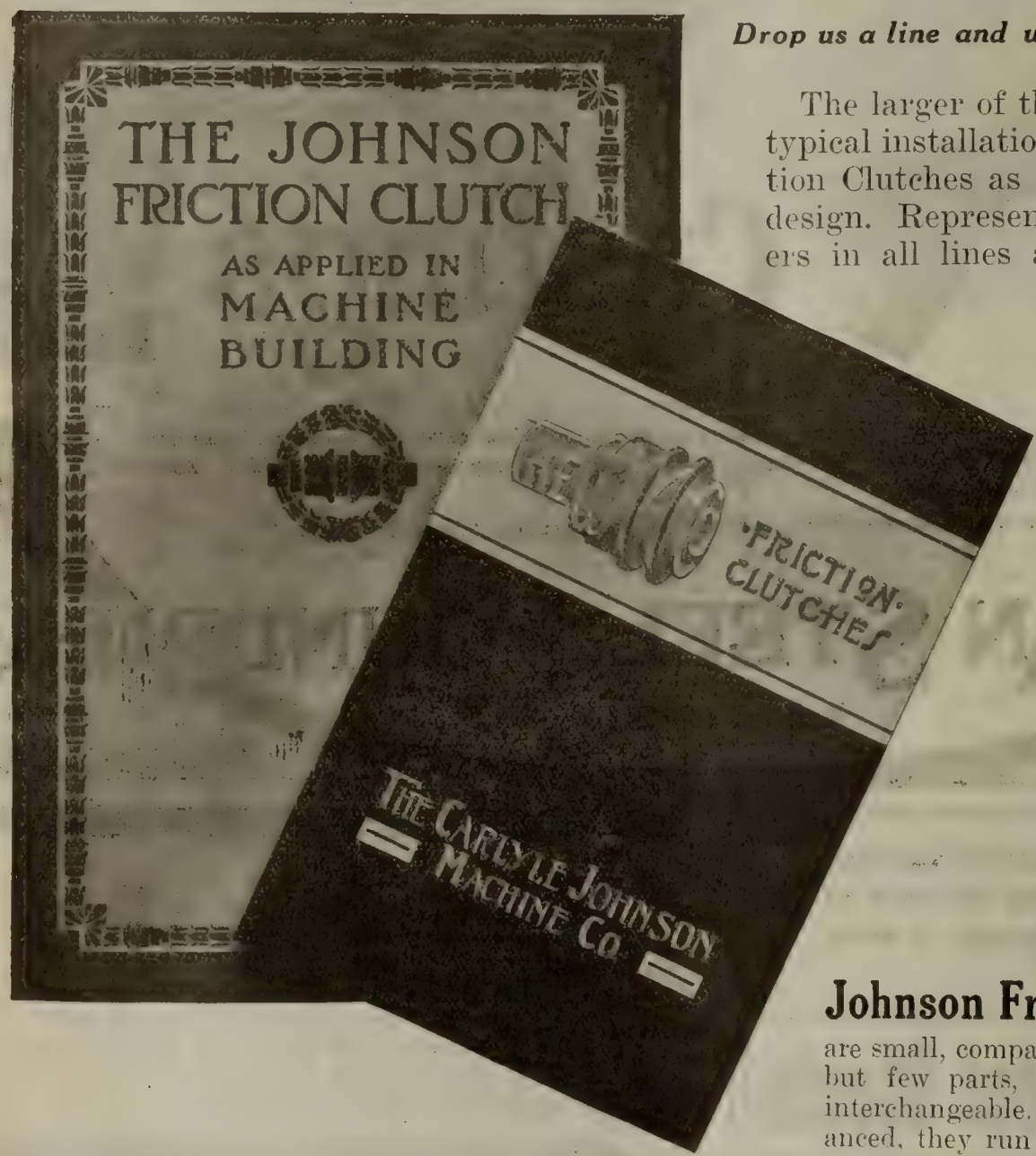
Depends not upon the amount of work it does, but the ease and thoroughness with which the work is done. These Thread Millers are noted for these qualities. Its quality of work is unrivalled. Our Service Department will give you all the particulars. *Write us!*

THE A.R. **WILLIAMS** MACHINERY CO., Limited
64-66 Front Street West
Toronto
Ontario



THE JOHNSON FRICTION CLUTCH

Two Interesting Books You Ought to Write For



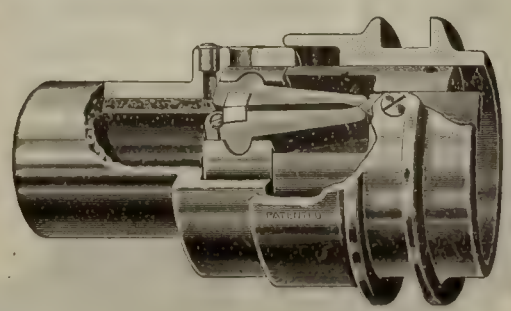
Drop us a line and we'll send you copies.

The larger of the two books shows typical installations of Johnson Friction Clutches as applied in machine design. Representative manufacturers in all lines are adopting these clutches as a necessary part of their machines. How they are doing it and what they say about results is something you ought to know about.

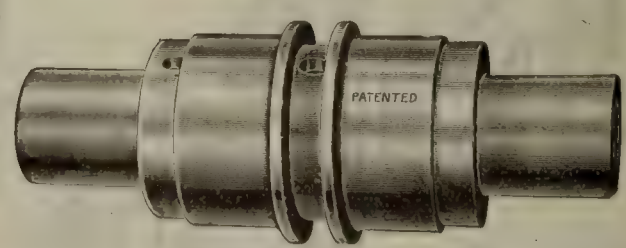
The other book is our YELLOW DATA SHEETS. Write for free copies, to-day.

Johnson Friction Clutches

are small, compact and powerful. Have but few parts, each made absolutely interchangeable. Being nicely balanced, they run at high speed without vibration. They are round and smooth, with no protruding parts, making accidents impossible. No bolts, nuts, links, etc., to become loose and cause trouble. They are the logical choice for you.



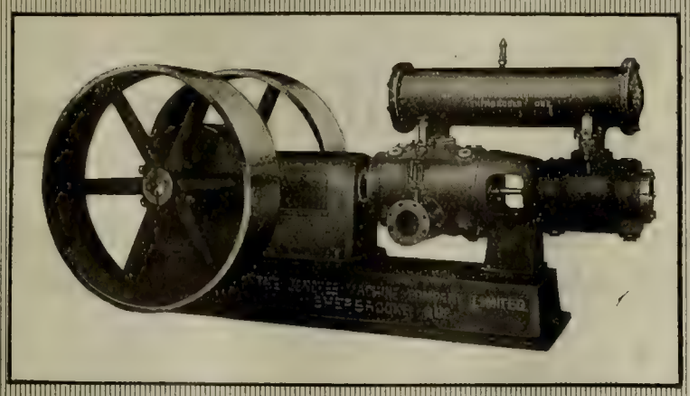
Section broken away, showing clutch disengaged.



Double Clutch—Exterior.

CANADA—Williams & Wilson, 320 St. James Street, Montreal; The Canadian Fairbanks-Morse Co., Ltd., Toronto.
ENGLAND—The Efandem Co., 159 Gt. Portland St., London. W., Sole Agents for British Isles.
AUSTRALIA—Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth Street, Melbourne, Victoria.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



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CB-2 AIR COMPRESSORS

Straight-line, two-stage, belt-driven, equipped with disc inlet and outlet valves, ensuring high efficiency and noiseless operation. Designed and built for severe and continuous service.

The
Jenckes Machine Co., Ltd.

Works:
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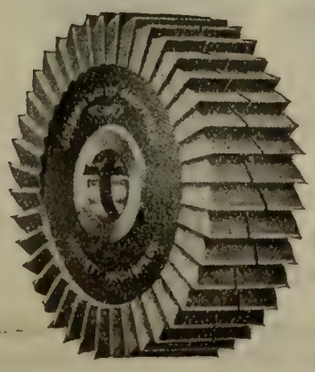
Offices—Sherbrooke, Montreal, St. Catharines, Toronto, Cobalt, South Porcupine, Vancouver.

DOUBLE
MUSHET
High Speed Steel

Carbon Steel
Gauge Steel
Alloy Steels

SOLE MAKERS
Samuel Osborn & Co. Ltd.
SHEFFIELD



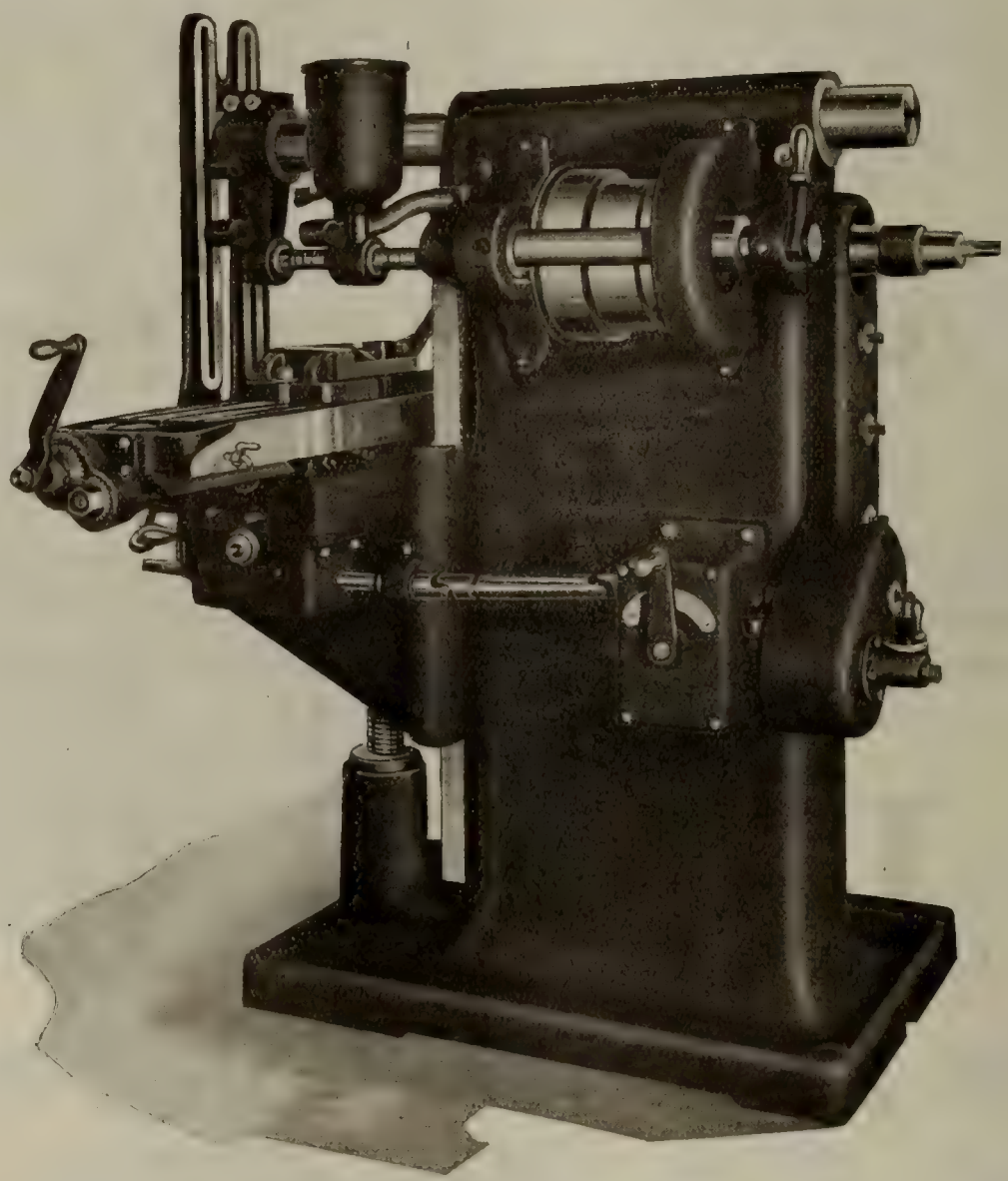
Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)
Limited
Head Office and Works: Montreal, P.Q.
Branch Office: Toronto, Ontario

The Ford-Smith Machine Company

Adv't. No. 4 Miller Series

BEARINGS: One of the most important points in any miller, and at this point we have placed only bearings of the best materials—with accuracy a feature.



It does not pay to attempt to use cheap material in place of the proper and proven best material—and purchasers will find our machines bear out this statement. **At present our deliveries are interesting.**

ARE YOU IN NEED OF A MILLER? IF SO, WRITE US.

The Ford-Smith Machine Company, Limited

HAMILTON ONTARIO CANADA

Sheet Metal Working Machinery

of any description

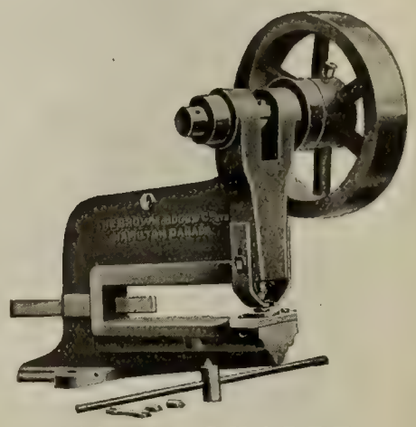
NO 7 SCREW PRESS

For

Quality Efficiency

Durability Speed

they are unsurpassed.



NO 100 GEARED POWER PUNCH

The Brown, Boggs Company, Limited

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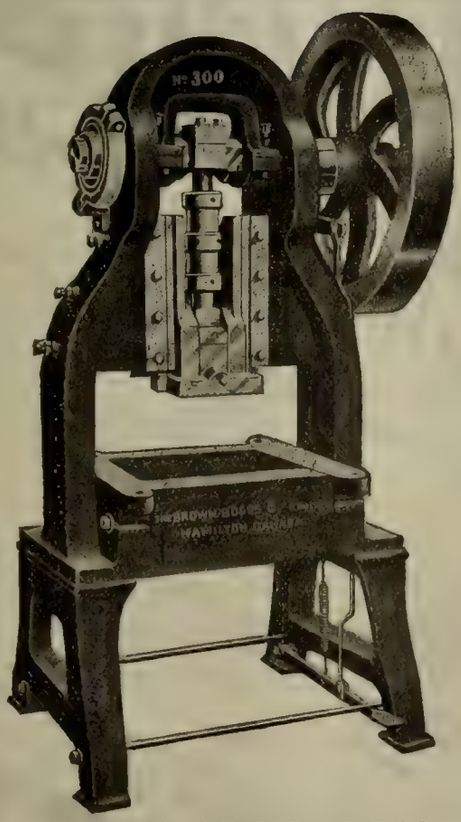

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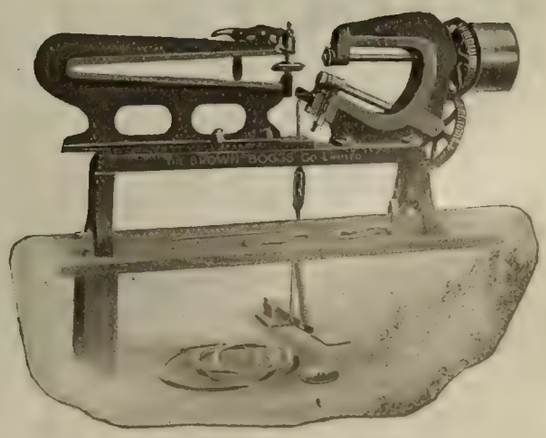
Manufacturers:

Tinsmiths', Heavy Sheet Metal Working Machinery, Canners' and Evaporating Machinery.



NO. 6 COMBINED RING and CYLINDER SHEARS

HIGHEST IN QUALITY

NATIONALLY KNOWN

OUR Country requires the extreme limit of production from every lathe, planer, miller or other machine tool.

BE PATRIOTIC

"Red Cut Superior"

The Nationally Known First Quality

HIGH SPEED STEEL

Will enable you greatly to increase your output

"IT'S THE BEST FOR ALL MACHINE WORK"

VANADIUM-ALLOYS STEEL CO.

PITTSBURGH, PA. Works at LATROBE, PA.

CARRIED IN STOCK AT THESE WAREHOUSES:

E. T. WARD'S SONS, 44 FARNSWORTH ST., BOSTON, MASS. — GEO. NASH CO., 304 HUDSON ST., NEW YORK, N. Y. — FIELD & CO., INC., 721 ARCH ST., PHILADELPHIA, PA. — VANADIUM-ALLOYS STEEL CO., PITTSBURGH, PA., AND LATROBE, PA. — GEO. NASH CO., 646 WASHINGTON BLV'D, CHICAGO, ILL.

WOLFRAM

MADE IN THE U.S.A.

HIGH SPEED STEEL

TRADE MARK

A Keen Cutter

WOLFRAM Is Both

Strong in the Neck

VULCAN CRUCIBLE STEEL CO.
Aliquippa ESTABLISHED 1900 Pa: U.S.A.
Represented in Canada by Messrs Norton Callard & Company MONTREAL QUE.

ELECTRITE-URANIUM High-Speed Steel

Will amaze you in its ability to remove metal

The introduction of this rare element—"URANIUM"—into the mixture of our already superb cutting product, has supplied the final perfection of the qualities of toughness and durability which has been the hitherto impossible goal of metallurgical hopes.

Electric Furnaces, Automatically regulated, produce inevitably similar results at every melt.

We are ready to assist your inquiry in every way possible.

Write

Latrobe Electric Steel Company
Latrobe, Pennsylvania

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One of the

Steels of the Century

Centurion High-Speed

Made from the BEST Materials

Iron, Tungsten, Chrome, Vanadium

Melted by the BEST Process

The Crucible Furnace Method

Handled by the BEST Workmen

Melters, Forgemen, Annealers, Metallurgists

CONSEQUENTLY

Will do the BEST Work

Quality *Delivery* *Service*

We have a catalog waiting for you. Write for it.

THE CENTURY STEEL CO. OF AMERICA

MANUFACTURERS OF HIGH-GRADE CRUCIBLE STEELS

Works:
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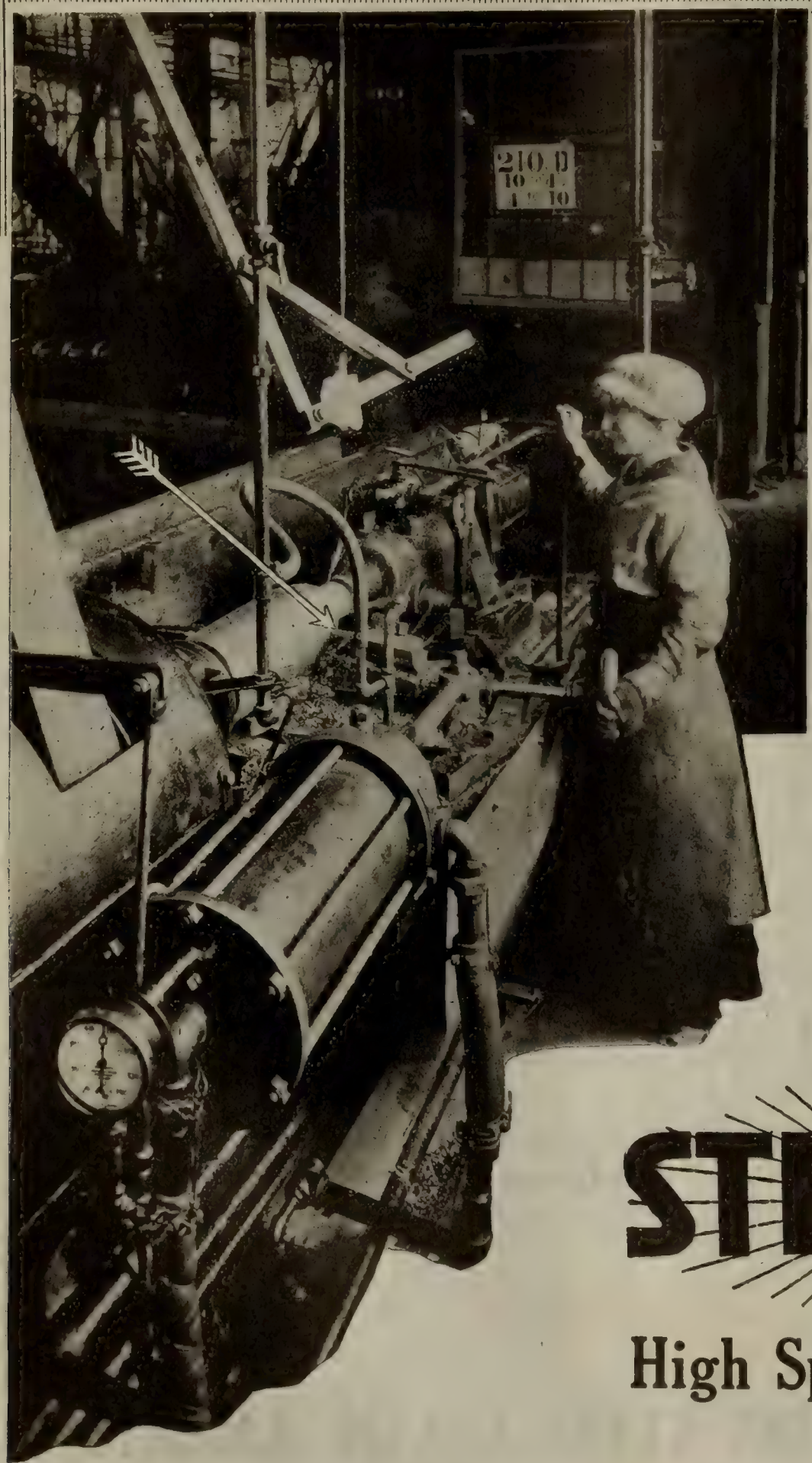
Sales Offices:
120 BROADWAY, NEW YORK



"Not a Steel, but its Master"

FINISHING the profile of 8-in. Howitzer shells made from rolled steel forgings.

The cut starts at a speed exceeding 200 ft. per min. and machines the surface 9 in. long in 1 min. 24 sec.

The tool is given a feed of ⅛ in. per revolution and imparts a highly finished surface to the work.

An output of 55 shells per grinding is maintained easily.

An instance of extreme conditions which Stellite is meeting successfully every day.

Stellite is harder and tougher than steel. Cuts longer and 25 to 300% faster. Requires no forging, and cuts as well when running at red heat as when cold—does not lose its temper. Convince yourself that STELLITE stands behind bigger production and tool economy by giving it a try-out.

STELLITE

High Speed Tool Metal

Deloro Smelting & Refining Co., Limited,

Stellite Sales Dept.
DELORO, ONT.

Toronto, 200 King St., West

Montreal, 315 Craig Street, West

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

TRADE MARK "WACO"

Reliance Steel Works
SHEFFIELD, ENG.

TRADE MARK:

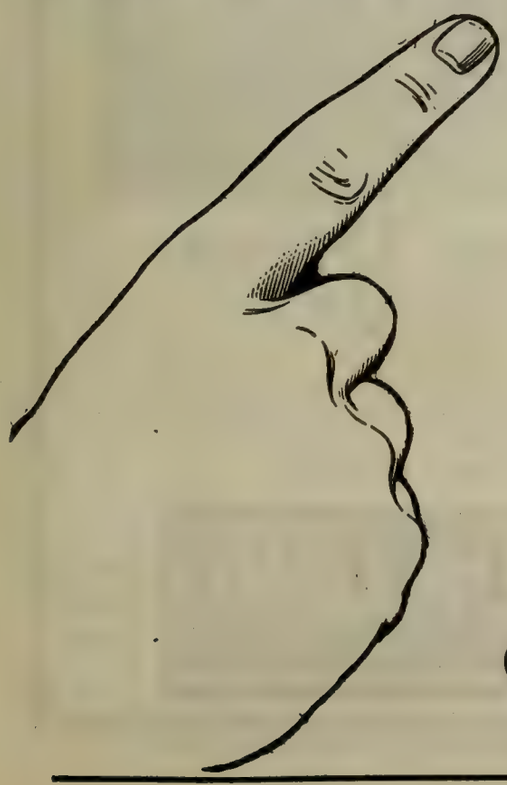
TRADE MARK

of the Famous

"WACO"

Brand

High Speed Steel and Twist Drills



"DOUBLE WACO" Quality

Specially Adapted for all kinds of
MUNITION WORK

"Turtle" Brand
High Class Tool Steel, Files, etc.
of all descriptions.

For particulars apply to our
Sole Representatives for Canada

GEO. A. MARSHALL & CO.
70 Lombard Street Toronto, Ontario

STEEL

FOR SHRAPNEL SHELLS AND SHELL BLANKS

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Company
Limited

Head Office: NEW GLASGOW, N.S.

Western Sales Office:
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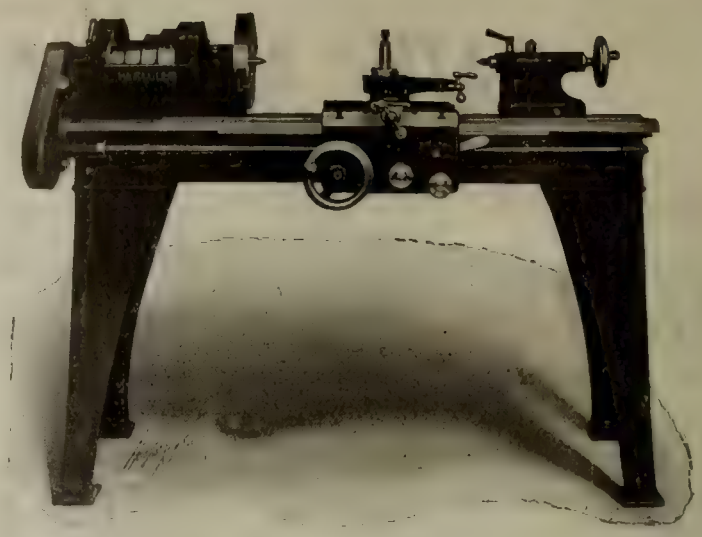


LATHES

12", 16", 18" and 21" swing

Strictly modern in design, rigidity and accuracy guaranteed.

Himoff Machine Company
45 Mills Street
Astoria, City of New York, N.Y.

Core Ovens

Perfect cores are a big item in cutting foundry costs.
Use Whiting Ovens and obtain uniform heating and regulation. Years of experience are back of our designs.

Send for catalog 121

Complete Foundry Equipments

WHITING
FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB.

Cranes of all kinds

"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

MANUFACTURED BY

Arthur Balfour & Co., Limited
Dannemora Steel Works,
Sheffield, England.

The Eagle & Globe Steel Company, Limited

Head Office, Canada and U.S. — 128 Craig Street West, Montreal
Ontario Office and Warehouse — 36 Colborne Street, Toronto
Winnipeg Stock — Dominion Equipment & Supply Co. Limited
Vancouver Stock — Frank Darling & Co.

W. A. BRADBURY, Agent, 128 Craig Street West, Montreal

FERRO-URANIUM *The Latest Discovery in Alloys for Efficient*

High-Speed and Other Steels of Quality

IT INSURES TOOLS THAT STAND UP ON THE JOB

Largest Producers in the World of URANIUM

WRITE US FOR PARTICULARS

STANDARD ALLOYS COMPANY

Forbes and Meyran Aves. -:- Pittsburgh, Pa.

JUST SHIPPED

Four Eighteen by Fourteen CISCO Lathes

to a customer who first purchased 14", then 16", and comes back for *more*. Is he *satisfied?* We think so.

Now these were beautiful machines. Just the right length to set off the *heavy, powerful durability* of the machine. And *accurate?* Well, *not within* .001 in 18" but.

BETTER THAN .0005 IN 18"

That's *going some* for a *big machine* like that. They will prove *money-makers* and *time-savers,* too, and there are no *complicated* levers or *intricate* operating parts. Don't have to study a chart to run a CISCO.

Have you bought a "LATHE WITH THE PULL?"

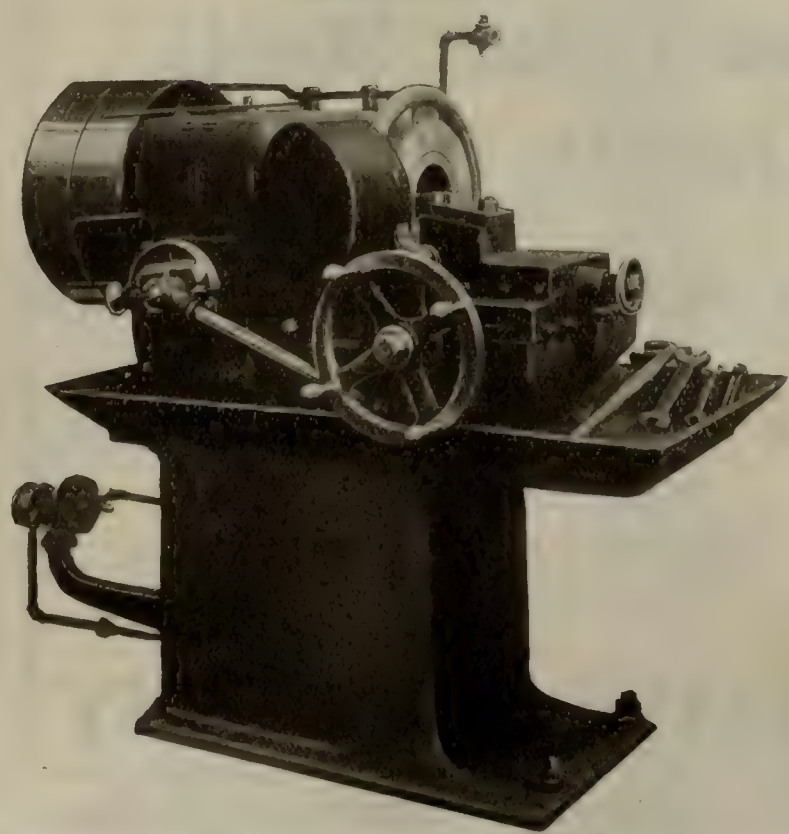
WILLIAMS (The A.R.Williams Mchy. Co. Ltd.) of Canada sells them

MADE IN CINCINNATI, U.S.A., BY

THE CINCINNATI IRON AND STEEL COMPANY

Makers of 14", 16", 18", 24" Engine and Tool Room Lathes

6" Light
Base Fac'ng
Machine



Another Worthy Victoria Product

THIS machine has proved itself a first-class investment.

Well-Designed
Carefully Built
Sturdy and Efficient

IT is a conclusive argument in favor of special purpose machines.

Space required 4x7 feet.
No countershaft required.
Approximate weight, 2000 lbs.

Victoria Foundry
Company Limited

OTTAWA - - ONTARIO

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more stury, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6" shells.

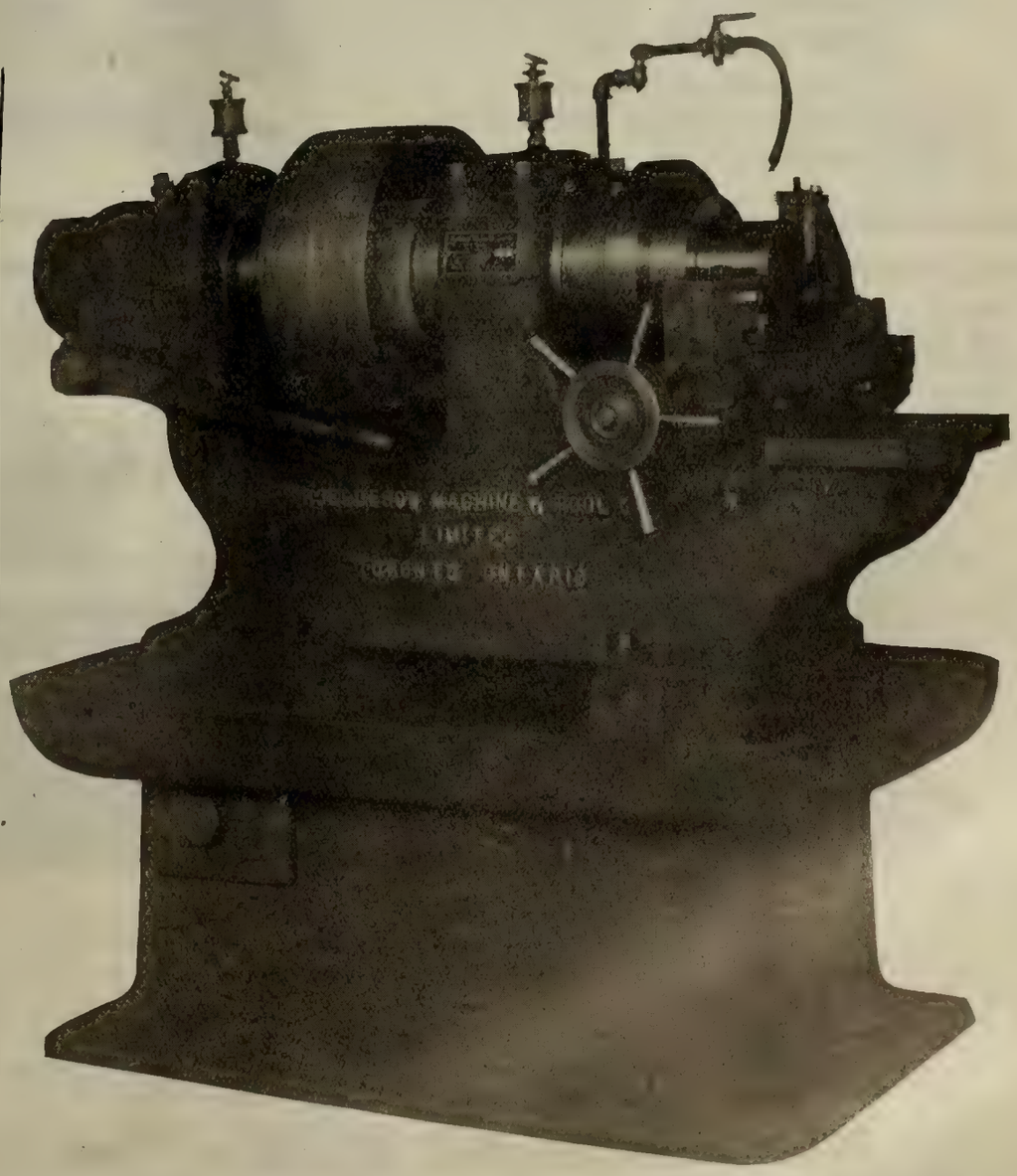
Roelofson Machine & Tool Co., Ltd.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

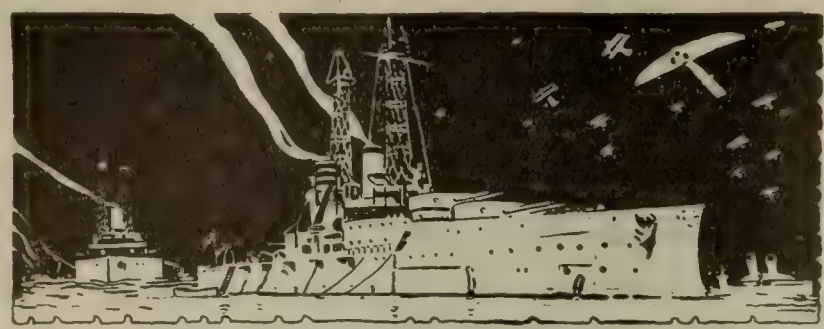
Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6" shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.



If any advertisement interests you, tear it out now and place with letters to be answered.



PUTTING "PEP" IN PREPAREDNESS

Preparedness is a continual process. It doesn't stop with the shipment of the first ammunition abroad. It involves "getting ready" for whatever the future may contain. Just now it is preparing for MORE war and the peace that will follow. "Sidney for Service" Lathes put "pep" in preparedness. They speed production. They minimize spoiled products. They permit men to do maximum duty. They put zip and go into industrial plants. Write for Bulletin 30.

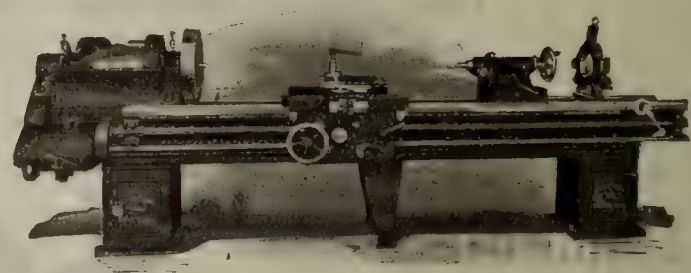
The Sidney Tool Co.

SIDNEY, OHIO, U.S.A.

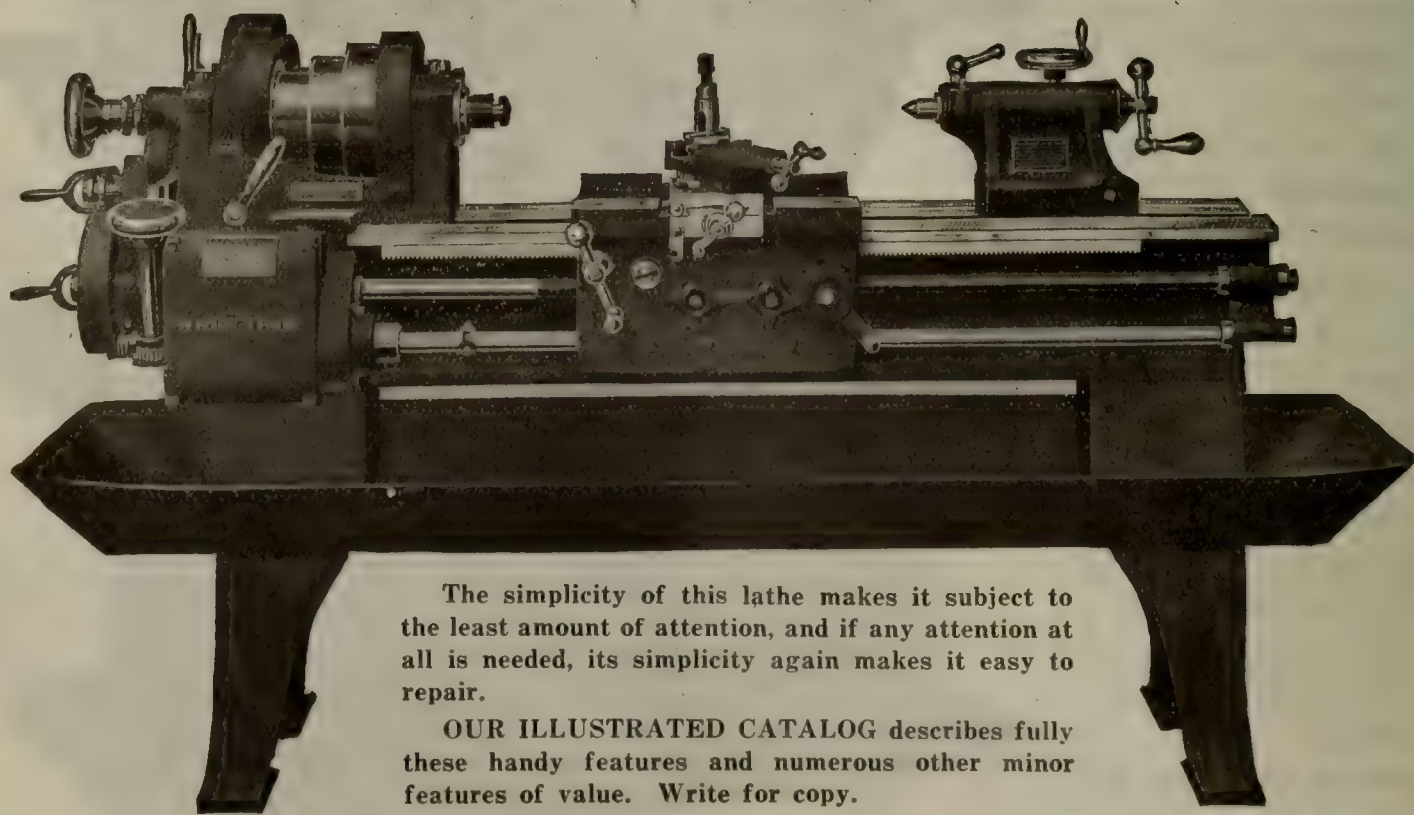
Represented in Canada by:

Foss & Hill Machinery Co., Montreal, Que.

H. W. Petrie, Ltd. - Toronto, Ont.



The Whitcomb-Blaisdell Tool Room Lathe



The simplicity of this lathe makes it subject to the least amount of attention, and if any attention at all is needed, its simplicity again makes it easy to repair.

OUR ILLUSTRATED CATALOG describes fully these handy features and numerous other minor features of value. Write for copy.

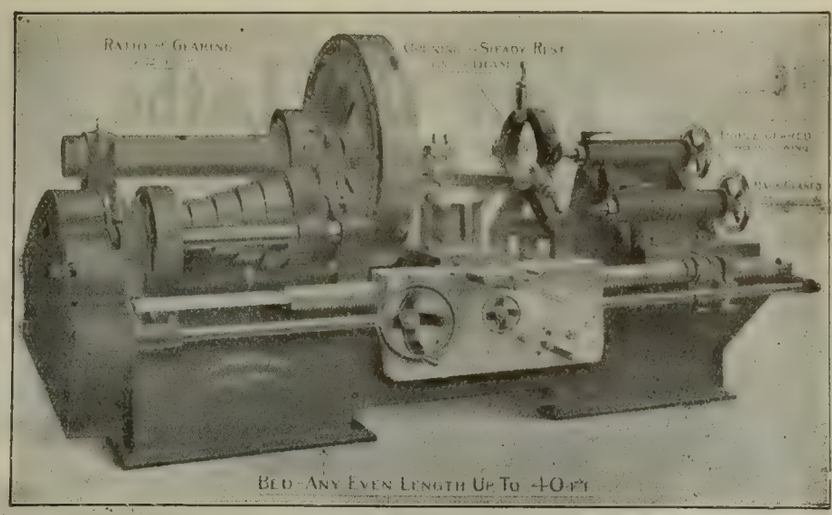
Whitcomb-Blaisdell Machine Tool Company

Engine Lathes WORCESTER, MASS. Metal Planers

One Ship-building Plant

wrote to six different Lathe-Builders

and bought McCabe's "2-in-1" Double-spindle Lathe—on a 30-ft. bed—because it was "different" and built especially for such a wide range of work.



McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing
As a 48 inch Triple-Geared Lathe

What other big Lathe can you get, and have full use of your Lathe, whether you have big or small work?

What Lathe Manufacturers except McCabe could make such a low price possible?

No other Lathe builder turns out 48-inch Lathes in such big lots at a time, making the parts all duplicate and interchangeable.

And in addition to the 48-inch Triple-geared Lathe, the 26-inch is the "Lathe plus" feature McCabe offers you—at no extra cost.

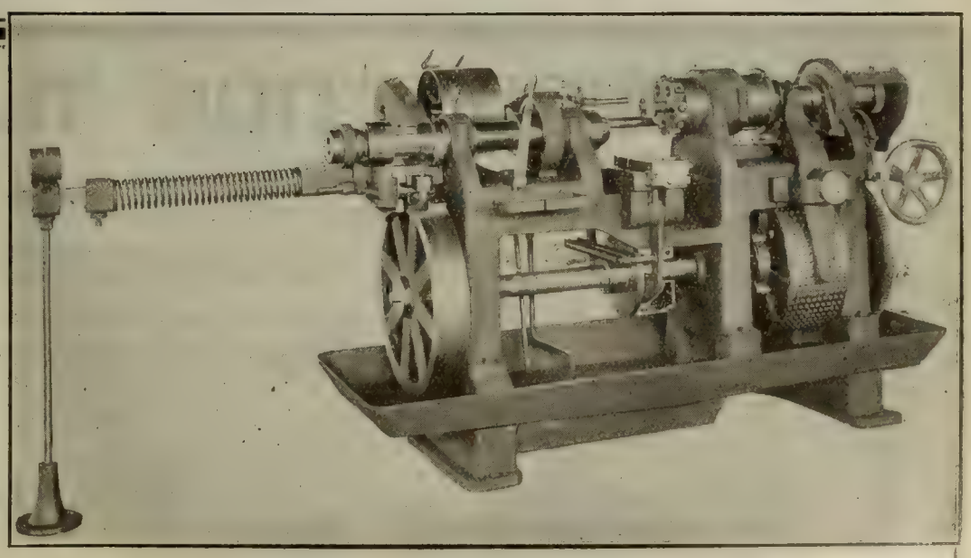
DOUBLE service—convenience and capacity—all described in Latest Bulletins.

J. J. McCABE, 149 BROADWAY, NEW YORK

The Chicago Automatic Screw Machine

TEN YEARS OF EXTENSIVE MANUFACTURE OF ONE PRODUCT — AUTOMATICS — STAND BEHIND EVERY MACHINE.

No complicated mechanism or a system of cams that are difficult to determine and arrange on this machine.



The rigidity of the machine has not been sacrificed for the flexible features which are embodied in the Chicago Automatic. Alignment is correct and there are no parts where excessive wear takes place—therefore, accurate production is assured during the long life of the machine.

Spindle speeds suitable to different sizes and kinds of stock within the capacity of the machine are obtained by changing two gears on the spindle head.

In less than six weeks we can place Chicagos in your plant ready for production.

They must satisfy you before we consider them sold. Write us about all the features now.

THE JOHN MACNAB MACHINERY COMPANY

NEW YORK CITY, U.S.A.

European Representatives: John Macnab, Hyde, England

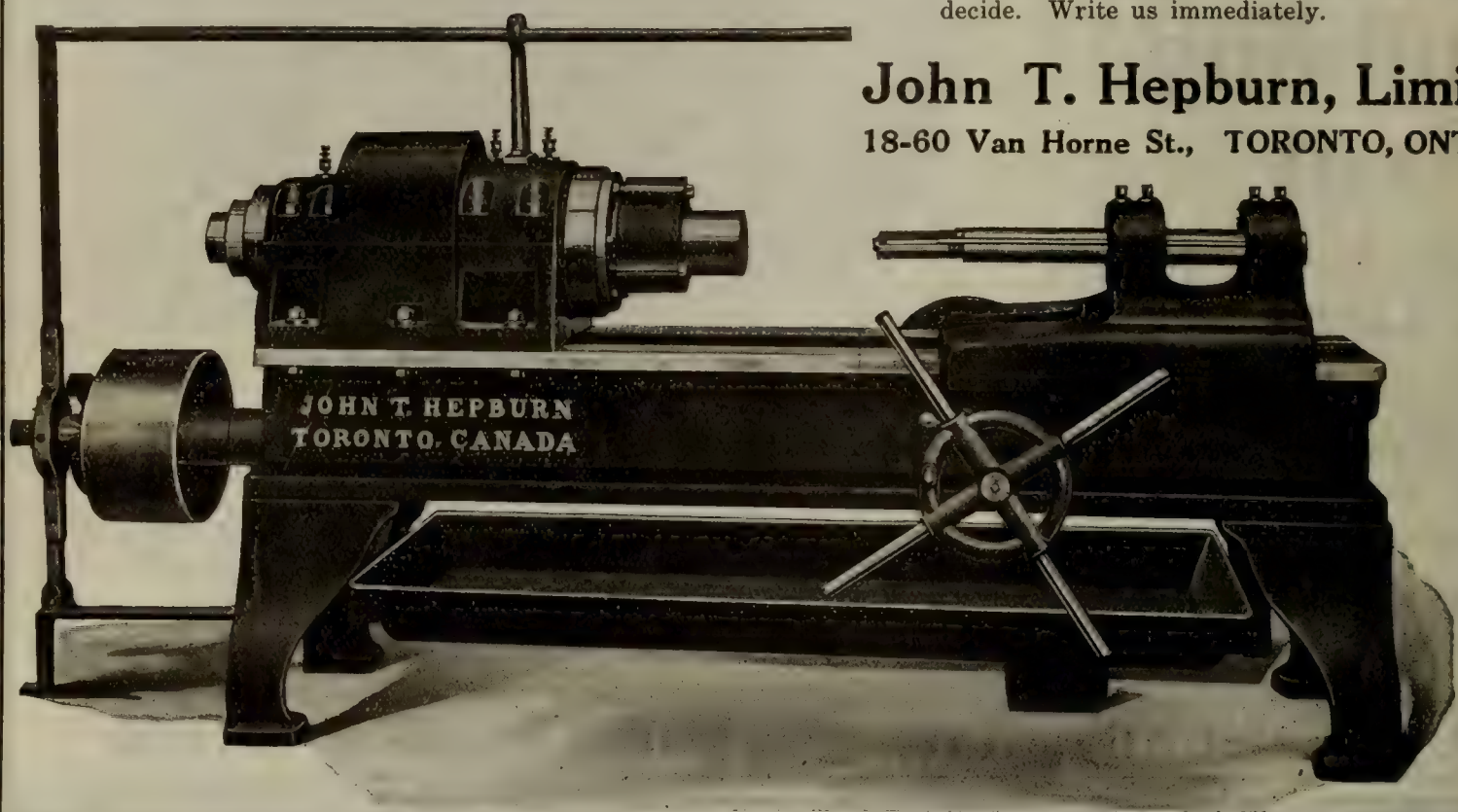
If any advertisement interests you, tear it out now and place with letters to be answered.

Renew Your Old Lathe

Not necessarily by securing a new one but take advantage of our thoroughly equipped machine shop. We repair lathes, plane the lathe beds. We build lathes and in our repairing the same care is exercised. If you intend securing a new lathe, get a list of the Hepburn line before you to help you decide. Write us immediately.

John T. Hepburn, Limited

18-60 Van Horne St., TORONTO, ONTARIO



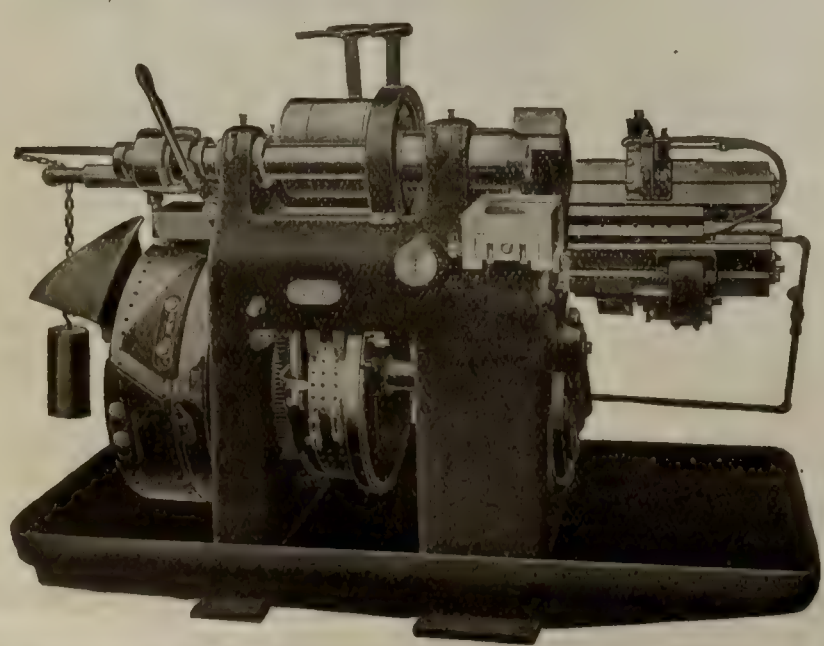
It Is PRODUCTION That COUNTS

Rapid and accurate production of duplicate parts at a low operating cost has always been a feature of the Gridley, as well as the maintenance of a uniform output during the longest runs.

The reason is found in the construction of the machine—rigid frame—spindle supported in two large bearings—tools held and advanced in slides on turret which is held in bearings in both ends of headstock—positive cam action.

Simplicity of construction throughout makes set-up easy and little attention necessary when in operation.

That is why GRIDLEY SINGLE SPINDLE AUTOMATIC TURRET LATHES have satisfied their users and caused an increased demand for the machines.



Four sizes of machines. Chuck capacity up to 5". Length of feed 13½". Handles bar or single-piece chucking work. Let us quote on your product without obligation.

The National Acme Company

WINDSOR, VERMONT

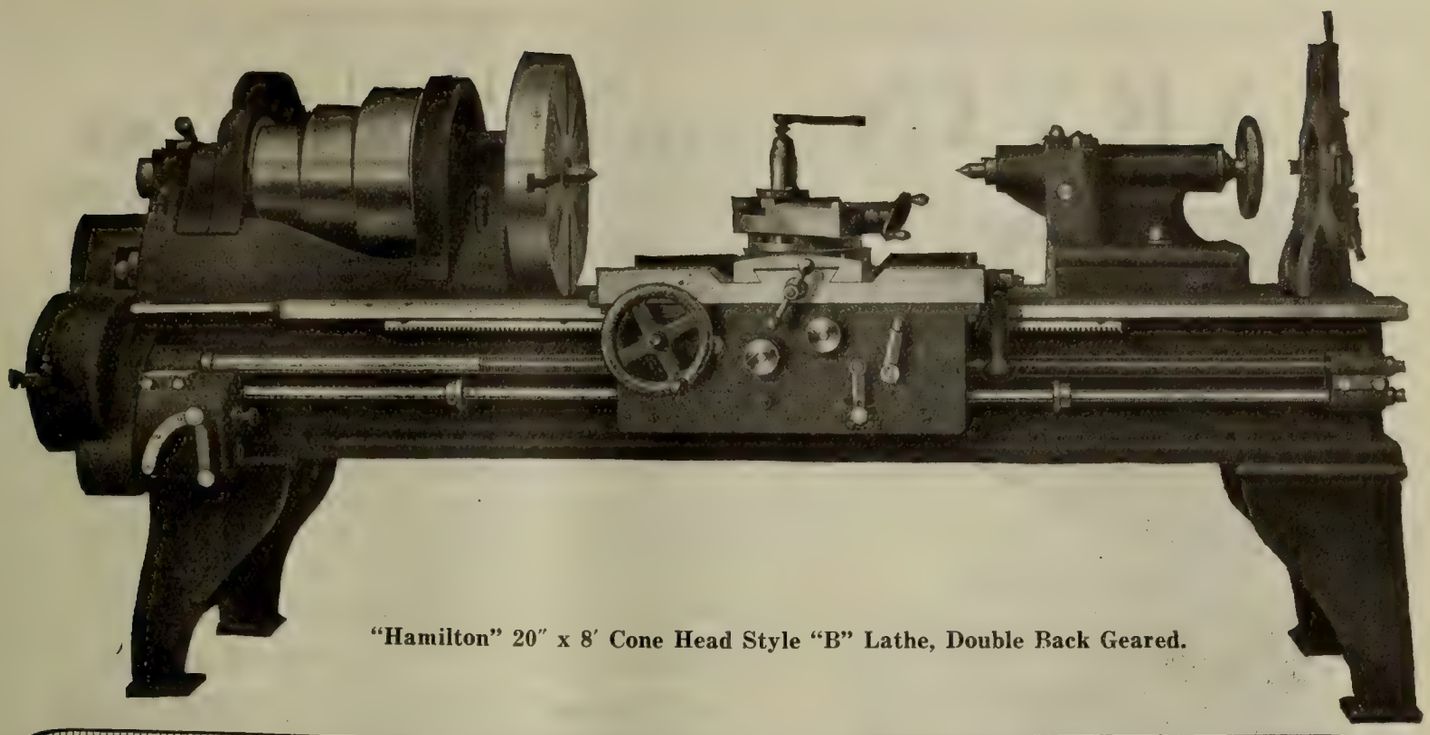
General Offices: Cleveland, Ohio.
Canadian Screw Plant, Montreal

Branch Offices:
New York Boston Chicago Detroit Atlanta
San Francisco

Warehouses: New York and Chicago

REPRESENTATIVES IN FOREIGN COUNTRIES.

Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont, and Acme Automatics, Threading Dies, and Screw Machine Products at Cleveland, Onio.



"Hamilton" 20″ x 8′ Cone Head Style "B" Lathe, Double Back Geared.

HAMILTON LATHES

MERIT

Year after year "HAMILTON" tools have been building their reputation—it has long since been established. To-day it is maintained just as it was built—through merit alone.

Hamilton Machine & Tool Co. mechanics have combined their skill in the construction of this Lathe, and in it have achieved a distinct triumph. Turns out work with unrivalled rapidity and it turns it out to finish style—work that you may well be proud of.

It is a most modern lathe, substantially constructed—built to meet the conditions of to-day for speed and reliability.

You make no mistake when you buy a Hamilton Lathe.

It will Produce.

HMT Co

For 25 Years Makers of fine Machine Tools

The Hamilton Machine Tool Co.

HAMILTON, OHIO

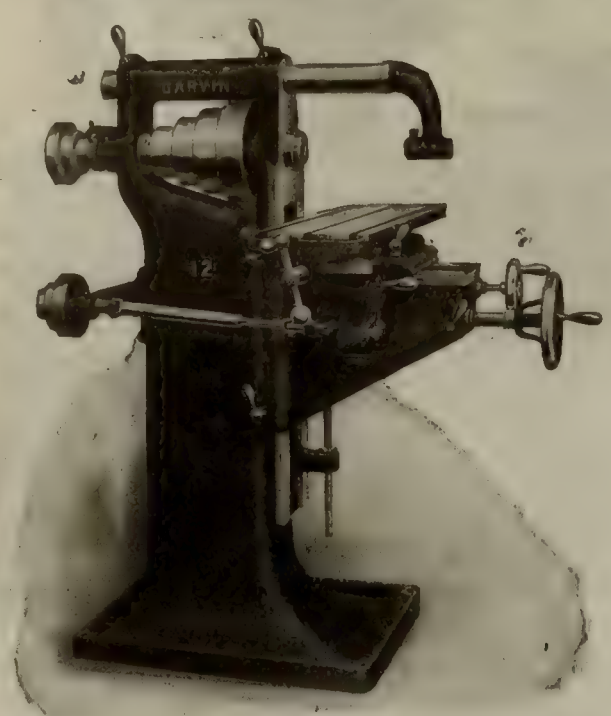
Sole Agents for Ontario:

H. W. PETRIE, Limited - Toronto, Ontario

GARVIN

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING



No. 12 Plain Milling Machine—Use Code Abrade

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rapidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments.....18 x 6 x 15 in.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

Manufactured by

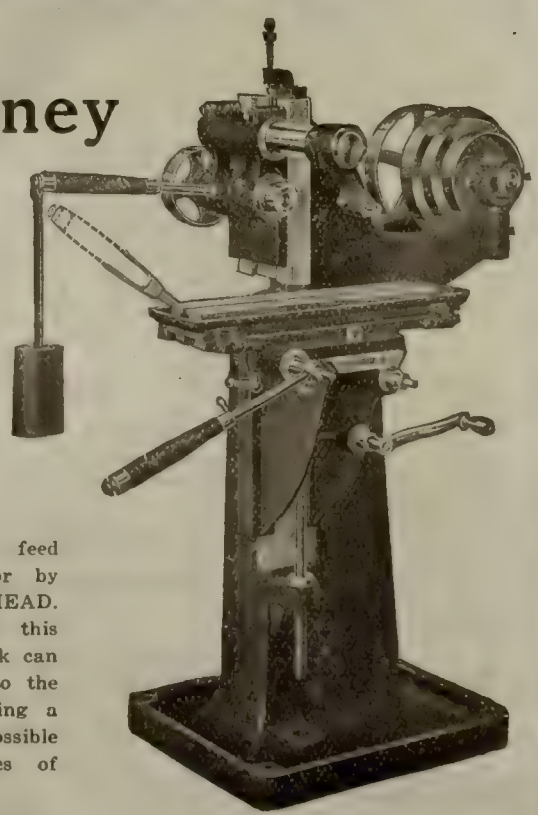
THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City

THOUSANDS IN USE

The Whitney

Hand (Feed) Milling Machine



The vertical feed is provided for by the SLIDING HEAD. On account of this feature the work can be held close to the table, thus giving a rigidity not possible on other types of Hand Millers.

Send for Catalogue A.

The Whitney Mfg. Co.

Hartford Conn. U.S.A.

Chains—Keys—Hand Milling Machines.

For Rapid Production and Accurate Work

USE THE

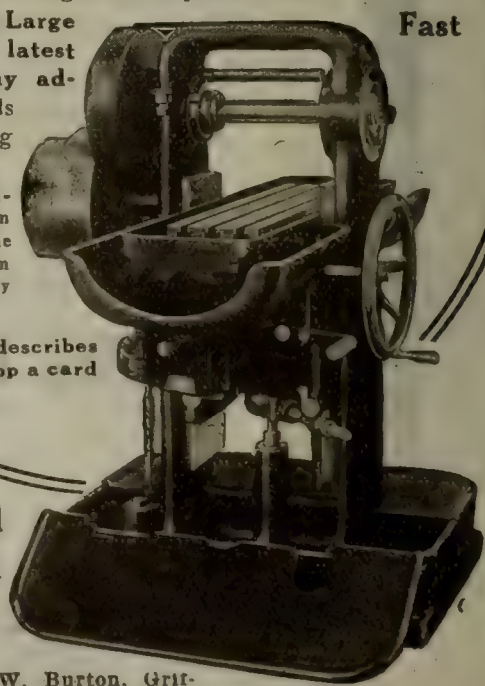
"BRIGGS"

The Briggs Miller handles work no other machine of its size can touch. It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

The Base Tank and Large Gear Pump is the latest addition to its many advantages. Tank holds 20 gallons of cutting lubricant

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

Fast



Our booklet describes fully. Drop a card for it.

Gooley & Edlund Inc.

Cortland, N.Y., U.S.A

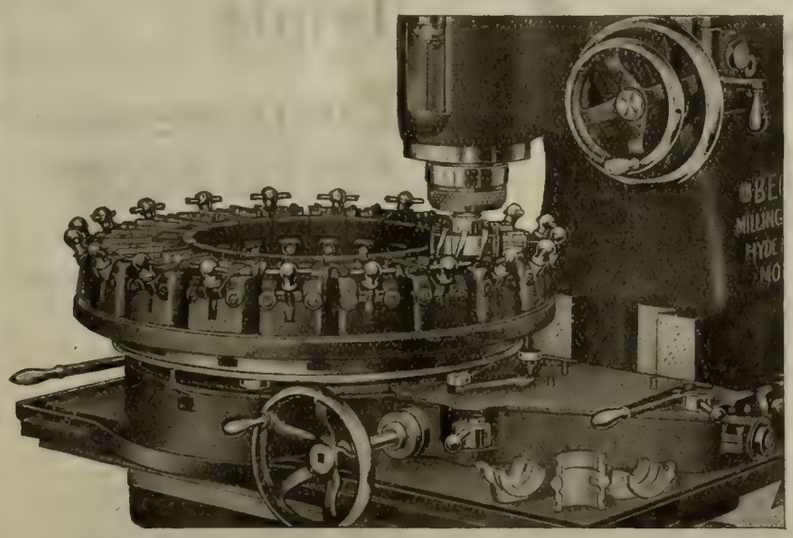
Foreign Agents: Allied America, France, Belgium, Italy, Switzerland, Machinery Company of Russia, Scandinavia, C. W. Burton, Griffiths & Co., London, Manchester and Glasgow, Barandiaran, Metivier, Gazeau & Cia, San Sebastian, Spain.

PRODUCTION

BY comparative tests the *Becker* method has far outstripped any competitor. Quantity production was the goal aimed at. We got there. On small parts it is quantity that will make the operation a success or a profit-eater. The method illustrated below can be applied to any work. We make a specialty of co-operating with clients to solve and overcome their milling problems.

The illustration below shows a **Becker** fixture holding 20 castings. The output by this method is 140 per hour. The manufacturer doing this work originally obtained 100 per hour. By this you can see the economic value of this Becker.

We invite your inquiries. If you are contemplating installing a milling machine, why not have one to suit your needs? Our organization and equipment are ready to co-operate with you. You are greatly losing if you do not get in touch with us.



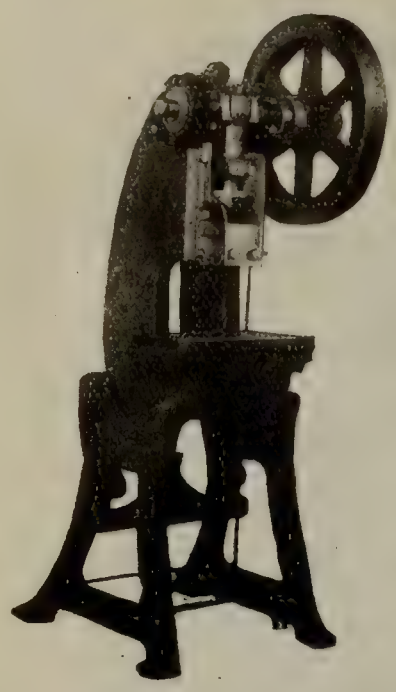
Becker Milling Machine Co.

HYDE PARK, BOSTON, MASS., U.S.A.

Agents:

THE A. R. WILLIAMS MACHINERY CO., LTD.
TORONTO and HAMILTON

WILLIAMS & WILSON, LTD.
MONTREAL, QUE.



Consolidated Presses

appeal to discriminating users because of the massive construction of all working parts, the generous crank shaft bearings, the increased diameter of crank pins, liberal crank cheeks, long and carefully fitted slide bearings, abnormally large connection screws, powerful gearing, and above all, the skill and care exercised in their construction.

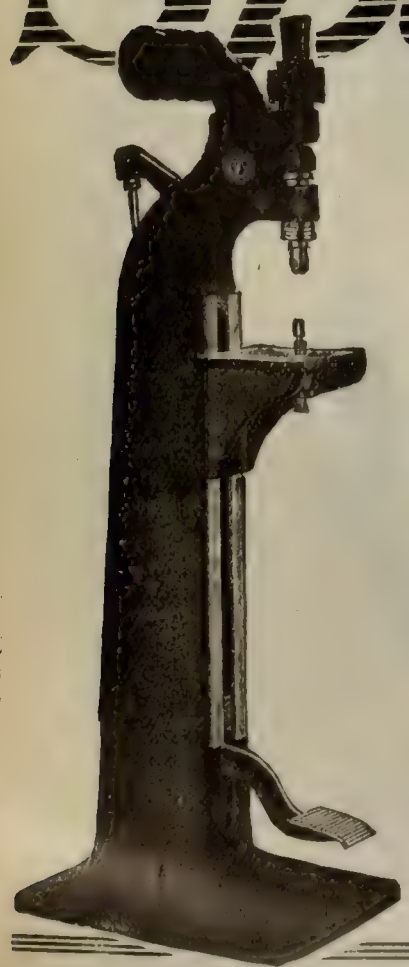
These are features which should be considered when purchasing.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

Speed



When the quality of the work is the best obtainable, the next item is speed. For upon speed depends your costs.

One rivet per second is the speed this machine will maintain indefinitely. Adapt that speed to your requirements and find out the value the Grant Riveter would be to you.

Write for our catalogue. It will give you complete information.

Grant Mfg. & Machine Company

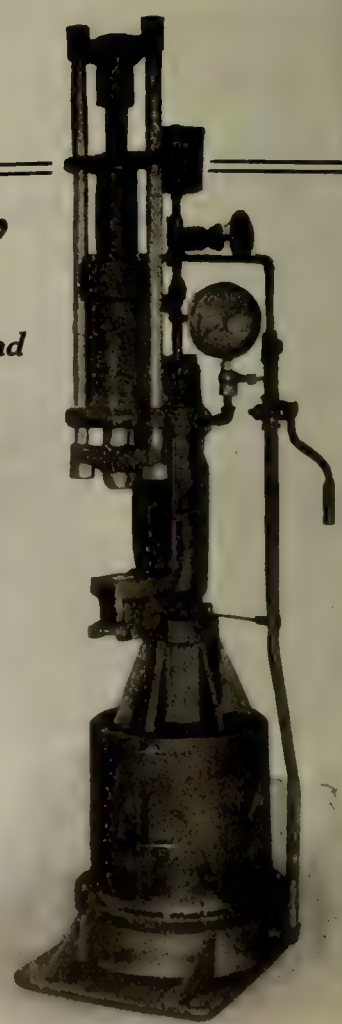
Bridgeport, Conn., U.S.A.

Triple Purpose

"METALWOOD" COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.

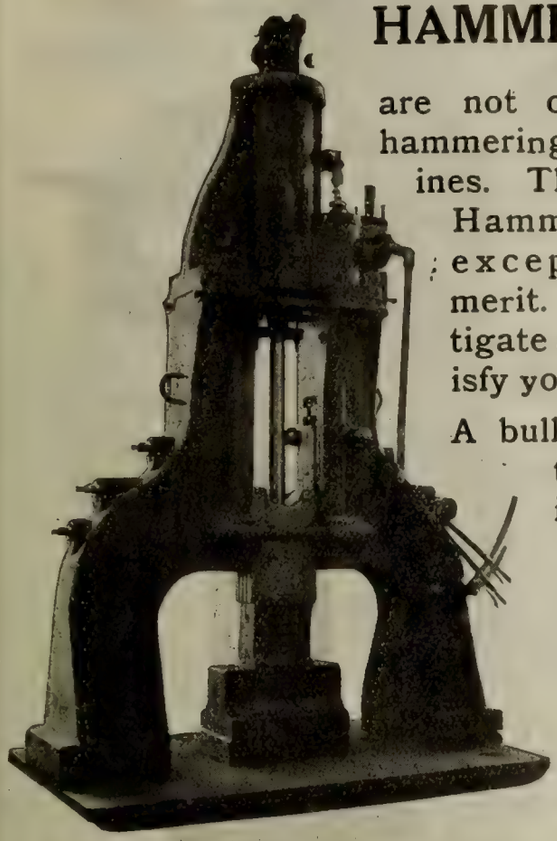


Metalwood Mfg. Co.

Leib & Wight Sts., DETROIT, MICH. U.S.A.

For Great Britain and Continent address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

"ERIE" STEAM FORGING HAMMERS



are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U. S. A.

Universal Gear Hobber

The machine which completes our lines to cut all types of small gears except internal, within 10" dia. 8 Pitch.

The Bilton Gear Hobber will cut spur spiral gears, worm gears, also various special shapes of teeth. It can cut a spiral gear on end of a shaft 1⅜" diam. 24" long.

SPECIFICATIONS

Capacity Gears: 10 Diametral Pitch
10 in. Outside Diameter
10 in. Width of Face
Range of hob feed 50-250 R.P.M.
Range hob feed to each rev. of worm .010 to .125
Drive: 3 Steps Cone Pulley; 2½ in. Belt
Weight 2,100 lbs.

A machine of latest design, introducing new features which increase production without sacrificing accuracy. The hob is cutting continuously; operation of machine entirely automatic.

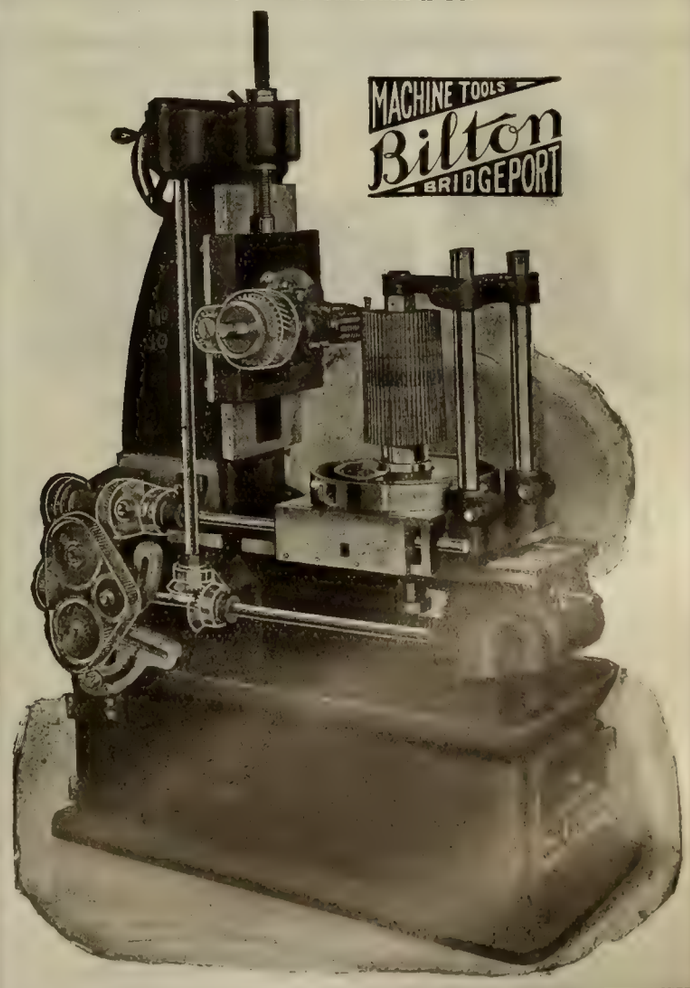
DELIVERY

A few of these machines are now available for October delivery.

Send for copy of new catalog No. 30, and bulletin describing this machine.

The Bilton Machine Tool Co.
Bridgeport, Conn.

Foreign Agents: Alfred Herbert Ltd., M. Mett Engineering Co., Chas. Churchill & Co.

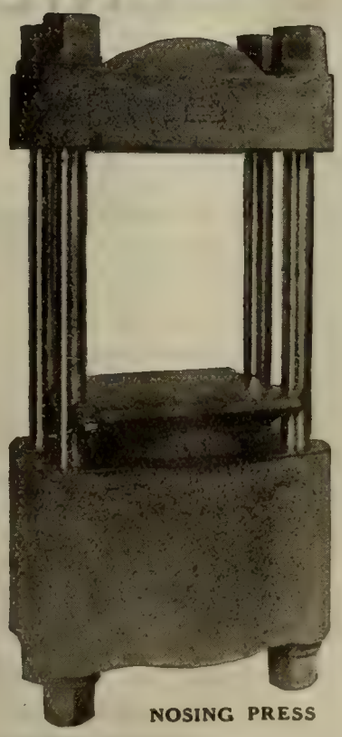


PRESSES

Pumps and Accumulators

FOR ALL PURPOSES

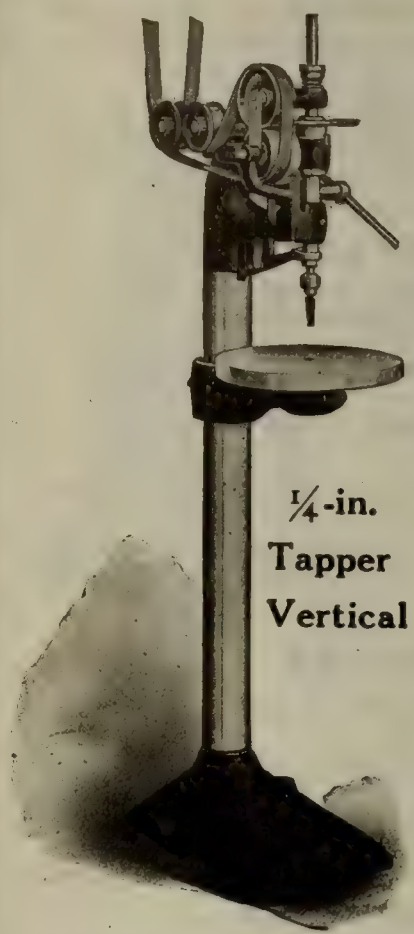
Made in Canada



NOSING PRESS

WILLIAM R. PERRIN, Limited
TORONTO

The Way to Greater Production—Use



¼-in. Tapper Vertical

THE RELIABLE

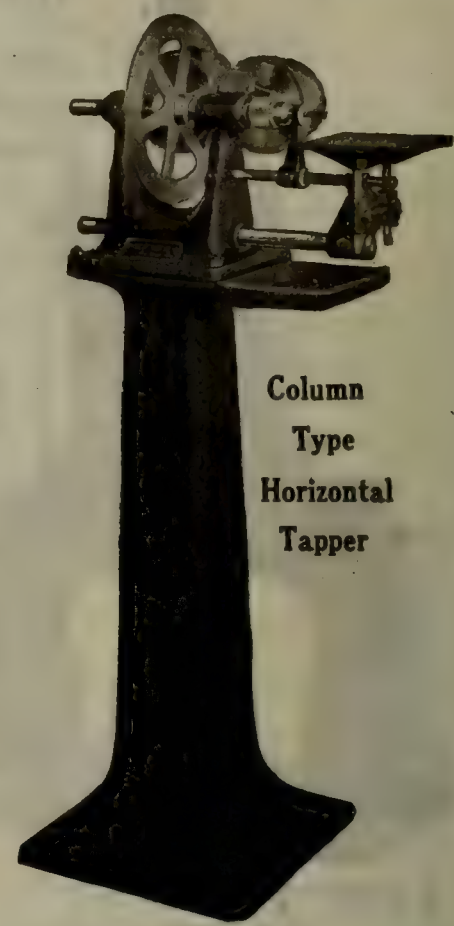
RICKERT-SHAFER

TAPPERS

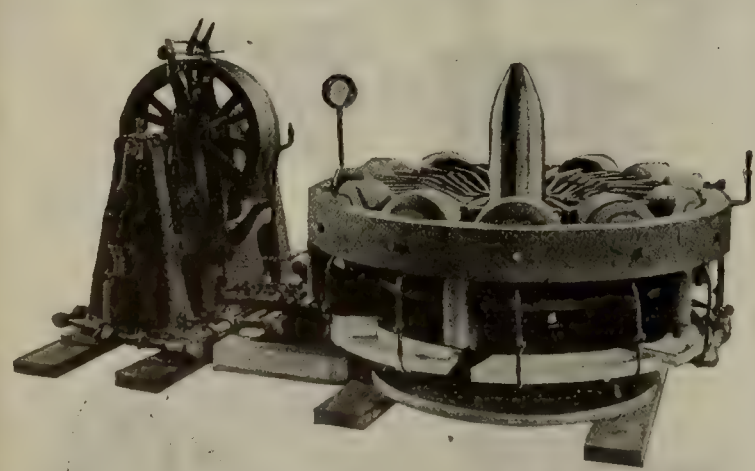
Tap Breakage ceases to be an annoyance and a retarder of production where the *R-S Tappers* are in use—cut breakage down to a minimum. Along with this asset they have exceptional speed and do a high-class of work.

We have a range of tappers for tapping of all kinds—from 3-16" to ⅝". Our range includes the Bench, Vertical and Horizontal types.

RICKERT - SHAFER COMPANY
ERIE, PA., U. S. A.
This is Our Address—How Can We Serve You?
ALFRED HERBERT, Foreign Agent.
COVENTRY, ENGLAND



Column Type Horizontal Tapper



The New "West" Banding Press

For 9.2" and 8" shells

12 Cylinders; Ample Power; Ample Strength; Reasonable Price.

NO ACCUMULATOR REQUIRED.

The West Tire Setter Co.

255 Mill Street, Rochester, N.Y.

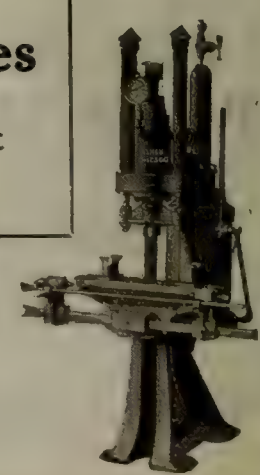
ELMES

Combination Hydro-Pneumatic Forcing, Broaching and Straightening Press

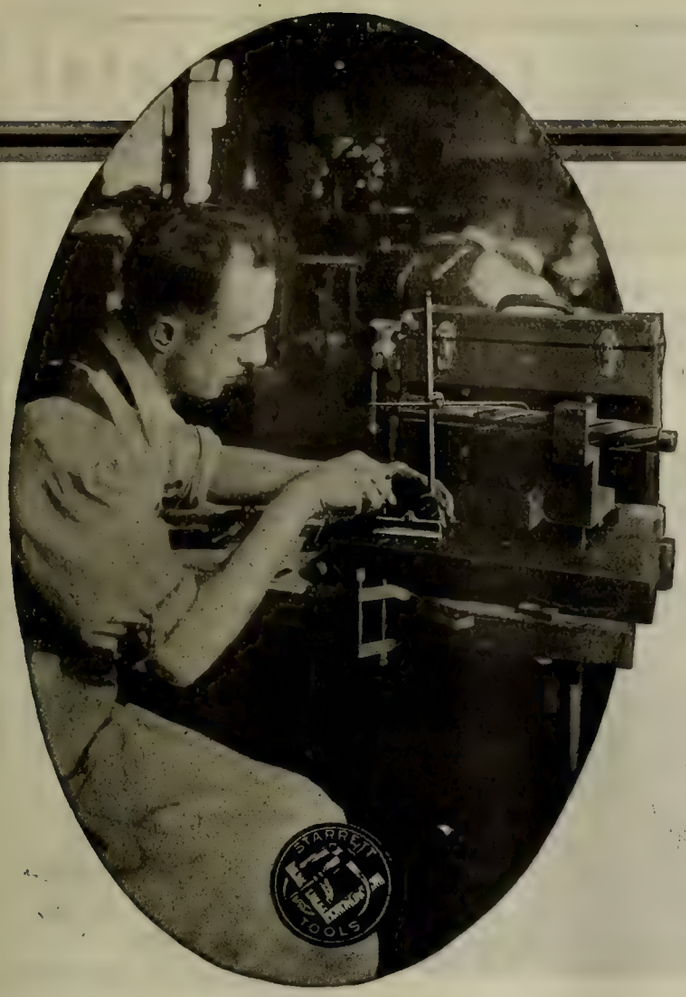
with or without auxiliary tables, can be used for a variety of purposes. Built in sizes to suit your needs.

Charles F. Elmes

Engineering Works
217 N. Morgan Street
Chicago, U.S.A.



Get our catalog describing our complete line



More Work, Fewer Men, Quality Maintained

The same demands that are now filling our factories with orders are taking away the very men who could do the work. Those men who remain must do more work. But accuracy cannot be sacrificed to speed.

Accuracy is more important than ever. Each step in a process must be made sure. In maintaining high standards

Starrett Tools

have played a large part. The finest mechanics the world over use them and know them to be reliable.

To meet every need there are 2100 styles and sizes of micrometer calipers, vernier height gages, depth gages, caliper squares, rules, squares, calipers, test indicators and many others.

All are described in our free catalog. Ask for Catalog No. 213.

The L. S. Starrett Co.

The World's Greatest Tool Makers

ATHOL - MASS.

NEW YORK LONDON CHICAGO

42-723

If any advertisement interests you, tear it out now and place with letters to be answered.

Oxy-Acetylene Welding for All Metal Constructional and Repair Work

Cylinders made by Oxy-Acetylene Welding to stand pressure of 1,000 lbs. per sq. in.

No matter what metal it is, if in general use, or what test it has to stand; whether light sheet metal or a massive casting; if two pieces have to be joined permanently, welding them by Oxy-Acetylene Process will Save Time, Save Money and Save Labor.

To fully realize all this means to you, you have to investigate its possibilities. Thousands of Dollars' worth of material is being scrapped that can be and should be restored to its original value, while valuable machinery and skilled labor are standing idle when they might be producing. Are you satisfied with "Efficiency" of ten years ago which is "Inefficiency" to-day?

IS YOUR PLANT FULLY EQUIPPED

for coping with machinery "breakdowns," which are inevitable; for the reclamation of broken parts; or joining metals by welding instead of the old "less efficient" and "more expensive" methods?

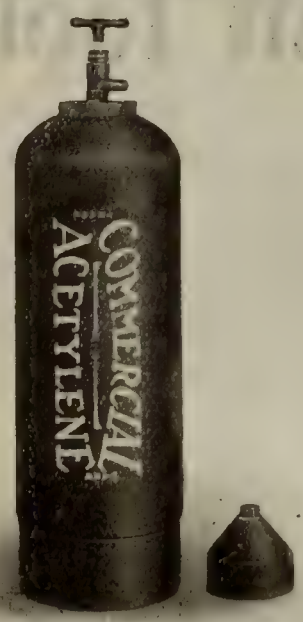
Let us tell you what the Oxy-Acetylene Process will do for you in your Industry, either in manufacturing or repairing.

Write to-day for particulars—no obligation.

L'Air Liquide Society

MONTREAL TORONTO WINNIPEG

Halifax Factory under construction



Quality Quantity *Guaranteed*

Write US About Your Acetylene Supply

Commercial Acetylene Welding Co., Inc.

103 Bay Street, Toronto

ATLANTA, GA.
AURORA, ILL.
BOSTON, MASS.
BOUND BROOK, N.J.
EAST DEERFIELD, MASS.

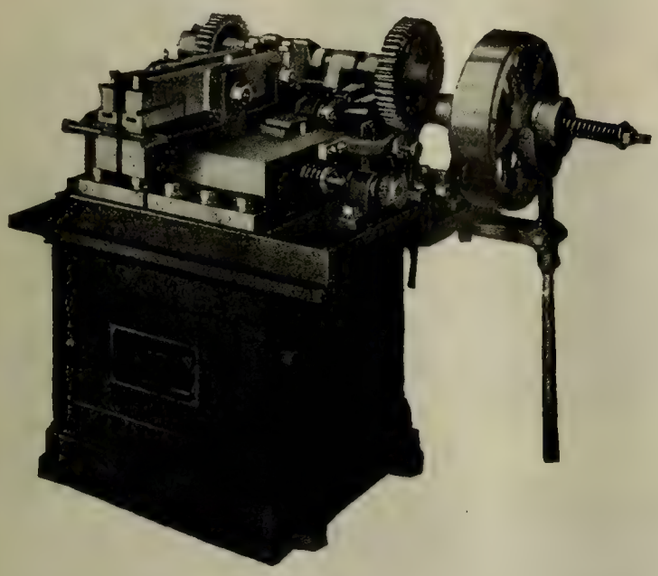
TORONTO, ONT.
SAN FRANCISCO, CALIF.
MOBERLY, MO.
W. BERKELEY, CALIF.

Main Office

80 Broadway, New York

Thomson Process
Electric Welding

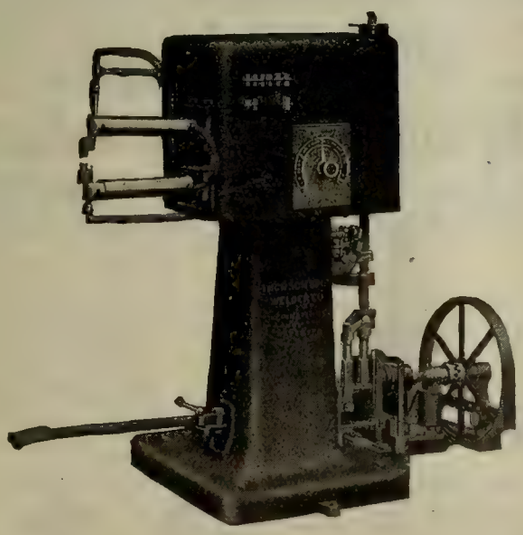
One Operator Merely Feeds



This Machine

This type of Thomson Electric Butt Welding Machine takes care of welding of small duplicate pieces, such as rings, buckles, etc., from the moment the operator places the piece in the clamping die until after the weld is made. A power-driven cam shaft tightens the clamps, turns on the current, applies the welding pressure, cuts off the current and releases the clamps after the weld is made. It can turn out 900 to 1000 welds per hour.

Send for Bulletin B-4



Noise Doesn't Always Mean Speed

When you hear the rattle and bang of a riveting shop—you think it means speed—but does it? Notice carefully how long it takes to rivet a small section—then go into a shop using the Thomson Spot Welder—no noise, no dirt, no danger, just quiet, efficient work that means speed. You will see one man at a Thomson Spot Welder doing five times as much work as by the old method, and the welds hold better than the rivets.

We will prove the efficiency and speed of our machines any time you say. Our catalog fully describes our entire line of spot welding machines. Where shall we send YOUR copy?

Send for Bulletin S-4

Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

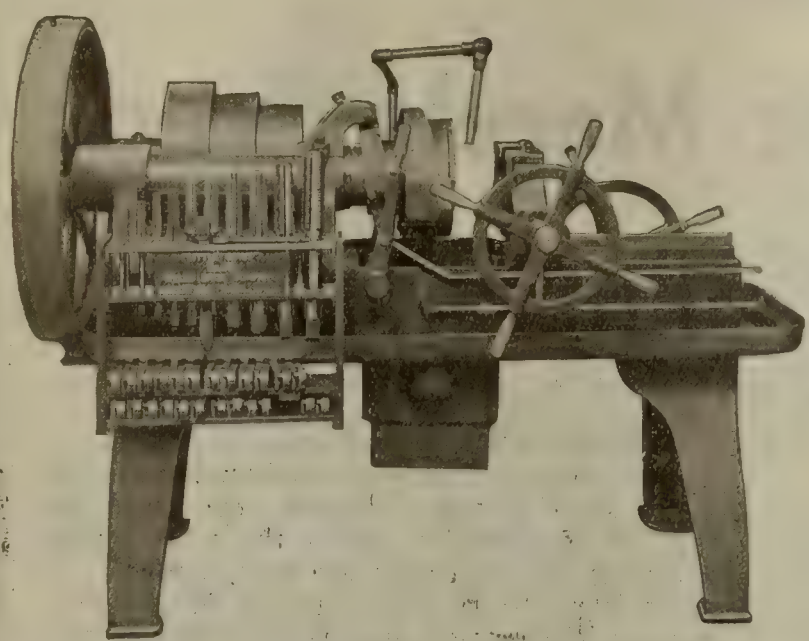
Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

If any advertisement interests you, tear it out now and place with letters to be answered.

Threading Machines

Little Giant



threading machines are free from time-consuming complications. Any shop employee can set them up in a few minutes. They are very easily operated. Any length of thread can be cut with the power machines, as they are fitted with hollow spindles.

The Little Giant line includes a complete range from the power machines with Automatic Opening Die Heads to the small bench machines with Solid Die Heads.

Send for general catalog showing our complete line of Bolt Cutters, Taps, Dies, Screw Plates, Gages, Reamers, etc.

Wells Brothers Co. of Canada, Limited
GALT, ∴ ONTARIO

Sales Agents: THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED,
Montreal Toronto Vancouver Winnipeg, St. John, Calgary.

May We Repeat

THAT

P H

TRADE MARK

QUALITY FILES

are the only files made in Canada using BEST CRUCIBLE CAST STEEL exclusively in their manufacture. What does that mean to the user?

IT MEANS a keener cutting edge to the teeth, and longer life to the file. IT MEANS the stock has that "pep" in it so beloved of metal workers. IT MEANS that after a long and honorable career on the bench, there is still fine steel in the file which warrants the users in having it re-cut and put on the job again on less "fussy" work.

THAT IS TRUE ECONOMY.

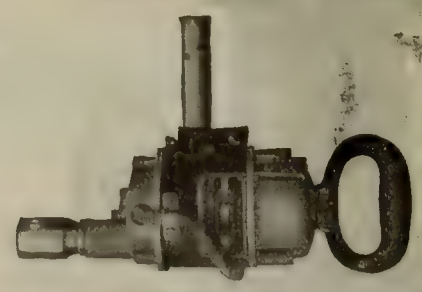
PORT HOPE FILE MFG. CO., LIMITED

Port Hope, Ontario

"Ask your jobber"

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

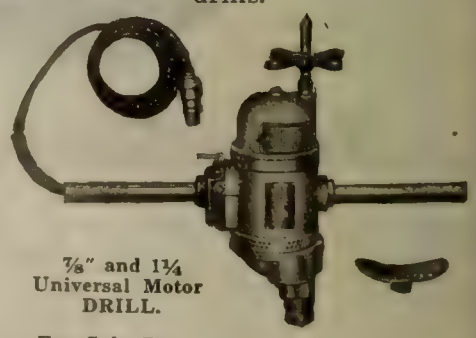
For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs
⅝ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞" and 1¼ Universal Motor DRILL.

For Sale By

The Canadian Fairbanks-Morse Co., Limited

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.
CINCINNATI, OHIO

THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

It's the Rigid Construction of B & S Grinding Machines That Makes Fast Production with Accuracy Possible

THE WHEEL STAND

is massive and strongly proportioned with a foundation of heavy walls of metal directly under each spindle bearing and extending to the floor. Vibrations that would affect the accuracy of the work are thus prevented. Firm support is assured for the heaviest of wheels while taking the deepest cuts at the fastest speeds and coarsest feed. The ruggedness of the entire machine is in keeping with this massive wheel stand. May we tell you of the many other features?

BROWN & SHARPE

Plain Grinding Machines

Send for Catalog

Brown & Sharpe Mfg. Co.

Providence, R.I., U.S.A.

Canadian Representative:

Canadian Fairbanks-Morse Co., Ltd., Toronto, Montreal, Winnipeg, Calgary, Vancouver, St. John, Saskatoon.

McDougall Shapers

ARE-MAC-DEE IS A GUARANTEE

These are up-to-date Shapers, designed for modern shop production.

They are plain in design, yet embody all essential features necessary for efficient work.

Every adjustment is convenient for the operator and fine for the most accurate work.

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Jas. H. Matthews & Co.

Established 1850

Pittsburgh, Pa.

Distributors for Canada

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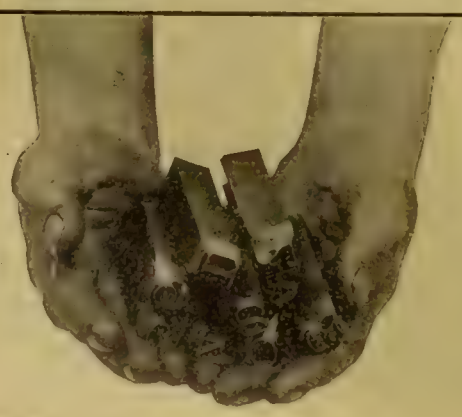

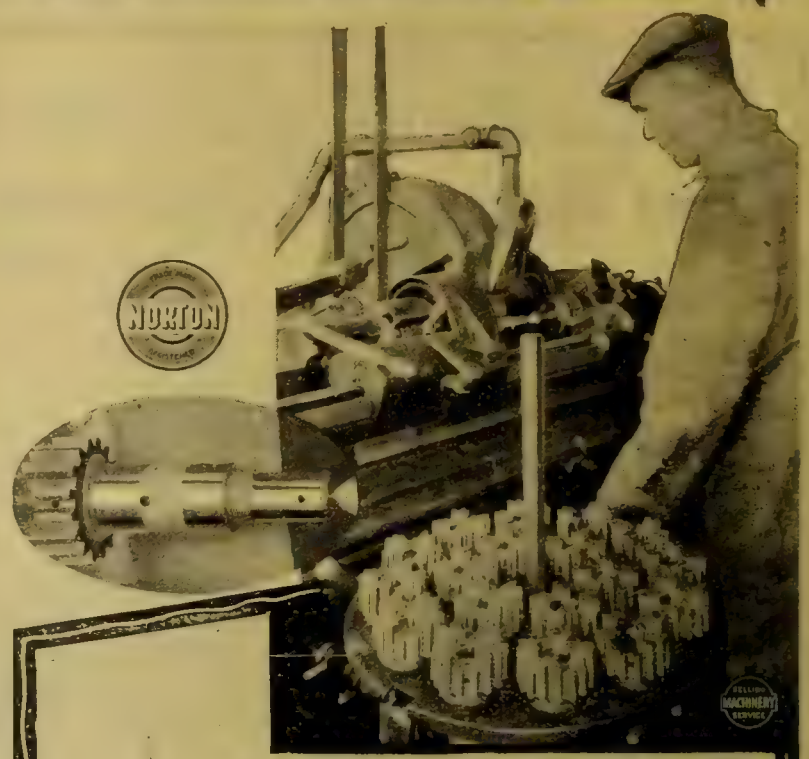

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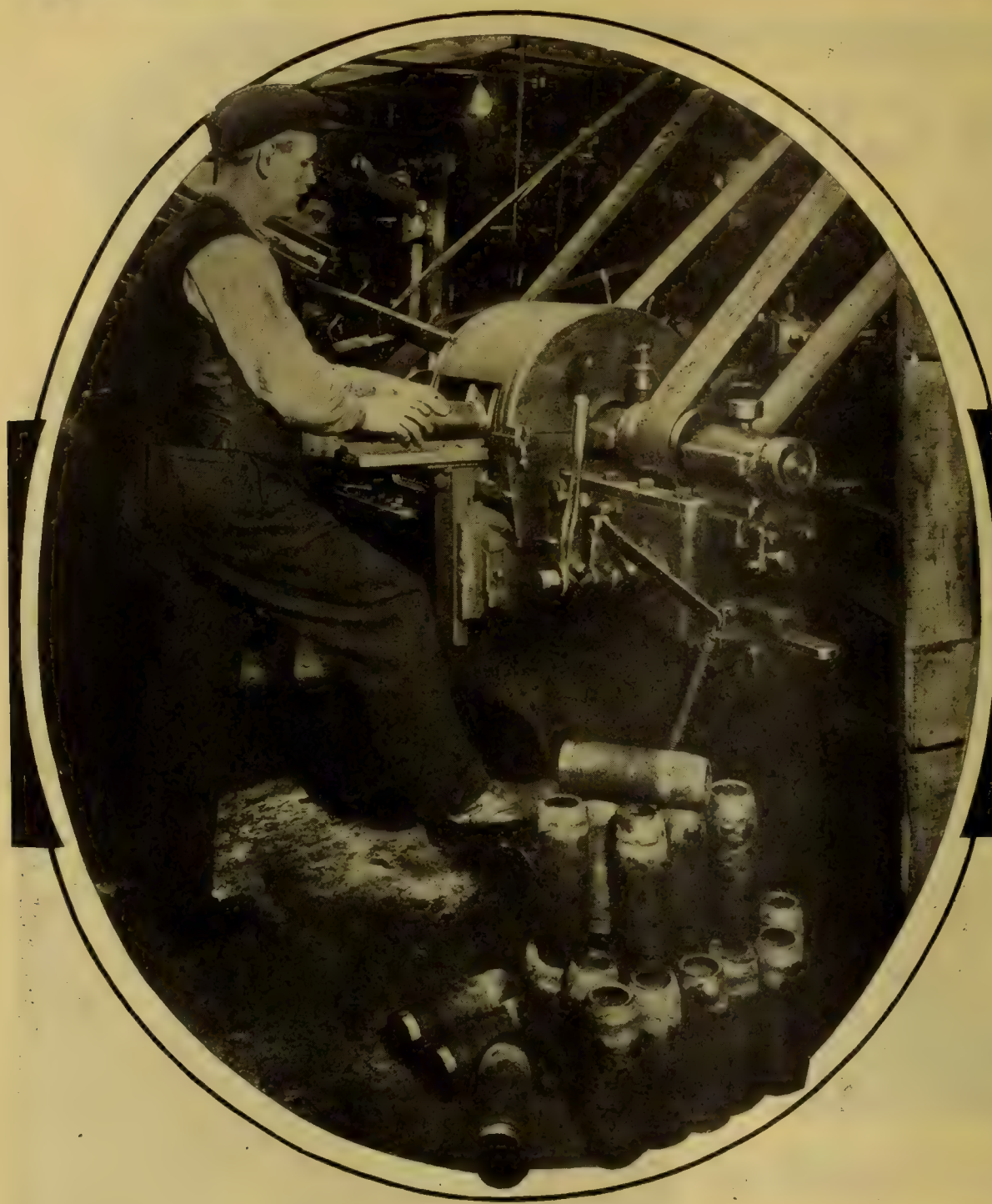

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The quality and finish of the work is perfect, and steady production can be maintained at an average rate of 5 per minute.

The discs are faced with abrasive at the outer part only, where the work is done.

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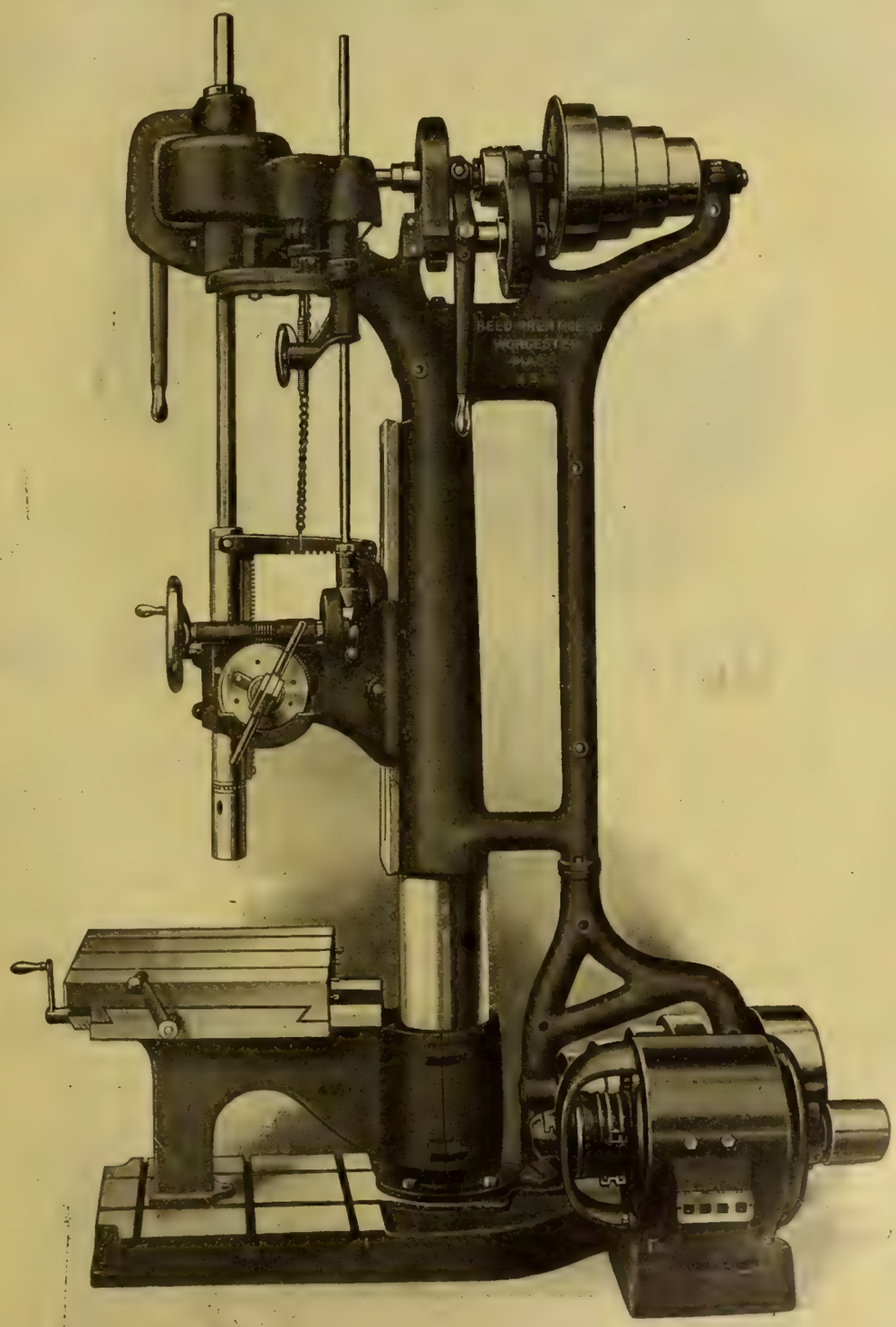

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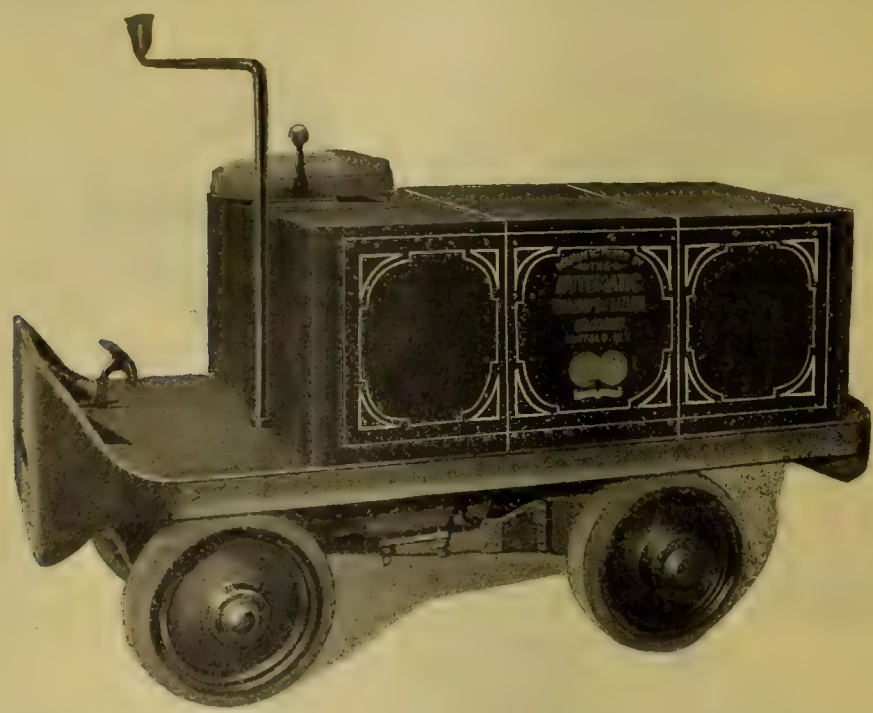

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The Last Word in Storage Battery Tractor and Construction

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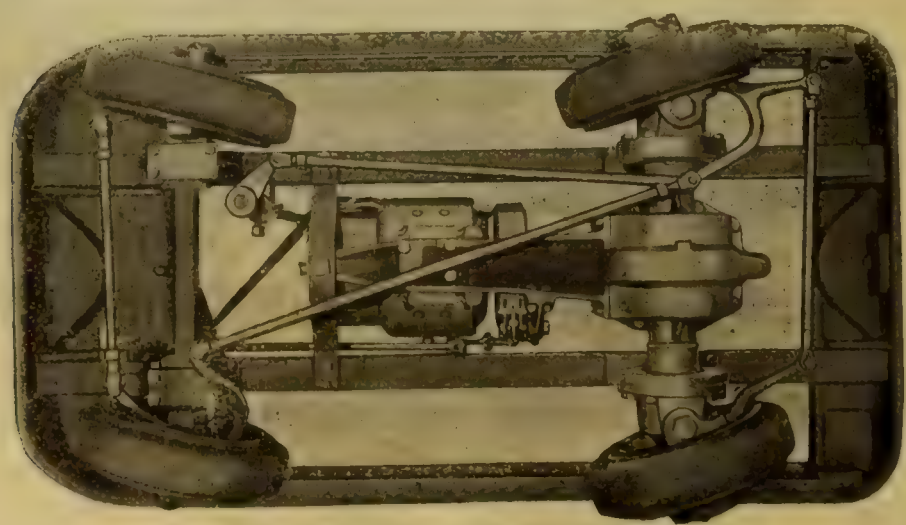


VIEW FROM UNDERNEATH.

EXTXERIOR VIEW OF FACTORY.

Abrasive Wheel Manufacturing Plant and Equipment

Staff Article

The progress which has been made in the manufacture of abrasive wheels in recent years is due to the more general adoption of grinding in our machine shops, and also to the variety of abrasives that have been introduced for a wide range of application. The grinding wheel is employed extensively, particularly where superior finish and accuracy, and time and labor-saving constitute the end in view.

THE growth of the Dominion Abrasive Wheel Co. business is typical of many Canadian industries, and the new plant now in operation at Mimico, Ont., emphasizes the development which has taken place in the manufacture of grinding wheels.

The demand for artificial abrasives during the past year or two has been stimulated by the scarcity of emery, due to supplies of the latter being cut off on account of the war. The best quality emery is found in Turkey and Greece; but as this material is practically unobtainable, artificial abrasives are now used almost exclusively. The use of artificial abrasive wheels has been steadily increasing for some years, but owing to its lower cost, the emery wheel has always found a ready market. The fact, however, that the artificial abrasive is more efficient will tend to make it more popular than the emery product and the cost will doubtless be reduced in course of time.

Abrasives and Their Origin

Before proceeding with a description of the Dominion Abrasive Co. plant, a brief reference to abrasives and their origin will assist in a better understanding of this concern's product and method of its manufacture. The principal natural abrasives are emery and corundum, while the principal artificial abrasives now on the market include carborundum, alundum, crystolon, and carbolite. Emery is similar to corundum, but is not so hard, and is not as pure. Corundum is found principally in Ontario, and is much in demand by makers of grinding wheels. It is an ideal abrasive for most kinds of grinding, as the grains keep their sharp points longer than emery and the absence of impurities is also an important feature. The corundum deposits in Ontario contain at least 90 per cent. crystalline alumina. Carborundum, carbolite and crystolon are artificial abrasives, and products of the electric furnace. They are each different formations of the same substance—carbide of silicon.

Carborundum is a crystalline formation of the elements carbon and silicon produced by subjecting a mixture of coke and sand in an electric furnace to an intense heat of 7,000 degrees Fah. for 36 hours. Alundum is oxide of alumina in crystalline formation. It is made by fusing bauxite to an intense heat in an electric furnace. Bauxite in its natural state has the appearance of clay, and it has to be dried and prepared in the form of gravel before being put in the electric furnace. The best bauxite mines are found in the southern part of the United States.

Vitrified and Silicate Processes

The choice of abrasives for grinding wheels and the process employed in their manufacture depend upon the purpose for which they are to be used. The Dominion Abrasive Co. employ two processes — vitrified and silicate, the majority of wheels being made by the former method. The vitrified process is of much longer duration than the silicate, both in regard to the manufacture and also as to the baking operation. Wheels made by the vitrified process are those mostly used on cylindrical and surface grinding machines. They are free cutting, well balanced, porous and wear well. The majority of wheels

MIXING DEPARTMENT, SHOWING MIXING KETTLES AND GRINDING WHEEL MOULDS DRYING ON BENCHES. DRY-ROOM IN THE BACKGROUND.

used are made by this process. Vitrified wheels take about ten to twelve days to manufacture, while silicate wheels can be produced in about 24 hours. An important feature in the manufacture of grinding wheels is the selection of the correct grain and suitable bond to produce a graded wheel. It is essential that wheels of a certain grade should all be alike and care must be taken in manufacturing to obtain this result so that wheels can be duplicated any time. The bond is a mixture of a special kind of clay and crushed quartz for a flux.

Plant Layout.

When the company was formed, the factory was located at New Toronto, but in time the premises became too small for the increasing business, so a move was made to Mimico, where a site covering three acres was purchased adjoining the Grand Trunk Railway main line, Toronto to Hamilton. A new factory was built on the site and manufacturing operations started on August 5, 1917. under E. W. Sawyer as general manager.

The plant comprises two wings each 150 feet long by 50 feet wide, lying at right angles to each other, with a kiln room 90 ft. by 64 ft. connecting them. One wing contains the mixing and shaving department, and also a dry room, while the other wing contains the finishing department, store room, shipping department and the silicate process department. The entire building is of brick construction, with steel sash for the windows. The roofs of the two wings are of wood sheeting covered with roofing material and supported by steel roof trusses. The roofs are monitor type, with windows opening the entire length and operated from the ground by chains. The roof of the kiln room is made of reinforced concrete with skylights. The office building is also of brick construction, 29 feet square and built separate from the factory. A siding from the G. T. R. runs along one side of the plant.

Mixing and Shaving Departments

Manufacturing operations begin at one end of the mixing department and the description will be in the meantime, confined exclusively to the vitrified process. The abrasives, of which there are several kinds, are received at the plant in barrels and are arranged in order according to size of grain. The clay for making the bond and the feldspar for the flux are also assembled at the same end.

SHAVING DEPARTMENT, SHOWING SHAVING MACHINES AND EXTERIOR OF DRY ROOM.

The process consists in mixing suitable clays and fluxes in certain proportions with the grains of abrasive. The materials are mixed in certain pre-determined proportions with water in a mixing kettle. This is known as the wet process. In preparing the mixture before the water is added, great care is taken to get the correct proportion of abrasive and different clays so that wheels made from a certain mixture may be uniform and that they can be duplicated at any time. Orders issued from the office specify the grit and grade and the wheels are thus made to a standard formula. The possibility of wheels varying in quality from the desired grade is obviated by the use of improved methods, and care in weighing out the correct proportions of abrasives and clays.

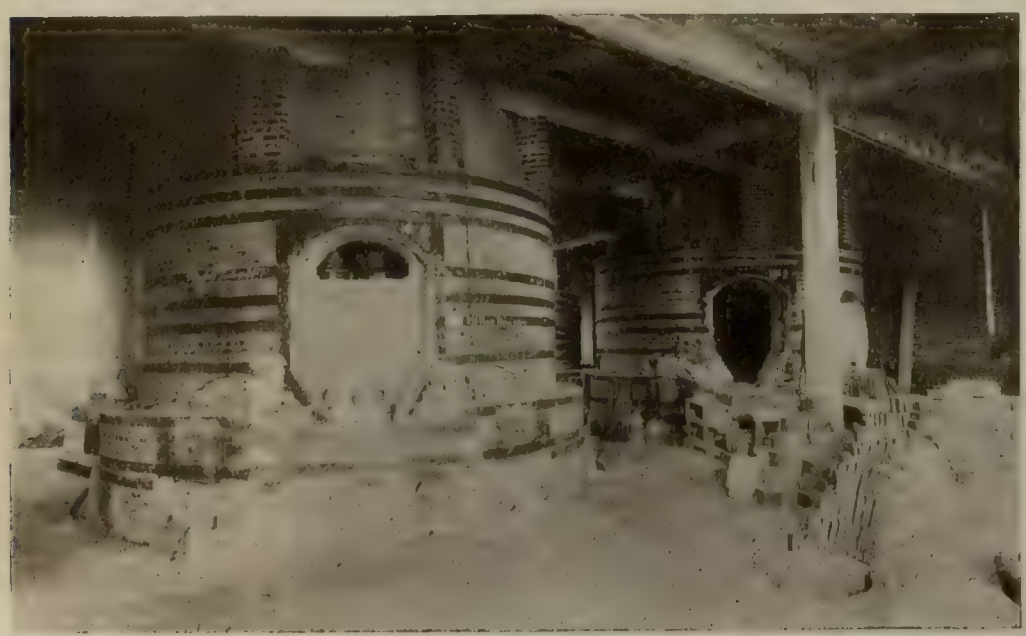
After being thoroughly mixed, the mixture is made up into moulds supported round the periphery by stout paper. The moulds are laid on boards for the preliminary drying which occupies from 18 to 24 hours. Very small wheels and sticks are made up in plastic form in moulds. The moulds are then taken to the drying room to be dried out again, which makes them hard enough to be handled. The drying room contains several rows of racks upon which are laid the moulds, and is heated by steam heat, being maintained at a temperature of about 100 degrees Fah.

The next process consists of shaving the wheel. The wheels are moulded larger than the size required and are shaved off on a machine resembling a potter's wheel. There are six of these machines each being driven independently from a motor-driven line shaft running in Chapman double ball bearings and located below the machine. A Crocker-Wheeler motor operates the line shaft, while the shaft hangers rest on the floor. Briefly, the machine consists of a horizontal revolving plate located in an open box. The moulds are placed on the plate and the shaving is done by a vertical steel cutter operated by hand on a cross slide above. The wheels are left large enough to allow for shrinking in the kiln and trueing up when baked. The hole is also put into the wheel on the machine while it is in its semi-finished state.

Burning or Baking Process

The wheels are now ready for the baking in the kilns. There are four brick kilns at this plant, each being 12 feet diameter inside and 19 feet diameter outside. They are about 11 feet high inside. Each kiln is built up of 22,000 red brick and 11,000 firebrick. They have seven fire holes and are fired with coal. The kilns are constructed so that the heat inside can be regulated by means of a damper placed in the centre at the top of the arch or roof. The heat comes up from the fires inside and passes down through holes in the floor to the flue.

The wheels are stacked up inside the kiln, each wheel being placed on a fireclay tile with sectional fireclay saggers around. The wheel is covered all over with quartz sand which keeps the flame from the wheel and helps to maintain



KILNS FOR BAKING GRINDING WHEELS. TILES AND SAGGERS CAN BE SEEN ON THE FLOOR TO THE RIGHT. NO. 1 KILN IS READY FOR BEING DRAWN.

an even temperature. There is a tile on top and bottom of each sagger, thus forming a kind of box. The kiln holds several hundred wheels, the number varying according to the sizes. Each kiln hold approximately $2,000 worth of wheels when rated at prevailing prices. The kiln is started with a slow fire, is worked up for 72 hours, and attains a maximum temperature of 2,300 degrees Fah. The kiln is then allowed to cool down gradually for a period of five days, when the charge is drawn. This baking process is a delicate one and the utmost skill is required to successfully burn a kiln, every possible device being used to bring the operation under perfect control. If the temperature is allowed to change too quickly, the wheels will be cracked. If they receive too much heat they will be harder than intended, and if not enough, they will come out too soft. The heat has to be sufficient to vitrify or partially melt the clay so that the bond may fulfil its function. As a precautionary measure, tests are taken to make sure that the wheels have been baked to the correct degree of hardness. Trial pieces covered with the actual material or mixture used for wheels are inserted into the kilns and samples are taken at certain intervals until the condition of the test pieces shows that the wheels have been baked the proper length of time. This method has been found to be very reliable for this particular class of work.

SILICATE PROCESS DEPARTMENT SHOWING TAMPING STOOLS, WHEEL MOULDS AND OVEN IN BACKGROUND. 4¾ IN.

The fire clay rings or saggers as they are termed in the trade, are made in sections and are moulded from fireclay in the mixing room. After being moulded, they are dried out on curved wooden racks. The fireclay tiles are also made in the mixing room. The fireclay is mixed in a clay mill, a certain proportion of used crushed material being mixed with the fresh clay. The saggers and tiles are baked before being used. The wads for making the joints for the saggers are made in the mixing room, a wad machine being used for this purpose.

Finishing Department

The wheels when taken from the kiln are sometimes found to have warped during the baking process. These wheels have to be trued up, which is done on a number of machines installed in the finishing department. Some of these are very similar to facing machines, but others are converted grinding machines and incidentally they are very suitable for the job. The wheel is held in a chuck and the steel cutter is carried in a tool post on a slide. Both the face and periphery of wheel can be trued up with the one cutting tool at one setting. Some of these machines were built by the Safety Emery Wheel Co. of Springfield, Ohio; and others are converted Ford-Smith grinding machines. The line shaft runs in Chapman double ball bearings and is operated by a Crocker-Wheeler motor. A system of galvanized ducts connected to each machine is installed for carrying away the dust. A Sheldon motor-driven exhaust fan is installed for this purpose. The atmosphere is consequently quite clear and the men suffer no ill effects from operating the machines.

Silicate Process

Up to this point, the manufacture of vitrified wheels only has been dealt with. The company, however, have a separate department for producing wheels by the silicate process. The principal advantage of this process is that wheels can be made in a comparatively short time. Larger wheels can also be made by this process than is possible by the vitrified process. The silicate wheel gives very satisfactory results for many purposes, but is not used to the same extent as the vitrified wheel.

For silicate wheels the same abrasive materials are used as for the vitrified process; a different bond is, however, employed. Silicate of soda or water-glass is the principal ingredient in the bond for these wheels. After it has been thoroughly incorporated with the abrasive grains in a special mixing machine, the whole mass has a thick adhesive quality. In this condition it is rammed into moulds. This part of the work recures considerable skill, and the uniformity and balance of the wheels depends largely upon the skill of the moulder. The moulds are fixed on tamping tools, which have a revolving plate on the top so that the mould will revolve readily while being tamped. A wire web is put in the mould during the tamping process. There are six tamping stools.

When the tamping is finished, the top and bottom plates of the mould are bolted together and the mould placed in an oven for the baking process. The oven is heated by a coal fire, but the fire gases are excluded. The baking causes a chemical reaction which hardens or sets the bond, and after sufficient cooling the wheels are ready for the finishing room. The oven is equipped with a Thwing Pyrometer and the maximum temperature attained is approximately 800 degrees Fah. The moulds are kept in the oven for about 24 hours. Many shapes and sizes of wheels are made by this process and the product is very regular and clean in appearance.

All wheels have a sticker giving the grade and number. The company does a considerable export business and ships a large number of wheels to the Old Country. They make any grade required by their customers, while wheels of almost any shape can be manufactured. This

FINISHING DEPARTMENT. SHOWING TRUEING WHEELS WITH DUST EXHAUSTING SYSTEM. WHEEL STORAGE IN BACKGROUND.

company, as in the case of other grinding wheel manufacturers, have for the past year or two experienced great difficulty in obtaining an adequate supply of abrasive material, but in this regard, the situation is improving and as a result a material increase in output is anticipated. The company have a well equipped and up-to-date plant with ample room for extensions when necessary.

ONTARIO'S METALLIFEROUS PRODUCTION

RETURNS received by the Ontario Bureau of Mines from smelters, refining works and metalliferous mines of the Province for the six months ending June 30, 1917, are summarized in the table below which gives comparative figures for the corresponding period in 1916.

SUMMARY OF METALLIFEROUS PRODUCTION, SIX MONTHS, 1917.

Product.		Quantity. 1916.	Quantity. 1917.	Value $ 1916.	Value $ 1917.
Gold	ounces	235,060	228,673	4,822,740	4,586,941
Silver	"	10,267,743	10,073,787	6,188,269	7,584,439
Cobalt (metallic)	lbs.	121,817	162,250	103,677	237,004
Nickel (metallic)	"	13,933	45,864	5,899	19,073
Nickel oxide	")		(5,495)		(1,648
Cobalt oxide	")	410,408	(153,498)	204,638	(175,308
Other Cobalt and nickel comp'ds	")		(122,076)		(15,879
Molybdenite	"	12,631	36,777	13,075	47,942
Lead	"	.....	912,934	.....	114,953
Copper ore	tons	922	1,543	14,368	45,688
Nickel in matte	"	20,651	20,230	10,325,766	10,115,000
Copper in matte	"	11,426	10,381	4,207,620	4,152,400
Iron ore (exported)	"	.....	24,332	.....	85,135
Pig iron	"	.....	40,968	.....	715,912
				25,886,052	27,897,322

It will be noted that above figures are for pig iron produced from Ontario ore only. Export figures for 1916 are not available for iron ore. Nickel and copper in matte have been valued at 25 and 20 cents per pound, respectively, whereas copper was valued at 18½ cents per pound in 1916.

Gold.—It was anticipated that the production for the half year would show a decline as compared with the same period in 1916, owing to labor troubles and labor shortage at the Porcupine camp. Nearly all the mines, including the Hollinger and Dome, have been developing their ore bodies and increasing milling capacity in preparation for the time after the war when labor will be more plentiful and operating costs decreased. In the meantime, production and dividends have been curtailed. New producers are Gold Reef and Tommy Burns at Porcupine, Teck-Hughes at Kirkland Lake, and Miller Independence at Boston Creek. A single stamp is dropping at the Rognon on Wabigoon Lake, District of Kenora. Mines, in order, producing 5,000 ounces or more gold were Hollinger, McIntyre, Dome, Porcupine Crown, Tough-Oakes, Schumacher and Porcupine V. N. T.

Silver.—High prices for silver, which averaged 75.44 cents for the half year as compared with 62.53 cents for the same period in 1916, have stimulated production from the Cobalt camp. The lowest New York price was 71.75 cents on March 27, and highest 78.64 on February 15. This advance in value has offset increased mining costs. If the Miller Lake O'Brien continues shipping at the same rate throughout the year, Gowganda will show a record production for 1917. The increase is attributed to the high grade vein discovered in the summer of 1916. The Hargrave mine is now shipping regularly. A new shipper this year is the National, formerly the King Edward mine. The Mining Corporation of Canada (Cobalt Lake and Townsite-City mines) shipped over 2,000,000 ounces in the half year. Shippers of 500,000 ounces or more were as follows: Nipissing, Kerr Lake, O'Brien, Beaver and Coniagas mines. Silver recovered from gold ores totalled 38,492 ounces and from copper ores 646 ounces.

Nickel-Copper.—The production of nickel-copper matte at Copper Cliff and Coniston shows a small decrease as compared with the same period in 1916, due to shortage of labor. Assays of samples of nickel-copper matte for their precious metal contents were made for the Royal Ontario Nickel Commission by Ledoux and Company of New York. Platinum and palladium were found in quantities varying from 0.32 ounces to 1.97 ounces per ton of matte. These metals are quoted at $100 per ounce. The British American Nickel Corporation have announced that their new electrolytic refinery will be located at Murray mine, and will have an initial capacity of 5,000 tons of nickel per annum. The Port Colborne refinery of the International Nickel Company will produce 7,500 tons of nickel, and provision is made for quadrupling the capacity.

Copper.—Shipments for the half year came from three sources, the Tip Top mine near Kashabowie, the Hudson Copper Company at Havilah, and the Kenyon Copper Company of Massey. The last mentioned operates the Massey mine where a 100-ton Callow flotation mill is producing 20 per cent. concentrates. Shipments from Bruce Mines are included under nickel-copper. The Port Arthur Copper Company at Mine Centre is erecting a concentrator and will be shipping soon.

Iron Ore and Pig Iron.—Shipments of ore were from the Helen and Magpie mines of the Algoma Steel Corporation, and a small shipment from Moose Mountain. Helen ore is shipped to the Magpie mine for treatment. In all, 61,796 tons worth $231,937 were marketed, of which 24,322 tons were exported to the United States. Pig iron produced at Sault Ste. Marie, Hamilton, Port Colborne and Deseronto totalled 347,190 tons worth $6,067,050. Out of a total of 577,773 tons of ore smelted only 77,202 tons came from Ontario, and in the table the quantity of pig iron produced and value of the same is figured on a pro rata basis.

Molybdenite.—The production of this ore is increasing rapidly. Concentrators are now in operation at Renfrew, Mount St. Patrick and Ottawa, and in the half year treated ore from thirteen different mines. At Orillia and Belleville, 80,334 pounds of ferro-molybdenum worth $200,835 were produced.

Lead.—Smelters at Galetta and Kingston produced 912,934 pounds of pig lead worth $114,953 from Ontario ores. The Kingston Smelting Company also treated 1,895 tons of lead ore from the United States. Ontario ore came from the Galetta and Frontenac mines.

Export of Coal to Canada.—A despatch from Washington, D.C., states that continued export of coal to Canada in large amounts through Great Lakes ports at the expense of the Northwestern States will be checked immediately by the Fuel Administration. Dr. H. A. Garfield, the Fuel Administrator, has requested the Exports Administration Board to permit no more coal to be shipped from the country except under license restrictions, and asked that no licenses be granted unless they are approved by the Fuel Administration. Coal heretofore, along with other American products, has gone to Canada under blanket licenses issued by Collectors of Customs. "The Fuel Administration," said Dr. Garfield, "does not intend to cut off Canadian exports, but with this supervision it will be able to equalize the distribution of coal, and see that the Northwest and Canada both get their fair shares."

A writer in the Blast Furnace and Steel Plant observes that with all its advantages, such as convenience of handling and absence of shock, the press has two failings. In the first place it is harder to get rid of scale, which is dislodged by the impact of a hammer, and it cannot strike in a mould as large a forging as a hammer its equivalent in other respects. The Midvale Steel Co. consider a 500-ton press as the equivalent of a 2¼-ton hammer, a 1,200-ton press as equal to a 10-ton hammer, and a 2,500-ton press as equivalent to a 25-ton hammer. Nevertheless, a 4½-ton hammer can make drop-forgings beyond the capacity of a 1,200-ton press, which in this respect is about equal to a 2½-ton hammer.

Jones—"'Say! When a fellow calls on a girl, should he leave his hat in the hall or take it into the parlor "

Mudge—"Well, if the girl is living in a boarding house, and the hat is worth anything, I think he had better hang on to it."

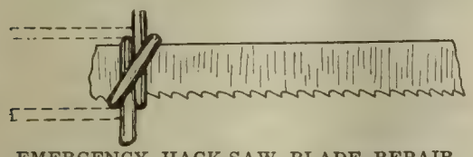
PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

EMERGENCY HACKSAW REPAIR

By J. E. McCormack.

SCENE—Out of town on a repair job. Circumstance — Only brought one hacksaw blade and broke it before done using it. Remedy applied—"Stove pipe iron wire wound once around the blade, crossed on top (back of blade), passed around



EMERGENCY HACK-SAW BLADE REPAIR.

again and the end shoved under the lap, thus forming a clove hitch.

The wire was then passed back around the rear pin of the frame, then brought forward and the ends joined by twisting. Though a bit wobbly, this served the purpose and it successfully cut in two a 1¼" iron shaft, thus proving the idea to be practicable in case some repair of the kind becomes necessary.

When a suitable drill is at hand and a good blade breaks near one end, the writer has often wound a strip of wetted flannel or other cloth a number of times around the blade near the broken end, and heated that end in a suitable flame to draw out the temper. This makes drilling of the hole easy, and the wetted cloth prevents damage to the remainder of the blade, which can then be used in an adjustable frame, or if in a solid frame, pass a wire through the hole and around the pin and fasten.

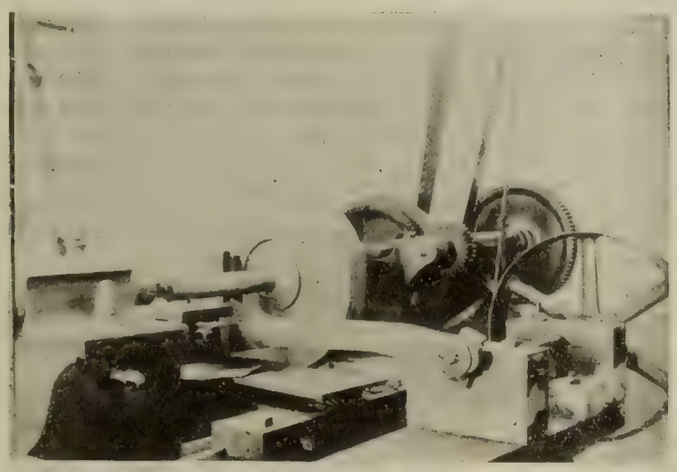
STILL ANOTHER LATHE

By D. A. H.

THE accompanying photo shows still another lathe that is doing its part in the present warfare, at work that is anything but lathe work. The machine, while a rather old one, is in good condition but had been set aside in preference for a more modern tool but when the pinch came it was belted up again and put to work as a grinder.

As will be seen, an emery wheel is held between flanges on an arbor that is placed on the centres just as a regular job. The wheel itself has a depressed centre and a broad working face against which the work pieces are pressed. The pieces are forgings and have a pad or two to finish true with three locating points on the back. They are dropped in a holder of right angle shape which may be seen fastened on top of the cross slide. A considerable amount of stock has to be ground off some of the pieces to go in the gauge and this variation is very nicely taken care of by the carriage movement:—a stop is set on the lathe bed for sizing and another to prevent the operator from losing time in running the carriage too far away. The pieces are dropped in the holder and a "kicker" throws them out, so there is no danger of personal injury.

The grinding pressure, or thrust, is taken by the hand feed of the carriage as has been told. There is another feature of the rig which relieves the workman of some labor, saves the wheel from becoming grooved, and is an important factor in producing first-class work and lots of it. This is the crank motion, belt driven from the countershaft, that imparts a constant back and forth movement to the cross slide. A hickory pitman and supports and bearings for the "crankshaft" of wood also are attached at the back of the lathe. In practice this inexpensive arrangement on this old lathe has been a good one, having turned out over a million pieces at a most satisfactory rate.



SHOWING HICKORY PITMAN OPERATING CROSS SLIDE OF OLD LATHE ARRANGED FOR DISC GRINDING.

FACTS AND DIRECTIONS REGARDING MODERN GRINDING PRACTICE

IN the early days of the grinding machine there was no "roughing cut." Whether much or little material was removed it was a finishing operation throughout. In a review of facts and suggestions as prompted by long experience, C. H. Norton, writing in Grits and Grinds, says: The grain of the wheel was always fine, so that "nice finish" could be obtained with rapid work revolution, with any depth of cut, and regardless of whether the wheel face was true or smooth. Wheel truing at that time was done with a diamond hand tool. The wheel was seldom, if ever, true, and never parallel with the work slide.

Cylindrical grinding is usually done by what we term "roughing and finishing" cuts. These cuts sometimes are made by two operations, the work is then handled twice. In many cases, however, the roughing and finishing cuts are merged one into the other by practically one operation, and the work is not removed from the machine until completed. When completed it may or may not have a fine finished surface, depending upon the nature of the work and where it is to be used. By fine finished surface is meant a finely ground surface, not a finely polished surface. The cylindrical grinding machine is what its name implies—a grinding machine, not a polishing machine.

The dividing line between a finely ground surface and a polished surface varies according to the mind and eye of the critic. A perfect surface to one is a very imperfect one to another. A commercial finish, however, is very generally recognized, and it is the commercial finish that is considered here.

Fine or Coarse Wheels

When the work is of such size and weight that the operator can quickly place it in the machine and remove it without effort, a special roughing wheel is used for the first operation. This wheel may be very coarse. For finishing operations a relatively fine wheel may be used, but when tried in the modern way and relatively slow work speeds used, it can be as coarse as 30, while by the older method it must be as fine as 80 to 100; in fact, in some cases 200 was used.

When the two cuts are merged into one handling, i.e., when the work is too large or too heavy to quickly place in the machine and remove without effort, or when but few pieces of a kind are to be ground, we then use a wheel so coarse that a finish can be obtained by making a temporary surface on its face by the use of a relatively smooth diamond. We then use the same wheel for both roughing and finishing. The diamond is traversed slowly across the face of the wheel. The wheel is then used with light cut for the finish surface. It resumes its coarse cut when it is made to cut deeply again. In this way we secure the rapid cut of the coarse wheel when taking the roughing cut, and yet obtain a commercial finish with one and the same wheel. This method is especially adapted for grinding large and heavy work.

The whole question of grain of wheel depends largely upon the manner in which the wheel is used, but grains from 24 to 46 are those used mostly to-day. Some prefer several sizes of grain, mixed to secure strength, but the latest experience indicates that the single size from 30 to 36 is the best for nearly all

work with a commercial finish, while from 46 to 60 is used for a finer finish. These last are not used when any considerable material is to be removed.

Depth of Cut

The depth of cut must depend upon the grain and grade of wheel and speed of work surface, as well as the power available at the wheel spindle. While some classes of work are rapidly produced, only by relatively deep cuts, in most cases the maximum production width of wheel face that the machine will carry, and the maximum traverse speed for that width of wheel, in order to cover the work with the maximum number of cutting particles per minute. The greater the number of cutting particles per minute, the less depth of cut necessary for a given amount of material removed.

Width of Wheel Face

The wheel face for the cylindrical grinding machine can be any width from ¼" for special shape work, to the widest that a cylindrical grinding machine is designed to utilize. If users of machines desire to pay the necessary price there is no limit to the width of face a machine can be made to carry and no limit to the width that can be made to grind, both precision work and commercial work, if the work is of such size and shape that it will not be distorted by the wheel pressure and temperature changes. Wheels 10" wide are now used in every day work. The widths now used are 2, 3, 4, 5, 6, 7, 8, and 10 inches.

In many cases work ground with 5" and 10" wide face wheels does not traverse. In such cases the width of the wheel face is slightly wider than the length of the surface being ground, and in some cases with 2", 3" and 4" wheels the work does not traverse.

Finishing

Finishing may be done with rapid work revolution and also with very slow work revolution, as well as with any work speed between. It may be done with wide wheels and with narrow wheels. It may be done with very fine wheels and also with very coarse wheels, and with all grains between.

Good finishing depends upon the skill of the operator, whatever speeds or wheels he may use, but ordinary commercial finish on steel is perhaps best obtained by using a medium coarse wheel, about Grade L, carefully trued, and with work revolution at a suitable speed for that particular wheel and that particular piece of material. In case of hardened steel the grades should be K, J, and I, according to the hardness, shape and nature of the object being ground.

When finishing, an artist operator will succeed with any wheel from I to L, and any grain from 16 to 60. But when well acquainted with the particular work in hand he will select some one wheel as giving the most production and best results. What wheel he would select for any piece of work cannot be foretold, because his success depends upon his skill. Different artists select different wheels for finishing the same work.

Traversing Work Table vs. Traversing Wheel

Some cylindrical grinding machines are so constructed that the wheel traveses, while others are so constructed that the work traveses. There is much useless discussion as to which is best—to traverse the work or to traverse the wheel. The answer is plain: that so far as the grinding action of the wheel is concerned there can be no difference, whether ahe wheel traverses or whether the work traverses.

When selecting a grinding machine the the quality of its workmanship, convenience of operation, degree of precision to which its various parts can be moved, set and maintained, and the general rigidity and durability of its design and construction should be considered, and not simply the fact that the wheel may or may not traverse.

A wise designer will use work traverse when that shall best serve to secure convenience, durability and accuracy with the kind of work to be ground, and wheel traverse when the shall best serve the needs of the kind of work to be ground.

HANDY HOLD DOWNS FOR SHAPER WORK

By F. Brewer

THE accompanying sketch shows a pair of "hold-downs" which the writer made for use when shaping or milling strips and plates. This extremely handy and effective pair of articles are, as will be seen by the sketch, simple in design

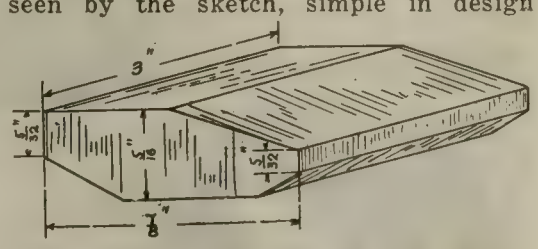


FIG. 1. HOLD-DOWN FOR SHAPER WORK.

and easy to make. Care, however, should be taken to see that the sides are square and parallel with one another, also that the side which touches the vise is above and the side which touches the "job" is below the centre of the "hold-down." Having respect for the boss' steel, I selected an old flat smooth file and annealed and shaped it to the dimensions shown in sketch, Fig. 1. The "hold-downs" were then tempered and ground on the sides, and were then ready for use. Their value is readily shown by sketch, Fig. 2. The job can be held low in the vise, thus relieving the vise from a great deal of strain, will take heavy cuts without shifting, and will come out absolutely true and parallel. The shape

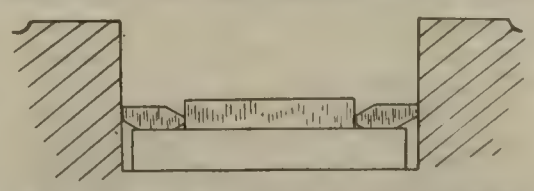


FIG. 2. METHOD OF USING HOLD-DOWNS.

of the "hold-downs" creates the tendency to force the job down firmly on the parallel strip. When shaping long strips or plates, use two pairs of exactly the same width.

EFFICIENCY AND CHEAP PATTERNS

By D. Street.

EFFICIENCY in the pattern shop, which is the key to cheap production, depends upon the number and condition of the machines, the organizing ability of the foreman, the initiative of the craftsman, and the quality of the timber used in the construction of the work. All pattern shops, however small they be, ought to have a saw, a band saw, a trimmer, a sand papering disc, a lathe and a grindstone. The idea that because a shop has only a few men no machines can be afforded is wrong. It is because the patternmaker has realized this truth that he can turn out work cheaper than many firms. It is often possible for the power in a large works to be on all the time, because there is always one or other of the machines in use, but in a small works it is essential that the power be cut off when no machinery is in use. It is possible for an ingenious foreman to improvise adjustments which will make the machines more serviceable, such as glueing a sheet of sandpaper on a lathe surface and making a small table to fix into the ordinary tee-rest.

Ill Treatment of Machines

Machines are more abused in the pattern shop than in any other shop. Carelessness is often the cause, but it is not always possible to foresee the exact finished shape, with the result that the saw "finds" screws and nails. It is cheaper, if need be, to change the saws several times a day than work with blunt saws, which latter practice necessitates much bench finishing and probably spoilt work. A common cause of spoilt work is a slack band saw; a tight band saw is subject to greater strain, and is more easily broken, but the danger of a slack band saw uncutting is very great. A very useful machine is a set of emery wheels for grinding gouges. They must be kept in good condition. If they are not, the outside edge of a true running grindstone is better. A soft stone carefully attended to is a sine qua non of the pattern shop; without it tools cannot be kept in good order, and good tools are necessary for good work.

Wood Lathe Features

Much time is often wasted in turning work; the lathe ought to be provided with several chucks and face plates of different sizes and rests suitable for concave and convex surfaces. The slide rest is occasionally useful in a wood-turning lathe for long straight barrels, but generally it is not of much use. If a workman has to turn a concave surface with a straight rest he has to be either continually stopping the lathe to move the point of the rest nearer to the work, or he takes the risk, which is a considerable one, of the tool dipping, and probably breaking, if there is the slightest vibration owing to the overhanging of the tool when turning at the centre of the rest.

In shops where there is much turning it ought to be done by one man. Turning work is more expensive than it ought to be, because only a specialist can acquire a high degree of dexterity in the

lathe. A patternmaker is a better pattern turner than a professional wood turner, because the latter is not accustomed to working to accurate sizes. It is an essential to have a man do the turning for the whole shop as it is for one man to be told off for a patternmaking machine. As little work ought to be turned as possible. The sandpapering disc can do much of the work that was formerly done in the lathe.

Division of Labor

There is not enough division of labor in the majority of pattern shops. Some jobs are peculiarly suited to boys. It is waste to have a highly skilled man making prints and flanges or building segmental work. Prints ought to be stocked in various thicknesses and sizes, and the youngest apprentices ought to make them. It is obvious, if an apprentice builds a segmental body, and a specialist turns it, the finished price is much lower than if one man made it throughout.

The kind and quality of the timber used has a considerable bearing on the finished cost of patterns. For general patternmaking yellow pine is the best timber. It is easily worked and, besides not warping readily, takes a good finish. Cypress and spruce are sometimes used, but are never satisfactory. The former warps, and is too brittle, and it takes more time to shape than yellow pine. Spruce is too open-grained, and changes its shape too readily. It is false economy to provide a bad quality timber to the pattern shops. Apart from the large proportion that is scrapped, cheap timber takes longer to work up. A foreman ought to consider it an important part of his duty to see that when men are breaking out timber they do not cut to waste. Carelessness or lack of skill in drawing off is responsible for this.

Re Setting Down

Too much time is usually spent in setting down work. Unless the drawing board is to be sent to the foundry, the metal need not be painted in. Three or four views are sometimes set down, when only one is necessary. It is often possible, indeed, to make a pattern direct from the blueprint without setting down. It is advisable when doing this, if there is a core box, to prepare it, first drawing the shape of the pattern as well as the core on the joint, when it can be used for taking sizes for the pattern. There is one important advantage of setting down work, and this is that the craftsman sees it full size, and thus it is easier for him to decide on the methods of construction he will adopt.

Prohibit Trading With Enemy Firms.—A supplement to the "Canada Gazette" of recent date has been issued containing a proclamation giving effect in Canada to the prohibition by the Imperial Government of trading with firms and persons in various countries of enemy nationality or association. The names of the firms and persons included in the list number several thousand, the majority belonging to countries of South America.

TEMPORARY REPAIRS TO GAS ENGINE GOVERNOR

By J. E. McCormack.

IN a gasoline engine governor of the type shown in section in Fig. 1, the arm A, broke at the hinge pin. Weights DD were connected by springs, as indicated in Fig. 2. Before the engine stop-

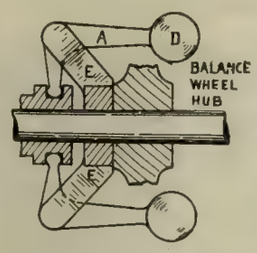


FIG. 1.

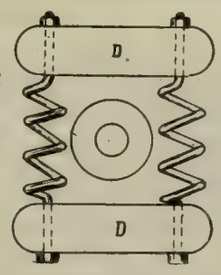


FIG. 2.

ped, one of these springs became badly stretched, but was put back as well as possible later. For a temporary quick repair, a piece of wood was cut as in K, Fig. 3, the side projection being shaped to fit down against the balance wheel hub and into the space between the spokes and was then attached to the yoke E, Fig. 1, by means of a suitably bent carriage bolt shown in Fig. 4. Smaller bolts were dropped into the springs FF (one into each spring), and a washer slipped between two coils of each spring and above the ends of the aforementioned small bolts. These bolts were then passed through the washers and through the wooden piece K, and washers and nuts put on these. The washers in the springs were large enough to hold the springs to K, yet small enough that the bolt heads did not pull through them.

After being planned, the repair did not require much time for its accomplishment, and the engine was again started. According to the speed indicator, it ran about eight per cent. slower than normal when first started, which was not considered bad, considering the stretched condition of the springs. They were,

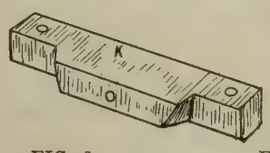


FIG. 3.

FIG. 4.

however, tightened a little more and operations continued; although the engine did not run quite so steadily as formerly, it was considered much better than shutting down to await new parts. The one weight acting alone against K, instead of against a duplicate of itself was much like one pulling on a rope tied to a post as compared with his pulling against another man on the some rope. The two pulling equally merely balance each other, the strain would be equal to the pull of one and the same as though the other end were fastened to something solid.

I might also add that with this engine a cord was passed from the ignition switch up through a pulley and across to where the operator of the driven machinery could easily reach it and thus cut out the ignition and so stop the engine whenever he wished. Also the priming bottle used was decorated with a large diamond shaped red label to prevent anyone mistaking the contents for kerosene or other liquid.

THE SHOP BUILT IN THE WOODS

By D. A. Hampson.

"MR. MACKEY, what kind of a shop is this to learn the trade in?" Johnny, the apprentice, asked the question of his foreman some fifteen years ago just after he had worked his first three weeks, and was beginning to think he should be "shoved ahead" faster. "Well, Johnny my boy, the kind of a shop this is to learn the trade in depends on the kind of men it turns out—you'll have to wait and see," was the reply. And after all wasn't that the very best answer that could be given?

The shop was located in the woods of Herkimer County and was started to make a couple of electrical specialties which the owner had invented. There were a planer and two lathes and three drill presses and a miller—all second-hand, bought that way because the inventor was true (financially) to his class. But the business was founded on merit and at the time of Johnny's question boasted a score of tools—second-hand—and had a force of ten, though it was only two years old. The business continued to grow slowly and to-day is housed in its own building, employs thirty-five men and is a shop worth going into to visit. Not marvellous growth—but substantial, a first grade credit rating, everything paid for out of earnings with no inflated capitalization, and with a demand for the product country wide.

The Boys Come Home.

Last fall they had an Old Home Week in Herkimer County and a particular effort was made to get all the old boys that worked in the shop to come back for a day or two. Most of them did and accounted for themselves in a creditable manner. Dick and Harry came down from Maine where one of them has charge of the assembling in a lathe plant and the other is superintendent of machinery for a firm of shipbuilders. Fred and "Dutch Bill" are master mechanics in auto factories in Detroit and couldn't be away long enough to come. Johnny, the same one, is in control of the tool-making at a central New York typewriter plant and his erstwhile pal Will left his $70 per week shell making job in Brooklyn long enough to shake hands anyway—Will is one of the prizes in the plant, a man that doesn't have to throw a bluff to hold the job. Herbert is a subway contractor's right hand man, has charge of a line of machinery far removed from the class that Hank works on as an expert tool-maker in a Pennsylvania watch plant. Mr. Mackay, the old foreman, left his own business on Long Island to drop in and greet his successor in the home shop, one of his own boys grown up in the business.

Based on his own rating, that shop must have been a good one to learn the trade in, for these boys went out from "the woods" into some of the most particular shops and made good from the start and there were others equally as successful as those named. The reasons why the shop turned out such good men are not hard to find. First, it selected good boys; but that was not all of the first part, for after six months' service the boys were frankly asked if they cared to continue in the trade or if they showed little aptitude, they were dropped. Second, the shop was located in a region where machine shops were not numerous and when a boy did land a job in the shop he considered himself fortunate and stuck to the job often for years after his apprenticeship was over.

A Final Reason

And thirdly is that old, old reason—the shop where the men cannot become specialists. For in the slack times the shop took in job work to help out on the pay roll and the boys got that most valuable experience of outside work—erecting, engine work, babbitting—all with makeshift, whatever-you-find-at-hand equipment. Inside the shop, some special machinery work was taken on. This necessitated a pattern shop and a small foundry; and lucky is the machinist who gets the benefit of work in these two branches along with his other training. Then the specialty business expanded and manufacturing in quantities was an important part of the business—really its financial backbone. With manufacturing of course came the machinery peculiar to it—punches, screw machine, turret lathe, and Lincoln millers and the equipment of jigs, tools, gauges, micrometers, etc., that goes with them.

So that the shop up in Herkimer County was well qualified to turn out good men and the men were not afraid to travel in fast company, mechanically speaking. And this lack of specialization was what gave the men this wider outlook—just as does the study of trade papers—and prepared them for the next job higher up.

TUNGSTEN FILAMENTS

By L. E.

A NEW preparation of tungsten filaments has been enquired into and adopted by some German firms, and in brief the process necessitates the mixing of the metal powder with 2 per cent. of thoria, which is kneaded into a paste with the addition of some binding agents, through which a thread is then squirted. The thread is first preheated, and then rapidly heated to 2,400 or 2,600 degrees C., the object being to make the crystallization of the metal more rapid than the passage of the wire through the heat zone. The first apparatus used for this delicate operation had the dimensions of several metres, the actual apparatus is only a few centimetres in height. The resulting wire is said to consist of crystals several metres in length though only a few hundredths of a millimetre in thickness, the cross-section of the wire coming out octagonal rather than circular. There are very few joints in the wire, whilst the first tungsten wires were really thin rods built up of very short sections. A recrystallization of the filament after long continued use of the lamp is said not to occur.

NEW METHOD OF SMELTING POOR IRON ORE

ACCORDING to the "London Times," two young Norwegian engineers have made an important discovery within the realm of steel smelting, which will probably have far-reaching results. The discovery has been patented and consists of a new method of smelting poor iron ore by electric energy into first-class steel at a very low cost and with less fuel. The smelting will be done by assistance of coal oxide gas and water gas, and the new important factor of the discovery is that the coal gas by passing through a flame oven is reduced to coal oxide, which can be utilized again.

The well-known metallic expert, Dr. Groendal, welcomes the new process, and has put his different metallic patents at the disposal of the young engineers. Practical people are sanguine of the success of the new smelting process, which will specially suit a country like Norway with only poor iron ore deposits, but plenty of cheap water power at disposal. The Norwegian mining trade journal, "Bergverkflyt," referring to this new discovery, says: "We welcome this discovery with sincere pleasure, and hope it will make our naturally poor country rich and mighty."

SCREW CONNECTIONS

ALL screw connections exposed to considerable heat or to moisture are liable to become very difficult to undo, if proper precautions are not taken. The unions on the generator of a steam car or the union on the exhaust pipe of a petrol car are, remarks the Autocar, good illustrations of this. The brake pins and nuts, the nuts on spring clips, etc., are also very likely to become rusted on. When ever any such connection is removed, a little pure graphite mixed with oil to a paste of the consistency of cream should be applied to the threads. The nut or union can then be unscrewed without difficulty, as although the oil may be burned off, the graphite never leaves the metal, so the threads cannot seize nor oxidize and give trouble. Why, adds our contemporary, makers do not adopt this system with new cars, is not easily understood, as it costs practically nothing. Those who have struggled with nuts firmly rusted on somewhere underneath the car—such as an axle spring clip—will appreciate this point.

IN San Francisco a firm of engineers is designing a ship with a length of 330 ft., a beam of 44 ft., and a depth of 31 ft., with a capacity of 4,500 tons, to be built of reinforced concrete. As far back as 1898 a concrete schooner is said to have been employed for some years in the North Atlantic coasting trade.

PALAU is the name of a new alloy of gold and palladium which has recently undergone tests at the United States Bureau of Standards, having been originated by a Californian metallurgist as a substitute for platinum in laboratory crucibles. The loss in weight on heating to 1,200 deg. Cent. is intermediate between that suffered by crucibles of platinum containing 0.6 and 2.4 per cent. iridium respectively. The melting point of the alloy is 1,370 deg. Ceut., which corresponds to that of an alloy of 80 per cent. gold and 20 per cent. palladium. In resistance to most of the chemical reagents to the action of which such ware is ordinarily exposed, palau compares favorably with ordinary platinum ware.

THE behaviour of silicon-iron alloys under the action of various acids was discussed by Prof. O. L. Kowalke recently before the American Electro-Chemical Society. The author's conclusions are that silicon-iron alloys of about 3 to 5 per cent. silicon are attacked very readily by sulphuric, hydrochloric, acetic, and citric acids. These alloys are not excessively brittle. Silicon-iron alloys of about 16 to 18 per cent. are exceedingly resistant to action of sulphuric, hydrochloric, nitric, acetic, and citric acids. These alloys are so brittle that they must be ground; they cannot be machined. A solid solution of FeSi in iron near 20 per cent. silicon is resistent to mineral acids. Search is in progress for a third metal which can be added to the iron-silicon alloys to improve their strength and still retain the resistence to the action of acids.

THE dependence of the Swedish iron and steel industry on foreign supplies of coal has resulted in the prices of these products rising to such a point that they are quite out of the British market. Swedish pig iron, if bought to-day, says the "Ironmonger," would cost the British consumer about $225 per ton, compared with $30 per ton before the war. The cost of rough bar iron for making crucible steel, and of steel billets, averages $325 per ton or a little more, compared with $52 and $60 in ordinary times.

A 6-hr. working day was recently advocated by Lord Leverhulme in an interview printed in a British paper. He would run the machinery 12 hours with two shifts of operatives, expressing the belief that the human machine would do as much in 6 hours as in 8, except in a few industries where exceptional conditions prevail and that the extra number of hours worked by the mechanical machines would enable such an increased output as to allow possibly for the same wages now paid for 8 hours. Incidentally, he expressed faith in co-partnership rather than in profit-sharing.

PNEUMATIC DOOR CONTROL FOR STREET CARS

FROM the earliest days of tramway or street railway service, engineers have been striving to maintain the highest standard of efficiency, not only in the mechanical operation of the equipment, but also in that which is equally if not more important — the safety and convenience of the travelling public. While the progress in street railway systems may not have been phenomenal, many remarkable improvements have been developed since the operation of the old horse car, or even the more recent ancestor of the modern electric tram car —the "Tonneville Trolley." It is in the larger cities, however, where heavy traffic is encountered, that modern cars are more extensively equipped with many of the latest innovations of the inventors' or engineers' art.

The Montreal Tramways Company operate their system on the pay-as-you-enter plan, where the conductor is located in a suitable position in the rear vestibule to collect fares from the incoming passengers, and observe when the entrance and exit are clear for the next movement of the car. Previous to the changes and address here described, the body or interior of the car was separated from the rear vestibule by a partition, containing a hinged entrance door, and a sliding exit door, both hand operated; the latter being adjacent to the street opening. Similar facilities are provided at the forward end for outgoing passengers. The alterations consist of the removal of the intervening partition, rearranging the conductor's cage, and equipping the street opening with air-operated folding doors and lower step. Fig. 1 illustrates a general view of the rear vestibule, showing the central cage and doors fully opened. The cage platform is on a level with the car floor and extends about two feet into the vestibule, the floor of which is about 6 inches lower than that in the body of the car; this provides a commanding position for the conductor over the heads of the passengers. A seat is supplied for the conductor's convenience, being so arranged that it can be tilted back out of the way when so desired; suitable stops maintaining it in either position.

FIG. 1. GENERAL VIEW OF REAR VESTIBULE.

FIG. 2. EXTERIOR VIEW, SHOWING DOORS CLOSED.

Mechanical Details

The control and operation of the folding doors can be better understood by reference to the line drawings. The doors and step are jointly operated by the action of a small double piston, single cylinder pneumatic engine, located in a suitable compartment directly above the folding doors. The conductor has absolute control over the opening or closing of the doors by the small handle A situated to the right of the cage. The railings of this cage are of ordinary gas pipe, which provide a suitable and protected means of supporting the vertical connecting rods and necessary wiring. On the lower end of the rod B to which A is secured, is the small lever C connected to a similar lever D on the upright rod E, by means of the cross rod F; the rod E being in turn connected to the operating lever on the valve of the engine G. The engine is so designed that when air is admitted into one end of the cylinder the air on the opposite end is exhausted, but in such a manner that a cushion action is attained just before reaching the extreme position in either direction. This action is obtained by means of two exhaust openings. A large one permitting rapid release for the greater proportion of its travel, and the remaining air as it exhausts through a pin hole opening, allows the doors to gradually close to a fixed position. This action results when handle A is in the extreme position either way; the doors may be held stationary in any desired midway location by placing the operating handle in a neutral position after operating. As before stated the small engine is of the double piston type, these pistons being rigidly connected by a central shaft, the upper portion of which is in the form of a rack; this rack engaging the teeth of a gear sector, the axis of which extends to the outside of the casing, and carries the lever H. Connected to this lever are the two rods I and J, the opposite ends of which are secured to the levers K and L, these being threaded pieces for providing accurate adjustment. It will be noticed that the lever K is directly connected to the door support, while L is fitted to an auxiliary gear section that in turn engages a similar one on the door support; this being necessary for uniform and opposite control.

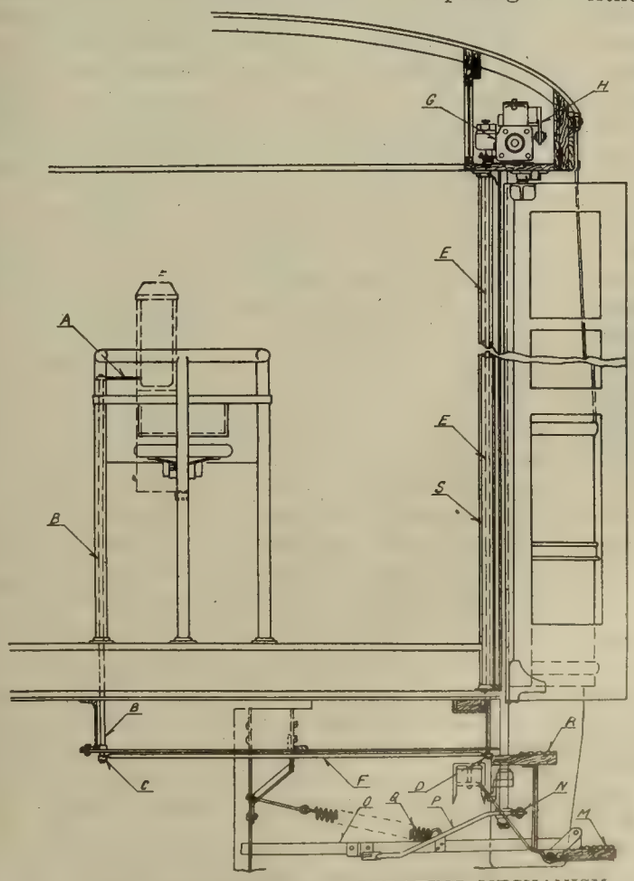


FIG. 3. END ELEVATION OF OPERATING MECHANISM.

The step M is simultaneously controlled with the action of the doors by means of underfloor connections. Secured to the lower end of the front door shaft is the lever N that operates the step rod O by means of the connecting rod P, this being freely supported in suitable framing. The spring Q is to assist in keeping the step up when the doors are closed, and when in this position the lower step folds up and under the top step R.

Safety Features

Several safety features are incorporated in the design of these doors that aid in eliminating possible injury to passengers. With anyone standing on the lower step it is impossible to close the folding doors, and when passengers are upon the vestibule floor the movement of the closing doors does not interfere with the convenience of the passengers. An interesting feature in connection with these doors is the arrangement of hollow rubber cushions on the contact edges of the two folding doors. These are so designed that should anyone outside inadvertently take hold of the central stanchion S—which is located about four inches inside and directly opposite the center of the closed doors—when the doors are closing, no injury will result, as the doors can be entirely closed and yet allow the hand to be withdrawn with a little effort. This method of contact has the additional advantage of providing a perfectly weather-tight joint. In conjunction with the operation of the doors there is an electric signal system that tells the motorman at the front end when the doors are closed. When the doors are just about closed contact is made that lights a small lamp contained in a perforated case located directly in front of the motorman, so that he can tell, without removing his eyes from the street in front, when the rear is clear. This light remains lit all the time the rear doors are closed.

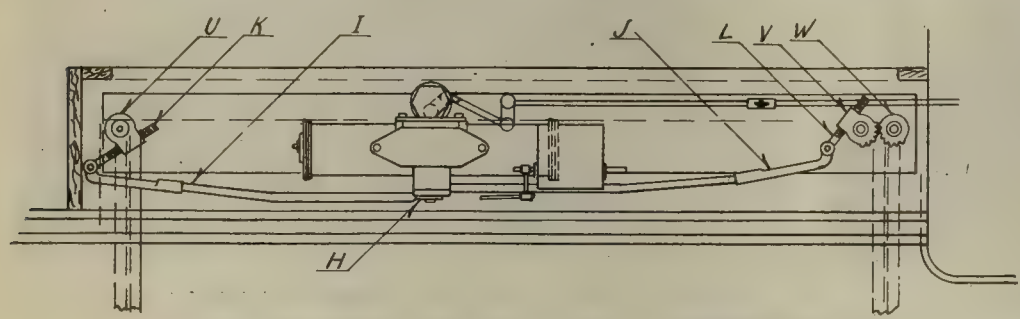


FIG. 4. PLAN OF DOOR OPERATING MECHANISM.

SOME SCREW MACHINE POINTERS

By D. A. Hampson

MAKE sure that the cut off tool is not narrower at the point than it is further back. If the point, or end, is narrower the tool will not cut freely but will crowd and bind, making a rough cut and breaking the pieces off. A tool that is dull acts the same way for the corners are the first to dull and after that the actual cutting edge is narrower by just so much.

Stopping the machine at quitting time—any old way to get it shut off—is disastrous to tools. The reasons are many:—a drill may be half way in a hole and when the machine is again started the supply of lubricant does not start instantly, perhaps not until the drill has reached its depth which it has to do dry; the same is true of the cut off tool whose edges may be ruined by cutting just that 1/16 in. before the flood is on. The best way is to watch and shut off the machine just as the cut off tool has severed a piece—then during the idle movements following, the lubricant has ample time to flood the work before a tool comes in contact with the bar.

Whenever it can be arranged, it is better to use a centering tool before starting a drill. With small drills, it is well nigh impossible to do good work unless a centre is put in first. An advantage of the centering tool in any case is, that the cut off tool does not have to be so perfectly set as without it, for the centre removes a button or tit that may have been left.

Drill holders of the "floating" variety are a great help. They take care of misalignments of the machine and save drill breakage. Floating holders for reamers are an essential if straight holes are to be produced.

Don't try to drill holes too deep. A depth of three times the drill diameter is about the limit for ordinary, everyday work that is "pushed." If the limits will allow it, grind the drill so it cuts larger than itself and if it can be arranged on the turret, divide the hole into sections and use two or more drills, the second a few thousandths smaller than the first.

The best steel is the cheapest; even if the speed isn't great enough to warrant high speed steel, the latter will wear much longer between grindings and effect a saving that way. If the time it takes to grind and set a tool is noted and the number of times it is done each week is noted also, there will be no doubt as to what kind of steel will be used.

Half a minute sighting over a bar to see if it is bent will save half an hour looking for trouble with the feed.

When a box tool is used on a heavy cut, the cutter itself can be made to stand up much longer if it is fed against a bevelled end rather than a square end on starting the cut for each new piece. Normally the tools leave a square end on the bar after each piece is made but if the cut off tool or the box tool or the forming tool as the case may be is made to feed a little farther or is made with the inside bevelled or rounded, there will be a corresponding part turned on the bar each time before it is fed. This "breaking down" of the blunt, square end saves the tool from the sudden heavy cut and prolongs its life.

As far as possible, set up the tools by measurements and "shadow" movements before putting in the bar. This saves many a broken tool and drill.

Setting the chuck too tight only strains the machine. If the bar slips under normal cuts, look for trouble (poorly ground or dull tools, chips clogging, a loosened screw, etc.) elsewhere before setting the chuck any tight. Because it strains all the parts concerned, a too tight setting is worse than none and is a source of future trouble. Because the bar is cold drawn, it does not follow that it is perfect in size—it is not unusual to run across bars in the same shipment that vary .005 inch.

THE TEXTILE MILLS OF BRAZIL

By F. J.

THERE are parts of Brazil which may some day become the Lancashire of South America, so far as manufacturing enterprise and development are concerned, for some of the mills in the vicinity of Rio de Janeiro and S. Paulo are amongst the most finely equipped for spinning and weaving cotton. From many of these places and others many textile workers, who had gone out there from Lancashire, had to return home on the outbreak of war, and up to that time cotton spinning and weaving had made good progress. Of course, with the outbreak of war, all calculations as to the money market were upset and work on mills then in course of construction had to be abandoned. During the past twelve months, however, there has been a better trade in the Brazilian markets, though the Lancashire manufacturers do not yet understand that they must fulfil the requirements of the customer. Nearly all the spinning and weaving rooms in the Brazilian textile mills are laid out on an elaborate plan and furnished with Oldham, Manchester and Bolton machinery, and in regard to the manner in which the machinery has been planned, particularly as to the space allowed between each machine, there are few mills in Lancashire to compare with them. Attached to the factories are houses and schools for the families of the workpeople, laid out, in some cases, on a model plan. This is especially the case in regard to the mills of Penedo, in the State of Alagoas, the Bangu mills and the concerns of the Confianca Industrial Company at Rio de Janeiro. In most of the developed States of Brazil the spinning and weaving of cotton already form the principal industry and the greater part of the machinery has been supplied from the Lancashire textile firms.

The man who is well paid for working twelve hours a day is better off than the one who is poorly paid and works eight.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

UTILIZATION OF OIL POWER

By L. E.

IN certain quarters the subject of oil fuel is receiving a good deal of attention, and it seems probable that after the war oil will be more largely used for power purposes than has hitherto been the case. Oil fuel, liquid oil fuel and fuel oil are interchangeable terms for the same product, and the term "crude oil" in this connection is a misnomer, as the latter contains a number of fractions such as petrols and paraffins, which can be used for power purposes after they are extracted by distillation from the crude oil before it becomes fuel oil. Generally speaking, the term "oil fuel" is applied to the heavy dark-colored oil which remains after certain of the lighter fractions are removed.

A comparison between the best steam coal and the highest grade oil at pre-war prices shows a decided balance in favor of the latter in equal heat-raising quantities. Not only is oil superior in this respect, but it is far more portable, weighs less, and occupies less space than coal for equal heating values. It is decidedly more convenient in every way for ship use, as it can be more easily stored both on the wharf and on board. Less time and labor are required in transhipping, and its use sets free for other duties a number of men who, under a continuance of the present system of firing, would be employed in the stokehold. For both industrial and general purposes also the use of oil power is likely to become increasingly popular, as the oil engine using ordinary grades of paraffin has demonstrated its value in a number of situations and for a variety of uses. More particularly is this the case in country districts, where the great majority of private electric light installations are driven by oil engines, and pumping, sawing, chaff-cutting and similar operations are almost invariably carried out by means of oil power. Even in towns where coal gas is available at a low cost and coal can be obtained cheaply and in plentiful quantities the oil engine has gained a firm footing, and to the engineer it is evident that the use of oil for power purposes will show a steady increase in the future.

Effects on Coal Consumption

Whilst this will have a considerable effect on coal for steam-raising purposes, it will have little or no effect on the amount of coal used in the country; the only difference will be that more coal will be subjected to destructive distillation than has formerly been the case. For some years to come it is probable that the after-effects of the war will militate against the importation of mineral oils, and many of the products of coal distillation, amongst which may be particularly mentioned the benzoles, will take their place. The distillation of shale oil will also be developed to a considerable extent. Shale oil has been extracted in Scotland for over half a century, but at the moment the Scotch supply is of relatively little importance. When mineral oils are heated in a retort the highly inflammable vapors, as petrol, benzoline, or naphtha are first driven off, followed in order by illuminating oils, intermediate and lubricating oils, leaving petroleum refuse, technically known as astaki. All those products can be used for the economical production of power, but they must, of course, be used in differing ways.

Methods of Using Oil

It is not generally known, except in engineering circles, that there are four separate and distinct methods by which power can be obtained from oil. The first and most common is that in which the more volatile constituents, as petrol, or gasoline, are made use of as in the ordinary motor car, launch or aeroplane. Engines worked with these light oils require a carburetter, in which air is mixed with the vapor in order to form an explosive mixture. In the second method, ordinary illuminating oil is used, the oil being vaporized by means of heat, mixed with a due proportion of air, and exploded behind a piston. In the Diesel modification of this, heavy oils are used, and are compressed with air to so great a pressure that the heat generated by the compression explodes the mixture and drives the piston. There is a great future for engines of this type on account of the great power they develop, the simplicity of their action and the comparative cheapness of the fuel they require. The third method, which is seldom adopted in Great Britain, is that in which the petroleum is distilled in a separate retort until it is given off in the form of a rich gas. This can be used for illuminating purposes, but in power work it is mixed with a large proportion of air and introduced into the cylinder of an internal combustion engine designed for use with gas, and not oil or petrol. The fourth method combines the cheapness of oil with the flexibility of coal firing. The mineral oil is used in the form of fuel, and burned under a boiler in order to produce steam. In this, the heavier and more common oils give the best results. The oil is blown, usually by means of steam, on to a bed of burning embers, consisting generally of cinders and chalk, when it is ignited and burns with great heat. A system used on certain railways makes use of the refuse from shale distilleries, green oil, tar from oil gas, creosote, and other heavy fuels. This method has proved reliable in practice, and has been widely adopted in marine work and will no doubt come extensively into use in the future.

ACCIDENT PREVENTION

By C. T.

THAT the importance of "Safety First" is recognized is shown by the fact that its progress is being watched and its principle observed by the majority of large manufacturing concerns. It is interesting to note the close relationship which exists between it and operating expenses. In one British public utility company employing 2,000 hands, during the period beginning January 1st, 1913, and ending December 31st, 1915, the time lost by employees on account of injuries received whilst attending to their various duties, amounted to no less than 22 1/3 years. As the average salary of the men injured was $75 per month, the company paid out during that period over $20,000 in salaries, for which it received no return in work. At the end of 1915 the company extended its business and increased its pay-roll, and it would naturally be thought as the number of workpeople increased the number of accidents would rise proportionately, but at that date the attention of the concern was directed to the "Safety First" movement, and an accident prevention campaign inaugurated. The immediate result was a great decrease in the number of workers receiving injuries, and at the end of the year the firm found out that they had paid out $5,000 less than during the preceding twelve months for accident pay. This shows plainly enough that the results of the care taken were quite sufficient to justify a continuance of the new policy from a financial standpoint alone.

Co-operation Pays

There is no need to mention the relationship existing between output and accident prevention. The wasteful effect of substituting a comparatively unskilled workman for one who has been injured will be apparent; and, further, if the experienced worker has been injured the chances are that the unskilled man will be still more liable to injury. If safeguards are provided and the workman knows that the guard offers him complete protection, his speed naturally increases, and with increased speed comes an increase in output.

The good feeling which is developed between employer, employee, and the public where the "Safety First" principles are observed is an important item. A good deal of "industrial unrest" has been attributed to a failure on the part of the firm to study the safety of their employees sufficiently. A plant which runs along smoothly, with everyone

working in perfect harmony, is not only one of the aims of safety work, but also one of the essential factors in ensuring the proper results. Accident prevention work certainly pays, because it cuts down the operating costs, increases the output of the plant and saves needless expense and suffering to workmen and their families, and develops a spirit of good-will between the parties concerned, which has a great financial value to the employing firms.

UNIQUE HIGH TEMPERATURE ALLOYS

By Mark Meredith.

THERE are two metals worth attention in most places where there are facilities for making and casting them—one being what is called "Mitis" iron, which, if properly made, is a homogeneous form of wrought iron which, without annealing, can be bent or forged either hot or cold, and very well takes the place of mild steel—it can be case-hardened—and the other is a form of bronze containing anywhere up to 60 per cent. of iron, but probably most usefully about 20 per cent, and which can be rolled and otherwise worked whilst it is practically incorrodible. Both of these to be successful must be made from carbon free iron, and both must be quickly melted in closed crucibles to prevent absorption of carbon in a gaseous state so far as possible; the successful results in each case being conditional upon the absence of carbon, phosphorus and sulphur. Only the best Swedish iron can be used in the work, and in the case of the iron only a small proportion of scrap arising from the casting processes can be utilized a second time, for which reason there must be an outlet for the scrap metal for cupola use. The bronze can, of course, be remelted if properly made with as pure commercial metals as are obtainable.

Relative Costs

In the case of the iron castings, there is little or no saving in cost over ordinary annealed malleable castings, whilst it is possible that even a higher cost may occur, the chief advantage being that time is saved, the castings being ready as soon as made; this not being the case with the ordinary annealed malleable iron castings, which often take a month or more for delivery. With the bronze the metal can be produced for 13c per pound or less, ready for pouring into the moulds, whilst machined castings are practically incorrodible when exposed to the air. There is nothing to prevent these things being made anywhere so long as the appliances are in existence, but this is just where the trouble comes in.

In making iron castings the iron should be melted in, roughly, 75-lb. lots (net), and it should be fluid in about 2 to 2½ hours; the crucibles are then opened and aluminum up to 0.5 per cent. added in the form of ferro-aluminum with an Al content of from 8 to 10 per cent., the actual amount being determined in the laboratory according to the iron used. The melting point of the iron will be somewhere between 1,500 deg. and 1,600 deg. Cent., or from 2,700 deg. to 2,900 deg. Fah., and it takes about 160 lbs. of really good furnace coke to melt each 100 lbs. of iron in a good furnace.

In making the bronze, the iron has to be melted as for the iron castings, and to this is added the copper at a red heat and with a melting point of about 1,050 deg. Cent., or 1,925 deg. Fah.; this being followed by the tin or zinc, both of which melt at a low temperature, and if added in as hot a state as possible, by the reactions caused, no additional heat is necessary. The alloy when made melts somewhere between 1,050 deg. and 1,200 deg. Cent., according to content, or, say, from 1,900 deg. to 2,100 deg. Fah., which is about the range for cast iron.

Crucible Consumption

As there must be the greatest freedom from carbon possible, clay or other crucibles free from carbon must be used, and, as such crucibles can rarely be used again after being cooled down, as many successive melts as possible must be secured for the sake of economy, this meaning that in practice either single or multiple pot furnaces must be provided with forced draught to ensure that the carbon of the fuel is reduced to the highest state of combustion—carbonic acid—and it also means that the heat must as far as possible be held in the furnaces and not sent up the flues. Of course, crucibles for this kind of work are stood on stands to keep them steady and in position, this assisting in the arrangement of the blast, and as this should not, as a rule, exceed 3 in. on the water gauge, there should not be excessive fusing of the walls of the furnaces, provided dry, or possibly preheated air is sent in.

To secure high rates of combustion large volumes of air at just sufficient pressure to cause it to penetrate to all parts of the fuel should be carefully arranged, while it is also desirable that the fuel should be broken to a moderate size to expose as much surface as possible. The physical structure of the coke has much to do with both the volume and pressure of the air used, and can only be determined by actual trial at the furnaces being operated.

Various forms of furnace can be used, but in every case the object aimed at should be that of concentrating the heat on the crucible or crucibles, which the particular form of furnace is made to contain, the mere burning of fuel not always being equivalent to heating power. There are many furnaces working well in various places for both single crucibles and for three and four crucibles in each fire, for which reason there should not be much difficulty in selecting a suitable form. Only the best workmanship in erecting and the best material will stand the intense heat for any time, which in general practice confines the choice very largely to fireclay bricks, which in the best forms will stand up to approximately 1,700 deg. Cent., and magnesia bricks up to 2,150 deg. Cent., whilst chromite bricks will stand up to 2,000 deg. Cent. It is really advisable to use the magnesia bricks, irrespective of cost; however, with a well constructed and carefully fired furnace the walls are not the hottest part, and a good fireclay brick will stand very well; but all depends on the bricks, in some cases the method of manufacture not being all that can be desired, quite irrespective of the content of the fireclay.

The tools used in connection with furnace work must be well made and of sufficient strength, particular attention being paid to the lifting tongs, which must fit the crucibles and grip them right round in two or three places, owing to the fact that the crucibles, whether of clay or plumbago, become more or less plastic at high temperatures, although they do not really reach a state of actual fusion. All stirring of metals should be done with fireclay rods or stirrers, and not with iron, as in the usually adopted manner, because carbon must not be introduced in any way, either in a solid or gaseous state. High temperature and freedom from carbon being necessary, it is quite possible that electric furnaces would answer better than fuel furnaces, and investigation in this direction is certainly worth some amount of investigation where facilities exist.

THE MARCH OF PROGRESS

By C. I.

THE development of any particular branch of industry generally divides itself into three separate parts, which are sufficiently well-defined to enable the stages to be marked with exactitude. The first stage is that in which the process of trial and error predominates. The machine or engine produced is the product of experience. Continued observation in working, alteration of detail and rearrangement of elements constitute the methods by which a degree of perfection is obtained. So-called theoretical considerations play no part in this stage of development, the instinct or experience of the designer or operator being the deciding factor in all changes. In the second stage, the whole subject is minutely examined from a purely technical standpoint, and the reasons which underlie the various peculiarities in construction or operations are critically scrutinized so that some rational basis for future work may be arrived at. In this stage of development the product of experience will be found to be developing on wrong lines, and in defiance of certain truths which can be scientifically demonstrated. Or it may be that these truths are ascertained for the first time as a result of these investigations. The third stage of development is that in which the work of the pure scientist is turned to practical account, and in which designs and processes are modified to bring them into agreement with the results of scientific investigation. It is in this third stage that the great competitive race is run, and where firms and individuals who refuse to be guided by the most up-to-date scientific factors must come to grief.

There are many fields of labor in which

the first machines are based on exact scientific facts and where, therefore, there are but two chief stages of development, but on closer investigation it will be found that in the thousand-and-one different branches which constitute one field of labor the three stages of progress are continually taking place. Thus, in the realm of machine tools, the first machine produced was one that would stand up to its work and give fair results in accuracy and quantity of production. Then when high-speed steel forced an investigation of the question of cutting power, and the forces at work during cutting, it was found possible to improve the design of the machines, increase speeds and also production. As the late Professor Nicholson once wrote: "The necessity for any serious application of theory or calculation in the design of machine tools was probably never felt until the universal adoption of high-speed steels, which rendered the reconsideration of the kinematical and dynamical principles governing design a matter of careful and of vital importance. A careful study of machine tool design from the theoretical side can be of substantial assistance to the successful designs. A complete knowledge of the forces operative, and the power required in performing a given piece of work, and of the most economical rates of cutting and feeding, taking into account all the factors which contribute to the total cost, must certainly be obtained and made use of, if the design is to stand absolutely secure in subsequent successful and useful employment."

Steam Generator Developments

In steam generator practice, the use of big flues and slow speeds of gases has been used so long, so as to allow a long period of contact of gas and plate, that it seemed as though this practice must be based on correct scientific facts. Many forms of spiral retarders were devised to increase this time of contact, and gave good results, but probably not for the reasons conceived by the inventors. Most probably for the very opposite reasons which the investigation revealed, namely, that the rate of heat transmission increased with the increase of gas speed, and that what was required was not a large volume of gas having a small surface area of contact with plate and a large control core which transmitted heat to the plate only by radiation, but a large volume of gas broken up into small streams drawn at very high speeds over the metal so as to yield all its heat by convection and do away with a slowly moving film in contact with the plate which acted as a heat insulator. The spiral and other retarders inserted in fire tubes had this effect in part, for they split up the gases and prevented the formation of a central core of gas, giving off heat by radiation only. So far theory has not found much practical application, but prejudice will be broken. The Lancashire type of boilers has advantages, and men are naturally reluctant to alter such an old friend; similarly in other fields. In agriculture, the farmer's idea of the action of his manure has been critically examined and found to be less promising than the new theories based on the action of nitrifying bacteria, with the result that new products, such as bacterized peat, are finding their way into service. So in all branches, including sewage treatment and water filtration, steam turbine engineering and air pump construction, the results of the second stage of the march of progress are always being brought forward for attention.

The necessity, therefore, for a thorough grounding in the theoretical side of the subject of one's life work, and the great value of a technical scientific training for the evolution of new inventions of merit, is one of the facts that these present days of the world's history are making increasingly evident.

PREPARING HEATING BOILERS FOR SERVICE

AS the winter season approaches, householders and other owners of heating boilers begin to make plans for placing the boilers in service. Persons who earnestly desire to obtain the best results from their heating plants, and who give careful thought to securing economy in operation and obtaining maximum length of service from their equipment, — in other words, all thrifty and methodical managers,—will have had their boilers well cared for at the time their operation was discontinued in the spring, so that in restoring them to service there will be little to do except to close up the various openings, supply the necessary water and start the fires.

The precautions that should be observed in laying up boilers, in the spring, were outlined in the Travellers Standard some three years ago. Commenting on the preparation of boilers for service, it says: If these have been faithfully observed the boilers should be in good condition in the fall, both internally and externally; but if they have been neglected, the delay has doubtless affected the heating equipment detrimentally, so that any defects that existed in it have probably grown worse, and deteriorating influences of various kinds have doubtless produced notable results during the period of idleness. In such cases, therefore, it is important to look the heating plant over with special care, to remedy the effects of neglect as far as possible. Some of the advice that is given below is based upon the assumption that the boiler was not properly cared for in the spring, and other parts of it should be heeded, whatever was done at that time. The reader will have no difficulty in distinguishing the parts that apply to his own case.

Before filling the boiler with water, clean every accessible part of it thoroughly, both internally and externally. Take down the smoke-pipe and remove the soot from it, and in the case of tubular or flue boilers thoroughly clean out the tubes or flues. When the smoke-pipe has been replaced, examine the joints carefully and make sure that they are tight, and give attention also to the supports for the pipe.

An equal amount of care should be exercised in cleaning the external surfaces of the boiler itself. All soot, dust and ashes should be removed from the setting, boiler and grates. See, also, that the brickwork of the setting is in good repair.

Do not forget that the gage-cocks and the connections to the water column may have become filled up. Make sure that they are free, even if it is necessary to remove them from the boiler for the purpose; and in the subsequent operation of the boiler do not rely upon the water glass to implicitly for determining the height of the water, but confirm its indications by the frequent use of the gage-cocks.

Steam Generator Developments

If the water was drawn off in the spring without drying out the boiler afterwards, or if the feed valve has leaked during the summer, small quantities of water may have remained upon the boiler surfaces for a considerable time. In this case corrosion and pitting have doubtless occurred to some extent. All areas affected in this way should receive special attention. If possible, the water should be removed, with a mop or otherwise, and the metal allowed to dry. The plates should then be scraped, or thoroughly cleaned with a stiff wire brush, and it is often well to paint the affected places with red lead and oil, or with some special protective preparation, after the dirt and oxide have been entirely removed. When this has been done, and sufficient time has been allowed for the paint or other protective substances to dry, the boiler should be filled with water and drained off again at least twice; and if the construction will permit, a hose should be used to wash out any sediment that may remain. In filling the boiler leave a vent open somewhere, for the escape of the air it contains. Opening the upper gage-cock suffices for this purpose, if the boiler is to be filled only to the working level; but if it is to be completely filled, the safety-valve should be eased from its seat, or some other opening should be left at or very near the top of the boiler to prevent the trapping of air in the upper part of the boiler.

Whenever it is feasible to do so, the safety-valve should be tested by hydrostatic pressure before the boiler is placed in service, to see that it operates at the pressure for which it is supposed to be set.

Look over the boiler accessories and attachments with special care. Raise the safety-valve from its seat, and if it does not work freely, or if any part of it is in need of repair, see that the trouble is made right before firing up the boiler. The diaphragm of the automatic damper regulator also requires a critical examination. See that it is soft and pliable, and if it is found otherwise, have it removed and replaced by a new one. See, also, that the diaphragm, with its connections and the dampers that it regu-

lates, works smoothly, easily and positively.

The fire should be run very low at the start, to permit the boiler and its contents, and the various other parts of the system, to become heated up gradually. The supply and return valves of the heating system should be opened so that the steam, as soon as it is generated (or the hot water if the system is of the hot-water type), will warm up the pipes gradually. Pounding in the pipes will be averted in this way, and the danger of rupturing the cast-iron fittings by rapid and unequal expansion of the piping will also be diminished. As soon as steam has been raised, the safety-valve should again be lifted, to see that it is free and in good working order. It is also well to run the pressure up to the point at which the safety-valve is supposed to blow, in order to make sure that it will operate properly under regular running conditions.

Skilled Examination Necessary

The boiler owner or attendant who has faithfully complied with the foregoing suggestions may feel reasonably confident that his boiler is in condition for safe and efficient service, unless the deterioration that it has experienced during the summer season has been very marked. It will probably give no trouble if it is in charge of an experienced and trustworthy attendant, who will see that it is properly supplied with water, and that the safety-valve, damper regulator and other accessories are kept in good working order. It is important, however, to have the boiler examined by a competent inspector, who will look over the entire equipment thoroughly, to make sure, so far as possible, that everything is in good condition, and to test and regulate the safety-valve and the steam-gage. The Travelers Indemnity Company renders service of this kind to its policyholders, free of charge; and it gives valuable expert advice on all matters relating to boiler management. The counsel that is given in this article will prove helpful in promoting safety and economy, but no article could be written that would make it wise to dispense with the services of an experienced inspector. One might as well dispense with his family physician, after reading a little of the elements of physiology and materia medica.

A considerable number of second-handed heating boilers will doubtless be installed at about this time, and many that are in poor condition, or even positively dangerous, may be accepted by inexperienced persons, upon the representations of unscrupulous or misinformed salesmen. A coat of paint often makes a poor boiler look good to a novice. Here, also, the services of Travelers inspectors are valuable, because their training enables them to detect weaknesses and defects that would easily escape the attention of persons with less experience.

SPELTER AND SULPHUR

IN a paper published in England by the Society of Chemical Industry, H. M. Ridge points out that the main source of spelter today is zinc blende, which, when pure, contains 67 per cent. zinc and 33 per cent. sulphur, but generally contains also some sulphide of iron and other impurities.

The utilization of the zinc contents of the deposit of argentiferous zinc and lead ore at Broken Hill presented unusual difficulty, because of the presence of garnet and rhodonite of about the same specific gravity as zinc blende. This was first overcome by the use of the Wetherell electro-magnetic separator with an intensely strong magnetic field. The process, however, was too expensive to be able to compete permanently, and was superseded by the modern methods of flotation. To-day the whole of the zinc concentrates at Broken Hill are produced by flotation, but these methods have not, up till now, proved effective for separating fluorspar or carbonates from blende.

The usual method of separating the sulphur from blende is to roast the ore with a sufficiency of air to form zinc oxide and sulphur dioxide. If the sulphur has to be used for technical purposes the fumes must not be contaminated and diluted with fire gases. Constructional difficulties were encountered in the design of furnaces for this purpose. Muffled furnaces have to be used, in which the fire gases do not come into contact with the ore, and the heat units have to be passed through firebrick in order to maintain the heat while the last units of sulphur are being oxidized, and while any sulphates which may have been formed are decomposed.

QUEBEC MINERAL PRODUCTION

THE annual report of the Mines Branch of the Department of Colonization, Mines and Fisheries of the Province of Quebec has just been issued. It covers the calendar year ending December 31, 1916.

This report, which is addressed to the Honourable Honore Mercier, the head of the Department, shows that the mining industry of the Province is in a healthy condition. The mineral production for the year in question amounted to a value of $13,287,024, which is the highest ever recorded, being an increase of nearly $200,000 over the previous banner year, 1913.

These results are all the more gratifying if we consider that the increase is wholly attributable to the products of the mines proper, such as asbestos, copper, cromite, magnestite, molybdenite, zinc, and lead, whereas the building materials, as stone, brick, lime cement, show decreases. Yet the total shows a marked advance as compared with previous years.

Besides the technical review of the mining operations the report goes fully into the statistics of accidents in mines, and the measures to be taken to prevent them. There has been a shortage of labor in the mines of the province which has been keenly felt and which has resulted in a very notable raise of the average wages.

The report also gives a full account of the results of an investigation of the mineral resources along the line of the Transcontinental Railway, between Hervey Junction and Doucet. The volume is carefully edited and well illustrated, and will be much appreciated by the interested public.

GOLD PRODUCTION IN CANADA

COMPARATIVE figures of the world's production of gold in 1916 shows that Canada improved her position slightly as compared with other countries. In 1914 Canada came seventh in the list with a contribution of $15,925,044, or 3.4 per cent. of the total output of all countries for the year; in 1915 the figures rose to $18,977,901, which represents 3.9 per cent. of the total and placed Canada in fifth place. That place was retained in 1916, with a total of $19,162,025 and the percentage to the grand total up to 4.8 per cent.

Although every effort was made to speed up the production of a metal for which the demand was greater than ever, the world output of a new gold in 1916 at $470,442,068 fell short of that of 1915 by $8,110,154; the total, however, was $10,344,640, or 2.2 per cent., higher than that of 1914. The largest output came from the Transvaal where $192,138,000 was the value of the production in 1916.

BRITISH IRON AND STEEL TRADE

IMPORTS of iron ore and scrap into Great Britain for the five months ending May 31 were valued at £10,312,752 in 1916, and £11,005,800 in 1917; an increase of £1,206,952. The quantities of iron ore are not stated.

Imports and exports of iron and steel and manufactures thereof for the five months ending May 31 are valued by the Board of Trade returns as follows:—

Imports	1916.	1917.
Iron and steel ...	£4,247,437	£3,324,501
Machinery	3,524,679	3,281,961
Hardware, etc. ...	315,947	136,783
Total	£8,088,063	£6,742,245

Exports	1916.	1917.
Iron and steel..	£23,826,285	£19,574,960
Machinery	5,850,868	7,009,394
Hardware, etc. .	3,269,802	2,959,061
New ships	299,043	504,002
Total	£33,245,816	£30,047,517

In mighty wrath the sergeant came into the midst of the new batch of recruits and fixed his eagle eye on one who evidently was so self-conscious that he simply hated to wash.

"Hi, you!" roared the fierce person, "have you taken a bath?"

Mild indignation was in the soldier's voice as he answered:

"No; is there one missing!"

WAR-TIME INFLUENCE ON SHOP DEVELOPMENT

DURING some ten years past changes have been apparent in the design and lay-out of engineers' workshop buildings. The contrast is most marked in passing from a shop that has been recently built and excellently arranged into one that is a legacy from an earlier period. The object-lesson is one of strongly accentuated opposites, which on examination reveal much more than merely superficial differences.

The old shops grew in a kind of haphazard fashion as business increased and additional capital became available; and even when a works had been planned on generous lines, and when capital was ample, several matters which are now regarded as being of first-class importance were either ignored or but indifferently dealt with, such as the orderly lay-out of shops that are intimately related, and of allied departments, with the object of forwarding and facilitating to the utmost the operations and the output of the entire works. Though each separate shop is an independent and self-contained unit, and its operations are unlike those of any others, yet all are linked by sequence of production in interchanges and supplies. The foundry and the pattern shop are intimately related. The smithy and the boiler and plating shops have much in common. The machine shops and the turnery include several distinct departments of major and minor dimensions, with satellite sections. tool rooms, storage areas, heavy and light tools, sections devoted to special products, and various services for hoisting and transport. Seldom are two great engineering works duplicated. Often, in fact, at extremes they may have but few features in common. Each separate design therefore has to be considered in all its myriad details, and worked out as an individual problem. Further, the possible as well as the probable requirements of the future have to be remembered when planning those of the immediate present, and this an aspect of the matter which was pretty much neglected when the older shops were being laid out. With hardly any exceptions the earlier works were placed in the poorest parts of densely crowded cities where labor was abundant. The new ones are now generally built in suburbs, or out in the open country where ample spaces provide for future expansion.

Works differ from one another in magnitude. The big, self-contained factory is that which includes every department necessary to the carrying through of a manufacture from the receipt of the raw materials. When possible the various buildings should be laid out in parallel lines, and all be in intercommunication with railway lines of standard or industrial gauge, flanking all the shops at ends or sides, and connected directly with each. The best arrangement is a track of standard gauge disposed outside, and with turntables just without the shop doors to serve industrial tracks of 18in. or 24in. gauge inside the shops. Loading, unloading, and transit are thus provided for, and direct connexion maintained with a railway siding. With such ample means of intercommunication secured, the precise position of the individual shops is of less importance than it would be in the absence of the extra-mural encircling tracks.

Handicapping of Old Shops

Few old firms who have outgrown their shells are so fortunately situated as to be able to abandon an extensive factory, the growth of perhaps a couple of generations, in the heart of a densely populated town, to build anew in the suburbs or miles away out in the country. The chance of effecting a sale of the old buildings is remote, since they are usually constructed solidly of brick or stone, and with glazed sashes they are not easily dismantled. Even if this were not the case, prudential considerations would not justify their re-erections. Again, most of the old buildings have galleries, or upper storeys and floors, which are not held in favor for new shops. Heavy machines are erected on deep foundations, and though the machines can be transported to new quarters, little can be salved from foundations.

Many firms when confronted with straightened surroundings have elected to retain the old works and build a new factory out in the open, surrounding the new shops with cottages for their workpeople, and thus creating an ideal garden city. It is most desirable that suitable means of intercommunication should exist in the shape of a railway siding or a canal. Failing these, if road transit must be employed, then only the lighter groups of works should be produced in the old shops, the heavier being reserved for the new.

Problems of New Shops

One of the problems which confront a firm when laying out a new works is that of uncertainty respecting the nature of the manufactures of a future period, and, again, of the methods of production. Herein occurs a sharp contrast between the ruling conditions of the present and the past. When firms were engaged in general engineering, as nearly all the old ones were, when interchangeable and gauging methods and speciality-manufacturing were not anticipated, when the old irregular congeries of isolated shops and handicraft methods predominated, little regard was had to the character and systematization of the buildings and of the operations performed in them. Many shops were mere sheds, or floors in old dwelling-houses. These were strengthened and stiffened, and connected with the old stairs, while a wall crane was installed outside to lift heavy articles to the several floors. Even when new large works were built the relative location of the departments was settled with little regard to the future, or to their means of inter-communication. Little attention was also paid to the internal dispositions and arrangements of the separate shops, for when there was no speciality in manufacture the reputation of firms for high-class work defied keen competition, and production progressed in a more leisurely fashion than it does in the changed conditions of the present day.

Single Floor Buildings

The impossibility of retaining the old shops and the obsolete methods in face of present-day conditions has resulted, first, in the general migration from town to country, and, second, in the employment of the ground floor design of building instead of storied shops of several floors—the mill building style. The latter are still constructed when products are of a uniformly light character, but unless space is restricted, the single-floor type is given the preference. The benefits are of a dual character. The design is favorable to the operations of the present, and will facilitate probable extensions in the future. The single ground-floor shop has the advantage of being in direct communication with the outside yard, and through it with the other departments of the factory. The transport and the hoisting services are of the simplest character, comprising rail tracks, hand trucks, walking cranes, overhead travelling cranes, overhead rail tracks carrying suspended hoists or travelling trolleys, and swinging jib cranes for serving the heavier machines and certain areas. It is neither easy nor necessary to attempt to allocate the premier place to any one of the beneficial results that follow from the adoption of the single ground-floor design; they include height, the clear, unobstructed area which is secured when shops are ranged side by side, the improved light and ventilation, and the ease with which longitudinal or lateral extensions can be made.

The ample height which is available in ground floor buildings affords several advantages which are not obtainable in storied shops. It permits of the employment of heavy overhead travelling cranes and of the ready handling of massive articles. Even if these advantages should not be desired, height favors natural ventilation, with large volumes of diffused air supplied with little draught—conditions which are of the first importance in foundries and smithies, and of hardly less value in the machine and erecting shops. It is also favorable to the installation of systems of artificial ventilation and heating.

Clear, unobstructed area, obtained when shops are ranged side by side, is a strong recommendation. It may be regarded from different aspects. The entire area is enclosed by four outer walls only, leaving the divisions into parallel separate shops to be made by the iron or steel columns spaced at suitable intervals to carry the roofs. These columns sustain crane gantries when such are required. To them are attached some kinds of machine tools, as radial drills and swinging jib cranes. They obstruct scarcely any of the light

that comes through windows in the outer walls, though light from that source is deemed of little or no importance now, since skylights in the roof usually supply the total volume that is required. Managers and foremen have an unobstructed view across the series of shops, and floor-tracks provide a through communication between all the areas. The economy of wall material is great when three, four, or half a dozen bays are ranged in parallel. Partition walls not only entail useless expense, but interference with freedom of movement, with illumination, and with general supervision. They do not support the roofs any more efficiently than do columns, nor are they so convenient for the carrying of crane gantries, machine-tools, wall cranes, or shafting bearings. Even the outer walls are frequently not utilized for these purposes, but columns are employed there, identical with those that separate the bays, and the walls are merely curtains which keep out the weather.

The parallel arrangement of shops in this design is another advantage. No hole-and-corner shops are permitted in a new works. Parallelism is imperative unless the outlines of the ground area available prevent its absolute realization. But even then the rectangle is available, and the main shops may have smaller buildings or sub-departments arranged at right angles, connected with tracks and turntables or with curved rails of large radius.

It is not necessary in parallel shops to have the separate areas roofed at the same height, or even in the same style. They are often uniform, but as frequently the heights of the spans are varied in harmony with the kind of work done, with economy in materials. A tall, central, wide bay may be flanked with lower and narrower ones, these dealing with the work that was done in the galleries that were commonly ranged round the shops of the transition period.

The ease with which extensions can be effected longitudinally or laterally recommends the adoption of the ground-floor shop built in parallel bays. Existing bays can be extended, and new ones built adjacent. The sections of the constructive elements being standardized, repetition is easy of accomplishment. Each space from column to column is a unit of construction, which can be multiplied as often as required. Columns, gantries, roofs, glass, tracks, floors, etc., can be repeated, and the cost estimated very closely.

Steel-Framed Structures

The present is the era of steel-framed buildings. The columns which take the loads of roofs and cranes were, when these loads were not imposed on walls, made of cast iron, of cylindrical or of H section, provided with brackets cast on or united with bolts for the support of crane gantries and the attachment of swing cranes, machine tools, and bearings for shafts and counter-shafts. These have been replaced by rolled steel sections used singly, or multiplied in parallel, or lattice braced. They are built up in two or more sections, those above the crane runways being of smaller sectional dimensions than those below. They are tied across the shop by the roof principals, and longitudinally by girders which are frequently utilized to carry the shafting bearings.

Since all the load of roof, cranes, and shafting is carried by columns, their design and spacing have to be determined in relation to the needs of each individual shop. But this need not involve extensive calculations, because a large volume of reliable data is now available in the hands of those who have made a speciality of workshop construction. The work has been standardized for various spans, heights, loads, and forms of roof. When a firm has settled the lay-out of new shops, and their approximate dimensions, it is better to obtain estimates from those who specialize in factory buildings than itself to undertake the calculations and the construction. In the United States, firms have gone to wide limits in work of this character, offerings a selection of several alternative designs to suit all conceivable requirements. This circumstance explains the rapidity with which new buildings are run up.

Roofs are of two kinds—the ridge design and the saw tooth. The first named is usual, though the second is frequently adopted. The direct glare of sunshine is not very persistent in England. Continuous skylights on both slopes of a ridge roof afford ample illumination without supplementary windows in walls. Sometimes the north slope alone is glazed. The roof is generally surmounted with a louvre, in order to afford natural ventilation. If an artificial system of ventilation and heating is installed, the louvre can be omitted. A leaky roof is an intolerable nuisance in a shop. The common practice has been to lay the slates on laths, fastening them with copper nails, or to employ tiles hitched on the laths. Both make good roof coverings, provided they are laid carefully. The soundest roof appears to be constructed of asphalt felt, laid on boards which are tongued and nailed on the rafters. The felt is laid in mastic, and the edges overlap. One thickness will suffice, but two are better. It is protected by giving it a coat of varnish at intervals of a few years. Another alternative is found in the patent asbestos slates which are made in squares, and laid with lapping joints.

Corrugated iron sheet is used more extensively than its rather flimsy character would seem to justify. The explanation is that results depend on the care exercised in its use. If it is painted within and without, it will endure for many years. The extremes of heat and cold can be modified by covering the rafters with match-boarding, grooved and tongued, and interposing a thickness of felt between that and the corrugated sheet; or, better still, by leaving an air space between. An advantage of this roof is that it is not liable to accidental fracture, as are slates and tiles.

In the older roofs the glazing was distributed in small sashes, alternating with opaque roof coverings, and the larger portion of the light was obtained from the windows in the walls. The results were much glare of direct sunlight, cross lights and shadows, and leaking roofs, resulting from the use of small sashes glazed with putty. The practice now is to occupy at least one-half the roof area with glass, which is continuous as far as it extends. Puttied glass is scarcely employed. There are several patented glazings which combine the features of a water-tight joint, and of wire woven into the centre of the glass to prevent fragments from falling should the glass become fractured.

The artificial lighting of shops has been passing into the hands of experts. The basis taken is that of foot-candle intensity, or the intensity of the illumination which is afforded by a light of one standard candle-power thrown on a surface one foot distant from it, and disposed at a right angle with the rays coming from the source of light. The candle-power varies inversely as the square of the distance of the surface illuminated from the source of light, and varies also with the angle which the rays of light make with the perpendicular when they do not come at a right angle with the surface illuminated. The foot candle intensity which is desirable varies from 3.50 to 6.0, measured on a horizontal plane, five being a standard but varying with the light reflected from the surfaces in a shop, from dark to bright. The daylight conditions should be at least three times more than this in winter, and are many times greater in summer time.

Floors

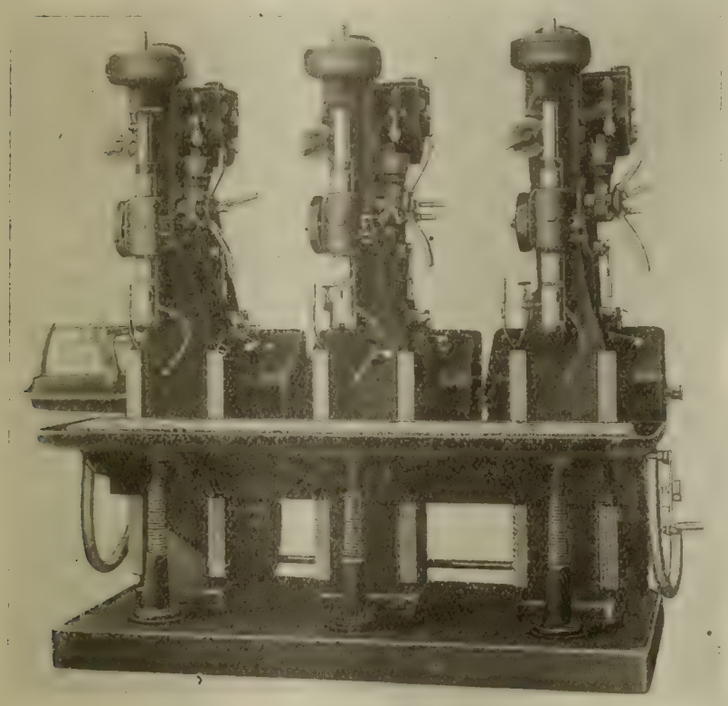
The floors of workshops are subjected to such great wear and tear that several alternatives have been adopted. Earth or cinder floors were formerly not uncommon in the machine shop, and are still employed in the smiths' and boiler shops. In foundries the deep sand forms the floor. But in machine and fitting shops the choice lies between stone, concrete, and wood. Stone flags are common in the older shops, though they are not laid now because they become fractured and settle unevenly. Concrete floors are used, but the material must be employed with discretion. It is suitable on a dry foundation, but not on a wet one. Oil is injurious to it. Coarse concrete forms the basis, with finer for the top layer. Creosoted wood blocks, laid end-grain upwards and bedded in tar, form an excellent floor, being durable and free from dust. In a dry soil the blocks may be laid on a concrete basis. For the lighter floors maple boarding is much used, grooved and tongued, and nailed down to joists bedded in concrete. Boards are liable to become torn up and roughened if heavy articles are thrown about on them, and they absorb oil, but they are nevertheless the most suitable floors for light Machin, fitting, and pattern shops.—*Times Engineering Supplement.*

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

SELF-OILING ALL GEARED GANG DRILL

THE machine illustrated in the accompanying engraving is a 22 in. gang drill, all geared and self-oiling, which has been placed on the market by the Barnes Drill Co., Rockford, Ill., for use in rapid production and heavy duty work. It is essentially a manufacturing machine and is excessively strong and rigid in construction. Every bearing, (aside from the spindle sleeve and cross spindles) is self oiled, while eight changes of geared speeds and ten changes of geared feeds are all under instant control of the operator from the front of the machine. Cones and belts are entirely eliminated, the entire motion of the machine being positive in every respect. The safety requirements of all state laws are completely met by the enclosing of all gears.



22-IN. SELF-OILING ALL-GEARED GANG DRILL.

The self-oiling system is manufactured under licence from Kearney & Trecker Co., and involves the use of a geared pump which delivers the oil to a reservoir from which it is distributed constantly to all gears and bearings, including the crown gears and feed box.

All transmission gears, except the friction clutch gears, but including the crown gear and pinion are cut from a special grade of chrome nickel steel, the parts being heat treated and tempered to prevent wear and provide increased strength and stiffness. Spindle may be stopped by placing shifter lever or neutral position or throwing out clutch lever.

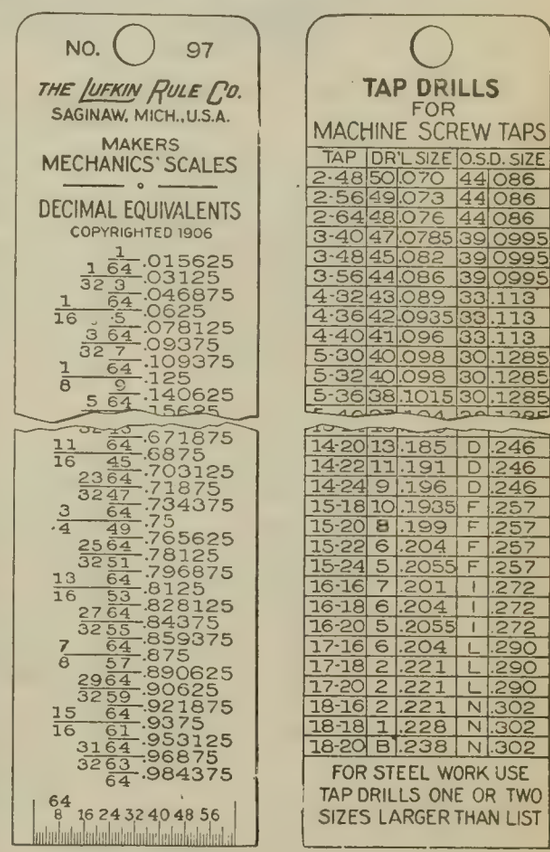
The ten changes of feed are controlled by levers directly in front of the operator and are indicated in plain figures on an index dial plate, the more important gears being case hardened, and all flooded automatically with oil. A safety overload device prevents unintentional damage.

Automatic reversing mechanism can be provided for tapping, the spindle being reversed automatically when the tap reaches the depth required; the device can also be operated so as to stop the spindle only, in addition to which a small hand trip lever is always ready for instant use if desired to reverse or stop spindle at any point in the operation. When used for drilling work only, crown gearing of 1 to 1 ratio is employed, giving eight spindle speeds from 575 to 58 rev. per min., and with 2 to 1 ratio crown gears, used for tapping, the speeds are from 280 to 28 rev. per min.

The machine has a capacity of from ½ in. to 2 in. high speed drills in steel, with the following principal dimensions: distance, center of spindle to face of column, 11 in.; max. distance table to nose of spindle, 33¼ in.; spindle travel, 14 in.; vertical travel of table, 23 in.; floor space, 3 spindle machine, 104 in. by 55 in.; distance, centre to centre of spindles, 28 in.; net weight (3 spindle), 7832 lb.

REFERENCE TABLE RULE

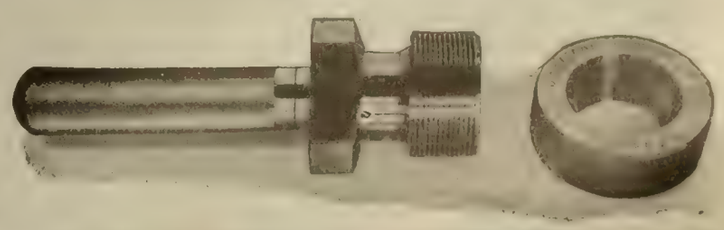
THE Lufkin Rule Co., Saginaw, Mich., have recently added to their line of tools a rule, known as Lufkin, No. 97 which carries on each side a compact reference table of information in constant demand by machinists, toolmakers, and others. It is made of flexible steel, 1 7-32 in. wide by 6¾ in. long, one side having the sizes of tap drills for machine screw taps, and the other side, decimal equivalents. The first column of the tap drill table gives the tap number, such as 3.48, 14.20, etc., followed by the drill size both in gauge number and thousandths of an inch. The third and last column contains the O. S. D. or body size, also in gauge numbers and thousandths of an inch. On the reverse side, at the foot of the table across the end of the rule a length of one inch is graduated to 64ths, clear, legible figures cut in the steel, making the rule durable and efficient in use.



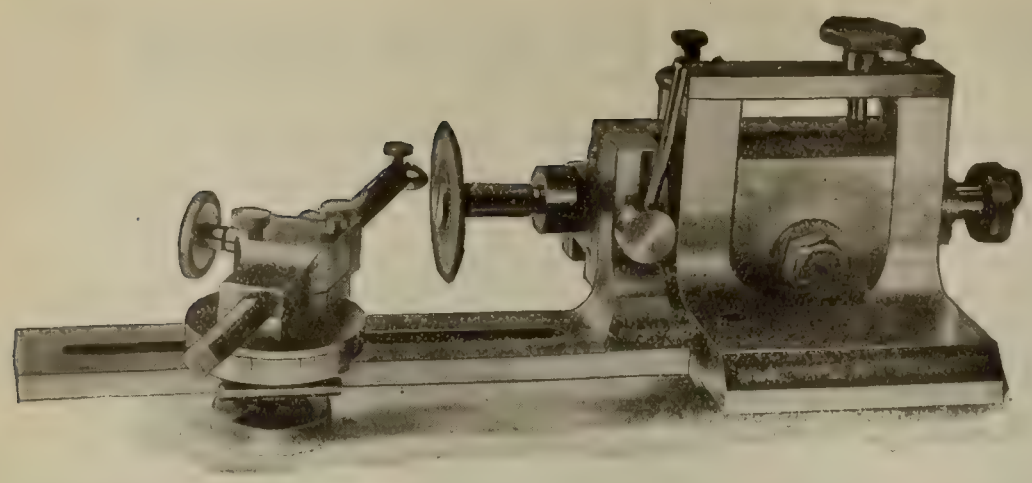
OBVERSE AND REVERSE SIDES OF LUFKIN RULE SHOWING DECIMAL EQUIVALENTS AND TAP DRILL SIZE TABLE.

THREAD GRINDING ATTACHMENT

THE device shown in the accompanying engraving has been specially designed for the purpose of grinding thread gauges to correct size and shape after hardening. It is known as a thread grinder, and is used on a lathe, being



SPECIMENS OF GAUGES HAVING HARDENED THREADS GROUND BY ATTACHMENTS.



ATTACHMENT FOR GRINDING EXTERNAL AND INTERNAL THREADS ON GAUGES AFTER HARDENING.

driven from its own countershaft. By its use, any ordinary workman can quickly become proficient in producing satisfactory standard interchangeable gauges in any style of thread, as it obviates the necessity of slow, tedious, uncertain and necessarily expensive lapping to size—thread distortion resulting from hardening is rapidly and efficiently corrected.

The illustration shows the attachment with the diamond truing device in place. The wheel, which runs at a speed of 5,500 rev. per min., is trued to the exact angle by a diamond which is held in a square bar and racked across the face of the wheel by the small handwheel shown. Spring pressure eliminates any lost motion in the racking bar, and the entire dressing attachment is rapidly adjustable to degrees and position.

The driving shaft is independent of main bearing shaft, and thus allows the wheel perfect freedom of operation. The bronze bearing of the spindle is indented with right and left hand, as well as straight oil grooves, equalizing the flow of oil and insuring the spindle running constantly in the lubricant.

Hardened threaded tools, worms, etc., can be brought to exact shape and size, and when used in conjunction with the relieving attachment of a lathe, it is possible to grind relieved threads on taps, hobs, dies, etc. The device weighs 35 lbs., and is the product of the International Equipment Co., Philadelphia.

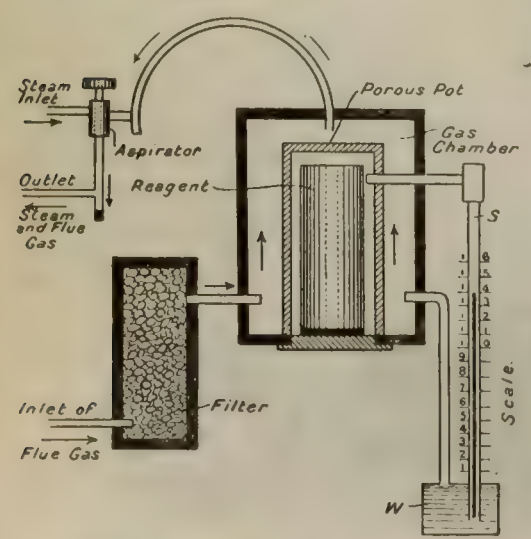
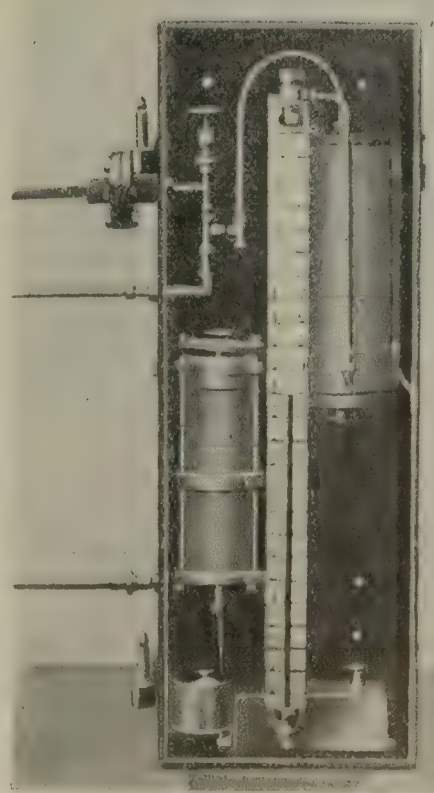


DIAGRAM ILLUSTRATING ACTION OF COMBUSTION INDICATOR.

CONTINUOUS CO_2 INDICATOR

A NOVEL type of combustion analysis apparatus is illustrated in the accompanying engravings, the principal features being the absence of solutions and moving parts along with simplicity of construction and facility of operation. Referring to the diagram, it will be seen that, after passing through a filter, the flue gas enters a gas chamber in which is mounted a porous pot containing a



CONTINUOUS COMBUSTION INDICATOR WITH VACUUM CONTROLLED COLUMN OF LIQUID AND GRADUATED SCALE.

cartridge of absorbing chemical. The inside space of the gas chamber is connected to the well of a fluid indicator having a graduated scale tube, the upper end of which connects with the space inside of the porous pot.

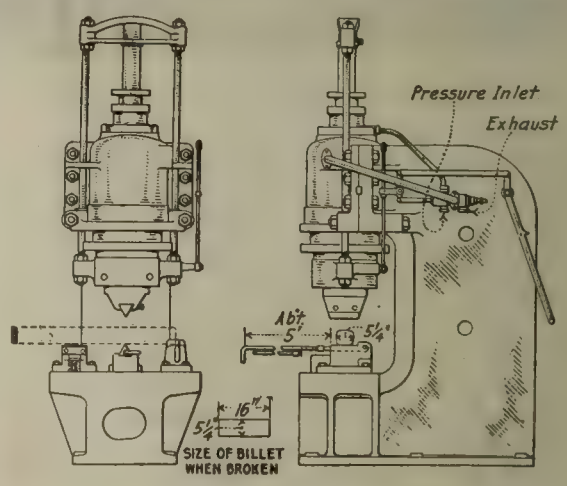
Passage of the gases through the apparatus is induced by a small steam aspirator, which operates continuously, and as the gases pass over the porous pot at a uniform rate, a constant amount passes into the interior and comes in contact with the absorbent which removes the carbonic acid gas, and thus causes a drop in the gas pressure surrounding the cartridge. This drop in pressure causes the colored liquid in the well to rise in the graduated tube in corresponding degree, the liquid being maintained at the same height as long as the proportion of CO_2 in the flue gas remains constant.

The instrument is read as easily as an ordinary thermometer, and requires no further attention than the renewal of the absorbing chemical, which is done every few days at a weekly cost of about 25 cents. The apparatus is made by Holdsworth & Sons, Ltd., Bradford, Eng., and has an accuracy within one-half of 1 per cent. of the well-known Orsat apparatus.

200-TON HYDRAULIC BILLET BREAKER.

THE machine shown in the accompanying line drawings was designed for breaking steel bars into 16 in. lengths, for use in munitions manufacture. A feature of the design is the provision of triangular section notching blades which nick the blade top and bottom simultaneously and thus avoid the necessity of turning over the billet to nick the bottom side. Their peculiar section enables them to be reset in the dies so as to get the use of three cutting edges.

The bar to be cut is fed over a spring supported roller which carries it clear of the bottom knife so that it can move over to the right hand stop. The upper knife is then forced down by the hydraulic cylinder, the spring supported roller yielding sufficiently to allow the work to be nipped between the two knives. After being thus notched, the



200-TON HYDRAULIC BILLET BREAKER.

lower knife is withdrawn by hand, and renewed pressure by the ram bends the bar down sufficiently far to break it. If the material is more than usually soft, it may be necessary to notch it all around.

The ram operates under a pressure of 1500 lb. per sq. in. and has a diameter of 20 in. with stroke of 12 in. giving a capacity of 38 billets per hour. Power is supplied direct from a three-throw pump 2½ x 6 in., driven by a 25 horsepower motor through double helical gearing. A weight controlled relief valve is fitted on the pump system. The machine is a recent design developed by a Yorkshire engineering firm in England.

OIL CIRCUIT-BREAKER ACCESSORIES

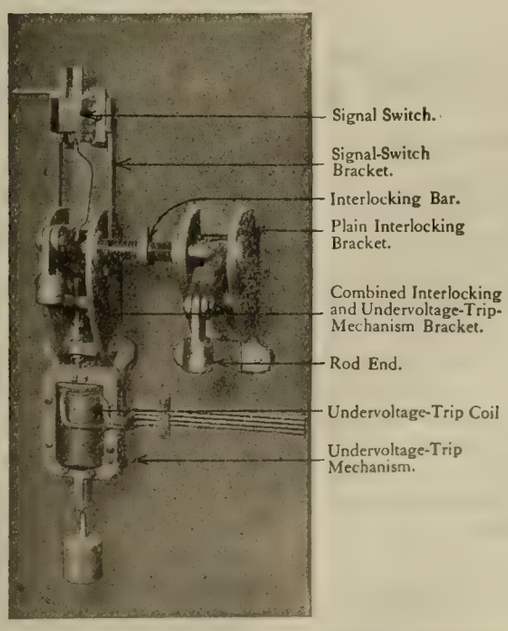
BULLETIN (DS272) recently issued by the Westinghouse Electric & Manufacturing Co., under the title of "Oil Circuit-Breaker Accessories" contains information regarding every combination of tripping and signalling likely to be required. Trip-magnet frames and coils are listed for obtaining underload, undervoltage, overload, over-voltage, series and shunt trip; several and, in some cases, all of these can be applied on the same breaker to act with the standard automatic overload trip mechanism.

WALL MOUNTING BRACKET SUPPORTING TYPE F-1. PANEL MOUNTING BREAKER, WITH REMOTE CONTROL COMPLETE.

For controlling the operating circuit of electrically operated breakers, central switches are listed. These can be connected with signal lamps to indicate the position of the breaker; one style has signal lamps mounted on its cover-plate. And to control the signal lamp circuits, "signal and shunt-trip cutout switches" are shown. These can be so connected as to light the proper lamps to indicate the position of the breaker at all times; they are also used to open the shunt-trip circuit when the breaker opens.

With a double-throw breaker, or with two single-throw breakers connected as a double-throw breaker, it is often desirable to have the throws so connected that with one throw closed it is impossible to close the other, and vice versa. This can be accomplished on electrically-operated breakers by interconnecting the operating circuit through a "signal and shunt-trip cutout" switch; with manually operated breakers, it is accomplished by an interlocking bar with a suitable bracket.

And there are described and listed: signal switches, inverse-time element attachments; bell-alarm signal-contact attachments; bell-crank accelerating devices; universal mounting brackets for mounting breakers, instrument transformers, and other accessories on the rear of the panel or on a separate pipe or angle-iron frame.



REAR OF SINGLE-HAND COVERPLATES OF TWO INTERLOCKED BREAKERS.

Screenings

Proud mother of young Corporal Jones: "You've heard about my boy, of course, Mrs. Evans?"

Mrs. Evans: "No. What is it?"

Mrs. Jones: "Why, just think—they have made a cockerel of him!"

"And how do you find school, Harold?"

Rather difficult, sir. The teachers are inconsistent. In English composition we are told to be original. In arithmetic we are all expected to get the same answer."—Louisville Courier-Journal.

A nervous man at the opera sat behind a pair of those persons who explain the plot until his endurance was exhausted. Then he leaned forward and said:

"Excuse me, will you speak a little louder? Sometimes the music prevents my hearing what you say."

Teddy had been invited out to tea. He wanted to have the afternoon off from school, but his mother would not hear of it. As his bedtime was 7 o'clock he had rather a short visit, and as he was leaving his hostess said cordially:

"I'm so sorry you've been able to stay such a little while, dear."

Teddy remembered his mother's injunctions to be polite on all occasions, and answered, sweetly: "Oh, it's quite long enough, thank you."

"Dear Clara," wrote the young man "pardon me, but I'm getting so forgetful. I proposed to you last night, but really forgot whether you said yes or no."

"Dear Will," she replied by note, "so glad to hear from you. I know I said 'no' to some one last night, but I had forgotten just who it was."

A certain learned Queen's counsel was arguing a commercial case before a learned judge. In doing so, he had occasion to speak repeatedly of an "eccentric," and the judge at length asked him what an eccentric was. The magistrate said he was familiar with the term as applied to individuals, but not to things. The Queen's counsel at once complied. "An eccentric," he said, "is a circular disk whose centre is not in the middle."

"I tell you, gentlemen," said the great explorer to the crowd in the hotel smoking room, who were listening breathlessly, "you can't imagine what things are like out in the Arctic regions!"

"Oh, I don't know!" said one. "Even if we haven't seen it, we can imagine what it feels like!"

"I doubt it. It's impossible until you've seen it; until you've stood there, a small, insignificant atom, surrounded by vast stretches of white—"

"Yes, I know. I've been like that."

"Really? Where was it, may I ask?"

"First time I appeared in public in a dress shirt!"

The MacLean Publishing Company

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PUBLISHERS OF

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

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QUEBEC BRIDGE COMPLETION—SUCCESS IMMINENT

AS we go to press, the task of placing the centre span of the Quebec Bridge in position has well-nigh been accomplished, and there is ample evidence that, ere our publication reaches its subscribers, complete success will have crowned the effort. Arising out of past misfortunes connected with the undertaking, popular interest the world over has been whetted to a high pitch and, for the time being, the daily war happenings, and the machinations of party politics have, so far as Canada is concerned at least, had to give place. The builders, the St. Lawrence Bridge Co., are to be commended for the dogged perseverance with which they have prosecuted the work, and, notwithstanding the tremendous strain under which those more directly concerned with the development and carrying out of the plans for "sealing the gap" have labored, and more especially during recent days, the reward will be at once commensurate and lasting. The completed structure will rank among the world's great achievements and its creation a brilliant exemplification of Canada's industrial prowess.

SHELL CONTRACTS STILL IN DEMAND

SHELLMAKING in Canada dies hard, judging by the interest taken in the possibilities of further contracts being secured by those who have for months been engaged in the work and who, in recent weeks have found the industry slipping away from them, so to speak, with nothing in sight to replace it. Rumors that orders for shells will continue to be placed in Canada are plentiful, and support is given such a contingency by advices that both Britain and France are negotiating for 6-in. shells in the United States to be delivered in six months. Of course, it has been understood all along, but more specifically since intimation was made a few weeks ago of the curtailment of orders, that 6-in. shell manufacture would continue here on a quantity basis.

It is gratifying to note that a large percentage of our pro tem munitions plants have "shaken" the industry for good, and are now well organized and furnished with orders along normal and peace-time lines. An instance of the declining volume of shell business and the increase in another direction is to be found in the following extract, from the Canadian Locomotive Co. statement. In June, 1916, the company's munition orders had a value of $1,200,000, while at the end of the year just closed the value was $199,600. Locomotive orders had, however, risen to $3,925,400, against $2,600,000 a year ago. In the case of this company the adjustment from war to peace activities has been almost completed.

While willing and ready to accept such shell business as continues to offer, it is undoubtedly the part of wisdom that our metal-working plants "dilute," as completely as lies in their power, munitions with peace time lines of product. Many are doing it, but the number should be promptly augmented.

TENDENCY OF FUTURE INDUSTRIAL CONDITIONS

ONE of the chief results of the international co-operation resulting from the war, and one which will have the most lasting results on the welfare of both individuals and nations is the increased interest which employers have been compelled to take in the conditions of employment under which working people spend their lives producing the goods to form the basis of any one nation's trade. In view of the increased participation by this country in the world's commerce and the prospective, nay, the certain requirements in skilled labor necessary to the attainment and maintenance of any prominence in international trade, it devolves upon all responsible bodies and individuals concerned with productive labor, to look closely into the quality of the help on which their future success depends.

In the discussion of such a subject at this time, the question of remuneration can be discounted; numerous anomalies in the matter of equitable payment for services rendered have been, and probably still are in existence, the adoption of unskilled but adaptable help on piece-work and premium systems, and the urgency of many war-time contracts which were chiefly responsible for these conditions in all countries rendering the wages question a negligible factor in international comparisons.

The ultimate and permanent industrial success of any one nation is being decided now; not so much by the production of munitions, ships and other vital needs of the moment, as by the manner in which the great supply of suitable manufacturing help brought to light is being absorbed, trained, and educated with a view to remaining a producer for the present and becoming a skilled worker in the future. Despite the adaptability shown by many adults during the last two years the indisputable fact remains that skilled engineering help must be bred from its youth up and the country, whose manufacturers recognize this fact and act accordingly, will easily and completely outdistance those who continue in the belief that the demand will create the supply.

WHEN you think you have reached the top rung of the ladder, don't forget how to yell for more ladder.

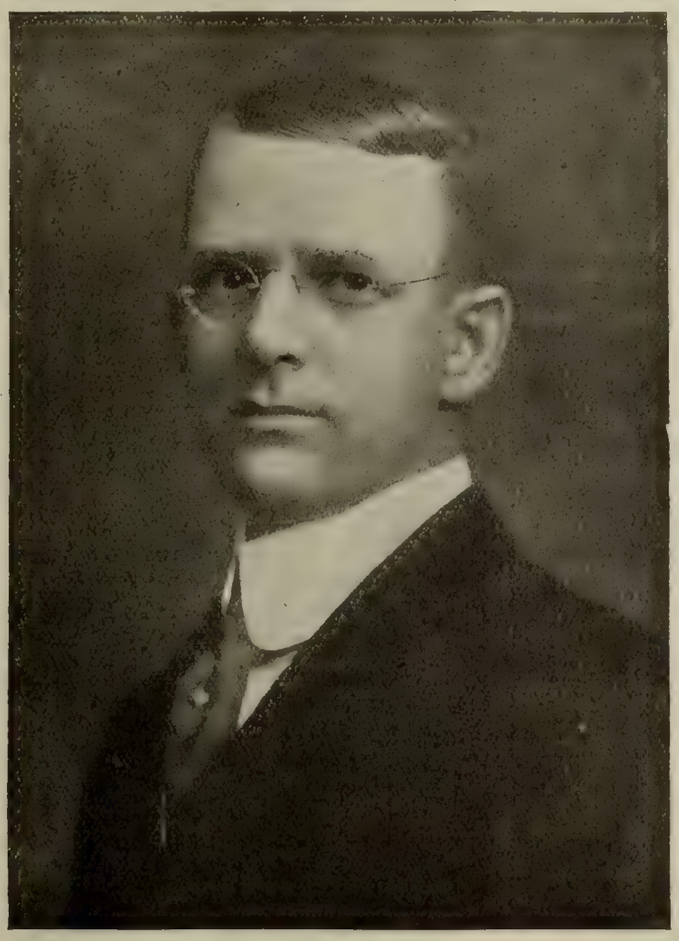
AN OFFICIAL French committee has been appointed to deal with purchases of reconstruction materials. Canada should be able to play a part in this rebuilding program.

WHY the difference? When a man wears good clothes at work his pay is a "salary"; when he wears overalls it is "wages."

INDUSTRIAL NOTABILITIES

WILLIAM S. ATWOOD, assistant to vice-president and managing director, the Canadian Car and Foundry Co., and Canadian Steel Foundries, Montreal, Welland and Fort William, with head office in Transportation Building, Montreal, was born at Conneaut, Ohio, January 19th, 1876, son of Edwin and Marion Atwood.

He received his education in the Public and Correspondence Schools, and



WILLIAM S. ATWOOD.

came to Canada in January, 1902. Previous to joining the staff of the Canadian Car & Foundry and Canadian Steel Foundries, he occupied the positions of draughtsman with the Simplex Railway Appliance Co., Hammond, Ind.; mechanical engineer with same concern at Montreal; and mechanical engineer, the Dominion Car & Foundry Co., Montreal.

Mr. Atwood married Jessie A. Elliott, daughter of A. B. Elliott, April 7, 1897, the family consisting of one daughter. His Clubs are Engineers', and Country; his Societies, the American Society of Mechanical Engineers; Canadian Society of Civil Engineers; K. of P., and I.O.F. His recreations are golf and tennis, and in religious persuasion he is Methodist. The family residence is 225 Metcalfe Avenue, Montreal.

Photo courtesy International Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$46 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	51 95
Basic, Valley furnace	48 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	60 00

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 00
Tank plates, Pittsburgh	9 00
Structural shapes, Pittsburgh	4 00
Steel hoops, Pittsburgh	5 25
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 00

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22 1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$33 00	$32 00
Electro copper	33 00	32 00
Castings, copper	32 00	31 00
Tin	62 00	62 00
Spelter	10 50	10 50
Lead	12 00	12 00
Antimony	20 00	19 00
Aluminum	65 00	62 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$12 00	$12 00
Heads	12 30	12 30
Tank plates, 3-16 in.	12 65	12 25

WROUGHT PIPE.

Effective July 5, 1917.

	Black	Galvanized
Standard Buttweld.		
Size.	Per 100 feet	
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00
Standard Lapweld.		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$20 00	$21 00
Copper, crucible	23 00	26 00
Copper, heavy	23 00	24 50
Copper wire	22 00	24 50
No. 1 machine composition	20 00	21 00
New brass cuttings	16 00	18 00
No. 1 brass turnings	14 00	17 00
Light brass	12 00	10 50
Medium brass	16 00	16 00
Heavy brass	16 00	18 00
Heavy melting steel	21 00	17 00
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	22 00	10 50
Axles, wrought iron	30 00	24 00
Rails	25 00	18 00
No. 1 machine cast iron	25 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	19 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	29 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	8 50
Stove plate	19 00	19 00
Scrap zinc	6 50	9 50
Heavy lead	10 00	10 50
Tea lead	7 00	7 00
Aluminum	30 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in and larger	$7 60
Structural rivets, as above	7 50
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	35
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$ 65 00
Open-hearth billets	65 00
O.H. sheet bars	75 00
Forging billets	100 00
Wire rods	90 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails	60%	
Spikes, ⅜ in. and larger	7 50	
Spikes, ¼ and 5-16 in.	8 00	

MISCELLANEOUS.

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 16
Putty, 100-lb. drum	4 35
White lead, pure, cwt.	19 00
Red dry lead, 100-lb. kegs, per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 61
Linseed oil, raw, single, bbls.	1 49
Linseed oil, boiled, single bbls.	1 52
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery Cloth	list plus 33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.37
British Manila Rope	.31
New Zealand Hemp	.31
Transmission rope, Manila	.43
Drilling cables, Manila	.39
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks	list plus 30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse ..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 50%; headers, 60; flanged unions, 40; malleable bushings, 50; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$11 00	$11 00
Sheets, black, No. 10	11 50	11 50
Canada plates, dull, 52 sheets	11 00	11 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	12 70
Premier, 10¾ oz.	13 85	13 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

	B
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$13 05
Connelsville Foundry Coke	14 00
Steam Lump Coal	7 25
Best Slack	6 50

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$33 00	....
1¼ in.	36 00	....
1½ in.	38 00	32 00
1¾ in.	38 00	32 00
2 in.	45 00	33 00
2¼ in.	48 00	35 00
2½ in.	50 00	38 00
3 in.	58 00	45 00
3¼ in.	....	53 00
3½ in.	70 00	55 00
4 in.	82 00	67 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THE placing of further orders for 6-inch shells in Canada has revived interest in the munitions industry. Although there has been recently a reduction in output of shells there is still a considerable amount of money being expended on the production of munitions. What might almost be termed a chaotic condition, prevails in the steel trade. What with the embargo and the delay in fixing prices at Washington, consumers do not know where they stand. The logical result is that they are keeping out of the market and business consequently is decidedly dull. It is not at all likely that business will pick up until the conditions in the trade improve and a more settled outlook prevails. The embargo will affect the building trade to a greater extent than any other business, as the larger shapes are not rolled in this country. Prices of steel are stationary with no indication of a decline in the meantime. The embargo will benefit Canadian mills and the additional business will tend to keep prices firm. The pig-iron market is dull, but prices are holding firm owing to the shortage of cars and also as a result of the embargo. The coke situation is unchanged and production is being hampered by scarcity of labor and shortage of cars. The non-ferrous metal markets are weak and demand generally is light. Declines in prices have taken place throughout the entire list. The market for old materials is dull and consumers are still refraining from buying. Prices of scrap copper, brass and lead have declined, but steel and cast iron scrap are firm. The machine tool market is quiet and the general situation unchanged.

Montreal, Sept. 15, 1917.—A factor that promises renewed interest in industrial circles is the announcement that further shell orders may be placed for the six-inch size. What the volume of this new business will be has not been definitely ascertained, but some plants are apparently assured of full capacity for the remainder of this year, and possibly well into 1918. The general conditions are practically unchanged, with the bulk of the interest centred in the shipbuilding activity.

Pig Iron

The pig iron situation is devoid of feature developments, and the market continues to reflect the uncertainty that is evident in other directions. Pittsburgh quotations indicate an easier market in Bessemer and foundry, the former having declined to $50.95, and the latter at the same price, being $3 per ton lower than last week. The composite price of pig iron has declined 50c per ton on the week, the present quotation being $50.46 per ton. This has been partly due to the easier position of coke, which has dropped $1 during the week. Canadian conditions are virtually the same, with producers practically out of the market and no prices yet available.

Steel

No developments have taken place to improve the general tone of the steel situation, as investigations and adjustments still seem to be hanging fire, which tends to keep the market in a more or less unsettled condition. Some rumors appear to indicate that the American Government is endeavoring to arrange for their present requirements at a figure that will be satisfactory to the producers and yet withhold the price paid from the trade. This action would undoubtedly create considerable uneasiness among the consumers, as they have been

long waiting definite action from this direction to guide them in their future transactions. The American market at present is somewhat concerned over the changes that have recently been brought to light by the development of the past few months. Early in the year it appears that orders were placed for a large volume of domestic work based on the possibility of a shortage of future supplies in this connection. The advent of the U. S. into the war, however, has necessitated many changes, with the result that much of this material will not be required for enterprise that is not considered by the Government to be strictly essential for the prosecution of the war. The solution of the present problem seems to be an open attitude on the part of the Government regarding their negotiations for war requirements, so that the public and domestic consumers will have something to guide them in their future buying, as the general trade realizes that the outside price must under the circumstances be on a higher level than that paid by the Government. For the past several weeks the market has been comparatively steady, and it is generally conceded that the apex has been reached, and in certain directions the tendency is downwards. No sudden reaction is expected, but the undercurrent of uncertainty as to future conditions is an influencing factor in the present inactivity of the market. The Canadian situation is still characterized by the inability to secure delivery of steel requirements, except those to be used exclusively for the manufacture of war necessities. Few price changes are reported from the American markets, and dealers here continue to quote the prices that have been ruling for the past few weeks.

Metals

The uncertainty that still surrounds the general conditions, more particularly in the States, is the predominating factor of the present metal situation, as recent reports seem to indicate that the Government are inclined to take an attitude not conducive to the best co-operation between the producers and those consumers not included in the war program. Secrecy in this connection would only lead to uneasiness and discontent throughout the trade, and eventually lead to further unsettlement and probable disorganization. Copper is fluctuating, but comparatively firm. Tin is not very active, but has taken on strength. Spelter is stronger on better inquiry. Lead has weakened and supplies are accumulating. Antimony is inclined to steadiness and to become stronger. Aluminum has an easier tendency.

Copper.—As no announcement has yet been made by the American Government in connection with the regulations that may be placed on the price and distribution of copper requirements, the trade in this and other metals has been quiet, as both the producer and the consumer are reluctant to enter the market until a definite policy has been adopted. A suggestion by the War Industries Board to the effect that the price fixed for Government requirements should not be divulged has not met with the approval of the trade, as this would undoubtedly tend to demoralize the situation and add to the uneasiness that is now so prevalent. Lake and electro are again coming on closer terms on the New York market, the former having lost ¼c and the latter gained ½c during the week, the present quotations being 27¾c and 27c respectively; castings are quoted at 26¾c per lb. Local copper continues firm at last week's quotations.

Tin.—In spite of the unsettled conditions that mark the present metal situation in the States, tin has added to its strength of last week, having advanced 1⅝c to 62⅜c per lb. The market, however, is not a very active one, the current quotation being ruled more by conditions abroad than a result of heavy buying on this side. Local conditions are slightly stronger on a steady market, an advance of ½c placing the quotation at 62c per lb.

Spelter.—The market has increased slightly in strength, but no pronounced activity has resulted, as conditions are still influenced by the unsettled situation in the States, due to the delay in the Government's action respecting the arranging of prices and their statement of requirements. New York prices have advanced ¼c during the week, the prevailing quotation being 8¼c per lb. Dealers here continue to ask 10½c on a quiet but fairly steady market.

Lead.—Keen competition, following the recent falling off in the average consumption has developed a weaker market, which is reflected in the New York quotation of 9c, this being the price asked by both the independents and the leading producers; this represents a decline of 1c over that quoted last week. The fact that the supply of lead is increasing and that no reasonable argument could be advanced for the maintenance of such high prices, is probably the chief reason for the weaker tendency, and also in the hope that heavy buying may again be resumed. The demand for lead on the local market is steady, but following the lead of the American producers the dealers here have reduced their asking price to 12c per lb., this being 1c lower than last week.

Antimony.—An unaccountable demand for antimony in the New York market has created a somewhat nervous condition, and this has been reflected in the added strength of the market, the price quoted this week being 1⅛c in excess of last week. The local demand continues to be steady, but not very active. Quotations are strong at 20c per lb.

Aluminum.—The American aluminum market has become easier, but the demand had shown little decline. New York quotations are falling off, due to increase of supplies. Dealers here report a steady but quiet market, with a decline of 2c on the price quoted; this week's quotation being 63c to 65c per lb.

Machine Tools and Supplies

The week has been a comparatively quiet one in the machine tool industry, especially respecting the placing of tools by the dealers. What little is passing is of a general nature without features of any kind. The activity in the States continues, and prices on all classes of equipment are in keeping with the high cost of raw materials. Supplies are in slightly decreased demand, due to the falling off in requirements.

Toronto, Ont., Sept. 18.—The announcement that some plants which hitherto have been engaged in making 9.2 inch and 8 inch shells will be given contracts for 6 inch shells has revived interest in the munitions industry. It is also understood that contracts will continue to be placed for other and smaller calibre shells. The industry is not by any means dead and considerable activity is likely for the remainder of this year, at least. The matter is one largely of finance and depends upon the ability of the Canadian Government to arrange credits on behalf of the British Government. The drafting of men from civil life to the army cannot help but affect the labor situation in a general way but will not be allowed to interfere with the production of shells.

Steel

There have been no developments during the week to relieve the unsettled conditions in the steel trade and the outlook continues rather obscure. The embargo on iron and steel from the United States is causing much delay and inconvenience due to the necessity of getting permits from the U.S. Government. There is also an element of uncertainty in connection with this business as permission to export material is as likely to be refused as not unless it is intended to be used in the manufacture of munitions. In spite of the adjustment in the terms of the embargo to favor certain industries, it does not appear likely that this will relieve the situation materially as indications point to a shortage of steel in the United States for any purpose other than for the war. This situation of course only affects a section of the trade but it is of sufficient importance to merit consideration in view of the large importations of iron and steel into Canada in recent years. Some relief may be looked for from the domestic mills later on in the year, when they have caught up with their orders but this will not be for several weeks. Certain materials such as larger structural shapes and plates which are not made in Canada and come under the embargo will be difficult to obtain and in consequence building operations will be curtailed while special arrangements will have to be made in regard to imports of shipbuilding material.

Now that Canadian steel companies will have additional domestic business to take care of, increased activity is looked for at the mills which will help to fill the gap caused by the reduction in output of shell steel. The recent announcement that contracts for 6 inch shells will be given out has caused much satisfaction in the trade. Notwithstanding the weakness in prices of steel products in the United States, the market

in Canada is holding firm and there have been as yet no price recessions. While higher prices are not anticipated, it is unlikely that there will be any marked decline in values owing to the unusual conditions now prevailing in the trade. The situation in the United States is such that Canada will have to rely to a greater extent than is usual, on its own resources which means increased business for domestic mills. The volume of this business will of course depend upon the attitude which consumers may take. High prices have had the effect of curtailing the demand for steel and if maintained will continue to restrict private enterprise. If on the other hand prices declined, consumers interest in the market would be quickened with a corresponding increase in volume of business. At present the trade is marking time owing to the uncertain outlook.

Although no decision has been arrived at regarding the U.S. Government price fixing policy, the market is practically under government control. The situation however is far from satisfactory as the mills are filling government orders and no prices are given out to the public. It is quite possible that private consumers who have been holding back purchases in the expectation of the government establishing lower values, will become tired of waiting and rush into the market. This would result in a scramble for whatever steel was available after government requirements have been satisfied. As government demands are growing heavier all the time the tonnage available for private consumers is decreasing. Such a situation might possibly lead to further advances. The market however, is so unsettled that it is impossible to say what will actually happen and the situation will not clear up until some definite policy is announced from Washington.

Pig Iron

The pig iron market continues quiet and unsettled. The embargo appears to be causing a temporary cessation of imports into Canada from the States which in view of the sold up condition of domestic furnaces is causing considerable inconvenience in the trade. The delay and trouble surrounding the issue of export licenses is making it very difficult to do business. It is expected that the whole matter will be adjusted in the near future which will relieve the situation to some extent. In addition there is a shortage of cars with no indication of when this condition will be relieved. In the States the market is tied up and promises to remain in this condition until the Government prices are fixed and made public. Business continues dull at nominally unchanged prices. The coke market is a little easier although there is still a shortage of cars and labor.

Scrap

The market for old material continues quiet. The demand for most metals is light as consumers are showing little or no interest in the market. Prices of old copper, brass and lead are down but steel and cast iron scrap are holding firm at unchanged prices.

Machine Tools

Interest in the machine tool market has been revived following the announcement that further contracts for 6 inch shells will be placed here. It is not expected however that this will cause much demand for machine tools as existing equipment will doubtless be tooled up to suit the occasion. It will mean new jigs and fixtures in many cases and may call for a few special tools. Plants are being established for building wooden ships on the Pacific Coast also at Toronto, Three Rivers, Que., and on the Atlantic seaboard. New equipment will be required for these yards. The machine tool market in the United States is very active owing principally to the heavy demand for equipment for munitions plants and airplane factories. The shipbuilding industry is also very active and heavy tools are in good demand for shipyards. It is becoming more difficult, than ever to obtain machine tools from the States which will benefit Canadian builders to some extent.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Supplies

The outlook in the supply business has not undergone any material change during the week. Business generally speaking continues fair and is of a more general character. Prices of most lines particularly those composed of iron, steel or brass are holding firm and there is no indication of lower values, just yet. A decline of 4c a pound has been put into effect on soldering coppers which now make a base price of 3 to 8 pounds, 66c per pound. For the 2½ lb. size the price is 67c per pound, 2 lb., 69c per pound; 1½ lb. 70c per pound and 1 lb. at 73c per pound. Prices of belting are unchanged but side lace leather is quoted at $1.75 and cut lace leather $1.95 per pound. Gasoline and coal oil continue firm and in good demand.

Metals

Weakness characterizes the local market and declines have taken place all along the line. The reason for this may be found in the unsettled condition prevailing in the trade owing to the uncertainty with regard to future prices. The falling off in munitions contracts has of course had some effect on the market but not to the extent that might have been expected as the ordinary demand has been steadily increasing for some time and is now considerable. The local market largely reflects conditions in New York where the delay in price fixing has had a depressing effect on the market there. The attitude of the U.S. Government is uncertain and consumers are awaiting developments.

Copper.—What may prove to be a temporary decline in prices of copper has brought prices down two cents per pound. The position of copper continues strong and has improved by the fact that the U.S. Government will pay 25c for copper being purchased for the Allies. This is interesting in that it indicates that the government will not make any drastic reduction when it fixes the price of copper. Local prices are now as follows. Lake and electrolytic 32c and castings 31c per pound.

Tin.—The market is dull and weaker with consumers still showing a lack of interest in current prices. The London market on the other hand has been firmer lately and higher prices have to be registered there. Tin has declined 2c locally and is now quoted at 62c per pound.

Spelter.—As in the case of other metals, spelter has also declined and the market is weak, and inactive. Spelter is now quoted locally at 10½c per pound a decline of ½c.

Lead.—The decline in prices of lead in New York reported last week has resulted in lower prices in the local market. The weakness of lead is attributed to increased production which government requirements have not absorbed. The market is also weak. Lead has declined 1c locally and is now quoted at 12c per pound.

Antimony.—The demand for antimony is light and the market weaker. Antimony has declined 1c and is now quoted at 19c per pound.

Aluminum. — The market remains quiet with light demand. Prices are lower at 62c per pound, being a decline of 2c.

Solders.—Prices have declined following the lower levels registered for tin and lead. Guaranteed is now quoted at 38½c and strictly at 36c per pound.

Pittsburgh, Sept. 15.—The general stagnation in the iron and steel markets continues. As has been pointed out in previous reports this condition is in line with all precedents, being the natural and necessary sequel to a period of great price advances and heavy buying. Two things must occur. Prices must be readjusted to a less unreasonable basis, so

as to establish a level at which business can be resumed, and buyers and sellers must work off a large part of the obligations they have assumed. Week by week progress is being made along these lines, but the end has not been reached as yet. It may be reached, possibly, in a few weeks, but more likely two months or more will be required still.

Price Declines

The most significant decline in the week was in billets, $10 a ton, sales having been made of limited tonnages at $65, with more offered at the same figure. This was by middle interests. There is an unconfirmed rumor that Italy has purchased a round tonnage of billets at $60. This, of course, would be from a mill. Thus far the mills have not admitted making cut price quotations, their position having been that cut prices would not enable them to effect important sales and that their best interest lay in endeavoring to maintain prices while they work off the high-priced business now on books.

In foundry pig iron there has been a clear cut decline of at least $3 a ton, some valley furnaces being willing to sell at $50, furnace. Resale lots are occasionally offered at still less, but do not make a well-defined market. This is the first clear decline in foundry iron, Bessemer and basic iron having previously declined about $6 a ton, since the top point for all grades of pig iron, reached late in June.

Plates, which recently declined to 8.00c, Pittsburgh, having been for some time firm at 9.00c to 10.00c, are being sold at slight cuts under 8.00c, down to 7.85c or lower.

Sheets are a trifle easier, quotations having been made in the past week at 8.35c on classes of business against which 8.50c would formerly have been quoted. Some sheet mills are now soliciting enquiries, their attitude previously having been apparently that they would prefer not to make sales.

It is learned that a leading steel mill has made one contract for merchant steel bars at 3.50c, the lowest price previously reported having been 4.00c, a decline from 4.50c as had been quoted for two or three months. There is no open quotation out at 3.50c and the market in general remains quotable at 4.00c.

Government Buying

The Government continues to place orders for steel, but very few details of transaction are allowed to become public. The total orders placed thus far is certainly far under the recent estimate in Wall Street, 3,200,000 tons. So far as Government buying is a factor in general trade conditions, the important matter is not the amount of steel the Government has bought at any one time, but the monthly rate at which the steel is to be furnished. The production of ingots is now running at fully 44,000,000 gross tons a year, which means about 33,000,000 gross tons of finished rolled steel, as the losses in scrap, scale, etc., from the ingot to the merchantable steel always runs from 25 per cent. Thus the monthly production of rolled steel is about 2,750,000 gross tons a month. The proportion that is passing into Government work of all descriptions is between 10 and 15 per cent., according to the most accurate estimates that can be made. Within a few months a great deal more steel will be passing into shipbuilding, as increased yard facilities become available, but on the other hand there will be some decreases in other directions, as the building of shipyards is at present taking a great deal of steel, and a considerable tonnage has been going into the equipment of the army cantonments, the airplane factories and training camps, and other activities. Shell steel requirements will probably increase. In the first six months of next year the proportion of the output passing directly or indirectly into the Government may somewhat exceed 15 per cent.

The amount of steel that will be furnished in future to our Allies is quite in doubt. Possibly on account of uncertainties as to prices, as it is far from being settled that our Allies are to be named the same prices as paid by the Government. The War Industries Board, which was to act as purchasing agent for our Allies, has done nothing in this direction, and the latest report is that the Allies have entered into some negotiations with steelmakers on their own account. As the amount of steel passing to them in the past has been very large, and as there has been little buying of this character in recent months, it will require quite heavy purchases in future merely to assure a continuance of the previous pace.

Thus there is no reason whatever for assuming that there is to be such an increase in war steel requirements, on the whole, as to make up for the decreased domestic consumption that is certain to occur in many directions, and indeed has already begun to occur, to say nothing of the continually increasing productive capacity. It is much more probable that steel will become more plentiful than that it will become scarcer.

Jobbers Somewhat Interested

Jobbers are now showing some slight signs of being interested in making purchases of steel products. Many of them did not contract for fourth quarter and although they are reducing their stocks and perhaps were in some instances overbought for third quarter, they will still need to buy some material. Manufacturing consumers, who as a rule are covered by contracts to the end of the year, are not yet showing any decided signs of interest in the market. Some of the automobile makers are sounding out the producing trade, on bars, sheets, etc., but evidently with a view to securing information as to what prices are likely to be asked rather than with an idea that they will really make any purchases at any early date.

New York, Sept. 17.—Interest in the steel industry continues to be centred almost entirely in Government purchases of material, present and prospective. It is more generally recognized that Government requirements will be of much greater magnitude than was anticipated several months ago. At the moment, attention is being directed toward the prospective placing of contracts for heavy tonnages of shell steel. No little surprise has resulted from the announcement that Great Britain is again seeking to place large orders with American manufacturers for large sizes of shell. Inquiries on British account have been put out for 3,000,000 six-inch shells, and delivery is wanted in about six months. Additional orders for 4.5, 8, 9.2, and 12-inch shell are expected to follow quickly.

The 6-inch shell, for which bids are now being taken, will require 225,000 tons of steel, and it is estimated that the total contract will call for the expenditure of $120,000,000. This sudden increase in the demand for steel forgings and billets will probably be reflected in a stronger tone for semi-finished steel, which has been steadily falling in price because of resale offerings for the last four to six weeks. Great Britain, however, will pay less for finished shells than was secured by manufacturers last year, and consequently lower prices will prevail for bars and billets. Orders for English shell are expected to be placed with the Bethlehem and the Crucible companies, with the American Car & Foundry Co., the Westinghouse Electric & Manufacturing Co., the American Can Co., the New York Airbrake Co., and the E. W. Bliss Co. The closing down of Canadian munition factories and the resale of machinery to American plants seems to indicate that the English authorities have changed their plans governing the manufacture of munitions.

The United States Government is still seeking to place additional contracts for heavy ordnance and other war munitions, but considerable difficulty is being encountered in finding manufacturers who are equipped to carry on this work successfully. Government representatives seeking to place orders for gun mounts among metal-working plants in the Ohio valley have found manufacturers already overcrowded with work. Several companies in the East, however, in anticipation of Government orders have been quietly inquiring for shop equipment. Manufacturers who have already accepted Government contracts for gun forgings or for machining ordnance have continued to place contracts for machine tools in the Philadelphia, New York and New England markets. Among the largest buyers in the last week were the American Brake Shoe & Foundry Co., the Tacony Ordnance Corporation, the Taylor-Wharton Iron & Steel Co., the Standard Steel Works, and the Bullard Machine Tool Co. The Inland Ordnance Co., Bedford, Ohio, has been buying tools in the Cleveland market, and another manufacturer in the Central West has placed an order for 60 turret lathes for making rifle grenades.

Shipbuilding interests also continue actively in the market for machinery of various kinds. One interesting development is the chartering of the Newfoundland Shipbuilding Co., Harbor Grace, Newfoundland, by the controlling interests in the Pennsylvania Shipbuilding

Co., the New Jersey Shipbuilding Co., and the Pusey & Jones Co. Wooden ships are to be built at first in Newfoundland, but it is planned to purchase equipment and to build steel ships in the future. This interest is now in the market for electric cranes, about 60-foot span. Another shipbuilding company has been organized at Kingston, New York, to build small craft for the United States Government and tools are to be bought for machine and fabricating shops.

The Army Department has placed contracts for 100 steel buildings for storage for the American army in France; 12,000 tons of steel are required, and bids are being taken on 32 additional buildings requiring 16,000 tons of shapes.

CANADA'S REVENUE STILL GROWING

THE financial statement of the Dominion covering the period from April 1, the beginning of the fiscal year, to September 10, shows total receipts of $112,000,000, an increase of $22,000,000 over the same period of last year. On the other hand payments on account of ordinary expenditure, including interest on war loans, are $43,000,000, which is almost identical with the expenditure on this account for the same period of last year. Capital expenditure is $7,500,000 less than last year. Of this last named reduction, public works expenditure shows a decrease of over $1,000,000, while railways and canals expenditure is $3,500,000 less than for the corresponding period of last year.

Taking into account both receipts and expenditures on capital and ordinary accounts, the period in question shows a surplus of receipts over these expenditures to the amount of $62,000,000. The war expenditure in Canada during the period was $57,000,000.

It thus appears that so far as receipts and expenditures have been entered in the books of the department, the revenues of the Dominion during the present year have more than equalled the expenditures on ordinary and capital accounts together with the war expenditure in Canada. The greater part of Canada's war expenditure, of course, is overseas. Payment on this account is arranged for with the Imperial treasury in London.

THE BRITISH COAL DISTRIBUTION SCHEME

By Mark Meredith

THERE is not the slightest doubt that the British Coal Controller is to be congratulated on the scheme that is to be put in operation on September 1, for reorganizing the transport of coal by public railway for inland consumption in the British Isles. By arranging that coal shall be sent from pits in certain specified directions instead of in any direction there will result the enormous saving of not less than 700,000,000 ton miles per annum. Apart from the ensuing economy in labor and reduction in wear and tear of rolling stock, this means that some millions of tons of coal that would otherwise be required for locomotive use in what is now seen to be largely unnecessary haulage will be freed for national purposes: in addition wagons and locomotives will become available for use overseas is required. Special provision has been made for meeting cases in which certain particular descriptions and qualities of coal are required for special purposes, such as for automatic stokers, gas producers and coke ovens. Firms needing coal for use in these will receive certificates issued by the Controller of Coal Mines entitling them to specified supplies of the particular fuels mentioned in the certificates. These fuels will be provided by diversion, where necessary, from firms who have not received certificates. Anthracite is the only variety of coal not affected by the new regulations. Its occurrence is limited geographically speaking, and it has been found impossible to make it fit in with the scheme. It can therefore be distributed in any direction, as heretofore, in this respect resembling coal that is conveyed otherwise than by public railway from the colliery or is conveyed to a port for shipment. This latter exception affects London particularly since the greater portion of the coal consumed in the metropolis is water-borne. Over 170,000,000 tons of coal per annum, are involved in this scheme and of this quantity factories need 55,000,000 tons; mines, metal industries and chemicals, etc., also 55,000,000 tons; domestic consumption 30,000,000 tons, and railways 13,000,000 tons. No allowance is made in these figures for the 80,000,000 tons of coal required for export and bunkers, which is not affected by these regulations. There is only one point that need have further attention and it would be a good suggestion that an instruction should be appended to these regulations that no unpicked coal is to be transported from the pits to the consumers, for in a year thousands and thousands of tons of dirt are transported owing to the so-called economies now practised at the pit heads.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

LIQUID FIRE IN THE WAR

LIQUID fire is a weapon of value principally because of its demoralizing effect upon those attacked. There have been some casualties resulting from liquid fire, but it is the psychological effect that is sought. According to a writer in the bulletin of American Chemical Society, the apparatus usually consists of a metal tank holding about 4 gal. of liquid to be burned, a section of pipe from the tank to a rubber hose at the other end, in which there is a smaller metal pipe about a yard long fitted with a nozzle and a friction igniter, as well as an oil burning wick. There is a valve near the tank and another near the nozzle. Benzol, from coal tar, and crude oil are used in equal proportions, and are carried in the tank under a pressure of approximately 300 lb. per sq. in., this pressure being maintained by compressed nitrogen, an inert gas having no effect upon the contents of the tank. The tank and accessories are carried by a companion when liquid is being burned. Or it may be fixed in position and operated by the same man who carries the tank.

In use a cap is drawn from the end of the nozzle, and a wick burning kerosene or similar oil is thereby lighted, since the cap is a friction igniter. The oil is then turned on, and is ignited as it leaves the nozzle under great pressure. The result is a flame of burning oil about 30 yd. long. For two-thirds of this distance the flame is straight, but it then turns up, as does any other flame. It may be directed against the ground, but care must be taken not to deflect it too sharply, as it may strike the ground and turn back on those operating the device. It is, therefore, not well suited to turning down into a trench.

It is said by an expert that liquid fire is not so effective now that it is understood by the troops and means for its defence have been worked out. It can be easily understood, however, that a number of such devices, with the roar of the escaping oil, when used together, gave a means of demoralizing the defenders of a trench, especially at night, and in the beginning was a valuable accessory, especially for raiding parties.

AN important raw product available in the State of Hyderabad which can be manufactured into products of commercial utility is the mowra flower. The mowra tree abounds in the forests and fields of Hyderabad, more especially in the districts of Nizamabad, Medak, and Asafabad. During the hot weather the flowers drop off the tree, and are gathered and dried to the consistency of raisins. Hitherto they have been utilized for liquor only. About 25,000 tons, it is calculated, are gathered annually, of which about 10,000 tons are used for liquor, and the balance is run to waste. It has been discovered that it is possible to make sugar, motor spirit, and several other valuable products out of them. The flower contains, in addition to sugar, acetic acid, and some acetone. It is stated in the "Chemical Trade Journal" that several types of motor cars have been successfully run on a spirit prepared from mowra at half the cost of petrol.

TRADE INQUIRIES

THE following inquiries have been received by the Department of Trade and Commerce, Ottawa, from which further particulars may be obtained:

1196. **Machine tools.**—An old-established British firm in Moscow, Russia, wishes to purchase in Canada machine tools required for works under construction for war purposes. Specifications will be furnished on application to the Commercial Intelligence Branch, Department of Trade and Commerce, Ottawa.

1200. **Test drills.**—The New York office of a Canadian manufacturing company have received an inquiry from abroad for 10,000 test drills of various size, and would like to get supplies in Canada. Specifications will be furnished on application to the Commercial Intelligence Branch, Department of Trade and Commerce, Ottawa.

1208. **Sulphate of copper.**—An important firm of manufacturers' representatives in Buenos Aires would like to be placed in communication with exporters with a view to selling on commission.

1213. **Engines (crude oil).**—A manufacturers' agent in Cape Town, specializing in agricultural machinery and now holding several Canadian agencies, makes inquiry re possibility of supply from Canada of a crude oil engine. (For illustration and further information see pages 445-447.)

1217. **Mining and railway supplies.**—A Johannesburg firm of engineers and importers of mining and railway supplies are in the market for agency of supplies from Canadian manufacturers of any line as above, except locomotives.

1218. **Rubber belting and hose.**—A Johannesburg firm making a specialty of mining supplies are open to take up a Canadian agency for rubber belting and hose.

1233.. **Motors, machinery and tools for agricultural, electrical and building purposes.**—An Italian firm at Bari would like to represent manufacturers of motors, machinery and tools for electrical, agricultural or building purposes, b. c. & t.

1235. **Electrical materials, chemicals, steel, tools, and general machinery and engineering articles.**—Genoa engineers would represent firms manufacturing or exporting electrical materials, chemicals, steel, tools and general machinery and engineering articles, g.p.c.

1237. **Industrial machinery, especially for shipbuilding.**— Engineer, manager of a mining company, would represent British manufacturers of industrial machinery in general, especially for shipbuilding purposes, i.a.g.

1239. **Anchors and chains and machinery for ships.**—A party at Genoa would handle anchors and chains for ships, and machinery for same, g.e.c.

1242. **Electrical supplies, lamps, insulators, lamp-holders, switches, etc.** — A Rome firm would represent on commission or buy for own account, electrical supplies, lamps, insulators, lamp-holders, etc., r.g.b.

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

"WILLIAMS SERVICE"

IMMEDIATE SHIPMENT TORONTO STOCK

Surface Grinders.

New No. 1 DIAMOND Automatic.
New No. 2 BROWN & SHARPE Auto.
New No. 2 LASALLE Automatic.
New No. 1 WILMARTH & MORMAN, plain.
New No. 3 LASALLE, plain.

New Shapers.

14" SMITH & MILLS.
16" SMITH & MILLS.
16" KELLY.
20" KELLY.
20" GOULD & EBERHARDT.
24" GOULD & EBERHARDT.
28" GOULD & EBERHARDT.

Radial Drills.

2—6' BERTRAM (almost new).
1—5' REED PRENTICE (new).
1—4' MUELLER (new).
1—3' DRESES.
1—2½' FOSDICK (new).

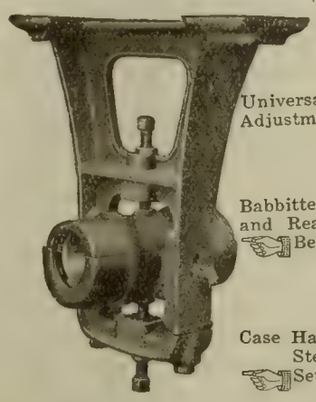
New LeBlond Heavy Duty Lathes.

17" x 6' Double Back Gear.
19" x 8' Double Back Gear.
19" x 10' Double Back Gear.
21" x 8' Double Back Gear.
25" x 10' Double Back Gear.
24" x 12' CMC, double back gear.
18" x 10' CISCO, double back gear.

THE
A. R. WILLIAMS MACHINERY CO., LTD.

64 FRONT ST., West TORONTO, ONT.

Speed Up—



IN War Times you should get all the speed out of your machines possible.

You can do this by using BOND Hangers. From the day you put a BOND Hanger on the job it starts saving your oil, your power, and your patience.

It is an investment that yields a steady return with every revolution of your shafting.

The sturdy, braced construction makes for smooth running without vibration. Its design permits full accessibility for adjustments or erection.

The Bond Hanger Book tells about everything we make in the line of power appliances.

Your files are not complete without it.

CANADIAN BOND HANGER & COUPLING CO.
Limited
ALEXANDRIA ONTARIO

Yes—
it does look bad

AND if you haven't a Walton Tap Extractor, this broken tap is going to give some trouble before it comes out.

You're going to fuss around, lose your temper, perhaps injure the thread and waste half an hour or more in addition.

But with this Walton Tap Extractor a broken tap presents no difficulties.

The crucible steel fingers go down into the flutes, and the rest is easy. Just apply a wrench to the squared outer end and back the tap out. Can you imagine anything more simple?

The Walton Co.

HARTFORD
CONN.

Write for Circular

If any advertisement interests you, tear it out now and place with letters to be answered.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Granby, Que.—The Southern Canada Power Co. will build a sub-station and office here.

London, Ont.—E. Leonard & Sons, York St., contemplate the erection of a blacksmith shop to cost $20,000.

Toronto, Ont.—The City Architect has issued a permit to the Hospital of Incurables to install underground fuel oil storage system, 130 Dunn avenue, at a cost of $3,000.

New Glasgow, N.S.—A 4,000 kilowatt steam turbine is now being erected at the Allan Mine. This addition to the existing system will give a plant of 7,000 kilowatts, constituting one of the largest power plants in the province.

Port Arthur, Ont.—Alderman Blaquier will introduce to the next meeting of the City Council a resolution to urge the Dominion Government to operate the blast furnace at the Atikokan Iron Works. The plant has been lying idle for a long time.

Ladysmith, B.C.—The smelter which was recently put in operation by the Ladysmith Smelting Corporation, will be capable of handling 1,200 tons of ore per day, although the initial capacity is 700 tons. There are two blast furnaces, one 42 in. x 120 in., and the other 42 in. x 160 in. at the tuyeres. The boiler plant consists of two 80 h.p., one 88 h.p., and one 104 h.p. boilers. Two electric generators furnish power for the motors and lighting system.

Tillsonburg, Ont.—Work has started on the new plant for the Maple Leaf Harvest Tool Co. The main building will include an office, 40 x 50 ft., at the south; paint shop, 50 x 90 ft.; finishing shop, 50 x 140 ft.; tin storage room, 50 x 60. Back of the main building will be a finished goods warehouse 100 x 130 ft. The buildings will be one storey in height of red pressed brick and steel window sashes, and will be a model factory building. In the spring a polishing shop, 50 x 80 ft. a storage room, 50 x 50 ft., and a forge shop will be erected, 50 x 270 ft.

GENERAL

Hamilton, Ont.—The American Can Co., will build an addition to their factory to cost $125,000.

Tillsonburg, Ont.—A firm in the United States has been investigating the situation here with a view to locating a branch factory.

Tillsonburg, Ont.—The Canadian Cereal and Flour Mills are rushing work on their new oatmeal mill, and will soon begin operations.

Hamilton, Ont.—A permit has been granted to the Canadian Fastener Co., for a factory to be built on Sherman Ave., at a cost of $20,000.

Oakville, Ont.—Manufacturing operations were started at the Oak Tire & Rubber Co.'s new factory on Thursday. Frank Law is managing director.

Brockville, Ont. — The large cheese factory at Seeley's Bay was destroyed by fire on Sept. 11. The owner D. Warner had only $1500 insurance on the property.

Durham, Ont.—The cement works, which have been remodeled to manufacture cement rock instead of marl, began operations recently, and will shortly be running at full blast, under the management of R. H. McWilliams.

MUNICIPAL

Prince Rupert, B.C.—The City contemplates extending the water main system which will cost $10,000.

St. Catherines, Ont.—The City Council are considering the purchase of a motor driven sewage pump. W. P. Near is the city engineer.

Bradford, Ont.—A by-law will be submitted to the ratepayers on Oct. 6, to authorize an expenditure of $15,600 on installing a hydro-electric transmission system.

Lethbridge, Alta. — Commissioner Freeman stated recently at a meeting of the City Council that a new steam turbine and generator will have to be ordered without delay in order to provide power for the increasing load. It is estimated that a new unit will cost $50,000.

ELECTRICAL

Aylmer, Ont.—The Town Council will purchase electrical transmission equipment and also motor driven pumps.

Hamilton, Ont.—The Barton Township Council has decided to submit Hydro-Electric and enabling by-laws to the ratepayers.

Welland, Ont.—The voltage of the Hydro-electric system here will be increased from 12,000 to 46,000 volts and the equipment in the sub-station is being changed to suit the new service.

Scarborough, Ont.—The Hydro-Electric Power Commission has notified the Township Council that work has been started on a line to go through Birchcliffe, Scarborough Junction and Agincourt. It is hoped to complete the work this fall.

New Toronto, Ont.—Building operations have been already commenced on the new hydro-electric sub-station at the corner of 9th street and Birmingham avenue, New Toronto, by Witchall and Son, the contractors. The concrete foundation is already laid and the contractors are aiming to have the building completed before the winter. It will be a three-storey structure of pressed brick, steel and concrete, at a cost of $80,000 with the equipment. The station will be about 40 feet high and 75 feet wide.

TENDERS

Charleswood, Man.—Tenders will be received by the undersigned up to September 22, for the drilling of one 5-inch well, and equipping same with pump and platform, on the Arboro Street, West Winnipeg. A. B. Blakely, secretary-treasurer.

Toronto, Ont.—Tenders will be received, addressed to the Chairman, Board of Control, City Hall, Toronto, up to October 2, for the construction and delivery of stop valves, valve operating pump and special castings, for main pumping station. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

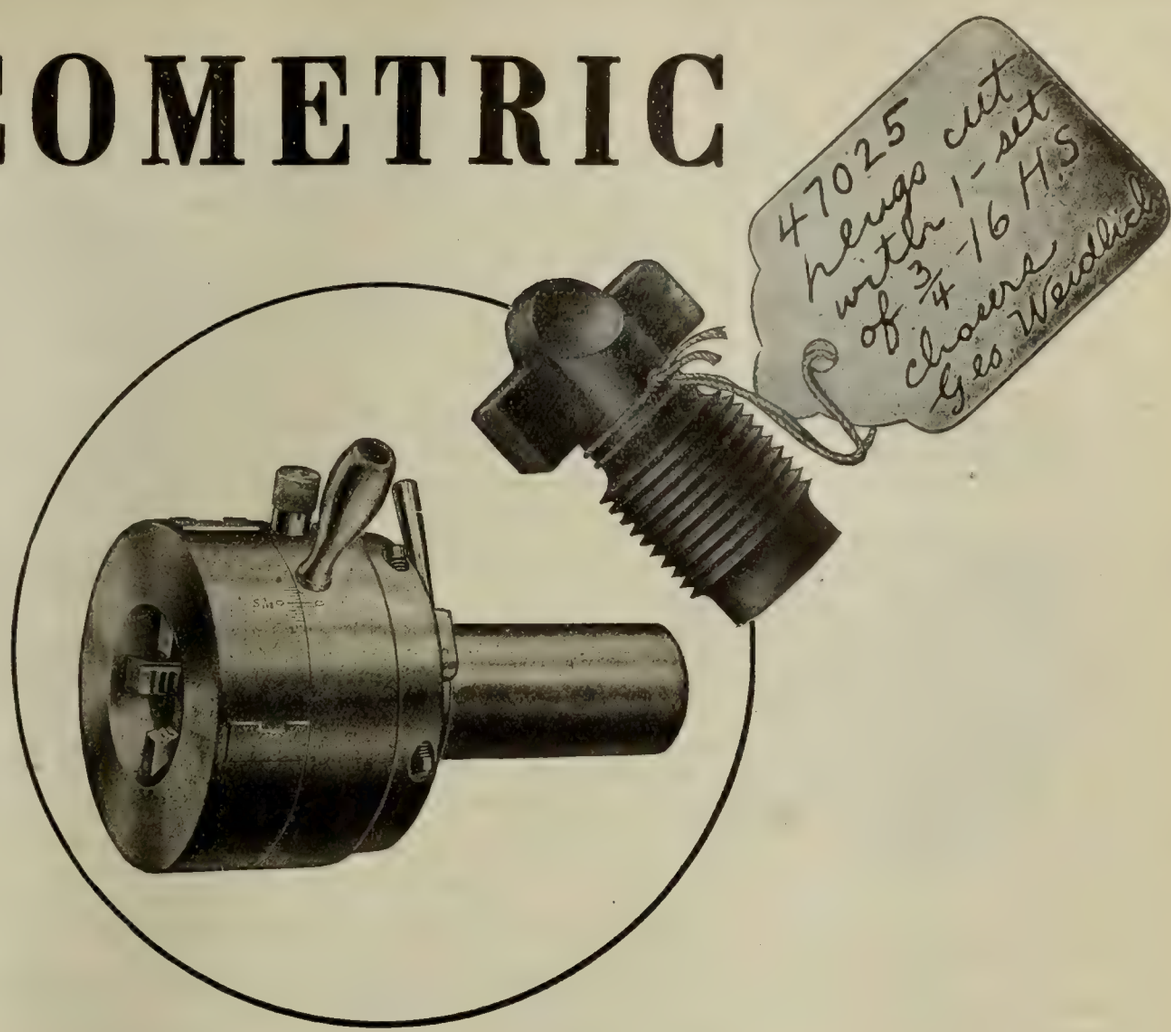
Toronto, Ont. — Tenders will be received, addressed to the Chairman, Board of Control, City Hall, Toronto, up to October 2, for the construction and delivery of stop valves, valve operating pump and special castings, for main pumping station. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Ottawa, Ont.—Tenders will be received at this office until Tuesday, September 25, 1917, for dredging required at West St. John, N.B. Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work.

Moncton, N.B.—Tenders will be received up to September 22, for the construction of the substructure of a three-track subway at Trenton, N.S., under the tracks of the Intercolonial Railway. Plans and specifications may be seen at the following locations:—Office of the chief engineer, Department of Railways and Canals, Ottawa, Ont.; office of the chief engineer, Canadian Government Railways, Moncton, N.B.; office of the resident engineer, Canadian Government Railways, New Glasgow, N.S.

Ottawa, Ont.—Tenders for Metallic Fittings, No. 1811, will be received until Wednesday, Sept. 26, 1917, for the supply of filing sections for Dominion Public Buildings, Ottawa. Plans, specification and forms of contract can be seen and forms of tender obtained on application to the office of the Caretaker, Post Office, London, Ont., the Overseer of Dominion Buildings, Post Office, Montreal, the Clerk of Works, Postal Station "F," Toronto, and at this Department.

GEOMETRIC



One Set of Chasers in a Geometric Die Head has cut 47,025 of these Plugs

The man who has operated the Geometric Die Head says: "In all my twenty-five years' experience I have never known a die to cut as many threads as this set has cut on cast iron."

A quarter of a century of specializing in one line has brought Geometric Thread Cutting Tools up to the high water mark.

Arrange to do your threading with a Geometric. Let our catalogue tell you about it.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN., U.S.A.

Canadian Agents:

Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

RAILWAYS—BRIDGES

Toronto, Ont.—The Ontario Railway Board has extended indefinitely the period in which the Toronto Railway Co. may construct a car line on Pape Avenue as it is impossible to secure rails.

Montreal, Que.—It is proposed to build a new bridge over the Back River at Cartierville. Alternative estimates ranging from $7,500 to $200,000 have been submitted to the Board of Control by W. Chase Thompson consulting engineer.

Orillia, Ont.—The Grand Trunk is to proceed at once with the building of a new station at this place. The new building, which will replace the one destroyed by fire, is to be a handsome structure of dark, brown brick, with stone and concrete base.

Montreal, Que.—The C. W. R. tunnel and other developments here have cost $9,632,718 up to April 30, 1917. It is estimated that $768,628 will be required to complete the terminal facilities in this city. The principal items are: Tunnel, $65,354; terminal, $441,373; electrification, $32,890.

Chatham, Ont.—The construction of a new and up-to-date station to replace the one which was burned to the ground at Charing Cross, has been commenced by the Michigan Central Railway at the site of the old depot. The plans and specifications call for a much larger and more modern building which will be, when completed, 70 feet long by 20 feet deep.

Toronto, Ont.—Two large concrete bridges of new design are being built on the C. P. R. line from North Toronto to Leaside. Each one will be about 390 feet long and 90 feet high. One will be double-tracked; the other will have three tracks. The bridges are of the reinforced concrete trestle type, founded on continuous piers resting on clay subsoil. The spans are 34 feet; the middle ones 36 feet. The design is by P. B. Motley, engineer of the C. P. R. department of bridges, Montreal. The local supervisor is Mr. Barber, divisional engineer of the C. P. R. in Toronto. Wells & Gray, Ltd., Toronto, are the contractors for the three-tracked bridge at Reservoir Ravine, and the Dominion Construction Co. will build the bridge over the Belt Line.

BUILDING

Toronto, Ont.—The City Architect has issued a building permit to W. T. Keens, 177 Spadina avenue, for the erection of a factory of brick construction to cost $75,000.

CONTRACTS

MacLeod, Alta.—The City Council has awarded a contract for a motor-driven centrifugal pump to Gorman, Clancy & Grindley, Ltd., of Calgary.

Woodstock, N.B.—The Town Council have let contract for filtration plant to the New York Continental Jewel Filtration Co., New York, at $64,948.

Moose Jaw, Sask.—A contract has been let to Gorman, Clancey & Grindley, Ltd., Calgary, for three motor-driven centrifugal pumps, for Rosedale pumping station.

Ottawa, Ont.—The Canadian Tungsten Lamp Co., Hamilton, have the general contract for tungsten lamps for the Department of Public Works, Dominion Government.

New Liskeard, Ont.—A contract has been let to the Turbine Equipment Co., Toronto, by the Casey-Cobalt Silver Mining Co., for a unit for operating against 450 foot head.

Jordan Harbor, Ont.—The Toms Contracting Co., Toronto, have been awarded the general contract for the construction of power house for the Provincial Government Department of Public Works.

MARINE.

New Glasgow, N.S.—Walter and Charles McNeil are preparing to build a couple of wooden vessels along the East River in New Glasgow.

Three Rivers, Que.—The Three Rivers Shipyard Co., has acquired a site here for a ship building plant. T. M. Kirkwood of Toronto who is interested in the proposition has a contract for two freighters.

Vancouver, B.C.—British Columbia's shipbuilding programme provides for the construction of some 117,000 gross tons of commercial shipping, to have a total carrying capacity of nearly 185,000 tons. The value of these ships, some fifty in all, is in the neighborhood of $25,000,000.

Sarnia, Ont.—The tug Michigan of the Great Lakes Towing Co., Mich., has left Port Huron for Georgian Bay, to assist the tug Favorite of the same company in raising the steamer Western Star, which was wrecked in the Georgian Bay district during the severe storms of the fall of 1915. This is the second effort made to raise this steamer by the Great Lakes Towing Co.

Ship for Cunard Company.—The first of a fleet of 150 vessels to be constructed in this country under British registry to replace the losses due to the submarine warfare was launched on Sept. 16, at the yards of the Chicago Shipbuilding Co., Chicago, Ill. The ship was built for the Cunard Line, the first to be constructed in America for that company. Its approximate cost was $800,000.

Three Rivers, Que.—A new concern known as the Three Rivers Shipyards, Ltd., has recently been incorporated at Ottawa to establish a shipbuilding plant at Three Rivers, Que. The company has obtained a contract from the Imperial Munitions Board to construct two wooden freighters to the following dimensions. Length 268 feet; beam 43 ft. 6 ins., and depth 27 ft. They will be 2900 tons deadweight. Work will be started shortly on the construction of the plant. W. T. Donnelly a well known naval architect is interested in the proposition

Alexander MacGregor, R.N.R., representative in Halifax of the London Salvage Association, died suddenly on September 13. Considered a high authority on steamship construction in Canada, Mr. MacGregor has since the commencement of the war been the means of saving much tonnage. Within the past month he brought safely into Halifax two steamships which had gone ashore on the Magdalens, and in addition to these had to his credit the saving of the Matatua, which sank at her dock in St. John, and the Clematis and Lord Antrim, which were ashore in dangerous positions on the Cape Breton coast. Mr. MacGregor was sent as guarantee engineer for the steamships built on the Cylde for the Boston and Yarmouth steamship service, and was engaged by that company as their marine superintendent. Later he was with the C.P.R., and at the outbreak of the war was in Scotland, superintending the building of monitors for the British Admiralty. His relatives are all on the other side of the Atlantic.

WOODWORKING

Parry Sound, Ont.—The Parry Sound Lumber Co.'s planing mills, tramway and part of the dam, together with a quantity of lumber were destroyed by fire on Sept. 11.

PERSONAL

Arthur Chenoweth, has succeeded M. A. Hunter as apprentice instructor at the G. T. R. shops, Stratford, Ont.

A. M. Robertson, formerly on the staff of the Dominion Glass Co., has been appointed mechanical engineer of the Acadia Coal Co., New Glasgow, N.S.

W. G. Ross, chairman of the Montreal Harbor Commission was re-elected president of the American Port Authorities at the convention held in Cleveland last wek.

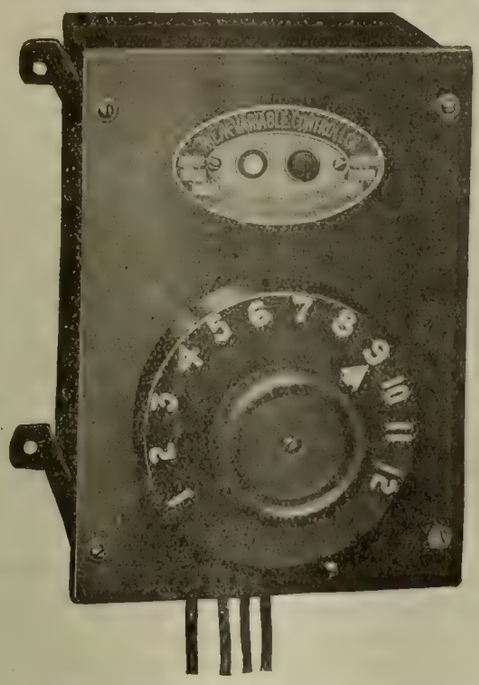
E. Jordan, has been appointed general manager and chief engineer of L'Air Liquide Society in succession to E. Roger who has resigned. The head office of the company is in Montreal.

W. H. Biggar, K.C., has been appointed as vice-president and general counsel of the Grand Trunk Railway. Mr. Biggar is also vice-president and director of the Grand Trunk Pacific Railway and other associated companies. He was appointed general counsel of the road in 1910, after holding the position of general solicitor for some years.

M. A. Humber, who has been local instructor of apprentices in the Grand Trunk shops at Stratford, Ont., has been appointed apprentice examiner over the whole system, which will necessitate him making monthly visits to the shops at Ottawa, Montreal, Battle Creek, as well as Stratford, to conduct examinations. His headquarters will be at Stratford.

Aikenhead's A. K.

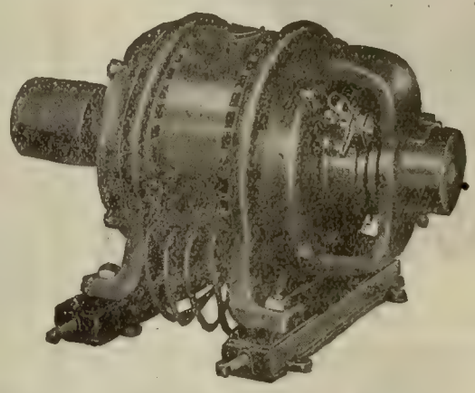
MOTOR AND CONTROLLER



The A.K. Motors are built for high efficiency and long durability.

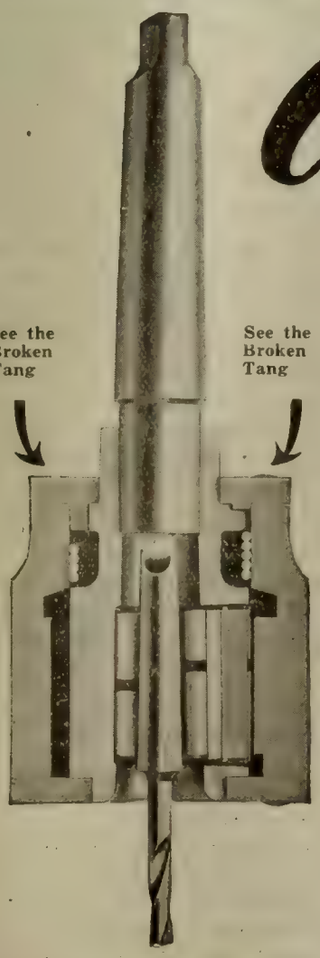
Single Phase, Variable Speed Type will run on 110 or 220 volts, 25 or 60 cycle.

These come in sizes from ¼ to 1½ H.P., and are stocked, complete with a 12-speed Controller, in Toronto.



Aikenhead Hardware Limited, 17, 19, 21 Temperance St., Toronto, Can.

Aikenhead's New Chuck



Don't Throw Away Broken Tang Drills

Perhaps you are about to discard some taper shank drills because the tangs are broken off—DON'T DO IT—they are worth their weight in gold. You can use them just as they are with a

Wahlstrom Automatic Chuck

One chuck holds drills from 1/16" to 1¼"

and you won't have to take time from your production to repair them.

Tool changes are made in two seconds—just grasp the shell of the chuck with one hand and put in or remove the tool with the other—no collets—no lost time, for the spindle never stops. The jaws grip, NOT BY THE TANG, BUT ON THE SIDE OF THE TAPER—there's no chance for slippage— Wahlstrom won't even mar the shanks.

AIKENHEAD HARDWARE LIMITED

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"HAWK"D CHROME VANADIUM STEEL

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WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

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There are many cases where each punch has turned out over 2,000 shells.

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TRADE GOSSIP

Ottawa, Ont.—C. A. Magrath, Canadian Food Controller, has issued a warning to coal dealers that they are not to increase prices, now that winter is approaching, without first making representations to him.

The Pangborn Corporation of Hagerstown, Md., manufacturer of sand-blast equipment, has purchased and taken over the sand blast department of the Curtis Pneumatic Machinery Co., St. Louis, which will enable it to greatly increase its line of sand-blast equipment.

Tungsten Prices Firm.—The demand for tungsten has been more active and prices while firm are unchanged. Wolframite is quoted at $23 to $25 according to grade and Scheelite at $26 per unit on the basis of 60 per cent. metal and 30c per unit additional up to 65 per cent.

Acadia Coal Co. Staff Change.—There have been several changes in the staff of the Acadia Coal Co. Neil McLean formerly manager at the Allan Mine, has been transferred to the Albion, and Rod Campbell, whom he succeeds, takes a position at the Allan. Edward O'Riley, formerly U. G. manager at the Allan, now assumes the position of mine manager. Jas. Mason has been promoted to the position of manager, and is in charge of the new singings at Thorburn.

More Shell Contracts Placed. — The Imperial Munitions Board has promised contracts for 6-inch shells to the owners of plants which hitherto made eight-inch and 9.2 inch shells, but which have been idle since the last contracts for these sizes expired and were not renewed owing to Britain's ability to turn out enough in its own plants. Should the owners of the works thus left idle care to convert the plants, the Board promises plenty of work.

Montreal, Que.—At a meeting held here recently of the Toronto Terminals Co., the following officers were elected: Howard G. Kelly, president; Sir George Bury, vice-president; Harry Phillips, secretary; H. E. Suckling, treasurer; W. H. Ardley, auditor, and J. W. Leonard, general manager. Good progress was reported on the construction of the new Union Station at Toronto, which has proceeded as rapidly as supplies of construction material will permit.

War Contract for Canadian Cottons.—A. O. Dawson, vice-president of the Canadian Cottons, Ltd., Montreal, states that the company has closed an order for 2,000,000 yards of khaki shelter tent duck. The order is said to have a value in the vicinity of $700,000. The company, having received orders from the Canadian Government for this type of material running into considerable volume, which it is claimed has given every satisfaction, was asked by the American Government to submit a sample. This was done and met with approval, with the result that the order was placed.

Dawson, Y.T.—A large production of gold will result from the heavy summer rainfall, according to reports from Nome, Alaska. Traces of platinum deposits in the Dime Creek country, tributary to the Kuyokuk River, on the lower Yukon, are being traced by experts, who said the metal comes from lava fields in the vicinity. A placer strike twenty miles west of Selkirk by a veteran Yukon prospector has resulted in quite a movement to that region. It is estimated that probably 150 claims have been staked on Kitchener and Seymour Creeks and their tributaries.

U. S. Government Let Shipyard Contracts.—Contracts for construction of a Government-owned shipbuilding yard at Hog Island, Penn., and for the construction therein of fifty fabricated steel merchant vessels, were let by the Emergency Fleet Corporation last Thursday to the American International Corporation. These contracts are the first actually signed for the three new plants in which the U. S. Government will have built a large number of fabricated ships. The Hog Island plant will cost slightly less than $20,000,000. The other contracts will go to the Submarine Boat Corporation for a plant at Newark, and to the Merchants' Shipbuilding Co. for one at Chester, Pa.

Large Credit for Imperial Government. It is understood that negotiations to provide a credit of $75,000,000 for Imperial Government purchases of meats, bacon, etc., in Canada are now in progress. The statement of the Minister of Finance, a few days ago, that larger credits to Great Britain would have to be arranged if Canada was to maintain its export trade, was followed at the beginning of the week by a conference between the Minister and representatives of the banks. The $75,000,000 credit, if it is arranged, would probably be spread over a fairly long period, as the resources of the banks are already pretty well taken up with financing the ordinary business of the country, in addition to the special business placed through the Imperial Munitions Board.

Guarantee Interest on Drydock Bonds. The Drydock Subsidies Act, introduced by Hon. Dr. Reid in the Commons at Ottawa, on September 13, differs in one or two respects from the measure as outlined when the preliminary resolution was considered earlier in the session. The most important change provides that the Government may guarantee the interest on bonds issued for drydocks when the expenditure by the builders has reached one million dollars. It was first proposed to require an investment of $500,000 before the Government assisted. The interest to be guaranteed will be up to 4½ per cent. instead of 4 per cent. In accordance with suggestions of the Admiralty the docks are to be 125 feet with a depth over the sills of 38 feet, a slight increase on former specifications.

Toronto Harbor Improvements.—The work of the Toronto Harbor Board for 1917 and 1918 is being confined solely to revenue-producing land in the Ashbridge's Bay harbor industrial area and the inner waterfront. Two hundred and fifty-seven acres have been filled in the former district and 160 acres are now under lease. This is valued at from

$2,000 to $3,000 an acre. Next year the commission intend to fill in about 150 additional acres, so that an asset worth at least about $3,000,000 will be produced by a portion of the $2,000,000 proposed to be expended next year. In addition to the 257 acres already reclaimed, there are 343 acres partially reclaimed. Work has been proceeding on the ship canal, and when the walls of this are complete, filling operations adjacent to it may be carried on. Work is now proceeding on the ship canal in the Ashbridge's Bay area. This runs from the Toronto Bay, north of the eastern gap, 7,500 feet east, and is 400 feet wide. Of the 16,400 feet of wall required 10,000 feet has been constructed.

Forest Fires Destroy B.C. Timber.—An estimate, made by an expert forester who has travelled through the British Columbia regions affected by the recent forest fires, is that $5,000,000 worth of timber was destroyed in Southern British Columbia alone. The loss by reason of the forest fires which have burned in the Alberta forest reserves is not nearly so great, in fact, would be covered, perhaps, by an estimate of $200,000, and this loss was principally in the one great fire which swept the slopes of Crow's Nest Mountain in the Crow's Nest Pass country. The timbers lost are mostly fir, with some tamarack and pine and a few cedar trees.

U.S. to Limit Her Exports.—The United States Government has published a conservation list of materials which cannot be exported except under license. The ruling is intended for Northern European Neutrals but also affects Canada. The list follows: "Acetone; alcohol; aluminum; ammonia salts; ammonia nitrate; anhydrous ammonia; arsenate of lead; arsenate of soda; boiler tubes (iron and steel); butter; carbolic acid (phenol); castor oil and castor beans; chrome nickel, steel; cotton linters; cyanide of sodium; ferromanganese; phosphoric acid; phosphorus; pig iron; potash and chlorate of potash; ferro-silicon; ferro-vanadium; flax, glycerine; iron and steel plates, including ship, boiler, tank and other iron and steel plates half inch thick and heavier and wider than six inches, whether plain or fabricated; mercury salts; nitrate of soda; nitric acid; nitric salts; potassium salts; saltpetre; scrap iron; scrap steel; searchlights and generators (suited for army or navy use); sodium sulphite; spiegeleisen; stearine and stearic acid; steel billets; steel blooms; steel ingots; steel sheet bars; steel slabs; sugar; sulphate of ammonia; sulphur and sulphuric acid; super phosphate; tinplate; toluol; tungsten; wireless apparatus; wheat; wheat flour and wool rags.

Must Use Cylindrical Head Planers.—For the protection of workmen employed in woodworking plants from the loss of a hand in square-head planers, the Minister of Public Works for Ontario has issued an order, immediately enforceable,

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These are the qualities that forced the leading safety and sanitary engineers to pick Puro in preference to all others.
No device can be as efficient that does not contain all these qualifications; and Puro was not tied for first place; Puro was first.
Don't be satisfied with half-way goodness, or makeshift drinking arrangements for your employees.
If the men in your factory must drink, give them a clean drink.
Puro is clean—it does not rust or corrode.
Puro is economical. It allows just the proper amount of cool, clean, fresh water to come through the bubbler. No spurting, no overflowing, no loss. Puro regulates itself. You can attach it in five minutes.
Tell us how many men in your factory and your water pressure in pounds—
We'll tell you just what it will cost to "PURO-FY" YOUR WATER SUPPLY.

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Owen Sound Iron Works
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Engineers
Boiler-makers
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Machinists
Tank Work
Smoke Stacks,
Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order

that in all pattern shops throughout the Province cylindrical head planers must be substituted for the square-head type so generally in use. If a workman's hand is caught in the cylindrical machinery only the tips of the fingers are severed, while in the square-head planer the whole hand is usually drawn into the machine and destroyed. The new order will eventually be extended to all woodworking factories in which the square-head planer is in use.

British Government Take Over Norwegian Freighters.—The steel vessels now being built in Vancouver for J. E. Knudson, representing large Norwegian shipbuilding interests close to the Norwegian Government, have been taken over by the British Government, according to notice received by the local construction firm. The Vancouver firm has a contract for eight boats. The keel of the first is laid and the boat is now in the frame, and is partially plated. It is expected the first boat will be completed in the fall.

Shipping Board Will Requisition Ships.—It is stated in Washington, D.C., that the Shipping Board and the Emergency Fleet Corporation will take control of all American shipping built, building and contracts, except small vessels unsuitable for the Government needs. When the request for $500,000,000 additional appropriation is presented to Congress, it will be shown that a small part will be applied to shipbuilding. The money the Board already has available is nearly sufficient for the building program. The $500,000,000 will be utilized for the most part in requisitioning practically every American ship over 2,500 tons now sailing the seas.

N. Y. Shipping Board Will Fix Rates.—An independent scheme of fixing trans-oceanic freight rates was worked out by the Shipping Board. Bainbridge Colby, of New York, the new member, received complete charge of rate-making. It was said the Board will fix the rates to be charged by all American vessels without regard to the rates charged on ships under the flags of the allied countries or on neutral ships. Efforts to pool all allied shipping undertaken in conference with the British War Mission have failed so far. The Board has flatly declined to surrender in any degree its control of American shipping.

B. C. Construction Programme.—British Columbia has a programme of construction, mostly of an industrial nature, which will necessitate the expenditure of nearly $60,000,000. Work to the value of $40,000,000 is now in progress or contracted for in the province. Of this sum, $27,000,000 is for the newly-established shipbuilding industry. About $30,000,000 is being expended on railway terminals, piers and wharves, dredging operations, sewer construction, cold storage plants, factories, mills, schools, churches, residences and stores. Of this sum, $13,500,000 is being expended in Vancouver, $8,500,000 in Victoria, and over $7,000,000 in other parts of the province.

CATALOGUES

Nautical Instruments.—John Lilley & Sons, Ltd., London and North Shields, England, have issued a descriptive list of specialties in nautical instruments, such as chronometers, compasses, sextants, sounding apparatus, semaphores, etc. Each specialty is illustrated and briefly described. The instruments shown in the catalogue are stated to be only a selection from stock and are principally the company's special patterns.

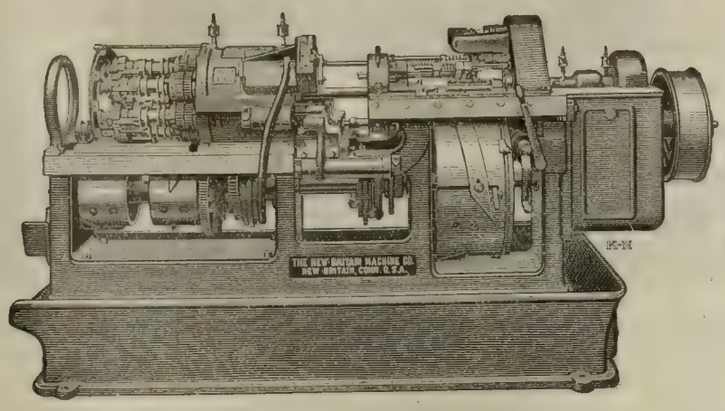
Centrifugal Pumps.—Bulletin No. 7251 dealing with multi-stage centrifugal pumps made by the A. S. Cameron Steam Pump Works, New York. The bulletin contains specifications covering the principal features of the Cameron pump while the improvements which have been made at various times are discussed in detail. The illustrations include pump details and cross-sections. The concluding page contains some useful hydraulic data.

Heavy Duty Lathes made by the Bridgeford Machine Tool Works, Rochester, N.Y., are described and illustrated in a series of loose leaf bulletins recently issued. The machines described include 26 inch to 50 inch geared head lathes, a 26 inch cone driven lathe, double head and centre drive axle lathes and a heavy duty plain turning machine etc. A brief specification given of each lathe and the principal dimensions and weights are also included.

Hoisting Machinery.—The Shepard Electric Crane and Hoist Co., Montour Falls, N.Y., have recently issued a Handbook of Hoisting Machinery for Industrial Works 1917. The handbook which contains 130 pages 8 x 4¾ in., consists of a series of bulletins bound together in loose leaf form, illustrating and describing an extensive line of hoisting machinery and giving the capacities, speed and prices, etc., for the various sizes of equipment. The handbook is intended to present in clear and exact form such data as will enable engineers and managers conveniently to consider the application of hoisting and conveying units to the various uses for which they are adapted.

BOOK REVIEW

Homestead Map.—A publication which should prove of considerable interest to the prospective settler to Western Canada, has just been issued by the Natural Resources Intelligence Branch of the Department of the Interior, Ottawa, Ont. It is known as the "Homestead" Map and shows graphically the exact location of each quarter-section which is still available for entry under the free Government offer of 160 acres. The map has been published in four separate sheets, one each for Manitoba, Saskatchewan, Northern and Southern Alberta, respectively, and is available for free distribution in individual sheets or in complete sets.



Screw Machine Queries:

"WHAT ABOUT LUBRICATION?"

THE system for distributing oil to the tools on the "New Britain" Six-Spindle Automatic Screw Machine is designed to eliminate much of the exterior piping heretofore common to all screw machines.

Oil is conveyed from the pump by means of a flexible metallic tube through an opening in the under side of the tool slide into a machined chamber at the centre surrounding the driveshaft bushing. From radially drilled holes connecting with this chamber the oil is tapped off at the circumference through short tubes to the individual tools.

This construction adds materially to the convenience of the operator as well as to the simplicity of appearance of the machine.

The pump is driven by spur gear from indexing shaft, which runs at constant speed regardless of speed of cam shaft or spindles. This insures a uniform supply of oil to the work under all conditions.

Sight feed oilers on top of spindle cylinder housing supply oil to the spindles when in the upper position, each bearing being lubricated in turn as the cylinder indexes. The danger of core dust and sand working into the bearings, which is common to many types of screw machines, is eliminated from the "New Britain" by machining the spindle carrier all over.

Why not acquaint yourself with the other advantages of the "Six-Spindle" Automatic? Descriptive bulletin mailed upon request

The New Britain Machine Company

—Automatic Screw and Chucking Machines—

New Britain, Conn., U.S.A.

The next page

is the first page of the Classified Advertising Section. Turn over and look through these pages. Whether you want to buy or sell, employ or be employed, you'll doubtless find there a proposition to interest you. If you don't, tell your wants in a little ad.

CANADIAN MACHINERY

Classified Advertising Section

143-153 University Avenue - Toronto

MARINE

Captain J. D. Warren, pioneer sealer of Victoria, B.C., and owner of the S.S. Beaver, the first steamer to ply the Pacific, died in the above city on September 9, aged 80 years.

Sarnia, Ont.—The tug Fischer, recently sold by the Reids, of Sarnia, to the French Government, has left for Montreal, where she will be fitted for ocean service. The Fischer was built in Toledo in 1896, and was one of the most powerful tugs on the lakes. She has been employed on many big wrecks since 1911. The selling price of the tug paid by the French was $265,000.

For Ocean Service.—Six vessels owned by the Canada Steamship Lines have been taken over, jointly, by the Canadian and British Governments for service. This is as a result of a decrease in shipping caused by ravages of the German U-boat campaign. The ships sold are the H. N. Pellatt, J. H. Plummer, Beaverton, A. E. Ames, Mapleton and Saskatoon.

To Protect Shipyards.—Precautionary measures, designed to protect ships under construction in Canadian shipyards, have been taken by an Order-in-Council. This provides that it shall not be lawful for any owner of a ship, ship's agent, ship broker, who is not a natural-born British subject, to enter or to be upon any shipbuilding premises without the permission in writing of the Minister of Marine and Fisheries. The penalty is a fine not exceeding $500.

Aemilius Jarvis, of Toronto, has been awarded the Special Service Decoration for his patriotic work since the outbreak of war. Mr. Jarvis placed his offices at 103 Bay Street at the disposal of the Admiralty to facilitate the return of British naval reservists, and followed this up with active participation in the recruiting campaign for men for all branches of the British navy. Lieut. "Bill" Jarvis, a son, lost his life at St. Julien; a second son is a member of the C.E.F. The only other decoration of this order conferred upon a Canadian was awarded to Sir John Eaton, whose patriotic efforts are well known.

$20,000,000 Corporation.—A twenty million dollar corporation to operate ships between San Francisco and the Orient, has been formed by seven Japanese, who have amassed fortunes in the shipping boom in the Far East, according to Teiji Ishida, president of the concern, who was in San Francisco to-day to establish an American office.

One of the directors of the concern, said Ishida, is Chozo Ito, who five years ago was a mechanic in a Tokio shipbuilding yard, and is now considered the richest man in Japan.

It is planned to make Manila a port of call to relieve the shipping conditions there, where it was said millions of dollars worth of hemp, copra, rice and other commodities are piled on the docks waiting shipment.

CLASSIFIED ADVERTISING SECTION

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

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A PAYING PROPOSITION FOR RAILROADS or manufacturers. Wish to sell our Canadian rights with fixtures. Address Frank Bayless, 311 Fair Street, Springfield, Ohio. c9m

FOR SALE — 1 LEES-BRADNER THREAD miller, equipped for threading nose and base of 6" shells. Apply The Hayes Wheel Co., Chatham, Ontario. c9m

SECOND-HAND 26" NEWTON TYPE COLD saw cutting-off machine, arranged for motor belt drive and complete, with or without motor. Price $600.00, cars Sherbrooke. MacKinnon, Holmes & Co., Limited, Sherbrooke, Quebec. c10m

ONE ARMINGTON & SIMS 10" x 12" HIGH speed engine, belted to one Westinghouse Electric Mfg. Co. direct current generator, 40 K.W., 550 volts, 75 amps.; speed 910 r.p.m.; also 40' 0"-10" double leather belting; all in good condition. Armstrong, Whitworth of Canada, Limited, Montreal, Que. c6m

FOR SALE—1 NEW 25 H.P. HOR. TUBULAR boiler, 1 second-hand 12 H.P. hor. tubular boiler, tested to 150 lbs.; 1 second-hand 50 H.P. loc. boiler; 1 second-hand Leonard 12 x 12 high speed engine; 1 second-hand 500-lb. belt-driven Beaudry power hammer, only in use two months; in perfect condition. Canadian Engineering & Mfg. Co., 128 Bleury St., Montreal, Que. c9m

HYDRAULIC EQUIPMENT FOR SALE.—The equipment listed below is in first-class shape having only been used about three months. Blue prints and specifications and foundations drawings will be furnished. 2—14 x 12 x 5" Fairbanks-Morse duplex steam driven high pressure pumps at 80 gals. per minute capacity each against 600 lbs. pressure, steam pressure 150 lbs. 1—Weighted Accumulator good for 1000 lbs. per sq. inch, 16" diameter, plunger 11 ft. stroke with squeezing water cushion and wooden outside bumper blocks. The tank for the weighing material surrounding the cylinder is 10' 7" in diameter and 11' 0" high. 1—Return Suction Tank for above pumps and accumulator. Height, 9' 0", diameter 8' 0". Capacity, 2700 Imperial gallons. This equipment can be shipped immediately and is open for inspection at the company's plant. Prices on application. The Canadian Copper Company, Copper Cliff, Ont. c8m

PATTERNS

THE BRANTFORD PATTERN WORKS ARE fully equipped to manufacture patterns, large or small, from blue prints, sketches or sample castings. Expert management. Prompt service. Prices reasonable. Brantford Pattern Works, 49 George St., Brantford, Ont. c13m

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H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition product equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto

SITUATIONS WANTED

TOOL MAKER — ACCURATE, GOOD draughtsman desires responsible position. Box 330, Canadian Machinery. c14m

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States will be open for position as superintendent or general foreman, July 15th. A1 references. Address Producer, Box 321, Canadian Machinery. c3m

MACHINE SHOP FOREMAN DESIRES change as shop foreman or master mechanic. Acquainted with scientific management; 26 years' experience. Box 328 Canadian Machinery. c11m

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States wants position as superintendent or general foreman. Large or small shop on ammunition or machinery; A1 references. Address Box 327, Canadian Machinery. c9m

WORKS MANAGER OR GENERAL SUPERintendent open for engagement—28 years' experience as machinist, toolmaker, inspector, superintendent of tool-making and tool-designing, experimental and development work, heat-treating and testing of steel in raw and finished state; shop superintendent, works manager. Experience has been on rifle work, electrical work, typesetting machines, lock-making and bridge-work. Correspondence solicited, and can furnish good references. Address Box 332, Canadian Machinery. c14m

WANTED

WANTED—SMALL SECOND-HAND POWER press, in good condition. Hosmer Stamping & Die Works, Ltd., 831 Dundas St., Toronto, Ont. c13m

WANTED—SECOND-HAND POWER SQUARing shear to cut No. 10 gauge steel up to 24" wide. Must be in good working condition. Packard Electric Company, St. Catharines, Ont. c4m

SITUATIONS VACANT

MAN WANTED TO ACT AS SUPERINTENDent of a fast growing die and stamping plant in City of Toronto. Box 329, Canadian Machinery. c12m

NIGHT SUPERINTENDENT FOR SHELL MAchinery plant in Western Canada; knowledge of four point five shell and good all-round experience essential. Write, stating qualifications, salary and references, otherwise application will not be considered. Box 325, Canadian Machinery. c6m

FOREMAN WANTED—FOR SHOP IN CENtre of Toronto, with up-to-date equipment, employing about thirty men, doing jobbing business and making fine special machinery and tools. When applying state experience and give references, also wages expected. Only first-class men need apply. Box 326, Canadian Machinery. c8m

FOR SALE

4—No. 2 Foster Plain Head Screw Machines and 2—No. 3 Foster Friction Head Screw Machines all completely equipped with air cylinders and air chucks suitable for use on No. 80 Time Fuse Bodies. These machines have never been used. Also one Graduating Machine made by the American Ammunition Co.

For full particulars apply the

Holden Morgan Thread Miller Limited

Toronto, Ontario

c14m

FOR SALE

4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 13 B. & S. Automatic Gear Cutter.

1—30" Newark Automatic Gear Cutter.

1—5 x 48 Pratt & Whitney Plain Grinder.

1—No. 2 Bath Universal Grinder.

1—12 x 60 Modern Plain Grinder, new.

2—Lees-Bradner Thread Millers.

1—30 x 30 x 8' Powell Planer, new.

Brownell Machinery Co.
Providence, R. I.

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15" three-jawed chuck.
1—Lathe, 28" swing, 8' bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22" Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15" three-jawed chuck.
1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 24" wheel.
1—Lathe, 14" swing, 6' bed.
2—Ford Smith Shell Grinders, complete.
1—17" LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
1—16" Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
1—Double End Painting Machine, with ¼ h.p. motor.
1—Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—5 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
Sherbrooke, Que.

Single End Punch

1—30" Throat Ironton Single End Punch and Shear, cap. ¾ through ¾. Rectangular gear drive.

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Allis-Chalmers Gates Works Rock and Ore Crusher, size "4K"; receiving opening 10" x 30"; discharge, 18" x 24"; capacity 20-40 tons per hour; weight, 22,000 lbs.

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Classified Advertising Section
143 University Ave., Toronto

H. W. PETRIE of MONTREAL Limited Montreal, Que.

LIST OF NEW AND USED MACHINERY IN STOCK FOR IMMEDIATE SHIPMENT

ENGINE LATHES

New 13" x 5' Lancaster Sgl. B.G., Geared Feed.
New 15" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 16" x 6' South Bend, Sgl. B.G., Stan. Change Gears.
New 15" x 7' Oliver Dbl. B.G., Q.C. Gear, Oil Pump and Pan.
New 16" x 24" x 10' South Bend Gap Sgl. B.G., Stan. Change Gears.
S.H. 17" x 8' Greaves Klusman Sgl. B.G., Geared Feed.
New, 18" x 8' Greaves Klusman Dbl. B.G., Geared Feed.
New 18" x 8' Giddings & Lewis Dbl. B.G., Geared Feed.
New 18" x 8' Stevens Sgl. B.G., Standard Change Gears.
New 18" x 8' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 18" x 10' Muller Sgl. B.G., Standard Change Gears.
New 18" x 12' South Bend Sgl. B.G., Stand. Change Gears.
S.H. 20" x 10' Flather Sgl. B.G., Standard Change Gears.
S.H. 36" x 10' Fay & Scott Sgl. B.G., Stand. Change Gears.

HEAVY DUTY MANUFACTURING LATHES

New 20" x 8' Petrie Heavy Duty Manufacturing Lathes.

TURRET, SPEED AND BRASS LATHES SCREW MACHINES

New 13" x 7' Putman Speed Lathe.
S.H. 15" x 5' 6" Fox Brass Lathe with Chasing Attachment.
S.H. 30" x 10' Vilter Lathe, Friction B.G., Geared Feed with 13" Hex. Power Feed Turret.

DRILLS

New 20" Excelsior, Back Geared Wheel Lever, Power Feed.
New 20" Silver, Back Geared Wheel Lever Power Feed.
New 14" Leland Gifford Single Spindle Sensitive.
S.H. 14" Avey Spingle Spindle Sensitive.
S.H. 14" Foote-Burt Four.
New No. 1 Emco Bench Single.

HACK SAW MACHINES

New Peerless High Speed.
New No. 1 Rapid.

GRINDING AND BUFFING MACHINES

New 20" Ford Smith Water Tool Grinder.
New 18" Ford Smith S.O. General Purpose Pedestal Grinder.
New 16" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. General Purpose Pedestal Grinder.
New 12" Ford Smith S.O. Combination Grinder and Buffer.
New 12" Ford Smith S.O. Buffing Machine.

MISCELLANEOUS

S.H. No. 22 Garvin Vertical Milling Machine.
S.H. No. 0 Burke Hand Milling Machine.
New 1¼" National Bolt Cutter with Lead Screw Attachment.
New No. 1 Grabo Metal Saw Table.
New D4 Rock River Slitting Shear.
New No. 4 Chicago Steel Bending Brake.

Telegraph, Phone or Write for Prices and Further Particulars

H. W. PETRIE of MONTREAL
LIMITED
MONTREAL, QUEBEC

PETRIE'S LIST

Of New and Used Machine Tools Stock for IMMEDIATE DELIVERY

TURRET LATHES AND SCREW MACHINES.

15" x 5½' American, fox.
16" x 5½' MacGregor, D.B.G. (3)
16" x 6' Pratt & Whitney, turret.
20" x 7' Fay & Scott.
22" x 8' Pratt & Whitney.
24" x 10' Conradson, D.B.G.
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
2" x 24" Stevens Screw Machines (2).
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES.

13" x 6' Filsmith, D.B.G.
14" x 6' Lodge & Shipley.
15" x 8' Sebastian, back geared (2).
16" x 8' McDougall, back geared.
18" x 6" New Haven.
18" x 8' C.M.C., double back geared.
18" x 10' Putnam, back geared.
20" x 8' Fifield, back geared.
21" x 8' Bawden, heavy duty (3).
24" x 11' Pond, back geared.
30" x 10' Ames, back geared.
31" x 16' Fifield, back geared.
18" x 32" x 12' C.M.C. gap.
24" x 40" x 20' Dundas, gap.
28" x 50" x 24' Bertram, gap.

DRILLS.

13" Perfect, 2-spindle.
16" Barr, sliding head.
18" Buffalo, post drill.
20" Perfect, lever feed.
20" Silver, back geared.
22" Barnes, back geared.
24" Kerkhoff, sliding head.
40" Bickford, back geared.
46" Allfree, upright.
64" Canedy-Otto, wall radial.
No. 10a Baush, 16-spindle.
D-1 Colburn, heavy duty.

GRINDERS.

No. 1 Cincinnati, universal tool.
No. 2 Landis.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
24" Barnes, wet tool.
20" Gardner, disk.

IRON PLANERS.

20" x 20" x 5' Bertram.
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Sellers, 4 heads.
40" x 40" x 12' New Haven, power feed.

MILLING MACHINES.

Bertram, plain.
Brown & Sharpe, power feed, plain.
Van Norman, bench.
No. 2 Ford-Smith.
No. 4 Fox, universal.
No. 6 Whitney, hand feed.

SHAPERS.

16" Canada Mach. Corp.
16" Queen City, back geared.
24" Bertram, back geared.
24" Gould & Eberhardt.
30" Morton, draw cut.

MISCELLANEOUS.

6" and 12" Racine Hack Saws.
4" and 6" Robertson Hack Saws.
6" Kennedy Cutting-off Machine.
12" Hall Pipe Machine.
No. 2 Colburn Keyseater.
No. 5 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 2 Bliss Foot-power Press.
No. 3 West Tire Setter Banding Press.
No. 3 Goldie & McCulloch Banding Press.
Brown-Boggs Punching Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
7' Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.
FRONT STREET WEST, TORONTO

FOR SALE

The following used machinery, guaranteed to be in first-class condition, at lowest prices:—

1—16" x 8' Hendey Engine Lathe.
1—18" x 10' Cisco Engine Lathe.
2—LeBlond Heavy Duty 19" x 8' Engine Lathes.
1—Fay Scott Engine Lathe, 24" x 8', with extra turret.
1—LeBlond Engine Lathe, 17" x 6'.
2—Oliver 16" x 7' Double Back-geared Engine Lathes.
1—14" x 7' Niles Engine Lathe.
1—16" x 8' Butler Engine Lathe.
1—Boring Lathe for 9.2 or 12" shells.
1—Turning Lathe for 9.2 or 12" shells.
19—Jones & Lamson 3 x 36 Flat Harkness Turret Lathes.
2—No. 50 Foster Turret Lathes, 16" swing.
4—John Hall & Sons No. 4 Cutting-off Machines.
5—10" x 36" Norton Grinding Machines.
1—6" x 32" Norton Grinding Machine.
1—Wilmarth & Morman Wet Tool and Twist Drill Grinder.
1—Banfield Plug Milling Machine.
2—Otis-Fensom Bench Thread Millers.
1—Cincinnati Universal Milling Machine, No. 3.
1—Brown & Sharpe Milling Machine, No. 1B.
1—Surface Grinder.
1—Gardner Grinder, No. 4, complete with discs.
1—No. 1 Racine Rapid Hack Saw.
1—Gould Triplex Hydraulic Pump, Fig. 997, single acting, 1¼" x 6".
1—Jno. Steptoe Shaper, 20" x 24" travelling head.
1—Cincinnati Bickford Drill.
1—Holden-Morgan Marking Machine.
2—Northern Electric Co.'s Electric Soldering Irons.
1—1/15 H.P. General Electric Motor.
1—Brown-Boggs Nosing Press, No. 320.
1—Hisey Wolff Grinder, Portable Electric.
1—Dumore Grinder, Portable Electric.
8—Mech. Engr. Co. Fuel Oil Burners.
4—Mech. Engr. Co. Fuel Oil Burning Furnaces, 24" x 16".
1—Gilbert & Barker Fuel Oil Burning Furnace, 24" x 16", C-15.
6—Gilbert & Barker Fuel Oil Burners, 2".
2—Gilbert & Barker Positive Pressure Blowers, 3".
2—Canadian Buffalo Forge Co. Blowers, No. 6, 30".
1—Portable Blacksmith's Forge.
1—Circular Banding Press, suitable for 18-pdr. shells.
4—Shore Instrument Co.'s Scleroscopes.
3—Resin Pots, Simplex Electric Co.'s make.
3—Chapman Double Ball-bearing Trucks.
2—Oil Quenching Tanks, 8' long x 3' 4" wide x 2' 6" deep.
1—Bury Air Compressor, 6 x 8.
2—Brown Instrument Co.'s Pyrometers.
1—Thwing Pyrometer.
3—Fairbanks 25-lb. Scales.
1—Clipper Belt Lacer.
1—International Time Clock for 200 men, with racks for tickets.
Also small tools, rotary pumps, vises, pulleys, belting and shafting, etc., etc

All can be inspected at Midland, Ontario

Prices on application to

Zenith Coal & Steel Products, Limited

MONTREAL—402 McGill Building
TORONTO—1410 Royal Bank Bldg.

Eastern Machinery & Equipment Co., Inc.

319 COMMERCIAL TRUST BUILDING PHILADELPHIA, PA.

NEW TOOLS FOR IMMEDIATE DELIVERY.

4—12" x 36" Bridgeport Grinders.
1—2½ x 2" Wm. Sellers Tool Grinder.
30—18" x 9' Turning and Boring Lathes.
3—26 x 14' Am. Patt. Eng. Lathe.
3—Double head Sullivan Grinders.
1—32" x 12' Pittsburgh Engine Lathe.
1—20" Ohio Shaper.

USED MACHINERY
ENGINE LATHES.

4—New 36" x 25' Wickes Engine Lathes, quick-change gear, double back gear.
8—30" x 10' American Gear head A-1.
5—20" x 8' Lodge & Shipley, geared head, q.c.g.
1—20" x 10' Bullard.
1—24" x 6' Bullard.
3—24" x 14' American.

TURRET LATHES.

9—18" x 6' Warner & Swasey Hexagon Turret, geared friction head.
36—Potter & Johnson 6A Automatic Turret Machines.
3—3 x 36 Jones & Lamson Flat Turret.
2—2¼" x 24" Jones & Lamson Flat Turret, bar equipment. Full set Turret Tools.
9—26" Gisholt 12" Collet chuck 6½" hole in spindle threading lathe.
3—26" Putnam heavy duty lathe.
—14" x 6' Lodge & Shipley Turret. Backgeared.
5—24" Gisholt 2-step cone, 6¼ H.S.

BORING MILLS.

1—Binsse Horizontal Boring Mill, 3" bar.
6—66" swing Bement-Miles Tire Turning Mills, two swivel heads—15½" under rail.
1—37" Baush Boring Mill, 2 heads, good as new.
1—Cylinder boring mill, capacity of 24" diam. to 96" diam. 10' long.
Tool equipment included, good as new.
1—42" Bullard Boring Mill (2) heads.

MILLING MACHINES.

1—No. 3 LeBlond Plain Miller, table 13½ x 58¼.
1—No. 2 Kempsmith, table 10' x 45".
1—24" x 8' Beaman & Smith Open Side Slab Miller, with two vertical spindles.
1—No. 1½ Universal Milling Machine.

GEAR CUTTERS.

1—24" Fellows Gear Shaper.
2—36" Fellows Gear Shapers.

SCREW CUTTING MACHINES.

1—2" Cleveland automatic.
1—No. 55 National Acme 4 spindle, good as new.
1—No. 54 National Acme 4 spindle, good as new.

SLOTTERS AND SHAPERS.

1—9" Bement Slotter.
1—12" Bement Slotter.
1—20" Wharton Slotter.
1—20" Gould & Eberhardt Shaper. B.G. Vise. C.S.
1—16" Steptoe Shaper.

GRINDERS.

8—12" x 36" Bridgeport.
1—1½" Full Universal Landis Machine.
1—No. 13 Brown & Sharpe Universal and Tool Grinder. Full equipment.
No. 1½ Universal Cutter and Reamer Grinder.
1—28" Bridgeport Face Grinder, with magnetic chuck.
5—Fisher Profile Grinders for Cutters.
1—No. 28 Brown & Sharpe Plain Grinder, 17" x 96".
5—No. 6 Std. Universal Tool & Cutter Grinders.

DRILL PRESSES.

1—24" Bickford Upright back gear sliding head lever and wheel feed drill.
1—4' Bickford Radial, with Tapping attachment, motor drive, with motor.

GOOD USED EQUIPMENT

OVERHEAD TRAVELING CRANES

20-Ton, 56' 3" span, three motor, 110 volts, D.C.
25-Ton trolley, three motor, 220 volts, D.C.
10-Ton, 40' span, 80' lift, three motor.
5-Ton, 47' 0" span, three motor, 220 V., D.C.
Crane Motors, 10 and 4½ H.P., 220 V., D.C.
10-Ton hand crane, 55' 0" span.
20-Ton hand crane, 29' 6" span.
2-Ton hand cranes, 22' span.

PUNCHES AND SHEARS

Lever Shear (double), cap. 2" sq.
28" throat (single), cap. ⅞x⅞" (belt).
48" throat (single), cap. 3x1¼" (steam).
16" throat (single), cap. 1½x1½ (belt).
36" throat (single), cap. ⅞x⅞" (belt).
15" throat (single), cap. ¾x½" (hand).
10" throat (double), cap. 1½x1" (belt).
Squaring Shear, 53" cap., 14 gauge.
Angle Shear (double), cap. 6x6x¾" (belt).
Plate Shear (Univ.), 18" blade, cap. ¾".
Rotary splitting, 36" throat, cap. ½".
Rotary bevel, 5" throat, cap. ½".
Coulter & McKenzie, cap. 3x½", spring steel.
Guillotine, Perkins, No. 6, cap. 2½" sq.
Butterfly shear for light scrap.

MISCELLANEOUS.

Ajax Bolt Header and Upsetter, 2½" cap.
Acme Bolt Header and Upsetter, 1½" cap.
Bulldozer, No. 12 Ajax, 30" stroke.
Bending Roll, 6', drop end, 6½ and 8" rolls.
Lathe, 24"x10' American, latest.
Grinder, No. 10 B. & S. Plain.
Grinder, No. 13, B. & S. Universal and Tool.
Rotary Planer, 36", Cleveland No. 2.
Saw, cold, 26" blade, 48" travel.
Press (trimming) No. 11 Perkins, 16,500 lbs.
Rolling Mill, 1 stand, 2 high, 30" bet. housings.
First-class condition—quick shipments.

McCoy-Brandt Machinery Co.

Office and Warehouse:
216-218 Penn Ave., Pittsburgh, Pa.

Machinery, Bar Stock, Twist Drills, Dies & Taps For Sale

MACHINE TOOLS.

5—Rickert-Shafer Vertical Tapping Machines (used).
1—Power Hack Saw (used).
1—No. 1 Sheldons Exhauster.
1—Stewart Gas Furnace (used).
1—No. 200 Oil Extractor (new).
6—No. 4 Smurr & Kamen Screw Machines, Auto. Chuck, W.F., B.G. (used).

BAR STOCK.

33,000 lbs. 1⅜" Round C.D. Screw Stock.
1,500 lbs. ¼" Round C.D. Screw Stock.

TWIST DRILLS (Straight Shank)

48—13/16" Left-hand, high speed steel.
18—21/32" Right hand, high speed steel.
36—41/64" Left hand, high speed steel.
12—17/32" Right hand, high speed steel.
108—33/64" Right hand, high speed steel.
84—33/64" Right hand, carbon steel.
191—13/32" Right hand, carbon steel.
59—¼" Left hand, carbon steel.
36—B Right hand, carbon steel.
71—No. 1 Left hand, carbon steel.
48—No. 4 Right hand, carbon steel.
161—No. 6 Right hand, high speed steel.
61—No. 25 Left hand, carbon steel.
50—No. 26 Right hand, high speed steel.
200—No. 27 Right hand, carbon steel.
240—No. 45 Right hand, high speed steel.

DIES AND TAPS.

13—No. 5B Modern Opening Dies (used).
16—Set 1.998"-14 Whitworth Chasers for above heads (new).
4—No. 4B Modern Opening Dies (used).
12—Set 1⅜"-14 Whitworth Chasers for above.
10—No. 4 Manufacturers Equipment Co. Collapsible Taps (used).
15—Set 1.378"-14 Whitworth Chasers for above taps.

The Packard Fuse Co., Ltd.

St. Catharines, Ont. c 13m

The Cost is Trifling

It will cost you very little to adequately tell your wants in this section. Send in your copy to-day for next week's issue.

CANADIAN MACHINERY
Classified Advertising Section
143 University Avenue, Toronto

For Quick Sale

PLANERS.

50" x 50" x 18' NEW HAVEN, two heads on cross rail, one extension head.

36 x 36 x 14' POND, two heads.

36 x 36 x 12' GRAY Planer.

30 x 30 x 8' CINCINNATI, two heads.

30 x 30 x 8' OHIO, one head.

24 x 24 x 6' LODGE & DAVIS.

36 x 36 x 12' DETRICK & HARVEY Open Side Planer, one head on cross rail, one side head.

LATHES.

New 24" STEINLE, turret chucking equipment.

New 36" x 24' BRADFORD, triple geared.

38" x 14' FAY & SCOTT, triple geared, quick-change gear.

40" x 18' PITTSBURGH, triple geared, quick change.

36" x 22' NEW HAVEN, triple geared.

MISCELLANEOUS.

84" BICKFORD Vertical Boring Mill, two swivel heads.

42" NILES Boring Mill, single pulley drive, two swivel heads.

No. 3 ROCHESTER Horizontal Boring, Drilling and Milling Machine, 3½" bar.

New NATCO Multiple Spindle Drill, eight 1¼" spindles.

2—48" x 10" GOULD & EBERHARDT Automatic Gear Cutters, practically new.

No. 2 LAPOINTE Broaching Machine.

New No. 3H LEBLOND Universal Miller, heavy duty, cone type.

New No. 2H LEBLOND Universal Miller, heavy duty, cone type.

New GOULD & EBERHARDT Continuous Vertical Milling Machine.

A. R. WILLIAMS MACHINERY CO., LIMITED
64 Front Street West **Toronto, Ontario**

"One insertion of this ad will do"

We receive from three to four ads a month from the firm who told us this when sending in their last ad. So you see they **know** what the Classified Advertising Section can do for them.

There is no reason why it won't do the same for you if you're proposition is of interest to our readers.

Canadian Machinery
Classified Advertising Section
143 University Avenue, Toronto, Ont.

RIVERSIDE Machinery List

We Own Every Tool Offered

ENGINE LATHES.

1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—22 x 14 Putman Standard Engine Lathe.
1—22 x 10 Reed Standard Engine Lathe.
1—22 x 8 Reed Standard Engine Lathe.
3—18 x 8 New Springfield Engine Lathes.
1—18 x 6 Jones & Lamson Standard Engine Lathe.
1—16 x 8 New Springfield Engine Lathe.
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.

TURRET AND SCREW MACHINES.

2—No. 6-A Potter & Johnston Automatic Lathes.
1—2¼ x 24 Jones & Lamson Flat Turret Lathe, S.G.H.
1—2 x 24 Jones & Lamson Flat Turret Lathe, cone head.
1—No. 4 F. G. H. Foster Hand Screw Machine.
1—No. 4 Smith & Rahlen Hand Screw Machine.
1—No. 5 Pierson F. G. H. Hand Screw Machine.
4—New 14" Pierce Turret Lathes.
2—New 1 x 8 Pierce Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND GRINDERS.

1—No. 2 Hendey Plain Milling Machine.
3—New No. 1½ American Plain Milling Machine.
1—No. 13½ Garvin Plain Milling Machine.
1—No. 6 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drilling Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
4—New No. 0 Burke Bench Mills.
1—No. 2½ Bath Universal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.
1—Miami Valley Universal Cutter Grinder.

DRILL PRESSES.

1—5' Mueller Plain Radial Drill, old type.
1—20" Baker H. D. Drill.
2—2" Buffalo Plain Drill Presses.
1—3-spindle 8" overhang Henry & Wright High speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.
3—12" Leland & Gifford High Speed Bench Drills.

SHAPERS AND PLANERS.

1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
2—16" New Springfield B.G. Crank Shapers.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS.

1—Waterbury Farrel O.B.I. Press, geared.
1—No. 10 Perkins Drawing Press.
5—No. 2-W Bliss Wiring Presses.
1—830-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—25-lb. Fairbanks Belt Hammer.
1—25-lb. Bradley Helve Hammer.

AIR COMPRESSORS.

1—16 x 18 x 12 Union Steam Pump Co. Steam Driven Air Compressor.
1—8 x 6 Westinghouse Steam Air Compressor.
1—10 x 10 Clayton Belt-driven Air Compressor.
1—8 x 8 Fairbanks-Morse Electrical-driven Air Compressor.
1—8 x 8 Gardner Single Belt-driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt-driven Air Compressor.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machine tools, both large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

If any advertisement interests you, tear it out now and place with letters to be answered.

IMMEDIATE DELIVERY

DRILLING MACHINES

Leland H.S., B.B., bench type.
No. 1½ Knight Driller and Miller.
32" Hamilton, s.h., b.g., p.f.
32" W. F. & J. Barnes, s.h., b.g., p.f.
20" W. F. & J. Barnes, 4 spindle.
No. 11 P. & W. Multiple, 10 spindles.
3' W. E. Gang Plain Radial.
3½' W. E. Gang Plain Radial.
4' Mueller Plain Radial.
Pawling & Harnischfeger Horizontal Driller.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. automatic.
30" x 9" G. & E. auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3—26" B. & S. for spur.
36" Walcott for spur.

GRINDERS

Yankee Drill.
No. 1-½ Cincinnati Cutter and Tool.
No. 2 Woods Universal Cutter and Tool.
No. 23 B. & S. Gear Cutter.
No. 1 Brown & Sharpe Universal.
14" x 20" B. & S. Plain.
Garvin hole grinder.
Gisholt tool grinder.
No. 5 Diamond water tool.
No. 16 Gardner disc grinder.
No. 24 Gardner disc grinder.

LATHES

13" x 5' P. & W., c.r., taper.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
18" x 8' L. & S. pat. head, c.r. taper.
18" x 10' Fitchburg, c.r.
18" x 12' Barker, c.r.
20" x 14' Blaisdall, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
36" x 20' American, t.b.g.
36" x 22' New Haven, t.b.g.

PLANERS

24" x 24" x 4' Gray, one head.
24" x 24" x 8' Cincinnati, one head.
26" x 26" x 8' Pease, one head.
30" x 30" x 8' Woodward & Powell, one head.
30" x 30" x 8' Cincinnati, two heads.
36" x 36" x 14' Sellers, one head.
40" x 38" x 14' Putnam, one head.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES

No. 1 Foster, Plain, A.C. and W.F.
1" B. & S. Plain.
16" P. & W. Plain.
No. 2 Costello, plain head.
No. 2 P. & W. friction head.
No. 4 Pearson, geared head.
No. 3 Bardons & Oliver, plain head.
⅞" Cleveland, automatic.

TURRET LATHES

No. 22 Garvin.
16" Lodge & Shipley.
25' Niles.
2 x 24" Jones & Lamson.
3 x 36" Jones & Lamson, chucking equipment.
3 x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt turret lathes, taper attachment.

PUNCHES AND SHEARS

No. 3 American Can.
No. 3 Bauroth, O.B.I.
No. 5 Bauroth Geared, O.B.I.
No. 6 N. American Can.
No. 2 L. & A. Angle Iron Shears, 5"x5"x½" (new).
No. 5 L. & A. Double Punch & Shear, ⅝"x⅝", 3"x⅝", 1⅛ rd. (new).
No. 1 L. & A. Multiple Punch (new).
No. 1 L. & A. Horizontal Punch, ½" in 1" (new).

MISCELLANEOUS

No. 0 Mitts & Merrill Keyseater.
50-lb. Bradley Strap Hammer.
¾" Acme Forging Machine.
52" Niles car wheel boring mill.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-ton Yale Duplex Hoist.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., CHICAGO, ILL.

SURPLUS
MACHINERY
FOR SALE

2—3" Hall cut-off machines
1—Lodge & Shipley Turret Lathe, 22" x 10'
1—Lodge & Shipley Turret Lathe, 24" x 10'
2—Libby Turret Lathes, 18"
1—Gisholt Turret Lathe, 18"
2—Gisholt Turret Lathes, 21"
1—Gardner Shell Base Grinder, 4A
1—Ford-Smith Grinder, 20"
2—Landis Traverse Grinders, No. 4 and 12 x 66
1—Symington Band Turn Lathe, 3"
1—3" Stamping Machine
2—Tate-Jones Shell Furnaces
1—16' Rushwarth Plate Planer
1—16' Bertram Plate Planer
1—Coping Machine

Polson Iron Works, Ltd.
TORONTO, ONTARIO

Let them know it's there

In complimenting us upon the results secured from their advertisement in this section, one advertiser said:

> "Of course we would not have sold it without letting people know it was here, that is obvious, and thanks are due you for letting the people know it was for sale."

If you have any old or used equipment for sale, let people know it's there. Your message in Canadian Machinery will be placed before the probable buyers of such equipment.

Canadian Machinery
Classified Advertising Section
143 University Ave., TORONTO

LOOK—HERE THEY ARE

BORING AND TURNING MACHINES—Vertical

1—30" Bullard, one turret head
1—30" Flather, one turret head
1—36" Baush, 2 swivel heads
2—36" B. & S. one turret head, Dec. Delivery
2—42" Colburn, 1 swivel head
1—NEW 42" Gisholt, 2 heads
1—54" Colburn, 2 swivel heads
1—72" Bickford, 2 swivel heads
1—72" Niles, 2 swivel heads
1—84" Niles, 2 swivel heads
1—90" Vertical Cylinder
1—NEW 8' Bickford
1—Niles 10'—16' Extension, 2 heads.

BORING MACHINES—Horizontal

1—No. 2—27" Barrett, 2 facing heads
1—Lucas 2¼" bar
1—Niles 2½" spindle.
1—24" Cleveland, 2½" bar, takes 4' 6", compound table
1—No. 1 Barrett Cylinder Borer, 3¾" bar type.

BULLDOZERS

1—NEW No. 4 Garrison (same as No. 4 Williams White)
1—No. 7 High Speed Ajax 16" stroke
1—No. 9 Williams & White Belt Drive
2—No. 23 Williams & White belt drive
1—No. 26 Williams & White, belt drive.

COMPRESSORS—Air

1—Ingersoll Sargent Duplex, 8 x 14½ x 8"
1—10" x 10" x 10" Single Cylinder Smith-Vaile, Steam Driven.
1—10" x 12" Chicago Pneumatic, belt driven
1—Cincinnati Cross Compound, two stagem, 790 cu. ft.
1—22" x 16" Ingersoll-Rand, motor driven.

CRANES

2—10-ton Electric, 47' span
1—60-ton Niles, 61' span Locomotive 35' boom, standard gaged steam driven.

CUTTING-OFF MACHINES

30—Davis 4½"
3—4" Curtis & Curtis
4—3½" Hall
10—4½" Williams.

DRILLING MACHINES—Radial

2—NEW 2' American cone drive
1—3' Bickford Semi-Universal table
1—3' Bickford, gear drive
3—3' New American, sensitive tapping attachment
1—NEW 3' Mueller, plain speed box drive
1—NEW 3½' Western Drill, 86" circle.
2—4' Mueller Plain, speed box drive
1—NEW 4' Ryerson—belt drive
1—5' Baush Radial; arranged for motor drive
1—5½' American Full Universal
1—NEW 6' Triumph Motor Drive, Sept. delivery.

DRILLING MACHINES—Heavy Duty

4—No. 310 Baker Single Pulley Drive, late type
2—NEW No. 2 Colburn
2—D-3 Colburn, plain Table.

DRILLING MACHINES—Multiple Spindle

4—NEW Leland-Gifford Sensitive Four Spindle
1—14 Spindle Baush, capacity 1" holes, 36" circle
1—No. 30-C Baush 12 spindle, capacity 1⅛" holes, 30" circle.

GEAR CUTTING MACHINES

1—No. 3 Bickett Gear Rack Planer, delivery 60 days
1—No. 3 Brown & Sharpe Auto. Gear Cutter spur
1—No. 3 Barber-Colman Hobber
1—NEW 6" Standard Gear Cutter, spur.
1—10" Gleason Bevel Gear Planer
1—15" Gleason Bevel Gear Planer
1—16" Bilgram Gear Bevel Generator
1—20" Grant-Lee Gear Hobber
1—No. 1 20" Schuchardt & Schutte Gear Hobber
1—22 x 8 G. & E. spur and bevel cutter
1—24" Fellows Gear Shaper
1—24" Becker Brainard
1—24" x 8" G. & E. for spur and bevel
1—NEW Flather, solid Pattern 30" Automatic Gear Cutter.

GRINDERS—Universal, for Cutters, Drills, Reamers, etc.

1—NEW Norton No. 1
1—No. 1 Cincinnati
1—NEW Walker, No. 1 Outfit B
2—NEW No. 2 Osterlein Universal.
1—NEW Walker, No. 2 Outfit K (capacity 9" x 26")
1—NEW Wilmarth & Morman, Style B.K.
8—NEW No. 190 Wells.
1—Gisholt No. 5—12"
1—NEW Le Blond

GRINDERS—Cylindrical—Plain

1—NEW No. 12 B. & S. 8" x 26", Sept. delivery.
20—12" x 24" Modern Self-Contained
2—10 x 30" Brown & Sharpe
1—12 x 32 Landis, rebuilt
6—12" x 36" Modern self-contained, motor or belt driven
2—12 x 42" Landis Self-Contained
6—12" x 48" Modern, self-contained, motor driven
1—NEW 10" x 50" Norton, Sept. delivery
1—10" x 50" Norton
1—14 x 50 Norton
1—16" x 66" Landis with crank grinding
1—NEW 10 x 72" Norton, Plain.

GRINDING MACHINES—Cylindrical—Universal

1—NEW No. 2 Bath, 9" x 20".
1—No. 2 Bath
1—Brown & Sharpe No. 13—8" x 24"
1—NEW No. 2 Walker, 9" x 20"
1—No. 1½ (10" x 37") Landis
1—NEW No. 2½ (10" x 36") Bath
2—NEW No. 3 Modern 13" x 49", Sept. delivery
1—No. 3 (12" x 49") Brown & Sharpe
1—12" x 42" Landis
1—No. 4 Cincinnati, capacity 12 x 72"

GRINDERS—Internal

1—No. 1½ Landis
1—No. 70 Heald
1—No. 75 Heald

GRINDERS—Cylinder

1—No. 60 Heald, single pulley drive

GRINDERS—Profile

1—NEW Cleveland

GRINDERS—Ring

1—No. 299 Heald
1—No. 210 Heald

GRINDERS—Surface

1—No. 1 Diamond, capacity 12" x 12" x 24" automatic
1—NEW No. 1 Wilmarth & Morman
2—NEW No. 1½ Walker's complete
4—NEW No. 2 Reid (same as B. & S.)
1—No. 2 Brown & Sharpe.

HAMMERS—Power—Forging

1—40-lb. Bradley Helve
1—150-lb. Bradley Helve, upright.

HAMMERS—Board-Lift, Drop.

1—E. W. Bliss 800 lbs.
1—No. 4 Standard Machinery Co. 400 lbs.

HAMMERS—Steam Forging

1—350-lb. Bell Single Frame Hammer
1—600-lb. Niles Single Frame
1—18" Morgan & Williams, 600 to 800 lbs., 21" gap
1—NEW 2,000 lbs. Morgan Single Frame
1—3,000 lbs. Morgan Double Frame
1—3,000 lbs., No. 787, Morgan Engineering Co.

KEYSEATERS

2—No. 0 Mitts & Merrill
1—No. 1 Baker Bros.
1—No. 2 Mitts & Merrill.

LATHES—Manufacturing—Not Screw-Cutting

2—NEW No. 3 Harding Bros. Bench Lathes
40—14" x 6' Reed Stud and Bolt
13—No. 3-X, Reed-Prentice, semi-automatic
14—16 x 8 Simplex Single Pulley Drive
3—16" x 6' Fairbanks-Morse, heavy duty
70—NEW Simplex, 16" x 8'
14—REED-Prentice Shell Lathes for 4" or 18 lbs. American shells
22—18" x 8' Battle Creek, heavy duty.
4—20" x 8' Merschon
50—20" x 10' Hindman, high duty.

LATHES—Engine

8" Wade Precision, Sept. delivery
1—14" x 6' Bradford, taper attachment
1—NEW Harding Bros. 15" Precision Lathe, Q.C.G., Page 35, Third Catalogue
3—NEW 16" x 6' Cleveland Tool Room Lathes, complete equipment
1—NEW 17" x 8' National quick-change gears
12—17" x 8' LeBlond, pan bed, quick-change gears
4—(NEW) 18 x 8 Hamilton
4—18" x 10' Lodge & Shipley
3—18" x 9' Chard
1—18 x 10 Hendey quick-change gear, 14" chuck
1—NEW 19" x 8' LeBlond heavy duty
5—20" x 8' Lodge & Shipley, quick-change gear
7—NEW 20" x 8' American Heavy Duty
1—NEW 20" x 10' Cleveland Geared Head
19—NEW 21" x 10' Porter, S.B.G.
5—NEW 22" x 10' Monarch, D.B.G., Q.C.G.
9—22" x 10' Putnam oil pan turrets
1—24" x 14' Lodge & Shipley, patent head
4—24" x 14' American, quick-change
6—24" x 12' Hamilton
2—24" x 12' S. & B.
1—24" x 24' Perkins, single back-geared, raising blocks, to 40", 18" chuck
1—24 x 45 x 22' McCabe, double spindle.
1—26" x 24' New Haven
4—27" x 14' Patent Head, Lodge & Shipley, double back-geared
1—28" x 18' New Haven, single back-geared
1—28" x 18' S. & B.
1—NEW 30" x 14' American Double Back-Geared, Quick-Change
3—NEW 32" x 12' Pittsburg Pattern
8—NEW 36" x 24' Putnam, triple-geared
1—60" x 12' American Gear Head, quick-change
1—71" x 20' Fifield, triple-geared.

LATHES—Turret

9—2¼ x 26" Greenlee Flat Turret Lathes
5—2 x 24" Jones & Lamson
1—3" x 36" Jones & Lamson, geared sliding head
1—NEW 21" Gisholt
1—NEW 24" Gisholt
2—24" Libbey
18—6-A Potter & Johnson.

MILLING MACHINES—Knee Type—Universal

1—New Kempsmith
1—No. 2 Kempsmith, 13" dividing head
1—No. 2 Kempsmith Vertical Attachment
1—No. 2 Kempsmith, back-geared
1—NEW No. 3 Kempsmith
3—NEW No. 3-H LeBlond
1—NEW No. 4 LeBlond, heavy duty, immediate.
1—No. 4 Cincinnati
1—NEW No. 4 LeBlond.

MILLING MACHINES—Knee Type—Plain

1—No. 0 Pratt & Whitney
1—No. 1 Kearney-Trecker
2—NEW No. 1 Kempsmith
2—NEW No. 1½ American back gear
2—NEW No. 2 Rockford
1—No. 3 LeBlond
2—NEW No. 3 Kempsmith
1—No. 4 Brown & Sharpe

MILLING MACHINES—Vertical

1—NEW Bickett, No. 0
4—NEW No. 4-B Becker
2—No. 5 Becker.

MILLING MACHINES—Planer Type

2—Ingersoll Slab Millers, working surface of table 60" x 20"
1—Bement-Niles Heavy Duty Planer Type 24" x 24" x 12'
1—Ingersoll Slab, 15" x 48" cap.
1—No. 33 Becker-Brainard Slab Milling, working surface 7' x 20'
1—No. 2 Beaman & Smith Vertical Spindle, open side.

PLANERS

1—24" x 24" x 6' Gray, one head on cross-rail
24" x 24" x 8' Cincinnati, one head, used three months
1—30 x 30" x 10' Ohio Machine Tool Co., 2 heads
1—30" x 30" x 8' Gale Planer, one head
1—36 x 36" x 12' New Haven, one head
2—NEW 36" x 36" x 12' Woodward & Powell, two heads on cross-rail, one side head. Oct. delivery
1—36" x 36" x 12' Gray, two heads
1—38 x 38" x 14' Ditrick & Harvey Openside
1—40" x 40" x 11' Niles, four heads
1—Gray 42" widened to 56" x 42" x 16', two heads
1—44" x 44" x 10' L. W. Pond, 2 swivel heads
1—50" x 50" x 16' Pond, 2 heads on rail
1—52" x 52" x 16' Betts, 2 heads on cross-rail
1—52" x 52" x 16' Betts, two heads, right angle drive
1—54" x 42" x 16' Gray, 3 heads
1—54" x 42" x 16' Gray; 2 heads on cross rail; one side head.

SCREW MACHINES—Automatic

3—No. 51 National Acme
2—No. 52 National Acme
2—No. 63 National Acme
9—No. 56 National Acme, 4-spindle
1—No. 515 National Acme.
4—1¾" x 2¼" Gridley, 4-spindle
4—3¼" x 4¼" Gridley, single spindle.

SHAPERS AND SLOTTERS.

1—NEW 8½" Betts Heavy Model Vertical Geared Crank Slotter
1—NEW 12" Betts, Belt Drive
1—NEW 16" Springfield
1—16" Motor Driven Rockford
2—NEW 24" Milwaukee
1—NEW Barker 24"
2—27" Smith & Mills, Rack-Geared
1—28" Smith & Mills, Triple-Geared
1—28" Walcott Gear Drive.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 549 Washington Blvd. **CINCINNATI, OHIO** 1018 Union Central Life Bldg. **CLEVELAND, OHIO** 508 Leader News Bldg. **NEW YORK CITY** Singer Bldg.

WRITE OR WIRE OUR NEAREST OFFICE FOR QUOTATIONS
THIS IS ONLY A PARTIAL LIST OF AVAILABLE MACHINES

If any advertisement interests you, tear it out now and place with letters to be answered.

New York's Greatest Stock

(Partial List)

BORING MILLS

52" Bement-Miles Vertical, two heads; motor driven, A.C., 250 volts.
36" Bridgeport Vertical, two heads.
34" Rogers Vertical, single turret head.
Five 30" Bullard Vertical, single turret head.
20" Bullard Vertical Turret Lathe, with side and turret heads.
18" Bullard Vertical Turret Lathe, with side head and turret head.
Betts Horizontal, 2¼" bar.
48" Niles Car Wheel.

MILLING MACHINES

No. 4B Brown & Sharpe Plain, single pulley drive.
No. 4 Cincinnati heavy duty Plain, single pulley drive.
No. 4 Brown & Sharpe Plain.
No. 2 Hendey-Norton Universal, dividing head, vise, arbor, vertical attachment.
No. 2 Cincinnati Universal, dividing head.
No. 2 Cincinnati Plain.
No. 14A Garvin Plain.
No. 1 Kempsmith Plain, gear box feeds.
Two No. 5 Brown & Sharpe Vertical.
Beaman & Smith 2 spindle Vertical Slab, table 24" x 48".

LATHES

60" Fifield, 9' centers, face plate drive.
Two 60" x 20' New Haven, face plate drive.
48" x 16' Niles Tire or Car Wheel, double head type, face plate drive, triple geared.
36" x 20' New Haven, compound rest, power cross feed, 14' 6" between centers.
36" x 16' Bradford, compound rest, power cross feed.
36" x 14' Putnam, heavy duty, triple geared, face plate drive.
30" x 28' Fifield, compound rest, power cross feed.
30" x 16' Fifield, raising blocks to swing 38", compound rest, power cross feed.
28" x 17' New Haven, raising blocks to swing 30", hollow spindle, full swing rest, compound rest, power cross feed.
24" x 24' Fitchburg, raising blocks to swing 30", compound rest, power cross feed, 19' between centers.

New York Machinery Exchange, Inc.

50 Church Street . . . New York City

MACHINE TOOLS IN STOCK

No. 4 Cincinnati Universal Miller with vertical attachment and power feed Rotary Table.
No. 3 LeBlond Universal Miller.
No. 1½ NEW American plain Millers.
5—No. 0 NEW Steptoe Hand Millers.
1" x 15" Pratt & Whitney Screw Machine.
28" x 16' Reed Lathe.
24" x 10' NEW Carroll-Jamieson heavy duty lathe.
20" x 6' Davis lathe.
20" x 10' Hamilton lathe.
6—19" x 8' NEW, Sidney D.B.G. quick change lathes, swing 21" over V's.
3—17" x 8' NEW, Sidney D.B.G. quick change lathe, swing 19" over V's.
15" x 6' NEW, Sidney D.B.G. quick change lathe, swings 17" over V's.
12—17" x 8' NEW, National quick change.
15" x 6' NEW, Carroll-Jamieson, quick change.
48" Harrington plain Radial Drill.
36" Dresses plain Radial Drill.
D-4 Colburn high duty Drills.
3—20" Rockford high duty Drills.
16" Queen City B.G. Shaper.
400 lb. Single Frame Steam Hammer.
125 lb. Dupont Belt Hammer.
30 Ton Watson & Stillman Hydraulic Press.

FRANK TOOMEY, INC.

127-131 North Third St., PHILADELPHIA, PA., U.S.A.

We Have for Immediate Delivery the Following Second-hand Machinery in Good Operative Condition

1 Landis No. 3 Universal Grinder 12" x 42", complete equipment, less internal grinding attachment. . $1,500

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $2,200

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $1,800

These machines are particularly good value, and may be seen at our works.

A. B. JARDINE & COMPANY
HESPELER, ONT.

We Have For Sale the Following Machines

At Plant of Canada Malleable Steel & Range Co., Oshawa, Ont.

1—No. 27 Double Floor Grinder—Canadian Hart Wheel make. Equipped with two 12" wheels and two spindles 33" long. Shaft bearings 24" long $100
2—Heavy Blount Double Floor Grinder, 45" spindle, two 8" wheels 100
3—Heavy Petrie Floor Grinders. No rest or c/s. Shaft 36" long, two 9" wheels 50
4—Stouffville Floor Grinder. No rest or c/s. Shaft 32", two 8" wheels 30
5—Large Polishing Stand (new). 4' shaft. Bearings 1¼" x 6 35
6—Brown & Boggs Lever Splitting Shear.. 50
9—Hanson & Van Winkle Polishing Stand (no c/s) 75
11—Hanson & Van Winkle Polishing Stand. Shaft 5', Bearings 2¼ x 12" 60
15—No. 7 Jarecki Pipe Machine, 1¼" 150
18—Brown & Boggs 6' 6" Power Shears 450
19—No. 21 Crosby Punch Press, Inclinable.. 350
20—Heavy Grinder, Bearings 2¼ x 12"—cross adjustment slide, one 12" wheel... 50
21—Heavy Gringer, same as No. 20. No wheels ..... $ 50
22—8-Wheel Robinson Detroit Grinder.... 825
23—60" Steel Plate exhaust for 23" L.H.B.H. discharge 85
24—Anvil, 154-lb. 15
27—5 H.P. Vertical Boiler, Submerged tubes, and one Steam Pump 3 x 2 x 3 125
28—Revolving Electric Plating Machine... 140
29—Platers Electric Dynamo 600 Amperes.. 200
30—Tumbling Barrel, 18" x 4' 50
32—No. 23 Brown & Boggs Hand Punch and Shear 60
35—Fairbanks Scale, 5-Ton 75
36—Hand Former, Toggle Type 15
31—15 H.P. Westinghouse, 550 volt, 60 cycle, 3 phase, 1,120 R.P.M. 325
33—40 H.P. Westinghouse, 550 volt, 60 cycle, 3 phase, 850 R.P.M. 600
34—3 Westinghouse Transformers, 30 kw., 3,200—550 volt 684

Garlock-Walker Machinery Company, Limited
32 FRONT STREET WEST, TORONTO

Opportunity Knocks Here Every Week!

It may not knock for *you* this week, but read these pages regularly and grasp the opportunity when it presents itself. Every ad here is an opportunity for someone! Your time is coming. If you think the time is ripe to spring that little proposition of yours, send in your copy now for the next issue. If it is of interest to our readers, rest assured it will get attention.

CANADIAN MACHINERY

Classified Advertising Section

143 University Avenue, TORONTO

4.5 H.E. Shell Plant FOR SALE

We offer the following Used Machinery and Equipment, subject to prior sale:

2—Hall Cutting-off Machines.
1—24″ x 8′ Bertram Engine Lathes, B.G., with plain saddle and tool post and arbor for rough turning.
1—20″ x 16′ Bertram Engine Lathe, B.G., with two head stocks, plain saddles with tool posts and arbors for rough turning.
1—20″ x 10′ Bertram Engine Lathe, B.G., with 3-jaw scroll chuck and Bertram waving attachment. Tooled for Mark VII. wave rib.
1—18″ x 12′ Engine Lathe, B.G., with 3-jaw scroll chuck and Bertram waving attachment. Tooled for Mark VII. wave rib.
1—Newton 2-spindle Boring Machine, fitted with tool holders and chucks for boring fuse hole.
1—Brown, Boggs Marking Machine, converted for finished tapping fuse hole, with tap holder and sliding chuck.
1—Special 3-spindle Finished Turning Machine, complete with tool holders and profile cam.
1—18″ x 6′ Draper Engine Lathe, with split chuck and steady rest. Equipped with boring bar for inside profile.
1—Holden-Morgan Thread Milling Machine for Base Recess Thread, with attachment for threading base plates.
3—18″ Single Drive Head Stocks, with hinged chucks, suitable for repair work on shells.
1—18″ Single Drive Head Stock, with 3-jaw scroll chuck, steady rest and saddle. Suitable for correcting weight, etc.
1—3-Spindle Drill Press for Drills No. 0 to ¼″.
1—Steel Ring Banding Press, complete with Lymburner belt-driven power pump, tank, piping and valves.
1—Copper Band Turning Machine, with friction clutch on countershaft. Tooled for Mark VII. band.
1—7-hole Tate-Jones Nose Heating Furnace, oil fired. Equipped with high and low pressure burner. Complete with Root L.P. blower and piping.
1—80-shell capacity Varnish Baking Oven.
1—Fixture for Nicking Nose.
1—Single Spindle, Motor-driven Paint Table, 250 volts, D.C.
1—Single Spindle, Motor-driven Varnish Table, 250 volts, D.C.
1—Paasche Air Varnishing Outfit.
4—4-Jaw Screwed Ring Type Chucks, with babbitted steady rests.
2—4-Jaw Hand-operated Draw Chucks, with steady rests.
5—Hinged Vices, for hand tapping or rivetting base.
1—3-Jaw Scroll Chuck, with extension and steady rest.
4—Finished Turning Profile Attachments.
22—Drip Pans with 18″ legs and C.I. settling tanks.
2—38 lbs. capacity Fairbanks Scales, with weights.
Assorted Gauges, Boring Bars, Tool Holder Sets.

READY FOR SHIPMENT. CAN BE EXAMINED AT ANY TIME AT OUR PLANT.

JENKINS BROS., LIMITED

103 ST. REMI STREET MONTREAL, QUE.

SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

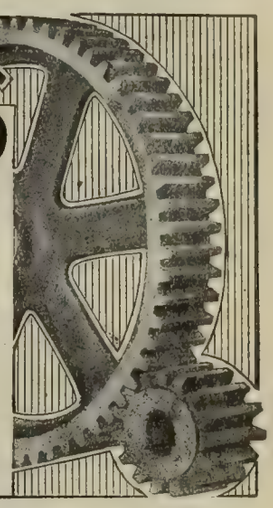
Homer & Wilson
Stamping & Tool Works

WE MAKE THE TOOLS
AND
PRODUCE THE STAMPINGS

Let us quote on your requirements.

1-3-5 Lancaster Street
Hamilton, Ontario

CUT GEARS

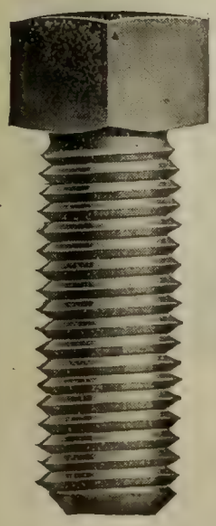


Rawhide — Steel — Brass — Cast Iron

Try our W-G Rawhide Silent Gear. Designers and Builders of Special Machinery.

Winnipeg Gear & Engineering Co.
197-199 Princess St., Winnipeg, Man.

ACCURACY



The discriminating buyer is the one we like to meet—the one who insists on accurate product. He will eventually buy "GALT" Cap and Set Screws because they measure up to his standard.

Your rush orders for S. F. Hex. nuts taken prompt care of. Better finished nuts—try a sample.

THE
GALT MACHINE SCREW CO., LIMITED
GALT, ONTARIO

Eastern Representatives: The Canadian B. K. Morton Company, Limited, 49 Common St., Montreal, Que.

AT
YOUR SERVICE
FOR

Tools, Gauges, Jigs, Fixtures
Special Machinery

GENERAL MACHINE WORK
Experimental work

Brass and Aluminum Castings
in large or small quantities

GENERAL JOBBING AND REPAIRS

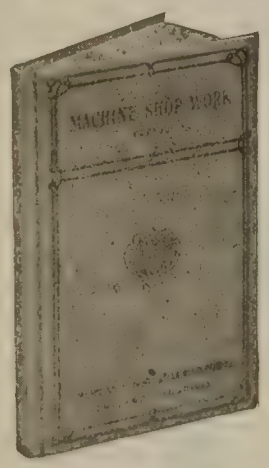
THE
MONARCH BRASS MFG.
COMPANY, LIMITED

71 Browns Ave., - Toronto, Ont.

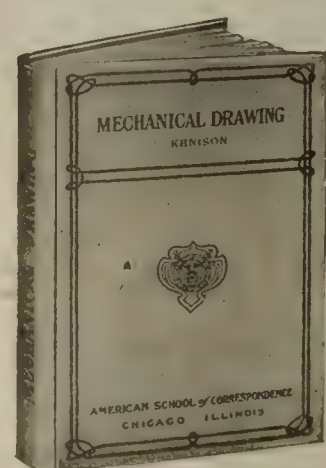
If any advertisement interests you, tear it out now and place with letters to be answered.

Mechanical Engineering Books

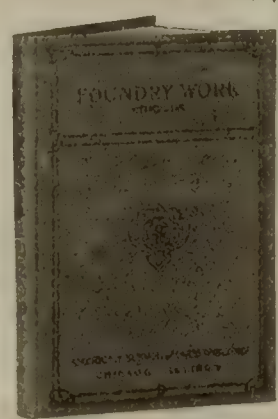
If you are desirous of improving yourself in your trade and so putting yourself in the position of making more money, these Mechanical Engineering Books will be found helpful.



MACHINE-SHOP WORK. By Frederick W. Turner, Instructor in Machine-Shop Work, Mechanics Arts High School, Boston. 208 pp., 241 illus. Cloth binding. The use of various hand tools is explained, followed by a comprehensive discussion of the lathe and lathe tools, with the methods of screw cutting, taper and eccentric turning, etc. The way to figure compound gears for screw cutting; drilling; boring; planers; shapers; slotters; milling machines and cutters; how to cut spirals, gears, cams, etc.; grinding; the operation of automatic machines. Price **$1.50**



MECHANICAL DRAWING. By Ervin Kenison, S.B., Assistant Professor of Mechanical Drawing. Massachusetts Institute of Technology. 176 pp., 120 illus. Cloth binding. Gives a course of practical instruction in the art of Mechanical Drawing, based on methods that have stood the test of years of experience. Includes orthographic, isometric and oblique projections, shade lines, intersections and developments, lettering, etc., with abundant exercises and plates. Price...**$1.00**



FOUNDRY WORK. By Wm. C. Stimpson, Head Instructor in Foundry Work and Forging, Department of Science and Technology, Pratt Institute. 160 pp., 142 illus. Cloth binding. A practical guide to modern methods of moulding and casting in iron, brass, bronze, steel, and other metals, from simple and complex patterns, including many valuable hints on shop management and equipment, useful tables, etc. Price **$1.00**

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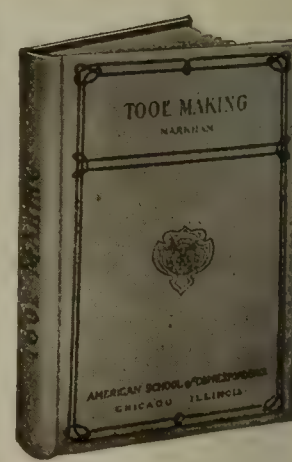

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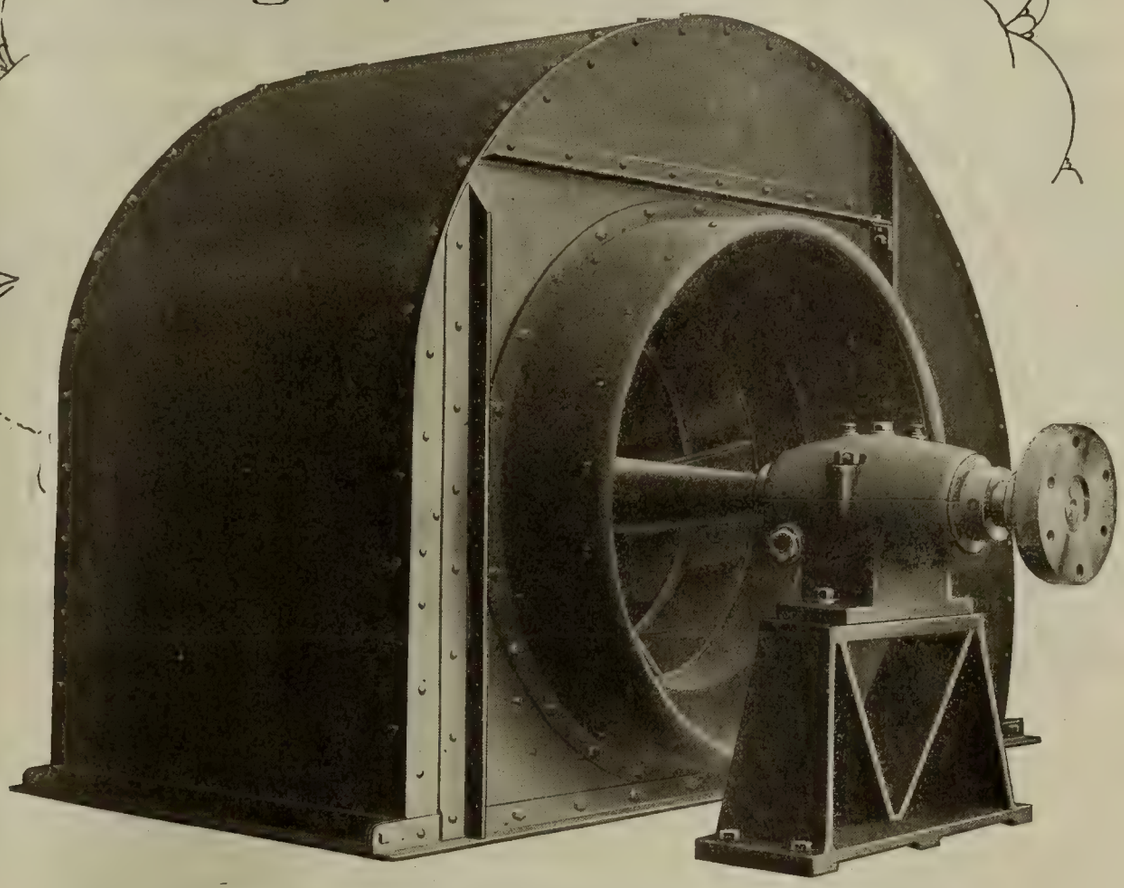
Announcing the Design 4 Turbovane Fan



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Engineers familiar with the very varying loads in power plants and with the changing demands upon the fan, will realize the immense importance of a fan with this characteristic.

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Germany's Secret Work in Canada

GERMANY is plotting in Canada and the United States right now. If you are curious to know just what she is doing, learn from Miss Agnes C. Laut's article in the October MACLEAN'S, "The Plot Behind the Pacifists."

THE biggest single feature ever secured by MACLEAN'S MAGAZINE is a serial story by E. Phillips Oppenheim, British author and a great writer of romantic stories.

The serial beginning in MACLEAN'S for October is "The Pawn's Count," a story of the present war, dealing with the work of the secret service agents of the various belligerent countries. You can depend on its being a strong, thrilling story, told by a master of his craft.

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Stringer, Fraser, Leacock and Hendryx

THE work of these masters of the short and long story appears in the October MACLEAN'S. Stringer's story is "The Redeemer of Waste Lands"; W. A. Fraser writes a love story, "For Catherine's Sake"; Leacock has a humorous sketch; and Hendryx continues his captivating story of the Canadian Northwest, "The Gun Brand."

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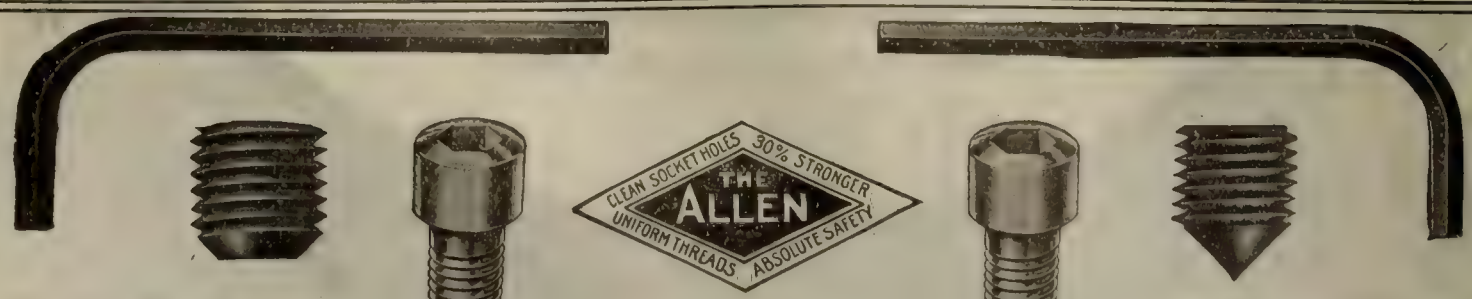

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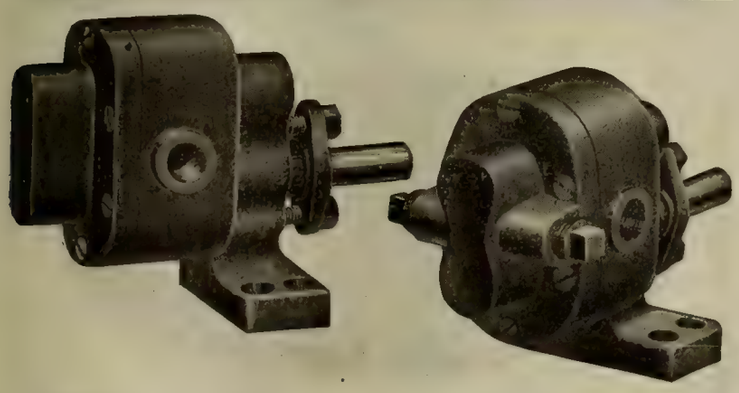

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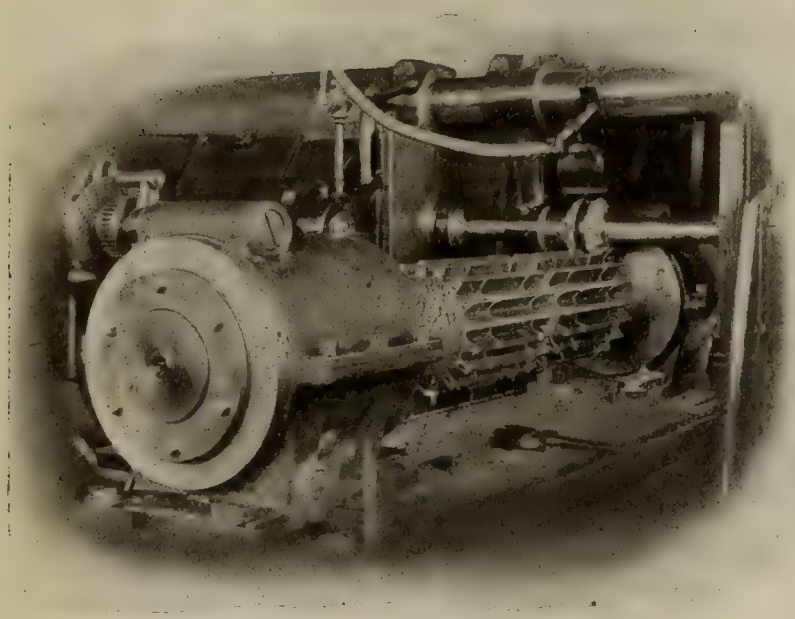

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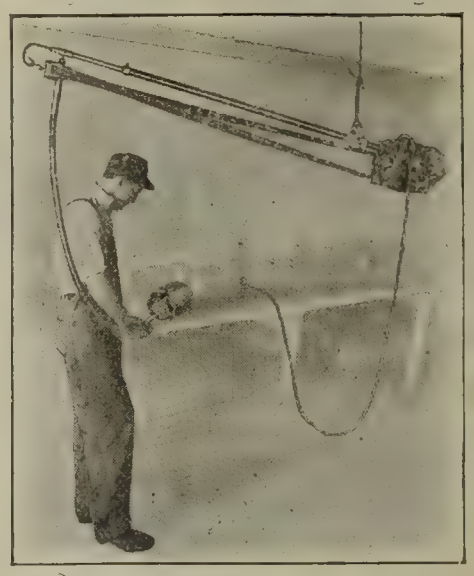

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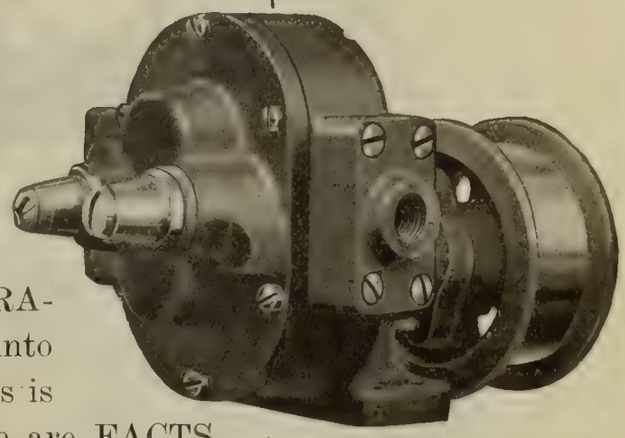

Fig. 1854 Reversible with double automatic relief valve.

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A Steptoe Hand Miller or small power feed can be handled quickly and will cut your production cost. You will have less money invested in your Milling Machines and have more machines to do the work.

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Saw frame guide of heavy semi-steel that will not spring. It holds the saw frame rigid, insuring accurate cuts.

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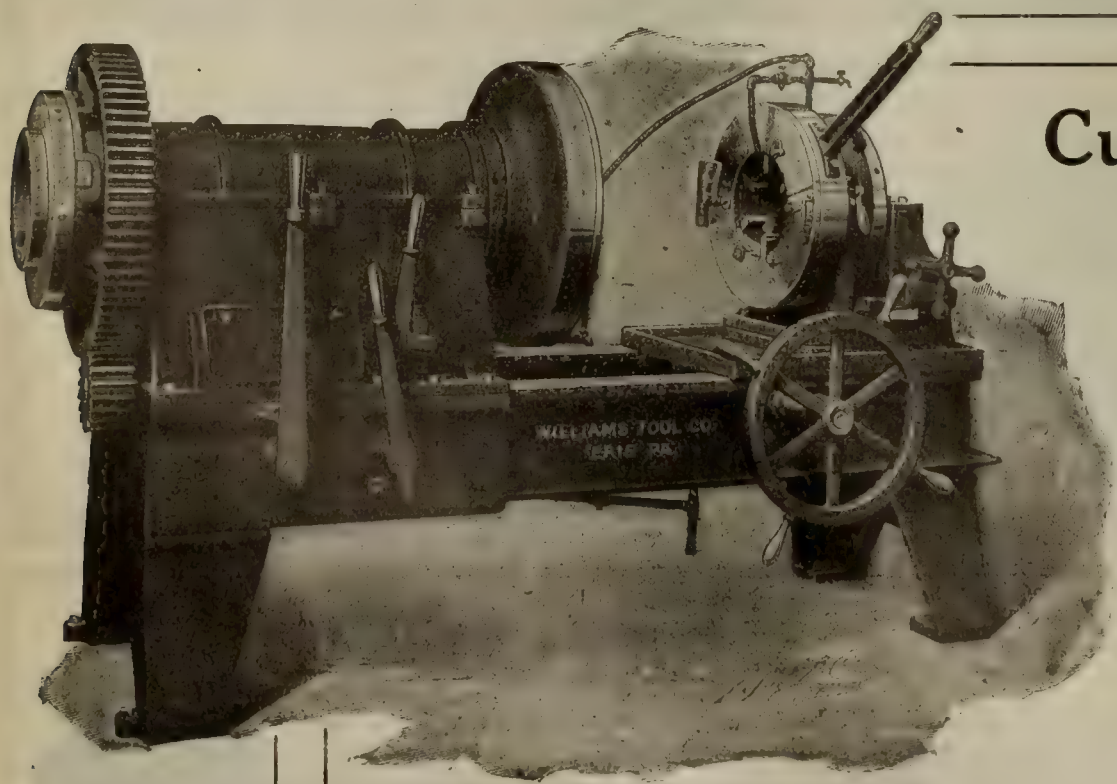

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We have made this claim all along and this judgment only verifies it.

Made in 11 sizes and each size has a range of 8 to 10 consecutive sizes between 1/4" and 18" diameter.

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Supposing you save only 1/16 on each cut, 200 lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

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Write for a list of users; some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

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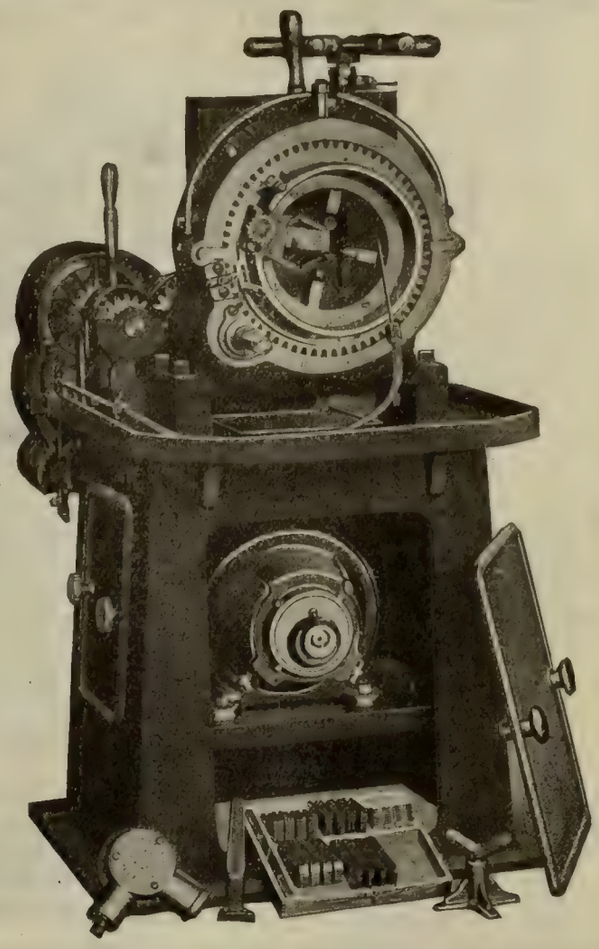

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Poor and indifferent threading in the first place is usually the seat of the trouble with Leaky Pipe Joints. To be sure of tight joints that won't leak, thread your pipes with the

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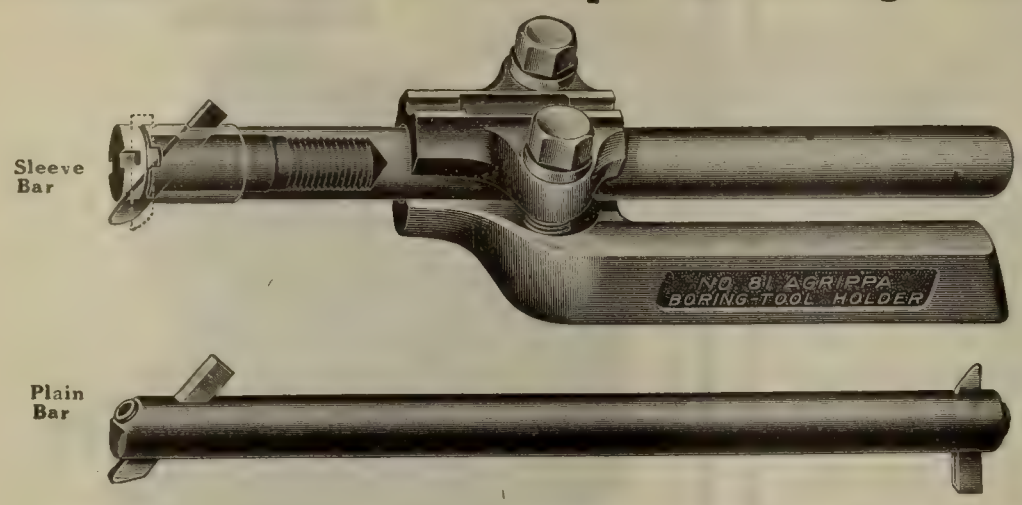

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ITS sleeve bar cap admits a straight or angular cutter; and you can quickly insert either at the business end of the bar without removing the cap or disturbing the setting of either the bar or the holder.

You need neither make nor buy any bushings hereafter, for the "twin screw" fastenings of "AGRIPPAS" within their range accommodate any bar section you may have handy.

Now's the time to begin saving—caps, bushings and time!

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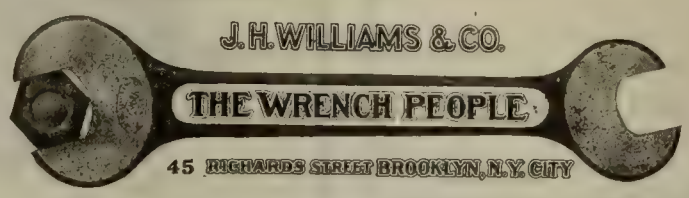

Quality alone is our measure of "AGRIPPA" Tool Holder Value

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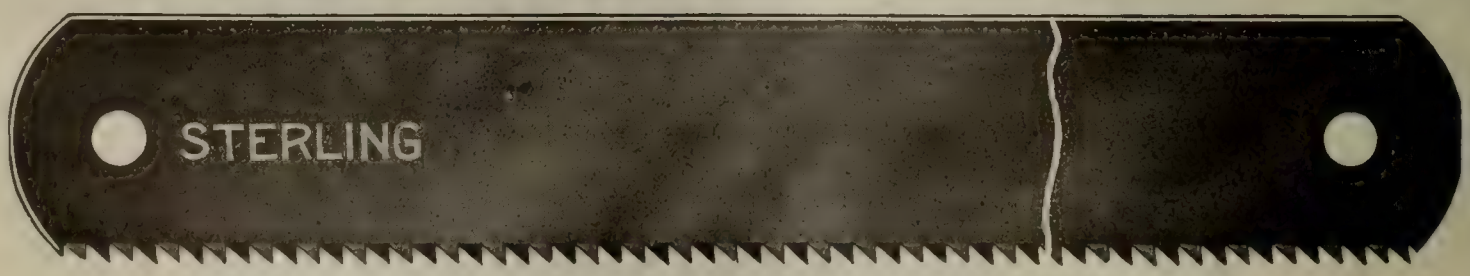

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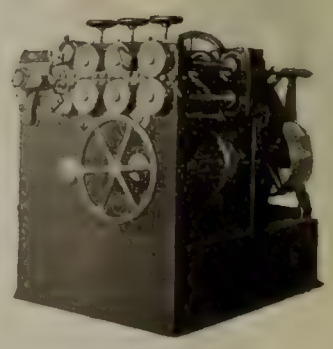

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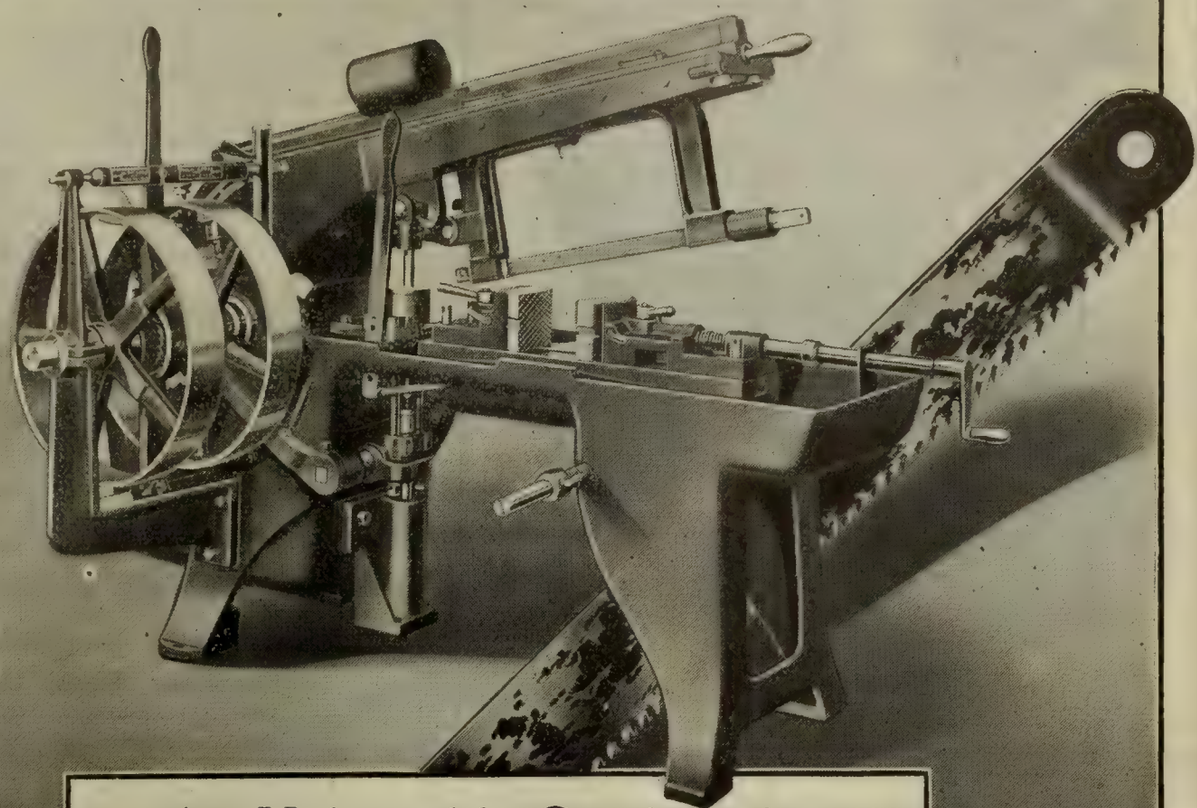

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Here's The Combination You Are Looking For

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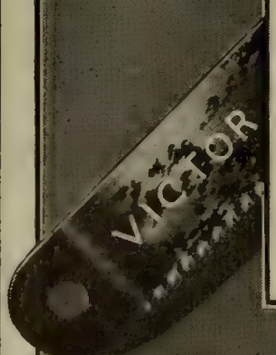
Why?

An actual machine and blade operated by one of your own men in you own shop will be the most convincing demonstration we can make.

Let us send you one V. S. W. machine on a thirty days' trial, with enough VICTOR blades to show you why.



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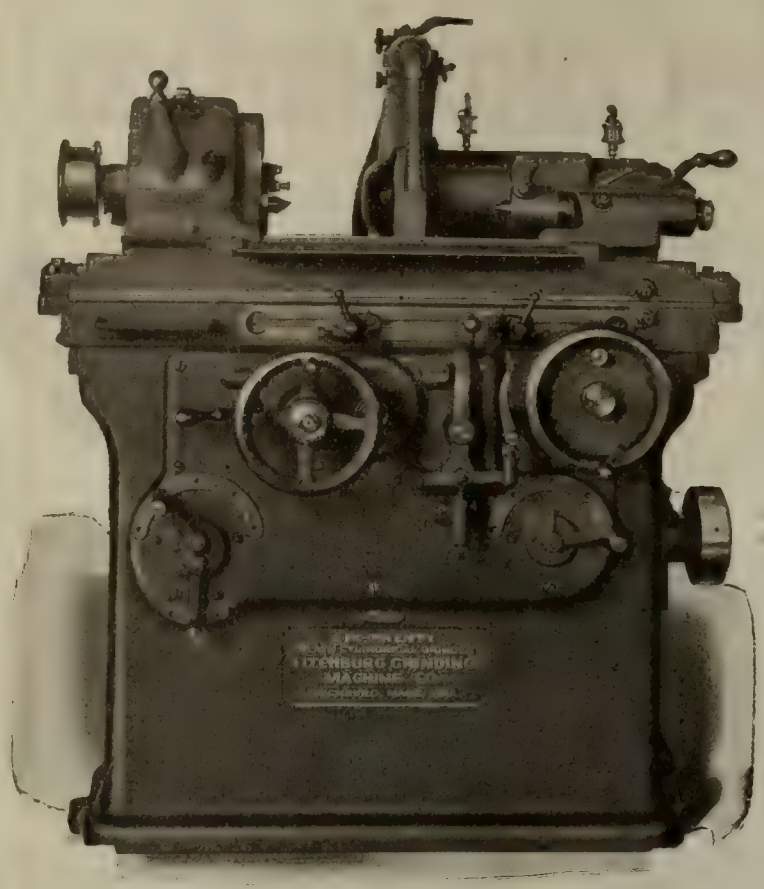

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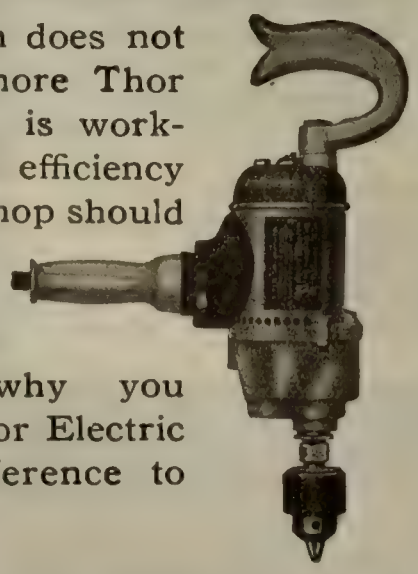

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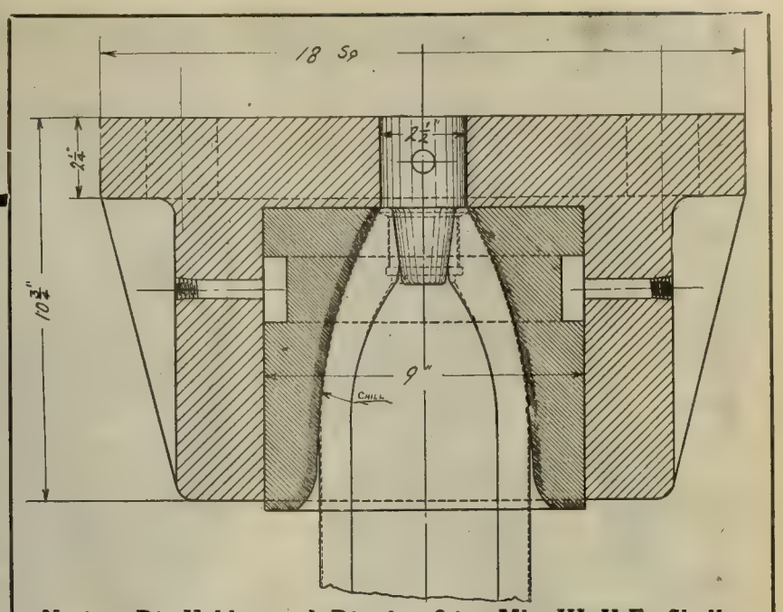

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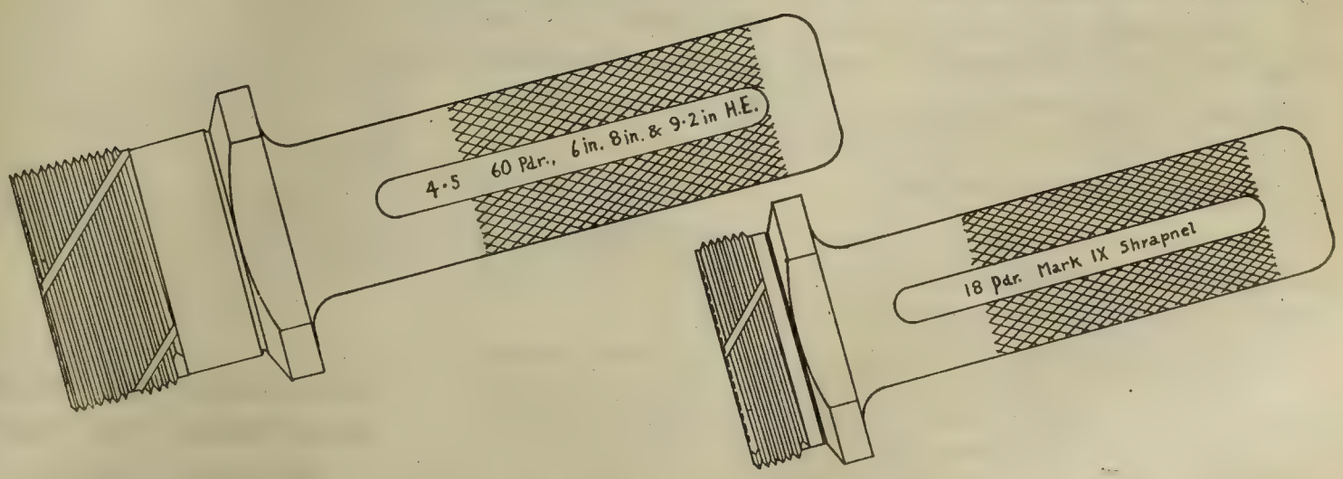

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PHOTO shows a long line of lathes on six-inch shells —all equipped with Hannifin Air Chucks. This plant has been turning out more shells per machine than any other in its vicinity, and the fact that Hannifin chucks have been used exclusively gives us a certain degree of justifiable pride.

That our claims for increased production with a Hannifin have been substantiated by the records of many Canadian munition plants is good reason why you should investigate them.

The Hannifin Chuck is almost instantaneous in action, holds securely, cannot slip, saves time and labor. The work is chucked and rigidly gripped by simply turning a lever. Another turn effects the release. With the introduction of female labor and skilled male help almost unobtainable, Hannifin chucks will save delays and make-overs by means of these time and labor-saving features.

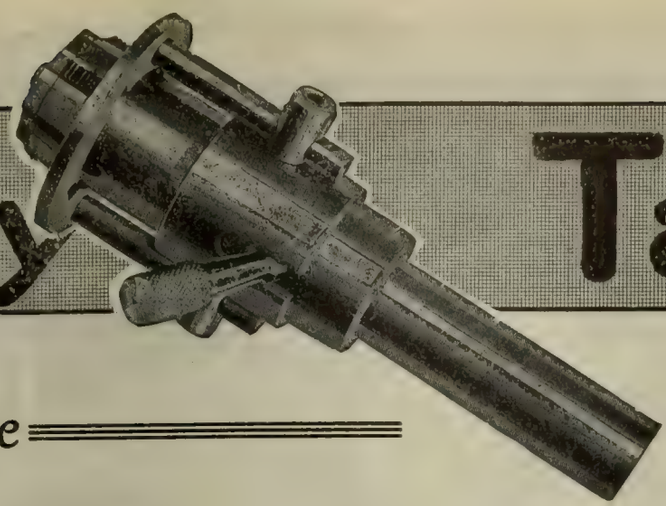
Our catalog will tell you more about this chuck. Send for it to-day.

Hannifin Manufacturing Co.

CHICAGO, ILL., U.S.A.

REPRESENTATIVES:—R. E. Ellis Engineering Co., Chicago; Coats Machine Tool Co., New York City; A. R. Williams Machinery Co., Toronto; Williams & Wilson, Montreal; The Canadian Fairbanks-Morse Co., Montreal. EUROPEAN REPRESENTATIVES:—Coats Machine Tool Co., Ltd., London; Fenwick Freres & Co., Paris; Iznosskoff & Co., Petrograd.

Murchey Taps



They are Collapsible

The only time they don't collapse or bend is under strain of heavy work and when in action. But for speedy adjustment, convenient, quick-acting operation, the collapsible and adjusting features stand prominently in the foreground.

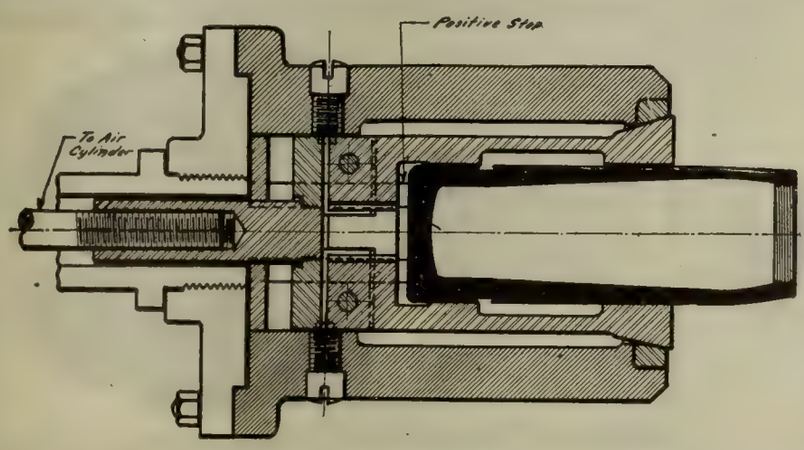
The chasers are adjustable to compensate for any wear, and this feature enables the tap to maintain its minute accuracy, and adds to its general dependability.

The records performed by Murchey Taps on munitions work is equally prominent in general lines. They are built for service, and they give it.

We maintain a special chaser service for our clients that enable them to renew chasers at the minimum cost. Inquire immediately. Quick action means quick solution to your troubles.

The Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, S.W., England.
Fenwick Freres & Co., 16 Rue Fenelon, Paris, France.

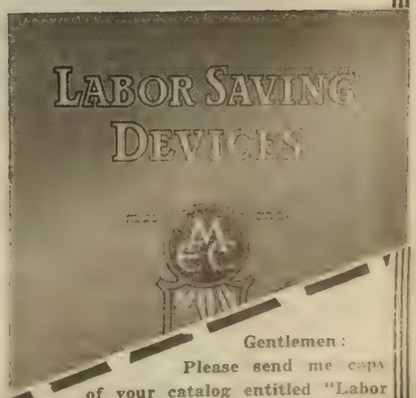
Murchey Machine & Tool Co., 75 Porter Street, Detroit, Mich.



Consider Just This One Feature of M.E.C. Air-operated Hinged Collets

They save from 50 per cent. to 90 per cent. of the time usually required to do the same work by an ordinary chuck. While they **possess many** other points of superiority, the above feature alone is one that should appeal to users of chucks.

May we send full particulars? Just fill in coupon.



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Gentlemen:
Please send me copy of your catalog entitled "Labor Saving Devices," according to your advertisement in Canadian Machinery.

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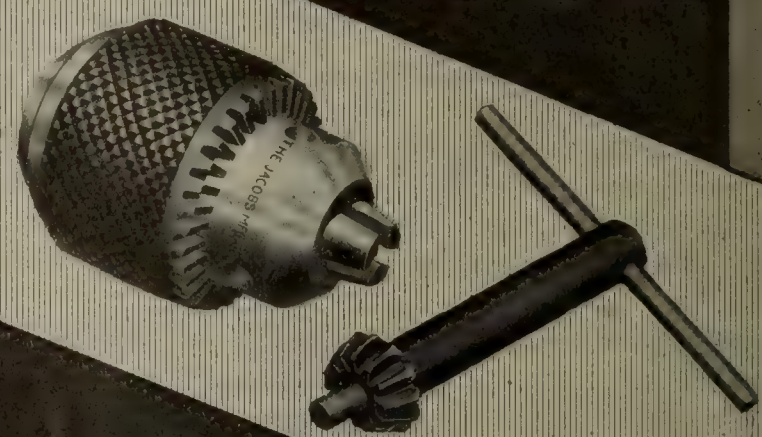
IMPROVED
Drill Chuck



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Try them and see for yourself.

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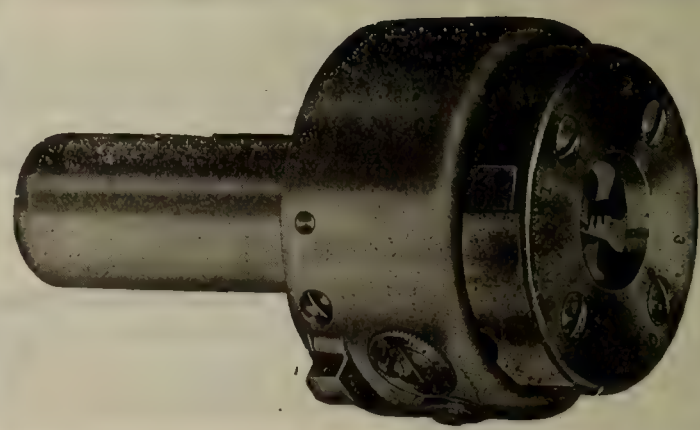
For Positive Accuracy—

and Big Time Saving

VICTOR Collapsible TAPS

"Victor" Collapsible Taps are simple in construction; the few parts can be made large and strong; the body is machine steel, and the chasers are high-speed; screw adjustment from front end makes it easy to maintain close accuracy; trip is automatic; reset by means of lever. The above features—and others—make the "Victor" a time and money saver for severe service. It is being used by many shell manufacturers.

Victor Tool Company
Waynesboro, Pa., U.S.A.



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The Chasers are set and held in place by a steel cam, which, once adjusted, locks; there is no stoppage or changing in size. The quick release not only insures the cutting of the thread to a given point every time, but permits cutting right up to a shoulder when necessary.

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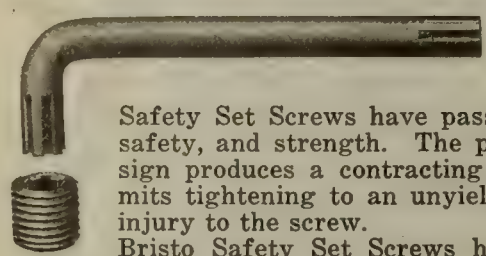

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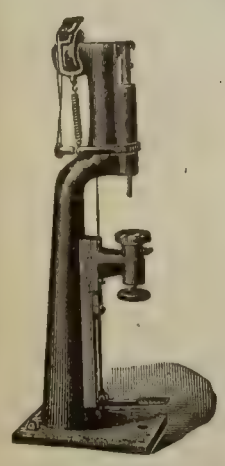

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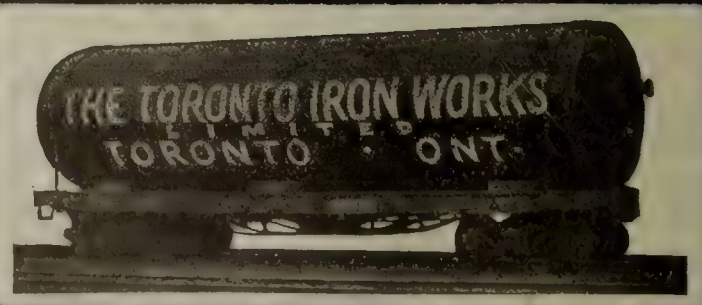

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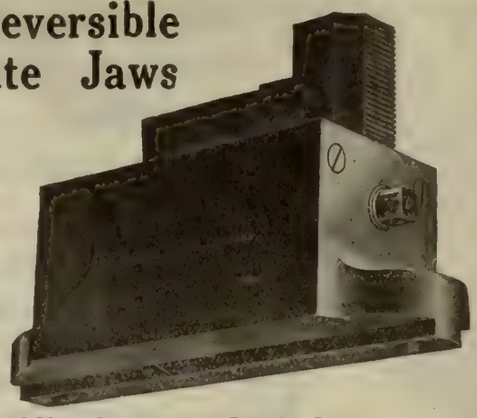

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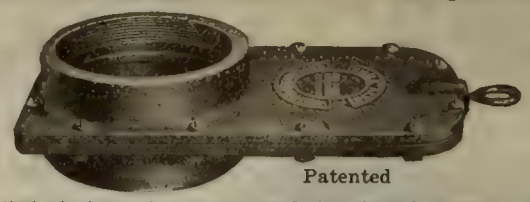

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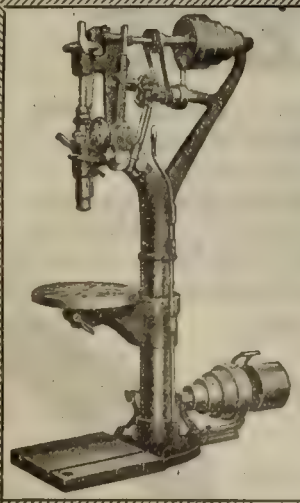

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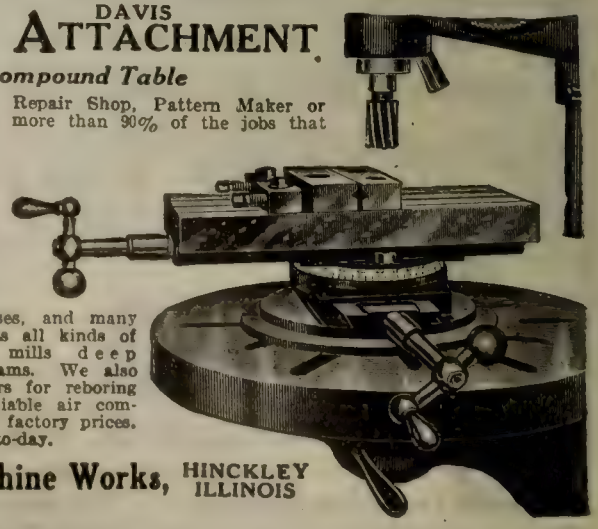

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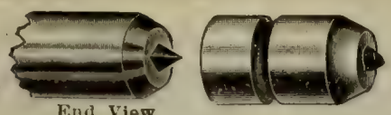
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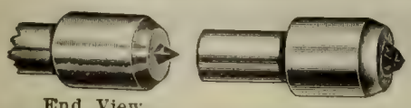
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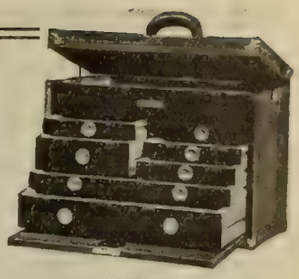
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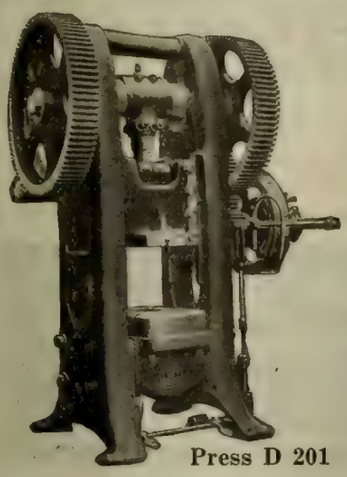
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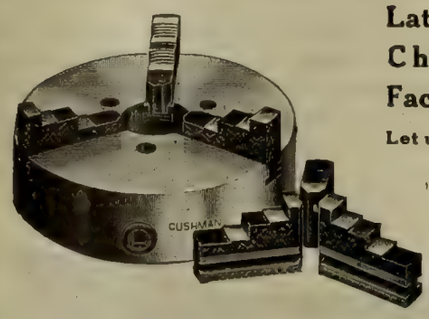

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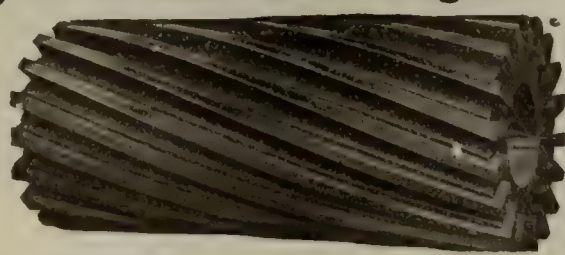

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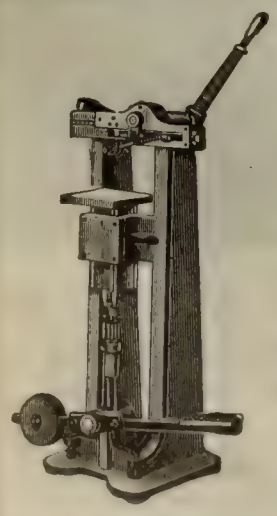

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Baxter Co., Ltd., J. R., Montreal, Que.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Montreal, Que.
Carborundum Co., Niagara Falls, N.Y.
Foss & Hill Machy. Co., Montreal.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.
H. W. Petrie, of Montreal, Ltd., Montreal.

ACETYLENE
Carter Welding Co., Toronto, Ont.
Commercial Acetylene Welding Co., Inc., Toronto
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

ACETYLENE GENERATORS
Commercial Acetylene Welding Co., Inc., Toronto
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

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Charles F. Elmes Eng. Works, Chicago
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York
Smart-Turner Mach. Co., Hamilton, Ont.
William R. Perrin, Ltd., Toronto

AIR RECEIVERS
Can. Ingersoll-Rand Co., Sherbrooke, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.

AIR WASHERS
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Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

ALUMINUM
Canada Metal Co., Toronto
Tallman Brass & Metal Co., Hamilton

ALLOY, STEEL
Can. B. K. Morton, Toronto, Montreal
H. A. Drury Co., Ltd., Montreal
Hawkridge Bros. Co., Boston, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium Alloys Steel Co., Pittsburg, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

ARBORS
Canadian Fairbanks-Morse Co., Montreal
Cleveland Twist Drill Co., Cleveland
Garlock-Walker Machinery Co., Toronto, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
H. W. Petrie, Toronto
H. W. Petrie, Ltd., Montreal
Pratt & Whitney Co., Dundas, Ont.

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Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.

AUTOMATIC MACHINERY
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Riverside Machinery Depot, Detroit, Mich.
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H. W. Petrie, Ltd., Montreal
Pratt & Whitney Co., Dundas, Ont.
Roelofson Machine & Tool Co., Toronto, Can.
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Baxter Co., Ltd., J. R., Montreal, Que.
Canadian Fairbanks-Morse Co., Montreal
Canada Metal Co., Ltd., Toronto
Can. B. K. Morton, Toronto, Montreal
Foss & Hill Machy. Co., Montreal.
Hoyt Metal Co., Toronto
Jobborn, Geo. A., Hamilton, Ont.
Magnolia Metal Co., Montreal
H. W. Petrie, Toronto
Tallman Brass & Metal Co., Hamilton

BALL BEARINGS
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Can. S K F Co., Toronto, Ont.
Chapman Double Ball Bearing Company, Toronto

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Cleveland Wire Spring Co., Cleveland

BASE FACING MACHINES
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Monarch Brass Mfg. Co., Toronto, Ont.
Niles-Bement-Pond Co., New York

BELT LACERS
Clipper Belt Lacer Co., Grand Rapids, Mich.

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BELT LACING LEATHER
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Foss & Hill Machy. Co., Montreal
Graton & Knight Mfg. Co., Worcester, Mass.

BELTING, BALATA
Baxter Co., Ltd., J. R., Montreal, Que.
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Federal Engineering Co., Toronto, Ont.

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Canadian Fairbanks-Morse Co., Montreal
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
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H. W. Petrie, Ltd., Montreal
Whitney Mfg. Co., Hartford, Conn.

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Can. B. K. Morton, Toronto, Montreal
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren, J. C., Belting Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Ltd., Montreal
Standard Machy. & Supplies, Ltd., Montreal, Que.

BELTING, STITCHED COTTON DUCK
Baxter Co., Ltd., J. R., Montreal, Que.
Bennett, W. P., 51 Montford St., Montreal, Que.
Dominion Belting Co., Hamilton, Ont.
Federal Engineering Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto

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New Britain Mach. Co., New Britain, Conn.

BENCH DRAWERS, FRICTIONLESS
New Britain Mach. Co., New Britain, Conn.

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John Bertram & Sons Co., Dundas
Bertrams, Limited, Edinburgh, Scotland
Brown-Boggs Co., Ltd., Hamilton, Can.
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Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
Charles F. Elmes Eng. Works, Chicago
Jardine, A. B., & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York
H. W. Petrie, Toronto
H. W. Petrie, Ltd., Montreal
Steel Bending Brake Works, Chatham, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

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BINS, STEEL
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MacKinnon, Holmes Co., Sherbrooke
Toronto Iron Works, Ltd., Toronto, Ont.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal
R. E. T. Pringle, Ltd., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Sturtevant Co., B. F., Galt, Ont.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

BLUE PRINTING MACHINERY
Mulliner-Enlund Tool Co., Syracuse, N.Y.

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Geo. A. Joyce Co., Ltd., New York, N.Y.

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MacKinnon, Holmes Co., Sherbrooke
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Riverside Machinery Depot, Detroit, Mich.

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Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
Cumming & Son, J. W., New Glasgow, Canada
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

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Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machinery Co., Toronto

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Landis Machine Co., Waynesboro, Pa.
Victor Tool Co., Waynesboro, Pa.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co. of Canada, Toronto
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Stow Mfg. Co., Binghampton, N.Y.

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Canada Machinery Corp. Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Hill, Clarke & Co., Chicago, Ill.
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
Roelofson Machine & Tool Co., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, STOVE AND COAL
Cumming & Son, J. W., New Glasgow, Canada

BORING AND TURNING MILLS
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
R. E. T. Pringle, Ltd., Toronto, Ont.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland
New Britain Mach. Co., New Britain, Conn.

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Brown, Boggs & Co., Hamilton, Can.

BRASS AND COPPER BARS, RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto

BRASS FOUNDERS
St. Lawrence Welding Co., Montreal, Que.

BRASS WORKING MACHINERY
Dominion Machy. Co., Toronto, Ont.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto, Ont.
Warner & Swasey Co., Cleveland
Niles-Bement-Pond Co., New York
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machy. Co., Toronto

BRIDGES, RAILWAY AND HIGHWAY
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke

BRONZE RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto

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Puro Sanitary Dk'g Fountain Co., Haydenville, Mass.

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Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Ltd., Montreal
R. E. T. Pringle, Ltd., Toronto, Ont.

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Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

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Canada Machinery Corp., Galt, Ont.

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Bellevue Industrial Furnace Co., Detroit, Mich.
Northern Crane Works, Ltd., Walkerville, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.

BURRING REAMERS
Wells Bros. Co. of Canada, Galt, Ont.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque.

CANNERS' MACHINERY
Bliss, E. W., Co., Brooklyn, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
Brown, Boggs & Co., Hamilton, Can.
Prest-O-Lite Co., Inc., Toronto, Ont.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Can.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CAR MOVERS
Dillon Mfg. Co., Oshawa, Ont.

CARTRIDGE MAKING MACHINERY
Blackall, Fred. S., Woolworth Tower, New York.
Bliss Co., E. W., Brooklyn, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER
Cumming & Son, J. W., New Glasgow, Canada.
Alexander Fleck, Ltd., Ottawa.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, GRAY IRON
Bernard Industrial Co., The A., Fortierville, Que.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Steel Foundries, Ltd., Montreal, Que.
Alexander Fleck, Ltd., Ottawa.
Gardner, Robt., & Son, Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Can. Steel Foundries, Ltd., Montreal, Que.
Dominion Steel Foundry Co., Ltd., Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
Can. Steel Foundries, Ltd., Montreal, Que.
Cumming & Son, J. W., New Glasgow, Canada.

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.

CEMENT MACHINERY
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.
H. W. Petrie, Toronto.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Wright Mfg. Co., Lisbon, Ohio.

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Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

CHESTS, TOOL
Union Tool Chest Works, Rochester, N.Y.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
John Bertram & Sons Co., Dundas, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Richmond Mfg. Co., Toronto, Ont.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
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Thomas Elevator Co., Chicago, Ill.
D. E. Whiton Machine Co., New London, Conn.

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Whitney Mfg. Co., Hartford, Conn.
Richmond Mfg. Co., Toronto, Ont.

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Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, GEARED SCROLL
Richmond Mfg. Co., Toronto, Ont.

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Ford-Smith Mach. Co., Hamilton, Ont.
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CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

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Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

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Hardinge Bros., Inc., Chicago, Ill.

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Bernard Industrial Co., A., Fortierville, Que.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.

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MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

COILING MACHINERY, WIRE AND SPRING
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

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COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke, Que.
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Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
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H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

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R. E. T. Pringle, Ltd., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

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Whiting Foundry Equipment Co., Harvey, Ill.

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Niles-Bement-Pond Co., New York.

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Aikenhead Hardware Co., Toronto, Ont.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

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Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.

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Bernard Industrial Co., The A., Fortierville, Que.

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Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES, LOCOMOTIVE
Northern Crane Works, Walkerille.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
H. W. Petrie, Toronto.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.

CUTTER GRINDERS AND ATTACHMENTS
Cincinnati Milling Machine Co., Cincinnati.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
H. W. Petrie, Ltd., Montreal.
Pratt & Whitney Co., Dundas, Ont.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
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Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTING COMPOUND AND CUTTING OIL
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Foss & Hill Machinery Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
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Tabor Mfg. Co., Philadelphia, Pa.

CYLINDERS, AIR
Manufacturers Equipment Co., Chicago, Ill.

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Hinckley Machine Co., Hinckley, Ill.

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Dominion Bridge Co., Montreal.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

DIAMONDS, BLACK AND ROUGH
Geo. A. Joyce Co., Ltd., New York.

DIAMOND TOOLS
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Geo. A. Joyce Co., Ltd., New York.
Wheel Trueing Tool Co., Windsor, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Banfield, W. H., & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Ltd., Montreal.
Wells Brothers of Canada, Galt, Ont.

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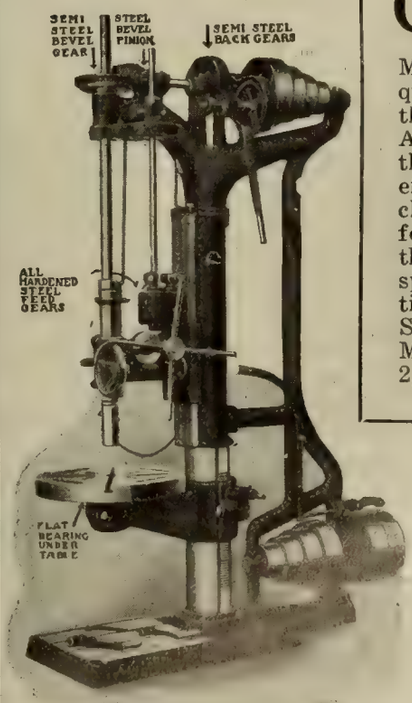

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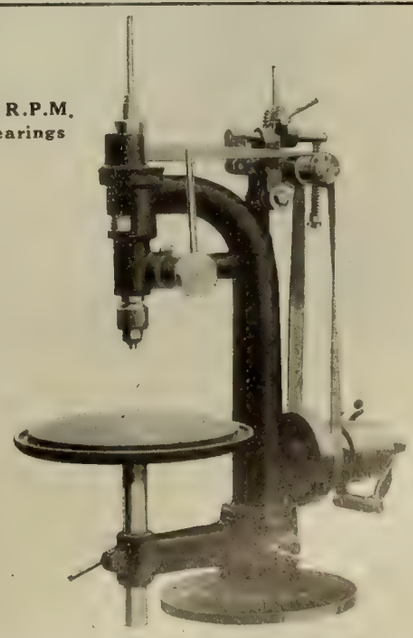

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Canada Machinery Corp., Galt, Ont.
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Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
New Britain Machine Co., New Britain, Conn.
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H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
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United States Electrical Tool Co., Cincinnati, O.

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Greenfield Machine Co., Greenfield, Mass.
LeBlond Mach. Tool Co., R. K., Cincinnati, O.
Norton Grinding Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilmarth & Morman, Grand Rapids, Mich.

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GRINDERS, DISK
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Grant Mfg. & Machine Co., Bridgeport, Conn.
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Norton Co., Worcester, Mass.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Blount, J. G., & Co., Everett, Mass.
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Ford-Smith Machine Co., Hamilton, Ont.
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Tabor Mfg. Co., Philadelphia, Pa.
Wing & Son, J. E., Hamilton, Ont.

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Modern Tool Co., Erie, Pa.
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Ford-Smith Mach. Co., Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
LeBlond Mach. Tool Co., R. K., Cincinnati.
Niles-Bement-Pond Co., New York.
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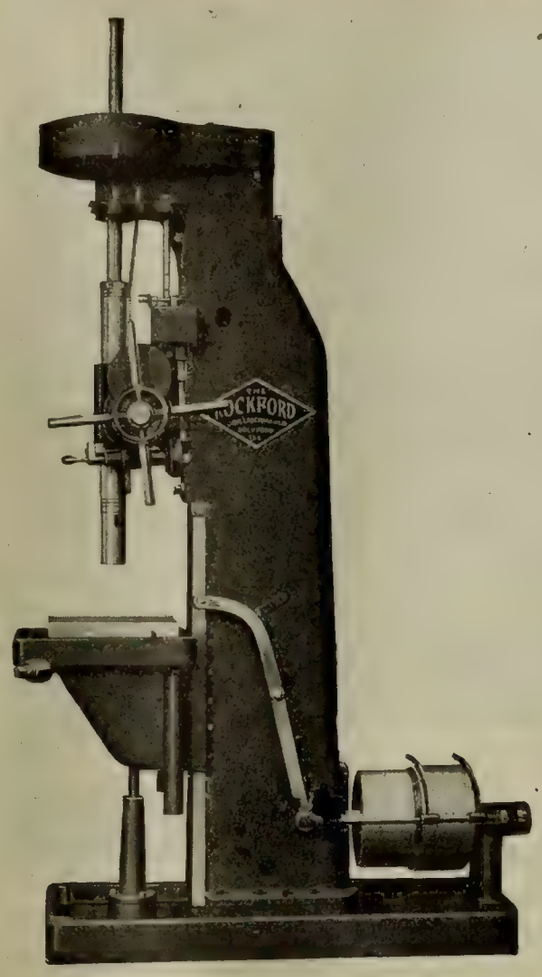

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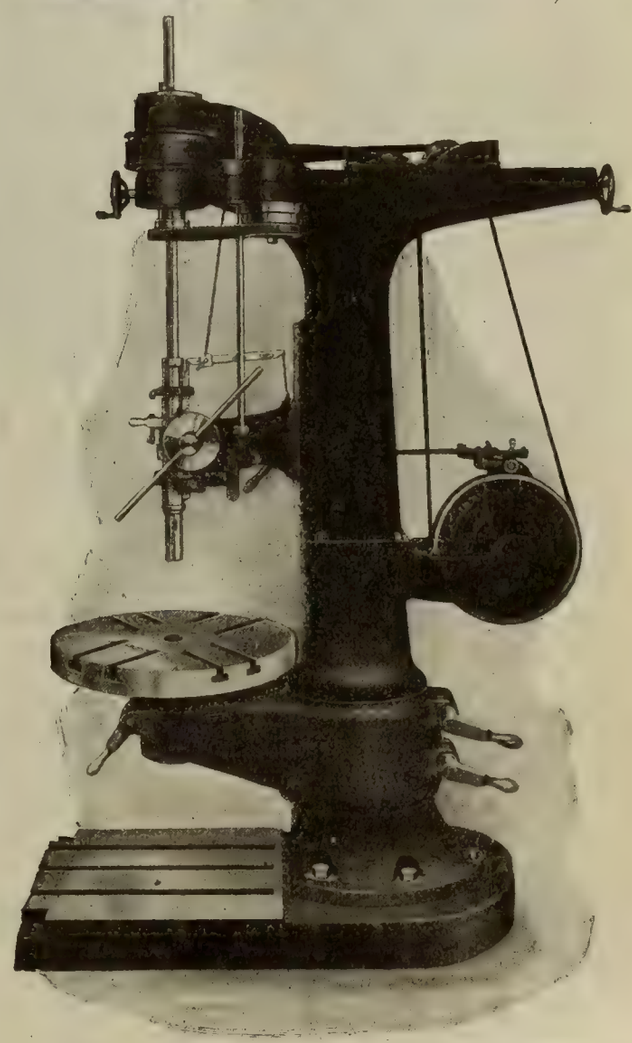

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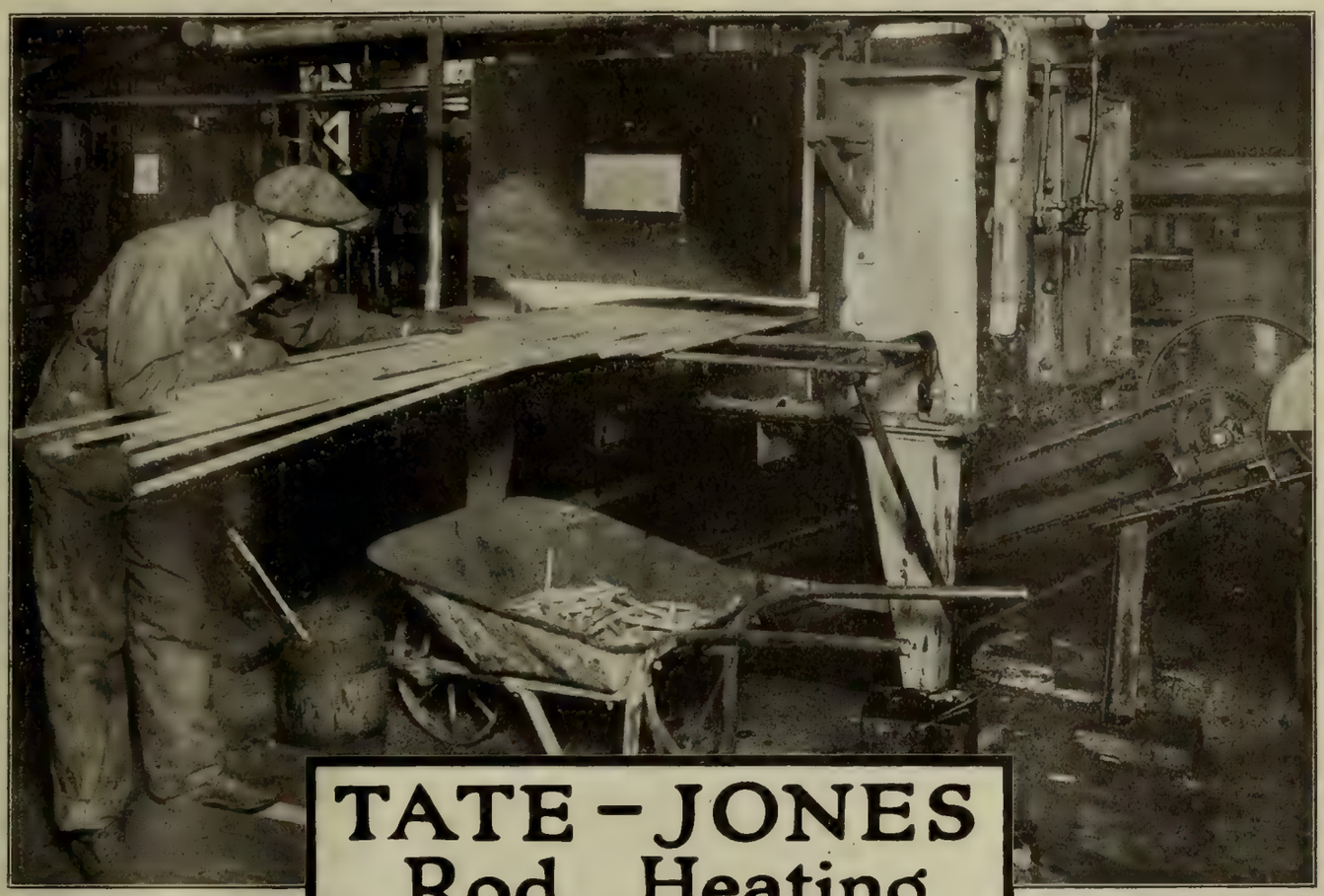

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Taft-Pierce Mfg. Co., Woonsocket, R.I.

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United States Mach. Tool Co., Cincinnati, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Whitney Mfg. Co., Hartford, Conn.

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Becker Milling Machine Co., Boston, Mass.
Brown & Sharpe Mfg. Co., Providence.
John Bertram & Sons Co., Dundas.
Cleveland Milling Machine Co., Cleveland, Ohio.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
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Niles-Bement-Pond Co., New York.
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H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.
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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.

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Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Tabor Mfg. Co., Philadelphia, Pa.

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Cummings & Son, J. W., New Glasgow, Canada.
Jenckes Mach. Co., Sherbrooke, Que.
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Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

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Jenckes Mach. Co., Sherbrooke, Que.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto.

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Garlock-Walker Machinery Co., Toronto, Ont.
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Garlock-Walker Machinery Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
H. W. Petrie, Ltd., Montreal.
R. E. T. Pringle, Ltd., Toronto, Ont.
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Garlock-Walker Machinery Co., Toronto, Ont.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

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NIPPLE THREADING MACHINES
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Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

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Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.

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National Machy. Co., Tiffin, O.
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National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

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National Machy. Co., Tiffin, O.
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Victor Tool Co., Waynesboro, Pa.

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MacKinnon, Holmes & Co., Sherbrooke, Que.
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Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
Toronto Welding Co., Toronto, Ont.

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L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

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L'Air Liquide Society, Montreal, Que.

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New Britain Mach. Co., New Britain, Conn.

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William R. Perrin, Ltd., Toronto.
H. W. Petrie, Toronto.

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MacKinnon, Holmes & Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

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Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.

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Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

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Steel Co. of Canada, Ltd., Hamilton, Ont.

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Dominion Machinery Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
H. W. Petrie, Toronto.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
A. R. Williams Machy. Co., Toronto.

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Wells Bros. Co. of Canada, Galt, Ont.

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Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Hill, Clarke & Co., Chicago, Ill.
Morton Mfg. Co., Muskegon Heights, Mich.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Toronto.
Riverside Machinery Depot, Detroit, Mich.
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A. R. Williams Machy. Co., Toronto.

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Hannifin Mfg. Co., Chicago, Ill.
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Metalwood Mfg. Co., Detroit, Mich.
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Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.

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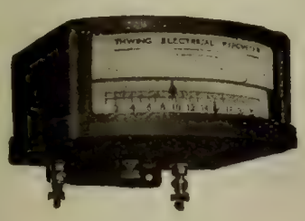

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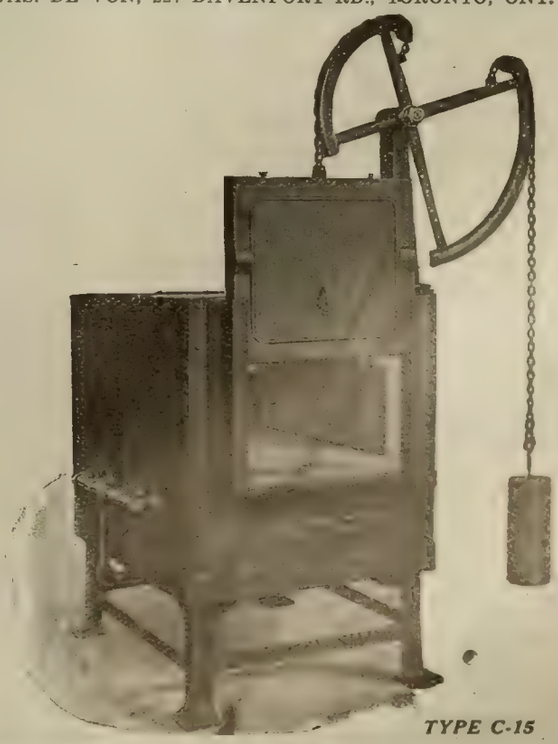

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Steel Co. of Canada, Ltd., Hamilton, Ont.
RIVETS, IRON, COPPER AND BRASS
Aikenhead Hardware Co., Toronto, Ont.
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Can. Ingersoll-Rand Co., Montreal.
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Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York
H. W. Petrie, Toronto.
R. E. T. Pringle, Ltd., Toronto, Ont.
RIVETING MACHINES, ELASTIC ROTARY BLOW
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High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.
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Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo, O.
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Bertrams, Ltd., Edinburgh, Scotland
RULES
Brown & Sharpe Mfg. Co., Providence
James Chesterman & Co., Ltd., Sheffield, Eng.
L. S. Starrett Co., Athol, Mass.
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Strong, Kennard & Nutt Co., Cleveland, Ohio.
SAFETY APPLIANCE GOGGLES
T. A. Wilson, Reading, Pa.
SAND BLASTS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
SANDING MACHINES
Canada Machinery Corp., Galt, Ont.
SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Dominion Machy. Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal
Curtis Pneumatic Machy. Co., St. Louis, Mo.
H. W. Petrie, Ltd., Montreal
H. W. Petrie, Toronto.
A. R. Williams Machy. Co., Toronto
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Tabor Mfg. Co., Philadelphia, Pa.
SAWS, HACK (SEE HACK SAWS)
SAWS, INSERTED TOOTH
Hunter Saw & Mach. Co., Pittsburgh, Pa.
Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.
SAWS, BAND AND COPING
Napier Saw Works, Springfield, Mass.
SCLEROSCOPES
Shore Instrument & Mfg. Co., New York City
H. E. Streeter, New Birks Bldg., Montreal, Que.
SCREW MACHINE PARTS
Johnson Mach. Co., Carlyle, Manchester, Conn.
SCREW MACHINE PRODUCTS
Galt Machine Screw Co., Galt, Ont.
Eastern Mach. Screw Corp., New Haven, Conn.
SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence, R.I.
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Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York
Himoff Mach. Co., Inc., Astoria, L.I., New York.
A. B. Jardine & Co., Hespeler
New Britain Machine Co., New Britain, Conn.
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H. W. Petrie, Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
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A. R. Williams Machy. Co., Toronto
SCREW MACHINES, AUTOMATIC, MULTIPLE SPINDLE
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Riverside Machinery Depot, Detroit, Mich.
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Wells Bros. Co. of Canada, Galt, Ont.
SCREW SLOTTERS
Garvin Machine Co., New York
Pratt & Whitney Co., Dundas, Ont.
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Rhodes Mfg. Co., Hartford, Conn.
Steptoe Co., John, Cincinnati, Ohio
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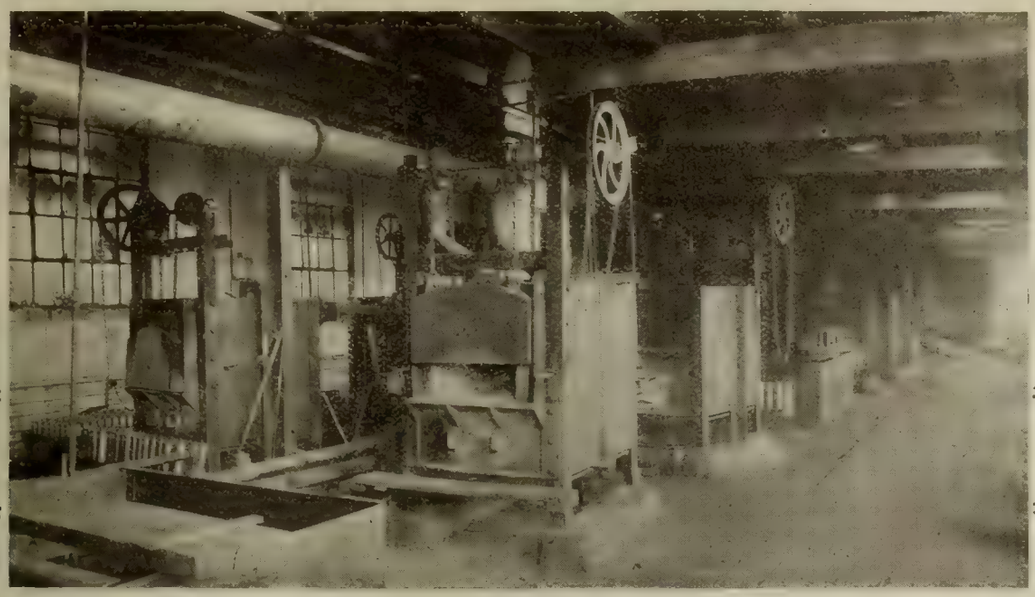

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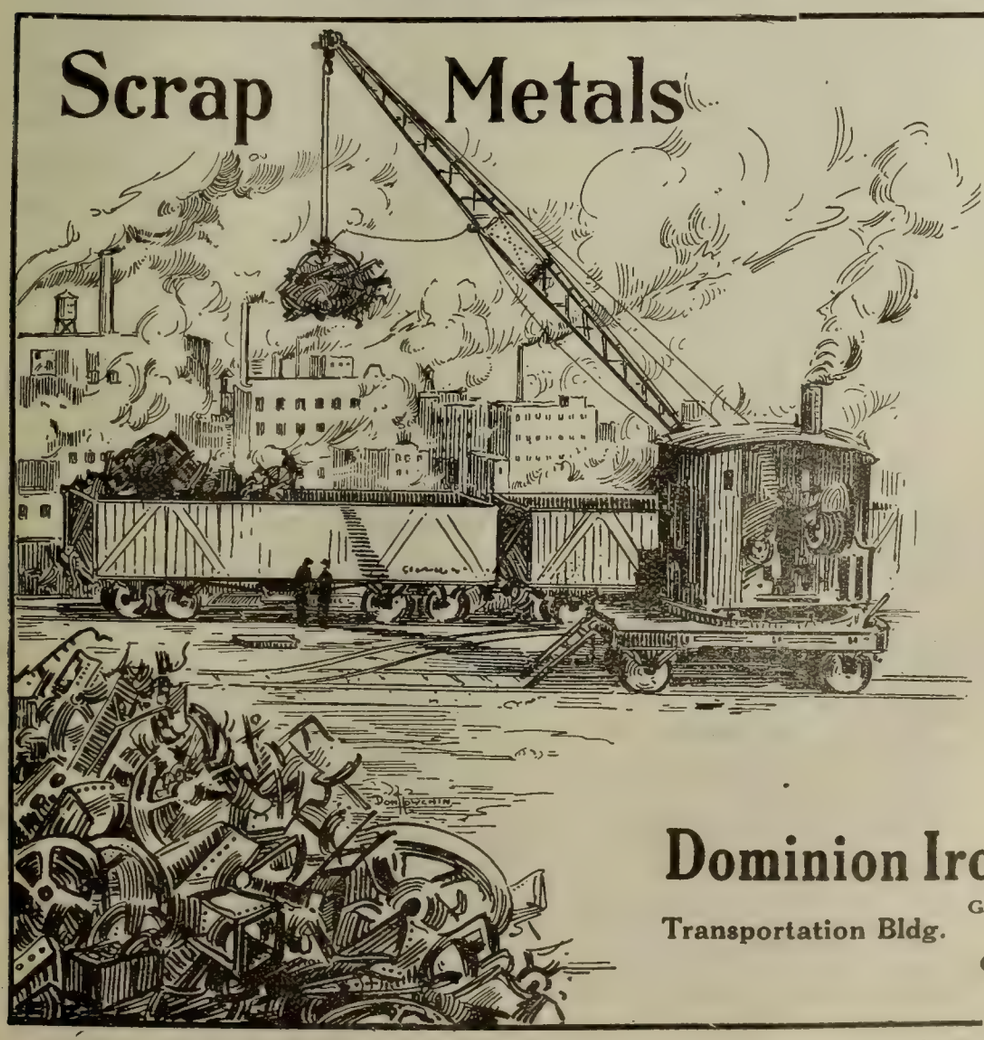

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Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

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SPROCKET WHEELS, CAST
Perrin, Wm. R., Toronto.

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Canada Wire & Iron Goods Co., Hamilton, Ont.

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Dom. Forge & Stamping Co., Walkerville, Ont.
Homer & Wilson, Hamilton, Ont.

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Brown, Boggs & Co., Hamilton, Canada
Canada Machinery Corp., Galt, Ont.
Ferracute Mach. Co., Bridgton, N.J.
Noble & Westbrook Mfg. Co., Hartford, Conn.

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Matthews, Jas. H. & Co., Hartford, Conn.
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Zenith Coal & Steel Products, Montreal, Que.

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Eagle & Globe Steel Co., Montreal, Que.
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Marshall & Co., Geo. A., Toronto, Ont.
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Fairley Davidson Steel Co., New York, N.Y.

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Butterfield & Co., Rock Island, Que.
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MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
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St. Lawrence Welding Co., Montreal, Que.
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Manufacturers Equipment Co., Chicago, Ill.
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Landis Machine Co., Waynesboro, Pa.
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Morse Chain Co., Ithaca, N.Y.
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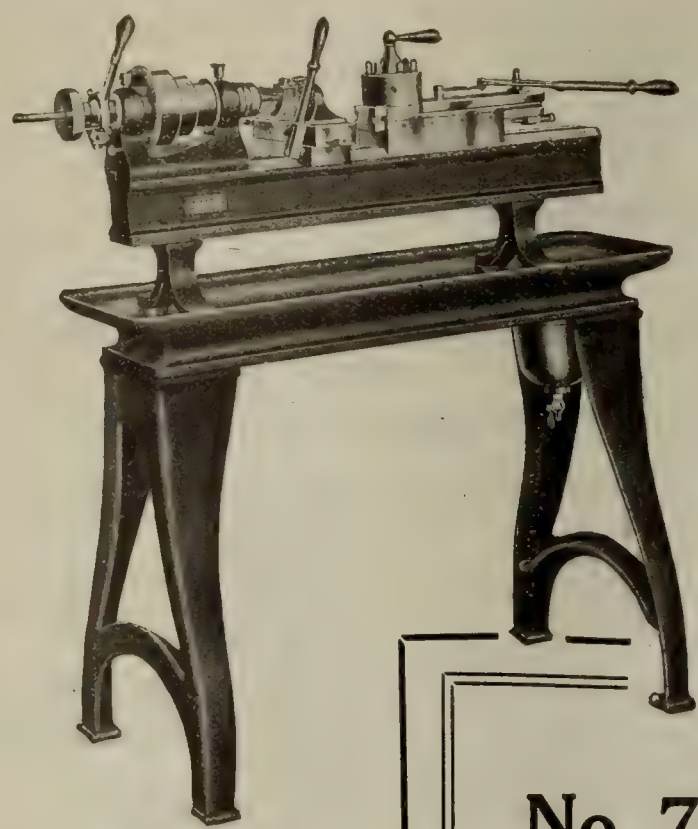

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A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XVIII. TORONTO, SEPTEMBER 20, 1917 No. 12

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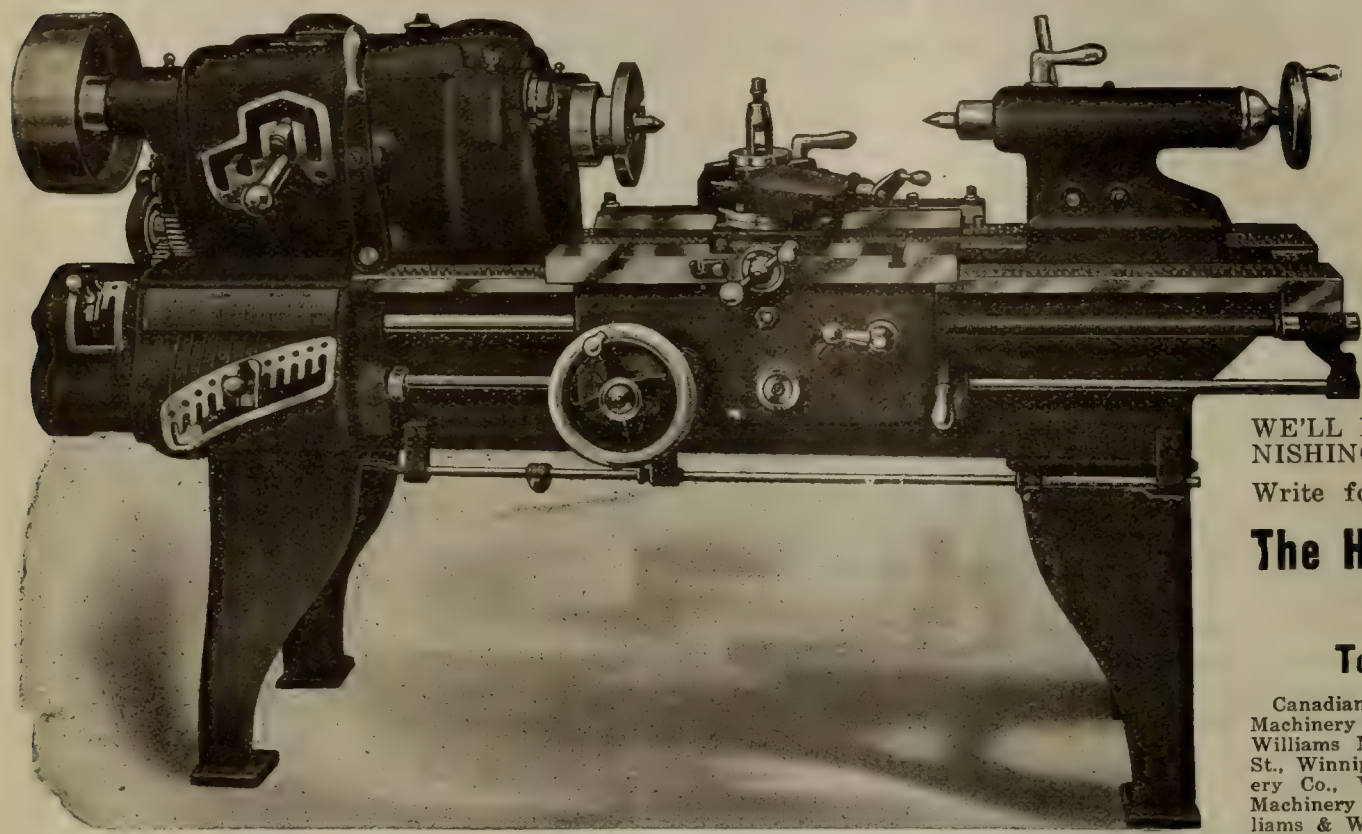

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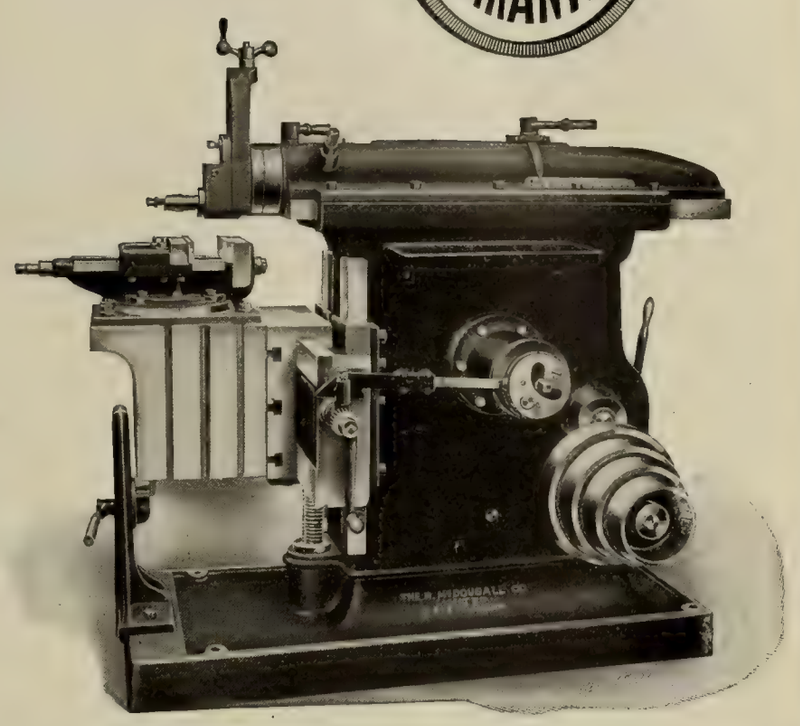

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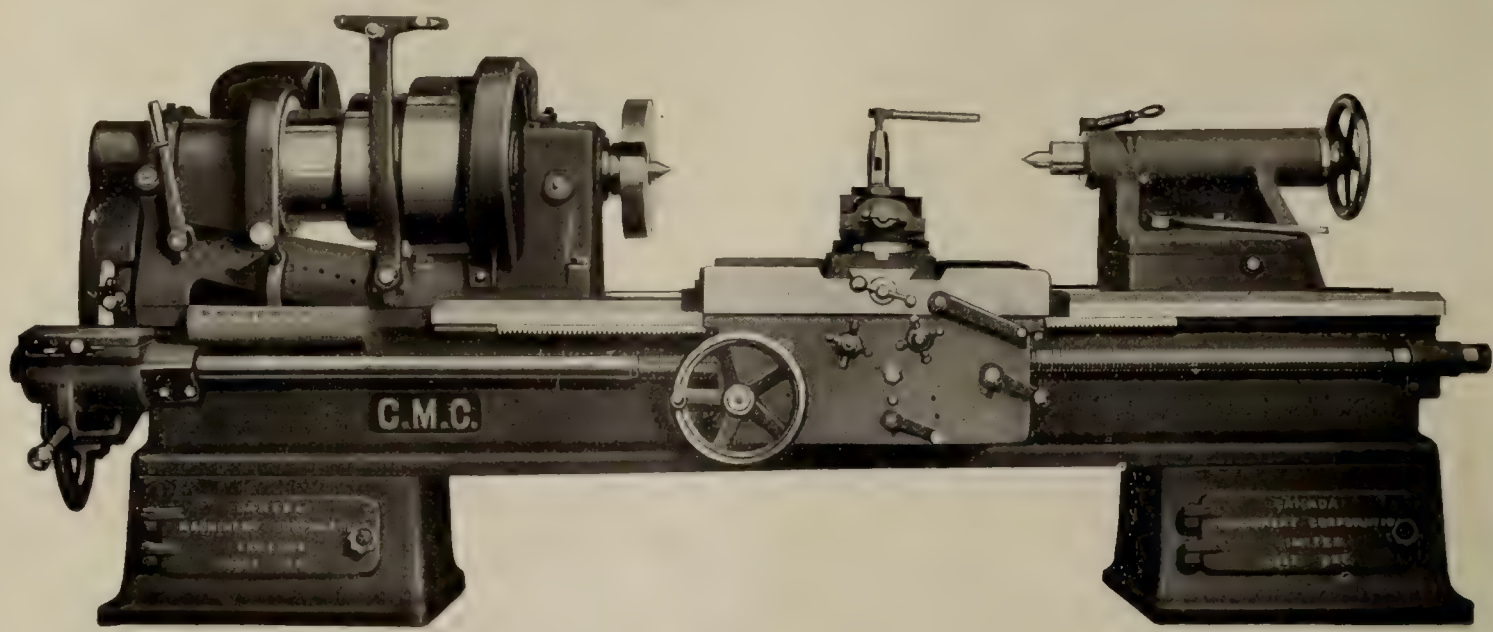

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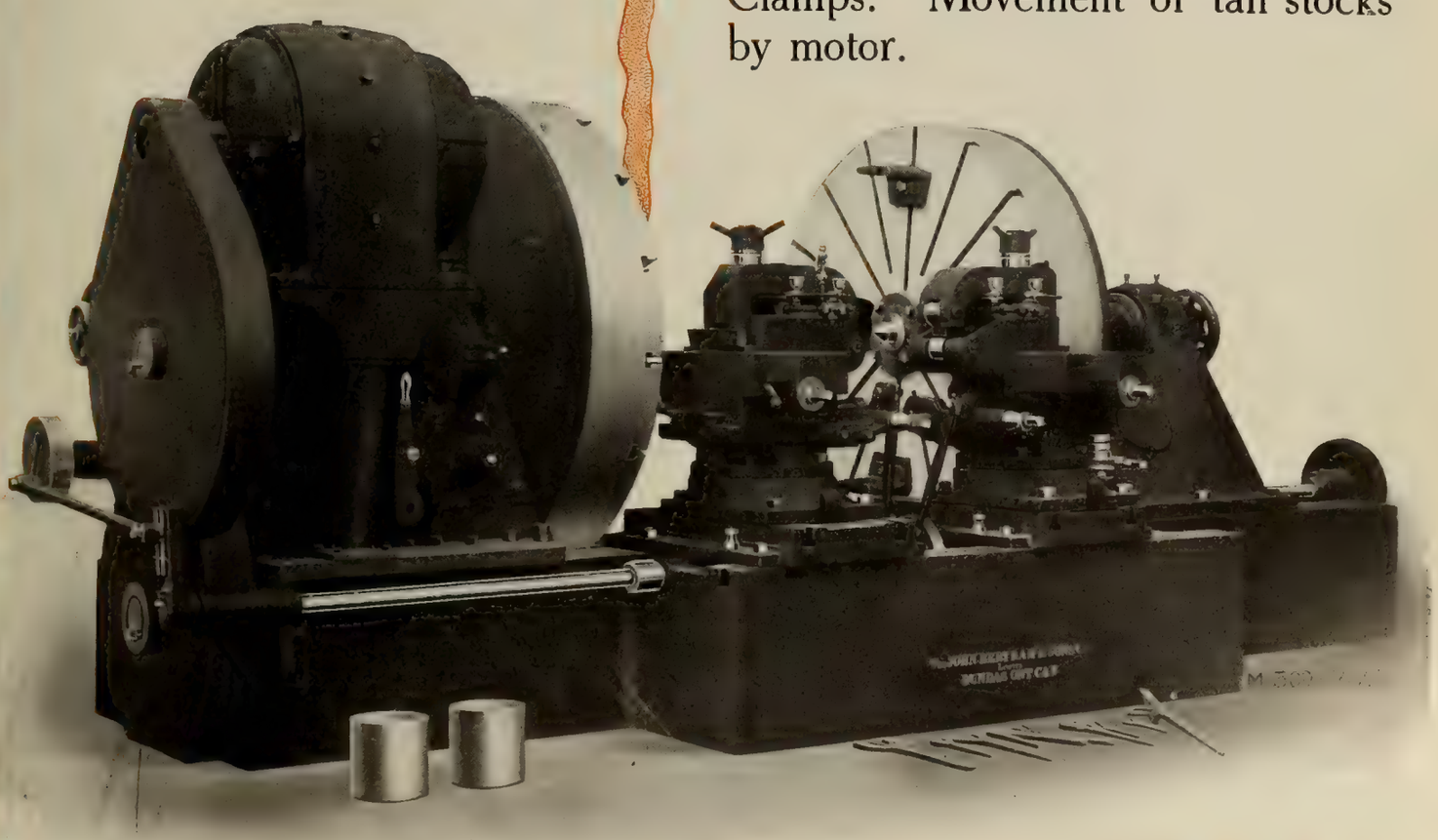

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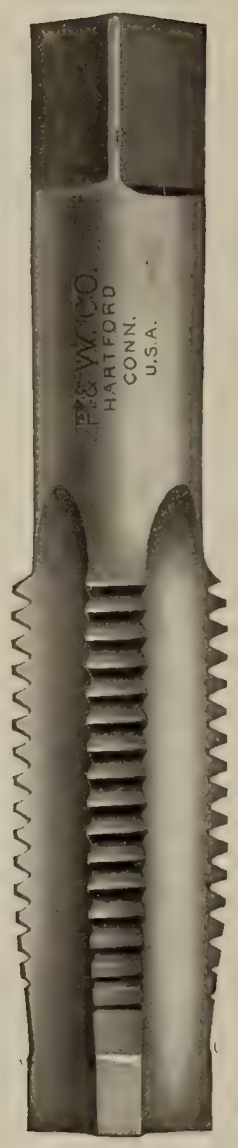
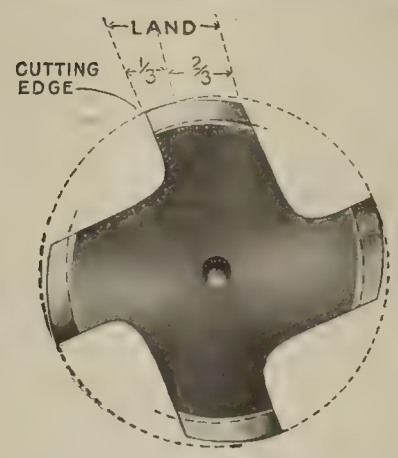


P. & W. TAPS

Insure the Greatest Accuracy



The Taps with the Con-eccentric Land

Trade-Mark Registered

As will be seen by the cross-section cut above, one-third of the land from the cutting edge has concentric relief. The remaining two-thirds is eccentrically relieved. A tap made in this way can be ground for sharpening at the only correct point—on the face of the cutting edge. Sharpening in no way affects its size or the form of the thread.

The Taper Tap has a cylindrical pilot and on the chamfered portion of the tap the top of the thread is relieved clear to the cutting edge to secure keen cutting qualities.

The construction of Pratt & Whitney Taps not only insures greater accuracy and refinement than has heretofore been possible to obtain in a commercial tool, but also insures the freest cutting tap with the longest life—an exclusive P. & W. Combination.

PROMPT SERVICE

is assured at our nearest store where P. & W. Small Tools are carried in stock. Place your order there to-day.

Precision Machine Tools, Standards & Gauges

PRATT & WHITNEY CO.

of Canada, Limited

Works: DUNDAS, ONTARIO

MONTREAL	TORONTO	WINNIPEG	VANCOUVER
723 Drummond Bldg.	1002 C.P.R. Bldg.	1205 McArthur Bldg.	B.C. Equipment Co.

BERTRAM MACHINE TOOLS

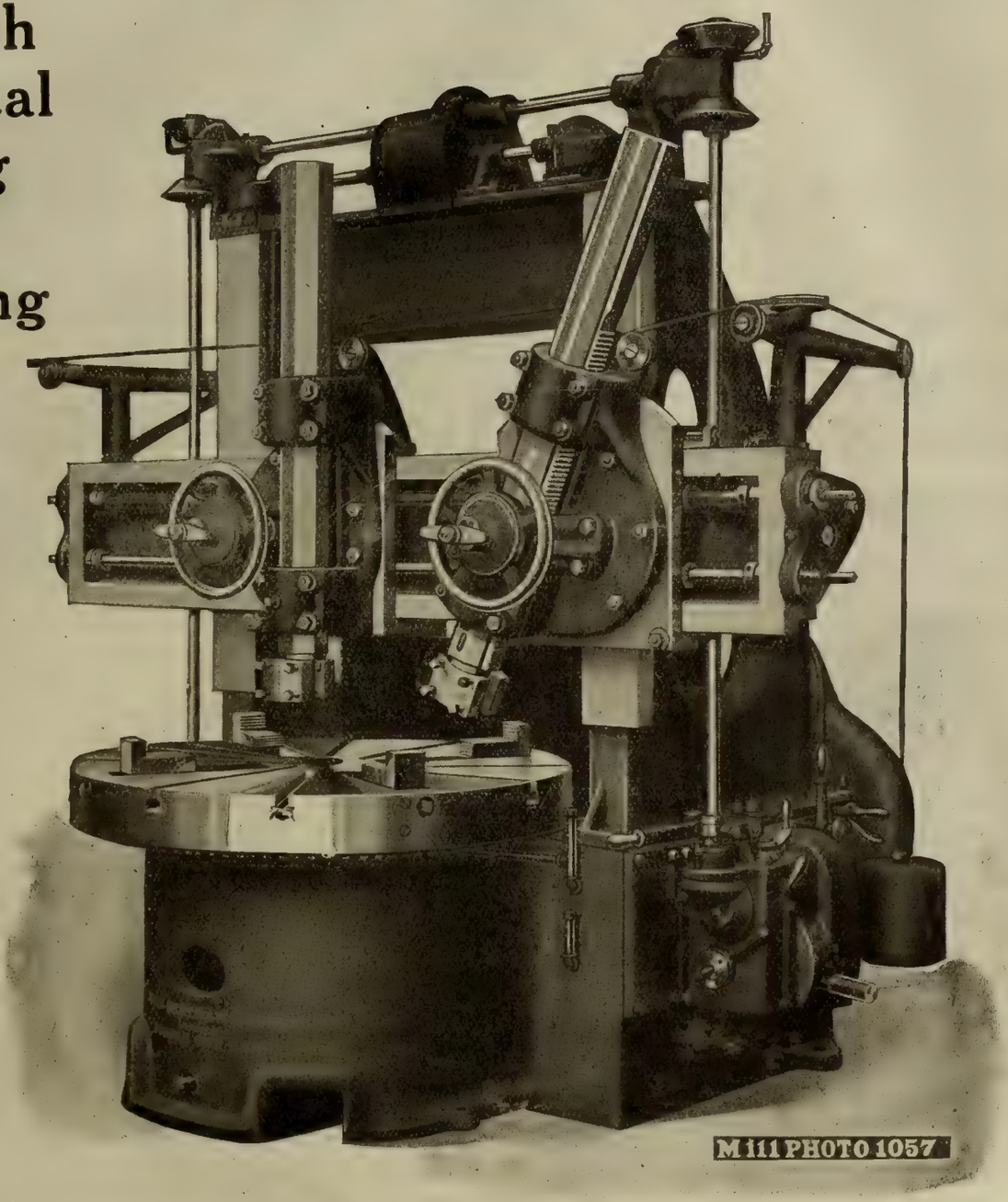
42-inch Vertical Boring and Turning Mill

Niles Type

Motor Driven Through Speed Box

Built in sizes from 42-inch to 100-inch Swing.

Drop us a line for Photographs and full particulars.



The John Bertram & Sons Company Limited

DUNDAS, ONTARIO, CANADA

MONTREAL 723 Drummond Bldg. | **TORONTO** 1002 C.P.R. Bldg. | **VANCOUVER** 609 Bank of Ottawa Bldg. | **WINNIPEG** 1205 McArthur Bldg.

The Publisher's Page

TORONTO September 27, 1917

THE sales-manager of one of the big steel companies told us a few days ago to book his order for two pages (in two colors), in the

ANNUAL REVIEW AND DIRECTORY NUMBER

Canadian Machinery
December 27th, 1917

Many of the leading manufacturers have arranged for big representation in this important issue.

The Biggest and Best Yet

Our Annual Number has come to be generally recognized as the greatest business influencing agent in industrial Canada. It has grown year after year until in 1916 it broke all records for Canadian publications, containing as it did 432 pages.

One advertiser alone carried twenty-four pages in last year's annual. Another used six pages. Several used four pages, many two pages. Many announcements were printed in colors or on colored paper.

This year we confidently expect our Annual Review Number will run over 500 pages. It will be the best and biggest and most complete Buyers' Guide ever placed in the hands of Canadian buyers. And that's just exactly what our Annual Number is—a Buyers' Guide and reference. Hundreds of copies of last year's Annual are still hanging beside the desks of buyers in the biggest shops in Canada—time-worn and soiled but still influencing business.

It is our intention to classify and group advertising as much as possible for the convenience of buyers and your co-operation is invited. If you will reserve your space at once and let us have your copy and cuts within a reasonable time it will enable us to render a much better service than would otherwise be possible.

Several firms were very much disappointed last year because we were compelled to go to press without their advertisements. Cuts forwarded by express were delayed in transit, some not arriving for two weeks after our Annual Number was in the mails! So we ask you to immediately reserve your space and to let us have copy instructions just as soon as possible. Some forms *must go to press early* and in order to properly arrange advertisements and do them justice it is absolutely necessary to press for immediate action.

If any advertisement interests you, tear it out now and place with letters to be answered.

The

Fairley Davidson Steel Co., Inc.

SPECIALISTS

	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
High Strength Steels	"Hehtemnd"
High Speed Steel	RUSHITOFF No. 6
Tool and Die Steels	"Fondwot" and "Giant"
Magnet Steels	Tungsten or Chrome
Non-Changeable Die Steel	Nugget "B" oil hardening

CHROME VANADIUM, oil hardening or case hardening

CHROME NICKEL oil hardening or case hardening

Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

Canadian Agents:

The Canadian Utilities Steel & Engineering, Limited

149 Craig Street West, Montreal, Canada

We carry a complete stock at our Montreal Warehouse

Works: LONGUEUIL, QUE.

CANADIAN MANUFACTURERS

are you using Steel

MADE IN CANADA?

We are manufacturing at our works at LONGUEUIL, QUE.

SPECIAL HIGH SPEED AND CARBON TOOL STEELS, MISCELLANEOUS SHOP TOOLS, GAUGES, Etc.

ARMSTRONG WHITWORTH of CANADA LIMITED

HEAD OFFICE: 298-300 St. James St., Montreal

Branches: 27 King William Street, HAMILTON
Dominion Bank Bldg., TORONTO
McArthur Bldg., WINNIPEG, MAN.

Coal
Coke
Iron Ore

Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

M.A. HANNA & CO.

Sales Agents, CLEVELAND

Canadian Office:

703 C.P.R. Bldg., Toronto

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

TRADE MARK "WACO"

Reliance Steel Works
SHEFFIELD, ENG.

TRADE MARK:

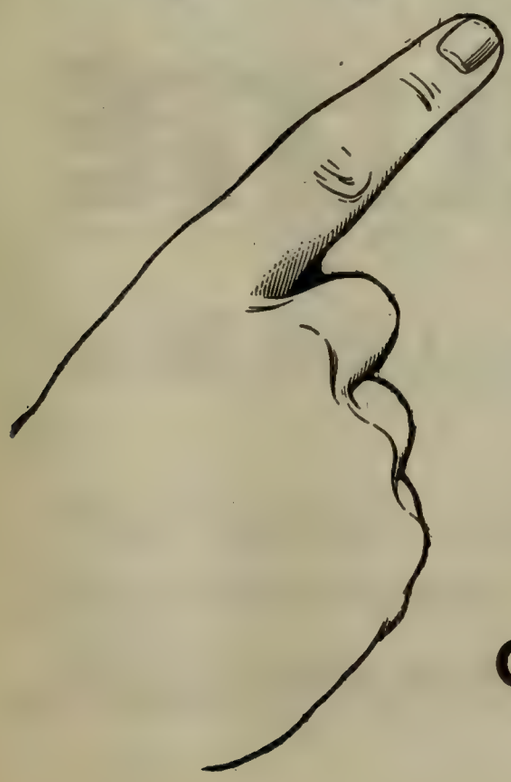
TRADE MARK

of the Famous

"WACO"

Brand

High Speed Steel and Twist Drills



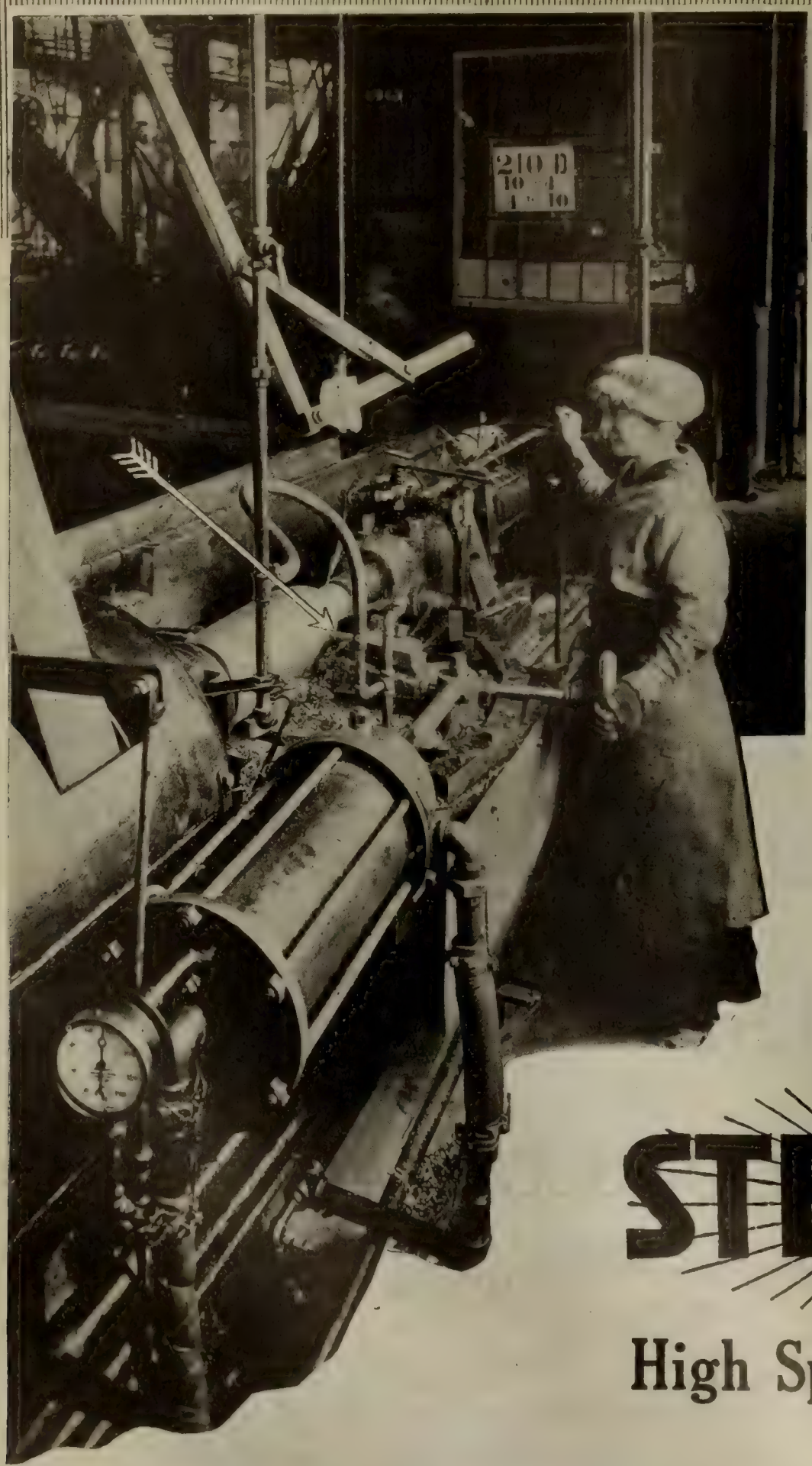
"DOUBLE WACO" Quality

Specially Adapted for all kinds of
MUNITION WORK

"Turtle" Brand
High Class Tool Steel, Files, etc.
of all descriptions.

For particulars apply to our
Sole Representatives for Canada

GEO. A. MARSHALL & CO.
70 Lombard Street Toronto, Ontario



"Not a Steel, but its Master"

FINISHING the profile of 8-in. Howitzer shells made from rolled steel forgings.

The cut starts at a speed exceeding 200 ft. per min. and machines the surface 9 in. long in 1 min. 24 sec.

The tool is given a feed of ⅛ in. per revolution and imparts a highly finished surface to the work.

An output of 55 shells per grinding is maintained easily.

An instance of extreme conditions which Stellite is meeting successfully every day.

Stellite is harder and tougher than steel. Cuts longer and 25 to 300% faster. Requires no forging, and cuts as well when running at red heat as when cold—does not lose its temper. Convince yourself that STELLITE stands behind bigger production and tool economy by giving it a try-out.

STELLITE

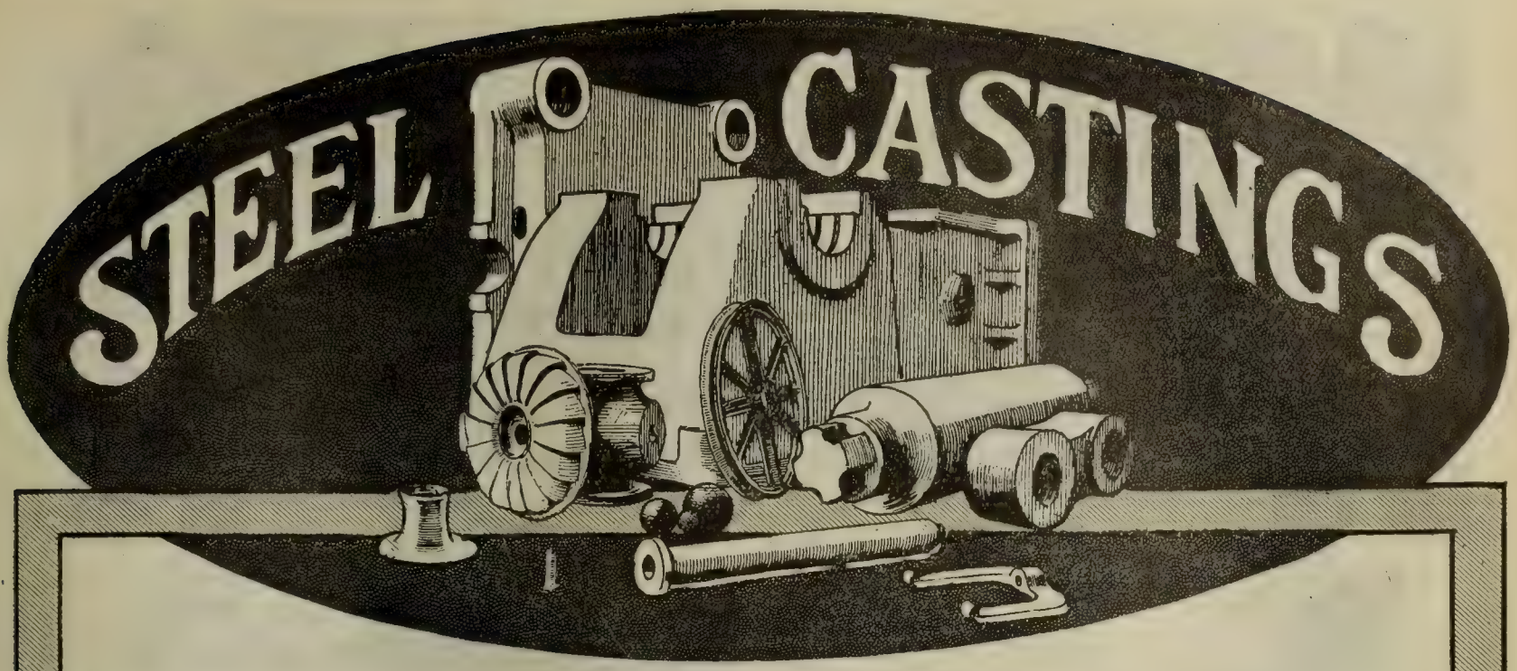
High Speed Tool Metal

Deloro Smelting & Refining Co., Limited,

Stellite Sales Dept.
DELORO, ONT.

Toronto, 200 King St., West

Montreal, 315 Craig Street, West



Manganese, Vanadium, Titanium, Chrome, Nickel Castings made in sizes from 1 lb. to 50 tons. Made to specifications and true to pattern. You can thoroughly depend on our products.

CANADIAN STEEL FOUNDRIES, Limited

MONTREAL *WELLAND*

SISCO

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" **Tool Steels**

Made in Sweden from selected Dannemora Ore

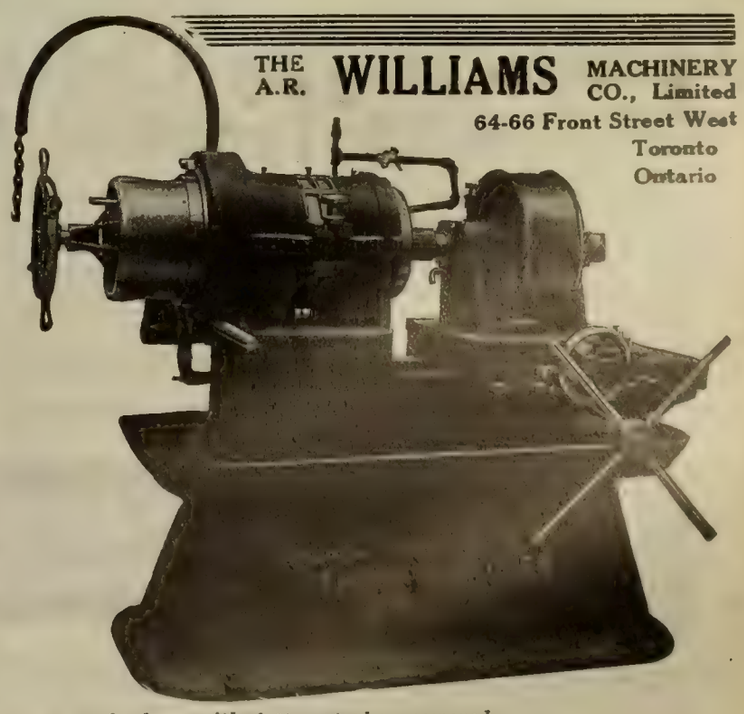
We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SIS-CO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

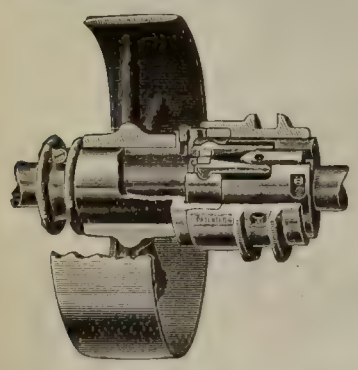
The Life of a Thread Miller

Depends not upon the amount of work it does, but the ease and thoroughness with which the work is done. These Thread Millers are noted for these qualities. Its quality of work is unrivalled. Our Service Department will give you all the particulars. *Write us!*

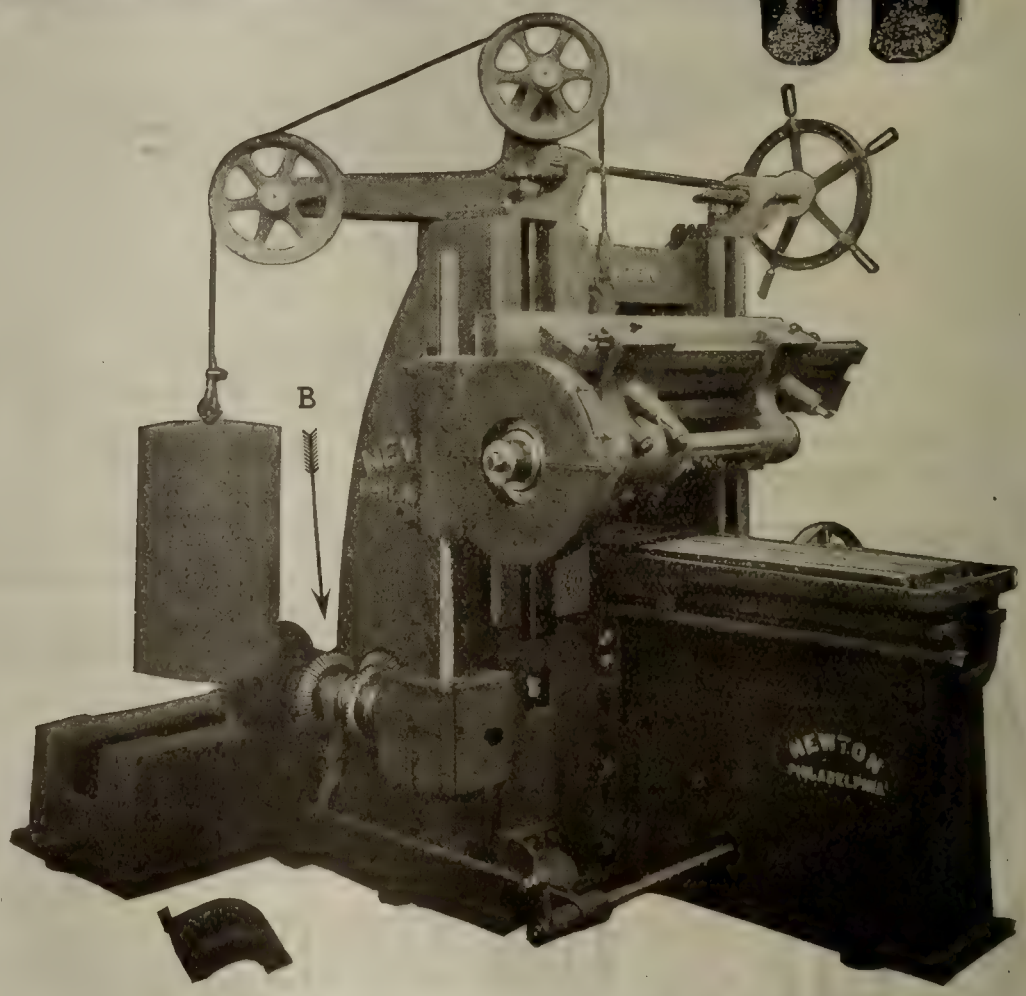
THE A.R. WILLIAMS MACHINERY CO., Limited
64-66 Front Street West
Toronto
Ontario



The Johnson Friction Clutch Is Being Used As A Part Of This Machine



Single Clutch with Pulley on Hub.



Courtesy, Newton Machine Tool Works, Philadelphia, Pa.

It's a Newton Miller

Many types of Newton Machine Tools have Johnson Friction Clutches in their make-up. The Milling Machine illustrated has a Johnson Double Friction Clutch incorporated between the gears at the point indicated by the arrow.

Johnson Friction Clutches Are Being Used on All Types of Machine Tools

Designers of all kinds of machine tools and special devices requiring clutches are invited to consult our engineering department for a solution to their problems. We are rendering this service free every day and are able to save you valuable time and many costly experiments. The construction of Johnson Friction Clutches makes them adaptable to all types of machine tools and mechanical devices.

Standard Double Clutch—Exterior

If you are a builder of machines, let us show you how a Johnson Friction Clutch will increase its efficiency.

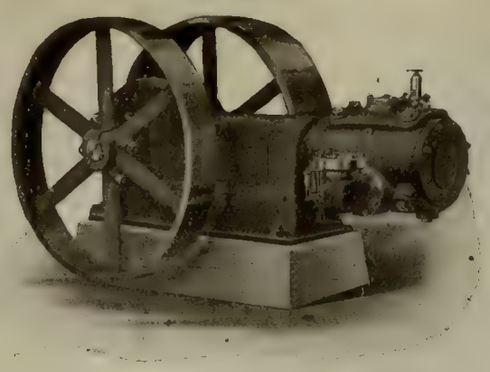
Send for our yellow data sheets and latest free booklet, "Clutches as Applied in Machine Building," now.

THE CARLYLE JOHNSON MACHINE CO.
MANCHESTER, CONN.

England—The Efandem Co., 159 Gt. Portland St., London, W., England. Sole Agents for the British Isles.

Canada—Williams & Wilson, Ltd., 320 St. James St., Montreal. Canadian Fairbanks-Morse Co., Limited, Toronto.

Australia—Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.



JENCKES

Machine Co., Limited

Works:
Sherbrooke, Que. St. Catharines, Ont.

Offices:
Sherbrooke, Montreal, St. Catharines, Toronto, Cobalt, South Porcupine, Vancouver

CB-1 Air Compressor

Equipped with disc inlet and outlet valves, machine is noiseless in operation; lubrication is of the splash gravity type; extra large bearings; machine entirely enclosed. Built and designed to give the most service that can be obtained with a compressor of this size, thus conforming to the Jenckes standard of construction.

We also manufacture boilers, engines, hoists, pulp mill machinery, stamp mills, ore cars and special machinery.

Write for further information.

FERRO-URANIUM *The Latest Discovery in Alloys for Efficient*

High-Speed and Other Steels of Quality

IT INSURES TOOLS THAT STAND UP ON THE JOB

Largest Producers in the World of URANIUM

WRITE US FOR PARTICULARS

STANDARD ALLOYS COMPANY

Forbes and Meyran Aves. -:- Pittsburgh, Pa.

STEEL

FOR SHRAPNEL SHELLS AND SHELL BLANKS

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Company
Limited

Head Office: NEW GLASGOW, N.S.

Western Sales Office:
Room 14, Windsor Hotel, MONTREAL

HIGHEST IN QUALITY — NATIONALLY KNOWN

OUR Country requires the extreme limit of production from every lathe, planer, miller or other machine tool.

BE PATRIOTIC

"Red Cut Superior"

The Nationally Known
First Quality

HIGH SPEED STEEL

Will enable you greatly
to increase your output

"IT'S THE BEST FOR ALL MACHINE WORK"

VANADIUM-ALLOYS STEEL CO.

PITTSBURGH, PA. Works at LATROBE, PA.

CARRIED IN STOCK AT THESE WAREHOUSES:

E. T. WARD'S SONS, 44 FARNSWORTH ST., BOSTON, MASS. — GEO. NASH CO., 304 HUDSON ST., NEW YORK, N. Y. — FIELD & CO., INC., 721 ARCH ST., PHILADELPHIA, PA. — VANADIUM-ALLOYS STEEL CO., PITTSBURGH, PA., AND LATROBE, PA. — GEO. NASH CO., 646 WASHINGTON BLV'D, CHICAGO, ILL.

6-inch Shell Cutting-off Machine

Cuts both ends at once

Forgings load in one end and discharge out the other end when cut

A Girl can operate it.

New quick power return for saddles

DELIVERIES REASONABLE

Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.

If any advertisement interests you, tear it out now and place with letters to be answered.

"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

MANUFACTURED BY

Arthur Balfour & Co., Limited

Dannemora Steel Works,
Sheffield, England.

The Eagle & Globe Steel Company, Limited

Head Office, Canada and U.S. — 128 Craig Street West, Montreal
Ontario Office and Warehouse — 36 Colborne Street, Toronto
Winnipeg Stock — Dominion Equipment & Supply Co. Limited
Vancouver Stock — Frank Darling & Co.

W. A. BRADBURY, Agent, 128 Craig Street West, Montreal

Electrite

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium—make this a steel of truly remarkably cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE
ELECTRIC STEEL CO.

LATROBE, PA.

High Speed Steel

Uranium

High-Speed STEEL

The tools that are made with "Wolfram" High Speed Steel are warranted to be super-keen at the edge and super-strong at the neck.

WOLFRAM

Embodies a true and permanent alloy of Tungsten, Chrome, Vanadium and Iron. No better High Speed Steel in the world.

VULCAN CRUCIBLE
STEEL COMPANY

ESTABLISHED 1900

Aliquippa - Pa., U.S.A.

Represented in Canada by Messrs. Norton, Callard & Company, Montreal.

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more stury, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6″ shells.

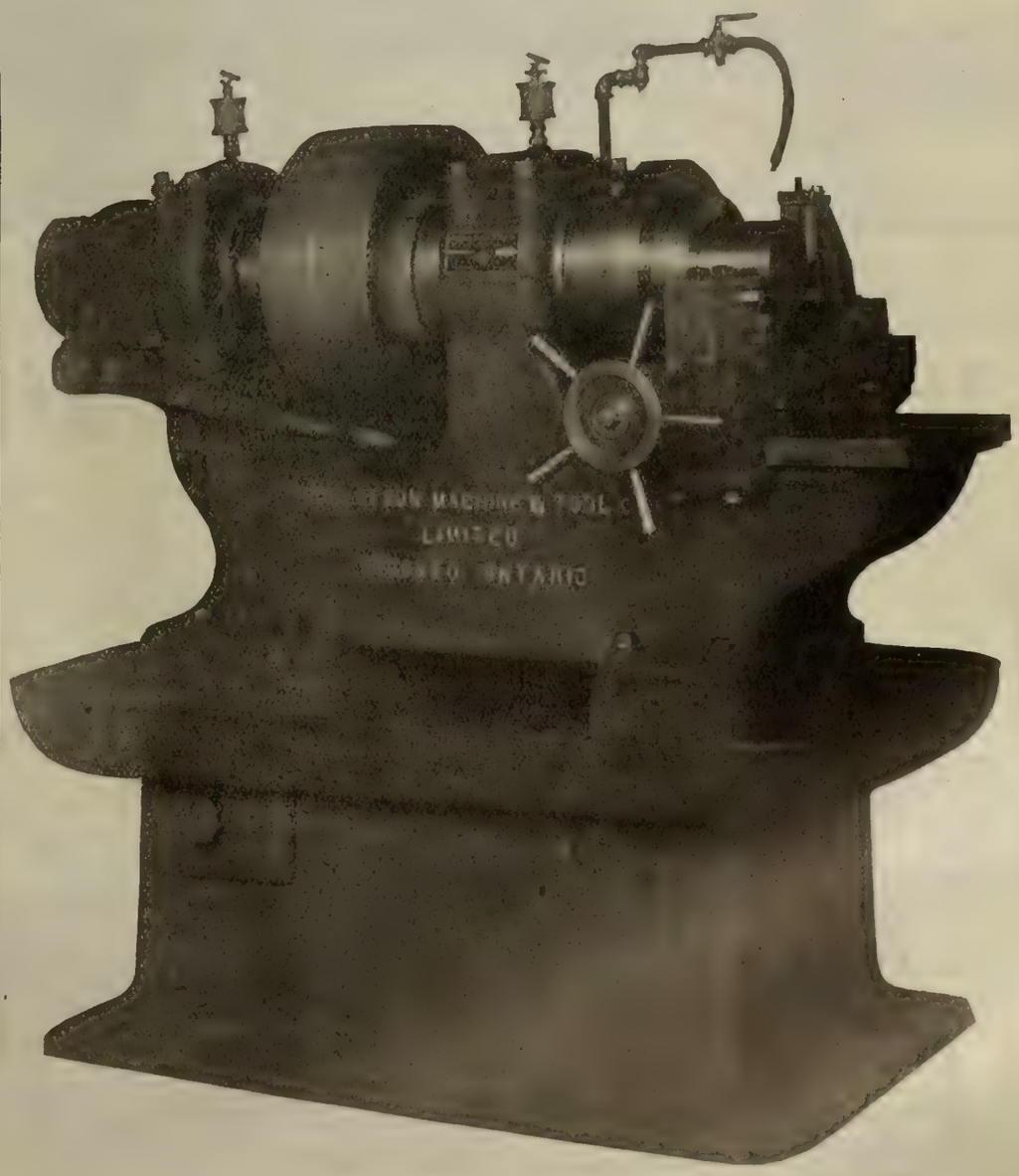
Roelofson Machine & Tool Co., Ltd.

Head Office 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6″ shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.



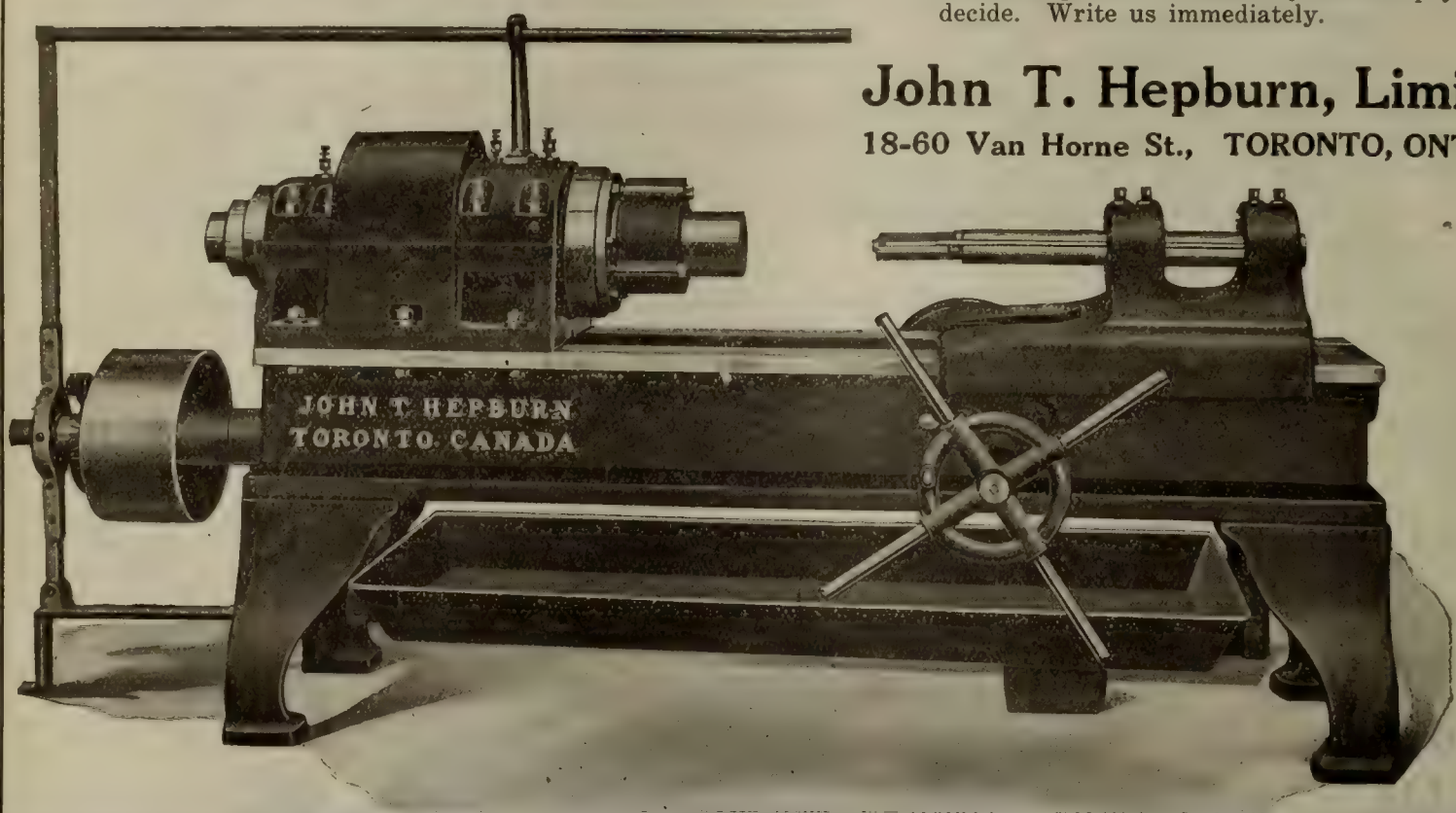
If any advertisement interests you, tear it out now and place with letters to be answered.

Renew Your Old Lathe

Not necessarily by securing a new one but take advantage of our thoroughly equipped machine shop. We repair lathes, plane the lathe beds. We build lathes and in our repairing the same care is exercised. If you intend securing a new lathe, get a list of the Hepburn line before you to help you decide. Write us immediately.

John T. Hepburn, Limited

18-60 Van Horne St., TORONTO, ONTARIO

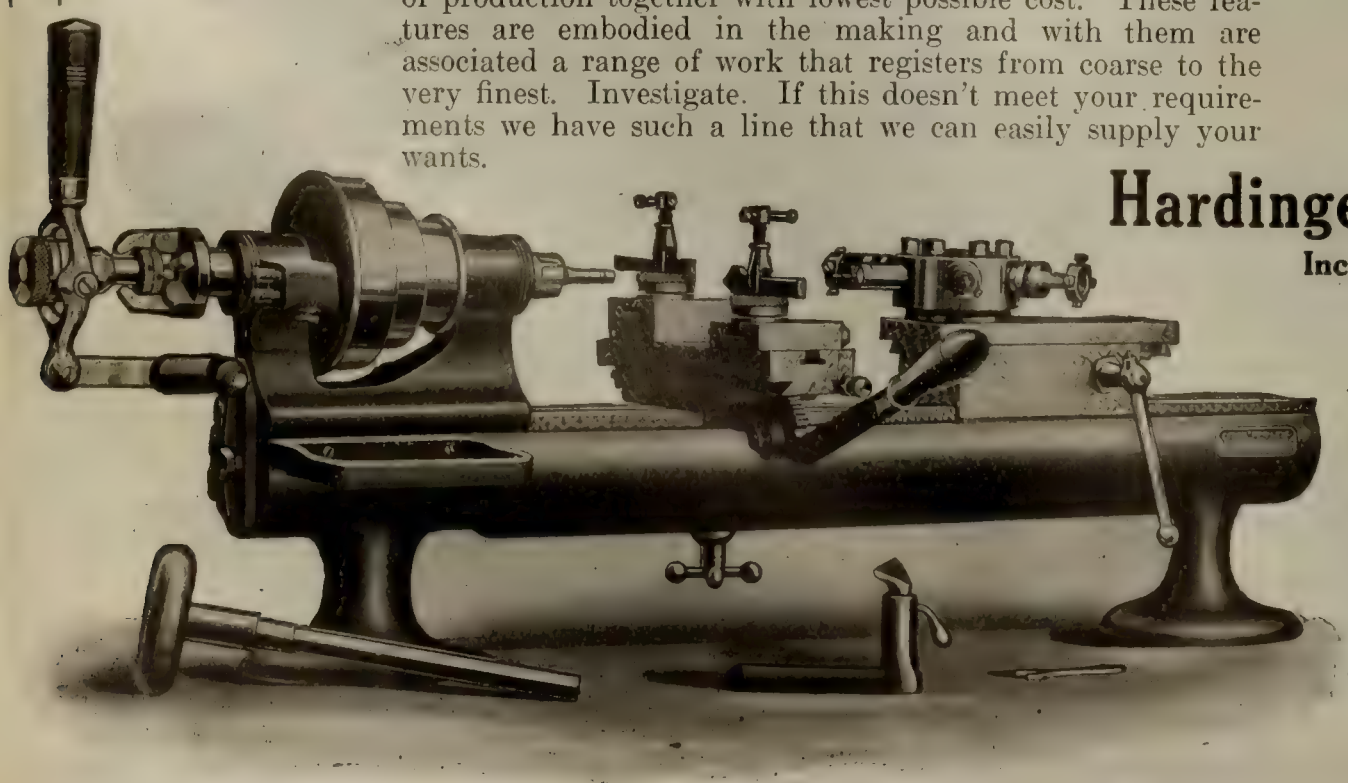


If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.

Hardinge Bros.
Inc.

1770 Berteau Avenue,
CHICAGO, ILL., U.S.A.

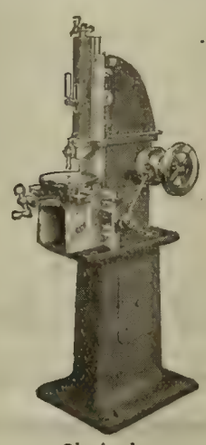


TEXTILE BELTING and PACKINGS

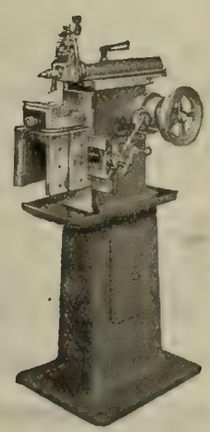
HIGH SPEED TWIST DRILLS

J. R. BAXTER & COMPANY LIMITED, MONTREAL

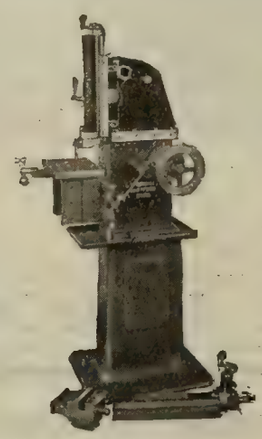
and GENERAL MACHINERY SUPPLIES



3½-inch



7-inch



Combination

Three of the machines that by their cost-reducing features have established themselves "solid" with the home users and by these same merits are reaching out in foreign countries. A silent, but powerful message of the Rhodes efficiency.

Their capacity is greatly promoted by the adjustments which may easily and quickly be attached. For shaping, slotting, die making, tool making, etc., these machines stand paramount. An inquiry on your stationery will receive prompt attention.

The Rhodes Mfg. Company

Hartford, Conn., U. S. A.

MAKE NAILS! NOT NOISE!

We offer the trade new types of

WIRE NAIL MACHINES

QUIET IN OPERATION; WITH VERY HIGH OUTPUT; ALL PARTS ACCESSIBLE; DECREASED MAINTENANCE COSTS; GREAT CAPACITY; OCCUPYING SMALL FLOOR SPACE.

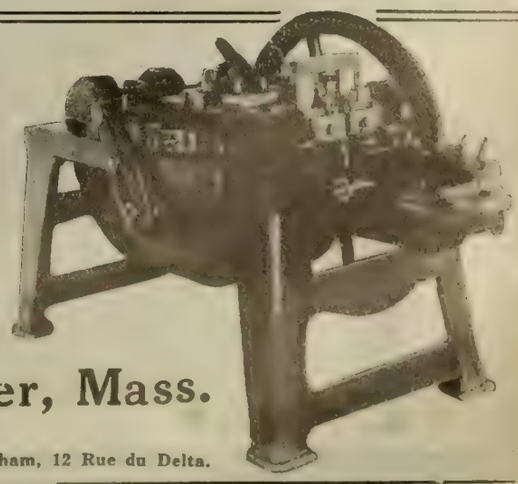
Smoothly running machines, with balanced mechanical motions and no rotating cams. Built in 5 sizes, handling wire from No. 17 to ⅜" diam.

PRACTICALLY NOISELESS IN OPERATION

Sleeper & Hartley, Inc., Worcester, Mass.

CANADIAN BRANCH, COATICOOK, P.Q.

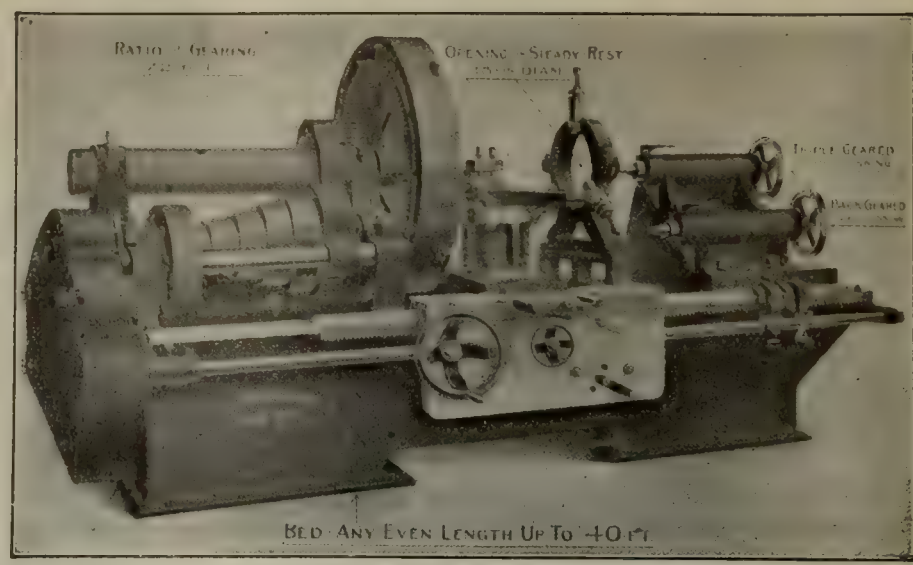
London, England, F. A. Perry, 63 Queen Victoria Street, E.C. 4. Paris, France, Edgar Bloxham, 12 Rue du Delta.



One Ship-building Plant

wrote to six different Lathe-Builders

and bought McCabe's "2-in-1" Double-spindle Lathe—on a 30-ft. bed—because it was "different" and built especially for such a wide range of work.



McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing
As a 48 inch Triple-Geared Lathe

What other big Lathe can you get, and have full use of your Lathe, whether you have big or small work?

What Lathe Manufacturers except McCabe could make such a low price possible?

No other Lathe builder turns out 48-inch Lathes in such big lots at a time, making the parts all duplicate and interchangeable.

And in addition to the 48-inch Triple-geared Lathe, the 26-inch is the "Lathe plus" feature McCabe offers you—at no extra cost.

DOUBLE service—convenience and capacity—all described in Latest Bulletins.

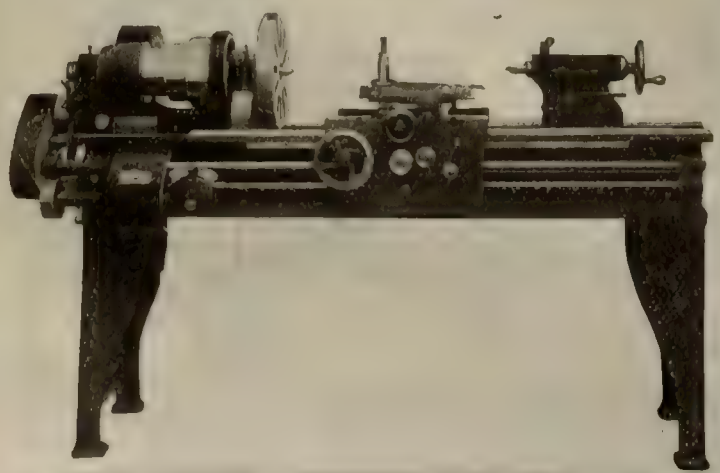
J. J. McCABE, 149 BROADWAY, NEW YORK

Quality Points

The **headstock** is the point where the size, strength and life of the machine is decided. The **carriage** decides the utility and the **tailstock** is the general assistant to both. At these points is the value of a machine judged. We invite your close inspection of the Filsmith 13" Engine Lathe, fully confident that you will reiterate the statements of praise that our clients are now expressing. An inquiry will receive prompt and intelligent attention.

The Philip-Smith Mfg. Co.

Sidney, Ohio, U.S.A.



PRACTICALITY

AFTER fifteen years' study of the Miner's and Lumberman's wants, we know just what is and what is not required in tools for them.

Practicality has been the keynote of our organization. Experience has aided us in eliminating all unnecessary parts and in perfecting the design of our tools.

The use of best material and finest workmanship enable us to manufacture tools that are unexcelled.

We make a complete line.

Write us for prices.

J. W. CUMMING & SON, LTD.
NEW GLASGOW, - - CANADA

Wood or Steel, let Cummings make it.

Two Cuts at One Time

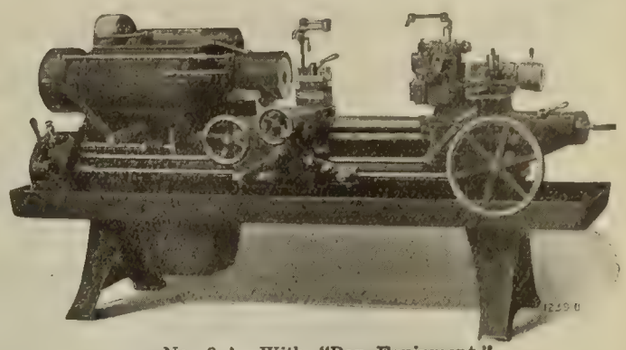
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

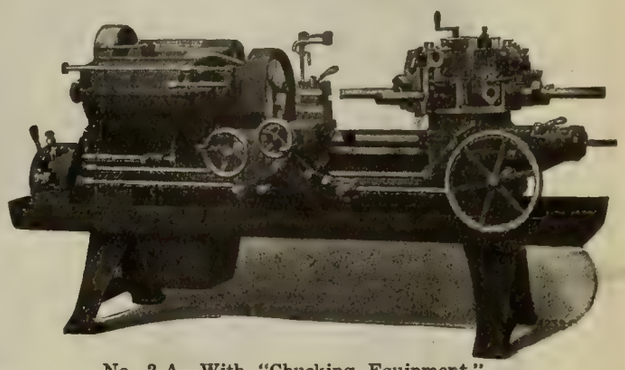
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."



No. 2-A—With "Chucking Equipment."

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal, Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

WHITCOMB-BLAISDELL

The Planer With the Second-Belt Drive

A smooth, easy reverse—which permits higher cutting and return speeds yet prolongs the life of the entire machine — that is the outstanding feature of this distinctive Whitcomb-Blaisdell Second-Belt Drive.

Our Planer Book gives the details of design and construction. Write for it.

Whitcomb-Blaisdell Machine Tool Co.
Worcester, Mass., U.S.A.

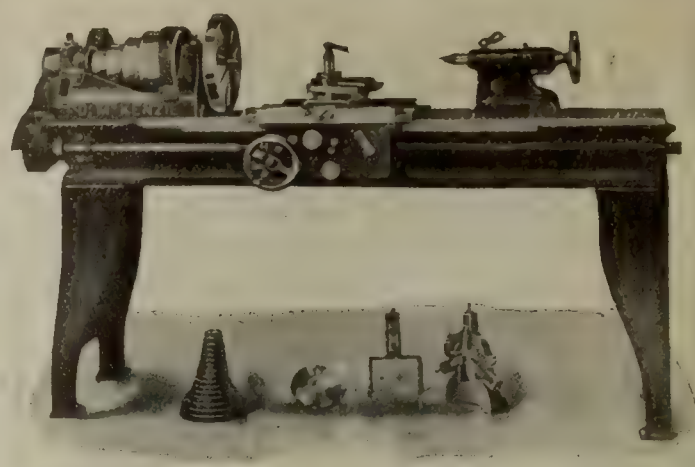
26x32 inch Whitcomb-Blaisdell Planer Widened Pattern.

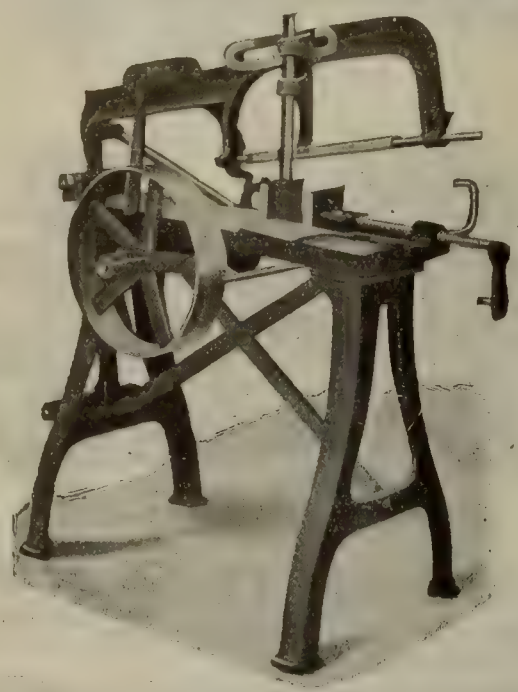
The "McKenzie" Engine Lathe

The Standard of Accuracy

Made from new patterns, of improved design, and constructed of the very best material by expert workmen. Every part is mechanically perfect and excellently finished. Its accuracy and durability mean a big saving of money to you.

Let us put full details before you. Write!





The Improved Power Hack Saw

will cover its cost many times over with the money it saves through long, efficient service.

Saws bars 6 x 6 in., either round or square, and is so constructed as to require no attention after work is put in vise, and stops automatically when piece is cut off.

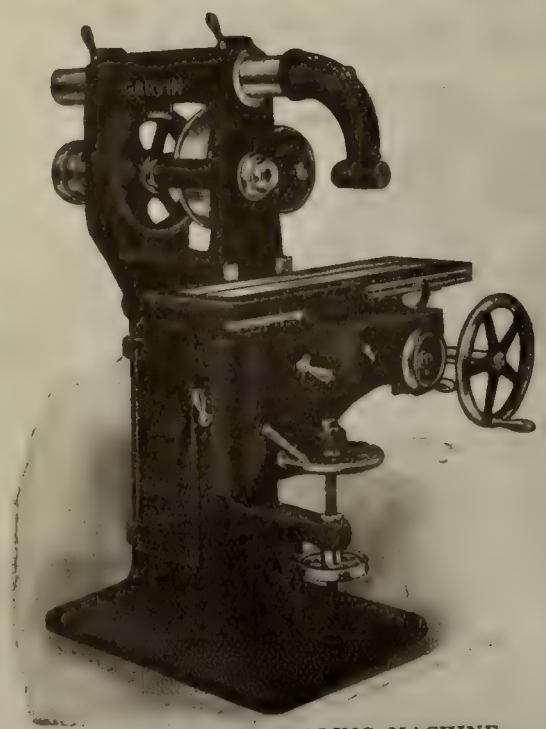
The Improved Saw Guide is a Special Feature — it keeps the saw perfectly in line at all times.

The D. McKenzie Machinery Co.

Guelph, Ontario

GARVIN No. 21 Plain Miller

Back Geared



No. 21 B.G. PLAIN MILLING MACHINE
Back Geared
Use Code - Abject

For Plain and Gang Milling for general manufacturing, and is used mostly in gangs of 5 or 6 machines to one operator. Spindle runs in adjustable bronze boxes, and is driven by a 3″ belt through back gears (3 to 1).

Knee is our improved solid top design, rigid and stiff to resist side pressure of heavy cuts.

DIMENSIONS:

Automatic Feed of Table	18 in.
Adjustment in line with Spindle	6 in.
Vertical adjustment under Spindle	13 in.
Table, inside Oil Pockets	6 x 30 in.
Changes of Speed	6
Changes of Feed	6
Net Weight, Skidded	1,575 lbs.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

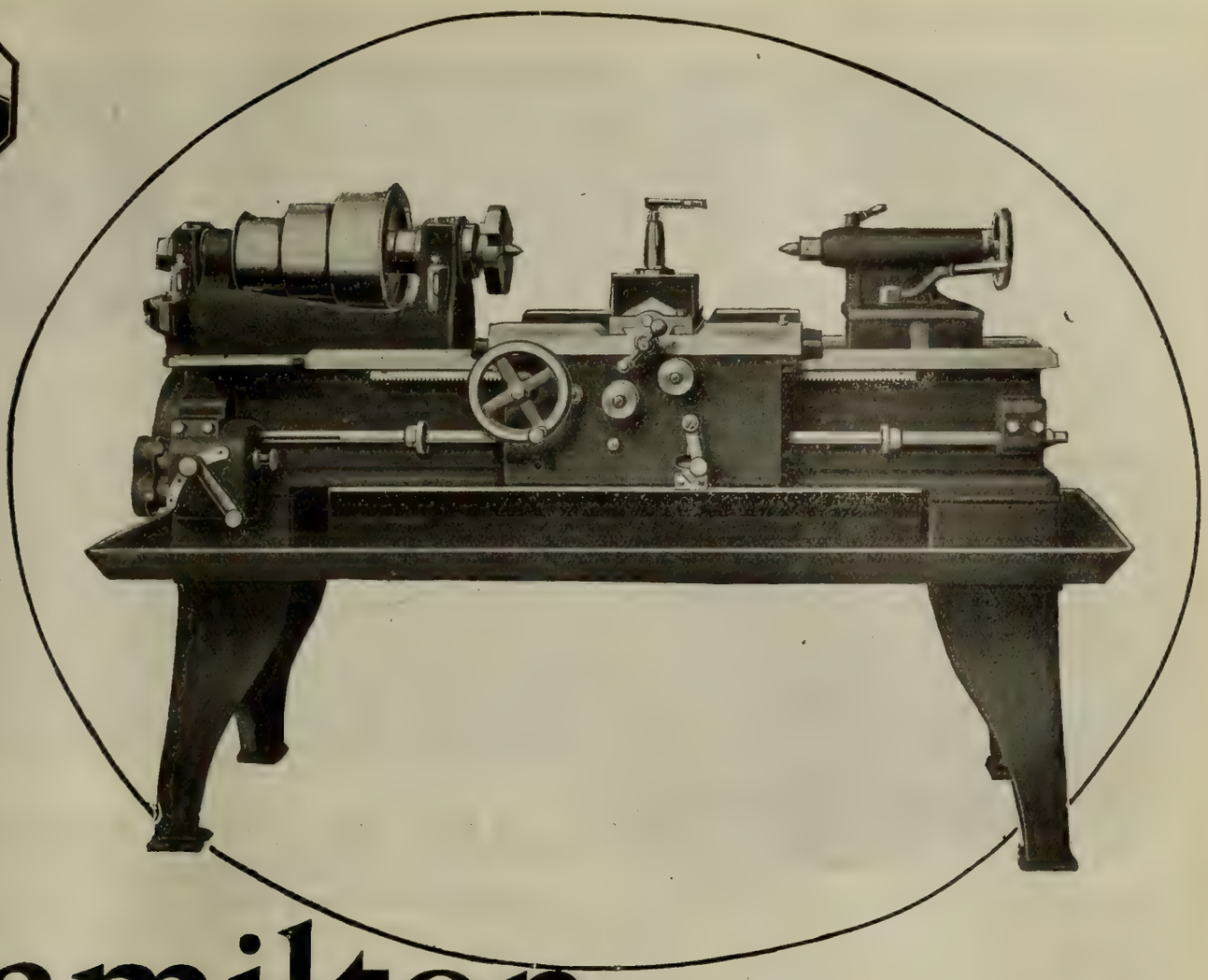
Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) **50 Years New York City**

Rapid Production HAMILTON Machine Tools



Hamilton Lathes

Equipped with a complete range of feeds with quick changes. Automatic Stop and other Hamilton features which make it an indispensable lathe for the shop in need of a speedy, cost-cutting, efficient machine.

Its simplicity of design to ensure ease of operation is a big factor in favor of this lathe.

For long runs on duplicate pieces we highly recommend this New Hamilton Lathe, built for plain turning, boring, etc. This machine meets the popular demand for a single-purpose machine for automobile and manufacturing of a like nature.

They can be converted and adapted to a wide range of operations by equipping with back gears, screw-cutting mechanism, etc. 14, 16 and 18-inch sizes. Bulletin with full descriptions on request.

Ask to-day.

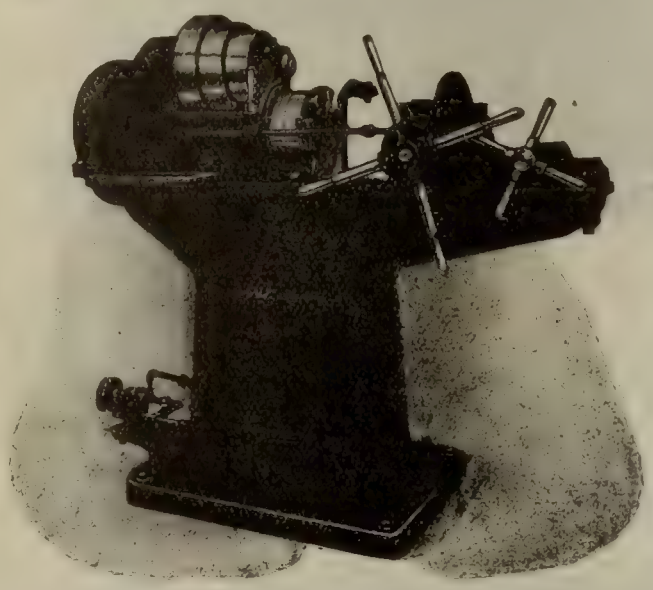
The Hamilton Machine Tool Co., Hamilton, Ohio

Sole Agents for Ontario: H. W. Petrie, Limited, Toronto, Ontario

Landis Threading Method Means Less Labor

AS labor becomes scarce and wages increase, industry requires the most efficient and most economical machine for every line of work.

Meeting that condition in regards to thread-cutting is the **Landis Threading Machine** or **Die Head** for bolt, pipe and special threads. The Landis Die can b e used advantageously for cutting every thread in your shop. No matter what form of thread, pitch or shape of the part to be threaded, the Landis will handle it to your complete satisfaction. Many threading jobs which were formerly done on lathes are now threaded with a Landis die head or machine and the results are **equal accuracy, a higher production** and **a lower threading cost.**



One customer writes:—"We have made an increase in production of 30 to 40% and a savings in the cost of chasers of 50 to 60% since installing your machine."

Does not that prove the efficiency of the Landis Threading Method?

Write for catalogues.

No. 22—Bolt Threading Machinery.

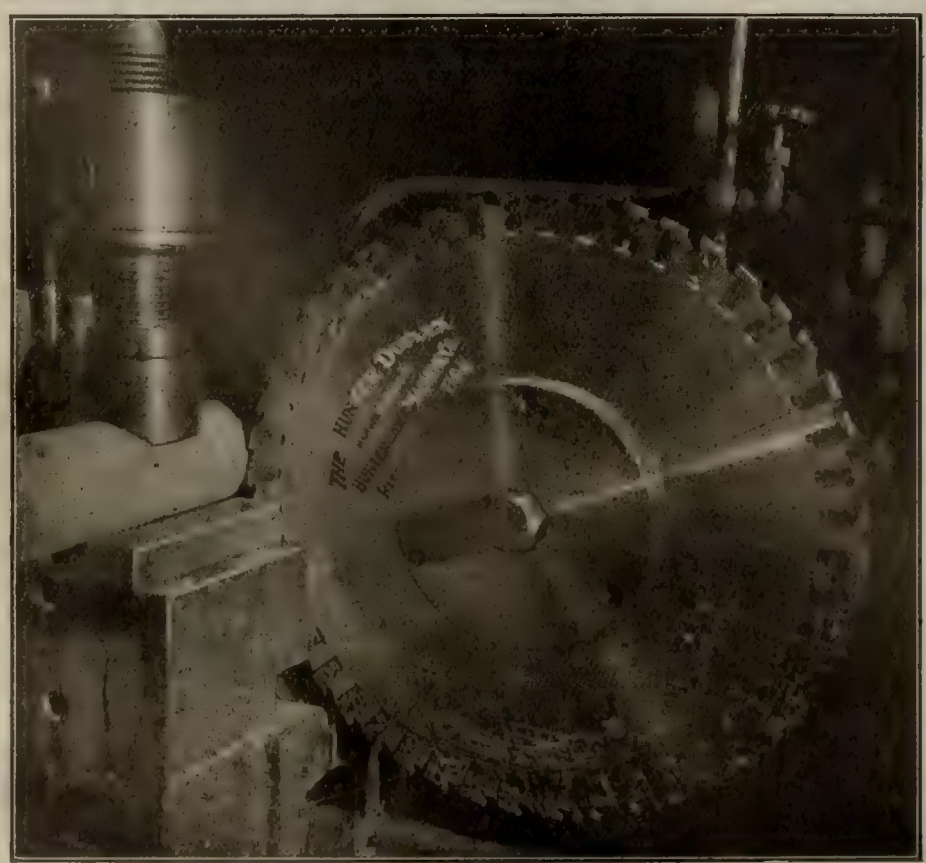
No. 23—Pipe Threading Machinery

Landis Machine Company

WAYNESBORO, PA.

Exclusive Canadian Agents: Williams & Wilson, Limited, Montreal

A Hunter "Duplex" on Shrapnel Stock



FAST GOING

on Newton Machine

Through 3½" round 60 Carbon, 70 Manganese Shrapnel Stock every

2 MINUTES

The secret of Hunter "Duplex" Saw speed is the method of holding the high speed teeth.

You can use this speed profitably — on shrapnel or any other stock.

Let us send full Particulars.

HUNTER SAW & MACHINE COMPANY, Pittsburg, Pa.

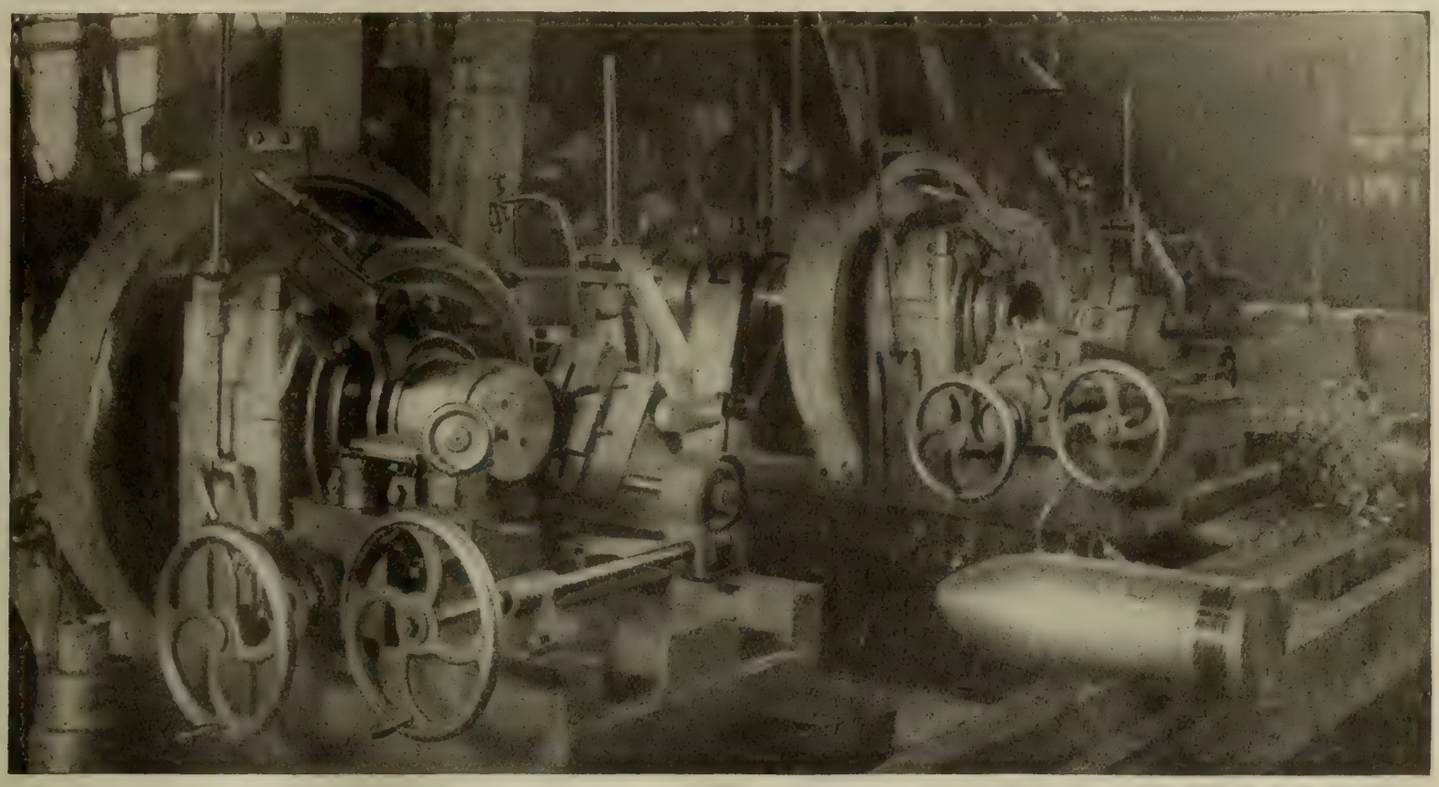


Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

These machines are built for turning bands on 8", 9.2" and 12" shells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. **Write for full particulars and price.**

Bennett Ave. **Warden King Limited** **Maisonneuve, P.Q.**

Two Cuts

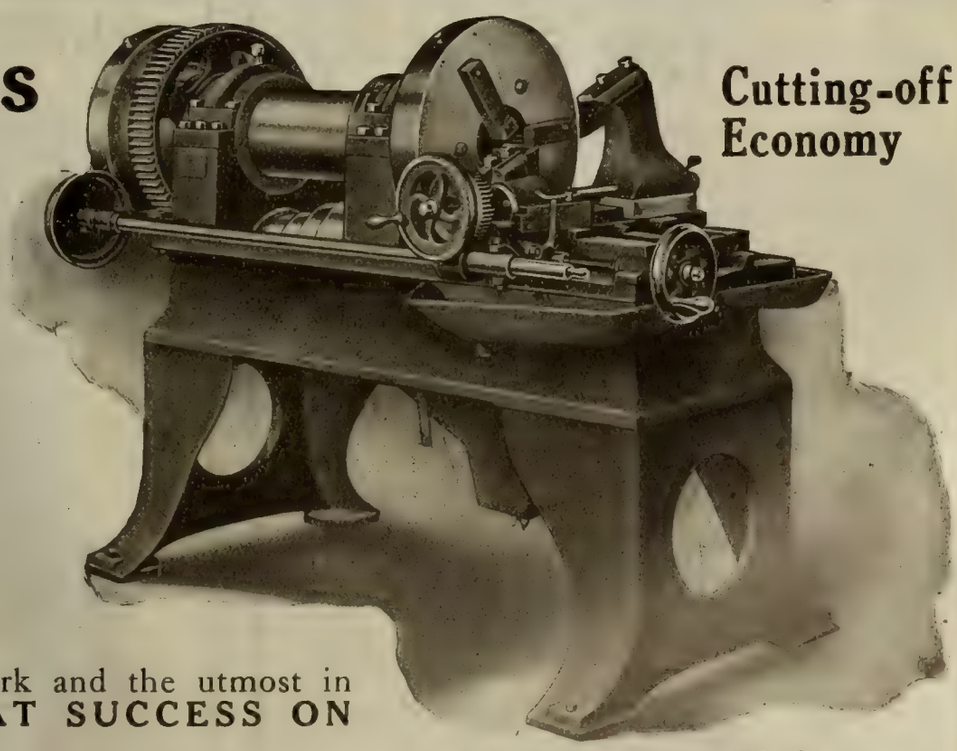
Simultaneously

One up, the other down. This is what makes the **Hurlbut-Rogers Cutting-Off and Centering Machine** virtually double the output and reduce the cost per piece about one-half.

The Hurlbut-Rogers Machine gives you capacity of two machines at the expense and in the floor space of one machine.

We build them for hard work and the utmost in accuracy—and their **GREAT SUCCESS ON SHELLS** shows it.

Cutting-off Economy



5-inch Cone-Driven Machine

Let us go into details.

HURLBUT-ROGERS MACHINERY CO., South Sudbury, Mass.

FOREIGN AGENTS—England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow and Newcastle-on-Tyne. H. W. PETRIE, TORONTO, CANADA.

The Success Obtained by Consolidated Presses

is due to the generous and correct proportion of the frame, the rigid bed construction, the extra long and wide slideways, the lengthy main bearings, the powerful clutch, large diameter and wide faced gears, steel pinions, the accurate machining and fitting of the various parts.

These are all vital points to be considered in buying presses.

Duplicate orders from satisfied Consolidated Press users are an indication that these features count.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

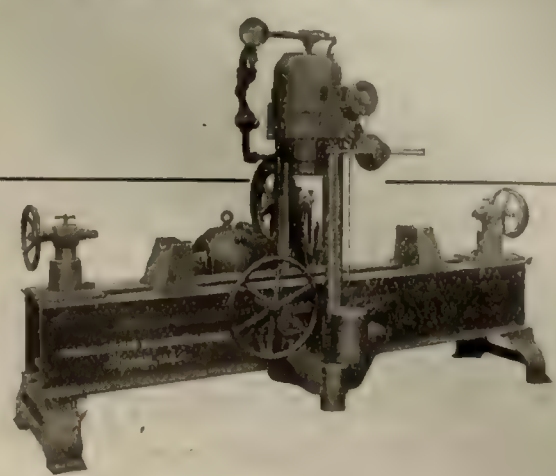
Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

ELMES

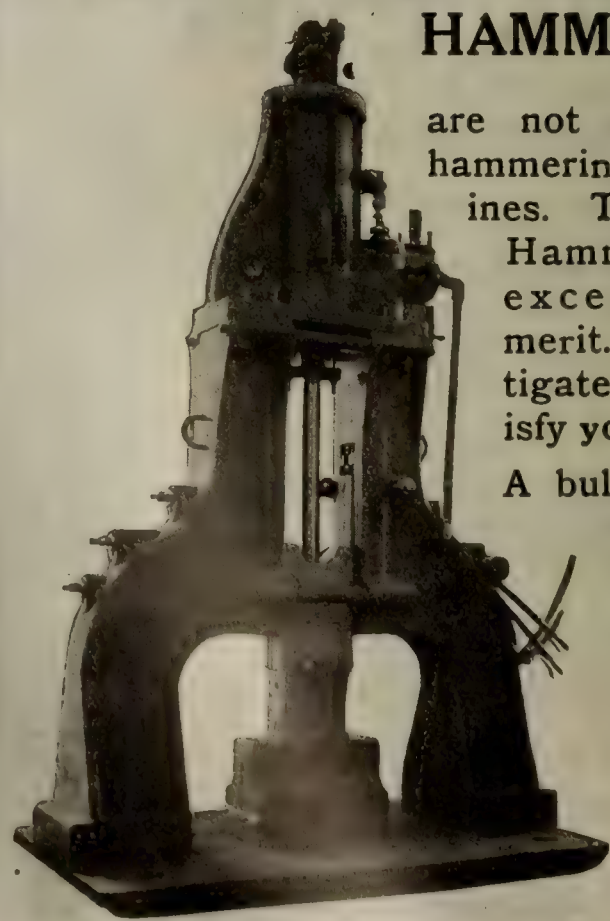
Motor Driven Straightening Press for shafts up to 5 in. Movable head, height adjustable, close regulation of action, strong screw centre parts. One of our many types.

Charles F. Elmes Engineering Works.

217 N. Morgan St. Chicago, U.S.A.



"ERIE" STEAM FORGING HAMMERS



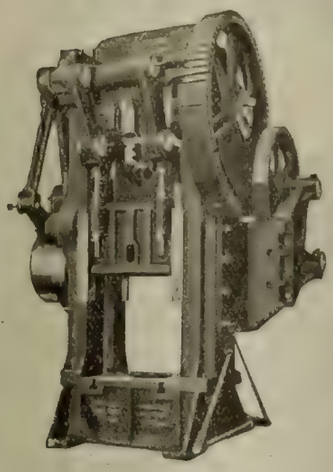
are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U. S. A.

THE "TOLEDO"

Toggle Drawing and Deep Stamping Presses

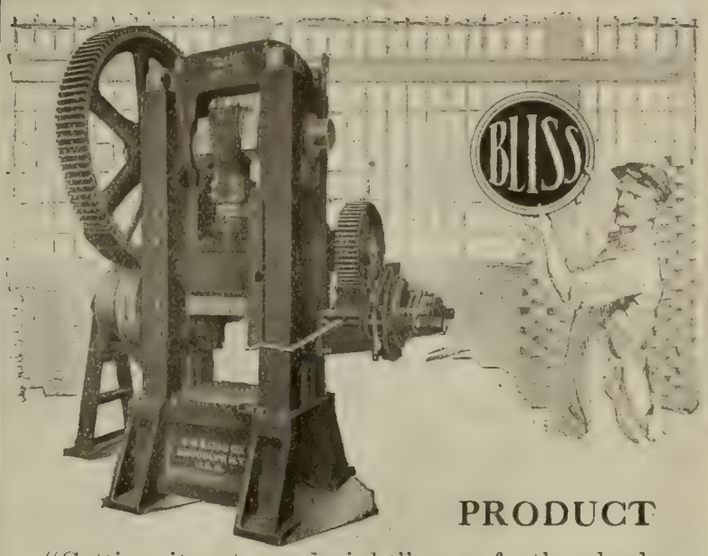


A few of the advantages: Perfect dwell of blank holder during entire drawing operation; the exertion of all the required power; elimination of wasters due to undulation of the blank holder pressure; perfect timing and consequent effective balancing of entire machine assuring smooth, silent running and safety for operator.

Toggle arms, rocker arms and yokes are made throughout of steel with inserted bronze bushings at each bearing.

Built in all sizes for work from tin cups to road scrapers.

The Toledo Machine & Tool Co.
TOLEDO, OHIO



PRODUCT

"Getting it out—and right" goes further back than the selection of the machine. It may go back 10 or 20 or 40 years to some point or problem solved in our 60 years' development of Presses that produce.

If you want machines with production capacity based on *longest* practical experience, buy "Bliss."

BLISS **E. W. BLISS CO.** BLISS
Brooklyn, N.Y., U.S.A.
1857 1917

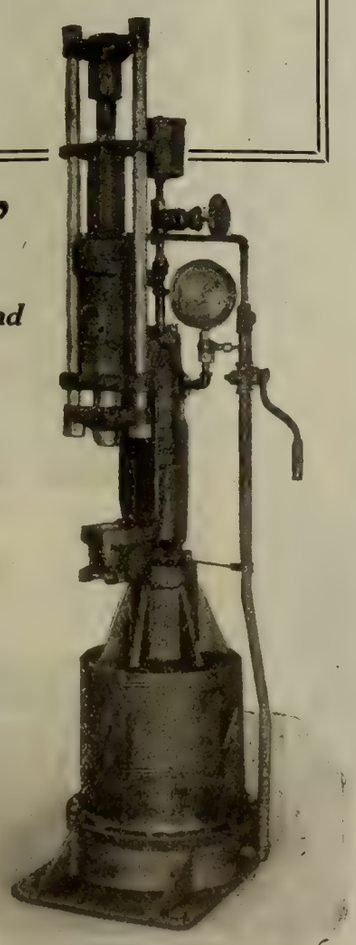
CHICAGO OFFICE People's Gas. Bldg.
DETROIT OFFICE Dime Bank Bldg.
CLEVELAND OFFICE - Union Bank Bldg.
LONDON, S. E., ENGLAND Pocock St., Blackfriars Road
PARIS, FRANCE 100 Blvd. Victor-Hugo St. Ouen

Triple Purpose

"METALWOOD" COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.



Metalwood Mfg. Co.
Leib & Wight Sts., DETROIT, MICH. U.S.A.

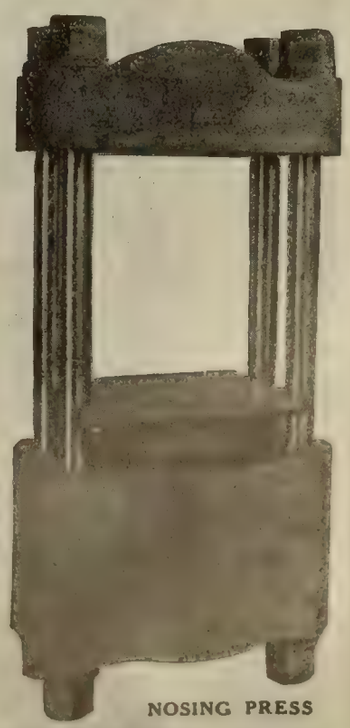
For Great Britain and Continent address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

PRESSES

Pumps and Accumulators

FOR ALL PURPOSES

Made in Canada



NOSING PRESS

WILLIAM R. PERRIN, Limited
TORONTO

Conserve Steel and Iron -Cut Out the Scrap Pile

MILLIONS of dollars worth of damaged or worn metal parts, castings and tools lie rusting in the scrap-piles of Canadian railroads, factories, mines, foundries, repair shops, etc.

By oxy-acetylene welding much of this enormous waste can be eliminated, and losses due to breakdowns—resulting in "tie-ups" of operating equipment—can be greatly reduced. The Prest-O-Lite Process is ideal for all classes of metal repair work. It handles repairs quickly and efficiently, — often right on-the-spot — makes the broken or worn part strong as new—saves time which would be wasted waiting for replacements—avoids the "scrapping" of valuable metal parts.

The welding outfit is portable—available at all times for outside work as well as for shop use.

In the manufacture of war munitions, ships, railway supplies, boilers, metal furniture, implements and tools this same process makes possible many striking economies — gives neater, stronger joints at less cost.

No matter what other welding method you now use, a Prest-O-Lite outfit put to work in your shops will speedily pay you profits. Write for special literature and data—now. Address Dept. C-107.

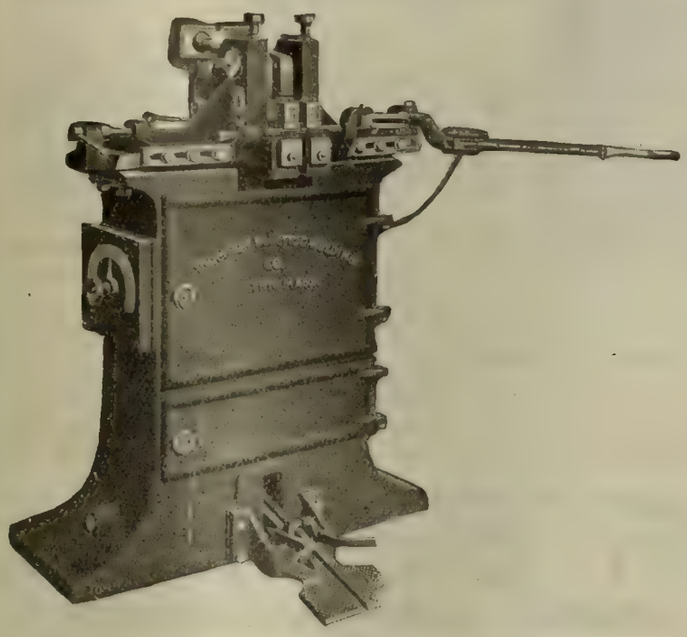
The Prest-O-Lite Co., Inc.

Canadian General Offices: 913-14 C.P.R. BUILDING, TORONTO

Direct Factory Branches:
Toronto, Ont.
Montreal, P.Q.
Merritton, Ont.
Winnipeg, Man.

Canadian Plants:
Toronto, Ont., Merritton, Ont.
Winnipeg, Man.
Shawinigan Falls, P.Q.
(Under Construction)

Thomson Process
Electric Welding

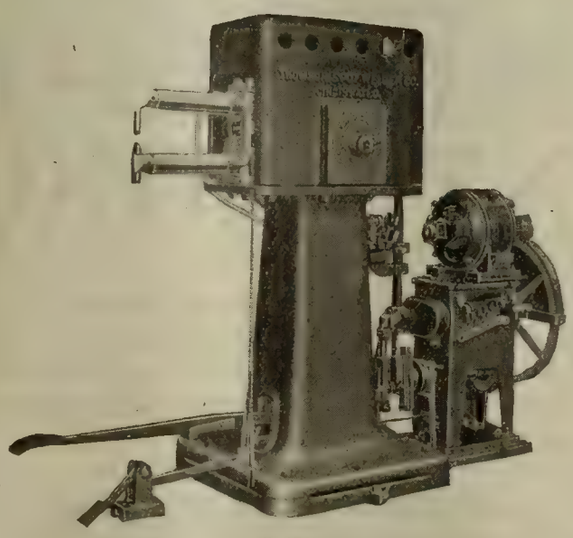


Adopt a "Thomson" For Your Work

We have shown thousands of manufacturers how to lower their costs and obtain better production by the use of Thomson Butt Welding Machines. No doubt there is work in your shop that could be handled faster and better by the "Thomson" Electric Welding Process.

Why not talk it over with us—let us give you actual facts on how we have saved other firms money and how we can benefit you? It costs nothing for this consultation. Get in touch with us to-day.

Write for Bulletin B-4.



Rivets Abolished—Time Saved

A Thomson Spot Welder will do your riveting and soldering 60% to 90% faster. No rivets or solder required, no holes to punch, and a boy can turn out as much work as five men using the old process. A thorough investigation will prove to you the merits of the Thomson Spot Welding Process and show you how to effect a big saving.

Write for Bulletin S-4.

Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

If any advertisement interests you, tear it out now and place with letters to be answered.

Strength, Durability and Low Cost

Welding Shells for Large Water Mains.

are three essential features of all metal constructional work, and which invariably differentiate the article that is manufactured and produced by means of

Oxy-Acetylene Welding

This fact is indisputable, and is why, during the comparatively short time since its inception, nearly all leading Canadian Manufacturers and others employing running machinery, have taken advantage of the benefits it offers in their manufacturing process and for the reclamation of broken machinery, etc., or for any other purpose that necessitates the joining of two pieces of metal.

Oxy-Acetylene Welding gives a better Product at a Lower Cost

Why not take advantage of this fact? The initial cost of an Oxy-Acetylene Installation for Welding and Cutting metals is incomparably less than the money saved, and for the reduction of maintenance costs of machinery in any Plant it is a permanent investment that often saves the total outlay the first time it is used. Further proof on application.

Write to-day for full particulars—no obligation.

L'AIR LIQUIDE SOCIETY THE PIONEERS OF THE PROCESS —FACTORIES THE WORLD OVER

Canadian Factories: TORONTO MONTREAL WINNIPEG HALIFAX, Factory under construction

HEATING and VENTILATING

"Keith" Fans will be found more economical and have a greater efficiency where conditions are unusually severe, because they possess advantages over other Fans used for the same purpose.

The "Keith" Fan is the one that will give you continued and unqualified satisfaction.

Our New Catalogue No. 55 has just come from the Press. Tell us where to address it and you will receive one by first mail.

SHELDONS LIMITED, Galt, Ont., Canada

Toronto (Canada) Office: 609 Kent Building.

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Messrs. Walkers, Ltd., 259-261 Stanley St., Winnipeg, Man.
Messrs. Gorman, Clancy & Grindley, Ltd., Calgary and Edmonton, Alta.
Messrs. Robert Hamilton Co., Ltd., Bank of Ottawa Bldg., Vancouver, B.C.

RACINE

All bearings long, heavy and adjustable, so that you can take up any wear that may occur from time to time.

Saw frame guide of heavy semi-steel that will not spring. It holds the saw frame rigid, insuring accurate cuts.

Write Us

Racine Tool & Machine Company

15 Melbourne Ave. **Racine, Wis., U.S.A.**

KEMPSMITH

UNIVERSAL MILLING MACHINES

Every Kempsmith Milling Machine of whatever size, is provided with a slotted spindle nose for positive drive of arbor and for positive drive of face milling cutter in either direction.

Every machine is equipped with our patented keyed overhanging arm which insures positive alignment of arbor and boring bar and also prevents the cutter being pounded out of line under cut.

Kempsmith machines are heavy, with weight well distributed and their accuracy is guaranteed within very close limits.

Send for Illustrated Catalogue.

Kempsmith Manufacturing Co.

MILWAUKEE, WIS., U.S.A.

AGENTS:

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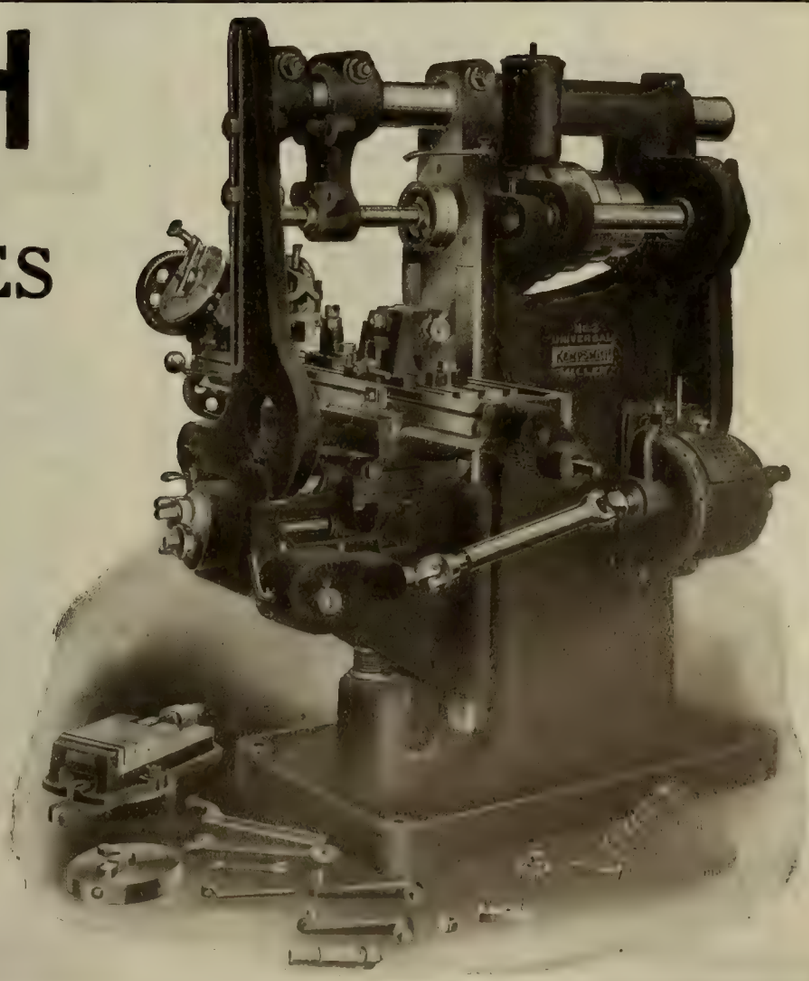
General Supply Company, Toronto and Ottawa.
Canadian Western Foundry & Supply Co., Calgary, Alta.



Universal Gear Hobber

The machine which completes our lines to cut all types of small gears except internal, within 10" dia. 8 Pitch.

The Bilton Gear Hobber will cut spur spiral gears, worm gears, also various special shapes of teeth. It can cut a spiral gear on end of a shaft 1⅜" diam. 24" long.

SPECIFICATIONS

Capacity Gears: 10 Diametral Pitch
10 in. Outside Diameter
10 in. Width of Face
Range of hob feed 50-250 R.P.M.
Range hob feed to each rev. of worm .010 to .125
Drive: 3 Steps Cone Pulley; 2½ in. Belt
Weight 2,100 lbs.

A machine of latest design, introducing new features which increase production without sacrificing accuracy. The hob is cutting continuously; operation of machine entirely automatic.

DELIVERY

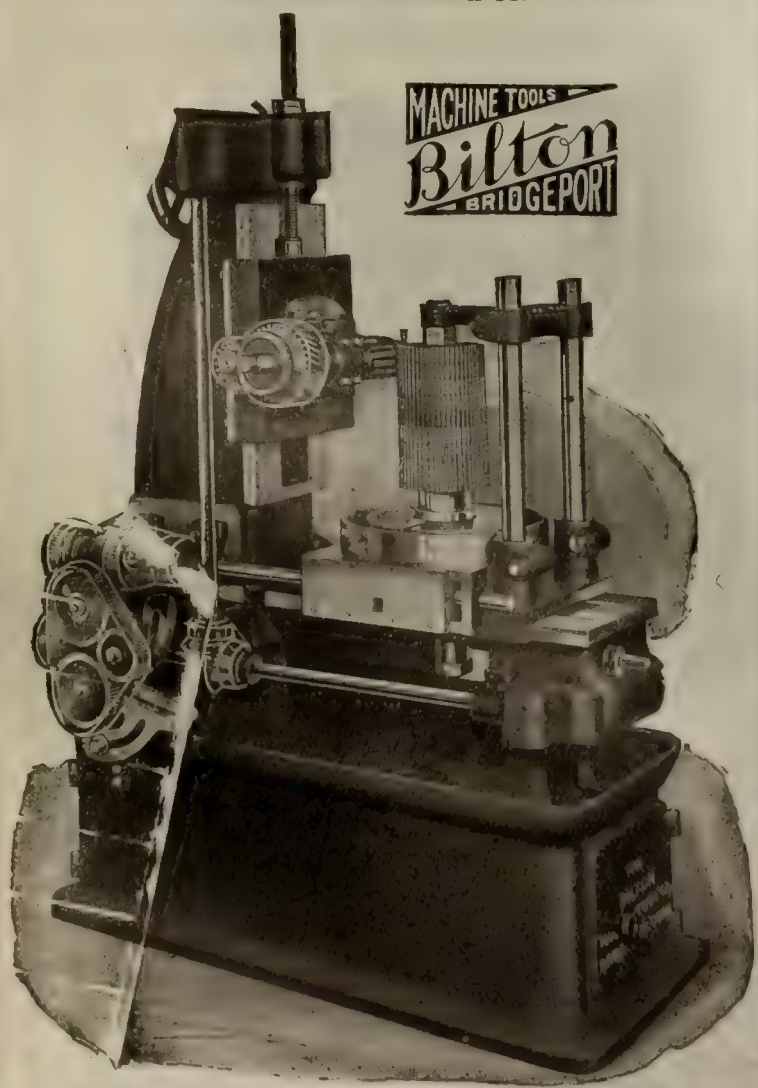
A few of these machines are now available for October delivery.

Send for copy of new catalog No. 30, and bulletin describing this machine.

The Bilton Machine Tool Co.

Bridgeport, Conn.

Foreign Agents: Alfred Herbert Ltd., M. Mett Engineering Co., Chas. Churchill & Co.



DOUBLE SAVINGS

in cutting on PEERLESS HIGH SPEEDMETAL SAWS; they save both Time and Material.

Supposing you save only 1/16 on each cut, 200 lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

Have you ever stopped to consider the waste of material in wide cuts, especially at the present high cost, will pay for a PEERLESS in a remarkably short time.

This is only one of the reasons for so many repeated orders and large concerns having standardized the PEERLESS. The many other reasons can only be fully appreciated after comparative test.

Write for a list of users; some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

WELDING

Oxy-Acetylene or Electric

AN EFFICIENT staff of consulting engineers; portable electric and oxy-acetylene welding apparatus; ability to undertake the most difficult welding on any metal of any nature: these are features that are at your disposal at any time.

Our consulting engineers will help you to decide the most economical manner in which your particular work may be accomplished.

Marine repairs undertaken by our Marine Welding Tug, Albert C., which is equipped with electric and oxy-acetylene apparatus, together with complete compressed air plant.

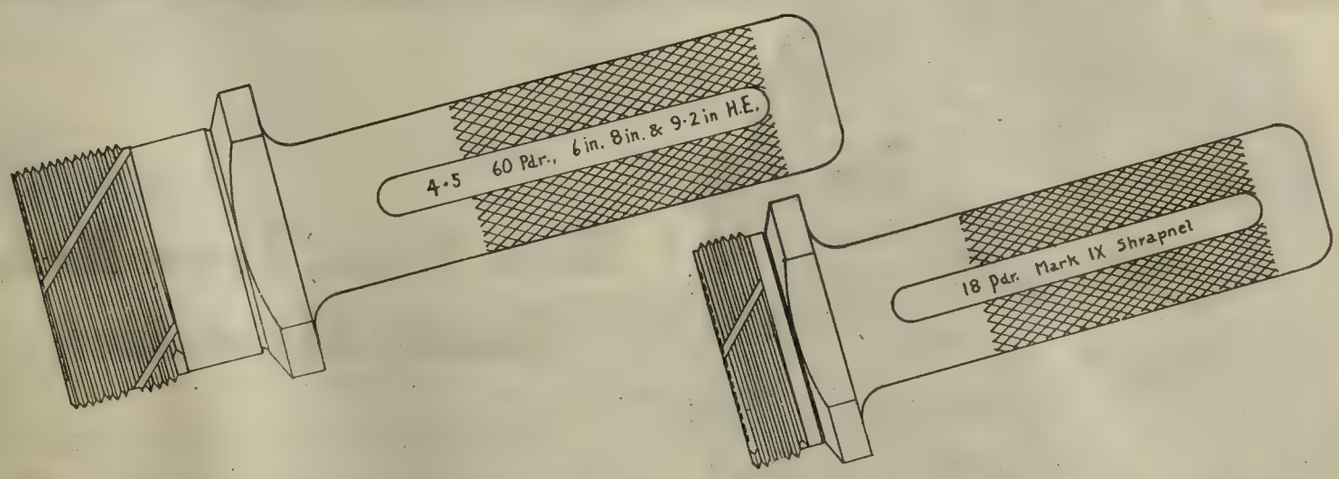
Get in Touch with Us.

The St. Lawrence Welding Co., Limited

MONTREAL - QUEBEC - CANADA

Office—138 Inspector St. Telephone—Office: Main 5779
Works—39 Olier St. Manager's Res.: West 3483

FUSE HOLE GAUGES



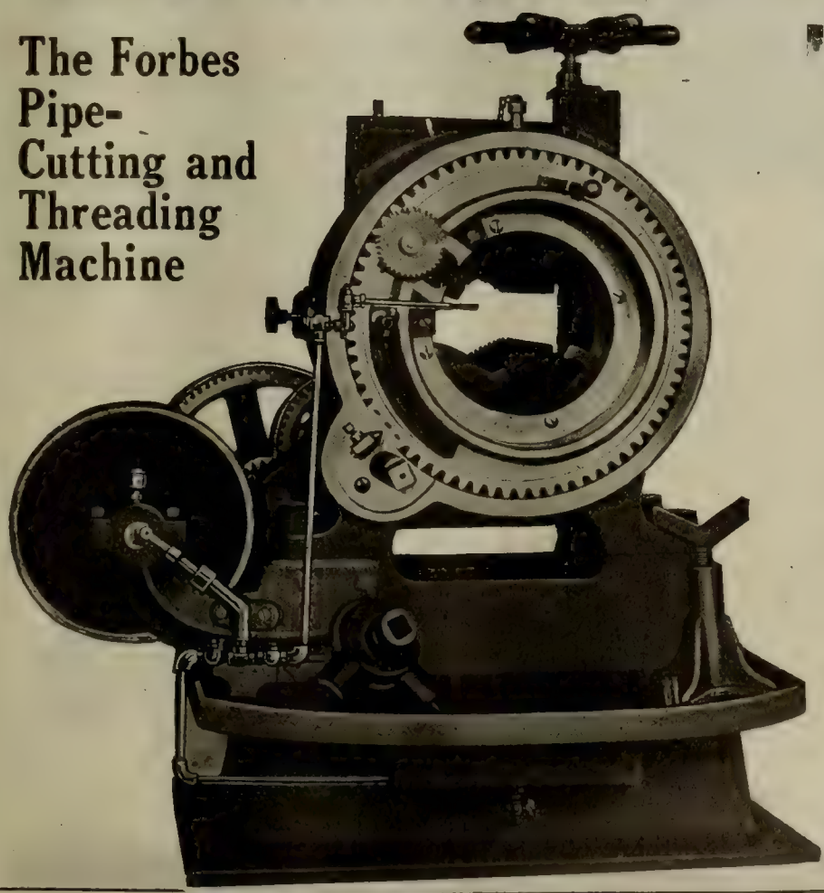
Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

CUTS THREADS FAST, CLEAN and TRUE

The Forbes Pipe-Cutting and Threading Machine



One man can do the work of six against old Stock and Die method of cutting

These are not exaggerated statements—they are facts that are being proven every day by Forbes' Users. Inquire for yourself. Investigate its performances closely and you can't help but admit its labor-saving, perfect-working value.

Inexpensive to Operate

It is simple, compact, self-contained, and all wearing parts are adjustable. One man can operate it and for heavy pipe work it can be taken right to the job.

Fitted with self-centering vise that holds the heavy pipe stationary, while the dies turn around it. The latter are clamped and released by a throw of the lever.

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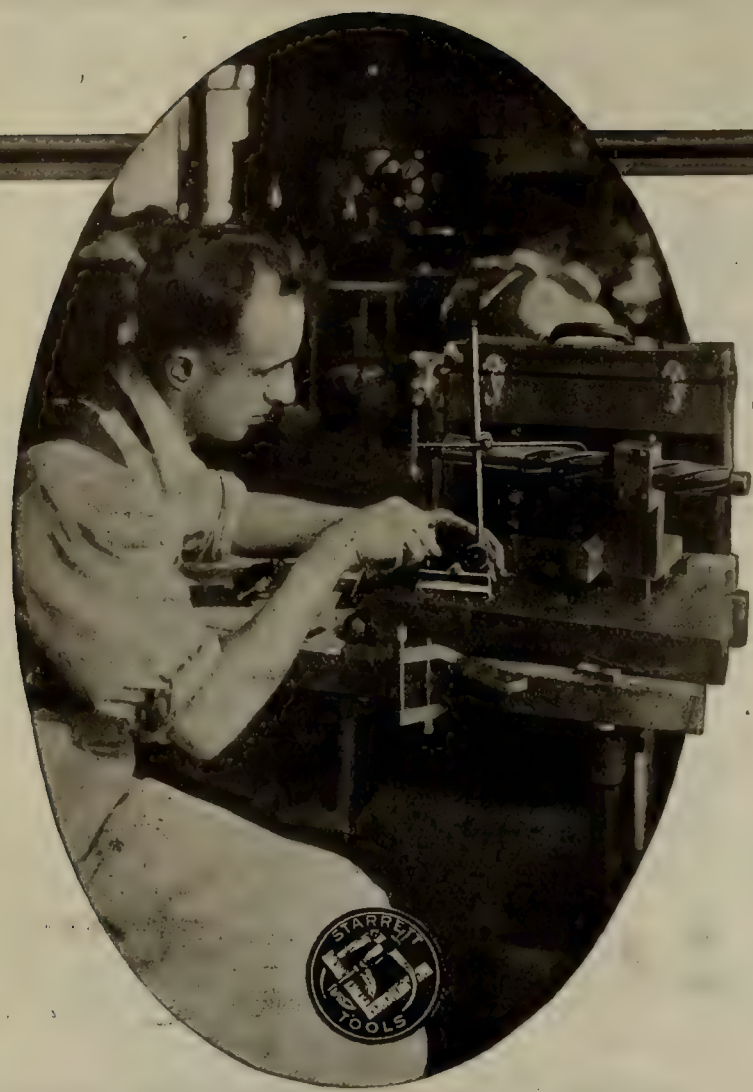

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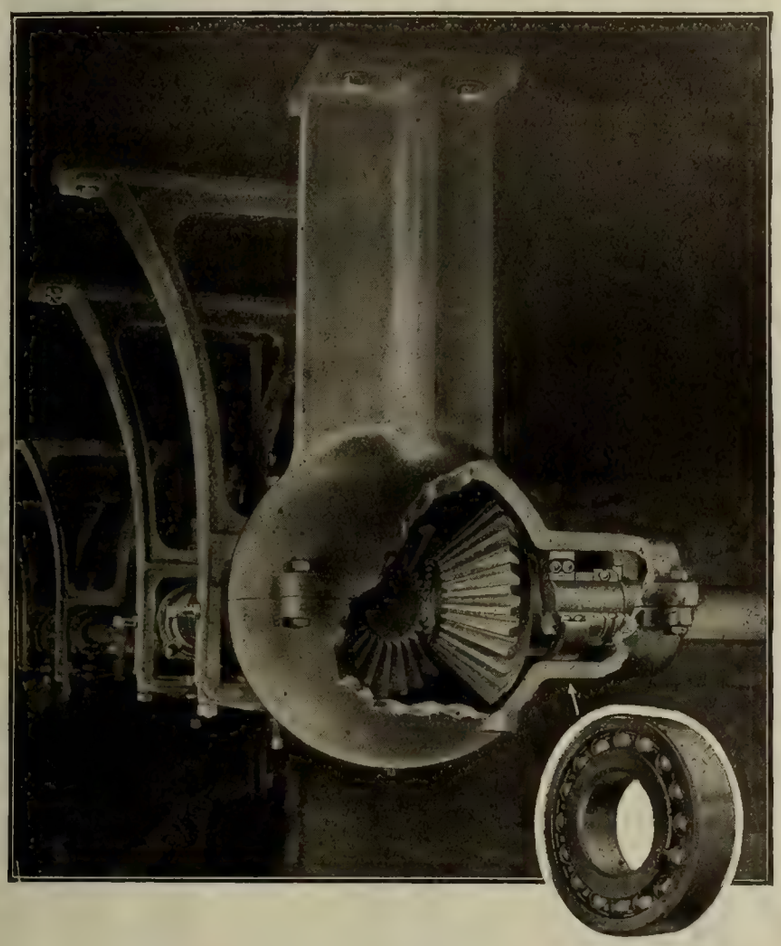

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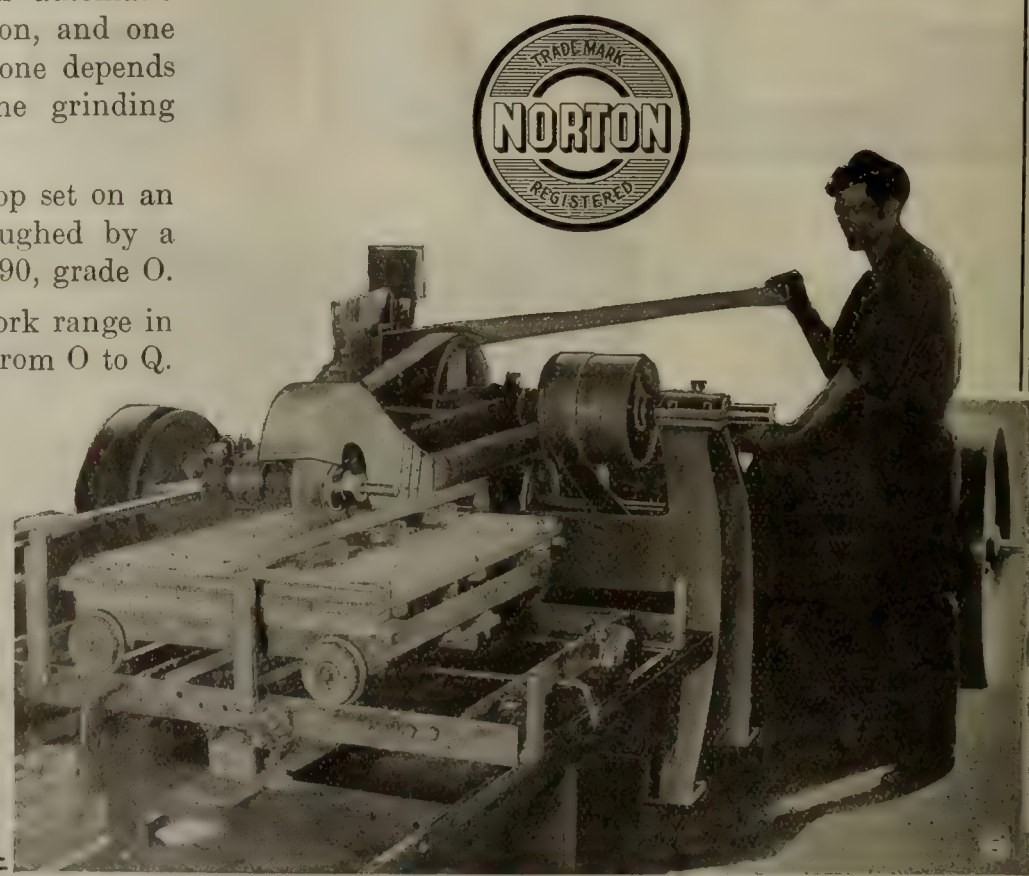

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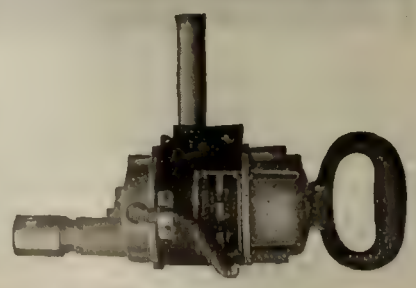

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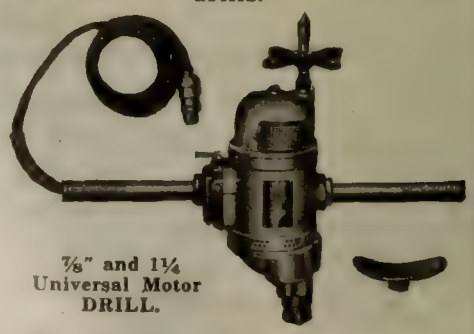

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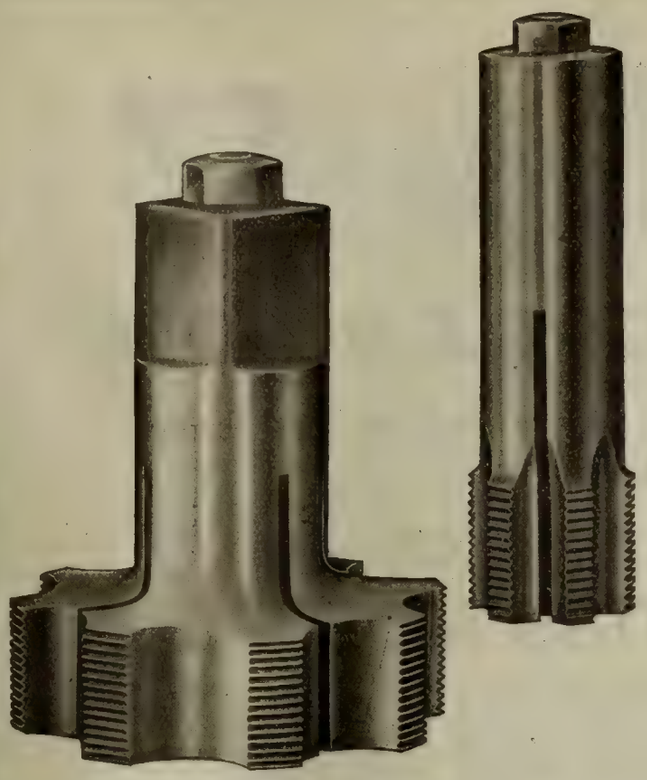

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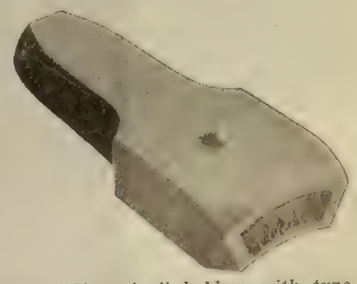

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Manufacturing Uses of Low Temperature Electric Ovens*

By C. F. Hirshfeld **

The utilization of electric heat on a large scale found excellent opportunity in the japanning of automobile bodies, and investigation of the reasons for the superior quality of product has yielded much valuable information. Following a detailed description of the art of japanning, the author deals with the application of low-temperature heating to foundry work and indicates the economies and improvements possible by its use in this industry.

THOSE who have become familiar with the various uses of electric furnaces of one sort and another have come to recognize the fact that, in a general sense, the electric furnace can not be considered a commercial competitor of furnaces heated by combustion. The use of the electric furnace must make possible the attainment of something unattainable by combustion methods or else there is no possibility of its being used in place of the older type excepting, possibly, under very unusual conditions as to the relative costs of fuel and electrical energy.

If this is true of high-temperature processes such as are commonly associated with electric furnaces it needs no argument to prove it true for low-temperature processes in which combustion methods have a greater advantage on an energy cost basis, because of the lower temperatures at which the products of combustion can be discharged.

This condition is frankly admitted, and it should be understood at the start that it is not the intention of this paper to urge the general substitution of electric heating for combustion heating in low-temperature proccesses in general, or in some low-temperature processes exclusively. There are certain low-temperature processes which, under certain corcumstances, can be conducted to better commercial advantage by means of electric heating than is possible by means of combustion heating, and it is the purpose of this paper to point out some of these processes, some of the phenomena connected therewith which indicate the advisability of heating electrically, and some of the possibilities which electric heating unfolds.

Electric Heating Not New

The term low temperature is not exact, but for present purposes may be taken as referring to temperatures below about 290 deg. C. (554 deg. F.). Such temperatures are below practically all commercial metal-melting temperatures but are common in numerous baking and drying operations which form a surprisingly large part of industrial processes.

The exploitation of electric heating for such low temperatures in industrial practice is really comparatively old, since numerous small electrically heated appliances operating at such temperatures have been used as a matter of convenience in manufacturing establishments for a number of years. During the past few years, however, the use of electric heating for such temperatures has been adopted in cases calling for the installation of equipments with capacities ranging from several hundred to several thousand kilowatts. This is obviously a different sort of a proposition, and must be based on a far broader consideration than mere convenience.

The best example of the extensive adoption of electric heating for low-temperature work is furnished by the electric japanning equipment installed during the past few years. For this reason this industry will be discussed at some length.

FIG. 1.

The name "japan" originally referred to a sort of liquid lacquer or varnish made from vegetable sources in Japan and used as a protective or decorative coating on objects made of wood and other materials. This original japan was converted into a hard, brilliant material by exposure to sunlight. At the present time the word japan is used as a sort of collective title for a number of paint-like materials which are intended to be baked at various temperatures between 100 deg. C. (212 deg. F.) and 260 deg. C. (500 deg. F.) and which are generally used for decorative or protective coatings on metal objects.

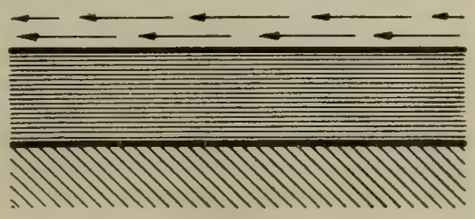


FIG. 2.

Originally, these baking japans were much like varnishes to which pigments had been added, but as the development of industry made more and more specific demands the number of japans manufactured was greatly increased and many different type formulas were adopted. At the present time one can purchase under the name of "japan" materials varying all the way from combinations of pigments with driers, linseed oil and expensive gums to materials which are little more than Gilsonite or other asphaltic compound carried in a suitable solvent with enough oil or similar material to make it resilient after baking. Driers are often included in the mixture, but this is not a universal practice.

The changes which occur during the baking of these japans are very complicated, and are not yet entirely analyzed from the scientific standpoint. It is certain that the solvent partly or wholly evaporates during the baking, and it is also certain that the oils and gums undergo oxidation and polymerization. It is also probable that complicated reactions occur between the numerous varieties of hydrocarbons and hydrocarbon derivatives present in the mixture.

The general lack of exact knowledge is shown by the fact that few, if any, makers of japan can predict the behavior of their materials under unusual conditions.

At the present time a number of chemists who have been specially trained in the technology of paints and varnishes are at work on japans, and it is probable that more exact information with regard to these materials will be available in the future.

Former Status of Japanning

When electric baking of japan was first considered a few years ago, it was found that practically all japanning practice was of an empirical character. Moreover, no two japanners seemed to agree upon the proper methods of applying and baking a given japan even when all essential variables, such as weight and character of work, were the same. Discussion of the various problems with many users and with many makers of japans brought out the fact that practically all agreed upon certain rules and regulations, but that there was a large mass of so-called trade secrets which were, partly or wholly, mutually contradictory.

Obviously, this particular art had not yet progressed beyond the empirical state. Scientific analysis had not been extensively undertaken, no consistent mass of scientifically accurate facts had been accumulated, and operators were hired on the basis of a self-advertised collection of rules of thumb combined with most wonderful and weird imaginary charms of various sorts for insuring excellent results. The executives responsible for factory production were entirely at the mercy of these self-styled experts, some of whom were really remarkably clever men, but many of whom could really lay no claim to such a title. It is not surprising that under such conditions, the japanning room should have been a source of constant

*Paper presented at the general meeting of the American Electrochemical Society, Detroit, 1917.

**Chief of Research Department, The Detroit Edison Co.

worry. On one day very satisfactory results were obtained, and on the next all sorts of imperfections appeared.

In many establishments an average rejection of as much as 10 per cent. of the finished work was regarded as a characteristic of japanning processes and was taken as a matter of course. In some instances on record rejection of over 50 per cent. for several days in succession occurred at irregular intervals.

After many abortive efforts to find means of studying what actually occurred during baking it was decided to resort to the microscope, in the hope that surface structure might throw some light on the matter. The results obtained greatly exceeded anticipations.

Microscopic Structure

A typical structure resulting from baking japan slowly in a direct-fired gas oven is shown in Fig. 1. This is a reproduction of a microphotograph. The straight and curved lines have no significance, the pock-marked surface being the feature of interest. Several perfect craters, which show at different points in the figure, indicate the probable origin of the pock marks as collapsed craters.

The formation of these craters seems to be typical of all baking methods in which the heating is done by means of hot gases bathing the work. It is possible that their occurrence may be explained by what may be called sub-surface vaporization. Imagine, for instance, that the diagonally hatched part of Fig. 2 represents a part section of a piece of metal and that the horizontally hatched part represents a section through a coat of japan applied to the surface of the metal. Assume now that hot gases, such as heated air or hot products of combustion, pass horizontally over the surface as indicated by the arrows.

It is obvious that vaporization of the solvent will occur at the surface of the liquid japan and that the temperature of the surface will be raised rapidly. Chemical change will, therefore, occur first at the exposed surface, and it seems probable that this surface films over rapidly.

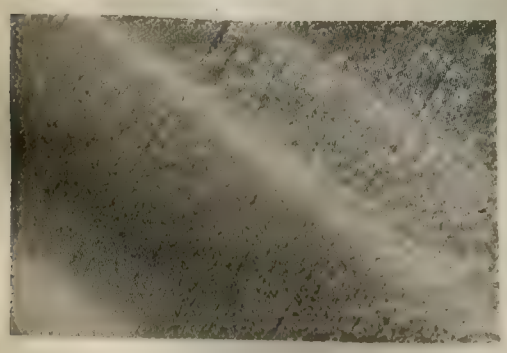


FIG. 3.

The condition would then be similar to that in a can of paint which has been left open to the atmosphere for several days; there would be a rather tough film on the side next the air with practically unchanged material below. If a can of paint in this conditon be imagined to be heated from below to such an extent as to cause vaporization of some of the constituents one of two things must happen; either the vapor must work its way along the under side of the film until it reaches the walls of the can and escapes or it must blow a crater in the film and escape in that way. In the case of japanned surfaces heated from the outside such subsurface vaporization could only escape through the surface, as there is ordinarily no break such as occurs at the wall of the can assumed above. The microphotograph reproduced in Fig. 1 would seem to indicate that vapors do escape through the surface while this is still in a somewhat plastic condition.

These craters are probably partly self-sealing, as the process is ordinarily conducted, but it is obvious from the illustration that the healing is not perfect. A collection of such craters is all that is necessary to account for poor gloss and poor weathering qualities.

It would be expected that the crater formation would be least severe with very long bakes, with gradually rising temperature, that it would be most severe with short time bakes and steep temperature gradients, and that a very short bake might actually result in pushing off flakes of the crater surface. No evidence of such flaking has been found, but finished work has been known to flake in a way which suggested a possibility of such a cause.

In Fig. 3 is shown a microphotograph of a piece of work directly comparable with that shown in Fig. 1. The metal was exactly the same in both cases, the pieces were prepared and dipped in the same japan, at the same time by the same man. They were dipped exactly alike and then baked, one in a direct-fired gas oven for 90 minutes and the other in an electrically heated oven for 45 minutes. It is obvious that the electrically baked piece has smaller and more evenly distributed craters, and that the surface is more perfect.

Similar comparative photographs of second and third coats show far more perfect surfaces resulting from electric heating. Reproductions of microphotographs of the fluid coats are given as Figs. 4 and 5. It is perfectly obvious that the electrically baked coat shown in Fig. 5 is much smoother and more perfect than the other which was baked by pure convection heating. It should be noted that many, if not all, of the large black spots which show in these two figures are small particles of carbon and that they were probably thrown out of the volatiles by a species of cracking, in contact with the air used for ventilation.

Remarkable Time Saving

It is interesting to note that the baking of the coats in the gas oven consumed a total of 5½ hours while the three corresponding coats were baked electrically in 2 hours and 40 minutes.

Inspection of pieces baked in direct-fired gas ovens and similar pieces baked in electrically heated ovens always shows that the electrically baked material has a higher and more perfect gloss or finish.

This could be accounted for by assuming some action between products of combustion and the japan itself, and some evidence seems to indicate such action under certain conditions. However, in view of the microphotographs already referred to and the explanation given to account for the craters, it seems more likely that the difference is due to the way in which heat is applied.

As a matter of fact, practically all heat transferred to the work in a direct-fired gas oven is carried to it by hot gases, that is, the transfer is by convection. In an

FIG. 4.

electrically heated oven at least part of the heat is brought to the work in the same way because of the circulation of oven atmosphere set up by the presence of the heaters. The rest of the heat is transferred by radiation from the hot heaters, and it seems probable that the action of the heat received in this way is different from that received by convection. It is at least probable that radiant energy penetrates the japan coat to a considerable depth before being entirely absolved and converted into heat, and this causes more rapid setting of the inner portions of that coat.

If craters are due to the causes assumed above, it should be possible to eliminate them entirely by baking the japan in a reversed direction, that is, from the inside out. This can be done electrically by heating the metal itself either by the direct passage of current or by induced eddy currents.

Methods of Applying Heat

Certain experiments were conducted on a small scale for the purpose of determining the relative effects of baking by pure convection, baking by combined radiation and convection and baking by heating of the metal itself. For this purpose similar samples, dipped in the same japan, were baked in bottles. For convection baking filtered air was heated in an electric oven to the proper temperature and was then drawn through a bottle in such a way as to make it bathe the enclosed sample. For combined convection and radiation, the sample was surrounded by electric heaters enclosed with it in a bottle, the volatiles being drawn off and circulation being maintained by means of a small laboratory pump. For baking by internal heating the bottle and its enclosed sample were suspended in an alternating magnetic field of sufficient intensity to give the desired temperature gradient. During baking volatiles were removed by a small laboratory pump as before.

Inspection showed the sample baked by convection heating to have the poorest

surface and that baked by internal heating very obviously had the highest gloss and most perfect surface. It was hoped that reproduction of micro-photographs of these samples could be given in this paper, but it was unfortunately impossible to prepare them in time for inclusion.

It is of particular interest to note that baking by internal heating is essentially an electric method, and that it is far removed in every way from methods previously in use. It is further important to note that with this method a maximum metal temperature of the order of 170 deg. C. (338 deg. F.) and a bake of 15 minutes are perfectly capable of giving better results than can be obtained with external electric heating with 45-minute bake and a maximum temperature of 230 deg. C. (446 deg. F.). It seems probable that one coat baked in this way will prove the equal of two or three baked by the older methods. The effect of all this upon energy charges for a given weight of metal baked is perfectly obvious.

It seems hardly necessary to discuss at greater length the various phases of the japanning art. It should be evident that electric heating opens up opportunities for improving the product and the production methods used in obtaining that product. It should also be evident that electric heating is capable of reducing factory operations in this field to so exact a procedure that accurate laboratory control is made possible. With industrial conditions brought to this point it becomes possible for research chemists to work to advantage toward the improvement of the japans themselves and toward the improvement of the methods of their utilization.

Application to Foundry Work

An equally promising field exists in foundry core rooms. The baking of foundry cores is at present a most haphazard process in the majority of foundries. A casual inspection of one batch of exactly similar cores will generally show colors

FIG. 5.

varying from a light tan or even lemon-yellow to a dark chocolate brown. One of the numerous varieties is certainly better than all the rest, and it would seem desirable to determine which one is the best for a given set of conditions and then to make all of them like it.

Preliminary experiments conducted for the purpose of discovering whether the essential properties of cores varied as greatly as their colors gave most astounding results. Strength was taken as reference in this case, although admittedly it is only one of numerous properties which must be considered in defining a perfect core.

One set of experiments was made upon exactly similar cores, made of the same materials and tamped to the same extent. They were baked at different rates and also with different maximum temperatures. Curves of strength plotted against time of bake and also plotted against maximum temperatures were sharply domed in all cases, and showed variations of several hundred per cent. in any one case. Samples of these cores were shown to experienced foundry men after rupture, so that both exterior and interior were visible, and they picked out as good cores which had shown relative variations of over 100 per cent.

Another set of experiments was made to determine the effect of air circulation. Again a number of exactly similar cores were tested. Baking methods were alike in every respect excepting for the quantity of air drawn over the core during baking. Strength of core was plotted against quantity of air passed in unit time, and again a sharply domed curve was obtained. Apparently, excess air is detrimental, though not to the same extent as a deficiency of air. What is most important is the demonstration that some definite quantity of air gives the best results.

Probable Developments

It seems probable that investigation will show that porosity, brittleness, character of surface, and all of the other properties which must be considered in connection with cores will be affected in some such way as strength has been shown to be affected by the variables studied. If this is true, it certainly seems as though the foundries which carefully study their production methods and costs will ultimately demand more perfect control of the core-baking process. When this time arrives it seems probable that electric heating will play a part similar to that which it has played in the japanning field during the past few years.

As a matter of fact, there are now in operation several electrically heated core-baking ovens, and their users all appear highly enthusiastic over the results attained.

The core problem appears to the author as one of the most promising fields for combined chemical and engineering investigation, and he feels certain that improvements such as those shown possible in japanning will appear insignificant in comparison with these which are possible of attainment in the core room.

Japanning and core-baking have been used as examples because of the tremendous extent of both of these industries, and because it happens to be possible to record the results of a small amount of experimental work in both of these fields. It must not be assumed, however, that they represent the only possibilities for the application of electricity to low-temperature baking.

There are numerous other low-temperature baking processes, and the majority are in the same undeveloped state as are the two cited above. One very important field in which little has been done is the baking of food stuffs, such as bread and other cereal products. Electric heating has been applied to the baking of such materials in several cases with very gratifying results, improving both the appearance and quality of the product.

In conclusion, it is well to call attention to the fact that the introduction of electrical methods for such purposes as enumerated above should be of particular interest to the chemist, because it makes it possible to reproduce on an industrial scale a sequence of operations and conditions which have been worked out on a small scale in the laboratory. It makes it possible to control industrial production to the same extent that laboratory investigations are controllable, and it thus opens to the chemist in the industrial field a tremendous opportunity for improvement of product and increased production.

RAILWAYS' HANDICAP INCREASING

"THE returns of railway revenues and expenses for June and for the first six months of the year 1917," says the Railway Age Gazette, "show that the railways of the United States are still breaking all previous records except in the vitally important item of operating income, which represents what is left, after expenses and taxes are paid, as a return on the capital invested and therefore determines the credit of the railways and their ability to finance improvements or additions to their facilities.

"They are, therefore, in much the same position as the man whose pay has been raised, but not quite enough to keep up with the increased cost of living.

"Total operating revenues for June were greater than in any previous month in history, the total of $349,739,636 being about $4,000,000 greater than for May, in which the highest earnings for a month were previously recorded, and $49,720,256, or 16.3 per cent. per mile greater than for June, 1916, but the figures for six months of the year show a decrease in operating income per mile of 4.2 per cent., as compared with the first six months of 1916. The total revenues for the six months were over $201,000,000 greater than in 1916, but expenses were $207,000,000 greater, taxes were $12.500,000 more, and the operating income was therefore over $18,000,000 less.

"These facts explain clearly why the stocks of some of our best railroads are selling at prices less than when the exchanges closed in July, 1914, and why in the same week that the figures were issued by the Interstate Commerce Commission, Pennsylvania fell below par for the first time in twenty years.

"For the month of June total operating revenues reached the record figure of $1,514 per mile of line, as compared with $1,301 in June, 1916, and $1,498 in the month of May of this year. This was an increase over June, 1916, of 16.3 per cent. Operating expenses, $1.020 per mile, increased 19.8 per cent. per mile over June, 1916, but were slightly less than for May, thereby reflecting the remarkable improvement in operating efficiency being obtained in the way of securing increased tonnage and mileage

for each freight car and locomotive in service. It is a noteworthy fact, however, that the decrease in expenses in June as compared with May is largely accounted for by the expenditure of $10 a mile less for maintenance of equipment.

"Operating income for June was $422 a mile, 8.1 per cent. greater than for June, 1916. Taken by themselves the June figures make the best showing of any month this year, although for the roads in the eastern district operating income per mile decreased 1.4 per cent.

"When the six months' figures are compared, however, the effect which the unprecedented increases in expenses of all kinds are having, in spite of the stupendous increase in the volume of business and in gross earnings, becomes plainly apparent. Total operating revenues were $1,898,210,538 as compared with $1,697,051,238 in the first six months of 1916, an increase per mile of line of 11.6 per cent. Operating expenses were $1,354,295,438 as compared with $1,147,-093,778, an increase for mile of 17.7 per cent. Net operating revenue was $543,-914,600 as compared with $549,957,460, a decrease per mile of 1.4 per cent., while taxes increased from $76,241,598 to $88,-936,624, or 16.3 per cent., and the operating income was $454,661,633 as compared with $473,295,808, a decrease of 4.2 per cent.

"The biggest increase in expenses is naturally found in the cost of conducting transportation, in which wages and the coal bill are the most important factors. This item shows an increase for the six months of $147,000,000. Maintenance of way and structures expenses increased $14,000.000, maintenance of equipment $35,000,000, traffic expenses less than $2,000,000, while miscellaneous and general expenses account for an increase of about $9,000,000. These items make up the total increase of $207,000,000 in expenses, or from $4,977 to $5,761 per mile of line.

"With an increase in earnings of over $200,000,000 over the calendar year and of over $400,000,000 over the fiscal year 1916, operating income for the twelve months ending June 30, 1917, was $20,-000.000 less than in the calendar year and only $40.000,000 greater than for the fiscal year, the increase in what is loosely termed profits being only one-tenth of the increase in earnings."

TORONTO HYDRO REPORT

THE Toronto Hydro-Electric system's total income for the six months ending June 30, was $998,956.40, according to a report made to the Board of Control recently. This was made up as follows: —Lighting, $345,389.91; power, $392,-110.37; street lighting, $183,405.30; bulk supply and other municipalities, $932,-630.91; income from sundry sources, $66,325.49.

The net income from operations of the period was $353,680.65, which is available for fixed charges. The balance available for depreciation was $138,-680.65, being $14,000 over the corresponding period last year. The volume of new business shows an increase of 15,000,000 kilowatt hours, being equal to 23 per cent. The revenue from the sale of current has increased approximately 16½ per cent. The cost of power purchased shows an increase of 28½ per cent.

ONTARIO FIRE LOSSES VERY HIGH

THERE were 852 fires reported in Ontario during the month of July and the total loss during the first seven months of the year is $6,449,435.

The summary is as follows:

Month	No. of Fires.	Loss
January	789	$ 808,419
February	1,020	1,329,369
March	765	1,144,373
April	666	896,461
May	908	1,242,486
June	682	515,936
July	852	512,391
Totals	5,691	$6,449,435

"The record for July is disappointing," saye the Public Service Bulletin. "The number of fires reported (852) is made up largely of lightning fires, which accounts for nearly one-half of the total. The aggregate loss is a little less than June. The chief items are shown above. The monthly aggregate is, however, very much too large."

GREAT INCREASE IN CANADA'S TRADE

TRADE figures for August and the first five months of the present fiscal year, made public on Sept. 19, by Hon. J. D. Reid, shows that Canada's great trade expansion continues unabated. Last fiscal year Canada's trade aggregated two billion dollars, but at the present rate the trade for the present fiscal year should be at least 500,000,000 more than last year's great record. For the first five months of the previous fiscal year our total trade was $768,635,214, while for the corresponding period this year it is $1,128,274,119. The trade balance in n our favor for the first five months of the present fiscal year is $180,000,000.

The total imports for August amounted to $91,931,000, as against $72,331,014 for August last year. For the five months of the present fiscal year, ending with August, our total imports were valued at $474,031,859, and for the same period last year $322,198,881. With this increase in our import trade has come a corresponding increase in revenue for August of $3,075,000, and for the five months, $17,540,000.

The export trade shows a corresponding increase of from $96,832,161 in August last year to $152,563,345 during the corresponding month this year. For five months our export trade totalled $672,-022,649, an increase of $217,291,385 over the same period last year. Fisheries show an increase for the month of $200,000 in export, animals and the produce $8,000,000, agricultural products $25,000,000, and manufactures $27,000,-000. There was a slight decrease in exports of minerals, and $2,000,000 decrease in products of the forest.

IRON WEAPONS OF THE AZTECS

WHEN Cortez had completed the conquest of Mexico, the Spaniards, among a great many other peculiar and extraordinary observations which they made in that remarkable country, were particularly struck and puzzled by one fact.

They noticed that the Aztecs possessed certain implements, such as knives, daggers, etc., made of iron, but it seemed that only the most distinguished of the natives possessed such, that iron was a great rarity and was prized higher than gold. At first the Spaniards believed that the Aztecs extracted the metal in some crude fashion from its ore, which abounds in many parts of the country, but they soon ascertained that this was not the case. They found that not a single smelting furnace existed in the empire, and their surprise was not small when they learned that the Aztecs were totally unacquainted with any method of extracting the iron from the ore, which, indeed, they had never suspected of any kinship with the highly valued metal.

The question whence the Aztecs had procured the little iron they possessed became a perplexing problem to the Spaniards, which they were never able to solve. The natives do not seem to have enlightened them much on the subject, for when asked they mysteriously pointed to the sky, and indicated that they obtained their iron from the regions above. Such assertions, no doubt, the Spaniards received with an incredulous smile, and they concluded that the Aztecs procured it by way of traffic from some other, perhaps more civilized, nation which they suspected to exist and kept looking for north and south for more than a hundred years.

It was left to modern science to unravel the mystery. The Aztecs were quite correct; the iron of which they had made their implements was not fashioned from materials of this terrestrial globe, but had come to them from the unknown regions of space. Their iron was, in fact, of meteoric origin, like that of the Mayas of Yucatan, and the Incas of Peru, of which many weapons are still preserved for collections.—Hensoldt.

GEAR MANUFACTURERS' CONVENTION

THE American Gear Manufacturers' Association held its semi-annual session in Chicago, Sept. 13-15, special Importance being attached to the meeting because of urgency for standardisation in many products due to war demands and conditions arising therefrom. F. W. Sinram, president, opened the sessions at which a number of topical papers were presented by members. Social activities were prominently featured.

Performing Complex Lathe Work by Turret Lathe Methods*

Herbert's Monthly

Extreme urgency of demand coupled with extreme accuracy of dimensions has featured much of the work which in recent months has absorbed the genius and effort of the Allies' technical resources. The accompanying article describes recent English practice, the sequence of operations having been developed to yield results conforming to rigid requirements. The increasing prominence of aeroplane engine manufacture imparts added interest to the data.

IT IS almost an axiom to state with regard to lathe work that the more complicated and involved it is, the greater are the savings when turret lathe methods are adopted.

The economy of the turret lathe is achieved in several ways:—

By the reduction of time required in setting, due to the use of specially adapted chucks and fixtures.

By the fact that a number of cutting tools can be in operation at once, thus reducing the cutting time.

By the saving of the time occupied in changing tools upon an ordinary lathe, all the tools being in position and ready to be brought up to the work.

By the elimination of measurements when the work is in progress by the use of stops.

By the possibility of using different kinds and more efficient forms of cutting

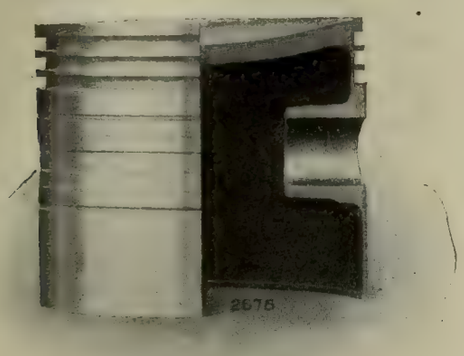
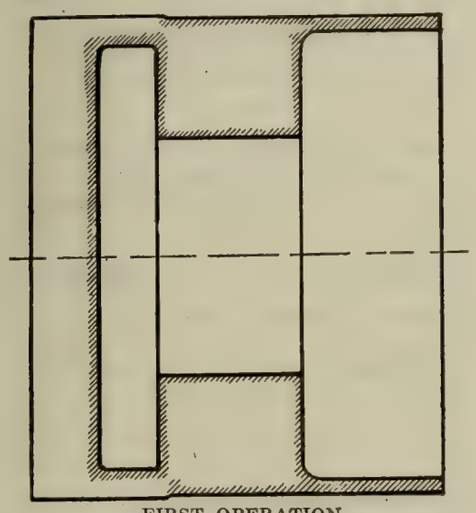


FIG. 1.

tools than can be employed on an ordinary lathe.

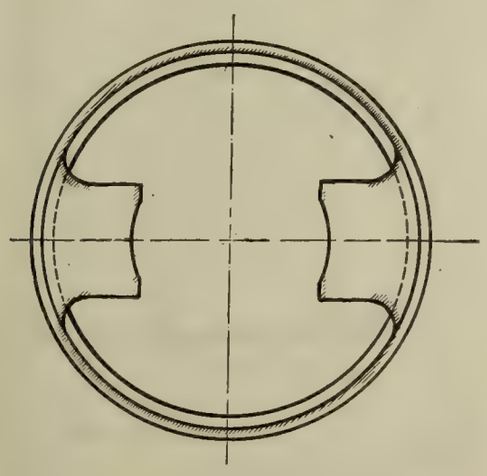
In Fig. 1 is shown an aeroplane engine piston which is made from steel; owing to the necessity of cutting down the weight and ensuring sound construction the ideal way is to make it all in one piece from a solid blank, as designers of aeroplane engines, in striving for the ideally efficient engine cannot allow difficulties of machining to stand in the way of any design which may seem likely to have advantages.

The finished piston is about 5⅛ in. dia. by 4⅜ in. long; in the rough the steel blank, which is of 40 tons tensile strength, weighs 27½ lbs. The machining operations at first sight seem formidable, but by the use of specially designed tools and fixtures this work is being handled without difficulty on a No. 9. Combination Turret Lathe by the following sequence of operations. In the line drawings the shaded portions show the machining at each operation.



FIRST OPERATION.

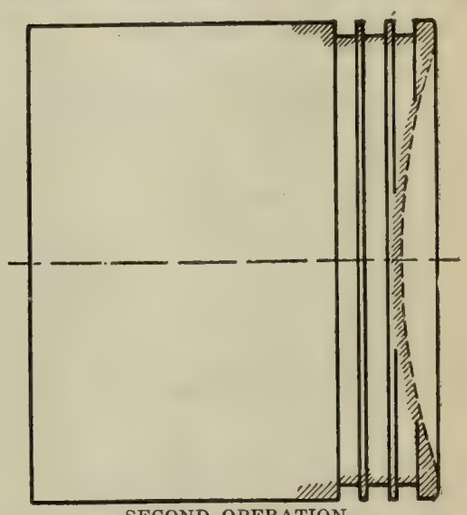
First Operation.—The blank is held in hard jaws of a 15 in. Coventry Chuck, where it is drilled, counter-bored, recessed, and rough turned as far as the chuck jaws. The time for this operation is 35 minutes.



THIRD OPERATION.

Second Operation.—The piston is turned end for end, and gripped by the diameter finished at the previous operation in a draw-back collet chuck, whilst the remainder of the outside diameter is rough turned, the head cupped out, and the grooves rough formed. The collet type of chuck is necessary at this operation, as the walls of the work are thin and a 3-jaw chuck would be certain to distort it. The time for this operation is 15 minutes.

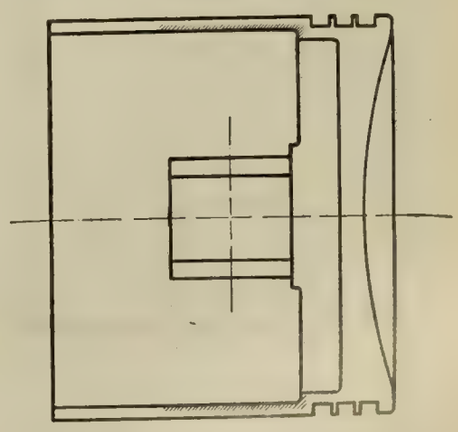
Third Operation.—This is done on a slotting machine or a vertical milling machine, where the ring of metal left at



SECOND OPERATION.

the first operation is removed as shown to form the gudgeon pin bosses.

Fourth Operation.—Here the piston is held in a special fixture on the No. 9 Combination Turret Lathe, whilst the gudgeon pin hole is rough drilled, and the bosses rough turned. The latter op-

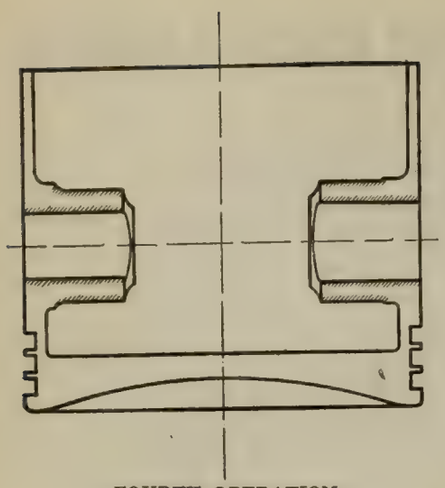


eration is done by means of hollow mills carried on a cutter bar passed through the hole. This operation takes 15 minutes.

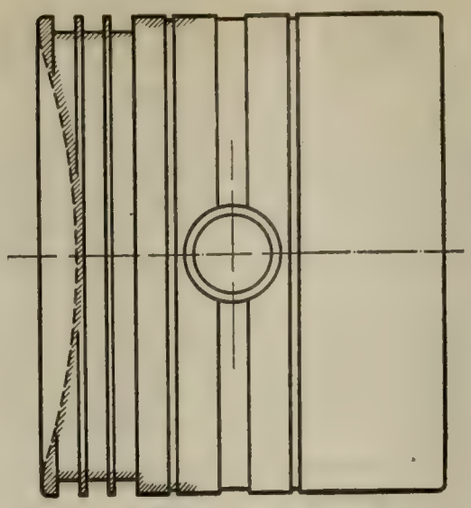
Fifth Operation.—The convex end of the interior is now formed, the piston being chucked with soft jaws gripping on the outside diameter. The machining time is 15 minutes.

Heat Treatment.—Having now been

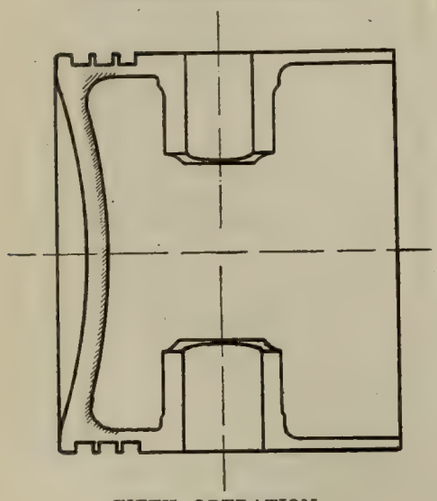
*Reproduced by courtesy Alfred Herbert, Ltd.



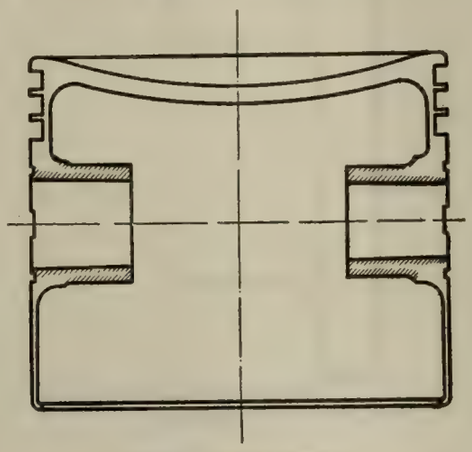
FOURTH OPERATION.



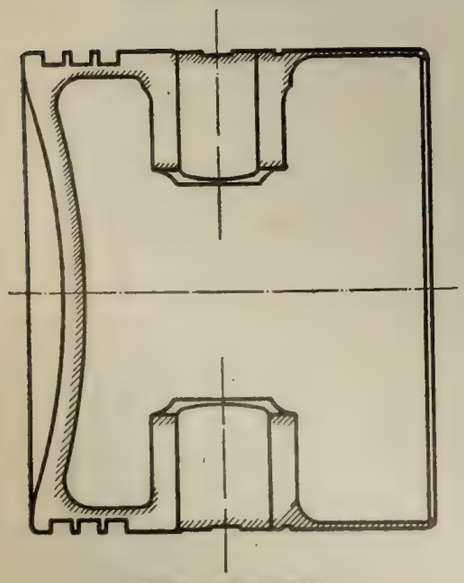
SEVENTH OPERATION.



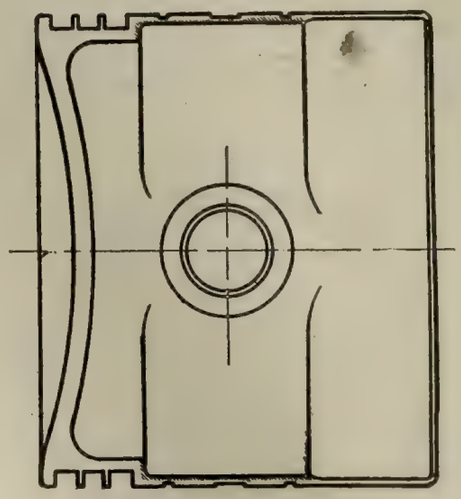
FIFTH OPERATION.



EIGHTH OPERATION.



SIXTH OPERATION.



NINTH OPERATION.

roughed out all over, it is necessary to heat treat the piston in order to normalize the material and remove the machining stresses; after which the machining operations proceed.

Sixth Operation.—The piston is chucked as in the fifth operation; the outside is finish turned as far as the chuck jaws. and grooved; whilst the whole of the interior is rebored, recessed and profiled. This operation occupies 60 minutes.

Seventh Operation.—At this operation the piston is held in a draw-back collet chuck, whilst the remainder of the outside diameter is finish turned, the cupped end finish faced, and the grooves finish formed. This operation takes 10 minutes.

Eighth Operation.—The piston is now held as at the fourth operation, whilst the gudgeon pin hole is finish bored and reamed taper, the gudgeon pin bosses finish turned with hollow mills as before, and the ends faced up flat. This operation takes 20 minutes.

Ninth Operation.—The lathe operations are now complete, and the last operation is to finish mill the walls around the gudgeon pin bosses. This is done on a vertical milling machine.

There remains a little metal to be removed around the gudgeon pin bosses, which cannot be reached by a straight forward milling machine operation, and this is removed by hand.

The total machining time on the No. 9 Combination Turret Lathe is 2 hours 50 minutes, whilst the finished weight of the piston is 4 lbs.

INTERNAL GRINDING ON HARD AND SOFT METALS

THE efficient and economical production of holes of accurate diameters and with a good finish in such parts as bushings, gears, cylinders, cutters, gauges, etc., is a problem which is solved most satisfactorily by the use of the internal grinding machine.

While it is true that reaming is more or less successful in soft metals, this method involves large expense for reamers which become undersize very quickly, when accurate limits are insisted upon, and with adjustable reamers there will always be continual variation as to size in the different pieces according to the frequency of readjusting and regrinding the reamers.

With the improvements made in internal grinding machines, the field has been developed and extended to such a degree that not only is it considered good practice to grind hardened work, but also parts made of cast iron, soft steel and bronze, whenever accurately round and straight holes of accurate diameters are desired so that proper uniform fits can be secured. In fact, on parts made of bronze, lumen and cast iron, it is often less expensive and far more satisfactory than finishing by reaming.

The internal grinding machine has completely displaced lapping from the rough, so that at the present time lapping as a finishing operation is used only when surfaces of great smoothness, or extreme accuracy, are to be produced beyond the usual limits of commercial work.

A good grinding machine will finish holes day after day rapidly and within a limit of one-quarter thousandth or better as desired, directly from the rough boring, and without any expense for reamers or for keeping such reamers sharp and in proper condition.

This method of finishing holes is doubly valuable when the piece to be finished is difficult to hold for reaming without distortion because of thin walls which go and come under pressure of the reamers, or under pressure of the chuck jaws, resulting in either case in very unsatisfactory work.

Furthermore, the improvements in the character of materials used in the construction of machinery, such as chrome nickel steel, manganese steel and other alloys, have made the use of the grinding machine an absolute necessity, because of the impossibility of finishing these materials satisfactorily in any way other than by the grinding process.

Carbonizing, heat treating and hardening always produce more or less distortion and also make the use of the grinding process imperative to secure accurate diameters and true surfaces.—James N. Heald, in "Grits and Grinds."

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

REMINISCENCES OF A 4.5 in. HIGH EXPLOSIVE SHELL

By W. J. M.

MY trials and vicissitudes, from babyhood, through childhood and youth to mature age, were many and varied. We were an innumerable family, and of rapid growth, millions of us having attained our complete status during the last three years, although some of us were indifferent, and some were of no use at all.

The first thing I remember was feeling fearfully hot and uncomfortable, and while in that state I received a heavy blow. This was my christening—when I received my name, which would go with me to the end of my life, and I would always in future be known as Z × 123. Presently I felt more comfortable and much cooler, and I was placed with some of my brothers and sisters in a quiet corner. I was not allowed much time for thought, however, and just as I was nicely settled, a big rough man suddenly picked me up and placed me on a lot of rollers, on which I was carried—or rather rolled down an incline for a short distance, till I fell off the end into a railway car which was waiting to take some fifteen hundred of us on our journey to a place where we would receive our preparatory education, and the initial formation of our characters.

My First Scare

Eventually the last of us was in his respective place, the doors were shut, locked and sealed, and we commenced our journey. Details of this journey need not be described—suffice it to say that after about two days, the doors were thrown open and we were lifted out one by one, thrown on to another set of rollers or "gravity carrier," and rolled into a large dark building.

In due course, not knowing what was to become of me, I was picked up and put with some of my fraternity in front of an iron door. When the door was raised, a fearful sight met my gaze—a roaring, fiery furnace, heated to 2,160° Fahr. What! Was I to undergo torture? If so, what for? Slowly I rolled down and yet further down an incline, getting hotter and hotter till my whole body became red—first a dull red, then brighter and brighter until I was in a semi-molten condition and writhing in agony. In that state I was seized, swung through the air and dropped into my place in a great "die." What was coming next? Down came a plunger right on the centre of my head, pressing with 350 tons till a hole was made almost right through me and my sides were squeezed and squelched in between the plunger and the die. I fairly screamed in pain and rage that I should be so mauled. At last it was over and after being lifted out and placed in the cooling room, I must admit that the experience, bad as it was, had done me good. I was a better child. I had been through the fire, my shape being changed from "billet" to "forging," and was now fit for further education.

Medical Inspection

I was now placed on a spindle by a government inspector who measured my walls, my length, looked to see if he could find any flaws or cracks in my constitution, and when he found I was perfect, he drove a steel stamp, shaped like the letter C with an arrow in the centre, into my flesh, and I was rolled down another "carrier" into another railway car for transportation to another school, i.e., a shell factory, where I would be further initiated into higher degrees of knowledge, and shaped into the finished article.

After a journey of a couple of days or so, I, along with my brothers and sisters—we were still together, except a few of us who had been discarded as not fit for further training—was lifted or rather thrown out of the car into a well lighted factory, where I was first looked at to see if the C with the arrow in it, was on me. Now came more pain. I was placed in a machine—a sort of vise and a steel saw was laid on one side of my head. I had not noticed an uneven growth which had been there since my release from the plunger of the forging press, and this growth had to be cut off. It was also necessary to cut off a portion of my head to see if there were any little pipe holes which could not be seen from the outside.

This being done, I was removed from the vise and put into a cavity which was called a "chuck." I began to turn round and round till I became quite giddy, and I felt a biting, tearing, pain, which began at my head and slowly travelled towards my base end. They were shearing off my outer skin, and when this operation was completed, I shone with a brightness I had never before felt. My appearance, however, — in spite of the brightness—was very rough, and when I was taken away from this machine and put into another, a little more skin was removed, which made me look and feel much better. I was getting used to being pulled about by now, but when, in yet another machine I felt an instrument cutting into my very bowels, I thought life had ended for me. After this operation I was bright inside and out, which made me feel really good. A bevel was now formed round my head and my name, Z × 123, was stamped on my side. I then had a cut taken from my base and my name was restamped there again.

Shaping My Cranium

Now came another sore trial. I was thrust head first into one more fiery furnace and all my shrieking and writhing was of no avail. As my head got hotter and hotter, I felt myself being turned so that the heat could get at me evenly, and then I was pulled quickly out, my head only being red hot, and placed in a vise which held my body tightly. I then began to rise up bodily, when suddenly—Oh!—my head was squeezed till I thought it would burst. But no, it was merely pressed into a pointed shape like the nose of a bullet.

When I had cooled off, they put another intrument into my breast and formed my "inside profile." Then I was taken and "finish turned," a fine cutting being taken from my entire length. I had a little respite after that while my name was transformed from my base to my body and the C and arrow placed alongside it. I lay on a pile of my brethren for two days, resting and getting back some of the strength I had lost during my rough travels. I had grown much thinner, but was considerably more refined that when I first arrived at the factory.

On the morning of the third day of my vacation, as it were, I was put into a machine that cut a groove in my body close to my base, and at the same time an instrument which wibble-wobbled backwards and forwards, put my "wave ribs" in the centre of the groove. This groove would later on hold a copper band—so I was informed, and those ribs would prevent this band from turning, when—but I am anticipating. At this time I knew nothing of future events, but I was learning fast. I learned that I would very soon have to sit for an examination, which, if I passed, would enable me to go forward to the higher classes of this wonderful, but trying school. Before this, I must have my base "hogged out," and my base recess finished. I remember crying aloud when these things were being done, and afterwards they nearly suffocated me with a mixture of steel shot and sand, which was called "blasting the bore."

On the Carpet

I well remember the excitement we were all under the next morning when we were taken to a bench to undergo an examination for our characters, and knowledge. Men examined us inside and out, gauged our dimensions and "grilled" us from end to end. Some of us had to go back to school for special coaching, others merely required polishing up a bit, but the majority passed with honors. But—this was only the "shop examination." Although we had passed this, we had to go before men who had been sent by the government of the country, who would put us through a stiffer examination. Five hundred and one of us were sent before these men in batches of one hundred. Out of 501,

only 480 passed, and out of the 21 who failed, three were rejected as being no use at all. Poor fellows! They were stamped as unfit and ended their days in the scrap heap.

When I came out of the "preliminary" examination room, I was placed head down in a machine which rivetted my base plate; then another machine "faced off" my base plate and a nice radius was made all round it with a file. Next I had my nose slots cut. These were put in to prevent my timefuse—which would come to me later on — from turning loose. Then my "fuse seat," my "exploder-container" seat, and recess, were put on me and my nose was "tapped."

During one of my earlier operations, a thread was "milled" in my nose, and this it was which was "tapped." Although I suffered a little during these operations, the pain was not so bad, as I was getting more accustomed to the necessity of being trained and formed for usefulness in life. Little did I think, at that time, how short my life would be.

I suffered great discomfort when my "driving band" was squeezed on with forty ton pressure, but when this was "turned," I felt proud of the bright copper ring which enhanced my general appearance, and when after undergoing another shop examination and being washed inside and out, I felt really good and very happy. A coat of varnish was now shot into me and I was placed in an oven for a little over two hours, where the varnish was baked hard. The heat was not very great, being only 300° Fahr., so it did not cause me much discomfort after the extreme torture of the forging furnaces.

I was now informed that I would have to sit for my "final" examination by the government men, and that if I passed this, I would be nicely dressed in a new suit of clothes, and would be taken on a long journey, and possibly have a voyage across the ocean. I did not fully understand what was to become of me, but determined to pass, if possible. Eventually I did, but before passing, had to return to school to have some of my ideas "rectified." I was, however, very proud when I received my "uniform of khaki" paint my threads were greased and I was laid with two others in a "three-round" box.

We Depart En Masse

Nearly two thousand of us left that factory one morning in a railway car on our way to the seaport from which we were to be shipped. In due course, after a rough passage, during which I was very sick, we arrived at our destination, and for a long time were laid aside in a storehouse where we had a thorough rest. I learned, about this time, what my work in life would be, and I made up my mind to do it to the best of my ability: I was told I was a good 4.5 in. high-explosive shell, that I would be filled up with a very high explosive, and that I must ever hold myself in readiness to "burst" whenever I was told to do so by the "time-fuse," which would accompany me. One day I was taken to the loading factory, and after being properly "prepared," was filled with a sticky, harmless-looking stuff which, when slowly stirred, gradually hardened. I was then carefully packed and sent on my last journey but one. Oh how I swelled with indignation when I was informed of the cruelties the Germans had practised! I said to myself that I would kill all I could at one time, and with one great explosion.

Well! Well! I reached the end of this second last journey, and had a little time for thoughts, which were many and varied. All the trouble and expense—the detail and exactness with which I had been made—were to go for nought. I would just die, but in dying I would render a service to my country, and I was proud to think that this service would be of some great and lasting benefit to the world in general and to my own community in particular—to those who had spent so much time and trouble in making me what I now was—a perfect 4.5 high explosive shell.

Finis

To me, Z × 342, has fallen the duty and honor of telling of the last moments of my beloved brother, Z × 123. He was taken behind a howitzer gun, his time fuse was screwed into his head and was "timed." He was placed in the gun, the firing charge was inserted behind him, and the "breech" was closed. With a blow of 200 tons on his base, he left the gun at a speed of 2,600 feet per second, at the same time revolving at 3,000 revolutions per minute. What a majestic "trajectory" he made in the air, when ! ! he disappeared in flame and smoke. He was too far away for us to be able to distinguish his last vengeful cry, but if he were alive, he would be proud to know the damage he did to the enemy. May he rest in "pieces."

MANGANESE IN STEEL MAKING*

By Dr. Henry M. Howe.

PASSING by the deoxidizing and desulphurizing effect of manganese as foreign to our present purpose, its effect on the mechanical properties of the steel seems to me in the last analysis due primarily to its retarding action both on the transformation and on the coalescence of the micro-constituents into progressively coarser masses, which while increasing the ductility lessens the cohesion in general, including the hardness and the elastic limit, and thus lessens the effective strength.

Before considering the retarding of the transformations by manganese let us refresh our memory as to these transformations, and as to the three prominent states of steel, between which they play:

The common low-temperature alpha or pearlitic state;

The high temperature or non-magnetic austenite state into which the metal passes spontaneously when heated up through the transformation range, say 725 to 900 deg. C., Ac^1-Ac^3;

The intermediate or martensitic state, in which carbon steel is caught in transit from the austenite to the pearlite state by means of a rapid cooling, as for instance on hardening by quenching small pieces in water.

The alpha state is magnetic and relatively soft and ductile, as in annealed carbon steel; the intermediate or martensitic state is magnetic, hard, and brittle as in hardened steel; while the non-magnetic high temperature or austenitic state when preserved in the cold, as in manganese steel, combines great ductility with hardness of a peculiar kind to which I will refer shortly.

In carbon steel this transformation is so rapid that it occurs to a very marked degree even in the water quenching of thin pieces, as is familiar to us in the fact that when this steel is made non-magnetic and austenitic by heating say to 900 deg. C., and is then quenched in water, it transforms as far as the magnetic, hard, brittle, martensitic state of common hardened steel even in this rapid cooling.

Most of the alloying elements, and notably carbon, manganese and nickel, retard this transformation greatly. Thus 2 per cent. of manganese plus 2 per cent. of carbon retard it so that in the water quenching of thin pieces the austenitic state is preserved. With 5 to 7 per cent. of manganese it is so slow that even in air cooling it goes only as far as the intermediate martensitic state. Hence the brittleness of these steels of manganese content. With about 12 per cent. of manganese the transformation is so sluggish that the austenitic state is preserved even through a common slow cooling.

The water-quenching of manganese steel in current manufacture is not to prevent the loss of the austenitic state, but to suppress the precipitation of the iron-manganese carbide, cementite, which would occur during slow cooling. The broad plates of this cementite would embrittle the mass by forming partings of low cohesion. It is derived from the large carbon content of the ferromanganese used, the cheapest source of manganese. Carbon-free manganese steel should not need quenching.

Industrial Value of Manganese Steel

The industrial value of this manganiferous austenite or manganese steel seems to be due to its combination of great ductility with great effective hardness. I say effective hardness, because initially it is rather soft. My own experiments indicate that the Brinell hardness of an undeformed specimen is only 125, or that of steel of about 0.22 per cent. of carbon when annealed, that of ultra low-carbon steel being about 75. But the hardness increases very greatly on the slightest deformation. Even that incidental to the Brinell test increases the observed Brinell harness to 223 easily, or to that of 0.60 per cent. carbon steel when annealed.

This hardening under deformation is one of the first things that forces itself on the user of this material. The first strokes of the hacksaw cut it rather easily, but the deformation thus set up in

*Presented at the annual meeting of the American Society for Testing Materials.

the path of the saw quickly causes such hardness as to bring the sawing to an abrupt end, thus giving the absolutely false impression that the material has a soft skin. This hardening causes the apparently contradictory combination of effective hardness with very low proportional limit, even as low as 28,250 lb. per square inch. The proportional limit represents the cohesion of the undeformed material, the effective hardness represents the cohesion as exaggerated by the deformation incidental to service. In the same way the act of tensile rupture may increase the Brinell hardness of 540, or that of about 0.50 per cent. carbon steel when hardened.

The surface of the jaw of a manganese steel rock crusher, deforming under the great pressure, quickly hardens itself, so that the combination of a very hard surface with a ductile back develops spontaneously. As fast as this hard surface wears away it is replaced by a new one made equally hard by the deformation which it at once receives.

This hardening probably represents in part the same cause which leads to the increase of cohesion in general, including the hardness, of all the malleable metals under all forms of deformation, such as wire drawing, and in part the martensitization of the austenite. That is to say, the arrested transformation from austenite through martensite to the alpha state which is due in cooling through the transformation range but is restrained by the retarding action of the manganese, is now stimulated by the deformation sufficiently to cause it to proceed as far as the martensitic state, with consequent hardening and embrittling effect. This martensitization through the stimulation of the arrested transformation is a common property of austenitic steels which have only a moderate excess of the retarding elements over the quantity needed for causing the retention of the austenitic state. It occurs strikingly in austenitic 20 per cent. nickel steel.

The retarding effect of manganese on the structural changes of carbon steel shows itself by leading in general to finer structure, to finer ferrite masses, finer network structure, and finer pearlite, indeed probably often to the replacing of lamellar pearlite with sorbite. This greater fineness leads to better quality in general and to a higher elastic limit in particular, though of course with a corresponding sacrifice of ductility.

Value of High-Manganese in Low-Carbon Steel

The great value of manganese for this purpose has not begun to receive the attention which it deserves. It is probable that a manganese content of say 1.25 per cent., with a correspondingly lessened carbon content, may be used so as to lessen the danger of cracking and the residual stresses when a high elastic limit is sought, because this large manganese content in and by itself raises the elastic limit by giving a fineness of structure which otherwise would be sought by increased violence of cooling or by the use of a lower drawing temperature. In other words, the use of 1.25 per cent. of manganese lessens the needed violence of cooling, and permits the use of a higher drawing temperature, in both ways tending to mitigate the residual stresses, and in the former way lessening the chances of cracking.

INVESTIGATING DEFECTIVE MAGNETO

By J. E. McCormack.

A gasoline engine was equipped with a rotary magneto and with batteries also. The idea was to start on the batteries and switch onto the magneto when speed was up, but as the engine failed to operate on the magneto (in fact the magneto was supposed to be of no use) the batteries were used entirely for some months. One day I removed the magneto, coil spark plug and connecting wires and placed the magneto on the stand of an old sewing machine from which the head had been removed. I removed the governor pulley from the magneto and bored out an empty (sewing thread) spool to fit the arbor, then used this for a pulley and a grip strap for a belt, I ran the magneto up to approximate speed by pedaling and kept it going and kept adjusting the vibrator on the coil until I got some buzz, and then found that a half turn of the screw either way would stop the buzz. This shows the fineness of the adjustment necessary in that case. The proper point thus located was 3 or 4 turns from where it had been set for use on the batteries. With the new adjustment of the vibrator it was possible to start on the batteries and then run on the magneto, thus greatly saving the said batteries. With the magneto connected up on the engine it had been practically impossible to adjust the vibrator to it, because the engine would not hold up speed sufficiently long, but now with the vibrator set for the magneto, the batteries will work with the same adjustment and it is O.K.

No fastening was required to hold the magneto on the sewing machine stand for testing. Its weight was sufficient to hold it steady and in place. During the testing, I had the ground connection bound to the outer nut of the sparkplug, and the secondary attached to the end of the plug in the ordinary way. This completed the circuit the same as though the spark plug had been screwed into place on the engine and the ground wire attached to the engine frame in the customary manner.

DEVELOPMENT OF OXYGEN MANUFACTURE

By J. W. G.

THE use of oxygen in connection with welding processes, carbon removal from engine cylinders, etc., has become such a commonplace matter in the ordinary routine of manufacturing activities that little or no thought is ever given to the processes whereby this now indispensable gas is separated and prepared for use.

The commercial production of oxygen dates from the year 1886, in which year operations were commenced by an English concern to develop a process invented by two Frenchmen, the Brin brothers, their process being based on previous discovery by Boussingault in 1851, that barium monoxide absorbs oxygen from the atmosphere when it is heated to 1,000 deg. F., and gives it up again when the temperature is raised to 1,600 deg. F. This cycle of operations was repeated indefinitely, the barium monoxide remaining unaffected by the alternate heating and cooling.

Despite the lapse of time from the original discovery of the process, many practical difficulties still remained until Brin's Oxygen Co. succeeded in developing the manufacture to such a high degree of perfection, that the barium process maintained its superiority against all efforts to develop other processes of obtaining oxygen on a commercial scale.

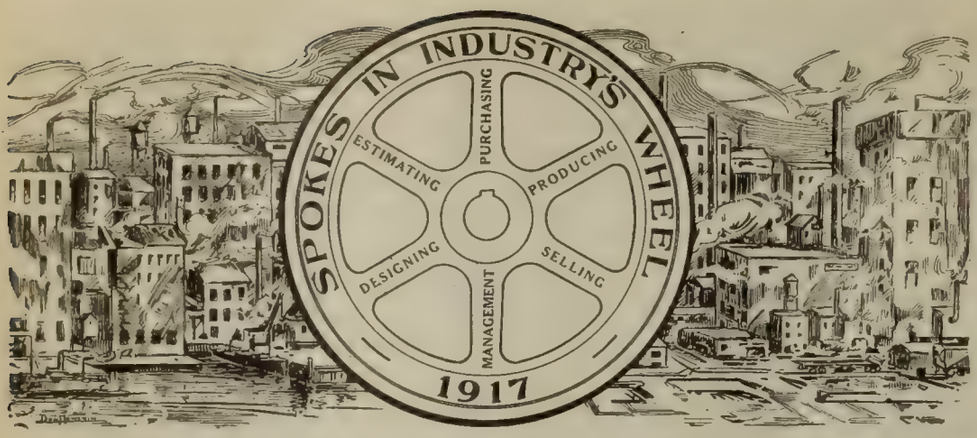
The commercial liquefaction of air had meanwhile been developed by Prof. Linde of Munich, in 1895, and from that time on the ultimate eclipse of the barium process became more and more a matter of time. The actual process of obtaining oxygen through liquefying air is a highly specialized proceeding and its success has been very complete, the barium process being entirely discarded, although the possibilities of electrolytic cells are the subject of intense experiment and research by interests allied with electric power supply companies, and developments in this direction are pending.

Despite the decadence of the original process, it is gratifying to know, especially at this time that oxygen production in Germany, France and United States was first put on a commercial basis with barium plants designed and erected by the original Brins' Oxygen Co.

NEW ALLIED TONNAGE

FIGURES of the new tonnage built during the six months from October, 1916, to April, 1917, have been published by the Bureau Veritas. No distinction is made in the figures between steamers and sailing vessels, but the number of the latter cannot be large:

	No. of ships.	Gross tonnage.
Great Britain	261	680,946
United States	150	484,381
Holland	103	190,619
Japan	46	128,913
France	42	61,988
Italy	20	34,051
Norway	42	34,044
Denmark	20	26,348
Sweden	26	20,023
Spain	7	4,422
Chili	3	823
Russia	5	750
Portugal	3	216
Total	728	1,667,524



The constitution of industrial enterprise is largely departmental—"spokes in a wheel." This series of articles has for its object the featuring in a racy, interesting and instructive fashion, the training, experience and achievement of those who to-day are transmitting, effectively, energy in their capacity as "spokes in the wheels" of our metal-working establishments.

ROBERT MORTON HAMILTON

THE career of the subject of this sketch began about the same time as the machine tool industry in Galt had its inception. Robert Morton Hamilton was born in Brantford, Ont., on March 8, 1864, of Scotch parentage, as his name indicates. He was educated partly at the Public School, Brantford, and later moving to Listowel, attended the High School there for two years, which he left at the age of 14, in 1878, to start an apprenticeship in McIlwraith & Austin's machine shop in that town. This concern was in a small way of business, the work consisting chiefly of repairs to farm and general machinery usually found in country districts. The company went out of business not long after young Hamilton joined it, so he had to look around for another job.

There was at Baden, Ont., at that time a machine shop owned by the Livingston family, who were also the proprietors of a linseed oil mill. This machine shop was originally the property of the father of Adam Beck, of Hydro-Electric fame, but was turned over to Mr. Livingston a short time before our youthful mechanic resumed his apprenticeship after his brief stay at Listowel. Our spoke in his early days must have exhibited a natural liking for machinery, and while in Baden got plenty of experience, as the firm made a varied line of machinery and also Corliss engines.

The fame of Galt as a town with good machine shops spread to Baden, where our spoke was busy absorbing mechanical knowledge and aroused his ambition. Realizing that opportunities would be greater in Galt, he went to that town in 1882, and secured a position as machinist at McGregor & Gourlay's Works. He stayed with this firm until 1886, when an opportunity presented itself to start in business on his own account. Our spoke, who was then only 22 years of age, joined J. J. Stevens in an enterprise which was the foundation of the machine tool industry in Galt. Mr. Stevens was a draftsman with McGregor & Gourlay. These two ambitious young men started in building machine tools with a capital of less than $1,000, in an old blacksmith shop in Ainslie Street. They admit that they had more nerve than capital, but this did not prevent them from making a success of the enterprise, for, two years later, in

ROBERT MORTON HAMILTON.

1888, they built a new shop, which is now owned by the S. J. Shimer Co. Some encouragement may be gleaned from this phase of our spoke's career, for it showed that a large amount of capital is not necessarily essential to success. It also proves that a good deal can be accomplished by a judicious mixture of pluck and hard work. This firm, Stevens, Hamilton & Co., were well known for the good quality of their product and they achieved considerable success until 1895, when they sold the plant to McGregor & Gourlay. In passing it should be mentioned that Mr. Stevens ultimately opened up another machine shop where he specialized in building the Jones & Lamson turret lathe. This concern is still in existence. When Stevens, Hamilton & Co. sold their business, Mr. Hamilton received stock in the McGregor, Gourlay Co. as his share of the transaction and remained with the latter concern as head of the machine tool branch of the business. The McGregor & Gourlay Co. moved the plant to their own premises in Concession Street, which is now the head works of the Canada Machinery Corporation.

From about this period the machine tool industry in Galt began to grow from comparatively small proportions until now it is the most important machine tool centre in Canada, when considering the number of firms engaged in the business and various types of tools built there. A few years later, in 1910, the Canada Machinery Corporation was formed, one of the firms absorbed being the McGregor, Gourlay Co. About this time Mr. Hamilton, needing a rest and change of scenery, took an extended vacation, returning to the Canada Machinery Corporation in the fall of 1914 as works manager. Since then the C.M.C. has enjoyed a most prosperous run of business, which coincided with Mr. Hamilton's return to the scene of his former activities. While the C.M.C. have not been actually engaged on production of munitions, they were for some time working night and day on machine tools for this purpose, and, although not so busy now, are actively engaged on work of a more general character.

Mr. Hamilton is fond of traveling, having recently returned from a combined business and pleasure trip to the Pacific Coast. He went as far North as Skagway and visited Prince Rupert and other important points while en route; this being his third trip to the Pacific Coast in recent years. Mr. Hamilton is of the opinion that the shipbuilding industry will be of material advantage to that province, and it will be a more permanent character if raw materials can be obtained readily.

From the foregoing it will be seen that the subject of this sketch has truly grown up with the machine tool industry in Galt. When he went to Galt in 1882, the town had a population of about 6,000; now it has a population of over 12,000, the increase having mostly taken place in recent years. It was the reputation of the Galt machine shops and also the opportunities for advancement for mechanics through the Mechanics Institute and Free Library that attracted our friend to this town. While following his vocation during the day-time he was able to attend night school at the Institute. This is an advantage which few of the smaller towns possess and it means a great deal to the ambitious apprentice. Mr. Hamilton is a firm believer in technical education and study of technical journals. He urges apprentices to embrace every opportunity of acquiring knowledge by these means, and in no better way can this be done than by study in the evening particularly when day classes are not

(Continued on page 70)

PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

RECENT DEVELOPMENTS IN BLAST FURNACE BLOWING EQUIPMENT

AFTER the general adoption of the steam turbine in large central power, the erroneous impression gained ground that the replacing of the reciprocating blowing engine by the turbo blower could only be a question of a comparatively short time. This expectation of the uninitiated was not realized and it is doubtful if it will ever be realized.

The same laws of nature which give the steam turbine advantages over the steam engine, are obstacles in the case of the turbo blower. Firstly, the steam turbine excels the steam engine only in the region below atmosphere, and in the compression of air for blast furnace use this region is absent, because, naturally the compression must start with atmospheric pressure. Secondly, the losses in the earlier or high pressure stages of the steam turbine are converted into heat which can be utilized in the latter stages, while in the turbo blower the losses in the early or low pressure stages mean additional work to be done in the latter stages. Thirdly, the steam turbine utilizes the highly efficient process of converting pressure into velocity, whereas, the turbo blower tries to utilize the very inefficient process of converting velocity into pressure. Fourthly, the central power station utilizing large turbo generators, makes power for the sake of selling it. High steam pressure, superheat and vacua which are impracticable around a blast furnace, can be introduced in the central station. Larger and larger units can also be installed, whereas the size of the turbo blower is limited by the size of the blast furnace.

While for these very reasons engineers with knowledge of the underlying principles always had their doubts concerning general adoption of the turbo blower, another rather unexpected reason has considerably delayed and hindered its introduction. The reason in question is, incorrect governing of the blower and consequent dusting of the furnace. The turbo blower is a machine supposedly free from pulsations, and great advantages were expected from a steady stream of air going to the furnace. But practice has shown that, quite on the contrary, the vast majority of turbo blowers vary in volume delivery a much greater amount than reciprocating blowing engines do. The amount of ore lost by dusting due to this fluctuation of air supply is so great that most blast furnace managers are, at the present time, afraid to install turbo blowers.

In blowing engines the course of development likewise has been following rather unexpected lines. By comparison of the number of new furnaces built with the number of new blowing engines and new turbo blowers installed, it is found that a comparatively small amount of new blowing equipment has been added. This surprising result is explained by the fact that a very large number of existing blowing engines have been rebuilt in such a way as to have a larger capacity and to serve a greater number of furnaces than heretofore. The possibility of increasing the capacity of existing blowing engines is largely due to the increase in piston speeds made possible by the introduction of plate valves which have been mentioned before in our columns. A great amount of rebuilding of existing blowing engines has been done by the Mesta Machine Company of Pittsburgh, Pa., with plate valves manufactured under Iversen patents.

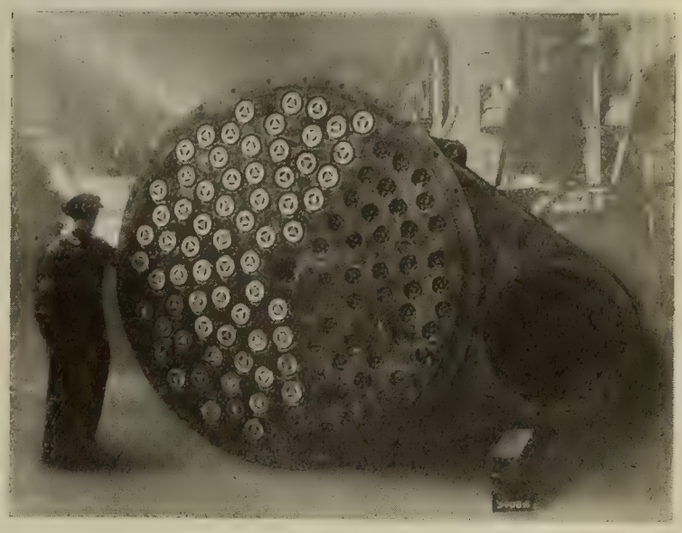


FIG. 3. ILLUSTRATING METHOD OF INSTALLING PLATE VALVES IN PLACE OF EXISTING VALVES IN THE HEAD.

The so-called rebuilding of blowing engines is, in some cases, limited to the simple replacing of the existing valves by automatic plate valves. In other instances it means more than that, namely, the removing of old cylinder heads and replacing them by heads containing plate valves. In the most extreme cases it means the removal of the whole air end including the air cylinder.

An illustration of the methods employed in replacing an old type of valves by plate valves is shown on Fig. No. 1. Here are seen plate valves arranged in cages, which take the place of large poppet valves, originally operating in the head. The cages are dished in order to reduce clearance to a very small amount. In many cases the clearance volume is smaller than it was with the original valves, while in other cases it is increased slightly, depending upon the type of valves being replaced by the cages. But even in this latter case, the advantages gained by the instantaneous opening of the valves, and the larger area secured, are so overwhelming, that the slight increase in clearance volume fades into insignificance.

The arrangement of the valves in cages offers several advantages. The removal of one cover plate exposes all outlet valves of the cage to inspection on the delivery side. The inlet cages are made in two parts so that the removal of one cover and the top of a cage exposes all the valves of that cage to inspection. In the extremely rare case of breakage of a valve, the whole cake can be easily removed and replaced by a spare one.

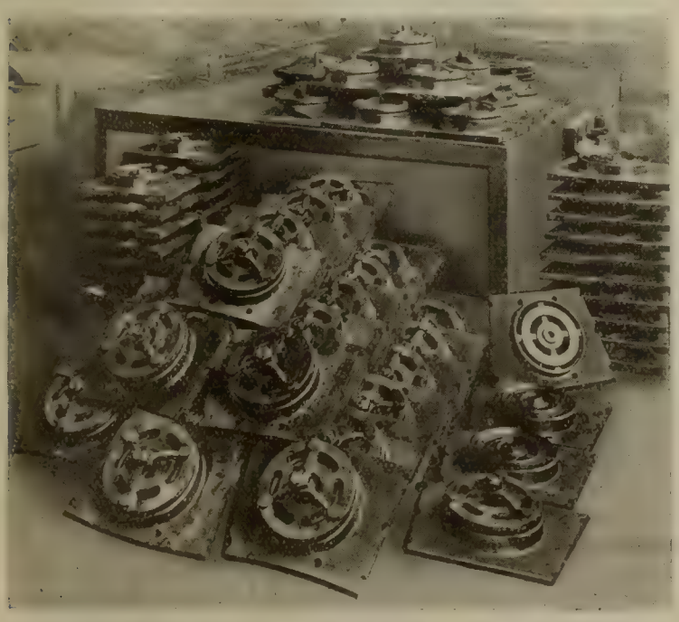


FIG. 2. SHOWING HOW VALVES HAVE BEEN MADE TO FIT A PREVIOUS SEGMENTAL ARRANGEMENT.

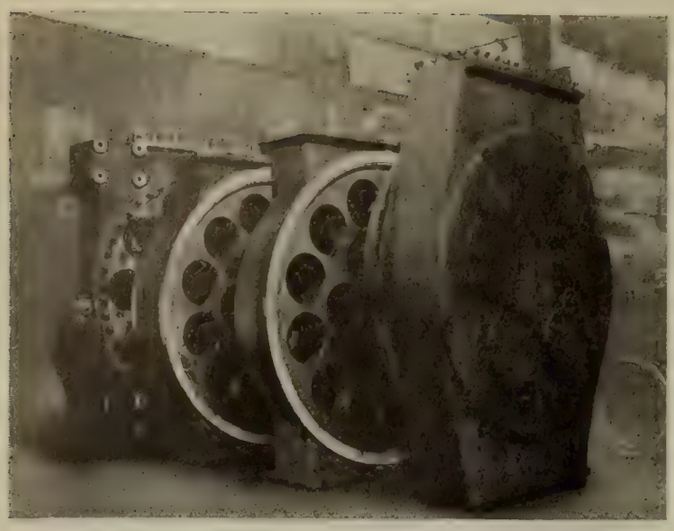


FIG. 4. REPLACING OLD AIR HEADS WITH NEW ONES.

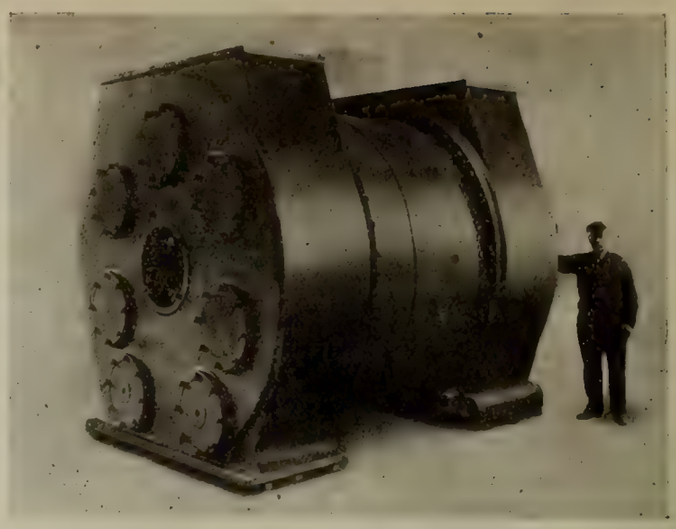


FIG. 5. NEW AIR ENDS WHICH HAVE REPLACED OLD ONES.

Fig. No. 2 shows how valves have been made to fit a segmental arrangement of old valves. Fig. No. 3 illustrates the method of installing valves in place of existing valves in the head. This latter method as a rule gives some increase in valve area, but not enough to warrant increasing the speed of the engine materially. This method is to be recommended particularly in the case of old blowing engines equipped with leather valves. The advantage is twofold: first, the plate valves are always tight and in consequence deliver more air, whereas leather valves soon begin to leak, due to warping or charring of the leather; second, higher pressure can be blown.

The second method, namely, that of replacing old air heads with new ones, ist very widely practised at the present time. Fig. No. 4 shows the appearance of such air heads. The third and last method, namely, that of replacing the old air end has been necessary only very occasionally. Fig. No. 5 shows the appearance of such an air end.

Mention has already been made of the fact that plate valves allow higher piston speeds. This feature is beneficial in several ways. Right now, due to the poor trade of coke available, many furnaces are troubled by the necessity of more air than was used in the past when better coke was on hand. Increasing the supply of air has pulled several furnaces out of a bad predicament. More air means not only more pig iron, but in addition, more furnace gas, more steam and steady profitable operation.

The installation of plate valves, and the resulting possible increase in speed of the blowing engines, has enabled a number of plants to erect another furnace without installing additional blowing units. The heretofore customary practice of blowing a furnace with three or sometimes four tubs, has given way to the present possibility of blowing a furnace with two tubs only; and, in fact, a great many furnaces in this country are being blown to-day, using only two 84 in. diameter blowing tubs equipped with automatic plate valves. From this it can be seen that the blowing capacity of existing plants can be increased 50 to 100 per cent. by equipping the present engines with automatic plate valves.

PASSING OF THE WOODEN CAR

A REPORT of the American special committee on relations of railway operation to legislation, just issued, shows that only three wooden cars for passenger service were built in 1916, and only ten wooden cars for passenger train service were under construction on Jan. 1. 1917.

"The building of wooden passenger train cars," the report says, "has practically ceased. There were in passenger train service on Jan. 1, 1909, approximately 629 all steel cars and 673 cars having steel underframes. On Jan. 1, 1917, there were in such service 15,754 all steel cars, and 6,136 cars having steel underframes, representing increases of 2,405 per cent. and 812 per cent., respectively. There are now in service 39,169 wooden cars in passenger train service, indicating a retirement of 8,957 wooden cars from service since Jan. 1, 1912, the date of the previous census. Of this number, 2,213 were retired during the calendar year 1916. This record includes a total of 615,309 passenger train cars and covers reports from roads representing 235,406 miles of railway in the United States.

The average cost per car on the first of January varied for the different classes of passenger train equipment from $14,800 for a baggage or express to $37,000 for a parlor, sleeping or dining car.

A class of boys were undergoing an examination in Scripture. The subject was the Good Samaritan. "And why do you consider the Pharisee, after looking at him, passed by on the other side?" "Because he saw he had been robbed already," was the answer given.

FIG. 1. PLATE VALVES ARRANGED IN CAGES TO REPLACE LARGE POPPET VALVES PREVIOUSLY EMPLOYED.

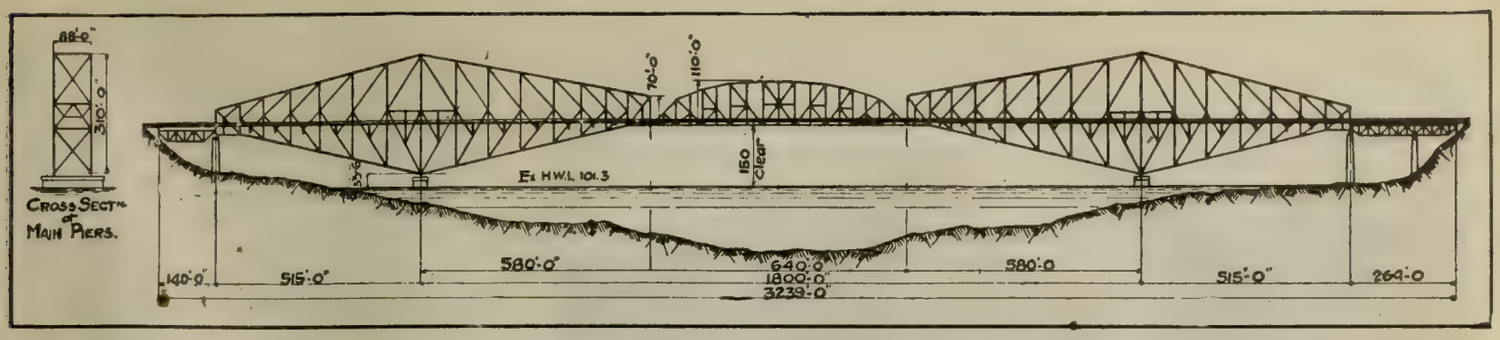


DIAGRAM OF QUEBEC BRIDGE SUPERSTRUCTURE GIVING PRINCIPAL DIMENSIONS.

Elevation of Span Insures Final Success of Quebec Bridge

Staff Article

After eleven years of unremitting toil, painstaking perseverance and overcoming of seemingly insuperable obstacles, the Quebec Bridge is now a unit structure uniting extensive provinces on the south side of the River St. Lawrence with the main portion of the Dominion. Heart-breaking disasters failed to shake the determination of the builders, and for years to come the structure and the men who built it will be the objects of endless eulogy.

LIKE a star passing across the meridian that records an epoch in the movement of the celestial bodies, the final connecting of the centre span of the Quebec Bridge marks an achievement in engineering feats that will stand out as one of the most remarkable of its kind ever attempted. Disappointed but undaunted by the failure of last year, the engineers went about the plans for the next attempt, profiting by their past experience, making such necessary changes and alterations that would entirely eliminate—as far as engineering ingenuity can at present devise—any possibility of a repetition of last year's disaster. Investigation proved that the primary cause of the collapse of last September was the breaking of one of the steel castings supporting one of the four corners of the span upon which it rested during its construction, and also during the actual raising of the span. The fact that this condition had existed for several months previous to September 11, 1916, might indicate to many that some other fault may have developed to result in the failure of the casting. It is undoubtedly true that the variable conditions, be they ever so small, that must subsequently have followed the removal of such a structure from a fixed resting place to the flexible support of the scows, and from there to the elevating chains, would subject the frame work to incalculable stresses, which in the case of these particular steel castings might develop serious defects, and probably early or inevitable disaster.

Satisfied that this feature was the vital weakness in the previous design of the lifting apparatus, the engineers concentrated all their energies on changing and perfecting this detail to avoid a similar occurrence. In some respects the principle of the pivoted support was the same as last year, but the round pins formerly used were eliminated and replaced by forged steel pieces of rectangular cross section, the top or pivot surface being curved to a two-foot radius, thus providing a wider bearing and, consequently, greater distribution of resultant pressure. During erection the span did not rest upon this support, but upon two specially designed rectangular bearings, located on either side of the central support; this construction, of course, being identical at each corner of the suspended span. These bearings were so designed as to allow for lateral movement, due to the expansion or contraction of the 640 feet of steel structure. The surface of the steel bearing piece had a length of 2 feet 6 inches, and the bronze plate upon which it rested a length of 3 feet, thus providing for a lateral movement of approximately 6 inches; the upper or friction surface of the bronze plate was polished and well lubricated. Special guides were provided to prevent side motion in the supports, with two steel plates beneath the bronze plate, the lower one resting on a bed of lead about 1½ inches thick. The side bearings upon which the span rested during its erection were not close fitting on the sides, the side guides in this particular instance being more of an emergency detail should anything happen to the central main bearing. When the bents had been removed from beneath the span previous to floating the scows into position, the entire weight of the structure was supported upon the two outer or sliding bearings, but when the weight was transferred from these bearings to the scow supports, the bronze plates and the top steel plate was removed so that when the hoisting chains were connected the falling of the tide again shifted the weight, which this time was taken by the main or central bearing, this bearing maintaining the weight during the entire lifting process. An additional precaution was provided at this point to prevent the span slipping off should accident happen to any of the main bearings. Whereas last year this detail of construction was entirely exposed, this year each corner was enclosed in a box girder built up of steel plates, and through which the pins that held the lower ends of the fixed links were secured, the upper end of this latter member receiving the lower end of the hoisting chain when the span was finally moored in the desired position beneath the cantilever arms.

THE COMPLETED BRIDGE AND ITS BUILDERS. FROM LEFT TO RIGHT: W. P. COPP, COL. C. N. MONTSERRAT, E. C. KERRIGAN, H. P. BORDEN, PHELPS JOHNSTON, E. H. PACEY.

THE SPAN SUSPENDED FROM THE BRIDGE AFTER SCOWS FLOATED AWAY.

Precautionary Measures

While these main supports were the essential details upon which the efforts of the engineers were concentrated, other minor changes were effected and additional precautionary measures were adopted to assist in the successful accomplishment of this wonderful and historic enterprise. Chief among the other alterations was the strengthening of the hanger chains described in another section of this article. Additional stiffening was provided in the lower top chord member, and in addition to the mooring arms being used for steadying the span during the initial connection of the hoisting chains, they were also utilized for anchoring the partly elevated span during such periods when actual hoisting operations were suspended. Despite the optimistic assurance that was silently expressed by those in control of the proceedings, no workmen were allowed to remain on the span after the scows had been floated from beneath; the only time that anyone ventured upon the hanging structure was when an intrepid engineer was lowered on to the span to inspect the various connections upon which so much depended.

Floating the Span

The actual elevation of the span from its erection supports was entirely dependent upon the weather, and while ideal conditions were not absolutely essential, it was highly important that wind and water be favorable to counteract those agents that tend to make such an undertaking increasingly difficult; namely, the tide and the current of the river, the tide running between twelve and sixteen feet, and the current at this particular part of the river about six or eight miles an hour. Under these circumstances it was necessary, owing to the high wind prevailing on the previous Saturday—the day originally set for the commencement of the final task—to postpone the floating of the span until the wind had abated. Some hopes had been entertained that operation could be started on the following morning, but it was not until late Sunday that the wind had sufficiently abated to insure success. In preparation for the time when the span would be floated, the scows or pontoons were placed in position under each end of the span and allowed to settle with the falling tide on to the cement foundations that had been previously constructed in the bed of the cove. When resting in this position, the valves in the hulls of the scows were left open, so that the water flowed freely in and out as the tide rose and fell each day. As the time required to float the scows, when taking the weight of the span, was nearly five hours, it was necessary to close the valves about midnight on the morning intended for the operation, in order that the span should be lifted clear at the favorable moment for floating up the river.

Towing Span to Bridge Site

Shortly after midnight on the morning of Monday, Sept. 17, the valves in the six pontoons were securely closed, and when the forces of Neptune arrived and failed to find an entrance, they began to exert a pressure on the exterior of the hulls, and after nearly five hours of resisting attack, the mighty forces of the sea god succeeded in accomplishing what would otherwise have been impossible. It was therefore about five o'clock in the morning that the various tugs took up their allotted positions under the directors of towing operations, who were on one of the smallest of the tugs in the fleet, and which was seen to dart from one position to another in order to see that every detail was carefully and accurately carried out. After much manoeuvring, the span was successfully towed to a position in the middle of the river, where the full force of the tide began to propel the massive structure up the river toward the site of the bridge. With the tugs guiding rather than towing the span up the river —the incoming tide being the propelling agent—the procession slowly advanced, followed by a fleet of river craft of every make and description. With the memory of last year's event still vividly impressed

CONNECTING HOISTING CHAINS TO SPAN SUPPORTS AFTER MOORING SPAN.

SPAN PARTLY RAISED. S.S. QUEBEC PASSING BELOW NORTH CANTILEVER.

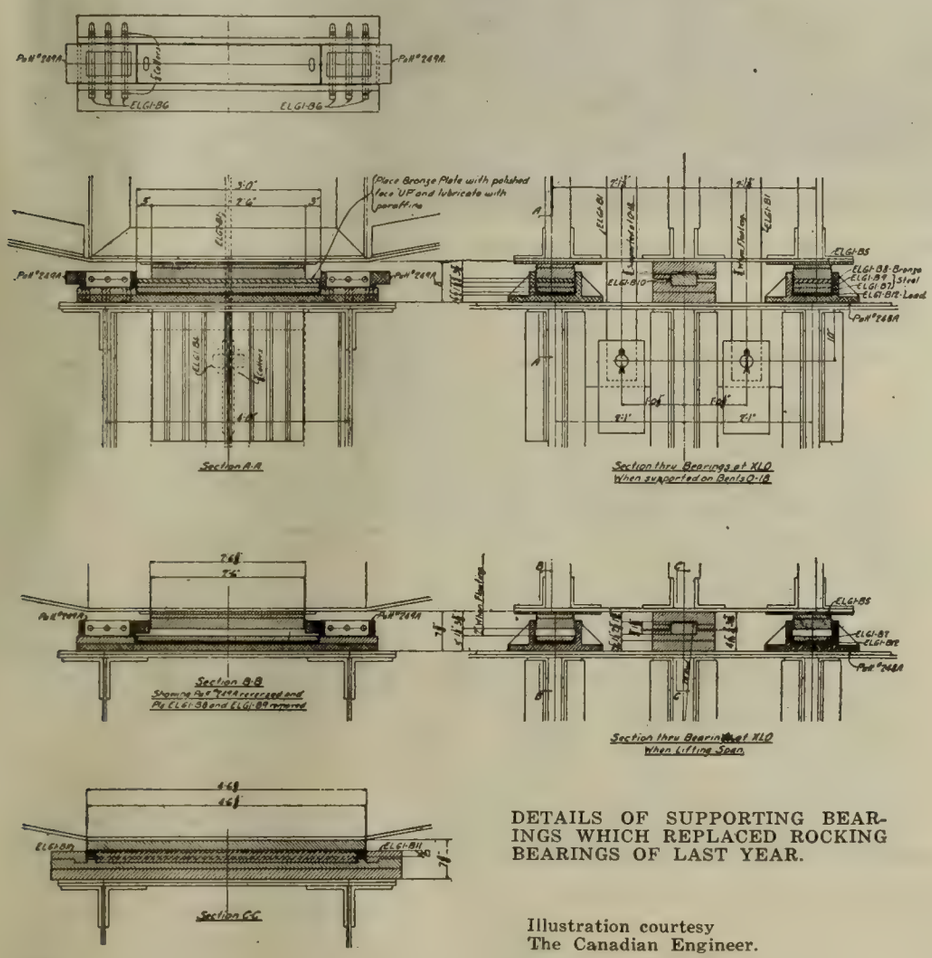
upon the minds of the sightseers, and with a fuller appreciation of the magnitude of the task and the risk involved for the men upon the structure, the enthusiasm, while none the less apparent, was more of the silent character, not only in the trip up the river, but also during the mooring operations and the raising of the span.

Mooring the Span

As the span approached a position below and between the cantilever arms it was necessary to manipulate the different tugs very accurately to bring and maintain the span in a steady position in order that the mooring frame might be properly attached to the four corners of the span. The operations were directed by the "captain" located on one of the four corners, and it was certainly no sinecure to "dock" such a liner with the use of those floating anchors—the tugs. When the mooring lines had been properly adjusted to bring the span to the exact position desired, the long slender plate chains were lowered to a vertical position and the ends bolted to the fixed link that extended up from each of the supporting girders located beneath the four corners of the span. No actual hoisting operations took place while the scows remained under the span, but the weight of upwards of 5,000 tons was gradually transferred from the six pontoons to the eight hanging chains as the outgoing tide lowered the level of the river. As the scows floated freely from beneath the span and the current of the river carried them down stream, tugs steamed alongside and guided them to a location a short distance above the site at Sillery Cove.

Period of Suspense

From the very moment that the scows floated clear of the span a concealed feeling of expectancy predominated throughout the multitudes that were perched upon all available observation points within a considerable distance on either side of the river; but while the average onlooker may have journeyed to the site to see a repetition of last year's tragedy, the attitude of the engineering profession that had carefully followed the events and circumstances surrounding the whole progress of the undertaking, particularly those engineers directly associated with the work of construction, was that of silent but hopeful optimism, coupled, however, with a nervous tension that was unavoidable under such trying and eventful conditions.



DETAILS OF SUPPORTING BEARINGS WHICH REPLACED ROCKING BEARINGS OF LAST YEAR.

Illustration courtesy The Canadian Engineer.

Changes in the Hoisting Chains

Following the final connecting of the lower ends of the hoisting chains to the fastenings upon the span, the leading engineers of the enterprise—who had ridden up the river on the span from Sillery—were hoisted up to the cantilever arm in a large cage secured to the end of a steel cable. After the men had had breakfast and before the first lift was made, a cage was lowered alongside the several hoisting chains to allow the engineers to examine the different link connections to see that everything was in order for the raising operations. This precaution was adopted at different stages of the hoisting process. It might be here stated that the hoisting chains had undergone some changes over those of last year, the strength being actually doubled. Where those of a year ago were composed of links in pairs, this year this detail has been doubled to four links in series. Each link is composed of rolled steel plate 30 feet in length, 30 inches in width and with a thickness of 2¼ inches, and provided with four hoisting holes located 6 feet apart, and the two holes for the link connections 24 feet apart; thus permitting of 12 lifts of two feet each for every link in the chain. The 12-inch diameter pins that connect the link sections are held in position by means of caps on either end, bound together by a 1¾-inch bolt passing through the centre of the 12-inch pin. In order to obtain a lift of 2 feet with the holes in the chains 6 feet apart, the jacking girders are provided with a series of three holes 2 feet apart, so that each hole in the hoisting chains is engaged three times during the lift of six feet, the locking pins being alternately placed in the three holes in the upper and lower jacking girders. On the central line of the link holes the cross sectional area of each link is (30-12) x 2¼ or 40½ square inches, which gives an area of 162 square inches on each of the eight chains, or a total of 1,296 square inches supporting the total weight of the suspended span.

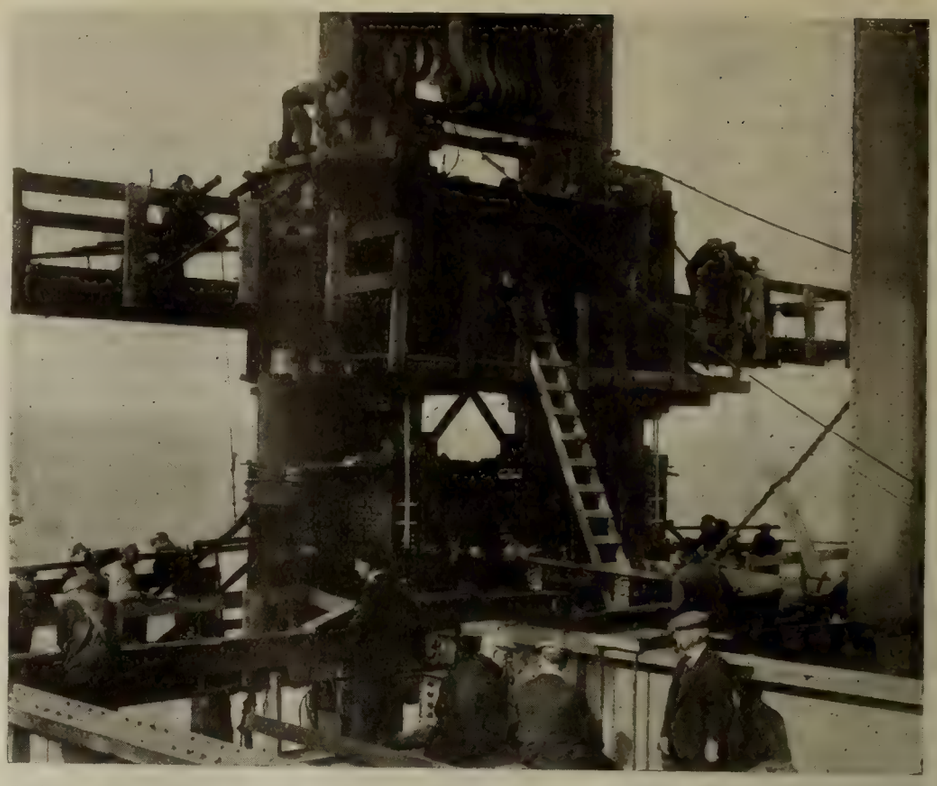
Hoisting Details

It is needless to dwell upon the gradual but successful upward movement of the span during the three and a half days occupied for the complete elevation of 150 feet; it is sufficient to say that nothing of importance occurred to mar the steady progress of the span from its initial position on the scows till the hour on Thursday afternoon when the final pins in the permanent connecting links were driven into position. The total casualties for the four days were confined to a broken nose and a few brusises sustained by workmen slipping on the wet plates of the steel structure.

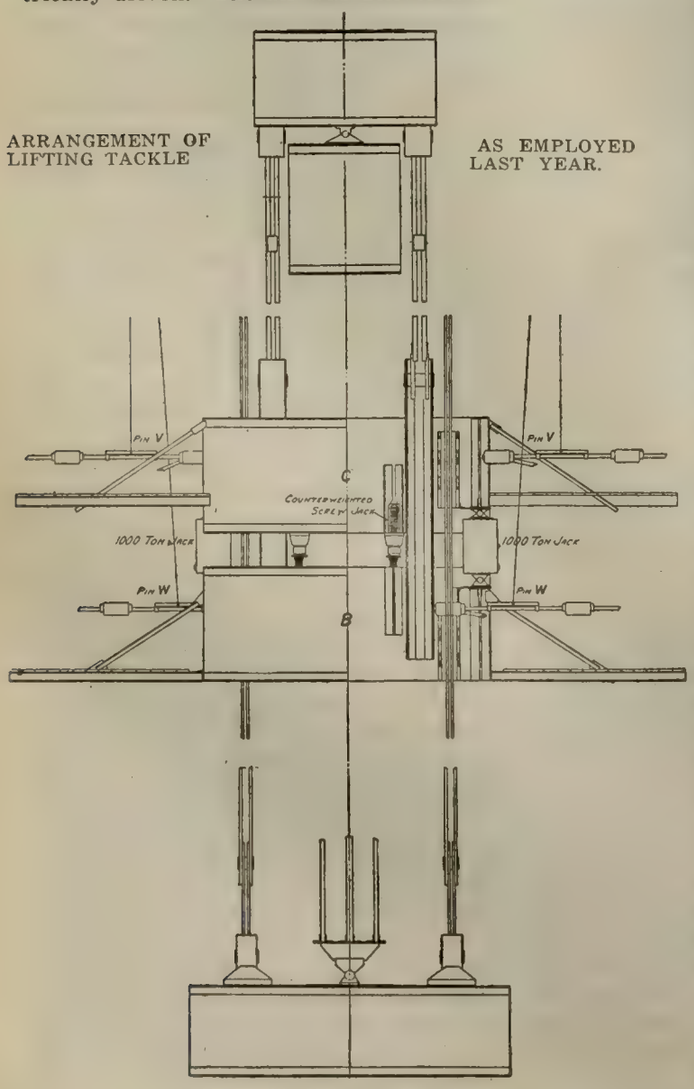
Before describing the actual lifting operation it might be well to give a brief survey of the construction of the various members that makes this feat possible. Dealing with one corner only, all four corners being alike, there is placed across the end of the upper chord of the cantilever arm, vertically over the point of intersection, and supported on a bearing similar to that beneath the suspended span, a heavy cross girder, from either end of which is suspended by means of hanger plates, another cross girder B, known as a fixed girder and placed at about the floor level of the cantilever arm. On each of the outer top ends of this lower girder are placed the hydraulic lifting jacks with a working stroke of slightly over two feet. Resting on the upper end of the rams of these jacks and

operated by them is the third or movable girder C, to which are connected the hoisting chains during the raising of the span. The hoisting chains pass through openings in the lower or fixed box girder, while a similar space is provided for a clearance for the hangers supporting the lower girder. The emergency jacks described in another section are located in a central line with a pair of lifting jacks, but nearer the centre of the girders. The slots in either girder through which the hoisting chains pass are provided with a set of three equi-distant holes, 24 inches apart, to permit of an elevation of two feet at each complete operation of the jacks.

Assuming that the lower ends of the hoisting chains have been connected to the span supports, the upper end of the chains would be connected to one of the holes in the top or movable girder so that with the removal of the scows the weight of the suspended span would be resting upon the rams of the hydraulic jacks. The operation of these jacks was accomplished by water being forced from hydraulic pumps through ⅜ in. copper pipes into the cylinders, which are 22 in. in diameter inside and 33½ in. outside, or a thickness of metal of nearly six in. The air that operated the pumps was supplied from compressors located in a power plant at the shore end of each cantilever; these compressors being electrically driven. The air was delivered to the pumps at a pressure of about 110 lbs. per sq. in., which in turn forced the water into the cylinder of the jacks at a pressure approximately 4000 lbs. per sq. in. As this water was forced into the cylinders of the jacks the rams were slowly pushed upward, in turn raising the top girder that supported the hoisting chains. When the complete lift of two feet had been accomplished and the lower hole in the chain came in line with one of those in the lower girder, the locking pins were placed in. When this had been attained at each one of the four corners of the span, the top pins were removed and the water allowed to drain from the jacks, thus permitting the rams and the top girders to fall to their initial position in readiness for the next lift. When at the lower extreme position the upper pins were inserted through holes in the top girder, and after removing those in the lower girder the process of another lift was proceeded with. In making these connections and also those that joined the various links together, paraffin was used to lubricate the bearings.



JACKS AND UPPER GIRDER BEING LOWERED WHILE LOWER PIN IS IN POSITION.



ARRANGEMENT OF LIFTING TACKLE AS EMPLOYED LAST YEAR.

Locking Pin Details

In order to facilitate the placing of the pins in various holes during many operations, holes in the girders and hanger chains are of an oval shape, thus eliminating the absolute accuracy that would be necessary if the holes were perfectly round. This was a feature that did not detract from the safety of the work, but assisted greatly in the rapidity with which the many connections were accomplished. The locking pins used in the top and bottom jacking girders were of a counter-weighted character, both as regards the horizontal position and gravity action, the latter being taken care of by a balance weight supported on the opposite end of a small steel cable. When in operating position these pins were locked by means of trip levers bearing against the inner edge of the vertical slot, and it was necessary to raise this trip lever before the pins could be removed.

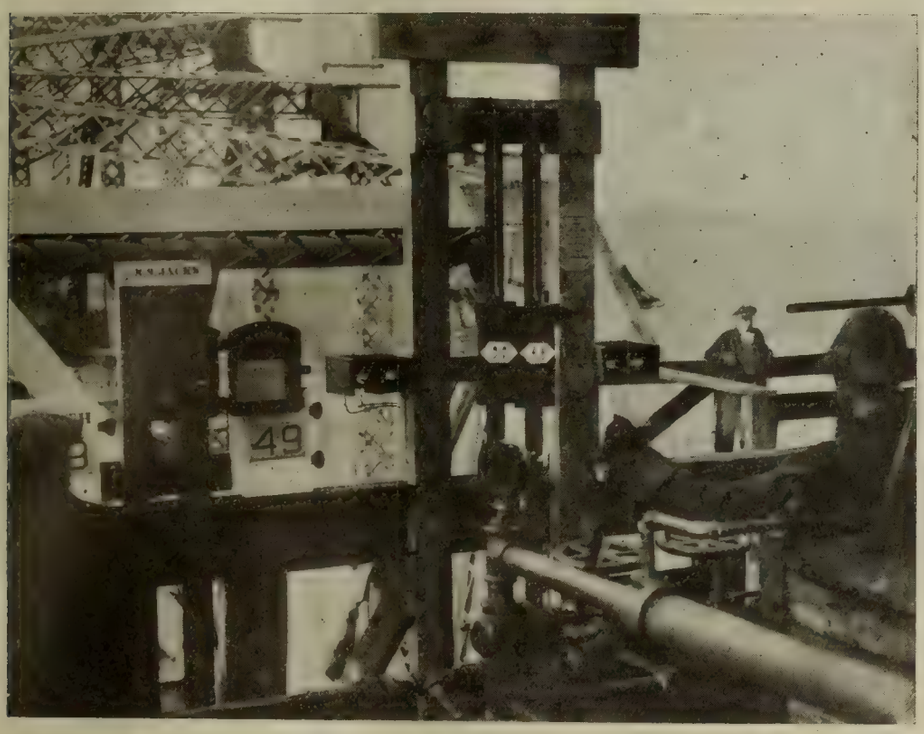
Emergency Jacking Facilities

In order to provide for any emergency through the blowing out of the pump packing or any unforeseen failure of the hydraulic jacks, a system of counterweighted screw jacks was fitted between the two main jacking girders and adjacent to the hydraulic jacks; each corner of both cantilever arms being identically equipped. By means of a large hand wheel these emergency screw jacks, which had an outside diameter of 12 in., were operated through a system of shafts and gearing so as to follow up the upper or movable girder as it was forced upwards by the action of the hydraulic jacks. This feature of construction was not for the purpose of facilitating the elevation of the span, but to maintain at all times a rigid support constantly adjusted to the gradually increasing space as each separate lifting operation pro-

gressed, to avoid any minute but sudden drop that might prove harmful to the enterprise. The counter-weight was a steel pin 12 in. dia., with a length of about 11¼ inches, and had an approximate travel of 16 feet 9 inches; fitted to the hangers was a bracket that supported a wooden block, upon which the counter-weight came to rest when the screw was within ¼ inch of normal high position for driving pin in the lower girder. The weight was supported by a ¼ inch steel cable, the opposite end of which was wound about a small drum secured to one of the horizontal screw jack operating shafts.

Tell-tale System of Indicating

An interesting feature in connection with the operation of the hydraulic jacks so as to control the flow of water, and thus maintain at all times a uniform movement in each set, was the tell-tale system of indicators and telephones; the latter for communicating from one cantilever to the other and checking the progress at either end. An electric tell-tale was provided at the outer end of each cantilever arm to indicate to the central valve operator the vertical position of the safety screws at two critical stages of the lifting operation. First, to indicate that the screws are all bearing against the upper lifting girder before commencing a lift; and second, to show that the screws were lowered far enough to clear the upper girder when transferring the load from the jacks. As shown in one of the illustrations, the tell-tale was placed directly in front of the operator so that he could have an unobstructed view at all times and by a slight movement of either hand could regulate the flow of water to either the right or left hand set so as to maintain a uniform elevation at each corner of the span. This tell-tale consists of four incandescent lamps, each in a separate circuit. Each circuit was arranged with a sliding contact depending on the elevation of a pair of screws geared together and was closed during 23½ in. of vertical motion of the screws, starting at the commencement of the 2 ft. lift, with the screws bearing against the upper lifting girder and ended when the screws had been lifted through a distance of 23½ in. In addition to the tell-tale electric lights for the emergency screw jacks, the proportional amount of lift at any time is shown by the central indicators, directly in front of the chief operator. This indicator consists of a graduated scale attached to a frame work fitted to the lower jacking girder, and a pointer attached to a sliding block hanging on the end of a thin cable, the opposite end of which is secured to the movable or upper lifting girder. Not only for each lift were these tell-tales provided, but one was installed to indicate to the engineers and workmen the number of lifts that had been accomplished, as shown to the right of the communicating telephone.



CONTROL PLATFORM SHOWING ELECTRIC TELLTALES AND ELEVATION INDICATORS.

During the erection of the span at Sillery, the structure rested upon steel bents supported on concrete foundations set in the river bed, these being clear at low tide and entirely submerged when the tide was full. A bent was provided for the main upright between each panel, and to allow for the camber of the lower chord suitable sand jacks were provided at each bent so that the level could be more easily adjusted as the upper members were gradually placed in position. The extreme camber at the commencement of operations was approximately 12 inches at the centre support. When the span had been constructed as far as was necessary for raising into position, the camber had been reduced to a few inches. Previous to the placing of the scows the majority of the bents had been removed to permit of floating the span and towing in to the middle of the stream.

Explanation of the Lift

From the dimensions given of the clearance in the centre of the channel at high tide it may seem ambiguous to some as to why it was necessary to have 75 lifts of two feet in order to raise the span to its final position. The statement that the clearance is 150 feet at high tide is relatively true, but this is only a nominal expression and one that refers to the highest approximate tide during the year. Had the engineers been in a position to float the span at an earlier date the tide would have been more favorable, inasmuch as the actual number of lifts would have been reduced, but the tide at that particular time during which the recent operations were accomplished was about 8 feet lower than the extreme high tide, and the time of arrival at the site and the subsequent delay in making the hoisting chain connections prevented the placing of the pins until the tide had ebbed somewhat, this accounting for the recorded number of lifts of seventy-five, the lower chords of the span being about eight feet above the surface of the river, due to the buoyancy of the scows and the supporting girders.

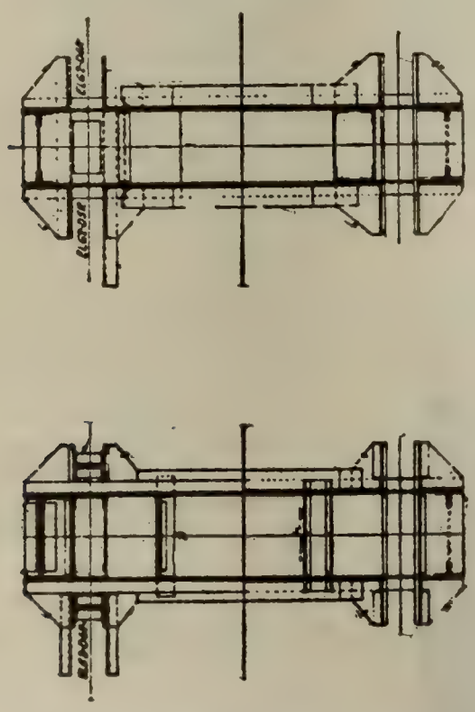
Despite the hazardous nature of the enterprise it is a noteworthy and commendable feature that with the exception of the loss of life that accompanied the falling of the span last year, the fatalities or even serious casualties have been surprisingly few. Boatmen were kept constantly in the river during the whole period of erection, immediately below the bridge so as to rescue anyone who might inadvertently fall into the river. The efforts of the company to provide comfortable and attractive camp life for the men have been greatly appreciated by the many workmen and has doubtless been a restraining and beneficial factor in influencing the character of the men and assisting them to exercise more than ordinary care in the performance of their varied and dangerous duties.

Owing to the climatic conditions, and the wide range of temperature between midsummer and midwinter, which may be anywhere from 100 to 125 degrees F., about 30 inches has been allowed for expansion and contraction throughout the entire length of the bridge. It is expected that three years will be required for the painting of the complete structure, and when the gang of painters have finished at one end they will immediately start at the other, thus assuring a permanent job for several workmen in order that the steel work will be sufficiently protected from the effects of the weather.

Forth Bridge Comparison

In reviewing the Quebec bridge, undoubtedly the greatest achievement of man's genius in the spanning of marine highways, the mind naturally reverts to its nearest rival, the Forth bridge, built over the Firth of Forth near Edinburgh. This is the next greatest structure of its kind in the world and comparisons are, therefore, interesting. Total cantilever of the Quebec bridge, including centre

span, is 2,830; that of the Forth bridge, including two spans, 2,349 feet. Width of channel between the main piers, 1,800 feet for the former against 1,710 for the latter. The Quebec bridge is designed to carry per lineal foot, exclusive of its own weight, approximately 14,000 pounds; the Forth bridge a weight of only 4,480 pounds per lineal foot. The total weight of steel used in the construction of the Quebec bridge is approximately 66,000 tons; that of the Forth bridge 57,000 tons. Weight per lineal foot for the cantilevers, 48,300 lbs. on the Quebec, and 21,360 lbs. on the Forth. Greatest depth of the main piers below high water is 101 feet for the Quebec bridge and 87 feet for the Forth. The weight of per lineal foot of the Quebec bridge is 2.3 times that of the Forth Bridge. The load for which the Quebec bridge was designed is 3.1 times greater



PLAN, SIDE AND FRONT ELEVATIONS OF SUPPORTING AND JACKING GIRDERS WITH HANGER CHAINS IN POSITION.

than that of the Forth bridge, while the prescribed test load for the former exceeds that for the latter about 4 1-3 times. The centre span of the Quebec bridge is the longest in the world and is approximately 100 feet longer than either of the spans that unite the cantilevers of the Forth bridge.

Brief History of Construction

The enormous structure that now spans the St. Lawrence is the successful fulfilment of a vision that has been in the minds of nation builders for nearly three-quarters of a century. As far back as 1852 a project for a bridge over the river at or near Quebec was considered, and again, in 1884 designs were prepared and plans submitted to the Quebec Board of Trade for a bridge at about the present site, but no definite action was taken until about 1900, when the Quebec Bridge and Railway Company located a site near Cap Rouge and took steps for the erection of such a structure; this initial site is vir-

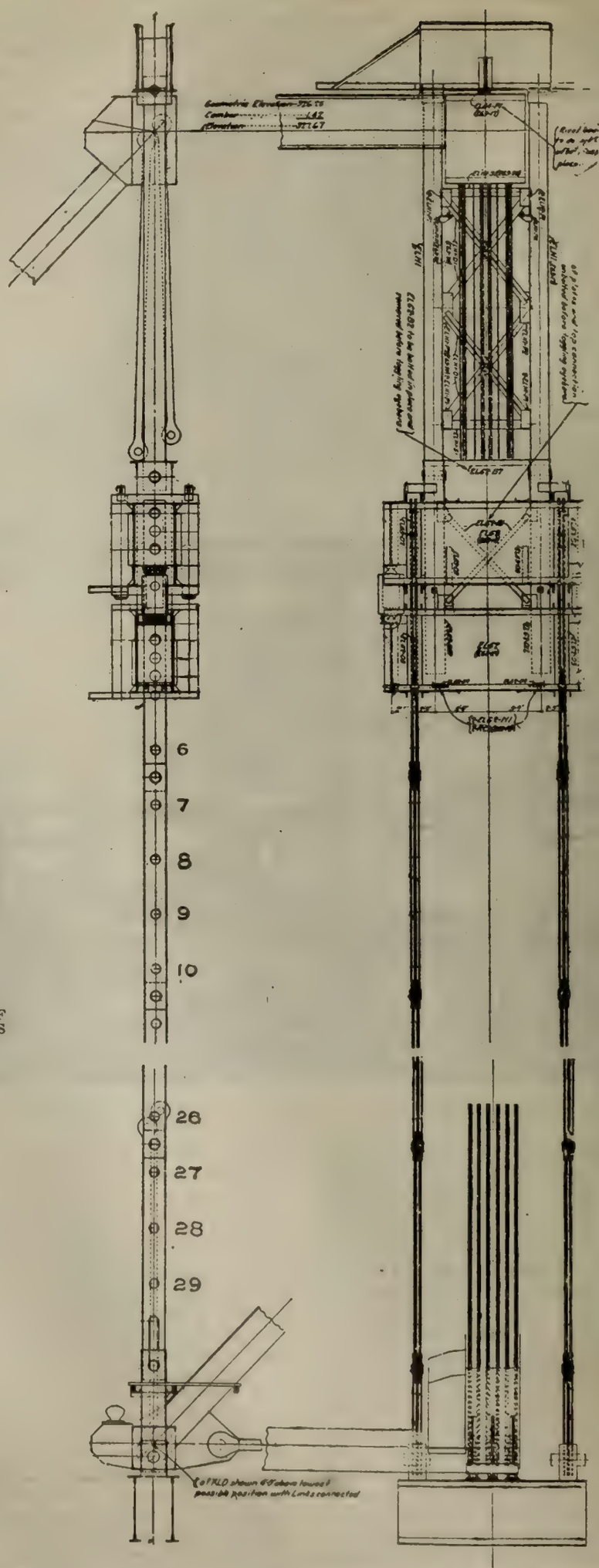


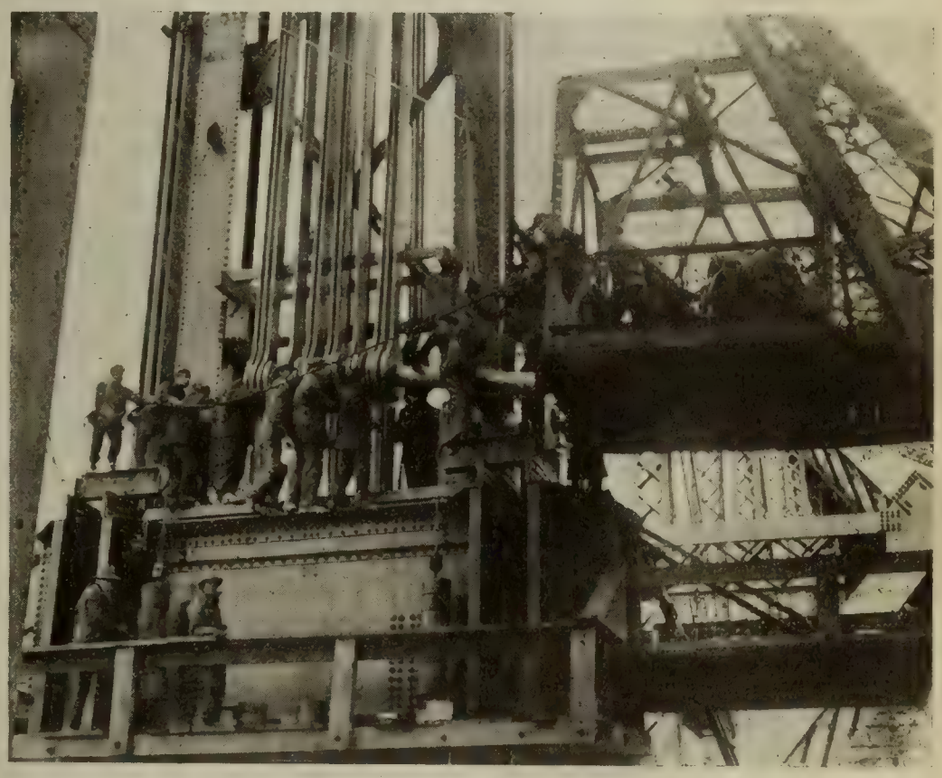
Illustration courtesy The Canadian Engineer.

tually that of the present bridge. The width of the river at this point is the narrowest between Montreal and the sea and is approximately six miles above Quebec; the distance across at mean water level being about 2,000 feet. In 1900 the Company awarded contracts for a structure of the cantilever type, having a span between the main piers of 1,800 feet. After seven years of fabrication and erection, the superstructure, which was then about half completed, collapsed into the river, carrying with it from sixty to seventy of the workmen.

Following this disaster the reconstruction was undertaken by the Dominion Government, then under the leadership of Sir Wilfrid Laurier, and the task was assigned to the Railway Deparment, with M. J. Butler as deputy minister and chief engineer. A commission comprised of such eminent men as Henry Holgate, Professor J. G. G. Kerry, of McGill, and Dr. Galbraith, of Toronto University, were appointed to examine and report on the fallen structure. Following the presentation of this report it was decided to select a commission who would have full charge of this mammoth enterprise. The parties named for this responsible work were H. E. Vautelet, of Montreal, chairman; Ralph Modjeska, of Chicago; and Maurice Fitzmaurice, chief engineer of the County Council of London, England. After a year's studies of the problems involved the last mentioned member of the commission resigned, and for some time difficulty was experienced in agreeing upon a suitable successor to Mr. Fitzmaurice. However, after some negotiations Charles McDonald, formerly of Gananoque, Ontario, was induced to act on the board until such time as a contract had been signed. Tenders were requested, either on the designs then in the hands of the Board or on plans prepared by the tendering companies. Upon the acceptance of the designs submitted by the present contractors of the bridge, the St. Lawrence Bridge Company was organized and the erection of a suitable plant was immediately proceded with at Rockfield, Quebec, situated on the Island of Montreal, this location offering ideal facilities for fabrication and shipment to the erection at the site. Despite the nature and the magnitude of the enterprise the work of construction progressed with remarkable rapidity so that in the summer of 1916 the work upon the two cantilever arms had practically been completed, with the erection of the centre span being accomplished simultaneously with that year's work. The centre span, the link that was to connect the two protruding arms, was erected at Sillery Cove about three miles below the bridge site, and floated into position on September 11 of last year, but after being successfully floated to the site and supported from the hoisting chains, the failure of one of the main castings caused the lower support to slip from its position and within less than 10 seconds the entire centre span had been released from its remaining supports and was resting on the bed of the river a mass of tangled and useless metal.

The final attempt, which has been successfully achieved during the past week, marks the culmination of effort that has taxed the engineering ability and utmost resources of those associated with the work of constructing the bridge from the very date of its inception. To the average layman it is difficult, if not utterly impossible, to conceive of the magnitude of this great and mighty undertaking, and to appreciate, even in a small and unlearned measure, the many problems of design and construction, it would be necessary to view the enormous structure as it now extends from one shore to the other, a fitting monument and everlasting memorial to those engineers whose ability has made this feat possible. There yet remain many minor, but essential, details to complete before the bridge is finally finished and ready for traffic, and it will probably be the spring of 1918 before the structure is officially opened, although it is anticipated that sufficient progress will have been made by November to allow trains to cross over. It is probable that very few of the vast crowds that patiently watched the massive structure mount slowly into position during the early half of last week, fully realized the chief object of the bridge and the inestimable importance that its successful completion would mean to the Dominion and particularly to that portion of the country immediately surrounding the bridge location. In addition to being the last link that will form the unbroken highway of the Transcontinental Railway from ocean to ocean, the bridge will provide communication to either side of the river for ten other converging transportation companies, the transferring of whose freight has until now been accomplished by railroad ferries. With the completion of such terminals as are now under construction and those contemplated, the increased facilities will eventually make the City of Quebec one of the leading railway centres in Canada.

The work has been carried out under the supervision of a Government Board of Engineers, composed of Messrs. C. N. Monserrat (chairman and chief engineer), Ralph Modjeska, and H. P. Borden. The St. Lawrence Bridge Company are the contractors for the superstructure, Phelps Johnston, president; G. H. Duggan, chief engineer; George F. Porter, engineers of construction; W. B. Fortune, superintendent of erection; and S. P. Mitchell, consulting engineer of erection; Works Superintendent Ladd being responsible for the fabrication. For the accompanying photographs we are indebted to Mr. E. N. Finn, bridge photographer; also to Mr. Millar, of the Montreal *Star*.



INSERTING THE FINAL PIN IN THE MAIN HANGERS.

OXIDE of aluminum is so nearly of the same specific gravity as the metal that it does not allow the molten metal to clear itself when in small globules or grains. For this reason mechanical aid has to be given. In practice the scrap is so far heated in the crucible that it becomes a pasty mass, in which state it is squeezed and kneaded for some time, preferably with an oak or other hardwood rod of fair cross area, and then the heat is raised, and with some manipulation of the rod the metal is cleared of the dross and dirt. If melted rapidly, a dirty mass of metal and oxide is produced with a heavy loss of actual metal held in the skimmings from which it cannot dissociate itself, owing to its slight weight.

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FIVE TALENTS OR ONE?

THE turmoil of world affairs during the past three years has been instrumental in bringing forcibly to the attention of the public, more particularly that section directly concerned with engineering activities, the degree of development attained by the various nations of the world, and of no nation can it be truly said that its efforts are in the fierce blaze of publicity so much as of Great Britain.

Born colonizers, successful traders, masterful administrators, the energies of the British people found outlet in every conceivable form of industrial activity, their world-wide markets and methods of merchandizing permitting them to control their own progress in their own manner until the present cataclysmic struggle shook precedent and conservatism to the winds, and drove the nation's engineers to unparalleled efforts in many more or less dormant fields of science and industry.

During the early months of war, many students of historical events drew inspiration from the saying that "history repeats itself," and on every hand one heard forecast after forecast which were all in turn completely upset as each phase of Armageddon unfolded itself to the world's inhabitants. At least one parallel drawn by a writer has been justified by the course of events. He drew attention to the fact, and it has not so far been contradicted, that at the close of the Napoleonic wars, the world was really more civilized, judged from the standpoint of intellectual knowledge and industrial achievement than it was at the beginning of those troublous times. Numerous advances in the arts and sciences, manufacturing developments, and political economy took place, which marked great progress at the time and formed a solid foundation for that phenomenal development of the British nation, the envy of which is not the least of the present war's causes.

Now that the threatened avalanche of militarism has been definitely averted, and seems in a fair way of being rendered harmless, the strain of recent events has found expression in many ways, not the least valuable of which is that of "self-search" as typified by some recently published books by authoritative writers. We refer specifically to the book "Eclipse or Empire," by H. B. Gray and S. Turner. The theme of this book is the subserviency of everything to the industrial national aspect. Extracts received from an English contemporary indicate the exceedingly chastened spirit in which the authors view the industrial placidity of the British nation during the past two or three decades. They state "that during the last twenty to forty years most of the inventions, new ideas and developments have been given to the world by countries other than our own; furthermore, that their value has been more quickly appreciated and put to practical use in foreign lands." As our authority expresses it, "the book, condensed to the point of extreme brevity, is a valuable resumé of alleged national shortcomings, and should be in the hands of every engineer; indeed, just such a compilation, cataloguing and digesting for easy reference a survey of the entire industrial field from one viewpoint was badly needed.

The burden of the foregoing remarks in their bearing on our past, present and future development is sufficiently obvious. We were not able, nor did circumstances give us the opportunity, to benefit industrially, at the time, by events of a hundred years ago, but now every force at the service of mankind is directly engaged in military, industrial and scientific activity, the results of which are, so to speak, immediately at our disposal.

True, the return of peace will see the re-entrance of our present enemies, under due limitations no doubt, into the world's industrial arena, but what of the present? Is the cessation of hostilities to find us where we were at the start? Shall we lack interest for the present, and avoid effort in the future to avail ourselves of the world's advance marked in years instead of decades or centuries as formerly? Amidst the wealth of information being spread almost daily, are we to find no atoms which we may retain and benefit thereby? Shall our record in the present forceful era be one of assimilation only, or one of forceful origination. The future alone can tell, but the making of the answer is in the hands of our manufacturers now. They are in the position of the talent receivers—the point is whether they wish to be known as the man who received five talents and doubled them, or the man who received one—and "hung on to it."

To quote from the work which prompts these remarks "It matters but little what a man is to-day—the great matter is what he desires and intends to be in one, or two, or three years' time. He is not a mere machine with two hands and two feet—but a living pulsating energy. He has a trinity of powers—spirit, mind and hand, and the least of these three is hand. For it is only the spirit to do, and the mind to create. that can make the hand move at all. . . . The progress of our nation will depend on the rate at which we turn the principles and theories of science into terms of ascertained facts."

A CANADIAN MONUMENT

THE final and permanent success of the Quebec Bridge undertaking seems now to be an assured fact. Nothing in the province of the humanly expected course of events can prevent it taking its place in that galaxy of notable accomplishments which have made the names of Canada familiar wherever perseverance and resource are estimated at their true worth. Of its ultimate economic influence on the country's development, it is yet early to more than approximate, but as a symbol of the unity of the confederation it holds a unique place in the hearts of all Canadians. It is the keystone of the Dominion, filling the final gap which geographically and physically has existed, albeit intangibly, as a barrier between the Maritime Provinces and the others.

That it may have a long and useful existence, and serve successfully the purposes and aims which prompted its creation, is the wish of all from now on.

INDUSTRIAL NOTABILITIES

PERCY McCUTCHEON YEATES, president, National Machinery & Supply Co., Ltd., Hamilton, Ont., was born in London, Ont., Oct. 29, 1882, son of William Yeates, and after attending public and private schools of London, completed his education at University of Toronto.

He commenced his business career with the London Machine Tool Co., Hamilton, afterwards with the Baldwin Locomotive Works, Philadelphia; and

PERCY McCUTCHEON YEATES.

later with the London Tool Co. Mr. Yeates organized the present business in 1909 and was vice-president and general manager until 1916 since when he has been president.

On Jan. 6, 1908, he married Emma Gilmour, daughter of Dr. J. T. Gilmour, of Toronto, their family consisting of one son and one daughter.

Mr. Yeates is a member of the following clubs: Hamilton; Tamahaac; Hamilton Golf and Country; Hamilton Jockey; University, Toronto. He also holds membership in Delta Upsilon Society (University of Toronto).

Golf, Motoring, Fishing, and Hunting are his principal recreations, while in politics he is Conservative and in religion, Methodist. His residence is 24 Undercliff Ave., Hamilton, Ont.

Photo, Courtesy British & Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$46 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	51 95
Basic, Valley furnace	48 00

	Montreal	Toronto
Hamilton	....	....
Victoria	....	60 00

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 00
Tank plates, Pittsburgh	9 00
Structural shapes, Pittsburgh	4 00
Steel hoops, Pittsburgh	5 25
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 00

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$31 00	$32 00
Electro copper	31 00	32 00
Castings, copper	30 00	31 00
Tin	63 00	63 00
Spelter	10 50	10 50
Lead	11 00	11 50
Antimony	18 00	19 00
Aluminum	65 00	62 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$12 00	$13 00
Heads	12 30	13 30
Tank plates, 3-16 in.	12 65	13 25

WROUGHT PIPE.

Effective July 5, 1917.

Standard Buttweld. Size.	Black Per 100 feet	Galvanized Per 100 feet
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00

Standard Lapweld. Size.	Black Per 100 feet	Galvanized Per 100 feet
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$20 00	$18 00
Copper, crucible	23 00	20 50
Copper, heavy	23 00	20 50
Copper wire	22 00	20 50
No. 1 machine composition	20 00	18 00
New brass cuttings	16 00	17 00
No. 1 brass turnings	14 00	15 75
Light brass	12 00	10 00
Medium brass	16 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	17 00
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	22 00	10 50
Axles, wrought iron	30 00	24 00
Rails	25 00	18 00
No. 1 machine cast iron	25 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	19 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	29 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	8 50
Stove plate	19 00	19 00
Scrap zinc	6 50	9 50
Heavy lead	10 00	10 50
Tea lead	7 00	7 00
Aluminum	30 00	35 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up	net
Coach and lag screws	25
Stove bolts	55
Plate washers ....List plus	10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in and larger	$7 60
Structural rivets, as above	7 50
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	35
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws...list plus	20
Collar screws ....list plus	30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$ 65 00
Open-hearth billets	65 00
O.H. sheet bars	75 00
Forging billets	100 00
Wire rods	90 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS.

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 16
Putty, 100-lb. drum	4 35
White lead, pure, cwt.	19 00
Red dry lead, 100-lb. kegs, per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 61
Linseed oil, raw, single, bbls.	1 49
Linseed oil, boiled, single bbls.	1 52
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. ..list plus	20
Emery Cloth .....list plus	33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.37
British Manila Rope	.31
New Zealand Hemp	.31
Transmission rope, Manila	.43
Drilling cables, Manila	.39
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks list plus	30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 50%; headers, 60; flanged unions, 40; malleable bushings, 50; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$11 00	$11 00
Sheets, black, No. 10	12 00	12 00
Canada plates, dull. 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	11 70
Premier, 10¾ oz.	13 85	12 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B	
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$
Connelsville Foundry Coke	
Steam Lump Coal	
Best Slack	

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

CONDITIONS in the steel trade are becoming more complex on account of the embargo, and indications point to a difficult situation for consumers to contend with. The market is consequently very unsettled and the trade is anxiously awaiting developments. What is likely to happen is difficult to foretell as the outlook is so obscure. The situation, however, will be relieved now that the United States Government has fixed prices on steel, iron ore, pig-iron and coke. The effort made to have the embargo modified does not appear to have met with much success as the situation is as acute as ever. Existing conditions will benefit the Canadian mills to a certain extent, but those consumers who rely on imported steel products will suffer considerable inconvenience. Shipbuilding will not be interfered with, but other industries using iron and steel will be seriously hampered in their manufacturing activities. One effect of the embargo is seen in higher prices on steel plate, boiler tubes and black sheets. The embargo seems to have changed the whole aspect of the situation with regard to prices. Until quite recently recessions were anticipated, but now indications point the other way. The pig-iron situation is unchanged and quotations are holding firm locally, although there is a downward tendency in prices across the line. The embargo and shortage of cars is keeping the market firm here. The scrap metal market is weaker and declines have been registered in copper and brass scrap, although steel and iron prices are unchanged. The non-ferrous metal markets are in a rather chaotic condition. An embargo on copper has been placed by the United States Government, which has also fixed a price to all consumers at 23½c a pound, or 3c below the market. Tin is higher, but lead has declined, otherwise prices are unchanged. The machine tool market is quiet and the general situation unchanged.

Montreal, Que., Sept. 24, 1917.—Renewed interest has developed over the announcement that additional orders have been placed for the six-inch shells, and while nothing definite has been learned as to the extent of this new business, it is believed that enough contracts have been obtained to operate many of the large plants at full capacity for a considerable time, probably well into 1918. A feature of the present situation is the difficulty that promises to become serious in the near future, of securing permission to get such steel from the States as is most urgently required for some domestic purposes. In some respects this material is not required directly for war purposes, but the loss likely to be sustained by certain industries will eventually result in serious disorganization of trade in general.

Pig Iron

The general situation has developed little of interest and the market is still marking time in respect to any alterations in pig iron quotations; apparently awaiting further action on the part of the U. S. Government regarding the regulations that are contemplated. The situation in the States is beginning to reflect the possibilities that may result on the announcement of the investigating committee, and an easier tone is evident in the declining quotations. The Pittsburgh price on basic pig is now quoted at $42.95 per ton, a decline over last week of $6 per ton. The composite price has been lowered during the week to the amount of $1.32 per ton, and is now below the $50 mark. The fuel situation is not so acute, but transportation facilities are still inadequate for all requirements. The Canadian situation is still unchanged, with prices withheld.

Steel

The increasing requirements of the American Government in meeting and filling the many demands that have arisen out of the prosecution of the war have necessitated a readjustment of conditions, so that everyone will realize the importance of any action taken in this connection. It is these conditions that should stimulate production, as there is a possibility of a steel shortage in the States, particularly for purposes other than war necessities. The fact that Canada is entirely dependent on United States mills for certain classes of steel makes the present developments much more serious for domestic consumers in this country, as it is practically impossible to secure supplies unless it is especially certified that they are to be used expressly for war requirements. Unless concerted action is brought to bear on the Governments by those manufacturers suffering under existing conditions, it will eventually result in very serious inconvenience and subsequently disorganize the business of this country. Some provision should be made so as to allow dealers to obtain such steel as might be required for urgent requirements, as certain delays, even in domestic enterprise, might have serious results in the advancement of the cause for which the present conditions are supposed to assist. Producers are apparently offering inducements for the placing of additional future business, as indicated in the easier market that has developed in certain directions. This, however, has not had the desired effect, as the market remains quiet and uncertain. A sharp decline has been reported on the Pittsburgh quotations for rolling and forging billets, the former on a drop of $25 being quoted at $75 per ton; the price of $85 on the latter showing a decline of $40 per ton. Steel bars are lower with the New York price having declined ½c per lb. Tank plates have an easier tendency, but the demand continues very heavy. The situation in blue annealed and galvanized sheets is not so acute, and American quotations have declined. It is not expected that the announcement of the American Government in respect to price regulations will materially affect the demand, although the price to be paid for steel for war requirements is considerably lower than present quotations on the open market. The effect of existing conditions on the Canadian market may well be one to receive the immediate attention of both the manufacturer and the Government, as a famine in domestic supply would seriously handicap many industries throughout the country. Dealers here are not favorably impressed with the outlook for the near future, and are making efforts to have the authorities at Ottawa take some action to relieve the situation. In the meantime conditions are very unsettled and prices continue uncertain and nominal at last week's level.

Metals

The market is beginning to feel the effects of the readjustment, as outlined by the American Government, and in respect to copper and lead, and also antimony the situation has weakened. Copper has declined to meet the price fixed by the Government, and will likely continue steady for some considerable time. Tin has again become stronger after a spell of weakness. Spelter is quiet and unchanged. Lead has been reduced by all interests. Antimony has declined on a quiet market. Aluminum continues firm and strong.

Copper.—The announcement that the American Government has made a statement regarding the copper situation and the fixing of a price to all buyers of 23½c per lb. has relieved the market of much of the tension that has characterized it during the past few months. The price mentioned was agreed upon after extended negotiations between the War Industries Board and some of the leading producers, with the stipulation that it will be subject to revision after a period of four months. One of the chief features of the agreement is that the wages of employees shall not be reduced during the time the agreement is in force; this clause will assure the full co-operation of all workmen and production will likely be maintained at maximum capacity. Unless this is done the small consumer may find himself in as bad a position as before, as the large buyer will possibly have the first call on covering his requirements. Under existing conditions and until further developments are reported, the price quotations for copper will remain constant, even though the market may have an uncertain character. The New York quotation is on the flat price of 23½c. per lb. With local prices set at 31c. for lake and electro, and 30c for castings, dealers here believe that these prices will prevail during the coming four months.

Tin.—This market is kept in a more or less unsettled position owing to the irregular advices that are received from London. The New York market which developed a weakness during the earlier part of the week has shown signs of recovering some of its previous strength, but present quotations of 61½c. are still one cent lower than last wek. It is not likely that this market will be affected by Government regulations unless some understanding can be arrived at between the British and American authorities. Dealers here report a stronger market, with prices up one cent; price quoted being 63c. per lb.

Spelter. — Developments in the States have resulted in again placing the spelter market in a very unsettled state and further complications are apparently making the situation more difficult to define. A misunderstanding has apparently arisen between the investigating committee and the Government which will mean further delay in coming to an agreement as to the price that will be fixed for this metal. The New York market has shown a little increased strength due to a better demand, the current quotation of 8⅜c. being ⅛c. higher than last week. Local spelter is firm and unchanged at 10½c. per lb.

Lead.—The recent rumor that this metal would soon experience another decline has at last materialized, and the drop of 1c per lb. during the week has placed the market at the base figure of 8c. Production has been stepped up so much during the last two months that supplies have been increasing in face of a quiet market, and one that has become rather demoralized owing to existing conditions and the uncertainty that characterized the entire situation. However, it is not to be supposed that this market is due to fall still further, as Government requirements at any time may result in another advance. There are those who think that this recent decline has been made more to stimulate buying than as a fair indication as to the actual condition of the market. So far no increased activity has resulted. Following the lower market in the States, local dealers have declined their quotations 1c per lb., the price asked being 11c per lb.

Antimony.—The market is quiet on light demand, with nothing of interest to report. New York is a little easier, the quotation of 15⅜c per lb. being ⅛c lower than last week. The market here has weakened to the extent of 2c per lb., the price quoted being 18c per lb.

Aluminum.—No change has taken place in the condition of the market, and prices are unchanged at 65c to 70c per lb.

Machine Tools and Supplies

While no pronounced activity has been reported in the machine tool industry, the fact that additional contracts have been placed for the 6-inch high explosive shells has again revived the waning interest throughout the trade. It is not anticipated that the demand for equipment will be very great, as many of the plants are already well supplied with the necessary machinery; others who have been fortunate in obtaining orders have been manufacturing the larger sizes and their requirements will be more for accessory attachments than for unit equipment. In fitting the latter machines for the making of the smaller shells it is expected that the demand for special devices and attachments will be renewed, as the experience gained during the past will result in the adoption of the most efficient devices for the filling of these latest orders. The demands for supplies and machine shop accessories has shown improvement since the placing of the additional business for the 6-inch shells. The difficulties that are still experienced in the securing of raw materials continues to maintain a very firm market and steady prices.

Scrap

All interests are transacting business in a more or less guarded fashion, and little heavy trading is reported. No action has been announced as to what steps will be taken to regulate the scrap situation. It is very likely, however, that this feature of industrial necessity will be subjected to similar regulations as that under consideration in other branches of activity. In view of the possibility that the iron and steel markets will undergo a change on the Government announcement re the fixing of prices, it is anticipated that the market in old materials will be likewise affected. The New York

market has developed a weaker tone, and dealers here report a very unsettled situation, with prices very uncertain and nominal. Local quotations are higher on old copper than that asked for new metal.

Toronto, Ont., Sept. 25.—Trade locally continues in satisfactory volume and many industries are still deriving considerable benefit from war orders. Business of this nature however, depends largely, as far as British Government contracts are concerned, upon the ability of the Canadian Government to finance these orders. As large credits are being, and will continue to be placed at the disposal of the British Government for war supplies, Canadian industries will benefit to that extent. The U.S. Government has also placed large contracts for supplies in Canada and there is a possibility of further development in this respect. While the munitions industry is not as active as formerly contracts for shells are still being placed representing in the aggregate a large sum of money.

Steel

The unsettled situation in the steel market arising out of the embargo on importations from United States continues to cause considerable delay and inconvenience to domestic consumers. Conditions at the present time are such that no one knows what is likely to develop either in regard to the supply of material or prices. The embargo has created unusual conditions in the trade in so far as it affects certain materials not produced in Canada among which may be included boiler tubes, plates, larger size structural shapes. These materials can be obtained for shipbuilding or for marine boilers but for any other purpose or for merchants' stocks it is very difficult to obtain an export license. Indications point to a much tighter situation owing to the heavy demand for steel which will ultimately develop in the United States. The capacity of the mills, although very large, is limited while the demand is apparently unlimited. It is not known publically what action the United States Government may take in regard to its requirements of steel for war purposes but it appears likely that a considerable percentage of the output of steel will be taken over for this purpose. A report is current that the U.S. Government contemplates taking over 95 per cent. of that country's output to be utilized in the manufacture of munitions and war equipment generally. Whether there be any foundation in this report or not, the fact that the Government's needs are increasing is sufficient to indicate that a shortage of steel for private consumers is likely to become more acute than ever before. Developments across the line will benefit Canadian steel concerns who will be called upon to supply considerable more tonnage for private consumers than in normal times. The production of shell steel is still considerable and although there has been some decrease in output of steel for this purpose the demand for this material is still sufficient to keep the mills busy while with the additional tonnage requirements for domestic consumers will in the aggregate represent a large volume of business.

What the future has in store with regard to prices is problematical. The general consensus of opinion for some time has been that the market is due for a decline in values. Conditions prevailing, particularly in regard to the embargo, have changed the aspect of the situation and a continuance of firm prices now appears more probable than it did a few weeks ago. The influence of conditions in the States upon prices in Canada is another factor in the situation about which there is considerable difference of opinion now. The question seems to be, will the embargo neutralize that influence and the Canadian market have its own basis of prices, that is for steel products such as are rolled in Canada. The market is so unsettled and outlook so obscure that it is impossible to predict what will develop. Until quite recently it was generally believed that prices were about to decline or at least remain stationary. This week there has been an advance of about 10 per cent. on seamless and lap-welded boiler tubes, while plates and black sheets have also advanced.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

The tense situation in the trade in the United States has been relieved by the announcement of prices which the Government has fixed on steel products. All prices are considerably reduced from current quotations and are as follows: Steel bars, plates and shapes are prices at Pittsburg and Chicago. Bars are now $2.90 per 100 lbs. recent price being $5.50; plates $3.25 as against $11. Shapes $3.00 now. were $6 per 100 lbs. Pig iron is now $33. per gross ton, the recent price being $58.00 a ton. Connellsville coke is now $6.00 as against $16 a ton. Iron ore $5.05 per gross ton, no change. These prices are subject to revisison Jan. 1, 1918, but will become effective immediately. It will be interesting to see what effect these prices will have on the situation as they are lower than were predicted. Business has been largely confined to Government requirements and private consumers are only buying to fill urgent needs.

Pig Iron

The pig iron market continues unsettled with the trend of prices downwards. There is however so little pig iron changing hands that there is practically no market price at the present time. The embargo and shortage of cars are both tending to keep prices up in spite of the belief that the market will decline. Buying is generally hand-to-mouth and stocks are low both at the foundries and furnaces. Coke production is still being hampered on account of shortage of labor and cars. Lately the labor suuply has been more liberal but the car shortage is more acute. The fact that the U.S. Government has at last fixed prices on pig iron, ore and coke will relieve the situation. Iron ore is unchanged at $5.05 a gross ton, basis lower lake ports. Coke in Connellsville, is $6. net ton, the recent price being $16. a reduction of 62.5 per cent. The price agreed upon for pig iron is $33 gross ton, the recent price being $58. net ton, a reduction of 43.1 per cent.

Scrap

A supervisor will be appointed by the Government to investigate the scrap situation and go into the question of prices and efficient utilisation of all old materials. The market is weaker and there has been a decline in prices of all coppers and brass scrap equivalent to about 3c per pound. The embargo which has been placed by the U.S. Government on the import of all metals has unsettled the local market and it is difficult to say to what extent it will affect the situation. There is only a moderate demand for non-ferrous scrap although there is a fair enquiry for steel and iron scrap at unchanged prices.

Machine Tools

The machine tool market continues dull with no outstanding feature of importance to note. The concerns who have contracts for 6 inch shells are buying a few special tools, but generally speaking the existing equipment will be utilized for the new work. New fixtures etc., will however, be required to suit the size of shell. Canadian machine tool builders are busy but not to the same extent as a few months ago. A number of machine shops are actively engaged on marine work but this will not necessitate new equipment. The Canadian Car & Foundry Co. have purchased some of the new tools for their car works at Fort William, Ont.

Supplies

There has been less activity in machine shop supplies since the shell orders declined in volume, but business is keeping up fairly well in general lines. Prices continue firm but there have been fewer changes of late. An advance in prices of oakum is expected

shortly and is due to the big demand for this material for shipbuilding. For the construction of wooden ships oakum is used in considerable quantities for caulking the seams. Prices of linseed oil have dropped 6c due to the decline in flax seed. Turpentine on the other hand has advanced 3c per gallon at a firm market. An advance of 50c per barrel has been made in resins. Gasoline and coal oil are firm but unchanged.

Metals

Interesting developments are taking place in the metal markets. An embargo has been placed on the export of copper by the U.S. Government and it is expected that it will be extended to include all other non-ferrous metals. This has naturally caused some excitement in the trade and the market consequently is unsettled. It is not clear at present what the full effect will be, but it cannot help but cause much inconvenience and will probably result in higher prices. As in the case of iron and steel a license has to be obtained before metal can be imported into Canada which is difficult to obtain except for certain specified purposes, such as munitions. The U.S. Government has also fixed a price of 23½c per pound, New York, on copper but this has not yet been reflected in the market price. Tin is a shade firmer and has advanced but lead is weaker and lower. All other prices are unchanged.

Copper.—The situation has been cleared up by the U.S. Government fixing a price of 23½c on copper f.o.b. New York. This is 3c below the market price. It has been agreed that sales to the Government, Allies and the public will be at this price. The producers pledged themselves to maintain maximum production and to prevent copper falling into the hand of speculators. What effect this new price will have on the local market is not easy to determine as the embargo has changed the aspect of the situation. Lake and electro are still quoted at 32c and castings at 31c per pound.

Tin.—The market is firmer in sympathy with the London situation and prices have advanced 1c a pound. Tin is now quoted at 63c a pound.

Spelter.—The market is firm but less active at unchanged quotations. Local price 10½c per pound.

Lead.—The Trust has again reduced its price of lead to 8c New York and the independents are quoting the same figure. The price has now dropped to the basis of the U.S. Government price, viz. 8c a pound. Locally the demand for lead has fallen off and there is less activity in the market than formerly. Lead is now quoted at 11½c a pound.

Antimony.—The general situation is unchanged although the market has a weaker tendency. Local price 19c per pound.

Aluminum.—The market is quiet and demand light with quotations unchanged at 62c a pound.

New York, Sept. 24.—Steel manufacturers in the United States are much interested in the report that the British Governmest is about to resume the purchase of shells on a large scale in Canada, through the Imperial Munitions Board. It is estimated that purchases on English account will cover at least 6,000,000 shells running from 4 to 12-in. in diameter. The United States Government is also actively negotiating with various manufacturers for shells of various calibers; in fact, some contracts have already been placed for 3-inch shells and negotiations now cover 6, 8 and 9.2 in. shells. The expectation is that the United States alone, will distribute orders for 9,000,000 shells. The orders placed by the two Governments, it is estimated, will require at least 1,500,000 tons of steel. In the Chicago territory manufacturers expect orders to be placed soon and machinery makers are preparing for a flood of orders for small sizes of tools in consequence.

The Ordnance Bureau of the Army, has recently closed contracts for about 3,000 3-in. field guns which will require about 25,000 tons of steel forgings. The War Department also has ordered 2,500,000 3-in. shells calling for 18,000 tons of forgings. The Ordnance Bureau of the Navy has given a contract for rough machine forgings for 4-in. guns to the Tioga Steel & Iron Co., a subsidiary of the Taylor-Wharton Iron & Steel Co., and the latter has purchased $600,000 worth of tools for installation in the forge and machine shops that are now building at the Philadelphia shops of the subsidiary company. It is understood that 40,000 tons of forgings will be machined.

The Army Department continues to place contracts for structural steel and machinery for export to France. In the last few days, orders have been distributed among ten fabricating shops for 13,000 tons of steel shapes for the building of ordnance stores in France. Orders are also being placed for buildings in which to manufacture 5,000 Liberty airplane motors in the French territory occupied by the American army. To equip these factories, army officials have just closed contracts for $3,000,000 worth of machine tools. Orders were distributed through the J. G. White Engineering Corporation for 1,000 tools, deliveries being demanded in thirty to sixty days. The Government also has awarded contracts for 15,000 Liberty motors to be manufactured in the United States. The Packard Motor Car Co. and Henry M. Leland & Son, Detroit, will each build, 6,000 motors while the Trego Motors Corporation, New Haven, and the Nordyke-Marmon Co., Indianapolis, will each build 1,500 engines. Many automobile manufacturers will also have a share in building parts of the engines which will expedite the filling of the initial contracts.

The Stone & Webster Corporation, that assisted the Government in placing structural contracts for barracks, warehouses and ordnance stores in France, are now placing orders for 359 machine tools for installation in the United States gun repair plant in France. The Army Department has also awarded contracts for 90 cranes among domestic manufacturers to be installed at railway and ship terminals in France. Manufacturers of these cranes are now in the market for 5,000 to 10,000 tons of steel bars, plates and shapes to be used in the building of this machinery.

Many other manufacturers having orders for war munitions from the Army and Navy Departments are actively in the market for machinery of various kinds, The Holt Manufacturing Co., Peoria, building caterpillar tractors, is buying tools in the Chicago market as are also Fairbanks Morse & Co., Beloit, Wis., and the Inland Steel Co., Indiana Harbor. These orders call for the expenditure of $150,000.

Pittsburg, Sept. 22.—While the iron and steel markets have continued stagnant, as regards the volume of transactions, some further, although slight, progress has been made in the price readjustment and there have been some interesting developments besides, as a general 10 per cent. wage increase has been inaugurated and the Government and copper producers have reached an agreement on copper prices such as to suggest what may be done in iron and steel.

Basic Iron Down

A striking development, illustrating how stagnant the market has been, was a sale of 2,000 tons of basic pig iron at $42, valley, when the market had been nominally quotable at $48. There was a sale of 5,000 tons in the closing days of August at $48, and afterwards the market was quotable at that figure, as representing the last sale. When, however, a steel interest in the Mahoning valley which had 16,000 tons stock and desired to reduce the stock by 6,000 tons, offered this tonnage there were no bidders among consumers and a merchant furnace interest agreed to take 2,000 tons at $42. There remains 4,000 tons offered at this price, which may now be quoted as the maximum rather than the minimum of the market. No similar effort has been made to dispose of Bessemer or basic iron, and these grades remain quotable at $50, an occasional lot, a carload to 200 tons, being sold at this figure. Any effort to force a few thousand tons upon the market would undoubtedly result in a much lower price.

Unfinished Steel

Transactions in billets and sheet bars are limited to pressing needs of consumers, for immediate deliveries, and thus involve very small tonnages. The offerings are by middlemen and consumers, mills refusing to quote, and there is a wide range of prices, depending on how closely the offering, as to size and analysis, fits the needs of the prospective purchaser. In general the billet market is $65 to $75, as evidenced by sales in the past ten days, while sheet bars and slabs are $75 and upwards.

Finished Steel

A fortnight and more ago there was some expectation that the finished steel market might be given some life by the buying of jobbers for fourth quarter deliveries, but the demand expected has not materialized and it appears that the jobbers will buy very little. They still have deliveries due them on second quarter and third quarter contracts, and their general policy at this time is to reduce stocks to the lowest possible level. As to manufacturing consumers, all are probably covered fully to the end of the year by contracts, and in some instances for the fore part of next year. Thus the position is that no buyer is forced to buy and the incentive of an expectation of higher prices later is totally lacking. Everyone expects prices to decline rather than advance.

Black sheets have been offered a couple dollars a ton lower, at 8.25c, and there are rumors of 7.75c having been quoted, this not being confirmed. Rumors continue of merchant steel bars being sold on contract at 3.50c, the commonly quoted market being 4.00c. They Carnegie Steel Co. states that it is not offering bars, because it is so well filled with Government orders for plates and shapes that it is diverting crude steel from its bar mills and has all it can do to fill its present bar obligations, but that if it were to sell the price would be 3.50c.

Mill Operations

Furnace and mill operations continue to be conducted with great difficulty owing to shortages of coke and of labor. The coke shortage results in merchant furnaces paying fancy prices for spot Connellsville coke, about $13, while the Steel Corporation, unwilling to buy coke, simply curtails its blast furnace operations, and generally has several furnaces banked, while a few are entirely out of blast. The production of steel is correspondingly restricted, the present rate of output being about 45,000,000 tons per annum, against about 44,000,000 tons in July and August, while the actual capacity is close to 50,000,000 tons. Some of the mills have feared they would be forced to curtail production on account of coal shortage, but thus far they have been able to get along. The danger from the fixed Government price, whereby the operators prefer to ship their output on the higher priced contracts, is less than from the diversion of so much coal to the lake trade.

Wage Advance

The United States Steel Corporation has just announced a general wage advance of about 10 per cent. for its various operating companies, to become effective Oct. 1. In 1916 there were three such advances, effective Feb. 1, May 1 and Dec. 15 respectively. Prior to the previous advance, early in 1913, the wages had been substantially as high as at any time in the history of the steel industry, so that wage rates are now very high, relatively speaking. The independents will necessarily make the same advance as the Steel Corporation. While a wage advance may seem strange at a time when market prices are falling, the real point is that realized prices on shipments have been constantly advancing as older and lower priced orders were worked out, and there is still a wide divergence between the average prices at which shipments are being made and the prices quoted as representing the market. These prices are still in large measure fictitious or nominal. Thus since last June black sheets have been quoted at 8.00c or higher, yet the sliding scale wage settlement with the Amalgamated Association showed that the average price realized on 26, 27 and 28 gauge sheets shipped during July and August lay between 5.00c and 5.05c.

The Copper Agreement

It was announced yesterday that the Government and the copper producers had reached an agreement whereby for the next four months copper will be sold to the Government, its Allies and the general public at 23½ cents. The average quoted price for the ten years ending 1913 was 15.36c, while the existing market was 27 cents. The Government has no authority to fix copper or steel prices, except upon its own purchases, but can reach an amicable agreement with producers and hold them to the agreement by the fact that it can at will commandeer plants to furnish materials for its own use. Washington advices are that an important meeting has just been held with the steel producers and it is possible that an agreement in steel is being reached similar to that just announced for copper. What the steel prices would be, however, is another matter, as the conditions are quite different in copper and in steel. The agreed price on copper is 55 per cent. above the average of the ten years before the war, and 13 per cent. below the market existing at the time of the war but a price for steel 55 per cent. above the ten-year average would be very much below a price 13 per cent. below the existing market.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

TO HELP EMPIRE TRADE

PROPOSALS of a far-reaching character have been put forward by the British Foreign Office and the Board of Trade for the purpose of improving the scope and completeness of the information placed at the disposal of the commercial community by the Government, according to the London *Daily Chronicle*.

At the present the Board of Trade has a Commercial Intelligence Department—which, by the way, has done excellent work under the guidance of Sir William Clark — and Trade Commissioners for dealing with matters affecting the Mother Country and the Dominion. Working side-by-side with these, and in many cases covering the same ground, the Foreign Office has its Commercial Attaches and its Consular service.

It is proposed to bring all these various agencies under one head in the shape of a Comemrcial Intelligence Department with a Parliamentary Secretary, who is to be appointed jointly by the Secretary for Foreign Affairs and the President of the Board of Trade and who will be responsible to both.

This is a unique departure so far as the Civil Service is concerned, but the question has been carefully considered by the Foreign Office and the Board of Trade. It was felt that this was the only way out of the difficulty, and the solution has received the approbation of the War Cabinet.

There is to be a great extension of the work under the new department. The staffs will be largely increased by the addition of trained men, and it is hoped to cover the whole world with an efficient service so as to give the fullest possible information on all points of interest to British traders. The Dominions have their own services of commercial information, but the British department will be prepared to give every assistance to them and to act as a clearing house between them.

The new department will also be in a position to furnish the Government with the information required before any changes can be made in tariffs or other international commercial relations.

The scheme has been laid before the Commercial Committee of the House of Commons by Lord Robert Cecil. That body has thanked the Under Secretary for Foreign Affairs for the action which has been decided upon, and has taken steps to lay the scheme before the British Chambers of Commerce and the Federation of British Industries. At the same time, the Commercial Committee has expressed the opinion that the agreement arrived at between the Foreign Office and the Board of Trade "seems to make a considerable step forward in the direction desired by the industrial and commercial community."

HOW TO RELIEVE THE CAR SHORTAGE

A WARNING on the facilities of the railroads which cannot be minimized, according to transportation officials in Toronto, has been issued by the Board of Railway Commissioners through the Toronto Board of Trade to merchants, manufacturers and all who do business with the railroads. It says:

"War conditions interfere with car movements. The weather conditions of last winter increased the congestion and the coming winter may repeat this. Additional freight cars can be obtained only with the greatest difficulty. Prompt deliveries of new rolling stock do not exist.

"If each freight car does more work the difficulty can be faced. A freight car saved is a freight car gained for extra service. More service per car equals more cars in service. If all shippers load to full capacity, or better, to 110 per cent., when practicable, the car shortage will largely disappear.

"Railways by cutting out road delays, and by improved handling in terminals, can make each car do more work. Prompt and heavy lading per car gives prompt service per car. So also does prompt release of cars. Consignors and consignees are interested in getting cars. Their co-operation in efficient car handling will help not only others but themselves as well."

WILL TEST LIGNITE

THE Scientific and Industrial Research Commission is arranging for the rental from the United States of a lignite testing plant for use in Western Canada to test some of the immense undeveloped low-grade coal-bearing areas of the Prairie Provinces. A proposal was made to the Government for the purchase by Canada of a complete plant for experimental Government operation of selected areas thought to be commercially feasible, but which private enterprise will not touch owing to the uncertainty as to economic development. This proposal of the Commission was, however, after consideration by the Government, turned down for this year. The Commission will now carry on the work through a rented American plant.

THE production of boron and ferro-boron of uniform quality requires expert study. Cheap and pure chromium is now obtainable; the electrolysis of its fused salts is difficult on account of their high melting points, but perhaps the electrolysis of aqueous solutions of chromium salts could be so controlled that heavy deposits would be produced. Then, too, chromium electro-plating is for many purposes superior to nickel, but the technique of constantly producing perfect plating has not been accomplished.—Dr. R. F. Bacon.

Mr. John T. Tussaud, the present "Madame Tussaud," tells many amusing stories of visitors to his well known establishment.

One relates to a parlor maid who was being interviewed by her mistress just after a recent bank holiday.

"And how did you spend your day off, Polly?" the mistress asked.

"Oh, we went to Madame Tussaud's," was the reply. "We always go there, mum. You see, having an uncle in the Chamber of Horrors, gives the place a family interest, so to speak."

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

CANADA'S LEADING MACHINERY HOUSE

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The A·R·WILLIAMS MACHINERY Company Limited

64-66 Front Street W Toronto, Canada

Complete 8-in. Shell Plant

Capacity---2,000 Per Week

Machines are tooled for British 8-in. Howitzer Shell but can be easily changed over for 6-in. shell.

TOOL ROOM

1—16" x 6' HENDEY lathe with complete tool-room equipment
1—14" x 6' LEBLOND tool-room lathe
2—19' x 8' LEBLOND heavy duty lathes, double back gear, quick change
1—26" x 12' PERKINS engine lathe
2—20" Wet Grinders, J. G. Blount
1—DOMINION Universal tool and cutter grinder
1—Profile Grinder
1—GISHOLT Universal Tool Grinder
1—STEVENS Universal Tool and Cutter Grinder
1—Drill Grinder
1—17" AVERBUCK Shaper
1—No. 3B LEBLOND Universal Miller
1—No. 3 BECKER Vertical Miller
1—RACINE Hack-saw
1—HENRY & WRIGHT Sensitive Drill
1—20" McDOUGALL Drill
1—BARNES all-geared drill press
2—S C & H Crude Oil Heat Treating Furnaces

SHELL PLANT

4—26" W. B. DOUGLAS heavy duty projectile boring lathe
6—27" x 12' BRIDGEFORD Heavy Duty Projectile Boring Lathes
6—27" x 12' BRIDGEFORD Heavy Duty Profiling Lathes
1—26" x 12' DOUGLAS Heavy Duty Profiling Lathe
1—20" x 9' FAIRBANKS profiling lathe
1—22" x 12' STANDARD ENGINE LATHE
1—20" x 9' FAIRBANKS waving and grooving lathe
2—FAIRBANKS 28" x 10' Heavy Duty Profiling lathes
1—16" x 8' EVANS HAMILTON Standard Engine Lathe
1—16" x 6' FITCHBURG Engine Lathe
1—20" x 8' FAIRBANKS Heavy Duty Engine Lathe
6—No. 6A POTTER & JOHNSON Automatics
1—JENCKES Copper Band Turning Lathe
3—HOLDEN MORGAN Thread Millers for base of 8" shell
2—WILLIAMS Cut-Off Machines
1—METALWOOD 6 cylinder banding press
1—PERRIN Triplex high pressure hydraulic pump
2—HOLDEN MORGAN external thread millers for base plugs
1—No. 6 PERFECT Pedestal Grinder, for 12" x 2" wheels
1—20" McDOUGALL Drill Press
1—HOSKINS Oil Furnace for heating copper bands
1—HOSKINS Type FG Electric Furnace

With complete set of tools and full equipment required to operate and maintain the plant. Also transmission belting, motors, etc. All this Equipment is in excellent condition. Inspection can be made by appointment.

This is an exceptional opportunity for American firms intending manufacturing shells as practically every machine can be shipped into the U. S. Free of Duty.

FULL DETAILS ON REQUEST

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

London, Ont.—The London Art Woodwork Co., will erect a factory here.

Granby, Que.—The Miner Rubber Co., contemplate the erection of a $3,000 power house.

Alix, Alta.—A syndicate is contemplating developing coal properties on the Red Deer River.

Rigaud, Que.—It is understood that Curtis & Harvey will not rebuild their plant at Dragon near here.

Sarnia, Ont.—Retails have been completed for the location of a branch of the Mueller Manufacturing Co., in Port Huron, Mich. This concern has also a factory at Decatur, Ill.

Welland, Ont.—Fire caused $3,500 damage to the plant of the Welland Machine and Foundries, Ltd., last Sunday. The blaze was confined to the roof of the molding shop.

Toronto, Ont.—The Imperial Oil Co., contemplate the construction of a large oil tank having a capacity of 1,470,000 gallons, for the storage of gasoline in the Ashbridge's Bay industrial district.

Sydney, N.S.—It is reported here that the Imperial Munitions Board are asking the Dominion Steel Corporation for a monthly output of at least 140,000 blanks which will mean a large increase since 17,000 was the average output for previous months.

Sarnia, Ont.—The plans for the new Romeo foundry, locating at the corner of Christina and Exmouth streets, are being prepared, and the machinery and other equipment has been ordered. It is expected that the new plant will be nearly completed by the end of the year.

Trenton, N.S.—Fire on Sept. 19 destroyed the machine shop at the Eastern Steel Co's. Plant. The damage is estimated at $125,000 which was practically all covered by insurance. The building which was constructed of reinforced cencrete was reduced to ruins and the machinery badly damaged.

Woodstock, Ont. — The Canadian Linderman Co., has rented the Tobin Arms Factory, and will instal machinery at once and put the factory in operation, working day and night on the order which the company has received for $14,000,000 worth of munitions for the United States Government. The Linderman people have their head office and factories in Muskegon, Mich.

Vancouver, B.C.—The Coughlan Shipyards, at which six big steel steamers will be constructed and at which four are already under construction, will also build the boilers for the vessels and a permit has been taken out for the construction of a boiler shop. The work done will be on a big scale as the steamers are to be 425 feet long and each will have a deadweight carrying capacity of 8800 tons.

Princeton, B.C.—The Canada Copper Corporation, will begin erection of its 3,000-ton mill on its property near Princeton, B.C., immediately. Development in the mines is being pushed, that mill may run to capacity as soon as possible after it is completed. Anticipating operations on a large scale, the company is building a modern town on its property and an extensive power plant is being installed.

Sault Ste. Marie, Ont.—The Algoma Steel Corporation is erecting another blast furnace, which when completed will have a capacity of 400 tons of pig iron per day. The furnace will be finished by the new year. The company recently completed its latest open-hearth furnace at the "Soo" plant, with a capacity of 75 tons per hearth, or about 200 tons per day, and makes the tenth open-hearth furnace which the company has in operation, as well as the duplex furnace, which has been most satisfactory.

Sherbrooke, Que.—The Southern Canada Power Co. is building 88 miles of high tension transmission lines, connecting up the cities of Sherbrooke, Magog, Waterloo, Granby and St. Johns. It is expected that these lines will be completed this fall. When completed this will give the company over 160 miles of high tension transmissions, principally 50,000 volt. The company have recently purchased property on the main street in Granby, almost opposite the Post Office, and are erecting a new substation, office and store for the sale of electrical equipment.

ELECTRICAL

Welland, Ont.—The new hydro substation is now in operation. The voltage in the system has been increased to 46,000 volts.

Brantford, Ont.—The city's terms not being acceptable, Brantford Township will itself go ahead with the construction of a hydro-electric system throughout the township.

Fort William, Ont.—E. F. Espenchied, of the Hydro-Electric Commission, has advised the city to close down the Current River power plant and not spend over $150,000 in repairs to dams, flumes, and equipment.

Kingston, Ont.—It is expected that this town will be connected up with the hydro-electric system on or about Oct. 1. Work on the line from Napanee is almost completed, and it is expected that the hydro will be able to furnish the entire need of the city this fall and winter.

Fort William, Ont.—By a vote of 548 to 82, the ratepayers on Sept. 19 ratified a by-law to enter into an agreement with the Hydro-Electric Commission of Ontario.

MUNICIPAL

Aurora, Ont.—The town has sold $8,000 debentures for installing a waterworks system.

West Lorne, Ont.—It is proposed to grant a loan of $5,000 to Bernard C. Weisbrood who will establish a factory here.

Three Rivers, Que.—The City Council have decided to proceed with the construction of a pumping station and reservoir.

Portage la Prairie, Man.—The Town Council will instal a 100 h.p. boiler with mechanical stoker in its electric station at a cost of $5,000.

Perth, Ont.—A by-law will be submitted to the ratepayers on Oct. 6, to sanction the purchase of the Canadian Electric & Water Power Co's. plant for $130,000.

Perth, Ont.—The Hydro by-law and a by-law to purchase the local electric power company carried here last Monday by a sweeping vote and Perth will have Hydro power before many months.

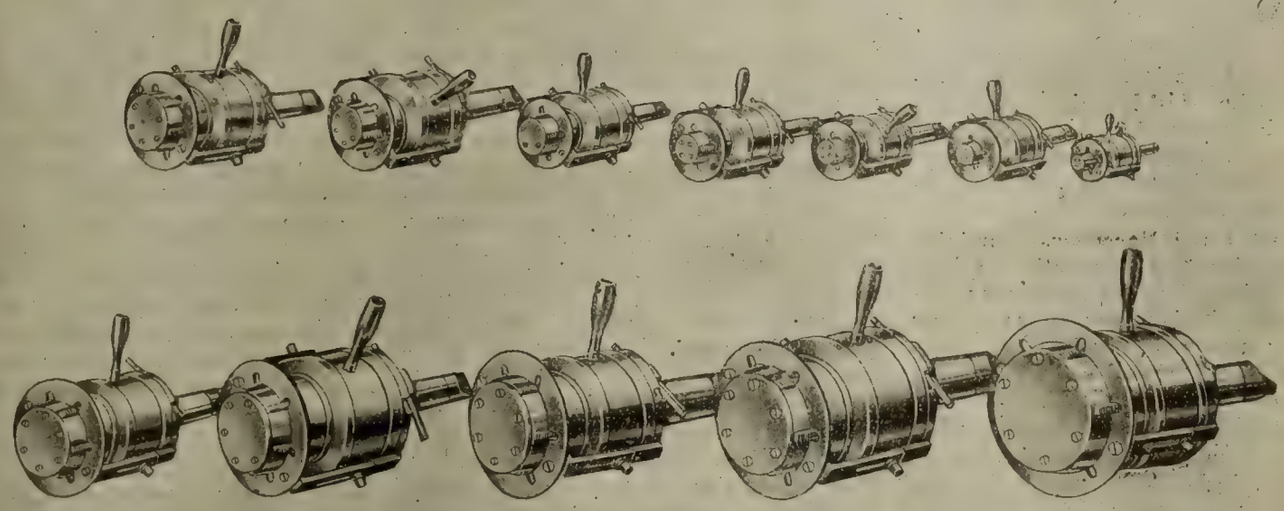
Weston, Ont.—At a special meeting of the Weston Water, Power and Light Commission held recently steps were taken to increase the capacity of the present machinery in the sub-station by exchanging three of the present 50 k.w. transformers for three of 100 k.w. development.

Calgary, Alta.—F. W. Lent, president of the Alberta Automobile League, at a meeting held here last Thursday, stated that the Alberta Legislature would hold a special meeting for the purpose of passing a vote of $30,000,000 to be used on construction of highways in the province.

Hamilton, Ont.—City Engineer Gray and engineer Bain have appealed to the Board of Control to have the proposed turbine pumps installed at the Beach pumping station without any further delay. It appears probable that the matter will be left over until the January elections when a by-law will be voted on to sanction the necessary expenditure

Walkerville, Ont.—The ratepayers by a vote of 231 to 116, passed a by-law giving the Sandwich, Windsor & Amherstburg Street Railway Co. the right to build an extension on Ottawa St. from Walker road to Lincoln road. In the agreement made with the company the town may purchase the entire system on giving one year's notice. The franchise for the extension will expire automatically in 1922, with other franchises held by the company.

GEOMETRIC TAPS



FOR U.S.

SIZES ¾" TO 6"—AT A U.S. ARSENAL

This illustrates only one of the groups of Geometric Collapsing Taps that have gone into United States Arsenals and Navy Yards to bear out the reputation that attaches to all Geometric Thread Cutting Tools.

These taps are equipped with the roughing and finishing attachment, a feature of Geometric Taps that are required for close work.

A micrometer scale adjusts them for a tight or loose thread. Because of the adjustable feature, Geometric Taps always produce accurate threads, no matter how often the chasers have been ground.

When ground beyond further use, the chasers may be replaced, while the tap remains as good as new.

Chasers recede automatically when the required depth of thread is reached.

Geometric Collapsing Taps can be fitted to Screw Machine or Turret Lathe, also live spindle.

Why not put your tapping proposition up to a Geometric?

THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents: Williams & Wilson, Limited, Montreal; The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg and St. John, N.B.

TRADE GOSSIP

The International Harvester Co. of Canada, Ltd. of Hamilton, Ont., has increased its capital stock to $15,000,000.

Painting Quebec Bridge.—It is estimated that it will take three year's to paint the Quebec Bridge. It is figured that the cost will be about $35,000. The work will be continuous, when the men have finished at one end, they will start again at the other.

Limit Export of Steel Rails.—An Order-in-Council has been passed at Ottawa, under the War Measures Act prohibiting the exportation of steel rails from Canada abroad to countries other than the United Kingdom, British possessions and protectorates.

Coal Prices for Vacouver.—Dominion Fuel Controller C. A. Magrath has fixed the price of coal in Vancouver as follows: Screened, delivered in sacks per ton, $8.50; screened, at wharf in sacks, per ton, $7.50; delivered in bulk, wagon-side, $8.00; wharf, in bulk $7.00.

Sherbrooke Firm Gets Marine Contracts.—It is understood that the firm of MacKinnon, Holmes & Co., Sherbrooke, Que., have recently received from the Imperial authorities a large order for marine work which will keep their plant in operation for many months to come.

Will Fix Coal Price.—At a conference with mine operators at Vancouver last Friday, Dominion Fuel Controller Macgrath intimated that the price of coal would be fixed at an early date by his department. Dealers present at the meeting declared that they would be satisfied with a profit of fifty cents per ton.

Inspecting the C.P.R.—Sir George Bury, vice-president of the C.P.R. accompanied by Grant Hall, western vice-president and general manager have arrived in Vancouver on a periodical inspection trip. Messrs. R. B. Angus and A. Wanklyn, Directors, and J. G. Sullivan, chief engineer, are also at the Coast.

Salonika to Be Re-Planned.—Thomas H. Mawson, the noted English town planner, well-known in Canada, has cabled Noian Cauchon, consulting engineer, of Ottawa, requesting that he collaborate with him immediately in the re-planning of Salonika, the commission for which has just been awarded him by the Greek Premier Venizelos.

Big Lumber Order Lost.—Owing to the lack of bottoms to transport freight to Australia, British Columbia is losing orders for ten million feet of lumber, and the orders will be given to mills in Washington and Oregon States, says Neil Neilson, of San Francisco, California, trade commissioner for New South Wales, who is now in Vancouver, B.C.

The Crane Packing Co., Chicago, manufacturers of the well known "John Crane" flexible metallic packing for all vapors and liquids, announce the establishment of their Eastern office in the Woolworth Building, New York City. Their engineer, A. W. Payne, with much experience with packing problems in the oil, mining and industrial fields, has been placed in charge of this branch.

Favored Building of Two Drydocks.—That the British Admiralty had recommended the construction of big drydocks at Esquimalt and Halifax and that the British Treasury Department had given favorable consideration to the matter, was made known to the Commons at Ottawa by Hon. Robert Rogers in explaining the steps taken by the Government to secure drydocks at those ports.

Canadian Explosives Ltd., Get Big Contract.—Announcement has been made in Washington, D.C., that the trinitrotoloul contract which the British Government had let to Curtis and Harvey, Canada, Ltd., and which they were unable to fill because of the blowing up of their plant at Dragon, Que., has been turned over to Canadian Explosives, Ltd. of Montreal. The contract is for several million dollars, and the profit will be correspondingly large.

Canadian Coal Imports.—An arrangement has been made with Dr. Garfield, Fuel Controller of the United States, whereby no general licensing system will be instituted as far as Canadian imports are concerned, but the authorities at Washington will call for periodical statements from United States exports showing the daily movements of coal to Canada. No serious inconvenience is anticipated as the result of these arrangements.

Submarine Boat Orders.—The Submarine Boat Corp., New York, has received an order for 90 submarine chasers from the Italian Government. The English Government has ordered 30 vessels of the same type. The English contract is a repeat order. This company completed an order for 550 of these vessels for England not long ago. The boats have given great satisfaction. In addition to these orders, the Submarine Boat Corp. is building 16 motor boats for the United States Navy.

Will Build Fifty Cargo Ships.—The Submarine Boat Corporation of New York has announced that it had entered into a contract with the Emergency Fleet Corporation for the immediate construction of fifty steel cargo ships which will be supplemented later by another contract for one hundred and fifty more vessels of the same type. The ships will be built in the Metropolitan district in a plant which will be among the largest in the country. The first keels will be laid in December it was said and the first launching will be in February.

Warning to Coal Men.—The office of the Dominion Fuel Controller repeats the warning to coal dealers throughout the country that objection will be taken to any advance in the price of coal being made without notification first being sent to the Fuel Controller. The view of the Fuel Controller is that the coal dealers had a liberal profit last summer, sufficiently so to enable them to continue the present prices into the winter, and give the smaller users of coal the same price notwithstanding any increase that the mines make at this time.

U. S. Government Fix Price of Copper. A Washington despatch states that the United States Government has fixed the price of copper at 23½c per pound, about 3c below the prevailing market, by agreement between the Government and leading copper producers, effective for four months. Sales to the Government, the public and the allies will be at this price, f.o.b. New York, and producers agreed not to reduce wages now paid in the industry. They also pledged themselves to maintain maximum production and to prevent copper from falling into the hands of speculators.

Standard Ship Great Success.—A despatch from London, England, states that complete success has attended the trial of the first standardized ships built to the order of the British Government. It was of a most exhaustive nature, and experts are unanimous in their praise of the vessel, which, with its sisters which will now be taking to the water in quick time, is destined to play an important part in the campaign against submarines. The standardized ship has been designed to provide a good style of cargo carrier in the shortest possible time, with the minimum expenditure of material. The keel was laid last February, and in less than the full six months the vessel was fully loaded and ready to go to sea.

Metal Supervisor Will Be Appointed.—The appointment of a supervisor of metal and fibre by the Dominion Government is indicated in an order-in-Council, which also authorizes the Minister of Customs to fix the price of scrap iron and scrap steel, rags, waste and other materials of metal or of animal, vegetable or mineral fibre. The supervisor is authorized to make such enquiries as the Minister of Customs deems necessary into the quantity, location and ownership of such materials, as well as into the prices at which they are held for sale. It is provided that any person who contravenes the provisions of this order-in-Council shall be guilty of an indictable offence and liable to a fine not exceeding $5,000 or to imprisonment for a term not exceeding three years.

Quebec Bridge Span Completed.—The central span of the Quebec Bridge was successfully lifted and secured in position on Thursday, after operations covering approximately four days. The span weighs 5,000 tons, is 640 feet long, and was lifted nearly 150 feet. The principal dimensions of the Quebec Bridge are: Length, from shore to shore, 3,239 feet; width, between anchor buttresses, 1,800 feet; length of central span, 640 feet; height of central span above water, 150 feet; number of railroad tracks carried, 2; street car tracks, 2; and roads, 2. The bridge has a central span 90 feet longer than the Forth Bridge, hitherto the holder of the world's record. The steel used in the bridge weighs 180,000,000 pounds, and cost $11,000,000 without the cost of

the central span. The masonry pier work cost $1,500,000.

Big Glove Contract for Canada.—It is reported that military contracts for twelve million pairs of woolen gloves for the United States army will be placed in Canada. It is believed that one of the principal reasons why the houses in the States could not keep these government contracts from going over the line to English and Canadian firms is the wool scarcity in the United States. It is understood the contract calls for all-wool gloves and this demanded an amount of the fiber greater than the U.S. manufacturers could supply. Under present working conditions in the United States, it is said the best possible price manufacturers could make the government for first grade woolen gloves was from $5.50 to $6 a dozen. The Canadians, with their past experience in filling army contracts for exactly the sort of gloves needed by our men, are able to quote prices as low as $3.50 a dozen.

New Canadian Patents Issued.—The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, 59 Yonge street, Toronto, from whom further particulars may be obtained:—Louis E. Barton, methods of producing composite titanic oxide products; Louis E. Barton, paints or pigments; Titanium Alloy Manufacturing Co., Titaniferous products and methods of producing the same; Wm. T. Graham, means for supplying liquid hydrocarbon to carburettors; Reginald T. Marshall; means for promoting circulation in steam generators and the like; T. Young, arithmetical educational apparatus; Richard A. Ducan, devices for preventing wastage of lubricant in axles of motor cars; James T. King, electrolytic apparatus; Nicolaus Rasmussen, spring bearing for centrifugal separators; Frederick H. Stevenson; attachments for fastening wires to springs; John W. Myatt, loose leaf books; James E. Haines, pneumatic tires; Thomas Rigby, peat gasification.

PERSONAL

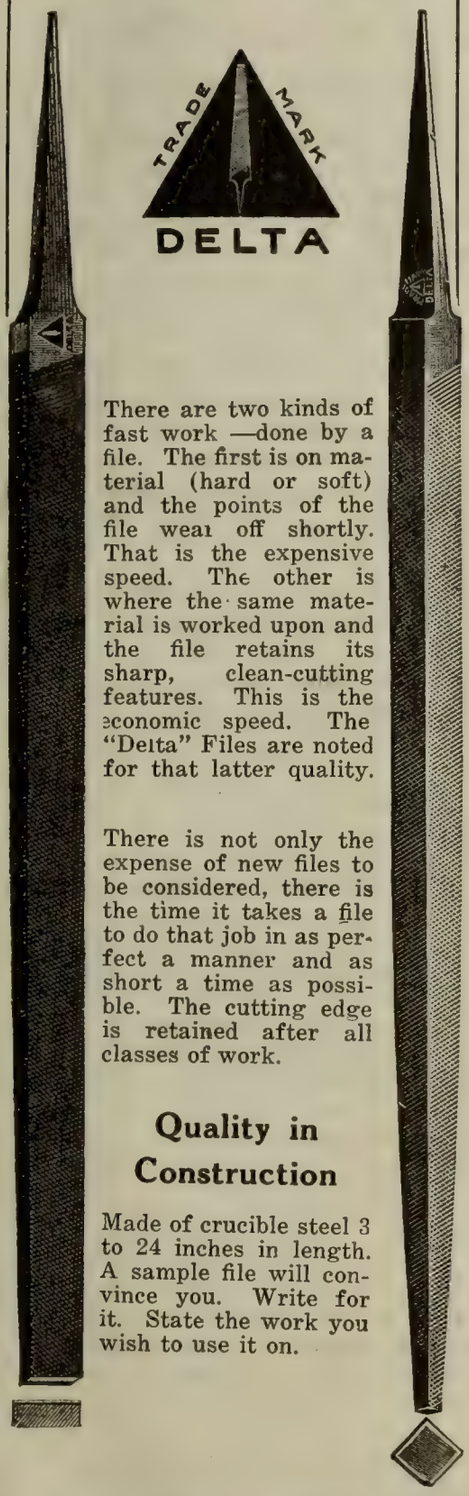
J. B. Mussellman, secretary of the Saskatchewan Grain Growers, has been appointed fuel controller for that province.

Thomas Russell, one of the best known mining men in British Columbia, died at Michel, B.C., on September 20. He was mine manager for the Crow's Nest Pass Coal Company.

C. Manning has been appointed assistant to W. D. Robb, vice-president in charge of motive power, car equipment and machinery, Grand Trunk Railway System. Mr. Manning was secretary to Mr. Robb when the latter was Superintendent of Motive Power, and has been more than thirty years in the Grand Trunk service.

John J. Harty has been appointed president of the Canadian Locomotive Co., Kingston, Ont. Mr. Harty was previously vice-president and general manager of

Fast Work



There are two kinds of fast work —done by a file. The first is on material (hard or soft) and the points of the file wear off shortly. That is the expensive speed. The other is where the same material is worked upon and the file retains its sharp, clean-cutting features. This is the economic speed. The "Delta" Files are noted for that latter quality.

There is not only the expense of new files to be considered, there is the time it takes a file to do that job in as perfect a manner and as short a time as possible. The cutting edge is retained after all classes of work.

Quality in Construction

Made of crucible steel 3 to 24 inches in length. A sample file will convince you. Write for it. State the work you wish to use it on.

All Leading Jobbers

Delta File Works

Philadelphia, Pa., U.S.A.

CANADIAN AGENTS:

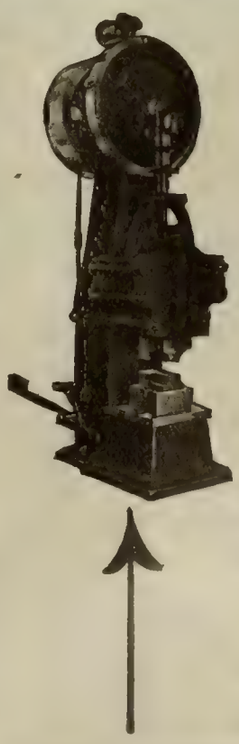
H. S. Howland, Sons & Co., Toronto
Starke, Seybold, Montreal
Wm. Stairs, Son & Morrow, Halifax
Merrick-Anderson Co., Winnipeg

The Original Solid Woven Cotton Belt

IT CAN BE USED on all Direct Drives, whether straight or crossed.
On Shifters
On Hot Places
On Oily Places
On Dusty Places
WRITE FOR OUR FREE BELTING BOOK.
It will help you end your belting troubles.

Federal Engineering Company Limited

172 John St., Toronto



The "Dupont" PATENT Power Hammer

The strength, durability, economy of power and simplicity of adjustment of the Dupont Power Hammer make it a decidedly superior tool.

Made carefully from carefully selected, high-class materials.

Positively Guaranteed

Seven sizes.
With rams from 35 to 300 lbs.

Write for full details.

THE PLESSISVILLE FOUNDRY
Plessisville, Que.

Ontario and Western Agents:
The General Supply Co. of Canada Ltd
Ottawa Toronto Winnipeg

"HAWK'D CHROME VANADIUM STEEL

Will Give You Exceptional

Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

Hawkridge Brothers Company

303 Congress St., BOSTON, MASS. U. S. A.

"Barnes-made" SPRINGS

are the result of over sixty years' experience in spring making, combined with unsurpassed equipment and the workmanship of men who have been with us, ten, twenty and in some cases thirty years.

Write for booklet No. 7-T.

Established 1857

THE WALLACE BARNES COMPANY

218 South St., Bristol, Ct., U.S.A.

Man'frs of "Barnes-made" Products

Springs, Screw Machine Products, Cold Rolled Steel and Wire

this concern. He is also a director of the Dominion Foundries & Steel Co. He is a son of the Hon. William Harty, who was some years ago president of the Locomotive Works, and is still one of its largest shareholders.

A. W. McLimont, a leading traction expert, has been appointed general manager of the Winnipeg Electric Railway Co., in succession to Wilford Phillips who has retired. Mr. McLimont is a Canadian and was born in the city of Quebec. Although a young man, he has held a number of important positions, but the work which brought him most prominently in the public eye was the electrification and operation of a considerable proportion of the transportation lines of New York, Mr. McLimont was employed as engineer under the New York Public Service Commission in New York, and became so successful that his services were in demand throughout the United States. Latterly he has been in control of some nine hundred miles of road, constituting the Michigan United Railway System.

TENDERS

Winnipeg, Man.—Tenders will be received up to Oct. 1, for the plant and properties of the Western Steel & Iron Co. The plant comprises, a foundry, machine shop and blacksmith shop etc. For full particulars apply Harry M. Agnew, Elmwood, Winnipeg.

Toronto, Ont.—Tenders will be received, addressed to the Chairman, Board of Control, City Hall, Toronto, up to October 2, for the construction and delivery of stop valves, valve operating pump and special castings, for main pumping station. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Winnipeg, Man.—Tenders, addressed to the Chairman, Board of Control, will be received up to Wednesday, October 3rd, 1917, for the supply and delivery f.o.b. Lac du Bonnet of quantity of cast iron pipe and specials; valves and accessories; vitrified clay pipe and cable clips. Instructions to bidders, specification and form of tender may be obtained at the office of the City Light and Power Department, 54 King Street.

CONTRACTS

Emerson, Man.—The contract for building a new Town Hall here has been let to Gray & Davidson, of Winnipeg, for $32,307.

Verdun, Que.—The City Council have awarded tenders for sidewalks and sewers to the M. J. Stock Paving & Construction Co.

Ottawa, Ont.—Announcement is made by the Department of Public Works that the contract for plumbing, pipes and fixtures for the new Parliament Buildings has been let to W. J. McGuire, Ltd., Toronto. The contract price $129,900, was the lowest tender received for the work.

BUILDINGS

Toronto, Ont.—The Harris Abattoir Co., will build a one-storey brick addition to evaporation house on St. Clair avenue, near Symes road, to cost $1,500.

Toronto, Ont.—The T. Eaton Co., propose buying a site for a warehouse between Gerard street and the G.T.R. right of way. The property belongs to the city and the purchase price is $30,000.

Winnipeg, Man.—The Dominion Government will erect an explosive store and magazine on the St. Charles rifle range property. Major T. W. Hawker, Great West Permanent Loan Bldg., Winnipeg has the matter in hand.

Fredericton, N.B.—The contract for the erection of the buildings in connection with the Soldiers' Convalescent Home to be established on Old Government House grounds, has been awarded to William J. Scott of this city, and Robert D. Forbes of Devon, who submitted a joint tender. Their tender was in the vicinity of $100,000 and is said to have been the lowest of six or seven submitted.

RAILWAYS—BRIDGES

Montreal, Que.—The Grand Trunk Pacific will purchase 100 refrigerator cars for the fish service from Prince Rupert, B.C., and the Eastern markets.

Campbellford, Ont.—The construction of the Trent Canal has made it necessary for the Grand Trunk to build a new bridge here, to give the necessary clearance for shipping passing through the canal, and work is now proceeding on this new structure. The new bridge will consist of seven spans and have a total length of 269 ft. 9 in.

Guelph, Ont.—Col. Boyce, president of the Toronto and Suburban Railway, arrived in the city recently over the radial line, on a tour of inspection. It is understood that this inspection tour means that the road is being turned over to the operating department for the first time, having been in the hands of the construction department since the line was built.

INCORPORATIONS

Tonsmore Truck Co., has been incorporated at Ottawa by E. D. Girardot, C. A. Smith and J. B. McLeod of Windsor, Ont., to manufacture motor truck and vehicles of all kinds at Windsor, with a capital of $100,000.

The Allied Truck Co., has been incorporated at Toronto with a capital of $40,000 to manufacture motor trucks, Toronto. The provisional directors are J. G. Bankat, C. E. A. Carr and F. W. Burrows all of Toronto.

McKinnon Industries Ltd., has been incorporated at Ottawa by L. E. McKinnon, W. A. Notman and J. W. McKinnon all of St. Catherines, Ont., to manufacture trucks, cars, wagons and metal goods of all kinds at St. Catherines, Ont., with a capital of $1,000,000.

MARINE

Toronto, Ont.—The new drydock of the Toronto Drydock Co., was used for the first time a few days ago when the freighter John Ralph was docked for repairs.

North Vancouver, B.C.—The Steamer Cassiar which was wrecked on Aug. 26, off Privett Island has been salvaged and will be repaired at the Wallace Shipyards.

Victoria, B.C. — The five-masted schooner Malahat, built by the Cameron-Genoa Mills Co., will make its maiden voyage as a sailing ship, owing to the non-arrival of the auxiliary engines. They will be installed on the completion of the first voyage.

Little Current, Ont.—The steel steamer Western Star of Buffalo sunk in the fall of 1915, with seven thousand tons of coal, was successfully raised and towed to a sheltered bay on Sept. 17. Captain Alex. Cummings, superintendent for the Great Lakes Wrecking Co., was in charge of the operations.

Shelburne, N.S.—The new steamer Keith Cann was launched on Sept. 18 at the shipyard of the Shelburne Shipbuilders Ltd. The vessel was christened by Miss M. Cann, daughter of Chas. W. Cann of Yarmouth, N.S. The Keith Cann is 130 ft. long, 25 ft., wide and 11 ft. 6 ins. deep.

Vancouver, B.C.—Frames for the second wooden steamer of the six being constructed by the Western Canada Shipyards. Ltd., at Vancouver, for the Imperial Munitions Board, have been hoisted into place. The first vessel has taken shape, the last frame having already been placed in position.

Fort William, Ont.—J. F. Paige, general manager of the Port Arthur Shipbuilding Co., stated a few days ago that the new freighter War-Fish, built to the order of James Playfair, of the Great Lakes Transportation, Co., will be delivered shortly and will be used in the coal trade on the Great Lakes.

Victoria, B.C. — The Cameron-Genoa Mill Shipbuilders will launch the fifth auxiliary schooner contracted for by the H. W. Brown interests shortly and the sixth vessel of the same type will be launched about November 15 thus completing the orders for the ships, which the company now has on hand and leaving it free to give all its attention to the building of the four wooden steamers for which it has been given contracts by the Imperial Munitions Board.

CATALOGUES

Reducing Valves.—Bulletin issued by Chaplin-Fulton Mfg. Co., Pittsburg, Pa., describes the "Fulton" steam reducing valve, and also gives directions for setting and operating this device. Two types are illustrated together with prices for the various sizes.

Radial Brick Chimneys. The Alphons Custodis Chimney Construction Co., New York, have gotten out an interesting

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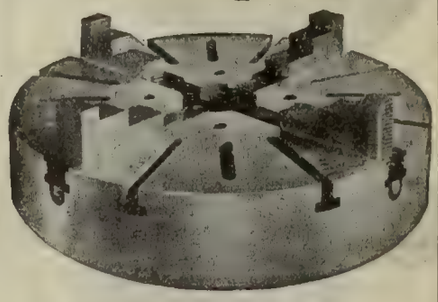
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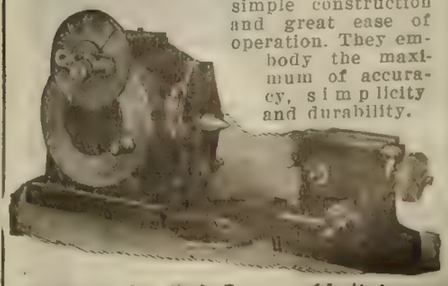
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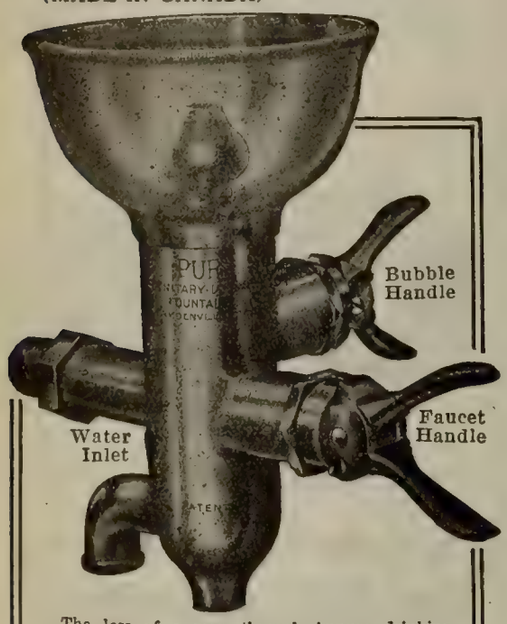

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bulletin showing a number of tall chimneys which they have constructed, with principal dimensions. The bulletin also contains details of the radial brick used and a copy of Kent's table of size of chimneys for steam boilers.

Boiler House Elevators is the title of a 28 page catalogue recently issued by the Ed. Bennis & Co., Little Hulton, Bolton, England. The catalogue after dealing with the advantages of elevating and conveying machinery in boiler plants, proceeds to describe the "Bennis" elevator, drawing attention to its principal constructional features and also to the economies that can be effected by its use. The greater part of the catalogue comprises several very clear views, covering a number of installations showing the wide field of application. A brief description accompanies each illustration detailing the chief points of interest.

Electro Platers Equipments and Supplies.—The Canadian Hanson & Van Winkle Co., Toronto, have issued a new illustrated catalogue and price list "B," dealing with an interesting and extensive line of electro-plating and polishing supplies which they manufacture. In this catalogue particular attention is called to the new plating dynamo, which is fully described, to a complete line of new polishing and buffing lathes and grinding machinery. Other products featured include polishing wheels and a complete line of lacquers, while in addition the catalogue describes at length a line of anodes, chemicals, and plating solutions, etc. The catalogue is gotten up in an attractive style and contains 104 pages, with a large number of illustrations.

Machine Stoking.—A new catalogue entitled "Recent Developments in Machine Stoking," has been issued by Ed. Bennis & Co., Little Hulton, Bolton, England. The opening pages contain a description of the "Bennis" patent improved smokeless chain grate, including matters relating to its durability and draught feature. Following are a number of views showing important installations, each briefly described. The catalogue also contains several sectional views of Bennis chain grates under various types of boiler. An interesting table is shown giving results of tests of this stoker under different types of boiler. The concluding pages contain a table of sizes of Bennis Chain grate stokers and also a table of properties of saturated steam. The catalogue contains 39 pages and is gotten up in attractive style.

BOOK REVIEW.

United States Artillery Ammunition by Ethan Vial, managing editor *American Machinist.* 97 pages, 8¾ x 11½ in. Fully illustrated. Published by The McGraw-Hill Book Co., Inc., New York. Price $2. This is the third of the series of munitions books compiled by the editorial staff of the *American Machinist.* The book was published for the purpose of giving shop men, engineers and manufacturers an accurate knowledge of the sizes, tools, shop work and gauges necessary in the production of the most common United States shells and cartridge cases. The book contains six chapters describing in turn the machinery operations used in the production of the following types and sizes of shell. 3 in., common shrapnel; 3 in., common high explosive shell; 3 in. naval shells; 3.8 in. to 6 in., shrapnel and high explosive shells: 6 in., naval shells and lastly 3 to 6 in. cartridge cases. For each type of shell every important machining operation is shown in a separate drawing. Several operations are also shown by means of half-tone illustrations. The operations on each type of shell are described in detail and particular features of each are also given. The book has list of contents and index, and is bound in substantial cloth covers.

ROBERT MORTON HAMILTON

(Continued from page 352.)

available or if the apprentice cannot spare the time during the day as is usually the case. He advises apprentices to work when they are young if they want to accomplish anything. He believes that any young mechanic with application, good habits and thrift, and able to grasp opportunities now presented by technical schools and journals, etc., can forge ahead so that by middle life he should be in a good position and able to enjoy the good things that life offers. Although our spoke is a hard worker, he is able to find time for activities in other useful directions. Being an Elder of the Knox Presbyterian Church, he takes a prominent part in the work of that body, and is also a member of the Galt Business Men's Club. He is not an active politician, but is a firm believer in the necessity of raising more troops in Canada to aid in the successful prosecution of the war. Mr. Hamilton is fond of outdoor life, but does not claim to be an athlete of any distinction. He says that he is too busy working to play ball, but gets lots of pleasure from motoring. His thoughts turned to more serious things, even in his younger days, for at the age of 24 he married Miss H. J. Webster, daughter of William Webster of Galt. He has a family consisting of three daughters and one son.

Mr. Hamilton believes that there is a bright future for the machine tool industry in Canada, providing that Canadian manufacturers specialize more in the design of tools they make; this, of course, presumes a demand sufficient to encourage manufacturers to do this. He believes that mechanics in Canada are fully as well trained as those in the United States, but admitting this, the business will have to grow until firms are able to specialize more so than at the present time.

BIG CUT IN STEEL PRICES ANNOUNCED

UNIFORM steel prices for U.S. Government, the public and the Allies, which

represent reductions of from 40 to 70 per cent. in the present market quotations, were approved on Monday by President Wilson.

The prices were determined in an agreement reached between steel producers and the War Industries Board after conferences lasting more than a month. The prices, all subject to revision January 1, 1918, but to become effective immediately, follow:

"Iron ore, basis, lower lake ports, price agreed upon $5.05, gross ton. No change.

"Coke, Connellsville, price agreed upon $6 net ton; recent price $16 a ton; a reduction of 62.5 per cent.

"Steel plates, basis Chicago and Pittsburgh, price agreed upon $3.25 hundredweight, recent price $11 hundredweight; a reduction of 70.5 per cent.

"Pig iron, price agreed upon $33 gross ton; recent price $58 gross ton; a reduction of 43.1 per cent.

"Steel bars, Pittsburgh and Chicago basis price agreed upon $2.90 per hundredweight, recent price, $5.50 per hundredweight; a reduction of 47.3 per cent.

"Steel shapes, basis Chicago and Pittsburgh, price agreed upon $3 hundredweight; recent price $6 hundredweight; a reduction of 50 per cent."

ENGINEERING STANDARD LOWER

IT has been decided by the Faculty of Applied Science of Queen's University, Kingston, Ont., that it is advisable during the period of the war to admit students with a lower requirements in mathematics, namely, pass matriculation. This decision was brought about because war conditions have caused a larger demand for men with education in engineering, and it is evident that after the war there will be a call for more such men. It is desirable, therefore, under these circumstances, to take measures to hasten the preparation of men for engineering work and to encourage young men to enter upon engineering courses. The deficiency will be made up the first year by devoting a larger amount of time to mathematics, so that the total requirements for a degree will remain exactly the same.

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1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 24" wheel.
1—Lathe, 14" swing, 6' bed.
2—Ford Smith Shell Grinders, complete.
1—17" LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
1—16" Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
1—Double End Painting Machine, with ¼ h.p. motor.
1—Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—5 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
Sherbrooke, Que.

FOR SALE

One 22" x 50" Wheelock Engine, left-hand, arranged for direct shaft coupling, with heavy balance wheel 8¼ x 14' x 17' 7" in dia.

Merchants Rubber Factory
KITCHENER, ONTARIO
c20m

FOR SALE

New Holden-Morgan Thread Miller for nose of 6 inch British H.E. Shell.

Box 324 Canadian Machinery.

Single End Punch

1—30" Throat Ironton Single End Punch and Shear, cap. ¾ through ¾. Rectangular gear drive.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Ave., Detroit, Mich.

If any advertisement interests you, tear it out now and place with letters to be answered.

RIVERSIDE Machinery List

We Own Every Tool Offered

ENGINE LATHES.

1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—22 x 14 Putman Standard Engine Lathe.
1—22 x 10 Reed Standard Engine Lathe.
1—22 x 8 Reed Standard Engine Lathe.
3—18 x 8 New Springfield Engine Lathes.
1—18 x 6 Jones & Lamson Standard Engine Lathe.
1—16 x 8 New Springfield Engine Lathe.
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.

TURRET AND SCREW MACHINES.

2—No. 6-A Potter & Johnston Automatic Lathes.
1—2¼ x 24 Jones & Lamson Flat Turret Lathe, S.G.H.
1—2 x 24 Jones & Lamson Flat Turret Lathe, cone head.
1—No. 4 F. G. H. Foster Hand Screw Machine.
1—No. 4 Smurr & Kamen Hand Screw Machine.
1—No. 5 Pierson F. G. H. Hand Screw Machine.
4—New 14" Pierce Turret Lathes.
2—New 1 x 8 Pierce Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND GRINDERS.

1—No. 2 Hendey Plain Milling Machine.
3—New No. 1½ American Plain Milling Machine.
1—No. 13½ Garvin Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drilling Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
4—New No. 0 Burke Bench Mills.
1—No. 2½ Bath Universal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.
1—Miami Valley, Universal Cutter Grinder.

DRILL PRESSES.

1—5' Mueller Plain Radial Drill, old type.
1—20" Baker H. D. Drill.
5—20" Buffalo Plain Drill Presses.
1—3-spindle 8" overhang Henry & Wright High speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.
3—12" Leland & Gifford High Speed Bench Drills.

SHAPERS AND PLANERS.

1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
2—16" New Springfield. B.G. Crank Shapers.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS.

1—Waterbury Farrel O.B.I. Press, geared.
1—No. 10 Perkins Drawing Press.
5—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—25-lb. Fairbanks Belt Hammer.
1—25-lb. Bradley Helve Hammer.

AIR COMPRESSORS.

1—16 x 18 x 12 Union Steam Pump Co. Steam Driven Air Compressor.
1—8 x 6 Westinghouse Steam Air Compressor.
1—10 x 10 Clayton Belt-driven Air Compressor.
1—8 x 8 Fairbanks-Morse Electrical-driven Air Compressor.
1—8 x 8 Gardner Single Belt-driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt-driven Air Compressor.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machine tools, both large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

FOR SALE

The following used machinery, guaranteed to be in first-class condition, at lowest prices:—

2—LeBlond Heavy Duty 19" x 8' Engine Lathes.
1—Fay Scott Engine Lathe, 24" x 8', with extra turret.
1—LeBlond Engine Lathe, 17" x 6'.
1—Oliver 16" x 7' Double Back-geared Engine Lathe.
1—14" x 7' Niles Engine Lathe.
1—16" x 8' Butler Engine Lathe.
1—Boring Lathe for 9.2 or 12" shells.
1—Turning Lathe for 9.2 or 12" shells.
19—Jones & Lamson 3 x 36 Flat Harkness Turret Lathes.
2—No. 50 Foster Turret Lathes, 16" swing.
4—John Hall & Sons No. 4 Cutting-off Machines.
5—10" x 36" Norton Grinding Machines.
1—6" x 32" Norton Grinding Machine.
1—Wilmarth & Morman Wet Tool and Twist Drill Grinder.
1—Banfield Plug Milling Machine.
2—Otis-Fensom Bench Thread Millers.
1—Cincinnati Universal Milling Machine, No. 5.
1—Brown & Sharpe Milling Machine, No. 1B.
1—Surface Grinder.
1—Gardner Grinder, No. 4, complete with discs.
1—Gould Triplex Hydraulic Pump, Fig. 997, single acting, 1¼" x 6".
1—Cincinnati Bickford Drill, 24".
1—Holden-Morgan Marking Machine.
2—Northern Electric Co.'s Electric Soldering Irons.
1—1/15 H.P. General Electric Motor.
1—Brown-Boggs Nosing Press, No. 320.
1—Hisey Wolff Grinder, Portable Electric.
1—Dumore Grinder, Portable Electric.
8—Mech. Engr. Co. Fuel Oil Burners.
4—Mech. Engr. Co. Fuel Oil Burning Furnaces, 24" x 36".
1—Gilbert & Barker Fuel Oil Burning Furnace, 24" x 36", C-15.
6—Gilbert & Barker Fuel Oil Burners, 2".
2—Gilbert & Barker Positive Pressure Blowers, 3".
2—Canadian Buffalo Forge Co. Blowers, No. 6, 30".
1—Portable Blacksmith's Forge.
1—Circular Banding Press, suitable for 18-pdr. shells.
4—Shore Instrument Co.'s Scleroscopes.
3—Resin Pots, Simplex Electric Co.'s make.
3—Chapman Double Ball-bearing Trucks.
2—Oil Quenching Tanks, 8' long x 3' 4" wide x 2' 6" deep water jackets.
1—Bury Air Compressor, 6 x 8.
2—Brown Instrument Co.'s Pyrometers.
1—Thwing Pyrometer.
3—Fairbanks 25-lb. Scales.
1—International Time Clock for 200 men, with racks for tickets.
1—Voltmeter, Western Electric Instrument Co.'s make 0-300, model 155.
1—Acetylene Cutting and Welding Outfit, without tanks, Prest-o-Lite make.

Also small tools, rotary pumps, vises, pulleys, belting and shafting, etc., etc

For Further Information Apply to

Zenith Coal & Steel Products, Limited

MONTREAL—402 McGill Building
TORONTO—1410 Royal Bank Bldg.

GOOD USED EQUIPMENT

OVERHEAD TRAVELING CRANES

20-Ton, 56' 3" span, three motor, 110 volts, D.C.
25-Ton trolley, three motor, 220 volts, D.C.
10-Ton, 40' span, 80' lift, three motor.
5-Ton, 47' 0" span, three motor, 220 V., D.C.
Crane Motors, 10 and 4½ H.P., 220 V., D.C.
10-Ton hand crane, 55' 0" span.
20-Ton hand crane, 29' 6" span.
2-Ton hand cranes, 22' span.

PUNCHES AND SHEARS

Lever Shear (double), cap. 2" sq.
28" throat (single), cap. ⅞x⅞" (belt).
48" throat (single), cap. 3x1¼" (steam).
16" throat (single), cap. 1½x1½ (belt).
36" throat (single), cap. ⅞x⅞" (belt).
15" throat (single), cap. ¾x½" (hand).
10" throat (double), cap. 1½x1" (belt).
Squaring Shear, 53" cap., 14 gauge.
Angle Shear (double), cap. 6x6x¾" (belt).
Plate Shear (Univ.), 18" blade, cap. ¾".
Rotary splitting, 36" throat, cap. ½".
Rotary bevel, 5" throat, cap. ½".
Coulter & McKenzie, cap. 3x½", spring steel.
Guillotine, Perkins, No. 6, cap. 2½" sq.
Butterfly shear for light scrap.

MISCELLANEOUS.

Ajax Bolt Header and Upsetter, 2½" cap.
Acme Bolt Header and Upsetter, 1½" cap.
Bulldozer, No. 12 Ajax, 30" stroke.
Bending Roll, 6', drop end, 6½ and 8" rolls.
Lathe, 24"x10' American, latest.
Grinder, No. 10 B. & S. Plain.
Grinder, No. 13, B. & S. Universal and Tool.
Rotary Planer, 36", Cleveland No. 2.
Saw, cold, 26" blade, 48" travel.
Press (trimming) No. 11 Perkins, 16,500 lbs.
Rolling Mill, 1 stand, 2 high, 30" bet. housings.
First-class condition—quick shipments.

McCoy-Brandt Machinery Co.
Office and Warehouse:
216-218 Penn Ave., Pittsburgh, Pa.

WANTED

Hendey Lathe, 14" swing 6 ft. bed, with taper and standard attachments.

No. 2 Cincinnati or B&S Universal Milling Machine.

Sensitive Drill, must be in good condition.

Box 323
CANADIAN MACHINERY

c14m

NOW!

You've been going to send in that ad for weeks, so why not mail it now for next week's issue?

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Ave. Toronto

We Have For Sale the Following Machines

At Plant of Canada Malleable Steel & Range Co., Oshawa, Ont.

1—No. 27 Double Floor Grinder—Canadian Hart Wheel make. Equipped with two 12" wheels and two spindles 33" long. Shaft bearings 24" long..... $100
2—Heavy Blount Double Floor Grinder, 45" spindle, two 8" wheels 100
3—Heavy Petrie Floor Grinders. No rest or c/s. Shaft 36" long, two 9" wheels..... 50
4—Stouffville Floor Grinder. No rest or c/s. Shaft 32", two 8" wheels 30
5—Large Polishing Stand (new). 4' shaft. Bearings 1¼" x 6 35
6—Brown & Boggs Lever Splitting Shear.. 50
9—Hanson & Van Winkle Polishing Stand (no c/s)..... 75
11—Hanson & Van Winkle Polishing Stand. Shaft 5', Bearings 2¼ x 12" 60
15—No. 7 Jarecki Pipe Machine, 1¼" 150
18—Brown & Boggs 6' 6" Power Shears 450
19—No. 21 Crosby Punch Press, Inclinable.. 350
20—Heavy Grinder, Bearings 2¼ x 12"—cross adjustment slide, one 12" wheel... 50
21—Heavy Gringer, same as No. 20. No wheels ..... $ 50
22—8-Wheel Robinson Detroit Grinder.... 825
23—60" Steel Plate exhaust for 23" L.H.B.H. discharge 85
24—Anvil, 154-lb. 15
27—5 H.P. Vertical Boiler, Submerged tubes, and one Steam Pump 3 x 2 x 3..... 125
28—Revolving Electric Plating Machine... 140
29—Platers Electric Dynamo 600 Amperes.. 200
30—Tumbling Barrel, 18" x 4' 50
32—No. 23 Brown & Boggs Hand Punch and Shear 60
35—Fairbanks Scale, 5-Ton 75
36—Hand Former, Toggle Type 15
31—15 H.P. Westinghouse, 550 volt, 60 cycle, 3 phase, 1,120 R.P.M. 325
33—40 H.P. Westinghouse, 550 volt, 60 cycle, 3 phase, 850 R.P.M. 600
34—3 Westinghouse Transformers, 30 kw., 3,200—550 volt 684

Garlock-Walker Machinery Company, Limited

32 FRONT STREET WEST, TORONTO

Eastern Machinery & Equipment Co., Inc.

319 COMMERCIAL TRUST BUILDING PHILADELPHIA, PA.

NEW TOOLS FOR IMMEDIATE DELIVERY.

4—12" x 36" Bridgeport Grinders.
1—2½ x 2" Wm. Sellers Tool Grinder.
30—18" x 9' Turning and Boring Lathes.
3—26 x 14' Am. Patt. Eng. Lathe.
3—Double head Sullivan Grinders.
1—32" x 12' Pittsburgh Engine Lathe.
1—20" Ohio Shaper.

USED MACHINERY

ENGINE LATHES.

4—New 36" x 25' Wickes Engine Lathes, quick-change gear, double back gear.
8—30" x 10' American Gear head A-1.
5—20" x 8' Lodge & Shipley, geared head, q.c.g.
1—20" x 10' Bullard.
1—24" x 6' Bullard.
3—24" x 14' American.

TURRET LATHES.

9—18" x 6' Warner & Swasey Hexagon Turret, geared friction head.
36—Potter & Johnson 6A Automatic Turret Machines.
3—3 x 36 Jones & Lamson Flat Turret.
2—2¼" x 24" Jones & Lamson Flat Turret, bar equipment. Full set Turret Tools.
9—26" Gisholt 12" Collet chuck 6½" hole in spindle threading lathe.
3—36" Putnam heavy duty lathe.
—14" x 6' Lodge & Shipley Turret. Backgeared.
5—24" Gisholt 2-step cone, 6¼ H.S.

BORING MILLS.

1—Binsse Horizontal Boring Mill, 3" bar.
6—66" swing Bement-Miles Tire Turning Mills, two swivel heads—15½" under rail.
1—37" Baush Boring Mill, 2 heads, good as new.
1—Cylinder boring mill, capacity of 24" diam. to 96" diam. 10' long. Tool equipment included, good as new.
1—42" Bullard Boring Mill (2) heads.

MILLING MACHINES.

1—No. 3 LeBlond Plain Miller, table 13½ x 58¼.
1—No. 2 Kempsmith, table 10' x 45".
1—24" x 8' Beaman & Smith Open Side Slab Miller, with two vertical spindles.
1—No. 1½ Universal Milling Machine.

GEAR CUTTERS.

1—24" Fellows Gear Shaper.
2—36" Fellows Gear Shapers.

SCREW CUTTING MACHINES.

1—2" Cleveland automatic.
1—No. 55 National Acme 4 spindle, good as new.
1—No. 54 National Acme 4 spindle, good as new.

SLOTTERS AND SHAPERS.

1—9" Bement Slotter.
1—12" Bement Slotter.
1—20" Wharton Slotter.
1—20" Gould & Eberhardt Shaper. B.G. Vise. C.S.
1—16" Steptoe Shaper.

GRINDERS.

8—12" x 36" Bridgeport.
1—1½" Full Universal Landis Machine.
1—No. 13 Brown & Sharpe Universal and Tool Grinder. Full equipment.
No. 1½ Universal Cutter and Reamer Grinder.
1—28" Bridgeport Face Grinder, with magnetic chuck.
5—Fisher Profile Grinders for Cutters.
1—No. 28 Brown & Sharpe Plain Grinder, 17" x 96".
5—No. 6 Std. Universal Tool & Cutter Grinders.

DRILL PRESSES.

1—24" Bickford Upright back gear sliding head lever and wheel feed drill.
1—4' Bickford Radial, with Tapping attachment, motor drive, with motor.

The Cost is Trifling

It will cost you very little to adequately tell your wants in this section. Send in your copy to-day for next week's issue.

CANADIAN MACHINERY
Classified Advertising Section
143 University Avenue, Toronto

Machinery, Bar Stock, Twist Drills, Dies & Taps For Sale

MACHINE TOOLS.

5—Rickert-Shafer Vertical Tapping Machines (used).
1—Power Hack Saw (used).
1—No. 1 Sheldons Exhauster.
1—Stewart Gas Furnace (used).
1—No. 200 Oil Extractor (new).
6—No. 4 Smurr & Kamen Screw Machines, Auto. Chuck, W.F., B.G. (used).

BAR STOCK.

33,000 lbs. 1⅜" Round C.D. Screw Stock.
1,500 lbs. ¼" Round C.D. Screw Stock.

TWIST DRILLS (Straight Shank)

48—13/16" Left-hand, high speed steel.
18—21/32" Right hand, high speed steel.
36—41/64" Left hand, high speed steel.
12—17/32" Right hand, high speed steel.
108—33/64" Right hand, high speed steel.
84—33/64" Right hand, carbon steel.
191—13/32" Right hand, carbon steel.
59—¼" Left hand, carbon steel.
36—B Right hand, carbon steel.
71—No. 1 Left hand, carbon steel.
48—No. 4 Right hand, carbon steel.
161—No. 6 Right hand, high speed steel.
61—No. 25 Left hand, carbon steel.
50—No. 26 Right hand, high speed steel.
200—No. 27 Right hand, carbon steel.
240—No. 45 Right hand, high speed steel.

DIES AND TAPS.

13—No. 5B Modern Opening Dies (used).
16—Set 1.998"-14 Whitworth Chasers for above heads (new).
4—No. 4B Modern Opening Dies (used).
12—Set 1⅜"-14 Whitworth Chasers for above.
10—No. 4 Manufacturers Equipment Co. Collapsible Taps (used).
15—Set 1.378"-14 Whitworth Chasers for above taps.

The Packard Fuse Co., Ltd.
St. Catharines, Ont. c 13m

If any advertisement interests you, tear it out now and place with letters to be answered.

IMMEDIATE DELIVERY

DRILLING MACHINES

Leland H.S., B.B., bench type.
No. 1½ Knight Driller and Miller.
32" Hamilton, s.h., b.g., p.f.
32" W. F. & J. Barnes, s.h., b.g., p.f.
20" W. F. & J. Barnes, 4 spindle.
No. 11 P. & W. Multiple, 10 spindles.
3' W. E. Gang Plain Radial.
3½' W. E. Gang Plain Radial.
4' Mueller Plain Radial.
Pawling & Harnischfeger Horizontal Driller.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. automatic.
30" x 9" G. & E. auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3—26" B. & S. for spur.
36" Walcott for spur.

GRINDERS

Yankee Drill.
No. 1-½ Cincinnati Cutter and Tool.
No. 2 Woods Universal Cutter and Tool.
No. 23 B. & S. Gear Cutter.
No. 1 Brown & Sharpe Universal.
14" x 20" B. & S. Plain.
Garvin hole grinder.
Gisholt tool grinder.
No. 5 Diamond water tool.
No. 16 Gardner disc grinder.
No. 24 Gardner disc grinder.

LATHES

13" x 5' P. & W., c.r., taper.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
18" x 8' L. & S. pat. head, c.r. taper.
18" x 10' Fitchburg, c.r.
18" x 12' Barker, c.r.
20" x 14' Blaisdall, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
36" x 20' American, t.b.g.
36" x 22' New Haven, t.b.g.

PLANERS

24" x 24" x 4' Gray, one head.
24" x 24" x 8' Cincinnati, one head.
26" x 26" x 8' Pease, one head.
30" x 30" x 8' Woodward & Powell, one head.
30" x 30" x 8' Cincinnati, two heads.
36" x 36" x 14' Sellers, one head.
40" x 38" x 14' Putnam, one head.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES

No. 1 Foster, Plain, A.C. and W.F.
1" B. & S. Plain.
16" P. & W. Plain.
No. 2 Costello, plain head.
No. 2 P. & W. friction head.
No. 4 Pearson, geared head.
No. 3 Bardons & Oliver, plain head.
⅞" Cleveland, automatic.

TURRET LATHES

No. 22 Garvin.
16" Lodge & Shipley.
25' Niles.
2 x 24" Jones & Lamson.
3 x 36" Jones & Lamson, chucking equipment.
3 x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt turret lathes, taper attachment.

PUNCHES AND SHEARS

No. 3 American Can.
No. 3 Bauroth, O.B.I.
No. 5 Bauroth Geared, O.B.I.
No. 6 N. American Can.
No. 2 L. & A. Angle Iron Shears, 5"x5"x½" (new).
No. 5 L. & A. Double Punch & Shear, ⅝"x⅝", 3"x⅝", 1⅛ rd. (new).
No. 1 L. & A. Multiple Punch (new).
No. 1 L. & A. Horizontal Punch, ½" in 1" (new).

MISCELLANEOUS

No. 0 Mitts & Merrill Keyseater.
50-lb. Bradley Strap Hammer.
¾" Acme Forging Machine.
52" Niles car wheel boring mill.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-ton Yale Duplex Hoist.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., CHICAGO, ILL.

Chas. A. Strelinger Co.,
43-51 E. Larned St.,
DETROIT - MICH.

Machine Tools For Immediate Delivery

DRILLING MACHINES.
3' American Sensitive Radials.
No. 1-S Garvin B.G. Horiz. Drill with Pump and Piping.
No. 102 Harrington S.S. Drill, belt drive, elevating table.
No. 1-B 8" overhang Henry & Wright H. S. Sensitive Drills.
14" U.S. Sensitive Drills.

GRINDERS.
No. 1¼ "T" Webster & Perks Grinders, with countershafts.
No. 3 Wilmarth & Morman Surface Grinders.
No. 2 Oakley Universal Cutter and Tool Grinders.
Model "B" Hand Feed Fitchburg Grinders.
No. 1 Wilmarth & Morman Aut. Un. Grinders, complete.
Geometric Chaser Grinders, with countershafts.
No. 3 Gardner B.B. Type "B" Polishing Lathes.

LATHES.
13" x 5' Blount Speed Lathes, with countershaft and hand rest.
No. 65-E 13" x 6' Seneca Falls Lathe, with countershaft.
No. 34-C 13" x 6' South Bend Screw Cutting Lathe.
14 x 6 Monarch Q.C., D.B.G. New Style Head Engine Lathes.
18 x 8 Monarch Q.C., D.B.G. Engine Lathes.
17 x 8 Sidney Q.C., 3-step cone, D.B.G. Engine Lathes.

MILLING MACHINES.
No. 1 Standard Hand Millers with cshafts.
H. B. Smith Hand Miller, with countershaft.
Wisconsin Hand Miller with countershaft, vise and arbor.
No. 1½ Valley City Universal Miller.

SCREW MACHINES.
No. 5 Federal Pl. Hd. Turret Lathe, with double cut-off rest and countershaft.
No. 1 New Howe Pl. Hd. Screw Machine, with Aut. Chuck and Wire Feed.
No. 11 Garvin Aut. Collet and Wire Feed Screw Machine.

MISCELLANEOUS.
No. 38 Curtis & Curtis Hand Power Pipe Machine, complete.
Type "A" Sioux Valve Seating Machine.
No. 1 Garvin Screw Slotter.

They must be getting results—

or why would they continue to advertise week after week? That's logic, isn't it? This is *direct-result* department.

Have you noticed that each week the same firms's lists appear? If you don't care to use large space, insert a "liner" ad.

Canadian Machinery
Classified Advertising Section
143 University Ave. - Toronto

STOP—MAYBE IT'S HERE

BORING MACHINES—Vertical.

1—30" Flather, one turret head
2—36" B. & S. one turret head, Dec. Delivery
1—42" McCabe, one swivel head.
1—42" Bullard, two heads.
2—Used 42" Colburn, one swivel head.
1—50" Niles, two heads.
1—54" Colburn, two swivel heads.
1—72" Niles, 2 swivel heads
1—90" Vertical Cylinder
1—NEW 8' Bickford
1—Used Niles 10'-16' extension, two heads.

BORING MACHINES—Horizontal

1—Lucas 2¾" bar
1—42" Cleveland, 2½" bar, takes 4' 6", compound table.
1—Betts Knee Type, 3" bar.
1—No. 1 Barrett Cylinder Borer, 3¾" bar type.

BULLDOZERS

1—No. 7 High Speed Ajax 16" stroke
1—No. 9 Williams & White Belt Drive
1—No. 12 Ajax, single pulley drive.
2—No. 23 Williams & White, belt drive.
1—No. 26 Williams & White, belt drive.

CRANES

1—Case 5-ton, 47' span.
1—60-ton Niles, 61' span
1—Locomotive, 35' boom, standard gaged, steam driven, 15-ton.

CUTTING-OFF MACHINES

10—4½" Williams.
30—Davis 4½"
2—NEW 4½" Davis.
2—NEW 6" Davis.

DRILLING MACHINES—Radial

2—NEW 2' American cone drive
6—NEW 3' Mueller, speed box drive, Dec. del.
1—3' Bickford Semi-Universal table
1—3' Bickford, gear drive
3—NEW 3' American, sensitive tapping attachment.
1—NEW 3' Mueller, plain speed box drive
1—NEW 3½' Western Drill, 86" circle.
2—4' Mueller Plain, speed box drive
1—NEW 4' Ryerson—belt drive
6—NEW 5' Mueller, speed box drive, Dec. del.
1—6' Baush Radial; arranged for motor drive
1—6½' American Full Universal
1—NEW 6' Triumph Motor Drive, Sept. delivery.

DRILLING MACHINES—Heavy Duty

4—No. 310 Baker Single Pulley Drive, late type
2—NEW No. 2 Colburn
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.

DRILLING MACHINES—Sliding Head.

2—NEW 24" Barnes Drills and Tappers.
5—NEW 24" Barnes Drills.

DRILLING MACHINES—Multiple Spindle

1—No. 5 Fox, 12-spindle, capacity 1".
1—No. 39-C Baush, 12-spindle, capacity 1⅛" holes, 30" circle.
1—14 Spindle Baush, capacity 1" holes, 36" circle

DRILLING MACHINES—Sensitive.

3—NEW 12" Albany High Speed Tool Room.
1—NEW No. P-4 Allen, one spindle.
1—NEW No. P-2-S Allen, two spindles.
2—NEW No. B-1 Allen, one spindle, 7" overhang.
1—NEW No. B-2 Allen, two spindle, 7" overhang.
3—NEW No. B-3 Allen, three spindle, 7" overhang, tapping attachment.
3—NEW No. B-4 Allen, four spindle, 7" overhang.

GEAR CUTTING MACHINES

1—NEW No. 3 Bickett Gear Rack Planer, delivery 60 days.
1—No. 3 Brown & Sharpe Auto. Gear Cutter spur
1—NEW 6" Standard Gear Cutter, spur.
1—15" Gleason Bevel Gear Planer
1—16" Bilgram Bevel Gear Generator.
1—24" Becker-Brainard.
1—24" x 8" G. & E. for spur and bevel
1—24" Fellows Gear Shaper
2—NEW Flather Solid Pattern 30" Automatic Gear Cutter.
3—36" Fellows Gear Shapers.

GRINDERS—Universal, for Cutters, Drills, Reamers, etc.

8—NEW No. 190 Wells.
3—NEW No. 1 Wood Universal.
1—NEW Wilmarth & Morman, Style B.K.
1—NEW Walker, No. 1 Outfit B
5—NEW No. 2 Wood Universal.
1—NEW Walker, No. 2 Outfit K (capacity 9" x 20")
1—NEW Norton No. 1
2—NEW No. 2 Osterlein Universal.
7—NEW LeBlond.
1—NEW Gisholt Universal.

GRINDERS—Cylindrical—Plain

2—NEW 8" x 18" Modern, self-contained.
1—NEW No. 12 B. & S. 8" x 26", Sept. del.
3—NEW 8" x 30" Modern, self-contained.
2—NEW 12" x 24" Modern, self-contained.
6—NEW 12" x 36" Modern, self-contained.
3—NEW 12" x 48" Modern, self-contained.
2—12 x 42" Landis, self-contained.
1—NEW 10" x 50" Norton, Sept. delivery
1—14" x 55" Norton.
1—NEW 12" x 60" Modern, self-contained.
1—NEW 10 x 72 Norton, plain.

GRINDERS—Cylindrical—Universal.

2—NEW No. 2 Bath, 9" x 20".
1—NEW No. 2 Walker, 9" x 26"
1—Brown & Sharpe No. 13—8" x 24"
1—NEW No. 2½ (10" x 36") Bath
2—NEW No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis
2—NEW No. 3 Modern, 13" x 40", Sept. del.
1—No. 4 Cincinnati, capacity 12 x 72"

GRINDERS—Internal

1—NEW No. 6 Modern, capacity 10" x 10".
1—No. 70 Heald
2—No. 75 Heald.

GRINDERS—Cylinder

1—No. 60 Heald, single pulley drive

GRINDERS—Profile

1—NEW Cleveland
5—Fisher Profile Grinders.

GRINDERS—Surface

1—NEW No. 1 Wilmarth & Morman
2—NEW No. 1½ Walker's complete
2—NEW No. 2 American with Walker No. 1¾ plain flat mag. chucks.
4—NEW No. 2 Reid (same as B. & S.)
1—NEW No. 2 Brown & Sharpe.

HAMMERS—Board-Lift, Drop.

1—No. 4 Standard Machinery Co. 400 lbs.
1—E. W. Bliss 800 lbs.

HAMMERS—Steam Forging

1—350-lb. Bell Single Frame Hammer
1—600-lb. Niles Single Frame
1—18" Morgan & Williams, 600 to 800 lbs., 21" gap
1—NEW 2,000 lbs. Morgan Single Frame
1—3,000 lbs. Morgan Double Frame
1—7,000-lb. Morgan Special Double Stand.

KEYSEATERS

2—NEW No. 1 Davis.
1—NEW No. 2 Davis.
1—No. 2 Mitts & Merrill.
1—No. 2 Knowles, 60" stroke.

LATHES—Manufacturing, Not Screw Cutting.

2—NEW No. 3 Harding Bros.' Bench Lathe.
3—16" x 8' Fairbanks-Morse, heavy duty.
70—NEW Simplex, 16" x 8'.
14—Reed-Prentice Shell Lathes for 4" or 18 lbs. American shells.
22—18" x 8' Battle Creek, heavy duty.
50—20" x 10' Hindman, high duty.

LATHES—Engine

8" Wade Precision, Sept. delivery
3—NEW 14" x 6' Bradford, quick change.
1—NEW 14" x 8' Champion.
14—NEW 15" x 6' Rockford.
4—NEW 16" x 8' Bradford, quick change.
3—NEW 16" x 6' Cleveland Tool Room Lathes, complete equipment
1—NEW 17" x 8' National, quick change gears.
12—17" x 8' LeBlond, pan bed, quick-change gears
1—18 x 10 Hendey quick-change gear, 14" chuck
1—NEW 19" x 8' LeBlond heavy duty
3—NEW 20" x 12' Bradford, quick change.
5—NEW 20" x 10' Bradford, quick change.
1—NEW 20" x 10' Cleveland Geared Head
19—NEW 21" x 10' Porter, S.B.G.
9—22" x 10' Putnam oil pan turrets
1—NEW 24" x 10' Bradford, quick change.
5—NEW 24" x 12' Bradford, quick change.
1—NEW 24" x 14' Bradford, quick change.
3—24" x 14' American, quick change.
1—24 x 45 x 22' McCabe, double spindle.
1—24" x 24' Perkins, single back-geared, raising blocks to 40", 16" chucks.
4—27" x 14' Patent Head, Lodge & Shipley, double back-geared
1—28" x 18' S. & B.
1—28" x 18' New Haven, single back geared.
1—NEW 30" x 14' American Double Back-Geared, Quick-Change
3—NEW 32" x 12' Pittsburg Pattern
8—NEW 36" x 24' Putnam, triple-geared
1—50" x 12' American Gear Head, quick-change
1—71" x 20' Fifield, triple-geared.
1—72" x 30' Farral, triple geared.

LATHES—Turret

1—NEW 13" Gisholt, G-13.
1—NEW 21" Gisholt, H-21.
2—NEW 24" Gisholt, I-24.
9—2¼ x 26" Greenlee Flat Turret Lathes
5—2 x 24" Jones & Lamson
2—24" Libbey
18—6-A Potter & Johnson.
1—NEW 18" Libby.

MILLING MACHINES—Knee Type—Universal

1—NEW No. 1 Kempsmith.
1—No. 2 Kempsmith, 13" dividing head.
1—No. 2 Kempsmith, vertical attach.
1—NEW No. 2 Hendey.
1—NEW No. 2 Rockford High Power.
1—NEW No. 3 Kempsmith
3—NEW No. 3-H LeBlond
1—NEW No. 3 Hendey.
1—No. 4 Cincinnati
1—NEW No. 4 LeBlond, heavy duty, immediate

MILLING MACHINES—Knee Type—Plain

9—NEW No. 0 Rockford.
1—NEW No. 1-B Hendey.
2—NEW No. 1 Kempsmith.
2—NEW No. 1½ American back gear
1—NEW No. 1 Rockford, high power.
2—NEW No. 2 Rockford
1—No. 3 LeBlond
2—NEW No. 3 Kempsmith
1—NEW No. 4 LeBlond.
1—No. 4 Brown & Sharpe

MILLING MACHINE—Hand.

3—NEW No. 1 Rockford, without column.
3—NEW No. 2 Rockford, on column.
2—NEW No. 3 Rockford, on column.
3—NEW No. 3 Rockford, on column, power feed.

MILLING MACHINES—Vertical

1—NEW Bickett, No. 0
4—NEW No. 4-B Becker
2—No. 5 Becker.

MILLING MACHINES—Planer Type

1—No. 2 Beaman & Smith Vertical Spindle, open side.
1—Ingersoll Slab, 18" x 48" cap.
1—Bement-Niles, heavy duty planer type, 24" x 24" x 12'.
2—Ingersoll Slab Millers, working surface of table 60" x 20"
1—No. 33 Becker-Brainard Slab Miller, working surface 7' x 20"

MILLING MACHINES—Lincoln Type.

3—NEW No. 1 American.

PLANERS

24" x 24" x 8' Cincinnati, one head, used three months
2—NEW 30" x 30" x 8' Cincinnati Medium Planer, one head.
1—30 x 30" x 10' Ohio Machine Tool Co., 2 heads
2—NEW 36" x 36" x 12' Woodward & Powell, two heads on cross-rail, one side head. Oct. delivery
1—36" x 36" x 12' Gray, two heads
1—38" x 38" x 14' Ditrick & Harvey, open side.
1—40" x 40" x 11' Niles, four heads
1—Gray 42" widened to 56" x 42" x 16', two heads
1—NEW 48" x 48" x 10' Cincinnati, two heads.
1—48" x 12' Pedrick, open side, one head.
1—50" x 50" x 16' Pond, 2 heads on rail
1—52" x 52" x 16' Betts, 2 heads, right angle drive.
1—54" x 42" x 16' Gray; 2 heads on cross rail; one side head.

SCREW MACHINES—Hand.

4—NEW No. 2 Foster, geared friction head.
1—NEW No. 4 Foster, geared friction head, power feed to turret slide.
2—NEW No. 5 Foster, all geared, power feed to turret slide.
3—NEW No. 5 Foster, all geared head, power feed to turret slide, power cross feed.
2—NEW No. 6 Foster, geared friction head, power feed to turret, power cross feed.
5—NEW No. 7, geared friction head, power feed to turret, power cross feed.
2—NEW No. 10, geared friction head, power feed to turret, power cross feed.
2—NEW 2¼" Dreses, F.G.B., power feed.

SCREW MACHINES—Automatic

2—NEW ⅝" Cleveland, Model A.
1—NEW ¾" Gridley Mult. Spindle, belt driven
2—NEW 1¼" Gridley Mult. Spindle, belt driven.
2—NEW 1¾" Gridley Mult. Spindle, belt driven.
1—NEW 2¼" Gridley Mult. Spindle, belt driven.
1—NEW 3¼". Gridley Single Spindle, belt driven.
2—No. 63 National Acme
4—No. 55 National Acme.
1—No. 515 National Acme.

SHAPERS

1—NEW 16" Springfield
1—16" Motor Driven Rockford
1—NEW Barker 24"
2—NEW 24" Milwaukee.
2—25" Smith & Mills, Back-Geared
1—28" Smith & Mills, Triple-Geared
2—30" Morton Draw Cut.

SLOTTERS.

1—NEW 12" Betts, belt drive.
1—18" Betts, heavy duty.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 549 Washington Blvd. | CINCINNATI, OHIO 1018 Union Central Life Bldg. | CLEVELAND, OHIO 508 Leader News Bldg. | NEW YORK CITY Singer Bldg.

WRITE OR WIRE OUR NEAREST OFFICE FOR QUOTATIONS
THIS IS ONLY A PARTIAL LIST OF AVAILABLE MACHINES

New York's Greatest Stock

(Partial List)

BORING MILLS

52" Bement-Miles Vertical, two heads; motor driven, A.C., 250 volts.
36" Bridgeport Vertical, two heads.
34" Rogers Vertical, single turret head.
Five 30" Bullard Vertical, single turret head.
20" Bullard Vertical Turret Lathe, with side and turret heads.
18" Bullard Vertical Turret Lathe, with side head and turret head.
Betts Horizontal, 2¼" bar.
48" Niles Car Wheel.

MILLING MACHINES

No. 4B Brown & Sharpe Plain, single pulley drive.
No. 4 Cincinnati heavy duty Plain, single pulley drive.
No. 4 Brown & Sharpe Plain.
No. 2 Hendey-Norton Universal, dividing head, vise, arbor, vertical attachment.
No. 2 Cincinnati Universal, dividing head.
No. 2 Cincinnati Plain.
No. 14A Garvin Plain.
No. 1 Kempsmith Plain, gear box feeds.
Two No. 5 Brown & Sharpe Vertical.
Beaman & Smith 2 spindle Vertical Slab, table 24" x 48".

LATHES

60" Fifield, 9' centers, face plate drive.
Two 60" x 20' New Haven, face plate drive.
48" x 16' Niles Tire or Car Wheel, double head type, face plate drive, triple geared.
36" x 20' New Haven, compound rest, power cross feed, 14' 6" between centers.
36" x 16' Bradford, compound rest, power cross feed.
36" x 14' Putnam, heavy duty, triple geared, face plate drive.
30" x 28' Fifield, compound rest, power cross feed.
30" x 16' Fifield, raising blocks to swing 38", compound rest, power cross feed.
28" x 17' New Haven, raising blocks to swing 30", hollow spindle, full swing rest, compound rest, power cross feed.
24" x 24' Fitchburg, raising blocks to swing 30", compound rest, power cross feed, 19' between centers.

New York Machinery Exchange, Inc.

50 Church Street . · . New York City

SURPLUS MACHINERY FOR SALE

2—3" Hall cut-off machines
1—Lodge & Shipley Turret Lathe, 22" x 10'
1—Lodge & Shipley Turret Lathe, 24" x 10'
2—Libby Turret Lathes, 18"
1—Gisholt Turret Lathe, 18"
2—Gisholt Turret Lathes, 21"
1—Gardner Shell Base Grinder, 4A
1—Ford-Smith Grinder, 20"
2—Landis Traverse Grinders, No. 4 and 12 x 66
1—Symington Band Turn Lathe, 3"
1—3" Stamping Machine
2—Tate-Jones Shell Furnaces
1—16' Rushwarth Plate Planer
1—16' Bertram Plate Planer
1—Coping Machine

Polson Iron Works, Ltd.

TORONTO, ONTARIO

Let them know it's there

In complimenting us upon the results secured from their advertisement in this section, one advertiser said:

> "Of course we would not have sold it without letting people know it was here, that is obvious, and thanks are due you for letting the people know it was for sale."

If you have any old or used equipment for sale, let people know it's there. Your message in Canadian Machinery will be placed before the probable buyers of such equipment.

Canadian Machinery

Classified Advertising Section

143 University Ave., TORONTO

4.5 H.E. Shell Plant FOR SALE

We offer the following Used Machinery and Equipment, subject to prior sale:

2—Hall Cutting-off Machines.
1—24" x 8' Bertram Engine Lathes, B.G., with plain saddle and tool post and arbor for rough turning.
1—20" x 16' Bertram Engine Lathe, B.G., with two head stocks, plain saddles with tool posts and arbors for rough turning.
1—20" x 10' Bertram Engine Lathe, B.G., with 3-jaw scroll chuck and Bertram waving attachment. Tooled for Mark VII. wave rib.
1—18" x 12' Engine Lathe, B.G., with 3-jaw scroll chuck and Bertram waving attachment. Tooled for Mark VII. wave rib.
1—Newton 2-spindle Boring Machine, fitted with tool holders and chucks for boring fuse hole.
1—Brown, Boggs Marking Machine, converted for finished tapping fuse hole, with tap holder and sliding chuck.
1—Special 3-spindle Finished Turning Machine, complete with tool holders and profile cam.
1—18" x 6' Draper Engine Lathe, with split chuck and steady rest. Equipped with boring bar for inside profile.
1—Holden-Morgan Thread Milling Machine for Base Recess Thread, with attachment for threading base plates.
3—18" Single Drive Head Stocks, with hinged chucks, suitable for repair work on shells.
1—18" Single Drive Head Stock, with 3-jaw scroll chuck, steady rest and saddle. Suitable for correcting weight, etc.
1—3-Spindle Drill Press for Drills No. 0 to ¼".
1—Steel Ring Banding Press, complete with Lymburner belt-driven power pump, tank, piping and valves.
1—Copper Band Turning Machine, with friction clutch on countershaft. Tooled for Mark VII. band.
1—7-hole Tate-Jones Nose Heating Furnace, oil fired. Equipped with high and low pressure burner. Complete with Root L.P. blower and piping.
1—80-shell capacity Varnish Baking Oven.
1—Fixture for Nicking Nose.
1—Single Spindle, Motor-driven Paint Table, 250 volts, D.C.
1—Single Spindle, Motor-driven Varnish Table, 250 volts, D.C.
1—Paasche Air Varnishing Outfit.
4—4-Jaw Screwed Ring Type Chucks, with babbitted steady rests.
2—4-Jaw Hand-operated Draw Chucks, with steady rests.
5—Hinged Vices, for hand tapping or rivetting base.
1—3-Jaw Scroll Chuck, with extension and steady rest.
4—Finished Turning Profile Attachments.
22—Drip Pans with 18" legs and C.I. settling tanks.
2—38 lbs. capacity Fairbanks Scales, with weights.
Assorted Gauges, Boring Bars, Tool Holder Sets.

READY FOR SHIPMENT. CAN BE EXAMINED AT ANY TIME AT OUR PLANT.

JENKINS BROS., LIMITED

103 ST. REMI STREET **MONTREAL, QUE.**

SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

CUT GEARS

Theoretically Correct

PROMPT SERVICE

ROBERT GARDNER & SON

LIMITED

52 NAZARETH ST., MONTREAL, P. Q.

RAWHIDE OR METAL

AT

YOUR SERVICE

FOR

Tools, Gauges, Jigs, Fixtures
Special Machinery

GENERAL MACHINE WORK

Experimental work

Brass and Aluminum Castings

in large or small quantities

GENERAL JOBBING AND REPAIRS

THE

MONARCH BRASS MFG.

COMPANY, LIMITED

71 Browns Ave., - Toronto, Ont.

Buying made easy

By grouping together these manufacturers of Special Machinery, Gears, Gauges, Dies, etc., we are making buying easy for you. Here you have a directory of the firms who can fill your requirements on any of these lines. When you are in need of any of the above, consult the firms listed here.

Canadian Machinery

Contract Work Section

143 University Ave, - - Toronto

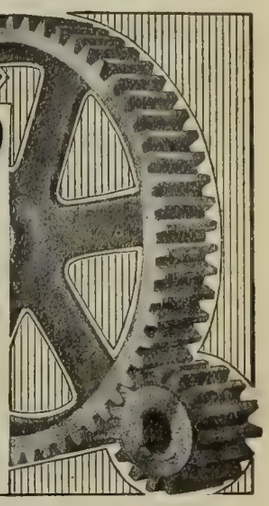
SPECIAL MACHINERY

Special Machinery, Gears, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Etc.

CONTRACT WORK

To Classified Advertising Section

CUT GEARS



Rawhide — Steel — Brass — Cast Iron

Try our W-G Rawhide Silent Gear. Designers and Builders of Special Machinery.

Winnipeg Gear & Engineering Co.
197-199 Princess St., Winnipeg, Man.

Brass, Phosphor Bronze, Copper and Aluminum CASTINGS

We have the largest Jobbing Brass Foundry in Canada.
Can make prompt delivery.

Tallman's reputation is in the goods.

Tallman Brass & Metal Co.
HAMILTON, ONT.
CANADA

TORONTO TOOL CO. TORONTO TOOL CO.

SPECIAL TOOLS

Gauges Taps Jigs

AUTOMATIC MACHINERY FOR MUNITIONS

4.5 Mark VII Shell Milling Machines

TORONTO TOOL CO.
TORONTO, ONT.
516 Richmond St. West Phone A. 1181

The "Feel" of a Good File

Did you ever watch a really capable mechanic test a file? He has a way of passing a sensitive thumb over its teeth. Instinctively, unfailingly, he thereby determines whether it is fit for use.

This man always chooses a "FAMOUS FIVE." He never buys blindly. He can "feel" that a "FAMOUS FIVE" is right. He can "feel" its sharp, keen-cutting teeth, arranged in rows of perfect uniformity. There is no doubt in his mind. He buys "FAMOUS FIVE." He makes sure of satisfaction.

Specify "FAMOUS FIVE" files when ordering.

Speed

When the quality of the work is the best obtainable, the next item is speed. For upon speed depends your costs.

One rivet per second is the speed this machine will maintain indefinitely. Adapt that speed to your requirements and find out the value the Grant Riveter would be to you.

Write for our catalogue. It will give you complete information.

Grant Mfg. & Machine Company

Bridgeport, Conn., U.S.A.

HIGH SPEED HAMMERS

For High Speed Work

FEATURES:

Economy in floor space, elimination of weight and a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushings are used throughout.

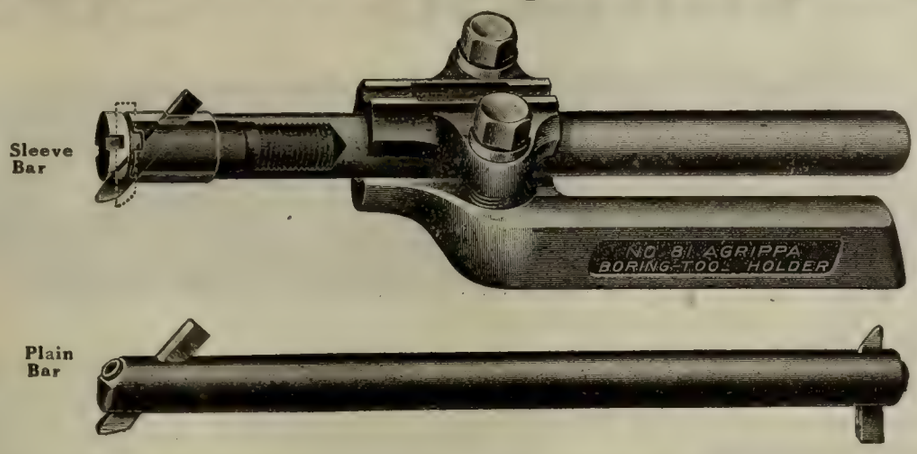
No riveting too intricate for us; no riveting which our machine cannot accomplish.

Send for our High Speed Hammer Book.

THE HIGH SPEED HAMMER CO.
Rochester, N.Y.

Sales Agents: The A. R. Williams Machinery Company, Limited, Toronto, Ontario.

Williams' "AGRIPPA" Multiple Bar Boring-Tool Holder Stops Waste



ALL "AGRIPPA" TOOL HOLDERS CAN BE SHIPPED PROMPTLY

ITS sleeve bar cap admits a straight or angular cutter; and you can quickly insert either at the business end of the bar without removing the cap or disturbing the setting of either the bar or the holder.

You need neither make nor buy any bushings hereafter, for the "twin screw" fastenings of "AGRIPPAS" within their range accommodate any bar section you may have handy.

Now's the time to begin saving—caps, bushings and time!

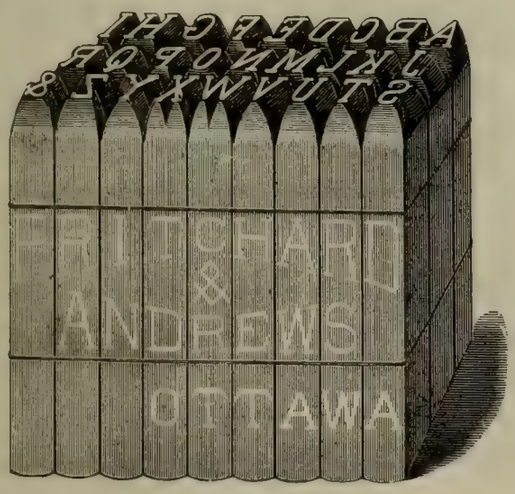
Procure your tool holder text book here or from your dealer and learn the many other economies afforded by

Williams' Grand Prize "AGRIPPA" Tool Holders

"THE HOLDERS THAT HOLD"

Western Office and Warehouse
40 S. Clinton Street
Chicago, Ill.

Quality alone is our measure of "AGRIPPA" Tool Holder Value



STEEL STAMPS

FOR MARKING SHELLS, ETC.

We will Give You Satisfaction on All Work of this Kind

SEND FOR PRICES

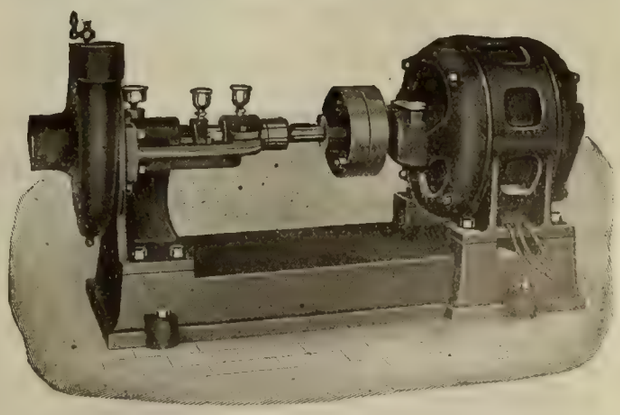
Pritchard-Andrews Co., of Ottawa

General Engravers and Die Sinkers

264 SPARKS ST. OTTAWA, CANADA

We are building a very wide range of sizes and types in Centrifugal

PUMPING MACHINERY



Also Steam and Power Pumps of other patterns.

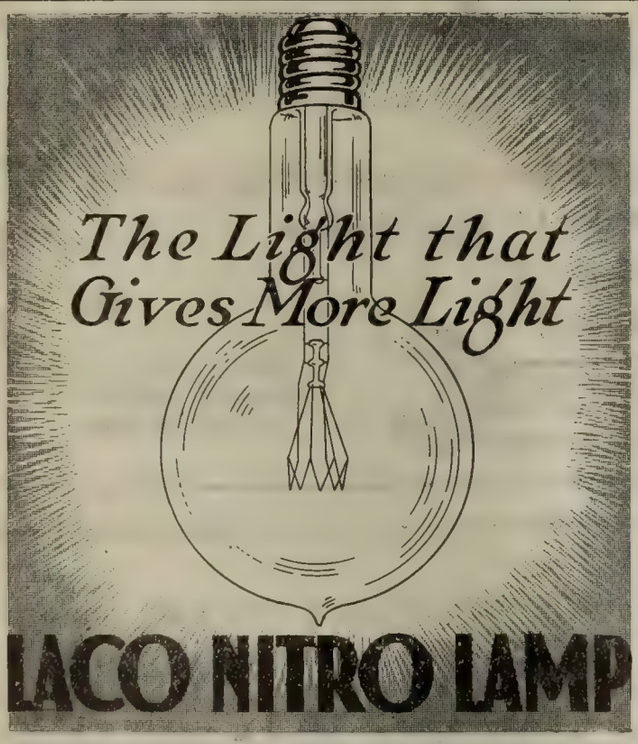
Send us your inquiries

The Smart-Turner Machine Co., Limited
HAMILTON, CANADA.

HACK "STERLING" SAWS

MANUFACTURED BY

DIAMOND SAW & STAMPING WORKS -:- BUFFALO, N.Y., U.S.A.



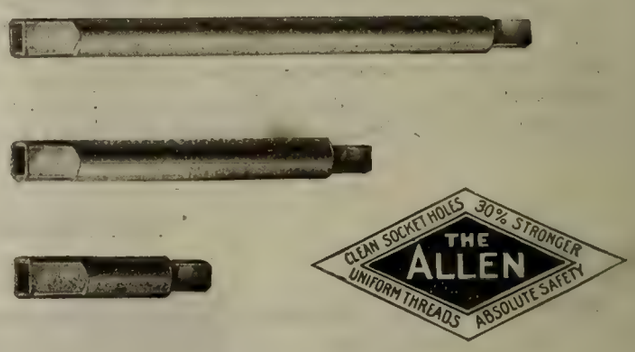
The Best Light for All Metal Working Plants

THE LACO NITRO LAMP is the highest development of Nitro Tungsten Lights.

The Tungsten filament, burning in the nitrogen filled bulb, gives a clearer, whiter light, more closely approximating daylight than any other light on the market.

Your nearest dealer can supply your demands. Stocks available at Montreal, Toronto, Winnipeg, Vancouver Warehouses.

CANADIAN LACO-PHILIPS COMPANY, LTD.



Tap Extensions

A small tap attached to our extension has the same value in strength and quality as a solid tap of similar length. Made in sets of three, two, four and six inches long, and can be combined to make six different lengths, ranging up to eleven inches. The sockets are formed by the Allen patent process and may be used on all standard taps. Special sizes made to order.

Write us for further particulars.

The Allen Mfg. Company

Hartford, nn. U.S.A.

For Oil or Water

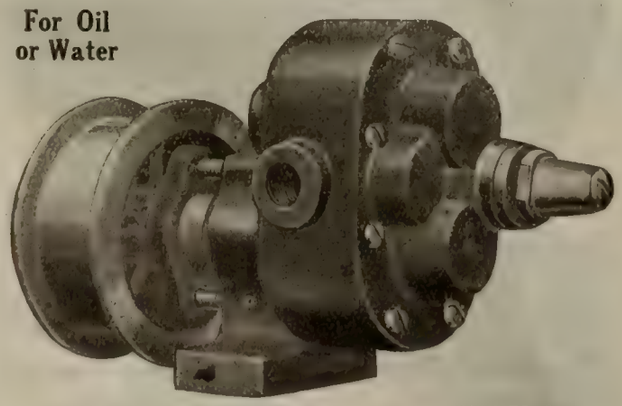


Fig. 1850—With Automatic Relief Valve

A NIAGARA *of* COOLANT

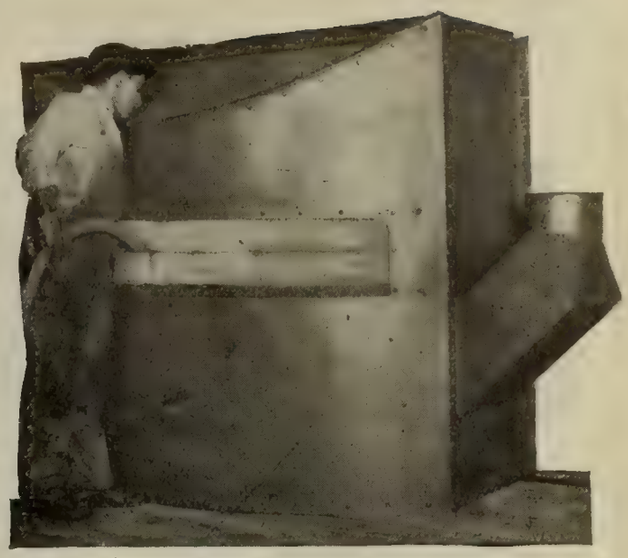
if you wish it, or just enough to cool the tool —whichever you prefer. That is the way TRAHERN ROTARY GEARED PUMPS deliver the lubricant. Don't delay another day—write at once.

TRAHERN PUMP COMPANY, ROCKFORD ILLINOIS

Canadian Agents:

A. R. Williams Machinery Co., Toronto

Humanizing the Sand Blast



Many kindly employers refuse to adopt sand blasting in spite of its evident advantages because they do not want to ask any employee to work in an atmosphere of flying sand and dust.

In most cases their impression of the sand blast is based upon the primitive methods of yesterday rather than the advanced state of the art today.

We illustrate, for instance, a Wadsworth Cabinet, made by the American Foundry Equipment Company of Cleveland, as a general type of humane apparatus now being built by several of the leading sand blast equipment manufacturers. The operator stands outside, breathing the clean air of the workshop, and only his gloved hands are inside the cabinet. He manipulates the hose or the work while peering through an opening protected by glass or a fine mesh brass screen.

This is only one of a number of modern humane devices.

Wrong notions about sand blasting have also resulted from the use of soft, dirty sand.

This, too, is being corrected by the widespread use of FLINT SHOT, a collection of clean, hard, pearl-like nodules of pure flint, free from dust.

Whether you have, as yet, installed a sand-blasting service in your plant, or not, we will welcome correspondence.

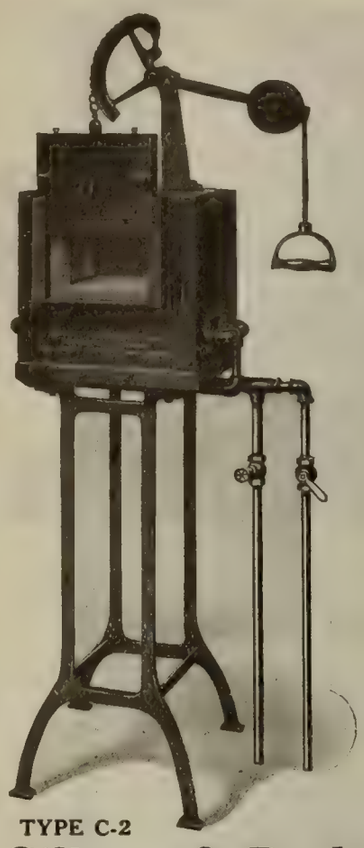
FLINT SHOT
TRADE MARK - REGISTERED

UNITED STATES SILICA COMPANY

Sole Producers of Flint Shot

430 Peoples Gas Bldg. Chicago, Ill.

The Right Furnace for
Every Purpose



TYPE C-2

THE types shown are only two of over one hundred types and sizes of Gilbert & Barker Furnaces—a furnace for every purpose.

G. & B. Furnaces are built right. Their construction and design have been perfected by our half century of experience.

We offer you the benefit of this experience and thorough knowledge of modern heat-treating methods through our engineering department. The service is free. Put your problems up to us.

Just now we are making prompt delivery of these two types and many others. Send for Stock List 24.

TYPE C-15

Gilbert & Barker Mfg. Co. West Springfield, Mass.

Canadian Agents:
James DeVon, 227 Davenport Rd., Toronto, Ont. Williams & Wilson, Montreal, Que.

The Oven Equipment & Manufacturing Company
NEW HAVEN, CONN.

"CRAWFORD SECTIONAL" OVENS

Heated with our Enclosed Flame Gas Burners, or Electricity

FOR BAKING JAPANS AND OTHER FINISHES ON METAL.

Ovens carried in stock and built to meet requirements of manufacturers.

Builders of All-Steel Oven Trucks with Roller Bearings.

Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.
ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

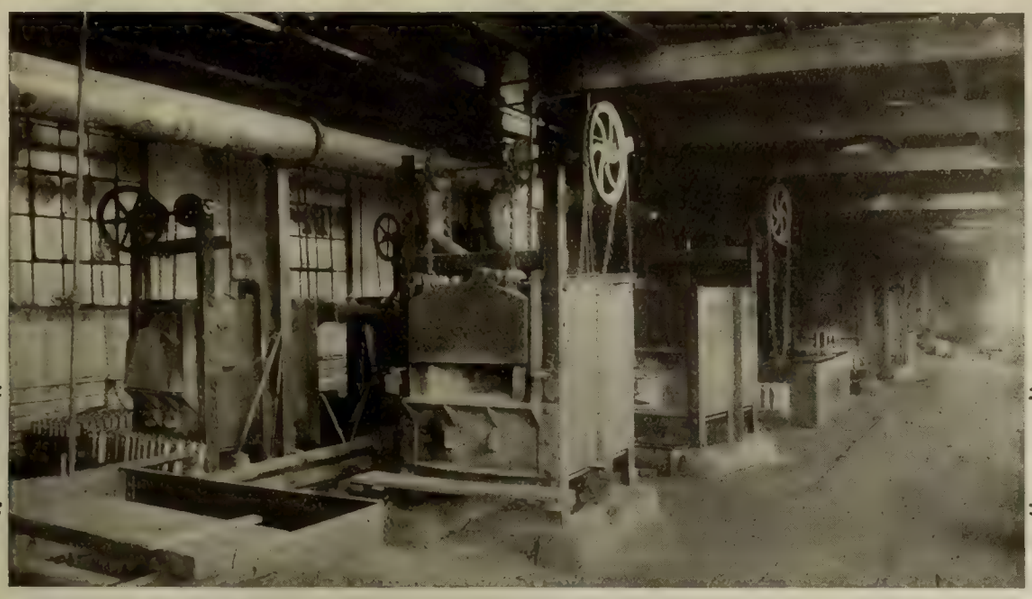
SHEET METAL STAMPINGS

Dominion Forge & Stamping Co., Limited
WALKERVILLE ONTARIO

DROP FORGINGS

Our facilities and equipment enable us to give you a top-notch quality at a very reasonable price.

AUTOMOBILE FENDERS, HOODS AND GASOLINE TANKS



Annealing and Tempering Furnaces installed in the plant of the Canadian Vickers, Limited, Montreal.

"Mecol"

The installation of "Mecol" furnaces shown here is but one instance where a quality furnace was chosen to give maximum production. The furnace you may require is the one we desire to give you complete and full information about. Write us.

Mechanical Engineering Co.
Limited
THREE RIVERS QUE. CANADA

H&M Thermometers

Tycos Thermometers

can be depended on

FOR ACCURACY

They are scientifically designed and skilfully made for practical power plant requirements.

Extreme precision is guaranteed.

Made in all styles in straight and angle patterns.

We also make Indicating, Controlling and Recording Thermometers, Pyrometers, Mercury Columns, etc.

Why not consult us on your temperature and pressure measurement problems? Write us to-day for Catalogs.

Taylor Instrument Companies

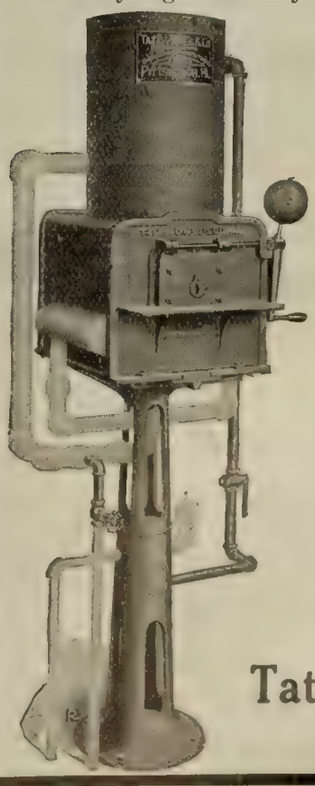
Rochester, N.Y.

201 Royal Bank Building, Toronto

There's a ***Tycos*** or ***Taylor*** Thermometer for Every Purpose.

Cut Out the "Rule of Thumb" in Your Heat Treating Methods

It was, is, and always will be risky. To-day—the day of necessary high efficiency and conservation of time, you dare not run any unnecessary risks in output.



Aside from its demonstrated money-saving features (which we will explain upon request), the Tate-Jones Recuperative Gas Oven Furnace shown here, gives your workmen the opportunity of knowing what the furnace will deliver even before the heat is started.

This Series A Furnace

is for heats of 900° to 1600° Fahr. For hardening carbon steel, reheating or preheating high-speed steels, annealing, etc. Uses artificial or natural gas. This is but one of the many styles of furnaces, large and small, made by the Tate-Jones Company of Pittsburgh.

For the plant requiring a small furnace that can be brought quickly to the proper heat, one that delivers a uniform product and saves time and money—this is the one to use.

Mention your line of work and we will send information to cover your particular requirements.

Tate-Jones & Co., Inc.

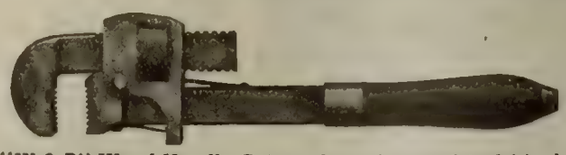
Furnace Engineers

PITTSBURGH, PA.

"W & B" Pipe Wrenches the Only Pipe Wrenches

MADE IN CANADA

The line comprises all sizes from 6 to 48 inches



"W & B" Wood Handle Grips. Length open 6 to 14 inches

"W & B" STEEL Handle Grips. Length open 18 to 48 inches

These Wrenches are extra strong frames well proportioned.

The Jaws are Drop Forged and tempered, giving them strength to resist the most severe strains.

Other patterns of "W & B" SCREW WRENCHES MADE IN CANADA at our St. Catharines factory, are our Machinists' Knife Handle, "Railroad Special," Regular (Agricultural Pattern). Adopt this established line as your standard CANADIAN-MADE WRENCHES.

Complete information and catalog No. 90 on request.

The Whitman & Barnes Manufacturing Company

ESTABLISHED 64 YEARS

ST. CATHARINES, ONT.

Convenience Quality

Keystone tools bear the stamp of quality that makes them to be desired because they are made in the most convenient shapes and give the maximum in service and economy.

Our ratchets and adjustable wrench illustrated here are samples of our line. The Keystone brand are carried by the best houses. Inquire of your dealer.

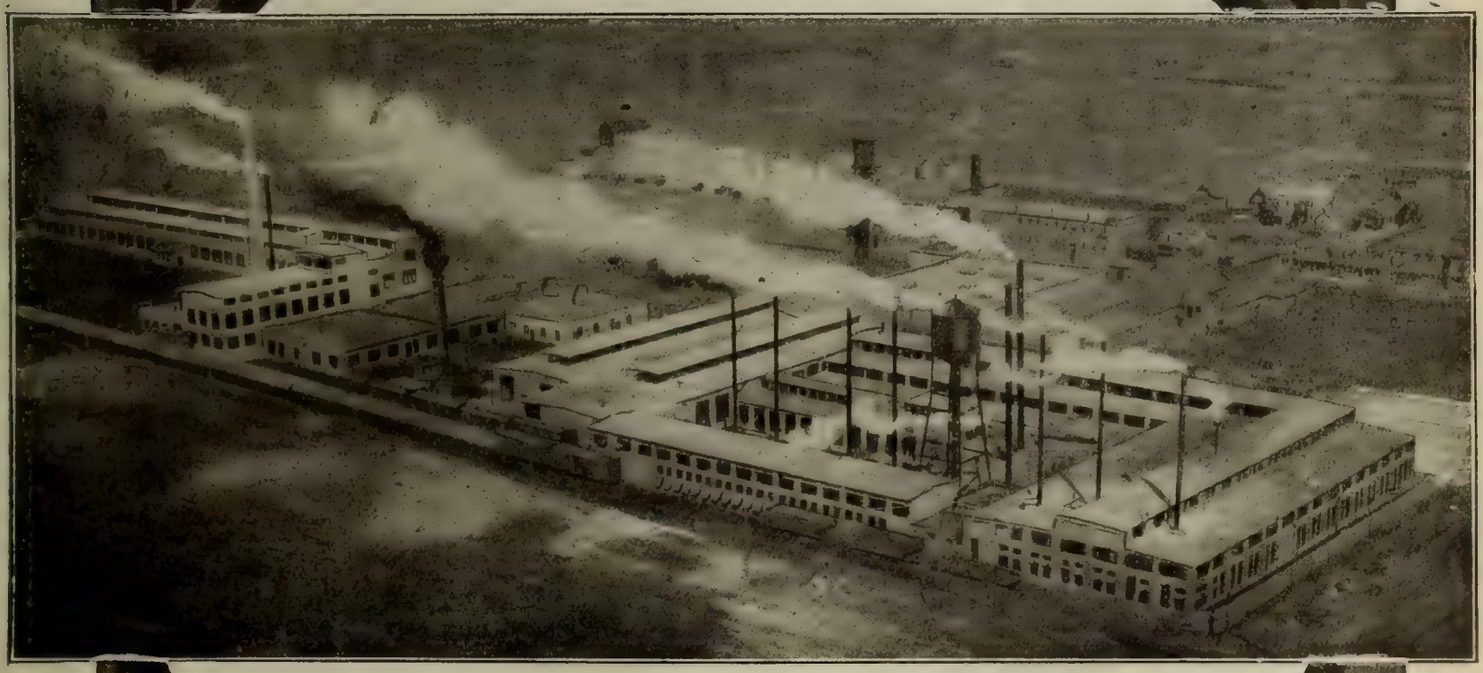
The Keystone Mfg. Co.

BUFFALO N.Y. U.S.A.

BROWN'S

BEAVER BRAND METALS

BRASS, BRONZE,
CANADA SILVER and GILDING METAL
In Sheets, Rolls, Plates and Rods



Brown's Copper & Brass Rolling Mills, Limited

General Offices and Works:
New Toronto, Ontario, Canada

COPPER & BRASS
BROWN'S
QUALITY
ROLLING MILLS

FORD TRIBLOC

Making the World Safe for Workmen

Safety has always been one of the outstanding features of the Ford Tribloc Chain Hoist. Our contribution to the world's safety is a chain hoist with steel working parts, a **LOOP Hand Chain GUIDE** that prevents "gagging," and planetary type spur gearing that converts 80% of the applied power into lifting energy.

Details and 5-year guarantee explained in Catalog 3. Write for it to-day.

FORD CHAIN BLOCK & MFG. CO.
139-141 OXFORD STREET, 2096-D PHILADELPHIA, PA.

SMOOTH-ON

TRADE MARK-REG.U.S. PAT.OFF.

Iron Cements

Positively stop all leaks of steam, water, fire or oil in iron or steel. Unequalled for smoothing over rough and defective castings.

Smooth-On Cements are easy to apply, harden quickly and make permanent repairs,

Every Engineer should have a copy of our new illustrated instruction book. It is free.

Smooth-On Iron Cements are sold by supply houses.

Smooth-On Mfg. Co.
JERSEY CITY, N.J. U.S.A.

Send for New No.16 Illustrated Instruction Book

TRADE B&C MARK

Convenience

This wrench will conveniently get at that nut "just around the corner" or in other inconvenient places where a straight handled wrench would be awkward. Easily operated and handled by one hand. We can give you service and good prices.

BEMIS & CALL
Hardware & Tool Company
Springfield Mass., U.S.A.

PEXTO TRAVELS MONTREAL

The Home of Williams & Wilson, Limited, and the Pexto Display

WILLIAMS & WILSON, LTD., of Montreal, hold Pexto Sheet Metal Workers' Machines and Tools in such high regard that the Pexto Display pictured above, is a permanent feature with them.

It is indeed significant when such a well established house expresses its approval of a product in this substantial way. There is no better evidence of Pexto Quality.

You'll find much of practical value in this display. Pexto Sheet Metal Machines and Tools embody many important improvements. They record the rapid advancement made in the Sheet Metal Trades during the past few years. They have more than kept pace.

The great need of trained mechanics in the Sheet Metal Industry gives added importance to Manual Training and Vocational Education. School Officials and School Shop Instructors will appreciate the practical assistance Williams & Wilson, Ltd., can give in the selection of proper school equipment.

Send for the Pexto Pocket Manual. It tells about the new ideas in sheet-metal working machines and contains other valuable information. Free.

The Peck, Stow & Wilcox Company

MFRS. Mechanics' Hand Tools, Tinsmiths' and Sheet Metal Workers' Tools and Machines, Builders' and General Hardware

Southington, Conn. **Cleveland, Ohio**

Address correspondence to 205 W. Center Street, Southington, Conn.

PEXTO

PEXTO

SHEET METAL WORKERS' MACHINES & TOOLS

FOR CROSS HEAD BEARINGS

Beloit, Wis.,
Oct. 11, 1916.

Magnolia Metal Company,
New York City.

Gentlemen:

I am using Magnolia Metal in all bearings that I re-babbitt.

In one place in particular is crosshead bearings of Corliss engines. The original crosshead bearings were brass, running on steel pins, and when they were down I bored out the brasses, leaving a rib on the ends, drilled holes for anchoring and lined the brasses with Magnolia Metal with success.

You may use my letter if you so desire. I remain,

Yours very truly,

E. A. McKEE,
953 Moore Street.

Engineer for P. B. Yates Machine Company.

PRACTICAL ENGINEER POCKET BOOK:

Over 600 pages. A valuable reference work imported from England and sold as an advertising medium at the low price of 40c post paid.

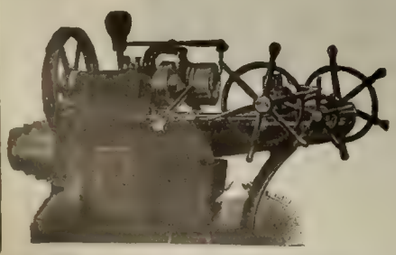
Address Montreal Office.

SOLD BY LEADING DEALERS EVERYWHERE OR BY

MAGNOLIA METAL CO.

OFFICE AND FACTORY:

225 St. Ambroise Street Montreal



BOLT, NUT, FORGING AND WIRE NAIL MACHINERY

"National" Bolt Cutters, "Wedge Grip" Bolt and Rivet Headers, Forging Machines, Nut Machines, Roll Threaders and Wire Nail Machines are used by leading Railroads and Industrials.

THE NATIONAL MACHINERY CO. TIFFIN, OHIO, U.S.A.

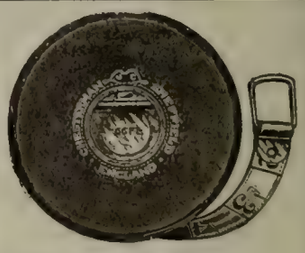
CANADIAN AGENT:
H. W. PETRIE, Ltd.
TORONTO, ONT.
MONTREAL, QUE.
VANCOUVER, B. C.

Measuring Tapes, Steel Rules, Straight Edges, Surveyors' Band Chains, Engineers' Tools

MANUFACTURED BY

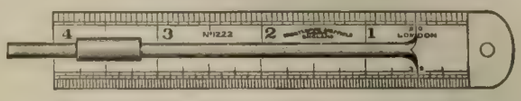
JAMES CHESTERMAN & CO., Limited

SHEFFIELD, - ENGLAND

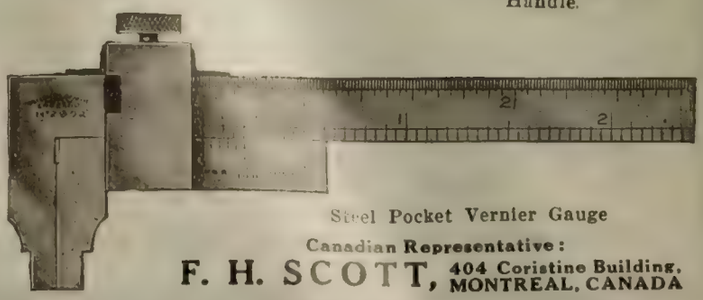


Wind-up Measures, Steel, Linen and Metallic. With Improved Patent Flush Handle.

Chesterman tools are the highest standard of accuracy in the British Empire, and the quality of steel and substantial build guarantee a maximum of service and economy.

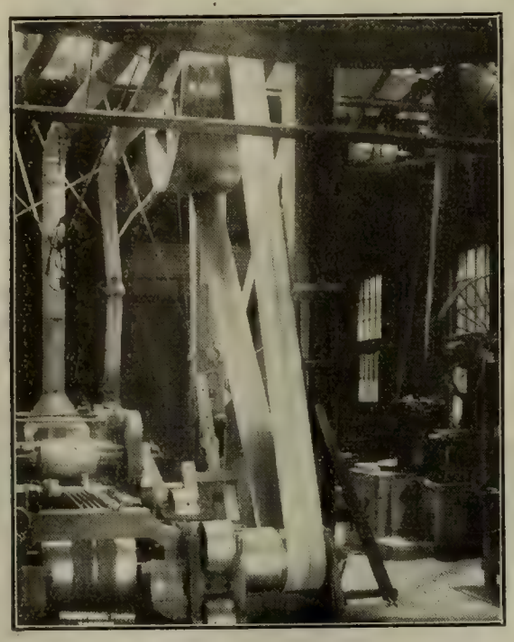


Steel Depth Gauge



Steel Pocket Vernier Gauge

Canadian Representative:
F. H. SCOTT, 404 Coristine Building, MONTREAL, CANADA



50% Longer Life
50% Lower Cost

We have claimed that Extra Power Belting has special features of construction that make it last longer and so give lower cost. We have claimed that it gives this service on hard drives. We have claimed that it delivers more power.

Now Mickle, Dyment & Son join with many other users of Extra Power in backing up our claims. They found that Extra Power lasted longer than belts that cost much more.

They found Extra Power service "beyond our expectations" on a very difficult drive. Read their letter:—

MICKLE, DYMENT & SON.

Gentlemen,—

In March, 1915, we purchased one of your 10 in. 6 ply extra power rubber belts for what we consider a very difficult drive.

We have much pleasure in informing you that same has stood up beyond our expectations, having lasted 50% or longer than the special leather belting which we previously used, besides being approximately 50% less in cost at that time.

Yours very truly,
MICKLE, DYMENT & SON,
(Signed) T. A. PATERSON, Manager.

Extra Power's goodness is the result of scientific building. It is the result of using high-grade materials—of forcing generous quantities of fine rubber through and through the fabric, welding it together—of sealing the seam with solid rubber—of using a friction surface.

These features give Extra Power long life—reduce stretching—prevent ply separation and seam opening—make the belt flexible on the pulleys—give it an irresistible grip to combat slipping and lost power.

Engineers in every line of industry have found that Extra Power is better for most of their drives. They have found that it saves shut-downs and delays—increases production—helps make a pleasant record to show the chief executive.

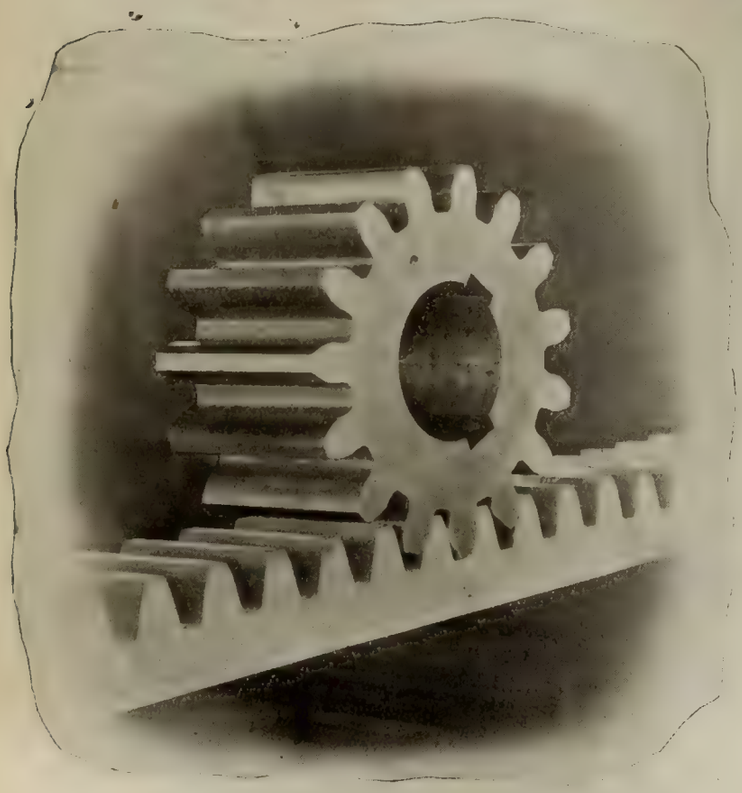
It will cost you nothing to have a trained Goodyear belting man visit you and advise with you on belting problems. Write or telephone our nearest branch.

The Goodyear Tire & Rubber Company
Of Canada, Limited

BRANCHES:
St. John, Montreal, Ottawa, Toronto, Hamilton, London, Winnipeg, Regina, Edmonton, Vancouver. Service Stocks in Smaller Cities.

EXTRA POWER BELTING

CUT GEARS



Note Our
Shop Capacities

Spur Gears	up to	91	ins.	diam.
Bevel Gears	" "	62	ins.	"
Worm Gears	" "	108	ins.	"
Helical or Herringbone	" "	54	ins.	"
Rack	" "	16	ft.	length

Write us for quotations.

Hamilton Gear & Machine Co.

Van Horne Street - TORONTO

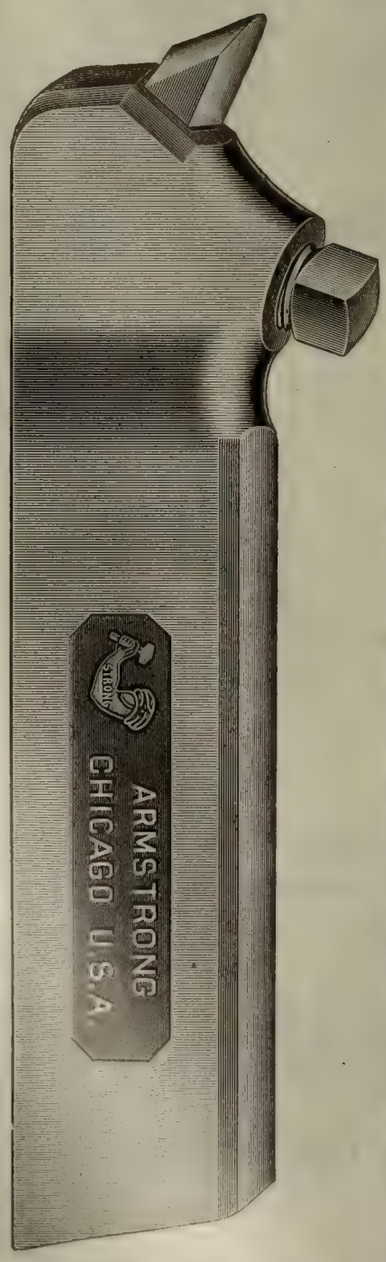
The Only Grand Prize for TOOL HOLDERS

Awarded separately and independent of other lines exhibited at the

PANAMA-PACIFIC EXPOSITION

WAS WON BY

ARMSTRONG TOOL HOLDERS



HIGHEST AWARD

at 4 World's Expositons

Paris - - - 1900
St. Louis - 1905
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San Francisco 1915

THEY ALWAYS MAKE GOOD

They Are Saving Millions of Dollars in High Speed Steel

CATALOG FREE

Armstrong Bros. Tool Co.

"The Tool Holder People"

306 N. Francisco Ave., CHICAGO, U.S.A.

The Panama-Pacific MEDAL OF HONOR was also won by ARMSTRONG Drop Forged Wrenches, Ratchets, Clamps, Lathe Dogs, Etc.

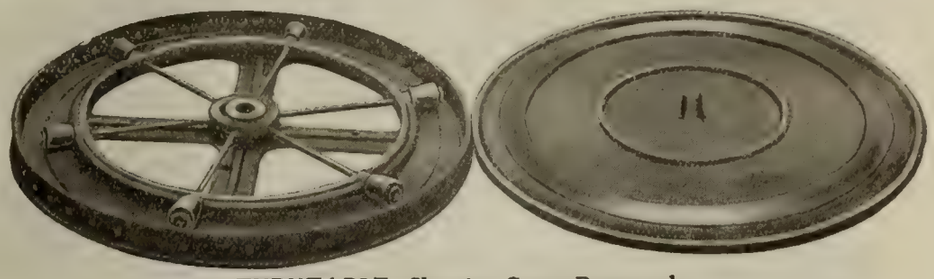
Whiting Turntables and Trucks

TURNTABLES

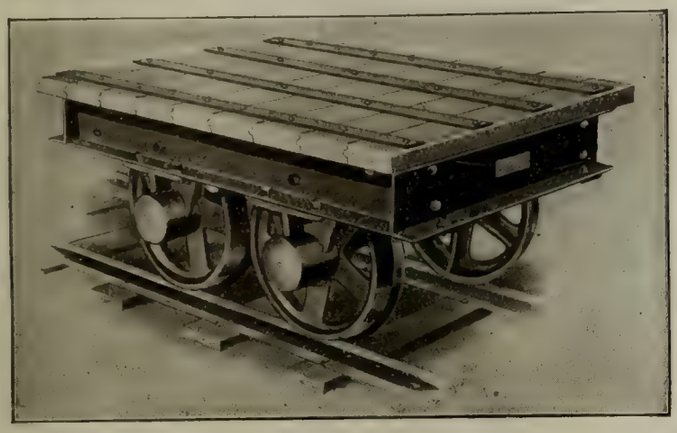
RIGID, self-contained construction. No tipping, no getting out of line, no journal friction.

Load is carried on conical chilled rollers, running on machined path, giving long life and smooth, easy operation.

Tops furnished plain or with raised or grooved tracks. Smaller sizes with plain tops kept in stock, also frogs.



TURNTABLE, Showing Cover Removed



668—Standard Steel Truck

Trucks and Cars

Built for severe service in the foundry, shop or yard.

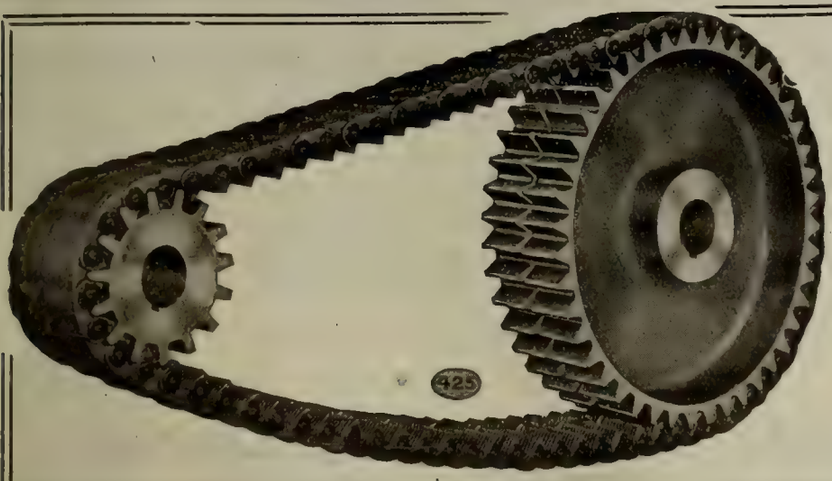
Heavy steel frames and castings of ample section give long life. Our design of roller bearings results in a very light-running truck.

Send for Catalog 124

Complete Foundry Equipments

WHITING FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB

Cranes of all Types



RENOLD CHAINS

PATENT SILENT

The proven efficient form of Power Transmission.

Equally suitable for main shaft or machine drives. Save space and power, increase output and ensure durability.

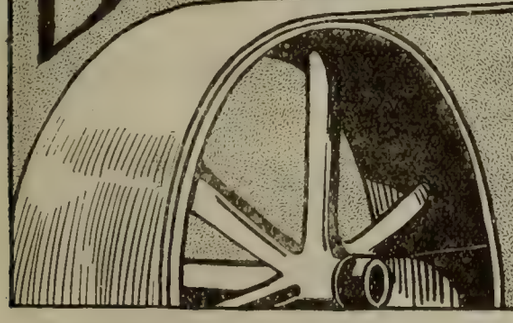
Chain and Parts Carried in Stock.

Sole Canadian Agents

Jones & Glassco. (Reg'd)

Branch Office: TORONTO, ONT. **ENGINEERS** **St. Nicholas Bldg. MONTREAL, P.Q.**

Scandinavia Belts



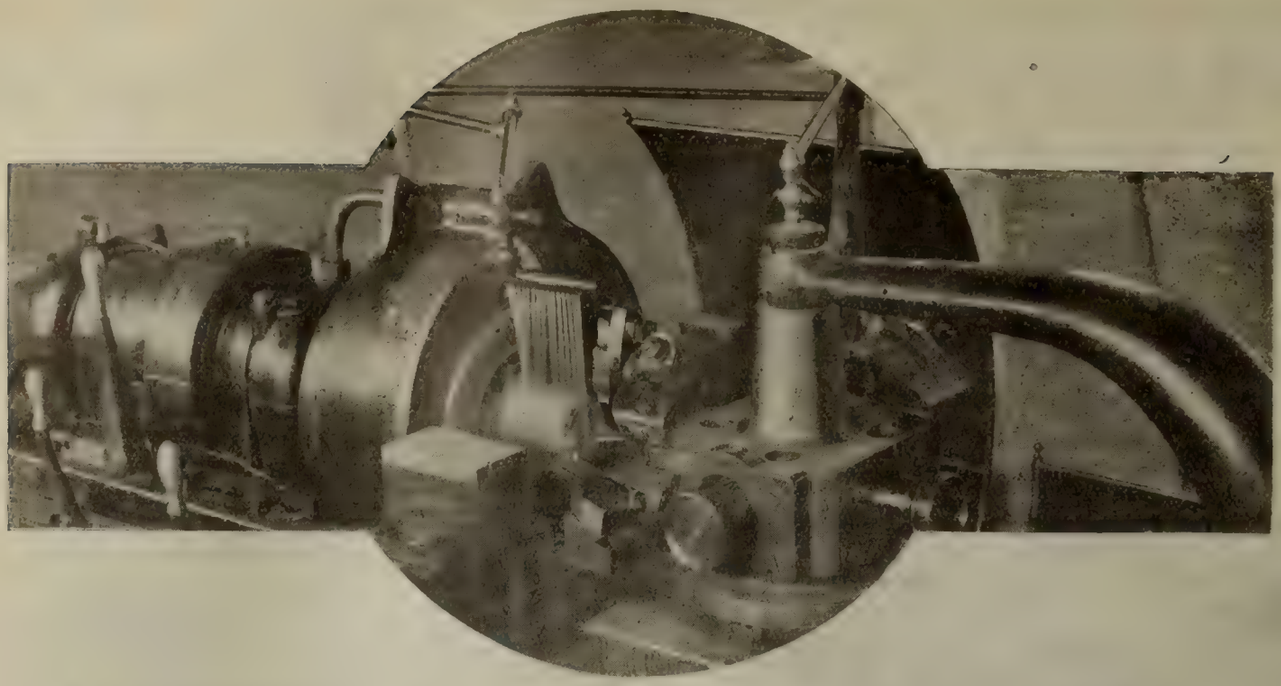
Can be used anywhere that leather can be used.

Scandinavia Belting is a solid woven cotton belt, made of long fibre cotton. It is impregnated to give further solidity, and the impregnation also acts as a moisture resistant. For direct drives where atmospheric conditions remain approximately the same, this belt is probably the best on the market to-day.

It stands up well on shifters.

W. P. BENNETT
51 Montfort Street, Montreal, P.Q.

Beltings *Packings* *Asbestos*



MYSTIC CUTTING COMPOUND

A free-flowing, unsaponified animal oil lubricant. Does not separate in solution, grow rancid or cause rust. It is non-combustible and will not harm operator's hands.

Mystic Cutting Compound increases production and keeps tools in best of condition. Your machines need it. Your operators like it. Test it at our expense.

Cataract Refining Co., Limited, Toronto, Ont.

Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send to our nearest factory for a trial box.

Manufactured and guaranteed by

The Canada Metal Company, Limited

Hamilton Montreal TORONTO Winnipeg Vancouver

Electric Travelling Cranes

(Direct or Alternating Current)

Steam and Electric Derricks

(Stationary or Travelling)

Up-to-date design. Built for fast, continuous service.

ACCESSIBILITY—DURABILITY.

Dominion Bridge Company, Limited

MONTREAL

MORSE SILENT CHAINS OPERATE PANAMA CANAL EMERGENCY GATES

FURTHER EVIDENCE OF

Morse Dependability

THE UNITED STATES GOVERNMENT, before selecting the form of POWER TRANSMISSION which should operate the Emergency Gates of the Panama Canal Locks, made a comparative investigation of all the large manufacturers of Silent Chains, putting their products through searching tests of STRENGTH and ADAPTABILITY.

MORSE SILENT CHAINS showed a much higher tensile strength than any other make, and were selected as the chains which could be depended upon in emergencies. Accordingly, the Otis Elevator Co., which installed the 36 Control Units was instructed to operate them through MORSE SILENT CHAINS. One of the units is pictured above.

Write us for still further evidence of the Government's confidence in "MORSE." Government tests are worth investigating.

MORSE CHAIN CO., - Ithaca, New York

Largest manufacturers of silent chains in the world.

CHAPMAN

DOUBLE BALL BEARINGS

Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

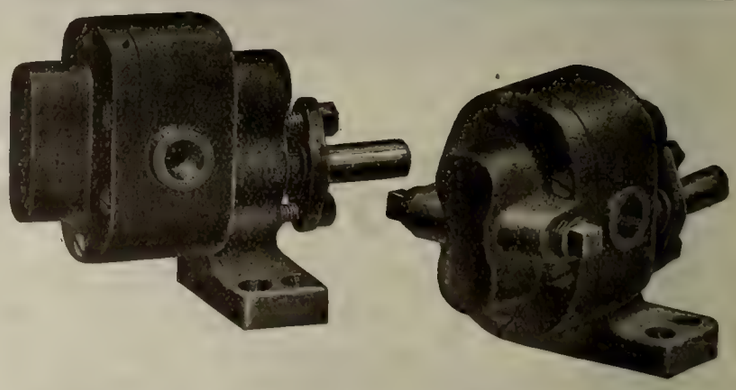
TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.

IN the midst of your busy day, with a thousand details crowding in on you from all sides, there are few things more unpleasant, as well as time-consuming, than to have your main drive belt break.

With a "Clipper" Belt Lacer this annoying situation can be overcome in three minutes.

A thirty days' trial would convince you.

Clipper Belt Lacer Company
976 Front Avenue Grand Rapids, Mich.

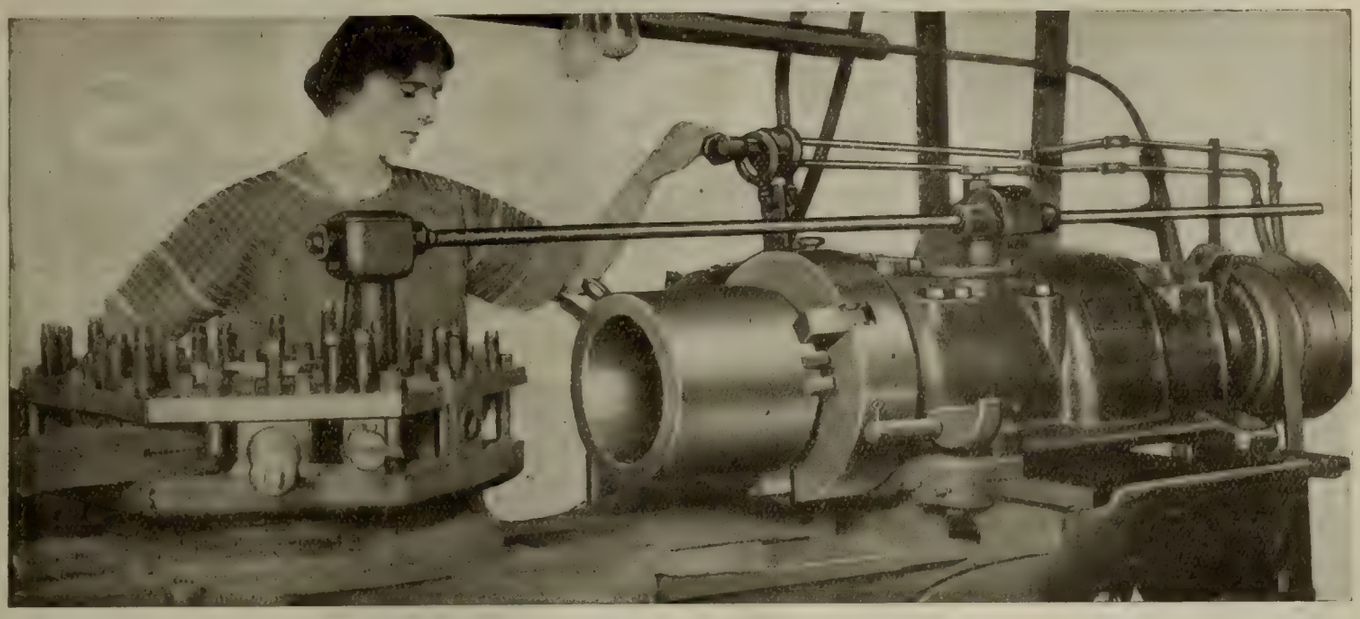


Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.



Hannifin Air Chucks

The fact that the Hannifin Air Chuck will answer instantly to the touch of a woman operator, that it can be operated just as easily by female labor, is a convincing argument to the simplicity of this chuck.

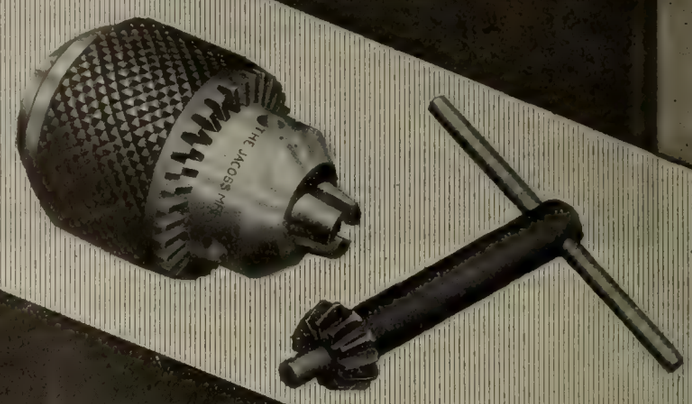
Operating under a 75-lb. pressure, a grip on the material is obtained that is vise-like in its rigidity, yet the simple turn of a lever will release it immediately. We have made the statement that an actual increase of 20% to 100% is made by the use of this chuck. We wish to prove it to you. Get in touch with us.

Hannifin Manufacturing Co.

Chicago, Illinois, U.S.A.

REPRESENTATIVES:—R. E. Ellis Engineering Co., Chicago; Coats Machine Tool Co., New York City; A. R. Williams Machinery Co., Toronto; Williams & Wilson, Montreal; The Canadian Fairbanks-Morse Co., Montreal. EUROPEAN REPRESENTATIVES:—Coats Machine Tool Co., Ltd., London; Fenwick Freres & Co., Paris; Iznosskoff & Co., Petrograd, Russia.

Jacobs
IMPROVED
Drill Chuck



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By Sheer Merit

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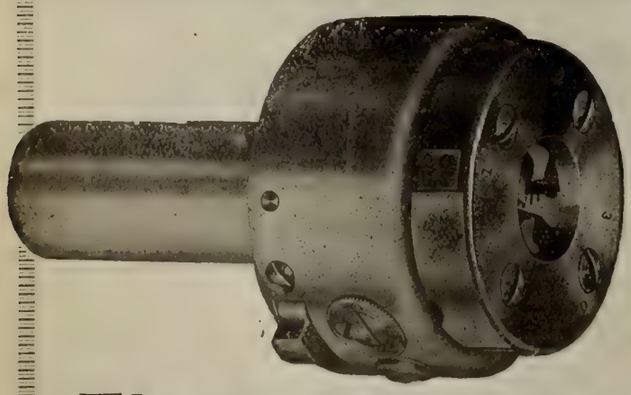

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That last question interests us vitally. Our Self-Opening Automatic Die Head will chase your troubles. Its quick release feature not only insures the cutting of the thread to a given point every time, but permits cutting right to the shoulder where required.

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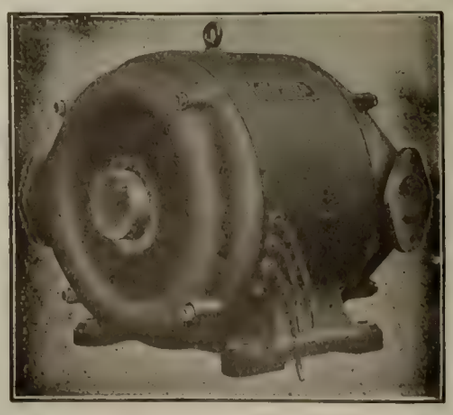

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FOR VERY DIRTY PLACES

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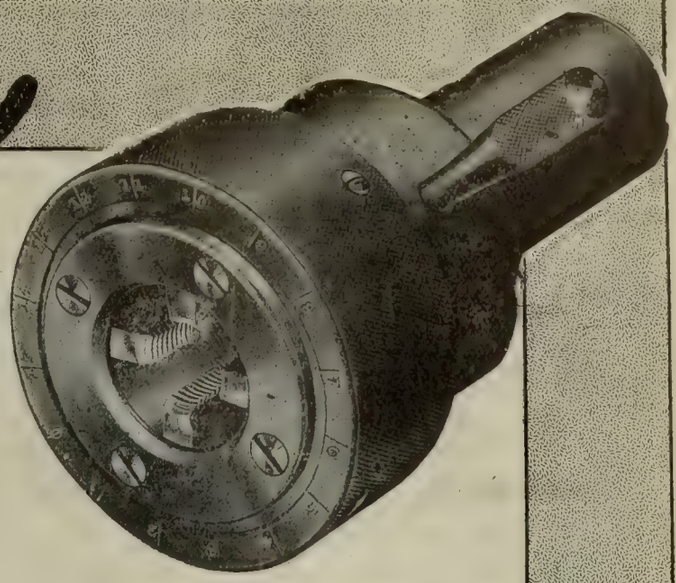

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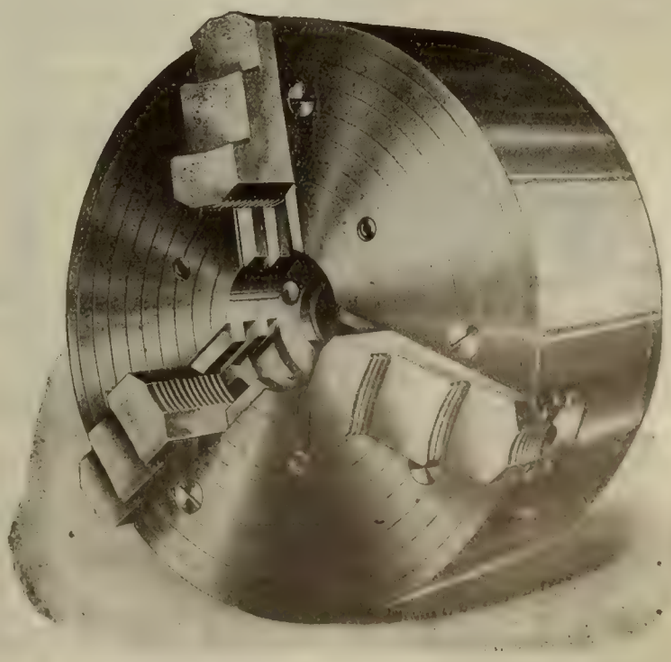

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GERMANY is plotting in Canada and the United States right now. If you are curious to know just what she is doing, learn from Miss Agnes C. Laut's article in the October MACLEAN'S, "The Plot Behind the Pacifists."

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AN article full of actual occurrences of how the public attempts to "beat" the Customs, and of how the Customs authorities beat the public. This absorbingly interesting narrative is by J. D. Ronald who, as a Customs officer, came into close touch with offenders and offences. A semi-detective article, this true story makes great reading.

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THE work of these masters of the short and long story appears in the October MACLEAN'S. Stringer's story is "The Redeemer of Waste Lands"; W. A. Fraser writes a love story, "For Catherine's Sake"; Leacock has a humorous sketch; and Hendryx continues his captivating story of the Canadian Northwest, "The Gun Brand."

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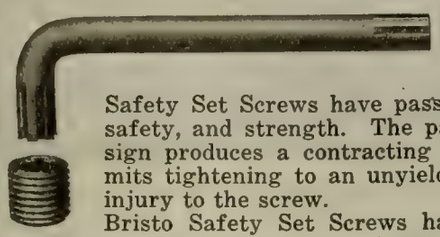

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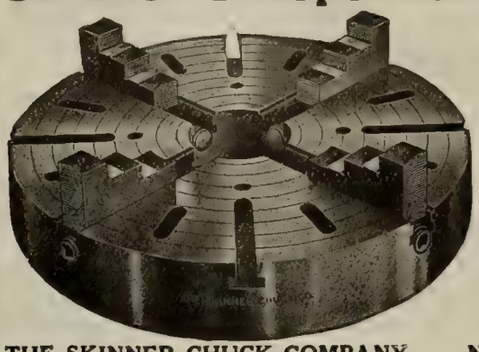

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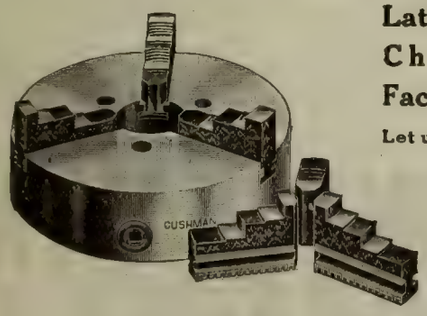

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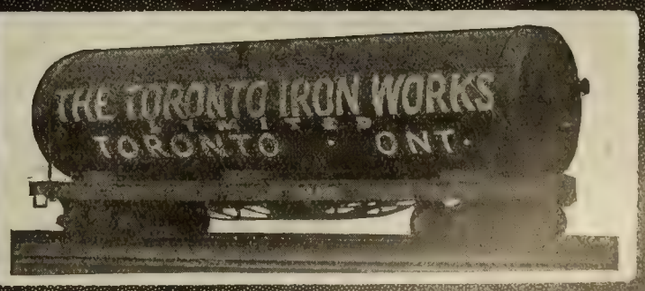

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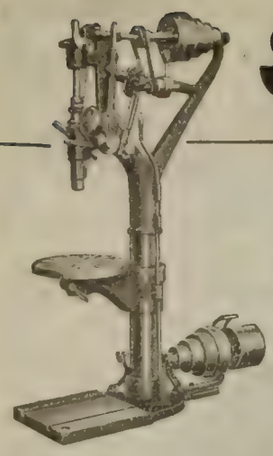

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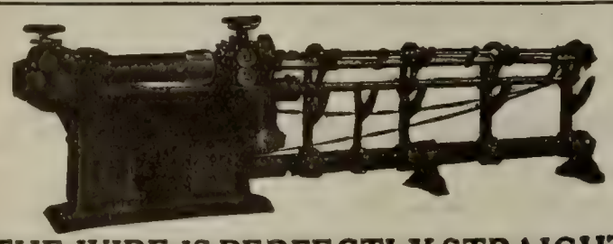

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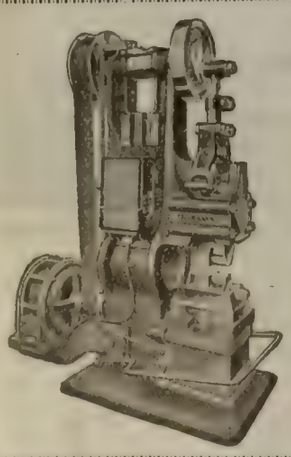

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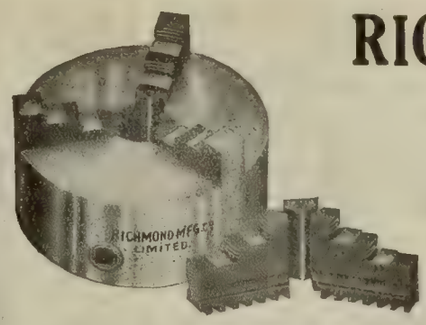

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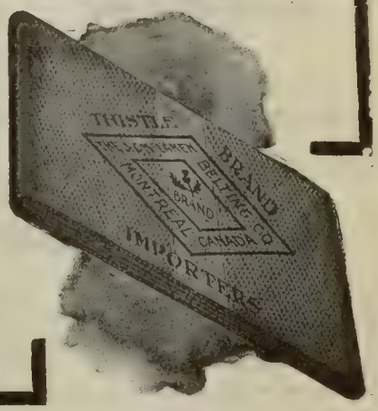

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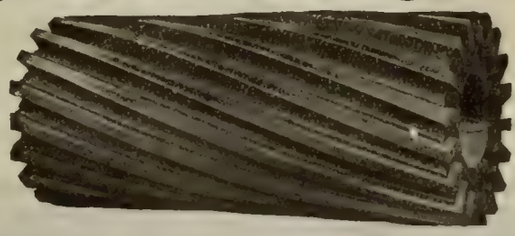

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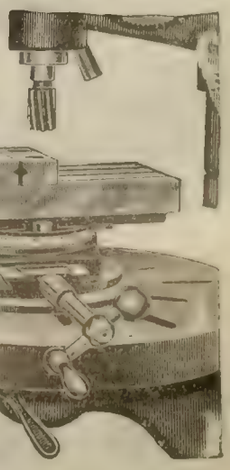

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Graton & Knight Mfg. Co., Worcester, Mass.

BELTING, BALATA
Baxter Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton, Toronto, Montreal
Federal Engineering Co., Toronto, Ont.

BELTING, CHAIN
Canadian Fairbanks-Morse Co., Montreal
Goodyear Tire & Rubber Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Whitney Mfg. Co., Hartford, Conn.

BELTING, CONVEYOR
Goodyear Tire & Rubber Co., Toronto, Ont.

BELTING, LEATHER
Canadian Fairbanks-Morse Co., Montreal
Can. B. K. Morton, Toronto, Montreal
Graton & Knight Mfg. Co., Worcester, Mass.
Goodyear Tire & Rubber Co., Toronto, Ont.
McLaren, J. C., Belting Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
H. W. Petrie, Ltd., Montreal
Standard Machy. & Supplies, Ltd., Montreal, Que.

BELTING, STITCHED COTTON DUCK
Baxter & Co., Ltd., J. R., Montreal, Que.
Bennett, W. P., 51 Montford St., Montreal, Que.
Dominion Belting Co., Hamilton, Ont.
Federal Engineering Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

BENCH LEGS, STEEL
New Britain Mach. Co., New Britain, Conn.

BENCH DRAWERS, FRICTIONLESS
New Britain Mach. Co., New Britain, Conn.

BENDING MACHINERY
John Bertram & Sons Co., Dundas
Bertrams, Limited, Edinburgh, Scotland
Brown-Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Canada
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
Charles F. Elmes Eng. Works, Chicago
Jardine, A. B., & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Steel Bending Brake Works, Chatham, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa.

BINS, STEEL
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Toronto Iron Works, Ltd., Toronto, Ont.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Sturtevant Co., B. F., Galt, Ont.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

BLUE PRINTING MACHINERY
Mullauer-Enlund Tool Co., Syracuse, N.Y.

BOARTZ
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York, N.Y.

BOILERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
Cumming & Son, J. W., New Glasgow, Canada
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

BOLT AND NUT MACHINERY
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machinery Co., Toronto

BOLT THREADING MACHINERY
Landis Machine Co., Waynesboro, Pa.
Victor Tool Co., Waynesboro, Pa.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co. of Canada, Toronto
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, UPRIGHT AND HORIZONTAL
John Bertram & Sons Co., Dundas
Canada Machinery Corp. Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York
Roelofson Machine & Tool Co., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Stow Mfg. Co., Binghampton, N.Y.

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Cumming & Son, J. W., New Glasgow, Canada

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John Bertram & Sons Co., Dundas
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Marsh & Henthorn, Belleville, Ont.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

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Bliss Co., E. W., Brooklyn, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.

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Alexander Fleck, Ltd., Ottawa.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton.

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Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.
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Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.

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CASTINGS, NICKEL STEEL
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Petrie, Ltd., H. W., Toronto, Ont.

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Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
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Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

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Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Wright Mfg. Co., Lisbon, Ohio.

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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

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Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.

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John Bertram & Sons Co., Dundas, Ont.
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Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Richmond Mfg. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
D. E. Whiton Machine Co., New London, Conn.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
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Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.
Richmond Mfg. Co., Toronto, Ont.

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Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, GEARED SCROLL
Richmond Mfg. Co., Toronto, Ont.

CHUCKS, MAGNETIC
H. E. Streeter, 523 New Birks Bldg., Montreal.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

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New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

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Hardinge Bros., Inc., Chicago, Ill.

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Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.

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Whiting Foundry Equipment Co., Harvey, Ill.

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Zenith Steel & Coal Products, Montreal, Que.

COLLARS
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COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
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Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.

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Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

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A. R. Williams Machy. Co., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, STEEL SLIDE-BLOW
Whiting Foundry Equipment Co., Harvey, Ill.

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John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

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Clark Equipment Co., Buchanan, Mich.
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Pratt & Whitney Co., Dundas, Ont.

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Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.

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Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

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Northern Crane Works, Walkerille.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

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Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, PORTABLE
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Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.

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Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

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Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
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Galt & Walker Machinery Co., Toronto, Ont.
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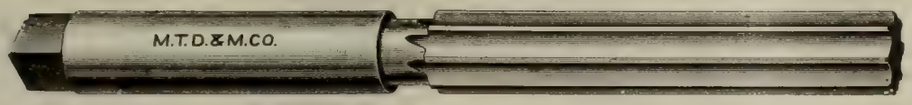

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Niles-Bement-Pond Co., New York.
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Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Hespeler, Ont.
National-Acme Co., Cleveland, Ohio.
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Garlock-Walker Machinery Co., Toronto, Ont.
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Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.

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Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
De Mooy Machine Co., Cleveland, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
D. McKenzie Machinery Co., Guelph, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, Ohio.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto, Ont.
W. F. & John Barnes Co., Rockford, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Millers Falls Co., Millers Falls, Mass.
Pratt & Whitney Co., Dundas, Ont.
United States Electrical Tool Co., Cincinnati.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.

DRILLS, ELECTRIC AND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.

DRILLS, HIGH SPEED
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Can. B. K. Morton, Toronto, Montreal.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Foss & Hill Machy. Co., Montreal.
Marshall & Co., Geo. A., Toronto, Ont.
McKenna Brothers, Pittsburgh, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
W. F. & John Barnes Co., Rockford, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

DRILLS, MULTIPLE SPINDLE
Henry & Wright Mfg. Co., Hartford, Conn.
Niles-Bement-Pond Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Niles-Bement-Pond Co., New York.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Millers Falls Co., Millers Falls, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Foss & Hill Machy. Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Cleveland Twist Drill Co., Cleveland.
Clark Equipment Co., Buchanan, Mich.
Foss & Hill Machy. Co., Montreal.
Morse Twist Drill & Mach. Co., New Bedford.

DRILLS, TWIST
Atkins & Co., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

DRINKING FOUNTAINS
Puro Sanitary Dk'g. Fountain Co., Haydenville, Mass.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sheldons, Ltd., Galt, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

DUST ARRESTERS (FOR TUMBLING MILLS)
Northern Crane Works, Walkerville.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

DYNAMOS AND ELECTRICAL SUPPLIES
Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
A. R. Williams Machy. Co., Toronto.

ELEVATOR ENCLOSURES
Canada Wire & Iron Goods Co., Hamilton, Ont.

ELEVATORS AND BUCKETS
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Whiting Foundry Equipment Co., Harvey, Ill.

ELEVATING AND CONVEYING MACHINERY
Can. Matthews Gravity Carrier Co., Toronto, Ont.

EMERY GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Stow Mfg. Co., Binghamton, N.Y.

EMERY AND EMERY WHEELS
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Ford-Smith Mach. Co., Hamilton, Ont.
Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

ENGINES, BALANCED VALVE
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Plessisville Foundry Co., Plessisville, Que.

ENGINES, STEAM, GAS, GASOLINE
Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.

ENGINES, HORIZONTAL AND VERTICAL
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
A. R. Williams Machy. Co., Toronto.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Parmenter & Bulloch Co., Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

FAUCETS
Puro Sanitary Dk'g. Fountain Co., Haydenville, Mass.

FENCE, IRON AND FACTORY
Canada Wire & Iron Goods Co., Hamilton, Ont.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Can. B. K. Morton Co., Toronto, Ont.
Delta File Works, Philadelphia, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Port Hope File Mfg. Co., Port Hope, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

FILING MACHINES
Noble & Westbrook Mfg. Co., Hartford, Conn.

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Bowser & Co., Inc., S. F., Toronto, Ont.

FILTERS, WATER
W. B. Scaife & Sons, Pittsburgh, Pa.

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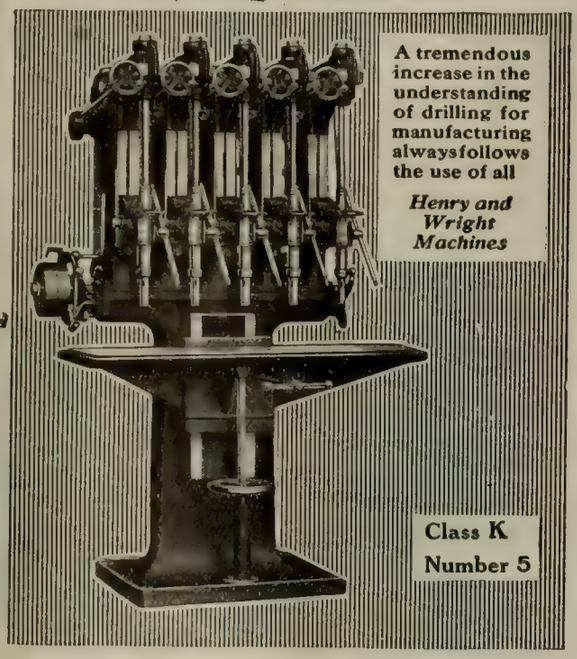

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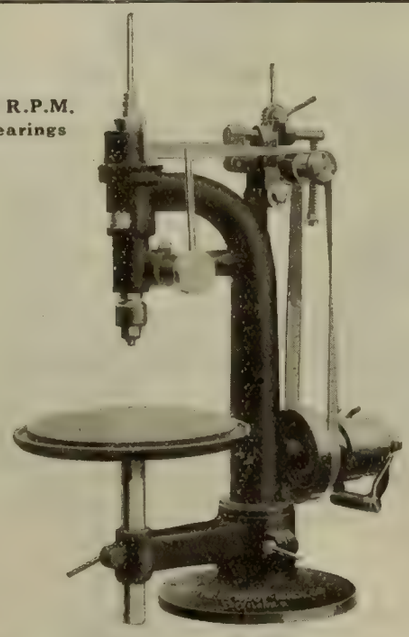

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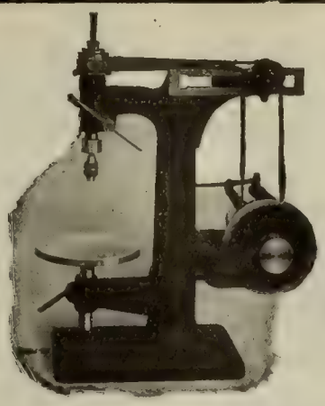

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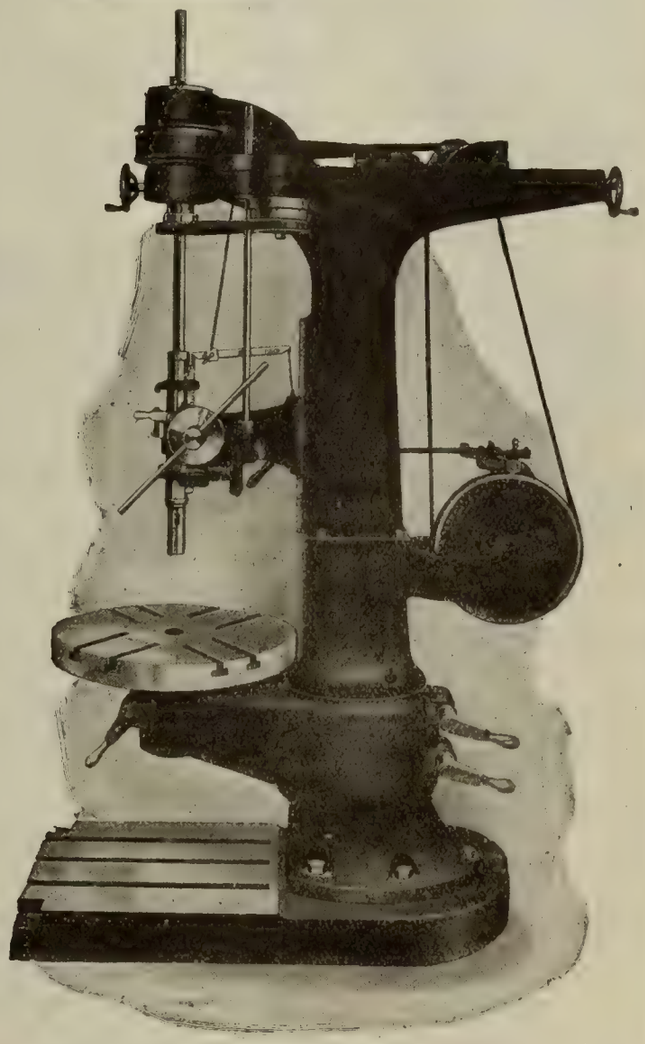

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Steel Co. of Canada, Ltd., Hamilton, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont
Williams & Co., J. H., Brooklyn, N.Y.

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Bliss, E. W., Co., Brooklyn, N.Y.
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Niles-Bement-Pond Co., New York, N.Y.

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Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Erie Foundry Co., Erie, Pa.
Garlock-Walker Machinery Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
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Toronto Iron Works, Ltd., Toronto.

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Dominion Forge & Stpg. Co., Walkerville, Ont.

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Noble & Westbrook Mfg. Co., Hartford, Conn.
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Charles F. Elmes Eng. Works, Chicago.

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Taylor Instrument Co., Rochester, N.Y.

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Can. Fairbanks-Morse Co., Montreal.
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Garvin Machine Co., New York.
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

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Can. Steel Foundries, Ltd., Montreal, Que.

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Dominion Machinery Co., Toronto.
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Himoff Mach. Co., Inc., Astoria, L.I., New York.
Petrie, Ltd., H. W., Toronto, Ont.
The Smart-Turner Machine Co., Hamilton.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.

GEAR HOBBING MACHINES
Himoff Mach. Co., Inc., Astoria, L.I., New York.

GEAR TURNING MACHINES, BEVEL
Bridgeford Mach. Tool Works, Rochester, N.Y.

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Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Foundries, Ltd., Hull, Que.
Illinois Tool Works, Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
The Smart-Turner Machine Co., Hamilton.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

GEARS, RAWHIDE
Hamilton Gear & Machine Co., Toronto.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Philadelphia Gear Works, Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

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Can. Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.
A. R. Williams Machy. Co., Toronto.

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Strong, Kennard & Nutt Co., Cleveland, Ohio.
Willson & Co., Inc., T. A., Reading, Pa.

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Hickory Steel-Grip Glove Co., Chicago, Ill.

GLOVES, STEEL GRIP, SAND BLAST
Hickory Steel Grip Glove Co., Chicago, Ill.

GRAVITY CARRIERS
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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH
Blake & Johnson Co., Waterbury, Conn.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati, O.

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Greenfield Machine Co., Greenfield, Mass.
LeBlond Mach. Tool Co., R. K., Cincinnati, O.
Norton Grinding Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
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Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
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Gardner Machine Co., Beloit, Wis.

GRINDERS, DRILL
Aikenhead Hardware Co., Toronto, Ont.
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Brown & Sharpe Mfg. Co., Providence, R.I.
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Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
United States Electrical Tool Co., Cincinnati, O.
A. R. Williams Machy. Co., Toronto.

GRINDERS, RADIAL
Rivett Lathe & Grinder Co., Brighton, Mass.

GRINDERS, TOOL AND HOLDER
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Blake & Johnson Co., Waterbury, Conn.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
Wing & Son, J. E., Hamilton, Ont.

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Fitchburg Grinding Machine Co., Fitchburg, Mass.
Modern Tool Co., Erie, Pa.
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GRINDERS, VERTICAL SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.
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Wilmarth & Morman, Grand Rapids, Mich.
Wing & Son, J. E., Hamilton, Ont.

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Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
LeBlond Mach. Tool Co., R. K., Cincinnati.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Wilmarth & Morman, Grand Rapids, Mich.
Stow Mfg. Co., Binghampton, N.Y.

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Aikenhead Hardware Co., Toronto, Ont.
Baxter Co., Ltd., J. R., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Carborundum Co., Niagara Falls.
Ford-Smith Mach Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto, Ont.

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Canada Wire & Iron Goods Co., Hamilton, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
New Britain Mach. Co., New Britain, Conn.
Stow Mfg. Co., Binghampton, N.Y.

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Baxter Co., Ltd., J. R., Montreal, Que.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Ford-Smith Machine Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Millers Falls Co., Millers Falls, Mass.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Montreal.
Racine Tool & Machine Co., Racine, Wis.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Victor Saw Works, Ltd., Hamilton, Canada.
Zenith Coal & Steel Products, Montreal, Que.

HACK SAW FRAMES
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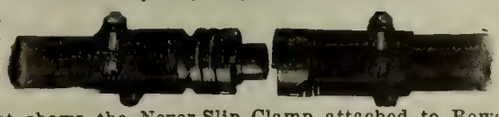

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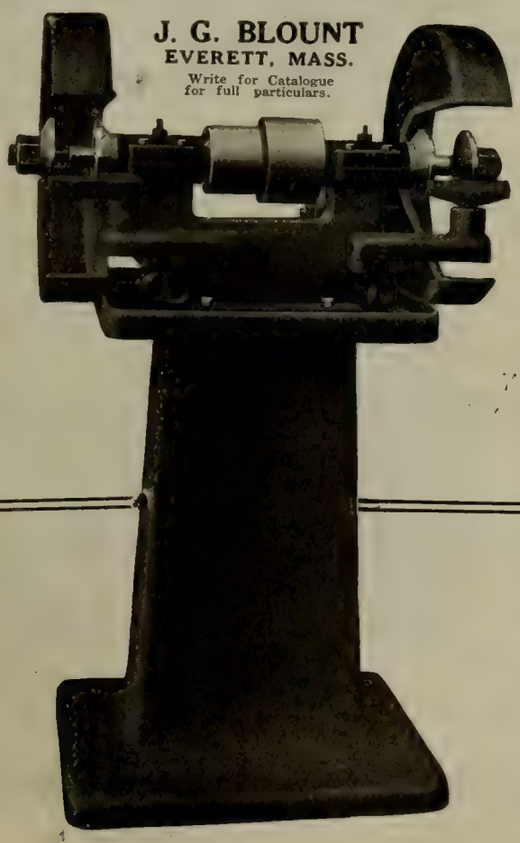

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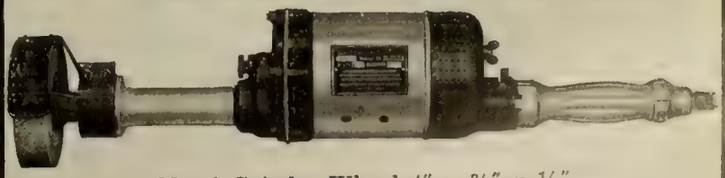

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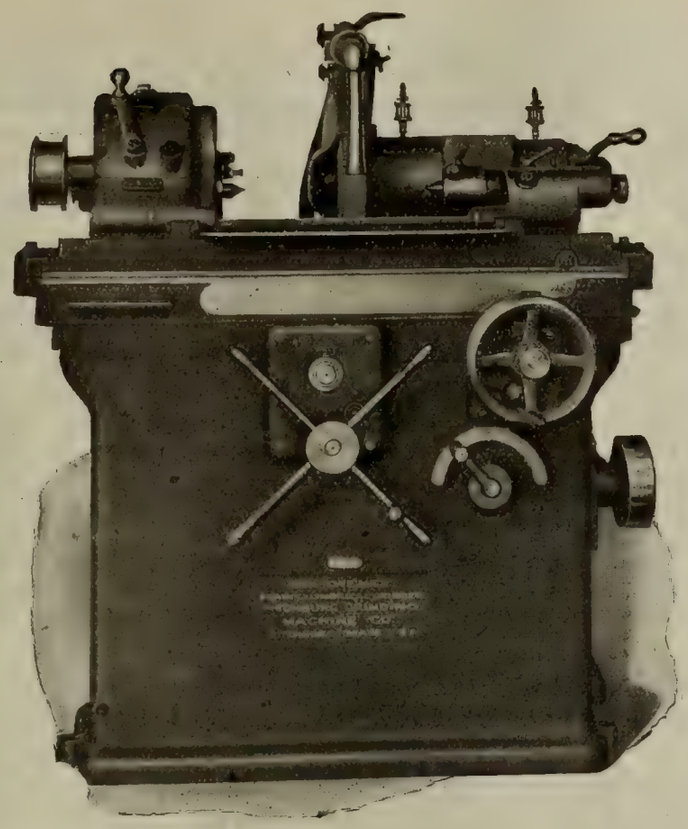

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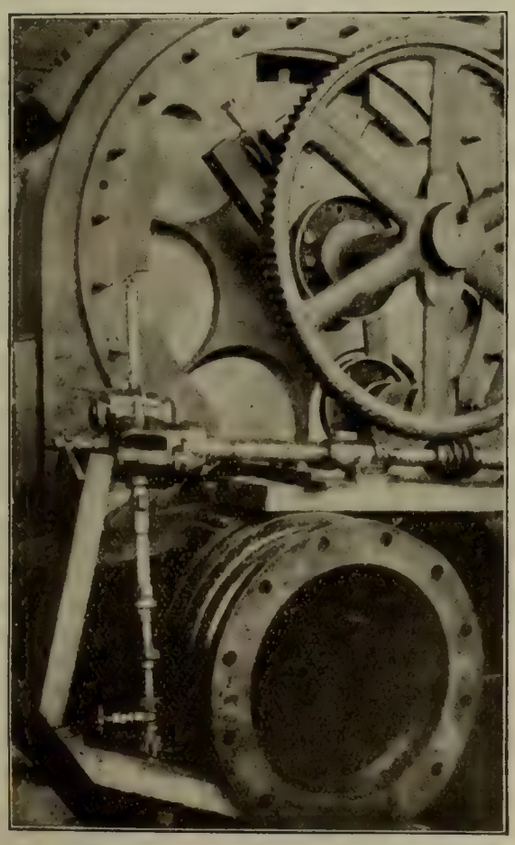

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Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
A. R. Williams Machy. Co., Toronto.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Can.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
John H. Hall & Sons, Ltd., Brantford, Ont.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

NUTS, SEMI-FINISH AND FINISHED
Canadian B. K. Morton, Toronto, Montreal.
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.

NUT BURRING MACHINES
National Machy. Co., Tiffin, O.

NUT MACHINES (HOT)
National Machy. Co., Tiffin, O.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machy. Co., Tiffin, O.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.

OIL, DRAWING
Elm Cutting Oil Co., Toronto, Ont.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Machine Co., The, Hamilton.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, Ont.

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Brantford Oven & Rack Co., Brantford, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVEN TRUCKS, STEEL
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MacKinnon, Holmes & Co., Sherbrooke, Que.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVENS FOR DRYING, TEMPER AND UNDER TRUCKS
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Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.

OXY-ACETYLENE WELDING AND CUTTING PLANT
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

OXYGEN (SEE ACETYLENE)
L'Air Liquide Society, Montreal, Que.

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New Britain Mach. Co., New Britain, Conn.

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Garlock-Walker Machinery Co., Toronto, Ont.

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Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
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Steel Co. of Canada, Ltd., Hamilton, Ont.

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Butterfield & Co., Rock Island, Que.
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Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Petrie, Ltd., H. W., Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
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Toronto Iron Works, Ltd., Toronto.

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Curtis & Curtis Co., Bridgeport, Conn.
John H. Hall & Sons, Ltd., Brantford, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

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Armstrong Bros. Tool Co., Chicago.

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Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

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Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

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Sheldons, Ltd., Galt, Ont.
Niles-Bement-Pond Co., New York.

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Canadian Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Conn.

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Hannifin Mfg. Co., Chicago, Ill.
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Ferracute Machine Co., Bridgeton, N.J.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

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Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.

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Ferracute Machine Co., Bridgeton, N.J.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

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William R. Perrin, Ltd., Toronto.

PRESSES, DROP AND FORGING
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E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
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Can. Fairbanks-Morse Co., Montreal.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Dominion Machinery Co., Toronto, Ont.
Toledo Machine & Tool Co., Toledo.

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John Bertram & Sons Co., Dundas.
Charles F. Elmes Eng. Works, Chicago.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo.
West Tire Setter Co., Rochester, N.Y.
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Toledo Machine & Tool Co., Toledo.

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Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
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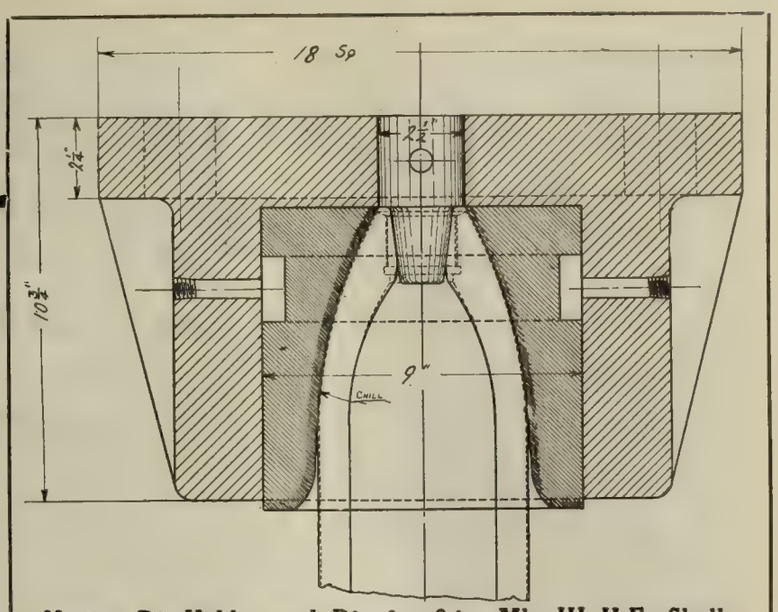

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William R. Perrin, Ltd., Toronto.

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Dominion Machy. Co., Toronto, Ont.
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Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
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Pratt & Whitney Co., Dundas, Ont.
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Brown, Boggs Co., Ltd., Hamilton, Canada.
Niles-Bement-Pond Co., New York.
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Taylor Instrument Co., Rochester, N.Y.
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Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York
Himoff Mach. Co., Inc., Astoria, L.I., New York.
A. B. Jardine & Co., Hespeler
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto

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Riverside Machinery Depot, Detroit, Mich.

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National-Acme Co., Cleveland, Ohio
Steel Co. of Canada, Ltd., Hamilton, Ont.

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Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Morse Twist Drill & Mch. Co., New Bedford, Mass
Wells Bros. Co. of Canada, Galt, Ont.

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Pratt & Whitney Co., Dundas, Ont.

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Dominion Machinery Co., Toronto
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Hill, Clarke & Co., Chicago, Ill.
McCabe, J. J., New York, N.Y.
New York Machinery Exchange, New York
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Strelinger Co., Chas. A., Detroit, Mich.
Stocker-Rumely-Wachs, Chicago, Ill.

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Allen Mfg. Co., Hartford, Conn.

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John Bertram & Sons Co., Dundas
Can. Fairbanks-Morse Co., Montreal
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal
Gardner, Robt., & Son, Montreal
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Steptoe Co., John, Cincinnati, Ohio

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Can. Bond Hanger & Coup. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Strelinger Co., Chas. A., Detroit, Mich.
A. R. Williams Machy. Co., Toronto

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Stow Mfg. Co., Binghampton, N.Y.

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Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

SHAVINGS, SEPARATOR
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

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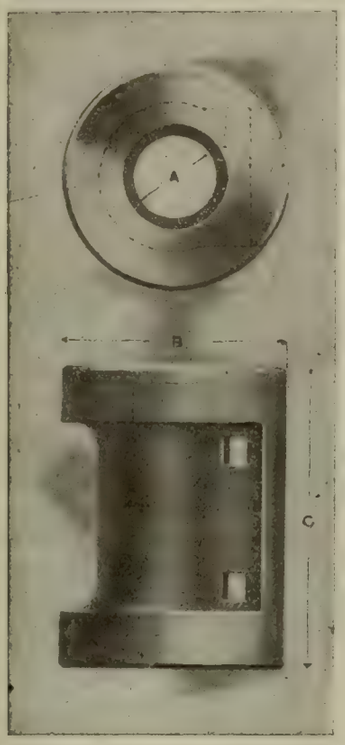

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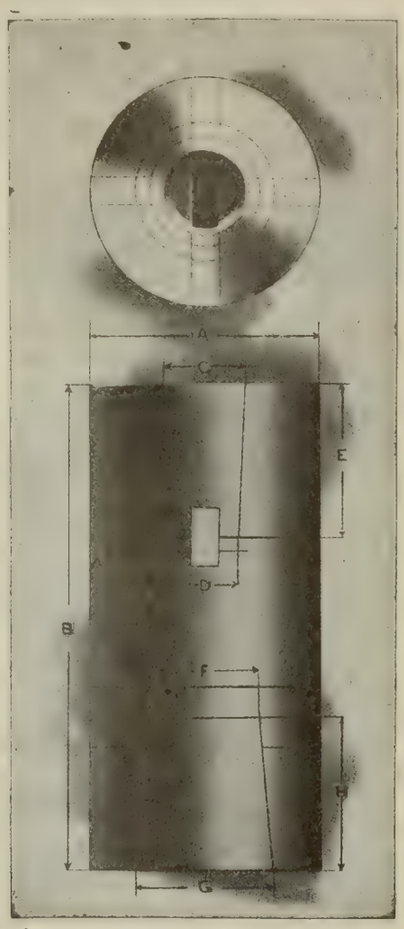
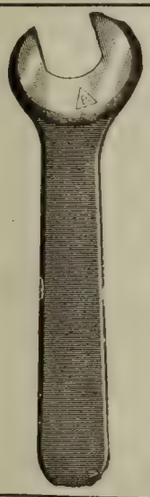


Stamp Head



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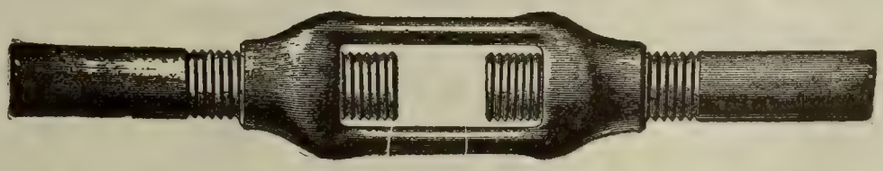

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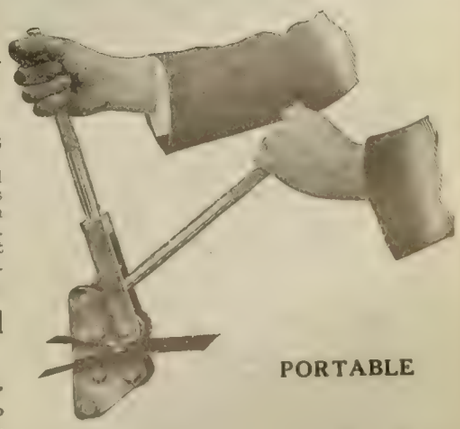

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Bertrams, Ltd., Edinburgh, Scotland
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A. B. Jardine & Co., Hespeler, Ont.
Montgomery, Smith & Co., Keynsham, Somerset, Eng.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo

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Ferrachute Machine Co., Bridgeton, N.J.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo

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SHEARS, SQUARING
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Brown, Boggs & Co., Hamilton, Canada
Peck, Stow & Wilcox, Southington, Conn.
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Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., W. R., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

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Sheldons, Ltd., Galt, Ont.

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Noble & Westbrook Mfg. Co., Hartford, Conn.

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Can. B. K. Morton, Toronto, Montreal.

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Strong, Kennard & Nutt Co., Cleveland, Ohio.

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Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York
Rhodes Mfg. Co., Hartford, Conn.

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MacKinnon, Holmes Co., Sherbrooke, Que.

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Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
J. H. Williams & Co., Brooklyn, N.Y.

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Prest-O-Lite Co., Inc., Toronto, Ont.
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Bliss, E. W. Co., Brooklyn, N.Y.
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Gooley & Edlund, Inc., Courtland, N.Y.
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John H. Hall & Sons, Brantford.
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McClean & Son, F. W., Niagara Falls, Ont.
National-Acme Co., Cleveland, Ohio.
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Rhodes Mfg. Co., Hartford, Conn.
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Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

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Pritchard-Andrews Co., Ottawa, Can.

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Century Steel Co. of America, New York
Colonial Steel Co., Pittsburgh, Pa.
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Eagle & Globe Steel Co., Montreal, Que.
Fairley Davidson Steel Co., New York, N.Y.
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Toronto Iron Works, Ltd., Toronto.

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St. Lawrence Welding Co., Montreal, Que.
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Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York
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Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
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Osborn (Canada), Ltd., Sam'l, Montreal, Que.

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Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

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Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
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Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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TOOL ROOM PARTITIONS
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Can. B. K. Morton, Toronto, Montreal.
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Deloro Smelting & Refining Co., Toronto, Ont.
H. A. Drury Co., Montreal.
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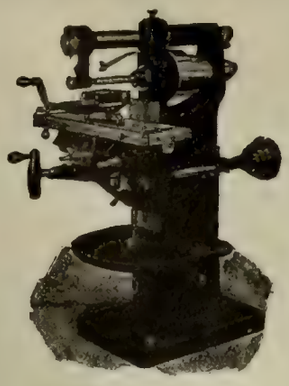
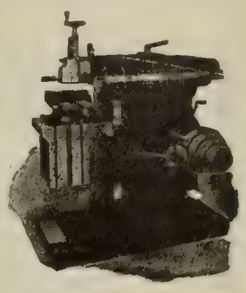


CUT YOUR SHOP COSTS



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Graton & Knight Mfg. Co., Worcester, Mass.
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A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XVIII. TORONTO, SEPTEMBER 27, 1917 No. 13

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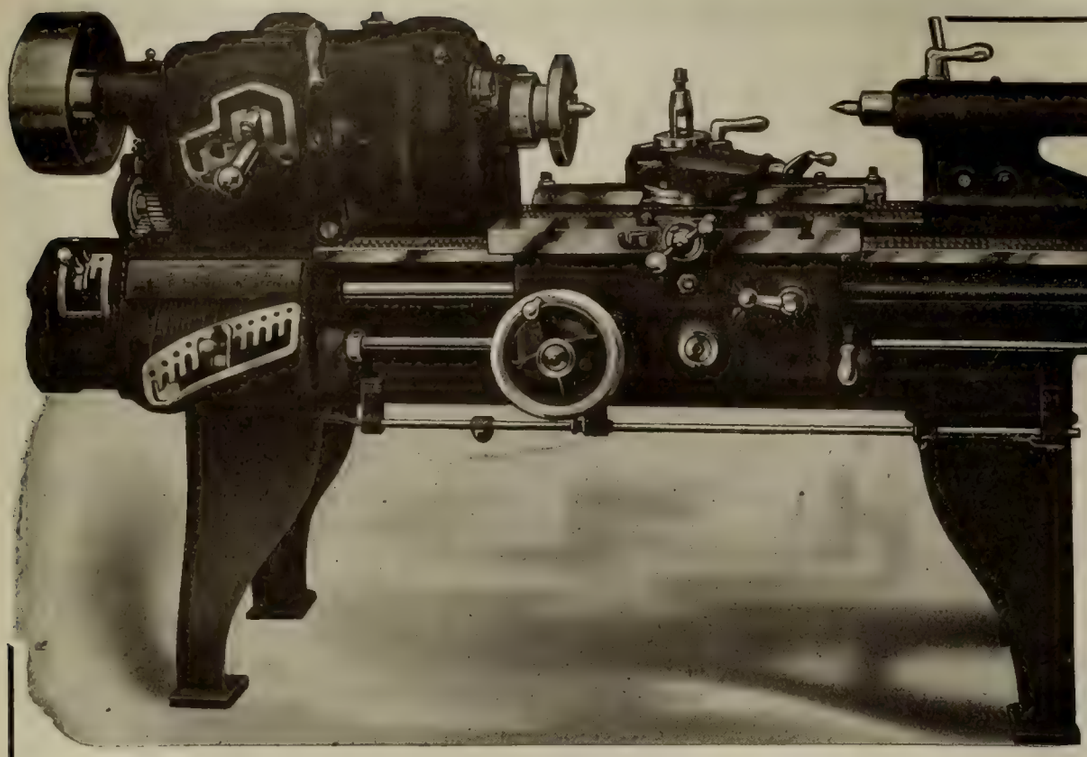

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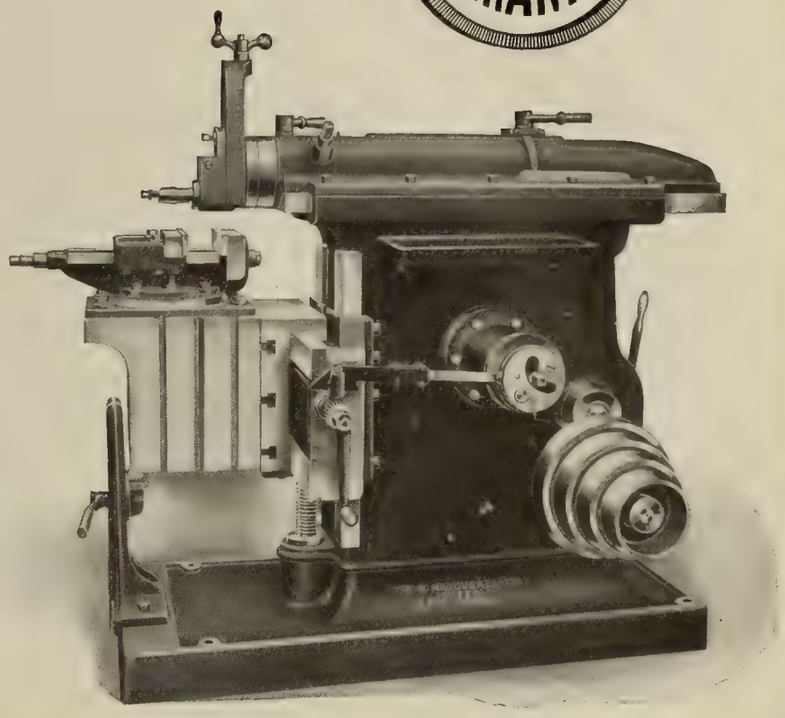

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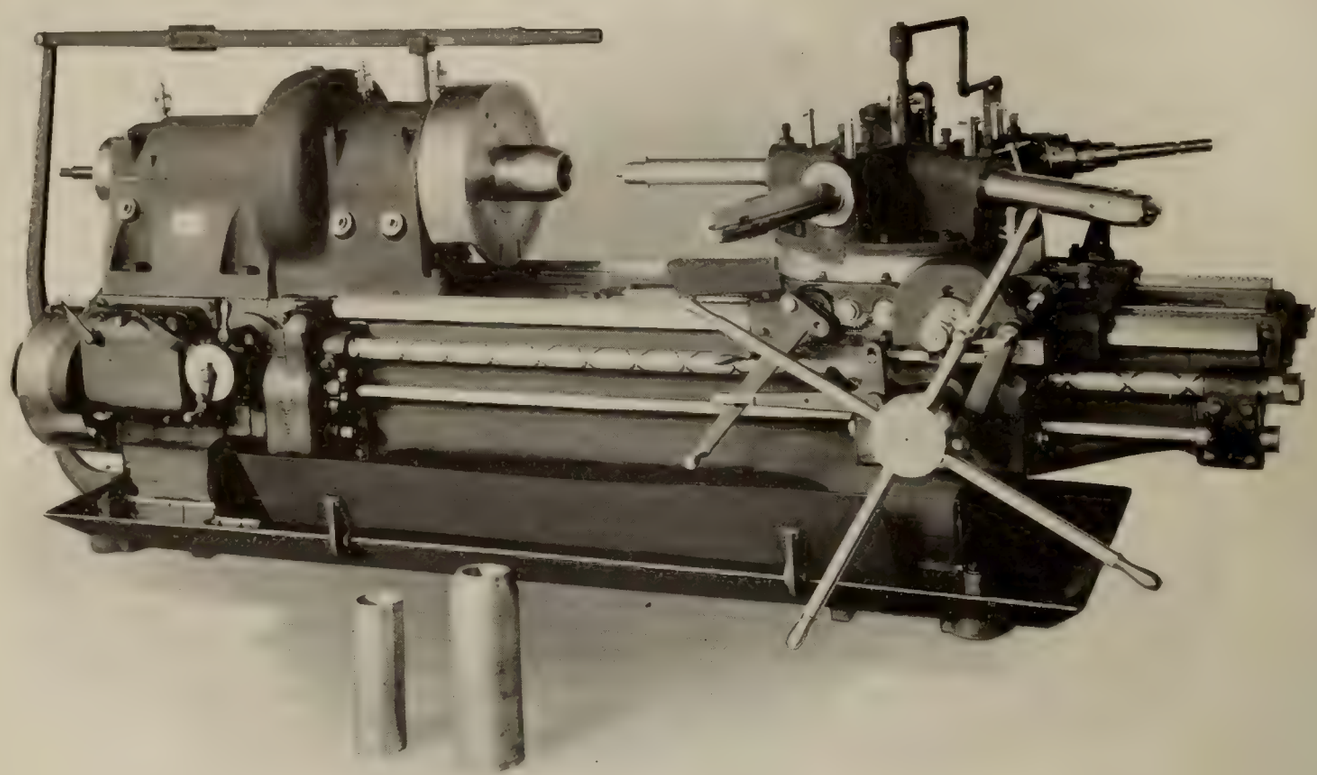

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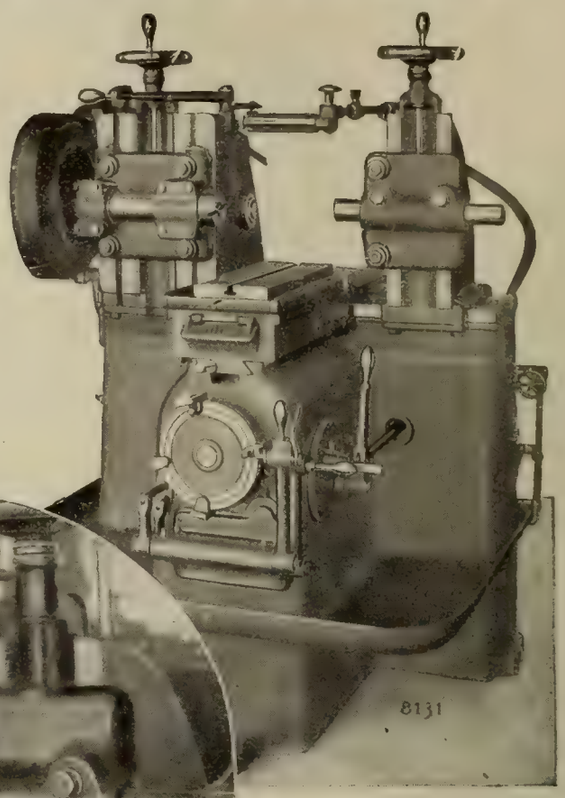

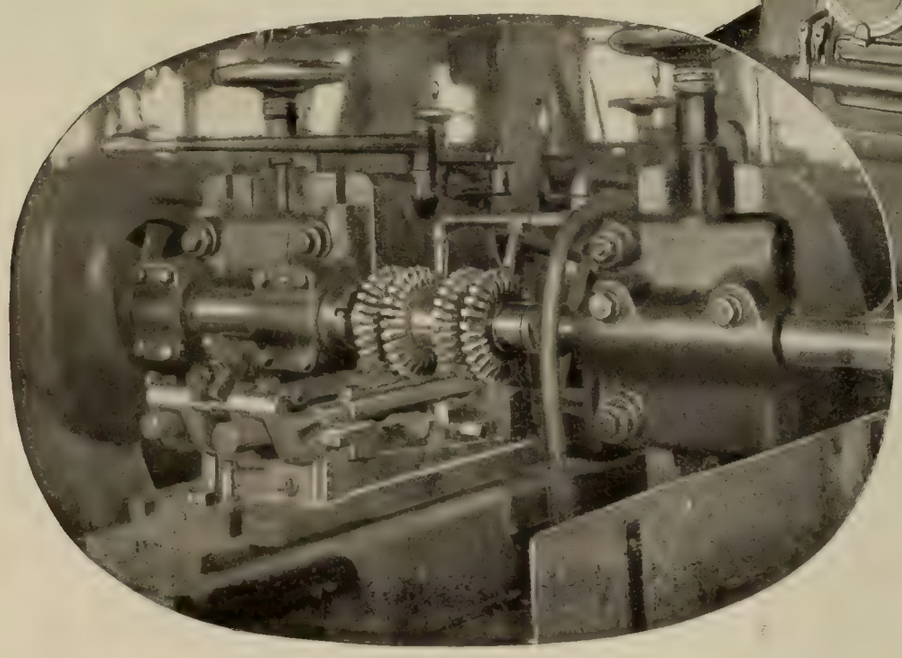

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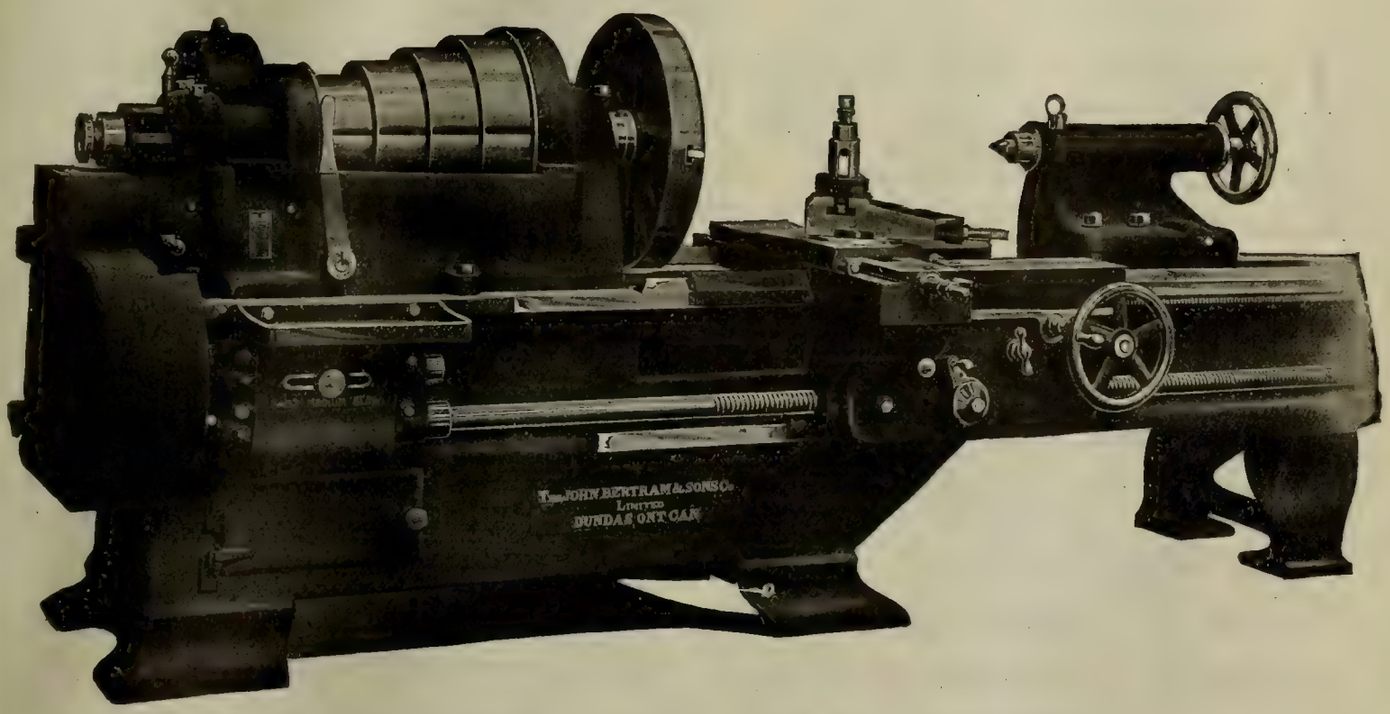

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The Publisher's Page

TORONTO October 4, 1917

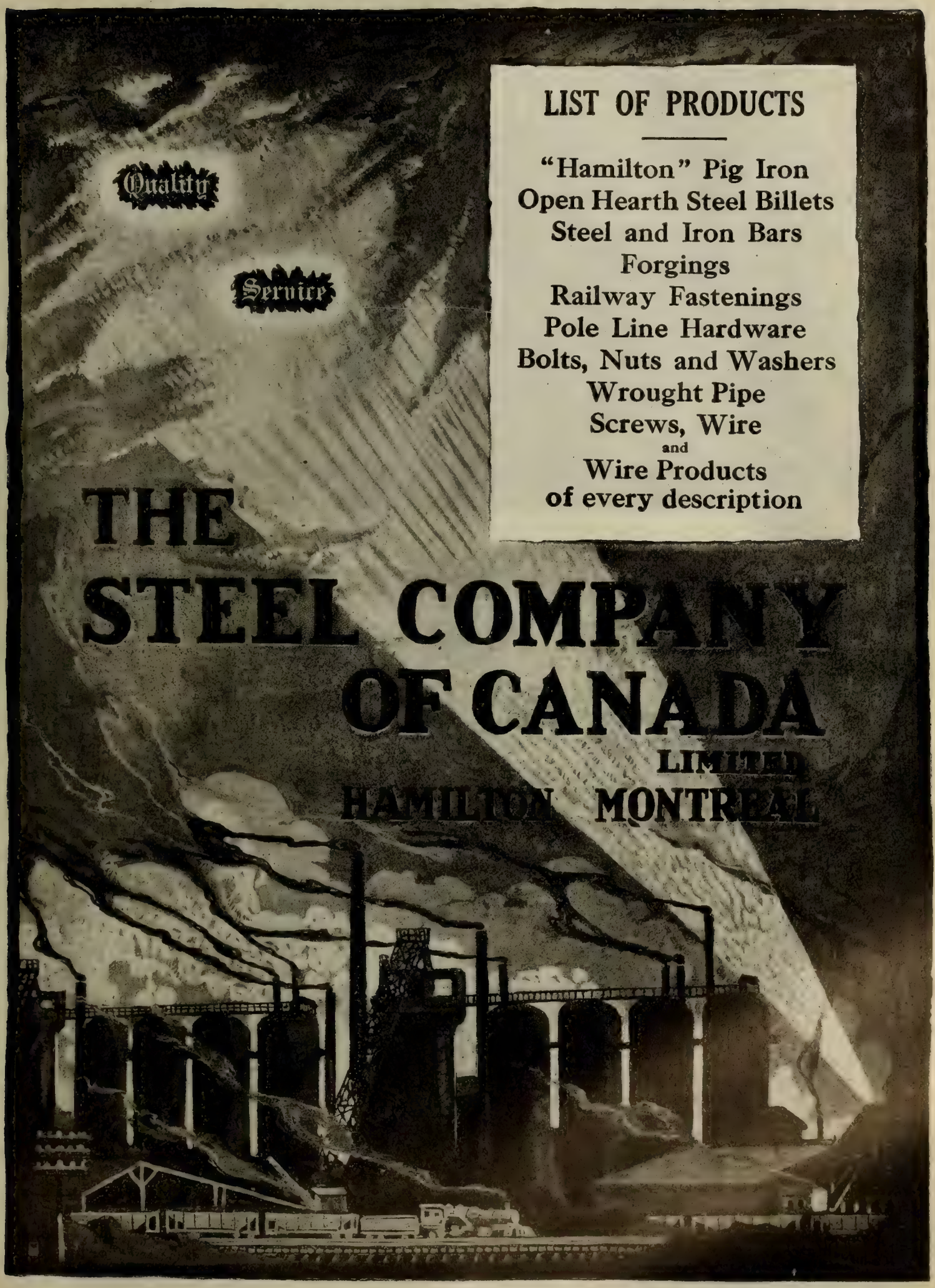
THE results of Lord Reading's visit to Washington indicate that the combined resources of North America are to be pooled for the common benefit of the Allies. Although the arrangement results from American co-operation, the resources of Canada constitute a fundamental necessity of it.

This opens up a new line of thought. If Canada is as a result of a sweeping Allied plan to be utilized to the fullest possible extent, the thought occurs that this plan may operate to Canadian benefit in conjunction with another general outcome of the war.

We refer to the constantly growing tendency toward centralization, specialization and the elimination of the wasted effort of long hauls and complicated distribution methods. The tendency of large manufacturing interests, such as, for instance, the United States Steel Corporation, is towards the turning out of the finished product as close as possible to the source of raw supply.

Canada ranks with Russia and China as the world's greatest reservoir of the raw material of many principal industries. Economically, industrially and politically, Canada is so far ahead of these principal rivals as to put it on the basis of actual potential production in a class by itself.

It is for this reason that thoughtful observers see for this country a great manufacturing growth that renders the establishment of a good connection here now most advisable on the part of those manufacturers who seek the line of least resistance for the development of their own interests.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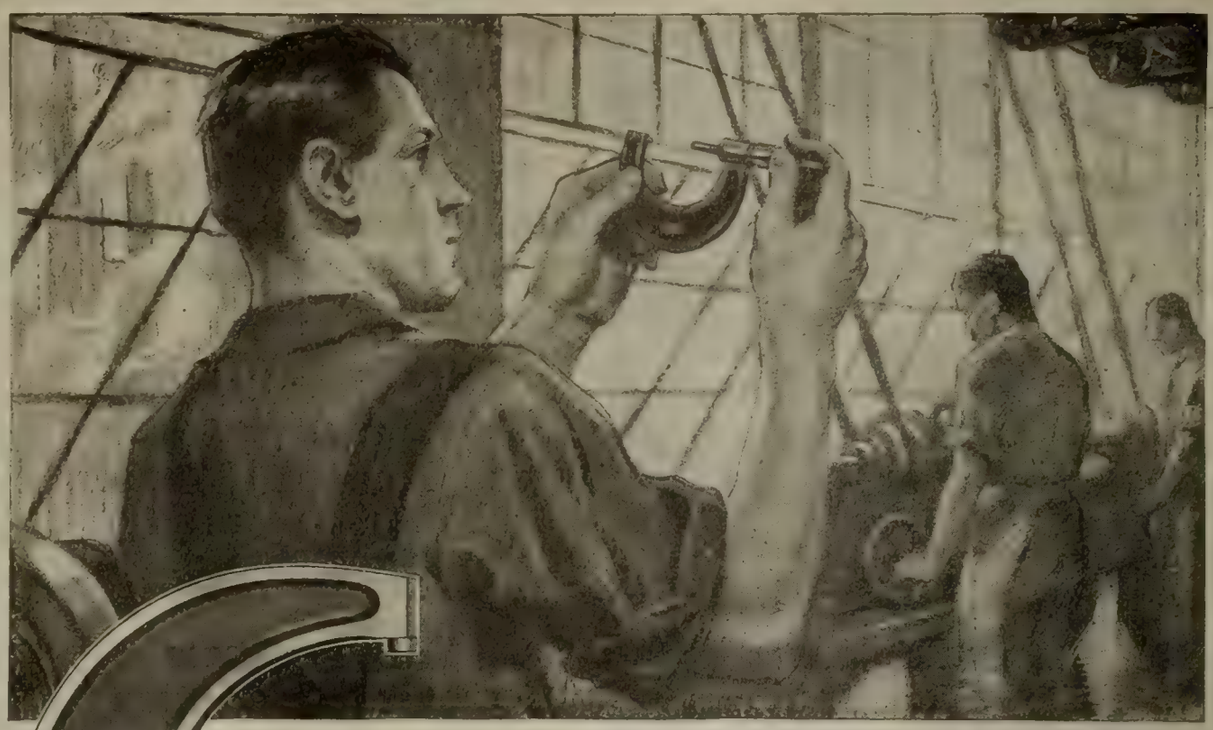

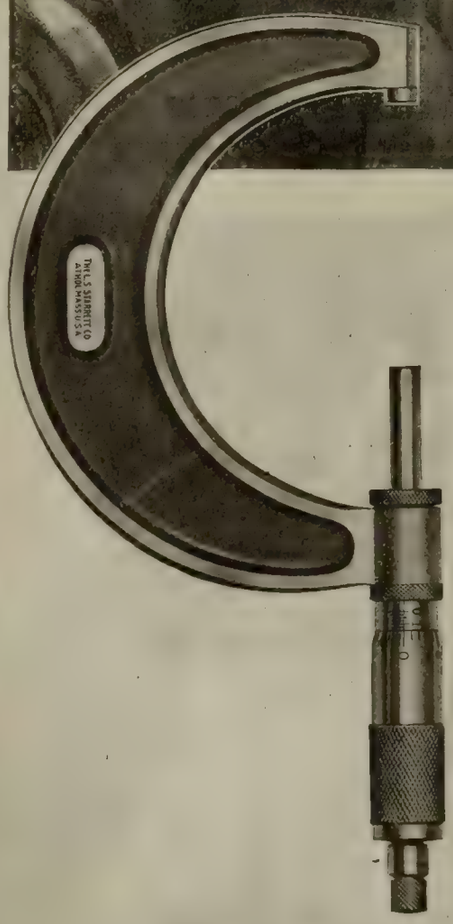

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Are your precision tools your best friends or your worst enemies? If you are never sure of the reading or if they wear easily and rapidly, you have to guess, and guessing produces seconds and makes thin pay envelopes.

If you use

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Starrett Tools
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you can be *sure* all the time. If a Starrett Micrometer reads .808 you know that the piece is exactly that diameter or thickness.

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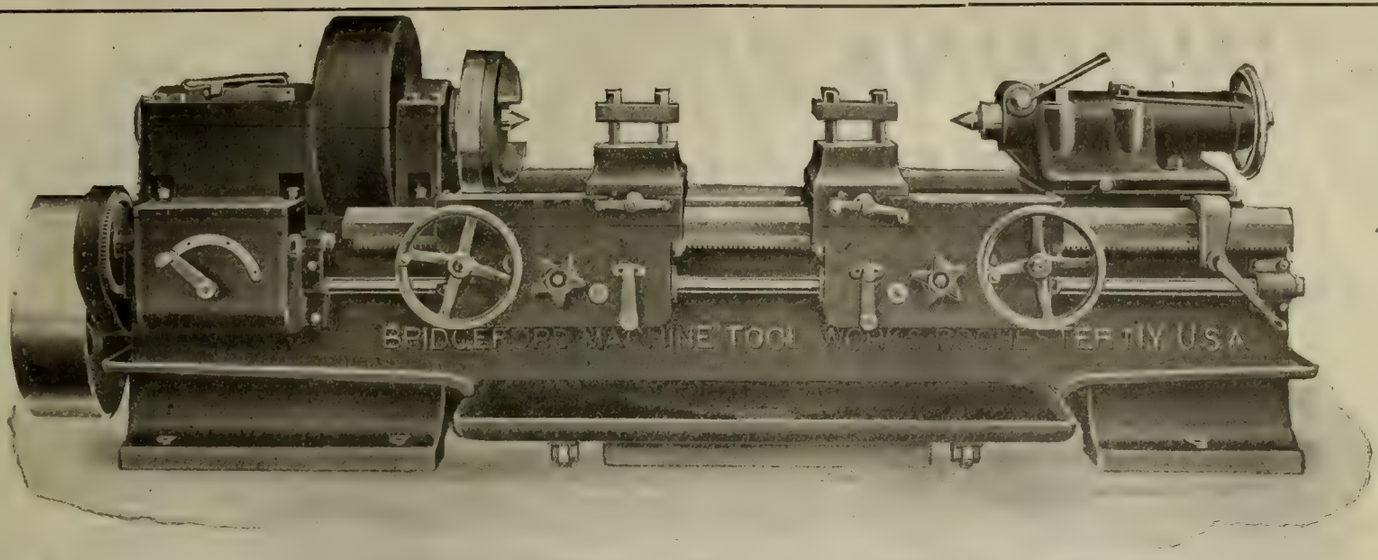
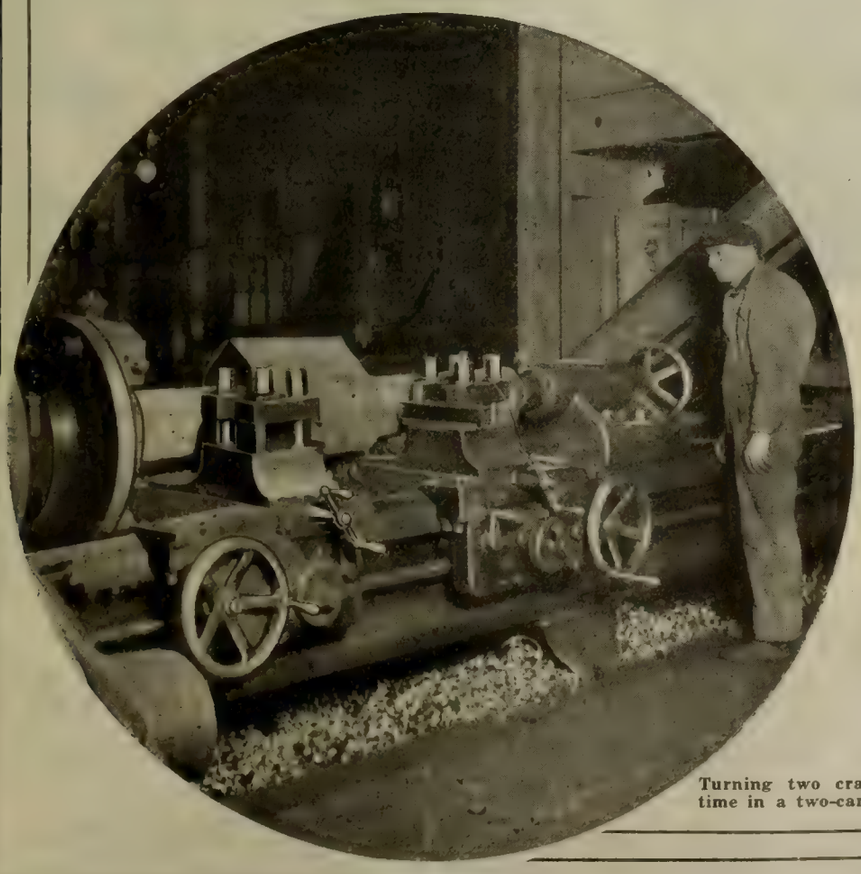


BRIDGEFORD HEAVY DUTY RAPID PRODUCTION LATHE

EARLY DELIVERIES
On These Heavy Forge Lathes

Why pay the extra cost for a screw cutting lathe, when a rapid production lathe is the machine you need? If your work is largely heavy forgings and shafts, put the extra cost into another carriage and double your production. Just look at the proportions of the

BRIDGEFORD
Heavy Duty Rapid Production Lathe



Turning two crank shaft bearings at the same time in a two-carriage Bridgeford.

Look at its size. There's strength there. It's a heavy duty lathe in the full meaning of the words.

Note the simplicity of its design. This elimination of all complicated mechanism makes an expert of an inexperienced operator. We have a few—a very few—available for early delivery.

Better write for particulars today.

Bridgeford Machine Tool Works

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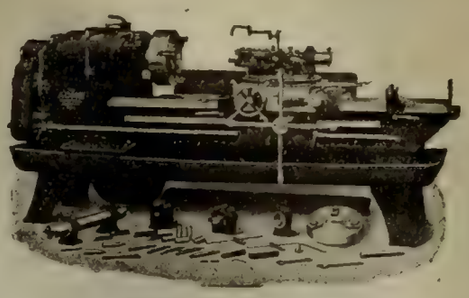
CINCINNATI ACME

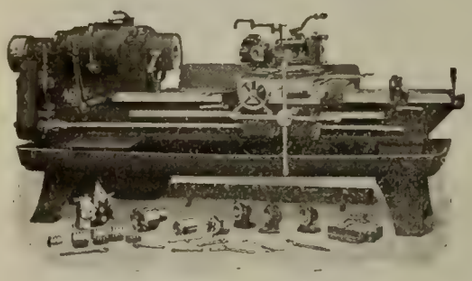
Fast, Accurate

Three Widely Used Turret Lathes



3¼"x36" Flat Turret Lathe with Chucking Equipment.

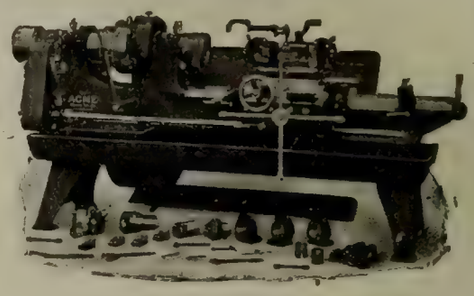
Cincinnati Acme flat turret lathes meet the most exacting demands for accuracy, convenience in operation and maximum production.



3¼"x36" Flat Turret Lathe with Bar Equipment.

A few of the meritorious features:
CROSS SLIDING TURRET revolves on hardened and ground stem of large diameter, and is automatically locked into position by hardened and ground tool steel taper plunger placed directly underneath cutting tool. OILING ARRANGEMENT provided so that oil can be fed to each individual tool. CROSS SLIDE moves on long, narrow, dovetail guide with wide, flat bearing surfaces on either side, and has adjustable taper gib to compensate for wear. SADDLE has continuous bearing on two exceptionally heavy vees on bed, and carries swinging stock stop (adjustable), attached to front.

Send for full details.



2¼"x26" Flat Turret Lathe with Bar Equipment.

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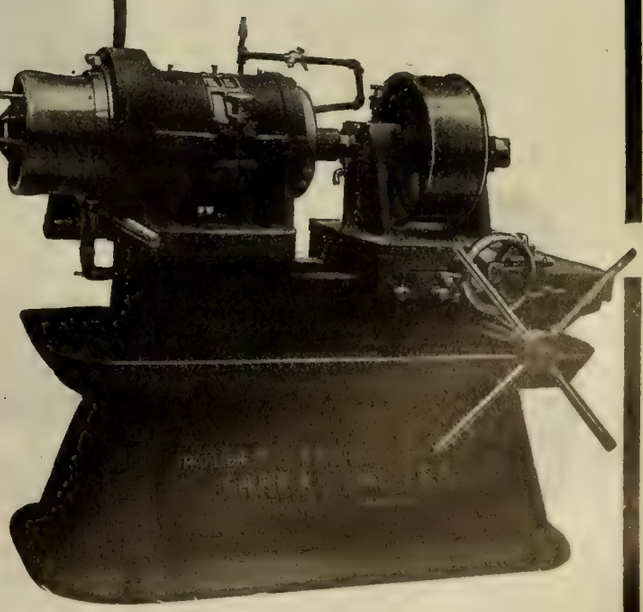

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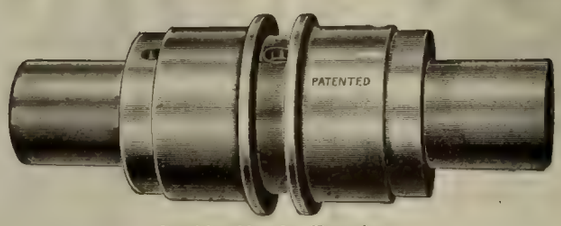


Double Clutch—Exterior.

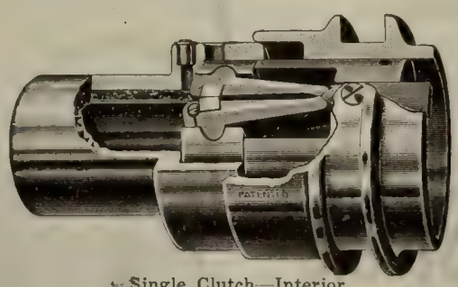
Been Watching Our Ads Lately?

We've been writing our ads to Machine Tool Manufacturers for the past few months. We've been telling you and showing you what Johnson Friction Clutches are doing for many of the Machine Tool Builders who are your business neighbors.

If you are a Machine Tool Builder and are not convinced that "Johnsons" are the clutches to use, it's our fault because we have just the evidence that will convince you in our files.

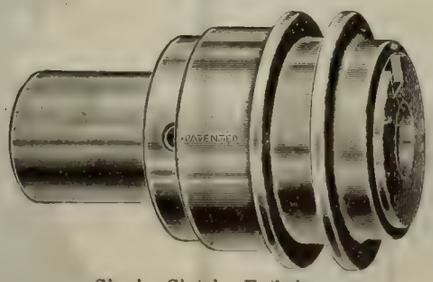
Let's talk about Clutches. Anyway, write to-day for the Blue Catalog.

Send for Our Booklet, "Clutches as Applied in Machine Building," and Yellow Data Sheets.

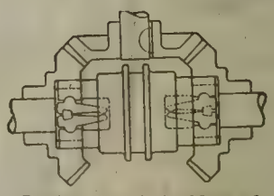


Single Clutch—Interior

Pulley mounted on Clutch Hub



Single Clutch—Exterior



Double Clutch in Nest of Gears

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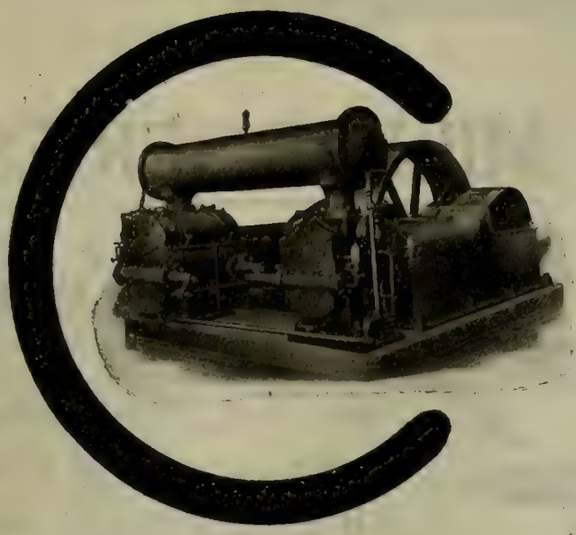
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



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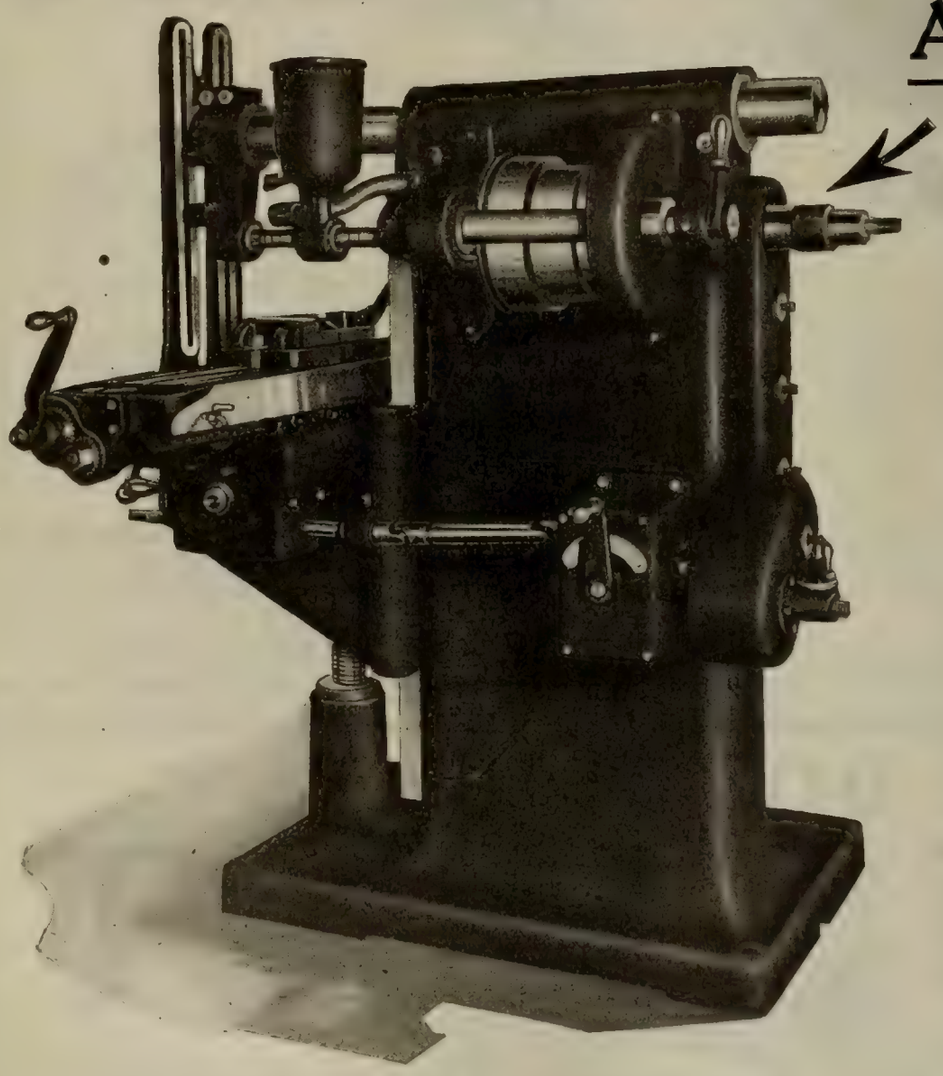

Have you really grasped the importance of an All Gear Feed on any machine tool. No doubt you have.

We did, and discarded the pulley drive, in favor of the more expensive---but more efficient Gear Drive. A study of the cut shows clearly the oilers at the end of each gear shaft as they follow down the train, in this way providing splendid lubrication, and easy access to all these points.

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Quality, Efficiency,

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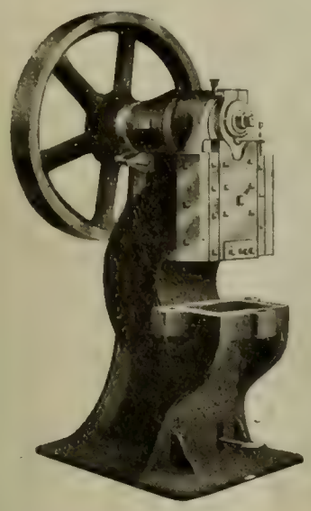
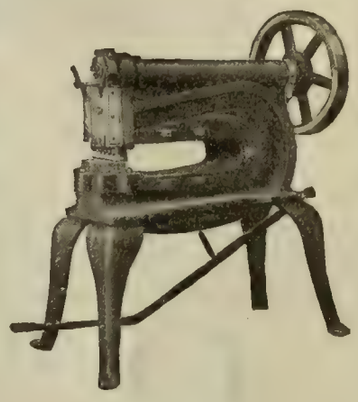
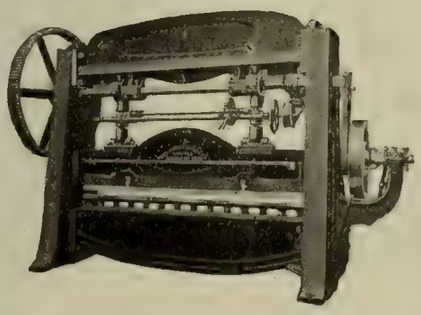


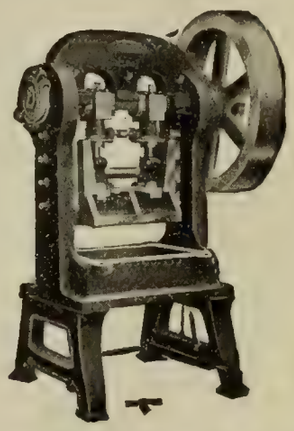
No. 2—G.A. Press



No. 126
Deep Throat Power Punch



No. 500—Power Brake or Press



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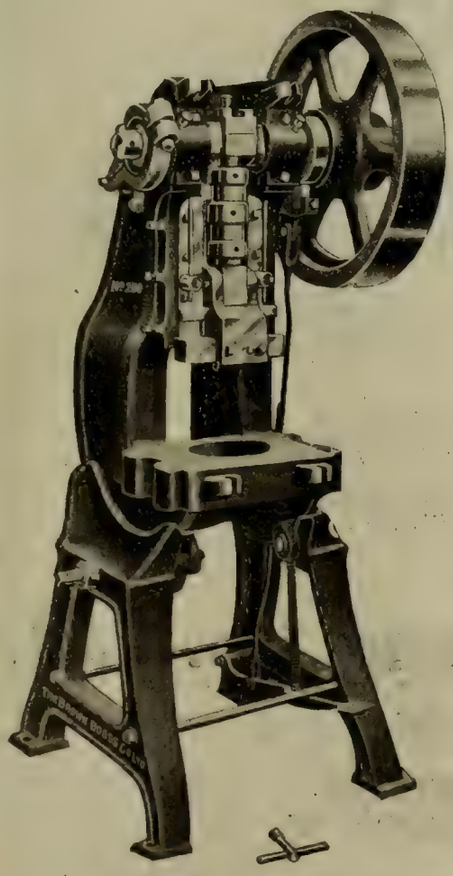
B.B. Presses embody special features for minimizing maintenance cost of both machines and tools.



No. 200—Power Press

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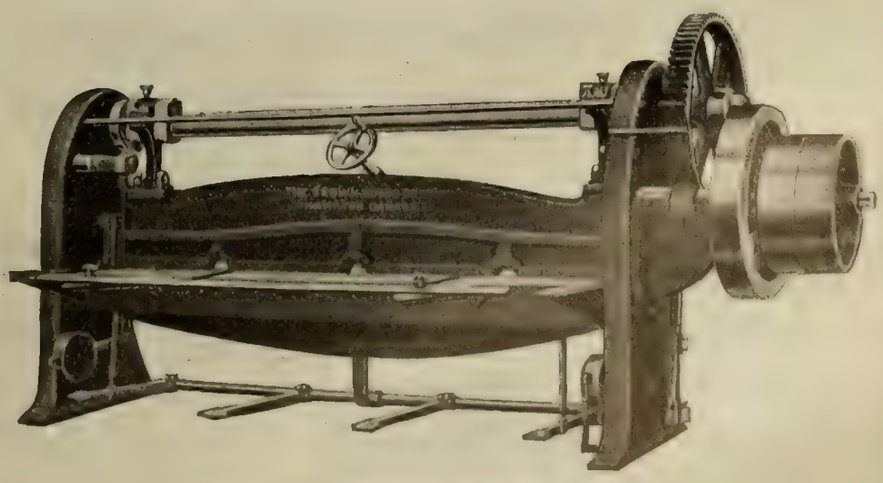

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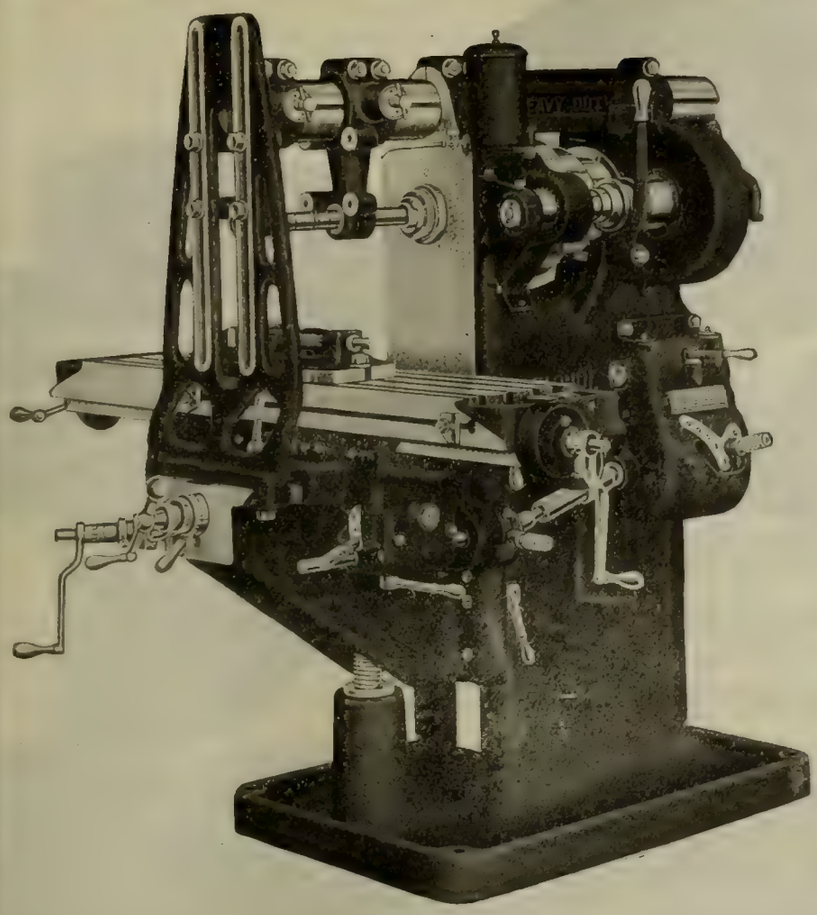

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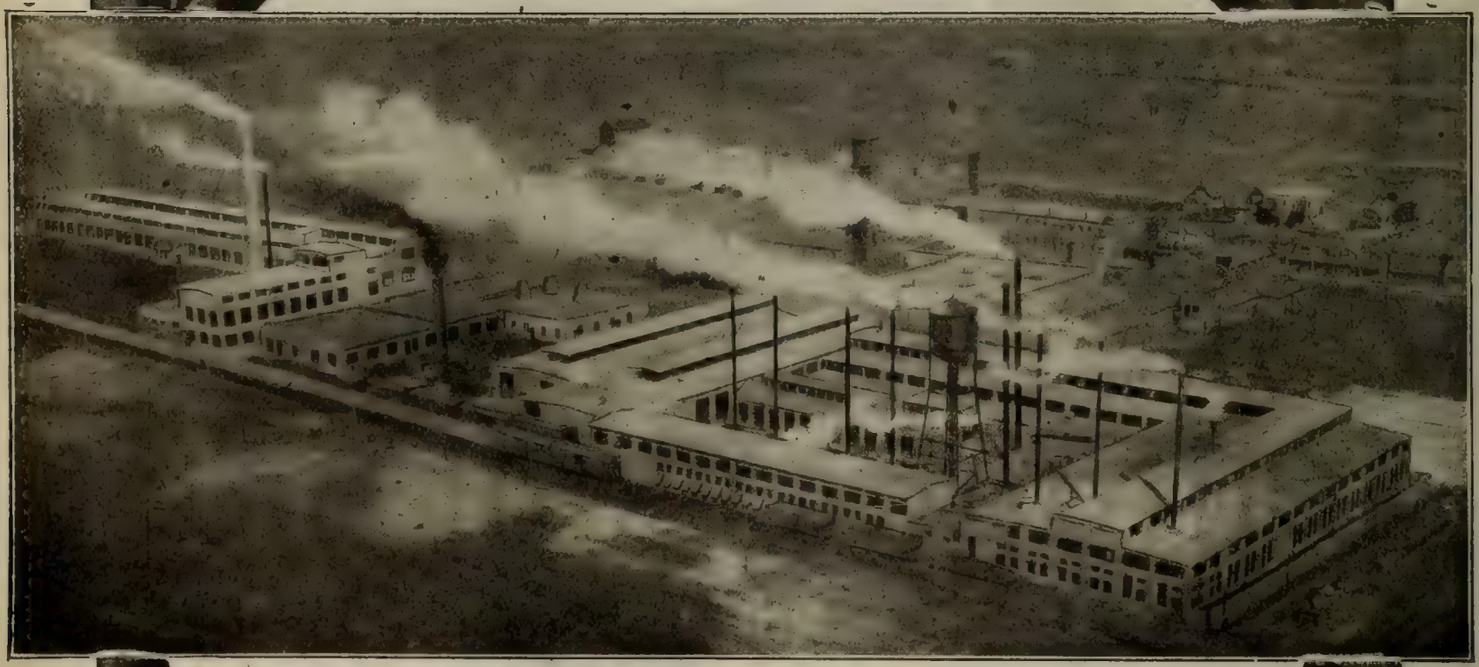

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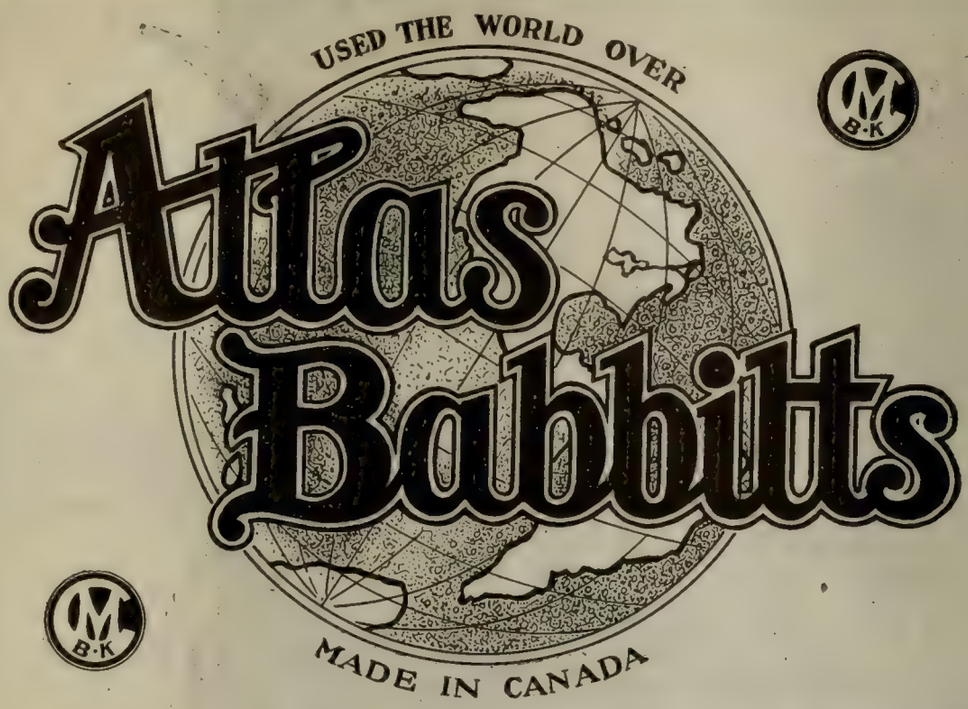

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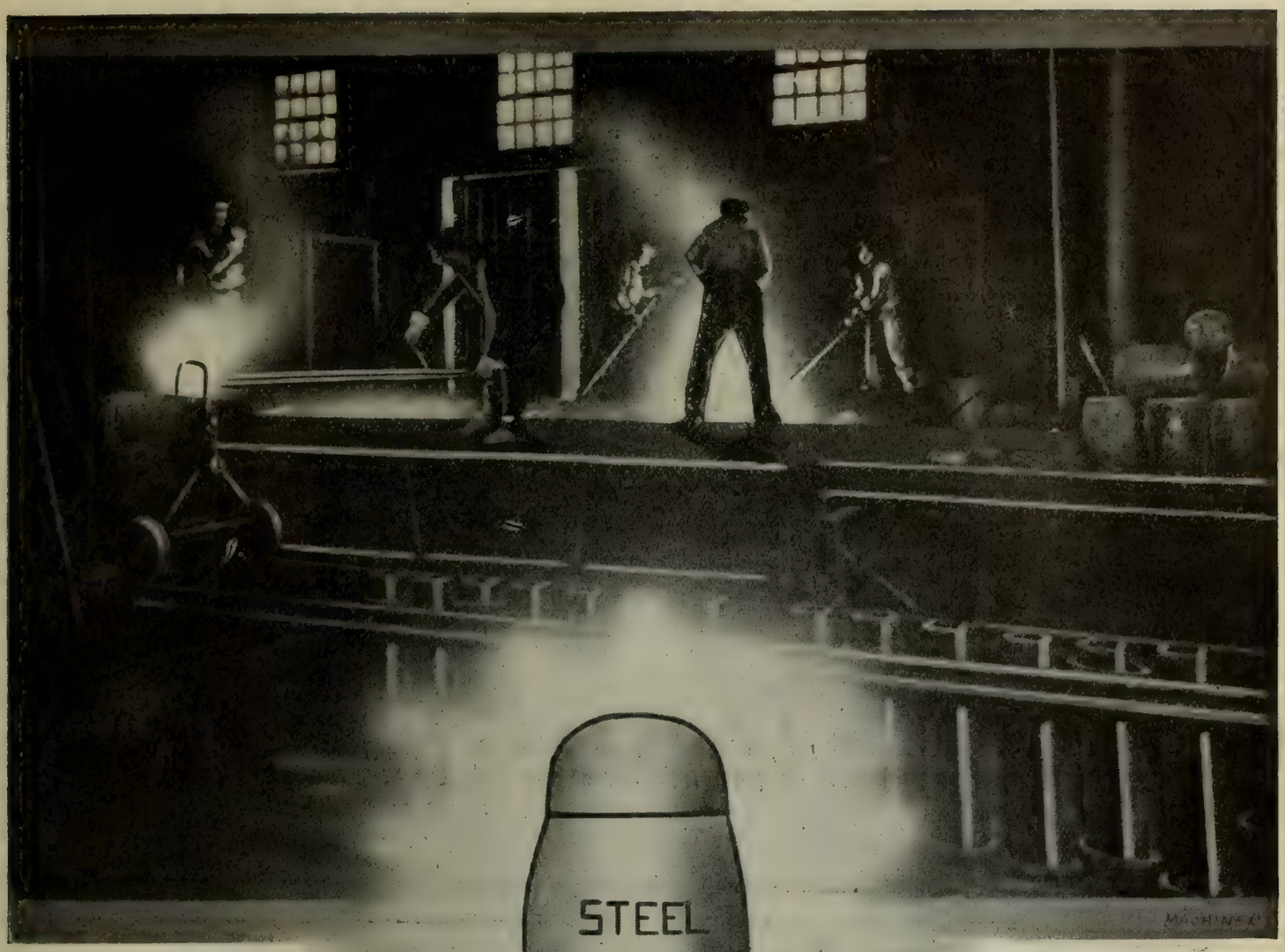

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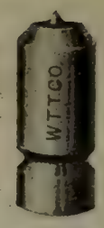

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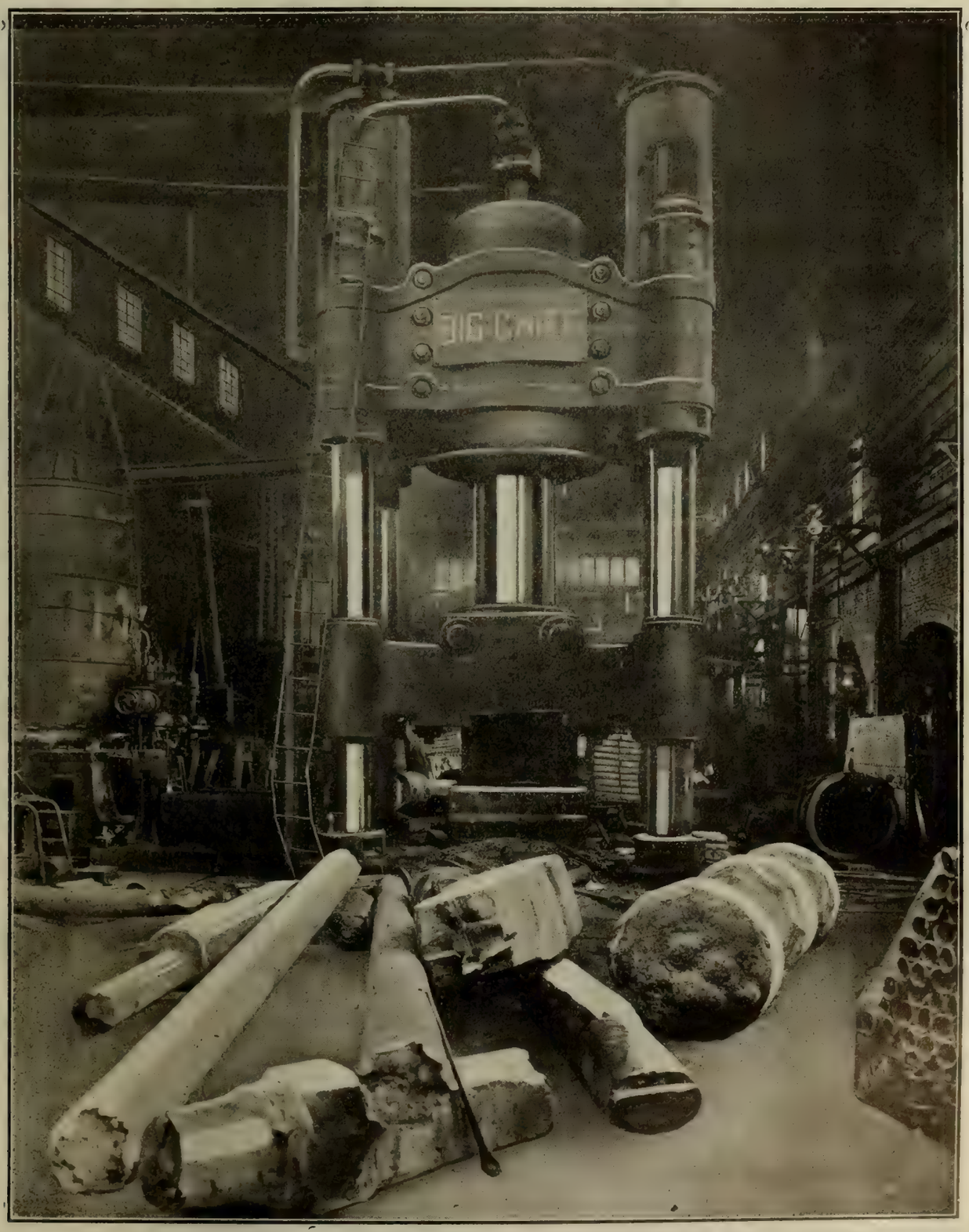

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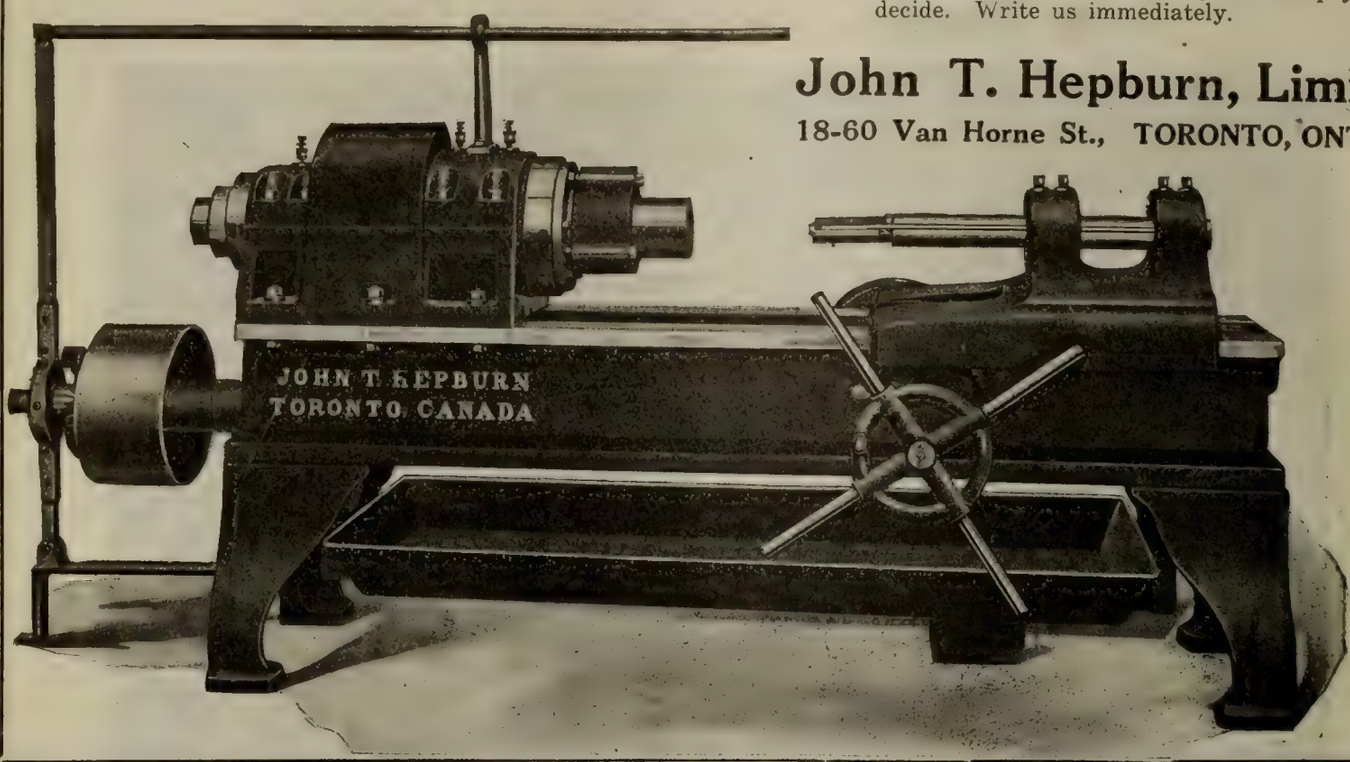
The product of a modern steam-hydraulic press is denser and more homogeneous than can be obtained with the steam hammer, due to the effect of the blow of the latter not penetrating to the centre, in contradistinction to the uniform kneeding effect of the press; while the amount of work that can be done by the latter at one time with little variation in temperature, strongly tends toward a better product. The greater uniformity and reliability of steam hydraulic forgings make their use imperative wherever high-class products are required.

Renew Your Old Lathe

Not necessarily by securing a new one but take advantage of our thoroughly equipped machine shop. We repair lathes, plane the lathe beds. We build lathes and in our repairing the same care is exercised. If you intend securing a new lathe, get a list of the Hepburn line before you to help you decide. Write us immediately.

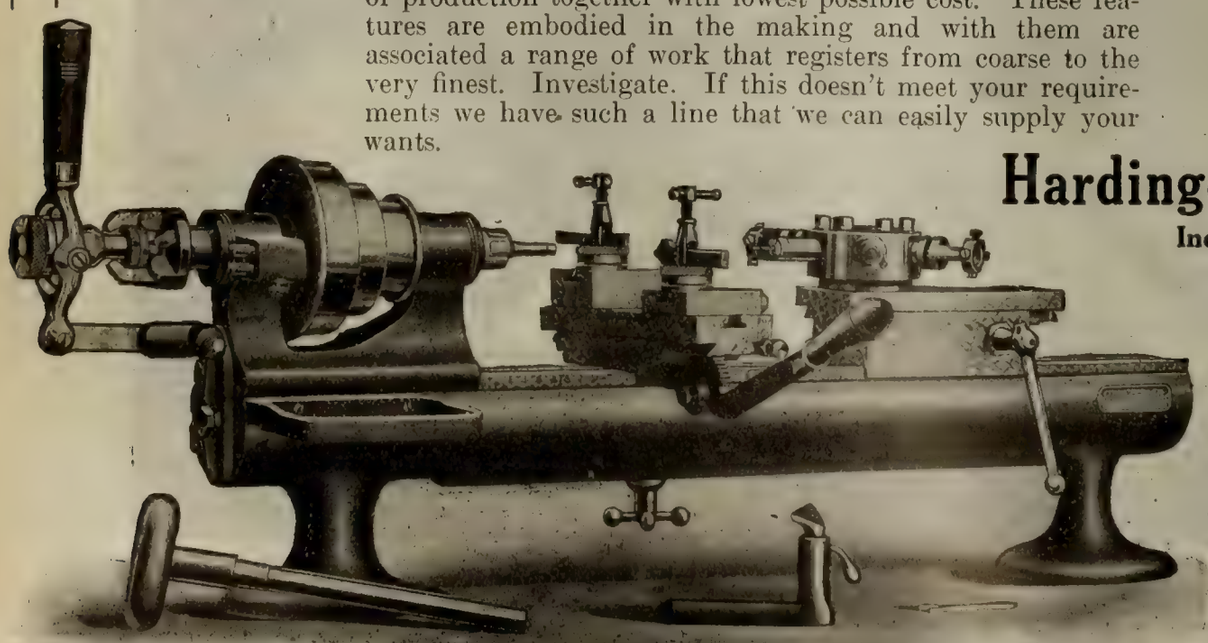
John T. Hepburn, Limited
18-60 Van Horne St., TORONTO, ONTARIO



If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.

Hardinge Bros.
Inc.
1770 Berteau Avenue,
CHICAGO, ILL., U.S.A.



Roelofson 6-in. Banding Machine

YOU couldn't imagine a more stury, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6" shells.

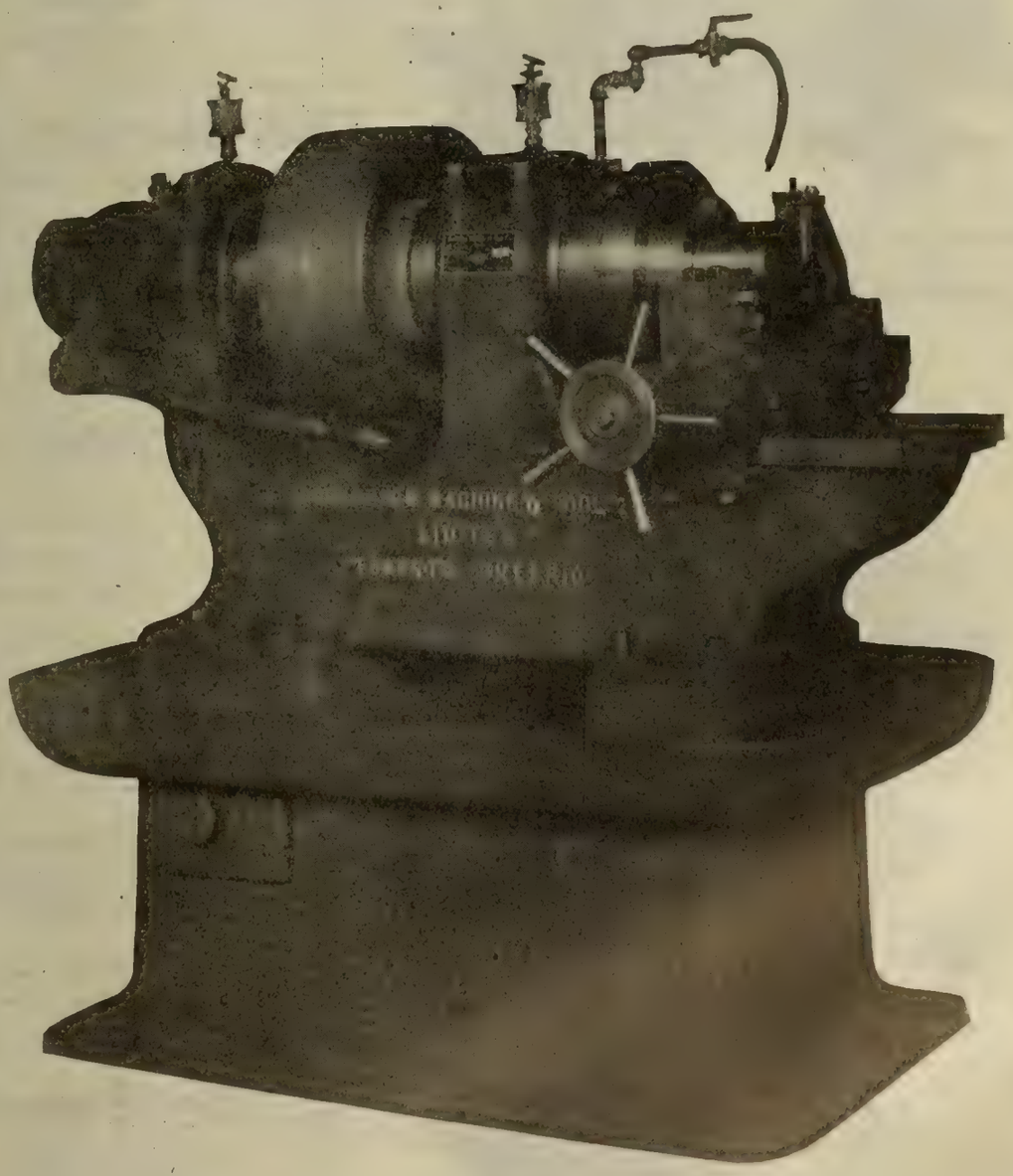
Roelofson Machine & Tool Co., Ltd.

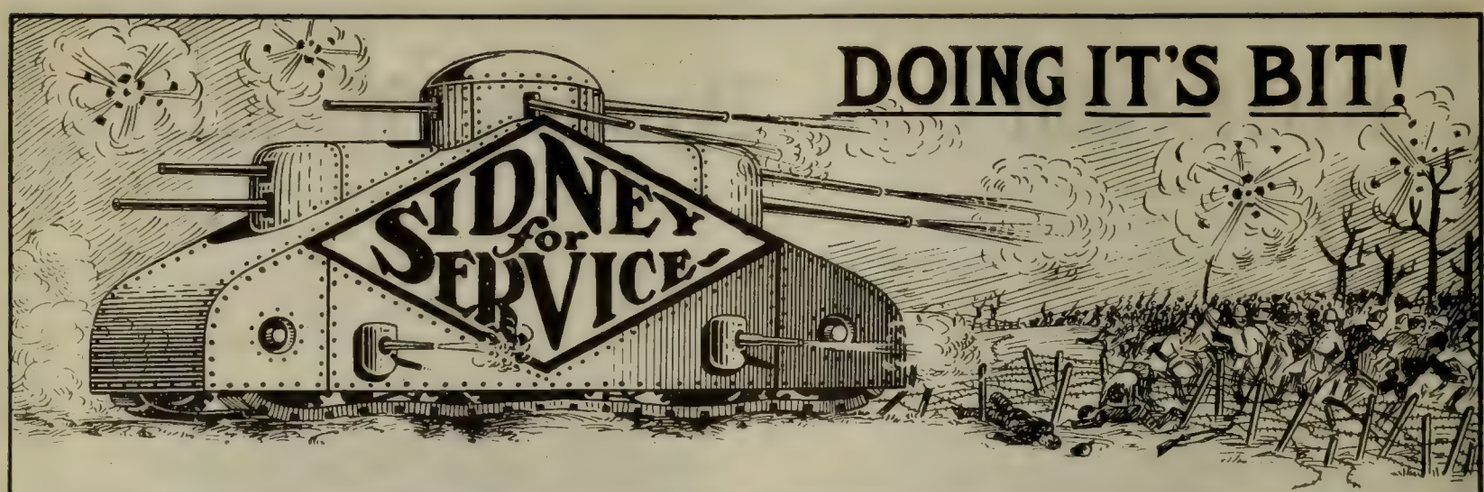
Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6" shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.

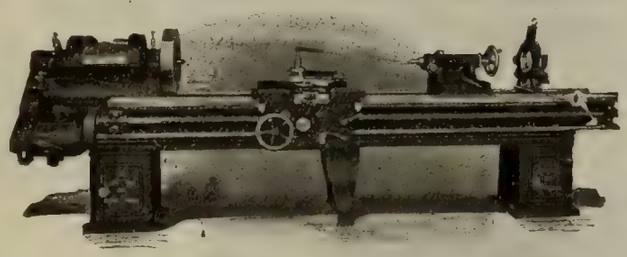




DOING IT'S BIT!

The hundreds of lathes that are doing service in the factories of Canada have rightly been called "the machines behind the men behind the guns."

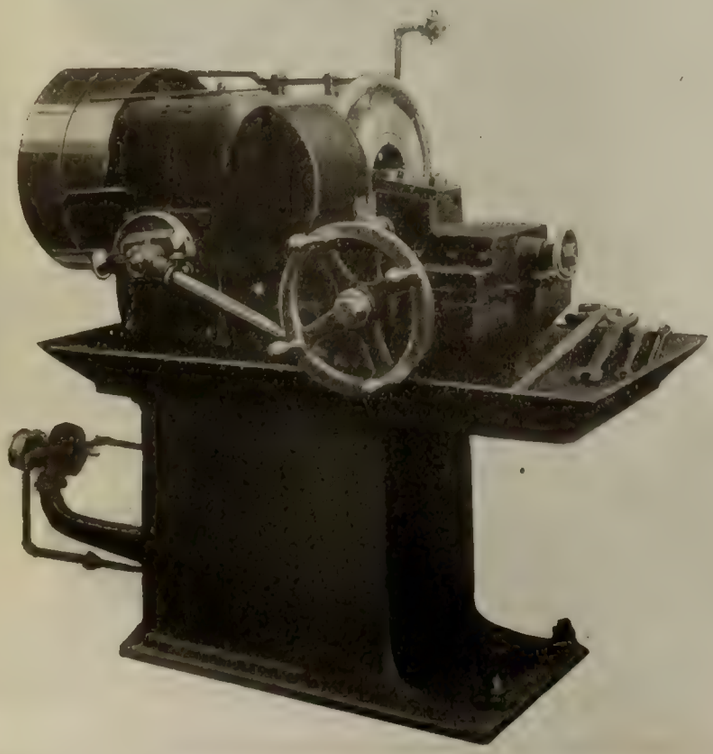
They are doing their bit to win the war. SIDNEY'S have won their spurs in the past three years! They have become one of the leaders among good lathes. Special attention is given in manufacturing to produce a lathe that will prove as steady as a rock under severe conditions. Write to the nearest agent and get Bulletin 30.



FOSS & HILL MACHINERY CO.,
MONTREAL, QUEBEC
H. W. PETRIE, LIMITED
TORONTO, ONTARIO

THE SIDNEY TOOL CO.,
SIDNEY, OHIO, U.S.A.

6″ Light
Base Facing
Machine



Another Worthy Victoria Product

THIS machine has proved itself a first-class investment.

Well-Designed
Carefully Built
Sturdy and Efficient

IT is a conclusive argument in favor of special purpose machines.

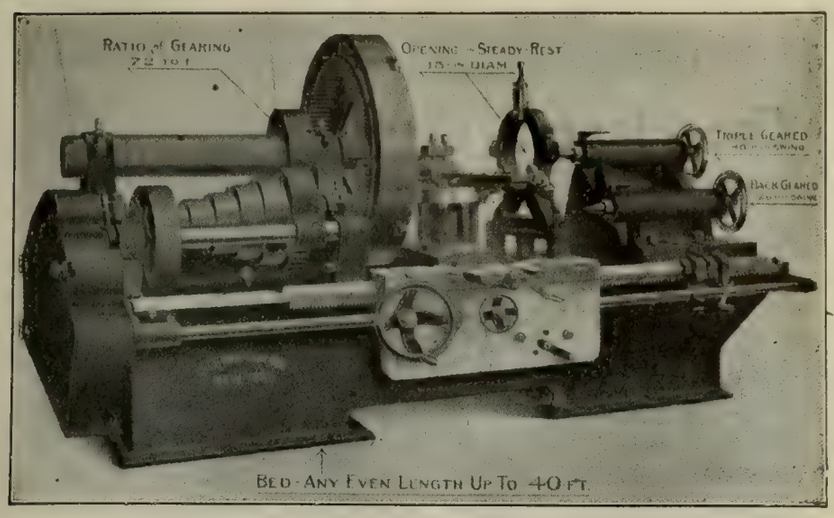
Space required 4x7 feet.
No countershaft required.
Approximate weight, 2000 lbs.

Victoria Foundry
Company Limited
OTTAWA - - ONTARIO

One Ship-building Plant

wrote to six different Lathe-Builders

and bought McCabe's "2-in-1" Double-spindle Lathe—on a 30-ft. bed—because it was "different" and built especially for such a wide range of work.



McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing
As a 48 inch Triple-Geared Lathe

What other big Lathe can you get, and have full use of your Lathe, whether you have big or small work?

What Lathe Manufacturers except McCabe could make such a low price possible?

No other Lathe builder turns out 48-inch Lathes in such big lots at a time, making the parts all duplicate and interchangeable.

And in addition to the 48-inch Triple-geared Lathe, the 26-inch is the "Lathe plus" feature McCabe offers you—at no extra cost.

DOUBLE service—convenience and capacity—all described in Latest Bulletins.

J. J. McCABE, 149 BROADWAY, NEW YORK

WHITING AIR HOISTS

Most convenient for the many quick, short lifts about the average shop.

Valve stem does not pass through air chambers and therefore no packings are required.

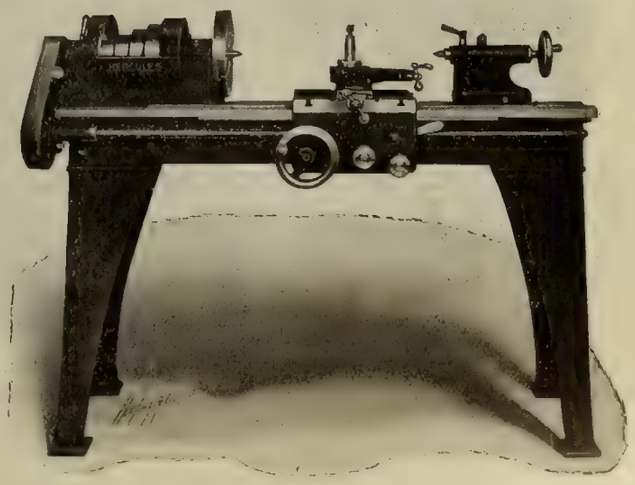
Automatic cut-off guards against waste of air.

All details the result of many years' study in manufacturing and operating cranes and hoists of all kinds.

Send for catalog 119

Complete Foundry Equipment. Cranes of all Types.

WHITING FOUNDRY EQUIPMENT CO. HARVEY-ILL. U.S.A. CHICAGO SUBURB.



LATHES

12", 16", 18" and 21" swing

Strictly modern in design, rigidity and accuracy guaranteed.

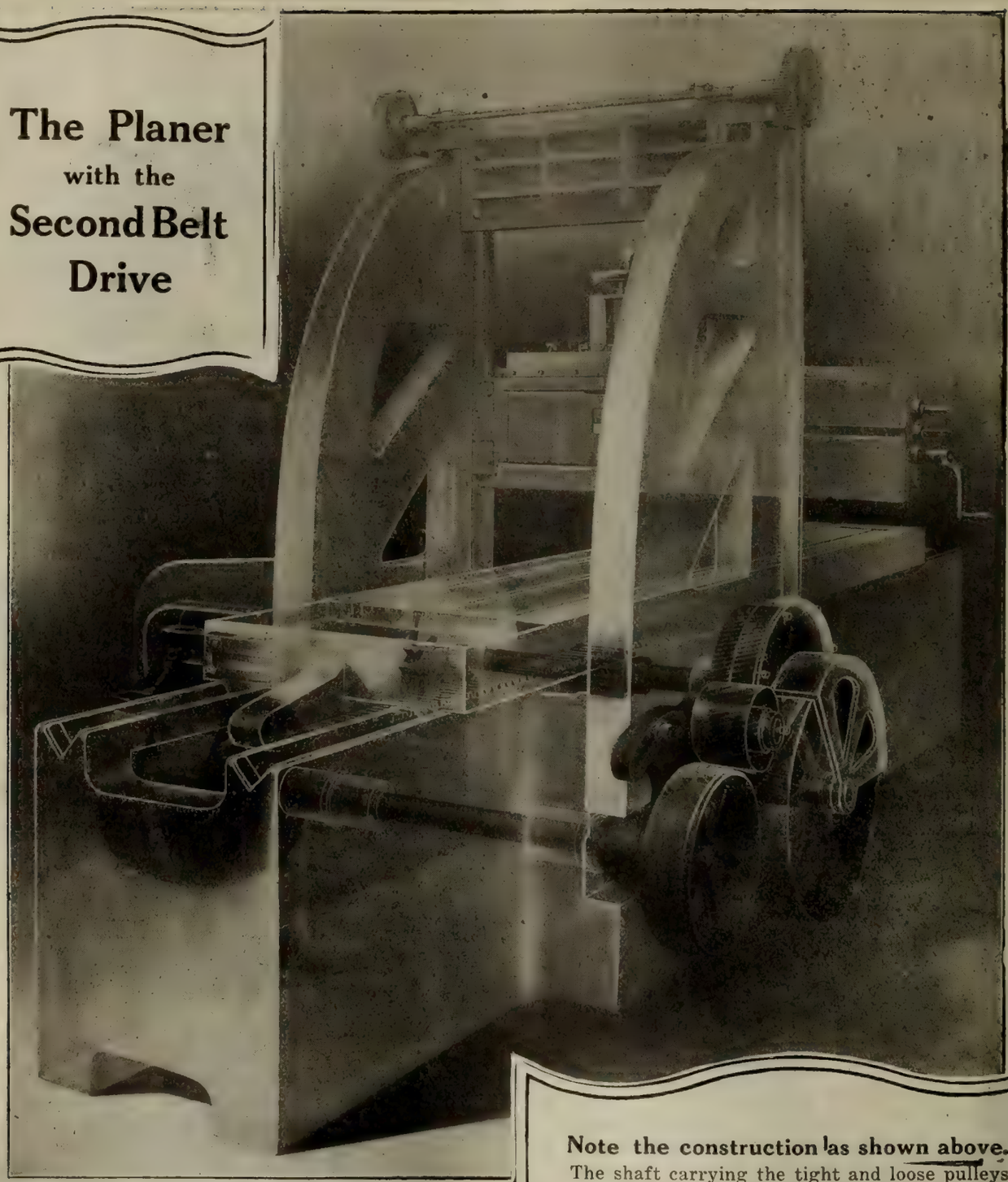
Himoff Machine Company

45 Mills Street

Astoria, City of New York, N.Y.

If any advertisement interests you, tear it out now and place with letters to be answered.

The Planer with the Second Belt Drive



Note the construction as shown above.

The shaft carrying the tight and loose pulleys extends clear through the bed to the opposite side of planer. Mounted on the shaft is a small pulley, known as the second belt pulley. From this pulley an endless belt, kept taut by an adjustable idler, conveys the power to the larger pulley, which carries a spiral pinion. This spiral meshes with a gear on the end of driving pinion shaft, which contains in itself the pinion driving the table.

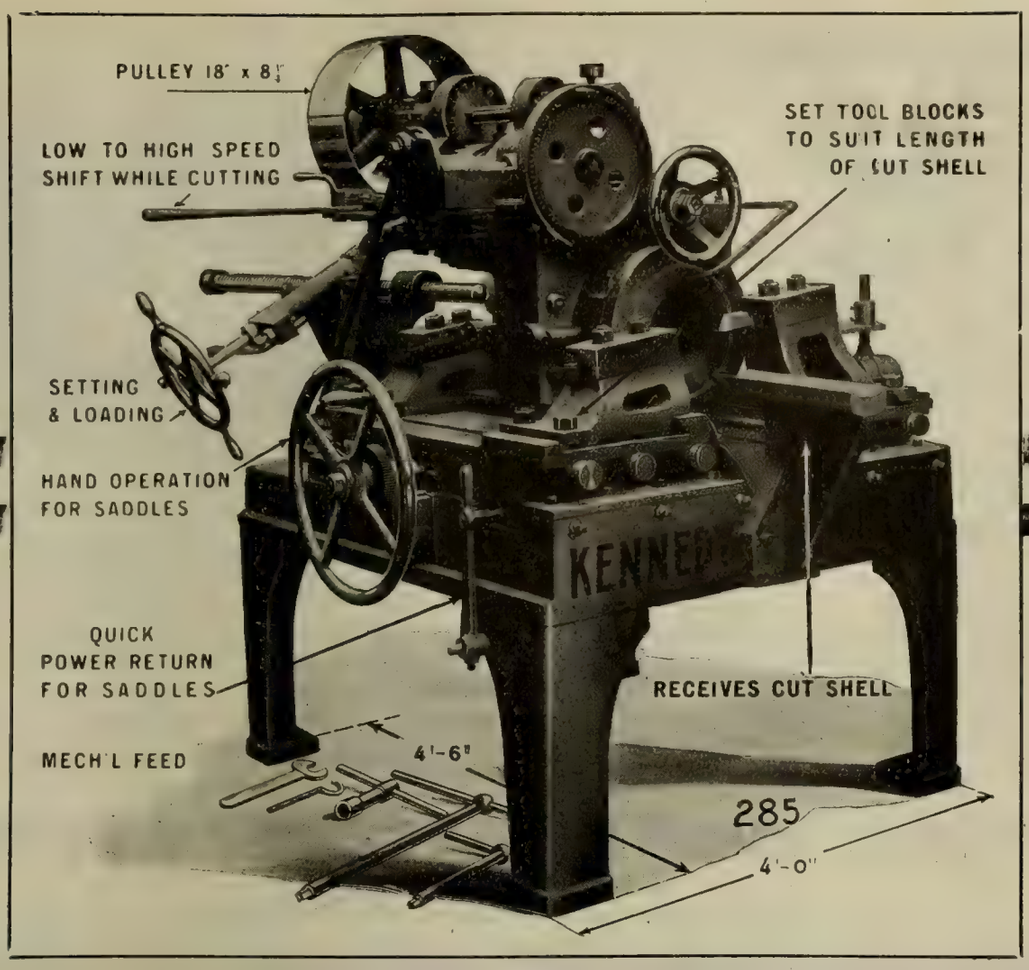
Thus the usual bull-wheel, and the noisy, inefficient gear train, are eliminated.

The smooth, easy action obtained by this belt drive allows the use of high cutting and return speeds.

Whitcomb-Blaisdell Planers have many distinctive features for rapid, accurate production. Write for the Illustrated Catalog that tells ALL about them.

Whitcomb-Blaisdell Machine Tool Co.
WORCESTER, MASS., U.S.A.

Whitcomb-Blaisdell Planers



6-inch Shell Cutting-off Machine

Cuts both ends at once

Forgings load in one end and discharge out the other end when cut

A Girl can operate it.

New quick power return for saddles

DELIVERIES REASONABLE

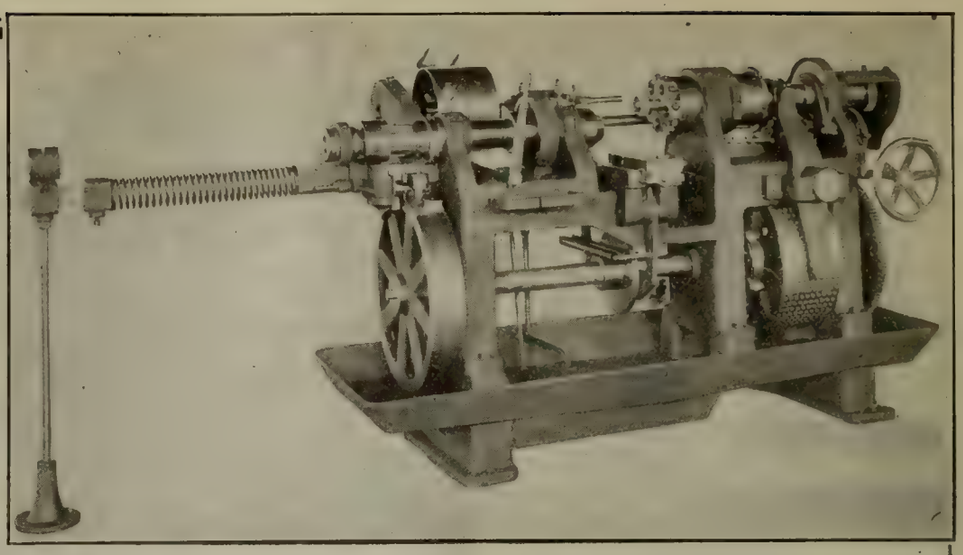
Wm. Kennedy & Sons, Limited

Owen Sound, Ontario

The Chicago Automatic Screw Machine

TEN YEARS OF EXTENSIVE MANUFACTURE OF ONE PRODUCT — AUTOMATICS — STAND BEHIND EVERY MACHINE.

No complicated mechanism or a system of cams that are difficult to determine and arrange on this machine.



The rigidity of the machine has not been sacrificed for the flexible features which are embodied in the Chicago Automatic. Alignment is correct and there are no parts where excessive wear takes place—therefore, accurate production is assured during the long life of the machine.

Spindle speeds suitable to different sizes and kinds of stock within the capacity of the machine are obtained by changing two gears on the spindle head.

In less than six weeks we can place Chicagos in your plant ready for production.

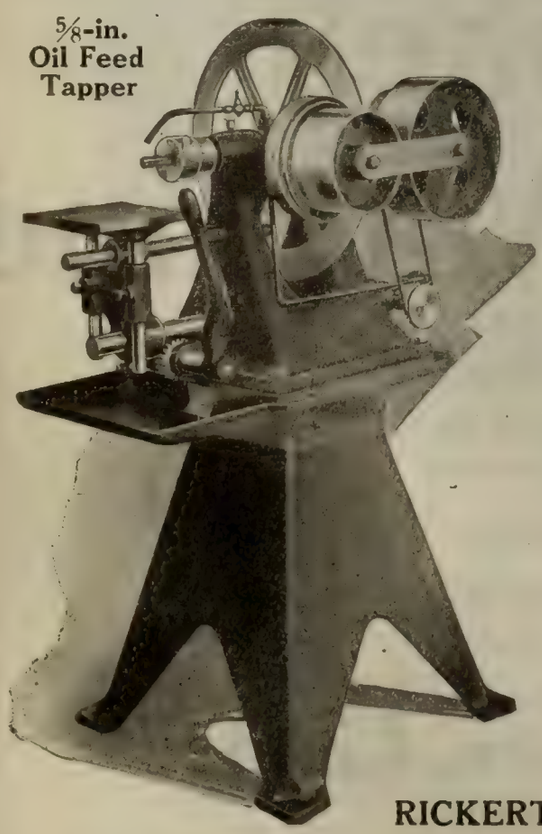
They must satisfy you before we consider them sold. Write us about all the features now.

THE JOHN MACNAB MACHINERY COMPANY

NEW YORK CITY, U.S.A.

European Representatives: John Macnab, Hyde, England

5/8-in. Oil Feed Tapper



This 5/8" Oil Feed Tapper is featured by the continuous oil feed, which allows greater speed, increased efficiency and output, and longer life.

THE RELIABLE

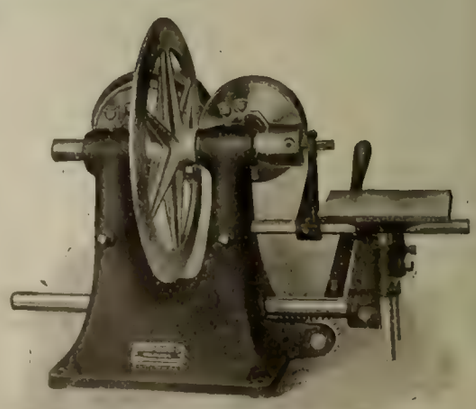
RICKERT-SHAFER TAPPERS

Speed, Accuracy and Minimum Breakage

These are outstanding results in shops that have installed R-S Tappers.

R-S range of Tappers permit of all kinds of work from 3-16" to 5/8". Made in bench, vertical and horizontal designs.

Pleased to tell you all about them. Write.



Bench Tapper

RICKERT - SHAFER COMPANY

ERIE, PA., U. S. A.

This is Our Address—How Can We Serve You?

ALFRED HERBERT, Foreign Agent.

COVENTRY, ENGLAND

DO YOU WANT TO SEE SOME LATHE?

The Heaviest and Most Powerful of its size made. Every line Symmetrical, every part Proportioned. Looks like a 30-inch; does as much work.

CISCO 24-INCH ENGINE LATHE

is ready for you now. It has the CISCO earmarks of simplicity in operation and of design. It is accurate and efficient. It is provided with many conveniences, shear wipers, double cabinet legs with shelves and doors opening oppositely; semi-enclosed head, in fact everything needed for a good lathe.

ASK WILLIAMS TO LET YOU KNOW ALL ABOUT IT

and if you want one soon, don't be too long in asking. Williams will also sell you a CISCO 14", 16" or 18", tool room or engine.

THE CINCINNATI IRON AND STEEL COMPANY

CINCINNATI, U. S. A.

Makers of the "LATHE WITH THE PULL"

—THREAD CUTTING—

COLLAPSING TAPS AND SELF-OPENING DIES

NAMCO Self-Opening Dies are made in revolving and non-revolving types, for use on Automatic Screw Machines, Bolt or Stud Threaders, etc.

—Their open construction makes them practically self-cleaning.
—Adjustments are easily made by micrometer gauge.
—Chasers are correctly made and supported directly back of the cutting edge.

A NAMCO Die for every threading requirement.

NAMCO Taps have these distinctive features:—

Positive collapsing and resetting—with no damaged threads.

"No hole too deep"—cutting diameter is the largest diameter on the tap.

Simplicity of construction—less parts to adjust or wear out.

Sold on the basis of less cost per thread tapped.

Special catalog sent on request—specify "O-D" or "Tap," or both.

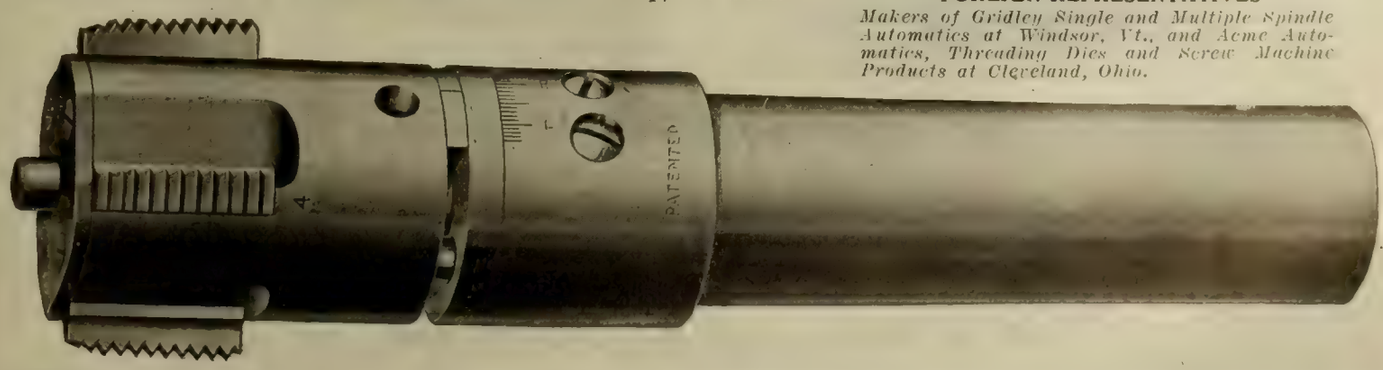
The **NATIONAL ACME COMPANY**
CLEVELAND, OHIO

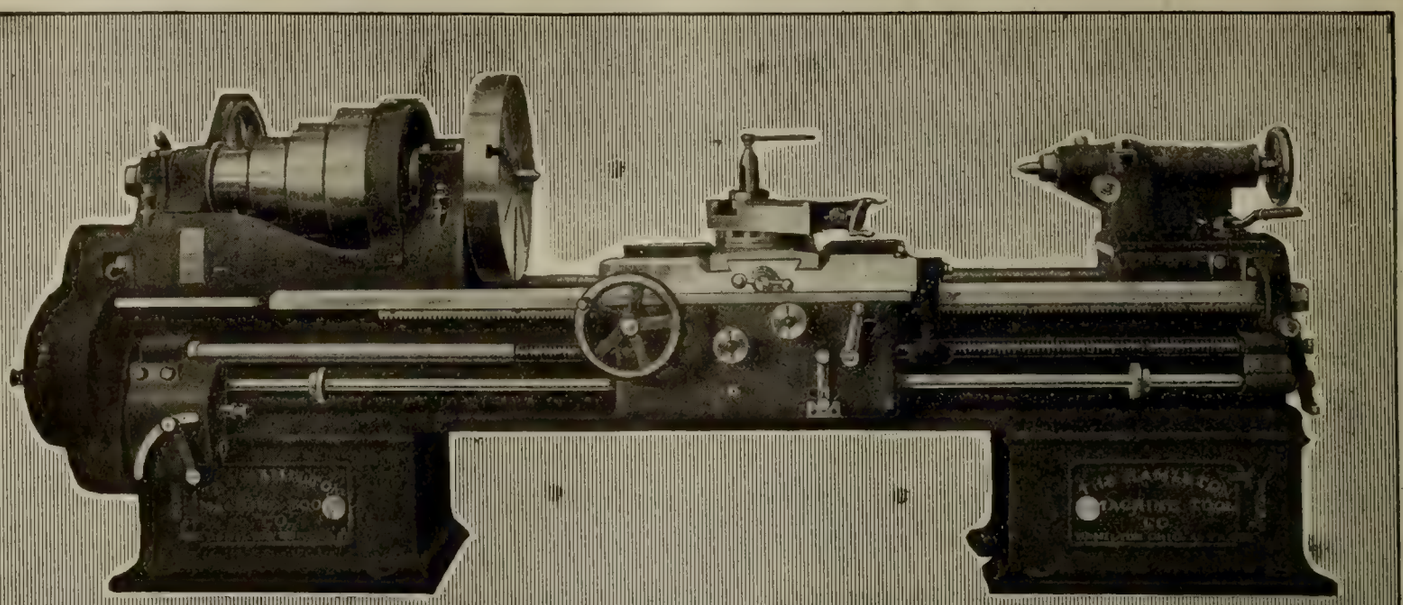
NEW ENGLAND PLANT WINDSOR, VT. — CANADIAN PLANT MONTREAL, P. Q.

Branch Offices
NEW YORK BOSTON CHICAGO DETROIT ATLANTA SAN FRANCISCO

FOREIGN REPRESENTATIVES

Makers of Gridley Single and Multiple Spindle Automatics at Windsor, Vt., and Acme Automatics, Threading Dies and Screw Machine Products at Cleveland, Ohio.





Hamilton Lathes

For 25 Years Makers of Fine Machine Tools

Rapid Production HAMILTON Machine Tools

The "Hamilton" Line has a Reputation to Sustain.

THERE are two phases of production that require expert attention; those of *quality* and *quantity*. We have made a study of them for your benefit. The result is that we are able to offer you machine tools that give the highest efficiency and will still keep down the cost of production.

Illustrated here is one of our lathes. A close study on your part will partly reveal the care we have taken to give you a machine that is fitted to the needs of the day—greater production.

The "Hamilton Line" of machine tools is very complete and users are never tired of telling others of their features. A letter will command our immediate attention.

WRITE US TO-DAY.

The Hamilton Machine Tool Co.

HAMILTON *Sole Agents for Ontario:* **OHIO, U.S.A.**

H. W. PETRIE. LIMITED, TORONTO, ONT.

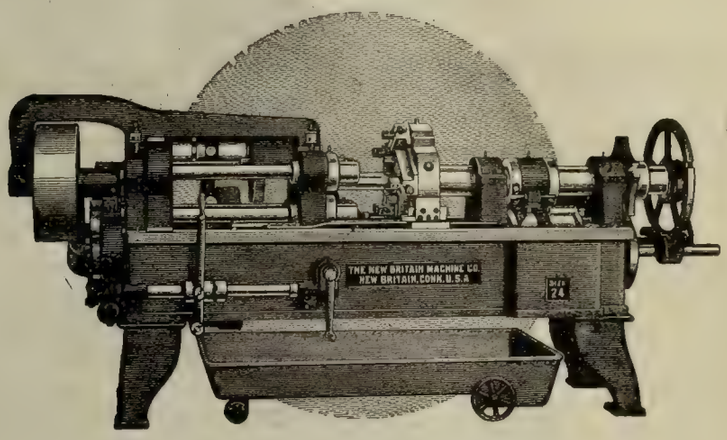
NEW BRITAIN

WHETHER it's a bar job or chucked work there's a "NEW BRITAIN" that will handle it with utmost accuracy and *unequalled* efficiency.

NB

SINGLE-HEAD MULTIPLE-SPINDLE AUTOMATIC CHUCKING MACHINE

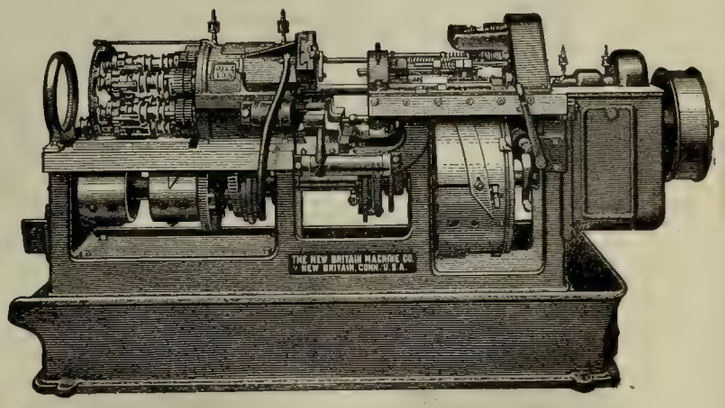
Designed for chucking castings, forgings and second-operation screw machine work. All operations are performed simultaneously, a finished piece being produced in the interval of a *single operation*—often a half or a third of that, by dividing a long cut between two or three similar tools.



NB

SIX-SPINDLE AUTOMATIC SCREW MACHINE

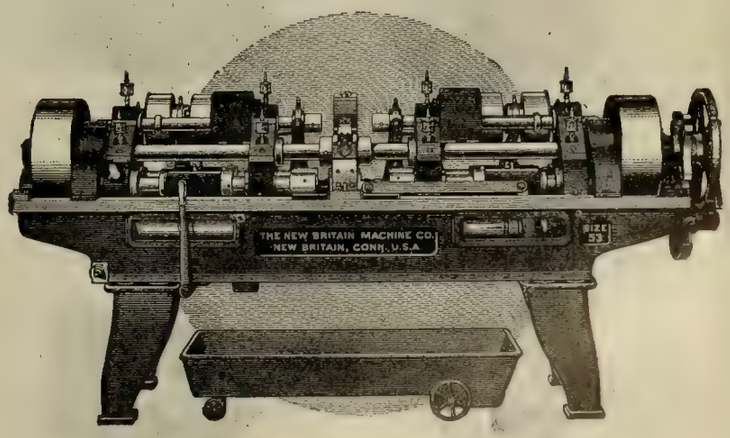
Its greater tooling capacity enables it to *finish complete* on the bar such work as is commonly rehandled when produced by machines of older type. On the ordinary run of bar work, not requiring the number of *different* tools for which the "New Britain" has capacity, production is greatly increased by subdividing the longer operations between two or three *similar* tools. On simple work the six-spindle machine will produce *two or three pieces* at each indexing, cutting off in two or three positions.



NB

DOUBLE-HEAD MULTIPLE-SPINDLE AUTOMATIC CHUCKING MACHINE

This machine is similar to the one at the top, except that it is designed to handle work which permits of machining on *both ends at once*. Its production is thus double that possible in the single-head type. It may be adapted for handling simple "single-head" work, thus finishing *two pieces* at an indexing.



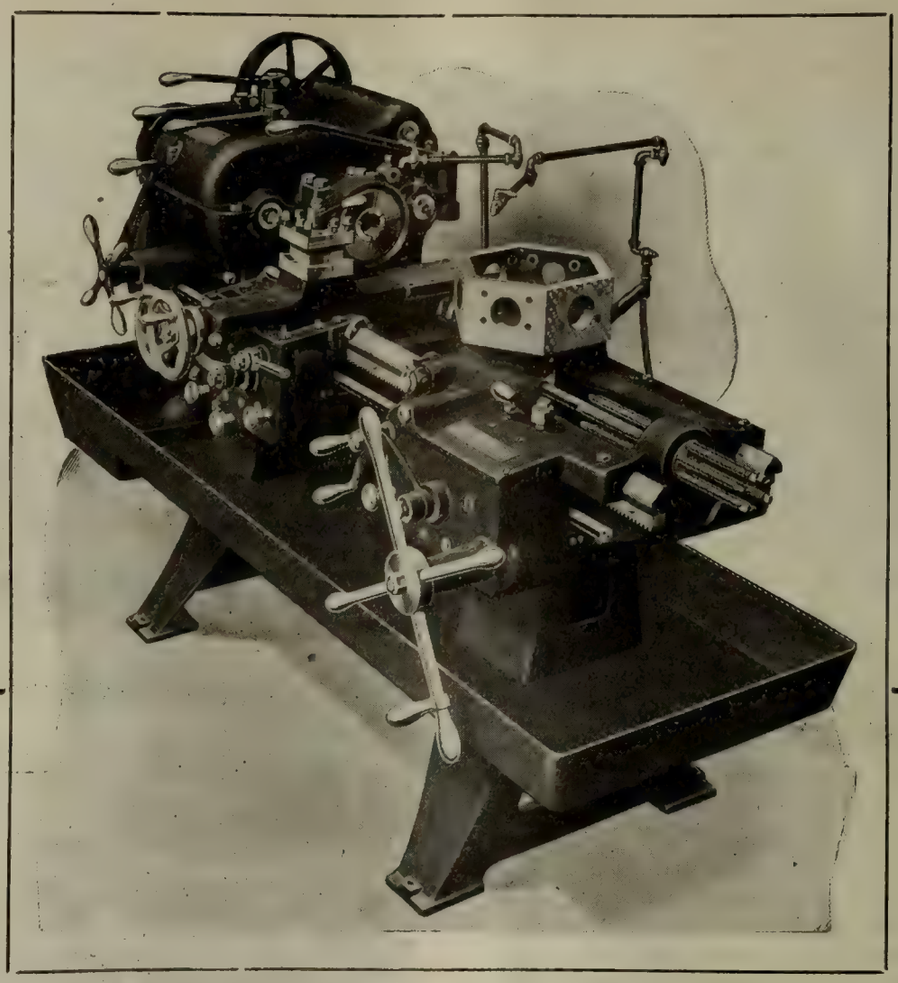
NB

"New Britain" productions range from 50% to .500% above those obtainable on other machines designed for bar and chuck work. Let us submit estimates on your work. Send samples or blueprints.

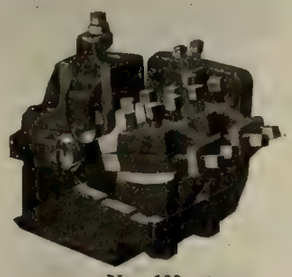
The
New Britain Machine Co.
New Britain, Conn., U.S.A.

AUTOMATICS

If any advertisement interests you, tear it out now and place with letters to be answered.



No. 138
Single Cutter Turner



No. 139
Multiple Cutter Turner

No. 149
Rear Forming Tool Holder

No. 143
Knurling Tool

Bar Equipment

These are only four of the many standard tools that substantiate the claim of the designer that the 1-B Universal Turret Lathe is the biggest producer of bar work of its class and size.

Note the rigidity of the Single Cutter Turner, and in connection herewith consider the effect of rigidity on production, also the time-saving effected by the graduated dial in setting the tool.

The Multiple Cutter Turner is the big time-saver on lighter work. As shown in the cut, it can carry four cutters and a drill for simultaneous operation, but on special order it can be equipped to carry six cutters and a drill, making seven cutting tools in all.

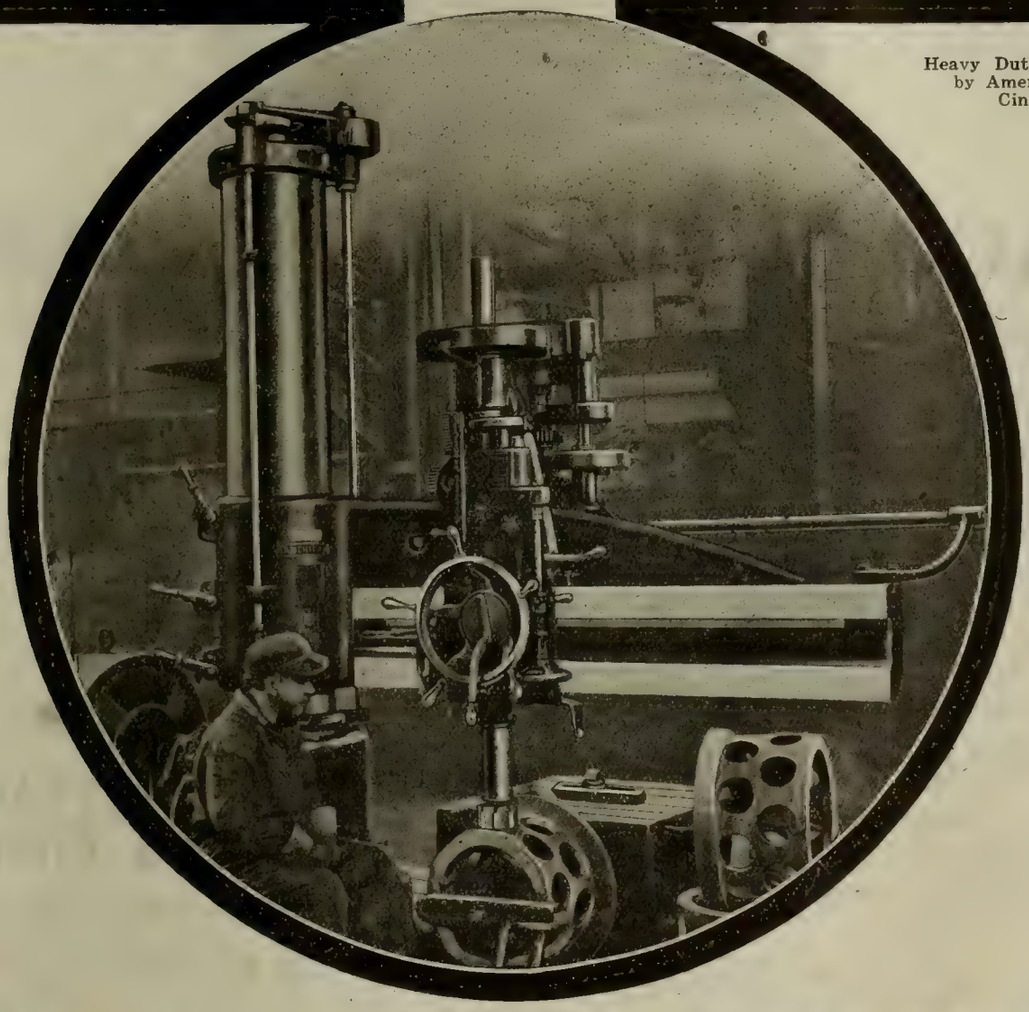
THE COMBINATION OF FOSTER MACHINE AND FOSTER TOOLS—MAXIMUM PRODUCTION.

Please note, however, that this applies to all of the general machines built by

FOSTER MACHINE COMPANY

Elkhart, Indiana

SKF



Heavy Duty Radial Drill made by American Tool Works, Cincinnati, Ohio.

BALL BEARINGS

No. 1 of a Series of SKF Equipped Drilling Machines

CAPACITY

The capacity for overloads—heavy, sustained; the capacity for big cuts; fast feeds; the capacity that gives you every ounce of twist at the drill point—that is the capacity made possible by S K F Ball Bearings.

This big American has capacity, because it is S K F equipped. How about **your** radial? S K F Ball Bearings will improve it. S K F service is at your disposal. Write our engineers to-day.

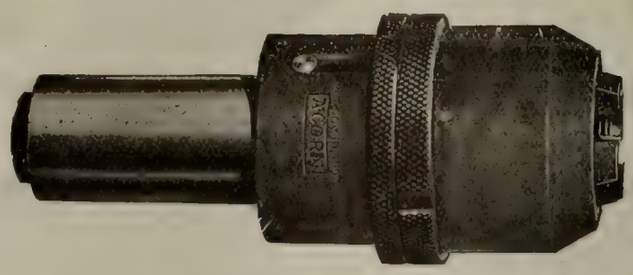
Canadian SKF Company, Limited

Toronto Ontario Canada

If interested, tear out this page and keep with letters to be answered.

ECONOMICAL SCREW THREADS

—The producing of them is the problem of thousands of manufacturers. We took a long step toward the solving of the problem in producing the



ACORN DIE AND HOLDER

It has so many advantages over the old style spring die and various other forms of dies and holders for machine use that it is difficult to enumerate them all.

A demonstration of the Acorn Die and Holder on your own work and on one of your own machines will give you a new standard for economy in screw threads.

WELLS BROTHERS COMPANY OF CANADA, Limited
GALT - ONTARIO

SALES AGENTS: The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary

TRADITION

We have a great tradition to perpetuate. The British-made file has always been the standard of file efficiency. It has always had better steel in it, quicker cutting teeth, and been harder and straighter than the files of other nations. That is unchallenged the world over.

Founded on an ideal—the production of Canada's Finest Files—this corporation is entirely Canadian, therefore all-British, and our whole organization is saturated with the maxim—

QUALITY FIRST

P H

TRADE MARK
Quality Files

CANADA'S STANDARD

Made in Canada, by Canadians, for Canadians.

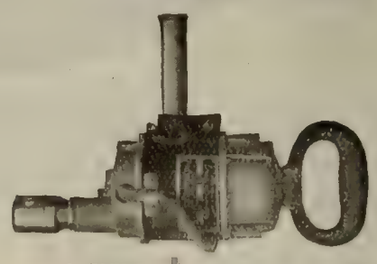
ARE YOU FILE-WISE?

PORT HOPE FILE MFG. CO., LIMITED
Port Hope, Ontario

"Ask your jobber"

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.

⅞" and 1¼ Universal Motor DRILL.

For Sale By

The Canadian Fairbanks-Morse Co., Limited

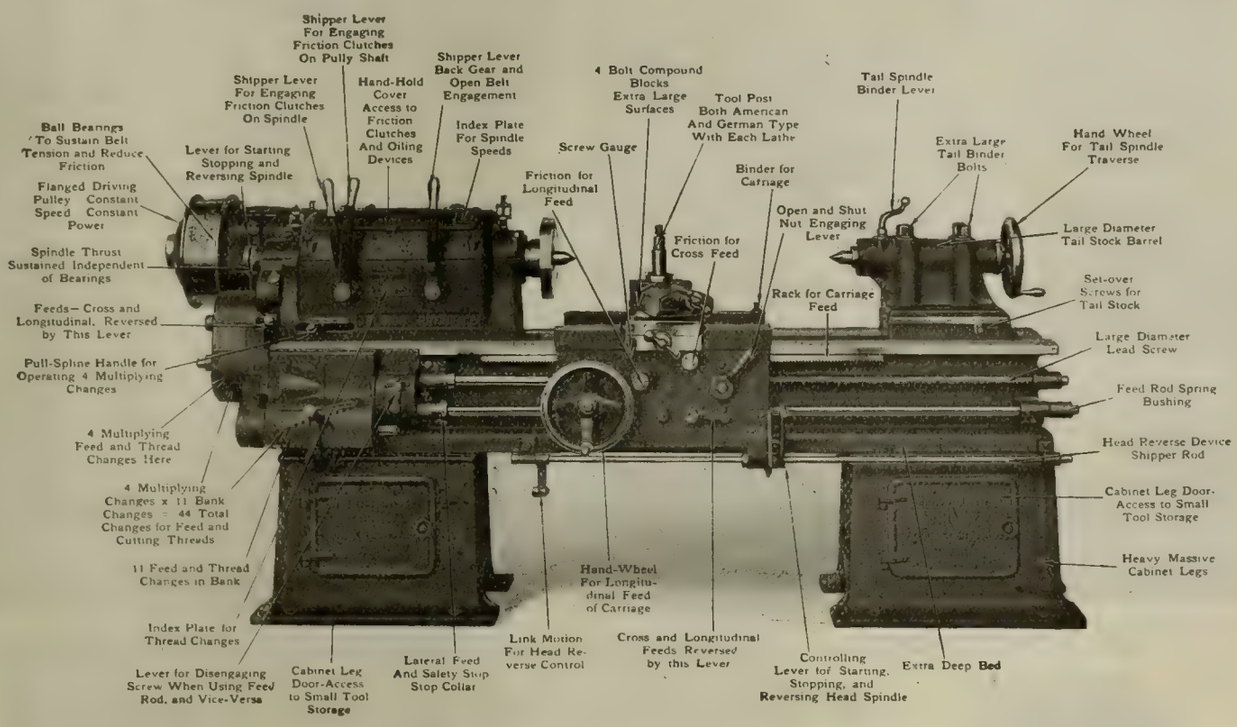
Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.
CINCINNATI, OHIO

REED-PRENTICE COMPANY

R-P ©

WORCESTER MASS. U.S.A.



Don't Use a Blunderbuss—
Use Modern Artillery!

YOU WOULD NOT THINK OF GOING INTO BATTLE UNLESS YOU WERE EQUIPPED WITH THE MOST MODERN ARTILLERY.

YOUR BATTLE IS THE STRUGGLE FOR PRODUCTION AND PROFITS.

USE REED-PRENTICE LATHES — THEY ARE THE MODERN ARTILLERY IN THE SHOP.

CANADIAN FAIRBANKS-MORSE CO., LTD.

If interested, tear out this page and keep with letters to be answered.

Grinding Planer Tools With Alundum Wheels

The wheel on the machine shown is a 24-inch Vitrified Alundum, grain 30, grade O, running at a speed of 900 r.p.m. The wheel is in actual operation grinding tools 90 per cent. of the time, and under this service wheels are lasting 4 to 5 months. Equally good results are being made on other grinding operations.

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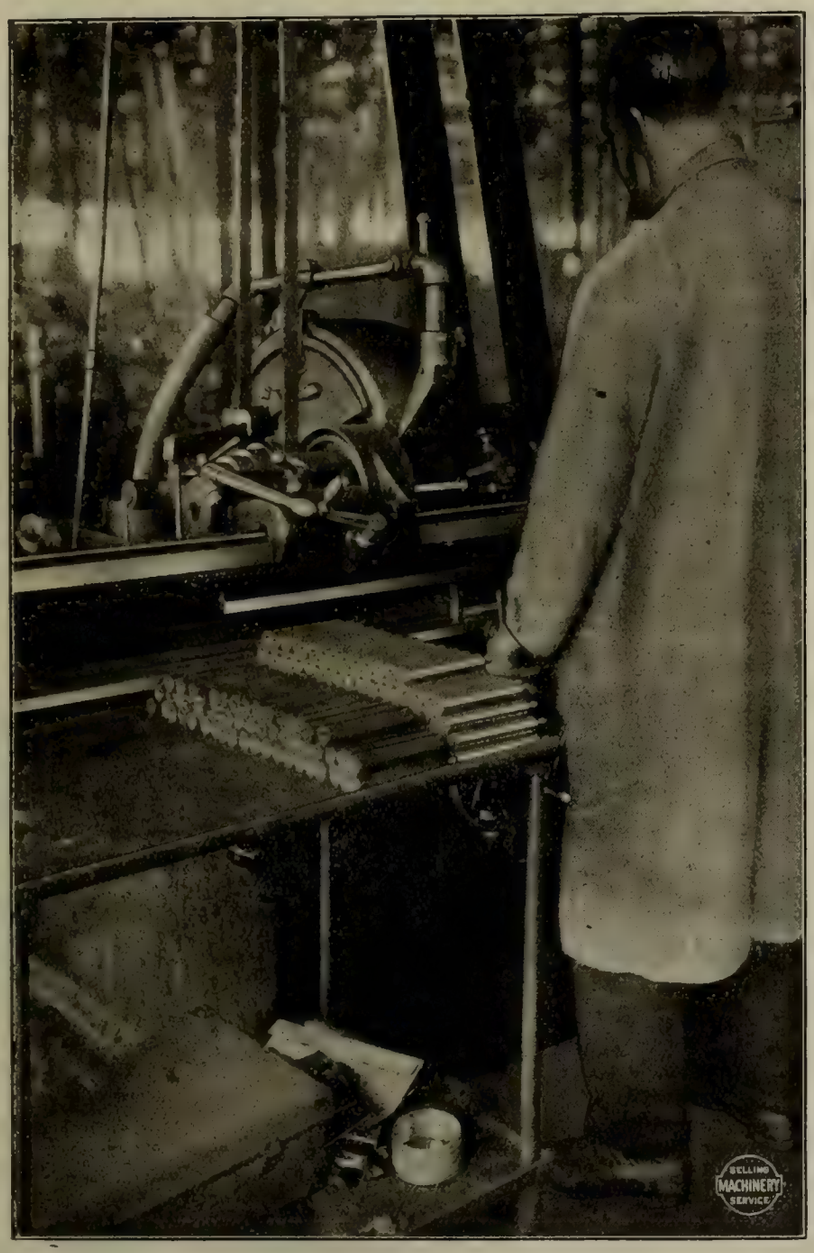

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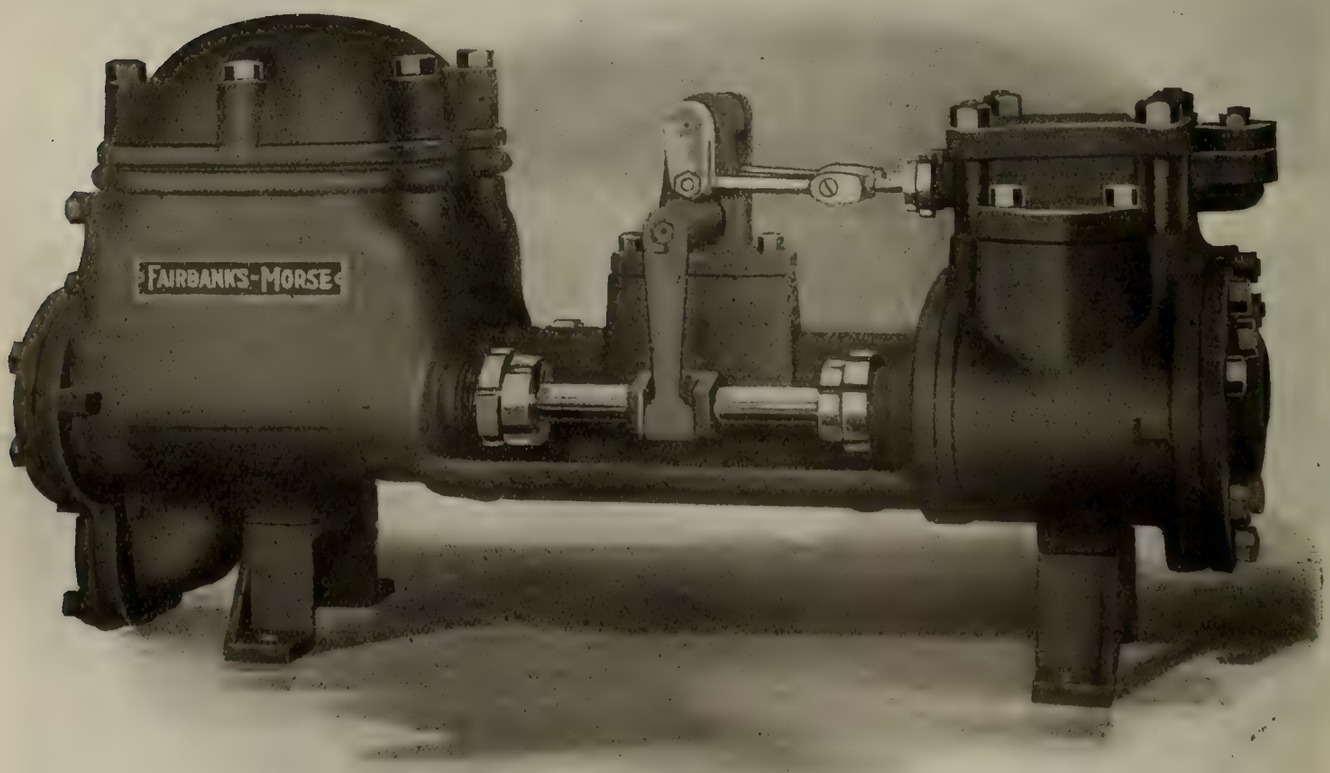


12 in. x 26 in. x 16 in. Compound Expansion Marine Engine

Staff Article

While the real extent to which Canadian shops are assisting in defeating the enemy on sea will perhaps never be known, the manner in which help is being rendered is familiar to most of our readers. The engines described herewith are purely a war-time product so far as design and material are concerned, but the fact that experience in the production of such items is being obtained on a wide scale is a factor of considerable importance at this time.

WITH the possible exception of the munitions activity of two years ago no other industry has made such rapid and remarkable advancement as that of shipbuilding. The developments in this direction have undoubtedly been hampered to a large degree by prevailing conditions, owing to the difficulty of obtaining labor and material. The labor problem is at present however, much relieved as a result of curtailment in the manufacture of shells, but the inability of securing plates for the construction of steel vessels, continues to be a deterring factor in the laying down of this type of boat. Irrespective however, of the class of hull, it is essential that power facilities be installed for the efficient operation of modern cargo vessels.

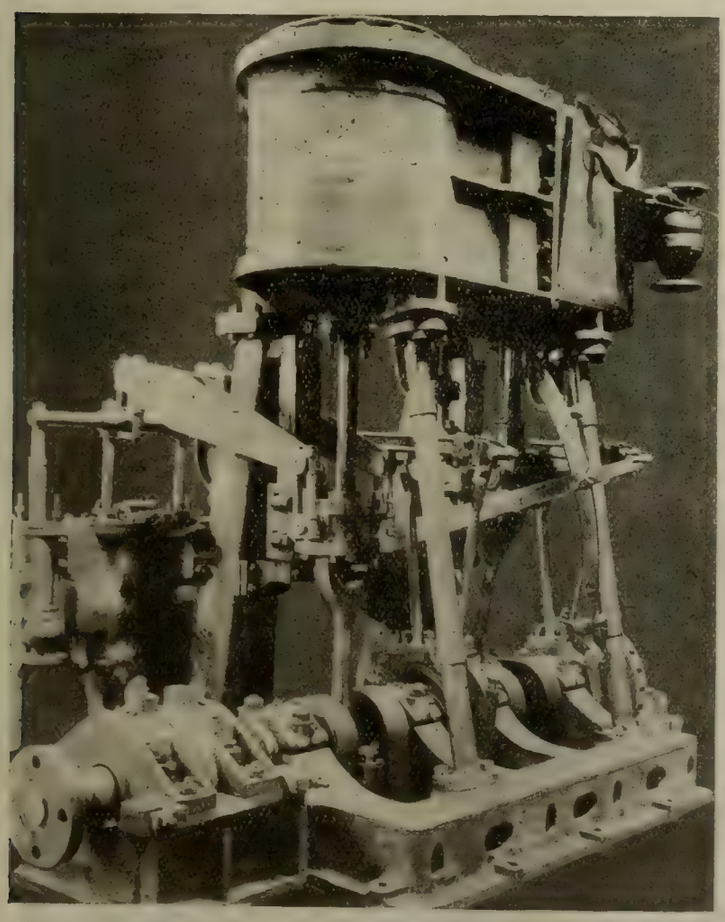
The accompanying cuts illustrate the design of a compound marine engine being constructed by various Canadian firms. The boats for which these engines are intended are 85 ft. long, 19 ft. 3 in. beam with a draft of about 11 ft., and will be used for ocean service. The boilers are of the Scotch multitubular marine type, 9 ft. 6 in. dia. by 9 ft. long, having two plain furnaces with separate combustion chambers. They are to have a working pressure of 140 lbs. per sq. in.; and before leaving the works were given a cold water test at double the working steam pressure and afterwards subjected to a steam test to meet the requirements of Canadian Government inspection.

Frame and Cylinders

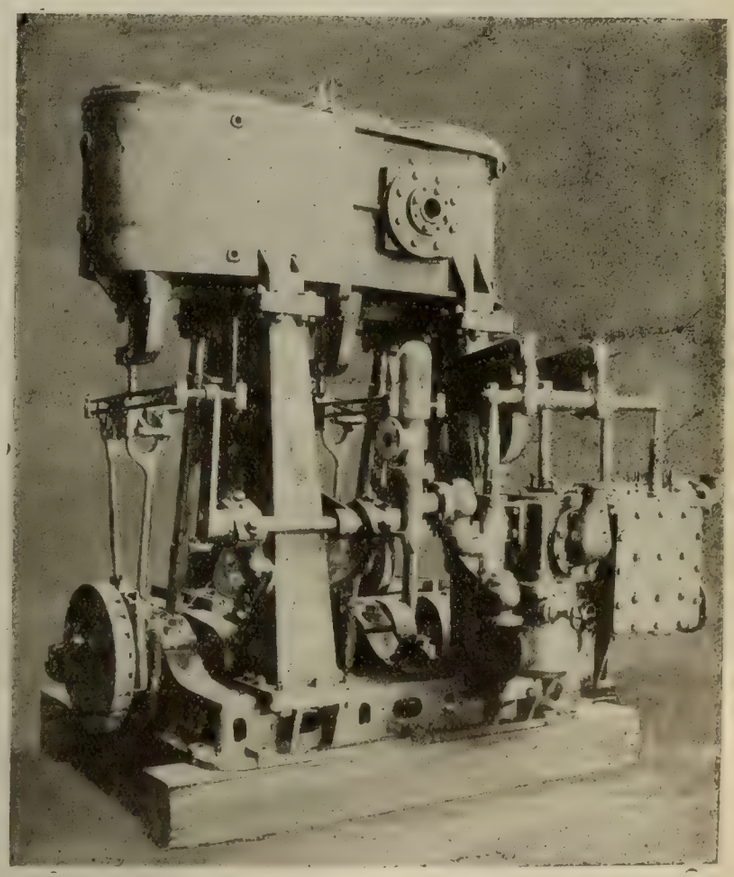
The bed plate of the engine is of heavy ribbed cast iron with flat bottom, having a depth of over 12 in. below the bearings. The main journal boxes are fitted with dovetailed sections of white metal that are well hammered into place, the bearings being so designed that the bolts that hold the caps can be freely removed after engine has been placed in position. Liners and distance pieces are provided, the liners being the same thickness as the babbitt metal and the distance pieces being equal to 1-7 the diameter of the bearing. The framing that supports the cylinders consists of cast iron columns at the back, the front columns being of forged steel, securely fitted to the bed plate and seatings of the cylinders. The cross head guides are of the hollow rectangular type for water circulation.

The cylinders are of hard close grained cast iron having a minimum thickness of 1⅛ in. The high pressure cylinder has a diameter of 12 in. and the low pressure cylinder 26 in., with a stroke of 16 in. The H. P. cylinder is fitted with a piston valve, the L. P. having a double ported slide valve. Facilities are provided for observing the setting of the valves without removing the covers. Cylinder covers are provided with eyebolts for hoisting and also suitable set screws for starting the joints. All covers are secured with steel bolts and fastened with case-hardened wrought nuts.

The pistons are of cast iron fitted with especially hard cast iron rings, the followers being secured in position by steel studs screwed into the pistons, bodies of the studs of the collar type and fitted into square holes in the followers. The piston rods are machine steel forgings, the ends being taper fitted into the piston and the cross head. The cylindrical portions of both piston rods are accurately ground to dimensions and highly polished. The stuffing boxes for piston rods



VIEW OF OPERATING SIDE OF 12 x 26 x 12 IN. COMPOUND MARINE ENGINE. THRUST BLOCK IN LEFT FOREGROUND



REVERSE SIDE OF ENGINE SHOWING BARRING WHEEL, VALVE GEAR, AIR, FEED, AND BILGE PUMPS

and valve stems are made of composition and fitted with metallic packing with ample lubricating facilities.

Operation of the Valves

The operation of the valves is obtained by means of the Stephenson link motion, the eccentrics being made of cast iron, while the straps are cast steel lined with white metal fitted into dove-tailed recesses and well hammered into place. The eccentrics are carefully fitted, by scraping, both on the face and rabbits, and channelled with oil grooves. The eccentric rods are made of high grade machinery steel forgings and fitted to the straps with collar stud bolts. The upper ends are fitted with adjustable brasses with the necessary gibs, set screws, etc.

All pins for the eccentric rods are forged on and accurately finished. The links of the double bar type, are so designed that when operating in forward position the passage way is not obstructed. The valve stems are connected to the link blocks with composition boxes, marine end type. Machinery steel link blocks are used with the jaws spanning the bars of the links; the jaws are fitted with composition gibs finished to the curve of the links and fitted with adjusting screws, the lower gibs having screws with lock nuts. Suspension bars are attached to the links at such a position that motion between the link and the block is reduced to the minimum when engine is in the ahead position. The reversing shaft is of steel with arms and pins for connection to the suspension bars forged to the shaft.

Crossheads and Connecting Rods

The crossheads are of high grade machinery steel with the journals forged on; the gibs for the slippers are lined with approved anti-friction metal both on the ahead and astern sides, cast and peened in place. The gibs are provided with lips at the top and bottom, liners being furnished for adjustment when taking up the wear. The slippers are designed with sufficient area so that the pressure on the anti-friction bearings will not exceed 40 lbs. per sq. in. and are amply supplied with oiling facilities.

The connecting rods of machinery steel are 40 in. long between centers, forked to span the crossheads and finished all over. The bearing boxes at either end are of composition and secured by forged steel bolts, the crank end being fitted with sections of white metal.

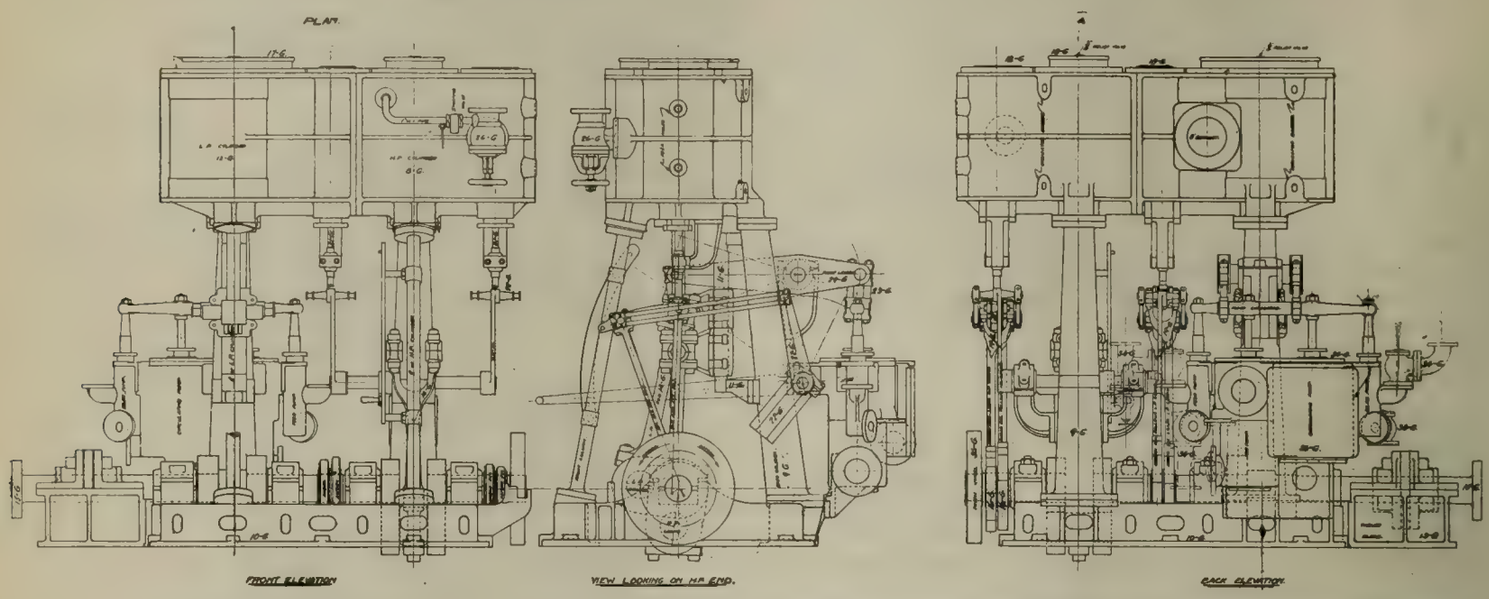
Crank Shaft

The crank shaft main journals are 5½ in. dia., with crank pins of a similar diameter and 6½ in. long, enlarged in the webs. The crank webs are of ample size with raised seatings for eccentrics forged on; the holes in all the couplings are drilled and reamed, and the bolts snugly fitted with a parallel body and the nuts locked with suitable split pins. The two cranks are set at an angle of 90 degrees with each other.

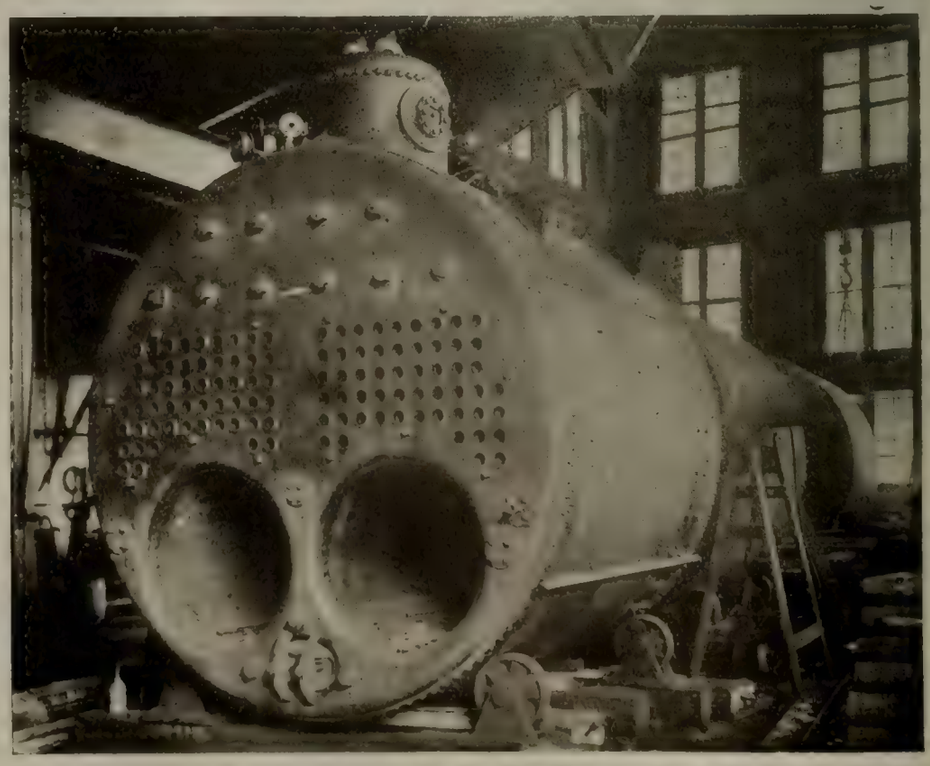
The thrust shaft is made of high grade machinery steel and has six thrust collars. The bearings are of the horse shoe type with four or more of the shoes fitted with anti-friction metal on both sides, and provided with suitable adjustment and also ample oiling facilities and water circulation for each shoe. There is also fitted at either end bronze stuffing boxes to prevent the escape of the lubricating oil. These bearings are designed to withstand a thrust of not more than 45 lbs. per sq. in.

Accessory Equipment

Independent surface condensers are provided, having tubes of seamless drawn



ELEVATIONS OF 12 X 26 X 16 IN. COMPOUND EXPAN SION MARINE ENGINE FOR CANADIAN-BUILT HULLS.



SCOTCH MARINE TYPE BOILER 9 FT. 6 IN. X 9 FT. FOR 140 LBS. WORKING PRESSURE.

brass No. 18 B. W. G. secured to the tube sheets with screw ferrules and packing, the tube sheets being amply stayed with through bolts. The condenser heads are removable without disturbing any of the piping connections. The cooling surface on the exterior of the tubes having a total area of over 400 square feet and before leaving the works the condensers are tested under a pressure of 20 lbs. to insure the soundness of the joints.

Directly mounted on the main engine and operated by levers connected to the L. P. piston rod, is the air pump, feed pump, and bilge pump; also a general service pump, Blake type. Other auxiliary equipment consists of a cast iron centrifugal circulating pump, brass fitted, direct connected to a vertical slide valve engine. The tail shaft is fitted with brass sleeves, and the end tapered to suit the propeller of cast iron four blade type. The tail shaft operates through a cast iron bearing lined with lignum vitae.

All bearings throughout are amply provided with efficient oiling facilities and the piping is sufficiently large to insure a regular supply of lubrication at all times. Wherever possible sight feeds have been provided for the convenience of the operators. The water circulation to the various surfaces requiring cooling is passed through brass piping. Before being shipped these engines are given a test under steam and must comply with various official requirements.

FIRST BRITISH STANDARDIZED SHIP PASSES TESTS

ACCORDING to recent advices, the first of the standardized ships built to the order of the British Government has completed her final tests and been put into commission as a cargo carrier for the nation. In every respect the trial proved an unqualified success. It was of a most exhaustive and comprehensive nature, and the experts who were on board during the inaugural trip were unanimous in their praise of the vessel, which marks a new epoch in the maritime history of the Empire, and which may be destined to play an important part in the campaign against enemy submarines.

Objects of Type

The standardized ship has been designed with the idea of providing a good type of cargo carrier in the shortest possible time, with the minimum expenditure of material, having regard to war conditions, which involves the question of the speed of the ship. The keel was laid in February this year, and in August —less than the full six months—the vessel was fully loaded and ready to go to sea. She is the first of the series of standardized ships, but actually there are two types of vessels, of 8,000 tons deadweight carrying capacity. These are classified "A" and "B" types, the first-named being single-deck ships and the others two-deck ships. This ship is of the "A" class. It is also intended to construct two smaller types—one known as class "C"—and these ships will be 5,000 tons deadweight each; and class "D," all of which will be 3,000 tons deadweight. In addition, however, other types are under consideration at present.

All the principal shipbuilders in the United Kingdom are busily engaged on the construction of standardized ships, and, while the number on hand need not be stated, the total output will be very substantial. The vessels are being constructed under the supervision of the classification societies—Lloyd's Register, British Corporation and the Bureau Veritas—all of which are really collaborating for this purpose. As in the case of the hull, the machinery and engines are all standardized, so that the first engine goes into the hull complete. This is an obvious advantage of the first order, as not infrequently it has been the experience of builders to wait some considerable time for the installation of the machinery. Engines and machinery, of course, lend themselves more readily to standardization than the ship itself, as variations occur in the construction of the vessel owing to the different facilities in the respective yards.

Economy and Comfort

On the question of speed it may be added that special attention has been devoted to this important aspect with a view to securing the maximum number of knots for the service in which the vessel is intended to trade. A feature of the general arrangements and equipment is provided in the very large hatchways, making the ship almost practically self-trimming, and immensely facilitating the loading and discharging of the ship. In fact, the central idea is that such steamers should be not only built quickly, but capable of being worked speedily. Thus the standardized ship represents a long advance on the way towards producing "a poor man's ship," as it can be run on the most economical lines, everything possible having been simplified. Admittedly, there are no "frillings" on the standardized ship. But the essential and paramount question of efficiency has not been overlooked. In the words of the experts, "it will be a very efficient cargo carrier," and there should not be the slightest difficulty in selling such vessels to any private owner after the war.

An important point—and one upon which there will be widespread interest —is that of the accommodation provided for the crew. This question, too, engaged the closest attention, with the result that it will be generally admitted that the provision made marks a big advance upon the men's quarters in ordinary cargo steamers, and particularly of the "tramp" class. The crew are berthed aft in the poop, instead of the forecastle, as has been the general rule hitherto, and separate cubicles are provided, each fitted with two berths. Messing arrangements are entirely separated from the sleeping accommodation; a smoke room is provided for general use, and special arrangements are made for steam-heating in the men's quarters.

OBSERVATIONS ON ROPE DRIVE PRACTICE

IT occurs to us that conditions and circumstances enter more largely into the determination of the various details constituting a rope drive than have to be accounted in that of a belt drive, therefore the following notes and observations on rope drive practice may be found interesting and useful:

Manila and cotton are the materials generally used for rope purposes, and may be constructed of 3 or 4 strands. The rope diameters in practice vary from 1 to 1¾ inches, although those below 1½ inches are somewhat uncommon. From investigation it has been computed that the safe and economical dorking strain for a 1 inch diameter rope is 200 pounds, with equivalent for other sizes. Rope wear is both internal and external, caused in the former by the movement of the fibres on each other, and in the latter by slippage and wedging in the pulley grooves. This wear, of course, is normal, and is dependent on the speed of drive.

As in belt drives the advantage lies with large diameter pulleys, the tendency being to less internal wear, due to fibre sliding decrease, with diameter increase. Care should be taken to have the grooves ground out smooth and of unbroken surface, so as to obviate unnecessary wear or tearing of the external surface of the rope. The groove angle may be 45 to 60 degrees. Rope wear is independent of pulley distance apart, because it takes place on the pulleys only; at the same time distance is a factor in first cost.

Experience goes to show that 80 feet per second is the speed at which the maximum horse-power is attainable; speeds beyond this having the horse-power output reduced by centrifugal tension. Cotton ropes require less lubrication than do Manila ropes.

RECENT ELECTRIC FURNACE ACHIEVEMENT

THE abnormal demand for munitions has, perhaps, done more than anything else could have done towards breaking down the prejudice against electric steel. Before the war had been in progress many months our armament makers found themselves accumulating enormous quantities of borings, turnings, screwings, etc., of very high grade steels, containing chrome, nickel, and other costly alloys. In ordinary times these turnings were of comparatively little value on account of the difficulty of remelting them without the loss of most of the alloys. But when the quantities of turnings produced in munition making became abnormal, it was at once realized that the best solution of the problem of utilization was afforded by the electric furnace, because it was capable of saving all the nickel and almost all the chrome, whilst remelting the scrap, besides which it could, if necessary, oxidize the chrome whilst retaining the nickel. Admittedly, no type of electric furnace was exactly perfect; but with a view to further perfection in the matter of treat-

ing these turnings, certain Sheffield metallurgists set to work in earnest to see what could be done to meet the new conditions. The result is the invention of a type of furnace for which the claim is made that something approaching perfection—certainly a very high level of efficiency—has been attained.

U. S. SHIPBUILDING PROGRAM

A CAREFULLY revised table showing the shipping facilities upon which the United States and its allies may depend during the next eighteen months or more to fight the German submarine was issued at Washington, D.C., on Sept. 26, by the United States Shipping Board.

Differing slightly from a statement earlier in the day by the Committee on Public Information, the table shows that the Government has under construction in dead-weight tonnage, including 400 vessels of foreign ownership which were requisitioned on the stocks, approximately 1,036 cargo vessels of 5,924,700 tons capacity. Most of these vessels will be completed by the end of 1918, and some of them will be off the stocks within sixty days.

These vessels have actually been contracted for. Congress, it was pointed out, also has before it a bill asking for funds with which to construct or purchase approximately 5,000,000 tons dead weight which will be completed in 1918 and 1919, raising the total of new construction under contract and the prospect to 10,924,700 tons dead weight. Reduced to gross tonnage this represents approximately 7,283,000 tons.

The statement issued by the Committee on Public Information showed that the Government now has in service for foreign trade 458 ships with an aggregate dead weight tonnage of 2,871,359 tons, not including 117 ships of German and Austrian origin totaling 700,285 tons, thus giving a grand total available for service to-day of 575 vessels of 3,571,644 dead weight tons. In June, 1914, the statement read: the available tonnage of the United States was only 1,614,222 tons.

The Shipping Board statement therefore shows as actually under construction or contemplated ships totaling 10,924,700 dead weight tons, or approximately 7,283,000 gross tons.

STEEL OUTPUT INCREASES

THE total production of steel ingots and direct castings in Canada in the first six months of the current year amounted to 836,149 short tons, an increase of 246,596 tons, or 42 per cent., over the corresponding period of 1916.

Average monthly production was 139,858, against 98,259 in the first half of 1916, and 106,268 tons for the full year, 1916. A new high record in output was reached in May, 155,346 tons, but the June figures show a falling off of about 18,000 tons.

The figures as compiled by the Mines Branch of the Department of Mines at Ottawa cover the entire output of the country, with the exception of two small plants.

Pig iron output, as estimated by the Mines Department from returns covering all producers, was 586,998 short tons, as against 562,097 in the first six months of 1916. The average monthly production was 97,833 tons, or only slightly higher than the average for the full year, 1916, which was 97,438 tons.

Imports from the United States have been on a considerably larger scale. The total imports of steel ingots and direct castings for the first six months of the year totalled 139,640 short tons, against 47,493 in the same period in 1916; in pig iron the increase was from 29,801 tons last year, to 38,858 tons this year.

Production figures in short tons by months this year are given as follows:

	Pig iron.	Steel Ingots, etc.
January	89,187	130,990
February	83,801	120,629
March	103,789	152,420
April	101,504	139,669
May	108,799	155,346
June	99,858	137,095

LARGE CHIMNEYS UNDER CONSTRUCTION

WHAT will be the largest chimneys in the world, when completed, are being constructed by the Alphons Custodis Chimney Construction Co. of New York. One of these chimneys, which is being built at Tacoma, Wash., for the Tacoma Smelting Co., has the following general dimensions.: Height above ground, 571 feet; inside diameter at top, 25 feet, and outside diameter at base, 50 feet 2 in. The other chimney, which is being constructed for the Anaconda Copper Co., Anaconda, Mont., will have the following dimensions: Height above ground, 525 feet; inside diameter at top, 60 feet, and outside diameter at base, 86 feet. The chimney at Tacoma when completed will be the tallest in the world, and that at Anaconda the largest in diameter.

The largest diameter chimney in existence at the present time was built in 1908 by the same concern for the Boston & Montana Copper Co., at Great Falls, Mont. It is 506 feet high and 50 feet inside diameter. These chimneys are built of special radial brick; some examples of this construction in Canada may be seen at the Toronto Carpet Mfg. Co., the Municipal Incinerator, Toronto, and the Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont.

WOOD FUEL VS. COAL

THE fuel value of two pounds of wood is roughly equivalent to that of 1 pound of coal. This is given as the result of certain calculations made in a Government forest service laboratory, which show also about how many cords of certain kinds of wood are required to obtain an amount of heat equal to that in a ton of coal.

Certain kinds of wood, such as hickory, oak, beech, birch, hard maple, ash, elm, locust, longleaf pine, and cherry, have fairly high heat values and only one cord of seasoned wood of these species is required to equal one ton of good coal. It takes a cord and a half of shortleaf pine, hemlock, red gum, Douglas fir, sycamore, and soft maple to equal a ton of coal, and two cords of cedar, redwood, poplar, catalpa, Norway pine, cypress, basswood, spruce and white pine.

Equal weights of dry, non-resinous woods, however, are said to have practically the same heat value, regardless of species, and as a consequence it can be stated as a general proposition that the heavier the wood the more heat to the cord. Weight for weight, however, there is very little difference between various species; the average heat for all that have been calculated is 4,600 calories, or heat units, per kilogram. A kilogram of resin will develop 9,400 heat units, or about twice the average for wood. As a consequence, resinous woods have a greater heat value per pound than non-resinous woods, and this increased value varies, of courdse, with the resin content.

The available heat value of a cord of wood depends on many different factors. It has a relation not only to the amount of resin it contains, but to the amount of moisture present. Furthermore, cords vary as to the amount of solid wood they contain, even when they are of the standard dimension and occupy 128 cubic feet of space. A certain proportion of this space is made up of air spaces between the sticks, and this air space may be considerable in a cord made of twisted, crooked and knotty sticks. Out of the 128 cubic feet, a fair average of solid wood is about 80 cubic feet.—"Canada Lumberman."

SMOKE BOXES FOR MERCHANT VESSELS

A RECENT issue of the "Hydrographic Bulletin" announces that the Bureau of Ordnance of the Navy Department at Washington has arranged for the supply of smoke boxes for merchant ships desirous of being equipped with them. The cost is approximately: smoke funnel, $125.00; smoke box, $25.00; phosphorus, $1.75 per lb. The smoke funnel is for the production of smoke on board the vessel and requires only the fuel for its continued use. The boxes are for throwing overboard and once used cannot be recovered. The Navy Department has announced as its policy that smoke-producing apparatus for the use of merchant vessels should be available for every vessel desiring to purchase same.

AT the Kawasaki Dockyard, at Kobe, a 9,000-ton steamer, complete with engines and masts on board, built for British owners, was recently launched in two months twenty-seven days from the laying of the keel. Within ten days of being launched her trials took place. Seven more steamers, of 9,000 tons deadweight each, are at present under construction at the same yard.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

USEFUL HOLDERS SUGGESTION

By E. F. C.

IT is a good idea, a great many times, where the same tools are constantly being handled over and over again to devise some arrangement to hold them, so that they may be convenient to pick up, or prevent them falling to the floor, and also to save space.

For instance in using a center punch

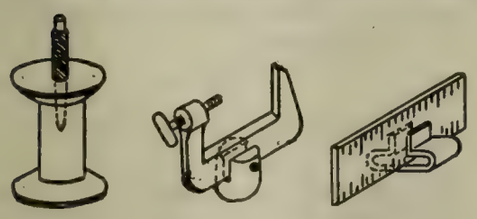


FIG.-1- FIG.-2- FIG.-3-

USEFUL HOLDERS KINK.

it very often happens that it will roll off on the floor, especially when in use on a drill-press table. A suitable holder for this purpose is a common wood-spool, in which the punch can be inserted in the hole where it is always handy when wanted. This suggestion is shown in Fig. 1.

In handling a clamp it is the usual practice to lay this down flat after using. When used in connection with other tools as jigs, etc., it takes up more room than can be spared. If a holder is made from a piece of round stock having a groove milled in it which can be fastened to the clamp with a screw, the clamp can be put down so that it will always remain upright, as seen in Fig. 2.

It is well-known that a scale is hard to pick up when resting on a plate or lathe carriage, especially if it has become immersed in oil. A convenient holder for this purpose can be made from a piece of sheet-steel, which can be snapped on the scale to hold it up straight, as shown in Fig. 3.

PRACTICAL OBSERVATIONS ON LUBRICATION

By D. O. Barrett

IT is surprising that in the design of up-to-date heavy-duty machine tools how much time and attention have been devoted to certain features of construction and how little to other seemingly unimportant parts but which become quite prominent when trouble occurs as it generally does. One particular place where the above is applicable is in connection with the countershafts usually supplied with all machine tools. On some heavy-duty lathes, in particular, built by manufacturers whose reputation tells the story of their success, countershafts are sent out which are constructed no more rigidly than those of five or ten years ago. We still find light shafting and hangers with long spans between bearings and with light clutches which are continually slipping and will not stand up to the regular work for which the machine is designed.

One source of continual trouble is the lubrication of the loose pulleys or the main driving pulley, in case a clutch is provided. These pulleys have, in most cases, a hole drilled through the hub into which a small quantity of oil may be poured but when the pulley starts to revolve centrifugal force will cause the oil to be thrown out. This applies equally well to the average drill press, which is provided with tight and loose pulleys.

In starting operations in a shop equipped throughout with new machine tools, trouble was experienced from these loose pulleys galling on the shaft due to insufficient lubrication. After loosening up several of these only to have the same thing occur again in a short time, the remedy as shown in Fig. 1, was decided upon after which no further trouble was experienced. The shafts were removed and a hole deep enough to reach to the center of the loose pulley put in, with a hand feed grease cup at the end. At the center of the pulley a hole was drilled entirely through the shaft and a couple of extra deep grooves were cut in the pulley bore. The grease could thus be positively forced where most needed. Another advantage was that the oiler could tighten up the cup while the driving belt was on the loose pulley. This method gave such entire satisfaction that all new countershafts and drill presses were equipped accordingly.

Another case where the same method was used to good advantage was in a heavy-duty lathe which had been operated but a few days when the back gears galled on the eccentric shaft. This was removed and drilled out as in Fig. 1 with

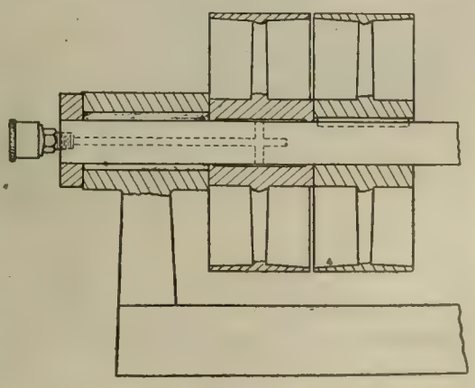
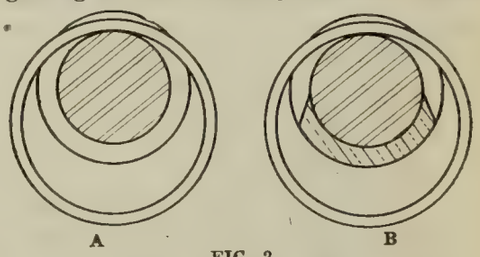


FIG. 1.

a grease cup at the end of the eccentric shaft and no further trouble was experienced.

The countershaft bearing on one of the larger boring mills was continually heating even though supplied with an excess of oil which would seem to be used effectively as the bearing was provided with a ring oiler. Upon investigation it was found that there were two separate bushings in the bearing with the oiling ring running between them as at A, Fig. 2. The oil was thus merely carried around the shaft between the bushings, very little running along the shaft and getting into the bushings. Had the bush-



A B

FIG. 2.

ing been made in one piece and then milled out at the top, for the ring as at B, the trouble would never have occurred as the edge of the bushing would have caught the oil, forcing it to travel along the shaft. Not having the material to make such a bushing the oiling ring was removed and the space filled with grease and a hand feed cup supplied. Little occurrences like these, while small matters in themselves, nevertheless cause great inconvenience and serve to ruin a reputation which might have been built up on the quality of the machine in general.

In connection with stationary gas engine work, the usual method of lubricating the cam rollers is shown at A, Fig. 3. These rollers are of either tool steel or machine steel case-hardened, and are made rather a loose fit on the hardened steel pin. They are generally made a fairly close fit in the slot which is milled in the end of the push rod which is of square cold drawn steel. A hole is drilled radially through the hole for oil but if the hole should happen to be in any other position than vertical and the roller is against the cam, the average operator does not take the trouble to turn the roller but contents himself with pouring a little oil on the side. Should the hole be filled with oil, as soon as the engine is started the centrifugal force will immediately throw it out so that in any case, the method is a failure.

A much better plan is shown at B where the slot is somewhat wider than the roller and the pin is provided with an oil groove for the full width of the slot. Oil applied at either side of the roller will at least fill the groove and cover that part of the pin which is exposed and as soon as the engine is started the roller will travel from side to side spreading the oil effectively over

the pin. Oil may, of course, be equally as well applied while the roller is turning.

The usual method of lubrication for clutches and cut-off couplings attached to

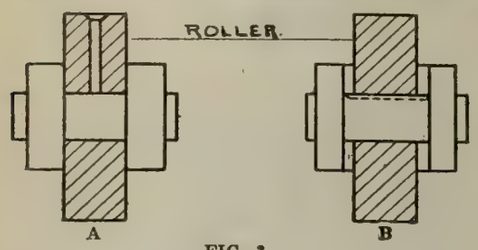
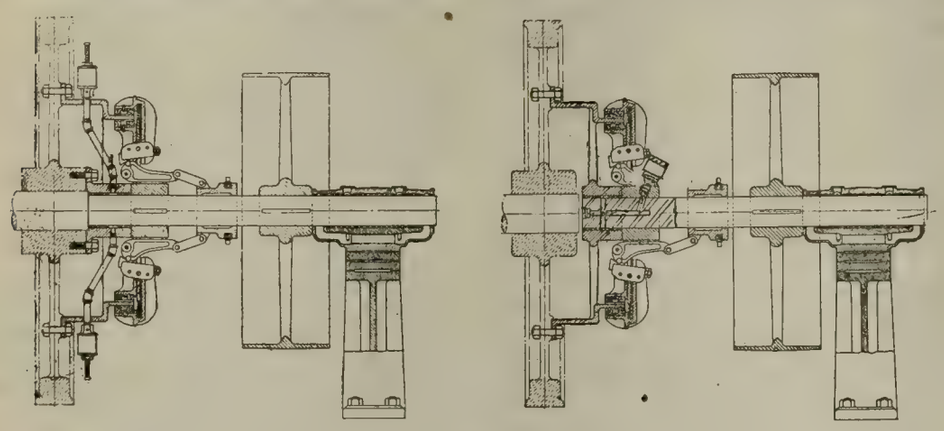


FIG. 3.

gas oil engines is shown at A, Fig. 4. The friction ring is bolted directly to the flywheel and the bearing for the shaft carrying the driving pulley is bolted to the wheel or cast integral with



A FIG. 4. B

the ring. The gripping mechanism is keyed to the extended shaft. In this way the shoes remain stationary and adjustments may be made on the friction surfaces by merely throwing out the clutch. Self-feeding grease cups are attached to the ring with pipes leading to the bearing. The cups can, of course, be filled only when the engine is shut down and no attention whatever can be given them after the engine is in operation no matter how many times the clutch may be thrown out, with the extended shaft stationary. Again, this style of cup is not very reliable in its operation since the spring operated piston in the cup may not be able to force the lubricant through the long pipe, especially in cold weather.

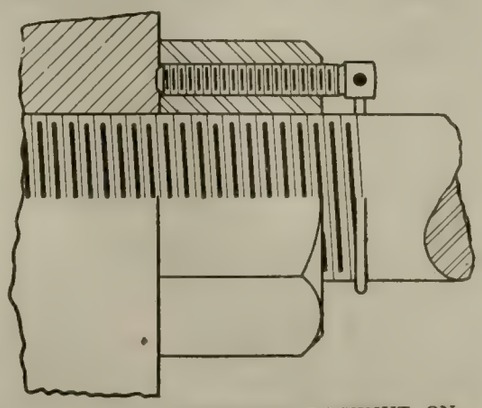
At B is shown a method which has proved far more satisfactory and costs little, if any more, to install. The shaft is drilled from the end and then plugged, the hole being deep enough to reach back to the member carrying the shoes. A hole is drilled through the shaft at the center of the bearing and another hole is drilled into the shaft to meet the center hole and corresponding to the grease cup which is carried in the hub of the mechanism. By throwing out the clutch and allowing the engine to run, the cup may be screwed down at any time thus insuring an ample supply of lubricant. Of course, it is necessary that the part carrying the grease cup maintain its exact position with relation to the shaft and this may be accomplished by drilling a shallow hole in the shaft for a set screw which is usually provided in the casting. Hand feed cups are the best for this arrangement as the grease may be positively forced where needed.

FASTENING SCREWS AND NUTS

By A. L. Loy.

CONSIDERABLE trouble had been experienced with the nuts on the piston rods of gas engines working loose. These nuts were used as lock nuts on the rod where it entered the crosshead. Tightening up the nut draws the threads on the rod to the back of those in the head, so that the pressure of the explosions comes directly on the nut. Should the nut become loosened only slightly, the small movement of the rod in the head will soon work the nut back, and either cause the piston to unscrew or, as sometimes happens, the piston rod is forced through the crosshead, tearing out the threads.

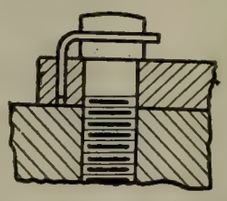
The nuts were drilled and tapped and the cup point set screws tightened against the crosshead after the main nut was tightly drawn up. Holes were drilled through the head of the cap screw and a wire was run through and then wrapped around the rod and the ends fastened together. Since the screw would cut into the metal of the crosshead a certain amount, it would have to back out this amount before the main nut could move



METHOD OF FASTENING LOCKNUT ON BACK OF CROSSHEAD.

and the wire very effectively insured that these parts would remain tight.

A wire may also be used very satisfactorily in the locking of cap screws, as shown in the cut. Holes are drilled through the heads of the screws, and also down into the piece being held by the screw, as close to the screw as convenient. The wire is pushed down into the hole and then pulled through the



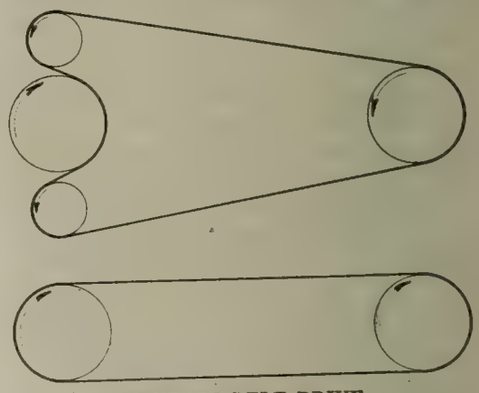
LOCKING CAP SCREW WITH WIRE.

head of the screw and cut off. It is immaterial whether the holes line up, as the wire will simply be bent to correspond and cannot come out unless deliberately removed.

A REVERSE BELT DRIVE

By A. L. Loy

IN a crushed stone plant which the writer recently visited the reverse belt drive for the main crusher was obtained in the manner shown in the drawing rather than by crossing the belt as is the usual practice. Those in charge of the plant were unable to explain the advantages obtained by this design but claimed that it had given perfect satisfaction. Certainly its efficiency would not be as great as the crossed belt due to the friction loss occasioned by the two idlers and the reverse bend would be harder upon the material of the belt. Of course, it is possible to secure a



REVERSE BELT DRIVE.

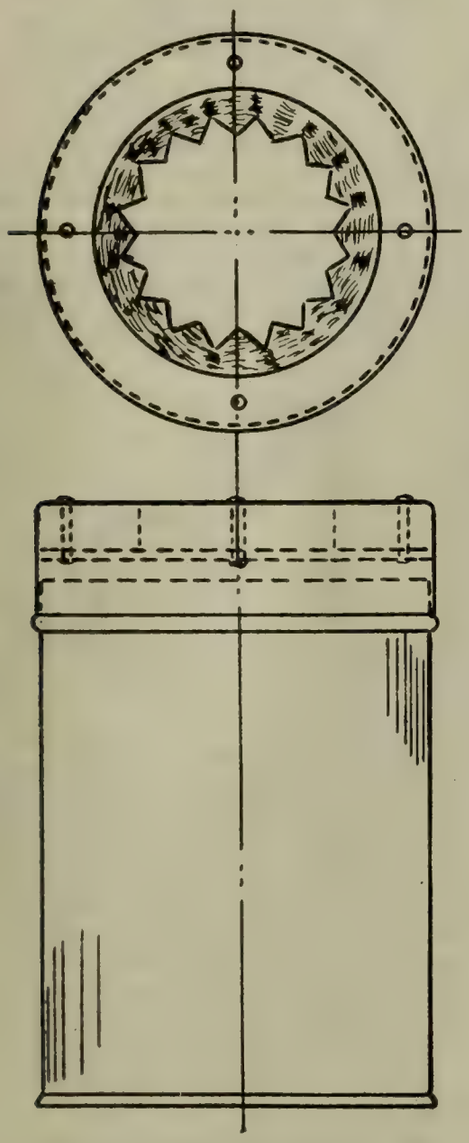
greater arc on contact by the proper location of the two idlers and this may have been the deciding factor.

TAP CLEANER AND CHIP BOX

By J. Edwin

WHEN cleaning chips off a tap, the ordinary method is to wipe out the tap grooves with a piece of waste or brush. The tap, as is well-known, requires to be cleaned off for each new hole tapped out. In doing this, generally the chips fall on the floor, the vise and even the work bench. In the illustration is shown a very convenient method for cleaning off a tap at the same time the chips falling in a receptacle for this purpose. It consists of a tin-can, having a section of the cover cut out, underneath of

which, is fastened a thick felt washer notched out as shown. The tap is simply placed in the opening and then rubbed upward against the notched edges of the washer which removes the



TAP CLEANER AND CHIP BOX.

chips, and these fall in the can. A thin steel washer is fastened under the felt with rivets to secure this in the cover. The cover is removable so that the chips can be emptied out.

GEAR SHAPER ADJUSTMENT HINTS

WHEN machine tools of a specialized type give occasional trouble, either in their operation or in the class of work produced by them, it can, in the majority of cases, be traced to a certain lack of knowledge on the part of the operator. It is commercially impossible to make all types of machines fool-proof, and a certain modicum of brains is desirable in the operation of all machines which are more or less automatic in their actual working. The gear shaper is an example of this class of machine, and with a view to insuring correct knowledge of essential facts by the operator, the Fellows Gear Shaper Co. have recently issued an instruction sheet regarding the mounting and clamping of gear shaper cutters. The accompanying illustration is reproduced therefrom and shows correct and incorrect methods of mounting the 4-in. cutter for "pull" and "push" strokes; the instructions applying equally to the 3 in. cutter.

Gear shaper cutters are made from high-speed steel, and, as is well known, high-speed steel has not the same strength as ordinary carbon steel, consequently greater care must be exercised in handling it. Special care should be taken to see that the proper washers, collars and nuts are used, and that the cutter-spindle, washers, etc., are free from fine chips and oil; also that the cutter has been sharpened on the top face to the proper cutting angle. The cutter used for the general run of work, and especially for finishing, has a top angle of 5 degrees (see illustration), and the washer which comes in contact with this face of the cutter should have a corresponding angle; if anything, it should be less than the angle of the cutter, so that the pressure will come at the circumference rather than near the hole; this not only serves to relieve the strains from the weakest portion of the cutter, but holds it more rigidly at that point where the greatest grip is desired.

Fig. A shows the correct method of mounting the 4-inch gear shaper cutter, when working on the "pull" stroke. Reference to the illustration will show that the top washer and cutter have the same angle, and that the lower washer is relieved in the centre and supports the cutter close to its outer circumference.

Fig. B shows the incorrect method exaggerated. Here it will be seen that the top washer has a greater angle than the angle on the top face of the cutter. When this is the case, the strain of clamping is confined to the weakest section of the cutter and there is a liability of cracking the cutter, when mounted with a washer of this type.

Fig. C shows another incorrect method of mounting the cutter. Here the lower washer is too small in diameter and does not support the cutter beyond its weakest section, as indicated by the arrows. Note that the washer for the 3-inch cutter should never be used for the 4-inch cutter.

Fig. D shows the correct method of mounting the gear shaper cutter when operating on the "push" stroke. For this purpose a special nut as illustrated is provided. Do not use nut shown at A.

Fig. E shows an incorrect method of mounting the 4-inch gear shaper cutter. Note, the collar is too small and does not support the cutter beyond its weakest section. The nut is not provided with a collar, and also does not support the cutter properly. A cutter so mounted is very liable to crack, because it has a tendency to vibrate when cutting and is not supported close enough to the circumference to hold it rigidly against the thrust of the cut.

Fig. F shows the correct method of mounting the 4-inch thin-web cutter. Note, the special spindle extension collar that is necessary, also the special nut. Do not use nut or collar shown at D on the thin-web cutter. Also note that a special spanner wrench is necessary for tightening nut used in connection with the thin-web gear shaper cutter.

In sharpening the gear shaper cutter special care should be taken to see that both faces are parallel with each other. If the sharpening is done on a Universal grinder then care should be taken to see that cutter runs true. If the sharpening is done on a rotary vertical surface grinder, the same care should be taken to see that the cutter runs true. If this point is not observed, and the cutter runs eccentric, then it will vary in thickness and the faces will not be parallel to each other. The variations should not exceed 0.00025-inch.

Do not use an extension pipe on the regular wrench furnished for clamping the gear shaper cutter. The thread on the spindle is a fine one and holds the cutter with the required rigidity. When clamping, and this applies especially to the thin-web type shown at F, see that the cutter is mounted properly and is seating

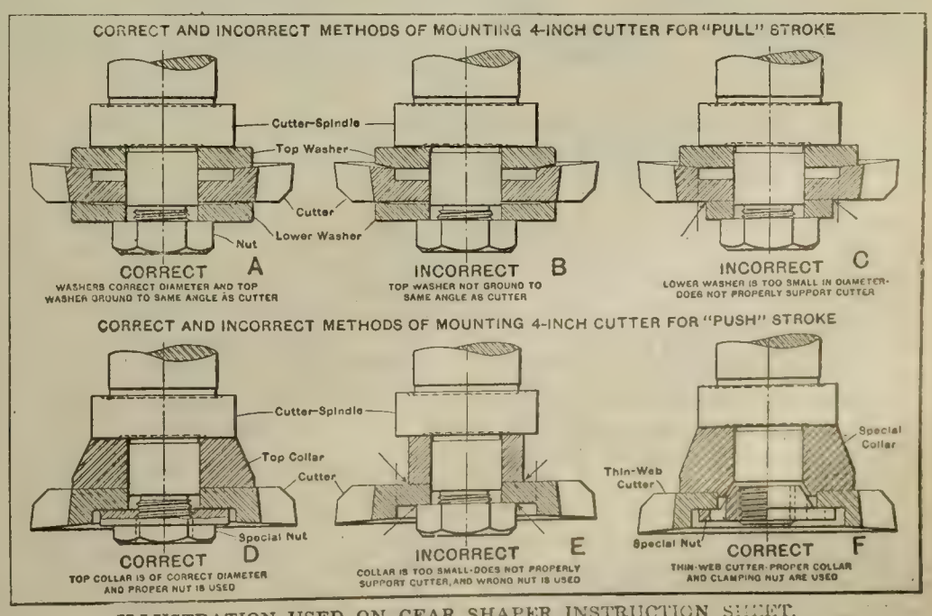


ILLUSTRATION USED ON GEAR SHAPER INSTRUCTION SHEET.

correctly on the collar before the nut is tightened to the full extent.

Do not use a gear shaper work arbor that does not run true. Test the arbor frequently with a good indicator when in position in the machine. The maximum eccentricity of the arbor is .00025 inch when cutting gears that must be accurate. If the work arbor runs out of truth, the pitch circle of the gears cut on it will be eccentric with the hole.

PATTERN MAKING NOTES

By J. W. Broadbent

Fillets

A CASTING would never pass the examination of a critical inspector unless all sharp corners were eliminated; not only has a casting a more finished appearance but it is greatly strengthened by putting fillets in all corners as in Fig. 5.

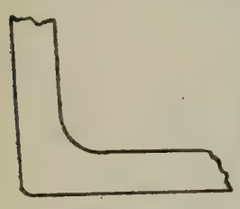


FIG. 5.

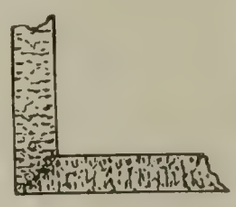


FIG. 6.

Cast iron is composed of a number of minute crystals and these crystals always set themselves at right angles to the cooling surface, thus in a right angled casting, Fig. 6, there will be a break in the crystals in the angle of the casting, which will form a permanent source of weakness, and under ordinary conditions the casting will break here before anywhere else.

By forming a curve, however, as shown in Fig. 7 the crystals will form without any line of separation; and it is

FIG. 7.

FIG. 8.

easily seen that a hollow cylindrical form of casting Fig. 8 will be the strongest, because the crystals will all radiate symmetrically.

From a moulder's point of view, fillets are a great convenience for they enable him to make a much cleaner casting, the sand not having the same liability to break away as in a square corner. Several methods are adopted by the pattern maker for filling in these angles,—either by working the fillet out of the solid wood of the pattern, or making them separately of wood, leather, beeswax, putty or lead.

Kinds of Fillets

Of these methods the first one always proves the most satisfactory and a good example is a hub for a pulley, the fillet of which can be very conveniently turned to make a good strong job by recessing the web of the arms as in Fig. 9 which method does away with the feather edge of the fillet.

Figs. 10 and 11 show two methods of making strong fillets, but owing to the expense are seldom used on any but standard patterns. For all straight surfaces the wooden fillet answers the purpose fairly well, but has a habit of curl-

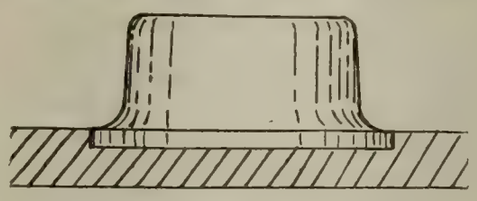


FIG. 9.

ing away from the pattern when glue is applied.

If the fillet is made with an angle of 93 deg. and the glue put on very sparingly, no difficulty should be found in making it lie down snug in the angle of the pattern.

Leather Fillet Preferred

Leather fillet is now the most popular and by far the best to use, for it can be easily adjusted to any kind of surface, either straight or curved, and is easily fastened to the wood by either shellac or

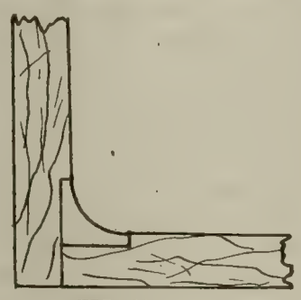


FIG. 10.

thin glue. It can be bought in all sizes from ⅛ in. up.

The method of applying is to cut the fillet to the necessary length and lay it on a board where the adhesive material can be easily brushed over it. It is then laid in the angle of the pattern and rubbed into position with a tool rounded at the end so as to give the required curve to the soft leather.

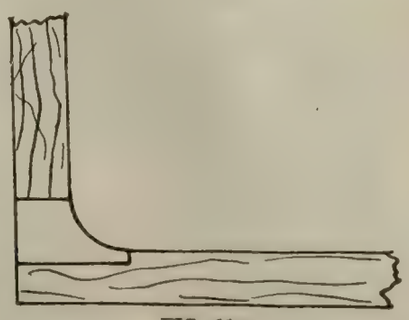


FIG. 11.

A rounded piece of wood is a common tool used for this purpose but Fig. 12 shows a better tool for applying leather fillet, it is made by fastening different sizes of ball bearings to a round rod, and no pattern maker's kit is complete without a set of these.

All surplus glue should be wiped off before it sets, which is easily done with a piece of rag dipped in hot water.

There are some who claim that fast-

FIG. 12.

ening leather fillet with shellac is a waste of good material. It is true that glue is cheaper than shellac, but when we consider the time spent in wiping off all the surplus glue, and that if the shellac does ooze out a little the damp sand will not stick to it, the ultimate cost works out about the same.

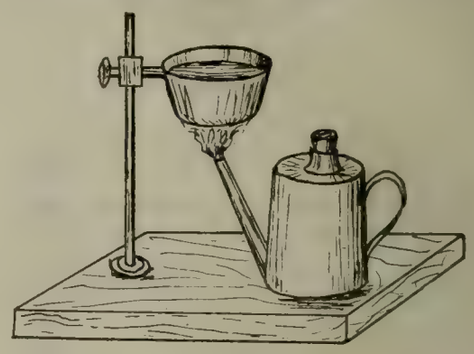


FIG. 13.

Beeswax and its Application

For some classes of patterns, beeswax is an indispensable material, not only for fillets and filling nail holes, but for parts of the pattern itself. It should be applied hot after the first coat of shellac has been put on the wood, and if a small proportion of resin is added to the wax, it will adhere better and set harder. Fig. 13 illustrates a cheap and effective apparatus for melting beeswax, The beeswax is melted in an ordinary tin cup heated by an alcohol lamp, the beeswax being applied with a curved spoon Fig. 14.

Putty takes too long to harden to make a good job and it is necessary to give the angles a light coat of lead and

FIG. 14.

oil before using the putty or it will not stick. Lead fillet has never met with much success, as it is heavy, takes too much nailing and does not lie close to the wood.

Three-Cornered Fillets

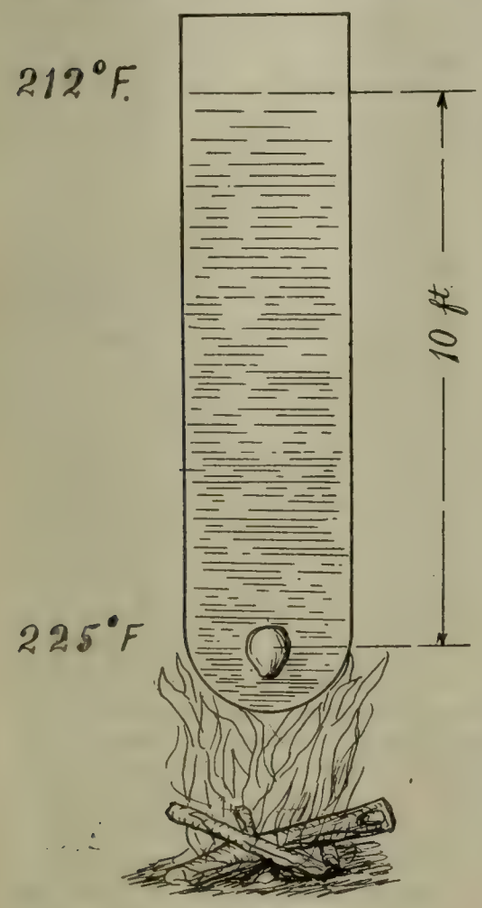
It is often necessary to make a pattern in a hurry and the pattern-maker decides to let the moulder cut the fillets out of sand. In these cases the appearance of the finished casting depends upon the skill of the moulder, and if appearance is not to be considered, it is advisable to use three-cornered fillets, they are easily nailed into the angles and fully answer the purpose for which fillets are intended, that is—to strengthen the casting, or to prevent shrinkage in a place that would weaken the casting and to make the moulder happy by not having any sharp corners of sand in his mould.

WHAT IS THE TEMPERATURE OF A STEAM BUBBLE?

By N. G. Near.

IT is generally assumed that the temperature of the water in a steam boiler is practically uniform from top to bottom, but it occurs to the writer that in some of our modern boilers there may be a considerable difference, especially in the steam temperature.

It is often explained that in the generation of steam, small steam bubbles form at the bottom of the boiler, whether tubes or shell, and that these bubbles then shoot upwards because of their low density. However, according to



ILLUSTRATING REMARKS ON TEMPERATURE OF STEAM BUBBLE.

steam tables, the temperature of a steam bubble at the bottom of a large boiler must be sometimes as much as 20 deg. F. higher than the temperature of the steam in the steam chamber.

Take the example shown herewith—a vertical tube holding 10 feet of water. The water pressure at the bottom is 4.34 pounds per sq. in., or 19 lbs. absolute. The temperature of steam under such a pressure must be at least 225 deg. F. The top of this tube being open to the atmosphere, the temperature of the steam escaping would therefore be 212 deg. F. at sea level. Hence we have a difference in steam temperature of 13 deg. F. The small round object drawn at the bottom of the tube is a "steam bubble."

OILING THE LINESHAFT

By A. L. Loy.

IN passing through a machine shop the writer noticed that about three feet below the main lineshaft was placed a platform about twelve inches wide. The shop was rather long, and this platform, consisting of a plank laid on brackets fastened to the building columns, extended the full length. When oiling the shaft, the oiler could traverse the entire distance without once getting to the floor, doing away entirely with the use of a ladder. The platform also came in handy in putting on or making repairs to belts. Of course, such an arrangement is possible only where the lineshaft follows the building columns.

MOLYBDENUM, ITS ORES AND USES

THE increasing use of what till recently have been classed as semi-rare metals, such as tungsten and molybdenum, etc., has created more than passing interest in their origination, geographical location, and methods of extraction from the ores. The development of molybdenum mining in the Province of Ontario is a fact of more than passing importance in view of the uses which are already in existence for this material. The practical and commercial characteristics of the metal are dealt with at some length in an article in "Engineering" substantially as follows:

Classification

Molybdenum belongs to the group of heavy metals comprising tantalum, titanium, tungsten and vanadium, which are capable of imparting special properties to steel. It was discovered by Hjelm in 1783; its symbol is Mo; it occurs as a solid; its atomic weight is 96.0; specific gravity 8.6-9.01, and specific heat 0.066. Molybdenum is a metallic element whose compounds are quite widely diffused, but its ores are very rarely found in considerable quantity. It has never been discovered in nature, but invariably alloyed with some other compound, of which it generally forms but a limited percentage. It is a white metal, hard, and somewhat malleable. The ore of molybdenum, on which the world depends for its main supply of the metal, is molybdenite, a sulphide, MoS_2, which occurs in hexagonal plates or masses, thin, foliated similar to graphite, and much resembling that mineral. This ore has a grey color and streak, olive-colored on white paper; it can be differentiated from graphite by its high specific gravity. Molybdenite occurs in a great variety of rocks in different parts of the world, including practically all the main groups, but its occurrence with granite and the more acid rocks, of which that is the type, is by far the most usual and typical. When molybdenum ores occur in veins, in quantity, they are usually in the form of oxides, as well as of sulphides.

Another mineral which has been found commercially suitable as a source of molybdenum is wulfenite, a lead molybdate. This ore, to be useful as a source for molybdenum, must not carry as impurities large quantities of copper, arsenic, vanadium or iron. The ease or difficulty of concentration has much to do with the feasibility of profitably mining and developing molybdenite deposits. Unless the minerals occur in tolerably large lumps, so that they can be hand-picked, it has been found somewhat difficult to discover a satisfactory method of separating the ore from the gangue material. Both the oil and the static electric methods have been used with varying success. Only rarely does the mineral occur so coarsely divided that it may be hand-picked; the ores are prepared for the market in two forms—powdered and as ferro-alloy.

The powdered form is obtained by heating some form of oxide with a reducing agent, such as carbon in the form of charcoal. The first stage produces the dioxide, which is not readily volatile. Prolonged heat and high temperature result in the production of the metal. Ferro-molybdenum, with varying molybdenum content, is made by the use of the electric-resistance furnace, either direct from the sulphide, or from the roasted high-grade sulphide. By this process the impurities can be slagged off; in the case of the powdered metal the impurities are subject to extraction by means of a solvent, otherwise they remain with the metal.

Niagara Activities

Molybdenum alloys are made in part at the Niagara Falls by means of the electric furnace, and when they are made elsewhere metallic aluminum is largely used as a reducing agent, which is also a Niagara power product. These alloys form the chief constituent of a group of products which are absolutely necessary in the manufacture of high-speed tool steel, magnet steel and a variety of special steels. Alloys can be formed of the two elements, molybdenum and tungsten, by compressing a mixed powder into briquettes, and then heating them with an electric current in an atmosphere of hydrogen. Alloys can be produced varying in composition from 100 per cent. molybdenum to 100 per cent. tungsten. Thermal and microscopical analyses show that molybdenum and tungsten are completely isomorphous. All alloys of this series are malleable and ductile under proper conditions. Alloys of molybdenum and tungsten have been suggested as a substitute for platinum and its alloys, the prices of which are abnormally high. It has been ascertained that, except in two respects, molybdenum meets the requirements of a practical substitute. These two defects are its relative ease of oxidation and the difficulty with which it can be soldered; but both appear to have been overcome by coating with a precious metal or alloy.

Several localities for the supply of molybdenum ores may be briefly referred to. Ores have recently been found in New Zealand, at Takata, and samples assayed are stated to have contained 50 per cent. of molybdenum oxide. Ores occur in New South Wales and Queensland; works for treating them have been established in Sydney.

Several deposits of the ores occur in Eastern Ontario; these have been opened

out and are being worked. There are dressing plants at Renfrew and Ottawa. Ferro-molybdenum is being made at Orillia and Belleville. The so-called "sierra" districts of Peru are highly mineralized, and contain molybdenum ores, as well as many other minerals. For several years important molybdenite mines near Phelomarken, in Norway, have been worked in a somewhat primitive manner, but during 1916 a more modern system has been introduced.

Other Developments

Up to the close of 1911 the demand for molybdenum remained stationary and very limited in the United States; with the exception of some slightly increased use of the metal in Europe the outlook did not look at all encouraging. The production in the United States was very small hardly worthy of notice—not due to any scarcity of the substance, but to small demand. More recently a larger supply was required, which resulted in an active search for molybdenum ores in the United States. During the spring of 1915 molybdenite concentrates were produced from a mine near Empire, Colorado. This is the first American mine to be extensively operated for molybdenite.

There are several known localities in the United States and Mexico where molybdenum ores could be mined profitably; they occur in more or less widely separated localities north of the international boundary of the United States and Mexico, in the Santa Rita and Patagonia Mountains, not far from the Southern Pacific Railway; in the Pinna and Santa Cruz counties, Arizona. Mines have been opened up some thirty miles south-east of the town of Tucson. Wulfenite has been found in a number of places in Utah, Nevada, Arizona and New Mexico, also to a very limited extent in California and some other States.

Some Uses

There are many uses to which molybdenum and its various compounds have been put, as ammonium molybdate to determine phosphorus in iron; as a fireproofing material; as a germicide; as a disinfectant; as sodium molybdate to color pottery and porcelain blue; to dye silks and woollens; as molybdenum tannate to color leather; and as molybdenum "indigo," Mo_2O_3, it is a useful but expensive pigment for india-rubber, which, it is stated, is not injured by its use. Molybdite, known as molybdic ochre, is a straw-color to white mineral containing from 50 per cent. to 60.7 per cent. of molybdenum, and is considered to be a hydrated iron molybdate. There are a dozen or more known salts of molybdenum, most of them of only scientific value.

The terms "unit" or "content" are frequently used in quoting the price of molybdenum ores; the former refers to the price ner net ton of ore guaranteed to contain a given percentage, possibly with bonus or penalty per unit for anything over or under the given percentage. The word "unit" is used in the same sense as per cent. The "content" system is a somewhat simpler mode of quoting, thus: 75c per pound for MoS_2 contained in concentrates of 90 per cent. molybdenum sulphide.

INDUSTRIAL RESEARCH

THERE is an imperative need for the extension and better recognition of research work. It has been said, truly, that there are few things more necessary for the sound economic development of manufacture than organized industrial research, and that is the considered opinion of the majority of leading engineers and metallurgists. Results are seldom obtained by casual workers, or those who, only interested in scientific investigation, pay no attention to the commercial side of their work. Practically all important results have been obtained by those who have undergone special training and who have devoted a great part of their life's work to ceaseless experiment and research. To such work it is necessary to pay undivided attention, with a view to finding the underlying laws of nature and to simplifying our understanding of those laws. After the war, it is more than likely that the future of every country will depend to a vital degree on scientific research; and, as has been said, whether any particular nation is to become a leader or a follower will depend to a considerable extent upon the facilities which that nation affords to those of its people who desire to undertake work of a scientific character with a view to improving its commerce and manufactures.

What is the purpose of industrial research? Surely its final object is to enable us to use the resources of nature to-morrow more efficiently than we do today. The engineering and metallurgical supremacy of the future will certainly belong, as an American writer once said, to those who conduct organized research work, improve their product by the knowledge thus gained, and keep ahead of others by constantly improving the quality and increasing the efficiency of their product by new developments.

Only recently an entirely new branch of chemistry, the chemistry of the free atom, resulted from the work of the British chemist, Langmuir, in the Electro-Chemical Research Laboratory of a certain electrical engineering concern; other cases might be cited, but, after all, the scientific research laboratories represent, as Steinmetz recently pointed out, only a part, often the minor part, of the research work done within the industry, and in many places ample opportunity is afforded for the right men to enter and carry out independent scientific research. In the United States, for example, it is the custom in the materials testing laboratories, in the standardizing laboratories, in the apparatus testing departments, and in the development departments of the big manufacturing houses to allow research work to be carried out, and not only to encourage it, but to fit up laboratories and workshops for those who, showing promise, wish to engage in such work. This is an example which is already being followed in England by a few firms, but there is urgent need for the development of the movement, which is perhaps of more vital importance to England, and to English manufacturers, than it is to any other country, if she is to keep her predominant position amongst the nations of the world.

CEYLON MONAZITE

THE mineral survey now being conducted in Ceylon in co-operation with the Imperial Institute has led to the discovery of beach deposits of monazite sand, which will usefully supplement the commercial supplies of thoria required for the manufacture of incandescent gas mantles. Samples of the sand have been investigated by the Imperial Institute, and the results are so promising that the Government of Ceylon has arranged to work the deposits. Suitable British concentrating machinery has been selected by the Institute for the purpose, after experimental trials, and will shortly be shipped to the colony.

This is the latest chapter in the story of the long struggle to rescue the gas mantle industry from German domination. Formerly the monazite deposits in Brazil were the only commercial source of supply of thoria, and these were controlled by the German Thorium Syndicate. The Brazilian monopoly enjoyed by this syndicate was broken by the discovery of extensive deposits of monazite in the native State of Travancore in India, so rich that samples examined by the Imperial Institute were found to contain nearly twice as much thoria as the Brazilian monazite. The German syndicate, however, obtained control of the company formed to work the Indian deposits, and they continued to exercise a dominating influence over the industry till the outbreak of the war. Since then the company has been reconstructed and given a British character, and it is understood that another portion of the deposits in Travancore has been taken up and will be worked by a second British company.

It is of interest to note that the work of the Mineral Survey has shown that Ceylon can furnish several other thoria minerals besides monazite. Among these is thorianite, the richest known source of thoria. This new mineral when it first came on the market was sold in England at as high a rate as $8,000 per ton, but the deposits have proved to be limited.

HE was under sixteen years old, but was very anxious to go out and do his bit, so he marched up to the recruiting office and boldly told the sergeant he was "nineteen and a half." The sergeant looked at him with a twinkle in his eye. "My lad," he said, "do you know where boys go to who tell lies?" "Yes, sir," came the prompt reply, "they go to the front." "Whatever do you mean?" asked the sergeant "Well, I've three pals at the front what's not seventeen. an' you passed 'em, anyhow," was the boy's rejoinder.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

BALL BEARINGS FOR HAND-POWER DETAILS

By T. J.

BALL bearings—both of the "journal" and "thrust" type, and either parallel or radial—are an acknowledged success in the elimination of friction and consequent saving of fuel when applied to power-driven details. On that point all engineers are agreed. But, why not carry their application a big step farther? Why not apply them to journals of "hand-power" details? More especially now when there is the necessity for the greatest possible output, and every possible means should be acquired for keeping the wheels of the factory turning sweetly. Could there be any better way to effect this than to apply ball bearings to all our hand gear? Such could be applied to all hand-winches, four wheel hand trucks, sack trucks, etc., and all the hand-power accessories which go to make up the sum total of the means of transporting goods in a factory or outside erection, and even applied to the lifting of shells for the big guns on the battlefield. At the present time it is imperative that not an ounce of power, either manual or motive is wasted and to provide the most efficient means of hand transport of goods is certainly a matter demanding the closest attention.

WAR EXPEDIENTS IN FRANCE

By D. Street

LINKED with the question of assisting agriculture, particularly from the moment when peace is declared, consideration is being given in France to the best means of providing the farmer with the most efficient mechanical aids for increasing his production.

Something has already been done as the result of the government grant in January last, but it is desired that arrangements should be made now for French industry to make adequate deliveries of the necessary appliances not less than six months after the close of the war. To this end it has been proposed that committees should be appointed by the French Ministry of Agriculture to determine exactly what will be needed and that munition works should remain under State control for the purpose of carrying out the manufacture. It is contemplated that local centres of instruction in the use and upkeep of mechanical cultivators shall be established. It would be desirable for this part of the scheme to be initiated at once by educating the farmer in the employment of motor tractors, seeing that the government's efforts in this respect have not been crowned with the success they merited.

The project of letting munition works turn over to the manufacture of motor tractors—of which it is estimated that 20,000 would be required—has, however, met with some criticism. It is represented that the French manufacturers of agricultural and other machinery ought rather to be placed in a position to fulfil the orders by helping them to secure the material and the men. On the other hand it would appear doubtful whether the general engineering industry of the country can reconstitute itself quickly even to cope with the demands for railway material.

National Footwear

The French government have now made satisfactory arrangements for State manufacture and distribution of boots for the needs of the civilian population, and the military authorities have approved of the details of the scheme, which is being carried out by the principal boot manufacturing associations under the control of the Ministry of Commerce, the leather being distributed by the Ministry of War. Each bootmaker will have a distinctive mark for his own goods, and will keep a record of the raw material allotted to him, and of his deliveries of "national" boots. The maximum profit allowed to the manufacturer has been fixed and no manufacturer may refuse to participate in the national scheme. Selected types of footwear will be arranged suitable for (1) men, (2) women, (3) youths and girls, and (4) children. These will be standardized, as well as a heavy type of workman's boot. It is hoped that by the time the hard winter weather sets in 500.000 pairs of national boots a month will be coming out of the factories, and that ultimately sufficient boots for the whole of the civilian population of France will be forthcoming.

Although under this scheme the use of leather needed by the Ministry of War is precluded, good material is evidently to be used throughout the national boot. The first sole is to be cut from the trimmed imported hide, provided it is not stout enough for army boots, and the second sole from vegetable tanned South American, Cape, Abyssinian, China or Madagascar hide, whilst the uppers are to be made from either tanned or chromed horse hide, imported cow hide, or calf skin, or Indian kip.

AWAKENING YOUR ENERGY

By W. Doolittle

THE life worth living, the life called real and purposeful, is one that is moulded and made by persistent striving and constructive energy. Swinging one's self forward daily with determination, forward and on a body animated and alive from head to heels.

We are not to be as vegetables that sprout up in the springtime of youth and wither and fall in the winter of life; living and breathing, and drawing substance; anchored in the same spot; without having made a single inconspicuous move.

Why Are You?

Look you deep, and consider well. The pangs of child-birth have been suffered and endured for you, not in order that you might be what you are now, but what you ought to be. Not in the lagging, bragging lazy-bone class, but, a living, wide-awake, alert, thinking human being.

You, who step into to-day, you of that class who are in the habit of wasting your time in listless endeavors, you, yourself, the human form that you are, awaken! The great energizing force within you calls you now to meet a challenge. A challenge direct from the great universe, not alone to give battle to the elements of earth and sky, but to push forward, forge ahead, and become an active, persisting, determined energized individual.

You are not to stand and stare; nor should your arms be akimbo or hang lifeless at your sides. But on these your sleeves should be rolled up; your spine fully straightened; your head and eyes clear; your nerves calm but vibrating; every part of your anatomy ready at all times to be brought into play. These are the pre-requisites to turn yourself from what you are now, into an ever-ready-to-thrust forward type of mortal.

We desire the good things, the luxuries of life; but instead of pushing forward and trying to obtain these by legitimate means, many live on the supposition or hope, that some day, someone, will be accommodating enough to die and leave them the wherewithal to secure these. The point to be emphasized is, that the thing worth the having, is worth the most energetic striving for. The mere thinking and wishing method has no place beside the man with unflinching power, whose superabundant energy is going to capture all that he most necessarily needs or wants. The great fault with the average of mankind is, that a little feeble expenditure of energy exerts such a strain upon one's ordinary efforts, that a two hours' relaxation is required for each hour's exertion. A slight bend of the back-bone requires a stimulant to put it back in place.

Many Are Lacking

Very few of us have that get-up-and-go, that swinging energetic gait, that forward going spirit, that buckles up and turns over obstacles. We spend much time in useless thought. And too much time in babbling talk. We know little of quietness—the great silence that

moves steadily, uncomplainingly forward, that makes each action count for something useful and big. The best that was ever obtained, or ever will be obtained, fell in the right white palm of the man who went determinedly forward, and stood his ground till he got it.

You who sit and whine, you who despair, wake from your sleep. The day is far fetched. Things may look to you more hopeful to-morrow, but to-day, this very moment, if you choose to make it so, has more hopes that can be realized if you are only wise enough, know enough to turn your steps towards them. Your energy is the mainspring in the clock of your existence. And it has run down a long ways. A few winding turns will not give you much speed. You need a thorough winding, and that winding process needs to be enacted with despatch.

Deep in the marrow of your bones, along the entire length of your spinal column, your cords and sinews,—all that is within you of flesh and blood and soul, is one vast network of ripping, vitalizing human energy. Only the will of you, only the brain of you, needs to press the starting button to set in motion that force called energy. And that energy, be what it is, is bound by the propelling power of which it is composed, to force you ahead in unswerving, unrelinguishing epoch-making achievements.

Can that fact be driven home, deep in the core of that being you call self. That which to you is a human frame built on symmetrical lines. Endowed at the top with a thinking machine called a brain. Extremities called arms and hands that do your bidding, limbs and feet that propel you. Can you not awaken these to serve with greater energy, with greater power, with greater activity? Working towards some grand end, be it small or big, but working and incessantly working, striving each day towards accomplishing something, in putting the mark of your personality and name, indelibly and uneraseable upon that which your efforts expend.

FLEXIBLE TURBINE GEARING

By L. E.

THE problem of ensuring equal distribution of pressure over the whole surface of the wide fine-pitched gears now coming into use for marine turbine speed reduction is being tackled in many ways. H. A. Macalpine, who was the first to act upon the growing realization of the matter, has proceeded upon the line of supporting the pinion in a rocking or floating cradle designed to permit of a continuous self-adjustment of the pinion to the wheel. In one of his arrangements the frame supporting the pinion is constructed so that the solid metal will afford a certain amount of spring whereby when the tooth pressure becomes unduly heavy on one side of the gears, due to unavoidable imperfections in gear-cutting or disalignment of the two shafts, that side yields just enough to allow the pressure to spread equally over the whole face. In another arrangement the same effect is obtained by sustaining the pinion bearings on interconnected hydraulic pistons.

The Macalpine device has now had extensive trial both on large mercantile vessels and on several battleships, and, though there has been a good deal of controversy on the matter, may be said to have established its claim to show a marked though varying advantage over the usual type of gearing on the respective scores of efficiency, durability, smoothness, and silence of working, amount of lubrication required, degree of reduction possible and weight of gearing set.

Sir Charles Parsons, confronted with the same difficulty, believed the solution lay in eliminating as far as possible the inaccuracies which the teeth of all large gears revealed, and set to work to discover and eliminate their source, arriving eventually at the ingenious methods by which the errors in the master gear of the gear-cutting machine are distributed over the face of the cut gear. By this means a considerable improvement was effected in the working of reduction gears without interfering with the solidity of the pinion journal supports, but it is doubtful whether even absolute initial accuracy, could that be obtained, would in the long run give as good results as some system of automatic continuous self-adjustment; for initial gear-tooth errors are only one part of the derangements of alignments that have to be provided against—there are also the torque of the pinion, the gradual wear of the bearings, and the slight but material distortion of the gear from under varying loads.

A third way of approaching the problem has been undergoing development for some years past. It consists of building up the main gear with a series of discs, chambered at the sides, threaded upon second-motion shaft. When first put together these discs are in close contact both at the hubs and at the rims, and the built-up gear blank is turned end out just as though it was a solid gear, but when the cutting is finished a parting tool is run down between each pair of discs, so that the gear in its final working form appears as a row of discs secured rigidly to the shaft and to each other at their bosses, but separate at their peripheries. The teeth are, of course, cut helically, and the effect of the disc construction is that when in working undue pressure comes upon any disc at any point of its circumference the disc deflects sideways, and thereby allows the load to spread over the remainder of the discs.

The proportioning of the discs, particularly as regards strength and contour of cross-section, is obviously a matter calling for careful calculation and experiment in order that the lateral deflection may at no time involve fibre strains which could possibly cause destructive fatigue, but a very small side movement is sufficient to afford even distribution of load across the entire surface of the gear. This type of flexible disc has now been applied to some eighty sets of turbo-generators with uniform success and is at present undergoing trial as a turbine reduction gear for steamships.

HOME SOURCES OF OIL SUPPLY FOR BRITAIN

By Mark Meredith

TO a great manufacturing community any extension of resources for cheap lighting and motive power is a matter of primary importance, and when also there is the probability of a great new industry arising from the exploitation of a potential oil field in all parts where the geographical conditions permit, it is apparent that no stone should be left unturned to secure supplies of oil from all possible parts of the country. Already there is a big scheme in hand by the British Government, to ensure that proper arrangements will be made for the production of petroleum, and licenses will be granted for the purpose of exploiting all the oil fields in Britain on payment of a royalty of ninepence per ton, and the application for a license to the British Board of Trade. The scheme is the outcome of investigations by experts who have advised the Government that the petroleum deposits, long suspected by geologists to exist in certain strata in certain defined areas, are worth developing in view of the necessity of adding to Britain's fuel resources and thus lessening the need of importing large quantities of liquid fuel.

It is strange that much English money has been invested in recent years in the exploitation of foreign oil fields, whilst the evidences of petroleum deposits at home have been ignored or entirely overlooked. No country has been so bored as Britain, and yet, no country has, strictly speaking, been less tested in depth for oil. And it is just at a depth below the objective of the coal miner that petroleum in Great Britain must be looked for.

A Late Realization

The fact is, of course, that the presence of petroleum deposits in bulk and at economically accessible levels has not been sufficiently realized or comprehended and when England strikes oil in her own rocks, and finds her wonderful wealth in liquid fuel as well as in coal seams, the thanks will be due to those laborious investigators, like Dr. Forbes Leslie, and other leading members of the British Institution of Petroleum Technologists, who have devoted years of patient research to the subject and have at last secured public recognition.

Petroleum has "occurred" at Hemsworth, Dinington, Clowne, near Chesterfield and on the fringes of Lancashire. Years ago petroleum was discovered as far in the west as Leigh and Wigan and even at Ormskirk: it is to be found today at Market Rason and Donnington in Lincolnshire, and there is record in Derbyshire of oil being found at the Southgate colliery, where an intermit-

tent volume of petroleum, mixed with its own volume of water, flowed at a rate of from seventy to a hundred gallons daily. The rock from which it issued lies at a depth of no more than 320 yards from the surface. The most notable and most historic escape in Great Britain was that in the Riddings Colliery at Alfreton, exactly seventy years ago. The famous chemist, Lyon Playfair wrote one day to his friend James Young, then at work in Manchester, telling him of a petroleum spring having been discovered in his brother-in-law's colliery. The spring yielded as much as 300 gallons a day. Young bought up the yield and manufactured paraffin from it until the supply gave out, when he removed to Scotland, and commenced the development of the Scottish mineral shales.

More recently, a boring at Helham, near Newark, led to the discovery at a depth of 2,439 feet from the surface, of oilsands, 13 feet thick, believed by some observers to be only the upper sands of a productive series of unknown thicknesses. The bore had passed through coal measures into millstone grit, containing sand producing highly saline water, then fireclay, some shale, and then petroliferous sandstone. This boring has led experts to the conclusion that the eastern counties contain a large oil field, extending possibly along the Trent valley to the Derbyshire coalfields. The indications so far observed taken in conjunction with the relationship noted between the known oil escapes and underground formations point to the fact that the oil escapes cannot be erratic exudations from the shales on the surface, but must be outward and visible signs of vast deposits of petroleum retained in long buried structures.

Future Supplies

At the present time it is futile to speculate on the yield which may be looked for by the tapping of this great new oilfield. It may be years even under favorable circumstances, before the output could enable us to be independent of oil importations from overseas, but the possibilities will appeal to the least imaginative mind, and the developments that may follow will be watched with increasing interest. In the meantime it is worth noting that out of a total world production of marketed petroleum of 400 million barrels, the United States in the first year of war, supplied 265 million barrels. Russia was second with 67 millions, and Mexico third with 21 millions but while the American output is not keeping proportionately in advance of the demand in the home market alone, the Russian output is declining and has been long since before the war.

The world has still Rumania, Galicia, the Dutch East Indies, Japan, Peru, China, Egypt, Trinidad, India and Canada to look to for petroleum, but new sources are ever needed. It is quite time that the English oilfields were developed for all they are worth; as oil fuel will be required in vastly increased quantities after the war, and it is only self-protection for the home supplies to be developed, though no fear need be felt that the imported article will not be needed also.

STEEL CHIMNEY TROUBLES

By T. J.

CHIMNEYS built up of steel plates require protection both inside and outside, if they are to have reasonably long life and perform their work properly. The outside of a chimney is exposed to the action of sun, wind and rain, and the approved method of protecting it from rust is to give it a coat of good paint, which should be renewed whenever and wherever it shows signs of peeling off and exposing the metal to the influence of the elements. On the inside the chimney is exposed to the action of the gaseous products of combustion, which may have a temperature of several hundred degrees. Any form of paint would, therefore, be quite useless. Besides it must be remembered that the gases which flow up the chimney are derived from the combustion of fuels containing carbon, hydrogen, and sulphur, and, therefore, contain carbon dioxide, steam and sulphur dioxide. The steam in the chimney gases will condense if cooling takes place to any great extent, and the moisture will combine with the dioxides of carbon and sulphur to form carbonic acid and sulphurous acid. Both of these acids are corrosive in their action on iron, and they are particularly active in the presence of heat. Therefore, the inside of the chimney needs to be well protected.

The usual method of protecting the interior of a steel chimney is to line it with brick, which is laid up against the wall of the chimney. It is advisable to fill the interstices between the lining with a grout made of cement, as this will not only give support to the brickwork, but will at the same time prevent the corrosive acids from reaching the shell. Such a lining should extend to the top of the chimney to be effective. If it is carried up only half-way or even to two-thirds of the full height of the chimney the corrosion is localized at the part of the structure that it is most difficult to reach. The formation of moisture, due to condensation of vapor in the flue gases, will occur in the upper part of the chimney rather than in the lower, because the gases grow colder as they ascend, due to radiation from the shell of the chimney. It is, therefore, very advisable to carry the lining all the way up to the top.

It will be found upon observing steel chimneys that are in service that the signs of discoloration and corrosion on the outside are largely confined to the upper half of the structure. The rings or sections composing the chimney are put together in such a way that each overlaps on the outside of the ring below it, so that the edges of the circumferential seams face downward outside. This construction prevents rain and snow from collecting on the edges of the plates outside. On the inside, however, the edges face upwards, and if moisture is formed it will lodge on these edges, find its way through the joint and run down outside, streaking and discoloring the chimney. A continuous lining from the top to the bottom will lessen the radiation loss, reduce and perhaps eliminate condensation and in any case eliminate the moisture from the edge of the plates.

DOES A PISTON STOP AT REVERSAL?

By R. W. Miller.

HERE is an interesting question about which a controversy has arisen in connection with recent litigation. Put into its simplest form, the question is—does the piston of a steam engine stop when its direction is reversed, this is assuming that there is no lost motion in the parts?

Strange as it may seem, engineers, attorneys and examiners in the Patent Office disagree on the question. I maintain that it does not stop, but that the motion is continuous, and I would be interested if some reader of this publication can prove that I am wrong. To stop means to produce a state of rest—in other words, then, if the piston stops it must rest—then, how long does it rest?

The curve of a piston's motion, provided the connecting rod were of infinite length, would be truly harmonic. According to one authority, "a harmonic motion may be defined as the motion executed by the foot of a perpendicular let fall on the diameter of a circle from a point moving with uniform velocity along the circumference."

It is unnecessary to reproduce here a harmonic curve, because it is one with which we are all familiar. We know that no portion of this curve contains any part of a straight line. Now if there were a rest at each end of the stroke there would be two flat portions at each extreme of the travel parallel with the base line. One flatly contradicts the other.

One man argued that there was a point where there would be no motion; what becomes of this argument when we know that a point has no magnitude? Finally, if the piston stopped even for an infinitesimally small fraction of a second would not the flywheel to which it is connected stop also?

To controvert the theory that the flywheel stops, we find in the definition quoted that the point executing the harmonic motion must move with uniform velocity. How can the flywheel stop twice in one revolution, and yet have any point in its circumference move with uniform velocity?—the motion of the piston is just as continuous as the flywheel.

The Kerr Engine Co., of Walkerville, Ont., valve manufacturers, have leased their iron foundries to the Standard Foundry & Supply Co., who will hereafter make all the grey iron castings for the Kerr firm in connection with their extensive valve and hydrant business, and will also go strongly into jobbing work.

Standard Aviation Engine for American Aeroplanes

Very considerable importance is attached to the fact that United States engineers have designed a flying engine which is to be standard equipment for the Republic's air fleet. The manner of its conception, development and materialization was the subject of the following statement by Newton D. Baker, United States Secretary of War.

THE invention and rapid development of this engine is one of the really big accomplishments of the United States since its entry in the war. The engine was brought about through the co-operation of more than a score of engineers, who pooled their skill and trade secrets in the war emergency, working with the encouragement of the aircraft production board, the war department, and the bureau of standards.

The story of the production of this engine is a remarkable one. Probably the war has produced no greater single achievement. One of the first problems which confronted the war department and the aircraft production board after the declaration of hostilities was to produce quickly a dependable aviation motor. Two courses were open. One was to encourage manufacturers to develop their own types; the other to bring the best of all types together and develop a standard.

Inception of Standard Motor

The necessity for speed and quantity of production resulted in a choice of the latter course, and a standard motor became our engineering objective. Two of the best engineers in the country, who had never before seen each other, were brought together at Washington and the problem of producing an all-American engine at the earliest possible moment was presented to them. Their first conference, on June 3, lasted from afternoon until 2.30 o'clock in the morning. These two engineers were figuratively locked in a room in a Washington hotel and charged with the development of an airplane motor for use by American aviators over the battlefields of Europe. For five days neither man left the suite of rooms engaged for them. Consulting engineers and draftsmen from various sections of the country were brought to Washington to assist them. The work in the drafting room proceeded continuously, day and night. Each of the two engineers in immediate charge of motor development alternately worked a 24-hour shift.

An inspiring feature of this work was the aid rendered by consulting engineers and motor manufacturers, who gave up their trade secrets under the emergency of war needs. Realizing that the new design would be a Government design and no firm or individual would reap selfish benefit because of its making, the motor manufacturers, nevertheless, patriotically revealed their trade secrets and made available trade processes of great commercial value. These industries have also contributed the services of approximately 200 of their best draftsmen.

The two engineers locked together in a hotel room in this city promised the Government if given an opportunity they would design a satisfactory engine before a working model could be brought from Europe. A remarkable American engine was actually produced three weeks before any model could have been brought from Europe. It was promised that this engine would be developed before the Fourth of July. Twenty-eight days after the drawings were started the new engine was set up. This was on July 3. In order to have the engine in Washington and in actual running order at the nation's capital on Independence Day, the perfected engine was sent from a western city in a special express car. The journey was made in 21 hours, and four young men guarded the engine en route to Washington and personally attended to its transfer from one railroad to another.

Made in Many States

With the need for speed as an incentive, tools for building the first engine were made even before the drawings were finished—on the assumption that they would be correct. Parts of the first engine were turned out at 12 different factories, located all the way from Connecticut to California. When the parts were assembled the adjustment was perfect and the performance of the engine was wonderfully gratifying. This in itself demonstrates the capabilities of American factories when put to the test and when thoroughly organized for emergency work of this sort.

One of the chief rules outlined at the beginning of the designing work was that no engineer should be permitted to introduce construction which had not been tried out. There was no time for theorizing. The new engine is successful because it embodies the best thought of engineering experience to date. Not only did this country furnish ideas through celebrated consulting engineers, but the representatives in the United States of England, France, and Italy cooperated in the development of this motor.

Thirty days after the assembling of the first engine preliminary tests justified the Government in formally accepting the engine as the best aircraft engine produced in any country. The final tests confirmed our faith in the new motor in every degree. Both the flying and altitude tests of the new motor have been gratifying. One test was conducted at Pikes Peak, where the United States aviation engine performed satisfactorily at this high altitude. One of the engines, in an airplane, broke the American altitude record in a recent flying test.

While it is not deemed expedient to discuss in detail the performances and mechanics of the new motor, it may be said that standardization is a chief factor in the development of the Government's motor. Cylinders, pistons, and every other part of the motor have been standardized. They may be produced rapidly and economically by a great many factories operating under Government contracts. They may be as rapidly assembled, either by these plants or at a central assembly plant. The new engine amounts practically to an international model. It embodies the best there is in American engineering and the best features of European models so far as it has been possible to adapt the latter to American manufacturing methods.

A Cosmopolitan Model

The two engineers most directly connected with the production of the United States aviation engine had before them not only the blue prints and models of the most successful engines the war has produced, but also every available American suggestion. Men skilled in the invention of motors, both automobile and airplane, advised these engineers who were charged with the duty of providing rapidly and unerringly a motor which would embody every essential for wartime use. Non-essential complexities were consistently discarded by these engineers. The result was a composite design of maximum power, minimum weight, great speed capability, and adaptability to quick production.

The standardization of parts materially simplifies the problem of repair and maintenance. Spare parts will be promptly available at all times. Even the cylinders are designed separately. It is possible to build the new engine in four models, ranging from 4 to 12 cylinders, and under the standardization plan now worked out an 8-cylinder or a 12-cylinder model can be made, using the same standard cylinders, pistons, valves, cam shafts, and so on. This will make the question of repairs back of the lines a comparatively simple matter. The parts of wrecked 8-cylinder or 12-cylinder engines will be interchangeable, and a new engine may be assembled from the parts of wrecked machines.

The standardization of the new engine does not mean there will be no change in it during the war. There will be continuous experimentation as new types and improvements develop at the front and new ideas are born of the war emergency. If the engine can be improved, it will be improved; but as the motor stands to-day it is one of wonderful success and produced under dramatic circumstances. Construction of the new standard engine will not interfere with the continued manufacture of other serviceable models, either European or American, which existing plants are already turning out. The production of the United States motor will be carried on almost entirely in a new and expanding industrial field.

Raison D'etre

The Government is sometimes asked, "Why does not the United States adopt

one of the successful British or French high-powered machines and manufacture them?" British and French machines, as a rule, are not adapted to American manufacturing methods. They are highly specialized machines, requiring much hand-work from mechanics who are, in fact, artisans. It would require a year or more to teach American manufacturers and their mechanics to turn out such highly-specialized airplanes.

With the completion of final tests of the motor—tests which satisfied and gratified both expert engineers and army officers—progress already has been made toward organizing industry for the manufacture of the new machines, and deliveries will begin within a comparatively short time.

THE APPLICATION OF PULVERIZED COAL TO MALLEABLE MELTING FURNACES*

By Joseph Harrington, Chicago.

MELTING malleable iron with powdered coal as a fuel must still be considered in the experimental stage. The assurance that its advocates feel comes from an analysis of the requirements for melting and the definitely defined results that can be obtained with this fuel in securing controllable temperatures. In but one instance known to the writer has malleable iron been melted with powdered coal on a commercial scale, and this experiment was so brief that the only practical effect was to supply the observers with a fund of optimism and a feeling of certainty that had the work been continued, economical operation would have been effected. My analysis, therefore, must necessarily be more or less along the lines of theory, but I hope thereby to bring out in discussion such actual experiences as have been obtained, confirming or rejecting the theories advanced in this paper.

A Diversity of Opinion

In conversations with foundrymen I have developed a considerable diversity of opinion as to the temperatures which actually obtain in the malleable furnace. This experience does not differ in any way from that which one develops when the matter of high temperature in steam boiler furnaces is under discussion. It is not the simplest matter to determine temperatures above the range of the thermo-electric couple. Nominally at least, the metal couple can be utilized up to 2,400 degrees Fahr., but rapid deterioration takes place at these temperatures and the reading to a considerable degree is unreliable. The use of the radiation or optical pyrometer is also uncertain to a certain extent, because of the ease with which the instrument may be put out of adjustment and the care that must be exercised in focusing on a solid body without a gas screen to affect the intensity of radiation. When a good instrument is properly used the readings are correct, and the writer has developed temperatures in this manner up to 3,000 degrees. Under these conditions the amount of excess air supplied was cut down to near the limit, the carbon-dioxide resulting being about 16 per cent.

Temperature is also affected by the size and proportions of the furnace, so that a proper design will enable the engineer to secure temperatures which are sufficiently high and at the same time practical in the matter of brickwork maintenance.

The iron charge melts at various temperatures, ranging from 2,200 degrees to probably as high as 2,600 degrees, so that it is necessary to obtain at least the latter temperature for the prompt and economical production of fluid iron. This can easily be obtained with pulverized coal, especially if it is introduced as in a bunsen burner, which provides the elements in proper proportion within the fuel jet itself. The question of proper mixing of the fuel with the air for its combustion is absolutely vital, and in this process particular care must be taken that all of the elements are under control. Both the coal and the air must be introduced in such a manner that the character of the flame can be changed at will in accordance with the requirements of the charge at its various stages of heating and fusing.

Charge Should Be Heated Rapidly

During the early stages of heating, the charge is cold and should be brought up to melting temperature as soon as possible consistent with the proper soaking effect. The charge as a whole should come to its melting temperature with a reasonable degree of uniformity, so the various ingredients will not be melted at different times and enter the bath unmixed. The time element in this introductory period is one that affects the fuel economy only. The curve of temperature rise should be as steep as possible, because this is usually a period when the combustion is least complete and the loss consequently greatest. With powdered coal I venture to state the firing end of the furnace can be brought to a high heat within an hour, even though the furnace is cold to start with. With hand firing this period is often several hours long. Herein we see the first evidence of economy with this fuel.

The second period is one in which both fuel economy and effect on the charge are to be considered. After the iron reaches its melting point the charge begins to subside and becomes liquid. This is a period when it is almost probable the loss of the valuable ingredients in the iron takes place. We have present the necessary temperature in both the metal and the oxygen, together with an intimate mixture of the two which practically necessitates the oxidation of an appreciable percentage of carbon, manganese and silicon in the charge. Not only do these elements burn out, but other and less desirable elements may increase if the contact is unduly prolonged. The presence of sulphur in the furnace gases is one that has been commented upon in many different ways. Foundrymen almost always go to the expense and trouble of buying a special grade of coal which is low in sulphur on the theory that this harmful element should be kept as low as possible for the sake of its effect on the product. At the same time I have heard it emphatically stated that some of the best physical tests were obtained from iron which analyzed high in sulphur, so that it is not definitely defined in my own mind just what weight the amount of sulphur in the coal should have in such a discussion.

Not Like Other Fuels

In any event, as has been so clearly stated by Mr. Spring of the Crane Co., the burning out of certain elements may be serious and the melting of the charge should therefore be effected as rapidly as possible. The intense and sustained temperatures which can be produced with powdered coal would certainly lead to the belief that the desirable conditions for quick melting could readily be obtained. It must always be borne in mind that the fuel we have under discussion is nothing like solid fuel. We introduce the entire body of fuel directly into the chamber to be heated and at the same time it is of such a nature that the mixture is most intimate and the combustion most complete. Any proportion of air and fuel may be introduced, so that the character of the resultant flame may be nicely adjusted to the requirements of the melting process. This is in very sharp contrast to the average hand fired furnace wherein the blast has to be shut off periodically while the door is opened for firing. The production of heat during this time is suddenly lowered, and the temperature of the furnace correspondingly drops. After the fresh charge has begun to burn freely, the temperature mounts to a point slightly higher than before and about the time the fire is in its best condition, the blast is again shut off and the operation is repeated.

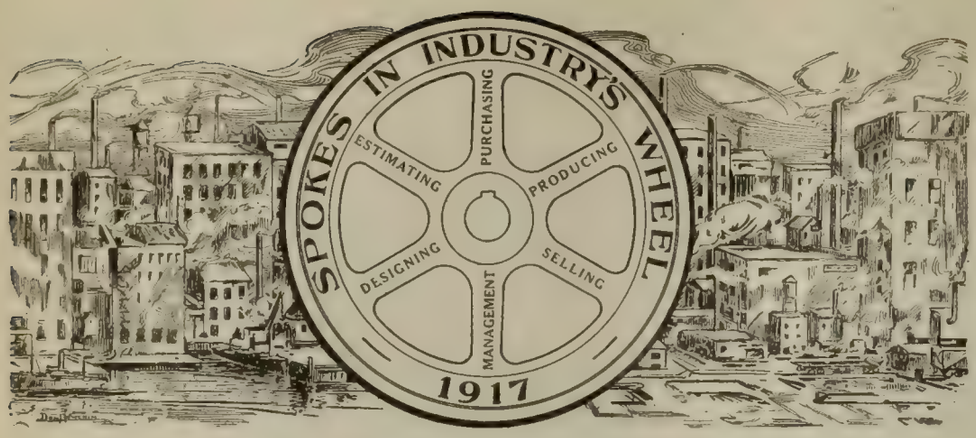
The temperature curve is therefore one of alternate risings and fallings, making it like a saw-tooth. This, of course, is not strictly the case with the relatively few natural draft furnaces, but the effect of the introduction of the fresh fuel is the same. The fire has to be continually raked, and the production of gas naturally varies. Not only does it vary, but it is under very little control, the only effect which the average furnaceman desires being the production of the required temperature. To this end he sacrifices everything else and under unfavorable conditions he may fire several hours just as hard as possible before the charge is properly heated.

More Hard Firing

After the iron has all liquefied and becomes covered with a layer of slag, further hard firing must be resorted to in order to produce a temperature high enough to render the iron sufficiently fluid for its purpose. With the iron thus protected from the effect of the furnace

(Continued on page 387.)

*A paper read at the annual meeting of the American Foundrymen's Association, at Boston, Sept., 1917.



The constitution of industrial enterprise is largely departmental—"spokes in a wheel." This series of articles has for its object the featuring in a racy, interesting and instructive fashion, the training, experience and achievement of those who to-day are transmitting, effectively, energy in their capacity as "spokes in the wheels" of our metal-working establishments.

MELVILLE P. WHITE

SEVERAL important changes were recently made in the organization and management of the works of Canadian Allis-Chambers, Limited, Toronto. Mr. Melville P. White, manager of the Architectural, Bronze and Iron Works for the past 11 years, has had his jurisdiction extended to include also the management of the Davenport Works, under the title of Works Manager. Born in Woodstock, Ont., he served his indentures for architect with the well-known firm of Burke, Horwood & White, Toronto, and afterwards was associated in architecture with S. S. Beaman of Chicago. Leaving that firm, he remained eight years with the Chicago Ornamental Iron Co. In 1906 he returned to Toronto to become manager of the Architectural Bronze and Iron Works, which has since developed until it has become second to no plant of its kind on the continent.

MELVILLE P. WHITE.

THOMAS BATE

Mr. Thomas Bate, who has been appointed Mechanical Superintendent of the Davenport works of Canadian Allis-Chalmers, Limited, was born in Manchester, England, in 1877, educated at the Grammar School of that city, and apprenticed to the Sir Robert Peel, Soho Iron Works in 1891. Having studied applied mechanics and mechanical drawing and steam engineering under Prof. Jamieson, he came to Canada in 1893, and soon afterwards entered the service of the Canadian Pacific Railway, Delorimier Avenue shops as improver. After a short time in the shops of John Gillis & Co., Carleton Place, as improver on boat engines, he entered the service of the Canada Atlantic and Parry Sound Railway at Ottawa, in 1898 as journeyman machinist. In 1899 he was promoted to the position of locomotive foreman and shore engineer for the Canada Atlantic Railway and Transit Co. at Depot Harbor, Ont. In 1902 he re-entered the services of the Canadian Pacific Railway as locomotive foreman at White River, Ont., and was gradually promoted on Eastern and Western lines, until at the time of leaving that company, he had risen to the position of Assistant Works Manager, Angus Shops, Montreal.

THOMAS BATE.

As a testimonial of esteem, the staff and six thousand employees of the Angus Shops presented Mr. Bate with an illuminated address and a cabinet of silver and also a silver plated traveling club bag for himself, and a traveling case in French pearl for Mrs. Bate.

CANADIAN STEEL OUTLOOK

A MEETING of prominent manufacturers was held at Ottawa on Friday to discuss the serious situation that has developed because of the embargo on the export of steel products from the United States. War has increased the demand, both domestic and foreign, for steel products made in the United States. Munition and ordnance plants, shipyards and other industries in Britain and other allied countries, in Canada and in the United States are calling for supplies of ship and boiler plates, angles and other rolled forms used in vessel and other construction. To control the disposition of the output of these products, the United States has prohibited exportation except under license and has established a priority board, such as exists in Great Britain, to pronounce upon applications for such licenses. The list of articles covered by the proposition includes boiler tubes of iron and steel, chrome nickel steel, ferro-manganese, ferrosilicon, ferro-vanadium, iron and steel ship, boiler and tank plates one-eighth of an inch thick and heavier and wider than six inches, pig iron, scrap iron, scrap steel, spiegeleisen steel billets, steel blooms, steel ingots, steel bars, steel slabs, tin plate and tungsten.

The stocks of certain of these products for which Canada has depended upon the United States are stated to be running low. Hence manufacturers are faced with the necessity of considering the question of securing further supplies. Some of the articles included in the United States list are produced in Canada and some of them may be produced by extensions of existing plants. Ship plates and larger sizes of shapes and angles for shipbuilding and of structural steel are not made in Canada.

The steel manufacturers have, therefore, met to consider the situation and are taking steps to estimate their immediate requirements in the products, which cannot be freely exported from the United States, showing in detail, the quantities and the specific purpose for which the goods are required. These statements will be presented to Sir George Foster and the Trade and Commerce Department will forward them through the British Ambassador at Washington to the United States Priority Board with such backing as can be

given them. To what extent that body will satisfy Canadian demands cannot be predicted. There is a feeling that materials needed for war purposes, including the carrying out of the shipbuilding programme, may be granted in full. Consideration will be given next to the applications for materials for industries indirectly connected with war activities and for transportation, such as for building locomotives. Finally, the requirements of other industries will be taken up. Should the demands of industries of this class not be met the erection of bridges and large buildings might perhaps be retarded.

Those present at the conference were: F. C. T. Ohara, Deputy Minister of Trades and Commerce; P. L. Miller, of the Canadian Vickers Co., representing the shipbuilding industry; R. M. Davy, of the Dominion Bridge Co., D. D. Fraser, of the Montreal Locomotive Co.; R. Harmer, of the Sawyer-Massey Co., for the manufacturers of farm machinery; T. McC. Hutchinson, representing merchants handling plates for general trade; F. R. Humphage, Walkerville, for firms using high carbon and alloy steel; C. A. Waterous, of the Waterous Engine Co., for the builders of boilers, tanks, pulp and general machinery. In addition, representatives will be appointed for the car builders, railways and foundry men. Three representatives will get in touch with firms throughout Canada to learn their needs.

THE APPLICATION OF PULVERIZED COAL TO MALLEABLE MELTING FURNACES

(Continued from page 385.)

gases the presence of more or less oxygen is a matter of indifference so far as the iron itself is concerned. Under these conditions, with powdered coal the excess air can be proportioned to produce the most intense temperatures, and I do not hesitate to state that flame temperatures well in excess of 3,000 degrees may thus be created. A peculiar effect which accompanies a powdered coal flame in proper condition is the absence of the heavy rolling opaque flame which is so noticable under ordinary conditions. It was found after many experiments with fuel oil that the non-luminous flame was the hottest. This, of course, is similar to the gas flame of the bunsen burner as compared to the fish tail burner. With powdered coal the condition chemically is similar, but on account of this fuel having a high percentage of fixed carbon in it, absence of luminosity cannot be obtained. At the same time the extent of the flame can be controlled so that complete combustion will take place within five or six feet of the burner even when this burner is delivering 500 to 600 pounds of coal per hour. The effect of the direct contact of such a flame with any object is extremely destructive. It is possible to melt a clay fire-brick almost as readily as a piece of iron after it is placed in exactly the right relation to the jet. The point of most intense temperature is just about at the end of the flame, and one can readily appreciate the reason why a pile of iron must liquefy promptly when one considers that the flame temperature is perhaps as high as 3,500 to 4,000 degrees.

Effect on Furnace Lining

Another serious question which arises in this connection is the effect upon the refractory lining of the furnace. This should be divided into two parts for discusion. First, the effect on the brick of the temperature alone, and second, the fluxing effect due to the chemical action between the bath or the slag and the brick which forms the furnace walls.

So far as the first is concerned I would not consider that the deterioration of the refractories would be any greater than with ordinary methods of firing. In the first place the powdered coal jet does not impinge directly upon any brick work, and there need be, therefore, no blow pipe action whatsoever. The controllability of the flame is such that just the right furnace temperature may be secured and I do not believe it is a necessary consequence that the high temperature jet will result in any greater fusing of the brickwork than now obtains with the long continued hand firing. A good brick should be able to withstand 2,800 degrees indefinitely, and 3,000 degrees for moderate periods. I doubt if these temperatures are often reached in the malleable furnace.

The second consideration of the firing effect is more serious, but is one which I feel can be kept under control. The chemical analysis of furnace slag does not differ in quality from the analysis of ash from powdered coal. Ash analyses show a wide range in the percentages of the various ingredients, but seldom any great diversity in the ingredients themselves. These are the oxides of silicon, aluminum, iron, manganese and calcium, which corresponds to the elements appearing in the malleable furnace slag. The addition, therefore, of melted coal ash to the bath does not alter anything except the range of its chemical constituents. The effect on the furnace lining may be altered in case the addition of the coal ash should bring some one element greatly in excess of the others, but I can see no reason why the addition of these elements should make the character of the slag seriously different. It would even be possible to introduce a certain amount of lime for instance, should it be necessary to keep the slag basic. In fact almost any such element could be introduced with the coal and very intimately mixed with it, so that the resultant slag could be readily controlled, both as to chemical analysis and fluidity. I cannot but feel, therefore, that fears regarding the destruction of the furnace sidewalls are based on considerations which will disappear when the matter is more fully studied.

Less Carbon Burned Out

All the evidence which I have been able to obtain from the brief practical experience with this fuel in this service, is that there was an actual diminution in the burning out of carbon to the extent of some 2 to 5 per cent., rendering it necessary to decrease the amount of new pig in the charge to that extent in order that the character of the iron should be the same. This experience is much the same as that which has been accepted by steel manufacturers in their experience with this fuel in heating steel. With fuel oil in steel heating service, we find from 6 to 8 per cent. of excess oxygen in the gases, the actual oxidation of the iron due to the heating in the furnace being about 4 per cent. With powdered coal in the same furnace the amount of excess air is reduced to between 2 and 3 per cent., so that the amount of oxygen actually present in the furnace gases is less than one-half and the oxidation of the metal is substantially reduced. Observations indicate that this reduction may be as great as 50 per cent.

What is true when iron is only heated to rolling temperature should most certainly be true when actually melted, so that the grounds for believing in a reduction of oxidation are certainly good.

The situation commercially at this moment is rather peculiar. Almost without exception foundrymen will admit all of the foregoing, and the figures which I have prepared in a number of cases showing the probable savings, have remained undisputed. These savings are as much as 100%. per annum, and yet the entire industry seems to be waiting for the other fellow to do it first. It is certainly a case where precedent is strong, and the reluctance of the foundrymen of this country to take the first step will probably be balanced by their eagerness to fall in line just as soon as the pioneer has completed his installation.

A SIMPLE method of filling up cracks in the water jackets of motor-car engines, which is often adopted in France, says a writer in the "Autocar," consists in making use of a liquid solution in which advantage is taken of the property possessed by copper salts to deposit their metallic contents when in contact with iron. To fill up a crack in a water jacket, all that is necessary is to fix the cylinder vertically in a bath or tank; plug up the lower water outlet in the jacket with a cork; then fill the jacket through the upper inlet with a sufficiently concentrated solution of sulphate of copper, which will at once commence to leak away through the crack or cracks and collect in the bath. The liquid should be scooped up as it collects and re-poured into the water jacket; the leakage will be quickly reduced to a slight "weeping" at the crack. When this weeping period has been reached, stop up the upper inlet with a cork in which a bicycle tire valve has been fitted, and by means of a tire inflater force air into the jacket. At first the degree of weeping will increase, but it will gradually disappear and become almost colorless instead of a bluey tint, the repair of the crack then being completed.

Annual Convention of American Foundrymen and Metal Men

The twenty-second meeting of the American Foundrymen's Association and the annual meeting of the American Institute of Metals were held conjointly in Boston, Sept. 24 to 28, and were marked by hospitality, patriotism and Entente sincerity which circumstances have not allowed full expression of in recent years. Active participation in the war imparted intense interest to the proceedings of two bodies whose active efforts are directly influencing the course of hostilities.

SEVERAL hundred delegates to the twenty-second annual meeting of the American Foundrymen's Association and the annual meeting of the American Institute of Metals were present at the joint opening meeting of the two organizations in Paul Revere Hall, Mechanics' Building, Boston, Sept. 24. A formal welcome on behalf of the city was extended to the visitors by Mayor Curley, the response of the visitors being made by R. A. Bull, of the Duquesne Steel Foundry Co., Coraopolis, Pa. J. P. Pero, president of the A.F.A., delivered his annual address and reviewed the work of the organization.

The major part of the convention period was spent by each organization in conventional manner, the meetings of the American Institute of Metals being held at the Hotel Somerset, with an occasional joint meeting at the quarters of the A.F.A. The application of the members' activities toward munition production was a feature of the non-ferrous topics. Following the usual entertainment features, the convention closed Sept. 28, the A.F.A. members adopting vigorous resolutions in support of the Government in carrying on the war against Germany, pledging their plant, efforts, and endorsement of the second Liberty loan. Officers elected on the closing day were: American Foundrymen's Association—President, Benjamin D. Fuller; vice-president, Stanley Flagg; secretary and treasurer, A. O. Backert. American Institute of Metals—President, W. M. Corse; senior vice-president, William B. Price; secretary and treasurer, F. L. Wolfe.

The exhibition of foundry equipment was held on the two floors of the Mechanics' pavilion, numerous moulding machines and sand-blast machines being in operation and providing the major attractions.

CONVENTION PAPERS, A.F.A.

General Topics and Foundry Costs

"The Foundry From the Viewpoint of the Sales Engineer," by H. R. Atwater, Osborn Mfg. Co., Cleveland.

"The Relationship of the Engineering Department to the Pattern Shop and Foundry," by F. J. McGrail, Struthers-Wells Co., Warren, Pa.

"How Character Analyses Solves the Man Problem," by William Judson Kibby, Cleveland.

Report of A.F.A. Committee Advisory to the U. S. Bureau of Standards, by Richard Moldenke, chairman, Watchung, N.J.

"Efficiency in the Foundry," by James A. Fitzgerald, Reno, Pa.

"Co-operative Shop Training," by W. B. Hunter, Fitchburg High School, Fitchburg, Mass.

Report of A.F.A. Committee on Classification of Technical Literature, by Richard Moldenke, Watchung, N.J.

"Facilities for Technical Training at Massachusetts Institute of Technology," by John Ritchie, Jr., Massachusetts Institute of Technology, Boston.

"Improving the Relationship Between Employer and Employee," by J. F. Kent, American Cast Iron Pipe Co., Birmingham, Ala.

Report of A.F.A. Committee on Safety, Sanitation and Fire Prevention, by Victor T. Noonan, chairman, Industrial Commission of Ohio, Columbus, O.

Report of A.F.A. Committee on Foundry Costs,, by B. D. Fuller, chairman, Westinghouse Electric & Mfg. Co., Cleveland.

Address on Cost Work of the American Foundrymen's Association, by C. E. Knoeppel, C. E. Knoeppel & Co., New York.

Report of A.F.A. Representatives on the Conference Board on Training of Apprentices, by Frank M. Leavitt, chairman, University of Chicago, Chicago.

Report of the A.F.A. Committee on Industrial Education, by Frank M. Leavitt, chairman, University of Chicago, Chicago.

MECHANICS' BUILDING, BOSTON, MASS., WHERE FOUNDRY EQUIPMENT WAS EXHIBITED.

Address, "The Labor Situation as Relating to Co-operation Between the Employer and Employee," by G. E. MacIlwain, Babson's Statistical Organization, Wellesley, Mass.

"Micro-Metallography for the Foundry," by Robert J. Anderson, Cleveland Metal Products Co., Cleveland.

Malleable Session

"The Theory of the Modern Waste-Heat Boiler and Possible Application of Such Boilers to the Malleable Melting Furnace," by A. D. Pratt, Babcock & Wilcox Co., New York.

"Application of Waste-Heat Boilers to the Malleable Melting Furnace," by C. D. Townsend, Danville Malleable Iron Co., Danvill, Ill.

"Application of Pulverized Coal to the Air Furnace," by Wr. R. Bean, Naugatuck Malleable Iron Works, Naugatuck, Conn.

"The Application of Pulverized Coal to Malleable Melting Furnaces," by Joseph Harrington, Chicago.

"How Malleable Iron Has Improved," by Enrique Touceda, Albany, N.Y.

"Troubles Encountered in Machining Malleable Iron: Causes and Remedies," by A. T. Jeffery, Dayton Malleable Iron Co., Dayton, O.

"Comparative Carbon Losses in Malleable Iron Annealing by Muffle and Pot Oven Methods," by Joseph B. Deisher, T. H. Symington Co., Rochester, N.Y.

"The Effect of Iron Oxide in Molding Sand," by W. R. Bean, Naugatuck Malleable Iron Works, Naugatuck, Conn.

Gray Iron Session

"Notes on Fine Molding Sands," by C. P. Karr, U. S. Bureau of Standards, Washington, D.C.

Report of A.F.A. Committee on General Specifications for Gray Iron Castings, by W. P. Putnam, chairman, Detroit Testing Laboratory, Detroit.

"Briquetting Foundry Borings," by A. L. Stillman, General Briquetting Co., New York.

"Cast Iron Shells in Permanent Molds," by Edgar Allen Custer, Philadelphia.

"The Seasoning of Gray Iron Castings," by L. M. Sherwin, Brown & Sharpe Mfg. Co., Providence, R.I.

"Factors in the Economical Production of Small Cores in Large Quantities," by R. E. Kennedy, University of Illinois, Urbana, Ill.

"Modern Centrifugal Cupola Blowers," by L. C. Loewenstein, General Electric Co., Schenectady, N.Y.

"The Effect of High Sulphur in Gray Iron Castings," by T. Mauland, International Harvester Co., Chicago.

Steel Session

"Molding and Casting Large Slag Pots," by C. J. McMahon, Illinois Steel Co., Chicago.

"A Description of a Small Open-hearth Furnace," by David McLain, McLain's System, Milwaukee.

"Steel Castings for Ordnance Construction," by Major C. M. Wesson, Watertown Arsenal, Watertown, Mass.

"A New System of Burning Crude Oil," by W. A. Janssen, Davenport, Ia.

"The Use of Vanadium in Steel Castings," by J. Lloyd Uhler, Union Steel Castings Co., Pittsburgh.

Report of A.F.A. Committee on Steel Foundry Standards, by W. A. Janssen, chairman, Davenport, Ia.

"Notes on An Electric Furnace Design," by John A. Crowley, John A. Crowley Co., Detroit.

"Recent Developments in the Application of the Electric Furnace to the Melting Problem," by Douglas Walker, Booth-Hall Co., Chicago.

"Comparison of Electric Furnace and Steel Converter for the Manufacture of Small Steel Castings," by C. R. Messinger, Sivyer Steel Castings Co., Milwaukee.

"The Electric Furnace From the Central Staion Standpoint," by E. L. Crosby, Detroit Edison Co., Detroit.

Final Professional and Business Session

"Solution of Foundry Transportation and Conveying Problems," by Robert E. Newcomb, Deane Works, Worthington Pump & Machinery Corp., Holyoke, Mass.

"Sand-Blasting in the Foundry," by H. L. Wadsworth, American Foundry Equipment Co., Cleveland.

"Experiments to Determine the Most Effective Means of Mixing and Blending Foundry Facing Sands," by R. Harrington, Hunt-Spiller Mfg. Corp., Boston.

"Oxy-Acetylene Welding and Cutting," by Stuart Plumley, Davis-Bournonville Co., Boston.

"Factors Contributing to the Economical Use of Grinding Wheels in the Foundry," by Wallace T. Montague, Norton Co., Worcester, Mass.

"Refractory Materials Employed in the Metallurgical Industries," by H. C. Arnold, University of Illinois, Urbana, Ill.

CONVENTION PAPERS, A.I.M.

Melting and Casting Non-ferrous Metals

"Raw Materials Used for Crucibles," by Prof. A. V. Bleininger, U. S. Bureau of Standards, Washington, D.C.

"Melting Yellow Brass in New Form of Induction Furnace," by G. H. Clamer, Ajax Metal Co., Philadelphia.

"Casting Bearings in Sand and Metal Molds," by R. R. Clarke, Pennsylvania Lines West of Pittsburgh, Pittsburgh.

"Negative Experiments on Waste Core Sand," by Dr. H. W. Gillett, U. S. Bureau of Mines, Ithaca, N.Y.

"The Crucible Situation," by M. McNaughton, Jos. Dixon Crucible Co., Jersey City, N.J.

"The Electric Furnace and Nonferrous Metals," by Dwight D. Miller, Society for Electrical Development, New York.

"My Experience With Metal Melting Furnaces," by W. H. Parry, National Meter Co., Brooklyn, N.Y.

"The Briquetting of Nonferrous Light Metal Scrap," by A. L. Stillman, General Briquetting Co., New York.

Use of Nonferrous Metals for Munitions, Etc.

"The Present Status of Tin Fusible Plug Manufacture and Properties," by Dr. George K. Burgess, U. S. Bureau of Standards, Washington, D.C.

"Stellite," by Elwood Haynes, Haynes Stellite Works, Kokomo, Ind.

"The Use of Die Castings in Munitions," by Charles Pack, Doehler Die Casting Co., Brooklyn, N.Y.

"Shrapnel Bullets," by Harold J. Roast, Jas. Robertson Co., Ltd., Montreal, P.Q.

"A Few Points on Alloy Patents," by Wm. J. Rich, Patent Office, Washington, D.C.

Address by a representative of the Lnited States Tariff Commission.

"The Use of Bronzes in Railroad Turntables and Movable Bridges," by O. E. Selby, Big Four Railroad, Cincinnati.

"Recent Industrial Uses of Aluminum," by F. G. Shull, Aluminum Co. of America, Boston.

"The Consumption of Copper and Its Varied Uses," by H. D. Hawks, United Metals Selling Co., New York.

Testing of Nonferrous Metals

"Comparative Tests on Test Bars and Actual Castings," by W. M. Corse, Titanium Bronze Co., Niagara Falls, N.Y.

"Aanalysis of Babbitts and Brasses," by E. W. Hagmaier, Buffalo.

"Standard Test Bars of 88-8-4, Being the Result of Co-operative Work of Six Foundries; a New Series of Tests," by C. P. Karr, U. S. Bureau of Standards, Washington, D.C.

"The Expansion Coefficient of Alpha and Beta Brass" and "The Corrosion of Manganese Bronze Under Stress," by Dr. Paul D. Merica, Bureau of Standards, Washington, D.C.

Address by Richard C. Maclaurin, president, League to Enforce Peace.

"The School End of the Job in Training Foundrymen," by Dean C. B. Connelley, Carnegie Institute of Technology, Pittsburgh.

"The Flux and Cleaner Question of Brass," by E. D. Frohman, S. Obermayer Co., Pittsburgh.

"Pyrometers—Their Construction and Application," by John P. Goheen, Brown Instrument Co., Philadelphia.

"Electrically-Heated Core Ovens," by Dr. C. F. Hirshfield, Edison Illuminating Co., Detroit.

"Brass Rolling Mill Alloys," by Roy A. Wood, Cheshire, Conn.

Metallurgy and Metallography

"The Electrolytic Production of Aantimony," by Prof. D. J. Demorest, Ohio State University, Columbus, O.

"The Electrical Properties of Some High Resistance Alloys," by Prof. M. A. Hunter, Rensselaer Polytechnic Institute, and F. M. Sebast, Troy, N.Y.

"The Amorphous Theory in Metals," by Zay Jeffries, Aluminum Castings Co., Cleveland.

"The Volatility of Zinc and Cadmium," by John Johnston and Edward Schramm, American Zinc, Lead & Smelting Co., St. Louis.

"Surface Tension and Deoxidizing of Metals," by W. J. Knox, Metals Deoxidizing & Refining Co., New York.

"Antimony—Its Metallurgy and Uses,"

by K. C. Li, Wah Chang Mining & Smelting Co., Inc., New York.

"Development and Reabsorption of the Beta Constituent in Alloys Which are Normally of the Alpha Type," by Prof. C. H. Mathewson, Department of Mining and Metallurgy, Yale University, and Philip Davidson, New Haven, Conn.

"The Swelling of Zinc Base Die Castings," by H. M. Williams, National Cash Register Co., Dayton, O.

EFFICIENCY IN THE FOUNDRY*

By James A. Fitzgerald, Reno, Pa.

WHAT is efficiency; where does it start, and where does it end? Efficiency is the easiest and shortest route by which we may obtain a particular desired result. Its starting point is closely allied with a good cost accounting system and its end is unmeasurable.

We are informed by statistical reports that the failures in the business world run exceedingly high, and we naturally wonder why this is true. Upon investigation we find either a deplorably inefficient cost accounting system or gross inefficiency in the way the business is being conducted, due either directly to faulty cost accounting or to errors of the men in authority. In the latter case, failure comes because men do not take sufficient time to consider the vital factors which control the destiny of business. I sincerely believe that there is not a man living who at some period of his life has not had the amibition to go into business for himself and has enjoyed the promise of future success. Many have succeeded after years of struggle, and if one could induce these men to honestly relate their advancement to success, they would, without doubt, mention their method of cost accounting, its efficiency or inefficiency, and its results.

Business Warnings Are Unheeded

On the other hand, there are many failures of which we are uninformed, because we surround ourselves with the promise of a bright future, thus preventing us from heeding the warnings sounded by the mistakes of others. For this reason, a number of manufacturers approach near to the brink of business disaster before they learn the necessity of promptly making radical changes in order to repair the damage done by inefficiency and improper cost accounting.

Efficiency in the foundry does not always imply that efficient methods shall exist only in the foundry proper. On the contrary, efficiency must be applied in all departments. If efficient management exists all along the line, the foundry will reflect in a most desirable manner the effort that has been put forth by the men in charge.

A few years ago, whenever we had occasion to call on foundries, we generally found an ill-lighted, vile-smelling, dust-covered, dirty institution.

To-day, conditions are just the reverse. Why? Because in the old days very little scientific work along foundry lines had been accomplished. The foundryman kept no real record that he could refer to and find out where or at what point in the transaction of his business he had sustained a loss. The casting business was decidedly risky from a financial standpoint, or at least was considered as such. To-day we have well-lighted, ventilated and heated foundries, with all of the most modern and up-to-date conveniences. Moreover, our shops are scrupulously clean. Why have these changes come about? One foundryman will say competition brought them, and another will say we did it in order to better our financial standing. Others will present other reasons, and each of these has a certain bearing on these changes. However, the two great factors which have brought about the transformation in the foundry are system and science. With system we keep an accurate record or records of what is being done, and with science we determine beforehand what results we may reasonably expect before we spend our money. In the foundry, as in all other lines of business, we are dealing with natural laws which have been in force ever since the beginning of time. As long as we recognize these natural laws and keep within certain well-defined limits, we may anticipate results with the assurance of success.

*A paper read at the annual meeting of the American Foundrymen's Association, at Boston, Sept., 1917.

COMPARATIVE CARBON LOSSES IN MALLEABLE IRON ANNEALING BY MUFFLE AND POT OVEN METHODS*

By Joseph B. Deisher, Rochester, N.Y.

WE know that carbon in any ferrous metal must exist in the form of combined carbon or graphitic carbon or both. To go a step farther, we must admit that, after all, it is principally the proportion and condition of the carbon present which determines in what class we shall ultimately define such metal—that it, whether we shall call it wrought iron, steel, malleable iron, or gray iron. Therefore, it seems hardly necessary to state that the vital importance of carbon in malleable iron cannot be over-estimated. However, the limitation of my subject does not invite any prolonged discussion of this element except as it is affected by the annealing process.

Combined carbon represents a condition where practically all of the carbon present has, due to certain laws of metallurgy, gone into solid solution with iron, forming iron carbide, or, in malleable practice, what is generally known as hard iron. Had the greater part of the carbon not gone into solid solution, an ordinary gray iron casting would have been the result, representing a composition of free graphite, combined carbon and pure iron. Here, the carbon would largely exist as graphitic carbon. The former represents a proper composition for annealing, while the latter does not.

Then, we may consider that the annealing of malleable cast iron consists of heating a hard iron casting of the proper chemical composition to a degree of temperature where practically all of the iron carbide is dissolved from solid solution, without subsequent fusion, after which the casting is allowed to cool to handling temperature (150 to 300 degrees, Fahr.) under conditions that will permit the carbon to precipitate as minute graphite deposits in a texture of practically pure iron. In other words, the annealing process is simply a precipitation or conversion of carbon which had previously been driven into solid solution with iron; but, this conversion is most always accompanied by a loss of carbon, and it is this removal of carbon that later on we are to discuss.

As briefly outlined herein, the annealing process seems very simple; yet, there are many conditions that may interfere with the perfect conversion of the carbon, some of which we will discuss in the following order: Hard iron composition; annealing temperatures; time required to dissolve iron carbide; rate of cooling; and removal of carbon.

Hard Iron Composition

In the first place, the analyses of the hard iron composition must, of course, come within certain specified or ratio limits; else, the iron carbide will not completely dissolve under ordinary annealing temperatures. To establish these limits is not the purpose of this paper. For the sake of brevity, we must assume that they are known. However, it might be appropriate here to state that a hard iron composition figured on the silicon alone is no better than guess work, so far as obtaining uniform physical results in the annealed product is concerned. In fact, the most uniform results can obtain only where we know with some degree of accuracy the total carbon content in the hard iron; and such knowledge is not readily available without the total carbon analyses of the pig iron, which, due to its high and variable carbon content, determines the percentage of the various grades of scrap material that can be carried in the melting mixture. The blast furnace people are reluctant to furnish or guarantee the carbon analyses of pig iron, which is a matter of such vital importance to the successful production of high-grade malleable iron castings that I hope it will merit thorough investigation by a competent committee.

Annealing Temperatures

In the matter of annealing temperatures for malleable cast iron, much depends upon the chemical composition of the hard iron. Ordinarily, the iron carbide commences to be slightly affected after the temperature has reached approximately 1,250 degrees Fahr., but the chemical union forming the carbide is not greatly weakened until a temperature of at least 1,400 degrees is reached. In fact, it is, for many reasons, desirable to run the temperature considerably

*A paper read at the annual meeting of the American Foundrymen's Association, at Boston, Sept., 1917.

higher than 1,400 degrees; and, therefore, below is given a table showing what may be considered safe maximum and annealing temperatures for both pot and muffle type ovens:

	Maximum Deg. Fahr.	Minimum Deg. Fahr.
Pot oven	1650	1450
Muffle oven	1700	1500

Exhaustive tests have shown that prolonged annealing has no detrimental effect upon the physical strength of the product, unless the temperature is run too high, in which case troubles too numerous to mention may result. Prolonged or repeated annealing at high temperatures will, however, have a growing tendency to produce a pearlite rim, which seriously interferes with any machining operation; but, the unreasonable length of time required to produce the rim, under normal annealing conditions, eliminates this as a disturbing factor. Therefore, it would seem only reasonable to assert that when malleable cast iron is seriously over-annealed it is usually because the temperature has been run too high rather than too long. However, on the other hand, it is, I believe, also a safe assertion to state that so far as annealing is concerned more poor-grade malleable cast iron is produced as the result of under-annealing than over-annealing. If the above temperature limits are adhered to and good results do not obtain, the trouble is not directly due to annealing temperatures.

Heat distribution sometimes brings up a troublesome problem, the difficulty being to reach the minimum temperature at the coolest point in the oven without exceeding the maximum temperature at the hottest point. This is largely a matter of oven design; and, unless any two points in the oven can be held within the limits herein prescribed, there is something radically wrong with the oven or the manner in which the burden is arranged. The trouble mught be that the flues are not clean.

Time Required to Dissolve Iron Carbide

For reasons not generally understood, it has been found necessary to hold castings at annealing temperature from 60 to 72 hours before the cooling process is commenced. Otherwise, the result will almost invariably show that the iron carbide has not been completely dissolved; that is, the annealed casting will show that a portion of the carbon remains in solid solution, as combined carbon, causing a brittle, inferior product.

It would seem that the chemical union forming the solid solution of carbon in iron is not thoroughly dissolved immediately the annealing temperature has been reached, or, if the iron carbide is completely dissolved in less than 60 hours, we have yet to discover the means of preventing a portion of the carbon from re-combining when the casting is cooled to handling temperature. Then, assuming, for the sake of argument, that it has been found necessary to hold the castings at annealing temperature for 60 hours, three questions arise which should invite interesting discussion, namely:

1.—Are 60 hours actually required to dissolve the iron carbide?

2.—Does the iron carbide dissolve in less than 60 hours, the balance of the allotted time being required for precipitation of graphite carbon?

3.—Does the precipitation of graphite carbon immediately follow the gradual dissolution of the iron carbide, requiring 60 hours to complete the conversion process?

I should answer the first question negatively. It is my opinion that dissolution of the iron carbide is very largely a matter of heat penetration, particularly where the muffle type oven is used. In the pot oven, there is little doubt but that the nature and composition of the packing material affects the dissolution of the iron carbide, which assumption is in part at least borne out by the fact that malleable annealing can be successfully conducted with this type of oven at approximately 50 degrees lower temperature than is required in the muffle oven. This does not necessarily mean that the temperature at which the iron carbide is affected in the pot oven is lower than in the muffle oven. In the pot oven, after say 1,400 degrees temperature is reached, it would seem that the effect of the oxide packing material tends to hasten the dissolution of the carbide at a lower ultimate temperature than is required in the muffle oven. In other words, I believe that by skilful manipulation of oven temperatures, the iron carbide can be dissolved in less than 60 hours after annealing temperature has been reached.

In regard to the second question, I am inclined to believe that the iron carbide can be dissolved in less than 60 hours, and that it is the obstinate or lagging precipitation of graphite carbon, at the usual annealing temperature, that delays the conversion process, under present practice. Then, assuming that such is the case, the question arises as to the state of the carbon between dissolution and precipitation. In my opinion, after the annealing temperature has thoroughly penetrated the entire body of the hard iron casting, the chemical union forming the iron carbide is so weakened that the rate of cooling determines whether the carbon will remain in solid solution as combined carbon or precipitate as graphite carbon. In other words, after dissolution of the iron carbide, I believe that the carbon exists in a semi-soluble state, from which it will precipitate as graphite if cooled under proper conditions.

It is doubtless unanimously agreed that the third question covers in a general way about what really happens. In fact, practical tests have shown that where test wedges were removed from the oven at regular intervals before 60 hours had elapsed after the annealing temperature was reached, combined carbon was almost invariably found to exist in direct proportion to the length of time the wedges were held at or above annealing temperature. However, in my mind, this does not prove conclusively that 60 hours are actually required to completely dissolve the iron carbide. On the other hand, I am inclined to think that in the test wedges just referred to the annealing temperature had not completely and uniformly penetrated the entire body of the metal and also in removing the wedges from the oven before the regular period for annealing was completed the cooling was too rapid. In other words, had the annealing temperature been as high as the castings would stand at the commencing of the anneal and the wedges that were withdrawn before the 60 hours of annealing had been completed, cooled very slowly, the results would doubtless have shown that a greater percentage of the carbon had precipitated as graphite.

In this connection, I recall an incident where by accident the arch forming a muffle chamber in a muffle type oven fell in and the fire had to be shut off about 36 hours before the regular time. The stack damper and the oven were sealed up practically air-tight and allowed to cool down as slowly as possible, with the result that when the oven was opened the castings were found to be fairly well annealed. The carbide appeared to be completely broken up, but there was scarcely a trace of decarbonization visible without the aid of a microscope. This condition I attribute to the fact that the annealing temperature was high when the accident occurred and the cooling was extremely slow, allowing plenty of time for the precipitation of graphite. It might also be of interest to know that the castings were not scaled. Professor Touceda has done some very enlightening research work along this line, but it has occurred to me that some of the conclusions he has arrived at in regard to the length of time required to break up the iron carbide, may, after further experiments, be altered by the effect of higher initial annealing temperature and slower rate of cooling. It should be thoroughly understood that I take no exception to the conclusions he has reached, based upon the experiments as they were made.

We must realize that one of the greatest drawbacks to the malleable industry is that it takes too long to anneal the castings. While my experience in malleable annealing has not gone far enough to justify any revolutionary results, there is no doubt whatever in my minds, but that the time required under present practice for this operation can be very materially reduced. To that end, if the presentation of this paper stimulates discussion and exchange of opinion regarding the points brought up, its purpose will have been accomplished.

Rate of Cooling

Aside from the absolute necessity of first completely dissolving the iron carbide, the rate of cooling is, in my estimation, of the utmost importance, particularly where it is desired to complete the annealing process in the shortest time possible.

It is generally considered that the sooner the castings can be brought to annealing temperature, the better; but the same rule does not hold true in the

matter of cooling to atmospheric temperature, after the annealing temperature has been reached and held for the required time. After the iron carbide is dissolved, the object then is to cool the oven under such conditions as will prevent recombining of the carbon. If cooled too fast, all the carbon will not precipitate as graphite.

Practical tests have shown that the recalescence point in cooling malleable cast iron from annealing temperature is slightly under 1,400 degrees. Plotted cooling curves have shown that at this temperature there is an abnormal liberation of heat from some source, presumably the result of rapid precipitation of carbon, first as graphite, then as carbon monoxide and carbon dioxide gas, depending upon the amount of oxygen present; hence, the ultimate removal of a portion of the carbon, as will be mentioned later on in this paper. Therefore, we will establish 1,390 degrees as the critical point in annealing at which graphite will precipitate with most repidity.

It is held by some authorities that, after the iron carbide is completely dissolved, the castings should be held at or slightly above the critical point in cooling for several hours in order that the precipitation of graphite carbon may be more complete, the theory being that graphite carbon will precipitate with more rapidity the nearer the critical point just referred to is approached. Contrary to such theory, it is the practice of some foundrymen to run the temperature to the highest point just before the fire is shut off; then seal up the oven and, as they express it, "allow the castings to soak." To my mind, such practice is quite the reverse of what it should be. In other words, I am inclined to believe that the nearer the temperature of 1,400 is reached in cooling, the more favorable become conditions for the precipitation of graphite carbon, providing, of course, the temperature has previously reached the point where all iron carbide was dissolved. Therefore, it would seem the better practice to reach the highest temperature at the beginning of the anneal, such temperature to be held until the iron carbide is dissolved; then, gradually drop to 1,400 degrees, a temperature which some believe will better favor the precipitation of graphite carbon. This would also lessen the danger of warping. In fact, I would not be at all surprised that, when the temperature is run high at the end of the anneal, some of the carbon is, due to being more nearly soluble in iron and lack of time in cooling, forced back into solid solution as combined carbon which would otherwise have precipitated as graphite had the temperature not been run so high just before the cooling process was commenced. In some cases, where the sulphur-manganese ratio may not be properly balanced in the hard iron composition, such practice is also much more apt to produce a pearlite rim or "picture-frame" fracture, a source of extreme annoyance where the castings have to be machined. However, this condition is rarely, if ever, produced by annealing alone, except where the annealing is prolonged almost indefinitely or the temperature run entirely too high.

A point which might have been mentioned in connection with establishing the critical point in cooling is that, while approximately 1,390 degrees represents the point in temperature at which graphite carbon precipitates with most rapidity (assuming, of course, that the iron carbide has been dissolved by subsequent heating at higher temperature), it does not necessarily follow that the precipitation of graphite ceases immediately the temperature drops below 1,390 degrees. In fact, the precipitation of graphite carbon, in some cases, may continue until the temperature drops to 1,242 degrees, below which temperature all precipitation is arrested. Therefore, in reality, 1,242 degrees is the critical point for dissolution of the iron carbide; or, in other words, this is the temperature at which the chemical union forming the carbide commences to weaken upon heating and is also the point at which the precipitation of graphite carbon ceases upon cooling. Malleable iron annealing could not be successfully conducted at either 1,390 or 1,242 degrees temperature, if at all, due to the length of time that would be required to dissolve the iron carbide; and, therefore, these temperatures are extremely important only in the matter of cooling the castings from annealing to handling temperature.

As to the effect of further cooling between the temperature of 1,242 degrees and handling temperature of the castings, this, I believe, depends solely upon the condition of the carbon when the temperature of 1,242 degrees in cooling is passed. Where combined carbon is present, the effect of the rate of cooling upon that part of the structure representing the carbide would be about parallel to the tempering of a piece of soft steel of the same carbon content, heated and cooled under similar conditions. In other words, the more rapid the cooling, the harder would become the crystallization of the carbide and consequently the more brittle the casting; and, vice-versa. Were all the carbon in graphitic form at 1,242 degrees temperature, the cooling might be forced to handling temperature without detriment to the physical characteristics of the metal. This is based upon the theory that iron and free carbon are not readily, if at all, soluble at 1,242 degrees Fahr.; therefore, the formation of iron carbide is impossible, and where there is not combined carbon present in ferrous metal it can usually be hardened very little by tempering. As a practical test, a well annealed malleable test wedge was heated in a handforge to a cherry red and quenched in cold water, without the slightest effect upon the ductility of the metal or condition of the carbon. Then, a duplicate wedge was heated to a slightly higher temperature and cooled under the same conditions, with the result that the carbon was re-combined and the metal very brittle, showing a steely, white fracture. In the first test the critical point was not reached where the iron and free graphite were soluble; and, as practically no carbide was present to commence with, the metal was not hardened to any noticeable extent by tempering. In the second test it would seem that the temperature was reached where the free graphite became dissolved in iron and by sudden cooling through the critical range was forced into solid solution as combined carbon, which composition was still further hardened by tempering.

The point which I wish to make clear is that where conditions have been ideal for conversion of the carbon, more liberty can be taken in cooling the castings from 1,242 degrees Fahr. to handling temperature, thus saving considerable time at present allowed for gradual cooling through the same range of temperature.

Removal of Carbon

It is possible to accomplish the conversion or annealing process without removing any carbon whatever; but, as this is neither practical nor desirable, it will not be discussed. The removal of carbon is entirely the result of oxidation; and, where no oxygen is present, no carbon can be removed. Oxygen for the removal of carbon in malleable iron annealing is supplied usually by an oxide packing material or by air, depending upon the type of annealing oven used.

For years it was thought that malleable iron annealing could not be accomplished unless the hard iron castings were packed in iron-oxide scale; but, as the tonnage of the industry rapidly increased, this packing material became harder to obtain, with the result that today most any kind of refractory material is used in the place of iron-oxide scale, and with comparatively good results. Some plants have even gone so far as to adopt the muffle-type oven, where no packing material at all is used. The castings are simply stacked up in the oven and protected from contact with the flame by muffled chambers or by covering with sheet-iron plates and sand or scale. Practically the only difference in the results obtained is that more carbon is removed from the casting where a strong oxide packing material is used, as will be shown later on in this paper.

While decarbonization or the removal of carbon in the anneal is in most cases desirable, some, I am afraid, are disposed to over-estimate its importance. In other words, it is the complete conversion rather than the removal of carbon in the anneal that determines the malleability of the product. It is a well-known fact that the higher the total carbon content in malleable cast iron (even though the conversion in the anneal be perfect), the lower will be its ultimate strength, the strength being affected in direct proportion to the minute cavities made necessary for graphite deposits in the ferrite structure. Even so, it does not necessarily follow, by any means, that the removal of carbon in the anneal is absolutely essential to the production of high-grade malleable iron. While at least a small amount of carbon will always be removed in the anneal, the total amount of carbon should be regulated in the white iron—a fact which cannot be

(Continued on page 394.)

PROGRESS IN NEW EQUIPMENT

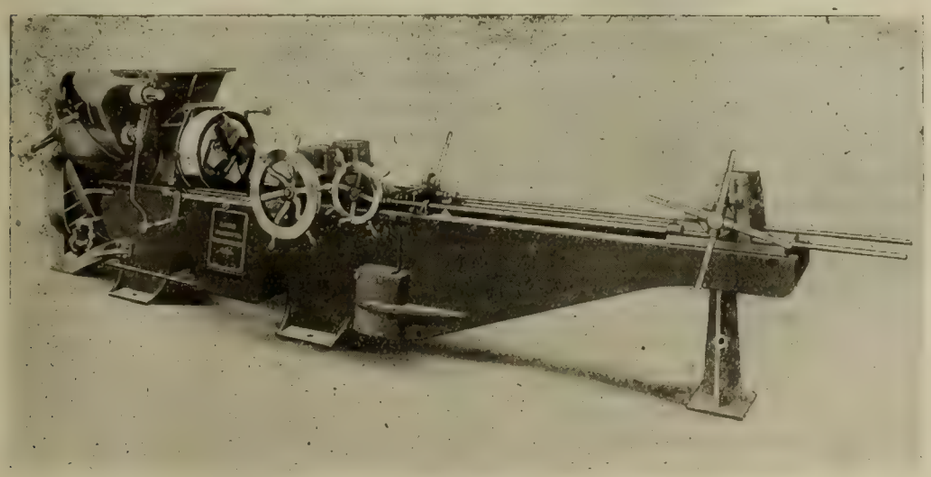
A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

STAY ROD THREADING MACHINE

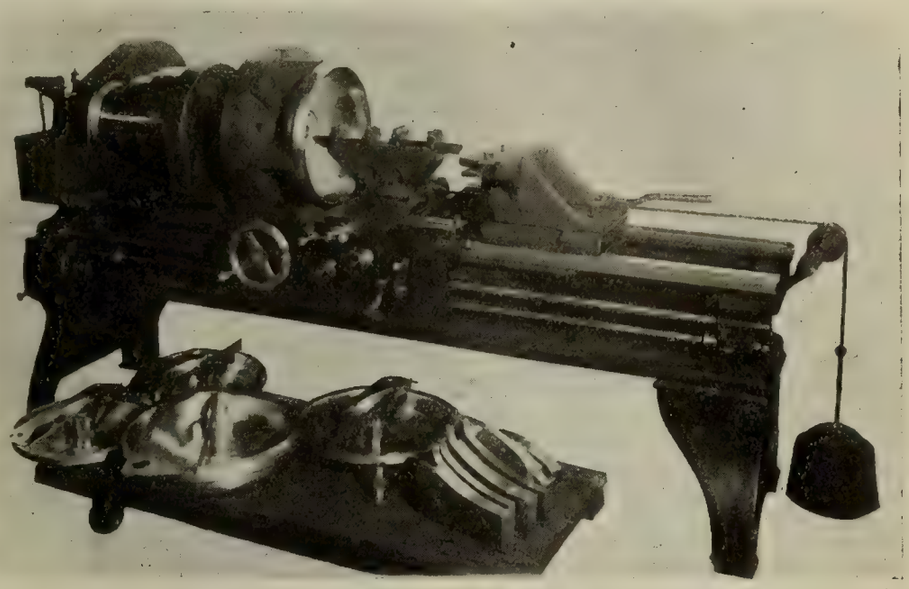
THE illustration below shows a Landis Threading Machine which was designed and built for a large shipbuilding plant for threading hollow staybolt tubes. The tubes vary from six to eight feet in length and from 2¾ in. to 3½ in. dia. The machine is equipped with an auxiliary bed which is attached to the main bed of the machine. This extension bed supports an auxiliary carriage fitted with threaded grips employed in timing the threads on the ends of the tubes and also in supporting the tubes. The machine is furnished with a leadscrew attachment which insures a high degree of accuracy and a perfect start of the thread, also a pitch indicator which shows the correct position for engaging the leadscrew nut. The illustration shows the machine arranged for an A. C. Constant Speed motor with mechanical speed change box and silent chain and sprocket drive, the photograph being taken prior to mounting the motor in position.

The method of threading the hollow staybolt tubes on this machine is as follows: Thread one end of all the tubes which are to be threaded, by gripping them in the vise of the regular carriage. Then take a master tube which has both ends threaded and with threads continuous. Place the master tube in the machine, close down the chasers in the threaded portion on one end, that is, make the grooves or serrated surfaces of the chasers fit in the threads already cut on the master stay tube. Grip the other end of the master tube with the threaded grips in the auxiliary carriage. These grips should be sufficiently loose so that they can adjust themselves endwise with the thread on the master tube. After the master tube is gripped in the extension carriage these threaded grips should be securely gripped in the auxiliary carriage vise jaws. Then throw in the leadscrew nut of the main carriage and grip the tubes in the regular vise of the main carriage. The chasers, the leadscrew and the threads on the staybolt tubes then will be all timed. Remove the master stay tube and place the tubes which have already been threaded on one end in the threaded grips of the auxiliary carriage and engage the leadscrew nut when the pitch indicator on the main carriage shows the correct position for engaging this nut. The operation of threading, the second end on all the tubes can then proceed and the threads on both ends of the tube will then be continuous.

The machine employs the Landis All-Steel Rotary Die Head and long life chasers which insure a high production of accurate threads.



STAY ROD THREADING MACHINE.



LATHE FOR MACHINING TORPEDO AIR FLASK HEADS.

LATHE FOR MACHINING TORPEDO AIR FLASK HEADS

THE increasing urgency attendant on the production of war supplies of all descriptions continues to influence the efforts of machine tool builders in modifying previous designs in use, and the lathe shown in the accompanying engraving illustrates a recent effort to simplify the work of machining air flask heads for torpedoes, the method employed being believed to be entirely new.

Formerly all of these heads used to be turned on a standard lathe, and the different radii on the various surfaces was obtained by various radius attachments. Since the inside of one head has at one time from two to five different curves, it was necessary to use ten different adjustments on the radius attachment in order to complete one head on both sides. Contrary to this, a standard lathe is now used, modified in various respects. Instead of using the radius attachment, there is a form attachment on the tail stock, and in some instances a forming attachment on both the carriage and tail stock.

The upper part of the tail stock has been removed, and a special attachment made for it. This special tail stock carries the form of the surface of the head to be machined. The tool post has a straight slot, longitudinally across. One side of the slot carries the cutting tool, and the other side carries the forming guide. The tool, as well as the forming guide, has on its cutting edge, or guiding edge, a true circle of, for instance, ¼ of an inch, as sketch shows. The distance of the centre of the circles between the cutting tool and the guiding tool is, therefore, to the extent of the width of the tool apart; which in this particular

case is about ¾ of an inch between the two centres.

The forming plate is marked "centre of tool" and "centre of work," and these two centres are about ¾ of an inch apart, so as to register correctly. On account of the fact that it is necessary to use a circular cutting edge, so as to be able to follow all around the form and go into the recesses, the condition arises that the form plate has not the same form as the finished torpedo head. If, for instance, the head is 16 in. radius on a certain face of the torpedo head, the radius on the form for this torpedo head will not be 16 in., since the cutting tool does not always cut on the same point, but changes around the circular form of the tool. Therefore, the builders have to develop each form plate according to the head for which it was made.

Some of these torpedo heads have a very decided transverse curve, ending in a longitudinal curve. In order to make the machine operate correctly it is necessary to disconnect the tool post screw and connect same with thet feed of the carriage, so that when one feed is thrown out, the other feed is thrown in without any interrup-

This has been accomplished by splitting the screw operating the tool post and connecting this attachment with the clutch on the carriage, which operates the feed screw of the carriage, thus making the machine practically automatic. For boring the centre of the torpedo head the machine is equipped with a progressive boring tool, which is registered by the guide in the centre of the form.

The heads are gauged by inserting a plug gauge into the centre of the head. The inside form of the head is registered from this plug gauge by means of a flat gauge. The outside form is gauged by another flat gauge, which rests on the upper surface of the inner gauge, which consequently not only gauges the inside and outside form, but also the thickness of the head, which otherwise would offer serious difficulties.

By means of this machine it is possible to machine a smaller head of about 12 in. in diameter within about six hours, and the larger head of about 22 in. diameter within ten to fourteen hours. These figures are taken from samples made of cast iron by the builders of the machine, the Luster-Jordan Co., Norristown, Pa.

UNIVERSAL CUTTER AND TOOL GRINDER

TWO designs of cutter grinders, designated No. 1 and No. 2 respectively, are being marketed by the Grand Rapids Grinding Machine Co., the former shown in the accompanying engraving being adapted for cutter and tool grinding only, while the larger machine is equipped for drill grinding in addition.

The machine illustrated has a capacity between centres of 9½ in. dia. by 20 in. long, while face milling cutters can be handled up to 12 in. dia. The spindle is of crucible steel with ground journals running in ring-oiled phosphor-bronze bearings with convenient means for adjusting to compensate for both radial wear and end play.

The longitudinal table travel is occasionally more conveniently operated by a lever instead of the usual handwheel, and an auxiliary lever which can be instantly mounted or taken off is shown on the machine. The table proper can be swiveled through 360 degrees, and is supported by the sub-table, a king bolt of liberal size and central turntable being provided. Both vertical and cross movements screws are made with Acme threads working in bronze nuts, graduated dials reading to thousandths of an inch, indicating the movement in each case. Longitudinal travel is obtained

UNIVERSAL CUTTER AND TOOL GRINDER.

by steel rack and pinion, which, combined with the lever handle, enables short, quick strokes to be taken in the manner which is so desirable in sharpening most milling cutters.

The standard equipment furnished includes 3 in. 3-jaw geared scroll chuck, fitted with shank, plate and pulley, universal vise, internal grinding attachment with belt and driving pulley, seven grinding wheels, three wrenches, two spring lip tooth rests, with blocks, base and bars, dogs, driving pin and countershaft complete. The net weight of the No. 1 machine is 525 lbs., and of the No. 2. Machine, 665 lbs.

COMPARATIVE CARBON LOSSES

(Continued from page 392.)

too forcibly impressed upon those who desire to maintain a high-grade product.

While possibly somewhat foreign to my subject, the statement just made again emphasizes the importance of knowing the carbon content of the pig iron entering into the mixture when charged into the melting furnace, inasmuch as the color method for making preliminary carbon tests, as used in steel practice, cannot be employed by the malleable melter, because the total carbon in hard iron is so much higher than in steel. Unless the total carbon can be regulated with some degree of accuracy more than guess-work in the melting mixture, the hard iron will not be of such consistency that we can reasonably expect uniform results to obtain in the anneal, regardless of the type of oven or annealing practice employed. Therefore, I again call to the attention of the association a most valuable service which can be performed for its malleable members by setting into motion some plan for a united request or demand upon pig iron dealers to furnish and guarantee the total carbon analyses, as well as the various elements which it is their present practice to supply.

To further emphasize the importance of regulating the total carbon in the hard iron, I can state as an absolute fact that the best malleable cast iron never results from a hard iron composition in which the total carbon is around 3.00 per cent., regardless of the amount of carbon removed in the anneal. However, in this connection, caution should be used not to run the carbon too low, else trouble will result from other sources. If the total carbon is allowed to go below 2.20 per cent. in the hard iron, the iron carbide will not dissolve under ordinary annealing temperatures, which is only one of the numerous troubles that will result from running the carbon too low.

In another part of this paper the statement is made that prolonged annealing will have no detrimental effect upon the physical strength of malleable cast iron, unless the temperature is run too high; also, that the removal of carbon in the anneal is not essential to the production of high-grade malleable iron. These statements are best corroborated by a series of practical tests conducted by Prof. Touceda, to whose liberal generosity I am indebted for many favors. In one of these tests eight test wedges were poured from the same ladle of iron and annealed in such a manner that one of the wedges was annealed eight times, one seven times, and so on down the line until one of the wedges received only one anneal. Physical tests showed that there was practically no difference in ductility between the wedge annealed once and the one annealed eight times; and, after each successive anneal, the physical test showed but very little comparative variation in strength. Upon analytical examination, however, it was found that the total carbon was diminished by each successive anneal — the first anneal showing a total carbon

THE EXHIBIT OF THE CANADIAN S K F CO. AT THE NATIONAL EXHIBITION DISPLAYED THE SELF-ALIGNING FEATURES OF THEIR BEARING IN AN EFFECTIVE MANNER.

of 1.40 per cent., while the eighth anneal showed that only 0.22 per cent. of carbon remained. The test showed conclusively that the consistent removal of carbon in each successive anneal did not improve the quality of the product; and, at the same time, it demonstrated that prolonged or re-annealing, under normal conditions, will not affect the strength of the metal.

Muffle Oven Versus Pot Oven

There are two types of oven generally used for annealing malleable cast iron; namely, the muffle oven and the pot oven, either of which has its particular advantages and disadvantages. The typical muffle oven is in reality an oven built within an oven, that is, the construction of the outside oven, or oven proper, is very similar to the pot oven, except that it encloses two small arches, separated by a partition, which form the muffle chambers in which the castings are placed for annealing. When filled with castings, the muffle chambers are sealed up as nearly air-tight as possible. The fire-box is arranged usually at the rear end of the oven in such a manner that the flame passes directly over the arches of the muffle, returning through specially constructed flues in either side-wall and underneath the floor to the main stack flue at the back end of the oven directly underneath the fire-box. There is, of course, a damper in the base of the stack for regulating the distribution of heat throughout the oven, which is a simple matter if the flues are kept clean.

In regard to the pot oven, I take it that all present are familiar with the general design of this type of oven and that a brief description is unnecessary. It is nothing more or less than the muffle oven, minus the muffle chambers.

The principal advantages in favor of the muffle type oven are the elimination of labor required to pack, handle and shake out the pots, cost of packing material, expense of renewing pots, etc. Among the objections to the muffle oven may be noted the following:

1.—On acount of the heat having to penetrate the brick arch forming the muffle chamber, it requires somewhat longer to bring the castings to annealing temperature.

2.—Not being supported by packing material, the castings are more apt to become warped or contorted.

3.—There is more danger of the castings becoming scaled, due to air leaking into the muffle.

4.—Small and delicately constructed castings cannot be annealed in this type of oven unless they are packed in trays.

The muffle-type oven is particularly adapted to annealing medium and heavy castings, where packing material is not necessary to prevent warping and where a small amount of scale on the castings is not a serious objection. For this class of work the muffle type oven has everything in its favor.

The pot oven is used by some foundrymen probably because they have never tried any other method of annealing; by others, because the nature of their work requires that the castings be annealed in packing. There is no doubt but that the pot anneal produces a cleaner and better casting for machining or nickel-plating, but so far as physical strength is concerned, the pot oven has no particular advantage over the muffle oven. Of course, the principal objection to the pot oven is the expense and inconvenience of packing the casting in pots However, where light and intricate castings are to be annealed, I can suggest no alternative.

Practical Tests

For the purpose of further proving certain statements made in this paper, I have had cast from the same ladle of iron a set of 30 test wedges and 30 tensile test bars. These were annealed in three lots of 10 wedges and 10 tensile bars each. Two lots of these tests were annealed in a pot oven, one lot being packed in mild packing material and one lot in strong packing material. The mild packing material was mill scale mixed with coke breeze; the strong packing material was iron-oxide scale. The third lot of tests was annealed in a muffle type oven, without packing material. The comparative results are shown in the accompanying table.

Total carbon in hard iron was determined from hard iron shot, cast in water. The carbon determinations after anneal were made from drillings taken entirely through the butt end of test wedges. The test wedge was 6 inches long, 1 inch wide, ½ in. thick at butt and tapered to wedge point. The tensile test bars were round, ⅝ in. in diameter. Each of the above tests represents the average for 10 bars, five of them being annealed near the roof and five near the floor of the oven, about midway between front and back end.

Unfortunately, the heat from which the above tests were poured was too high in both carbon and manganese to produce an extremely ductile and tough material. However, it accomplished the purpose for which the tests were made.

By reference to the tabulated results, it will be noted that the mild packing material removed less carbon than the strong packing, and that more combined carbon remained in the iron annealed in mild packing, which strengthens the statement that in addition to removing more carbon the oxide packing material has a tendency to hasten the dissolution of the carbide after annealing temperature has been reached. I would also call attention to the fact that, while the muffle-type oven removed less carbon than the oxide packing material in the pot oven did, the conversion of carbon in the muffle oven was more nearly complete. This, in conjunction with the results of the physical tests, proves that it is the conversion rather than the removal of carbon in the anneal that produces ductility.

In closing, I wish to express my appreciation of services rendered to the writer by the Eastern Malleable Iron Co., in whose laboratory some of the tests herein referred to were made.

COMPARATIVE RESULTS OF POT OVEN AND MUFFLE OVEN ANNEALING.

	POT OVEN Mild Packing	POT OVEN Strong Packing	MUFFLE OVEN Without Packing
Total carbon in hard iron (per cent.)	2.63	2.63	2.63
Combined carbon after anneal (per cent.)	0.53	0.13	0.05
Graphitic carbon after anneal (per cent.)	1.75	1.85	2.12
Total carbon after anneal (per cent.)	2.28	1.98	2.17
Total carbon removed in anneal (per cent.)	0.35	0.65	0.46
Wedge test (length of butt in inches)	2⅞	2¾	2
Tensile strength (pounds per square inch)	49,448	50,044	49,542
Elastic limit (pounds per square inch)	38,746	37,122	37,398
Elongation (per cent. in 2 inches)	6.3	6.7	7.3

NAYTHUR OF THEM

"As I was crossing the bridge the other day," said an Irishman, "I met Pat O'Brien. 'O'Brien,' says I, 'how are you?' 'Pretty well, thank you, Brady,' says he. 'Brady,' says I, 'that's not my name.' 'Faith,' says he 'and mine's not O'Brien.'

"With that we again looked at each other, an' sure enough it was naythur of us."

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STANDARDIZATION, ITS POSSIBILITIES AND PROBABILITIES

CURRENT events continue to afford evidence that the theory of standardization carried to a logical and common sense extent will be the saving grace of the world, industrially, and in a sense militarily, not only during the stress of present conditions, but for an indefinitely long period in the future.

When the question of standardized ships was first mooted, it was viewed in the light of an emergency measure only and its future development was not accepted offhand as a definite probability of any great magnitude, but the putting into commission of the first British ship of this description has been the occasion for an expression of expert and authoritative opinion which leaves no doubt as to the possible developments of the theory. Not that the theory is new, or that its present application is on such a scale that its success could have been seriously questioned. The real point at issue was whether the individualism of British shipbuilders and shipowners could be completely put aside under stress of national necessity and every available effort put forth toward producing a need of the moment.

The answer to all the critics, for and against the policy was afforded on August 30, on which day the authorities in Britain announced their satisfaction with the initial production. Every yard, the Shipping Controller stated, was full of standardized ships, and while the first of the fleet had been built in practically five months, it was expected that similar vessels would be turned out in four or four and a half months. One personage stated that while quicker immediate results, in some cases at least, might have been obtained by a repetition of customary designs, for such a purpose as the authorities had in view, standardization held the field, as obviously it made possible standardization of ship material which would not be possible if shipowners were merely repeating their usual designs.

The success attending the British materialization of the standard ship idea lends further interest to the United States' efforts which are now being put forth, and likewise draws attention to the work being executed throughout the Dominion. In our case, as in that of Britain, detailed reference to localities and builders is not possible at this time, but the particulars of ships' engines published in this issue are evidence that "something" is being accomplished. There is nothing spectacular or mysterious about design, materials or workmanship. These factors are all made to meet the case, but the mere fact that they are being made, in numbers more or less imposing, is further evidence of the inroads which standardization is making on engineering fields hitherto almost exempt.

A third proof of the possibilities of the idea, especially when developed in receptive soil, is afforded by the official announcement regarding the design of aeroplane motor achieved under the auspices of the United States war department. The detailed procedure as outlined by Secretary Baker has produced actual results of the most gratifying nature. In magnitude of operation, and directness of influence on the struggle, it measures well up to the shipbuilding schemes of both nations, but the circumstances attending the inception and development of the idea, and the degree of success attained, mark a standard of engineering accomplishment both in design and manufacture which in the normal course of events is not ever likely to be duplicated.

It must not be supposed, however, that such developments foretell the possibility of the great majority of manufacturing efforts being reduced to a plane of repetition. As a matter of fact, all past evidence seems to indicate that one result has been an increasing keenness of competition, more alertness for improved production methods, wider and more systematic search for new materials, and an all round effort to give more value for money received.

The classic instance of such industrial development is the automobile. The adoption of standard dimensions, materials and types has had no apparent restrictive effect on the initiative energy of designers. Changes in external appearance are largely a matter of fashion, but back of all there continues a steady effort at research, design improvement, and productive efficiency which has made the industry a standard of international comparison in most industrial discussions.

The lesson of the motor car has its bearings on all the other vital questions of the moment. Standardization has had no more debasing effects on it than the standard keyboard has had on pianos and typewriters. Ships' dimensions and scantlings are ripe for such treatment, and the idea expressed in many handbooks that every ship is an experiment has been disproved absolutely and for all time. Capacity, speed, power and efficiency are calculated with an amazing degree of accuracy, and if the various kinds of cargo, specialized and miscellaneous, are duly allowed for, there seems no insurmountable reason why ships, both freight and passenger, were not standardized long ago, the same as railroad equipment.

THE STEEL EMBARGO

WIDESPREAD apprehension has been created in all branches of metal-working plants through the action of the United States Government in restricting the export of steel and iron products which are absolutely essential to the welfare of this country, and which in their ultimate influence thereon, contribute in no small measure to Canada's ability to continue her participation in the war on a scale commensurate with her dignity and past efforts.

While awaiting the result of official negotiations with every belief in their ultimate and rapid success, it is at least pertinent to suggest to the United States officials responsible for the measure, that its effect both materially and morally on their Allies, the people of Canada, at this time, would be much more detrimental than the stream of trouble notes, objections and representations which were the order of the day when our big neighbor was in the neutral class. Now that she is with us and for us, legislation of this type should be at least consistent, not irritant, whatever the ulterior motives.

INDUSTRIAL NOTABILITIES

GEORGE DOUGLAS MacKINNON, B.A., Sc., vice-president and general manager, MacKinnon, Holmes & Co., Ltd., Sherbrooke, Que.; vice-president and general manager, MacKinnon Steel Co., Ltd., was born in Charlottetown, P.E.I., June 8, 1874, son of Alexander and Grace (Douglas) MacKinnon.

He received his education at Prince of Wales' College, Charlottetown, and McGill University, and on graduating from the latter institution in mechanical

GEORGE DOUGLAS MACKINNON, B.A.Sc.

engineering in 1897, became instructor in manual training Acadia University, Wolfville, N.S., 1897-1898. Following this he engaged in engineering work in Canada and United States, including heavy forging, steel and iron casting and general machine work in connection with army and navy equipments, munitions and marine engine construction with Midvale Steel Co., Philadelphia; with A. R. Holmes, organized MacKinnon, Holmes Co., Ltd., 1909, for general structural and steel plate work, and has also executed shell forging contracts.

Mr. MacKinnon is a member of Canadian Manufacturers' Association, and his society affiliations include: A.F. & A.M.; I.O.F.; I.O.O.F.; Canadian Society of Civil Engineers.

He married Mary Louise Bowman, of La Colle, Que., in 1892, and has four daughters. In politics Mr. MacKinnon is Independent, and in religion Scotch Presbyterian. His residence is Drummond Street, Sherbrooke, Que.

Photo, Courtesy British & Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$46 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	60 00

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 00
Tank plates, Pittsburgh	8 00
Structural shapes, Pittsburgh	4 00
Steel hoops, Pittsburgh	5 75
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 00

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$31 00	$32 00
Electro copper	31 00	32 00
Castings, copper	30 00	31 00
Tin	63 00	63 00
Spelter	10 50	10 50
Lead	11 00	11 00
Antimony	18 00	19 00
Aluminum	65 00	62 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$12 00	$13 00
Heads	12 30	13 30
Tank plates, 3-16 in.	12 65	13 25

WROUGHT PIPE.

Effective July 5, 1917.

Standard Buttweld.

Size.	Black Per 100 feet	Galvanized Per 100 feet
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00

Standard Lapweld.

2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.

4½" and larger, 40%.

4" and under, running thread, 25%.

Standard couplings, 4" and under, 35%.

4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$18 00
Copper, crucible	21 00	20 50
Copper, heavy	21 00	20 50
Copper wire	21 00	20 50
No. 1 machine composition	20 00	18 00
New brass cuttings	16 00	17 00
No. 1 brass turnings	14 00	15 75
Light brass	12 00	10 00
Medium brass	16 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	17 00
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	22 00	18 00
Axles, wrought iron	30 00	24 00
Rails	25 00	18 00
No. 1 machine cast iron	25 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	10 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	29 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	8 50
Stove plate	19 00	19 00
Scrap zinc	6 50	6 50
Heavy lead	10 00	9 00
Tea lead	7 00	7 00
Aluminum	30 00	25 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up	net
Coach and lag screws	25
Stove bolts	55
Plate washers ..... List plus	10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in. and larger	$7 60
Structural rivets, as above	7 50
Wood screws, flat, bright	72½
Wood screws, O. & R., bright	67½
Wood screws, flat, brass	37½
Wood screws, O. & R., brass	32½
Wood screws, flat, bronze	27½
Wood screws, O. & R. bronze	25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws...list plus	20
Collar screws ....list plus 30,	10
Thumb screws	20
Thumb nuts	65
Patch bolts ..... add 40,	10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$ 60 00
Open-hearth billets	60 00
O.H. sheet bars	70 00
Forging billets	90 00
Wire rods	85 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS.

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 16
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	18 00
Red dry lead, 100-lb. kegs, per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 69
Linseed oil, raw, single, bbls.	1 49
Linseed oil, boiled, single bbls.	1 52
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. ..list plus	20
Emery Cloth .....list plus	33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila Rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks .... list plus	30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%

At warehouse..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 25%; headers, 60; flanged unions, 40; malleable bushings, 25 and 7½; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$11 00	$11 00
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	11 70
Premier, 10¾ oz.	13 85	12 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$
Connelsville Foundry Coke	
Steam Lump Coal	
Best Slack	

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.65
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THE assurance that further shell contracts will be placed in Canada will create a more optimistic feeling in engineering circles, for at one time it was thought that the end had come to munitions orders. Steps are being taken to relieve the acute situation caused by the embargo on steel products. There will be no difficulty in obtaining export licenses on steel required for agricultural implements, railways or shipbuilding. The materials coming in for these purposes will consist principally of steel plates, boiler tubes and ship sections. There have been no changes in steel prices in Canada and it appears likely that prices will remain practically stationary for some time. The market is very unsettled and outlook continues obscure, so it is impossible to say definitely what will develop. There is an impression in the trade, however, that the embargo will tend to stiffen the market. The situation in regard to pig-iron is much the same as for steel and prices of domestic iron are still unchanged. The fact that mills and furnaces are booked up for some considerable time will prevent any material decline in prices in the meantime. The fixing of copper prices has not affected the local situation, due partly to the scarcity of red metal caused by the embargo. There is also very little spot copper to be had. Lead has declined but otherwise prices are unchanged. The scrap metal market continues more or less stagnant. Prices of scrap lead, zinc and aluminum have declined. Prices of Manila and hemp ropes have advanced, but white lead is down. The machine tool market has been fairly active this week.

Montreal, Que., Oct. 1, 1917.—Local interest is centred on the recent developments that have taken place in the States in connection with the fixing of prices on certain classes of steel and metals. This action may eventually solve a problem that has promised to become very perplexing, but as far as present conditions are concerned it would appear that the general situation is just as unsettled as ever. The question more than any other that concerns the Canadian buyer is to what extent he will benefit by the American regulations. At present it is almost impossible to obtain delivery of material other than that required for war needs, and even in this respect it is imperative that the purchase be expressly used for essential war requirements. During the past week an effort was made on the part of a delegation of Canadian manufacturers to induce the Government at Ottawa to take some action towards meeting their urgent requirements, and assist in relieving a situation that promises to become extremely serious. While Canadian manufacturers are aware of the priority of war demands, they nevertheless realize that the business of the country will be seriously disorganized unless the embargo on certain steels is partly lifted, thus allowing the entrance of such materials that may be utilized in keeping certain industries going, that would eventually have to close down if the desired steel is not available.

Pig Iron

In order to meet the changes that have been made in the price of steel a corresponding decline has been made in the price fixed for steel-making pig iron. With the exception of Bessemer, the price of which has been set subject to

revision, the quotations on Pittsburgh pig iron represent the figure agreed upon between the Government and the producers. The regulation price of $37.25 a ton for Bessemer shows a decline on the recent open market price of $13.70 per ton, the latest quotation being $50.95. The base price on basic, No. 2 foundry, and malleable has been placed at $33.95, which represents a decline of $9 per ton on basic, $17 on foundry, and $19 on malleable. Quotations at other pig iron centres are at present firm, but it is expected that these will be affected very shortly. No change is noted on the Canadian situation, and the market is still in rather unsettled condition.

Steel

The past week has marked another epoch in the history of the steel industry, one that is still marked by perplexities arising from the action of the American Government in regulating the prices that are to govern the future trade in certain classes of material, at least as far as the remainder of the present year has to deal. It is anticipated that further readjustment will be considered about the beginning of the coming year, but nothing definite can be stated as to the nature of these changes, as they will no doubt be based on the developments of the next three months. Just what effect the recent action will have on business generally is largely problematical, but the fact that many of the largest producers have practically agreed upon the prices that are now in force will tend to steady the market and keep the situation firmly in hand until a fair test has been made under the new ruling. While the announcement regarding the recent regulations has given some relief to the market, there is still in evidence considerable uneasiness as to the action that will be taken in connection with such materials that have not yet received the full consideration of the investigating committees. A feature of present conditions is the result which these developments will eventually have upon Canadian business. At present it is quite possible to secure steel that is specifically required for war necessities, on obtaining a license to that effect, at reasonable dates of delivery, but in face of the prices just put into force there may or may not be increased difficulty in obtaining such material. In the interests of these domestic users of steel and also those manufacturers that are dependent upon the States for plates, shapes, etc., that are now under the ban except for war purposes, a delegation of Canadian manufacturers paid a visit to Ottawa and placed the matter before the authorities in the hopes that some relief might be given and prevent such demoralization of business as would seriously handicap much of the trade that is of vital importance to the nation's welfare. The steel prices that have been agreed upon between the American Government and the large producers are for bars, shapes and plates. The base price on bars has been set at $2.90 per hundred; tank plates, $3.25, and shapes at $3 Pittsburgh, with slight allowance for other points of delivery. These prices have been arranged under agreement, but are subject to revision upon future developments. The local situation is still unsettled, and will likely continue so until some action is taken by the Government regarding the embargo.

Metals

While the primary intention of the American Government, in the regulation of prices on various commodities, was to better regulate the production, sale and distribution of metals, recent developments have not shown that the desired effect will be immediately realized, as the market to-day is, if anything, more unsettled than before. This, however, might have been expected, as it will be some little time before the trade can adjust itself to the changed conditions. The market at present is a very uncertain one, and early conditions will depend upon the way that both the producers and consumers will adapt themselves to the wishes of the higher powers. Copper is experiencing an anxious period, due to the recent fixing of prices. Tin is firm, but influenced by conditions in other metals. Spelter is quiet on poor demand. Lead is dull, with consumers looking for further decline. Antimony and aluminum are both quiet, but unchanged.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Copper.—As was expected, the regulation of copper prices has not had the effect of removing the uncertainty of conditions. The producers are apparently undecided as to the course they should adopt, and are very reluctant to accept business at the price of 23½c, fixed by the Government. The total absence of details regarding the proposed methods of controlling and distributing copper has maintained the market in a very unsettled condition, and until this matter is more clearly understood it is unlikely that producers will accept business at the price stated. Another feature of the situation is the standing of those consumers that have placed orders at much higher figures; whether the previous prices agreed upon will still hold is a question still unsettled, and further details are anxiously awaited to relieve the nervous tension of the present market. With the situation as it exists to-day, no quotation other than the Government price can be announced. Local conditions are unchanged, and dealers here are anxiously watching developments across the line. Quotations here are firm and unchanged at last week's prices.

Tin.—The situation in tin, while unsettled, is nevertheless fairly well maintained. The market is steady as well as the demand, but prevailing conditions prevent any pronounced activity, as the trade is more or less affected by the uncertainty that prevails in other lines of industry. Prices in New York are steady and unchanged at 61½c per pound. Dealers here report a steady market without feature, the quotation being unchanged at 63c per lb.

Spelter.—This market is very quiet on the absence of any demand, and an undertone of weakness is apparent. Like other metals, spelter is influenced by the Government's policy of regulation, and the situation is, therefore, dependent upon what action will be taken in the near future. A slight decline is reported on New York quotations, but local prices are unchanged at 10½c per lb.

Lead.—The decline that was made in the price of lead a week or so ago seems to have impressed some consumers that further reductions would be announced, as they are endeavoring to get additional concessions before placing future business. While there is an indication that some of the independents might be willing to accept a lower figure than that quoted on the open market, the attitude of the leading producers is a factor in keeping up the price. Recent developments in the lead situation has made the buyers of metal cautious, with the result that they are reluctant to enter into contract for more than their immediate requirements. New York continues to quote on a base of 8c per lb. on a dull market. The market here is unchanged, with the price steady at 11c per lb.

Antimony.—This market is not active, and the general demand is light. While prices are firm, an undertone of weakness seems to be apparent. New York is still quoting 15⅜c, and local prices are unchanged at 18c per lb.

Aluminum.—This market is quiet, but steady, with prices firm and unchanged at 63c to 68c per lb.

Machine Tools and Supplies.

With the exception of a little increased activity in the purchasing of additional equipment for the production of 6-inch shells, the machine tool industry shows no developments of importance. Considerable interest is at present displayed in the disposal of used equipment, as many plants that have been engaged in the manufacture of shells and fuses are endeavoring to sell their machinery. Getting rid of special tools proves a difficult matter, but where the equipment can be adapted to general use the sales are satisfactory, as much of this can be used in those plants that are at present.

or may contemplate, working on various shipbuilding requirements. Supplies on the whole are not in great demand, but slight increase has been apparent where additional orders have been placed for the 6-inch shells.

Scrap

With the general adjustment in the prices of all classes of steel and iron products, as contemplated by the American Government, the market in old materials is awaiting with considerable interest and also anxiety, further action in this connection. The present situation is very unsettled and quotations are mostly nominal. The general tone of the New York market is weaker, but the local market is one of uncertainty, and with the exception of coppers, dealers are quoting last week's prices. A decline of 1c has been announced on light and 2c on heavy, quotations ranging from 19c for the former to 21c for heavy copper and copper wire.

Toronto, Ont., Oct 2. — Activity in the munitions industry is assured for the remainder of the year, at least, as it is understood that further credits have been set apart for this purpose. The manufacture of 6 in., shells will keep those plants going which were formerly producing larger sizes such as 8 in. and 9.2 in. while contracts 4.5 H.E. and 18 pdr. shrapnel will also be distributed among firms already in the business. While circumstances have caused the Imperial Munitions Board to cut down a third of its output the plans for the coming season contemplate an expenditure of about $30,000,000 per month in munition orders. This expenditure taken in conjunction with the activities in other industries will be of the greatest benefit to Canada.

The financial statement of the Dominion for the first half of the fiscal year is regarded as being very satisfactory. Receipts from all sources show an increase of $24,000,000 over the corresponding period of last year. During the six months under review the surplus of revenue over capital and ordinary expenditure amounted to $65,000,000 which was applied in payment of principal of war expenditure in Canada.

Steel

The serious situation developing in Canada in consequence of the United States' embargo on the export, except under licenses, of pig iron, steel plates, chrome nickel steel, boiler tubes, billets, tin plate, and other raw materials of iron and steel manufacture, was discussed last Friday at Ottawa with the Minister of Trade and Commerce, Sir George Foster, by a representative deputation of Canadian iron and steel manufacturers. The Washington embargo prevents the importation into Canada of these basic requirements of the industry unless it is shown they are necessary for munitions work or other win-the-war purposes. The shortage of raw material for domestic use threatens to cause a temporary shutting down of some plants, or at least a restricted output and short shifts. That would materially affect the whole industrial prosperity of Canada. It is possible that steps will be taken under Government supervision to conserve and co-ordinate iron and steel supplies and secure as far as possible a distribution of the limited supplies obtainable, covering a program for the next six months or so. A Controller of steel and iron may be appointed by the Dominion Government for this purpose, with duties analogous to those of the Fuel Controller. A committee of interested manufacturers has been appointed to investigate the situation more fully and to ascertain what firms are needing steel and the extent of their requirements. The data obtained will be placed before the Minister of Trade and Commerce who will then make representations to Washington with the view of a change being made in the existing rulings. It is understood that steel etc., required in the manufacture of agricultural implements, maintenance of railways and shipbuilding will be licensed for export to Canada as being for war purposes or directly contributory thereto.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

In spite of the relief that may be obtained through diplomatic channels the steel and iron industry will still be in a complicated condition owing to the shortage in supply of certain steel products due to the heavy demand for material for war purposes in the States. While some material may be permitted to come through it does not necessarily follow that the full requirements will be obtainable. This matter however, will have to be adjusted to meet the situation. In the meantime manufacturers do not know where they stand and business is suffering because of this.

The question of prices continues to cause considerable anxiety in the steel trade. It is not yet clear what immediate effect the new schedule in the States will have on the situation in Canada. In spite of the advance in prices of some steel products last week it now seems practically certain that the crest has at last been reached. That a recession of prices will now set in, however, does not appear likely in the meantime. The general consensus of opinion in the trade seems to be that prices will be more or less stationary for some time and any adjustment downwards will likely be gradual. Warehouses have stocks of steel purchased at high prices and it is not to be expected that jobbers will cut down their prices all at once. Owing to the fact that the mills will be working on old contracts for some time the effect of the new schedules will not be felt just yet, even in the States. Indications rather point to the Canadian market being less influenced by the situation in the States than formerly because of the embargo. Whether the Canadian market will be on its own basis depends, in part, upon the extent of the restriction imposed by the embargo.

The prosperous condition of the steel industry in Canada is revealed in the returns recently issued by the Dominion Department of Mines. The total production of steel ingots and direct castings in Canada in the first six months of the current year amounted to 836,149 short tons, an increase of 246,596 tons, or 42 per cent., over the corresponding period of 1916. The average monthly production was 139,858, against 98,259 in the half of 1916, and 106,268 tons for the full year 1916. A new high record in output was reached in May of 155,346 tons, but the June figures show a falling off of about 18,000 tons.

Pig Iron

Pig iron output in Canada from returns issued by the Department of Mines covering all producers was 586,998 short tons, as against 562,097 in the first six months of 1916. This represents an increase for this year of 24,901 tons which is very satisfactory particularly when considering the shortage of coke, etc., for the greater part of that period. The situation here has not as yet been affected by the new schedule of prices in the States. The embargo may as in the case of iron and steel tend to keep prices up in Canada. In the States pig iron is selling on the new price basis but both consumers and producers are awaiting action by the Pig Iron Committee at Washington to establish differential prices.

Scrap

The scrap market continues unsettled with no business passing to speak of. Both consumers and dealers are awaiting developments and little activity is anticipated until the situation becomes less obscure. The embargo on iron, steel and copper is of course affecting the scrap market. It is tending to stiffen prices of iron and steel but on the other hand non-ferrous scrap is weaker. The price changes this week include spelter, lead and aluminum.

Machine Tools

The general situation in the machine tool market is unchanged. Business continues fairly active and is assuming a more general character although there has been some demand for special tools for making of 6 inch shells. The market in the States is very active and machine tool builders are exceptionally busy on government and other orders connected with the war. Representatives of concerns in the States which have shell contracts are reported to be

in Canada trying to buy up munitions plants.

Supplies

Prices of machine shop and mill supplies continue firm with advances in some lines. Ropes have advanced affecting the following. Pure Manila is now quoted at 39c; British Manila and New Zealand hemp 33c; sisal rope, 27½c; transmission rope 45c and drilling cables 41c per pound, base. The higher prices are due to the increase in cost of raw materials. Turpentine is higher at 69c and putty has also advanced, being now quoted at $4.75 per 100 lbs., in drums. White lead in oil has declined and is now quoted at $18 per 100 lbs., in ton lots.

Metals

There has been no charge in the price of copper here and it does not appear likely that there will be in spite of the new price fixed at Washington. On account of the embargo there is a scarcity of red metal and for this reason prices will be held firm. Lead has declined again in sympathy with the market in New York. The markets generally speaking are dull and unsettled. A good steady business is being done on a hand-to-mouth basis, for under prevailing conditions consumers do not care to buy heavily; the expectations being that lower prices are probable on some metals, but which will decline is difficult to define.

Copper.—The market is holding firm due to the embargo which has caused a scarcity of copper. In New York the market is quiet and business is dull. While the agreed price of 23½c is generally considered fair there is no copper for sale at this price. The leading producers have for some time been withdrawn from the market as they did not want to incur obligations until the U.S. Government had made known its requirements. It is believed that the Government will require a large amount of copper and until this demand is satisfied, the public must wait. The local prices are unchanged, lake and electrolytic being quoted at 32c and castings at 31c per pound .

Tin.—Little interest is being shown in tin and the market is dull. Dealers on this side are watching the London market closely on account of the unsettled situation there. Tin is unchanged at 63c per pound.

Spelter.—The situation has been cleared by the announcement that the U.S. Government has paid 10.67½c per lb., for two million pounds of spelter. The ordinary demand continues quiet and quotations locally are unchanged at 10½c per pound.

Lead.—Although the price of lead in New York is now down to 8c, business has not been stimulated and the market is dull. Nearby lead is scarce but futures are offered more freely. Lead has declined ½c locally and is now quoted at 11c per pound.

Antimony.—The market has a weaker tendency due to the increase in available supply but quotations are unchanged at 19c per pound.

Aluminum.—The demand for aluminum is lighter and the market continues week and irregular. Present price 62c per pound.

Sydney, Sept. 27.—A fire of unexplained origin destroyed the bankhead of the No. 1. Colliery of the Dominion Coal Company during the night of the 8th September. The colliery was idle until the 24th September, during which short period the headframe and other bankhead arrangements were rebuilt by timber construction, a very creditable performance. The mine is again producing at the same rate as before the fire, and the loss of output has only been between 10,000 and 15,000 tons, much smaller than might have been expected from the completeness of the destruction of the bankhead. The good work of the firemen and the fact that the shaft was an upcast, prevented the extension of the fire to the pit-bottom.

The output of the Glace Bay colleries for September will not exceed 250,000 tons, which compares with 315,000 tons in September, 1916, and 419,000 tons in 1915. Notwithstanding the practical cessation of enlistments the coal production still continues to decline.

There is evident a great desire among the miners and steelworkers to enlist before the conscription draft is made, and although for some time past applications for enlistment from among these essential munition workers have been refused, there will occur a still further restriction of output following the calling of the draft, if for no other reason than the reduction of the available working forces in other industries and in the country at large. The Government has at various times been urged to issue munition workers' badges to the steel and coal workers, so as to give these men some tangible recognition of their importance in national service, but it has unfortunately not been done. No man, or very few among the workers of this district wishes to be a "slacker." A badge is a little thing, but it would have been an effective means of limiting the serious reduction that has taken place in the production of the basic materials, coal and steel.

The following annual figures will give some idea of the reduction that has taken place in the production of coal from the Glace Bay mines of the Dominion Coal Company, and it may be taken as typical of all the other Nova Scotian colleries:

	Long Tons.
1913	4,739,149
1914	4,287,717
1915	4,708,978
1916	4,091,790
1917	3,580,000*
1918	3,300,000*

*Estimated.

The figures forecast for 1918 are the very outside that can be counted upon. The capacity of these mines for output, if sufficient labor were available is 5,250,000 tons, about. It is not difficult to see why there is a shortage of soft coal in Montreal.

Pittsburgh, Sept. 29.—The long suspense as to how iron and steel prices will be made is ended. They will be fixed by agreement between the Government and the producers, and perhaps later on by Government decree resting upon legislation now contemplated. As it was suggested in last report might be the case, an agreement was made upon iron and steel corresponding with that previously made upon copper.

The iron and steel manufacturers assembled in Washington Friday, Sept. 21, as reported a week ago. Addresses were made urging them to settle the matter of prices and to dismiss such opposition as they might have to President Wilson's strongly held view that there should be but one price, applying to the Government, its Allies in the war, and the general trade. It may be mentioned, parenthetically, that there has never been a precise statement as to whether the phrases, "the public" and "the general trade," in this connection would be interpreted as including foreign buyers of steel for commercial purposes. The iron and steel manufacturers accordingly submitted a schedule of prices to the War Industries Board. which conducted the negotiations, and Chairman Scott, of the Board, while observing that the prices were somewhat higher than they had hoped for, agreed to submit them to the President. On Saturday afternoon the manufacturers were advised that the President had accepted the schedule, but it was not until Monday afternoon that the announcement was made by the Committee on Public Information at Washington. The schedule was: Lake Superior iron ore, no change from the 1917 list, which sets Mesabi non-Bessemer at $5.05 on Lake Erie dock; pig iron, $33; steel bars, 2.90c; structural shapes, 3.00c; plates, 3.25c, f.o.b. mill, Pittsburgh or Chicago. Thus Pittsburgh prices as a basis for the whole country disappear, and Chicago is made a separate basing point, a radical departure right at the start.

Merely a Basis

Two things occurred. First, the manufacturers agreed to make "one price for all," whereas legally the Administration had authority to fix prices only with respect to purchases made for the Government's own account. Second, a general basis for prices was adopted. It was not a schedule of prices, but a statement of certain specific prices, from which other prices could be worked out, in proper relation to the basis. What was needed was a basis to determine the general level, and to show what measure of profits the manufacturers should be accorded. The $33 pig iron price applies to basic, No. 2 foundry and malleable, at valley furnaces. Bessemer, low phosphorus, etc., at valley furnaces, as well as prices for various grades at furnace in other districts, are to be worked out. It is suggested that Bessemer should be set at 10 per cent. above basic, as that has been the average spread for years. Birming-

ham prices will probably be a shade below $30. Pig iron prices in general, and prices for the various important finished steel products, are to be worked out by committees of the American Iron and Steel Institute, in the main the committees that have been engaged for several months past in distributing Government orders to the mills in accordance with their tonnage capacity and their ability to produce the various materials. The conclusions of these committees will be placed before the War Industries Board, and prices as approved will be announced at Washington from time to time. The statement is made, apparently upon official authority, that prices upon about 150 iron and steel commodities are to be fixed.

For wire prices it seems quite probable that the official prices of the American Steel & Wire Company will be adopted, these being based upon $3.20 for nails. The prices were first announced March 5 last, and have been adhered to by the leading interest, while independents advanced first to $3.50 and then to $4.

For steel pipe it is likewise probable that the official prices of the National Tube Company will be adopted. This discount list is based upon 55 per cent., and was published April 2 last. Afterwards all the independents but Republic advanced to 49 per cent., and later some advanced to 42 per cent.

To determine a price for billets, a familiar practice often employed in making sliding scale contracts, is to take one and one-half times the price of pig iron, which would make $49.50, and sheet bars for such contracts have usually been set at $1 above billets. Thus billets and sheet bars are likely to be in the neighborhood of $50. If so, black sheets would be fairly fixed at 5.00c, or a trifle less, with blue annealed on a slightly lower basis. Galvanized would be about 1.50c above black.

Market Inactive

Naturally the market has been inactive. There was scarcely any activity before the price fixing agreement, and now there is practically none. The whole thing is new. Producers, of course, do not rush to sell when there has been a radical reduction, even though it is a reduction from a quite fictitious level. Buyers are indisposed to buy, except for early deliveries, and these the mills cannot make. The new prices are subject to revision January 1 or later. There is also the contingency that the Pomerene Bill, now in the Senate, may be enacted. It looks to giving the Administration full legal authority to fix all iron and steel prices for everybody. With such authority the Administration might be disposed to reduce prices below the present agreed level. In the circumstances, there will be little disposition in future for producers to sell, or consumers to buy, for deliveries far ahead. The Priority Board is to have strict supervision of the sequence in which orders are filled, and thus the placing of an order by a commercial buyer does not insure that it will be filled at any particular time. In the circumstances, with the mills well filled with orders and with the great mass of consumers correspondingly well covered, there will be a transition to a condition of hand-to-mouth buying, relatively speaking. This necessarily involves a period, perhaps of several months, in which commercial buying will be quite light.

Enormous War Orders

An immediate result of the price agreement is that large war orders will be placed. Upon excellent authority it is stated that within two months the Government will distribute orders for about 7,000,000 tons of steel, chiefly for shipment in 1918. While the Government has been placing orders right along, chiefly at tentative prices, to be revised when the price question should be finally settled, it has naturally held back such business as could be held back without detriment to the prosecution of the war. Substantially all the purchases on account of our Allies have been held back since the Government did not have, as in the case of its own purchases, the power to fix the prices. Thus a large amount of business has accumulated, and the 7,000,000 ton statement, while somewhat startling, really furnishes no cause for astonishment. Production of finished rolled steel has of late been at the rate of about 33,000,000 tons a year, while the capacity is equal to 35,000,000 tons or more, full operation having been impossible, chiefly because of shortage of coke. Thus the 7,000,000 tons is in the neighborhood of 20 per cent. of a year's output. Part of it is merely in sequence to the steel furnished the Entente Allies last year, when production was less, only about 30,500,000 tons. Eventually there should be plenty of steel for commercial requirements.

Coke

While a price for Connellsville coke was fixed at the same time that steel prices were agreed upon, the procedure was slightly different, and the principle was different. The procedure was different in that the President accepted without modification the iron and steel prices submitted, while the $6.50 price submitted by the Connellsville coke producers he cut by 50c, making the announced price $6. The principle was different in that the President, under the Lever Act, has full authority to fix the coke price for everybody. A differential for foundry coke, above the $6 furnace coke price, will doubtless be established.

New York, Oct. 1st.—Great excitement prevailed throughout the iron industry last Monday when Washington authorities announced the prices—established through co-operation between the Government and large producers—to rule for thre months upon current and future orders for steel bars, shapes and plates and for raw material—iron ore, coke, and pig iron—placed by the United States and Allied Governments and by the American public with the producing interests. The statement made by the Government was so meager, ambiguous and perplexing that manufacturing consumers were thrown into the utmost confusion and business was entirely suspended for several days. Later, some of the many pertinent questions asked about prices were re-assuringly answered by representatives of the producers who had attended the Washington meetings, but, still other obscure points, upon which enlightenment is desired, cannot be passed upon until after the conferences of the War Industries Board with the Committees of the Iron and Steel Institute, having jurisdiction over the affairs of pig iron and steel, that are scheduled for this and next week. At these meetings prices will be established upon steel ingots, billets, sheet bars, wire products, tubes, sheets, tinplate and a host of minor products. Differentials will also be fixed on the various kinds and grades of pig iron and steel products.

The prices thus far established are base prices and it is now known that $5.05 per ton for iron ore at lower lake ports applies to Mesaba non-Bessemer, there being no change from the price previously current in the open market on season contracts. The price of $6.00 per ton for coke at Connellsville ovens, presumably applies to foundry as well as to furnace fuel, but it is possible that a differential may be established. The base price for pig iron, $33 per ton, is for basic and for No. 2 foundry at Northern furnaces. The prices of 2.90c for bars, 3.00c for shapes and 3.25c for plates, Pittsburg and Chicago base, are equivalent to $58 per net ton for bars, $60 per ton for shapes and $65 per ton for plates. Differentials are yet to be established for special grades. It is believed that the price of steel ingots will be fixed at approximately $40 per ton and for billets at close to $47.50 per ton, based upon conversion charges of $7 and of $7.50 per ton respectively, from pig iron to ingots and from ingots to billets.

The War Industries Board has determined that all contracts made prior to last Monday shall remain inviolate and that shipments shall be made against these contracts, subject only to priority of war orders, as speedily as is possible. These contracts must be worked out before consumers can purchase additional supplies on the new basis of prices. Some impetuous consumers, imagining that they can now buy steel at the fixed Government prices for early shipment, have come to grief. Almost no steel will be available for purely commercial purposes until the war requirements of the United States and Allied Governments have been satisfied, and as these contracts, now aggregating 7,000,000 tons, having priority of shipment—and will soon be increased by several more million tons—there is small prospect that the public can obtain new material, direct from the mills, inside of three to six months. It is understood that in the near future all applications to purchase steel products of any kind will be referred to Washington where preference will be given to consumers working upon war munitions contracts whether obtained directly or indirectly from the Government.

The Steel Committee of the Iron and Steel Institute, that recently suspended its activities in distributing orders among the mills on behalf of the Government until its legal status was established, will resume this function within a week, now that the Government and the steel industry are working in co-operation. Specifications against heavy war contracts are now being made expeditiously—several hundred thousand tons in the last week—and within sixty days, disposition of the entire 7,000,000 tons will have been made. Great Britain, France and Italy are still negotiating for nearly 1,000,000 tons more steel, including 500,000 tons of shell bars and forgings for England. France and Italy are most anxious for steel to be used in ship building, including war craft. The shipbuilding program of the United States and Allies calls for 2,400,000 tons of steel. Back of these great tonnages are heavy requirements for railroad equipment to be put into service in France and Russia.

RESTRICT COAL INTO CANADA

ALL shipments of coal into Canada from American lake ports were ordered stopped last Sunday by Fuel Administrator Garfield, to divert coal from these ports to meet fuel shortage in the Northwest. The order also directs that producers shall fulfill contracts for delivery of coal to Lake Erie ports for transhipment, directs all handling agencies to expedite shipments, and forbids the reconsignment of such coal to any points either in the United States or Canada other than the Northwest.

When the diversion of coal to Canada first was protested against Dr. Garfield announced that the Exports Council would be asked to license no shipments to Canada without consultation with the Fuel Administration. The Canadian buyers continued to drain the lake ports of their coal however, and of 180,000 tons shipped daily on lake carriers, only about 53,000 tons have been reaching the Northwest. To meet the needs of the section the daily shipments should average 150,000 tons.

EXPLOSIONS of coal dust can be prevented, according to Dr. J. Harger, of the Society of Chemical Industry, Liverpool University. His experiments proved that a small reduction of oxygen and the addition of a little carbon dioxide was sufficient to render coal dust ignition impossible. The reduction in oxygen necessarily varied with the different coals and with the method of working. In most mines a reduction of 1 per cent. in the oxygen and the addition of ½ per cent. of carbon dioxide was sufficient. With others a reduction of nearly 2 per cent. in the oxygen and an addition of ¾ per cent. carbon dioxide was necessary to render them safe. If the reduction in oxygen was made to 17½ per cent., with ½ per cent. to 1 per cent. carbon dioxide, absolute safety was secured, not only from coal dust, but from fire-damp explosions.

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

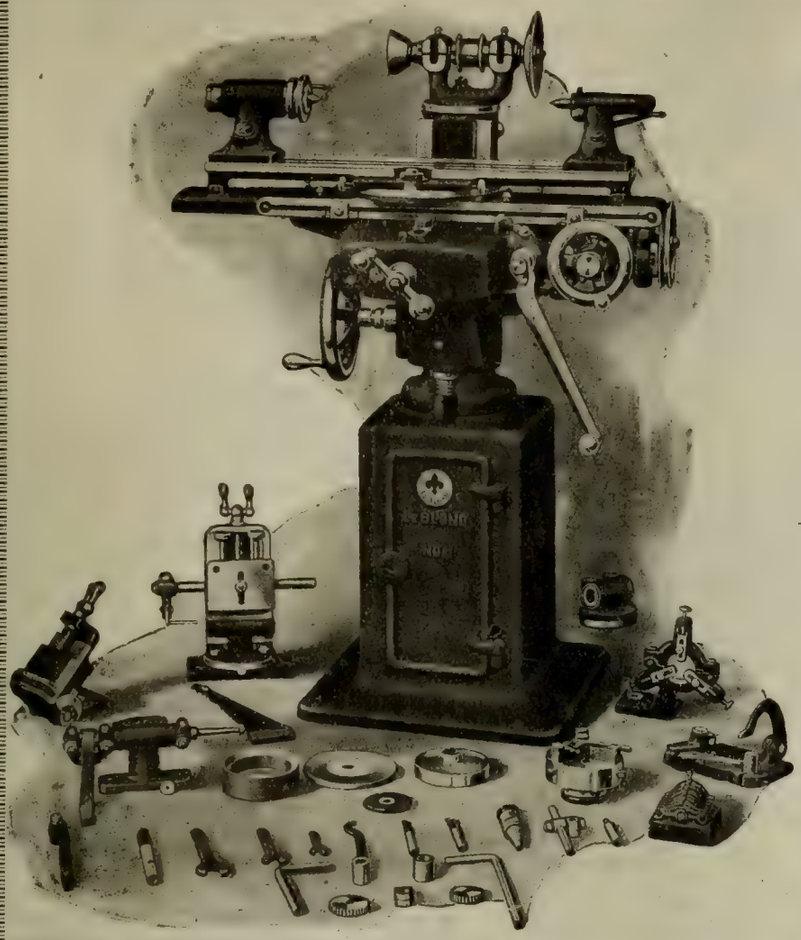
BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.



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IS ALSO { a Cylindrical Grinder / a Surface Grinder / an Internal Grinder

That's the Le BLOND Universal Tool and Cutter Grinder. It is a complete tool-room machine; sharpens all sorts of cutters, including large face mills and saws.

The AUTOMATIC TABLE FEED enables you to do cylindrical, internal and surface grinding with the greatest facility.

SPECIFICATIONS:

Swings	8" dia. x 17" between centres	
Table, working surface	29" x 5¼"	
Longitudinal feed (automatic)	15"	
Vertical feed	7¾"	Grinds cutters to....18" dia.
Cross Feed	6¼"	Grinds saws to.....36" dia.

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Guaranteed Accuracy!

Mulliner Quick Change Lathes are guaranteed to bore and to turn true to within .001", when properly set up.

Only the finest materials and workmanship are used in constructing these lathes. Every Mulliner Lathe is tested to a standard which is way above ordinary requirements.

Circulars giving details on request

THE HEAD: Pan construction—rigid—backward deflection of front bearing impossible.

AUXILIARY QUADRANT: Allows for application of additional gears.

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VARIABLE SPEEDS.

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INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Lachine, Que.—The Dominion Wire Rope Co. will build an addition to their factory here.

Toronto, Ont.—The Dominion Wheel & Foundries, Ltd., contemplate building a machine shop to cost $5,000.

Hamilton, Ont.—The Acme Tool & Stamping Co. have awarded a contract to the Hamilton Bridge Works, for the steel for their new factory addition.

Toronto, Ont.—A building permit has been granted to Canadian Aeroplanes, Ltd., to erect a $1,500 addition to their dry kiln on the West side of Dufferin street.

Sydney, N.S.—Coal is again being hoisted from No. 1 colliery. This is the same one in which a fire broke out three weeks ago, but energetic measures were taken to restore the mine to working conditions.

Port Arthur, Ont.— A company which has ben formed here has secured an option on 200 acres in Conme Township to exploit deposits of molybdenite. It is understood that the ore will grade about 20 lbs. to the ton.

Montreal, Que.—It is reported here that several Canadian concerns which have been engaged in the manufacture of munitions have received offers for the purchase of their plants by manufacturers in the United States, but only the preliminary stages of the negotiations have been reached as yet.

Montreal, Que.—Following a meeting of the Board of Directors of the Shawinigan Water & Power Co. on Sept. 26, President J. E. Aldred stated that before the end of the year 18,000 h.p. of new business would go into effect on the system, 15,000 of this at Shawinigan Falls alone. That increase would be in addition to 6,000 h.p. connected up as a new load so far this year.

Montreal, Que.—The Canada Foundry and Forgings Co. is going into the shipbuilding industry extensively and contemplates purchasing the plant of the Delaney Iron and Forge Co. at Buffalo. The Canadian concern will operate in Buffalo as well as in Welland. A special meeting of the shareholders of the Company will be held at Brockville on Oct. 10, to ratify the Delaney deal.

Kirkland Lake, Ont.—Work of pouring concrete for the foundations of a new 80-ton mill commenced last week. Due to the fact that most of the building material for the mill building is on the ground, construction work should be pretty well completed within the next five weeks. After that the installation of machinery can be gone on with, and before the close of the current year, this mill should be making its initial run.

Temiskaming, Ont.—The Riordon Pulp and Paper Co. has acquired a site near Temiskaming, on the Upper Ottawa, for the building of a large sulphite mill and paper plant, and the opportunity is being taken to develop a model town adjacent to the mill site for the housing of the employees of the company and others. The plan of the town has been prepared by Thomas Adams, of Ottawa, of the Commission of Conservation, as consulting engineer.

ELECTRICAL

Bradford, Ont.—The ratepayers will vote on the Hydro-Electric by-law on Oct. 6.

Fort William, Ont.—The ratepayers voted in favor of the Hydro-Electric by-law by a majority of 7 to 1.

GENERAL

Fergus, Ont.—Monkland's Mills, owned by Jas. Wilson & Sons, were destroyed by fire on Sept. 29.

Elgin, Man.—Fire on Sept. 23 completely destroyed the Western Canada Elevator and the Imperial Oil Co.'s plant here. The total loss is estimated at $15,000, which is covered by insurance.

London, Ont.—The Battle Creek Toasted Corn Flakes Co. will build an extension to their factory at a cost of $50,000. This amount will include buildings, storage tanks and machinery. The additional buildings will be of brick and concrete, a three-storey building of 50 x 60 feet, and a one-storey building of larger dimensions. Six large fireproof storage tanks will be erected. The contract for the buildings and grain tanks has been let the Archibald & Holmes Co., of Winnipeg.

MUNICIPAL

Chapleau Township, Ont.—A by-law will be submitted to the ratepayers on Oct. 9, to authorize an expenditure of $6.000 for addition to pumping station and installation of an electrically-operated pumping unit.

Toronto, Ont.—By a vote of 12 to 7, the City Council at a special meeting on Friday decided to sell the municipal abattoir to the Wm. Harris Co., Ltd., for the sum of $427,784, on condition that the purchasers entered into an agreement with the city to provide accommodation for the smaller butchers to continue the slaughtering of their animals under similar terms and conditions now existing.

Niagara Falls, Ont.—The Hydro-Electric Power Commission has denied this city permission to build a submerged dam in the Upper Niagara River for the purpose of supplementing the city's water supply. Sir Adam Beck told the Water Commission that some permanent arrangement will be made with the city for a full water supply. In the meantime the city will be allowed to supplement its supply from the Ontario Power Co.'s conduit.

BUILDINGS

Toronto, Ont. — Fairweather & Co. have acquired the lease of 90 Yonge street for twenty-one years, renewable. A fireproof steel and concrete building will be erected on the ground.

Regina, Sask.—The T. Eaton Co. has purchased Dominion Park, Regina's athletic grounds, for $100,000, and will erect a distributing warehouse on the property. The deal has been ratified by the city council.

Montreal, Que.—A permit has been issued to the Canadian Northern Express Co., to build an office building on Mansfield street at a cost of $58,000. The building will be on the east side of Mansfield street, near Dorchester and will be 100 x 79 feet.

Windsor, Ont.—Contracts for the construction of some one hundred and fifty brick residences at Ojibway, near here, will, it is expected, be awarded to Canadian contractors by the Canadian Steel Corporation probably this week. This work will cost approximately one million dollars, and is apart from the building of a dock and a canal on the river front below Sandwich, all of which is to be a part of the new steel city. Already railroad tracks and pavements cover the new territory, and preliminary work for the construction of the docks has been under way for the past two months.

CONTRACTS

Granby, Que.—The Southern Canada Power Co. have let the general contract for a sub-station here to Loomis, Dakin & Co.

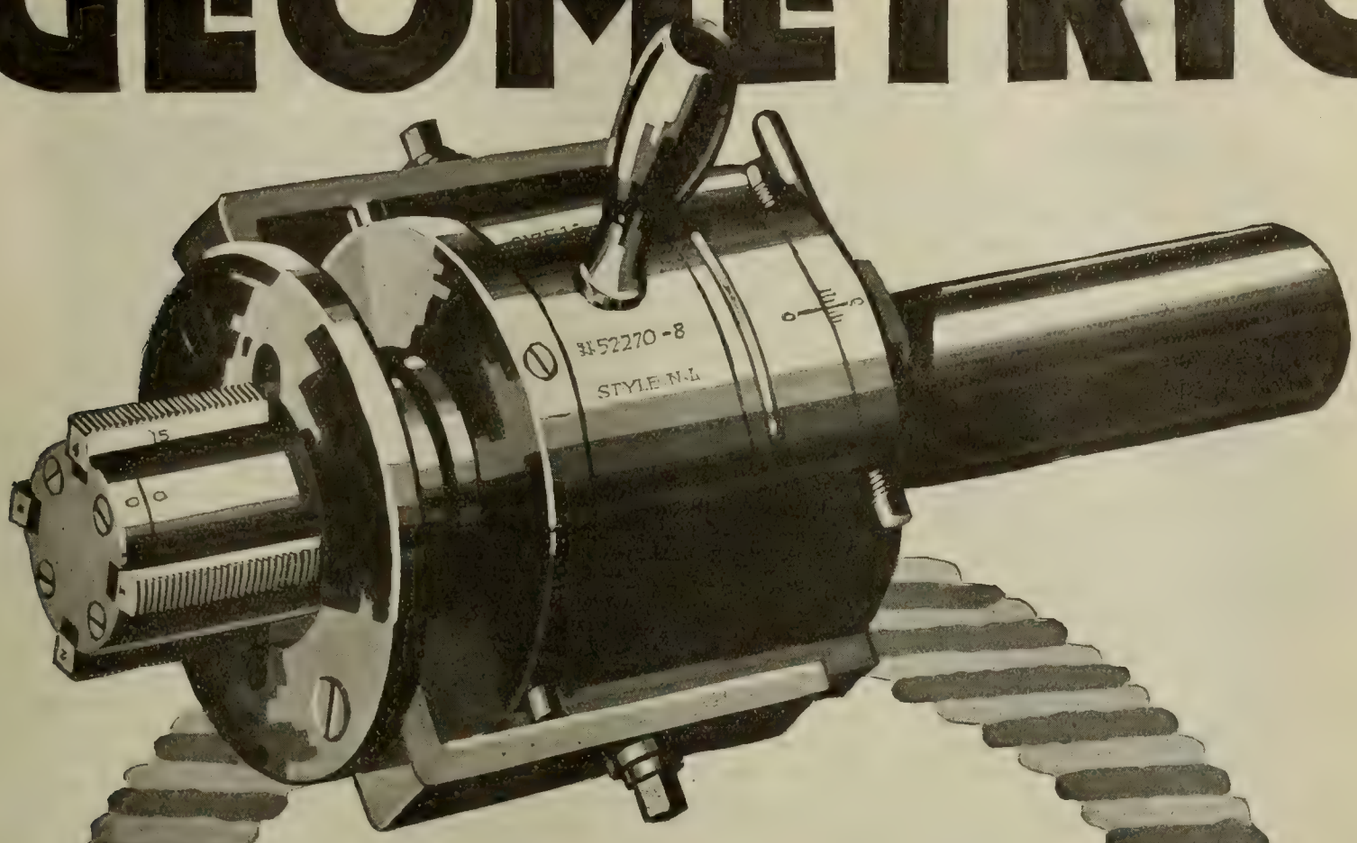
Chambly Canton, Que.—The Otis-Fensom Elevator Co., Montreal, have been awarded the elevator contract for the new factory for the Canadian Leatherboard Co.

RAILWAYS—BRIDGES

Belleville, Ont.—The overhead wooden bridge which spanned the G. T. R. tracks on North Front Street has been torn down, preparatory to the erection of an up-to-date steel structure, the building of which will be proceeded with as rapidly as possible.

Montreal, Que.—The Montreal and Southern Counties Railway has ordered for its South Shore service six new passenger cars—three with motors and three of the trailer type. They are being built by the Ottawa Car & Manufac-

GEOMETRIC



The Tap Famous For Good Work

Geometric Collapsing Taps share the popularity of Geometric Die Heads. They have the same good reputation for tapping inside threads that the Die Heads have for cutting outside threads. All objections of a solid tap are overcome in the Geometric Collapsing Tap. They are as rigid as solid taps while cutting, but collapse the chasers automatically when the required depth of thread has been cut. Are adaptable to Screw Machine, Turret Lathe or Live Spindle. Made in sizes suited to any diameter above ¾-inch in straight threads or standard pipe thread sizes.

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NEW HAVEN, CONN., U.S.A.

Canadian Agents:

Williams & Wilson, Ltd., Montreal

The A.R. Williams Machinery Co., Ltd. Toronto, Winnipeg and St. John, N.B.

turing Co., and will be in service by November 1st. The new cars are 55 feet long by 8 feet, 1½ inches in width; have steel underframes and interiors, finished in mahogany. They are divided into two sections—the general passenger compartment and smoking compartment, and have forced ventilation and hot air heaters.

PERSONAL

Robert Sloane Gourley, president of the Toronto Harbor Commission has had his term of office extended another three years by the Dominion Government.

Michael P. Fennell has been appointed secretary-treasurer of the Montreal Harbor Commissions, to succeed Major David Seath, who has retired after holding that position for eighteen and a half years. Mr. Fennell has been assistant secretary-treasurer of the Commission since 1909.

Matthew W. Kirkwood, former general superintendent of the G., P. and H. and L. E. and N. Railway, Galt, Ont., has been promoted to general manager of the two roads. Mr. Kirkwood has been identified with the first named radial for 23 years, commencing as electrician and master mechanic.

Milne Martin Todd, of Galt, Ont., third son of the late Martin N. Todd, has been elected to succeed his father as president of the G., P. and H. Railway and vice-president of the L. E. and N. Railway. Milne M. Todd represents the third generation of the Todd family to hold the presidency of the G., P. and H. Railway. Mr. Todd is 24 years of age.

Francis H. Sheppard, M.P. for Nanaimo, has been selected by the Dominion Government, it is understood, for the position of inspector of dredging for British Columbia. Mr. Sheppard is an engineer by profession. He has had considerable experience in mining engineering in Canada, Australia, New Zealand and Alaska, and in railroad construction in British Columbia.

Lawrence H. Cooney, general manager of the St. Algoma Steel Co. plant and wharves at Sault Ste. Marie, Ont., has resigned. He was for many years in charge of the rolling mill department of the Ohio Works, Carnegie Steel Co., Youngstown, Ohio, before coming to Canada three years ago. He is to be succeeded at the Algoma works by **James Nelson,** who for the past year has been in charge of the duplex department of the Bethlehem Steel Co. at Bethlehem, Pa.

The Electric Furnace Construction Co., Philadelphia announces that **Frank W. Brooke,** who was originally connected with the Gronwall Dixon furnace at Detroit, and latterly as metallurgist for the Ludlam Steel Works and the Ludlam Electric Furnace Co., is joining their staff as director. Mr. Brooke will be responsible for the construction and running of the Greaves-Etchells Furnaces. He will be assisted in the erection and installation by **G. W. Ketter, B.Sc.,** who has installed a great many of the electric furnaces now running and who has just completed the installation of ten furnaces for the British Forgings Co., Toronto.

TRADE GOSSIP

The Electric Furnace Construction Co., 1304 Finance Bldg., Philadelphia, makes the following announcement of contracts closed for the "Greaves-Etchells" electric furnaces: Steel Corporation of South Africa, two 5-ton furnaces; Sociedad Espanola De Construction Naval Madrid, two 10 and one 6-ton furnaces; Singer Manufacturing Co., New York, one 6-ton furnace.

Regina, Sask.—The local Scientific Research Association is asking the Cabinet to bring influence to bear on the Federal Government to take practical action to encourage research work. The proposals include the provision that $2,500,000 be granted annually for five years, to be divided between the various provinces for industrial research work.

The St. Lawrence Welding Co., of Montreal, have opened up their new brass foundry at 39 Olier Street. The plant is equipped on a large scale with all the latest brass foundry requirements and production of castings has recently been started. The firm has secured the services of Robert Stark, who is one of the best known foundry men in Canada, and who will have charge of the brass foundry under the direction of A. M. Barry.

Fredericton, N.B.—It is reported that anthracite coal has been discovered in the Salmon River district of Queen's County, about 50 miles from here, by Capt. Russell Bellaney, a geologist of New York City. Tests made showed it to produce an intense heat and to be almost odorless and clinkerless. It ignites quickly and burns slowly. It is estimated conservatively that there is at least a half-million tons in sight.

Interesting Electric Furnace Performance.—A "Greaves-Etchells" furnace of two tons capacity was recently started up at Messrs. Kayser, Ellison & Co., Sheffield, England, on special aeroplane steels, and 28 heats of sound steel were obtained from cold new furnace started Monday noon to Friday evening. The firm reported the furnace could have been worked quicker, but the men were not accustomed to such rapid melting with a new furnace.

The Homestead Valve Mfg. Co., of Homestead, Pa., announces that it has almost completed the rebuilding of its manufacturing plant and office buildings, whereby it added about 75 per cent. additional space to take care of the increase in its business. In addition to adding more floor space in its factory and offices the company has also added considerable new machinery and equipment, especially in the foundry, where the production has been almost doubled in a short time.

Canada's Trade Balance.—For the eight months of the calendar year Canada is credited with a favorable trade balance of $227,266,000, or about $37,000,000 ahead of the record established in the corresponding period a year ago. If comparison is made with the previous cycle of business activity in this country, say around the 1912-13 period, when the eight months' figures were showing unfavorable balances of upwards of $200,000,000, the net improvement in the trade position so far this year amounts to about $450,000,000.

Big Shipping Plan in the U. S.—The Shipping Board plans call for 1,200 merchant vessels of about 6,000 tons being completed within a little more than a year. Completion of ships commandeered in shipyards and of vessels actually or about to be contracted for will give the United States a fleet of 1,600 ships with a total tonnage of more than 9,000,000. In addition to this, the board will complete in 1919 vessels already contracted for, and under negotiation of about 4,000,000 tons. A billion dollars has just been asked of Congress to complete the programme.

Hamilton, Ont.—The following tenders have been submitted in connection with the proposed pumping installation for the Beach Station:—Allan General Supplies Co., $3,715; Canadian General Electric Co., transformers, $14,010; DeLaval Co., centrifugal pumps, $22,420; Canadian General Electric Co.. switching apparatus, $4,990; Canadian Westinghouse Co., motors, $16,620; Babcock & Wilcox Co., boilers and insulation, $17,555; Turbine Equipment Co., steam turbine pumps, $52,517. The original estimate for the pumping equipment was $127,000.

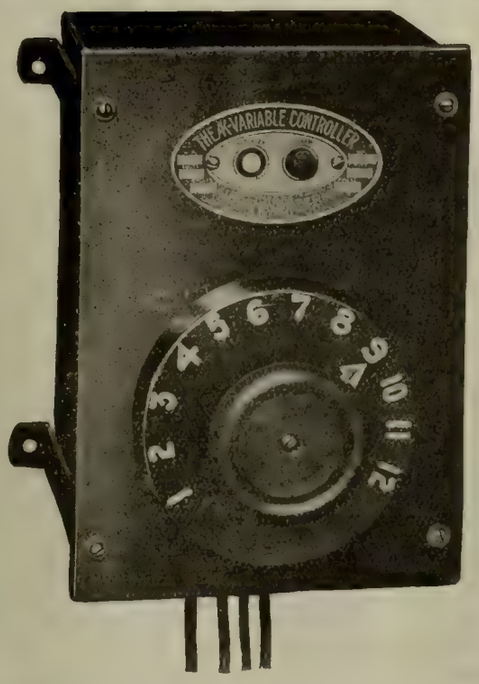
Building Concrete Ships at Montreal.—The concrete boat now being built by the Atlas Construction Co. for a number of Montreal capitalists, is fast approaching the stage when the pouring of the cement will commence. The reinforced steel frame is about finished, and the exterior form is just about completed. About the 1st of October it is expected that the placing of the inner forms will be started and a week later the concrete will be poured. When this latter operation begins, the pouring of the mixture will be continuous until well above the load water line, to insure a homogeneous body of material.

Coal Situation Better Than Year Ago. Cities and larger towns in Canada are better supplied with anthracite coal at present than they were at the same period of last year, according to reports received by the Dominion Cost of Living Commissioner. In smaller centres throughout Canada, however, there is a grave shortage of hard coal. This statement of the fuel situation is based upon the reports of 2,500 coal dealers in various parts of the Dominion. The Cost of Living Commissioner's office is now simply investigating organization which discloses conditions, and should action be required reports to the Fuel or Food Controller.

New Japanese Industry.—When the present war broke out and checked the supply of potassium chloride to the United States, Japan prohibited the sale of the chemical to foreigners, at the

Aikenhead's A. K.

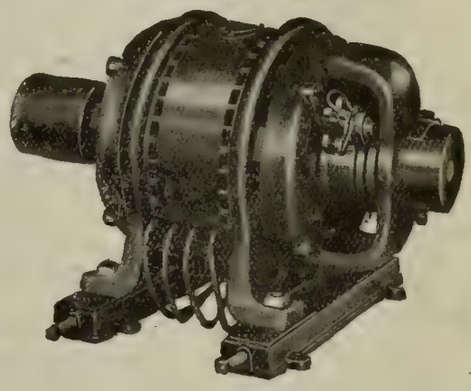
MOTOR AND CONTROLLER



The A.K. Motors are built for high efficiency and long durability.

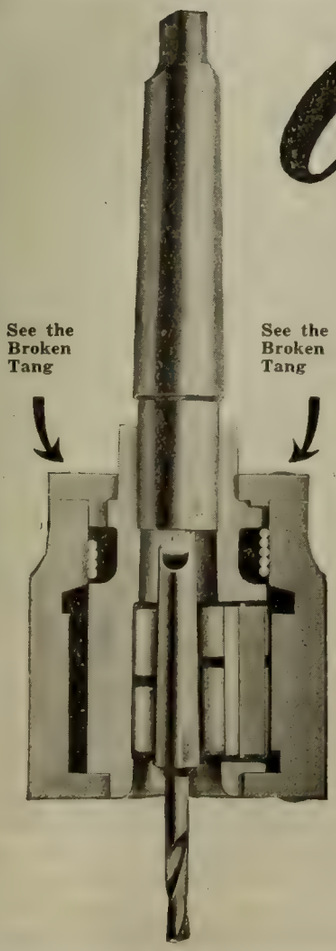
Single Phase, Variable Speed Type will run on 110 or 220 volts, 25 or 60 cycle.

These come in sizes from ¼ to 1¼ H.P. complete with 12-speed controller and 1½ to 6 H.P. with 49-speed controller.



Aikenhead Hardware Limited, 17, 19, 21 Temperance St., Toronto, Can.

Aikenhead's New Chuck



Don't Throw Away Broken Tang Drills

Perhaps you are about to discard some taper shank drills because the tangs are broken off—DON'T DO IT—they are worth their weight in gold. You can use them just as they are with a

Wahlstrom Automatic Chuck

One chuck holds drills from 1/16" to 1¼"

and you won't have to take time from your production to repair them.

Tool changes are made in two seconds—just grasp the shell of the chuck with one hand and put in or remove the tool with the other—no collets—no lost time, for the spindle never stops. The jaws grip, NOT BY THE TANG, BUT ON THE SIDE OF THE TAPER—there's no chance for slippage— Wahlstrom won't even mar the shanks.

AIKENHEAD HARDWARE LIMITED

17, 19, 21 Temperance Street - Toronto, Canada

same time encouraging its production. At that time there was only one factory in Japan, its production being 600 barrels a month. Since that time, Japan has so increased her capacity for producing this chemical that she is selling large quantities to American match companies. The material originally sold at $20 per barrel, which is a normal price. A Kobe firm recently made a contract for 2,500 barrels, and later another contract for 6,000 barrels. The last quotation was $42.50 per barrel, an increase of almost 50 per cent. in the past seven months.

Emery Mines Closed.—One of the effects of the war has been to close the great emery mines of Asia Minor to the Entente Allies, and as emery is an absolute necessity in the manufacture of ammunition, Greece has become one of the chief sources of supply in fine emery, produced on the Island of Naxos. The American ammunition makers took most of it in 1915 when they were rushing their orders to the Allies, American firms taking 9,000 tons of this Greek emery. But the product was considered so essential to the war that the French Government took over the mines last year, and are operating them so that all the Allies obtain a share of this essential of shell-making. Last year the share going to the French ammunition makers reached 17,500 tons, while the amount sent to the United States fell to 1,600 tons.

Dominion Finances Satisfied. — The financial statement of the Dominion for the first half of the fiscal year, which ended on September 30th, is regarded by the Minister of Finance as most satisfactory. Receipts from all sources show an increase of $24,000,000 over the corresponding period of last year. Payments on capital and ordinary account, including the increased interest and pension charges, are $1,800,000 less than for the first six months of last year. The net result, apart from war expenditures, shows an improvement in the financial position of $25,000,000, as against the first half of the year 1916-17. During the six months in question, the surplus of revenue over capital and ordinary expenditure amounted to $65,000,000, which was applied in payment of the principal of war expenditure in Canada.

Charter Rate Fixed for Ocean Tonnage.—A Washington, D.C., despatch states that a charter rate of $5.75 a ton a month has been decided on by the Shipping Board as a base the U. S. Government will pay for requisitioned ocean-going merchant vessels. Within a short time the board will take over for Government use every American vessel available for overseas service. This amount compares with a present tonnage of 3,500,000, of which 700,000 tons represent German and Austrian ships under operation by the United States. The American ships available for overseas service number 548, with a tonnage of 2,871,000. There are 117 German and Austrian ships with a tonnage of 700,000. The Emergency Fleet Corporation has commandeered in American shipyards nearly 400 steel ships of more than 2,500,000 tons, and has contracted for 636 ships with a tonnage of 3,124,700.

Lake Boats for Atlantic.—In order to meet the great demand for steamers to handle the traffic between Canada, the United States and British and European ports, the Department of Marine and Fisheries, Ottawa, is collaborating with the United States Shipping Board in transferring boats formerly plying on the Great Lakes to the overseas routes. A representative of the U. S. Shipping Board was in conference with officials of the department recently, when arrangements were made for the transfer of a number of U. S. steamers now on the Great Lakes to the Atlantic service. These vessels, when too large to pass through the canals, will be cut in two. Some will be docked at the Canadian Vickers plant at Montreal, and others at the Marine Department shipyard at Sorel, where they will be put together again for the trip around to an Atlantic port. The Marine Department has for a considerable time been making arrangements whereby a number of boats on the Great Lakes will be put on the Atlantic routes before the close of lake navigation.

MARINE

Montreal, Que. — It is reported here that the United States Government will take over a big ship repair equipment plant at Buffalo and remove it to Montreal to rejoin lake vessels which are brought in sections through the Welland Canal.

Crew of Meaford Get $500.—Geo. E. Fair, managing director of the Farrar Transportation Co., Toronto, has received a cheque for $500 from the Department of Naval Service, Ottawa, for distribution among the crew of the SS. Meaford for sinking a German submarine in the Mediterranean on June 12th of this year.

Victoria, B.C.—For the housing and assembling of marine engine parts, a contract has been let to Grant, Smith & Co. and McDonnell, Ltd., for the construction on Pier 2 of the new ocean docks, at Ogden Point, of a shed which will use up 2,000,000 feet of lumber in building. The structure will be 703 feet in length by 200 feet in width. Henry A. Bayfield, former superintendent of Dominion dredges, has been appointed by the local representatives of the Imperial Munitions Board to take full charge of the plant.

Halifax, N.S.—Foley Bros., Welch, Stewart & Fauquier, contractors for the Halifax Ocean Terminals, have commenced the undertaking of refloating the wrecked Canadian hospital ship Letitia. The big Donaldson liner lies with her bow well upon a ledge of rock ten miles from the centre of Halifax harbor. Nearly half of her length overhangs in deep water, and from the time of her wreck it has been feared that the hull would not stand the immense strain and that her complete submersion was a matter of a short time. The powerfully-built hull is, however, still practically intact.

To Assist Shipbuilding.—The visit of Lord Reading and Lord Northcliffe to Ottawa this week will bring to the front the financial situation. Ways and means will be discussed of utilizing to the full Canadian resources, and possibilities here with respect to an accelerated shipbuilding programme will be reviewed. Recognizing that shipbuilding is a war purpose, the United States is permitting the exportation of steel plates to this end. The committee appointed to investigate steel conditions in Canada, in view of the establishment of a licensing system in the United States, is expected to report shortly.

TENDERS

Montreal, Que.—Tenders for purchase of tug "Montmorency" will be received at this office until Friday, October 12, 1917. This tug is constructed of wood, has a length over all of 68 feet, a beam of 11 ft. 5 in., and draft of 6 ft. It is equipped with a triple expansion engine and a Robert type pipe boiler. Further particulars and information as to the locality where it can be examined can be had from J. L. Dansereau, district engineer, Shaughnessy Building, Montreal, P.Q.

CATALOGUES

The Vanadium Alloys Steel Co., Pittsburgh, Pa., has mailed to the trade the latest stock list of "Red Cut Superior" high-speed steel in warehouses at Pittsburgh, Pa., and Latrolie, Pa.

Cheap Steam.—The May issue of the organ "Cheap Steam" has been mailed by Ed. Bennis & Co., Little Hulton, Bolton, England. This publication contains a short descriptive article covering power plants where Bennis stokers are installed and other matter of interest to steam users.

Knudsen Packless Joints.—Bulletin issued by the Universal Valve Co., Burlington, Vt., describing the Knudsen packless swivel joint for iron pipe in steam, gas air or ammonia lines. The advantages claimed for this joint and details of its construction are dealt with fully, while a number of views are included showing applications under various conditions.

Pulleystone for Belts.—Bulletin distributed by the National Chemical Works, South Acton, London, England, deals with the material "Pulleystone" for coating main driving pulleys and for other purposes where belt dressing is used. The main advantages claimed for this material are given in detail. Reference is also made to a material named "Permanite" for making joints and repairing cracks in metal articles.

A Chain of Evidence is the title of publication No. 15 ,issued by the Morse Chain Co., Ithaca, N.Y., to feature small power drives, which include drives of less than 100 h.p. The design and principal advantages of the Morse chain are dealt with fully, and a number of illustrations

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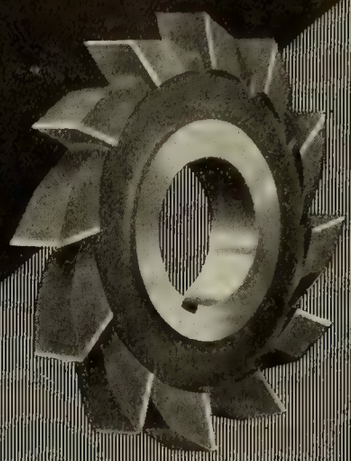

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"HAWK'D CHROME VANADIUM STEEL

Will Give You Exceptional

Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

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Owen Sound, Ont.

Engineers Boiler-makers Founders Machinists

Tank Work Smoke Stacks, Grey Iron and Brass Castings, Special Machinery Made to Order

show different types of drive featuring the wide range of application and accompanied by particulars of each. An information blank for ordering Morse chains and a page of data to be used in the design of these drives are also included. Copies of this publication may be obtained from the Canadian agents, Jones & Glassco., Montreal and Toronto.

BOOK REVIEW

Concrete Ships is the title of a 26-page booklet, containing a number of extracts from technical journals in various countries collected by the committee on the Merchant Marine and Fisheries, for the United States Government. Those extracts deal with the use of concrete in the construction of merchant and other types of vessel. Some of the articles discuss the subject in detail and contain much useful and interesting data covering vessels built of reinforced concrete under various conditions. Copies may be obtained from the Government printing office, Washington, D.C.

"Pictures of Figures."—A remarkably interesting pamphlet has just been published by the LaSalle Extension University, of Chicago, on "Graphic Charts for the Business Man." It is the work of Stephen Gilman, C.P.A., vice-president of the Tanner-Gilman Co., public accountants. "The entire subject is only in its infancy," says Mr. Gilman, "and it may reasonably be expected that the art will be developed very extensively within the next decade. Unquestionably the enthusiasm of business men and accountants for these 'pictures of figures' is becoming greater every day." Besides a clear account of the whole process of graph making, this booklet contains 56 examples of graphs, from the simplest forms to highly elaborate charts. They include records of manufacturing costs, production, business organization, flow of materials, salaries of employees, net profits, relation of stock market to business activity, salesmen's productivity, sales, responses to advertisements, geographical distribution of customers, collections, relation of assets to liabilities, shipments, cash balances, time studies, idle time, traffic, bank deposits, complaints, telephone service, and many other things. These charts are so selected as to illustrate all the principal varieties of graphs in use at the present time. The pamphlet has been prepared for use in the Business Administration Course of the LaSalle Extension University.

U.S. GOVERNMENT FIXING STEEL PRICES

THE War Industries Board, Washington is prepared to extend Government control to the entire steel trade. The fixing of prices for plates, shapes, bars and pig iron was but the beginning, and before the board finishes there will be 150 articles of steel manufactured under fixed prices. This will be done even if Congress fails to pass the Pomerene bill providing for Government control of iron and steel products.

Should that bill become a law, the Government will have specific authority to name the maximum price for every article in the iron and steel trade, but if it does not pass, the same tactics will be adopted as were used in dealing with the four articles named. The Government will enter into an agreement with the manufacturers under which they will bind themselves to cahrge stipulated prices for all the 150 articles. These prices will apply not only to the United States Government, but to the Allies and the general public.

EFFECT OF MOUTHPIECES ON FLOW OF WATER

AN investigation has been completed by the Engineering Experiment Station, University of Illinois, under the direction of Fred B. Seely, Associate in Theoretical and Applied Mechanics, to determine the effect of mouthpieces upon the flow of water through a submerged short pipe. A knowledge of the extent of the loss of head due to contraction or expansion of a stream is of considerable importance in a variety of hydraulic problems. For example, it may be possible, through attention to the shape and angle of connections and intakes to increase the flow through the suction and discharge pipes of low head pumps, through large valves, through locomotive water columns, through the sluiceways of dams, through culverts and short tunnels, etc.

It is to be noted that losses of head due to contraction or expansion of a stream, which may in themselves be of relatively little consequence, may have a considerable influence upon subsequent losses because of the turbulent motion started by the contraction or expansion. A slight change in the conditions under which flow takes place may cause a large difference in the action or behavior of the water.

The experiments conducted by Mr. Seely involved the use of a cast iron pipe 22½ inches long and 6 inches in diameter, bored to a smooth surface. Cast iron conical mouthpieces of different lengths and angles were used. The laboratory tank employed was divided into two compartments by a vertical partition in which the short pipe was set in horizontal position.

The results of the investigation are set forth in detail in Bulletin 96 of the Engineering Experiment Station, copies of which may be obtained gratis

"Oh, dear, oh, dear-" moaned wifey, in tears. "I wish I'd taken poor mother's advice and never married you!" Hubby, the strong, silent man, swung aro on her quickly, and at last found voice. "Did your mother try to stop you marrying me?" he demanded. Wifey nodded violently. A look of deep remorse crossed hubby's face. "Great Scott," he cried, in broken tones, "how I have wronged that woman!"

U. S. COAL OUTPUT INCREASES

ACCORDING to the United States Geological Survey all the principal coal-producing States show increases in output for 1916. The most notable increase was in Ohio, whose production of coal was 12,293,528 tons, or nearly 55 per cent. greater than in 1915. The increase in the value of the Ohio product was nearly $22,000,000, or about 91 per cent. The largest increase in quantity was in Pennsylvania—12,340,287 tons, or 7.8 per cent., compared with 1915. The increase in West Virginia was 9,276,058 tons, or 12 per cent.; in Illinois, 7,465,760 tons, or 12.5 per cent., and in Indiana, 3,087,376 tons, or 18 per cent. Iowa, New Mexico, Oklahoma, South Dakota and Texas recorded slight decreases in 1916 compared with 1915. The output of bituminous coal in 1916 established a new record in the United States as a whole, and also in most of the individual States.

U.S. EXPORT RESTRICTIONS

THE United States Government has placed export restrictions on a large number of products except when for war or directly contributory purposes. Industries in Canada not engaged in work which might be stated to be for war purposes or directly contributory thereto may suffer great hardships through the shutting off of supplies of necessary raw materials from the States. It is understood that materials required in the manufacture of agricultural implements for railway equipment and for shipbuilding will be licensed for export to Canada. The following materials are included in the list of export restrictions:

- Acetone
- Alcohol
- Aluminum
- Ammonnia salts
- Ammonia nitrate
- Anhydrous ammonia
- Arsenate of lead
- Arsenate of soda
- Boiler tube (iron and steel)
- Carbolic acid (phenol)
- Castor oil and castor beans
- Chrome nickle steel
- Cyanide of sodium
- Ferro-manganese
- Ferro-silicon
- Ferro-vanadium
- Iron and steel plates, including ship, boiler, tank and other iron and steel plates ⅛ of an inch thick, and heavier and wider than 6 inches, whether plain or fabricated.
- Mercury salts
- Nitrate of soda
- Nitric acid
- Nitric salts
- Phosphoric acid
- Phosphorus
- Pig iron
- Potash and chlorate of potash
- Potassium salts
- Saltpeter
- Scrap iron
- Scrap steel
- Searchlights and generators (suited for Army and Navy use)
- Soldium sulphite
- Spiegeleisen
- Stearin and stearic acid
- Steel billets
- Steel blooms
- Steel ingots
- Steel sheet bars
- Steel slabs
- Sugar
- Sulphate of ammonia
- Sulphur and sulphuric acid
- Superphosphate
- Tin plate
- Toluol
- Tungsten
- Wireless apparatus

CANADA MAY GET SOME U.S. EXPORTS

THE Department of Trade and Commerce, Ottawa, has received further information from Washington respecting the licensing of certain exports, "whose conservation is necessary on account of the limited supply and the needs of the United States in its successful prosecution of the war." Among the exports licensed are iron and steel products necessary to Canadian war and commercial

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In all countries. Ask for our Investor's Adviser, which will be sent free.
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A want ad. in this paper will bring replies from all parts of Canada.

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PORTABLE PLANERS
DRAW CUT SHAPERS
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FINISHED MACHINE KEYS
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BLACK DIAMOND OVENS
OVENS
Enameling and Varnishing Ovens heated by Gas, Electricity, Steam or Coal.
Write for Booklet.
Brantford Oven & Rack Co., Ltd.
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MACHINE TOOLS for IRON WORKERS
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We are manufacturers of stamped parts for other manufacturers.
We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.
We can finish steel stamping in Nickel, Brass or Copper.
Send us a sample order.

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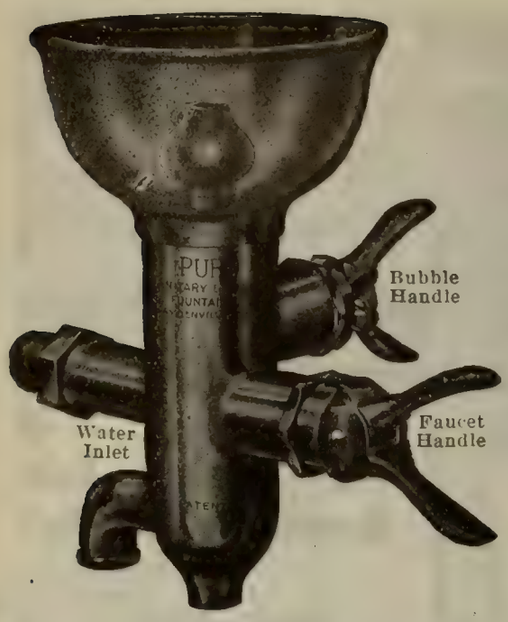

Saving or Wasting?

The manner in which you handle the drinking water problem in your plant may seem to be a small matter to you —but investigate. The results will be surprising.

The old-time faucet is costly. Running hour after hour, day after day, its ceaseless flow is costing you money, yet without any better service.

Puro Saves 35%

A Puro Sanitary Drinking Fountain will cut that water bill 35%. We can prove that it has done that for others.

It will give every employee a safe, saner draught of bubbling water free from the contamination of the common drinking cup.

In a word, it is the only sanitary Drinking Fountain that is really safe, sanitary, simple, automatic in control, and easy to attach.

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YOUR WATER SUPPLY

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"Barnes-made" SPRINGS

are the result of over sixty years' experience in spring making, combined with unsurpassed equipment and the workmanship of men who have been with us, ten, twenty and in some cases thirty years.

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Established 1857
THE WALLACE BARNES COMPANY
218 South St., Bristol, Ct., U.S.A.
Manf'rs of "Barnes-made" Products
Springs, Screw Machine Products, Cold Rolled Steel and Wire

industries. While the Exports Administrative Board of the United States has practically prohibited the export of these articles, export licenses may be granted:

(a) When destined for actual war purposes or when they will directly contribute thereto.

(b) In certain unusual cases when such exports will contribute directly to the immediate production of important commodities required by the United States.

(c) And also in certain other cases where the articles may be exported in limited quantities without detriment to the United States.

(d) Further licenses may also be granted for limited quantities of these conserved articles when required for purely mericine or pharmaceutical purposes.

A committee of leading iron and steel men, working in connection with the Department of Trade and Commerce, has been appointed to secure information on the effect in Canada of the United States regulations. The difficulty arises chiefly in connection with industries not actually war industries, although related thereto.

Iron and steel "destined for actual war purposes" can be secured, but concerns not engaged in the manufacture of war supplies will be unable to secure the articles listed, unless the regulations are relaxed.

TRADE ENQUIRIES

THE following enquiries have been received at Ottawa by the Department of Trade and Commerce from which further particulars made be obtained.

1309. **Machinery.** — An important official body in Omsk, Siberia, is anxious to receive particulars as soon as possible with regard to the ability of Canadian manufacturers to supply machinery and appliances for the working of wool, skins, hides, grease, bone, horns, hoof, blood and other bye-products of the animal-raising industry of the Siberian steppes. Further information may be had on application. (File No. 16412.)

1310. **Electrodes.** — An important firm in Genoa has an urgent inquiry for 10 tons of either carbon or graphite electrodes, 100 mm. or 120 mm. in diameter, the length to be from 1,600 to 1,800 metres. Quotations by cable with statement of definite delivery are asked for.

1317. **Hardware.**—A Port Elizabeth firm of wholesale importers requests catalogues and discounts and prices of household and builders' hardware.

1320. **Agricultural Implements.**—A Queenstown firm of wholesale jobbers request catalogues and price-lists quoting f.o.b. Canadian ports, and full details regarding packing, on agricultural implements, tools, ploughs and other farm utensils.

1323. **Wire.**—A Queenstown firm of wholesale jobbers ask for quotations and full particulars re delivery on plain and barbed wire.

Tool Room Surface Grinder

Easily Adjusted, Strong, Accurate, Fast.

Has rigid grinding surface and large tray and water pot combined. It's an unbeatable tool room surface grinder. Tell us your machinery wants—experts on special designs. Satisfaction assured.

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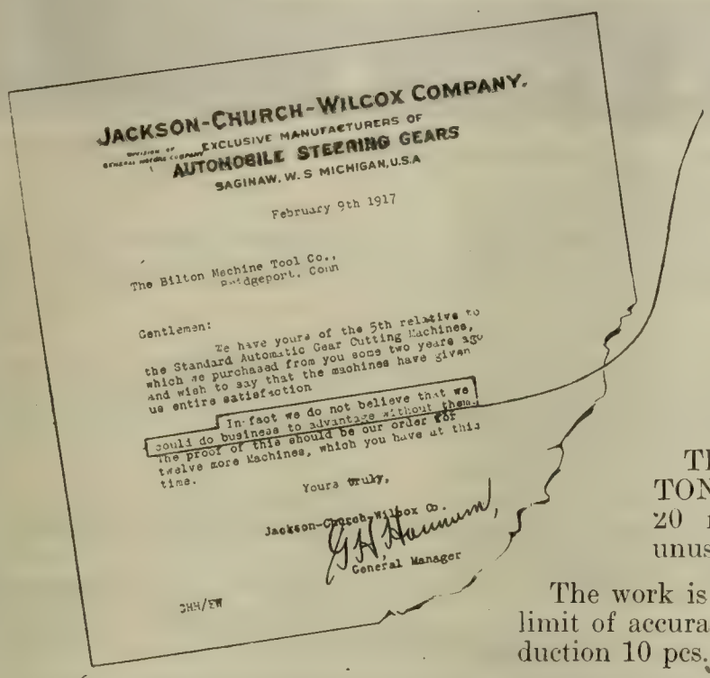

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EXCLUSIVE MANUFACTURERS OF
AUTOMOBILE STEERING GEARS
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February 9th 1917

The Bilton Machine Tool Co.,
Bridgeport, Conn

Gentlemen:

We have yours of the 5th relative to the Standard Automatic Gear Cutting Machines, which we purchased from you some two years ago and wish to say that the machines have given us entire satisfaction

In fact we do not believe that we could do business to advantage without them. The proof of this should be our order for twelve more machines, which you have at this time.

Yours truly,

Jackson-Church-Wilcox Co.

G. H. Hammond,
General Manager

CHH/EW

"We could not do business to advantage without them."

PROOF:

"An order for twelve more machines."

Jackson-Church-Wilcox Co.

SAGINAW, MICH., U.S.A.

The best known concern making Automobile Steering Gears.

The above letter written in appreciation of "BILTON" Gear Millers is a worthy tribute. A battery of 20 machines now in operation, every one giving unusual satisfaction and saving money for this concern.

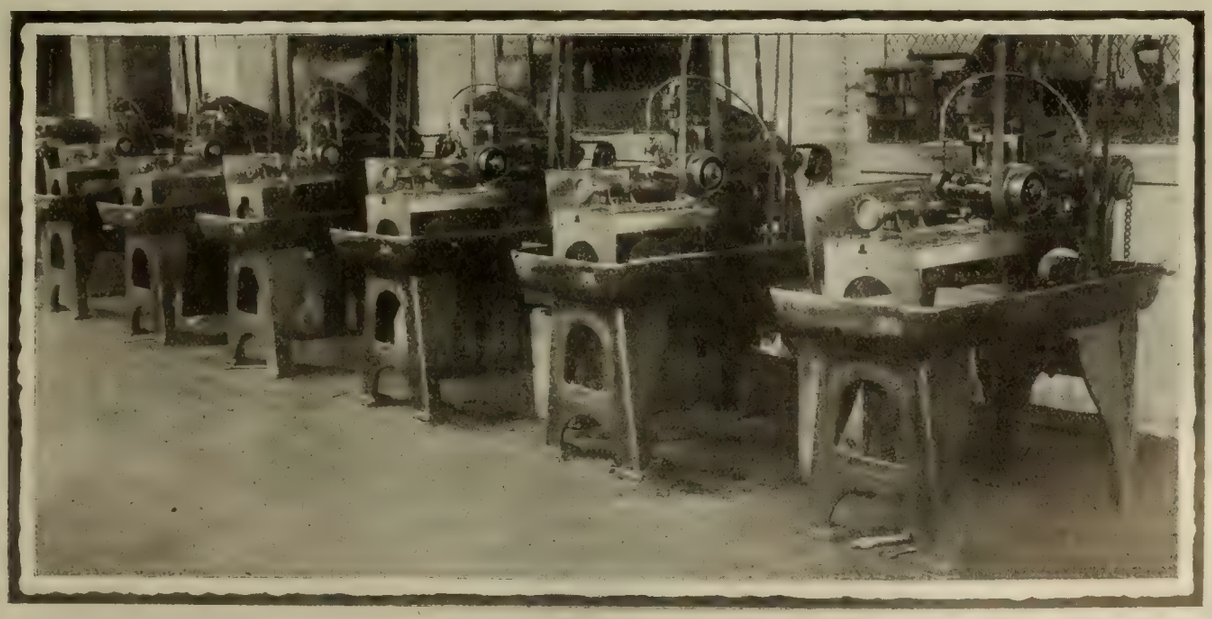
The work is milling flutes in Yoke Shaft 30-40 Carbon Steel, limit of accuracy +.001 and —.001. 36 flutes, 1½" long. Production 10 pcs. per hour.

Considering the kind of material, the number of slots and length, the output is exceptionally large.

Such a remarkable showing is common to "BILTON" Gear Millers. We can tell you of many other interesting jobs done on these machines.

Think of some milling problems, or gear cutting problems you have, and send them to us for solution.

Ask for Catalogue 30.



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SECOND-HAND 26" NEWTON TYPE COLD saw cutting-off machine, arranged for motor belt drive and complete, with or without motor. Price $600.00, cars Sherbrooke. MacKinnon, Holmes & Co., Limited, Sherbrooke, Quebec. c10m

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HYDRAULIC EQUIPMENT FOR SALE—THE equipment listed below is in first-class shape having only been used about three months. Blue prints and specifications and foundations drawings will be furnished. 2—14 x 12 x 5" Fairbanks-Morse duplex steam driven high pressure pumps at 80 gals. per minute capacity each against 600 lbs. pressure, steam pressure 150 lbs. 1—Weighted Accumulator good for 1000 lbs. per sq. inch, 16" diameter, plunger 11 ft. stroke with squeezing water cushion and wooden outside bumper blocks. The tank for the weighing material surrounding the cylinder is 10' 7" in diameter and 11' 0" high. 1—Return Suction Tank for above pumps and accumulator. Height, 9' 0", diameter 8' 0". Capacity, 2700 Imperial gallons. This equipment can be shipped immediately and is open for inspection at the company's plant. Prices on application. The Canadian Copper Company, Copper Cliff, Ont. c8m

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THE BRANTFORD PATTERN WORKS ARE fully equipped to manufacture patterns, large or small, from blue prints, sketches or sample castings. Expert management. Prompt service. Prices reasonable. Brantford Pattern Works, 49 George St., Brantford, Ont. c13m

SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto

SITUATIONS WANTED

TOOL MAKER — ACCURATE, GOOD draughtsman desires responsible position. Box 330, Canadian Machinery. c14m

GRADUATE MALE NURSE, AGE 32. HAVE established hospitals for three large manufacturing concerns. Familiar with social service, accident prevention and modern methods of employing. At present employed. Less than $2,400 not considered. Box 336, Canadian Machinery. c15m

MACHINE SHOP FOREMAN DESIRES change as shop foreman or master mechanic. Acquainted with scientific management; 26 years' experience. Box 328 Canadian Machinery. c11m

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States wants position as superintendent or general foreman. Large or small shop on ammunition or machinery; A1 references. Address Box 327, Canadian Machinery. c9m

WORKS MANAGER OR GENERAL SUPERintendent open for engagement—28 years' experience as machinist, toolmaker, inspector, superintendent of tool-making and tool-designing, experimental and development work, heat-treating and testing of steel in raw and finished state; shop superintendent, works manager. Experience has been on rifle work, electrical work, typesetting machines, lock-making and bridge-work. Correspondence solicited, and can furnish good references. Address Box 332, Canadian Machinery. c14m

WANTED

WANTED—SMALL SECOND-HAND POWER press, in good condition. Hosmer Stamping & Die Works, Ltd., 831 Dundas St., Toronto, Ont. c13m

WANTED—SECOND-HAND POWER SQUARing shear to cut No. 10 gauge steel up to 24" wide. Must be in good working condition. Packard Electric Company, St. Catharines, Ont. c4m

SITUATIONS VACANT

MAN WANTED TO ACT AS SUPERINTENDent of a fast growing die and stamping plant in City of Toronto. Box 329, Canadian Machinery. c12m

WANTED — FOREMAN BLACKSMITH FOR Montreal shop on general work. Six forges and 1,500-lb. steam hammer. Must be a hustler. Apply, in confidence, stating experience and wages expected, to Box 335, Canadian Machinery. c15m

WANTED — MECHANICAL DRAUGHTSMAN for engine, compressor, and general work. State experience and salary expected. Apply The Jenckes Machine Company, Limited, Sherbrooke, Que. c16m

FOR SALE

4—No. 2 Foster Plain Head Screw Machines and 2—No. 3 Foster Friction Head Screw Machines all completely equipped with air cylinders and air chucks suitable for use on No. 80 Time Fuse Bodies. These machines have never been used. Also one Graduating Machine made by the American Ammunition Co.

For full particulars apply the

Holden Morgan Thread Miller Limited

Toronto, Ontario

c14m

FOR SALE

4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 13 B. & S. Automatic Gear Cutter.

1—30" Newark Automatic Gear Cutter.

1—5 x 48 Pratt & Whitney Plain Grinder.

1—No. 2 Bath Universal Grinder.

1—12 x 60 Modern Plain Grinder, new.

2—Lees-Bradner Thread Millers.

1—30 x 30 x 8' Powell Planer, new.

Brownell Machinery Co.
Providence, R. I.

SHIPBUILDING EQUIPMENT

STEEL BUILDING (almost new) 120 x 300 ft. in two Bays with Two 10-ton WHITING ELECTRIC TRAVELLING CRANES 47 ft. span running full length of each Bay, for 3/60/550 volt service.

PLATE ROLLS

1 set NILES for 14′ 6″ plates, drop housing, belt driven.
1 set SCULLY for 12′ 0″ plates, drop housing, belt driven. Brand new.

STEAM HAMMERS

3,000-lb. MORGAN double frame, fine condition.
1,500-lb. BELL single frame, brand new.

PLANERS

62 x 62 x 20 CANADA TOOL WORKS, with 2 heads.
52 x 52 x 16 McKECHNIE BERTRAM, one head.
36 x 36 x 11 INDUSTRIAL, one head.

SHAPERS AND SLOTTERS

New 28″ GOULD EBERHARDT "Invincible."
New 24″ GOULD EBERHARDT High-duty
24″ NILES back geared crank.
24″ SELLERS slotter.
14″ INDUSTRIAL slotter.

HEAVY LATHES

26—48 x 20 McCABE double spindle.
60″ x 26 PUTNAM Triple geared.
36 x 20 NILES geared head, motor driven.
30 x 13 NILES geared head, motor driven.
25 x 10 LeBLOND heavy duty, d.b.g.
28—20 x 10 CONRADSON geared head.
27 x 16 BERTRAM heavy duty, d.b.g.

PUNCHES AND SHEARS

C.M.C. double end 18″ throat 1″ hole.
C.M.C. double end 26″ throat 1″ hole.
ROCKRIVER single 48″ throat, 1¼″ hole.
ROCKRIVER single 36″ throat, 1¼″ hole.
BERTRAM single 24″ throat 1″ hole.
BERTRAM single 18″ throat 1″ hole.
This is just a selection from our large stock —write us.

The A. R. Williams Machinery Co., Limited

64 FRONT STREET WEST TORONTO, ONTARIO

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15″ three-jawed chuck.
1—Lathe, 28″ swing, 8′ bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22″ Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15″ three-jawed chuck.
1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 24″ wheel.
1—Lathe, 14″ swing, 6′ bed.
2—Ford Smith Shell Grinders, complete.
1—17″ LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
1—16″ Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
1—Double End Painting Machine, with ¼ h.p. motor.
1—Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—6 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
Sherbrooke, Que.

FOR SALE

One 22″ x 50″ Wheelock Engine, left-hand, arranged for direct shaft coupling, with heavy balance wheel 8¼″ x 14″ x 17′—7″ in dia.

Merchants Rubber Factory
KITCHENER, ONTARIO
c20m

FOR SALE

New Holden-Morgan Thread Miller for nose of 6 inch British H.E. Shell.

Box 334 Canadian Machinery
c15m

Single End Punch

1—30″ Throat Ironton Single End Punch and Shear, cap. ¾ through ¾. Rectangular gear drive.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Ave., Detroit, Mich.

PETRIE'S LIST of New and Used Machine Tools

In Stock for Immediate Delivery

TURRET LATHES AND SCREW MACHINES

16″ x 5½′ MacGregor, D.B.G. (3)
16″ x 6′ Pratt & Whitney.
18″ x 6′ Prentice, high speed.
20″ x 7′ Fay & Scott.
22″ x 8′ Pratt & Whitney.
24″ x 10′ Conradson, D.B.G.
24″ x 8′ Lodge & Shipley.
26″ x 8′ Fay & Scott, B.G.
2″ x 24″ Stevens Screw Machines (2).
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

13″ x 6′ Filsmith, D.B.G., comp. rest.
14″ x 6′ Mulliner, B.G., comp. rest (2).
15″ x 6′ Sebastian, B.G., comp. rest (3).
16″ x 8′ McDougall, B.G., comp. rest (2).
16″ x 8′ Porter, B.G., comp. rest.
18″ x 8′ C.M.C., D.B.G., comp. rest.
20″ x 8′ New Haven, B.G., plain rest.
21″ x 8′ Bawden, heavy duty (3).
24″ x 11′ Pond, B.G., comp. rest.
25″ x 16′ Niles, B.G., turret tool post.
30″ x 10′ Ames, B.G., plain rest.

DRILLS

14″ Excelsior, sliding head, lever feed (6).
16″ Barr, sliding head, lever feed.
20″ Silver, back geared, power feed (3).
20″ Barnes, 3-spindle, lever feed.
22″ Barnes, back geared, power feed.
24″ Kerkoff, back geared, power feed.
26″ Prentice, back geared, power feed.
40″ Bickford, back geared.
46″ Allfree, back geared, power feed.
No. 10a Baush, 16-spindle.
D-1 Colburn, back geared, heavy duty.

GRINDERS

No. 1 La Salle, plain and surface.
No. 1 Cincinnati, universal (2).
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer.
24″ Barnes, wet tool.
26″ Gardner, disk.

IRON PLANERS

20″ x 20″ x 5′ Bertram.
24″ x 24″ x 6½′ Bertram.
25″ x 25″ x 12′ Lodge & Davis.
36″ x 36″ x 10′ Sellers, 4 heads.
40″ x 40″ x 12′ New Haven, power feed.

MILLING MACHINES

Bertram, plain.
Brown & Sharpe, power feed, plain.
Monarch, vertical.
Van Norman, bench.
No. 2 Ford-Smith, plain.
No. 4 Fox, universal.

SHAPERS

16″ Petrie, back geared.
16″ Canada Mach. Corp., back geared.
16″ Queen City, back geared.
24″ Gould & Eberhardt, back geared.
24″ Bertram, back geared.
30″ Morton, back geared, draw cut.

MISCELLANEOUS

6″ and 12″ Racine Hack Saws.
4″ and 6′ Robertson Hack Saws.
4½″ Martin cutting-off machine.
12″ Hall Pipe Machine.
4″ Oster Hand Power Pipe Machine.
No. 2 Mitts & Merril Keyseater.
No. 2 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 4 GA. Brown & Boggs punching press.
No. 200 Brown & Boggs Inclinable Power.
No. 2 Bliss Foot-power Press.
No. 3 West Tire Setter Banding Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
7′ Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.

FRONT STREET WEST, TORONTO

FOR SALE

The following used machinery, guaranteed to be in first-class condition, at lowest prices:—

2—LeBlond Heavy Duty 19" x 8' Engine Lathes.
1—Fay Scott Engine Lathe, 24" x 8', with extra turret.
1—LeBlond Engine Lathe, 17" x 6'.
1—14" x 7' Niles Engine Lathe.
1—16" x 8' Butler Engine Lathe.
1—Boring Lathe for 9.2 or 12" shells.
1—Turning Lathe for 9.2 or 12" shells.
2—No. 50 Foster Turret Lathes, 16" swing.
4—John Hall & Sons No. 4 Cutting-off Machines.
1—Wilmarth & Morman Wet Tool and Twist Drill Grinder.
1—Banfield Plug Milling Machine.
2—Otis-Fensom Bench Thread Millers.
1—Cincinnati Universal Milling Machine, No. 3 cone drive.
1—Surface Grinder.
1—Gardner Grinder, No. 4, complete with discs.
1—Gould Triplex Hydraulic Pump, Fig. 997, single acting, 1¼" x 6".
1—Holden-Morgan Marking Machine.
2—Northern Electric Co.'s Electric Soldering Irons.
1—1/15 H.P. General Electric Motor.
1—Brown-Boggs Nosing Press, No. 320.
1—Hisey Wolff Grinder, Portable Electric.
1—Dumore Grinder, Portable Electric.
8—Mech. Engr. Co. Fuel Oil Burners.
4—Mech. Engr. Co. Fuel Oil Burning Furnaces, 24" x 36".
1—Gilbert & Barker Fuel Oil Burning Furnace, 24" x 36", C-15.
6—Gilbert & Barker Fuel Oil Burners, 2".
2—Gilbert & Barker Positive Pressure Blowers, 3".
2—Canadian Buffalo Forge Co. Blowers, No. 6, 30".
1—Portable Blacksmith's Forge.
1—Circular Banding Press, suitable for 18-pdr. shells.
4—Shore Instrument Co.'s Scleroscopes.
3—Resin Pots, Simplex Electric Co.'s make.
3—Chapman Double Ball-bearing Trucks.
2—Oil Quenching Tanks, 8' long x 3' 4" wide x 2' 6" deep water jackets.
1—Bury Air Compressor, 6 x 8.
2—Brown Instrument Co.'s Pyrometers.
1—Thwing Pyrometer.
3—Fairbanks 25-lb. Scales.
1—International Time Clock for 200 men, with racks for tickets.
1—Voltmeter, Western Electric Instrument Co.'s make 0-300, model 156.

Private sale of small tools, rotary pumps, vises, pulleys, belting and shafting, etc., etc., to be held on Oct. 6th, at Midland, Ont.

For Further Information Apply to

Zenith Coal & Steel Products, Limited

MONTREAL—402 McGill Building
TORONTO—1410 Royal Bank Bldg.

c16m

Subscriptions Invited From Friends Abroad

Canadian Machinery and Manufacturing News is published weekly. Representing, as it does, the industrial life and activities of Canada, it should prove of very considerable value to those who wish to buy Canadian products, and to those who may wish to sell in Canada.

As a technical journal it compares very favorably, we think, with any other high class publication, and will be found to be well worth the subscription price, and more.

If you are favorably impressed with this number, we think you will find other issues equally interesting. Canadian Machinery contains from one hundred and twelve to one hundred and seventy-eight pages—fifty-two issues in the year. We invite subscriptions from our friends abroad, and attach a coupon for the sake of convenience.

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To the Publishers,
CANADIAN MACHINERY,
143 University Ave.,
Toronto, Canada.

Gentlemen,—

You may enter our subscription to CANADIAN MACHINERY for one year, and until ordered discontinued, to be sent to address below. We enclose money order covering same.

Yours truly,

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Full address .....

City ..... County .....

The subscription price to Great Britain and her colonies is 12s. 6d. United States, $3.50, other countries 16/- per year.

Eastern Machinery & Equipment Co., Inc.

319 COMMERCIAL TRUST BUILDING PHILADELPHIA, PA.

NEW TOOLS FOR IMMEDIATE DELIVERY.

4—12" x 36" Bridgeport Grinders.
1—2½ x 2" Wm. Sellers Tool Grinder.
30—18" x 9' Turning and Boring Lathes.
3—26 x 14' Am. Patt. Eng. Lathe.
3—Double head Sullivan Grinders.
1—32" x 12' Pittsburgh Engine Lathe.
1—20" Ohio Shaper.

USED MACHINERY
ENGINE LATHES.

4—New 36" x 25' Wickes Engine Lathes, quick-change gear, double back gear.
8—30" x 10' American Gear head A-1.
5—20" x 8' Lodge & Shipley, geared head, q.c.g.
1—20" x 10' Bullard.
1—24" x 6' Bullard.
3—24" x 14' American.

TURRET LATHES.

9—18" x 6' Warner & Swasey Hexagon Turret, geared friction head.
36—Potter & Johnson 6A Automatic Turret Machines.
3—3 x 36 Jones & Lamson Flat Turret.
2—2¼" x 24" Jones & Lamson Flat Turret, bar equipment. Full set Turret Tools.
9—25" Gisholt 12" Collet chuck 6½" hole in spindle threading lathe.
3—26" Putnam heavy duty lathe.
—14" x 6' Lodge & Shipley Turret. Backgeared.
5—24" Gisholt 2-step cone, 6¼ H.S.

BORING MILLS.

1—Binsse Horizontal Boring Mill, 3" bar.
6—66" swing Bement-Miles Tire Turning Mills, two swivel heads—15½" under rail.
1—37" Baush Boring Mill, 2 heads, good as new.
1—Cylinder boring mill, capacity of 24" diam. to 96" diam. 10' long.
Tool equipment included, good as new.
1—42" Bullard Boring Mill (2) heads.

MILLING MACHINES.

1—No. 3 LeBlond Plain Miller, table 13½ x 58¼.
1—No. 2 Kempsmith, table 10' x 45".
1—24" x 8' Beaman & Smith Open Side Slab Miller, with two vertical spindles.
1—No. 1½ Universal Milling Machine.

GEAR CUTTERS.

1—24" Fellows Gear Shaper.
2—36" Fellows Gear Shapers.

SCREW CUTTING MACHINES.

1—2" Cleveland automatic.
1—No. 55 National Acme 4 spindle, good as new.
1—No. 54 National Acme 4 spindle, good as new.

SLOTTERS AND SHAPERS.

1—9" Bement Slotter.
1—12" Bement Slotter.
1—20" Wharton Slotter.
1—20" Gould & Eberhardt Shaper. B.G. Vise. C.S.
1—16" Steptoe Shaper.

GRINDERS.

8—12" x 36" Bridgeport.
1—1½" Full Universal Landis Machine.
1—No. 13 Brown & Sharpe Universal and Tool Grinder. Full equipment.
No. 1½ Universal Cutter and Reamer Grinder.
1—28" Bridgeport Face Grinder, with magnetic chuck.
5—Fisher Profile Grinders for Cutters.
1—No. 28 Brown & Sharpe Plain Grinder, 17" x 96".
5—No. 6 Std. Universal Tool & Cutter Grinders.

DRILL PRESSES.

1—24" Bickford Upright back gear sliding head lever and wheel feed drill.
1—4' Bickford Radial, with Tapping attachment, motor drive, with motor.

WANTED

Hendey Lathe, 14" swing 6 ft. bed, with taper and standard attachments.

No. 2 Cincinnati or B&S Universal Milling Machine.

Sensitive Drill, must be in good condition.

Box 333
CANADIAN MACHINERY

c14m

NOW!

You've been going to send in that ad for weeks, so why not mail it now for next week's issue?

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Ave. Toronto

GOOD USED EQUIPMENT

OVERHEAD TRAVELING CRANES

20-Ton, 56' 3" span, three motor, 110 volts, D.C.
25-Ton trolley, three motor, 220 volts, D.C.
10-Ton, 40' span, 80' lift, three motor.
10-Ton P. & H., 40' 10" span, three motor.
5-Ton, 47' 0" span, three motor, 220 v., D.C.
Crane Motors, 10 and 4½ H.P., 220 V., D.C.
10-Ton hand crane, 55' 0" span.
20-Ton hand crane, 29' 6" span.
2-Ton hand cranes, 22' span.

PUNCHES AND SHEARS

Lever Shear (double), cap. 2" sq.
28" throat (single), cap. ⅞x⅞" (belt).
48" throat (single), cap. 3x1¼" (steam).
16" throat (single), cap. 1½x1½ (belt).
36" throat (single), cap. ⅞x⅞" (belt).
15" throat (single), cap. ¾x½" (hand).
10" throat (double), cap. 1½x1" (belt).
Squaring Shear, 53" cap., 14 gauge.
Angle Shear (double), cap. 6x6x¾" (belt).
Plate Shear (Univ.), 18" blade, cap. ¾".
Rotary splitting, 36" throat, cap. ½".
Rotary bevel, 5" throat, cap. ½".
Guillotine, Perkins, No. 6, cap. 2½" sq.
Butterfly shear for light scrap.

MISCELLANEOUS.

Ajax Bolt Header and Upsetter, 2½" cap.
Acme Bolt Header and Upsetter, 1½" cap.
Bulldozer, No. 12 Ajax, 30" stroke.
Bending Roll, 6', drop end, 6½ and 8" rolls.
Lathe, 24"x10' American, latest.
Grinder, No. 10 B. & S. Plain.
Grinder, No. 13, B. & S. Universal and Tool.
Rotary Planer, 36", Cleveland No. 2.
Saw, cold, 26" blade, 48" travel.
Press (trimming) No. 11 Perkins, 16,500 lbs.
Rolling Mill, 1 stand, 2 high, 30" bet. housings.
First-class condition—quick shipments.

McCoy-Brandt Machinery Co.
Office and Warehouse:
216-218 Penn Ave., Pittsburgh, Pa.

RIVERSIDE Machinery List

We Own Every Tool Offered

ENGINE LATHES.

1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—22 x 14 Putman Standard Engine Lathe.
1—22 x 10 Reed Standard Engine Lathe.
1—22 x 8 Reed Standard Engine Lathe.
3—18 x 8 New Springfield Engine Lathes.
1—18 x 6 Jones & Lamson Standard Engine Lathe.
1—16 x 8 New Springfield Engine Lathe.
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.

TURRET AND SCREW MACHINES.

2—No. 6-A Potter & Johnston Automatic Lathes.
1—2¼ x 24 Jones & Lamson Flat Turret Lathe, S.G.H.
1—2 x 24 Jones & Lamson Flat Turret Lathe, cone head.
1—No. 4 F. G. H. Foster Hand Screw Machine.
1—No. 4 Smurr & Kamen Hand Screw Machine.
1—No. 5 Pierson F. G. H. Hand Screw Machine.
4—New 14" Pierce Turret Lathes.
2—New 1 x 8 Pierce Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND GRINDERS.

1—No. 2 Hendey Plain Milling Machine.
3—New No. 1½ American Plain Milling Machine.
1—No. 13½ Garvin Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drilling Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
4—New No. 0 Burke Bench Mills.
1—No. 2½ Bath Universal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.
1—Miami Valley Universal Cutter Grinder.

DRILL PRESSES.

1—5' Mueller Plain Radial Drill, old type.
1—20" Baker H. D. Drill.
5—20" Buffalo Plain Drill Presses.
1—3-spindle 8" overhang Henry & Wright High speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.
3—12" Leland & Gifford High Speed Bench Drills.

SHAPERS AND PLANERS.

1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
2—16" New Springfield B.G. Crank Shapers.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS.

1—Waterbury Farrel O.B.I. Press, geared.
1—No. 10 Perkins Drawing Press.
5—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—600-lb. P. & W. Roll Board Hammer.
1—25-lb. Fairbanks Belt Hammer.
1—25-lb. Bradley Helve Hammer.

AIR COMPRESSORS.

1—16 x 18 x 12 Union Steam Pump Co. Steam Driven Air Compressor.
1—8 x 6 Westinghouse Steam Air Compressor.
1—10 x 10 Clayton Belt-driven Air Compressor.
1—8 x 8 Fairbanks-Morse Electrical-driven Air Compressor.
1—8 x 8 Gardner Single Belt-driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt-driven Air Compressor.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machine tools, both large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

The Cost is Trifling

It will cost you very little to adequately tell your wants in this section. Send in your copy to-day for next week's issue.

CANADIAN MACHINERY
Classified Advertising Section
143 University Avenue, Toronto

If any advertisement interests you, tear it out now and place with letters to be answered.

New York's Greatest Stock

(Partial List)

SHAPERS

NEW 24" HOLLINGWORTH IMPROVED TRIPLE GEARED CRANK SHAPERS.

PLANERS

60" x 60" x 28' Betts Planer, two heads.
55" x 46" x 14' Lincoln, four heads.
48" x 48" x 12' Niles, two heads.
32" x 32" x 10' Pond.
30" x 30" x 8' Pease, two heads.
Two—28" x 28" x 7' New Haven.
26" x 26" x 8' Niles.
26" x 26" x 6' Hendey.

LATHES

60" Fifield, 9' centers, face plate drive.
60" x 20' New Haven, face plate drive.
48" x 16' Niles Tire or Car Wheel, double head type, face plate drive, triple geared.
36" x 20' New Haven, compound rest, power cross feed, 14' 6" between centers.
36" x 16' Bradford, compound rest, power cross feed.
36" x 14' Putnam, heavy duty, triple geared, face plate drive.
42" x 19' Putnam, heavy duty, triple geared, face plate drive, raising blocks to swing 54".
30" x 28' Fifield, compound rest, power cross feed.
30" x 16' Fifield, raising blocks to swing 38", compound rest, power cross feed.
28" x 17' New Haven, raising blocks to swing 30", hollow spindle, full swing rest, compound rest, power cross feed.
24" x 24' Fitchburg, raising blocks to swing 30", compound rest, power cross feed, 19' between centers.

BENDING ROLLS

No. 1 Hilles & Jones Straightening Rolls, 5' 2" between housings.
Ship Plate Bending Rolls, 9' 2" between housings.
Ship Plate Bending Rolls, 5' 10" between housings.
Niles double geared Bending Rolls, drop end housing, 40½" between housings.

GEAR CUTTERS

Four 48" Newton Automatic Spur Gear.
40" Flather Automatic Spur Gear.
36" Brown & Sharpe Automatic Hob and Spur Gear.
24" Brown & Sharpe Automatic Spiral Gear.
24" Gould & Eberhardt Spur and Bevel Gear.
24" Whiton Automatic Spur and Bevel Gear.
24" Brainard Automatic Spur.
Two No. 12 Brown & Sharpe Automatic Spur and Bevel.
19" x 5" Less Grant Automatic Spur and Spiral.

New York Machinery Exchange, Inc.

50 Church Street . . . New York City

MACHINE TOOLS IN STOCK

No. 4 Cincinnati Universal Miller with vertical attachment and power feed Rotary Table.
No. 3 LeBlond Universal Miller.
No. 1½ NEW American plain Millers.
5—No. 0 NEW Steptoe Hand Millers.
1" x 15" Pratt & Whitney Screw Machine.
28" x 16' Reed Lathe.
24" x 10' NEW Carroll-Jamieson heavy duty lathe.
20" x 6' Davis lathe.
20" x 10' Hamilton lathe.
6—19" x 8' NEW, Sidney D.B.G. quick change lathes, swing 21" over V's.
3—17" x 8' NEW, Sidney D.B.G. quick change lathe, swing 19" over V's.
15" x 6' NEW, Sidney D.B.G. quick change lathe, swings 17" over V's.
12—17" x 8' NEW, National quick change.
15" x 6' NEW, Carroll-Jamieson, quick change.
48" Harrington plain Radial Drill.
36" Dresses plain Radial Drill.
D-4 Colburn high duty Drills.
3—20" Rockford high duty Drills.
16" Queen City B.G. Shaper.
400 lb. Single Frame Steam Hammer.
125 lb. Dupont Belt Hammer.
30 Ton Watson & Stillman Hydraulic Press.

FRANK TOOMEY, INC.

127-131 North Third St., PHILADELPHIA, PA., U.S.A.

We Have for Immediate Delivery the Following Second-hand Machinery in Good Operative Condition

1 Landis No. 3 Universal Grinder 12" x 42", complete equipment, less internal grinding attachment. . $1,500

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $2,200

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $1,800

These machines are particularly good value, and may be seen at our works.

A. B. JARDINE & COMPANY
HESPELER, ONT.

STOP—MAYBE IT'S HERE

BORING MACHINES—Vertical.

1—30" Flather, one turret head
2—36" B. & S. one turret head, Dec. Delivery
1—38" Baush, two heads.
1—38" Niles, two swivel heads.
1—42" McCabe, one swivel head.
1—51" Niles, two swivel heads, motor driven.
1—84" Bickford.
1—72" Niles, 2 swivel heads
1—90" Vertical Cylinder
1—NEW 8' Bickford
1—Niles, 10'-16' extension, two heads.

BORING MACHINES—Horizontal

1—Lucas 2¾" bar
1—24" Cleveland, 2½" bar, takes 4' 6", compound table.
1—No. 1 Barrett Cylinder Borer, 3¾" bar type.
1—Betts Knee Type, 3" bar.
1—No. 2 Barrett Cylinder, 5" bar.

BULLDOZERS

1—No. 8 Ajax, motor driven.
1—No. 9 Williams & White Belt Drive
1—No. 12 Ajax, single pulley drive.
2—No. 23 Williams & White, belt drive.
1—No. 29-U Williams & White, arranged for motor drive.

CRANES

1—Case 5-ton, 47' span.
1—50-ton Niles, 61' span.
Locomotive, 35' boom, standard gaged, steam driven, 13 ton.

CUTTING-OFF MACHINES

2—NEW 4½" Davis.
30—Davis 4½"
10—4½" Williams.
2—NEW 6" Davis.

DRILLING MACHINES—Radial

2—NEW 2' American cone drive
6—NEW 3' Mueller, speed box drive, Dec. del.
1—3' Bickford Semi-Universal table
3—NEW 3' American, sensitive tapping attachment.
1—NEW 3' Mueller, plain speed box drive
1—NEW 3½' Western Drill, 86" circle.
2—4' Mueller Plain, speed box drive
1—4½' Bickford, plain.
1—5' Dreses, full universal, gear box drive.
1—5' Fosdick, plain.
6—NEW 5' Mueller, speed box drive, Dec. del.
1—6' Baush Radial; arranged for motor drive
1—NEW 6' Triumph Motor Drive, Oct. delivery.

DRILLING MACHINES—Heavy Duty

4—No. 310 Baker Single Pulley Drive, late type
2—NEW No. 2 Colburn
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.

DRILLING MACHINES—Sliding Head.

2—NEW 24" Barnes Drills and Tappers.
5—NEW 24" Barnes Drills.

DRILLING MACHINES—Multiple Spindle

1—No. 5 Fox, 12-spindle, capacity 1".
1—14-spindle Baush, capacity 1" holes, 36" circles.
1—Baush, 12-spindle, capacity 1¼", 30" circle, motor driven.

DRILLING MACHINES—Sensitive.

3—NEW 12" Albany High Speed Tool Room.
1—NEW No. P-4 Allen, one spindle.
1—NEW No. P-2-S Allen, two spindles.
2—NEW No. B-1 Allen, one spindle, 7" overhang.
1—NEW No. B-2 Allen, two spindle, 7" overhang.
3—NEW No. B-3 Allen, three spindle, 7" overhang, tapping attachment.
3—NEW No. B-4 Allen, four spindle, 7" overhang.

GEAR CUTTING MACHINES

1—NEW No. 3 Bickett Gear Rack Planer, delivery 60 days.
1—No. 3 Brown & Sharpe Auto. Gear Cutter spur
1—NEW 6" Standard Gear Cutter, spur.
1—15" Gleason Bevel Gear Planer
1—16" Bilgram Bevel Gear Generator.
1—24" Becker-Brainard.
1—24" x 8" G. & E. for spur and bevel
1—24" Fellows Gear Shaper
2—NEW Flather Solid Pattern 30" Automatic Gear Cutter.
3—36" Fellows Gear Shapers.

GRINDERS—Universal, for Cutters, Drills, Reamers, etc.

8—NEW No. 190 Wells.
3—NEW No. 1 Wood Universal.
1—NEW Wilmarth & Morman, Style B.K.
1—NEW Walker, No. 1 Outfit B
5—NEW No. 2 Wood Universal.
1—NEW Walker, No. 2 Outfit K (capacity 9" x 26")
1—NEW Norton No. 1
2—NEW No. 2 Osterlein Universal.
7—NEW LeBlond.
1—NEW Gisholt Universal.

GRINDERS—Cylindrical—Plain

1—NEW No. 12 B. & S., 8" x 26", Oct. del.
2—NEW 8" x 18" Modern, self-contained.
3—NEW 8" x 30" Modern, self-contained.
2—NEW 12" x 24" Modern, self-contained.
6—NEW 12" x 36" Modern, self-contained.
3—NEW 12" x 48" Modern, self-contained.
2—12 x 42" Landis, self-contained.
1—NEW 10" x 50" Norton, Oct. delivery.
1—14" x 50" Norton.
1—NEW 12" x 60" Modern, self-contained.
1—NEW 10 x 72 Norton, plain.

GRINDERS—Cylindrical—Universal.

2—NEW No. 2 Bath, 9" x 20".
1—NEW No. 2 Walker, 9" x 26"
1—Brown & Sharpe No. 13—8" x 24"
1—NEW No. 2½ (10" x 36") Bath
1—NEW No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis
2—NEW No. 3 Modern, 13" x 40", Oct. del.
1—No. 4 Cincinnati, capacity 12 x 72"

GRINDERS—Internal

1—NEW No. 6 Modern, capacity 10" x 10".
1—No. 70 Heald
2—No. 75 Heald.

GRINDERS—Cylinder

1—No. 60 Heald, single pulley drive

GRINDERS—Profile

1—NEW Cleveland
5—Fisher Profile Grinders.

GRINDERS—Surface

1—NEW No. 1 Wilmarth & Morman
2—NEW No. 1½ Walker's complete
2—NEW No. 2 American with Walker No. 1¾ plain flat mag. chucks.
4—NEW No. 2 Reid (same as B. & S.)
1—NEW No. 2 Brown & Sharpe.

HAMMERS—Board-Lift, Drop.

1—Used No. 4 Standard Machinery Co., 400 lb.
1—Used E. W. Bliss, 800 lb.

HAMMERS—Steam Forging

Morgan & Williams, 600 to 800 lbs., 21" gap.
1—3,000 lbs. Morgan Double Frame
2—3,500 lbs. Chambersburg Steam Drop Hammer.
2—5,000 lbs. Chambersburg Steam Drop Hammer.
1—7,000-lb. Morgan Special Double Stand.

KEYSEATERS

2—NEW No. 1 Davis.
1—NEW No. 2 Davis.
1—No. 2 Mitts & Merrill.
1—No. 2 Knowles, 60" stroke.

LATHES—Manufacturing, Not Screw Cutting.

2—NEW No. 3 Harding Bros.' Bench Lathe.
3—16" x 8' Fairbanks-Morse, heavy duty.
70—NEW Simplex, 16" x 8'.
14—Reed-Prentice Shell Lathes for 4" or 18 lbs. American shells.
22—18" x 8' Battle Creek, heavy duty.
50—20" x 10' Hindman, high duty.

LATHES—Engine

8" Wade Precision, October delivery.
3—NEW 14" x 6' Bradford, quick change.
1—NEW 14" x 8' Champion.
14—NEW 15" x 6' Rockford.
4—NEW 16" x 8' Bradford, quick change.
3—NEW 16" x 6' Cleveland Tool Room Lathes, complete equipment
1—NEW 17" x 8' National, quick change gears.
12—17" x 8' LeBlond, pan bed, quick-change gears
1—18 x 10 Hendey quick-change gear, 14" chuck
1—NEW 19" x 8' LeBlond heavy duty
3—NEW 20" x 12' Bradford, quick change.
5—NEW 20" x 10' Bradford, quick change.
1—NEW 20" x 10' Cleveland Geared Head
19—NEW 21" x 10' Porter, S.B.G.
9—22" x 10' Putnam oil pan turrets
1—NEW 24" x 10' Bradford, quick change.
5—NEW 24" x 12' Bradford, quick change.
1—NEW 24" x 14' Bradford, quick change.
3—24" x 14' American, quick change.
1—24" x 24' Perkins, single back-geared, raising blocks to 40", 18" chucks.
1—28" x 18' S. & B.
1—NEW 30" x 14' American Double Back-Geared, Quick-Change
3—NEW 32" x 12' Pittsburg Pattern
1—32" x 12' 6" Rahn-Mayer-Carpenter, taper attach.
8—NEW 36" x 24' Putnam, triple-geared
1—38" x 18' Schumacher & Boye, triple geared, quick change.
1—50" x 12' American Gear Head, quick-change
1—50" x 24' Prentiss.
1—71" x 20' Fifield, triple-geared.

LATHES—Turret

1—NEW 13" Gisholt, G-13.
1—NEW 21" Gisholt, H-21.
2—NEW 24" Gisholt, I-24.
9—2¼ x 26" Greenlee Flat Turret Lathes
5—2 x 24" Jones & Lamson
1—24" Libbey, universal facing head, three-jaw chuck.
18—6-A Potter & Johnson.
1—NEW 18" Libby.

MILLING MACHINES—Knee Type—Universal

1—NEW No. 1 Kempsmith.
1—No. 2 Kempsmith, 13" dividing head.
1—No. 2 Kempsmith, vertical attach.
1—No. 2 LeBlond.
1—NEW No. 2 Hendey.
1—NEW No. 2 Rockford High Power.
1—NEW No. 3 Kempsmith
3—NEW No. 3-H LeBlond
1—NEW No. 3 Hendey.
1—NEW No. 4 LeBlond, heavy duty, immediate.

MILLING MACHINES—Knee Type—Plain

9—NEW No. 0 Rockford.
1—NEW No. 1-B Hendey.
2—NEW No. 1 Kempsmith.
2—NEW No. 1½ American back gear
1—NEW No. 1 Rockford, high power.
2—NEW No. 2 Rockford
1—No. 3 LeBlond
1—NEW No. 3 Kempsmith.
1—NEW No. 4 LeBlond.
1—No. 4 Brown & Sharpe

MILLING MACHINES—Hand.

3—NEW No. 1 Rockford, without column.
3—NEW No. 2 Rockford, on column.
2—NEW No. 3 Rockford, on column.
3—NEW No. 3 Rockford, on column, power feed.

MILLING MACHINES—Vertical

1—NEW Bickett, No. 0
4—NEW No. 4-B Becker
2—No. 5 Becker.

MILLING MACHINES—Planer Type

1—No. 2 Beaman & Smith Vertical Spindle, open side.
1—Ingersoll Slab, 16" x 48" cap.
1—NEW 17" x 5' Eynon, planer type.
1—Bement-Niles, heavy duty planer type, 24" x 24" x 12'.
2—Ingersoll Slab Millers, working surface of table 60" x 20"

MILLING MACHINES—Lincoln Type.

3—NEW No. 1 American.

PLANERS

24" x 24" x 8' Cincinnati, one head, used three months
2—NEW 30" x 30" x 8' Cincinnati Medium Planer, one head.
1—30" x 30" x 8' Ohio Machine Tool Co., 2 heads.
1—36" x 36" x 10' American, two heads.
1—40" x 40" x 11' Niles, four heads
1—Gray 42" widened to 56" x 42" x 16', two heads
1—NEW 48" x 48" x 10' Cincinnati, two heads.
1—48" x 12' Pedrick, open side, one head.
1—50" x 50" x 16' Pond, 2 heads on rail.
1—52" x 52" x 16' Betts, 2 heads, right angle drive.
1—54" x 42" x 16' Gray; 2 heads on cross rail; one side head.
1—36' Niles Plate Planer, extra heavy, almost new, arranged for motor drive.

SCREW MACHINES—Hand.

4—NEW No. 2 Foster, geared friction head.
1—NEW No. 4 Foster, geared friction head, power feed to turret slide.
2—NEW No. 6 Foster, all geared, power feed to turret slide.
3—NEW No. 5 Foster, all geared head, power feed to turret, power cross feed.
2—NEW No. 6 Foster, geared friction head, power feed to turret, power cross feed.
5—NEW No. 7 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW No. 10 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW 2¼" Dreses, F.G.B., power feed.

SCREW MACHINES—Automatic

2—NEW ⅝" Cleveland, Model A.
1—NEW ¾" Gridley Mult. Spindle, belt driven.
2—NEW 1¼" Gridley Mult. Spindle, belt driven.
1—NEW 2¼" Gridley Mult. Spindle, belt driven.
1—NEW 3¼" Gridley Single Spindle, belt driven.
2—No. 53 National Acme
4—No. 55 National Acme.
1—No. 515 National Acme.

SHAPERS

1—NEW 16" Springfield
1—16" Motor Driven Rockford
1—NEW Barker 24"
2—NEW 24" Milwaukee.
2—25" Smith & Mills, Back-Geared
1—28" Smith & Mills, Triple-Geared
2—30" Morton Draw Cut.

SLOTTERS.

1—NEW 8½" Betts, heavy model, vertical geared crank slotter.
1—NEW 12" Betts, belt drive.
1—18" Betts, heavy duty.

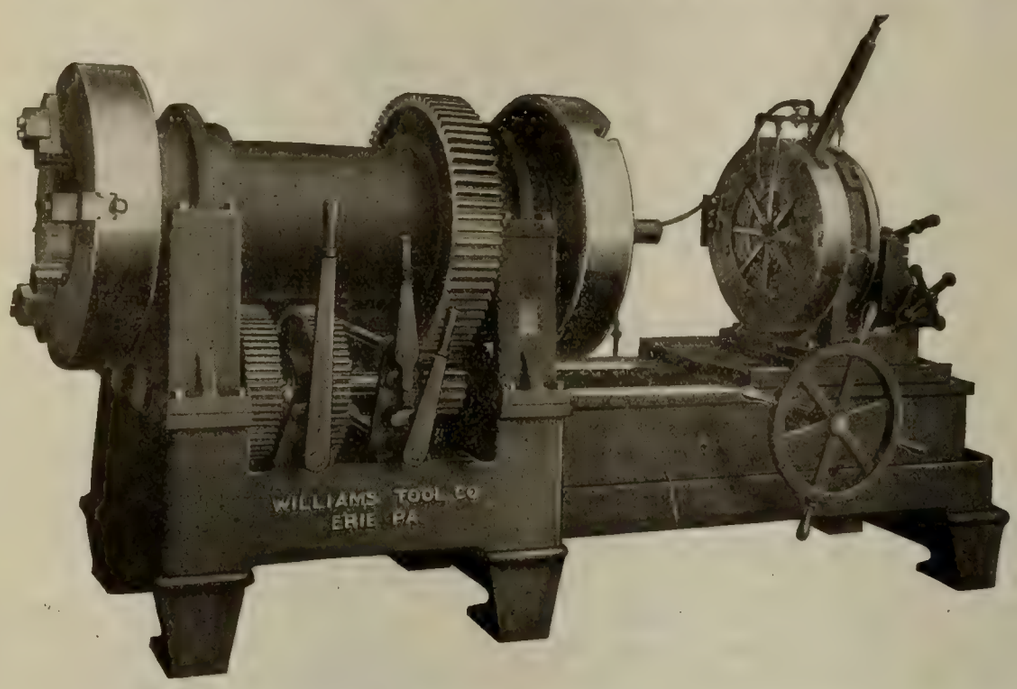
W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 549 Washington Blvd. **CINCINNATI, OHIO** 1018 Union Central Life Bldg. **CLEVELAND, OHIO** 508 Leader News Bldg. **NEW YORK CITY** Singer Bldg.

WRITE OR WIRE OUR NEAREST OFFICE FOR QUOTATIONS
THIS IS ONLY A PARTIAL LIST OF AVAILABLE MACHINES

If any advertisement interests you, tear it out now and place with letters to be answered.

A One Thousand Dollar Bargain



No. 5 New Model Pipe Cutting and Threading Machine, used on two jobs only.

Complete with direct connected electric motor.

Specification

Will cut, thread and ream, 2½ inch. to 12 inch. pipe inclusive, and make nipples.

550 volts, 5 H.P. Motor, A. C. current. 5.2 Amperes.

Better than new. Only used on two jobs. Will sacrifice for quick sale and reasonable terms.

Can ship at once.

Drop us a line for full particulars.

J. R. Devereux & Company

233 ST. JAMES STREET, MONTREAL

Fuse Plant For Sale

The entire equipment, with a daily capacity for producing 10,500 complete sets of parts for time fuses, is offered subject to prior sale.

Williams Manufacturing Co. Limited

MUNITIONS DEPARTMENT

1789 St. James St. - Montreal

We Have For Sale the Following Machines

At Plant of Canada Malleable Steel & Range Co., Oshawa, Ont.

1—No. 27 Double Floor Grinder—Canadian Hart Wheel make. Equipped with two 12" wheels and two spindles 33" long. Shaft bearings 24" long	$100
2—Heavy Blount Double Floor Grinder, 45" spindle, two 8" wheels	100
3—Heavy Petrie Floor Grinders. No rest or c/s. Shaft 36" long, two 9" wheels	50
4—Stouffville Floor Grinder. No rest or c/s. Shaft 32", two 8" wheels	30
5—Large Polishing Stand (new). 4' shaft. Bearings 1¼" x 6	35
6—Brown & Boggs Lever Splitting Shear	50
9—Hanson & Van Winkle Polishing Stand (no c/s)	75
11—Hanson & Van Winkle Polishing Stand. Shaft 5', Bearings 2¼ x 12"	60
15—No. 7 Jarecki Pipe Machine, 1¼"	150
18—Brown & Boggs 6' 6" Power Shears	450
19—No. 21 Crosby Punch Press, Inclinable	350
20—Heavy Grinder, Bearings 2¼ x 12"—cross adjustment slide, one 12" wheel	50
21—Heavy Gringer, same as No. 20. No wheels	$ 50
22—8-Wheel Robinson Detroit Grinder	825
23—60" Steel Plate exhaust for 23" L.H.B.H. discharge	85
24—Anvil, 154-lb.	15
27—5 H.P. Vertical Boiler, Submerged tubes, and one Steam Pump 3 x 2 x 3	125
28—Revolving Electric Plating Machine	140
29—Platers Electric Dynamo 600 Amperes	200
30—Tumbling Barrel, 18" x 4'	50
32—No. 23 Brown & Boggs Hand Punch and Shear	60
35—Fairbanks Scale, 5-Ton	75
36—Hand Former, Toggle Type	15
31—15 H.P. Westinghouse, 550 volt, 60 cycle, 3 phase, 1,120 R.P.M.	325
33—40 H.P. Westinghouse, 550 volt, 60 cycle, 3 phase, 850 R.P.M.	600
34—3 Westinghouse Transformers, 30 kw., 3,200—550 volt	684

Garlock-Walker Machinery Company, Limited

32 FRONT STREET WEST, TORONTO

IMMEDIATE DELIVERY

DRILLING MACHINES.

Leland H.S. B.B., bench type.
No. 1½ Knight Driller and Miller.
30" Lodge & Davis, S.H., B.G., P.F.
20" W. F. & J. Barnes, 4-spindle.
No. 11 P. & W. Multiple, 10 spindles.
3' W. E. Gang Plain Radial.
4' Mueller Plain Radial.
Pawling & Harnischfeger Horizontal Driller.

GEAR CUTTERS.

Reynolds Hobber.
No. 11 B. & S. Automatic.
30" x 9" G. & E. Auto., for spur and bevel.
24" x 7" G. & E., for spur.
No. 3 26" B. & S., for spur.
36" Walcott, for spur.

GRINDERS.

Yankee Drill.
No. 184 Wells Cutter and Reamer.
No. 2 Woods Universal Cutter and Tool.
No. 1 Brown & Sharpe Universal.
No. 2 Brown & Sharpe Surface.
14" x 20" B. & S., plain.
No. 21 Landis, plain.
Garvin Hole Grinder.
Gisholt Tool Grinder.
No. 1 Gardner Disc.
No. 5 Diamond Water Tool.
No. 6A Diamond Universal Disc.
No. 16 Gardner Disc Grinder.
No. 24 Gardner Disc Grinder.

LATHES.

13" x 5' P. & W., C.R. taper.
14" x 6' Fairbanks, C.R., taper.
16" x 6' Prentice, C.R.
18" x 8' L. & S., pat. head, C.R., taper.
18" x 10' Fitchburg, C.R.
18" x 12' Barker, C.R.
20" x 14' Blaisdell, C.R.
21" x 12' New Haven, C.R.
24" x 13' New Haven, C.R.
31" x 26' Bradford.
36" x 20' American, T.B.G.
38" x 16' Fifield.
36" x 20' Houston, Stanwood & Gamble, selective geared head, single pulley drive, taper attachment (new).
36" x 28' Houston, Stanwood & Gamble, selective geared head, single pulley drive, taper attachment (new).

PLANERS.

24" x 24" x 4' Gray, one head.
24" x 24" x 6' American.
26" x 26" x 8' Pease, one head.
30" x 30" x 8' Woodward & Powell, one head.
30" x 30" x 8' Cincinnati, two heads.
36" x 36" x 14' Sellers, one head.
40" x 38" x 14' Putnam, one head.
50" x 50" x 18' New Haven, two heads, two extension heads.
72" x 48" x 14' Gray, two heads, one side head.

SCREW MACHINES.

1" B. & S., plain.
No. 1 Foster, plain A.C. and W.F.
Belt Lacing Machine.
16" P. & W., plain.
No. 2 Costello, plain head.
No. 2 P. & W., friction head.
No. 4 Pearson, geared head.
No. 3 Bardons & Oliver, plain head.
⅞" Cleveland, Automatic.

TURRET LATHES.

No. 22 Garvin.
16" Lodge & Shipley.
25' Niles.
2" x 24" Jones & Lamson.
2" x 26" P. & W., power feed to turret slide and cut-off.
3" x 36" Jones & Lamson, chucking equipment.
3" x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt Turret Lathes, taper attachment.

PUNCHES AND SHEARS.

No. 3 American Can.
No. 3 Bauroth, O.B.I.
No. 74½ Bliss, S.S., Geared.
No. 3A Lennox Double-end Punch and Shear.

MISCELLANEOUS.

24" Bullard Vertical Turret Lathe, 1 swivel head and one side head.
No. 2 Cochrane-Bly Die Filer.
50-lb. Bradley Strap Hammer.
¾" Acme Forging Machine.
52" Niles Car Wheel Boring Mill.
6" x 14" P. & W. Thread Miller.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-ton Yale Duplex Hoist.

STOCKER-RUMELY-WACHS COMPANY

117-121 No. JEFFERSON STREET CHICAGO, ILLINOIS

Convinced?

Probably the impartial opinion of a user—not our claim alone—has carried weight with you. Perhaps you're convinced—almost. For the sake of better pulley service throughout your plant, now is the time to give the Bernard a trial.

The Bernard Wood Split Pulley

in material and workmanship, in appearance and finish, is precisely what it looks—a wood split pulley built to serve both best and longest.

But a trial is more convincing than our claims or a user's opinion. For your own sake, we urge a trial; also because repeat orders so frequently follow trial orders.

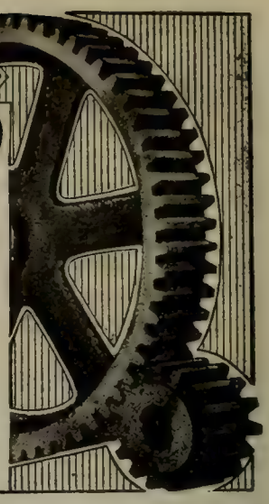
Write for prices and full particulars.

The A. Bernard Industrial Company

Manufacturers of High Grade Power Transmission Appliances.

Office and Works:
FORTIERVILLE, QUE., CAN.

CUT GEARS



Rawhide — Steel — Brass — Cast Iron

Try our W-G Rawhide Silent Gear. Designers and Builders of Special Machinery.

Winnipeg Gear & Engineering Co.
197-199 Princess St., Winnipeg, Man.

WE CAN SELL

Your second-hand machinery.

Let us tell you about the results from condensed ads in

CANADIAN MACHINERY
Classified Advertising Section

Opportunity Knocks Here Every Week!

It may not knock for *you* this week, but read these pages regularly and grasp the opportunity when it presents itself. Every ad here is an opportunity for someone! Your time is coming. If you think the time is ripe to spring that little proposition of yours, send in your copy now for the next issue. If it is of interest to our readers, rest assured it will get attention.

CANADIAN MACHINERY

Classified Advertising Section

143 University Avenue, TORONTO

SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

Shell Manufacturers

Get our Prices on Gauges, Boring Bars Rough Turn Drivers, Etc., for 6 in. SHELL.

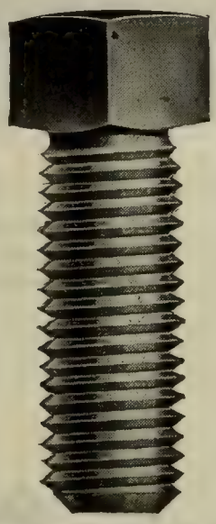
GENERAL MACHINE WORK

Brass and Aluminum Castings

Prompt Delivery

THE
MONARCH BRASS MFG.
COMPANY, LIMITED
71 Browns Ave., - Toronto, Ont.

ACCURACY



Send us your rush orders for Screws and Nuts. We ship from a stock where "Accuracy" is all important.

Prompt service and "G A L T" quality goods only.

Specialists in Gap and Set Screws.

THE
GALT MACHINE SCREW CO., LIMITED
GALT, ONTARIO
Eastern Representatives: The Canadian B. K. Morton Company. Limited, 49 Common St., Montreal, Que.

Homer & Wilson
Stamping & Tool Works

WE MAKE THE TOOLS
AND
PRODUCE THE STAMPINGS

Let us quote on your requirements.

1-3-5 Lancaster Street
Hamilton, Ontario

SPECIAL MACHINERY

QUALITY PRODUCTS AT REASONABLE PRICES

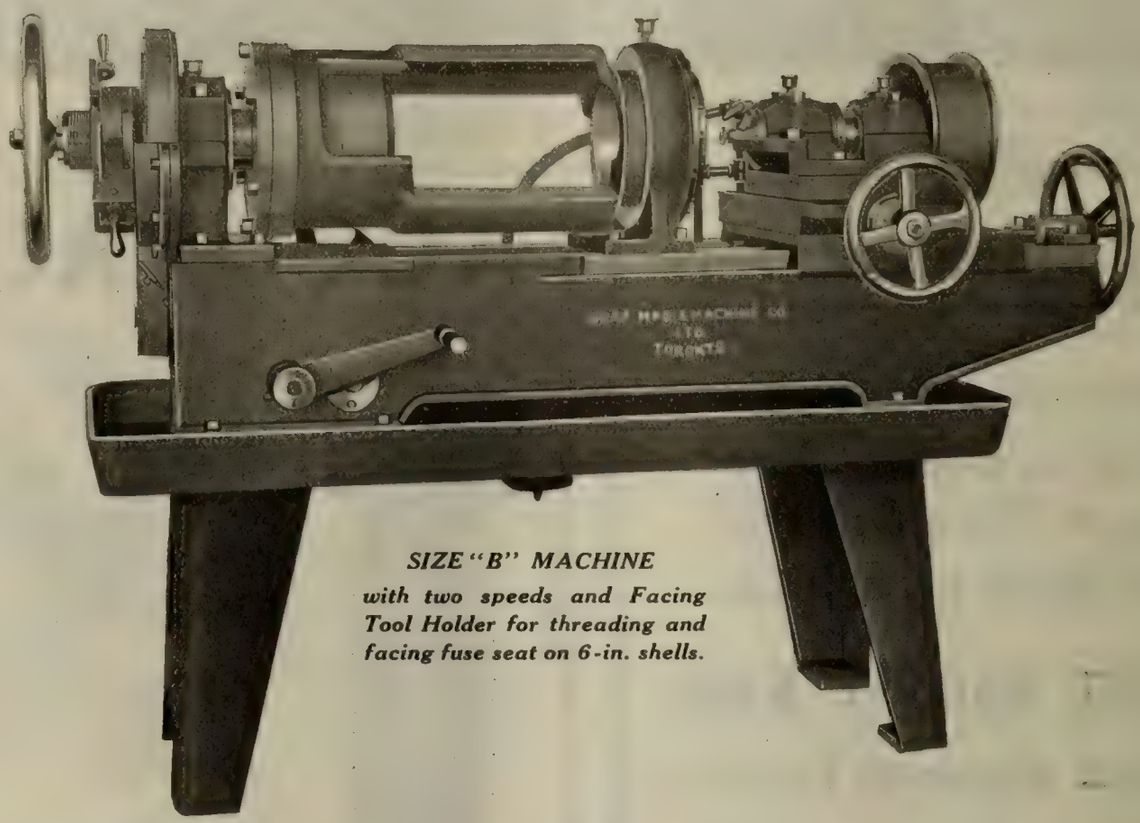
We make special tools for many purposes—Gear Cutting, Gauges, Jigs and Fixtures, special machinery and small tools of every description.

MADE IN BR·EN·CO CANADA

Brown Engineering Corporation
LIMITED, TORONTO
415-419 King St., W. Tel. Adel.425

If any advertisement interests you, tear it out now and place with letters to be answered.

THREAD MILLERS



SIZE "B" MACHINE
with two speeds and Facing Tool Holder for threading and facing fuse seat on 6-in. shells.

Gray's Guarantee

that their THREAD MILLERS will MILL THREADS to SIZE, and TRUE UP FUSE SEAT, thus eliminating hand tapping and hand seating, and also guarantee a stated production.

Size "A" Machine handles Shells from 3-in. to 5-in.
Size "C" Machine handles 8-in. and 9.2 in. Shells and Adapters.

Thread Millers for Fuses and any line of manufacturing work.

PROMPT DELIVERIES

THE GRAY MFG. & MACHINE CO., LIMITED
686-692 St. Clarens Avenue TORONTO, CANADA

CELFOR

HIGH SPEED TWIST DRILLS

CELFOR drills are made by a fundamentally correct principle—twisted (not milled) while hot, thus preserving the natural fibrous grain of the metal. The finest high speed steel goes into them. The nickel steel shank is larger than that used on milled drills. They are provided with maximum chip clearance; cut freely; require less grinding; eliminate tang trouble; consume less power; reduce drill breakage.

Do you wonder why we say "Let your choice be a Celfor."

CLARK EQUIPMENT CO.
Buchanan, Mich.
Canadian Agents: RUDEL-BELNAP
Toronto, Montreal

Doing it the Winfield Way

at the plant of the Winnipeg Ceiling & Roofing Co., Winnipeg, Manitoba

ANOTHER installation where the Winfield Way proved to be the most efficient and economical method of handling the variety of welding work in this shop. Mr. W. J. McMartin, President and Manager, says: "This machine has done good work for us, and we could not afford to be without it."

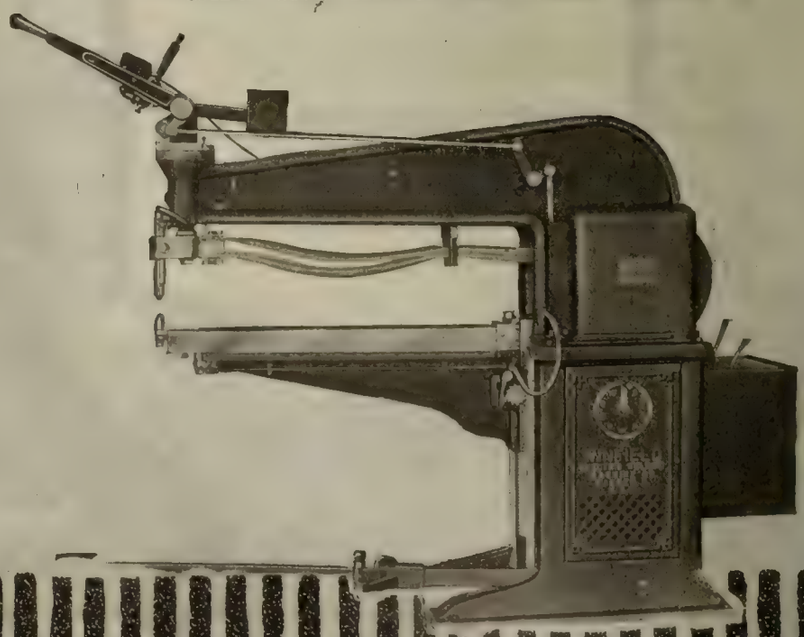
Two boys can turn out more and better work with a Winfield Welder than could eight to ten men by the old punch and rivet method. Does that mean anything to you in these days of mounting labor costs and the scarcity of labor?

The Winfield will help you solve these problems of labor.

Its design and construction are perfect, its operating cost is small, its operation is simple. It is adapted to the welding of any conceivable sort of metal. There is a Winfield for your shop.

OUR service and advisory department will gladly furnish you with samples of welding as applied to your requirements and material, together with full data as to costs and time.

---and the machine that does it

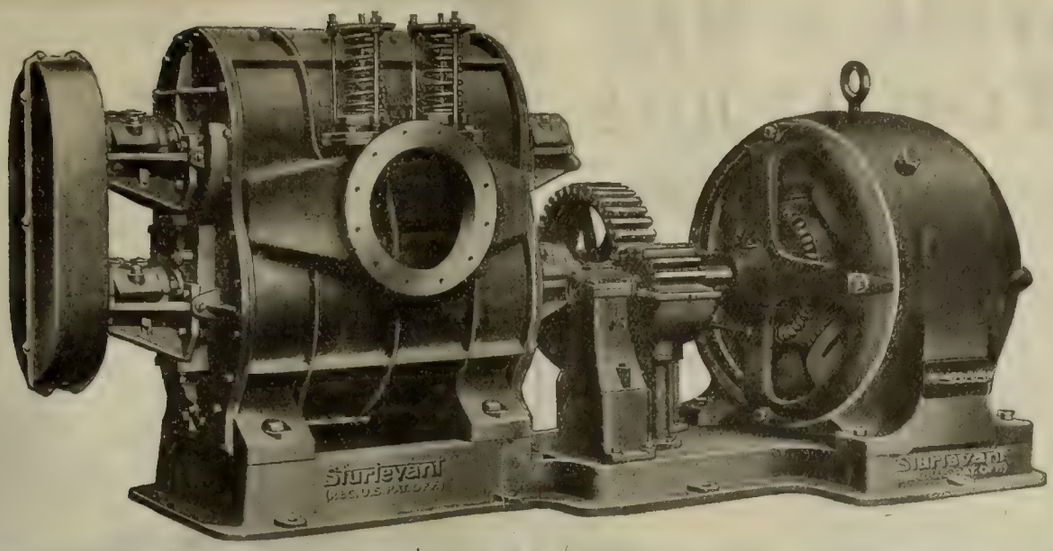


The Winfield Electric Welding Machine Co.

WARREN, OHIO

31 Ottawa Bank Bldg., Montreal, Que.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



FOUNDRY BLOWERS

What Type Shall I Install?

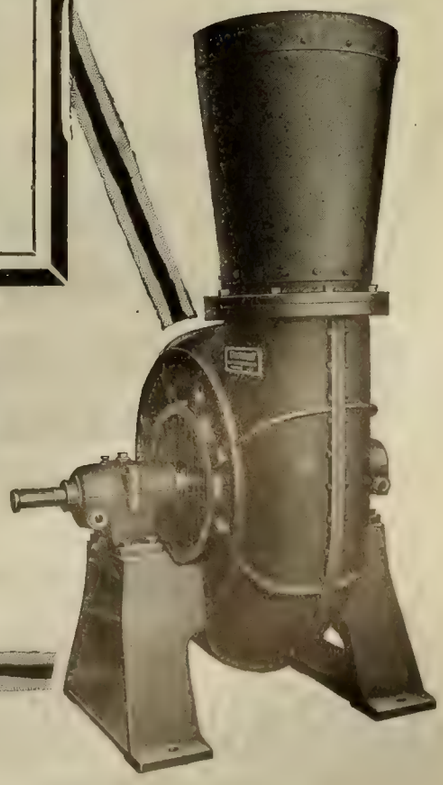
THE particular blower to meet the conditions in your own foundry can be furnished by Sturtevant. We do not make just one type of blower and recommend it for any or all conditions. On the other hand, we have a complete line which comprises various types of High Pressure Positive Blowers and Centrifugal Steel Pressure Blowers. For this reason we can make recommendations without prejudice.

Why not dictate a letter now to our engineering department, giving details of your conditions.

Sturtevant

(TRADE MARK)

B. F. STURTEVANT COMPANY
of Canada Limited
GALT, ONTARIO
Montreal, Toronto, Winnipeg, Vancouver



PROVIDE A MAN WITH GOOD TOOLS

and you will get good results.

In files---give him one or other of the "Famous Five."

They are hard and sharp ---consequently the mechanic does good work with the minimum of labour.

And that's a desirable result for all concerned.

Specify "Famous Five" when ordering.

They are:

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

Made in Canada by

NICHOLSON FILE CO
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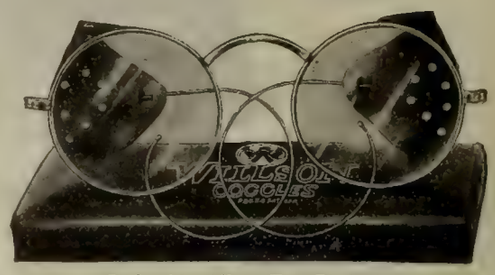
WILLSON
SAFETY GOGGLES
REG. U.S. PAT. OFF.

For the comfortable protection



Style A1, Albex Eye Protector

The most successful leather sideguard goggle for grinders, machinists and turning-process operators. Also worn by many British and United States troops. Rustproof, adjustable and can be worn over other glasses. Furnished with detachable elastic headbands or flexible cable earbows. Amber, smoke, fieuzal or clear micoquille lenses. Price, including steel cases, $9.60 per doz.; $1.25 per pair.

T. A. Willson & Co., Inc., 23 Scott St., Toronto
Factory and Main Offices, Reading, Pa., U.S.A.
Chicago Mallers Bldg. **San Francisco** Head Bldg. **London** 9 Hatton Garden

A Giant for Work

An Infant for Oil

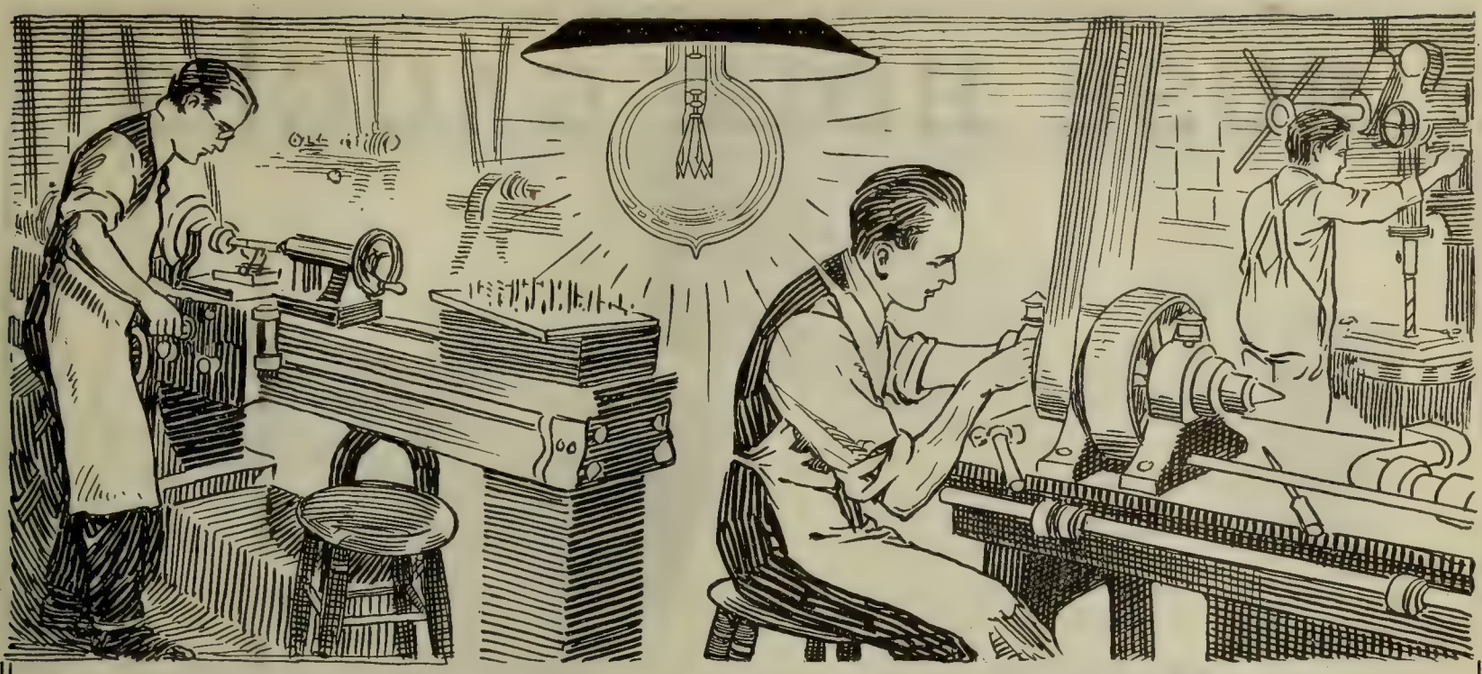
That describes the Bond as well as anything we know. Constructed of the finest materials, it will outlast any hanger on the market.

Made with the famous ring oiling system, the Bond gets positive lubrication without wasting a drop of oil.

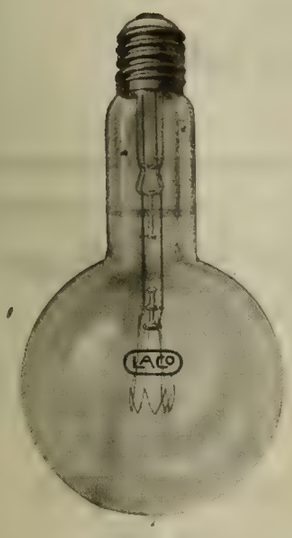
Try a Bond—that's all we ask. The result—repeat orders—are reassured.

Get that Bond Book to-day.

CANADIAN BOND HANGER & COUPLING CO.
Limited
ALEXANDRIA ONTARIO



GOOD LIGHTING



Adds To Quality and Increases Production

Decreasing hours of daylight are giving greater importance to the problem of efficient, artificial shop lighting.

Factories, mills and shops are working under forced pressure, but shorter hours of bright sunlight increase the hazard of error, and tend to decrease accurate production.

Keep your factory bright and cheerful. As the darkness of the late afternoon approaches, flood every corner with the brightest, soft, clear, white light which is conducive to continuous, accurate work.

Large quantities of material and many hours of labor are lost through careless, haphazard, inaccurate tooling and finishing during the late afternoon hours and throughout the night shift because of partially lighted factories.

LACO NITRO LAMP "THE LIGHT THAT GIVES MORE LIGHT"

puts the equivalent of soft, bright sunlight in your factory, mill or shop. It gives you twenty-four hours of bright, clear, soft, white light. It relieves eyestrain, increases accuracy, eliminates losses due to inadequate lighting, reduces accident and error hazard and makes your shop cheerful, bright and agreeable for your men.

This wonderful new Laco Nitro Lamp reduces the current consumption. It is the latest development of the tungsten electric bulb. The tungsten filament in the Laco Nitro Lamp is suspended in a nitrogen gas-filled bulb—giving a clearer, whiter and greater light for a given amount of power than any other type lamp.

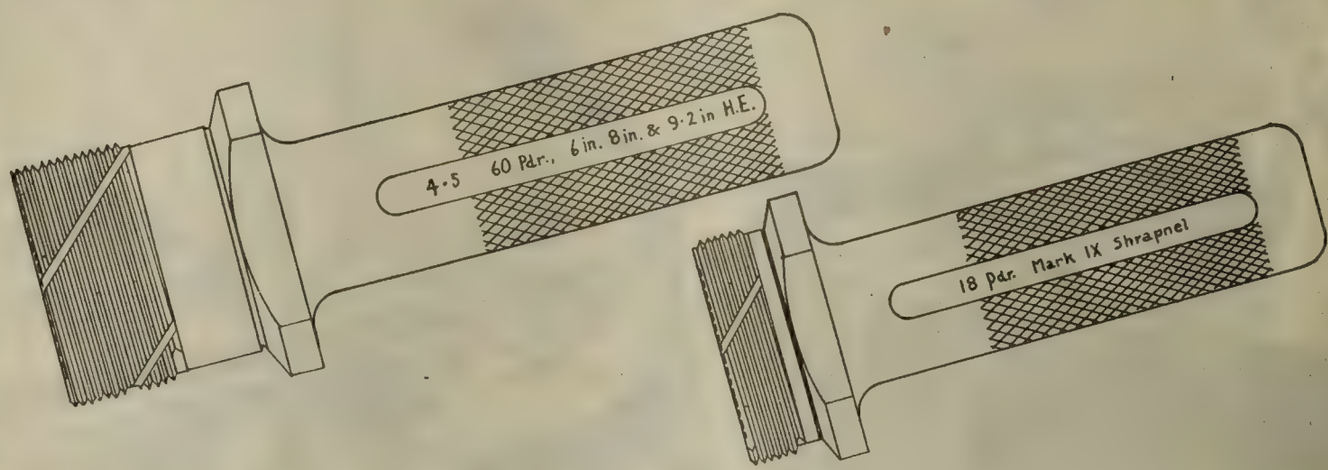
Inquire from your nearest dealer.

CANADIAN LACO-PHILIPS COMPANY, Limited

Stocks available at

Montreal **Toronto** **Winnipeg** **Vancouver**

FUSE HOLE GAUGES

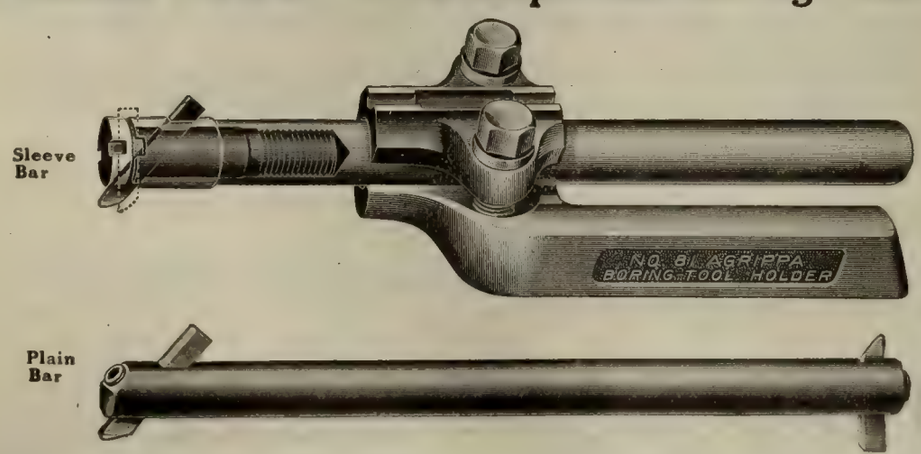


Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

Williams' "AGRIPPA" Multiple Bar Boring-Tool Holder Stops Waste



ALL "AGRIPPA" TOOL HOLDERS CAN BE SHIPPED PROMPTLY

ITS sleeve bar cap admits a straight or angular cutter; and you can quickly insert either at the business end of the bar without removing the cap or disturbing the setting of either the bar or the holder.

You need neither make nor buy any bushings hereafter, for the "twin screw" fastenings of "AGRIPPAS" within their range accommodate any bar section you may have handy.

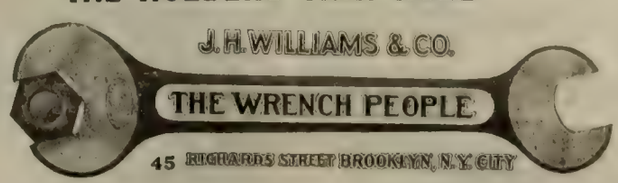
Now's the time to begin saving—caps, bushings and time!

Procure your tool holder text book here or from your dealer and learn the many other economies afforded by

Williams' Grand Prize "AGRIPPA" Tool Holders

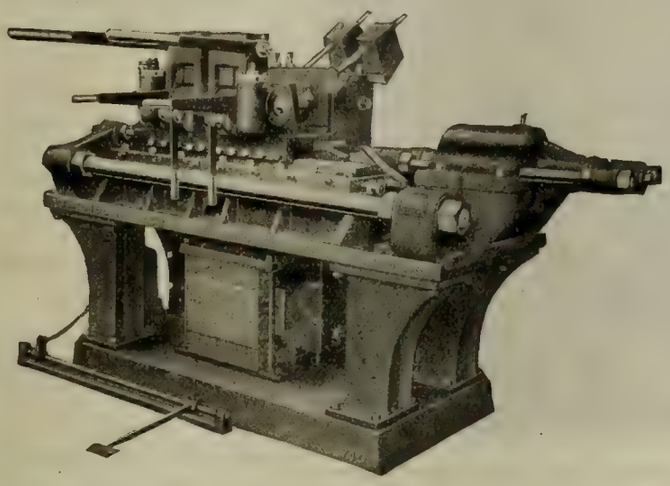
"THE HOLDERS THAT HOLD"

Western Office and Warehouse
40 S. Clinton Street
Chicago, Ill.



Quality alone is our measure of "AGRIPPA" Tool Holder Value

Thomson Process
Electric Welding



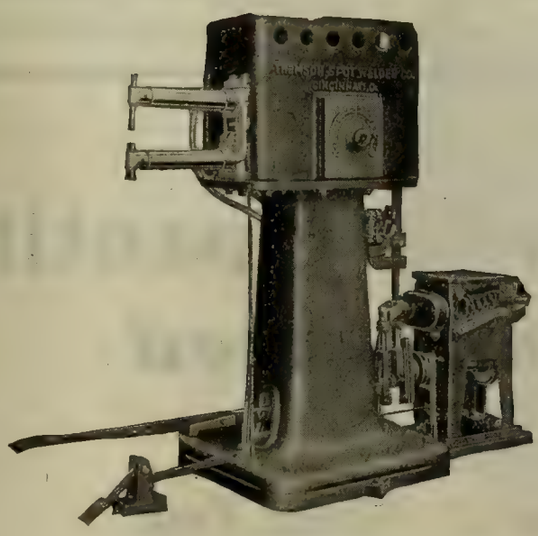
40-A-9
Butt Welding Machine

Waste!

The Thomson System of Electric Welding eliminates waste. Big manufacturers who allow so much for spoiled work each day will find it far cheaper to buy a Thomson Butt Welder. The saving in six months will more than pay for the initial cost.

For welding automobile rims, brake rods, angle irons, pipe joints or whatever your problem might be there is a style of Thomson Butt Welder that will do it more economically than you are getting it done now.

Send for Bulletin B-4.



Combination Foot Operated and Six Speed Gear Box. Belt Driven. Type 177.

The Thomson Spot Welder makes more and better work possible

One firm writes, "One boy and a 'Thomson' can do more and better work than five men were able to do by the method we formerly used."

The Thomson Spot Welder is simple to operate. Just place the two pieces of metal to be welded between the copper die points—press the foot treadle and the pieces are united forever. No smoke, danger or dirt. No holes to punch. No rivets used.

There is a Thomson Spot Welder for your work. Let us have your requirements and we'll show you the machine.

Send for Bulletin S-4.

Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

Economy, Reliability and Durability

The Inevitable Results of Oxy-Acetylene Welding

Whatever the nature of your industry or whenever the necessity arises for joining two pieces of metal for any purpose whatsoever, Oxy-Acetylene Welding is almost invariably the most efficient, convenient and economical method to employ.

For coping with machinery break-downs and avoiding losses in production, obviating enormous costs of replacements and other incidental losses, it saves its cost many times over.

Steam Dryer entirely constructed by Oxy-Acetylene Process.

With a complete Oxy-Acetylene Welding and Cutting Plant, Iron and Steel can be quickly cut to shape and welded together, producing an article of unequalled strength and durability, perfectly leak-proof and of a neat appearance. After smoothing the parts it is impossible to detect the joint.

By this method, not only is the manufacturing cost of the article reduced, but its market value is greatly enhanced.

"Efficiency" of ten years ago is not Efficiency to-day.
Other Industries **similar** to yours are benefitted by the Oxy-Acetylene Process. **Why not yours?**
Investigation incurs no obligation. Write to-day for particulars.

L'Air Liquide Society, **Canadian Factories: Toronto, Montreal, Winnipeg, Halifax (Under construction)**

Quality Quantity

Guaranteed

Write US About Your Acetylene Supply

Commercial Acetylene Welding Co., Inc.

103 Bay Street, Toronto

ATLANTA, GA.
AURORA, ILL.
BOSTON, MASS.
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SAN FRANCISCO, CALIF.
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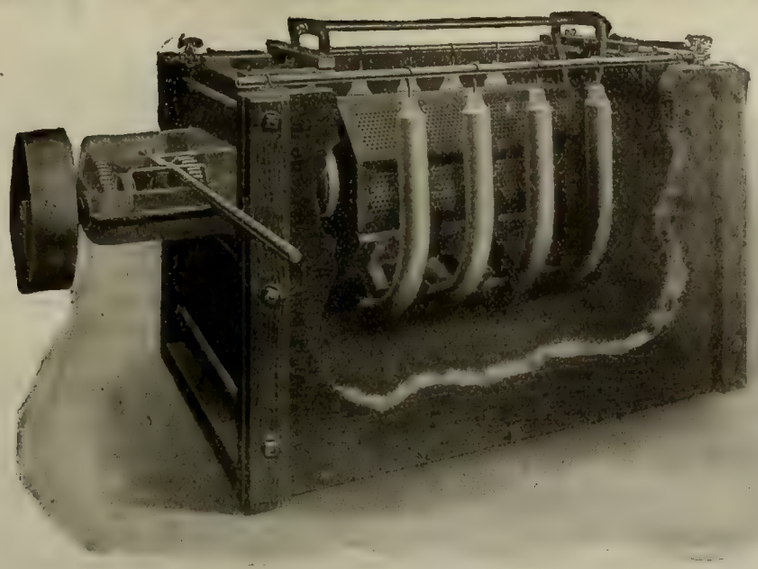
Main Office
80 Broadway, New York

Mechanical Electro-Plating Apparatus



The C. H. & V. W. Mechanical Electro-Plating Apparatus Type B. Gear Drive.

Modern in every detail, particularly adapted for electro-plating quantities of small work in bulk. Saves time labor and material. Write for Bulletin No. 113.

Oblique Plating Barrel Apparatus

These machines are made in four sizes; they are smaller and less expensive than the Type B. A wonderful aid in plating screws and other small articles. Write for Bulletin No. 116.

We manufacture everything for *Polishing and Plating of Metals.*

CONSULT US AND REDUCE YOUR COSTS

CANADIAN HANSON & VAN WINKLE COMPANY, LIMITED

TORONTO - - CANADA

To Shipbuilders and Steel Corporations

THE Radiagraph is one of the exclusive developments by the Davis Bournonville Company for mechanical cutting of steel plate, with the oxy-acetylene or oxy-hydrogen flame. With the radiagraph, steel plate and armor plate from 1 to 18 inches thick is smoothly cut at speed varying from 4 to 18 lineal inches a minute, according to thickness of steel. With the Oxygraph, another exclusive development, steel plate from 1 to 18 inches thick is readily cut in any direction, according to pattern or tracing, following straight or irregular lines, curves or sharp angles with equal facility. Extensively used by

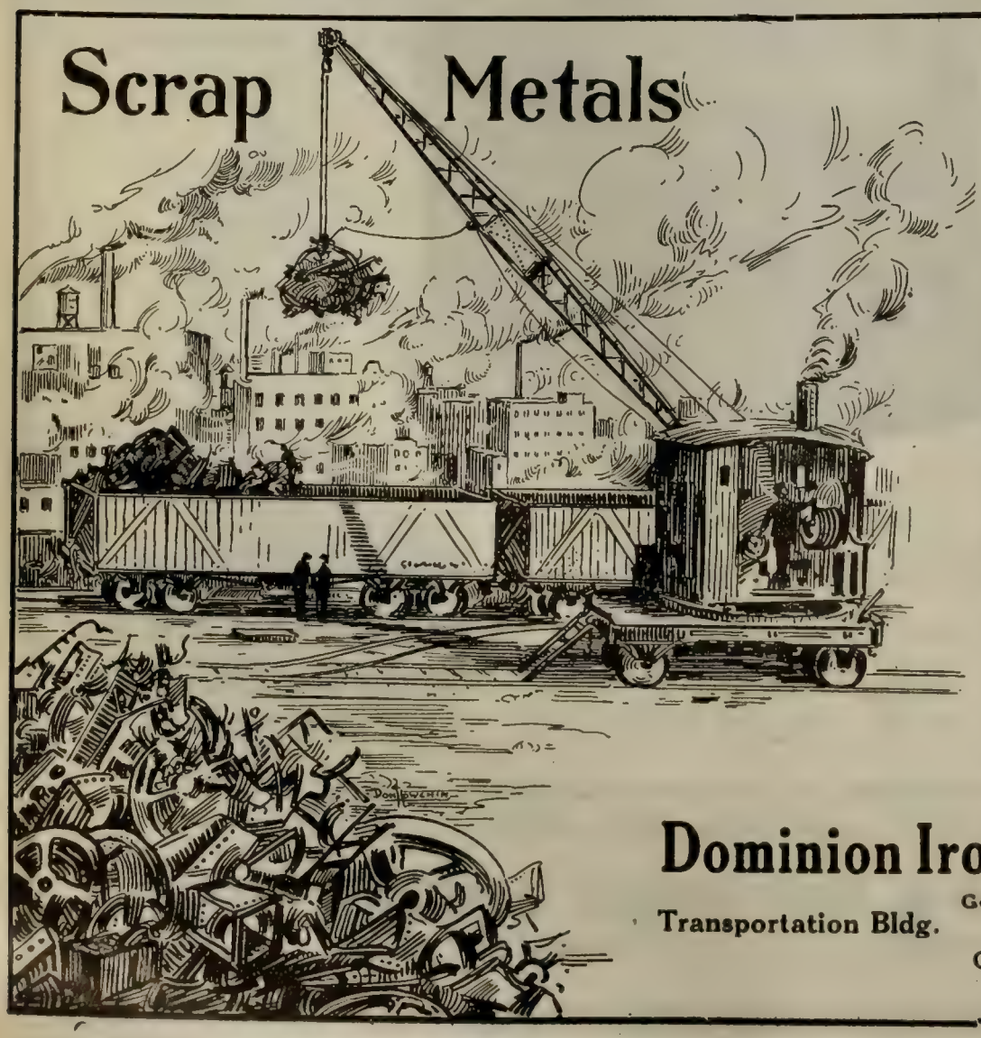
Bethlehem Steel Company,
Youngstown Sheet & Tube Company,
Carnegie Steel Company,
Lukens Iron & Steel Company,
New York Shipbuilding & Dry Dock Company,
General Electric Company,
Westinghouse Electric,
Canadian Westinghouse,
American Locomotive,
Canadian Locomotive,
Lima Locomotive Company,
Marion Steam Shovel,
Camden Forge Company,
Pennsylvania Shipbuilding,
United States Navy Yards at Boston, Brooklyn, Philadelphia, Norfolk, Washington, San Francisco and Seattle.

We are demonstrating the Radiagraph and Oxygraph throughout Canada, and if you are interested we would be glad to forward catalogue and price lists. "Davis Apparatus" leads the World for Range, Efficiency and number of Users.

Carter Welding Co. of Toronto, Limited

Canadian Agents for Davis-Bournonville

9 SHEPPARD STREET - - TORONTO, ONT.



Scrap Iron, Steel and Metals

No undertaking is too large for us. We are Scrap Metal Specialists, and can co-operate with you in the dismantling of railway equipment, bridges, plants, steamers, mills and will take your rails and machinery.

Shell Makers. We can take care of all your scrap materials, at highest prices.

Give us particulars and we will relieve you of all worry.

Dominion Iron & Wrecking Co. LIMITED

Transportation Bldg. General Offices: - Quebec, Que. **Montreal, Quebec**

CUTTING STEEL PLATES With Oxy-Acetylene or Oxy-Hydrogen Torches

No. 2 OXYGRAPH

Cutting Plates ¼ to 20 inch thick. Speed 4 to 15 inch per minute.

This was one of the striking exhibits at the recent American Foundrymen's Convention in Boston

The Oxygraphs, Nos. 1 and 2, and the Radiagraph, are exclusive Davis-Bournonville developments for mechanically cutting steel plate, ingots, billets, and risers, with the oxy-acetylene and oxy-hydrogen flame. With the Oxygraph, steel plate up to 20-in. thick is cut in any direction, following pattern or tracing, along straight or angular lines, curves or sharp angles, with equal facility, at speeds varying from 4 to 15-in. or more per minute according to thickness. The No. 2 Oxygraph is a heavy-duty machine, and with two torches, duplicate cuts are made, as in the illustration showing side frame being cut out for journal boxes. Frame of the machine moves back to permit service by shop crane.

Oxygraphs and Radiagraphs are extensively used by American Locomotive Co., Canadian Locomotive Co., Lima Locomotive Co., J. G. Brill Co., Lukens Iron & Steel Co., Bethlehem Steel Co., Carnegie Steel Co., Crucible Steel Co., Youngstown Sheet & Tube Co., Camden Forge Co., E. W. Bliss Co., Marion Steam Shovel Co., American Brass Co., United Shoe Machinery Co., General Electric Co., Westinghouse Electric & Mfg. Co., Canadian Westinghouse Co., New York Shipbuilding Corp., Newport News Shipbuilding & Dry Dock Co., Pennsylvania Shipbuilding Co., and in numerous other metal working plants, including United States Navy Yards at Boston, Brooklyn, Philadelphia, Norfolk, Charleston, Washington, San Francisco and Seattle.

Broad basic patents Nos. 1,059,329 and 1,118,183 cover cutting torches and mechanical means for supporting and propelling same at uniform and determined speed.

Manufactured and sold only by the Davis-Bournonville Company, which has developed the widest range of equipment made for utilizing the oxy-acetylene and oxy-hydrogen processes of welding and cutting, and **"Davis' Apparatus" leads the world for range, efficiency, and number of successful users.**

DAVIS-BOURNONVILLE COMPANY

General Offices and Factory, JERSEY CITY, N.J.

CARTER WELDING COMPANY, *GENERAL DEALERS* TORONTO

Canadian Factory, NIAGARA FALLS, ONTARIO

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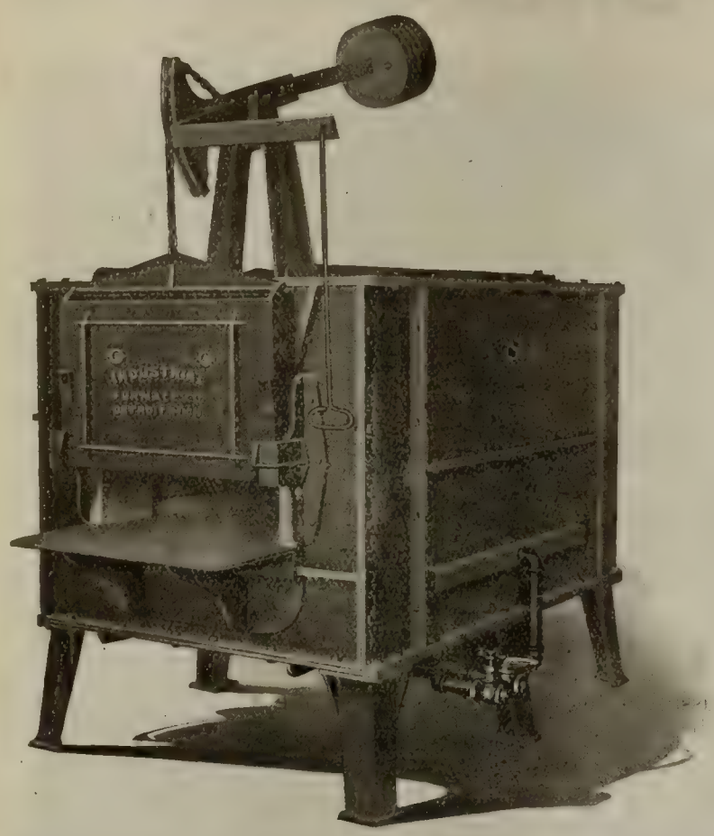
OXY-ACETYLENE WELDING DAVIS APPARATUS DAVIS-BOURNONVILLE CO. N.Y.

BELLEVUE FURNACES



For Heating, Case Hardening and Annealing

Under present conditions in Canada, fuel economy is an important factor. The use of a Bellevue Furnace will save in fuel consumption, and assure the highest possible class of work.

The type illustrated is our semi-muffle design. The combustion is perfect and precludes the formation of any oxidizing elements. The flame is not visible in the muffle, and does not come in contact with the material. Scaling is reduced to a minimum, and cannot fall into the combustion chamber.

The furnace heats up rapidly and will retain heat for a long period after burners have been shut off, with resulting economy in fuel consumption.

We have furnaces of every type for every purpose. The Bellevue Line is designed particularly to save labor and fuel. Let us send full particulars. Write for illustrated catalogue.

Bellevue Industrial Furnace Co.

Julius Hinz, President

703 Bellevue Avenue Detroit, Mich.

Representative in Canada:
H. W. Petrie, Limited, Toronto, Canada

BRASS Castings

The coupling of expert work with unexcelled equipment enables us to produce on a large scale Brass Castings of any size or alloy.

Our prices, too, are most reasonable; for our large purchases direct from the smelters command their every price favor.

For better Brass Castings at a money saving, send your orders to us. We promise that our work will please you.

The St. Lawrence Welding Company, Ltd., Montreal, P.Q.

Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, Etc. Electric Welders, Oxy-Acetylene Welders. Boiler Repairs. Lead Burning and Brass Foundry Work.

Office: 138 Inspector Street Works: 59 Olier Street Telephone: Office, Main 5779, Manager's Res., Westmount 3483

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NEW HAVEN, CONN.

"CRAWFORD SECTIONAL" OVENS

Heated with our Enclosed Flame Gas Burners, or Electricity

FOR BAKING JAPANS AND OTHER FINISHES ON METAL.

Ovens carried in stock and built to meet requirements of manufacturers.

Builders of All-Steel Oven Trucks with Roller Bearings.

Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.

ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

Large output on very low fuel consumption

This is assured you when you install Tate-Jones Side Fired (Single or Double Chamber) Annealing Furnaces. Large output, of course, is the aim of every manufacturer. The bigger the output and the smaller the amount of fuel used, the greater the profits. Then, too, there must be a uniformity of finished product.

Accurate control and a uniform distribution of heat are also highly essential. All these you will secure with

TATE-JONES

Side Fired Annealing Furnaces

as illustrated below.

In the double furnaces, the heating chambers are separated by a solid fire brick wall, making it possible to heat each chamber independently of the others. The arrangement of the combustion chamber and flues permits you to get the maximum heating value from the fuel.
These furnaces are designed to take care of all classes of heat treating. They give an even heat all over the chamber without any danger of oxidation. These furnaces require no stack and burn either oil or gas.

Full information concerning these, as well as any other Tate-Jones Furnaces, sent upon request. State your particular needs, or give some idea of the products handled. Ask for Catalog of Heat Treating Furnaces.

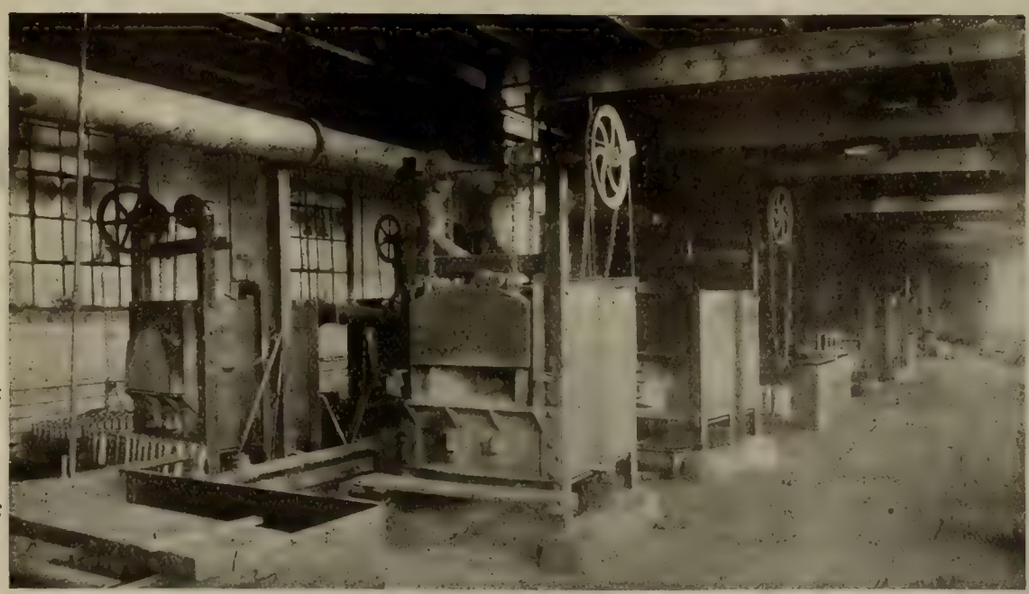
TATE-JONES & CO., Inc., Pittsburgh, Pa.

FURNACE ENGINEERS

TATE-JONES ***Double Chamber Side Fired Furnaces***

Installed at

LINDERMAN STEEL AND MACHINERY CO., Muskegon, Mich.

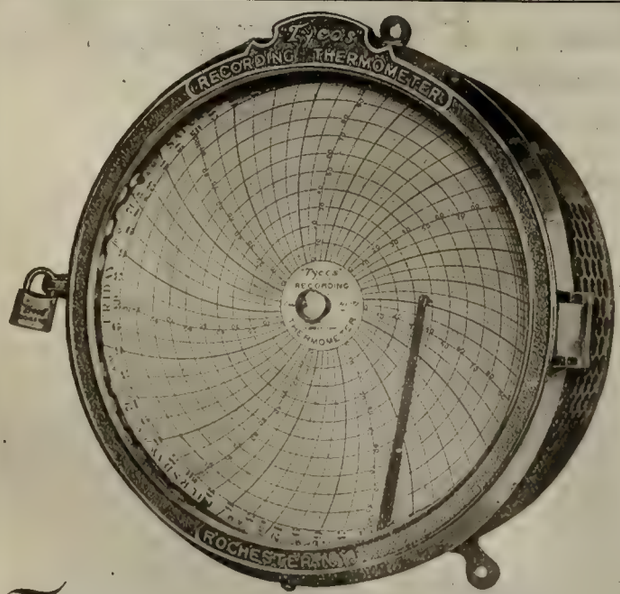


Annealing and Tempering Furnaces installed in the plant of the Canadian Vickers, Limited, Montreal.

"Mecol"

The installation of "Mecol" furnaces shown here is but one instance where a quality furnace was chosen to give maximum production. The furnace you may require is the one we desire to give you complete and full information about. Write us.

Mechanical Engineering Co.
Limited
THREE RIVERS QUE. CANADA



Tycos Recording Thermometer

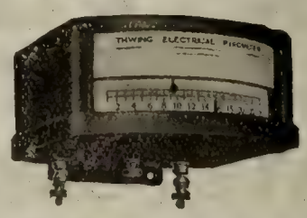
Self-contained

Rugged, Sensitive, Accurate. An ideal instrument for recording atmospheric temperatures.

Taylor Instrument Companies
Rochester, N.Y.

201 Royal Bank Building, Toronto, Canada

There's a ***Tycos*** or ***Taylor*** Thermometer for Every Purpose



Insuring Accurate Temperature Measurements

THWING

HIGH RESISTANCE MULTIPLE RECORD

PYROMETERS

are instruments of exact precision. Yet they have the rugged durability to withstand hard usage in the toolroom, the steel mill, and similar places.

Thwing Instruments are furnished in either the Indicating or Recording style, giving as many as twelve readings on a single recorder.

Our New Catalog No. 8 covers the entire line. Send for copy.

Canadian Representative:
Mr. James DeVon, 227 Davenport Road, Toronto

Thwing Instrument Co.
34th Street and Lancaster Ave.,
PHILADELPHIA, PA.

The Furnace Determines the Result

Type C-15

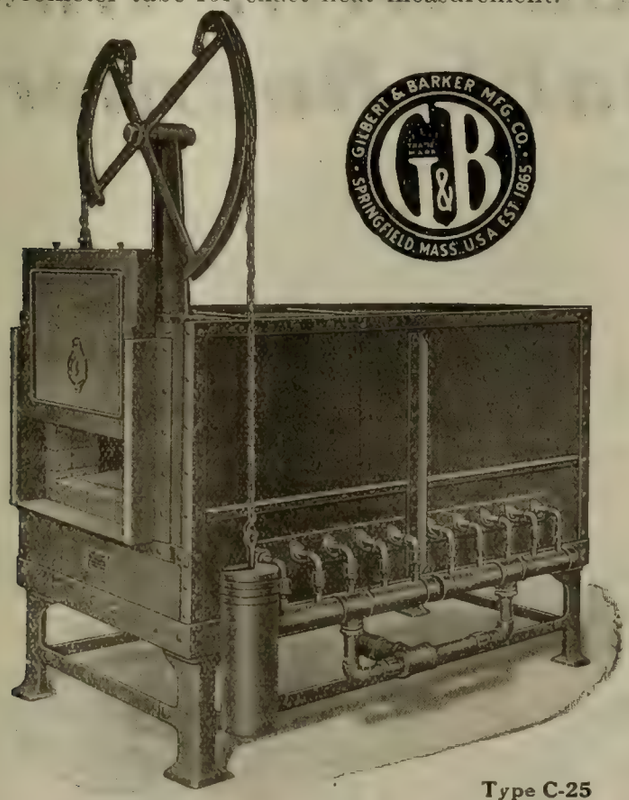
IF you are not getting the results you expected from your heat-treating department, don't blame the men; more than likely the furnaces are the cause of it.

To successfully temper, harden, anneal or case-harden metal, your furnaces must be capable of heating to the proper temperature and staying at that temperature.

Gilbert & Barker Furnaces have been the standard for over fifty years. They are being used in the biggest plants and are giving perfect satisfaction.

They are built right—from the ground up. The built-up construction with heavy sheet metal is reinforced with heavy angle iron straps riveted and bolted. The counter-balanced door clears the opening to full height, admitting the heaviest charge. Fire brick chamber lining, door lining and floor tile are of best quality. An opening is provided for pyrometer tube for exact heat measurement.

THE types shown are only two of over one hundred types and sizes—a furnace for every purpose, made the way they should be made. Our fifty years of practical experience, combined with a thorough knowledge of heat-treating methods used in modern plants, enable us to advise you and furnish you heat-treating furnaces that will do your work right at the lowest cost. This experience is at your service free. Put your problems up to us.



Type C-25

Gilbert & Barker Mfg. Company

WEST SPRINGFIELD, MASS.

Canadian Agents:

Williams & Wilson, Montreal, Que.
James DeVon, 227 Davenport Rd., Toronto, Ont.

JUST now we are making immediate delivery from stock on many sizes. Stock list No. 24 gives the entire list and more details. Send for it now.

Acquainting you with the Martell Adjustable Reamer

—an accurately adjustable reamer and adjustable bushings for aligning and finishing crank case bearings of internal combustion engines or any series of bearings which should be *in perfect alignment.*

By its use, all bearings in the same line are reamed and finished simultaneously—an adjustable centering mechanism providing the means for securing the correct alignment of cutting tools.

The design and alignment of the reamer blades absolutely eliminate the possibility of "chatter" or "waves" and insures perfectly finished bearings which are superior to a scraped surface.

By means of a micrometer adjustment, the diameter of the reamer blades may be increased or decreased at will with definite precision. It is also possible to caliper the blades in position for checking the size.

This method of line reaming will produce a better job than can possibly be obtained by hand scraping and a saving of from 50% to 80% in the time required has been effected in many cases.

Let us make a proposition covering your particular requirements.

TAFT-PEIRCE
Woonsocket, R.I., U.S.A.

CHAPMAN

DOUBLE BALL BEARINGS

Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

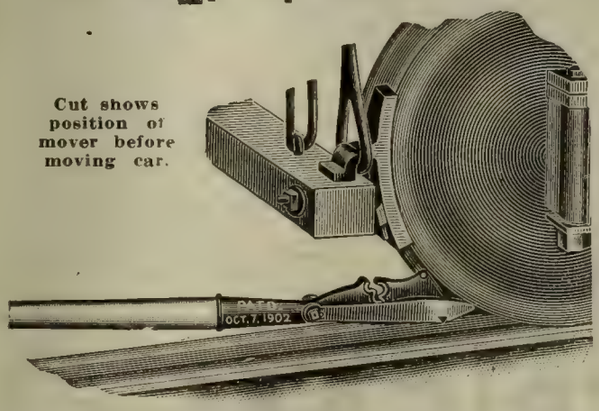
The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

TRANSMISSION BALL BEARING CO., Inc.
1 050 Military Rd., Buffalo, N. Y.

THE "SAMSON" RAILWAY CAR MOVER



Cut shows position of mover before moving car.

Every railway siding should be supplied with one of these tools. Takes the place of fifteen men and puts the heaviest loaded car just where you want it. It will pay for itself in 30 days.

It is one of the most simple and powerful devices for moving cars by hand.

It is provided with Never-Slip Spurs, which is the most important feature on a Car Mover.

Special attention given to export orders.

Dillon Manufacturing Company
Oshawa, Ontario

Eastern Sales Agent
Alexander Gibb
3 St. Nicholas St., Montreal, Que.

Western Sales Agent
D. Philip
138 Portage Ave., Winnipeg, Man.

Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send to our nearest factory for a trial box.

Manufactured and guaranteed by

The Canada Metal Company, Limited
Hamilton Montreal TORONTO Winnipeg Vancouver

Every Manufacturer Who Uses Pulleys Should Read This

LAMB MACHINE COMPANY
Incorporated

IDEAL TRADE MARK

ENGINEERS,
Manufacturers of and Dealers in
MACHINERY.

HOQUIAM, WASH. October 13. 1916.

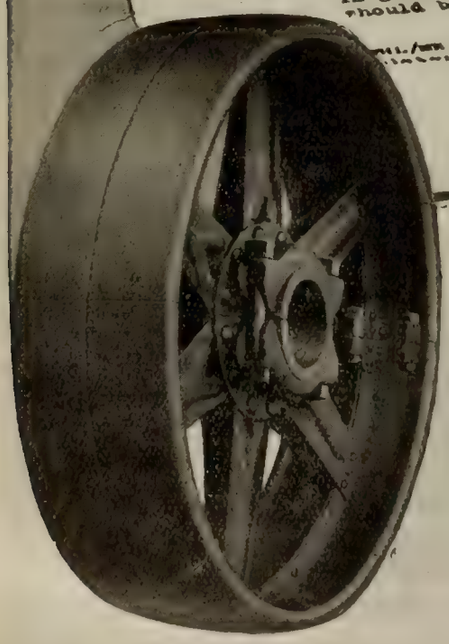
American Pulley Company,
42 Wissahickon Avenue,
Philadelphia, Pa.

Gentlemen:

In reference to our experience with the American Steel Split Pulley, the principal industry using pulleys in this section is saw mills and other lumber manufacturing industries. It has been a recognized fact that saw mill use is one of the hardest tests to which a pulley can be placed. Till within the past few years practically all of the pulleys in use were heavy cast iron pulleys. Some of the mills were using solid built up wood pulleys. When we began to stock American Pulleys two or three years ago, we experienced a great deal of difficulty in convincing lumber manufacturers that the lighter construction of steel would withstand the heavy duty. At first we were able to supply them for the lighter work and gradually have been able to induce manufacturers to install them in other and more severe locations.

We have adopted a policy of absolutely guaranteeing every pulley which we put into service, and are pleased to report that the failures due to inherent weakness of the pulley have been nil. In lumber manufacturing the service is to a very large extent intermittent and our experience with motor drives has shown us that the horsepower consumed on certain machines at certain times is many times the normal horsepower load. It is such service as this that sometimes wreck any type of pulley. We refer, however, to one pulley in particular with a 12" face-driving a heavy planer-which replaced a cast iron pulley and which we were compelled to guarantee for one year. The pulley has stood up to the work perfectly and shows no sign of failure. The American is so entirely satisfactory that we feel absolutely safe in guaranteeing their performance in any position in which a pulley should be placed.

Yours very truly,
LAMB MACHINE COMPANY
President.



AMERICAN STEEL SPLIT PULLEYS

The above letter is eloquent testimony of the great strength and durability of "American" Steel Split Pulleys.

They are guaranteed to perform double belt duty under all conditions not demanding a special pulley. They transmit maximum power with minimum belt slip. They will stand up under greater strains than other pulleys having much more weight.

They reduce pulley power losses to a minimum and are the most efficient and economical pulleys you can buy.

The American Pulley Company, Philadelphia, Pa.

Canadian Distributors:

Williams & Wilson, Ltd., Montreal, Quebec; A. R. Williams Machinery Company, St. John, N.B.; A. R. Williams Machinery Company, Toronto, Ontario; A. R. Williams Machinery Company, Vancouver, B.C.; A. R. Williams Machinery Company, Winnipeg, Manitoba; H. W. Petrie, Ltd., Toronto, Ontario.

Why pay 50% more than is necessary for unloading your Pig Iron when you can save that percentage by using MATHEWS GRAVITY PIG IRON CONVEYOR? Write for our Bulletin C.

CANADIAN MATHEWS GRAVITY CARRIER CO., Ltd.
484 RICHMOND STREET W., TORONTO

STEEL TUBING

Steel Tubing, Butted and Welded for Bedsteads, Agricultural Implements, Trolley Arms, Fence Posts, Etc.

14 to 20 gauge.

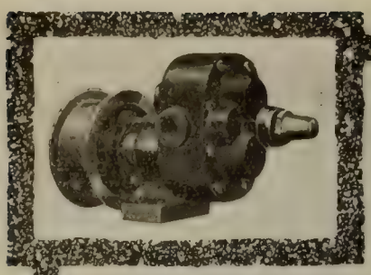
Sizes 3/8" to 2" outside diameter.

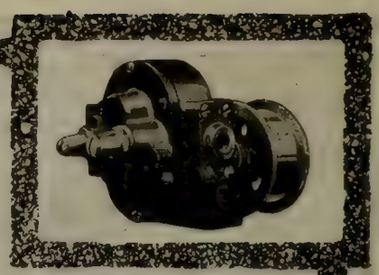
Let us send you samp es.

We are equipped with facilities for turning out big orders with the utmost dispatch. Prompt deliveries is one of our specialties.

Standard Tube & Fence Co.

Woodstock, Ontario





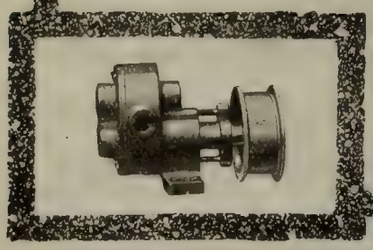
What Pumping Capacity Do You Require ?

Does the cutting tool on your metal working machine require a stream of 1½ or 16 gallons per minute?

Trahern Rotary Geared Pumps

are so diversified in construction that you can obtain just the size and style suited to the peculiar conditions prevailing at YOUR plant. They will operate at a speed of from 300 to 500 R.P.M. and deliver a stream of from 1½ to 16 gallons per minute. Our special TRAHERN relief valve permits shutting off at discharge without stopping machine.

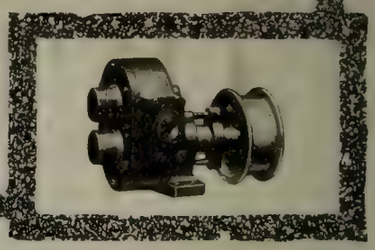
The drive shaft is of high grade, cold rolled steel. The pumps are constructed to prevent excessive wear at stuffing box, a distinctive point of superiority over the centrifugal type. *Write for particulars and list of leading machine tool manufacturers using our pumps.*

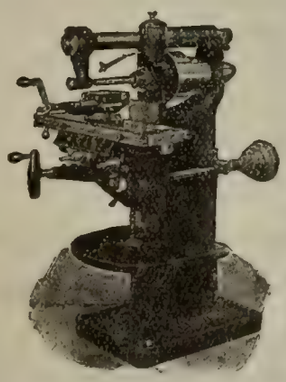


Trahern Pump Company

Rockford, Illinois

Canadian Agents : A. R. Williams Machinery Co., Toronto





Don't Crowd Your Large Machines

You cannot manufacture small parts economically on a large machine. Steptoe Small Power Feed Millers and Hand Millers are especially adapted for that kind of work, a stiff, heavy tool that can be quickly handled and crowded to the limit. That is the machine to buy for small parts.

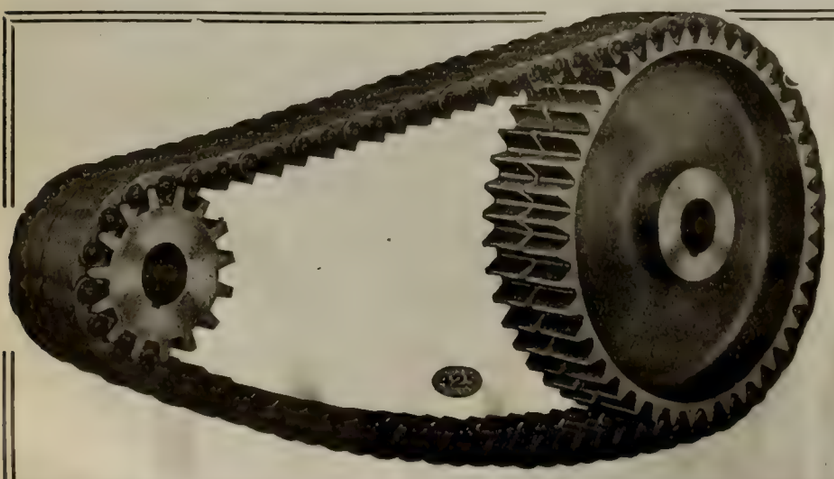
If your Planers are crowded take the small jobs and put them on a Steptoe Shaper and you will do them quicker and you will have less money invested in equipment.

STEPTOE SHAPERS "Just a Little Better."

CIRCULAR ON REQUEST.

John Steptoe Co., Cumminsville, Cincinnati, Ohio, U.S.A.

Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.



RENOLD PATENT SILENT CHAINS

The proven efficient form of Power Transmission.

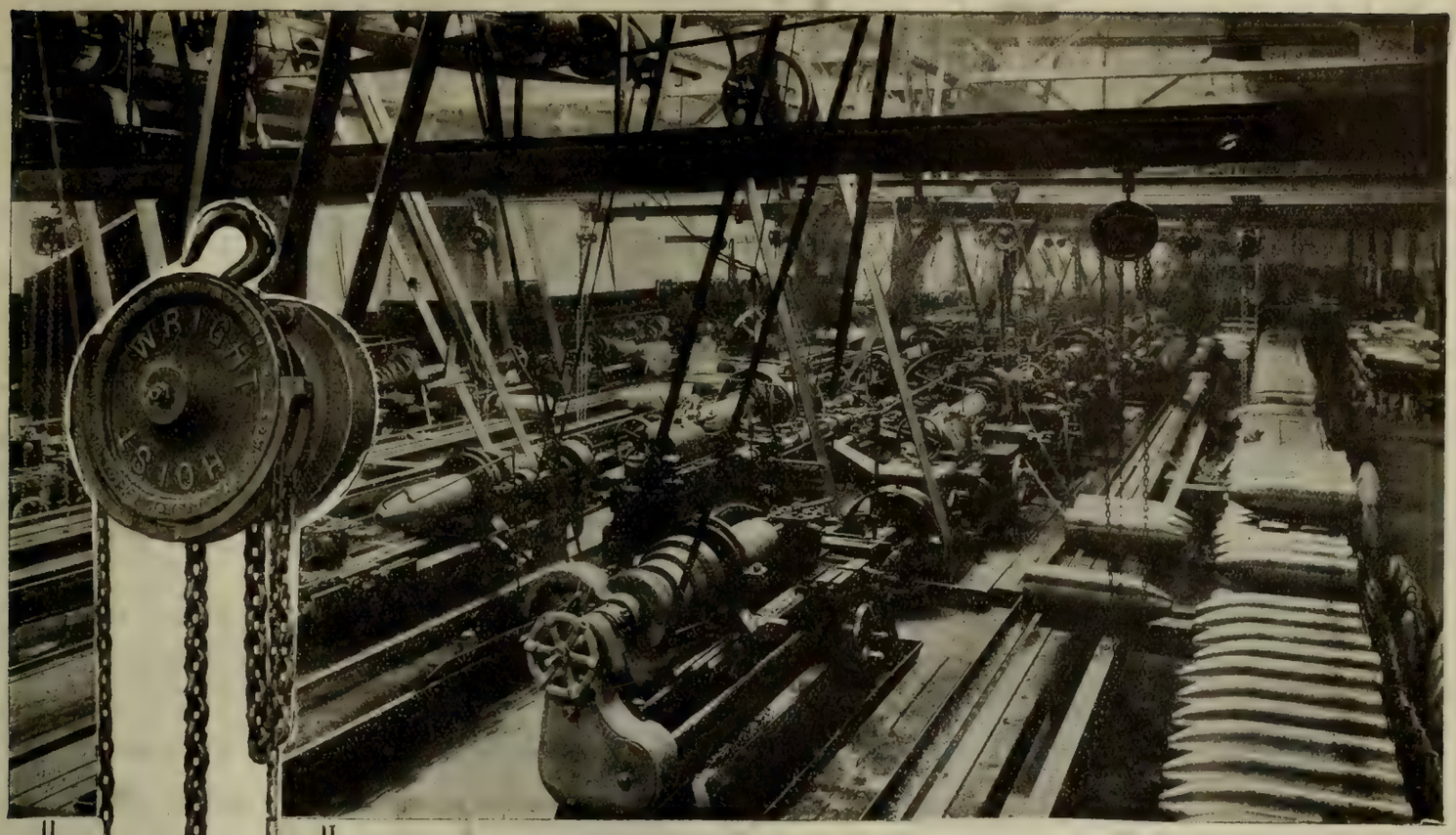
Equally suitable for main shaft or machine drives. Save space and power, increase output and ensure durability.

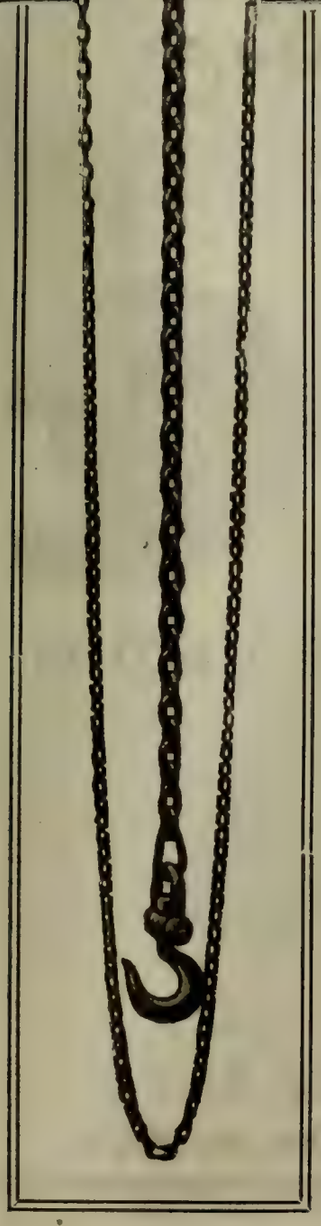
Chain and Parts Carried in Stock.

Sole Canadian Agents

Jones & Glassco. (Reg'd)

Branch Office: TORONTO, ONT. **ENGINEERS** **St. Nicholas Bldg. MONTREAL, P.Q.**





Will They Fit Your Organization?

SHOWING how simple 70 Wright High-Speed Steel Hoists entered into the organization of a Canadian Firm.

The steel construction of this hoist, featured by the non-fouling chain guide, has established the Wright hoist firmly in the minds of Works Managers that they are decided assets in the economy plan of the organization. Regarding your shop organization—is it complete? Could it be made more complete and more economical by the addition of this hoist? Think it over and then inquire of us.

Wright Manufacturing Company

Lisbon Ohio U.S.A.

Canadian Distributors: The A. R. Williams Machinery Co.
Toronto, Winnipeg, Vancouver, St. John

WRIGHT

High Speed Steel Hoists

When Work Goes Smoothly

BOWSER ESTABLISHED 1885

Oil Storage Systems

assist in many ways to aid production, produce economy and efficiency wherever oil is used.

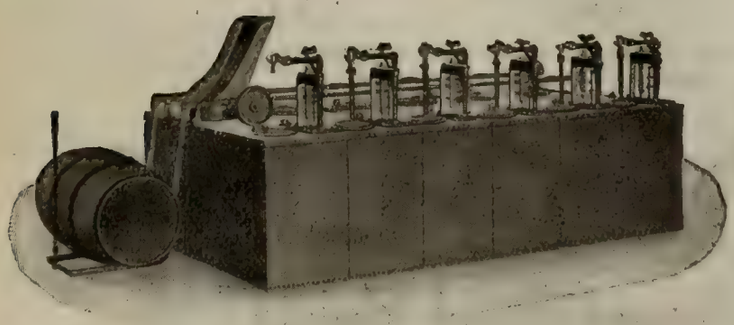
They provide effective storage and handling facilities for all kinds of oils. Keep oil clean, retain its value, prevent waste, and encourage the proper use of oil, which results in better work with less effort.

Outfits can be placed where most convenient, saving time and trouble.

They are accurate, durable and safe; every shop needs the Bowser.

S. F. BOWSER & Co., Inc.

Sales Offices In all Centers **TORONTO, ONT.** Representatives Everywhere



A System for Every Need

Philadelphia GEAR Works

Vine St., Philadelphia, Pa. U.S.A.

Rawhide Gear

Spur, Bevel, Herringbone Spiral and Intermittent

GEARS AND PINIONS

Made in all kinds of Metals, Rawhide and Fibre.

SPROCKET WHEELS

Made To Order

Distributors of

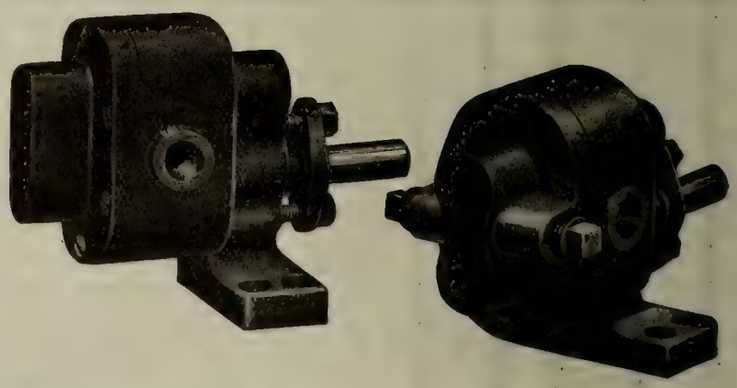
DIAMOND CHAINS

For Power Transmission Machinery & Motor Trucks Motor-Cycles and Bicycles

We ship GEARS to all parts of Canada.

Write us when you want good gears, good service.

Get our Gear Catalog: "ALL ABOUT GEARS."



Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.

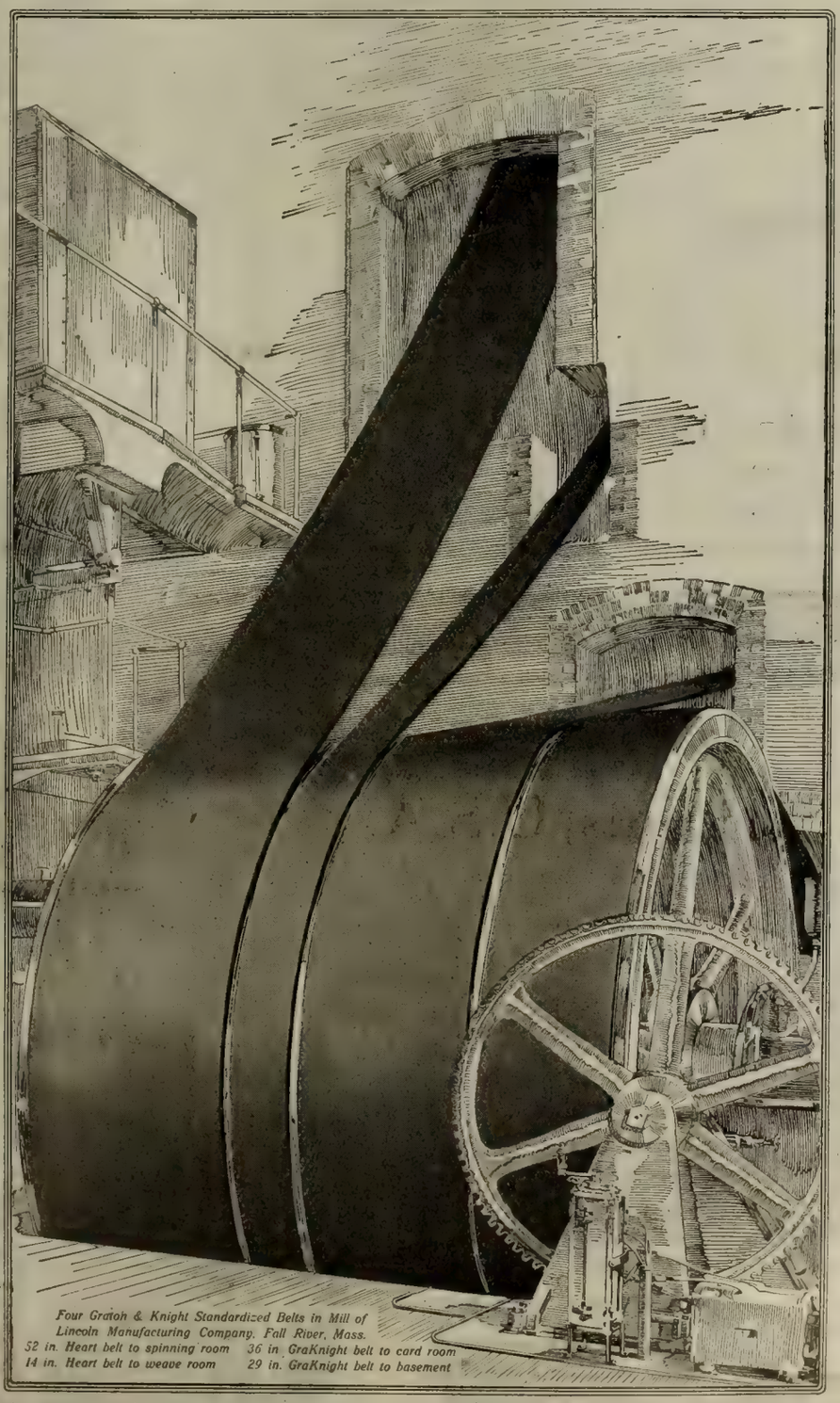
Hopedale : Mass. : U.S.A.

GRATON & KNIGHT

Standardized Series

LEATHER BELTING

Tanned by us for belting use



Four Graton & Knight Standardized Belts in Mill of Lincoln Manufacturing Company, Fall River, Mass.
52 in. Heart belt to spinning room *36 in. GraKnight belt to card room*
14 in. Heart belt to weave room *29 in. GraKnight belt to basement*

Big Belts— For Big Jobs

There is one right way, and only one right way, to buy belting. That is on the basis of the *work to be done.* A big job needs a big belt.

If you buy it as you buy machinery — you will standardize it, as you have standardized your machinery. You will buy Standardized Belting.

Standardized Belts are made to the actual standards of the job. They have been worked out during sixty-six years of belting experience. The requirements of every kind of power transmission have been classified and a Standardized Belt evolved to meet the actual demands of each.

There is Graton & Knight Heart Brand, the standardized extra-heavy oak-tanned center stock belt — GraKnight, the standardized, medium-weight, oak-tanned center stock belt — GraKnight Dynamo, the standardized, light-weight, oak-tanned center stock belt—Neptune, the standardized, water-proof belting — Spartan, standardized for exacting conditions or difficult drives.

The way to save money on belting isn't to buy cheaper belts— but to buy the belt that will do your work best.

Apply Standards to your power Transmission. Our Engineers are at your service—let them help you standardize your belting.

The Graton & Knight Mfg. Company

Oak Leather Tanners, Makers of Leather Belting, Lace Leather, Leather Packings and Sundries

Worcester, Mass., U S.A.

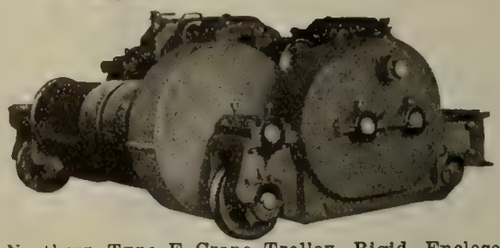
Canadian Representatives: The Canadian Fairbanks-Morse Co., Limited, St. John, Montreal, Ottawa, Toronto, Hamilton, Quebec, Calgary, Edmonton, Vancouver, Windsor, Winnipeg, Victoria.

GRATON AND KNIGHT

CANADIAN MADE CANADIAN MADE

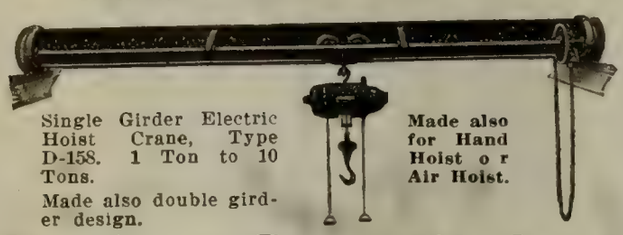
Electric and Hand Traveling Cranes

Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons.



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons.

Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

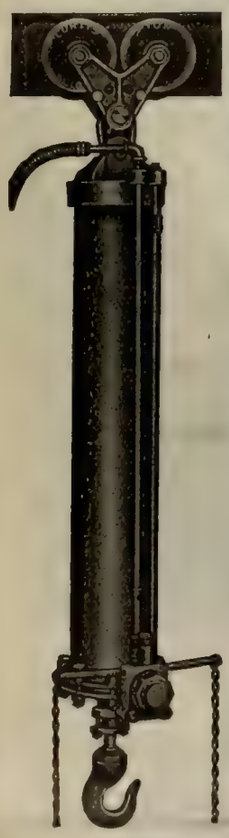
Type D Electric Hoists —½ to 10 Tons.

Air Hoists, Trolleys and Tracks.

Type No. 20 Air Hoist.

Northern Crane Works, Limited

Walkerville, Ontario, Canada



CURTIS, St. Louis, U.S.A.

AIR COMPRESSORS — AIR HOISTS — TROLLEYS AND TROLLEY SYSTEMS—SAND BLASTS—PNEUMATIC AND HYDRO-PNEUMATIC ELEVATORS—JIB AND TRAVELING CRANES.

We have specialized for over 22 years on pneumatic machinery. We have developed the simple air cylinder into a straight line motor with wonderful speed control and dependability capable of the widest application to hoisting problems.

Our new controlled-splash oiling system with regulatable sight feed cylinder oiling is something entirely new in air compressor design.

Complete catalogs and descriptive circulars on our entire line furnished on request.

Curtis Pneumatic Machinery Co.

1585 Kienlen Avenue - St. Louis, U.S.A.
New York Office - 532F Hudson Terminal

Standard Pressed Steel Co., Philadelphia, Pa., U.S.A.

Sole Distributors for Ontario

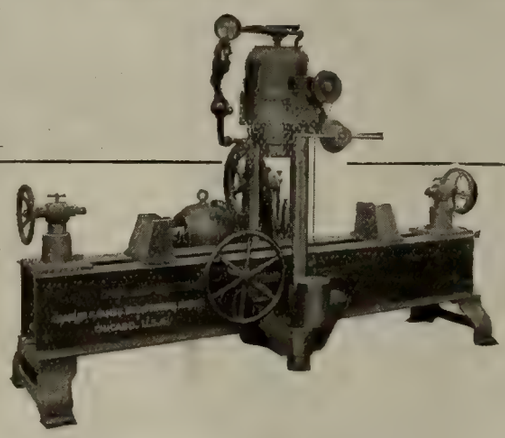
H. W. Petrie, Limited, Toronto, Ontario

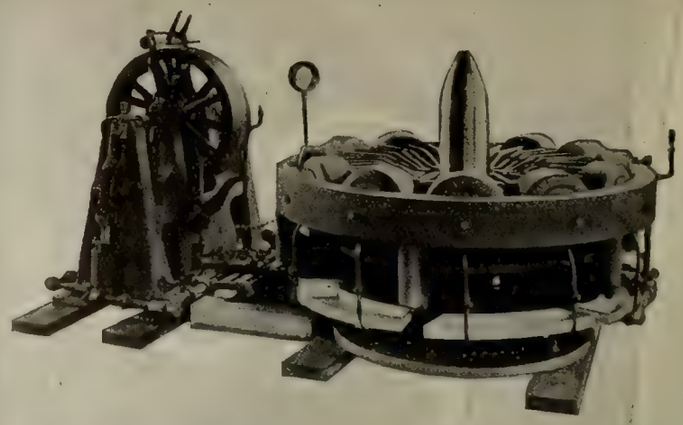
ELMES

Motor Driven Straightening Press for shafts up to 5 in. Movable head, height adjustable, close regulation of action, strong screw centre parts. One of our many types.

Charles F. Elmes Engineering Works.

217 N. Morgan St. Chicago, U.S.A.





The New "West" Banding Press

For 9.2" and 8" shells

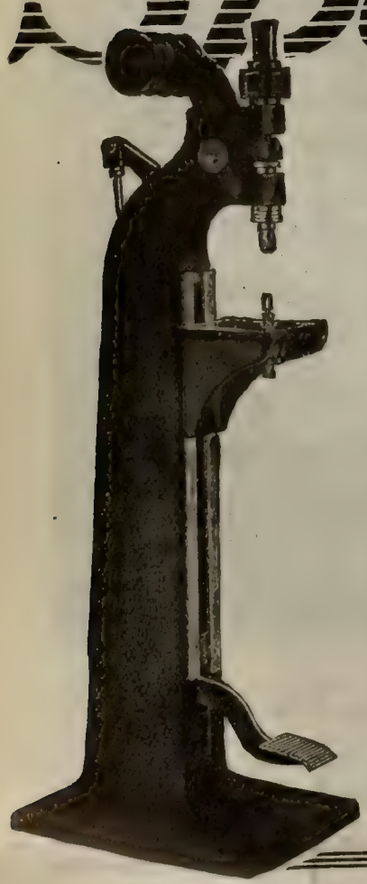
12 Cylinders; Ample Power; Ample Strength; Reasonable Price.

NO ACCUMULATOR REQUIRED.

The West Tire Setter Co.

255 Mill Street, Rochester, N.Y.

Speed



When the quality of the work is the best obtainable, the next item is speed. For upon speed depends your costs.

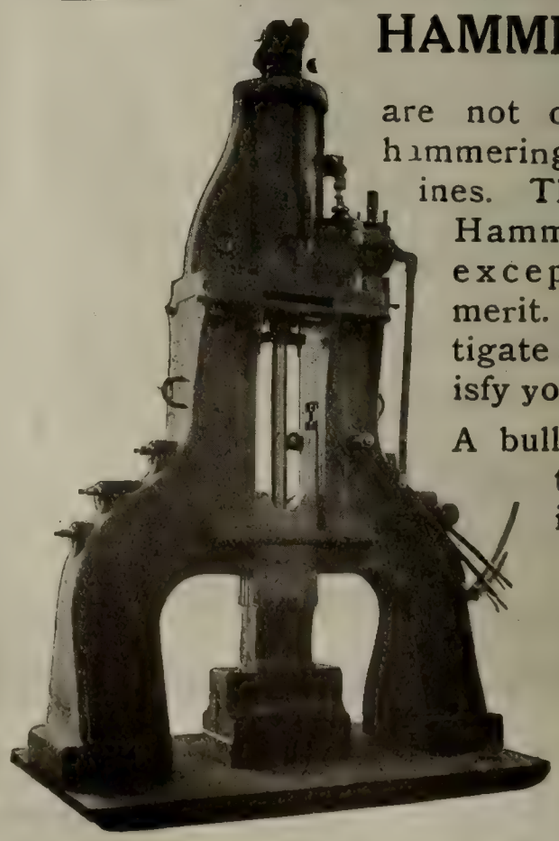
One rivet per second is the speed this machine will maintain indefinitely. Adapt that speed to your requirements and find out the value the Grant Riveter would be to you.

Write for our catalogue. It will give you complete information.

Grant Mfg. & Machine Company

Bridgeport, Conn., U.S.A.

"ERIE" STEAM FORGING HAMMERS



are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

ERIE FOUNDRY COMPANY

ERIE, PENNSYLVANIA, U. S. A.

A time saver
Can you beat it?

HAVE you noticed the Consolidated Clamp Connection on all Consolidated Presses, grips like a vise and stays put, one of the bull-dog kind, which, when properly tightened, will not break away, or slip.

If you break it we will furnish a new one free of charge.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

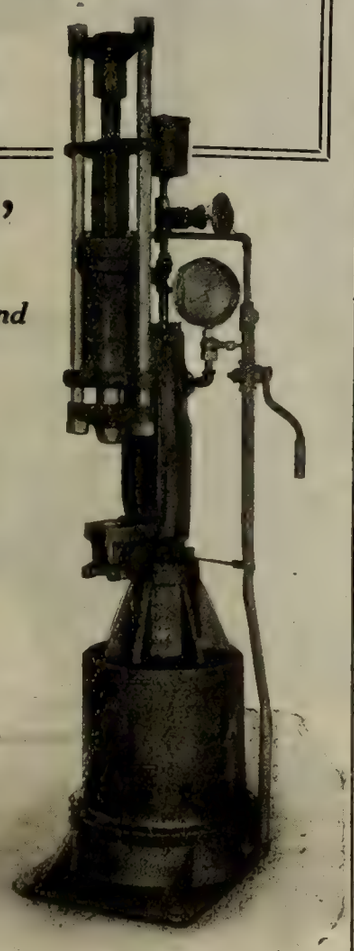
Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

Triple Purpose

"METALWOOD" COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.



Metalwood Mfg. Co.

Leib & Wight Sts., DETROIT, MICH. U.S.A.

For Great Britain and Continent address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

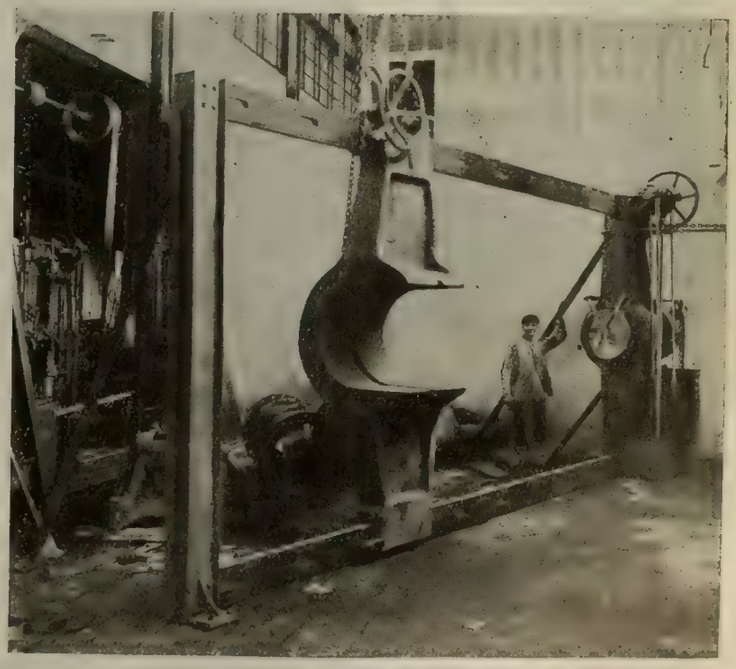


Illustration shows Hydraulic Press for Government Shipbuilding Plant, Sorel, Que.

Hydraulic Presses, Pumps and Accumulators for all Purposes.

Write for Prices and Deliveries.

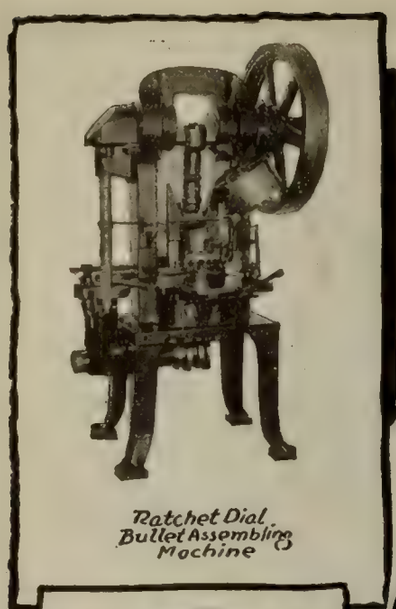
WM. R. PERRIN, LIMITED

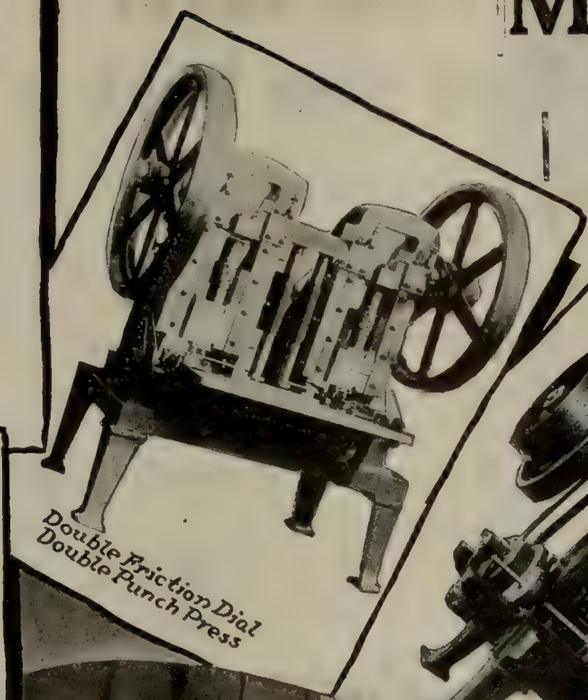
TORONTO, CANADA.

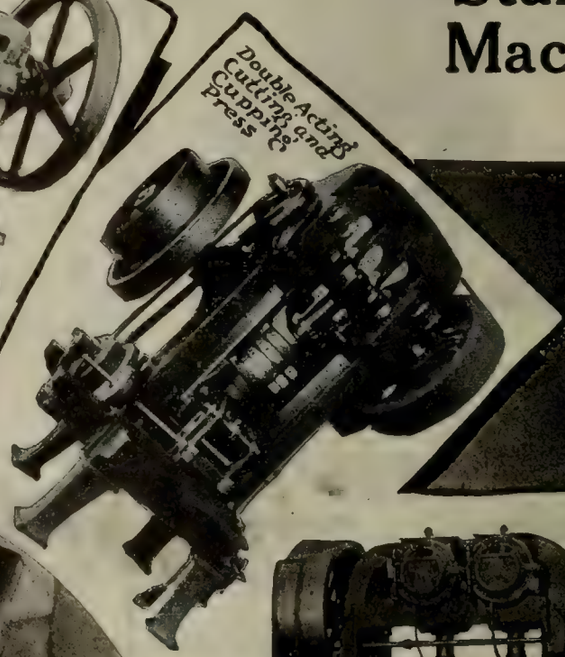
If any advertisement interests you, tear it out now and place with letters to be answered.

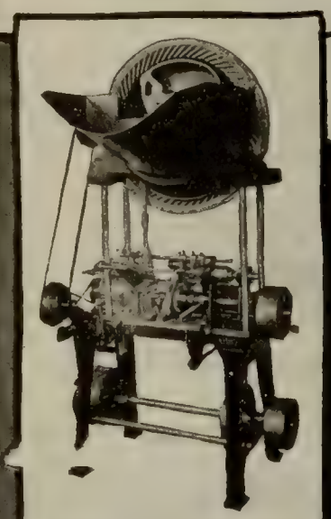
CARTRIDGE MACHINERY

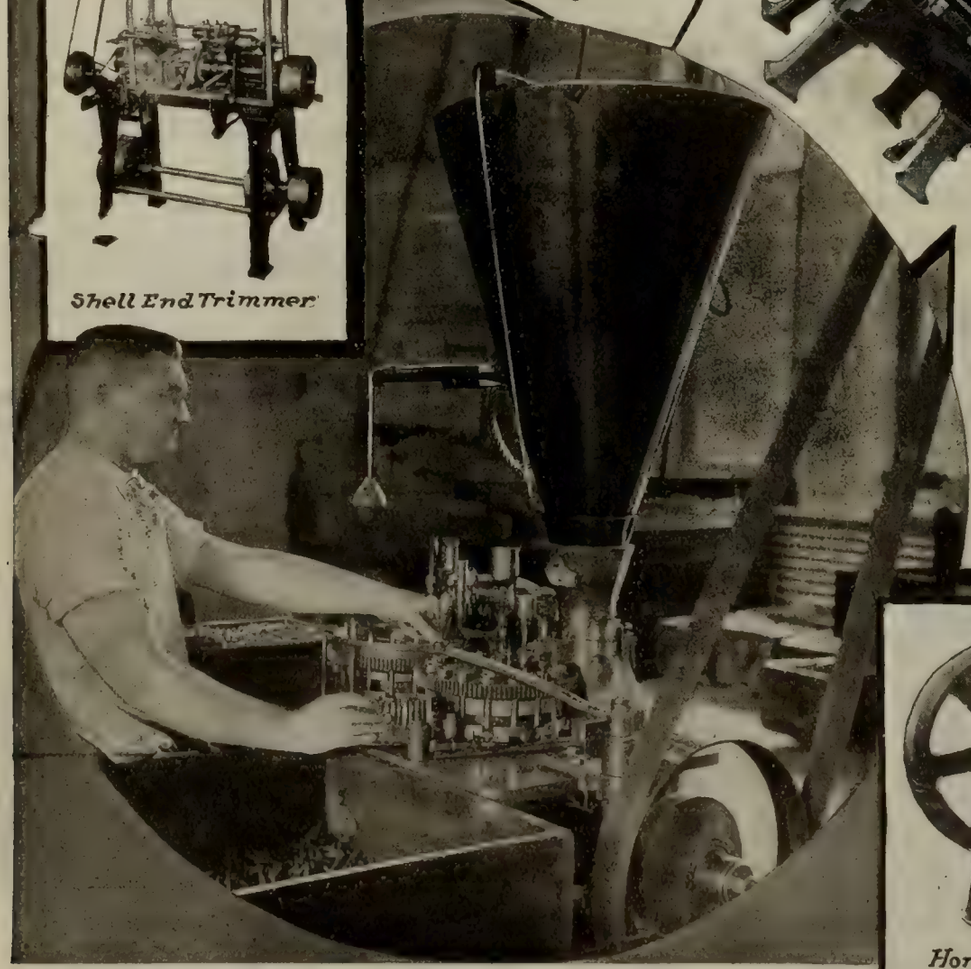
Waterbury Farrel Standard Machines


Ratchet Dial Bullet Assembling Machine


Double Friction Dial Double Punch Press


Double Acting Cutting and Cupping Press


Shell End Trimmer

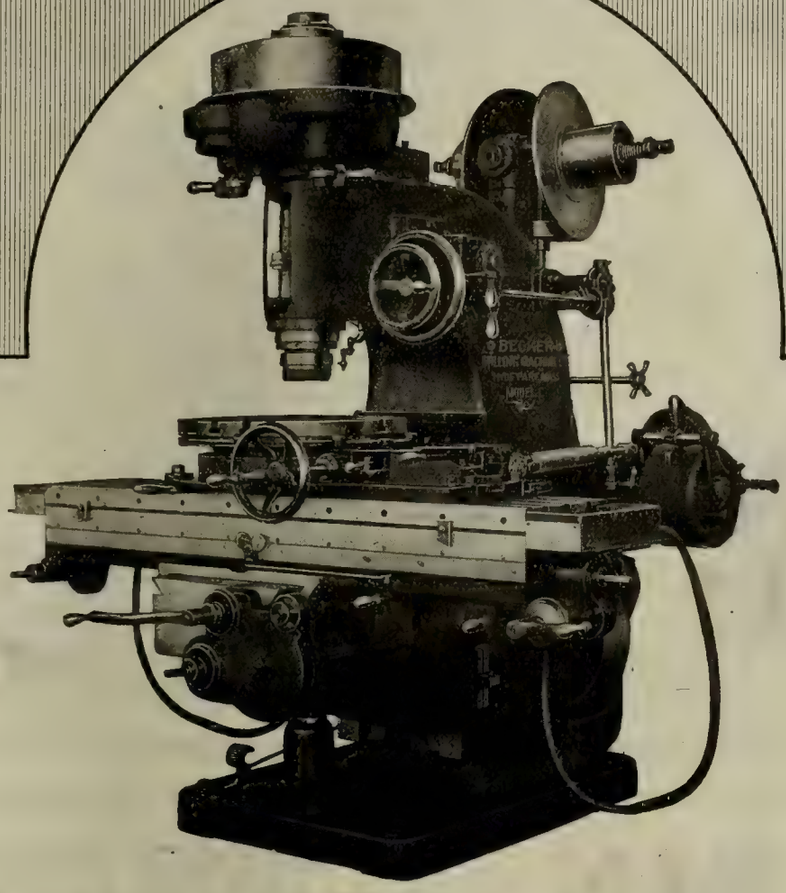

Standard Loading Machine in Government Arsenal

Straight Line Bullet Assembling Machine

Horizontal Header Hopper Feed

The Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn., U.S.A., has appointed me to be the sole manufacturer for export of their entire line of Cartridge and Shot Shell-Making Machinery. Proposals and Estimates covering complete plants or separate units, required for export will be furnished on request.

FREDERICK S. BLACKALL, Woolworth Tower, New York, U.S.A.



Selling Price *vs.* Production

Quantity production regulates the selling price. Quantity production also regulates the profit you make to meet competitive prices. When you have quality, does not your selling price control the market? We wish to consider your milling costs.

Comparative tests have always resulted in the Becker proving decidedly superior in quantity and quality production. The fixtures (not encumbrances) give an added ability of 40 to 360%. Your work comes within that range of actual saving. Let us co-operate with you.

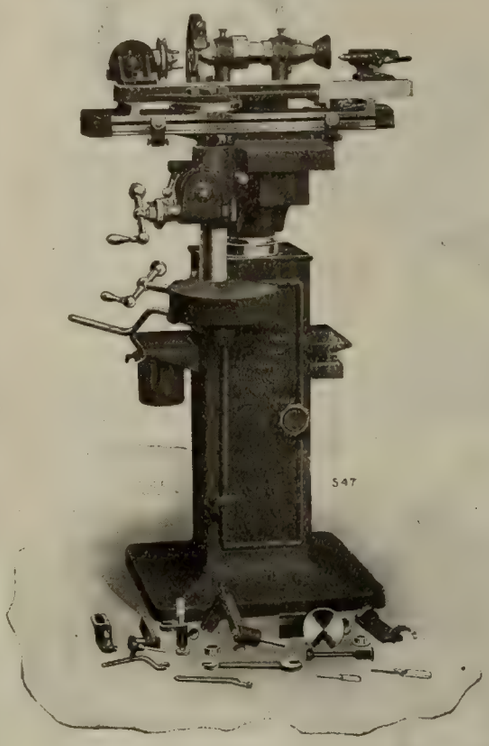
Becker Milling Machine Co.

HYDE PARK, BOSTON, MASS., U.S.A.

Agents:

The A. R. Williams Machinery Co., Limited, Toronto and Hamilton
Williams & Wilson, Limited, Montreal, Que.

The Cincinnati Number 1 Cutter Grinder



For the medium and smaller sizes of spiral mills, end mills, side mills, angular cutters, etc.—in other words—for the cutters which are used most extensively—this No. 1 Grinder has been popular for many years.

Practically every shop of any consequence has at least one. Many large shops use dozens. They find it just as valuable for sharpening reamers as it is for sharpening cutters.

It is handy. Can be quickly set to any angle. The knee carrying the table swings through a complete circle, and in addition, the table may be set at an angle with the slide. Has graduated dials for all settings, and the lever feed can be operated from any position handiest for the work being done.

We are offering these machines for quick shipment

The Cincinnati Milling Machine Co.
Cincinnati, Ohio

Canadian Agents: H. W. Petrie, Ltd., Toronto, Ont.; H. W. Petrie, of Montreal, Ltd., Montreal, Que.; Taylor Engineering Co., Ltd., Vancouver, B.C.; General Supply Co., of Canada, Winnipeg, Man.

GARVIN

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

No. 12 Plain Milling Machine—Use Code Abrade

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rapidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments . . . . . 18 x 6 x 15 in.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

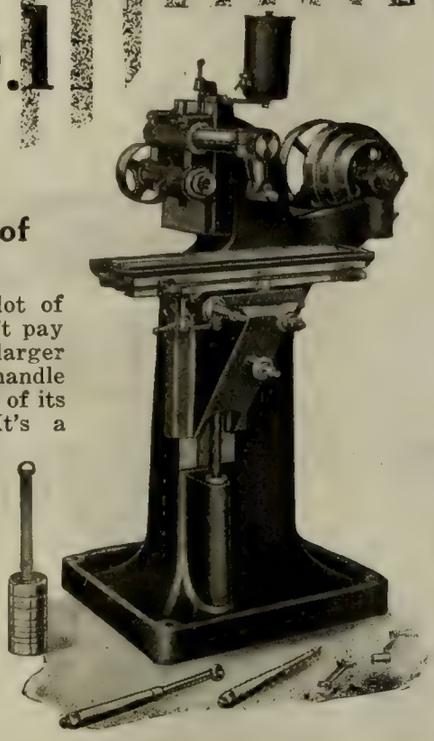
Send for Complete Catalog

Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City

U.S. Milling Machine No. 1



Capable of
Wide Range of Work

You can handle a lot of work that it wouldn't pay you to put on a larger machine and it will handle work no other miller of its size can touch. It's a little machine with a big capacity—an economy worker.

United States Machine Tool Company
Cincinnati, Ohio, U.S.A.

Universal Gear Hobber

The machine which completes our lines to cut all types of small gears except internal, within 10″ dia. 8 Pitch.

The Bilton Gear Hobber will cut spur spiral gears, worm gears, also various special shapes of teeth. It can cut a spiral gear on end of a shaft 1⅜″ diam. 24″ long.

SPECIFICATIONS

Capacity Gears: 10 Diametral Pitch
10 in. Outside Diameter
10 in. Width of Face
Range of hob feed 50-250 R.P.M.
Range hob feed to each rev. of worm .010 to .125
Drive: 3 Steps Cone Pulley; 2½ in. Belt
Weight 2,100 lbs.

A machine of latest design, introducing new features which increase production without sacrificing accuracy. The hob is cutting continuously; operation of machine entirely automatic.

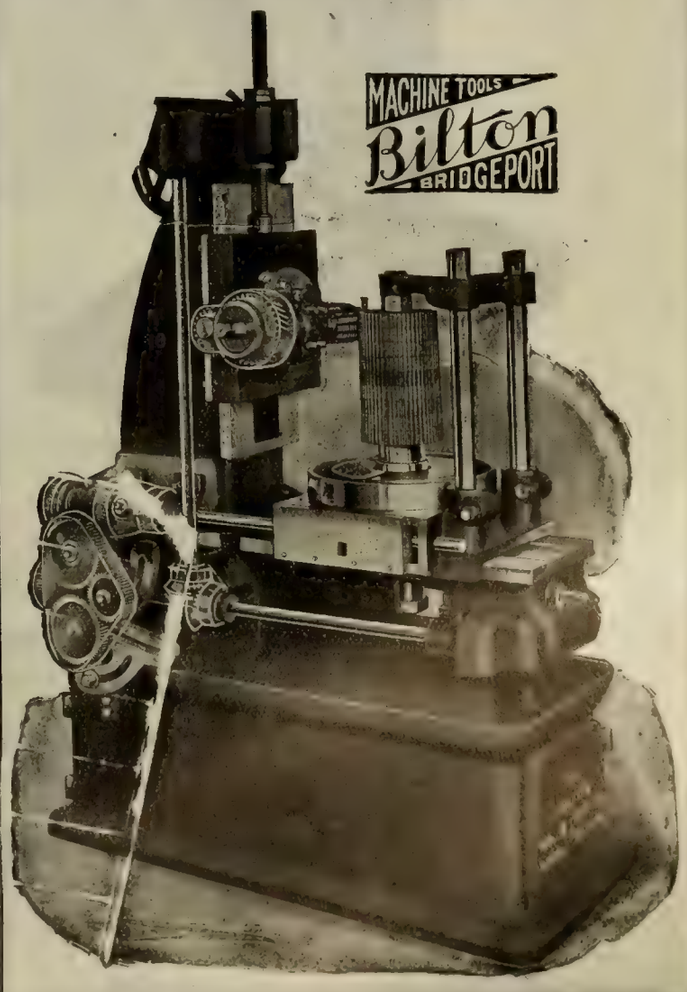
DELIVERY

A few of these machines are now available for October delivery.

Send for copy of new catalog No. 30, and bulletin describing this machine.

The Bilton Machine Tool Co.
Bridgeport, Conn.

Foreign Agents: Alfred Herbert Ltd., M. Mett Engineering Co., Chas. Churchill & Co.



For Rapid Production and Accurate Work

USE THE

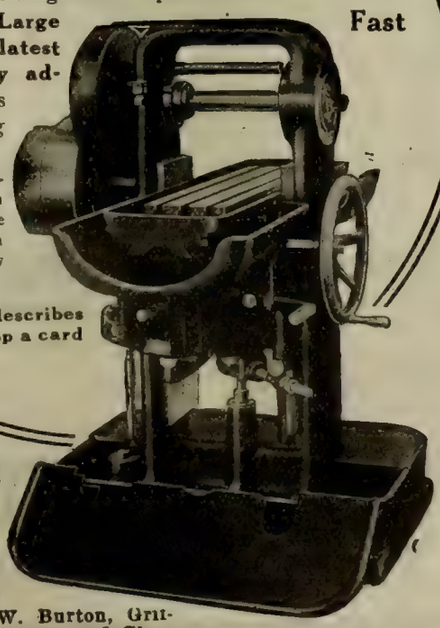
"BRIGGS"

The Briggs Miller handles work no other machine of its size can touch. It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

The Base Tank and Large Gear Pump is the latest addition to its many advantages. Tank holds 20 gallons of cutting lubricant

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

Fast



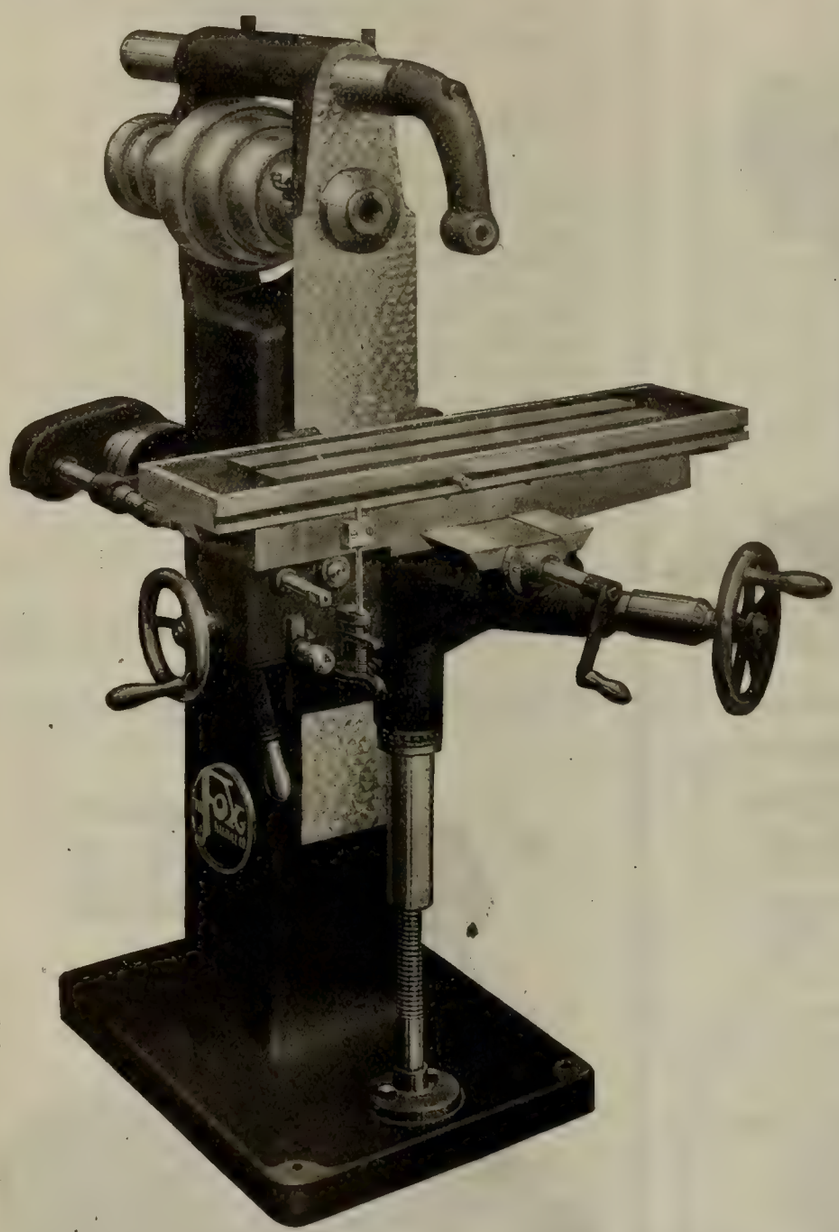
Our booklet describes fully. Drop a card for it.

Gooley & Edlund Inc.
Cortland, N.Y., U.S.A

Foreign Agents: Allied Machinery Company of America, France, Belgium, Italy, Switzerland, Russia, Scandinavia, C. W. Burton, Griffiths & Co., London, Manchester and Glasgow, Barandiaran, Metivier, Gazeau & Cia, San Sebastian, Spain.

The Fox Milling Machine

For Intense Production



Fox

MILLING MACHINES

lead the field

Power Feed Milling No. 3

The Fox Milling Machines are ideal, as they are particularly adapted for just that sort of work.

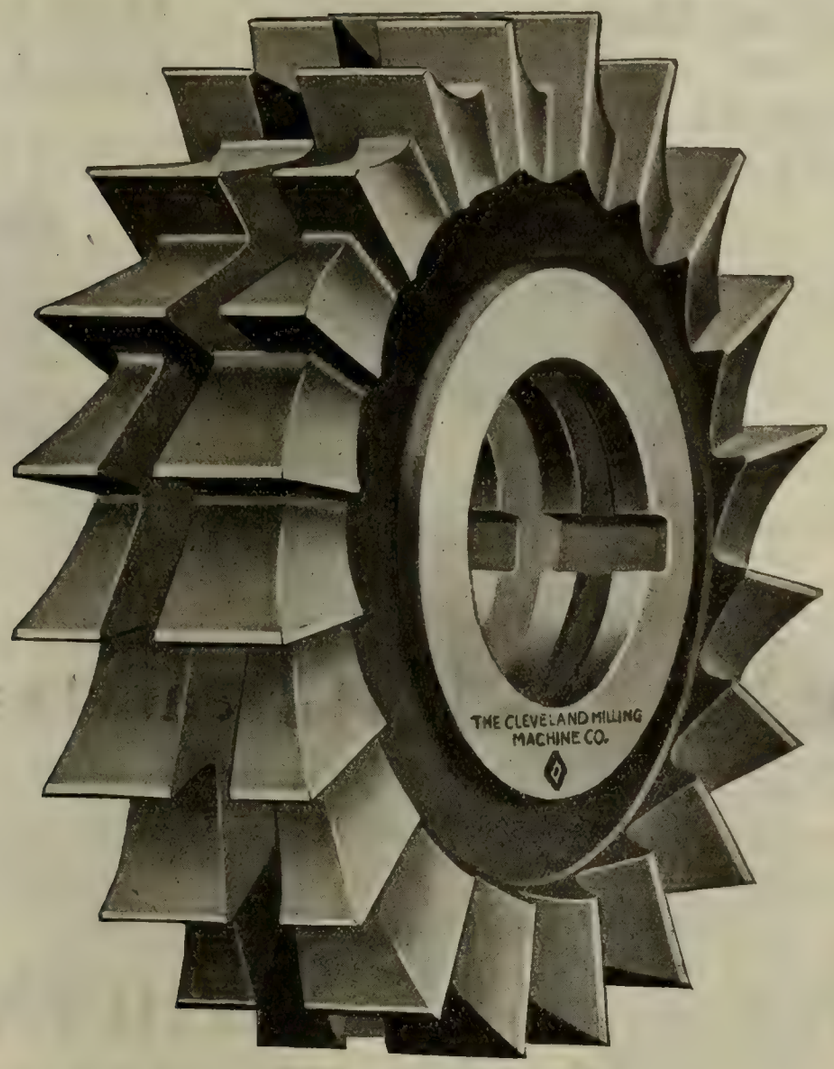
Every machine is provided with micrometer dials on the vertical and transverse movements, thus insuring accuracy in every detail.

Write for full particulars.

FOX MACHINE COMPANY

1047 W. Ganson Street, Jackson, Michigan

Milling Cutters Milling Machines Relieving Machines



The great ideal of service is uppermost in the mind of every man who has anything to do with the manufacture of this cutter, from the selection of the steel to the final inspection. Even then we do not consider the cutter finished until it has proven to your entire satisfaction that it is really the best cutter made.

Service Courtesy

We have a complete stock of Standard Cutters

IMMEDIATE DELIVERY

THE CLEVELAND MILLING MACHINE CO.

Cleveland, Ohio

HALL

Pipe Threading Machinery
AND
Shell Cutting-off Machines

This illustration shows the new No. 8 Hall Gear Box Driven Pipe Lathe. Regular Capacity 2½" to 8" inclusive.

The last word in Pipe Machine Construction

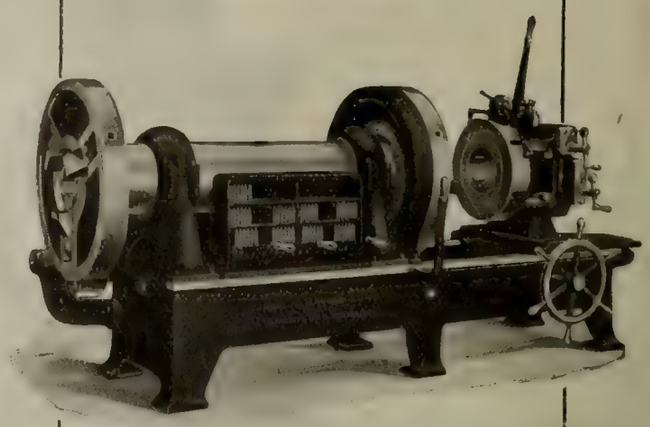
Let us give you full particulars of this machine which is only one of a large number having capacity ⅛" to 18" pipe.

Write us for catalog and prices on:

Pipe Threading Machines Nipple Threading Machines
Roller Pipe Cutters
or
Cutting-off Machine for shells or bar stock.
Any capacity ⅛" to 18".

John H. Hall & Sons, Ltd.
BRANTFORD, CANADA
EUROPEAN AGENTS:
Universal Machinery Corporation, Limited, London

Made in Canada



Capacity
2½" to 8"
inclusive

Tel. Main 6755 **Jos. Bickerstaff, Mgr.**

THE ELM CUTTING OIL COMPANY
645 East King Street
TORONTO

You have tried the rest. Now use the best for screw cutting and threading.

Our standard is uniformity at all times and a guarantee of quality with every barrel of oil produced.

PRICES ON APPLICATION

"WHITNEY"
KEY-SEAT CUTTERS
For the Woodruff System of Keying
GET OUR PRICES

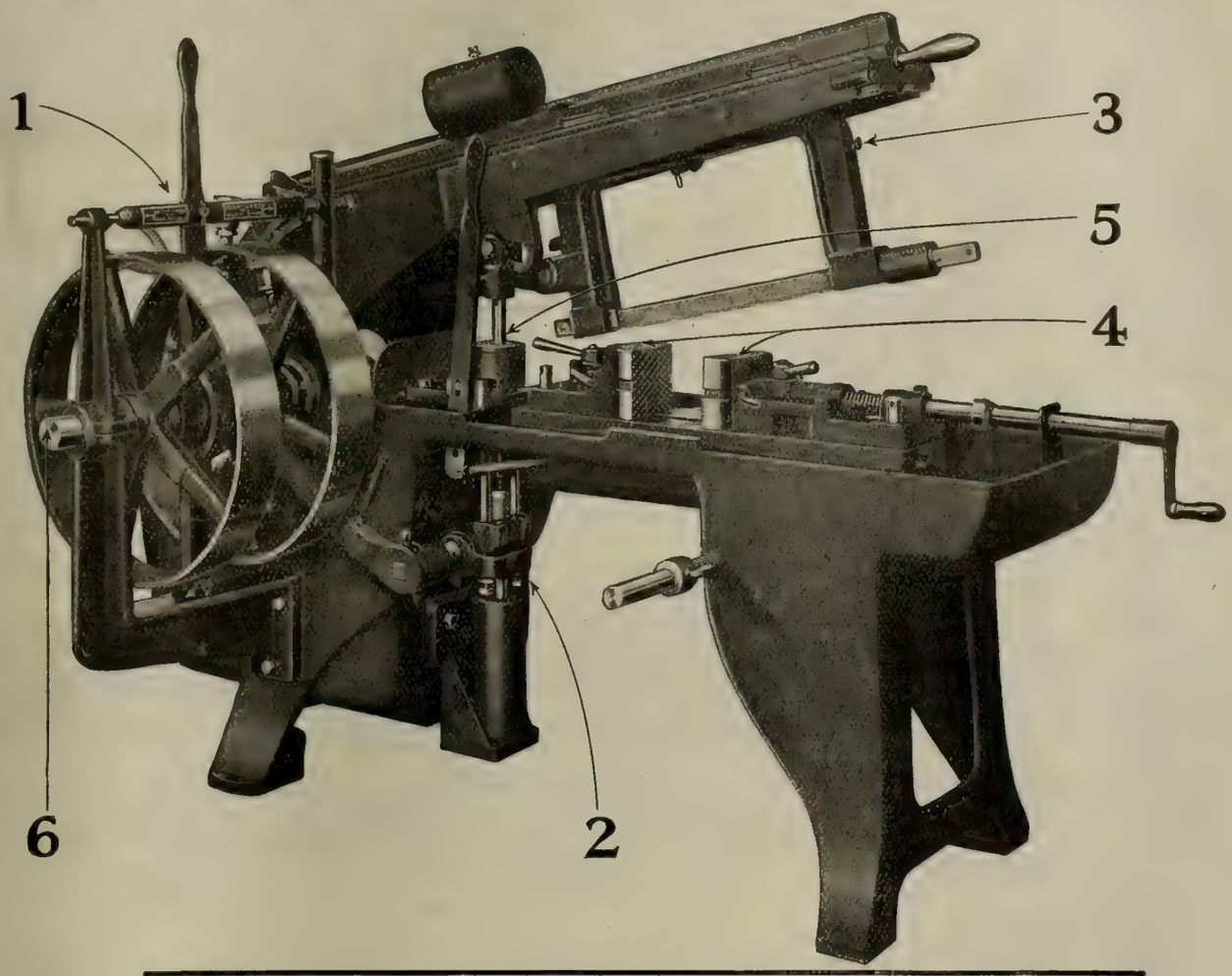
Either carbon or high-speed steel. Material the best obtainable. Unsurpassed in efficiency and durability. Centred at both ends. Unsurpassed in accuracy and finish. Large quantities carried in stock.

The Whitney Mfg. Co., Hartford Conn.
Chains, Keys and Cutters, Hand Milling Machines

Distinctive Features

of the V.S.W. No. 5

High Speed Hack Saw Machine



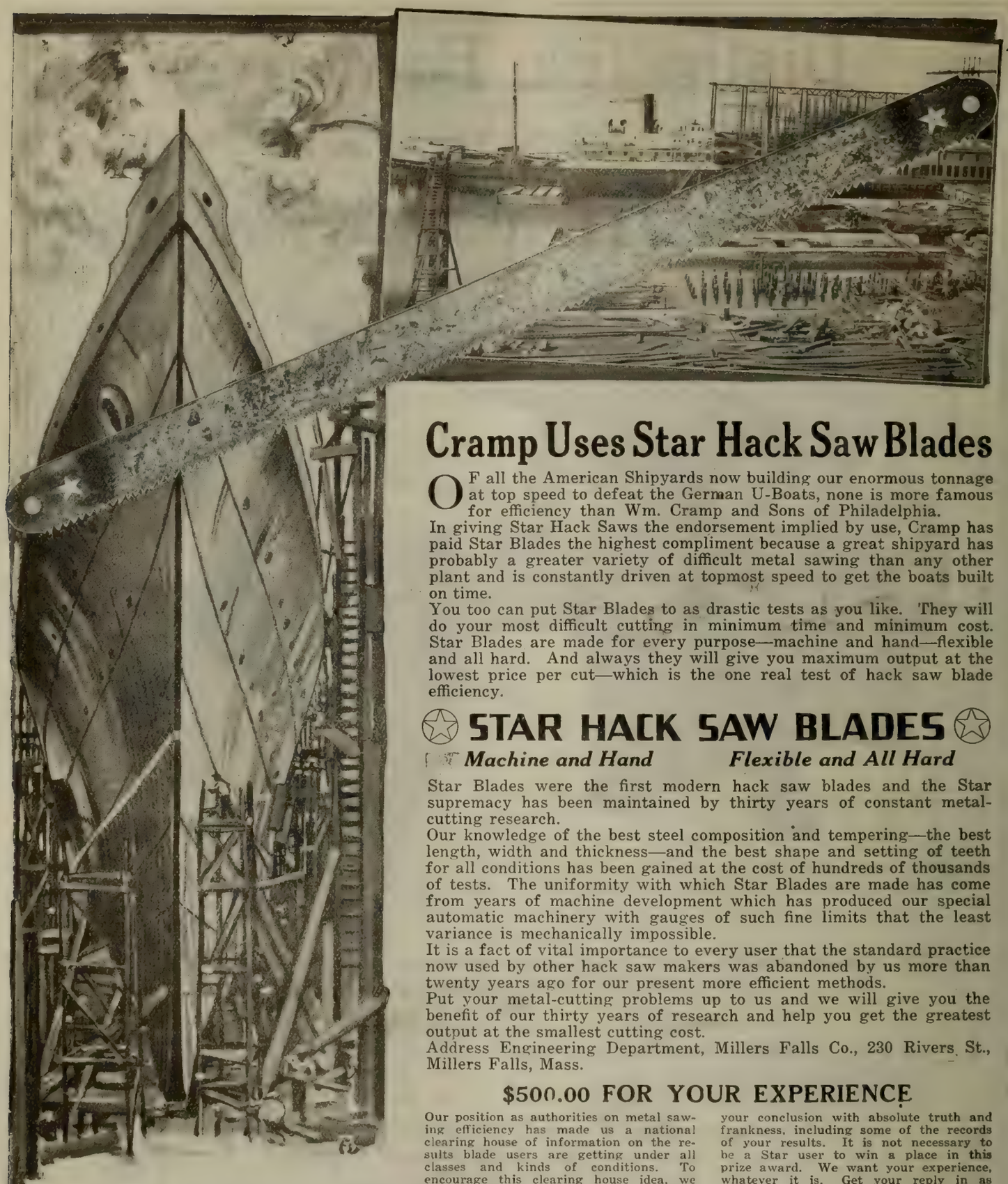
DISTINCTIVE FEATURES

1. Two Speeds.
2. Shock Absorber.
3. Extension Frame.
4. Patent Swivel-Jawed Vise.
5. Automatic Patent Lift.
6. Frame Swings on Shaft Center.
7. Rotary Pump.
8. Knock-off.
9. Frame Bearings.
10. Tank.
11. Perfect Blade Alignment.
12. Lubricating System.
13. Draw-Cut.

For Explanation of these and other features send for Circular

VICTOR SAW WORKS LIMITED

HAMILTON, CANADA



Cramp Uses Star Hack Saw Blades

OF all the American Shipyards now building our enormous tonnage at top speed to defeat the German U-Boats, none is more famous for efficiency than Wm. Cramp and Sons of Philadelphia.

In giving Star Hack Saws the endorsement implied by use, Cramp has paid Star Blades the highest compliment because a great shipyard has probably a greater variety of difficult metal sawing than any other plant and is constantly driven at topmost speed to get the boats built on time.

You too can put Star Blades to as drastic tests as you like. They will do your most difficult cutting in minimum time and minimum cost. Star Blades are made for every purpose—machine and hand—flexible and all hard. And always they will give you maximum output at the lowest price per cut—which is the one real test of hack saw blade efficiency.

STAR HACK SAW BLADES

Machine and Hand ***Flexible and All Hard***

Star Blades were the first modern hack saw blades and the Star supremacy has been maintained by thirty years of constant metal-cutting research.

Our knowledge of the best steel composition and tempering—the best length, width and thickness—and the best shape and setting of teeth for all conditions has been gained at the cost of hundreds of thousands of tests. The uniformity with which Star Blades are made has come from years of machine development which has produced our special automatic machinery with gauges of such fine limits that the least variance is mechanically impossible.

It is a fact of vital importance to every user that the standard practice now used by other hack saw makers was abandoned by us more than twenty years ago for our present more efficient methods.

Put your metal-cutting problems up to us and we will give you the benefit of our thirty years of research and help you get the greatest output at the smallest cutting cost.

Address Engineering Department, Millers Falls Co., 230 Rivers St., Millers Falls, Mass.

$500.00 FOR YOUR EXPERIENCE

Our position as authorities on metal sawing efficiency has made us a national clearing house of information on the results blade users are getting under all classes and kinds of conditions. To encourage this clearing house idea, we offer $500.00 in gold for the best articles on "How I Test Hack Saws."

Tell us your methods in detail (either on machine or hand blades) and give us your conclusion with absolute truth and frankness, including some of the records of your results. It is not necessary to be a Star user to win a place in this prize award. We want your experience, whatever it is. Get your reply in as early as possible. Contest closes at Millers Falls, Nov. 30. The best replies will be published in book form and in our advertising.

1st Prize	$250.00	3rd Prize	$50.00	5th Prize	$15.00
2nd Prize	100.00	4th Prize	25.00	6th to 11th Prizes each	10.00

Manufactured By
CLEMSON BROS.
MIDDLETOWN, NEW YORK

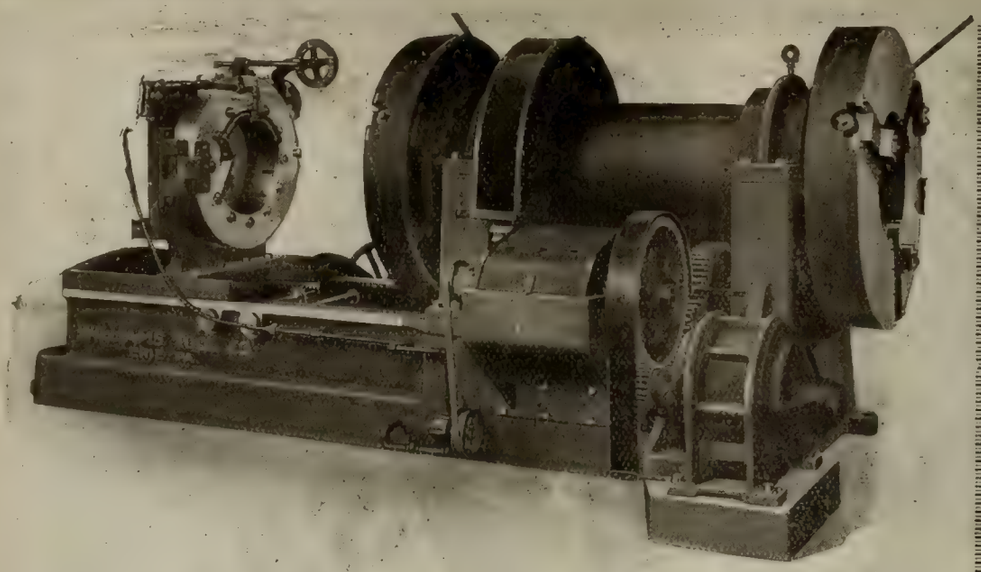
Sole Distributors
MILLERS FALLS CO.
MILLERS FALLS, MASS.

THE SUN NEVER SETS ON QUALITY SAWS

EVERY TOOTH CUTS
ON
EVERY QUALITY SAW
THEY CUT STRAIGHTER AND LAST LONGER

Canadian Representative:
F. Bacon & Company, Montreal, Canada

NAPIER SAW WORKS Inc.
SPRINGFIELD, MASSACHUSETTS U.S.A.



Highest Award Panama Exposition

Williams Tool Company

Erie, Penn., U.S.A.

Canadian Agents:
The A. R. Williams Machinery Co., Ltd., Toronto, Canada

European Agents:
Universal Machinery Corp. London, England

Pipe Machines

Threading

Cutting-off

Quality will tell in every test. At the Panama Exposition the Williams Cutting-off Machine was given the highest award. What does that mean to you?

It means that your pipe-threading and cutting-off operations will cease to give you any cause to worry if you are "Williams" equipped.

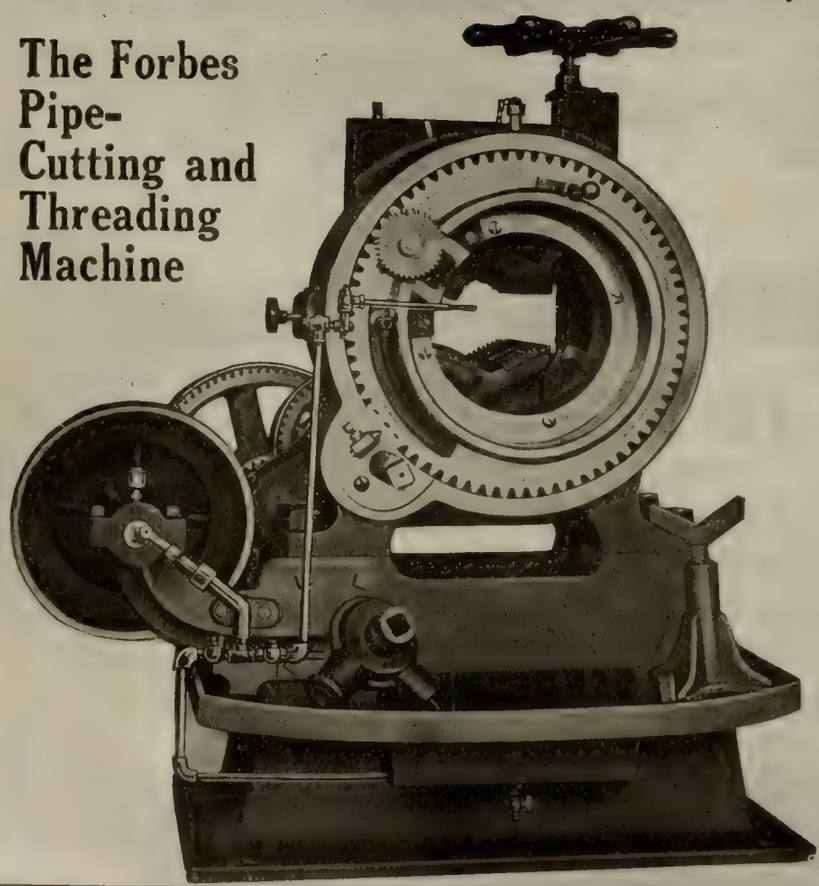
Made in 11 different sizes, each machine handling 8 to 10 consecutive sizes of pipe from ¼" to 18" dia.

Williams cutting-off machine is an investment, not an expenditure. It realizes exceptional dividends.

Write us at once!

CUTS THREADS FAST, CLEAN and TRUE

The Forbes Pipe-Cutting and Threading Machine



One man can do the work of six against old Stock and Die method of cutting

These are not exaggerated statements—they are facts that are being proven every day by Forbes' Users. Inquire for yourself. Investigate its performances closely and you can't help but admit its labor-saving, perfect-working value.

Inexpensive to Operate

It is simple, compact, self-contained, and all wearing parts are adjustable. One man can operate it and for heavy pipe work it can be taken right to the job.

Fitted with self-centering vise that holds the heavy pipe stationary, while the dies turn around it. The latter are clamped and released by a throw of the lever.

Write for our latest bulletin giving full details.

THE CURTIS & CURTIS CO.
Garden Street, Bridgeport, Connecticut, U.S.A.

Known the World Over

Admitted to be Superior

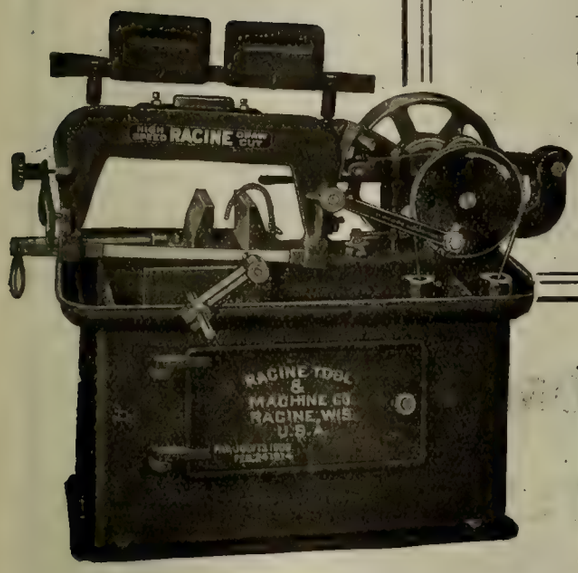
The Racine for Scientific Metal Cutting.

Demonstrate the value of this machine in your own shop, on your own work. Our confidence in the ability of this machine is such that we will send it to you on *trial*. This will give you ample opportunity to study the machine from close quarters; to verify our statements regarding simple construction and operation, accuracy and speed, features that stamp our machine in a class by itself.

We invite your inquiries for full information and installation.

Racine Tool & Machine Co.

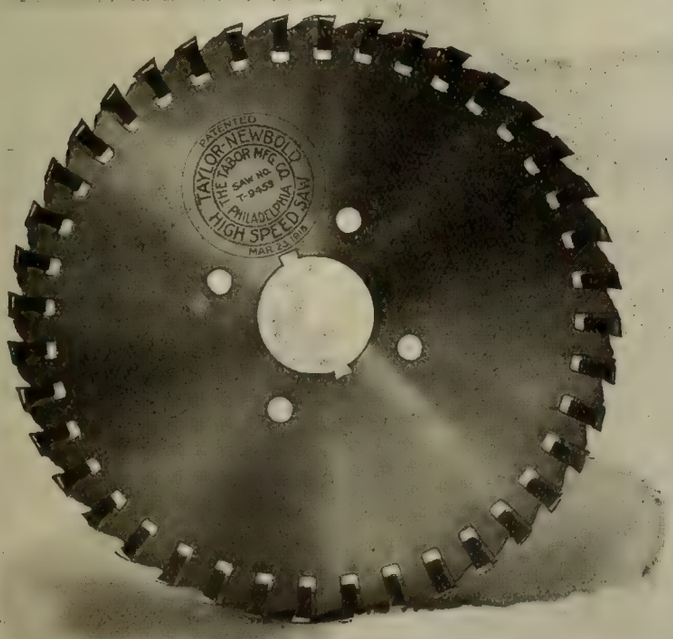
15 Melbourne Ave. **Racine, Wis., U.S.A.**



RACINE

THE IMPROVED

TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW

WRITE FOR BULLETIN T-S

Tabor Mfg. Co., Philadelphia, U.S.A.

DOUBLE SAVINGS

in cutting on PEERLESS HIGH SPEEDMETAL SAWS; they save both Time and Material.

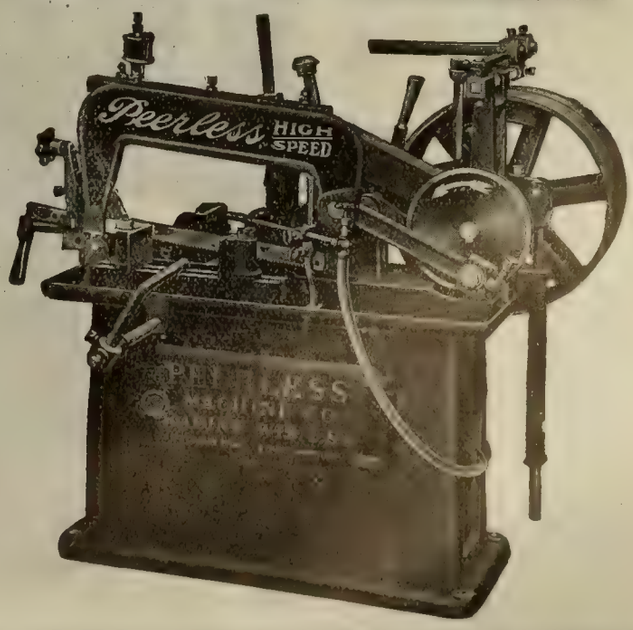
Supposing you save only 1/16 on each cut, 200 lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

Have you ever stopped to consider the waste of material in wide cuts, especially at the present high cost, will pay for a PEERLESS in a remarkably short time.

This is only one of the reasons for so many repeated orders and large concerns having standardized the PEERLESS. The many other reasons can only be fully appreciated after comparative test.

Write for a list of users; some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

PEERLESS MACHINE CO. **1607 Racine St. RACINE, WIS., U.S.A.**



What Counts Save Results?

Embodied in the meaning of that word "Results" are—quality, quantity and the efficiency of the machine. So, when the quality is undoubted, speed is the primal requisite.

This No. 7½, Single Spindle Grinder, is built with unusually large dimensions throughout. The 30" disc wheel is interchangeable with the 20" ring wheel chucks. Spindle, 2¾" diameter and mounted in self-aligning radial and thrust ball bearings. The rocker shaft is 3½" diameter and supports two Lever Feed Tables. The 9" face of the pulley gives wonderful driving power.

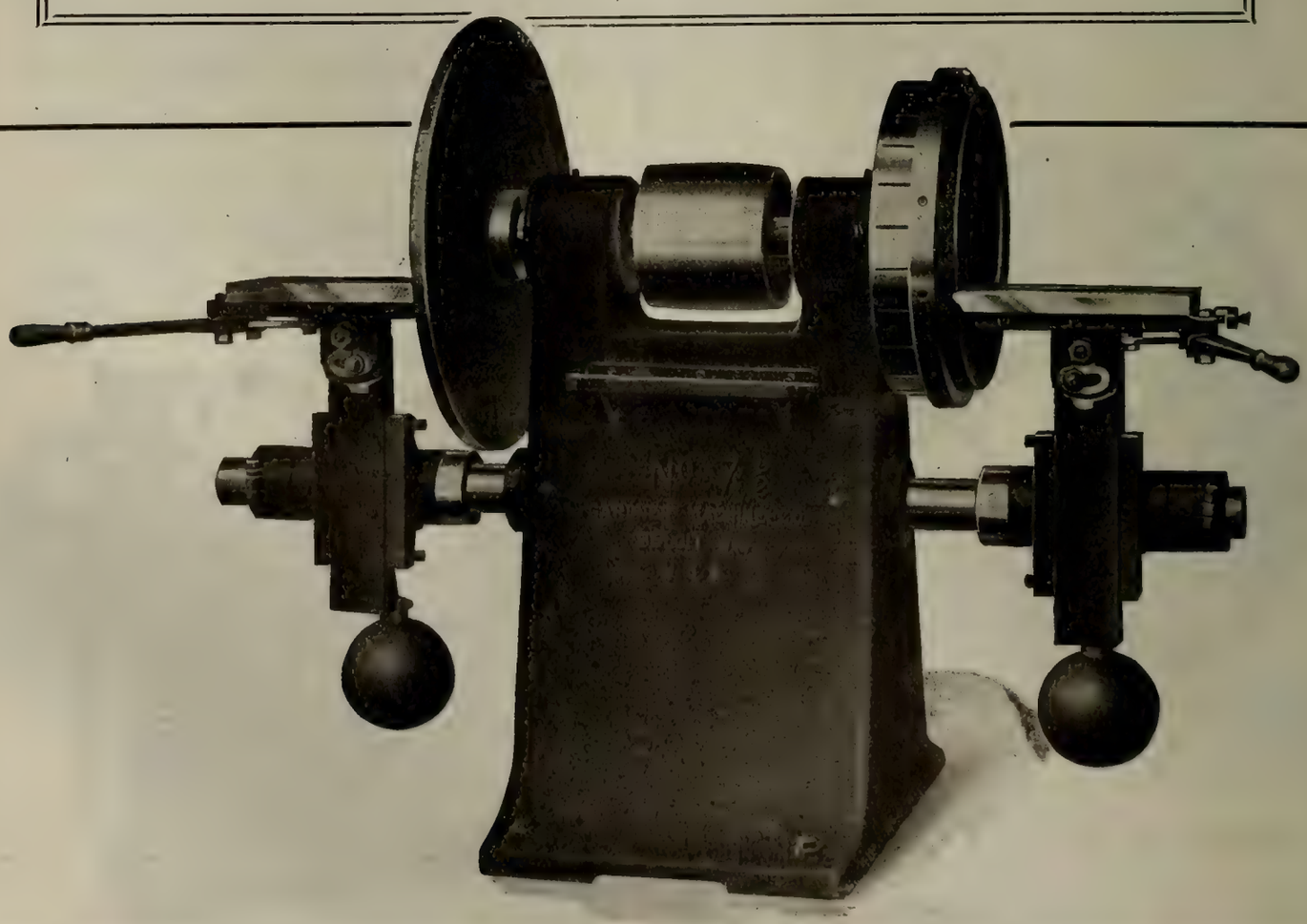
If you are not acquainted with the Gardner line of Single or Double Spindle Grinders, consider it a pleasure for us to supply you with all the information you desire. Our line is most comprehensive. We maintain a Service Department solely to give valuable service to the trade. Write us. We could help one another.

GARDNER MACHINE COMPANY

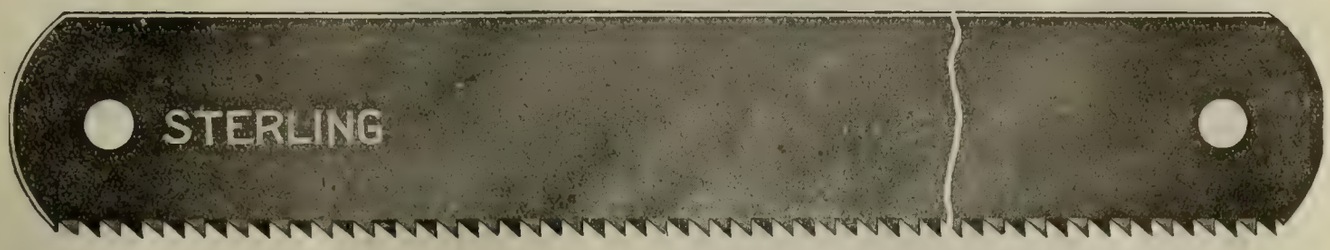
Beloit, Wisconsin, U.S.A.

Canadian Sales Agents: **THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED**

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

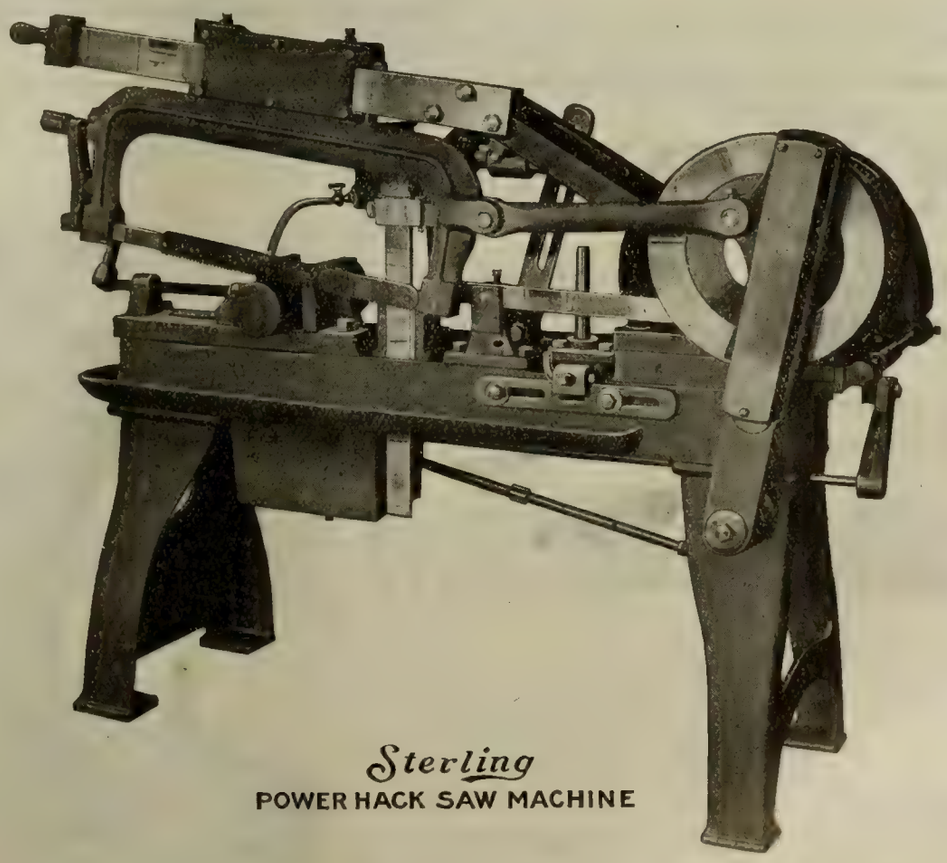


"STERLING"



The man who knows, says this brand of Hack Saw Blade is good—he believes there are none better. The hand blades in all pitches are the best that can be made, also for power machines, they cut true, cut fast and last long. They give real value used in any first-class machine.

A combination of this blade with a "STERLING" No. 5 High Duty Power Hack Saw Machine is a real winner, and for cutting shell and shrapnel material has no superior.

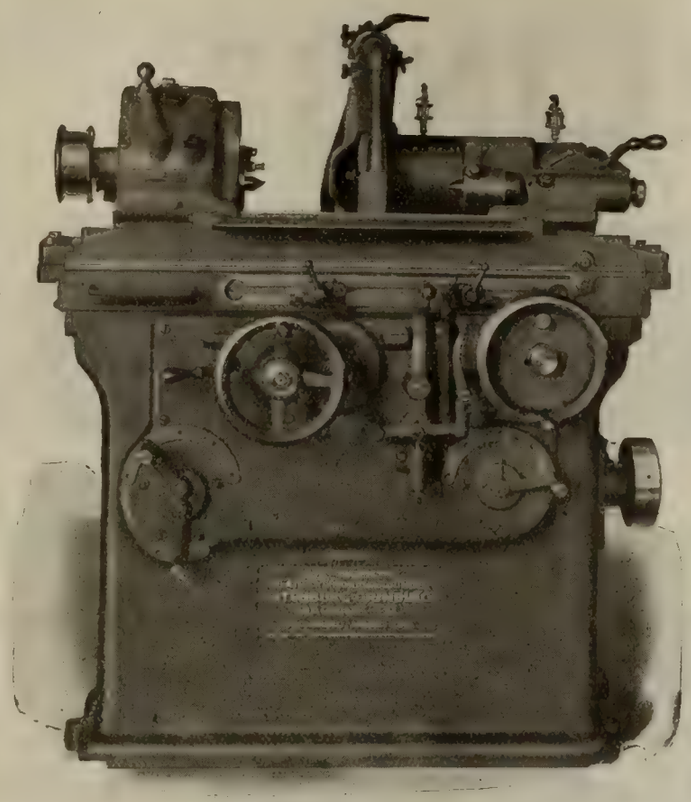


Sterling
POWER HACK SAW MACHINE

Manufactured by

DIAMOND SAW & STAMPING WORKS

357 SEVENTH STREET BUFFALO, N. Y., U. S. A.



MODEL "A"

Cylindrical Grinding

Model "A" Grinding Machine for straight or taper cylindrical grinding is a machine ideal because of the following few facts:—occupies only 52" x 66" space; requires 7 h.p. to operate 640 r.p.m.; three speeds, 1,300, 1,500 and 1,800. Constructed on the unit system, each part is removable. Our catalogue contains all the facts in detail and is yours by simply writing us.

Fitchburg Grinding Machine Co.
Fitchburg, Mass., U.S.A.

TOOL GRINDING

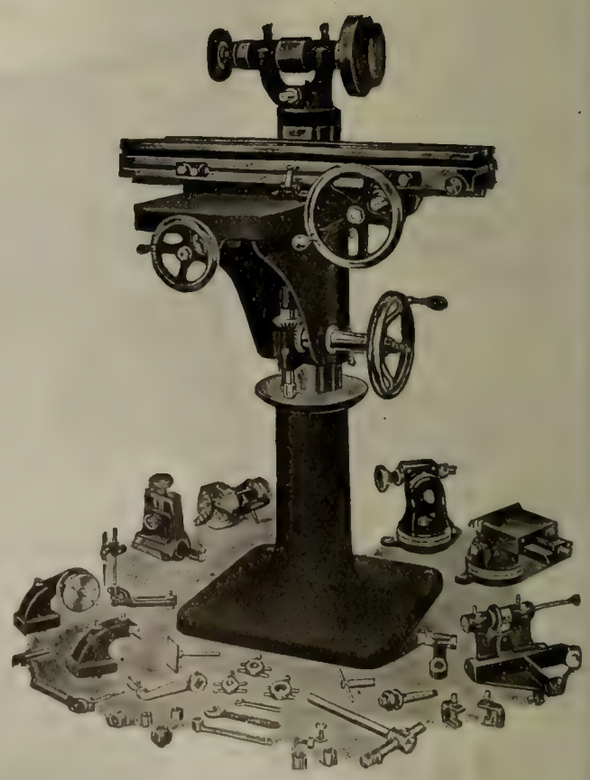
Milling Cutters, Reamer Counterbores, etc.

can be most conveniently sharpened on the various attachments furnished with the

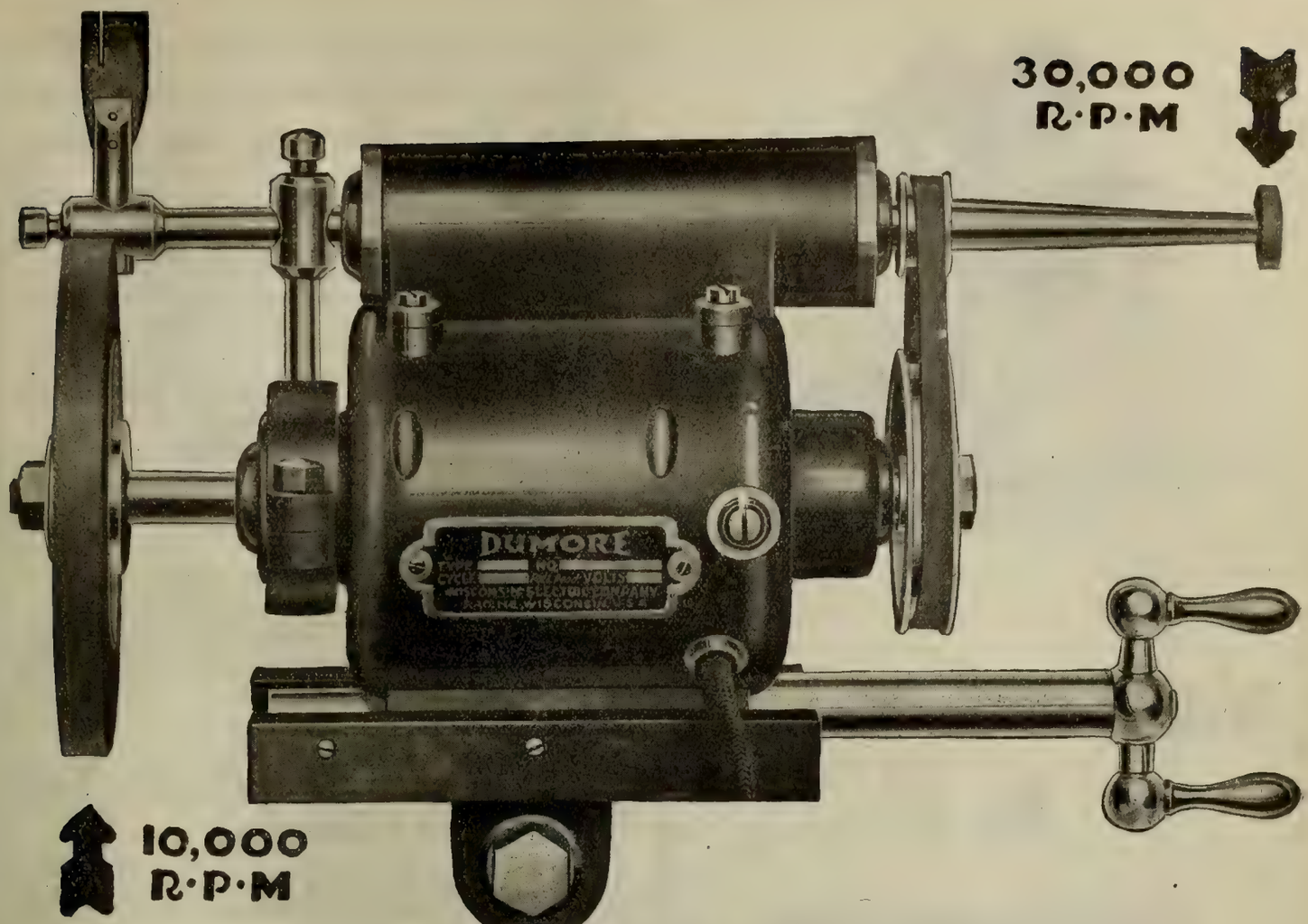
Greenfield

These Attachments are simple, practical and require no complicated adjustments, each being complete in itself. This feature alone will save a vast amount of time in "setting up." We claim, and we believe with perfect justice, that there is no other tool grinder that can be shifted from one job to another as easily and quickly as this one.

We are always glad to send out catalog which illustrates each attachment in actual use. It might have some suggestions for you.



Greenfield Machine Company
Greenfield, Mass, U. S. A.

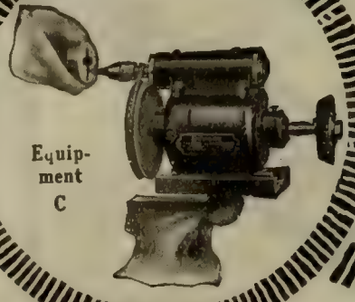


Dumore Grinders are used in thousands of manufacturing plants and machine shops. Used especially for grinding tools, gages, dies and similar work. For efficiency, investigate these grinders and the wide range of work they do.

30,000 R.P.M.! That's the first thing that interests every manufacturer because there is no other portable grinder that makes such high speed.

This high speed is made practical by dynamically balancing the armature. The high speed prevents the wheels from breaking down and insures extreme accuracy.

DUMORE PORTABLE ELECTRIC GRINDER

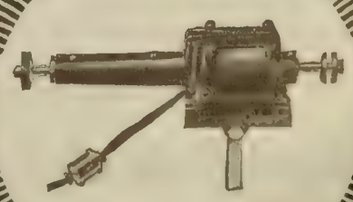


Equipment C

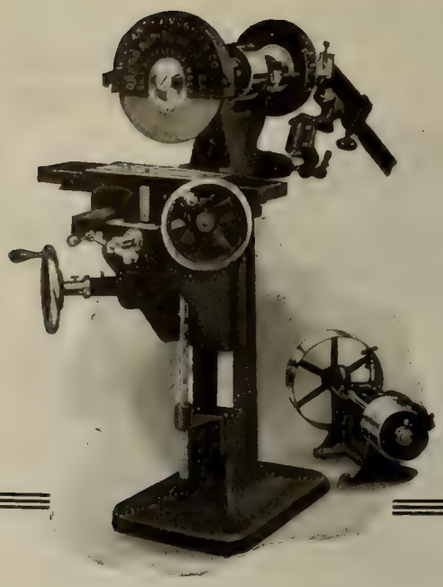
Three types of Dumore Grinders are made as shown here. All types are fitted with SKF Ball Bearings and equipped with the well-known Dumore Universal Motor, operating on either direct or alternating current.

Any one of these grinders will be sent to you on approval. Use it, then decide—that's how Dumore sales are made. State voltage of your current when ordering. Literature on request.

WISCONSIN ELECTRIC CO.
1715 Dumore Bldg., Racine, Wis.
Sold in England by Canadian-American Machy. Co., Ltd., 8 Bouverie St., London, E.C., Eng.



Equipment B



Wilmarth & Morman No. 1

Big Production Surface Grinder

for

Immediate Delivery

Rigid—Accurate
Convenient

Capacity 6 in. x 14 in. x 10 in.

Circular on Request.

Wilmarth & Morman Co.

Makers of

DRILL GRINDERS—SURFACE GRINDERS
UNIVERSAL GR NDERS

1200 Monroe Ave., N.W.

Grand Rapids, Mich., U.S.A.

Carry Your Grinder to the Work Not Your Work to the Grinder

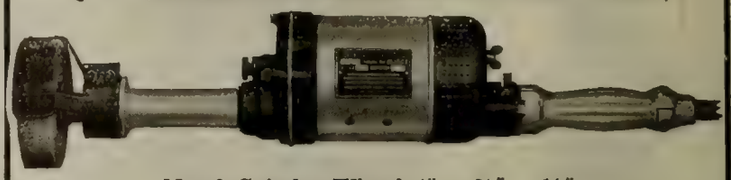
Thor

Portable Electric GRINDER

Equipped with Universal Motor for Operating on Direct or Alternating Current

110 TO 250 VOLTS

(Licensed Under Burke Universal Motor Patent.)



No. 6 Grinder-Wheel 4" x ¾" x ½"

ATTACH TO ANY LAMP SOCKET

Thor Portable Electric Grinder is equipped throughout with ball and roller bearings, and has a specially constructed motor, insuring speed, power, ease of operation and increased capacity.

IT RUNS AT 4,500 R.P.M.

Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.

Toronto: 32 Front St. W.; Winnipeg: 123 Bannatyne Ave. E.; Vancouver: 1142 Homer Street

Yes— it does look bad

AND if you haven't a Walton Tap Extractor, this broken tap is going to give some trouble before it comes out.

You're going to fuss around, lose your temper, perhaps injure the thread and waste half an hour or more in addition.

But with this Walton Tap Extractor a broken tap presents no difficulties.

The crucible steel fingers go down into the flutes, and the rest is easy. Just apply a wrench to the squared outer end and back the tap out. Can you imagine anything more simple?

The Walton Co.

HARTFORD
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If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

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Chilled Cast Iron

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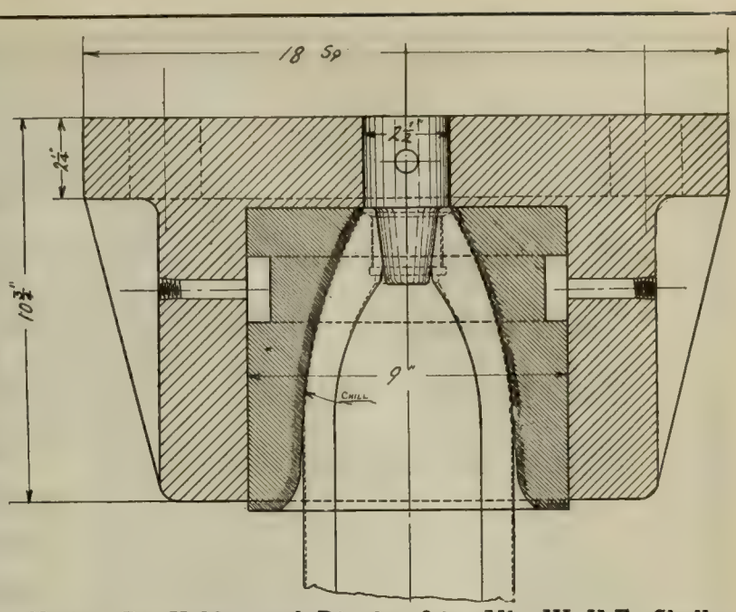
4.5-in. 5-in. and 6-in. Shells



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We are specialists in Grinding Wheel Dressers and can recommend the best types for any particular needs.

Our Dressers are:

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Desmond Huntington, 3 sizes
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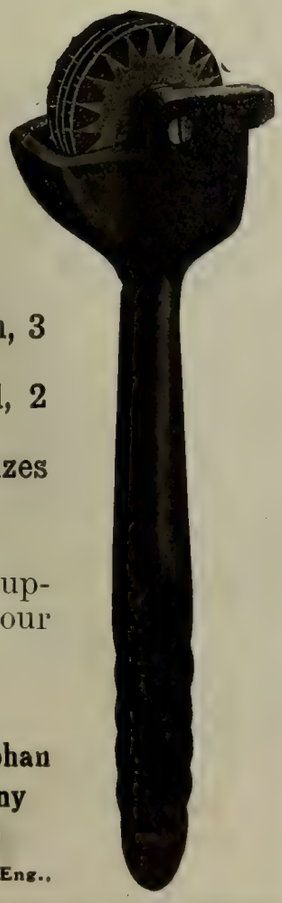
We can promptly supply your needs from our stock.

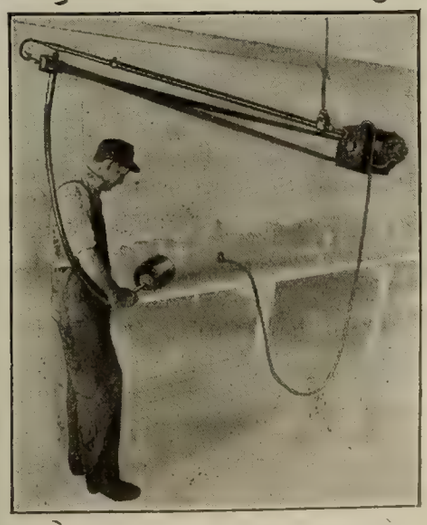


The Canadian Desmond-Stephan Manufacturing Company

HAMILTON, ONTARIO

Alfred Herbert, Ltd., Coventry, Eng., Agent for Great Britain.

Stow Shell Grinders Increase Production



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Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.

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Oldest Portable Tool Manufacturers in America

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"Our Customer Considers this an Extraordinarily Good Performance"

The job is grinding, rough from the sand, chilled iron rolls on a Landis special grinder. The rolls are 32 inches long, 16 7/16 inches in diameter and 7/16 stock is removed. It takes the Carborundum Wheel, 24 grit, L grade, G 3 + bond just 4¾ hours to do the work.

¶ The finish is uniform, the wheel cuts clean and it loses but 1/15 of an inch.

¶ It is the unbeatable grinding combination that gets these results. —The right wheel, Carborundum service and a good grinding machine.

What can this service do for you?

THE CARBORUNDUM COMPANY
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SELF-OPENING and ADJUSTABLE DIE HEADS

The Die Heads that have made good on every threading operation, and which are constantly meeting the demand where Die Heads are required for accurate thread-cutting.

In purchasing "MODERN" Die Heads you have the assurance that you are getting tools of "quality," mechanically perfect in design and construction and uniformly efficient in all sizes.

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A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

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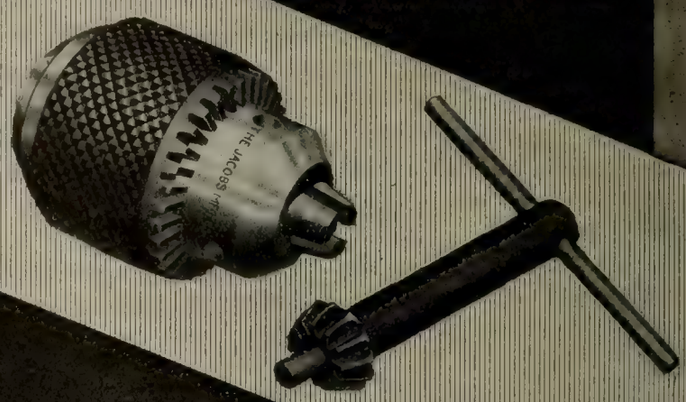

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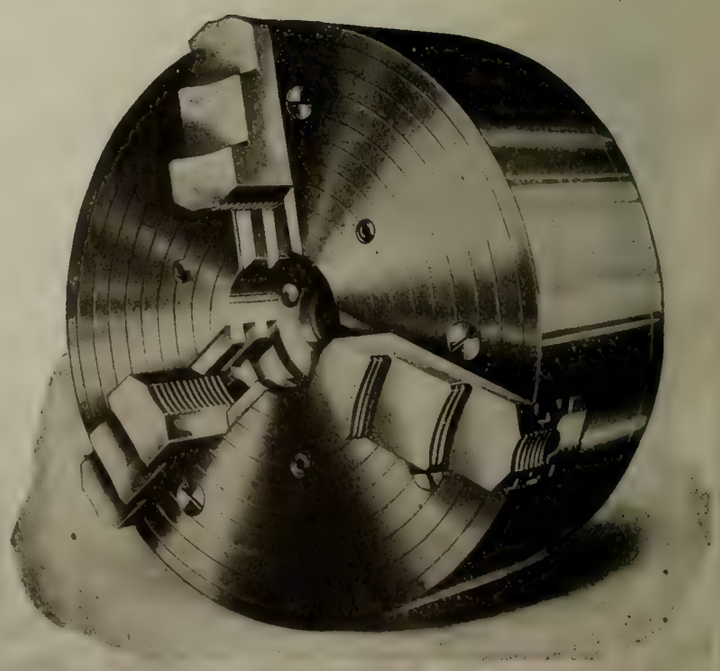

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Also makers of M. E. C. Two and Three-Jaw Air-Operated Chucks, Expanding Mandrels and Collapsible Taps

CANADIAN AGENTS:
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Air Chucks on 6" Shells

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Their instantaneous action, positive grip and ease of operation will save time to the extent of increasing output 20 to 100 per cent.

And if you have adopted female labor, the problem of unskilled help will present fewer difficulties. The operation of the Hannifin is so simple that very little effort is required by the operator.

Hannifin Manufacturing Co.

Chicago, Ill., U.S.A.

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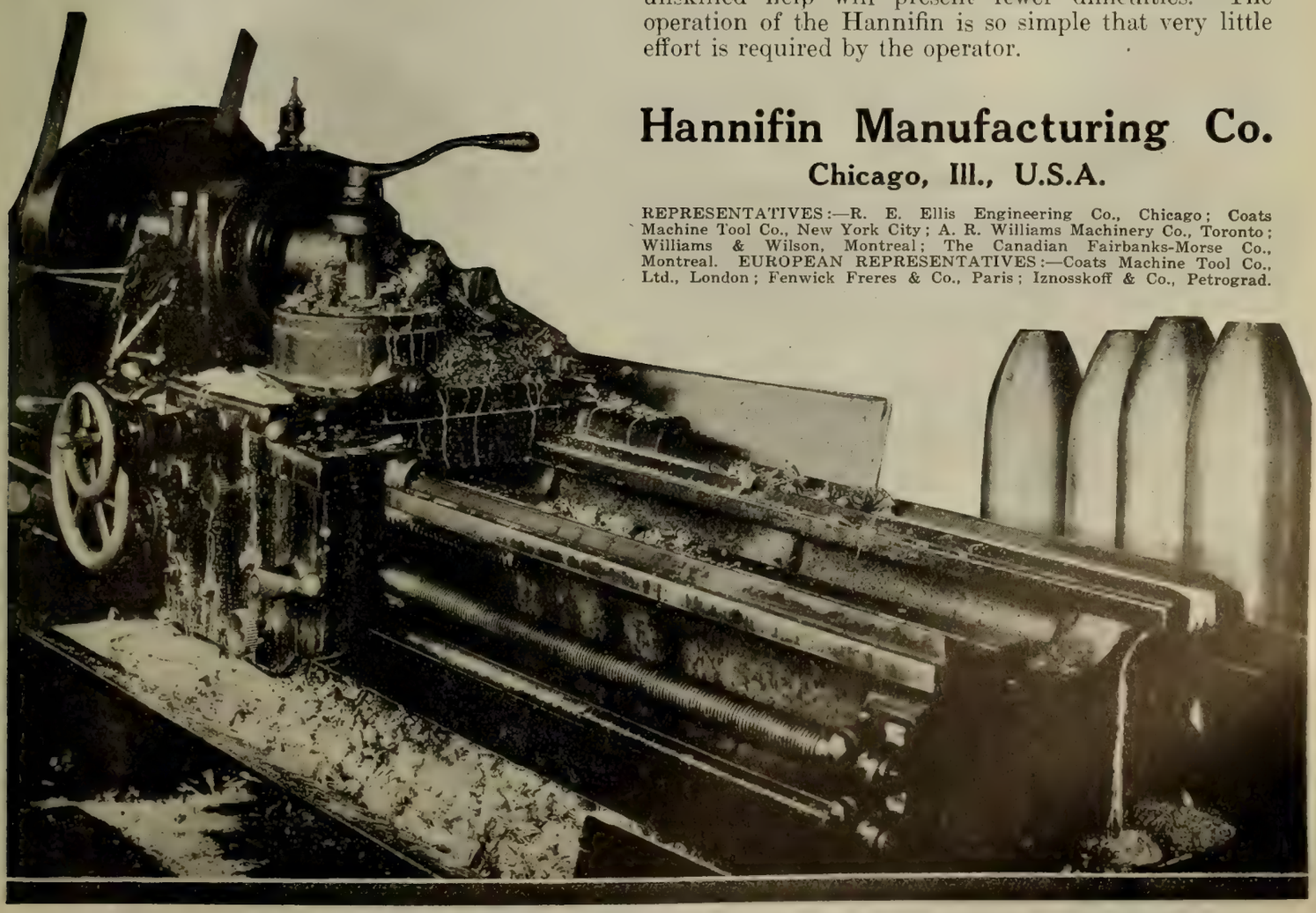
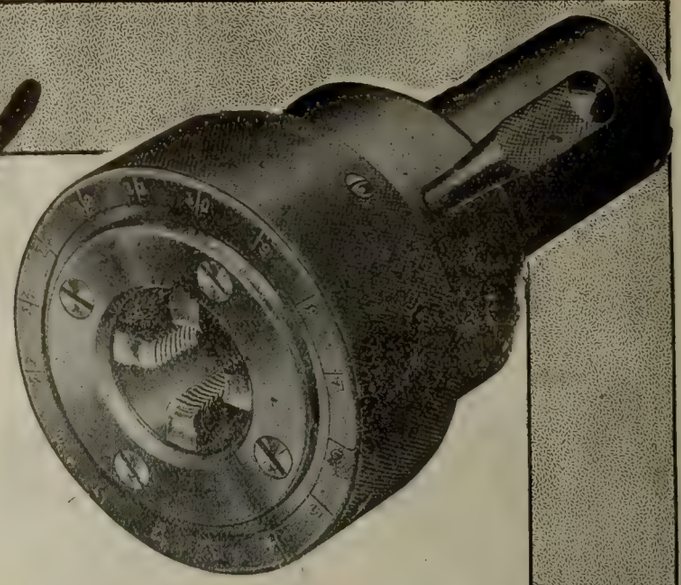


Murchey



COLLAPSING Taps are superior to other types of taps for many reasons. A study of their construction will show that individual chasers may be adjusted (this allows you to compensate for any wear). When the chasers are finally worn out a new set may be inserted. The adjusting features maintain absolute and original accuracy of the chasers. (What happens a solid tap after first sharpening?) When in operation all parts are rigid and have the stability of a solid tap, yet with ease and convenience the adjustments may be effected.

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"Victor" Collapsible Taps are simple in construction; the few parts can be made large and strong; the body is machine steel, and the chasers are high-speed; screw adjustment from front end makes it easy to maintain close accuracy; trip is automatic; reset by means of lever. The above features—and others—make the "Victor" a time and money saver for severe service. It is being used by many shell manufacturers.

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are giving you the kind of threads you are now getting. Do you like them? Is the head consuming too much of your time, adjusting and repairing? H. & G. Automatic Self-opening Die heads eliminate all that. The **chasers** are locked, and no stoppage or changing in size required. The **quick release** allows cutting to a certain point each time. It also permits cutting right up to the shoulder when necessary.
Our booklet will tell you all about it. Write for it, anyway; it is valuable to have around.

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It is made by expert workmen—from the finest materials obtainable—and thoroughly tested before shipment.

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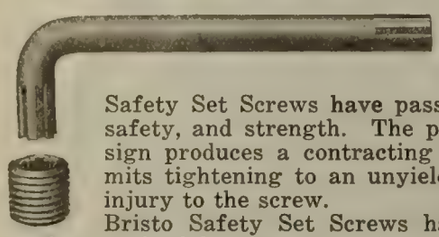

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Safety Set Screws have passed every test for safety, and strength. The patented fluted design produces a contracting effect which permits tightening to an unyielding grip without injury to the screw.

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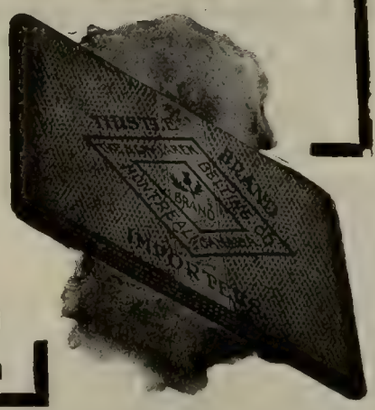
Write to-day.



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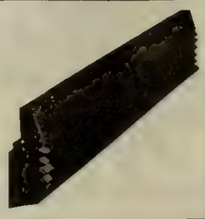

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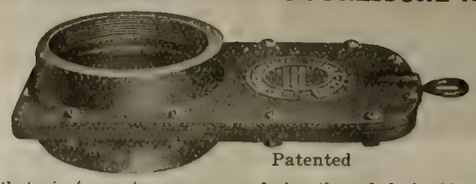
FOR LOW AND MODERATE PRESSURE AIR



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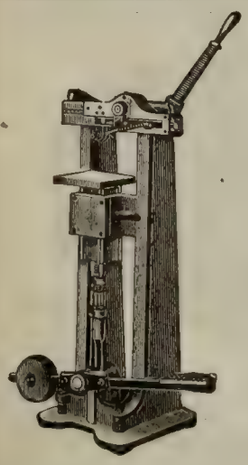

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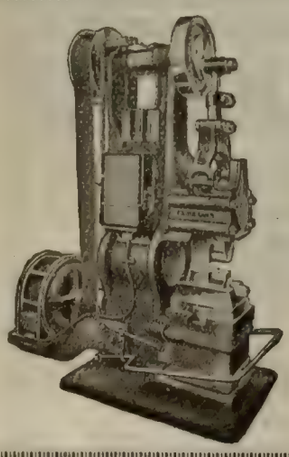

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25 to 300 lbs.

Belt or Motor Drive

These Hammers Embody a Design and Workmanship that are Unsurpassed.

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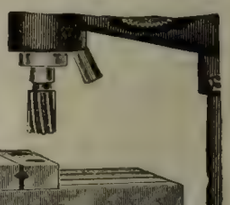

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For any Drill Press 14" to 42" swing. Big Economy — Big Convenience — Small Price. It relieves your large millers, comes in handy spotting castings, milling ends of bosses, and many other odd jobs. Cuts all kinds of keyseats perfectly; mills deep grooves, slots and cams. We also make cylinder reamers for reboring Ford car, and a reliable air compressor—all at special factory prices. Write for circulars to-day.

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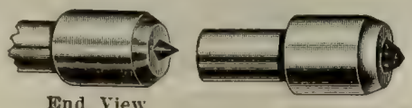
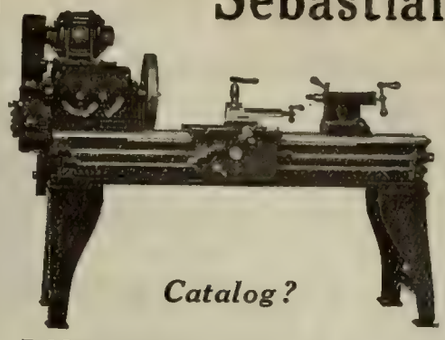

End View

Sebastian



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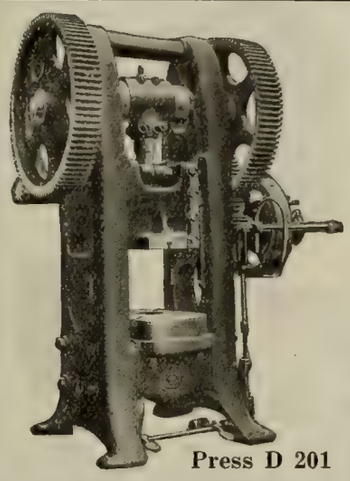
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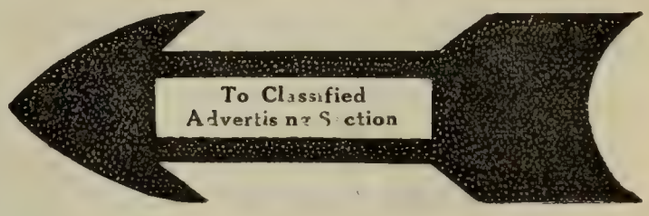

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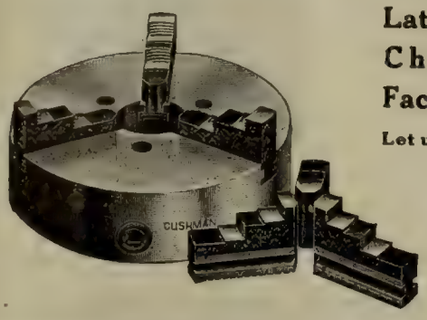

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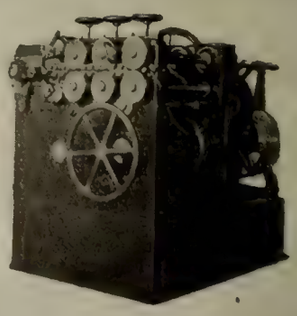

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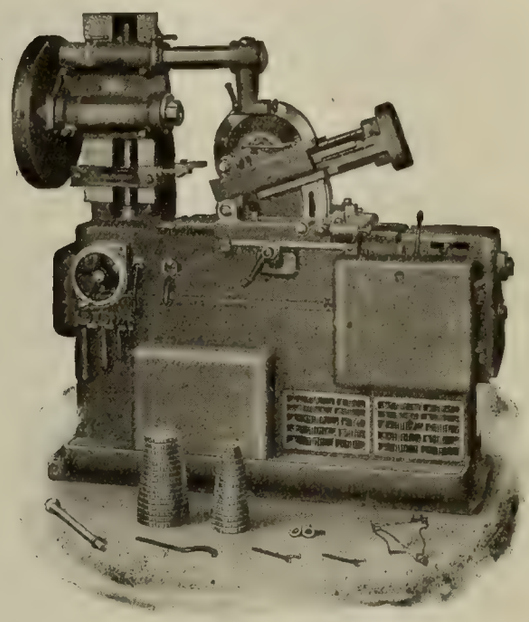

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Armstrong Bros. Tool Co., Chicago.

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Sheldons, Limited, Galt, Ont.

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Taylor Instrument Co., Rochester, N.Y.

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Pratt & Whitney Co., Hartford, Conn.
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Wells Brothers Co. of Canada, Galt, Ont.
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A. R. Williams Machy. Co., Toronto.

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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.

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Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
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Norton Grinding Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilmarth & Morman, Grand Rapids, Mich.

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Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

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Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
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Garvin Machine Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
LeBlond Mach. Tool Co., R. K., Cincinnati.
Niles-Bement-Pond Co., New York.
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Stow Mfg. Co., Binghampton, N.Y.

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Carborundum Co., Niagara Falls.
Ford-Smith Mach Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
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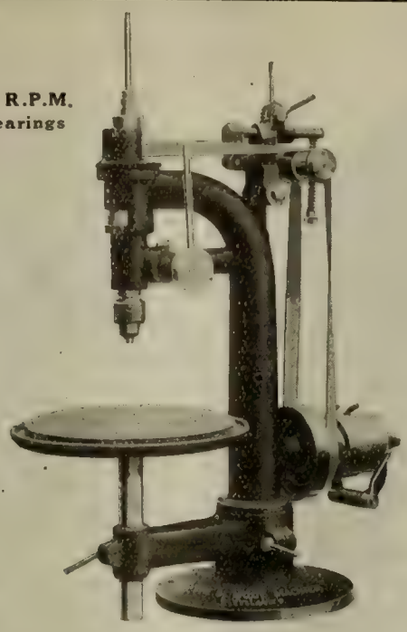

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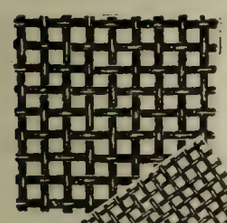

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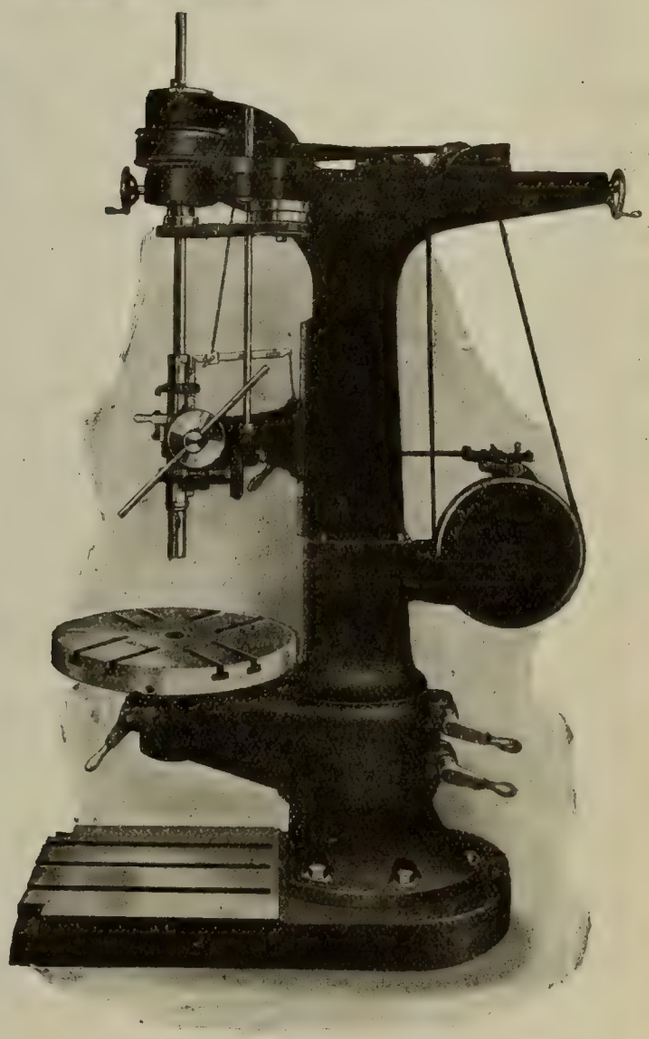

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Toronto Tool Co., Toronto, Ont.

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LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Goods Co., Hamilton, Ont.

LUBRICANTS
Cataract Refining & Mfg. Co., Toronto.

LUBRICATORS
Roper, C. F., & Co., Hopedale, Mass.
Trahern Pump Co., Rockford, Ill.

MACHINERY DEALERS
Baird Machy. Co., W. J., Detroit, Mich.
Can. Fairbanks-Morse Co., Montreal.
Dickow, Fred C., Chicago, Ill.
Garlock-Walker Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Petrie, Ltd., H. W., Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

MACHINERY GUARDS (SEE GUARDS)

MACHINERY REPAIRS
Prest-O-Lite Co., Inc., Toronto, Ont.
Sumbling Mach. Co., W. H., Toronto, Ont.

MACHINISTS' SCALES, SMALL TOOLS AND SUPPLIES
Can. Fairbanks-Morse Co., Montreal.
Frank H. Scott, Montreal.
J. H. Williams & Co., Brooklyn, N.Y.

MANDRELS
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Hannifin Mfg. Co., Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Manufacturers Equip. Co., Chicago, Ill.
Monarch Brass Mfg. Co., Toronto, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES
Pritchard-Andrews Co. of Canada, Ottawa, Ont.
Matthews, Jas. H., & Co., Pittsburgh, Pa.

MARKING MACHINERY
Brown, Boggs Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Martin Machine Co., Greenfield, Mass.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Perrin, Wm. R., Toronto.

MEASURING MACHINES
Pratt & Whitney Co., Dundas, Ont.

MEASURING TAPES AND RULES
James Chesterman & Co., Ltd., Sheffield, Eng.

METALLURGISTS
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Ltd., Toronto.

METALS
Can. B. K. Morton, Toronto, Montreal.
Dom. Iron & Wrecking Co., Ltd., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.

METERS, OIL, WATER
Bowser & Co., Inc., S. F., Toronto, Ont.

MILL MACHINERY
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John Bertram & Sons Co., Dundas.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.

MILLING MACHINES, HAND
Hardinge Bros., Inc., Chicago, Ill.
United States Mach. Tool Co., Cincinnati, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Whitney Mfg. Co., Hartford, Conn.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Becker Milling Machine Co., Boston, Mass.
Brown & Sharpe Mfg. Co., Providence.
John Bertram & Sons Co., Dundas.
Cleveland Milling Machine Co., Cleveland, Ohio.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.
Steptoe, The John Co., Cincinnati, Ohio.
United States Mach. Tool Co., Cincinnati, Ohio.
Whitney Mfg. Co., Hartford, Conn.
A. R. Williams Machy. Co., Toronto.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Becker Milling Machine Co., Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

MILLING MACHINES, PROFILE
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Tabor Mfg. Co., Philadelphia, Pa.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Cummings & Son, J. W., New Glasgow, Canada.
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
Marsh & Henthorn, Belleville, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Jenckes Mach. Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

MITTENS
Hickory Steel-Grip Glove Co., Chicago, Ill.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Mach. Co., New Britain, Conn.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
A. R. Williams Machy. Co., Toronto.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Can.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
John H. Hall & Sons, Ltd., Brantford, Ont.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

NUTS, SEMI-FINISH AND FINISHED
Canadian B. K. Morton, Toronto, Montreal.
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton, Ont.

NUT BURRING MACHINES
National Machy. Co., Tiffin, O.

NUT MACHINES (HOT)
National Machy. Co., Tiffin, O.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machy. Co., Tiffin, O.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.

OIL, DRAWING
Elm Cutting Oil Co., Toronto, Ont.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Machine Co., The, Hamilton.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford, Ont.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVENS FOR DRYING, TEMPER AND UNDER TRUCKS
Brantford Oven & Rack Co., Brantford, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.

OXY-ACETYLENE WELDING AND CUTTING
Can. Welding Works, Montreal, Que.
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.

OXY-ACETYLENE WELDING AND CUTTING PLANT
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

OXYGEN (SEE ACETYLENE)
L'Air Liquide Society, Montreal, Que.

PACKINGS, ASBESTOS
Bennett, W. P., 51 Montford St., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
New Britain Mach. Co., New Britain, Conn.

PACKINGS, LEATHER, HYDRAULICS, ETC.
Graton & Knight Mfg. Co., Worcester, Mass.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.

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Bertrams, Ltd., Edinburgh, Scotland.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.

PATENT SOLICITORS
Budden, Hanbury, A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

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Winnipeg Gear & Engr. Co., Winnipeg, Man.

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PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

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Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Petrie, Ltd., H. W., Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
A. R. Williams Machy. Co., Toronto.

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Toronto Iron Works, Ltd., Toronto.

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Curtis & Curtis Co., Bridgeport, Conn.
John H. Hall & Sons, Ltd., Brantford, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Niles-Bement-Pond Co., New York.

PLIERS
Aikenhead Hardware Co., Toronto.
Canadian Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Conn.

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Atlas Press Co., Kalamazoo, Mich.
Hannifin Mfg. Co., Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
E. W. Bliss Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES FOR SHELLS
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

PRESSES, FILTER
William R. Perrin, Ltd., Toronto.

PRESSES, DROP AND FORGING
W. H. Banfield & Son, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Charles F. Elmes Eng. Works, Chicago.
Can. Fairbanks-Morse Co., Montreal.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo.

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John Bertram & Sons Co., Dundas.
Charles F. Elmes Eng. Works, Chicago.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo.
West Tire Setter Co., Rochester, N.Y.
A. R. Williams Machy. Co., Toronto.

PRESSES, PNEUMATIC
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
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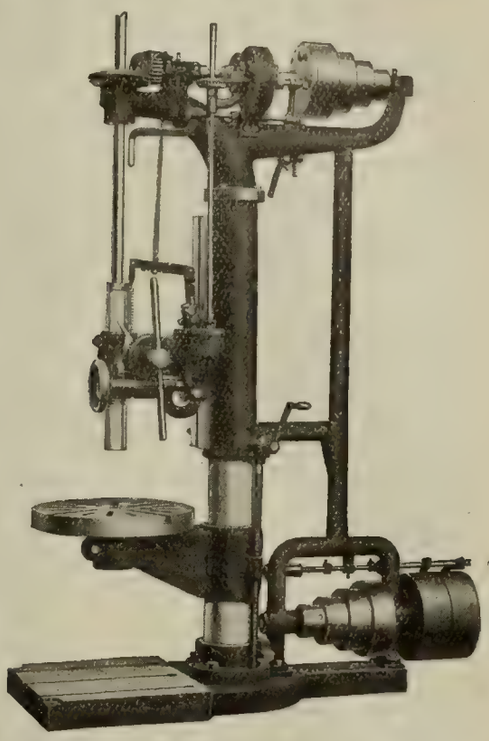

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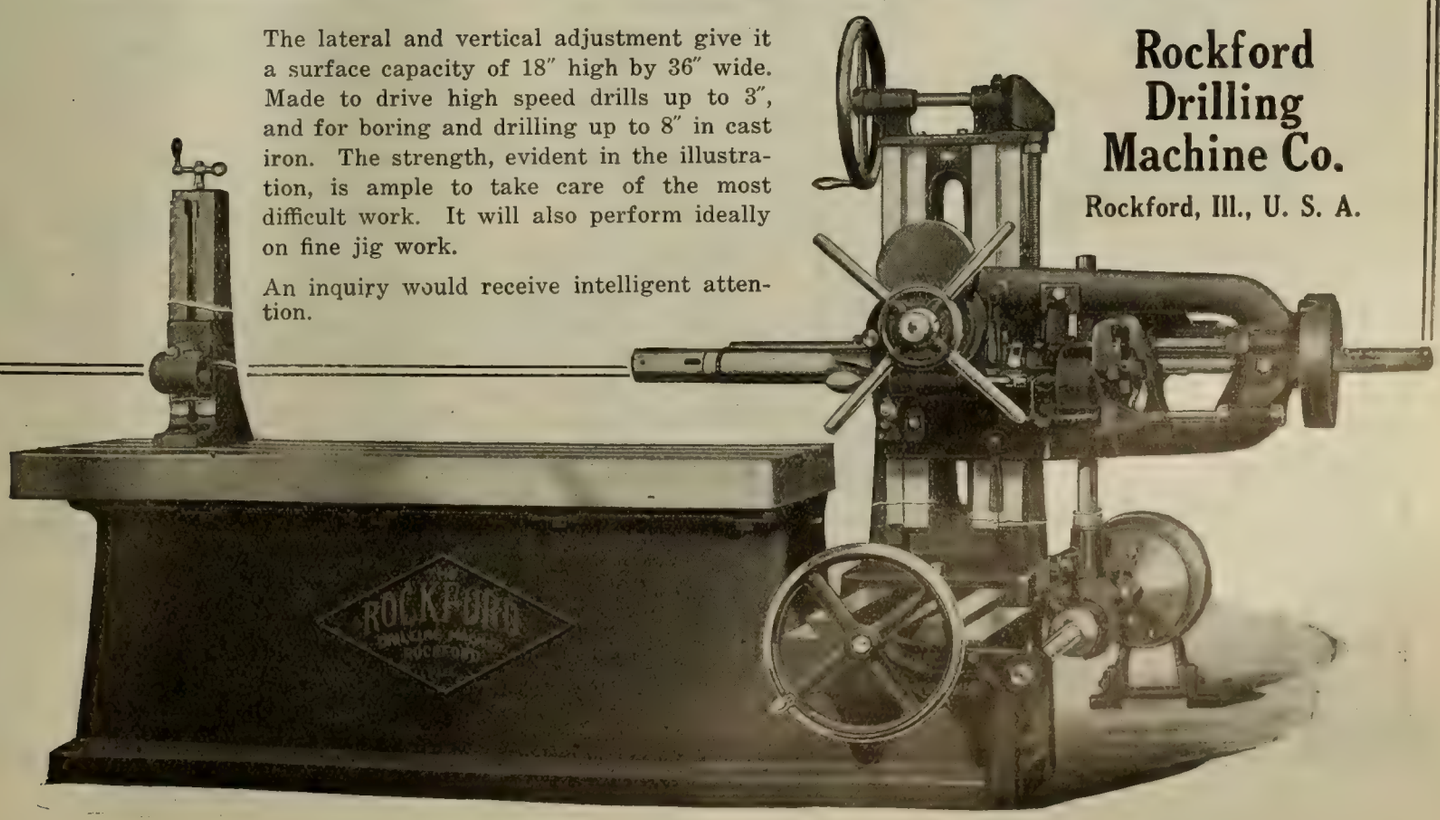

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William R. Perrin, Ltd., Toronto.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.

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Barnes, W. F., & John, Co., Rockford, Ill.
Bliss Co., E. W., Brooklyn, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
William R. Perrin, Ltd., Toronto.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Erie Foundry Co., Erie, Pa.
Ferracute Mach. Co., Bridgeton, N.J.

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Kennedy & Sons, Wm., Owen Sound, Ont.

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American Pulley Co., Philadelphia.
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Brown & Sharpe Mfg. Co., Providence, R.I.
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Can. Fairbanks-Morse Co., Montreal.
Dominion Machy. Co., Toronto, Ont.
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Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
The Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.

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Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Ltd., Toronto.

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Can. Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Wells Bros. of Canada, Galt, Ont.

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Smart-Turner Mach. Co., Hamilton.

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Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Mach. Co., Hamilton.
Sturtevant Co., B. F., Galt, Ont.

PUMPS, FUEL OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

PUMPS, HIGH PRESSURE
Blake Pump & Condenser Co., Fitchburg, Mass.
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William R. Perrin, Ltd., Toronto.
Smart-Turner Mach. Co., Hamilton.

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Can. Blower & Forge Co., Kitchener, Ont.
Charles F. Elmes Eng. Works, Chicago.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.

PUMPS, HYDRAULIC
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Charles F. Elmes Eng. Works, Chicago.
Metalwood Mfg. Co., Detroit, Mich.
Smart-Turner Mach. Co., Hamilton.
William R. Perrin, Ltd., Toronto.

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Bellevue Industrial Furnace Co., Detroit, Mich.
Bowser & Co., Inc., S. F., Toronto, Ont.
Roper, C. F., Co., Hopedale, Mass.
Trahern Pump Co., Rockford, Ill.

PUMP LEATHERS
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.

PUMPS, ROTARY, POWER DRIVEN
Bowser & Co., Inc., S. F., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

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W. H. Banfield & Sons, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Kitchener, Ont.
Ferracute Mach. Co., Bridgeton, N.J.
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Toledo Machine & Tool Co., Toledo, O.

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John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Ferracute Mach. Co., Bridgeton, N.J.
Niles-Bement-Pond Co., New York.

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Bertrams, Ltd., Edinburgh, Scotland.
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Niles-Bement-Pond Co., New York.
W. A. Whitney Mfg. Co., Rockford, Ill.

PURIFYING AND SOFTENING APPARATUS
Scaife & Sons Co., Wm. B., Pittsburgh, Pa.

PYROMETERS
Bellevue Industrial Furnace Co., Detroit, Mich.
Can. Hoskins, Ltd., Walkerville, Ont.
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York City.
H. E. Streeter, New Birks Bldg., Montreal, Que.
Taylor Instrument Co., Rochester, N.Y.
Thwing Instrument Co., Philadelphia, Pa.

QUARTERING MACHINES
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

RAILING, IRON AND BRASS (SEE GUARDS)

RAIL BENDERS
Niles-Bement-Pond Co., New York.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
Niles-Bement-Pond Co., New York.

RAILS, STEEL
Cumming & Son, J. W., New Glasgow, Canada.

RATCHETS
Keystone Mfg. Co., Buffalo, N.Y.

RAW HIDE PINIONS (SEE GEARS)

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMERS, ADJUUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
H. E. Streeter, New Birks Bldg., Montreal, Que.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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Aikenhead Hardware Co., Toronto.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
McKenna Brothers, Pittsburgh, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, PIPE, CYLINDER AND LOCOMOTIVE
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

RECORDING INSTRUMENTS
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

RESPIRATORS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

RIVET MACHINES
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Grant Mfg. & Machine Co., Bridgeport, Conn.
National Machinery Co., Tiffin, O.

RIVETS, TUBULAR, BIFURCATED
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

RIVETS, IRON, COPPER AND BRASS
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ot.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.

RIVETING MACHINES, ELASTIC ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport, Conn.
High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.

ROLLS, BENDING AND STRAIGHTENING
John Bertram & Sons Co., Dundas
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo, O.

ROLLS, CRUSHING
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.

RUBBER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland

RULES
Brown & Sharpe Mfg. Co., Providence
James Chesterman & Co., Ltd., Sheffield, Eng.
L. S. Starrett Co., Athol, Mass.

SAFETY APPLIANCES
Strong, Kennard & Nutt Co., Cleveland, Ohio.

SAFETY APPLIANCE GOGGLES
T. A. Wilson, Reading, Pa.

SAND BLASTS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.

SANDING MACHINES
Canada Machinery Corp., Galt, Ont.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Gardner, Robt., & Son, Montreal
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto

SAWS, CIRCULAR METAL
Hunter Saw & Machine Co., Pittsburg, Pa.
Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (SEE HACK SAWS)

SAWS, INSERTED TOOTH
Hunter Saw & Mach. Co., Pittsburgh, Pa.
Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, BAND AND COPING
Napier Saw Works, Springfield, Mass.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York City
H. E. Streeter, New Birks Bldg., Montreal, Que.

SCREW MACHINE PARTS
Johnson Mach. Co., Carlyle, Manchester, Conn.

SCREW MACHINE PRODUCTS
Galt Machine Screw Co., Galt, Ont.
Eastern Mach. Screw Corp., New Haven, Conn.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York
Himoff Mach. Co., Inc., Astoria, L.I., New York.
A. B. Jardine & Co., Hespeler
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto

SCREW MACHINES, AUTOMATIC, MULTIPLE SPINDLE
New Britain Machine Co., New Britain, Conn.
Riverside Machinery Depot, Detroit, Mich.

SCREWS
Can. B. K. Morton, Toronto, Montreal
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SCREW PLATES
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wells Bros. Co. of Canada, Galt, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SCREW SLOTTERS
Garvin Machine Co., New York
Pratt & Whitney Co., Dundas, Ont.

SECOND-HAND MACHINERY
Davis Machine Tool Co., W. F., New York
Dominion Machinery Co., Toronto
Foss & Hill Machy. Co., Montreal
Hill, Clarke & Co., Chicago, Ill.
McCabe, J. J., New York, N.Y.
New York Machinery Exchange, New York
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Strelinger Co., Chas. A., Detroit, Mich.
Stocker-Rumely-Wachs, Chicago, Ill.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto, Ont.
Allen Mfg. Co., Hartford, Conn.
Wilkinson & Kompass, Hamilton, Ont.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

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John Bertram & Sons Co., Dundas
Can. Fairbanks-Morse Co., Montreal
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal
Gardner, Robt., & Son, Montreal
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Steptoe Co., John, Cincinnati, Ohio

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Can. Bond Hanger & Coup. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Strelinger Co., Chas. A., Detroit, Mich.
A. R. Williams Machy. Co., Toronto
Wilkinson & Kompass, Hamilton, Ont.

SHAFTS, FLEXIBLE
Stow Mfg. Co., Binghampton, N.Y.

SHARPENING STONES
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

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Can. Blower & Forge Co., Kitchener, Ont.
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Oppenheim

John Bayne Maclean

COL. MACLEAN contributes another chapter on the war situation as he knows it, in his forceful, smashing style. These articles by Colonel Maclean are truly startling by reason of their revelations.

Germany's Secret Work in Canada

GERMANY is plotting in Canada and the United States right now. If you are curious to know just what she is doing, learn from Miss Agnes C. Laut's article in the October MACLEAN'S, "The Plot Behind the Pacifists."

THE biggest single feature ever secured by MACLEAN'S MAGAZINE is a serial story by E. Phillips Oppenheim, British author and a great writer of romantic stories.

The serial beginning in MACLEAN'S for October is "The Pawns Count," a story of the present war, dealing with the work of the secret service agents of the various belligerent countries. You can depend on its being a strong, thrilling story, told by a master of his craft.

BELAND
Prisoner of War

THE HON. LOUIS BELAND, a prisoner in Belgium since the beginning of the war, gives the story of his captivity, chiefly in the form of letters to Sir Wilfrid Laurier, in whose last cabinet he held a portfolio.

The story is intimate, vivid, gripping, wholly unusual, and appears in the October MACLEAN'S.

Beating the Customs

AN article full of actual occurrences of how the public attempts to "beat" the Customs, and of how the Customs authorities beat the public. This absorbingly interesting narrative is by J. D. Ronald who, as a Customs officer, came into close touch with offenders and offences. A semi-detective article, this true story makes great reading.

Stringer, Fraser, Leacock and Hendryx

THE work of these masters of the short and long story appears in the October MACLEAN'S. Stringer's story is "The Redeemer of Waste Lands"; W. A. Fraser writes a love story, "For Catherine's Sake"; Leacock has a humorous sketch; and Hendryx continues his captivating story of the Canadian Northwest, "The Gun Brand."

MacLean's Magazine
For OCTOBER

At All News-dealers 15 cents

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas
Bertrams, Ltd., Edinburgh, Scotland
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A. B. Jardine & Co., Hespeler, Ont.
Montgomery, Smith & Co., Keynsham, Somerset, Eng.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo

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Bliss, E. W., Co., Brooklyn, N.Y.
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National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York
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Toledo Machine & Tool Co., Toledo

SHEARS, PNEUUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Canada

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Brown, Boggs & Co., Hamilton, Canada
Peck, Stow & Wilcox, Southington, Conn.
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Sheldons, Ltd., Galt, Ont.

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High Speed Hammer Co., Rochester, N.Y.

SHRAPNEL SHELL MARKER
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Noble & Westbrook Mfg. Co., Hartford, Conn.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton. Toronto, Montreal.

SIGNS, ENAMEL
Strong, Kennard & Nutt Co., Cleveland, Ohio.

SILVER SOLDER
Geo. H. Lees & Co., Hamilton, Ont.

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Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York
Rhodes Mfg. Co., Hartford, Conn.

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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.

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Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
J. H. Williams & Co., Brooklyn, N.Y.

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Allen Mfg. Co., Hartford, Conn.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Canada

SOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

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Banfield, W. H., & Sons, Toronto.
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Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
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Gray Mfg. & Mach. Co., Toronto, Ont.
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Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
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McClean & Son, F. W., Niagara Falls, Ont.
National-Acme Co., Cleveland, Ohio.
D. McKenzie Machinery Co., Guelph, Ont.
Mulliner & Enlund Tool Co., Syracuse, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Sleeper & Hartley, Inc., Worcester, Mass.
Smart-Turner Machine Co., Hamilton, Ont.
T. C. M. Mfg. Co., Harrison, N.J.
Victoria Foundry Co., Ottawa, Ont.
William R. Perrin, Ltd., Toronto.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

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Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele, Ltd., Guelph, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

SPIRAL CONVEYORS
Can. Matthews Gravity Carrier Co., Toronto, Ont.

SPROCKETS, CHAIN
Grant Gear Works, Boston, Mass.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

SOLDER
Jobborn, Geo. A., Hamilton, Ont.

SPROCKET WHEELS, CAST
Perrin, Wm. R., Toronto.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS
Dillon Mfg. Co., Oshawa, Ont.
Dom. Forge & Stamping Co., Walkerville, Ont.
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Canada Machinery Corp., Galt, Ont.
Ferracute Mach. Co., Bridgton, N.J.
Noble & Westbrook Mfg. Co., Hartford, Conn.

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Matthews, Jas. H. & Co., Hartford, Conn.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

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Sleeper & Hartley, Inc., Worcester, Mass.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.
Can. Morehead Mfg. Co., Woodstock, Ont.
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Sturtevant Co., B. F., Galt, Ont.

STEEL ALLOY (SEE ALLOY STEEL)

STEEL BENDING BRAKES
Steel Bending Brake Works, Ltd., Chatham, Ont.

STEEL FOR AXES, PLOWS, SAWS, DRILLS, ETC.
Colonial Steel Co., Pittsburgh, Pa.

STEEL, CARBON, FERRO-TUNGSTEN
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Zenith Coal & Steel Products, Montreal, Que.

STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

STEEL DRUMS
Smart-Turner Machine Co., Hamilton, Ont.

STEEL PRESSURE BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Century Steel Co. of America, New York
Colonial Steel Co., Pittsburgh, Pa.
H. A. Drury Co., Ltd., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Fairley Davidson Steel Co., New York, N.Y.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.
Zenith Coal & Steel Products, Montreal, Que.

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Fairley Davidson Steel Co., New York, N.Y.

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Drury, H. A., Co., Montreal, Que.
Standard Alloys Co., Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

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Wells Bros. Co. of Canada, Galt, Ont.

STOOLS, STEEL, SHOP
New Britain Machine Co., New Britain, Conn.

STRAIGHTENING MACHINERY
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Bertrams, Ltd., Edinburgh, Scotland.

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

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Sleeper & Hartley, Inc., Worcester, Mass.

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Bowser & Co., Inc., S. F., Toronto, Ont.
Dominion Forge & Stamping Co., Walkerville.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.

TANKS, STEEL, WATER PRESSURE
Bowser & Co., Inc., S. F., Toronto, Ont.
Can. Welding Works, Montreal, Que.
Jenckes Machine Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TANK WAGONS
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.

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TAPPING MACHINES AND ATTACHMENTS
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Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.

TAPS, ADJUSTABLE
Baxter Co., Ltd., J. R., Montreal, Que.
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Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.

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Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

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Butterfield & Co., Rock Island, Que.
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Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wells Bros. Co. of Canada, Galt, Ont.

TAP EXTENSIONS
Allen Mfg. Co., Hartford, Conn.

TESTING INSTRUMENTS METALLURGICAL
Shore Instrument & Mfg. Co., New York City.

THERMOMETERS, ALL KINDS
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Bellevue Industrial Furnace Co., Detroit, Mich.

TESTING LABORATORIES
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

THREADING TOOLS
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.

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Gray Mfg. & Mach. Co., Toronto, Ont.
Taft-Peirce Co., New York, N.Y.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Peck, Stow & Wilcox, Southington, Conn.

TIRE SETTING MACHINES, HYDRAULIC
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES
Union Tool Chest Works, Rochester, N.Y.

TOOL HOLDERS
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Cleveland Twist Drill Co., Cleveland.
Armstrong Bros. Tool Co., Chicago.
Can. B. K. Morton, Toronto, Montreal.
Deloro Smelting & Refining Co., Toronto, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOL STEEL
Atkins & Co., Wm., Sheffield, Eng.
Armstrong, Whitworth, Ltd. of Canada, Montreal.
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Deloro Smelting & Refining Co., Toronto, Ont.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.

Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Toronto, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.
Swedish Steel & Importing Co., Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago, Ill.
Stow Mfg. Co., Binghamton, N.Y.
A. R. Williams Machinery Co., Toronto.
United States Elec. Tool Co., Cincinnati, O.

TOOLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

TORCHES, STEEL
Armstrong, Whitworth of Canada, Ltd., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.

TRACK SYSTEMS
Dillon Mfg. Co., Oshawa, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
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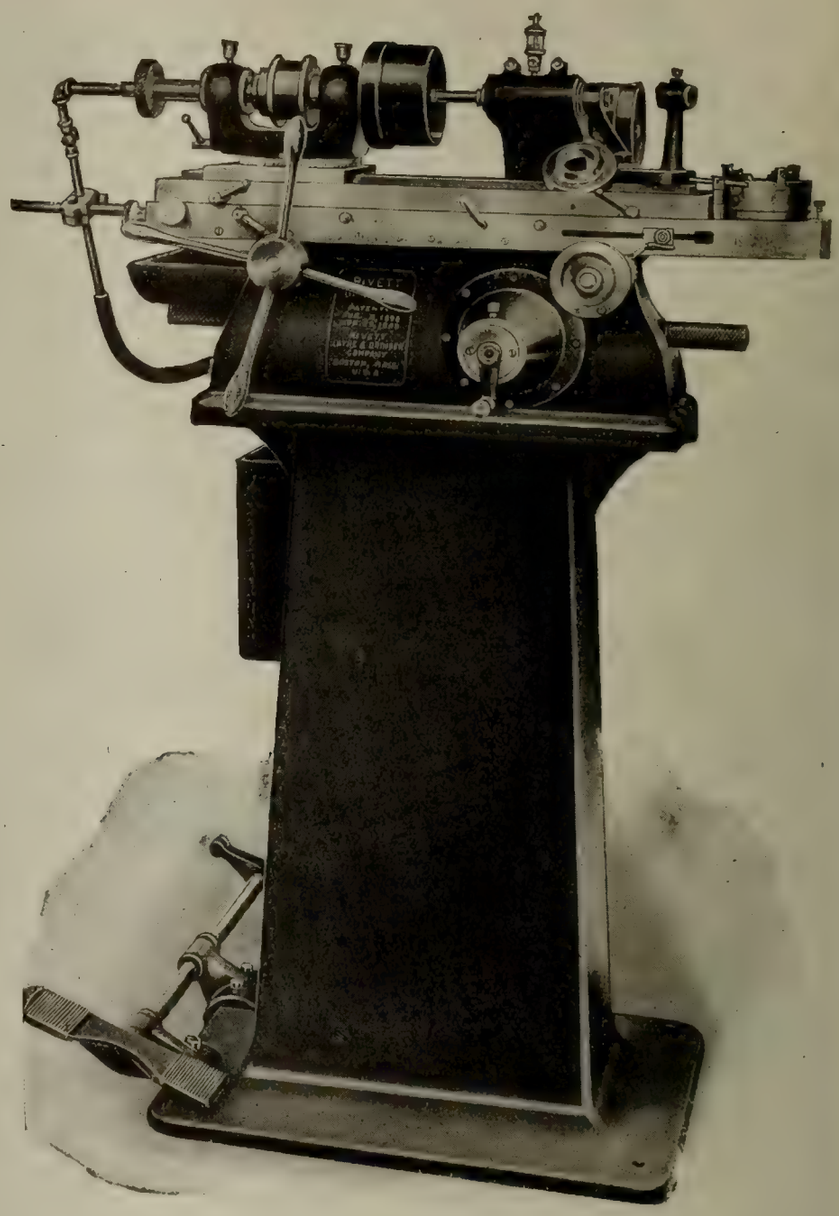

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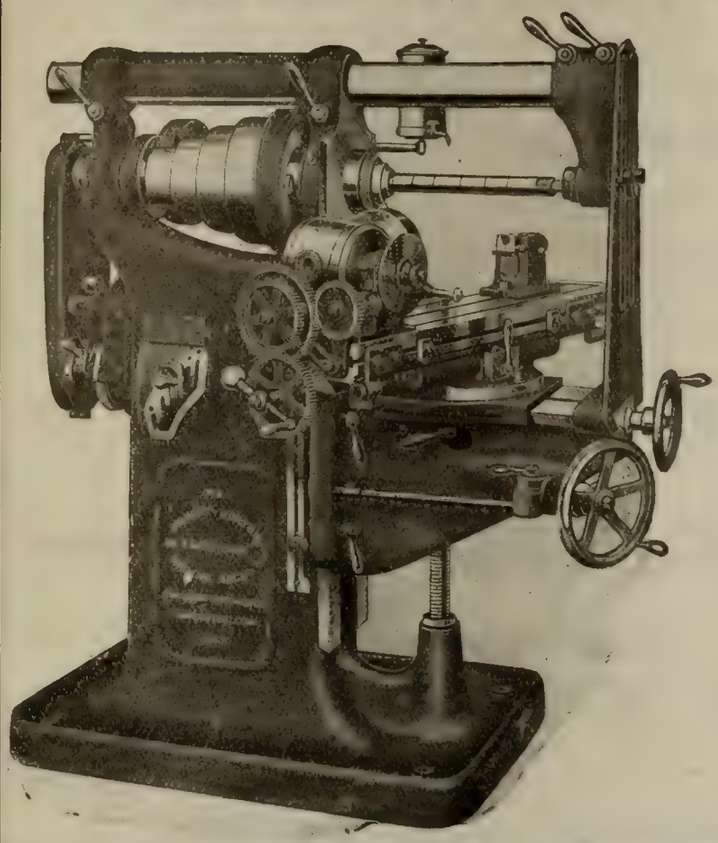

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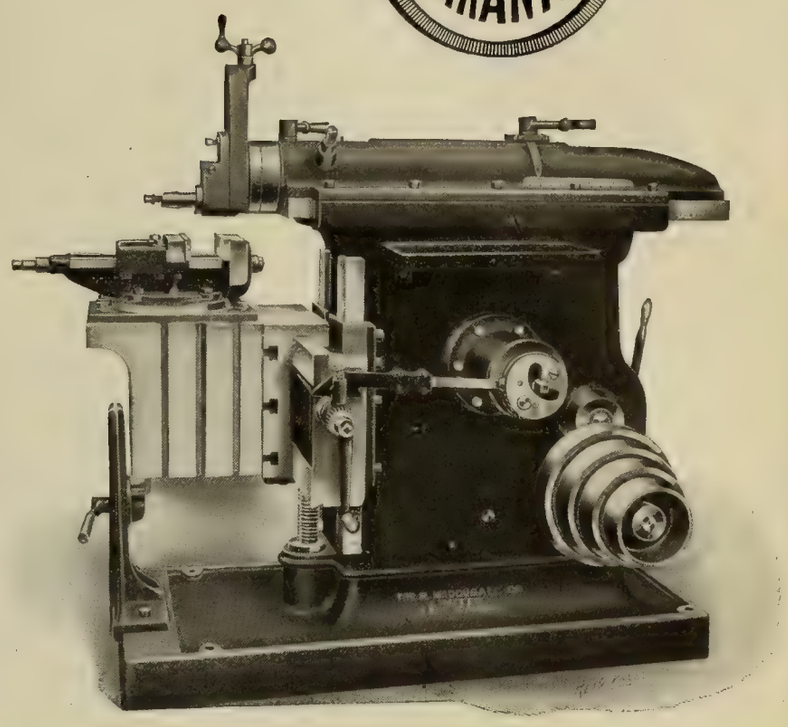

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1—No. 4 Foster screw machine

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305 ST. JAMES ST., MONTREAL, QUE.

REGISTERED TRADE-MARK
OF THE
CANADA MACHINERY CORPORATION, Limited

C.M.C.

This Trade-Mark appears on all Machine Tools for Wood and Iron Working, manufactured by us, and is a guarantee that the quality and workmanship are of highest standard.

CANADA MACHINERY CORPORATION
LIMITED

GALT, ONTARIO

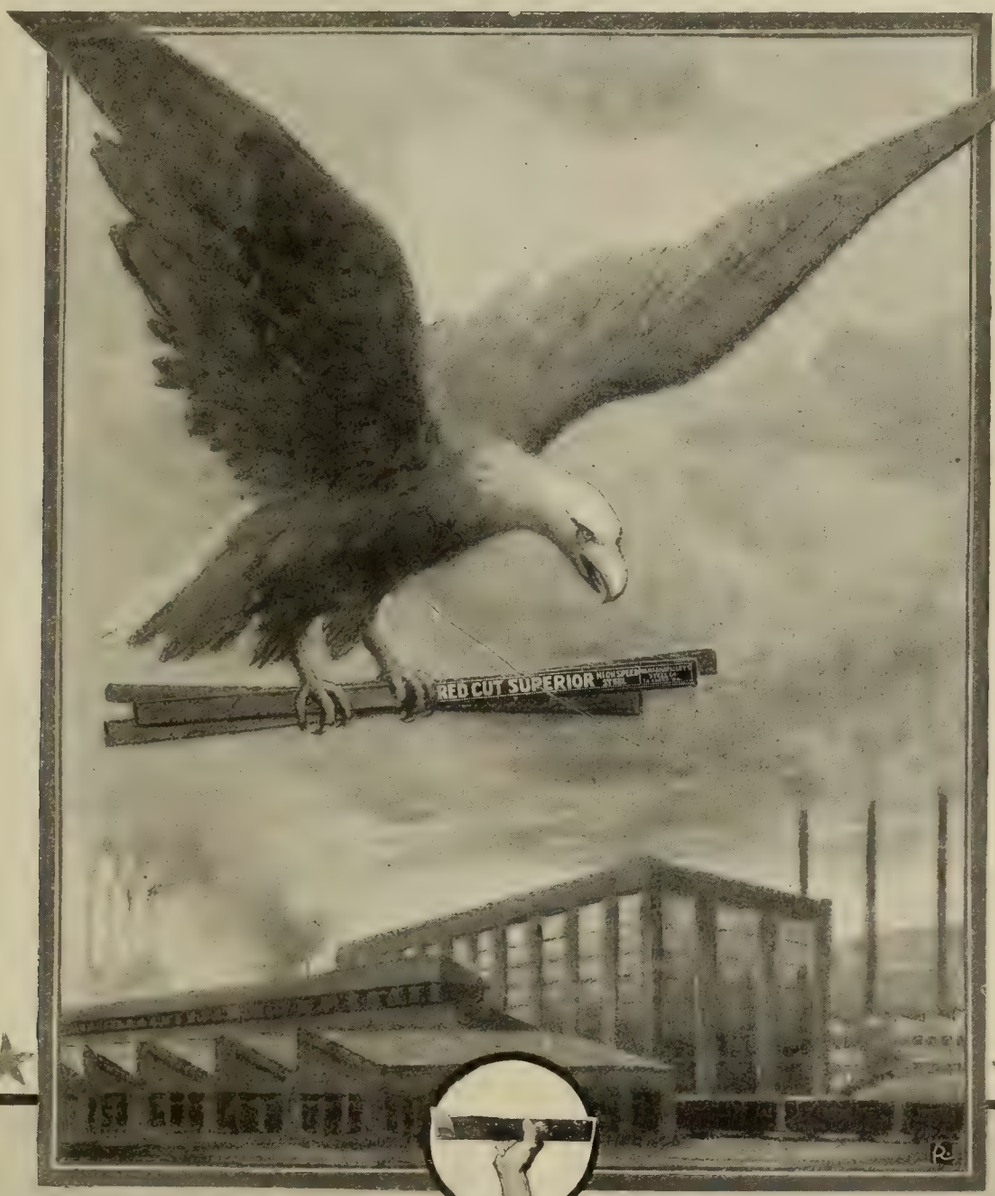
BUILDERS OF MACHINE TOOLS AND WOODWORKING MACHINERY

TORONTO SHOW ROOMS:
Brock Avenue Subway.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical, power, foundry and allied fields.
Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

Vol. XVIII—No. 15 Publication Office: Toronto, October 11, 1917 Subscription Price $3.00 per Year



HIGHEST IN QUALITY

NATIONALLY KNOWN

Our Country requires the extreme limit of production from every lathe, planer, miller or other machine tool

BE PATRIOTIC

"Red Cut Superior"

The Nationally Known First Quality

HIGH SPEED STEEL

Will enable you greatly to increase your output

"IT'S THE BEST FOR ALL MACHINE WORK"

VANADIUM-ALLOYS STEEL CO.

PITTSBURGH, PA. Works at LATROBE, PA.

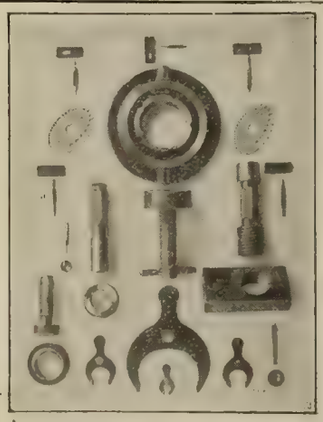
CARRIED IN STOCK AT THESE WAREHOUSES:

E. T. WARD'S SONS 44 FARNSWORTH ST., BOSTON, MASS. | GEO. NASH CO. 304 HUDSON ST., NEW YORK, N. Y. | FIELD & CO., INC 721 ARCH ST., PHILADELPHIA, PA. | VANADIUM-ALLOYS STEEL CO PITTSBURGH, PA., AND LATROBE, PA | GEO. NASH CO. 646 WASHINGTON BLV'D., CHICAGO, ILL.

SMALL TOOLS

PROMPT SERVICE

is assured at our nearest store where P. & W. Small Tools are carried in stock. Place your order there to-day.



PRATT & WHITNEY
Standards and Gauges
Accuracy Unequalled

P. & W. Die-Stock Dies

These dies are practically solid when in use and can be adjusted 1-32 in. larger or smaller. The chasers can be quickly removed for the purpose of renewal or sharpening. Standard sizes furnished include U. S. Standard, Whitworth Standard, S. A. E. Standard and "V" form, all right hand; also special right-hand Briggs Standard taper pipe thread.

The Pratt & Whitney policy of highest quality materials, together with the necessary refinement and accuracy, is maintained.

PRATT & WHITNEY CO.

of Canada, Limited

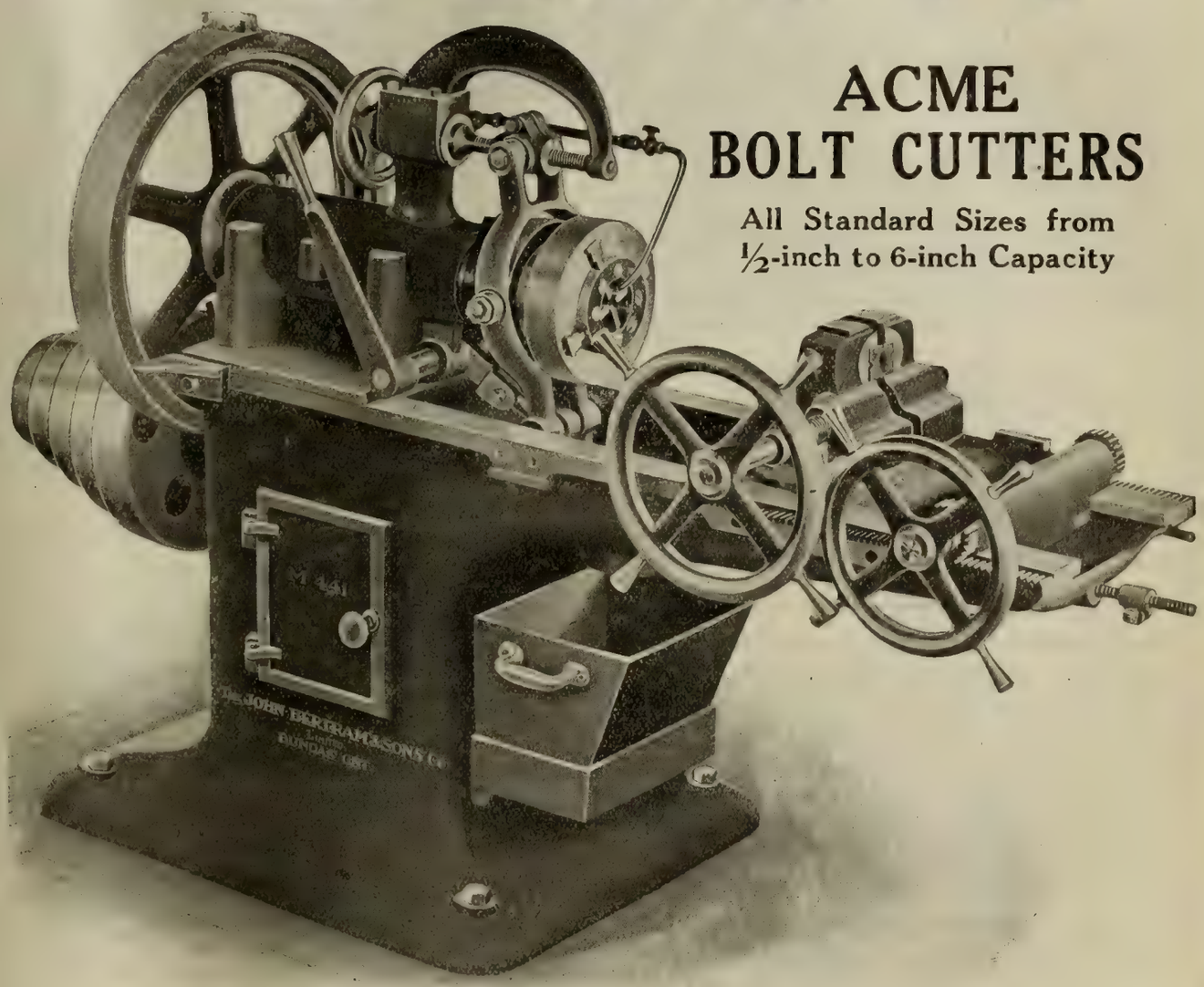
Works: DUNDAS, ONTARIO

MONTREAL	TORONTO	WINNIPEG	VANCOUVER
723 Drummond Bldg.	1002 C.P.R. Bldg.	1205 McArthur Bldg.	B.C. Equipment Co.

BERTRAM MACHINE TOOLS

ACME BOLT CUTTERS

All Standard Sizes from ½-inch to 6-inch Capacity



Supplied with Leadscrew Attachment for Stay Bolts or other work requiring special Accuracy of Pitch.

WRITE US FOR FULL DETAILS ON ANY MACHINE OR MACHINES IN WHICH YOU ARE INTERESTED

The John Bertram & Sons Company Limited

DUNDAS, ONTARIO, CANADA

MONTREAL	TORONTO	VANCOUVER	WINNIPEG
723 Drummond Bldg.	1002 C.P.R. Bldg.	609 Bank of Ottawa Bldg.	1205 McArthur Bldg.

The Publisher's Page

TORONTO October 11, 1917

Measuring Direct Returns

EVERY advertiser is entitled to know what he is getting for his money.

Every publisher is anxious that his paper shall be credited with the returns which it produces.

Yet the fact of the business is that it is next to impossible to trace all of the results of advertising. Direct returns as a measure of the value of space are therefore inadequate, and fail to indicate the accomplishments of the advertising.

This is indicated in a particularly convincing way by the experience of a well-known book publisher, whose business is handled entirely by mail, and is therefore altogether the product of advertising.

All ads published are keyed; direct advertising is likewise watched carefully, with special key numbers, so as to enable the publisher to note the percentage of returns from each piece of advertising sent out.

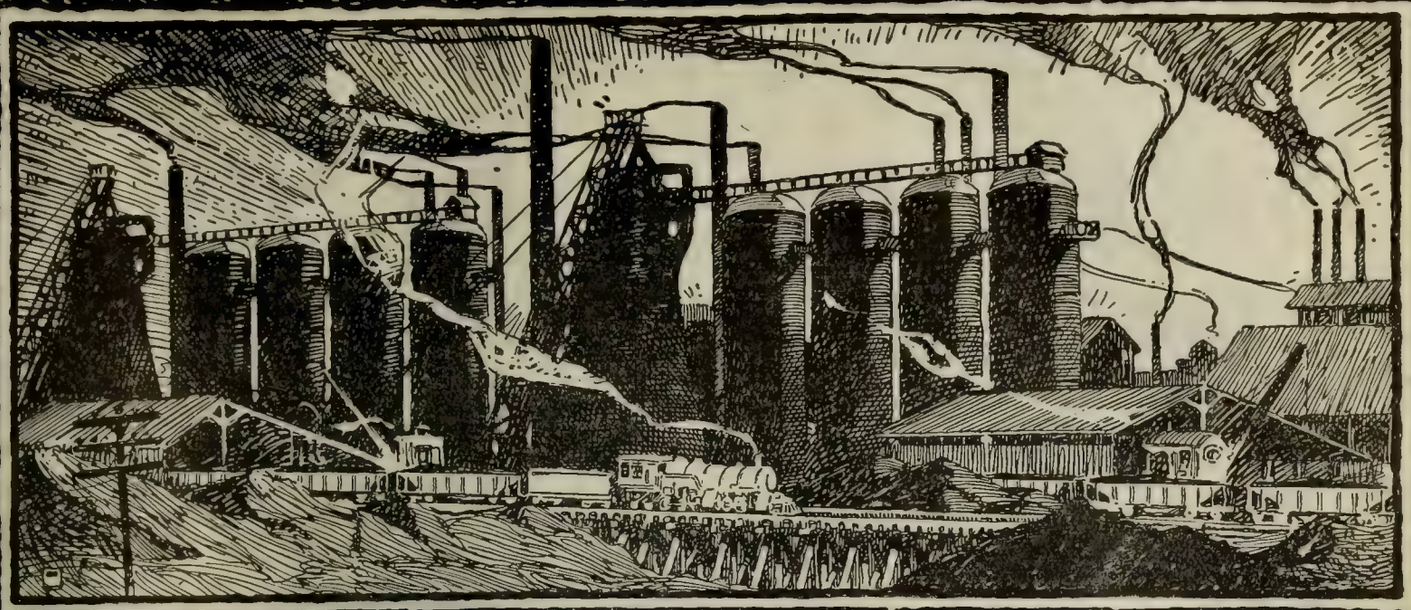
In spite of all this, however, the business which can be definitely attributed to specific forms of advertising is only about fifty per cent. of the total.

In other words, at least half of the business cannot be credited at all, and yet without any question it is the result of advertising, because all of the business of the house is secured in this way.

As a result of his experience, this book publisher now multiplies the direct results of advertising by two in order to get a line on the complete results.

Most advertisers in other fields would probably be able to use a larger multiple, especially if they have salesmen and are following up their advertising in other ways, because in that event the situation is complicated by the opportunity for personal solicitation to interpose and take up the work where it was left off by the printed advertisement.

Consequently, when an advertiser says he didn't get results, an analysis of his business would probably demonstrate that results were secured, but were not credited to specific media.—*Class.*



LITTLE WORDS WITH BIG MEANING

Quality

According to "Webster," Quality is "an excellence of character; natural superiority."

Service

Webster's definition of "Service" is; "The performance of labor for the benefit of another."

We use these words advisedly—fully understanding their definitions—and realizing the obligation we place upon ourselves by their continued use in connection with our products of Iron and Steel, and our attitude to the people we serve.

THE

STEEL COMPANY

OF

CANADA

LIMITED

MONTREAL HAMILTON

Pig Iron,
Steel & Iron Bars,
Horse Shoes,
Steel and Iron Products.

Steel Billets,
Track Spikes &
Bolts, Forgings, Wire
of every description.

"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

MANUFACTURED BY

Arthur Balfour & Co., Limited
Dannemora Steel Works,
Sheffield, England.

The Eagle & Globe Steel Company, Limited

Head Office and Warehouse, Canada and U.S. — 128 Craig Street West, Montreal
Ontario Office and Warehouse — 36 Colborne Street, Toronto
Winnipeg Stock — Dominion Equipment & Supply Co. Limited
Vancouver Stock — Frank Darling & Co.

W. A. BRADBURY, Agent, 128 Craig Street West, Montreal

Works: LONGUEUIL, QUE.

CANADIAN MANUFACTURERS
are you using Steel
MADE IN CANADA?

We are manufacturing at our works at
LONGUEUIL, QUE.

SPECIAL HIGH SPEED AND CARBON TOOL STEELS, MISCELLANEOUS SHOP TOOLS, GAUGES, Etc.

ARMSTRONG WHITWORTH of CANADA
LIMITED
HEAD OFFICE: 298-300 St. James St., Montreal
Branches: 27 King William Street, HAMILTON
Dominion Bank Bldg., TORONTO
McArthur Bldg., WINNIPEG, MAN.

Coal
Coke
Iron Ore

Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

M.A. HANNA & Co.

Sales Agents, CLEVELAND

Canadian Office:
703 C.P.R. Bldg., Toronto

TRADE MARK

of the Famous

"WACO"

BRAND

HIGH SPEED STEEL

AND

TWIST DRILLS

"DOUBLE WACO" Quality

Specially Adapted for Munition Work

"TURTLE" BRAND

High Class Tool Steel, Files, etc., of all descriptions.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

TRADE MARK "WACO"

Reliance Steel Works

SHEFFIELD, ENG.

TRADE MARK

For particulars apply to our

Sole Representatives for Canada

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario

STELLITE

QUITE remarkable economies have been effected in turning, planing and shaper work on all kinds of steel, cast iron, bronze and other materials by the new alloy

STELLITE

But we are now able to recommend it for Milling Cutters and Form Tools of all kinds.

Information and quotations supplied by our Service Department on application.

Deloro Smelting & Refining Co. Ltd.

Head Office & Works—Deloro, Ont.

TORONTO
200 King St. W.

MONTREAL
315 Craig St. W.

Steel Castings

No castings too small or too large for the capacity of our plant. Manganese, Vanadium, Titanium, Chrome, Nickel, castings for Marine, Railroad, Mill and hydraulic purposes are our specialty. Made true to specifications and pattern.

Illustration above shows Stern casting for Ice-Breaker, "John D. Hazen."

CANADIAN STEEL FOUNDRIES.
LIMITED

Montreal, P.Q. Welland, Ont.

SISCO

We guarantee shipment within 24 hours of receipt of order

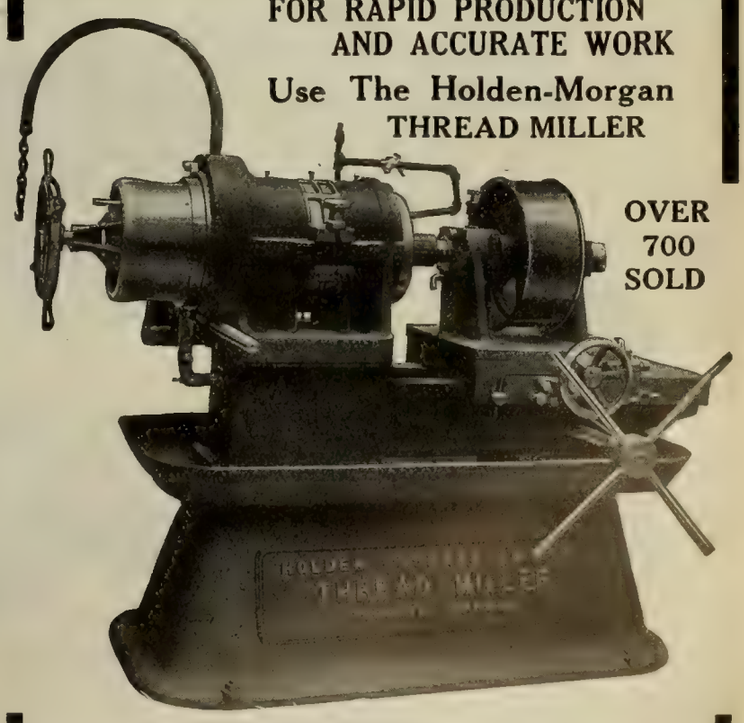
"Extra" "Special" "High Speed" **Tool Steels**

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

FOR RAPID PRODUCTION AND ACCURATE WORK
Use The Holden-Morgan THREAD MILLER

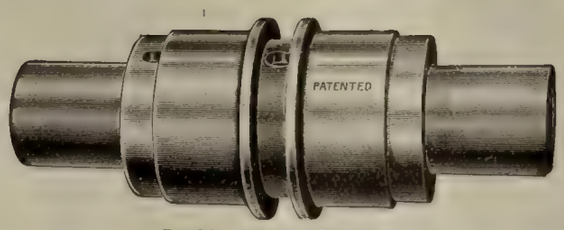


OVER 700 SOLD

Prompt Delivery
On Nose or Base Machines, also Internal or External Fuse Machines—with air-chucks.

The A. R. WILLIAMS MACHINERY COMPANY
LIMITED
64 FRONT ST. W. TORONTO

THE JOHNSON FRICTION CLUTCH



Double Clutch—Exterior.

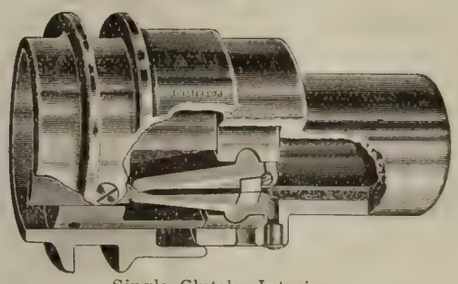
Another Talking Point Is Added When Johnson Friction Clutches Are Added To Your Machines

Many of the machine tools that are noted for their ease of manipulation have gained this mechanical perfection by using JOHNSON FRICTION CLUTCHES.

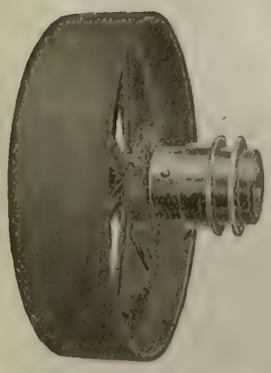
When JOHNSON FRICTION CLUTCHES are mentioned where details of working mechanism are given, you gain the favor of mechanical men and give them the proof that your machines are mechanically perfect.

We'll gladly give you a list of the prominent machine tool builders who are incorporating our clutches in their latest machines.

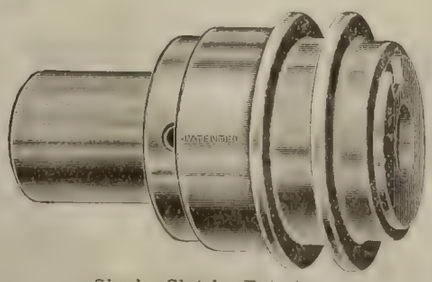
Write for Our Booklet, "Clutches as Applied in Machine Building," and Yellow Data Sheets.



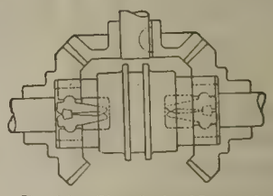
Single Clutch—Interior



Pulley mounted on Clutch Hub



Single Clutch—Exterior



Double Clutch in Nest of Gears

CANADA—Williams & Wilson, 320 St. James Street, Montreal; The Canadian Fairbanks-Morse Co., Ltd., Toronto.
ENGLAND—The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents for British Isles.
AUSTRALIA—Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth Street, Melbourne, Victoria.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

We will Fill Your Requirements *Send Us Your Inquiries*

Air Compressor Evidence

The greatest evidence of the value of any article is the demand for it after investigation and trial. Below are four carloads of our compressors which fills one order to a large concern in Canada. Our line of compressors is very large.

Write us and explain your requirements.

The Jenckes Machine Company, Limited

CANADIAN SALES OFFICES:
Sherbrooke, Montreal. St. Catharines, Toronto
Cobalt, South Porcupine, Vancouver

WORKS: Sherbrooke, Que.

WORKS: St. Catharines, Ont.

FERRO-URANIUM *The Latest Discovery in Alloys for Efficient*

High-Speed and Other Steels of Quality

IT INSURES TOOLS THAT STAND UP ON THE JOB

Largest Producers in the World of URANIUM

WRITE US FOR PARTICULARS

STANDARD ALLOYS COMPANY

Forbes and Meyran Aves. -:- Pittsburgh, Pa.

SaBeN ExTrA
HIGH SPEED STEEL

The most Economical and Efficient Steel for Machining Shells

"Extra" Die Steel another good one

Manufactured by
SANDERSON BROTHERS & NEWBOULD, Limited
SHEFFIELD, ENGLAND

H. A. DRURY COMPANY LIMITED
MONTREAL TORONTO NEW YORK

High-Speed STEEL

The tools that are made with "Wolfram" High Speed Steel are warranted to be super-keen at the edge and super-strong at the neck.

WOLFRAM

Embodies a true and permanent alloy of Tungsten, Chrome, Vanadium and Iron. No better High Speed Steel in the world.

VULCAN CRUCIBLE STEEL COMPANY
ESTABLISHED 1900
Aliquippa - Pa., U.S.A.

Represented in Canada by Messrs. Norton, Callard & Company, Montreal.

Electrite

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium—make this a steel of truly remarkably cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.
LATROBE, PA.

High Speed Steel

Uranium

The

Fairley Davidson Steel Co., Inc.

SPECIALISTS

	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
High Strength Steels	"Hehtemnd"
High Speed Steel	RUSHITOFF No. 6
Tool and Die Steels	"Fondwot" and "Giant"
Magnet Steels	Tungsten or Chrome
Non-Changeable Die Steel	Nugget "B" oil hardening

CHROME VANADIUM, oil hardening or case hardening

CHROME NICKEL, oil hardening or case hardening

Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

Canadian Agents:

The Canadian Utilities Steel & Engineering, Limited

149 Craig Street West, Montreal, Canada

We carry a complete stock at our Montreal Warehouse

STEEL *for*

Shrapnel Shells and Shell Blanks

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Steel Ingots
by the
HARMET
Liquid Process

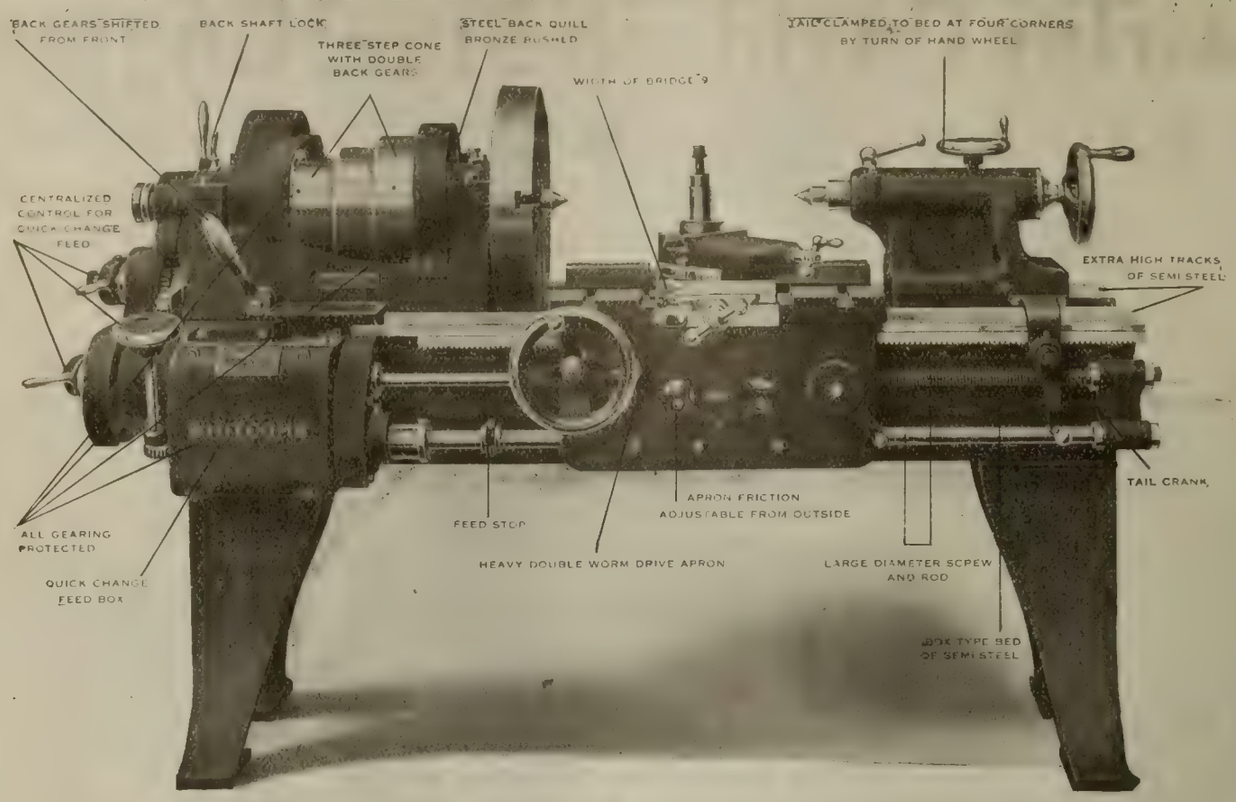
Nova Scotia Steel and Coal Co., Limited

Head Office:
New Glasgow, N.S.

Western Sales Office:
Room 14 Windsor Hotel
MONTREAL

16" HEAVY DUTY ENGINE LATHE

NOTE THE GOOD FEATURES EMBODIED IN THIS MACHINE



WHITCOMB-BLAISDELL MACHINE TOOL CO.

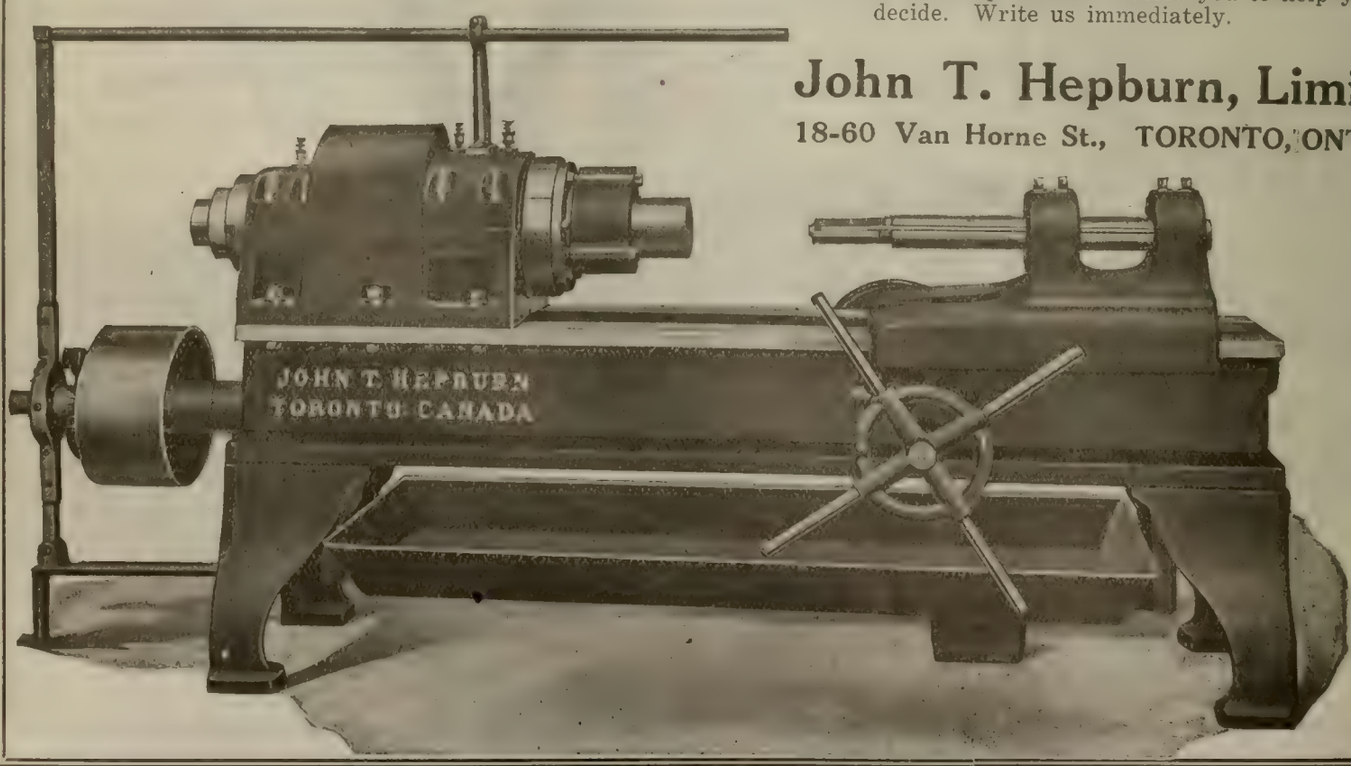
ENGINE LATHES — WORCESTER, MASS. — METAL PLANERS

Renew Your Old Lathe

Not necessarily by securing a new one but take advantage of our thoroughly equipped machine shop. We repair lathes, plane the lathe beds. We build lathes and in our repairing the same care is exercised. If you intend securing a new lathe, get a list of the Hepburn line before you to help you decide. Write us immediately.

John T. Hepburn, Limited

18-60 Van Horne St., TORONTO, ONTARIO



Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6″ shells.

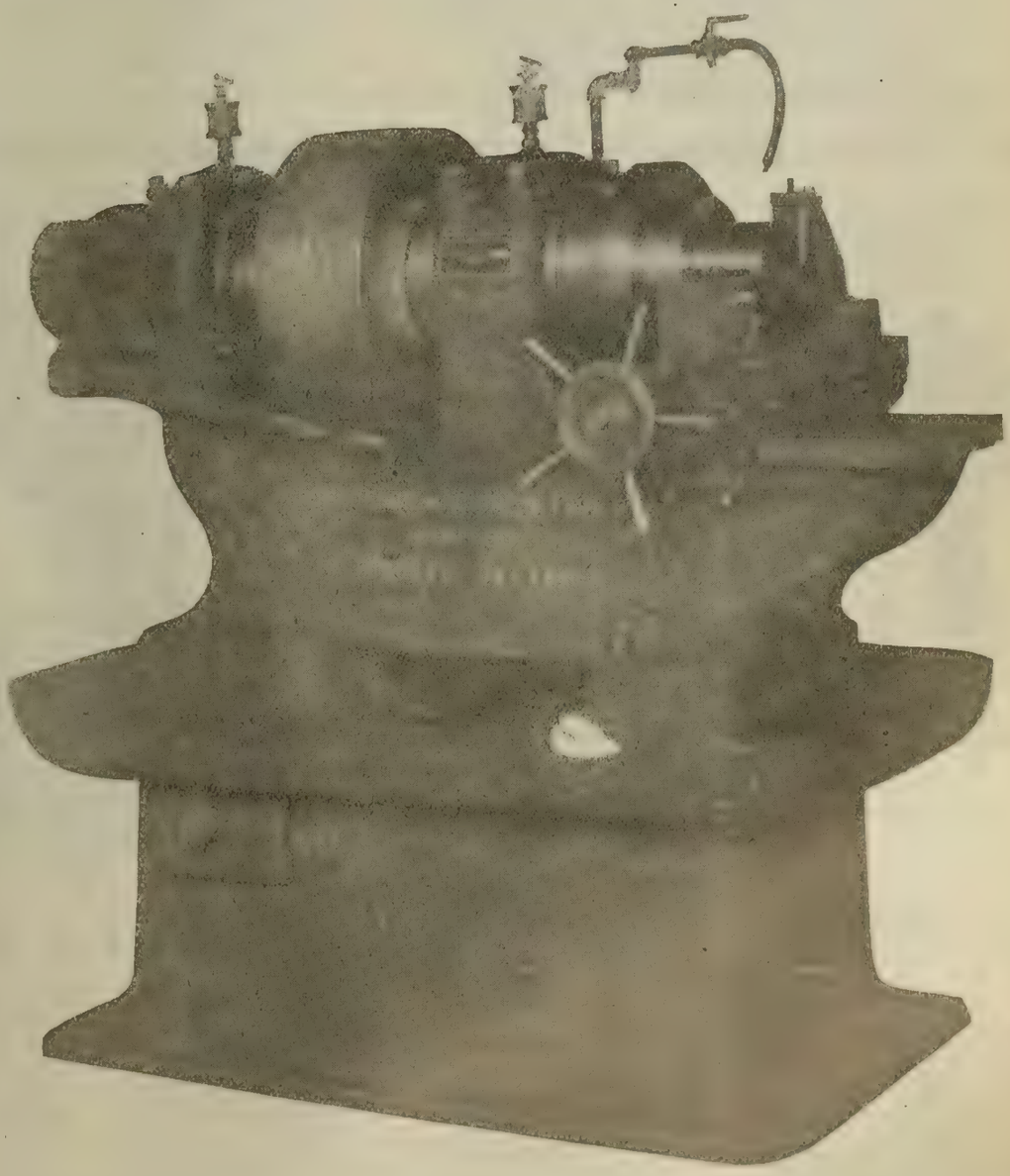
Roelofson Machine & Tool Co., Ltd.

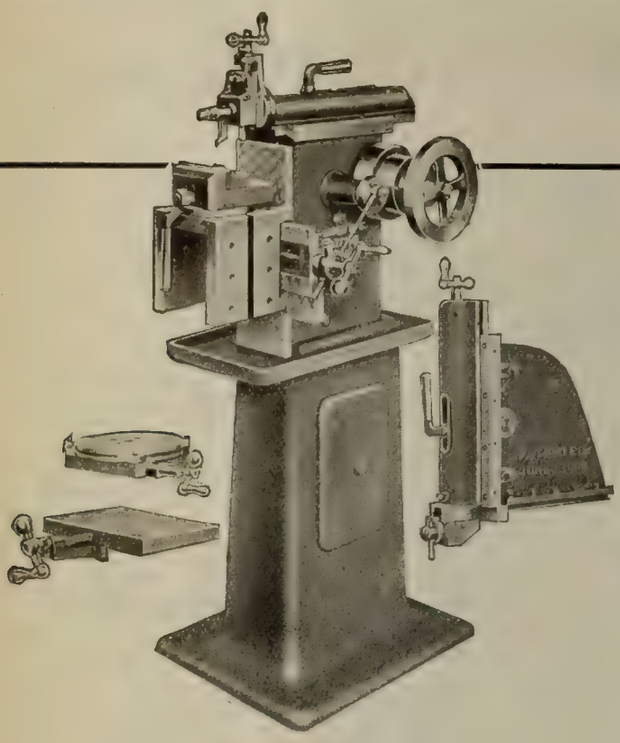
Head Office 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6″ shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.





Patented—June 23, 1914

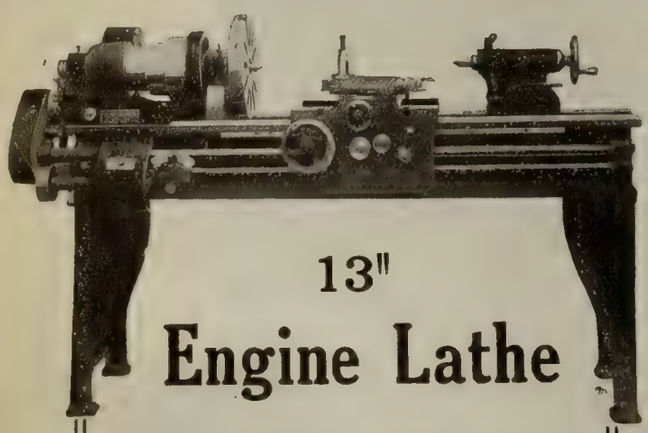
The Complete Machine

A machine whose efficiency can be added to by the quick and convenient changes shown here. Nothing cumbersome. A clean-cut machine that answers the most modern requirements in efficiency.

Designed especially for making tools, dies, models, and for slotting and shaping all classes of work.

Increased efficiency gives increased production which offsets increased costs and gives increased profits. A short but vital lesson on "increase." Think it over and write us.

The Rhodes Manufacturing Company, Hartford, Conn., U.S.A.



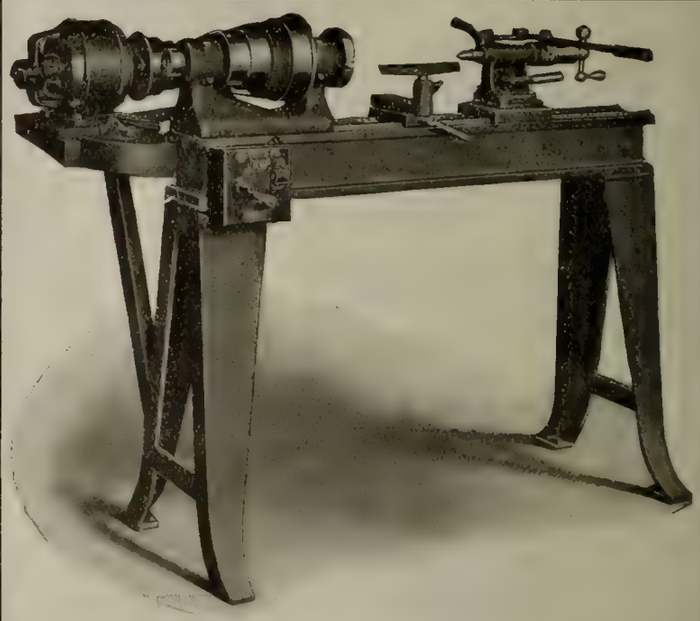
13" Engine Lathe

Such features as solid, full-webbed headstock, 50 point carbon crucible steel spindle, rigidly clamped tailstock and an unwavering principle to maintain a standard of machine that is proportionate throughout and conforms to the requirements of "Filsmith Quality."

These features have put this lathe in the foreground, where its daily performances keep it.

Inquire of us. It is a pleasure to help you.

The Philip Smith Mfg. Co.
SIDNEY OHIO U.S.A.



Built For *Service*

This BLOUNT Motor-driven Lathe is well adapted to all speed lathe uses. It is of late design, and has a number of features in which you will be interested. Provided with constant-speed motor. Lathe spindle made of hollow, high-carbon steel, ground to size and bored for Morse taper. Runs in self-oiling bronze bearings.

J. G. Blount Co., Everett, Mass., U.S.A.

TEXTILE BELTING and PACKINGS

HIGH SPEED TWIST DRILLS

J R BAXTER & COMPANY LIMITED, MONTREAL

and GENERAL MACHINERY SUPPLIES

Two Cuts at One Time

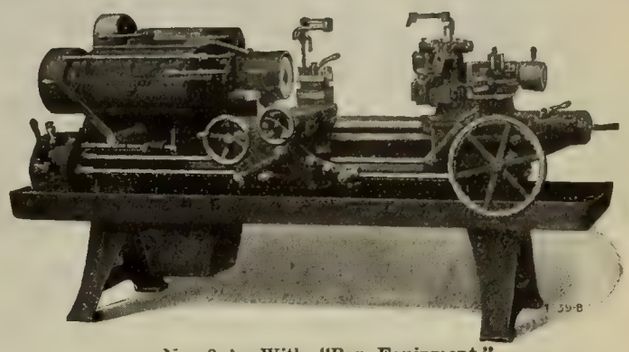
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

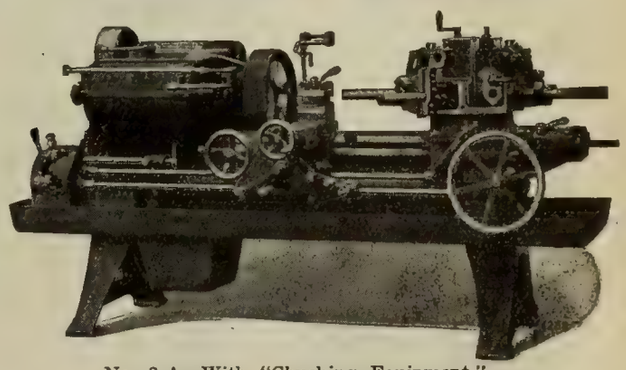
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."



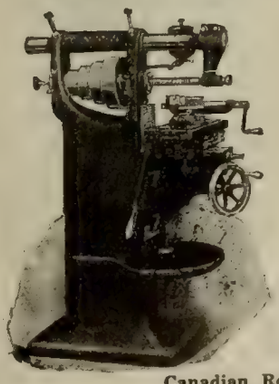
No. 2-A—With "Chucking Equipment."

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal, Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

Increased Production Means Increased Profits

Large Millers for large work —STEPTOE MILLERS for small work.



Large Planers for large work —STEPTOE SHAPERS for small work.

Will result in increased production; less money invested in machinery, and increased profits.

THE JOHN STEPTOE COMPANY

CUMMINSVILLE, CINCINNATI, OHIO, U.S.A.

Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.

If any advertisement interests you, tear it out now and place with letters to be answered.

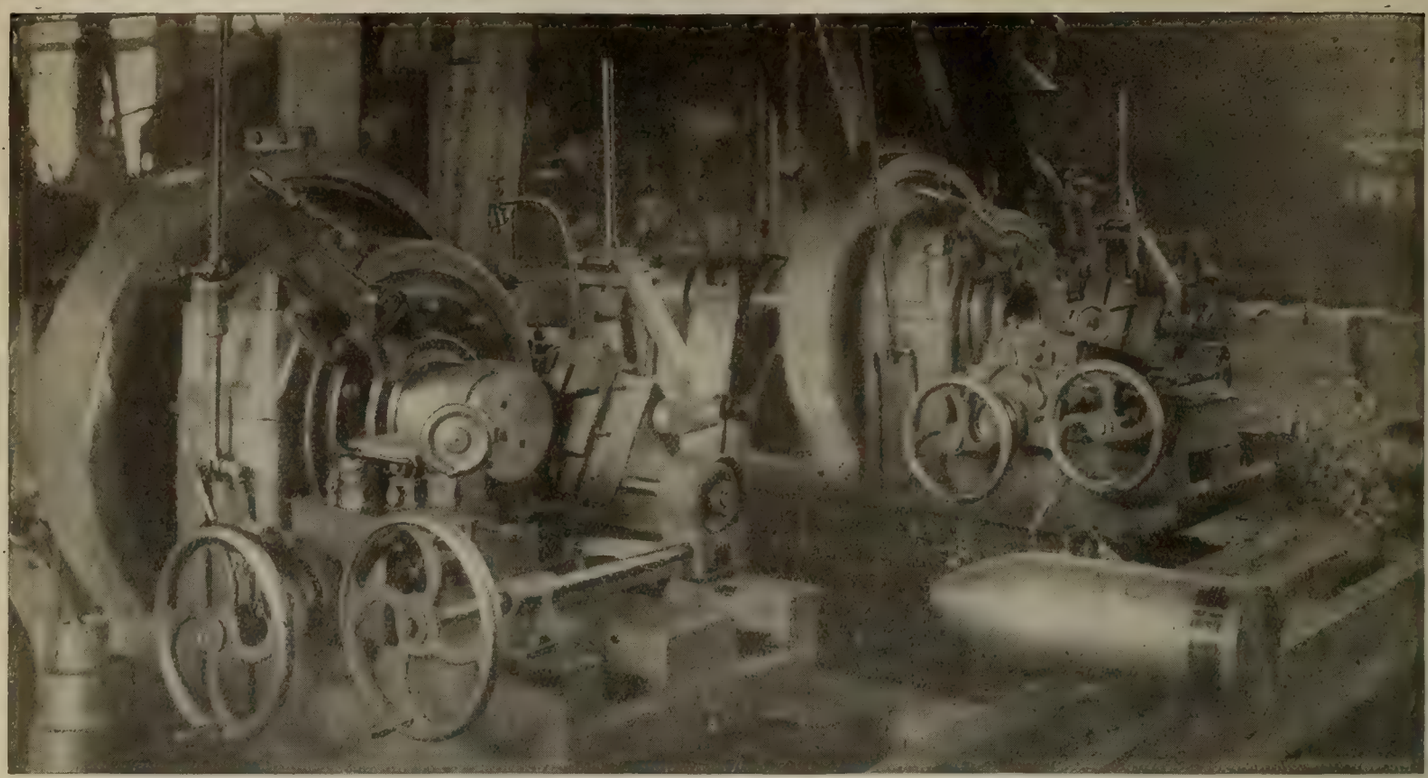


Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

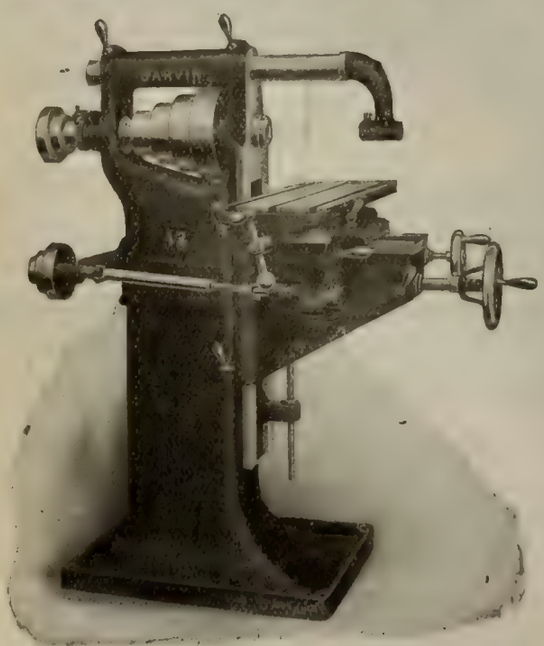
These machines are built for turning bands on 8", 9.2" and 12" shells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. Write for full particulars and price.

Bennett Ave. **Warden King Limited** Maisonneuve, P.Q.

GARVIN

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING



No. 12 Plain Milling Machine—Use Code Abrade

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rapidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments.....18 x 6 x 15 in.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

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Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City

BUILT TO TURN OUT BIG AND FINE WORK—STURDY, EASY TO HANDLE, ACCURATE —A TRIUMPH OF THE HAMILTON SHOPS.

Hamilton

"The Distinguished Service Lathe"

In this Lathe you see exemplified the skill of expert workmen with years of "Hamilton" experience—experience which means something. It is a lathe that well represents the best of our high-class machines—a lathe most carefully constructed with lasting materials—a lathe that turns out work of the calibre of its own ideal construction.

The illustration shows the sturdy, easy working "Hamilton" complete with equipment — single back gears, hollow steel spindle, self-oiling bronze boxes, power cross feed, chasing dial, quick change feed box, automatic stop for feed. There is a good deal more we can tell you about this profit-making quality worker. Write to us and we will send you interesting literature.

Rapid Production HAMILTON Machine Tools

FOR 25 YEARS MAKERS OF FINE MACHINE TOOLS

The Hamilton Machine Tool Co.

HAMILTON, OHIO

Sole Agents for Ontario: H. W. Petrie, Limited, Toronto, Ontario

Bilton Automatic Gear Millers—Spur or Bevel Gears

CAPACITY

No. 1 - - 14 Pitch
No. 2 - - 10 Pitch
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The Bilton Machine Tool Company

Succeeding The Standard Mfg. Company
Housatonic Ave., Bridgeport, Conn., U.S.A.

Also Manufacturers of —
Plain Horizontal Millers
Automatic Millers
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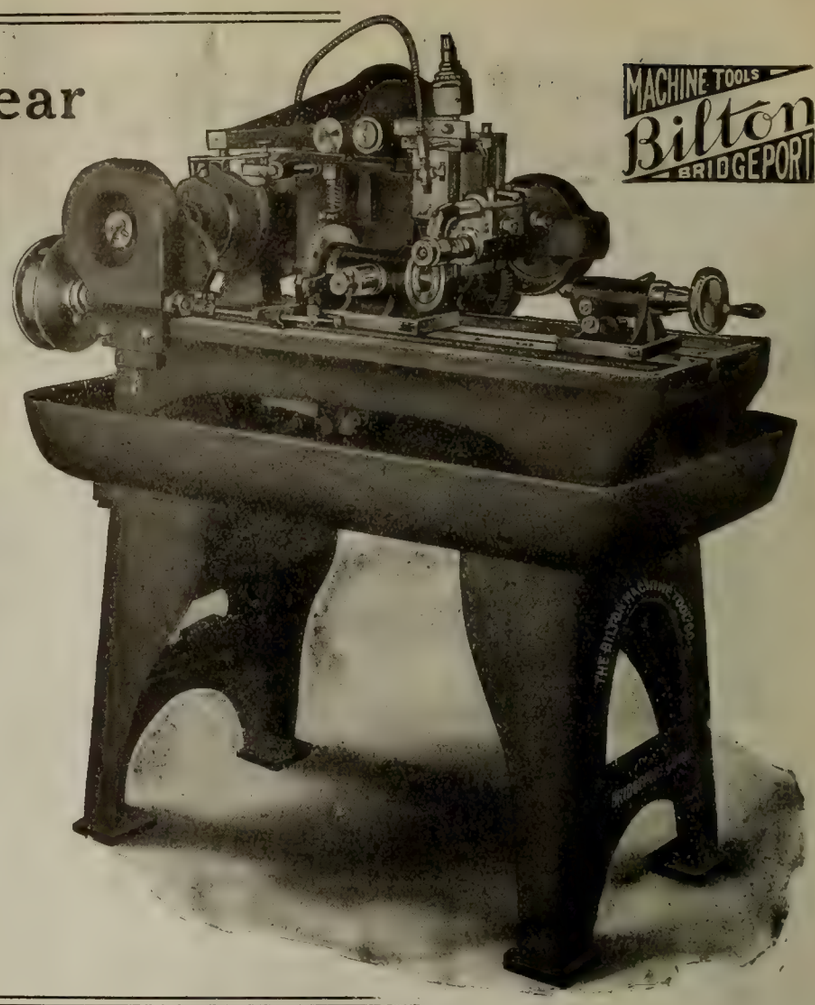

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UNIVERSAL MILLING MACHINES

Are built in three standard sizes. They embody every worth-while feature to be found on a tool room Milling Machine. We call especial attention to the Dividing Head which is part of the regular equipment of every Universal Miller.
The Kempsmith Dividing Head is compact and rigid, unusually convenient in operation and so constructed as to maintain its accuracy under heavy service.
We publish a thirty-two page book elaborately illustrating and describing this Dividing Head. A copy will be sent free on request. Just ask for "Dividing Head Book."

Kempsmith Manufacturing Co.

MILWAUKEE, WIS., U.S.A.

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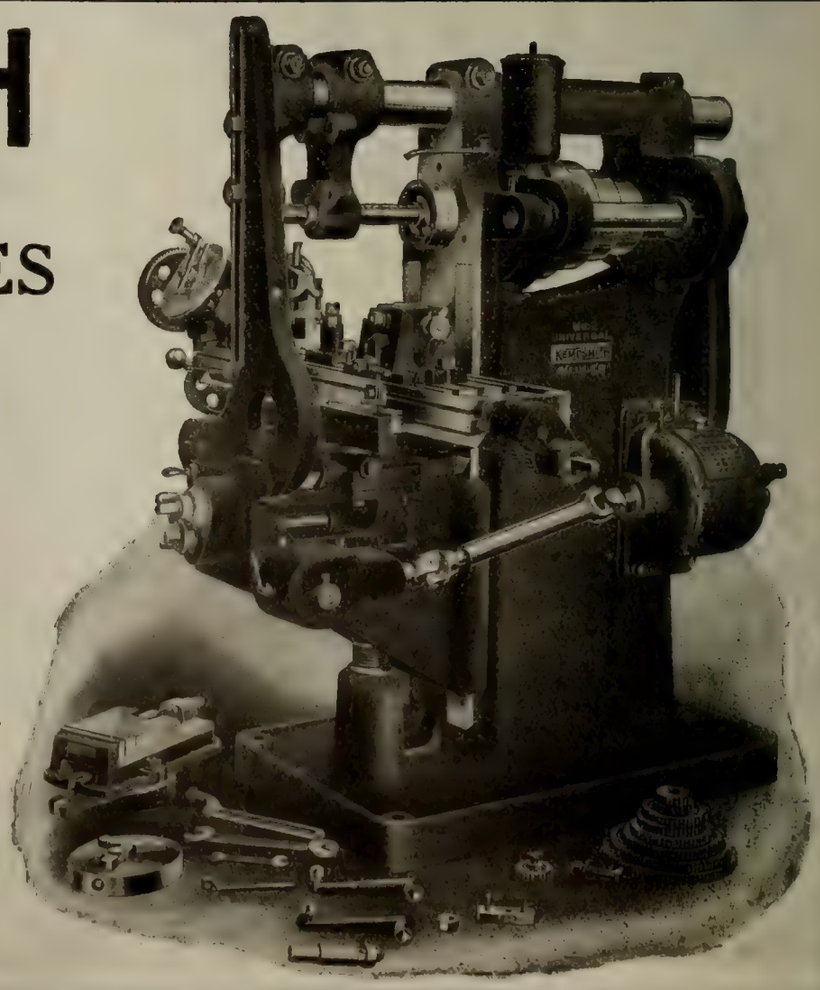
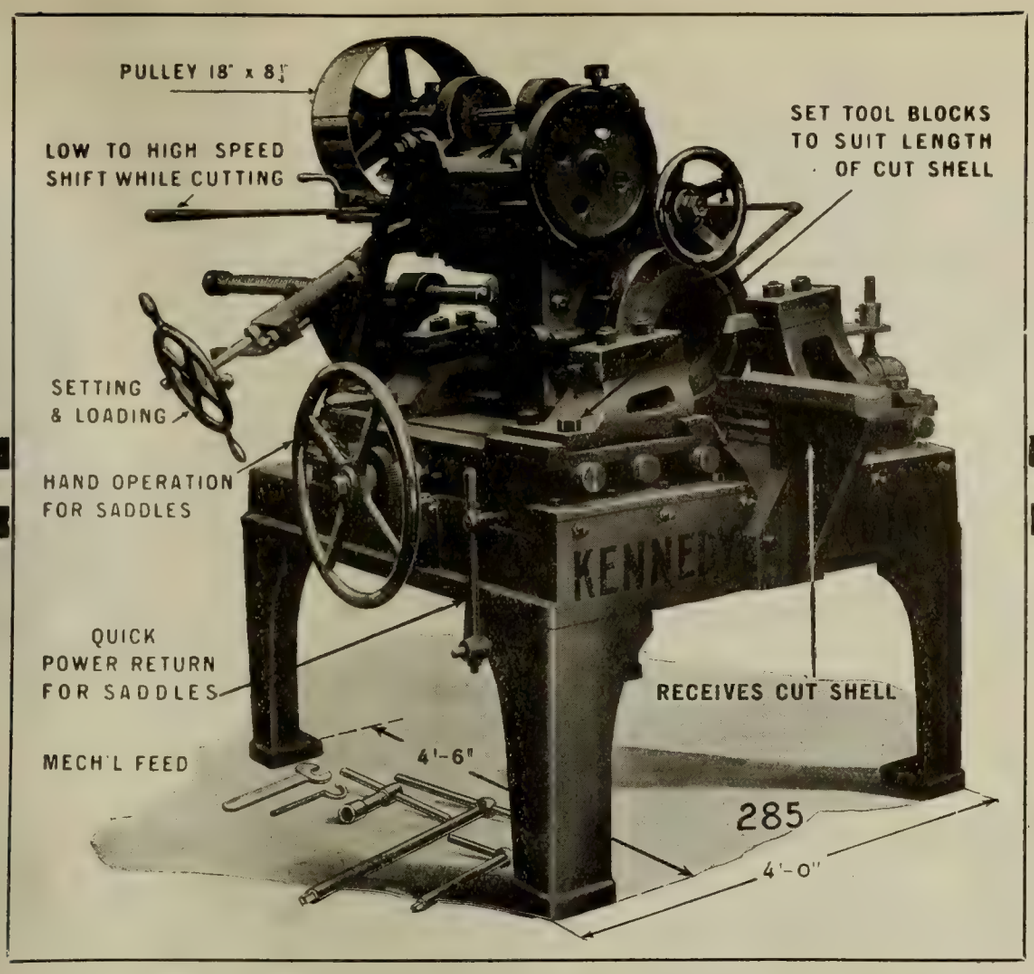
General Supply Company, Toronto and Ottawa.
Canadian Western Foundry & Supply Co., Calgary, Alta.





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Cuts both ends at once

Forgings load in one end and discharge out the other end when cut

A Girl can operate it.

New quick power return for saddles

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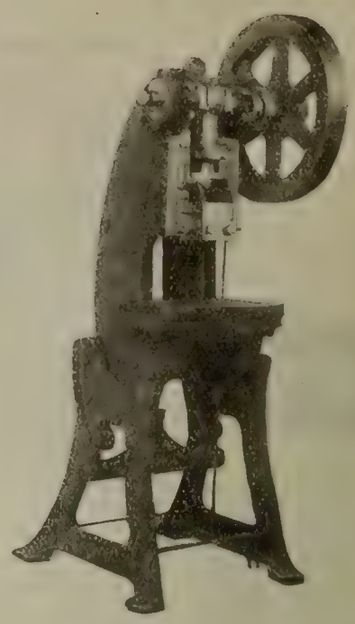
HAVE you examined the patented Ball Joint Connection on the smaller Consolidated Presses? This ball joint is instantly adjustable for wear, all lost motion can be eliminated by loosening the locking screws and adjusting the ball cap downward—no machining or filing required.

There is another important feature in considering this connection. The ball cap and adjustable split bushings can be removed from the connection screw without removing the screw from the connection or disassembling any other parts.

That is economy that cannot be overlooked.



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Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

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Combination Hydro-Pneumatic Forcing, Broaching and Straightening Press

with or without auxiliary tables, can be used for a variety of purposes. Built in sizes to suit your needs.

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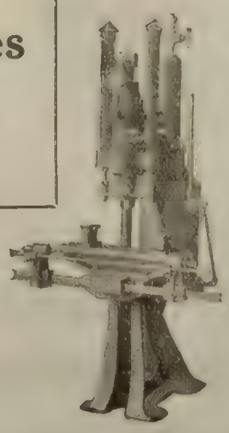

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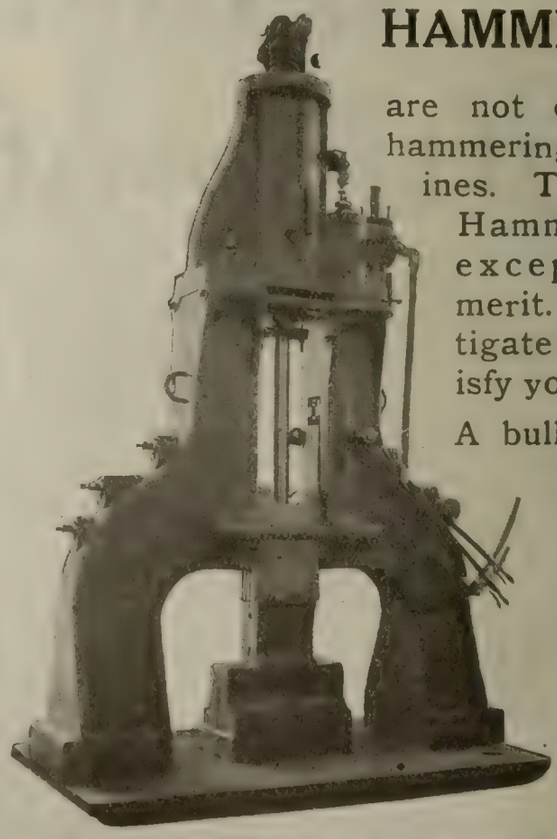
"ERIE" STEAM FORGING HAMMERS

are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

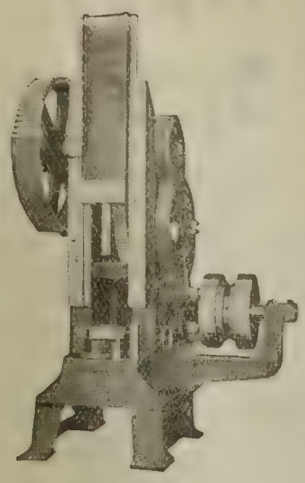
A bulletin for the asking.



ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U. S. A.

THE "TOLEDO"

Rack and Pinion Reducing Presses



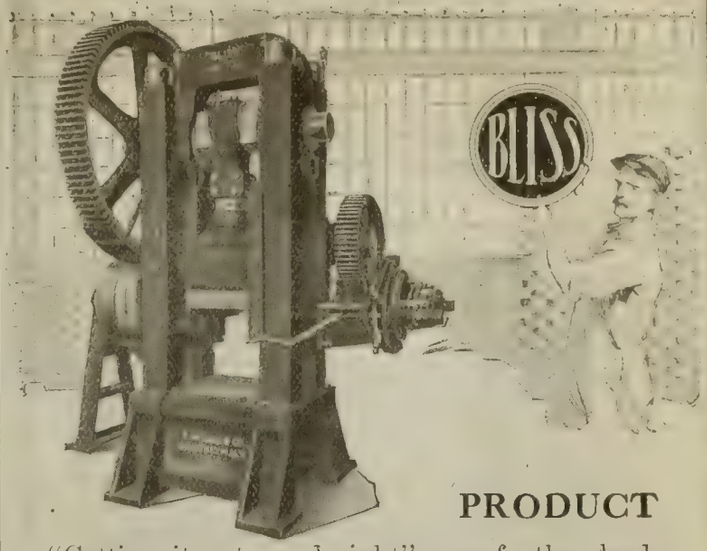
Particularly recommended for the manufacture of brass cartridge cases, soda water fountain tubes, gasoline stove and lamp burner tubes, etc.

The slide is operated in a manner to give a uniform speed to the punch during entire drawing operation; admits of easy adjustment for various heights of work and provides for a quick return.

We build presses weighing pounds or tons—for delicate requirements or heavy needs.

The Toledo Machine & Tool Co.

Toledo, Ohio, U.S.A.



PRODUCT

"Getting it out—and right" goes further back than the selection of the machine. It may go back 10 or 20 or 40 years to some point or problem solved in our 60 years' development of Presses that produce.

If you want machines with production capacity based on *longest* practical experience, buy "Bliss."

E. W. BLISS CO.

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1857 1917

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Hydraulic Presses, Pumps and Accumulators for all purposes

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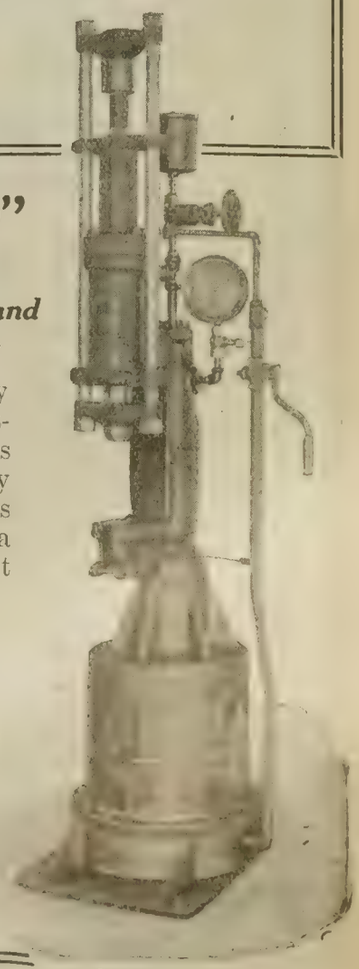
Triple Purpose

"METALWOOD"

COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.



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For Great Britain and Continent address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

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Oxy-Acetylene Welding and Cutting

Operator reclaiming broken machine parts by the Prest-O-Lite Process.

Conservation *vs.* Waste

Hundreds of thousands of dollars' worth of valuable castings, machine parts and tools are being reclaimed from the scrap heap by this process. Not only is oxy-acetylene welding of great value as a manufacturing process, but it effects big savings in repair work of all kinds—broken metal parts and castings quickly and inexpensively reclaimed for useful service—in factories, large and small, and in railroad shops, mines and thousands of repair shops.

Many savings and advantages are possible in your shop or factory. Investigation may show a real need for welding.

Prest-O-Lite PROCESS

employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene (ready-made carbide gas) is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Apparatus consists of an equal pressure blow pipe, automatic regulators and gauges, and all necessary equipment. Adaptable for oxy-acetylene cutting by the addition of special cutting blow pipe.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

We will gladly send illustrated literature and interesting data showing actual instances of savings made by others. It may suggest valuable ideas to you. Write for it. Address Department C-107.

THE PREST-O-LITE COMPANY INC.

CANADIAN GENERAL OFFICES:
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Direct Factory Branches: Toronto, Ont: Montreal, Que.; Merritton, Ont.: Winnipeg, Man.

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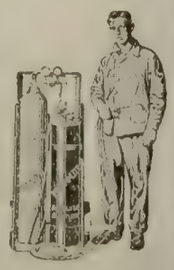
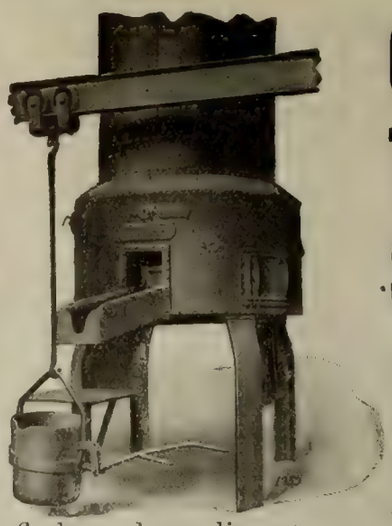


World's Largest Makers of Dissolved Acetylene



Overhead Trolley Systems

are invaluable in light work foundries for delivering molten metal, collecting and delivering castings, and distributing flasks and supplies, etc.

Any point in foundry or shop is easily reached, even remote corners. Extensions readily made.

Save labor, time and floor space.

Send for Catalog No. 111.

Complete Foundry Equipments
Cranes of all kinds

WHITING FOUNDRY EQUIPMENT CO.
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CHICAGO SUBURB.

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AFTER fifteen years' study of the Miner's and Lumberman's wants, we know just what is and what is not required in tools for them.

Practicality has been the keynote of our organization. Experience has aided us in eliminating all unnecessary parts and in perfecting the design of our tools.

The use of best material and finest workmanship enable us to manufacture tools that are unexcelled.

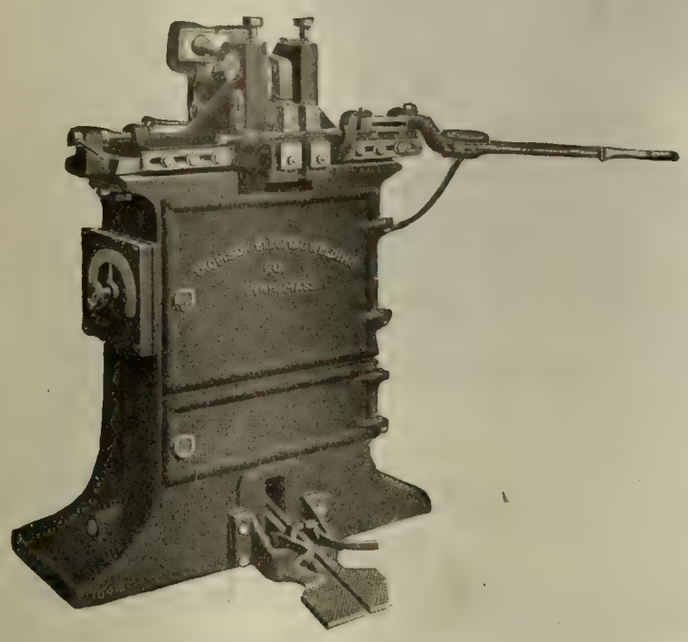
We make a complete line.

Write us for prices.

J. W. CUMMING & SON, LTD.
NEW GLASGOW, - - CANADA

Wood or Steel, let Cummings make it.

Thomson Process
Electric Welding



Adopt a "Thomson" For Your Work

We have shown thousands of manufacturers how to lower their costs and obtain better production by the use of Thomson Butt Welding Machines. No doubt there is work in your shop that could be handled faster and better by the "Thomson" Electric Welding Process.

Why not talk it over with us—let us give you actual facts on how we have saved other firms money and how we can benefit you? It costs nothing for the consultation. Get in touch with us to-day.

Write for Bulletin B-4.

Rivets Abolished—Time Saved

A Thomson Spot Welder will do your riveting and soldering 60% to 90% faster. No rivets or solder required, no holes to punch, and a boy can turn out as much work as five men using the old process. A thorough investigation will prove to you the merits of the Thomson Spot Welding Process and show you how to effect a big saving.

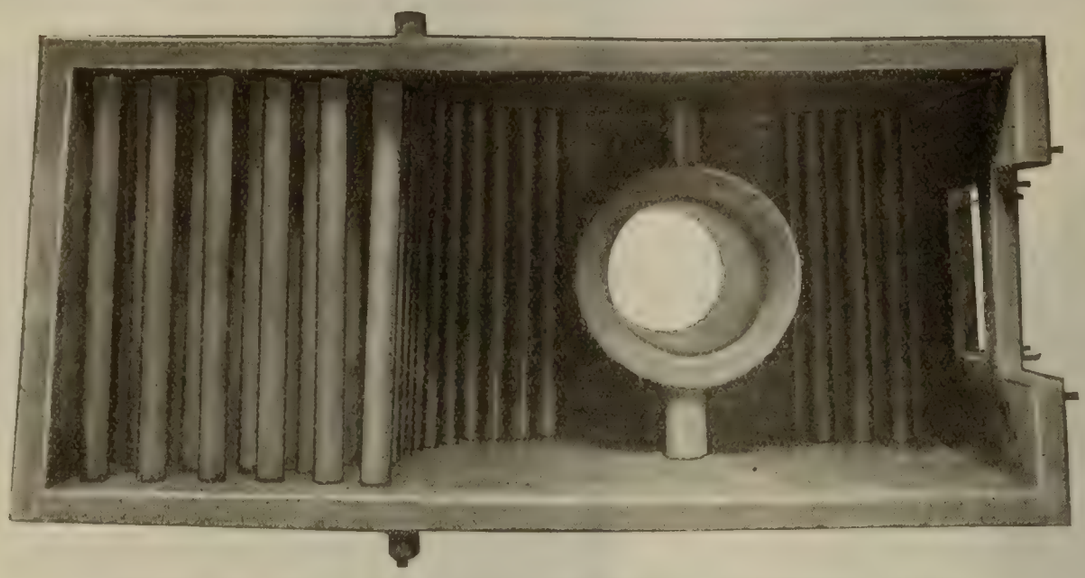
Write for Bulletin S-4

Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

The POSSIBILITIES of OXY-ACETYLENE WELDING



Bottom inside view of Boiler entirely constructed by Oxy-Acetylene Process.

are every day becoming more generally known, and profitable use made of them.

The Boiler illustrated (which is to be used for Steam Heating a building) was constructed entirely by the Oxy-Acetylene Process. All the Plates were cut to size by the Oxy-Acetylene Cutting Torch, and every joint WELDED by the Oxy-Acetylene Blowpipe. Tested hydraulically under high pressure, it was found to be perfect in every respect.

There are hundreds of ways in which you can use an Oxy-Acetylene Outfit to similar advantage, why not do so?

In any Plant where there is running machinery, an Oxy-Acetylene Outfit is the most profitable installation you can make. It obviates Machinery "tie-ups." Saves the cost of replacement by reclaiming broken parts, etc., Saving Time, Money and Material from the day it is installed.

Why not investigate to-day?—particulars sent without obligation.

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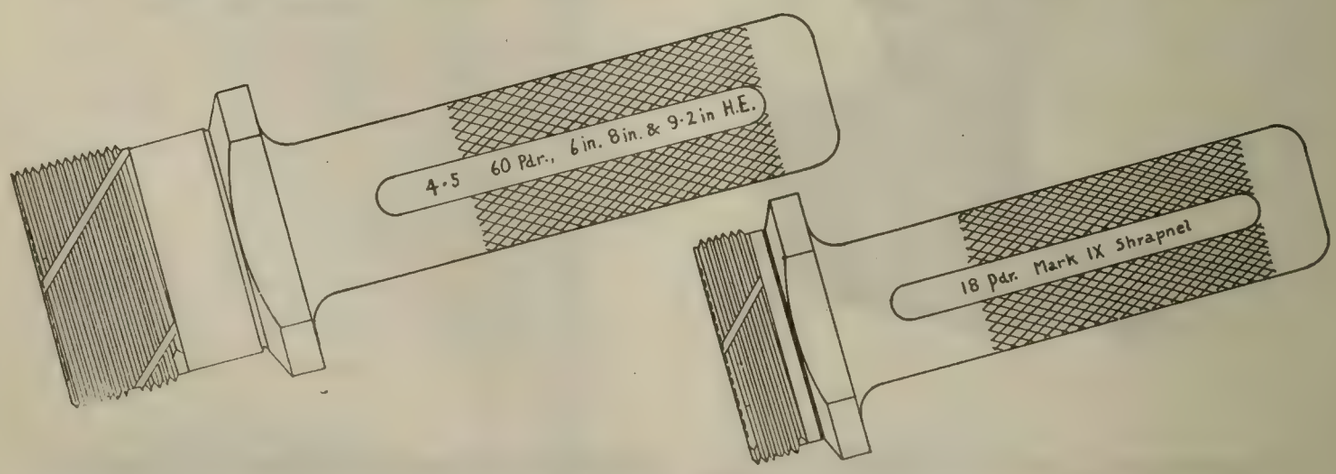
FUSE HOLE GAUGES

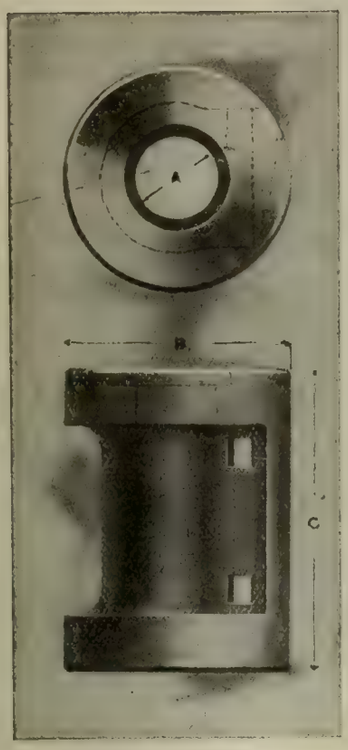


Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

Mining Machinery Parts



Two-key Tappet

Shoes and Dies, Tappets, Bosses, Cams and Stamp Heads

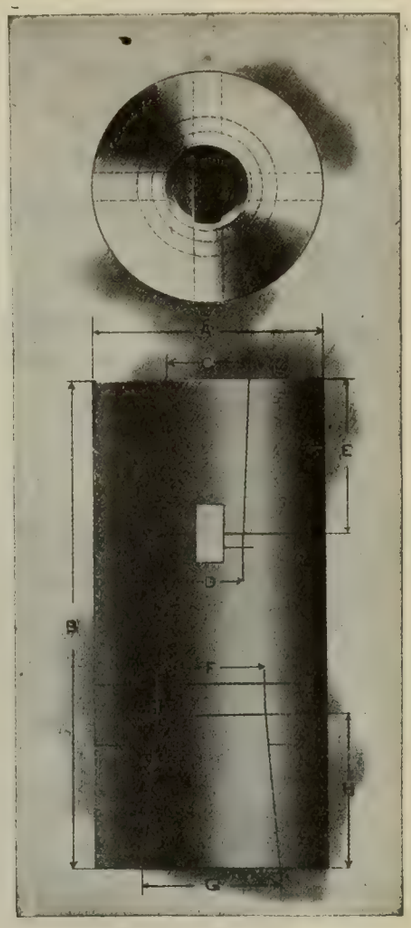
Also Manufacturers of Lining Plates for Ball and Tube Mills Concaves and Heads for Gyratory Crushers.

Machine Moulded Gears

Any size up to 18 feet in diameter. No patterns needed.

Send Us Your Specifications, We Do the Rest. Write—

Hull Iron & Steel Foundries, Limited
HULL, P.Q.

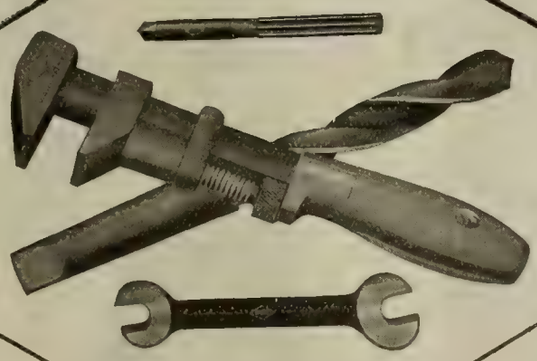


Stamp Head

WHITMAN & BARNES

Twist Drills
and
Reamers

Screw and Drop
Forged Wrenches
Hammers



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Special
High Grade
Drop Forgings

Cotters
Chisels
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CO

Users recognize "W & B" Tool Quality, backed by 64 Years' Uninterrupted Experience. If your Jobbers and Dealers cannot supply, write us and we will see that you are supplied. Send for Catalog No. 90.

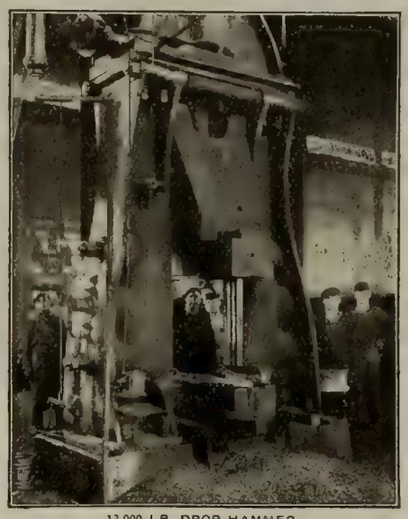
THE WHITMAN & BARNES MFG. CO.

ESTABLISHED 1854

CANADIAN OFFICE AND FACTORY ∴ ∴ ST. CATHARINES, ONTARIO

Witness
a
Drop-Forge
Shop
in action

And
you acquire
a new idea
of
endurance



12,000 LB. DROP HAMMER
WHAT DROP-FORGINGS ENDURE THERE EXPLAINS WHY
"SUPERIOR DROP-FORGINGS" ENDURE EVERYWHERE

J. H. WILLIAMS & CO.
THE WRENCH PEOPLE
45 [illegible] BROOKLYN, N.Y. CITY

Watch a Capable Mechanic Test a File

See him pass his thumb over the teeth.

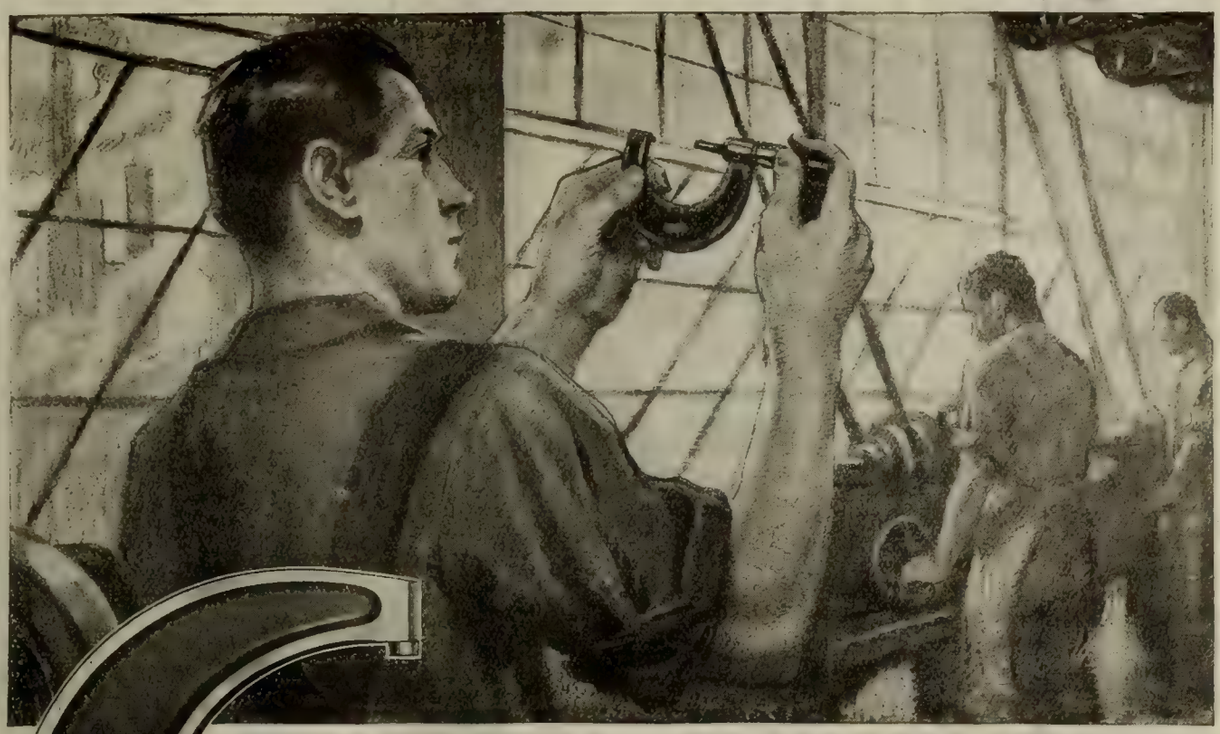
By instinct, he knows, at once, whether a file will do its work.

He senses, at once, the quality of the steel—its balance—and the sharp-edged teeth.

He makes no mistakes in buying —and his choice every time will be for "Famous Five" Files.

Be influenced by *his* judgment and specify "Famous Five" Files when ordering.

They are:



Accurate

Are your precision tools your best friends or your worst enemies? If you are never sure of the reading or if they wear easily and rapidly, you have to guess, and guessing produces seconds and makes thin pay envelopes.

If you use

TRADE MARK
Starrett Tools
REG. U.S. PAT. OFF.

you can be *sure* all the time. If a Starrett Micrometer reads .808 you know that the piece is exactly that diameter or thickness.

You can place the same confidence in all the other Starrett Tools from Vernier Height Gages and Caliper Squares to Test Indicators. All of the 2100 styles and sizes of this complete line are recognized for their enduring accuracy. They help to put speed in your work and bonuses in your pocket.

Ask for Catalog No. 213.

The L. S. Starrett Company

THE WORLD'S GREATEST TOOL MAKERS

ATHOL, MASS.

BY INVITATION MEMBER OF

NEW YORK LONDON CHICAGO

STARRETT TOOLS

42-731

For Polishing Stove Tops

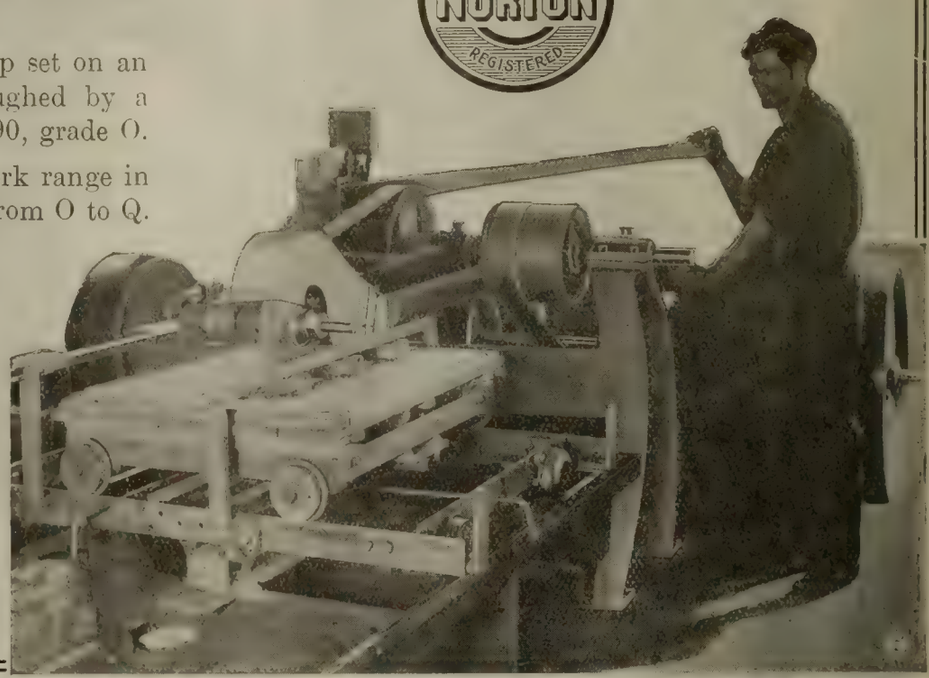
The polishing of stove tops on automatic machines is an interesting operation, and one where the quality of the work done depends largely upon the selection of the grinding wheels and abrasives.

The photograph shows a stove top set on an automatic machine and being roughed by a 10 x 2 x 1 Crystolon wheel, grain 90, grade O.

The wheels usually sold for this work range in grain from 60 to 90 and in grade from O to Q.

Crystolon grain is the abrasive used for the final polishing operation.

TRADE MARK NORTON REGISTERED



Norton Company

Worcester, Mass.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que.

ELECTRIC FURNACE PLANTS

Niagara Falls, N.Y. Chippawa, Ont., Canada

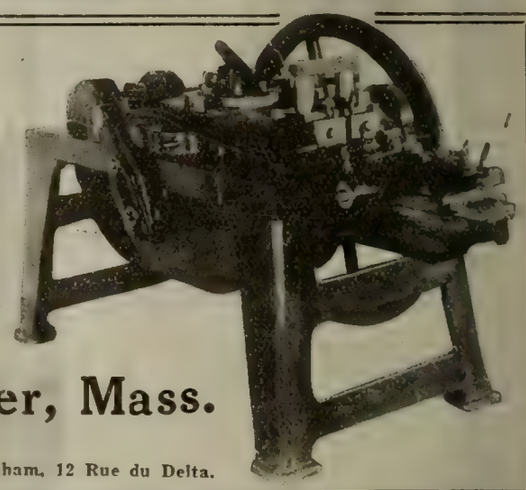
MAKE NAILS! NOT NOISE!

We offer the trade new types of

WIRE NAIL MACHINES

QUIET IN OPERATION; WITH VERY HIGH OUTPUT; ALL PARTS ACCESSIBLE; DECREASED MAINTENANCE COSTS; GREAT CAPACITY; OCCUPYING SMALL FLOOR SPACE.

Smoothly running machines, with balanced mechanical motions and no rotating cams. Built in 5 sizes, handling wire from No. 17 to ⅜" diam.



PRACTICALLY NOISELESS IN OPERATION

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CANADIAN BRANCH, COATICOOK, P.Q.

London, England, F. A. Perry, 63 Queen Victoria Street, E.C. 4. Paris, France, Edgar Bloxham, 12 Rue du Delta.

Double-Quick Cutting-Off

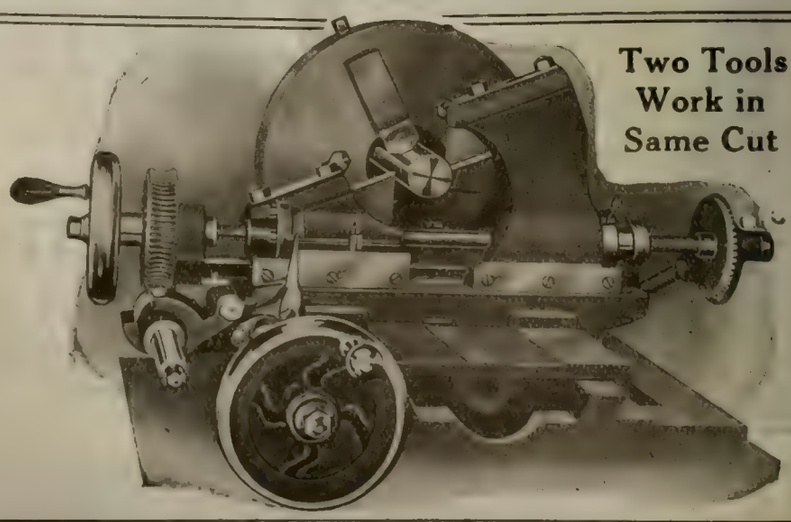
Two Tools Work in Same Cut

THE HURLBUT-ROGERS CUTTING-OFF AND CENTERING MACHINE has the advantage of two cutting tools.

Each tool is rigidly supported in a stationary block at an angle which permits a strong shearing cut.

WITH THIS MACHINE PRODUCTION CAN BE NEARLY DOUBLED, and the utmost accuracy maintained under the hardest of work.

Read full details. Write for catalogue.

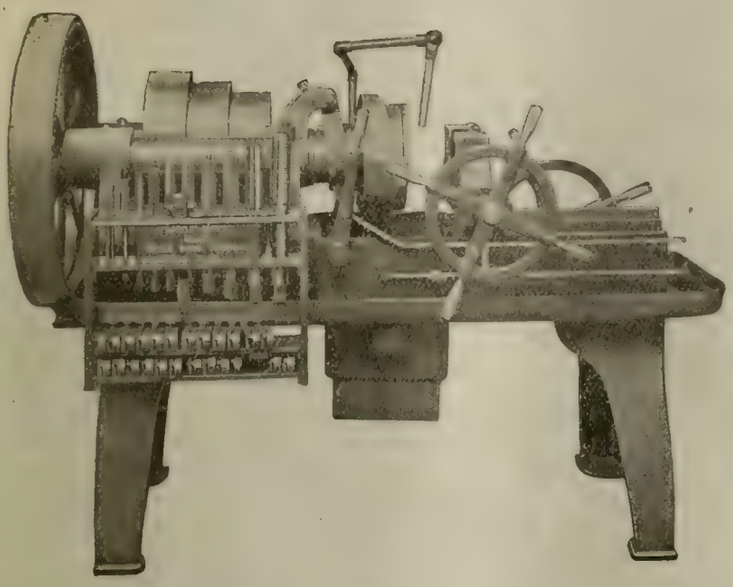


Hurlbut-Rogers Machinery Company

South Sudbury, Mass., U. S. A.

FOREIGN AGENTS—England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow, Newcastle-on-Tyne. H. W. Petrie, Toronto, Canada.

Threading Machines



Little Giant

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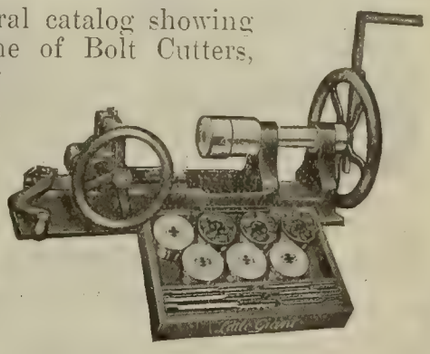

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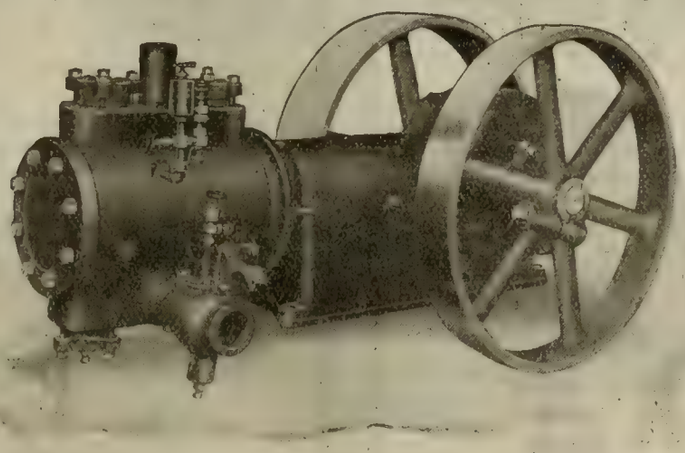

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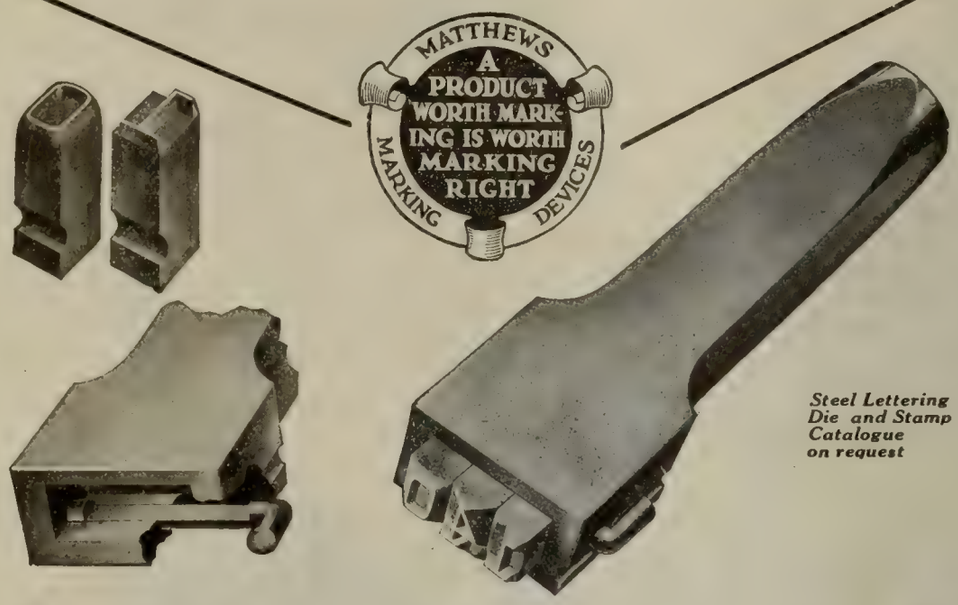

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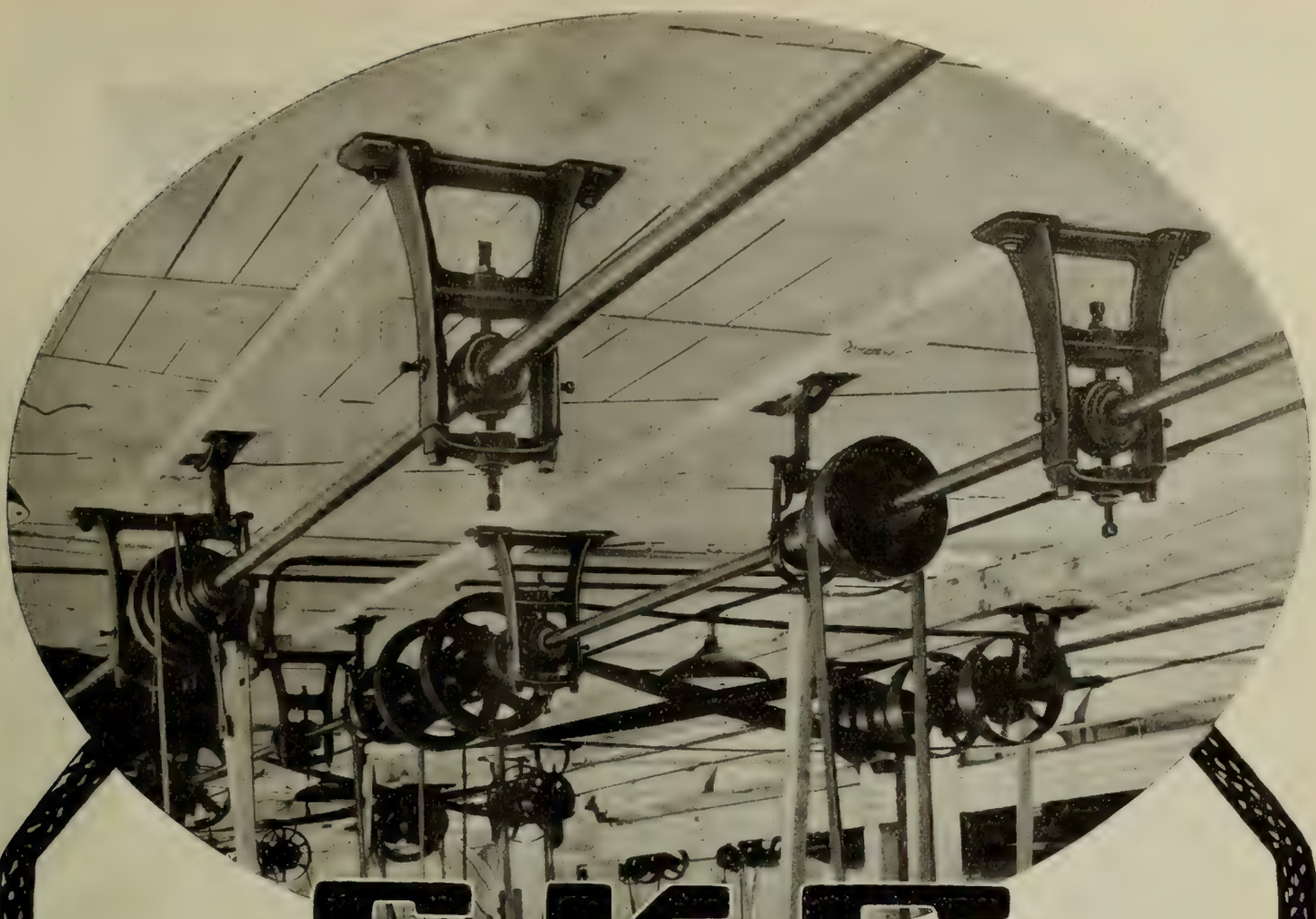

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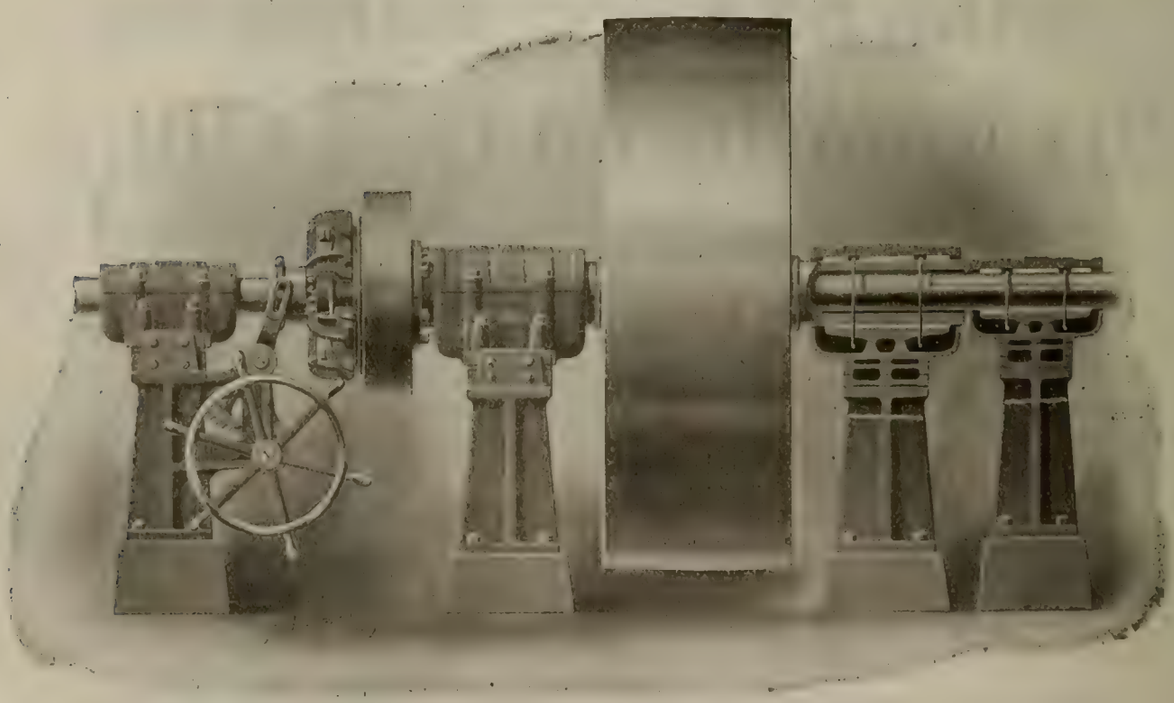


Special and General Applications of Autogenous Welding

Staff Article

It is now a generally recognized fact, that, given suitable apparatus and proper care in operation, there are few limits, except extreme volume of metal, to the successful commercial use of the oxyacetylene welding process. Not alone in repairs, but in regular manufacturing operations the welding department is assured of permanent prominence.

OXY-ACETYLENE cutting and welding is rapidly being recognized as a very important and essential branch of modern engineering practice; not alone in affecting repairs, but also in connection with the initial production of many lines of manufactured articles. At the commencement of the present century the practical application of this art was almost, if not entirely, nil; its use being chiefly confined to experimental work in certain scientific laboratories. While in many respects the progress that has been accomplished in the autogenous method of welding has been very remarkable, it is doubtful if its practical growth has advanced in relative proportion to its usefulness and adaptability. One of the chief reasons for its comparatively slow development has been the skepticism of many mechanical men as to its serviceability under severe test. It is true that many of those who, in the past, have shown reluctance to accept the possibilities of this new method, may have been influenced by the unsatisfactory work of inexperienced operators, where the weld has been made without the necessary technical knowledge that is absolutely essential for the achievement of sound and reliable welding.

Faulty or defective welding can be traced more often to the inexperience of the operator, or the careless manipulation of the blow pipe, than to any other cause. It must not be thought, however, that faulty welding is always directly due to the inability of the operator in the actual making of the weld; for while the fusing and uniting of the metal is the essential factor in this class of work, there are other equally important features that require careful attention in order that the desired objective may be attained. The preparation of the work requires more than ordinary consideration, particularly where the prices are of such a character that the heating of the adjoining metal will create internal stresses and distortion; the result in such cases invariably being a recurrence of the break, either while cooling or after the piece has been placed in service. The second failure may occur at the weld, or if this has been well done, at the weakest point adjoining. Under the conditions just cited, where the uneven expansion and contraction is one of the problems to contend with, it is only by experience that operators are able to successfully overcome any difficulties that are likely to arise. It is unquestionably true that the application of heat will cause metal to expand; therefore it is this condition, and the calculations made by the welder for these contingencies, that assures the success or failure of the job. Where the expansion does not develop stresses in the work it is seldom that preheating is resorted to, but where the work consists of different shapes and thicknesses, such as pulleys, gears, small cylinders, etc., the practice of preheating the work is generally adopted. This process allows the entire piece, or that portion adjacent to the weld, to assume a condition of expansion that permits of uniform contraction of the metal after the weld has been completed, thus eliminating the strains that might otherwise develop.

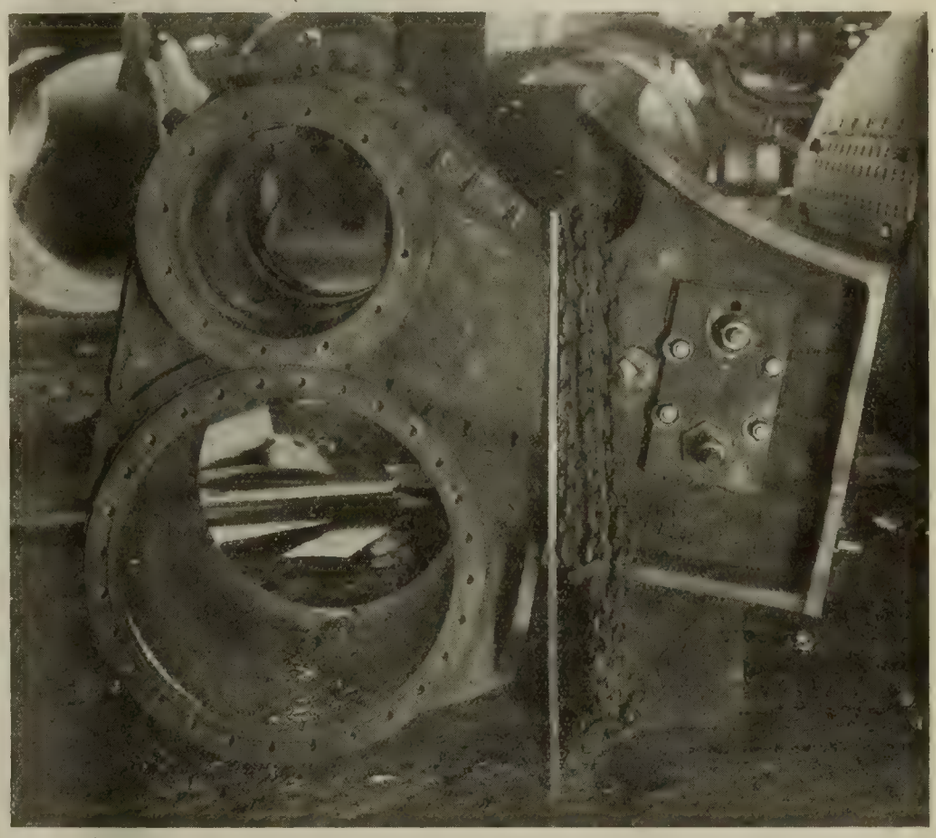


FIG. 2. LOCOMOTIVE CYLINDER CASTING WITH DEFECTIVE BORE REPAIRED BY AUTOGENOUS WELDING.

FIG. 1. BEVEL GEAR 85 IN. DIA. REPAIRED AFTER BEING BROKEN IN NINE SEPARATE PIECES.

The best method of heating and the proper distribution of the heat can only be determined from previous experience, as the various jobs must be considered according to their own special requirements. Not only is it necessary to preheat certain work to avoid subsequent failure through unequal contraction, but it is very often also advisable from an economic standpoint, as the assimilation of heat in the material assists in the fusing of the metal immediately adjoining the crack being welded, and to a large degree prevents the possibility of cold shuts; this objectionable feature often occurring, particularly when the blow pipe is in the hands of an inexperienced operator. It is, however, interesting to note that the mechanical world at large is giving more favorable consideration to this branch of engineering than has ever been accorded it in the past, realizing that its field of usefulness is increasing very rapidly, and is becoming a contend-

ing factor in many ways. While the field of autogenous welding, as a manufacturing feature of the metal industry, is showing interesting developments, it is in the repairing of machinery and other mechanical equipment that its application has been most pronounced. Frequent opportunities have arisen during the past three years which have greatly emphasized the importance of this industry and the inestimable value that its general adoption would eventually be to many industrial activities. Conditions that have characterized the metal working trade during the period of war developments, where the outstanding feature has been the inability to obtain machinery or material—except on very extended delivery—have necessitated manufacturers adopting methods that would not have been considered in normal times. Delay of this nature has often resulted in the overhauling of the scrap pile in an effort to utilize discarded parts and assemble them in such a way as to become a very useful part of the plant equipment. In this connection it is safe to say that the oxy-acetylene process of welding has been an essential factor in converting scrap into useful machine tool attachments. Not only has this practice been the means of reducing the size of the scrap pile, but it has also been of material assistance in the saving and putting back into prompt service machinery that would otherwise have remained idle for long periods while broken parts were being replaced.

Repairs to Large Gear

To illustrate the importance that this method of reclamation bears to general industrial work, we give here a number of practical examples that have recently been successfully accomplished in the plant of the St. Lawrence Welding Company of Montreal. Fig. 1 illustrates a large cast iron gear, 85 in. dia., used on a heavy mixing machine. For some apparently unknown reason the machine became jammed, with the result that the gear was broken into nine parts, as indicated by the ten cracks marked by the arrows. The breakage of this gear not only meant the stopping of this particular machine, but left the greater portion of the plant in a state of practical shut-down while the machine was out of commission. To replace this gear with a new one meant a delay of many weeks, as few foundries were in a position to undertake the work. It was, therefore, decided to reclaim the gear by welding the broken sections. The "scrap" was taken to the welding plant and the broken parts prepared by roughly beveling the edges to an approximate angle of 45 degrees, thus making an included angle of about 90 degrees when the parts were placed together; the cracks on the rim being prepared from the back so as to avoid the accumulation of added metal between the teeth. About five hours was spent in preparing the various parts, and after setting up on a suitable support to maintain the sections in proper alignment, a charcoal fire was built around the wheel and allowed to heat for five hours, when welding was commenced. The cracks in the rim were welded first and the two arms afterwards, as this method assured more uniform contraction when cooling. The total cross sectional area united was approximately 80 sq. in., and the work was completed in nearly 14 hours. After being placed in position, a little chipping was necessary at some of the welded parts in the rim, but the time that the machine was out of service, due to repairs, was only a little over 30 hours. The cost of this job was $120, and when compared with an approximate cost of $150 for a new gear,, may not appear a remarkable saving, but when the delay that would have been entailed in getting a new gear was taken into consideration, the cost of the repairs was insignificant. Since repairs were made this gear has been in operation for nearly three years.

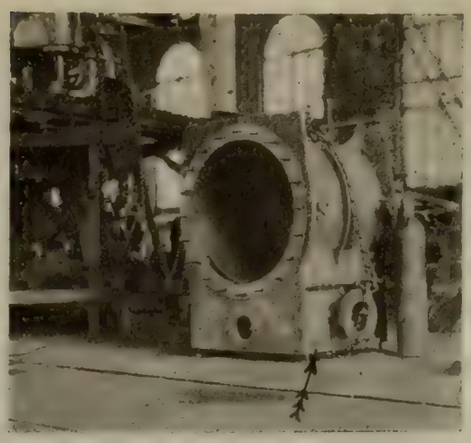


FIG. 3. LARGE MARINE ENGINE CYLINDER REPAIRED BY WELDING.

Locomotive Cylinder Repaired

Fig. 2 shows a large locomotive cylinder that was cracked near the end of the bore by the contraction of the metal during the casting of the cylinder. This defect was not apparent until considerable machining had been accomplished, and when discovered it was decided to have the broken part welded with the blow pipe. The crack, which extended for a length of about 28 in., was gouged out to form a channel for the metal that was added by means of a feed rod of cast iron. The portion surrounding the break was subjected to a preheating process for nearly five hours to bring the metal up to a dull red heat when the welding operation was commenced; the time for making the weld, including the time required to prepare the crack, occupied a period of about four hours. Owing to the position of the weld it was obvious that further machining was necessary to obtain an accurate finish on the bore. It is the work of this nature that emphasizes the importance of autogenous weld-

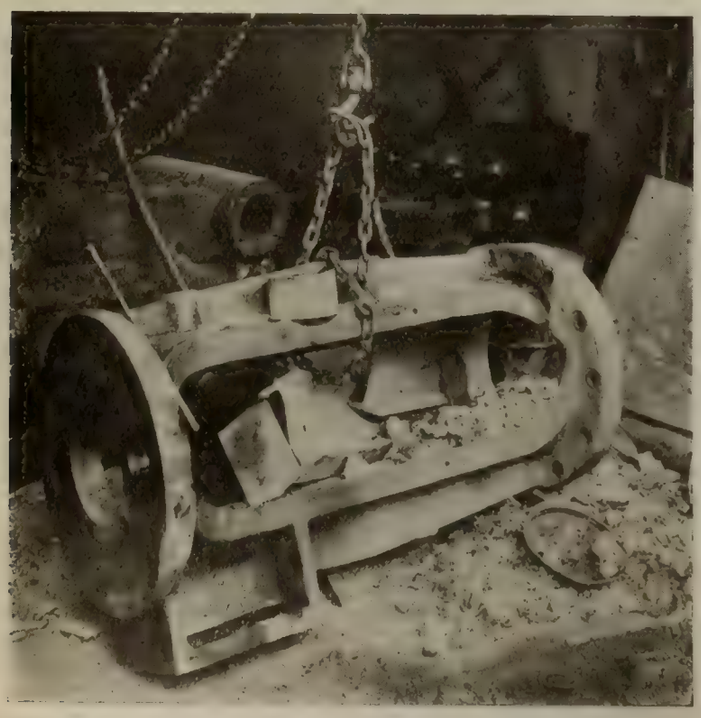


FIG. 4. CROSS-HEAD SLIDE OF HYDRAULIC PUMP WHICH WAS CRACKED THROUGH AT ONE END.

FIG. 5. SLIDE SHOWN IN FIG. 4, COMPLETELY REPAIRED. NOTE DAMAGED CYLINDER ABOVE WAITING REPAIR.

ing in reclaiming costly parts of machinery, and its value can possibly be better understood when it is known that the cost of repairing this particular cylinder was only $20, as compared against the cost of a new cylinder, which would be in the neighborhood of $250.

Break From a Defective Chain

The danger of handling large pieces of machinery by means of the crane is clearly illustrated in the cut shown in Fig. 3, which shows a large 30 x 30 in. low pressure marine engine cylinder that was dropped from its hanging support by the failure of a defective chain that allowed the heavy casting to collapse, with the result that the portion indicated by the arrow, having an approximate length of 14 in. and containing three studs, was broken out. This cylinder, with a weight of nearly four tons, had been practically finished and represented an approximate cost, including the machining, of about $900. To scrap this, therefore, meant no small loss, and in order to save it, the piece was welded in, the corner being heated by means of a charcoal fire, raising the adjacent metal to a red heat. The time required to repair this job, including the preparation of the parts, the preheating, and the actual welding, was just about 24 hours, at a total cost of $150. This being a portable job, the charge included the shipping of the welding outfit to and from the plant in addition to the actual cost of welding.

Reclaiming a Crosshead Slide

With the probable exception of the automobile industry, it is doubtful if any line of manufacturing activity has been systematized to such a standard of efficiency as that of the making of shells, as practised during the past few years. Owing to the routine method of performing the various operations it was essential—especially where no auxiliary equipment was installed—that every machine be kept in good working condition throughout the entire 24 hours of the day, as the tying up of any of the equipment invariably resulted in disorganizing the regular movement of the product through the shop, with subsequent loss of time and curtailment of output. In the forging plant the main source of power in the hydraulic pumps that supply power to the accumulator for the operation of the presses, the stoppage of which for any length of time meant a shortage of forgings upon which the various machine shops were dependent. In a Montreal plant a short time ago, through a loose nut on the piston rod, the cross head slide of the high pressure hydraulic pump was broken. The cost of a new slide, approximating $350, was a matter of small moment under the circumstances, but the date of delivery, about six months, was out of the question entirely. It was, therefore, imperative that the piece be immediately repaired and it was decided to do this by the oxy-acetylene process. Upon delivery at the welding shop, the piece was at once prepared by cutting away the metal at either side of the cracks, which extended entirely through the metal where the slide joins the flange, as shown is Fig. 4, which is a view of the weld partly completed, the charcoal preheating fire at the time being partly scattered. The metal at the welded portion was about four inches thick and the approximate length, both sides, was 27 in., making a cross sectional area of nearly 110 sq. in. Before starting work with the blow pipe, the broken end of the casting was raised to a dull red heat by the charcoal fire, this taking about five hours. For work of this character, requiring continuous operation for long periods, it is the practice to use two welders to relieve each other. The welding of this crosshead slide was completed in about ten hours, and the time the pump was out of service, owing to the repairs, was 36 hours, at a cost of $110. Fig. 5 shows the casting finished, the Corliss engine cylinder above awaiting treatment for pieces broken out of the end.

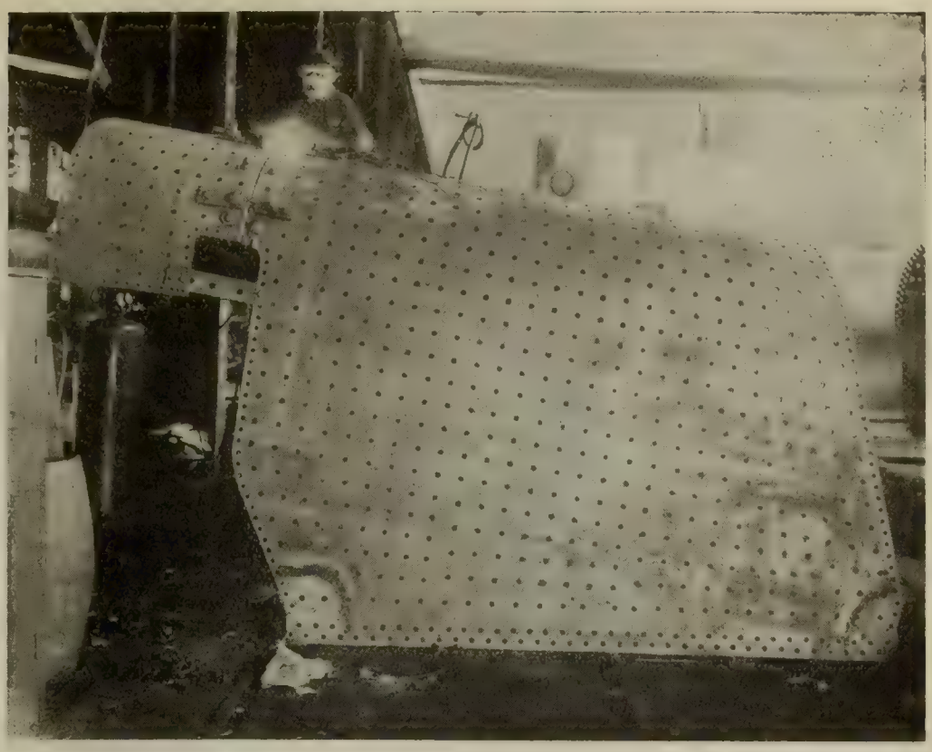


FIG. 7. PIECING UP A FIRE BOX BY AUTOGENOUS WELDING. A REGULAR OPERATION IN LOCOMOTIVE BOILER BUILDING.

Repairs to Locomotive Tube Sheet

A good illustration of what can be accomplished by the oxy-acetylene process of cutting and welding is shown in Fig. 6. This is a section of a tube sheet that was removed from a locomotive boiler by cutting out with the blow pipe. When this head had been made, it appears that an imperceptible flaw had been formed at the bend of the flange, which in a very short time developed into a serious crack. In an effort to save the sheet the crack was welded with the blow pipe as shown; soon afterwards, however, additional trouble arose, not only at the flange, but also at quite a number of the bridges between the holes in the tube sheet. It was

FIG. 6. DEFECTIVE TUBE SHEET CUT FROM PLACE IN LOCOMOTIVE BOILER.

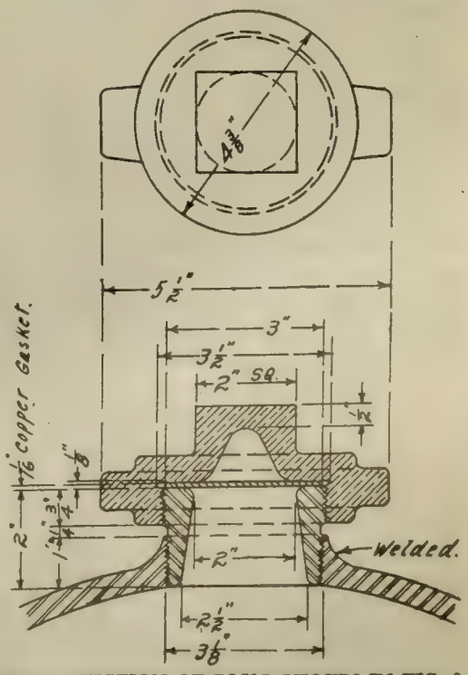


FIG. 9. SECTION OF PLUG SHOWN IN FIG. 8.

FIG. 8. IMPROVED WASHOUT PLUG FOR LOCOMOTIVE BOILERS. IT IS WELDED INTO POSITION.

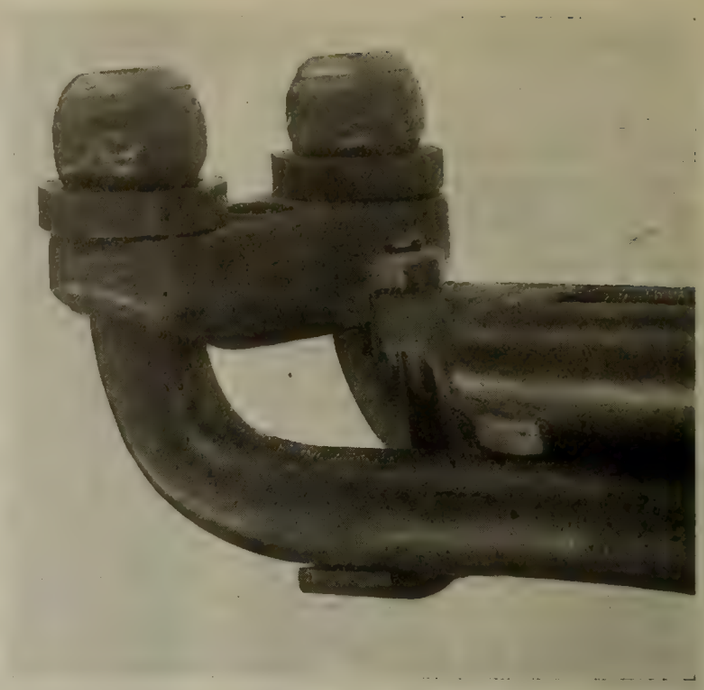


FIG. 10. SHORT BENDS IN SUPER-HEATER PIPES MADE BY OXY-ACETYLENE BLOWPIPE.

then decided to cut out the affected portion of the sheet, and also that section of the boiler shell adjoining. The diameter of the shell was 5 ft. 2 in. and the thickness of the tube sheet ⅜ in. The approximate length of the cut section was 5½ ft. and the piece was cut out in about half an hour; the new piece, exclusive of its preparation, was welded in position in a little over five hours by one welder and a helper. This job consumed 250 cubic feet of oxygen and a similar volume of acetylene, and was completed at a total cost of $70 portable job; only entailing a boiler shut down of about 48 hours, due to welding repairs. This tube sheet, after a period of three years, is still in good condition.

Boiler Construction

In the manufacture of boilers of every description the blow pipe is rapidly acquiring a permanent place. In Fig. 7 is illustrated a regular welding job on the section of the shell on one of the large Mallette articulated type of locomotive boiler. After the edges are beveled, which takes about fifteen hours, the extension is secured in position by suitable clamps, with the desired allowance of separation for expansion of the metal. The total length of the joint in this particular instance was 9 ft. 4 in., and the welding was accomplished in about 10 hours. Work of this character is performed at an approximate cost of $1.15 per ft. of length.

Special Washout Plugs

An interesting detail in the construction of boilers to which the blow pipe has been adapted, is the welding in of special wash-out plugs, as shown in Figs. 8 and 9. This particular design of plug eliminates the objectionable feature, so pronounced in the old type, of destroying the threads in the hole when using the muck bars for cleaning. The sectional view of the plug shows the method of applying the plug and also the reinforced section of added metal. The outer thread on the bush is cut large and finished to size after the bush has been welded in position. Between the cap and the bush a copper gasket is used to insure a tight joint. These improved plugs are applied to a boiler at a total cost of $10.

In the manufacture of superheaters and in refrigeration, short bends are often desired, and for this class of work the blow pipe is particularly adapted, as shown in Fig. 10.

WOMEN IN FOUNDRY WORK

"DILUTION" in engineering works of all kinds is generally recognized as a means of getting over the difficulties of the actual present times in engineering industries; and whilst it is essential as a means of overcoming the demands for larger output, there is little doubt that there are limits to the employment of women on work which has hitherto been done by men. In the general foundry, for example, there would not appear to be much room for female labor, outside the core-making department, as owing to the heaviness of the work and the weights to be lifted, strength considerations would prove a severe handicap. In specialized work of a light character, however, women might be very well employed, and after preliminary training they should turn out quite as much work and be paid as high wages as the men.

Certain rules are as necessary in the foundry as they are in the engineering shops. Of course, suitable dress must be worn whilst at work; such things as high-heeled boots, floppy "munition" outfits, stiff corsets, and such like, would have to be thrown aside for the working period, and practical men's dress used, as freedom of movement is essential in the whole of the work, while at the same time skirts and loose garments are not conducive to safety. But as these commonsense methods have been accepted by women and girls in munition factories generally, there should be no hindrance in this direction. It is more important to observe that female labor should be closely confined to moulding and core-making; the melting and handling of metal, and the pouring and dealing with the metals in the moulds being done by men and boys, this part of the work not being at all suitable for women. When molten metal has to be dealt with, chances cannot be taken with any degree of safety, and whilst a splash will only cause a man to give a hearty swear, with a woman the chances are that the ladle or crucible would be dropped, and on a damp floor this would be disastrous, and probably the ambulance would be often wanted.

Much of the art work which used to be imported could be produced by women up to the pouring stage, and particularly that done by the **cire perdu** process; but heavy work would be beyond their strength, if nothing more. Women are doing good work in machine shops at the present time, but what appears to be lost sight of is that the bulk of the women are on repetition work of what may be called the "one job" type, and really that they are not doing the run of work which has to be taken by the male operatives.

THE EFFECT OF SPELLERIZING ON THE LIFE OF STEEL TUBE

THE beneficial results on the longevity of steel tube manufactured by the spellerizing process are pointed out in an article in the "Compressed Air Magazine," the process having been devised to overcome the tendency of corrosion in the smaller sizes of steel piping in which the greatest corrosion in service occurs on account of the thinness of the metal.

Large sizes, being made from heavier plates of more uniform quality are not so seriously affected by corrosion.

The process consists in subjecting the metal bloom to the action of rolls having regularly shaped projections on their working surfaces, then subjecting the bloom while still hot to the action of smooth faced rolls and repeating the operation, the surface of the metal thus being worked so as to produce a uniformly dense texture better adapted to resist corrosion, especially in the most objectionable form of pitting. The process is quite analogous to the kneading of dough and operates upon the metal all through instead of merely on the surface. The aim is to make the metal uniform and without the spots of varying texture from which pitting results.

Uniform Results

As the process is entirely mechanical and does not in any way depend upon the skill of a workman, uniform treatment and results are assured. The process is applicable to the smaller sizes of pipe, say up to 4 inch.

Pipe has been made by this process for ten years in increasing amounts. The official records of the American Iron and Steel Institute show that during this period the percentage used of steel pipes has increased from 74.3 to 87.9 per cent.

Appended are some special experiences as to the use of this process and its effect upon steel pipe in actual service.

H. J. Macintire, Professor of Mechanical Engineering, Washington University, says in Power:

"In the case of ordinary steel pipe, mill scale is always present, and this likewise is electro-negative to the iron. If this scale is evenly distributed, as in Spellerized steel, the self-corrosion on its account will be slight; but if it is segregated, then local electrolysis and pitting of the material will result."

Morgan M. Smith, in the October, 1913, issue of *Ice*, states with reference to the merits of the Spellerizing process:

"Steel pipe, which has been treated in such a manner as to eliminate or at least distribute evenly the mill scale may be joined with wrought iron or cast iron safely as a rule. The same stock without the treatment for mill scale will show a decided tendency to corrode when joined with wrought iron or cast iron. The so-called Spellerized steel fulfills this condition with respect to the scale."

R. B. Duncan, associated with the United Gas Improvement Company of Philadelphia, Pa., in a paper "Installation and Maintenance of Service," read before the Ninth Annual Meeting of the American Gas Institute, 1914, states:

"The steel industry has been developing a new process which, after several years' time, has given many encouraging results. By this process the steel is treated mechanically and does not in any way depend upon skilled labor, beyond keeping up the machinery involved, hence uniform treatment is assured.

"This new process is a method of treating metal which consists in subjecting the heated bloom to the action of rolls having regularly shaped projections on their working surfaces, then subjecting the bloom, while still hot to the action of smooth faced rolls and repeating the action whereby the surface of the metal is worked so as to produce a uniform dense texture better adapted to resist corrosion, especially in the form of pitting."

The Gas Record, (issue of September 23, 1914, page 222) in commenting on Mr. Duncan's paper in regard to the Spellerizing process, says:

"The consensus of opinion is that modern steel pipe, particularly if Spellerized, is as durable as wrought iron, and is, besides, cheaper, stronger and more ductile and more uniform in composition."

Pipe steel made in 1906 by this roll-knobbling process tested against pipe steel made in 1897 resulted not onl yin a somewhat greater loss of weight by corrosion of the latter, but a decidedly deeper pitting of the 1897 steel in six months than occurred in the 1906 steel in thirteen months. In comparison with wrought iron it was found that the two materials lost practically the same weight by corrosion yet the steel had the advantage of uniform corrosion since the "wrought iron skelp pitted in seven months much deeper than the steel did in thirteen months." (Prof. H. M. Howe, Am. So. for Testing Materials, 1908).

A. Sang, in a thorough resume of the question, entitled "The Corrosion of Iron and Steel" (McGraw Hill Book Co., New York, 1910), says:

"The carefully acquired experience of the largest manufacturers of tubes in the world, which induced them recently to abandon the manufacture of wrought iron pipe, teaches that the use of steel in place of iron, at least in the United States, for the special purpose of tubing is to be preferred; the tendency of steel to pit is somewhat less than that of iron and it welds at the joint fully as well."

"There is very little, if any, difference between the corrosion on the wrought iron and the corrosion on the steel pipe. If anything, the wrought iron is pitted a little deeper, i.e., the pitting on the steel pipe is probably more general all over the surface, but the pitting on the wrought iron pipe is deeper in spots that are affected." (Proc. American Gas Institute, Vol. III, 1908, page 274).

"While the corrosion was about the same, there was a pitting in the iron that we did not find in the steel, and the steel was corroded more uniformly. From the tests made I know that the steel pipe is better for such conditions." (Supt. of one of the largest bituminous coal operations in the Pittsburgh district).

It is believed sufficient has been mentioned to show that the tendency of the Spellerizing process is to render the surface of pipe uniform and reduce the tendency to corrosion—especially in the form of pitting.

ELECTRIC LOCOMOTIVE BUILT BY MONTREAL TRAMWAYS CO. FOR STREET RAILWAY WORK. IT WEIGHS 85,000 LBS., AND HAULS 25 LOADED FREIGHT CARS.

NEW ELECTRIC LOCOMOTIVE

THE accompanying cut illustrates a type of electric locomotive recently built by the Montreal Tramways Company, for operation on various sections of their system where heavy haulage is often necessary. The total weight is approximately 85,000 lbs., and the drawbar pull is upwards of 25 loaded freight cars. A feature of the locomotive is the method of obtaining the desired weight; the steel framing of the platform, consisting of I beams and channels, has an area of about 246 square feet and a depth or thickness of 12 inches, the intervening space being filled with solid concrete, giving a weight in the frame alone of nearly 35,000 lbs.

Tractive power is obtained by four 200 horse-power motors, two of which are installed on each truck. The electric equipment is located in one of the apartments adjoining the central operating cab, while the other contains the air pumps and other pneumatic appliances. The sand is forced to the rails by means of small injectors operated by compressed air. Every facility has been provided for the convenience of the engineer or operator. The general dimensions are as follows: Over-all length at drawbar connections, 31 ft. 8 in.; length of car body, 29 ft.; size of cabin, 9 ft. long by 7 ft. 4 in. wide, with a height from the floor of 7 ft. 7 in. The wheel base is 21 ft. 6 in., the centres of the trucks being 15 ft. apart.

ELECTRIC FURNACE DEVELOPMENT

THE number of electric furnaces in Sheffield now built, or building, is about forty, with every probability of a further increase. Turnings, borings, etc., are being converted into steel for shells, rifle barrels, light armor plates, and aircraft. Until the introduction of the electric furnace, there was no type that could melt more than a somewhat limited proportion of turnings per heat. It was necessary to use a large percentage of new raw materials, such as pig-iron bar-iron, etc., along with the scrap. Now, not only is it possible to have a whole heat of turnings, but to have "boils" of ten and even fifteen tons, by the electric process, whereas prior to the war few electric furnaces were of more than 2½ tons capacity. Now these larger furnaces can make sound steel direct from turnings, and at less cost than by the crucible process. The introduction of this type of furnace is, perhaps, one of the most outstanding features of war-time developments in Sheffield's chief industry.

Greaves and Etchells have assisted largely in this recent development and have recently perfected a special furnace of small capacity for the production of high-speed and other tool steels, besides their larger furnace for the melting of turnings. They claim that electric steels made by their process have the following advantages over other steels: (1) Regularity of composition, (2) lowering of sulphur and phosphorous contents, (3) absence of gases, (4) higher yield of sound ingots, and (5) positive control of all furnace operations. They also claim that their furnace, used in connection with a basic open-hearth furnace, permits the production of steels higher in quality than acid steel at a lower cost price than the latter.

THE PREVENTION OF MINERS' PHTHISIS

FOR collecting and counting the fine particles of mine dust, which play such an important part in the causation of miners' phthisis, Mr. Kotze, the African Government mining engineer, has devised a mechanical collector, to which the name "Konimeter" has been given. This has been tested with satisfactory results, and has been submitted to the Phthisis Committee of the Transvaal Chamber of Mines, with the object of dedicating it for the free use of the mines of the Union. The Konimeter in its present form comprises an aluminum casting about 5 in. long, in which is mounted the barrel of a small air suction pump. The suction end of the barrel communicates with a shallow chamber formed on the side of the casting. This chamber has one open side, which in use is closed air-tight by means of a glass microscope slide, which is removably held in place by a spring. Communication between the chamber and the external atmosphere is made by a small nozzle positioned at right angles and close to the glass plate. The air pump piston is fitted with a leather cup packing so directed as to cause the air to be drawn into the barrel when the piston is raised. The end of the barrel is so shaped as to eliminate dead space when the piston is fully depressed. Upon releasing the trigger the piston is forced up by the spring until it comes in contact with a stop, so that a definite volume of air is collected at each suction stroke. Before being placed in position, the glass slide is coated with a sticky substance, usually vaseline. Upon the piston making a suction stroke it tends to exhaust the air from the slide chamber. The external air accordingly flows through the nozzle, and, impinging as a jet on the sticky surface of the slide, deposits its contained dust on such surface. The strength of the spring and the size of the nozzle are such that the jet of air impinges on the slides at the rate of 40 metres per second. After removal of the slide the dust particles in the spot are counted with the aid of a microscope provided with an eye-piece micrometer, consisting of a piece of glass ruled into squares to facilitate counting. The number so obtained compared with the known volume of air passed into the pump, gives the number of particles per unit volume of the air tested. One glass slide can be utilized for taking a considerable number of samples, as the spots of dust are small. After the samples are taken, the slide is transferred to a specially designed dust-proof carrier for safe transport to the surface. If necessary, however, the slide can be immediately examined underground by means of a portable hand microscope.

BALL BEARINGS

By C. T.

EVERY specialist whose work and effort lies in more or less narrow grooves is apt to consider that his particular specialty is of universal application. The fallacy of the position is easily realized, and much harm has been done to many good devices by irrational recommendation. The case of ball bearings is a case in point. These are decidedly not applicable in a universal sense, and their limitations are obvious to most engineers. It is impossible to utilize ball bearings in connecting rod ends; ball thrust has been tried for a steamer's thrust block, but has not met with general acceptance. It is doubtful if a ship's tunnel would prove a suitable field. The average practical man would hesitate a long time before prescribing ball bearings for a dusty atmosphere or where adverse conditions as to moisture or fumes exist.

The average ball bearing salesman is an enthusiast, the average engineer a cautious, skeptical person, and to overcome the prejudices of the latter it will need more than a mere statement or anti-frictional proof on the part of the former. The average engineer prefers stable and reliable conditions, or even something which gives limited and recurrent trouble to any alternative whose failure means a total and expensive breakdown. Ball bearings in general are not suitable for shock stress, or for heavy-running load, though for great loads under thrust conditions, such as occur in crane hooks they are admirable. In this last case, however, all the load is carried by the balls, and consequently the stress is evenly distributed.

The success of the ball bearing depends on nearly absolute refinements, sphericity of ball and perfectly hardened and polished races. Quite a small speck of grit can play the mischief, and once there is the slightest abrasion total failure is very speedy. Moreover, the specialist-made article may be wrongly applied in service, and so, through no default of the maker, be unsatisfactory. In no other manufacturing industry is the same perfection of product needed.

As a consequence, in certain locations and for certain purposes where speed and low co-efficient of friction are of the highest importance, ball bearings are the only solution. For universal consumption as a panacea for all bearing ills they have their limitations, and by reason of cost and unsuitability will never become general or replace babbit or gun-metal in a universal sense. In these days, when concurrent efforts to produce machinery producing complicated functions and to simplify mechanism as far as possible, are so greatly intensified, it is necessary to keep in mind both the uses and limitations of those triumphs of skill, the ball bearings. Also to remember that even yet much remains to be said as regards their design and manufacture, as recent discussions before the professional societies have shown.

FOR the production of tungsten by a method protected by an English patent, I. C. Butterfield of London, Eng., and A. Ashworth, Bury, Eng., employ scheelite (calcium tungstate) which they grind to a fine powder, briquette with 12 to 13 per cent. charcoal, then heat in a graphite crucible for four or five hours at a temperature of 1,100 to 1,200 deg. C. The mass when cold is crushed, screened and concentrated on a shaking table to gather the metallic tungsten which is then treated with dilute hydrochloric acid to remove lime, after which it is washed and is ready for sale to the steel maker.

Angle and Lead Testing Machine for Thread Gauges

Editorial Correspondence

In the manufacture of taps, hobs and male thread gauges, the question of correct lead and correct angle of the thread has been found to be more important even than the correct diameter, and very few gauges made for checking the angle of the thread are sufficiently accurate and reliable for accurately checking both angle and lead. The machine described herewith was developed for the latter purpose and possesses features of very timely interest.

IN these days of interchangeable manufacturing, where gauges are playing so important a part, the thread gauge is the most difficult to make accurately and also to measure accurately. Large numbers of mechanics who have attempted to make thread gauges, have given the proposition up as a bad job for several reasons. One was the obtaining of machinery accurate enough to do the work, and another reason is that facilities for measuring thread gauges were not in common use or for sale, and still another is the lack of men skilled in their manufacture, due to the fact that most thread gauge makers take the first chance they get to find an easier way to make a living.

The reason for this was that the making of thread gauges was confined to a very few factories who had made a special duty of the matter, and who had been fairly successful in their manufacture, on account of their familiarity with the proposition and the lack of familiarity with the proposition on the part of many of their customers, who simply took what was given to them, and believed that the gauges must be right because of the standing of the name of the firm which supplied them.

During the last two years, however, there has been considerable education among users of thread gauges. The engineering societies, the large munition concerns and the large manufacturing concerns, realize that the question of screws, taps and tapped holes in work are one of their most difficult problems.

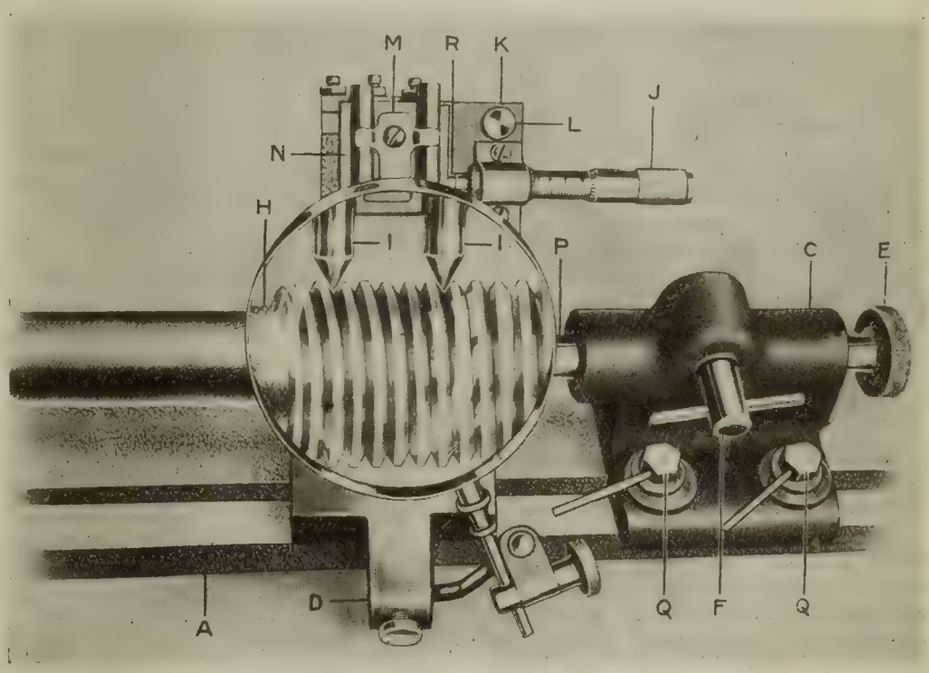


FIG. 2. VIEW THROUGH MAGNIFYING GLASS SHOWING POINT OF ANGLE TEST PIECES FITTING INTO ANGLE OF THREADS ON GAUGE.

In the manfacture of taps, hobs for hobbing dies, male thread gauges and hobs for female thread gauges, the question of correct lead and correct angle of the thread has been found to be more important even than the correct diameter measurement, and while a number of gauges of different types have been offered for checking the angle of the thread, there are hardly any of them, if any, sufficiently accurate and reliable for the accurate checking of angle and lead.

Multiplying gauges, even when most carefully made, are very prone to inaccuracy due to wear, rust, oil, dirt or other foreign substances which, although infinitesimal in themselves, due to the multiplying feature of the gauge, would cause a marked error in the reading. Then again multiplying gauges are delicate and a light pressure will throw them out of adjustment.

Problem and Solution

The problem, therefore, is to design a thread gauge testing device or "measuring machine" for the angle and the lead, which is rigid and substantial, thoroughly accurate and upon which a very small degree of error may be easily ascertained.

In testing the truth of a flat surface, a knife edge straight-edge is used, as the smallest amount of error, even less than .0001 in. will readily show light between the surface tested and the knife edge. This principle seems to be the most simple and reliable principle to be used in testing lead and angularity. Two curving surfaces coming together on a line of contact, will show light through any inequality as readily as a knife-edge gauge on a flat surface; yes, it will even show more light under such circumstances, and the thread lead and angle measuring machine described below, is based on this principle; that is, of see-

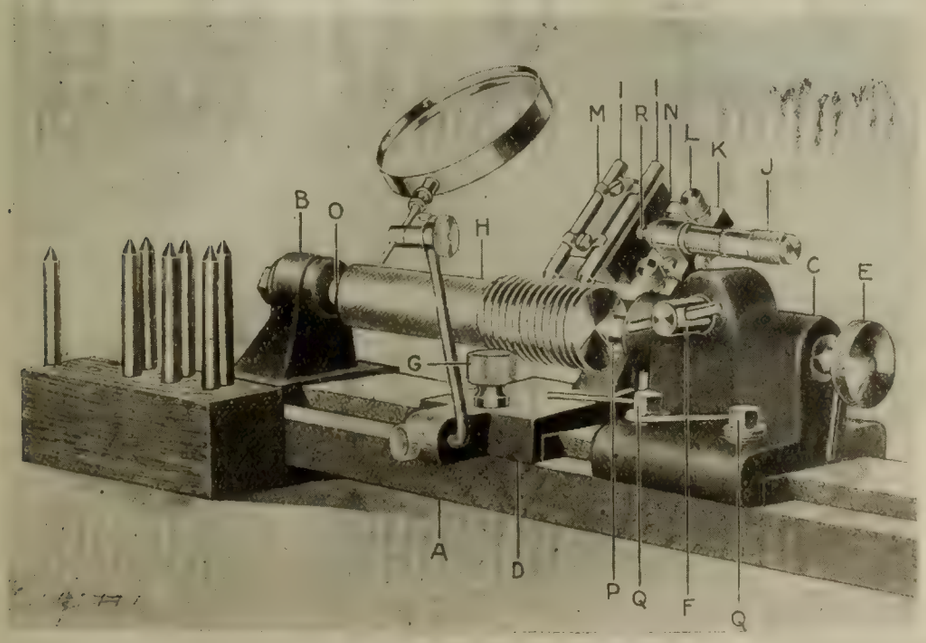


FIG. 1. GENERAL VIEW OF THREAD-LEAD AND ANGLE TESTING MACHINE WITH GAUGE IN POSITION FOR INSPECTION.

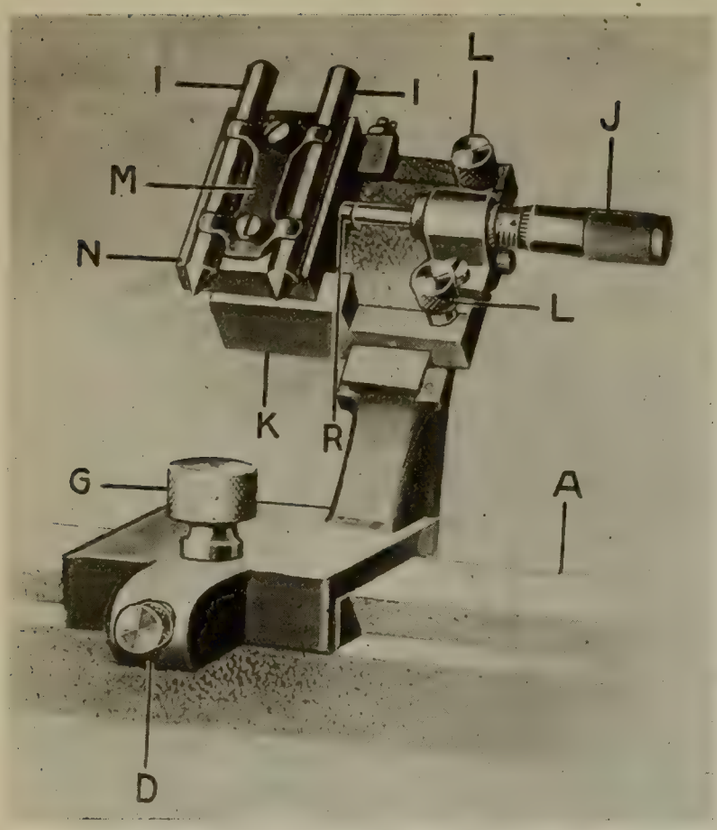


FIG. 3. SLIDE WHICH CARRIES THE ANGLE TEST PIECES AND MICROMETER ADJUSTMENTS FOR MEASURING THE THREADS.

ing light between two curved surfaces, if they do not coincide. The machine was developed and built by the H. E. Harris Engineering Co., Bridgeport, Conn., for their own use, and has also been supplied to the Bureau of Standards.

An error of .0001 in. can be detected by a person with ordinary eyesight, and with the aid of a magnifying glass, .00005 in. can easily be seen where such error exists.

Referring to Fig. 1, which is a general view of the thread, lead and angle measuring machine, the solid and substantial construction will be noted. The machine consists primarily of A, which is a heavy cast bed, stationary head; B, which carries a fixed centre O, and is permanently fixed for casting A; C, which is a sliding tailblock, which can be clamped positively to the bed A, by means of the two clamping screws QQ, and which carries a spring centre P, which can be withdrawn by the knob E. or clamped in position by the screw F.

The gauge H is put between centres by putting one centre of the gauge upon the centre O, bringing up the tailstock C, clamping by screws Q, and allowing the centre P to go in the opposite centre of the gauge, by means of a spring inside of C, clamping into position with F.

So far the means described are simply to hold the gauge true between centres and in correct alignment with the measuring devices, which are carried on the slide D. The slide D is shown in a separate view in Fig. 3. It is carefully fitted to the bed A and is clamped into the position required by the thumb screw G.

It consists primarily of a compound slide which is carefully and accurately made, so as to be in correct alignment with the axial line through the centres O and P, of the measuring machine, all planes and surfaces being either accurately perpendicular or accurately parellal to this axis.

The lower member of the compound slide K is adjustable in toward, and out from, the line of the centres through O-P, and may be clamped in such position as is suitable to suit the diameter of the thread gauge to be measured, by the clamp screws LL. This carries a micrometer head J, which operates against a hardened stud R in the upper member of N of the compound slide. This upper member N has lateral movement along through O-P, the movement of which can be measured by the micrometer head J. or by the use of distance gauges or Swedish blocks, between the point of the micrometer clamped stationary, and the point R on the upper member N.

The upper member N carries two angle test pieces II. These are held by the spring clip M, which permits adjustment by finger pressure in towards and out from the gauge or thread to be measured. The centre distances between the V's and the angle test pieces I are just one inch apart, giving a basis for checking error of lead in gauges which are to English measurement, and which are over one inch long. On metric threads less than one inch long, the micrometer or else proper distance gauges such as Swedish gauge blocks, as before explained, are used between the point of the micrometer and the stud R o nthe slide.

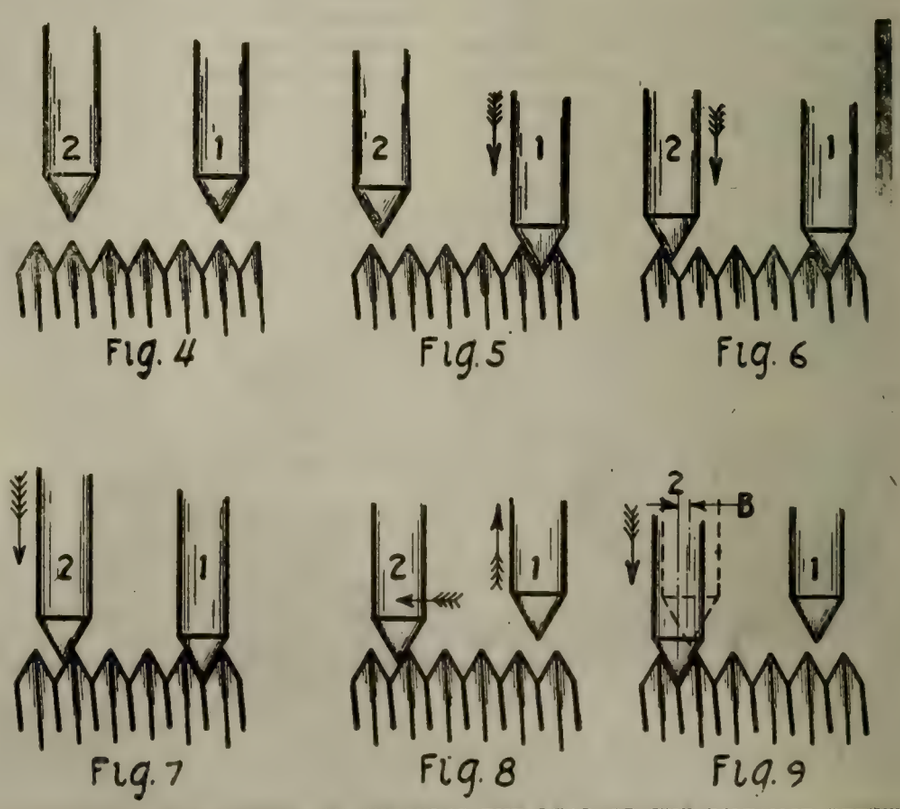
Referring to Fig. 2, and looking through the large magnifying glass, the point of these angle test pieces are shown as fitting in to the angle of the threads on the gauge H, which is in position.

Method of Checking the Lead of the Distance Between Threads.

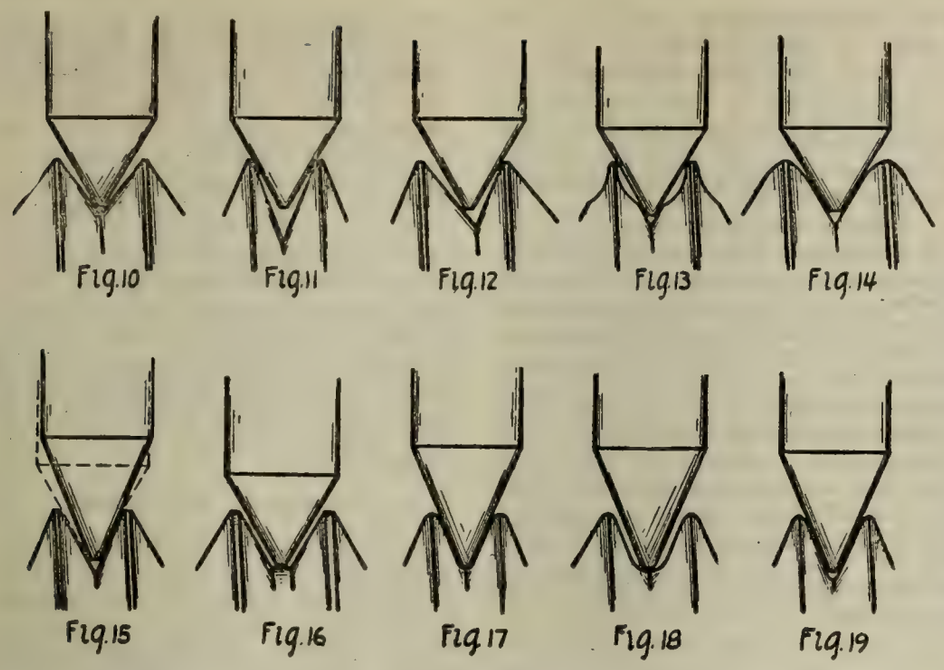
In Fig. 4 a representation is shown of the thread gauge as placed in the machine with the two points 1 and 2 in position ready to check the lead. The first operation is to turn the thread gauge on the centres in the machine until the thread will allow test point 1 to be moved into it as shown in Fig. 5, shutting out light on both sides of the cone point. This is done merely by rotating the gauge by hand in between the centres of the machine and gives a very fine adjustment.

After the point 1 has been pressed down lightly in the direction of the arrow to assist the thread as shown in Fig. 5, point 2 is then brought down in the same direction, till it touches the thread as shown in Fig. 6 and Fig. 7. If the lead on the thread gauge is short, the effect will be shown as in Fig. 6, which has been exaggerated to illustrate the point clearly. If the lead on the thread gauge is long, the effect will be as shown in Fig. 7.

The problem now is, to determine the



ILLUSTRATING THE METHOD OF CHECKING THE LEAD OR THE DISTANCE BETWEEN THREADS ON THE GAUGE UNDER INSPECTION.



ILLUSTRATING THE METHODS USED IN CHECKING THE ANGLE OF THE THREAD WITH THE ANGLE TEST GAUGES, WHILE IN POSITION IN THE MACHINE.

amount that the lead on the thread gauge is long or short. The micrometer with the point R on the point N being set at zero, point 1 is drawn back from the thread as shown in Fig. 8, in the direction of the arrow. This permits moving point 2 in either direction.

Assuming that the lead on the gauge is long as in Fig. 7, by means of the micrometer screw point 2 is moved in the direction of the arrow as in Fig. 8; when it is opposite the thread, it is moved down in the direction of the arrow as in Fig. 9. The amount which it has moved over as indicated by B in Fig. 9, is the extent which the lead of the gauge is long in one inch.

If the lead was found to be short it merely means reversing the operation. The amount B could be measured either by the micrometer direct or with a Swedish block between the micrometer point, and the point R. If the thread on the thread gauge is not more than 1 in. long, only one of the measuring points are used, and in this case point 1 or 2, whichever is used, is moved over the entire number of threads over which the lead is to be checked. The distance moved, measured either by the micrometer or Swedish block, and then compared with the nominal or correct distance, and the difference from the correct figure, being the error in lead for that number of threads.

Method of Checking the Angle of the Threads

The line drawings Figs. 10 to 19 inclusive, show the methods used in checking the angle of the thread with the angle test gauges, while in position in the machine. The views simply show the end of the angle test gauge, and the contour of the thread in the gauge where it is being checked. Fig. 10 shows a standard test angle gauge fitted into a thread which is off angle, having an angle too large. After testing it with the standard plug, a plug with a greater angle is fitted, as is shown by the dotted line, and in this way the amount of angular error can be ascertained.

Fig. 11 shows a gauge where the angle in the thread is too small. Fig. 12 shows where the angle of thread leans to one side. Fig. 13 shows a thread having hollow spots in its wall. These errors show up very prominently by the amount of light which passes through between the angle test gauge and the thread. Fig. 14 shows a thread which is rounded over near the top. This is often caused by excessive lapping with the old style lead lap. Fig. 15 shows how a thread, as shown in Fig. 12, can be checked to ascertain the amount of angular error, by different angle test pieces against each side of the thread walls.

The angle test gauge shown by the full line is checking one side of the wall of the thread, while the angle test gauge shown by the dotted line checks the angle on the other side. Assuming that the standard angle is 60 deg. and the test bar shown in full size is 58½ deg., and the test gauge, as shown in dotted lines, is 61½ deg., it would show that the thread was "tipped" or leaned over ¾ deg., while the included angle of the thread might be or might not be standard.

Fig. 16 shows where the angle test gauge discloses the bottom of the thread that is rounded, and the root diameter is too large. Fig. 17 shows a Whitworth form of thread which checks correctly on the angle and at the bottom. Fig. 18 shows the test of a Whitworth thread gauge which is too shallow—that is, it has too large a radius at the bottom of the thread. Fig. 19 shows a Whitworth thread being checked with a correct angle test gauge which is cut too deep, or has too small a radius at the bottom or root diameter.

The foregoing illustrations, Figs. 10 to 19, are merely intended to show in a somewhat exaggerated degree a few of the diversified defects of the angle which this angle and lead testing machine will check.

REPLACING GASOLINE WITH COAL GAS

THE use of coal gas in place of gasoline has received notable impulse in Britain recently, due to the scarcity and expense of gasoline for commercial purposes. In order to obtain definite information, the British Commercial Gas Association carried out extensive experiments which formed the basis of a report by F. W. Goodenough, which has just been published.

It is pointed out that there is no essential difference between a gas engine and a petrol engine. To convert a gas engine for use with petrol, the principal alteration needed is the addition of a carburetor, while the adaptation of gas to a petrol engine simply renders the carburetor superfluous. Petrol possesses the immense advantage of containing a large amount of energy in a small space. Coal gas, on the other hand, being for practical purposes a "perfect gas," not a vapor, conduces to clean pistons and cylinders, absence of troubles due to injector stoppages, and the complete elimination of starting difficulties in cold weather. For equal energy, however, it is very much more bulky than petrol, and herein lies the only real difficulty in connection with its use as a substitute. The gas supplies in different parts of the country not being standardized either in quality or in price, the gas obtained at some places will give a better mileage than that obtained at others; the gas equivalent, however, is unlikely ever to be higher than 300 cubic feet per gallon of petrol, but may be as low as, and even lower than, 250 cubic feet.

Flexible Gas Containers

The method of storing the gas in a flexible, balloon-like holder under a very slight pressure, probably only a few tenths of an inch head (water-gauge) above atmosphere, has several obvious advantages. The holder can be easily and cheaply replenished with gas from any ordinary supply and behaves as its own constant-pressure governor, thus obviating the need for auxiliary governing accessories; it is cheap to install and adds little or no weight to the vehicle, and there is no need for gas-compressing machinery. The practical disadvantages are the fragile nature of the holder and its bulky dimensions, which seem to unfit it for hard work in towns; nevertheless, owing to its simplicity and low cost, the system warrants careful consideration as a war measure.

From the practical engineering point of view, however, the report declares the use of gas compressed into steel cylinders to be far better, though this method must be for the future, owing to the present state of the iron market. At one time there was a considerable weight of opinion in favor of compression to 120 atmospheres (1.800 pounds per square inch), but to this there are several objections, such as the high cost of compression, the care and supervision required in dealing with cylinders stressed to this degree, the liability of the metal to more rapid "fatigue" owing to continual vibration, and the depreciation of

the gas by subjection to such a high pressure. Experiments with gas stored at this extreme pressure were found to be impossible owing to the lack of the necessary material and apparatus, but experiments were made on the lines along which ultimate success will probably lie, if gas is at all practicable on a large scale, namely, the use of moderate pressures up to 20 or 25 atmospheres (300 to 375 pounds per square inch.)

There was no opportunity of determining, under present conditions, the effect on the calorific value due to compression to 20 atmospheres, but from observations made seven years ago it was found that the loss due to compression to 300 pounds per square inch was from 3 to 4 per cent., so that if due allowance be made for the difference in constitution of the gas at the present day the effect of compression would be less than 3 per cent. and probably virtually negligible. Compression to only 20 atmospheres would cause the gas to deposit 95 per cent. of its normal water contents, and, as in practice it would have very little opportunity of taking up water on its release from the storage cylinders, it would be used in a virtually dry state. The avoidance in this way of dilution by water vapor would compensate for the loss of calorific value due to deposition of hydrocarbons at 20 to 25 atmospheres' compression.

Result of Experiments

As to the nature of the hydrocarbons thrown down by compression, naphthalene will be precipitated, but observations go to show that there is always a sufficiency of liquid bodies to prevent it from assuming the solid form. These liquid bodies, however, have a tendency to polymerize, and therefore it appears desirable that containers for high-pressure gas should be fitted with drain cocks, and perhaps provision should be made for the occasional use of small hand-operated spraying device to facilitate the outflow of viscid deposits.

While there would certainly be a larger deposit of hydrocarbons at extreme pressure like 120 atmospheres, there would at the same time be greater difficulty in cleaning out the containers. It would probably be necessary to expel the deposited matter by means of heating, which would mean the dismantling of the cylinders—an expensive job. The periodical heating would also in time adversely affect the strength of the cylinders and this seems a weighty reason in addition to those already enumerated against the adoption of pressure higher than 25 atmospheres. Another point is that with 120 atmospheres the reservoirs would be smaller and the deposits greater than at 25 atmospheres, so that the volumetric capacity of the reservoirs would suffer serious diminution unless they were frequently cleaned.

Operating Weights

Figures given for several steel reservoirs show that the weights for 1,000 cubic feet of free gas vary from 1,455 pounds to 1,900 pounds for pressures of 20 to 25 atmospheres, down to 1,080 pounds for 120 atmospheres. The report states that there is reason to believe that after the war the question of weight will be found less formidable than at present, and that the weights quoted for reservoirs will be capable of reduction by 50 per cent. or more, owing to the production of steel of greater tensile strength. The use of gas at 120 atmospheres would mean a tangible economy in weight, but the fact remains that the cylinders work at a low factor of safety, which in turn necessitates a degree of supervision that scarcely seems practicable with reservoirs used for the storage of gas for motor traction. High-pressure cylinders are also more expensive per 1,000 cubic feet of free gas than those intended for more moderate pressure, but this increased cost would soon be repaid by the higher carrying capacity of the vehicle, due to the smaller dead-weight.

STANDARD LOCOMOTIVES FOR BRITISH RAILWAYS

By Mark Meredith.

PRIOR to the war there were only occasional suggestions for the standardization of locomotives in the United Kingdom, notwithstanding the fact that standardization of practice within the limits of most of the leading railways has been generally recognized for many years, whilst standard locomotive designs are already accepted in regard to Indian railways. Indeed, it was often contended that each home railway was justifiably a law unto itself, and that careful selection of type, dimensions and constructional features was a necessary corollary to the provision of locomotive equipment truly adapted to the conditions and traffic requirements of the railway concerned. It is true that the history of British locomotive engineering includes several instances when a particular engineer has virtually taken with him from one railway to another the chief features which he had found desirable, and his designs in his new sphere have been quite as satisfactory as those he left behind him. In this connection the names of Patrick and James Stirling, T. W. Worsdell and Dugald Drummond may be mentioned, and there are several living locomotive engineers who might also be cited. But war conditions have introduced so many new factors that it is becoming generally realized that there is ground for arguing in favor of locomotive designs being standardized, and that whatever real justification there has been for individuality of practice in the past, is due, less to the actual necessities of the situation now, than to the magnitude of the operations of most of the leading railways now. Thus, if locomotives were required only in relatively small numbers, it could not be contended that several individual designs were justified; but with hundreds of engines in use on every large railway, there is no occasion, under normal conditions, for inter-railway standardization, providing that there is effective standardization within the limits of the railways concerned. It was, therefore, good practice for each locomotive engineer to adopt designs which seemed suitable for the particular characteristics of the traffic involved. Now it is generally recognized that the case for individuality of practice cannot be supported, as far as the contention that because one design is best for certain traffic on a particular railway no other design, taken from another system, can be equally suitable, apart, of course, from the consideration of local and dimensional limitations, suitability for specified qualities of fuel available, and similar legitimate factors which must be taken into account.

Changes in War Operation

During the war period, however, it has become quite a usual thing for a locomotive of one railway to work regularly over another, far beyond the possibilities of pre-war running powers and working arrangements. Moreover in order to supply locomotive of types suitable for military railways in France and elsewhere, some lines have supplied classes not so suitable to work as part of the locomotive stock of other railways to enable them to send more of their own engines overseas, than they could otherwise spare. There has also been the loan of engines from various railways in need of additional motive power for emergency periods. Furthermore, it is now quite a usual thing for engines of all classes to be employed for traffic other than for which they were designed. For instance, considerable numbers of 4-6-0 express engines are now used systematically for goods traffic of a heavy kind, and even the 4-4-0 and similar express passenger class do a lot of good working.

The case of individuality of design has, therefore, to be considerably modified in view of recent experience, and with the policy of mutual assistance it is found that for all except certain special traffics the designs are suitable for the general traffic of almost any railway, except in regard to questions of repair and maintenance, which requires supplies of spare parts and the like from the owning to the using company. There is, in fact, in view of the urgent need for new material which must follow the conclusion of the war, a very good case for the construction of suitable locomotives on a wider scale than the needs of any one railway may require, and this must pave the way for standarization of locomotive designs in due course.

IT IS said that the present scarcity of manganese and manganese ore in Germany has been met by the utilization of blastfurnace slag accumulations of the past. These slags are smelted in electric furnaces, the alloy produced at one plant analysing about 60 per cent. manganese, 20 per cent. silicon, and 2 per cent. carbon. The phosphorus is, of course, very low, as all that was in the ore originally went into the metal on the first smelting.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

REGARDING A DEGREE FOR ENGINEERS

IN your issue of Sept. 27, page 71, "Engineering Standard Lower," it is stated, "War conditions have caused a larger demand for men with education in engineering, and it is evident that after the war there will be a call for more such men. It is desirable, therefore, under these circumstances to take measures to hasten the preparation of men for engineering work and to encourage young men to enter upon engineering courses. The deficiency will be made up the first year by devoting a large amount of time to mathematics, so that the total requirements for a degree will remain exactly the same."

What are the total requirements for a degree?

How can a degree be obtained?

Theoretical training, coupled with actual workshop practice, should no doubt be the basis of education in engineering; both are of equal importance, but how often do we find the latter neglected?

Do you not think that some encouragement should be given to the studious, hard-working mechanic to enable him to obtain a degree in engineering? Take this case of, say, Mr. A., who has had 16 years' workshop experience. During this time he has taken courses in mathematics and mechanical drawing, subscribed to one or two engineering papers, as circumstances permitted; has two complete libraries of engineering books, besides a number of works on special engineering subjects, which he has studied hard and diligently, yet never had an opportunity of attending a university and obtaining a degree, though he is considered an authority on certain branches of engineering by those who are acquainted with him.

This is just one case; but I have met several, men who are well informed and educated in engineering, yet no degree.

What, then are the total requirements for a degree?

Is there any way such persons can obtain a degree in this country? If not, I feel sure if one our universities or some representative examining board held examinations from time to time, and awarded degrees, it would be a surprise to find the amount of latent talent we have in this country.

Perhaps some of our readers will give their opinions on this subject.

A MECHANIC.

Walkerville, Ont.

MOTIVE POWER FOR SMALL USERS

By C. T.

THE question of the best motive power for small users, as determined by the use of steam, gas or electricity, is one that can only be answered by a full knowledge of the circumstances existing in each particular case. In a case which was considered recently, where duplicate power was absolutely necessary, where the user had two engines and two boilers, one of each being always at rest, but ready to be started at a moment's emergency, the question was raised, when one of the engines had worn out, whether another engine should be installed or whether gas or electricity should be requisitioned as the motive power. It was ultimately decided that in this particular case another steam engine should be purchased on account of the large capital outlay that would be involved in converting to electricity, gas being quite out of the question. Later, a consulting engineer, who had been asked for an opinion on this problem, recommended that, as additional plant was put in, each machine should have its own motor, and in the case of replacements the same course should be adopted, and when replacement had reached a certain point the older machine should be scrapped and a dynamo put in as a stand-by in case of failure of the electric supply. The advice proved correct, and it shows the advantage of power users going to the expense of getting expert opinion before deciding on the course to be adopted. It is difficult to lay down a hard-and-fast rule for application in every case, but it is possible for steam plant to be scrapped long before it is worn out, and the resulting saving has been so small that it has meant a capital loss.

SOME SCREW MACHINE POINTERS

I HAVE read with considerable interest the above article by Mr. D. A. Hampson in Sept. 20 issue. In fact, I am always interested in articles of that nature, and being a mechanic myself, I have some ideas of my own on the subject. Mr. Hampson does not say whether the article applies to hand screw or automatics, but I presume he refers to the latter. He says, make sure that the cut-off tool is not narrower at the front than further back. An operator that has no more knowledge of grinding tools than that should not be allowed to grind his tools. He further states that stopping the machine while the tools are engaged is disastrous to drills, etc. Surely he must be referring to automatics, for no operator, much less a helper, would be guilty of such gross carelessness. He states further it is better to use a centering tool, as the cut-off tool does not have to be set on the centre. Suppose a drill pushes back, what happens then? I consider there is only one place for a cut-off and that is on the centre, and you don't have to worry about the tit on the end. I have used on the most accurate of work drills as small as ¼ in., with no centering tool preceding it, with the best of success, lots of times having no room for it in the turret. He states that floating drill holders should be used whenever possible. Here I might say I have been fifteen years in screw machine work and failed to have seen the use of one. As to the misalignment of machines, I think Mr. Hampson would have better success by aligning his machines or using a drill holder that would throw his drill off centre to meet the misalignment. Mr. Hampson refers to setting the feed fingers too tight. This is one of the first instructions in care of a screw machine that should be taught an operator before he is allowed to operate any machine. In cases where the stock varies in size, I have used compression collars, same as used on Cleveland automatics with good success.

ALBERT E. WILLIAMS.

Brantford, Ont.

DOES A PISTON STOP AT REVERSAL?

By W. F. Schaphorst, M.E.

R. W. MILLER'S query in your issue of Oct. 4, inspires me to write my convictions pertaining to this question which has been the cause of much "argufication" from time to time.

Yes, a piston stops at reversal. That is, at each end of the stroke of the piston its velocity is zero, and when the velocity of a thing is zero we generally conclude that the thing has "stopped." Mr. Miller states that to stop means to produce a "state of rest." I do not like to use the word "rest" in connection with a piston, because it often signifies sleep, repose, death, and such other items that have comparatively long duration. A piston doesn't rest, therefore, because the period of reversal is infinitesimal. I cannot state "how long" a piston stops, in answer to Mr. Miller's query, nor can anybody else. All I know is that as the piston approaches the end of its stroke, its velocity decreases gradually, and when the end of the stroke is reached, the velocity is zero. At the beginning of the return stroke, then, the velocity is zero from whence it accelerates again to a maximum.

Motion, you know, is only relative anyway. That point has been threshed out very carefully in text books on kinematics, physics, etc. I am pretty sure that all authorities agree that a piston stops at reversal. If it didn't stop, how could it ever start moving in an opposite direction, and all in the same straight line? In a flywheel the particles in the rim constantly change in velocity, but not in speed. Quoting Prof. Goodman: "The velocity of a body may be changed

by altering the speed with which it is moving, or by altering the direction in which it is moving. It does not follow that if the speed of a body be uniform, the velocity will be also. The idea of velocity embodies direction of motion, that of speed does not."

We can, therefore, conclude that there is a considerable difference in definitions of words that we commonly regard as synonyms, and in that event "rest" may mean a period of anything from a second to a day, or thereabouts.

As for the argument, "If the piston stopped even for an infinitesimally small fraction of a second, would not the flyhweel to which it is connected stop also?" the piston is no more connected to the flywheel than is the base of the engine. There are several pins connecting the piston with the flywheel, whereas there is but one pin between the base and flywheel. Surely the base is at actual "rest" all of the time.

There are several other instances in which we have "stopping and moving" motion as in the automobile or wagon or carriage tire. A given point in the periphery of the tire moves with variable speed from zero to twice the velocity of the car. When the point is in contact with the road it does not move at all. It stops. Its velocity is zero. As for the duration of the stop—nobody can answer that any more accurately than can Mr. Miller's question be answered.

This takes me to a pet idea of mine pertaining to the question, "Does light stop at reversal?" That's a question that isn't so easily answered, because light, you know, travels at a velocity that is fairly uniform through the air, through a vacuum through glass through water, etc. Now, when light strikes a mirror perpendicularly and is reversed in direction, does it stop? There is no deceleration or acceleration. The writer knows of no reason why there should be a change in velocity, because light has no mass or weight, and therefore concludes that there is no changed velocity. In that case, therefore, the inference must be reached that there is no stopping for there can be no zero velocity when the thing or phenomena or whatever it is is in constant motion.

In comparison the piston problem is easy. There is no question but that the piston stops. The best way in which to oil a piston rod is to oil it at the end of its stroke—when it isn't moving. An automobile tire, you see, catches the mud in a muddy road when its velocity is zero and flings it off soon when high centrifugal force develops. The same is true when you or I run through mud. Mud clings to our shoes when they are in contact and aren't moving at all, but is often thrown off again before the same shoe again strikes or touches the ground.

These analogies may seem crude, but in the mind of the writer they are proofs that such objects as pistons, automobile wheels, shoes, etc., all stop at one time or other at periodic intervals.

As for the last paragraph: "To controvert the theory that the flywheel stops, we find in the definition quoted that the point executing the harmonic motion must move with uniform velocity. How can the flywheel stop twice in one revolution, and yet have any point in its circumference move with uniform velocity? —the motion of the piston is just as continuous as the flywheel." This is answered by the quotation above from Prof. Goodman's splendid work, "Mechanics Applied to Engineering." The velocity of a point in a flywheel rim "in a given direction" becomes zero once each revolution. The speed of the flywheel, aside from the fluctuations due to variable load, is constant.

TECHNICAL EDUCATION IN FRANCE

THAT France, as well as other leaders of civilization is devoting increased consideration to technical education is evidenced by a lecture delivered recently by M. Leon Guillet, the eminent French scientist, before the Society of Civil Engineers of France. At a time like the present, when the relation of education to industrial supremacy is being subjected to continuous investigation, Professor Guillet's conclusions are of particular interest. Briefly outlined these are:

(A) As regards the preparations for the highest-grade schools: (1) The study of the classics is useful. Hence those who have studied them should enjoy some advantages. (2) The teaching of experimental sciences is to be modified. (3) The special classes for mathematics, the present bugbear of so many candidates, might be abolished; the teaching of mathematics should form part of the syllabus of study during a preparatory year. (4) Admission of the highest-grade schools should be by examination, including elementary mathematics. (5) The age limit of pupils should be reduced considerably, a matter of great importance. (6) After a preparatory year at the school, a rigorous weeding out (up to 50 per cent. if necessary) of the candidates who do not give any promise for the future. (7) The syllabus of study during the preparatory year should be so arranged that students who fail may enter institutions of the rank of universities, or other paths of studies.

In connection with (3) M. Guillet quoted a passage from a statement once made by M. Haton de la Goupillere, the famous ex-professor of mathematics at the School of Mines and at the Sorbonne, that he had cut down the time spent on teaching the differential and integral calculus to ten lessons, into which he had carefully condensed all that his pupils required, in his opinion, to help them through the rest of their studies. As regards (5) it should be explained that French engineers now enter upon their professional career between the ages of 25 and 27, while everywhere else their colleagues enter the shop at the age of 22 to 24, because the young Frenchman has to serve two or three years in the army, while the young German engineer only serves one year, and probably is often exempt altogether.

(B) As regards the Technical School itself, M. Guillet's recommendations are: (1) Maintenance of strict discipline. (2) A slight relaxing of examinations. (3) Individual efforts and initiative should be encouraged by all possible means. (4) Professors should only be chosen from among men in actual practice in the branch of the industry they are teaching. (5) The teaching should be encyclopaedic, comprising everything that must be known by a certain category of engineers. (6) Less teaching of theory, and in its place more of generalization in the study of industrial sciences. (7) More practical work carried on by the pupils individually instead of pupils watching in groups someone else. (8) More "documents" in the shape of a brief written outline of the lessons to guide pupils in their studies; plans of modern workshops, workshop and test room fittings; "economic" documents, such as computation of cost of production, list of selling prices, statistics (output, consumption, exports of principal countries), customs, tariffs, etc.; test-sheets, specifications. (9) Absolute necessity of pupils working as improvers, of visits to works and journeys for educational purposes. (10) Establishment, if possible, of centres of specialized education by the Universities. (11) The very interesting employment of the cinematograph in the teaching of the higher branches of technical science. (12) The real need of higher-grade teaching centres for "old boys."

Although some of these proposals may appear to be of a revolutionary character, Professor Guillet has already adopted them in his own claasses. As regards cinematograph films for teaching, the only objection to them is their great cost, but the author has been able to make arrangements with the Gaumont firm satisfactory to both parties to the agreement. Some of the views selected were:—(1) The charging of a blast furnace in the old-fashioned and the modern way. (2) The manufacture of zinc from the ore through all its stages to the refined metal in crucibles. (3) Modern methods of testing metal by tension and shock.

ERRATUM

ON page 128 of our issue, August 2, in a paper by E. Jones on "Recent Developments in Air Pump Design," it was stated that the quantity of injection water used by the Hick-Brequet Ejectair was 94 gal. per min., which should have read 367 gal. per min. The author tenders his regrets to Hick Hargreaves, Ltd., Soho Works, Bolton, and La Maison Brequet, Paris, for this regrettable error.

STAINLESS cutlery seems to have come to stay. The claim of the makers that the steel was proof against the corrosive influences of air, water and acids contained in foodstuffs, has been amply proved by two years' use. The only drawback to this kind of cutlery is the tendency to wear blunt, whereas ordinary knives are kept sharp by the repeated application to the cleaning board.

PIONEER DAYS IN THE FOUNDRY

By John Woodside.

I WAS a pioneer, not of my own choosing, but because I was born so; for I was born in the middle year of last century in a pioneer log-house, between the fast developing booze centre, Ballyduff, and the later and better known Railway Station, Bethany. Many of my earliest days were spent on the old Hill-of-Bones farm, where the grinning "think tanks" of aboriginal inhabitants were still dug up in startling numbers. Those landmarks in Durham County show the place of my birth.

Ere I came to years of full memory the pioneer spirit had carried us away up to the lands of the newly opened up "Indian Peninsula," where we settled in the solid "bush," near the namesake of famous Irish Tara, though the "halls" that interested the early settlers here most were the "hauls" of suckers from the shallow Big Sauble river, upon a crossing and small water power of which the village was built. Here my earliest recollections were of crashing maple, beech, and elm, of flaming piles and smoke-filled skies. The maple yielded us about all the sweets we needed; the beech and butternut was our nut supply; while the "beaver meadows" on every creek yielded an abundant supply of such fruits as wild grapes, red plums, and choke cherries, for the possession of which we had sometimes to contend with the black bear. These garden spots also afforded some grazing on coarse grasses for the pioneer cattle, though they generally had to eke out their winter supplies with basswood and elm browse. We had only to scratch the surface amongst those big stumps to make it produce such crops of potatoes as the old pioneers sigh for in vain now.

Youthful Occupations

My first, well remembered toy was a small axe, armed with which I went forth to mimic warfare with the surrounding forest, sometimes to the detriment of the ornamental trees left near home by the pioneer father; and I never lost my love for this great pioneer weapon, the axe.

Canada could fittingly have chosen her shapely axe as a national emblem in place of the more ungainly wood cutter, the beaver; for her sons certainly excelled in the use of this implement, as they now are excelling in the use of weapons of war. We boys were the fire spreaders in season, and had to be closely watched out of season, and many a fortune in hard woods we sent up in smoke.

I passed on to hoe, to hand spike, to harrow and plough, to scythe and cradle, and before I finally left the rural life I had, for at least a couple of harvests, bound after the wonderful new harvester, handled by two men—one to drive and the other to rake off the grain in bunches, to the sweating men to a side of the square, who deftly twisted the straw bands and passed them around the sheaves.

This was in the earlier 60's, while the U. S. was torn with war, and occasional "skeddadlers" came across to our harvest fields, and we youths, with fine disdain for a soldier afraid, used to chant to them, from a distance , the latest ditty: "Bull's Run, Bull's Run, Bull's Run and Candy; Yankee doodle, doodle, do, and Yankee doodle dandy." We had no more sympathy with a slacker in those days than we have to-day.

Looking for a Job

I was 16 years of age before I ever saw a foundry, or dreamed of my future fate. Then I went into Owen Sound to try for a place. I happened to arrive at the shop just as they had finished the cast, and viewed with some dismay the steaming chaos. The old boss, who met me as I came out, asked me how I liked the looks of that place, and I promptly asked him for a chance in the cooler-looking region of the machine shop. No chance; so as I had decided to change from the muddy ruts of the country road to the enticing sidewalks of town, I accepted the inevitable, and tackled the sand heap, and received a pretty thorough course in foundry practice, in green sand, including cupola work, for an apprentice had to go the rounds in those small shops, at the rate of $30, $40, $50, and $60 per year, with board and lodging.

So pioneering was in my blood; and when, after some years at the trade, I received an offer to go out to Tara and put in a small foundry plant, along with their agricultural works, I cheerfully accepted the offer, though the monetary inducements were not heavy—$1.25 per day during construction work, and then the dazzling raise to $1.50 when moulding commenced; so I had an inducement to hurry the instalment. It looks small nowadays, but the highest city wages then were $1.75 to $2 per day, and living was cheap. We had no bikes, nor autos to sigh for. I did scrape up enough, after a while, to buy a big horn in the local brass band, and found it a most interesting diversion.

Preparing the New Shop

As soon as sleighing was good, I proceeded to the most convenient sand pit of moulding sand and helped load and deliver to the new shop, some 15 miles distant, a dozen loads of "the best local." This was dumped down against the wall of the shop—the outside wall—exposed to the variable winter weather of that districts: snow, rain and frost alternating.

We occupied the ground floor of a two-storey shop building, the upper floor being sometimes used as a work room and store room. This had its disadvantages, when we got going below, and the heat opened some cracks in the floor, through which dust, sawdust, and other things sifted down, but we knew that we sent back a fair equivalent in gases, smoke and foundry or beam dust.

The cupola equipment, ladles, etc., had been brought from Owen Sound; it was the old-fashioned style—a square base plate laid on a brick box foundation, only open in front; four columns encircled the shell, and supported the top plate, also square, upon which the local bricklayer erected a stack up through the roof to a safe height, the charging door, of course, being in it. Fire brick and clay had been provided; so I went to work and lined up the cupola, springing a small arch over the tapping pole, placing two tuyeres in regulation position, and altogether making a job which called forth the commendation of the local brick artist, who looked it over and remarked "some job."

We had installed a heater, with a flat top, or baking cores on, and around this I piled as much of the new sand as I could conveniently chop out; and it promptly went into mud, necessitating a drying and burning on plates to fit it for work. This, with a couple of loads of old sand from the town shops, sufficed for a start. The soil was a solid clay, and pretty well frozen before I started to work. It looked neat when I got floors levelled along each side, and a marsh up the middle; but as we heated up and it got thoroughly thawed out, it went into various shapes. I put as much dry sand on top as I could spare, to keep the clay from sticking to my feet, and made a start at moulding.

Some plow patterns and flasks had been purchased in town; some new boxes were built to suit smaller work, amongst which was the main article manufactured in the new works—fanning mills. Now a set of fanning mill castings consists of some 16 pieces, exclusive of the gears; and as we had no knowledge of snap flasks or match boards, we had gone on picking those patterns out one at a time with a pair of tweezers reversed. We had attained to a set gate for them, however, which hastened somewhat the work. But for one man to do some core work for the plows and make up a heat of a couple of plow beams for weight—plow points were, of course, a snap to fill up with—along with this other nest of stuff, and cultivators, turnip seeders, scufflers, etc., and then do his own melting, was likely to become monotonous.

We had always ground our own facings, in town, out of anthracite, charcoal, and sea coal; another 'prentice job; so we secured enough to start on, though the half-barrel of inflammable charcoal dust which I kept stored under the little core bench, in a corner beside the cupola, was blamed, much later on, for catching a spark and eventually setting fire to the bench, shelves and core boxes against the brick wall, and eating its way through the floor above and also the roof, when it was fortunately discovered and extinguished.

The First Heat

The millwright of the shop had put up a home-made fan, not warranted to be noiseless; so in the merry springtime we had all ready for the momentous event in the history of the village, and a goodly crowd assembled to see the first iron run, and incidentally to discover how we induced it to run; but they were doomed to disappointment that day, for though our new fan went off with a fair volume of sound, no pressure resulted; no spark blew from the tapping hole; no sound at the tuyeres; the fan builder had evidently copied the big open fan of the fanning mill, and no pressure was gained, so after nearly an hour of fruitless effort we gave

it up, dropped the bottom and announced for next evening.

They ripped the thing apart, cut out a snail shell spiral, and put it up with a light sheet iron band for a cover. Again I had all ready, the new fan started with a more business-like tone, sparks flew, the tuyere pipes thrilled to the pressure, and soon a trickle of molten iron appeared. The crowd, again assembled, were becoming absorbed in the spectacle of the fizzing fireworks, when with a rending crash the fan above gave way; the spectators mostly hastened from the scene, nor stood upon the order of their going. When we rushed upstairs, we found that something had got loose; one of the riveted fan blades, we presumed, and had made rags of the sheet iron cover, though forunately without injuring the arms or sides of the fan. So it was another drop; this sorting over so much mixed material from under the cupola was trying, but we hoped it would not ever be thus.

Next day everything was ready again, but the crowd was not so large, and they betrayed an air of uneasiness; but this time all went well, the molten iron flowed, it was controlled, and ran into the moulds almost like water, and those who had persevered got their money's worth. The only jar was when the top plate, having been cast in a solid ring, upon getting very hot on the inner side, burst with a bang, which shook the stack a little, but did no further damage. To close the show, I dropped the bottom, with even a greater show than before of hot stuff, and finished my reputation, for the report was around the village next morning that the bottom had again fallen out of the furnace.

CONCERNING BELTS

EXPERIENCE has shown that a long belt, other things being equal, will transmit more power and last longer than a short one. It is easy to remember that a belt one inch wide, travelling 800 feet per minute, and with suitable tension, will transmit one horsepower. If the same belt travels 1600 feet per minute, or if the 800 feet belt is 2 inches wide, both will transmit two horse-power, and so, for every extra inch of width, or an additional speed of 800 feet per minute, an extra horsepower will be procured. If a belt is laced too tightly there will be no fault in its driving, but the journals of the shafts that carry the pulleys will have too much to do, and will soon wear out. If a belt is laced too much on the slack side-slipping will take place, and extensive friction on large cast pulleys has been known to generate sufficient heat to crack the pulleys, even to cause them to burst and fly about and kill. A horizontal belt of considerable length and laced only just tight enough is an ideal drive. Between this ideal drive to the worst, i.e., a vertical drive with a short belt, there are many gradations, but so long as one always visualises the ideal and the worst, care will always be taken when arranging drives to approach the former and ignore the latter.

FIREPROOFING BY PAINT

By O. C.

IN a sense, all painting is fireproofing; or, more properly speaking, it is fire-retarding. There are some paints made specially for fireproofing purposes, though the number of such paints is small. Most fireproofing consists in the application of some chemical solution to the raw wood that will prevent combustion; and over this paint may be applied, or, as happens in many cases, varnish or wood finish of some sort. There are many chemicals that are useful in this connection, and some are very cheap and simple. Alum is one, lime is another.

A certain master painter uses the following formula with much success: Place some fresh lump lime in a barrel, and sprinkle water over it until it crumbles into dust. Then sift it through a fine sieve, and to every 6 qt. add 1 qt. of salt and 1 gal. of water; then place on a fire and boil, skimming it occasionally. To each 5 gal. of this liquid add 1 lb. of pulverized alum, ½ lb. of pulverized copperas, and while stirring the mixture add 12 oz. potash, also 4 lb. fine clean sand. If color is desired, any pigment may be added that will not be affected by lime; any of the earth colors will do. This paint or liquid must be applied with a fibre brush, for it would injure bristles. By adding the proper coloring the effect on a wooden roof will be quite as fine as slates. It also stops leaks in the roof, if made thicker for that purpose; prevents the growth of moss by keeping the water from saturating the wood, and—the principal object—makes it impossible for the shingles to burn. This coating is also very durable.

A different but very good fireproof paint may be made as follows: Mix together one measure of clean fine sand, two measures of sifted wood ashes and three measures of powdered lime. Mix, or better still, grind in a hand mill, with raw linseed oil, or boiled oil as preferred, the latter requiring no driers, while the former does. Apply the first coat thin, let it become hard-dry; then apply the second coat, made stouter than the first coat. This paint will do for any buildings liable to be burnt, and at the same time makes a good weather-proof paint.

Oxide of iron paint, mixed with linseed oil, makes a serviceable fire-retarding paint, because its surface is quite hard and non-inflammable so far as sparks are concerned. The paint may be further improved by the addition of fine sand. A spark may fall on such a paint and burn itself out without doing any damage.

IT IS stated that the firm of Franz Schilling & Sohn, bell founders to the Court, at Apolda, Hanover, have melted down some 70,000 church bells during the war, the metal of which has been used for military purposes. The famous Kaiserglocke from the Cologne cathedral, cast from cannon taken from the French during the Franco-German war of 1870-71, will, it is further said, also be removed for the same purpose. Lightning conductors, rumor also states, are being also pulled down from the churches, and their metal used for army requirements.

AN alloy of 2 per cent. palladium with silver is said to form a good substitute for platinum in contact and spark devices. The alloy which gives the greatest resistance to spark erosion is 60 per cent. palladium and 40 per cent. silver. Palladium raises the melting point and lowers the thermal conductivity.

THE St. Charles deposit of iron ore in Quebec is one of titaniferous magnetite, occurring in large segregation masses. The quantity available is estimated from 1,000,000 to 5,000,000 tons. A sample was found to contain 50.53 per cent. of iron, 10.55 per cent. of titanium, with 0.02 per cent. sulphur and 0.03 per cent. phosphorus. By magnetic concentration the iron can be raised to 77 per cent.

IN the past nitric acid carboys have been closed by a loose-fitting stopper surrounded by clay or plaster of Paris, all held in place by burlap or similar material. This, says the Chemical Trades Journal, has proved very unsatisfactory, and many cases of leakage, with consequent destruction of property and injury to persons, have resulted, and it is believed that the majority of the fires in nitric acid shipments have their basic cause in defective closure. Experiments to determine practicable methods for the improvement of these conditions have been made by prominent manufacturers of acids, and when recently the situation became especially acute on account of the large increase in acid shipments, the Bureau of Explosives, with full support of the Manufacturing Chemists' Association, decided to require the use of a positive form of closure, consisting of a stopper with gasket held in place by some form of wire fastening. This is now being adopted voluntarily by the nitric acid interests, and will be recommended as a requirement of the regulations in the near future.

THE United States Government Bureau of Standards has issued a statement with regard to liquid fuel in which it states that the definition of gasoline will have to be based on the percentage that distils over between specified temperatures, when the distillation is carried out under specified conditions. This distillation test, speaking in non-technical terms, is a measure of the freedom with which the gasoline will vaporize. The gasoline must not vaporize too freely for two reasons—one that it would not be safe, and secondly, its loss in storage by evaporation would be too great. Hence, the specification may have to contain limitations of the percentage distilling over below a certain temperature, coupled, perhaps, with a proviso that certain percentages shall distil over below other fixed temperatures, in order that requisite amounts of low-boiling constituents shall be present to ensure easy starting of an engine. The specification must also contain a provision that all must distil over below a certain maximum temperature in order to exclude from the gasoline the heavier petroleum distillates such as kerosene.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

MACHINING A FEED CLUTCH SHOE

By F. Scriber.

IT often happens that it is more economical to manufacture certain machine parts by grouping together than by handling them as they would appear when finished, and an example of this is shown in the accompanying illus-

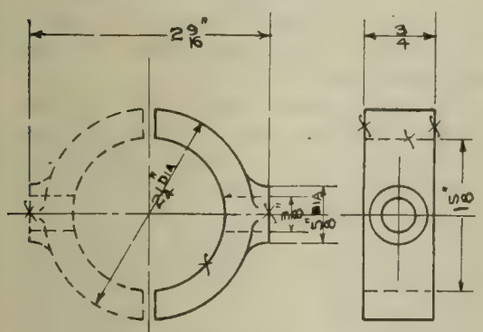


FIG. 1. FEED CLUTCH SHOE.

tration, Fig. 1, which is a feed clutch shoe, finished as shown by the full lines, while for convenience in manufacture two parts are made together, as shown by the dotted lines. These clutch shoes are made from bronze castings, and are finished as follows:—The 1⅝ in. hole, the sides, the bosses at 2 9/16 in. dimension, and the ⅜ in. holes.

The first operation on these parts, which is shown by Fig. 2, consists of boring the 1⅝ in. hole and also drilling and reaming the small holes. To accomplish this, a jig is used, of which the body A

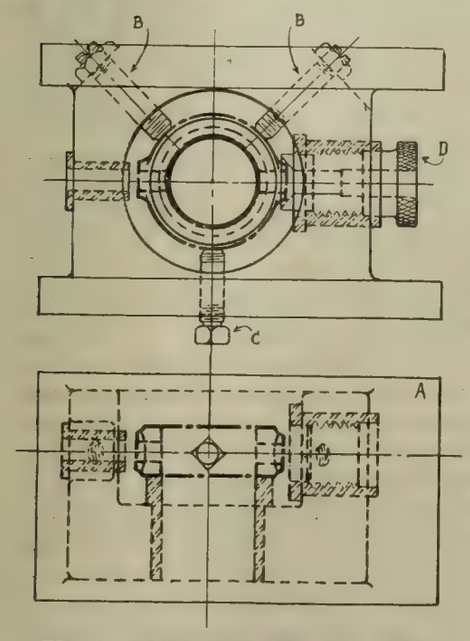


FIG. 2. DRILL JIG USED FOR FIRST OPERATION.

is cast iron, the clutch shoes being located in the jig by three screws and a screw bushing. Two of these screws B are not moved after having once been set

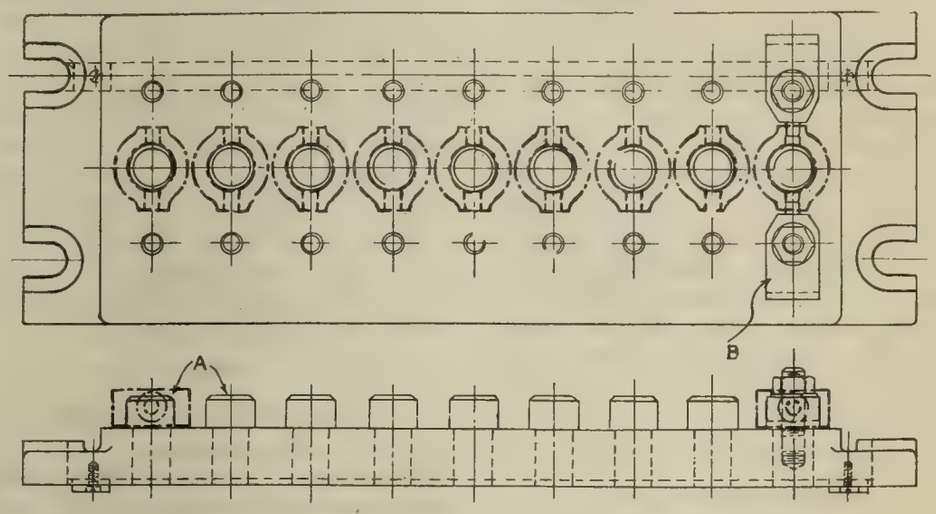


FIG. 4. FIXTURE FOR MILLING SIDES OF FEED CLUTCH SHOES.

correctly, while the third screw C is used for clamping the work securely in place. Before clamping the work tight, but with the binding screw holding the work lightly, the screw bushing D is brought into position, thus locating the bosses in the right place for drilling. The screw C is now tightened securely, and we can

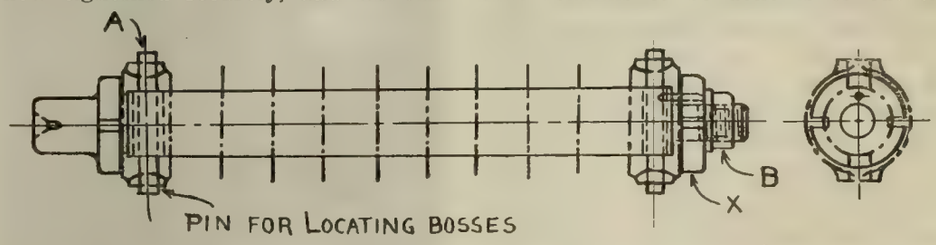


FIG. 5. ARBOR ON WHICH A BATCH OF FEED CLUTCH SHOES ARE SPLIT.

then drill and ream the holes in the usual manner, using the bushings shown to guide the drills.

The next operation, "spot facing the bosses," is accomplished as shown in Fig. 3, by simply slipping each piece over an arbor A, held in an angle plate B, when, by using the stop on the drill press and a piloted facing tool, the operation is accomplished without clamping the work in any manner.

For machining the sides of the clutch shoes, which is the next operation, a mill-

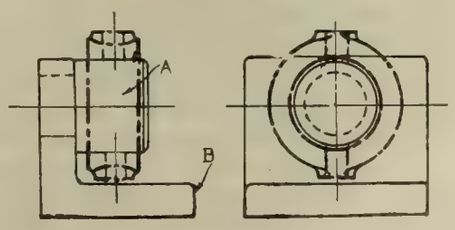


FIG. 3. SPOT FACING FIXTURE.

ing machine is used, this, in connection with the fixture Fig. 4, quickly accomplishing the desired result. In this fixture the work is slipped over the various studs A, and is clamped by means of finger clamps B in the holes, which leaves the upper surface clean, so a milling cut can be taken across. After one side has been milled on all parts, the opposite side is milled in the same manner.

Having now completed the milling, all that remains to be done is to cut the parts in two, and this is done by using a saw and the arbor shown in Fig. 5 on a milling machine. In using this arbor a gang of the clutch parts are slipped over it, while through the holes in the bosses pins A are placed. These pins locate the work radially while being free to slide in the elongated slots for clamping purposes, which is done by the nut B.

The arbor is used between centres of

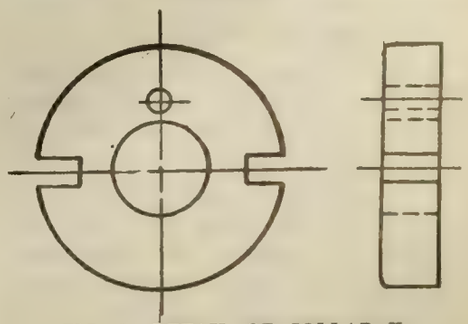


FIG. 6. DETAIL OF COLLAR X.

the milling machine, and after one side of a gang of clutch shoes has been split, the arbor is indexed half-way and the other side finished.

STRAIGHTENING SHAFTS

THE straightening of shafts in the lathe is, like many another job, when one knows how to do it, quite a simple one. A knowledge of what is required, and a fair modicum of patience are desiderata and indispensable. Given a shaft, say 2½ in. in diameter, straight from the drawing mills, such a shaft being all that may be desired as regards size and soundness, but with a slight bend, and perhaps two, in its length, such bends precluding its use as a shaft, and fit to run in ordinary journals or in ball bearings. The first thing to do is to chuck one end, run the other in the steady and centre that end with a large centre drill. Then the other end, previously held in the chuck is held in the steady rest and faced and centred. The shaft is then provided with a pair of suitable half clips—it must not be gripped in the chuck—or a suitable driver and the lathe started. Bends in the shaft may be easily discerned, and a rough judgment made as to the size of the "job."

Preliminary Inspection

Notice having been taken as to the extent of the bends, it is as well then to let the centre of the shaft run freely in a steady. The acquisition and use of the steady at this stage, and in the centre of the length of the shaft is simply for the purpose of eliminating an accession of spring which would accrue, as a result of out of balance, were the lathe to be run at a considerable speed. It is quite possible, however, that the worst of the bend may be situated just about in the middle of the shaft. If such be the case, another and more suitable position must be found, i.e., if there be one. If there is no part of the shaft found to run, even approximately true, or in other words, sufficiently true to run in the steady, then it is a case of running the lathe slowly round, so that there is no "swing" as the shaft is rotated, and to choose a part to set true first. When such is done, the steady should be applied and attention given to the straightening of the parts on each side of the steady. It should be observed, however, that there is no royal road to the art of straightening shafts any more than there is to the art of flattening a circular saw, or a large steel plate. An expert at either is able to do with a few blows more than a novice can do in an hour, if at all.

Theory of Drawing

As with circular saw or steel plate flattening a "drawing" of the shorter parts is the essential, and the man who knows how to do this well may become an expert on the straightening of shafts. But we may hear the novice exclaim when his patience has been exhausted towards the removal of recalcitrant bends, "when I get this bend out another comes in." Just so, and this will be the case generally, until by judicious drawing the bends become reduced in extent, and the shaft becomes approximately, or, as it is sometimes called, commercially straight. It may be said that the method of drawing—with the aid of copper pad—flogging hammer and steel lever,—the old-fashioned way—is far more preferable, and a more direct remedy for bent shafts than any crowbar; and for this reason: If the shaft has become bent in transit, or by any other means, the convex side had become long by stretching—and common sense will support the idea that to bring the shaft back to an approximate normal, the concave side should be equally stretched. That may be accomplished with the orthodox accessories, copper pad, flogging hammer and steel bar—as a lever—and by no means excluding a good heavy laborer for the bar, a useful man for the hammer and a skilful man to hold the copper pad and direct operations. Such a man, where many shafts are required to be dealt with, is worth high pay, though difficult to discover.

A FACE MILLING CUTTER

By A. L. Loy.

THE cut shows a face milling cutter which was designed for heavy work, milling off the sides of gasoline engine beds. The steel body was threaded to screw on

FACE MILLING CUTTER WHICH IS SUITED FOR HEAVY CUTS.

the nose of the spindle, being beveled at a 45 degree angle where the teeth were inserted. The cuttters were of ⅝ in. round high-speed steel, and were about 2 in. in length projecting from the body of the cutter about ¾ in. The face of these pins was milled off flat to provide the cutting surface, this extending to within one-eight inch of the bottom end, thus allowing this to fit the reamed hole in the body. Three-eighth inch holes were drilled at an angle to the cutting face of the pins, and into these holes were driven holding pins which had been milled off at the same angle, so that, when these were driven in, the cutting face of the pins would be parallel with the axis of the spindle. The pins were cut to bottom in their respective holes, and when much worn, balls could be placed beneath them to bring them out the necessary amount. This type of cutter will stand up under the heaviest cuts, and is to be recommended especially in the larger sizes.

PATTERN-MAKING NOTES

By J. W. Broadbent

THERE are many varnishes on the market strongly recommended for finishing patterns, and the lower the price of the varnish the stronger the recommendation, but there is nothing "just as good" as shellac cut with pure grain-alcohol and mixed right in the shop, for manufacturers delight to add foreign materials which cause the moulder to turn grey and find the biggest sledge in the shop to coax the pattern out of the sand.

Varnish

How often we hear the remark made, either by a pattern-maker, or a man in the shop who comes around to dab a little shellac on a cut. "What is that stuff made out of "

Lac is the name applied to the substance in its first form, a resinous incrustation formed on the twigs and young branches of various species of trees by an insect resembling the cochineal fly, whose home is in different parts of India. The insects in large numbers fasten themselves on the young shoots and there they live, eat and die getting their nutriment from the sap of the plant, depositing the resinous substance on the branches and over their bodies, forming in appearance a cocoon.

The twigs are gathered by the natives in June and November and are known as "stick lac," and are taken to the factories where the resin is crushed and washed in hot water to free it from the coloring matter from which dyes are made. It is then known as "seed lac" and after being melted and strained through thick canvas, it is spread in thin layers or rolled between iron rollers to produce the flaky substance known as shellac which is so useful in our industries.

Shellac varies in color from dark amber to almost pure black and can be bleached white by extracting the resin; white shellac varnish does not dry so quickly or produce so hard a surface as orange shellac which color is generally used in pattern making.

Shellac varnish should be prepared in a glass or glazed earthenware vessel and never kept in a metal can, as the oxidation of the metal discolors the varnish; it is well to keep the container air tight as much as possible as the alcohol evaporates very rapidly.

Purpose of Varnish

The idea of applying shellac to a pattern is to fill up the pores of the wood thus producing a hard, smooth surface able to protect the wood from the moisture in the sand and make it easier to withdraw the pattern from the mould. It is a common error to assume that shellac when applied to wood will dry in ten minutes time and is then ready for the next coat. To produce a good hard surface several hours should be allowed between each coat and each coat rubbed down with fine sandpaper before the next is applied.

It is absolutely necessary to have a pattern smooth and flat before the varn-

ish is spread, for putting numerous coats of shellac on a rough coarse job only makes the roughness more apparent.

Coloring matter is added to varnish, the general practice being to varnish patterns so as to distinguish the core prints from the main body of the pattern. Black, the most common color used is produced by adding lampblack, red by adding Chinese vermilion and blue by adding Prussian blue. It is necessary to have this coloring matter perfectly dry and the best results are obtained by mixing to a smooth paste with a little varnish and then adding varnish to this mixture until the desired consistency is produced.

Desirability of Color

From observation the writer has come to the conclusion that if all small patterns were finished in the original color of the orange shellac, they would receive better treatment in the moulding shop, besides leaving the construction of the pattern more visible when alterations or repairs have to be made.

Shellac and plaster of paris or shellac and powdered chalk mixed into a thick paste form an excellent filling for nail holes and holes made by the moulders vent wire; it dries quickly and after being worked into the holes and cracks, what projects is easily sandpapered off, then after a coat of varnish is applied a good hard surface is the result.

Glue

A good quality of glue should be used in the pattern-shop, "good" glue when allowed to soak in cold water will swell up without dissolving and when again dried should resume its original properties. It should be free from specks or grit and of a light brownish yellow transparent appearance, breaking with a glassy fracture.

There is no hard and fast rule as to the proportions of water and glue to be used, this is sometimes determined by the class of work to be glued; thicker glue being required when gluing the end grain of wood. The best method of mixing is to soak the hard glue in cold water over night and then cooking this in an aluminum vessel surrounded by water, either heated by steam, gas, or electricity. The electric glue heaters now on the market are admirable for the purpose, keeping the glue at a uniform temperature. The outside kettle should never be allowed to get dry as burned glue is practically useless.

Strength of Glued Joint

The strength of a glued joint depends, not on the amount of glue used, but upon the quality and the perfect fitting of the joints and surfaces, for it is easily seen that when the surfaces are pressed into close contact there only remains a very thin film of glue and such an amount as has entered the pores of the wood. A good joint, glued under the best of conditions, will withstand a pull of 700 lbs. per sq. in. Nothing should ever be put on the joints to prevent the glue from soaking into the pores of the wood.

When gluing the end grain of wood, or where the grain runs diagonally in such a way as to present the end pores of the wood for the gluing surface, this end wood should be first "sized" that is: it should receive an application of thin glue and after being allowed to dry and scraped lightly with a sharp tool, the joint may be glued in the ordinary manner.

Wherever possible, glued joints should be nailed or secured with screws that is if they can be placed in such position that they will not present themselves to any cutting tools used in turning or shaping the pattern.

CLEARANCE GRINDING ON MILLING CUTTERS

THE angle of clearance of a cutter is measured with a bevel protractor from a line at right angles to the radial as in Fig. 1, A representing the angle of clearance. At B is shown the land of the tooth, and this is generally the deciding factor as to whether to use a disk or a cup wheel. Usually a disk wheel is used

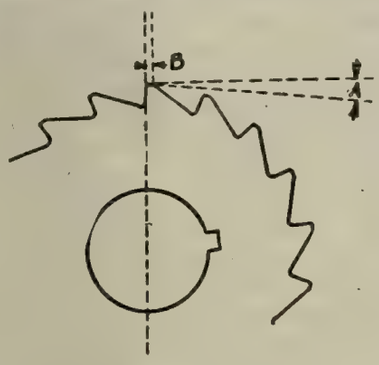


FIG. 1.

on narrow lands and a cup wheel on wide lands.

The angle of clearance on milling cutters under 3 in. in diameter is from 6° to 7°, and from 4° to 5° for those 3 in. and over, but the angle naturally depends on the material to be machined.

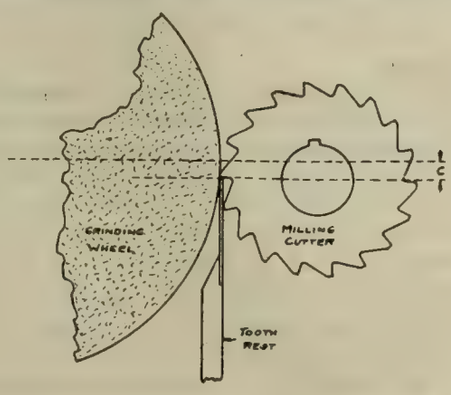


FIG. 2.

Fig. 2 represents a milling cutter and a disk wheel. The method of procedure in obtaining the angle of clearance is this: Set centre of wheel spindle and work centres in the same horizontal plane. Then fasten tooth rest to the table of machine and adjust the tooth rest to the same height as the work centres, using the height gauge. The distance to raise the wheel head (see Fig. 2) may be calculated by the following rule, using the constant .0088 in.; clearance angle times the diameter of grinding wheel times .0088 in.

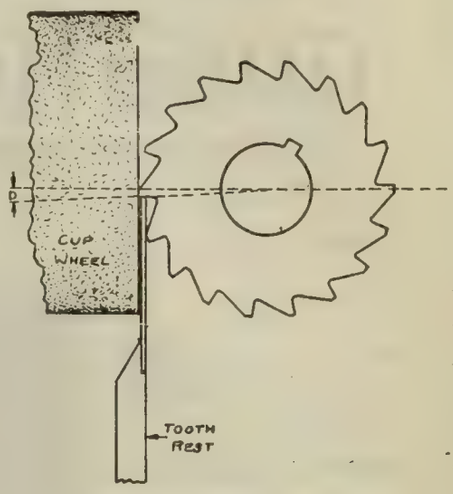


FIG. 3

Example: To find elevation of wheel centre for 5° clearance angle, diameter of grinding wheel, 6 in.

Solution: 5 x 6 in. x .0088 in. = .264 in. Answer.

Therefore, the wheel head should be raised .264 in. to get the proper clearance angle, using the graduated hand wheel.

In sharpening the periphery teeth of a milling cutter with a cup wheel the diameter of the cutter is used in place of the wheel diameter as above, and the rule then reads as follows: Clearance angle times the diameter of cutter times .0088 in.

In Fig. 3 we have a 3 in. diameter cutter with a desired clearance angle of 4°.

Example: To find the distance to locate the tooth rest below the centre of cutter to give a clearance angle of 4°.

Solution: 4° x 3 in. x .0088 in. = .106 in. Answer.

To get the setting proceed as follows: Fasten the tooth rest to the wheel head, and set the tooth rest with a surface gauge to the same height as the centre of the cutter. Then lower the wheel head (Fig. 3) the calculated distance.—Robert J. Spence in "Grits and Grinds."

THE Fonderie des Gobelins, Paris, France, has increased its daily production of 155 mm. shells from 120 when high-speed steel was used to 200 when stellite was used. According to Metaux et Alliages, of Paris, the cost of stellite for finishing 1,000 shells of this size was about 6c per shell. With a cutting speed of 17 meters (about 56 ft.) the roughing of the shell and the finishing of the shell each took 21 min. with high-speed steel. When stellite was employed, the roughing out period consumed 11 min., while the finishing work required 4 min., the cutting speed in roughing being 25 meters (82 ft.) and in the finishing work 37 meters (121 ft.).

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THE PRE-EMINENCE OF THE TOOLMAKER'S CRAFT

PERHAPS no phase of munitions activity has afforded such convincing evidence of the importance of the machinist's art as the production of gauges. Statements by responsible parties, both in official government positions and otherwise, have been frequently made on this subject, more especially in recent months, when the question arose as to whether the United States should proceed with the production of its own types of munitions or adapt its requirements to those of the Allies which were being supplied in immense volume by American firms.

Those of our readers who have been in touch with these activities across the line know that the decision to adopt certain Allied types of ordnance, small arms and ammunition was based principally, if not solely, on the question of the supply of gauges. To generate new standards and duplicate them on the scale necessary to ensure the mammoth production aimed at, meant a delay, the results of which would be much more costly for the United States in particular, and much more serious for the Allies in general, than the slight loss of prestige involved in the abandonment pro tem. of a few United States standards.

Such action, while being convincing evidence of the single-purpose manner in which the latest recruit is getting down to business, has also directed more than passing interest to the whole question of gauges, and has stimulated interest in the methods of producing them and the degree of accuracy obtainable.

While it may be said of some modern commercial achievements that the supply creates the demand, the reverse is the case with the subject under consideration. The demand has undoubtedly created the supply, the demand in most cases being such that no denial of its requirements was possible, let alone allowable. "Do or die" has been the unseen slogan invisibly engraved on many a war contract, and it is to the everlasting credit, not to say glory, of the machine shop industry that conditions are as they are now. And the keystone of the whole fabric has been the craft, skill, perseverance and painstaking effort of that inner group of workers known as toolmakers.

Modern high-grade machine tools such as tool room lathes, grinding machines and millers formerly sufficed, with the addition of certain hand operations, to produce the greater variety of gauges in commercial use, and when refined methods of checking and measuring were employed, the results were both creditable and suited for the purposes in view. The extreme accuracy required in certain classes of munitions gauges, particularly thread gauges, brought about a state bordering on bewilderment, temporary of course, but of sufficient intensity to arouse all the resource and ingenuity of master craftsmen.

Ordinary cylindrical, taper and profile work called for nothing more than intense care and application of known methods and devices, both for making and measuring, but the work involved in producing thread gauges of the required accuracy seems to have resulted in perfection of measurement without a correspondingly high degree in the articles themselves; which is not to say that thread gauges of very high accuracy cannot be produced in quantity, but that the latest methods of checking can detect errors which it seems almost impossible to wholly eliminate, and which previously were not possible of detection by ordinary means.

The question of accurate thread production and measurement possesses an abstract interest for the skilled machinist which is as intense as it is perennial. The wire system of measuring pitch diameter was welcomed and adopted with a true appreciation of its value until scientific investigation resulted in its shortcomings in certain features being made evident—it afforded no evidence regarding the exact contour of the thread, the angle of lead, or accuracy of pitch. Scientific apparatus which indicates minute variations in all of these important points has become available through recent efforts, and many of the hitherto cherished methods of lapping, etc., are now known to produce results far short of perfection. It would seem, therefore, that the next step in advance is due to be taken by the producer,—detective apparatus is now in the lead, the onus of pulling up level in the contest lies in the direction of improved productive methods. When they attain an even level, the toolmaker's craft will be held still higher in the esteem of all connected with machine shops and manufacturing activities in general.

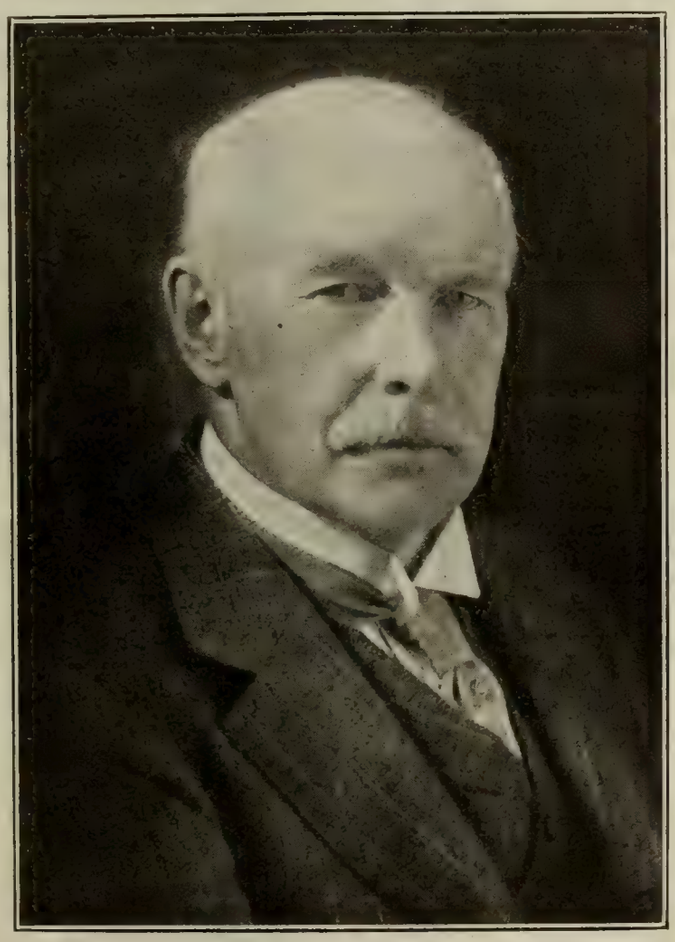
IRON AND STEEL SITUATION

ALTHOUGH the embargo has precipitated a crisis in the iron and steel industry, events have been leading up to the climax for some months. Conditions in the trade have, for some time past, been causing considerable anxiety, but it is only quite recently that the real significance of these developments has come to be realized. Shortage of steel and high prices have been hampering manufacturers' operations increasingly of late, but the embargo has brought the situation to a climax. The situation is serious, more especially to those manufacturers not engaged upon war work, it being assumed that licenses will be issued on steel for war purposes only. No important developments are expected until the committee of manufacturers appointed to investigate the situation has necessary data upon which to base its report to be submitted to the Minister of Trade and Commerce.

In the meantime the market remains in a very unsettled condition and business is almost at a standstill. Consumers are placed in an unfortunate position, not knowing how they stand in regard to obtaining material or what price they may have to pay. This applies of course only to imported steel, but as this class of material forms a considerable proportion of the requirements of Canadian manufacturers, it is an important factor in the situation. While consumers are naturally anxious in regard to the outcome of the pending negotiations with Washington, it is fair to presume that their position will be viewed in a sympathetic manner and suggestions given the consideration that their importance merits. Owing, however, to the exigencies of the situation it appears doubtful whether relief can be obtained to the full extent desired, otherwise the purpose of the embargo would be defeated.

INDUSTRIAL NOTABILITIES

PHELPS JOHNSON, president, Dominion Bridge Co., Ltd., and president, St. Lawrence Bridge Co., Ltd., Montreal, Que., was born in Warwick, Orange County, N.Y., Oct. 23, 1849, son of W. H. and Eliza (Phelps) Johnson, and was educated at public schools of Springfield, Mass., and Goldthwait's Private School, Longmeadow, Mass.



PHELPS JOHNSON.

Mr. Johnson has been with the Dominion Bridge Co. since 1882 and became president of same on the death of the late James Ross, 1912. He also became president of the St. Lawrence Bridge Co. in 1910, when it was reorganized.

He is past president, Canadian Society of Civil Engineers, and is a member of the following clubs: St. James; Engineers; Mount Royal; Royal St. Lawrence Yacht. Mr. Johnson is unmarried and is Conservative in politics.

Mr. Johnson's residence address is Windsor Hotel, Montreal, Que.

Photo, Courtesy British & Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$46 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	60 00

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 00
Tank plates, Pittsburgh	8 00
Structural shapes, Pittsburgh	4 00
Steel hoops, Pittsburgh	5 75
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 00

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$31 00	$32 00
Electro copper	31 00	32 00
Castings, copper	30 00	31 00
Tin	63 00	63 00
Spelter	10 50	10 50
Lead	11 00	11 00
Antimony	18 00	19 00
Aluminum	65 00	62 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$13 00	$13 00
Heads	13 30	13 30
Tank plates, 3-16 in.	13 65	13 25

WROUGHT PIPE.

Effective July 5, 1917.

	Black	Galvanized
Standard Buttweld.		
Size.	Per 100 feet	
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00
Standard Lapweld.		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$18 00
Copper, crucible	21 00	20 50
Copper, heavy	21 00	20 50
Copper wire	21 00	20 50
No. 1 machine composition	20 00	18 00
New brass cuttings	16 00	17 00
No. 1 brass turnings	14 00	15 75
Light brass	12 00	10 00
Medium brass	16 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	17 00
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	22 00	18 00
Axles, wrought iron	30 00	24 00
Rails	25 00	18 00
No. 1 machine cast iron	25 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	10 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	29 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	8 50
Stove plate	19 00	19 00
Scrap zinc	6 50	6 50
Heavy lead	10 00	9 00
Tea lead	7 00	7 00
Aluminum	30 00	25 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up	net
Coach and lag screws	25
Stove bolts	55
Plate washers ..... List plus	10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass ..... add	20
Machine screws, o. and fil. hd., brass ..... add	25
Nuts, square blank ..... add	$1 50
Nuts, square, tapped ..... add	1 75
Nuts, hex. blank, ... add	1 75
Nuts, hex. tapped ..... add	2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in. and larger	$7 60
Structural rivets, as above	7 50
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	35
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws ... list plus	20
Collar screws .... list plus	30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts ..... add	40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$ 60 00
Open-hearth billets	60 00
O.H. sheet bars	70 00
Forging billets	90 00
Wire rods	85 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS.

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 16
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	18 00
Red dry lead, 100-lb. kegs, per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 69
Linseed oil, raw, single, bbls.	1 49
Linseed oil, boiled, single bbls.	1 52
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. ..list plus	20
Emery Cloth .....list plus	33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila Rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks .... list plus	30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 25%; headers, 60; flanged unions, 40; malleable bushings, 25 and 7½; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$11 00	$11 00
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	11 70
Premier, 10¾ oz.	13 85	12 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$
Connelsville Foundry Coke	
Steam Lump Coal	
Best Slack	

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THE industrial situation continues unsettled owing to the embargo on steel from the States, but it is hoped that some relief will be obtained when representations have been made to the Priority Board at Washington. It is absolutely essential that steel for shipbuilding and other war purposes be allowed to enter Canada, but while such materials may be licensed, it is extremely improbable that steel will be permitted to enter for purely domestic purposes. The situation is acute and the shortage of steel cannot help but restrict manufacturing operations. There have been no further developments in regard to prices and the market is holding firm in the meantime. Indications point to the embargo tending to keep prices up in Canada in spite of the reductions in the States. The outlook is so obscure, however, that it is difficult to say what will be the outcome of the prevailing unsettled conditions. The appointment of a Controller of Steel and Iron should help materially in clearing up the situation. The non-ferrous metal markets are dull and prices unchanged. The embargo on copper has resulted in a scarcity of this metal and prices are firm locally. Scrap prices are also unchanged and the market is stagnant. Consumers continue to stay out of the market until the situation is more settled. Prices of machine shop supplies are holding firm with an upward tendency on some lines.

MONTREAL, QUE., Oct. 6, 1917.—While increased impetus has been given to the shell industry through the renewal of orders for six inch shells, which will ensure a fair degree of activity in this connection, the munitions end of the country's business is declining. To offset this however, the ship building enterprise has materially assisted in putting off the time that will eventually come when the labor situation will be a serious problem. At present the surplus of labor that has been released from the shell plants has been absorbed by ship building activity and work that is directly associated with this industry. It is encouraging to note that many Canadian firms are actively interesting themselves in acquiring the manufacturing rights of certain lines of ship machinery that in former years had been largely imported from the States and other countries. At present the interests of the Canadian manufacturers are centered on the developments that are taking place in the States, as conditions arising out of the recent regulations may eventually create a very serious situation in this country, unless some arrangement is made to relieve what promises to develop into a very acute and grave condition, the importance of which may not be fully realized by the average layman.

Pig Iron

In view of the developments that are rapidly changing the situation in the States, the market in pig iron is in a very unsettled condition. Following the announcement last week of the fixing of the price for pig iron at the Pittsburgh source, other centers have been affected, and it is expected that the near future will see a general adjustment of prices to comply with the Government regulations. The approximate in the price of pig iron has been nearly $20 per ton. With the market in such an unsettled state, it is very difficult to say just what effect the change will have, but so far nothing has transpired to indicate that immediate relief will be achieved. The Canadian situation is if anything increasingly [illegible], as the difficulty in obtaining certain ma-

terials has become more pronounced. Canadian producers of pig iron are still out of the market.

Steel

The characteristic that features the entire steel and metal market is that of practical stagnation, and this condition is likely to continue so long as price fixing is being considered. The agreements that have already been announced have made little effect upon the situation and business is almost suspended awaiting further developments. With orders being withheld there is undoubtedly a considerable volume of buying that must eventually be placed as soon as the market becomes more settled, but for the present the trade appears to favor a policy of watchful waiting. The existing condition of partial disorganization was to be expected following the unprecendented action of the American Government in the regulation of prices on the scale that has been adopted, but it is anticipated that as soon as the final arrangements have been made the situation will resume a more normal condition; this is apparently emphasized by the fact that upwards of 80 per cent. of the concessions adopted in the fixing of prices, were made by the producers themselves. The market is however, more or less of a technical nature, and will to a large extent remain so until the complete fixing of prices has been accomplished covering all lines under consideration. Producers are indisposed to sell and business at the new prices is practically nil. One possible result of present developments is the improved situation that will prevail at the termination of hostilities. Producers will probably be in a position where their obligations will be such that the readjustment of trade will be more easily and speedily accomplished. The American price changes that have gone into force during the past week have been confined to additional fixed or agreed prices on other commodities; the New York and Philadelphia price for No. 2 Foundry has been fixed at $33.75 per ton, this being a reduction, on the previous open market quotations of $20 per ton. Corresponding reductions have also been made at Boston and Buffalo. The purchase of supplies is still regulated by the necessity of having a license to show that the material required is to be used for war purposes only, and it is almost impossible to obtain steel for domestic purposes. The Canadian situation is as acute as ever and with the exception of war requirements there is developing a virtual famine in plates and other materials that are now being largely used for Government needs. Dealers here have added $20 per ton to their previous quotation on plates, and are reserving their small supplies for special requirements only; local prices are now 13c for ¼ to ½ inch plates, 13½c for heads, and 13.65 for 3/16 inch tank plates. The market is almost stagnant in all lines.

Metals

One effect of recent developments throughout the general metal situation has been to cause the consumers to carry lower stocks than they have been accustomed to during the past, not being anxious to overload themselves in face of the uncertainties of existing nervous position owing to the delayed action of the Government in relation to the further regulation of prices. Copper is not active as producers are reluctant to sell. Tin has strengthened after a brief spell of weakness. Spelter is quiet and easier. Lead is less active with a lower tendency. Antimony and aluminum are both quiet and easier.

Copper.—Following the fixing of a price for the sale of copper, the American Government has appointed a committee to assist in the distribution of the metal. It is not yet known just what are the functions of this body, but they will co-operate with the producers in seeing that all demands are filled to meet the needs of the situation. While in some respects the price that has been set for the sale of copper will prevail on the open market, it has been reported that high premiums have been offered and accepted for second hand metal. The situation at present is one of uncertainty as the producers are evidently waiting a reply from the Government in connection with their requirements before meeting the demands of the trade. Under these conditions metal is accumulating at the refineries. Local prices are unchanged at 31 and 30c per lb.

Tin.—This metal is not directly affected by the regulations that are being put into force but is nevertheless influenced by the action of the Government, and when the situation becomes more settled it is anticipated that the British authorities will to some extent reciprocate, with the result that tin may also come under the regulations that are now under consideration. The present demand for tin has shown a little increase and a better tone has developed, but the quotation of 60¾c on the New York market shows a decline of ¾c over that quoted last week. The market here is unchanged and dealers continue to quote last week's price of 63c per lb.

Spelter.—The quiet demnd for spelter during the past few weeks has resulted in the accumulation of stocks, which under present conditions tends to increase the weakness of the market. Producers are still ignorant as to the Government requirements, which continues to keep the market in a very unsettled condition. A slight decline has been announced in the New York quotation, but dealers here are still quoting last week's price of 10½c on a quiet and featureless market.

Lead.—The market appears to have attained a more normal condition than it has experienced in many months. The demand at present is comparatively light and does not correspond to the quantity being produced. These conditions are resulting in the accumulation of stocks that will eventually materialize in a still weaker market, unless increased buying follows the developments that are taking place in Government circles. As a shortage of lead becomes less apparent the consumers are not so anxious to load up with much surplus material, which tends to make the outlook more encouraging. New York continues to quote 8c as the base price, although sales are reported to have been made at slightly lower figures. The situation locally is unchanged with dealers quoting 11c per lb.

Antimony.—Increased supplies and lighter demand has developed a weaker market and prices have a downward tendency; New York quotations having declined ⅜c to 15¼c per lb. Local conditions and prices are unchanged at 18c per lb.

Aluminum.—The market has become a little easier in face of the lighter demand. Prices here however, are unchanged at 63 to 68c per lb.

Machine Tools and Supplies

Activity throughout the machine tool industry is more of a general but quiet character, although small increases have been noted in the demand for shell machinery, particularly for the six inch sizes. Business is not brisk but the volume is sufficient to maintain interest. The embargo on steel and iron has affected the manufacturing operations as it is becoming increasingly difficult to obtain delivery on steel etc., even when it is known that the same is to be used for war requirements. However it is hoped that as the situation becomes clearer, the Government will turn their attention to the relieving of the acute conditions that dominate manufacturing activities. In view of the abnormal requirements in the States on account of the heavy program for munitions and supplies, the machine tool industry across the line is exceptionally active, and in some instances representatives from the States have opened negotiations with Canadian firms for the purchase of some or all of their shell equipment that has become more or less a burden since the falling off of shell con-

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

tracts. The demand for all classes of supplies continues to be encouraging although the business in this direction has shown a proportionate decline with that of the munition industry. Owing however, to the difficulty of obtaining raw materials and the high cost, the market in supplies continues very firm.

Scrap

Still uncertain as to the attitude of the American Government in connection with their policy of fixing prices for old materials, the scrap market remains in a very unsettled condition. Trading is light, dealers and consumers arranging only for their immediate requirements. The prices that have been set for the sale of steel and iron products, as well as certain metals, has had no material effect upon the quotations on old materials, and dealers and consumers of scrap are anxiously awaiting the action of the adjusting committee on which to base their future trading. Despite the fact that the price of copper has been set at 23¼c, the New York quotation for old copper is practically on a par with that of virgin metal. The market here is much the same as in New York, being unsettled, with dealers holding firm at prices quoted last week.

TORONTO, ONT., Oct. 9.—The chaotic condition prevailing in the iron and steel industry is causing considerable anxiety in manufacturing circles, and seems destined to restrict production of many products required for the carrying on of manufacturing operations. The effect of the embargo will be widespread, as the shortage of iron and steel will make it very difficult for some consumers to continue operations, except in a limited way. While certain industries, such as those engaged upon war work, will perhaps not be affected to any great extent, there are others which will be seriously hampered. The whole question is so complicated, as many industries are closely connected, that an adjustment satisfactory to all seems almost an impossibility. Those manufacturers to whom relief cannot be extended will be obliged to accept conditions with good grace in view of the necessity of providing for war requirements first.

Steel

The outlook in the trade in regard to the embargo continues obscure, and will remain so until the question has received further consideration by the authorities at Washington. What is likely to develop is difficult to say, but it is not easy to be optimistic concerning the outcome of the negotiations. The embargo was put on for the specific purpose of conserving the steel output for war poses. As the U. S. Government requirements for this purpose are increasing all the time, the supplies available for domestic requirements are that much less. Canadian consumers will naturally be affected to the same extent as those in the States, if not more so; it is, therefore, difficult to see how the situation can be materially improved. Steel will be allowed to come in under license for shipbuilding, railways and farm implements, which covers a fairly extensive field, but there are still many other industries not engaged in war work which will unfortunately suffer. This latter contingency could hardly have been avoided, embargo or no embargo, for there has been for sometime a shortage of steel which promises to become more acute in view of the heavy demands for war purposes. Although much has been written about the serious situation created by the embargo, which in the main is true, it must not be forgotten that for some time past deliveries have been very backward and supplies difficult to obtain. The embargo has served rather to bring the situation to a climax than to add greatly to its difficulties. It has, however, brought the trade to a more thorough realization of existing conditions, and in this respect may be a blessing in disguise, for a united effort is now being made to obtain relief.

There has been no further development in regard to prices, which continue on the same basis as last week. What is likely to materialize in this regard is problematical, as the situation is so confusing. On account of conditions prevailing in the market, business is practically at a standstill. The state of the market here reflects conditions across the line, where the steel industry continues unsettled pending the completion of the Government regulation of prices. Until this matter is finally disposed of the present unsettlement seems destined to be prolonged. Canadian mills are hardly likely to take any action, even if they propose doing so, until the situation in the States becomes more settled.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

Pig Iron

Business is practically at a standstill, owing to the unsettled situation created by the embargo and price regulation. Consumers are showing a disposition to await developments as the outlook is so uncertain. There is every reason to expect continued quiet conditions in the market as most consumers are covered for 1917 and the output of practically all furnaces has been sold up to Jan. 1st. An announcement is expected shortly at Washington giving definite prices on all grades of pig iron. Local prices are unchanged in the meantime but are nominal.

Scrap

The market is practically stagnant due to the unsettled conditions created by the embargo and price regulation. Prices on all scrap metals are unchanged and are more or less nominal as it is difficult to quote prices when so little metal is changing hands. While the market has a weak tendency just now, it appears likely that owing to the shortage of good scrap, prices may become firmer. No developments of importance however, may be expected until the market is more settled.

Machine Tools

The list of products upon which an embargo has been placed includes boring mills, 42 in. and larger; lathes, 30 in. swing and larger, and planers over 36 in. wide. It is likely that exception will be made in the case of tools required for railway shops and shipyards, although this has not been stated definitely. In any event, it should encourage the building of these tools in Canada to a greater extent than formerly. Business has been rather quiet this week, although the renewed activity in the munitions industry is creating a demand for special tools for 6-in. shells.

Supplies

The demand for machine shop supplies is fairly active and prices continue firm, with an upward tendency on some lines. One firm of dealers report a scarcity of emery wheels and carborundum wheels, and have accordingly instructed their representatives to discontinue quotations. In lieu thereof they are placing an artificial abrasive wheel before the trade, which they are quoting at 45 per cent. off list. Recent costs of asbestos sheeting to importers from the United States have necessitated a material advance in prices locally. Where formerly the range of prices was from $9 to $12 per 100 pounds, the new range is from $12 to $15, representing an advance of 25 per cent. This material is scarce and very hard to obtain. A shipment came into the local market recently and the first cost to importers established a new record for this material. Other building materials held steady in price during the week.

Metals

The metal markets continue dull and featureless, while prices are unchanged on the basis of last week's quotations. The copper market holds firm, due more to the embargo than for any other reason, although the decline in production may have something to do with it. Tin is unchanged with light demand, while lead is holding steady. Spelter aluminum and antimony are dull and unchanged.

Copper.—Although the price of copper has been fixed at 23½c New York, there is practically no business being done at this figure, except by the U. S. Government. Supplies of copper available for private consumers are very scarce, and the serious decline in production caused by the strikes has aggravated the situation. The local market is holding firm on account of the embargo, the price regulation not having as yet affected this market. Lake and electrolytic copper is quoted at 32c and castings at 31c per pound.

Tin.—The market is steady and a little

firmer, although prices are unchanged. The London market has advanced. Tin is quoted nominally at 63c per pound.

Spelter.—The market is quiet and easier in New York owing to the lack of buying interest. Locally there is no change in the situation and spelter is being quoted at 10½c per pound.

Lead.—There is a fair demand for lead and the market is holding steady at unchanged quotations. Price, 11c per pound.

Antimony.—The market is dull, with no inquiry, but prices are steady at 19c per pound.

Aluminum.—The market continues dull and demand light. Consumers are well supplied for the time being, and have retired from the market. Local price, 62c per pound.

NEW YORK, Oct. 6.—The machinery industry is on the crest of a wave of prosperity. Never before have such large orders for machine tools been placed in a single month as during September, and buying this month bids fair to be of equal magnitude. In the last two weeks machinery orders placed are valued at $18,000,000. The War and Navy Departments and manufacturers having large Government contracts for various kinds of war munitions, are the main factors in the buying at present. The largest recent orders have been placed by the General Electric Co. for equipping the Erie, Pa., plant. These contracts have amounted to about $2,500,000. The same company has also ordered tools to be installed at the Schenectady, N.Y., and at the West Lynn, Mass., works. All of these plants are working on Government orders. The American International Corporation has the distinction of placing the largest single contract for hoisting machinery ever given to a single manufacturing concern, valued at $2.400,000. The equipment purchased is for the Government shop-assembling plant on Hogg Island. The derricks included in this order were bought from the American Hoist & Derrick Co. of St. Paul, Minn. The American Corporation is also closing contracts for $218,000 worth of pumps and air compressors, and is still negotiating for machine shop power plant equipment.

Adopt Electric Furnaces

The United States Government is about to emulate the example of British Government in making guns from heavy castings of special steel, and to that end has placed contracts for seven additional electrical furnaces costing $50,000 each. These furnaces, of the Herault type, will be manufactured by the American Bridge Co. Three of the furnaces will be installed at the Watertown Arsenal and one at the ordnance plant at Washington. The castings will be mainly for the manufacture of short howitzers. Heretofore practically all of the guns manufactured in this country have been made from steel forgings. The other three furnaces will be installed at the Government plant now building at Charleston, W.V. The steel produced will be used in the manufacture of high explosive projectiles. The United States Navy Department is now taking bids on 61 machine tools for the Boston Navy Yard. The Navy Department has also awarded contracts for additional magazine warehouses at Lake Denmark, New Jersey. The Crucible Steel Co. of America, which is also understood to have adopted electrical steel castings in the manufacture of ordnance and which has been a heavy buyer of machinery to execute Government contracts, has again come into the market for a large number of machines required for manufacturing shells for the Government. It is understood that the work will be done at the Harrison, New Jersey plant. Several other manufacturers, having received Government orders for gun mounts, gun carriages and primers, have been buying machine tools actively. Several large shipbuilding concerns, including the Fore River Shipbuilding Corporation, the Merchant Shipbuilding Corporation and the Chester Shipbuilding Co., have placed contracts for between $3,000,000 and $4,000,000 worth of machine tools, cranes, hydraulic and other machinery required to equip the plants now building to take care of the Government contracts for cargo boats and war craft recently placed. The Fore River Shipbuilding Corporation will build 75 of the 150 destroyers for the United States Navy for which contracts are placed.

Aircraft Manufacture

Several manufacturers who have recently received orders for building Liberty airplane engines amounting to about $10,000,000, are now actively in the market for machine tools calling for the expenditure of nearly $1,000,000. At Detroit, the Lincoln Motor Co. is spending $5,000,000 for plant and equipment to manufacture aircraft engines. It is understood that manufacturers in the Detroit district now hold Government contracts for motor cars, trucks, airplane engines and other war munitions aggregating $250,000,000. The American Car & Foundry, Detroit plant, has just received another large contract for artillery wagons, and the Government is now taking bids on 40,000,000 rounds of ammunition.

PITTSBURGH, Oct. 6.—There is not much light on the iron and steel market situation as yet, even though it is practically a fortnight since the announcement was made that prices are to be controlled and held at the same level for all classes of buyers, the Government, its Allies, and the general public. It is freely admitted that the agreement between the Government and the producers was rather unexpected by the latter. The majority opinion had been, apparently, that no agreement could be reached, at least without further delay. Very nearly all the producers have since expressed themselves as very well satisfied with the agreement.

The schedule of fixed prices has not been enlarged since the first announcement, detailed in last report, which fixed Lake Superior iron ore on the 1917 season basis, set pig iron at the general level indicated by $33 at valley furnaces for No. 2 foundry, basic and malleable, and set bars at 2.90c, shapes at 3.00c and plates at 3.25c. The steel manufacturers assert that the Government's statement that the bar, shape and plate prices were to be "Pittsburgh or Chicago" is an error, that the Pittsburgh basis is to obtain as formerly, and that Chicago prices will be Pittsburgh prices plus the freight of 18.9 cents per 100 lbs.

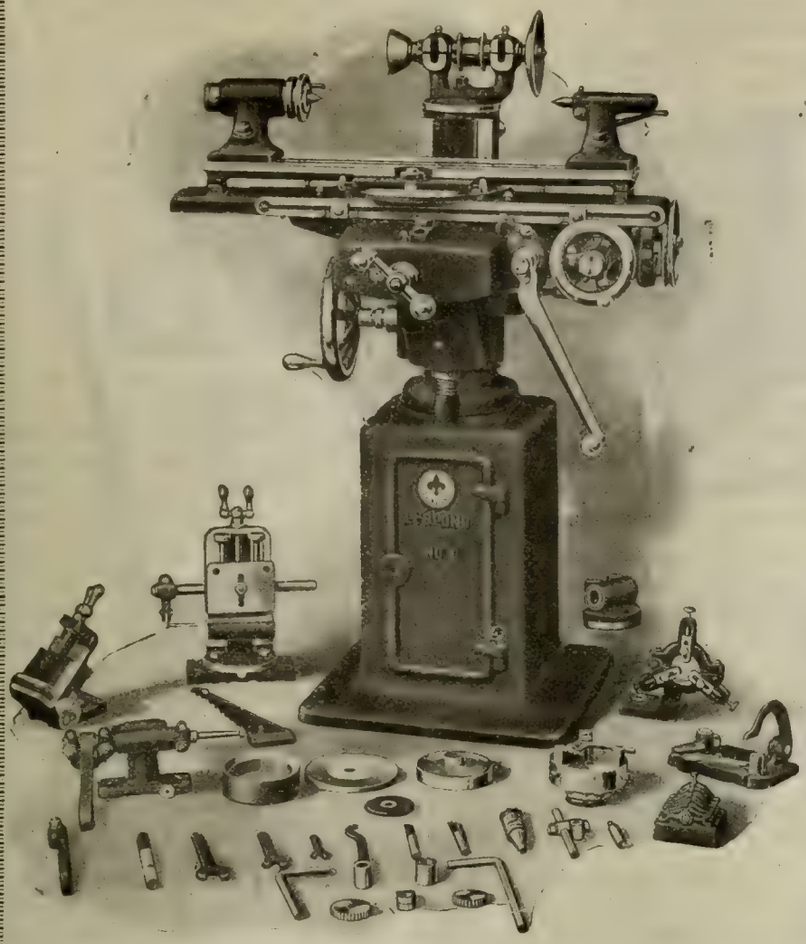
The various other prices are to be fixed by the manufacturers submitting tentative prices to the War Industries Board, which will make all announcements. It is understood that prices on a number of commodities have already been submitted, and a fresh batch of prices is expected to be announced at Washington next week.

No Offerings

There is practically no material being offered at the new prices. Fixing prices at a reduced level has naturally not increased the offerings, but is certain to decrease them, for the whole trend of the market now will be to reduce the volume of obligations on mill books. The control of the Priority Board, it appears, is going to be quite rigid and complete. The Board will fix the sequence in which all orders on books are to be filled, hence delivery is going to depend very much less upon when the order was placed than upon the use to which the purchaser is going to put the material. Some buyers would like to place orders for small tonnages for early deliveries, but, of course, such are not offered, and the average buyer has no incentive to buy at this time, as in the circumstances he has no assurance of delivery, nor is he moved by fear that if he delays prices will be higher. It seems to be the common opinion that if prices as now being fixed are altered in the future, the revision will be downward rather than upward.

Wire Products Easier

Apart from the matter of price fixing, wire products are easier. There have been three classes of contracts of late—those on the basis of $3.20 for nails, confined to the American Steel & Wire Company, and those at $3.50 and $4 in the case of independents. For a while the shipments of independents were rather largely on the $4 basis, but now these contracts seem to be rather dormant and shipments are being made against $3.50 contracts. There are even rumors of independents going back to the $3.20 basis. It is the common view that $3.20 will be the fixed basis, but, of course, if wire could not be bought on that basis, buyers would specify on $3.50 or $4 contracts. The sheet market has continued to weaken, although only slightly. There is really not much demand, and perhaps there would be more shading if the mills saw a prospect of securing a reasonable volume of tonnage by that means. Buyers are holding off, and perhaps when sheet prices are fixed there will be found to be considerable demand, on account of requirements banking up. Whatever the basis fixed, it will certainly be much below 8.00c for 28-gauge black, and even now there are few, if any, mills quoting as low as that. It is believed that several of the mills have shipping orders for only a very few weeks ahead of them, though others are well filled. The Am-



A Cutter Grinder that

IS ALSO { a Cylindrical Grinder / a Surface Grinder / an Internal Grinder

That's the Le BLOND Universal Tool and Cutter Grinder. It is a complete tool-room machine; sharpens all sorts of cutters, including large face mills and saws.

The AUTOMATIC TABLE FEED enables you to do cylindrical, internal and surface grinding with the greatest facility.

SPECIFICATIONS:

Swings	8" dia. x 17" between centres		
Table working surface	29" x 5¼"		
Automatic longitudinal feed	16"		
Vertical feed	7¾"	Grinds cutters to	18 dia.
Cross Feed	6¼"	Grinds saws to	36 dia.

IN STOCK TORONTO *Send for catalog describing this machine.*

The A. R. Williams Machy. Co.

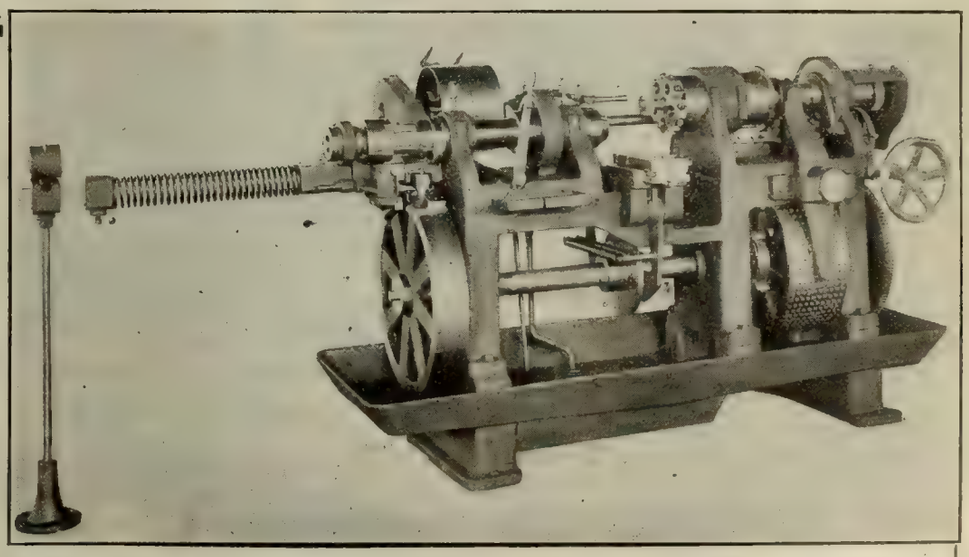
Limited

64 Front St., W. Toronto

The Chicago Automatic Screw Machine

TEN YEARS OF EXTENSIVE MANUFACTURE OF ONE PRODUCT — AUTOMATICS — STAND BEHIND EVERY MACHINE.

No complicated mechanism or a system of cams that are difficult to determine and arrange on this machine.



The rigidity of the machine has not been sacrificed for the flexible features which are embodied in the Chicago Automatic. Alignment is correct and there are no parts where excessive wear takes place—therefore, accurate production is assured during the long life of the machine.

Spindle speeds suitable to different sizes and kinds of stock within the capacity of the machine are obtained by changing two gears on the spindle head.

In less than six weeks we can place Chicagos in your plant ready for production.

They must satisfy you before we consider them sold. Write us about all the features now.

THE JOHN MACNAB MACHINERY COMPANY

NEW YORK CITY, U.S.A.

European Representatives: John Macnab, Hyde, England

erican Sheet & Tin Plate Company will hardly finish filling its second half contracts before the end of January.

Production Unsatisfactory

There is no improvement in production, which has been in the neighborhood of 10 per cent. under capacity for months past. In pig iron the rate is below the rate of last year, while in steel the rate is slightly greater, but both blast furnace and steel works capacity has been materially increased in the past year, so that capacity operations would show a much larger tonnage. Production of pig iron in September was at the lowest rate since last February. Production since January 1 has been at the rate of 38,750,000 tons a year, while the actual production last year was 39,434,797 tons. The restriction in output is due almost entirely to shortage of coke, and there is an interesting discussion whether the fixing of the coke price at $6, when the market had been $10 to $15 for months past, will result in larger production. The 10 per cent. wage advance, which came about under the leadership of the Steel Corporation, became effective October 1, and applies to the coke region as well, but a wage advance does not necessarily increase the supply of men or their assiduity in keeping at work.

Ore Shipments Sufficient

Lake Superior iron ore shipments in September showed a slight decrease from those of the preceding September, the three preceding months having shown gains. Present prospects are for a total movement out of the Lake Superior region of 64,000,000 tons for the year, or a decrease of more than 2,000,000 tons from last year. There will be no shortage of ore, however, at the furnaces tributary to the region. There might have been a shortage if production of pig iron had not been restricted by shortage of coke. There will probably be no surplus for the eastern producers to draw upon, when their supplies of imported ore are restricted and are very expensive.

Market Prospects

There is no likelihood of a really active market in pig iron or steel products for some time to come, even after the full schedule of prices has been developed. Consumption is certainly slowing down in many directions; while apart from that delivery, prospects are so uncertain, on account of the priority to be given to certain classes of orders, that the trade is likely to trend towards a hand-to-mouth basis for doing business. As to prospects for consumption, there is the startling fact that the regular railroads did not order a single freight car in either August or September. There were some orders placed, though not in large volume, by private shippers or industrial railways, by foreign buyers, and by the Government. The car shops are still working, but their orders would have been practically completed months ago if their output had not been restricted by slow deliveries of steel.

COAL PRODUCTION IN CANADA

REPORTS from the principal coal mine operators in the Dominion for the six months ending June 30, last shows a total coal production of 6,154,420 short tons. Nova Scotia led all other provinces with a total of 3,058,216 tons. Alberta was second with 1,763,506 tons and British Columbia third with 1,100,100 tons. Exports averaged around 130,000 tons per month, and were considerably lower than for the same period a year ago. Total production for 1916 was 14,483,395 tons. Bituminous imports for the first six months of the year were 6,392,378, compared with 5,848,289 for the same period a year ago. Anthracite imports up to June 30, 2,231,857, and for the corresponding period last year 2,097,151.

Tokyo, Japan, Sept. 17, 1917.
To the Manager of the Canadian Machinery and Manufacturing News,
143-153 University Ave.,
Toronto, Canada.

Gentlemen,—We beg to introduce ourselves to you as one of the leading machinery importers in Tokyo, who have been in the business for the past 15 years, devoting themselves exclusively to the line of machine tools.

Now that the United States of America, from whom we have been buying solely in the past, has recently declared an embargo on machine tools, we are now under the necessity of finding other sources elsewhere.

Although your machine tools have not yet been much used in this country, the present check will be a fair chance to give an opportunity to your manufacturers to cultivate this field for their products.

Under the circumstances as hitherto stated, we shall feel much obliged if you will kindly bring them to the notice of your manufacturers and interested parties so as they may approach us directly by means of letters and catalogues.

Thanking you in anticipation,
Yours truly,
ROKUROKU SHOTEN,

Total coke production in Canada for six months was 580,997. Imports were 490,830, and exports 8,905. Production of coke includes only the coke made in bee-hive or by-product ovens and does not include coke made by gas companies in retorts.

STEEL PRODUCTION FOR WAR PURPOSES

THE steel industry in the United States in the last nine months has operated at an average rate of about 3,600,000 tons of steel ingots per month, which would give an annual output of 43,200,000 tons of ingots, permitting the production of approximately 32,400,000 tons of rolled products. The United States Government is calling upon the steel mills now for about 5,400,000 tons of various products for war purposes, and this tonnage, doubtless, will be increased by a million tons in the near future. Of the total annual output of the rolling mills, therefore, the United States Government is taking 16.6 per cent., and this probably will be increased to 20 per cent. within a few months. If it be assumed that the Government will pay an average price of 3 cents per pound for this material, the total expenditure will be $416,880,000 for this 5,400,000 gross tons, or $500,256,000 for the 6,480,000 tons to be bought.

The Allied Governments to-day are taking 2,600,000 tons of steel from the United States mills, and this will be increased to 3,600,000 tons in the near future, equivalent to about 11 per cent. of mill output. Together, the United States and Allied Governments, therefore, will take about 30 per cent. of the total rollings of the steel mills, and there is a possibility that 40 per cent. may be needed when all of the indirect demands for war munitions have been satisfied.

Of the 20.000.000 tons of unfilled orders on the books of the steel companies, it is understood that only a few million tons represent war orders, so that in the aggregate mill capacity is pre-empted for almost a year. This does not mean that all products are fully sold for this period. In some lines mill capacity is sold for six to eight months, while capacity to produce other products has been taken up for from twelve to fourteen months.

S. S. REGINOLITE TRIAL TRIP

THE fourth oil tank steamer, the Reginolite, which Collingwood Shipbuilding Co. has on contract for the Imperial Oil Co. of Sarnia, was given a trial trip, on Sept. 30. The day was stormy, but the steamer came up to the mark in every detail, and especially in the matter of speed, the contract in this being exceeded by one and a half knots per hour.

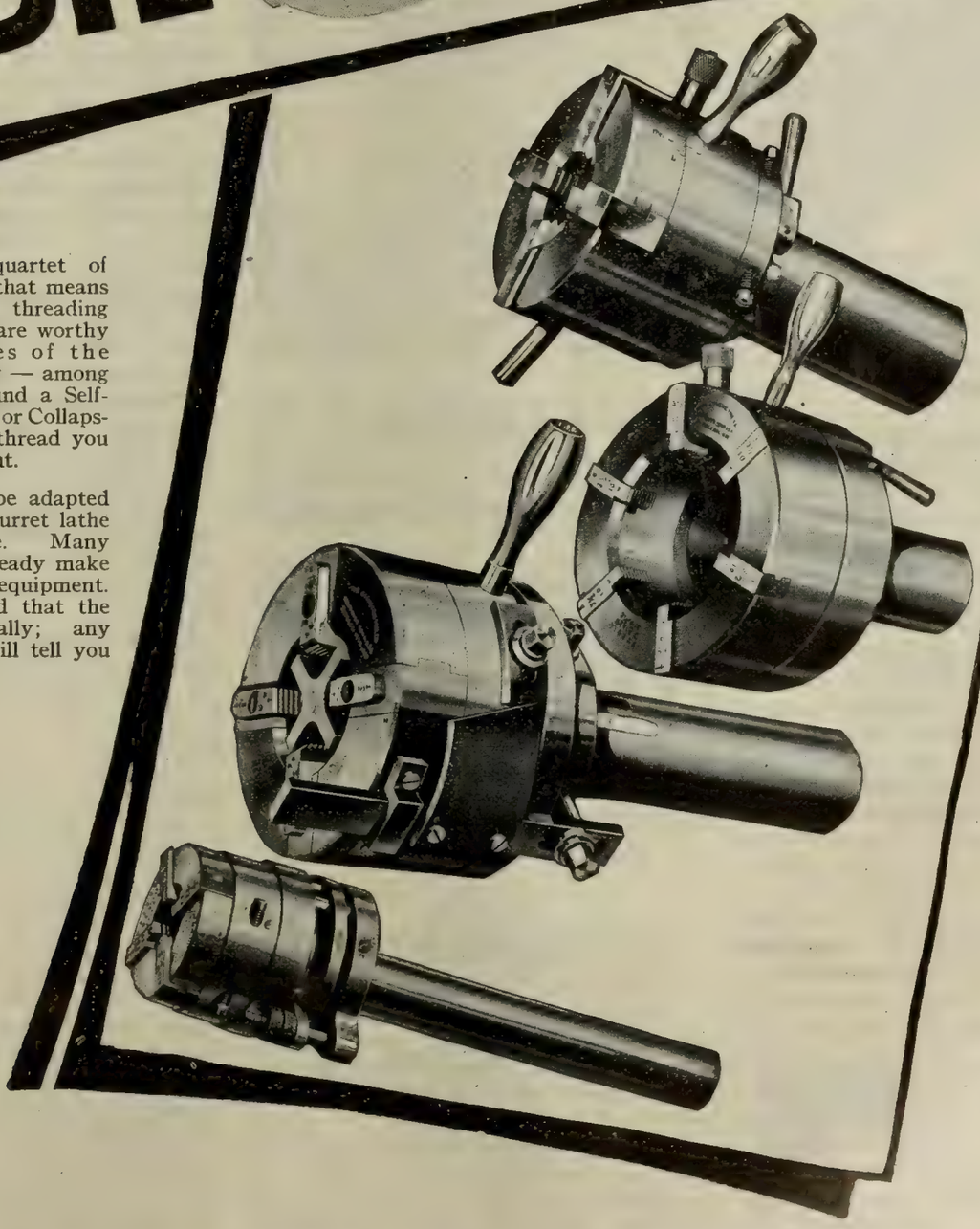
This vessel is intended for ocean service exclusively and is of the following dimensions: Length, 250 ft.; breadth, 43 ft. 9 in.; depth, 25 ft. moulded. The vessel is divided into five cargo tanks, and with a longitudinal counterline bulkhead running the full length, making ten oil tanks in all. A fuel oil bunker is fitted immediately in front of the boiler-room and a bulkhead separates this from the main cargo tanks.

The main propelling machinery consists of one set of triple-expansion engines having cylinders 18, 30 and 50 inches by 36 inch stroke, steam being supplied by two single-ended Scotch boilers 13 ft. 6 in. diameter by 11 ft. long, steam pressure 180 lbs., working under natural draft.

The oil pumping arrangement is of the most elaborate kind of design, the object being to handle the cargo in the most expeditious manner.

The fifth steamer of this type for the same company may be launched this week.

GEOMETRIC DIE-HEADS



HERE'S a quartet of die heads that means death to threading trouble. They are worthy representatives of the Geometric family — among which can be found a Self-Opening Die Head or Collapsing Tap for any thread you could possibly want.

These tools can be adapted to any make of turret lathe or screw machine. Many manufacturers already make them standard equipment. We are convinced that the rest will, eventually; any Geometric user will tell you why.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents: Williams & Wilson, Limited, Montreal; The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg and St. John, N.B.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ELECTRICAL

St. Thomas, Ont.—Several farmers residing in the neighborhood of Dutton have petitioned the Dunwich Council to have the hydro-electric extended to their premises. The Council will make a requisition upon the Hydro-Electric Commission to install the power.

ENGINEERING

Winnipeg, Man.—The Canada Metal

Montreal, Que.—The Simonds Canada Saw Co. will make additions to its plant and instal new equipment to cost $5,000.

Hamilton, Ont.—The Toronto, Hamilton and Buffalo Ry., will build a machine shop here.

Perth, Ont.—H. K. Wampole & Co., are building a soap factory and are in the market for power plant equipment.

Hamilton, Ont.—The Canada Screw Co., are building an extension to their factory. W. H. Yates has the general contract.

Campbellville, Ont.—The cars of machinery have arrived here for oil drilling operations to be carried on here. Oil leases have been secured on a large block of land.

Toronto, Ont.—A building permit has been issued to the Willys-Overland Co., for the construction of a one-storey brick addition to machine shop on Weston road, to cost $3,500.

Toronto, Ont.—The Imperial Government has placed a large contract with the Willys-Overland Co., Weston road, for the manufacture of airplane motors. The necessary plant is now being installed, and the work will give employment to a large number of additional hands.

Toronto, Ont.—The request of the Toronto Harbor Commission for permission to sell a site of four acres of land in the Ashbridge's Marsh industrial district to the Imperial Oil Co., has been rejected by the City Council. Leave, however, was granted the company to erect a large tank for the storage of gasoline and to lay conduits under certain streets, so that it might supply oil to the Consumers' Gas Co. Whether this will be done is an open question, as the management of the company has repeatedly declared that it will not make large expenditures on land of which it cannot obtain the freehold.

Penticton, B.C.—Announcement was made recently of a railway, mining and power development programme involving the early expenditure of over $6,000,000, in the Southern Okanagan and Similkameen Valleys. The Kettle Valley Railway Co. will build a branch from Penticton to Copper Mountain through 14 miles of mountainous country at an expenditure of approximately $1,000,000. This is to provide ore freight facilities for the Canada Copper Co., which is entering upon a two and a half million dollar programme at Copper Mountain. A large concentrator is to be built as soon as the property is on a producing basis, and a smelter probably will be erected later. The Kootenay Power Co. will expend $2,500,000 in building a high tension power line from Greenwood, west as far as Copper Mountain, and will extend a line to Penticton for industrial purposes.

CONTRACTS

Stirling, Ont.—Quinlan and Robertson, Ltd., Crookston, received word from the Provincial Department of Highways that their tender for the construction of a permanent road on St. Lawrence Street, Madoc, has been accepted.

GENERAL

Melfort, Sask.—The Saskatchewan Co-operative Creameries will build a cold storage plant.

Weston Ont.—A new firm contemplate establishing a factory here for making rubber tires. The company is appealing for a fixed assessment on a prospective site.

St. Thomas, Ont.—The planing mill of D. L. Shafer of St. Thomas was badly damaged by fire on Oct. 3. The fire started in the drying kiln and before the flames were extinguished the stock and building were damaged to the extent of $7,000, partly covered by insurance.

INCORPORATIONS

W. Harris & Co. has been incorporated at Toronto with a capital of $500,000 to manufacture fertilizers, glue, casings, etc., at Toronto. The incorporators are: J. B. Harris, F. K. Harris and J. H. Harris, all of Toronto.

Standard Foundry & Supply Co. has been incorporated at Toronto to carry on a general foundry business at St. Thomas, Ont., with a capital of $40,000. The provisional directors are Fred S. Ferguson and Tom P. Charlton, the former being the general manager.

Central Iron Works, Ltd., has been incorporated at Ottawa to carry on business as ironfounders, steel melters and manufacture metal goods of all kinds at Toronto, with a capital of $100,000. The incorporators are: A. J. Thomson, W. S. Morlock, and R. H. Parmenter, all of Toronto.

BUILDING

Winnipeg, Man.—The Canada Metal Co. of Toronto, propose enlarging their office building here to take care of large increase in business contemplated after the war.

MUNICIPAL

Alvinston, Ont.—Town Council contemplates the installation of an electric lighting system.

Aylmer, Ont.—The Town Council will purchase electrical transmission equipment, motor-driven pumps, etc.

Rosthern, Sask.—The Town Council will install a power plant. The Perry Electric Co. of Edmonton have the contract.

St. Mary's Ont.—The Town Council are building an addition to the civic power plant and are in the market for a motor driven pump.

Victoria, B.C.—The City Council are selling off a large quantity of plant, machinery, fire equipment and corporation supplies of various kinds.

Chapleau Township, Ont.—The Township Council will build an addition to its pumping station and instal an electrically-operated pumping unit to cost $6,000.

Prince Rupert, B.C.—The preliminary readings of a bylaw to raise $10,000 for the extension of the water mains at Seal Cove took place at the council meeting recently.

Winnipeg, Man. — City Engineer Brereton has been instructed by the Board of Control to advertise for sale a quantity of machinery for which the city has no further use.

Toronto, Ont.—On the new Ottawa-Prescott highway, where operations are expected to start next spring, and which is to cost the municipalities something like $160,000, the work is to be under the direction of the Provincial Government Department of Highways.

Brandon, Man.—The sale has been completed of the properties of the Brandon Electric Light Co. and the Brandon Gas & Power Co., to the Canada Gas & Electric Corporation, a company composed of financial interests in the City of Cleveland. G. A. Paterson, who for the last twenty-five years has been managing director of the Brandon Electric Light Co., has been appointed general manager of the new corporation's properties in Brandon.

Montreal, Que.—At the Board of Control meeting a letter was read from T. M. Kirkwood, of the Three Rivers Shipyards, Ltd., asking if the city would be willing to guarantee a bond issue of $500,000 for the erection of a shipbuild-

ing yard in Montreal. The Board decided to send the proposal to the law department and to the City Council for report.

WOODWORKING

Langley, B.C.—Fire on Sept. 30, completely destroyed the saw mill and shingle mill of W. E. Laking. The loss is partly covered by insurance.

PERSONAL

Norman A. Hill, an American efficiency expert and engineer has been appointed general manager of Carriage Factories, Ltd., Montreal.

H. A. Harrington, of Toronto, secretary of the Retail Merchants' Association of Canada, has been appointed Assistant Ontario Fuel Controller.

Charles C. Ballantyne head of the Sherwin-Williams Paint Co., Montreal and a prominent business man of that city has been appointed Minister of Public Works in the Dominion Government.

M. Clifton Dawson, formerly district superintendent of the Pullman Co., Toronto, died in Toronto on Sept. 29. Mr. Dawson had been in the service of the company for the past thirty-years.

M. J. McCormick, for some time manager of the machine tool department of the Canadian Fairbanks-Morse Co., Montreal, Can., has resigned to accept a position with the McCormick Machinery Co., Montreal.

A. C. Boyce, M.P. for West Algoma, Ont., has been appointed to the Board of Railway Commissioners. Mr. Boyce was born at Wakefield, Yorkshire, England, in 1867. He graduated from Osgoode Hall, Toronto, with honors and a bronze medals in 1890, and has practised law in Sault Ste. Marie since 1903.

Dr. Otto Julius Klotz, LL.D., F.R.A., has been appointed chief astronomer for the Dominion Observatory. Dr. Klotz entered the service of the Dominion Government in 1879, and since 1908 has been assistant chief astronomer. He was born in Preston, Ont., and educated at the Galt Grammar School and Toronto University.

John Dennis has been appointed inspector of stationary and hoisting engineers under the supervision of the Stationary Engineers Board, Department of Public Works for the Province of Ontario. Mr. Dennis who has been serving in the R.N.C.V.R. for the past year was also a member of the C.E.F. until transferred. He served in the British Navy for nine years in the capacity of engine room artificer.

F. Borysewicz has been appointed assistant general manager for Canada, of the Liquid Air Society, with headquarters in Montreal. Before coming to Canada, Mr. Borysewicz was connected with the work of the Society of Japan, having taken a similar position there some years ago, previous to which he had been asso-

METAL STAMPINGS

We are manufacturers of stamped parts for other manufacturers.

We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.

We can finish steel stamping in Nickel, Brass or Copper.

Send us a sample order.

W. H. BANFIELD & SONS

372 Pape Avenue, Toronto, Can.

MORTON MANUFACTURING CO.
PORTABLE PLANERS
DRAW CUT SHAPERS
SPECIAL DRAW CUT R.R. SHAPERS
FINISHED MACHINE KEYS
STATIONARY & PORTABLE KEY WAY CUTTERS
SPECIAL LOCOMOTIVE CYLINDER PLANERS
OFFICE WORKS MUSKEGON HEIGHTS U.S.A.

After the war—
What?

Few can predict—yet all can prepare! Our present prosperity rests in part on an artificial basis which peace must remove. Now is the time to consolidate your position by regulating your expenditures—by husbanding the surplus—and by investing to the limit in Canadian War Loans, that help so much to maintain present prosperity.

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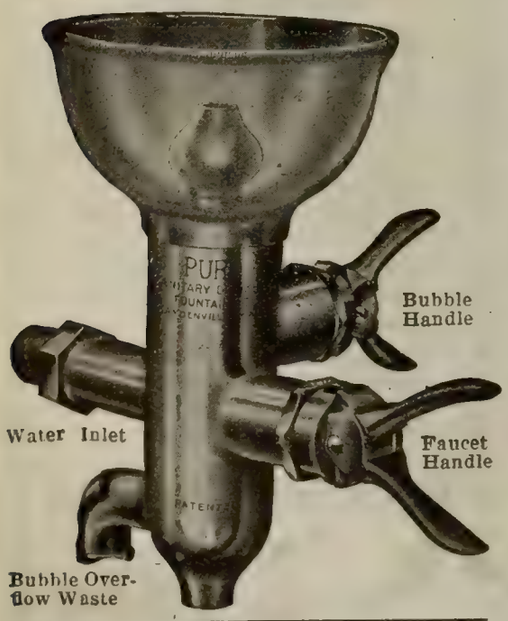

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ciated with the head office in Paris, France. In the absence of Mr. Jordan, who is now in France, Mr. Borysewicz is acting general manager.

TRADE GOSSIP

The London Rolling Mills Co. has increased its capital stock to $500,000.

Hopewell Hill, N.B.—The copper mine at Midway, owned by Henry A. Copp & Sons, has been optioned to J. D. Hubbard, of Chicago, the price mentioned in the option being $750,000. It is said the ore has a heavy percentage of high-grade copper and the veins run to great length.

Export of Rails Prohibited. — An Order-in-Council has been passed at Ottawa, under the War Measures Act, prohibiting the exportation of steel rails from Canada to countries other than the United Kingdom, British possessions and protectorates.

Tungsten Demand Active.—The demand for tungsten continues active and the market in New York is firm at unchanged prices. Wolframite is quoted as to quality at $23 to $25 and Scheelite at $26 per unit for the highest grade on the basis of 60 per cent. metal or 30c per unit additional up to 65 per cent.

Welding & Supplies Co. — A new company has recently been formed in Montreal, under the name of Welding and Supplies Co., to carry on a general oxy-acetylene welding business, and a plant has been located at 1227 Ontario Street East. C. Roger, formerly Canadian manager of the "L'Air Liquide Society," is manager of the company.

Launching At Kingston.—The launching of the first of two Fishery Protection Vessels was successfully accomplished at the Kingston Shipbuilding Co's. yards at Kingston, Ont., on Sept. 27. The christening ceremony was performed by Mrs. H. C. Walsh, manager of the company. The vessel will be known as the Loos. Length between perpendiculars is 130 feet; breadth, moulded, 25 feet; depth, moulded, 14 feet 3 in. The sister ship, which will be known as the Thiepval, will be launched in a few weeks. Both are being built to Lloyds' specifications for ocean service.

Embargo on Machine Tools.—The Exports Administrative Board, Washington, D.C., has issued a further list of commodities, the export of which is practically prohibited. The list includes the following: Oil well casing, boring mills, vertical, 42 inches and larger; engine lathes, with 30-inch swing and larger; planers, metal working, 36 inches wide and larger. Export licenses may be granted for the above articles when destined for actual war purposes, or when they will directly contribute thereto. Individual licenses will be required for shipment to Canada and Newfoundland.

Fishing Protection Vessels Launched.—Two vessels for the Fishery Protection Service were launched at Collingwood on Oct. 1, having been built by the Collingwood Shipbuilding Co. to the order of the Naval Service Department, of which Capt. J. W. Norcross is the director of ship construction. The vessels have the following dimensions: Length, b.p., 125 feet; length over all, 135 feet; breadth, 23 feet 6 in.; depth, 13 feet 6 in. Triple-expansion engines, 12½, 21½ and 35 in. by 24-inch stroke, steam being supplied by one boiler 13 feet 6 in. diameter by 10 feet 6 in. long, working at 180 lbs. pressure. Accommodation is provided for a crew of 17 men.

The National Potash Corporation, Ltd., with E. L. Wettlaufer, of Wettlaufer Brothers, Toronto, as president, has been incorporated to manufacture and produce potash in Canada from feldspar in the vicinity of Muskoka Lakes, where it is found in large quantities. The company has acquired the plant of the Gravenhurst Crushed Granite Co., Ltd., of Gravenhurst, Ont. The officers of the National Potash Corporation, when it is fully in operation, confidently anticipate that they will be able to sell potash at about $10 per ton less than Germany's average price in normal times, as they will produce it for less than the Transatlantic freight from Germany.

L. G. Vincent and **C. G. Morris**, both of whom were formerly connected with the Hyde Engineering, have opened up an office at 248 St. James Street, Montreal, and under the name of Vincent & Morris, will carry on a consulting and commercial engineering business. Mr. Vincent has a wide and varied experience in the sale and manufacture of gas and oil engines, also in marine engines and auxiliary machinery. Previous to his connection with the Hyde Engineering Co., Mr. Morris was for nearly five years general foreman of the Allis-Chalmers Co., of Rockfield, Quebec. They will specialize in marine and general consulting and commercial engineering.

Big Sum Spent on Ontario Roads.—That Ontario in the past ten years has spent something like $28,000,000 on rural highways, of which less than one-quarter remains as a bonded debt. is the information given by the annual report of the Department of Public Highways, just issued. To-day there are only six counties in Ontario that are without county road systems and two of these are committed to the early adoption of road building schemes. The report, which this year is prepared chiefly as an explanation of the county roads system, for the use of the counties just coming in, reviews last year's road construction and outlines the machinery of organization required.

Canadian Steel Corporation Dock Contract.—The Great Lakes Dredging Co. of Canada, with headquarters at Port Arthur, Ont., have been awarded the contract for the construction of wharves, slips, and dredging in connection with the steel plant to be erected for the Canadian Steel Corporation, Ojibway, Ont. This contract involves the expenditure of millions of dollars.

The Canadian Steel Corporation have acquired some twenty-five hundred acres of land at Ojibway, with a frontage on the Detroit River. The slips to be built are some twenty-one hundred feet. All

this work is to be rushed, as the Canadian Steel Corporation wish to start manufacturing as soon as possible.

The Sanford Riley Stoker Co., of Worcester, Mass., has had such an increased volume of business in the Riley underfeed stoker, that it has arranged for additional manufacturing facilities in Detroit, Mich., at the plant of the Murphy Iron Works. There will be no change in the management or policy of the Murphy Iron Works. They will continue the manufacture of the Murphy automatic furnace, increasing their manufacturing facilities as required for the production of Riley stokers. R. Sanford Riley, of Worcester, Mass., has been elected president of the Murphy Iron Works. The B. F. Sturtevant Co., of Hyde Park, Mass., will continue to manufacture and act as selling agents for the Sanford Riley Stoker Co.

Industrial Secrets Are Being Discovered.—Closely-guarded secrets of German manufacture are giving way to research. J. E. Ray, Canadian Trade Commisisoner in Birmingham, England, in an official report received at Ottawa, tells of some of the work done in this direction by the British Advisory Council for Scientific and Industrial Research. Prof. Jackson, Mr. Ray writes, has been investigating the composition of certain optical glasses. He has succeeded in defining the composition of the batch of mixtures necessary for the production of several glasses hitherto manufactured exclusively in Jena. In these is included the famous fluor-glass.

Coal Figures on Lakes.—There have been received at the head of the lakes up to date 370,000 tons of anthracite coal this year, as compared with 386,000 ton of the same coal unloaded here during the whole season of navigation in 1916. With almost two months and a half of the navigation season yet to come, this figure looked extremely favorable. The most serious aspect of the hard coal situation, however, is the high price of bituminous coal, which sells at Fort William now at nine dollars per ton, as compared with $5.50 and less in other years. Of the 370,000 tons received this year not more than 100,000 tons remain in store at Fort William and Port Arthur, the balance having already been shipped to western points.

Hudson Bay Terminals Progress.—Work at Port Nelson, on the Hudson Bay terminals, has closed for the season, and Foreman George H. Roy, of Ottawa, and a party of seventy men arrived at Halifax on October 3 on the Dominion Government steamer Sheba. Mr. Roy brings photographs showing the progress of the work during the past season. The great iron bridge extends over the sand beach and low-tide waters for a distance of half a mile, and at its extremity an island is being built up upon which the grain elevators will be erected. Work has commenced on the docks at the island. During the summer there have been no supplies coming in on account of the shortage of tonnage and labor, so it is quite certain that there cannot be much progress made next summer.

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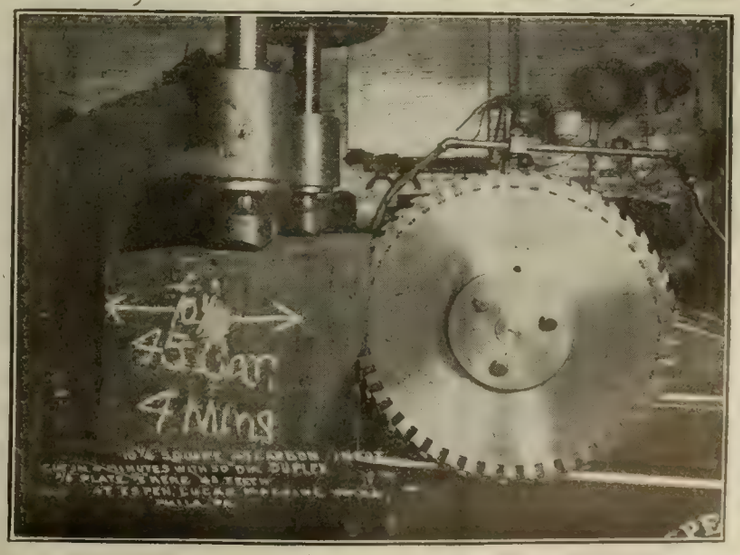

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A PAYING PROPOSITION FOR RAILROADS or manufacturers. Wish to sell our Canadian rights with fixtures. Address Frank Bayless, 311 Fair Street, Springfield, Ohio. c9m

SECOND-HAND 26" NEWTON TYPE COLD saw cutting-off machine, arranged for motor belt drive and complete, with or without motor. Price $600.00, cars Sherbrooke. MacKinnon, Holmes & Co., Limited, Sherbrooke, Quebec. c10m

FOR SALE—1 90-FT. THOMAS SPACING table complete, including one indicator carriage, one trolley carriage, stands, adjustable roller, racks, etc. Adjustable as to length. The Manitoba Bridge & Iron Works, Winnipeg, Man. c15m

FOR SALE—1 NEW 25 H.P. HOR. TUBULAR boiler, 1 second-hand 12 H.P. hor. tubular boiler, tested to 150 lbs.; 1 second-hand 50 H.P. loc. boiler; 1 second-hand Leonard 12 x 12 high speed engine; 1 second-hand 500-lb. belt-driven Beaudry power hammer, only in use two months; in perfect condition. Canadian Engineering & Mfg. Co., 128 Bleury St., Montreal, Que. c9m

HYDRAULIC EQUIPMENT FOR SALE—THE equipment listed below is in first-class shape having only been used about three months. Blue prints and specifications and foundations drawings will be furnished. 2—14 x 12 x 5" Fairbanks-Morse duplex steam driven high pressure pumps at 80 gals. per minute capacity each against 600 lbs. pressure, steam pressure 150 lbs. 1—Weighted Accumulator good for 1000 lbs. per sq. inch, 16" diameter, plunger 11 ft. stroke with squeezing water cushion and wooden outside bumper blocks. The tank for the weighing material surrounding the cylinder is 10' 7" in diameter and 11' 0" high. 1—Return Suction Tank for above pumps and accumulator. Height, 9' 0", diameter 8' 0". Capacity, 2700 Imperial gallons. This equipment can be shipped immediately and is open for inspection at the company's plant. Prices on application. The Canadian Copper Company, Copper Cliff, Ont. c8m

PATTERNS

THE BRANTFORD PATTERN WORKS ARE fully equipped to manufacture patterns, large or small, from blue prints, sketches or sample castings. Expert management. Prompt service. Prices reasonable. Brantford Pattern Works, 49 George St., Brantford, Ont. c13m

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A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States wants position as superintendent or general foreman. Large or small shop on ammunition or machinery; A1 references. Address Box 327, Canadian Machinery. c9m

WORKS MANAGER OR GENERAL SUPERintendent open for engagement—28 years' experience as machinist, toolmaker, inspector, superintendent of tool-making and tool-designing, experimental and development work, heat-treating and testing of steel in raw and finished state; shop superintendent, works manager. Experience has been on rifle work, electrical work, typesetting machines, lock-making and bridge-work. Correspondence solicited, and can furnish good references. Address Box 332, Canadian Machinery. c14m

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WANTED—SMALL SECOND-HAND POWER press, in good condition. Hosmer Stamping & Die Works, Ltd., 831 Dundas St., Toronto, Ont. c13m

WANTED—SECOND-HAND POWER SQUARing shear to cut No. 10 gauge steel up to 24" wide. Must be in good working condition. Packard Electric Company, St. Catharines, Ont. c4m

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4—No 2 Foster Plain Head Screw Machines and 2—No. 3 Foster Friction Head Screw Machines all completely equipped with air cylinders and air chucks suitable for use on No. 80 Time Fuse Bodies. These machines have never been used. Also one Graduating Machine made by the American Ammunition Co.

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4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

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1—30" Newark Automatic Gear Cutter.

1—5 x 48 Pratt & Whitney Plain Grinder.

1—No. 2 Bath Universal Grinder.

1—12 x 60 Modern Plain Grinder, new.

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1—30 x 30 x 8' Powell Planer, new.

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3—18 x 8 New Springfield Engine Lathes.
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1—16 x 8 New Springfield Engine Lathe.
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.

TURRET AND SCREW MACHINES.

2—No. 6-A Potter & Johnston Automatic Lathes.
1—2¼ x 24 Jones & Lamson Flat Turret Lathe, S.G.H.
1—2 x 24 Jones & Lamson Flat Turret Lathe, cone head.
1—No. 4 F. G. H. Foster Hand Screw Machine.
1—No. 4 Smurr & Kamen Hand Screw Machine.
1—No. 5 Pierson F. G. H. Hand Screw Machine.
4—New 14" Pierce Turret Lathes.
2—New 1 x 8 Pierce Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND GRINDERS.

1—No. 2 Hendey Plain Milling Machine.
3—New No. 1½ American Plain Milling Machine.
1—No. 13½ Garvin Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drilling Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
4—New No. 0 Burke Bench Mills.
1—No. 2½ Bath Universal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.
1—Miami Valley Universal Cutter Grinder.

DRILL PRESSES.

1—5' Mueller Plain Radial Drill, old type.
1—20" Baker H. D. Drill.
5—20" Buffalo Plain Drill Presses.
1—3-spindle 8" overhang Henry & Wright High speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.
3—12" Leland & Gifford High Speed Bench Drills.

SHAPERS AND PLANERS.

1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
2—16" New Springfield B.G. Crank Shapers.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS.

1—Waterbury Farrel O.B.I. Press, geared.
1—No. 10 Perkins Drawing Press.
5—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—25-lb. Fairbanks Belt Hammer.
1—25-lb. Bradley Helve Hammer.

AIR COMPRESSORS.

1—16 x 18 x 12 Union Steam Pump Co. Steam Driven Air Compressor.
1—8 x 6 Westinghouse Steam Air Compressor.
1—10 x 10 Clayton Belt-driven Air Compressor.
1—8 x 8 Fairbanks-Morse Electrical-driven Air Compressor.
1—8 x 8 Gardner Single Belt-driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt-driven Air Compressor.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machine tools, both large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

Some Absolutely New Others Quite Like New

None too far gone to necessitate Re-building

USED PLANERS

24" x 24" x 6' American, 1 hd.
30" x 30" x 6' Pond, 1 hd.
36" x 36" x 8' Whitcomb, 1 hd.
36" x 36" x 10' Flather, 2 hds.
36" x 36" x 12' Niles, 1 hd.

PLANER TYPE MILLING MACHINES

24" x 24" x 8' Bement-Miles Hor. Spdl.
24" x 24" x 12' Bement-Miles Hor. Spdl.
46" x 26" x 11' Becker-Brainard.
Hor. Spdl. Arranged for Motor Drive.

GREAT BIG TURRET LATHE

40" Swing, weighing about 22,000 lb. Built by American Turret Lathe Co. Hollow spdl. (3¾" hole), capacity for handling work 6' 9" between chuck and turret fitted up with main turret carrying five tools and supplementary turret with four tools, all the automatic feeds, in A-1 condition, having seen but little service.

USED ENGINE LATHES

48" swing, 20' bed, Putnam.
36" swing, 20' bed, Putnam.
24" swing, 15' bed, Bement.
20" swing, 14' bed, Hamilton.
18" swing, 10' bed, Porter.
18" swing, 8' bed, Le Blond.
18" swing, 6' bed, Seneca Falls. Quick change, Taper Draw-in attachment.
16" swing, 6' bed, Le Blond.

USED RADIAL DRILLS

3½' arm, Bement-Miles.
3' arm, Dreses.
2½' arm, Dreses-Simplex (2).

HORIZONTAL CYLINDER BORING MACHINE

No. 2 Barrett, 5" Boring Bar, Continuous Feed. Travel 48" in either direction, having capacity for boring and facing both ends of the cylinder at the same time. Bed is 12' 6" long, widened part 60" x 52". Will bore, counterbore and face off both ends of 10" x 18" cylinder in one hour.

MULTIPLE SPINDLE DRILLS

18 Spindle Speed Box Baush.
8 Spindle with C-shaft Baush.

BIG SLOTTING AND KEYSEATING MACHINE

30" Stroke Baker Bros. Combination Draw-stroke, Slotter and Keyseater, with actual stroke of 33". Table 36" diam. with 12" tool. Automatic feeds in all directions. Can be used for keyseating wheel centers up to 72" diam. Bar carrying cutting tool can be any shape or size up to and including 4½" diam. This machine is adapted to do a great variety of work for slotting in forgings or castings having a great amount of metal to remove or any long deep holes where the regular slotter cannot reach.

MISCELLANEOUS TOOLS

30" swing, Brown & Sharpe Turret Head Boring Mill.
2 x 24 Jones & Lamson Flat Turret.
20" swing, Potter & Johnston Automatic Turret Lathe.
21" swing, Gisholt Gap Style 30" in gap.
12" stroke Travelling Head Shaper, "Sellers."
20" and 24" Crank Shapers, backgeared, Gould & Eberhardt.
14" stroke Slotting Machine, Putnam.
36" Gear Shaper, "Fellows."
No. 2 Baker Keyseater, capacity 2" wide, 18' long.
6" Espen & Lucas Cold Saw.
10" Double End Cutting-off and Centering Machine, Bement-Miles.
20" Lincoln Type Milling Machine. Boring bar 4½" diam., 8' 6" long, with sliding head and inserted screw for feeding.

HAMMERS

Steam—2500-lb. Single Frame Bement-Miles, Cylinder 12" x 50".
Drop—900-lb., Belt Lifter, Williams-White.

NEW LATHES

McCabe Heavy Duty Latest Pattern 3-Step Cone, Double Back Gears, Quick Change Gear Mechanism. Absolutely new, nothing better built in point of workmanship, power, and convenience in handling and installed with that understanding.
16" swing to 26" swing.
6' to 16' Beds or any other lengths if desired.
26-48" x 12', 16' and 22' Beds "McCabe" Double Spindle, Triple-geared.
All these Lathes are in stock right now.

NEW SHAPERS

12" to 32" Stroke, Plain and Back-geared, Crank, with "Speed Box." LATEST PATTERN.

NEW RADIAL DRILLS

2½', 3½' and 4' Arms, with Speed Box, Single Pulley Drive and Tapping attachment.

J. J. McCABE

149 Broadway - New York

Slightly Used Machinery For Immediate Delivery

1—No. 27 Double Floor Grinder—Canadian Hart Wheel Make, equipped with two 12″ wheels and two spindles 33″ long. Shaft bearings 24″ long.
1—Heavy Blount Double Floor Grinder, 45″ spindle, two 8″ wheels.
1—Heavy Petrie Floor Grinder. No rest or countershaft. Shaft 36″ long, two 9″ wheels.
1—Stouffville Floor Grinder. No rest or countershaft. Shaft 32″, two 8″ wheels.
1—Large Polishing Stand (new) 4′ shaft, bearings 1¼″ x 6.
1—Brown & Boggs Lever Splitting Shear.
1—Hanson & Van Winkle Polishing Stand (no c/s)
1—Hanson & Van Winkle Polishing Stand. Shaft 5′, bearings 2¼″ x 12″.
1—No. 7 Jarecki Pipe Machine, 1¼″.
2—Heavy Grinders, Bearings 2¼″ x 12″—cross adjustment slide, one 12″ wheel.
1—8-Wheel Robinson Detroit Grinder.
1—Anvil, 154-lb.
1—Revolving Electric Plating Machine.
1—Platers Electric Dynamo, 600 Amperes.
1—Tumbling Barrel, 18″ x 4.
1—No. 23 Brown & Boggs Hand Punch and Shear.
1—Fairbanks Scale, 5-ton.
1—Hand Former, Toggle Type.
1—40 H.P. Westinghouse, 550-volt, 60-cycle, 3-phase, 850 R.P.M.
3—Westinghouse Transformers, 30KW., 3,200-550-volt.
1—2⅛″ Dreses Turret Lathe, power feed, oil pan, spring chuck No. 37220.
2—No. 6 Warner & Swasey Turret Lathes, power feed, oil pan, spring chucks.
1—No. 3 Garvin Turret, oil pan, spring chuck, 2⅛″ hole.
1—No. 22—1¾″ Garvin Monitor Lathe, oil pan, spring chuck.
1—1¼″ Davis & Egan Lathe, oil pan, spring chuck.
1—2″ Pratt & Whitney Turret Lathe, spring chuck.
1—32½ Garvin Turret Lathe, spring chuck.
1—12½ Garvin Turret Lathe, spring chuck.
1—Style "F" Single Spindle, heavy duty, Baker Drill.
1—Four Spindle Rockford Drill Press, 20″ box column, back-geared, automatic feed, automatic stop, with pump connection.
1—Garrison Press, 26,000-lb.
2—Heavy Thread Chasing Attachments.
1—No. 3 Cincinnati Universal Miller with Dividing Heads.
1—No. 2 Cincinnati Universal Miller with Dividing Heads.
1—No. 2 West Tire Setter Band Press.
1—No. 3 West Tire Setter Band Press.
1—Cincinnati Bickford 24″ Drill.
1—Cincinnati Upright 24″ Drill with tapping attachment.
2—No. 25 Foote-Burt Drills with belt guards.
2—D2. Colburn Drills with belt guards.
1—Niles-Bement-Pond 50″ Drill Press.
1—No. 400 Brown & Boggs 42″ Geared Gap Shear.
2—No. 21 Crosby Presses.
1—300-lb. Bliss Board Lift Hammer.
1—100-lb. Bliss Board Lift Hammer.
1—Barnes 24″ Geared Drill.

Write For Particulars.

Garlock-Walker Machinery Company, Limited

32 FRONT STREET WEST, TORONTO, ONT.

"EVERYTHING IN MACHINERY"

IMMEDIATE DELIVERY

DRILLING MACHINES.

Leland H.S. B.B.. bench type.
No. 1½ Knight Driller and Miller.
30″ Lodge & Davis, S.H., B.G., P.F.
20″ W. F. & J. Barnes, 4-spindle.
No. 11 P. & W. Multiple, 10 spindles.
3′ W. E. Gang Plain Radial.
4′ Mueller Plain Radial.
Pawling & Harnischfeger Horizontal Driller.

GEAR CUTTERS.

Reynolds Hobber.
No. 11 B. & S. Automatic.
30″ x 9″ G. & E. Auto., for spur and bevel.
24″ x 7″ G. & E., for spur.
No. 3 26″ B. & S., for spur.
36″ Walcott, for spur.

GRINDERS.

Yankee Drill.
No. 184 Wells Cutter and Reamer.
No. 2 Woods Universal Cutter and Tool.
No. 1 Brown & Sharpe Universal.
No. 2 Brown & Sharpe Surface.
14″ x 20″ B. & S., plain.
No. 21 Landis, plain.
Garvin Hole Grinder.
Gisholt Tool Grinder.
No. 1 Gardner Disc.
No. 5 Diamond Water Tool.
No. 6A Diamond Universal Disc.
No. 16 Gardner Disc Grinder.
No. 24 Gardner Disc Grinder.

LATHES.

13″ x 5′ P. & W., C.R. taper.
14″ x 6′ Fairbanks, C.R., taper.
16″ x 6′ Prentice, C.R.
18″ x 8′ L. & S., pat. head, C.R., taper.
18″ x 10′ Fitchburg, C.R.
18″ x 12′ Barker, C.R.
20″ x 14′ Blaisdell, C.R.
21″ x 12′ New Haven, C.R.
24″ x 13′ New Haven, C.R.
31″ x 26′ Bradford.
36″ x 20′ American, T.B.G.
38″ x 16′ Fifield.
36″ x 20′ Houston, Stanwood & Gamble, selective geared head, single pulley drive, taper attachment (new).
36″ x 28′ Houston, Stanwood & Gamble, selective geared head, single pulley drive, taper attachment (new).

PLANERS.

24″ x 24″ x 4′ Gray, one head.
24″ x 24″ x 6′ American.
26″ x 26″ x 8′ Pease, one head.
30″ x 30″ x 8′ Woodward & Powell, one head.
30″ x 30″ x 8′ Cincinnati, two heads.
36″ x 36″ x 14′ Sellers, one head.
40″ x 38″ x 14′ Putnam, one head.
50″ x 50″ x 18′ New Haven, two heads, two extension heads.
72″ x 48″ x 14′ Gray, two heads, one side head.

SCREW MACHINES.

1″ B. & S., plain.
No. 1 Foster, plain A.C. and W.F.
Belt Lacing Machine.
16″ P. & W., plain.
No. 2 Costello, plain head.
No. 2 P. & W., friction head.
No. 4 Pearson, geared head.
No. 3 Bardons & Oliver, plain head.
⅞″ Cleveland, Automatic.

TURRET LATHES.

No. 22 Garvin.
16″ Lodge & Shipley.
25′ Niles.
2″ x 24″ Jones & Lamson.
2″ x 26″ P. & W., power feed to turret slide and cut-off.
3″ x 36″ Jones & Lamson, chucking equipment.
3″ x 36″ Jones & Lamson, bar equipment.
21″ Gisholt, with taper.
2—24″ Gisholt Turret Lathes, taper attachment.

PUNCHES AND SHEARS.

No. 3 American Can.
No. 3 Bauroth, O.B.I.
No. 74½ Bliss, S.S., Geared.
No. 3A Lennox Double-end Punch and Shear.

MISCELLANEOUS.

24″ Bullard Vertical Turret Lathe, 1 swivel head and one side head.
No. 2 Cochrane-Bly Die Filer.
50-lb. Bradley Strap Hammer.
¾″ Acme Forging Machine.
52″ Niles Car Wheel Boring Mill.
6″ x 14″ P. & W. Thread Miller.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-ton Yale Duplex Hoist.

STOCKER-RUMELY-WACHS COMPANY

117-121 No. JEFFERSON STREET CHICAGO, ILLINOIS

New York's Greatest Stock

(Partial List)

SHAPERS

NEW 24" HOLLINGWORTH IMPROVED TRIPLE GEARED CRANK SHAPERS.

PLANERS

60" x 60" x 28' Betts Planer, two heads.
55" x 46" x 14' Lincoln, four heads.
48" x 48" x 12' Niles, two heads.
32" x 32" x 10' Pond.
30" x 30" x 8' Pease, two heads.
Two—28" x 28" x 7' New Haven.
26" x 26" x 8' Niles.
26" x 26" x 6' Hendey.

LATHES

60" Fifield, 9' centers, face plate drive.
60" x 20' New Haven, face plate drive.
48" x 16' Niles Tire or Car Wheel, double head type, face plate drive, triple geared.
36" x 20' New Haven, compound rest, power cross feed, 14' 6" between centers.
36" x 16' Bradford, compound rest, power cross feed.
36" x 14' Putnam, heavy duty, triple geared, face plate drive.
42" x 19' Putnam, heavy duty, triple geared, face plate drive, raising blocks to swing 54".
30" x 28' Fifield, compound rest, power cross feed.
30" x 16' Fifield, raising blocks to swing 38", compound rest, power cross feed.
28" x 17' New Haven, raising blocks to swing 30", hollow spindle, full swing rest, compound rest, power cross feed.
24" x 24' Fitchburg, raising blocks to swing 30", compound rest, power cross feed, 19' between centers.

BENDING ROLLS

No. 1 Hilles & Jones Straightening Rolls, 5' 2" between housings.
Ship Plate Bending Rolls, 9' 2" between housings.
Ship Plate Bending Rolls, 5' 10" between housings.
Niles double geared Bending Rolls, drop end housing, 40½" between housings.

GEAR CUTTERS

Four 48" Newton Automatic Spur Gear.
40" Flather Automatic Spur Gear.
36" Brown & Sharpe Automatic Hob and Spur Gear.
24" Brown & Sharpe Automatic Spiral Gear.
24" Gould & Eberhardt Spur and Bevel Gear.
24" Whiton Automatic Spur and Bevel Gear.
24" Brainard Automatic Spur.
Two No. 12 Brown & Sharpe Automatic Spur and Bevel.
19" x 5" Less Grant Automatic Spur and Spiral.

New York Machinery Exchange, Inc.

50 Church Street . . . New York City

Eastern Machinery & Equipment Co., Inc.

319 COMMERCIAL TRUST BUILDING, PHILADELPHIA, PA.

NEW TOOLS FOR IMMEDIATE DELIVERY.

4—12" x 36" Bridgeport Grinders.
1—2½ x 2" Wm. Sellers Tool Grinder.
39—18" x 9' Turning and Boring Lathes.
3—Double head Sullivan Grinders.
1—32" x 12' Pittsburgh Engine Lathe.
4—24" Shapers.

USED MACHINERY

ENGINE LATHES.

8—30" x 10' American Gear head A1.
1—20" x 10' Bullard.
3—24" x 14' American.

TURRET LATHES.

10—Potter & Johnson 6A Automatic Turret Machines.
3—3 x 36 Jones & Lamson Flat Turret.
2—2¼" x 24" Jones & Lamson Flat Turret, bar equipment. Full set Turret Tools.
9—26" Gisholt, 12" Collet chuck. 6½" hole in spindle threading lathe.
3—26" Putnam Heavy Duty Lathe.
—14" x 6' Lodge & Shipley Turret. Backgeared.
5—24" Gisholt 2-step Cone, 6¼ H.S.

BORING MILLS.

1—Binsse Horizontal Boring Mill, 3" bar.
6—66" swing Bement-Miles Tire Turning Mills, two swivel heads —15½" under rail.
1—Cylinder Boring Mill, capacity of 24" diam. to 96" diam. 10' long. Tool equipment included, good as new.
1—42" Bullard Boring Mill (2) heads.

MILLING MACHINES.

1—No. 3 LeBlond Plain Miller, table 13½ x 58¼.
1—24" x 8' Beaman & Smith Open Side Slab Miller, with two vertical spindles.
1—No. 1½ Universal Milling Machine.

GEAR CUTTERS.

1—24" Fellows Gear Shaper.
2—36" Fellows Gear Shapers.

SCREW CUTTING MACHINES.

1—No. 55 National Acme, 4-spindle, good as new.
1—No. 54 National Acme, 4-spindle, good as new.
2—2¾" Cleveland Automatic Machines, Model A.
1—1¼" Cleveland Automatic Machine, Model A.
1—⅞" Cleveland Automatic Machine, Model A.

SLOTTERS AND SHAPERS.

1—12" Bement Slotter.
1—20" Gould & Eberhardt Shaper, B.G., vise., C.S.
1—16" Steptoe Shaper.
1—48" x 12' Pedrick & Ayer Open Side Planer, shaper type.

GRINDERS.

8—12" x 36" Bridgeport.
1—1½" Full Universal Landis Machine.
1—No. 13 Brown & Sharpe Universal and Tool Grinder, full equipment.
No. 1½ Universal Cutter and Reamer Grinder.
1—28" Bridgeport Face Grinder, with magnetic chuck.
5—Fisher Profile Grinders for Cutters.
5—No. 6 Std. Universal Tool and Cutter Grinders.

DRILL PRESSES.

1—24" Bickford Upright, back gear, sliding head, lever and wheel feed drill.
2—No. 1-D Colburn High Duty Drills.
2—No. 3-D Colburn High Duty Drills, tapping attachment.
1—4' Prentice Radial Drill, tapping attachment.
1—2' 6" Forslick Radial Drill, tapping attachment.

Let them know it's there

In complimenting us upon the results secured from their advertisement in this section, one advertiser said:

> "Of course we would not have sold it without letting people know it was here, that is obvious, and thanks are due you for letting the people know it was for sale."

If you have any old or used equipment for sale, let people know it's there. Your message in Canadian Machinery will be placed before the probable buyers of such equipment.

Canadian Machinery

Classified Advertising Section

143 University Ave., TORONTO

STOP—MAYBE IT'S HERE

BORING MACHINES—Vertical.

1—30" Flather, one turret head
2—36" B. & S. one turret head, Dec. Delivery
1—38" Baush, two heads.
1—38" Niles, two swivel heads.
1—42" McCabe, one swivel head.
5—NEW 48" Colburn, 1 swivel, 1 turret head; January delivery.
1—51" Niles, two swivel heads, motor driven.
4—NEW 60" Colburn, 1 swivel, 1 turret head; January delivery.
1—84" Bickford.
1—90" Vertical Cylinder
1—NEW 8' Bickford
1—Niles, 10'-16' extension, two heads.

BORING MACHINES—Horizontal

2—NEW Universal with motor; immediate delivery.
1—Lucas 2¼" bar
1—24" Cleveland, 2½" bar, takes 4' 6", compound table.
1—No. 1 Barrett Cylinder Borer, 3¾" bar type.
1—Betts Knee Type, 3" bar.
1—No. 2 Barrett Cylinder, 5" bar.

BULLDOZERS

1—No. 8 Ajax, motor driven.
1—No. 9 Williams & White Belt Drive
1—No. 12 Ajax, single pulley drive.
2—No. 23 Williams & White, belt drive.
1—No. 29-U Williams & White, arranged for motor drive.

CRANES

1—Case 5-ton, 47' span.
1—10-ton Maris, 55' span, hand operated.
1—50-ton Niles, 61' span.

CUTTING-OFF MACHINES

1—NEW 4½" Davis.
30—Davis 4½"
10—4½" Williams.
2—NEW 6" Davis.

DRILLING MACHINES—Radial

6—NEW 3' Mueller, speed box drive, Dec. del.
3—NEW 3' American, sensitive tapping attachment.
1—NEW 3½' Western Drill, 86" circle.
2—4' Mueller Plain, speed box drive
1—4½' Bickford, plain.
1—NEW 5' Western, plain, with motor.
1—NEW 5' Niles Universal, with motor.
1—5' Dreses, full universal, gear box drive.
1—5' Fosdick, plain.
6—NEW 5' Mueller, speed box drive, Dec. del.
1—6' Dreses, plain.
1—NEW 6' Fosdick, plain, latest type.
1—NEW 6' Triumph Motor Drive, Oct. delivery.

DRILLING MACHINES—Heavy Duty

2—NEW No. 2 Colburn
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
4—No. 310 Baker Single Pulley Drive, late type

DRILLING MACHINES—Sliding Head.

2—NEW 24" Barnes Drills and Tappers.
5—NEW 24" Barnes Drills.

DRILLING MACHINES—Multiple Spindle

1—No. 5 Fox, 12-spindle, capacity 1".
1—Baush, 12-spindle, capacity 1¼", 30" circle, motor driven.
1—14-spindle Baush, capacity 1" holes, 36" circles.

DRILLING MACHINES—Sensitive.

3—NEW 12" Albany High Speed Tool Room.
1—NEW No. P-4 Allen, one spindle.
1—NEW No. P-2-S Allen, two spindles.
2—NEW No. B-1 Allen, one spindle, 7" overhang.
1—NEW No. B-2 Allen, two spindle, 7" overhang.
3—NEW No. B-3 Allen, three spindle, 7" overhang, tapping attachment.
3—NEW No. B-4 Allen, four spindle, 7" overhang.

GEAR CUTTING MACHINES

1—NEW No. 3 Bickett Gear Rack Planer, delivery 60 days.
1—No. 3 Brown & Sharpe Auto. Gear Cutter spur
1—NEW 6" Standard Gear Cutter, spur.
1—15" Gleason Bevel Gear Planer
1—16" Bilgram Bevel Gear Generator.
1—22 x 8" G. & E. for spur and bevel.
1—24" Becker-Brainard.
1—24" Fellows Gear Shaper
2—NEW Flather Solid Pattern
3—36" Fellows Gear Shapers.

GRINDERS—Universal, for Cutters, Drills, Reamers, etc.

8—NEW No. 190 Wells.
4—No. 1 Cincinnati.
3—NEW No. 1 Wood Universal.
1—NEW Wilmarth & Morman, Style B.K.
1—NEW Walker, No. 1 Outfit B
5—NEW No. 2 Wood Universal
1—NEW Walker, No. 2 Outfit K (capacity 9" x 26")
2—NEW No. 2 Osterlein Universal.
7—NEW LeBlond.
1—NEW Gisholt Universal.

GRINDERS—Cylindrical—Plain

1—NEW No. 12 B. & S., 8" x 26", Oct. del.
2—NEW 8" x 18" Modern, self-contained.
3—NEW 8" x 30" Modern, self-contained.
2—NEW 12" x 24" Modern, self-contained.
6—NEW 12" x 36" Modern, self-contained.
2—12 x 42" Landis, self-contained.
3—NEW 12" x 48" Modern, self-contained.
1—NEW 12" x 60" Modern, self-contained.
1—NEW 10" x 50" Norton, Oct. delivery.
1—14" x 56" Norton.
1—NEW 10 x 72 Norton, plain.

GRINDERS—Cylindrical—Universal.

2—NEW No. 2 Bath, 9" x 20".
1—NEW No. 2 Walker, 9" x 26"
1—NEW No. 2½ (10" x 36") Bath
1—NEW Thompson, 10 x 36.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis
2—NEW No. 3 Modern, 13" x 40", Oct. del.
1—No. 4 Cincinnati, capacity 12 x 72"

GRINDERS—Internal

1—NEW No. 6 Modern, capacity 10" x 10".
1—No. 70 Heald
2—No. 75 Heald.

GRINDERS—Cylinder

1—No. 60 Heald, single pulley drive

GRINDERS—Profile

1—NEW Cleveland
5—Fisher Profile Grinders.

GRINDERS—Surface

1—NEW No. 1 Wilmarth & Morman
2—NEW No. 1½ Walker's complete
2—NEW No. 2 American with Walker No. 1¾ plain flat mag, chucks.
4—NEW No. 2 Reid (same as B. & S.)
1—NEW No. 2 Brown & Sharpe.

HAMMERS—Board-Lift, Drop.

1—No. 4 Standard Machinery Co., 400 lb.
1—E. W. Bliss, 800 lb.

HAMMERS—Steam Forging

Morgan & Williams, 600 to 800 lbs., 21" gap.
1—3,000 lbs. Morgan Double Frame
2—3,500 lbs. Chambersburg Steam Drop Hammer.
2—5,000 lbs. Chambersburg Steam Drop Hammer.
1—7,000-lb. Morgan Special Double Stand.

KEYSEATERS

2—NEW No. 1 Davis.
1—NEW No. 2 Davis.
1—No. 2 Mitts & Merrill.
1—No. 2 Knowles, 60" stroke.

LATHES—Manufacturing, Not Screw Cutting.

2—NEW No. 3 Harding Bros.' Bench Lathe.
3—16" x 8' Fairbanks-Morse, heavy duty.
70—NEW Simplex, 16" x 8'.
14—Reed-Prentice Shell Lathes for 4" or 18 lbs. American shells.
22—18" x 8' Battle Creek, heavy duty.
50—20" x 10' Hindman, high duty.

LATHES—Engine

2—NEW 14" x 6' Bradford, quick change.
14—NEW 15" x 6' Rockford.
3—NEW 16" x 6' Cleveland Tool Room Lathes.
4—NEW 16" x 8' Bradford, quick change.
1—NEW 17" x 8' National, quick change gears.
12—17" x 8' LeBlond, pan bed, quick-change gears
1—18" x 10' Hendey, quick-change gear, 14" chuck.
5—NEW 20 x 10 Bradford, quick change.
3—NEW 20" x 12' Bradford, quick change.
1—NEW 20" x 10' Cleveland Geared Head
19—NEW 21" x 10' Porter, S.B.G.
9—22" x 10' Putnam, oil pan and pump.
1—NEW 24" x 10' Bradford, quick change.
5—NEW 24" x 12' Bradford, quick change.
1—NEW 24" x 14' Bradford, quick change.
3—24" x 14' American, quick change.
1—24" x 22' Bullard, triple geared, taper attachment.
1—NEW 26" x 48" x 12' McCabe, Double Spindle.
1—New 26" x 48" x 22' McCabe, Double Spindle.
1—29" x 18' 6" Schumacher & Boye.
1—NEW 30" x 14' American Double Back-Geared, Quick-Change
1—NEW 32" x 12' Pittsburg Pattern.
1—33" x 12' 6" Rahn-Mayer-Carpenter, taper attachment.
8—NEW 36" x 24' Putnam, triple-geared
1—38" x 18' Schumacher & Boye, triple geared, quick change.
1—50" x 12' American Gear Head, quick-change
1—50" x 24' Prentiss.
1—NEW 66" x 46' Putnam, triple geared, face plate drive, 5-step cone, 6½" belt; October delivery.
1—71" x 20' Fifield, triple-geared.

LATHES—Turret

1—NEW 13" Gisholt, G-13.
8—NEW 21" Gisholt, H-21.
2—NEW 24" Gisholt, 1-24.
5—2 x 24" Jones & Lamson
1—NEW 18" Libby.
3—24" Libby, universal facing head, 3-jaw chuck.
18—6-A Potter & Johnson.

MILLING MACHINES—Knee Type—Universal

1—NEW No. 1 Kempsmith.
1—No. 2 Kempsmith, vertical attach.
1—No. 2 Kempsmith, 13" dividing head.
1—NEW No. 2 Rockford High Power.
1—NEW No. 2 Hendey.
1—No. 2 LeBlond.
1—NEW No. 3 Hendey.
1—NEW No. 3 Kempsmith
3—NEW No. 3-H LeBlond

MILLING MACHINES—Knee Type—Plain

9—NEW No. 0 Rockford.
2—NEW No. 1 Kempsmith.
2—NEW No. 1½ American back gear
1—NEW No. 1 Rockford, high power.
2—NEW No. 2 Rockford
1—No. 3 LeBlond
1—NEW No. 3 Kempsmith.
1—NEW No. 4 LeBlond.
1—No. 4 Brown & Sharpe

MILLING MACHINES—Hand.

3—NEW No. 1 Rockford, without column.
3—NEW No. 2 Rockford, on column.
2—NEW No. 3 Rockford, on column.
3—NEW No. 3 Rockford, on column, power feed.

MILLING MACHINES—Vertical

1—NEW Bickett, No. 0
1—No. 3 Brown & Sharpe.
2—NEW No. 4-B Becker.
2—No. 4 Becker.

MILLING MACHINES—Planer Type

1—No. 2 Beaman & Smith Vertical Spindle, open side.
1—Ingersoll Slab, 16" x 48" cap.
1—NEW 17" x 5' Eynon, planer type.
1—Bement-Niles, heavy duty planer type, 20" x 24" x 12'.
1—3[illegible]" x 30" x 8' Ingersoll No. 928, single spindle, with motor.

MILLING MACHINES—Lincoln Type.

3—NEW No. 1 American.

PLANERS

24" x 24" x 8' Cincinnati, one head, used three months
1—30" x 30" x 8' Ohio Machine Tool Co., 2 heads.
1—36" x 36" x 10' American, two heads.
1—40" x 40" x 11' Niles, four heads
1—NEW 48" x 48" x 10' Cincinnati, two heads.
1—48" x 12' Pedrick, open side, one head.
1—50" x 50" x 16' Pond, 2 heads on rail
1—52" x 52" x 16' Betts, 2 heads, right angle drive.
1—60" x 60" x 21' L. W. Pond, 3 heads.
1—72" x 60" x 16' Gray, 4 heads.
1—72" x 72" x 20' McKechrim & Bertram, 4 heads.
1—36' Niles Plate Planer, extra heavy, almost new, arranged for motor drive.

SCREW MACHINES—Hand.

4—NEW No. 2 Foster, geared friction head.
1—NEW No. 4 Foster, geared friction head, power feed to turret slide.
2—NEW No. 6 Foster, all geared, power feed to turret slide.
3—NEW No. 5 Foster, all geared head, power feed to turret, power cross feed.
2—NEW No. 6 Foster, geared friction head, power feed to turret, power cross feed.
5—NEW No. 7 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW No. 10 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW 2¼" Dreses, F.G.B., power feed.

SCREW MACHINES—Automatic

2—NEW ⅝" Cleveland, Model A.
1—NEW ¾" Gridley Mult. Spindle, belt driven.
2—NEW 1¼" Gridley Mult. Spindle, belt driven.
2—NEW 1¾ Gridley, mult. spindle, belt driven.
1—NEW 2¼" Gridley Mult. Spindle, belt driven.
1—NEW 3¼" Gridley Single Spindle, belt driven.
2—No. 63 National Acme
1—No. 55 National Acme.
1—No. 515 National Acme.

SHAPERS

1—NEW 16" Springfield
1—16" Motor Driven Rockford
1—NEW Barker 24"
2—NEW 24" Milwaukee.
2—25" Smith & Mills, Back-Geared
1—28" Smith & Mills, Triple-Geared
2—30" Morton Draw Cut.

SLOTTERS.

1—NEW 8½" Betts, heavy model, vertical geared crank slotter.
1—16" Sellers Slotter, rebuilt.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 549 Washington Blvd. **CINCINNATI, OHIO** 1018 Union Central Life Bldg. **CLEVELAND, OHIO** 508 Leader News Bldg. **NEW YORK CITY** Singer Bldg.

WRITE OR WIRE OUR NEAREST OFFICE FOR QUOTATIONS
THIS IS ONLY A PARTIAL LIST OF AVAILABLE MACHINES

If any advertisement interests you, tear it out now and place with letters to be answered.

FOR SALE

The following used machinery, guaranteed to be in first-class condition, at lowest prices:—

2—LeBlond Heavy Duty 19" x 8' Engine Lathes.

1—Fay Scott Engine Lathe, 24" x 8', with extra turret.

1—LeBlond Engine Lathe, 17" x 6'.

1—14" x 7' Niles Engine Lathe.

1—16" x 8' Butler Engine Lathe.

1—Boring Lathe for 9.2 or 12" shells.

1—Turning Lathe for 9.2 or 12" shells.

2—No. 50 Foster Turret Lathes, 16" swing.

4—John Hall & Sons No. 4 Cutting-off Machines.

1—Wilmarth & Morman Wet Tool and Twist Drill Grinder.

1—Banfield Plug Milling Machine.

2—Otis-Fensom Bench Thread Millers.

1—Cincinnati Universal Milling Machine. No. 3 cone drive.

1—Surface Grinder.

1—Gardner Grinder, No. 4, complete with discs.

1—Gould Triplex Hydraulic Pump, Fig. 997, single acting, 1¼" x 6".

1—Holden-Morgan Marking Machine.

2—Northern Electric Co.'s Electric Soldering Irons.

1—1/15 H.P. General Electric Motor.

1—Brown-Boggs Nosing Press, No. 320.

1—Hisey Wolff Grinder, Portable Electric.

1—Dumore Grinder, Portable Electric.

8—Mech. Engr. Co. Fuel Oil Burners.

4—Mech. Engr. Co. Fuel Oil Burning Furnaces, 24" x 36".

1—Gilbert & Barker Fuel Oil Burning Furnace, 24" x 36", C-15.

6—Gilbert & Barker Fuel Oil Burners, 2".

2—Gilbert & Barker Positive Pressure Blowers, 3".

2—Canadian Buffalo Forge Co. Blowers, No. 6, 30".

1—Portable Blacksmith's Forge.

1—Circular Banding Press, suitable for 18-pdr. shells.

4—Shore Instrument Co.'s Scleroscopes.

3—Resin Pots, Simplex Electric Co.'s make.

3—Chapman Double Ball-bearing Trucks.

2—Oil Quenching Tanks, 8' long x 3' 4" wide x 2' 6" deep water jackets.

1—Bury Air Compressor, 6 x 8.

2—Brown Instrument Co.'s Pyrometers.

1—Thwing Pyrometer.

3—Fairbanks 25-lb. Scales.

1—International Time Clock for 200 men, with racks for tickets.

1—Voltmeter, Western Electric Instrument Co.'s make 0-300, model 156.

Private sale of small tools, rotary pumps, vises, pulleys, belting and shafting, etc., etc., to be held on Oct. 6th, at Midland, Ont.

For Further Information Apply to

Zenith Coal & Steel Products, Limited

MONTREAL—402 McGill Building
TORONTO—1410 Royal Bank Bldg.

c16m

Start to-day!

IF you haven't been using this section to sell your used equipment, to secure men, machinery or a job, start to-day!

Every week you will find listed here the wants of many of our readers.

This week one firm wants a lathe, a milling machine, a drill. Another wants a superintendent. Still another wants a draughtsman, while another wants a foreman blacksmith. Others offer for sale all manner of new and used machinery.

There's an opportunity for some one in every line. Read them all carefully.

If you don't see what you want, send in your copy for a small ad., outlining your needs. The rate is only two cents per word for first insertion, and one cent per word for subsequent insertions. Display rates and full particulars on application.

Canadian Machinery

Classified Advertising Section

143 University Avenue, Toronto, Ont.

SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

Shell Manufacturers

Get our Prices on Gauges, Boring Bars Rough Turn Drivers, Etc., for 6 in. SHELL.

GENERAL MACHINE WORK

Brass and Aluminum Castings

Prompt Delivery

THE
MONARCH BRASS MFG.
COMPANY, LIMITED
71 Browns Ave., - Toronto, Ont.

GEARS

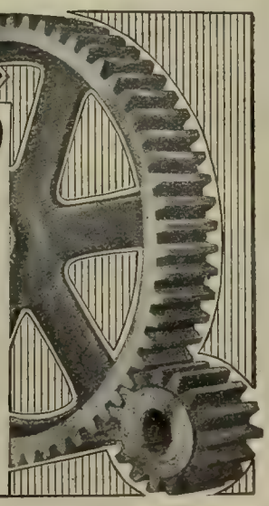
HAMILTON

GEAR & MACHINE CO.

Cor. Concord & Van Horne TORONTO

ACCURACY IN CUTTING makes SILENT POWER

CUT GEARS



Rawhide — Steel — Brass — Cast Iron

Try our W-G Rawhide Silent Gear. Designers and Builders of Special Machinery.

Winnipeg Gear & Engineering Co.
197-199 Princess St., Winnipeg, Man.

TORONTO TOOL CO. TORONTO TOOL CO.

SPECIAL TOOLS

Gauges Taps Jigs

AUTOMATIC MACHINERY FOR MUNITIONS

4.5 Mark VII Shell Milling Machines

TORONTO TOOL CO.
TORONTO, ONT.
516 Richmond St. West Phone A. 1181

The Right Heat

is the only heat to work with if you are going to turn out good work.

An ordinary mechanic can keep a Gilbert & Barker Furnace steady and even, insuring a uniform temperature.

G. & B. are built right—from the ground up. The built-up construction with heavy sheet metal is reinforced with heavy angle iron straps riveted and bolted. The counter-balanced door clears the opening to full height, admitting the heaviest charge. Fire brick chamber lining, door lining and floor tile are of best quality.

And in every G. & B. furnace you get the benefit of 52 years of experience and study with gaseous and liquid fuels. Our line includes more than one hundred types of furnaces.

At present we are making prompt delivery on many types. Stock list 24 describes them all.

Gilbert & Barker
Manufacturing Company
West Springfield Mass.

Canadian Agents:
WILLIAMS & WILSON, LIMITED
Montreal, Que.
JAMES DEVON,
227 Davenport Rd., Toronto, Ont.

GILBERT & BARKER MFG. CO. G&B SPRINGFIELD, MASS. U.S.A. EST. 1865

Type C-15
In Stock

Tycos
Temperature Instruments

Indicating Recording Controlling

Their construction, their never failing accuracy, is due to the careful application of our many years experience in producing *only* the most perfect instruments for the work they must perform. No detail is to small to receive complete consideration. Results obtained from the service they give under the most adverse conditions, continually guide us in the perfection of our product.

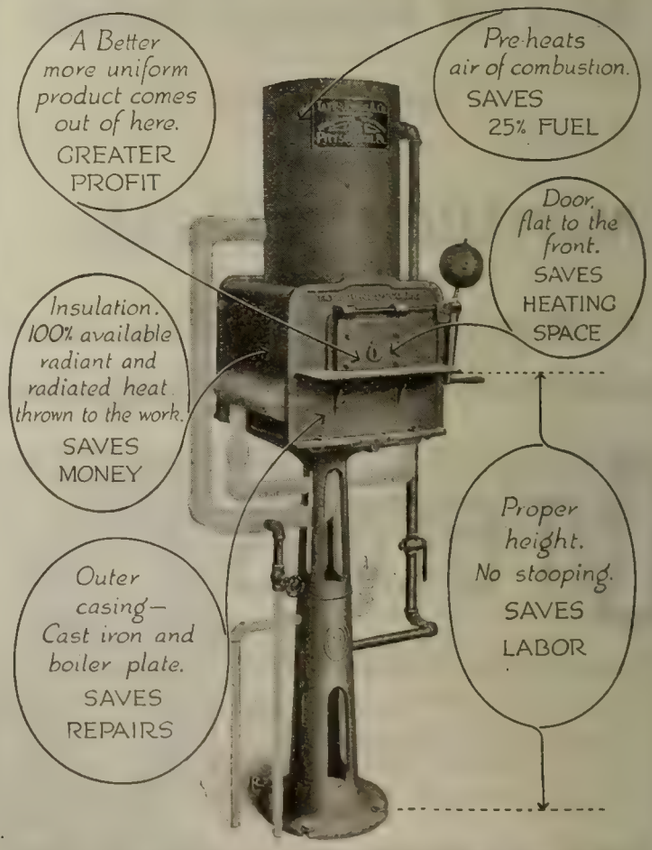
If you demand the word **Tycos** *on the instrument*

you install, nothing will be lacking in the service you receive. *The experience* of many users back us up in the claim.

We have carefully prepared information which will help you select the thermometer best suited to your needs. When you incur no obligation, why not request this *now?*

Taylor Instrument Companies
Rochester, N. Y.

NO. 123 **201 Royal Bank Building, Toronto, Ont.**



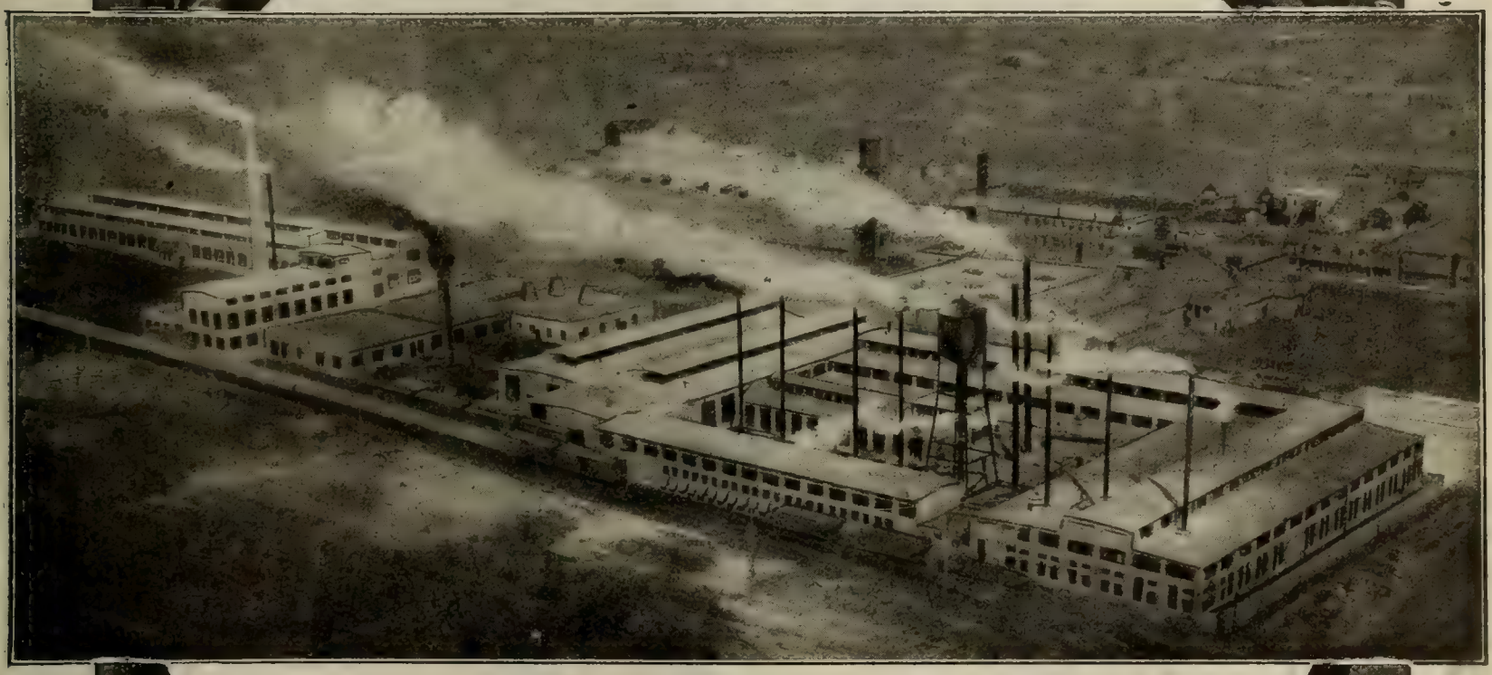
Six of the features that make this TATE-JONES RECUPERATIVE GAS OVEN FURNACE (Series A) a profitable one for the manufacturer. Write for full information to

Tate-Jones & Co., Inc., FURNACE ENGINEERS Pittsburgh, Pa.

BROWN'S

BEAVER BRAND METALS

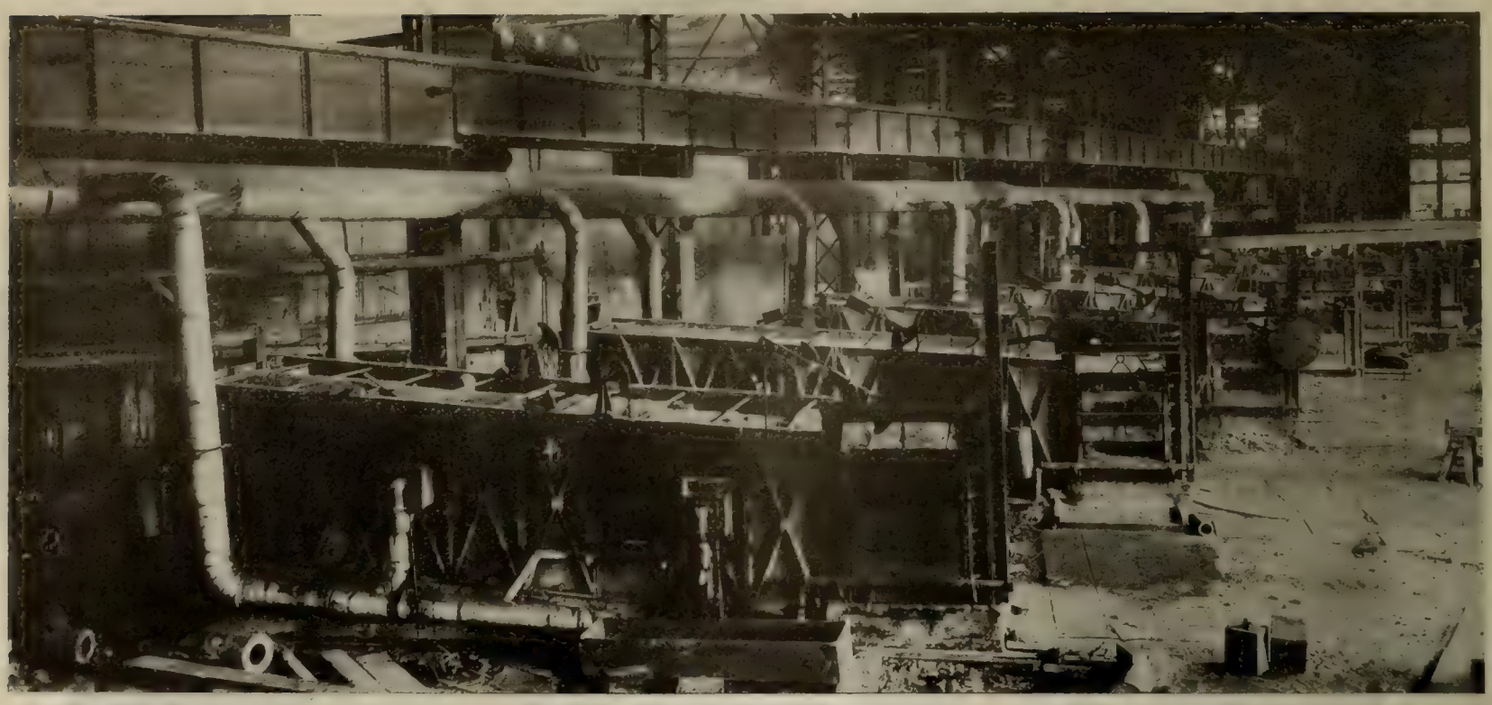
BRASS, BRONZE,
CANADA SILVER and GILDING METAL
In Sheets, Rolls, Plates and Rods



Brown's Copper & Brass Rolling Mills, Limited

General Offices and Works:
New Toronto, Ontario, Canada

COPPER & BRASS
BROWN'S
QUALITY
ROLLING MILLS



Battery of Continuous Billet Heating Furnaces

Installed in the Plant of Canadian Steel Foundries, Limited, Pointe St. Charles, Montreal.

There's a MECOL Furnace for every purpose, for every kind of fuel. They give the service that only a well-designed furnace can give. Tell us your requirements—we'll gladly send particulars.

Mechanical Engineering Company, Ltd., Three Rivers, Que.

DOUBLE SAVINGS

in cutting on PEERLESS HIGH SPEEDMETAL SAWS; they save both Time and Material.

Supposing you save only 1/16 on each cut, 200 lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

Have you ever stopped to consider the waste of material in wide cuts, especially at the present high cost, will pay for a PEERLESS in a remarkably short time.

This is only one of the reasons for so many repeated orders and large concerns having standardized the PEERLESS. The many other reasons can only be fully appreciated after comparative test.

Write for a list of users; some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

SHEET METAL STAMPINGS

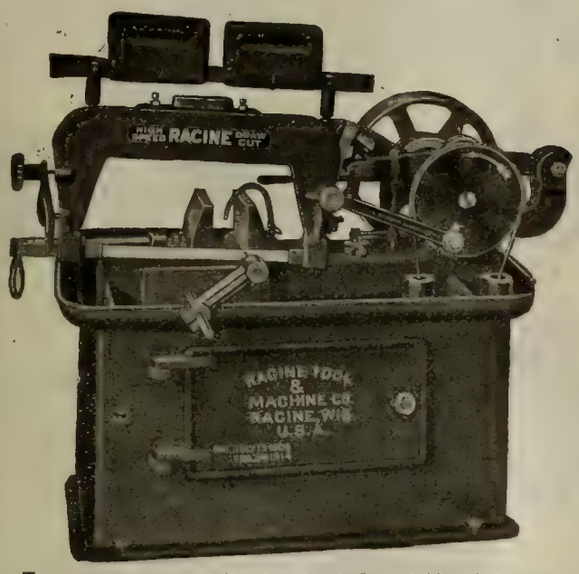
The quality of our production is one grade — THE BEST. Our facilities and equipment enable us to give a very attractive price and prompt service.

Dominion Forge and Stamping Co., Limited

WALKERVILLE, ONTARIO

DROP FORGINGS

NO DRAGGING BACK ON THE NON-CUTTING STROKE



To protect users of Racine High-Speed Metal-Cutting Machines, we carry a large stock of the famous Racine H.S. Tungsten Blades.

A patented device of this Racine High Speed Metal Cutting Machine automatically lifts the blade clear of the work on every return stroke.

In this feature alone the Racine increases both output and endurance of the blade 500 per cent.

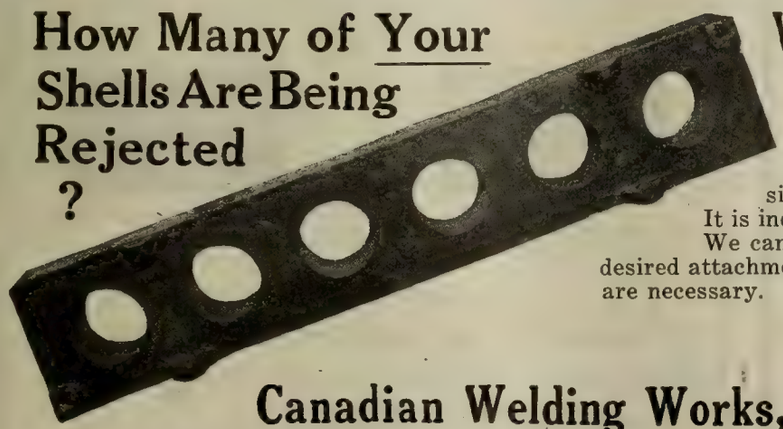
Therefore time saved—blades saved—would soon return to your pocket the reasonable cost of a Racine.

This fact—because it is a fact—could be proved to your satisfaction if you'd let us send you names of Canadian plants using Racines—one Montreal plant is using 168—or if you'd let us ship a Racine on trial terms that you consider fair.

Write us to-day.

RACINE TOOL & MACHINE CO., 15 Melbourne Ave., Racine, Wis., U.S.A.

How Many of Your Shells Are Being Rejected ?



Water Jacket for Nosing Furnace

This STEEL jacket holds a large amount of water, which keeps the body of shell cold, and permits of proper heating of the nose for nosing operations. Being made of steel, it stands contraction and expansion—not possible with cast iron.

It is indestructible and fool-proof. Made for all sizes of shells. We can make this jacket to any special dimensions, with any desired attachments. No patterns are required—specifications all that are necessary.

Tested and Guaranteed.

IMMEDIATE DELIVERY.

Canadian Welding Works, Ltd., 51 Montfort Street **Montreal, P. Q.**

The Oven Equipment & Manufacturing Company

NEW HAVEN, CONN.

"CRAWFORD SECTIONAL" OVENS

Heated with our Enclosed Flame Gas Burners, or Electricity

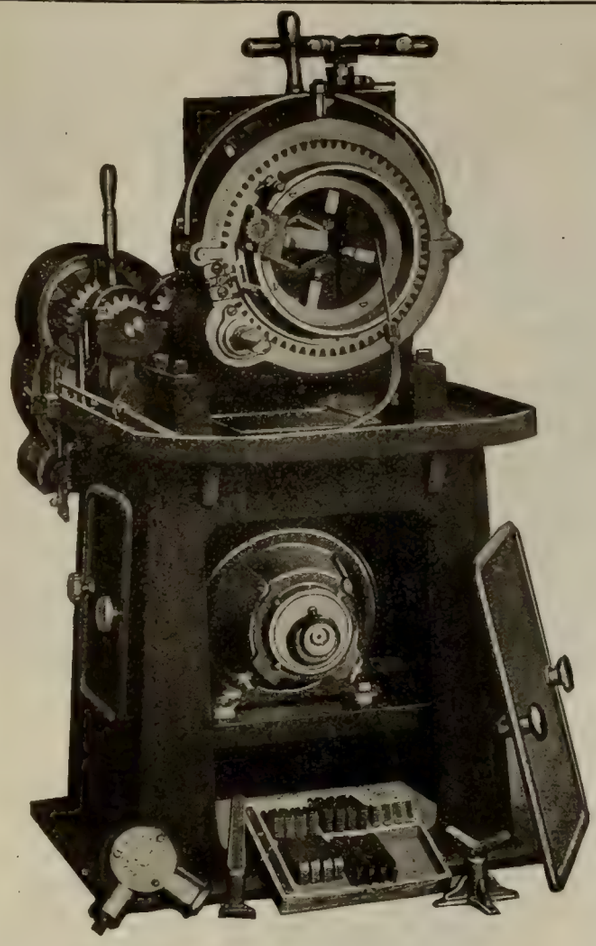
FOR BAKING JAPANS AND OTHER FINISHES ON METAL.

Ovens carried in stock and built to meet requirements of manufacturers.

Builders of All-Steel Oven Trucks with Roller Bearings.

Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.

ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

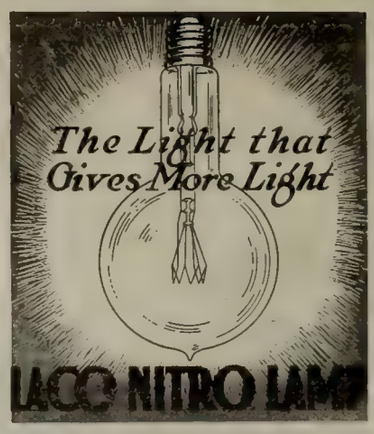


"Forbes Facts"

1. One man can do the work of six against the old stock and die method of cutting.
2. It is the only machine on the market with receding gear.
3. It is self-contained and motor-driven.
4. It is portable.

These are convincing arguments for the construction and utility of this machine. Thread cutting can be performed fast, clean and true. Equipped with self-centering vise.

The Curtis & Curtis Co.
115 Garden St. Bridgeport, Conn.



AS THE SUN GOES DOWN

THE CHANCES OF ACCIDENT, ERROR AND INACCURACY INCREASE.

The shorter daylight hours of the fall and winter add to this period of hazard.

Keep your factory and shop bright, cheerful and agreeable by using—

LACO NITRO LAMP "THE LIGHT THAT GIVES MORE LIGHT"

It gives the equivalent of twenty-four hours of soft, bright sunlight, thus maintaining labor efficiency, reducing accident, error and spoilage hazard, and helps to prevent decreased production at nightfall.

Laco Nitro Lamps will surprise you in many ways. Less current used. Greater and better light for given power than any other type lamp. Longer utility and the nearest approach to real sunlight. **Inquire from your nearest dealer.**

CANADIAN LACO-PHILIPS CO., Limited
Stocks available at Montreal, Toronto, Winnipeg, Vancouver

IF self-interest be the mainspring of a man's actions, then you should act at once, because the "Clipper" Belt Lacer saves money for you.

Each time a belt breaks from 1 to 150 men and machines are idle.

"Clipper" lacings have been made in 45 seconds. The maximum time required is only three minutes. How long are **your** men and machines idle when a belt breaks?

Clipper Belt Lacer Company
976 Front Avenue Grand Rapids, Mich.

CHAPMAN

DOUBLE BALL BEARINGS

Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.

BRASS Castings

The coupling of expert work with unexcelled equipment enables us to produce on a large scale Brass Castings of any size or alloy.

Our prices, too, are most reasonable; for our large purchases direct from the smelters command their every price favor.

For better Brass Castings at a money saving, send your orders to us. We promise that our work will please you.

The St. Lawrence Welding Company, Ltd., Montreal, P.Q.

Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, Etc. Electric Welders, Oxy-Acetylene Welders. Boiler Repairs. Lead Burning and Brass Foundry Work.

Office: 138 Inspector Street Works: 59 Olier Street Telephone: Office, Main 5779, Manager's Res., Westmount 3483

Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

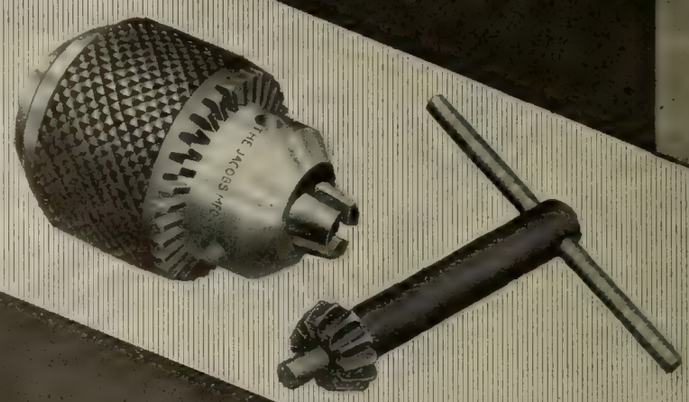
Send to our nearest factory for a trial box.

Manufactured and guaranteed by

The Canada Metal Company, Limited

Hamilton Montreal TORONTO Winnipeg Vancouver

Jacobs
IMPROVED
Drill Chuck

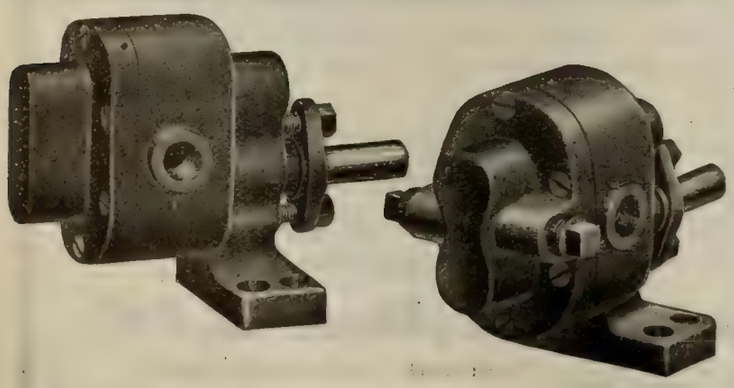


A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.

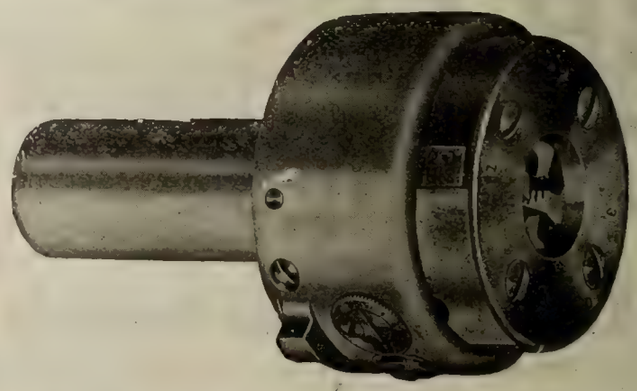


Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.



This Point Is Valuable

The chasers are set and held in place by a cam. That cam once adjusted, locks; there is no stopping or changing in size. This H. & G. Automatic Self-Opening Die Head has a quick release that not only issues the cutting of the thread to a given point every time, but permits cutting right up to a shoulder when required. Our booklet will tell you more. Write for it.

Eastern Machine Screw Corp.
New Haven, Conn., U.S.A.

Little Journeys of the "Flint Shot Man"

CHAPTER XX

Sand Blasting Hardened, Forged Steel Camshafts for Automobiles and Airships Is an Interesting Operation

A big "Rotary" sign on the wall of Mr. F. C. Whitney, the Secretary and General Manager of the Michigan Motor Specialties Company, at Muskegon, welcomed the Flint Shot Man, himself a Rotarian.

And the whole beautiful plant seemed vibrant with the sort of snap that marks the true Rotarian.

They make nothing but camshafts and only high-class ones at that, their best customers being high-grade automobile manufacturers and motor builders, especially those building motors for aeroplanes.

These companies deliver to them the rough forgings, which are carbonized and case hardened—the surface being so hard that no file will touch it.

Then comes the sand blasting, to replace the old costly and unsatisfactory method of pickling.

A special Mott equipment, designed for the purpose, with the assistance of Mr. F. L. Flanders, the general superintendent, delivers a blast of Flint Shot at 45 lbs. pressure.

Said Mr. Flanders: "It is vital that every particle of scale be removed from every smallest area of these shafts, for scale is a form of carborundum, the most cutting of all abrasives, and the slightest particle becoming loose in the crank case plays havoc with the bearing surfaces. The U. S. Government inspectors of Motor Truck and Aeroplane Shafts are extremely particular, and after trying all kinds of abrasives, your Flint Shot is the only one that wholly satisfies them."

This company hardens, sand blasts and machines 500 camshafts a day in its big, busy plant.

If you, dear reader, are permitted to supply Uncle Sam with any castings, forgings or other things metallic requiring exceptional cleanness of finish, remember the experience of this "Rotary" shop in Muskegon.

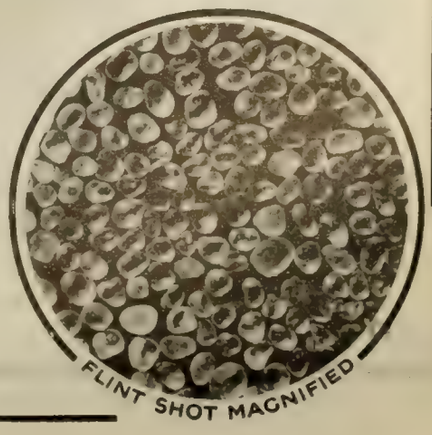
Ask for our Book of "Little Journeys" and let us send you an envelope sample of FLINT SHOT.

FLINT SHOT
TRADE MARK-REGISTERED

United States Silica Company

Sole Producers of Flint Shot

430 Peoples Gas Bldg. Chicago

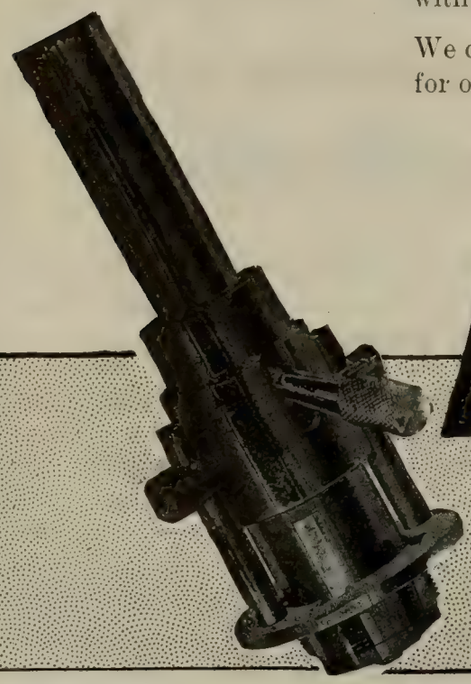


We will give you an estimate from your blueprints.

ONE minute to tap a 4.5 mark VII shell. Five minutes to tap a 9.2 shell. Compare this speed with your rate. 800 to 1,000 9.2 shells tapped with one set of chasers, so along with speed you can add endurance. Uniformity is another feature. When a chaser wears down it can easily be adjusted to compensate for wear. A solid tap loses its accuracy with first grinding. Adjustments are convenient and quick-acting.

We can give you excellent service. We also maintain a special chaser service for our clients. Get in touch with us immediately.

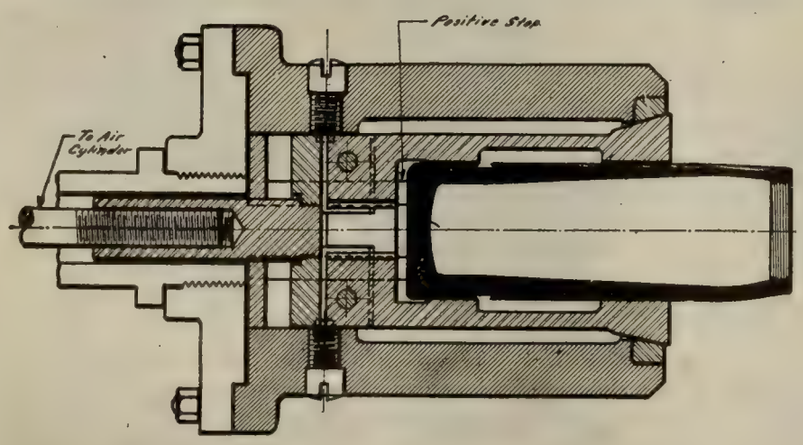
The Coats Machine Tool Co., Ltd., Caxton House,
Westminster, London, S.W., England.
Fenwick Freres & Co., 16 Rue Fenelon, Paris, France.



Murchey

Machine & Tool Co.

75 Porter Street, Detroit, Mich.



Consider Just This One Feature of M.E.C. Air-operated Hinged Collets

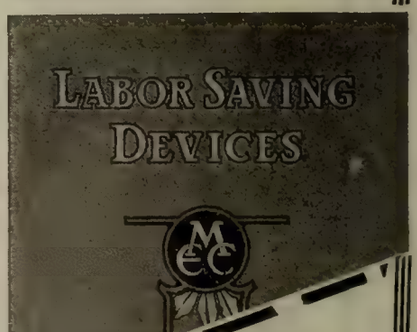
They save from 50 per cent. to 90 per cent. of the time usually required to do the same work by an ordinary chuck. While they possess many other points of superiority, the above feature alone is one that should appeal to users of chucks.

May we send full particulars? Just fill in coupon.

Manufacturers Equipment Co.

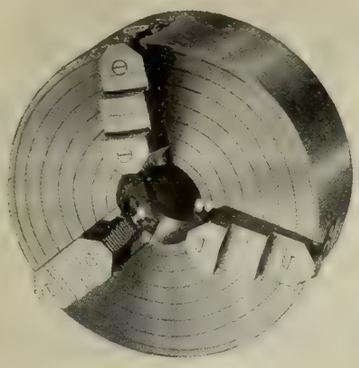
175-179 N. JEFFERSON ST. CHICAGO, U. S. A.

Canadian Agents:
J. R. Stone Tool and Supply Co., Goebel Bldg., Detroit, Mich.



Gentlemen:
Please send me copy of your catalog entitled "Labor Saving Devices," according to your advertisement in Canadian Machinery.

Name .....
Address .....
Position .....
With .....



Air Operated Three-Jaw Universal Chuck

Hannifin Air Chucks

Air Operated Two-Jaw Universal Chuck

Increase Your Output 20 to 100 Per Cent.

This is a big claim, but it's nevertheless within the range of possibility in your plant. Other plants have increased their production 20 to 100 per cent.—you can do likewise. At the Worthington Pump and Machinery Corporation's Hazelton, Pa., plant, Hannifin Air Chucks are in sole possession of the field. They won this distinction through superior merit.

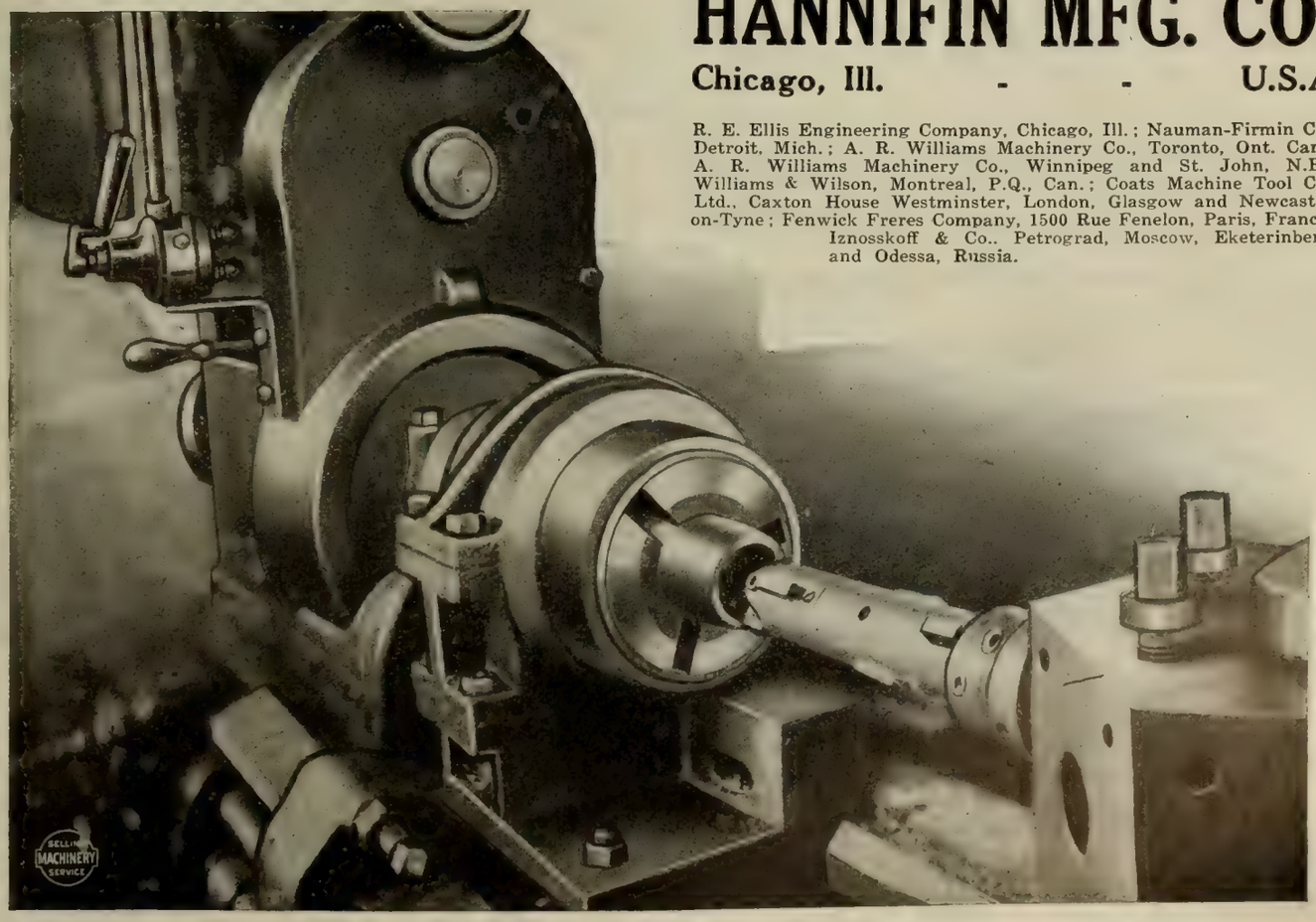
Cut below shows a 3" Russian shell *Hannifin chucked* for inside operation.

For quick handling and rigid slip grip work the "Hannifin" is the chuck for the job. Works on and under 75 pounds pressure.

HANNIFIN MFG. CO.

Chicago, Ill. - - U.S.A

R. E. Ellis Engineering Company, Chicago, Ill.; Nauman-Firmin Co., Detroit, Mich.; A. R. Williams Machinery Co., Toronto, Ont. Can.; A. R. Williams Machinery Co., Winnipeg and St. John, N.B.; Williams & Wilson, Montreal, P.Q., Can.; Coats Machine Tool Co., Ltd., Caxton House Westminster, London, Glasgow and Newcastle-on-Tyne; Fenwick Freres Company, 1500 Rue Fenelon, Paris, France; Iznosskoff & Co., Petrograd, Moscow, Eketerinberg, and Odessa, Russia.



OVER 50,000 COPIES PER MONTH

Canadians

should be thankful that our Country has a Canadian Magazine fit to take its place in the company of the big American magazines — a magazine equalling in interest and literary merit the big magazines produced in a Country of 100,000,000, where it is possible to obtain $1,000 to $5,000 a page per issue or more for advertising space.

THE making of MACLEAN'S MAGAZINE month by month, year after year, has been hard labor. One difficulty was to get the right sort of matter—Canadian in origin and theme. A few years ago our country possessed few writers and artists of trained and high ability. To-day, thanks very largely to MACLEAN'S MAGAZINE, we have men and women writers and artists producing first-class work; they developed when they found a medium demanding a grade of work equalling the best contributors to American magazines. Also, the Canadian writers and artists who were finding a market for their wares in the United States turned to MACLEAN'S when this magazine showed itself to be a sufficient and creditable vehicle for their work.

The future has a good crop of A1 Canadian writers and artists in store, whose work will appear in MACLEAN'S; but consider these names of Canadian men and women who have already "arrived," and whose work appears in MACLEAN'S MAGAZINE:—

Sir Gilbert Parker,	**E. Phillips Oppenheim,**
Arthur Stringer,	**Peter McArthur,**
Arthur E. McFarlane,	**L. B. Yates,**
Stephen Leacock,	**Geo. Eustace Pearson,**
Robert W. Service,	**W. A. Craick,**
Alan Sullivan,	**H. F. Gadsby,**
Agnes C. Laut,	**C. W. Jefferys,**
L. M. Montgomery,	**J. W. Beatty,**
"Janey Canuck,"	**Arthur William Brown,**
A. C. Allenson,	**Lou Skuce,**

These are some of the names of Canadian men and women—writers and artists—who are doing work of the highest class, acceptable to the hardest-to-get-into publications of the United States. Ten years ago such a Canadian galaxy had no existence.

BESIDES these professional writers and artists —men and women who depend on their pen and pencil and brush for their livelihood—is a big host of others who write only when successfully urged to do so—because they have something to say that is worth saying. These are usually men in a big way of business, or professional men at the top of the ladder, or men and women doing unusual work of a most important sort—often obscurely because they are not self-trumpeters of their achievements or labors. For example, such men and women as:—

THE LATE SIR MORTIMER CLARK
JOHN BAYNE MACLEAN
ERMAN J. RIDGWAY
LORD NORTHCLIFFE
JOSEPH MARTIN, M.P.
BILLY SUNDAY

All these have contributed under their own name or a nom de plume to MACLEAN'S MAGAZINE in the last 12 or 15 months, recognizing that this magazine can give their messages to the whole nation, and to a class of persons whom they wish to reach.

NOBODY who knows MACLEAN'S would ever call it a story magazine, but rather a national magazine—almost a news magazine. Stories there are in every issue—enough of them to satisfy the right and natural desire for romance, adventure, achievement, business, love and intrigue. But the greater part of the contents of every issue of MACLEAN'S MAGAZINE may be called **NEWS**—NEWS of men and their work and triumphs; news of the nation's work and workers; news of discoveries; news of movements; news of politics; news of the builders and building of Canada. MACLEAN'S, as Canada's National Magazine, prepared for thinking and intelligent men and women, must be an informative and interpretive magazine, must mirror national opinion, record national affairs and developments, and be the **VOICE** of prophets, statesmen and leaders. MACLEAN'S is a magazine of to-day—a newspaper of a sort, dealing with big news passed over by daily newspapers whose function is the recording of the day's news—passing news; and who leave the fuller statement —the summed-up presentation of things they can but touch on—to MACLEAN'S MAGAZINE.

A Magazine *of* Power

News features of MACLEAN'S MAGAZINE greatly liked by its 50,000 readers are

The Business Outlook—article.
The Investment Situation—article
The Review of Reviews Department.
The Nation's Business.
Women and their work.

These are regular department features appearing in every issue of MACLEAN'S. They are of the nature of surveys or digests, and perform a service welcomed and praised by all readers who aim to keep themselves broadly informed concerning what's doing in Canada and what's being thought and said and done the wide world over.

REVIEW of Reviews is the outstanding feature of MACLEAN'S, in that it gives the best articles, in condensed form, from the best magazines of the world. A staff of trained people read and study the contents of all magazines and select for each issue of MACLEAN'S twenty or more articles which mirror the world's progress and present the changing aspects of world opinion.

IN rounding out this presentation of Canada's National Magazine a brief reference may be made to one large and discriminating and important class of contributors to it—advertisers. Literally hundreds of them employ MACLEAN'S for their advertising, to reach the influential classes represented by MACLEAN'S list of subscribers, and because they get national publicity economically. These makers and producers of goods of national consumption appreciate the fact that a select circulation of 50,000 gives them, among the most important families of Canada, strong local publicity as well as broad national publicity, and that retail distributors are both canvassed and assisted by their national advertising in MACLEAN'S MAGAZINE. They recognize that $1,000—$3,000 invested in space in MACLEAN'S MAGAZINE to buy 365-day national influence is dirt cheap publicity.

THIS is but condensed presentation of MACLEAN'S MAGAZINE. Very much more can be said about its editorial policy and character, about its making, about its quest for and development of new contributors, about the policy that keeps canvassing methods and advertising columns clean, about the hearty approval of subscribers of MACLEAN'S MAGAZINE, about the significance of 50,000 circulation, about the wisdom of doing a "little advertising in a few magazines" as an initial step in national advertising plans; about the advertising of MACLEAN'S MAGAZINE in all the MacLean Publishing Company's list of business and technical newspapers, about the influence of MACLEAN'S MAGAZINE on distributors.

But time and space forbid here and now a continuation of the MACLEAN story.
What is enough to be impressed is—

MACLEAN'S MAGAZINE

Canada's National Magazine

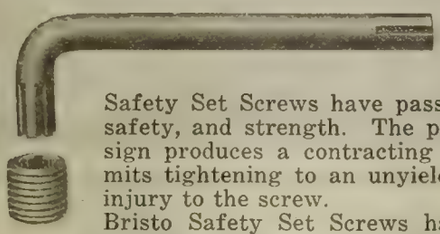
143 University Ave., Toronto

Union Trust Bldg., WINNIPEG Boston New York Chicago London, Eng. Southam Bldg., MONTREAL

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

HINTS TO BUYERS

BUILDERS OF MACHINERY WHAT SET SCREWS DO YOU USE?



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BRISTO
REG. U. S. PAT. OFF.

Safety Set Screws have passed every test for safety, and strength. The patented fluted design produces a contracting effect which permits tightening to an unyielding grip without injury to the screw.

Bristo Safety Set Screws have been adopted as the standard by many prominent machine builders. Ask for free samples and Bulletin I-809.

THE BRISTOL CO., Waterbury, Conn.
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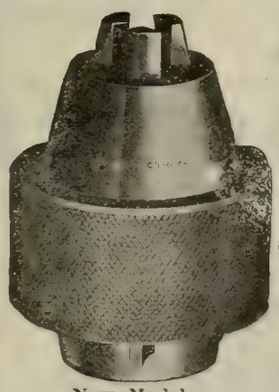
SKINNER DRILL CHUCKS



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THE LARGEST ASSORTMENT Made By Any Manufacturer

The "New Model" is especially adapted to rapid, sensitive drilling. It is accurate, light, strong and hand operated.

The price is surprisingly low. Illustrations of complete line on request.

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We guard your purchases and tell you if you are getting what you are supposed to get.

Once you have formed the habit of consulting us for expert advice you wonder how you got along without our service.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED

Head Office and Main Laboratories—MONTREAL

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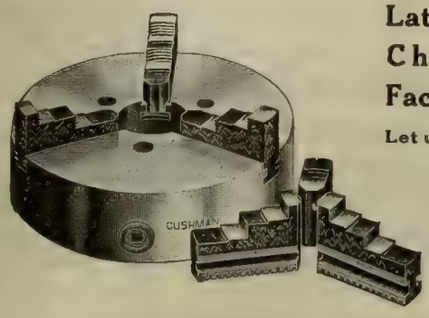
TORONTO, WINNIPEG, EDMONTON, VANCOUVER, NEW GLASGOW

STEEL CASTINGS

We are well equipped to make all kinds of steel castings, 100 lbs. to 50,000 lbs.

Dominion Steel Foundry Co.
Hamilton LIMITED Ontario

Cushman Chucks

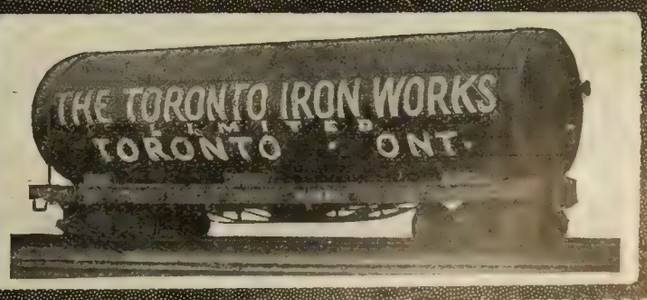


Lathe Chucks, Drill Chucks, Portable Face Plate Jaws.

Let us send you our catalog.

The Cushman Chuck Co.
Hartford, Conn., U.S.A.

RIVETED STEEL TANKS FOR EVERY PURPOSE



OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
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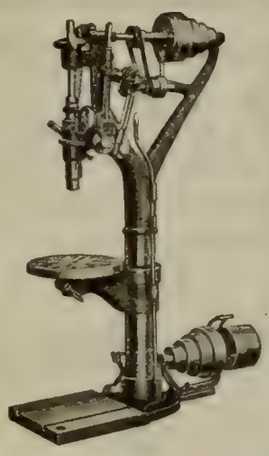

20" Swing Drills in four distinct styles. Plain lever feed, lever and wheel feed, power feed and automatic stop, and with back gearing. Made singly or in 2, 3 or 4 spindle gangs. Write us for complete information and Catalogue No. 62; also for particulars on our new 25" Drilling Machine.

The Silver Mfg. Company
Box 290 Salem, Ohio

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Zenith Coal & Steel Products Limited
COAL COKE HACK SAW BLADES
CARBON STEEL MACHINERY STEEL
HIGH SPEED STEEL
Royal Bank Bldg., Toronto; McGill Bldg., Montreal, Que.

Every Tooth Cuts on Every *Quality* Saw
They cut straighter.
They last longer.
NAPIER SAW WORKS, Inc., Springfield, Mass., U. S. A.

NORTON JACKS
FOR ALL KINDS OF HEAVY LIFTING
Send for complete catalogue showing 50 styles 10 to 100 tons capacity.
Made only by
A. O. NORTON, LIMITED
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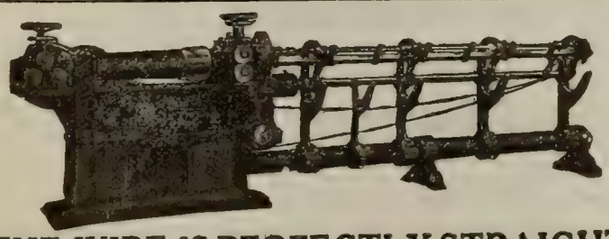
A universal grinder. A grinder with all attachments. A grinder that will handle all kinds of tool-sharpening as well as cylindrical, internal and surface grinding. An all-around machine for your tool-room.
Catalog No. 6.

Greenfield Machine Co.
Greenfield, Mass., U.S.A.

Adjustable and Rustproof
WILLSON SAFETY GOGGLES
Can be worn over other glasses

FOR MUNITION WORKERS Send for details.
T. A. Willson & Co., Inc. Canadian Office, 23 Scott St., Toronto



THE WIRE IS PERFECTLY STRAIGHT
and cut to accurate lengths when it comes from our AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE, whether it's ¾" diameter or only .020" wire, hard or soft wire, highly polished or rough stock.
May we send you catalogue C?

The F. B. SHUSTER COMPANY, New Haven, Conn.
Formerly John Adt & Son. Established 1866.
Also makers of Riveting Machines, Sprue Cutters, Cotter Pin Machines, etc.

Oxy-Acetylene Welding and Cutting Apparatus
OXY-ACETYLENE WELDING DAVIS APPARATUS DAVIS-BOURNONVILLE CO. N.Y.
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GEARS AND GEAR CUTTING SPROCKETS AND CHAINS
In stock and to order any size from one-quarter inch to six-foot in diameter, any material. Estimates and gear advice cheerfully furnished.
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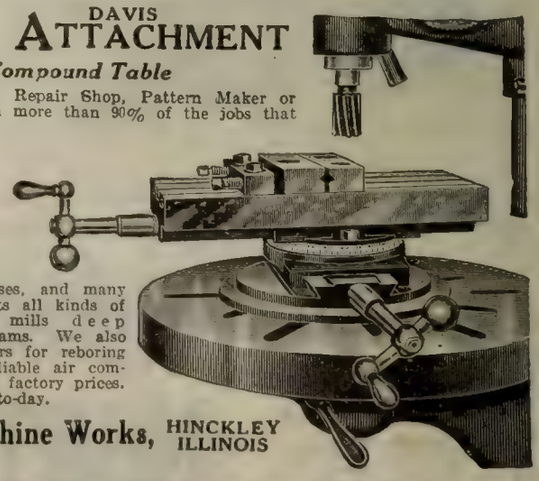
Beaudry Hammers
FOR GENERAL FORGING
Save Fuel, Time and Labor. Cut Forging Costs in two.
BELT OR MOTOR DRIVEN
BEAUDRY & COMPANY, Inc.
141 Milk Street, Boston, Mass.
Alfred Herbert, Ltd., Coventry, England, London, Paris, Calcutta, Yokohama.

THE DAVIS MILLING ATTACHMENT
and Compound Table
For the Die Maker, Repair Shop, Pattern Maker or Garage; will perform more than 90% of the jobs that come up.



For any Drill Press 14" to 42" swing. Big Economy — Big Convenience— Small Price. It relieves your large millers, comes in handy spotting castings, milling ends of bosses, and many other odd jobs. Cuts all kinds of keyseats perfectly; mills deep grooves, slots and cams. We also make cylinder reamers for reboring Ford car, and a reliable air compressor—all at special factory prices. Write for circulars to-day.

Hinckley Machine Works, HINCKLEY ILLINOIS

"End View"

For Truing Grinding Wheels

Francis Diamond Hand and Grinder Tools always give entire satisfaction. The diamonds in these tools are of the hardest and best quality and set very securely. Length of Hand Tool shown here 11½ in. over all. Rosewood handle. Let us send you an assortment for selection.

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Hartford - - Conn.

"THISTLE" BRAND RUBBER BELTING

"Maintenance of Quality"

is our motto, and our experience in the manufacture of belting since the year 1856 should be invaluable to you. Let us tell you all about this friction faced belting. The price will appeal to you.

Write to-day.

J. C. McLAREN BELTING CO., LTD.

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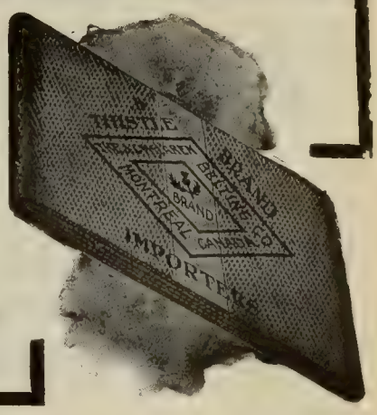

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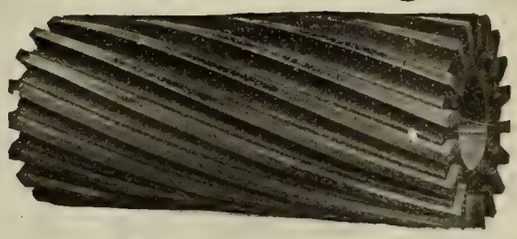
Taylor-Newbold Milling Cutters



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Johansson Standard and Shop Gages
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Gardner Disc Grinders are made in all sizes, types and combinations. We can successfully meet any disc grinding problem in existence. Largest builders of Disc Granding machinery in the world.

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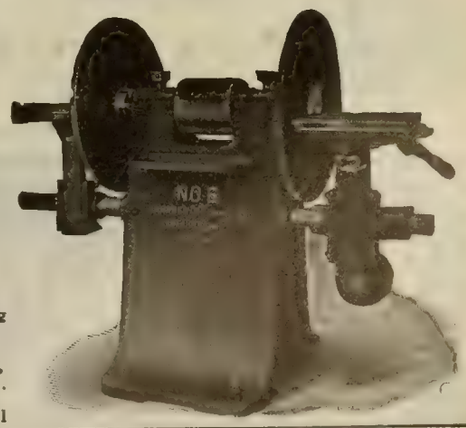

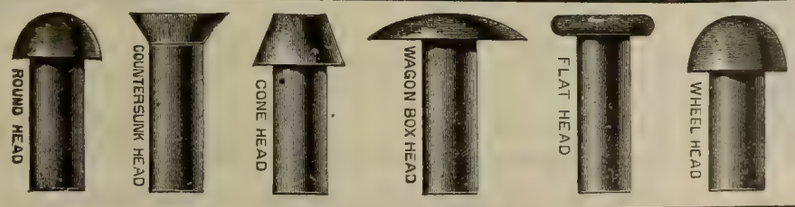

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PARMENTER & BULLOCH CO., LTD.
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"FROST KING"—*the Mechanic's Friend*

The most exacting mechanics find in "Frost King" their ideal of babbitts.
Used in Canada's largest and most efficient plants because of its splendid performance under heavy duty.
Frost King is an all-round babbitt and has wide use for all classes of stationary engines, traction rolling mills, planing mills, saw mills, pulp machinery, etc.
Use it for your most exacting requirements.

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EASTERN AVE. and LEWIS ST., TORONTO, CANADA
New York, N.Y. London, Eng. St. Louis, Mo.

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HEAVY DUTY LATHES

Engine Lathes from 26" to 60" swing; Plain Turning Lathes, 20" and 30" swing; Axle and Journal Turning Lathes and Bevel Gear Turning Lathes. Write for Catalogue.

BRIDGEFORD MACHINE TOOL WORKS
161 Winton Road Rochester, N.Y.

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WITH
WILMARTH & MORMAN GRINDERS
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WILMARTH & MORMAN COMPANY, 1200 Monroe Avenue, N. W.
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Manufacturers of Drill Grinders, Surface Grinders, Universal Grinders

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ALL WOOD—COMBINATION—IRON—STEEL
Every pulley fully guaranteed.
Write for interesting printed matter.
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WAYNESBORO, PENNA.
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Exclusive Canadian Agents:
Williams & Wilson, MONTREAL, CAN.
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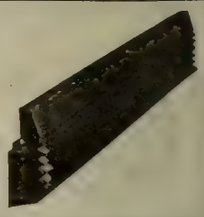

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You want Tool Holders that have made good
ARMSTRONG TOOL HOLDERS
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AIR WASHERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
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Canada Metal Co., Toronto
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Baird Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
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Aikenhead Hardware Co., Toronto, Ont.
Baxter & Co., Ltd., J. R., Montreal, Que.
Canadian Fairbanks-Morse Co., Montreal
Canada Metal Co., Ltd., Toronto
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Foss & Hill Machy. Co., Montreal.
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Canadian Fairbanks-Morse Co., Montreal
Can. S K F Co., Toronto, Ont.
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Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland

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Baxter & Co., Ltd., J. R., Montreal, Que.

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Aikenhead Hardware Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal
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Baxter Co., Ltd., J. R., Montreal, Que.
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BELTING, CHAIN
Canadian Fairbanks-Morse Co., Montreal
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Goodyear Tire & Rubber Co., Toronto, Ont.
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Petrie, Ltd., H. W., Toronto, Ont.
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Baxter & Co., Ltd., J. R., Montreal, Que.
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Dominion Belting Co., Hamilton, Ont.
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New Britain Mach. Co., New Britain, Conn.

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John Bertram & Sons Co., Dundas
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Steel Bending Brake Works, Chatham, Ont.
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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
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BLASTING MACHINES, SHOT AND STEEL GRIT
Gray Mfg. & Mach. Co., Toronto, Ont.
U. S. Silica Co., Chicago, Ill.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Sturtevant Co., B. F., Galt, Ont.

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Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

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Mullinger-Enlund Tool Co., Syracuse, N.Y.

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Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York, N.Y.

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MacKinnon, Holmes Co., Sherbrooke
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Riverside Machinery Depot, Detroit, Mich.

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Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

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Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
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BOLT THREADING MACHINERY
Landis Machine Co., Waynesboro, Pa.
Victor Tool Co., Waynesboro, Pa.

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Cleveland Pneumatic Tool Co. of Canada, Toronto
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Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Stow Mfg. Co., Binghampton, N.Y.

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John Bertram & Sons Co., Dundas
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Niles-Bement-Pond Co., New York
Roelofson Machine & Tool Co., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Stow Mfg. Co., Binghampton, N.Y.

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Cumming & Son, J. W., New Glasgow, Canada

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John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal
Niles-Bement-Pond Co., New York
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Cleveland Wire Spring Co., Cleveland
New Britain Mach. Co., New Britain, Conn.

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Brown, Boggs & Co., Hamilton, Can.

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Brown's Copper & Brass Rolling Mills, New Toronto

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St. Lawrence Welding Co., Montreal, Que.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto, Ont.
Warner & Swasey Co., Cleveland
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machy. Co., Toronto

BRIDGES, RAILWAY AND HIGHWAY
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke

BRONZE RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto

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Puro Sanitary Dk'g Fountain Co., Haverhill, Mass.

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Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.

BUCKETS, CLAM SHELL, CRAB, DUMP
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

BULLDOZERS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.

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Bellevue Industrial Furnace Co., Detroit, Mich.
Gray Mfg. & Mach. Co., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.

BURRING REAMERS
Wells Bros. Co. of Canada, Galt, Ont.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque.

CANNERS' MACHINERY
Bliss, E. W., Co., Brooklyn, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
Brown, Boggs & Co., Hamilton, Can.
Prest-O-Lite Co., Inc., Toronto, Ont.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Can.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CAR MOVERS
Dillon Mfg. Co., Oshawa, Ont.

CARTRIDGE MAKING MACHINERY
Blackall, Fred. S., Woolworth Tower, New York.
Bliss Co., E. W., Brooklyn, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER
Cumming & Son, J. W., New Glasgow, Canada.
Alexander Fleck, Ltd., Ottawa.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton.

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Bernard Industrial Co., The A., Fortierville, Que.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Steel Foundries, Ltd., Montreal, Que.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Can. Steel Foundries, Ltd., Montreal, Que.
Dominion Steel Foundry Co., Ltd., Hamilton, Ont
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
Can. Steel Foundries, Ltd., Montreal, Que.
Cumming & Son, J. W., New Glasgow, Canada.

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.

CEMENT MACHINERY
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.
Petrie, Ltd., H. W., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Wright Mfg. Co., Lisbon, Ohio.

CHEMISTS
Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

CHESTS, TOOL
Union Tool Chest Works, Rochester, N.Y.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
John Bertram & Sons Co., Dundas, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
D. E. Whiton Machine Co., New London, Conn.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, MAGNETIC
H. E. Streeter, 523 New Birks Bldg., Montreal.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

CHUCKING MACHINES
Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

CLOCKS, WATCHMAN, PORTABLE
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Que.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.

COAL HANDLING MACHINERY
MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

COILING MACHINERY, WIRE AND SPRING
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

COLLARS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

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Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, STEEL SLIDE-BLOW
Whiting Foundry Equipment Co., Harvey, Ill.

COPING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

COUNTERSHAFTS
Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.

COUPLINGS, PLAIN AND FLEXIBLE
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES, LOCOMOTIVE
Northern Crane Works, Walkerille.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.

CUTTER GRINDERS AND ATTACHMENTS
Cincinnati Milling Machine Co., Cincinnati.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining & Mfg. Co., Toronto.
Elm Cutting Oil Co., Toronto.
Racine Tool & Machine Co., Racine, Wis.

CUTTING-OFF MACHINES
Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machinery Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Mchy. & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

CYLINDERS, AIR
Manufacturers Equipment Co., Chicago, Ill.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.

DAMPER REGULATORS
Canadian Fairbanks-Morse Co., Ltd., Montreal.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

DIAMONDS, BLACK AND ROUGH
Geo. A. Joyce Co., Ltd., New York.

DIAMOND TOOLS
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Banfield, W. H., & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
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Standard Machy. & Supplies, Ltd., Montreal.
Wells Brothers of Canada, Galt, Ont.

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DIES, NOSING
Marsh & Henthorn, Ltd., Belleville, Ont.

DIES, PIPE THREADING
Landis Machine Co., Waynesboro, Pa.

DIE SINKERS
Becker Milling Machine Co., Boston, Mass.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

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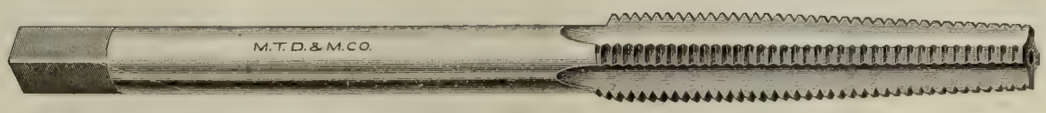
Aikenhead Hardware Co., Toronto, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

UNIFORMITY



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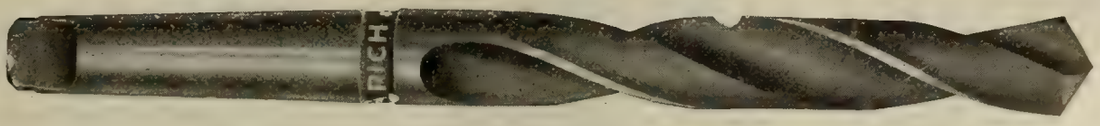

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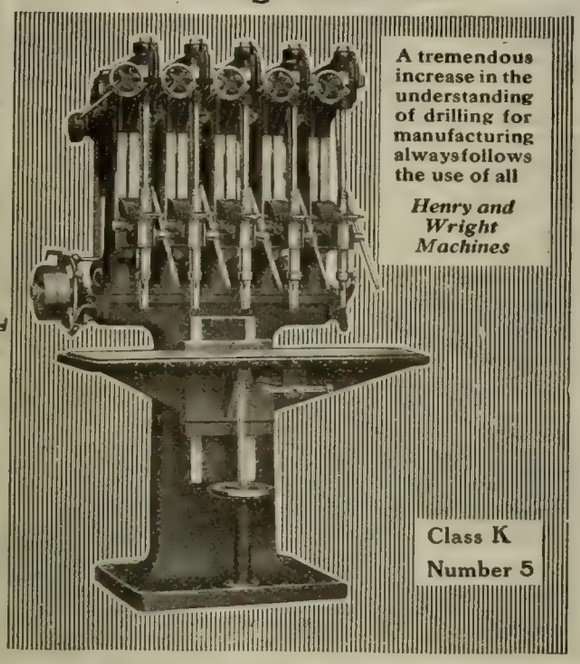

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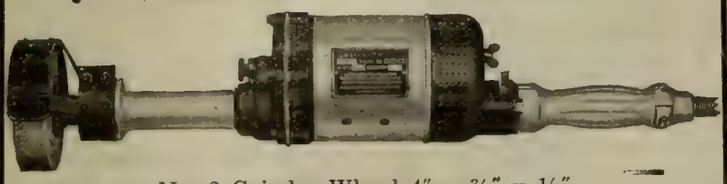

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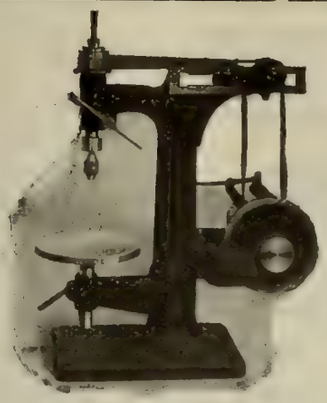

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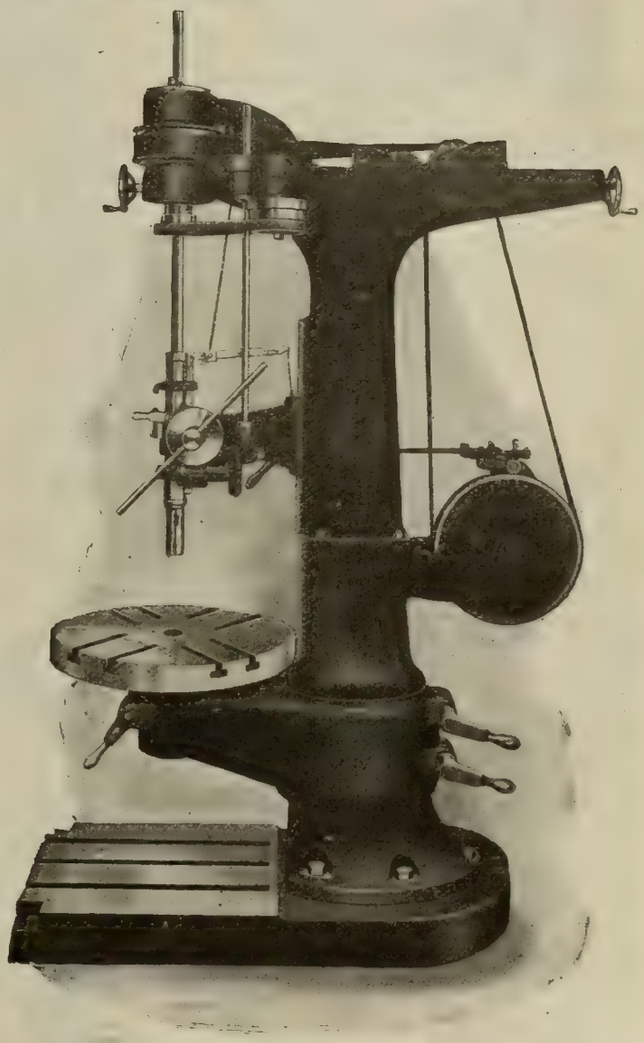

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GLOVES, STEEL GRIP, SAND BLAST
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Wilmarth & Morman, Grand Rapids, Mich.

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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.

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Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Modern Tool Co., Erie, Pa.
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New Britain Machine Co., New Britain, Conn.
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United States Electrical Tool Co., Cincinnati, O.

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Wilmarth & Morman, Grand Rapids, Mich.

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Gardner Machine Co., Beloit, Wis.

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United States Electrical Tool Co., Cincinnati, O.
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Foss & Hill Machy. Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
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Foss & Hill Machy. Co., Montreal.
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Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
United States Electrical Tool Co., Cincinnati, O.
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Greenfield Machine Co., Greenfield, Mass.
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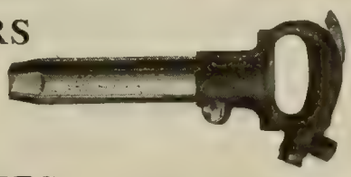

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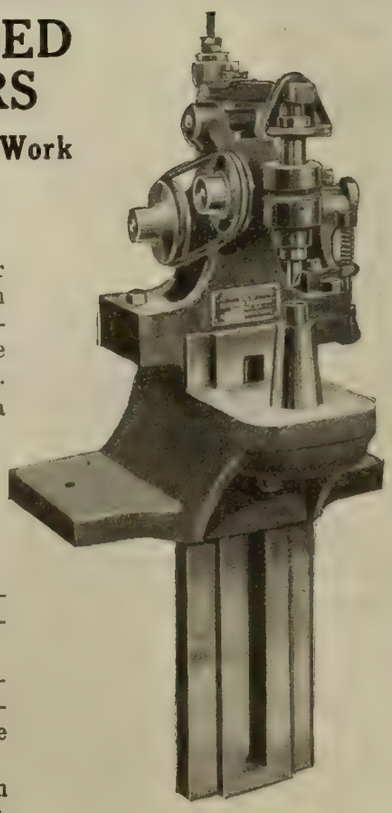

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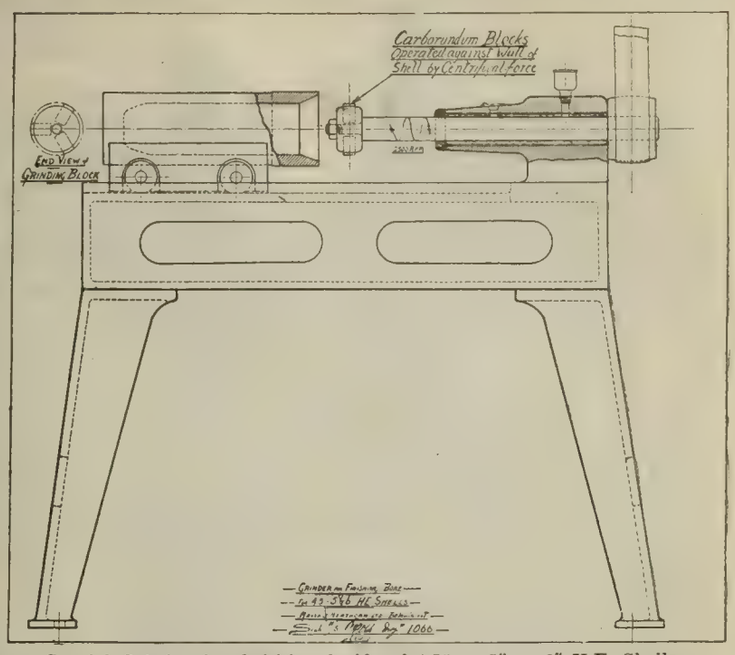

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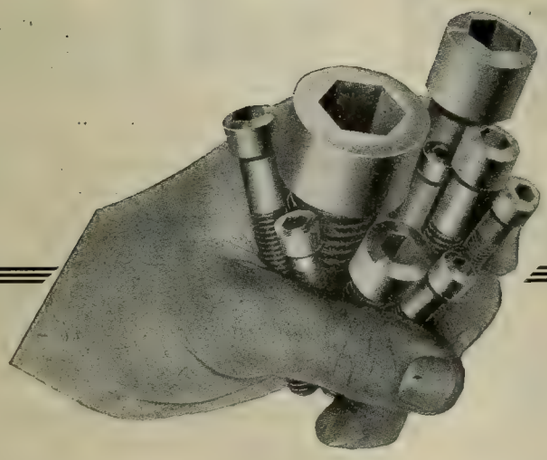

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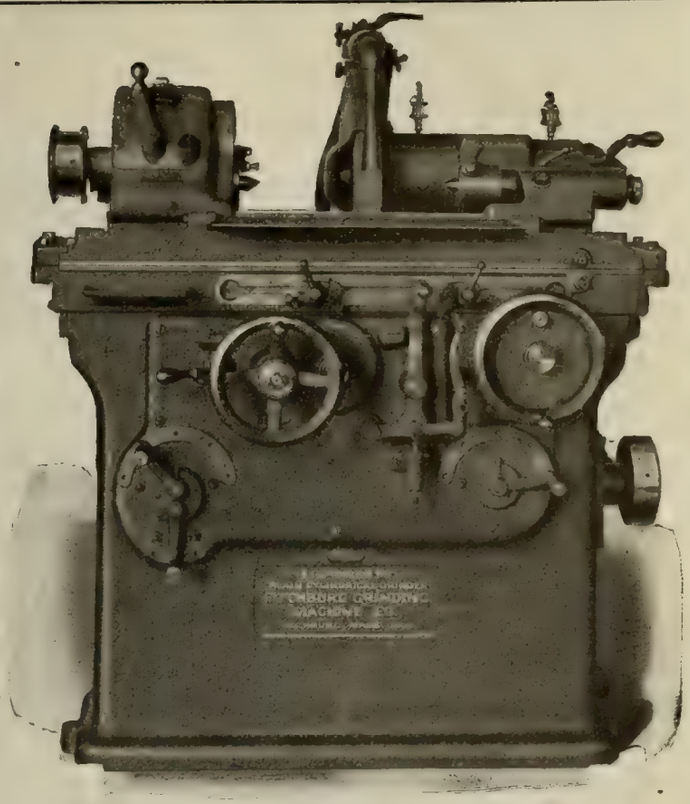

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Canada Machinery Corp., Galt, Ont.
Gardner, Robt., & Son, Montreal
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.
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Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

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Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, BAND AND COPING
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Shore Instrument & Mfg. Co., New York City
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New Britain Machine Co., New Britain, Conn.
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Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
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Riverside Machinery Depot, Detroit, Mich.
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A. B. Jardine & Co., Hespeler, Ont.
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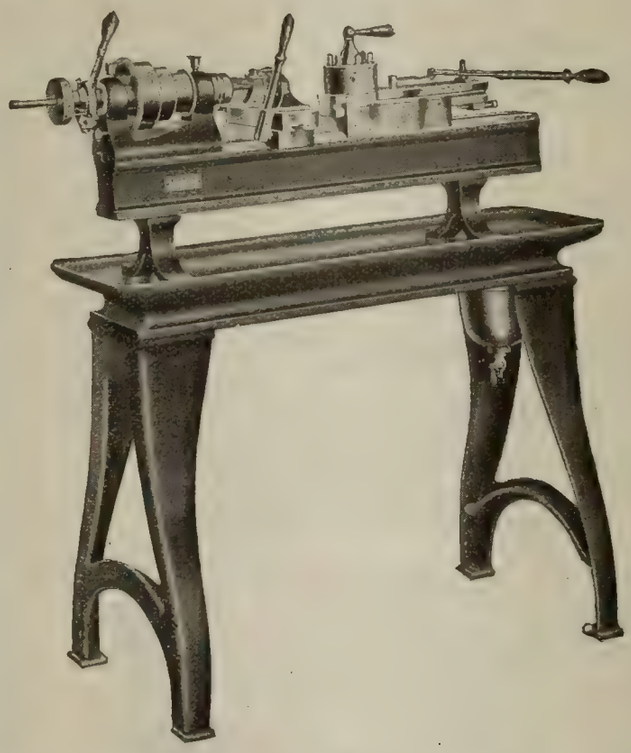

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A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XVIII. TORONTO, OCTOBER 11, 1917 No. 15

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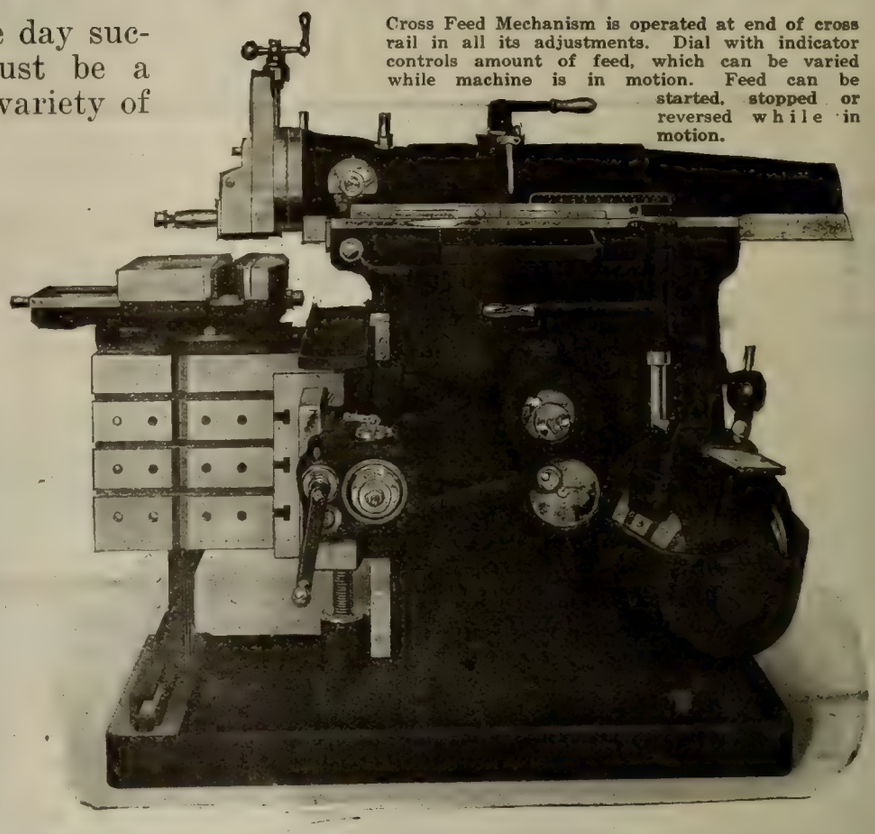

Cross Feed Mechanism is operated at end of cross rail in all its adjustments. Dial with indicator controls amount of feed, which can be varied while machine is in motion. Feed can be started, stopped or reversed while in motion.

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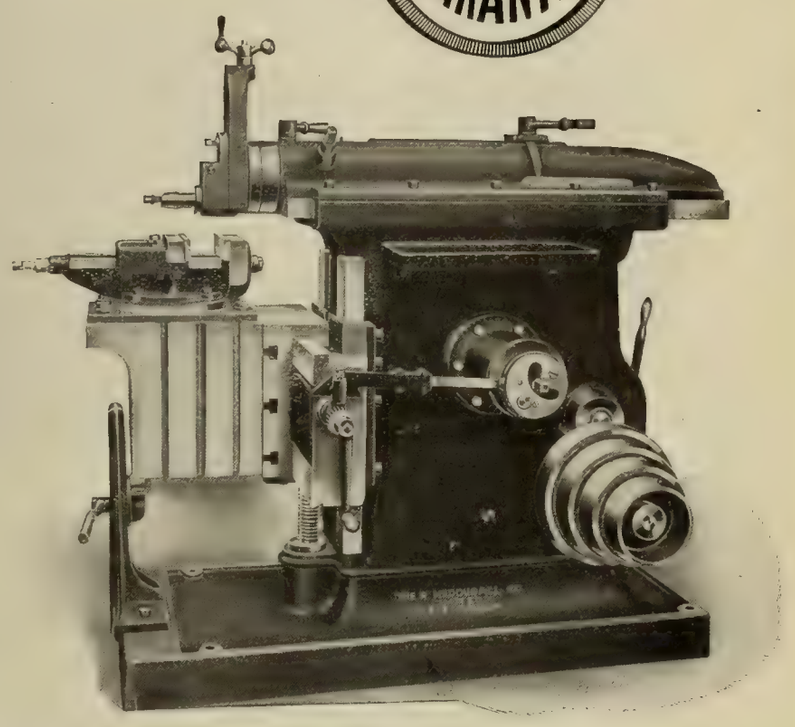

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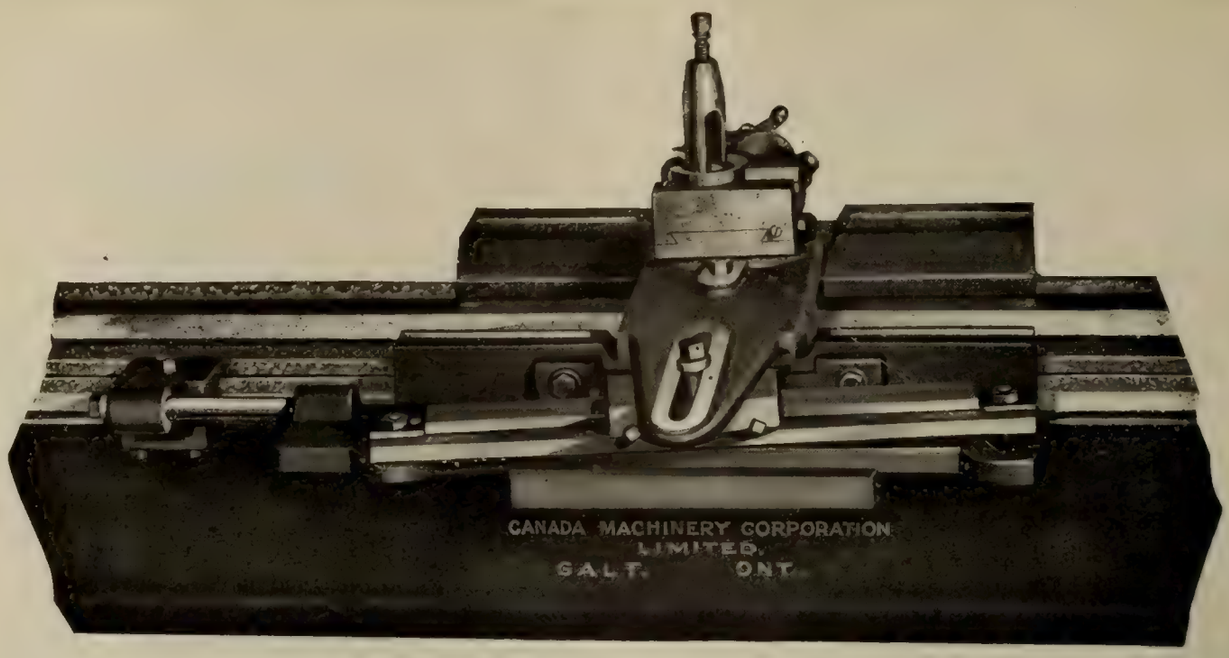

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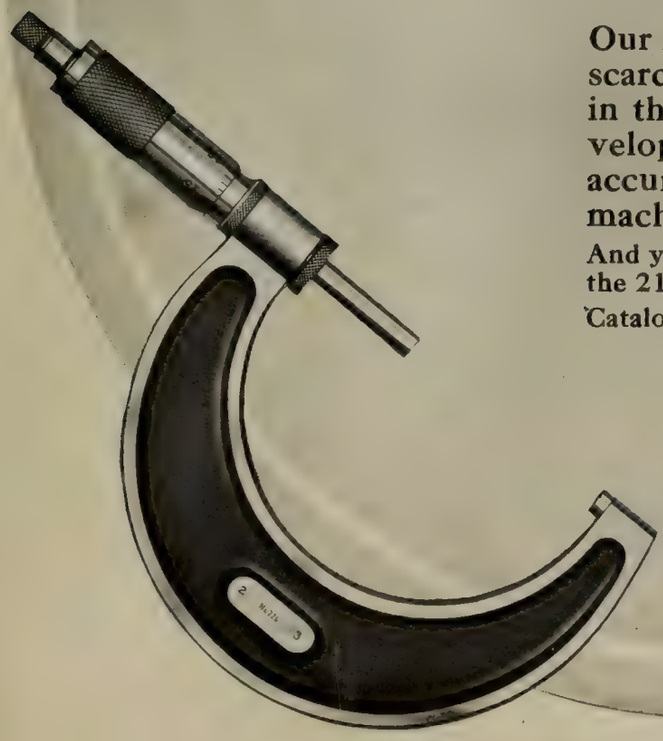

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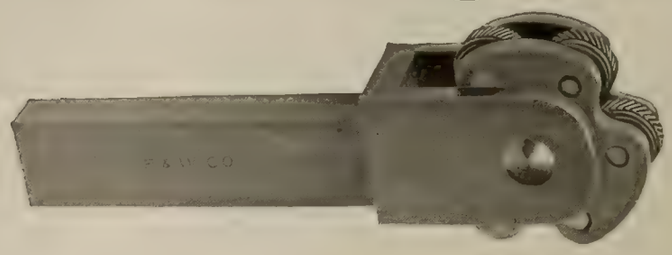

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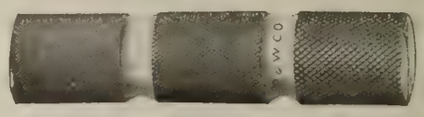

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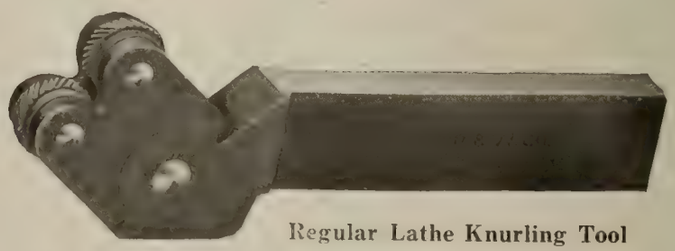

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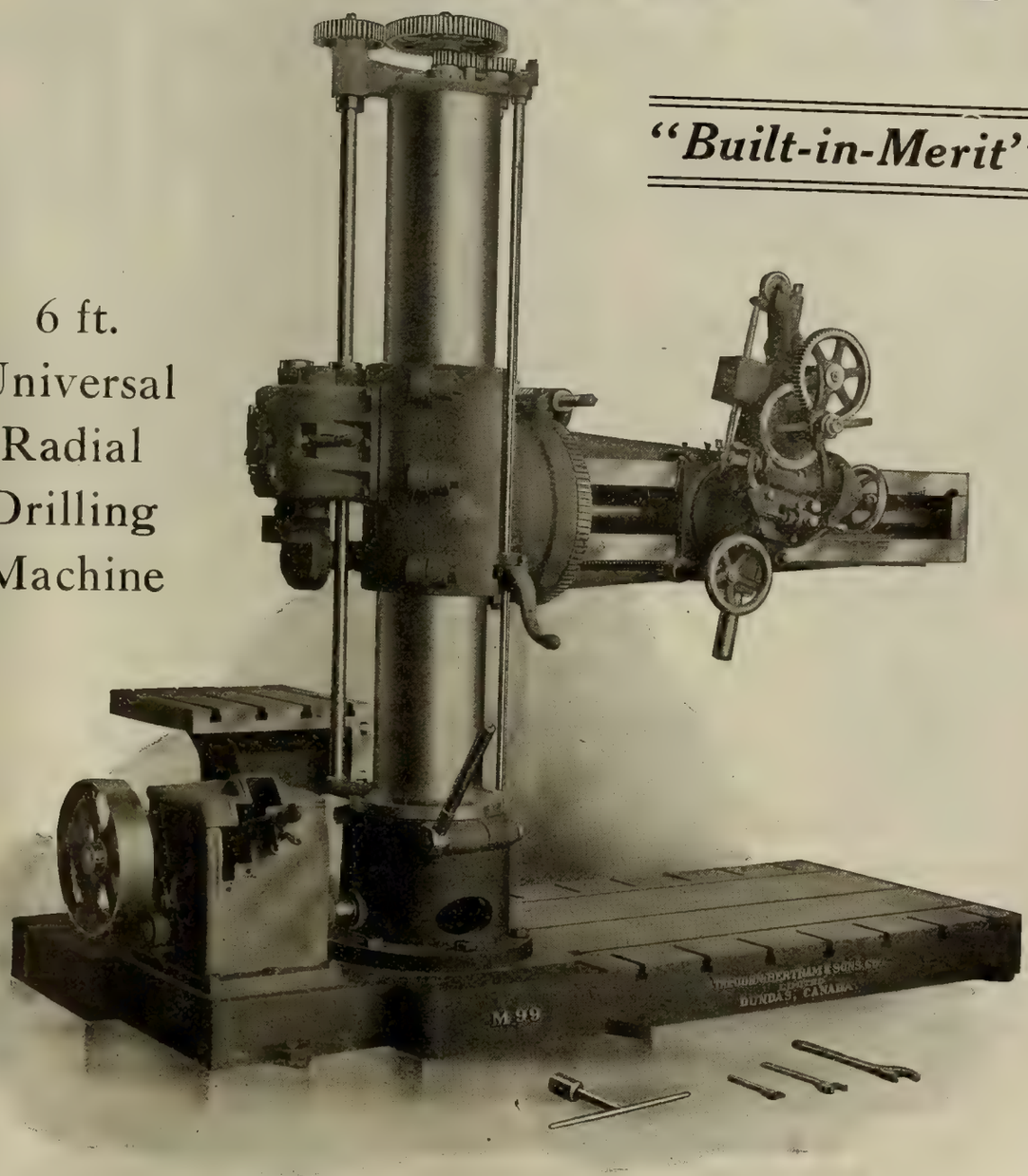
Drilling
Machine



DROP US A LINE FOR PHOTOGRAPHS AND FULL DETAILS
on any machine or machines in which you are interested

The John Bertram & Sons Company Limited

DUNDAS, ONTARIO, CANADA

MONTREAL	TORONTO	VANCOUVER	WINNIPEG
723 Drummond Bldg.	1002 C.P.R. Bldg.	609 Bank of Ottawa Bldg.	1205 McArthur Bldg.

The Publisher's Page

TORONTO October 18, 1917

Possibilities for Business with Japan

MESSRS. ROKU-ROKU SHOTEN, Tokyo, Japan, under date of September 17th, wrote us as follows:

"We beg to introduce ourselves to you as one of the leading machinery importers in Tokyo, who have been in the business for the past fifteen years, devoting ourselves exclusively to the line of machine tools. . . .

"Although your machine tools have not yet been much used in this country the present check (referring to the embargo on machinery from other sources) will be a fair chance to give an opportunity to your manufacturers to cultivate this field for their products.

"Under the circumstances as hitherto stated we shall feel much obliged if you will kindly bring this to the notice of your manufacturers and interested parties so as they may approach us directly by means of letters and catalogues."

On October 4th, we were favored with a call by Mr. Toshiro Yamashita, representing Mitsubishi Co. of Tokyo, naval architects and engineers, and the oldest and largest shipbuilding firm in Japan.

We have received this week subscriptions from the Tokyo Chamber of Commerce (you will understand the full significance of this).

Two subscriptions from Takata and Co., Tokyo and Kitahama. Another subscription from the Kawasaji & Co., Kove, Japan. And another from Siber Migner & Co., Yokohama.

For the past eighteen months we have been sending over one thousand copies of the first issue of each month (known as our Export Numbers) to a carefully compiled list of machinery importers and large machinery users in Great Britain, France, Russia, Holland, Norway and Sweden, Italy, Australia, New Zealand, India, China and Japan.

Many of our advertisers have expressed themselves very frankly as being well pleased with results, and judging by some of the results we have seen we are not surprised.

A profitable export connection cannot be established in a month or even in a year, and if a profitable connection is to be established at all manufacturers should be willing to invest a little in preliminary cultivation, or as it is commonly known, missionary work. The war seems to have given Canada an exceptional opportunity to cultivate the Japanese, Chinese and Australian markets. Opportunities exist, too, in Great Britain and in France, Russia, etc., although transportation to the latter countries offers very serious difficulties at the present time.

We shall continue sending copies of our monthly Export Numbers to the list above mentioned, and we should like to carry a message regarding your line in our next and succeeding issues.

Full particulars will gladly be sent upon request and without placing you under any obligation. Our next Export Number will be dated November 1st. Copy and cuts should be in our hands by October 22nd or 23rd. And in preparing a message for the foreign reader and for the average foreign buyer, remember that cuts tell a plainer story than words. Use lots of cuts and sufficient space to display them properly.

If any advertisement interests you, tear it out now and place with letters to be answered.

SKF

Gang Radial Drill made by the Carlton Machine Tool Co.

BALL BEARINGS

No. 2 of a Series of SKF Equipped Drilling Machines

ACCURACY

For accurate work drilling machines must be accurately built. Spindles, shafts, gears—all must be mounted with extreme exactness.

The accuracy of S K F so well known to the builders of machine tools is a permanent one, created within the most exacting manufacturing limits.

Our Engineering Service Department would welcome the opportunity of discussing your bearing problems with you.

Canadian SKF Company, Limited

Toronto Ontario Canada

DIAMOND

LANDIS NORTON

All sizes, finest quality, awaiting your command, stones

"THAT SUIT"

either unmounted or mounted in our improved (any style) CAST STEEL MOUNTING;

GUARANTEED TO BRING RESULTS.

"MADE IN CANADA"

WHEEL TRUEING TOOL CO.

88 WEST PITT STREET WINDSOR, ONTARIO

FERRO-URANIUM *The Latest Discovery in Alloys for Efficient*

High-Speed and Other Steels of Quality

IT INSURES TOOLS THAT STAND UP ON THE JOB

Largest Producers in the World of URANIUM

WRITE US FOR PARTICULARS

STANDARD ALLOYS COMPANY

Forbes and Meyran Aves. -:- Pittsburgh, Pa.

UNIFORMITY

USED THE WORLD OVER

SATISFACTION

Atlas Babbitts

MADE IN CANADA

AMACOL
ADAMAS

TENAXAS
ATLAS

DURASTIC
MASCOT

TIN-TOUGHENED
W. E. W. BABBITT

These Babbitts are the result of years of experience and have a world-wide reputation for uniformity and reliability.

No Shock Too Severe No Load Too Heavy No Speed Too Great

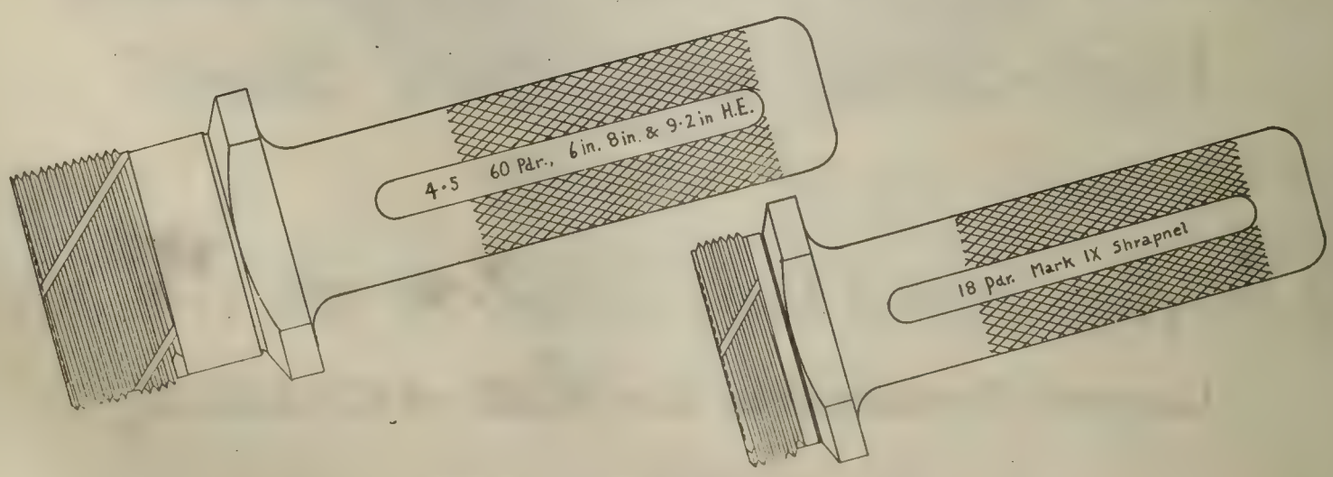
ATLAS METAL & ALLOYS COMPANY OF CANADA, LIMITED, MONTREAL

Sales Agents:

The Canadian B. K. Morton Co., Limited

MONTREAL: 49 Common Street. TORONTO: 86 Richmond Street East.

FUSE HOLE GAUGES



Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

Solid Manganese Steel Intersection for Montreal Tramways Company.

Steel Castings

For Hydraulic, Mill Gear, Locomotive, Rolling Stock, Marine—in fact we make castings of any size and any kind—Manganese, Vanadium, Titanium, Chrome, Nickel, etc. Dependable products always.

Canadian Steel Foundries, LIMITED
MONTREAL WELLAND

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" **Tool Steels**

SISCO

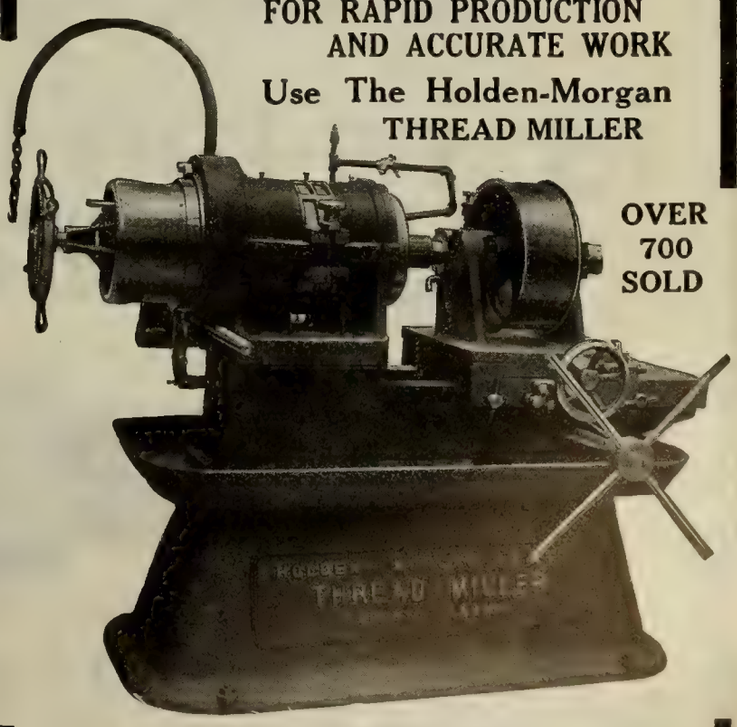
Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

FOR RAPID PRODUCTION AND ACCURATE WORK
Use The Holden-Morgan THREAD MILLER

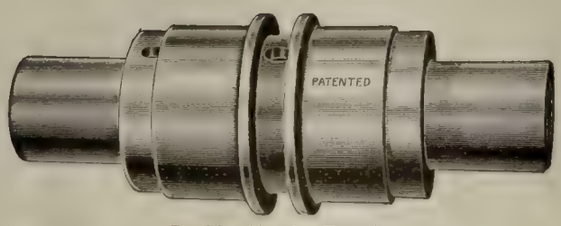
OVER 700 SOLD



Prompt Delivery
On Nose or Base Machines, also Internal or External Fuse Machines—with air-chucks.

The A. R. WILLIAMS MACHINERY COMPANY
LIMITED
64 FRONT ST. W. TORONTO

THE JOHNSON FRICTION CLUTCH



Double Clutch—Exterior.

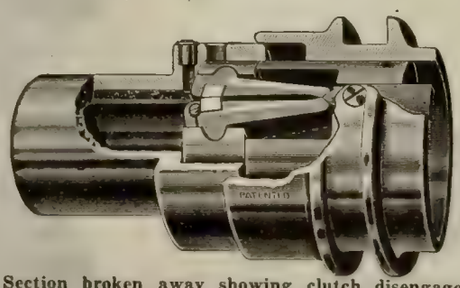
Has But Few Parts Is Very Compact

A body fastened to the shaft carries a split ring in which are inserted a pair of levers. A curve-shaped wedge, which is made part of a shipper sleeve, forces the levers apart, expanding the ring, bringing its outer surface into frictional contact with the inner surface of the friction cup, the hub of which is made to suit requirements.

The leverage is so compounded that it requires but little pressure to operate the Clutch.

One screw which moves two taper blocks, set into the levers, adjusts the contact of the ring and cup to any tension. This is easily reached with a screwdriver through hole in the friction cup. The perfectly smooth shipper sleeve entirely covers the working parts so no dirt can get near them. The double clutch requires but little more space than the single and has two friction cups with hubs, on which can be mounted pulleys, cones, gears, etc., of any diameter and face.

Write for our free booklet—"Clutches as Applied in Machine Building." Also, Yellow Data Sheets



Section broken away showing clutch disengaged.

Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal; Can. Fairbanks-Morse Co., Ltd., Toronto,
England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

We will Fill Your Requirements *Send Us Your Inquiries*

Air Compressor Evidence

The greatest evidence of the value of any article is the demand for it after investigation and trial. Below are four carloads of our compressors which fills one order to a large concern in Canada. Our line of compressors is very large.

Write us and explain your requirements.

The Jenckes Machine Company, Limited

CANADIAN SALES OFFICES:
Sherbrooke, Montreal, St. Catharines, Toronto
Cobalt, South Porcupine, Vancouver

WORKS: Sherbrooke, Que.

WORKS: St. Catharines, Ont

"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

MANUFACTURED BY

Arthur Balfour & Co., Limited
Dannemora Steel Works,
Sheffield, England.

The Eagle & Globe Steel Company, Limited

Head Office and Warehouse, Canada and U.S. — 128 Craig Street West, Montreal
Ontario Office and Warehouse — 36 Colborne Street, Toronto
Winnipeg Stock — Dominion Equipment & Supply Co. Limited
Vancouver Stock — Frank Darling & Co.

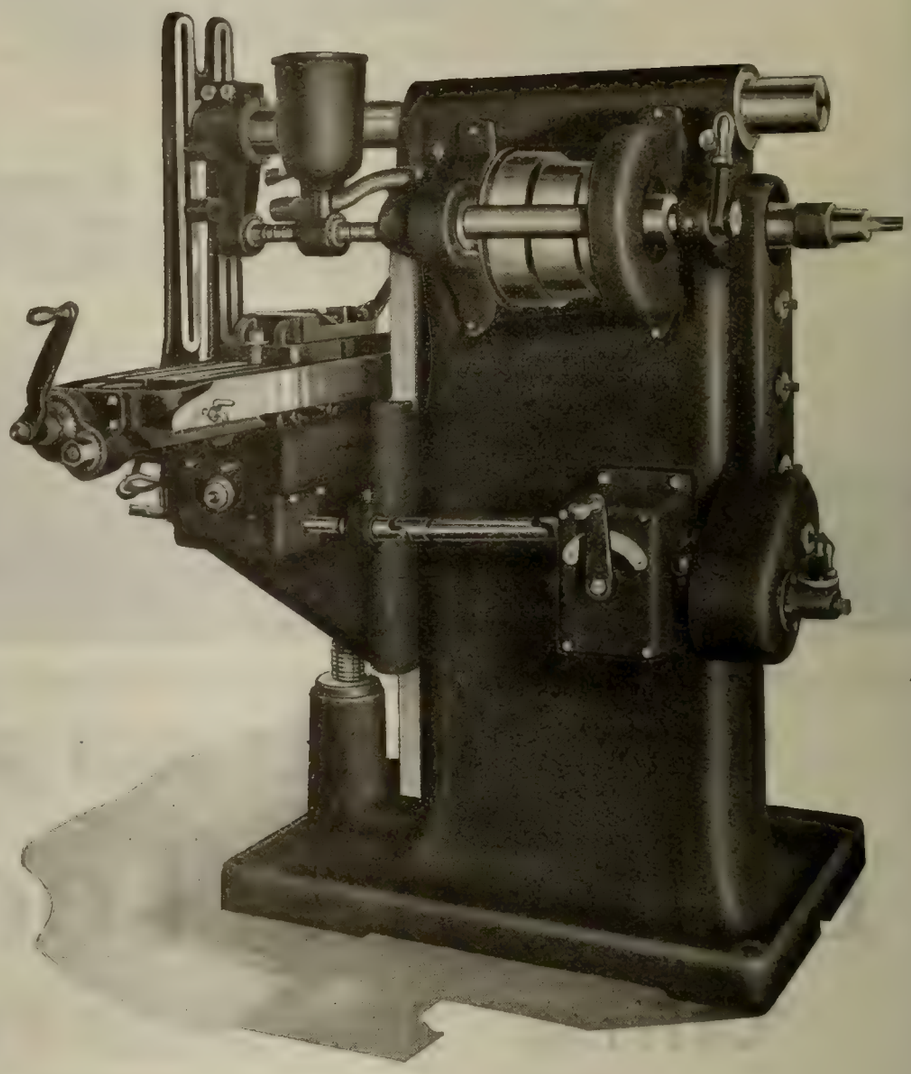
W. A. BRADBURY, Agent, 128 Craig Street West, Montreal

The Ford-Smith Machine Company

Adv't. No. 6

MILLER SERIES

CONFIDENCE:



When an operator starts on any work he likes to feel certain that the machine will do the job, accurately and successfully, not to speak of the fact that the owner wishes it done in the shortest time possible.

Have our advertisements so far shown you that our Millers are so built to accomplish the results just spoken of?

We ourselves feel confident our machines will accomplish their work—because not only is the best of material part of their success—but also the workmanship.

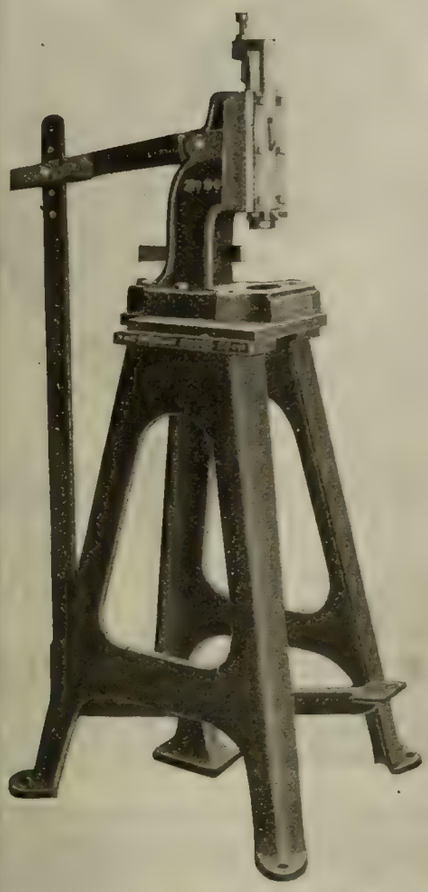
Next Advertisement We Will Tell You Of Our Staff

The Ford-Smith Machine Company, Limited

HAMILTON ONTARIO CANADA

If interested, tear out this page and keep with letters to be answered.

WHY A "B. B.?"

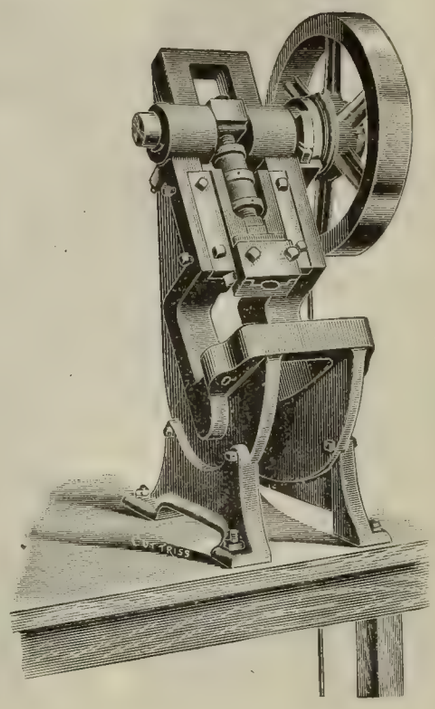


Experience has proved
that

B.B. PRESSES

qualify for

Economy
Durability
Speed



The Brown, Boggs Co.,

LIMITED

HAMILTON, ONT., CANADA

HIGHEST IN QUALITY

NATIONALLY KNOWN

OUR Country requires the extreme limit of production from every lathe, planer, miller or other machine tool.

BE PATRIOTIC

"Red Cut Superior"

The Nationally Known First Quality

HIGH SPEED STEEL

Will enable you greatly to increase your output

"IT'S THE BEST FOR ALL MACHINE WORK"

VANADIUM-ALLOYS STEEL CO.

PITTSBURGH, PA. Works at LATROBE, PA.

CARRIED IN STOCK AT THESE WAREHOUSES:

E. T. WARD'S SONS, 44 FARNSWORTH ST., BOSTON, MASS. GEO. NASH CO., 304 HUDSON ST., NEW YORK, N. Y. FIELD & CO., INC., 721 ARCH ST., PHILADELPHIA, PA. VANADIUM-ALLOYS STEEL CO., PITTSBURGH, PA., AND LATROBE, PA. GEO. NASH CO., 646 WASHINGTON BLV'D CHICAGO, ILL.

ELECTRITE-URANIUM High-Speed Steel

Will amaze you in its ability to remove metal

The introduction of this rare element—"URANIUM"—into the mixture of our already superb cutting product, has supplied the final perfection of the qualities of toughness and durability which has been the hitherto impossible goal of metallurgical hopes.

Electric Furnaces, Automatically regulated, produce inevitably similar results at every melt.

We are ready to assist your inquiry in every way possible.

Write

Latrobe Electric Steel Company
Latrobe, Pennsylvania

LESCO

One of the

Steels of the Century

Centurion High-Speed

Made from the BEST Materials

Iron, Tungsten, Chrome, Vanadium

Melted by the BEST Process

The Crucible Furnace Method

Handled by the BEST Workmen

Melters, Forgemen, Annealers, Metallurgists

CONSEQUENTLY

Will do the BEST Work

Quality *Delivery* *Service*

We have a catalog waiting for you. Write for it.

THE CENTURY STEEL CO. OF AMERICA

MANUFACTURERS OF HIGH-GRADE CRUCIBLE STEELS

General Office and Works:
POUGHKEEPSIE,
N.Y.

Sales Offices:
120 BROADWAY,
NEW YORK

DOUBLE

MUSHET

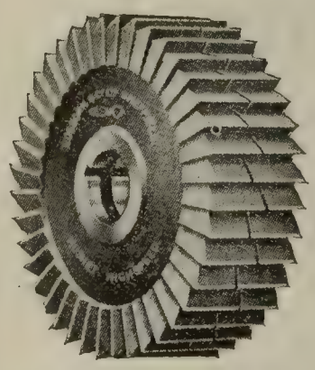
High Speed Steel

Carbon Steel

Gauge Steel

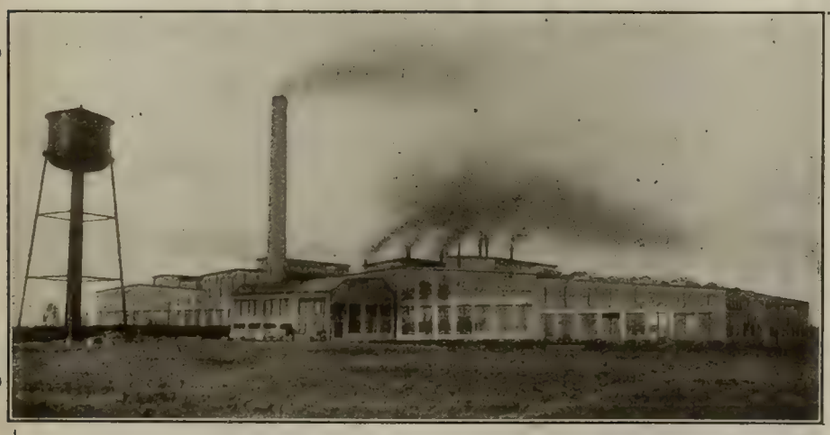
Alloy Steels

SOLE MAKERS
Samuel Osborn & Co. Ltd.
SHEFFIELD



Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)
Limited
Head Office and Works: Montreal, P.Q.
Branch Office: Toronto, Ontario



Works: LONGUEUIL, QUE.

Armstrong, Whitworth of Canada Limited
Standard Sizes of
HIGH SPEED STEEL
Carried in Stock
CARBON AND ALLOY STEELS
Shop Tools, Gauges, etc.
HEAD OFFICE: 298-300 St. James St., Montreal
Branches: Dominion Bank Bldg., TORONTO
27 King William Street, HAMILTON
McArthur Bldg., WINNIPEG, MAN.

Coal
Coke
Iron Ore

Pig Iron
Victoria FOUNDRY & MALLEABLE
Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

M.A. HANNA & Co.
Sales Agents, CLEVELAND
Canadian Office:
703 C.P.R. Bldg., Toronto

TRADE MARK

of the Famous

"WACO"

BRAND

HIGH SPEED STEEL

AND

TWIST DRILLS

"DOUBLE WACO" Quality

Specially Adapted for Munition Work

"TURTLE" BRAND

High Class Tool Steel, Files, etc., of all descriptions.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

TRADE MARK

"WACO"

Reliance Steel Works

SHEFFIELD, ENG.

TRADE MARK

For particulars apply to our

Sole Representatives for Canada

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario

STEEL

FOR SHRAPNEL SHELLS AND SHELL BLANKS

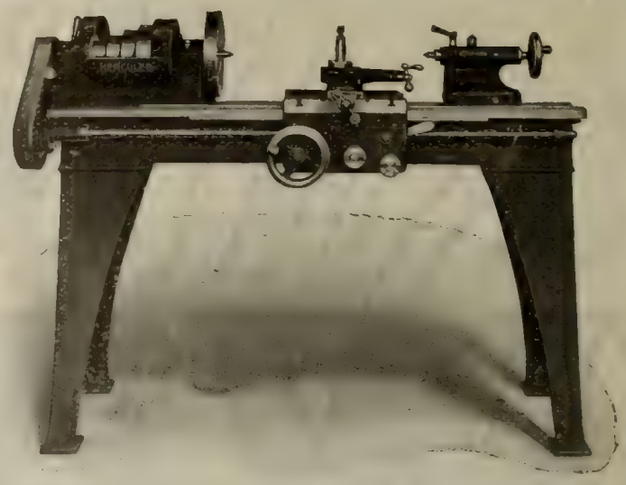
We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Company
Limited

Head Office: NEW GLASGOW, N.S.

Western Sales Office:
Room 14, Windsor Hotel, MONTREAL



LATHES

12", 16", 18" and 21" swing

Strictly modern in design, rigidity and accuracy guaranteed.

Himoff Machine Company
45 Mills Street
Astoria, City of New York, N.Y.

The Heat in Your Steam Condensation

What Are You Doing With It?

A big *economy* or a big *waste?*
A big *saving* or a big *loss?*
Which is it in your plant?

Are you returning the condensation in your steam lines *immediately* back to the boilers as pure hot feed water—or are you allowing it to clog up your apparatus and slow down the operation of your plant.

The thousands of concerns—both large and small—who use the

Morehead
Back to Boiler
SYSTEM

turn the water of condensation right back to the boilers at from 270 to 312 Degrees F.—save from 8% to 10% in coal over the wasteful steam pump—and at the same time keep every inch of heating surface on their equipment working at the highest possible thermal efficiency.

If you are still depending upon steam pumps or other makeshifts for handling the condensation in your plant you can convert a big loss into a big saving by investigating the Morehead System at once. For complete particulars address.

CANADIAN MOREHEAD MFG., CO.
Dept. "L"
WOODSTOCK, ONTARIO

STELLITE

QUITE remarkable economies have been effected in turning, planing and shaper work on all kinds of steel, cast iron, bronze and other materials by the new alloy

STELLITE

But we are now able to recommend it for Milling Cutters and Form Tools of all kinds.

Information and quotations supplied by our Service Department on application.

Deloro Smelting & Refining Co. Ltd.

Head Office & Works—Deloro, Ont.

TORONTO
200 King St. W.

MONTREAL
315 Craig St. W.

What is there about a CISCO LATHE you do not like?

We are very willing at any time to receive suggestions or criticisms on

THE LATHE WITH THE PULL
THE LATHE OF SIMPLIFIED ACCURACY

from anyone, and though to-day, we feel we have one of the best machines manufactured we are constantly adding some new little feature, such as shear wipers, etc., in order to keep pleased

Cisco's Many Pleased Customers

So, come along; let us hear from you. We will take it kindly. And by the way, have you seen in operation one of our

NEW CISCO 24'' LATHES

Oh, but it's a bull. Never so much power, in any lathe built, and lake all other Ciscos it's just as

Simple in Operation, Accurate and Efficient

SOLD IN CANADA BY
THE
A. R. Williams Machinery Co., Ltd.

MADE IN CINCINNATI, U.S.A. BY
The Cincinnati Iron & Steel Company
14-in., 16-in., 18-in., 24-in. Lathes

Improved Centering Machine

Mr. Shell Manufacturer:

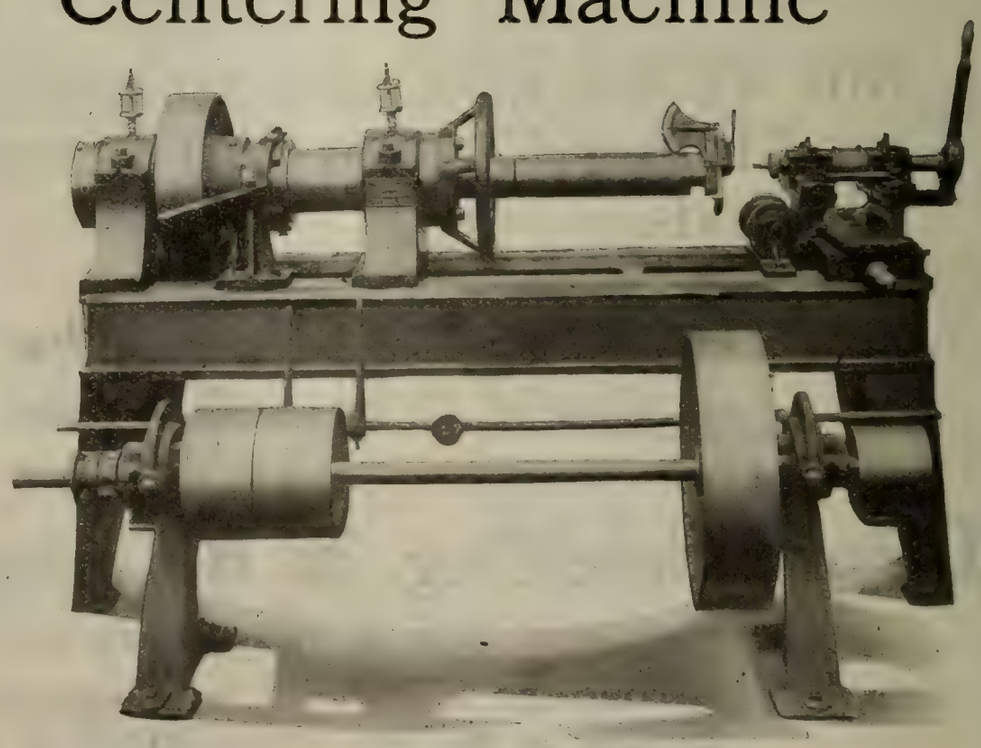
The importance of centering is obvious.

This tool is giving real satisfaction every day and stays on the job.

Write for price and description.

Delivery, ship 10 days after order.

Shipping weight 2040 pounds.



VICTORIA FOUNDRY COMPANY, LIMITED
OTTAWA, ONTARIO

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6" shells.

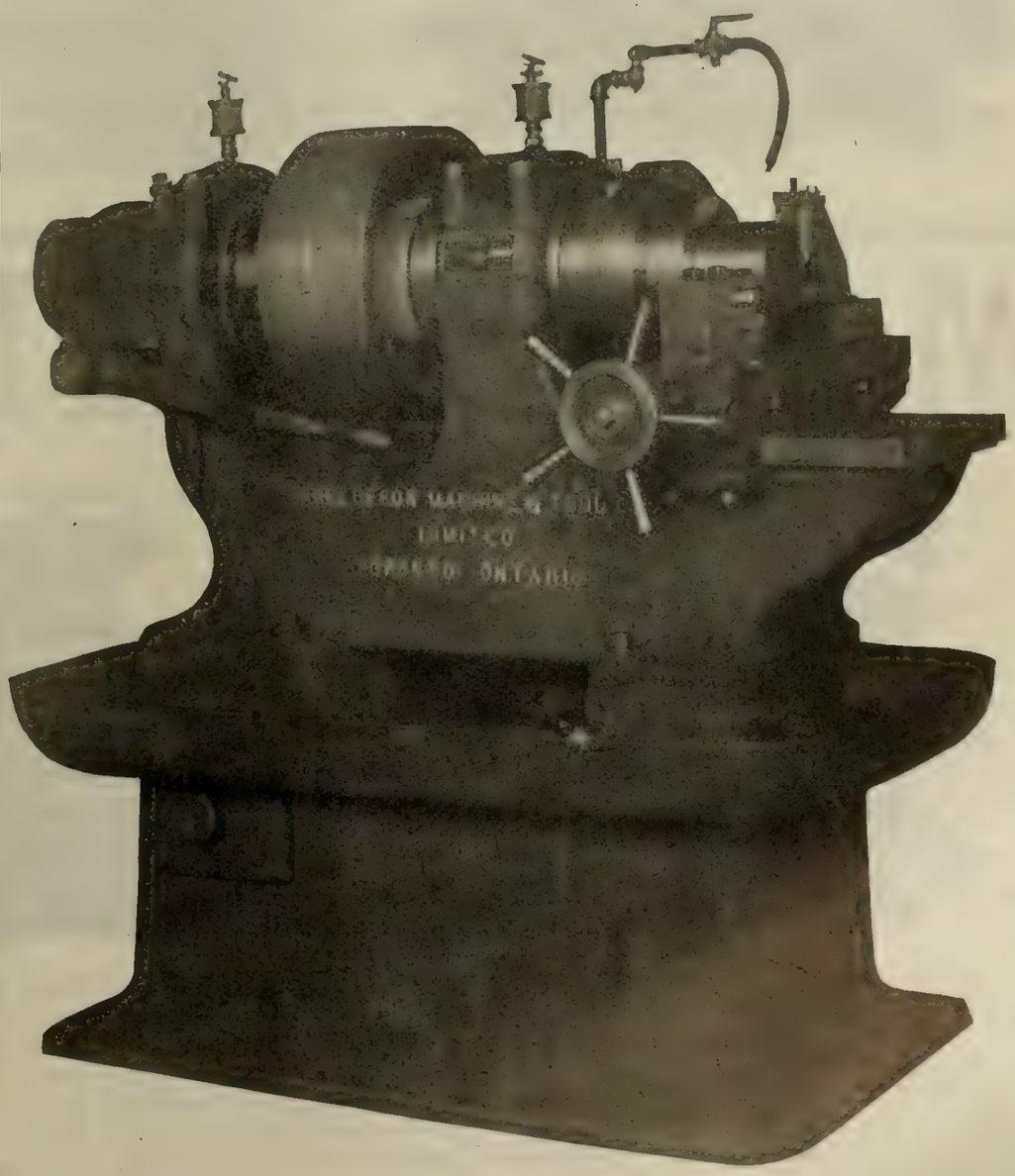
Roelofson Machine & Tool Co., Ltd.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

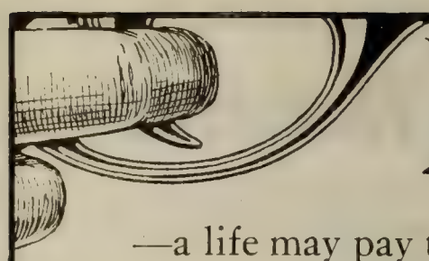
Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6" shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.



If any advertisement interests you, tear it out now and place with letters to be answered.



IF ··the finger on the trigger wabbles.....

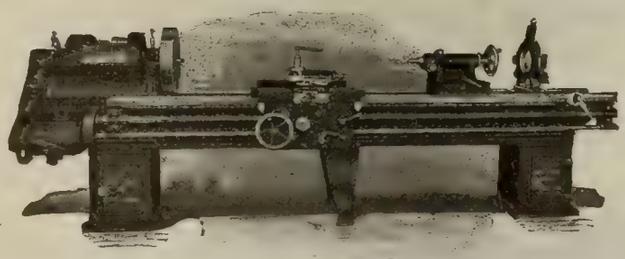
—a life may pay the final penalty. Steady nerves win the battles of life.

"Sidney for Service" lathes are built with steady nerves—they don't chatter and wabble under heavy duty.

A lathe that does not permit absolutely accurate work is dangerous. A lathe that wabbles is as great a menace to life as a finger that wabbles when on the trigger.

The "Sidney-for-Service" construction assures a machine that stands as firm as Gibraltar. Drop a line to our nearest agent in Canada, or write to us for Bulletin 30.

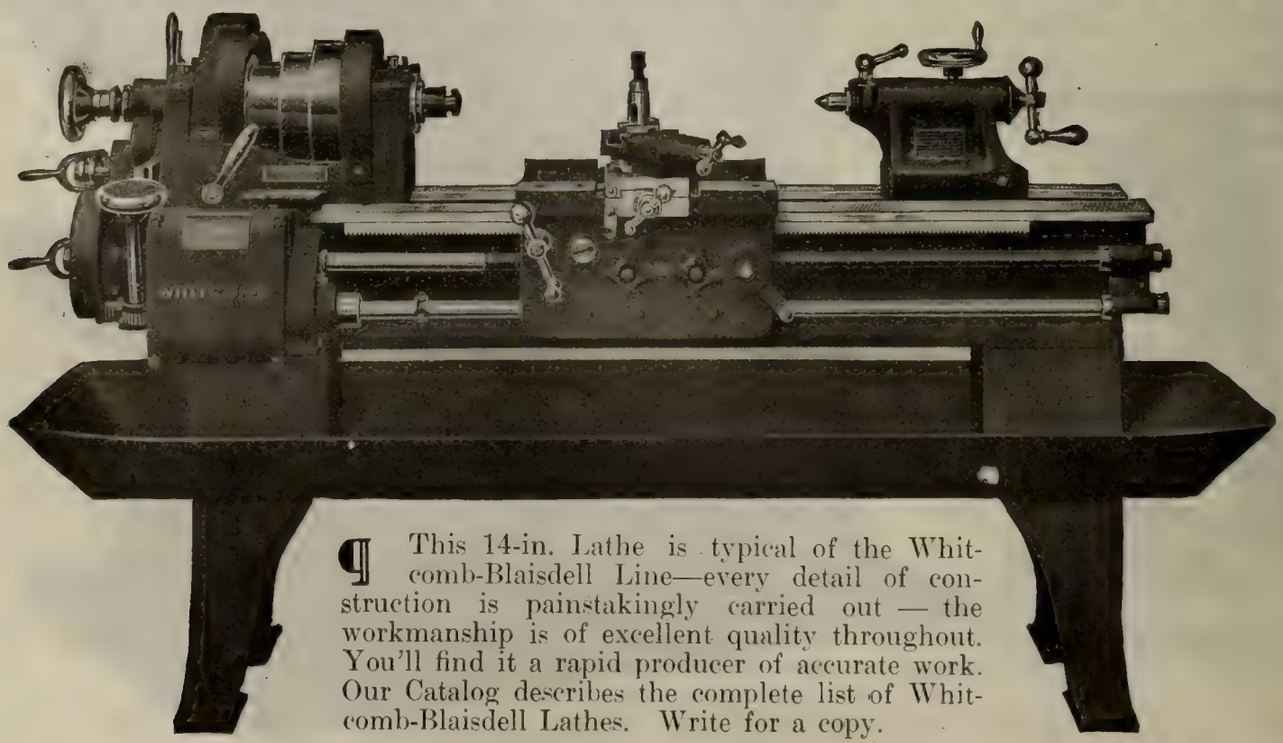
SIDNEY for SERVICE



FOSS & HILL MACHINERY CO.,
MONTREAL, QUEBEC
H. W. PETRIE, LIMITED
TORONTO, ONTARIO

THE SIDNEY TOOL CO.,
SIDNEY, OHIO, U.S.A.

Whitcomb-Blaisdell Lathes



¶ This 14-in. Lathe is typical of the Whitcomb-Blaisdell Line—every detail of construction is painstakingly carried out — the workmanship is of excellent quality throughout. You'll find it a rapid producer of accurate work. Our Catalog describes the complete list of Whitcomb-Blaisdell Lathes. Write for a copy.

The Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass.

IMMEDIATE SHIPMENT

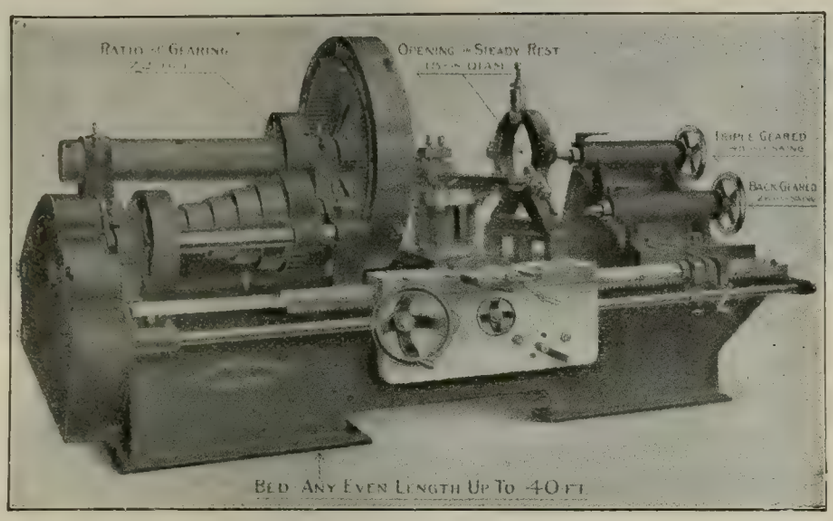
30-ft. BED

McCabe 2-in-1 Lathe

26 and 48-INCH SWING

TRIPLE-GEARED—RATIO 72 to 1

J. J. McCabe, 149 Broadway New York



Showing McCabe's Latest Heavy Type "2-in-1" Double-spindle Lathe—26/48-in. Swing.

48-in. Swing. Triple Geared — ratio 72 to 1.

26-in. Swing. Back-geared.

Turns between centers—24 ft.

Swing over carriage on 48-in. Lathe is 40 in.

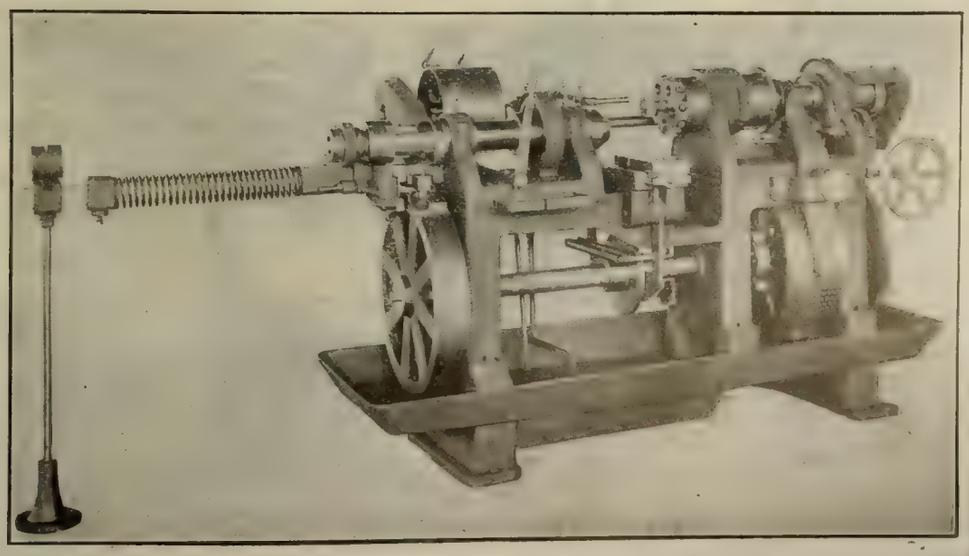
Prominent ship-builders are using McCabe Lathes on long beds.

Thousands in operation all over the world.

Power is Costly--- Don't Waste It

A STRIKING feature of the Chicago Automatic is the 100 per cent. utilization of power. Operated by a single belt run direct from the lineshaft, troublesome overhead belting and countershafts, with the power they waste, are eliminated, making it easy to install one or a battery of these machines.

Equally as important is the general simplicity of construction; there is no reversing or belt shifting, no complicated mechanisms, and all parts are readily accessible. Action is positive, results unvaryingly uniform and accurate. The machine is extremely well built in every particular and produces fine work at very low costs. Made in ¾", 1¼", 1⅝", 2" sizes. Catalog for full particulars.



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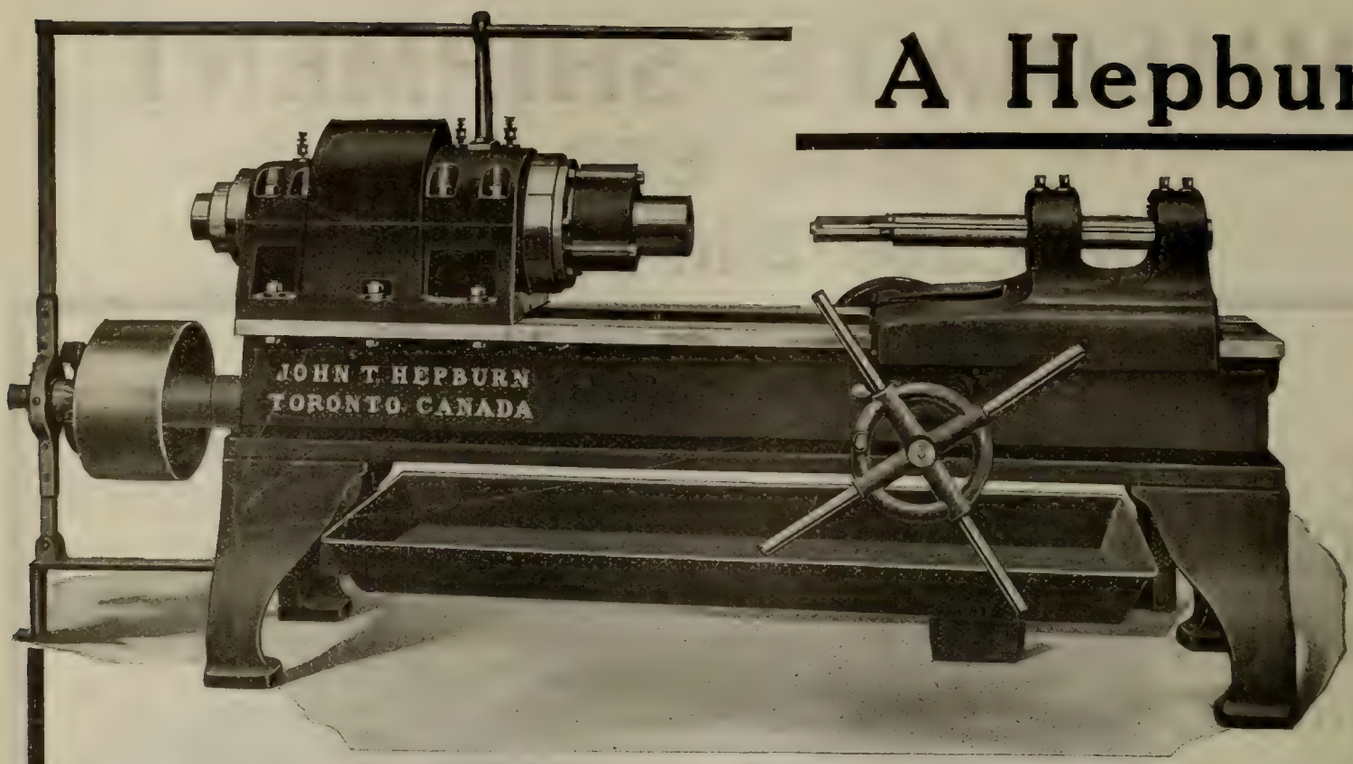
John MacNab, Hyde, England

A Hepburn



This HEPBURN Single Bar Boring Lathe's rigid construction has proven it to be the **BEST 6" BORING LATHE** procurable.

The HEPBURN NEW STYLE NOSE BORING AND INSIDE PROFILE LATHE is the last word in machine design for these operations.

We can convert your old turrets or other lathes into these up-to-date machines.

We make Lathes for all operations on shells.

John T. Hepburn, Limited
18-60 Van Horne St., TORONTO, ONTARIO

THE FINAL TEST IS PRODUCTION

and that is the reason why the demand for the

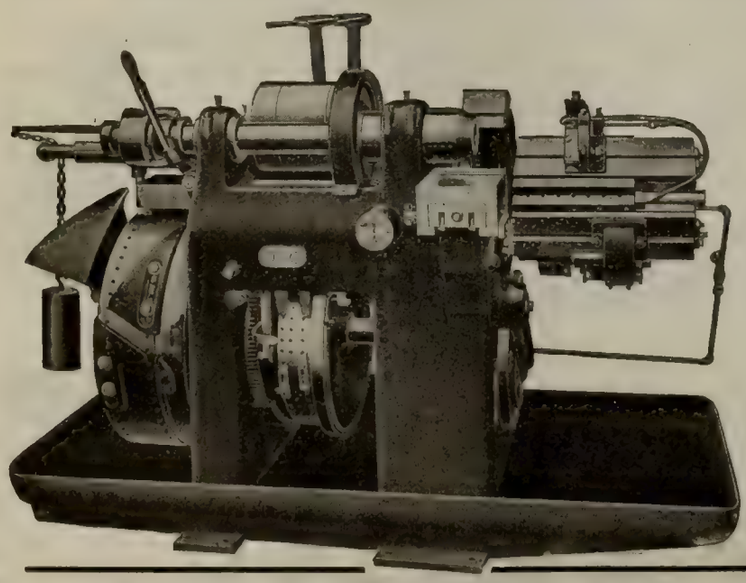
GRIDLEY AUTOMATIC TURRET LATHE

has constantly increased; for Gridleys are *producing*—not only those recently built but those first put in use.

Gridley production has been the kind that every manufacturer wants, viz.—accurate—rapid—uniform—economical.

Why not let us tell you about Gridley production on your turret lathe work?

Send Sample or Blue Print for quotation.



GRIDLEY AUTOMATIC TURRET LATHE
Chuck Capacities up to 5 in.
for Bar or Single-piece Chucking Work.

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Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont, and Acme Automatics, Threading Dies, and Screw Machine Products at Cleveland, Ohio

If any advertisement interests you, tear it out now and place with letters to be answered.

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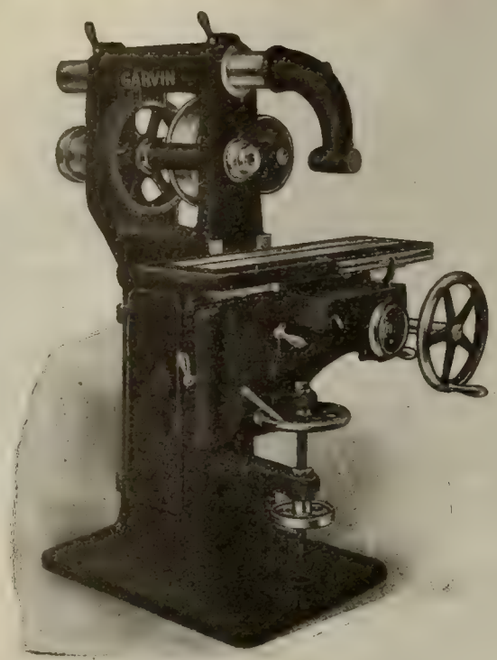
Back Geared



No. 21 B.G. PLAIN MILLING MACHINE
Back Geared
Use Code - Abject

For Plain and Gang Milling for general manufacturing, and is used mostly in gangs of 5 or 6 machines to one operator. Spindle runs in adjustable bronze boxes, and is driven by a 3" belt through back gears (3 to 1).

Knee is our improved solid top design, rigid and stiff to resist side pressure of heavy cuts.

DIMENSIONS:

Automatic Feed at Table	18 in.
Adjustment in line with Spindle	6 in.
Vertical adjustment under Spindle	13 in.
Table, inside Oil Pockets	6 x 10 in.
Canges of Speed	6
Changes of Feed	6
Net Weight, Skidded	1,575 lbs.

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"WHITNEY"

KEY-SEAT CUTTERS

For the Woodruff System of Keying

GET OUR PRICES

Either carbon or high-speed steel.
Material the best obtainable.
Unsurpassed in efficiency and durability.
Centred at both ends.
Unsurpassed in accuracy and finish.
Large quantities carried in stock.

The Whitney Mfg. Co., Hartford Conn.

Chains, Keys and Cutters, Hand Milling Machines

For Rapid Production and Accurate Work

USE THE

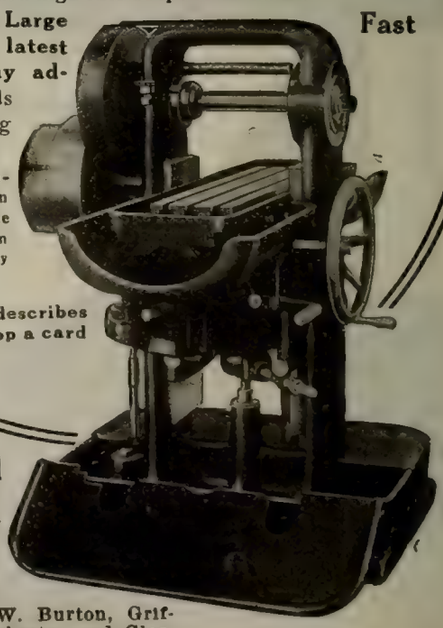
"BRIGGS"

The Briggs Miller handles work no other machine of its size can touch. It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

The Base Tank and Large Gear Pump is the latest addition to its many advantages. Tank holds 20 gallons of cutting lubricant

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

Fast



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Foreign Agents: Allied America, France, Belgium, Italy, Switzerland, Machinery Company of Russia, Scandinavia, C. W. Burton, Griffiths & Co., London, Manchester and Glasgow, Barandiaran, Metivier, Gazeau & Cia, San Sebastian, Spain.

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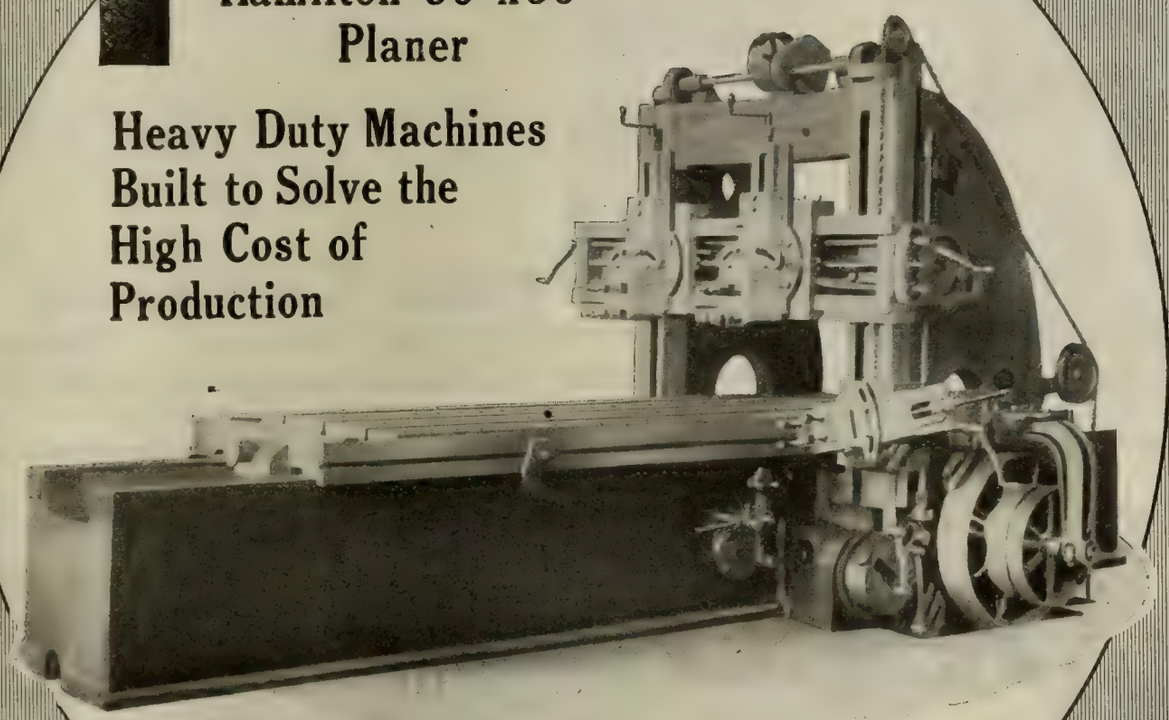
Hamilton 36"x36" Planer

Heavy Duty Machines Built to Solve the High Cost of Production



WEIGHT, RIGIDITY, DIMENSIONS and POWER—these are the combination of assets that give exceptional productive ability to "HAMILTON" PLANERS.

The installation of the "HAMILTON" strikes a crushing blow at the High Cost of Production. They do big work fast and accurately. Sizes from 24" x 24" to 54" x 54".

Our bulletin will tell you all about this planer. Give us your address.

The Hamilton Machine Tool Company, Hamilton, Ohio

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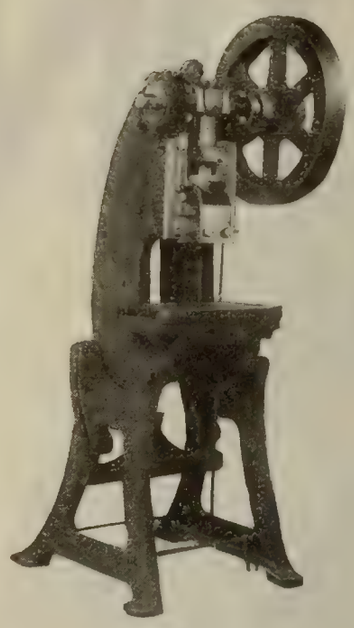

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appeal to discriminating users because of the massive construction of all working parts, the generous crank shaft bearings, the increased diameter of crank pins, liberal crank cheeks, long and carefully fitted slide bearings, abnormally large connection screws, powerful gearing, and above all, the skill and care exercised in their construction.

These are features which should be considered when purchasing.

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Speed

When the quality of the work is the best obtainable, the next item is speed. For upon speed depends your costs.

One rivet per second is the speed this machine will maintain indefinitely. Adapt that speed to your requirements and find out the value the Grant Riveter would be to you.

Write for our catalogue. It will give you complete information.

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Triple Purpose

"METALWOOD" COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.

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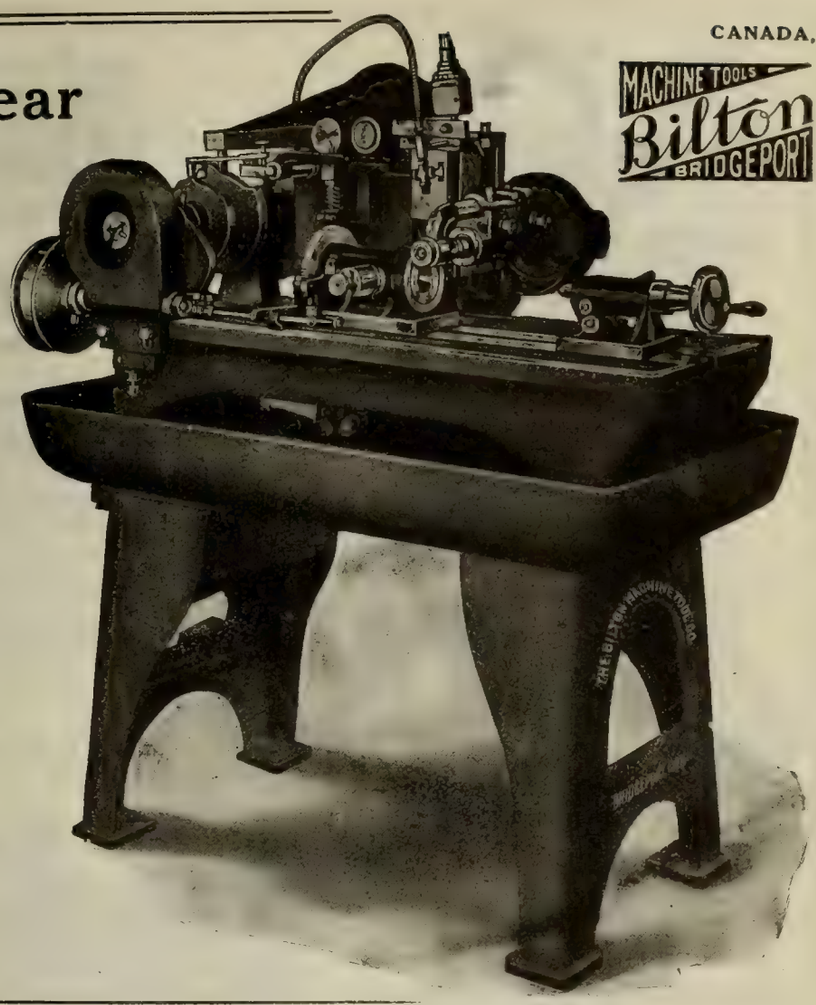

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No. 1 - - 14 Pitch
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FOR ALL PURPOSES

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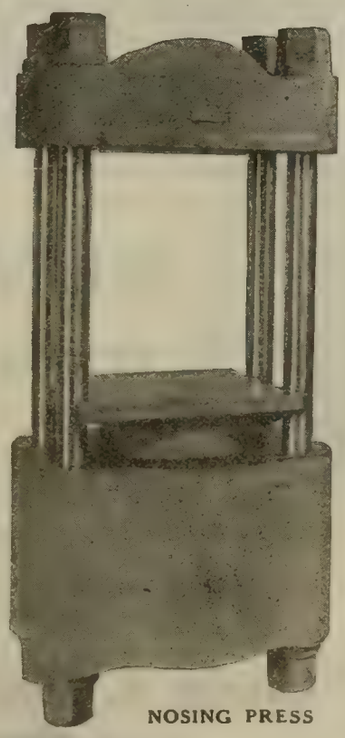

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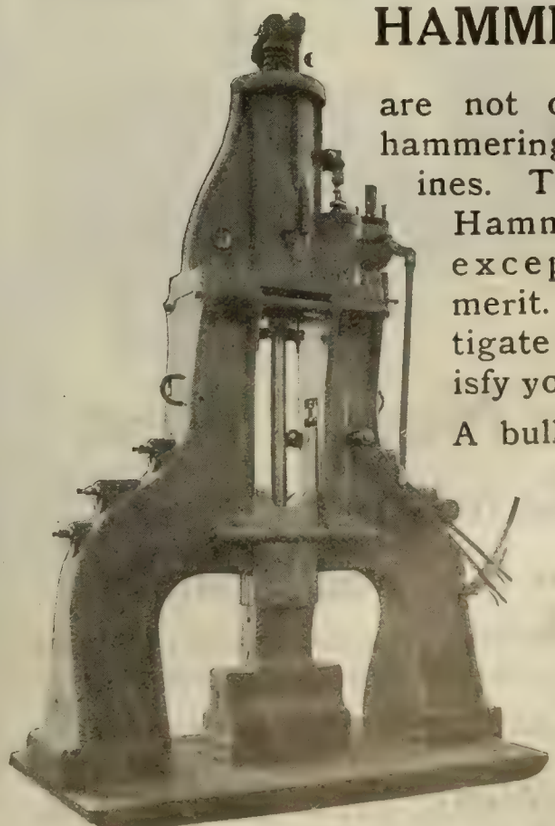
"ERIE" STEAM FORGING HAMMERS



are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

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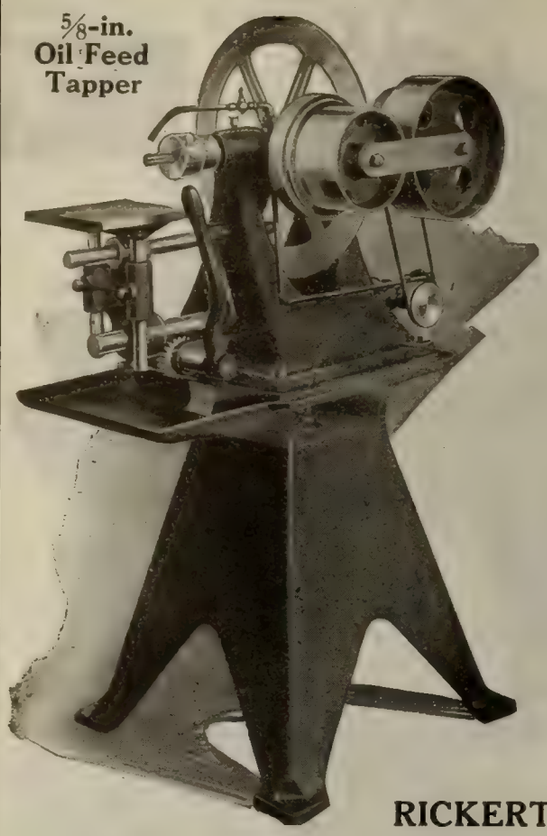

5/8-in. Oil Feed Tapper

This 5/8" Oil Feed Tapper is featured by the continuous oil feed, which allows greater speed, increased efficiency and output, and longer life.

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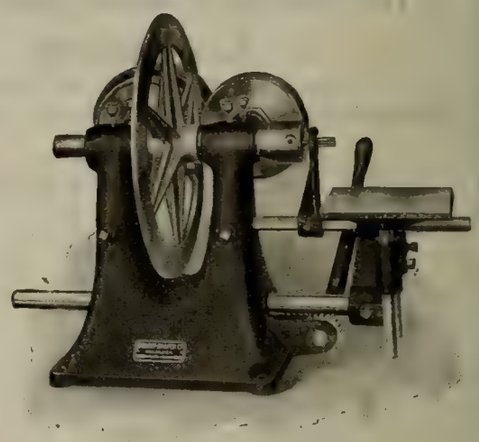
TAPPERS

Speed, Accuracy and Minimum Breakage

These are outstanding results in shops that have installed R-S Tappers.

R-S range of Tappers permit of all kinds of work from 3-16" to 5/8". Made in bench, vertical and horizontal designs.

Pleased to tell you all about them. Write.



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This is Our Address—How Can We Serve You?

ALFRED HERBERT, Foreign Agent.

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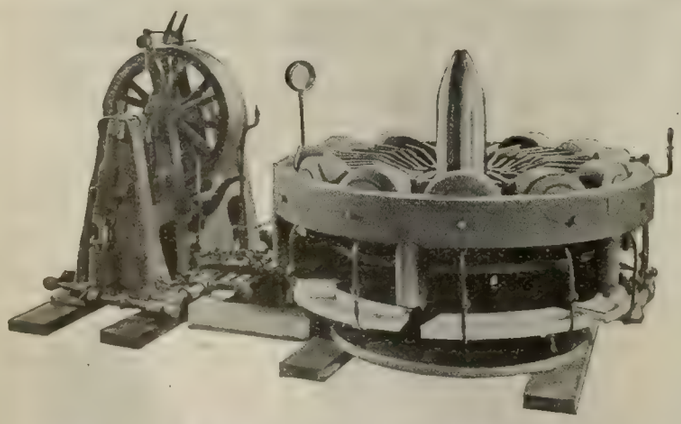

The New "West" Banding Press

For 9.2" and 8" shells

12 Cylinders; Ample Power; Ample Strength; Reasonable Price.

NO ACCUMULATOR REQUIRED.

The West Tire Setter Co.

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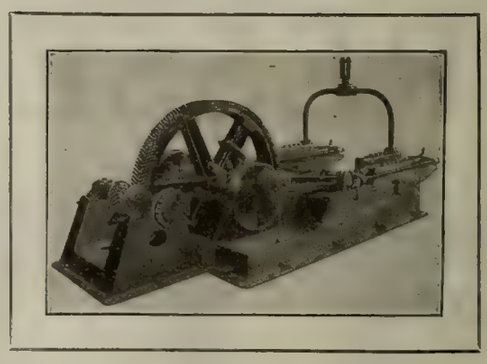

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18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

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R-P Co

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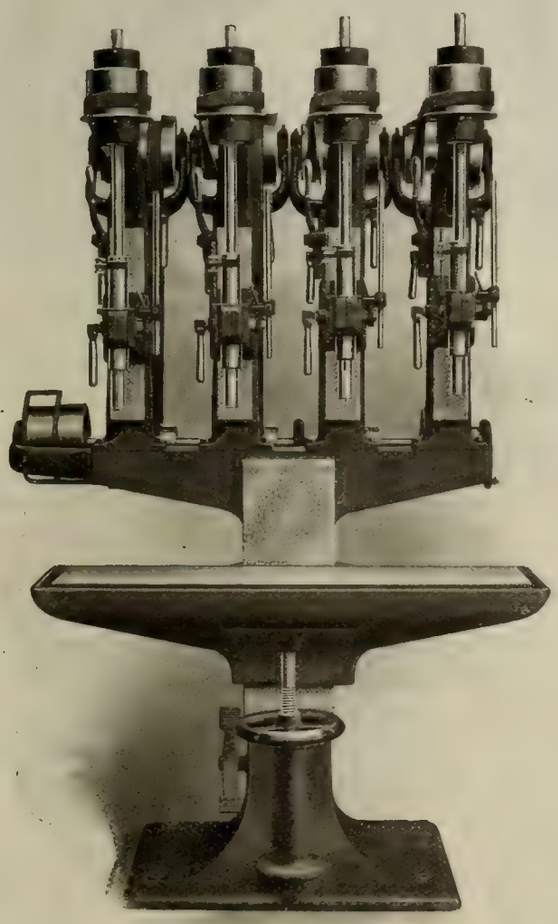
THIS REED-PRENTICE IS EQUIPPED WITH BALL BEARINGS THROUGHOUT—RUNS WITHOUT VIBRATION—ALL PULLEYS ARE SUPPORTED AT BOTH ENDS OF HUB—AND CONVENIENT HANDLES ARE PROVIDED BY WHICH THE HORIZONTAL AND VERTICAL BELTS ARE ADJUSTED SIMULTANEOUSLY WITH EQUAL TENSION.

IMMEDIATE DELIVERY ON THREE AND FOUR SPINDLE MACHINES.



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Manning, Maxwell & Moore, Inc., New York — Allied Machinery Co., of America, Paris

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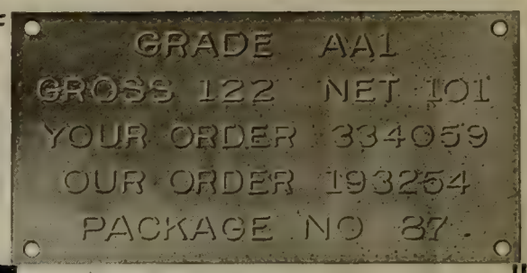

Assure the Safe Arrival of Your Shipments

Rapidly embosses names, addresses, weight numbers, order numbers, etc., on tin or zinc tags of various sizes, quickly making any change in reading matter desired.

Used by a number of manufacturers who believe it desirable to use metal tags in place of linen tags for labeling, identifying and addressing export or domestic shipments.

Established 1850
Jas. H. Matthews & Co.
Marking Devices
Pittsburgh, Pa., U.S.A.

Foot press as illustrated. Steel holders, and interchangeable type constitute this equipment. Easy and economical to operate.

Write now for a copy of our complete book illustrating this machine and list of firms using it; also our complete line of steel lettering dies and stamps.

Just What You Need For Export Shipments

Metal tags are naturally more durable than linen and not as easily lost in transit—then again they are just as cheap as linen tags in the long run.

Any inexperienced boy can quickly learn to operate this machine and make the necessary tags for your shipments. Further particulars gladly furnished on request.

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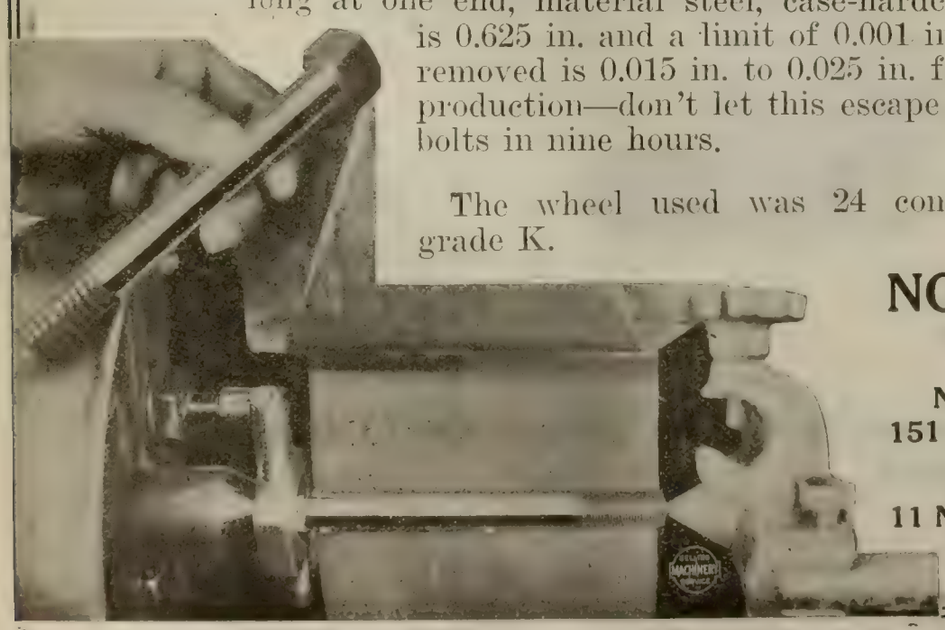
Pittsburgh, Pa., U.S.A.

Distributors for Canada: The Canadian Fairbanks-Morse Co., Ltd., Montreal, St. John, Toronto, Winnipeg, Calgary, Vancouver, Ottawa, Quebec, Saskatoon, Victoria.

Grinding Operation on Front Axle Spindle Bolts

An interesting grinding operation in a large plant for manufacturing automobile parts in which accuracy is combined with good production is the grinding operation on front axle spindle bolts. The bolts are 6 in. long under the head, threaded 1½ in. long at one end, material steel, case-hardened. The diameter is 0.625 in. and a limit of 0.001 in. is allowed. Stock removed is 0.015 in. to 0.025 in. from diameter. And production—don't let this escape you—is 480 spindle bolts in nine hours.

The wheel used was 24 combination Alundum, grade K.



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NORTON

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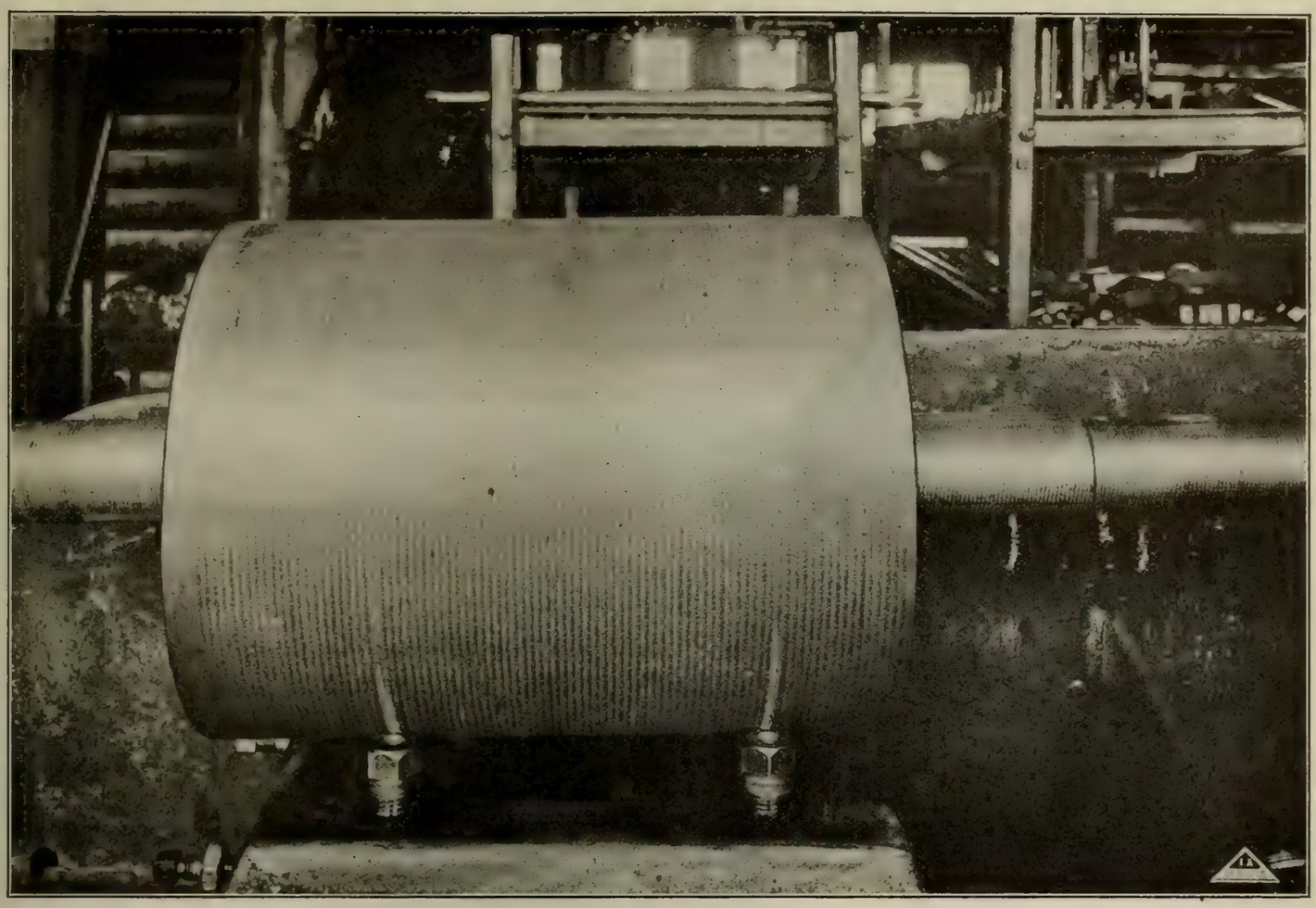

Grind Wherever and Whenever You Can

The Norton Grinding Machine will cut your costs and production time.

You wouldn't think of performing rough cuts of coarse feeds and high speeds on the ordinary grinding machine. You would do it on the lathe instead. But why do it on a lathe when you can get much better results in the Norton way? The Norton Grinding Machine will do everything but extremely heavy and rough work.

The illustration shows a rough turned roll 2′ 9½″ over all, with a 12″ body and 2⅜″ shaft. In 45 minutes 1/64 of stock was removed from the diameter.

Interesting, isn't it? We have many more such cases to tell you about. May we?

NORTON GRINDING COMPANY

WORCESTER, MASSACHUSETTS, U.S.A.

Canadian Sales Agents: THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

521N

Let the ACORN DIE Cut Your Threads

Die and Holder

THE DIE

The adjustment is mechanically perfect—simply turn the cap and all the prongs of the die converge equally—a great advantage over the spring die.

The Acorn Die Holder is smaller in diameter than any other die holder of equal cutting size.

The float permits the die to follow its own lead.

The die projects slightly beyond the adjusting cap, making it admirably adapted for shoulder work—and the chips are thrown ahead of the work, so the die does not clog.

Will you try the Acorn Die on your own work—under your own conditions?

WELLS BROTHERS COMPANY OF CANADA, Limited

GALT - ONTARIO

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TRADITION

We have a great tradition to perpetuate. The British-made file has always been the standard of file efficiency. It has always had better steel in it, quicker cutting teeth, and been harder and straighter than the files of other nations. That is unchallenged the world over.

Founded on an ideal—the production of Canada's Finest Files—this corporation is entirely Canadian, therefore all-British, and our whole organization is saturated with the maxim—

QUALITY FIRST

P H

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CANADA'S STANDARD

Made in Canada, by Canadians, for Canadians.

ARE YOU FILE-WISE?

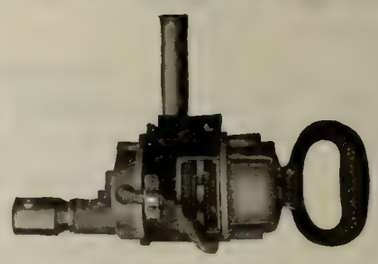
PORT HOPE FILE MFG. CO., LIMITED

Port Hope, Ontario

"Ask your jobber"

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

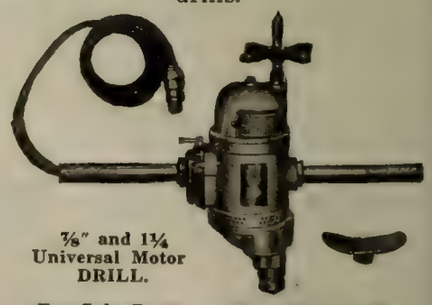
3 SIZES

3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞" and 1¼ Universal Motor DRILL.

For Sale By

The Canadian Fairbanks-Morse Co., Limited

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.

CINCINNATI, OHIO

THE BANFIELD PLUG MILLER

Patented in Canada and United States

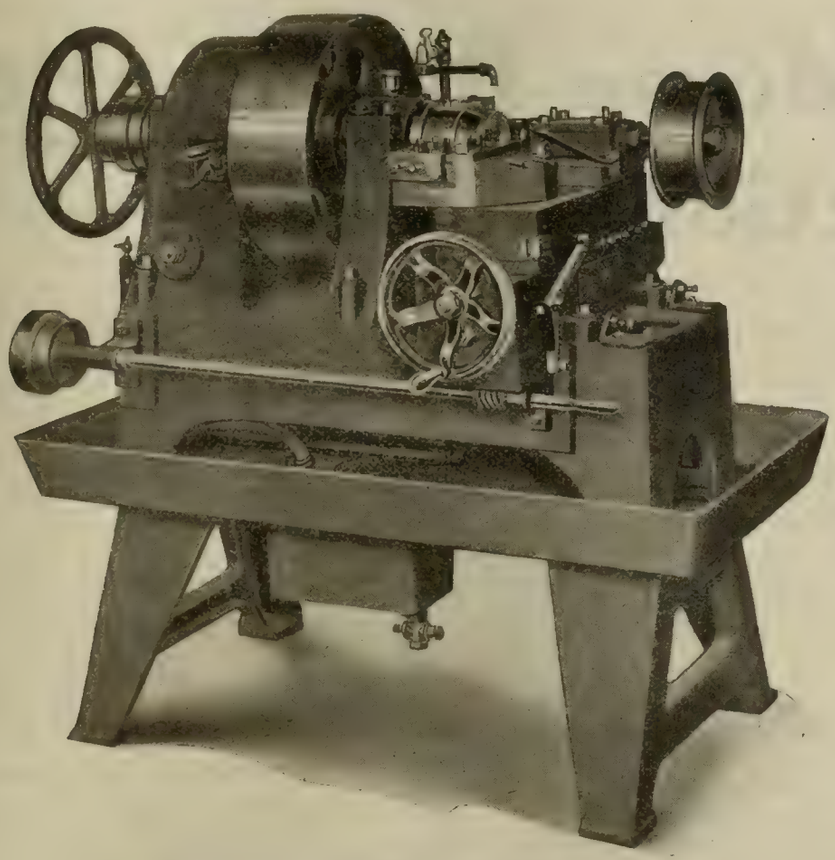
THE COMPLETE PLUG FINISHED IN SIX MINUTES BY UNSKILLED LABOR

A machine especially designed for finishing base plugs, turning the outside diameter, finishing the face with any camber desired and milling the thread—*all in one chucking.*

One man can operate two machines, considerably reducing your cost per plug.

The Banfield Plug Miller is equipped with quick draw in collet.

Drive pulley 18" x 6", with bronze bush having cut jaw clutch for turning and facing. Worm gear 100 to 1 ratio with jaw clutch for milling, driven by 10" x 1½" flanged pulley. The milling cutter is driven by an 8" x 2½" flanged pulley. Tool post carriage is equipped with power feed (two speeds), having automatic stop. Power feed pump with relief valve driven, from worm shaft (all drives direct from main line shaft). Rigidly built; simple and economical to operate.



For Turning and Milling the Thread on Gas Check Plugs for 6-inch High Explosive Shells

Weight 1800 lbs.

For 18-pdr., 4.5 and 60-pdr. High Explosive Shells. Can furnish machines of same type, weighing 1250 lbs. Particulars on request. These machines are tooled up for finishing plain machined or bevel plugs if desired.

BASE PLUGS

Machined to Government Specification

Have in stock for immediate shipment machined base plugs for 4.5, 60-pdr., and 6" High Explosive Shells, either threaded or beveled.

Machine work subject to acceptance of Government inspector at your plant.

Capacity 4,000 *per day.* Write for prices.

EDWIN J. BANFIELD

STAIR BUILDING - - TORONTO, ONT.

Casting End Rings
Making Indestructible Rotors for

Fairbanks-Morse Ball Bearing Induction Motors

By this process rotor bars and end rings are made a unit, eliminating all joints in the rotor.

Ball Bearings require the least attention, are most efficient and are cleanest. They are lubricated with grease instead of oil, and this need be applied only once in a great while.

The bearings have no distinct top and bottom. Thus, to mount the motor on wall or ceiling requires absolutely no change in the motor frame.

We can supply motors with either plain or ball bearings, but we recommend the latter.

Send for your copy of the F.-M. Book, our new 1,000 page general catalogue.

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CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

St. John, N.B., Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

Locomotive Construction from a Maintenance Standpoint *

By W. H. Winterowd **

At no time in the past has the well-being of the country been so dependent on the efficiency of railroad operation as during the last three years. As the moving factor in industrial circles, the railroad locomotive has attained special prominence, and the theory and application of the principles contributing to its success are of special interest at this time.

IT is a question if there has ever existed an enginehouse foreman who has not, at some time or other, had the feeling that if some part of a locomotive had been designed a little differently, he could make repairs quicker, easier and at less expense.

While in many instances he may have been justified in this feeling there are, however, cases influenced by other factors which may have been of greater importance from the standpoint of ultimate economy of operation.

The type and size of a locomotive have an important bearing on certain details of design. A discussion of the factors relating to the selection of the desired type and size is far beyond the scope of this paper as it would involve a thorough consideration of the economics of railway operation. Some of these factors, usually considered from the standpoint of both present and future, are grades, track curvature, train speeds, train resistances, kind and nature of business, size and type of existing locomotives, transportation expenses, maintenance of equipment, and physical conditions such as clearances, bridges, turntables, enginehouses, repair shops, terminal and water facilities, etc.

Occasionally certain of these factors may be such that some detail of the resulting design, while undesirable from a maintenance standpoint, is unavoidable. However, the majority of locomotive details are free from other than purely local restrictions and may be designed almost entirely from a maintenance standpoint.

It should not be inferred from what follows that mechanical and operating men, as well as locomotive builders, have not given a great deal of consideration to the points mentioned. Very many locomotives in service to-day bear witness of such consideration. However, there are at present justifiable reasons for emphasizing and reviewing the importance of locomotive design from a maintenance standpoint.

Present Day Requirements

To-day, under changed conditions, the railroads are being called upon to render greater service than ever before. But little new equipment is available other than that which the railroads may build in their own shops. Repair shops are being worked to capacity. Skilled railway mechanics are scarce. Material of all kinds is difficult to obtain. All of which means that maximum service must be obtained from every bit of existing equipment. It is, therefore, essential to consider every legitimate means whereby the "out of service period" of a locomotive may be decreased and the "in service period" increased.

New an Rebuilt Loco Service

All new locomotives should be constructed to give maximum service with minimum maintenance. All locomotives being rebuilt, or modernized, should be turned out of the shops prepared to give similar results. Any improvement that can be made to any locomotive, new, modernized, or under repairs, which will result in increased service, increased efficiency, or decreased maintenance, will help to increase the capacity of the railroads.

The following covers briefly a few of the points worthy of consideration:

It seems hardly necessary to state that a well designed boiler of ample capacity is easier and cheaper to maintain than one of smaller capacity and which has to be forced continually. The importance of ample capacity can scarcely be overemphasized, either from a maintenance or operating standpoint. Within its limits of weight and size a boiler should be designed to have a capacity as large as possible consistent with other governing factors. In this connection the values of the superheater, the brick arch, and the feed water heater are unquestionable. These values have been practically demonstrated from the standpoint of economy as well as locomotive capacity.

Maintenance Factors

The maintenance of locomotive boilers is an important factor, the greatest difficulties being leaky flues, leaky mud rings, broken staybolts and cracks in firebox sheets.

Knowing that firebox heating surface does a great deal more work per square foot than flue heating surface, boiler capacity does not depend upon long flues. Short flues are the easiest to maintain.

Flue location and spacing should be carefully considered so as to permit easy maintenance, proper distribution of stresses with a minimum amount of staying, and also to facilitate washing out, particularly in bad water districts.

Many failures are frequently the result of crowding in too many flues, placing them too close to the heel of the flue sheet flange, and the use of too small a bridge.

The flue sheet flange radius should be carefully considered in relation to the flue layout. Too small a radius with flues located close to the heel will not give as much flexibility as may be desired and will make the top flues difficult to maintain. Continued expanding of the flues will cause the sheet to flow, often resulting in flange cracks.

The bead on the flues adjacent to the flanges should always rest on the flat surface of the sheet and never on the curved inside surface of the heel.

With two and one-quarter inch, or greater diameter flues it is best that the width of bridges be not less than three-quarters of an inch.

Detail Consideration

Assuming that these points have been taken into consideration, it is important to see that the shop layerout and driller follow the design. There have been cases where a layerout has located flues incorrectly and also added one or more. It is also important that flue sheet holes be drilled the proper diameter as it is almost impossible to keep flues tight in holes that are too large.

The radii of door and back head sheet flanges should be studied in relation to the staybolt stresses. A moderately large back head sheet radius will reduce the stress in outer rows of bolts by transferring a portion of the load to the wrapper sheet.

Too small a door opening radius will frequently result in cracking of the sheet at this point as provision is insufficient for expansion.

Mud ring corners of ample radius will be easy to construct and maintain. Trouble due to small radius has, in many instances, been overcome by electric or acetylene welding the bottom edges of the sheets at this point to the mud ring.

Flexible staybolts reduce staybolt breakage. A careful investigation will indicate the zones of maximum staybolt stress and sheet movement. In these zones the flexible bolts will give good results and reduce staybolt renewals.

Washout plugs should be so located that all points of the firebox and barrel can be easily reached with standard washout equipment.

Grates should have sufficient air space, be as free as possible from dead spots, and be easy to remove. Where certain kinds of fuel are used, properly designed dump grates may be a means of reducing the time the engine is on the ash pit.

As far as possible, all brackets, clamps or fittings applied on the boiler or firebox, should be so located that staybolts, rivets, or portion of caulking edges will be accessible with a minimum of labor.

In connection with the barrel of the boiler, points which may be mentioned are—throttle and dome arrangement which will permit interior inspection of

*A paper read before the Canadian Railway Club, Montreal, Oct. 16, 1917.

*Assistant to Chief Mechanical Engineer, Canadian Pacific Railway.

the boiler without the removal of the standpipe; also the elimination, as far as possible, of all small studs. The latter will apply equally to all parts of the boiler under pressure.

Expansion slides, instead of an expansion sheet, under the front of the mud ring, will eliminate the maintenance of a considerable number of bolts and rivets. Proper consideration of all other expansion sheets will further reduce the maintenance of many bolts and rivets and tend to eliminate the many resulting troubles as well.

The front end, or smoke box, should be arranged to permit of access to all parts with the least possible work.

Frames

Frames should be of ample cross section and well braced to hold them rigid. Maximum cross section may be of little avail unless accompanied by sufficient and properly located bracing.

In this connection, it hardly seems necessary to mention the advantages of a valve gear located outside the frames. The outside gear has made posible better frame bracing, to say nothing of the advantages of easier inspection and maintenance of the gear itself.

As far as possible, bolt holes in frames should not be located where stresses are greatest.

Where cylinder design will permit, a one piece frame with a top tie splice seems desirable. Where large cylinders prevent the above arrangement, a one piece frame with ample depth under the cylinders, and having no reduction in thickness, will give excellent service.

Cylinders

The advantages of outside steam pipes are self evident from the standpoint of both construction and maintenance.

Cylinders should have saddle faces well bolted together to prevent working. All other things being equal a double row of bolts is better insurance than a single row.

Weakening grooves cut in covers will reduce repairs to a minimum in case of failure.

Motion.

All bearing pressures should be as low as consistent with good practice in order to reduce wear and resultant replacement.

Ample pin length is desirable in order to obtain lateral stability.

Arrangement of motion and design of back steam chest and back cylinder covers should be such that both valve stem and piston rod packing will be easily accessible.

Fillets on pins, axles, etc., should be of ample radius. Small fillets are frequently factors in failure.

Where possible a piston rod of sufficient length to permit piston ring renewals without the removal of the rod from the cross head will reduce maintenance cost.

Rod bolts and wedges may be dispensed with by the use of solid bushes. Rods should be designed and arranged so that it may be possible to remove them with a minimum of labor.

The Canadian Pacific Railway has found that knuckle pins with a small extension on the threaded end through which a strong flat cotter can be placed have been excellent insurance against the usual consequences of loose nuts.

Valves of light weight will reduce the load on all valve parts and result in reduced maintenance.

Selection of high grade, close grained, cast iron for cylinder and valve bushes, piston heads and rings, and in some cases rod bushes, is more than warranted in view of the increased mileage obtainable and the corresponding decrease in maintenance.

If conditions permit the consideration of heat treated, or alloy steels, unbalanced forces may be very materially reduced by the use of light reciprocating parts. The reduction of such forces will in turn tend to reduce maintenance of pins, bushings, etc.

Equalization

Locomotives should be equalized so as to secure the most efficient guiding power from both leading and trailer trucks, or wheels. This involves the proper distribution of weight and a means of keeping the proper amounts on the various axles at all times.

In general, the best results seem to be obtained by dividing the equalizing system so that the division between the front and back systems is as directly under the centre of gravity of the locomotive as wheel base and other conditions will permit.

The spring gear and equalizing system should receive particular attention when being erected and also when being repaired. The tops of the driving boxes should be milled out squarely and in a plane parallel with the journal bearings. The equalizer and saddles should be fitted to their seats squarely with the pin holes so that the engine will ride squarely on her springs and track properly. The same will apply to the trailer truck equalizers and spring rigging. Trailer trucks that do not carry the back of the engine level are responsible for much avoidable tire wear.

Spring and Brake Rigging

The application of bushes will facilitate and cheapen renewal of worn parts.

Hangers and their connections should be accessible and easily removable.

A driver brake man felcrum shaft in two pieces of equal length, the outer ends supported in bushed bearings integral with the main frames and the central portion supported by a sleeve, will give more even distribution of braking power and maximum accessibility for repairs and adjustments.

Brake cylinders, if at all possible, should be located vertically, in order to reduce packing wear and provide accessibility.

Brake shoe heads and hangers should be so constructed and hung that shoes will swing clear of wheels when pressure is released and permit easy application of new shoes.

Safety hangers should be provided to support and prevent sagging of brake rods.

The ratio of brake cylinder to brake shoe pressure should be kept as low as consistent, and should not exceed commonly accepted ratios. This will insure that fast travel will be kept to a minimum.

Piping.

The importance of ample clamping and provision for expansion cannot be overemphasized.

Piping should be as short as possible consistent with conditions.

Accessibility is of prime importance.

Piping should be so located that there is no obstruction of washout plugs, arch tube covers, pads, etc.

Where pipes pass through the front of the cab, provision should be made for clearance or for sleeve protection to prevent wearing or cutting.

The Canadian Pacific Railway has found it a decided maintenance economy to place lubricator piping from cab to cylinders, etc., in a slightly larger wrought iron pipe where the feeds pass beneath the jacket and lagging. By this means the feed pipes can be removed or applied without the necessity of removing any outside covering.

Air brake and steam piping should drain properly and contain no traps in which water can accumulate and freeze.

It is desirable that pipes from the sand dome be as nearly vertical as possible, the bottom ends being securely clamped in alignment with the rails.

Miscellaneous

Ash pans should be as simple as possible, and the sides should have sufficient slope to prevent the accumulation of ash under the grates. Swing doors can be suspended so that their own weight helps to keep them closed. This results in less strain on the door operating rigging.

Easy inspection and maintenance results from placing main reservoirs in an accessible location. Where this is impossible and drain cocks are hard to reach, an extension handle, the end of which is easily accessible, makes the reservoir easy to drain.

Removable lines on engine and tender truck pedestals make it easy to take up wear and reduce pedestal renewals.

To prevent rapid wear between wheel hub and liner face and driving box sufficent provision for lubrication should be made.

Shoes and wedges should be so designed that wear can be easily reduced and wedges kept in their proper place with a minimum of labor. Improperly maintained shoes and wedges soon result in increased maintenance of boxes, rods, pins, etc.

Pilots made of scrap boiler flues cost less to maintain than those of wood.

All oiling points should be made as accessible as possible. Handholds or small steps, properly located, to make

oiling points accessible, will soon pay for themselves.

Lubricator chokes should be placed in proper position and located as near to the cylinder, or steam chest, as possible. Proper inspection and maintenance of chokes has been found the key to many lubrication troubles.

The location of the lubricator in the cab where the feeds may easily be seen and adjusted will result in better lubrication. When located close to the front of the cab, or where the light is poor, proper adjustment is exceedingly difficult.

Four pane cab side windows are easier and cheaper to maintain than those containing one large pane.

Boiler jacketing should be applied in sections, so that panels can be removed with minimum of labor.

The foregoing are but a few of the multitudinous details which merit most careful thought. But little mention has been made of the possibilities of simplified design by the use of cast steel. It is felt that with the development of the cast steel industry and the production of castings which are practically equivalent to wrought iron that locomotive construction in the future may be greatly simplified. We are to-day, using castings that ten years ago would have been deemed impossible to successfully cast. For example, one piece locomotive frames are now under consideration and will soon be in experimental service. These consist of the two main frames and all cross braces cast in one pieces. This is an indication of the degree of simplification that may be obtained. The maintenance of such parts has in turn been made possible by the development of the art of electric and acetylene welding.

The foregoing are simply a few indications of the importance of design in its relation to maintenance. To mention all the points that merit attention and to discuss them in detail would be far beyond the scope of this paper.

Good and far reaching results can be obtained by inviting criticism and suggestions from those directly responsible for construction and maintenance.

In conclusion, simplicity co-related with efficiency should be the keynote of locomotive design. This principle, which in other words is simply good judgment, will make for that degree of efficiency which will be reflected, not only in reduced maintenance costs, but also in the increased capacity of the locomotive plant as a whole.

IT IS stated in an American paper that the great guns which the Germans used at the commencement of the war were made of an alloy of molybdenum, in which this ingredient amounted to from 3 to 4 per cent. It is estimated that at present prices 12 in. guns made of an alloy of this kind, containing from 3½ to 4 per cent. molybdenum, would cost 25 per cent. more than with ordinary steel, but the useful life would be increased 2,000 per cent.

Features of Canada's Production of Munitions *

By Brigadier-General Sir Alex. Bertram

The results of Canada's participation in munition production have had a stimulating influence on the industries of this country, which, responding thereto, have demonstrated and brought into actual productive state many fields of endeavour and resources which otherwise might have remained more or less dormant for years to come.

FORTY years ago, in Canada there was practically no basic industry, beyond that of agriculture. A Canadian National Policy was devised as a nursery of Canadian Industry. Its provisions were merely so many practical devices for warding off the ailments of our infant industries. There were far-seeing men in those early days who knew of the great natural resources of our broad Dominion and who visioned what has come to pass. Yet it was the holocaust of war which has really made Canadians know Canada. Through the fiery furnace of the great conflagration we have been brought to the actual realization that the vision of our forefathers were not the dreams of speculative optimists.

BRIG.-GEN. SIR ALEX. BERTRAM.

That we had more than a country of magnificent distances, and that even our mountains and rock bound coasts were mines of infinite wealth was admitted in a general way within the present decade, but only practical men can realize the difficulties, or some part of them, which confronted those who first tried to organize and convert our great metal deposits into an efficient machine for the supply of munitions to the British Empire and our Allies.

Men, Money, Metals

Out of the chaos and crime of this awesome war, Canada has learned that her natural resources are now actual and active and that she has contributed the three great essentials of war—men, money and metals—in generous quantity and in superb quality:—that we shall benefit from this development in the years and the ages to come is what you must know and feel.

Let me preface or illuminate the figures which I am about to give you; we have shipped in shells a sufficient tonnage to build nineteen bridges across the St. Lawrence River, each bridge equal to the size of the Quebec bridge. We talked a few years ago of contributing three battleships; our tonnage in shells shipped to the Empire would build sixty-six battleships of 18,000 tons each.

My remarks deal only with munitions. What Canada has done and could do, could be written in other chapters of industry. It is my purpose therefore, to speak only on the manufacture of munitions in Canada and also to place before you a statement of the quantity of shells and the weight of material, in steel, copper, spelter and lead required to complete the orders given by the British Government.

The introduction of the refining of copper and spelter is a new industry in Canada. The Consolidated Mining & Smelting Co. of Trail, B.C., are producing 360 tons of copper, 1700 tons of lead and 1200 tons of zinc per month. This taxed the capacity of all our steel producing and refining plants. There were also new plants organized for the manufacture of all kinds of explosives.

Ships and Aeroplanes

Concurrently with the carrying out of the production of munitions as indicated above, the Imperial Munitions Board was given large contracts for the building of ships of all sizes. Few men but those who live by the lake and sea know that huge contracts for ships are being carried to completion daily, and that every old shipyard and many new shipyards are working day and night. In connection with this, I may here make a suggestion to Timid Capital. The component parts of ships are all made in Canada with the one important exception, we have to import all the rolled plates for the steel ships. It only requires this one industry to balance up the component parts of shipbuilding. I am pleased to state that this is now under serious consideration.

The manufacture of aeroplanes was introduced about eight months ago and to-day is an excellently developed organization, producing upwards of one hun-

* Read before the regular metting of the Montreal branch of the Canadian Society of Civil Engineers.

dred (100) aeroplanes per month. Plans are being put into operation to double this output immediately.

In addition to this, the Board have established plants for the manufacture of nitrocellulose powder, T.N.T. and cordite.

The production of these factories are enumerated herewith:—

Shell		Tons
18-pdr. Shrapnel	27,931,714	189,556
18-pdr. High Explosive	5,300,908	71,559
4.5" H.E.	8,738,470	235,893
60-pdr. H.E.	1,097,317	48,281
6" H.E.	2,959,626	233,310
8" H.E.	747,190	113,106
9.2" H.E.	744,179	168,155
Total	47,519,404	1,029,860
Cartridge Cases		Copper and Brass
18-pdr. Cartridge Cases	30,188,904	
4.5" Cartridge Cases	9,466,523	
Total	39,655,427	20,768 tons
Shell Forgings Exported		
18-pdr. Shrapnel Forgings	447,112	
4.5" H.E. Forgings	3,574,214	
6" H.E. Forgings	899,711	
Total	4,921,037	138,498

Propellants and Explosives

British Chemical Co. T.N.T. Produce about 40,000 lbs. per day, nitrocellulose powder about 80,000 lbs. per day. Approximately 46,000,000 lbs. of T.N.T. has been manufactured since the commencement of the war. The number of boxes required for all sizes of shells and explosives runs up to about 25,000,000.

Cordite

The production of the British Cordite Co., Ltd., will reach in the neighborhood of 2,000,000 lbs. per month.

Time Fuses

British Munitions in Montreal.—This was also a new industry and plants were organized for this purpose and when operating at full force they produce 40,000 time fuses per day.

Acetone

I might state in connection with this, that one plant was volunteered for this purpose and is to-day producing over one hundred (100) tons per month. It is a model of perfection and has been reliable and a satisfactory source of supply of this commodity, which is used in the manufacture of cordite.

Electric Steel

When a year ago there appeared to be a shortage of steel the Board established an electric steel melting plant for the purpose of utilizing the scrap material. This plant is almost completed and today is producing steel for the British Government. They expect to reach approximately 4,500 tons per month.

The total value of all munitions and supplies purchased since the inception of the shell making industry from September 1914 to September 1917, is approximately $700,000,000. The work carried on embraces no less than 400 factories and plants in the Dominion, three-fifths being directly associated in the production of shells and two-fifths associated with the production of components, basic supplies and shipbuilding. The object, from the inception of the manufacture of these shells was to produce the finished article from the raw materials found in Canada's own mills and mines. This has been done. The shells have been made in Canada from fuse to cartridge cases.

The Imperial Munitions Board has accomplished a great work in the present and has presaged a great future for the industries of Canada. When the history of their accomplishments may be written; when the stories of how they have had to surmount adverse conditions can be told without reservation; then only will you know, as I know, what a magnificent and stupendous work has been carried out for the benefit of and for the future of the Dominion of Canada.

ROUGHING OUT LUMBER FOR AEROPLANE CONSTRUCTION IN A LONDON, ENG. FACTORY.

EFFECT OF STORAGE ON COAL

A REPORT on the deterioration in the heating value of coal during storage, covering a five-year period, has just been issued by the Bureau of Mines, Department of the Interior, as Bulletin 136, Horace C. Porter and F. K. Ovitz being authors.

The tests show that the amount of deterioration of coal in heating value during storage has commonly been overestimated. Except for the sub-bituminous Wyoming coal, no loss was observed in outdoor weathering greater than 1.2 per cent. in the first year, or 2.1 per cent. in two years.

The loss in heating value is given for New River and Pittsburgh coals during five years' storage in the open air and under water, for Pocahontas during two years' storage in the air, and for Sheridan, Wyoming, coal during two and three-quarters years' storage in the air.

The tests with New River and Pittsburgh coal were made to determine the advantage to be gained by storing coal under water, and particularly under salt water. The results show that storage of New River coal under water effectively prevents deterioration of calorific value and that storage in the air under severe conditions causes only small deterioration, about one per cent. in one year's exposure and about two per cent. in two years. After two years the loss is continuous but slow, reaching 2.5 to 3 per cent. in five years. The deterioration of Pittsburgh coal during one year's open-air storage was practically negligible. During the second, third, fourth and fifth years the deterioration proceeded very slowly and did not reach an amount greater than 1.1 per cent. in five years. The submerged portions suffered no loss measurable by the degree of accuracy of the methods used.

The tests of Pocahontas coal, a semi-bituminous type, were undertaken chiefly to determine the effect of tropical conditions in Panama. They were made on an outdoor pile of 100 tons of run-of-mine coal. During two years' outdoor exposure this coal deteriorated less than one per cent. in heating value.

The Sheridan, Wyoming, sub-bituminous coal, known also as "black lignite," is commonly supposed to deteriorate rapidly in storage, especially by "slacking" or crumbling of the lumps. Under the conditions of the tests this coal lost 3 to 5.5 per cent of its heat value in two and three-fourths years' storage, the greater part of this loss being in the first nine months. In general, the lumps became badly cracked, but retained their form sufficiently to permit ready access of air. However, they were weakened so that they broke up badly on handling. By the use of bins with air tight bottoms and sides and a protecting layer of fine slack on the surface, the deterioration of Sheridan coal in heat value can probably be kept below 3 per cent. in one year, and the physical deterioration can also be largely prevented in the under portions of the pile.

The results show that the amount of deterioration of coal in heating value during storage has commonly been overestimated. With coal such as New River and Pittsburgh the expense of underwater storage equipment is not justified

except as a preventative of fires from spontaneous combustion.

Detailed results and a full account of the tests and analytical data are given in the bulletin, which may be obtained free of charge by addressing the Director of the Bureau of Mines, Washington, D.C.

SHELL MANUFACTURE SHOWN BY MOTION PICTURE

By R. Hamilton.

TO the average layman the mention of moving pictures conveys no other meaning than a brief sojourn at a regular "movie" to wile away a pleasant hour; but that this art has a deeper and wider purpose for enlarging on the present methods of industrial and scientific education was amply demonstrated at the regular monthly meeting of the Montreal branch of the Canadian Society of Civil Engineers, when through the courtesy of Brig.-Gen. Sir Alexander Bertram the members and their friends were favored with a highly interesting and instructive summary of what has been accomplished in Canada during the past three years, in connection with the manufacture of muntions of war, and also the component parts.

Apart from the figures submitted by General Bertram, showing the magnificent but stupendous achievement of Canadian manufacturers in undertaking and placing upon a successful footing an industry that has rapidly attained to front rank in the country's activities, the feature of the evening was the showing of five reels of motion pictures illustrating in every detail the production of the 8-inch high explosive shell from the blast furnace to the forge, through the successive detail operations of machining and packing, and thence their transportation to the field artillery, the last reel including actual scenes from the French battle front. The pictures were reproduced upon the screen in such a vivid manner that the impression was almost one of actual observation of the work in the shop. To those unacquainted with modern practice in shell-making, and also to many who were thoroughly conversant with plant methods, the pictures were a revelation; not so much respecting the shop work, but in the remarkable clearness with which every detail was reproduced, amplifying the possibilities of the motion picture as an educator of the highest standard.

HOW TO MAKE YOUR OWN LOG TABLE

Have you ever been "out in the woods" away from a table of logarithms and "up against it" simply because you didn't have any logarithms to work with?

If so, this rough method of finding approximate logarithms will doubtless interest you. It is simple and very easily remembered.

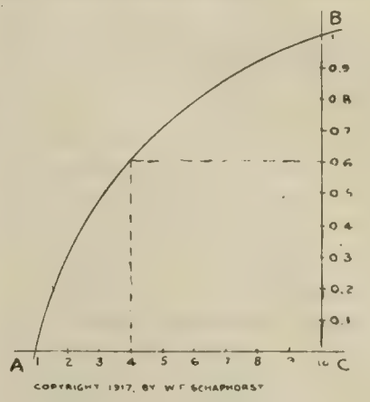
HAVE you ever been "out in the woods" angles to each other. From the intersection lay off nine equal spaces to the left as shown and mark them 1, 2, 3—10 from left to right.

Then lay off ten equal spaces upward from the intersection as shown and mark them 0.1, 0.2, 0.3, etc. Then, with the extremes A and B as centers, and distance AB as the radius, locate center D. From that center describe the arc AB.

We are now ready to read off our approximate logarithms. For example, what is the logarithm of 4?

The dotted line shows how it is found. It is just a "hair" more than 0.6.

Anybody familiar with logarithms will now understand the rest.

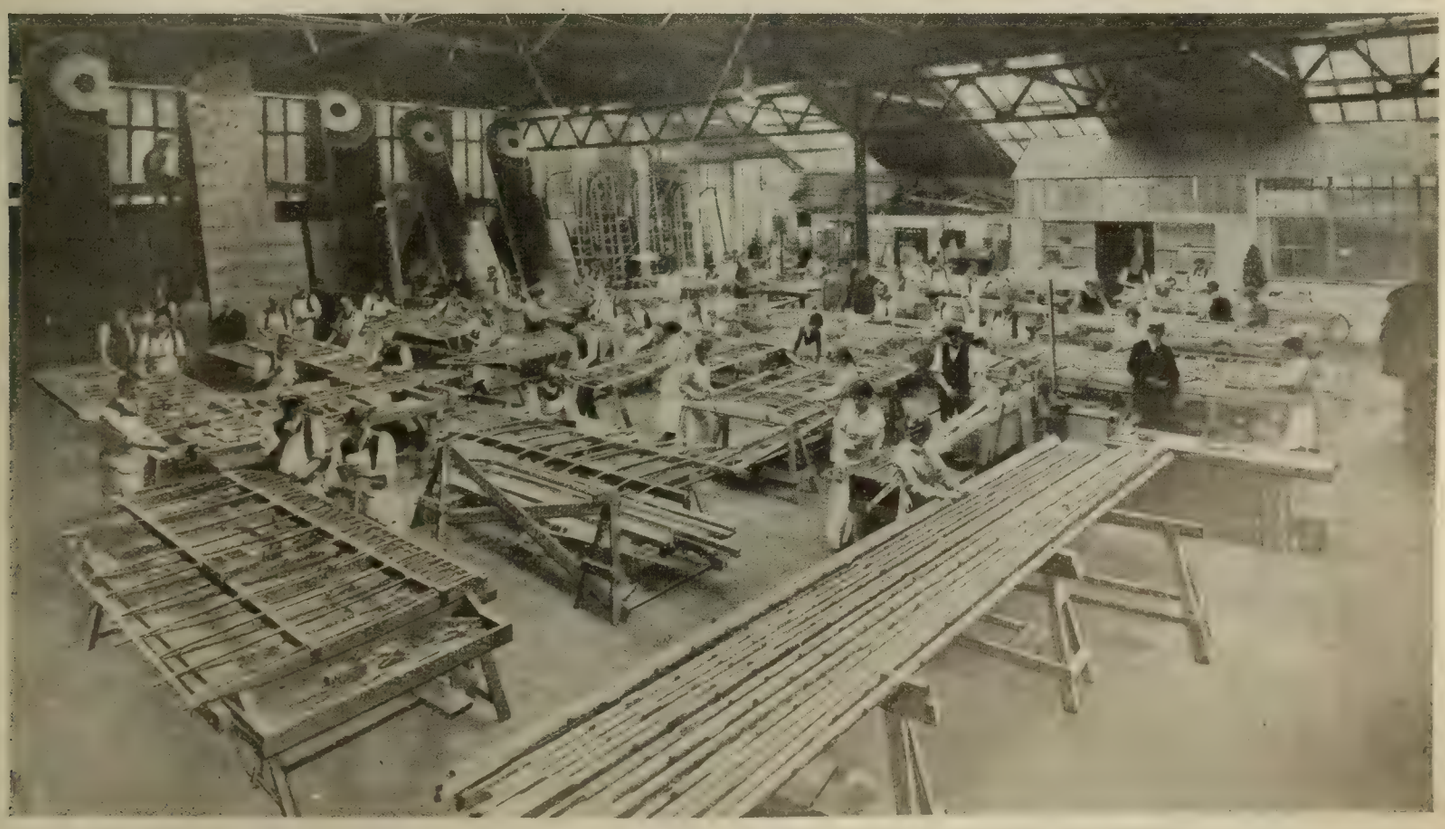


LOGARITHIM CHART.

It is more convenient, of course, to make the drawing on squared paper, but if such paper is not handy one can easily do without and use plain paper.

Of course, this is not claimed to be "better" than a logarithm table, nor is it as good, but as an approximate method results will be found to be "pretty close" to the tabular results. Best of all is its simplicity and the ease with which the method can be remembered. Do it once and you will never forget it.

Wm. Murdoch, C.E., city engineer of St. John, N.B., died suddenly on Oct. 8, of apoplexy. Mr. Murdoch was born in Paisley, Scotland, 69 years ago.



VIEW OF ASSEMBLING DEPARTMENT WHERE AEROPLANE WING FRAMES ARE PUT TOGETHER.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

THE MANUFACTURE OF TAPS FOR FUSES

By H. James.

THE manufacture of fuses has developed many new processes and revived many old recognized methods, but the extreme inspection demands have brought forth attention to detail that many makers had previously failed to consider.

The greatest difficulties experienced seem to have been caused by the failure of machines to line up correctly or to remain so under the exceptional demands put upon them. Working from different ends of the fuse instead of from the same end, and the evils of frequent rechucking have been contributing factors in producing inaccuracies. Yet not all of these points are the sole causes of rejections. Threads have given their quota of difficulties which are partially due to the not-go plain plug or plain ring gauges which measure the root or outside of the threads.

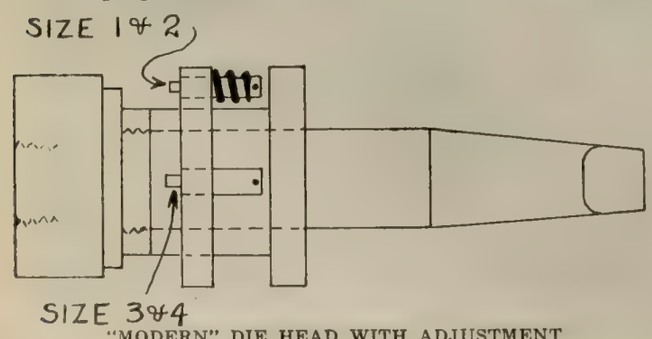
CAP WITH PRICK PUNCH HOLES FOR MARKING DIE, AND BLOW PIPE NOZZLE FOR DRAWING BACK PORTIONS OF DIE MARKED X.

The difference between the root diameter of the go thread and the not-go plain plug or ring diameters varies from .008 to .010 in., and the sizes of commercially produced machine taps vary from .003 to .008 in., consequently specially made taps are necessary in order to obtain the required results.

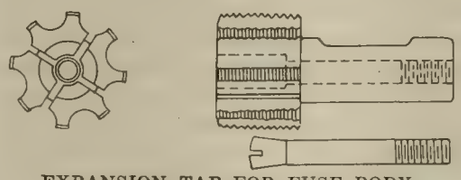
Problems Involved.

The making of accurate taps for cutting brass was an operation few were accustomed to perform. Some of the problems were how wide should the lands be, how many teeth should there be, how should they be hardened and how should they be ground, should they be relieved, and how should the lead of first teeth be ground.

These are not all the important factors, as the size of the hole to be tapped is of great importance as is also the action of tap in going in and coming out. Small sized taps wear out and break so rapidly that their manufacture is a production proposition.

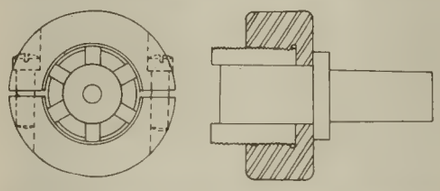


"MODERN" DIE HEAD WITH ADJUSTMENT FOR FOUR SIZES.



EXPANSION TAP FOR FUSE BODY.

The master taps for making dies were made on a bench lathe having an accurate lead screw. There were only ten to each set, and each tap cut .002 in. With these taps two spring dies were made. These dies had three lands which provided enough strength and gave enough chip room. The metal marked on sketch was drawn back with a gas flame controlled by a special nozzle screwed to the regular torch. This nozzle had a hole 1-64 in. in diameter, which permitted of a fine jet of flame. In making these dies,



TAP FITTED WITH INSERTED CHASERS.

instead of laying off the holes on each separate pieces, a convenient piece of brass stock was bent to form a cover which fitted over the die blanks like a cap. This cap had centre punch holes drilled through and all that it was necessary to do was to place the cap on a blank and centre punch mark through the holes. After the three holes were drilled, they were plugged with drill rod and the tapping hole drilled and tapped. A Modern die head was now rigged up with a special shank to fit in a lever feed tailstock and with a bearing surface back of die head proper, just long enough to hold a collar and sliding bush. This bush held two filler blocks which were oblong in section and which varied .003 in. on each size, making 4 sizes in all.

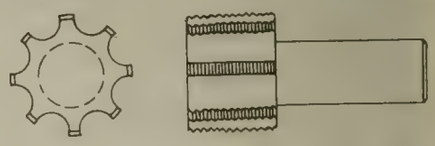
The drill rod for the taps was cut to length and had one end chamfered the correct angle for lead. These pieces were held in the bench lathe with drawback collet chucks and the die head run over them. The Modern die head is so arranged that by now putting in each filler block in turn and pulling it out before it jambed, it was possible to further reduce the size of blocks. These filler blocks were placed in between the die block and lug. The last two reductions of .002 in dia. were done with the special dies, also held in a floating holder held in the tailstock. All taps were, however, completed with die-head and then regripped in collet for each succeeding operation. In this way 15 taps were produced in each hour.

The fluting of taps was done on a bench lathe equipped with milling attachment. Hardening was done in a small electric furnace at 1,475 deg. Fahr. and in drawing them back to an orange straw, a bench forge was utilized by placing a plate on it, and on this plate the taps were placed. As they arrived at the correct color, another tap was rolled on which rolled the one to be drawn, off into the water and the others progressed, being one tap nearer finished. The smaller sizes, say .164 in. in diameter were made with three teeth in order to provide sufficient chip room. It was found that taps must be allowed to run themselves out without pulling or forcing them, or they would cut large. They should not be relieved on the straight part or the chips are liable to

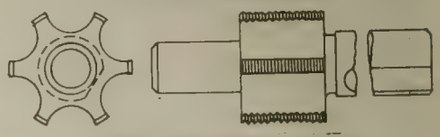
STRING OF CHASERS BEFORE SEPARATING.

wedge in the tops of the threads which will be spoiled.

In making commercial taps, male or female gauges may be used for sizing, but for fuse work the taps must be made to size or be adjustable. The smaller sizes are, of course, too small, but for the larger sizes it is a profitable design to have them adjustable, as each fraction of a thousandth wear can be taken up by packing behind chasers. Two approved designs are shown. The expansion type is not so successful as the inserted chaser type, as it is difficult to get the teeth to expand evenly after hardening. If, however, a thin wall of metal is allowed to remain between teeth after milling and after the hardening is done, this



TAP USED FOR CUTTING DIES FOR FORMING CHASERS.



HAND TAP WITH PILOT.

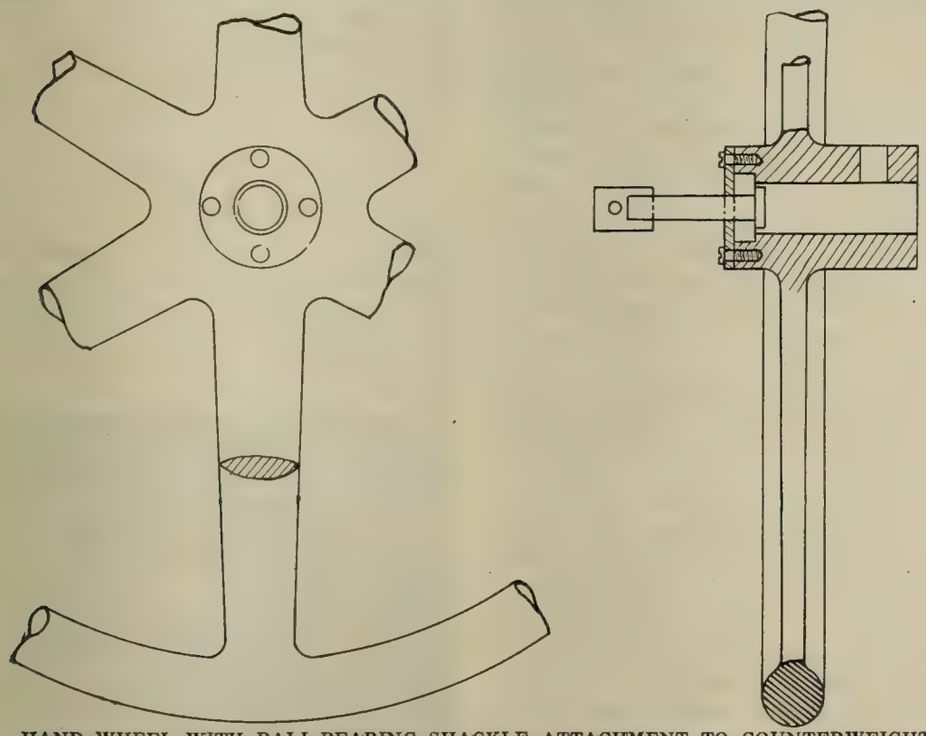
metal is ground away some of the difficulty will be eliminated.

Inserted Chaser Taps

The inserted chaser tap is very effective, because as the machine bearings or tool holders become worn, the differences due to the drills and taps being out of line and cutting large, may be com-

pensated for by grinding off the back of chasers. In making these chaser taps for this class of work, great care was taken to make the bottoms of the slots in holder concentric with the stem or shank. After chasers were inserted, the holders were placed between centres and the lead ground, care being taken that the angle was not the same as the chamfer or recess in work which was to be threaded. If the angle was the same, it was found to be difficult to get the tap to start. All threads on taps were cut with a very smooth finish and after hardening they were dipped in a little oil containing emery flour and the threads held to a wire revolving brush. Instead of grinding off the heel of chasers as it is necessary to do for the larger sized taps, they were cut larger in diameter and in strings as the sketches show. The strings of chasers were cut with a rivet dock which hastened operations. Taps with teeth cut radial and with a slight rake gave the greatest satisfaction.

Hand taps for final sizing or rectifying were made with a pilot which greatly facilitated starting the thread, all the more so when the regular wrenches were abandoned in favor of hand wheels which made it possible to accomplish half the job with the centrifugal force due to the weight of the rim. Girls or women performed the hand tapping and in nine hours as many as 1,500 fuse bodies have been tapped, although the general practice was 1,200.



HAND WHEEL WITH BALL-BEARING SHACKLE ATTACHMENT TO COUNTERWEIGHT USED FOR HAND-TAPPING OF FUSE BODIES.

THINGS ANYBODY CAN DO?

By D. A. Hampson.

BUILDING a fire in the forge and dressing an emery wheel! Anybody can do those things, you say—and yet if you come right down to the fine point, few mechanics can do these homely but important tasks well.

Building the Forge Fire

While any man can build a fire of some sort, not every one can build a forge fire in a room occupied by other workmen without almost smoking them out. Following the few simple rules will make this easy. To begin with, scoop out the coal over the tuyers down to the lining of the forge or to the pan itself if it is unlined, making a pocket that will just about hold a double handful of shavings. More shavings than this are unnecessary. If shavings are not available, use excelsior wadded into about the same size. Waste will do in a pinch, but is open to several objections, principal of which are the odor from burning, greasy cotton, and the loss of expensive material, for in these days it pays to have waste washed.

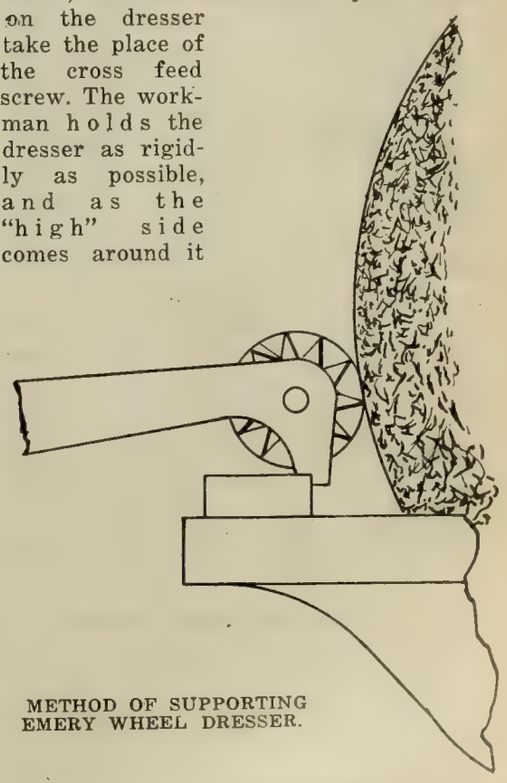
The pocket made in the dead coal is better than scraping the coal all away, for it starts the fire in compact form and prevents many a lost start. As soon as the shavings are lighted, begin to throw on pieces of coal that have once burned—not fresh coal or clinkers—and turn on the blast gently. If the blast is started too hard, the shavings will burn so quickly that the coal does not get a chance to ignite; what is wanted is just enough air to keep the fire going and furnish free, smokeless combustion for the shavings, but at the same time, to burn slow enough to give the coal a chance to "catch." Following the flame with a light covering of coal—not too much in the middle—will produce in less time than it takes to tell it, a small but live fire that may be enlarged if it is so desired. And the best part of it is that the trick could be turned in your own parlor without creating any smoke that you could notice.

Dressing the Emery Wheel

It is hard to impress upon the minds of many mechanics the fact that the wheel on which they sharpen their tools must in turn be sharpened and have the nicks taken out of it. Not many jobbing shops possess a diamond, but they all have one or more emery wheel dressers around somewhere, that use fluted or star wheels, or cutters. These wheels present a broken area of contact to the emery wheel or grindstone and as they revolve with the latter, they cannot slide along and fill or glaze as does the work being ground. As they revolve, the hardened points cut or break up the surface of the grinding wheel, thus exposing new, sharp grains for working. A few passes across a grindstone or emery wheel will do this sharpening.

But through the carelessness of workmen the face of grinding wheels gets grooved and dug up, and, worse still, they get flat spots worn on them producing what appears like a wheel out of round. To restore the wheel to a round again requires something more than following across with the dresser. The high side must be turned off and the process is similar to a like job in the lathe, but the tools used are the dresser and the work rest of the machine; in case the latter is of odd shape, a bar of steel and two C-clamps will answer.

The drawing shows how the work is done. The dresser is the cutting tool, the bar of steel corresponds to the cross slide, and the hands aided by the hooks on the dresser take the place of the cross feed screw. The workman holds the dresser as rigidly as possible, and as the "high" side comes around it is cut down, each revolution taking a little more. In doing this, the work is started on that part of the wheel that is largest in diameter and a cross movement imparted to the dresser so it doesn't cut grooves in the wheel just as would a piece of work held in one place. Keeping up this cross movement with the handle of the dresser held fixedly in one place and gradually raising it, will cut the stone down to a true cylinder. But it takes care and it couldn't be done except from the steadying provided by the hooks on the dresser.



METHOD OF SUPPORTING EMERY WHEEL DRESSER.

PATTERNMAKING NOTES

By J. W. Broadbent.

Contraction of Castings

WHEN cast iron and other metals are in their molten state they occupy more space than when cooled off to the temperature of the atmosphere; in the natural process of cooling they contract, and, therefore, it is necessary to make the mould into which such metals are poured larger in such proportions as have been found by practice to govern the contraction of different metals.

Shrink Rules and Their Use

To enable the patternmaker to build up his patterns, with the necessary allowance for this contraction of metals without wasting time making approximate calculations, what is commonly called a shrink rule is used. Shrink rules are made longer than the standard rules of measurement, and are graduated proportionately, for instance: the foot rule generally used for measuring a pattern from which a casting is required in cast iron would be exactly ⅛ in. longer than the standard rule.

For general work the following contractions have been found to work out fairly well:

Cast Iron—	
Small castings with cores	⅛ in. per ft.
Large thick castings	1-16 in. per ft.
Beams and girders	1-10 in. per ft.
Large cylinders	3-32 in. per ft. dia.
Small cylinders	1-16 in. per ft. dia.
Malleable iron	3-16 in. per ft.
Steel	3-16 to ¼ in. per ft.
Brass—	
Thick castings	5-32 in. per ft.
Thin castings	3-16 in. per ft.
Copper	3-16 in. per ft.
Aluminum	17-64 in. per ft.
Zinc	5-16 in. per ft.
Lead	5-16 to ¼ in. per ft.
Tin	9-32 in. per ft.
Silver	⅛ in. per ft.

These rules, of course, will not hold good in every variety of castings, and must not be taken too literally, as cases happen in the moulding shop which knock all one's pet theories on the head, for it is only by practice and observation that just the exact allowance for contraction can be given in special classes of work.

A heavy casting will contract less than a light one, and hard white iron will contract more than soft grey iron, as also different mixtures of iron will contract differently.

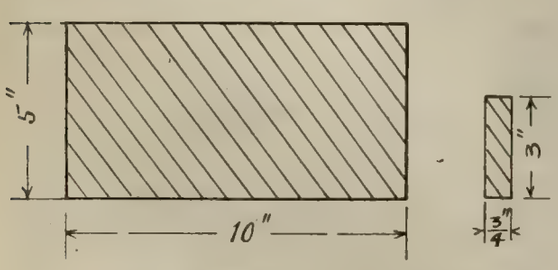


FIG. 15.

Cores will often prevent the free contraction of a casting, and the rapid or steady lowering of the temperature of the metal in cooling also has an influence on the ultimate size of the casting.

There is always an element of uncertainty about the contraction of a badly proportioned casting, and where heavy and light sections are combined there is danger of the casting cracking from the unequal contraction, making it necessary for the moulder to expose the heavy parts to the air as soon as the solidity of the metal will admit of it. A good example of uneven contraction is a pulley with a heavy hub, where the thin rim contracting faster and more than the arms and hub, often causes the arms to crack, the reason being that the metal in the thin rim has become solid, and is already contracting while the heavy hub is yet in a semi-molten state. When the hub solidifies it contracts, pulling the arms with it and causing a strain which will make the arms crack when the pulley gets a slight jar.

Importance of Proper Proportions

The patternmaker in a small shop where no draughtsmen are employed has often to design his own jobs, and it is necessary that he should be able to produce work in proper proportions, and not put a big heavy hub on an otherwise light pulley, or heavy ribs or flanges on a weak casting, thinking by doing so that the casting is strengthened. Some castings having heavy ribs crack much sooner than if the supposedly strengthening pieces were left off altogether owing to the strains caused by the cooling of the metal.

As an illustration of the unequal contraction of light and heavy castings, we will assume that two bars are cast, each 12 ft. long, with the sections shown in Fig. 15, one being 10 in. by 5 in. and the other 3 in. by ¾ in.

Upon measurement of the cooled castings it will be found that the light one has contracted twice as much as the heavy one.

Theory of Contraction

The most plausible theory that can be presented for this unequal contraction is that some parts of a casting must cool faster than others, and it naturally follows that the outward portions—these being nearer to the sand of the mould—must be the first to solidify. In the heavy casting the outside commences to cool, and also endeavors to contract, but owing to the mass of metal inside this crust being in a semi-molten condition, and not yet in a state of contract, the outside is held in tension.

There is a certain feature in the nature of iron that permits its particles to be stretched to a certain limit, but when this limit is exceeded the result is a cracked casting. As the inside begins to cool and tends to contract, the outside has by this time lost most of its heat and contracted about all it can, thus forming a resisting force and preventing the natural contraction of the inside portion. In the light casting there are none of these conflicting forces to contend with, and it, therefore, contracts about all that the grade of iron composing it naturally calls for.

Effect of Rapping

Small castings, say, 6 in. or under in size, will generally come out as large, and sometimes larger, than their patterns, owing to the moulds becoming enlarged by rapping the pattern. In theory, the shrinkage of a casting 3 in. long would be 1-32 in., and it is easy to see that it does not need very much effort for a moulder to enlarge a mould to that extent. In machine moulding, where the loosening of the pattern is reduced to a minimum, there will necessarily be the average variation in size between the casting and pattern.

Another effect of the variation in sections of a casting is to cause the casting to "buckle" or "warp," and it is impossible to lay down any reliable rules as to how much this warping will be. The only guide as to how much a pattern must be rounded in the opposite direction to that in which the casting will go hollow is by observation and experience. The rule appears to hold good that a long light narrow casting will warp more than a broad heavy one, and a slight excess of metal in a light casting will cause a curve in the direction of that excess.

A TAILSTOCK DRIVE

By A. L. Loy.

HAVING a great deal of boring and facing to do on certain parts, and the shop not being provided with a turret lathe, it was decided to rig up one of the standard engine lathes, so that these two operations could be carried on simultaneously. The feed shaft was provided with a sprocket at the end, this in turn driving another shaft in the centre of the bed, one bearing being in the end of the bed, while the other was carried on a bracket extending down from the tailstock. A small sprocket on this shaft drove the one just inside of the hand wheel, and which could be connected to the same by inserting a pin through the two. The size of the sprockets was such that the feed was just one-half that of the cross feed. This arrangement worked very satisfactorily and resulted in a considerable saving on such jobs as could be handled in this manner.

TAILSTOCK SPINDLE DRIVEN FROM LEAD SCREW.

STEEL CONDUCTORS FOR ELECTRICAL WORK

By D. Street.

GERMANY set the fashion in the use of steel conductors for electrical light work indoors, because, as all the world knows, she requires all the copper she can get hold of for her shells, but now America is following suit because copper is dear; the war has sent up the price to figures that copper mine owners have only hoped for; and now British electrical engineers are also turning their attention in the same direction. Every one is talking of the big bill to be paid after the war and how it behooves everyone else to be saving in every possible way to help pay the bill. After the war it is more than probable that there will be a good deal of inside wiring done in buildings for electric light and power. The metallic filament incandescent lamp enables electric light undertakings to compete very favorably with gas, even in towns where gas is cheap and electricity dear, while the advent of the half watt lamp promises to enable the electric light to sweep the board. In addition, electricity is becoming more and more used in plates of business and private houses for heating and power. Electric cooking is also steadily making its way, as well as the heating of offices and rooms in private houses that are only used occasionally; the latest one price hotels in London have electric fires in all the bedrooms.

All this means more and more small insulated electrical conductors; a great deal of copper. If iron or steel can be substituted for copper for all conductors below a certain gauge, there will be a great saving in copper that can, of course, be used for other purposes; and there should be a considerable saving in cost.

Relative Efficiency

Iron and steel wire of any given gauge, the small gauges for instance used for the bulk of inside work, is only a fraction the cost of copper wire of the same gauge. Iron and steel have electrical resistance six and seven times that of copper; but in a very great number of cases, if the matter is carefully gone into, it will be found that the increased resistance is not of much consequence. The smaller currents required for the metallic filament and half watt lamps allow of distributing conductors of very much higher resistance being employed with the same result at the lamps.

According to the rules issued by the Institution of Electrical Engineers, a total drop of three volts only is allowed, practically inside a building; but a drop of three volts with a certain number of the old carbon filament lamps, taking anywhere up to four watts per candle, is a very different matter from a similar drop with either the metallic filament lamp or the half watt lamp. Merely substituting half watt lamps for carbon filament lamps, where this is practicable, should enable the resistance of the distributing conductor to be increased by at least the difference between the resistance of copper and steel. And this is not all; by the rules of the Institution of Electrical Engineers, no copper conductor is allowed to be employed for work of the kind mentioned of a smaller gauge than No. 18 S.W.G. The reason for this is a purely mechanical one. The passage of an electric current through any conductor tends to make it brittle, particularly at the points where connections are made to terminal screws and at joints; with the result that if the wires employed are allowed to be too small there is a strong tendency for them to be continually breaking at those joints. When joints are made also, as is well known, it is difficult to leave the metal conductor on each side of the joint in the same condition as before the joint was made; there is an increasing tendency to brittleness. Soft steel wire, such as could easily be drawn, would have a very much higher tensile strength than coper wire of the same gauge; and if properly drawn and properly handled should be very much stronger in every way; in fact, so far as mechanical strength is concerned, it should be quite safe to employ soft steel wire of No. 20, and even smaller gauges. The soft steel wire should stand the handling of careless wiremen very much better than copper wire, so that there should be a considerable gain all round.

Manufacturers of insulated wires who have to tackle the problem of insulating the iron wires very carefully, but there is no reason to suppose that there would be any difficulty about the matter; it is more than probable that carefully drawn soft steel wire would be more easily covered with an insulating envelope than copper wire.

Possible Hysteresis Loss

One objection to the use of iron or steel wire is the possible loss that may arise from hysteresis in the wires themselves. It will be remembered that when a current of electricity passes through a conductor it creates a mannetic field around the conductor; and every magnetisable substance meeting the lines of force thrown out from the conductor, responds to them. As the great bulk of electric lighting is now done by the aid of alternating currents, this means that each of the wires forming a pair of conductors, if they were of iron or steel, would be magnetized alternately fifty times a second, or whatever their periodicity might be; and there would be a certain consumption of energy in accomplishing this.

For the small conductors employed for indoor work the loss due to this would be very small; it would be merely an addition to the loss due to the power factor of the whole system, and not a great addition. It is found of advantage to employ alternating currents for distribution, for light, heat and power, notwithstanding the undoubted losses due to the power factor, even under the most favorable conditions, and the small aditional charge due to the employment of iron or steel wires for indoor work would be really inappreciable. It should be remembered too, that cables carrying alternating currents are armoured when they are laid in the ground; known that there is a resultant magnetic field produced outside of the conductors, which is constantly changing and which must lead to hystersis losses in the armour of the cable or in the iron piping; the additional loss due to the use of iron or steel wires for the conductors themselves should be quite negligible.

SULPHUR FROM GAS ENGINES AND ELECTRICAL EQUIPMENT

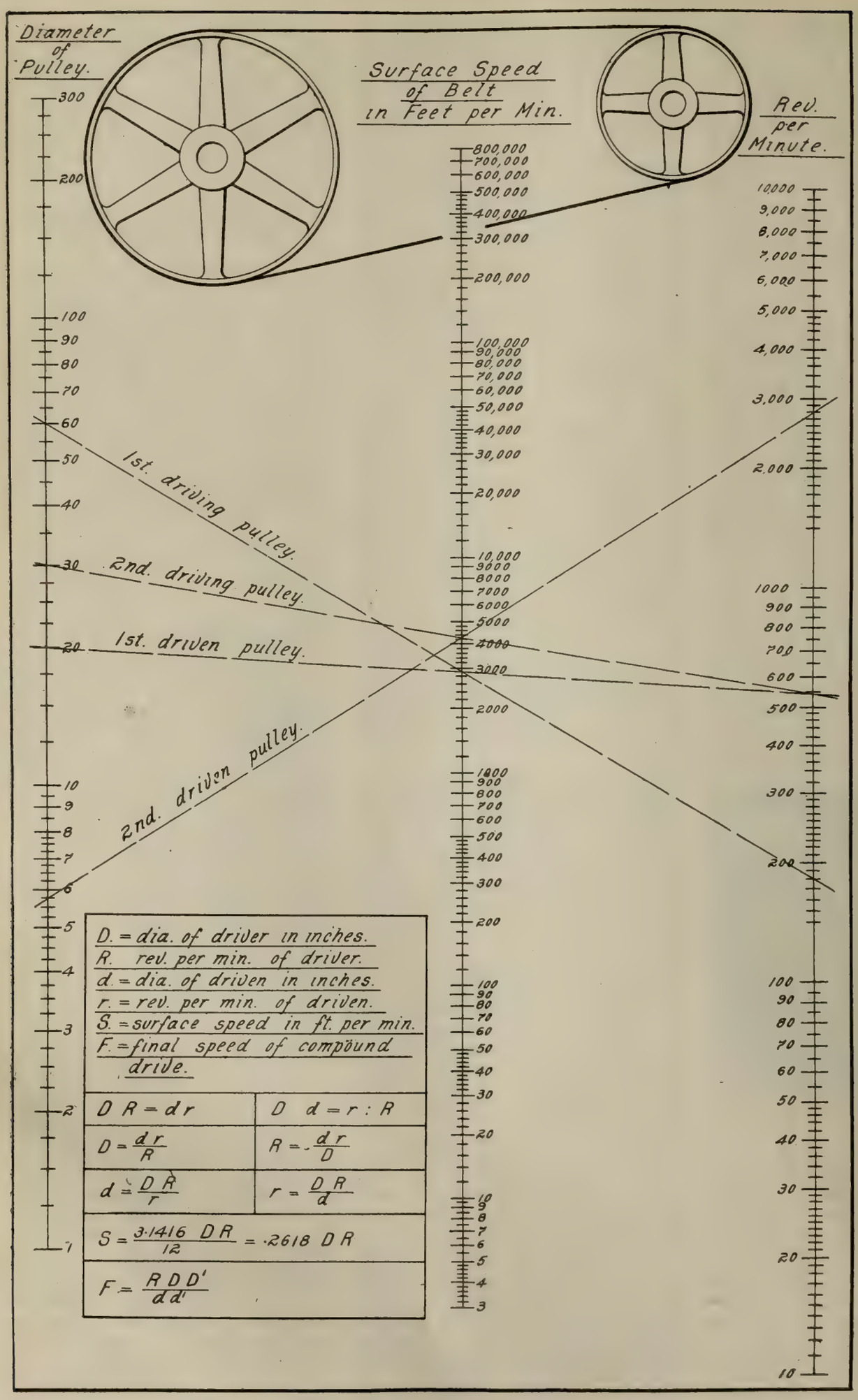
By T. J.

IN the search for the economic generation and use of power, the association of gas engines as prime movers with electrical apparatus is becoming more and more general. There is certainly much to be said in favor of this, and therefore it is all the more necessary to face such difficulties as crop up in actual practice, as frank recognition of drawbacks usually lead to the discovery of means to overcome them. Now, one of the points that calls urgently for consideration is the fact that power houses which are equipped with large gas engines, especially those working with furnace, coke oven or producer gases, present troubles in connection with the maintenance of the switch gear and electrical plant. Something is constantly getting out of order, necessitating renewals, perhaps at awkward moments, and proving in the aggregate fairly expensive. These troubles it will be found, are due to the sulphur in the atmosphere, which attacks the switch contracts, and also affects the insulation of the windings of the machines.

So far it has been found practically impossible to prevent the sulphur laden atmosphere getting to the windings of alternators, but, of course, the switch gear and transformers, etc., may be placed some distance away from the engines, and further protected by being immersed in oil. These simple precautions usually prove effective. But the question of protecting the insulation of windings has still to be solved. This is one of a number of small points of which account has to be taken when installing gas engines, but which advocates of gas engines for any and every purpose generally omit to mention.

This is the wrong spirit in which to approach such problems, in this instance, proving harmful to the advance or the use of both class of apparatus. What is required is further experimentation, both with standard materials and with substitutes therefor.

Experience has of late taught that it is a mistake to assume that any one substance is the inevitable and the only one suitable for any special purpose. Actual practice has for years been handicapped by accepting certain existing conditions as those which must limit the work in hand. Other methods and substitute materials, which have long been held taboo, have been used under the stress of circumstances and discovered to work very well. It is, therefore, unwise to assume that the producer gas is hopelessly inimical to the working of electrical plant in close proximity.



TRANSMISSION SPEED DATA CHART.

TRANSMISSION SPEED DATA CHART

By J. H. R.

PRACTICAL problems involving the application of arithmetical calculations are often encountered in machine shop work. The solution of many of these apparently perplexing operations is invariably left to the foreman of the department, partly because he is responsible for that particular duty, but more often for the reason that a large number of the men under him do not, or possibly will not, acquire the necessary knowledge to perform the mental tasks that are unquestionably the foundation of the very work they are engaged in. It is a deplorable fact that a large number of workmen have neglected to retain the learning of their earlier days, when their school tasks were more of a mental than a physical character. There are also others that are unconsciously supplied with the potential requirements, but fail to see where they can make practical application of this elementary yet fundamental knowledge.

Calculations for the speeds of shafting, and the diameters of the pulleys by which the speeds are determined, are probably among the most frequent problems met with in general machine shop practice. Work of this character resolves itself down to simple proportion, or the rule of three where the equation of two ratios comprises the basis of operations. For instance, a line shaft running 200 revolutions per minute, is fitted with an 18 inch pulley and it is required to drive a countershaft at a speed of 120 rev. per

min.; what must be the diameter of pulley on the latter shaft? As pulleys derive their motion from the connecting belt it is obvious that the surface speed of coupled pulleys must always be the same (neglecting slippage). However, as the circumferences of pulleys vary directly as their diameters, it is the practice to use the latter in the calculations, therefore, as the speed of the known pulley is equal to $18 \times 3.1416 \times 200$, the diameter of the required pulley will be this value divided by the product of the speed and the constant 3.1416, or $\frac{18 \times 3.1416 \times 200}{129 \times 3.1416} = 30$ inches. It will be noticed that the value 3.1416 is common to both the numerator and the denominator, thus the practice of eliminating this factor.

The accompanying chart illustrates a convenient method of finding the various values of pulleys, shafts and belt speeds in transmission problems. The left hand column represents the diameters of pulleys in inches; the middle column indicates the belt speeds in feet per minute; and the right hand scale denotes the speed of the shaft in revolutions per minute.

To illustrate the operation of the chart we will suppose that the line shaft has a running speed of 180 rev. per min., and is fitted with a 60 inch pulley. applying a scale or fine taut thread from the points on the two outer scales, it will be found that the line intersects the middle column at the graduation between 2800 and 3000—the actual value by calculation being 2827—this being the surface speed of the belt. As the diameter of the driving pulley must necessarily determine the belt speed, it is evident that the coupled pulley will have a similar surface speed. Therefore by using the straight edge and connecting the intersection of the middle line with a certain diameter of pulley (in this case 20 inches), we find the speed of the second shaft to be 540 rev. per min. To compound this drive by using a second set of pulleys we continue as before. Connect the last found value (540 revs.) with the second driving pulley diameter, 30 inches, and through the intersection of the middle scale, connect with the final speed desired (in this particular case 2800 revs. per min.), and we at once find 5¾ inches as the diameter of the second driven pulley.

In the lower left hand corner of the chart are given the necessary data and formulae to solve for the various values. It will be noticed that the product of the speed and the diameter of a pulley on one shaft always equal the product of the speed and diameter of a pulley on another shaft, when the two are belted together. It will also be noted that the diameters are in inverse proportion to their respective speeds, that is, the smaller of a pair of coupled pulleys will always run the faster. The surface speed of the pulley, which is likewise the belt speed, can be found by using the formula, $S = \frac{3.1416\ D\ R}{12} = .2618\ D\ R$.

Example:—To find the belt speed of a drive when the driving pulley is 28 inches in diameter and running at 225 rev. per min., the solution would be $S = .2618\ D\ R = .2618 \times 28 \times 225 = 1649$ feet per minute. In a compound drive, where it is desired to find the final shaft speed and the various pulley diameters are known, also the speed of the driving shaft, the formula:— $F = \frac{R\ D\ D^{1}\ D^{11}}{r\ r^{1}\ r^{11}}$ is used. Suppose the line shaft runs at a speed of 160 revs. per min., and the driving pulleys have diameters of 36 inches, 30 inches and 20 inches, with driven pulleys of 24 inches, 18 inches and 6 inches, the resultant speed of the final shaft would be:—

$$F = \frac{R\ D\ D^{1}\ D^{11}}{r\ r^{1}\ r^{11}} = \frac{160 \times 36 \times 30 \times 20}{24 \times 18 \times 6} =$$

1333 rev. per min. nearly.

AEROPLANE MANUFACTURING ACTIVITY IN ENGLAND

THE growing importance of the aeroplane and its probable influence, through a vigorous reprisal policy, on the final stages of the war, were emphasized during a recent visit by Lord Montague to an aeroplane works in West London. According to The Engineer, to whom we are indebted for the illustrations of aeroplane manufacture reproduced in this issue, the workers were reminded that the need for expediting the output of aircraft is more necessary at this juncture than at any previous period. On the preparation now made in connection with the provision of the necessary number of aeroplanes for raiding enemy territory much will depend in the concluding phases of the war.

In connection with possible day raids by aeroplanes on England, Lord Montagu has received assurances which suggest that all necessary provision for defence has been made, but the only way of dealing with night raids by aeroplane is by destroying enemy aerodromes within flying distance of London and the

VIEW OF WING CONSTRUCTION IN AN ENGLISH AEROPLANE FACTORY.

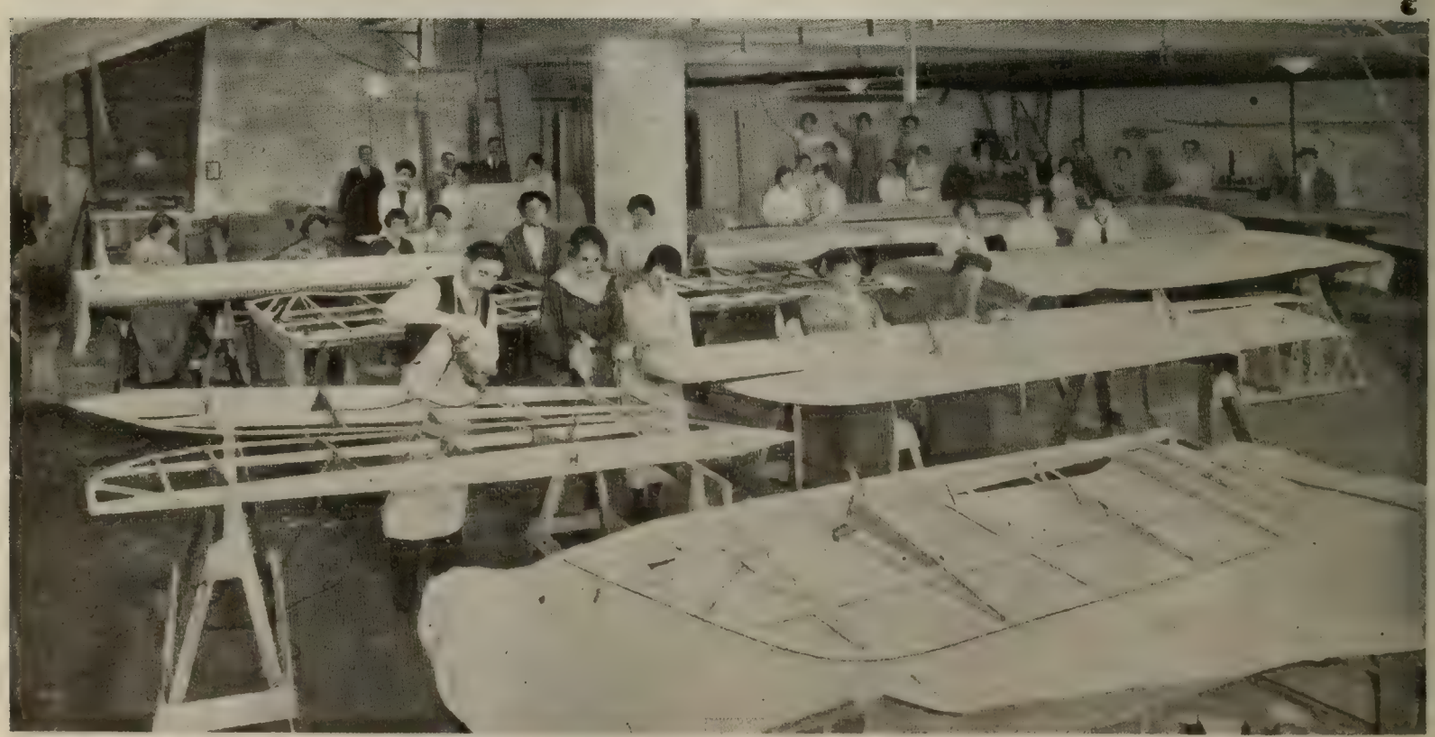
WING FRAMEWORK IN AN ADVANCED STAGE OF CONSTRUCTION.

East and South Coasts, and generally carrying the air war into enemy territory. In Germany the labor resources formerly employed in Zeppelin construction have now been diverted to aeroplane manufacture, and the training of German airmen in night flying is receiving unremitting attention. These things portend the opening of a new phase of the aerial war.

What is being done at these particular factories in West London is typical of the general effort being made to meet the new enemy threat, and the illustrations indicate the remarkable progress in manufacturing capacity which has been made in the course of a few months. Beginning about twelve months ago with little more than a score of hands, the principal output during the early period was ammunition boxes and cases for aeroplane engines. To-day these works, which comprise sixteen shops having a superficial area of 58,000 ft., employ 1,000 hands, of whom about one-fourth are women workers, whose energies are devoted to the manufacture of aeroplanes and their parts.

THE BEGINNING OF MECHANICAL REFRIGERATION

THE original air refrigerating machine was brought out in 1845 by Dr. Gorrie, of New Orleans, who with Dr. Cullen felt a special need of artificial refrigeration in the aid of his profession. This mechanism had a cylinder in which the air was first compressed. It was passed from this cylinder to a chamber cooled by running water where a pressure of fifteen pounds per square inch above that of the atmosphere was maintained. The air was already cooled partly during compression by the injection of water, the cooling chamber receiving in reality a mixture of air and water. This on passing to another cylinder was expanded down to something like atmospheric pressure. While expanding it was mixed with brine injected into the cylinder, the low temperature of the expanding air communicating itself to the brine. The air on leaving this cylinder was allowed to escape to the atmosphere while the brine, now cooled to 20 deg. F., was conveyed into a tank and applied to ice making.—Edison Monthly.



AEROPLANE WINGS RECEIVING THEIR FABRIC COVERING. THE CONSTRUCTION OF A WING IS CLEARLY SHOWN HERE.

PROGRESS IN NEW EQUIPMENT

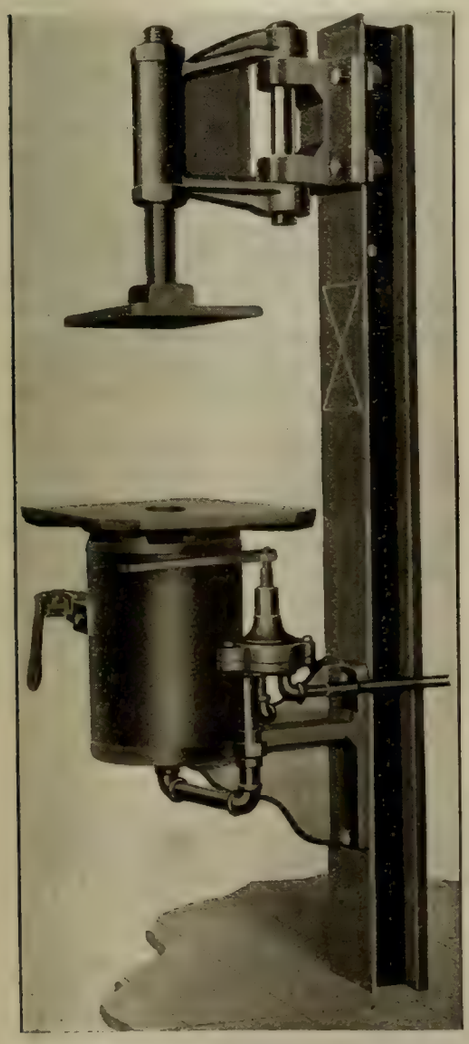
There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

NEW SQUEEZER MOULDING MACHINE

THE moulding machine illustrated in the accompanying engraving is of the squeezer type, and has been specially designed to combine speed, efficiency, simplicity, and fool-proofness. The Rapid moulding machine is the product of the Federal Malleable Co., West Allis, Wis., who have developed it during the past two years so as to enable it to be operated by unskilled moulders over a wide range of work.

Highly refined features have been avoided, and rapid and simple adjustment provided, whereby castings may be made varying in weight from considerably less than an ounce to over fifteen pounds in weight.

The bench plate is 21 in. long by 14 in. wide, while the squeezer head is 14 in. long by 8 in. wide. Maximum adjustment between squeezer head plate and bench plate is 15 in. The cylinder has a bore and stroke of 8 in. by 5¼ in., and operates at from 65 to 85 lbs. pressure per sq. in., 80 lbs. being recommended for general use. The shipping weight is 800 lbs.



SQUEEZER TYPE OF MOLDING MACHINE WITH RAPID ADJUSTMENT FOR WIDE RANGE OF WORK.

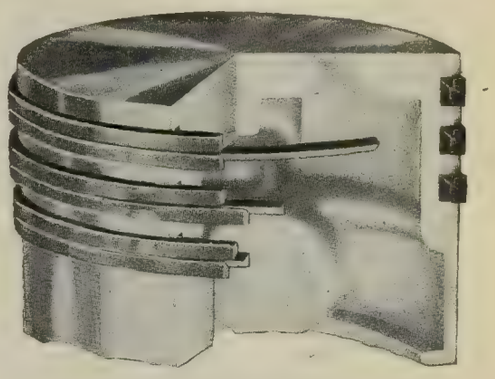
These machines are fitted with the Rapid operating valve, which is self-seating and leak-proof.

IMPROVED TYPE OF PISTON RING

CYLINDER efficiency is one of the chief essentials in the successful operation of any type of pump or engine, be it air, gas, steam or hydraulic. The one outstanding feature in engine construction that has received more thought and attention than any other is the piston. The effective power of an engine is largely dependent upon the free running movement of the piston and the total absence of leakage, either when driving or under compression. This effect is only assured when the piston rings have been accurately fitted in their respective grooves, and even then the durability is more or less uncertain, owing to the variable conditions.

In the accompanying illustration is shown an interesting and highly serviceable type of piston ring, designed by E. Duchesne, Montreal, and being made in various sizes to suit any make of cylinder, from motorcycles and automobiles to locomotives and marine engines. In the design of these rings, several features have been incorporated to increase and maintain the efficiency of the engine, and also extend the useful life of the rings themselves. In the ordinary one piece split ring, the pressure against the cylinder wall is obtained by the spring in the ring itself. The special rings here described not only contain their own initial spring, but are prevented from any possibility of "setting" by the action of the inside wedge ring, which is made from special spring steel. The construction prevents this interior ring from coming in contact with any of the friction surfaces; its essential purpose is to maintain a constant but flexible pressure of the cast iron rings against the cylinder bore. In addition to the radial thrust, the 60 deg. bevel of the spring ring acting against a similar bevel on the inner middle edges of the friction rings assures a perfect fit on the sides of the groove, resulting in a permanent fit irrespective of any subsequent wear.

With a one-piece ring the lateral fit is often so good that any slight binding of the sides prevents the free radial movement of the ring, when the same is passing over imperceptible irregularities of the cylinder bore; or, after becoming worn, will allow the steam or gas to "wire draw" down the sides and below the rings. The three-piece rings here shown have the distinct advantage that they will adjust themselves to the above conditions and entirely eliminate binding or wire drawing. It may be also stated that the possibility of the gas or steam leaking down the sides and below the rings is reduced to the minimum in this type of ring, as the action of the inner spring forces the two outer portions firmly against either side of the groove, thus avoiding any space where the gases could enter and thereby increasing the engine efficiency. Another highly interesting feature in the manufacture of these "Wedgerite" piston rings is the softer grade of cast iron than is generally used for the purpose. Where it is necessary, as in the one-piece ring, to rely upon the spring of the friction ring to maintain contact on the cylinder walls, it was the practice to use a hard iron to insure a durable spring, but the adoption of the spring steel ring permits a softer iron in these special piston rings, which minimizes the wear upon the bore of the cylinder. These rings are cast independently and ground to the desired dimensions and eccentricity. Vincent & Morris, Montreal, are placing this article on the market.

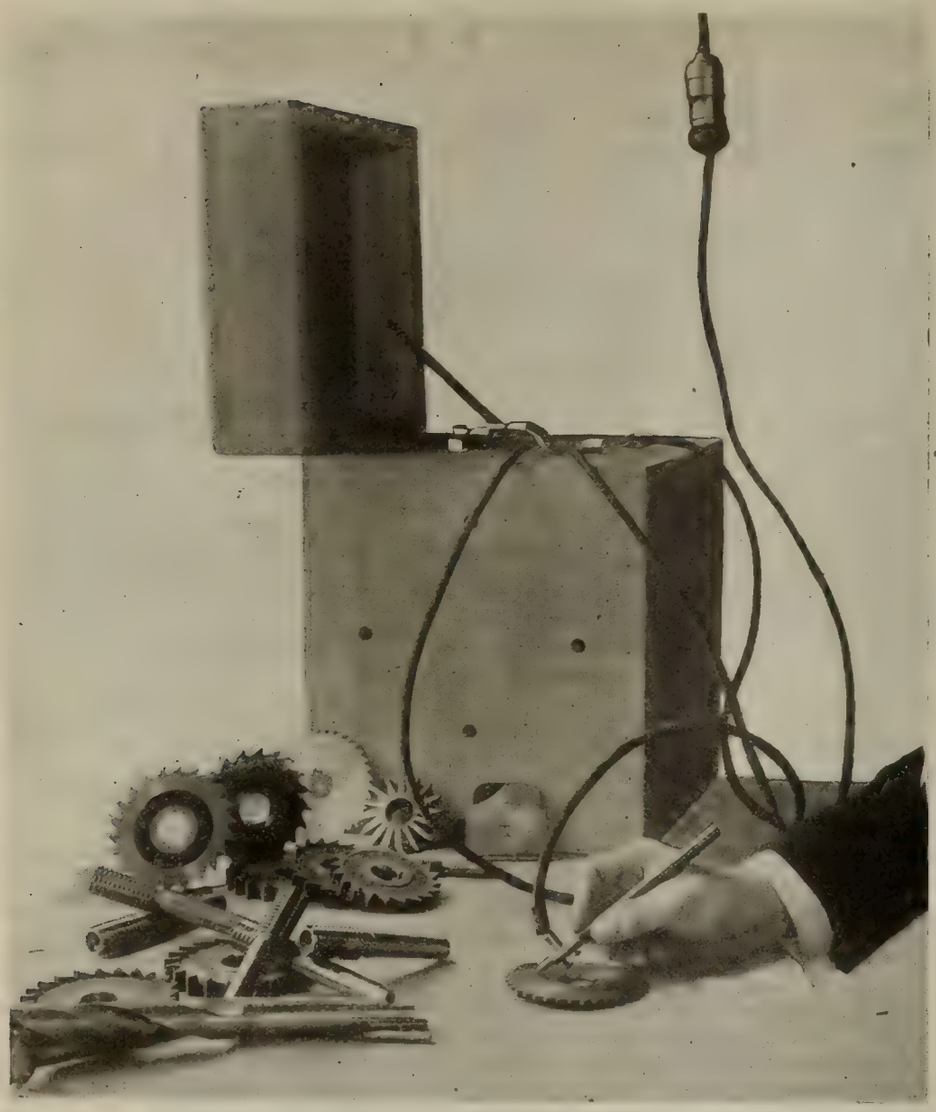


DOUBLE TYPE OF PISTON RING WITH BEVELLED SPRING SUPPORTING RING.

ETCHOGRAPH APPARATUS FOR MARKING TOOLS

THE elaboration of modern shop systems, along with the multiplicity of small tools, fixture parts, etc., has accentuated the unsatisfactory features of marking accessory equipment by the acid etching process. In addition to the time required for applying wax, etching, putting on acid, and subsequent cleaning, etc., the work demanded more skill and patience than usually possessed by the ordinary workman, the necessary feature of legibility being frequently almost absent.

All of these handicaps have been completely removed by the apparatus shown in the engraving herewith, which requires nothing further save an ordinary light socket and reasonable penmanship. It is known as the Etchograph and consists of a special pencil wired up to a trans-



ETCHOGRAPH APPARATUS WHICH MARKS HARDENED STEEL TOOLS AND MACHINE PARTS WITHOUT ACID OR OTHER SUBSTANCES.

former as shown. When the current (110 volt alternating) is turned on, and the article placed on one terminal, the pencil is used for writing with in any required style, the only limitation being the skill of the operator. The work is done as quickly as ordinary writing and requires no liquids or other materials except the work itself. Any width of line, any style or size of letters, figures or design, and any size of tool, gauge or fixture may be marked as described.

Power is used only when etching, and if direct current only is available a D.C.—A.C. generator is furnished at reasonable cost. The transformer supplied is an Adams-Bagnall, and the outfit is being marketed by William Brewster Co., Inc., New York.

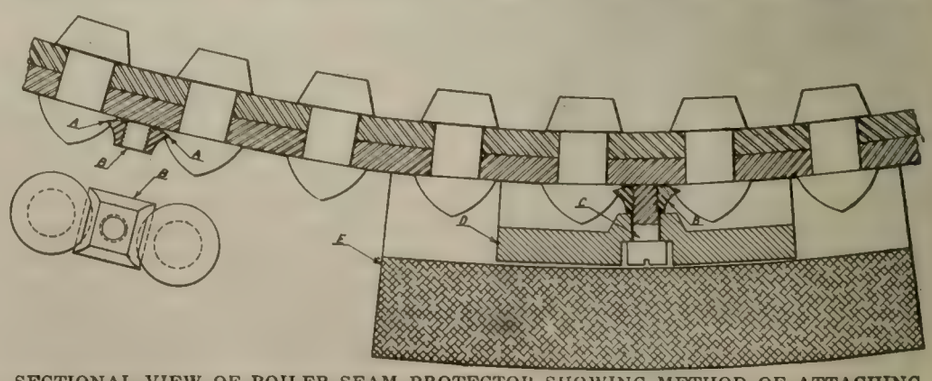
BOILER GIRTH SEAM PROTECTORS

A TROUBLE always present in horizontal tubular boilers is that arising from cracks on the boiler shell surface, directly above the fire chamber. These defects invariably originate at the girth seam, which, owing to the general construction of this type of boiler, is located immediately above the fire, where it is exposed to intense heat. The heat in itself is not the objectionable feature, but owing to the necessity of opening the fire box door to replenish the fire, this portion is subjected to continually varying stresses, caused by the frequent expansion and contraction of the plates. In an effort to minimize this trouble boilers have been designed where the section exposed to the high temperature of the fires, has been made in one piece, to bring the seam in a position out of the direct action of the hot gases. Owing, however, to the great area required, this method has not given satisfaction, and the seam has still remained more or less a source of trouble and inconvenience.

A simple device for preventing the formation of fire cracks that has been recently perfected, and for which patents have been granted, has been placed on the market, and installed on a large number of boilers, both in the United States and Canada with remarkable results. It is claimed that a boiler equipped with this seam protector will be permanently protected from all danger of fire cracking and subsequent leakage resulting therefrom; an unprotected seam that has developed a leak can be caulked tight and fitted with this device, and the claim is made that the seam will remain dry indefinitely. The illustrations herewith show a general view of the detached parts and the method of applying to the boiler shell. It will be seen that the application of this seam protector is very simple and that it does not interfere with the heating qualities or detract from the strength of the seam. As a matter of fact, the construction of the protector, with the large semi-circular sections of fire brick or reinforced asbestos, provides a reserve of heat that prevents any sudden reaction in the seam when the fire door is opened or closed. As the cold outside air from the open door or the hot gases from the fire are not permitted to come in direct contact with the boiler seam, the effect is to retain a uniform temperature on the outer lap, thus avoiding sudden or violent contraction or expansion of the lap.

In addition to preventing exterior fire cracks, it has been demonstrated that the accumulation of sediment along the edge of the inner lap, and about the heads of the rivets—a condition that is generally the cause of interior mud cracks—is largely, if not entirely eliminated, as the retaining of a more uniform temperature at this particular point has shown the tendency to prevent the formation of injurious muddy scale that bakes to this portion of the seam, when the same is exposed to the direct action of the fire. It is thereby claimed that these protectors have made the weakest portion of the boiler equally as strong and durable as any other part.

In fitting this boiler seam protector to units already in service, two adjacent rivets, at suitable distances apart, on the girth seam, are notched by means of a special diamond point chisel as shown at AA to receive the wedge nut B, this being made a snug fit. When same is in position, the metal lug or tile support D is attached by means of a small ½ in. bolt C. When this is firmly placed, the



SECTIONAL VIEW OF BOILER SEAM PROTECTOR SHOWING METHOD OF ATTACHING TO RIVET-HEADS.

fire brick or asbestos tile E is slid over the extending lugs of the cast iron piece D. Each one of these units is placed approximately 9½ in. apart, and five or more may be required to cover the length of the affected seam. This seam protector is not only used on stationary boilers, but is applicable to all fire exposed seams on locomotive and marine boilers. These seam protectors are manufactured in Canada by the National Boiler Protector Co. of Canada, 382 St. James Street, Montreal.

ECONOMICAL USE OF FUEL URGENT

TALKING to a representative gathering of men who are to assist the Fuel Administration in the different States, at their meeting in Washington with Dr. H. A. Garfield, Van H. Manning, director of the Bureau of Mines, Department of the Interior, said concerning the necessity of urging the economical use of fuels:

"The economical use of fuel has proved to be no simple problem. The coal, the equipment, and the human variables make hard and fast general rules impossible. The Bureau of Mines has carried on extensive experiments to determine the fundamental principles of the combustion process and of furnace design, and, at the same time has been making practical application of improved practice in government power plants. Many publications are available which show the progress of the work along these lines. Americans have been as wasteful of coal as of other resources, largely because coal has been abundant. To many consumers it has seemed hardly worth while to give time and thought to the saving of coal.

"Conditions have suddenly changed. To-day it is everybody's business to save coal. Coal is the foundation stone of industry. Without it the production of equipment for war must halt. Transportation facilities must stand still. One man's careless and wasteful use may mean an idle factory or a cold house for his neighbor. With the world looking to us largely for its coal supply, with increased demands at home, with a scarcity of available labor, with overtaxed transportation facilities, the consumer of coal must pause and give serious consideration to the problem which confronts the country.

Saving Through Intelligent Consumption

"If the consumers can be aroused to an intelligent consideration of the burning of coal, they can begin to save ten per cent. of the production, (600,000,000) at once. With more effort, through instruction and a moderate remodeling of coal burning equipment, which could all be accomplished during the war, a further considerable saving can be made. The possible coal saving when present practice is compared with the best ideal practice is very large. If it were possible to supply the need of this country for light, heat, and power, through the highest type of mechanical devices, and if we could make a skilled coal user out of the average user, we could probably get along with half as much coal as we are now consuming. This ideal is far beyond present realization.

"The immediate problem is a difficult one. We cannot scrap all out-of-date power plants. We must start by doing the best with what we have. We must begin saving coal at once. The problem is personal. It deals with the human element. We must reach the man with the shovel.

Household Consumption

"About fifteen million people shovel the twenty per cent. of our coal used for domestic purposes. Only about two hundred and fifty thousand firemen shovel the sixty-odd per cent. of our coal used by power plants and railroads. While we must appeal to the householder to serve coal it is vastly more important to reach the fireman through whose hands the larger part of our coal passes.

"The householder must realize that when he throws a shovelful of anthracite coal into his furnace its value is equivalent to half a pound of sugar, or half a loaf of bread, or a pint of milk. He must appreciate that it is worth while to examine his house and to overhaul his heating equipment. Weather strips, double windows, pipe coverings, clean flues and chimneys, and tight fittings in ash-pit, doors, dampers and furnace parts will all pay. Damper control is one of the chief secrets of economical heating. Clean surfaces are most essential, as soot is a poorer conductor of heat than asbestos, Care, attention, and taking pains will be the greatest factors in saving domestic coal.

The Steam Plant Fireman

"The fireman is, however, the biggest single factor to be considered in a campaign to secure the largest saving of coal. Many manufacturers have made a serious mistake in failing to consider the fireman as a skilled worker. Too often he is treated as a roustabout. He is not well instructed nor given proper labor saving devices. As coal increases in price, or becomes difficult to get, the fireman handles more and more of his employer's money. His efficiency means more in dollars and cents. This is an encouraging feature in the situation. It means a better recognition of the importance of the fireman, more efficient work on his part, and a consequent increased saving of coal. The viewpoint is changing. It is no longer cheaper to pay for the coal than to educate the firemen.

"In carrying out a campaign to promote the saving of coal, let the appeal be made to the householder to cut down his consumption in every way possible, but above all, give serious consideration to methods by which a systematic relationship may be established between the office and the fireman. Encourage the manufacturer to take a keener interest in his fuel consumption and to back up his fireman by giving him the best information and equipment available. This problem has two phases, first to arouse the interest of the manufacturer and his engineer and fireman, and to point out the part which they can play in relieving the present crisis in coal supply; second, to furnish whatever technical information may be desirable and which will be immediately applicable to accomplish the result sought."

Screenings

A sentry, an Irishman, was on post duty for the first time at night, when the officer of the day approached. He called, "Who comes there?"

"Officer of the day," was the reply.

"Then what are you doin' out at night?" asked the sentry.

He was a very young British subaltern and the son of a general, which fact he never ceased to rub in. One day he was sent with a message from the general to the gunners. "If you please," he said to the major, "father says will you move your guns?" Now it happened that the major was in a very irate mood. "Oh," he snapped out, "and what the deuce does your mother say"

Two Tommies, one a giant and the other a dwarf, were digging trenches. An N.C.O. came to see how they were getting on, and noticing one of them doing more work than the other, he called down to the big fellow.

"Hi, you! How is it that little Jenkles, who is only half as big as you, is doing twice as much work?"

Glancing down at Jenkles the giant replied:

"And why shouldn't he, ain't he nearer to it?"

The class was being instructed in the mysteries of mental arithmetic. "Now, Robert," said the teacher, "supposing your father owed the butcher $29.30, the baker $30.40, the greengrocer $6.70, the milkman $2.10, and the coal man $16.90, what would that come to?" Robert was not a bright pupil, and the teacher was prepared to repeat the sum once or twice, but to her surprise Robert was ready with his answer. "It would come to a flitting, mum," he said.

Johnny was crying in the hall as his mother came along, hatted and coated. She asked what had happened.

"You are going away; and so is papa!" Johnny sobbed.

"Why, child, I shall be away two or three days, but father is not going away!"

"Yes, he is!" cried Johnny. "Hes going to Rome."

"Rome? What do you mean, dear?" asked the surprised mother.

"He said to-day to Mr. Brown that he would make Rome howl when you left!"

"Indeed- Well, dear, I sha'n't leave you now."

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INDUSTRIAL SITUATION SOUND, ALTHOUGH UNSETTLED

CONTINUED activity in Canada's munition industry on a scale that will compare more or less favorably with the operations of the past thirty months appears to be largely if not wholly dependent on the ability of our Government to finance contracts available through the Imperial authorities. It is not surprising, therefore, if just a tinge of uncertainty marks the immediate outlook, besides tending to a restraint of commitments as regards both investment in or development of manufacturing enterprise. There is not a little apprehension apparent concerning the future of our steel industries, and if one would judge by the steady, although slow, downward trend of steel security values, uncertainty is being given a definite practical demonstration.

There is a disposition, however, to over-estimate the effect that contraction of our munitions industry is having or is likely to have during the next three or probably six months on our steel output. It is true that shell-making is now largely confined to one size only, i.e., the 6-inch high explosive projectile. Steel contracts with our several mills have not, as a result, been cancelled or trimmed as might have been expected or as may be unwittingly assumed. The now general concentration on the output of one size and type projectile has meant simply the switching of the steel production of our mills to that end, in other words, the unfilled balance of steel quantity orders placed several months ago is to enter wholly into 6-inch high explosive shell manufacture.

There is apparent an increasing tendency to caution on the part of the spending public, and this is having some effect on consumer demand in all lines of manufacturing enterprise. From a national point of view such a circumstance cannot be considered otherwise than healthy. It has been suggested that the spirit of caution referred to may reflect a popular desire to participate in the coming Victory Loan; our own view, however, is that of individual self-protection against the inevitable "rainy day." While there has been a substantial curtailment of shell machining orders, affecting in the natural course of things many firms with equipment unsuitable for 6-inch shell production, unless they launched out into large expenditures to participate in the latter, a proceeding the profitable outcome of which is problematical, there is every reason to believe that the monthly disbursement of something like $30,000,000 on shell contracts is little likely to suffer restriction, much less elimination altogether for many months to come.

The present situation is not without its bright spots. Not only are Canadian manufacturers securing what may be termed overflow orders in quantity from the United States bearing on the war preparations there, but for the latter reason also, numbers of our metal-working plants whose shell-making activities have ceased, are finding a profitable market for the disposal of their specialized equipment instead of having it left on their hands as had confidently although regretfully been anticipated.

Shipbuilding continues active, but not nearly so much so nor on so comprehensive a scale as the exigencies of the situation and the wealth of opportunity warrant. The number of vessels contracted for and building in our various plants reaches a fair total, as do also the launchings, although the latter for the present year will include many craft altogether distinctive from the much needed ocean-going freighter. Our export trade is now, to a large extent, dependent on "bottoms," and will be trebly so at least when all menace of the seas has been removed. Our plant capacity has nevertheless been but little developed, while the immediate outlook for a determined effort to that end is none too bright.

We accepted munitions-making as but temporary in its sojourn, yet we went into it so whole-heartedly as to both astonish ourselves, our neighbors, our friends and our enemies with the results achieved. Shipbuilding, on the other hand, in spite of its known high-degree permanence as a staple industry, has not as yet developed the equivalent of the munitions enthusiasm, and may possibly fail to do so while the difficulty of securing materials of construction continues. The strongest possible support—Government and individual, financial and otherwise—should be made immediately available for the propagation of this very desirable industrial enterprise, in view of the fact that much of our future success in a commercial sense is thereon dependent. The issues are sufficiently momentous to make the subject of supreme national importance, second only to the otherwise successful prosecution of the war besides being co-related to it.

LABOR AFTER THE WAR

THERE can be no doubt but that the greatest of after-war problems will be the relations between capital and labor. Men are now being paid wages for munitions and other war-time work which has raised the level of the market to previously unheard of levels. True much of the increased return has been absorbed by the higher cost of living, but in the period after the war, when munitions work stops—when the nations now spending so recklessly start to retrench—the present returns for labor cannot be expected to last. The crux of the situation will be that industrial wages will decline more rapidly than will the cost of living and the civilian individual will then feel the pinch of war conditions, which, generally speaking, he has been far from doing up to the present time.

When the demand for munitions ceases and there is still a shortage in the world food supply, Canada should take her place in the sun to a greater extent than ever as a producer of foodstuffs. For a time at least, especially with the return of the troops, the movement of population promises to be from the urban centres to the rural districts, just as it was the opposite for months after war industrial activity commenced, and not a little evidence is already forthcoming that a "back to the land" movement of fair proportions is gaining momentum and popularity.

INDUSTRIAL NOTABILITIES

EBENEZER CARNEGIE, Hon. Colonel; president, Electric Steel & Metals Co., Ltd., Welland, Ont.; managing director, Electric Steel & Engineering Ltd., Welland; director, British Forgings, Ltd., Toronto, Ont., was born at Aberdeen, Scotland, Sept. 7, 1881, son of David and Margaret (Bogue) Carnegie.

His education was received at E. London Technical College, and City of London College, supplemented by private tuition.

EBENEZER CARNEGIE.

Mr. Carnegie began his career as apprentice engineer with J. Richmond & Sons, London, 1898-1900; engineer improver, Vickers, Sons & Maxim, Erith, Kent, 1900-1903; experimental gun work, Royal Arsenal, Woolwich, 1903-1906; designing and erection of plant, Cammell, Laird & Sons, Sheffield, 1906-1907; assistant engineer, Thomas Firth & Sons, Sheffield, 1907-1910.

During 1910-1913, Mr. Carnegie was manager and technical advisor of the Gram-o-phone Co., London, and in 1913 he organized the Electric Steel & Metals Co., becoming secretary and general manager; elected vice-president 1914; appointed president 1916.

Mr. Carnegie was also a member of the Shell Committee; member Munitions Resources Commission; member Parliamentary Executive Committee, Sheffield, Eng., 1907-1909.

Golf and motoring are his principal recreations, while his clubs are National (Toronto); Engineers (Toronto); Welland (Welland). In politics he is Independent, and in religion Presbyterian.

Mr. Carnegie's residence is Parkway, Welland, Ontario.

—Photo, courtesy International Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$46 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	60 00

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 00
Tank plates, Pittsburgh	8 00
Structural shapes, Pittsburgh	4 00
Steel hoops, Pittsburgh	5 75
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 00

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22 1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$31 00	$32 00
Electro copper	31 00	32 00
Castings, copper	30 00	31 00
Tin	63 00	63 00
Spelter	10 50	10 50
Lead	11 00	10 75
Antimony	18 00	19 00
Aluminum	65 00	62 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$13 00	$13 00
Heads	13 30	13 30
Tank plates, 3-16 in.	13 65	13 25

WROUGHT PIPE.

Effective July 5, 1917.

Standard Buttweld. Size.	Black Per 100 feet	Galvanized Per 100 feet
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00

Standard Lapweld.		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$18 00
Copper, crucible	22 50	20 50
Copper, heavy	22 50	20 50
Copper wire	22 50	20 50
No. 1 machine composition	20 00	18 00
New brass cuttings	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	12 00	10 00
Medium brass	16 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	17 00
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	18 00
No. 1 machine cast iron	25 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	7 50	9 00
Tea lead	6 50	7 00
Aluminum	30 00	25 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 20
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Elevator bolts	5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	25
Eq. & Hex. Head Cap Screws	20
Rd. & Fil Head Cap Screws	net
Flat ⅞ But. Hd. Cap Screws plus	25
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	plus 10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$ 60 00
Open-hearth billets	60 00
O.H. sheet bars	70 00
Forging billets	90 00
Wire rods	85 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS.

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 16
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	18 00
Red dry lead, 100-lb. kegs, per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 78
Linseed oil, raw, single, bbls.	1 42
Linseed oil, boiled, single bbls.	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery Cloth	list plus 33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila Rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto ..... net

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	25
Bit stock	25
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks	list plus 30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A. add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 25%; headers, 60; flanged unions 40; malleable bushings, 25 and 7½; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$11 00	$11 00
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No 28	25	10 00
Premier, No. 28 U.S.	13 75	11 70
Premier, 10¾ oz.	13 85	12 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B	
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	40
Black Diamond	40
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	37½
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke	$
Connelsville Foundry Coke	
Steam Lump Coal	
Best Slack	

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THE situation in the iron and steel industry continues to cause considerable uneasiness in manufacturing circles. No changes have as yet been made in the embargo and until a decision is made in regard to its application the outlook will continue unsettled. Although some relief may be obtained for a number of industries, little, if any, improvement is expected in the situation, as it affects consumers not engaged in the production of war supplies. The shortage of iron and steel, which seems destined to become more acute as time passes, will be a serious matter for some firms and cannot help but restrict manufacturing operations. There is no indication as yet of any downward tendency in prices in the steel market and it is becoming more apparent that there will be few if any recessions for some time. The fact that the mills have still considerable tonnage to deliver tends to keep prices up in spite of the price regulations. Canadian mills are maintaining their prices and have made no intimation of any pending change in schedules. The pig iron market continues quiet and the outlook unsettled, due to the price-fixing policy and shortage of iron. Lower prices on pig iron in Canada are not anticipated just yet as the furnaces are still paying high prices for raw materials; also they have comparatively little iron to sell. The metal markets continue inactive and prices unchanged with the exception of lead which is a shade lower. The shortage of copper seems likely to become more acute owing to drop in production and increasing demand for war purposes. Scrap metals are dull and prices unchanged.

MONTREAL, Que., Oct. 15, 1917.—Activity in industrial circles continues to be of a fair volume but in certain directions, particularly in connection with the manufacture of munitions, the decline has been pronounced. Many plants that have been actively engaged in this work from the start are now closing out on the last of their shell work and in the majority of cases little prospect is offered for renewal contracts. The six inch size is the only one now being produced on a large scale. American developments continue to hold the interest of Canadian manufacturers and at the same time affect the Canadian market to such an extent that business here may receive a setback unless relief is given in securing materials for domestic enterprise. The approaching close of navigation will place additional pressure on railroad operation which is at present taxed exceedingly in taking care of the country's needs.

Pig Iron

The adjustment of pig iron prices at the various United States sources has now become effective in response to the announcement of the government of a fixed price. The approximate decline resulting from recent developments has been about $20 per ton, and the composite price of pig iron at the present time is just above $34 per ton; this being a decline during the week of $10.25 per ton. The present situation is rather complex as consumers are finding it very difficult to place orders at the new prices, and some uncertainty prevails as to what attitude will be taken on orders that were placed when prices were at the high level of the open market. The Canadian situation sees no immediate relief through the changes that have taken place across the line.

Steel

Following the recent announcements by the American Government regarding the fixing of prices and the uncertainty due to developments, the present steel situation remains in a rather unsettled condition. The extent to which further readjustment in steel prices may eventually go, is indicated in the leveling effect that has taken place in the regulations on pig iron, where the prices fixed are practically on the same basis for all furnaces. The entire situation hinges on the requirements of the U.S. Government, as producers are not offering steel or accepting orders at the fixed price until is definitely known the full extent of needs of the Government and Allied requirements. With the exception of war supplies, business is virtually at a standstill. While considerable reductions have of late been made on the open market quotation of billets and sheet bars, it is anticipated that the proposed price for this commodity will be in the neighborhood of $45 per ton, with probably a little higher figure for sheet bars. Activity in plates has been confined to war demand, as owing to the filled up condition of the mills the producers claim they cannot supply the demands of the domestic consumer; since the fixing of prices, no new outside business has been placed and so far the mills have made no sales on the open market at the reduced price fixed by the Government. In some respects the position in plates is even more acute than when the market was controlled by the open demand. A similar condition exists in sheets as the trade is waiting with interest the action of the Government regarding price to be set on this class of steel; such buying as is reported by domestics is only for immediate and urgent requirements. The ever increasing needs of the American Government for their war program tends to maintain the entire market in a very uncertain and unsettled condition. Early developments are further reflected in the market on wire products, which has taken on a very quiet condition in expectation of a lower prevailing price to be fixed by the Government. The Canadian situation is much the same, with the interests of the dealers centered in American developments and the possible effect that such changes will have in the near future. Prices continue very firm owing to the practical embargo that exists on steel coming in from the States.

Metals

The entire market is influenced by the unsettled conditions that are the feature of this and the American situations. The requirements of the United States for the filling of the war program has somewhat disorganized the trade as domestic consumers have been side-tracked during the past few weeks in favor of the Government. To some extent this condition has recently been relieved and in a short time domestic consumers may be assured of a place where their wants will be considered. It has been reported that the full requirements of the Governments for their war needs has been announced and this fact will enable the producers to figure on the requirements of the domestic buyer. Copper supply has increased and is more easily obtainable for domestic use. Tin has become stronger following additional regulations. Spelter and lead are unsettled in view of approaching price fixing. Antimony and aluminum are both dull and easier.

Copper. — Until the requirements of the American Government have been satisfied it is very unlikely that the general situation will be free from the uncertainty that continues to feature the present market. Domestic consumers have been required to wait until the war needs were supplied and even where metal was due on contract it has been impossible to obtain delivery of the same as in every case the Government has commandeered all metal produced for their special use. However, this condition has become easier as the present needs of the war office are known to the producers and consumers are in a better position to cover their requirements. An additional relief has been apparent in the better production that has of late taken place and it is anticipated that conditions will from now on be considerably easier. With no market in the States the fixed price of 23½c prevails. The local market is unchanged, quiet but steady, with prices firm at 31 and 30c per lb.

Tin.—Owing to increased restrictions being placed on shipments from the sources of supply the American market in tin has taken on strength. In an effort to confine the sale of metal as far as possible to essential needs the British Government has issued new regulations on disposal of metal and before shipment will be allowed, it is necessary that specific information be submitted as to the destination of the purchase. The New York quotation has advanced ¼c during the week, the present price being 61c per lb. The local situation is not active but the volume of trade is steady; quotations remain firm at 63c per lb.

Spelter.—Price fixing on spelter will more than likely be announced in the very near future and every indication points to a price closely allied to that prevailing on the market or even lower, as statistics show that production facilities are at present much greater than current requirements; as a matter of fact, operations at some smelters have been discontinued owing to an over supplied market. The New York market is firm but not active and has developed a weaker tendency. The local market is quiet but steady but with an easier tendency; dealers are quoting 10½c per lb.

Lead.—The market is expected to receive a further setback very shortly as a result of the finding of the investigating committee into the lead situation; just what price has been decided on has not been announced but it is anticipated that it will be below that at present prevailing on the open market. For the past several weeks the base price of the market has been 8c although it is believed that sales have been made below this figure. Dealers here are awaiting the American announcement but it is not likely that this market will be immediately affected by Government action. Prices are firm at 11c per lb., but an undertone of weakness is apparent.

Antimony.—Trading is quiet and the market is generally easier, inquiries are light and a weaker tone is developing. New York has declined and dealers here are quoting 18c on a dull market.

Aluminum.—Poor demand has weakened the market and lower prices have been announced; quotations on the New York market have declined one cent per lb., and dealers here report a weaker tone but are maintaining prices at from 63 to 68c per lb.

Machine Tools and Supplies

Nothing of importance has transpired in the machine tool situation and conditions are practically unchanged with business confined to the sale of small requirements of a general character. Business in connection with the munitions industry in Canada is almost nil, owing to the decline in the production of shells. Inquiries for equipment suitable for different classes of marine work have shown some falling off but sufficient is still passing to maintain a favorable degree of activity. Owing to the ever increasing activity that is developing in the States, it has become almost impossible to secure delivery on certain classes of machinery, more particularly of the heavier type, as the bulk of these are needed for American war requirements. The demands in this respect are taxing the capacity of machine tool builders in the States, and the result of this condition should be to stimulate activity through the Canadian industry. The demand for supplies continues to be of a very fair volume but the decrease has been marked in connection with munition requirements; this has however, been somewhat balanced by the increase that has been evident respecting the requirements for ship building purposes. The fixing of prices on raw and semi-finished materials has as yet not affected the price of supplies as the general market continues very firm; it is anticipated however, that the near future will see changes in this direction.

Scrap

The entire scrap situation is affected by the uncertainty surrounding the developments now pending in the States, and the attitude of the American Government in the policy they adopt in the adjusting of prices on old materials; Should action be taken in this connection it is generally believed that the market will assume an easier tone as it is anticipated that any price fixing would be to a lower level. While the scrap iron and steel market in the States has developed a weaker tone, the local situation remains firm and in some instances stronger; old boiler plate has advanced $1 and is quoted at $23 per

ton. Steel rails are bringing $25 while wrought iron rails are quoted as high as $29 per ton. Wrought iron pipe has been advanced and is now quoted at $15. Steel axles quotations are 3c higher than last week the prevailing price being $32 per ton, certain classes are however bringing as high as $40 per ton. Cast borings at $15 show an advance of $3 per ton. In the old metals light copper has remained firm while the heavier grades have developed strength, the quotation of 22½c representing an advance of 1½c per lb. Brass turnings are firm with an average price quotation of 15c per lb. Scrap zinc is easier, a decline of 1½c placing the quotation at 5c per lb. Heavy lead at 7½c shows a decline of 2½c per lb. Tea lead is weaker having declined ½c to 6½c per lb. The market here is nervous and unsettled owing to American developments.

TORONTO, Ont., Oct. 16.—The power question will apparently be a difficult problem to solve this coming winter for in addition to the coal situation there is reported to be a shortage of hydro power in this province. Factories working on war orders will not suffer, but some other hydro power users may have to get along as well as they can. According to reports there is a shortage of approximately 60,000 h.p. and no way of obtaining relief except by utilizing old steam plants put out of commission when hydro power was installed. This will throw an additional strain on the coal situation and supplies are none too heavy. Fuel Controller C. A. Magrath has issued an order limiting coal dealers' profits which may have beneficial results, although there has been an increase in schedule of coal prices in certain mining districts in the States which indicates the possibility of an upward revision of prices already fixed in other districts from which coal for Canada is obtained.

Steel

It is becoming more apparent that the price regulation of steel products in the United States is not going to affect the Canadian markets to any appreciable extent for some time. The U.S. mills have not as yet reduced their prices on export business, except, of course, on Government requirements, and indications are that they will hesitate to accept orders from private consumers at the prices fixed by the Government. The reason advanced by them is that they cannot promise any definite delivery owing to the congested conditions at the mills and heavy demand for steel by the Government. The steel companies are not looking for business as they have still a large amount of steel to deliver before they can consider the new price schedule. Furthermore, the requirements of the U.S. Government and the Allies are becoming increasingly heavy and it will not be long before the tonnage required for war purposes will be such that ordinary consumers will have much difficulty in getting steel at all, regardless of price, for any purpose other than for war business or directly contributary thereto. This situation taken in conjunction with the embargo does not place jobbers or manufacturing consumers in Canada in a very enviable position. While the representations which will be made to the Priority Board at Washington by Canadian manufacturers may result in some relief, it is fairly obvious that the situation will still be acute and manufacturing operations considerably restricted. It is unlikely that firms engaged on war business in Canada will be affected any more than those concerns in the States engaged in similar business, but consumers in both countries working on purely domestic business will be equally handicapped in their manufacturing operations. It is this feature that encourages the belief that prices of iron and steel products will likely remain higher than the regulations call for. There have been no further developments in regard to the embargo and none are expected until the committee of manufacturers have completed their work of collecting data as to the amount and kind of steel required from the States. In the meantime the whole situation is confused and outlook uncertain. Business is quiet as consumers are awaiting developments. Prices continue stationary but firm.

The War Industries Board at Washington has fixed maximum prices on some more steel products in addition to those agreed upon a short time ago. Blooms and billets, 4 by 4 in. and larger are now $47.50 gross ton; billets under 4 by 4 in. are $57; slabs, $50, and sheet bars $57, Pittsburgh and Youngstown bases. The prices will apply to private as well as to Government contracts. The price of billets, fixed at $47.50, represents a reduction from the current market price of about $22.50 a ton; billets at $51, a reduction of from $29 to $44 a ton, and wire rods fixed at $57, a reduction of $33 a ton. Prices later will be fixed on most of the other iron and steel products.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

Pig Iron

The pig iron market continues quiet but unsettled owing to the situation created by the embargo and price regulation. There is very little iron moving as consumers are keeping out of the market pending an adjustment of outstanding difficulties. Practically nothing can be done in Canada to effect any material improvement as Canadian producers, who are principally affected by prevailing conditions, obtain their raw material from across the line. Those concerns which have their own iron ore and coke are in a fortunate position, being independent of outside sources, but, as these firms are using practically their entire pig iron output for their own mills, foundries cannot obtain pig iron from them. Indications point to it becoming increasingly difficult to obtain pig iron from the States as there will be very little left for export when the Government and consumers have filled their requirements. There is apparently no cheap coke in sight for some time as it is not believed that there will be a free movement of coke at the Government price until after the beginning of the second half of next year when the greater proportion of contracts will have expired.

Scrap

There is no improvement in the scrap metal situation; the market continues dull with a weak tendency. The hand-to-mouth policy of consumers still obtains and more or less uncertainty controls the business. There is a general shortage of scrap and, were it not for this. prices would doubtless be lower than the prevailing levels. There are no price changes to note this week.

Machine Tools

The trend of business in machine tools appears to be turning right round if the recent development in the market comes to anything. Certain firms in the States appear to be anxious to buy munitions plants in Canada which have not been operated since contracts were completed and there is a ready market for them. Whether the sale of these plants will be allowed or not is open to doubt, but, in view of the fact that the munitions business is now only one-third of what it was formerly, it is not unlikely that permission in some cases will be given. Indications at present are that no more shrapnel contracts will be given out and that 6 in. shells will be the principal size to be made in Canada. Developments may, however, result in a change of present arrangements so it is difficult to say what will actually happen in this regard. A number of firms have contracts for 6 in. shells and the expenditure on munitions will run into about $30,000,000 per month, for the remainder of this year, which is a guarantee of considerable activity in this industry. Some firms are understood to have contracts which will keep them busy for at least three to four months of next year.

Metals

The metal markets are dull and inactive owing to the unsettlement prevailing on account of the price fixing policy in the States. Lead has declined, which is the only price change to note. The outstanding feature is the scarcity of copper due partly to the embargo and also to the shortage which has developed in this metal in the States. The demand for lead and spelter has declined as many consumers of these two metals and copper, not being able to get the latter, are not buying either lead or spelter. Business locally is fairly good, being more of a general character; buying is, however, largely hand-to-mouth.

Copper.—A shortage of copper has de-

veloped in the States due to the decline in production on account of strikes. It is now realized that the U.S. Government will take more copper than was anticipated; there will thus be considerably less metal for private consumers. The local market is firm and prices unchanged. Lake and electrolytics are quoted at 32c and castings at 31c per pound.

Tin.—An advance in London has been reflected in a firmer market here, but prices are unchanged in the meantime. Tin is quoted locally at 63c. per pound.

Spelter.—Statistics on spelter recently issued show a marked increase in smelting capacity in spite of the unsatisfactory market conditions which will tend to keep prices down. The market is easier but unchanged at 10½c per pound.

Lead.—Further weakness has developed in lead in sympathy with the situation in New York. The market is unsettled as it is expected that the price to be fixed by the Government will be lower than the present market. Lead has declined ¼c and is now quoted at 10¾c per pound locally.

Antimony.—The market is weaker, but prices are unchanged at 19c per pound.

Aluminum.—Weakness has developed in the market but quotations are unchanged at 62c per pound.

NEW YORK, Oct. 13. — Machinery manufacturers are receiving heavy orders for shop equipment from shipyards, from airplane engine makers and from builders of guns, gun mechanisms and from ammunition manufacturers. At the moment the greatest interest is centered in the requirements of shellmakers and numerous companies, in anticipation of Government awards, are sounding the market for machine tools.

The United States Government is on the point of distributing contracts for large numbers of high explosive projectiles and of smaller shells. One interesting point is that many of the shells will be manufactured to French rather than to American standards. The full program will cover the making of 45,000,000 to 50,000,000 shells for which the United States Government will expend probably between $750,000,000 and $1,000,000,000 for the finished shells. It is estimated that the steel mills will be called upon to deliver 2,000,000 tons of steel bars and forgings to manufacturers of ammunition in the next twelve months and at an average price of 3¾c per pound this steel will call for the payment of $150,000,000.

In the last week, manufacturers of ordnance, gun mechanisms and shells, who have received Government contracts amounting to $100,000,000, have placed orders for several million dollars worth of tools and other large machinery contracts are still pending. The Ordnance Department of the Army has succeeded in including a number of manufacturers at Detroit, Chicago and at other points in the Central West to co-operate closely in the manufacture of gun mechanisms and of shells and shell parts. Manufacturers at Dayton, Ohio, have been installing tools preparatory to beginning work on shell contracts amounting to $20,000,000. Detroit automobile companies are co-operating to fill a $30,000,000 Government contract for gun mechanisms and a Chicago organization, to manufacture special tools for making big guns, is being perfected. At St. Louis manufacturers are preparing to co-operate in the manufacture of gun carriages and gun mounts and in the East several manufacturers are preparing to execute orders for firing mechanisms.

As a result of these activities orders are being placed for over $1,000,000 worth of machine tools and there are other inquiries in the market for tools to be used in equipping shops engaged in work on Government contracts. The Standard Ordnance Co. is buying machinery for a plant at Hamilton, Ohio, in the New York market, and another Ohio manufacturer is buying 145 machine tools at Cleveland. The United States Government is buying 25 turret lathes in the same market, and the Forest City Machine & Forge Co. is building an addition to its Cleveland plant to execute an order for 2,300,000 detonators for 2 and 3-inch shells, while the Cleveland Ordnance Co. is preparing a list of machines required for forging, turning and boring 3-inch and 4-inch guns. Activity continues at the Rock Island Arensal, another contract having been placed for nearly 1,000 tons of steel for 21 store houses, and additional purchases of machine tools have been made in the Chicago territory.

The J. G. White Engineering Corporation has put out a second list covering about 800 machine tools to be installed in airplane engine factories in France for the United States Government. This is a duplication of the purchase made some time since of machine tools to build Liberty motors. Other airplane manufacturers continue in the market for equipment.

Shipyards are still prominently represented in the machinery market. Charles L. Seabury & Co., New York, with a contract to build five mine sweepers for the United States Navy, is buying pneumatic and other tools. The New York Shipbuilding Corporation, who are pushing preparations to build torpedo boat destroyers for the Navy, is issuing a large list of machines and cranes needed. Supplementary orders for machinery are being placed in the New York market by the Union Iron Works of San Francisco. This plant is building a large number of destroyers for the Government.

Steel manufacturers and the War Industries Board have agreed on fixed prices for semi-finished steel, and action will be taken on finished steel prices within a few days.

PITTSBURGH, PA., Oct. 13.—A fresh batch of steel prices was announced at Washington Thursday evening: Billets, 4 x 4 and larger, $47.50; under 4 x 4, $51; slabs, $50; sheet bars, $51; wire rods, $57, all per gross ton; grooved steel skelp, 2.90c; universal mill skelp, 3.15c; sheared skelp, 3.25c; shell steel rounds, 3-inch to and including 5-inch, 3.25c; to 8-inch, 3.50; to 10-inch, 3.75c; over 10-inch, 4.00c. Billets, slabs and sheet bars are f.o.b. Pittsburgh or Youngstown. Wire rods, skelp and shell bars are f.o.b. Pittsburgh. The bar, shape and plate prices of 2.90c, 3.00c and 3.25c announced September 24 were stated to be Pittsburgh or Chicago basis, but the steel manufacturers afterwards stated there had been no mention of a separate Chicago basis and their attitude was that the Pittsburgh basis was to remain as formerly, Chicago prices being Pittsburgh plus freight. As the later announcement names Pittsburgh only, it is fairly safe to assume that the Government has dropped the idea of making Chicago a separate basing point.

The prices announced, as in the former instance, are stated to represent a voluntary agreement between the Government and the manufacturers. As some commercial consumers state they have approached mills and found them unwilling to sell at the new prices and, therefore, question whether all mills are disposed to carry out the agreement, it may be well to state that the writer's interpretation of the spirit of the agreement is that the steel makers will sell freely to the Government for itself, and to the Government's Allies, direct or through the Government, at the stated prices, and that they will not sell to others at higher than the stated prices. This, it would appear, is the obvious interpretation. The mills have a great deal of tonnage on their books, and the Priority Board is to determine the sequence of filling all orders. It would be futile for them to agree to sell to everybody at the stated prices or, for that matter, at any prices at all. All that is practicable is to agree not to sell to other buyers at more than the stated prices.

The announcement of this second batch of prices was the result of a general meeting at Washington Wednesday and Thursday between the War Industries Board and the steel manufacturers, the prices after the meeting having been passed upon by the President. The steel makers had previously been holding meetings among themselves at which they discussed prices, being given some hints it is understood, as to what prices the War Industries Board had in mind. It was expected that prices would be announced for some other products, such as tubular goods, wire products and sheets. The delay is presumably to be attributable to difficulty in reaching a common ground, and further announcements may be expected any day.

Prices in Harmony

Scrutinized in the light of information as to costs of production in different departments, all the prices thus far announced are in close harmony with each other, in better harmony, indeed, than has obtained at any time under ordinary open market conditions, while the price structure of the past few months, created by the competitive bidding of buyers, has been utterly discordant. It would appear that if similar principles obtain as to further price fixing that standard steel pipe will be set on about a 55 per cent.

list, which indeed is the present list of the National Tube Co., most of the independents having either a 49 per cent. or a 42 per cent. list. A 55 per cent. list would apparently be fairly in harmony with the skelp prices announced. The sheet bar prices of $51 would suggest a price for 28 gauge black sheets of about 5.00c, which would call for something like 6.50c for galvanized sheets. The blue annealed sheet question is somewhat intricate, but one method of comparison would set them at 4.00c for 10 gauge, to be in relation to plates at 3.25c, and 28 gauge black sheets at 5.00c. It would seem difficult to avoid setting wire products on the basis of $3.20 for nails, the price the American Steel & Wire Co. has adhered to since early in March, while the independents advanced first to $3.50 and then to $4, while of late they have wavered rather noticeably from the $4 basis.

Markets Continues Dull

The finished steel market had been dull, and increasingly so, for about three months prior to the time when price-fixing actually began, some three weeks ago. There had previously been a sharp decline in buying for far forward deliveries, and then the buying for relatively early deliveries had dwindled. Naturally price fixing would not revive such a market. If there were a call for early deliveries in considerable tonnages it could not be met, as the mills are filled, and as for very late deliveries no one could have an idea when they could be made, with the Priority Board regulating the sequence of filling of all orders. There is no reason to suppose, however, that there would be much buying for early deliveries if the mills were willing to sell freely. Consumers as a rule are covered already and the requirements of many are evidently diminishing. There has been a noteworthy decrease in specifications filed against open contracts, in the past fortnight. However limited may be the offerings in the open market, it has become clear that steel is more plentiful, or it may be said to be less scarce. Buyers have less difficulty in securing deliveries against their contracts.

Exports

As the administration had no legal authority for requiring that sales of steel to all buyers should be at a fixed maximum, and had to depend upon a voluntary agreement to secure the establishment of its "one price for all" doctrine, it naturally had to use all methods that presented themselves for applying pressure. If it be assumed, as seems reasonable, that the embargo on exports was employed in part for this purpose, there is a distinct possibility that the agreement will be followed by a relaxation in the matter of granting export permits, and in the case of Canada in particular. The recent embargo on exports of coal to Canada has been lifted. It had been placed because it was found that advantage was being taken of the priority order, in favor of full shipments in the lake trade, coal being diverted to Canada after it had been routed to Lake Erie ports. Under date of October 10 the Fuel Administration authorized a statement which contained the following reference: "The embargo against sending coal to Canada has been lifted and an arrangement made whereby she is to be supplied on a pro rata basis, substantially as though she were a State of the Union." This year's coal production is estimated to be 10 per cent. in excess of that of last year, and as Canada received 19,000,000 tons last year she is to get 10 per cent. more this year.

Pig Iron

Contrary to expectations, the pig iron schedule has not been announced. It would show the relations between grades, and also between districts, the original fixing being of foundry and basic at $33, valley furnaces. The furnaces assert that they will take care of pressing needs of regular customers, but are not in the open market as they are well sold up.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

MORE STEEL PRICES FIXED

ADVICES from Washington state that an agreement between the War Industries Board and steel manufacturers fixing maximum prices for steel products, about one-third under existing market prices, was approved last Friday by President Wilson. Prices agreed upon, with Pittsburgh and Youngstown as bases, are:

Blooms and billets (4 by 4 in. or larger), $47.50 gross ton; billets (under 4 by 4 in.), $51; slabs, $50; sheet bars, $51.

Prices with Pittsburgh as base are: Steel bars (3 to 5 in.), $3.25 per 100 lbs.; steel bars (5 to 8 in.), $3.50; steel bars (8 to 10 in.), $3.75; steel bars, (over 10 inch), $4; skelp (grooved), $2.90; skelp, (universal), $3.15; (sheared), $3.25.

Prices for pig iron and steel shapes, frames, etc., were fixed by agreement some time ago, and the policy is now extended after frequent conferences between the War Industries Board and the Federal Trade Commission, which supplied cost of production figures, and between the board and the manufacturers. The prices become effective immediately, subject to revision January next.

The board, when announcing the agreement, made this announcement: "The prices will apply to private as well as to Government contracts. The price of billets, fixed at $47.50, represents a reduction from the current market price of about $22.50 a ton; billets at $51, a reduction of $74; sheet bars at $51, a reduction of from $29 to $44 a ton, and wire rods fixed at $57, a reduction of $33 a ton. Prices later will be fixed on most of the other iron and steel products."

IS THERE TOO MUCH STEEL IN SHIPS?

By T. J.

THERE are many people who in these days think that there is too much steel in ships of all kinds, and they may be interested in some remarks which were made by the late Sir William White at a meeting of the Institution of Naval Architects in 1911. He said that in his judgment the margins which were often taken in merchant ship construction were frequently excessive. After allowing fully for the different and difficult conditions under which many classes of merchant ships had to work, he was convinced that in certain classes of vessels a closer approximation might be made with safety to the scantlings and methods of construction which had proved so successful in war ships for long periods, and that much weight might be saved whilst ample strength was provided.

In warship construction they necessarily employed very light scantlings, and the provision of sufficient local strength was often the governing factor in limiting scantlings. Warship builders believed that their proper course was to get from the steel makers beams and bars of sectional forms which would enable them to associate in the best way lightness with strength, and to reduce the work of "building-up" the sections required. The progress of steel manufacture had brought to mercantile shipbuilders the power of getting sections such as were then quite out of the question in the days of iron because of the great cost of special sections. In ships built for the Admiralty service, prices were paid which no private ship-owners would then have looked at. The difficulty had now been surmounted, thanks to the development of steel manufacture, and warships as well as merchant ships had, in that respect, come together more closely than was formerly the case.

But, broadly speaking, he was still of the opinion that, in regard to shell-plating, deck-plating and bulkheads as well as many other portions of structures, there was no real necessity for such marked differences between warships and merchant ships as still existed in practice. Of course, if a mercantile ship has to take the ground frequently, her framing and bottom plating must be

different from those of warships, which are intended to be kept afloat. Merchant ships, also, had to carry large, heavy localized cargoes and this involved special precautions. After allowing for essential differences in conditions of service, however, great benefit might, in his opinion, be derived from a study of the experience gained with warships throughout the world. Designers and builders of merchant ships might safely avail themselves of this experience and that would be true both in regard to considerations of general strength and of local strength.

JAPAN BECOMING BIG STEEL PRODUCER

PROJECTS for two new steel factories in the vicinity of Yokohoma are reported by the Japan *Advertiser*. The Asano Steel Works are projected by Mr. Soichiro Asano, and the other plant is that of the Japan Steel Pipe Factory. Mr. Asano is the president of the Toyo Kisen Kaisha and the founder of the Asano Shipbuilding Co. His shipyards, established only ten months ago, are now operating at full capacity. The Mitsubishi Engine and Iron Works, Nagasaki, and the Kawasaki Dockyard Co., Kobe, also have found it imperative to be able to produce their own steel. Mr. Ryozo Asano, managing director of the Toyo Kisen Kaisha, and son of Mr. Soichiro Asano, has sailed for the United States, where he will investigate the steel industry and make purchases of the latest steel-producing equipment.

Regarding the new Asano Steel Works, Mr. Kato, managing director, and chief engineer of the Asano Shipbuilding Co., is quoted by the *Advertiser* as stating that the independence of the supply of steel has much to do with the independence of the shipbuilding industry of Japan.

The Japan *Chronicle* states that several projects have been launched in that country for establishing iron works. The Tokai Kogyo Kaisha, recently established, has bought an extensive tract of land in a suburb of Wakamatsu, where workshops are being erected.

Another iron-manufacturing company in course of flotation is the Fuji Seiko Kaisha, with a capital of $2,991,000. The Nippon Kotetsu Kaisha also recently invited subscriptions from the public to its capital of $498,500. There is besides, the gigantic project of the Kuhara family of Osaka, with a capital of $4,985,000. The Toyo Seitetsu Kaisha has lately increased its capital to $14,955,000, and has bought an extensive site in Kyushu for new workshops, the building of which will be commenced in April next. When these new factories have been completed the company will be able to produce 170,000 tons of pig iron a year.

Sorel, P.Q.—The Sorel shipyard, one of the oldest shipbuilding plants in Canada, has been acquired by the Federal Government. It has been under lease to the latter for several years.

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

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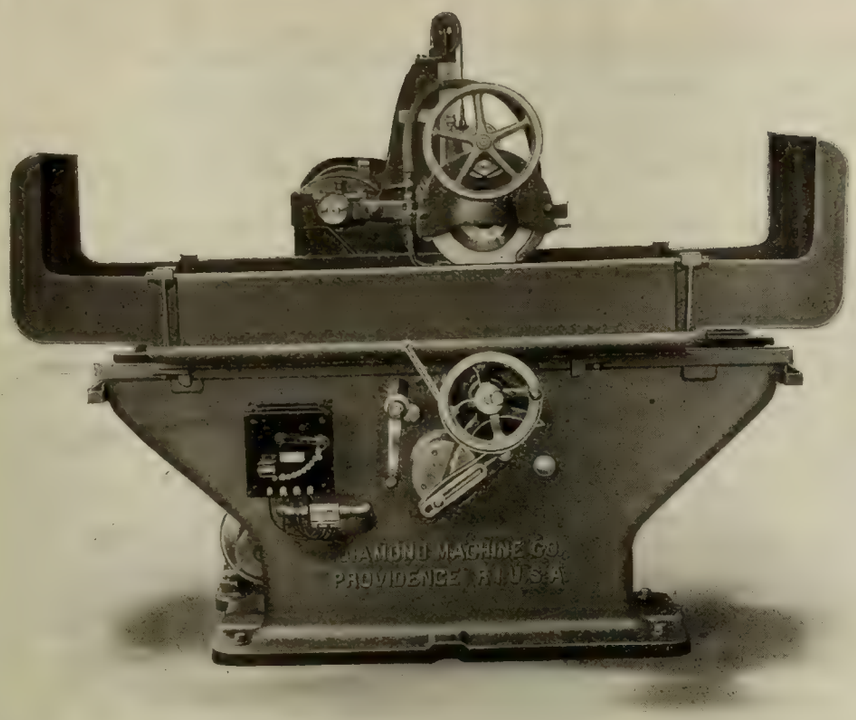

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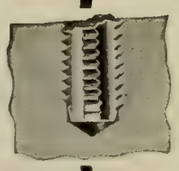

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INDUSTRIAL AND CONSTRUCTION NEWS

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ENGINEERING

Bradford, Ont.—The hydro-electric by-law was carried here by a large majority.

Perth, Ont.—The Henry K. Wampole Co. are building a soap factory here, and are in the market for a steam power plant equipment.

Montreal, Que.—The Montreal Locomotive Co. has been granted a permit to build an addition to its plant on Notre Dame Street East, to cost $23,000.

Port Colborne, Ont.—During a storm here on Friday, the ore bridge at the Canadian Furnace Co's. plant was damaged to the extent of $80,000.

Chambly, Que.—The Canadian Leather Board Co. is in the market for shafting, pulleys and other equipment for its factory which is being erected at a cost of $250,000.

Brockville, Ont.—At a meeting of the Canada Foundries and Forgings Co., held here on Oct. 10, it was decided to purchase the Delaney Iron & Forgings Co's. plant at Buffalo, N.Y. The company will go extensively into the manufacture of marine forgings.

Cochrane, Ont.—The plant of the Metagami Pulp & Paper Co. at Smooth Rock Falls, on the Metagami River, is completed. The turbines have been tested, and the installation considered successful. The plant will be in operation within the next few days.

Victoria, B.C.—The Canadian Copper Co. has sold a $2,500,000 bond issue in New York to finance development of their properties at Copper Mountain and Similkameen. The plans provide for expending the proceeds of the bond issue on the further development of the mine and the construction of a concentrating plant to handle eventually 3,000 tons of ore per day. The company has already spent a million and a quarter dollars on the property. The company has been in negotiations with the Kettle Valley Railway for a branch line to Princeton 13 miles long. Oscar Lachmond is the general manager.

Bridgeburg, Ont. — The shipbuilding plant owned by Canadian Allis-Chalmers Ltd. of Toronto on the Niagara River three miles below Bridgeburg, which has been closed for several years, will be opened at once for the construction of all-steel ships of Welland Canal size. The works were built in 1903 by the now defunct Canadian Shipbuilding Co. Only one boat was built, the E. B. Osler, but that was then the largest steel freighter under Canadian registry on the Great Lakes. It was 553 feet over all. The buildings are modern, and the docks and ways are intact. Some additional shipbuilding machinery will be needed as some of the original machinery was sold by the foundry company which operated the plant for three years in fabricating steel.

Victoria, B.C. — The expenditure of well over one million dollars, spread over eighteen months' work, is involved in the purchase of 350 acres of coal lands at Cassidys Landing in the Nanaimo district of Vancouver Island, establishment of shipping facilities and the erection of a coke and by-products plant at Anyox by the Granby Consolidated Mining, Smelting and Power Co. The coal mined from this property will be shipped north to Anyox to the proposed coke plant, which will be started as soon as possible. It is expected that the manufacture of coke at Anyox will begin within eighteen months. The plant capacity is to be 350 tons of coke per day. The company propose to manufacture sulphate of ammonia, benzol and toluol etc.

U.S. FIRMS PLACE ORDERS IN CANADA

News has just reached us that two Canadian firms have secured contracts for approximately $1,000,000 worth of orders for equipment for ships, from firms in the United States. The delivery of the necessary steel has been guaranteed by the U.S. Government.

GENERAL

Trenton, N.S.—The Humphrey's Glass Works will build a glass factory here to cost $150,000. E. H. Humphrey, of Trenton, is interested.

Campbellford, Ont. — The storage building at the Northumberland Paper and Electric Co.'s plant was destroyed by fire on Oct. 10. The loss is covered by insurance.

Regina, Sask. — The Saskatchewan Co-operative Elevator Co's. elevator at Maryfield was destroyed by fire last Saturday, with an estimated loss of $10,000. Some 6,500 bushels of wheat were also burned. Building and grain were covered by insurance.

MUNICIPAL

Sherbrooke, Que.—The City Council contemplate the installation of a filtration plant.

Stratford, Ont.—A by-law was passed by the City Council on Monday to provide $15,000 for water works extensions.

St. Lambert, Que.—A by-law will be submitted to the ratepayers to sanction an expenditure of $100,000 for street improvements.

Hamilton, Ont.—The City Council have decided to purchase additional steam pumping equipment, at a cost of $159,000. The contract for the pumps was let to the Turbine Equipment Co., and boiler to the Babcock & Wilcox Co.

Montreal, Que.—Following the latest overtures made by the city, the Montreal Abattoirs Co. has written a letter to the Board of Control stating that it is willing to move its packing house and rendering plant outside the city limits upon a yearly payment of $50,000 for twenty years, or $1,000,000 in all.

Regina, Sask.—Preliminary negotiations for the manufacture of the new fuel, oakole, from city garbage and refuse are being conducted between the Canadian Nufuel Co., and the City Commissioners with the object of establishing a plant here for the manufacture of oakole, either as a municipal enterprise or as a private concern with municipal co-operation.

Victoria, B.C.—Seventy-five mayors, aldermen, publicity and development men, from all the chief centres of the province at Duncan recently adopted a constitution of the Good Roads League. A resolution was passed unanimously that the Government be urged to proceed with the construction of a road across the province with the utmost expedition and to endeavor to obtain financial assistance from the Federal Government.

PERSONAL

F. D. Canfield, Junior, a director and large shareholder of the Canada Foundries & Forgings Co., died in New York recently.

Frank Parrish, for many years assistant general purchasing agent of the American Bridge Co., Pittsburgh, and well and favorably known to the trade, has been appointed purchasing agent of the Canadian Steel Corporation, Ltd., effective October 8, and will be located at Ojibway, Ont.

CONTRACTS

Windsor, Ont.—Contracts have been let to the Chick Contracting Co., Windsor, for extension of the Essex Terminal Railway from Ojibway to near Amherstburg, where the Brunner Mond Co., a subsidiary of the Solvay Process Co., is building an $8,000,000 plant. The contract is worth $60,000.

Fort William, Ont.—In open competition with engineers from New York, Chicago and other American cities the Fort William firm of E. J. McQueen and Co. has secured the contract for the erec-

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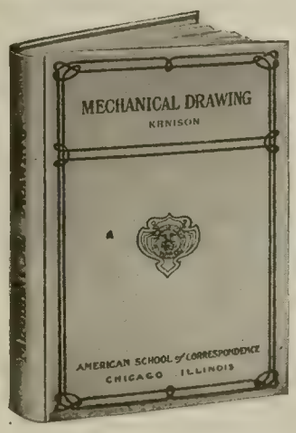
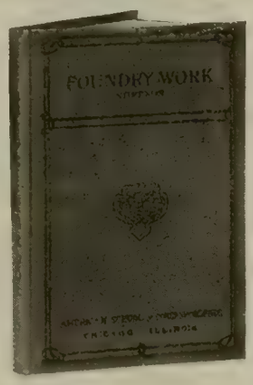
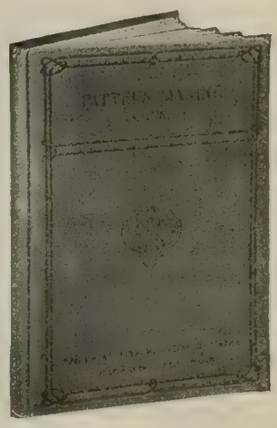


MECHANICAL DRAWING. By Ervin Kenison, S.B., Assistant Professor of Mechanical Drawing. Massachusetts Institute of Technology. 176 pp., 120 illus. Cloth binding. Gives a course of practical instruction in the art of Mechanical Drawing, based on methods that have stood the test of years of experience. Includes orthographic, isometric and oblique projections, shade lines, intersections and developments, lettering, etc., with abundant exercises and plates. Price...**$1.00**



FOUNDRY WORK. By Wm. C. Stimpson, Head Instructor in Foundry Work and Forging, Department of Science and Technology, Pratt Institute. 160 pp., 142 illus. Cloth binding. A practical guide to modern methods of moulding and casting in iron, brass, bronze, steel, and other metals, from simple and complex patterns, including many valuable hints on shop management and equipment, useful tables, etc. Price **$1.00**



PATTERN MAKING. By James Ritchey, Instructor in Wood Working, Armour Institute of Technology. 160 pp., 250 illus. Cloth binding. Shows the reader how to take the blueprint and from it make the pattern for any kind of casting under any condition. The allowances for shrinkage, draft, and finish are explained. Simple and built-up patterns of all kinds are clearly treated. Various special cases are taken up, such as pulleys, cranks, pipe connections, valves, etc. Price **$1.00**

MACHINE DESIGN. By Charles L. Griffin, S.B., Assistant Engineer, the Solvay-Process Co., American Society of Mechanical Engineers. 208 pp., 82 designs. Cloth binding. Explains in detail how to make the entire design of all kinds of machinery, how to lay cut gears, etc., with complete specimen designs of numerous machines. Price **$1.50**

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TOOL MAKING. By Edward R. Markham, Consulting Mechanical Engineer, formerly Superintendent of the Waltham Watch Tool Co., American Society of Mechanical Engineers, Author of "The American Steel Worker." 224 pp., 325 illus. Cloth binding. Takes up the methods of treating tool steels—annealing, tempering, spring tempering, hardening, case-hardening, etc.; how to make drills and reamers of all kinds; the making of arbors and mandrels, taps, hobs, reamer and tap-holders, jigs, gauges, dies and die-holders of all kinds, counterbores, facing tools, milling cutters, hollow mills, and forming tools. Gives all necessary information for tool making in all its branches. Price ...**$1.50**

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tion of a reinforced concrete elevator for Henry Ford and Son, of Detroit, Mich., to be erected on the Ford country estate at Dearborn, Mich., and is to be completed before Jan. 1, 1918.

TRADE GOSSIP

Red Cross Donation.—The Vanadium-Alloys Steel Co., Pittsburgh, Pa., have forwarded through Canadian Machinery a cheque for $300 towards the British Red Cross fund, the city of Toronto week's campaign for which opened on Monday, October 15.

High Cost of Glycerine.—Glycerine a few days ago reached highest price it has ever touched, selling at 70 cents a pound in the United States. Highest before the war was 24½ cents a pound. Within the last few weeks the price has been rising rapidly because of the demand from explosives manufacturers.

Victoria, B.C.—The persistent rumors that it was the intention of the Imperial Munitions Board in Canada not to renew British Columbia contracts for munitions of war are apparently true, since already some 800 workers, male and female, engaged in their manufacture, have been laid off in Victoria, Vancouver and New Westminster.

Carry No Matches Into Explosive Plants.—An order in council has been passed at Ottawa providing heavy penalties for any person who attempts to take matches, or has matches in his possession, in any explosive factory. Anyone guilty of infraction is liable to a fine not exceeding $100, or six months imprisonment, or both.

Blow to Hydro-Electric.—"If the Dominion Government gives the Aluminum Co. the right to dam the St. Lawrence, it will be a calamity and a blow to the Hydro-Electric power development in the province," Sir Adam Beck declared at Toronto recently in referring to the report that the Aluminum Co. has been given permission to build a dam at the Long Sault in the St. Lawrence river.

Research Work in Great Britain.—J. E. Ray, Dominion Trade Commissioner in Great Britain, reports that important work is being done by the British Advisory Council for Scientific and Industrial Research. He states that progress has been made in the production of a marketable hard porcelain from purely British material, also in discoveries in respect to high-speed steel, which have proved of great value to the Admiralty.

Marine Insurance Drops.—A Washington, D.C. despatch states that a cut of 22 per cent. in the cost of Government insurance for crews traversing the submarine zone was taken as further evidence of waning U-boat effectiveness. Vessels trading with the Azores, the Canary Islands and Morocco ports on the Atlantic were added by to-day's treasury order to those touching at European and Mediterranean ports as requiring seamen's insurance.

The Turbine Equipment Co., Toronto, have been awarded the contract for the new pumping plant for the City of Hamilton. The new equipment will be installed at the Beach pumping station and will consist of the following: One ten million Imperial gallon capacity De Laval centrifugal pump driven by a 815 h.p. De Laval steam turbine. One pump of the same make, type and capacity driven by a 900 h.p. Canadian Westinghouse motor, and a 400 h.p. Babcock and Wilcox water tube boiler.

To Aid Montreal Manufacturers.—Facilities to enable Montreal manufacturers to obtain more promptly information on transportation tariffs are being provided by the Montreal branch of the Canadian Manufacturers' Association. W. P. Hughes, the local secretary, spent some time in Toronto recently with J. E. Walsh, the association's transportation manager, and his assistant, S. B. Brown, revising the tariff files. Now a list of about 500 tariffs is available at the Montreal office for consultation by members.

Noel J. Ogilvie succeeds the late Dr. W. F. King, C.M.G., as superintendent of the Geodetic Survey of Canada. Mr. Ogilvie received his commission as a surveyor in February, 1905. In 1905-06 he was in charge of a survey party on the International boundry survey of the 49th parallel of latitude, covering all branches of this work. In 1914 Mr. Ogilvie was given the title of assistant superintendent of the Geodetic Survey. Recently he was in charge of the geodetic survey of the British Columbia coast.

U. S. Steel Corporation's Unfilled Tonnage.—The unfilled tonnage on the books of the U. S. Steel Corporation of September 30 last was 9,833,477 tons, a decrease of 573,572 tons from August 31, according to the monthly statement of the corporation issued recently. This is the fifth successive monthly decrease in the figures since the high record of 12,183,083 tons was established last April. The unfilled tonnage to-day compared with 10,407,049 Aug. 31, and 10,844,164 July 31. On Sept. 30, 1916, unfilled tonnage totalled 9,552,584.

U.S. Fuel Oil for Great Britain.—An ample supply of fuel oil for the British navy was assured at a conference between British Government representatives, Standard Oil officials and members of the U.S. Shipping Board at Washington on Oct. 10. The Shipping Board will rush construction of 58 oil tankers recently commandeered in shipbuilding yards, and is considering building at least forty more. The problem, it was declared, is entirely one of tonnage, as there is an abundance of oil on this side of the Atlantic.

Terminal Transportation Association Formed.—Departmental heads of the transportation companies in Toronto have formed an association for improvement of business conditions which is to be known as the Toronto Terminal Transportation Association. The intention is for the present that the association will confer with shippers and shippers' representatives to bring about bettered conditions on the railways first and then with the public. W. H. Farrell, Superintendent G. T. R., Toronto, is Chairman of the association.

G. T. R. Directors Return East.—A. W. Smithers, chairman of the Grand Trunk Railway System, accompanied by a number of officials, has returned to Montreal, after a twelve thousand-mile inspection of the G. T. R. System. In addition to Mr. Smithers, the party included Howard G. Kelley, newly-appointed president of the system; J. E. Dalrymple, vice-president, in charge of traffic; Frank Scott, vice-president and treasurer; C. G. Jones, assistant to the president; R. Molson Macpherson, of Quebec, director of the G. T. P., and Jules Horne, of Montreal, director of the G. T. P.

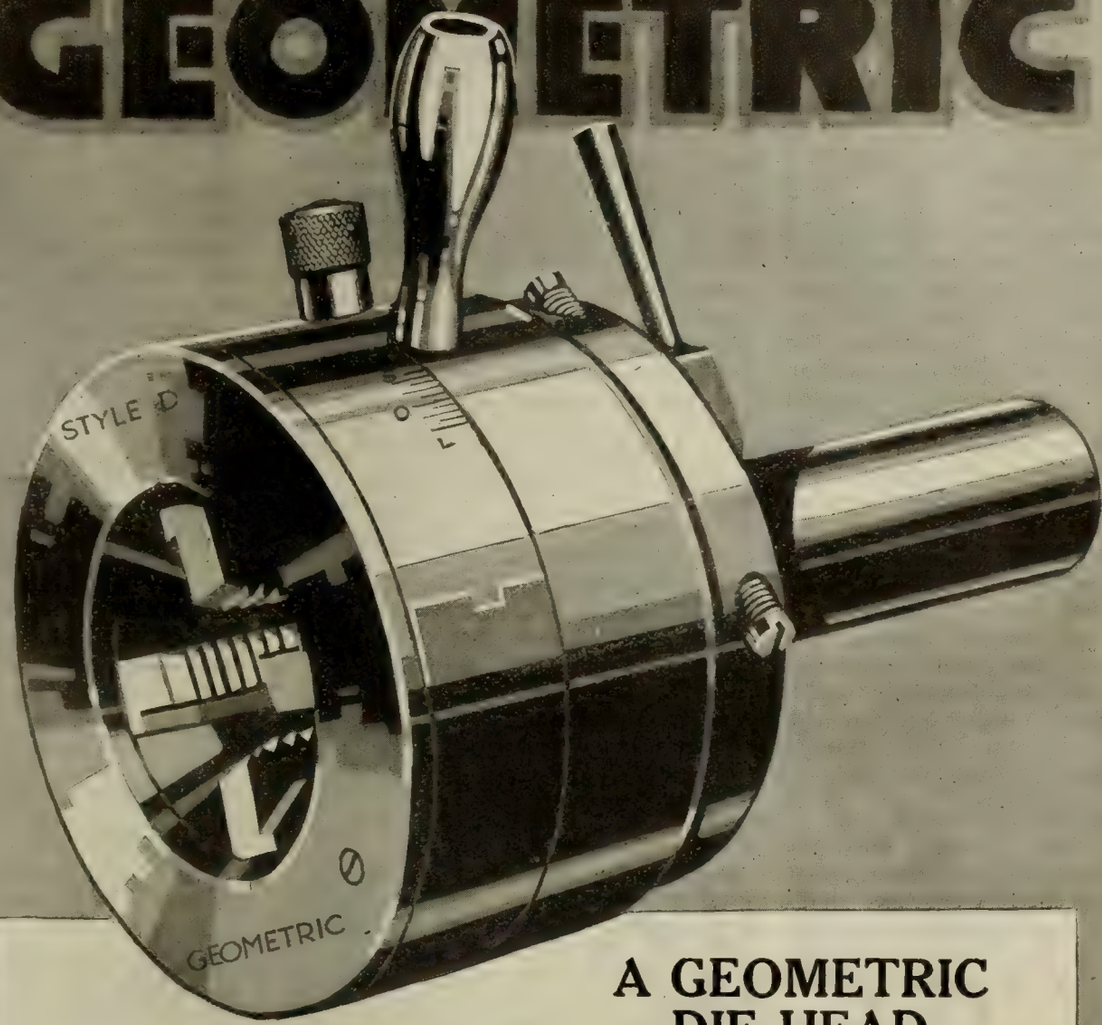
To Fix Dealers' Profits on Coal.—Regulations are being framed by C. A. Magrath, fuel controller, for the fixing of profits on the sale of coal by brokers, wholesalers and retailers, throughout Canada. It is understood that retail profits will be limited to 50c a ton and wholesale dealers' and brokers' profits will be on a still lower scale. It is also likely that provision will be made to restrict undue accumulation of coal in the hands of consumers. The fuel controller in his new regulations is following closely the precedent established in fixing the price of coal in Great Britain, which deals with restrictions of profits of middlemen rather than cost of production.

Railway Stock Ready for France.—American manufacturing enterprise again has demonstrated its ability to meet the extraordinary demands of war. It was disclosed recently that within twenty days after the War Department delivered designs for special locomotives and cars for the troops in France, the first of 680 engines and the first of 6,000 cars were ready for shipment. French railroads will not stand the weight and length of standard American rolling stock. The special engines weigh 166,500 pounds and the new cars are only 36 feet in length, to negotiate the short curves of French roads.

Montreal Firm Builds Wooden Ships.—Keels have been laid by the Fraser Brace Co. of Montreal for the erection of two wooden ships in their shipyard on the south bank of the Lachine Canal, between the Atwater and Cote St. Paul bridges. And just as soon as these have been well advanced, keels will be laid for two more. The ships will be built of wood and each will have a carrying capacity of 2,500 tons. The Fraser Brace Co. will build the hulls only, and each of these will cost about $250,000. This $1,000,000 contract has been awarded the Fraser Brace Company by the Imperial Munitions Board. The company has taken out permits to put up four small buildings at the shipyard that will mean an expenditure of about $8,000. A sawmill is included in the list.

Coal Embargo to Canada Lifted.—The embargo on coal shipments to Canada was lifted last Wednesday by the fuel administration at Washington which decided that shipments can go forward through lake ports without endangering

GEOMETRIC



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the supply of the north-western states. "This action was taken," it was announced, "because it is vital that Canada's war industries be kept going at full blast. Canada got approximately 19,000,000 tons of coal, anthracite and bituminous, from the United States last year. This year she will receive the same amount, plus an increase prorated upon the excess over last year's production.

Ships of Concrete.—There is under construction at the Bureau of Standards in Washington a nine-foot model of an ocean-going ship made of concrete. It is being made at the request of the United States Emergency Fleet Corporation to test the virtue of claims of engineers that a seaworthy ship may be built of concrete; that it can be constructed more cheaply, and that it will weigh less than a wooden ship of the same tonnage. The Fleet Corporation also has its eyes on a 5,000 ton vessel that is being constructed of concrete in San Francisco. This vessel, ordered by the Standard Oil Co., has been taken over by the Government, and will be tested in actual operation as soon as it is finished.

U.S. Firm to Build Concrete Boats.—Ships of concrete are to be built near Detroit by the Torcrete Shipbuilding Co., recently organized in Chicago. The company is now negotiating for a suitable site on which to begin building 1,200-ton reinforced concrete vessels after what is known as the Torcrete system. Steamers are to be built here for the Great Lakes service. Additional yards will be established later, it is said, in New York, New Orleans and Los Angeles. Torcrete is a combination of steel and concrete. The practical application of which is described as creating a laminated hull inside steel reinforcing. It is applied under air pressure, following a new process.

Asbestos Production.—The production of asbestos in Canada during 1916 and the first half of 1917, according to returns received by the Mines Branch, Department of Mines, Ottawa, is shown: Total sales and shipments amounted to 73,203 tons for the first six months of 1917, valued at $3,091,575, while the whole number of shipments for 1916 were 154,149 tons, with a value of $5,228,869. The value of asbestos exported in 1916 was $4,133,735, while for the asbestos exported during the first half of the current year $2,465,957 was received. Imports in the way of manufactured asbestos during 1916 amounted to $334,670, while the imports for the first six months of 1917 have amounted to $287,056.

Robert Weir, president and director of J. & R. Weir, Ltd., Montreal, marine engineers, boilermakers and machinists, died Oct. 8, at the Western Hospital, Montreal, where he had been ill for the past three weeks. He was in his 72nd year, and had been a resident of Montreal for forty-six years. Mr. Weir was born in Glasgow, Scotland, in 1846, and came to Montreal in 1871, following his brother, the late James Campbell Weir, who had come here in 1860, and established the marine engineering and machinist business. He joined his brother in the business, and in 1875 they formed the partnership of J. & R. Weir, which later expanded and became J. & R. Weir, Ltd. When J. C. Weir died, about six years ago, Robert Weir succeeded him as president and director of the company.

Sulphuric Acid Production Increase.—Increase in the production of sulphuric acid to the extent of 2,000,000 tons a year by means of greater activity in the mining of domestic pyrites was set forth as a war service of the American Institute of Mining Engineers at session of the International Congress held at St. Louis, Mo., last week. Sulphuric acid is a requisite in the manufacture of ammunition, and also is an important ingredient in fertilizer. More than 6,000,000 tons of sulphuric acid were produced in the United States last year, and the war makes it necessary to increase this production to 8,000,000 tons. The principal American pyrites mines are in Virginia, New York and California. Last year almost half of the sulphuric acid produced in the States was made from Spanish pyrites.

U. S. Coal Movement Light.—A Cleveland, O., despatch states that the movement of bituminous coal from Lake Erie ports dropped below a million tons last week for the first time in six weeks. The fleet loaded 967,430 tons, and it is claimed the million-ton mark would have been reached only for cutting off shipments to Canadian ports. There is some coal that is consigned to Canada that American dealers will not take, and there are a number of cargoes of that class waiting at Lake Erie ports. In September the fleet loaded 4,609,366 tons of soft coal and Canadian ports received about a third of the total movement. Shipments to American ports for the month were 3,413,932 tons, and vessels took 1,195,434 tons to Canadian ports. The Lake Superior ports received about 3,000,000 tons, and shipments to Lake Michigan ports were 926,063 tons.

Shortage of Hydro Power in Ontario.—Sir Adam Beck of the Hydro Commission announced recently that there was a serious shortage of power, particularly between Toronto and Niagara. It was stated that about 60,000 h.p. was badly needed and the engineers have been gathering data in order to determine what industries can be restricted in the use of power between the hours of 5 p.m. and 8 p.m. This information will further show the number of plants which supplied power for the operation of railways previous to the advent of hydro and then it can readily be seen the amount that can be diverted to the munition plants which are in need of power. It is understood new contracts are being discouraged and municipalities being warned to look out for themselves when their present contract terminates and as their places cease to be hydro customers the amount of power they consume will be turned over to plants working on war materials.

Large Ventilating Contract.—Sheldons Ltd. of Galt, Ont., have secured the largest contract for ventilating equipment ever awarded in Canada. The equipment is for the New Union Station now approaching completion at Toronto, and will consist of 26 Keith multivane fans driven by Canadian Westinghouse motors. Twelve of these will be supply fans delivering a total volume of 270,000 cu. ft. of air per minute and fourteen will be exhaust fans having a total capacity of 210,000 cu. ft. per minute. The contract includes air washing, cooling and humidifying equipment consisting of eleven air washers of the Sheldon Spray type and 17,400 sq. feet of vento radiating surface used in the form of tempering and reheating coils. The contract price was $63,000. Wells & Newton of New York and Toronto are the contractors for the plumbing, heating and ventilating. Walter A. Armstrong is the consulting engineer and Ross & MacDonald are the architects.

Canadian Steel Corporation Developments.—Further particulars have been received respecting the Great Lakes Dredging Co.'s contract at the Canadian Steel Corporation plant at Ojibway, Ont. The marine slip or harbor and wharves will provide for the unloading and storage of ore, limestone and fuel. The harbor will extend about 2,403 feet inland from the harbor line along the left bank of the Detroit River. Its width, from face to face of the concrete walls, which will be 9 feet high by 12 feet wide, will be 400 feet. This reduces to 202 feet between walls at a distance of 303 feet from the harbor line. It continues at the width of 202 feet for a further distance of 2,100 feet inland from this point. The depth will be 23 feet measured from the mean water level of the Detroit River. All piles supporting concrete walls will be approximately 80 feet in length and will be driven to rock. Ore and limestone will be unloaded and stored on one side of this slip and coal for by-product coke ovens and general plant use on the other side. The work does not include piling or concrete walls for support of bridges; neither does it include any unloading machinery.

BUILDING

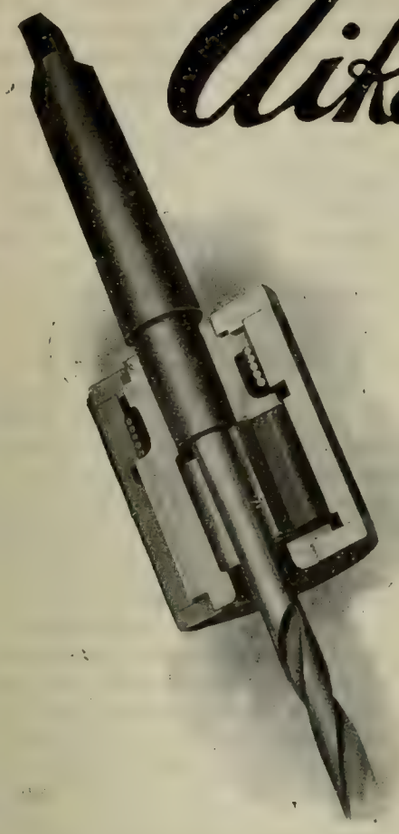
Toronto, Ont.—A building permit has been issued to the Toronto Hosiery Co. for a factory addition at 1103 Queen St. West, to cost $1,600.

TENDERS

Toronto, Ont.—Tenders, addressed to the Board of Control, will be received up to Tuesday, October 30th, 1917, for supplying 5,000 feet 2½-inch fire hose. Forms of tender and all information may be obtained upon application at the office of the Fire Department, No. 152 Adelaide Street West, Toronto.

INCORPORATIONS

Canadian Union Iron Mines Corporation has been incorporated at Ottawa by A. Savard, T. F. Lyons and N. Terk, all of Montreal, with a capital of $1,000,000.



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Minutes mean profit—are you losing minutes? There is no loss of time in tool changes when you use a

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It is entirely automatic in its action — tool changes may be made without stopping the spindle—just grasp the shell of the chuck with one hand and make the tool change with the other. The change is made in a tenth of the time required with the ordinary chuck—and the tool automatically centers itself.

The Wahlstrom comes in two types—one for straight shank tools—the other for Nos. 1, 2 and 3 M.T. shank tools—they are both "Production Increasers," which demands your attention. Write for information now.

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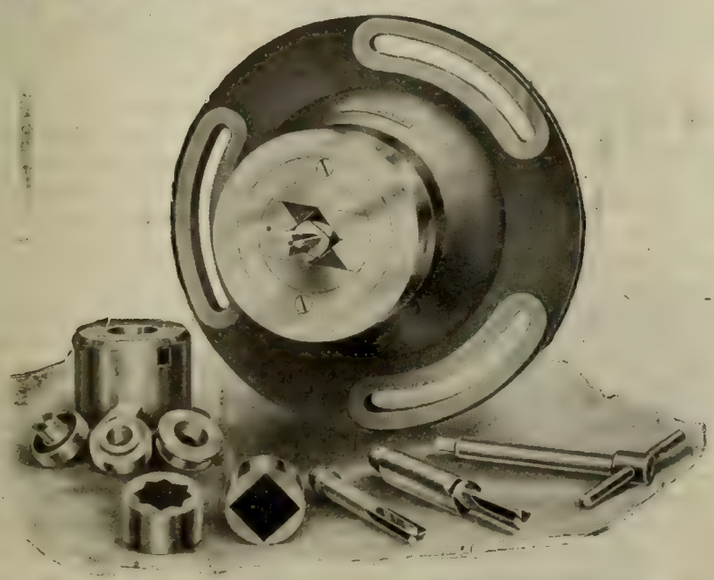

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to acquire and develop mining properties. The head office is at Montreal.

The Ontario-Quebec Pulpwood Co. has been incorporated at Toronto with a capital of $40,000, to manufacture pulp and pulp products at Cochrane, Ont. The provisional directors are Charles M. Garvey, T. M. Weatherhead and B. E. Lawless, all of Toronto.

The Dominion Battery Co. has been incorporated at Ottawa with a capital of $200,000 to manufacture batteries of all kinds, flashlights, lamps, heating appliances, etc., at Montreal. The incorporators are: Eldon Moir, John Campbell, and Oral N. Birchard, all of Montreal.

The Canada Scale & Slicer Co. has been incorporated at Ottawa with a capital stock of $150,000 to manufacture weighing machines, scales, slicers, etc., at Toronto. The incorporators are: Charles E. Strowger, Edward P. Park, and Arthur E. Watts, all of Toronto.

The Bethune Pulp & Lumber Co. has been incorporated at Toronto with a capital stock of $50,000 to carry on business as saw millers, pulp and paper millers, etc. The head office is at Toronto, and the provisional directors are: J. L. Ross, A. W. Holmstead, and L. B. Campbell, all of Toronto.

WOODWORKING

Pembroke, Ont.—Representatives of the Waterous Engine Co., of Brantford, have been in Pembroke lately, preparing plans for the enlargement of the Petawawa Lumber Co.'s mill, which will be used temporarily by the Colonial Lumber Co., or until such time as conditions are favorable for the erection of a large new mill by that company.

RAILWAYS—BRIDGES

Bathurst, N.B.—A largely signed petition of Gloucester county residents has been forwarded to Ottawa asking the Government to take over the Caraquet and Gulf Shore Railroad and operate it as part of the Canadian Government system. It is set forth that the road is in poor condition physically, a fact admitted by the management and that operations are likely to cease entirely.

CATALOGUES

Chromel. Folder issued by the Canadian Hoskins, Ltd., Walkerville, Ont., describing the material chromel an alloy of nickel and chromium, and detailing the purposes for which it is used. Reference is also made to the company's tool laboratory and melting furnaces.

Screw Cutting Lathe.—Bulletin describing the Hercules 12 inch screw cutting engine lathe built by the Himoff Machine Co., New York. The bulletin contains a detailed description of the lathe with illustrations and a specifications giving the general dimensions, weights, etc.

Pneumatic Tools.—Circular 2 just off the press is being distributed by the Independent Pneumatic Tool Co., Chicago, Ill. The circular illustrates and describes an interesting line of "Thor" pneumatic tools and electric drills. Specifications are also included giving the principal dimensions, capacity etc., of the various sizes.

Stellite.—Bulletin describing the properties and principal features of Stellite, an alloy for high-speed cutting tools. The bulletin contains particulars of some cutting performances of this material and how it is used. The concluding pages contain particulars of other lines handled by the Canadian B. K. Morton Co., Toronto, and Montreal, from whom copies of the bulletin can be obtained.

The Taylor Instrument Companies, Rochester, N.Y,. have just issued a new catalogue on temperature regulators, which is especially valuable to the engineer and the buyer, because it shows many illustrations of varied applications. In fact, the company has made a sincere effort to put into the catalogue those things which are too often left out of the average book, namely, "pictures." It is the most complete catalogue covering one specific type of temperature regulator which the Taylor Instrument Companies has published. Section 17,000 will be sent to anyone who will write to the above company and give his name, address and business connections.

BOOK REVIEW

The Commissioner of Conservation has published a report of the eighth annual meeting held at Ottawa in January. The report contains twenty-four chapters covering matters of vital interest to Canadians presented in a comprehensive manner together with figures and statistics which materially increase the value of the subject matter. The following include some of the principal subjects covered in the report: The social evil in Canada. An address on The Production and Preservation of Food Supplies, by Dr. P. H. Bryce, gives tables showing the relative values of different foods. Results of experiments by the Commission of Port Dover, Ont., in utilizing fish waste in the manufacture of stock meal, oils and fertilizers, are set forth, whilst Drs. H. J. Wheeler and Frank T. Shutt make interesting contributions on the use of commercial fertilizers. In addition, a readable account is given of the varied activities of the Commission including town-planning, game preservation, waterpowers, agriculture, mining and general publicity work.

TRADE IN NEW ZEALAND

THE following information respecting trade in machinery in New Zealand in 1916 is taken from a report recently issued on the trade of the Dominion by R. W. Dalton, H. M. Trade Commissioner in New Zealand. In those trades in this class in which the position of British firms is unsatisfactory, the reason is to be found chiefly in one or more of the following facts: (1) That British manufacturers have not examined the development of the Dominion; (2) that if they knew of the development they have either not realized its importance or have not attempted to cater for it, but have persisted in offering unsuitable lines; and (3) that their selling campaigns are not adequate. Mr. Dalton says he can quite understand that firms may not find it profitable to manufacture certain lines exclusively for the New Zealand market, if those lines are different from their standard designs. If this is so, however, it would, in his opinion, be better for themselves and for the reputation of British trade in general to refrain from offering lines which are unsuitable, or from offering suitable goods in such a manner as would seem to indicate that it was immaterial to them whether they got the trade or not. As it is, British manufacturers are continually being compared with American manufacturers to the disadvantage of the former. The fact is, of course, that the American manufacturers supply machinery which is similar to that made for their own home conditions, and it is, therefore, not particularly enterprising of them thus to supply New Zealand's needs.

TRADE INQUIRIES

THE following trade inquiries have been received by the Department of Trade and Commerce, Ottawa, from which further particulars may be obtained:

1353. **Pyrites.**—A fertilizer company in the United States requires regular shipments of Canadian pyrites. Would purchase ten carloads weekly and would be glad to pay cash when loaded on cars if necessary.

1367. **Metallic.**—A Genoese house interested in cobalt and stellite high-grade steel, and importers of same, is prepared to buy metallic cobalt and stellite.

1369. **Castings and Rolled Steel.**— An engineer in Milan, with references in Great Britain and the United States, desires to hear from Canadian manufacturers interested in steel castings for railways and tramways cars, drums and discs for steam turbines, shafts for steamers and railway and tramway points and crossings.

U. S. PRIORITY PLAN FOR STEEL

ADDITIONAL details of the United States priority plan in regard to iron and steel have been received by the Department of Trade and Commerce, Ottawa. The announcement received by the department is signed by Judge Robert S. Lovett, chairman of the United States Priorities Committee of the War Industries Board of the Council of National Defence, and is approved by the Secretaries of War any the Navy.

Under regulations of the committee, the announcement states all orders and work are divided into three classes:

Class A comprises war work—that is to say, orders and work urgently necessary in carrying on the war, such as arms, ammunition, ships, etc., and the materials required in their manufacture.

Class B comprises orders and work which, while not primarily designed for the prosecution of the war, yet are of public interest and essential to the national welfare, or otherwise of exceptional importance.

Class C comprises all orders not em-

braced in class A or class B. The first two classes are again divided into four sub-divisions.

Difficulties encountered by Canadian importers and users of steel since the adoption of the United States system of licensing iron and steel exports is under review by a committee, which is expected to report within a week or so.

BUYING MORE FROM THE UNITED STATES

CANADA is now buying from the United States at the rate of $26,500,000 a month more than last year.

The detailed figures of the foreign trade of the United States for the fiscal year ending June 30 show an increase of $319,000,000 in the total of Canada's purchases in that country as compared with 1915-16.

Washington's details of American trade for the twelve months ending June 30 show Canada as the third largest purchaser of goods in the United States, and offer substantial reasons why Canada's occasional applications for credit arrangement merit favorable consideration.. Great Britain again led, with a total of upwards of two billions, and France was second with upwards of a billion. But at upwards of three-quarters of a billion dollars, Canada's total was $360,000,000 ahead of the country fourth in the list—namely, Russia-in-Europe.

Comparisons of American exports to the four leading customers of the United States for the last two fiscal years ending June 30 show:

	1917.	1916.
Britain ..	$2,047,545,843	$1,526,685,102
France ..	1,011,529,095	628,851,988
Canada ..	787,529,729	468,784,793
Russia ..	428,284,663	178,694,800

U. S. PIG IRON PRODUCTION SHRINKAGE

RAILROAD embargoes, a shortage of fuel at steel plants and at blast furnaces. resulting from a diversion of railroad cars to the Northwest, and causing the banking of many furnaces, together with the rebellious labor at various works, conspired in September to reduce the output of pig iron and of rolled and cast steel in the U.S. by three to five per cent., as compared with the preceding month. It is estimated that the United States Steel Corporation operated less than 90 per cent. of capacity in September. There were also only 24 working days in the month, indicating that the total production of steel ingots was a little over 1,500,000tons, which means the production of 1,134,000 tons of rolled products. There was thus a decrease of over 200,000 tons in the production of crude steel and a loss of 180,000 tons of rolled products, as compared with August. Shipments, for the same reasons that cut down production, were estimated to have been 150,000 tons less than in August, pointing to total September shipments of 1,100,000 tons. If the subsidiary companies booked as large orders in September as in August, it would indicate a decrese of 300,000 tons in unfilled orders.

"HAWK"D CHROME VANADIUM STEEL

Will Give You Exceptional

Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

Hawkridge Brothers Company

303 Congress St., BOSTON, MASS. U. S. A.

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Successors to Owen Sound Iron Works

Owen Sound, Ont.

Engineers Boiler-makers Founders Machinists

Tank Work Smoke Stacks, Grey Iron and Brass Castings, Special Machinery Made to Order

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BOILER FOR SALE—ONE HEINE SAFETY horizontal, single drum, water tube boiler, 120 H.P., 36" diam., 19 ft. long, 5-16" shell steam drum. Apply The Parkhill Mfg. Co., Limited, 400 St. Ambroise St., Montreal. c18m

SECOND-HAND 26" NEWTON TYPE COLD saw cutting-off machine, arranged for motor belt drive and complete, with or without motor. Price $600.00, cars Sherbrooke. MacKinnon, Holmes & Co., Limited, Sherbrooke, Quebec. c10m

FOR SALE—1 90-FT. THOMAS SPACING table complete, including one indicator carriage, one trolley carriage, stands, adjustable roller, racks, etc. Adjustable as to length. The Manitoba Bridge & Iron Works, Winnipeg, Man. c15m

FOR SALE—1 NEW 25 H.P. HOR. TUBULAR boiler, 1 second-hand 12 H.P. hor. tubular boiler, tested to 150 lbs.; 1 second-hand 50 H.P. loc. boiler; 1 second-hand Leonard 12 x 12 high speed engine; 1 second-hand 500-lb. belt-driven Beaudry power hammer, only in use two months; in perfect condition. Canadian Engineering & Mfg. Co., 128 Bleury St., Montreal, Que. c9m

HYDRAULIC EQUIPMENT FOR SALE—THE equipment listed below is in first-class shape having only been used about three months. Blue prints and specifications and foundations drawings will be furnished. 2—14 x 12 x 5" Fairbanks-Morse duplex steam driven high pressure pumps at 80 gals. per minute capacity each against 600 lbs. pressure, steam pressure 150 lbs. 1—Weighted Accumulator good for 1000 lbs. per sq. inch, 16" diameter, plunger 11 ft. stroke with squeezing water cushion and wooden outside bumper blocks. The tank for the weighing material surrounding the cylinder is 10' 7" in diameter and 11' 0" high. 1—Return Suction Tank for above pumps and accumulator. Height, 9' 0", diameter 8' 0". Capacity, 2700 Imperial gallons. This equipment can be shipped immediately and is open for inspection at the company's plant. Prices on application. The Canadian Copper Company, Copper Cliff, Ont. c8m

AGENCIES WANTED

ENGINEER AND BUSINESS MAN WITH office in Manchester, England, is prepared to work for a good firm desiring representative in England. Would attend to the interests of a firm shipping munitions. Box 337, Canadian Machinery. c19m

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H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto

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WORKS MANAGER OR GENERAL SUPERintendent open for engagement—28 years' experience as machinist, toolmaker, inspector, superintendent of tool-making and tool-designing, experimental and development work, heat-treating and testing of steel in raw and finished state; shop superintendent, works manager. Experience has been on rifle work, electrical work, typesetting machines, lock-making and bridge-work. Correspondence solicited, and can furnish good references. Address Box 332, Canadian Machinery. c14m

We require a high-class

Specialty Salesman

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47 King St. W., Toronto

WANTED

WANTED—SMALL SECOND-HAND POWER press, in good condition. Hosmer Stamping & Die Works, Ltd., 831 Dundas St., Toronto, Ont. c13m

WANTED—SECOND-HAND POWER SQUARing shear to cut No. 10 gauge steel up to 24" wide. Must be in good working condition. Packard Electric Company, St. Catharines, Ont. c4m

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4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 13 B. & S. Automatic Gear Cutter.

1—30" Newark Automatic Gear Cutter.

1—5 x 48 Pratt & Whitney Plain Grinder.

1—No. 2 Bath Universal Grinder.

1—12 x 60 Modern Plain Grinder, new.

2—Lees-Bradner Thread Millers.

1—30 x 30 x 8' Powell Planer, new.

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Providence, R. I.

COMPLETE 8-INCH SHELL PLANT

Capacity—2,000 per week

MACHINES ARE TOOLED FOR BRITISH 8-IN. HOWITZER SHELL BUT CAN EASILY BE CHANGED OVER FOR 6-IN. SHELL

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1—16" x 6' HENDEY Lathe with complete tool-room equipment.
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1—DOMINION Universal Tool and Cutter Grinder.
1—Profile Grinder.
1—GISHOLT Universal Tool Grinder.
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1—Drill Grinder.
1—17" AVERBUCK Shaper.
1—No. 3B LEBLOND Universal Miller.
1—No. 3 BECKER Vertical Miller.
1—RACINE Hack-saw.
1—HENRY & WRIGHT Sensitive Drill.
1—20" McDOUGALL Drill.
1—BARNES All-geared Drill Press.
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4—26" W. B. DOUGLAS Heavy Duty Projectile Boring Lathe.
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1—26" x 12' DOUGLAS Heavy Duty Profiling Lathe.
1—20" x 9' FAIRBANKS Profiling Lathe.
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1—16" x 6' FITCHBURG Engine Lathe.
1—20" x 8' FAIRBANKS Heavy Duty Engine Lathe.
6—No. 6A POTTER & JOHNSON Automatics.
1—JENCKES Copper Band Turning Lathe.
8—HOLDEN MORGAN Thread Millers for base of 8" shell.
2—WILLIAMS Cut-off Machines.
1—METALWOOD 6 Cylinder Banding Press.
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2—HOLDEN MORGAN External Thread Millers for Base Plugs.
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1—20" McDOUGALL Drill Press.
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With complete set of tools and full equipment required to operate and maintain the plant. Also transmission belting, motors, etc. All this Equipment is in excellent condition. Inspection can be made by appointment.

This is an exceptional opportunity for American firms intending manufacturing shells as practically every machine can be shipped into the U. S. Free of Duty.

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16" x 5½' MacGregor, D.B.G. (3)
16" x 6' Pratt & Whitney, B.G.
20" x 7' Fay & Scott.
22" x 8' Pratt & Whitney, B.G.
24" x 10' Conradson, D.B.G.
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
2" x 24" Stevens Screw Machines (2).
No. 2 Warner & Swasey, plain head.
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13" x 6' Filsmith, D.B.G., comp. rest.
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14" Excelsior, sliding head, lever feed (6).
16" Barr, sliding head, lever feed.
20" Silver back geared, power feed (3).
20" Barnes, 3-spindle, lever feed.
22" Barnes, back geared, power feed.
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26" Prentice, back geared, power feed.
40" Bickford, back geared.
46" Allfree, back geared, power feed.
No. 10a Baush, 16-spindle.
D-1 Colburn, back geared, heavy duty.

GRINDERS

No. 1 La Salle, plain and surface.
No. 1 Cincinnati, universal (2).
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer.
24" Barnes, wet tool.
26" Gardner, disk.

IRON PLANERS

20" x 20" x 5' Bertram.
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Sellers, 4 heads.
40" x 40" x 12' New Haven, power feed.

MILLING MACHINES

Bertram, plain.
Brown & Sharpe, power feed, plain.
Monarch, vertical.
Van Norman, bench.
No. 2 Ford-Smith, plain.
No. 4 Fox, universal.

SHAPERS

16" Petrie, back geared.
16" Canada Mach. Corp., back geared.
16" Queen City, back geared.
24" Gould & Eberhardt, back geared.
24" Bertram, back geared.
30" Morton, back geared, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6' Robertson Hack Saws.
4½" Martin cutting-off machine.
12" Hall Pipe Machine.
4" Oster Hand Power Pipe Machine.
No. 2 Mitts & Merril Keyseater.
No. 2 Grant Rotary Riveting Hammer.
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7' Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
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1—Cutting-off Machine, with 15" three-jawed chuck.
1—Lathe, 28" swing, 8' bed.
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1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22" Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15" three-jawed chuck.
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1—Tool Grinder, 24" wheel.
1—Lathe, 14" swing, 6' bed.
2—Ford Smith Shell Grinders, complete.
1—17" LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
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1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—5 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
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Sherbrooke, Que.

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6" x 30" Dalton Bench Lathe.
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No. 24-C 13" x 6' South Bend Screw Cutting Lathe.
14" x 6' Monarch Q.C., D.B.G. Engine Lathe.
16" x 6' Monarch Q.C., D.B.G. Engine Lathe.
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No. 1 Standard Hand Miller.
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Atlas Arbor Presses (all sizes).
No. 00 and No. 0 Springfield Straightening Presses.
No. 101 Niagara Power Presses.
Gould Force Pumps.
Peerless High Speed Metal Hack Saw, cap. 6" x 6".
No. 5 Federal Plain Head Screw Machine.

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2—LeBlond Heavy Duty 19" x 8' Engine Lathes.

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1—LeBlond Engine Lathe, 17" x 6'.

1—14" x 7' Niles Engine Lathe.

1—16" x 8' Butler Engine Lathe.

1—Boring Lathe for 9.2 or 12" shells.

1—Turning Lathe for 9.2 or 12" shells.

2—No. 50 Foster Turret Lathes, 16" swing.

4—John Hall & Sons No. 4 Cutting-off Machines.

1—Wilmarth & Morman Wet Tool and Twist Drill Grinder.

1—Banfield Plug Milling Machine.

2—Otis-Fensom Bench Thread Millers.

1—Cincinnati Universal Milling Machine, No. 3 cone drive.

1—Surface Grinder.

1—Gardner Grinder, No. 4, complete with discs.

1—Gould Triplex Hydraulic Pump, Fig. 997, single acting, 1¼" x 6".

1—Holden-Morgan Marking Machine.

2—Northern Electric Co.'s Electric Soldering Irons.

1—1/15 H.P. General Electric Motor.

1—Brown-Boggs Nosing Press, No. 320.

1—Hisey Wolff Grinder, Portable Electric.

1—Dumore Grinder, Portable Electric.

8—Mech. Engr. Co. Fuel Oil Burners.

4—Mech. Engr. Co. Fuel Oil Burning Furnaces, 24" x 36".

1—Gilbert & Barker Fuel Oil Burning Furnace, 24" x 36", C-15.

6—Gilbert & Barker Fuel Oil Burners, 2".

2—Gilbert & Barker Positive Pressure Blowers, 3".

2—Canadian Buffalo Forge Co. Blowers, No. 6, 30".

1—Portable Blacksmith's Forge.

1—Circular Banding Press, suitable for 18-pdr. shells.

4—Shore Instrument Co.'s Scleroscopes.

3—Resin Pots, Simplex Electric Co.'s make.

3—Chapman Double Ball-bearing Trucks.

2—Oil Quenching Tanks, 8' long x 3' 4" wide x 2' 6" deep water jackets.

1—Bury Air Compressor, 6 x 8.

2—Brown Instrument Co.'s Pyrometers.

1—Thwing Pyrometer.

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MONTREAL—402 McGill Building
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c16m

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We Own Every Tool Offered

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For Immediate Delivery

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1—18 x 8 Springfield Standard Engine Lathe.
1—16 x 8 Springfield Q.C.G. Engine Lathe.
2—16 x 6 Springfield Q.C.G. Engine Lathes.
1—14 x 6 Springfield Geared Head Engine Lathe.
3—16" Springfield B.G. Shapers.
2—20" Springfield B.G. Shapers.
1—25" Springfield B.G. Shapers.
1—30 x 30 x 10' Wilson Two-head Planer.
3—14" Pierce Turret Lathes.
2—1 x 8 Pierce Hand Screw Machines.
3—No. 1½ American Milling Machines.
1—No. 20 Bliss O.B.I. Press.
1—No. 19 Bliss O.B.I. Press.
1—No. 18C Bliss O.B.I. Press.
1—No. 18 Bliss O.B.I. Press.
5—20" Buffalo B.G., P.F. Drill Presses.
3—20" Canedy-Otto B.G., P.F. Drill Presses.
2—20" Champion B.G., P.F. Drill Presses.
2—20" Champion Plain Drill Presses.
3—20" Silver Plain Drill Presses.
3—20" Canedy-Otto Plain Drill Presses.
2—14" Champion Plain Drill Presses.

USED MACHINERY

ENGINE LATHES.

1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—22 x 14 Putman Standard Engine Lathe.
1—22 x 10 Reed Standard Engine Lathe.
1—18 x 6 Jones & Lamson Standard Engine
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.
2—13 x 8 Barnes Engine Lathes.
1—13 x 5 Barnes Engine Lathe.
1—10 x 4 Sebastian Engine Lathe.

TURRET AND SCREW MACHINES.

2—No. 6-A Potter & Johnston Automatic Lathes.
1—4¼" Gridley Automatic Screw Machine, motor driven.
2—4" Foster F.G.H. Hand Screw Machines.
1—5" Pierson F.G.H. Hand Screw Machine.
4—12" Warner & Swasey Turret Lathes with air chucks.
4—16" Warner & Swasey Turret Lathes with air chucks.
2—2" Cleveland Automatic Screw Machines, jigger feed.
1—⅝-¾ Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND GRINDERS.

1—No. 2 Hendey Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drilling Machines.
3—Fox Milling Machines.
1—Garvin Hand Miller.
1—No. 2½ Bath Universal Grinder.
1—No. 12 Modern Plain Grinder.
1—No. 1 Landis Internal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.
1—Miami Valley Universal Cutter Grinder.

DRILL PRESSES.

1—6' Mueller Plain Radial Drill, old type.
1—28" Niles, Bement, Pond B.G., P.F. Drill Presses.
1—3-spindle 8" overhang Henry & Wright High speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.

SHAPERS AND PLANERS.

1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
1—36 x 36 x 10' New Haven Planer, S.H.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS.

1—Waterbury Farrel O.B.I. Press, geared.
1—No. 30 Perkins Drawing Press.
3—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—160-lb. Bradley Steam Hammer.
1—25-lb. Fairbanks Belt Hammer.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machine tools, both large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

Eastern Machinery & Equipment Co., Inc.

319 COMMERCIAL TRUST BLDG.
PHILADELPHIA, PA.

NEW TOOLS FOR IMMEDIATE DELIVERY.

2—No. 3 Hendey Universal Milling Machines.
1—2½ x 2" Wm. Sellers Tool Grinder.
30—18" x 9' Turning and Boring Lathes.
3—Double head Sullivan Grinders.
1—32" x 12' Pittsburgh Engine Lathe.

USED MACHINERY

ENGINE LATHES.

8—30" x 10' American, Gear Head, A-1.
1—20" x 10' Bullard.
3—24" x 14' American.

TURRET LATHES.

36—Potter & Johnson 6A Automatic Turret Machines.
3—3 x 36 Jones & Lamson Flat Turret.
2—2¼" x 24" Jones & Lamson Flat Turret, bar equipment. Full set Turret Tools.
9—25" Gisholt Chucking Lathes, 6½" hole in spindle, square turret.
14" x 6' Lodge & Shipley Turret, back geared.
5—24" Gisholt, 2-step cone, 6¼ H.S.

BORING MILLS.

6—66" swing Bement-Miles Tire Turning Mills, two swivel heads, 15½" under rail
1—37" Baush Boring Mill, 2 heads; good as new.
1—Cylinder Boring Mill, capacity of 24" diam. to 96" diam., 10' long.
Tool equipment included, good as new.
1—42" Bullard Boring Mill (2) heads.

MILLING MACHINES.

1—No. 3 LeBlond Plain Miller, table 13½ x 58¼.
1—24" x 8' Beaman & Smith Open Side Slab Miller, with two vertical spindles.
1—No. 1½ Universal Milling Machine.

SCREW CUTTING MACHINES.

2—2¾" Cleveland Automatic, Model A.
1—1¼" Cleveland Automatic, Model A.
1—2" Cleveland Automatic.
1—No. 55 National Acme, 4 spindle; good as new.
1—No. 54 National Acme, 4 spindle; good as new.

GRINDERS.

1—1½" Full Universal Landis Machine.
1—No. 13 Brown & Sharpe Universal and Tool Grinder. Full equipment.
No. 1½ Universal Cutter and Reamer Grinder.
5—Fisher Profile Grinders for Cutters.
5—No. 6 Std. Universal Tool and Cutter Grinders.

DRILL PRESSES.

1—4' Prentice Radial Drill, tapping attachment.
1—2' 6" Fosdick Radial Drill, tapping attachment.
1—5' 6" Full Universal American Radial Drill, tapping attachment.
2—D1 Colburn Heavy Duty Drills, latest pattern.
2—D3 Colburn Heavy Duty Drills, tapping attachment, latest pattern.

FOR SALE

One 22" x 50" Wheelock Engine, left-hand, arranged for direct shaft coupling, with heavy balance wheel 8¼" x 14" x 17'—7" in dia.

Merchants Rubber Factory
KITCHENER, ONTARIO

p1h

Slightly Used Machinery For Immediate Delivery

1—No. 27 Double Floor Grinder—Canadian Hart Wheel Make, equipped with two 12" wheels and two spindles 33" long. Shaft bearings 24" long.
1—Heavy Blount Double Floor Grinder, 45" spindle, two 8" wheels.
1—Heavy Petrie Floor Grinder. No rest or countershaft. Shaft 36" long, two 9" wheels.
1—Stouffville Floor Grinder. No rest or countershaft. Shaft 32", two 8" wheels.
1—Large Polishing Stand (new) 4' shaft, bearings 1¼" x 6.
1—Brown & Boggs Lever Splitting Shear.
1—Hanson & Van Winkle Polishing Stand (no c/s)
1—Hanson & Van Winkle Polishing Stand. Shaft 5', bearings 2¼" x 12".
1—No. 7 Jarecki Pipe Machine, 1¼".
2—Heavy Grinders, Bearings 2¼" x 12"—cross adjustment slide, one 12" wheel.
1—8-Wheel Robinson Detroit Grinder.
1—Anvil, 154-lb.
1—Revolving Electric Plating Machine.
1—Platers Electric Dynamo, 600 Amperes.
1—Tumbling Barrel, 18" x 4.
1—No. 23 Brown & Boggs Hand Punch and Shear.
1—Fairbanks Scale, 5-ton.
1—Hand Former, Toggle Type.
1—40 H.P. Westinghouse, 550-volt, 60-cycle, 3-phase, 850 R.P.M.
3—Westinghouse Transformers, 30KW., 3,200-550-volt.
1—2⅛" Dreses Turret Lathe, power feed, oil pan, spring chuck No. 37220.
2—No. 6 Warner & Swasey Turret Lathes, power feed, oil pan, spring chucks.
1—No. 3 Garvin Turret, oil pan, spring chuck, 2⅛" hole.
1—No. 22—1¾" Garvin Monitor Lathe, oil pan, spring chuck.
1—1¼" Davis & Egan Lathe, oil pan, spring chuck.
1—2" Pratt & Whitney Turret Lathe, spring chuck.
1—32½ Garvin Turret Lathe, spring chuck.
1—12½ Garvin Turret Lathe, spring chuck.
1—Style "F" Single Spindle, heavy duty, Baker Drill.
1—Four Spindle Rockford Drill Press, 20" box column, back-geared, automatic feed, automatic stop, with pump connection.
1—Garrison Press, 26,000-lb.
2—Heavy Thread Chasing Attachments.
1—No. 3 Cincinnati Universal Miller with Dividing Heads.
1—No. 2 Cincinnati Universal Miller with Dividing Heads.
1—No. 2 West Tire Setter Band Press.
1—No. 3 West Tire Setter Band Press.
1—Cincinnati Bickford 24" Drill.
1—Cincinnati Upright 24" Drill with tapping attachment.
2—No. 25 Foote-Burt Drills with belt guards.
2—D2. Colburn Drills with belt guards.
1—Niles-Bement-Pond 50" Drill Press.
1—No. 400 Brown & Boggs 42" Geared Gap Shear.
2—No. 21 Crosby Presses.
1—300-lb. Bliss Board Lift Hammer.
1—100-lb. Bliss Board Lift Hammer.
1—Barnes 24" Geared Drill.

Write For Particulars.

Garlock-Walker Machinery Company, Limited

32 FRONT STREET WEST, TORONTO, ONT.

"EVERYTHING IN MACHINERY"

IMMEDIATE DELIVERY

DRILLING MACHINES.

20" Mechanics.
22" Sibley, S.H., B.G., P.F.
30" Lodge & Davis, S.H., B.G., P.F.
2½' Gang Plain Radial.
3½' Hamilton Plain Radial, tapping attachment.
4' Mueller Plain Radial.
4—No. 310 Baker Heavy Duty.
3-spindle Rockford.
4-spindle Rockford.
4-spindle Washburn, with power feed.
4-spindle Allen.
No. 11 Pratt & Whitney, 10 spindles.

GEAR CUTTERS.

24" x 7" G. & E., spur gears.
No. 3—26" B. & S., spur gears.
30" x 9" G. & E., spur and bevel gears.
36" x 9" G. & E., spur gears.
36" Walcott, spur gears.

GRINDERS.

No. 184 Wells Cutter and Reamer.
No. 1 B. & S. Universal.
No. 2 Woods Tool and Cutter.
Brainard Cutter,
Leland Universal, with power feed.
No. 2 Landis Universal.
No. 21 Landis Plain.
No. 1 Gardner Disc.
No. 24 Gardner Disc.
No. 6-A Diamond Universal.

LATHES.

10" x 4' Seneca Falls, C.R.
13" x 5' P. & W., taper attachment.
14" x 6' Prentice, C.R.
14" x 6' LeBlond, C.R., taper attachment.
14" x 6' Rockford, C.R.
15" x 6' Rockford Tool Co., C.R.
16" x 8' Bradford, C.R.
18" x 6' Bradford, C.R., taper attachment.
18" x 8' Lodge & Shipley, pat. head, C.R., taper attachment.
18" x 10' Fitchburg, C.R.
20" x 14' Blaisdell, C.R.
21" x 12' New Haven, C.R.
36" x 18' Schumacher & Boye, T.B.G., Q.C.G.
36" x 20' American, T.B.G.
38" x 16' Fifield, C.R.
42" x 28' Hamilton, T.B.G., raising blocks to swing 54".

PLANERS.

24" x 24" x 4' Gray, one head.
24" x 24" x 6' American, one head.
26" x 26" x 6' Gray, one head.
26" x 26" x 8' Pease, one head.
30" x 30" x 8' Cincinnati, two heads.
30" x 30" x 8' Woodward & Powell, one head.
36" x 36" x 14' Sellers, one head.
39" x 39" x 12' New Haven, one head.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES.

No. 2 P. & W., friction head.
No. 2 Foster, plain head, A.C. and W.F.
No. 3 Bardons & Oliver, plain head, A.C. and W.F.
No. 4 Pearson, friction head, A.C. and W.F.
No. 5 Foster, geared friction head, auto. chuck, power feed to turret slide and power feed to cross slide.
No. 5 Foster, all geared head, auto. chuck and wire feed, power feed to turret slide.
2¾" Cleveland Automatic.
1¾" Gridley 4-spindle Automatic.
3¼" Gridley 1-spindle Automatic.

TURRET LATHES.

No. 2 Foster-Kimball, plain head.
No. 22 Garvin, plain head.
16" Lodge & Davis, back geared.
16" Warner & Swasey, friction head.
2 x 24 J. & L., cone head.
24" Gisholt, 4¼" spindle hole, taper attachment.
No. 3A Warner & Swasey, bar attachment.

PUNCHES AND PRESSES.

No. 74½ Bliss, straight sided, geared.
Blake & Johnson Embossing.
No. 3A Lennox Double End Punch and Shear.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾", 12" throat; new.
No. 4 Long & Allstatter Single End Punch and Shear, 1¾" x ¾", 18" throat; new.
No. 4 Long & Allstatter Single End Punch and Shear, 1¾" x ¾", 24" throat; new.

MISCELLANEOUS.

24" Bullard Vertical Turret Lathe, turret head and one side head.
No. 00 Baker Keyseater.
4-spindle Warner & Swasey Valve Milling Machine.
No. 3 Cincinnati Vertical Milling Machine.
No. 3 Burr Cold Saw.

STOCKER-RUMELY-WACHS COMPANY

117-121 No. JEFFERSON STREET CHICAGO, ILLINOIS

POWER EQUIPMENT

(Partial List)

Two 5,000 cu. ft. Laidlaw-Dunn-Gordon Duplex Air Compressors, rope drive
707 cu. ft. Norwalk Tandem Compound Straight Line Air Compressor
425 cu. ft. Clayton cross compound Duplex Air Compressor
425 cu. ft. McKernan cross compound Duplex Air Compressor
12" and 18½" x 8½" x 10" Worthington Duplex Compound double action pump
8" x 12" x 12" Marsh Steam Pump
12" x 7" x 12" Buffalo Duplex Pump, 360 gals. per minute
No. 8 Buffalo Double Suction Centrifugal Pump, engine driven
60" x 8' Closed Pressure Tank.
6' x 10' Open Iron Tank
41½" x 24" Lidgerwood Single Drum Hoist, with 38 H.P. General Electric D.C. Motor
9" x 10" Lidgerwood Double Cylinder Hoist
105 K.V.A. Engine-Generator Set
100 K.W. Sturtevant Generator Set, engine driven
100 K.W. General Electric continuous current Generator
50 K.W. American Ball Generator, engine driven
50 K.V.A. Engine-Generator Set
40 K.W. Fisher D.C. Generator
20 K.W. Compound Generator, Type MP, 250 volts
Three 75 H.P. Westinghouse Motors, 3 phase, 60 cycle, 440 volts
25 H.P. General Electric Motor, 3 phase, 60 cycles, 200 volts
25 H.P. General Electric Motor, D.C., 250 volts
25 H.P. Western Electric Motor, D.C., 125 volts
15 H.P. Bullock Motor, D.C., 220 volts
15 H.P. General Electric Motor, D.C., 230 volts
10 H.P. General Electric Motor, D.C., 220 volts
10 H.P. Browning Motor, D.C., 230 volts
110" Buffalo Steel Plate Fan, engine driven
15" x 14" Ames Center Crank Automatic Engine
12" x 12" Ames Center Crank Automatic Engine
10" x 10" Ames Automatic Engine
8" x 8" Doregan & Swift Vertical Steam Engine
8" x 8" O. & S. Upright open type Engine
10 H.P. White & Middleton Gas Engine
60 H.P. Wooley Gas Engine
32" x 120" Kelly-Berriman Feed Water Heater
70 H.P. Erie City Boiler Works Locomotive Boiler, 100 lbs. pressure
15 ton Speidel Chain Block
Toledo Electric Spot Welder, 60 cycle, 220 volts
Allis-Chalmers Gates Works Rock and Ore Crusher, Size 4K, weight 22,000 lbs.

New York Machinery Exchange, Inc.

50 Church Street . . . New York City

MACHINE TOOLS IN STOCK

No. 4 Cincinnati Universal Miller with vertical attachment and power feed Rotary Table.
No. 3 LeBlond Universal Miller.
No. 1½ NEW American plain Millers.
5—No. 0 NEW Steptoe Hand Millers.
1" x 15" Pratt & Whitney Screw Machine.
28" x 16' Reed Lathe.
24" x 10' NEW Carroll-Jamieson heavy duty lathe.
20" x 6' Davis lathe.
20" x 10' Hamilton lathe.
6—19" x 8' NEW, Sidney D.B.G. quick change lathes, swing 21" over V's.
3—17" x 8' NEW, Sidney D.B.G. quick change lathe, swing 19" over V's.
15" x 6' NEW, Sidney D.B.G. quick change lathe, swings 17" over V's.
12—17" x 8' NEW, National quick change.
15" x 6' NEW, Carroll-Jamieson, quick change.
48" Harrington plain Radial Drill.
36" Dresses plain Radial Drill.
D-4 Colburn high duty Drills.
3—20" Rockford high duty Drills.
16" Queen City B.G. Shaper.
400 lb. Single Frame Steam Hammer.
125 lb. Dupont Belt Hammer.
30 Ton Watson & Stillman Hydraulic Press.

FRANK TOOMEY, INC.

127-131 North Third St., PHILADELPHIA, PA., U.S.A.

We Have for Immediate Delivery the Following Second-hand Machinery in Good Operative Condition

1 Landis No. 3 Universal Grinder 12" x 42", complete equipment, less internal grinding attachment. . $1,500

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $2,200

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $1,800

These machines are particularly good value, and may be seen at our works.

A. B. JARDINE & COMPANY
HESPELER, ONT.

STOP—LOOK—INQUIRE

BORING MACHINES—Vertical.

1—30" Flather, one turret head
2—36" B. & S. one turret head, Dec. Delivery
1—38" Baush, two heads.
1—42" Rogers, 2 swivel heads.
1—42" King, 2 swivel heads; almost new.
5—NEW 48" Colburn, 1 swivel, 1 turret head; January delivery.
1—51" Niles, two swivel heads, motor driven.
4—NEW 60" Colburn, 1 swivel, 1 turret head; January delivery.
1—84" Bickford.
1—Niles, 10'-16' extension, two heads.

BORING MACHINES—Horizontal

2—NEW Universal with motor, 3" bar; immediate delivery.
1—Lucas 2¼" bar
1—24" Cleveland, 2½" bar, takes 4' 6", compound table.
1—No. 1 Barrett Cylinder Borer, 3¾" bar type.
1—Betts Knee Type, 3" bar.
1—London 6" bar.

BULLDOZERS

1—No. 8 Ajax, motor driven.
1—No. 9 Williams & White, belt driven.
1—No. 12 Ajax, single pulley drive.
2—No. 23 Williams & White, belt drive.
1—No. 29-U Williams & White, arranged for motor drive.

CRANES

2—10-ton Electric, 47' span, 25' lift, 3 motors.
1—10-ton Maris, 55' span, hand operated.
1—50-ton Niles, 61' span.

CUTTING-OFF MACHINES

1—NEW 4½" Davis.
30—Davis 4½"
10—4½" Williams.
2—NEW 6" Davis.

DRILLING MACHINES—Radial

6—NEW 3' Mueller, speed box drive, Dec. del.
3—NEW 3' American, sensitive tapping attachment.
1—NEW 3½' Western Drill, 86" circle.
2—4' Mueller Plain, speed box drive
1—4½' Bickford, plain.
1—NEW 5' Western, plain, with motor.
1—NEW 5' Niles Universal, with motor.
1—5' Dreses, full universal, gear box drive.
1—5' Fosdick, plain.
6—NEW 5' Mueller, speed box drive, Dec. del.
1—6' Dreses, plain.
1—NEW 6' Fosdick, plain, latest type.
1—NEW 6' Triumph Motor Drive, Oct. delivery.

DRILLING MACHINES—Heavy Duty

2—NEW No. 2 Colburn
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
4—No. 310 Baker Single Pulley Drive, late type

DRILLING MACHINES—Sliding Head.

2—NEW 24" Barnes Drills and Tappers.
5—NEW 24" Barnes Drills.

DRILLING MACHINES—Multiple Spindle

1—No. 5 Fox, 12-spindle, capacity 1".
1—Baush, 12-spindle, capacity 1¼", 30" circle, motor driven.
1—14-spindle Baush, capacity 1" hole, 36" circle.

DRILLING MACHINES—Sensitive.

1—NEW No. P-4 Allen, one spindle.
1—NEW No. P-2-S Allen, two spindles.
2—NEW No. B-1 Allen, one spindle, 7" overhang.
1—NEW No. B-2 Allen, two spindle, 7" overhang.
3—NEW No. B-3 Allen, three spindle, 7" overhang, tapping attachment.
3—NEW No. B-4 Allen, four spindle, 7" overhang.
3—NEW 12" Albany High-Speed Tool-Room.

GEAR CUTTING MACHINES

1—NEW No. 3 Bickett Gear Rack Planer, delivery 60 days.
1—No. 3 Brown & Sharpe Auto. Gear Cutter spur
1—NEW 6" Standard Gear Cutter, spur.
1—15" Gleason Bevel Gear Planer
1—16" Bilgram Bevel Gear Generator.
1—22 x 8" G. & E. for spur and bevel.
1—24" Becker-Brainard.
1—24" Fellows Gear Shaper
2—NEW 30" Flather, Solid Pattern.
3—36" Fellows Gear Shapers.

GRINDERS—Universal, for Cutters, Drills, Reamers, etc.

8—NEW No. 190 Wells.
4—No. 1 Cincinnati.
1—NEW Wilmarth & Morman, Style B.K.
1—NEW Walker, No. 1 Outfit B
3—NEW No. 1 Wood Universal.
5—NEW No. 2 Wood Universal.
1—NEW Walker, No. 2 Outfit K (capacity 9" x 26")
2—NEW No. 2 Osterlein Universal.
7—NEW LeBlond.
1—NEW Gisholt Universal.

GRINDERS—Cylindrical—Plain

2—NEW 8" x 18" Modern, self-contained.
3—NEW 8" x 30" Modern, self-contained.
2—NEW 12" x 24" Modern, self-contained.
6—NEW 12" x 36" Modern, self-contained.
2—12 x 42" Landis, self-contained.
3—NEW 12" x 48" Modern, self-contained.
1—NEW 10" x 50" Norton, Oct. delivery.
1—14" x 56" Norton.
1—NEW 10 x 72 Norton, plain.

GRINDERS—Cylindrical—Universal.

2—NEW No. 2 Bath, 9" x 20".
1—NEW No. 2 Walker, 9" x 26"
1—NEW No. 2½ (10" x 36") Bath
1—NEW Thompson, 10 x 36.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis
2—NEW No. 3 Modern, 13" x 40", Oct. del.
1—No. 4 Cincinnati, capacity 12 x 72"

GRINDERS—Internal

1—NEW No. 6 Modern, capacity 10" x 10".
1—No. 70 Heald
2—No. 75 Heald.

GRINDERS—Cylinder

1—No. 60 Heald, single pulley drive

GRINDERS—Profile

1—NEW Cleveland
5—Fisher Profile Grinders.

GRINDERS—Surface

1—NEW No. 1 Wilmarth & Morman
2—NEW No. 1½ Walker's complete
2—NEW No. 2 American with Walker No. 1¾ plain flat mag. chucks.
4—NEW No. 2 Reid (same as B. & S.)
1—No. 2 Brown & Sharpe.
1—Blanchard Heavy Vertical with motor; almost new.

HAMMERS—Board-Lift, Drop.

1—No. 4 Standard Machinery Co., 400 lb.
1—E. W. Bliss, 800 lb.

HAMMERS—Steam Forging

Morgan & Williams, 600 to 800 lbs., 21" gap.
1—3,000 lbs. Morgan Double Frame
2—3,500 lbs. Chambersburg Steam Drop Hammer.
2—5,000 lbs. Chambersburg Steam Drop Hammer.
1—7,500-lb. Morgan Special Double Stand.

KEYSEATERS

2—NEW No. 1 Davis.
1—NEW No. 2 Davis.
1—No. 2 Mitts & Merrill.
1—No. 2 Knowles, 60" stroke.

LATHES—Manufacturing, Not Screw Cutting.

2—NEW No. 3 Harding Bros.' Bench Lathe.
3—16" x 8' Fairbanks-Morse, heavy duty.
70—NEW Simplex, 16" x 8'.
14—Reed-Prentice Shell Lathes for 4" or 18 lbs. American shells.
22—18" x 8' Battle Creek, heavy duty.
50—20" x 10' Hindman, high duty.

LATHES—Engine

3—NEW 14" x 6' Bradford, quick change.
14—NEW 15" x 6' Rockford.
3—NEW 16" x 6' Cleveland Tool Room Lathes,
4—NEW 16" x 8' Bradford, quick change.
1—NEW 17" x 8' National, quick change gears.
12—NEW 17" x 8' LeBlond, pan bed, quick-change gears.
1—18" x 10' Hendey, quick-change gear, 14" chuck.
5—NEW 20 x 10 Bradford, quick change.
1—NEW 20" x 10' Cleveland Geared Head
3—NEW 20" x 12' Bradford, quick change.
19—NEW 21" x 10' Porter, S.B.G.
9—22" x 10' Putnam, oil pan and pump.
1—NEW 24" x 10' Bradford, quick change.
5—NEW 24" x 12' Bradford, quick change.
1—NEW 24" x 14' Bradford, quick change.
3—24" x 14' American, quick change.
1—24" x 22' Bullard, triple geared, taper attachment.
1—NEW 26" x 48" x 12' McCabe, Double Spindle.
1—New 26" x 48" x 22' McCabe, Double Spindle.
1—29" x 18' 6" Schumacher & Boye.
1—NEW 30" x 14' American Double Back-Geared, Quick-Change
1—NEW 32" x 12' Pittsburg Pattern.
1—32" x 12' 6" Rahn-Mayer-Carpenter, taper attachment.
8—NEW 36" x 24' Putnam, triple-geared
1—38" x 18' Schumacher & Boye, triple geared, quick change.
1—50" x 12' American Gear Head, quick-change
1—50" x 24' Prentiss.
1—NEW 66" x 46' Putnam, triple geared, face plate drive, 5-step cone, 6½" belt; October delivery.
1—71" x 20' Fifield, triple-geared.

LATHES—Turret

1—NEW 13" Gisholt, G-13.
8—NEW 21" Gisholt, H-21.
2—NEW 24" Gisholt, 1-24.
5—2 x 24" Jones & Lamson
1—NEW 18" Libby.
3—24" Libby, universal facing head, 3-jaw chuck.
18—6-A Potter & Johnson.

MILLING MACHINES—Knee Type—Universal

1—No. 2 Kempsmith, vertical attach.
1—No. 2 Kempsmith, 13" dividing head.
1—No. 2-B Kearney & Trecher.
1—NEW No. 2 Rockford High Power.
1—No. 2 LeBlond.
1—NEW No. 3 Hendey.
10—NEW No. 3 Owen.

MILLING MACHINES—Knee Type—Plain

9—NEW No. 0 Rockford.
2—NEW No. 1 Kempsmith.
2—NEW No. 1½ American back gear
2—NEW No. 2 Rockford
10—NEW No. 2 Owen; November delivery.
1—No. 3 LeBlond
1—NEW No. 3 Kempsmith.
5—NEW No. 3 Conradson, single pulley drive.
4—NEW No. 3-H LeBlond.
1—NEW No. 4 LeBlond.
1—No. 4 Brown & Sharpe

MILLING MACHINES—Hand.

3—NEW No. 1 Rockford, without column.
3—NEW No. 2 Rockford, on column.
2—NEW No. 3 Rockford, on column.
3—NEW No. 3 Rockford, on column, power feed.

MILLING MACHINES—Vertical

1—NEW Bickett, No. 0
1—No. 3 Brown & Sharpe.
2—NEW No. 4-B Becker.
2—No. 5 Becker.

MILLING MACHINES—Planer Type

1—No. 2 Beaman & Smith.
1—Ingersoll Slab, 16" x 48" cap.
1—NEW 17" x 5' Eynon, planer type.
1—Bement-Niles, heavy duty planer type, 20" x 24" x 12'.
1—30" x 30" x 8' Ingersoll No. 928, single spindle, with motor.

MILLING MACHINES—Lincoln Type.

3—NEW No. 1 American.
18—NEW Sellers Auto., quick return.

PLANERS

24" x 24" x 8' Cincinnati, one head, used three months
1—30" x 30" x 8' Ohio Machine Tool Co., 2 heads.
1—36" x 36" x 10' American, two heads.
1—40" x 40" x 11' Niles, four heads
1—48" x 12' Pedrick, open side, one head.
1—50" x 50" x 16' Pond, 2 heads on rail
1—52" x 52" x 16' Betts, 2 heads, right angle drive.
1—60" x 60" x 21' L. W. Pond, 3 heads.
1—72" x 60" x 16' Gray, 4 heads.
1—72" x 72" x 29' McKechnie & Bertram, 4 heads.
1—36' Niles Plate Planer, extra heavy, almost new, arranged for motor drive.

SCREW MACHINES—Hand.

4—NEW No. 2 Foster, geared friction head.
1—NEW No. 4 Foster, geared friction head, power feed to turret slide.
2—NEW No. 5 Foster, all geared, power feed to turret slide.
3—NEW No. 5 Foster, all geared head, power feed to turret, power cross feed.
2—NEW No. 6 Foster, geared friction head, power feed to turret, power cross feed.
5—NEW No. 7 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW No. 10 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW 2¼" Dreses, F.G.B., power feed.

SCREW MACHINES—Automatic

2—NEW ⅝" Cleveland, Model A.
1—NEW ¾" Gridley Mult. Spindle, belt driven.
2—NEW 1¼" Gridley Mult. Spindle, belt driven.
2—NEW 1¾ Gridley, mult. spindle, belt driven.
1—NEW 2¼" Gridley Mult. Spindle, belt driven.
1—NEW 3¼" Gridley Single Spindle, belt driven.
2—No. 0 Brown & Sharpe.
1—No. 2-G Brown & Sharpe.
1—No. 515 National Acme.

SHAPERS

1—NEW 16" Springfield
1—16" Motor Driven Rockford
1—NEW Barker 24"
2—NEW 24" Milwaukee.
1—25" Springfield.
2—25" Smith & Mills, Back-Geared
2—30" Morton Draw Cut.

SLOTTERS.

1—NEW 8½" Betts, heavy model, vertical geared crank slotter.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL.
549 Washington Blvd.

CINCINNATI, OHIO
Union Central Life Bldg.

CLEVELAND, OHIO
Leader News Bldg.

NEW YORK CITY
Singer Bldg.

WRITE OR WIRE OUR NEAREST OFFICE FOR QUOTATIONS
THIS IS ONLY A PARTIAL LIST OF AVAILABLE MACHINES

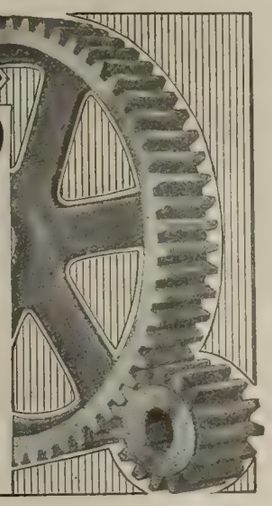
If any advertisement interests you, tear it out now and place with letters to be answered.

SPECIAL MACHINERY

Special Machinery, Gears, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Etc.

CONTRACT WORK

CUT GEARS



Rawhide — Steel — Brass — Cast Iron

Try our W-G Rawhide Silent Gear. Designers and Builders of Special Machinery.

Winnipeg Gear & Engineering Co.
197-199 Princess St., Winnipeg, Man.

F. W. McCLEAN & SON

CONSULTING AND MECHANICAL ENGINEERS
NIAGARA FALLS ONTARIO

Designers and Builders of Special and Automatic Machinery. Experimental and Metal Pattern Work. Electric Welding Machinery. Wire Forming Machinery.

WELLAND MOTOR & MACHINE CO.

WELLAND, ONT.

Builders of Special Machinery.
JIGS, GAUGES AND SPECIAL TOOLS.
General Machine Shop Work of all Descriptions.
Bids Submitted on all Classes of Contract Work.

ACCURACY

The discriminating buyer is the one we like to meet—the one who insists on accurate product. He will eventually buy "GALT" Cap and Set Screws because they measure up to his standard.

Your rush orders for S. F. Hex. nuts taken prompt care of. Better finished nuts—try a sample.

THE
GALT MACHINE SCREW CO., LIMITED
GALT, ONTARIO

Eastern Representatives: The Canadian B. K. Morton Company, Limited, 49 Common St., Montreal, Que.

Shell Manufacturers

Get our Prices on Gauges, Boring Bars Rough Turn Drivers, Etc., for 6 in. SHELL.

GENERAL MACHINE WORK

Brass and Aluminum Castings

Prompt Delivery

THE
MONARCH BRASS MFG.
COMPANY, LIMITED
71 Browns Ave., - Toronto, Ont.

SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

SPECIAL MACHINERY

SMALL TOOLS OF EVERY DESCRIPTION

We are specialists in this line of manufacturing and you can't do better than link up with us. Quality products, reasonable prices, prompt deliveries.

MADE IN BR·E·N·Co CANADA

Brown Engineering Corporation
LIMITED, TORONTO
415-419 King St., W. Tel. Adel.425

Homer & Wilson
Stamping & Tool Works

WE MAKE THE TOOLS AND PRODUCE THE STAMPINGS

Let us quote on your requirements.

1-3-5 Lancaster Street
Hamilton, Ontario

PUNCH PRESS WORK

What Can You Save?
By Using Parts Made in the Punch Press

Look over your standard parts, Mr. Manufacturer, and see what parts can be made (or could be made by slight change in design) by this process.

You will be surprised at the saving you can effect.

We make Blanking, Perforating, Drawing, Forming and all classes of dies and tools for plain or difficult stamping to suit the production required.

A Battery of presses is also available at our plant to manufacture parts for you with the understanding that you pay only for good parts made. Our facilities ensure prompt deliveries at right prices.

W. H. BANFIELD & SONS LTD.
370-386 PAPE AVE., TORONTO.

OVER 50,000 COPIES PER MONTH

Canadians

should be thankful that our Country has a Canadian Magazine fit to take its place in the company of the big American magazines — a magazine equalling in interest and literary merit the big magazines produced in a Country of 100,000,000, where it is possible to obtain $1,000 to $5,000 a page per issue or more for advertising space.

THE making of MACLEAN'S MAGAZINE month by month, year after year, has been hard labor. One difficulty was to get the right sort of matter—Canadian in origin and theme. A few years ago our country possessed few writers and artists of trained and high ability. To-day, thanks very largely to MACLEAN'S MAGAZINE, we have men and women writers and artists producing first-class work; they developed when they found a medium demanding a grade of work equalling the best contributors to American magazines. Also, the Canadian writers and artists who were finding a market for their wares in the United States turned to MACLEAN'S when this magazine showed itself to be a sufficient and creditable vehicle for their work.

The future has a good crop of A1 Canadian writers and artists in store, whose work will appear in MACLEAN'S; but consider these names of Canadian men and women who have already "arrived," and whose work appears in MACLEAN'S MAGAZINE:—

Sir Gilbert Parker,
Arthur Stringer,
Arthur E. McFarlane,
Stephen Leacock,
Robert W. Service,
Alan Sullivan,
Agnes C. Laut,
L. M. Montgomery,
"Janey Canuck,"
A. C. Allenson,
E. Phillips Oppenheim,
Peter McArthur,
L. B. Yates,
Geo. Eustace Pearson,
W. A. Craick,
H. F. Gadsby,
C. W. Jefferys,
J. W. Beatty,
Arthur William Brown,
Lou Skuce.

These are some of the names of Canadian men and women—writers and artists—who are doing work of the highest class, acceptable to the hardest-to-get-into publications of the United States. Ten years ago such a Canadian galaxy had no existence.

BESIDES these professional writers and artists—men and women who depend on their pen and pencil and brush for their livelihood—is a big host of others who write only when successfully urged to do so—because they have something to say that is worth saying. These are usually men in a big way of business, or professional men at the top of the ladder, or men and women doing unusual work of a most important sort—often obscurely because they are not self-trumpeters of their achievements or labors. For example, such men and women as:—

THE LATE SIR MORTIMER CLARK
JOHN BAYNE MACLEAN
ERMAN J. RIDGWAY
LORD NORTHCLIFFE
JOSEPH MARTIN, M.P.
BILLY SUNDAY

All these have contributed under their own name or a nom de plume to MACLEAN'S MAGAZINE in the last 12 or 15 months, recognizing that this magazine can give their messages to the whole nation, and to a class of persons whom they wish to reach.

NOBODY who knows MACLEAN'S would ever call it a story magazine, but rather a national magazine—almost a news magazine. Stories there are in every issue—enough of them to satisfy the right and natural desire for romance, adventure, achievement, business, love and intrigue. But the greater part of the contents of every issue of MACLEAN'S MAGAZINE may be called **NEWS**—NEWS of men and their work and triumphs; news of the nation's work and workers; news of discoveries; news of movements; news of politics; news of the builders and building of Canada. MACLEAN'S, as Canada's National Magazine, prepared for thinking and intelligent men and women, must be an informative and interpretive magazine, must mirror national opinion, record national affairs and developments, and be the **VOICE** of prophets, statesmen and leaders. MACLEAN'S is a magazine of to-day—a newspaper of a sort, dealing with big news passed over by daily newspapers whose function is the recording of the day's news—passing news; and who leave the fuller statement—the summed-up presentation of things they can but touch on—to MACLEAN'S MAGAZINE.

A Magazine *of* Power

News features of MACLEAN'S MAGAZINE greatly liked by its 50,000 readers are

The Business Outlook—article.
The Investment Situation—article
The Review of Reviews Department.
The Nation's Business.
Women and their work.

These are regular department features appearing in every issue of MACLEAN'S. They are of the nature of surveys or digests, and perform a service welcomed and praised by all readers who aim to keep themselves broadly informed concerning what's doing in Canada and what's being thought and said and done the wide world over.

REVIEW of Reviews is the outstanding feature of MACLEAN'S, in that it gives the best articles, in condensed form, from the best magazines of the world. A staff of trained people read and study the contents of all magazines and select for each issue of MACLEAN'S twenty or more articles which mirror the world's progress and present the changing aspects of world opinion.

IN rounding out this presentation of Canada's National Magazine a brief reference may be made to one large and discriminating and important class of contributors to it—advertisers. Literally hundreds of them employ MACLEAN'S for their advertising, to reach the influential classes represented by MACLEAN'S list of subscribers, and because they get national publicity economically. These makers and producers of goods of national consumption appreciate the fact that a select circulation of 50,000 gives them, among the most important families of Canada, strong local publicity as well as broad national publicity, and that retail distributors are both canvassed and assisted by their national advertising in MACLEAN'S MAGAZINE. They recognize that $1,000—$3,000 invested in space in MACLEAN'S MAGAZINE to buy 365-day national influence is dirt cheap publicity.

THIS is but condensed presentation of MACLEAN'S MAGAZINE. Very much more can be said about its editorial policy and character, about its making, about its quest for and development of new contributors, about the policy that keeps canvassing methods and advertising columns clean, about the hearty approval of subscribers of MACLEAN'S MAGAZINE, about the significance of 50,000 circulation, about the wisdom of doing a "little advertising in a few magazines" as an initial step in national advertising plans; about the advertising of MACLEAN'S MAGAZINE in all the MacLean Publishing Company's list of business and technical newspapers, about the influence of MACLEAN'S MAGAZINE on distributors.

But time and space forbid here and now a continuation of the MACLEAN story.
What is enough to be impressed is—

MACLEAN'S MAGAZINE

Canada's National Magazine

143 University Ave., Toronto

Union Trust Bldg., WINNIPEG Boston New York Chicago London, Eng. Southam Bldg., MONTREAL

Side Partners

Your tools—when they're right, when they're dependable—are real side partners, always on the job ready for the biggest thing that comes along.

But this "side partner" quality must be built into them. It doesn't just happen. It means years of experience in tool making. It means right materials and right methods all the way through.

These are Pexto "reasons why"; all these qualities are deeply embedded in the tools stamped with this name.

When you need a wrench, for instance, one that is ever ready, dependable, strong and husky enough for the toughest kind of jobs, then ask your dealer for Pexto. Any one, or all three of these sturdy members of the Pexto Wrench Family will prove out as regular side partners.

PEXTO SOLID HANDLE WRENCH

Like its husky brother this solid handle wrench is made of three strong, simplified parts with the addition of a heavy wooden riveted handle. With bars and jaws that stand the heaviest strain this wrench will come through with flying colors.

PEXTO SOLID STEEL WRENCH

Here's a husky member of the Pexto Family. It is made in only three parts, each part of special high quality steel forged so as to give weight and strength where most needed. The head, bar and handle are forged solid from one piece of steel.

PEXTO STILLSON WRENCH

They grip like a vise, these jaws of hardened steel, and there's no getting away. Quick response to a touch on the slide screw gives ready adjustment. They're Pexto-made right straight through. You can say these things and many more about this Stillson wrench and Pexto will back you up.

If your dealer doesn't carry Pexto tools, write us for the name of the nearest dealer who does. We'll make it easy for you to get Pexto Quality.

THE PECK, STOW & WILCOX COMPANY

Manufacturers Mechanics' Hand Tools, Tinsmiths' and Sheet Metal Workers' Tools and Machines. Builders' and General Hardware.

SOUTHINGTON, CONN. - CLEVELAND, OHIO

Address Correspondence to 205 W. Center St., Southington, Conn.

PEXTO

PEXTO

MECHANICS' HAND TOOLS

Man-Size Conversation

Something about Jones---The Test Question that Silenced Jennings---Where Jones gets the information that makes him listened to when he speaks.

AFTER the little group had finished their cigars, and were about to separate, each going his own way, Brown said to Smith: "Wasn't Jones great? And didn't he put it all over Know-It-All Jennings?"

It was just such a group of men as you see gathered every day round a luncheon table, or in the club lounge; and the theme of the conversation was likewise common enough—the present business situation, and the probable situation when Peace is made.

At first every man had opinions to declare, but most of all Jennings. Jones was, at the beginning, the silent one. But at a point when Jennings, with his usual cocksureness, was voicing some extravagant views, Jones rather jolted him by asking him, "What is your authority?" And Jennings didn't have authority—nothing more than opinions.

It was then that Jones began to talk, and his tactful, well-informed views and statements instantly commanded the attention of every man round the table; for every man was learning. Even Jennings had the grace of keep quiet, for he knew he was listening to a better-informed man.

Jones has a staggering question to put to men with opinions which they express boldly and confidently. It is: "What is your authority? Your opinions are no better than your information." The average man expressing opinions doesn't possess much solid information; he just "feels" that way.

Every man not an idler is interested in Business—first, in his own business; second, in the Nation's business. Whether he be a retailer in a country town; or a manufacturer; or a lawyer advising clients on investments; or a bond-dealer needing to know much about the many factors that affect prices; or a banker; or a private investor whose funds, invested or waiting investments, are his main source of income; he is interested in Business, and he needs information—the real stuff which is the basis of opinion.

Where can each get the kind and amount of information desired?

Let him get it where Jones gets much of his information —from THE FINANCIAL POST OF CANADA.

Jones does a good deal more than just pay $3 to get this paper every Saturday; he *reads* it. To him the POST is the newspaper prized most of all. He sets aside a certain set time each week for reading it. It satisfies him because its views are based on information, and information is the POST'S chief material.

The POST keeps Jones soundly and broadly informed about the business affairs of the country. He finds that the POST takes a business-like view of all questions; that it is not influenced by any political factions or "interests," that it tells the truth whether the readers like it or not. He knows that little of importance will occur in connection with the business of the country without enlightening information or comment appearing in the POST.

He gets the best-informed news about listed and other securities, in the POST:—Milling, Transportation, Pulp and Paper, Iron and Steel, Electrical Enterprises; and so on. This weekly Security News he finds is of an authoritative character —usually signed—prepared by specialists, who, from the nature of their daily work, are in intimate touch with the factors that affect prices, and with high-up or well-informed men who have *knowledge*. Jones finds no other paper in Canada attempting to give the service the POST does in relation to listed securities.

Jones finds the POST'S editorial page stimulating. He enjoys the biographical stories of Big Men which appear in the POST. The article each week by Agnes Laut gives him information gathered by one of the best informed and highest paid writers in America. In short, for Jones the POST is a treasury of information about Business; and it is Business by which Jones earns his bread and butter and something more.

When Jones mingles with his fellow men, and Business is the Theme of Conversation, most men are willing to listen to him, because his opinions are based on sound and reliable information.

Now, what is the application of all this? It is that you, the reader of this advertisement, may also make yourself a well-informed man about *Business—by reading THE FINANCIAL POST*. The $3 it costs per year is neither here nor there to the man who really wants to *know*—to have knowledge about matters and markets pertaining to his own business; and about the Country's business.

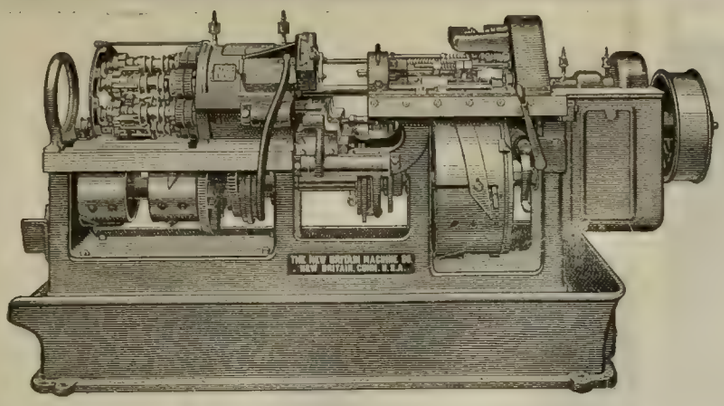
If you want your opinions to be well-informed; if you want a wide knowledge of Business; let the POST go to your home each Saturday. Sign the coupon below. Send no money now. Have the bill go forward in the usual way.

The Financial Post OF CANADA

The MacLean Publishing Co., Ltd.,
143-153 University Ave., Toronto.

Send me *The Financial Post,* for which I will pay $3.00 per year on receipt of invoice.

Name..... Address.....



Screw Machine Queries:

"IS REHANDLING NECESSARY?"

YES and no! The answer to this question depends upon the variety of operations required and the spindle capacity of your machine.

Pieces requiring drilling, tapping and similar operations on the "cut-off" end must, of course, be handled over—regardless of type of machine used.

On the other hand, there is much work that is commonly rehandled which could just as well be finished complete on the bar, were it possible to work the necessary number of tools without over complication.

In the "New Britain" Six-Spindle Automatic Screw Machine opportunity is afforded for the handling of those pieces whose variety of operations renders their production in a four-spindle machine impossible, or, if undertaken, necessitates the use of a complicated set-up, requiring excessive attention and liable to result in inaccurate work.

Particular attention is drawn to the fact that this additional capacity for performing end operations is not lost on work of a simpler character. In most cases advantage may be taken of the full spindle capacity of the machine by sub-division of the longer operations.

So that, while the work might have been accomplished with fewer spindles, its performance on a "New Britain" is attended by a considerable increase in production.

If you want an "all-around" screw machine, let your next installation be a "New Britain" Six-Spindle Automatic.

The New Britain Machine Company

—Automatic Screw and Chuck Machines—

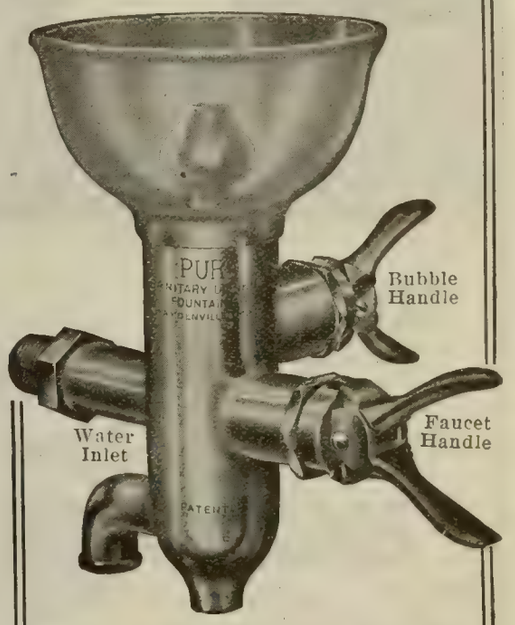
New Britain, Conn., U.S.A.

PURO

(MADE IN CANADA)

Saves Dollars

Why let that old-fashioned faucet go on year after year wasting water—MONEY? Why more drinking cups and glasses, only to become unsanitary—lost, broken or carried away? Puro Sanitary Drinking Fountain stops all this needless waste. Puro saves you 35% on the water bill alone. Puro saves you all that money you spend for cups. YET Puro is always ready with a clear, cool drink with dollars in the bank.



Puro Pays for Itself

You don't have to wait years to get back the small investment you have tied up in Puro equipment—

You start cashing in at once—not only on your water bill saving, but on the increased efficiency of your workers as well.

Men like PURO—it's clean. No danger of deadly germs lurking in its sparkling bubble.

Write us—tell how many men, how many departments, and we'll tell you how much the cost will be to

"PURO-FY"

YOUR WATER SUPPLY

Puro Sanitary Drinking Fountain Company

147 University Ave., Toronto, Canada

BLACK DIAMOND OVENS

OVENS

Enameling and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Write for Booklet.

Brantford Oven & Rack Co., Ltd.

Brantford, Canada.

BLACK DIAMOND OVENS

MORTON MANUFACTURING CO.

PORTABLE PLANERS
DRAW CUT SHAPERS
SPECIAL DRAW CUT R.R. SHAPERS
FINISHED MACHINE KEYS
STATIONARY & PORTABLE KEY WAY CUTTERS
SPECIAL LOCOMOTIVE CYLINDER PLANERS

OFFICE AND WORKS: MUSKEGON HEIGHTS U.S.A.

'Barnes-Made'

Springs

are unusual in service and wear.

They are the result of sixty years' experience, unsurpassed equipment and highly skilled workmanship.

A trial will convince you that "Barnes-Made" Springs are the best buy.

Established 1857.

THE WALLACE BARNES COMPANY

218 South St., Bristol, Ct., U. S. A.

Man'frs of "Barnes-made" Products

Springs, Screw Machine Products, Cold Rolled Steel and Wire

ON PAGE 68

You'll find a host of Opportunities.

TURN TO IT!

BERTRAMS LIMITED

Engineers

Sciennes, EDINBURGH

PAPER MILL MACHINERY

and

MACHINE TOOLS for IRON WORKERS

Catalogues offered to Purchasers.

If any advertisement interests you, tear it out now and place with letters to be answered.

Quality? Production? Spoilage?

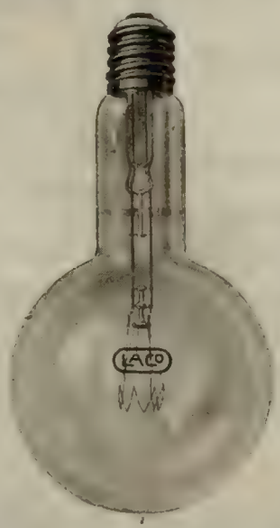
Are All Closely Related to the Lighting Efficiency of Your Shop

Poor or cheap light for your men is an exceedingly unprofitable "economy."

For late fall and winter afternoons and for the night shift, provide the equivalent of bright sunlight. Make it possible for your men to work with equal accuracy and efficiency, both during daylight and darkness.

Laco Nitro Lamp "The light that gives more light"

Puts the equivalent of bright, cheerful sunlight in your shop. It gives you twenty-four hours of daylight and its equal. It helps to maintain quality and production and eliminates much spoilage, due to insufficient light and inaccurate workmanship.



THE LACO NITRO LAMP is the latest development of the tungsten electric bulb. It is a tungsten filament suspended in a nitrogen gas-filled bulb. Less current, longer utility and more candle power per watt than any other type lamp.

Inquire from your nearest dealer.

CANADIAN LACO-PHILIPS COMPANY, LIMITED

STOCKS AVAILABLE AT

MONTREAL, TORONTO, WINNIPEG, VANCOUVER

Witness a Drop-Forge Shop in action

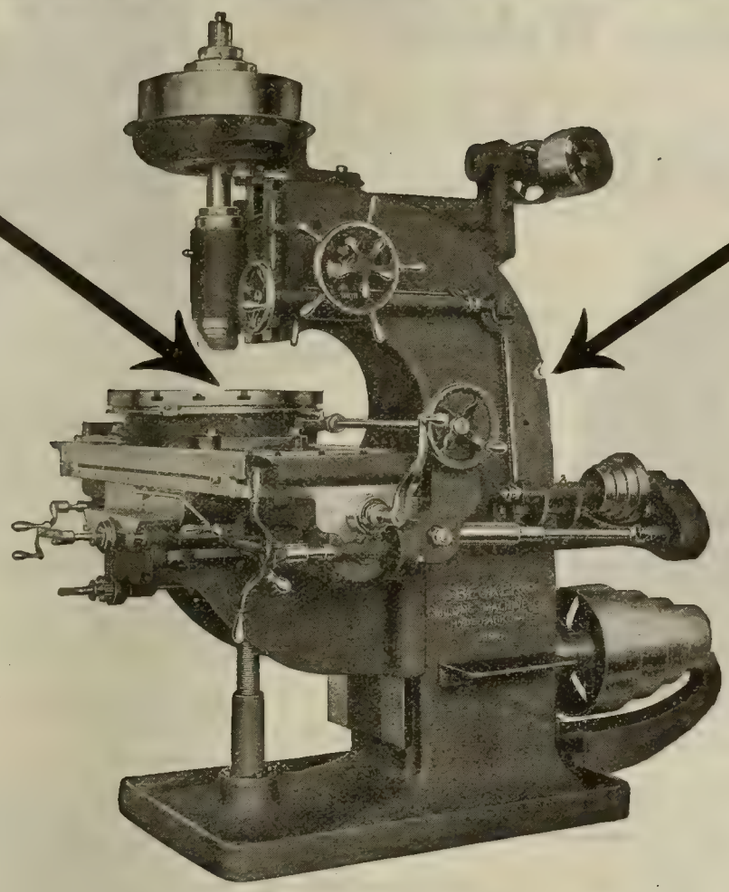
And you acquire a new idea of endurance

12,000 LB. DROP HAMMER
WHAT DROP-FORGINGS ENDURE THERE EXPLAINS WHY "SUPERIOR DROP-FORGINGS" ENDURE EVERYWHERE

J. H. WILLIAMS & CO.
THE WRENCH PEOPLE
45 [illegible] STREET BROOKLYN, N.Y. CITY

Built For Your Needs

QUANTITY STRENGTH



Fourteen Types, Twenty-four Sizes

If your requirements are such as are included in the range of these machines, you are one that can benefit most by Becker service. While it is true that each of our machines will make radical production increases, it is equally true that your special or peculiar work may have the same increase effected.

Becker service would be incomplete without a department that co-operates and helps to solve a client's peculiar and extraordinary needs.

We invite your inquiries. It will help us and at the same time may prove of inestimable value to you.

Becker Milling Machine Company

Hyde Park, Boston, Mass., U.S.A.

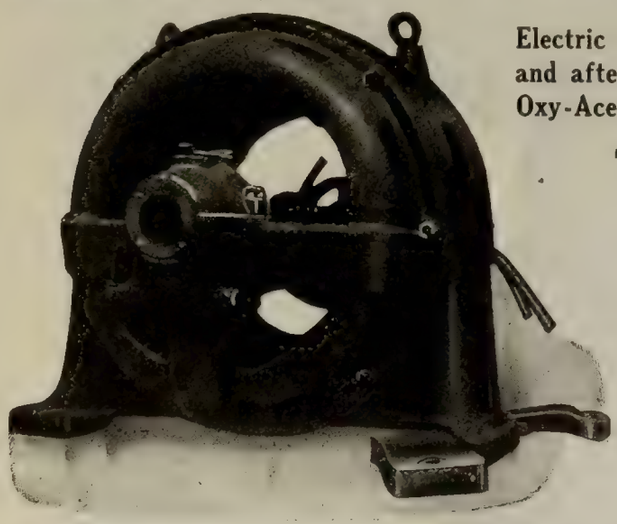
Agents:

The A. R. Williams Machinery Company, Limited, Toronto and Hamilton

Williams & Wilson, Limited, Montreal, Que.

Loss through Depreciation is Considerably Reduced by Oxy-Acetylene Welding

With a Welding Outfit at hand to constantly repair the minor breakages to machinery and equipment as they occur, the life of the equipment in a plant is prolonged indefinitely, and the loss by depreciation is appreciably reduced, in addition to the further advantage of obtaining a more efficient service from them whilst they are in use. The avoidance of loss of time when a "breakdown" occurs is alone sufficient to render the installation of an Oxy-Acetylene Outfit a profitable investment, and **"the bigger the break the greater the saving."**



Electric Motor before and after repairing by Oxy-Acetylene Welding

The cost of repairing this Motor was infinitesimal

and is representative of the constant and profitable uses that can be found for an Oxy-Acetylene Welding Outfit.

Why not investigate this to-day?

Attach this ad. to your letter head and mail to us. Full particulars as to how the Oxy-Acetylene Process can save YOU money, time and material will be sent by return, without obligation. We are in Canada in the best position to give you service, both practical and technical and there is no time like the present, **do it now.**

L'AIR LIQUIDE SOCIETY

Canadian Factories: **TORONTO MONTREAL WINNIPEG HALIFAX (Under Construction)**

COMMERCIAL ACETYLENE IS USED IN LARGEST SHIPBUILDING PLANTS

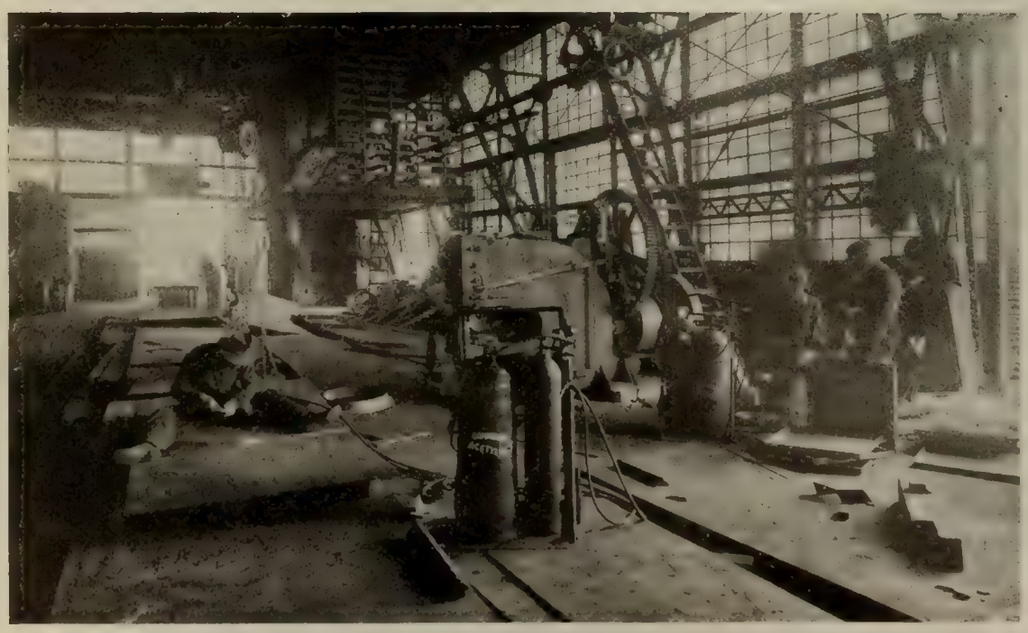


Illustration shows Commercial Acetylene cutting ship plates in one of the largest shipbuilding plants in Canada. We guarantee both quantity and quality of Commercial Acetylene. Write our nearest office about your supply.

MAIN OFFICE:

80 Broadway, New York

BRANCHES:

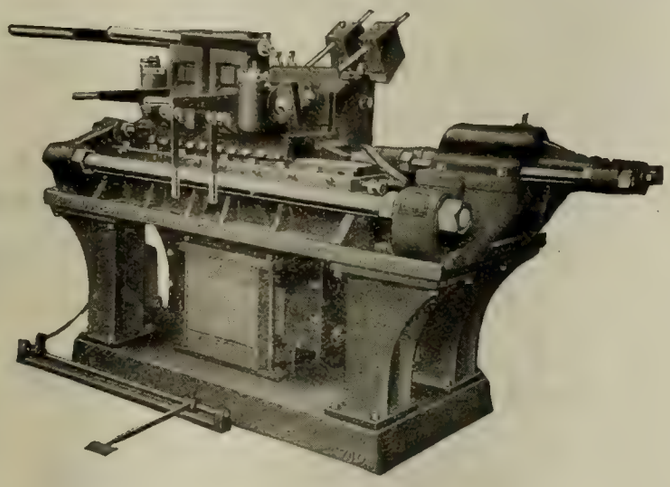
ATLANTA, GA.
AURORA, ILL.
BOSTON, MASS.
BOUND BROOK, N.J.
EAST DEERFIELD, MASS.
SAN FRANCISCO, CALIF.
MOBERLY, MO.
W. BERKELEY, CALIF.

COMMERCIAL ACETYLENE WELDING CO., INC.

103 BAY STREET, TORONTO

Thomson Process
Electric Welding

Waste!

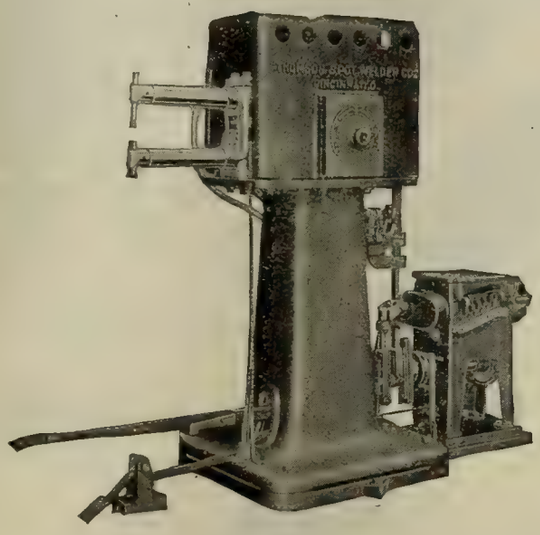


40-A-9
Butt Welding Machine

The Thomson System of Electric Welding eliminates waste. Big manufacturers who allow so much for spoiled work each day will find it far cheaper to buy a Thomson Butt Welder. The saving in six months will more than pay for the initial cost.

For welding automobile rims, brake rods, angle irons, pipe joints or whatever your problem might be there is a style of Thomson Butt Welder that will do it more economically than you are getting it done now.

Send for Bulletin B-4



Combination Foot Operated and Six Speed Gear Box. Belt Driven.
Type 177

The Thomson Spot Welder makes more and better work possible

One firm writes, "One boy and a 'Thomson' can do more and better work than five men were able to do by the method we formerly used."

The Thomson Spot Welder is simple to operate. Just place the two pieces of metal to be welded between the copper die points—press the foot treadle and the pieces are united forever. No smoke, danger or dirt. No holes to punch. No rivets used.

There is a Thomson Spot Welder for your work. Let us have your requirements and we'll show you the machine.

Send for Bulletin S-4.

Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

BRASS Castings

The coupling of expert work with unexcelled equipment enables us to produce on a large scale Brass Castings of any size or alloy.

Our prices, too, are most reasonable; for our large purchases direct from the smelters command their every price favor.

For better Brass Castings at a money saving, send your orders to us. We promise that our work will please you.

The St. Lawrence Welding Company, Ltd., Montreal, P.Q.

Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, Etc. Electric Welders, Oxy-Acetylene Welders. Boiler Repairs. Lead Burning and Brass Foundry Work.

Office: 138 Inspector Street Works: 59 Olier Street Telephone: Office, Main 5779, Manager's Res., Westmount 3483

Stow Shell Grinders Increase Production

Suspended Pedestal Mounted on Truck

Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.

Binghamton, New York, U.S.A.

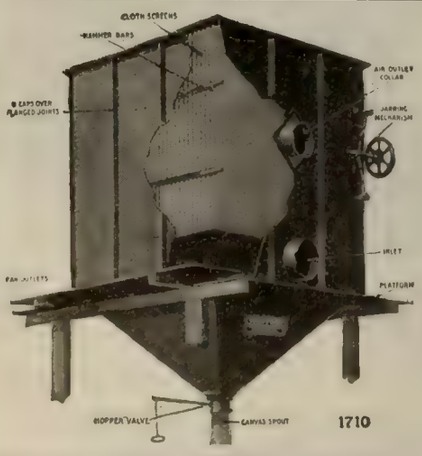
Oldest Portable Tool Manufacturers in America

H. E. W. Service

Our ability to serve is limited by the demands of your organization. Repair work, special marine repairs, machinery built. Our air chucks which are performing such efficient service in the shell industry is but an evidence of our ability. We have a large and complete staff of expert workmen and thorough equipment. Consult us. We will gladly co-operate with you.

Hyde Engineering Co.

27 William Street
Montreal, Que.



Healthy Air in Your Mill Room

is possible only by removing the dust. Our cloth-screen arrester retains all the fine vapor dust and passes cleaned air back into the room.

Write for catalog 120.

Complete Foundry Equipments

WHITING FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB.

Cranes of all Types

Let Starrett Tests Pick Your Blade

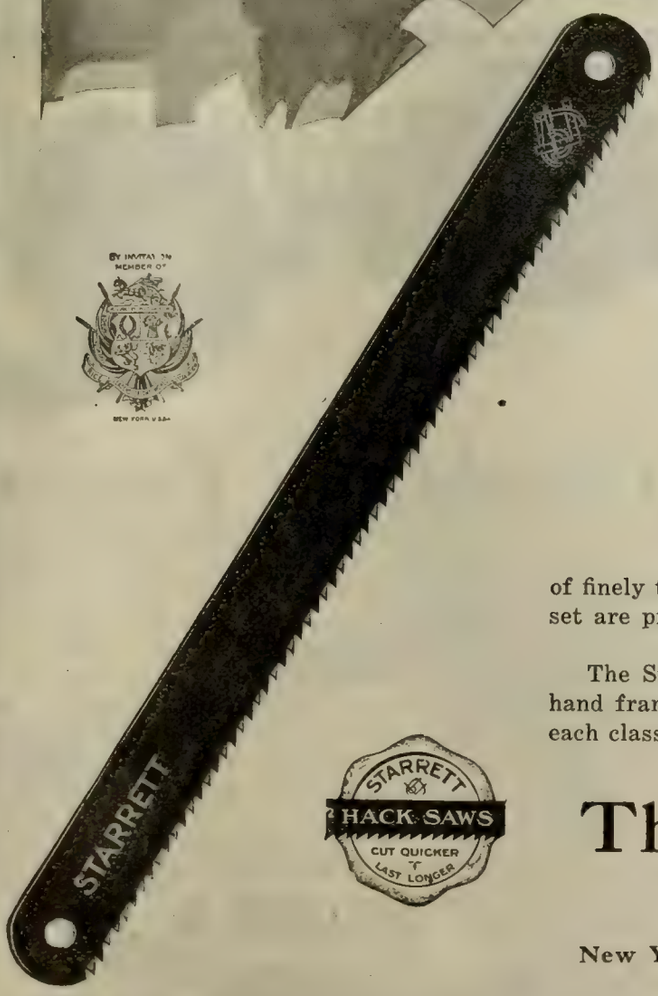
On brass rod or tool steel, sheets or girders, you can't be sure of the best work unless tests have come first. Tests are important. Tests **prove** that this or that blade is **the** blade to use.

Tests cost time and money. For that reason we have made the tests for you. We have spent much time in perfecting a hack saw blade for each class of work. That's why

Starrett Hack Saws

of finely tempered tungsten steel, with milled teeth having the proper set are preferred when good work and fast work are demanded.

The Starrett catalog, besides listing a full line of hack saws and hand frames, gives much valuable information on the best blade for each class of work. Drop us a post card asking for Catalog No. 213.



STARRETT HACK SAWS CUT QUICKER LAST LONGER

The L. S. Starrett Co.

The World's Greatest Toolmakers
ATHOL, MASS.

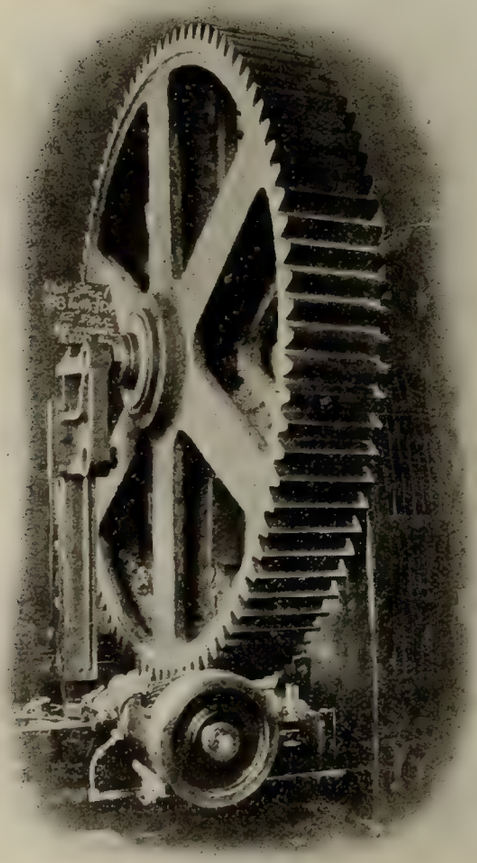
New York **London** **Chicago**

42-736

If any advertisement interests you, tear it out now and place with letters to be answered.

CUT GEARS

CUT GEARS



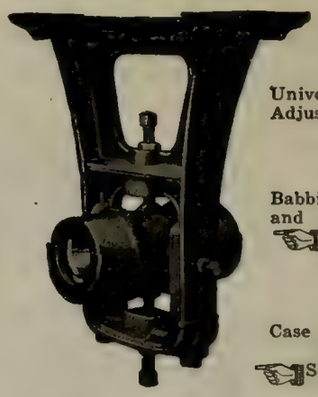
Heavy Steel Spur Gear
90" dia., 6,500 lbs.
88 T., 1 d.p., 12" F.

Write us for quotations.

Hamilton Gear & Machine Co.
Van Horne Street, TORONTO

A Giant for Work

An Infant for Oil



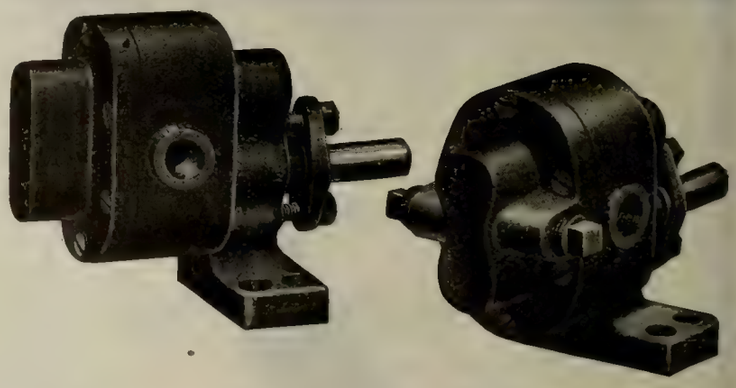
That describes the Bond as well as anything we know. Constructed of the finest materials, it will outlast any hanger on the market.

Made with the famous ring oiling system, the Bond gets positive lubrication without wasting a drop of oil.

Try a Bond—that's all we ask. The result—repeat orders—are reassured.

Get that Bond Book to-day.

CANADIAN BOND HANGER & COUPLING CO.
Limited
ALEXANDRIA ONTARIO



Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.

CHAPMAN

DOUBLE BALL BEARINGS

Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.

DEPENDABILITY

Has Made

HARRIS HEAVY PRESSURE

THE MOST POPULAR BABBITT METAL IN THE DOMINION

Manufactured by

THE CANADA METAL CO., LTD.

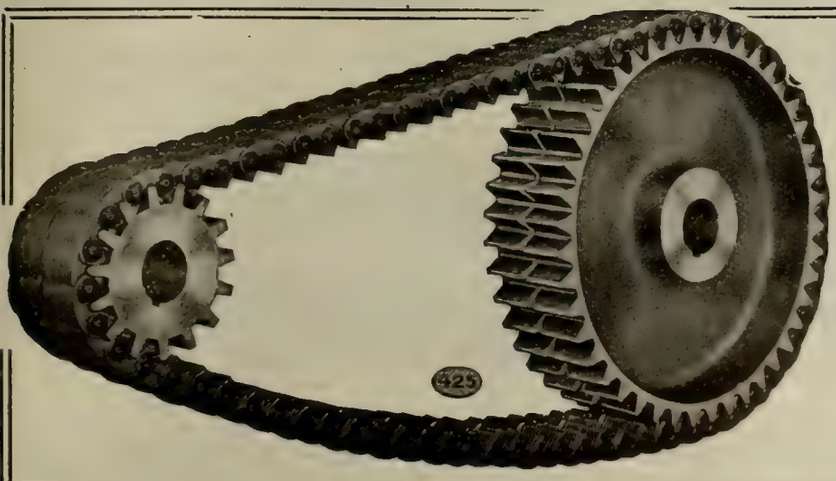
Hamilton, Montreal, TORONTO, Winnipeg, Vancouver

IT FLOWS FREELY

IT WILL NOT CRACK

IT IS COPPER COATED

IT IS COPPER HARDENED



RENOLD CHAINS

The proven efficient form of Power Transmission.

PATENT SILENT

Equally suitable for main shaft or machine drives. Save space and power, increase output and ensure durability.

Chain and Parts Carried in Stock.

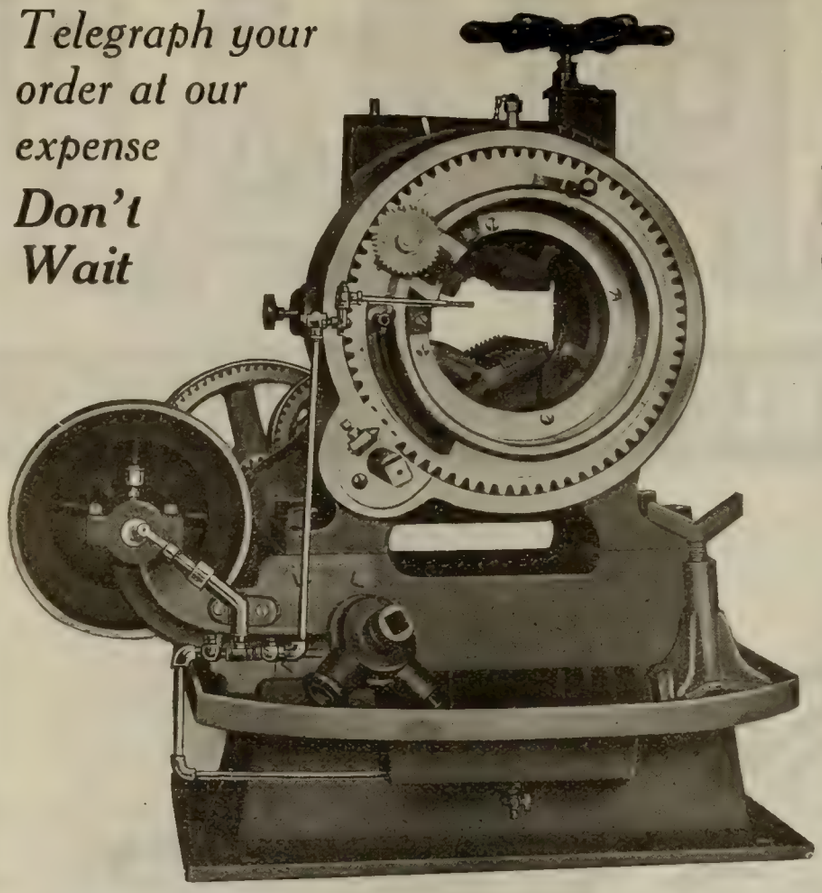
Sole Canadian Agents

Jones & Glassco. (Reg'd)

Branch Office: TORONTO, ONT. ENGINEERS St. Nicholas Bldg. MONTREAL, P.Q.

Telegraph your order at our expense

Don't Wait



In These WAR Times

If you have need of a

Pipe Cutting and Threading Machine

You want to know three things and in this order.

Delivery

All sizes up to 15", for either Hand, Belt or Electric drive, kept in stock for immediate shipment. No waiting.

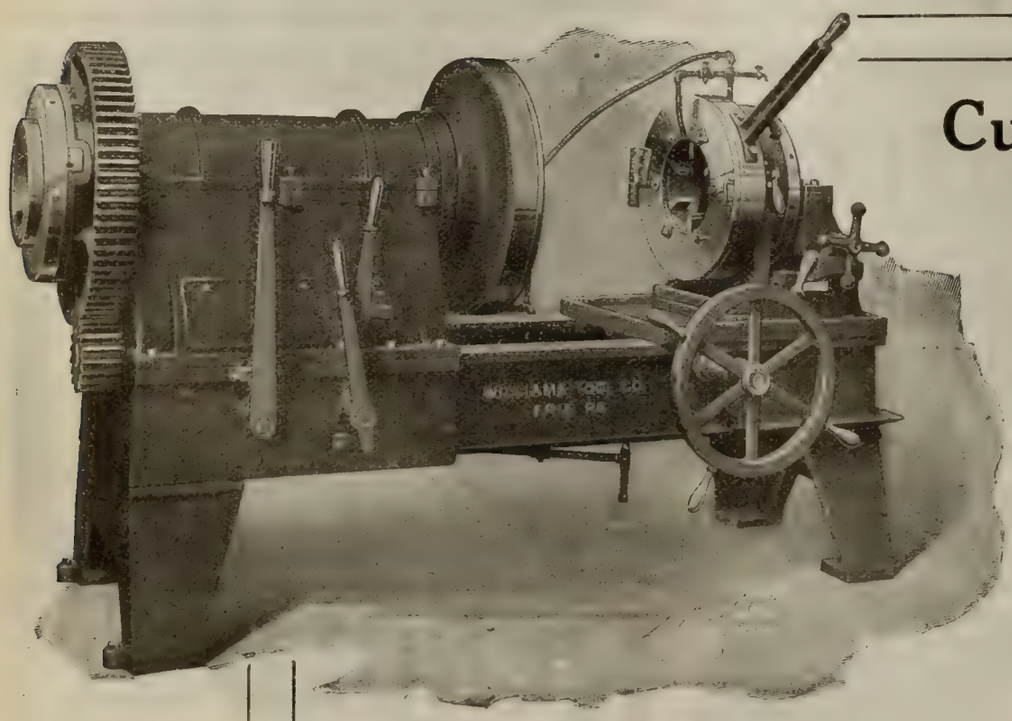
Quality

The original FORBES. Our specialty since 1882. More than 25,000 in use.

Price

Less than any other Standard Machine on the market, and less than half of many. Our system is the reason.

THE CURTIS & CURTIS CO., 115 Garden Street, Bridgeport, Conn.



Cutting-off and Threading

By the decree of expert judges Williams Cutting-off Machine has been declared the most **efficient.**

We have made this claim all along and this judgment only verifies it.

Made in 11 sizes and each size has a range of 8 to 10 consecutive sizes between ¼" and 18" diameter.

Write us about them. They will save you money, time, and increase the quality of your product.

Williams Tool Company

Erie, Penn., U.S.A.

Canadian Agents:
The A. R. Williams Machinery Co., Ltd., Toronto, Canada

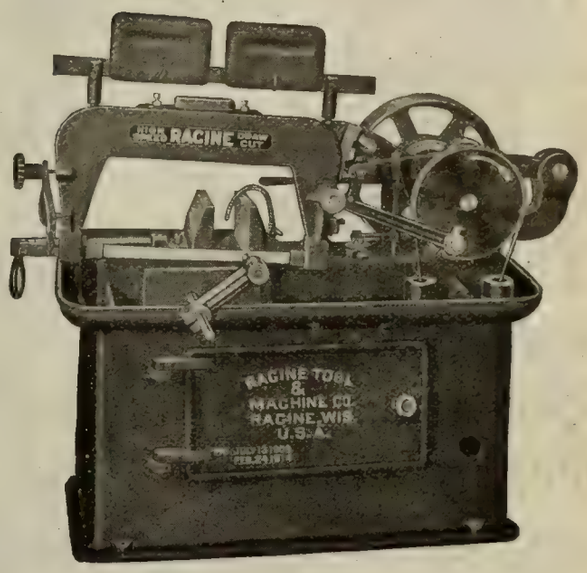
European Agents:
Universal Machinery Corp. London, England

This Racine

ASK FOR OUR TRIAL OFFER TO PROVE OUR CLAIMS

Cut 2500 Steel Bars With a Single Blade

The Racine patented return-stroke automatic-lifting device saves blades—saves time—saves *money*. Ample stock of the Famous Racine H.-S. Tungsten Blades is always at hand to protect users of Racine High-Speed Metal Cutting Machines.



RACINE TOOL & MACHINE COMPANY
15 MELBOURNE AVENUE, RACINE, WIS., U.S.A.

Safety Set Screws
Tap Extensions

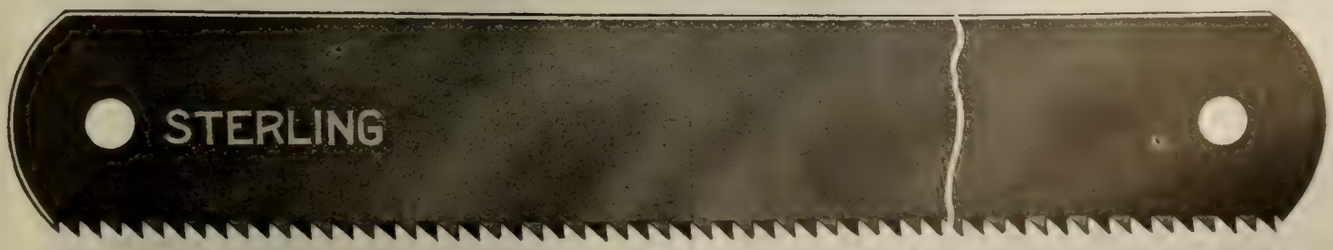
Socket Head
Cap Screws

Safety Set Screws
Socket Wrenches

MANUFACTURED BY

135 Sheldon Street **The Allen Manufacturing Co.** Hartford, Conn.

HACK "STERLING" SAWS



MANUFACTURED BY

DIAMOND SAW & STAMPING WORKS -:- BUFFALO, N.Y., U.S.A.

You Don't Like to Shave with a Blunt Razor

—It tries your temper and spoils your skin.

Then don't expect your men to file with blunt files.

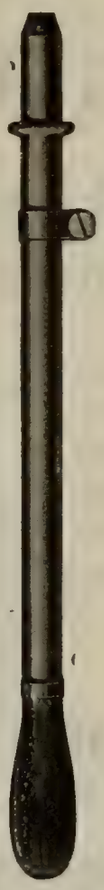
It makes *them grouchy* and spoils *your* work.

That costs *you* money any way you look at it.

Give your men "Famous Five" files to work with, and you'll get good results; because "Famous Five" files are hard, sharp and retain their keen cutting qualities for the longest time.

Remember this and specify them when ordering. They are:

Grinding Wheel Dressers



We are specialists in Grinding Wheel Dressers and can recommend the best types for any particular needs.

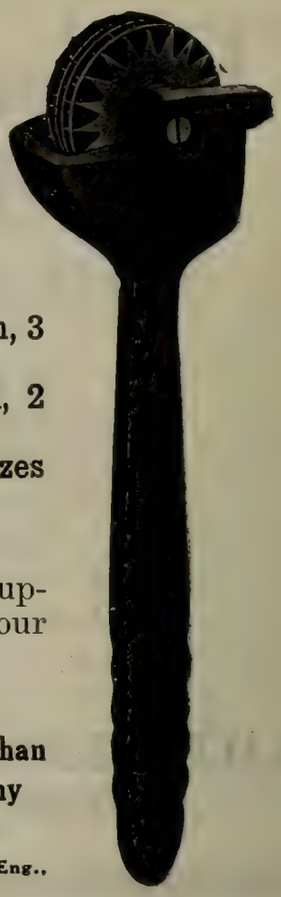
Our Dressers are:

Diamo-Carbo
Desmond Huntingdon, 3 sizes
Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

We can promptly supply your needs from our stock.

The Canadian Desmond-Stephan Manufacturing Company
HAMILTON, ONTARIO

Alfred Herbert, Ltd., Coventry, Eng., Agent for Great Britain.



DOUBLE SAVINGS

in cutting on PEERLESS HIGH SPEEDMETAL SAWS; they save both Time and Material.

Supposing you save only 1/16 on each cut, 200 lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

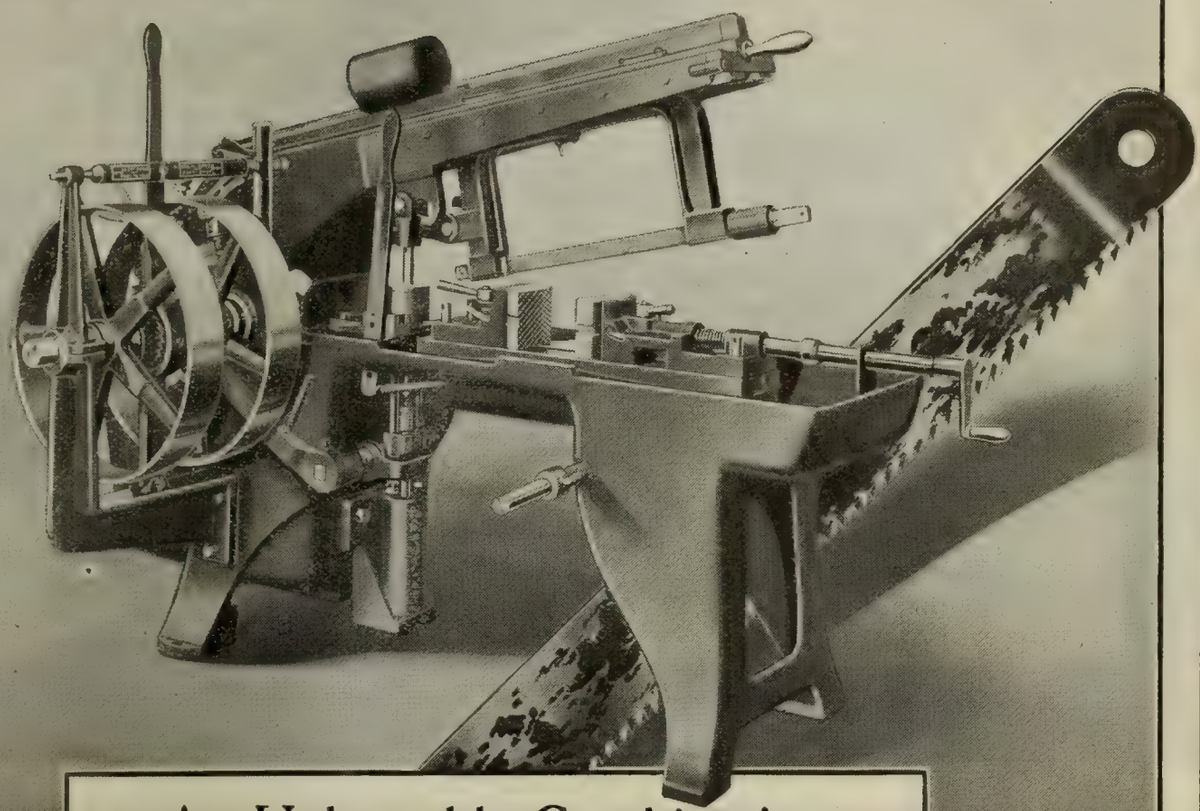
Have you ever stopped to consider the waste of material in wide cuts, especially at the present high cost, will pay for a PEERLESS in a remarkably short time.

This is only one of the reasons for so many repeated orders and large concerns having standardized the PEERLESS. The many other reasons can only be fully appreciated after comparative test.

Write for a list of users; some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

An Unbeatable Combination



An Unbeatable Combination

Are you a manufacturer of metal products, where accuracy, speed, production and economy count, and which require constant cutting-off of stock.

Here's The Combination You Are Looking For

The V. S. W. No. 5 High Speed Hack Saw Machine equipped with a VICTOR blade is unbeatable when it comes to increased production, and a minimum amount of power blade breakage and consumption.

Why?

An actual machine and blade operated by one of your own men in you own shop will be the most convincing demonstration we can make.

Let us send you one V. S. W. machine on a thirty days' trial, with enough VICTOR blades to show you why.

VICTOR SAW WORKS LTD - HAMILTON, CANADA

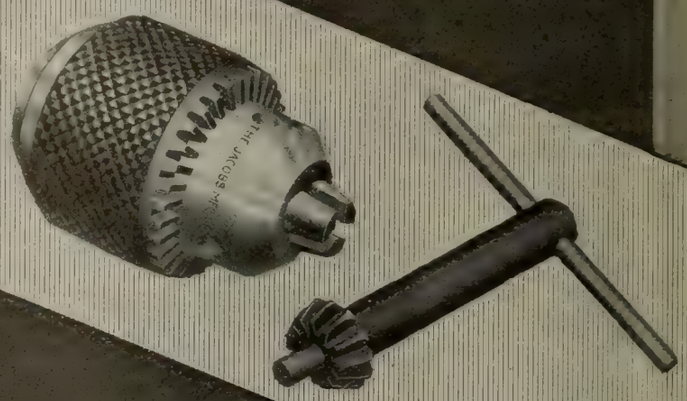
Jacobs
IMPROVED
Drill Chuck

A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.

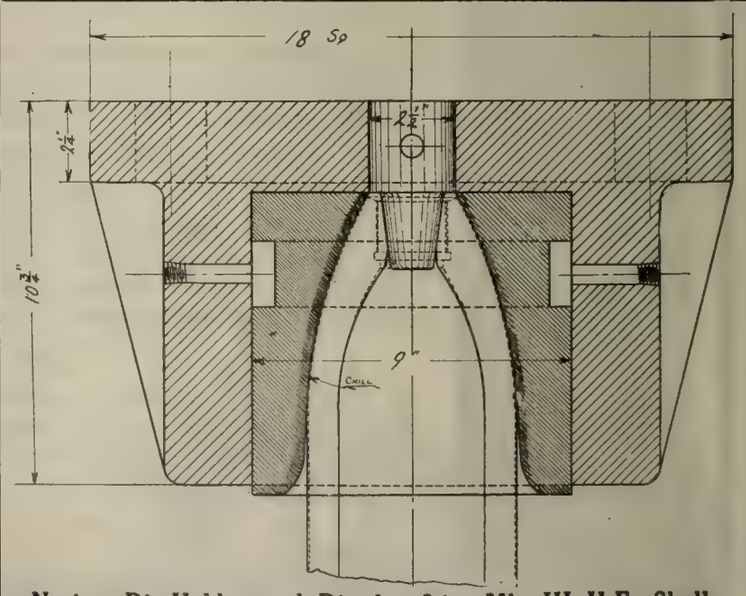


Why Are Over 50 Shell Factories

in Canada and the United States using our

Nosing Dies & Holders?

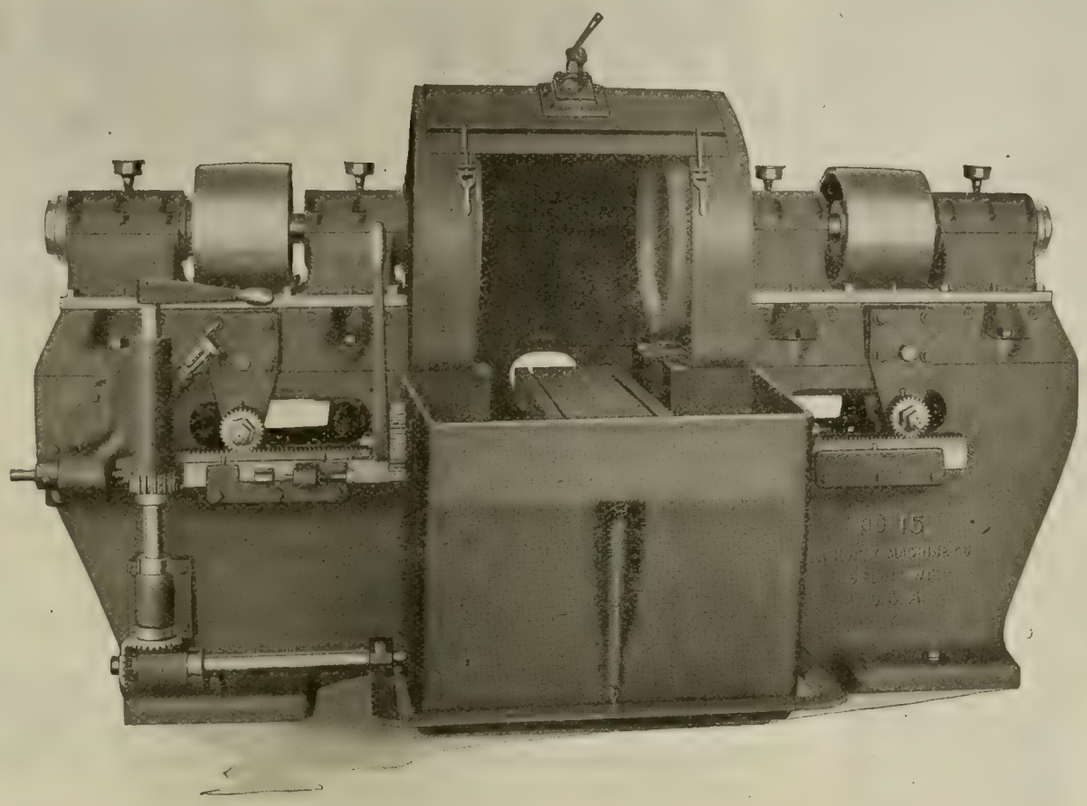
BECAUSE our experience of a quarter of a century in making Car Wheels, Crusher Jaws, etc., of special Chilling Iron Mixtures enables us to produce just the right mixture for each size of Die, consequently



Nosing Die-Holder and Die for 6-in. Mk. III H.E. Shells.

They are made right, and chilled to the right depth to give long life, without being too brittle. Nearly 2,000 have now been made to the satisfaction of the users. Are you one of them?

MARSH & HENTHORN, LIMITED
BELLEVILLE, ONTARIO



Solve Your Grinding Troubles

Possibly your trouble is that you are "letting well enough alone." Your grinding may not be up to the grade of efficiency desired. You have no doubt thought about that. Have you ever sought information or help from a firm who feature their organization by the service they render? If not, we would welcome your starting on us.

This No. 15 Double Spindle Grinder is but one of a great number we manufacture. It is specially adapted for builders of guns, ammunition and motor cars. It carries 24″ disc wheels or 2″ ring wheels. It has 8½″ face pulleys, giving abundant driving capacity and all other dimensions are proportionately large and powerful. Both types of grinding wheels are interchangeable. Get in touch with us on any grinding problem. Give our Service Department a test.

GARDNER MACHINE COMPANY

Beloit, Wisconsin, U.S.A.

Canadian Sales Agents: THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

Murchey

EQUALS 10 SOLID TAP LIVES

That point alone is sufficient to stamp Murchey adjustable taps as the undisputed leader of its class.

The point is this: when a chaser on a Murchey Tap is ground it can be adjusted to compensate for wear; with a solid tap this cannot be done with the fineness, the finish, the absolute accuracy that characterizes our adjustable taps. A solid tap will lose its accuracy, and the more grindings the greater the inaccuracy. We maintain a special chaser service for our clients.

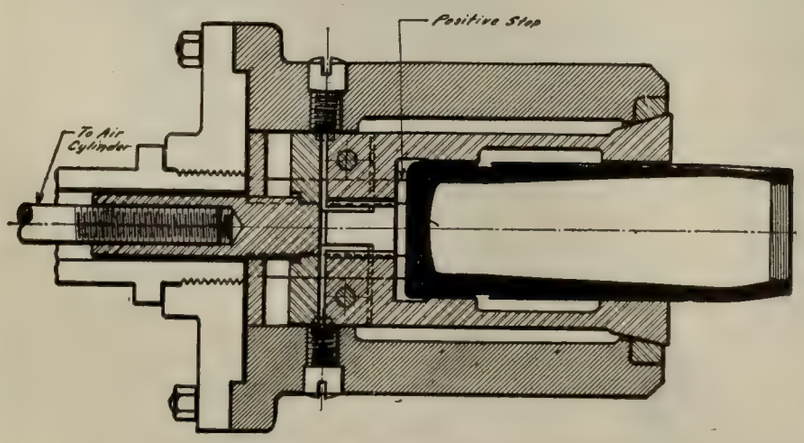
The Murchey Adjustable Tap has other features which we will gladly furnish upon request.

MURCHEY MACHINE & TOOL CO.

75 Porter St. Detroit, Mich.

The Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, S.W., England
Fenwick Freres & Co. 16 Rue Fenelon Paris, France

EVERY MINUTE EVERY DAY PRODUCTION SPEEDED



M. E. C. THREE JAW HINGED COLLET CHUCKS

with steel body are almost everlasting. Not one complicated part to get out of order. Grip firm and positive, their simple air valve control greatly facilitates the quick insertion or withdrawal of work.

Instead of wasted minutes chucking with slow hand-operated chucks, do the same work in seconds, and do it better, with M. E. C. Three Jaw Chucks—compressed air operated.

M. E. C. Chucks
Air Operated

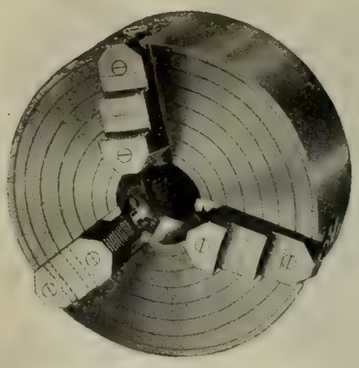
are 100% efficient wherever rapid manufacturing and absolute accuracy are the demands.

Know what great helps to speed production M. E. C. Chucks and Air Cylinders have proved themselves. Write to-day for our catalogue and 30-day free trial plan.

Manufacturers Equipment Company

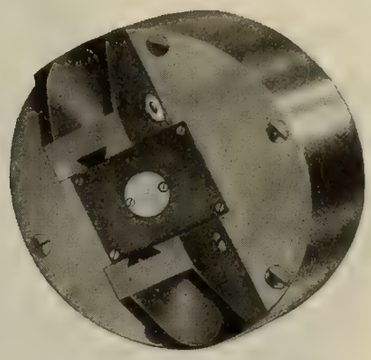
175-179 North Jefferson St., CHICAGO, ILL.

CANADIAN AGENTS: J. R. Stone Tool and Supply Co., Detroit, Mich.
New York: J. R. Stone Tool and Supply Co., 30 Church St.



Air Operated Three-Jaw Universal Chuck

Hannifin Air Chucks



Air Operated Two-Jaw Universal Chuck

Increase Your Output 20 to 100 Per Cent.

This is a big claim, but it's nevertheless within the range of possibility in your plant. Other plants have increased their production 20 to 100 per cent.—you can do likewise. At the Worthington Pump and Machinery Corporation's Hazelton, Pa., plant, Hannifin Air Chucks are in sole possession of the field. They won this distinction through superior merit.

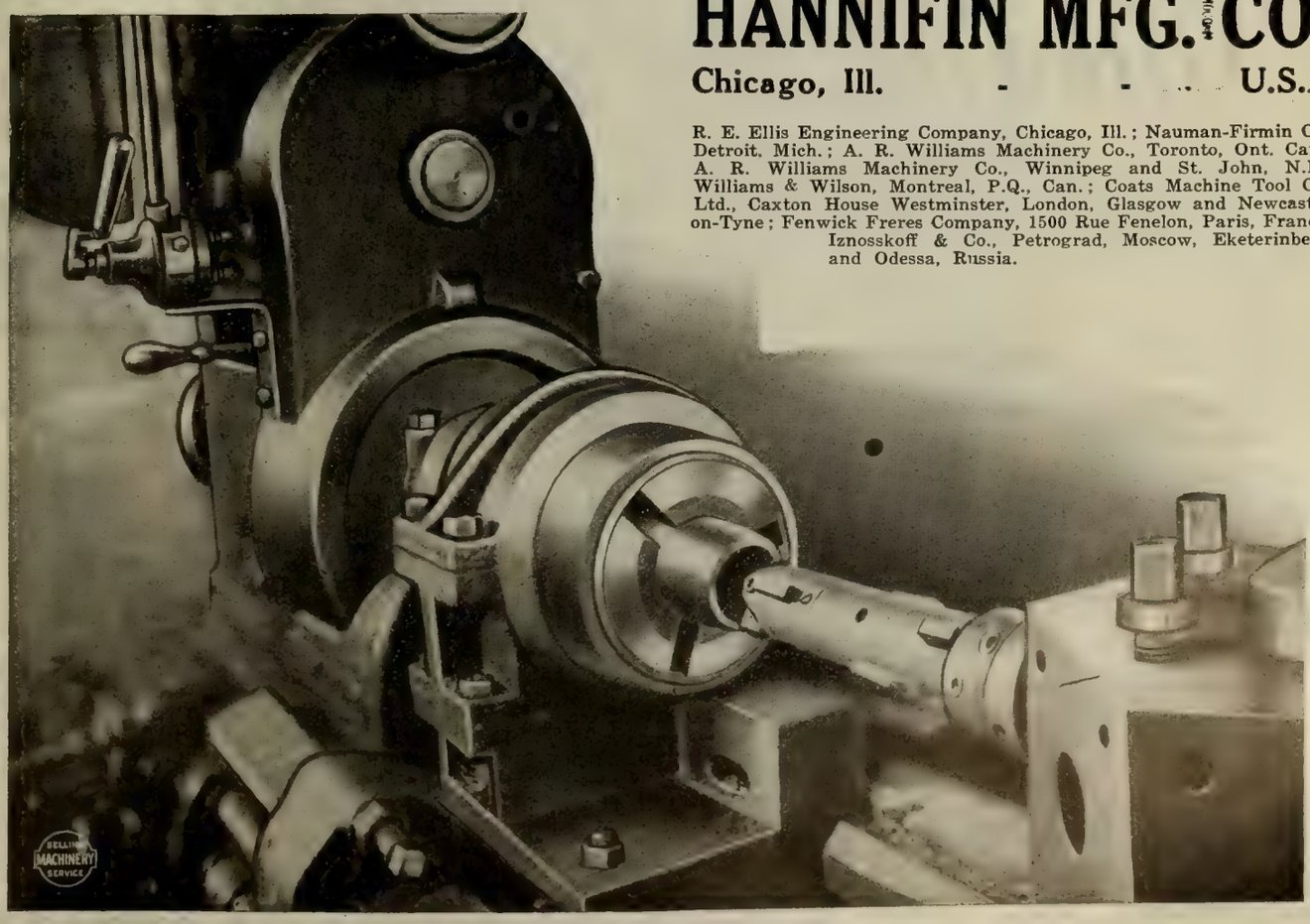
Cut below shows a 3" Russian shell *Hannifin chucked* for inside operation.

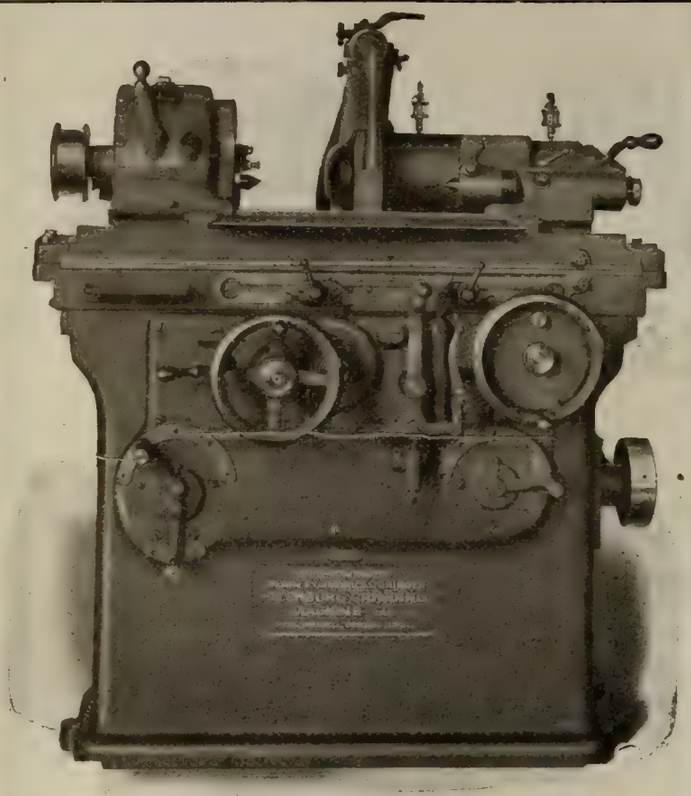
For quick handling and rigid slip grip work the "Hannifin" is the chuck for the job. Works on and under 75 pounds pressure.

HANNIFIN MFG. CO.

Chicago, Ill. - - U.S.A

R. E. Ellis Engineering Company, Chicago, Ill.; Nauman-Firmin Co., Detroit, Mich.; A. R. Williams Machinery Co., Toronto, Ont. Can.; A. R. Williams Machinery Co., Winnipeg and St. John, N.B.; Williams & Wilson, Montreal, P.Q., Can.; Coats Machine Tool Co., Ltd., Caxton House Westminster, London, Glasgow and Newcastle-on-Tyne; Fenwick Freres Company, 1500 Rue Fenelon, Paris, France; Iznosskoff & Co., Petrograd, Moscow, Eketerinberg, and Odessa, Russia.





MODEL "A"

Fitchburg Grinders

Model "A" illustrated here is a machine whose chief feature is its capacity for size, variety and quality of work. Its speed will give you greater production; its size, convenience, increased production, strength and saving in floor space will effect such a saving as to make it preferable over all other machines of similar character.

It is specially adapted for grinding straight or taper shafts.

An inquiry would speedily get you valuable information and data.

Fitchburg Grinding Machine COMPANY

Fitchburg, Mass., U.S.A.

Every Thread is Straight, Even and Accurate

The Chasers in an *H & G Automatic, Self-Opening Die Head* are set and held in place by a steel cam. That cam once adjusted, locks; there is no stoppage or changing in size.

The quick release not only issues the cutting of the thread to a given point every time, but permits cutting right up to a shoulder when required.

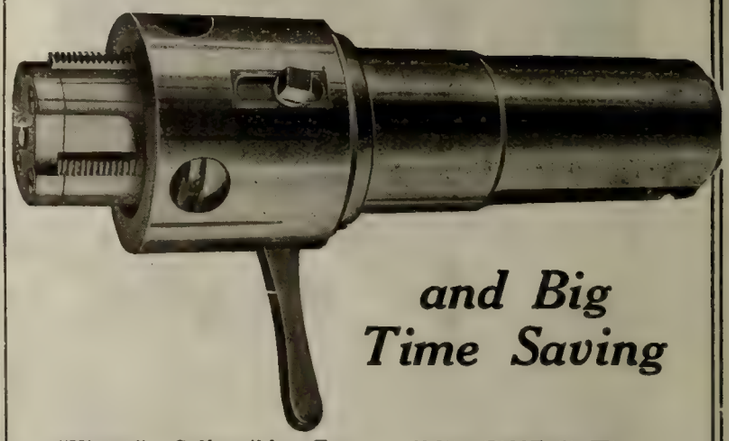
Simple, Strong and Compact.

Our booklet tells more. ***Drop a card for it.***

Eastern Machine Screw Corp.

New Haven, Conn., U.S.A.

For Positive Accuracy—



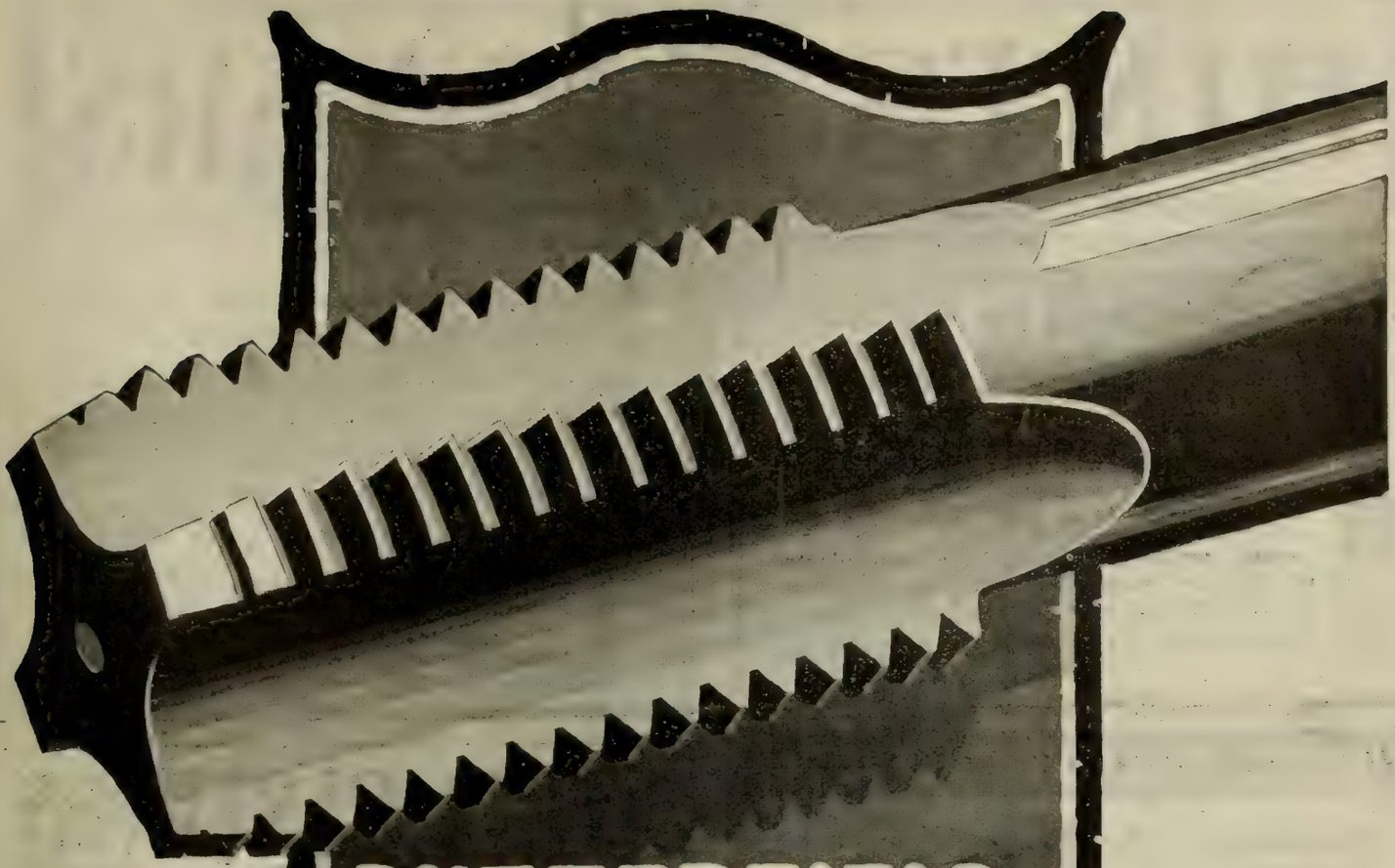
and Big Time Saving

"Victor" Collapsible Taps are simple in construction; the few parts can be made large and strong; the body is machine steel, and the chasers are high-speed; screw adjustment from front end makes it easy to maintain close accuracy; trip is automatic; reset by means of lever. The above features—and others—make the "Victor" a time and money saver for severe service. It is being used by many shell manufacturers.

VICTOR Collapsible TAPS

Victor Tool Company

Waynesboro, Pa., U.S.A.



BUTTERFIELD.

The name that means *quality* and *service*.

Butterfield Taps, Dies and Reamers are the finest development of many years' experience in tool making. Material design, workmanship—every detail is correct.

For the minimum of wear and breakage—Butterfield Tools.

Catalog No. 16 on request.

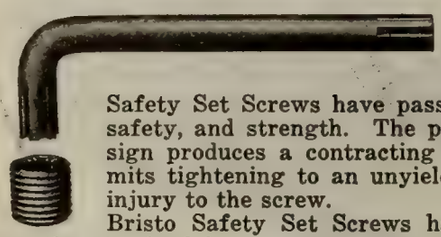
Butterfield & Company

Derby Line - Vermont, U. S. A.

New York—52 Reade Street
Canada—Rock Island, Que.
Chicago—11 S. Clinton St.
Detroit—58 Cadillac Sq.

HINTS TO BUYERS

BUILDERS OF MACHINERY WHAT SET SCREWS DO YOU USE?



TRADE MARK
BRISTO
REG. U. S. PAT. OFF.

Safety Set Screws have passed every test for safety, and strength. The patented fluted design produces a contracting effect which permits tightening to an unyielding grip without injury to the screw.

Bristo Safety Set Screws have been adopted as the standard by many prominent machine builders. Ask for free samples and Bulletin I-809.

THE BRISTOL CO., Waterbury, Conn.
U. S. A.

THOUSANDS of Dollars are saved every year by our clients, because we have experts who are trained to make exhaustive tests of all the material you are purchasing, whether raw material or finished products.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED

Head Office and Main Laboratories—MONTREAL

Branch Offices and Laboratories:
TORONTO, WINNIPEG, EDMONTON, VANCOUVER, NEW GLASGOW

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"Maintenance of Quality"
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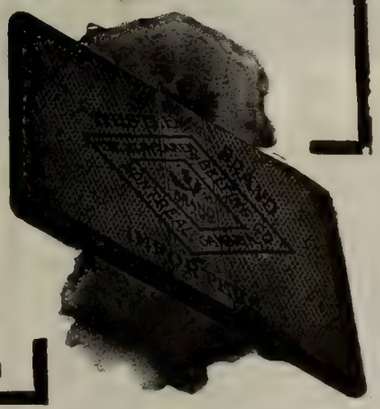

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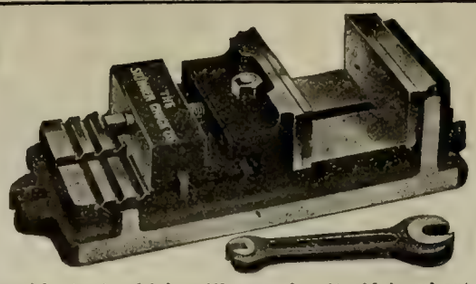

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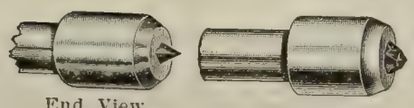

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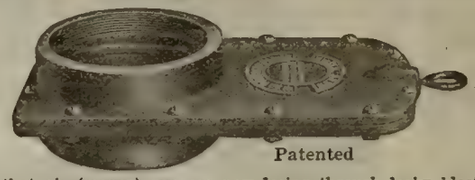

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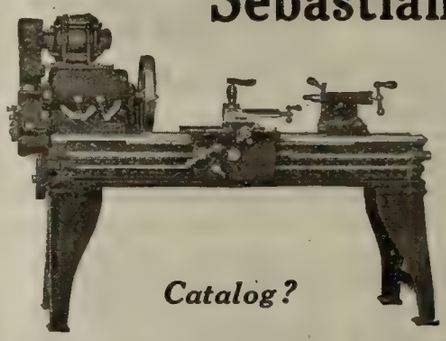

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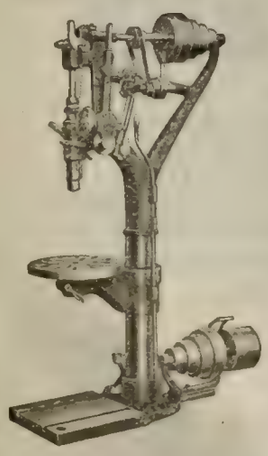

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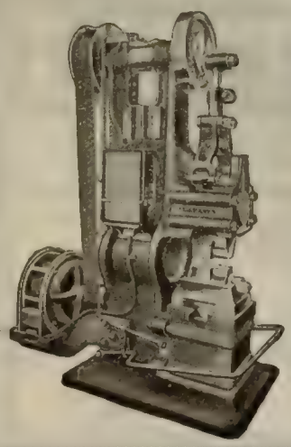

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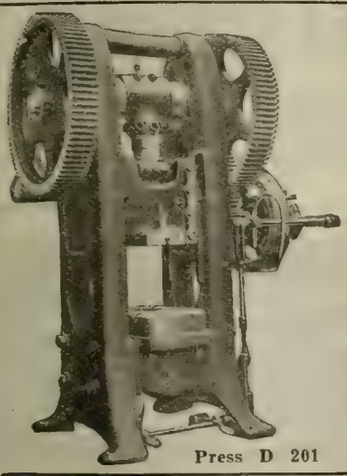

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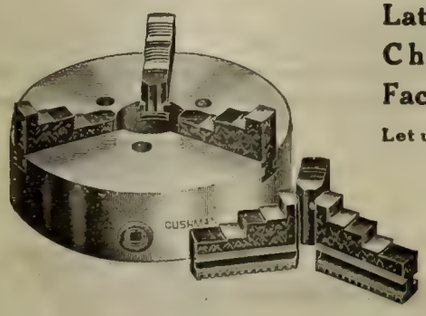

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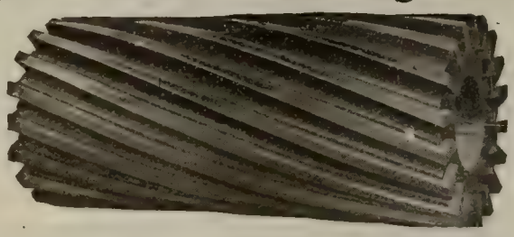

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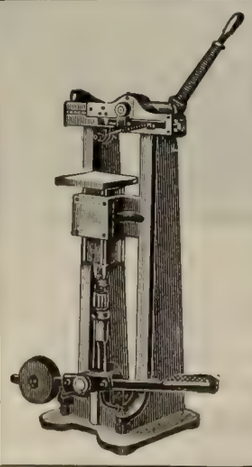

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Garlock-Walker Machinery Co., Toronto, Ont.
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Roelofson Machine & Tool Co., Toronto, Ont.
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BORING MACHINES, STOVE AND COAL
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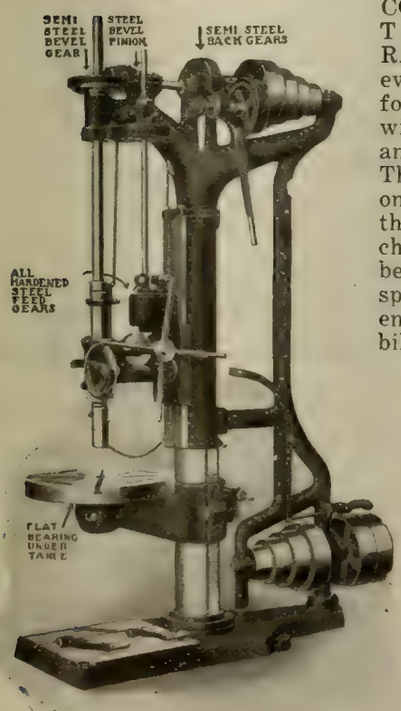

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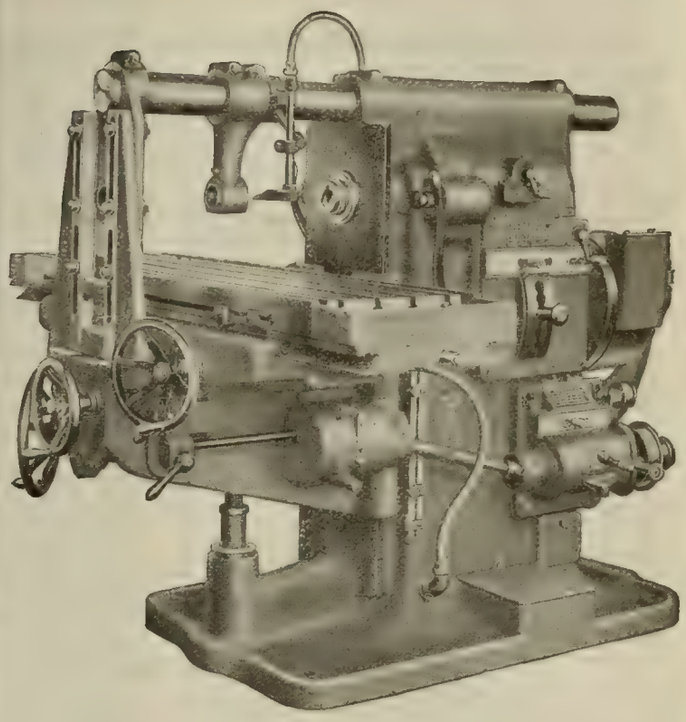

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Foss & Hill Machy. Co., Montreal.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.

DRILLS, HIGH SPEED
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Can. B. K. Morton, Toronto, Montreal.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Foss & Hill Machy. Co., Montreal.
Marshall & Co., Geo. A., Toronto, Ont.
McKenna Brothers, Pittsburgh, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
W. F. & John Barnes Co., Rockford, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

DRILLS, MULTIPLE SPINDLE
Henry & Wright Mfg. Co., Hartford, Conn.
Niles-Bement-Pond Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

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Morse Twist Drill & Mch. Co., New Bedford, Mass.

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Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Niles-Bement-Pond Co., New York.

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Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

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Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Millers Falls Co., Millers Falls, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

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Foss & Hill Machy. Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
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Clark Equipment Co., Buchanan, Mich.
Foss & Hill Machy. Co., Montreal.
Morse Twist Drill & Mach. Co., New Bedford.

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Armstrong Bros. Tool Co., Chicago.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Whitman & Barnes Mfg. Co., St. Catharines, Ont.
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Ford-Smith Mach. Co., Hamilton, Ont.
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Foss & Hill Machy. Co., Montreal.
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Niles-Bement-Pond Co., New York.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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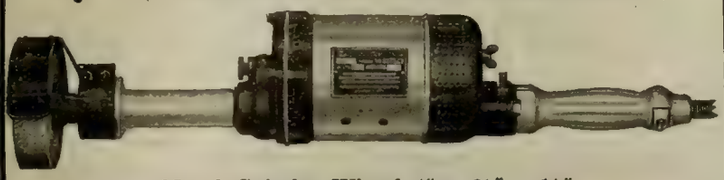

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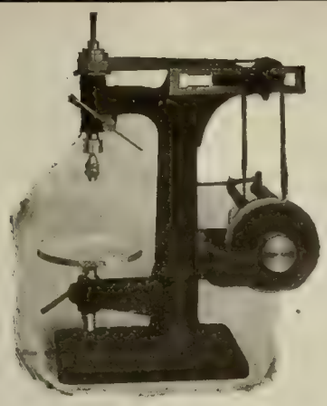

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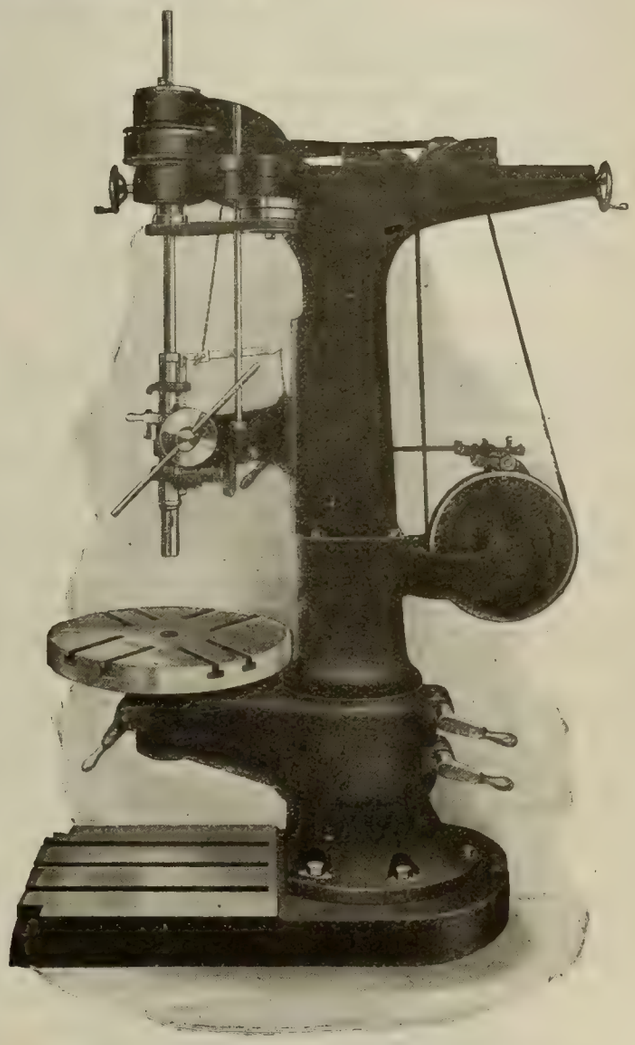

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Ford Chain Block & Mfg., Philadelphia, Pa.
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Jenckes Mach. Co., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
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Kennedy & Sons, Owen Sound, Ont.
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Toronto Tool Co., Toronto, Ont.

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Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich.
A. R. Williams Machy. Co., Toronto.

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KILNS
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Sheldons, Limited, Galt, Ont.

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LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

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Can. Laco-Philips Co., Toronto, Ont.

LAMPS, TUNGSTEN (Vacuum and Gas Filled)
Can. Laco-Philips Co., Toronto, Ont.

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Winnipeg Gear & Engrng Co., Winnipeg, Man.

LATHES, AXLE
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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hardinge Bros., Chicago, Ill.
New Britain Mach. Co., New Britain, Conn.
Pratt & Whitney Co., Dundas, Ont.
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Warden King Co., Montreal, Que.

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Hardinge Bros., Inc., Chicago, Ill.

LATHES, ENGINE
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John Bertram & Sons Co., Dundas.
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Cincinnati Iron & Steel Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Mach. Tool Co., Hamilton, Ohio.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
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R. McDougall Co., Galt.
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Sebastian Lathe Co., Cincinnati, Ohio.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
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Garlock-Walker Machy. Co., Toronto, Ont.
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McCabe, J. J., New York, N.Y.
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Garlock-Walker Machy. Co., Toronto, Ont.
Gray Mfg. & Mach. Co., Toronto, Ont.
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Himoff Mach. Co., Inc., Astoria, L.I., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McCabe, J. J., New York, N.Y.
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Foss & Hill Machy. Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
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Hepburn, John T., Ltd., Toronto.
McCabe, J. J., New York, N.Y.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

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Ferracute Mach. Co., Bridgeton, N.J.
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Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto, Ont.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
McCabe, J. J., New York, N.Y.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
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New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
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Trahern Pump Co., Rockford, Ill.

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Foss & Hill Machy. Co., Montreal.
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Standard Machy. & Supplies, Ltd., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

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Pratt & Whitney Co., Dundas, Ont.

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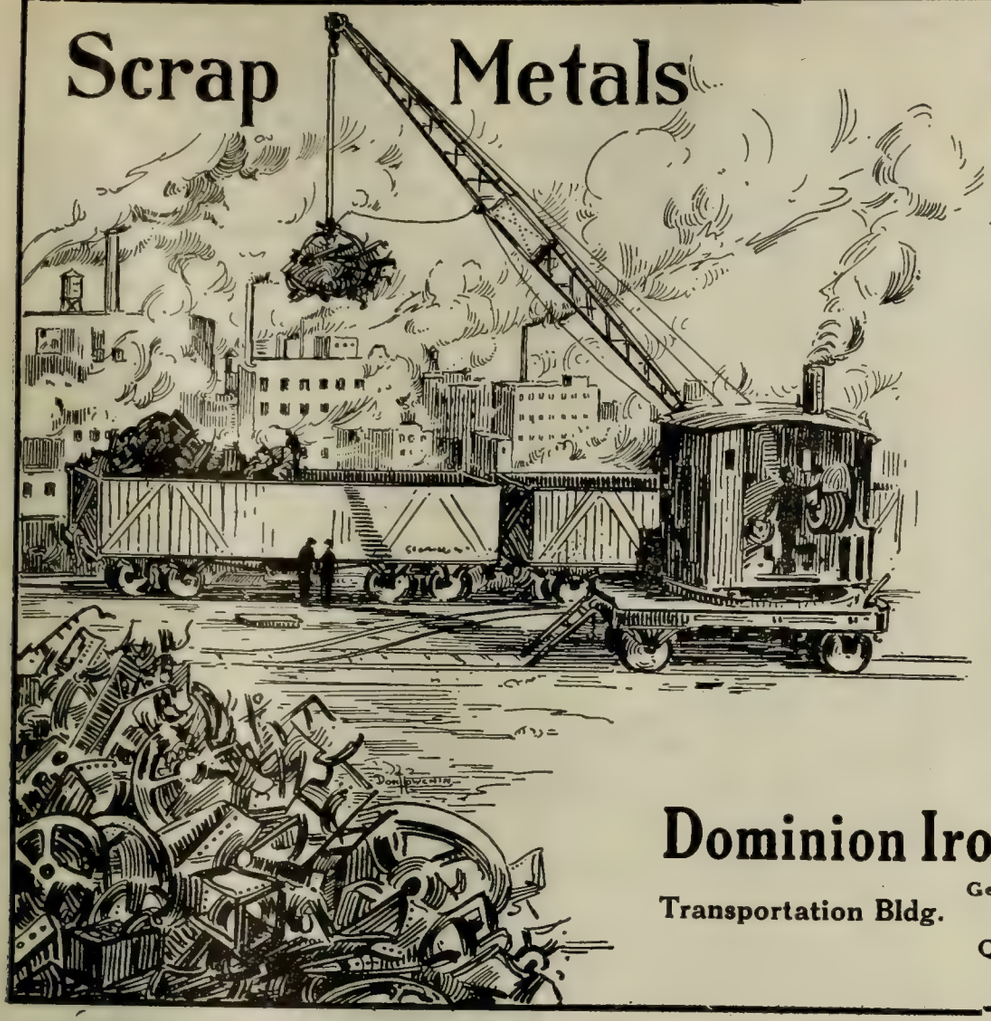

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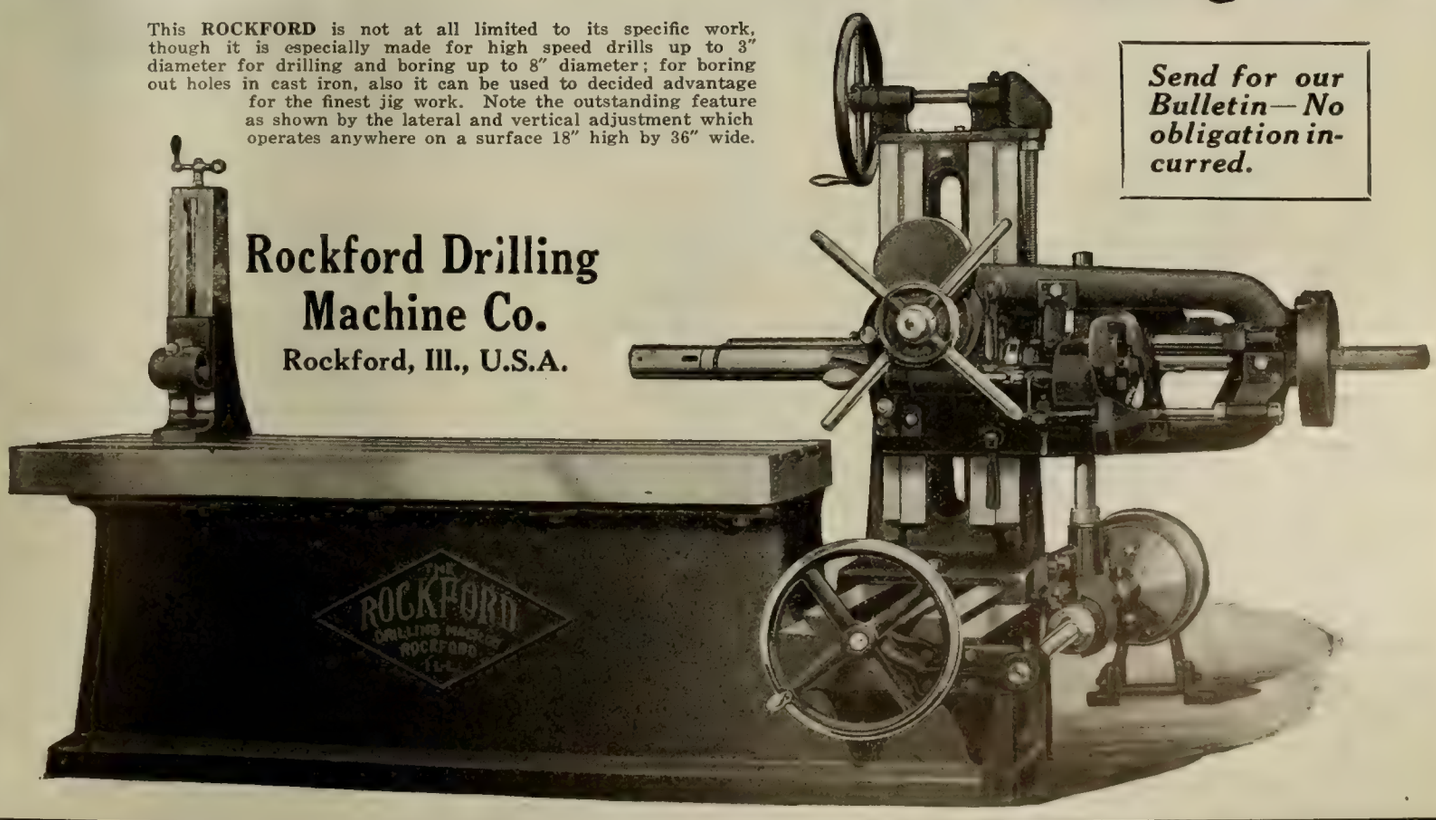

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Rockford, Ill., U.S.A.

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Cleveland Milling Mach. Co., Cleveland, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
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Niles-Bement-Pond Co., New York.
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Taft-Peirce Mfg. Co., Woonsocket, R.I.

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Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
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Pratt & Whitney Co., Dundas, Ont.
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A. R. Williams Machy. Co., Toronto.

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Cincinnati Milling Machine Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington.
Kempsmith Mfg. Co., Milwaukee, Wis.
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Niles-Bement-Pond Co., New York.
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Garlock-Walker Machinery Co., Toronto, Ont.

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Prest-O-Lite Co., Inc., Toronto, Ont.
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Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

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Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Petrie, Ltd., H. W., Toronto, Ont.
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Williams Tool Co., Erie, Pa.
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Toronto Iron Works, Ltd., Toronto.

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PLANER JACKS
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Garvin Machine Co., New York.
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Petrie, Ltd., H. W., Toronto, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

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Hannifin Mfg. Co., Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

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Ferracute Machine Co., Bridgeton, N.J.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

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Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.

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Bliss Co., E. W., Brooklyn, N.Y.
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Ferracute Machine Co., Bridgeton, N.J.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
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Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
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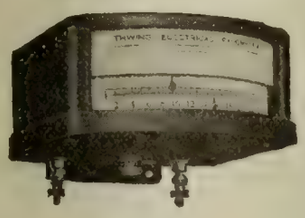

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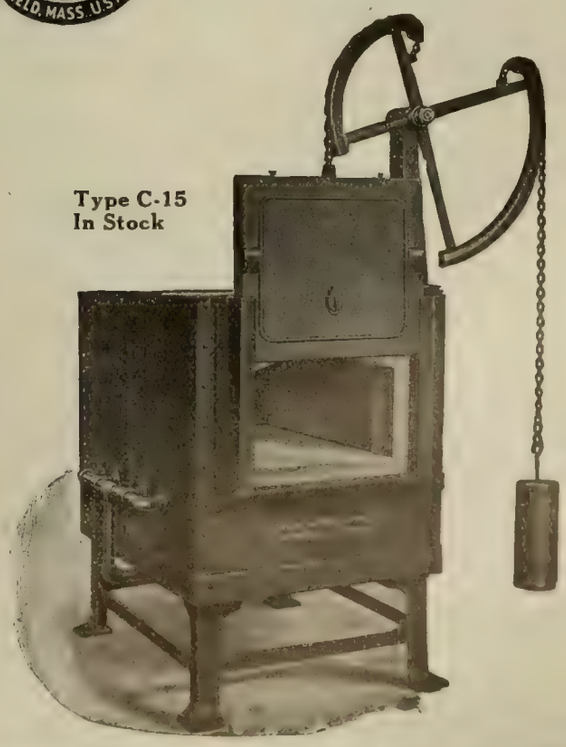

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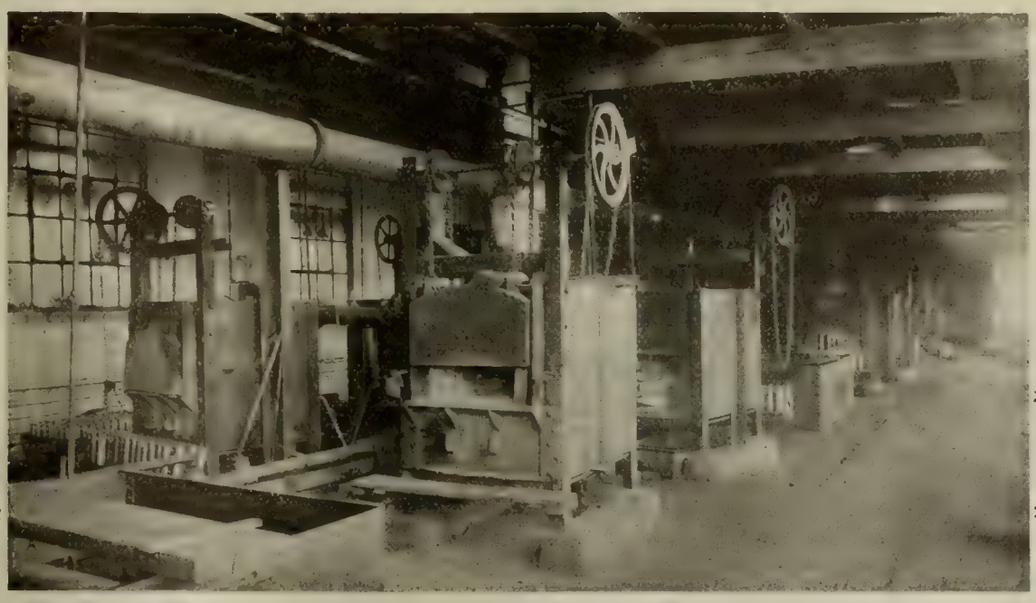

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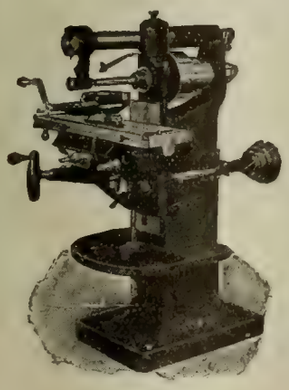

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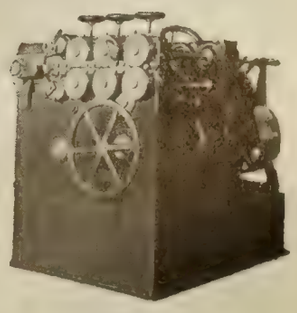

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SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas
Bertrams, Ltd., Edinburgh, Scotland
Canada Machinery Corp., Galt, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Montgomery, Smith & Co., Keynsham, Somerset, Eng.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo

SHEARS, POWER
John Bertram & Sons Co., Dundas
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Ferrachute Machine Co., Bridgeton, N.J.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo

SHEARS, PNEUUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Canada

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Peck, Stow & Wilcox, Southington, Conn.
Steel Bending Brake Works, Ltd., Chatham, Ont.

SHEET METAL STAMPINGS
Dominion Forge & Stpg. Co., Walkerville, Ont.

SHELL BANDING MACHINES, HYDRAULIC
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., W. R., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

SHELL PAINTING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

SHELL RIVETERS
Grant Mfg. & Machine Co., Bridgeport, Conn.
High Speed Hammer Co., Rochester, N.Y.

SHRAPNEL SHELL MARKER
Brown, Boggs & Co., Hamilton, Canada
Noble & Westbrook Mfg. Co., Hartford, Conn.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton, Toronto, Montreal.

SIGNS, ENAMEL
Strong, Kennard & Nutt Co., Cleveland, Ohio.

SILVER SOLDER
Geo. H. Lees & Co., Hamilton, Ont.

SKATE SHARPENERS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SLOTTERS
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York
Rhodes Mfg. Co., Hartford, Conn.

SMOKESTACKS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
J. H. Williams & Co., Brooklyn, N.Y.

SOCKET HEAD CAP SCREWS
Allen Mfg. Co., Hartford, Conn.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Canada

SOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Banfield, W. H., & Sons, Toronto.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Brown Engineering Corp., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
Grant Mfg. & Machy. Co., Bridgeport, Conn.
Gray Mfg. & Mach. Co., Toronto, Ont.
John H. Hall & Sons, Brantford.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McClean & Son, F. W., Niagara Falls, Ont.
National-Acme Co., Cleveland, Ohio.
D. McKenzie Machinery Co., Guelph, Ont.
Mulliner & Enlund Tool Co., Syracuse, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Sleeper & Hartley, Inc., Worcester, Mass.
Smart-Turner Machine Co., Hamilton, Ont.
T. C. M. Mfg. Co., Harrison, N.J.
Victoria Foundry Co., Ottawa, Ont.
Welland Motor & Machine Co., Welland, Ont.
William R. Perrin, Ltd., Toronto.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

SPRINGS, MACHINERY
Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele, Ltd., Guelph, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

SPIRAL CONVEYORS
Can. Matthews Gravity Carrier Co., Toronto, Ont.

SPROCKETS, CHAIN
Grant Gear Works, Boston, Mass.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

SOLDER
Jobborn, Geo. A., Hamilton, Ont.

SPROCKET WHEELS, CAST
Perrin, Wm. R., Toronto.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS
Dillon Mfg. Co., Oshawa, Ont.
Dom. Forge & Stamping Co., Walkerville, Ont.
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Canada Machinery Corp., Galt, Ont.
Ferracute Mach. Co., Bridgton, N.J.
Noble & Westbrook Mfg. Co., Hartford, Conn.

STAMPS, STEEL ALPHABET, FIGURES
Matthews, Jas. H. & Co., Hartford, Conn.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.
Can. Morehead Mfg. Co., Woodstock, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.
Sturtevant Co., B. F., Galt, Ont.

STEEL ALLOY (SEE ALLOY STEEL)

STEEL BENDING BRAKES
Steel Bending Brake Works, Ltd., Chatham, Ont.

STEEL FOR AXES, PLOWS, SAWS, DRILLS, ETC.
Colonial Steel Co., Pittsburgh, Pa.

STEEL, CARBON, FERRO-TUNGSTEN
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Zenith Coal & Steel Products, Montreal, Que.

STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

STEEL DRUMS
Smart-Turner Machine Co., Hamilton, Ont.

STEEL PRESSURE BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Century Steel Co. of America, New York
Colonial Steel Co., Pittsburgh, Pa.
H. A. Drury Co., Ltd., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Fairley Davidson Steel Co., New York, N.Y.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.
Zenith Coal & Steel Products, Montreal, Que.

STEELS, HIGH STRENGTH, HOT-WORKING, DIE, MAGNET
Fairley Davidson Steel Co., New York, N.Y.

STEEL, VANADIUM
Drury, H. A., Co., Montreal, Que.
Standard Alloys Co., Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STELLITE, HIGH-SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.

STOCK RACKS FOR BARS, PIPING, ETC.
New Britain Machine Co., New Britain, Conn.

STOCKS, PIPE
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.

STOOLS, STEEL, SHOP
New Britain Machine Co., New Britain, Conn.

STRAIGHTENING MACHINERY
Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

TACK (DOUBLE POINT) MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

TANKS, GASOLINE AND OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Dominion Forge & Stamping Co., Walkerville.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.

TANKS, STEEL, WATER PRESSURE
Bowser & Co., Inc., S. F., Toronto, Ont.
Can. Welding Works, Montreal, Que.
Jenckes Machine Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TANK WAGONS
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.

TAPPING MACHINES (PENUMATIC)
Cleveland Pneumatic Tool Co. of Can., Toronto.

TAPPING MACHINES AND ATTACHMENTS
Bertram, John, & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.

TAPS, ADJUSTABLE
Baxter Co., Ltd., J. R., Montreal, Que.
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.

TAPS, COLLAPSIBLE
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

TAPS, DIES AND WRENCHES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wells Bros. Co. of Canada, Galt, Ont.

TAP EXTENSIONS
Allen Mfg. Co., Hartford, Conn.

TESTING INSTRUMENTS METALLURGICAL
Shore Instrument & Mfg. Co., New York City.

THERMOMETERS, ALL KINDS
Taylor Instrument Co., Rochester, N.Y.
Bellevue Industrial Furnace Co., Detroit, Mich.

TESTING LABORATORIES
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

THREADING TOOLS
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.

THREAD MILLING MACHINES
Gray Mfg. & Mach. Co., Toronto, Ont.
Taft-Peirce Co., New York, N.Y.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Peck, Stow & Wilcox, Southington, Conn.

TIRE SETTING MACHINES, HYDRAULIC
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES
Embree, Ira, 281 Emerald St. N., Hamilton, Ont.
Union Tool Chest Works, Rochester, N.Y.

TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Armstrong Bros. Tool Co., Chicago.
Can. B. K. Morton, Toronto, Montreal.
Deloro Smelting & Refining Co., Toronto, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOL STEEL
Atkins & Co., Wm., Sheffield, Eng.
Armstrong, Whitworth, Ltd. of Canada, Montreal.
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Deloro Smelting & Refining Co., Toronto, Ont.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.

The Oven Equipment & Manufacturing Company
NEW HAVEN, CONN.
"CRAWFORD SECTIONAL" OVENS
Heated with our Enclosed Flame Gas Burners, or Electricity
FOR BAKING JAPANS AND OTHER FINISHES ON METAL.
Ovens carried in stock and built to meet requirements of manufacturers.
Builders of All-Steel Oven Trucks with Roller Bearings.
Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.
ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Toronto, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.
Swedish Steel & Importing Co., Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago, Ill.
Stow Mfg. Co., Binghamton, N.Y.
A. R. Williams Machinery Co., Toronto.
United States Elec. Tool Co., Cincinnati, O.

TOOLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

TORCHES, STEEL
Armstrong, Whitworth of Canada, Ltd., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.

TRACK SYSTEMS
Dillon Mfg. Co., Oshawa, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
A. R. Williams Machinery Co., Toronto.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
The Smart-Turner Machine Co., Hamilton.

TRANSMISSION TOWERS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TROLLEYS
Wright Mfg. Co., Lisbon, Ohio.

TRUCKS, FACTORY, FREIGHT, ETC.
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

TRUCKS, LUMBER AND KILN
Sheldons, Ltd., Galt, Ont.
Northern Crane Works, Walkerville.

TUBING, SEAMLESS, BRASS & COPPER
Standard Tube & Fence Co., Woodstock, Ont.

TUBING COILERS, FLEXIBLE METAL
Sleeper & Hartley, Inc., Worcester, Mass.

TUMBLING BARRELS
Baird Machine Co., Bridgeport, Conn.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TUNGSTEN FILAMENT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

TURNBUCKLES
Canadian Billings & Spencer, Ltd., Welland.

TURNTABLES
Whiting Foundry Equipment Co., Harvey, Ill.

TURRET MACHINES
Brown & Sharpe Mfg. Co., Providence
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney, Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURBINE WATER WHEELS
Jenckes Mach. Co., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.

UPSETTING AND BENDING MACHINERY
John Bertram & Sons Co., Dundas
Brown, Boggs Co., Ltd., Hamilton, Canada.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Jenckes Mach. Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

VACUUM PUMPS
Can. Blower & Forge Co., Kitchener, Ont.
Smart-Turner Machine Co., Hamilton, Ont.

VALVE LEATHERS
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Montreal.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

VALVES, FOOT
Smart-Turner Machine Co., Hamilton, Ont.

VALVES, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

VALVES, BACK PRESSURE, STEAM
Sheldons, Limited, Galt, Ont.

VENTILATING APPARATUS
Brantford Oven & Rack Co., Brantford, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.
A. R. Williams Machy. Co., Toronto.

VISES, AIR OPERATED
Hannifin Mfg. Co., Chicago, Ill.

VISE STANDS, PORTABLE
New Britain Machine Co., New Britain, Conn.

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Foss & Hill Machy. Co., Montreal.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.

VISES, PIPE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.
J. H. Williams & Co., Brooklyn, N.Y.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Barnes, Wallace, Co., Bristol, Conn.
Dillon Mfg. Co., Oshawa, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

WATER PURIFYING AND SOFTENING APPARATUS
Wm. B. Scaife & Sons Co., Pittsburgh, Pa.

WATER CINDER MILLS
Whiting Foundry Equipment Co., Harvey, Ill.

WATER JACKETS
Can. Welding Works, Montreal, Que.

WATER TOWERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

WATER WHEELS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.

WELDING, ELECTRIC, SPOT, BUTT, ETC.
St. Lawrence Welding Co., Montreal, Que.

WELDING MASKS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

WELDERS, ELECTRIC, SPOT, BUTT, ETC.
National Electric Welder Co., Warren, O.
Tabor Mfg. Co., Philadelphia, Pa.
Thomson Electric Welding Co., Lynn, Mass.
Winfield Electric Welding Mach. Co., Warren, Ohio.

WELDING, WORK AND SUPPLIES (Autogenous and Oxy-Acetylene) see OXY-ACETYLENE

WINCHES
John H. Hall & Sons, Brantford.
Kennedy & Son, Wm., Owen Sound, Ont.
Northern Crane Works, Walkerville.

WIRE COILING AND POINTING MACHINERY
Baird Machine Co., Bridgeport, Conn.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE CLOTH AND PERFORATED METALS
Canada Wire & Iron Goods Co., Hamilton.

WIRE FORMING AND STAMPING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
McClean & Son, F. W., Niagara Falls, Ont.
F. B. Shuster Co., New Haven, Conn.

WIRE NAILS
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

WIRE STEEL, BRASS, COPPER, BRONZE
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE RAILS
Sleeper & Hartley, Inc., Worcester, Mass.

WOOD BORING MACHINES
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

WIRE STRAIGHTENERS AND CUTTERS
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WOODWORKING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machy. Co., Toronto.

WOOD LATHES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

WORKS STANDS, PORTABLE
New Britain Mach. Co., New Britain, Conn.

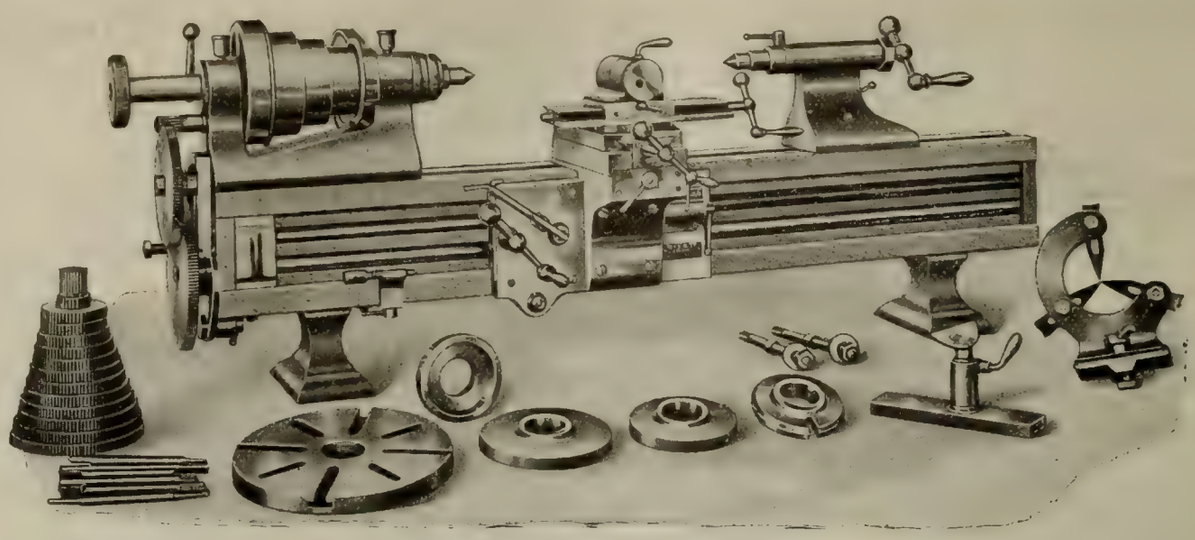
WRENCHES
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canadian Billings & Spencer, Ltd., Welland.
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, AUTOMOBILE NARROW JAW AND MONKEY
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, PIPE, MONKEY, TAP
Aikenhead Hardware Co., Toronto, Ont.
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Peck, Stow & Wilcox Co., Southington, Conn.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, RATCHET AND BASIN
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Keystone Mfg. Co., Buffalo, N.Y.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, SOCKET
Allen Mfg. Co., Hartford, Conn.



No. 608. BACK GEARED LATHE.

Its Work Reflects Its Quality

It is impossible to secure first class results from an inferior machine. That's just the reason we take so much time and care in the manufacture of the Rivett Line. We have aimed to have every member of the Rivett Line turn out the finest, most accurate work that a machine made by human brains and hands could. We have succeeded.

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But in these days of unusual activity in the machine world, speed is very essential, so we build speed into the tools in addition to accuracy and quality.

Look into the Rivett Line if you are anxious to secure a small lathe or grinder that will produce quality work with great speed. Our catalog gives full particulars.

Rivett Lathe & Grinder Company

BRIGHTON DISTRICT OF BOSTON, MASS.

RIVETT Quality

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XVIII. TORONTO, OCTOBER 18, 1917 No. 16

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THE MACLEAN PUBLISHING COMPANY, LIMITED

JOHN BAYNE MACLEAN, Pres. H. T. HUNTER, Vice-pres. H. V. TYRRELL, Gen. Man.

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If there is one machine more than another where

Absolute Accuracy

is required, it is in the construction of an Experimental Lathe.

Accurate fitting, assembling, aligning of head and tailstock and carriage with lathe bed, are found without exception in the "Hendey."

Motor-driven. Besides regular equipment it has small tool cabinet for operators' fine tools—also gear closet for extra gears to cut special threads.

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Hendey Machine Co.

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Hendey Experimental Lathe

12-Inch

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McDougall Shapers

These are up-to-date Shapers, designed for modern shop production.

They are plain in design, yet embody all essential features necessary for efficient work.

Every adjustment is convenient for the operator and fine for the most accurate work.

Let us have your inquiry.

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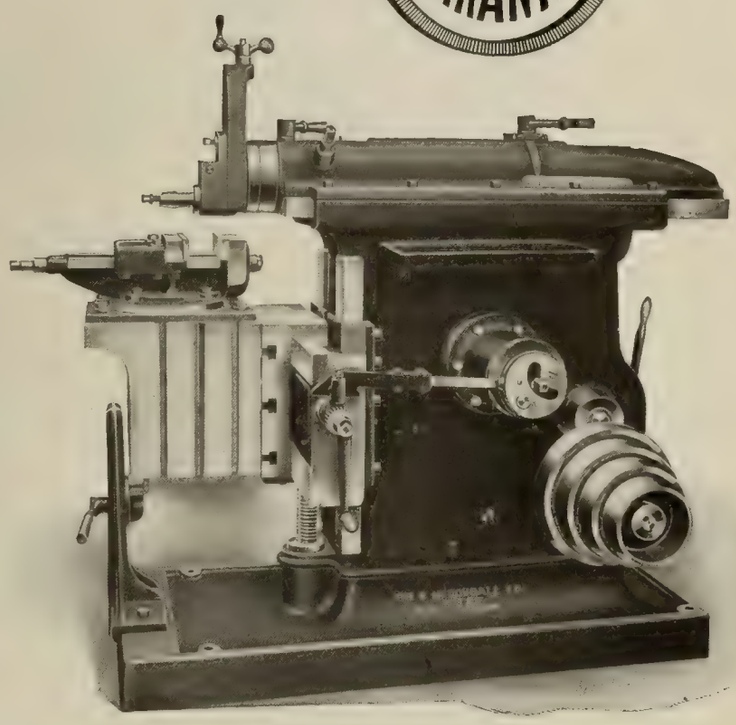

The R. McDougall Company Limited

Manufacturers

GALT, ONTARIO, CANADA

The Canadian Fairbanks-Morse Company, Limited
Sales Agents

Machine Tools

FOR IMMEDIATE DELIVERY

1—4 ft. Fosdick Plain Radial Drill, single pulley, gear box drive
1—2½ ft. Swift Plain Radial Drill
1—24″ Sibley Sliding Head Drill Press
1—26″ Sibley Sliding Head Drill Press
1—28″ Sibley Sliding Head Drill Press
1—28″ Barnes Sliding Head Drill Press
2—20″ Excelsior Drill Presses, B.G., worm and lever feed
6—20″ Champion Drill Presses, B.G., worm and lever feed
2—20″ Champion Drill Presses, worm and lever feed only
1—1″ Henry & Wright, Class B. Drill
1—16″ Reed Single Spindle Sensitive Drill Press
1—Sipp Type B.W., Ball-bearing, High-speed Drill Press
2—14″ Two-spindle Sensitive Drill Presses
2—14″ Three-spindle Sensitive Drill Presses
1—No. 2 Brown & Sharpe Vertical Chucking Machine
1—48″ Bickford Vertical Boring Machine, two swivel heads on cross-rail
1—No. 20 Bliss Inclinable Back Power Press
1—No. 180 Brown & Boggs Inclinable Back Power Press
1—No. 200 Brown & Boggs Inclinable Back Power Press
1—36 x 36 x 8 Planer, one head on cross-rail
1—20 x 20 x 4 London Planer
1—24 x 12 Boye & Emmes Lathe, quick-change gear, three-step cone
4—28 x 12 Boye & Emmes Lathes, quick-change gear, three-step cone
2—30 x 14 Boye & Emmes Lathes, quick-change gear, four-step cone
1—24 x 10 Milwaukee Lathe, double back gear, quick-change gear, three-step cone
4—20 x 10 Sidney Lathes, double back gear, quick-change gear, three-step cone
1—20 x 12 Sidney Lathes, quick change gear and taper attachment
1—18 x 8 Mueller Lathe
1—15 x 10 South Bend standard lathe
1—13 x 5 Champion standard lathe
1—12 x 5 Perfect standard lathe
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4—21 x 8 Le Blond turret turning lathes
6—21 x 8 Le Blond turning lathes
4—18 x 8 Battle Creek heavy duty turning lathes
1—24 x 24 New Haven standard engine lathe
1—16 x 8 Gardener standard engine lathe
1—No. 6 Foster screw machine
1—No. 4 Foster screw machine

The Foss & Hill Machinery Company

305 ST. JAMES ST., MONTREAL, QUE.

C.M.C.

We have built Machine Tools and Woodworking Machinery for many years, using the highest grade materials and employing the most skilled workmen obtainable. Our Plant at Galt, Ontario, speaks success well earned.

Machine Tools

Lathes
Shapers
Drills
Hammers
Planers
Slotters
Punches
Shears
Presses

Woodworking Machinery

Moulders
Planers
Matchers
Rip-Saws
Band-Saws
Sanders
Borers
Tenoners
Mortisers

CANADA MACHINERY CORPORATION
LIMITED

Galt Ontario

Show Rooms at Brock Avenue Subway, Toronto, Ontario

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical, power, foundry and allied fields.
Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

Vol. XVIII—No. 17 Publication Office: Toronto, October 25, 1917 Subscription Price $3.00 per Year

JB&SCO

BERTRAM MACHINE TOOLS

JB&SCO

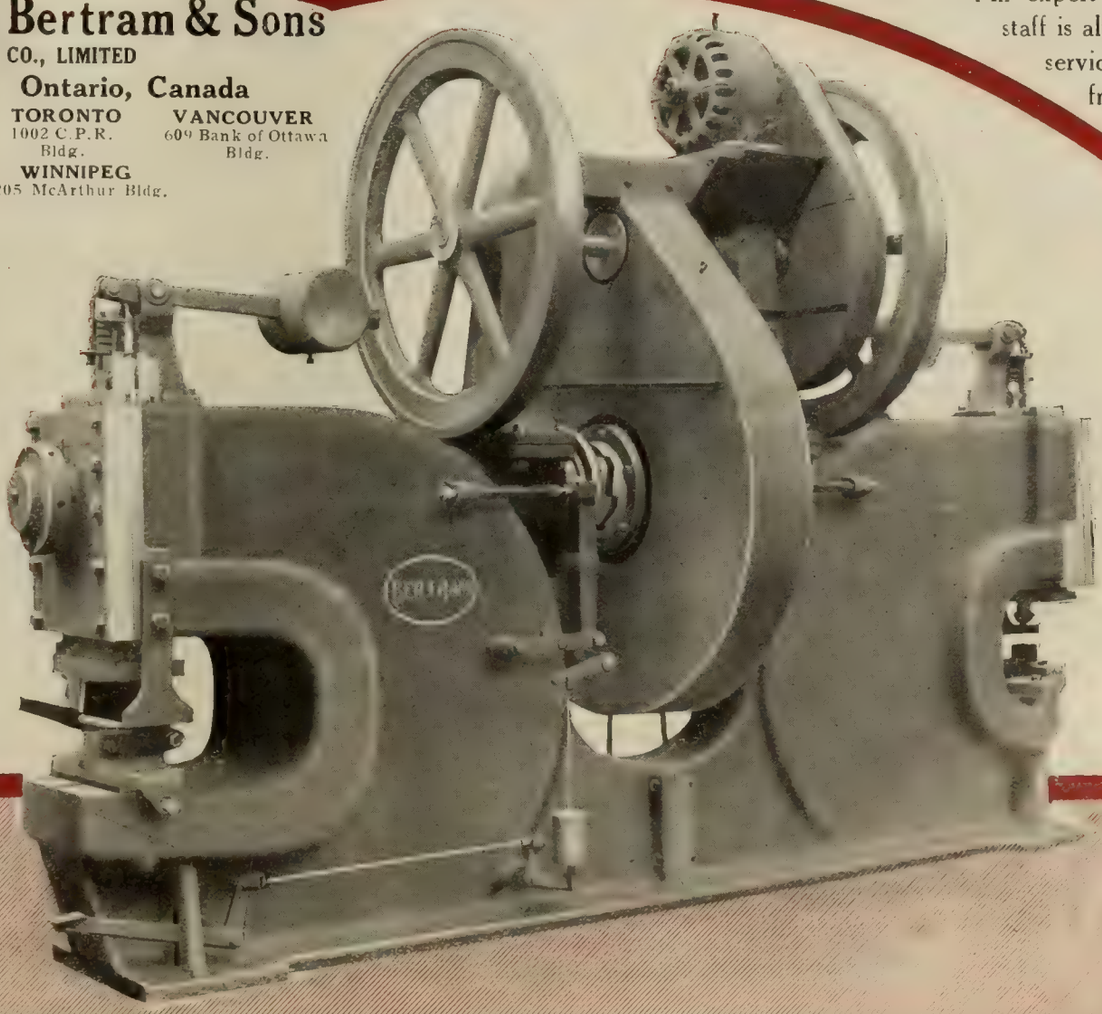
For Structural, Bridge and Ship Building Plants

Bertram Machine Tools typify all that is modern and best in their line. We make a varied assortment of Punches, Shears, Bending and Straightening Rolls, Coping Machines, Rotary and Plate Planers.

The John Bertram & Sons CO., LIMITED
Dundas Ontario, Canada

MONTREAL 723 Drummond Bldg.
TORONTO 1002 C.P.R. Bldg.
VANCOUVER 609 Bank of Ottawa Bldg.
WINNIPEG 1205 McArthur Bldg.

An expert engineering staff is always at your service. Advice free.



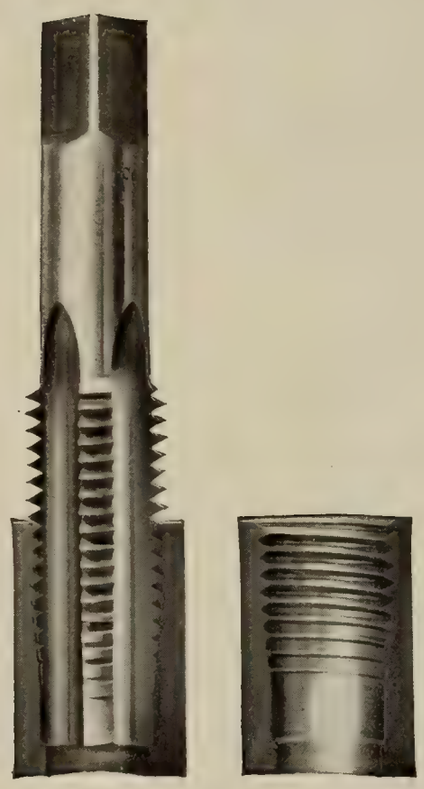
Double Punch and Shear

Capacity — shears 8-in. by 1½-inch plate.

Punches 2½-inch hole in 1½-in. plate.

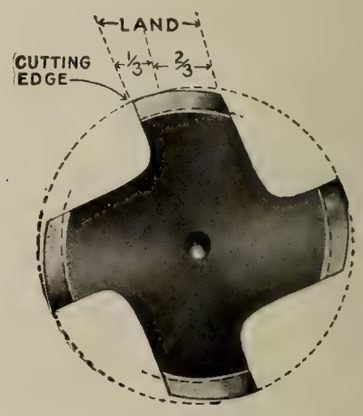
SMALL TOOLS

A Test of P. & W. Tap Superiority



This cut shows a P. & W. Taper Hand Tap, after being forced by power nearly through a nut in which the hole was purposely drilled considerably smaller than the root diameter of the tap. This, of course, left an excessive amount of work for the tap to do. Yet, owing to the design and construction of the tap (notably the cylindrical pilot with relieved chamfer on the point, and the full relief given to the chamfered portion), there was no evidence of imperfect threading or any indication whatsoever of the hard usage to which the tool had been put.

As will be seen by this cross-section cut, one-third of the land from the cutting edge is concentric. The remaining two-thirds is eccentrically relieved. A tap made in this way can be ground for sharpening at the only correct point—on the face of the cutting edge. Sharpening in no way affects its size or the form of the thread.



The Taper has a cylindrical pilot, and on the chamfered portion of the tap, the top of the thread is relieved clear to the cutting edge to secure keen cutting qualities.

The Tap with the Con-Eccentric Land
(Trade-Mark Regd.)

PROMPT SERVICE

is assured at our nearest store where P. & W. Small Tools are carried in stock. Place your order there to-day.

PRATT & WHITNEY CO.

of Canada, Limited

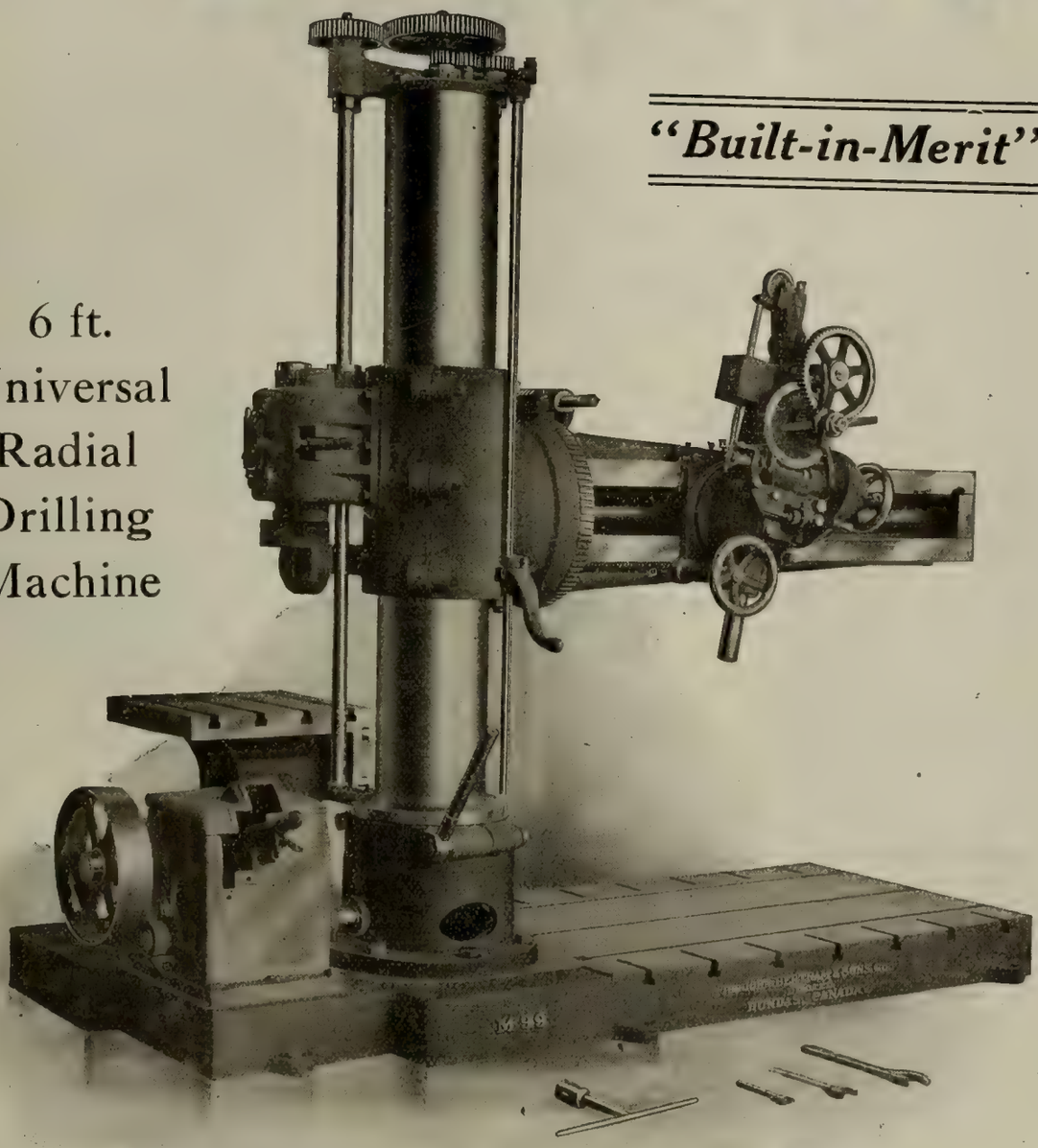
Works: DUNDAS, ONTARIO

MONTREAL	TORONTO	WINNIPEG	VANCOUVER
723 Drummond Bldg.	1002 C.P.R. Bldg.	1205 McArthur Bldg.	B.C. Equipment Co.

BERTRAM MACHINE TOOLS

"Built-in-Merit"

6 ft.
Universal
Radial
Drilling
Machine



DROP US A LINE FOR PHOTOGRAPHS AND FULL DETAILS
on any machine or machines in which you are interested

The John Bertram & Sons Company Limited

DUNDAS, ONTARIO, CANADA

MONTREAL	TORONTO	VANCOUVER	WINNIPEG
723 Drummond Bldg.	1002 C.P.R. Bldg.	609 Bank of Ottawa Bldg.	1205 McArthur Bldg.

The Publisher's Page

TORONTO October 25, 1917

The Story of Flint Shot

A STORY OF ADVERTISING

By R. R. Shuman, President Shuman Advertising Company, Chicago

There be still agnostics who refuse to believe the gospel of the class journal appeal. But, happily, their number is growing less and less. In fact, there has been a radical revolution in the thought of the business world in this direction, the grand outstanding proof of which is the fact that all the leading class journals have gained mightily in the advertising they carry in face of the almost universal condition of plants being oversold and practically out of the market.

That class journal advertising does pay when rightly done and that the buying power of the vast audiences reached by these journals is very much worth-while is also illustrated by the beautiful and effective and costly art work and engraving and the carefully thought out copy which are now so widely used by trade journal advertisers in the mediums they select.

How different this is from conditions as they existed only ten years ago! For even at that comparatively recent date the average trade journal page was a jumble of ugly cards left standing until the type and cuts reminded one of the bleared face of the morning after the night before.

That class journal advertising does pay is also proved in a better way than either of the two bits of evidence just referred to. It pays by the grand conclusive evidence of money-in-bank results. I have no more striking example of this proof-of-proofs than the case of the Flint Shot campaign, which it has been my privilege to handle for the United States Silica Company of Chicago.

The company is owned and officered by two alert, courageous young men, seasoned in the ways of modern business, but brave enough to acknowledge that they knew nothing about advertising, and with faith enough in their product and in their counsellor to let the counsellor work out their salvation along his own lines.

Their product, Flint Shot, outwardly resembles silica sand blast sand, and until the campaign was started this product was sold as sand in competition with sand, at a sand price. This, in spite of the fact that it was more than sand, in fact, was a manufactured product secured by disintegrating St. Peter's Rock and separating from it the hard, round tiny flint nodules and washing, drying and screening the nodules to size.

The first problem, therefore, was to show the metal-working world that here was something that was better than sand, lasted two or three times as long as sand, and was worth two or three times as much as sand. Photo-micrographs were used to show the difference between Flint Shot and sand, and the theory was evolved and the case proved to the satisfaction of the counsellor, at least, that the time-honored tradition that sharp sand was necessary to do good work was founded wholly upon an erroneous notion about the function performed by the granules in the sand blast.

How was this theory to be proved to be more than theory?

What better way could there be than to investigate the results obtained in the shops of the customers who bought and used Flint Shot?

This was the plan pursued, and the counsellor traveled over 5,000 miles, spending a month of time in the first-hand study of sand blasting operations in a multitude of different forms of industry in which the Flint Shot was used. These investigations were given the title of "Little Journeys of the Flint Shot Man," and it was the effort of the counsellor to develop in each story practical every-day shop kinks which should be useful to the readers of the Little Journeys. Notable among these kinks were uses discovered for the waste dust left from the process of sand blasting, a dust which is usually separated from the good sand granules either by a centrifugal or bolting separator.

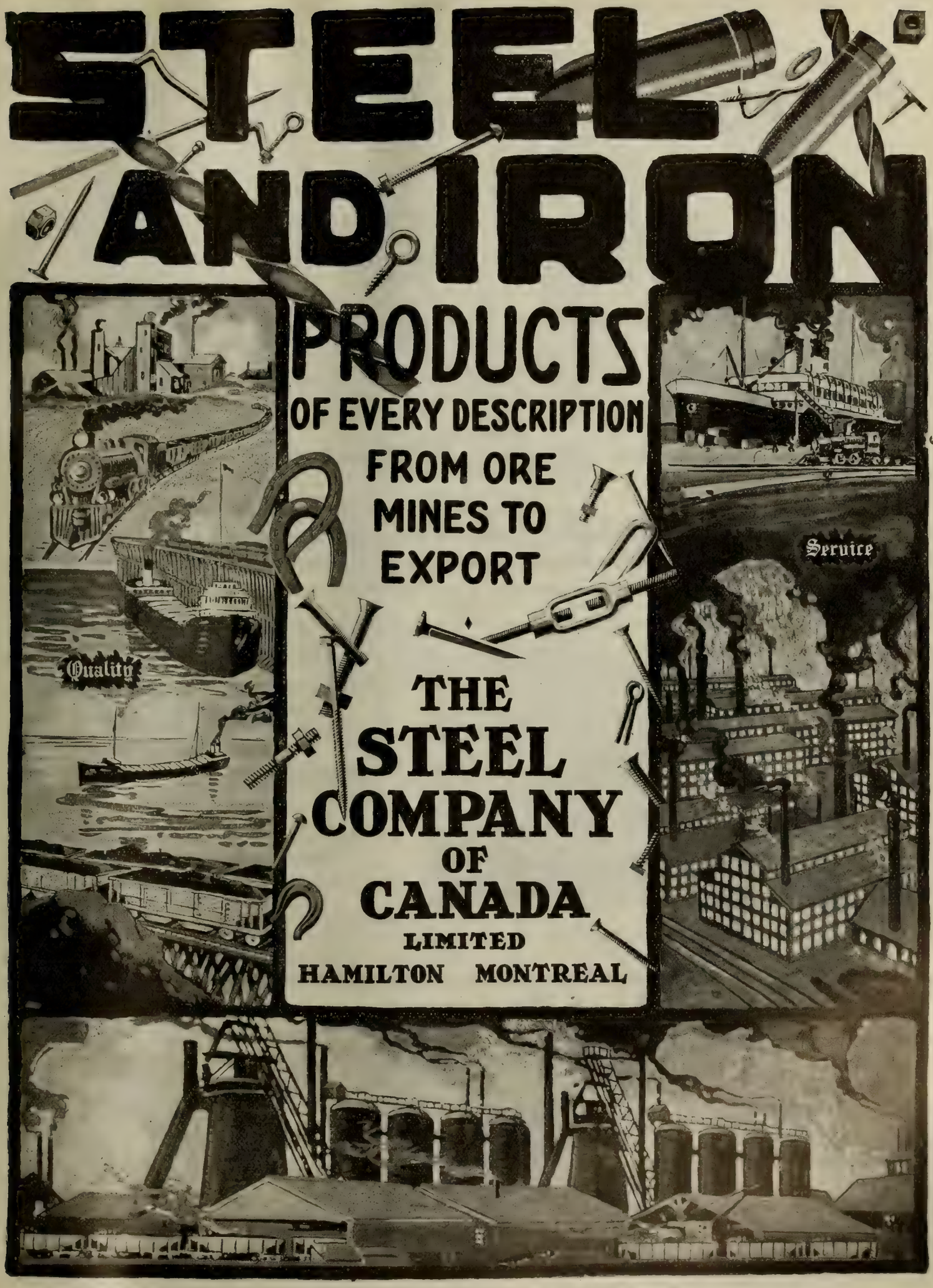
As the advertising campaign progressed the demand increased and the zone of operations widened until they were shipping from the plant at Ottawa, Ill., to both Pacific and Atlantic Coast Points, customers paying what had heretofore been considered prohibitive freight rates in order to get Flint Shot, even though they had deposits of silica sand almost at their doors.

The advertising also developed many new and till-then undiscovered avenues of distribution, greatly widening the field of operation of the company, and giving its outlet a diversity that not only meant a largely increased tonnage, but also the sense of safety that always accompanies a widely diversified demand. The large increase in tonnage due both to widened geographical zone of operation and diversification of industries served has led to the erection by the United States Silica Company, at Ottawa, of a new plant—the largest of the kind in the country.

The Little Journeys, some sixty in all, have been compiled into a book form, the book being, in effect, an authoritative text book on sand blasting in general, the first and only book of the kind ever written and printed.

The advertising campaign itself started out with full-page copy, well illustrated, to take the place of quarter pages that had never shown appreciable results. The magical effect of the change is illustrated by a bulging card index file in the office of the United States Silica Company showing hundreds of cards bearing the names of inquirers who referred to the advertising or used the keys employed to check the media.

The following publications have been or are being used: **The Iron Age, Foundry, Metal Industry, Brass World, Chilton Automobile Directory, The Automobile Trade Directory, Automobile Trade Journal, CANADIAN MACHINERY, CANADIAN FOUNDRYMAN, The Automobile Builder, The American Drop Forger, American Machinist, American Machine & Tool Record, Metallurgical & Chemical Engineering; Pocket List of Railway Officials.** Nothing but full-page copy is used and ads are never repeated.—Class for October.



If any advertisement interests you, tear it out now and place with letters to be answered.

The

Fairley Davidson Steel Co., Inc.

SPECIALISTS

	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
High Strength Steels	"Hehtemnd"
High Speed Steel	RUSHITOFF No. 6
Tool and Die Steels	"Fondwot" and "Giant"
Magnet Steels	Tungsten or Chrome
Non-Changeable Die Steel	Nugget "B" oil hardening

CHROME VANADIUM, oil hardening or case hardening

CHROME NICKEL, oil hardening or case hardening

Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

Canadian Agents:

The Canadian Utilities Steel & Engineering, Limited

149 Craig Street West. Montreal, Canada

We carry a complete stock at our Montreal Warehouse

Works: LONGUEUIL, QUE.

Armstrong, Whitworth of Canada Limited

Standard Sizes of

HIGH SPEED STEEL

Carried in Stock

CARBON AND ALLOY STEELS

Shop Tools, Gauges, etc.

HEAD OFFICE: 298-300 St. James St., Montreal

Branches: Dominion Bank Bldg., TORONTO
27 King William Street, HAMILTON
McArthur Bldg., WINNIPEG, MAN.

Coal
Coke
Iron Ore

Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

M.A. HANNA & Co.

Sales Agents, CLEVELAND

Canadian Office:

703 C.P.R. Bldg., Toronto

TRADE MARK

of the Famous

"WACO"

BRAND

HIGH SPEED STEEL

AND

TWIST DRILLS

"DOUBLE WACO" Quality

Specially Adapted for Munition Work

"TURTLE" BRAND

High Class Tool Steel, Files, etc., of all descriptions.

ESTABLISHED 1870

WM. ATKINS & CO., LTD

Reliance Steel Works

SHEFFIELD, ENG.

TRADE MARK "WACO"

TRADE MARK

For particulars apply to our

Sole Representatives for Canada

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STELLITE

QUITE remarkable economies have been effected in turning, planing and shaper work on all kinds of steel, cast iron, bronze and other materials by the new alloy

STELLITE

But we are now able to recommend it for Milling Cutters and Form Tools of all kinds.

Information and quotations supplied by our Service Department on application.

Deloro Smelting & Refining Co. Ltd.

Head Office & Works—Deloro, Ont.

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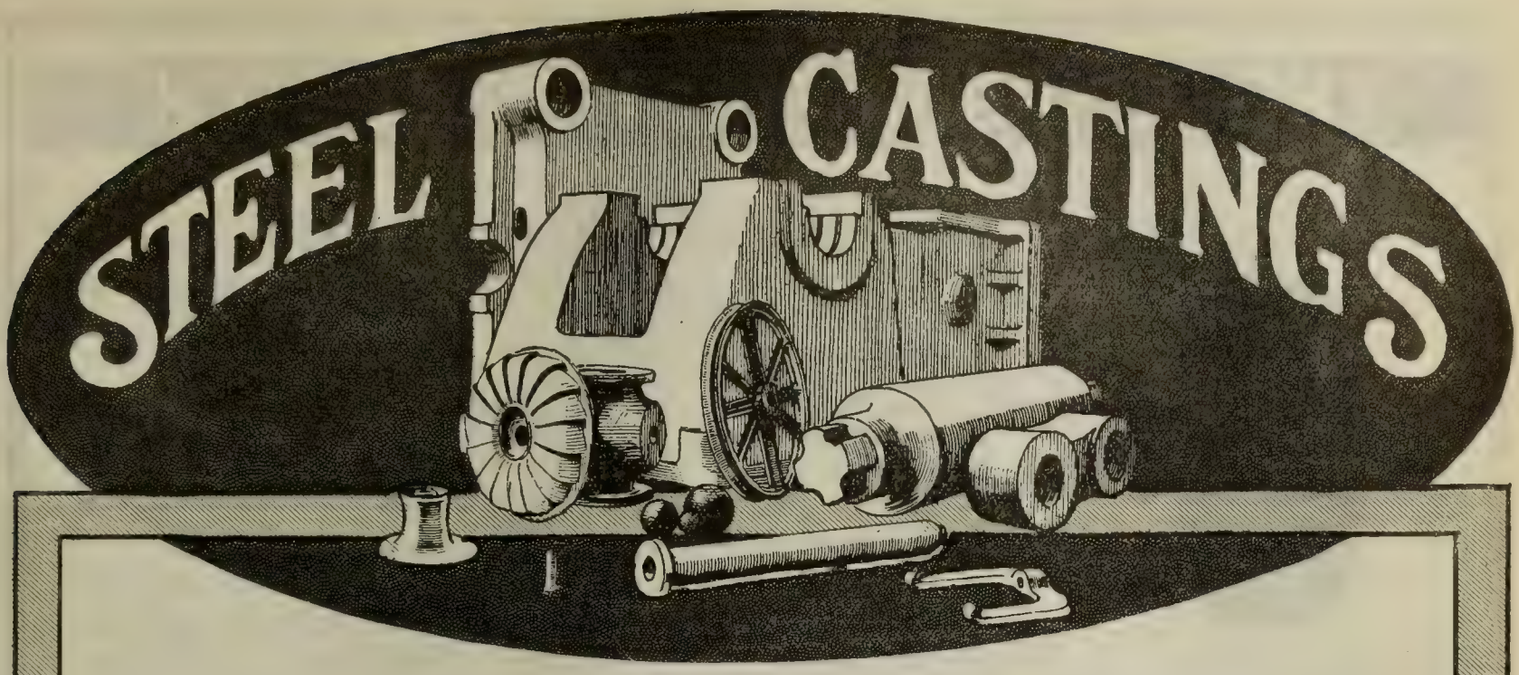

Manganese, Vanadium, Titanium, Chrome, Nickel Castings made in sizes from 1 lb. to 50 tons. Made to specifications and true to pattern. You can thoroughly depend on our products.

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H. E. W. Service

Our ability to serve is limited by the demands of your organization. Repair work, special marine repairs, machinery built. Our air chucks which are performing such efficient service in the shell industry is but an evidence of our ability. We have a large and complete staff of expert workmen and thorough equipment. Consult us. We will gladly co-operate with you.

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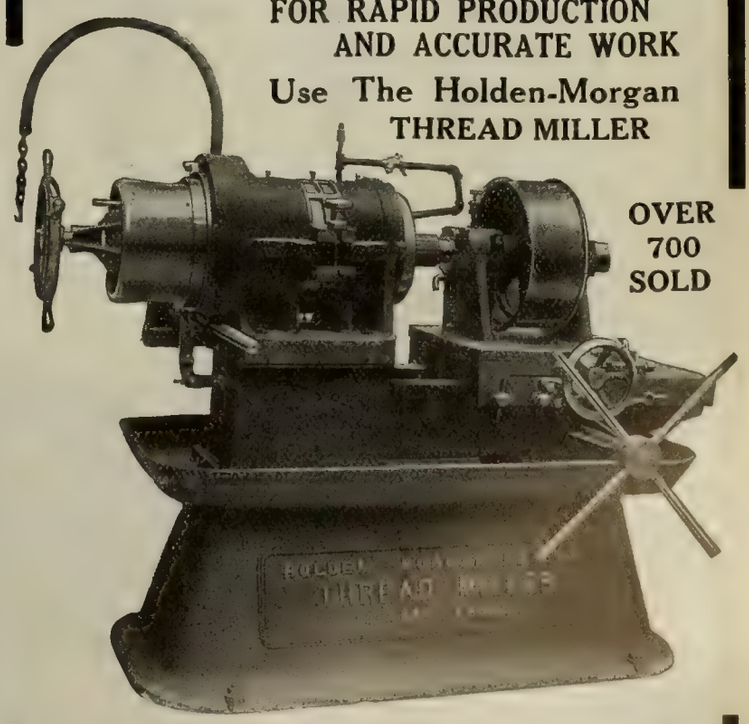
FOR RAPID PRODUCTION AND ACCURATE WORK
Use The Holden-Morgan THREAD MILLER



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Prompt Delivery
On Nose or Base Machines, also Internal or External Fuse Machines—with air-chucks.

The A. R. WILLIAMS MACHINERY COMPANY
LIMITED
64 FRONT ST. W. TORONTO

THE JOHNSON FRICTION CLUTCH

SINGLE TYPE

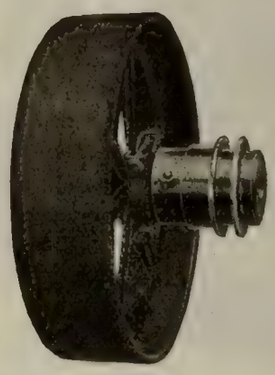

Fig. 1S

Mounted With Split Steel Pulley

The Johnson Friction Clutch embodies all the principles which make a perfect friction clutch.

It is small, powerful, simple, neat and operates easily and quietly.

Has but few parts, each made absolutely interchangeable. Being nicely balanced, it runs at high speed without vibration. It is round and smooth, with no protruding parts, making accidents impossible.

No bolts, nuts, links, etc., to become loose and cause trouble. It can be instantly adjusted to any tension with one screw.

The working parts being entirely covered are kept free from dirt.

As seen from the illustration in Fig. 2S, this type of clutch has but few parts and is very compact. A body fastened to the shaft carries a split ring in which are inserted a pair of toggle levers. A curve shaped wedge, which is made part of a sliding sleeve, forces the levers apart, expanding the ring, bringing its outer surface into frictional contact with the inner surface of the friction cup, the hub of which is made to suit requirements. The leverage is so compounded that it requires but little pressure to operate the clutch. One screw which moves two taper blocks, set into the levers, adjusts the contact of the ring and cup to any tension. This screw is easily reached with a screw driver through a hole in the friction cup.

The perfectly smooth shipper sleeve entirely covers the working parts so no dirt can get near them.

These clutches have been thoroughly tested before being put on the market. They operate smoothly at any speed without bang or clatter, can be instantly adjusted with one screw, have no projections to catch anything, thus avoiding the accidents so common with ordinary clutches, and save much space by their compactness.

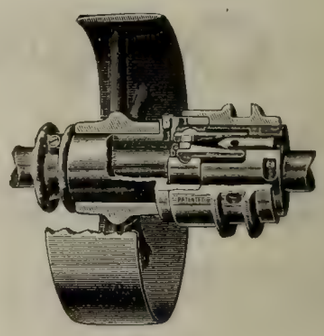

Fig. 2S

Section Broken Away Showing Clutch-Engaged, Pulley Mounted On Hub of Friction Cup

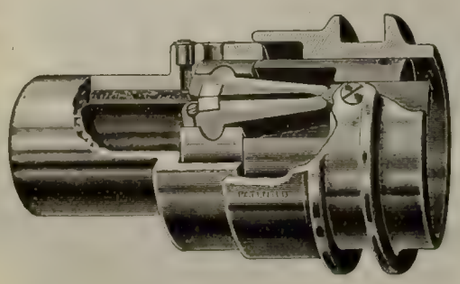

Fig. 3S

Section Broken Away Showing Clutch Disengaged

In the past several years we have made extensive improvements, which simplify the working mechanism of these clutches, and add to their efficiency, so that to-day we have a product which is the Height of Perfection, and the Acme of Simplicity, in a small, compact clutch.

A trial will convince you, as it has others, that they are the best clutches ever put on the market, for light power within their rating.

Write for our Booklet, "Clutches as Applied in Machine Building" and Yellow Data Sheets.

Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal; Can. Fairbanks-Morse Co., Ltd., Toronto.
England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

We will Fill Your Requirements *Send Us Your Inquiries*

Air Compressor Evidence

The greatest evidence of the value of any article is the demand for it after investigation and trial. Below are four carloads of our compressors which fills one order to a large concern in Canada. Our line of compressors is very large.

Write us and explain your requirements.

The Jenckes Machine Company, Limited

CANADIAN SALES OFFICES:
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WORKS:
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WORKS:
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Shrapnel Shells and Shell Blanks

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Steel Ingots
by the
HARMET
Liquid Process

Nova Scotia Steel and Coal Co., Limited

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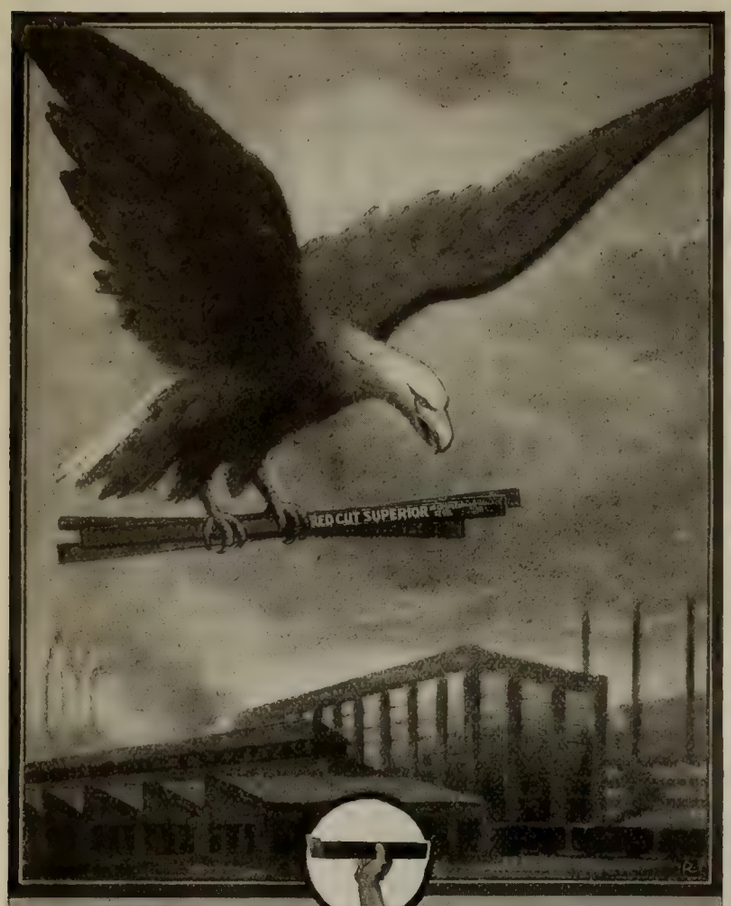
MONTREAL



HIGHEST IN QUALITY

NATIONALLY KNOWN

OUR Country requires the extreme limit of production from every lathe, planer, miller or other machine tool.

BE PATRIOTIC

"Red Cut Superior"

The Nationally Known First Quality

HIGH SPEED STEEL

Will enable you greatly to increase your output

"IT'S THE BEST FOR ALL MACHINE WORK"

VANADIUM-ALLOYS STEEL CO.

PITTSBURGH, PA. Works at LATROBE, PA.

CARRIED IN STOCK AT THESE WAREHOUSES

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We guarantee shipment within 24 hours of receipt of order

SISCO

"Extra" "Special" "High Speed" Tool Steels

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SIS-CO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.

MONTREAL, QUE.

TRADITION

We have a great tradition to perpetuate. The British-made file has always been the standard of file efficiency. It has always had better steel in it, quicker cutting teeth, and been harder and straighter than the files of other nations. That is unchallenged the world over.

Founded on an ideal—the production of Canada's Finest Files—this corporation is entirely Canadian, therefore all-British, and our whole organization is saturated with the maxim—

QUALITY FIRST

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TRADE MARK

Quality Files

CANADA'S STANDARD

Made in Canada, by Canadians, for Canadians.

ARE YOU FILE-WISE?

PORT HOPE FILE MFG. CO., LIMITED

Port Hope, Ontario

"Ask your jobber"

TEXTILE BELTING and PACKINGS

HIGH SPEED TWIST DRILLS

J. R. BAXTER & COMPANY LIMITED, MONTREAL.

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"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

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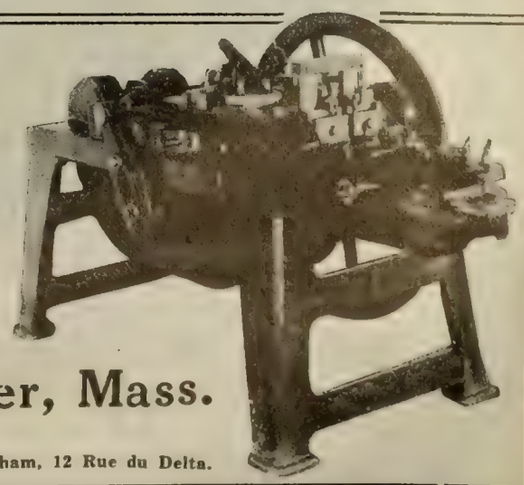
We offer the trade new types of

WIRE NAIL MACHINES

QUIET IN OPERATION; WITH VERY HIGH OUTPUT; ALL PARTS ACCESSIBLE; DECREASED MAINTENANCE COSTS; GREAT CAPACITY; OCCUPYING SMALL FLOOR SPACE.

Smoothly running machines, with balanced mechanical motions and no rotating cams. Built in 5 sizes, handling wire from No. 17 to 3/8" diam.

PRACTICALLY NOISELESS IN OPERATION



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FERRO-URANIUM *The Latest Discovery in Alloys for Efficient*

High-Speed and Other Steels of Quality

IT INSURES TOOLS THAT STAND UP ON THE JOB

Largest Producers in the World of URANIUM

WRITE US FOR PARTICULARS

STANDARD ALLOYS COMPANY

Forbes and Meyran Aves. -:- Pittsburgh, Pa.

Electrite Uranium High Speed Steel

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium—make this a steel of truly remarkably cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.

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High-Speed STEEL

The tools that are made with "Wolfram" High Speed Steel are warranted to be super-keen at the edge and super-strong at the neck.

WOLFRAM

Embodies a true and permanent alloy of Tungsten, Chrome, Vanadium and Iron. No better High Speed Steel in the world.

VULCAN CRUCIBLE STEEL COMPANY

ESTABLISHED 1900

Aliquippa - Pa., U.S.A.

Represented in Canada by Messrs. Norton, Callard & Company, Montreal.

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6" shells.

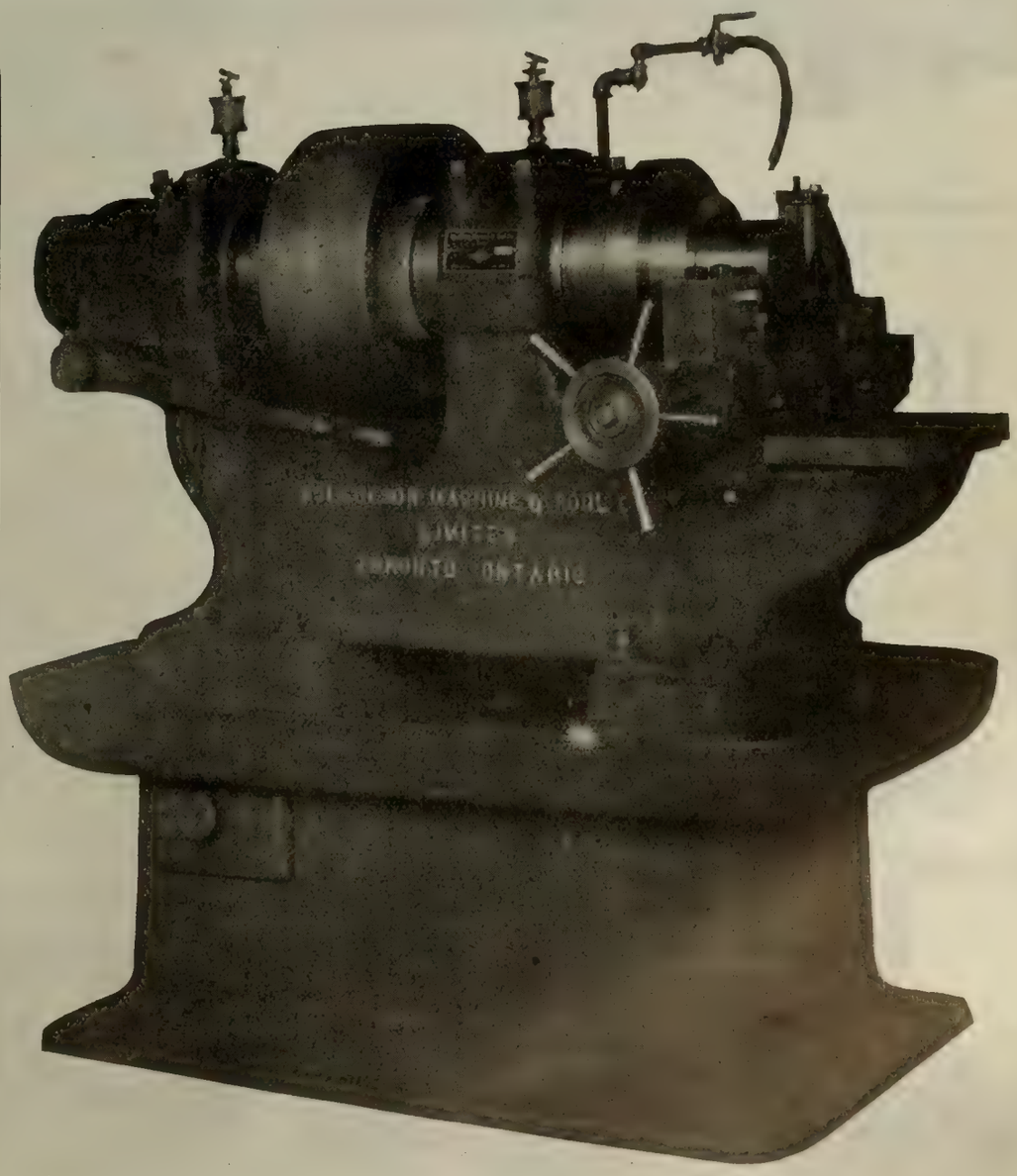
Roelofson Machine & Tool Co., Ltd.

Head Office 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6" shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.



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Into the Driving Gears— Strength

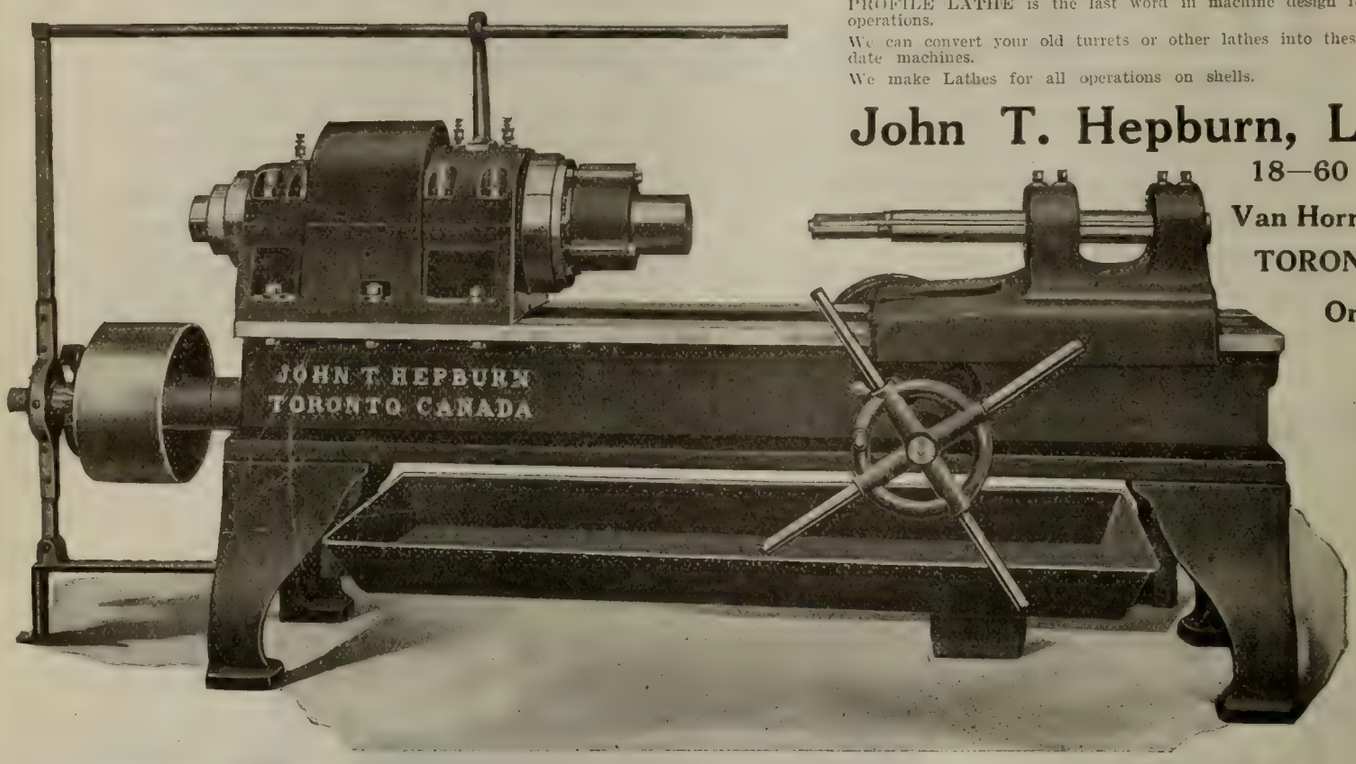
This HEPBURN Single Bar Boring Lathe's rigid construction has proven it to be the BEST 6" BORING LATHE procurable.

The HEPBURN NEW STYLE NOSE BORING AND INSIDE PROFILE LATHE is the last word in machine design for these operations.

We can convert your old turrets or other lathes into these up-to-date machines.

We make Lathes for all operations on shells.

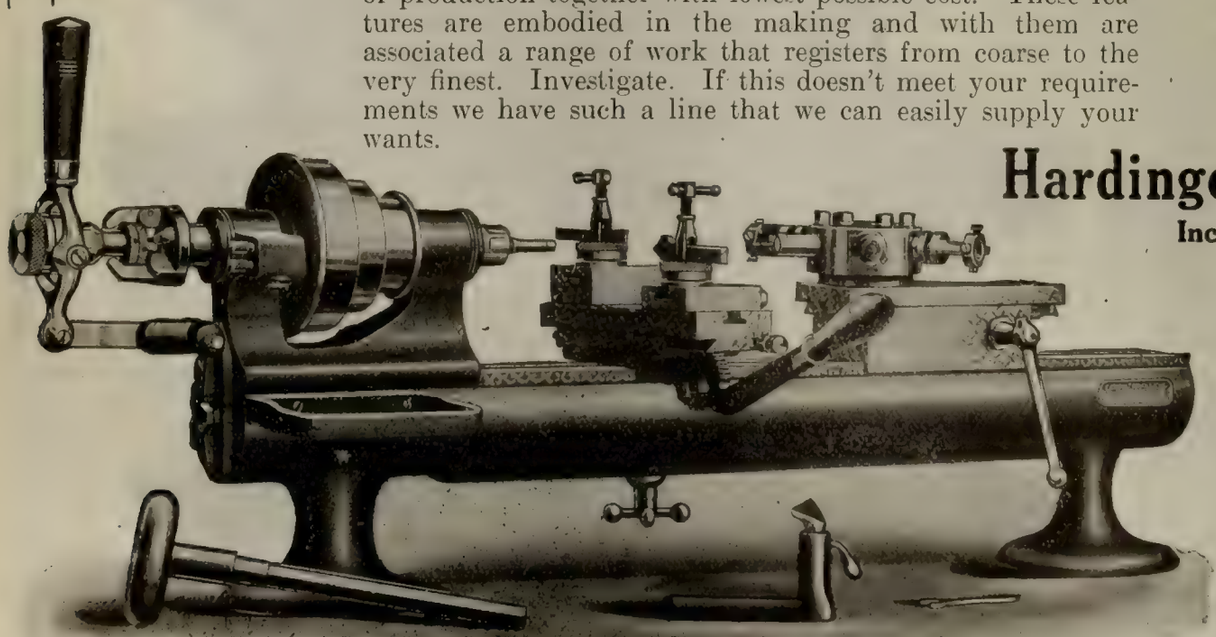
John T. Hepburn, Ltd.
18—60
Van Horne St.
TORONTO
Ontario



If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.

Hardinge Bros.
Inc.
1770 Berteau Avenue,
CHICAGO,
ILL., U.S.A.



THE BANFIELD PLUG MILLER

Patented in Canada and United States

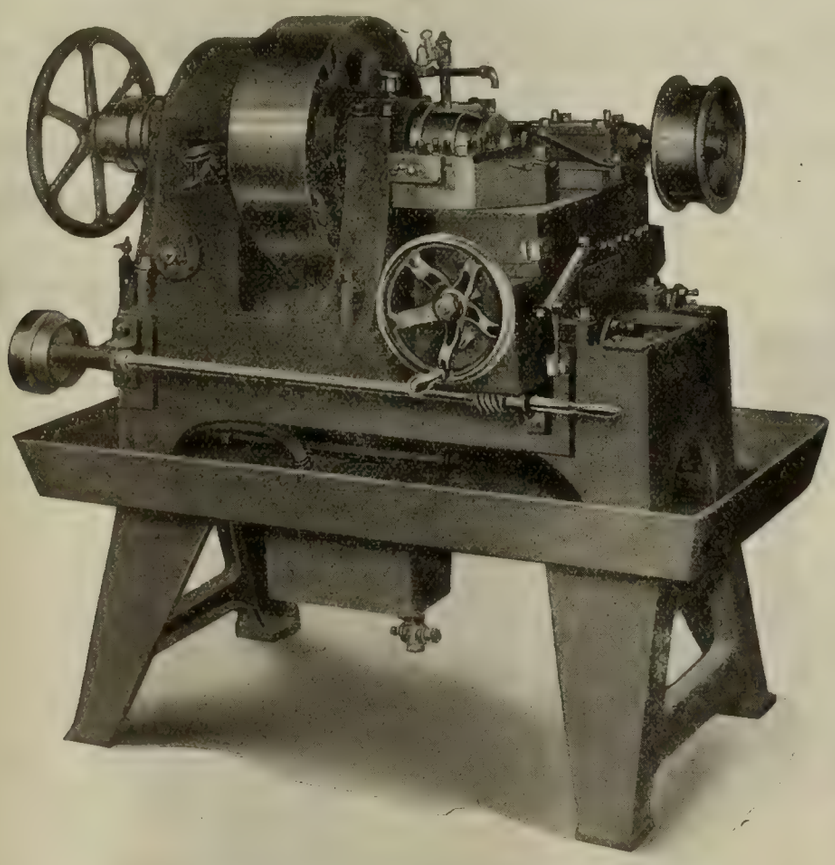
THE COMPLETE PLUG FINISHED IN SIX MINUTES BY UNSKILLED LABOR

A machine especially designed for finishing base plugs, turning the outside diameter, finishing the face with any camber desired and milling the thread—*all in one chucking.*

One man can operate two machines, considerably reducing your cost per plug.

The Banfield Plug Miller is equipped with quick draw in collet.

Drive pulley 18″ x 6″, with bronze bush having cut jaw clutch for turning and facing. Worm gear 100 to 1 ratio with jaw clutch for milling, driven by 10″ x 1½″ flanged pulley. The milling cutter is driven by an 8″ x 2½″ flanged pulley. Tool post carriage is equipped with power feed (two speeds), having automatic stop. Power feed pump with relief valve driven from worm shaft (all drives direct from main line shaft). Rigidly built; simple and economical to operate.



For Turning and Milling the Thread on Gas Check Plugs for 6-inch High Explosive Shells

Weight 1800 lbs.

For 18-pdr., 4.5 and 60-pdr. High Explosive Shells. Can furnish machines of same type, weighing 1250 lbs. Particulars on request. These machines are tooled up for finishing plain machined or bevel plugs if desired.

BASE PLUGS

Machined to Government Specification

Have in stock for immediate shipment machined base plugs for 4.5, 60-pdr., and 6″ High Explosive Shells, either threaded or beveled.

Machine work subject to acceptance of Government inspector at your plant.

Capacity 4,000 *per day.* Write for prices.

EDWIN J. BANFIELD

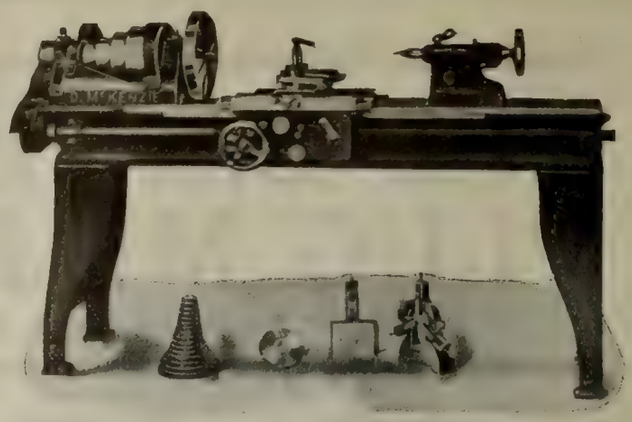
STAIR BUILDING - - TORONTO, ONT.

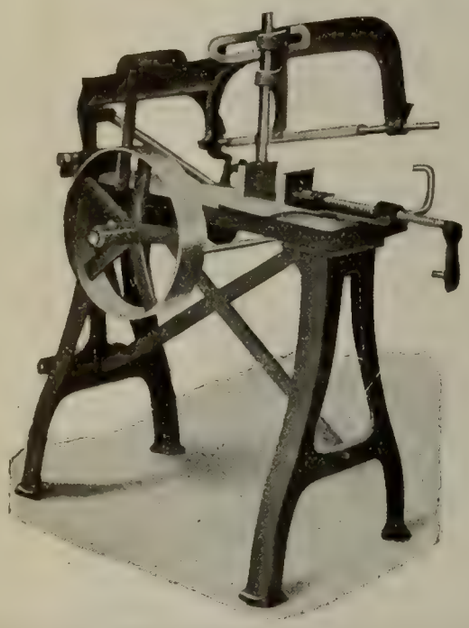
The "McKenzie" Engine Lathe

The Standard of Accuracy

Made from new patterns, of improved design, and constructed of the very best material by expert workmen. Every part is mechanically perfect and excellently finished. Its accuracy and durability mean a big saving of money to you.

Let us put full details before you. Write!





The Improved Power Hack Saw

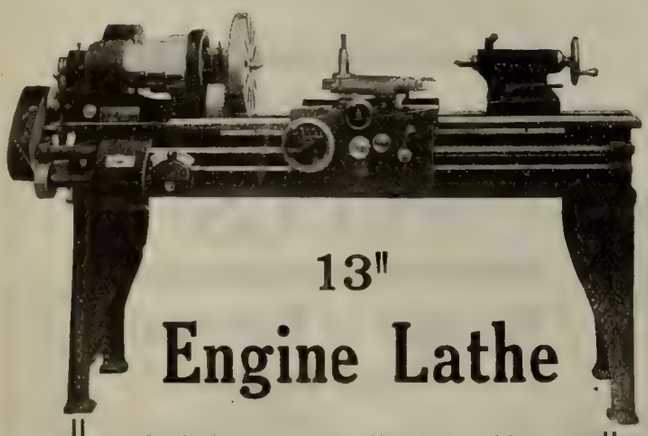
will cover its cost many times over with the money it saves through long, efficient service.

Saws bars 6 x 6 in., either round or square, and is so constructed as to require no attention after work is put in vise, and stops automatically when piece is cut off.

The Improved Saw Guide is a Special Feature — it keeps the saw perfectly in line at all times.

The D. McKenzie Machinery Co.

Guelph, Ontario



13" Engine Lathe

Such features as solid, full-webbed headstock, 50 point carbon crucible steel spindle, rigidly clamped tailstock and an unwavering principle to maintain a standard of machine that is proportionate throughout and conforms to the requirements of "Filsmith Quality."

These features have put this lathe in the foreground, where its daily performances keep it.

Inquire of us. It is a pleasure to help you.

The Philip Smith Mfg. Co.
SIDNEY OHIO U.S.A.

PRACTICALITY

AFTER fifteen years' study of the Miner's and Lumberman's wants, we know just what is and what is not required in tools for them.

Practicality has been the keynote of our organization. Experience has aided us in eliminating all unnecessary parts and in perfecting the design of our tools.

The use of best material and finest workmanship enable us to manufacture tools that are unexcelled.

We make a complete line.

Write us for prices.

J. W. CUMMING & SON, LTD.
NEW GLASGOW, - - CANADA

Wood or Steel, let Cummings make it.

Two Cuts at One Time

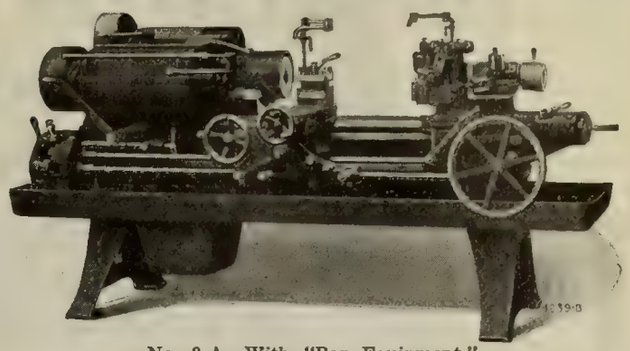
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

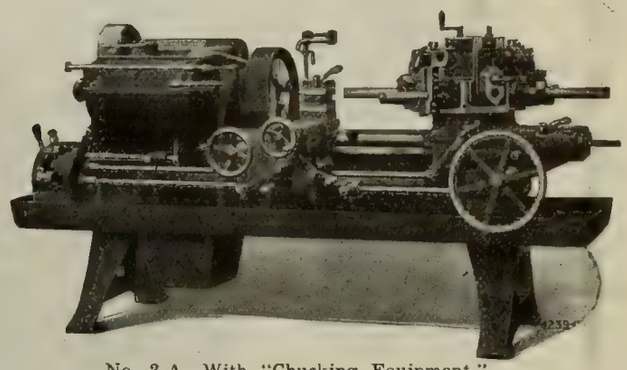
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."



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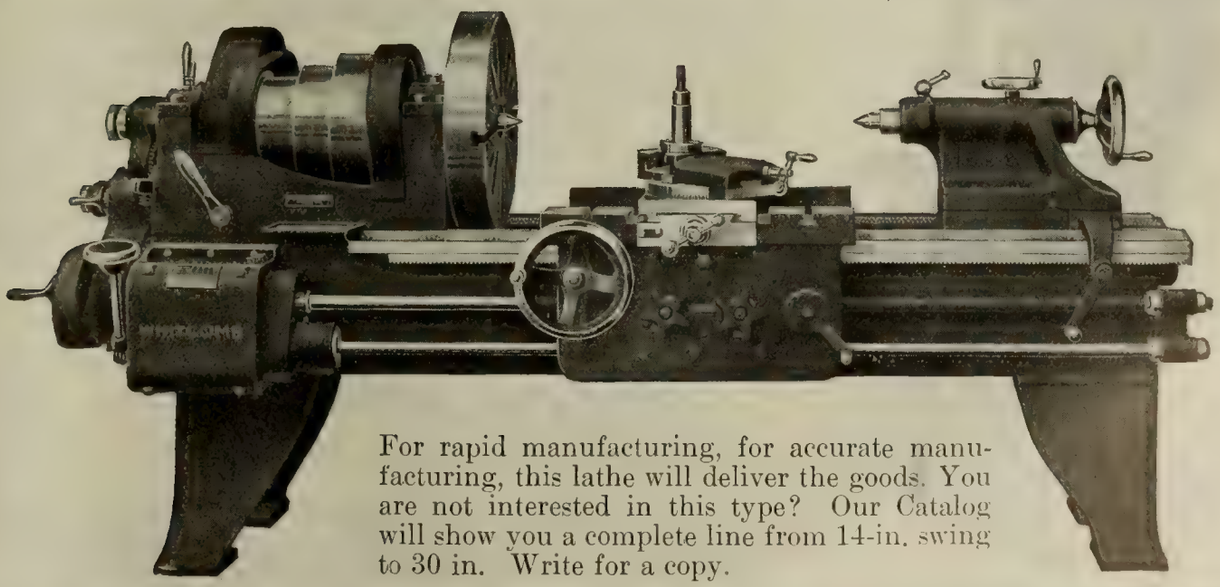
THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal, Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

For Manufacturing—

This 20 in. Whitcomb-Blaisdell Lathe



For rapid manufacturing, for accurate manufacturing, this lathe will deliver the goods. You are not interested in this type? Our Catalog will show you a complete line from 14-in. swing to 30 in. Write for a copy.

LATHES From 14" to 30" SWING

WHITCOMB-BLAISDELL MACHINE TOOL CO.
WORCESTER, MASS., U.S.A.

PLANERS From 17" to 48" WIDE

IMMEDIATE SHIPMENT

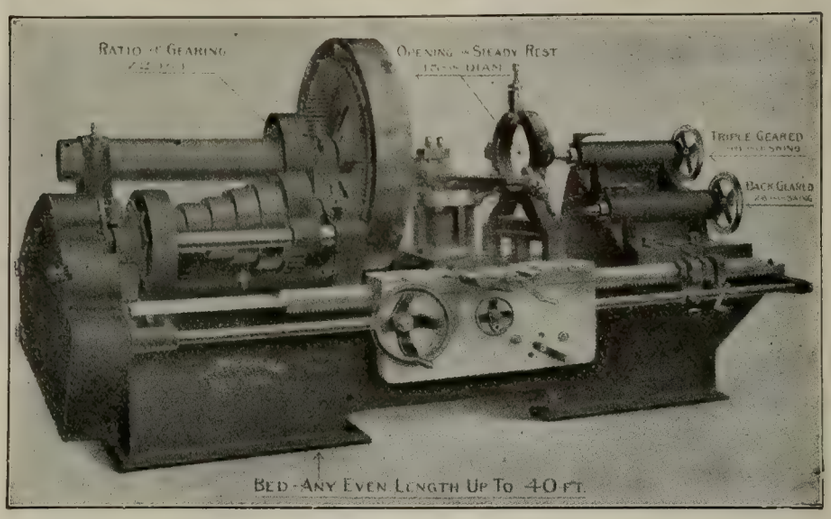
30-ft. BED

McCabe 2-in-1 Lathe

26 and 48-INCH SWING

TRIPLE-GEARED—RATIO 72 to 1

J. J. McCabe, 149 Broadway New York



Showing McCabe's Latest Heavy Type "2-in-1" Double-spindle Lathe—26/48-in. Swing.

48-in Swing. Triple Geared — ratio 72 to 1.

26-in. Swing. Back-geared.

Turns between centers—24 ft.

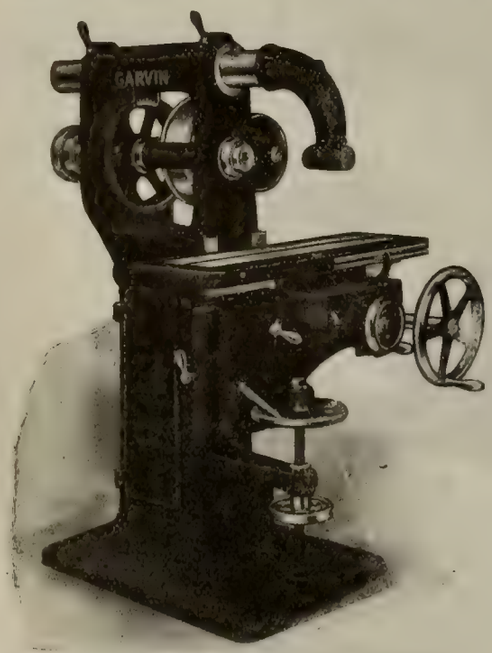
Swing over carriage on 48-in. Lathe is 40 in.

Prominent shipbuilders are using McCabe Lathes on long beds.

Thousands in operation all over the world.

GARVIN No. 21 Plain Miller

Back Geared



No. 21 B.G. PLAIN MILLING MACHINE
Back Geared
Use Code - Abject

For Plain and Gang Milling for general manufacturing, and is used mostly in gangs of 5 or 6 machines to one operator. Spindle runs in adjustable bronze boxes, and is driven by a 3″ belt through back gears (3 to 1).

Knee is our improved solid top design, rigid and stiff to resist side pressure of heavy cuts.

DIMENSIONS:

Automatic Feed at Table	18 in.
Adjustment in line with Spindle	6 in.
Vertical adjustment under Spindle	13 in.
Table, inside Oil Pockets	6 x 10 in.
Canges of Speed	6
Changes of Feed	6
Net Weight, Skidded	1,575 lbs.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

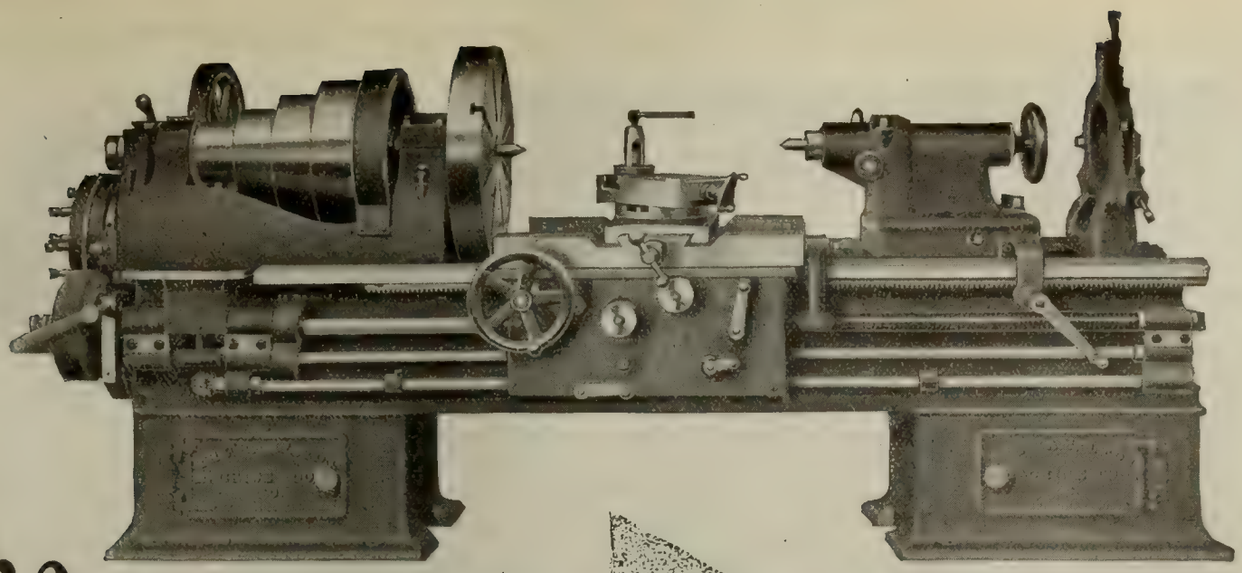
IMMEDIATE DELIVERIES

Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) **50 Years New York City**



The "HAMILTON"

Speeds Production

INSTALL the most modern machinery in your plant to meet the new conditions of to-day. You get it in Hamilton Lathes.

We are living in the greatest speed-up, cut-the-cost-of-production period of modern times. War time conditions demand speed and economy in the machine shop as well as in other institutions of commerce. Shops everywhere are now producing more work with the same force of men than before the war. The war has created a demand for the utmost efficiency and brought out the resourcefulness of the country in new machinery.

Hamilton Lathes represent the conditions in the machine shop and the spirit of the times with their speed, durability and accuracy.

Write now for Bulletins—yours for asking.

The Hamilton Machine Tool Co.

HAMILTON, OHIO

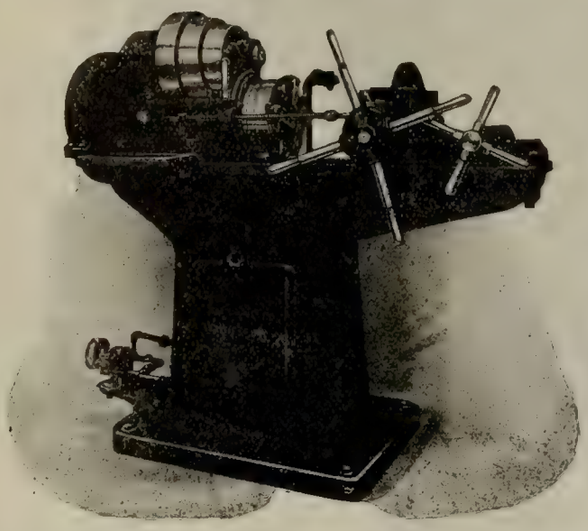
Sole Agents for Ontario:

H. W. PETRIE, Limited - TORONTO, ONT.

Landis Threading Method Means Less Labor

AS labor becomes scarce and wages increase, industry requires the most efficient and most economical machine for every line of work.

Meeting that condition in regard to thread-cutting is the **Landis Threading Machine** or **Die Head** for bolt, pipe and special threads. The Landis Die can be used advantageously for cutting every thread in your shop. No matter what form of thread, pitch or shape of the part to be threaded, the Landis will handle it to your complete satisfaction. Many threading jobs which were formerly done on lathes are now threaded with a Landis die head or machine and the results are **equal accuracy, a higher production and a lower threading cost.**



One customer writes:—"We have made an increase in production of 30 to 40% and a savings in the cost of chasers of 50 to 60% since installing your machine."

Does not that prove the efficiency of the Landis Threading Method?

Write for catalogues.

No. 22—Bolt Threading Machinery.

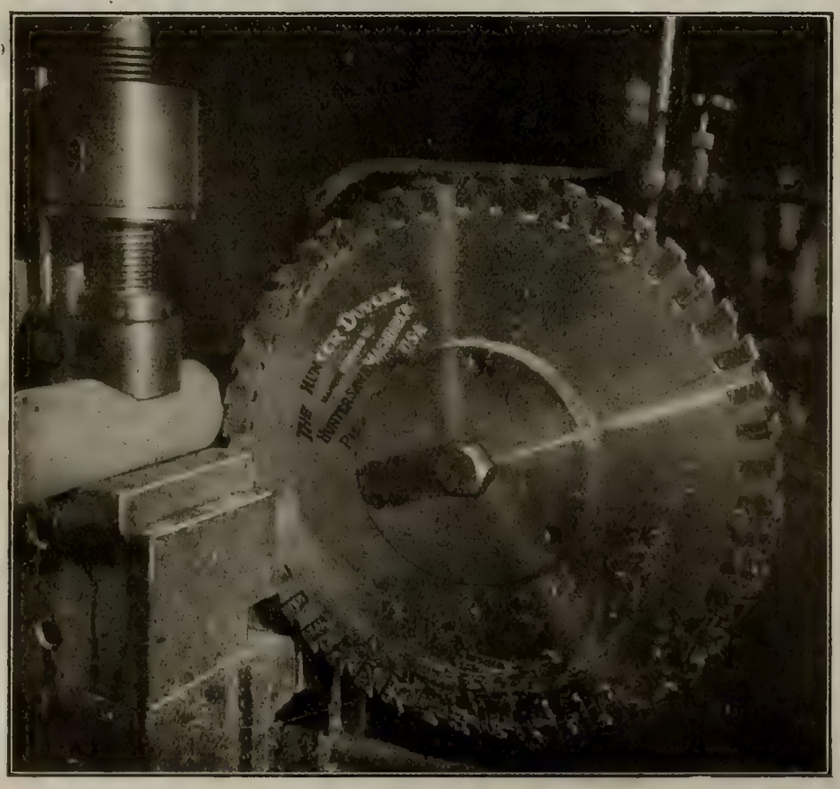
No. 23—Pipe Threading Machinery.

Landis Machine Company

WAYNESBORO, PA.

Exclusive Canadian Agents: Williams & Wilson, Limited, Montreal

A Hunter "Duplex" on Shrapnel Stock



FAST GOING
on Newton Machine

Through 3½" round 60 Carbon, 70 Manganese Shrapnel Stock every

2 MINUTES

The secret of Hunter "Duplex" Saw speed is the method of holding the high speed teeth.

You can use this speed profitably — on shrapnel or any other stock.

Let us send full Particulars.

HUNTER SAW & MACHINE COMPANY, Pittsburg, Pa.

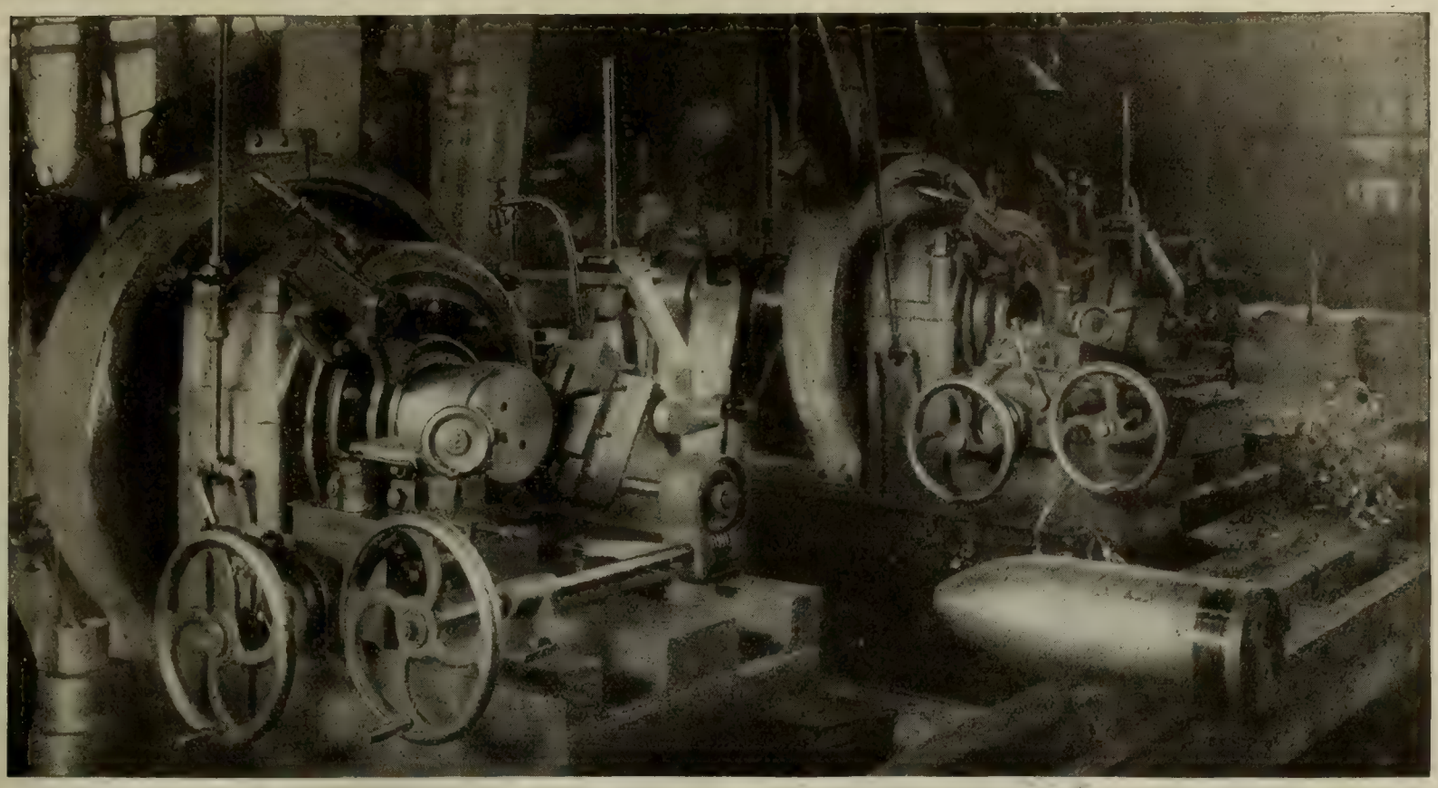


Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

These machines are built for turning bands on 8". 9.2" and 12" shells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. **Write for full particulars and price.**

Bennett Ave. **Warden King Limited** **Maisonneuve, P.Q.**

Two Cuts

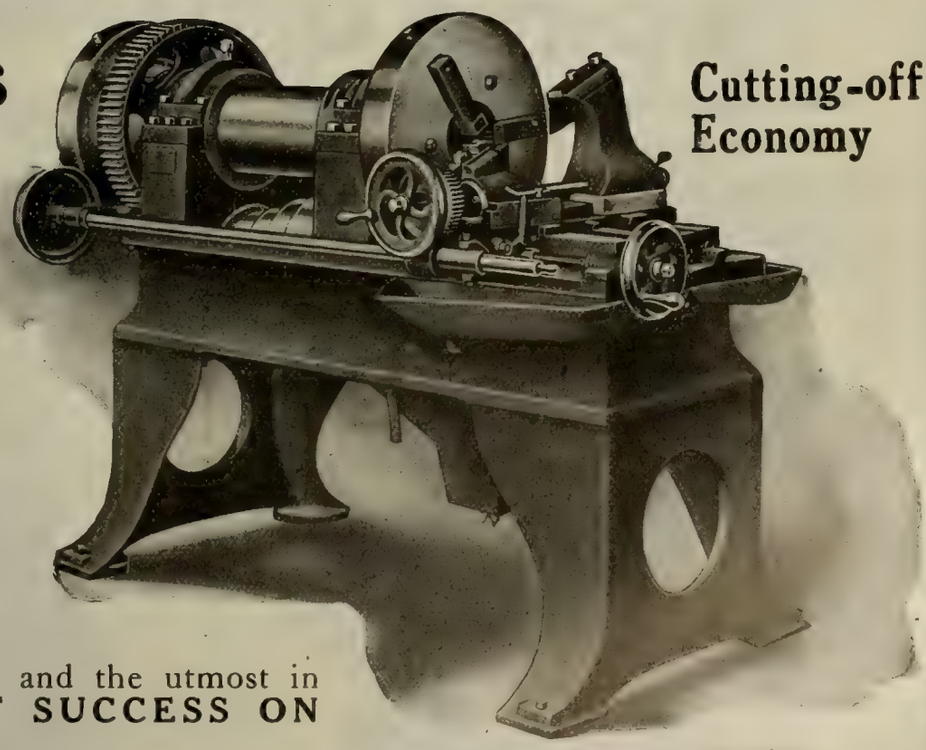
Simultaneously

One up, the other down. This is what makes the **Hurlbut-Rogers Cutting-Off and Centering Machine** virtually double the output and reduce the cost per piece about one-half.

The Hurlbut-Rogers Machine gives you capacity of two machines at the expense and in the floor space of one machine.

We build them for hard work and the utmost in accuracy—and their **GREAT SUCCESS ON SHELLS** shows it.

Cutting-off Economy

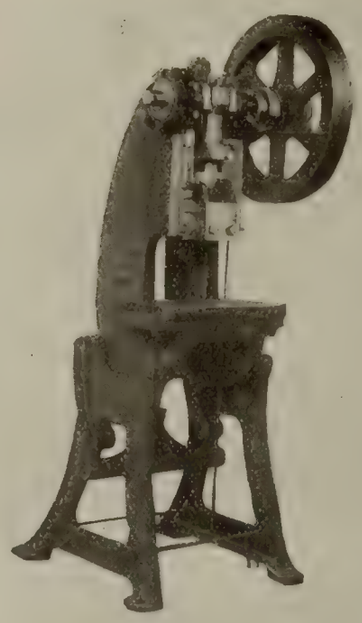


5-inch Cone-Driven Machine

Let us go into details.

HURLBUT-ROGERS MACHINERY CO., South Sudbury, Mass.

FOREIGN AGENTS—England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow and Newcastle-on-Tyne. H. W. PETRIE, TORONTO, CANADA.



THE Crank Shafts of all Consolidated Presses are made from .50 to .60 carbon steel hydraulic forgings, accurately machined and ground to size. The body bearings are carefully scraped to fit, thus insuring a perfect bearing.

The Crank Pins are larger in diameter than the main bearings. This has always been a Consolidated feature. Crank cheeks are liberal and guarantee strength and rigidity in the shaft; this, together with the enlarged crank pin, materially resist torsion when the press is in operation.

You cannot ignore these features.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* **MICHIGAN**

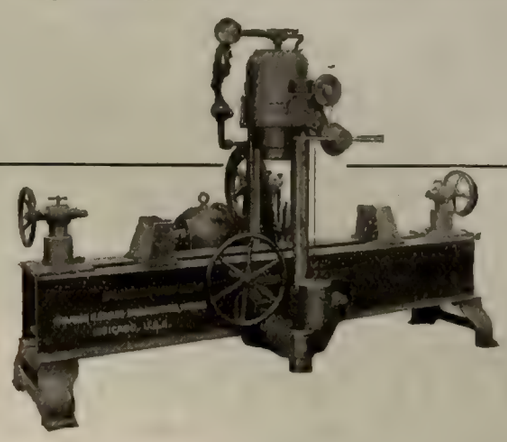
Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

ELMES

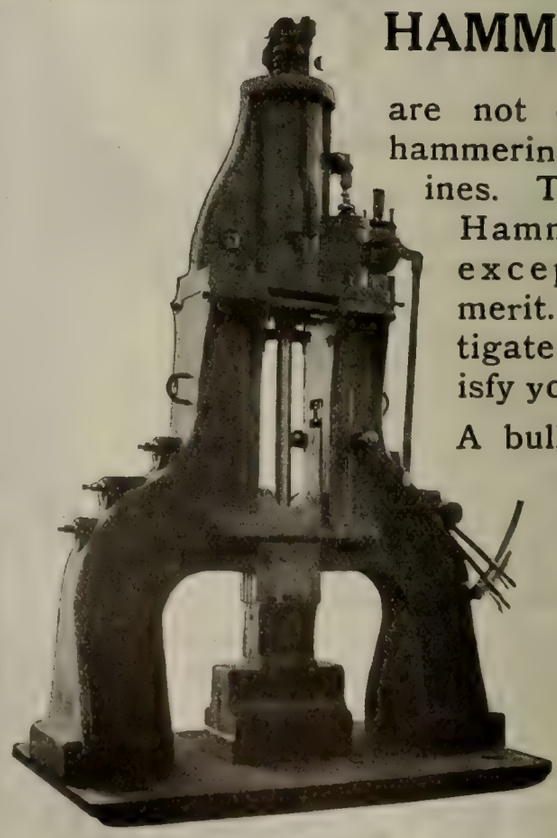
Motor Driven Straightening Press for shafts up to 5 in. Movable head, height adjustable, close regulation of action, strong screw centre parts. One of our many types.

Charles F. Elmes Engineering Works.

217 N. Morgan St. Chicago, U.S.A.



"ERIE" STEAM FORGING HAMMERS



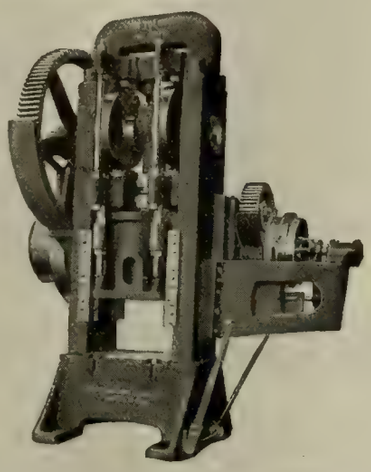
are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U. S. A.

THE "TOLEDO"

Straight Column Double Action Cam Drawing Presses

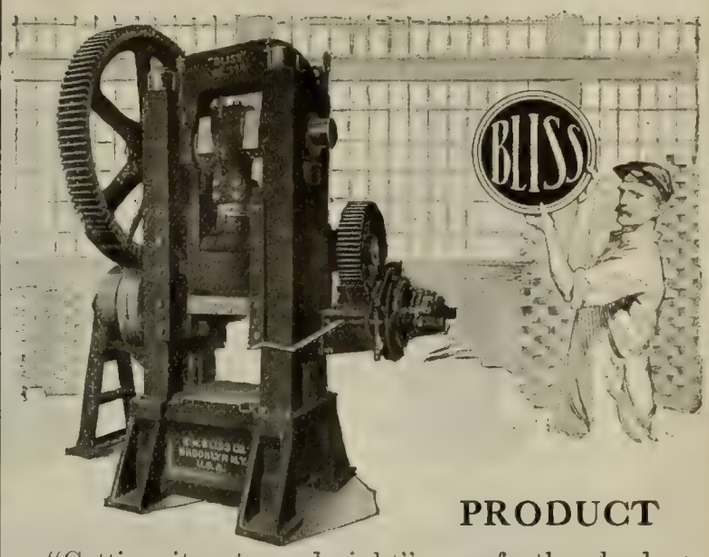


For cutting and drawing in one operation cups and shells made from heavy metal.

For economy and rapidity of production automatic feeds and auxiliary devices may be attached.

These presses are of the highest grade construction throughout to make for long service and low upkeep, and the most advanced ideas are embodied in the design.

The Toledo Machine & Tool Co.
TOLEDO, OHIO



PRODUCT

"Getting it out—and right" goes further back than the selection of the machine. It may go back 10 or 20 or 40 years to some point or problem solved in our 60 years' development of Presses that produce.

If you want machines with product on capacity based on *longest* practical experience, buy "Bli s."

BLISS **E. W. BLISS CO.** BLISS
Brooklyn, N.Y., U.S.A.
1857 1917

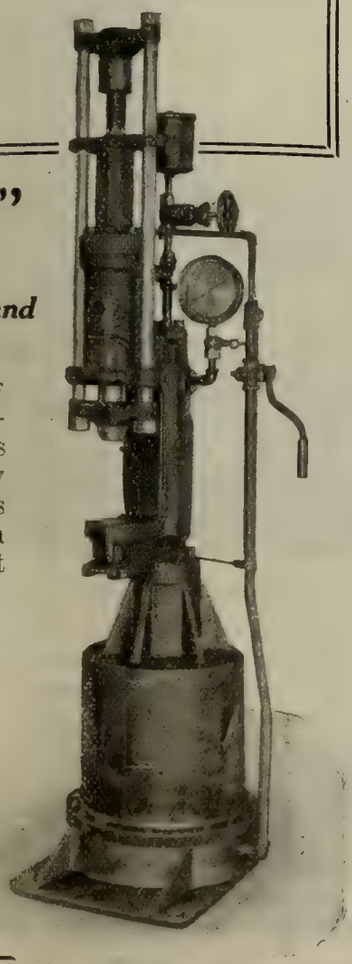
CHICAGO OFFICE People's Gas. Bldg.
DETROIT OFFICE Dime Bank Bldg.
CLEVELAND OFFICE - Union Bank Bldg.
LONDON, S. E., ENGLAND Pocock St., Blackfriars Road
PARIS, FRANCE 100 Blvd. Victor-Hugo St. Ouen

Triple Purpose

"METALWOOD"

COMBINATION

Forcing, Broaching and Straightening Press.



Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.

Metalwood Mfg. Co.

Leib & Wight Sts., DETROIT, MICH. U.S.A.

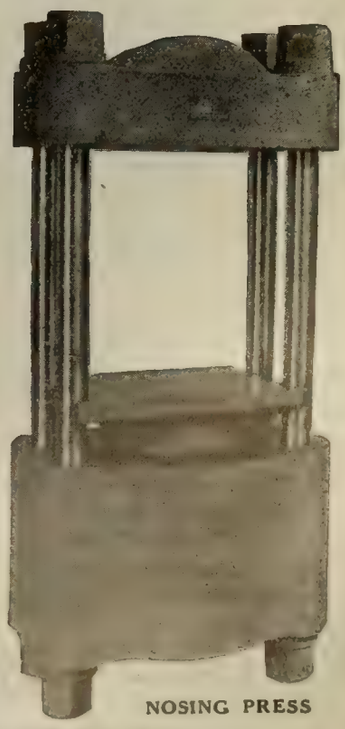
For Great Britain and Continent address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

PRESSES

Pumps and Accumulators

FOR ALL PURPOSES

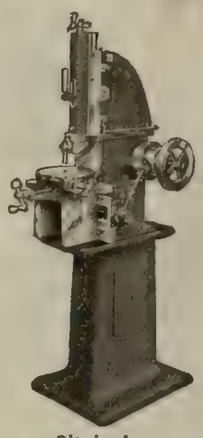
Made in Canada



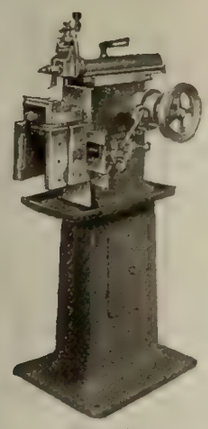
NOSING PRESS

WILLIAM R. PERRIN, Limited
TORONTO

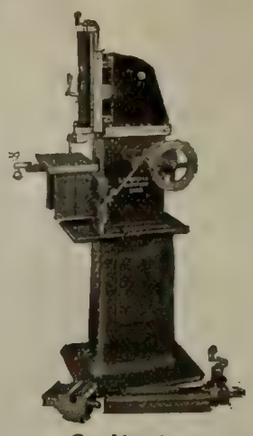
If any advertisement interests you, tear it out now and place with letters to be answered.



3½-inch



7-inch



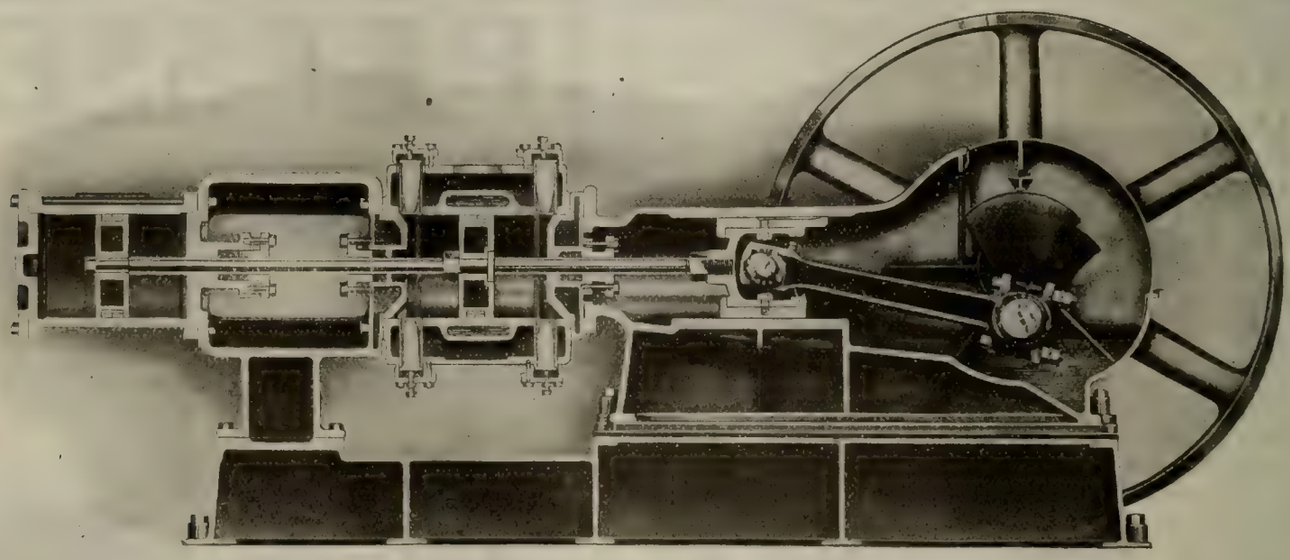
Combination

Three of the machines that by their cost-reducing features have established themselves "solid" with the home users and by these same merits are reaching out in foreign countries. A silent, but powerful message of the Rhodes efficiency.

Their capacity is greatly promoted by the adjustments which may easily and quickly be attached. For shaping, slotting, die making, tool making, etc., these machines stand paramount. An inquiry on your stationery will receive prompt attention.

The Rhodes Mfg. Company

Hartford, Conn., U. S. A.



Sectional view of "FL-1" Steam Driven, Single Stage, Straight Line Air Compressor

This view shows the simple, compact construction of this class of compressor. Thorough lubrication and thorough water-jacketing are strong features of this machine.

The location of the steam cylinder enables the machine to be readily converted to belt drive should conditions require it, by disconnecting the valve gear and removing the steam piston. If necessary later on, the machine may be changed back to the steam-driven type. Bulletin K-302 describes the machine fully. Write our nearest branch.

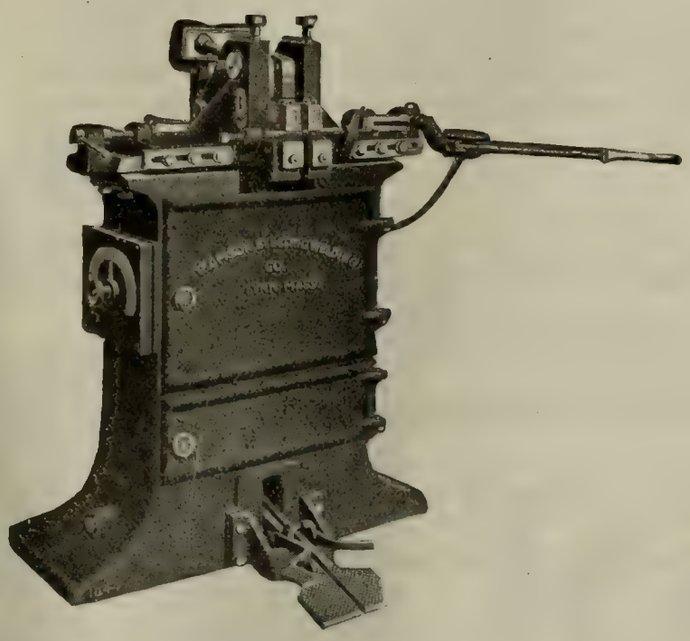
CANADIAN INGERSOLL-RAND COMPANY, LIMITED

COMMERCIAL UNION BUILDING

MONTREAL - - CANADA

Branches: SYDNEY SHERBROOKE MONTREAL TORONTO COBALT TIMMINS WINNIPEG NELSON VANCOUVER

Thomson Process
Electric Welding

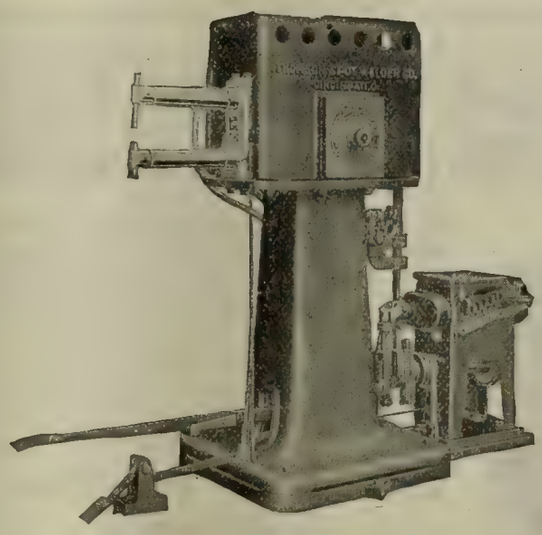


Adopt a "Thomson" For Your Work

We have shown thousands of manufacturers how to lower their costs and obtain better production by the use of Thomson Butt Welding Machines. No doubt there is work in your shop that could be handled faster and better by the "Thomson" Electric Welding Process.

Why not talk it over with us—let us give you actual facts on how we have saved other firms money and how we can benefit you? It costs nothing for this consultation. Get in touch with us to-day.

Write for Bulletin B-4.



Rivets Abolished—Time Saved

A Thomson Spot Welder will do your riveting and soldering 60% to 90% faster. No rivets or solder required, no holes to punch, and a boy can turn out as much work as five men using the old process. A thorough investigation will prove to you the merits of the Thomson Spot Welding Process and show you how to effect a big saving.

Write for Bulletin S-4.

Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

HEATING and VENTILATING

"Keith" Fans will be found more economical and have a greater efficiency where conditions are unusually severe, because they possess advantages over other Fans used for the same purpose.

The "Keith" Fan is the one that will give you continued and unqualified satisfaction.

Our New Catalogue No. 55 has just come from the Press. Tell us where to address it and you will receive one by first mail.

SHELDONS LIMITED, Galt, Ont., Canada

Toronto (Canada) Office: 609 Kent Building.

AGENTS:

Messrs. Ross & Greig, 412 St. James St., Montreal, Que.
Messrs. Walkers, Ltd., 259-261 Stanley St., Winnipeg, Man.
Messrs. Gorman, Clancy & Grindley, Ltd., Calgary and Edmonton, Alta.
Messrs. Robert Hamilton Co., Ltd., Bank of Ottawa Bldg., Vancouver, B.C.

IS YOUR PLANT 100 PER CENT EFFICIENT?
Oxy-Acetylene Welding Helps Maintain this Standard

Patch welded in boiler by Oxy-Acetylene process.

The efficiency of Oxy-Acetylene Welding for the reclamation of Broken Machinery has been demonstrated and proven beyond doubt, and its sphere of usefulness is without limit. The welded joint being practically equal in tensile strength to the metal adjacent enables the Oxy-Acetylene Process to be used for immediate repairs to Boilers, Fire Boxes, Furnaces, etc., as well as other essential repairs to broken machinery at

Enormous Savings in Time and Money

and the maintenance of a

100% Standard of Efficiency

These and other advantages to be obtained by the installation of an Oxy-Acetylene Welding Outfit in your plant, and the present abnormal industrial and labor conditions render investigation of the possibilities of Oxy-Acetylene Process imperative. Why not investigate to-day? Full particulars and valuable information free, without obligation.

L'Air Liquide Society

Canadian Factories:
Toronto Montreal Winnipeg
Halifax (Under construction)

Known the World Over

Admitted to be Superior

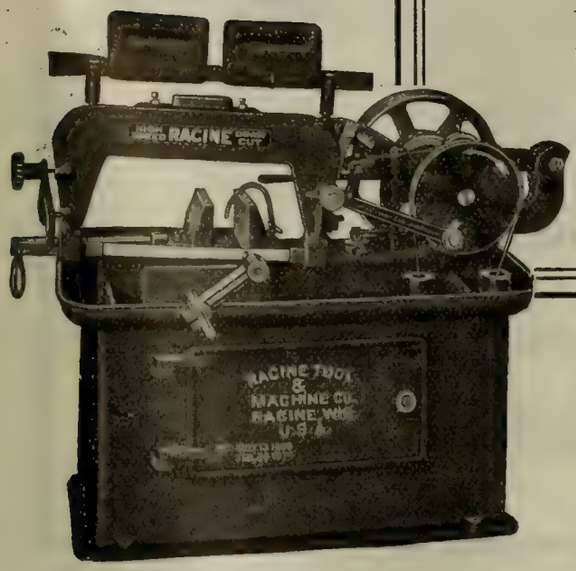
The Racine for Scientific Metal Cutting.

Demonstrate the value of this machine in your own shop, on your own work. Our confidence in the ability of this machine is such that we will send it to you on *trial.* This will give you ample opportunity to study the machine from close quarters; to verify our statements regarding simple construction and operation, accuracy and speed, features that stamp our machine in a class by itself.

We invite your inquiries for full information and installation.

Racine Tool & Machine Co.

15 Melbourne Ave. **Racine, Wis., U.S.A.**



RACINE

KEMPSMITH

UNIVERSAL MILLING MACHINES

Every Kempsmith Milling Machine of whatever size, is provided with a slotted spindle nose for positive drive of arbor and for positive drive of face milling cutter in either direction.

Every machine is equipped with our patented keyed overhanging arm which insures positive alignment of arbor and boring bar and also prevents the cutter being pounded out of line under cut.

Kempsmith machines are heavy, with weight well distributed and their accuracy is guaranteed within very close limits.

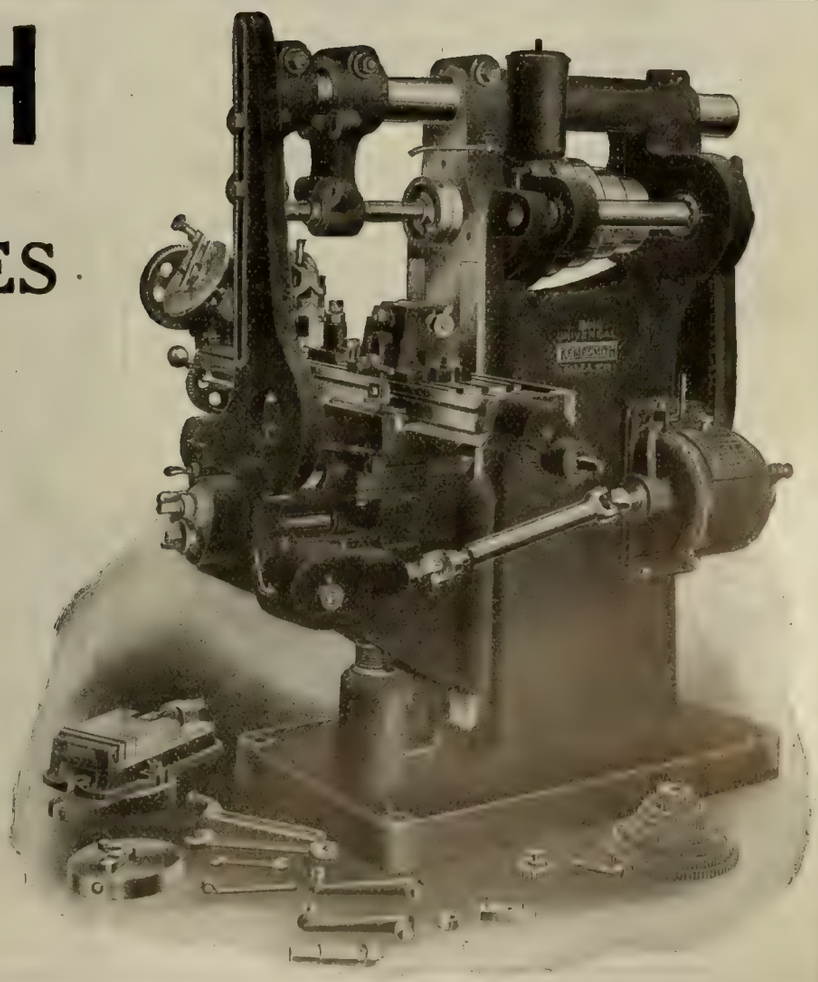
Send for Illustrated Catalogue.

Kempsmith Manufacturing Co.

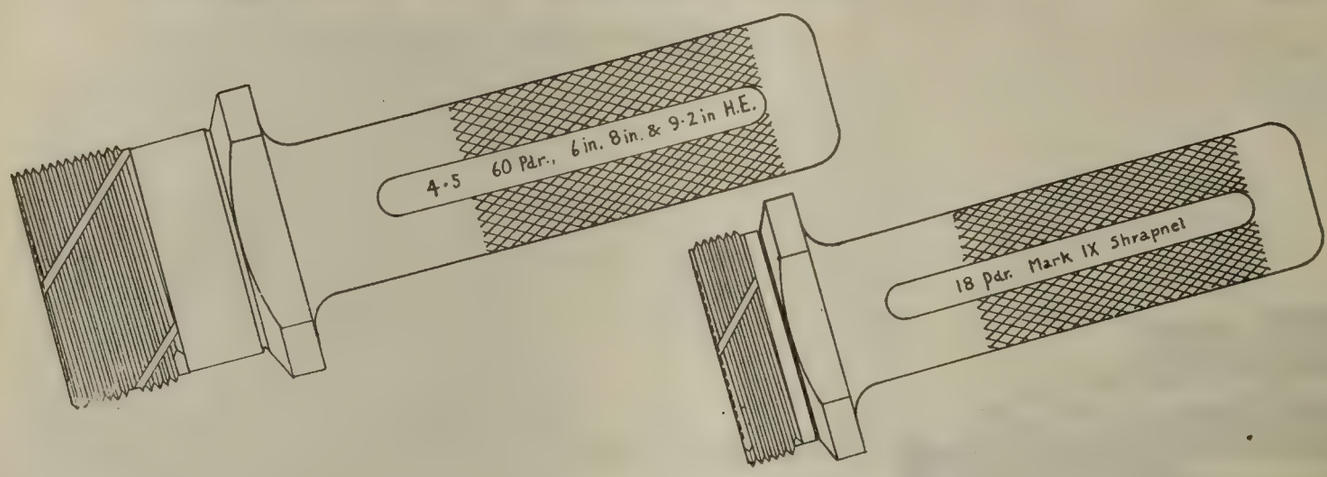
MILWAUKEE, WIS., U.S.A.

AGENTS:

Foss & Hill Machinery Co., Montreal.
General Supply Company, Toronto and Ottawa.
Canadian Western Foundry & Supply Co., Calgary, Alta.



FUSE HOLE GAUGES



Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

DOUBLE SAVINGS

in cutting on PEERLESS HIGH SPEEDMETAL SAWS; they save both Time and Material.

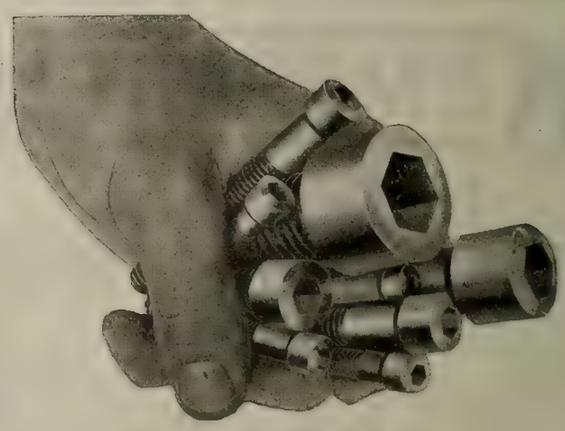
Supposing you save only 1/16 on each cut, 200 lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

Have you ever stopped to consider the waste of material in wide cuts, especially at the present high cost, will pay for a PEERLESS in a remarkably short time.

This is only one of the reasons for so many repeated orders and large concerns having standardized the PEERLESS. The many other reasons can only be fully appreciated after comparative test.

Write for a list of users; some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.



Socket Head Cap Screws

Meet all the requirements of machine tool builders who need a stronger and better screw than the slotted fillister, hexagon head or square head cap screw. Can be set up hard and loosened without marring the heads. Are threaded accurately to standard gauges and perfect in lead. Heads turned true with body, very convenient in close corners and greatly improves the appearance of any machine. Write for circular and free samples.

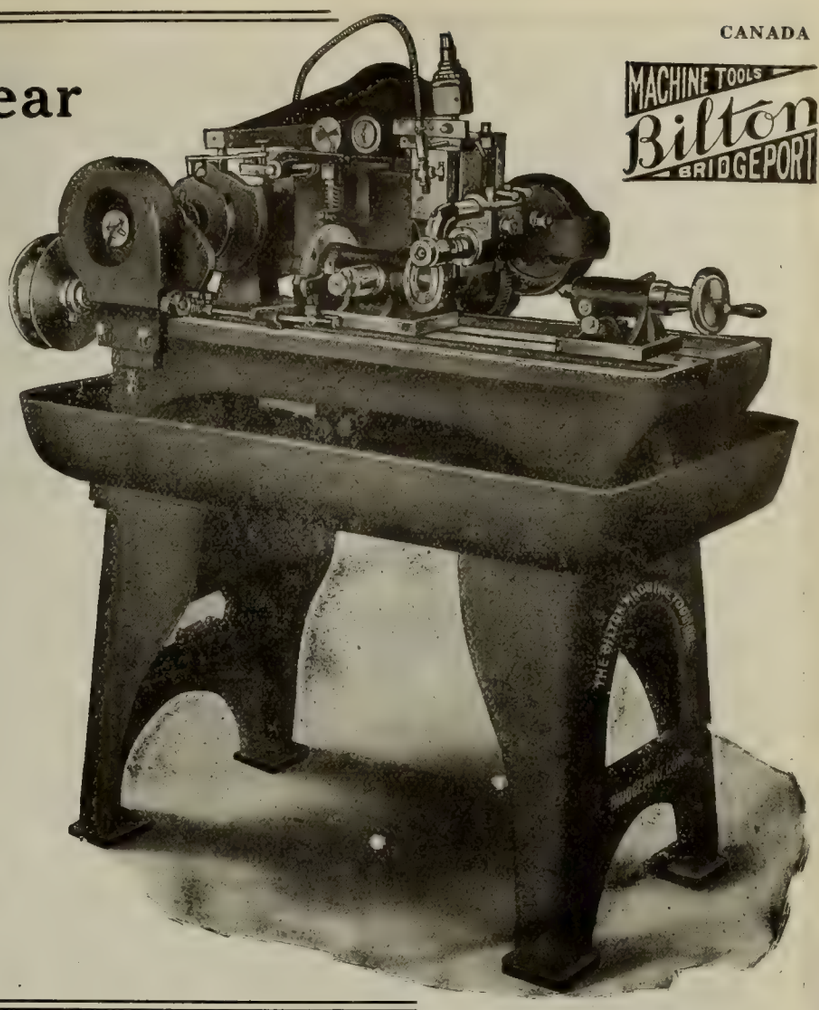
The Allen Mfg. Company

Hartford, Conn., U.S.A.

Bilton Automatic Gear Millers—Spur or Bevel Gears

CANADA

MACHINE TOOLS Bilton BRIDGEPORT



CAPACITY

No. 1 - - 14 Pitch
No. 2 - - 10 Pitch
No. 3 - - 8 Pitch

The Bilton Machine Tool Company

Succeeding The Standard Mfg. Company

Housatonic Ave., Bridgeport, Conn., U.S.A.

Also Manufacturers of —
Plain Horizontal Millers
Automatic Millers
Plain and Ball Bearing
Bench and Column Drills
Milling Cutters
Riveting Machines

Catalog 30 on request

Foreign Agents:
Alfred Herbert, Limited
M. Mett Engineering Company
Chas. Churchill Company, Limited

Telegraph your order at our expense

Don't Wait

In These WAR Times

If you have need of a

Pipe Cutting and Threading Machine

You want to know three things and in this order.

Delivery

All sizes up to 15", for either Hand, Belt or Electric drive, kept in stock for immediate shipment. No waiting.

Quality

The original FORBES. Our specialty since 1882. More than 25,000 in use.

Price

Less than any other Standard Machine on the market, and less than half of many. Our system is the reason.

THE CURTIS & CURTIS CO., 115 Garden Street, Bridgeport, Conn.

Let Starrett Tests Pick Your Blade

On brass rod or tool steel, sheets or girders, you can't be sure of the best work unless tests have come first. Tests are important. Tests **prove** that this or that blade is **the** blade to use.

Tests cost time and money. For that reason we have made the tests for you. We have spent much time in perfecting a hack saw blade for each class of work. That's why

Starrett Hack Saws

of finely tempered tungsten steel, with milled teeth having the proper set are preferred when good work and fast work are demanded.

The Starrett catalog, besides listing a full line of hack saws and hand frames, gives much valuable information on the best blade for each class of work. Drop us a post card asking for Catalog No. 213.

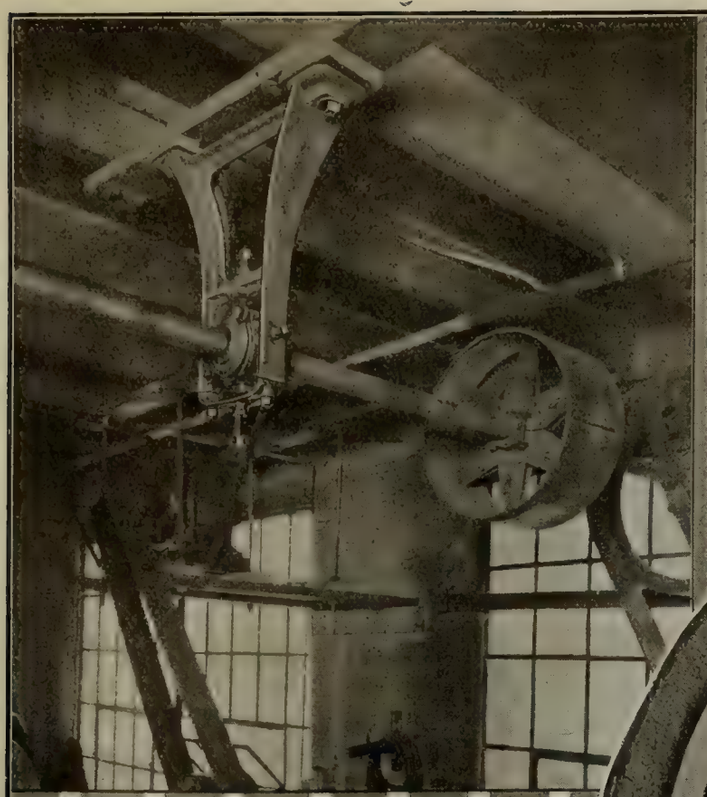
STARRETT HACK SAWS CUT QUICKER LAST LONGER

The L. S. Starrett Co.

The World's Greatest Toolmakers
ATHOL, MASS.

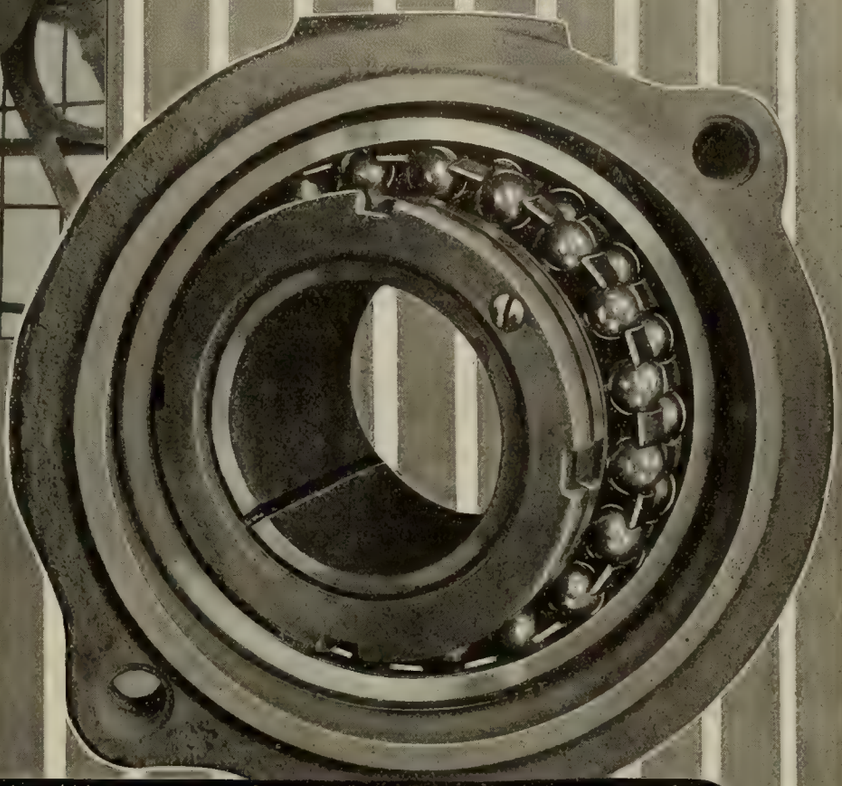
New York **London** **Chicago**

42-736



SKF

BALL BEARING HANGERS



Four Instances of SKF Satisfaction

"We equipped our dye-house with your ball bearings throughout, about two years ago, this being the second installation, the first being only four bearings, and they have proved entirely satisfactory and have not caused us one minute's delay or trouble."
CANADIAN KNITTING CO., LTD.
Hamilton, Ont.

"We are pleased to state that we have been using your bearings since we put up our plant about three years ago, and have had no trouble with them whatever."
THE CANADA STOVE & FOUNDRY CO., LTD.
Ville St. Laurent, P.Q.

"We are thoroughly satisfied with the S K F Ball Bearings which we have been using for several years. They are giving very satisfactory service."
THE WILLIAMS, GREENE & ROME CO., LTD.
Kitchener, Ont.

"I would say a person could not help being satisfied as they are no trouble, just running day after day. Most of them have never been opened or new grease used on them. In fact they are the most satisfactory apparatus I ever had anything to do with."
W. J. BALDWIN,
Aurora, Ont.

MAY WE SEND YOU OUR LATEST HANGER CATALOG?

CANADIAN SKF COMPANY, LIMITED, Toronto, Ontario

SALES AGENTS:

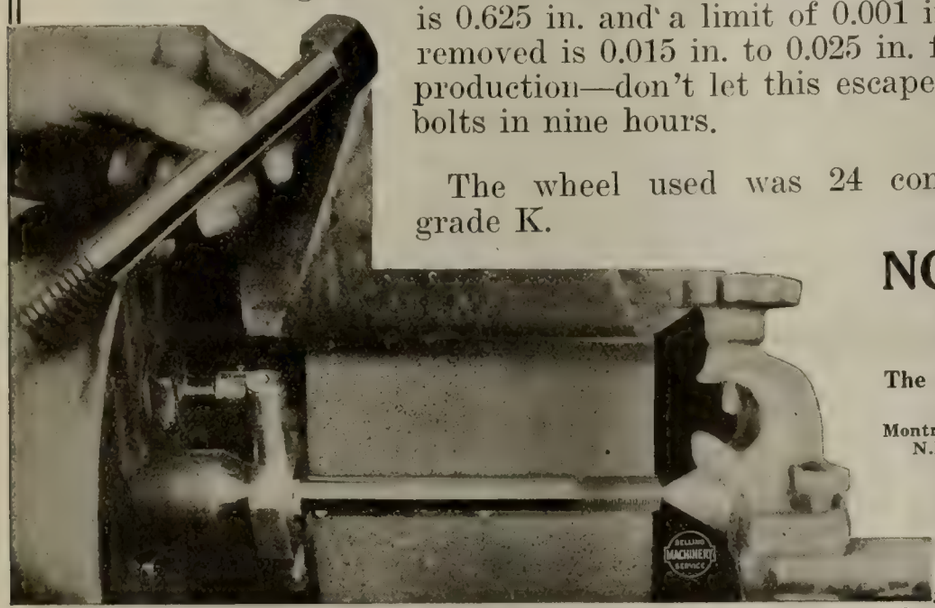
THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED

St. John Quebec Montreal Ottawa Toronto Hamilton Windsor Winnipeg Saskatoon Calgary Vancouver Victoria

Grinding Operation on Front Axle Spindle Bolts

An interesting grinding operation in a large plant for manufacturing automobile parts in which accuracy is combined with good production is the grinding operation on front axle spindle bolts. The bolts are 6 in. long under the head, threaded 1½ in. long at one end, material steel, case-hardened. The diameter is 0.625 in. and a limit of 0.001 in. is allowed. Stock removed is 0.015 in. to 0.025 in. from diameter. And production—don't let this escape you—is 480 spindle bolts in nine hours.

The wheel used was 24 combination Alundum, grade K.



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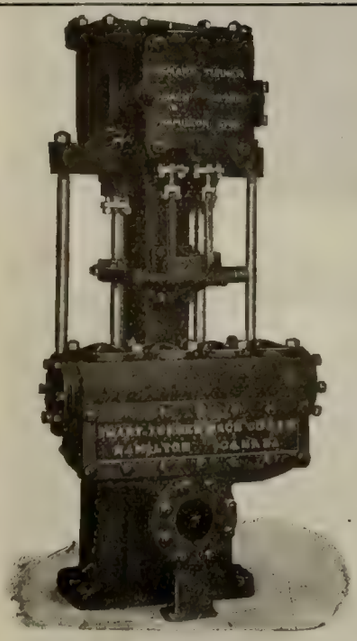

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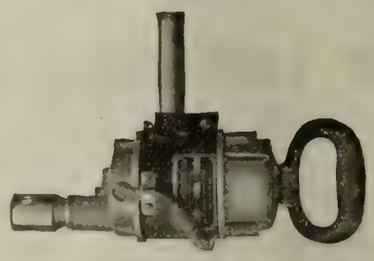

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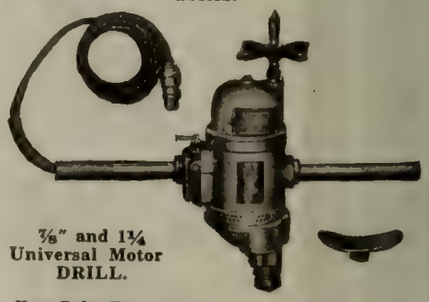

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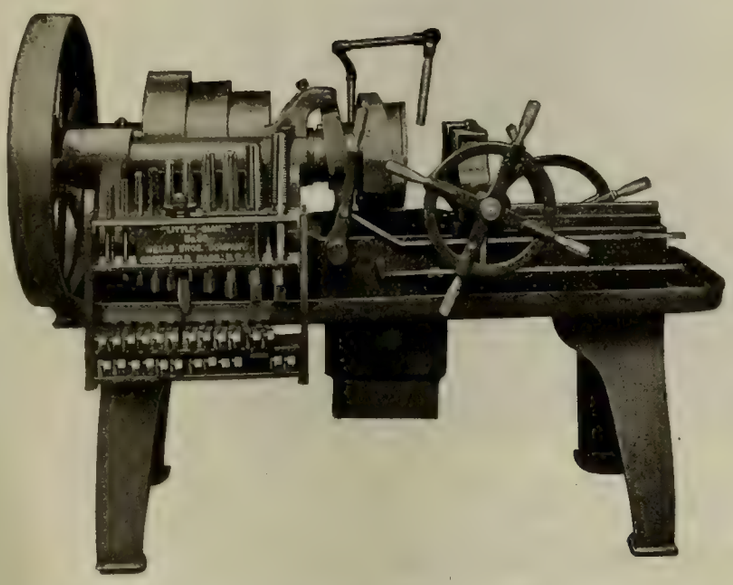

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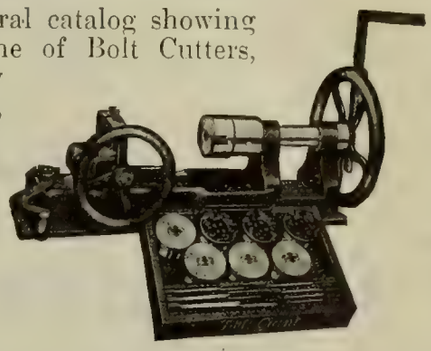

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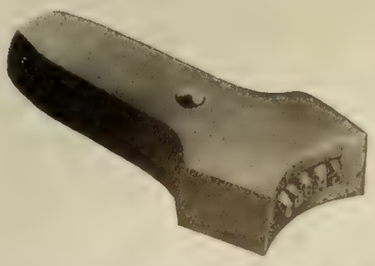

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Press Work Operations in Hospital Equipment Production--I.

By D. A. Hampson

Operations possessing marked features of economy, adaptability and lack of intricacy in the finished product are characteristic of the work described. The factors of labor cost, quantity production, necessary degree of accuracy, and cost of dies are related to each other in a manner which must receive careful consideration if successful results are to be obtained.

NO method yet devised can equal that of press work for rapid production of those parts which can be made to come within that particular field. To cut out sixty pieces of sheet metal per minute of intricate shape, for instance, by any other means would be simply impossible. There is of course the commercial side to be considered and, unless there are enough pieces of the same kind to be made so that the cost of the dies added to the labor charge will be less than the cost by some other method, it is better to adopt the method which does not entail this heavy initial expense. But, if the piece is to be made in large quantities and if it is a job that is recurring, then the savings of the press method speak in loudest terms.

In stamping intricate shapes on the press, the saving in labor charges will be the most apparent, for by no other method could the same piece be produced as quickly and, what is more important in these days, by no other method could as accurate work be turned out by a like grade of unskilled labor. Any person of average intelligence and care makes as good a press hand as the best machinist in a short time and, unlike the latter, is content to stick to the work.

Adaptability of Presses

Presses, or punch presses as they are often called, are used for a great variety of work such as bending, forming, cutting-off, and drawing, in addition to just that of cutting out various shapes from sheets and strips of sheet metal. Quite often assembling operations are performed. It is not always necessary to make a new punch and die for each new job that presents itself; often a notch or a half round is to be cut and by a shifting of the guides on an existing set, the old tools can be made to answer fully as well and at no expense. A careful following of this plan will result in substantial saving and in a plant manufacturing a staple line this can be kept in mind in designing new tools, and a single punch and die with adjustable pieces can be used to form the same piece for the several sizes of the device being made.

There are a number of interesting features to be found in the press work done in a factory that at present makes metal furniture for hospitals though its regular line in peace times is very closely related and many tools that proved their worth in the past were applied or adapted to the new work. Stands, beds, chairs, and cots are equipment that demands no great degree of accuracy in the making. Being of metal they are amply strong for the severest strain that can be put upon them. The external finish is also not as important as would be the case if the pieces were not finally given several coats of white enamel, applied by dropping the piece—whole—in a tank and then baking

Material Used

The materials used on such work are of the poorest grade. That does not mean that the work is slighted because it is heavily coated, for it is not, but there is no economy in putting a piece of automobile steel in a chair when an iron rod of the same size will do as well, show a factor of safety of four, and cost a third of the steel. Rods are of iron, angles and channels and tees are rerolled material, oftentimes very hard, and sheets are black with more or less scale. These are the materials used for press work and as may be supposed they are hard on tools, the gritty nature of all of them taking the edges off in a relatively short run.

One of the most common mistakes made in connection with punch and die work is the too close fitting of these parts. Where an exact size of opening or of "wad" is not required, the common rules, for making the clearance between the punch and die a proportion of the metal thickness to be cut, do not give clearance enough for tool economy. In this shop, they always leave 1/64 in. clearance all round for any work down to the thinnest sheet and more for thicker pieces, and they have little or no trouble, a set of tools lasting indefinitely. As an instance, a great many ⅜ in. holes are punched through the ¼ in. thick channels and punches 23/64 in. had been used with fair success and occasional breakages: the press hand carelessly (?) put in a 9/32 in. punch one day and never noticed the difference until it was about time for a broken or stuck punch, and he investigated the lack of trouble. From that time, the shop made all punch fits decidedly sloppy and effected a marked saving in tool upkeep.

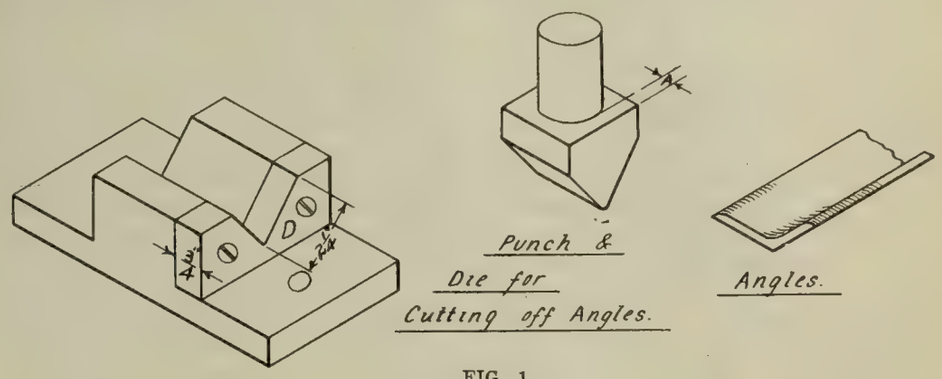


FIG. 1.

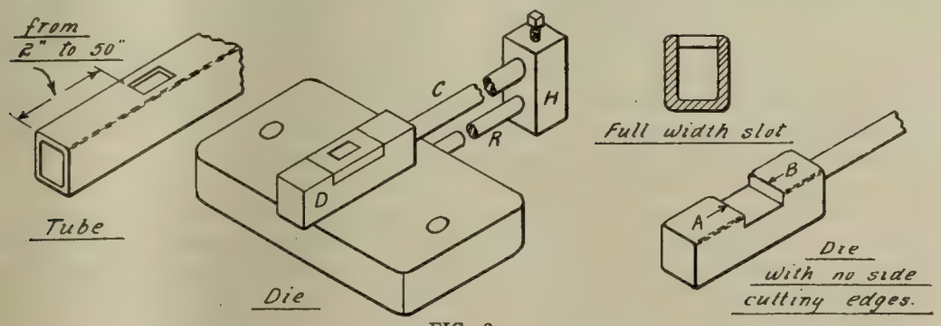


FIG. 2.

The quickest way to cut off any piece of stock is to shear it. Angles are no exception. The punch and die used on the press for this are shown in Fig. 1. The punch is made solid with the shank and gives less trouble than a built up one. A wearing distance A on each side gives the two cutting faces indefinite life. The die D is also double faced, reversible, and like the punch is worn on both faces before grinding. It is held against a planed vertical face of the bolster. As will be noticed, the inner corner of the angles is rounded and the outer one sharp; the tools are made to correspond and to accommodate all sizes up to 2 in.

Notching Tubing

One of the interesting jobs is the cut-

ting of notches in tubing and pipe to receive cross members or stay rods. These notches have to be put in sometimes as far as 50 in. from the end of the tube. The arrangement for this work is shown in Fig. 2. What corresponds to a bolster is a cast iron plate fastened to the bed of the press and having a ⅝ in. rod R set in the back and carrying the block H. In this block another rod C slides and it in turn is set to whatever spacing of notches it is desired to punch. The adjustable rod is fixed to the die proper. This is a soft steel piece, an easy sliding fit in the tubing to be punched: it has an inserted tool steel plate on top that does the actual cutting. In use, the tube is slid over the die piece D until it strikes the block in the rear and the punch is then tripped. There is clearance between the die and the bolster, and the supporting rod is yielding enough so that, under the pressure of the punch, the whole combination rests firmly on the bolster. Cutting is remarkably easy and is neatly done. The tubes have walls varying from 1/16 in. to 3/32 in. thick.

When there happens to be a shortage of tool steel of near size, the dies just described are made from worn out files and they give very good service. Some of the tubing dies are made entirely of one piece of tool steel, but usually this is only done when there is to be cut a full width slot as shown by the section. The odd feature of this job is that, though a four sided slot is punched, the die has only two cutting edges, the edges A and B. The average mechanic would not believe that this would produce a good job, but it does as thousands of holes are punched in this way.

Supporting the Punches

An improved form of punch is used in this shop and in many others, but its use is not wide spread. Assuming that a notch is to be cut in the side of a piece of bar stock as shown, the average punch would be a square one and the die an open sided one, both as shown in Fig. 3. With the machine in loose condition, the die poorly set, the shear on the punch ground a certain way, and with careless feeding—all of these conditions would have a tendency to force the punch away from the die and result in a badly burred cut as well as running the risk of bending or breaking the punch. Now with the improved form this is impossible under any or all of the unfavorable conditions. The die is made four sided with two cutting edges, as before, and the other two edges rounded. The punch has an extended end on the non-cutting side which guides it into the die before shearing begins. And, once in the die, the punch is supported against any side movement.

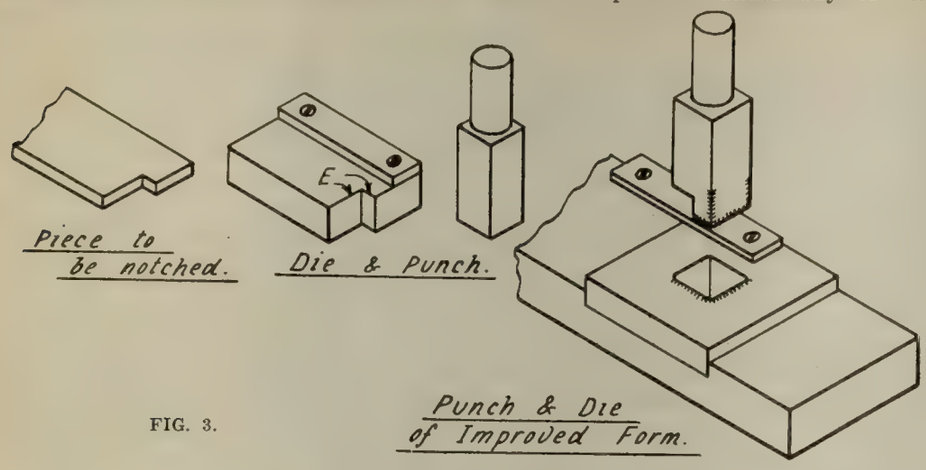


FIG. 3.

INDUSTRIAL TRAINING IN SCOTLAND

ACCORDING to recent reports in the Times Engineering Supplement, the new scheme of continuation classes which the Glasgow School Board has just put in operation for the ensuing winter session forms at least a promising step in the direction of meeting the educational needs of the workers.

As regards technical education in subjects bearing upon the staple trades and industries, the West of Scotland area is already well organized. In all local centres of industry evening continuation and technical classes are held during the winter months; the former act as a connecting link between the day school and the technical classes and the latter as a preparation for the higher technical education provided at the Royal Technical College, Glasgow. The instruction provided at all local centres is co-ordinated with that of the Royal Technical College, all courses are worked to a syllabus circulated by that body and the classes are subject to inspection and report by the Director of Studies and his staff. In this way a uniform standard is maintained throughout the various local technical schools.

This organization of the technical side of education has already produced good results, and when trade education is organized on equally efficient lines an important step forward will have been taken. That there are numerous difficulties in the way of the attainment of this standard of efficiency will be at once apparent from consideration of the fact that as the scientific facts upon which technical education is built up are universal and unchangeable the same theoretical treatment of any subject is universally applicable, whereas trade practices vary from district to district and from shop to shop, and are subject to constant change and modification also. The vast number of specialized branches which shoot off from parent trades and call for special educational treatment make the fixing of suitable trade school courses a problem of considerable complexity. At present trade instruction is provided for those directly connected with the trades in each of the following subjects:—Mechanical engineering, marine engineering, locomotive engineering, patternmaking and moulding, boilermaking, carpentry and joiner work, masonry and building. In practically all cases lectures embracing drawing office work, simple calculations, and the minimum amount of theoretical work necessary to the intelligent understanding of the trade processes taught form part of the course, and arrangements are made to give special attention and tuition to trade class students who may be in need of it owing to a deficiency in general education.

Only by the direct aid of the heads of commercial and manufacturing firms can progress be made, for the drawing up of a syllabus of trade classes which will be useful to the employees of a group of works of the same trade, but of divergent branches, must rest very largely on an amicable compromise in regard to the special requirements of employers in each branch of the trade. To a great extent the Glasgow School Board has secured the interest and co-operation of employers, but much yet requires to be done to extend the movement and to make the alliance between the educationist and the employer a permanent and increasingly important asset in the development of individual efficiency.

SUBSTITUTES FOR PLATINUM

THE enormously enhanced price of platinum since the outbreak of war has been due to two causes: first, the greatly decreased production (especially in Russia) and the largely increased demand for essential war purposes. In normal times the United States imports about 75,000 ounces (troy weight) of which roughly one-third was used for electrical and chemical purposes, one-third in dentistry and one-third for jewellery.

The special physical and chemical properties of platinum render a perfect substitute a practical impossibility, but recent investigation has produce several alloys which are satisfactory for certain purposes. The only metals which come into consideration as useful alloys with platinum, are iridium, rhodium, palladium, gold and silver. Iridium and rhodium are so rare and are so difficult to work that they are practically excluded and silver is too readily attacked by acids. There thus remains only gold and palladium, but by alloying these three metals in various proportions a number of useful products have been produced, and they have been given the name of "Rhotanium."

HEAT-TREATED GEARING.

By W. H. Phillips.*

STEEL gears may be divided as to material and structure into two general classes, i.e., alloy steels and carbon steels. Alloys of nickel, chrome, vanadium, and similar elements, with the steel, produce a very strong, tough gear which, however, due to its high cost is practicable for only a few special uses. The great field of gearing is served by carbon steel products with entire satisfaction. Since it is possible by heat treatment to increase the life of carbon steel gears by as much as 200 to 400 per cent., with a cost increase of but 25 to 50 per cent., these processes have received much attention. There are now three general classes of treatment in vogue, viz.: Oil treatment, case hardening, special treatment.

The first two were introduced in the above sequence and have met many problems. Each has its advantage for different services and in such has proved very efficient. There are conditions encountered, however, in which these two processes are not applicable. The third process mentioned has been developed after a careful study of actual conditions and embodies the best qualities found in the other two.

There are applications where the service is so light, that the resultant long life and low maintenance cost do not recommend a high grade product. There are other services where the gear must transmit a uniformly high torque without sudden jars or dynamic blows, in which case it is a question of wear alone, requiring such surface hardness as is found in the case hardened product. There are still other applications where the load to be transmitted is uniformly low but with occasional shocks. This last named condition requires a gear with only medium hardness but with high ductility such as the first class or oil treated gear. Other installations, and these constitute a majority, impose both the heavy duty service with its resultant wear as well as shocks with the liability of breakage. It is for such service that the third class or special grades have been developed. By analyzing the conditions and selecting the proper grade, it will be possible to obtain the best results.

Carbon Steel Treatment

With the ever increasing knowledge of steel and its heat treatment being accumulated year by year, the first two grades were improved gradually until now they have been perfected as far as possible and the metallurgist for some time has been looking to other fields for a grade that would include the good qualities of both the above grades yet supplying what they lacked and if possible reducing the cost of the heat treatment. As stated before the alloy steel had to be eliminated due to its cost and the only course left was to develop a treatment for carbon steel that would give the required results.

*Research Engineer, R. D. Nuttall Co., Pittsburgh, Pa.

It was found that by slight changes in chemical structure, a combination could be obtained, which when subjected to a special treatment produces physical properties peculiarly adapted to gearing. The hardness at the surface of the steel is from three to four times that of untreated steel, and grades off slightly toward the center of the tooth until it is from two and one-half to three times as hard as untreated steel. This reduction in hardness is in a straight line ratio and each fibre of the steel from the surface to the center, or neutral axis of the tooth, which may be slightly to one side of the geometric center, will be stressed in proportion to its ability to carry the load. When the tooth receives a blow or shock, every fibre is carrying its share of the load.

The ductility of this steel is comparatively high and is in inverse ratio to the strength. The metal is homogeneous, there being no line of demarcation between any two fibres. While the surface of the tooth is hard yet it is of a tough hardness and will not check nor spall. It is often advisable to treat the pinion only of a combination, it being the weaker and hardest worked member. A pinion so treated, due to the nature of the harness, is not liable to cause excessive wear on the meshing untreated gear. It can be readily seen that a gear of this type will have a great tendency to overcome breakage and at the same time give a high resistance to wear. It should at least triple the life of untreated gearing, and eliminate the cost of consequential damage and delays caused by gear breakage.

If by increasing the cost of gearing from 25% to 50%, a gear is produced that will more than triple the life of the untreated steel gear and at the same time eliminate breakage with its consequential damage, there can be no doubt of its economy. A few of the advantages to be derived from such a step are:

1.—Lower ultimate cost of gearing.
2.—Reduction of time loss.
3.—Reduction of labor maintenance.
4.—Reliability.

For example the untreated gear costs $20.00 and runs one year. The treated gear costs $30.00 and runs three years. This would show a saving of $30.00 on initial cost. If it requires two hours to make replacement, it would require six hours to replace the $20.00 gear three times, and but two hours to replace the $30.00 gear, or four hours saved in labor, also four hours saved in production of the machine. The hazard of breakage with its consequences is an unknown factor but may be serious in some services.

The wide application of the heat treated gear not only in the railway and automobile field but also in many branches of the industrial field, among the more notable being the steel mills, foundries, glass plants and mines has been so successful that it is not a question of heat treated vs. untreated gearing but rather the selection of the proper grade of treated gear for the service to be performed.

In conclusion it might be said that with many industries of the country working over capacity, the necessity for reliability of machine parts was never before so desirable or the consequences of breakdown so costly. A careful study of the gear situation in the plant or mine should be made at this time and any changes insuring this reliability acted upon at once.

MANUFACTURE OF SYNTHETIC ALCOHOL IN SWITZERLAND

By Mark Meredith

IN 1897 the Uzines Electriques de la Lonza commenced the manufacture of calcium carbide at Gampel, in a works with a motive power of 2,000 h.p., and similar enterprises were commenced about the same time at Lauterbach (near Soleure), Neuhausen and Thusis. From that time onwards the industry has grown enormously, owing to the great developments in the utilization of hydraulic power, and has now become one of the most important industries in the whole of Switzerland, the present output of carbide being about 70,000 tons per annum, and absorbing some 45,000 h.p.

Until quite recently the chief use of calcium carbide was for generating acetylene for lighting and more latterly for autogenous welding, but it has other applications as well, such as the fixation of atmospheric hydrogen. If finely powdered carbide be heated to about 1,000 deg. C., it combines with the nitrogen of the air to form calcium cyanamide, which is in growing demand as a fertilizer, computing with nitrate of soda and sulphate of ammonia. Treated with steam, calcium cyanamide furnishes ammonia, and calcium carbide therefore may serve as the raw material in making sulphate of ammonia, and, indeed, for nitric acid too.

A new industry is now springing up, which is based on the fact that acetylene is an unsaturated hydrocarbon, namely, the manufacture of acetic acid and alcohol, for which purpose the La Lonza Co. is erecting a works in the Valais canton, and has applied to the Swiss Excise Board for a twenty years' concession, the object being to render the country independent of foreign countries in respect of products which have hitherto had to be imported. The production of alcohol from calcium carbide is effected by treating acetylene in such a way as to combine with it one molecule of water, acetaldehyde being formed. This product is readily oxidized, one atom of oxygen giving acetic acid, whilst two atoms of hydrogen furnish alcohol. Briefly the production of this synthetic alcohol is as follows: Calcium carbide is produced by fusing quicklime and coal together in the electric furnace, and acetylene is generated by adding water to the carbide. The purified gas is treated, in a special apparatus, with mercury salts, and transformed, by the addition

of water into acetaldehyde, which in turn is converted into alcohol by combination with hydrogen.

Apart from the manufacture of the carbide, the production of the necessary hydrogen entails a very large consumption of electrical energy. To make one ton of alcohol requires, in practice, two tons of carbide and 500 cubic metres of hydrogen, the former needing 8,000 kilowatt hours and the latter 3,000 kilowatt hours of electrical energy, or 11,000 kilowatt hours in all, to say nothing of 2½ tons of coal and four tons of lime. The new La Lonza works are constructed for an output of 7,500 tons of alcohol per annum, with a possible increase to 10,000 tons, which is equal to the average annual imports of this product to Switzerland. The manufacture will consume 100 million kilowatt hours of electrical energy and 20,000 tons of coal, which latter must be imported.

WOMEN ENGINEERS IN BRITAIN

A THOUSAND women are wanted at once to train for engineering and other advanced forms of work in the munition factories. The call is urgent, and to enable patriotic women to offer their services immediately the Training Section of the Ministry of Munitions is providing free instruction in machine work (general and more advanced), oxy-acetylene welding, aeroplane woodwork, optical instrument work, draughtsmanship, electrical work, core making, etc., etc. Instructional workshops, where the conditions of the best modern factories obtain, have been set up in London, Birmingham, Bristol, Luton, and Manchester, and other training centres have been established in twelve Metropolitan areas and in twenty-four provincial districts, as well as in four centres in Scotland.

An appeal is made to women who are adaptable and intelligent, of good physique, and between the ages of eighteen and thirty-five years, to offer themselves at once for training in this essential war work. Such women are to be found in every class of society, and they are asked to apply at once to the Director, Training Section, Ministry of Munitions, 6, Whitehall Gardens.

BIG INCREASE IN LUMBER OUTPUT

THE volume of logs produced in the Vancouver district of British Columbia during August showed a very substantial increase over that of August last year, being no less than 12,000,000 feet in excess of the production for that month.

W. W. B. Armstrong, secretary of the B. C. Loggers' Association, discussing the logging situation generally, declared that while the demand for lumber had increased greatly of late, owing in a large measure to shipbuilding, it was not anticipated that there would be any shortage of supply, nor did he anticipate there would be any great surplus. It is understood that some yards have recently experienced difficulty in getting certain special kinds of lumber, but this condition was stated not to apply to timber in general.

Each of the forty wooden ships now on the building programme in this province would, it was said, absorb 1,500,000 feet of lumber, making a total of 60,000,000 feet which would be required in all for this purpose alone. As indicating the manner in which shipbuilding had influenced lumber production, it was pointed out that according to Mr. Van Dusen, district forester, 2,000,000 more feet of Douglas fir was produced in August as compared with the corresponding month last year, when the output was 36,000,000.

According to figures it is indicated that perhaps the greatest effect which the war has had upon the lumber industry of the province, is in respect to the production of spruce, which is used chiefly in the construction of aeroplanes. In this district in August, 1916, only 2,200,000 feet of spruce were scaled, while in August this year the output had jumped to approximately 7,000,000 feet. Hemlock and other timber also showed big increases, and it was estimated that if the present rate of increase continued the year's output of lumber will show an increase of about 52,000,000 feet over last year.

PICKLING VS. SAND-BLASTING

IN a paper read before the American Drop Forge Association it is stated that, in the drop-forge industry, pickling, tumbling and sand-blasting are the three principal methods used for cleaning. Pickling is the preferable way if the acids and salts are thoroughly washed from the surfaces of the forgings. There is no favorable comparison between pickling and sand-blasting. In the former method all surfaces are cleaned thoroughly from oxides or foreign substances, which are detrimental to the machining operation, while in the tumbling and sand-blasting fine sand is hammered into the surfaces. The resulting cost of machining is from 300 per cent. to 400 per cent. more than that of pickled forgings. Moreover, the drop-forgings that have small bores or indentations are not cleaned properly except by pickling. The additional cost of pickling is more than offset in the machining.

TESTING YOUR PRODUCT UNDER ACTUAL CONDITIONS

By A. L. Loy

IN the drilling of oil wells, the use of steam as a motive power has always been pre-eminent. This was due, somewhat, to the partiality of the driller and also to the flexibility of this power. One manufacturer of oil engines, in endeavoring to introduce his engine and other apparatus for this class of work, decided to test the engine under the actual conditions such as would prevail in the field. Being located in a district in which crude oil had at one time been found quite extensively, a well was drilled right in the yard of the plant. A regular driller was hired who had previously used nothing but steam, thus subjecting the engine to the same care it would actually receive in the field. While this seemed rather an expensive sort of a test, as the well proved to be a non-producer, yet this very test brought out all the weak points in the design of the engine for this particular class of work and, needless to say, there were many. It would have been a much more expensive procedure to have put the engine out on the market and let others discover these points. The engine is located in the corrugated iron shed at the left and is not visible itself. Even in the machine tool field at the present time we find many tools which show that they have not had a sufficient test under actual running conditions before being placed on the market and the purchaser very naturally resents being put to the expense of doing work which should have been done by the manufacturer himself.

TESTING OUT OIL DRILLING MACHINERY IN THE YARD OF THE MANUFACTURER.

UNIQUE SPECIMEN OF OLD PLANING MACHINE WITH CHAIN DRIVE.

AN INTERESTING OLD PLANER

By D. S. Mann

THE writer recently ran across the old planer shown in the cut in the toolroom of a factory manufacturing wooden pails. The planer had been in their plant for about three years but they were unaware of the original purchaser. According to the name plate it had been built in Boston in 1848. It will be noticed that the table is driven from the link chain. The vees supporting the table are inverted, presumably so as not to retain any chips which might fall upon them. The crossrail is raised and lowered by the central screw. An automatic cross feed is also provided.

TESTING STEAM HEATING APPARATUS

By T. J.

A CERTAIN weight of steam at a certain pressure, and, therefore, containing a certain number of heat units, raises the temperature of a certain volume or weight of water or air a certain number of degrees, absorbing a definite number of heat units; the proportion between the heat units absorbed by the water or air and the number present in the steam entering the heating apparatus is the measure of the efficiency of the apparatus. By keeping records of these quantities, any failures, and tendency to failure on the part of the heating apparatus, will be given early notice of. Exhaust steam that has done its work in an engine is often very properly used for heating apparatus purposes; it sometimes carries the vapor of oil that has been used to lubricate the piston of the cylinder, and the oil is deposited upon the steam surface of the steam pipes used in the heating apparatus. A very thin film of oil interposes a considerable resistance to the passage of heat from the steam to the water, so that more steam is required to heat the water to a given temperature. The steam flow charts, compared with the water flow and temperature chart, should give warning of this, and show the engineer when the steam pipes should be cleansed.

Grids of steam pipes sometimes leak at the joints, some of the steam passing through the leak into the water. This may be very bad where the water is used for certain purposes and requires to be checked; the steam and water charts should again give warning by the smaller quantity of steam used to heat the water. When steam is delivered directly into a body of water, the whole of the heat units it carries go to raise the whole of the water's temperature; when the steam is flowing in a pipe and the water is surrounding the pipe, the usual arrangement in steam heating apparatus, only a portion of the heat units present in the steam go to raise the temperature of the water.

The check upon the use of the steam for heating may be carried still further. Whether the radiators or heating pipes employ steam or hot water, a certain definite number of heat units are delivered to each radiator, and each length of pipe, and the heat units are employed in maintaining the pressure of the air in the plant to be warmed against the continuous flow of heat from it, through the walls, windows, etc. The flow of heat outwards varies with the difference of temperature between the inside and the outside atmospheres; its rate differs through the walls and windows, but it may be calculated with a fair approximation. The proportion between the heat units delivered in the radiators and those absorbed by the air of the apartment in making up for the outflow will be the measure of efficiency of the radiators. If a record is kept also of the temperatures in different parts of each apartment heated, and of the quantity of steam or hot water, and their temperatures delivered to each radiator, a check will be furnished upon the heating system of each apartment, of each building, and of the heating system as a whole.

POWER FROM SAWDUST

By L. E.

WITH the object of affecting further reductions in the transit and use of anthracite coal for gas making for gas engines, experiments have been made with the use of sawdust and shavings. All users of suction gas plants who have quantities of this material available will find that their gas engines will work equally well on sawdust as on coal, and that three tons of sawdust will give the same results as one ton of anthracite coal. For the conversion of sawdust into gas, the plant is slightly larger than for coal, and with the addition of a tar extractor the principle is the same. The possibility of the use of these waste materials is not so generally known, so that the volume of sawdust wasted and destroyed is serious.

CHILLED iron is the result of the sudden cooling of molten cast iron when poured against an iron ring which is part of the mold. Its discovery is said to have been accidental. In an English foundry, in the eighteenth century, the slopping over of a ladle of cast iron caused part of its contents to come in contact with cold iron lying on the floor. In breaking up this scrap it was discovered that the iron was white and much harder than that secured from the ordinary foundry process of pouring the metal into a sand mold. The result of this discovery was the introduction of chilled iron.

THE attention of the British Food Controller has been called to the wastage of foodstuffs in some of the iron foundries. It is the custom for a considerable quantity of flour, either wheaten or rice, to be used to "dust" the moulds before pouring the molten metal. In practice there is required on an average from 1½ lb. to 2 lb. of flour in the working of seventy to eighty moulds per day, the size of moulds or flasks used being 24 in. by 12 in. For small work, approximately 20 lb. to 30 lb. of flour would be used per ton of castings. An experiment has shown that fine sawdust constitutes an efficient substitute, also that wood dust, such as is produced in finishing wood on sand or glass paper machines, is better than flour—either wheaten or rice.

DROP-FORGING dies made from alloy steel castings are now in use with a gratifying degree of success. The most satisfactory alloy, according to the "American Drop Forger," is vanadium-carbon steel, with a fine close-grained structure. The use of vanadium gives the necessary combination of toughness and hardness with exceptional wearing qualities and resistance to cracking. A run of 40,000 motor-brake support forgings was, for example, made from a pair of cast-steel dies without any great amount of wear. For general drop-forge work the best practice is to cast the dies with the tenons and with the impressions for breakdowns approximately to shape, allowing a small amount for finish. The impression for the die is then sunk in the solid block. For plain forgings, the impressions also are sometimes cast in the dies, allowing some metal for finish. Cast vanadium-steel dies, when properly annealed by the foundry, can be machined without much difficulty. After being machined the general practice is to heat the dies to 1,550 deg. or 1,575 deg. Fah., and quench in oil, and in most cases no further heat treatment is required.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

THE MANUFACTURE OF HARDENED THREAD GAUGES—I*

By G. Doorakers

VERY little practical information has been published concerning the manufacture of hardened thread gauges. The available data usually do no more than inform us how to determine the correct thread, and make little attempt to show us how to obtain it. The optical way of checking the gauge is, of course, an excellent one, but in the following notes I shall only give a mechanical way of checking, which has, in all respects, compared very favorably with the optical way.

In settling the layout for the manufacture, the first item of importance is what machine to employ. The lathe is most commonly used, but in some cases thread milling machines are used with fairly good results. For the finishing of a reliable screw gauge, however, a lathe is hard to beat. It is necessary to select one with a correct lead screw, as all results will depend upon that item. All other faults can be easily rectified. The lead screw can be tested by screwing a plug of a certain pitch, but as the screw may vary in different places, it is necessary to use in making the gauges the same part that has been used for the test, unless we test a considerable length, by screwing plugs 1 in. or 2 in. long, in different places between the centres. By carefully numbering and marking these test pieces we may obtain an accurate record of the lead screw. If we cannot test the pitch ourselves we have to depend on the report from a reliable source.

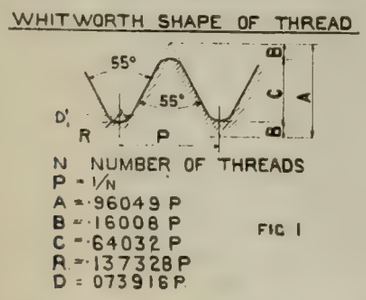


FIG 1

The Whitworth shape of thread being most commonly used, in England at any rate, and at the same time being the most difficult to produce, we will only consider that particular shape of thread.

Fig. 1 shows the shape of the thread, and the value of some of the most important dimensions expressed in terms of the pitch. For cutting a correct thread internal as well as external circular form tools are used, and to obtain these form tools we set out from two original tools, which we will call the master tools. The first tool which cuts the flanks of the threads, and the correct radius at the point, will be called the male master tools, and the second one, which cuts the radius only, will be called the female master tool.

Male Master Tool

Fig. 2 shows the male master tool, which is made of round material. The round shape was chosen because it is easy to manufacture, and at the same time cheap. The cutting edge of the tool has no top rake. The angle in the flat must therefore be exactly 55 deg. The front relief is 15 deg. The first thought was, of course, how to produce that 55 deg. angle in the flat, combined with the 15 deg. relief. For that purpose a fixture, shown in Fig. 3, was designed. This fixture can be bolted on the table of a surface grinder, or used on a magnetic chuck.

To obtain the greatest obtainable accuracy the pegs A are kept as far apart as possible. The tools are therefore made in double lengths, and a nick is turned half-way down to fit peg B, so that when the finished cut is taken over the four sides with one setting of the wheel, the angle in the cutting edge will be central, and both tools will be the same length.

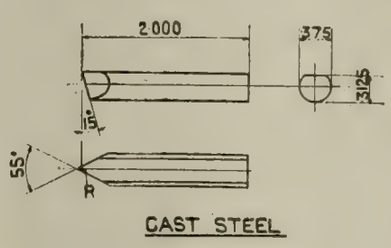


FIG 2

The tools are laid with the flat side against the planes V, and held in position by a little clamp plate. The diameter of the pegs A was made .376 inches to allow for a press fit in a .375 in. hole. The angle of the flats in the cutting edge is 55 deg., therefore the pegs A in the planes V make an angle with the vertical which equals 90 deg.—27 deg. 30 min. = 62 deg. 30 min. The angle of inclination of the planes B with the vertical is the complement of the angle a in Fig. 4.

Fig. 4 represents a perspective view of the point of the tool. Assume A C =1. In triangle A B C, A B = tan 15 deg.

In triangle ABD, AD=AB sine 27½ deg.

AD=tan 15 deg. × sine 27½ deg.

In triangle A C D:

$$\tan a = \frac{1}{AD} = \frac{1}{\tan 15 \text{ deg.} \times \sin 27\tfrac{1}{2} \text{ deg.}}$$

a=82 deg. 57 min.

The angle of inclination of the planes V—Fig. 3—with the vertical is the complement of angle a and therefore 7 deg. 3 min. The angle of 55 deg. is verified by a gauge shown in Fig. 5. This gauge consists of a cast iron plate with a hole in it. The pegs A are so arranged that when the hardened parallel strips B are laid against them the whole point of the tool is visible against the light through the hole. The positions of the pegs A in relation to one another are very important, and a template must be made for drilling and reaming these holes. After grinding the flats the required radius was originally produced by an oilstone, but as oilstoning is a lengthy and an unsatisfactory job, a fixture was devised to produce the radius in a mechanical way.

Fig. 6 shows the general arrangement of that fixture. It is clear that the success of the fixture depends on the accurate spacing of the pegs A, which are the stops for peg B. In rotating the knob from one stop to the other, the angle traversed must be exactly the required angle. For that reason four holes are bored round the centre hole, and after calculating all the chords, a template is made to bore the holes, three of which are carefully bushed afterwards. The top hole is utilised as a centre, which serves for setting the fixture exactly under the centre of the wheel. The pegs A and B are made a good fit in the bushes, and can therefore be easily replaced in case of wear. At the same time it makes it easy to replace the pegs A by different diameters which will be found useful later on.

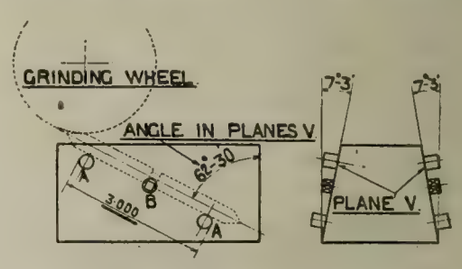


FIG 3

With the new fixture it is possible to grind the sides as well as the radius in one adjustment, and it therefore supersedes the other fixture. The first fixture—Fig. 3—was, however, still used for roughing the angle. As the removal of a large amount of metal has a tendency to soften the point, the tools are rehardened on the point after roughing, and then finally ground on the radius fixture. It might be mentioned that the first fixture is used later on for producing sharp pointed tools with different angles.

The radius fixture is used on a sur-

*Contributed to a recent number of The Engineer.

face grinder bolted to the table, or on a magnetic chuck. When the tool is clamped down with the flat against the face, turn the knob to the extreme right and take a very light cut over the one side, moving the table to and fro. Then turn the knob to the extreme left and do the same.

To produce the radius set the fixture under the centre of the wheel, and move the knob from right to left and vice versa. Repeat this process until the correct radius is obtained. By grinding the radius in the above-mentioned way a slight error is made, because the tool is tilted forward 15 deg. In the fixture the true radius is ground in a plane at 15 deg. angle with the plane in which the radius ought to be true. Calculation shows this error to be very slight, especially for the finer pitches.

With a more elaborate fixture even this error can be nullified by a compensating arrangement, consisting of a cam and a slide, but up to and including twelve threads per inch a compensating arrangement of the kind is unnecessary. For fourteen threads the extreme point of the radius is about .00017 in. short, which I feel sure cannot be improved by oilstoning. The angle of swivel on the fixture is the angle in a plane, making 15 deg. with the plane of the 55 deg. angle—see Fig. 7.

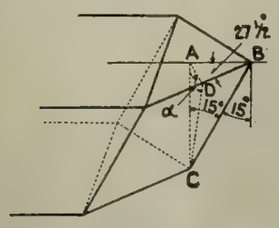


FIG. 4

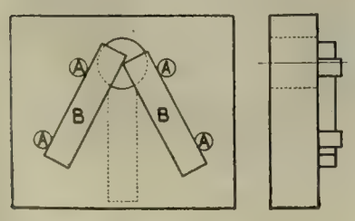


FIG. 5.

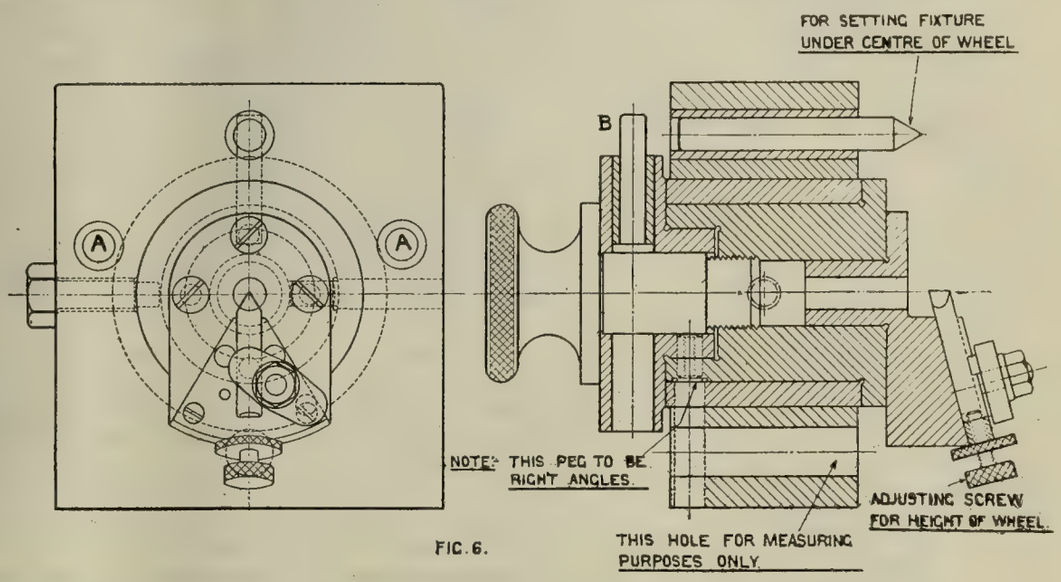


FIG. 6.

In triangle C E A: angle C E A = half the required angle.

$$\tan \text{ angle } C\,E\,A = \frac{A\,C}{C\,E}$$

The required angle is therefore $2 \times \tan 27\frac{1}{2}$ deg. / cos 15 deg. = 56 deg. 38 min. 35 sec.

The angle of movement of the radius fixture, i.e., the angle of movement of peg B between the two pegs A is the supplement of 56 deg. 38 min. 35 sec.—see Fig 8.

The angle a the pegs A make with the centre line =

$$90 \text{ deg.} - \frac{56 \text{ deg. } 38 \text{ min. } 35 \text{ sec.}}{2} + b.$$

b is dependent on the diameters of the pegs and the radius R.

$$\text{sine } b = \frac{\frac{1}{2}(D+d)}{R}$$

Angle a = 61 deg. 40 min. 42 sec.+b.

For the fixture I designed the values for the pegs and the radius were chosen as follows:—D = .500 in., d = .375 in., R = 2.4375 in., therefore sine b = $\frac{.500 + .375}{2 \times 2.4375} = \frac{.4375}{2.4375} = .17948$, b = 10 deg. 20 min. 24 sec., and a = 61 deg. 40 min. 42 sec. + 10 deg. 20 min. 24 sec. = practically 72 deg.

From Fig. 1 we see that by producing the radius the overall length of the tool shortens by a distance B = .16008 P. As it is very difficult to measure a tool over a sharp point, I made the gauge shown in Fig. 9. A micrometer reading can be taken from the back of the tool to the top of the small plate, which provides at the same time an accurate reading from the back of the tool to the point by subtracting a constant.

Fig. 10 shows the same gauge. The master tool being 55 deg. in the cutting edge, and the rake being 15 deg., the angle in section C A is 56 deg. 38 min. 35 sec., as calculated before. By using a ball of known dimensions, we can measure the distance K H. The distance G H can be calculated. The distance K G can therefore be found by subtraction.

The dimension from the back of the tool to the sharp point is the difference of the distance from the back of the tool to the top of the small plate and the distance K.G. The distance from the sharp point to the top of the radius of the tool being .16008 P, we know that the distance O from the back of the tool to the top of the radius is O = L—(K G + .16008 P). K G = K G — G H, where K H is measured, and G H is calculated as follows:—

In Fig. 10, AC =

$$\frac{d}{2 \times \text{sine } 28 \text{ deg. } 19 \text{ min. } 17\frac{1}{2} \text{ sec.}}$$

$$A\,D = \frac{A\,C}{\cos 15 \text{ deg.}}$$

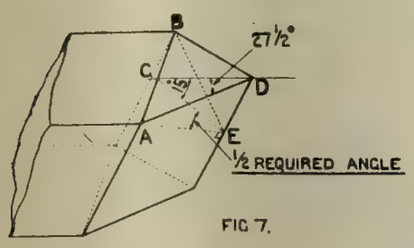


FIG 7.

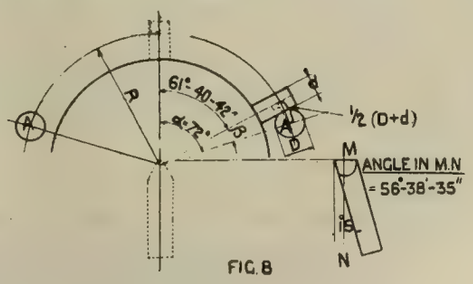


FIG. 8

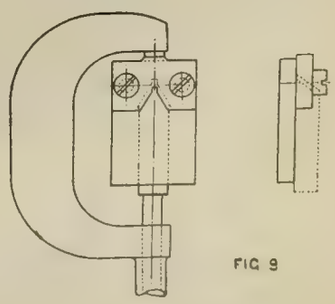


FIG 9

In Fig. 7 angle B D A in triangle B D A = 55 deg. Triangle B E A lies in a plane making 15 deg. with the plane of the 55 deg. angle.

Assume C D = 1, then in triangle A C D: A C = tan 27½ deg.

In triangle C D E: C E = cos 15 deg.

$$A\,D = \frac{d}{2 \cos 15° \times \text{sine } 28° \text{ 19 min. } 17\frac{1}{2} \text{ sec.}}$$

$$E\,G = \frac{d \tan 15 \text{ deg.}}{2}$$

$$HG = HF + AD + EG.$$

$$HG = \frac{d}{2} + \frac{d}{2\cos 15^\circ \times \sin 28^\circ\ 19\text{ min. } 17\tfrac{1}{2}\text{ sec.}} + \frac{d \tan 15\text{ deg.}}{2}$$

$$= \frac{d}{2}\left(1 + \frac{1}{\cos 15^\circ \times \sin 28^\circ\ 19'\ 17\tfrac{1}{2}''} + \tan 15^\circ\right)$$

The gauge I made was checked with two balls, one 3/16 in. diameter and the other ¼ in.

The measurement K H over the 3/16 in. ball was .6258.

The measurement K H over the ¼ in. ball was .7335.

The calculated distance H G for the 3/16 in. ball was .3235.

The calculated distance H G for the ¼ in. ball was .4312.

If the gauge is correct the distance K G must be the same in both cases. K G = K H — G H = .3023. That distance is a constant, and can therefore be etched on the gauge.

Example 1.—The distance L for a fourteen-thread master tool measures 2.250.

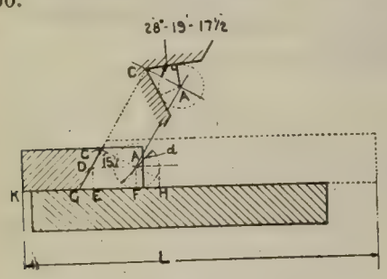


FIG 10

$$O = L - (KG + .16008\ P) = 2.250 - (.3023 + .01143) = 1.9363.$$

Example 2.—The distance L for a twenty-four-thread master tool measures 2.2830.

$$O = L - (KG + .16008\ P) = 2.2830 - (.3023 + .006669) = 1.9740.$$

The manufacture of the top plate of the gauge presents no difficulties if it is done in the following manner:—Mill a piece to dimensions for length and width, but leave it about ¼ in. thicker, as the carbon has to be milled off on both sides for drilling purposes. Then mill the angle with an angle cutter. After carbonising; mill ⅛ in. off each side, and clean up angle with cutter. Then harden, and clean up the angle with an oilstone. In the cleaning up the only care to be taken is that the sides

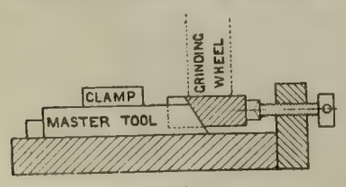


FIG 10A.

must be flat, for the angle corrects itself on the fixture shown in Fig. 10A.

In that fixture the plate is clamped to a carefully ground master tool, and the top face is ground on a surface grinder. It is, of course, vital that the bottom plate of the fixture be ground parallel. After grinding the first side in correct relation to the angle, the other side can be ground parallel on the magnetic chuck.

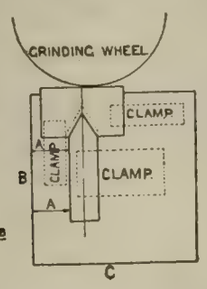


FIG 10B

The edge of the plate opposite the angle must be square to the angle and to the sides. For that purpose it is ground on a fixture shown in Fig. 10B. The fixture consists of a square block, of which the sides B and C are flat and square. The master tool is set up parallel to face B, and clamped against the face. By grinding the edge of the plate, it will be square in relation to the angle and the sides. The finishing will present no further difficulties.

PIPE THREAD TAP HEADS

The Sheffield Small Tool Manufacturers have adopted the following list of sizes for the squares of pipe thread taps:

No. of □	Size of □ Fraction	Decimal Inches	Whitworth Thread Taps Inches	International Thread Taps Millimetres	Gas Tap Inches
0	7–64	.109	⅛	3 to 3½	
1	9–64	.140	5–32	4 to 4½	
2	5–32	.156	3–16	5	
3	13–64	.203	¼	6 to 7	
4	15–64	.234	5–16 and ⅜	8 to 10	⅛
5	9–32	.281	7–16	11 to 12	
6	5–16	.312	½ and 9–16	13 to 14	¼
7	25–64	.390	⅝ and 11-16	15 to 17	⅜
8	29–64	.453	¾ and 13–16	18 to 21	½
9	35–64	.546	⅞ and 15–16	22 to 23	
10	41–64	.640	1	24 to 26	⅝ and ¾
11	23–32	.718	1⅛	27 to 30	
12	13–16	.812	1¼	31 to 33	⅞ and 1
13	27–32	.843	1⅜	34 to 36	
14	29–32	.906	1½	37 to 41	1¼
15	1 5–64	1.078	1⅝ and 1¾	42 to 46	1½ and 1¾
16	1 13–64	1.203	1⅞ and 2	47 to 52	
17	1⅜	1.375	2⅛ and 2¼	54 to 58	2 and 2¼
18	1½	1.500	2⅜ and 2½	60 to 64	
19	1⅝	1.625	2⅝ and 2¾	66 to 70	
20	1¾	1.750	2⅞ and 3	72 to 76	2½ to 3

Notes

Intermediate diameters have same squares as sizes below.

The heads of fluted hand reamers have same size squares as Whitworth taps and International thread taps respectively.

The sizes of squares are stated in fractions, and in decimals of inches, to facilitate measurements with either the mechanics' rule or the micrometer calliper.

No. of square may be quoted when ordering tap wrenches.

MACHINING NO. 103 FUSE BODIES

Herbert's Monthly Review

THE No. 103 Fuse is an improved design of the Graze Fuse No. 100, the principal difference being that the body is made in cast iron instead of gunmetal.

It was found that cast iron, if sound, is quite suitable, and the saving in the cost of the material over gunmetal is very considerable. At first sight it appeared as though the machining time would be increased through using cast iron, and the first consideration, therefore, was to obtain a material which would be both homogeneous and easy to machine. With a view to securing such a material, a number of experiments were carried out, which showed that the iron is best cast in bar form in permanent moulds, on the system which we

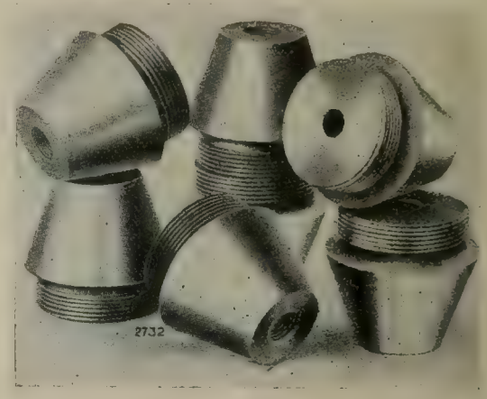


FIG. 1

have used for a number of years. The cast iron bars, when sawn up into blanks, provide a material which is sound, easy to handle, and which can be machined at high speeds.

In Fig. 1 is shown a number of finished fuse bodies as produced on a No. 4 Capstan lathe and the lay-out which is used on these machines will doubtless be of interest at the present time. In laying-out the tools, it was considered that "Stellite," which has now passed the experimental stage, could be used to advantage for several of the cutting tools, and preliminary experiments confirmed this.

At the first operation, which is shown in Fig. 2, the blanks are held in a 9-in. Coventry chuck and positioned by a stop. The first tool used is a centering and facing tool, which is followed up by a twist drill for the small diameter, which goes part way through. The turning of the thread diameter is done

at two cuts with a special knee turning tool holder fitted with a "Stellite" cutter. This is shown in greater detail in Fig. 3. The roughing cut is done at a speed of over 150-ft. per minute, and the finishing cut at 300-ft. per minute. The finish facing of the conical shoulder and the chamfering at the end are done simultaneously from the square turret,

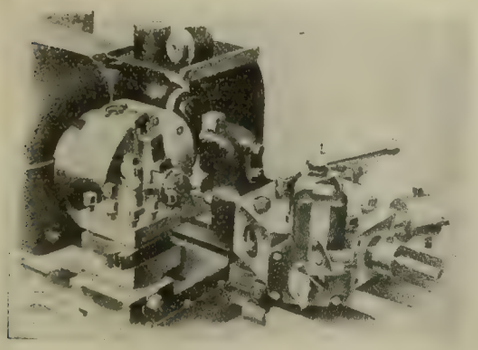


FIG. 2

with two suitable form tools, whilst the thread is cut with our standard inverted chaser holder. The time for this operation is two and a half minutes.

At the second operation, shown in Fig. 4, the partly finished fuse body is held by the thread in one of our special drawback chucks which have been described on previous occasions. The first tool is a turning tool carried in the square turret, which removes the scale before forming. It has a "Stellite" tip brazed

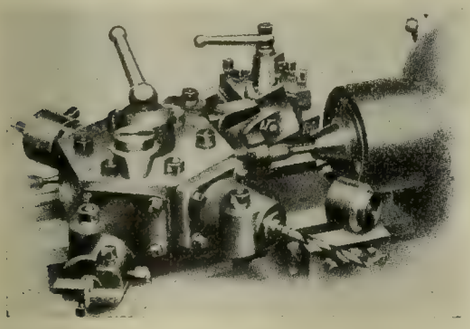


FIG. 4

on to a carbon steel shank. The rough taper form tool which follows it is also a composite "Stellite" tool carried in the square turret. The end is then centred, faced and drilled, the drilled hole providing a support for the finish forming tool shown in position. The hole is finally reamed and tapped, completing the operation, which occupies three and a half minutes.

The "Stellite" turning tool holder used at the first operation has given such good results that it was decided to standardize it, and it is now offered for use on engine lathes as an ordinary sliding tool. Two views of the tool in this form are given in Figs. 5 and 6.

It has been found that this method of using "Stellite" is very satisfactory and econ-

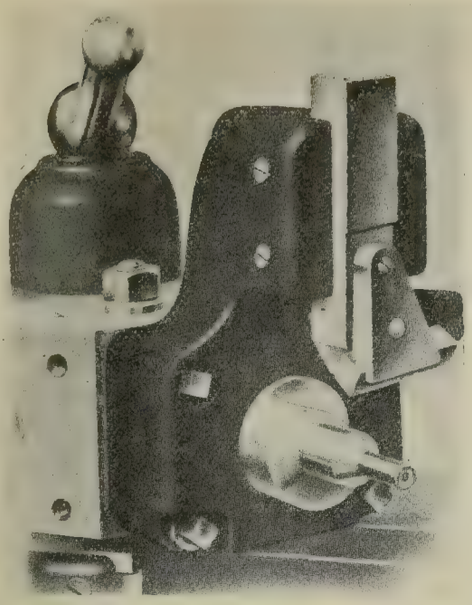


FIG. 3

omical. As will be seen, the cutter is presented tangentially to the work with a natural front and side clearance of 6 deg. The cutter is ground only on the end which enables the top rake to be varied to suit different materials without weakening the cutter in any way. This method of grinding is not only the most economical, but also the most suitable when "Stellite" cutters are used, since there is no excuse whatever for impairing the exceptional cutting qualities of that alloy by grinding away the very hard skin which forms the sides of "Stellite" bars. The adjustable clamping device holds the tools securely, and will accommodate all likely variations from the nominal size of cutters. A positive support is provided, which also serves to adjust the height of the cutting edge.

These holders are designed for turning only, and are not suitable for facing, but the range of work on which they can be used to advantage is very wide.

SAVING WEIGHT ON MACHINE PARTS

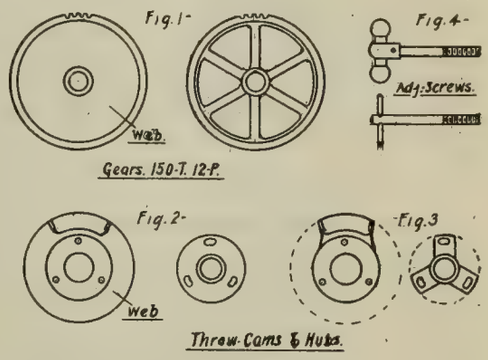
By J. E. C.

THE continual rise in the price of materials such as steel, cast iron, etc., has necessitated of course, an increase in the price of machines and tools. Placed beside this is the fact of the scarcity of metals, concerning which, in the present state of things, little encouragement is to be had from the usual sources of supply.

A careful study in machine design has disclosed many instances where a great deal of stock is, to use a very strong expression, "wantonly wasted." Surplus metal is found where it could easily have been saved. When we consider a machine that has been built and sold, we look at it from the point that it is to be installed and used for an indefinite period, or until the time it will be scrapped, or similarly disposed of. The surplus amount of metal in any machine which has been built, more especially if the machine is to be tied up, unused, would have been better left unmined, than wasted by uneconomical designing.

There are, however, few machines, no matter how well designed these may be, but what will stand a certain amount of reduction in their material without in any way destroying their utility or productiveness, if only these are given proper study to find out where the reductions can be made.

A few brief illustrations are given,

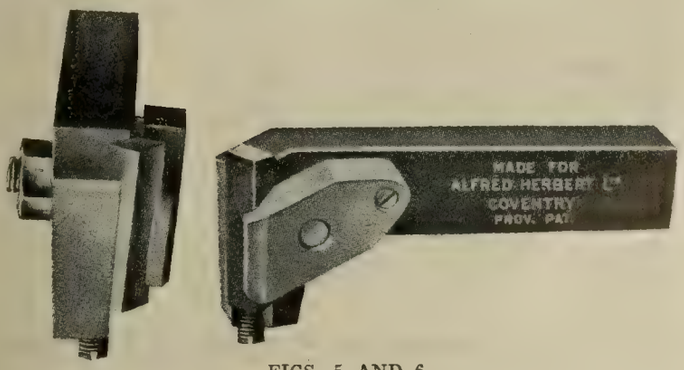


showing where, in a number of instances, a common waste is found on machine parts. In a certain type of machine, built in lots of 50 to 100, there is used a 150 tooth 12 pitch gear. This gear has a thin web wall instead of spokes. Changing this gear into a six-spoke type reduced the weight of the casting five pounds, the saving on a hundred gears amounting to $40.00.

An adjustable throw cam which fastens in a hub, had a web rim, (see Fig. 2) which had no other office than to add extra weight. This rim was taken from the pattern, reducing the weight of the cam nearly three pounds. (See dotted line Fig. 3). The strength of the cam was in no way weakened by this change. Similarly, the hub used in this was reduced in weight by cutting out three notches in the rim, as shown in Fig. 3.

A cast iron handle had always been placed on an adjusting screw on the same machine containing the cam and hub just described. The weight of this was one pound. A wire rod inserted in the screw served equally as well as the handle to turn it by, saving not only weight but also the cost of machining the handles. (See Fig. 4).

From the brief description given, it will be readily seen that a large amount of saving can be made both in weight



FIGS. 5 AND 6.

and cost of producing machinery. A careful inventory with this end in view will disclose this fact to any machine builder.

ENGINE EFFICIENCY CHART

IT is sometimes very convenient for an engineer to know the efficiency of his engine, and while this can be determined by calculation, if certain factors are known, the use of a table or chart works to better advantage. Tables, however, while possibly more accurate than a chart, are often contained in books and entail loss of time searching for the desired information; for this reason the accompanying chart has been prepared to assist in finding the efficiency of an engine by the simple application of a rule, or perhaps a piece of thread. By placing the straight edge against two known values, the third can be found on the corresponding scale. Thus, if the indicated horse power (I.H.P.) is known to be 20, and the brake horse power (B.H.P.) to be 10; the efficiency (E) will be 50 on the right hand graduated column. If the efficiency is known to be 80 per cent. and the rating of the engine to be 200 I. H. P., the B. H. P. will be found to be 160 on the middle scale. Formulae for calculating the different values are found on the chart.

GASKET MEMORANDA

A THIN gasket is best where joint surfaces are smooth, and is less likely to blow out than a thick one.

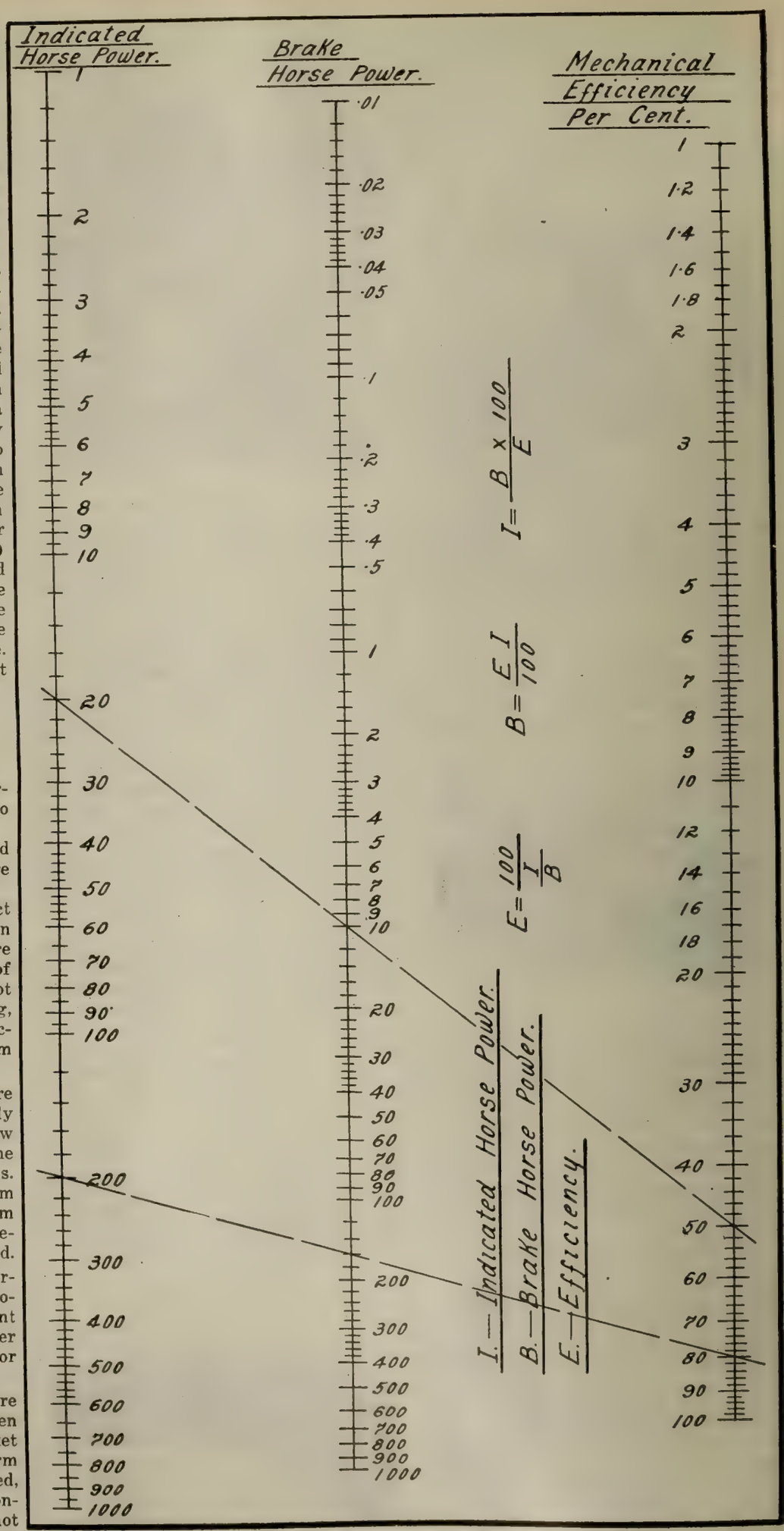
Gasket seats should be well cleaned and pieces of old gasket removed before placing the new gasket in position.

When installing a gasket, the object should be to apply, when setting up on it, an even, well-distributed pressure over as large a part of the surface of the gasket as possible. Nuts should not be set up too tightly in the beginning, but should be followed up as found necessary to prevent leaks when the steam pressure rises.

Cases have been experienced where handhole plates were set up so tightly with a long-handled wrench that the new gasket was mostly squeezed out of the joint and its structure torn in places. These small crevices or torn places form small openings, through which steam soon leaks, and the only remedy is to replace the gasket which has been ruined.

Gaskets with too wide a flange surface, or carelessly put in place, may project too far beyond the edge of the joint and jam the handhole or manhole cover at that point, so it cannot be set up or made to seat properly.

Gaskets of compressed fiber sheet are likely to tear when the joint is broken and to leave pieces of the old gasket sticking to the metal. These often form high spots which are easily overlooked, and likely to cause leaks and the condemnation of new gaskets which are not faulty.



ENGINE HORSE-POWER EFFICIENCY CHART.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

BALL BEARINGS

THE article by C. T. under the above caption, while containing some truth regarding their applications, also gives information which is rather misleading. It is true that the average ball bearing salesman is an enthusiast, for the simple reason that he is in close touch with developments and has seen the wonderful improvements made possible in machinery by their use.

Your correspondent expresses a doubt regarding their use in a ship's tunnel, for the propeller thrust, neglecting the fact that they have been successfully used for this purpose. The steam-electric driven ship, "Majolner," being so fitted, the bearings naturally being carried in protective housings to prevent the intrusion of dirt, besides this the American and British submarines are fitted with ball bearing thrusts for propellers as well as for various parts of their mechanism.

I do not believe that the average engineer is a cautious, skeptical person, but that he is open to accept a new development if he can be shown good reasons for its use.

Regarding the application of ball bearings for dusty places, the writer had one experience in a Toronto plant, where their repair bill amounted to several hundred dollars a month for motors, as it was an extremely dusty place the operators wearing masks, the dust, being a cleanser compound and very gritty, previously getting into the bronze bearings which were rapidly destroyed allowing the armature to drop on the field, burning them out. Ball bearings were installed, without any protective covering or lubrication and were successful for almost a year, which reduced their repair bill tremendously; but when a closed housing was used they ran indefinitely saving the enormous repair bills altogether.

Another case your correspondent will no doubt be familiar with is the "Dumore" and "A.R.O." grinders, which work in dusty and gritty places at high speeds, grinding to very fine limits of accuracy. The makers of these machines state that their development would have been impossible without high grade ball bearings.

As for heavy running loads mentioned in your article, no specific loads being stated, I would add that bearings having a shaft size of 9-in. carrying loads of 50 tons each are in successful use on certain classes of paper machinery.

What will no doubt surprise your correspondent more is the fact that the type "F" locomotives on the Swedish State Railways weighing 143 tons each and being one of the largest in Europe have twelve axle journals on engine, bogie and tender fitted with ball bearings, this being adopted after successful experiments on railway coaches.

This letter is not intended as a criticism of your correspondent's article, which no doubt was written in good faith, but is intended to correct the erroneous impressions given, which are apt to prevent advancement of one of the greatest engineering developments of our age, the modern high grade ball bearing.

GORDON JANES.

Toronto.

DOES A PISTON STOP AT REVERSAL?

AS a connecting rod is not of "infinite length" I think Mr. Miller's argument falls down from the fact that, to arrive at his conclusion, he has to introduce a proposition that is impossible. The piston travels fastest as the crank is at right angles with the piston and slows down as it approaches the direct horizontal and again is accelerated as the opposite angle is approached. At the centre as the piston reverses its motion it must stop to make the return trip.

Also, if therefore the speed of the piston varies during each stroke, while the flywheel is in constant and uniform motion, it is not beyond the possible that at the moment of reverse motion the pison could and does stop.

W. K. MACLEOD.

Chilliwack, B.C.

SOME SCREW MACHINE POINTERS

By D. A. Hampson

IN THE Oct. 11 issue Mr. Williams criticises some of the statements made under that heading in the original article. I must agree with him in everything he says; there is no doubt that he knows automatic screw machine work and would be able to contribute pointers of his own that would be of value to the craft. But, in so far as his criticisms are concerned, he has overlooked the point.

The articles in a trade paper are published primarily for instruction—instruction for somebody. Each man who reads such a paper does it to learn more about his business; if he is a foundryman he naturally is more interested in foundry articles, if he is a draftsman he cares more about the articles that deal with design, or maybe he is a specialist against his will and wants to broaden out but has no chance on his present job which he must hold until he can land one in the broader field—it is only through home study, trade papers and the like, that he can get in touch with the work he longs to do. Then again there are the new mechanics coming along all the while, the boys—yes and girls—of today. All the articles that are cut and dried to the skilled men are a part of the open book of knowledge to them. They can find what they want to know in the trade paper, and perhaps nowhere else, and so it is that such papers publish over and over again matter which is stale to older men.

Returning to Mr. Williams' criticisms all I can say is that he is fortunate indeed if in running a battery of automatics he always has had operators who remembered and followed the instruction given them, who didn't try to grind or set a tool according to their own ideas when the boss was not around, if he has never had to run a machine to get out work long overdue when he knew that machine would be the better for repairs or adjustments, if he never has had to use tools or collets or drill holders that would be better scrapped which was impossible because the toolmakers were all busy just then and to get factory parts would mean a month's delay.

A centering tool preceding a drill is not an essential but it is a good thing. Mr. Williams says, "Suppose a drill pushes back." Then suppose a cut off tool pushes back. There is no good reason why we should have either but we **do**, and in the latter case if the tool does not cut off cleanly or if for any of the other reasons there is a tit left on the end of the bar, then it has got to be a relatively large drill, short and stiff, in a machine whose moving parts are in almost perfect condition if that drill doesn't run off center some of the time. The centering tool is the sure cure for such troubles and in any case is good screw machine practice. To prove that it is not absolutely necessary, I have a machine that for thirteen months has been drilling 3/32 in. holes ⅜ in. deep in steel without a centering tool making 1200 pieces per day per spindle, but I freely admit that we loose some pieces and that it would be better practice the other way, and it would be so done but for certain conditions.

There are few of the little pointers of our business that will not bear calling attention to at regular intervals. How often do we hear good mechanics answer. "Why yes I know that, but it had slipped my mind, you see there are so many thousands of details in our business that a man can't help getting rusty on some of them?" Screw machine operators are too human to be exceptions to the rule. Particularly in the last few years have executives been forced to get along with green help and it is folly to suppose

that each and every one of them has received instruction down to the last minute detail and to suppose that they followed it to the letter. There was a machine screw company in New Jersey —a modest one, making cap screws mostly, with an investment in machines running into six figures—which prospered up to three years ago when three-fourths of their operators were won away by the high wages offered by nearby powder mills. During the "reconstruction" period the company failed, due entirely to the losses from new hands, even though they were tutored by the original foreman whose ability was undoubted.

ERRATUM

REFERRING to the article. "Transmission Sheet Data Chart," appearing in last Week's issue of Canadian Machinery, an error was made in the formula giving the final speed of a compound drive. The formula as shown is $F = \frac{R\,D\,D^{1}\,D^{11}}{r\,r^{1}\,r^{11}}$ and should be $F = \frac{R\,D\,D^{1}\,D^{11}}{d\,d^{1}\,d^{11}}$ the same as that appearing in the last section of the chart insert.

HARDNESS OF METALS

IN a paper recently read before the Institute of Metals in England, Professor T. Turner said that the definition of hardness which he preferred was that it is the property whereby a body is able to penetrate another body, and conversely the property whereby a body itself resists being penetrated. This does not differ materially from the definition proposed by Osmond in 1892 that hardness is "resistance to permanent deformation." Sir Robert Hadfield's definition is simply "resistance to deformation."

From the mechanical aspect hardness, as so defined, will closely correspond with the "yield-point" or "breaking-down point" of the material. In ductile materials, such as relatively pure metals, of which mild steel is an example, the yield-point is often roughly proportional to the ultimate tensile strength; in such cases the hardness, as measured by the stress per unit of area required to produce penetration is less than, but varies with, the tenacity. In brittle materials the yield-point and ultimate strength are practically identical; in such cases tenacity and hardness will nearly coincide. The hardness may, however, exceed the tenacity, since in a tensile test the particles are drawn away or separated from each other, while in a penetration test there is a certain amount of "backing" in the material which tends to support the penetrating body.

Penetration Tests

With penetration tests, such as those of Brinell, in which an appreciable quantity of metal is displaced, the true hardness is not obtained, since the displaced material becomes more or less work-hardened, and another similar test on the same spot will not give the same result, though the difference may not be large. In wearing tests the polishing and consequent hardening of the rubbing surfaces on the one hand, or their disintegration on the other, may lead to quite erroneous conclusions. The conception underlying the Brinell test is simply that a unit of surface will just maintain a stated pressure before being deformed. So long as the amount of deformation is not excessive, and provided the body tested is not brittle, the Brinell hardness number closely corresponds with true physical hardness.

For many purposes, however, the engineer does not really require hardness, though he asks for it. What he does desire is resistance to wear, or to deformation, or some other property or combination of properties which are of importance for the particular purpose he has in view. Thus in a wearing or grinding test it is necessary, if the metal is not to wear away quickly, (1) that the particles on the surface shall not be readily displaced, and (2) that the particles so displaced shall not be readily removed. Substances which are really hard do not permit of their particles being readily displaced—hence they wear well. Plastic metals do not permit of their displaced particles being readily removed—hence they too may give good wearing surfaces, though they are really very soft.

Effects of Alloying

If attention were confined to the pure metals in their cast, annealed, or unwrought condition, the question would be much simplified, for the hardness varies inversely as the atomic volume. In other words, the hardness increases as the number of atoms in a unit space increases. But for the majority of purposes pure metals are too soft, and must be hardened (1) by alloying, (2) by cold working, or (3) by chilling. The last may be regarded as a combination or variation of the first two methods. It may lead to the setting up of internal strains, which really produce the effect of cold work; or it may change the chemical composition of an alloy by causing some constituent to remain in solution, or even prevent a constituent from going into solution. The hardening of steel, and the softening of certain bronzes, by chilling, are examples of this effect on internal composition. Ultimately, therefore, metals or alloys can be hardened only by a change of composition or by strain.

When to one metal is added another metal, or other element, and the product allowed to solidify, the result is a mixture, a compound, an eutectic, or a solid solution. The useful ductile alloys are, almost without exception, solid solutions. If a series of solid solutions be interrupted by the presence of compounds, or eutectics, these will be indicated by irregularities in the hardness and other physical properties, at such points as correspond with the end of the series in the respective cases. It is therefore possible to harden either constituent by the addition of moderate proportions of the other. At the same time the material becomes less ductile —in other words, more brittle. A point is frequently reached at which the tenacity can no longer be increased with safety, owing to the continued increase in brittleness, but the added metals do not necessarily diminish the ductility in their alloys at the same rate as they increase the tensile strength. With increased knowledge of the effects produced by relatively small additions of the less common metals to alloys, it is probable that a useful field will be opened for increasing their hardness without producing brittleness.

Effects of Cold Working

The effect of processes of cold working upon the mechanical properties of many metals and alloys is remarkable. The yield point and tensile strength are raised, while the elongation and reduction in area (or ductility) are markedly lowered. Further work put upon the metal causes it to fracture. By suitable annealing the material may be rendered soft and ductile as before. The material in its wrought state not only has greater strength, but is also harder than the original metal or alloy. But when that hardness is measured by different instruments, such as the sclerometer, the scleroscope, or the Brinell tester, it is not found that the values obtained are in agreement. Hence the hardness prduced by cold working is different in kind from that resulting from the alloying previously discussed.

It might perhaps be assumed that rolling, hammering, or pressing a metal would render it more dense, and that the observed increase of hardness is due to such added density. But any change of density due to mechanical processes is far too small to permit of being explained on the principle of atomic volume. Further, as a matter of fact the change is ultimately in the opposite direction. The first result of pressure is to close up any pores, cracks, or blowholes, and thus to increase the apparent density; hence bars are usually more dense than the ingots from which they have been rolled. The subsequent effect of cold working is to diminish slightly but appreciably the relative density of the worked material.

If a solid crystal is under strain, as a result of which shear occurs along a plane of crystal symmetry, it is evident that at the moment the particles are pushed asunder and caused to slide upon each other they were clinging to each other, and were separated only with difficulty, and by what is usually called a "pull" of sufficient strength. The materials thus clinging to each other, and forcibly separated, were in a state of tension. It would therefore appear that the intervening layer of "amorphous" material cannot be in a normal or unstrained condition, neither can it be in compression; it must therefore be in a state of tension. When a bar of metal is in tension it becomes longer, and the extension is proportional to the stress

applied. But in such a case the bar becomes thinner as it elongates; so the extension must not be regarded as indicating any volume change. Yet doubtless there is a small, but nevertheless real, volume change when a bar is stretched or compressed. It is just as real as the expansion of a gas on reducing the pressure, though almost indefinitely smaller in amount. It is this volume change, due to tension, which leads to the observed diminution of density in wrought metals.

Theory of Work-Hardness

In the case of a metal or alloy consisting of mixed crystals differently oriented, strain leads to the production of a series of slip planes in each crystal aggregate. Adjoining areas, as viewed in a microscopic section, have their planes at various angles to each other, owing to the different arrangement of the component micro-crystals in each crystal aggregate. These planes, or thin films of amorphous material, may be regarded as being held in tension either by the rigidity of the crystal envelope (or cement), or by the mass of the unchanged material, or by both of these. But in ordinary mechanical processes, such as rolling, hammering, or drawing, deformation follows deformation, and planes are set up in many directions. These slip planes cross and recross each other, their direction being limited only by the necessities of crystal symmetry. A section thus shows a network of crossing lines, each of which is assumed to correspond with an extremely thin layer in tension. In such a section there is an intricate network, which is held together by tightly stretched strings or tapes, and supported by intervening, unaltered crystalline material. Remembering the great strength of a lattice girder, or of woven wire, it can be more readily understood how these extremely thin layers of amorphous material, all of which are in tension, are able to confer great tenacity and hardness upon a worked ductile metal. Since the whole of the crystalline material never is, and never can be, completely converted into the amorphous condition, it follows that there must be unequal hardness and unequal tenacity throughout the various portions of the worked-hard material.

BRITAIN'S INLAND WATERWAYS

By O. C.

IT is the stress of war that has made Britain recognize the value of her inland waterways and her transit facilities by water are now taking new forms and directions under the more direct management of the state. The Government has already made arrangements for more effective administration of some leading canals and yet at the same time it would be unreasonable to expect too much from an intervention which was probably intended more to avert bankruptcy and the suspension of traffic rather than to develop them immediately, though probably after the war something may be done to resuscitate the use of the canal as a trade route to inland industrial centres.

It is not generally known that there are hundreds of miles of inland waterways in the United Kingdom and although perhaps many of them are now derelict and useless, judged by modern standards of commercial utility, there must remain a number which only require expert engineering and business attention to restore them to their former prosperity. They will be found to tap the natural resources of some countryside, collieries, and quarries and brickfields, which the modern railway has overlooked. Probably too, dock and transport charges might be considerably saved by a greater use of the canal systems radiating from the river estuaries: and since the advent of the motor boat of shallow draft there are even greater possibilities in the suggested linking up of the British canal and boat traffic with that of France and Belgium. There seems to be little or no reason why the canal barges should not pass quite safely across the narrow seas for many months of year, either under their power or by towing and navigate successfully the Belgian and French inland waterways, taking outward or homeward cargoes without transhipment. That is certainly a possibility of the future.

THE BLAZING TRAIL OF EXISTENCE

By W. Doolittle

THE throbs and thrills of life are but the volcanic sputterings of human energy, that which from time immemorial has been freely handed down to every breathing mortal. Have we not beaten paths across the wilderness wastes? Have we not turned the course of mad rushing streams, or leveled hills and mountains into cities and habitable places by great energetic endeavor? And are you one to sit and enjoy these accomplishments, or think that they are all for your own particular benefit? If you are not conscious of your own particular debt for these, it is only possible to believe that the soul and mind and body of you is firmly encouched in a shell, or you may be likened to a clinging vine, that must needs have artificial support and other's hands to straighten out your cramped and intertwining branches.

Do you not see or realize that above and below you are billions of rolling and swaying spheres, and the one on which you dwell, even though it is but a dot among them, and you a mere human speck upon that dot, that the place you occupy, even that small space, has a value? And during your occupancy you can make it worthy of your presence, worth something to yourself, worth something to those around you and to untold millions yet unborn. Do you not see how possible it is to rise with a bound, that advancement means progress, that the ills and inconveniences of life are to disappear when you shed your artificial cloak of timidity and fear, laziness and lethargy, and become an enlivened, enthusiastic, active human being?

It was a great event in the history of the world when prehistoric man met his first catastrophe; when lava streams submerged his mountain cave; when gale and wind upheaved both root and branch of his noon-day retreat; because it threw him on his own resources; woke his brain; started him to thinking on his own account; and, standing on the shores of time, he was converted from a lounging, loafing being into an earnest active man.

Effort Benefits

Throughout intervals of time, he and most of his kind have been benefited by just such changes. It was one of his number, no doubt, who phrased up the saying, "Courage can rise above disaster." And, though the world is not overpopulated with his type, yet it is for what few there are that the world moves, that the wheels of progress still revolve, and not for the particular benefit of those who live inactive lives.

To those who are slowly dying and wasting away with world-weariness; to those who are in doubt, who do not know which way to turn; to those who live in deadening environments, whose days are just an ordinary repetition of the day before; to each one of you unconscious, unstirred individuals, could you but once feel the scorch and heat of the star-spark of energy, become charged with it's great outflowing waves, this great world power is free—free to yourself, free to everyone, if you would but inject it once into the fibre of your organisms.

Turn the stone image of yourself into something useful. Step down from your pedestal base and defy each dark phantom with which you have long threatened yourself! Have you eyes? Let them gleam! Have you hands? Clinch them! Have you feet? Tread with them! Eyes, hands, and feet? Belt these to the wheels of energy! Tread on thorns if thorns are before you! Harden your muscles if these have become soft! Make your nerves tireless! Swing ahead! Don't wait to be pushed! No desert was ever crossed by a whiner; no boulder ever impeded determination. Remember, the length and breadth of the continent is yours, in which to achieve something useful, something on which your name can never die!

Too long a pallor has bedecked your cheeks; too long your eyelids drooped, your chin hung low. Too long, too idle you've lived! Up at some worthy task! UP and make your mark! Seek no longer the velvet clouds on which to ride! Choose instead the thunder's path and lightning's flash as a guide! Don't be a clinging vine or a soft-shell animalcule! Shun ease as a bridge of decayed timber, and dependency as a crime. Cut out your boasting and swagger, and don't be too dainty!

The book you make, the brick you lay,

the field you plow, the star you gaze at and study, becomes a part of you. Either attains your name, or contains your individuality. No longer is lost, no incessant and painstaking toil is wasted throughout abiding time; for you put yourself in it when you work in it. It becomes a part of you, and you become a part of it. Strength yields strength, and power yields power.

Do You Respond?

The most distressful thing in life, the most sad thing, is that of a human being, who, between the cradle and the grave, has put no impress on the blazing trail of his existence. Spend not a day in vain! Call unto yourself each morning like an echo sweeping across a mountain as you rise from your slumbers, to grasp again determinedly the thing you left uncompleted the day before! Call unto yourself from your slumber chamber the need of yourself in the great world's work! Are you ready? Are you willing? Are you determined? Be not afraid, Soul of whoever you are, to tackle greatness and grandeur; to strive for the things you most humanly wish for! Be not afraid to delve to the very core of the earth; to explore ocean beds or speed in infinite space above! Whatever you do, wherever you labor, don't dream, don't grope, neither lean or lag!

Work intelligently and carefully! Take pains and do the best you know how! Practise, and practise, and practise! Repetition is the secret of skill and knowledge. There's a chance for improvement in every task in life. There is always something that can be made better than it already is. Hate that existence which brings no good to you! Despise that life which has no pure and active purpose in it! Be not afraid of sweat or dirt; nor if grime and grit ensoil the brow. Work hard and faithfully on the things that you will have carefully beforehand thought out! Make yourself better! Make the things around you better!

Subject each thing, each detail at hand, to a close scrutinizing examination. Despise not little things, for these alone can become great! Know first what you wish to do, and then, do it with all your might and main! Cast to the four winds the desire for flabbiness, the easy life! Become clothed with energy, with determination, with vigor and vitality! Man's source of energy is inexhaustible. Every forward move, every undertaking, be it great or small, is simply energy generated into muscular and mental effort. A gripping hand is an energized appendage, as is also an alert mind, or a penetrating eye. The more of this you expend, the more you achieve and the more result you accomplish. The wise expenditure of this force turns man into a highly organized superior being.

WOMEN'S MUNITION WORK

A SERIES of exhibitions, illustrating the manufacture of munitions in French and English factories, the uses to which be felt that ultimately they will be able they are put in warfare at sea and on land, and the work of naval aircraft, submarines, destroyers and other warships, has been given recently throughout Great Britain by the Technical Section of the Labor Supply Department of the Ministry of Munitions, and have proved so attractive to the general public that they were recently reinforced by the Ministry with new features of popular interest.

In order to demonstrate more clearly the uses to which women's work is being put a number of completed articles are now shown of which women have made a considerable part. Thus, in the exhibition proper are a large number of parts of the Clerget engine, made entirely by women; and what these amount to in relation to the entire mechanism is illustrated by the exhibition of a complete Clerget engine, lent by the Air Board. For the same purpose complete Stokes guns, Vickers machine-guns, and Service rifles are shown, and where the articles are too large to be brought into the exhibition they are represented in many cases by photographs. As a sample of the tangible results that are being obtained by the work of munition makers a small collection is likewise shown of captures from the enemy. The Air Board has lent two of the latest German aeroplane engines, a Benz and a Mercedes, taken from machines brought down in the British lines with the engines uninjured; and the War Trophies Committee have provided a captured German field gun, a trench howitzer, and two machine-guns.

Optical Work

The exhibits are divided into 15 groups, the optical munitions being now separated from the chemical and surgical glass ware. The exhibits of optical work include everything that enters into the manufacture, from the crude lenses and prisms to the finished instruments. They are now accompanied by some interesting and instructive notes on the work involved. The work done by women in optical factories, where before the war only a few were employed, and these only in one or two factories, now includes every process in the manufacture of optical parts. The accuracy required, not in special laboratory instruments, but in those that are used for daily gun and field work and have to be turned out in large quantities, is perhaps the highest demanded of any industry. Lenses, for instance, are ground to a maximum error of about 0.00003 in. over their entire surface, and even this error has to be distributed uniformly from the centre of the lens to its periphery. The angles of prisms, again, have to be finished in most cases to an accuracy of five minutes, or for a small prism to a limit of anything from 0.0003 in. upwards. In special cases even higher accuracy is required. Women are said already to bring this work well up to the finishing stage, and when the relatively short apprenticeship they can have had is considered, no doubt can to do even the final working which now is done by highly skilled men. In making, finishing, dividing, and engraving the metal parts women are employed as they are in other exact mechanical work; and they also carry out the accurate optical measurements and tests and the very delicate adjustments that are required in the final assembly of the optical parts.

The exhibits of glass-blowing work contain several fresh examples of considerable interest. These include some electric lamp bulbs, which women are now blowing direct from the furnace in the glass-house, protected against the high temperature by screens. For some time they have done the dividing and engraving of tubes for clinical thermometers; and examples are now shown of the finished instrument, made by women complete. The complexity of the work they are doing is further illustrated by some large X-ray tubes.

Aircraft

Another highly important branch of work in which the exhibition shows women to be practically covering the whole field of manufacture is that of aircraft, represented in the three groups of engines, metal work, and wood-work, and in part of the group of internal-combustion engine accessories. Still fuller particulars than before are given of the manufacture of the engines, in which there is little that women are not doing, and perhaps nothing that they could not do if it were entrusted to them. Of the metal fittings a great variety is shown, 74 of which were made in a women's shop under women's supervision, including marking off from drawings and making scribing templates where necessary. These include not only individual details, welded, bent, and machined, but complete parts of the structure, such, for instance, as the rear skid, of which women not only make individual details such as the level, post, shaft, stays, cross members, and runner, but assemble all the components complete under the supervision of a woman.

In the woodwork section the exhibits indicate no less proficiency in women. Ribs for Maurice-Farman biplanes are said to be made by girls after a few days' instruction at the rate of eight per day, not including varnishing and drilling the holes, which is done by girls on 20 ribs at a time clamped together. A series of excellent photographs supplement two specimens of propellers, and show women doing every operation on their manufacture down to the final balancing.

Miscellaneous

The remaining groups of exhibits include "tank" and motor-lorry engines, accessories (in which very interesting particulars are given of the manufacture of magnetos by women), steam-engines, guns and components, small arms (mostly machine-guns), tool-room work and gauges, drills and cutters, etc., punches and dies (with jigs, chucks, test pieces, etc.), projectiles and trench warfare,

(Continued on page 469)

PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

NOVEL FOUR SPINDLE AUTOMATIC SCREW MACHINE

THE machine shown in accompanying engravings embodies a double bed construction involving use of a top and bottom bed, the top bed carrying the cam shaft, drums and all the working parts together with the driving pulley. This radical change results in there being no working parts on the bottom bed whatever.

The tooling system adopted may be classed as being of the open type. Double decked forming slides are provided, there being one forming position and one cut-off position at front and two forming positions on the back slide.

The cutting-off is performed on the upper front spindle. The work drops into a shoot which is not shown, and separates into a receptacle directly in front of the motor. The chips drop directly into the chip storage below, and the oil drains into an oil pan below the chip storage. The chip pan is made open at the left hand end so by having a receptacle at the left of the machine directly below the bars where it does not take up any extra room, the chips can be removed at any time without stopping the machine, and the operator is not interfered with.

By cutting-off on the top spindle it is easy to separate the work, and it brings the heavy forming and heavy turning on the two lower spindles where the greatest volume of chips are made; thus the two top spindles are used for the sensitive tools such as drilling, threading, reaming and cutting-off. On the two top spindles there are very few chips to pile on top of the lower ones with this method of laying out the machine. The turners and drill holders are mounted on a slide which carries the turning and drilling tools for the two bottom spindles.

The upper front tool holder as shown in the engraving is arranged for an independent feed, and the upper back spindle as shown is arranged for high speed drilling with a high speed drilling attachment and works independent of the lower slide, that is, two sets of tools on the bottom slide work together in pairs, and the two upper tool holders are operated separately or together. This makes a very flexible combination and the overhead camming makes it very convenient to operate the tools independently. Either vertical or circular forming tools can be used without changing the cross slides.

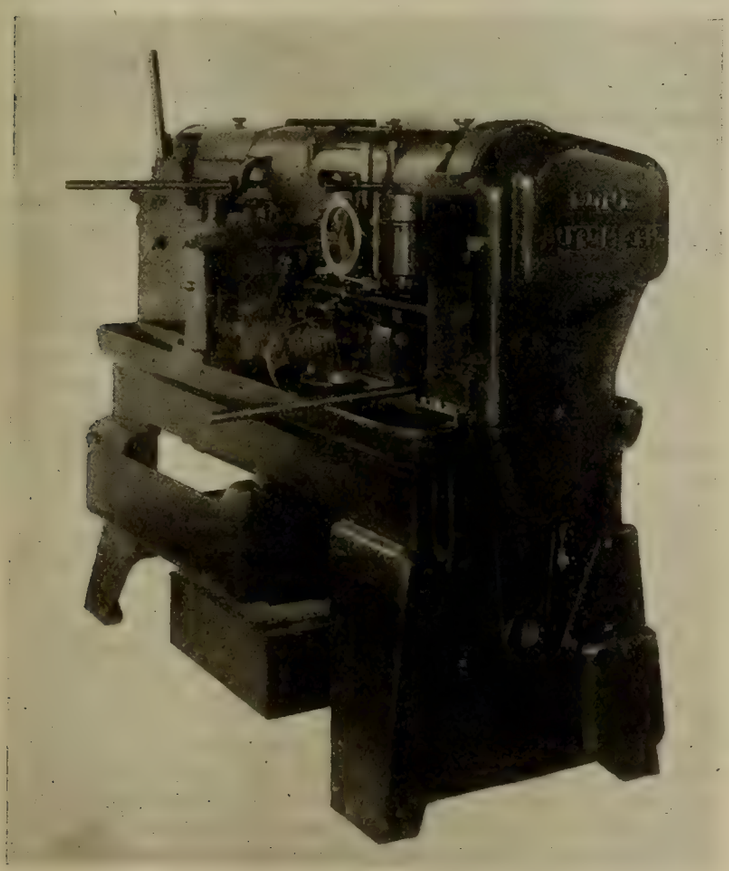
The spindle carrier is held in two housings, and is provided with adjustable bushings for the spindles. The spindles are hardened, heat treated and ground and are fitted with draw-back collets and the regular type of stock feeding fingers. All of the spindle bearings together with the stock feeding parts are entirely encased. The change gears for both power feed and driving are covered by a door at the right end of the machine and are easy to get at so that quick changes can be made without loss of time.

The motor is mounted directly under the bed and is arranged with an elevating base to take up the belt which runs directly through the bed of the machine and the right end housing, thus, the motor and belt are protected from oil. In all cases the levers come within easy reach of the operator and both the forming and tool slides have hand return which is only used when setting up the machine as these levers are removed when the machine is in operation. The oil pumps are below the supply so they do not need priming and they are of the gear type.

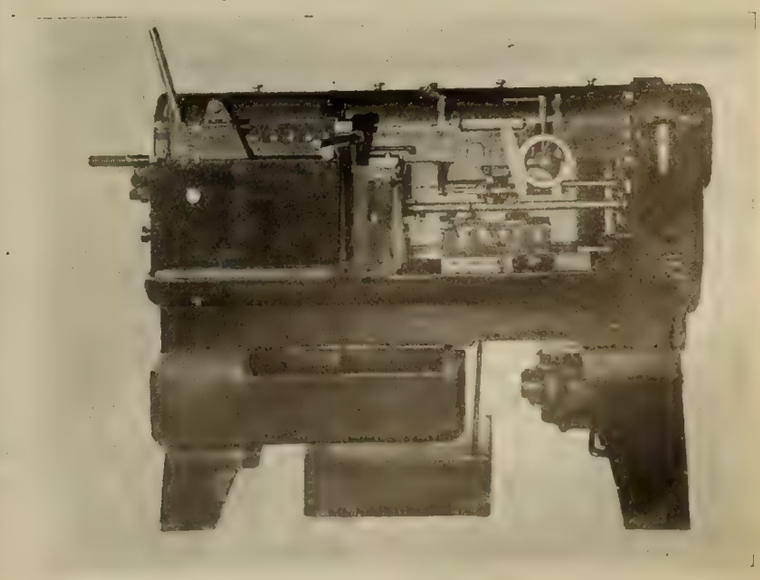
This machine is a recent product of the Cone Automatic Machine Co., Windsor, Vt.

CRANK PIN FORMING LATHE

THE machining of crank shafts is a branch of machine work which in recent years has attained peculiar prominence in view of the ever-increasing output of motor vehicle engines and lately of aeroplane engines. Practice varies in different countries to some extent, and the accompanying engravings, which illustrate an advanced type of English machine, are of interest in view of the stress under which engine builders there have been operating for some time. The illustrations, for which, along with the particulars, we are indebted to "Engineering," show a single-pin forming machine, which is capable of dealing with a crankshaft of which the length measured over the outside webs of the outer cranks, plus the length of the longest end, does not exceed 4 ft., and of such dimensions that it will swing in a circle 20 in. in diameter. The height of centres is 18 in. and the hole in the spindle is 21 in. in diameter. The machine is intended to finish the crank-pins and down the sides of the crank-webs, the main journals of the



VIEW SHOWING LOCATION OF MOTOR AND BELT DRIVE.



FOUR-SPINDLE AUTOMATIC WITH DOUBLE BED CONSTRUCTION.

shaft having been previously finished to size.

As will be seen from Figs. 1 to 4, the design of the bed is very substantial, and has the cross-slide cast solid with it. At the end of the bed is fixed an extension piece, of closed-box section, on which the loose headstock is mounted. The driving head is arranged so that the machine can be driven either by belt or by a constant-speed motor, the power being transmitted through steel gear machine-cut from the solid, and the final drive to the spindle being through a pair of double-helical gears. Six changes of speed are provided, only those gears which are actually transmitting power being in mesh. The changes of speed are controlled by the upper left-hand lever and the hand wheel seen on the front of the machine in Fig. 1, while the power cutting feeds to the tool slides are regulated by the lower left-hand lever shown in the same view. The feeds provided for are four in number.

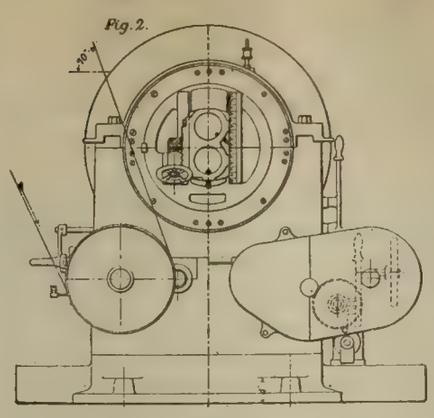


FIG. 2

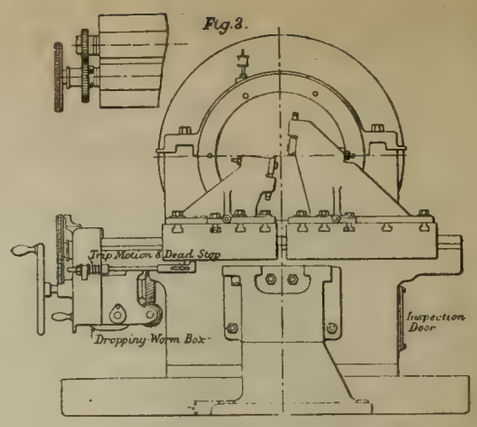


FIG. 3

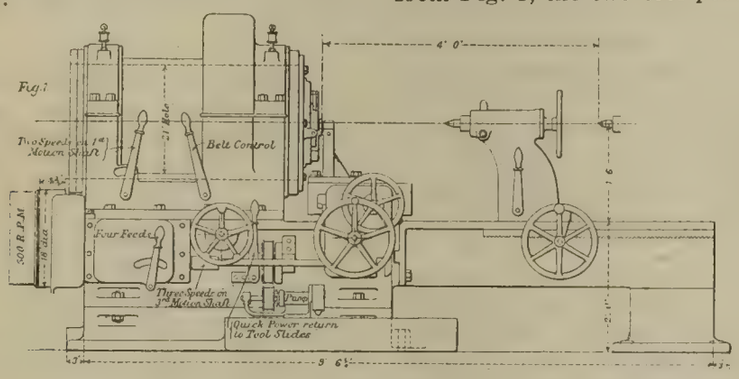
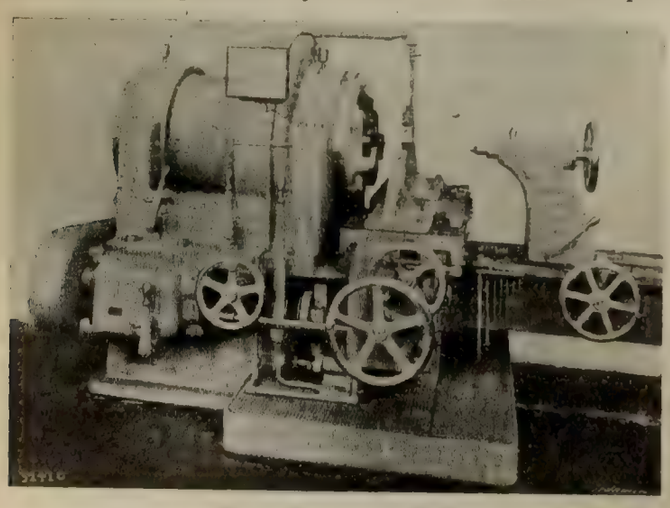


FIG. 1.

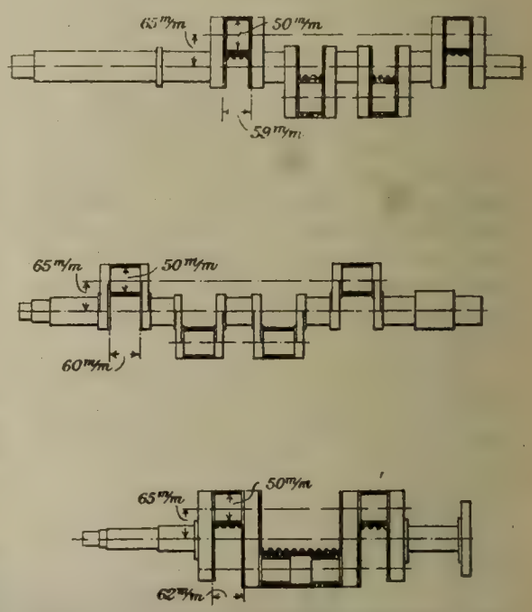
A special feature of the design is that the two tool slides are operated simultaneously. When the pin being operated upon is approaching its final diameter the front tool is put out of gear and the back finishing tool finishes the pin. By this means much time is saved as compared with the usual practice of employing only one tool at any time. The tool slides are arranged to trip automatically at predetermined positions when the final diameter is controlled by hand-feeding the finishing tool to a dial indicator. In practice it is found quite possible and easy to finish a pin to any given size, and, if necessary, to reduce the diameter of the work with precision by as small an amount as 0.001 in. To avoid the really hard labor and loss of time involved in winding back the heavy tool slides, a quick-acting power return motion is fitted, this motion being controlled by the lever marked in Fig. 1. As will be seen from Fig. 3, the two tool posts are firmly bolted down to the carriage slides, and the whole design is very rigid. The movement of the slides is effected by large-diameter screws made of high-carbon steel fitted with long phosphor-bronze nuts.

Inside the main drive or spindle there is mounted a sliding head carrying an adjustable work-holder, adapted to receive the end of the crankshaft which is to be machined. This work-holder, which will be seen in Fig. 2, is under control by a hand wheel with pointers showing the correct position for any throw of crank. On the front of the drum is mounted another adjustable work-holder, also provided with pointers to show its correct position. This latter work-holder grips the main bearing or pin of the crankshaft which happens to be next that which is to be machined, while the loose headstock supports the outer end of the crankshaft. The crankshaft is thus held in two bearings and supported at the end, while the drive is transmitted close up to the cutting tool.



CRANK PIN FORMING LATHE

Splash lubrication is provided for all the main driving gears, while the main bearings of the spindle are fitted with sight-feed lubricators, and the other bearings of the driving mechanism with ring lubricators. A complete self-contained pump and tanking system is provided to ensure an efficient supply of lubricant on the work. This lathe is constructed by Thomas Ryder & Co., Ltd., Bolton, Lancs.



TYPES OF CRANK SHAFTS OPERATED ON.

HIGH POWER 14 IN. LATHE

WITH the object of providing a lathe embodying features which render it suited for either manufacturing or tool room use, the American Machine Tool Engineering Works, Chicago, Ill., have developed the 14 in. high power lathe illustrated in the accompanying engraving. Simplicity, rigidity, and accuracy are features which have received special attention.

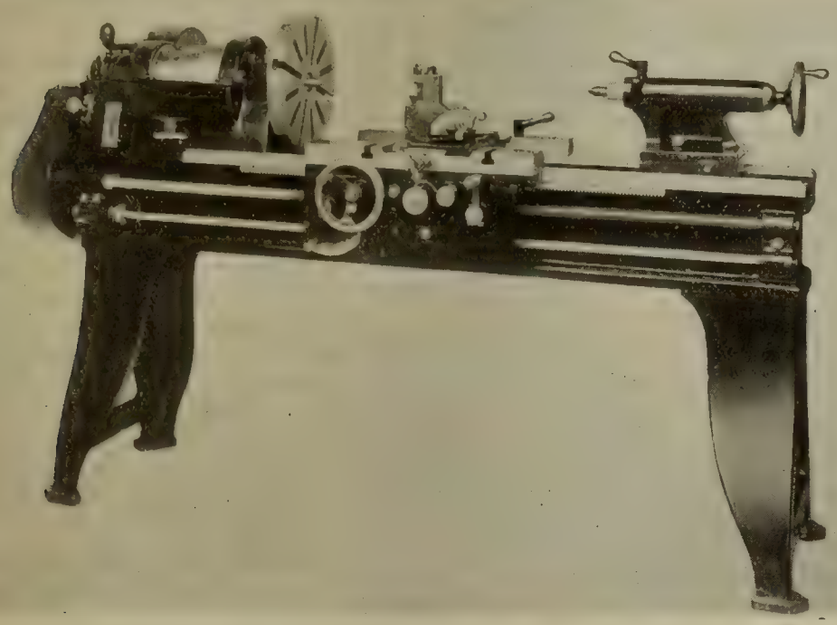
The headstock is of the bowl type, and carries a 60 point carbon, crucible steel spindle, having a front journal 2 7/16 in. dia., by 4 in. long, the rear bearing being 1⅞ in. dia., by 3 in. long. Bronze bearings are fitted to the spindle, which has a 1 5/16 in. hole throughout its length. The drive is through a three-step cone pulley, with double back gearing with a maximum ratio to the spindle of 8 to 1. The lever for shifting the

back gears is within easy reach of the operator; headstock gears are of steel, and idlers are bronze-bushed.

The bed is of ample depth to insure perfect rigidity under the heaviest pull taken by the belt, and the carriage has a bearing of 23 in. on the vees. The compound rest is unusually large.

A feature of the apron is the provision of a feed change lever with four locations by means of which a similar number of feeds can be obtained, either cross or longitudinal, this device being distinct from the customary feed reverse lever. The apron is cast in one piece with integral bearings. The feed is driven direct from within the headstock by a train of gears, provided with an overload friction device to provide slippage and avoid damage by accident or otherwise.

The tailstock is fitted with an extra-long spindle, 1¾ dia., and having a travel of 8 in., giving great rigidity, allowing of deep holes being drilled without bringing up tailstock. No. 3 Morse taper centres are fitted.



14 IN. HIGH POWER LATHE WITH FOUR FEED CHANGES IN APRON.

When desired the lathe is equipped with pan bed, taper attachment, draw bar and collets. When so constructed it becomes a desirable tool room lathe possessing remarkable flexibility. When needed for gauge making it will be found to possess all that may be desired for this class of work. This not only applies to plug and ring gauges but thread gauges as well. A sufficient quantity of change gears are furnished with the lathe, making it possible to cut a large range of threads and from 2 to 48 per inch. When desired it can be furnished with metric lead screw and change gears for cutting metric threads from 1 to 7 millimetres.

The lathe swings 14⅝ in. over the vees; swings 7 in. over carriage; takes 36 in. between centres with 6 ft. bed; and weighs 1,600 lbs. Regular equipment consists of double friction countershaft; steady rest; large and small face plate; wrenches, and necessary change gears.

OCEAN FREIGHTER LAUNCHED

THE ocean-going cargo steamer, Tento, was launched at the Polson Iron Works, Toronto, on Monday, October 22. The Tento, which was ordered by Norwegian interests, was christened by Mrs. Andre Refnes, wife of the Norwegian captain who will command the ship. The principal dimensions of the vessel are as follows: Length 261 feet, breadth 43 feet 6 inches, depth 23 feet, deadweight capacity 3,500 tons, mean draught 19 feet 6 inches. She is of the single deck type; is built on the deep frame principle, with cellular double bottom all fore and aft, and peak tanks; has four watertight bulkheads, two masts, and is equipped with six steam winches—one at each mast and derrick, steam and hand steering gear, electric light, evaporating outfit, etc. The propelling machinery consists of triple expansion engines having cylinders 20½ in., 33 in. and 54 in. diameter by 36 in. stroke. Steam is supplied by two Scotch marine type boilers, each 14 feet diameter by 12 feet long. Each boiler has three corrugated steel furnaces of 42 inches diameter.

WOMEN'S MUNITION WORK

(Continued from page 466.)

and general engineering (including pneumatic and machine tools). An interesting exhibit in the small-arms group consists of details of the Vickers type of automatic machine-gun. These were made at a works that before the war had never done machine-gun work. The bulk of the machining is done on milling machines worked exclusively by women. About 70 per cent. of the drilling machines and capstan lathes are also worked by women and the remainder by boys. The machining is done to very close limits, so as to reduce the bench work to little more than removal of burrs; and of this about 40 per cent., together with the whole of the gauging and a large and increasing part of the tool-setting, is performed by women.

The catalogue which was received so favorably at the Leeds and Newcastle Exhibitions is continued in the same form as before. As will be remembered, it was not merely a list of exhibits, but also for most articles contained against each exhibit much valuable information as to the machines and methods used in manufacture. Considerable additions have been made to this information in the present catalogue.

Screenings

School Teacher: "Why is a certain part of the church called the altar?"

Tommy: "Because it's where people change their names."

Tommy: "I've got something wrong inside me stummick, sir. First it seems to come up, then goes dahn; then it goes up an' then dahn again."

M. O.: "Perhaps you've swallowed a lift!"—London Opinion.

On the Western plains the sheepman goes out with several thousand head and one human companion. The natural result is that the pair, forced on one another when they least want it, form the habit of hating each other.

An ex-sheepman while in a narrative mood one evening was telling a party of friends of a fellow he once rode with. "Not a word had passed between us for more than a week, and that night when we rolled up in our blankets he suddenly asked:

" 'Hear that cow beller?"

" 'Sounds to me like a bull,' I replied.

"'No answer, but the following morning I noticed him packing up.

" 'Going to leave?' I questioned.

" 'Yes,' he replied.

" 'What for?'

" 'Too much argument.' "

A tall, official-looking man with a notebook in his hand called on old Smith the other day and observed:

"Excuse me, Mr. Smith, but I believe you possess a little fox terrier with a black patch over his left eye?"

Visions of unpaid dog taxes burst upon Smith, but, being very stingy, he with great energy replied:

"Oh, no, naething o' the kin'. He is only a puir stray dog that followed me hame. He disna belang tae me ava'."

"Is that so?" said the stranger. "That is all right, then. Only our client, Mr. Macdonald, accidentally shot the dog this morning, and I came round to compromise the matter by offering you ten pounds, but, of course, if he is not your dog—well, good morning."

And old Smith could not refrain from kicking himself.

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EFFICIENCY AND EFFICIENCY EXPERTS

AMONG the numerous war-born problems is one which is receiving increasing attention as these troublous times approach a climax—one which received more or less desultory consideration in pre-war days, and which in the strenuous days of post-war competition will receive, must receive, ever-increasing devotion from those who hope to maintain the industry of the country on an equitable basis under the stress of international competition.

About few phases of modern industry has there been so much written, said, understood, and misunderstood as efficiency. Well might the Goddess of Industry exclaim, "Oh, Efficiency! what deeds have been perpetrated in thy name!" Few factories and business establishments but have been "through the mill" at the hands of an efficiency expert, and few of them indeed but could have achieved similar, if not frequently surpassing, results by the application of home talent. But, because of the fact that the truth is always unpleasant, home talent, like the time-worn prophet, is generally at a discount, and it is much pleasanter and less humiliating, likewise much more fashionable, to have the truth unearthed and served up in the form of a so-called efficiency report than to admit to one's subordinates that things have not been run properly.

Experts! their name is legion. Possessed of analytical minds and intellects of high penetrative power, they have, as a result of legitimate effort and commendable success on the part of the few, assumed unto themselves powers of diagnosis bordering on the uncanny. One of the species will enter a plant, observe the rate of lift at which a crane operates, decide that it could lift at twice the speed and save so much time resulting in twice the work, etc., **quod erat demonstrandum.** So many dollars being lost every time the crane lifts anything at the old speed! Against this hypothetical leak must be set the increased stress under which crane operator and equipment will be placed, increase in accidents involving possible damage to employees and work in progress and the old adage, "the more haste the less speed" will doubtless appear behind the maze of alterations and speeding up suggestions which fill the report presented to the management.

Another phase of the subject is the manner in which the expert deals with the respective services of various officials of the plant. When it is remembered that an exhaustive report on a plant will cover everything from the activities of the floor sweeper to the policy of the management,—and from the color and style of the letter head to the shade of the window blinds, the official is indeed fortunate whose efforts are not criticized to some extent. And it is just at this point that experts become inexpert. If the investigation has been conducted in an open and above board manner, the plant officials notified of its objects and their co-operation as loyal employees secured in a frank, sensible manner, the firm is indeed fortunate, and is assured of maximum benefit. The expert, if worthy of the name, finds his task lightened enormously. Many plans are brought to light, which for various reasons have been held back by different officials. He becomes the melting pot into which years of experience pour their mature reflections, and if, by great good fortune, and this is the important "if," he has had personal experience in the same or an allied line as the plant in question, all concerned may well bless the day when he commenced his task.

Such, however, is the ideal. The real, unfortunately, is far from approaching it in thoroughness and skilfulness, and nearly always terminates where it commenced or soon gravitates back to its former condition.

Efficiency, like Charity, begins at home. No man likes to be told that he does not know his business as well as he thinks he does, or ought to. It is much nicer, and more pleasing to his vanity to have the onus of things laid on others. Calling down employees is considered a necessary qualification by many executives, and the expert who finds the backlash in quarters where admonitions must be heard but not refused is sure to be supported in almost any system of reorganization short of a general upheaval.

The tragedy of the play is frequently staged in the superintendent's office. Brow-beaten and discouraged by an interfering principal who knows not when to leave well enough alone, the unfortunate recipient has allowed matters to take the line of least resistance, and it is comparatively easy for any pseudo-expert to make recommendations which should obviously have been put into practice long before.

On the other hand, the business which is run by men with ideals, who wish to be known by their work for themselves and those associated with them, who recognize the laborer as worthy of his hire, and that as we do unto others so will others do unto us, such a business has no room for another expert—it is already full up.

During the past three years many of our factories and business houses have run the gamut from extreme depression to overflowing, yes, fulsome prosperity. When times were bad they did not want efficiency experts. They had no money to pay them and no work to expertize. Now they have money they do not want to spend it on unproductive labor, but, are they any more efficient now than they were before? Have they not grown rich, some of them, in spite of themselves? Are they going to remain rich or what?

Time alone will tell, but to him who considers what his position will be when real competition comes, when each employee will be valued for what he can and can not do, when the faithful employee of years is repeatedly asked for his opinion and valued and remunerated because of his loyalty and ability, to such men the future will give its rewards, provided they recognize the opportunities of the present to set their house in order and use the ensuing interval as a period of introspection, in which efficiency is the keynote and every man an expert, the motto.

INDUSTRIAL NOTABILITIES

CHARLES EDWARD FRASER, B.A. Sc., president, Fraser, Brace & Co., Ltd., Montreal; president, Fraser, Brace & Co., New York; managing director, St. Maurice Construction Co., was born in Montreal, April 7, 1873.

He was educated in public schools, Montreal, and graduated from McGill University (Bachelor of Applied Science), 1899.

Supervised construction of a section of the first New York Subway, 1900-1904; also half of the construction of four tunnels for the Pennsylvania Railroad under the East

CHARLES EDWARD FRASER, B.A. Sc.

River, New York, 1904-1908. In 1908 established the firm of Fraser, Brace & Co., New York, which company have carried out a large number of notable undertakings.

In Canada: Intake section of the Canadian Light & Power Company's power development at Valleyfield, 1910-1911; construction of the Cedar Rapids hydro-electric development, 1913-1914. In the United States; Viaduct construction for the Pennsylvania Railroad, 1909; shaft and tunnel at Niagara Falls, 1908-1910; two hydro-electric developments on the Deerfield River, Mass., 1912-1913; construction of four miles of flooring on the Hell Gate Bridge, 1915-1917; construction of cantonment for the United States Navy, Philadelphia, 1917; construction of shipbuilding yards at Newark for the Federal Ship Building Company, 1917.

In 1914 the Canadian firm of Fraser, Brace & Co., Ltd., was established and have constructed a smokeless powder plant at Trenton, Ont.. for the Imperial Munitions Board, 1917. Construction work now under way; Dam at La Loutre, Que., on the Upper St. Maurice River; a second power development at Cedar Rapids; four wooden steamers for the Imperial Munitions Board at Montreal.

Mr. Fraser is a member of the Canada Club and Engineers' Club; member Can. Soc. Civil Engineers; member Am. Soc. Civil Engineers; and in creed is Congregational. He married Helen Sweezy, daughter of Richard L. Sweezy, their family consisting of two sons and one daughter.

Mr. Fraser's residence is 466 Roslyn Ave., Westmount, Que.

—Photo. courtesy British and Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$46 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00
	Montreal Toronto
Hamilton	....
Victoria	..... 60 00

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 00
Tank plates, Pittsburgh	8 00
Structural shapes, Pittsburgh	4 00
Steel hoops, Pittsburgh	5 75
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 00

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$31 00	$32 00
Electro copper	31 00	32 00
Castings, copper	30 00	31 00
Tin	63 00	63 00
Spelter	10 50	10 50
Lead	10 00	9 00
Antimony	18 00	19 00
Aluminum	65 00	62 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$13 00	$13 00
Heads	13 30	13 30
Tank plates, 3-16 in.	13 65	13 25

WROUGHT PIPE.

Effective July 5, 1917.

Size.	Black Per 100 feet	Galvanized
	Standard Buttweld.	
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00
	Standard Lapweld.	
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	20 00	20 50
New brass cuttings.	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	15 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel.	20 00	20 50
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron.	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	7 00	7 00
Tea lead	6 00	5 75
Aluminum	30 00	25 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up.	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 20
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less.	10
Blank bolts	net
Bolt ends	net
Elevator bolts	5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank,	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze.	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	25
Eq. & Hex. Head Cap Screws.	20
Rd. & Fil Head Cap Screws	net
Flat ⅞ But. Hd. Cap Screws plus	net
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and semi-fin. nuts, over 1½ in., up to 2 in. plus	10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws...list plus	20
Collar screws ....list plus 30,	10
Thumb screws	20
Thumb nuts	65
Patch bolts add 40,	10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$ 60 00
Open-hearth billets	60 00
O.H. sheet bars	70 00
Forging billets	90 00
Wire rods	85 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS.

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	18 00
Red dry lead, 100-lb. kegs, per cwt.	15 45
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 78
Linseed oil, raw, single, bbls.	1 42
Linseed oil, boiled, single bbls.	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. ..list plus	20
Emery Cloth .....list plus	33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila Rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto ..... net

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52.	30
S.S. drills, wire sizes, No. 53 to 80	net
Standard drills to 1½ in.	30
Standard drills, over 1½ in.	30
3-fluted drills, plus	10
Jobbers' and letter sizes	20
Bit stock	25
Ratchet drills	15
S.S. drills for wood	30
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 30
Bridge reamers	52½
Centre reamers	10
Chucking reamers	net
Hand reamers	10

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A. add 35%; B and C, plus 25%; cast iron, net; standard bushings, 25%; headers, 60; flanged unions, 5; malleable bushings, 30; nipples, 45; malleable lipped unions, 40.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	$11 00	$10 50
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	10 95
Premier, 10¾ oz.	13 85	11 25
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B	
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	40
Black Diamond	40
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	37½
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke	$
Connelsville Foundry Coke	
Steam Lump Coal	
Best Slack	

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

WHILE the outlook in the iron and steel industry continues unsettled there is a more general realization that little improvement may be looked for in the near future even if some relief is obtained through a modification of the terms of the embargo. The shortage of steel, which will undoubtedly become more acute as demands for war purposes become heavier, will be a serious matter for the consumer engaged in the manufacture of products not required for the prosecution of the war. The restriction in output will be felt by the public generally and will doubtless result in a shortage of many articles used for every-day purposes. On account of the unsettled conditions prevailing in the steel market, consumers are only buying from hand to mouth to fill more urgent requirements. Steel prices are holding firm with the exception of light gauge black sheets which have declined. There is no indication at present of any general recession in prices, same appearing improbable for some time. Pig-iron prices are firm and the situation in the market is unchanged. Here again lower prices do not appear likely in the meantime. The coal situation is easier, although prices are still high. It is reported that ten per cent. more coal will be allowed to enter Canada over and above the amount imported last year. Scrap metal prices are firmer. Copper, heavy melting steel and rails have advanced, but lead and spelter have declined. New discounts have been issued on hand, machine and pipe taps. Prices of supplies are holding firm, but deliveries are getting slower. The non-ferrous metal markets are quiet and prices unchanged with the exception of lead which has declined.

MONTREAL, OCT. 22, 191.—Industrial uneasiness is still apparent and manufacturers are becoming more anxious over developments across the line, many of which were primarily intended to relieve a situation that promised to become quite serious. In relation to industries directly connected with the prosecution of the war, a certain degree of relief has undoubtedly been shown, but the domestic situation is, if anything more acute than before, as it is almost impossible to place contracts for material at the prices fixed by the American Government. Under the circumstances, industrial activity is greatly hampered. As an offset to the foregoing it is understood that orders will be placed here for a considerable quantity of marine equipment, such as boilers, engines and deck machinery, for vessels now under construction in the States, and for which the material would be available from American mills through the U.S. Government.

Steel

The magnitude of the work of price regulation undertaken by the American Government is becoming more and more evident each week and is being reflected in the apparently slow progress that has been made so far. The announcements that have been made to date are however a fair indication of what may be expected in those commodities not yet touched by the price fixing regulations. It is anticipated that in view of what has already taken place that further adjustment will only be a question of a few weeks at the latest. The efforts of the Government in their price fixing programme has been to set a price as low as possible and yet one that is entirely agreeable to the producers, so that the latter will co-operate in main-

taining maximum production, and in so doing keep the market supplied with every needful commodity.

It is still a question of great importance as to whether recent developments will immediately benefit the domestic consumer. Producers are showing an apparent reluctance to entertain business from the latter source, advancing the claim that they are filled up for many months ahead and are therefore unable (or willing) to accept orders at the present time; thus the market generally is still featured by the uncertainty that has marked it during past months. The price of $47.50 for billets is somewhat lower than was expected and in addition to this the market is surprised by the range that is effective on the large and small sizes. The fixing of wire rods at $57.00, a decline on the open market price of $33.00, is undoubtedly the preliminary to the adjustment of prices now prevailing in wire products. With the exception of the war demands, the market in wire products is very quiet, consumers evidently awaiting the announcement of the Government in connection with these lines.

The plate situation is much the same. Only war requirements are receiving consideration from the mills. For this reason the domestic consumer is still as much in the dark as ever, and this condition is likely to prevail until the market becomes more settled and price-fixing has been completed. The Pittsburgh price on grooved and sheared steel skelp has been agreed upon and has been fixed at 2.90c for the former and 3.25c for the latter. In anticipation of a lower price on sheets, based on the action of the Government in relation to sheet bars, the open market has declined and prices are easier. The base price of black has declined one cent per lb., and blue and galvanized are lower by ½ cent per lb. Domestic consumers are holding back awaiting the announcement of price readjustment. The entire steel market is dominated by war conditions, producers being in no way anxious to accept orders from the trade generally. The local situation is unchanged and dealers here do not anticipate any immediate effect as a result of the price changes now in force in the States. The near future may see a slightly easier tone but the impossibility of obtaining material except under special license may have a contrary effect and such material as is now on hand may bring still higher prices than now quoted.

Metals

With the exception of tin, which retains its firm position, the general tone of the metal market is one of nervousness, largely as a result of the unsettled condition that has continued to feature the situation in the States. The fixing of prices, while seemingly eliminating the fluctuating feature of the market, has not had the effect of relieving the situation as far as the securing of material is concerned, and it is if anything more difficult for domestic consumers to obtain materials now than it was a few months ago. This however, may not be of a permanent character, and with the further fixing of metal and steel prices it is hoped that the general situation will become easier. The copper situation is quite acute and the supply falling below the demand. Tin is strong and fairly active. Spelter is dull and inactive. Lead is weak and unsteady, while antimony and aluminum are easier on poor demand.

Copper.—The price fixing of copper has had no material effect upon the market other than to ensure that the U.S. Government requirements will be filled at the prices arranged. One of the factors that tends to make the situation somewhat acute is the falling off in production, making it increasingly difficult for the domestic consumer to supply his needs. Delivery on old contracts is being made, but there is an apparent reluctance on the part of the smelters to accept or entertain new business on the present basis of prices. Should the present shortage have a similar result as that developed in other metals, there seems to be the possibility that the excess output expected at the beginning of the new year will not be able to find a market. The local situation is affected by conditions in the U.S., as the virtual embargo there operative makes it very difficult to obtain material, even under license. The market is not active and quotations are unchanged at 31 and 30 cents per lb.

Tin.—This appears to be the only metal that is maintaining any degree of stability owing to the fact that it does not come directly under the American Government regulations and the market is therefore fairly active on a steady demand with prices firm. A problem that has been receiving considerable attention of late is that of securing sufficient tin on this side to meet all requirements, and it is believed that the efforts of the American Tin Committee will shortly bear fruit in the relief that may be forthcoming in relation to the granting of permits by the British Government. While the latter will undoubtedly benefit most those consumers that are exclusively occupied on war necessities, there is the possibility that the small dealer and general consumer may share in such agreements as may be made. The New York market is nominal but ½ cent stronger at 61½ cent per lb. Local dealers report a steady and firm market at 63 cents per lb.

Spelter.—The situation in spelter is one of listless uncertainty, inactive in the extreme and awaiting the action of the Government regarding the price regulations. This latter feature is not of a very disturbing character owing to the fact that the open market quotation is little more than the actual cost of production, and for this reason it is anticipated that any price fixed by the Government will not very greatly from that now quoted. New York has again declined ⅛ cent on total absence of demand. The market here is quiet. Prices are firm, although developing an easier undertone; dealers here quote 10½ cents per lb.

Lead.—The position of lead is assuming a place similar to that prevailing in spelter, as the gradual decline in quotations during the past few weeks has brought the open market price to a figure closely approaching the cost of production. This will undoubtedly have the effect of curtailing the output, as many producers will not be inclined to operate at capacity on such small profits. With the market very inactive, the surplus stocks have gradually been increasing, and recent declines may have been made with the object of cutting down production. The New York market is now on the basis of 6½ cents per lb., this quotation representing a decline on the week of 1½ cent per lb. The local situation is quiet with dealers asking 10 cents per lb., this price being one cent lower than last week.

Antimony.—The market is very quiet and the demand is light. New York prices are lower, the quotations being 14⅝ cents; dealers here report a steady market but not heavy. Prices remain unchanged at 18 cents per lb.

Aluminum.—The situation is weaker at this writing on poor demand. New York quotations are lower but dealers here continue to quote 63 to 65 cents per lb.

Machine Tools and Supplies

Conditions in this industry show no signs of returning to the activity of say one or two years ago, the situation being practically the same as it has been for the past few weeks. With the exception of the manufacture of the six-inch shell the munitions activity is confined to the closing up of such orders as were placed several months ago. Very few of the latter are expected to be renewed. As a consequence, orders for machine tools are on a limited scale. Considerable interest is still centered in the attitude of American firms in their efforts to obtain equipment now becoming idle in many Canadian shops. The possibility of considerable ship equipment business being placed in Canada, is being actively discussed in machine circles. It is believed that United States firms are looking around with a view to placing business for marine boilers and engines with Canadian plants in a position to handle this class of work. The demand for supplies continues to be of an encouraging nature, and prices for same are well maintained.

Scrap

Dealers are still awaiting U.S. Government action in connection with the regulation of scrap prices. Uncertainty has had, and still is having, an unsettling effect on the market, and any business passing is largely of a hand to mouth nature, being only sufficient for immediate needs. The New York market is easier on all grades of scrap and old materials, while the situation here is very unsettled as both dealers and consumers are not anxious to overstock under existing conditions. The local market is lower on old

brass, leads and heavy melting steel, a decline of one cent placing the current quotation on these particular metals at 11 cents for light, and 15 cents for medium brass; heavy melting steel $20 per ton. Lead on a decline of ½ cent is quoted at 7 cents for heavy and 6 cents for tea lead.

TORONTO, ONT., Oct. 23. — Trade generally continues good, in spite of shortage of raw materials. Manufacturers, however, are handicapped because of this, and output is consequently being restricted. That conditions will become worse in this respect is practically certain, particularly for consumers using imported iron or steel products. The enormous demand for steel for war purposes is bound to affect the situation, although war orders will offset to some extent the reduced activities of firms engaged in purely domestic business.

Steel

That a serious situation for private consumers of steel products is inevitable is indicated by recent developments in the States. There is every indication of a serious shortage of steel, due to the steady increase in tonnage required for war purposes. Not only will prices be regulated by the Government, but the entire output of the mills will be supervised by the Priority Board, who will see that the U. S. Government and Allies have all the steel that is required for war purposes, and then allot what is left for commercial purposes. In view of the large tonnage required for war purposes, it will be a difficult matter to meet the demands of the ordinary consumer to the full extent of his requirements. This being the case, it is unlikely that the embargo will be modified to a greater extent than has already been done, although some leniency may be shown in the interpretation of the clause for war purposes or contributory thereto. In any event, consumers not working on war contracts are bound to suffer and manufacturing operations will be restricted. This is the most serious feature of the whole situation for those concerns using material such as can only be obtained from the States. Manufacturers who use domestic material will not be inconvenienced, except perhaps by some delay in deliveries, which can be overcome by judicious purchasing.

It is understood that the fixed prices do not apply on export business. This may be so for the time being, as the mills are not booking orders at the new prices, because they have no steel to deliver except on high-priced contracts. All new contracts will, of course, be subject to investigation by the Priority Board. The embargo also tends to neutralize the effect of the agreed upon prices, and at the present time there is no indication of a general recession in prices. There has been a decline in black sheets, although in the lighter gauges only; No. 10 and heavier have not been affected. Prices of all other steel products continue firm and unchanged.

In the United States, Government buying is the principal feature; private consumers are still holding back on account of the unsettled conditions in the market. The additional prices on steel have helped to clear the situation, but prices on a large number of steel products have still to be fixed, and until that is done buying will be light. For this reason it is probable that unfilled tonnage reports for this month will show a further decline over preceding months. Now that prices are fixed on the chief products, the U. S. Government is distributing orders for an enormous tonnage of steel for shell and ship construction.

Pig Iron

Prices of domestic pig iron continue firm and unchanged, with no indication of a decline in the meantime. It appears unlikely that there will be, in any case, a decline in prices until the furnaces have disposed of a considerable portion of the tonnage already booked. The embargo has also to be taken into consideration, which in itself is tending to hold prices up. It is hardly to be expected that U. S. pig iron will be freely licensed to Canadian consumers, as so much iron will be required in the States. Furthermore, the agreed upon prices do not apply to this market, which would preclude furnaces in the States selling iron in Canada on the fixed price basis. There has been no appreciable improvement in the coke situation, the agreed upon prices not having as yet resulted in a lowering of the market. Shortage of cars and labor has reduced the output of coke and volume of supply from the ovens.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

Scrap

The market is a little firmer, and there has been a slight advance in prices of some old materials. All copper scraps have advanced 1c a pound and machinery composition is up 2c a pound. There is a great scarcity of heavy melting steel, and in consequence prices have advanced $3, making the new price $20 per ton, while steel rails are also higher at $20 per ton. Leads are weaker, heavy lead being now quoted at 7c and tea lead at 5¼c per pound. Scrap zinc has also declined, and is now quoted at 6c per pound. The market is quiet and business is dull, due to the unsettled conditions prevailing. Dealers are not anxious to sell, as they are looking for higher prices, while consumers are keeping out of the market in anticipation of lower prices.

Machine Tools

There have been no further developments in regard to the sale of munition plants in Canada. The outlook in regard to munitions continues obscure. Although some contracts for shells will doubtless be distributed from time to time, it appears unlikely that the industry will ever assume its former activity. A number of plants will, therefore, be lying idle, so it is a good opportunity to dispose of them.

Supplies

Prices of machine shop supplies are holding firm, with an upward tendency on some lines. The movement is not, however, so pronounced as formerly. The main difficulty now is deliveries, which are slow, particularly on imported lines. The following new discounts have recently been issued: Hand taps, ¼ to 1 in., 35 per cent.; 1⅛ to 2 in., 10 per cent.; 2⅛ to 2½-inch., plus 25 per cent.; machine taps, No. 12 and smaller, 50 per cent.; No. 13 and larger, 35 per cent. off list; pipe taps up to 1 inch, 60 per cent.; 1¼ to 2 inch, 55 and 5 per cent.; 2½ to 3 inch, 35 per cent. off list. Screw plates, dies, colletts and stocks are now list plus 10 per cent. Albany grease has advanced and is now 35c per pound. Lead wool has declined 1c, and is now quoted at 15c per pound.

Metals

The metal markets are dull, with little business of importance being transacted. The local situation reflects conditions in the States, where the price regulation has unsettled the market. The uncertain outlook is tending to make consumers hold back, and any pronounced activity seems unlikely until conditions are more settled. Prices generally are unchanged, with the single exception of lead, which has declined in sympathy with the market in New York.

Copper.—Although a price of 23½c has been fixed on copper to the United States Government and the Allies, there is considerable uncertainty in the trade in regard to the distribution of red metal at the agreed upon price. A committee of leading copper producers is working on a plan to relieve the situation and a solution of the difficulty is expected shortly. Lake and electrolytic are quoted at 32c and castings at 31c a pound.

Tin.—There is no change in the tin situation, the market being fairly active and steady. Quotations are nominal and unchanged at 63c per pound.

Spelter.—The market is dull and featureless, the chief reason being the uncertain position of copper. Local quotation is unchanged at 13½c per pound.

Lead.—Another reduction in the price of lead has been made, which brings it down to 6½c New York; the Trust and independent producers all quoting the same price. The market is weak, and is entirely without support, a further decline being probable. Lead has declined 1¾c locally, and is now quoted at 9c per pound.

Antimony.—The market is dull and

stagnant, with practically no business offering. Local price, 19c per pound.

Aluminum.—The market is dull and weak, with prices unchanged at 62c per pound.

PITTSBURGH, Oct. 20.—Price fixing at Washington is proceeding somewhat more slowly than was expected, as no additional prices have been announced since those of Oct. 11, referred to in last report. Those prices were upon large and small billets, sheet bars, slabs, wire rods, skelp and shell rounds, the prices previously fixed, Sept. 24, having been on coke, pig iron, bars, shapes and plates.

What the trade has been expecting lately has been prices on sheets, tubular goods and wire products, possibly also upon scrap, together with a precise statement as to pig iron, covering the different grades and districts. The original agreement upon pig iron was as to foundry and basic at valley furnaces. Meanwhile there have been sales of foundry pig iron by northern furnaces other than valley at the price of $33 at furnace as a tentative one.

There is ground for surmising that difficulties have arisen whereby the War Industries Board has been unable to reach a conclusion as to sheets, tubular goods and wire.

More Pig Iron Activity

The pig iron market, on the whole, has been somewhat more active than might have been expected, when set prices were named at less than two-thirds the prices at which a very considerable volume of business has been done for delivery in the fore part of next year. That business occurred chiefly in June, the market thereafter, up to the time of the price fixing, being very quiet, with transactions confined to small lots for early deliveries. In the past ten days the market has been distinctly more active than in that period. At least 50,000 tons of valley Bessemer and basic has changed hands, and the valley furnaces have sold small lots of foundry iron, all the sales being for early delivery. Some of the Virginia furnaces, on the other hand, have sold for extended delivery.

The blast furnaces are perfectly ready to let their iron go at the fixed prices, but as there are contracts on books at much higher prices they wish to protect that business as much as possible and to sell indiscriminately in the open market would make it more difficult to enforce the contracts. Accordingly the common attitude is to sell only to regular customers, and only iron that is urgently needed.

Steel Market Quiet

The finished steel market is very quiet. In the commodities for which prices have already been fixed the mills will not sell except to take care of customers for early deliveries, and as the customers are already quite well covered scarcely any business occurs. In the products for which prices have not already been fixed, it is quite significant that there is hardly any business being done. If buyers were fearful that they would be unable to secure deliveries at the prices to be fixed, they would now be playing safe by paying the higher prices that would now be asked, for on such purchases perference in delivery would naturally be given. This they are not doing, to any extent, therefore it is impossible to believe that steel is really very scarce. In the case of sheets, for instance, there were buyers for several months of both blue annealed and black at between 8.00c and 9.00c, while now, with prospects that the prices will not be much, if any, above 4.00c for blue annealed and 5.00c for black, there is no buying at intermediate prices, and one mill has been canvassing for business in the past few days on the basis of making sales subject to the prices when fixed. This is quite a curious commentary on the picture producers were drawing of their market and prospects for demand only a few weeks ago. In other words, the sheet bubble has burst.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

War Steel Tonnage

The question of how much steel will be required for prosecuting the war is not being answered. The situation is no clearer and the latest developments merely suggest that it never will become clearer. The Government has asked sellers not to give out specific information as to orders placed, and the statements at Washington as to the amount of business expected to be placed are rather indefinite. One statement is that orders are to be placed, following upon the price agreement, for 6,000,000 or 7,000,000 tons of steel. This would be for delivery in 1918 but it does not throw much light on the matter, first because it is not known how the tonnage will be distributed among the various commodities, or whether the deliveries will be required uniformly throughout the year. Then there is the matter of purchases for the Government's Allies, which do not seem to be included in the figures just mentioned. Orders placed thus far by the Government are understood to total about 3,000,000 tons. A considerable part of this steel has already been delivered, and perhaps not much will run into next year.

Production of finished rolled steel last year was about 31,500,000 gross tons, while production now is probably running at the rate of 32,000,000 or 33,000,000 tons a year, with a probable capacity in excess of 35,000,000 tons. Production is limited by shortage of coke and labor, chiefly the former. It would seem fair to make a rough guess that the proportion of the output required for all war purposes will be not less than 30 per cent. nor more than 40 per cent. of the total output. This would include exports to the Allies. As there have been large exports to the Allies hitherto, say between 15 and 20 per cent. of the output, including steel worked up here into shells, rolling stock, machinery, etc., for export, as well as exports to neutrals of between 5 and 10 per cent., and the exports to neutrals may be extremely light, it does not seem altogether probable that steel for commercial purposes will be extremely scarce in future.

Certainly there will eventually be a large decrease in the consumption of steel by the railroads unless something is done. The railroads have been buying practically nothing of late and it is quite uncertain whether they will take hold with prices as now fixed. While there is a large reduction, prices are still fully double the average of the ten years ending 1913, and the railroads may not be able to pay. The Interstate Commerce Commission was expected to do something by way of reopening the subject of advanced freight rates, Oct. 28, but it has just been announced that the subject is postponed for 60 days beyond that date.

A foundry coke differential has not been established and the coke situation remains that $6.00 per net ton at ovens was set Sept. 21 as a general basis price. In some instances coke operators have sold regular customers foundry coke at $6.00, while it is understood a few have set their own differential by selling in a few cases at $7.00. In general there is very little foundry coke to be had and the situation is very distressing to many iron foundries.

NEW YORK, Oct. 22.—United States Government purchases of steel and machinery, for the manufacture of railroad equipment, ships, aircraft and other war munitions, on behalf of its Allies and on its own account, are heavy. Upward of one million tons of steel and $10,000,000 to $20,000,000 worth of machinery are now being distributed among American mills and manufacturers. Of the million tons of steel under consideration about 650,000 tons of steel bars, plates and shapes are required for building cars and

locomotives to be put into service in Russia and in France. Contracts for 30,000 cars and for 628 locomotives have been distributed among manufacturers for Russian account, alone. It is understood now that 1,500 locomotives are to be built here for Russian railroads. Additional purchases of 9,000 cars have also been made for the United States Government road in France.

Domestic railroads are also more actively negotiating for rolling stock and for motive power. The inquiries now in the market will call for 100,000 to 150,000 tons of rolled, forged, and cast steel, for American railroad equipment. Shipbuilders, holding Government contracts for destroyers and for merchant boats that will be supplied with plates and shapes on Government account at 3¼c and 3c per pound respectively, have taken up with fabricating shops the problems of supplying 125,000 tons of steel-fabricated material in the next six to eight months. Some of the contracts have already been closed and others will be placed in the next few days.

The Bethlehem Shipbuilding Co. has been organized to bring together under one direct management the various shipbuilding interests controlled by the Bethlehem Corporation. The Fore River Shipbuilding Corporation, the most important subsidiary of this merger, it is now known, has contracts to build 50 destroyers for the U.S. Government that are to be completed in sixteen months. This concern has awarded a contract to the Aberthaw Construction Co. to build a boiler shop at Providence, Rhode Island, a machine shop for building turbines at Buffalo, N.Y., and a plate and angle shop at Squantun, Mass. To facilitate the equipping of these shops in the shortest possible time, the United States Government has granted to the Fore River Company Class A priority certificates for all the machinery needed which will cost about $3,000,000. Most of the contracts for the Squantun plant have been closed, the tools being obtained practically through commandeering.

An effort is now being made at Washington to prepare a comprehensive schedule of all the machinery needed in the next year by the war and navy departments. With these facts in hand the Government will issue priority orders to manufacturers engaged on important war contracts. The Government has already secured a record of the orders taken by the leading manufacturers of machinery by which it will be able to facilitate the placing of orders for machine tools for delivery in the shortest time possible. The navy department is buying a number of tools to equip machine shops on battleships now under construction. The department has also ordered $400,000 worth of pumps from the Worthington Pump & Machinery Corporation and has placed a contract for mines with the American Gas Accumulator Co. These concerns have purchased tools in the last few few days to excute these contracts and the Kemper Construction Co. of Philadelphia, which is manufacturing various parts for cargo ships, has purchased 25 second-hand tools in the open market. A ready sale is found for nearly all of the used machinery that is available. It is an interesting fact that at a recent auction sale of second-hand tools at Chicago, prices, higher than the original cost of the machinery, were realized.

Foreign orders are being placed for tools for delivery in six to twelve months. These export orders are relatively small, but many more would be placed if the machinery were available. English manufacturers have placed orders for 25 screw machines with a Cleveland concern, while other tools for export to France and Japan are under negotiation.

HIGH STEAM PRESSURE AND FUEL ECONOMY

AN interesting experiment relating to the fuel economy to be realized by the use of steam at high pressures and temperatures has been carried out by the British Thomson-Houston Company, who at the end of 1914 installed in their Rugby works a 1,500 kw. turbo-alternator supplied with steam at a pressure of 350 lb., and superheated to a total temperature of 700 deg. F. It was originally hoped to use a pressure of 500 lb., but ultimately a compromise at 350 lb. was adopted after consultation with Messrs. Babcock and Wilcox, who furnished a boiler of their self-contained marine type with a capacity of 18,000 lb. of steam an hour, and fitted with chain-grab stoker and induced draught. The turbine, of the impulse type, was built to standard design, modified to suit the new conditions. The generator is totally enclosed, and the air used for cooling is delivered to the boiler grate.

Tests showed the steam consumption per kw. hour to be about 12.8 lb. at half-load, 12 lb. at 1,020 kw., 11.6 lb. at 1,230 kw., and 11.2 lb. at full load, the vacuum being 28½ in.; these figures include generator losses and excitation, but not power for the auxiliaries. On a ten hours' test the actual coal consumption was found to be 1.83 lb. per unit generated, the calorific value of the coal as fired being 10,985 B.Th.U. per lb. The boiler efficiency varied from 80 to 83 per cent., and the vacuum was 27.7 in. This consumption refers to the turbo-alternator only, and does not include the power taken for auxiliaries, which could not be properly estimated as the circulating pump also supplied other condensers.

The plant proved so successful and economical that it was put in commercial operation on the power circuit for the works, and the saving in coal exceeded the 15 to 18 per cent. predicted in 1912 by Mr. F. Samuelson, the turbine engineer to the company, owing to the improved efficiency of the plant under the constantly varying load and power conditions in a large works, though the older power plant was of comparatively modern construction. Some of the parts were found unsuitable for the high temperature and had to be renewed, but only troubles of a minor character have been encountered in either turbine or boiler, and have not interfered with the working of the plant, which is now regarded as having passed out of the experimental stage.

Recent investigation of a large power plant with a favorable load factor indicated that with a boiler pressure of 350 lb., steam temperature of 750 deg. F., and circulating water at 55 deg., the heat consumption per kw. hour generated would be 15,000 B.Th.U., with a boiler efficiency of 80 per cent., and including all losses in the turbo-generator, but not power for auxiliaries. Allowing 6½ per cent. for the last, the gross heat consumption per unit generated would be about 16,000 B.Th.U.—Times Engineering Supplement.

CANADIAN HARDWOODS NEEDED IN CUBA

"COMPARATIVELY few persons in Canada realize what a valuable asset we have in our hardwood forests of Eastern Canada," says J. C. Manzer, Acting Canadian Trade Commissioner in Cuba.

"The price of mahogany and Cuban cedar is steadily advancing, and to-day mahogany is being sold by wholesale dealers at from $110 to $130 per thousand, and cedar at from $120 to $140 per thousand. Some of our hardwoods, such as curly birch and bird's eye maple, would bring as high a price in Cuba as mahogany or cedar, and when a person uses a log of bird's eye maple or curly birch for firewood he is probably using for fuel wood that is worth from $75 to $100 per thousand. In cutting timber for firewood, all hardwood logs perfectly sound, free from knots, seams, or other blemishes, that are found to have a particularly good grain, should be put to one side to be sold for manufacturing purposes, and logs substituted for fuel that are seamy, hollow, knotty, or have other defects that would render them of no special value for manufacturing purposes.

"Good sound ash, birch and maple lumber is in demand here for making funiture, and will sell at high prices.

"This lumber should be shipped to this country in the round log, as sawn hardwood lumber is liable to warp and check when coming into a hot country, which would detract greatly from its value. This lumber could be shipped in car lots to Boston or New York and thence by steamer to Havana, or should depost in 30 to 45 minutes. The deposit be shipped direct to Havana by rail via Key West."

THE ENEMY OF THE SUBMARINE

By C. T.

THE submarine has a deadly enemy—the aeroplane. For every poison there seems to be an antidote and this is a law of nature. The aeroplane can carry bombs capable of being set to ex-

plode either on contact with the water, or so many feet under the water. The submarine under the water is unable to see the aeroplane circling above, but the latter can and does see the shadow of the submarine many feet below the surface. Directly she goes down so does the aeroplane swoop and drop bombs upon bombs on the U-boat, which must either dive lower and lower, or come up and fight with anti-aircraft guns, if she possesses them. Actually the submarine has no chance against properly armed aeroplanes, especially if there are a number of them flying in squadrons. The obstacle to the successful operation of the aeroplane defence against submarines is that they are of limited carrying capacity and therefore only capable of effective work within a radius of 200 miles or so, even if of the most powerful type.

METAL INDUSTRY IN VICTORIA

A SECTIONAL committee of the Institute of Victorian Industries is studying the possibilities of the metalliferous minerals and metal industries of Victoria. Arrangements have been made by the Ministry of Mines for the publication, during the next financial year, of information in regard to clays and other non-metalliferous minerals which should be useful to manufacturers.

A WRITER in a foreign journal points out that according to Jean Jacques Perret, the well-known French author living in the eighteenth century, Damascene blades were probably hardened in olden times by a powerful blast of cold air issuing from a narrow passage between two walls specially built for the purpose. GERMANY has actually remade Great Britain and her Colonies and her Dominions, and has done a better job than ever she accomplished in her laboratories, in the imitation of another nation's chemical products, or in her machine-shops in the duplication of another nation's patented devices.—Thomas Edison in "The Observer."

IN addition to the ordinary and well-known refractories in which silica and alumina play the chief parts, the somewhat rare product zirconia has recently received much consideration. Whilst zirconium is fairly widely distributed in Nature, it is in very small quantities, and can be rightly classed as one of the rarer elements. The most important source of the element was until quite recently the mineral zircon with its gem varieties, hyacinth and jargon. The chief source of the ore at present is the naturally occuring oxide, baddeleyite, which is almost pure zirconia. This has been obtained from the pyroxenite sand of Sao Paulo, South Brazil, also in Ceylon and in Montana, U.S.A. Its melting point is probably about 2,700 deg. Cent., and at 3,000 deg. Cent. it begins to volatilize.

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

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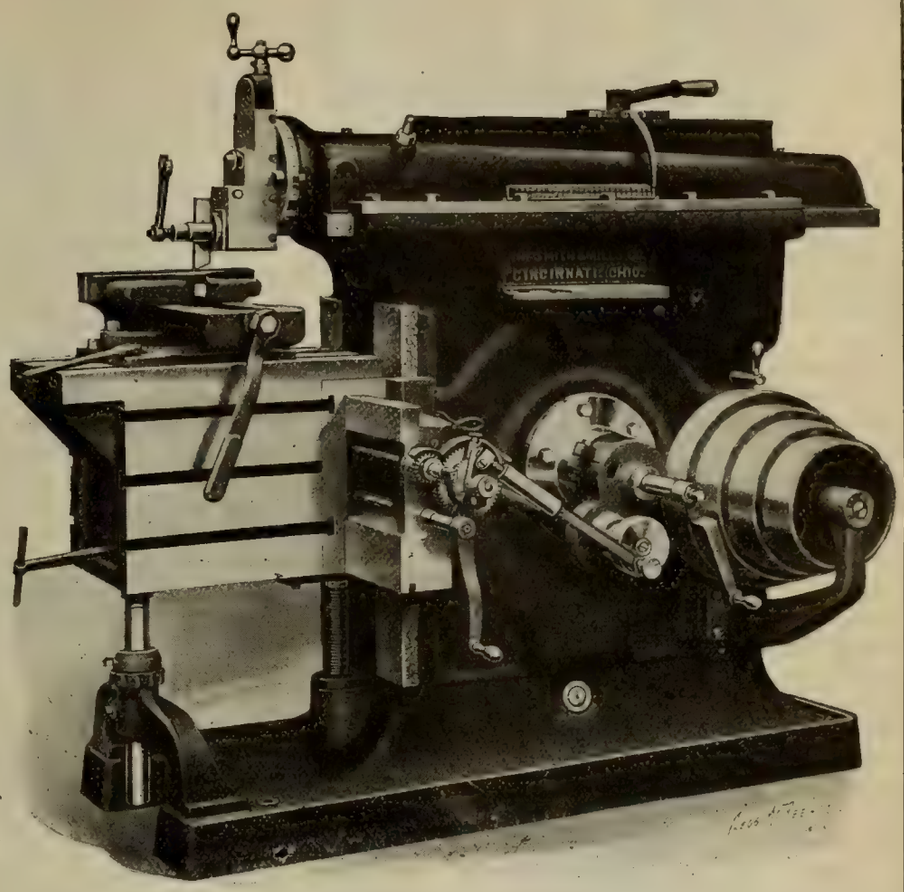

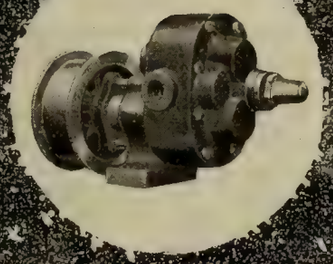

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INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Walkerville, Ont. — The Dominion Stamping Co. will build a forge shop to cost $16,000.

Toronto, Ont.—The Canadian Fairbanks-Morse Co. will build an addition to their factory on Bloor street.

Shawinigan Falls, Que.—The Shawinigan Water & Power Co. will build a power house at St. Narcisse, Que.

Toronto.—The Palmolive Soap Co. will build a power house at their factory on Natalie Street at a cost of $3,000.

Sydney, N.S. — A permit has been granted to the Sydney Foundry and Machine Co. to erect an addition to their foundry.

Toronto.—The Toronto Carpet Mfg. Co., have been granted a permit for an addition to a boiler house to cost $2,500.

Hamilton.—It was reported here last Wednesday that the Government contemplates erecting a large aerodrome and securing a training site in the vicinity of Winona. The expenditure is estimated at half a million dollars, General Hoar and Major McPherson have been negotiating with the property owners.

GENERAL

Brantford, Ont. — Fire damaged the Kitchen Overall Co's. factory on Oct. 15 to the extent of $15,000.

Vancouver, B.C.—The Ayres Varnish and Paint Co. will erect a new paint factory here at a cost of $2,000.

Weyburn, Sask.—The Potash Development Co. will investigate potash deposits in this district and if successful will instal a manufacturing plant.

Saskatoon.—The Maple Leaf Elevator at Southey, Sask., was destroyed by fire on Oct. 13. The origin is unknown. It is estimated that 20,000 bushels of grain were lost.

Port Hope, Ont.—Two gentlemen from Toronto visited town recently with a view to establishing a toy factory here. The two top storeys of the Cream Separator factory have been secured, and the work of placing the building in shape for manufacturing purposes begins at once.

Prince Albert, Sask.—Pat Burns, of Calgary, the Albert meat king, has purchased the Russell-Baker abattoir here, and will make Prince Albert the headquarters of his meat packing business in Saskatchewan. He will take over the plant this week.

Montreal.—The Atlas Glass plant, or later known as Premier Glass, which has been in the market for some years, has been acquired by a company which will be known as the Consumers Glass Co., composed of well-known local capitalists, who are now organizing to commence operations. The plant which was brought nearly to a state of completion about the time the business boom of 1912-13 culminated was never operated and finally fell into the hands of the bondholders. It is located at Ville St. Pierre and is regarded as an up-to-date plant and it is believed that there is plenty of room in the Canadian market for another producer, as a large quantity of glass goods is annually imported.

MUNICIPAL

St. Lambert, Que.—The ratepayers have voted in favor of borrowing $100,000 to be expended in permanent improvements.

Leamington, Ont.—A by-law will be submitted to the ratepayers to grant assistance to a company who propose establishing a sugar refinery here.

Edmonton, Alta. — The Edmonton Property Owners' Association has decided to urge the construction of a union railway station. Representations will be made to the Dominion Railway Commission.

St. Catharines, Ont.—Owing to shortage of natural gas in the district, the City Council has decided to raise the price of the supply from its municipal plant from 75 cents to $1 per thousand feet. The Council also passed a resolution requesting the Government to grant the Hydro-Electric Power Commission further power to increase its supply, owing to the fact that the supply of power from the Commission is failing.

ELECTRICAL

Tottenham, Ont.—Poles for the Hydro transmission line between Allandale and Alliston have been erected over half the distance between Cookstown and Allandale.

Toronto.—The city has received the notice being sent to all municipalities by the Hydro-Electric Power Commission of Ontario notifying them that no further contracts were to be entered into for supply of power, nor for any increase in the load of the present power users.

WOODWORKING

Arnprior, Ont.—The Arnprior Cabinet Co., in whose favor the ratepayers recently passed a bylaw, propose to construct a one-storey building about 200 x 200 of brick and concrete. The product of the factory at the start will be the cabinet work for the National Cash Register Co., victrola cabinets, high-class office furnishings and filing cabinets.

TENDERS

Toronto.—Tenders, addressed to the Secretary-Treasurer of the Board of Education, will be received until Thursdey, October 25, 1917 for electric wiring, steamfitting, plumbing, tinsmithing, ash hoists for sundry schools. Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, 155 College street.

Toronto, Ont.—Tenders will be received, addressed to the Chairman, Board of Control, City Hall, Toronto, up to Tuesday, October 30, 1917, for the supply and delivery of the following supplies:—Brass and bronze castings, cast iron pipe, hydrants, pipe, fittings and valves, lead pipe, special castings, stop valves, iron castings, manholes, gullies and grates, iron and steel, rubber valves, hose, packing, etc., etc. Specifications may be obtained at the Works Dept., Room 12, City Hall.

INCORPORATIONS

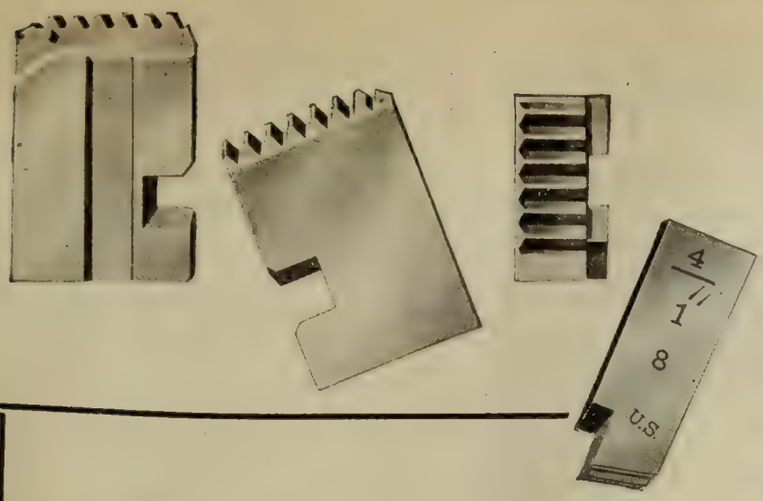
Multipost Co. of Canada, Ltd. has been incorporated at Toronto with a capital of $40,000 to manufacture machines for affixing stamps and other machines for use in mailing departments. The head office is at Toronto and the provisional directors are Donald B. Menzies and John A. Ryan of Toronto.

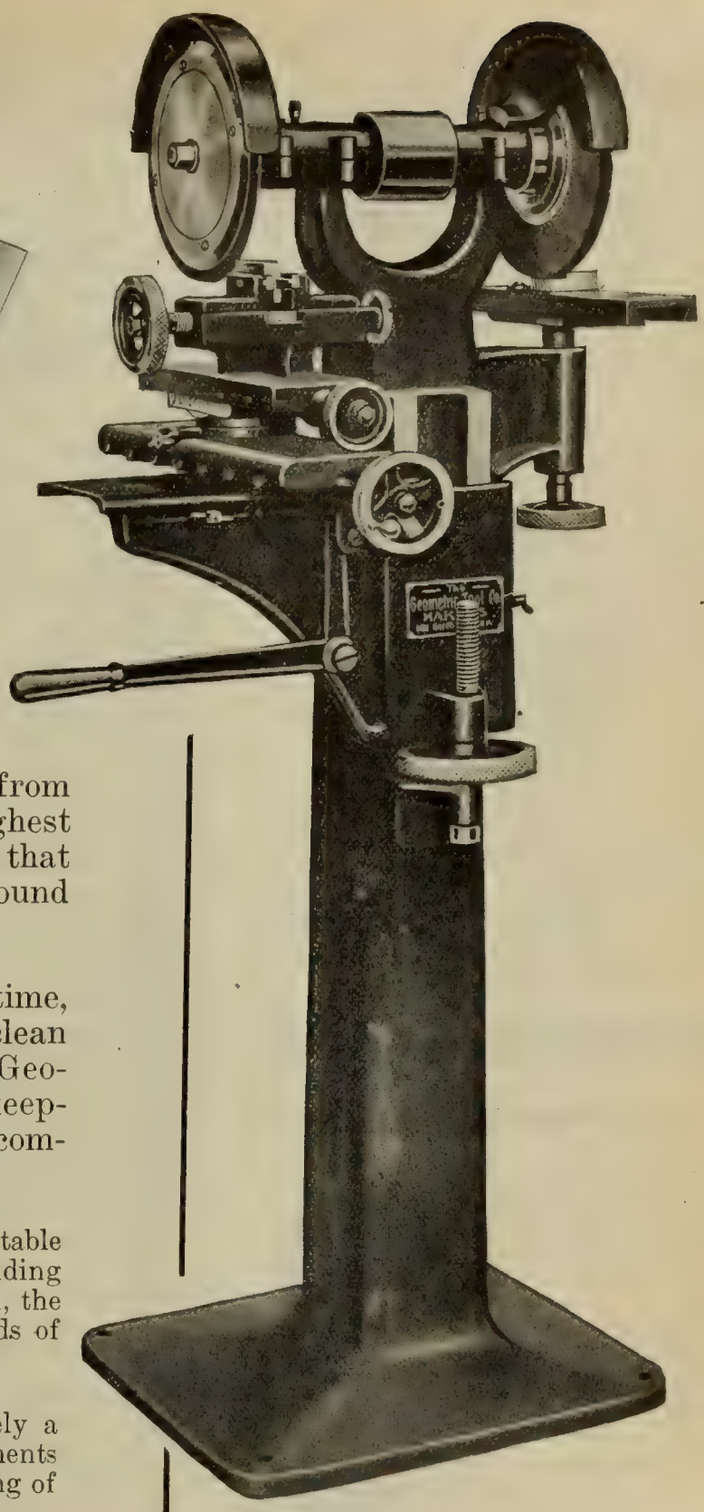
Rockwood Oil & Gas Co. has been incorporated at Toronto to sink wells and explore for natural gas and petroleum and to refine same. The head office is at Toronto and the incorporators are Leon P. Millard, William A. Brodie and John E. Gorsett, all of Toronto. The company is capitalized at $1,000,000.

Spruce Falls Pulp & Paper Co., has been incorporated at Toronto with a capital of $3,500,000 to carry on the business of manufacturing pulp wood, wood pulp and paper at Spruce Falls, Ont. The provisional directors are Thomas H. Barton, Charles M. Garvey and Thomas M. Weatherhead, all of Toronto.

BUILDING

Toronto, Ont.—City Architect Pearse, after utilizing the City of Chicago code in granting permits for flat slab concrete construction, has made extensive tests of this kind of worrk, the results of dwhich will be incorporated in new bylaws to cover future flat slab construction.





Sharp Chasers Cut Clean Threads

Accurate, uniform threads result only from dies which are maintained in the highest state of cutting efficiency. This means that chasers must be kept sharp, and ground uniformly.

Even if just touched up from time to time, the chasers respond splendidly, with clean threads. And with this machine—the Geometric Chaser Grinder—the matter of keeping threading tools up to scratch is a comparatively simple matter.

Any make of chaser can be ground on this adaptable machine. The two wheels permit the easy grinding of both milled and tapped chasers. In addition, the plain wheel lends itself readily to various kinds of tool grinding.

Uniform grinding of a set of chasers is purely a mechanical matter through the use of adjustments which can be accurately set to govern the grinding of an entire set of chasers.

The Catalog describing this machine is a mine of information on chaser grinding. Write for it.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

PERSONAL

Percy C. Brooks, vice-president and manager of the Canadian Fairbanks-Morse Co., Toronto, has been appointed president of the E. & T. Fairbanks Co., scale manufacturers, St. Johnsbury, Vt., in succession to Frank H. Brooks, who has resigned.

W. A. Bostwick has been elected president of the International Nickel Co., to succeed Ambrose Monell, who resigned to enter the Government service. **R. C. Stanley** was elected a member of the board of directors to fill the vacancy created by Mr. Monell's resignation.

R. V. H. Keating, of Port Arthur, Ont., has left for Windsor, Ont., where he will spend some time as resident engineer on the large contract which the Great Lakes Dredging Co., of Port Arthur, has obtained at Ojibway on the Canadian Steel Corporation.

Sir Stephenson Kent, director of the Labor Supply Department of the Ministry of Munitions of Great Britain, with four other officials of the Munitions Ministry who are making a tour of inspection of the large war manufacturing plants in the United States, has arrived in Pittsburg. He will probably visit several plants in Canada.

Wm. Rodger, for the past year construction engineer with Fraser, Brace and Company, has resigned his position with that firm and has started business for himself as a lumber broker, specializing in ship and heavy timbers. He has the contract for supplying the timber for two of the ships now building for the above mentioned firm. Mr. Rodger has offices in the McGill Building, Montreal.

Harry Bayne, of Hamilton, Ont., has been appointed by the Department of Trade and Commerce as supervisor of metals and fibres. His business is to ensure to Canadian industries a sufficient supply of these raw materials at a reasonable price. Mr. Bayne has a thorough knowledge of this work, having for many years been connected with the Westinghouse Company and the National Car Co., Hamilton.

Ernest Belanger, well known civil engineer and member of the firm of Marion and Marion, died on Sunday night at his home, 14 Selkirk street, Montreal. He was 54 years of age. For eight years Mr. Belanger was a director of the Polytechnic School and a professor there. In 1911 he was named a member of a Royal Commission to visit the chief European countries to study technical education. He was a member of the Engineers' Association, and the Quebec Streams Commission.

C. W. Johnson, who was elected vice-president of the American Institute of Metals at its recent meeting at Boston, is general superintendent of the East Pittsburgh works of the Westinghouse Electric & Mfg. Co. He joined the Bullock Electric Co., Cincinnati, in 1897, successively holding the position of chief draftsman, engineer and production manager. From 1904 to 1907 he was superintendent of the combined Allis-Chalmers and Bullock plants at Montreal. In the latter year he entered the employ of the Westinghouse Electric & Mfg. Co. as chief inspector.

TRADE GOSSIP

J. L. Murray, son-in-law of M. J. O'Brien, who holds a controlling interest in the Renfrew Machinery Co. of Renfrew, Ont., has been elected president of the company.

Large Orders for Aeroplane Motors.—Orders for aeroplane motors, taken recently by one American firm, include 4,500 motors for the United States, 4,500 for Canada and 1,000 for England.

Arthur S. Leitch & Co., Toronto, have been appointed Ontario representatives for Mason Regulator and Engineering Co., (formerly H. L. Peiler & Co.), Montreal, who recently closed their own office in Toronto.

Goderich, Ont.—The National Shipbuilding Co. shipped recently a complete outfit comprising a 500 h.p. triple expansion engine, condensing plaint, boiler, etc. This is the fifth outfit that has been completed by this firm this season.

The Dominion Molybdenite Co., operating the mine at Quyon, Que., has in successful operation its own concentrating plant. The Callow cell is being used and the results obtained by the oil flotation process are said to be excellent.

The Standard Molybdenite Co. has been incorporated at Ottawa with a capital of $1,000,000, to acquire and develop certain mining claims situated in the Township of Egan, P.Q. The head office is at Montreal and the incorporators are O. A. Letts of Ottawa, also C. J. E. Charbonneau and E. Roy of Montreal.

Britain Acquires New Ships.—The Entente Allies have increased their shipping, according to the London Times, through the acquisition of the Royal Mail Steam Packet Co., the Lamport and Holt Line, and the controlling interest in the Argentine Navigation Co., which has a capital of $10,000,000 and owned more than 300 vessels. Three of the leading French lines and one Italian shipping company participated in the transaction.

First Train Crossed Quebec Bridge.—Another stage towards the completion of the Quebec bridge was reached on Oct. 17, when the first train crossed from the north to the south shore and back again. The train consisted of an engine drawing two flat cars, the latter carrying the bridge engineers, officials, employees and visitors. It is not definitely known when the first regular train will cross, but this is expected to be sometime in November. Much work still remains to be done.

Big Shell Output in France.—The following statement was recently made by M. Andre Tardieu, High Commissioner for France in the United States: "At the beginning of the war we could turn out 12,000 shells a day for '75's.' In the year past we have been able to turn out 250,000 shells a day. In 1914 we had only 300 heavy guns, organized in regiments. Now we have more than 6,000. Besides, we gave more than 800 heavy guns to our Russian, Roumanian and other allies.

Must Stop Export of Electric Power.—At a meeting of the Ontario Municipal Electric Association Executive at Toronto on Oct. 16 the following resolution was adopted: "That it is the opinion of this association that it is the duty of the Dominion Government to pass an order-in-council to prohibit the export of power, as it has become an imperative duty in consequence of the public necessities of the people of the western section of the Province of Ontario for additional electric power."

Abitibi Output Doubled.—The output of the Abitibi Paper Co. at Iroquois Falls, Ont., has been doubled as a result of the completion of the new pulp mill, according to an announcement of President F. H. Anson. He states that instead of 65 tons a day, the sulphite pulp plant is now turning out 130 tons a day, while at the same time the company's capacity of ground wood pulp has been increased to 300 tons daily. "We are selling now to the extent of our total increased output, and the prospects are that we will be able to do so for some time."

Oil Boat Launched at Collingwood.—The Collingwood Shipbuilding Co. last Thursday successfully launched without any formalities the oil tank steamer *Talaralite*, which they are building for the International Petroleum Co. of Toronto. This vessel is intended for ocean service exclusively, and is of the following dimensions: Length, 250 feet, breadth, 43 feet 9 inches, depth, 25 feet moulded. The oil pumping arrangement is of the most elaborate kind and of design to handle the cargo in the most expeditious manner. This is the fifth oil tank steamer built by the Collingwood Shipbuilding Co. for the same owners.

Will Build Concrete Ships At Dundee.—Plans are well advanced for the construction of concrete ships at Dundee, Scotland, according to information received in a despatch from H. Albert Johnson, the American Consul at that port. The despatch says that the Dundee harbor trust has been informed by the Caledon Shipbuilding Co. that it has accepted the offer of the harbor trust of a building site for the construction of the concrete ships. The site is to include approximately fourteen acres, and will be put in condition by the harbor trust immediately for the commencement of work on the building of the shipyard by the Caledon Co.

B. C. Government Aids Railway.—Provincial credit will be extended to the Pacific Great Eastern Railway to the end that the contract which the company let last November for some 21,000 tons of steel rails to the United States Steel Corporation may be held. The price at which the company let the contract last November was approximately $800,000 and the cost of the rails, plates and other accessories ordered at that time would,

when landed in British Columbia aggregate $1,250,000. At present prices it is estimated there is shown a profit of $1,000,000 on the contract entered into by the company last November.

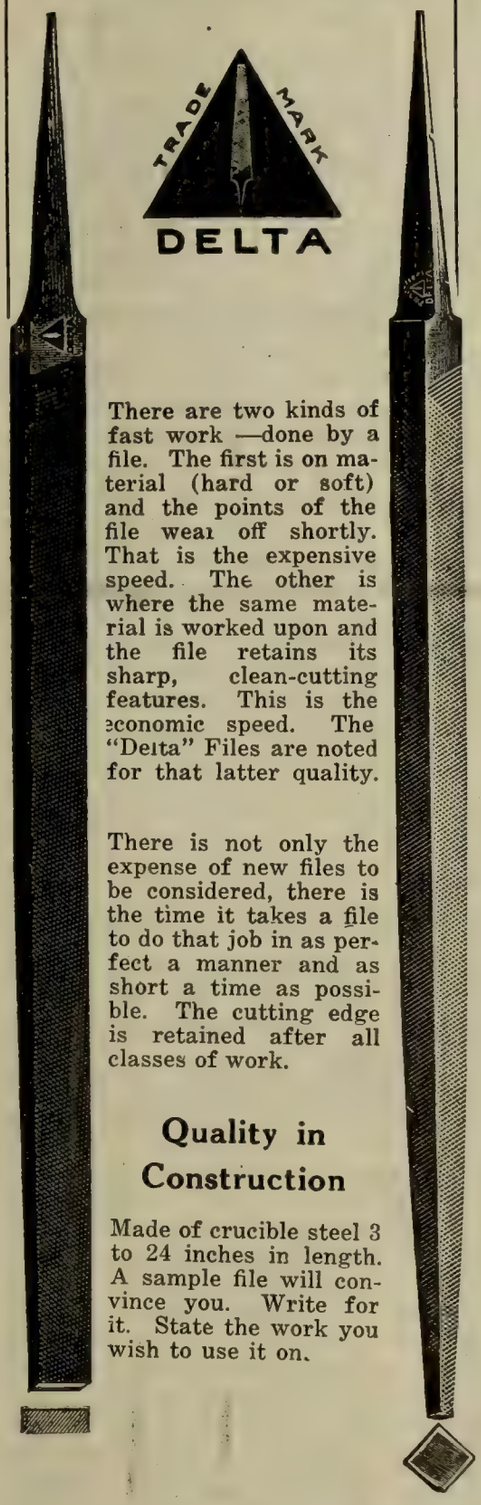
U. S. Pig Iron Output Larger.—News from American steel and iron trade centres that buying of pig iron on the new price basis is expanding rapidly is the most satisfactory development in the industry since the first prices were fixed. It speaks well for the realization of the country's full expectations of the industry—that operations in all lines necessary to the completion of the war and shipping program be maintained at the highest level. If pig iron, the basic commodity, begins to move out rapidly from the furnaces, it is axiomatic that the semi-finished and finished steel products will be turned out at a faster rate than in recent weeks.

New Coal Regulations Pending.—It is understood that new regulations limiting coal exports to Canada will be announced in a few days by the fuel administration, Washington. The control will be through special permits to shippers, who will be allowed to forward cargoes up to the amounts prescribed by the fuel administration without obtaining special export licenses. Permits will be granted only to shippers who sent coal to Canada last year. The plan is to hold Canada the rest of this year to supplies not exceeding ten per cent. more coal than was received last year. This arrangement is based on a ten per cent. increase in production in the United States this year and permits Canada to share equally with the States.

Ships for Ocean Service.—The first of the Canada Steamship Lines' boats, the H. M. Pellatt, which have been taken over jointly by the Canadian and Imperial Governments, has reached Montreal and will be put in service shortly. The work of overhauling and refitting the boat was completed in Kingston over a week ago. The vessel has been considerably strengthened for the more exacting work that is required in ocean traffic. The steamer A. E. Ames is now being fitted in Kingston and the steamer "Beaverton" is in dry dock at Buffalo and should be completed in a few days. The work is being rushed and when these boats have cleared their places will be taken by the Calgarian and the Hamiltonian.

Associate Committees for Special Research.—In order to increase the scope and efficiency of the work being done by the Advisory Council for Scientific and Industrial Research, the Council will appoint a number of associate committees to deal with various special subjects. Two special committees have already been formed, in connection with the chemical industries and with mining and metallurgy. Each of these committees consists of twenty members, with special qualifications for looking after the industries of Canada in these two important fields. It is also announced that the Council has taken over from the Arthur D. Little Co., on behalf of the Dominion Government, the natural resources sur-

Fast Work



There are two kinds of fast work —done by a file. The first is on material (hard or soft) and the points of the file wear off shortly. That is the expensive speed. The other is where the same material is worked upon and the file retains its sharp, clean-cutting features. This is the economic speed. The "Delta" Files are noted for that latter quality.

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vey of the Dominion which this company has inaugurated. The work will be continued by the Council on a much more extended scale, in co-operation with the various Government departments.

Revenue of Dominion.—The revenue of the Dominion for the first six months of the fiscal year ending Sept. 30, as shown in the September financial statement issued by the Department of Finance, was $127,477,904, as compared with $103,589,680 during the same period last year, an increase of nearly $24,000,000. Ordinary expenditure was slightly in excess of $50,000,00, a decrease of almost half a million as compared with last year. Capital expenditure, including war account, totalled $95,144,093, as compared with $116,057,905 for the six months period in 1916. The decrease is due to the fact that war expenditures in Canada from April to September last year amounted to$104,538,895, while this year's expenditure in Canada was $87,772,857. The decrease is due to the heavy movement of troops overseas. The debt of the Dominion now stands at $901,009,501, an increase of $36,865,910 for the month.

Russian Car Purchases in the U. S.—The United States War Purchasing Board has approved the request made by the Russian War Purchasing Board located at Washington for 3,000 freight cars for Russian railroads. A former request for 10,000 freight cars was approved some time ago. Of these 10,000 cars, all shipped in parts, to be assembled later in Russia, about 6,000 have been, it is said, landed in Russia, the other 4,000, still in parts, being held up at some Pacific port awaiting transportation. The Russian War Purchasing Board here set out to buy 30,000 freight cars, and for that purpose tried to buy outright several plants. They were not allowed to do this, as it would take such plants as they purchased beyond the control of the United States Government, which desired to control them for its own use if necessity arose. So the Russian War Purchasing Board here can enter into contracts for railroad equipment only when such contracts as it may make are approved by the United States War Purchasing Board.

British Steel Suggestion. — British steel makers, with an eye to market conditions in the future, are considering ways to reduce costs and get the most efficiency out of existing plants. At a recent meeting at the Iron and Steel Institute in London the following suggestion was presented by a committee, which had studied the manufacturing situation: That if the steel trade of Britain is to hold its own in open competition with other steel-producing countries of the world, it will be necessary, among other things, to have a Central Board to which all orders will go, and from whence the work will be allocated to the different works, according to their ability to do it. This would save the enormous amounts of capital locked up in rolls. Many mills have rolls for practically all the British standard sections, and change the rolls as required to suit orders. If, on the other hand, the orders were sent from a Central Board mills could be kept on work allocated to them for long periods, thus reducing the amount of roll changing and also the cost of production.

RAILWAYS & BRIDGES

Montreal, Que.—Paul Mercier, chief engineer, has reported to the Board of Control that $20,000 would have to be expended on the Lachapelle Bridge to put it in a state of repair which would make it safe for the public to use without danger.

Toronto, Ont.—An agreement between the Counties of York and Peel and the Toronto-Hamilton Highways Commission, regarding the apportionment of the cost of new bridges on the highway, will be reached shortly as a result of the hearing before the Ontario Railway and Municipal Board. Chief Engineer Hogarth, of the Highways Department, stated that a bridge of the type approved by the department would cost about $15,000. The bridges constructed by the Commission at Mimico Creek, Etobicoke and Port Credit represent an expenditure of about $25,000, so that the counties will have to pay approximately $10,000 on each bridge.

MARINE

Cornwall, Ont.—The steamer St. Laurent, owned by the Montreal and Cornwall Navigation Co., was burned to the water's edge while lying moored in the Cornwall Canal, opposite Central Park, on Friday evening. The loss is estimated at $15,000, with $5,000 insurance.

Oshawa, Ont.—The Department of Public Works, through J. M. Wilson, district engineer, has notified G. D. Conant, Mayor of Oshawa, that work will be at once proceeded with for the purpose of making the wharf at Oshawa harbor available for the landing of coal next spring.

Sarnia, Ont.—The Sarnia Bridge Co. have been awarded the contract for the erection of a large gantry crane for the Playfair interests at Midland, Ont. The tower will be 40 by 40 feet square, with cantilever arms 87 feet long, and the total length of the crane will be about 216 feet.

Kingston, Ont.—Another severe gale swept the lake on Oct. 15. The steamer Richard W., belonging to Montreal, went ashore four miles below Long Island. The Donnelly Company succeeded in releasing the steamer Thiepval, which broke away from her lines and drifted on to Barriefield shoal.

Port Dover, Ont.—A large delegation of businessmen and manufacturers in this district who came here recently to inspect the harbor, passed a resolution urging upon the Dominion Government the necessity of improving the present slip for docking facilities at Port Dover, to be ready for the opening of navigation in the spring of 1918.

The G. A. Graham Wrecked.—The steel freighter G. A. Graham, owned by the Montreal Transit Co., was driven out of her course while crossing Lake

Huron on Sunday and, driven ashore at South Bay, close to Manitoulin Island. She is believed to be a total constructive loss. The G. A. Graham was built in 1891. She is 310 feet long, has a beam of 39 feet, and is of 2,409 gross tons.

Sarnia, Ont.—The steamers Waubic, Rochester and Noronic have been placed in their winter berths in Sarnia Bay, and according to previous announcements made by the Northern Navigation Co., the Hamonic and Huronic will also winter here upon the completion of the season. The Hamonic is now in dry-dock at Detroit for repairs to the propeller, a blade of which was broken off by contact with some obstruction, while the steamer was en route to Windsor for freight.

Sarnia, Ont.—The contract for floating the steamer George A. Graham, wrecked off Manitoulin Island, has been awarded to the Reid Wrecking Co. The wreckers are to deliver the boat and cargo in port for a lump sum or on percentage basis, underwriters' option. The contract is on "no cure no pay" plan, the wreckers getting nothing if they fail. The Graham is in bad shape, it is stated, having broken in two, but a large part of the grain cargo can be saved. The boat was formerly the Marina.

CATALOGUES

Centrifugal Pumps.—Bulletin No. 14 showing a few centrifugal pumps made by the Smart-Turner Machine Co., Hamilton, Ont.

The American Institute of Metals has issued volume 10 of transactions covering the tenth annual meeting held at Cleveland, O., in Sept. 1916.

Marine Specialties.—A new bulletin 50E has been issued by the James Morrison Brass Mfg. Co., Toronto, dealing with an interesting line of marine specialties which they manufacture.

Grinding Wheels.—American Emery Wheel Works, Providence, R. I. Reference card. Gives considerable useful information as to the speeds that are recommended for grinding wheels and the various grades and grains for handling different classes of work. The card consists of a celluloid holder and a slide upon which the various information is contained and may be read through slits in the casing.

Gear Hobber.—The Himoff Machine Co., New York, have issued a bulletin illustrating and describing their 8-inch and 24-inch Hercules gear hobbers. The principal features embodied in the design are dealt with and a specification giving the principal dimensions is also included. A separate price list is mailed along with the bulletin containing specifications and prices, for each size of machine.

Power Presses.—Toledo Machine & Tool Co., Toledo, Ohio. Catalog No. 11 and pocket reference book. The first shows an extensive line of presses and other machinery, dies, and special tools. It is divided into 17 sections, each dealing with some particular class of machine. In

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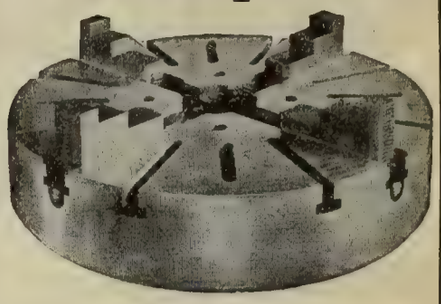

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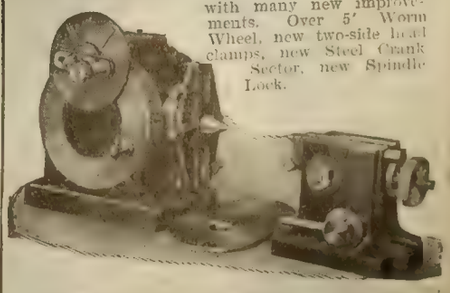
Accuracy Guaranteed
10-Inch Universal Index Centers
with many new improvements. Over 5' Worm Wheel, new two-side head clamps, new Steel Crank Sector, new Spindle Lock.



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No device can be as efficient that does not contain all these qualifications; and Puro was not tied for first place; Puro was first.
Don't be satisfied with half-way goodness, or makeshift drinking arrangements for your employees.
If the men in your factory must drink, give them a clean drink.
Puro is clean—it does not rust or corrode.
Puro is economical. It allows just the proper amount of cool, clean, fresh water to come through the bubbler. No spurting, no overflowing, no loss. Puro regulates itself. You can attach it in five minutes.
Tell us how many men in your factory and your water pressure in pounds—
We'll tell you just what it will cost to "PURO-FY" YOUR WATER SUPPLY.

PURO SANITARY DRINKING FOUNTAIN
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147 University Ave. TORONTO, ONT.

THE IRON WORKS LIMITED
Successors to
Owen Sound Iron Works
Owen Sound, Ont.
Engineers
Boiler-makers
Founders
Machinists
Tank Work
Smoke Stacks,
Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order

general a brief description of the construction of the line of machines covered by each section is presented on the first page or two followed by illustrations and short descriptions of the different machines. A sectional index which will facilitate the finding of any particular machine is included, as well as a comprehensive telegraph code and tables of useful information. The reference book is intended to slip in the vest pocket and gives in much briefer form the information contained in the large catalog.

BOOK REVIEW

The Utilization of Pyrite Occurring in Illinois Bituminous Coal.—The possible recovery and utilization of pyrite occurring with bituminous coal is suggested in Circular 5 of the Engineering Experiment Station of the University of Illinois by Professor E. A. Holbrook of the department of Mining Engineering. A series of experiments conducted on a commercial scale has shown that, where pyrite occurs in sufficient quantities to justify its recovery, a 50-ton plant may be designed to serve a single mine or group of mines which will yield a profit of about $75.00 per day, or $1.50 per ton of raw pyrite, with an initial capital cost of about $18,000. It is pointed out that the market for domestic pyrite is active at present and that prices as high as $8.00 per ton are offered. The supply of Spanish pyrite which normally is adequate to meet the demand in the United States has been cut off while the extent of the uses for the mineral has increased. The circular referred to presents a discussion of the composition of pyrite, a detailed review of present market conditions, a description of the machinery required in a preparation plant, and a statement of the methods of operations to be employed. The circular is illustrated with charts and photography, and also with drawings showing suggested plant arrangements. Copies of the publication may be had by addressing the Engineering Experiment Station, Urbana, Illinois.

BIG INCREASE IN CANADIAN TRADE

FOR the first six months of the fiscal year ending with August, the total trade of the Dominion amounted to $1,347,781,936, as compared with $1.148,859,412, an increase of approximately two hundred million dollars. For the month of August alone, Canada's trade reached the large figure of $193,803,517. For August, 1916, it was $161,767,951.

For the six months' period free goods were imported to the value of $250,836,205 and dutiable goods to the value of $299,089,013. Imports totalled $549,925,223 apart from coin and bullion, as against $390,965,243. Duty collected for the six months amounted to $88,280,620, as compared with $70,102,854 for the same period last year.

Domestic goods to the value of $767,091,657 were exported during the six months. Last year for a similar period the value of domestic exports was $536,722,671.

The total value of domestic manufactured goods exported for the six months was $345,960,390, as compared with $190,823,240 in a similar period last year. Agricultural products (domestic) exported during the six months' period reached a total of $260,654,960, as compared with $206,141,326 last year. Domestic animals and animal products exported were valued at $83,002,705, as against $53,382,886 last year.

G.T.P. PROGRESS REVIEWED

THE adjourned annual meeting of the Grand Trunk Pacific Railway Co. was held at the general offices, McGill St., Montreal, on Oct. 17.

In reviewing the results for the past year, the Chairman, Alfred W. Smithers, said it was gratifying to note an improvement, although much remains to be accomplished before the property could be on a self-sustaining basis. This condition, however, could only be the natural result of constructing lines of transportation through hitherto unsettled and undeveloped country, and was the history of all other transportation lines. It was therefore encouraging to note marked improvement in these conditions from year to year as the advent of the railway had made possible the discovery and opening of almost unlimited natural resources. Notwithstanding the stopping of foreign immigration during the war, a very considerable immigration from the United States, well equipped financially for farming and other pursuits, continued to go into the new country, and in addition to the increased acreage taken up, a number of lumber mills along the Fraser River, in British Columbia, had been built to supply the increasing demand for lumber on the prairies, all of which made traffic for the railway.

Mr. Smithers presided, and the following directors and officers were elected for the ensuing year: Directors—Alfred W. Smithers, Sir H. M. Jackson, John A. Clutton-Brock, Sir Wm. Lawrence Young, Howard G. Kelley, E. J. Chamberlin, W. H. Ardley, Frank Scott, W. H. Biggar, Hon. R. Dandurand, Wm. Molson MacPherson, J. E. Dalrymple, Peter McAra and J. B. Fraser. Officers—Howard G. Kelley, President; W. P. Hinton, Vice-President and General Manager; W. H. Biggar, Vice-President and General Counsel; J. E. Dalrymple, Vice-President; Frank Scott, Vice-President and Treasurer; Henry Phillips, Secretary; W. H. Ardley, Comptroller.

U.S. Coal Prices Revised.—The first general increases in schedules of coal prices fixed by President Wilson in August are announced by the Fuel Administration at Washington. Increases are granted in the Kentucky, Tennessee and Virginia fields, where operators complained that the prices set by the President were too low to allow them to operate

at a profit. The new schedule of prices for these three States follows: for run-of-mine, $2.40, former price, $2; for prepared sizes, $2.65, former price, $2.25; for slack or screenings, $2.15, former price $1.75. Fuel Administrator Garfield, in making announcement of the new prices, says: "The conditions in the fields named are exceptional, and do not affect the prices heretofore fixed by the President in the principal bituminous fields. If upon completion of the investigation now being made of operators' costs in the fields affected it is found that these changes are not justified further modifications will be made at once."

TRADE ENQUIRIES

THE following trade enquiries have been received by the Department of Trade and Commerce, Ottawa.

1374. An English house at Buenos Aires, having connections with English railways and Government buying departments, wishes to represent Canadian manufacturers of the following lines: Iron sheets, iron and steel, wires, railway material and railway supplies.

1383. Zinc ores.—A London company who import zinc ores invites offers from Canadian producers able to export regular supplies. They would also consider proposals of other minerals.

1390. Mining material.—A Durban firm of import merchants makes demand for mining material.

1394. General agency.—A Durban manufacturers' representative seeks the representation of and requests correspondence from Canadian manufacturers prepared to export galvanized iron, etc.

1402. Iron and steel.—A firm in the Eastern Cape Province, South Africa, handling in a wholesale way lines suitable for the native trade, requests catalogues and price lists from Canadian manufacturers of iron and steel.

1405. Carbide.—A South African firm of engineers, acting as merchants and agents in some cases, requests direct communication from manufacturers of carbide for acetylene lighting and oxy-aceteylene welding and cutting work.

1406. Agencies.—A Durban firm of engineers, with branches in each centre of South Africa, is prepared to take up the representation for Canadian manufacturers of railway and signalling apparatus, mechanical machinery, electrical machinery, machinery specialties, steam and water packing, etc.

1407. Electrical supplies.—A Glasgow firm will be glad to receive catalogues and price lists of electrical supplies.

BERTRAMS LIMITED
Engineers
Sciennes, EDINBURGH
PAPER MILL MACHINERY
and
MACHINE TOOLS for IRON WORKERS
Catalogues offered to Purchasers.

Special Machinery
MADE TO ORDER
Mill Machinery, Engine Work
Grey Iron and Brass Castings
TRY US FOR GENERAL REPAIRS
ALEXANDER FLECK, LIMITED
(Vulcan Iron Works) OTTAWA, ONT.

WIRE SPRINGS OF ALL KINDS
Machine Springs, Valve Springs, Automobile Cushion Springs, etc., of a quality that defies competition. Tell us your requirements. Send sample or specification for price.
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GUELPH, ONTARIO

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Our large stock of Machine Bolts, Rivets and Washers assures quickly filled orders and prompt shipment. One quality only—The Best.
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London Ontario

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OVENS
Enameling and Varnishing Ovens heated by Gas, Electricity, Steam or Coal.
Write for Booklet.
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We specialize in Bridges, Buildings, Towers, Tanks, Penstocks, Roof Trusses, Columns, Smoke Flues and Stacks, Coal Bins, Ore Bins, Buckets, Refuse Burners, Stills, Air Receivers, etc.
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PORTABLE PLANERS
DRAW CUT SHAPERS
SPECIAL DRAW CUT R.R. SHAPERS
FINISHED MACHINE KEYS
STATIONARY & PORTABLE KEY WAY CUTTERS
SPECIAL LOCOMOTIVE CYLINDER PLANERS
OFFICE AND WORKS: MUSKEGON HEIGHTS U.S.A.

Oil Tempered Steel Springs
—for every purpose and the best for each use.
Special styles of all kinds to order.
THE CLEVELAND WIRE SPRING COMPANY
Cleveland, Ohio
U.S.A.

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SIX COMPRESSORS FOR SALE — VERY cheap. The National Quarry, 81 St. Peter St., Quebec. c18m

BOILER FOR SALE—ONE HEINE SAFETY horizontal, single drum, water tube boiler, 120 H.P., 36" diam., 19 ft. long, 5-16" shell steam drum. Apply The Parkhill Mfg. Co., Limited, 400 St. Ambroise St., Montreal. c18m

FOR IMMEDIATE SALE—150 No. 1 AND 10 No. 7C Racine hack saw machines; in excellent condition. The Peck Rolling Mills, Limited, Montreal, Quebec. c19m

2 NORTON GRINDERS — 10" x 36"—IN FINE condition; complete with stock of Norton wheels. Price $1,400 each, f.o.b. Hamilton. The National Machinery & Supply Co., Ltd., Hamilton, Ont.

3 JONES & LAMSON TURRET LATHES, WITH Collet chucks; 3" x 36"; geared head machines in fine condition. Price $1,000 each, f.o.b. Hamilton. The National Machinery & Supply Co., Ltd., Hamilton, Ont.

FOR SALE—1 90-FT. THOMAS SPACING table complete, including one indicator carriage, one trolley carriage, stands, adjustable roller, racks, etc. Adjustable as to length. The Manitoba Bridge & Iron Works, Winnipeg, Man. c15m

FOR SALE—1 NEW 25 H.P. HOR. TUBULAR boiler, 1 second-hand 12 H.P. hor. tubular boiler, tested to 150 lbs.; 1 second-hand 50 H.P. loc. boiler; 1 second-hand Leonard 12 x 12 high speed engine; 1 second-hand 500-lb. belt-driven Beaudry power hammer, only in use two months; in perfect condition. Canadian Engineering & Mfg. Co., 128 Bleury St., Montreal, Que. c9m

HYDRAULIC EQUIPMENT FOR SALE—THE equipment listed below is in first-class shape having only been used about three months. Blue prints and specifications and foundations drawings will be furnished. 2—14 x 12 x 5" Fairbanks-Morse duplex steam driven high pressure pumps at 80 gals. per minute capacity each against 600 lbs. pressure, steam pressure 150 lbs. 1—Weighted Accumulator good for 1000 lbs. per sq. inch, 16" diameter, plunger 11 ft. stroke with squeezing water cushion and wooden outside bumper blocks. The tank for the weighing material surrounding the cylinder is 10' 7" in diameter and 11' 0" high. 1—Return Suction Tank for above pumps and accumulator. Height, 9' 0", diameter 8' 0". Capacity, 2700 Imperial gallons. This equipment can be shipped immediately and is open for inspection at the company's plant. Prices on application. The Canadian Copper Company, Copper Cliff, Ont. c8m

SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto.

AGENCIES WANTED

ENGINEER AND BUSINESS MAN WITH office in Manchester, England, is prepared to work for a good firm desiring representative in England. Would attend to the interests of a firm shipping munitions. Box 337, Canadian Machinery. c19m

SITUATIONS WANTED

GENERAL SUPERINTENDENT DESIRES position with reliable firm. Possess years of practical machine shop experience as well as production methods, including shell work. Box 338, Canadian Machinery. c18m

GRADUATE MALE NURSE, AGE 32. HAVE established hospitals for three large manufacturing concerns. Familiar with social service, accident prevention and modern methods of employing. At present employed. Less than $2,400 not considered. Box 336, Canadian Machinery. c15m

MACHINE SHOP FOREMAN DESIRES change as shop foreman or master mechanic. Acquainted with scientific management; 26 years' experience. Box 328 Canadian Machinery. c11m

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States wants position as superintendent or general foreman. Large or small shop on ammunition or machinery; A1 references. Address Box 327, Canadian Machinery. c9m

WORKS MANAGER OR GENERAL SUPERintendent open for engagement—28 years' experience as machinist, toolmaker, inspector, superintendent of tool-making and tool-designing, experimental and development work, heat-treating and testing of steel in raw and finished state; shop superintendent, works manager. Experience has been on rifle work, electrical work, typesetting machines, lock-making and bridge-work. Correspondence solicited, and can furnish good references. Address Box 332, Canadian Machinery. c14m

We require a high-class

Specialty Salesman

for Montreal Territory, Engineering graduate preferred, good prospects offered.

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47 King St. W., Toronto

WANTED

WANTED—SMALL SECOND-HAND POWER press, in good condition. Hosmer Stamping & Die Works, Ltd., 831 Dundas St., Toronto, Ont. c13m

WANTED—SECOND-HAND POWER SQUARing shear to cut No. 10 gauge steel up to 24" wide. Must be in good working condition. Packard Electric Company, St. Catharines, Ont. c4m

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WANTED — SUPERINTENDENT-FOREMAN, 6" British shells. Box 340, Canadian Machinery. c19m

SHOP SUPERINTENDENT—WANTED, MAN competent to take entire charge of machine shop solely engaged in manufacture of small tools. Must be thoroughly competent and have had some years' experience. Shop while small at present offers excellent opening for advancement. Apply, stating experience, salary, etc., to Box 339, Canadian Machinery. c17m

WANTED — FOREMAN BLACKSMITH FOR Montreal shop on general work. Six forges and 1,500-lb. steam hammer. Must be a hustler. Apply, in confidence, stating experience and wages expected, to Box 335, Canadian Machinery. c15m

WANTED — MECHANICAL DRAUGHTSMAN for engine, compressor, and general work. State experience and salary expected. Apply The Jenckes Machine Company, Limited, Sherbrooke, Que. c16m

FOR SALE

4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 13 B. & S. Automatic Gear Cutter.

1—30" Newark Automatic Gear Cutter.

1—5 x 48 Pratt & Whitney Plain Grinder.

1—No. 2 Bath Universal Grinder.

1—12 x 60 Modern Plain Grinder, new.

2—Lees-Bradner Thread Millers.

1—30 x 30 x 8' Powell Planer, new.

Brownell Machinery Co.
Providence, R. I.

Last week in this space we advertised an 8 inch shell plant—We sold it. We now offer

A complete 4.5" shell plant

1—No. 6 HALL Cut-off Machine.
1—4.5" HAMILTON Heavy Cut-off Machine.
1—36" x 14' BERTRAM Engine Lathe for rough turning.
1—HAMILTON Single Purpose, Heavy Duty Rough Turning Lathe.
3—HAMILTON Single Purpose, Heavy Duty Boring Lathe, with collets.
4—DAVIS 24" Chucking Lathes for boring and tapping nose.
1—16" x 8' REED Lathe for finish turning.
1—18" x 8' BERTRAM Lathe for finish turning.
1—HAMILTON Single Purpose, Heavy Duty Lathe for facing base.
1—20" x 8' REED Lathe for waving and undercutting.
1—19" x 8' BERTRAM Lathe, with Bertram waving and undercutting attachment.
1—20" x 8' FLATHER Lathe, with turret on carriage, boring and tapping base.
1—28" x 8' LEBLOND Heavy Duty Lathe, turret on carriage, boring and tapping base.
1—HAMILTON Single Purpose Lathe, arranged for turning copper bands.
1—HAMILTON Single Purpose Lathe for facing base plate.
1—20" x 10' REED Lathe for seating and recessing fuse hole.
1—14" x 6' SEBASTIAN Lathe.
1—18" x 8' McGREGOR-GOURLAY Lathe, for rectifying.
1—HAMILTON Single Purpose Centering Lathe.
1—HAMILTON Single Purpose Re-centering Lathe.
1—HAMILTON Special Nose Milling Machine.
1—HAMILTON Special Pneumatic Base Plate Rivetting Machine.
1—HAMILTON Sand Blast Machine.
1—Electric-driven Painting Machine, 110 volts, 60 cycle.
1—HAMILTON Oil-burning Nosing Furnace.
1—HAMILTON 200-ton Hydraulic Press.
2—Triplex Pumps, 1" x 4".
1—Accumulator.
1—No. 3 CINCINNATI Universal Milling Machine.
1—24" x 6' PRATT & WHITNEY Engine Lathe.
1—GISHOLT Tool Grinder.
1—STEWART Toolroom Gas-heated Bench Furnace.

All tooled up for British 4.5" High Explosive Shells. This equipment is all in good operating condition and can be inspected by appointment.

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TURRET LATHES AND SCREW MACHINES

16" x 5½' MacGregor, D.B.G. (3)
16" x 6' Pratt & Whitney, B.G.
20" x 7' Fay & Scott.
22" x 8' Pratt & Whitney, B.G.
24" x 10' Conradson, D.B.G.
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
2" x 24" Stevens Screw Machines (2).
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

13" x 6' Filsmith, D.B.G., comp. rest.
14" x 6' Lodge & Shipley, taper attachment.
15" x 6' Sebastian, B.G., comp. rest (3).
16" x 8' McDougall, B.G., comp. rest (2).
16" x 8' Porter, B.G., comp. rest.
18" x 8' C.M.C., D.B.G., comp. rest.
18" x 10' Putnam, back geared.
20" x 8' Fifield, B.G., plain rest.
21" x 8' Bawden, heavy duty (3).
24" x 11' Pond, B.G., comp. rest.
26" x 14' Gleason, D.B.G.
30" x 10' Ames, B.G., plain rest.
31" x 16' Fifield, back geared.

DRILLS

14" Excelsior, sliding head, lever feed (6).
16" Barr, sliding head, lever feed.
20" Silver, back geared, power feed (3).
20" Barnes, 3-spindle, lever feed.
22" Barnes, back geared, power feed.
24" Kerkhoff, back geared, power feed.
26" Prentice, back geared, power feed.
40" Bickford, back geared.
46" Allfree, back geared, power feed.
No. 10a Baush, 16-spindle.
D-1 Colburn, back geared, heavy duty.

GRINDERS

No. 1 La Salle, plain and surface.
No. 1 Cincinnati, universal (2).
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer.
24" Barnes, wet tool.
26" Gardner, disk.
2¼" Yankee, twist drill.

IRON PLANERS

20" x 20" x 5' Bertram.
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
40" x 40" x 12' New Haven, power feed.

MILLING MACHINES

Bertram, plain.
Brown & Sharpe, power feed, plain.
Monarch, vertical.
Van Norman, bench.
No. 2 Ford-Smith, plain.
No. 4 Fox, universal.

SHAPERS

16" Petrie, back geared.
16" Canada Mach. Corp., back geared.
24" Gould & Eberhardt, back geared.
24" Bertram, back geared.
30" Morton, back geared, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6' Robertson Hack Saws.
4½" Martin cutting-off machine.
12" Hall Pipe Machine.
4" Oster Hand Power Pipe Machine.
No. 2 Mitts & Merrill Keyseater.
No. 2 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 4 GA. Brown & Boggs punching press.
No. 200 Brown & Boggs Inclinable Power.
No. 2 Bliss Foot-power Press.
No. 3 West Tire Setter Banding Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
7' Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

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Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15" three-jawed chuck.
1—Lathe, 28" swing, 8' bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22" Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15" three-jawed chuck.
1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 24" wheel.
1—Lathe, 14" swing, 6' bed.
2—Ford Smith Shell Grinders, complete.
1—17" LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
1—16" Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
1—Double End Painting Machine, with ¼ h.p. motor.
1—Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—5 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
Sherbrooke, Que.

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Mail your copy now for next week's issue.

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1—14 x 6 Springfield Geared Head Engine Lathe.
3—16" Springfield B.G. Shapers.
2—20" Springfield B.G. Shapers.
1—25" Springfield B.G. Shapers.
1—30 x 30 x 10' Wilson Two-head Planer.
3—14" Pierce Turret Lathes.
2—1 x 8 Pierce Hand Screw Machines.
3—No. 1½ American Milling Machines.
1—No. 20 Bliss O.B.I. Press.
1—No. 19 Bliss O.B.I. Press.
1—No. 18C Bliss O.B.I. Press.
1—No. 18 Bliss O.B.I. Press.
5—20" Buffalo B.G., P.F. Drill Presses.
3—20" Canedy-Otto B.G., P.F. Drill Presses.
2—20" Champion B.G., P.F. Drill Presses.
2—20" Champion Plain Drill Presses.
3—20" Silver Plain Drill Presses.
3—20" Canedy-Otto Plain Drill Presses.
2—14" Champion Plain Drill Presses.

USED MACHINERY

ENGINE LATHES.

1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—22 x 14 Putman Standard Engine Lathe.
1—22 x 10 Reed Standard Engine Lathe.
1—18 x 6 Jones & Lamson Standard Engine
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.
2—13 x 8 Barnes Engine Lathes.
1—13 x 5 Barnes Engine Lathe.
1—10 x 4 Sebastian Engine Lathe.

TURRET AND SCREW MACHINES.

2—No. 6-A Potter & Johnston Automatic Lathes.
1—4¼" Gridley Automatic Screw Machine, motor driven.
2—4" Foster F.G.H. Hand Screw Machines.
1—5" Pierson F.G.H. Hand Screw Machine.
4—12" Warner & Swasey Turret Lathes with air chucks.
4—16" Warner & Swasey Turret Lathes with air chucks.
2—2" Cleveland Automatic Screw Machines, jigger feed.
1—⅝-¾ Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND GRINDERS.

1—No. 2 Hendey Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drilling Machines.
3—Fox Milling Machines.
1—Garvin Hand Miller.
1—No. 2½ Bath Universal Grinder.
1—No. 12 Modern Plain Grinder.
1—No. 1 Landis Internal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.
1—Miami Valley Universal Cutter Grinder.

DRILL PRESSES.

1—5' Mueller Plain Radial Drill, old type.
1—28" Niles, Bement, Pond B.G., P.F. Drill Presses.
1—3-spindle 8" overhang Henry & Wright High speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.

SHAPERS AND PLANERS.

1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
1—36 x 36 x 10' New Haven Planer, S.H.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS.

1—Waterbury Farrel O.B.I. Press, geared.
1—No. 30 Perkins Drawing Press.
3—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—160-lb. Bradley Steap Hammer.
1—25-lb. Fairbanks Belt Hammer.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machine tools, both large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

Form the habit of using this section

When you want to buy or sell new or used equipment, use this section.

If you need machinery in a hurry, here is where you will find the names of firms equipped to supply your needs. And if you have old machinery which has outgrown its usefulness to you, tell Canadian Machinery readers about it in these pages.

That the same firms advertise here week after week is pretty good evidence that they are getting business. That you have looked over these ads. for equipment is evidence that others will do the same thing.

Get the habit of looking over this section every week. The bargains you will pick up by being first on the job will pay you for the time you spend each week.

Canadian Machinery
Classified Advertising Section
143 University Ave. - Toronto

Eastern Machinery & Equipment Co., Inc.

319 COMMERCIAL TRUST BLDG.
PHILADELPHIA, PA.

NEW TOOLS FOR IMMEDIATE DELIVERY.

2—No. 3 Hendey Universal Milling Machines.
1—2½ x 2" Wm. Sellers Tool Grinder.
30—18" x 9' Turning and Boring Lathes.
3—Double head Sullivan Grinders.
1—32" x 12' Pittsburgh Engine Lathe.

USED MACHINERY

ENGINE LATHES.

8—30" x 10' American, Gear Head, A-1.
1—20" x 10' Bullard.
3—24" x 14' American.

TURRET LATHES.

36—Potter & Johnson 6A Automatic Turret Machines.
3—3 x 36 Jones & Lamson Flat Turret.
2—2¼" x 24" Jones & Lamson Flat Turret, bar equipment. Full set Turret Tools.
9—25" Gisholt Chucking Lathes, 6½" hole in spindle, square turret.
14" x 6' Lodge & Shipley Turret, back geared.
5—24" Gisholt, 2-step cone, 6¼ H.S.

BORING MILLS.

6—66" swing Bement-Miles Tire Turning Mills, two swivel heads, 15½" under rail
1—37" Baush Boring Mill, 2 heads; good as new.
1—Cylinder Boring Mill, capacity of 24" diam. to 96" diam., 10' long.
Tool equipment included, good as new.
1—42" Bullard Boring Mill (2) heads.

MILLING MACHINES.

1—No. 3 LeBlond Plain Miller, table 13½ x 58¼.
1—24" x 8' Beaman & Smith Open Side Slab Miller, with two vertical spindles.
1—No. 1½ Universal Milling Machine.

SCREW CUTTING MACHINES.

2—2¾" Cleveland Automatic, Model A.
1—1¼" Cleveland Automatic, Model A.
1—2" Cleveland Automatic.
1—No. 55 National Acme, 4 spindle; good as new.
1—No. 54 National Acme, 4 spindle; good as new.

GRINDERS.

1—1½" Full Universal Landis Machine.
1—No. 13 Brown & Sharpe Universal and Tool Grinder. Full equipment.
No. 1½ Universal Cutter and Reamer Grinder.
5—Fisher Profile Grinders for Cutters.
5—No. 6 Std. Universal Tool and Cutter Grinders.

DRILL PRESSES.

1—4' Prentice Radial Drill, tapping attachment.
1—2' 6" Fosdick Radial Drill, tapping attachment.
1—5' 6" Full Universal American Radial Drill, tapping attachment.
2—D1 Colburn Heavy Duty Drills, latest pattern.
2—D3 Colburn Heavy Duty Drills, tapping attachment, latest pattern.

FOR SALE

One 22" x 50" Wheelock Engine, left-hand, arranged for direct shaft coupling, with heavy balance wheel 8¼" x 14" x 17'—7" in dia.

Merchants Rubber Factory
KITCHENER, ONTARIO
c20m

New York's Greatest Stock

Our Own Machines Rebuilt and Guaranteed

(Partial List)

Detrick and Harvey Open-Side Planer, 8-foot Capacity, 12-foot Platen, Four Heads. Fine Condition.

PIPE MACHINES

No. 9 Saunders, 8" to 16" capacity.
10" Cox, 4½" to 10" capacity.
No. 6 Saunders, 2" to 8" capacity.
8" Eaton-Cole & Burnham, 2" to 8" capacity.
6" Stoever, 1¼" to 6" capacity.
6" Curtis & Curtis, 1½" to 6" capacity.
4" Morris, 2½" to 4" capacity.
4" Armstrong, 2½" to 4" capacity.
2" Borden, ½" to 2" capacity.
2" Jarecke, ¾" to 2" capacity.
2" Saunders, ¾" to 2" capacity.

NEW SHAPERS IN STOCK

Twelve New 24" Hollingworth Improved Triple Geared Crank.

BORING MILLS—SLOTTERS

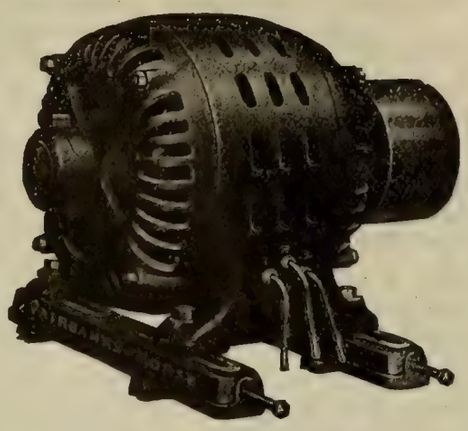
No. 2 Barrett Horizontal Cylinder Boring Machine, 5" bar.
Betts Horizontal Boring Mill, 2¼" bar.
Four 30" Bullard Vertical Boring Mills, single turret head.
20" Bullard Vertical Turret Lathe, with side head and turret head.
18" Bullard Vertical Turret Lathe, with side head and turret head.
Niles Car Wheel Boring Mill, table 48" diameter.
20" Sellers Slotter.

ENGINE LATHES

60" x 16' Fifield, face plate drive.
60" x 20' New Haven, face plate drive.
50" x 15' New Haven.
42" x 19' Putnam heavy duty.
36" x 18' Farrel.
36" x 16' Bradford.
36" x 14' Putnam heavy duty.
30" x 20' Fifield.
30" x 16' Fifield.
28" x 10' Niles.

New York Machinery Exchange, Inc.

50 Church Street . · . New York City



Fairbanks-Morse Induction Motors

FOR

Immediate Delivery

We have in stock at Montreal and Toronto the following motors :

3 Phase		60 cycle
1— ½	H.P.	110 volts
2— 1	"	550 "
2— 1	"	220 "
1— 1	"	110 "
6— 2	"	550 "
1— 2	"	220 "
6— 3	"	550 "
2— 3	"	220 "
6— 5	"	550 "
4— 5	"	220 "
7— 7½	"	550 "
1— 7½	"	220 "
24—10	"	550 "
2—10	"	220 "
7—15	"	550 "
1—15	"	220 "
1—20	"	550 "
5—25	"	550 "
1—25	"	220 "
2—30	"	550 "
2—40	"	550 "
1—50	"	550 "
2—75	"	550 "

3 Phase		25 cycle
2— 1	H.P.	220 volts
1— 2	"	550 "
3— 3	"	550 "
1— 7½	"	550 "
1—10	"	550 "
3—15	"	550 "
3—20	"	550 "
2—30	"	550 "
2—35	"	550 "
1—75	"	550 "

The Canadian Fairbanks-Morse Co., Limited

St. John Quebec Montreal Ottawa Toronto Hamilton Windsor Winnipeg Saskatoon Calgary Vancouver Victoria

CFM

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

If any advertisement interests you, tear it out now and place with letters to be answered.

Slightly Used Machinery For Immediate Delivery

1—No. 27 Double Floor Grinder—Canadian Hart Wheel Make, equipped with two 12" wheels and two spindles 33" long. Shaft bearings 24" long.
1—Heavy Blount Double Floor Grinder, 45" spindle, two 8" wheels.
1—Heavy Petrie Floor Grinder. No rest or countershaft. Shaft 36" long, two 9" wheels.
1—Stouffville Floor Grinder. No rest or countershaft. Shaft 32", two 8" wheels.
1—Large Polishing Stand (new) 4' shaft, bearings 1¼" x 6.
1—Brown & Boggs Lever Splitting Shear.
1—Hanson & Van Winkle Polishing Stand (no c/s)
1—Hanson & Van Winkle Polishing Stand. Shaft 5', bearings 2¼" x 12".
1—No. 7 Jarecki Pipe Machine, 1¼".
2—Heavy Grinders, Bearings 2¼" x 12"—cross adjustment slide, one 12" wheel.
1—8-Wheel Robinson Detroit Grinder.
1—Anvil, 154-lb.
1—Revolving Electric Plating Machine.
1—Platers Electric Dynamo, 600 Amperes.
1—Tumbling Barrel, 18" x 4.
1—No. 23 Brown & Boggs Hand Punch and Shear.
1—Fairbanks Scale, 5-ton.
1—Hand Former, Toggle Type.
1—40 H.P. Westinghouse, 550-volt, 60-cycle, 3-phase, 850 R.P.M.
3—Westinghouse Transformers, 30KW., 2,200-550-volt.
1—2⅛" Dreses Turret Lathe, power feed, oil pan, spring chuck No. 37220.
2—No. 6 Warner & Swasey Turret Lathes, power feed, oil pan, spring chucks.
1—No. 3 Garvin Turret, oil pan, spring chuck, 2⅛" hole.
1—No. 22—1¾" Garvin Monitor Lathe, oil pan, spring chuck.
1—1¼" Davis & Egan Lathe, oil pan, spring chuck.
1—2" Pratt & Whitney Turret Lathe, spring chuck.
1—32½ Garvin Turret Lathe, spring chuck.
1—12½ Garvin Turret Lathe, spring chuck.
1—Style "F" Single Spindle, heavy duty, Baker Drill.
1—Four Spindle Rockford Drill Press, 20" box column, back-geared, automatic feed, automatic stop, with pump connection.
1—Garrison Press, 26,000-lb.
2—Heavy Thread Chasing Attachments.
1—No. 3 Cincinnati Universal Miller with Dividing Heads.
1—No. 2 Cincinnati Universal Miller with Dividing Heads.
1—No. 2 West Tire Setter Band Press.
1—No. 3 West Tire Setter Band Press.
1—Cincinnati Bickford 24" Drill.
1—Cincinnati Upright 24" Drill with tapping attachment.
2—No. 25 Foote-Burt Drills with belt guards.
2—D2. Colburn Drills with belt guards.
1—Niles-Bement-Pond 50" Drill Press.
1—No. 400 Brown & Boggs 42" Geared Gap Shear.
2—No. 21 Crosby Presses.
1—300-lb. Bliss Board Lift Hammer.
1—100-lb. Bliss Board Lift Hammer.
1—Barnes 24" Geared Drill.

Write For Particulars.

Garlock-Walker Machinery Company, Limited

32 FRONT STREET WEST, TORONTO, ONT.

"EVERYTHING IN MACHINERY"

USED MACHINERY

IMMEDIATE DELIVERY

DRILLING MACHINES.

20" Mechanics.
22" Sibley, S.H., B.G., P.F.
30" Lodge & Davis, S.H., B.G., P.F.
2½' Gang Plain Radial.
3½' Hamilton Plain Radial, tapping attachment.
4' Mueller Plain Radial.
4—No. 310 Baker Heavy Duty.
3-spindle Rockford.
4-spindle Rockford.
4-spindle Washburn, with power feed.
4-spindle Allen.
No. 11 Pratt & Whitney. 10 spindles.

GEAR CUTTERS.

24" x 7" G. & E., spur gears.
No. 3—26" B. & S., spur gears.
No. 4—48" B. & S., spur gears.
No. 13—B. & S., spur gears.
30" x 9" G. & E., spur and bevel gears.
36" x 9" G. & E., spur gears.
36" Walcott, spur gears.
24" Gleason Gear Planer.

GRINDERS.

No. 1 B. & S. Universal.
No. 2 Woods Tool and Cutter.
Brainard Cutter.
Leland Universal, with power feed.
No. 2 Landis Universal.
No. 21 Landis Plain.
No. 1 Gardner Disc.
No. 24 Gardner Disc.
No. 6-A Diamond Universal.

LATHES.

14" x 6' Rockford, C.R.
15" x 6' Rockford Tool Co., C.R.
16" x 8' Bradford, C.R.
18" x 6' Bradford, C.R., taper attachment.
18" x 8' Lodge & Shipley, pat. head, C.R., taper attachment.
18" x 10' Fitchburg, C.R.
20" x 14' Blaisdell, C.R.
21" x 12' New Haven, C.R.
36" x 18' Schumacher & Boye, T.B.G., Q.C.G.
36" x 20' American, T.B.G.
38" x 16' Fifield.
42" x 28' Hamilton, T.B.G., raising blocks to swing 54".

PLANERS.

24" x 24" x 6' American, one head.
26" x 26" x 6' Gray, one head.
26" x 26" x 8' Pease, one head.
30" x 30" x 8' Cincinnati, two heads.
30" x 30" x 8' Woodward & Powell, one head.
36" x 36" x 14' Sellers, one head.
39" x 39" x 12' New Haven, one head.
48" x 48" x 10' Woodward and Powell, two heads.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES.

No. 2 P. & W., friction head.
No. 2 Foster, plain head, A.C. and W.F.
No. 3 Bardons & Oliver, plain head, A.C. and W.F.
No. 4 Pearson, friction head, A.C. and W.F.
No. 5 Foster, geared friction head, auto. chuck, power feed to turret slide and power feed to cross slide.
No. 5 Foster, all geared head, auto. chuck and wire feed, power feed to turret slide.
1¾" Gridley, 4-spindle Automatic.
2¾" Cleveland Automatic.
3¼" Gridley 1-spindle Automatic.

TURRET LATHES.

No. 2 Foster-Kimball, plain head.
No. 22 Garvin, plain head.
16" Lodge & Davis, back geared.
16" Warner & Swasey, friction head.
2 x 24 J. & L., cone head.
24" Gisholt, 4¼" spindle hole, taper attachment.
No. 3A Warner & Swasey, bar attachment.

PUNCHES AND PRESSES.

No. 74½ Bliss, straight sided, geared.
Blake & Johnson Embossing.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾", 12" throat; new.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾", 18" throat; new.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾," 24" throat; new.

MISCELLANEOUS.

24" Bullard Vertical Turret Lathe, turret head and one side head.
No. 00 Baker Keyseater.
No. 3 B. & S. Universal Miller, with vertical and rack cutting attachments.
6" x 48" P. & W. Thread Miller.
4-spindle Warner & Swasey Valve Milling Machine.
No. 3 Cincinnati Vertical Milling Machine.
No. 3 Burr Cold Saw.

STOCKER-RUMELY-WACHS COMPANY

117-121 NO. JEFFERSON STREET CHICAGO, ILLINOIS

OPPORTUNITY KNOCKS BUT ONCE!

BORING MACHINES—Vertical.

1—30" Flather, one turret head
2—36" B. & S. one turret head, Dec. Delivery
1—38" Baush, two heads.
1—42" King, 2 swivel heads; almost new.
1—51" Niles, two swivel heads, motor driven.
1—84" Bickford.
1—NEW 8' Bickford, 90" table, 2 swivel heads; Feb. delivery.
1—Niles, 10'-16' extension, two heads.

BORING MACHINES—Horizontal

2—NEW No. 3A Universal, with motor, 3" bar; immediate delivery.
1—Lucas 2¾" bar
1—No. 1 Barrett Cylinder Borer, 3¾" bar type.
1—Betts Knee Type, 3" bar.
1—London 6" bar.

BULLDOZERS

1—No. 8 Ajax, motor driven.
1—No. 9 Williams & White, belt drive.
1—No. 12 Ajax, single pulley drive.
2—No. 23 Williams & White, belt drive.
1—No. 29-U Williams & White, arranged for motor drive.

CRANES

1—10-ton Maris, 55' span, hand operated.
2—10-ton Electric, 47' span, 25' lift, 3 motors.
3—10-ton P. & H. Electric, 72' span.
1—50-ton Niles, 61' span.
1—15-ton Locomotive Crane, 40' boom, 8-wheel type.

CUTTING-OFF MACHINES

1—NEW 4½" Davis.
30—Davis 4½"
10—4½" Williams.
2—NEW 6" Davis.

DRILLING MACHINES—Radial

6—NEW 3' Mueller, speed box drive, Dec. del.
3—NEW 3' American, sensitive tapping attachment.
1—NEW 3½' Western Drill, 86" circle.
2—4' Mueller Plain, speed box drive
1—4½' Bickford, plain.
1—NEW 5' Western, plain, with motor.
1—NEW 5' Niles Universal, with motor.
1—5' Dreses, full universal, gear box drive.
1—5' Fosdick, plain.
6—NEW 5' Mueller, speed box drive, Dec. del.
1—NEW 6' Triumph, motor drive; Nov. delivery.

DRILLING MACHINES—Heavy Duty

2—NEW No. 2 Colburn
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
4—No. 310 Baker Single Pulley Drive, late type

DRILLING MACHINES—Sliding Head.

2—NEW 24" Barnes Drills and Tappers.
5—NEW 24" Barnes Drills.

DRILLING MACHINES—Multiple Spindle

1—No. 5 Fox, 12-spindle, capacity 1".
1—Baush, 12-spindle, capacity 1¼", 30" circle, motor driven.
1—14-spindle Baush, capacity 1" hole, 36" circle.

DRILLING MACHINES—Sensitive.

1—NEW No. P-4 Allen, one spindle.
1—NEW No. P-2-S Allen, two spindles.
2—NEW No. B-1 Allen, one spindle, 7" overhang.
1—NEW No. B-2 Allen, two spindle, 7" overhang.
3—NEW No. B-3 Allen, three spindle, 7" overhang, tapping attachment.
3—NEW No. B-4, four spindle, 7" overhang.
3—NEW 12" Albany High-Speed Tool-Room.

GEAR CUTTING MACHINES

1—NEW No. 3 Bickett Gear Rack Planer, delivery 60 days.
1—No. 3 Brown & Sharpe Auto. Gear Cutter spur
1—NEW 6" Standard Gear Cutter, spur.
1—15" Gleason Bevel Gear Planer
1—16" Bilgram Bevel Gear Generator.
1—22 x 8" G. & W., for spur and bevel.
1—24" Becker-Brainard.
1—24" Fellows Gear Shaper
2—NEW 30" Flather, Solid Pattern.
3—36" Fellows Gear Shapers.

GRINDERS—Universal, for Cutters, Drills, Reamers, etc.

6—NEW No. 190 Wells.
4—No. 1 Cincinnati.
1—NEW Wilmarth & Morman, Style B.K.
1—NEW Walker, No. 1 Outfit B
3—NEW No. 1 Wood Universal.
5—NEW No. 2 Wood Universal.
1—NEW Walker, No. 2 Outfit K (capacity 9" x 26")
2—NEW No. 2 Osterlein Universal.
7—NEW LeBlond.

GRINDERS—Cylindrical—Plain

2—NEW 8" x 18" Modern, self-contained.
3—NEW 8" x 30" Modern, self-contained.
2—NEW 12" x 24" Modern, self-contained.
6—NEW 12" x 36" Modern, self-contained.
2—12 x 42" Landis, self-contained.
3—NEW 12" x 48" Modern, self-contained.
1—NEW 10" x 50" Norton, Oct. delivery.
1—14" x 50" Norton.
1—NEW 10 x 72 Norton, plain.
1—12 x 96" Springfield.

GRINDERS—Cylindrical—Universal.

2—NEW No. 2 Bath, 9" x 20".
1—NEW No. 2 Walker, 9" x 26"
1—NEW No. 2½ (10" x 36") Bath
1—NEW Thompson, 10 x 36.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis
1—No. 4 Cincinnati, capacity 12 x 72"

GRINDERS—Internal

1—NEW No. 6 Modern, capacity 10" x 10".
1—No. 70 Heald
2—No. 75 Heald.

GRINDERS—Cylinder

1—No. 60 Heald, single pulley drive

GRINDERS—Profile

1—NEW Cleveland
5—Fisher Profile Grinders.

GRINDERS—Surface

1—NEW No. 1 Wilmarth & Morman
2—NEW No. 1½ Walker's complete
2—NEW No. 2 American with Walker No. 1¾ plain flat mag, chucks.
4—NEW No. 2 Reid (same as B. & S.)
1—No. 2 Brown & Sharpe.
1—Blanchard Heavy Vertical with motor; almost new.

HAMMERS—Board-Lift, Drop.

1—No. 4 Standard Machinery Co., 400 lb.
1—E. W. Bliss, 800 lb.
1—NEW Beaudry, 500-lb., belt driven.

HAMMERS—Steam Forging

1—Morgan & Williams, 600 to 800 lbs., 21" gap.
2—3,500 lbs. Chambersburg Steam Drop Hammer.
2—5,000 lbs. Chambersburg Steam Drop Hammer.
1—7,000-lb. Morgan Special Double Stand.

KEYSEATERS

2—NEW No. 1 Davis.
1—NEW No. 2 Davis.
1—No. 2 Mitts & Merrill.
1—No. 2 Knowles, 60" stroke.
1—Colburn, 4" capacity, 43" stroke.

LATHES—Manufacturing, Not Screw Cutting.

1—NEW Wade 8" Precision.
2—NEW No. 3 Harding Bros.' Bench Lathe.
3—16" x 8' Fairbanks-Morse, heavy duty.
70—NEW Simplex, 16" x 8'.
14—Reed-Prentice Shell Lathes for 4" or 18 lbs. American shells.
2—25" Barrett Heavy Duty Boring Mill.
50—20" x 10' Hindman, high duty.

LATHES—Engine

3—NEW 14" x 6' Bradford, quick change.
14—NEW 15" x 6' Rockford.
1—NEW 14" x 6' Hendey, geared head.
3—NEW 16" x 6' Cleveland Tool Room Lathes,
4—NEW 16" x 8' Bradford, quick change.
1—NEW 17" x 8' National, quick change gears.
12—NEW 17" x 8' LeBlond, pan bed, quick-change gears.
1—18" x 10' Hendey, quick-change gear, 14" chuck.
5—NEW 20 x 10 Bradford, quick change.
1—NEW 20" x 10' Cleveland Geared Head
3—NEW 20" x 12' Bradford, quick change.
19—NEW 21" x 10' Porter, S.B.G.
9—22" x 10' Putnam, oil pan and pump.
1—NEW 24" x 10' Bradford, quick change.
5—NEW 24" x 12' Bradford, quick change.
1—NEW 24" x 14' Bradford, quick change.
3—24" x 14' American, quick change.
1—24" x 22' Bullard, triple geared, taper attachment.
1—NEW 26" x 48" x 12' McCabe, Double Spindle.
1—New 26" x 48" x 22' McCabe, Double Spindle.
8—NEW 28" x 12' Conradson, duplex helical drive, screw cutting type.
1—29" x 18' 6" Schumacher & Boye.
1—NEW 30" x 14' American Double Back-Geared, Quick-Change
1—NEW 32" x 12' Pittsburg Pattern.
8—NEW 36" x 24' Putnam, triple-geared
1—50" x 12' American, geared head, quick change.
1—50" x 24' Prentiss.
1—NEW 66" x 48' Putnam, triple geared, face plate drive, 5-step cone, 6½" belt; October delivery.
1—71" x 20' Fifield, triple-geared.
1—84" x 18' Special Boring Lathe.

LATHES—Turret

1—NEW 13" Gisholt, G-13.
8—NEW 21" Gisholt, H-21.
2—NEW 24" Gisholt, I-24.
5—2 x 24" Jones & Lamson
1—NEW 18" Libby.
3—24" Libby, universal facing head, 3-jaw chuck.
1—20" Steinle, almost new.
18—6-A Potter & Johnson.

MILLING MACHINES—Knee Type—Universal

1—No. 2 Kempsmith, vertical attach.
1—No. 2 Kempsmith, 13" dividing head.
1—No. 2-B Kearney & Trecher.
1—NEW No. 2 Rockford High Power.
1—No. 2 LeBlond.
10—NEW No. 3 Owen.
1—No. 3 Cincinnati Full Universal.
1—No. 3-H LeBlond Heavy Duty, almost new.

MILLING MACHINES—Knee Type—Plain

9—NEW No. 0 Rockford.
2—NEW No. 1 Kempsmith.
2—NEW No. 1½ American back gear
2—NEW No. 2 Rockford
10—NEW No. 2 Owen; November delivery.
1—No. 3 LeBlond
2—No. 3 Kempsmith.
5—NEW No. 3 Conradson, single pulley drive.
4—NEW No. 3-H LeBlond.
10—NEW No. 3 Owen.
1—NEW No. 4 LeBlond.

MILLING MACHINES—Hand.

3—NEW No. 1 Rockford, without column.
3—NEW No. 2 Rockford, on column.
2—NEW No. 3 Rockford, on column.
3—NEW No. 3 Rockford, on column, power feed.

MILLING MACHINES—Vertical

1—NEW Bickett, No. 0
1—No. 3 Brown & Sharpe.
2—NEW No. 4-B Becker.
2—No. 5 Becker.

MILLING MACHINES—Planer Type

1—No. 2 Beaman & Smith.
1—Ingersoll Slab, 16" x 48" cap.
1—NEW 17" x 5' Eynon, planer type.
1—30" x 30" x 8' Ingersoll No. 928, single spindle, with motor.

MILLING MACHINES—Lincoln Type.

1—NEW No. 1 Gooley & Edlund, Briggs type.
3—NEW No. 1 American.
18—NEW Sellers Auto., quick return.

PLANERS

1—NEW 24" x 24" x 6' Powell, Single Head.
1—30" x 30" x 8' Ohio Machine Tool Co., 2 heads.
1—36" x 36" x 10' American, two heads.
1—36" Rotary Planer, motor driven.
1—40" x 40" x 11' Niles, four heads
1—44" x 44" x 12' Cleveland Openside, 3 heads, arranged for motor drive.
1—48" x 12' Pedrick, open side, one head.
1—50" x 50" x 16' Pond, 2 heads on rail
1—52" x 48" x 15' Betts, 2 heads.
1—60" x 60" x 21' L. W. Pond, 3 heads.
1—72" x 72" x 20' Gray, 4 heads.
1—72" x 66" x 14' Smith Globe, 2 swivel heads.
1—72" x 72" x 20' McKechnie & Bertram, 4 heads.

SCREW MACHINES—Hand.

4—NEW No. 2 Foster, geared friction head.
1—NEW No. 4 Foster, geared friction head, power feed to turret slide.
2—NEW No. 5 Foster, all geared, power feed to turret slide.
3—NEW No. 5 Foster, all geared head, power feed to turret, power cross feed.
2—NEW No. 6 Foster, geared friction head, power feed to turret, power cross feed.
5—NEW No. 7 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW No. 10 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW 2¼" Dreses, F.G.B., power feed.

SCREW MACHINES—Automatic

2—NEW ⅝" Cleveland, Model A.
1—NEW ¾" Gridley Mult. Spindle, belt driven.
2—NEW 1¼" Gridley Mult. Spindle, belt driven.
2—NEW 1¾ Gridley, mult. spindle, belt driven.
1—NEW 2¼" Gridley Mult. Spindle, belt driven.
1—NEW 3¼" Gridley Single Spindle, belt driven.
2—No. 0 Brown & Sharpe.
1—No. 2-G Brown & Sharpe.
1—No. 515 National Acme.

SHAPERS

1—NEW 16" Springfield
1—16" Motor Driven Rockford
5—NEW Barker, 24".
2—NEW 24" Milwaukee.
2—NEW 24" Potter & Johnson, universal rotary table.
1—25" Springfield.
2—30" Morton Draw Cut.

SLOTTERS.

1—NEW 8½" Betts, heavy model, vertical geared crank slotter.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 549 Washington Blvd. — **CINCINNATI, OHIO** Union Central Life Bldg. — **CLEVELAND, OHIO** Leader News Bldg. — **NEW YORK CITY** Singer Bldg.

WRITE OR WIRE OUR NEAREST OFFICE FOR QUOTATIONS
THIS IS ONLY A PARTIAL LIST OF AVAILABLE MACHINES

SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

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GEARS

CUT GEARS

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GEAR & MACHINE CO.

Cor. Concord & Van Horne **TORONTO**

Poor Gears don't pay dividends. No, nor your maintenance bills either.

GEAR

GEARS AND GEAR CUTTING SPROCKETS AND CHAINS

In stock and to order, any size from one-quarter inch to six-foot in diameter, any material. Estimates and gear advice cheerfully furnished.

Grant Gear Works, Inc., 151 Pearl St. Boston, Mass. U.S.A.
G. B. GRANT

Long Distance is Calling!

Telegrams and Long Distance Telephone Messages are not uncommon among the replies to ads in our Classified Advertising Section.

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FOR

Tools, Gauges, Jigs, Fixtures
Special Machinery

GENERAL MACHINE WORK

Experimental work

Brass and Aluminum Castings

in large or small quantities

GENERAL JOBBING AND REPAIRS

THE

MONARCH BRASS MFG.

COMPANY, LIMITED

71 Browns Ave., - Toronto, Ont

CUT GEARS

Theoretically Correct

PROMPT SERVICE

ROBERT GARDNER & SON

LIMITED

52 NAZARETH ST., MONTREAL, P. Q.

RAWHIDE OR METAL

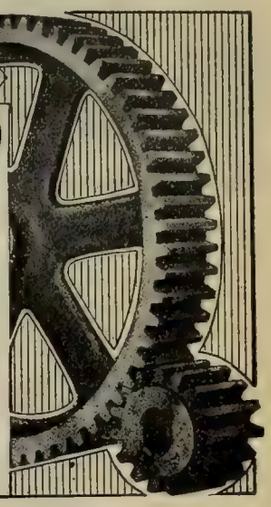
SPECIAL MACHINERY

Special Machinery, Gears, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Etc.

CONTRACT WORK

To Classified Advertising Section

CUT GEARS



Rawhide — Steel — Brass — Cast Iron

Try our W-G Rawhide Silent Gear. Designers and Builders of Special Machinery.

Winnipeg Gear & Engineering Co.
197-199 Princess St., Winnipeg, Man.

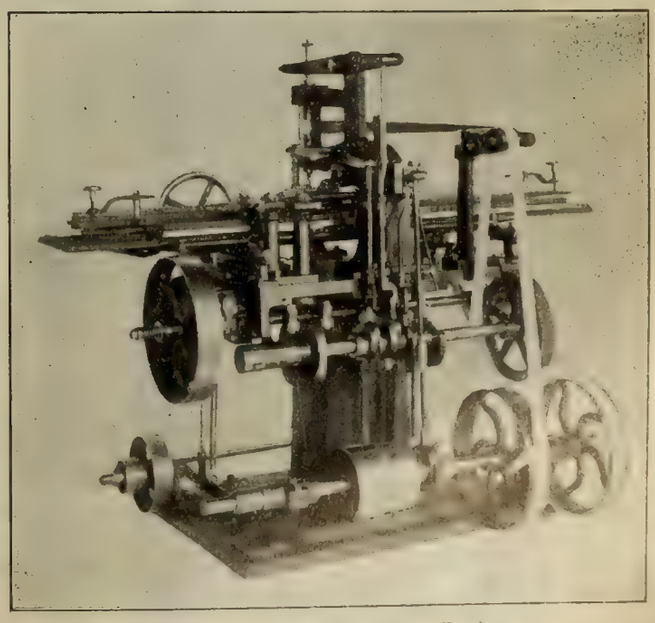
Brass, Phosphor Bronze, Copper and Aluminum CASTINGS

We have the largest Jobbing Brass Foundry in Canada.
Can make prompt delivery.

Tallman's reputation is in the goods.

Tallman Brass & Metal Co.
HAMILTON, ONT.
CANADA

We will show here from time to time some machines we build that you may judge our capabilities in this line.

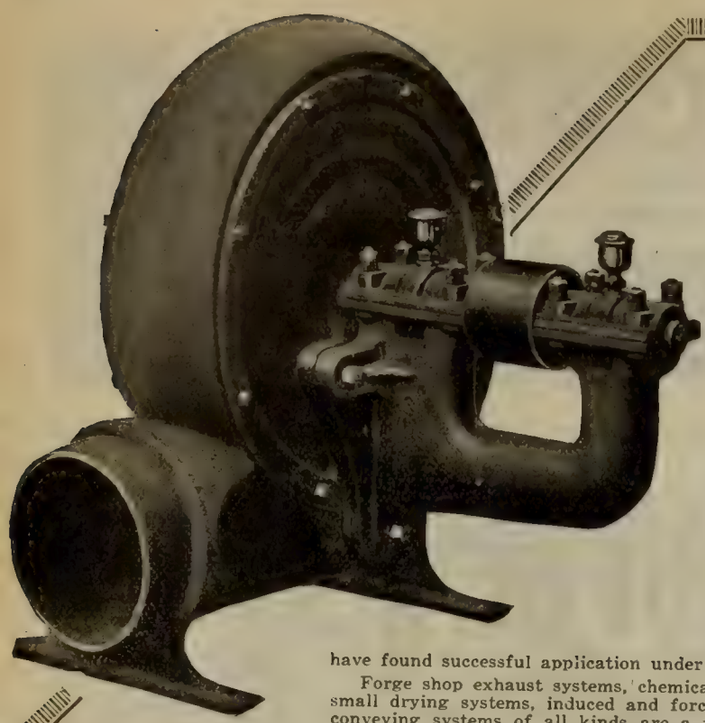


Balance Rail and Keyframe Boring Machine

Manufactured Solely By

TORONTO TOOL CO.,
TORONTO, ONT.

516 Richmond St., West **Phone Adel. 1181**



Keep Your Shop Clean

The installation of an exhaust system to remove refuse from emery wheels, buffing wheels or machines used in any abrasive process—in fact for the removal of all dust, fumes or gases requires an exhauster that will stand up under the most varied and trying conditions.

"CANADIAN"

"B"

Volume Exhausters

have found successful application under every conceivable condition.

Forge shop exhaust systems, chemical plants for the removal of fumes, small drying systems, induced and forced draft for boilers and pneumatic conveying systems of all kinds are a few direct applications.

Shavings and other stringy material can be removed economically and satisfactorily with a "B" Volume Exhauster equipped with a special non-clogging blast wheel.

Write Dept. 16 for more information.

Canadian Blower & Forge Co., Ltd.

Kitchener, Ont.

Let the Boss Know It!

IF you are a reader of Canadian Machinery, go tell your employer about it some convenient time! You couldn't tell the up-to-date manufacturer anything that would please him more. He would know that you are abreast of the times; that you are ambitious and interested in your work; that you are acquainted with methods and machinery which make for greater efficiency. He will say softly to himself: "Here is a live wire,—I'll just keep my eye on that chap."

If you are not a regular reader it will pay you to become one right away—quick.

Subscription price—$3.00 per year. 52 issues.

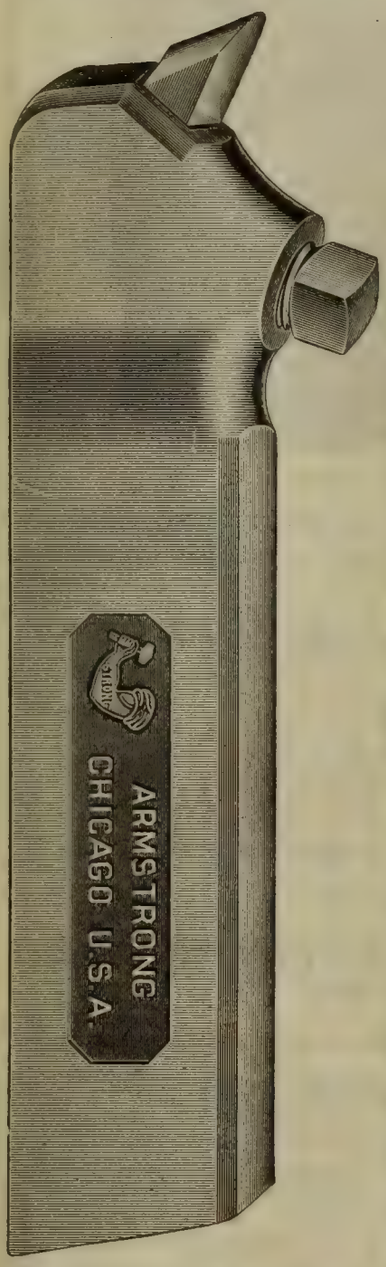
The Only Grand Prize for TOOL HOLDERS

Awarded separately and independent of other lines exhibited at the

PANAMA-PACIFIC EXPOSITION

WAS WON BY

ARMSTRONG TOOL HOLDERS



HIGHEST AWARD

at 4 World's Expositons

Paris - - - 1900
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THEY ALWAYS MAKE GOOD

They Are Saving Millions of Dollars in High Speed Steel

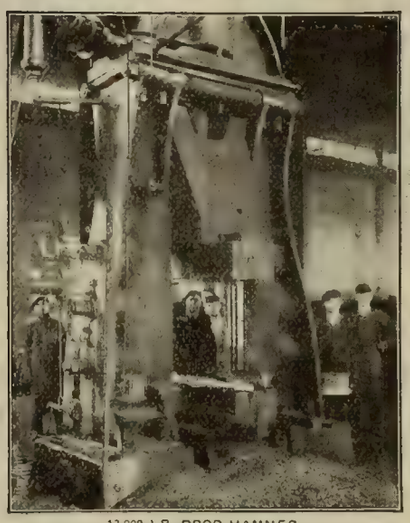
CATALOG FREE

Armstrong Bros. Tool Co.
"The Tool Holder People"
306 N. Francisco Ave., CHICAGO, U.S.A.

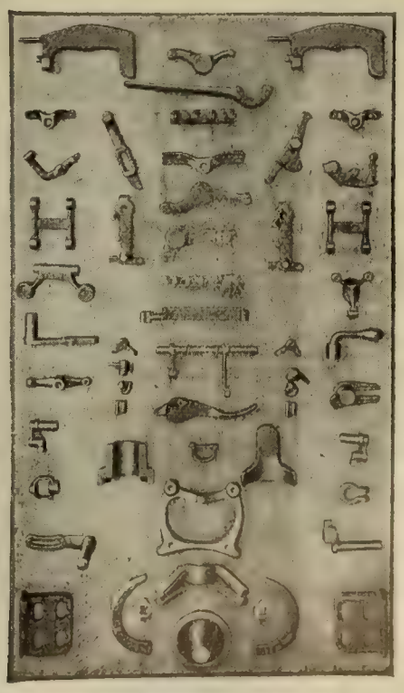
The Panama-Pacific MEDAL OF HONOR was also won by ARMSTRONG Drop Forged Wrenches, Ratchets, Clamps, Lathe Dogs, Etc.

Witness a Drop-Forge Shop in action

And you acquire a new idea of endurance



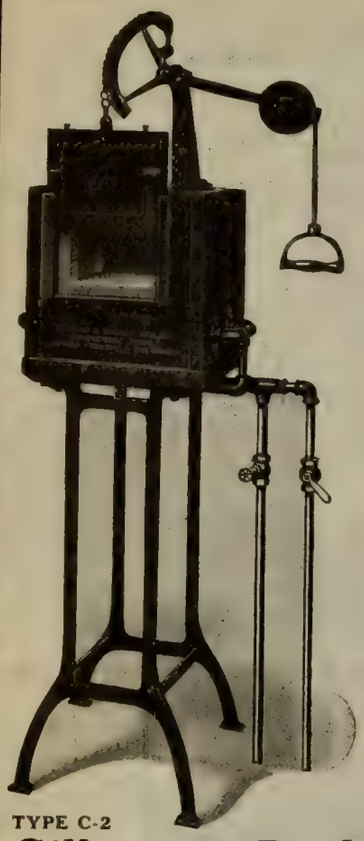
12,000 LB DROP HAMMER
WHAT DROP-FORGINGS ENDURE THERE EXPLAINS WHY "SUPERIOR DROP-FORGINGS" ENDURE EVERYWHERE



J. H. WILLIAMS & CO.
THE WRENCH PEOPLE
78 RICHARDS STREET BROOKLYN, N.Y. CITY

If any advertisement interests you, tear it out now and place with letters to be answered.

The Right Furnace For
Every Purpose



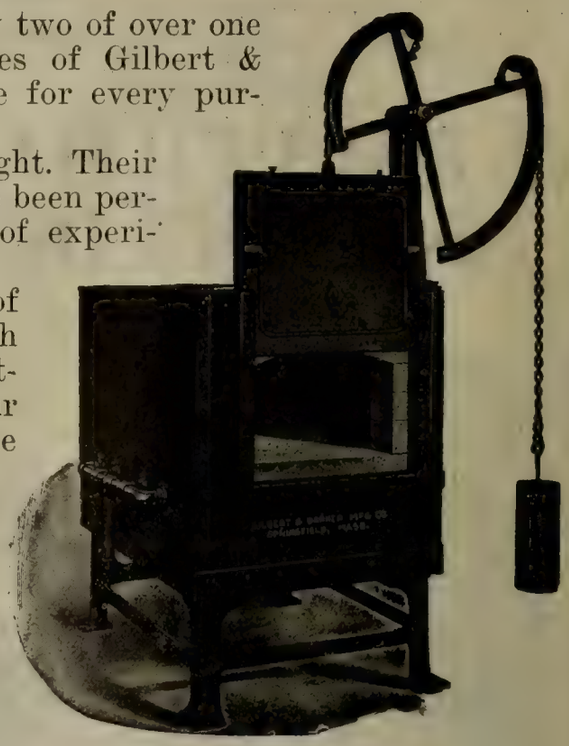
TYPE C-2

THE types shown are only two of over one hundred types and sizes of Gilbert & Barker Furnaces—a furnace for every purpose.

G. & B. Furnaces are built right. Their construction and design have been perfected by our half century of experience.

We offer you the benefit of this experience and thorough knowledge of modern heat-treating methods through our engineering department. The service is free. Put your problems up to us.

Just now we are making prompt delivery of these two types and many others. Send for Stock List 24.



TYPE C-15

Gilbert & Barker Mfg. Co. West Springfield, Mass.

Canadian Agents:
James DeVon, 227 Davenport Rd., Toronto, Ont. Williams & Wilson, Montreal, Que.

The Oven Equipment & Manufacturing Company
NEW HAVEN, CONN.

"CRAWFORD SECTIONAL" OVENS

Heated with our Enclosed Flame Gas Burners, or Electricity

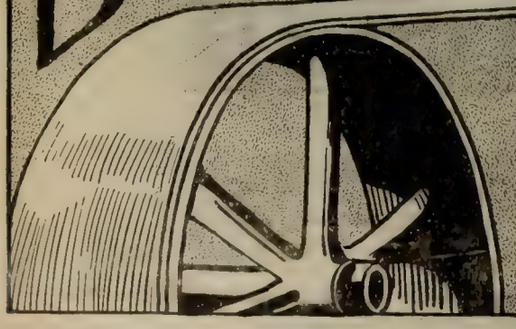
FOR BAKING JAPANS AND OTHER FINISHES ON METAL.

Ovens carried in stock and built to meet requirements of manufacturers.

Builders of All-Steel Oven Trucks with Roller Bearings.

Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.
ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

Scandinavia Belts



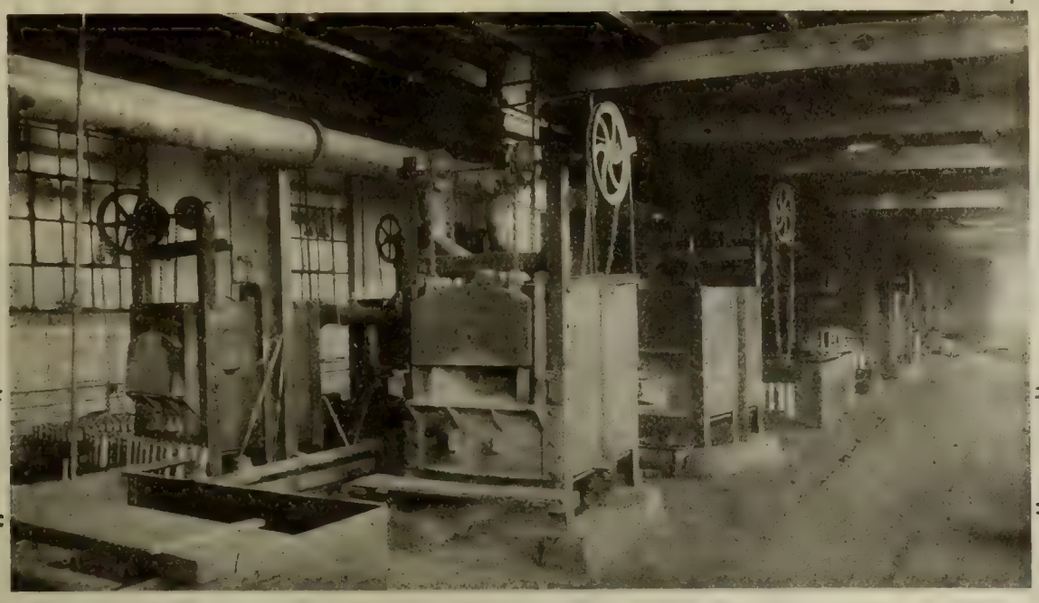
Can be used anywhere that leather can be used.

Scandinavia Belting is a solid woven cotton belt, made of long fibre cotton. It is impregnated to give further solidity, and the impregnation also acts as a moisture resistant. For direct drives where atmospheric conditions remain approximately the same, this belt is probably the best on the market to-day.

It stands up well on shifters.

W. P. BENNETT
51 Montfort Street, Montreal, P.Q.

Beltings *Packings* *Asbestos*



Annealing and Tempering Furnaces installed in the plant of the Canadian Vickers, Limited, Montreal.

"Mecol"

The installation of "Mecol" furnaces shown here is but one instance where a quality furnace was chosen to give maximum production. The furnace you may require is the one we desire to give you complete and full information about. Write us.

Mechanical Engineering Co.
Limited
THREE RIVERS QUE. CANADA

James McKay Company

Pittsburgh, Penna., U.S.A.

Manufacturers of

Shell Forgings

We have the Equipment and Experience and can execute orders for

Nose Sockets Base Plates Adapter Plates

for any size shells. Can execute orders promptly.

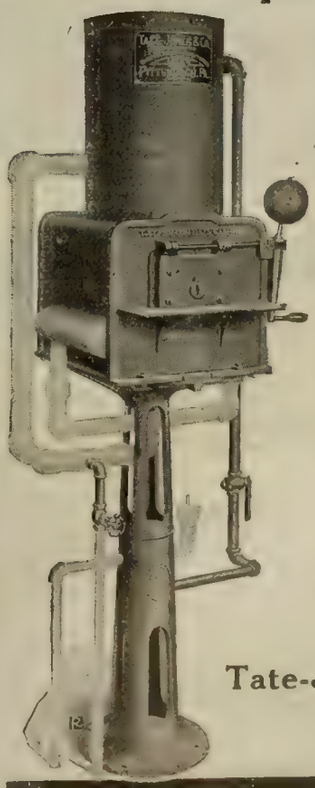
SPECIAL FORGINGS—We can make any forgings that can be made under Drop Hammers.

CHAINS AND ACCESSORY FORGINGS—We have a complete line.

ADDRESS OUR REPRESENTATIVE:

JOHN A. BUCHANAN
King Edward Hotel, TORONTO

This furnace turns back to its owner ¼ of every dollar ordinarily spent for fuel



It is a scientifically designed recuperative furnace for accurate temperature work — for heats from 900 to 1600 degrees Fahr. Uses artificial or natural gas.

The recuperator utilizes the gases of combustion for preheating the air for combustion, thereby effecting a saving in fuel of 25 per cent.

The fire brick linings are of molded tile of the highest quality. Between these linings and the outer shell is one inch of a special insulation which is equivalent to 9 inches of fire brick in its prevention of heat loss.

The interior design of the brick permits 100 per cent. of the available radiant and radiated heat to be thrown to the work. Other furnaces, under practical tests, show only half this much.

Tate-Jones

Recuperative Gas Oven Furnace
Series A)

Write for Bulletins—which explain this furnace.

Tate-Jones and Company, Inc.
PITTSBURGH, PA.
FURNACE ENGINEERS

WHITMAN & BARNES

Twist Drills
and
Reamers

Screw and Drop
Forged Wrenches
Hammers

Special
High Grade
Drop Forgings

Cotters
Chisels
Punches, Etc.

Users recognize "W & B" Tool Quality, backed by 64 Years' Uninterrupted Experience. If your Jobbers and Dealers cannot supply, write us and we will see that you are supplied. Send for Catalog No. 90.

THE WHITMAN & BARNES MFG. CO.

ESTABLISHED 1854

CANADIAN OFFICE AND FACTORY ∴ ∴ ST. CATHARINES, ONTARIO

Convenience Quality

Keystone tools bear the stamp of quality that makes them to be desired because they are made in the most convenient shapes and give the maximum in service and economy.

Our ratchets and adjustable wrench illustrated here are samples of our line. The Keystone brand are carried by the best houses. Inquire of your dealer.

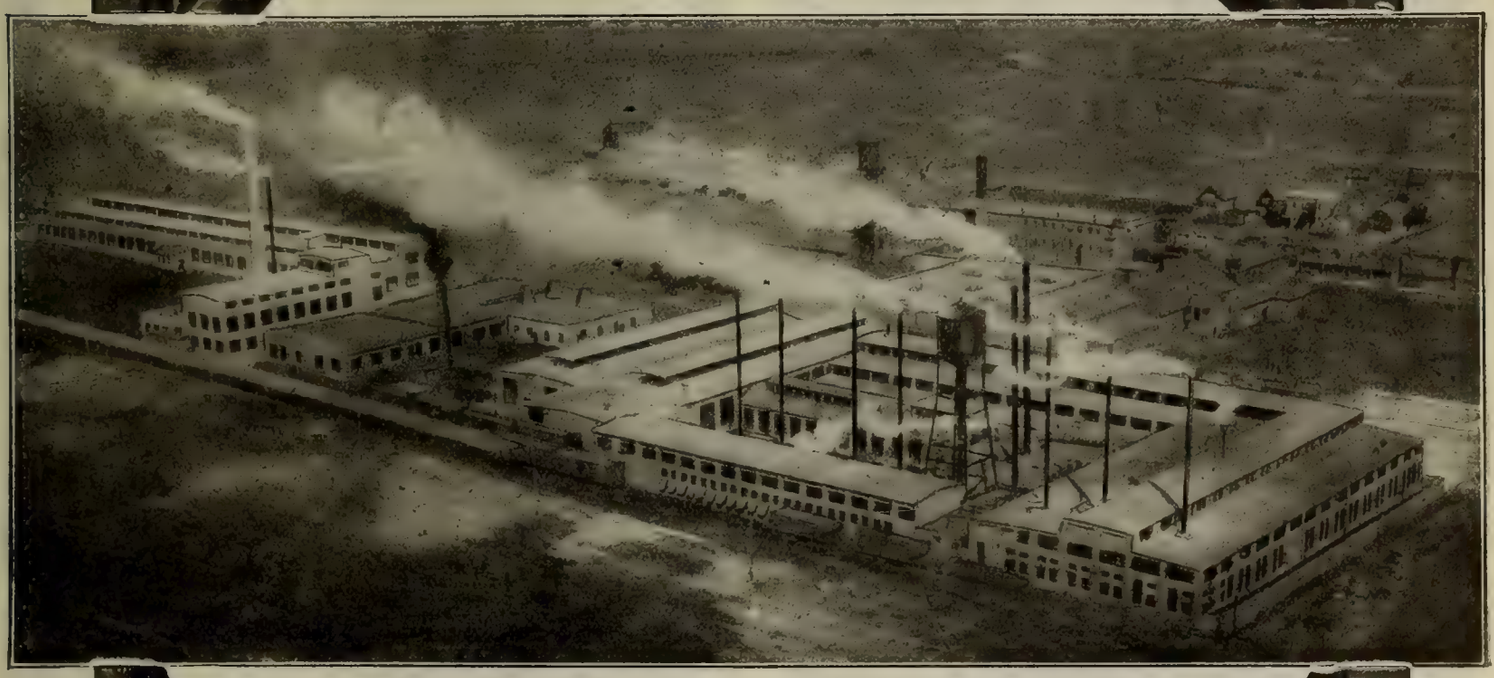
The Keystone Mfg. Co.

BUFFALO N.Y. U.S.A.

BROWN'S

BEAVER BRAND METALS

BRASS, BRONZE,
CANADA SILVER and GILDING METAL
In Sheets, Rolls, Plates and Rods



Brown's Copper & Brass Rolling Mills, Limited

General Offices and Works:
New Toronto, Ontario, Canada

COPPER & BRASS
BROWN'S
QUALITY
ROLLING MILLS

FORD TRIBLOC

Men Can Watch Their Work; The Hoist Needs No Watching

It's equipped with the Ford patented LOOP Hand Chain GUIDE that prevents "gagging" of the hand chain and damaging of the blocks. All the working parts are made of steel—they surely do not need watching as they have a factor of safety of 31/2 to 1.

If you must watch something, watch the mails for our new Catalogue 3. Write for it to-day.

FORD CHAIN BLOCK & MFG. COMPANY
139-141 OXFORD STREET PHILADELPHIA, PA.
2097-D

SMOOTH-ON

TRADE MARK-REG.U.S. PAT.OFF.

Iron Cements

Positively stop all leaks of steam, water, fire or oil in iron or steel. Unequalled for smoothing over rough and defective castings.

Smooth-On Cements are easy to apply, harden quickly and make permanent repairs.

Every Engineer should have a copy of our new illustrated instruction book. It is free.

Smooth-On Iron Cements are sold by supply houses.

Smooth-On Mfg. Co.
JERSEY CITY, N.J. U.S.A.

Send for New No.16 Illustrated Instruction Book

TRADE B&C MARK

Convenience

This wrench will conveniently get at that nut "just around the corner" or in other inconvenient places where a straight handled wrench would be awkward. Easily operated and handled by one hand. We can give you service and good prices.

BEMIS & CALL
Hardware & Tool Company
Springfield Mass., U.S.A.

TRADE MARK

MAGNOLIA ANTIFRICTION METAL

TRADE MARK

BETTER THAN "GENUINE"

ATLANTIC ICE & COAL CORPORATION.

Athens, Ga.,
Dec. 19, 1916.

The Magnolia Metal Co.,
New York, N.Y.

Gentlemen,—

For your information wish to advise you I have recently used your Magnolia metal on our large engine where I formerly used Genuine babbitt which cost just twice the price of Magnolia, and find that Magnolia is as good if not better, and I will continue to use Magnolia babbitt as long as I can get it. I do not hestitate to recommend it to engineers, where a good metal is required.

Yours truly,
ATLANTIC ICE & COAL COR.
Francis Jackson, Supt.

PRACTICAL ENGINEER POCKET BOOK:

Over 600 pages. A valuable reference work imported from England and sold as an advertising medium at the low price of 40c post paid.

Address Montreal Office.

SOLD BY LEADING DEALERS EVERYWHERE OR BY

MAGNOLIA METAL CO.

OFFICE AND FACTORY:

225 St. Ambroise Street Montreal

The WHITING CONVERTER

The increasing demand for steel castings on machinery of all kinds and the savings effected by the side-blow converter process proves that

It Pays to Make Your Own Steel Castings

right at home.

A more uniform product of whatever analysis required, reduced pattern expense, and castings when you want them are some of the reasons why every user of steel castings should investigate the Whiting Converter.

Write for Catalog 129

Complete Foundry Plants

WHITING FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB.

Cranes of all Types

RELIABILITY

is an important quality of Famous Five files.

You can depend upon them to stay sharp for the longest possible time.

This is insured by the quality of our high carbon steel; the efficiency of its heat treatment; the perfection of our manufacturing process and the accuracy and evenness of the teeth.

Their RELIABILITY has made them standard grade tools in the estimation of all mechanics.

Specify them when ordering.

They are:

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

Made in Canada by

NICHOLSON FILE CO.
PORT HOPE
ONTARIO

STEEL STAMPS

FOR MARKING SHELLS, ETC.

We will Give You Satisfaction on All Work of this Kind

SEND FOR PRICES

Pritchard-Andrews Co., of Ottawa

General Engravers and Die Sinkers

264 SPARKS ST. OTTAWA, CANADA

Speed

When the quality of the work is the best obtainable, the next item is speed. For upon speed depends your costs.

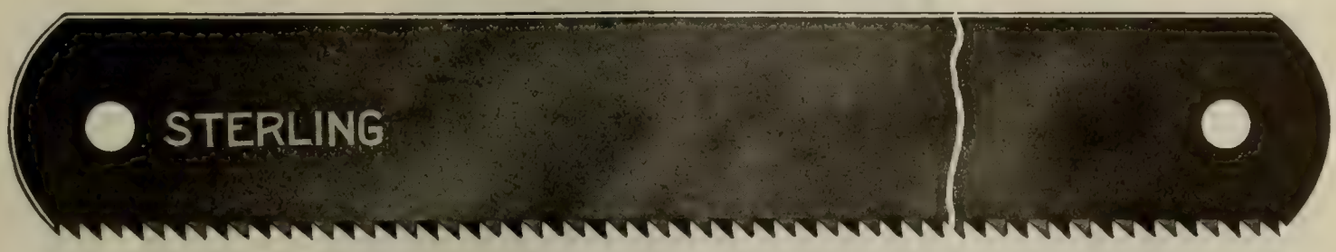
One rivet per second is the speed this machine will maintain indefinitely. Adapt that speed to your requirements and find out the value the Grant Riveter would be to you.

Write for our catalogue. It will give you complete information.

Grant Mfg. & Machine Company

Bridgeport, Conn., U.S.A.

HACK "STERLING" SAWS



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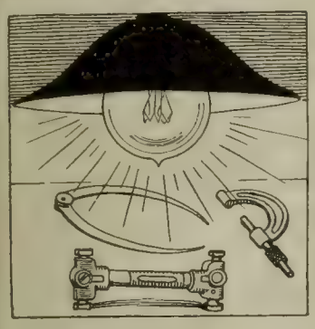
DIAMOND SAW & STAMPING WORKS -:- BUFFALO, N.Y., U.S.A.



GOOD LIGHT

AND

ACCURATE TOOLS

Add To Quality And Increase Production

There's an old saying—

"Neither men nor fools Can work without tools"

and in these days of high speed, large production, and night shifts, one of the most indispensable needs in your shop is—GOOD LIGHT.

LACO NITRO LAMP "THE LIGHT THAT GIVES MORE LIGHT"

puts the equivalent of bright, soft sunlight in your workshop. It gives your men a chance to use the delicate tools and big machines with equal accuracy, both day and night.

LACO NITRO LAMPS relieve eye-strain, prevent labor and material losses, and reduce the hazard of accident and error.

The LACO NITRO LAMP represents the latest development of the tungsten electric bulb. It is a tungsten filament in a nitrogen gas-filled bulb. Less current consumption—greater light and longer utility.

Inquire from your nearest dealer.

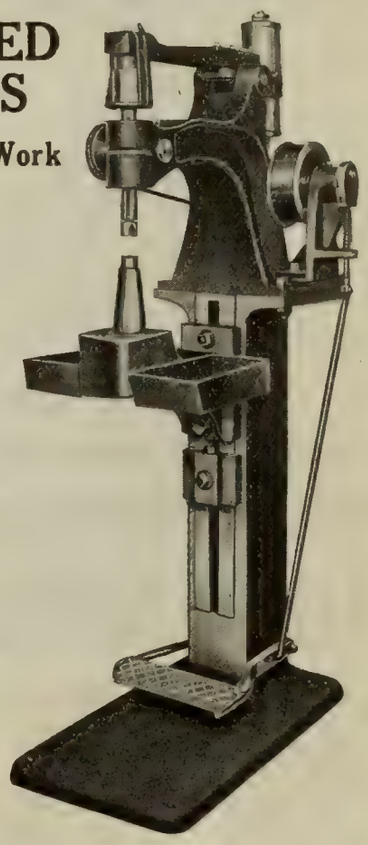
Canadian Laco-Philips Co., Ltd.

Stocks available at

Montreal Toronto Winnipeg Vancouver

HIGH SPEED HAMMERS

For High Speed Work



FEATURES:

Economy in floor space, elimination of weight and a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushings are used throughout.

No riveting too intricate for us; no riveting which our machine cannot accomplish.

Send for our **High Speed Hammer Book.**

THE HIGH SPEED HAMMER CO.

Rochester, N.Y.

Sales Agents : The A. R. Williams Machinery Company, Limited, Toronto, Ontario.

BRASS Castings

The coupling of expert work with unexcelled equipment enables us to produce on a large scale Brass Castings of any size or alloy.

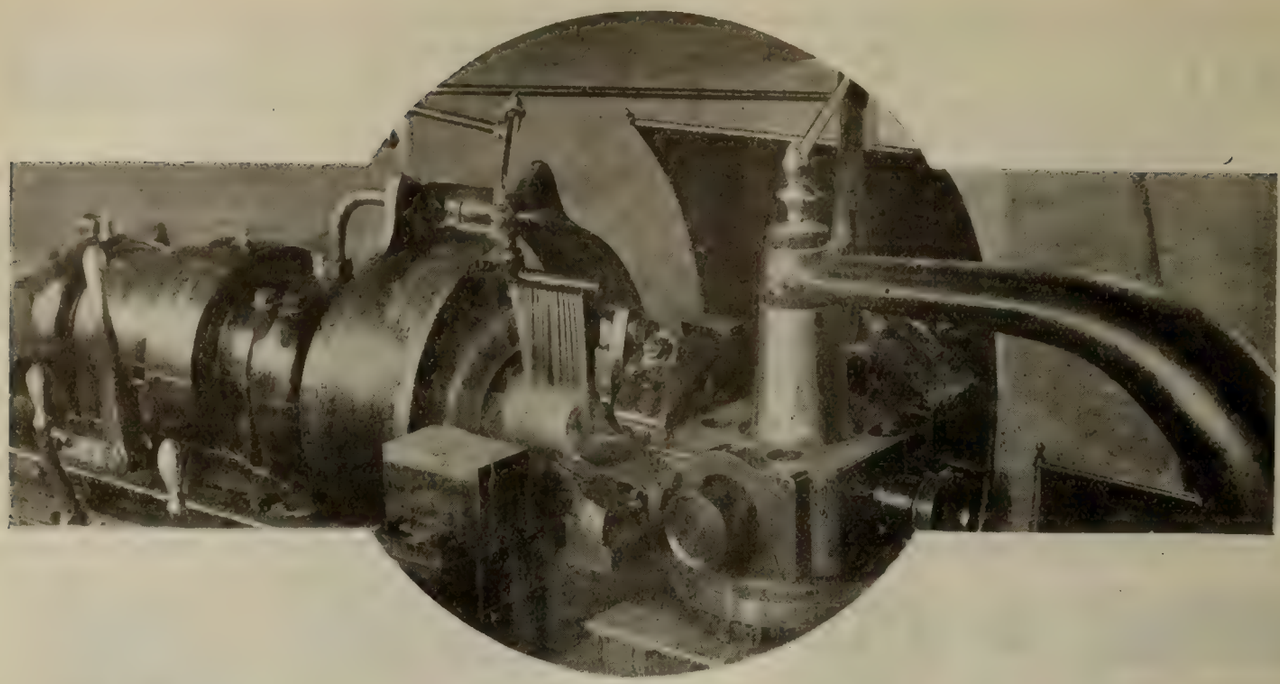
Our prices, too, are most reasonable; for our large purchases direct from the smelters command their every price favor.

For better Brass Castings at a money saving, send your orders to us. We promise that our work will please you.

The St. Lawrence Welding Company, Ltd., Montreal, P.Q.

Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, Etc. Electric Welders, Oxy-Acetylene Welders. Boiler Repairs. Lead Burning and Brass Foundry Work.

Office: 138 Inspector Street Works: 59 Olier Street Telephone: Office, Main 5779, Manager's Res., Westmount 3483



MYSTIC CUTTING COMPOUND

A free-flowing, unsaponified animal oil lubricant. Does not separate in solution, grow rancid or cause rust. It is non-combustible and will not harm operator's hands.

Mystic Cutting Compound increases production and keeps tools in best of condition. Your machines need it. Your operators like it. Test it at our expense.

Cataract Refining Co., Limited, Toronto, Ont.

DEPENDABILITY

Has Made

HARRIS HEAVY PRESSURE

THE MOST POPULAR BABBITT METAL IN THE DOMINION

Manufactured by

THE CANADA METAL CO., LTD.

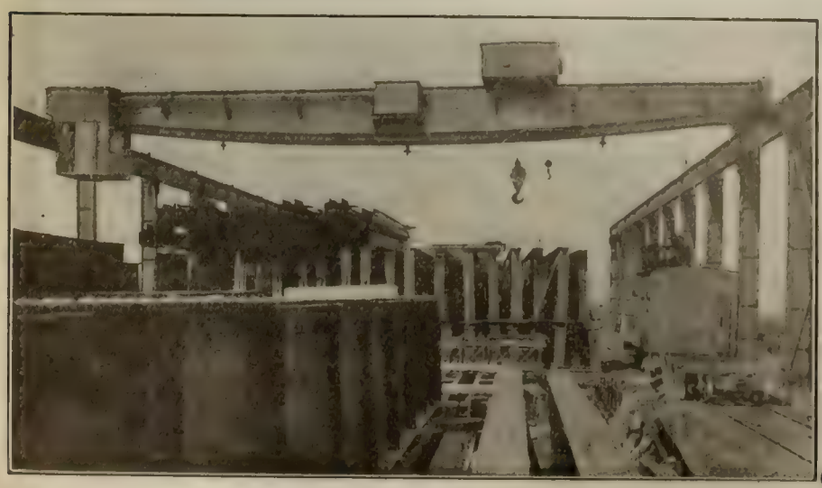
Hamilton, Montreal, TORONTO, Winnipeg, Vancouver

IT FLOWS FREELY

IT WILL NOT CRACK

IT IS COPPER COATED

IT IS COPPER HARDENED



Electric Travelling Cranes

(Direct or Alternating Current)

Steam and Electric Derricks

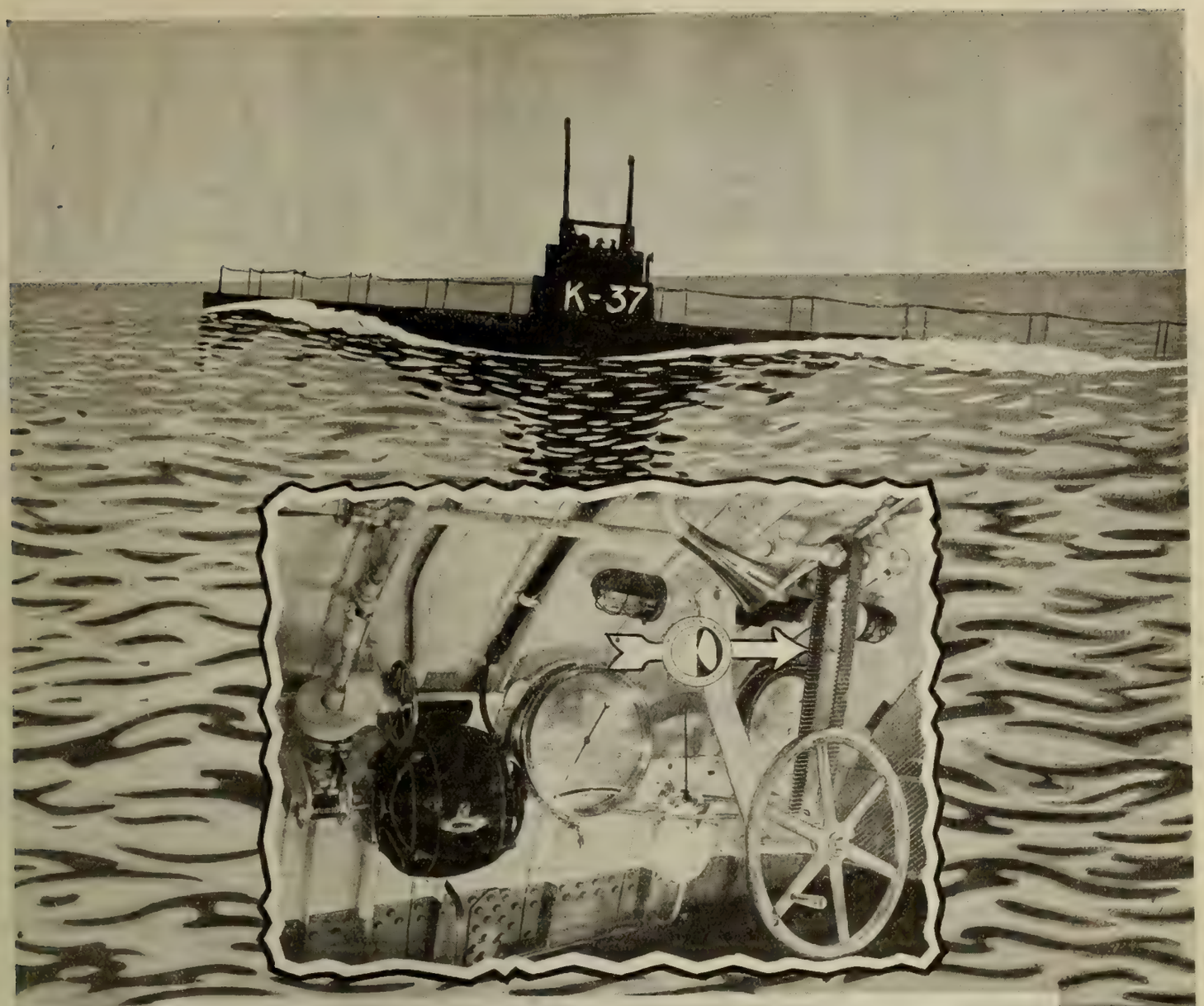
(Stationary or Travelling)

Up-to-date design. Built for fast, continuous service.

ACCESSIBILITY—DURABILITY.

Dominion Bridge Company, Limited

MONTREAL



ISN'T THIS RATHER GOOD EVIDENCE THAT THE

Morse Silent Chain

IS DEPENDABLE?

THE above insert shows them operating the DIVING CONTROL in United States submarines. Could DEPENDABILITY be more essential anywhere? They also operate the STEERING APPARATUS and the PUMPING SYSTEM. Ever since the Government made comparative tests of all makes of silent chains (prior to the awarding of the contract for chains to operate the Panama Canal Emergency Gates), and discovered that MORSE SILENT CHAINS were of much higher tensile strength and much smoother running than any other make, Government specifications of all sorts are usually met only by "MORSE."

Why Don't You Profit by the Government's Experience?

MORSE CHAIN CO., Ithaca, N. Y.

Largest Manufacturers of Silent Chains in the World

CHAPMAN

DOUBLE BALL BEARINGS

Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

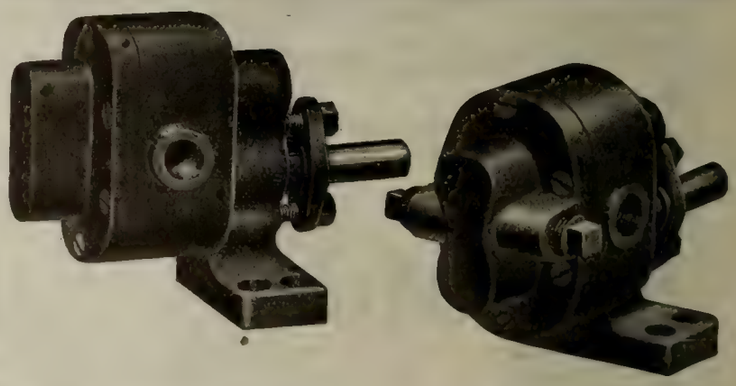
TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.

THE real cost of an article is not the price, but the use. To-day the value of things is based on what they can do, not on their purchase price.

The adaptability of the "Clipper" Belt Lacer to nearly every belt in your plant renders the "Clipper" invaluable to you.

Three minutes is the maximum time required to "Clipper" lace a belt.

Clipper Belt Lacer Company
976 Front Avenue Grand Rapids, Mich.

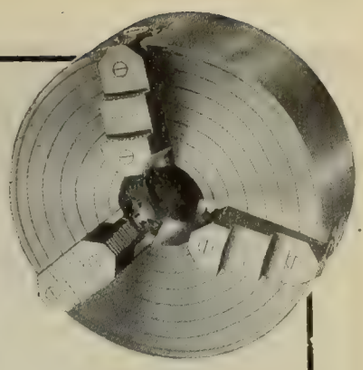


Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.



Order on Trial Let it Prove its Own Case—You the Judge

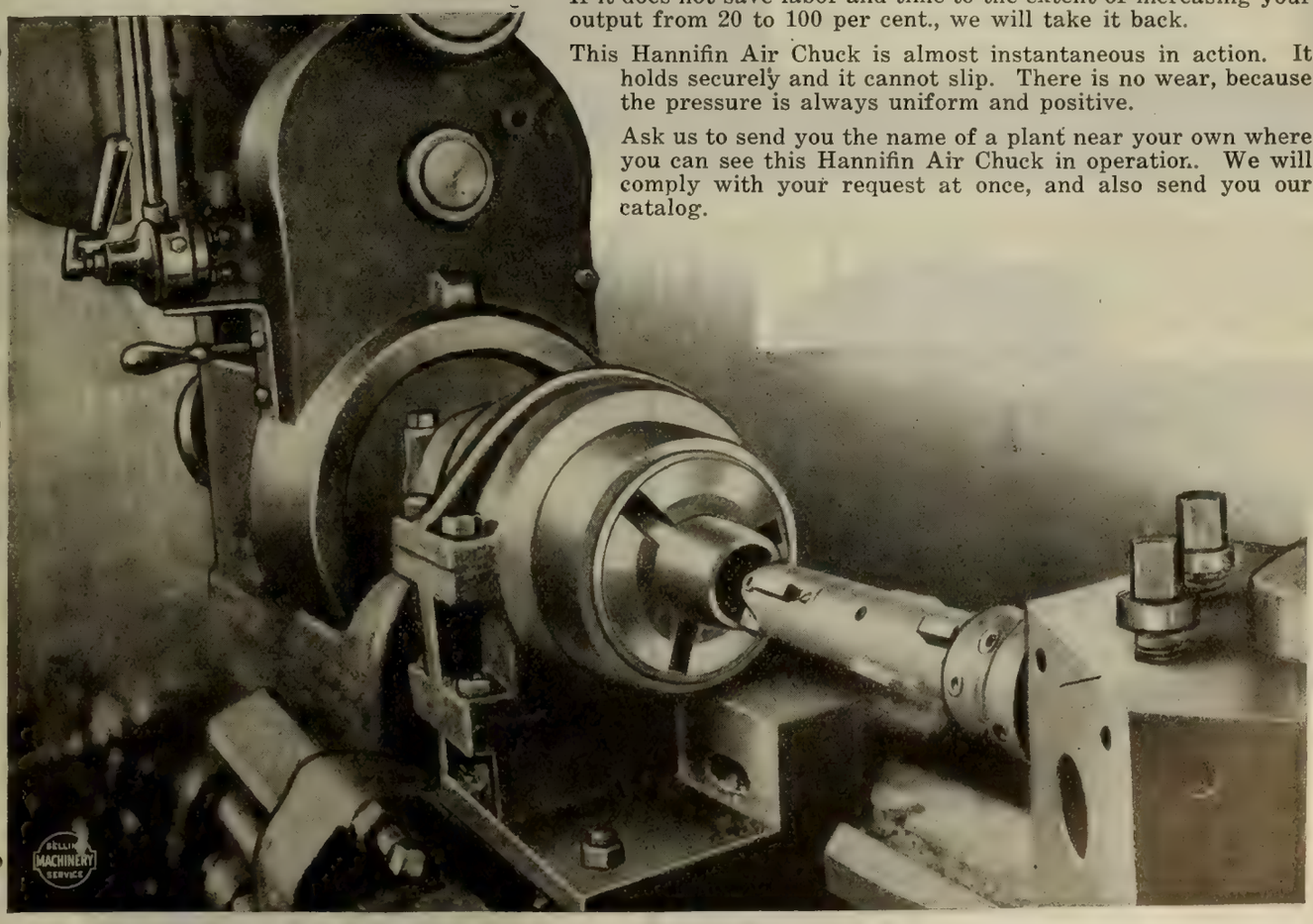
If we are over-confident, it is because we have never seen a Hannifin Chuck fail. On the other hand, in American and Canadian plants too numerous to mention here, we have seen the Hannifin Chuck increase output from 20 to 100 per cent. So we say to you: Order on trial

This HANNIFIN Air Chuck

If it does not save labor and time to the extent of increasing your output from 20 to 100 per cent., we will take it back.

This Hannifin Air Chuck is almost instantaneous in action. It holds securely and it cannot slip. There is no wear, because the pressure is always uniform and positive.

Ask us to send you the name of a plant near your own where you can see this Hannifin Air Chuck in operation. We will comply with your request at once, and also send you our catalog.



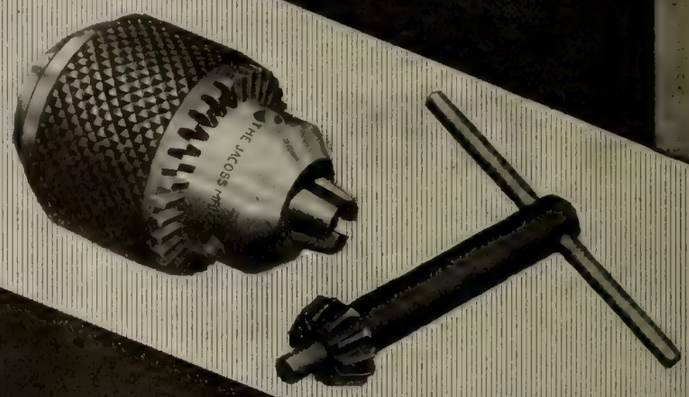
Hannifin Manufacturing Company

Representatives: The Canadian Fairbanks-Morse Co., Montreal; Knox-Andresen Co., Empire Bldg., Pittsburg, Pa. European Representatives: Coats Machine Tool Co., London; Fenwick, Freres & Co., Paris; Iznosskoff & Co., Petrograd.

Chicago
U.S.A.

Representatives: R. E. Ellis Engineering Co., Chicago; A. R. Williams Machinery Co., Toronto; Williams & Wilson, Montreal; C. C. Firmin, 602 Kerr Bldg., Detroit, Mich.; Carl Naumann, 411 Seitz Bldg., Syracuse, N.Y.

Jacobs
IMPROVED
Drill Chuck

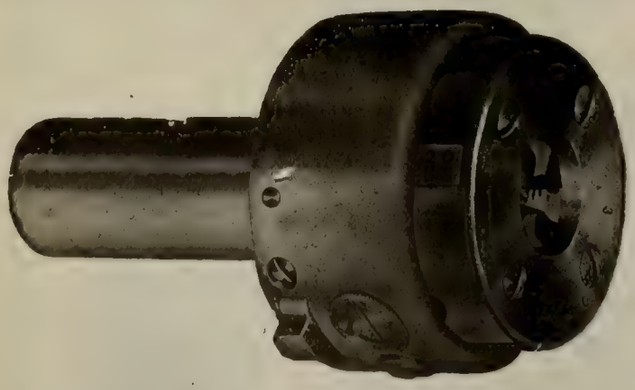


A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.



This Point is Valuable

The chasers are set and held in place by a cam. That cam once adjusted, locks; there is no stopping or changing in size. This H. & G. Automatic Self-Opening Die Head has a quick release that not only issues the cutting of the thread to a given point every time, but permits cutting right up to a shoulder when required. Our booklet will tell you more. Write for it.

Eastern Machine Screw Corp.
New Haven, Conn., U.S.A.

The Lancashire Dynamo & Motor Company, of Canada, Limited
107-109 Duke Street, TORONTO

ELECTRICAL MACHINERY for all Purposes.
ELLIOTT BROS'. { INSTRUMENTS / RECORDING GAUGES

PIPE VENTILATED A C MOTOR
FOR VERY DIRTY PLACES

Murchey

EQUALS 10 SOLID TAP LIVES

That point alone is sufficient to stamp Murchey adjustable taps as the undisputed leader of its class.

The point is this: when a chaser on a Murchey Tap is ground it can be adjusted to compensate for wear; with a solid tap this cannot be done with the fineness, the finish, the absolute accuracy that characterizes our adjustable taps. A solid tap will lose its accuracy, and the more grindings the greater the inaccuracy. We maintain a special chaser service for our clients.

The Murchey Adjustable Tap has other features which we will gladly furnish upon request.

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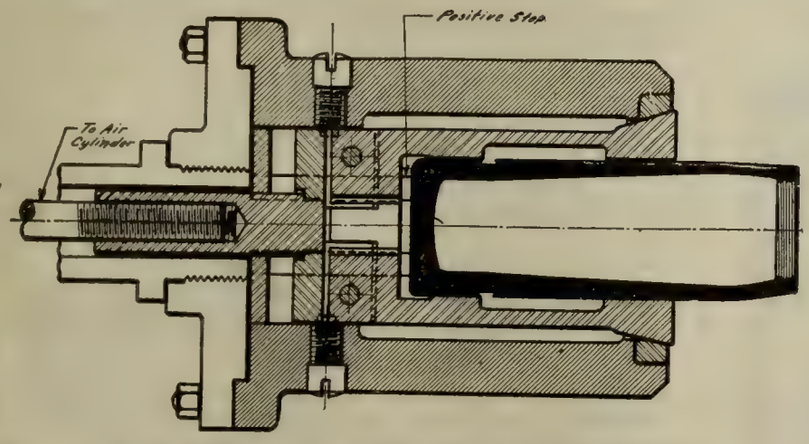
The Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, S.W., England
Fenwick Freres & Co. 16 Rue Fenelon Paris, France

EVERY MINUTE EVERY DAY PRODUCTION SPEEDED



M. E. C. THREE JAW HINGED COLLET CHUCKS

with steel body are almost everlasting. Not one complicated part to get out of order. Grip firm and positive, their simple air valve control greatly facilitates the quick insertion or withdrawal of work.

Instead of wasted minutes chucking with slow hand-operated chucks, do the same work in seconds, and do it better, with M. E. C. Three Jaw Chucks—compressed air operated.

M. E. C. Chucks
Air Operated

are 100% efficient wherever rapid manufacturing and absolute accuracy are the demands.

Know what great helps to speed production M. E. C. Chucks and Air Cylinders have proved themselves. Write to-day for our catalogue and 30-day free trial plan.

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CANADIAN AGENTS: J. R. Stone Tool and Supply Co., Detroit, Mich.
New York: J. R. Stone Tool and Supply Co., 30 Church St.

Escaped from Germany

AN escaped prisoner tells the story of his fearful experiences in Germany in MACLEAN'S MAGAZINE for November; and gives a vivid picture of conditions in Germany as he saw them. He got out by way of Holland after appalling perils and hardships. In Holland, he was photographed, but so altered was he that his wife quite failed to recognize him in this photograph. Read this story of this Canadian soldier's escape. It is gripping stuff—a rare tale.

Canadian Finances After the War

WILL business in Canada collapse when peace comes? It may. What do the big men say? What do they know? What do you think? Are your opinions well informed? The subject is of the greatest possible importance, and you will get light and leading by reading the contribution of Col. John Bayne Maclean, who has taken the trouble to get the opinion of the biggest and most highly placed men in Canada to help him prepare his article.

Back from the Arctic

WILLIAM THOMPSON, representing the American Geographical Society, was this year in the Arctic Regions. He went to the delta of the Mackenzie River, and took many excellent pictures of the country and its Eskimo inhabitants. He makes the November MACLEAN'S the vehicle of many of his pictures and for an account of his journey. Read what this Arctic scientist has to tell us about a remote part of our land.

Slackers and Conscription

WHAT is your attitude towards the draft? You have positive opinions, of course. How do they square with Miss Laut's as they are expressed in her ringing article on Slackers in the November MACLEAN'S?

The Nation's Business

THIS is a new feature—a fearless, well-informed survey of national affairs. What we all want is an outspoken—but not vindictive—and clear-visioned presentation of factors and facts affecting our national, political and economic welfare.

Sketches of Trench Life

By Gunner McRitchie

MCRITCHIE was a cartoonist on a Western Canada daily before he went overseas. He has done a number of sketches of trench life "On the Spot," and these he has sent home, for publication in MACLEAN'S MAGAZINE. They're interesting and good.

The Late Sir Mortimer Clark

BEFORE he died, a few weeks ago, the late Sir Mortimer Clark, eminent jurist and an ex-Lieutenant-Governor of Ontario, wrote for MACLEAN'S an article on "Safeguarding Your Heirs." It has to do with the functions, service and safety of Trust Companies as executors of estates. This article by a man so distinguished, so cautious, so able, and so wise a counsellor, can be of first-rate value to every man perplexed with the problem of how his estate can be safely and prudently administered after he, the testator, has passed from this life.

A Complete Novelette

By Peter B. Kyne

HIS story in the November MACLEAN'S is a thunderingly good story of lumbermen and lumbering. Red blood is in this tale of business. R. M. Brinkerhoff illustrates it.

Short Story

By Ethel Watts Mumford

THE writer of this short story—the first of a delightful series by this author to appear in MACLEAN'S—is very well known among short story writers. Delicate fancy, wholesomeness, freshness and finished workmanship characterize all her work.

Short Story

By W. A. Fraser

A MIGHTILY well-written story of India—the kind that we all delight in; tense, bewildering, and lots of action. Fraser never wrote a better short story than this. Ben Ward illustrates it.

Hendryx and Oppenheim

SERIALISTS

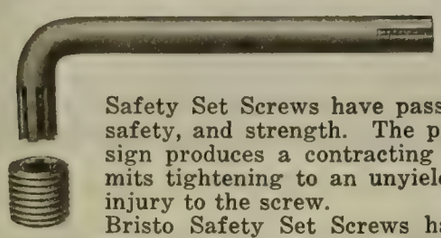
"THE Gun Brand," by Hendryx, comes to an end in the November issue. Oppenheim's greatest story, "The Pawns Count," is continued. Oppenheim's story is the biggest single feature ever secured by MACLEAN'S.

MACLEAN'S MAGAZINE

for November At All News Dealers **15c.**

HINTS TO BUYERS

BUILDERS OF MACHINERY WHAT SET SCREWS DO YOU USE?



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Safety Set Screws have passed every test for safety, and strength. The patented fluted design produces a contracting effect which permits tightening to an unyielding grip without injury to the screw.

Bristo Safety Set Screws have been adopted as the standard by many prominent machine builders. Ask for free samples and Bulletin I-809.

THE BRISTOL CO., Waterbury, Conn.
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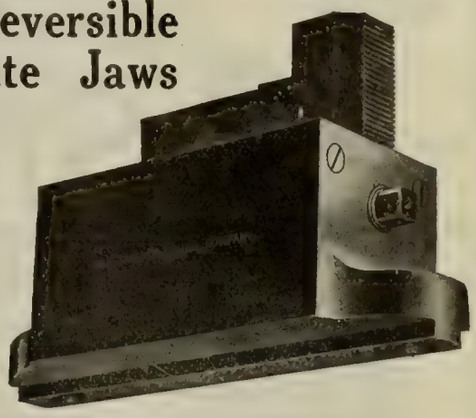
Skinner Reversible Face Plate Jaws



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Iron or Steel Body, Single Rib for Large Lathes and Double Ribs Boring Mills

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We are well equipped to make all kinds of steel castings, 100 lbs. to 50,000 lbs.

Dominion Steel Foundry Co.
LIMITED
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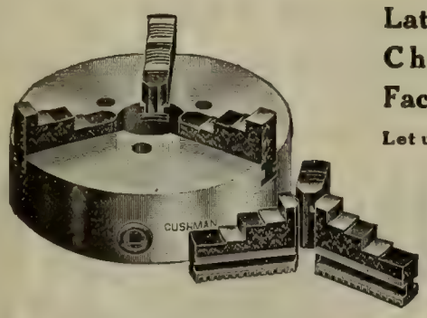
Cushman Chucks



Lathe Chucks, Drill Chucks, Portable Face Plate Jaws.

Let us send you our catalog.

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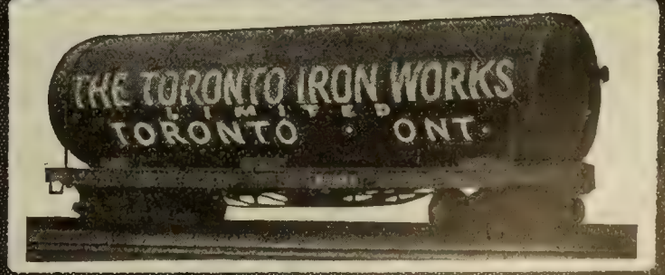
Hartford, Conn., U.S.A.

RIVETED STEEL TANKS FOR EVERY PURPOSE



OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
PNEUMATIC WATER SUPPLY TANKS - SMOKE STACKS
BOILER BREECHING - RIVETED STEEL PIPE BINS & HOPPERS

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LIMITED
WALKERVILLE
ONTARIO
Electric Cranes
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Foundry Equipment

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MADE IN CANADA
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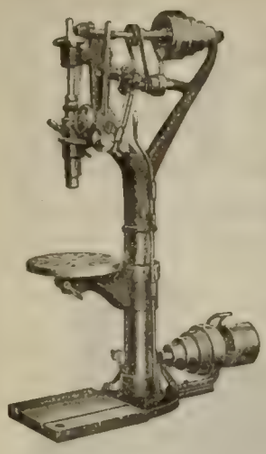

20" Swing Drills in four distinct styles. Plain lever feed, lever and wheel feed, power feed and automatic stop, and with back gearing. Made singly or in 2, 3 or 4 spindle gangs. Write us for complete information and Catalogue No. 62; also for particulars on our new 25" Drilling Machine.

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COAL COKE HACK SAW BLADES

CARBON STEEL MACHINERY STEEL

HIGH SPEED STEEL

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Every Tooth Cuts on Every Quality Saw

They cut straighter.
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A universal grinder. A grinder with all attachments. A grinder that will handle all kinds of tool-sharpening as well as cylindrical, internal and surface grinding. An all-around machine for your tool-room.

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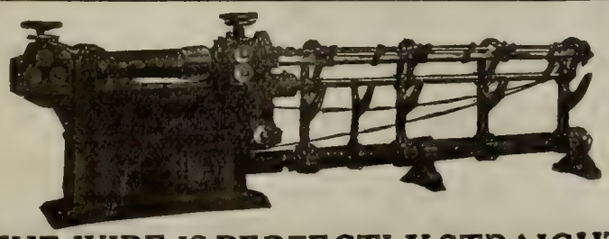

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and cut to accurate lengths when it comes from our AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE, whether it's ¾" diameter or only .020" wire, hard or soft wire, highly polished or rough stock.

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ACTUAL TESTS under trying circumstances have proven that boring expenses may be cut in half by using the DIXON PATENT BORING TOOL. License to make this tool may be purchased outright. Get in touch with me.

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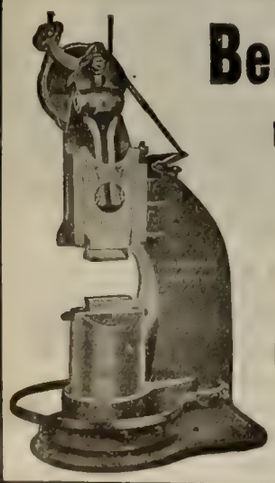

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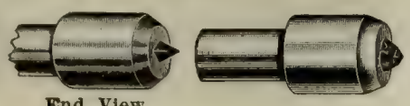

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"Maintenance of Quality"

is our motto, and our experience in the manufacture of belting since the year 1856 should be invaluable to you. Let us tell you all about this friction faced belting. The price will appeal to you.

Write to-day.

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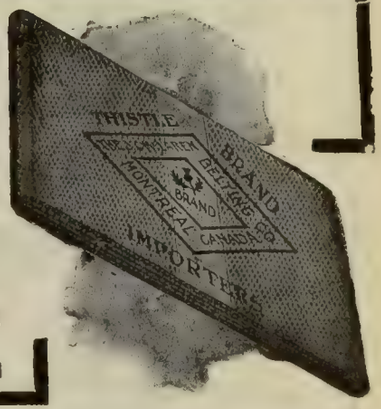

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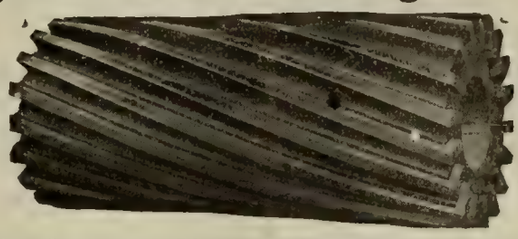

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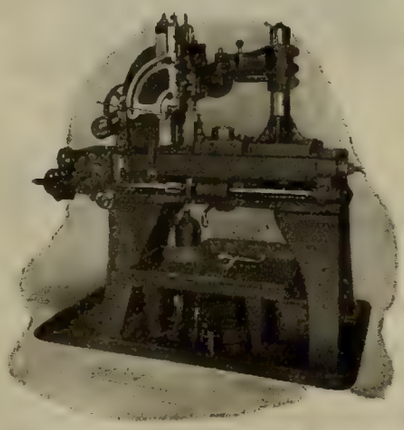

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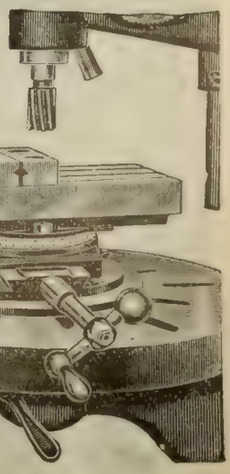
For the Die Maker, Repair Shop, Pattern Maker or Garage; will perform more than 90% of the jobs that come up.



For any Drill Press 14" to 42" swing. Big Economy — Big Convenience— Small Price. It relieves your large millers, comes in handy spotting castings, milling ends of bosses, and many other odd jobs. Cuts all kinds of keyseats perfectly; mills deep grooves, slots and cams. We also make cylinder reamers for reboring Ford car, and a reliable air compressor—all at special factory prices. Write for circulars to-day.

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The enormous demand for "Frost King"—sales $5,000,000 annually—is due to its perfection. Forty years have been devoted to the perfecting of white metal alloys, and "Frost King" is undoubtedly the highest achievement in babbitts. Its performance under heavy duty and the way it cares for high speed is very gratifying.
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Every pulley fully guaranteed.
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Engine Lathes from 26" to 60" swing; Plain Turning Lathes, 24" and 30" swing; Axle and Journal Turning Lathes and Bevel Gear Turning Lathes. Write for Catalogue.

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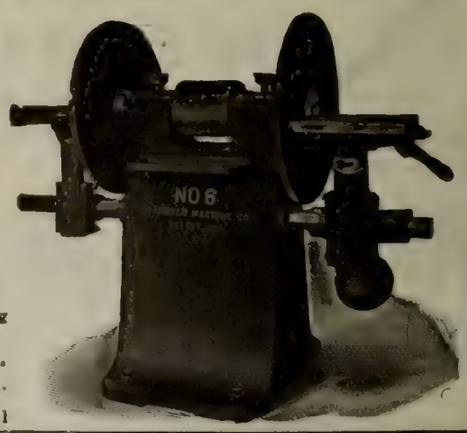

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The Disc Grinding Authorities
Beloit, Wis. U.S.A.
Canadian Agents: Can. Fairbanks-Morse Co.
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Canada Metal Co., Ltd., Toronto
Can. B. K. Morton, Toronto, Montreal
Foss & Hill Machy. Co., Montreal.
Hoyt Metal Co., Toronto
Magnolia Metal Co., Montreal
Petrie, Ltd., H. W., Toronto, Ont.
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Chapman Double Ball Bearing Company, Toronto

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Cleveland Wire Spring Co., Cleveland

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Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Whitney Mfg. Co., Hartford, Conn.

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Goodyear Tire & Rubber Co., Toronto, Ont.

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Canadian Fairbanks-Morse Co., Montreal
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Graton & Knight Mfg. Co., Worcester, Mass.
Goodyear Tire & Rubber Co., Toronto, Ont.
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Baxter & Co., Ltd., J. R., Montreal, Que.
Bennett, W. P., 51 Montford St., Montreal, Que.
Dominion Belting Co., Hamilton, Ont.
Federal Engineering Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

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Jardine, A. B., & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York
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Steel Bending Brake Works, Chatham, Ont.
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Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Sturtevant Co., B. F., Galt, Ont.

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Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

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Geo. A. Joyce Co., Ltd., New York, N.Y.

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Canada Machinery Corp., Galt, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

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Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
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Gardner & Son, Robt., Montreal.
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Cleveland Pneumatic Tool Co. of Canada, Toronto
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Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
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Cumming & Son, J. W., New Glasgow, Canada

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Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal
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Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
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MacKinnon, Holmes Co., Sherbrooke

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Garlock-Walker Machinery Co., Toronto, Ont.
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Canada Machinery Corp., Galt, Ont.

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Gray Mfg. & Mach. Co., Toronto, Ont.
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Oven Equipment & Mfg. Co., New Haven, Conn.

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Brown, Boggs & Co., Hamilton, Can.
Prest-O-Lite Co., Inc., Toronto, Ont.

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Cumming & Son, J. W., New Glasgow, Canada.
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Marsh & Henthorn, Belleville, Ont.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

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Dillon Mfg. Co., Oshawa, Ont.

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Blackall, Fred. S., Woolworth Tower, New York.
Bliss Co., E. W., Brooklyn, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.

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St. Lawrence Welding Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton.

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Brown, Boggs Co., Ltd., Hamilton, Canada.
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Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.

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Wm. Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
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CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.

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Gardner, Robt., & Son, Montreal.
Petrie, Ltd., H. W., Toronto, Ont.

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Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Wright Mfg. Co., Lisbon, Ohio.

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Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

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Embree, Ira, 281 Emerald St. N., Hamilton, Ont.
Union Tool Chest Works, Rochester, N.Y.

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Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

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Aikenhead Hardware Co., Toronto, Ont.
John Bertram & Sons Co., Dundas, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
D. E. Whiton Machine Co., New London, Conn.

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Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.

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Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

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H. E. Streeter, 523 New Birks Bldg., Montreal.

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Gardner Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

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Roelofson Machine & Tool Co., Toronto, Ont.
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Hardinge Bros., Inc., Chicago, Ill.

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Bernard Industrial Co., A., Fortierville, Que.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.

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MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

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Sleeper & Hartley, Inc., Worcester, Mass.

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Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

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COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.

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Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

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Niles-Bement-Pond Co., New York.

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Pratt & Whitney Co., Dundas, Ont.

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Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.

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Bernard Industrial Co., The A., Fortierville, Que.

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Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

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Northern Crane Works, Walkerille.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

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Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

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Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.

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Cincinnati Milling Machine Co., Cincinnati.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining & Mfg. Co., Toronto.
Elm Cutting Oil Co., Toronto.
Racine Tool & Machine Co., Racine, Wis.

CUTTING-OFF MACHINES
Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machinery Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Mchy. & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

CYLINDERS, AIR
Manufacturers Equipment Co., Chicago, Ill.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.

DAMPER REGULATORS
Canadian Fairbanks-Morse Co., Ltd., Montreal.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

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Geo. A. Joyce Co., Ltd., New York.

DIAMOND TOOLS
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York.
Wheel Trueing Tool Co., Windsor, Ont.

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Matthews, Jas. H., & Co., Pittsburgh, Pa.

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Aikenhead Hardware Co., Toronto, Ont.
Banfield, W. H., & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
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Standard Machy. & Supplies, Ltd., Montreal.
Wells Brothers of Canada, Galt, Ont.

DIES FOR BIT BRACE USE
Wells Brothers Co. of Canada, Galt, Ont.

DIES, NOSING
Marsh & Henthorn, Ltd., Belleville, Ont.

DIES, PIPE THREADING
Landis Machine Co., Waynesboro, Pa.

DIE SINKERS
Becker Milling Machine Co., Boston, Mass.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Landis Machine Co., Waynesboro, Pa.
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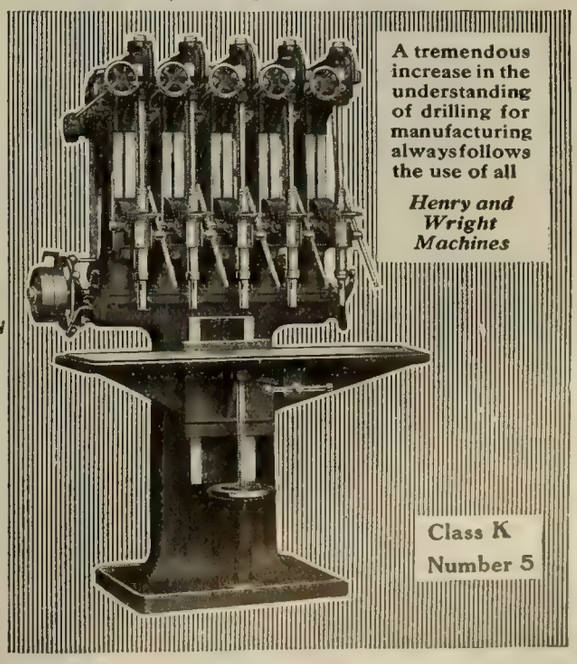

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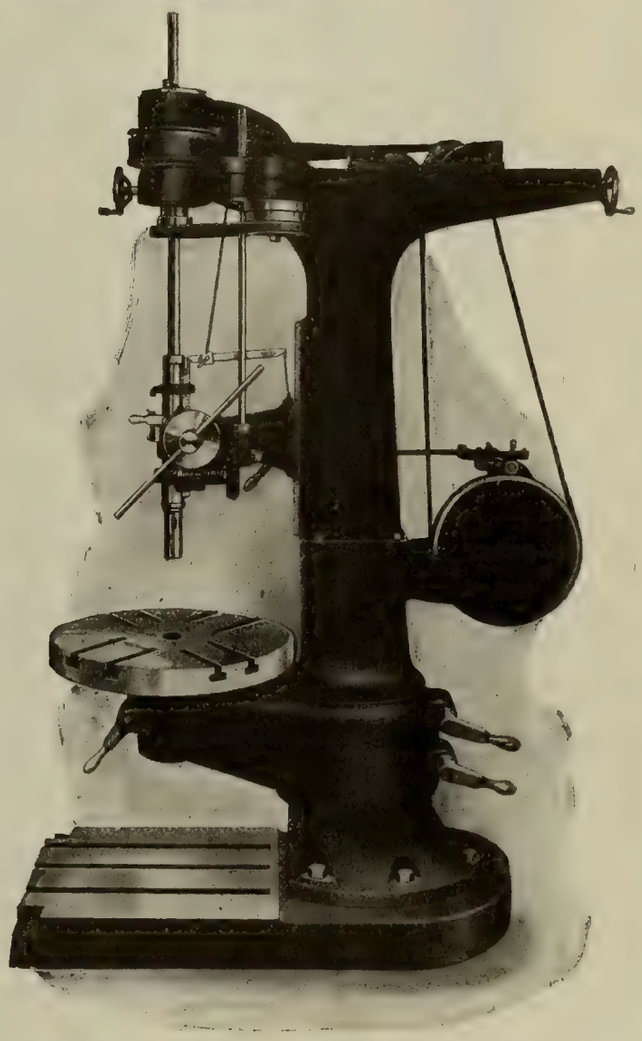

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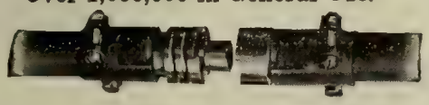

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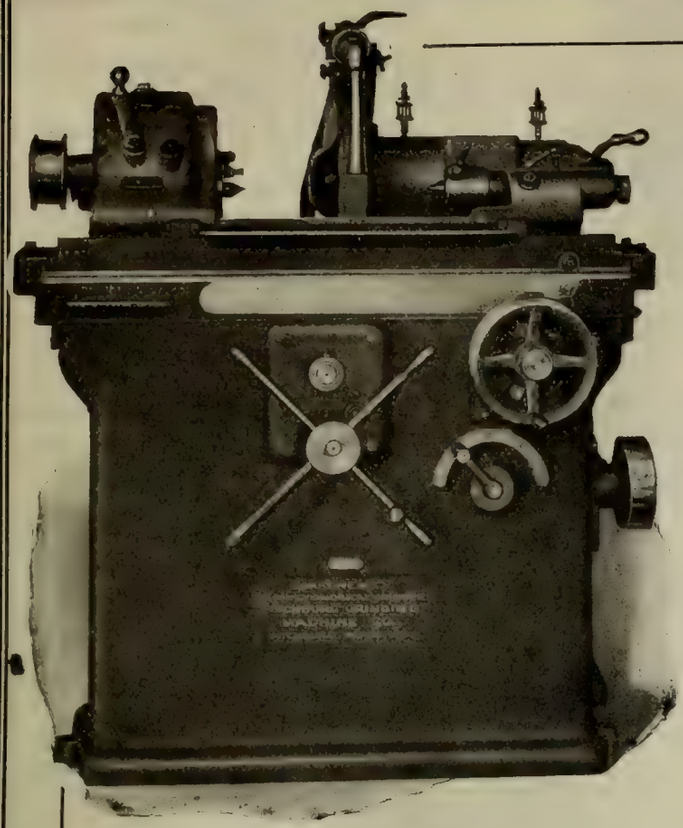

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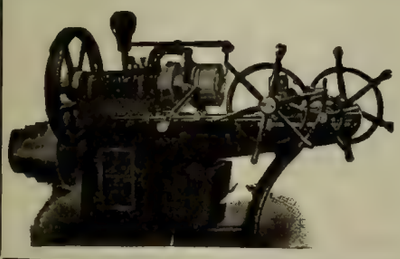

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Taft-Peirce Mfg. Co., Woonsocket, R.I.

MILLING MACHINES, HAND
Hardinge Bros., Inc., Chicago, Ill.
United States Mach. Tool Co., Cincinnati, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Whitney Mfg. Co., Hartford, Conn.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Becker Milling Machine Co., Boston, Mass.
Brown & Sharpe Mfg. Co., Providence.
John Bertram & Sons Co., Dundas.
Cleveland Milling Machine Co., Cleveland, Ohio.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.
Steptoe, The John Co., Cincinnati, Ohio.
United States Mach. Tool Co., Cincinnati, Ohio.
Whitney Mfg. Co., Hartford, Conn.
A. R. Williams Machy. Co., Toronto.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Becker Milling Machine Co., Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

MILLING MACHINES, PROFILE
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Tabor Mfg. Co., Philadelphia, Pa.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Cummings & Son, J. W., New Glasgow, Canada.
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
Marsh & Henthorn, Belleville, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Jenckes Mach. Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

MITTENS
Hickory Steel-Grip Glove Co., Chicago, Ill.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Mach. Co., New Britain, Conn.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
A. R. Williams Machy. Co., Toronto.

MOTORS, PNEUMATIC
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Garlock-Walker Machinery Co., Toronto, Ont.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Can.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
John H. Hall & Sons, Ltd., Brantford, Ont.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

NUTS, SEMI-FINISH AND FINISHED
Canadian B. K. Morton, Toronto, Montreal.
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton, Ont.

NUT BURRING MACHINES
National Machy. Co., Tiffin, O.

NUT MACHINES (HOT)
National Machy. Co., Tiffin, O.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machy. Co., Tiffin, O.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.

OIL, DRAWING
Elm Cutting Oil Co., Toronto, Ont.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Machine Co., The, Hamilton.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
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Brantford Oven & Rack Co., Brantford, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford, Ont.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVENS FOR DRYING, TEMPER AND UNDER TRUCKS
Brantford Oven & Rack Co., Brantford, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.

OXY-ACETYLENE WELDING AND CUTTING
Can. Welding Works, Montreal, Que.
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.

OXY-ACETYLENE WELDING AND CUTTING PLANT
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

OXYGEN (SEE ACETYLENE)
L'Air Liquide Society, Montreal, Que.

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Bennett, W. P., 51 Montford St., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
New Britain Mach. Co., New Britain, Conn.

PACKINGS, LEATHER, HYDRAULICS, ETC.
Graton & Knight Mfg. Co., Worcester, Mass.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.

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Bertrams, Ltd., Edinburgh, Scotland.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

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Canada Machinery Corp., Galt, Ont.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.

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Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

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Winnipeg Gear & Engr. Co., Winnipeg, Man.

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Canada Wire & Iron Goods Co., Hamilton.

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Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

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Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Petrie, Ltd., H. W., Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
A. R. Williams Machy. Co., Toronto.

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Toronto Iron Works, Ltd., Toronto.

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Curtis & Curtis Co., Bridgeport, Conn.
John H. Hall & Sons, Ltd., Brantford, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

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Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

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Sheldons, Ltd., Galt, Ont.
Niles-Bement-Pond Co., New York.

PLIERS
Aikenhead Hardware Co., Toronto.
Canadian Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Conn.

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Atlas Press Co., Kalamazoo, Mich.
Hannifin Mfg. Co., Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

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Atlas Press Co., Kalamazoo, Mich.
E. W. Bliss Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, CAM, TOGGLE, EYELET
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Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES FOR SHELLS
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

PRESSES, FILTER
William R. Perrin, Ltd., Toronto.

PRESSES, DROP AND FORGING
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E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Charles F. Elmes Eng. Works, Chicago.
Can. Fairbanks-Morse Co., Montreal.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo.

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John Bertram & Sons Co., Dundas.
Charles F. Elmes Eng. Works, Chicago.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo.
West Tire Setter Co., Rochester, N.Y.
A. R. Williams Machy. Co., Toronto.

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Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

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Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
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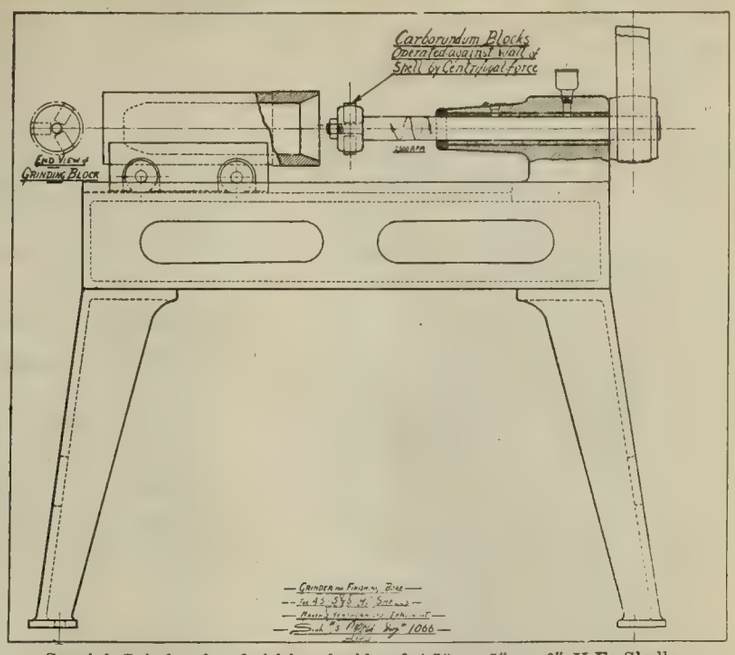

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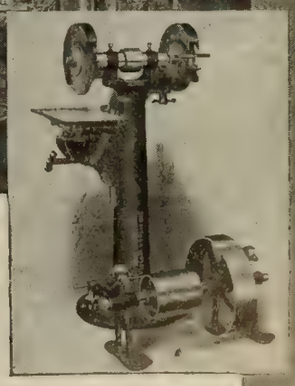

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Positive Clutch & Pulley Works, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
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Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Mach. Co., Hamilton.
Sturtevant Co., B. F., Galt, Ont.

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Smart-Turner Mach. Co., Hamilton.
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Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
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Pratt & Whitney Co., Dundas, Ont.
Toledo Machine & Tool Co., Toledo, O.

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Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Ferracute Mach. Co., Bridgeton, N.J.
Niles-Bement-Pond Co., New York.

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John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Niles-Bement-Pond Co., New York.
W. A. Whitney Mfg. Co., Rockford, Ill.

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H. E. Streeter, New Birks Bldg., Montreal, Que.
Taylor Instrument Co., Rochester, N.Y.
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QUARTERING MACHINES
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Niles-Bement-Pond Co., New York.

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Cumming & Son, J. W., New Glasgow, Canada.
Niles-Bement-Pond Co., New York.

RAILS, STEEL
Cumming & Son, J. W., New Glasgow, Canada.

RATCHETS
Keystone Mfg. Co., Buffalo, N.Y.

RAW HIDE PINIONS (SEE GEARS)

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Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
H. E. Streeter, New Birks Bldg., Montreal, Que.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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Clark Equipment Co., Buchanan, Mich.
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Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
McKenna Brothers, Pittsburgh, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

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Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
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Can. Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

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Taylor Instrument Co., Rochester, N.Y.

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Can. Blower & Forge Co., Kitchener, Ont.
Grant Mfg. & Machine Co., Bridgeport, Conn.
National Machinery Co., Tiffin, O.

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Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

RIVETS, IRON, COPPER AND BRASS
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ot.

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Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.

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High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.

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John Bertram & Sons Co., Dundas
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo, O.

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RUBBER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland

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Brown & Sharpe Mfg. Co., Providence
James Chesterman & Co., Ltd., Sheffield, Eng.
L. S. Starrett Co., Athol, Mass.

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SAW MILL MACHINERY
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Gardner, Robt., & Son, Montreal
Curtis Pneumatic Machy. Co., St. Louis, Mo.
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Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York
Himoff Mach. Co., Inc., Astoria, L.I., New York.
A. B. Jardine & Co., Hespeler
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto

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Riverside Machinery Depot, Detroit, Mich.

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Wells Bros. Co. of Canada, Galt, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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Pratt & Whitney Co., Dundas, Ont.

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Dominion Machinery Co., Toronto
Foss & Hill Machy. Co., Montreal
Hill, Clarke & Co., Chicago, Ill.
McCabe, J. J., New York, N.Y.
New York Machinery Exchange, New York
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Strelinger Co., Chas. A., Detroit, Mich.
Stocker-Rumely-Wachs, Chicago, Ill.

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Can. Fairbanks-Morse Co., Montreal
Canada Machinery Corp., Galt, Ont.
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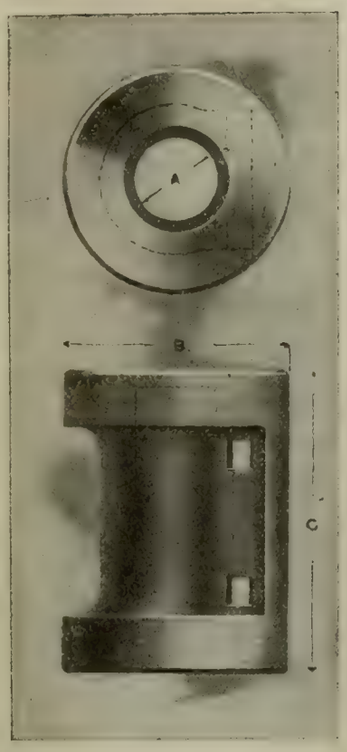

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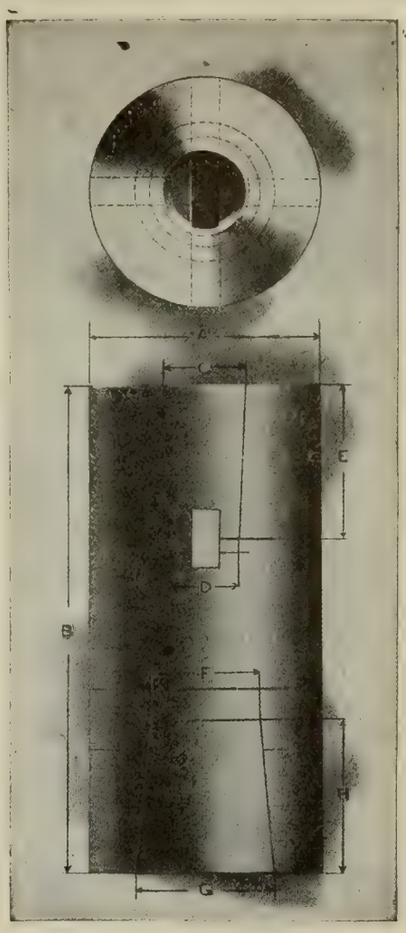

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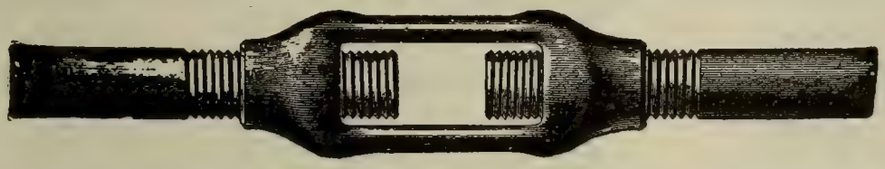

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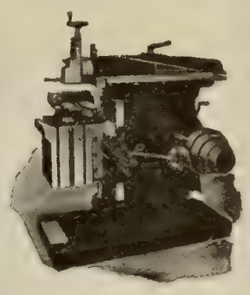

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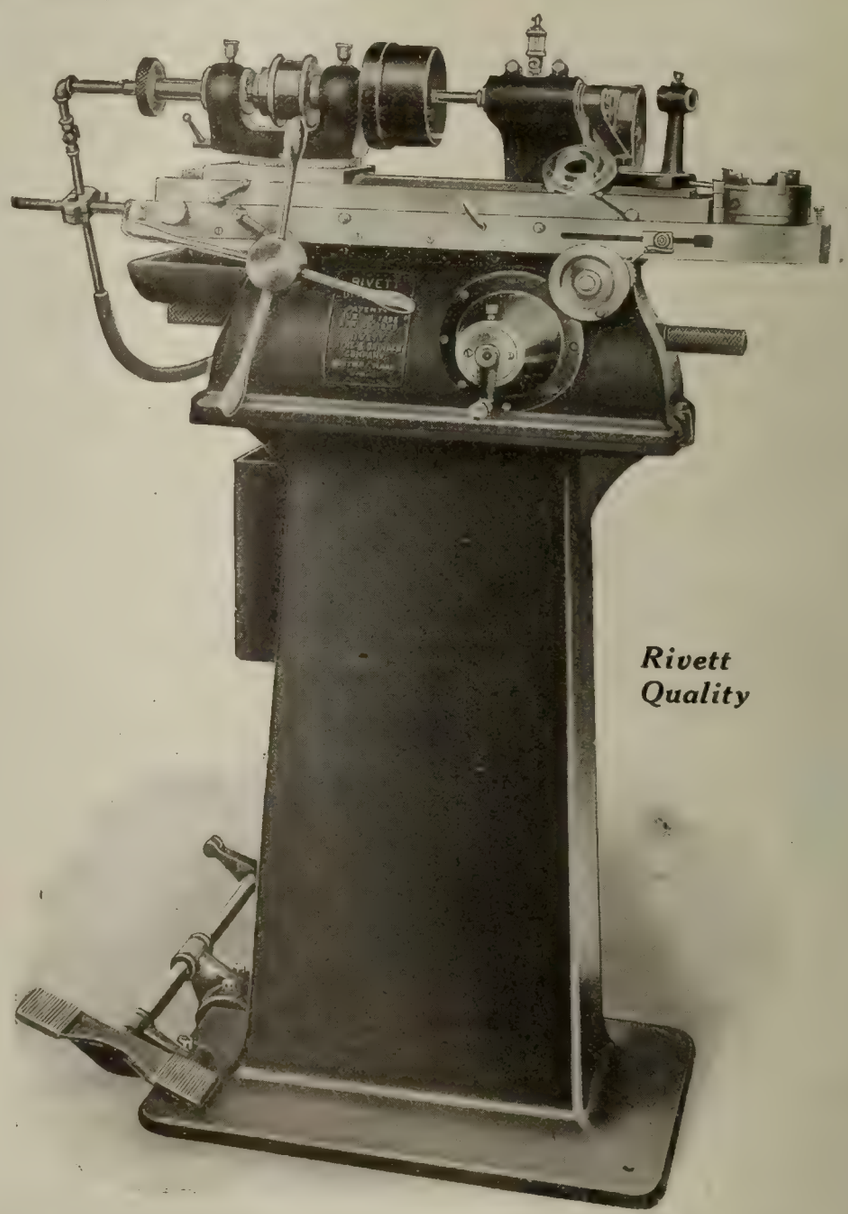

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A weekly newspaper devoted to the machinery and manufacturing interests.

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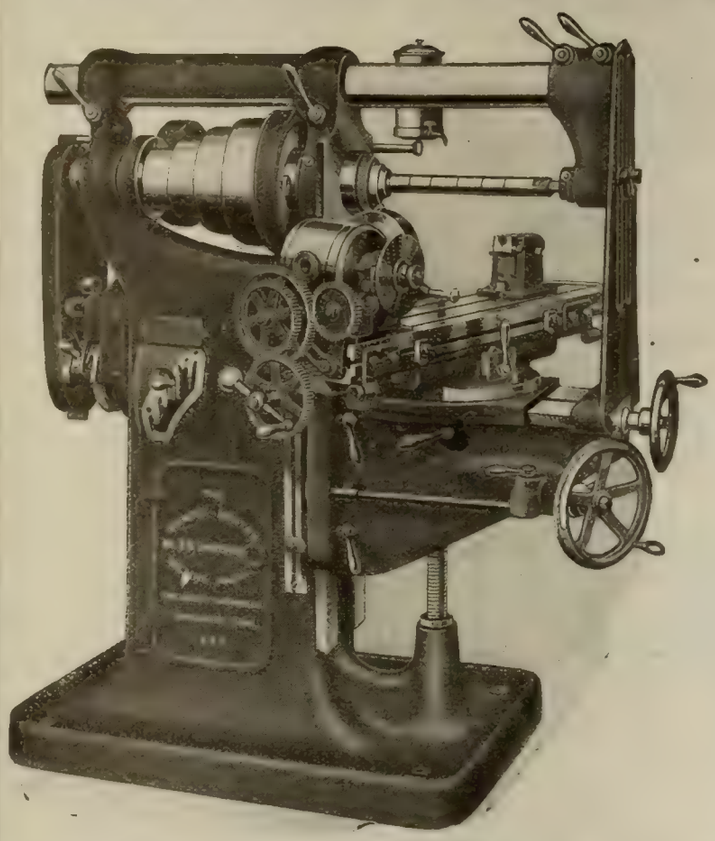

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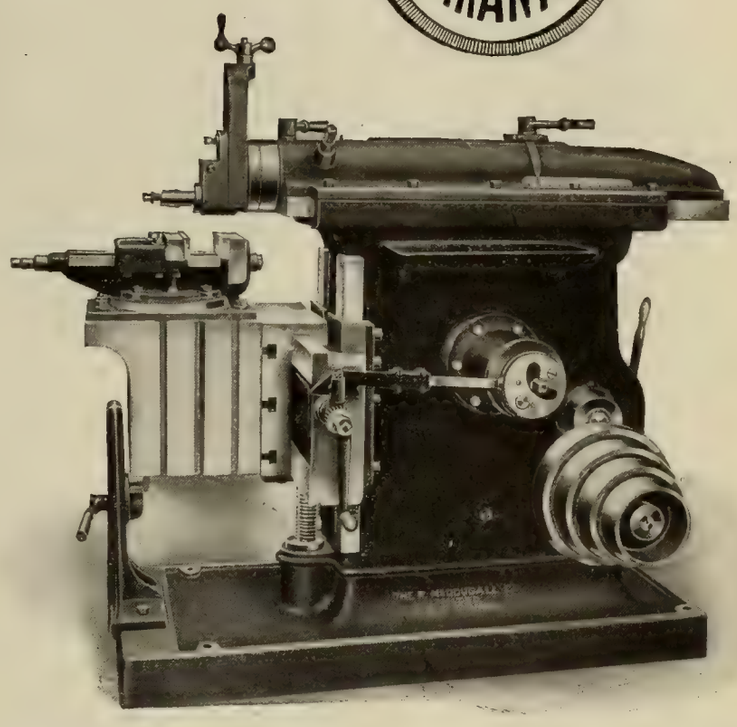

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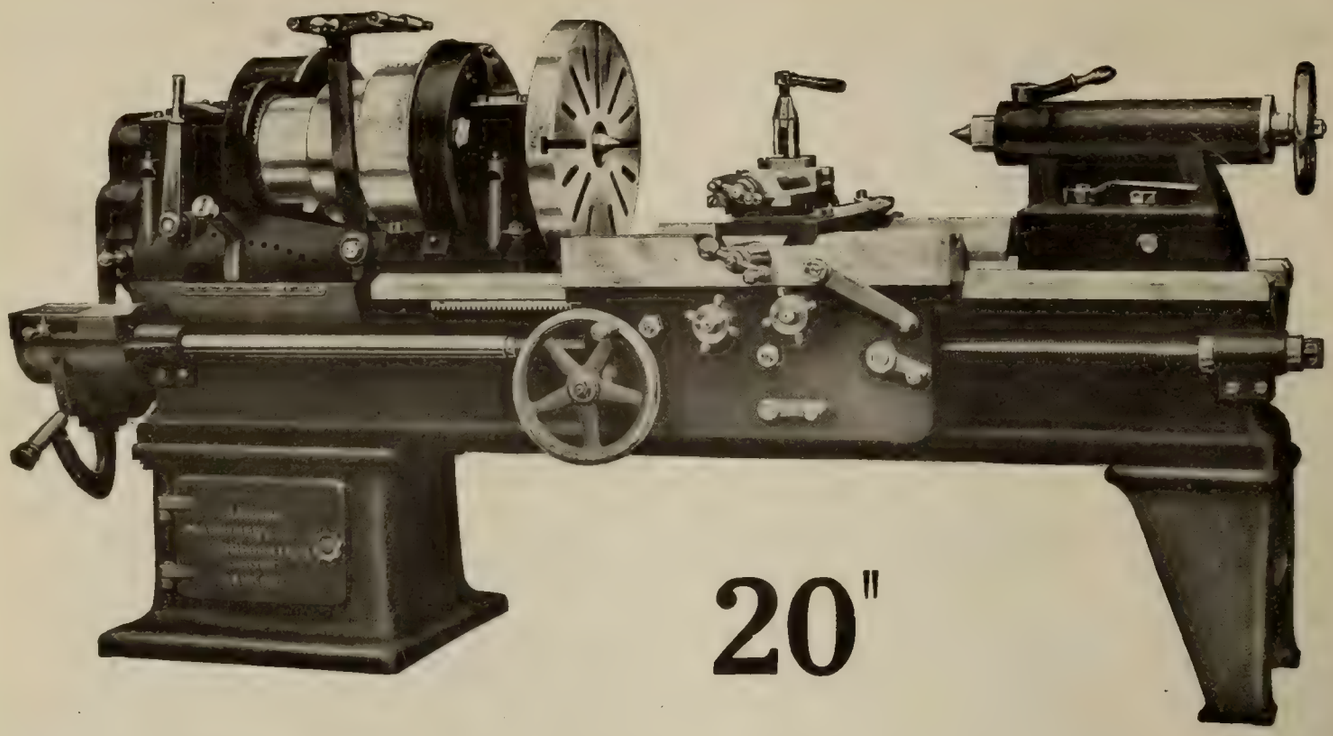

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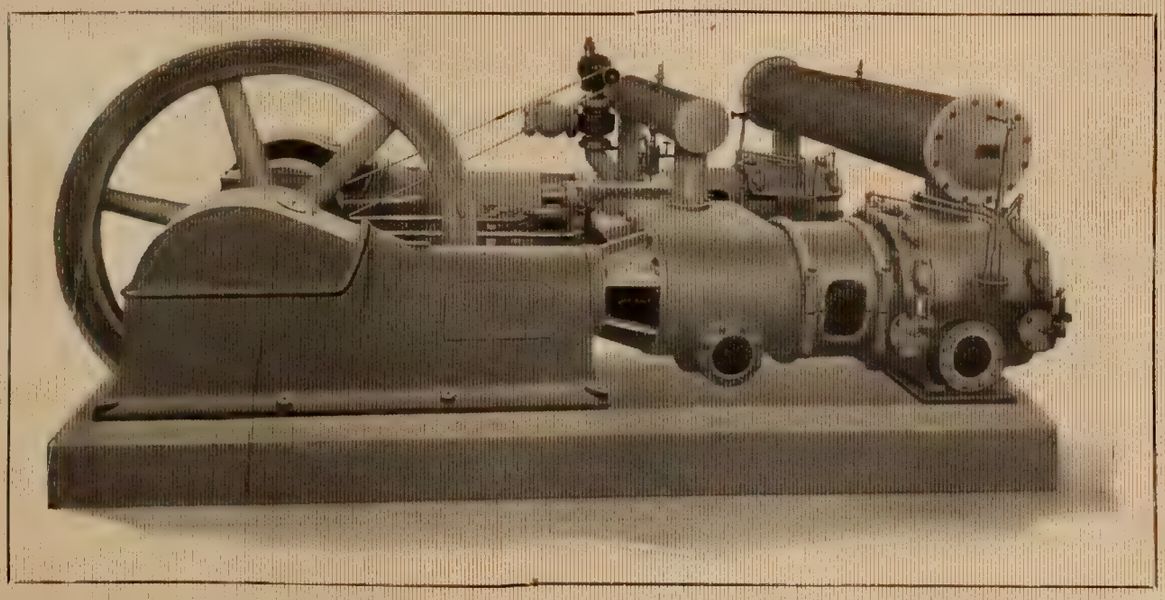
It has Corliss Inlet Valves, Disc Outlet Valves, enclosed and dust proof frame, minimizing wear, Flood Lubrication system, and bearings are extra large.



The type illustrated is Duplex, Cross Compound Meyer Steam Driven, two stage Corliss Air Compressor. Air Compressors of the type shown in the cut are built by us in sizes ranging from 445 to 6150 cubic feet displacement per minute

Let us know your requirements, and quotation will be promptly sent for the size best suited for your conditions.

The Jenckes Machine Company, Limited

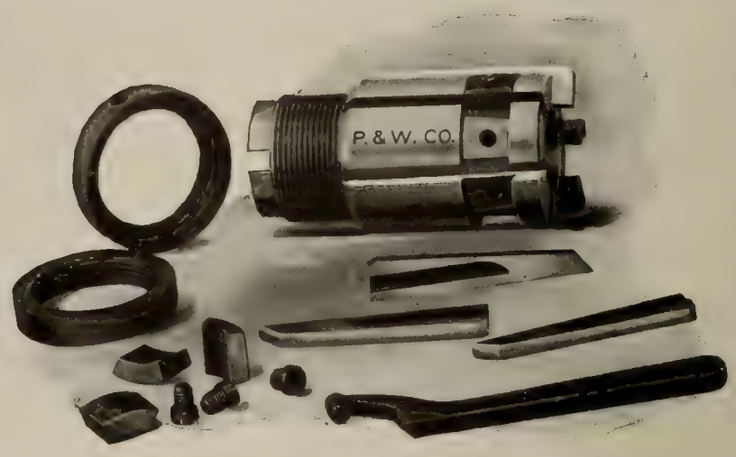
WORKS:
Sherbrooke, Que.

CANADIAN SALES OFFICES:
Sherbrooke, Montreal, Toronto
St. Catharines, Cobalt, Vancouver

WORKS:
St. Catharines, Ont

SMALL TOOLS

P. & W. Adjustable BLADE REAMERS



These reamers have eccentric relief and can be set to size without regrinding. They are unexcelled for design and simplicity and ease of adjustment. The eccentrically relieved blades are stronger than others, do not chatter, and produce a smoother hole. The hand, shell and fluted chucking reamers have interchangeable nuts, screws and wrenches. The bottom of a hole can readily be faced. By a simple adjustment of the blades the reamers can easily be set to size without regrinding.

PROMPT SERVICE

is assured at our nearest store, where P. & W. Small Tools are carried in stock. Place your order there to-day.

Precision Machine Tools Standards and Gauges

PRATT & WHITNEY CO.

of Canada, Limited

Works: DUNDAS, ONTARIO

MONTREAL	TORONTO	WINNIPEG	VANCOUVER
723 Drummond Bldg.	1002 C.P.R. Bldg.	1205 McArthur Bldg.	B.C. Equipment Co.

Bertram MACHINE TOOLS

Locomotive and Car Shop Equipment

Structural and Bridge Shop Machinery

Repair Shop Machinery

General Machine Shop Equipment

30-Inch Vertical Drilling Machine

Photographs and full particulars gladly mailed upon request.

WRITE US NOW

We'll be pleased to submit photographs and full details on any line or lines in which you are interested.

The John Bertram & Sons Company Limited

DUNDAS, ONTARIO, CANADA

MONTREAL	TORONTO	VANCOUVER	WINNIPEG
723 Drummond Bldg.	1002 C.P.R. Bldg.	609 Bank of Ottawa Bldg.	1205 McArthur Bldg.

The Publisher's Page

TORONTO November 1, 1917

The Economy of Business Paper Advertising

By H. E. CLELAND, NEW YORK

Awarded the Higham prize at the convention of Associatea Advertising Clubs, at St. Louis, June 1917. This prize is given annually to the one delivering the most constructive address in the fewest woras.

ECONOMY is a many sided question and may mean anything up to the threshold of total abstinence. But Webster tagged it best when he said it means "a judicious expenditure of money."

War is shoving economy of this kind into the spotlight, thereby proving that war is not all battles, blood and what Sherman said it was. War has its good side. It has upset a centuries-old and centuries-rotten despotism. It has whipped British manufacturing methods into a state of high efficiency. It has waked up a snoring America.

In these conditions there's room for the advertising man, whether he be publisher, agent, salesman or user, who persists in dressing advertising in garments of glittering guff. It must be stripped to its effective self; made ready to fight, not to pose.

In brief, advertising must now line up with every other business and make every dollar spent for it a "judicious expenditure of money."

The business press of the country welcomes this return to the fundamentals, for with this attitude must come a full appreciation of the effective economy of business paper advertising.

Business paper advertising has never posed. It never has been nor will be surrounded by the pomp and circumstance of enormous circulation. It cannot hope to fly the banner of tremendous rates. The average cost per page is so low that it doesn't sound respectable.

In short, business paper advertising is not the bass drum of this band. It doesn't make the noise—but it carries the tune, clear and true.

We assert for it a very high efficiency per dollar of cost. And that, we believe, is the aim—and rightfully the aim—of every straight-thinking advertising man.

THE REASONS WHY

And these are the reasons why it is effective.

First, the editorial character of each paper limits the circulation to those men in an industry or trade who are responsible for results. These are the men who actually buy or recommend the buying of the machinery or merchandise advertised in the paper. Therefore, waste circulation practically does not exist and is in every event cut to the bone. Hence, at the very beginning we strike at effective advertising's greatest extravagance, waste circulation, and put in its place intensive circulation.

Second, the buying power per subscriber represents an infinitely greater sum than the buying power per subscriber of any other class of publication because each buyer purchases for business and not private consumption.

Third, the editorial contents of the paper are in harmony with the advertising pages. The first tells a man "how" and the second shows "what with." To borrow the simile of a colleague of mine, the whole paper may be regarded as an enormous advertisement with the editorial pages carrying the educational copy and the advertising pages representing the return coupon.

In a recent investigation as to the effectiveness of advertising run next to reading matter and advertising which was segregated, it was demonstrated that when the reading matter next to the advertisement was germane to the product advertised, then results from the advertising were far and away ahead of results when the reading matter was on a subject foreign to the product advertised.

This investigation was carried on in the general field, but I regard it as one of the best arguments for business paper advertising I have ever heard. In a sense, all advertising in a business paper is "next to reading."

Those three fundamental reasons form the backbone of effective economy in advertising and sum up thus:—

THE CONCLUSIONS

Business paper advertising is economical because it reaches—and the advertiser only pays for—a circulation of tremendous buying power which is continually being taught by the publication itself to want the products advertised.

The business of the business papers is to exert a wise and wide influence upon the commercial and industrial development of the country.

We cannot surround them with flowers and furbelows, nor is it necessary to allure the non-technical, non-trade man with pictures of Gertie Coughdrop, "the film's flossiest flapper."

Our readers are not to be caught by any cheap expedients. And those editors and advertising writers who find it necessary to mount their untamed vocabularies, jab them a couple of times with their favorite adjectives, and ride off in a ribald revel of words, have no place in the modern business publication.

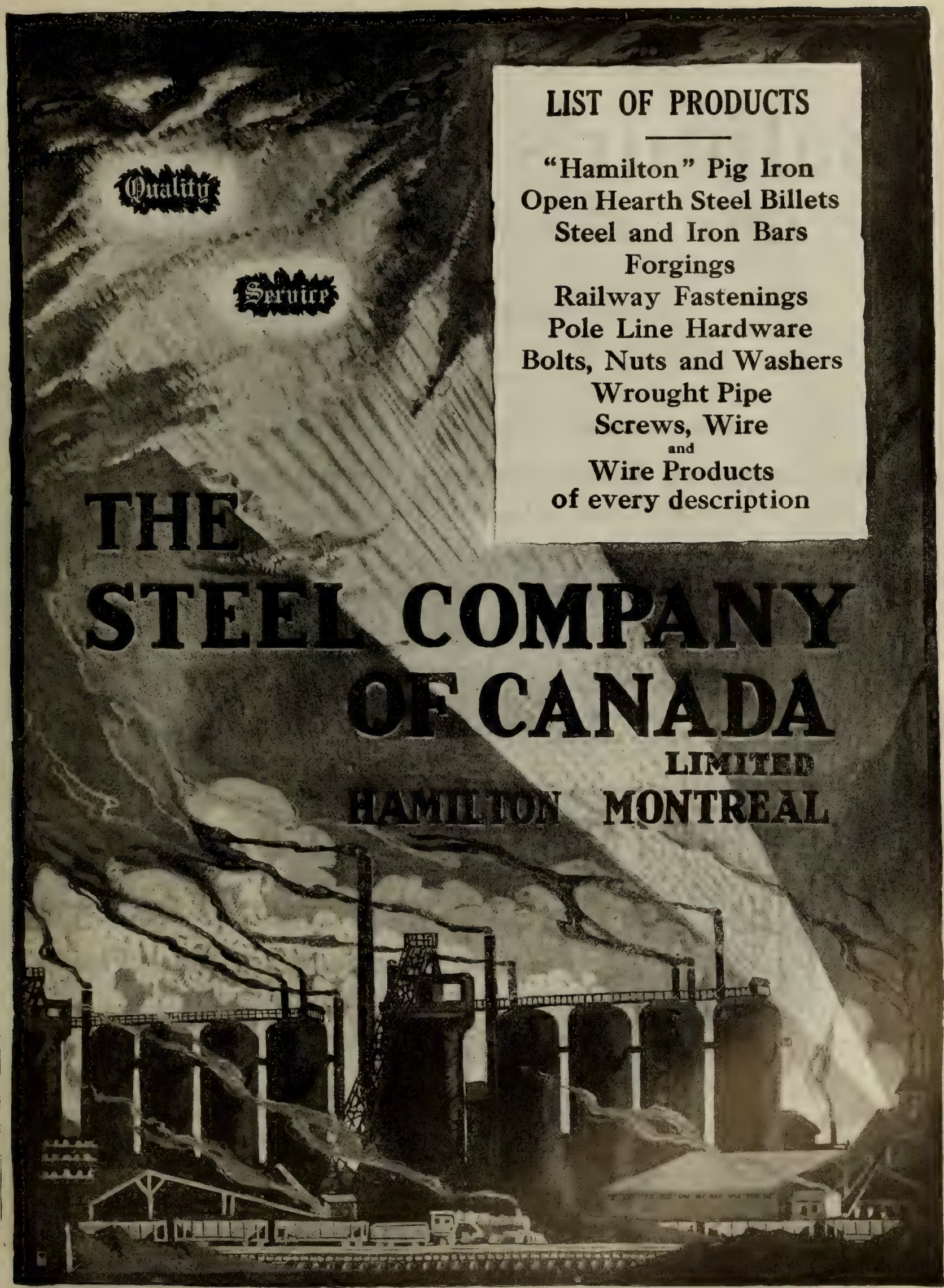
Business papers are not intended to amuse, are not intended for the tired business men. They touch men—and men only—on that side of their lives which occupies most of their wakeful hours. They instruct, lead, guide and help men to do things, to build things and to sell things. They are for the world's doers when they are in the midst of doing.

In one of Mark Sullivan's editorials in Collier's he says:—

> "Progress is no monopoly of the cannon makers. In one issue of the 'Electrical World' we note that the Columbus (Ohio) Railway, Power & Light Company has set out to make its buildings safer. Fire escapes, standard doors, and other improvements have been added along with a rigid system of inspection to prevent the accumulation of waste and grease, so that in three years fire risks and insurance rates have been cut nearly in half. In Johnston, S.C., F. M. Boyd, manager for the Carolina Public Service Company, has devised a new type of twenty-five-foot pole with a twelve-foot mast-arm sticking out on the street side so as to keep the poles lined up on the curb but get the wires away from the beautiful old elms and water oaks that are the glory of Johnston's highways. Anyone who has seen the ruin and mutilation left by fanatical tree trimmers will appreciate Mr. Boyd's device. The Ohio Electric Light Association reports that its members have saved from three to five cents per ton on all coal handled at certain of their power houses by putting in an eight-hour day for firemen. This ought to interest the old-timers who think twelve hours' toil an inalienable right for engine-room workers. Those three items cover vital subjects and are only part of the grist in one issue of a live technical journal. That's how our United States goes along."

Those of you who know Collier's know that this comment is from an authority whose point of observation is a long way from the bull pen.

(Continued next week.)


Quality
Service
LIST OF PRODUCTS
"Hamilton" Pig Iron
Open Hearth Steel Billets
Steel and Iron Bars
Forgings
Railway Fastenings
Pole Line Hardware
Bolts, Nuts and Washers
Wrought Pipe
Screws, Wire
and
Wire Products
of every description
THE STEEL COMPANY OF CANADA
LIMITED
HAMILTON MONTREAL

"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

MANUFACTURED BY

Arthur Balfour & Co., Limited
Dannemora Steel Works,
Sheffield, England.

The Eagle & Globe Steel Company, Limited

Head Office and Warehouse, Canada and U.S. — 128 Craig Street West, Montreal
Ontario Office and Warehouse — 36 Colborne Street, Toronto
Winnipeg Stock — Dominion Equipment & Supply Co. Limited
Vancouver Stock — Frank Darling & Co.

W. A. BRADBURY, Agent, 128 Craig Street West, Montreal

SISCO

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" **Tool Steels**

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

James McKay Company

Pittsburgh, Penna., U.S.A.

Manufacturers of

Shell Forgings

We have the Equipment and Experience and can execute orders for

Nose Sockets Base Plates Adapter Plates

for any size shells. Can execute orders promptly.

SPECIAL FORGINGS—We can make any forgings that can be made under Drop Hammers.

CHAINS AND ACCESSORY FORGINGS—We have a complete line.

ADDRESS OUR REPRESENTATIVE:

JOHN A. BUCHANAN
King Edward Hotel, TORONTO

WHERE A

BRIDGEFORD LATHE

Saved 14½ Hours on a 21 Hour Job

Some time ago we furnished J. H. Horne, Sons & Company, Lawrence, Mass., estimates of what a Bridgeford Lathe could do on big textile machine spindles. The figures looked good and we sold them this 32" x 28' machine. The spindles come to the lathe as castings from which considerable stock must be removed. There is a long taper and two or three irregular sections as well as straight portions to be turned. While the spindles vary in size and shape, an average job by former methods meant 21 hours of good hard work, including handling time and turning time. The first spindle put up to the newly installed "Bridgeford" came off the lathe in 6½ hours. And that is a good example of the Bridgeford pace.

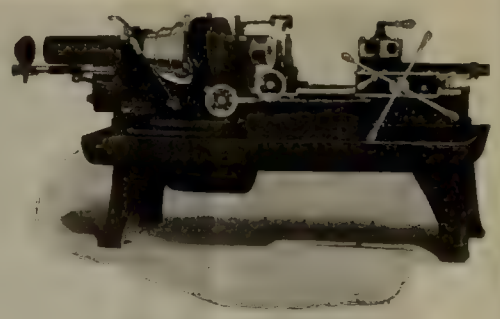
Bridgeford Lathes are rigid, accurate machines, adapted for turning heavy rolls, big shafts, massive pinions and similar work, machines capable of pulling any cut the best high speed steel tools will take.

The harder the work, the stiffer the pace, the more you need Bridgeford Lathes.
Shall we send you our catalogue?

BRIDGEFORD MACHINE TOOL WORKS

161 WINTON ROAD — MANUFACTURERS FOR HEAVY DUTY LATHES FOR MORE THAN 20 YEARS — ROCHESTER, N.Y.

Accurate Work is easily produced on a Cincinnati Acme

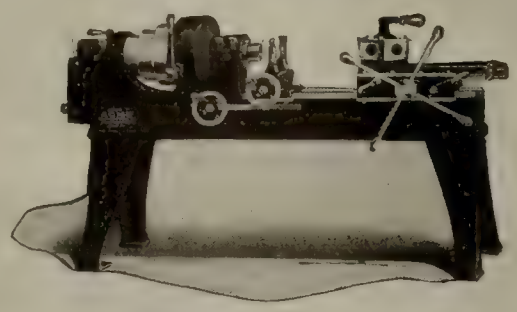


2¼-in. x 11-in. Screw Machine

IN the first place, Cincinnati Acme Machines have head and bed cast solid, insuring permanent and positive alignment of the spindle with the ways of the bed.

Secondly, the automatic chuck is forged solid on the spindle; dirt and chips cannot therefore work in and destroy the accuracy of this chuck.

And in the third place, adjustable taper gibs provide for taking up wear in the slide and saddle.

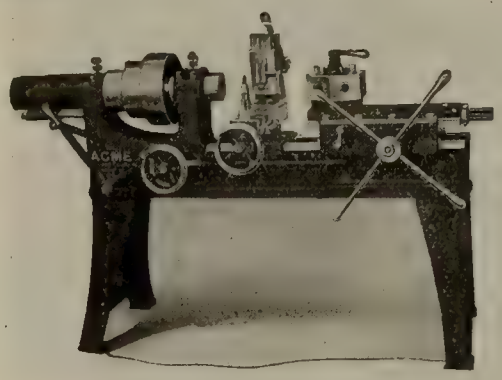


18-in. Turret Lathe

In addition to their accuracy, Cincinnati Acme Machines are noted for their productiveness and ability to stand up under severe strains.

Our Catalogue explains in detail many more valuable features of Cincinnati Acme Machines.

Catalogue upon request.



16-in. Forming Turret Lathe

The Acme Machine Tool Company

CINCINNATI, OHIO, U.S.A.

Canadian Agents: Rudel-Belnap Machinery Co., Montreal, Toronto

Works: LONGUEUIL, QUE.

Armstrong, Whitworth of Canada Limited

Standard Sizes of

HIGH SPEED STEEL

Carried in Stock

CARBON AND ALLOY STEELS

Shop Tools, Gauges, etc.

HEAD OFFICE: 298-300 St. James St., Montreal

Branches: Dominion Bank Bldg., TORONTO
27 King William Street, HAMILTON
McArthur Bldg., WINNIPEG, MAN.

Coal
Coke
Iron Ore

Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

M.A. HANNA & Co.

Sales Agents, CLEVELAND

Canadian Office:
703 C.P.R. Bldg., Toronto

Steel Castings

Our lengthy and varied experience in making Manganese, Vanadium, Titanium castings assures you of getting the best of products.

Anything in castings from 1 lb. to 50 tons is right in our line. Ships' castings our specialty.

Castings made true to specifications and patterns.

Propeller shaft Bearing for Ice-Breaker "John D Hazen."

Canadian Steel Foundries
Limited

GENERAL OFFICE: Transportation Bldg., Montreal, Canada.

LONDON (England) OFFICE: Trafalgar House, Waterloo Place

WORKS: Welland, Ont.; Point St. Charles, Montreal; Longue Pointe, Montreal.

Air Chucks for 6" Shells in Stock

General Machine Work of All Kinds

Gear Cutting, Etc.

Hyde Engineering Works

27 William St., Montreal

P.O. Box 1185
Telephones: M. 1899 & M. 2527

---

70 Holden-Morgans in One Plant

Aonther firm would not accept a contract until assured they could get HOLDEN-MORGAN'S.

That's the reputation they have. How about your requirements? We can give

IMMEDIATE DELIVERY

on 6" shell machines.

Over 700 Sold

THE A. R. WILLIAMS MACHINERY CO.
W. FRONT ST. (Limited) TORONTO

THE JOHNSON FRICTION CLUTCH

DOUBLE TYPE

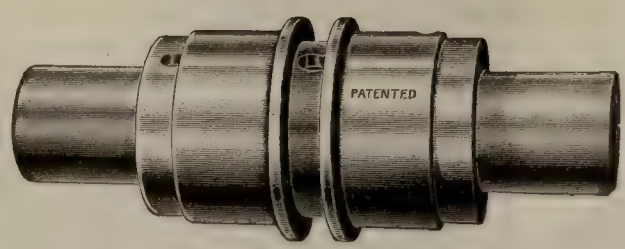


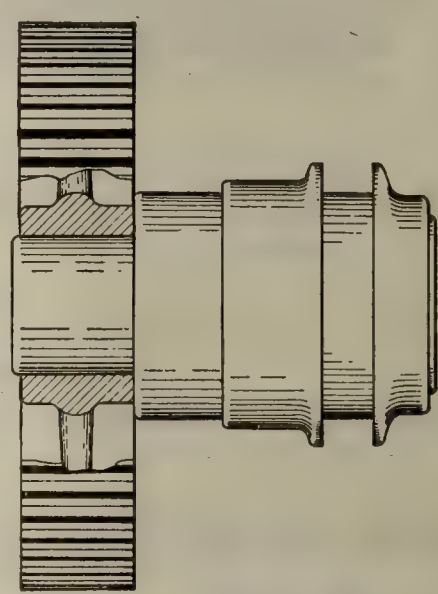
Fig. 4D
Double Clutch Exterior

The double clutch requires but little more space than the single, and has two friction cups with hubs, on which can be mounted pulleys, cones, gears, sprockets, etc., of any diameter and face.

The double clutches are constructed on the same principle as the single clutches, and have the same general characteristics.

For countershafts, the advantages of JOHNSON FRICTION CLUTCHES are obvious. They operate smoothly at any speed, without bang or clatter, have no projections to catch anything, thus avoiding accidents so common with the ordinary clutches, and save space by their compactness.

By using a double clutch on the countershaft, as illustrated, Fig. 5D, with two pulleys, one with an open belt and one with a crossed belt, any machine can be run forward or reverse. This arrangement is especially desirable in running all machines requiring a reverse motion.



Gear Mounted on Clutch Hub

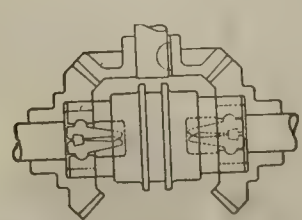


Fig. 6D
Clutch in Nest of Gearing

Johnson Double Friction Clutch incorporated in Bevel Gearing.

Hubs are made to suit requirements as to diameter and length, so that ordinary stock pulleys can be used.

The advent of high-speed steel demands better and more powerful clutches on countershafts. The JOHNSON FRICTION CLUTCH is highly endorsed for this purpose and is being widely adopted.

DOUBLE JOHNSON CLUTCHES can be used in nests of gearing in place of positive clutches, in order to obtain more flexibility at any point and to make operating easier.

Send for our Booklet, "Clutches as applied in Machine Building" and yellow data sheets.

Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal; Can. Fairbanks-Morse Co., Ltd., Toronto.
England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

OUR GOVERNMENT will spend a minimum of $350,000,000 for Destroyers—when these are built the American Navy will lead the world in boats of this type and the submarine is doomed. Nothing but the best materials will enter into the construction of these vessels. *This is also true of*

"Red Cut Superior"

The Nationally Known
First Quality

HIGH SPEED STEEL

The greatest vigilance is observed in every detail of its manufacture—we spare no expense to insure the highest quality in every bar. No better all purpose High Speed Steel has as yet been produced.

It's best for all machine work

VANADIUM-ALLOYS STEEL CO.

PITTSBURGH, PA. Works at LATROBE, PA.

CARRIED IN STOCK AT THESE WAREHOUSES:

E. T. WARD'S SONS, 44 FARNSWORTH ST., BOSTON, MASS. — GEO. NASH CO., 304 HUDSON ST., NEW YORK, N. Y. — FIELD & CO., INC., 721 ARCH ST., PHILADELPHIA, PA. — VANADIUM-ALLOYS STEEL CO., PITTSBURGH, PA. AND LATROBE, PA. — GEO. NASH CO., 646 WASHINGTON BLV'D CHICAGO, ILL.

U. S. S. Warrington, torpedo boat destroyer, the type of vessel that safely escorted Major General Pershing and his staff to England.

This is the type that is now aiding the British and French navies in wiping out the submarine menace. They are doing great work in lessening the effectiveness of the submarine warfare.

Passed by the Censor

If interested in High Speed Steel and you care to receive our printed matter at intervals, send us your name and address for our mailing list.

The Ford-Smith Machine Company

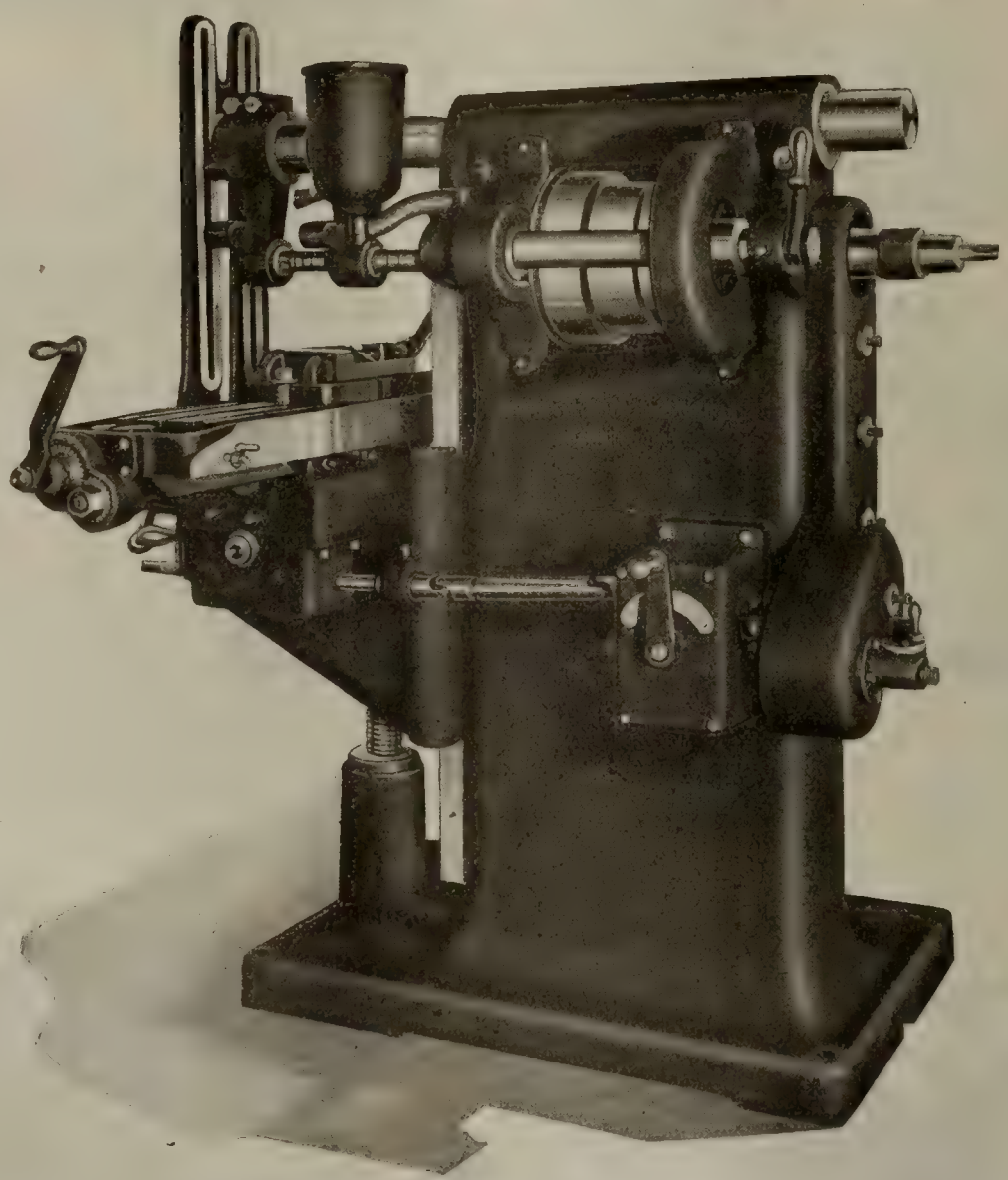
Adv't. No. 7 MILLER SERIES

OUR STAFF:

We promised last issue to speak of our staff. First let us say that our whole organization, including the majority of our men are Machine Tool men only, and by their efforts we produce Millers that mark a high notch in Machine Tool manufacture. Purchasers will find the good workmanship is not merely on the surface—but that the Quality goes clear through.

No. 2 Plain
27" x 19 x 7½

No. 3 Plain
34" x 20" x 10



No. 2 Universal
25" x 18" x 8

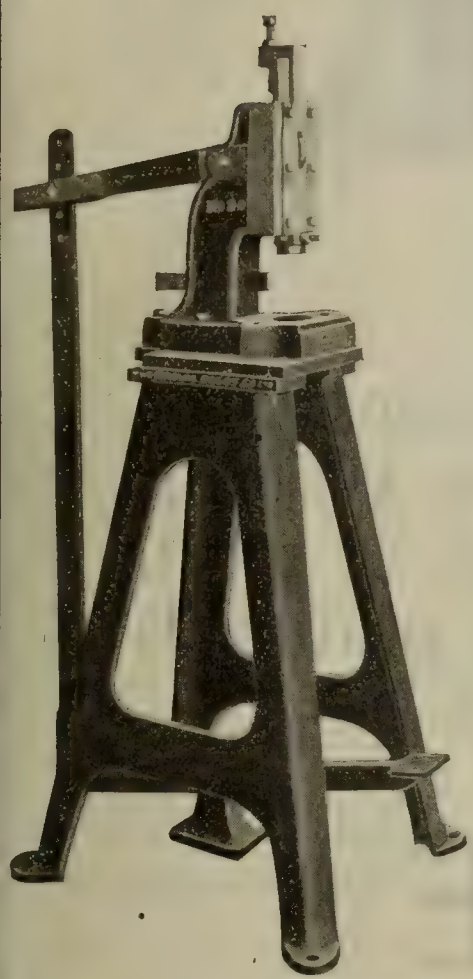
No. 3 Universal
34" x 19" x 10

We don't wish to bother you with letters, spouting about our business, but we sure would like to see a copy of our Catalog and Bulletin on your desk. It would pay you. A postcard will accomplish the result.

Are you acquainted with the fact that we can usually supply direct from stock Plain or Universal Dividing Heads, also various time-saving fixtures for use in conjunction with our MILLERS.

The Ford-Smith Machine Company, Limited
HAMILTON ONTARIO CANADA

WHY A "B. B.?"

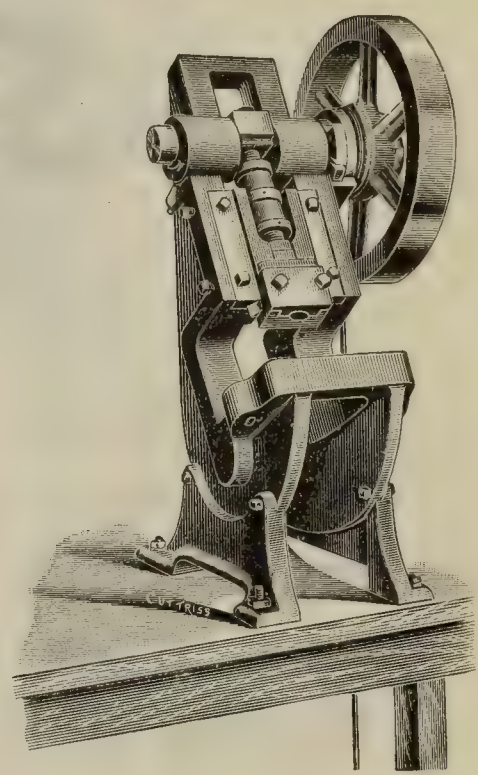


Experience has proved
that

B.B. PRESSES

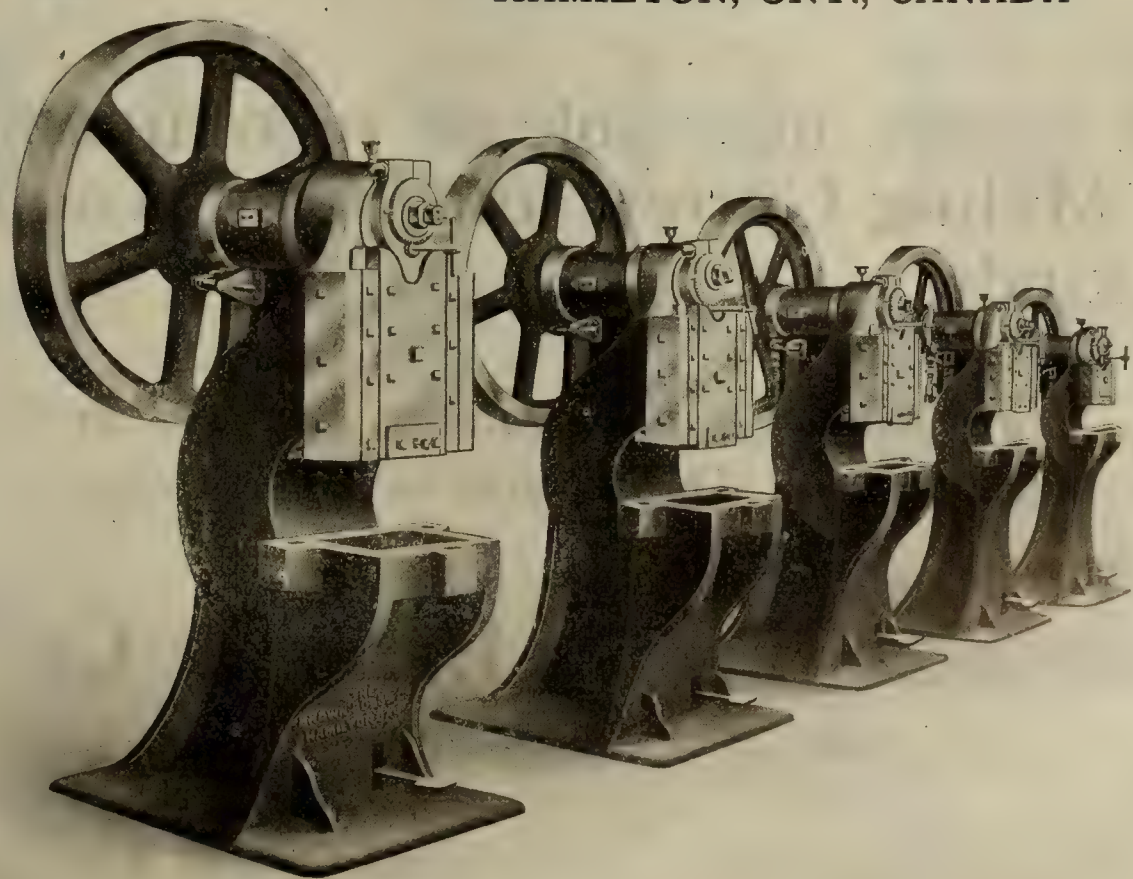
qualify for

Economy
Durability
Speed



The Brown, Boggs Co.,
LIMITED

HAMILTON, ONT., CANADA



If any advertisement interests you, tear it out now and place with letters to be answered.

QUITE remarkable economies have been effected in turning, planing and shaper work on all kinds of steel, cast iron, bronze and other materials by the new alloy

STELLITE

But we are now able to recommend it for Milling Cutters and Form Tools of all kinds.

Information and quotations supplied by our Service Department on application.

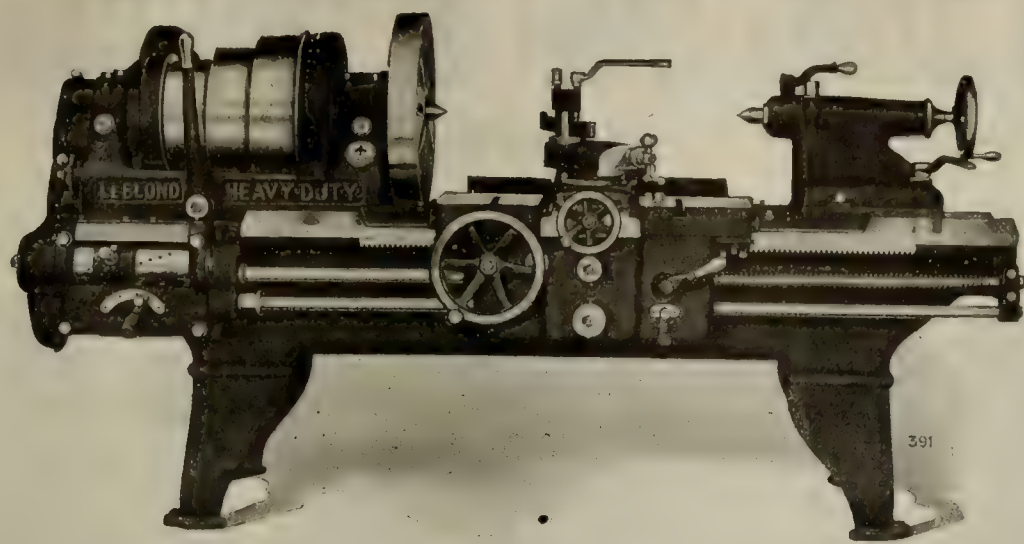
Deloro Smelting & Refining Co. Ltd.

Head Office & Works—Deloro, Ont.

TORONTO
200 King St. W.

MONTREAL
315 Craig St. W.

LEBLOND HEAVY DUTY LATHES



Are lathes built for a definite service—And this a class of Production to which only LeBlond Heavy Duty Lathes are adapted.

There's a reason—
Hardened Spindle Bearings—
One-piece, box section, aprons—
Patent Compensating Vee Bed Design—
Double Friction Back Gears—
and LeBlond Workmanship *do add to the continuous productive life of a lathe.*

The R. K. LeBlond Machine Tool Co.

Cincinnati, Ohio, U.S.A.

Agents in Principal Cities

DOUBLE

MUSHET

High Speed Steel

Carbon Steel

Gauge Steel

Alloy Steels

SOLE MAKERS
Samuel Osborn & Co. Ltd.
SHEFFIELD

Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)
Limited

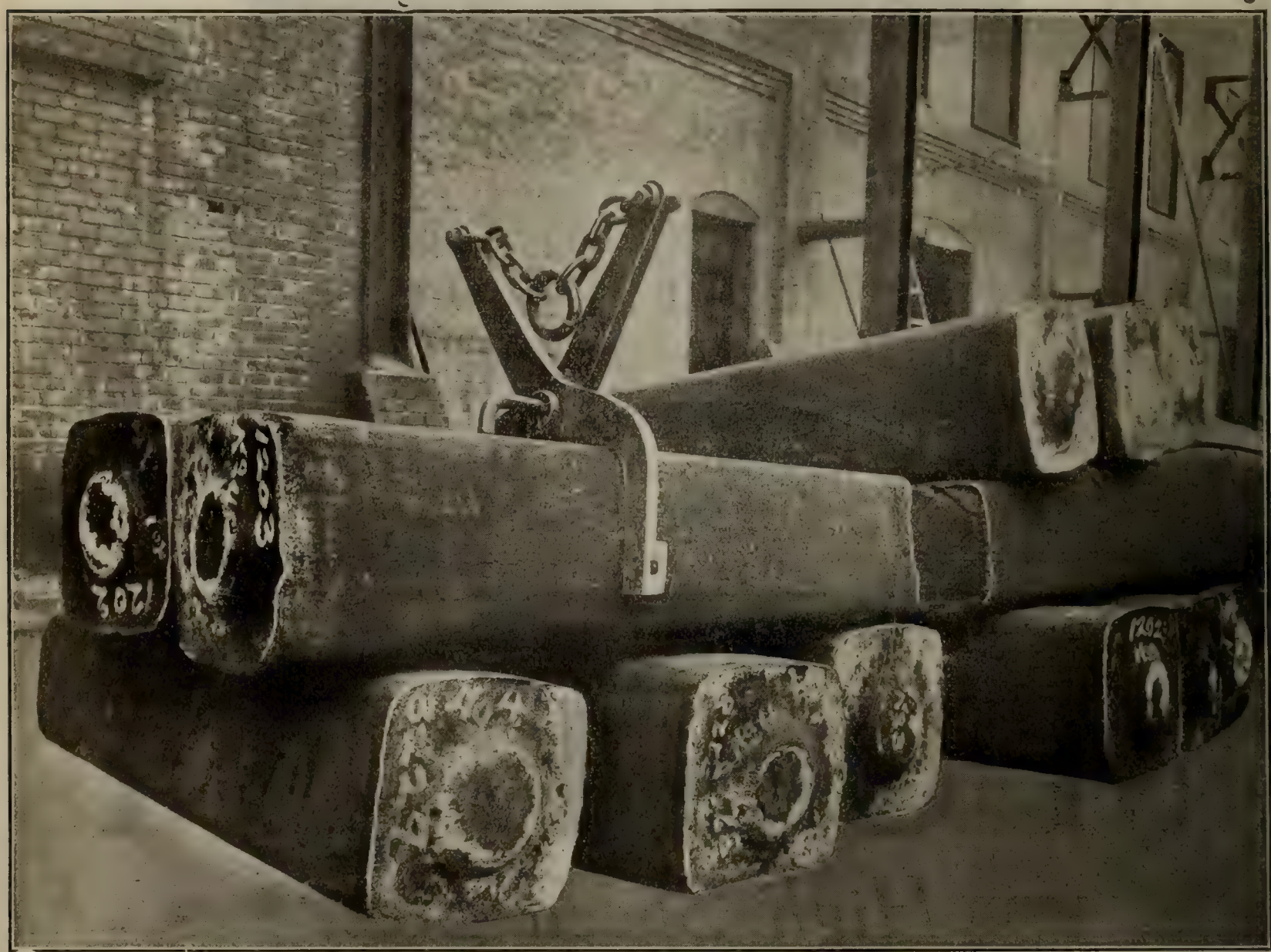
Head Office and Works: Montreal, P.Q.

Branch Office: Toronto, Ontario

Nova Scotia Steel & Coal Company

Limited

New Glasgow, Nova Scotia, Canada



THREE AND ONE-HALF AND FIVE-TON "FLUID COMPRESSED" STEEL INGOTS.

The Nova Scotia Steel & Coal Co., realizing the importance of "fluid compression" as a valuable aid in producing reliable and first-class steel products, procured by purchase the Canadian license from M. Harmet, of St. Etienne, France, whereby they own the sole rights in this Country to use his process. This they considered in accordance with their policy of taking advantage of every important metallurgical development, thus advancing with modern progress, and particularly that their high reputation as manufacturers of the best marine, railway and machine forgings obtainable should be maintained.

The "fluid compression" plant laid down at Sydney Mines, N.S., consists of one group of four Harmet presses, each of 1,250 tons and capacity to handle 3½ to 5-ton ingots; and one of 4,000 tons to handle ingots up to 30 tons.

The product of this process is used in the manufacture of high-grade forgings, such as locomotive axles, crank shafts, marine forgings, artillery tubes and armor plate of the highest grade; in fact for all commodities in which maximum reliability and homogeneity of structure enter and are demanded.

TRADE MARK

of the Famous

"WACO"

BRAND

HIGH SPEED STEEL

AND

TWIST DRILLS

"DOUBLE WACO" Quality

Specially Adapted for Munition Work

"TURTLE" BRAND

High Class Tool Steel, Files, etc., of all descriptions.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

Reliance Steel Works

SHEFFIELD, ENG.

TRADE MARK "WACO"

TRADE MARK:

For particulars apply to our

Sole Representatives for Canada

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario

One of the

Steels of the Century

Centurion High-Speed

Made from the BEST Materials

Iron, Tungsten, Chrome, Vanadium

Melted by the BEST Process

The Crucible Furnace Method

Handled by the BEST Workmen

Melters, Forgemen, Annealers, Metallurgists

CONSEQUENTLY

Will do the BEST Work

Quality *Delivery* *Service*

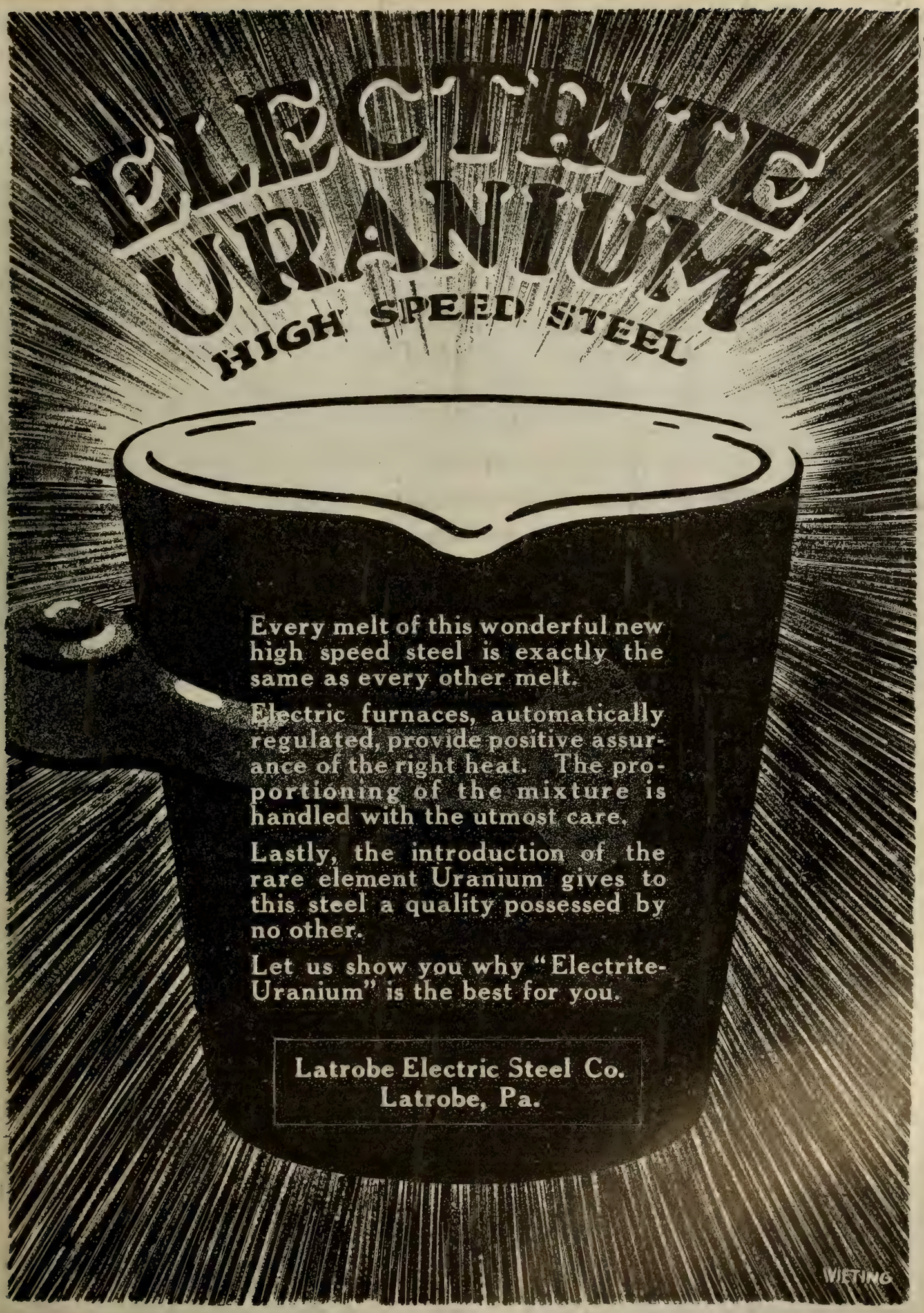
We have a catalog waiting for you. Write for it.

THE CENTURY STEEL CO. OF AMERICA

MANUFACTURERS OF HIGH-GRADE CRUCIBLE STEELS

General Office and Works:
POUGHKEEPSIE,
N.Y.

Sales Offices:
120 BROADWAY,
NEW YORK


ELECTRITE
URANIUM
HIGH SPEED STEEL
Every melt of this wonderful new high speed steel is exactly the same as every other melt.
Electric furnaces, automatically regulated, provide positive assurance of the right heat. The proportioning of the mixture is handled with the utmost care.
Lastly, the introduction of the rare element Uranium gives to this steel a quality possessed by no other.
Let us show you why "Electrite-Uranium" is the best for you.
Latrobe Electric Steel Co.
Latrobe, Pa.
WIETING

UNIFORMITY

USED THE WORLD OVER

SATISFACTION

Atlas Babbitts

MADE IN CANADA

AMACOL
ADAMUS

TENAXAS
ATLAS

DURASTIC
MASCOT

TIN-TOUGHENED
W. E. W. BABBITT

These Babbitts are the result of years of experience and have a world-wide reputation for uniformity and reliability.

No Shock Too Severe No Load Too Heavy No Speed Too Great

ATLAS METAL & ALLOYS COMPANY OF CANADA, LIMITED, MONTREAL

Sales Agents:

The Canadian B. K. Morton Co., Limited

MONTREAL: 49 Common Street. TORONTO: 86 Richmond Street East.

FERRO-URANIUM

The Latest Discovery in Alloys for Efficient

High-Speed and Other Steels of Quality

IT INSURES TOOLS THAT STAND UP ON THE JOB

Largest Producers in the World of URANIUM

WRITE US FOR PARTICULARS

STANDARD ALLOYS COMPANY

Forbes and Meyran Aves. -:- Pittsburgh, Pa.

WOLFRAM
HIGH SPEED STEEL

is of uniform high quality and may be worked down to the last ounce without variation. Wolfram is ready for prompt delivery.

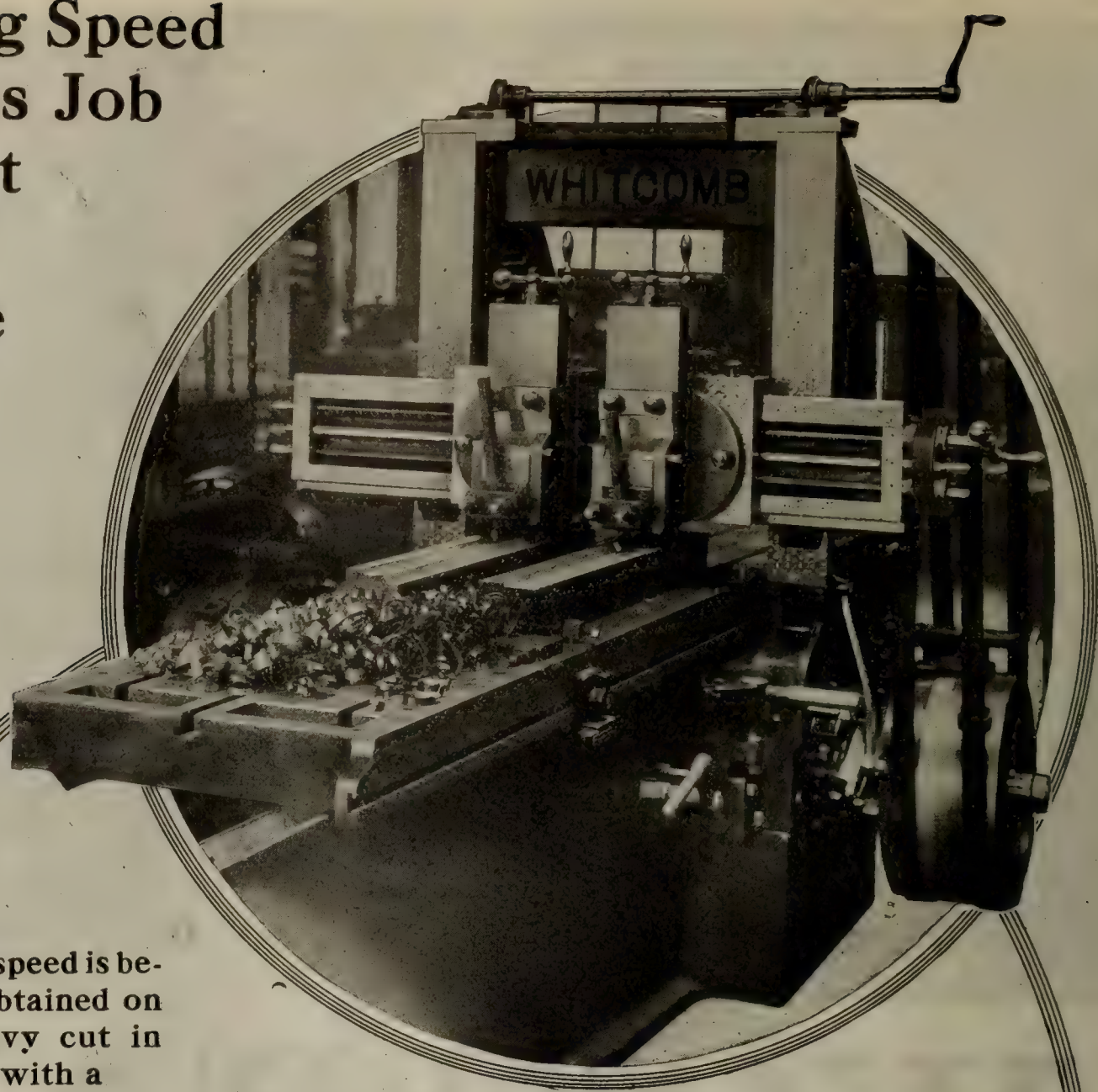
Vulcan Crucible Steel Company

ALIQUIPPA *Established 1900* **PA., U.S.A.**

Makers of Wolfram High Speed Steel

Represented in Canada by Messrs Norton, Callard & Co., Herald Bldg., Montreal

Cutting Speed on This Job 70 Feet Per Minute



That speed is being obtained on a heavy cut in steel, with a

Whitcomb-Blaisdell Planer

The Planer with the Second-Belt Drive

The smooth, easy action and rapid, yet gentle, reverse required for such rapid cutting rates is secured by the distinctive table-drive of the Whitcomb-Blaisdell Planer.

There are many other Whitcomb-Blaisdell Planers operating at similar high speeds in steel. In numerous cases they are planing brass, copper and other soft materials at one hundred feet per minute.

The Second-Belt Drive—using a belt and pulley to convey power from the pulley shaft to the drive-pinion shaft—eliminates the usual bull wheel and the rapid running train of gears.

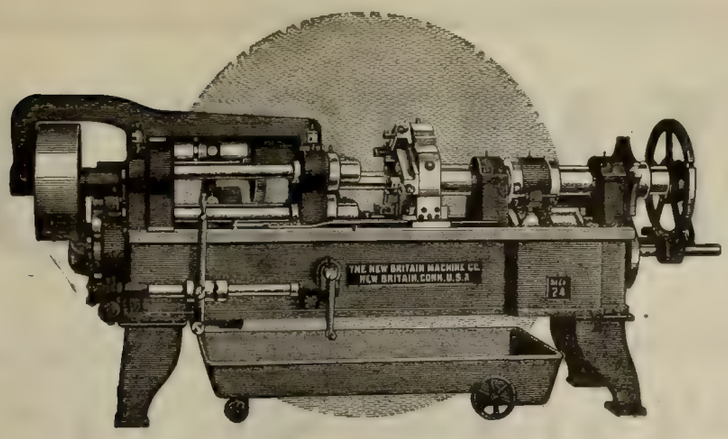
On the Whitcomb-Blaisdell Planer, the table is given a smooth, quiet, yet powerful drive. At the end of the stroke the belt transmission acts with a cushion effect and the planer reverses without shock or jar, yet with the utmost speed.

That is one reason why this machine attains the highest speeds without impairing the accuracy or finish of the work.

Write for Illustrated Catalog that tells all about it.
The big features of this machine will be of interest.

WHITCOMB-BLAISDELL MACHINE TOOL CO.
WORCESTER, MASS., U.S.A.

LATHES PLANERS



NEW BRITAIN

Let Machine Power Make Good Your Loss of Man Power

WHAT measures are you adopting to meet the steady drain which the military draft will put upon your working force?

How will you maintain your output—to say nothing of increasing it?

Can you readily replace the men who leave? Not without some other manufacturer suffering a loss.

Can you hope for a sufficiently greater individual efficiency from those who remain? Hardly, with the same facilities. What, then, is the solution for this perplexing problem?

The solution—if there is one—lies in the direction of improved processes and more efficient machinery.

Naturally, first and most careful consideration should be given to the field presenting the greatest possibilities for increasing output while saving labor.

IN no section of the machine shop are the opportunities for effecting economies so great as on bar and chuck work.

The "NEW BRITAIN" Six-Spindle Automatic Screw Machine's greater tooling capacity enables it to produce 50% to 200% greater output than is possible with machines of older type.

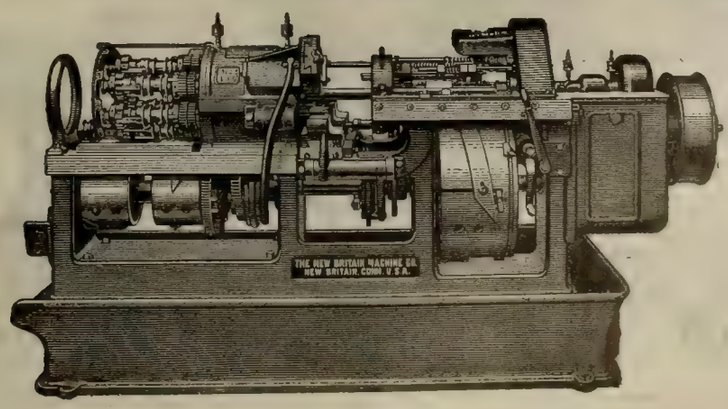
While "NEW BRITAIN" Multiple-Spindle Automatic Chucking Machines, by performing all operations simultaneously—in some cases, finishing both ends at once—are able to chuck castings, forgings, and second-operation bar work 300% to 500% faster than other machines designed for a similar purpose.

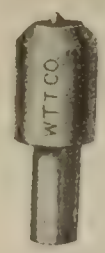
Let us give you production estimates for handling your work "The New Britain Way," for comparison with output you are now obtaining. Send samples or blueprints.

THE NEW BRITAIN MACHINE COMPANY

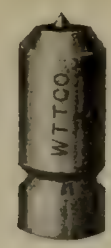
NEW BRITAIN, CONN., U.S.A.

AUTOMATICS





DIAMONDS



LANDIS NORTON

All sizes, finest quality, awaiting your command, stones

"THAT SUIT"

either unmounted or mounted in our improved (any style) CAST STEEL MOUNTING;

GUARANTEED TO BRING RESULTS.

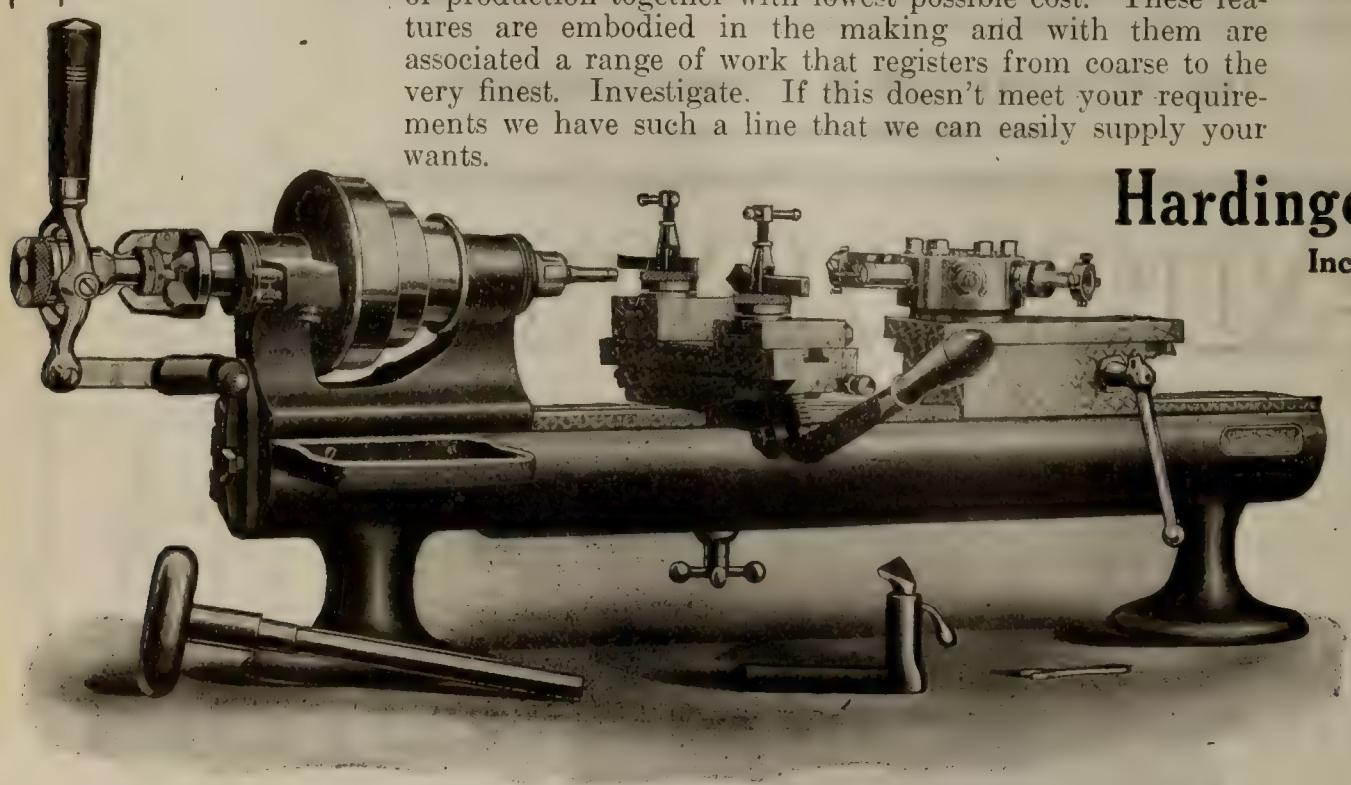
"MADE IN CANADA"

WHEEL TRUEING TOOL CO.

88 WEST PITT STREET WINDSOR, ONTARIO

If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.



Hardinge Bros.
Inc.

1770 Berteau Avenue,
CHICAGO, ILL., U.S.A.

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6″ shells.

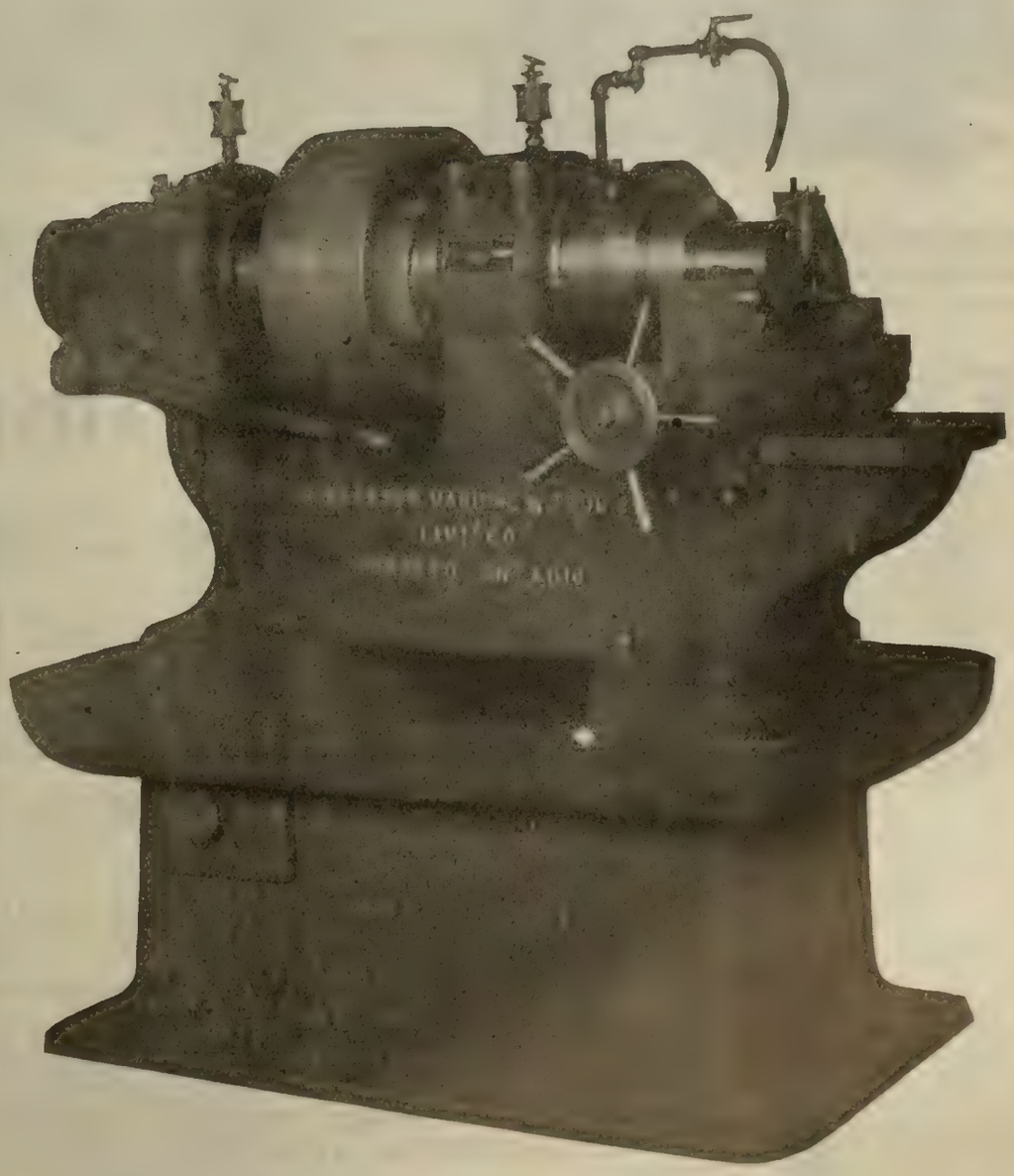
Roelofson Machine & Tool Co., Ltd.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6″ shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.



If any advertisement interests you, tear it out now and place with letters to be answered.

SIDNEY for SERVICE

Lathes help turn the WORLD

Modern tools "turn the world." The automatic and swift production of wonderful machines is due to the genius of men who have perfected metal-working tools and machines.

"Sidney for Service" Lathes are doing "their best" to serve the manufacturers of Canada and the United States in an effort to raise production several additional notches. Put SIDNEYS on the job —and watch production climb!

Write a letter for Bulletin 30.

SIDNEY TOOL COMPANY - SIDNEY, OHIO, U.S.A.

Represented in Canada by

FOSS & HILL MACHINERY CO.
MONTREAL, QUEBEC
H. W. PETRIE, LIMITED
TORONTO, ONTARIO

For Export and Import—

Iron — Steel — Metals

Machinery, Raw Products and Manufactured Goods

A. G. KIDSTON & CO.

with offices in

LONDON GLASGOW MONTREAL NEW YORK
AUSTRALIA NEW ZEALAND SOUTH AFRICA

and connections all over the civilized world, have exceptional advantages for the marketing of Canadian and other products. Enquiries invited and promptly handled.

Manager for Canada and U.S.A.:
C. E. GAUSDEN, 17 ST. JOHN STREET, MONTREAL
Cables: "KIDCO," Montreal

IMMEDIATE SHIPMENT

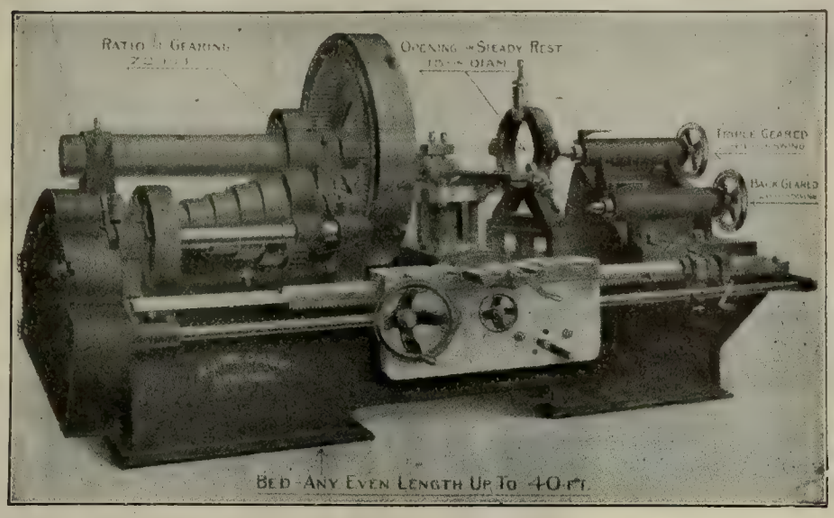
30-ft. BED

McCabe 2-in-1 Lathe

26 and 48-INCH SWING

TRIPLE-GEARED—RATIO 72 to 1

J. J. McCabe, 149 Broadway New York



Showing McCabe's Latest Heavy Type "2-in-1" Double-spindle Lathe—26/48-in. Swing.

48-in Swing. Triple Geared — ratio 72 to 1.

26-in. Swing. Back-geared.

Turns between centers—24 ft.

Swing over carriage on 48-in. Lathe is 40 in.

Prominent ship-builders are using McCabe Lathes on long beds.

Thousands in operation all over the world.

Hepburn---

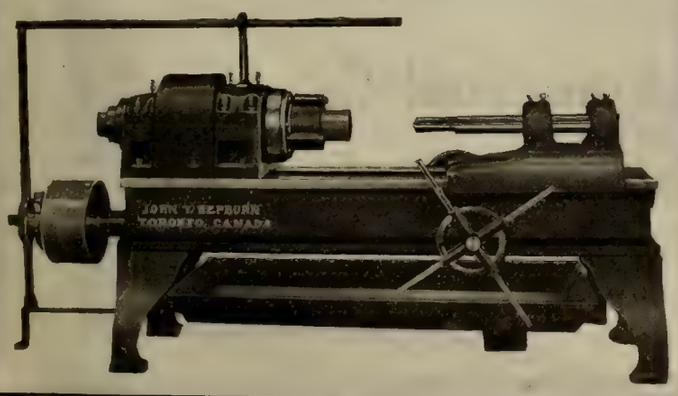
the Lathe that stands the test

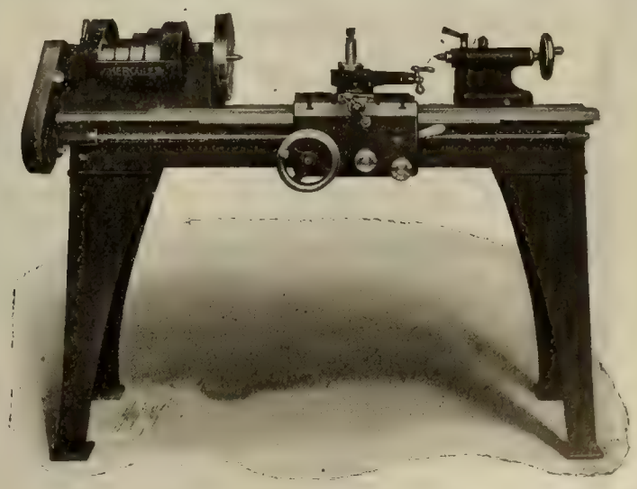
Shell work thoroughly tests the ability of a lathe. The **Hepburn Lathe** is making a wonderful record in the munitions plants of Canada in boring up to 6" shells. It has shown superior speed and superior quality of work and keeps right at it day in and day out. We also rebuild lathes embodying in them all latest improvements.

The Hepburn is the lathe for you.

JOHN T. HEPBURN, LIMITED

18-60 Van Horne Street **Toronto, Ontario**





LATHES

12", 16", 18" and 21" swing

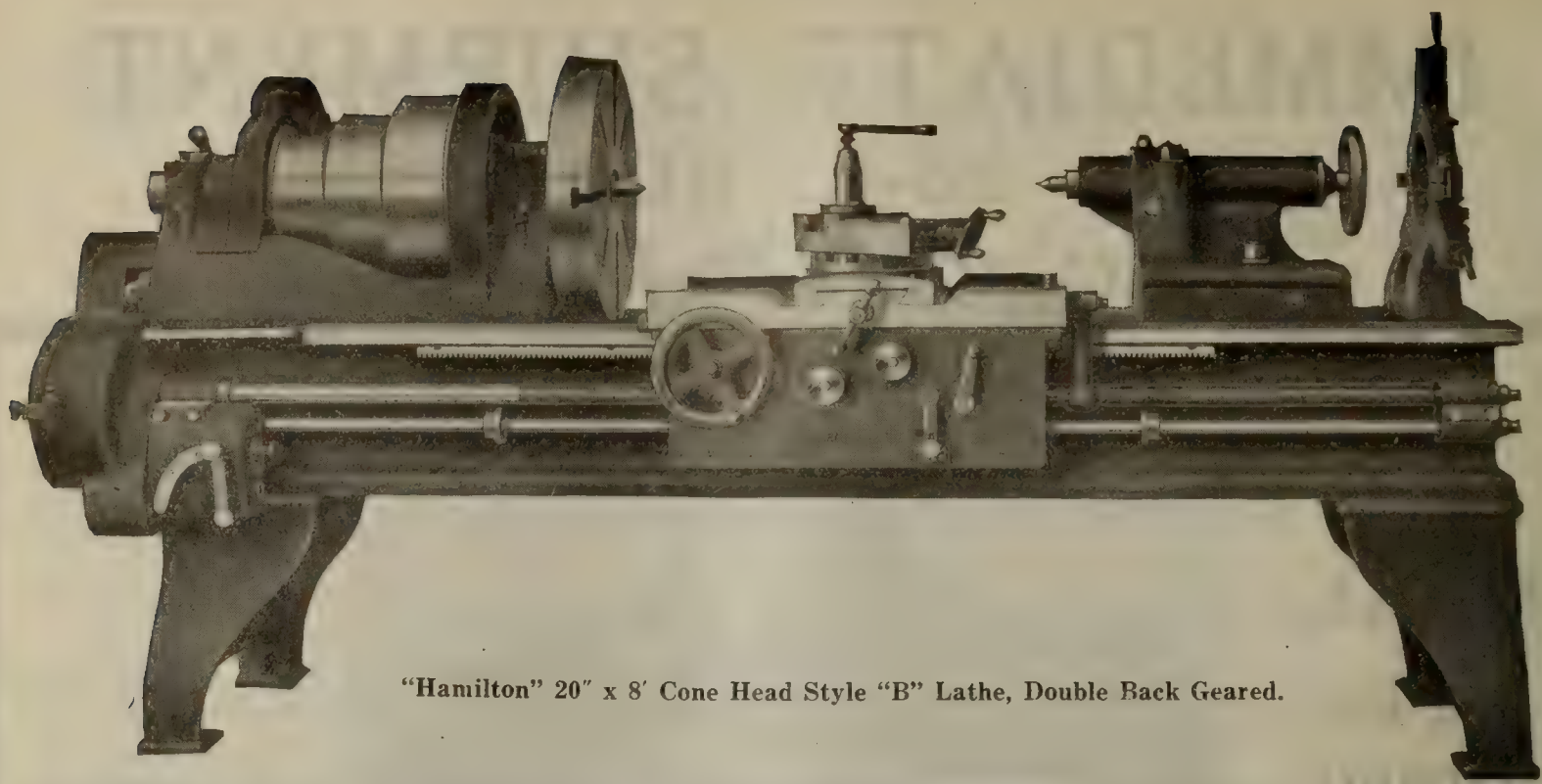
Strictly modern in design, rigidity and accuracy guaranteed.

Himoff Machine Company

45 Mills Street

Astoria, City of New York, N.Y.

If any advertisement interests you, tear it out now and place with letters to be answered.



"Hamilton" 20″ x 8′ Cone Head Style "B" Lathe, Double Back Geared.

HAMILTON LATHES

MERIT

Year after year "HAMILTON" tools have been building their reputation—it has long since been established. To-day it is maintained just as it was built—through merit alone.

Hamilton Machine & Tool Co. mechanics have combined their skill in the construction of this Lathe, and in it have achieved a distinct triumph. Turns out work with unrivalled rapidity and it turns it out to finish style—work that you may well be proud of.

It is a most modern lathe, substantially constructed—built to meet the conditions of to-day for speed and reliability.

You make no mistake when you buy a Hamilton Lathe.

It will Produce.

HMT Co

For 25 Years Makers of fine Machine Tools

The Hamilton Machine Tool Co.

HAMILTON, OHIO

Sole Agents for Ontario:

H. W. PETRIE, Limited - Toronto, Ontario

THE BANFIELD PLUG MILLER

Patented in Canada and United States

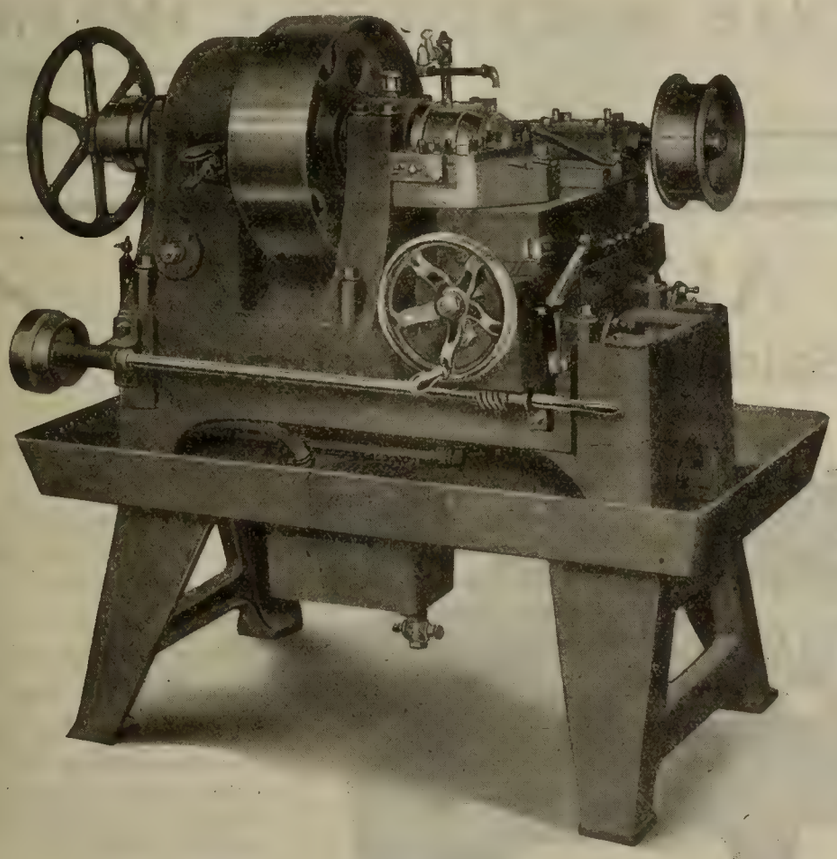
THE COMPLETE PLUG FINISHED IN SIX MINUTES BY UNSKILLED LABOR

A machine especially designed for finishing base plugs, turning the outside diameter, finishing the face with any camber desired and milling the thread—*all in one chucking.*

One man can operate two machines, considerably reducing your cost per plug.

The Banfield Plug Miller is equipped with quick draw in collet.

Drive pulley 18" x 6", with bronze bush having cut jaw clutch for turning and facing. Worm gear 100 to 1 ratio with jaw clutch for milling, driven by 10" x 1½" flanged pulley. The milling cutter is driven by an 8" x 2½" flanged pulley. Tool post carriage is equipped with power feed (two speeds), having automatic stop. Power feed pump with relief valve driven from worm shaft (all drives direct from main line shaft). Rigidly built; simple and economical to operate.



For Turning and Milling the Thread on Gas Check Plugs for 6-inch High Explosive Shells

Weight 1800 lbs.

For 18-pdr., 4.5 and 60-pdr. High Explosive Shells. Can furnish machines of same type, weighing 1250 lbs. Particulars on request. These machines are tooled up for finishing plain machined or bevel plugs if desired.

BASE PLUGS

Machined to Government Specification

Have in stock for immediate shipment machined base plugs for 4.5, 60-pdr., and 6" High Explosive Shells, either threaded or beveled.

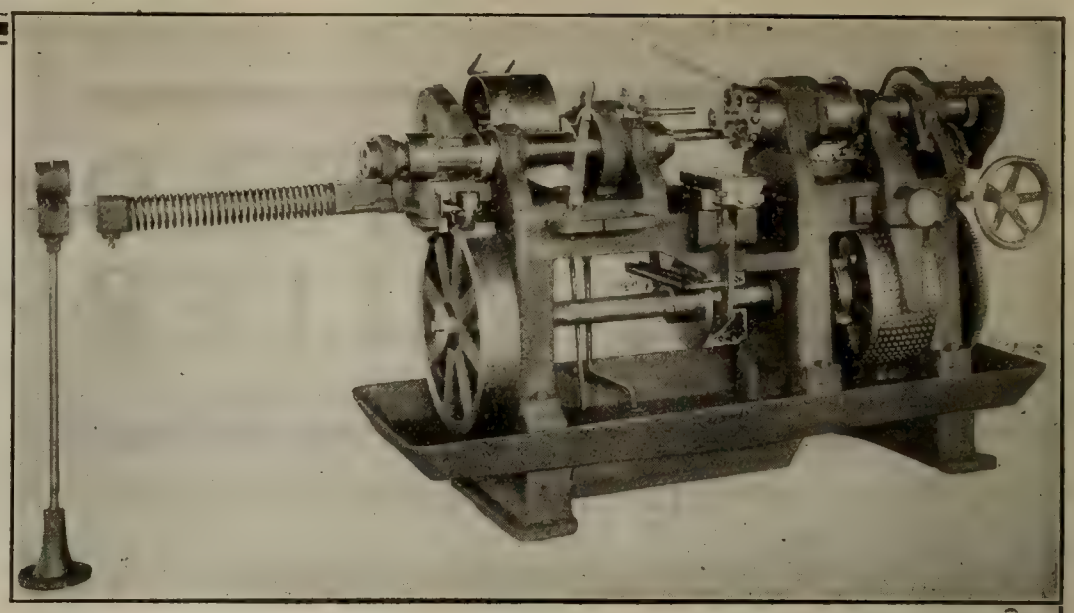
Machine work subject to acceptance of Government inspector at your plant.

Capacity 4,000 *per day.* Write for prices.

EDWIN J. BANFIELD

STAIR BUILDING - - TORONTO, ONT.

The Chicago Automatic Screw Machine



TEN YEARS OF EXTENSIVE MANUFACTURE OF ONE PRODUCT — AUTOMATICS — STAND BEHIND EVERY MACHINE.

No complicated mechanism or a system of cams that are difficult to determine and arrange on this machine.

The rigidity of the machine has not been sacrificed for the flexible features which are embodied in the Chicago Automatic. Alignment is correct and there are no parts where excessive wear takes place—therefore, accurate production is assured during the long life of the machine.

Spindle speeds suitable to different sizes and kinds of stock within the capacity of the machine are obtained by changing two gears on the spindle head.

In less than six weeks we can place Chicagos in your plant ready for production.

They must satisfy you before we consider them sold. Write us about all the features now.

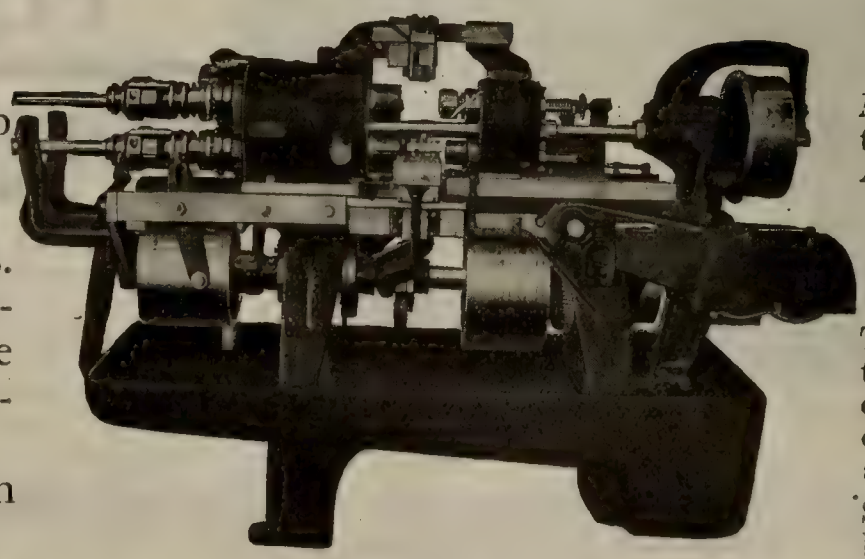
THE JOHN MACNAB MACHINERY COMPANY

NEW YORK CITY, U. S. A.

European Representatives:
John Macnab, Hyde, England

ACME AUTOMATIC

Multiple Spindle Screw Machine



Chuck capacities up to 3¾" diameter.
Four bars of stock.
Eight tool positions.
All operations performed in the time of the longest single operation.
Acme catalog on request.

No extra operations on the average job due to *Acme features* of

Cross drilling
Side Milling and
Special Shaving Tools.

The "Acme Way" makes the production of duplicate parts (up to 3¾" diameter) rapid, accurate and economical.

Submit your samples or blue prints for quotations.

THE NATIONAL ACME COMPANY

NEW ENGLAND PLANT
WINDSOR, VERMONT

CLEVELAND, OHIO.

CANADIAN SCREW PLANT
MONTREAL, P.Q.

Branch Offices
NEW YORK, BOSTON, CHICAGO, DETROIT, ATLANTA, SAN FRANCISCO
WAREHOUSES—NEW YORK, CHICAGO FOREIGN REPRESENTATIVES

Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont, and Acme Automatics, Threading Dies, and Screw Machine Products at Cleveland, Ohio.

Oil Fed R & S Tappers *FOR* Great Speed

You will see the difference the first day used.

Top speed all the time —no tap broken.

Output increased—and improved.

R. & S. Tappers—from 3-16" to 5/8"—are built to cut the cost of tapping by doing tapping work much faster and always accurately.

We'd like to tell you about our Bench, Vertical and horizontal types.

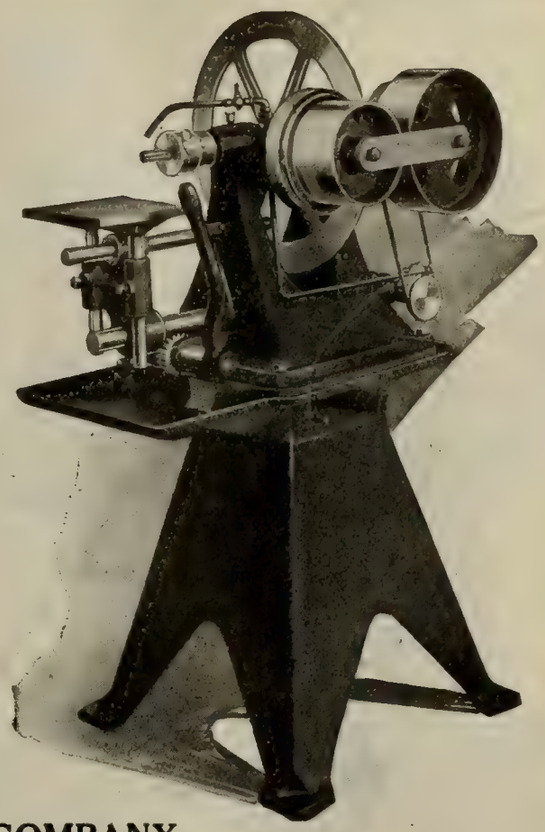


Illustration shows R. & S. 5/8" Oil Feed Tapper. The continuous Oil Feed adds years to the life of this machine.

Write.

RICKERT - SHAFER COMPANY
ERIE, PA., U. S. A.
This is Our Address—How Can We Serve You?

3

WE MAKE THREE (3) ASSERTIONS:

We are making the best lathe built
and we ask you to examine every point of a CISCO in this comparison.

CISCO lathes are most powerful
and we want any manufacturer to show a lathe that will pull more.

No lathes built have more simplified accuracy
and, while we know lots of lathes are accurate, look at the mechanism; see the intricate means of obtaining feeds and speeds. Then look at a CISCO.

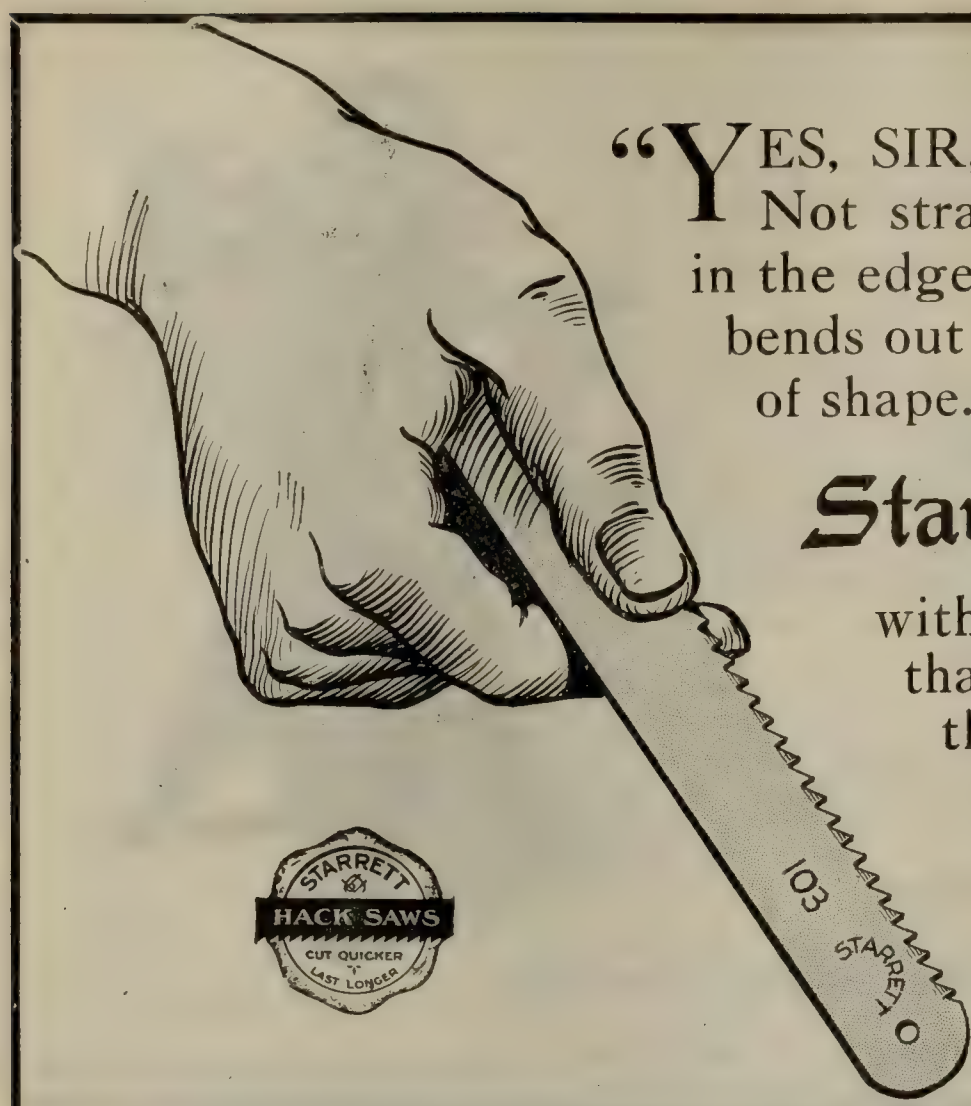
Now if you doubt these points, BUY and TRY

We stand back of every lathe, of every part of every lathe

And we say to you A CISCO IS THE LATHE FOR YOU

SOLD ALL OVER CANADA BY
The
A. R. Williams Machinery Co., Ltd.

MADE IN CINCINNATI, U.S.A., BY
The Cincinnati Iron & Steel Company
14-in., 16-in., 18-in., 24-in. Lathes



"YES, SIR, that's a real hack saw. Not strapping with notches cut in the edge. Not inferior steel that bends out of shape and stays out of shape. No, sir! thats a

Starrett Hack-Saw

with snap and whip to it that means business from the time it gets its teeth in the metal until the cut is finished.

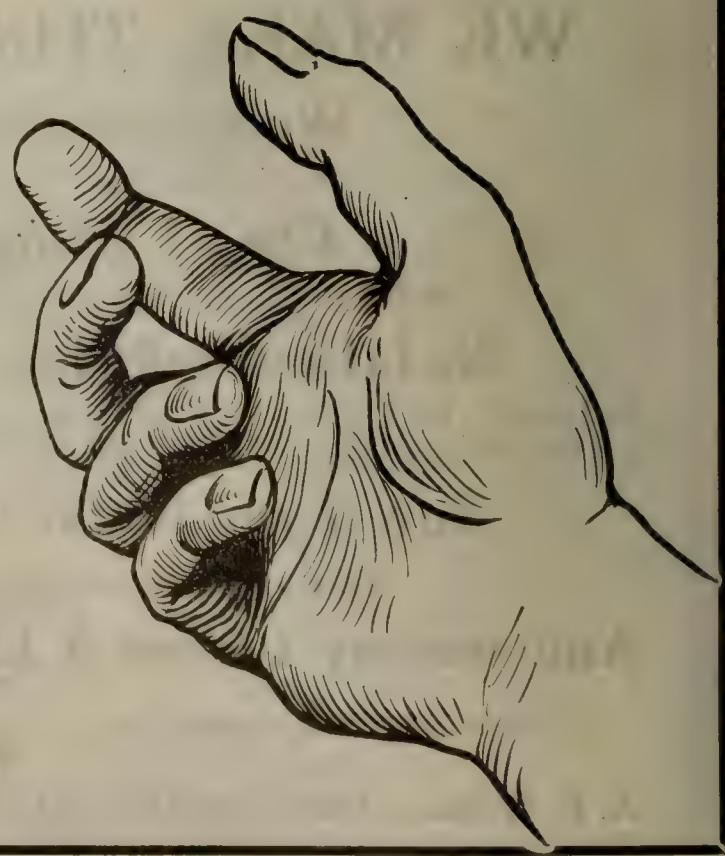
"Just a hack saw, you say. But this common name won't do for a tungsten steel blade like this. Why, every tooth in it is milled and set just as if this hack saw were to establish the Starrett reputation.

"And it fits its job, too. Maybe you don't think that's important, but try it yourself.

"You don't call in a grocer when you have a toothache. But there are some mechanics who try that stunt with hack saws—put a brittle, coarse-toothed blade on a piece of tubing and then wonder why it strips. Or use a fine-toothed saw on brass rod and wonder why the teeth clog and the blade snaps.

"No, sir, you can't treat hack saws mean any more than you can people; and that's another reason why I like Starrett Hack Saws. You don't need to go wrong. They have got good saws and they know how to pick the one that does the work best. Guess that's why they say that Starrett Hack Saws **cut faster and last longer.** I know they do."

Send for catalog No. 213.



The L. S. Starrett Co.

The World's Greatest Toolmakers

ATHOL, MASS.

NEW YORK LONDON CHICAGO

42-738

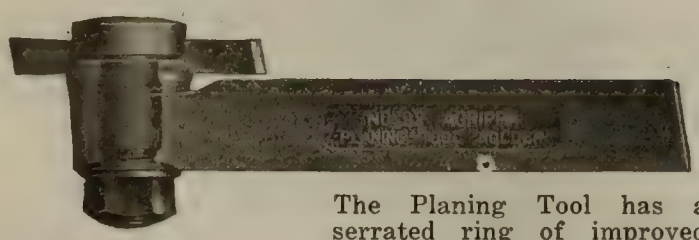
If any advertisement interests you, tear it out now and place with letters to be answered.

The Measure of Superiority of

The Threading Tool with lockable spring head will do roughing, finishing and threading at one setting of the tool post.

WILLIAMS' "AGRIPPA" Tool Holders

"THE HOLDERS THAT HOLD"



The Planing Tool has a serrated ring of improved steel which affords unequaled variety and rapidity of adjustment. The ring is correctly hardened to resist the wear of the cutter. The body of the holder receives a very different heat treatment that prevents breakage.

is the proportion in which they excel and endure.

You can verify our GUARANTEE of the exceptional resistance, adjustment, interchangeability, usefulness, life and economy by exhaustively testing them on own machines.

J. H. WILLIAMS & CO.
THE WRENCH PEOPLE
45 RICHARDS STREET BROOKLYN, N.Y. CITY

Tel. Main 6755 Jos. Bickerstaff, Mgr.

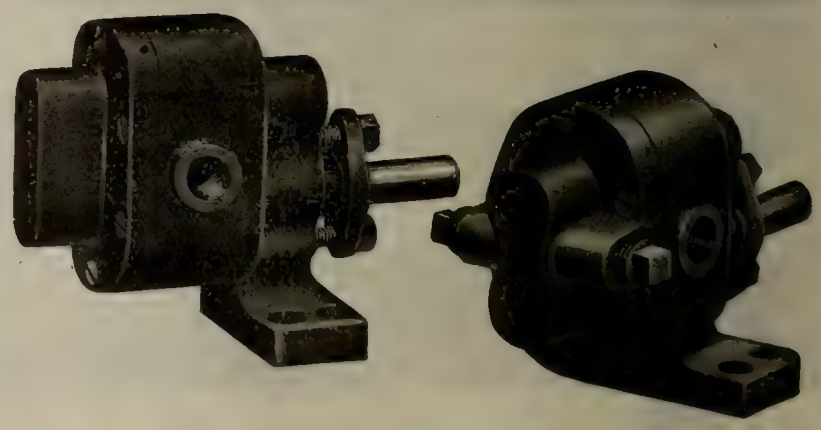
THE ELM CUTTING OIL COMPANY

645 East King Street
TORONTO

You have tried the rest. Now use the best for screw cutting and threading.

Our standard is uniformity at all times and a guarantee of quality with every barrel of oil produced.

PRICES ON APPLICATION



Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.

Hopedale : Mass. : U.S.A.

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

Belting Is Machinery

Belting isn't an accessory to machinery—belting is machinery. Buy a belt just as you buy a machine. The right belt takes up all the power; carries all the power; delivers all the power.

For every drive there is **one** right belt. For example: Graton & Knight Spartan, an extra-durable leather belt, is standardized for difficult machine shop work, overload drives, or exposure to oil, fumes, or other adverse conditions. Graton & Knight Neptune, standardized for damp and wet places. Graton & Knight Heart, GraKnight, and GraKnight Dynamo, the standardized extra heavy, medium and light weight oak-tanned center stock belts respectively.

And so on, through the whole gamut of power transmission, there is a Graton & Knight Leather Belt that is standardized for each and every belting job.

Don't try to save money by cheapening your belting—the right way, the profitable way is to **standardize it.**. A Graton & Knight Belt Expert will show you how to put the right belt to work in the right place. Let us send him to see you—there's no obligation.

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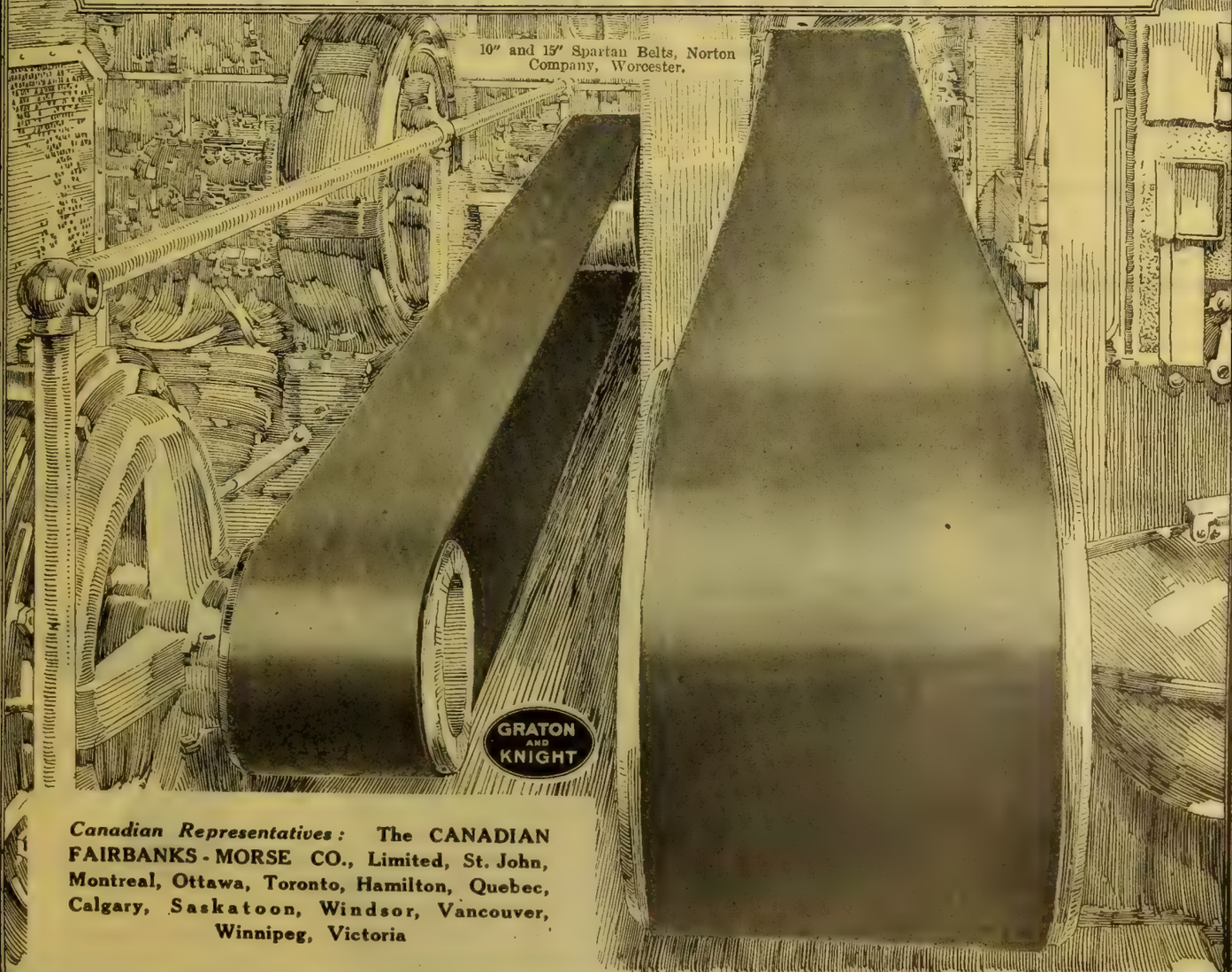
GRATON & KNIGHT

Standardized Series

LEATHER BELTING

Tanned by us for belting use



10" and 15" Spartan Belts, Norton Company, Worcester.

Canadian Representatives: The CANADIAN FAIRBANKS-MORSE CO., Limited, St. John, Montreal, Ottawa, Toronto, Hamilton, Quebec, Calgary, Saskatoon, Windsor, Vancouver, Winnipeg, Victoria

THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

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What Counts Save Results?

Embodied in the meaning of that word "Results" are—quality, quantity and the efficiency of the machine. So, when the quality is undoubted, speed is the primal requisite.

This No. 7½, Single Spindle Grinder, is built with unusually large dimensions throughout. The 30" disc wheel is interchangeable with the 20" ring wheel chucks. Spindle, 2¾" diameter and mounted in self-aligning radial and thrust ball bearings. The rocker shaft is 3½" diameter and supports two Lever Feed Tables. The 9" face of the pulley gives wonderful driving power.

If you are not acquainted with the Gardner line of Single or Double Spindle Grinders, consider it a pleasure for us to supply you with all the information you desire. Our line is most comprehensive. We maintain a Service Department solely to give valuable service to the trade. Write us. We could help one another.

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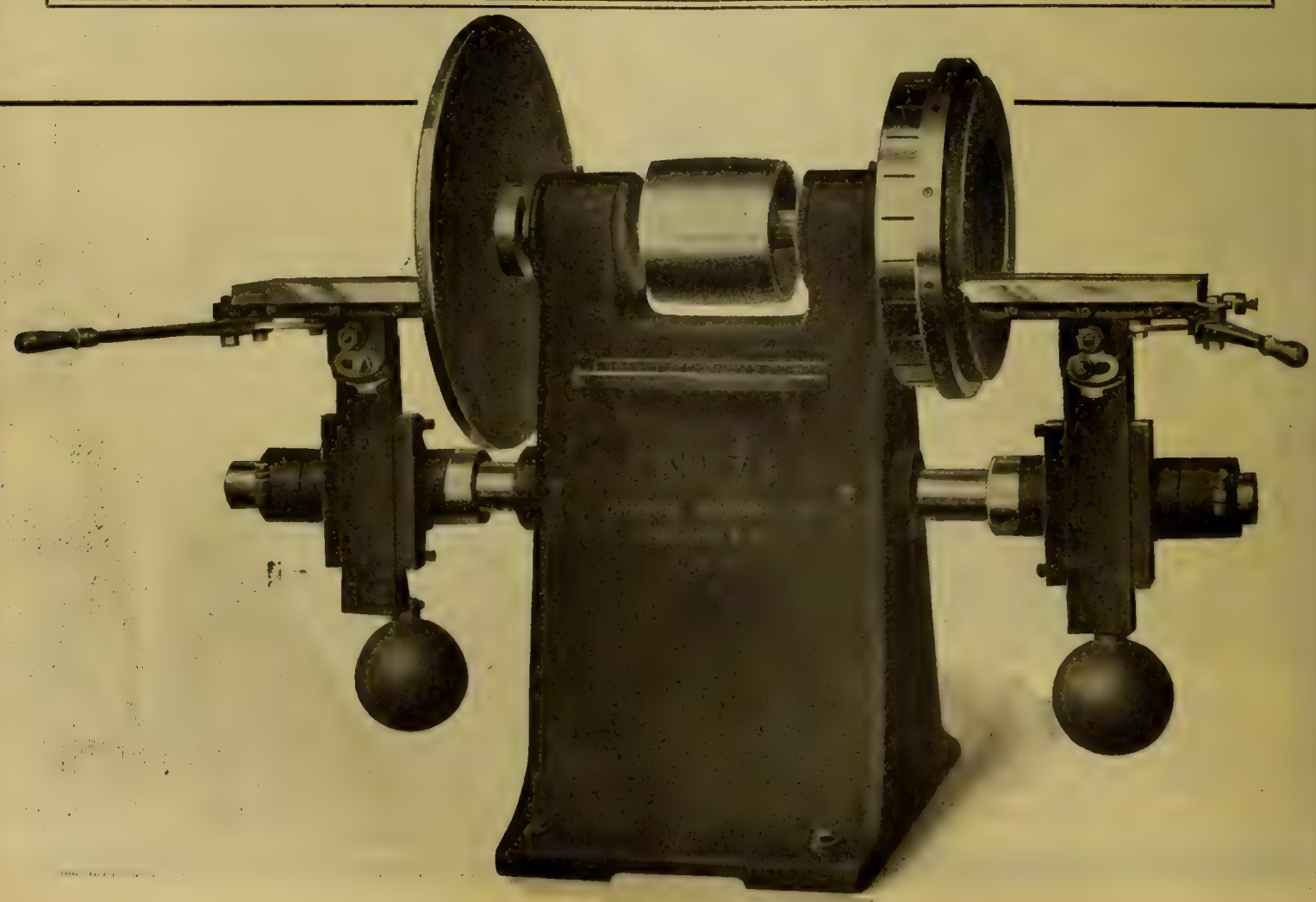


THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

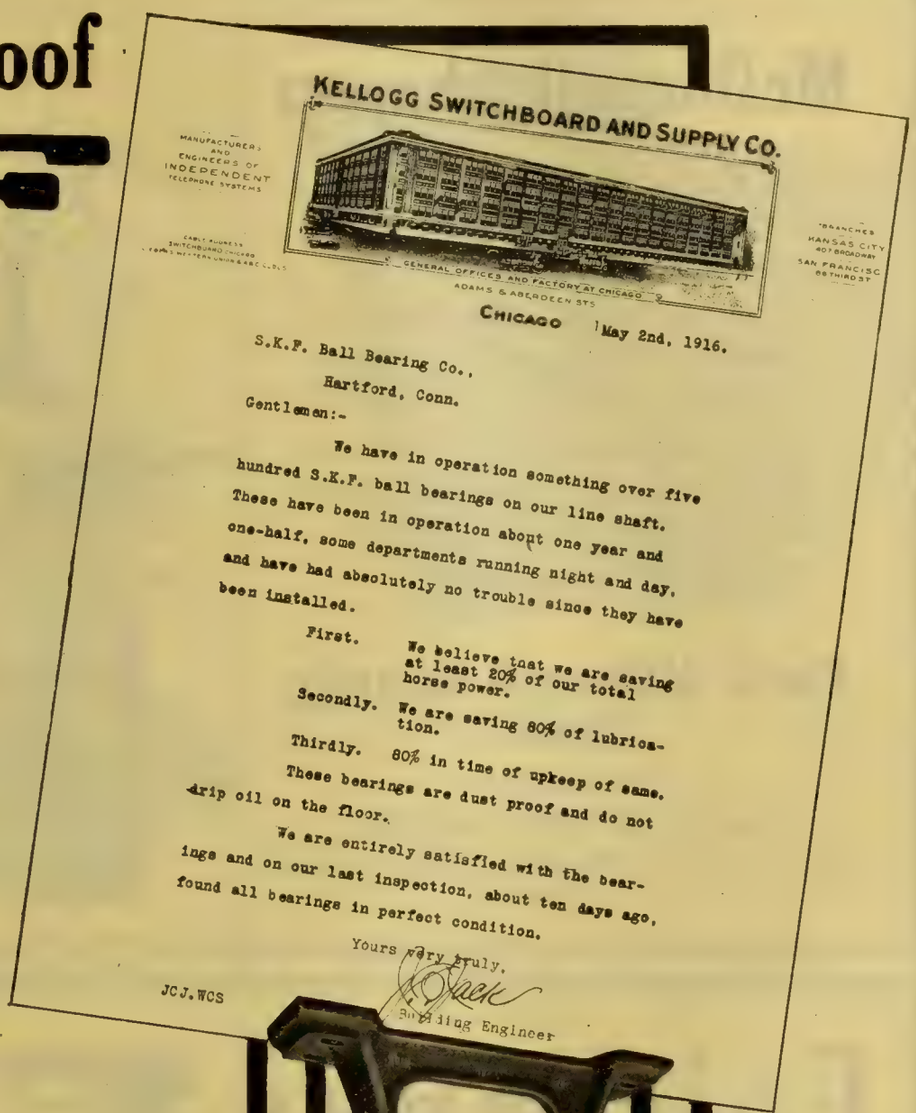
CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

Convincing Proof

SKF

Evidence

Nothing is as convincing as actual evidence. We might tell you that S K F Ball Bearing Hangers save power. But you want the testimony of the man who is using these hangers. He has nothing to sell you. When the Kellogg Switchboard & Supply Company equipped their plant with S K F Self-Aligning Ball Bearing Hangers, they believed that they would save power, money, lubrication attention and trouble. They believed that S K F were the best means of reducing friction. They were not disappointed. Read the letter from the Kellogg Switchboard & Supply Company. It is the kind of evidence that counts.



KELLOGG SWITCHBOARD AND SUPPLY CO.

MANUFACTURERS AND ENGINEERS OF INDEPENDENT TELEPHONE SYSTEMS

CABLE ADDRESS SWITCHBOARD CHICAGO. CODES WESTERN UNION & ABC

GENERAL OFFICES AND FACTORY AT CHICAGO
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KANSAS CITY 407 BROADWAY
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CHICAGO May 2nd, 1916.

S.K.F. Ball Bearing Co.,
Hartford, Conn.

Gentlemen:-

We have in operation something over five hundred S.K.F. ball bearings on our line shaft. These have been in operation about one year and one-half, some departments running night and day, and have had absolutely no trouble since they have been installed.

First. We believe that we are saving at least 20% of our total horse power.

Secondly. We are saving 80% of lubrication.

Thirdly. 80% in time of upkeep of same.

These bearings are dust proof and do not drip oil on the floor.

We are entirely satisfied with the bearings and on our last inspection, about ten days ago, found all bearings in perfect condition.

Yours very truly,

Building Engineer

JCJ.WCS

Here is the story:

The Kellogg Switchboard & Supply Company have over 500 S K F Self-Aligning Ball Bearing Hangers.

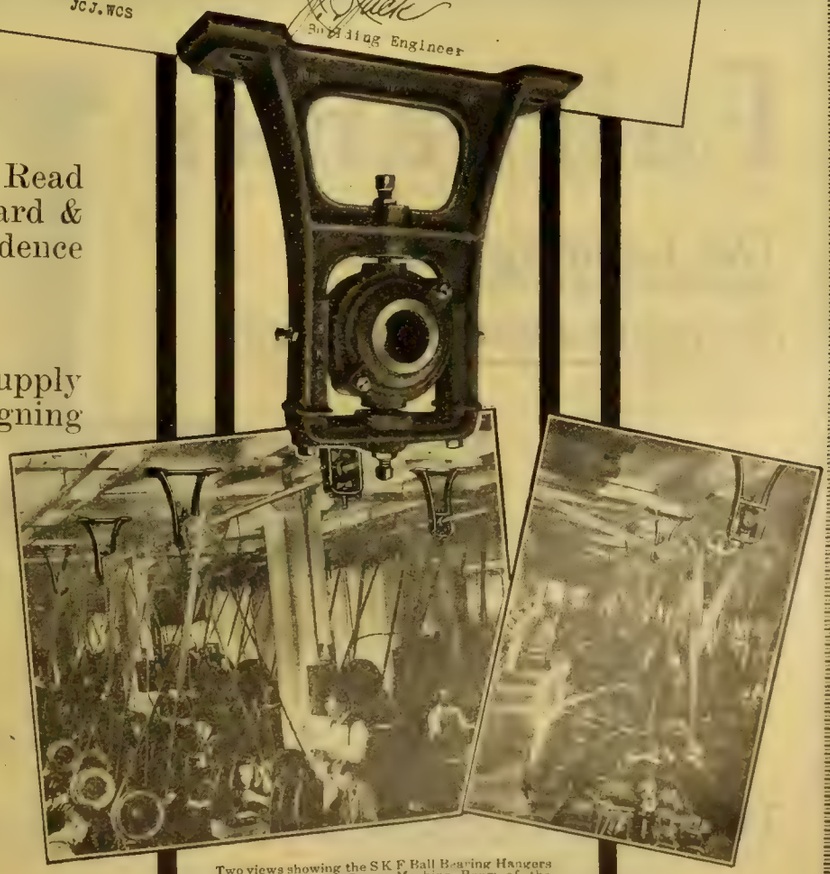
The power saving is at least 20% of the total horse power.
Lubrication saving, 80%.
Time of upkeep, 80% saving.
No leakage of oil.

No wear in the bearings after 1½ years of day and night service.

Need we say more?

Figure out what similar savings would mean to you.

Then write us for our Hanger Catalog, so you can review SKF features at your leisure.



Two views showing the S K F Ball Bearing Hangers in the Punch and Screw Machine Room of the Kellogg Switchboard & Supply Company.

CANADIAN SKF COMPANY
Limited, Toronto, Ont.

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They are plain in design, yet embody all essential features necessary for efficient work.

Every adjustment is convenient for the operator and fine for the most accurate work.

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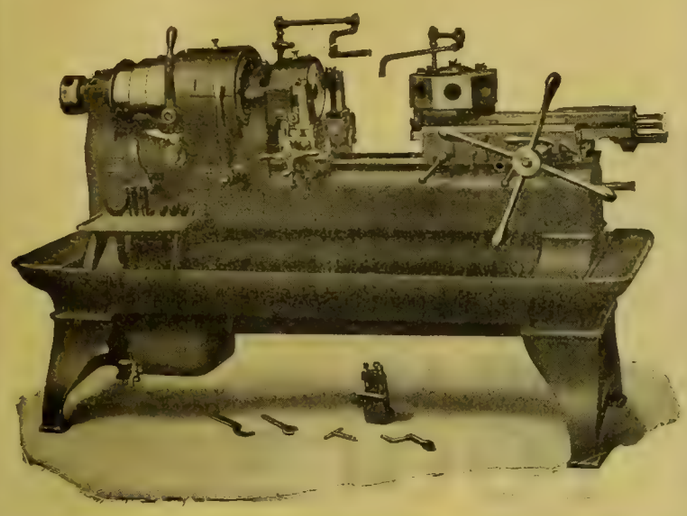

If you are lathe turning duplicate parts in lots of twenty or more

Brown & Sharpe Screw Machines

of the Plain or Wire Feed types

will increase your production. Your turning department will easily keep step with the rest of the shop, for these machines produce interchangeable parts at a rate that maintains a constant high production level.

On the Plain type of machine you can finish small castings, forgings, and irregular shaped pieces, or make screws, studs, and small parts from bar stock previously cut in sections. The Wire Feed Machines have an automatic chuck and stock feed which make them very efficient in producing studs, screws, bolts, etc., from the bar.

These machines are built rugged for long service. They are easy to set up and operate—all control levers are directly before the operator—every movement counts.

Ask us for further details.

Brown & Sharpe Mfg. Co.
PROVIDENCE, R.I., U.S.A.

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Your Mark

On your product—is it the kind that proves your pride in the product? If your product is good, if its service is likely to recommend it, mark it so any one can easily tell who made it.

We make any form of a steel lettering die or stamp to mark your name, address, trade-mark, or any distinctive mark you desire to show on your product. Sixty-seven years in business as the largest manufacturers of our kind is the record behind Matthews steel lettering dies and stamps.

Our catalogue illustrates and describes a complete line of dies and stamps for every marking purpose. Send for it to-day.

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Speed Lathes,
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Profiling Machines,
Gear Cutting Machines,
Boring Mills,
Arbor Presses,
Presses, all kinds,
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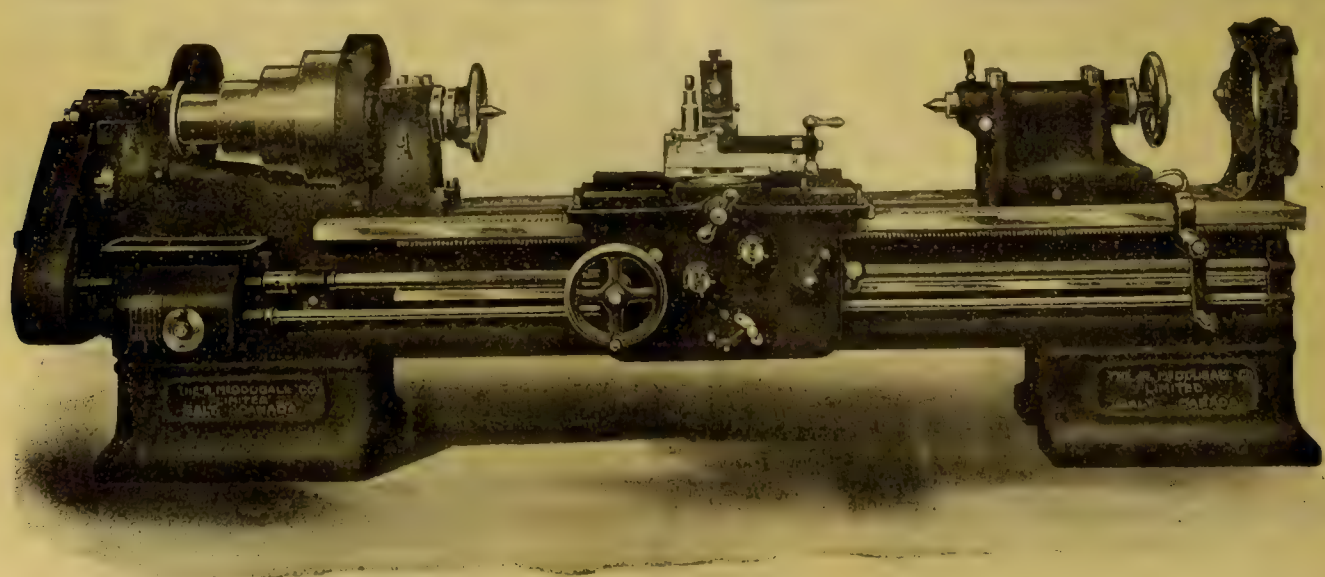


Up-to-Date Patternmaking and Pattern Storage Building

Staff Article

There has recently been completed at the John Bertram & Sons Co. plant, Dundas, Ont., a pattern shop and pattern storage building, which is likely to rank among the best of its kind in the Dominion. The structure is indicative of the progressive spirit dominating the administration of this old-established concern, recognizing as it does, among other things, that valuable patterns should be stored in nothing short of a fireproof structure.

OWING to the variety of types and large size of many of the machine tools which are built at the Bertram plant, Dundas, Ont., the patterns form an important feature in the company's plant. They would be in many cases costly to replace, and suitable storage, is therefore, all the more necessary. The pattern shop and storage are part of a scheme of expansion which is now under way at John Bertram & Sons' plant, and includes a general store and machine shop projected and a handsome office building nearly completed. It should be here stated that the old pattern shop and storage was pulled down in order to make way for an overhead travelling yard crane, which operated between the foundry and the new storage building, thus facilitating the handling of large patterns, etc.

INTERIOR VIEW OF PATTERN SHOP SHOWING LOCATION OF MACHINERY. LAYOUT FLOOR IN BACKGROUND.

Constructional Features

The general character of the building will be noted from the accompanying illustrations. It is of flat slab reinforced concrete construction with brick curtain walls, and steel sash with factory wired glass. It is of modern construction in every respect and is absolutely fireproof, even to the extent of providing a sprinkler system and fire doors, which close automatically in case of fire.

The building is 100 feet square and approximately 45 feet high, with a concrete roof, and is constructed so that another storey can be added when required. There are four storeys, including the ground floor and a basement. The building has approximately 45,000 square feet of storage, excluding the spaces occupied by the elevator shaft, stairway and pattern shop. The stairway is built inside the building, and is isolated from the storage rooms, access being obtained by fire doors on each landing. The stairs are of concrete, with chequered steel plate treads and iron pipe handrails. The elevator, which is 12 feet square, runs from the basement to the top floor, the motor and operating mechanism being located in the basement. The elevator was supplied by the Otis Fensom Elevator Co. Each floor has a sprinkler system connected to a standpipe running the full height of the building and served from an existing water tank on the premises. The pressure regulating apparatus is located in the basement. The basement and second floors are used for storing large patterns, and for this reason have plenty of head room, being about 12 feet high. The ground floor, which is also lofty, is partitioned off to form a pattern shop and a pattern storage. The pattern shop takes up rather more than half the floor area, and is separated from the storage by hollow-tile walls, which can be removed in the event of the entire space being required for a pattern shop.

EXTERIOR VIEW OF PATTERN SHOP AND PATTERN STORAGE BUILDING. OVERHEAD TRAVELLER NOW RUNS ALONGSIDE IN FRONT OF MAIN ENTRANCE.

Pattern Shop Feature

The pattern shop is exceptionally bright and roomy, and has a hardwood floor. A work bench, equipped with Emmert's universal pattern vises, extends the full length of the south side of the shop. The machinery is grouped about the centre of the shop, leaving ample space for the lay-out floor, where the

larger patterns are assembled. The shop also contains a lavatory and foreman's office.

The machinery at present installed comprises the following units, but other equipment will be installed in the near future. The machinery driven from the line shaft includes a Downer grinder, a small wood-turning lathe, a tool grinder, and a C.M.C. 30 in. by 40 feet wood-turning lathe. The transmission equipment, including wooden pulleys, was supplied by the Dodge Mfg. Co. The line shaft is driven by a 5 h.p. Can. Westinghouse motor, controlled by a starter, supplied by the Condit Electrical Co., Boston, Mass. All the other machines are driven by individual motors, using Hydro-Electric current 3-phase, 25-cycle. These machines include the following:—A 24-inch planer supplied by P. B. Yates Machinery Co., Hamilton, Ont., and driven by a 10 h.p. Can. Westinghouse motor; one C.M.C. rip saw, driven by a 5 h.p. Can. Westinghouse motor; one 16-in., a C.M.C. jointer, driven by a Can. Westinghouse 5 h.p. motor; an 18-inch cut-off saw, by P. B. Yates Machine Co., driven by a 3 h.p. Crocker Wheeler motor; and two 36-in. C.M.C. band saws, driven by 3 h.p. Crocker Wheeler motors. Ample provision for artificial lighting has been made, the main switches for both the pattern shop and entire building being located in the pattern shop. The section of the ground floor not occupied by the pattern shop is used for storing large patterns.

Small Pattern Storage

The third and top floors are used for storing smaller patterns. An interesting feature on the third floor is a system of steel racks for storing the smallest patterns. There are six rows of racks, each being approximately 80 feet long. The top racks are barely six feet from the floor, so are easy of access. The accompanying illustration shows, in a general way, the arrangement and style of these racks. The racks are all numbered and a record of the patterns is kept by means of a card index. The larger patterns on the other floors are arranged in numbered sections and a record is kept in the same way. The patterns themselves are also numbered. By means of the above system it is easy to keep track of each and every pattern in the building, and no time is lost when any particular pattern is wanted.

SHOWING STEEL STORAGE RACKS FOR SMALL PATTERNS ON THIRD FLOOR OF PATTERN STORAGE BUILDING. NOTE SPRINKLER SYSTEM.

Overhead Runway System

A system of overhead runways is installed to facilitate the handling of heavy or bulky patterns. The system, which was supplied and installed by the Herbert Morris Crane & Hoist Co., of Niagara Falls, Ont., is used in all parts of the building except on the third and fourth floors, where the lighter patterns are kept. On the second floor the runway serves two sides and one end of the store room for carrying patterns to the elevator. There is a switch in the system where the two lines connect up near the elevator. The layout in the basement is essentially the same as on the second floor. On the ground floor the system is arranged to serve the storage section and also the lay-out floor in the pattern shop. The branches of the system converge at the elevator, the tracks and switches being arranged to give the most efficient service. The pulley blocks have a capacity of one ton, and the trolleys are equipped with a buffer device.

The general contractors for the building were the E. G. M. Cape Co. of Montreal, who sub-let the various smaller contracts. It may be of interest to note that some of the concrete work was done in almost zero weather, which apparently had no ill-effect. The construction of the building was completed in May and machinery in the pattern shop installed during the month of July. All the contracts have been successfully carried out, and the building is a valuable addition to the company's plant.

PART OF LAYOUT FLOOR IN PATTERN SHOP, SHOWING SYSTEM OF OVERHEAD RUNWAYS WITH ELEVATOR IN BACKGROUND.

FUEL REGULATIONS ISSUED

AN Order-in-Council has been passed by the Dominion Government authorizing regulations issued by the Fuel Controller for Canada, respecting the importation and sale of coal, which go into effect in November.

Provision is made for the licensing of all importers and dealers in coal now doing business in Canada and that may, hereafter, desire to do so. Application must be made to the Fuel Controller be-

fore November 21, by registered letter, for a dealer's or importer's permit. Heavy penalties are provided for doing business without permit. Provision is also made for the cancellation of permits in cases where any dealer has been found guilty of giving short weighs or where any other sufficient cause exists.

Under the regulations every mine operator in Canada must forthwith enter into an agreement with the Fuel Controller fixing the maximum prices per ton he may charge for the output of his mine.

The most far-reaching provision of the new regulations are those dealing with dealers' commissions and profits. Brokers are allowed a maximum of 30 cents per ton for their services, wholesalers a maximum of 35 cents per ton, and retail dealers a sum not exceeding 50 cents per ton. These maximum profits are allowed over and above reasonable overhead and handling charges, and will effectually do away with profiteering in coal.

FOREIGN CAPITAL IN BRITAIN

THE future attitude of British business houses toward firms controlled from foreign sources, and operating in such a manner as to appear essentially British in character, is indicated by the fact that the Enemy Influence Sub-committee of the Unionist War Committee have been considering what steps should be taken to prevent foreign-controlled companies or corporations from passing themselves off in the future as British concerns, without discouraging the investment of foreign capital in British business. The "British Trade Review" states that after giving full consideration to the various aspects of the matter, the committee are of the opinion that it would be reasonable to require that where a company or corporation carrying on business in the United Kingdom is actually under foreign control, unless the existing title of the company clearly and correctly designates its foreign nature, the fact should be disclosed in its title by adding the words "foreign controlled," so that every one having dealings with it may be aware of such foreign control. For the purpose of legislation it is suggested that the expression "foreign-controlled company" shall mean any company or corporation: (1) Where the majority of the directors are not British subjects of British parentage; (2) where control has in fact been exercised by reason of shares of the company having been held by persons who are not British subjects; (3) where the executive is a foreign-controlled company, or where the majority of the executive are appointed by a foreign-controlled company. Legislation on these lines is very desirable.

THE NAUTICAL MILE

By R. Hamilton.

HOW often do we hear the expression "knots per hour" when reference is made to the speed of a vessel? This phrase while not entirely erroneous is nevertheless misleading, as the uninitiated are inclined to infer that a corresponding speed on land would be expressed as miles per hour. In reality, the values of the land and the sea mile are widely different, that of the latter being approximately 1/6 greater than the former; the relative distances being 5280 feet and 6080 feet. The speed of a vessel is indicated in nautical miles per hour, or simply so many knots. To make this meaning more clear it might be well to briefly define the origin of the term. During the primitive days of navigation it is doubtful if much consideration was given to the speeds of such vessels as then existed, but before the adoption of the "continuous log"—the recognized instrument for calculating ship speeds of the present day—it was customary for sailors to ascertain the vessel's velocity by means of the "common log." Its employment depends on the fact that a piece of wood attached to a line is thrown overboard (casting the log), to lie like a log in a fixed position, motionless, the ship's speed being calculated by observing what length of line ran out in a given time.

Ship's Speed by Common Log

To ascertain the ship's speed by the common log, four articles are necessary —a log-ship or log-chip, log-reel, log-line, and log-glass. The log-ship is a wooden quadrant ½ inch thick, with a radius of 5 or 6 inches, the arc of which is weighted with lead to keep it in a vertical position, and thus retard its passage through the water. Two holes are made near its lower angles. One end of a short piece of thin line is passed through one of these holes, and knotted, while the other end has spliced to it a hard bone peg, which is inserted in the other hole. The holes are so placed that the log-ship will hang square from the span thus formed. The log-line is secured to this span and consists of two parts. The portion nearest the log-ship is known as the "stray line"; its length varies from 10 to 20 fathoms, but should be sufficient to insure that the log-ship shall be outside the disturbing element of the ship's wake. The point where it joins the other part is marked by a piece of bunting, and the line from this juncture towards its other end is marked at known intervals with "knots," which consist of pieces of cord worked in between its strands.

A mean degree of the meridian being assumed to be 69.09 statute miles of 5280 feet, the nautical mile (1/60 degree) is taken as 6080 feet, which is a sufficient close approximation for all practical purposes, and the distances between the knots on the line are made to bear the same relation to 6080 feet as 28 seconds to an hour (3600 seconds): that is, they are placed at intervals of 47 feet 3 inches. The end of the first interval of this length—counting from the piece of bunting—is marked by a bit of leather, the second by a cord with two knots, the third with three knots, and so on; the middle of each section (half knots) being marked with a cord with one knot. Suppose eight knots of the line runs out in 28 seconds, the vessel has gone 5 x 47¼ feet in that time, or is travelling at the rate of 5 x 6080 feet (five nautical miles) an hour; hence the common use of the term "knots," as equivalent to nautical miles per hour. In the log-glass the time is measured by runing sand, which however, is apt to be affected by the humidity of the atmosphere. Some practice is made of the 30-second glass, in which case the intervals between the knots on the log-line are made 50 feet 7 inches instead of 47 feet 3 inches. For speeds over six knots, a 14-second glass is employed, and the speed indicated by the log-line is doubled. In preparing a new log-line it is first well soaked, stretched and marked with knots, and wound uniformly on the log-reel, to which the inner end of the line is securely fastened.

"Heaving the Log"

To "heave the log," a man holds the log-reel over his head (at high speeds the man and portable reel are superseded by a fixed reel and a winch fitted with a brake), and the officer places the peg in the log-ship, which he then throws clear and to windward of the ship, allowing the line to run out freely. When the bunting at the end of the stray line passes his hand the officer calls to his assistant to turn the glass and permit the line to pay out freely. When all the sand has run through, the assistant calls "stop" when the log-line is quickly nipped, the knots counted and the intermediate portion estimated. The strain on the log-ship, when the line is nipped, causes the peg to be withdrawn from it, and the log-ship is readily hauled in. In a steam vessel running at high speed on an ocean route, with engines working smoothly and uniformly, a careful officer with correct line and glass, can obtain very accurate results with the common log.

RAILWAY ASSOCIATION FOR NATIONAL DEFENCE

AS a result of suggestions made by the Government that during the period of the war there should be closer co-operation between the railways of Canada, an association has been formed by lines corresponding to the railways war board of the United States with the object of securing greater co-operation not only between the railroads themselves, but also between the railways and the public.

The new board will be known as the Canadian Railway Association for National Defence and will have general authority to formulate in detail a policy of operation for all or any of the railways for the co-ordinating of industrial activities toward the prosecution of the war and for rendering the most efficient possible service to the national cause. It is expected that through heavier loading of cars, elimination of unnecessary train service, the co-operative use of all facilities, etc., to the best advantage the country's needs may best be served.

The Education and Training of Foundrymen by Mail

By C.T.R.

It should be the ambition of every man, who has a trade, to become a high grade exponent of same, and while common school, high school and university education as preliminaries may and do contribute a whole lot to that end as auxiliaries to natural deftness and keenness of perception, research, discovery and development, which are increasingly active, make it encumbent that the further education of oneself suffer neither restriction nor let-up in its quest and appropriation. Opportunities to this end are many and varied.

AT the recent Exhibition of foundry equipment and supplies held in the Mechanics' Building, Boston, Mass., under the joint auspices of the American Foundrymen's Association and the American Institute of Metals, not the least interesting among the many excellent booth displays, because of its war-time appropriateness and actual practical demonstration of progressive foundry effort, was that staged by "McLain's System," of Milwaukee, Wis.—to wit, the tangible and visible results of instruction in foundry practice by mail. For obvious reasons, we refrain from making observations or from giving even a brief description of the varied type and size shell shown in the accompanying illustration; the fact that they are in no sense experimental projectiles, but real war-time utilities, and the further fact that their metallic constituent and method of production are creations of a system of instruction for foundrymen by mail—otherwise correspondence—make elaboration or intricate detail superfluous and unnecessary under the circumstances.

Foundrymen beyond the confines of the United States are not as familiar as they might be with the history and development of McLain's System, which is practically the life story and foundry experience of one man—David McLain—crystallized, and made to shoot its beams of light into the darkness, figuratively speaking, so long surrounding foundry practice and militating against progressive effort, not to mention achievement. It is not, of course, to be understood that David McLain was the lone star in the foundry firmament, but he certainly can lay claim to be one of less than a score of American foundrymen who have been responsible for the craft uplift of the present century, and to whom the greatest credit is due for the high standing the industry to-day enjoys, not only in the United States, but also in Canada and Great Britain.

It should be an inspiration to budding and prospective foundrymen to know that David McLain rose from the ranks. Somehow our hearts go out to such a one, no matter what his particular vocation. Great Britain's present chief of staff for the conduct of her gigantic military operations—Sir William Robertson—rose from the ranks. Men are rising to prominence—in some cases to mere publicity—every day; the records are, however, not always such as to inspire. McLain's history of himself, starting with his birth in Belfast, Ireland, and his quitting the "Old Sod," when five years of age, with his parents, to journey to Pittsburgh, Pennsylvania, is brimful of human interest, and has a tendency to make one feel like getting to know the man a little better and compare notes and personalities with a view to finding out just where his strength lies comparatively.

Times were hard in Pittsburgh; therefore, during the panic of 1873 little Dave McLain set out to help support the family of which he was a member. He seems to have been destined for the foundry from his early boyhood, for at ten years of age we find him twisting hay ropes for core barrels in Smith's pipe foundry, Pittsburgh, at $2.25 per week. An exploison in a pipe pit, which killed twenty men, unnerved him somewhat, so

"McLAIN'S SYSTEM" BOOTH AT THE EXHIBITION OF FOUNDRY EQUIPMENT AND SUPPLIES, HELD IN BOSTON, MASS., DURING WEEK OF SEPTEMBER 24, 1917.

he quit foundry work, but not for long; to use his own words, "I naturally drifted back to the foundry, working both in iron and steel." The latter circumstance seems to have been a very great convenience, as well as profitable, for, quoting him again, "when I could not get a job in one I would work in the other." The human interest reference above to Dave

DAVID McLAIN IN A TYPICAL DEMONSTRATION POSE.

McLain's business career may at this point be judged as to merit by the following paragraph:

"At the age of eighteen," he says, "I was married and earning moulder's wages. All I could see ahead of me was the sand heap—'typical of the times.' I had no education to speak of, neither had I influential friends; yet I felt I must get away from it. On the floor to my right was John Williams, 65 years of age; on my left was Frank Jones, some 52 to 55 years of age. I would stop work at odd times, lean on my rammer, look first at John and then at Frank, and wonder if I was going to end the same way."

Books on foundry practice were not available in those days, and trade papers were more or less in their infancy, in both of which respects the rising generation have much to be thankful for, and perhaps more so as regards iron and steel founding. Later from the brain of an ambitious moulder was evolved and established, that world-known publication, "The Foundry," of Cleveland, Ohio. Evening class tuition in the arts and crafts, technical and correspondence school instruction were, if existent, but as the shadow to the substance of our day.

Dave McLain was dour enough to have been born in the "Land of the Heather," judging by the way he persisted in educating himself, notwithstanding many apparently insuperable difficulties. As a result we find him in charge of a grey iron and steel shop at the age of 23, from which circumstance he lays claim to being the oldest steel foundryman, in point of experience, in the United States or Canada.

Mixing irons by analysis, not by guesswork, tradition, or some rule-of-thumb method, equally unsatisfactory, had burned itself into the heart and head of young McLain; little wonder, then, is it that the melter, so long regarded as a sort of craft deity, but who in reality knew nothing of the constituent of his cupola mixtures, got out of harmony with his surroundings. "All irons are good irons when you know how to use them," is an axiom of McLain's System, and few will be disposed to challenge the assertion.

At 35 years of age David McLain was drawing $3,000 per year as foundry superintendent. He was still drawing heavily—and is yet, on the research of himself and others in the matter of a larger and wider development of foundry enterprise, and it was when, with 35 years' practical experience behind him, he made his decision and established his system of scientific mixing and melting and the manufacture of the much discussed material entitled semi-steel. As regards nomenclature, much difference of opinion exists as to the product being so described. For the purpose of this article, nomenclature is largely, if not wholly, immaterial.

McLain's research and experiment in the direction of charging certain percentages of steel into the iron foundry cupola, to attain a product of some definite strength, homogeneity, and readily machined, did not at first appeal to those more directly concerned, or whose best interests were most directly at stake. Steel had been added to iron in the ladle for 50 years or more preceding the McLain discovery, and even slight amounts were on record as having been charged to the cupola. So far as large percentages of steel being employed in light castings are concerned, no records were, however, available.

With confidence begotten of knowledge, therefore, and being a "child of the foundry," so to speak, and with the best interests of his craft as strongly embedded in his bosom as those of his own personal interest, in January, 1908, David McLain quit a high-salaried position to establish what is getting to be quite universally known as McLain's System of Instruction for Foundrymen by Mail. In the decade now almost past since embarking on this new and untried enterprise, vicissitudes have not been lacking, opposition being on many occasions powerful, menacing, and jeeringly disposed. Here and there good sports among foundrymen came out into the open. They recognized a ring of sincerity about Mac that was worth taking a chance on, and to their surprise they won out on the venture.

Good news travels quickly; in any case, there are men in all ranks and trades and crafts who are on the lookout for bigger and better things, and such never fail to be in the right place at the right time. Is it any wonder, then, that there is today no representative of the foundry craft more highly respected and appreciated—iron or steel—by his confreres and contemporaries, in the United States, than David McLain, and no more popular enterprise than McLain's System of Foundry Instruction by Mail.

The open-hearth furnace for steel melting, as well as the cupola for grey iron or semi-steel, is included in the scope of the work undertaken by McLain's System, Goldsmith Building, Milwaukee, Wisconsin, and, judging by the clientele—plant administrative, foundry superintendents, foundry foremen, and men on the floor, whose ambitions are to get on top of the sand heap, who have passed through and are still on the books of the "System," it is not assuming too much when we make prediction that the coming handful of years will show even greater development than any like period preceding, much as that most immediate has unfolded.

Unique in many respects as is this McLain's System from trade uplift and efficiency of production points of view, that of its business management and administration is easily no less so. Known to hundreds of foundrymen all over the United States, Canada, and Europe is the signature of "I. V. Scanlan," attached to letters of technical and practical import issued from McLain's System headquarters. Foundrymen attending the annual exhibition of equipment and supplies for the first time receive the sur-

I. V. SCANLAN,
Secy.-Treas. and Chief Assistant, McLain's System, Incorporated.

prise of their lives in meeting I. V. Scanlan, for I. V. is not a man at all, but a keen-eyed, alert, slenderly-built young woman.

Miss Scanlan has the distinction of being the only woman in the world who teaches the foundry business to foundrymen. The technique of the subject, the diagnosis of complicated metals and mix-

tures hold no terrors for her; as a matter of fact, she simply revels in the work, bringing to the many problems involved a brain that many of us are disposed to envy, and a precision of expression readily appreciated by those interested in the various solutions. As first assistant to Mr McLain, she has assumed almost entire charge of the business, and that she is partner in same as well is due to Mac's business acumen, for he discovered quite early in his correspondence school enterprise that she was too valuable an asset to risk losing by any chance.

Needless to say, hard work and hard study are the secret of Miss Scanlan's success, and aside from the personal instruction of her chief, nothing has contributed more to acquirement of the craft knowledge she now possesses than the intimacy with progress and development in foundry practice recorded in the columns of trade and technical journals.

WOOD SHIPBUILDING AT MONTREAL

AMONG recently established wood shipbuilding plants, attention may be directed to that of Fraser, Brace & Co., of Montreal. Although a new departure for this firm, they go into it with a wide expert knowledge of large construction work and engineering undertakings generally. They have acquired a very desirable location for the plant site, which consists of approximately eight acres adjoining the Lachine Canal, on the south side of the latter and in the district known as Cote St. Paul. The shipyard offers ideal conditions for its specific purpose, forming an old basin that is readily and rapidly being transformed into an excellent slip or dry dock. When this basin was formerly used, the entrance was spanned by the bascule bridge on the C.P.R. which runs parallel to the canal; the abutments for the bridge being of concrete. The dam that at present prevents the water of the canal from entering the basin will eventually be replaced with a lock gate, so that the basin will form a dry dock 600 feet long and 150 feet wide; sufficiently large to provide erection and working space for four wood ships, each of which will be 250 feet long and of 42 feet beam.

Excavation is nearing completion, as will be seen from the accompanying photograph which shows the progress made at the middle of the present month. The buildings in the background are being equipped with the most modern machinery, so that with the possible exception of the first two vessels, and probably even for a large portion of these, the timbers used in the ships will be dressed directly from the logs being brought in by rail from the forests of Quebec and adjacent territory. For the present and immediate future, the timbers required will be brought from Oregon and British Columbia. The initial contract secured is for four standard 2,500 ton boats, and the keels for two of these are now being placed on the pile foundations which have been laid on the eastern bank of the slip. The illustration shows one of the main keel timbers being laid in position for the first vessel. The first two will be side-launched when completed. The keels for the other two will be laid in the bed of the slip, and when the boats are finished they will be floated by simply flooding the slip, water being allowed to pass through the canal entrance. This method will eliminate the construction of launching ways and will also facilitate the actual "launching" operation.

A tentative contract has been obtained for other four boats of the same class, and provision is being made to accommodate the entire eight at the one site; four in the slip and the remainder on the upper level. Buildings have been erected for offices, stores, air compressors, transformers, saw mill, also carpenter and machine shops. A mold loft 150 feet by 50 feet has also been provided. The power used throughout will be electric. The property adjoins both the G.T.R. and the C.P.R., admitting of facilities for the handling of materials promptly and direct to the job.

It is anticipated that within a few months Fraser, Brace & Co. will have a force of about 600 men employed as the first four boats are to be delivered by the middle of 1918. Their contract covers the building of the hulls only, the installation of propelling machinery, general equipment and the interior fittings being taken care of by other contractors.

SHIPYARD OF FRASER, BRACE & CO. IN THE MAKING AT MONTREAL. NOTE THE KEEL TIMBER FOR A WOOD SHIP BEING PLACED IN POSITION.

U. S. LENDS STEAMERS TO ITALY

THE United States Shipping Board has agreed to charter to the Italian Government approximately 25 American commandeered steel ships of an aggregate of 100,000 deadweight tons, to relieve Italy's shortage of shipping for the transport of urgently needed supplies. This action was announced on Oct. 26 by Chairman Hurley, of the Board. Great Britain has been supplying France and Italy with shipping to meet their emergency needs, but cannot continue to do so in view of her own increasing shipping requirements.

Italy has strongly represented its great need, and she gets five more ships than were allotted to the French Government earlier in the present month.

Part of the ships chartered will be old and part new, and some may be taken from those on the way from the Great Lakes to the ocean. They will be used between the United States and Italian ports.

Increase in Price of Coal at Mines.—President Wilson last Saturday granted an increase of 45 cents a ton in the price of bituminous coal at virtually all mines in the country, effective at 7 o'clock Monday morning. The new price will absorb wage increases recently agreed upon between operators and miners in the mineral competitive and other fields.

Brass and Other Copper Alloys Used in Marine Engineering*

By . T. Milton

In this paper it is intended only to deal with brass and other copper alloys in their different forms as they are used by the marine engineer, and it will be found that even with this restriction the subject covers a great deal of ground. The author is chief engineer surveyor of Lloyd's Registry. By virtue of his position he is therefore well qualified by experience to give an expression of opinion warranting close attention of all engaged on marine work.

THE first point to be mentioned is that of nomenclature, and this is found to be a very difficult matter. Marine engineers, as well as many others who use brass, bronze, and various alloys of copper and other metals, have very vague ideas as to names, calling all sorts of metals "brass" which are not true brass, and calling others "bronze" which are more nearly allied to brass than to bronze. In fact, we generally call parts of bearings "brasses" which are made of so-called gun-metal, phosphor bronze, or anything but brass. Even when they are made of cast steel or cast iron and lined with white metal they are often still called "brasses." Some of the white metals are sometimes called "bronzes."

The Terms Brass and Bronze

It has been recommended that the term "brass" should be restricted to alloys of copper and zinc only, but containing more copper than zinc, i.e., containing over 50 per cent. copper. An alloy containing a third metal is to be denoted with the name of the additional element used as a prefix. Thus the alloy containing 1 per cent. of tin, 29 per cent. of zinc, and 70 per cent. of copper used for Admiralty condenser tubes should be called "tin-brass." Similarly, the term "bronze" should be used to denote an alloy containing more than 50 per cent. of copper, the remainder being tin only. If other metals are present, then their names should be used as prefixes, thus the ordinary Admiralty mixture usually called "gun-metal," containing 88 per cent. of copper, 10 per cent. of tin, and 2 per cent. of zinc, should be called "zinc-bronze." It may be stated that these names have not yet come into general use, and both the terms "brass" and "bronze" are being frequently used in most misleading ways.

Even the name gun-metal conveys no precise idea, either of the composition of the metal or of what a gun is made of, as when copper alloys were used for making guns they were generally composed of copper and tin only; that is to say, they were "bronzes," whereas the term "gun-metal" is now more often employed to denote an alloy containing zinc in addition to copper and tin. Moreover, these guns were generally spoken of by the soldiers who used them as "brass" guns.

In this paper the alloys will be spoken of by the names usually employed, although they are admittedly not precise, but it is hoped that no misconception will arise through the use of these common names, as it is intended in all cases to state the main elements of their composition.

Copper-Tin Alloys

Copper-tin alloys were known and used in the remote past, in the so-called "bronze" age before the use of iron. It is stated that a rod of metal found by Dr. Flinders Petrie, at Meydum, was found to contain 89.8 per cent. of copper and 9.1 per cent. of tin. It was estimated to date from 3700 B.C. Objects of bronze were found at Troy, supposed to date from 1200 B.C. The first artificer we read of in the Bible was Tubalcain, who was an instructor of every artificer in brass and iron. In Hiorns' book on alloys there is a question from another work, in which it is stated that the word translated as "brass" in this and in other places in the Bible, probably refers to "bronze," an alloy of copper and tin. From Percy's Metallurgy, however, it is evident that real brass, i.e., an alloy of copper and zinc, was in use in Roman times. He gives the analyses of four ancient coins, all containing not less than 10 per cent. of zinc, of dates about 20 B.C., 60 A.D., 79 A.D., and 120 A.D., and also analyses of other ancient brass coins of somewhat later period; one of these has a composition which would be suitable for making condenser tubes. Percy states that although zinc was used in these ancient alloys, it was not known as a separate metal. He implies that it was not until the 16th century that zinc was so known, and that from the Roman times until then the brass alloy was made by what is known as the "calamine" process, a method which was in use in Great Britain so late as 1859.

Calamine

Calamine is a zinc ore consisting primarily of carbonate of zinc. In making brass 100 lbs. of calcined calamine was mixed with 40 lbs. of ground coal and a little water. This was then mixed with 66 lbs. of bean-shot copper and charged into crucibles which, in groups of nine, were placed in a furnace. The heat applied permitted the coal to combine with the oxygen of the ore. At a temperature somewhat below the melting point of copper the zinc which was reduced was vaporous and combined with the copper which, being in small pieces, presented a large surface to the action of the zinc vapor. The brass produced in this way has about the composition of 2 parts copper to 1 of zinc. "Calamine" brass was for a long time thought to be of superior quality to brass produced by the direct mixture of zinc and copper, which is the method of manufacture now always adopted.

Copper and Zinc Alloys—Brass

Copper and zinc alloy in all proportions, and the alloys throughout their range have been scientifically studied perhaps more than any other series of alloys. Law gives a table of no less than 144 records collated for the Committee on Alloys appointed by the United States Board (reported in 1881). G. Charpy, an eminent French metallurgist, in a volume upon alloys, published by the Societie Nationale d'Encouragement, Paris, has given a very complete account of the microstructure of these alloys. A. H. Hiorns in his book on "Metallic Alloys" gives a table of 54 different alloys mainly of copper zinc, but a few containing small quantities of other metals. He also gives a table of the freezing points of the alloys throughout the range, which table agrees with the curve given in the Fourth Report of the Alloys Research Committee of the Institute of Mechanical Engineers, which report deals with alloys of copper and zinc, and also those of copper and tin.

This report points out that the brass alloys which admit of industrial application are those containing from a minute proportion of zinc to 45 per cent. of that metal. When the proportion of zinc becomes as high as 50 per cent., the alloys become fragile. The report states that it is found that generally the limit of elasticity, the resistance to penetration, and the hardness increase with the proportion of zinc, the tenacity also increases until it attains a maximum at about 45 per cent. of zinc. The extensibility, compressibility, and reduction of sectional area increase with increase of zinc, but attain their maximum at about 30 per cent.

In alloying copper and zinc there is no doubt whatever that true chemical union takes place between the metals, but this can only occur in atomic proportions. The atomic weights of the two metals are nearly equal, being 63.2 for copper, and 65 for zinc. Various experimentees have considered that the compounds Cu Zn, Cu Zn, Cu_3 Zn_2, Cu_4 Zn, all may exist. In the tables of brass alloys quoted both by Hiorns and Law, compositions are given ringing by units right up to Cu_{10} Zn, and down to Cu Zn_4. What might fairly be considered is that the alloys containing the least proportion of zinc are composed of a compound of copper and zinc existing as a solid solution in copper, and that those containing more zinc as solid solutions of one zinc copper compound in another compound of different proportion.

Copper Zinc Alloy Structure

When copper zinc alloys are examined microscopically by suitably preparing etched and examined under a micros-

*From paper read before the Institute of Marine Engineers, the author being a vice-president.

and etching sections, it is found that all those containing from about 67 to 100 per cent. of copper have a uniform crystalline structure. Those of less copper content down to about 55 or 50 per cent. have a duplex structure; that is to say, they consist of two constituents, at about 50 per cent. one constituent only is present. The above refers to the metal, both in the annealed and also in the "hard-worked" condition. If, however, the metal is raised to a very high temperature and quenched, the duplex structure is found to have disappeared. Apparently the two constituents mutually dissolve into one another at a high temperature, and are retained as solid solutions by quenching. Slow cooling, however, permits them to again separate, and the slower the cooling the more complete is the separation which takes place. In the alloy named "Muntz metal," containing approximately 60 per cent. copper and 40 per cent. zinc, the separation is well marked.

Improved By Working

All the alloys containing 55 per cent. and above of copper have their useful properties considerably improved by working. Those below, about 66 per cent. of copper may be forged or rolled hot, Muntz metal being easily so worked; above 67 per cent. it is generally considered that the metals can only be worked cold. As the critical proportion, say 66 or 67 per cent., is approached, more care is required in forging hot. Muntz metal and the other low zinc alloys can also be worked cold as well as hot. In all cases of cold working every deformation given to the metal hardens it and renders it less able to withstand further deformation, but this hardness may be removed by annealing.

A remarkable example of how cold work can alter the shape of a mass of metal without producing fracture was given by Sir William Anderson in the discussion on the Fourth Report of the Alloys Research Committee, in an explanation of the manufacture of brass cartridge cases for 6-inch quick-firing guns. These are made from an alloy of 70 per cent. copper and 30 per cent. zinc. This is rolled cold into a plate from which circular discs are cut. The discs are then pressed cold into a cup shape, then annealed and cleaned. The cups are then gradually drawn out into close-ended tubes, thinner and thinner. each draw, except the last one, being followed by annealing and cleaning. In all, there are eight annealings, the whole of the work being done cold.

Marine Engineering Applications

The same alloy, 70 per cent. copper and 30 per cent. zinc, is also used for making condenser tubes, although sometimes a slightly higher percentage of zinc is used for this purpose, say up to 33 per cent., and similar metal is also sometimes used for cartridge cases. For the Admiralty, condenser tubes have a little tin added to the mixture, their standard proportions being 70 per cent. copper, 29 per cent. zinc, and 1 per cent. tin. In making condenser tubes the metal is first cast into tubes about 3½ inches external diameter, ½ inch thick. These tubes are then drawn down cold upon smooth mandrels several stages until they become of the finished size; each draw, with the exception of the last, is followed by annealing. The last draw leaves the tube "hard." The amount of "draw" or "pinch," or reduction of cross sectional area at the last operation is such as to leave the tube sufficiently hard to withstand the tendency to crush, owing to its being tightly packed in the tube plates, but not so hard as to be brittle.

As a surface defect on the inside of the original cast tube would not be entirely removed by the drawing process, it is usual to bore out the cast tube before any drawing takes place, and so produce a clean and good surface to start from. This, however, is not always done. The same alloy, viz., 70 per cent. copper and 30 per cent. zinc is used for making turbine blades. The process of making them, so far as the author is aware, has not been made public.

Condenser ferrules are made of an alloy containing a little more zinc than the condenser tubes. They are machined from tubes "hard" drawn, as for them hardness is a desirable quality, enabling them to be screwed up tight upon the packing without deformation.

The brass tube plates of condensers are usually made of "Muntz metal," i.e., an alloy of 60 per cent. copper and 40 per cent. zinc. For Admiralty work the mixture specified is 62 per cent. copper, 37 per cent. zinc. and 1 per cent. tin, and this metal is called naval brass. The tin is required, as it is thought that its presence assists in resisting corrosion. These plates are rolled hot.

Zinc and Alloy Strength

It has been stated that with these brass alloys greater strength is obtained with those containing a larger proportion of zinc. Many figures are given in different books of test results of the various brasses, their diversity is due partly to variations in the quantity of work put upon the metal, partly to the greater or less amount of annealing to which it has been subjected, and partly to the effect of impurities in the metal. Quoting the report on Alloys Research previously referred to, the alloy "with 40 per cent. of zinc elongates 40 per cent., with a strength of 23.8 tons per square inch. By adjusting the softening effect due to annealing and the strength produced by working, it is easy to increase the tenacity of bars and sheets to 38.09 tons per square inch, and to attain even greater strength in the case of wires."

In the same report there is a statement by Dr. D. Watson, the manager of the Broughton Copper Co., of Manchester, showing the effect of small quantities of impurities upon the strength and ductility of brass. He gives the following:—

	Tenacity per sq. inch tons	Elongation %
Brass containing 70% of copper and 30% of zinc.....	20.2	65½
Same brass, with the addition of 0.5% of iron	24.2	31¼
Same brass with the addition of 0.5% of iron and 0.1% of phosphorous	26.5	28

The above samples were thoroughly worked, and afterwards annealed before testing. Dr. Watson stated that the effect of iron was very marked, and that aluminum manganese and tin also had influence in increasing the tenacity and elastic limit, although they decreased the elongation.

Cold Working and Annealing

It has been mentioned that when much cold work has to be put on brass, as, for instance, in the manufacture of cartridge cases, seamless tubes, etc., the brass has to be frequently annealed. The temperature at which this takes place is of great importance. Law quotes some information from Mons. G. Charpy, which shows that when brass of 70-30 composition has been worked to its maximum condition of strength of over 30 tons per square inch, the full effect of annealing is produced by a temperature of 600 degs. C., which reduces the strength (cold) to 17.4 tons per square inch. Annealing below 280 degs. C. has practically no effect; at 420 degs. C. there is a marked softening effect, but the maximum is reached at the temperature stated above.

Some information as to the increase of tenacity due to cold work and also as to the effect of annealing at different temperatures was given by Captain C. Grard, of Paris, in a paper read at the Congress of the International Association for Testing Materials, held in 1912, at New York. He dealt with copper and also with brass containing 90 per cent. copper, 10 per cent. zinc, and brass containing 67 per cent. copper, 33 per cent. zinc, the latter being an alloy used for the manufacture of cartridge cases by the French War Department. He states that the brasses experimented upon were of good quality, very malleable when cold, but fragile and short when hot.

He further states that the effect of cold working was the same, whether produced statically (drawing and rolling) or dynamically (under a drop hammer), and that the effect of cold work was completely removed by proper annealing. In making experiments with drastic amounts of cold rolling, recourse had to be had to successive cold rollings without intermediate reheatings.

Although valuable properties are given to these brass alloys by cold work, such as increase of strength and of elastic limit, it must not be forgotten that the ductility is much reduced at the same time. When brass is subjected to much cold work it is liable to spontaneous fracture. Cases are not unknown of condenser tubes spontaneously cracking longitudinally, and of cold-rolled brass rods being found split after being stored for some time. Such occurrences are sometimes called "season cracking." The cause is to some extent obscure, but the fact that it occurs shows how unwise it would be to rely upon what may be termed an artificial strength produced by cold rolling for articles in which a failure would cause disaster. This is sometimes not sufficiently realized by engineers, who think they are securing a better article by specifying stringent conditions of high tensile strength and high elastic

limit which can only be obtained by cold rolling.

Useful information on the effects of cold work upon metals is given in the May lecture of 1914 by Professor E. Heyn, of Berlin, delivered at a meeting of the Institute of Metals, in which he shows that the internal strains are set up by cold working affecting the metal near the surface differently to that nearer the centre of the piece. He mentions that cold rolling and cold hammering produce tension strains in the core of the worked pieces, whereas cold drawing has the contrary effect, bringing about tension strains on the superficial layers and compression in the core.

Brass such as has been considered above is mostly used by marine engineers in connection with condensers, or as bolts and nuts, and is never used in details exposed to high temperatures. At high temperatures its tenacity becomes considerably lowered. In the Alloy Research Committee's report already referred to a table is given, from which the following is extracted:

Temperature.			Tenacity Tons per sq. inch
20 degs. C.	=	68 degs. F.	20.7
100 "	=	212 "	13.6
200 "	=	392 "	12.6
250 "	=	482 "	10.4
300 "	=	572 "	7.3
350 "	=	662 "	6.8
450 "	=	842 "	3.6
500 "	=	932 "	2.8

Tenacity of brass of composition copper 61.2 per cent., zinc 38.8 per cent.

Spelter, or Hard Solder

Another alloy of copper and zinc used in marine engineering is known by the names of "Spelter," and also "Hard Solder." It is used for brazing purposes. (Note the name spelter is also used to denote ingot zinc, but brazing solder is generally termed "spelter" by coppersmiths and engineers). This alloy is composed of copper and zinc, varying from 60 per cent. copper, 40 per cent. zinc, to about equal proportions of each, according to the purpose for which it is to be used; the higher proportion of zinc in any solder lowers the temperature at which it melts. During fusion, in brazing some of the zinc evaporates, leaving the solder on the finished article richer in copper than the original alloy. Hard solder is always made on a granulated form, which is obtained by casting the alloy into flat ingots. These are heated to a high temperature, judged by the color, and at this temperature it is very brittle. It is then pounded up into small pieces in an iron mortar. The broken pieces are sifted out to various degrees of fineness; the large pieces, if any should remain, are then repeated and repounded.

Pure Metal Essential

In making brass alloys it is important to use as pure metals as possible for the constituents. It has been stated that iron has a very marked effect upon the strength and ductility. Lead is often present in small quantities, being generally introduced along with the zinc, as much of the commercial zinc contains lead. It is, however, considered to be of great importance that the metal should not contain either antimony or arsenic, both of which may be introduced along with the copper. There is a workshop test known as the Muntz Metal test, practised in order to detect these impurities if their presence is suspected, either in copper or brass. A weighed portion of the copper or brass to be tested is melted in a small crucible and sufficient pure zinc is added to bring the proportion of copper and zinc to 60/40, the composition of Muntz metal. The resulting metal is poured into an open cast-iron mould, the quantity being sufficient to make a flat cake about 1 inch in thickness. This is allowed to cool. When cold it is nicked across with a chisel and broken. If the metal is good the fracture is fine and silky, but if even small traces of arsenic or antimony are present the fracture is different. The skilled workmen can in this way determine the proportion of either of these pernicious elements with almost the same precision as can be obtained in a chemical laboratory.

Copper, Tin, Zinc Alloys—Bronzes

We will now consider the bronzes, i.e., alloys of copper and zinc.

Pure bronzes, i.e., alloys of copper and tin only, are not much used by marine engineers, as almost invariably some zinc is added to the alloys, which in their various forms are usually misnamed either "brass" or "gun-metal." These alloys are used as castings, no forging work, either cold or hot, being put upon them. The reasons for their use for many purposes are the facility with which they can be cast to the shape required, their comparative resistance to corrosive influences, and their strength.

The alloy known as Admiralty gun-metal is composed of 88 per cent. copper, 10 per cent. tin, and 2 per cent. zinc, and this is without any doubt a very useful alloy. All kinds of boiler mountings, such as gauge cocks, feed and blow out and scum valves and chests, and the valves and seats of stop and safety valves requiring a strong and incorrodible metal, are made of this alloy. Sometimes where a little harder metal is required to resist wear, such as in some valves and valve seats, water gauge cocks, etc., the zinc is omitted and pure bronze is employed of a composition of 90 copper and 10 tin.

The addition of the zinc serves a very useful purpose in rendering the casting sound, besides the influence it has on the strength of the metal. When copper is melted and exposed to the air it rapidly oxidises, and molten copper has the property of dissolving the copper oxide so formed. When a bronze is melted both the copper and tin composing it are oxidised. The tin oxide is not soluble in the molten metal, but the copper oxide is; the tin oxide formed, therefore, remains on the molten metal as a scum, but the copper oxide disappears by going into solution in the molten metal. During the solidification of the metal at least part of the oxide becomes thrown out of solution and separated, and the result is a multitude of minute particles of copper oxide dispersed through the metal, which in consequence is more or less porous and unsound. If, however, there is a small proportion of zinc present, this metal has a greater affinity for oxygen than copper, and the copper oxide becomes reduced to metallic copper, giving up its oxygen to form zinc oxide, which, not being soluble in the fluid metal, rises to the surface in the scum. A small addition of zinc, therefore, permits a sounder casting to be produced.

Phosphor Bronze

A similar result may be obtained by the addition of a small proportion of phosphorus, which, as is well known, has a very great affinity for oxygen. When this is added to a copper-tin alloy the result is termed a "phosphor bronze." The phosphorus is added either in the form of phosphor-copper or phosphortin. Phosphor-copper is commercially obtainable in two forms, one containing 15 per cent. of phosphorus, the other 10 per cent., the latter melting at a lower temperature than the former.

If the precise proportion of phosphorus necessary to remove the oxygen is added to the bronze, the metal remaining is still called "phosphor bronze," although it will contain no phosphorus, but its properties are considerably better than those of a bronze not deoxidised.

Zinc is often used in the so-called "gun-metals" employed in marine engineering in considerably greater proportions than the 2 per cent. specified in the Admiralty mixture. It is sometimes said that the greater proportions are used because zinc is cheaper than either copper or tin. Lead is also often added, but not always with the view of making a cheaper mixture, as reference to Mr. Dewrance's research, to be presently referred to, will show. The addition of lead renders the metal less tough, and, therefore, more easy to machine, and for this reason it is, to say the least, not objected to by the machinists. It is also claimed for certain admixtures of lead that they render the metal more suitable for bearing purposes, by reducing the friction under heavy loads, and, especially in America, alloys containing considearble quantities of lead are used for bearings in heavy mchinery.

Microscopic Structure of "Gun-Metal"

The microscopic structure of the so-called "gun-metal" used in marine engineering work is peculiar. When ordinary castings are being machined with a fairly rough cut the surface is seen to present a mosaic of ordinary yellow and of a rather lighter color. Each portion showing one color is a crystal with different orientation to its neighbors, and the crystals so shown are fairly large, their size depending upon the rate at which the casting cooled from its liquid condition. When a cut surface of the metal is carefully polished and suitably etched and examined under a microscope, it is seen that each of the above-

mentioned crystals is really composed of a number of "dendrites," arranged in regular geometrical fashion like the divisions of a fern leaf.

What happens in the cooling out of the metal is that the particles which first solidify are richer in copper than the average of the metal. They arrange themselves in a skeleton form of dendrites. Next to solidify are other particles not quite so rich in copper as the preceding, these arrange themselves outside those already formed, and the process goes on, the skeleton drendrites becoming more and more clothed with metal less and less rich in copper, and the portion of the metal which still remains fluid becomes relatively poorer in copper and richer in the tin or tin and zinc, until a point is reached at which it all becomes solid. The dendrites thus formed have been referred to by American metallographists as being of "onion" type, not because the shape is that of onions, but because it is formed of successive layers deposited on one another. Suitable etching of sections of the dendrites shows by the deeper colors of the centres that this difference of composition exists.

Where the copper is not more than about 91 per cent. of the composition the metal cannot well be worked either by hammer or by roll, either hot or cold. With greater proportion of copper than 91, especially when the metal has been deoxidized by phosphorus, some amount of work can be put upon it, and we have made in this way the so-called "phosphor bronze" rolled sheets which are used for air-pump valves, and which are hard and elastic. It is also drawn into wire for electrical purposes where high conductivity, combined with high strength and resistance to corrosion, are required.

Heat Treatment

In view of the peculiar onion-like, minute structure of gun-metal, it may be thought that it will be possible to modify its qualities by such heat treatment as will make the constituents diffuse into one another and become a homogeneous whole instead of remaining of diverse composition. Experiments in this direction were made by Messrs. H. S. Primrose and J. S. G. Primrose, and were communicated to the Institute of Metals in 1913. They experimented on metal cast in ordinary dry sand moulds, and also on samples cast in chill. Their tests included raising the metals to different high temperatures, keeping them at these temperatures for different lengths of time, and cooling some by quenching, and allowing others to cool out as in ordinary annealing. Their conclusions were:—

1—No improvement results from heating and quenching which lowers the strength of the material.

2—Simple annealing of the metals for thirty minutes very considerably increases its strength and elongation, the maximum results being obtained after annealing at 700 degs. C.

3—The homogeneity and other physical properties of the metal are correspondingly improved, but particularly the capability of the castings to withstand hydraulic pressure.

In the results quoted in the paper the unannealed dry sand casting had a tensile strength of 17.2 tons per square inch, and an extension of 24 per cent., whilst that which had been annealed for thirty minutes at 700 degs. C. had a tensile strength of 18 tons, and an extension of 37.5 per cent. With the "chilled" castings the improvement was still greater. It may be stated that the requirements of the Admiralty specification for gun-metal are a minimum tensile strength of 14 tons per square inch, and extension of at least 7½ per cent. in a length of 2 inches.

High Temperature Effects

Although "gun-metal" is extensively used for boiler fittings, and therefore exposed to temperatures as high as that of high pressure steam, very little information is available upon the strength and ductility of the metal. There has, however, long been an uneasy suspicion that high temperatures considerably depreciate its qualities.

John Dewrance in a paper communicated to the Institute of Metals, gives some valuable information on this subject, which shows that the suspicion was well founded. Good Admiralty mixture with a tensile strength of over 16 tons per square inch, and extension of 11 per cent. when cold retains its strength up to a temperature of 350 degs. F. (corresponding to a boiler pressure of 120 lbs. per square inch). At 375 degs. F. (corresponding to 170 lbs. pressure), its strength fell to 13.5 tons per square inch, whilst at 400 degs. F. (corresponding to 245 lbs.), its strength fell to 9.2 tons per square inch, and its extension fell to 1 per cent. At higher temperature the deterioration was still worse. Mr. Dewrance, however, found that the admixture of a little lead to the metal considerably improved matters. If the tin and zinc were retained at 10 and 2 per cent. respectively, and the copper was reduced by ½ per cent. and ½ per cent. of lead added, the extension when cold was a little lowered, but the tensile strength was not affected. At high temperatures, however, a great difference was found. No reduction of strength took place until a temperature of 550 degs. F. was exceeded, and the extension was continuously improved right up to this temperature. Mr. Dewrance made similar experiments with still larger proportions of lead. His conclusions were that ½ per cent. lead gave the best results, but even more than this still left the metal better at high temperature than that containing none.

Alloys Claiming Special Strength

Attention will now be directed to some of the alloys for which very special qualities of strength, etc., are claimed. They all are composed mainly of copper and zinc, and all or nearly all contain a proportion of iron, some of them contain one or more other components, such as tin, aluminum, manganese, or nickel. They are mainly proprietary articles, and their exact composition and the methods of making them are supposed to be trade secrets; their composition, however, can easily be determined by analysis. The fact that iron could be added to brass, and that its addition strengthened the alloy, has been known for very many years, and such metals have long been known under the names of "Sterro metal" and "Aich's metal." Law states that these two metals each contain 60 per cent. of copper, 38 per cent. of zinc, and 1.5 to 2 per cent. of iron, although the composition, so far as iron is concerned, varies within wide limits. This variation was due to the imperfect methods of introducing the iron.

Delta Metal

In 1883 Mr. Dick took out a patent for manufacturing an iron-brass, which he called "Delta" metal, by introducing the iron in the form of an alloy of iron and zinc, which could be obtained of reliable composition, other metals, however, were added. Law gives the average composition of Delta metal as copper 55 per cent., zinc 42 per cent., iron 1 to 2 per cent., with small quantities of manganese, aluminum, tin, and sometimes also lead.

Delta metal, like most of these iron-brasses, can be easily cast, and it is also capable of being rolled or drawn cold, and of being forged hot. It is also often "extruded." In this process, instead of being hot rolled from a billet, finished bars are made by forcing the highly-heated metal through dies by applying a great pressure by means of a hydraulic press. By such means bars of almost any desired cross section may be made, but it is not generally considered that the quality of bar so made is equal to that of bars of the same composition made by the ordinary rolling process. Extrusion may be applied to most of the alloys containing from 55 to, say, 60 per cent. copper.

Manganese Bronze

"Manganese bronze" is another of the alloys frequently used. It really ought not to be called bronze, but might, perhaps, claim to be called manganese-brass, although the amount of manganese in it is exceedingly small. This metal is used for castings, especially for propeller blades, and it is also forged when required and rolled into bars from which studs, bolts, valve spindles, etc., are made. It is made by several firms who all have their own ways of introducing the iron, the vital constituents, into it. The basis of the iron in the case of this metal is Ferro-manganese.

It has been stated that copper when melted dissolves copper oxide, which is an undesirable constituent. The manganese has great affinity for oxygen, and hence acts as a deoxydizer. It, therefore, sometimes happens that the whole of the manganese added in the ferro-manganese leaves the metal as manganese oxide, as, however, the iron remains in the metal the desired

strengthening quality is preserved. Ferro-manganese also contains carbon, which no doubt assists in the deoxydizing process. Some tin is usually added to the manganese bronze used for propeller blades, and often some aluminum as well.

Analysis shows that the iron is not always uniformly distributed through a large casting, the difference sometimes ranging to from 1.5 per cent. of iron to as much as 4 per cent., even when taken from contiguous parts of the casting. When a sample containing much iron is polished for microscopic examination minute hard spots are seen in it. These are thought by Mr. Dewrance and Arnold Philip, the Admiralty chemist at Portsmouth, to be particles of an iron in alloy, due to the iron alloying with the tin, and a greater proportion being present than can be kept in solid solution.

Many analyses of manganese bronze have been published, Law gives the following:

	Copper	Zinc	Tin	Lead	Manganese	Iron	Alum.
Cast	57.20	40.14	1.18	0.02	0.03	1.33	0.10
Rolled	62.45	36.00	0.63	0.06	0.02	0.84	....

It will be seen how little manganese there is in either of these alloys.

Law states that nickel is sometimes added to manganese bronze used for propellers, in order to prevent erosion. It is undoubtedly present in one alloy used largely for forging purposes, which, however, is not called manganese bronze by its maker.

The tensile strength and elongation of good rolled manganese bronze is about the same as those of ordinary mild steel. Like mild steel, when the bars are used for studs the material ought to be annealed in order to remove from it any possible effect of cold working. When bolts are made from it by forging, the heating in the process effectually removes this particular trouble, but if bolts are machined out from the solid bar, as they sometimes are, then the bars should be annealed, as in the case of studs.

Aluminum Bronze

Aluminum brass, or, as it is usually called, aluminum bronze, has sometimes been used for propellers. This is very similar to the manganese bronzes, and like them contains a small quantity of iron. The aluminum is added to replace a small part of the zinc, the copper contents not being much varied.

Cast manganese bronzes of the special types as made by various makers can be relied upon to have a tensile strength of from about 30 to 35 tons per square inch. They are, therefore, about as strong as cast steel, but they do not corrode so much as steel. and can be made with good surfaces. The influence of a smooth surface in improving the efficiency of propellers is now fully appreciated, especially in fast ships, and with high speeds of rotation. It need not be mentioned how much greater efficiency is claimed by makers of special propeller bronzes over ordinary iron or steel screws.

When so-called "bronze" propellers were first used it was found that the iron of the ships suffered from corrosion in their vicinity; if by chance the paint became injured, this was put down to galvanic action. This led to a different composition being used for the propellers. Now, more trouble appears to be met with in the corrosion of the propeller itself, and in some few cases very serious deterioration has occurred, especially in quick-running propellers, such as are used with turbine engines. To meet this, makers have in some cases again changed the mixtures, and "bronzes" are made which are claimed to be non-corrodible.

For yachts and small craft, which are built of wood and are copper sheathed, and in which iron or steel shafts are peculiarly liable to corrosion, forged "bronze" shafts of different sorts have been used, but it cannot be said with marked success, as all of the forgeable bronzes are copper-zinc alloys, and all seem to be peculiarly liable to a form of deterioration to which the term "dezincification" has been applied. Copper-tin alloys would probably be more durable, but they do not possess the strength of the copper-zinc alloys. It is with the view of preventing, or, at least, retarding this dezincification that the Admiralty require at least 1 per cent. of tin to be added to condenser tube metal, and to all brass exposed to the action of sea water. The question of the best metal for making screw shafts for wood vessels will soon be raised in view of the decision to build a large number of wood steamers in the United States.

BRITISH PRODUCTION OF STAINLESS STEEL PROHIBITED

THE production of stainless steel for cutlery in Great Britain has been prohibited by an order of the Ministry of Munitions, Sept. 8, 1917. The order reads as follows:

In view of the difficulties in getting supplies of ferrochrome I am directed to inform you that from the above date the use of the same in connection with the manufacture of stainless steel for cutlery purposes is prohibited. Ferrochrome must only be used in connection with high speed, crucible carbon steel and alloy steel and, in the case of the latter, only where a priority certificate or other permit number has been obtained which will warrant the manufacture of the steel in question.

As will be seen, the prohibition relates only to stainless steel for the cutlery trade and, therefore, such steel can still be made for other uses providing that these are connected with the production of munitions of war. That such uses exist is not generally known, but it appears that the material has proved extremely valuable for various engineering purposes, says an English authority. Apart from cutlery, steel rendered stainless or rustless by the employment of chromium in its composition is likely to become a big factor in the engineering industry of the future.

COMMITTEE TO AID SCIENCE BOARD

TWO sub-committees composed of scientists have been appointed by the Advisory Council for Scientific and Industrial Research and will assist that body in its investigations.

One sub-committee will deal with the subject of mining and metallurgy and will be composed of Dean Frank D. Adams, of McGill University, chairman; Prof. S. F. Kirkpatrick, Queen's University, vice-chairman; Major Chas. L. Cantley, acting works manager, Nova Scotia Steel and Coal Company; A. A. Cole, Cobalt, mining engineer for the Temiskaming and Northern Ontario Railway Commission; C. V. Corless, general manager Mond Nickel Company; T. Denis, superintendent of mines, province of Quebec; Charles Fergie, Montreal; A. R. Globe, assistant manager Hollinger Mines; Prof. George E. Guess, University of Toronto; Prof. J. C. G. Willin, Queen's University; E. H. Hamilton, Trail, B.C.; Prof. H. E. T. Haultain, University of Toronto; Prof. A. Mailhiot, Ecole Polytechnique, Montreal; E. P. Mathewson, Toronto, general manager British-American Nickel Corporation; Lieut.-Col. D. H. McDougall, Sydney, N.S., general manager Dominion Steel Corporation; J. G. Morrow, Hamilton; Prof. J. Bonsall Ported, McGill University; F. D. Reid, Cobalt; W. Fleet Robertson, provincial mineralogist, British Columbia; F. H. Sexton, president Nova Scotia Technical College; Prof. A. Starsfield, McGill University; John T. Sterling, chief inspector of mines, Alberta; R. H. Stewart, Vancouver; J. B. Tyrell, Toronto; O. E. S. Whiteside, Coleman, Alta. An associate committee in chemistry has also been named.

According to Prof. Thomas H. Norton, the cost of nitric acid made by the Birkeland and Eyde process of fixation of atmosphere nitrogen was but little more than half that of the acid from Chili saltpetre at 1914 prices, and by the Ostwald process, from ammonia obtained from cyanamide in the first place, even less than half. The production of ammonia in Germany by the Haber synthetic process, according to the Frankfurter Zeitung, rose from 30,000 tons in 1913 to 60,000 tons in 1914, 150,000 tons in 1915, and 300,000 tons (estimated) in 1916. An output of 500,000 tons of ammonia is anticipated in 1917, containing 100,000 tons of nitrogen; at the same time 700,000 tons of sulphate of ammonia (140,000 tons of nitrogen), and 400,000 tons of calcium nitrate (80,000 tons of nitrogen) are expected to be produced, the total including 320,000 tons of nitrogen.

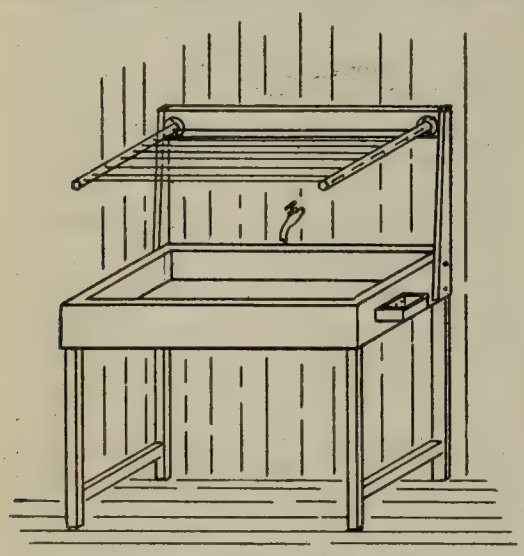
PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

BLUE-PRINT DRYING FRAME

By C. A. N.

IN the accompanying sketch is shown a firmly constructed blue-print drying frame. Made for the purpose of attaching to a wash-tray, where the walls in the drawing-rooms are of plaster instead of wood. It consists of a wood frame arch, having two projecting arms made from ¼ in. wrought iron pipe.



BLUE-PRINT DRYING FRAME.

These are screwed into pipe-flanges and then fastened to the cross-piece as shown. Holes are drilled in the pipes through which is inserted a continuous length of cord on which to hang the prints. A small box fastened to the side of the tray will be found handy to keep clips in. These, when left hanging on the cords, as is often the case, sometimes fall off and injure the print while it is being washed.

HANDY CHART FOR DETERMINING CUTTING SPEED

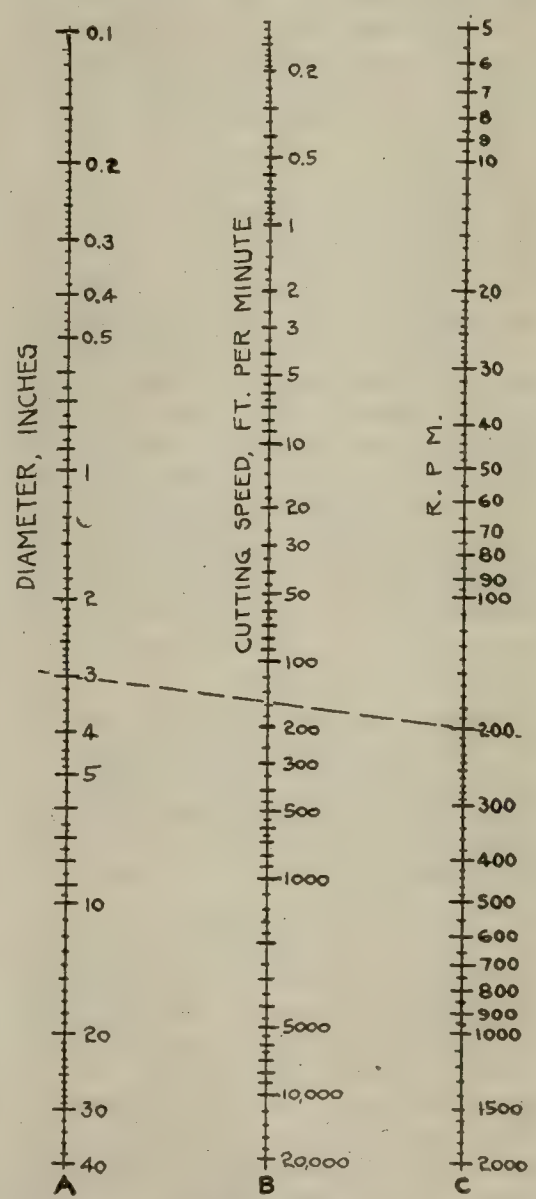
By N. G. Near

BY means of this simple chart any machinist can quickly determine the cutting speed of any piece from 0.1 to 40 in. in diameter by just taking out his watch and counting the rev. per min. of the stock, and by measuring the diameter of the stock in in. Then lay a rule across the chart and the middle column immediately gives the cutting speed in feet per minute.

For example, what is the cutting speed of a piece 3 in. in diameter when rotating at a speed of 200 rev. per min.? The dotted line drawn across the chart shows how it is solved. Connect the 3 (column A) with the 200 (column C) and the intersection with column B shows the cutting speed to be just a bit less than 160 ft. per min.

Of course, at the higher speeds it is not possible to count the rev. per min. "by hand" or mentally. The speed can be very closely approximated, however, by making note of the pulley sizes and speeds. Or, if you happen to have a speed counter, that, of course, will simplify matters greatly.

The writer ran across a good counting kink some time ago which does not seem to be generally known. In fact, I have never seen it written up. The idea is to count up to ten only, and then repeat the count, keeping tab all the while on your fingers. You can count much quicker than when you endeavor to



CUTTING SPEED CHART.

count straight along for the reason that you can go over the words "one, two, three, four," etc., much more quickly mentally than the words "twenty-one, twenty-two, twenty-three," etc. From one to ten all of the words are one syllable words whereas the farther along one gets the longer and more cumbersome are the words to pass through one's mind even though they are not spoken aloud. By counting to ten and then repeating over and over the writer has found it possible to count 600 r.p.m. with comparative ease. It is not necessary to count for a full minute. By keeping the eye on the watch and counting for 10 or 15 seconds a very close figure can be determined for the revolutions per minute.

This chart, it will be noted, has a very wide range—much wider than is ordinarily needed. Although the writer has never heard of a cutting speed as high as 20,000 ft. per min. it is inserted herewith nevertheless for we can never tell what will happen in the future. Stellite is doing cutting at amazingly high speeds these days. Perhaps something even speedier than stellite will some day be discovered. On the other hand it is hardly likely that anyone could ever endure the slowness of a cut that would creep along at the rate of 0.2 ft. per min., yet it is included in the chart because there is room for it and it may come in handy in some way or other although at the present time the writer does not see where.

Altogether the chart will be found to save considerable time, especially if the machinist has been accustomed to resort to the mathematical gymnastics otherwise necessary to arrive at the same results that may be obtained by simply laying a straightedge across the chart.

HOLDING WORK FOR INTERNAL GRINDING

THE unsatisfactory service rendered by the ordinary three-jaw chuck when used for manufacturing purposes was pointed out by James N. Heald in a recent article in Grits and Grinds. In most cases where such chucks are used, it will be

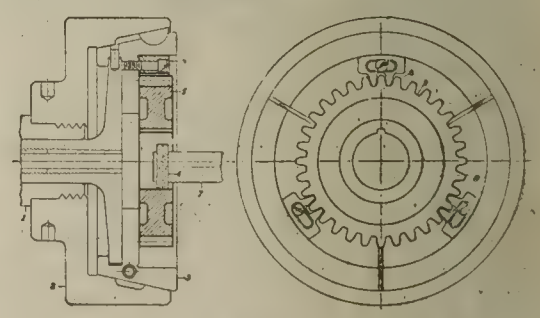


FIG. 1.

found that the time required for setting up is greater than for grinding, which is, of course, radically wrong.

A great amount of study has been given to the design and operation of various type of chucking fixtures to reduce the time required for getting the new piece in proper position for the grinding wheel. The attention given this matter usually accounts for the difference in production of one shop as

compared with another on exactly similar work.

For instance, in chucking gears one shop will equip its machine with a high grade type of gear holding chuck, in which the gear is trued up instantly by a method of pitch line control in combination with a drawn collet which takes but a moment to operate. In another shop the chucking method will be so crude that a similar gear will be held in a three-jaw chuck and the operator will either true it up with a piece of chalk, or some other device which will require a longer time than is required for both the chucking and the grinding of the gear when using a properly designed fixture.

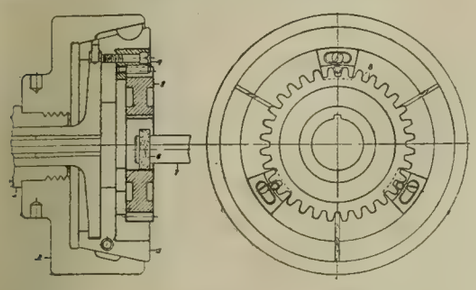


FIG. 2.

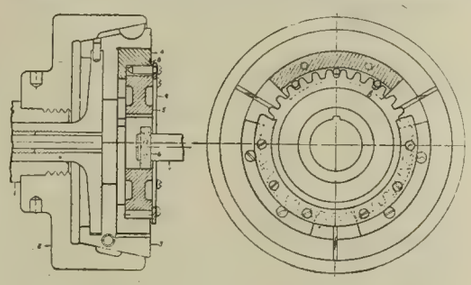


FIG. 3.

There are three methods of chucking gears in use:

First, holding the gear by the outside diameter, or tops of the teeth.

Second, holding the gear with jaws of special shape, making contact with the gear at the bottom of the tooth space, and known as root control.

Third, holding the gear by using rolls between the teeth, sometimes called pitch line control.

In regard to these methods, first, the outside of the blank is very often not exactly true with the hole and even if it should be, the teeth will sometimes be cut eccentric if the arbor does not run true in the gear cutter, or if the gear is a loose fit on this arbor.

Still another chance for error occurs when a string of gears is cut at one time and the hubs are not absolutely uniform in thickness at all points, because the clamping of these together will tend to spring the arbor on which they are mounted, especially if its diameter is small compared to the total length of the hubs, and the gears in the centre of the string will then be cut eccentric, both as regards the hole and the outside diameter.

For this reason, holding gears by the outside diameter is not a satisfactory way to locate for grinding.

The second method, which has been used to some extent, is based on the principle of having the holding jaws make contact at the bottom of the tooth space and has certain advantages.

This method is illustrated in Fig. 1 which shows a jaw having two contact points reaching to the bottom of the tooth space. According to this method it does not matter whether the outside diameter is concentric with the cutting of the teeth or not, as this surface is not used. It is a simple matter to maintain the accuracy of the jaws because the points which make contact with the gear can be trued up occasionally with the grinding wheel used in grinding the hole, and, of course, does away with the continual truing up of each gear individually in chucking.

The disadvantages are that sometimes gears are roughed out with what is known as a stocking cutter and this cutter may go to a depth beyond the point reached by the finishing cutter and in that case, of course, the surface which these jaws would make contact with would not be exactly right.

Another difficulty is that the bottom of the tooth space has usually rather large rounding corners and very little flat surface for the jaws to come against and this makes it difficult to locate the jaws so that points will not ride up on the rounding corners and give inaccurate results.

We therefore favor the third method, namely, that of pitch line control, for securing the best results, and it is the writer's belief in the great majority of cases that a properly designed fixture working on this principle will give results of the highest grade and be most satisfactory in everyday service.

While such chucks have been designed using three rolls around the circumference of the gear, as in Fig. 2, it has been our experience that a larger number is far more desirable and gives a better average setting, and we therefore recommend a larger number running from five rolls with small pinions having from 12 to 15 teeth, to nine rolls with gears having say, 40 or 50 teeth, the number used always being odd, like 5, 7 or 9.

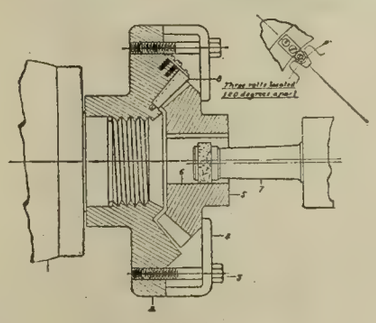


FIG. 4.

A very successful form of chuck of this type is illustrated in Fig. 3, arranged in connection with an ordinary draw-in-collet chuck. This cut shows a number of rolls, nine in fact, arranged around the circumference of the gear, each collet in this case supporting three rolls. These rolls are carried loosely in a light metal ring, or retainer, which allows the rolls to enter freely between the teeth of the gear and come to a firm bearing on the machine surface.

The tapering ends make it easy for the rolls to be inserted between the teeth and also to easily enter the chuck along with the gear.

The rolls can be fastened to the collet jaws if preferred, but the mounting of the rolls in the retainer ring as shown in this cut enables the operator to more easily keep dust and grit from getting behind the rolls where it would be likely to affect the accuracy of the chucking operation.

To maintain the accuracy of the chuck, the face of the blocks behind the rolls should occasionally be reground to a true surface.

Chucking Bevel Pinions and Gears

Figure 4 shows a method of holding bevel gear blanks by the use of three sets of taper rolls located at three points around the circumference of the gear to enter the spaces between the teeth and locate the gear in the correct position according to the pitch line.

These taper rolls can be so designed as to make contact the entire width of the face of the gear by having the correct relative proportions as to diameter and taper. This makes an extremely accurate device for holding bevel pinions, and if quiet running and high grade results are desired the chuck will quickly repay the cost of manufacture.

Fig. 5 illustrates an excellent method of holding large bevel gears, such as are used in automobile transmissions. According to this method an unhardened gear (as shown at 2) is mounted on the face plate, which can be recessed slightly to center this master gear so that it will run perfectly true. The gear to be ground is turned with its face to the master gear, and held by three clamps (as shown at 4). It is a good plan to cut back a portion of the teeth of this master gear, as shown in the cut at the right of 5, leaving full length teeth, as at 6, at three points in the circumference.

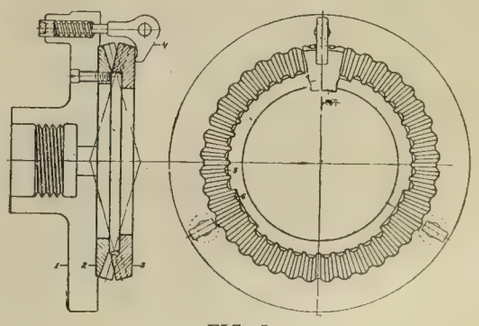


FIG. 5.

The gear to be ground will then run true, and will not rock on its support because of the three points of contact, and the teeth of the gear will run as true as it is possible to make any gear of this character.

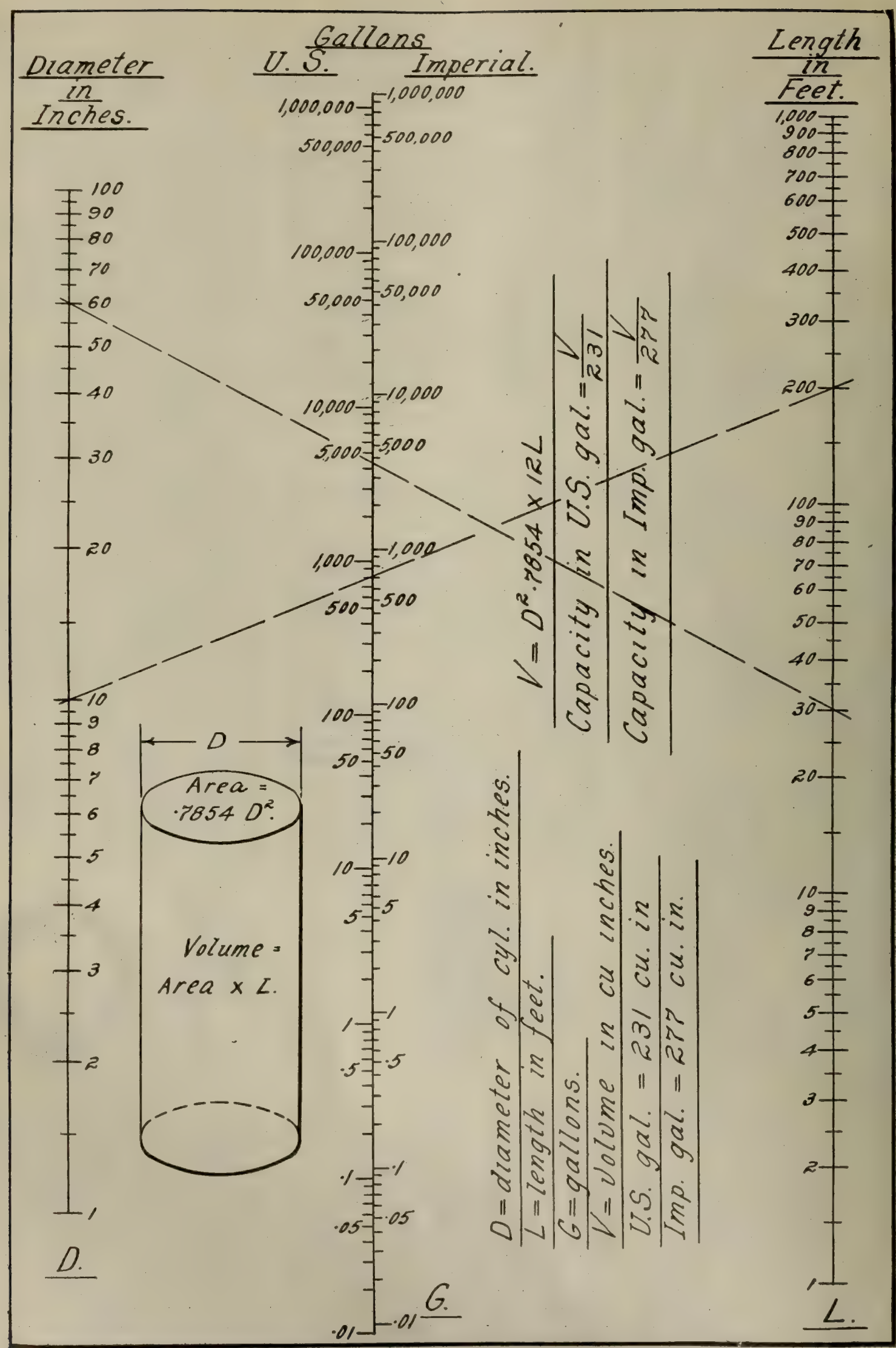


CHART OF CYLINDRICAL TANK CAPACITIES.

CAPACITY OF CYLINDRICAL TANKS

CALCULATIONS for the capacity of cylindrical vessels are often tedious work to those not very familiar with the method by which these results are attained. While many handbooks can be had that give the tables for the various capacities for certain diameters, it is invariably the case that the time occupied in securing the desired information is greater than would be required to figure it out. It is well, therefore, to learn the principle by which these mental problems are solved. Generally speaking the capacity of a vessel is computed in gallons, while the dimensions are invariably given in feet or inches, and it is, therefore, necessary to determine the volume of the interior and find the corresponding capacity for such a volume. The volume of a cylindrical vessel is found by multiplying the area of the base by the length or height. The area is .7854 times the square of the diameter; for instance, it is desired to find the volume of a cylindrical tank 15 feet in diameter and one foot deep. The area of the base would be $.7854 \times D^2 = .7854 \times 15 \times 15 = 176.7$ sq. ft., and one foot in height would give a volume of 176.7 cu. ft. One cubic foot of water contains 6.23 Imperial gallons or 7.48 U.S. gallons; therefore the capacity of the above tank in Imperial gallons would be $6.23 \times 176.7 = 1100.8$ Imp. gallons. In United States measure the capacity would be $7.48 \times 176.7 = 1321.716$ U.S. gal. In smaller tanks where the diameter is usually given in inches and the respective volumes of an Imperial and U.S. gallon are 277 and 231 cu. inches, it is customary to use these latter values in calculations.

A cylindrical tank 60 inches in diameter and 30 feet long would have a volume of $.7854 \times D^2 \times L = .7854 \times 60 \times 60 \times 30 \times 12 = 1{,}017{,}878$ cubic inches. The capacity in English measure would be $1{,}017{,}878 \div 277 = 3674$ Imp. gal. In U.S. gal. the capacity would be $1{,}017{,}878 \div 231 = 4406$ gal.

To convert Imperial gallons to United States gallons multiply by 1.2; thus, in the above example $3674 \times 1.2 = 4408$ U.S. gal. To convert U.S. to Imperial multiply by .833.

$4406 \times .833 = 3671$ Imp gal. The small differences in the values result from the slight error in decreasing the number of decimal places in the constants 1.2 and .833. These constants are derived from dividing the respective volumes by each other; as 277 divided by 231 gives 1.199, and 231 divided by 277 gives .833.

It is often possible that an approximate value is sufficiently accurate for tank capacities, and for this purpose the accompanying chart will be found of great service. On the graduated scale D, to the left, are given the various diameters of tanks in inches, and in the right-hand column L the length in feet. A straight line drawn from any two points on the two outer scales will interest the middle column G at the approximate capacity in U.S. and Imperial gallons.

AN EMERGENCY SHRINK FIT

By J. H. R.

IN order to make a satisfactory shrink fit, it is necessary that the shaft be slightly larger than the hole into which it is to be placed; however, some time ago I had occasion to see a fit of this kind made where the part has been used as a running fit, and the result was all that was expected and answered the purpose very nicely. A piece of light tin was secured and cut to a size equal to the length of the hole and a width equal to the circumference of the shaft; the bracket containing the hole was then heated to a dull red and placed over the thin tin bush, so that when the outer portion cooled off, the fit was almost as good as if the contact had been made between the shaft and the bore. To assist in keeping the shaft perfectly tight, a pin was driven into a drilled hole, but after several week's service, no slackness was apparent.

BENCH LATHE KINKS

By G. C. White.

KNURLING is a simple operation which, however, needs to be carefully done. The appearance of nice work is often spoiled by poor knurling or the time required to do this class of work is exceeded in setting up. In performing this operation

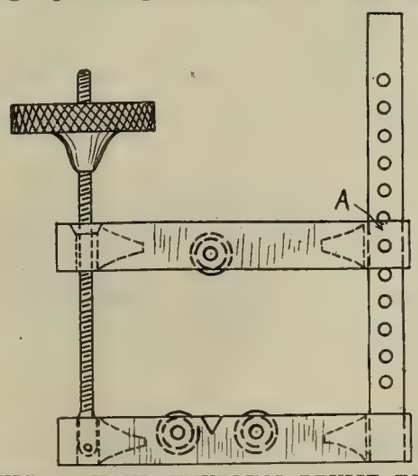


FIG. 1. HAND KNURLING DEVICE FOR BENCH LATHE.

on a lathe it is customary to place a tool in the cross slide holder and force the knurl radially into the work. This procedure necessitates setting the tool square with the work, and if the work is long and slender it may spring and consume considerable time, or if the tool

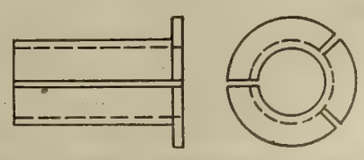


FIG. 2. SPLIT BUSHING FOR USE IN REGULAR COLLET.

was not squared up, the appearance will not be pleasing to the eye. The Acme screw machine equipment includes a knurling tool holder where the knurls are placed one above the other, and the work is located between the rolls, which makes the pressure of the one equalize the pressure of the other. This permits of knurling the full depth at one time.

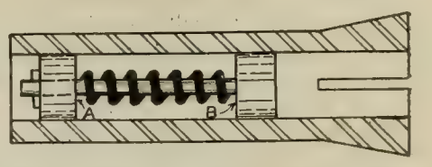


FIG. 3. SPECIAL COLLET WITH SPRING STOP FOR REPETITION WORK.

A knurling tool of this type for bench lathe work, one which is efficient, requiring a minimum of time to set up and perform the operation, is illustrated in Fig. 1. Two rolls are cut right-hand and one left-hand. The pressure is counterbalanced and is adjusted by the knurled clamping nut. The tool is held in the hand and the speed of the machine is slightly reduced. The distances between

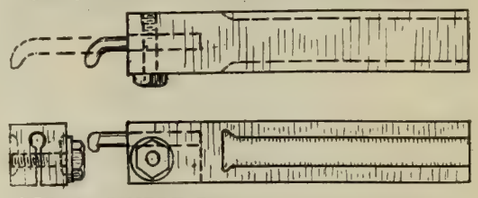


FIG. 4. SIMPLE TYPE OF BORING TOOL.

centres of the rolls can be varied to suit any diameter of stock up to 1½ in. by drawing the pin A and inserting it in the proper hole. Kerosene used freely keeps the work and knurls cool and free from cuttings. One cut is sufficient, but sometimes it is necessary to traverse the work twice if the steel is hard. The angle of the cutting teeth should be varied to suit the quality of the metal being cut, but the details given in the tables have been found satisfactory for ordinary work on steel and drill rod.

	Fine Knurl.	Coarse Knurl.
Dia. inches	.58	.60
Lead, inches....	2.50	2.78
Number of teeth	50	47
Angle of cutter.	45°	45°

Collet Kinks

An improvised collet can be made quickly by inserting a split bushing in an ordinary collet of larger size. It frequently happens that some other fellow has the collet that you require in his lathe, or that you are using some drill rod which the collets on hand in the tool stores will not suit, and to hold up the work long enough to make a regular collet would be impossible, to say nothing of the expense for possibly a small job. These split bushes, as shown in Fig. 2, can be made up to suit the odd sizes, and they will save many steps and temporary hold-ups.

The collet shown in Fig. 3 is for use on machines employed on bench lathe repetition work requiring that the back face of the work be gripped in the collet, so that the axis of work is parallel to the axis of spindle. The block or plug A is a pressed fit for the bore of collet, and the block B is a sliding fit. The work is

pressed against the face of the sliding block compressing the spring. The collet drawback is tightened, and after the operation has been performed the spring will force the work out of collet when the drawback is released.

The boring tool illustrated is simple and hardly needs describing, and yet it is astonishing how many boring tools are made with adjustments to permit of boring different sized holes by adjusting a thumb nut. These latter bars I have not found satisfactory, in that they are not rigid enough for fast work. The tool is a piece of drill rod and the bar is split at the end, the tool being held by the clamping nut, which pinches the split portion of bar together.

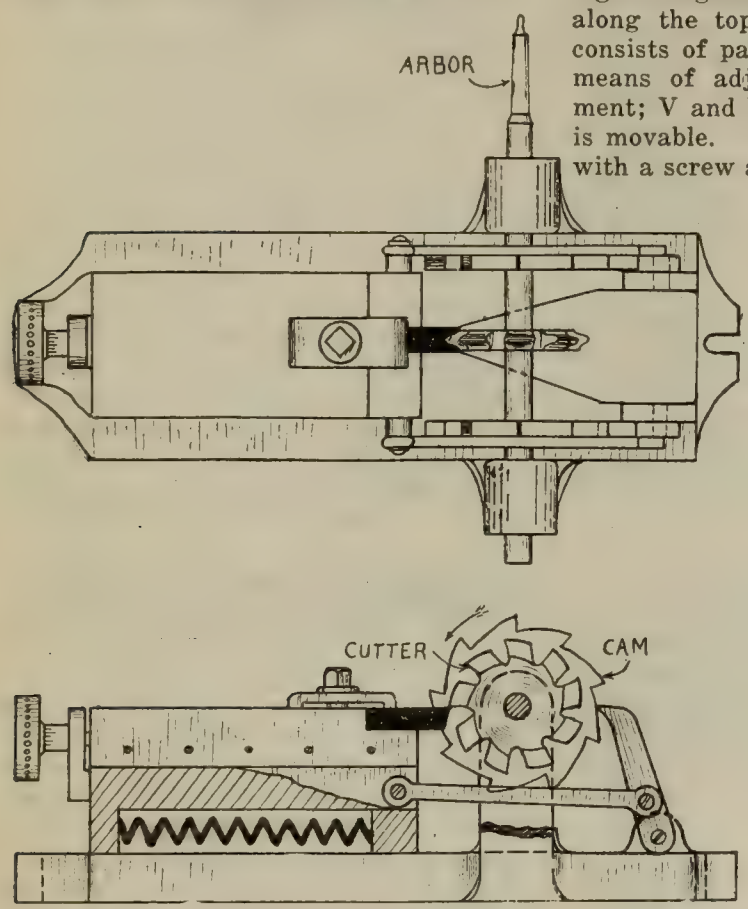


FIG. 5. RELIEVING ATTACHMENT FOR USE ON BENCH LATHE IN MAKING SMALL CUTTERS.

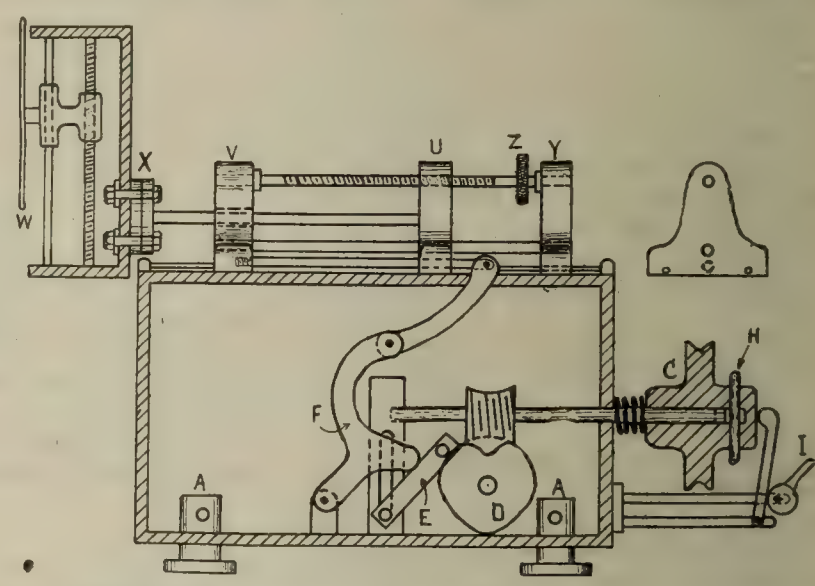


FIG. 6. AUTOMATIC FEED ATTACHMENT FOR BENCH GRINDER ON LATHE.

Fig. 5 illustrates a relieving attachment for small cutters. The attachment is placed on the lathe bed, arrangements having been made in the course of manufacture to provide means of locating the spindle in line with the lathe spindle. The jig spindle is inserted in the lathe spindle and the sketch is self-explanatory. The economical feature of this little jig is that it does away with the tying up of a larger machine.

Automatic Feed Device

In Fig. 6 is shown an automatic feed attachment for a bench grinder. This mechanism fits on the lathe bed just back of the regular grinding attachment, and it is secured in the T slot by means of the T bolts (A), which are tightened by eccentric bolts through the holes and into the housing at the back. The pulley C with the pin H is kept out of mesh by means of a spring, and when it is desired to use the jig the eccentric lever I forces the pulley and pin back against the U slot in end of shaft which it rotates. To this shaft is fastened a worm, which engages with a worm gear attached to a heart-shaped cam D. This cam transmits motion to a lever E, which transmits it to another lever F. Lever E has a means provided to adjust the location of its centre, which varies the stroke of the contrivance. The reciprocating arrangement, which rests and slides along the top of the rectangular box, consists of parts U, V, Y, which provide means of adjusting the relative movement; V and Y are tied together, and U is movable. This movement is obtained with a screw actuated by the knurled nut Z. The brass disc W butts against the handle of the grinder attachment and gives it the rectilinear motion. If the grinding attachment is swung at an angle, the small discs are swung to suit. Two of these machines can be operated by one man, and it is obvious that, on certain classes of work, there is considerable economy to be gained.

FUEL SHORTAGE LIKELY IN COMING WINTER

THE following memoranda indicate that there will be a greater coal shortage next winter than last, and, therefore, we should arrange for our fuel supply accordingly:

1.—Great Britain is short 15,000,000 tons of coal; France lacks even more; the coaling of Allied warships on the Atlantic coast, the naval, domestic and industrial requirements incidents to the entrance of United States as a belligerent, all mean that the coal production must be increased.

2.—United States officials anticipate that next fall there will be unprecedented demands on rolling stock as well as greater difficulty in handling the production.

3.—The situation is that the United States companies have placed an embargo on coal going out of that country, and the United States desires to keep coal cars in that country for any emergency that may arise.

4.—The present rather acute shortage of coal in many quarters will not be helped by war conditions in the United States.

5.—Coal prices have generally increased, and, unless there is Government regulation, they will reach higher levels.

6.—The U.S. Geological Survey, as well as other agencies having knowledge of the facts, is urging all consumers of coal, both large and small, to store their winter's fuel during the summer months.

In so far as central and western Canada is concerned, the situation is intensified by the fact that owing to the coal strike in the West some 200,000 tons has already been lost from production this year; also, owing to the shortage of ships and the great demand for iron ore for the manufacture of munitions, much less coal than ordinarily was brought up the Great Lakes last year, so that there are practically no supplies on hand.

From the above it is evident that, to be assured of our winter's supply of coal, and, at the same time, save inconvenience and perhaps higher prices, we should buy coal during the summer months wherever and whenever it is available.

The Dominion Government has appointed a Fuel Controller to take charge of the situation, and the coal dealer and householder can assist by filling their bins now with sufficient coal to last through the whole winter. By so doing they will help out conditions when the railway congestion occurs next fall.

Quebec.—The big dry-dock at Quebec on the St. Lawrence is now nearly completed. The boilers and machinery have been tested, the new gates are in position, and the coffer-dam, or false gate, blown up. Within a few weeks it is hoped to fill the dock for the first time, but as the approach has not been thoroughly sounded, it is not expected that any ship will enter the dock this year.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

A FEW NOTES ON PRODUCTION

By Chief Examiner

THE first aim and object of the manufacturer of any article, is obviously "production". To make the goods in sufficient quantity, and with the least expense is of course his principal endeavour. Just how to accomplish this end is often the cause of a great deal of worry, and, in many cases, of loss of sleep to not only the head of the firm, but to his superintendent and foreman.

After all, it is not such a big matter as it would seem to be. There are many points which the head of a firm should look to. Among those we might select first, machinery; second, organization; third, quality.

In discussing those three points, it must of course be taken for granted that the order for the goods is there and that suitable premises for their manufacture are in the possession of the manufacturer. The same principles apply to the making of all articles, but for the sake of the argument I propose to choose the making of 4.5 high explosive shells as the base, from which will grow the "production."

Machinery

The first point is the machinery. It is far better, and more economical in the long run, to procure new machines rather than old, or even second-hand ones. To get a true bore the boring lathe must be on a solid bed, and all parts must be tight. The same applies to the eccentric turn, the finishing turn, the milling machine, and all others.

Then the speed at which the work revolves must be just the right speed at which the greatest number of shells can be turned out at the required standard of efficiency.

One very important thing, under the head of machinery, is the question of tools. A superintendent should see that a duplicate set of tools for each and every machine is always on hand. He should further see that those tools not in actual use are always kept in a properly sharpened state so that the work is never stopped because of defective tools. He should also make a point of having two or three machines always ready so that, in the event of a breakdown, he can transfer the work to one of the auxiliaries. There should be a machine for every operation, and each individual operation should always be moving—never still. Much could be said from the machinery point of view, but there are probably more important points to be gained from the second phase viz.:

Organization

Organization or system, is undoubtedly the life of a factory. If it is not, it should be; for without it the firm might just as well go out of business first as last. The first thing to do is to pay good wages—not on an exorbitant or fancy scale, but sufficient to be fair and just according as the man is fair and just to his employer. Start him at a low figure, then, immediately you see he is showing an interest in his work, raise his rate and keep it raised. Don't cut a man because he is turning out a large number, but—and this is important—insist that all work that has to be rectified from his machine is done by him—for nothing. If you find him "banking," fine him at once. Make it perfectly clear that all work done in a day must be booked for that day, and not carried on to the next. In many cases the day operator "works it" with the night man, then, of course, the night man repays the favor, at a cost to production.

Watch carefully for spoilages. Sometimes you will find them dumped outside a window or hidden in all sorts of corners. This brings up another point to consider. Once every week have a clean-up. Bring all the rectifications up to date—I refer to the earlier operations in the making of the shell. If you have many "eccentrics," get them put through by "drawing the centre" and don't hoard them up. If they are too bad send them back to the steel plant as soon as possible. Any shells that develop flaws, seams, etc., should be put into storage to await the steel man, but —clean your floors thoroughly every week.

The Importance of Plant Layout

A good point to emphasize is the laying out of a plant. Have all the operations follow one another consecutively and eliminate trucking and carrying as much as possible. Some firms do two or three operations on one side of the factory and the fourth away across on the other side. This is not only silly, but a great loss of time and production.

Divide the entire manufacture into three parts; one, from the commencement to, say, the preliminary shop inspection bench; the second, from there to the final shop inspection bench; a third, from entering the varnish room to the shipping of the shell. The superintendent would of course be boss over all, but under him one foreman could control the 1st part, one the 2nd, and another the third. Under the 2nd, or finishing part, there should be one man to run a machine equipped for rectifying only, with another man to handle the rectification from the government room—or two if necessary. The foremen in the first and second parts should devote their attention to keeping the work going, and should supervise everything that has to do with the machines and the operators, making their first endeavour that of getting the greatest possible number of shells through per day.

Shop Inspection

A very necessary department, however, is that of shop inspection. There should be an efficient chief shop inspector having under his personal control a staff of inspectors. These should have full control of the quality of the work and should be placed at various points to enable them to supervise each operation. There should be one inspector at the bores, who should control the shell from the rough turn to the base cut off. Another should take charge of it through the nosing press, and watch that the proper heat is given.

One man should inspect every shell that is finished in the interior profile to see that the tool has not worn. If it does so, a ridge is almost sure to develop. Another inspector should take charge of the finished turn, first weigh, and transference of the heat number from the base to body. He could also take in the "waver"—the machine that cuts the driving band recess and wave ribs. Hogging the base recess and finishing the same is a simple operation which the chief inspector could keep his eye on.

Then there are the preliminary and final shop inspection benches, which should have sharp experienced men at them, men who will act without fear or favor. One inspector should look after the nose operations; another, the base plates and bands; and yet another, the varnish and paint. If all those inspectors do their work properly and remain impervious to, and fearless of threats, inducements, or favoritism, there is no reason why shells of high quality should not be produced in large numbers.

Quality the First Aim

This brings us to the third point—that of quality, which should be your first consideration as an employer or foreman. There is a government man on the job, who, if he does his duty, will insist on a certain standard. It is of no use for a manufacturer to expect to "get things passed" which do not conform with the wishes of this autocrat—for such he undoubtedly is. What is the use of sending in shells which are faulty for government inspection?

Take an instance of loose base plates. It is not only perfectly easy, but obviously the proper thing, to find that they are loose at the base facer. If the shop inspector is attending to his work, not more than six loose plates

should pass him without the matter being reported and rectified.

The same thing applies to high or low or loose bands, the threads in the nose, the fuse hole recess, the container seat, and in fact every detail.

Co-operate With Government

Faults should be detected and rectified by the shop before going to the government room. Government rectifications mean double work for every body concerned and never fail to cause friction between the inspectors and shop. Some firms work on the principle of "Let it go through; take a chance on it; they will not see it." This is very foolish indeed because "they" always see it.

Another foolish thing is for the shop to argue with the government man and try to make him out to be wrong. He is only human, and can make mistakes, but he demands a standard and he will get it, no matter how much argument is offered.

It is not wise for the manufacturer to be continually asking for "rulings." Make your shells properly and you will not require them.

Still another word of advice—never try to work the government production department against the government inspection department. This has often been tried and always fails. These two departments work hand in hand with one another and it always works out, in the long run, that the production department favors inspection, and the n-spection department favors production, but each attends to its own business first.

Now, Mr. Manufacturer, the boys at the front want shells, shells, shells. Produce to your limit—aye above your limit, if possible. Attend to your tools! Organize! Make a system and stick to it. Turn out a first-class article. Give equal attention to quality as to dollars and cents and don't quibble. You make the shells, and the dollars and cents will fall on you in showers, but cut out fighting inspection.

PROSPECTS OF COMMERCIAL AERONAUTICS

THAT the development of the aeroplane business after the war will take place on sound, rational business lines, is the opinion of C. G. Grey, editor of *The Aeroplane*. In a recent article contributed by *The British Trade Review*, he quotes present conditions and outlines what he considers as very certain probabilities of the near future.

Obviously aircraft will be of the greatest use in those countries where the land is least served by railways and roads, such as the great plains of Canada, the United States, South America, Australia, Africa, and Asia. The great feature of the aeroplane is its high speed over the ground. But this high travelling speed is counterbalanced by delays in starting, merely because one cannot have a big aerodrome in a big city. At present, if anyone wanted to run an air-line between London and Birmingham—a matter of 110 miles, and therefore about an hour's flying—he might use the Hendon Aerodrome as his London terminus and the Castle Bromwich Aerodrome as his Birmingham terminus. It would take about an hour for passengers to get to Hendon by taxi from anywhere in London proper and get started, and it would take them pretty near an hour to get into the heart of Birmingham from Castle Bromwich. Therefore the "house-to-house" journey would take three hours, whereas a train only takes two hours from Euston to New Street, which stations are within a quarter of an hour by taxi of anywhere in their respective cities where most travellers would wish to go.

A Great Achievement

Over a long journey it is quite another story, for then the high speed of the journey itself more than makes up for terminal losses. For example, London to Paris has been done over and over again in less than three hours by real passenger machines. In one case a Handley Page biplane, carrying a pilot, six passengers, and 900 lb. of luggage (150 lb. per man, or just about first-class allowance), flew, from an aerodrome not far from London, to Paris in 2¼ hours. Now the best trains used to take three hours for the Paris to Boulogne run, after which there was all the trouble of transhipping at Boulogne and Folkestone, and the whole journey used to take something like seven hours.

Another aspect of present conditions is shown by the case of a ranch owner in the Argentine who considered it would be a good idea to inspect his property once a week by aeroplane, instead of once a month on horseback, and at much less trouble. He came into Buenos Aires the typical ranchero, bought an aeroplane, and started to learn to fly at the local aerodrome. In a few months the local aviators found he was a very good flier, and so presently the shy but farsighted ranchero became a popular hero of the air, and quite one of the "knuts," so to say, of Buenos Aires. Anyhow, he did not do any ranch inspecting by aeroplane.

How To Buy An Aeroplane

But after the war all that will be quite different. There will be hundreds of big aeroplane firms run by sound business men, and they will go about their business in a proper commercial manner. Take my Argentine friend, for example. Instead of going to the local aerodrome and being lost in the whirl of the gay city, he, or his kind, would merely write to a few aeroplane firms whose names they had seen in the aeroplane papers, and after a little paper negotiation a representative of the firm would fly to his ranch to see him, and would probably pilot him round the various outlying stations to show how it could be done. Then, if the ranchero decided to go in for an aeroplane, the firm would either supply him with a chauffeur or would send an instructor down to act as chauffeur till the owner himself could fly well.

To take a bigger example, suppose a colonial Government wanted to buy a dozen aeroplanes, and perhaps two or three airships, for commercial purposes —which would, of course, include post office work—after the war, they would presumably go to their local aviators for advice. The local aviators, having probably flown in the war, would all have their particular likes and dislikes of different aircraft manufacturers' workmanship or design, and so the colonial authorities, being mostly English, would form a committee to talk it over for a few months. In the meantime the local aviators would probably each have written to some friend in England about it, and so one or two enterprising manufacturers would have heard about the proposition. They would promptly send representatives out with sample machines, "just exactly what you want for your special conditions" kind of thing. And very probably the colony would get what it wanted.

A Topeka business man employs two negroes to work on his gardens, which he personally oversees. One morning Sam did not appear.

"Where is Sam, George?" he asked.

"In de hospital, sah."

"In the hospital? Why, how did that happen?"

"Well, Sam he been atellin' me ev'ry morning' foh ten days he gwine to lick his wife 'cause o' her naggin'."

"Well?"

"Well, yestiddy she done ovarheah him, da's all."

Critics of the lack of reverence on the part of modern youth take considerable pleasure in relating the story of a certain Middle West boy who was hearing for the first time the cherry-tree-and-hatchet story. It was very dramatically related by a patriotic aunt, but Louis was not so deeply interested as he might have been. When the climax was reached and George Washington said, "I can not tell a lie," Louis displayed his first glimmer of enthusiasm. "Couldn't he?" he asked. "What was the matter with him?"

A lady rang up the club the other evening.

"Please call my husband to ——," she began, but she was interrupted.

"Your husband ain't here, ma'am," said the attendant, blandly.

"My goodness gracious me!" the lady exclaimed. "You're mighty sure about it, aren't you? And I haven't told you my name yet, either. Look here, mister, how do you know my husband isn't at the club when I haven't told you my name?"

The attendant answered more blandly than ever:

"Nobody's husband ain't never at the club, ma'am."

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

INTERNAL ROTARY CUTTING-OFF MACHINE

THE machine illustrated in the accompanying engraving has been specially designed to satisfactorily perform the extreme duty demanded in such work by rolling mills, car and locomotive works, navy yards, engine builders, electrical machinery builders and machine makers generally, and is capable of being operated constantly with a minimum cost of repair.

The machine is of lighter weight than those hitherto built by the makers, George Gorton Machine Co., Racine, Wis., the heavier type having been developed over a period of several years and largely adopted in shell manufacture. The present design is suited for work on 1 in. to 4½ in. rounds; 1 in. to 3¼ in. squares; and for any other shape or size which can be contained within a 4⅛ in. circle. Figs 1 and 2 show the exterior of the machine from either side, while the cutter blade and cutter grinder are shown in Fig. 3.

The internal tooth type of cutter blade, see Fig. 3, has a capacity for heavy feeds not possible with other types of construction. The cutters, being on the bore of the blade, may be keyed in very rigidly without distorting the blade, as the effect of the arrangement is equivalent to a heavy band surrounding the cutters, and securely fastened around its periphery to a heavy cutter drum. It will not deflect and snake and stock is thereby cut off squarely.

The drum bearings are of the same special vee type as used on the larger machine, and are quickly adjustable after wear even over many years. The blade is made of chrome vanadium manganese steel, is heat treated, and ground on both sides after rough milling the cutter pockets, after which a light cut is taken to finish the pockets to size, insuring a blade accurately made, and with no strains tending to throw the cutters out of alignment.

Cutters are made from a fine grade of high speed steel, accurately machined and carefully heat treated. They are alternately wide and narrow, the narrow cutter projecting a slightly greater distance toward the center of the blade than the wide cutter. The narrow cutter cuts out the metal in the center of the cut and te wde cutter cleans up the corners.

The automatic power feed mechanism, which is adjustable, is of a new type, designed to obviate the necessity for the operator to reverse any clutches when ready to raise the cutterhead to position after finishing a cut. The handwheel is used to adjust the cutterhead either up or down as it automatically disengages the feeding pawls when raising the cutter head, allowing the screw to be turned in the opposite direction. A large spring under the cutterhead acts as a counterbalance taking the weight off the screw.

Oiling is practically perfect. The main gear and pinion bearings, as well as the drum bearing, run in oil, this supply also oiling the pinion shaft bearings. The working parts and ball bearings of the feed mechanism are submerged in oil making them practically wear proof. The only other bearings are those of the pump which are lubricated by grease cups.

A high grade friction clutch is incorporated in the machine so that it can be driven direct from the line shaft, doing away with countershaft, and overhead belt shifters. A geared pump for delivering lubricant to cutters is furnished with machine, together with strainer, check valve and all necessary piping. All belt driven machines are arranged so that motor drive may be applied at any time, a 3 h.p. D.C. variable speed mtor of 900-1800 r.p.m. If a

FIG. 3. LEFT: CUTTER BLADE SHOWING METHOD OF INSERTING CUTTERS. RIGHT: CUTTER GRINDER WITH SPECIAL FIXTURES FOR SHARPENING CUTTERS.

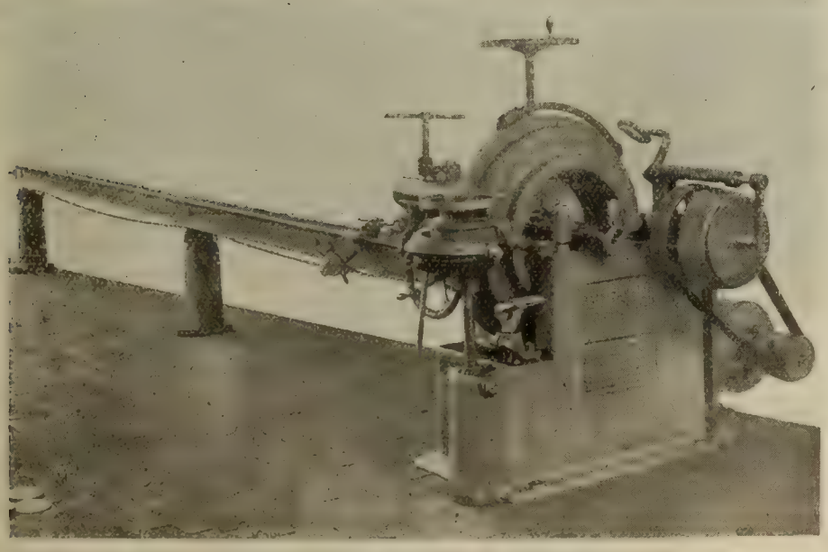


FIG. 1.—INTERNAL ROTARY CUTTING OFF MACHINE FOR HEAVY DUTY WORK OF MEDIUM DIMENSIONS.

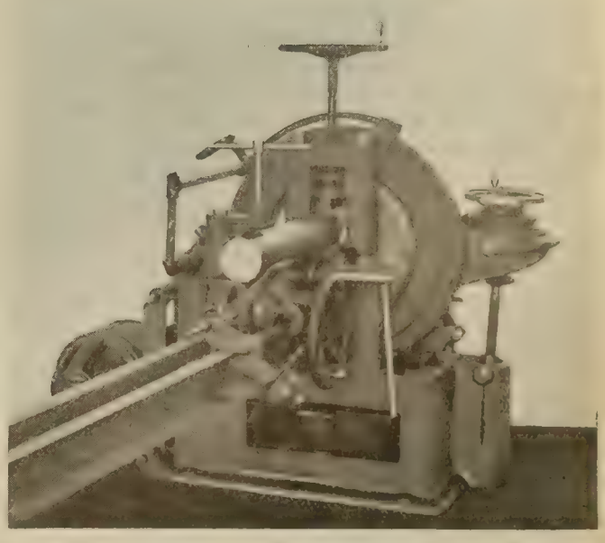
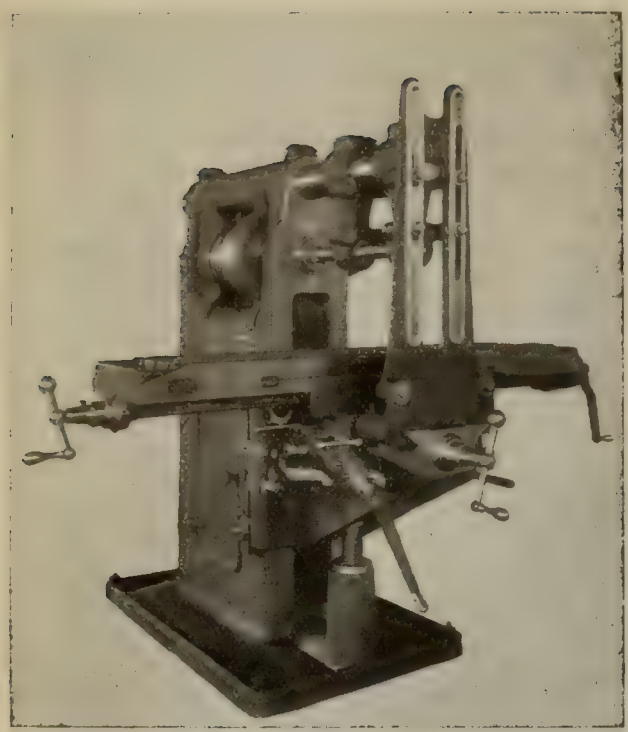
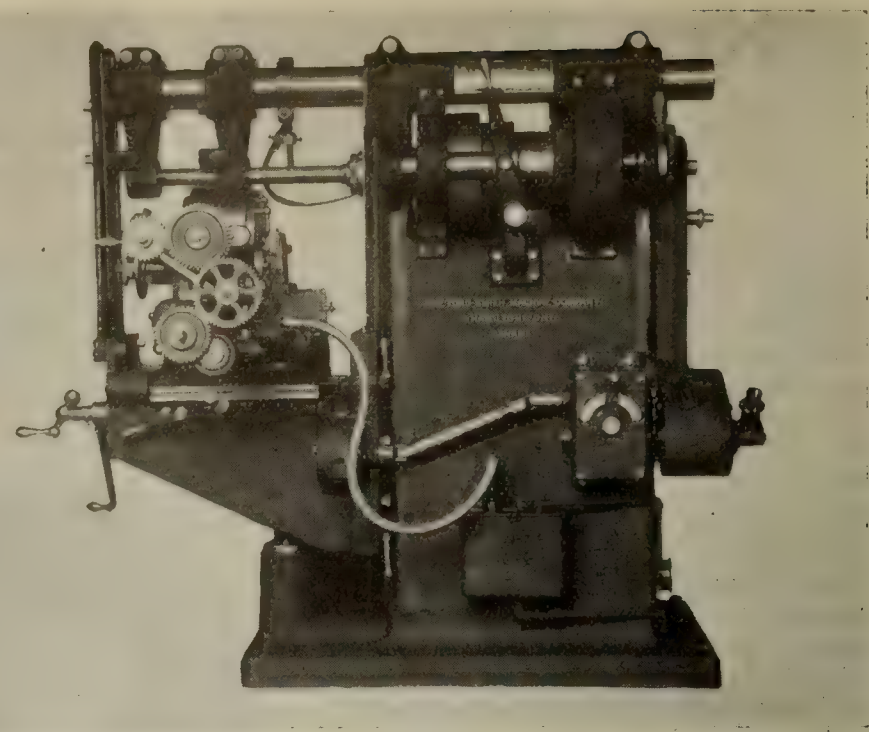


FIG. 2.—REVERSE SIDE OF MACHINE, SHOWING WORK IN POSITION, AND MEASURING DEVICE ON STOCK RACK.



PLAIN MILLING MACHINE WITHOUT POWER ELEVATION.



UNIVERSAL MILLING MACHINE WITH FULL AUTOMATIC FEEDS.

constant speed motor must be used any speed between 1500 and 1800 r.p.m. will be suitable.

The cutter grinder furnished with each machine is belt driven by tight and loose pulleys and needs no countershaft. The spindle is case hardened and ground to size, and runs in ring oiling bearings. Only one machine is furnished to each customer as one grinder will take care of a large number of cutting off machines.

A stock rack of any length desired and operated by means of a handwheel conveniently located beside the machine can be furnished as shown in Figs. 1 and 2. Where the machine is in continuous operation, this stock rack will be found to greatly increase production ing device, making it unnecessary for the operator to walk around to the rear of the machine for measuring. A single roller stand can also be furnished for use where only a few cuts are to be and is equipped with a patented measur-

PLAIN AND UNIVERSAL MILLING MACHINES

THE accompanying engravings illustrate two recent models of their No. 3 milling machine, which are now being produced by the Ford-Smith Machine Co., Hamilton, Ont. The illustrations show two types, viz., plain and universal, which, while of the same general proportions, are characterized by variations in certain dimensions and in weight according to their individual requirements.

The column, base plates and head are cast integral, the column being of heavy box type construction with internal shelves for tools, wrenches, etc. The spindle is a crucible steel forging, accurately machined, and provided with a 15/16-inch hole throughout its length. The spindle nose is threaded to receive a chuck or cutter head, and a cap is provided for protecting the threads when not in use. The spindle bearings are of ample size and substantial construction, and both are adjustable; the front bearing is of the tapered type, while that at the rear is of standard design. Adjustment of the rear bearing is secured by drawing up the tapered bush which in turn fits a tapered hole in the column. The spindle nose is bored No. 11 B. & S. taper, and is also slotted for positive drive.

The knee is a box type casting, heavily ribbed to resist the stresses from the saddle and table. Vertical adjustment is by means of telescoping screw fitted with ball thrust bearings.

The table of the plain miller has automatic feeds in both directions, and provision is made for the subsequent installation, if desired, of a vertical feed. The universal machine, however, has automatic feeds in the three directions, viz., cross, longitudinal, and vertical. Each feed is fitted with a positive knock-off which disengages the gear within safe limits of the extreme travel as well as at any desired point before.

All slides are oiled by means of felt wipers which provide efficient protection for the wearing parts against dust and cuttings.

Two arbor supports are supplied for supporting the arbor in the centre and the end, a front brace as shown supplying additional rigidity under severe operating conditions. A two-speed friction type countershaft is regularly supplied, and, when desired, an oil pump and piping can be fitted. Lubrication of the working parts has been carefully studied and a standard system evolved.

The principal dimensions of the machines are as follows: No. 3 plain miller. —Working surface of table, 53½ in. by 13½ in., three ¾ in. tee slots provided; traverse, longitudinal, 34 in., cross, 10 in., vertical, 20 in.; dia. of front bearing, 3⅜ in.; dia. overhanging arm, 4½ in.; centres, arm to arbor, 9⅝ in.; belt, 3½ in. wide; speeds, 18, from 12 to 260 rev. per min.; feeds, 12 from .006 in., to .092 in. per spindle rev.; floor space 95 in. by 115 in.; weight, 5,500 lbs. No. 3 universal miller.—Working surface of table, 52 in. by 12 in., three ⅝-in. tee slots provided; traverse, longitudinal, 30 in., cross, 10 in., vertical, 19 in., all automatic and reversible; weight, 5,750 lbs., other dimensions similar to plain type machine.

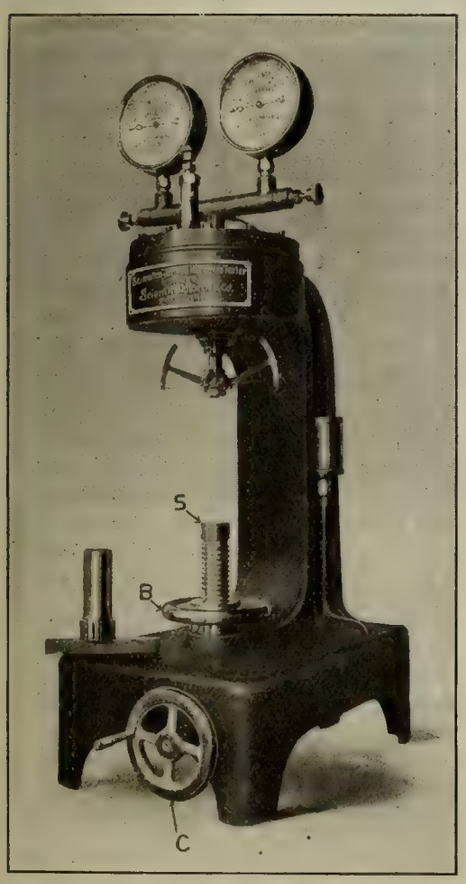
BRINELL HARDNESS TESTING MACHINE

A SIMPLE and accurate device for testing the hardness of metals is found in the improved model Brinell testing machine, which is a development of the common "ball and indentation" method for determining the degree of hardness of the metal undergoing test. The indentation or Brinell method, which is now very largely employed, consists in pressing a hardened steel sphere, which will not undergo deformation, into the surface of the metal to be tested and measuring the diameter or preferably the depth of the indentation. The degree of hardness may be computed by dividing the total load or force acting on the ball, by the area of indentation in the test sample, this area being determined by direct observation of the diameter of the circular depression by means of a convenient form of microscope.

While this method of computing the hardness numeral yields very valuable results, it is quite generally conceded that more accurate results are obtainable from direct measurements of the depth of the indentation in the test piece rather than the diameter of indentation. The Bureau of Standards and other laboratories have found that the plastic

flow of the metal of the specimen, when pressure is applied in the ball, introduces uncertainties in the measurements of diameter, which do not arise when depth measurements are employed. This is a valuable point in favor of the latter method because the depth of indentation is directly proportional to the amount of pressure applied, while the diameter of indentation is not. Another advantage in using this machine with depth gauge, is that the extra operation of measuring the diameter of indentation is done away with and the personal equation is entirely eliminated.

The machine is a hydraulic press consisting of a heavy base in which the hydraulic power generation and transmission is provided; the upper neck formed with the base into a single piece casting, carrying the hydraulic piston, upon the end of which is mounted the standard hardened steel ball, 10 millimeters in diameter; and two pressure gauges. As shown in the figure, the depth gauge is mounted directly on the piston rod and reads the depth of the indentation accurately. The hydraulic pressure is produced by an easy turning spindle wheel, permitting a steady and finely regulated increase and decrease of pressure. The liquid employed is glycerine and the plunger of the press is constructed with a glycerine seal or trap so that no air can leak in behind the plunger during the compression.



BRINELL HARDNESS TESTING MACHINE.

The operation of the machine is simple and requires no special training nor does it involve any calculations. To make the test, the specimen to be tested is placed on the automatic levelling stage, mounted on the spindle, which permits irregularly shaped pieces to be tested, and any size up to 15 inches can be accommodated. The spindle is fed up to the stationary ball by turning the handwheel until the sample just touches the ball and the pointers of the depth gauge tend to register. The initial scale reading on the depth gauge is noted and the pressure applied slowly by turning the handwheel clockwise until the pressure gauge on the top of the machine indicates 3,000 kilograms, if hard metal is being tested, or 500 kilograms if the metal is soft. After the pressure has been acting for 1½ minutes, the reading of both pointers on the depth gauge may be taken, which completes the mechanical part of the work and the pressure may then be removed.

The mean of the two scale readings, using the figures noted on the scale, multiplied by 0.2 will give the depth of the indentation in millimetres. A convenient way to compute the depth of the indentation in millimetres is to add the two scale deflections and divide by 10. The hardness numeral is then found by referring to the table for depth measurements. A microscopic attachment can also be supplied for measuring the diameter of the indentation should that method be followed.

The weight of the machine complete is about 550 pounds.

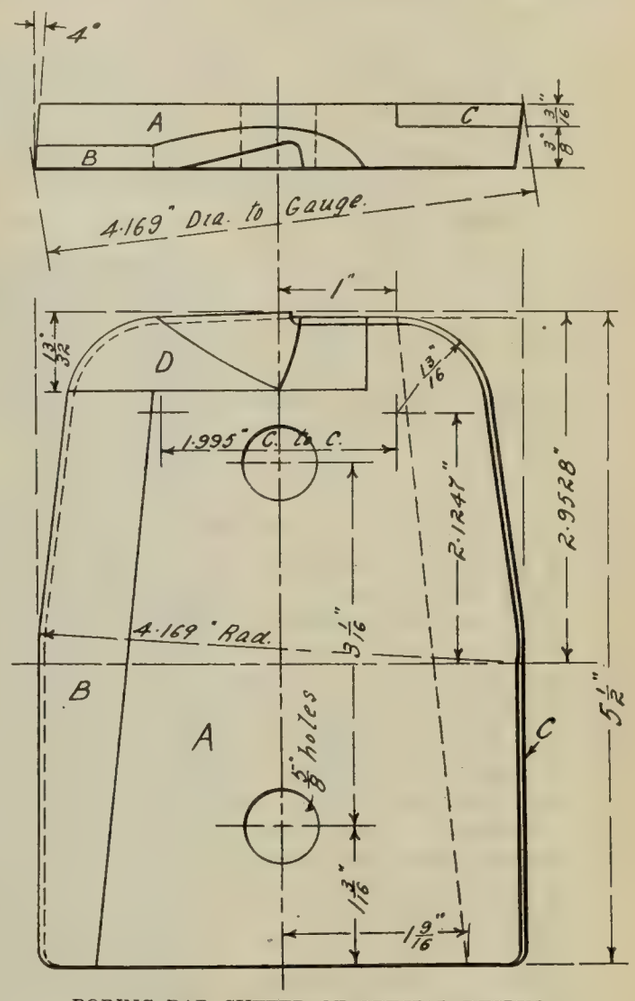
The machine, which is the product of the Scientific Materials Co., Pittsburgh, Pa., is carefully, substantially, and accurately constructed.

SPECIAL DESIGN BORING CUTTER

By J. H. R.

A DETAIL of machine shop practice that has always given more or less trouble has been the maintenance of flat boring cutters, this problem having of necessity received a great deal of attention during the past three years, owing to the wide use of this class of tool in the production of munitions. Various designs have been used by the different manufacturers, the general type being made of high speed steel of the desired size and shape. The high cost of this class of steel however, and the large quantity of cutters that were invariably required for maximum production, often resulted in considerable expense for the upkeep of cutters.

The cutter shown in the accompanying sketch was designed and constructed to minimize many of the disadvantages of the ordinary high speed steel cutter. It is claimed that these cutters will do more work than the solid type, as the soft steel center reduces the possibility of breakage, and also assists in absorbing the heat from the cutting edges of the tool. The center A is made of drop forged steel and the high speed steel pieces, B, C and D are welded on; the nose section D extending somewhat over the center, and shaped to allow for grinding a groove as shown, permitting of freer cutting and chip clearance. The use of this cutter effects economy in manufacture and tool maintenance together with increased accuracy in boring operations, as it is claimed that the center of the hole cannot be shifted during the cutting of the tool. These tools can easily be swedged out to size several times, often resulting in a saving of over 50 per cent. of cutter maintenance cost.



BORING BAR CUTTER OF SPECIAL DESIGN.

While these cutters were primarily designed for shell production, they may, with modifications, be adapted for many classes of boring work where flat cutters are used. This particular tool was designed and patented by C. L. Dixon of Montreal, P.Q., who is placing them on the market, both in the United States and Canada.

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A weekly newspaper devoted to the machinery and manufacturing interests.

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VALUE OF A TRADESMAN'S ADVICE

WHAT is the difference between professional and trade advice? If a man follows a profession, such as that of the lawyer or doctor, he invariably seeks remuneration for services rendered, and it is quite proper that he should do so, as this is undoubtedly the source of his livelihood; but what is the status of the man who works at a trade during the day and is requested in a casual interview with one of these professional men to advise him concerning some small matter pertaining to tradesman knowledge? While a machinist was paying a visit to a physician some time ago in connection with a slight physical disability, the conversation turned to automobiles, with which the tradesman was quite familiar. As it turned out, the car owned by the doctor was not in the best of running condition. Before the patient left, the doctor knew considerably more about his motor than he did before the machinist called.

In the course of a few weeks the tradesman was confronted with a bill of several dollars for professional services rendered. What comparatively was the value of the "services rendered" to the doctor? If the machinist had put in a bill for his services, it is very unlikely that payment would have been made. The wage earner probably did not give a thought to receipt of payment for the advice he gave his physician; notwithstanding, the question still remains, what is the parallel between the two "services rendered?"

OUR DUTY TO THE RISING GENERATION OF MECHANICS

CONSERVATION is the watchword of the hour. Under the stress of present conditions which call for the co-operation of every individual in all walks of life to so conserve his own and the country's resources, that we may successfully meet the issues of the moment and those of the future, it is essential that due consideration be given to the perpetuation of such knowledge as each one of us may possess. A fact that must impress every fair-minded person during these revolutionary times is that a greater proportion of the world's work in the near future will be placed upon the shoulders of those young men who have not yet attained their majority. This will become increasingly apparent the longer the war lasts, as the need of more men, and still more men, will continue to make serious inroads into the rank and file now actively engaged in keeping the wheels of industry turning.

There is an old saying that "You cannot have old heads on young shoulders," and while there may be a few exceptions to this rule, it is invariably true, as most of us older ones must admit, that "Boys will be boys" and it is probably well that it is so. Nevertheless, when death and destruction are removing hundreds of thousands of men, who a few years ago were the keystones of the world's industry, it behoves us as waiting reserves, to hand down to the rising generation such tools as will enable it to "carry on" the heavy duties that are even now being placed upon its willing but untried shoulders.

Nowhere is this more evident than in the metal-working spheres of industrial activity, where revolutionary methods are being adopted to replace the efflux of men from all lines of manufacture. Under the stress of existing conditions, it has been found necessary to employ a greater percentage of female labor in trades formerly reserved for males exclusively. These conditions may continue for some time after the close of hostilities, but the post-war readjustments may eventually place the industries back on the pre-war footing, with the extreme likelihood that a large proportion of the future responsibilities will need to be borne by the youth of to-day, who now travels about carefree and unconcerned.

The education of our youths means more than the school training they are now receiving and the subsequent entrance to an engineering establishment to earn a living. The country's future depends very much upon the practical knowledge that the boy of to-day can acquire from the experience of his elders, before the latter pass from the sphere of action. Every facility should therefore be provided to allow him to become familiar with current practice, and his older fellow workmen should not discourage his apparent inquisitiveness in the endeavor to acquire information, but on the contrary should use every effort to instil into the younger mind as much of his own knowledge and experience as the boy is capable of absorbing.

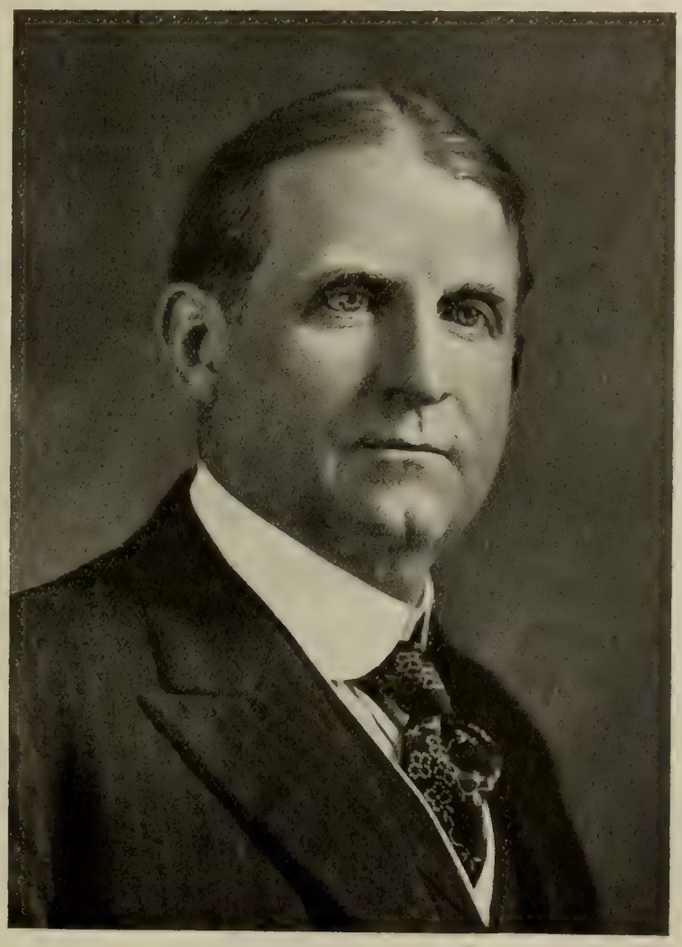
"As the twig is bent, so is the tree inclined." The problem of to-day is to so shape and mould the life and character of the coming men that they may be persuaded to take a deeper and wider interest in the practical business affairs of life, and thus enable them to assume the obligations that circumstances have virtually thrust upon them. The executives of manufacturing plants should not consider the growing boy from the standpoint of earning capacity only, as the early training of every boy is more of a liability than an asset, but should look upon the lad as an essential factor in the ultimate efficiency of the business, and make provision for seeing that the same becomes an established fact. The boy of to-day is the man of to-morrow, and, realizing this, no effort should be spared in making the future man as efficient as possible.

A fault that is only too prevalent to-day is that many men are doing things without the knowledge of why they are done, and while this condition is often more profitable to the manufacturer, it does not tend to increase the productive qualities of the workmen, and may be the means of destroying any initiative they may possess. It does not follow that more time should be spent in instructing men in the fundamentals underlying their daily tasks, as many of the older men are past the age of accepting and appropriating such instructions, but where the boy is concerned it should be the duty of the employer and also his older associates to use every means to advance his theoretical and practical training and thus enable him to better qualify himself for those duties and obligations that the future will undoubtedly have in store.

INDUSTRIAL NOTABILITIES

ROBERT HARRIS PARKS, operating manager, Canadian Car & Foundry Co., Ltd., Montreal, Que., was born in St. Charles, Mo., son of W. H. and Anna (Ruggles) Parks, and received his education at public schools, St. Charles.

He commenced his business career with the St. Charles Car Co., now part of the organization of the American Car & Foundry Co., remaining with this



ROBERT HARRIS PARKS

concern till 1896. He then became general manager with Merchants' Dispatch Transportation Co., Rochester, N.Y., 1896-1913; appointed general manager for the Bettendorf Company, Davenport, Iowa, 1913, which position he held till June 1, 1917, when he was appointed to present position with the Canadian Car & Foundry Co.

Mr. Parks married Ann Edith Silver, daughter of Robert D. Silver, of Denver, Colorado, June 1, 1898, and has one daughter.

His clubs are: Genesee Valley (Rochester, N.Y.); Rock Island Golf (Rock Island, Ill.); Outing (Davenport, Iowa); Kaministiquia (Fort William, Ont.).

In politics, Mr. Parks is Independent, and is Anglican in creed. His residence is Ritz-Carlton Hotel, Montreal, Que.

—Photo. courtesy British & Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	35 50
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	60 00

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	....
Tank plates, Pittsburgh	....
Structural shapes, Pittsburgh	....
Steel hoops, Pittsburgh	....
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	4 50
Structural shapes	5 00
Plates	7 00

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$31 00	$32 00
Electro copper	31 00	32 00
Castings, copper	30 00	31 00
Tin	63 00	63 00
Spelter	10 50	10 50
Lead	9 00	8 50
Antimony	18 00	18 00
Aluminum	65 00	62 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$13 00	$13 00
Heads	13 30	13 30
Tank plates, 3-16 in.	13 65	13 25

WROUGHT PIPE.

Effective July 5, 1917.

Size.	Black	Galvanized
Standard Buttweld.	Per 100 feet	
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00
Standard Lapweld.		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	20 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	15 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	20 00	20 50
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	7 00	7 00
Tea lead	6 00	5 75
Aluminum	30 00	25 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up.	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 20
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less.	10
Blank bolts	net
Bolt ends	net
Elevator bolts	5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾-in and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	.72½
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze.	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	25
Eq. & Hex. Head Cap Screws.	20
Rd. & Fil Head Cap Screws	net
Flat ⅞ But. Hd. Cap Screws plus	net
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and semi-fin. nuts, over 1½ in., up to 2 in. plus	10
Studs	net
Taper pins	10
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$ 60 00
Open-hearth billets	60 00
O.H. sheet bars	70 00
Forging billets	90 00
Wire rods	85 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS.

Solder, strictly	0 35
Solder, guaranteed	0 37½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 55
Red dry lead, 100-lb. kegs, per cwt.	16 25
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 78
Linseed oil, raw, single, bbls.	1 42
Linseed oil, boiled, single bbls.	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery Cloth	list plus 33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila Rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto ..... net

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52.	30
S.S. drills, wire sizes, No. 53 to 80	net
Standard drills to 1½ in.	30
Standard drills, over 1½ in.	30
3-fluted drills, plus	10
Jobbers' and letter sizes	20
Bit stock	25
Ratchet drills	15
S.S. drills for wood	30
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 30
Bridge reamers	52½
Centre reamers	10
Chucking reamers	net
Hand reamers	10

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable. A. add 35%; B and C, plus 25%; cast iron, net; standard bushings, 25%; headers, 60; flanged unions, 5; malleable bushings, 30; nipples, 45; malleable lipped unions, 40.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$11 00	$10 50
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	10 95
Premier, 10¾ oz.	13 85	11 25
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B	
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	40
Black Diamond	40
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	37½
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke	$
Connelsville Foundry Coke	
Steam Lump Coal	
Best Slack	

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THERE have been no further developments in regard to the embargo although some announcement may be expected shortly as to what attitude the Priority Board will take concerning the export of iron and steel to Canada. It is to be hoped that there will be some modification of the embargo, but in view of the situation in the United States it is advisable not to expect too much. The demand for steel for war purposes is such that it is hardly likely that much material will be allowed to come in for any purpose other than for war contracts or contributory thereto. Fortunately the Canadian mills are well able to take care of the requirements for many commercial purposes, although some delay in deliveries may be expected. Prices of steel products continue firm with no indication of a decline. The pig-iron market continues firm at unchanged prices. There is a shortage of iron which affects the smaller foundries and those not having contracts. The non-ferrous metal markets are quiet and unsettled in sympathy with the situation in the States. The copper price regulation is causing some trouble, but a satisfactory adjustment is expected shortly. Lead, solder and antimony have declined, otherwise prices are unchanged. The machine shop supply business continues fairly active at firm prices with an upward tendency in some lines, particularly iron, steel and brass goods. The machine tool business is more active, as there have been a number of enquiries for shell plants from across the line. It is not unlikely that eventually some shell contracts will come to Canada from the States.

MONTREAL, Oct. 29, 1917.—Despite the embargo that exists on the shipment of materials from the States, business here continues to be of an encouraging character, although some anxiety is expressed as to early future conditions, which seem likely to become quite serious unless some relief is given to Canadian manufacturers, particularly in connection with steel and metals. A deputation of manufacturers and steel dealers is to wait upon Mr. O'Hara to-morrow and see what can be done to ensure relief.

Pig Iron

The attitude of the American Government in setting a fixed price on the sale of pig iron is not expected to bring any relief to the Canadian situation, as the requirements of the American Government and the market in the States will, it is thought, be sufficient to use the bulk of the metal turned out from the furnaces there. As domestic supply appears to be more or less left in the hands of the trade to adjust, it is believed that this market will suffer for the next few monthly, partly due to the low price set, and also to the inability of producers to supply other than the needs of the war department at the present time. The coke situation is a feature in the uncertainty of present conditions. The Canadian market is influenced by American developments, and furnaces here are not quoting on their output, as they are able to use all they produce with little surplus for the open market.

Steel

Developments of the past week contributed little improvement to the steel situation; no further price regulations have come into force, and results of previous adjustments have not materially

assisted in clearing the way for better conditions. The Priority Board at Washington are concentrating on their efforts to supply the American Government and that of the Allies with every requirement for war purposes before any material is allowed to leave the mills for domestic or non-essential enterprise. Summing up the situation, it would appear that the general consumer is as far in the dark as ever, as nothing has transpired to indicate that the producer is less reluctant to sell than when conditions were controlled by the open market.

A feature in the setting of prices to govern the prices of steel and other products is the possible effect that such action will have in connection with the output of the mills, as the attitude of the mills so far has not been conducive to relieving the general situation, few of the producers showing any great willingness to accept future domestic business at the price agreed on, even though this price is supposed to cover all sales of steel. The uncertainty of war requirements, however, may be the factor that influences the steel makers in not loading themselves up with orders they might be unable to fill. As there is a belief that the prices recently set are for the control of this quarter's business, the mills are showing no anxiety as to what the future has in store; again, it is expected that a further revision of prices may be effective at the New Year.

With additional price fixing pending, the market continues to be more or less unsettled. Buying on most products is confined to Government and other war demands. With the exception of ferro-alloys, which have become easier, the entire market is one of watchful waiting for further developments. The local situation has no feature to report, and dealers are in much the same position as the previous week, with all quotations holding firm. Apart from the necessary material that is required for the manufacture of war supplies, which can be obtained under license, it is practically impossible to secure steel for domestic or other purposes. A conference is to be held at Ottawa to-morrow by some of the leading steel dealers and manufacturers in connection with the situation that confronts Canada, due to the embargo that is virtually in effect regarding the shipment of steel to this country.

Metals

The general metal market is dull and inactive, being influenced by the uncertain conditions that still prevail in United States political circles. Local business is reflected in American developments. Copper is giving the consumer some anxiety. Tin is improving, while spelter is very quiet, and lead is reacting rapidly. Antimony and aluminum are quiet on poor demand.

Copper.—Ever since the fixing of prices to control the sale of copper, the consumer has been beset with greater difficulties than those experienced under the old method when the market was controlled by open quotations. Those users of copper who are working on Government contracts are amply supplied with metal, but the trade at large is much demoralized by present conditions. When it is definitely known just what the full requirements for war purposes will be, the open market may experience some relief. The New York market is nominal at the fixed price of 23½c. Local conditions are unchanged, with dealers quoting 31c and 30c per lb.

Tin.—The situation in this metal has developed a more encouraging tone under the belief that an understanding may soon be reached regarding the freer issuing of permits by the British Government. The urgent requirements of tin plate users is a factor in the situation that may induce the British authorities to reciprocate in relieving the conditions on this side. The market is not very active, but prices are slightly stronger, New York having advanced ½c during the week, the price quoted being 62c per lb. Dealers here report a fair demand, with prices firm at 63c per lb.

Spelter.—The absence of demand for American war requirements is more or less a puzzle to the trade, and what buying is reported is not heavy. Brass foundries are apparently showing little interest, and sales in this direction are light. A further decline of ¼c on the New York market has emphasized the dullness of this metal. The local situation is quiet, prices being weak at 10½c per lb.

Lead.—The rapid decline of lead has been the feature of the metal market for the past few weeks, and it is apparent that the extreme low has not yet been reached. The chief factor in the recent reaction has doubtless been that of supply over demand, together with the possible price that may be fixed by the Government. The week's decline of 1c in New York has placed the quotation at 5½c per lb., and demand is light even at this figure. Dealers here are asking 9c on a quiet market.

Antimony.—Very little business is offering and the situation is quiet. The New York quotation of 14½c shows a decline on the week of ¾c per lb. Dealers here report a weak market, with prices unchanged at 18c per lb.

Machine Tools and Supplies

Nothing of importance has developed to renew the waning interest in the machine tool industry; as a matter of fact, it is rumored that negotiations are under way for the disposal of munitions machinery in several plants that were among the largest producers of all types of shells. No definite action has, however, been taken as yet, owing to the uncertainty that still surrounds the shell making activity, and the evident reluctance of the Munitions Board to permit the dismemberment of those plants formerly engaged in this work. The Canadian demand for machinery during the past few weeks has been very quiet, the little that is passing being more of a general nature, much of the business going to plants that are interesting themselves in marine commodities. The activity that has followed the developments in the States has resulted in an abnormal demand for all classes of supplies, and has made it increasingly difficult to obtain delivery on imported products. Prices are not only well maintained, but show a stronger tendency.

Scrap

The situation in scrap metals and old materials is much the same, the trade still awaiting an announcement regarding the attitude of the American Government respecting fixed prices on this material. The New York market is generally easier, with lower prices ruling, but local dealers, while reporting a weaker tone, have so far maintained their quotations, which are on a par with last week.

TORONTO, Ont., Oct. 30. — Interest has been created in the machine tool trade by the possibility of shell contracts being placed in Canada by the United States Government. It may be some time before this business materializes or assumes important dimensions, but the possibility of such a development shows the advisability of trying to obtain war contracts of any kind from the States that may be offering. Canadian concerns have been for some time engaged upon marine work for the interests in the States, which has opened up a new field of activity and one which is highly desirable at the present time. The fact that a local concern has decided to open up a branch factory across the line shows the importance that they attached to this field.

Steel

While some improvement in the steel situation may follow the visit of the Deputy Minister of Trade and Commerce to Washington it will not be wise to expect too much as a result of the negotiations with the Priority Board. The situation in regard to the allotment of steel in the States may be studied with advantage for developments across the line will in a measure be reflected in the market here. The Priority Board which has to do with the distribution of steel will have the task of keeping plants working on war orders supplied with steel and relegating the surplus to purely commercial purposes. This process of distribution is somewhat complicated, although very necessary. Firms not engaged upon war work are being handicapped by difficulty in obtaining steel and delay in deliveries incidental to the distribution process. Delivery of structural steel for private and public buildings has in many cases been stopped and construction held up. The automobile industry has already been seriously affected and manufacturing operations in many industries have been considerably curtailed. Conditions such as exist in the States are already discernible in Canada, for there has been for some time a shortage of steel for purely domestic purposes. With the above in view a material modification in the embargo seems unlikely and manufacturers not producing war equipment will

have difficulty in obtaining steel except such as is made in Canada. In other words strictly private enterprise will be held back for want of material. There has been no further development in the local steel market in regard to prices and the impression still prevails that prices will remain stationary for some time. It is understood that in the States very few sales have been made at the agreed prices so it is difficult to say what the market really is. How much more then must the uncertainty be in Canada in regard to prices, for it is generally understood that the price control does not affect this market. Purchasers of war material will, it appears, have to pay higher prices, at least for some time to come. Probably when the mills in the States have filled most of their orders, booked at high prices, there may be some reduction, but this eventuality is not yet assured as the outlook is so uncertain. At the present time there is no indication of lower prices, the only sign of weakness being in the lighter gauges of black sheets, which it is generally conceded were too high in price even when compared with other steel products.

Advices from United States steel centres indicate that further price-fixing announcements from Washington seem unlikely. The trade has been waiting for some weeks for additional prices to be announced on products not already agreed upon, such as sheets, tubular goods, wire products, and the delay has occasioned some surprise. One theory advanced is that, prices having been determined on pig iron, billets and the most important steel products, it is advisable to let the market work itself into a position that would not require any additional formal control, the idea being to give the industry an opportunity to regulate its own prices. While this may tend to steady the market, the situation is very unsettled in the meantime and consumers are holding off awaiting developments.

Pig Iron

The pig iron market continues quiet and the situation generally unchanged. There appears to be no possibility of lower prices for some time as the furnaces are booked up for a considerable part of the first quarter of next year. Canadian furnaces are still operating on high priced coke, which alone would prevent any material decline in the market. There is also the embargo to be taken into consideration which has accentuated the shortage previously existing. The situation in the States appears to be improving. The iron trade is arranging a tentative price basis between buyer and seller and is not waiting for the official differentials defining the prices of the various grades and deliveries to be fixed. The furnaces have a lot of contracts to clear off before they can undertake much new business and it is a difficult matter just now to secure iron for prompt or nearby delivery as there is very little to be had. The coke situation is anything but satisfactory and promises to interfere with the production of pig iron.

Scrap

The market for old materials continues unsettled with both buyers and sellers awaiting developments in the situation. Prices are unchanged and entirely nominal.

Machine Tools

There is an air of expectancy in the machine tool trade in regard to future developments. On the one hand United States interests are investigating the market here for machine tools for munition plants, while there is also a strong possibility that war orders may be secured by Canadian concerns from the United States Government. Any extensive business of this nature, however, is hardly likely to materialize until the plants in the States are filled up with orders. The fact that Canadian plants and organizations are in a favorable position for quick production may help to bring business to this country. As far as actual domestic orders are concerned business in the trade is rather quiet but, as already inferred, interesting developments are anticipated.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

Supplies

Trade has been fairly active in machine shop supplies and the market continues steady. Prices are firm on most lines with an upward tendency, although white lead has declined. White lead is now quoted at $16.20 per 100 lbs. in ton lots and $16.55 in less than ton lots. Linseed oil and turpentine are firm and unchanged.

Metals

The metal markets continue quiet and unsettled. Lead and antimony have declined but otherwise prices are unchanged. Considering the unsettled situation, business locally continues good, although the decline in munitions orders has affected those metals involved in the manufacture of shells. With the embargo on copper still in force, this metal is firm and scarce except in regard to supplies for munitions.

Copper.—The market in New York is still unsettled as far as it concerns smaller consumers and dealers as they are uncertain as to their position in regard to prices and they are having considerable difficulty in obtaining copper. The Copper Producers Committee which has been entrusted with the distribution of copper for the United States Government and the Allies has not yet completed its plans so the market is unsettled in the meantime. Lake and electrolytic are quoted at 32c and castings at 31c per pound.

Tin.—The market is firm but unsettled in New York owing to the delay in shipments caused by the import regulation. As a result of this delay there is a shortage of spot tin and prices are consequently firm. Local quotations are unchanged at 63c per pound.

Spelter.—There is no improvement in the spelter market as far as demand is concerned, this metal being affected in sympathy with the quiet copper market. The trade is waiting for prices to be fixed, which is understood will likely be higher than the present market. Local price, 10½c per pound.

Lead.—Prices have again declined in sympathy with the New York market where the Trust price is now 5½c. The heavy fall in prices has stimulated business and the market is more active than for some time. Lead has declined ½c. locally and is now quoted at 8½c per pound.

Antimony.—The position of antimony shows no improvement and the market is weaker owing to lack of demand. Antimoney has declined 1c and is now quoted at 18c per lb.

Aluminum.—There is no change in the situation, the market remaining quiet and easy at 62c per pound.

Solders.—Owing to the continued weakness in the lead market, prices of solders have declined. Guaranteed is now quoted at 37½c and strictly at 35c per pound.

PITTSBURGH, PA., Oct. 27.—The chief topic of discussion in iron and steel trade circles the past few days is the rumor that has been circulating freely in Pittsburgh and New York that the Government has called a halt in the price fixing programme. No specific authority is cited for the rumor, and different members of the trade have different views about it. Some insist that there is no possibility of the Government doing anything but carry out its announced programme in full, and it may be recalled that early in the operation the statement was made, apparently upon the authority of the War Industries Board, that prices were to be fixed on "about 150 articles" of iron and steel. Others in the trade insist that there is something in the rumor, and point out that it would be a perfectly natural and reasonable procedure. A general price level has been clearly established. Prices have been set practically covering all pig iron; practically all unfinished steel such as billets, large and small; sheet bars, slabs and wire rods have had prices attached; and bars, shapes and plates, which comprise about one-half the finished steel output, have been fixed. As it was the intention to have all other prices set in relation to these, the trade can be left to develop these in a rational manner, if it can. If it cannot, then the operation of price fixing can be resumed at any time. Frank A. Scott, chairman of the War Industries Board, is reported to have

resigned on account of ill health and to have gone to a sanatarium.

New Wire Prices

What the trade considers rather a curious thing is that the American Steel & Wire Co. has promulgated new prices, to be effective as from October 24. These prices represent advances of $2 a ton on plain wire, also galvanized; and $6 a ton on wire nails and barb wire, making nails $3.50. In some quarters the present action is interpreted as foreshadowing a Government fixing of prices at the $3.50 level, while in other quarters it is held that the advance may mean that the wire trade is expected to find its level. If the latter interpretation is correct it means that that War Industries Board will give the independents an opportunity to drop to $3.50 and if they do not it will resume price fixing.

Break in Sheets

A spectacular break has occurred in the sheet market. Last June and July it was difficult to buy at 8c, except in special circumstances, and considerable tonnages were sold at 9c and higher, in both black and blue annealed. It was not until about 30 days ago that sheets became easily obtainable at 8c. Ten days ago it was difficult if not impossible to buy at 7c. Last Monday some offerings of both blue annealed and black appeared at 6c, and later in the week the offerings became so common as to make the market quotable at 6c as maximum, if not as minimum also.

When the market declines with such rapidity to 6c one naturally doubts whether it will stop there, and it is interesting to recall that 30 days ago the sheet manufacturers were arguing that the Government should set a price of about 6.50c. Afterwards they yielded to 6c or a trifle less. There were predictions that the Government price would be 5c, but the sheet mills insisted such a price would be too low. Apparently the sheet market was a bubble and the bubble has been punctured. Many of the mills had no foundation in well filled order books but were simply selling at the fancy prices buyers chose to bid. Foreseeing Government price fixing the buyers have been able to hold off for a short time, and the mills could not bridge the interval.

The consumption of sheets in most directions has undoubtedly decreased, and it is possible the supply of sheet bars has increased. For some time past the production of sheets has been at considerably less than the sheet rolling capacity as the sheet bar supply was limited, the steel being put into other commodities.

Active Pig Iron

Government price regulation in pig iron is not preventing the market from being active. There is as much activity as there is any occasion for, there being frequent sales in nearly all districts of small lots for early deliveries, while neither buyers nor sellers are disposed to act upon late deliveries. It is nearly four weeks since the furnaces sent their recommendations to the War Industries Board, as to differentials between grades and districts, but Washington has made no announcement as to these details. Meanwhile the trade has adopted the practice of holding basic and foundry iron at $33 at furnace, irrespective of district. They are disposed to call No. 2 foundry 1.75 to 2.25 per cent. silicon, abandoning the 2.00 to 2.50 per cent. guarantee that became common three years ago when pig iron was hard to sell.

Steel Market Quiet

The finished steel market has continued decidedly quiet, but there is no good reason for assuming that the price fixing at Washington is the chief cause of its being quiet, except in the respect that it makes both buyers and sellers less disposed to act on the late deliveries. As to early deliveries there is little consuming demand, consumers as a rule being well covered. Generally speaking the consumption of steel in ordinary peace channels is decreasing as the country gets more and more to a war basis and is more disposed to economize.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

The Railroads

The railroads have not been buying to any extent for months, and there is relatively little steel still due them in the form of locomotives and cars, and otherwise. Consumption in various other directions is decreasing more or less. The maximum amount of steel the Government and its Allies could find means of consuming, for war purposes, cannot possibly represent anything like half the steel output. There is every reason to believe that unless there is heavy steel consumption on the part of the railroads steel will become relatively plentiful within a few months.

What will occur as to the railroads is one of the great questions. Steel prices are still very high and the railroads claim they cannot afford to buy. The 15 per cent. freight rate advance case, decided last July with some slight advances and tabled for further consideration unless conditions should change, has now been reopened by the Interstate Commerce Commission, the first hearings being set for November 5, but it is quite problematical whether the railroads will be given much of an advance. Then there is talk of the Government financing some railway purchases as a war measure since adequate transportation facilities are absolutely essential. Upon what is done with, or for, the railroads, may hinge the steel market a few months hence.

NEW YORK, OCT. 27.—Great activity continues throughout the machinery industries. The United States Government, shipbuilders and manufacturers of ordnance and ammunition holding Government contracts are the heaviest buyers. The shipbuilding programme of the Government, while somewhat delayed, is being carried out as has been previously outlined. In the past week the War Industries Board alloted contracts for 85,000 tons of steel plates and shapes for the building of destroyers and the shipyards holding these contracts placed additional orders for machine tools to be installed in the shops now under construction.

The Bethlehem Shipbuilding Co., through its Pacific subsidiary, the Union Iron Works, is rehabilitating the Risdon Iron Works at San Francisco. New shops are being built and equipped to build 16 destroyers for the Navy, a part of the contract for 40 destroyers awarded to the Union Works. Two destroyers will be built simultaneously on each of the eight ways of the Risdon Works. The tools for equipping the machine and fabricating shops originally purchased in the New York market, and a few additional orders for tools were placed this week. The New York Shipbuilding Corporation which is to build 20 destroyers at Camden, N.J. has put out a list of tools required for this work. The Newport News Drydock & Shipbuilding Co. and the William Cramp & Sons Ship & Engine Building Co., which will also build destroyers, also have placed additional orders for machine tools. The Federal Shipbuilding Co. has obtained from the Dominion Bridge Co. enough cranes to command the ship ways building in the Hackensack Meadows and is now in the market for 15 cranes to be installed in the shops at the same point. A list is also being prepared for about 150 tools to be installed in the machine shop.

The Submarine Boat Co., which has practically completed contracts for the fabrication of all of the steel needed for the construction of 50 boats for the Emergency Fleet Corporation, has just secured a priority order from Washington for the 85,000 tons of steel needed. The American International Corporation has also applied for priority certificates on 125,000 tons of steel, but the permits

are withheld until the fabricating contracts have been placed. Both of these interests are also buying fabricated steel shapes for buildings now under course of construction at the Government owned shipyards. The American Co. has just asked for bids on 7,000 tons of steel for tower foundations, while 10,000 tons of shapes are required for the shops and buildings. About 10,000 tons of shapes are required for the shops and buildings being constructed by the Lackawanna Bridge Co. and Worden & Allen Co. for the Submarine Boat Co. The latter company is purchasing equipment for the shops, and an order for cranes has just been placed.

The Merchant Shipbuilding Corporation and the Chester Shipbuilding Co., who will build 40 cargo boats for the Government, have placed contracts for the fabrication of 132,000 tons of steel with the American Bridge Co.; the latter company will also fabricate 33,000 tons of shapes and plates for the ten merchant boats to be built by the Federal Shipbuilding Co.

The War Industries Board is thus called upon to distribute orders for 500,000 tons of steel among the various structural mills, of which 170,000 tons have been allocated in the last five or six days. It will be recalled that the full Government programme for shipbuilding calls for 2,400,000 tons of steel, so that the tonnages now being distributed are less than one-fourth of the total amount needed. It is an interesting fact that the fabricated contracts placed by the Submarine Boat Co. call for completion by April 1, 1918, and some deliveries are to be made in November and December of this year. The first boat will be launched May 1, and all of the 50 boats will be launched by July 1.

Crane manufacturers are co-operating with the United States Government to build and deliver 300 locomotive cranes for shipbuilding, army cantonments and aviation camps, in the next three or four months.

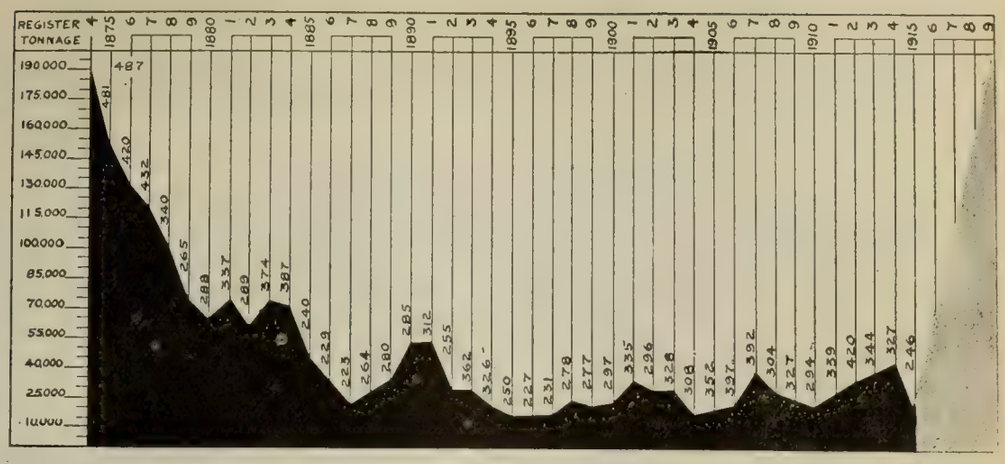


CHART SHOWING NEW VESSELS BUILT AND REGISTERED IN THE DOMINION OF CANADA DURING THE PERIOD ENDED DECEMBER 31 OF EACH YEAR FROM 1874 TO 1915, INCLUSIVE. THE SHADED PORTION TO THE RIGHT INDICATES THE ANTICIPATIONS FOR 1917-18-19.

RIGID ECONOMY IN METAL URGED

THE situation in regard to iron and steel supplies remains serious. Rigid economy in every scrap of metal is strongly urged as the result of a visit which F. C. T. O'Hara, Deputy Minister of Trade and Commerce, has paid to Washington. Some misunderstandings have been cleared up in respect of procedure in the handling both of export license applications and applications for priority assistance. Arrangements have been made, which it is greatly hoped will assist the Canadian manufacturer to secure articles he needs from the United States.

It is pointed out in Ottawa, however, that demand in the United States is abnormal. There is even a likelihood that a number of Canadian manufacturers will have to face sacrifice in the future for the reason it is not possible for the United States to supply many materials required for commercial purposes in Canada. Further, there is reason to believe that there will be a scarcity in materials required in Canada for the manufacture of articles which might properly be regarded as articles contributory to the war. It is felt that the situation can only be met by the strictest economy in the use of metals.

Arrangements have been reached with Washington whereby all articles now requiring piority shall first be covered by a priority application made by the United States shipper. Such priority application must be forwarded to the department of trade and commerce, Ottawa. The department of trade and commerce upon investigation as to the need and urgency of the article in Canada will recommend such priority as it can, based on the scheme laid down by Judge Lovett, chairman of the priorities committee.

It has been arranged to have an officer of the British embassy in Washington detailed to follow up with the export license bureau applications for export licenses which have been endorsed by the department of trade and commerce.

A committee of prominent iron and steel men is now investigating the iron and steel situation in Canada.

TO RECOVER SULPHUR FROM DIOXIDE FUMES

A NEW process for recovering sulphur from waste sulphur dioxide fumes is discussed in a report just issued by the United States Bureau of Mines, which says: "The results of the laboratory study of the wet Thiogen process demonstrate that the technical operation of the process can be carried out successfully for the recovery of sulphur from sulphur dioxide."

It is pointed out that the process will be of great value in the matter of conserving the supply of sulphur, especially as the supplies of pyrites imported from Europe have been curtailed since the beginning of the war. With the price of sulphur around $60 per ton, the added supply which can be produced from

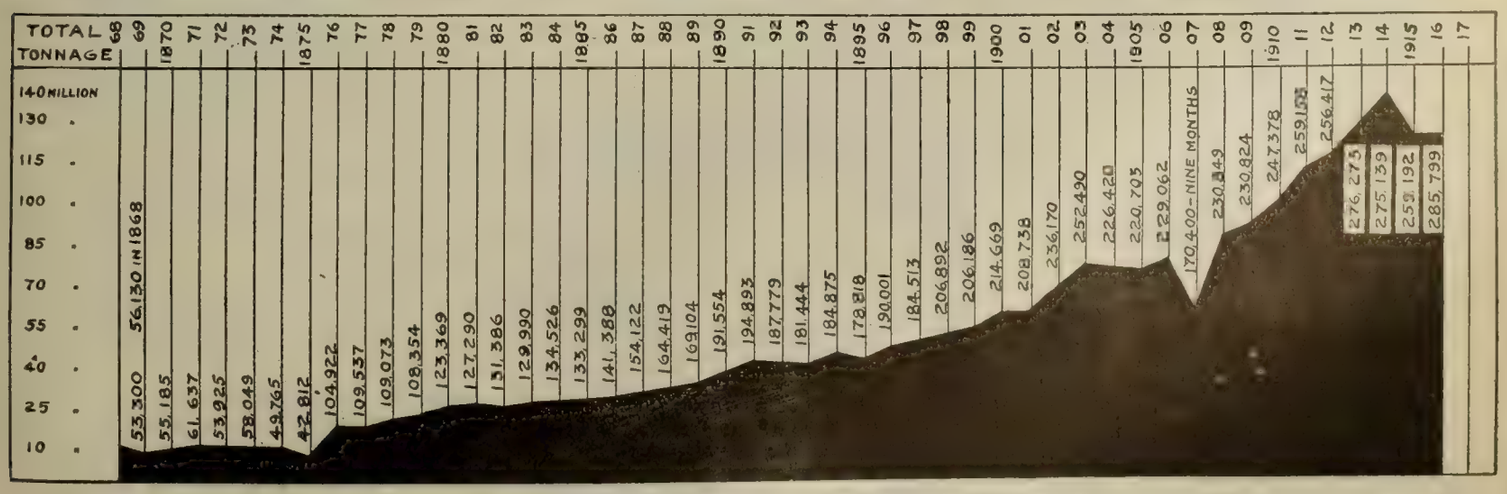


CHART SHOWING NUMBER AND TONNAGE OF SEA-GOING VESSELS; ALSO THOSE, EXCEPT FERRIES, TRADING ON THE LAKES AND RIVERS BETWEEN CANADA AND THE UNITED STATES, INCLUDING ALSO VESSELS EMPLOYED IN THE COASTING TRADE WHICH ENTERED AND CLEARED FROM CANADIAN PORTS DURING THE FISCAL YEARS 1868 TO 1916 INCLUSIVE.

waste smelting fumes for $13 per ton will do much, it is stated, to relieve the situation. It is believed that this process can be adapted to plants smelting from 2,500 to 3,000 tons per day.

The process is described in the "New York Engineering and Mining Journal" as follows: In carrying out the Thiogen process the gases are first cooled and cleared of all duct and fumes. They are passed through an absorption tower in which the sulphur dioxide is absorbed in water or mother liquor. To the solution of sulphur dioxide is added powdered barium sulphite, thiosulphite and sulphur; the precipitate is settled and the mother liquor is returned to the absorption tower. The settled precipitate is then filtered and dried. The elemental sulphur and one half the sulphur from the thiosulphite is distilled and the sulphur vapors condensed. The residue, consisting of barium sulphite and sulphate, is then reduced to sulphide, which is returned to the operation as a precipitate.

LIGNUM VITAE

THE lignum vitae of commerce, which is so extensively used in the stern bushings of ships for the bearings of the propeller shafts, ship pulleys, etc., is most suitable for this purpose owing to the highly desirable qualities that it possesses. This wood is obtained from the guaiacum tree, and its growth is almost confined to the isles of the West Indies and the northern coast of North America. The wood is of a yellow color merging into green, and has an almost pulverulent fracture owing to the peculiar characteristics of the fibrous layers, which are of a combined diagonal and oblique arrangement. On a transverse section the annual growth is very slightly marked in concentric rings, and it is only with the aid of a magnifying glass that traces of the pith, or spongy section is apparent; the medullary rays are equidistant, minute and very numerous. The outer wood, the sap-wood or alburnum, is of a pale yellow hue and devoid of resin; the inner heart-wood or duramen, which is by far the greater proportion, is of a dark greenish brown, containing about 26 per cent. of resin, and has a specific gravity of 1.333, and therefore sinks in water on which the sapwood floats. The high specific gravity denotes hardness and density, and the fact that it is impossible to split it, makes it very durable and serviceable where great pressure and friction are required. In addition to its extensive use in engineering practice, this wood is possessed of high medicinal qualities, and in past times was, and even yet is, largely used in the compilation of drugs and chemicals.

THE modern bicycle, fully equipped, weighs about 35 lbs., and will carry a load of six times its own weight with perfect safety under all ordinary conditions.

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

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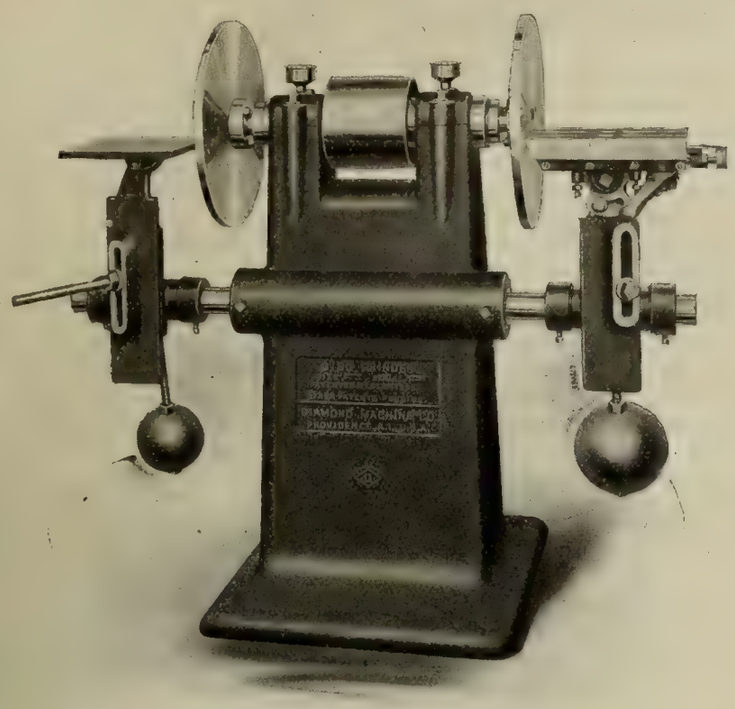

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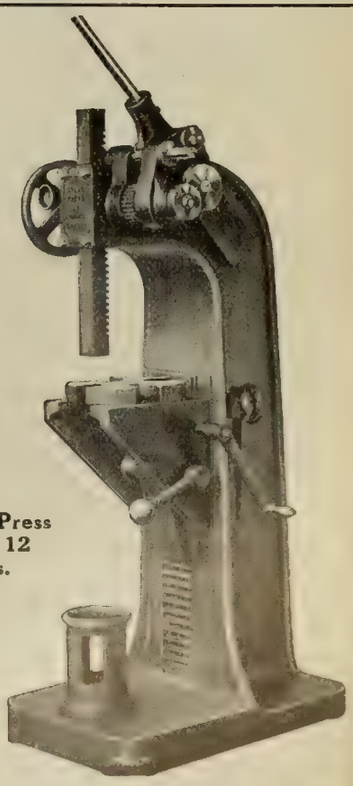

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INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Montreal, Que. — The Cedar Rapids Mfg., and Power Co., will build an addition to the power house at Cedars, Que.

Dartmouth, N.S. — The Liquid Air Society, Montreal, have purchased a site on which they will erect an acetylene plant.

Toronto, Ont.—Pugsley Dingman has a building permit for an addition to storage tanks at the soap factory on Cawthra Ave., to cost $1,200.

Toronto, Ont.— Oborn & Ellis, engineers and architects, will call for tenders shortly on drilling six-inch wells and supply of pumps, screens, etc.

Port Arthur, Ont.—Representations have been made to Ottawa asking that the Atikokan Iron Co's. plant be taken over and operated under government supervision.

Preston, Ont.—The Preston Woodworking Co., are building an addition, 40 x 100 feet, to their plant to accommodate the pattern shop and to make more room in the main building.

Sarnia, Ont.—The plans for the new foundry, to be built on the north side of Exmouth Street, Point Edward, have been completed by the engineers and the tenders and specification are now ready for the contractors.

Port Arthur, Ont.—J. J. Carrick, who some months ago procured the extensive pulp limits known as the Black Sturgeon, east of here, announced that arrangements have been completed for the establishment of a big pulp and paper mill at Port Arthur, the building of a pulp mill being one of the conditions of the limits.

Brantford, Ont.—The Dominion Steel Products Co. of this city has secured a large contract for the construction of heavy machinery for upwards of 100 merchant ships now being constructed in shipyards throughout the United States. The contract involves the extension of the company's plant in the Holmedale, and already extra land has been acquired for the purpose.

MUNICIPAL

St. Mary's, Ont.—The Town Council will purchase a motor driven pump.

Stratford, Ont.—The City Council will purchase seven-ton tandem gasoline road roller.

Kaslo, B.C.—Ratepayers passed a by-law to provide $1,500 to improve the electric light plant.

GENERAL

Toronto, Ont.—The Toronto Electric Supply Co. have a permit for building an addition to their premises on Hanna Avenue.

Chatham, N. B.—It is reported here that Montreal interests are negotiating for the purchase of the Dominion Pulp Co.'s mill and lands in this section.

Vancouver.—The Pacific White Lead Co. of Montreal will build a plant on Industrial Island, B.C., for the manufacture of lead, paint, etc., to cost $50,000.

Hastings, Ont.—The plant of the Hastings Tanning Co. was completely destroyed by a fire on Oct. 23. The loss is about $200,000. The Breithaupt Co. of Kitchener controls this concern.

Toronto.—The B. J. Johnston Soap Co. of George Street, will erect a reinforced concrete factory on Natalie street at a cost of $110,000. The new building will be 200 feet long by 82 feet wide and two storeys high.

Montreal.—Explosions and fire dedestroyed seven buildings of the Canadian Explosives Co., at Ile Perrot, near Vaudreuil, Que., on October 26. The explosions followed a fire which started in the shell-filling house of the assembling plant, and they continued at intervals throughout the day until about 6 o'clock. Among the buildings destroyed were the shell-filling house, the assembling house, the storehouse, and smaller structures, all having been constructed of flimsy materials, as is usual at such plants. The damage is estimated at $200,000.

INCORPORATIONS

The Warwick Machine Co. of Quebec has been incorporated with a capital of $100,000.

The Wallace Foundry Co. of North Vancouver has been incorporated with a capital of $75,000.

The Albert Lea Gas & Electric Co., of Moose Jaw, has been incorporated with a capital of $75,000.

The Warwick Machine Co. has been incorporated at Ottawa by J. E. Zuben, Samuel Fleury and J. A. Boulard to manufacture threshing machines, saws, waggons, sleighs, etc., at Quebec with a capital of $100,000.

Montreal Shipbuilders Ltd., have been incorporated at Ottawa with a capital of $300,000 to build and repair ships of all kinds at Montreal. The incorporators are Earl M. Macdougall, John B. Henderson and Leslie G. Bell, all of Montreal.

Heating Specialty Co., has been incorporated at Ottawa by James Parrish, Samuel Egan and William A. Ross of Toronto to manufacture stoves, furnaces, gas, electric and steam heaters, of all kinds at Toronto with a capital stock of $50,000.

Railway & Power Engineering Corporation has been incorporated at Ottawa by Theodore Malm, Gerard Ruel and William Bowler, all of Toronto, to carry on the business of manufacturing equipment, machinery and tools of all kinds at Toronto with a capital of $50,000.

Alloy Steel Works Ltd. has been incorporated at Toronto to take over the Moffatt-Irving Steel Works and to carry on business as steel founders at Toronto with a capital of $100,000. The provisional directors are Reginald H. Parmenter, Arthur J. Thomson and Samuel D. Fowler, all of Toronto.

ELECTRICAL

Thornton, Ont.—The Hydro by-law passed in the police village of Thornton on Oct. 22 by 46 for and 3 against.

Cobourg, Ont.—A movement is on foot to supply the village of Warkworth and farmers along the line in Percy Township with light and power, which will be brought in from Campbellford.

Owen Sound, Ont.—Plans are ready for the extension of the plant at Eugenia Falls by the Government, and a report by the department's engineers will be issued shortly suggesting the alterations and extensions required. It is understood that the Eugenia power plant is proving inadequate for all the power required.

RAILWAYS & BRIDGES

Montreal, Que.—An Act will be applied for at the Quebec Legislature to incorporate the Quebec and Atlantic Railway Company to build a road from Quebec City to Chicoutimi and to Cape St. Charles on the Labrador coast, the company to be capitalized at $1,000,000. The new railway is to connect with the N. T. R.

London, Ont.—The C.P.R. will, by the time that winter stops further work, have completed improvements east and west of London that involve an expenditure of about half a million dollars. Many thousand dollars are being spent at Galt in rebuilding the bridge and enlarging the yards. New abutments are being put under the bridge at Ayr. A new $35,000 station is being built at Windsor and about $20,000 is being spent in London on additions to the station and an addition to the blacksmith shop in East London.

CONTRACTS

Moncton, N.B.—The Humphries Glass Works have let contract for the erection of their new building to Ambrose Wheeler, of Moncton.

Walkerville, Ont. — The Dominion Stamping Co. have let some of the contracts for a new forge shop.

ECONOMY

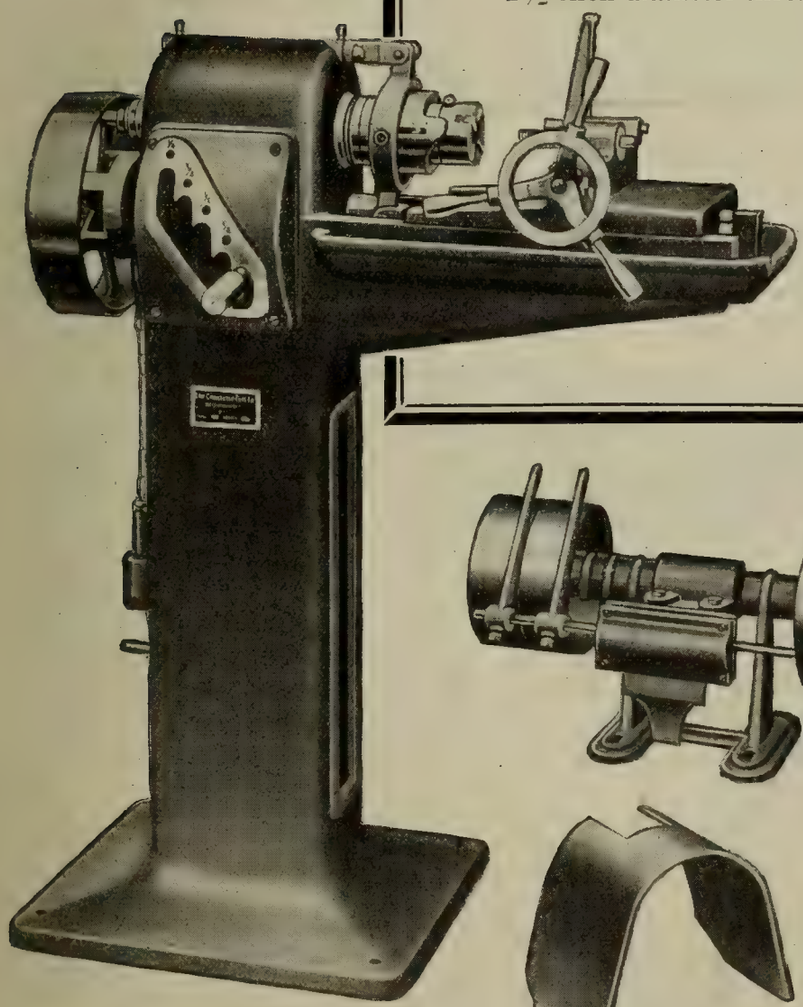
That is the lesson we are slowly learning

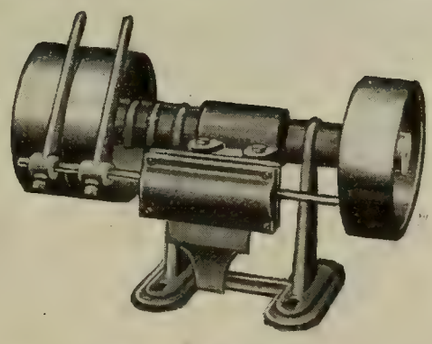
Here is a machine—the Geometric Threading Machine—which has been economizing in screw thread production for a number of years. Busy automatic screw machines cannot profitably be slowed down to cut threads when there is a Geometric Threading Machine at hand. Especially since a Geometric Threading Machine costs one-tenth the price of automatics.

Geometric Threading Machines are employed on a large class of small threaded parts that cannot be produced economically on the ordinary screw machine.

Made in three sizes—to cut 1/8 to 1/2 inch, 1/4 to 3/4 inch, and 3/4 to 1 1/2 inch diameter threads. The carriage is mounted on slides and on the largest size machine is moved back and forth by rack and pinion, and in the smaller sizes by hand.

Spindle speed changes readily made, adapting the machine to the diameter and material of the work. An adjustable stop assures accurate length of thread, and automatically opens the die head, permitting of drawing the work straight back.





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Canadian Agents: Williams & Wilson, Limited, Montreal; The A. R. Williams Machinery Co., Limited, Toronto, Winnipeg and St. John, N.B.

MARINE

St. John, N.B.—There is a possibility of a wooden shipbuilding plant being established at Upper Gagetown near here.

Sarnia, Ont.—A contract has been let to the Gibb Dock Co. for the construction of a new ferry slip at this place for the Pere Marquette ferries. The work will start at once.

Sarnia, Ont.—Captain Wm. Sparling, of the Reid wrecking steamer Manistique, who was injured when a boom broke while the boat was working on the sunken steamer Graham, is reported to be in a serious condition at the Alpena Hospital. Captain Sparling, it was thought at first, was not badly injured, but later reports received here tell of his serious condition. He is very well known on the Great Lakes.

Yarmouth, N.S.—Two more shipbuilding companies have been organized in the Municipality of Clare, Digby County. One at Saulnierville is known as the Acadian Shipbuilding Co.; with F. E. Comeau as president. The other, the Comeau Shipbuilding Co., is located at Comeauville, where they have just completed a mill which will be fitted with modern machinery. A large proportion of the stock of this company is controlled by the Clare Shipping Co. At Meteghan River, just south of the bridge, a New York concern has taken up property for shipbuilding purposes. They have erected two large mills on the premises, and they propose to commence building operations as soon as the necessary machinery is received.

TENDERS

Chapleau, Ont.—Tenders will be received by the town clerk until Thursday, Nov. 15, 1917, for turbine pump, 400 gallons capacity, operated by 40 h.p. motor. Specification, plan, etc., may be seen at the office of the town clerk at Chapleau, or at the office of Chipman & Power, Mail Building, Toronto.

PERSONAL

W. R. Payne, a well-known retired Canadian Government railway veteran, died at Moncton, N.B., on Sunday. He was born in Quebec 67 years ago.

F. C. T. O'Hara, Deputy-Minister of Trade and Commerce, Ottawa, has been in Washington conferring with the United States Priority Committee in regard to steel and other exports from the United States to Canada.

Frank G. Burch, who for several years has been connected with the sales staff of the Mussens Ltd., and later with the Canadian Allis-Chalmers Co. has become associated with the Canadian Ingersoll-Rand Co. as a salesman for the Montreal district.

Major Austin Taylor, of Montreal, has been appointed director of aeronautic supplies in British Columbia by the Imperial Munitions Board. Major Taylor will have charge of all matters pertaining to the development of the supply of the spruce required by the board for the construction of aeroplanes in Great Britain and Canada. Major Taylor was in charge of the Montreal Locomotive Works when they were engaged in the manufacture of munitions.

TRADE GOSSIP

The Ontario Molybdenum Co. has increased its capital stock to $60,000.

Victoria, B.C.—The Minister of Mines has received the information that an order for 6,000 tons of lead has been placed by the Imperial Munitions Board with the Consolidated Mining & Smelting Company of Trail, B.C.

Embargo Is Placed on Silver Spruce.—The exportation from Canada of silver spruce, (except under license) has been prohibited to all destinations abroad other than the United Kingdom, British possessions and protectorates.

The Davis Shipbuilding Co., Levis, Que., has obtained the contract for six more military barges. These vessels will be 130 feet long and will furnish work for 600 men throughout the winter. Two military barges are at present in course of construction at the Davie works.

On Prohibited List.—The British Government has prohibited the exportation of the following articles, effective October 18:—Coir fibre, fish hooks, goatskins and sheepskins, animal hair, lead, farming machinery, hosiery, needles, seal oil, wool and manufactures thereof.

Tungsten Market Quieter. — The tungsten market has not been quite so active of late but there is still a good demand at unchanged prices. Wolframite is quoted as to quality, at $23 to $25 and Scheelite at $26 per unit for the highest grade on the basis of 60 per cent. metal, or 30c per unit additional up to 5 per cent.

Record Government Contract.—The Bethlehem Steel Corporation has received orders from the United States Government for over 150 torpedo boats, to cost around $1,500,000 each. This would make the total value of the order approximately $225,000,000, which is the largest contract from the amount of money involved awarded by the Government since war was declared.

The Canuk Supply Co., Montreal, announce that J. T. Dohn, manager of their Toronto office, has been transferred to the Winnipeg office as manager there in charge of territory west of Fort William, Ont. W. J. Espey has been appointed manager of the Toronto branch, and E. L. Foley has been made eastern sales manager with headquarters at Ottawa.

Scythes & Co., Toronto, have extended the scope of their business by equipping a workshop at their premises in Church Street for making and repairing nautical instruments of all kinds. They have an up-to-date plant which will be a great convenience for vessel owners. The instruments manufactured will include among others, liquid and dry compasses, Kelvin pattern, sounding machines, etc.

North Vancouver Wants Drydock.—The council of the city of North Vancouver has taken a decided stand in favor of a Dominion government-constructed drydock on Burrard Inlet, and in a memorial prepared by Mayor Vance and which received the assent of the council, the Federal authorities are to be asked to undertake immediately the building of a drydock on the north shore as a Government undertaking.

The Electric Furnace Construction Co. of Philadelphia, Pa., announces that Frank Wharton Brooke, formerly metallurgist at Crowleys, Detroit, Mich. and at the Ludlam Steel Works, and G. W. Ketter, who has just finished the erecting and installation of ten to six ton furnaces at the British Forgings, Ltd., Toronto, Ont., and who has been erecting and superintending electric furnaces for years, have joined their staff at Philadelphia.

The Victoria Machinery Depot, Victoria, B.C. has the contract for the construction of twelve boilers of the Howden water-tube type for installation in the wooden hulls now being built on the Pacific Coast for the Imperial Munitions Board. It appears that these are the first contracts placed on Vancouver Island for boilers. Since there are 27 ships being built for the Imperial Munitions Board, which will require 54 boilers, it is possible further orders will be placed.

Coal Allotment for Canada.—Under a definite allotment of American coal for Canada, announced on Oct. 24, by the fuel administration, at Washington, about 2,000,000 tons of bituminous and 700,000 tons of anthracite will be permitted to move across the Canadian border during the next two months. The allotments, which will materially reduce the volume of exports, were arranged in consultation with the Canadian authorities, and after a review of statistics showing the Dominion's fuel consumption during the past year and the future needs of its industries and domestic consumers.

Permanent Harbor Headline is Made.—An Order-in-Council has been passed at Ottawa establishing a permanent harbor headline on the south shore of the Fraser river opposite New Westminster, beyond which no wharves may extend from Port Mann to the Government wing dam at Annieville bar. This harbor line was determined on resolution of the New Westminster Board of Harbor Commissioners, recommended by the chief engineers of the Public Works and Marine Departments, and is concurred in by the Minister of Public Works and Marine. Plans and a description are on file at the office of C. C. Worsfold, resident engineer of the Public Works Department, Post Office Building, New Westminster.

Close of Navigation Soon on Great Lakes.—It is expected that navigation on the Great Lakes will close about November 26. According to informa-

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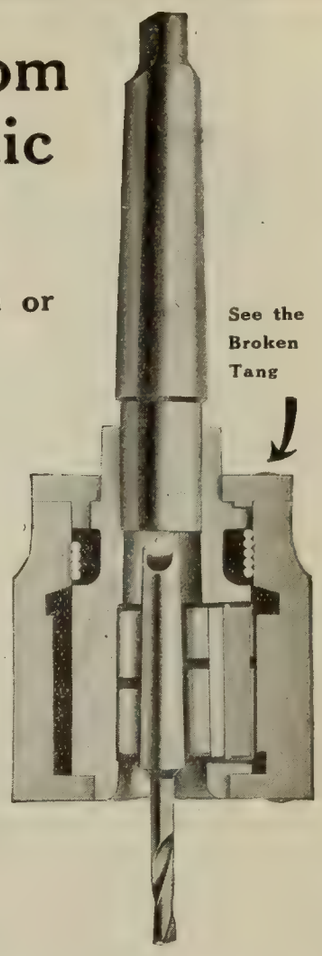
Can Supply You with this New Money-Saving Tool

Wahlstrom Automatic Chuck

Holds tools with or without tangs



Have you heard of this latest Wahlstrom triumph and what it stands for? This new chuck permits the use of BROKEN TANG DRILLS —so don't throw away any more taper shank drills because the tangs are broken off, but install the *Wahlstrom* and save money.

Here are three other reasons why you should install the new chuck:

1. Produces work at greater speed—because tool changes are made in less than two seconds and there is no chance of tool slippage in the *Wahlstrom.*

2. Produces work with more accuracy—because tools are automatically centered and the shanks are not torn and chewed, making true drilling impossible.

3. Produces work at less cost—because greater cutting speeds may be used—tools will last longer and workmen will produce more work.

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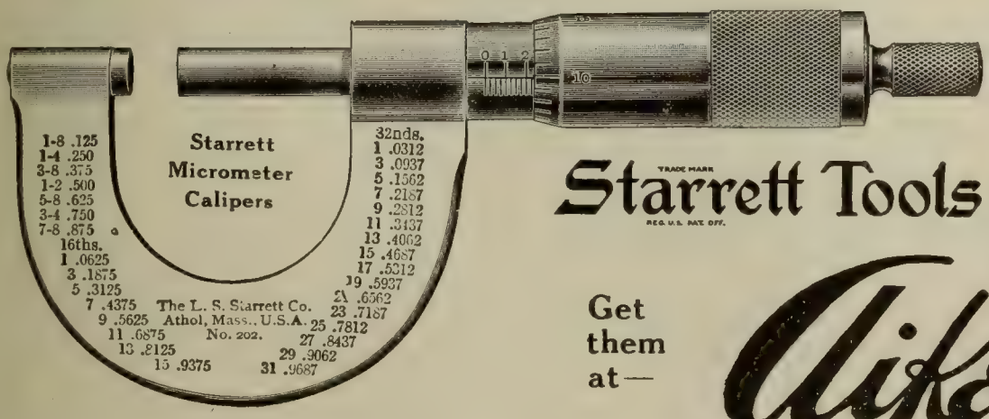

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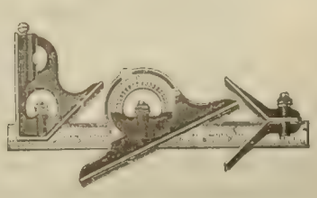

Starrett Combination Sets

AIKENHEAD HARDWARE LIMITED

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If any advertisement interests you, tear it out now and place with letters to be answered.

tion received by the General Freight Department of the Canadian Northern Railway, the last steamers of the Great Lakes Transit Corporation, carrying package freight, will clear from Cleveland on Thursday, November 15, and from Buffalo, N.Y., on Monday, November 26. The boats will run to all Lake Superior ports, including Duluth and Superior. Shipments of freight made from eastern United States on and after November 1 and routed via the Great Lakes Transit Corporation will only be accepted subject to all-rail rates in event of the lake lines being unable to handle the traffic.

Telephone Without Wires.—Dr. Alexander Graham Bell, addressing the Canadian Club Friday night at St. Catharines, Ont., on "Apparent Impossibilities," said: "If the telephone has reached its extreme limits, what next? I cannot say what next, but I can tell you of something that happened in Washington about three weeks ago. The telephone has been applied to wireless, and a man in Arlington, just across the river from Washington, talked with a man on the Eiffel Tower in Paris by telephone without wires. But that is not all. A man in Honolulu heard the conversation. From Honolulu to the Eiffel Tower is 8,000 miles, one-third of the circumference of the globe. Does it not mean that we can talk from any part of the world to any other and without wire?"

Conserving British Blast-Furnace Dust.—Conservation of blast-furnace dust has been introduced in England, evidently with a view to recovering its potash content. The Minister of Munitions has issued an order providing that no person shall buy, sell, deal in or dispose of any blast-furnace dust, except under, and in accordance with the terms of a license issued on behalf of the Minister of Munitions by the Controller of Potash Production, and that no person shall treat any such dust so as to extract any component part thereof, except in accordance with the terms of the license. For the purpose of this order, blast-furnace dust shall mean dust deposited or otherwise derived from the gases of any furnace used for treating ores for the production of iron or any of its alloys.

New Lead Contract Closed by Smelters.—J. J. Warren, managing director of Consolidated Mining and Smelting Company, stated that the embargo on lead ores containing over four per cent. zinc was lifted, inasmuch as Sir Joseph Flavelle, head of the Munitions Board, had agreed to purchase the lead production of the company until March, 1918. The Minister of Munitions at Victoria, B.C., received the information that an order for 6,000 tons of lead had been placed by the Imperial Munitions Board with the Consolidated Mining and Smelting Company, of Trail. Furthermore and as a sequel to the representations made to the Federal Cabinet by Premier Brewster, the Dominion Government has agreed to remove the embargo prohibiting the exportation of lead and zinc into the United States.

Dominion Government Lifts Embargo on Lead.—As a sequel to the representations made to the Federal Cabinet by Premier Brewster, the Dominion Government has agreed to remove the embargo prohibiting the exportation of lead and zinc into the United States. Another matter has been referred to the Federal authorities, through the instrumentality of Hon. Mr. Sloan; the possibility of securing a remission of the duty on lead and zinc going from Canada into the United States, thereby establishing a uniform market for the disposal of those metals used in the manufacture of munitions. The smelter has agreed to receive, after November 1, all lead ores as formerly, to the extent of average shipments made last year from each mine, advancing the usual amount of money on receipt of the ore, and making final settlement when, and in such proportion as, the lead can be sold.

U. S. Embargo Extended.—A despatch from Washington states that another long addition to the list of articles which will be licensed for export only where they will contribute to successful prosecution of the war was issued recently by the War Trade Board. The new list includes: "Amorphous phosphorus, anti-friction metals, bichromate of potash, bismuth salts, boring machines and mills, brass, caustic potash, China weed oil, chrome steel, cronium, cobalt, copper, and alloys unless containing less than ten per cent., crucibles, industrial diamonds, drill presses (except sensitive), drilling machinery, ferro chrome, ferro vanadium, ferro tungsten, all articles containing flax manufactured in the United States, flannelette, grinders, graphite electrodes, animal hair, hydrofluoric acid, jute and producers, manganese, drilling machines except hand drillers, mercury, molybdenum, naxos emery, nickel and alloys, plumbago and products, planers, peas, salammoniac, sheetite, sodium phosphate, solder, tin and alloys, tungsten and alloys, vanadium, wool and all its products suitable for military purposes, and yellow phosphorus."

CATALOGUES

The Williams Bulletin and stock list of machine tools for October has been issued by the A. R. Williams Machinery Co., Toronto.

Ed. Bennis & Co., Little Hulton, Bolton, England, have issued an illustrated bulletin containing a description of the chain grates, sprinkling stokers and coal handling plant at the Corporation Electricity Works, Coventry, England.

The Goldie & McCulloch Co., Galt, Ont., have issued an attractive wall calendar for the twelve months ending October, 1918. The calendar is printed in colors, two schemes being utilized for alternate months. Each sheet has the days of the month in bold figures, and also views of the works and power plant installations.

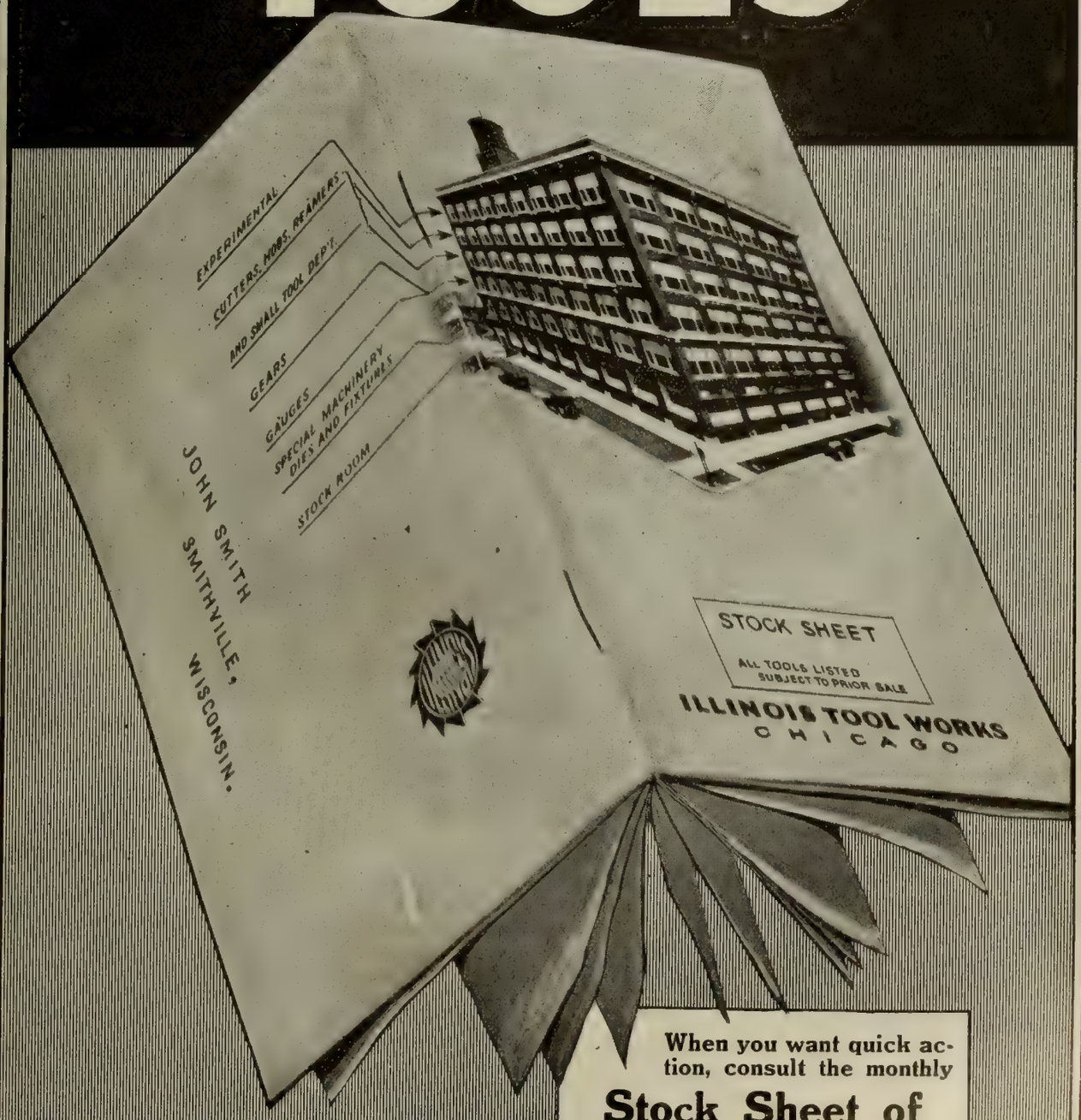
Grinding and Polishing Machinery.—The Webster & Perks Tool Co., Springfield, Ohio, have issued a loose leaf folder containing a number of leaflets illustrating and describing an extensive line of ball bearing and plain bearing grinding and polishing machinery. A specification is included for each type of machine, giving the principal dimensions, etc.

Bennis Coking Stoker.—Catalogue issued by Edward Bennis & Co., Little Hulton, Bolton, England, dealing with the Bennis patent high temperature smokeless and gritless coking stoker. The catalogue contains a description covering the construction and operation of this stoker together with a number of illustrations showing installations with Lancashire boilers.

BOOK REVIEWS

The Japan Mercantile and Manufacturers Directory, 1917.—Published by The Far Eastern Advertising Agency, 7 Harima-machi, Kobe, Japan. This is the first directory that has been published covering the whole of commercial Japan and is a development of the Osaka and Kobe Directory published by the same concern. The rapid growth of business in Japan, particularly in the Osaka district, during recent years on account of the Great War, and shortage of many commodities in Europe, has caused the business men of Japan to realize the important position which their country has attained as a manufacturing nation. Merchants in foreign countries were anxious to know to whom they could apply for special lines of goods required, and also who were buyers. Many of these merchants were visiting Japan and it was felt that a commercial directory would be of the greatest assistance to both buyers and sellers. This situation created a field for a directory and accordingly this publication was compiled. The names and addresses of manufacturers and merchants which are given in both English and Japanese are arranged alphabetically. Each important city or commercial centre has its own section with a thumb tab index. One section contains a list of products and manufacturers. Among other features of interest in the directory are a list of diplomatic and consular representatives, tables of Japanese weights and measures, postal and telegraphic information and a number of views of the principal cities in Japan. The advertising pages also contain considerable interesting matter as the advertisers are the principal firms in the country. This is unquestionably the most complete publication of its kind dealing with commercial Japan and will be very useful to Canadian manufacturers or merchants who desire to extend their business activities in Japan. The directory contains 800 pages, 11½ x 5½ ins., and is bound in attractive red cloth covers with general index and advertising index.

ILLINOIS TOOLS



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Tools of proved accuracy and durability.

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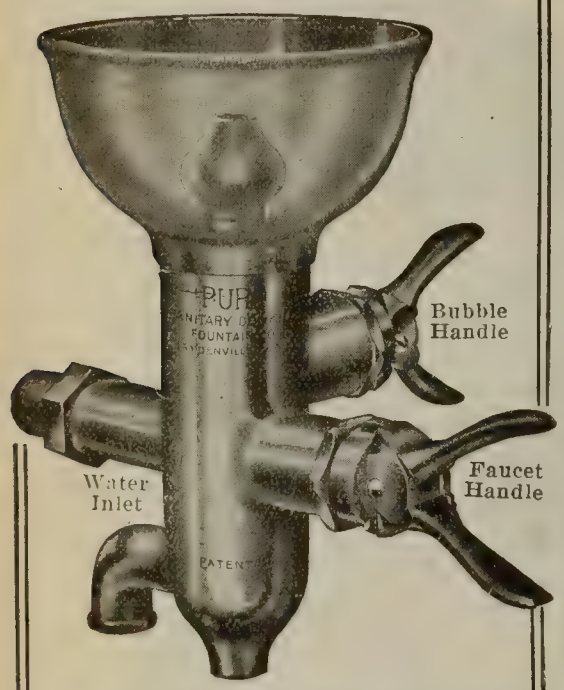
Saves Dollars
Why let that old-fashioned faucet go on year after year wasting water—MONEY?
Why more drinking cups and glasses, only to become unsanitary—lost, broken or carried away? Puro Sanitary Drinking Fountain stops all this needless waste. Puro saves you 35% on the water bill alone. Puro saves you all that money you spend for cups. YET Puro is always ready with a clear, cool drink with dollars in the bank.



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You start cashing in at once—not only on your water bill saving, but on the increased efficiency of your workers as well.
Men like PURO—it's clean. No danger of deadly germs lurking in its sparkling bubble.
Write us—tell how many men, how many departments, and we'll tell you how much the cost will be to
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STEEL PRODUCTION FOR WAR PURPOSES

THE steel industry in the United States in the last nine months has operated at an average rate of about 3,600,000 tons of steel ingots per month, which would give an annual output of 43,200,000 tons of ingots, permitting the production of approximately 32,400,000 tons of rolled products. The United States Government is calling upon the steel mills now for about 5,400,000 tons of various products for war purposes, and this tonnage, doubtless, will be increased by a million tons in the near future. Of the total annual output of the rolling mills, therefore, the United States Government is taking 16.6 per cent., and this probably will be increased to 20 per cent. within a few months. If it be assumed that the Government will pay an average price of 3 cents per pound for this material, the total expenditure will be $416,880,000 for this 5,400,000 gross tons, or $500,256,000 for the 6,480,000 tons to be bought.

The Allied Governments to-day are taking 2.600,000 tons of steel from the United States mills, and this will be increased to 3.600,000 tons in the near future, equivalent to about 11 per cent. of mill output. Together, the United States and Allied Governments, therefore, will take about 30 per cent. of the total rollings of the steel mills, and there is a possibility that 40 per cent. may be needed when all of the indirect demands for war munitions have been satisfied.

Of the 20,000,000 tons of unfilled orders on the books of the steel companies, it is understood that only a few million tons represent war orders, so that in the aggregate mill capacity is pre-empted for almost a year. This does not mean that all products are fully sold for this period. In some lines mill capacity is sold for six to eight months, while capacity to produce other products has been taken up for from twelve to fourteen months.

1917 CANADIAN COAL OUTPUT

THE mines branch of the Department of Mines, Ottawt, has received from the principal coal mine operators returns of their production during the first three months of 1917 on the basis of which the following estimates have been made of total production during this period. According to these estimates the total production of coal during the first quarter of 1917 was 3,590,991 short tons, comprising 1,233.934 tons in January; 1,143,956 tons in February, and 1,213,101 tons in March.

The record would appear to show that the average rate of production in Nova Scotia and British Columbia was less than the average rate of production during 1916, but greater in the Provinces of New Brunswick, Saskatchewan and Alberta.

The exports of coal during the three months were 501,570 tons, as against exports of 737,744 tons during the corresponding period of 1916.

The imports of coal during the three months were 3,921,824 tons, as against imports of 4,002,892 tons during the corresponding period of 1916.

The production of oven coke during the first three months of 1917 was 308,690 tons—the imports during the same period being 207,139 tons, and the exports 5,606. tons.

PROJECTED IRON AND STEEL INDUSTRY IN PORTUGAL

THE "Diario do Governo" (Lisbon) of 14th April publishes a law authorizing the Portuguese Government to grant, by means of a public call for tenders to a Portuguese firm or enterprise, a fifteen years' concession for the establishment and exclusive right of working of an iron and steel industry by the most modern processes. The concessionnaries must install at their own cost a modern iron and steel works, comprising blast-furnaces, steel furnaces, rolling mills, presses, shearing machines, wire-drawing plant, and any other necessary accessories for an initial annual production of at least 100,000 metric tons of cast iron and for the manufacture of iron and steel bars, plates, sheets, rails, etc. The establishment must be in working order within a period of five years from the date of the granting of the concession. The Government, on its part, will grant land for the erection of the works, exemption from industrial and other taxes, etc. The concessionnaire will be able to import free of customs duty all plant and materials which cannot be satisfactorily acquired in Portugal during the first five years of the the concession. The Government will also authorize the construction of railway lines up to 15 kiloms. (about 9¼ miles) to connect the new works with the State railway lines in the vicinity.

ROMANCE OF "WIRELESS"

WIRELESS telegraphy is playing an extraordinarily important part in the war. Its uses were foreseen, up to a point, before hostilities began, but its developments have been beyond the wildest pre-war imagination. Every moment it is figuring in the great world drama, and almost day by day we are receiving illustrations of its principal part in what may be called the subdramas of the conflict raging over so large a portion of old Earth's surface.

It is difficult to say which is the more wonderful and intensely interesting—the manner in which wireless co-ordinates an army's many activities in the field or that in which it narrows the seas. Wireless at sea has had its more widely known romances, perhaps. It has an important share in the conduct of the submarine campaign—and a greater one in meeting it. Our patrol boats in their thousands, our destroyers and submarine hunters in general, have ranged the water unceasingly, always on the alert for their prey and for news of where submarines may be operating. In the majority of cases the news comes by wireless. A merchant ship, say, is attacked by one of the pirates. Out go

her aerial signals, to be picked up by vessels near and far, warning passenger or cargo boats of the place where there is danger and inviting the fighting craft to the rescue.

Of such episodes scores stand out as spies. One of the most thrilling was the adventure of the Anglo-Californian, a vessel which was homeward bound from Montreal with a cargo of horses, and was chased and shelled by a submarine. At once the wireless operator, J. F. Rea, sent out the news into the air. Many miles away it was picked up by a warship. Then ensued a long-sustained and poignant wireless dialogue. The warship was coming along at top speed, and the Anglo-Californian's wireless man was telling of the progress of the chase. Fight it could not be, as the merchant vessel was unarmed. Shell after shell tore into the ship, but the gallant captain proceeded on his way, meeting the submarine's tactics with skilful navigation which kept the pirate astern, the while he followed as well as possible the wireless instructions, as to his course, received from the warship. An hour passed; two; three. The Anglo-Californian, told to hold on as long as possible, was grimly enduring a terrible bombardment in which the captain, eight hands, and 20 horses were killed. "For God's sake, hurry up. Firing like blazes," was one of the messages radiated by the wireless man to the warship. Mr. Rea was lying on the floor of his room with broken glass all around him, and "the place stinking with gunpowder," as he told the warship by wireless.

The submarine, in the event, was foiled. After four hours of effort she had to dive, apprehending trouble from the warship, and the survivors on the Anglo-Californian proceeded on their way in due course, later to receive a high tribute from the Board of Admiralty. Mr. Rea was presented by the Board with a gold watch in recognition of his conduct (brilliantly described by Alfred Noyes in those wonderful articles of his) which saved the situation.

Many columns could be filled with fine stories of the share of wireless in sea warfare. Our fleets have a conspectus of the North Sea by the aid of wireless, the messages coming from the patrol ships on the water and the aircraft which traverse the sky in all directions above. German submarines use wireless, and act according to instructions received, from Heligoland or elsewhere, through their aerials. A British aviator may detect a submarine below the surface and wireless to a handy destroyer, which may therefore be able to trail the pirate to his doom. During the battle of Jutland, Jellicoe and Beatty owed much to wireless; and there are stories of how Von Spee intercepted and misconstrued radiated information and inquiries emanating from Admiral Sturdee. In short, whatever is happening on the sea nowadays becomes known through wireless.

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Will Give You Exceptional

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WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

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PORTABLE PLANERS
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FINISHED MACHINE KEYS
STATIONARY & PORTABLE KEY WAY CUTTERS
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SIX COMPRESSORS FOR SALE — VERY cheap. The National Quarry, 81 St. Peter St., Quebec. c18m

BOILER FOR SALE—ONE HEINE SAFETY horizontal, single drum, water tube boiler, 120 H.P., 36" diam., 19 ft. long, 5-16" shell steam drum. Apply The Parkhill Mfg. Co., Limited, 400 St. Ambroise St., Montreal. c18m

FOR IMMEDIATE SALE—150 No. 1 AND 10 No. 7C Racine hack saw machines; in excellent condition. The Peck Rolling Mills, Limited, Montreal, Quebec. c19m

2 NORTON GRINDERS — 10" x 36"—IN FINE condition; complete with stock of Norton wheels. Price $1,400 each, f.o.b. Hamilton. The National Machinery & Supply Co., Ltd., Hamilton, Ont.

3 JONES & LAMSON TURRET LATHES, WITH Collet chucks; 3" x 36"; geared head machines in fine condition. Price $1,000 each, f.o.b. Hamilton. The National Machinery & Supply Co., Ltd., Hamilton, Ont.

FOR SALE—1 90-FT. THOMAS SPACING table complete, including one indicator carriage, one trolley carriage, stands, adjustable roller, racks, etc. Adjustable as to length. The Manitoba Bridge & Iron Works, Winnipeg, Man. c15m

FOR SALE—1 NEW 25 H.P. HOR. TUBULAR boiler, 1 second-hand 12 H.P. hor. tubular boiler, tested to 150 lbs.; 1 second-hand 50 H.P. loc. boiler; 1 second-hand Leonard 12 x 12 high speed engine; 1 second-hand 500-lb. belt-driven Beaudry power hammer, only in use two months; in perfect condition. Canadian Engineering & Mfg. Co., 128 Bleury St., Montreal, Que. c9m

AGENCIES WANTED

ENGINEER AND BUSINESS MAN WITH office in Manchester, England, is prepared to work for a good firm desiring representative in England. Would attend to the interests of a firm shipping munitions. Box 337, Canadian Machinery. c19m

AGENCIES WANTED—FRENCH ENGINEER having large established clientele, desires direct agency for France of labor-saving machinery of all kinds for wood and iron working, as well as factory equipment. Headquarters in hearts of Paris, near the Opera. Write E. A. B., Room 444, 14 Phillips Sqr., Montreal.

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H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto

SITUATIONS VACANT

WANTED — SUPERINTENDENT-FOREMAN, 6" British shells. Box 340, Canadian Machinery. c19m

SHOP SUPERINTENDENT—WANTED, MAN competent to take entire charge of machine shop solely engaged in manufacture of small tools. Must be thoroughly competent and have had some years' experience. Shop while small at present offers excellent opening for advancement. Apply, stating experience, salary, etc., to Box 339, Canadian Machinery. c17m

WANTED — FOREMAN BLACKSMITH FOR Montreal shop on general work. Six forges and 1,500-lb. steam hammer. Must be a hustler. Apply, in confidence, stating experience and wages expected, to Box 335, Canadian Machinery. c15m

WANTED — MECHANICAL DRAUGHTSMAN for engine, compressor, and general work. State experience and salary expected. Apply The Jenckes Machine Company, Limited, Sherbrooke, Que. c16m

WANTED—MACHINE SHOP FOREMAN FOR small shop doing general work, not munitions, near Toronto. State experience and salary expected. Give references. Box 345, Canadian Machinery. c20m

WANTED

WANTED — SECOND-HAND CUPOLA AND other foundry equipment. State full particulars and price. Box 346, Canadian Machinery. c21m

WANTED—ONE No. 166 BLISS 2-SPINDLE automatic trimmer and beader, also 1 No. 156 single spindle trimmer, or machines of similar design. Must be in good condition. In replying state fully the name of maker of machines and lowest price, also where they could be seen. Box 342, Canadian Machinery. c18m

WANTED—ONE HORIZONTAL RE-DRAWING or reducing press, fitted with bottom knockout, the general dimensions of which should be equal to Bliss No. 62. Must have flywheel not less than 725 lbs. weight and approximately 3 ft. 6 in. in diameter. Press must be in good working order. In replying, give all dimensions, also state name of maker and lowest price. Box 341, Canadian Machinery. c18m

WANTED

Vertical Boring Mills, 50 to 60" swing.

Horizontal Boring Mills, 3 to 6" boring bar.

Hobbing Machine, for cutting worm wheels 42" diameter.

Spur Gear Cutter, 60", B. & S.

All for Government work. Machines must be in first-class condition. Wire prices and where machines can be inspected.

RUSSELL MOTOR CAR COMPANY, LIMITED

Toronto - Canada

SITUATIONS WANTED

MECHANICAL AND CONSTRUCTION ENgineer desires change; twenty years' general experience; specialty steam power plants; knowledge pulverized coal. Box 343, Canadian Machinery. c21m

GENERAL SUPERINTENDENT DESIRES position with reliable firm. Possess years of practical machine shop experience as well as production methods, including shell work. Box 338, Canadian Machinery. c18m

GRADUATE MALE NURSE, AGE 32. HAVE established hospitals for three large manufacturing concerns. Familiar with social service, accident prevention and modern methods of employing. At present employed. Less than $2,400 not considered. Box 336, Canadian Machinery. c15m

MACHINE SHOP FOREMAN DESIRES change as shop foreman or master mechanic. Acquainted with scientific management; 26 years' experience. Box 328 Canadian Machinery. c11m

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States wants position as superintendent or general foreman. Large or small shop on ammunition or machinery; A1 references. Address Box 327, Canadian Machinery. c9m

WORKS MANAGER OR GENERAL SUPERintendent open for engagement—28 years' experience as machinist, toolmaker, inspector, superintendent of tool-making and tool-designing, experimental and development work, heat-treating and testing of steel in raw and finished state; shop superintendent, works manager. Experience has been on rifle work, electrical work, typesetting machines, lock-making and bridge-work. Correspondence solicited, and can furnish good references. Address Box 332, Canadian Machinery. c14m

FOR SALE

4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 13 B. & S. Automatic Gear Cutter.

1—30" Newark Automatic Gear Cutter.

1—5 x 48 Pratt & Whitney Plain Grinder.

1—No. 2 Bath Universal Grinder.

1—12 x 60 Modern Plain Grinder, new.

2—Lees-Bradner Thread Millers.

1—30 x 30 x 8' Powell Planer, new.

Brownell Machinery Co.
Providence, R. I.

Immediate Shipment

1—AUTO MULTIPLE PUNCH made by D. Bergue & Company, of Manchester, England, 26′ long by 6′ 6″ wide, fitted with eighteen punches to punch ⅞″ diameter holes through ⅝″ plate, including eighteen ⅞″ punches and one set of twenty-seven ⅝″ punches. This machine is practically new and each punch is adjustable for centers and any one can be thrown out of action at any time.

1—10′ NILES BORING MILL takes 43″ under the crossrail, width of rail 19″, two swivel heads, tool bar 6″ round by 24″ travel, power friction feeds drive six step cone for 4″ belt, in absolutely first-class condition.

1—42″ NILES BEMENT POND BORING MILL, latest type, two swivel heads, single pulley drive, all geared feeds, nearly new. Four-jaw combination chuck in table

1—6′ BERTRAM HEAVY DUTY RADIAL DRILL, single pulley drive, four speeds in speed box, tapping attachment in spindle, plain box, table excellent condition.

1—6′ LONDON DRESES PATTERN HEAVY DUTY RADIAL DRILL, round column type, speed-box drive arranged for motor drive, in first-class working order.

1—BERTRAM HORIZONTAL BORING MACHINE, cone type headstock, four step cone for 4″ belt, spindle 4″, diameter 36″, feed slotted, adjustable table 48″ wide 36″ long.

The A. R. Williams Machinery Co., Limited
64 FRONT STREET WEST TORONTO, ONTARIO

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15″ three-jawed chuck.
1—Lathe, 28″ swing, 8′ bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22″ Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15″ three-jawed chuck.
1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 24″ wheel.
1—Lathe, 14″ swing, 6′ bed.
2—Ford Smith Shell Grinders, complete.
1—17″ LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
1—16″ Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
1—Double End Painting Machine, with ¼ h.p. motor.
1—Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—5 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
Sherbrooke, Que.

The Chas. A. Strelinger Co.

43-51 East Larned St., Detroit, Mich.

MACHINE TOOLS IN STOCK FOR IMMEDIATE DELIVERY

DRILLING MACHINES

10″ Myers Sensitive Bench Drills with chucks.
No. 1-B 8″ Henry & Wright Sensitive Drills.
12″ Albany H.S., B.B. Tool Room Drill.
15″ Barnes Upright Drills.
No. 3 Barnes Horiz. Radial Drill.
No. 1-S Garvin B.G. Horiz. Drill.

GRINDERS

No. 3 Blount Double End Emery Grinders.
14″ Diamond Grinder, complete.
No. 1¼ "T" Webster & Perks Grinder.
14″ Blount Wet Tool Grinder.
No. 6 Gardner Pl. Bearing Disc Grinder.
No. 3 Wilmarth & Morman Surface Grinder.
Style "JB Point" Wilmarth & Morman Drill Grinder.
Geometric Chaser Grinder.

LATHES

No. 5½ Sloan & Chase Precision Bench Lathe.
15″ x 5′ Blount Speed Lathe.
16″ x 6′ Monarch Q.C., D.B.G. Eng. Lathe.
18″ x 8′ Monarch Q.C., D.B.G. Eng Lathe.
17″ x 8′ Sidney Q.C., D.B.G. Eng. Lathe.
17″ x 6′ Wickes Single Purpose Lathe.

MISCELLANEOUS

No. 6 Whitney Hand Millers.
No. 1 Standard Hand Millers, with oil pump.
No. 101 Niagara Power Press.
No. 1 and No. 2 Marvel Power Hack Saws.
No. 1 Racine Hack Saws, cap. 6″.
No. 5 Federal Pl. Hd. Turret Lathe.
Niagara 30″ Queen City Squaring Shear.
No. 2 Quickwork Shear.
No. 1 Garvin Screw Slotter.
¾″ Geometric Threading Machine.
Type "A" Sioux Valve Seating Machine.

PETRIE'S LIST of New and Used Machine Tools

In Stock for Immediate Delivery

TURRET LATHES AND SCREW MACHINES

16″ x 5½′ MacGregor, D.B.G. (3)
16″ x 6′ Pratt & Whitney, B.G.
20″ x 7′ Fay & Scott.
22″ x 8′ Pratt & Whitney, B.G.
22′ x 8′ Martin, single purpose.
24″ x 8′ Lodge & Shipley.
26″ x 8′ Fay & Scott, B.G.
2″ x 24″ Stevens Screw Machines (2).
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

6″ x 30″ Dalton, B.G., bench.
13″ x 6′ Filsmith, D.B.G., comp. rest.
14″ x 6′ Lodge & Shipley, taper attachment.
15″ x 6′ Sebastian, B.G., comp. rest (3).
16″ x 8′ McDougall, B.G., comp. rest (2).
16″ x 8′ Porter, B.G., comp. rest.
18″ x 8′ C.M.C., D.B.G., comp. rest.
18″ x 10′ Putnam, back geared.
20″ x 8′ Fifield, B.G., plain rest.
21″ x 8′ Bawden, heavy duty (3).
24″ x 11′ Pond, B.G., comp. rest.
26″ x 14′ Gleason, D.B.G.
30″ x 10′ Ames, B.G., plain rest.
31″ x 16′ Fifield, back geared.

DRILLS

14″ Excelsior, sliding head, lever feed (6).
16″ Barr, sliding head, lever feed.
20″ Silver, back geared, power feed (3).
20″ Barnes, 3-spindle, lever feed.
22″ Barnes, back geared, power feed.
24″ Kerkhoff, back geared, power feed.
26″ Prentice, back geared, power feed.
40″ Bickford, back geared.
46″ Allfree, back geared, power feed.
No. 10a Baush, 16-spindle.
D-1 Colburn, back geared, heavy duty.

GRINDERS

10″ x 30″ Landis, universal.
No. 1 Cincinnati, universal (2).
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer.
24″ Barnes, wet tool.
2¼″ Yankee, twist drill.

IRON PLANERS

20″ x 20″ x 5′ Bertram.
24″ x 24″ x 6½′ Bertram.
25″ x 25″ x 12′ Lodge & Davis.
36″ x 36″ x 10′ Pond, two heads
40″ x 40″ x 12′ New Haven, power feed.

MILLING MACHINES

Bertram, plain.
Brown & Sharpe, power feed, plain.
Monarch, vertical.
Cataract, bench, hand feed.
No. 2 Ford-Smith, plain.
No. 4 Fox, universal.

SHAPERS

16″ Petrie, back geared.
16″ Canada Mach. Corp., back geared.
16″ Cincinnati, back geared.
24″ Gould & Eberhardt, back geared.
24″ Bertram, back geared.
30″ Morton, back geared, draw cut.

MISCELLANEOUS

6″ and 12″ Racine Hack Saws.
4″ and 6′ Robertson Hack Saws.
4½″ Martin Cutting-off Machine.
12″ Hall Pipe Machine.
4″ Oster Hand Power Pipe Machine.
No. 2 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 4 GA Brown & Boggs Punching Press.
No. 200 Brown & Boggs Inclinable Power.
No. 3 Goldie & McCulloch Hydraulic Banding Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
7′ Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.
FRONT STREET WEST, TORONTO

If any advertisement interests you, tear it out now and place with letters to be answered.

RIVERSIDE Machinery List

We Own Every Tool Offered

NEW MACHINE TOOLS

For Immediate Delivery

2—18 x 8 Springfield Q.C.G. Engine Lathes.
1—18 x 8 Springfield Standard Engine Lathe.
1—16 x 8 Springfield Q.C.G. Engine Lathe.
2—16 x 6 Springfield Q.C.G. Engine Lathes.
1—14 x 6 Springfield Geared Head Engine Lathe.
3—16" Springfield B.G. Shapers.
2—20" Springfield B.G. Shapers.
1—25" Springfield B.G. Shapers.
1—30 x 30 x 10' Wilson Two-head Planer.
3—14" Pierce Turret Lathes.
2—1 x 8 Pierce Hand Screw Machines.
3—No. 1½ American Milling Machines.
1—No. 20 Bliss O.B.I. Press.
1—No. 19 Bliss O.B.I. Press.
1—No. 18C Bliss O.B.I. Press.
1—No. 18 Bliss O.B.I. Press.
5—20" Buffalo B.G., P.F. Drill Presses.
3—20" Canedy-Otto B.G., P.F. Drill Presses.
2—20" Champion B.G., P.F. Drill Presses.
2—20" Champion Plain Drill Presses.
3—20" Silver Plain Drill Presses.
3—20" Canedy-Otto Plain Drill Presses.
2—14" Champion Plain Drill Presses.

USED MACHINERY

ENGINE LATHES.

1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—22 x 14 Putman Standard Engine Lathe.
1—22 x 10 Reed Standard Engine Lathe.
1—18 x 6 Jones & Lamson Standard Engine
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.
2—13 x 8 Barnes Engine Lathes.
1—13 x 5 Barnes Engine Lathe.
1—10 x 4 Sebastian Engine Lathe.

TURRET AND SCREW MACHINES.

2—No. 6-A Potter & Johnston Automatic Lathes.
1—4¼" Gridley Automatic Screw Machine, motor driven.
2—4" Foster F.G.H. Hand Screw Machines.
1—5" Pierson F.G.H. Hand Screw Machine.
4—12" Warner & Swasey Turret Lathes with air chucks.
4—16" Warner & Swasey Turret Lathes with air chucks.
2—2" Cleveland Automatic Screw Machines, jigger feed.
1—⅝-¾ Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND GRINDERS.

1—No. 2 Hendey Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drilling Machines.
3—Fox Milling Machines.
1—Garvin Hand Miller.
1—No. 2½ Bath Universal Grinder.
1—No. 12 Modern Plain Grinder.
1—No. 1 Landis Internal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.
1—Miami Valley Universal Cutter Grinder.

DRILL PRESSES.

1—5' Mueller Plain Radial Drill, old type.
1—28" Niles, Bement, Pond B.G., P.F. Drill Presses.
1—3-spindle 8" overhang Henry & Wright High speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.

SHAPERS AND PLANERS.

1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
1—36 x 36 x 10' New Haven Planer, S.H.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS.

1—Waterbury Farrel O.B.I. Press, geared.
1—No. 30 Perkins Drawing Press.
3—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—600-lb. P. & W. Roll Board Hammer.
1—150-lb. Bradley Steap Hammer.
1—25-lb. Fairbanks Belt Hammer.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machine tools, both large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

Good Used Equipment

TRAVELING CRANES.

20-ton Browning Trolley, 5 ton aux., 56½" ga. (new).
20-ton Shaw, 56' 3" span, 110 V.D.C., 3 motor.
10-ton P. & H., 48' span, 110 V.D.C., 3 motor.
20-ton Reading, 29' 6" span, hand.
10-ton Maris, 55' 0" span, hand.

PUNCHES AND SHEARS.

Single, 48" tht., cap. 3 x 1¼", Providence.
Single, 12" tht., cap. 1 x 1", L. & A. (2.).
Single, 28" tht., cap. ⅞ x ⅞", belted, Cleveland.
Single, 6" tht., cap. ⅞ x ⅞, Cleveland.
Single, 15" tht., cap. ¾ x ½" (hand), new Doty.
Double, 12" blades, Bar Shear, cap. 2" sq., Cruc.
Double Angle Shear, cap. 6 x 6 x ¾", Cleveland, belted.
Univ. Plate Shear, 18" blades, cap. ¾", Cleveland, belted.
Univ. Plate Shear, 26" blades, cap. ½", Lewis, belted.
Lennox Rotary Splitting, 30" tht., cap. ½", belted.
Lennox Rotary Bevel, 5" tht., cap. ½", belted.
Guillotine Shear, cap. 2½" sq., belted, Perkins No. 6.
Guillotine Shears, No. 0 H. & J., 6 and 7" blades (2).
Guillotine Shear, Fisher, 21" blade, cap. 8 x 2".
Squaring Shear, Stoll, 53" cap., 14 gauge (new).
Squaring Machine, United, 108", cap. ¼".

MISCELLANEOUS.

Bolt Cutter, 2" Acme, Class A, single head, dies.
Boring Mill, 10' Niles, Vertical, 2 heads.
Forging and Upsetting Machine, 1½" Acme, with dies.
Forging and Upsetting Machine, 2½" Ajax.
Hammer, 200-lb. Bradley, belted.
Hammer, 300-lb. Johnson & Jennings, belt driven.
Hammer, 80-lb. Bradley Cushion Helve, belted.
Hammer, 40-lb. Bradley, belted (rebuilt).
Hammer, 35-lb. Maggowan & Finigan (Perfect), belted.
Rotary Planer, 36" Cleveland, belt driven.
Rotary Planer, 60" Cleveland, motor 60 cy., 440 v.

GOOD CONDITION.
PROMPT SHIPMENT.

McCoy-Brandt Machinery Co
216-18 Penn Ave.
PITTSBURGH, PA.

Eastern Machinery & Equipment Co., Inc.

319 COMMERCIAL TRUST BLDG.
PHILADELPHIA, PA.

NEW TOOLS FOR IMMEDIATE DELIVERY.

2—No. 3 Hendey Universal Milling Machines.
1—2½ x 2" Wm. Sellers Tool Grinder.
30—18" x 9' Turning and Boring Lathes.
3—Double head Sullivan Grinders.
1—32" x 12' Pittsburgh Engine Lathe.

USED MACHINERY

ENGINE LATHES.

8—30" x 10' American, Gear Head, A-1.
1—20" x 10' Bullard.
3—24" x 14' American.

TURRET LATHES.

36—Potter & Johnson 6A Automatic Turret Machines.
3—3 x 36 Jones & Lamson Flat Turret.
2—2¼" x 24" Jones & Lamson Flat Turret, bar equipment. Full set Turret Tools.
9—25" Gisholt Chucking Lathes, 6½" hole in spindle, square turret.
14" x 6' Lodge & Shipley Turret, back geared.
5—24" Gisholt, 2-step cone, 6¼ H.S.

BORING MILLS.

6—66" swing Bement-Miles Tire Turning Mills, two swivel heads, 15½" under rail
1—37" Baush Boring Mill, 2 heads; good as new.
1—Cylinder Boring Mill, capacity of 24" diam. to 96" diam., 10' long. Tool equipment included, good as new.
1—42" Bullard Boring Mill (2) heads.

MILLING MACHINES.

1—No. 3 LeBlond Plain Miller, table 13½ x 58¼.
1—24" x 8' Beaman & Smith Open Side Slab Miller, with two vertical spindles.
1—No. 1½ Universal Milling Machine.

SCREW CUTTING MACHINES.

2—2¾" Cleveland Automatic, Model A.
1—1¼" Cleveland Automatic, Model A.
1—2" Cleveland Automatic.
1—No. 55 National Acme, 4 spindle; good as new.
1—No. 54 National Acme, 4 spindle; good as new.

GRINDERS.

1—1½" Full Universal Landis Machine.
1—No. 13 Brown & Sharpe Universal and Tool Grinder. Full equipment.
No. 1½ Universal Cutter and Reamer Grinder.
5—Fisher Profile Grinders for Cutters.
5—No. 6 Std. Universal Tool and Cutter Grinders.

DRILL PRESSES.

1—4' Prentice Radial Drill, tapping attachment.
1—2' 6" Fosdick Radial Drill, tapping attachment.
1—5' 6" Full Universal American Radial Drill, tapping attachment.
2—D1 Colburn Heavy Duty Drills, latest pattern.
2—D3 Colburn Heavy Duty Drills, tapping attachment, latest pattern.

FOR SALE

One 22" x 50" Wheelock Engine, left-hand, arranged for direct shaft coupling, with heavy balance wheel 8¼" x 14" x 17'—7" in dia.

Merchants Rubber Factory
KITCHENER, ONTARIO

c20m

USED MACHINERY

IMMEDIATE DELIVERY

DRILLING MACHINES.

20" Mechanics.
22" Sibley, S.H., B.G., P.F.
30" Lodge & Davis, S.H., B.G., P.F.
2½' Gang Plain Radial.
3½' Hamilton Plain Radial, tapping attachment.
4' Mueller Plain Radial.
4—No. 310 Baker Heavy Duty.
3-spindle Rockford.
4-spindle Rockford.
4-spindle Washburn, with power feed.
4-spindle Allen.
No. 11 Pratt & Whitney, 10 spindles.

GEAR CUTTERS.

24" x 7" G. & E., spur gears.
No. 3—26" B. & S., spur gears.
No. 4—48" B. & S., spur gears.
No. 13—B. & S., spur gears.
30" x 9" G. & E., spur and bevel gears.
36" x 9" G. & E., spur gears.
36" Walcott, spur gears.
24" Gleason Gear Planer.

GRINDERS.

No. 1 B. & S. Universal.
No. 2 Woods Tool and Cutter.
Brainard Cutter.
Leland Universal, with power feed.
No. 2 Landis Universal.
No. 21 Landis Plain.
No. 1 Gardner Disc.
No. 24 Gardner Disc.
No. 6-A Diamond Universal.

LATHES.

14" x 6' Rockford, C.R.
15" x 6' Rockford Tool Co., C.R.
16" x 8' Bradford, C.R.
18" x 6' Bradford, C.R., taper attachment.
18" x 8' Lodge & Shipley, pat. head, C.R., taper attachment.
18" x 10' Fitchburg, C.R.
20" x 14' Blaisdell, C.R.
21" x 12' New Haven, C.R.
36" x 18' Schumacher & Boye, T.B.G., Q.C.G.
36" x 20' American, T.B.G.
38" x 16' Fifield.
42" x 28' Hamilton, T.B.G., raising blocks to swing 54".

PLANERS.

24" x 24" x 6' American, one head.
26" x 26" x 6' Gray, one head.
26" x 26" x 8' Pease, one head.
30" x 30" x 8' Cincinnati, two heads.
30" x 30" x 8' Woodward & Powell, one head.
36" x 36" x 14' Sellers, one head.
39" x 39" x 12' New Haven, one head.
48" x 48" x 10' Woodward and Powell, two heads.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES.

No. 2 P. & W., friction head.
No. 2 Foster, plain head, A.C. and W.F.
No. 3 Bardons & Oliver, plain head, A.C. and W.F.
No. 4 Pearson, friction head, A.C. and W.F.
No. 5 Foster, geared friction head, auto. chuck, power feed to turret slide and power feed to cross slide.
No. 5 Foster, all geared head, auto. chuck and wire feed, power feed to turret slide.
1¾" Gridley, 4-spindle Automatic.
2¾" Cleveland Automatic.
3¼" Gridley 1-spindle Automatic.

TURRET LATHES.

No. 2 Foster-Kimball, plain head.
No. 22 Garvin, plain head.
16" Lodge & Davis, back geared.
16" Warner & Swasey, friction head.
2 x 24 J. & L., cone head.
24" Gisholt, 4¼" spindle hole, taper attachment.
No. 3A Warner & Swasey, bar attachment.

PUNCHES AND PRESSES.

No. 74½ Bliss, straight sided, geared.
Blake & Johnson Embossing.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾", 12" throat; new.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾", 18" throat; new.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾," 24" throat; new.

MISCELLANEOUS.

24" Bullard Vertical Turret Lathe, turret head and one side head.
No. 00 Baker Keyseater.
No. 3 B. & S. Universal Miller, with vertical and rack cutting attachments.
6" x 48" P. & W. Thread Miller.
4-spindle Warner & Swasey Valve Milling Machine.
No. 3 Cincinnati Vertical Milling Machine.
No. 3 Burr Cold Saw.

STOCKER-RUMELY-WACHS COMPANY
117-121 NO. JEFFERSON STREET CHICAGO, ILLINOIS

We Have for Immediate Delivery the Following Second-hand Machinery in Good Operative Condition

1 Landis No. 3 Universal Grinder 12" x 42", complete equipment, less internal grinding attachment. . $1,500

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $2,200

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $1,800

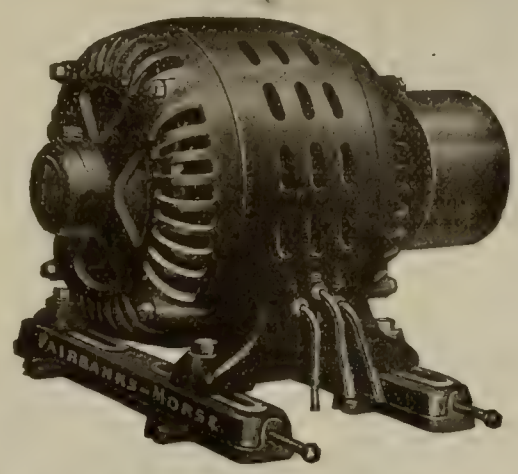
These machines are particularly good value, and may be seen at our works.

A. B. JARDINE & COMPANY, Ltd.
HESPELER, ONT.

MACHINE TOOLS IN STOCK

No. 4 Cincinnati Universal Miller with vertical attachment and power feed Rotary Table.
No. 3 LeBlond Universal Miller.
No. 1½ NEW American plain Millers.
5—No. 0 NEW Steptoe Hand Millers.
1" x 15" Pratt & Whitney Screw Machine.
28" x 16' Reed Lathe.
24" x 10' NEW Carroll-Jamieson heavy duty lathe.
20" x 6' Davis lathe.
20" x 10' Hamilton lathe.
6—19" x 8' NEW, Sidney D.B.G. quick change lathes, swing 21" over V's.
3—17" x 8' NEW, Sidney D.B.G. quick change lathe, swing 19" over V's.
15" x 6' NEW, Sidney D.B.G. quick change lathe, swings 17" over V's.
12—17" x 8' NEW, National quick change.
15" x 6' NEW, Carroll-Jamieson, quick change.
48" Harrington plain Radial Drill.
36" Dresses plain Radial Drill.
D-4 Colburn high duty Drills.
3—20" Rockford high duty Drills.
16" Queen City B.G. Shaper.
400 lb. Single Frame Steam Hammer.
125 lb. Dupont Belt Hammer.
30 Ton Watson & Stillman Hydraulic Press.

FRANK TOOMEY, INC.
127-131 North Third St., PHILADELPHIA, PA., U.S.A.



Fairbanks-Morse Induction Motors

FOR

Immediate Delivery

We have in stock at Montreal and Toronto the following motors:

3 Phase		60 cycle
1— ½ H.P.		110 volts
2— 1 "		550 "
2— 1 "		220 "
1— 1 "		110 "
6— 2 "		550 "
1— 2 "		220 "
6— 3 "		550 "
2— 3 "		220 "
6— 5 "		550 "
4— 5 "		220 "
7— 7½ "		550 "
1— 7½ "		220 "
2— 10 "		550 "
2— 10 "		220 "
7— 15 "		550 "
1— 15 "		220 "
1—20 "		550 "
5—25 "		550 "
1—25 "		220 "
2—30 "		550 "
2—40 "		550 "
1—50 "		550 "
2—75 "		550 "

3 Phase		25 cycle
2— 1 H.P.		220 volts
1— 2 "		550 "
3— 3 "		550 "
1— 7½ "		550 "
1—10 "		550 "
3—15 "		550 "
3—20 "		550 "
2—30 "		550 "
2—35 "		550 "
1—75 "		550 "

The Canadian Fairbanks-Morse Co., Limited

St. John Quebec Montreal Ottawa Toronto
Hamilton Windsor Winnipeg Saskatoon
Calgary Vancouver Victoria

New York's Greatest Stock

Our Own Machines Rebuilt and Guaranteed

(Partial List)

Detrick and Harvey Open-Side Planer, Eight Foot Capacity, Twelve Foot Platen, Four Heads. Fine Condition.

REDUCING PRESSES

FOR DRAWING SHRAPNEL CASES 21" DEEP—Four No. 60½ BLISS, adjustable stroke from 4" to 42".

NEW SHAPERS IN STOCK

Twelve new 24" Hollingworth Improved Triple Geared Crank.

PIPE MACHINES

No. 9 Saunders, 8" to 16" capacity.
10" Cox, 4½" to 10" capacity.
No. 6 Saunders, 2" to 8" capacity.
8" Eaton, Cole & Burnham, 2" to 8" capacity.
6" Stoever, 1¼" to 6" capacity.
6" Curtis & Curtis, 1½" to 6" capacity.
4" Morris, 2½" to 4" capacity.
4" Armstrong, 2½" to 4" capacity.
2" Saunders, ¾" to 2" capacity.
2" Borden, ½" to 2" capacity.
2" Jarecke, ¾" to 2" capacity.

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MACHINE TOOLS—HOW ABOUT THESE?

BORING MACHINES—Vertical.

2—32" Bullard, 1 turret head.
2—36" B. & S. one turret head, Dec. Delivery
1—38" Baush, two heads.
1—42" King, 2 swivel heads; almost new.
1—42" Baush, 2 swivel heads, quick change.
1—61" Niles, two swivel heads, motor driven.
1—84" Bickford.
1—NEW 8' Bickford, 90" table, 2 swivel heads; Feb. delivery.

BORING MACHINES—Horizontal

1—Niles 2½" bar, knee type.
1—Lucas, 2¾" bar.
1—No. 2 Barrett, 5" bar.
1—London 6" bar.

BULLDOZERS

1—No. 9 Williams & White, belt drive.
1—No. 12 Ajax, single pulley drive.
2—No. 23 Williams & White, belt drive.
1—No. 26 Williams & White, belt drive.
1—No. 29-U Williams & White, arranged for motor drive.

CRANES—Traveling.

1—10-ton Maris, 55' span, hand operated.
2—10-ton Electric, 47' span, 25' lift, 3 motors.
3—10-ton P. & H. Electric, 72' span.
1—10-ton Niles, 72' span.
1—10-ton Whiting, 3 motors, 24' span.
1—50-ton Niles, 61' span.

CRANES—Locomotive.

3—10-15-ton McMyler, broad gauge, steam locomotive, 60' boom, bucket, 3 drums.
1—15-ton Industrial Locomotive, 8 wheel, 40' boom, bucket.
1—15-ton Brown Hoist Locomotive, 36' boom, bucket, 8 wheels.
1—20-ton Orton & Steinbrenner Steam Locomotive, 8 wheel, double drum, 37' boom, bucket.

CUTTING-OFF MACHINES

1—NEW 4¼" Davis.
30—Davis 4½"
10—4½" Williams.
2—NEW 6" Davis.

DRILLING MACHINES—Radial

6—NEW 3' Mueller, speed box drive, Dec. del.
3—NEW 3' American, sensitive tapping attachment.
2—4' Mueller Plain, speed box drive
1—4½' Full Universal, cone drive.
1—NEW 5' Western, plain, with motor.
1—NEW 5' Niles Universal, with motor.
1—5' Fosdick, plain.
6—NEW 5' Mueller, speed box drive, Dec. del.
1—6' Pond, cone drive.
1—NEW 6' Triumph, motor drive; Dec. delivery.

DRILLING MACHINES—Heavy Duty

2—NEW No. 2 Colburn
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
4—No. 310 Baker Single Pulley Drive, late type

DRILLING MACHINES—Sliding Head.

2—NEW 24" Barnes Drills and Tappers.
5—NEW 24" Barnes Drills.

DRILLING MACHINES—Multiple Spindle

1—4-spindle 20" Barnes, all geared.
1—No. 5 Fox, 12-spindle, capacity 1".
1—Baush, 12-spindle, capacity 1¼", 30" circle, motor driven.

GEAR CUTTING MACHINES

1—NEW No. 3 Bickett Gear Rack Planer, delivery 60 days.
5—No. 3 Brown & Sharpe Auto. Gear Cutter, spur.
2—No. 4 Brown & Sharpe, latest model, cap. 48" x 10".
1—NEW 6" Standard Gear Cutter, spur.
1—15" Gleason Bevel Gear Planer
1—16" Bilgram Bevel Gear Generator.
1—22 x 8" G. & E., for spur and bevel.
1—24" Becker-Brainard.
1—24" Fellows Gear Shaper
2—NEW 30" Flather, Solid Pattern.
3—36" Fellows Gear Shapers.

GRINDERS—Universal, for Cutters, Drills, Reamers, etc.

6—NEW No. 190 Wells.
4—No. 1 Cincinnati.
1—NEW Premier Universal.
1—NEW Wilmarth & Morman, Style B.K.
1—NEW Walker, No. 1 Outfit B
1—NEW No. 1 Wood Universal.
5—NEW No. 2 Wood Universal.
1—NEW Walker, No. 2 Outfit K (capacity 9" x 26")
2—NEW No. 2 Osterlein Universal.
7—NEW LeBlond

GRINDERS—Cylindrical—Plain

2—NEW 8" x 18" Modern, self-contained.
3—NEW 8" x 30" Modern, self-contained.
2—NEW 10" x 24" Modern, self-contained.
6—12" x 36" Modern, self-contained.
2—12 x 42" Landis, self-contained.
5—12" x 48" Modern, self-contained.
7—NEW 10" x 50" Norton; October delivery.
1—14" x 50" Norton.
1—NEW 10 x 72 Norton, plain.
1—12 x 96" Springfield.

GRINDERS—Cylindrical—Universal.

2—NEW No. 2 Bath, 9" x 20".
1—NEW No. 2 Walker, 9" x 26"
1—NEW No. 2½ (10" x 36") Bath
1—NEW Thompson, 10 x 36.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis
1—No. 4 Cincinnati, capacity 12 x 72"

GRINDERS—Internal

1—NEW No. 6 Modern, capacity 10" x 10".
1—No. 70 Heald
1—No. 75 Heald.

GRINDERS—Cylindrical.

1—No. 60 Heald, single pulley drive

GRINDERS—Profile

1—NEW Cleveland
5—Fisher Profile Grinders.

GRINDERS—Surface

1—NEW No. 1 Wilmarth & Morman
2—NEW No. 1½ Walker's complete
2—NEW No. 2 American with Walker No. 1¾ plain flat mag, chucks.
4—NEW No. 2 Reid (same as B. & S.)
3—No. 2 Brown & Sharpe.
1—Blanchard Heavy Vertical with motor; almost new.
1—3' Pratt & Whitney Vertical, magnetic chuck.

HAMMERS—Board-Lift, Drop.

1—No. 4 Standard Machinery Co., 400 lb.
1—E. W. Bliss, 800 lb.
1—NEW Beaudry, 500-lb., belt driven.

HAMMERS—Steam Forging

1—Morgan & Williams, 600 to 800 lbs., 21" gap.
2—3,500 lbs. Chambersburg Steam Drop Hammer.
2—5,000 lbs. Chambersburg Steam Drop Hammer.
1—7,000-lb. Morgan Special Double Stand.

KEYSEATERS

2—NEW No. 1 Davis.
1—NEW No. 2 Davis.
1—No. 2 Mitts & Merrill.
1—No. 2 Knowles, 60" stroke.
1—Colburn, 4" capacity, 43" stroke.

LATHES—Manufacturing, Not Screw Cutting.

2—NEW No. 3 Harding Bros.' Bench Lathe.
3—16" x 8' Fairbanks-Morse, heavy duty.
70—NEW Simplex, 16" x 8'.
14—Reed-Prentice Shell Lathes for 4" or 18 lbs. American shells
2—25" Barrett Heavy Duty Boring Mill.
50—20" x 10' Hinman, high duty.

LATHES—Engine

3—NEW 14" x 6' Bradford, quick change.
14—NEW 15" x 6' Rockford.
1—NEW 14" x 6' Hendey, geared head.
3—NEW 16" x 8' Cleveland Tool Room Lathes.
4—NEW 16" x 8' Bradford, quick change.
1—NEW 17" x 8' National, quick change gears.
12—NEW 17" x 8' LeBlond, pan bed, quick-change gears.
1—18" x 10' Hendey, quick-change gear, 14" chuck.
5—NEW 20 x 10 Bradford, quick change.
1—NEW 20" x 10' Cleveland Geared Head
3—NEW 20" x 12' Bradford, quick change.
19—NEW 21" x 10' Porter, S.B.G.
9—22" x 10' Putnam, oil pan and pump.
1—NEW 24" x 10' Bradford, quick change.
5—NEW 24" x 12' Bradford, quick change.
1—NEW 24" x 14' Bradford, quick change.
3—24" x 14' American, quick change.
1—24" x 22' Bullard, triple geared, taper attachment.
1—NEW 26" x 48" x 12' McCabe, Double Spindle.
1—New 26" x 48" x 22' McCabe, Double Spindle.
8—NEW 28" x 12' Conradson, duplex helical drive, screw cutting type.
1—29" x 18' 6" Schumacher & Boye.
1—NEW 30" x 14' American Double Back-Geared, Quick-Change
1—30" x 14' Lodge & Shipley, single pulley drive, quick change.
1—NEW 30" x 12' Pittsburg Pattern.
8—NEW 36" x 24' Putnam, triple-geared
1—42" x 28' Hamilton, triple geared, quick change, raising blocks to 54".
1—50" x 12' American, geared head, quick change.
1—50" x 24' Prentiss.
1—NEW 66" x 46' Putnam, triple geared, face plate drive, 5-step cone, 6½" belt; October delivery.
1—71" x 20' Fifield, triple-geared.
1—84" x 18' Special Boring Lathe.

LATHES—Turret

8—NEW 21" Gisholt, H-21.
2—NEW 24" Gisholt, 1-24.
5—2 x 24" Jones & Lamson
1—NEW 18" Libby.
3—24" Libby, universal facing head, 3-jaw chuck.
1—20" Steinle, almost new.
18—6-A Potter & Johnson.

MILLING MACHINES—Knee Type—Universal

1—No. 2 Kempsmith, vertical attach.
1—No. 2 Kempsmith, 13" dividing head.
1—NEW No. 2 Rockford High Power.
2—NEW No. 2 Garvin.
1—No. 2 LeBlond.
1—No. 25 Osterlein.
10—NEW No. 3 Owen.
1—No. 3 Cincinnati Full Universal.
1—No. 3-H LeBlond Heavy Duty, almost new.

MILLING MACHINES—Knee Type—Plain

9—NEW No. 0 Rockford.
2—NEW No. 1 Kempsmith.
2—NEW No. 1½ American back gear
2—NEW No. 2 Rockford
10—NEW No. 2 Owen; November delivery.
1—No. 3 LeBlond
2—No. 3 Kempsmith.
5—NEW No. 3 Conradson, single pulley drive.
4—NEW No. 3-H LeBlond.
10—NEW No. 3 Owen.
1—NEW No. 4 LeBlond.

MILLING MACHINES—Hand.

3—NEW No. 1 Rockford, without column.
3—NEW No. 2 Rockford, on column.
2—NEW No. 3 Rockford, on column.
3—NEW No. 3 Rockford, on column, power feed.

MILLING MACHINES—Vertical

1—NEW Bickett, No. 0
1—No. 3 Brown & Sharpe.
2—NEW No. 4-B Becker.
2—No. 5 Becker.

MILLING MACHINES—Planer Type

1—No. 2 Beaman & Smith.
1—Ingersoll Slab, 16" x 48" cap.
1—NEW 17" x 5' Eynon, planer type.
1—30" x 30" x 8' Ingersoll No. 928, single spindle, with motor.

MILLING MACHINES—Lincoln Type.

1—NEW No. 1 Gooley & Edlund, Briggs type.
3—NEW No. 1 American.
18—NEW Sellers Auto., quick return.

PLANERS

4—NEW 24" x 24" x 6' Powell, Single Head.
1—26" x 26" x 10' Gray, 1 head.
1—30" x 30" x 8' Ohio Machine Tool Co., 2 heads.
1—36" x 36" x 10' American, two heads.
1—36" Rotary Planer, motor driven.
1—36" x 36" x 8' Gray, 1 head.
1—40" x 40" x 11' Niles, four heads
1—42" x 42" x 12' Butler, high speed, 3 heads; almost new.
1—44" x 44" x 12' Cleveland Openside, 3 heads, arranged for motor drive.
1—48" x 12' Pedrick, open side, one head.
1—48" x 48" x 12' Scott, heavy type, milling attachment on rail.
1—50" x 50" x 16' Pond, 2 heads on rail
1—52" x 48" x 15' Betts, 2 heads.
1—60" x 60" x 21' L. W. Pond, 3 heads.
1—72" x 56" x 16' Gray, 4 heads; A1 condition.
1—72" x 60" x 14' Smith Globe, 2 swivel heads.
1—72" x 72" x 20' McKechnie & Bertram, 4 heads.

SCREW MACHINES—Hand.

4—NEW No. 2 Foster, geared friction head.
1—NEW No. 4 Foster, geared friction head, power feed to turret slide.
2—NEW No. 6 Foster, all geared, power feed to turret slide.
3—NEW No. 5 Foster, all geared head, power feed to turret, power cross feed.
2—NEW No. 6 Foster, geared friction head, power feed to turret, power cross feed.
5—NEW No. 7 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW No. 10 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW 2¼" Dreses, F.G.B., power feed.

SCREW MACHINES—Automatic

2—NEW ⅝" Cleveland, Model A.
1—NEW ¾" Gridley Mult. Spindle, belt driven.
2—NEW 1¼" Gridley Mult. Spindle, belt driven.
2—NEW 1¾ Gridley, mult. spindle, belt driven.
1—NEW 2¼" Gridley Mult. Spindle, belt driven.
1—NEW 3¼" Gridley Single Spindle, belt driven.
2—No. 0 Brown & Sharpe.
1—No. 2-G Brown & Sharpe.
1—No. 515 National Acme.

SHAPERS

1—NEW 16" Springfield
1—16" Motor Driven Rockford
5—NEW Barker, 24".
2—NEW 24" Milwaukee.
2—NEW 24" Potter & Johnson, universal rotary table.
1—25" Springfield.
2—30" Morton Draw Cut.

SLOTTERS.

1—NEW 8½" Betts, heavy model, vertical geared crank slotter.

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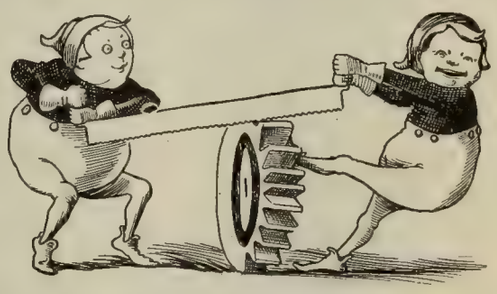

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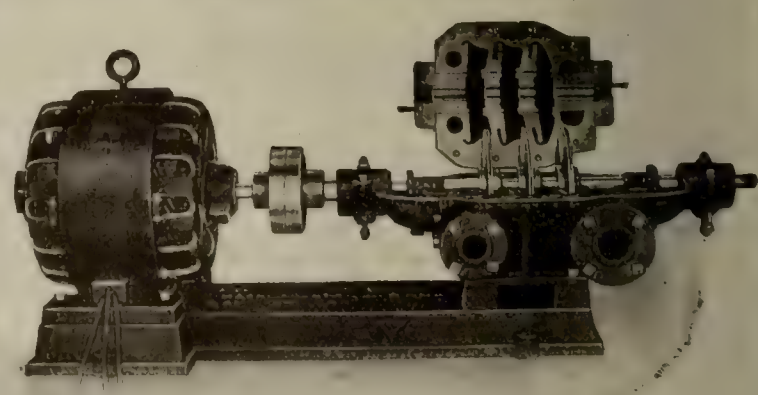

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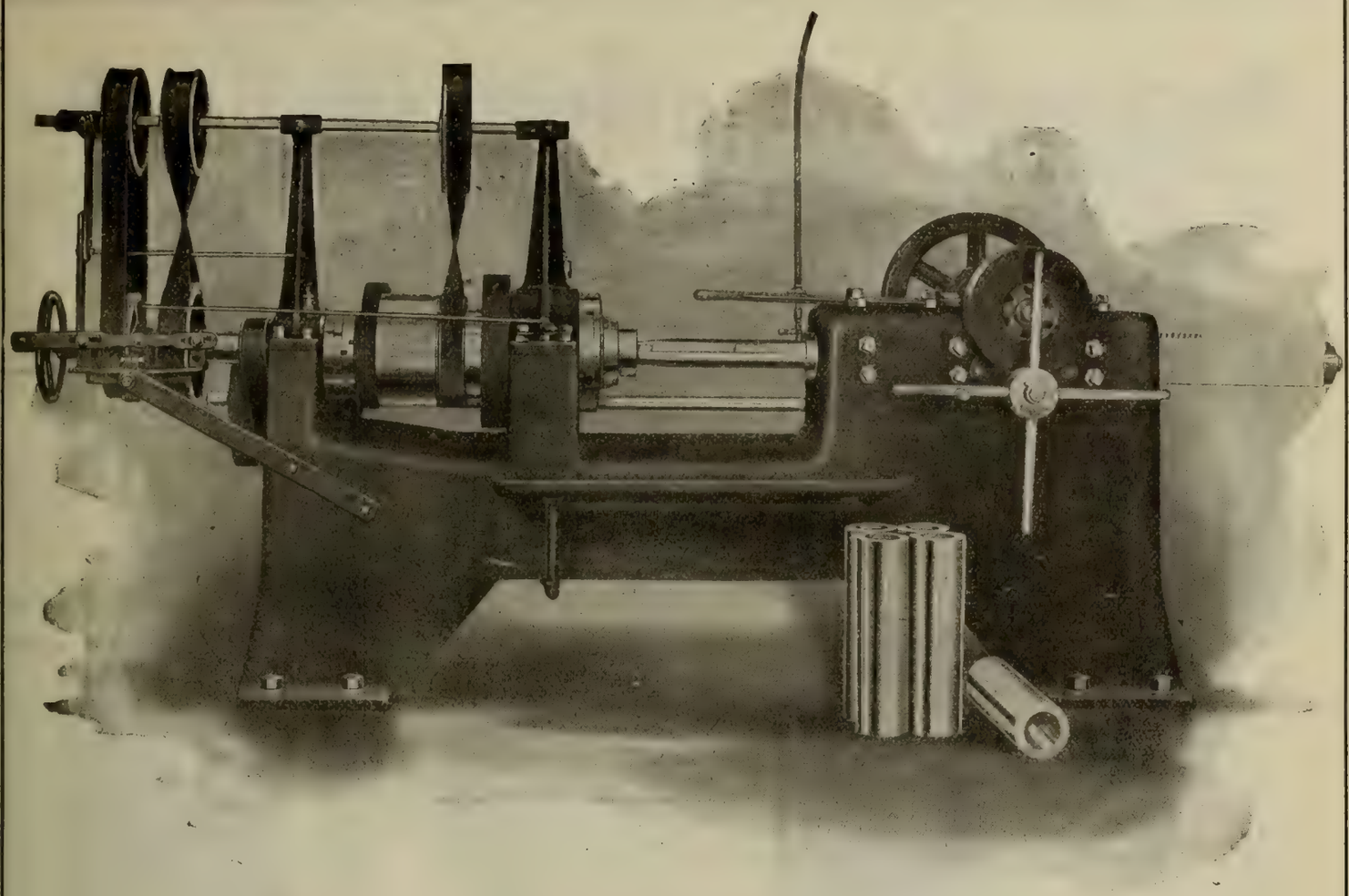

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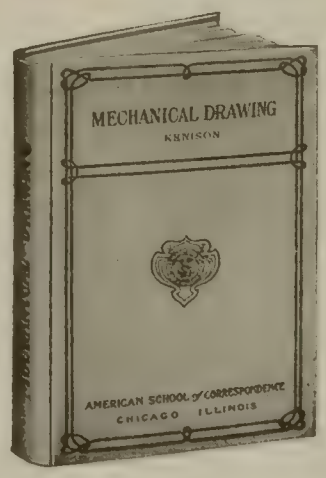

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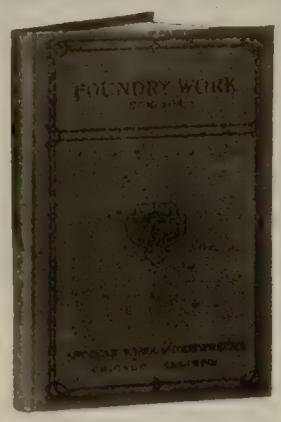

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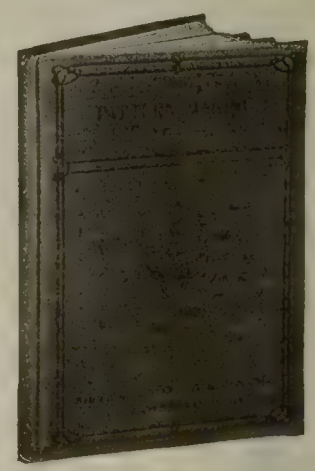

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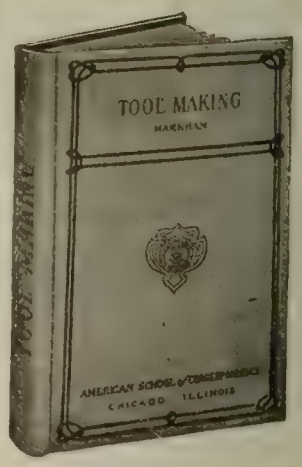

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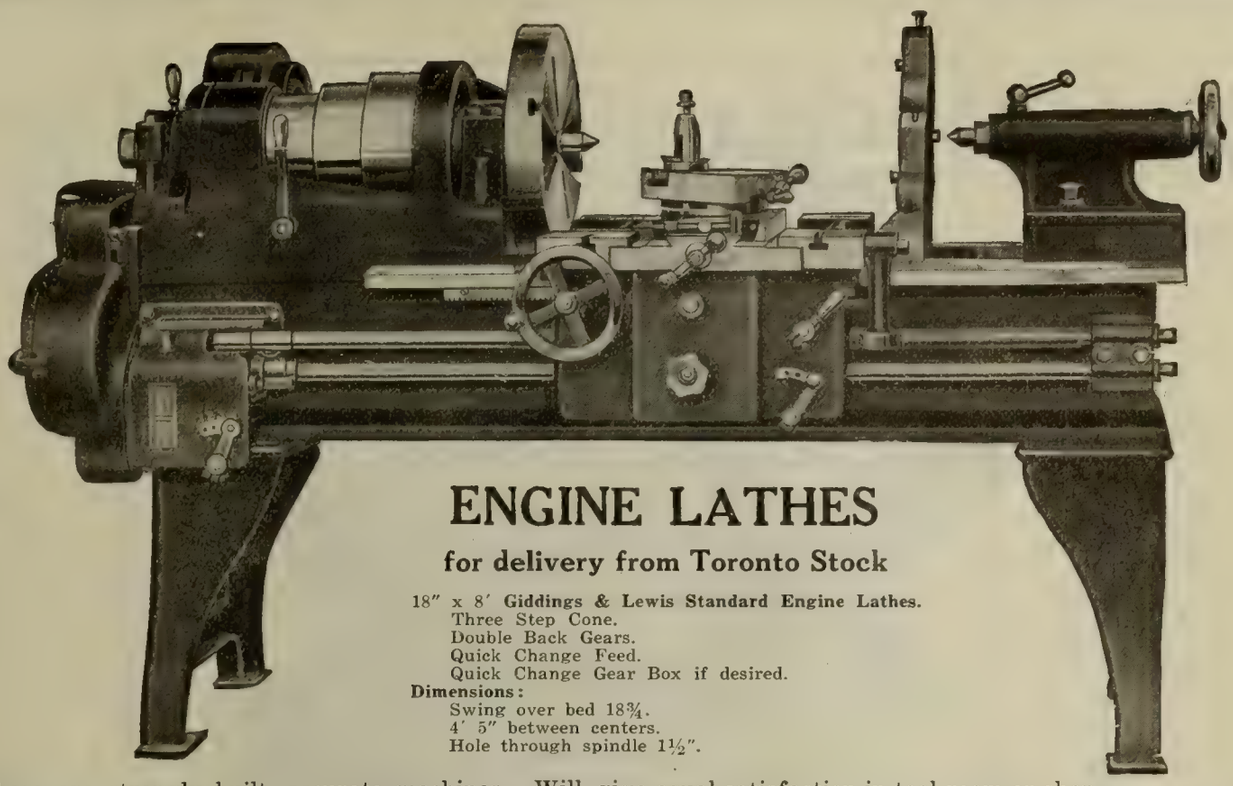

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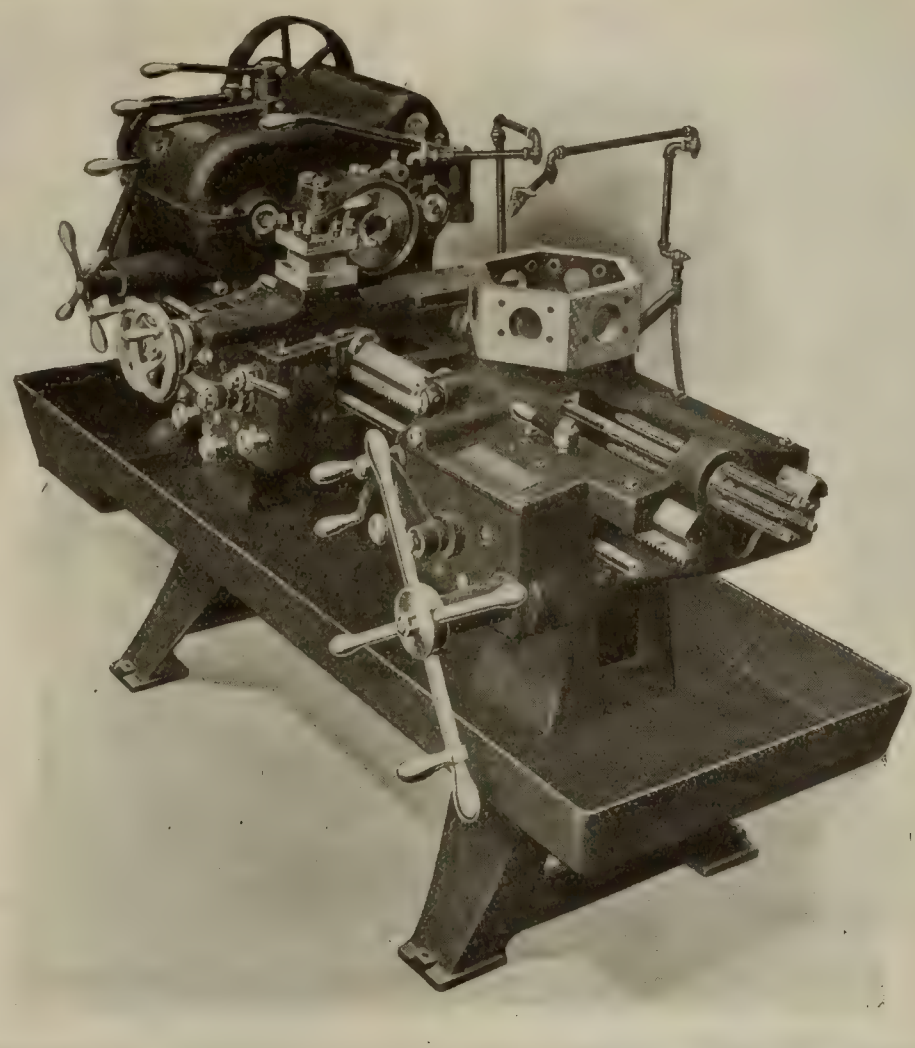
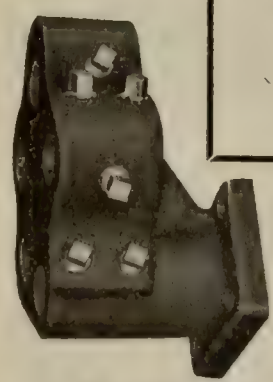




No. 147
Multiple Turning Head

No. 107 A
Cutter Holder

No. 144
Slide Tool

Chucking Equipment

These are only a few of the many standard chucking tools with which the 1-B Universal Turret Lathe can be equipped and which are doing their share toward establishing a ***new and higher standard for production per dollar invested.***

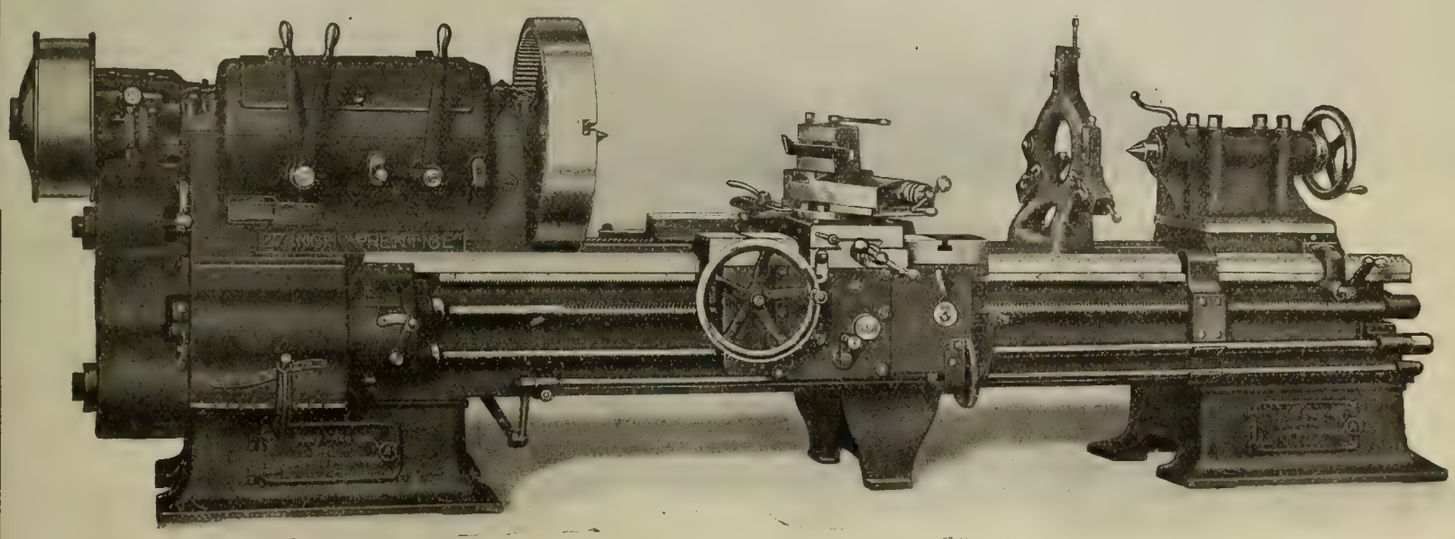
Foster Machine Co.

Elkhart, Indiana

REED-PRENTICE COMPANY

R-P Co

WORCESTER MASS. U.S.A.



THE EXACTNESS OF FIT—THE HIGH STANDARD OF WORKMANSHIP AND THE CLEVERNESS OF DESIGN MAKE REED-PRENTICE TOOLS WHAT THEY ARE—THE BETTER TOOLS.

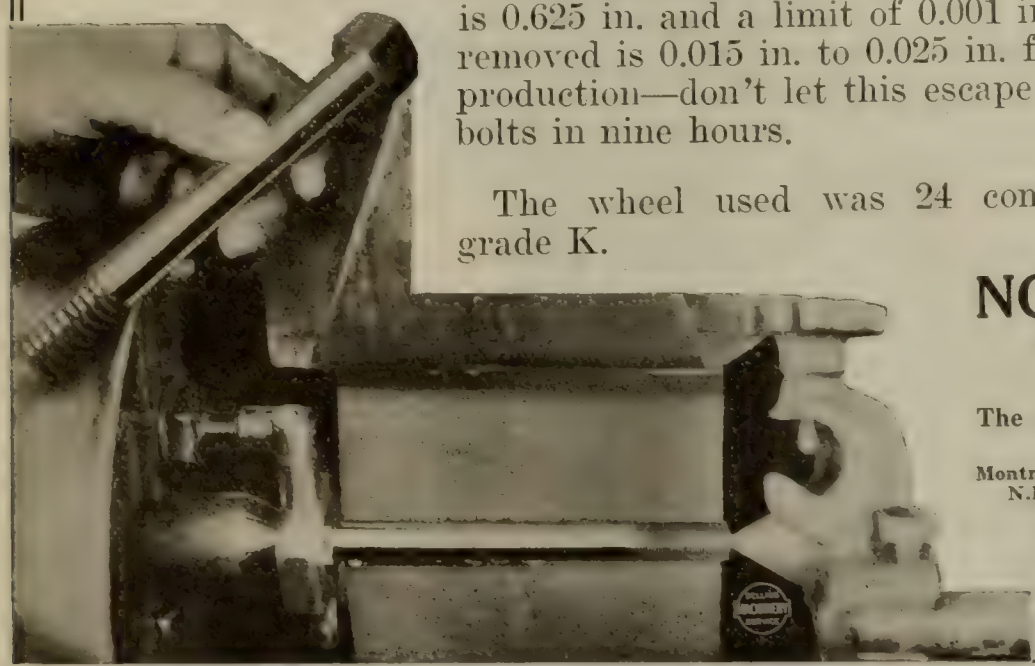
CANADIAN FAIRBANKS-MORSE COMPANY, LTD.

ore, Inc., New York Allied Machinery Co. of America, Paris

Fenwick Freres, Paris

Grinding Operation on Front Axle Spindle Bolts

An interesting grinding operation in a large plant for manufacturing automobile parts in which accuracy is combined with good production is the grinding operation on front axle spindle bolts. The bolts are 6 in. long under the head, threaded 1½ in. long at one end, material steel, case-hardened. The diameter is 0.625 in. and a limit of 0.001 in. is allowed. Stock removed is 0.015 in. to 0.025 in. from diameter. And production—don't let this escape you—is 480 spindle bolts in nine hours.



The wheel used was 24 combination Alundum, grade K.

NORTON COMPANY
WORCESTER - MASS.

Canadian Agents:
The Canadian Fairbanks-Morse Co., Limited
Montreal Toronto Ottawa St. John, N.B. Winnipeg Calgary Saskatoon Vancouver Victoria
F. H. Andrews & Son,
Quebec, Que.

NORTON

852

ELECTRIC FURNACE PLANTS
Niagara Falls, N.Y. Chippawa, Ont., Canada

Dominion Cast Steel Parts

Open Hearth Products

Machinery Castings of all kinds, Motor Frames, etc., for electrical trade, Pedestal and Miscellaneous Bridge Work, Rolling Mill and Blast Furnace Castings, Gears and Gear Blanks.

We are also prepared to furnish steel plate to 20" wide—for prompt delivery.

We have recently increased the capacity of our plant and can guarantee quick delivery on castings weighing anywhere from 100 lbs. to 50,000 lbs.

Quick Deliveries

Quality and Economy

DOMINION STEEL FOUNDRY COMPANY, Limited
HAMILTON - - ONTARIO

The New Norton

Features That Mean Production

The Wide Wheel

For the ordinary line of work the wheel is of 6″ face. No automatic feed of the wheel is provided. But a hand traverse so locates the grinding wheel that the full width of the wheel face is utilized,—thereby production.

The wheel head can be raised to give a distance of 17″ between the surface of the table and a 14″ diameter wheel, thus making provision for use of magnetic chuck or supplementary table.

The Entire Working Surface

of the table can be ground in place. On all tables this is 15″ wide and 6′, 8′, 10′, 12′ and 14′ long, depending on the length of machine.

In addition to grinding all kinds of plane surfaces this Norton Grinding Machine can be used for grinding a variety of shape surfaces—for which a special forming attachment is used to true the wheel face to produce the shape required.

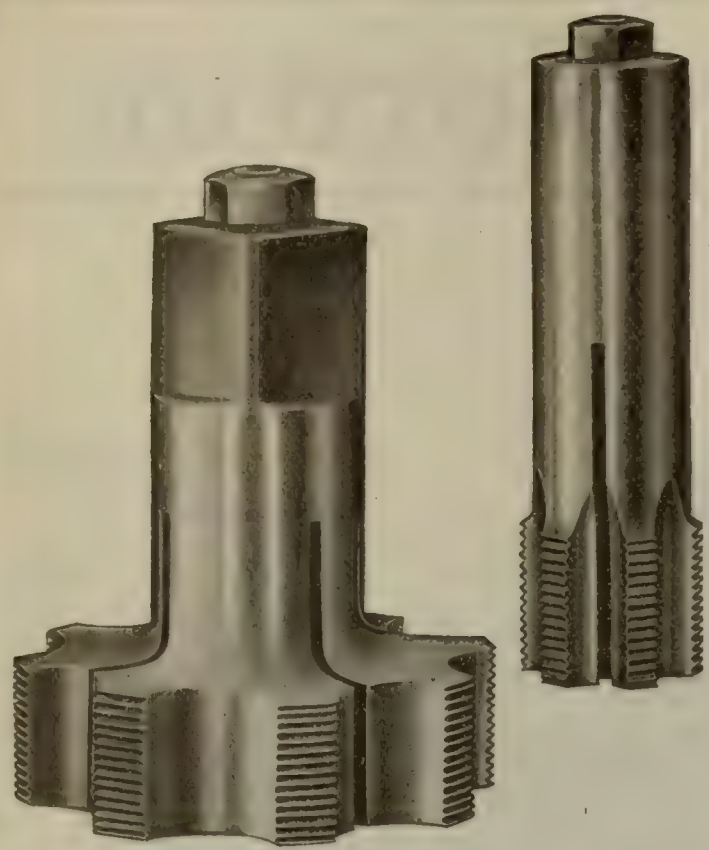
Norton Grinding Co., Worcester, Mass.

Canadian Selling Agents: The Canadian Fairbanks-Morse Co.

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

Note the Open Side

522N



ADJUSTABLE FINISHING TAPS

Will they stand up? Will they produce?

These are questions which are uppermost in the minds of present-day buyers of *Adjustable Finishing Taps*. And they mean a great deal to manufacturers at this time, when deliveries are of such vital importance.

Are your threading jobs moving as fast as you would like to have them?

If not, tell us about it. We'll recommend a remedy for your threading troubles. If one of our standard products won't do, we'll prescribe a special tool. Forty years' experience and a factory devoted to specials enable us to give the best of service in screw-cutting problems.

Send for our general catalog. The most complete catalog of its kind published.

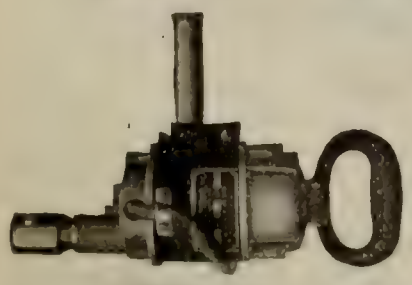
Wells Brothers Company of Canada, Limited

GALT, ONTARIO

Sales Agents: The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

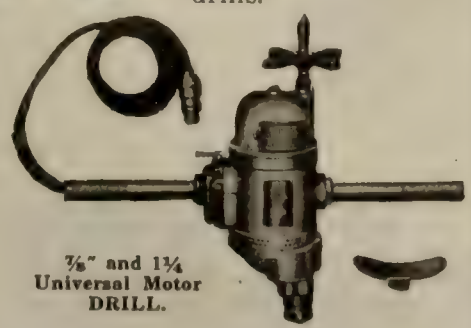
For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞" and 1¼ Universal Motor DRILL.

For Sale By

The Canadian Fairbanks-Morse Co., Limited

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.
CINCINNATI, OHIO

TRADITION

We have a great tradition to perpetuate. The British-made file has always been the standard of file efficiency. It has always had better steel in it, quicker cutting teeth, and been harder and straighter than the files of other nations. That is unchallenged the world over.

Founded on an ideal—the production of Canada's Finest Files—this corporation is entirely Canadian, therefore all-British, and our whole organization is saturated with the maxim—

QUALITY FIRST

P H

TRADE MARK
Quality Files

CANADA'S STANDARD

Made in Canada, by Canadians, for Canadians.

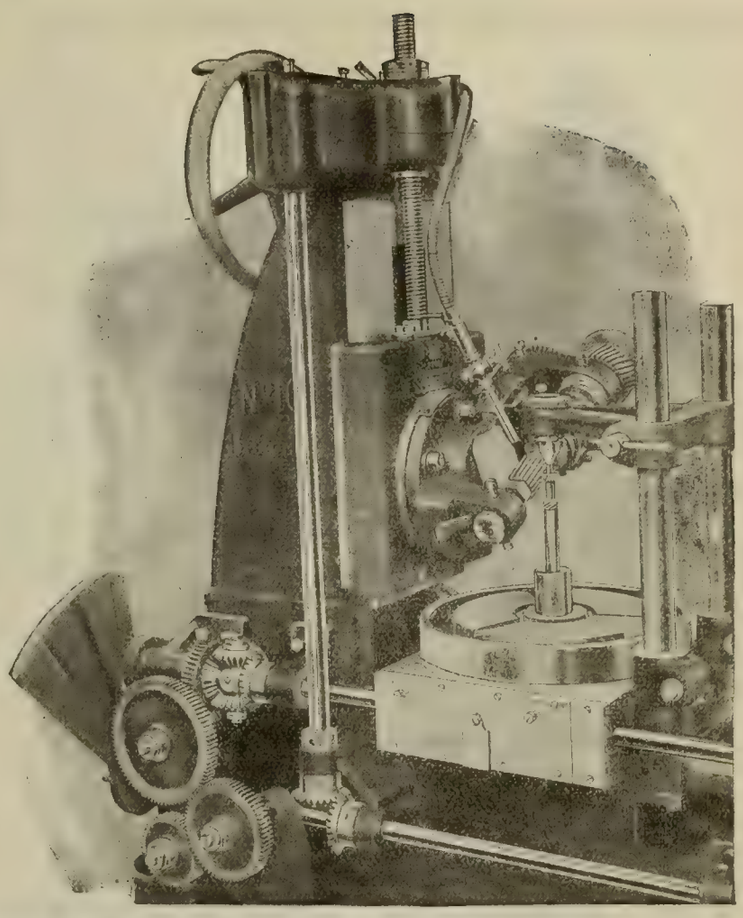
ARE YOU FILE-WISE?

PORT HOPE FILE MFG. CO., LIMITED

Port Hope, Ontario

"Ask your jobber"

You know the "Bilton" Gear Hobber—But do you know what it will do?



You know that the "Bilton" is substantially built; that it embodies new features of operation and control; that it is fully automatic, etc. But do you know the interesting facts of its operation? Read below a few examples of economical production with a Bilton.

Cutting Malleable Iron Gears.

10 pitch, 70 teeth, 5-16 face. Twenty-three of these gears are mounted on the arbor, each set-up taking 27 minutes to cut. This means that each gear is cut in 70 seconds or one tooth a second. One operator can easily attend to four machines.

Cutting Double End Spiral Gears.

One gear being 16 teeth, 26 pitch, 27½° angle, the other gear being 8 teeth, 26 pitch, 62½° angle. This gear has a ⅜ hole and is made of machine steel. The time for cutting the 27½° angle is 1½ minutes or 40 pieces per hour. On the 62½° angle the time is 3 minutes or 20 pieces per hour. One operator can attend to two machines on this work.

Production—The hobbing method compares very favorably with any other method of cutting gears as to accuracy and speed. The No. 10 "BILTON" Gear Hobber is built to withstand almost unlimited feed, in fact, the only limit is the finish you desire on the work. On the two jobs mentioned above, the feed was as follows: .126 feed on the spur gear and .040 on the spiral gears.

Will cut spur, spiral gears, worms and worm gears, also many other shapes of teeth and gears. Because of its wide adaptability it can be called universal in use. Gears cut on the "BILTON" Hobbing Machine are done accurately and economically. The Hob is working 100% of the time, without attention of the operator. Only necessary to load and unload blanks on arbor.

Capacity for cutting gears: Diametral pitch 10; outside diameter 10 in.; width of face 10 in.; weight of machine, 1,100 lbs.

We can give a guaranteed estimate of Bilton performance on your production. Send us blueprints of your work—or, better still, send us a few blanks and let us finish them, showing quality of work as well as time.

Catalog 30, with full details, on request.

MACHINE TOOLS Bilton BRIDGEPORT

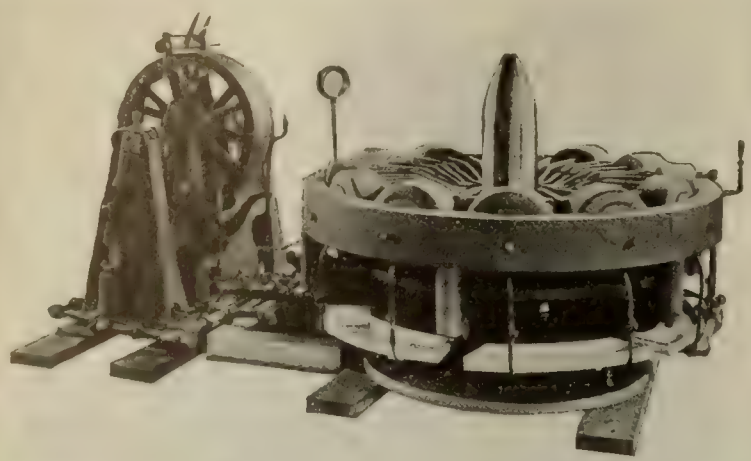
THE BILTON MACHINE TOOL CO.

BRIDGEPORT, CONN.

FOREIGN AGENTS:

Alfred Herbet, Ltd. **M. Mett Engineering Company.** **Chas. Churchill, Ltd.**

MACHINE TOOLS Bilton BRIDGEPORT



The New "West" Banding Press

For 9.2" and 8" shells

12 Cylinders; Ample Power; Ample Strength; Reasonable Price.

NO ACCUMULATOR REQUIRED.

The West Tire Setter Co.

255 Mill Street, Rochester, N.Y.

Speed

When the quality of the work is the best obtainable, the next item is speed. For upon speed depends your costs.

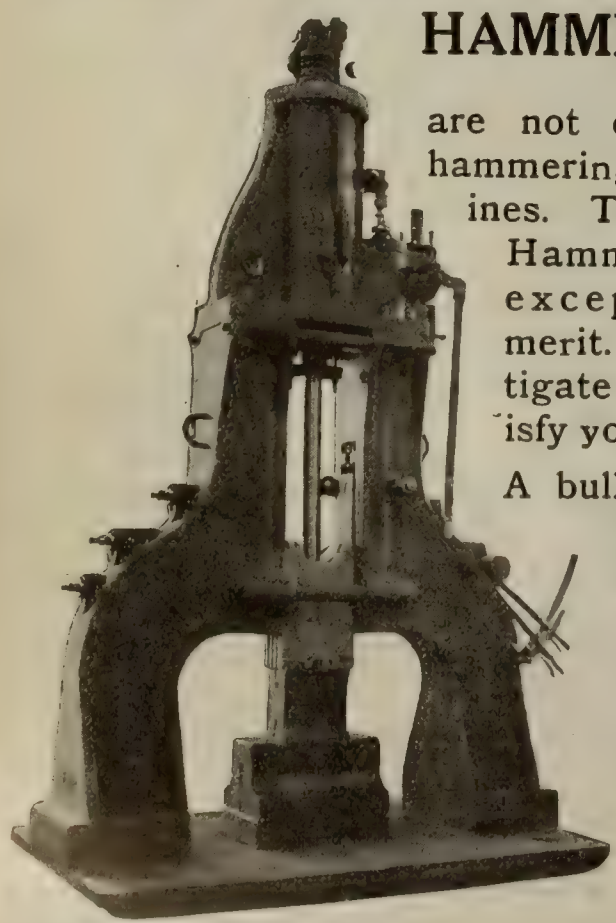
One rivet per second is the speed this machine will maintain indefinitely. Adapt that speed to your requirements and find out the value the Grant Riveter would be to you.

Write for our catalogue. It will give you complete information.

Grant Mfg. & Machine Company

Bridgeport, Conn., U.S.A.

"ERIE" STEAM FORGING HAMMERS

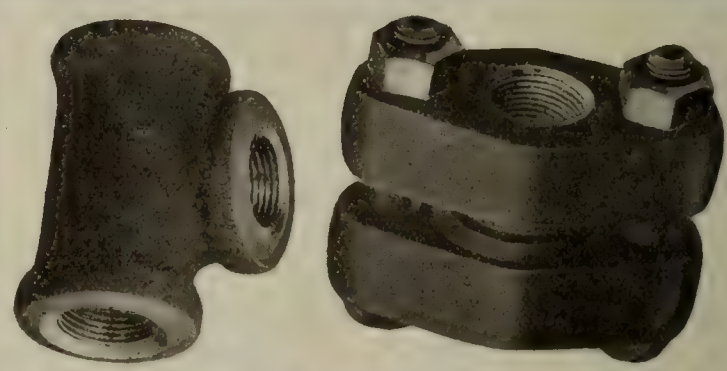


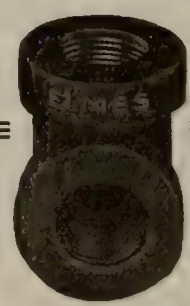
are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

ERIE FOUNDRY COMPANY

ERIE, PENNSYLVANIA, U. S. A.





ELMES' Forged Steel High-Pressure Fittings

They are made after a thorough study of the requirements of these fittings. Our manufacturing knowledge of the machines these fittings are for has given us an intimate knowledge of the strength required.

Write us for full information, prices, etc.

Charles F. Elmes Engineering Works

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THE Crank Shafts of all Consolidated Presses are made from .50 to .60 carbon steel hydraulic forgings, accurately machined and ground to size. The body bearings are carefully scraped to fit, thus insuring a perfect bearing.

The Crank Pins are larger in diameter than the main bearings. This has always been a Consolidated feature. Crank cheeks are liberal and guarantee strength and rigidity in the shaft; this, together with the enlarged crank pin, materially resist torsion when the press is in operation.

You cannot ignore these features.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

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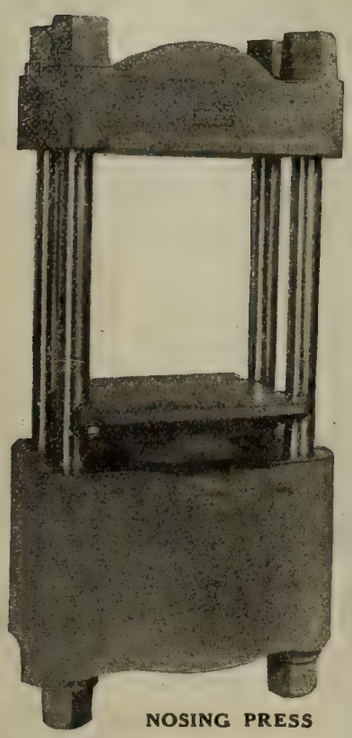
PRESSES

Pumps and Accumulators

FOR ALL PURPOSES

Made in Canada



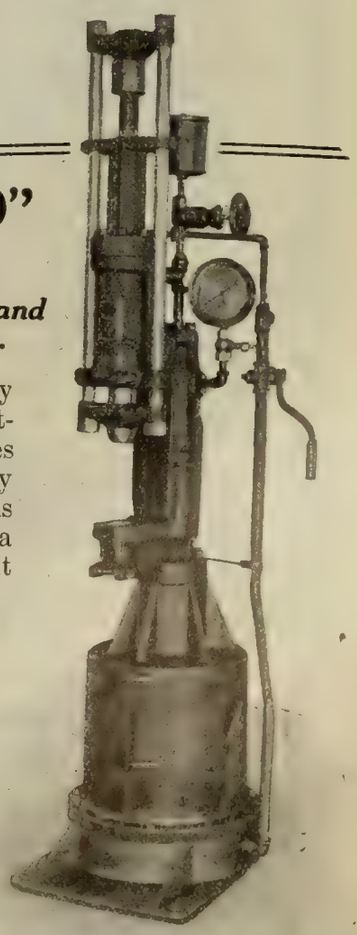
NOSING PRESS

WILLIAM R. PERRIN, Limited
TORONTO

Triple Purpose
"METALWOOD"
COMBINATION

Forcing, Broaching and Straightening Press.

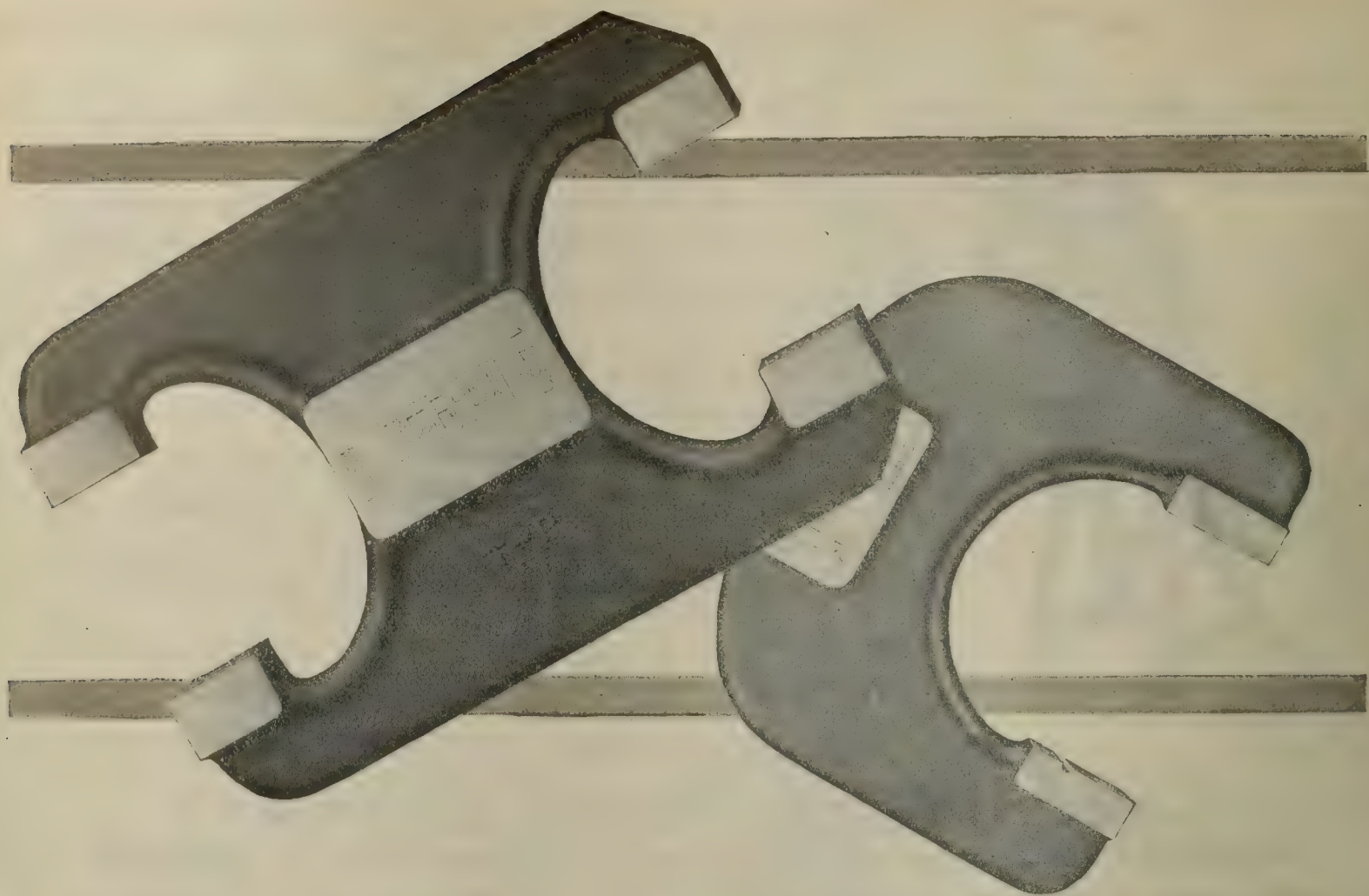
Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.



Metalwood Mfg. Co.

Leib & Wight Sts.,
DETROIT, MICH.
U.S.A.

For Great Britain and Continent address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.



Most Rigid Limit Gauges Ever Offered

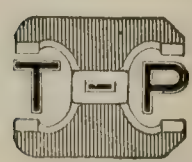
Made in Stock Sizes

At last a complete set of standard limit gauges—double-enders and singles. These limit gauges are the most rigid ever put upon the market. They are far too heavily built to be sprung over work by the most careless workman. To make them inaccurate it would be necessary to wear away the metal.

Made in standard stock sizes from ¼-inch up to 3 inches inclusive varying by 16ths, which will be carried in stock.

Those for measuring 2 inches and under are double-enders, the "go" at one end, the "not go" at the other. Those that handle sizes over 2 inches are single-enders, with the "go" and "not go" in one jaw eliminating reversing. On sizes ¼-inch to 1-inch the "go" size is .012 and the "not go" .008 large. On sizes over 1 inch the "go" size is .014 and the "not go" .010 large. Special sizes to order.

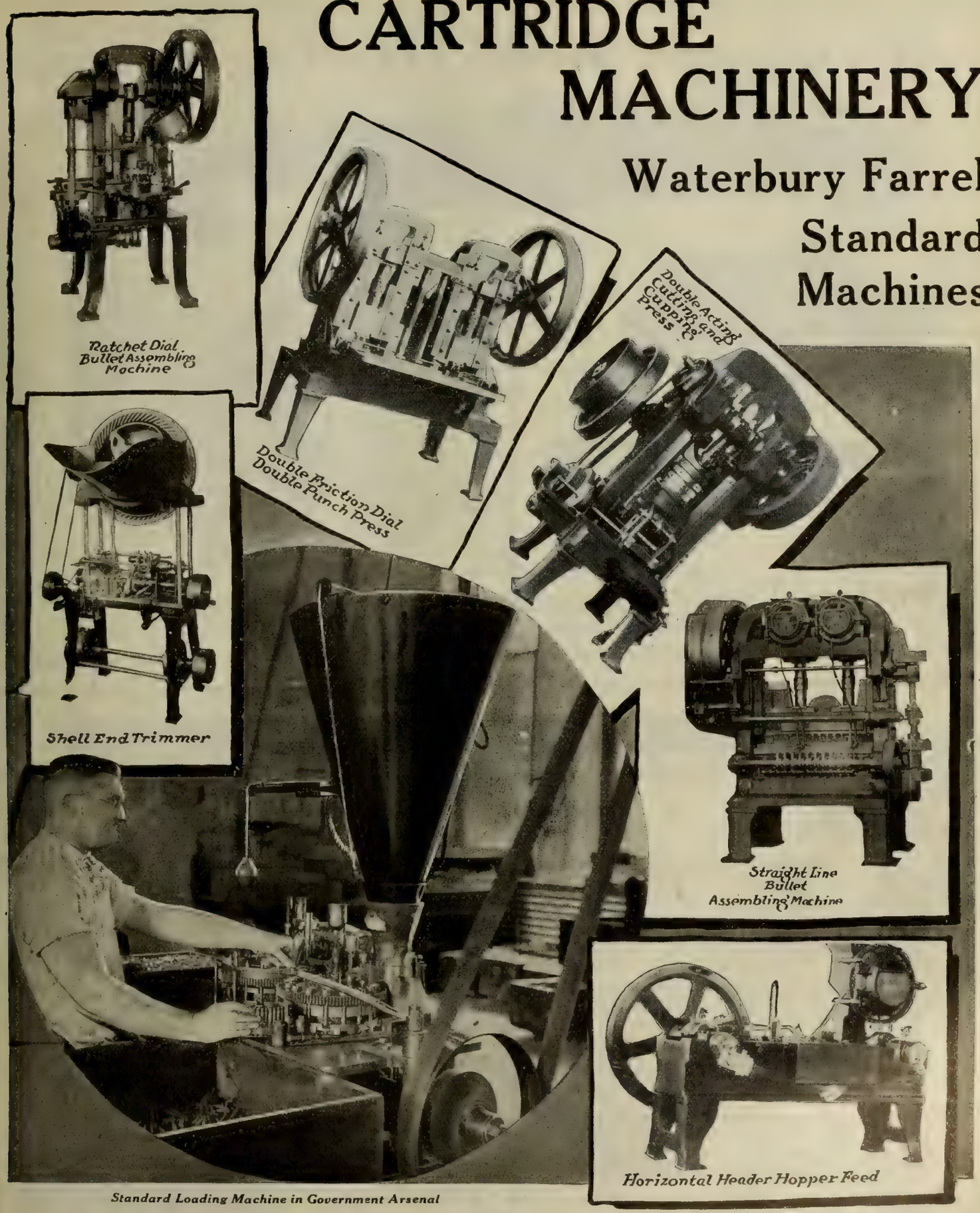
Let us send our catalog describing the whole T-P line of toolroom specialties. Please ask for "Catalog E."



Tool Room Specialties

CARTRIDGE MACHINERY

Waterbury Farrel Standard Machines



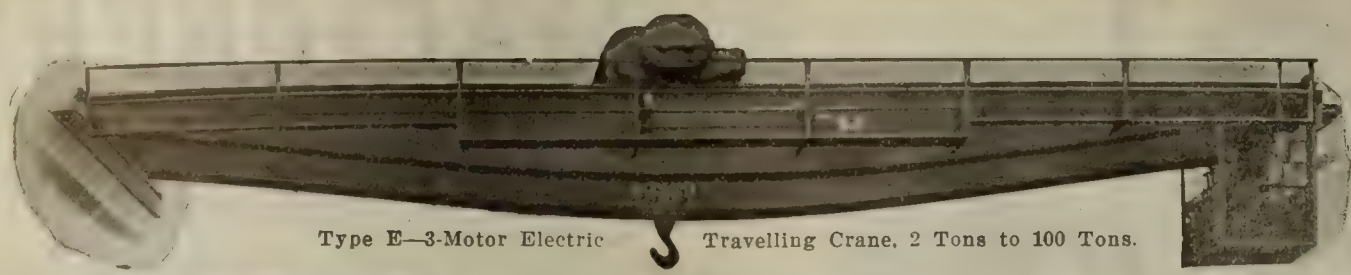
Standard Loading Machine in Government Arsenal

The Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn., U.S.A., has appointed me to be the sole manufacturer for export of their entire line of Cartridge and Shot Shell-Making Machinery. Proposals and Estimates covering complete plants or separate units, required for export will be furnished on request.

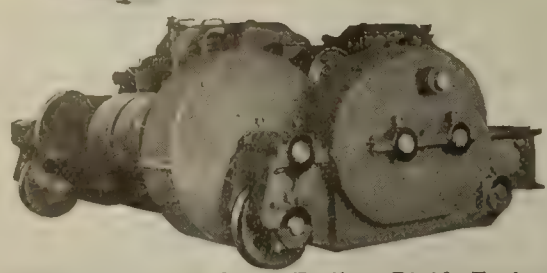
FREDERICK S. BLACKALL, Woolworth Tower, New York, U.S.A.

CANADIAN MADE CANADIAN MADE

Electric and Hand Traveling Cranes

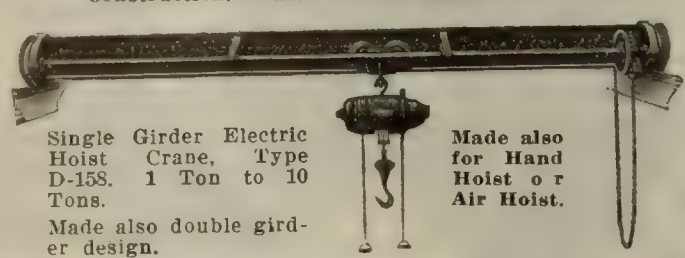


Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons.



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons.

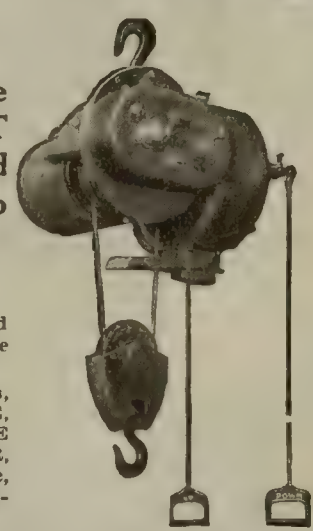
Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

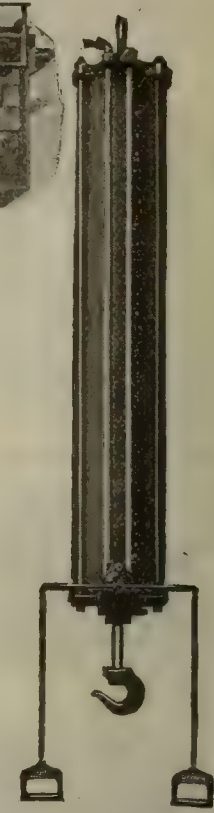
In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.



Type D Electric Hoists —½ to 10 Tons.

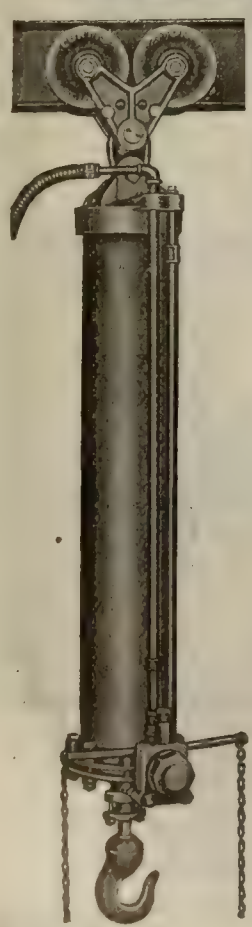
Air Hoists, Trolleys and Tracks.

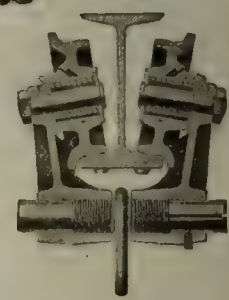


Type No. 20 Air Hoist.

Northern Crane Works, Limited

Walkerville, Ontario, Canada





CURTIS, St. Louis, U.S.A.

AIR COMPRESSORS — AIR HOISTS — TROLLEYS AND TROLLEY SYSTEMS—SAND BLASTS—PNEUMATIC AND HYDRO-PNEUMATIC ELEVATORS—JIB AND TRAVELING CRANES.

We have specialized for over 22 years on pneumatic machinery. We have developed the simple air cylinder into a straight line motor with wonderful speed control and dependability capable of the widest application to hoisting problems.

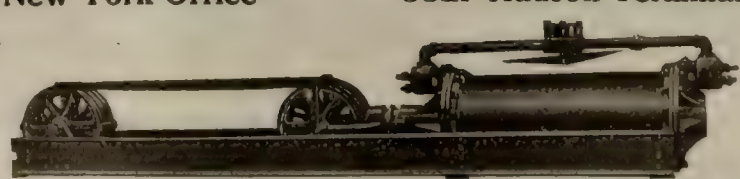
Our new controlled-splash oiling system with regulatable sight feed cylinder oiling is something entirely new in air compressor design.

Complete catalogs and descriptive circulars on our entire line furnished on request.

Curtis Pneumatic Machinery Co.

1585 Kienlen Avenue - St. Louis, U.S.A.

New York Office - 532F Hudson Terminal



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ESTABLISHED 1885

Oil Storage Systems

assist in many ways to aid production, produce economy and efficiency wherever oil is used.

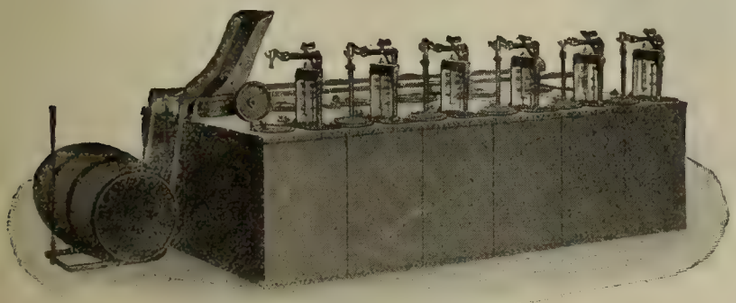
They provide effective storage and handling facilities for all kinds of oils. Keep oil clean, retain its value, prevent waste, and encourage the proper use of oil, which results in better work with less effort.

Outfits can be placed where most convenient, saving time and trouble

They are accurate, durable and safe; every shop needs the Bowser.

S. F. BOWSER & CO., Inc.

Sales Offices In all Centres **TORONTO, ONT.** Representatives Everywhere



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VENUS PENCILS

NOW, when the work of the engineer, the designer, and the draftsman is of tremendous importance and volume due to the war's demands, the use of the highest quality pencil, the VENUS, is a necessity for accuracy, cleaness and speed in drawing.

VENUS Pencils Are Perfect!

Buy them for the unequalled service they give.

17 black degrees from 6B softest to 9H hardest and hard and medium copying. Look for the distinctive VENUS finish.

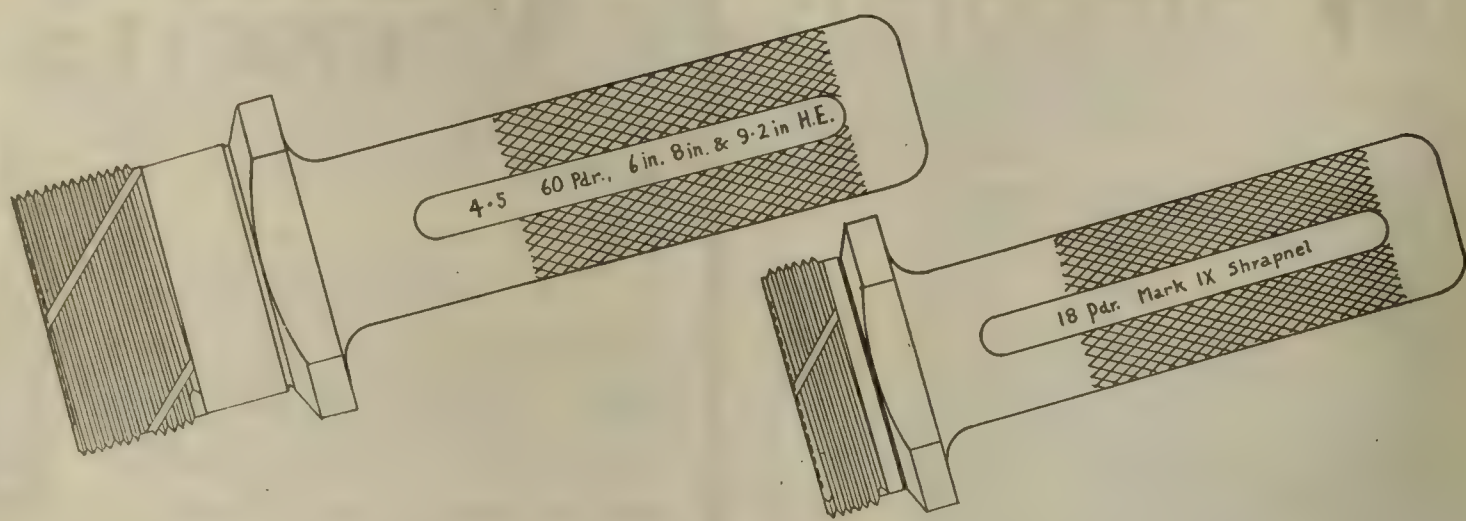
VENUS ERASER *Superfine Quality* *Rubs out Cleanly and Easily*
Will not soil or streak. 12 SIZES, FROM 100 TO BOX, TO 4 TO BOX. BOX PRICE $2.00

FREE!

This trial box with five VENUS Drawing Pencils, Holder, and VENUS Eraser sent free! Write for it.

American Lead Pencil Co.
238 Fifth Avenue, New York
and Clapton, London, Eng.

FUSE HOLE GAUGES

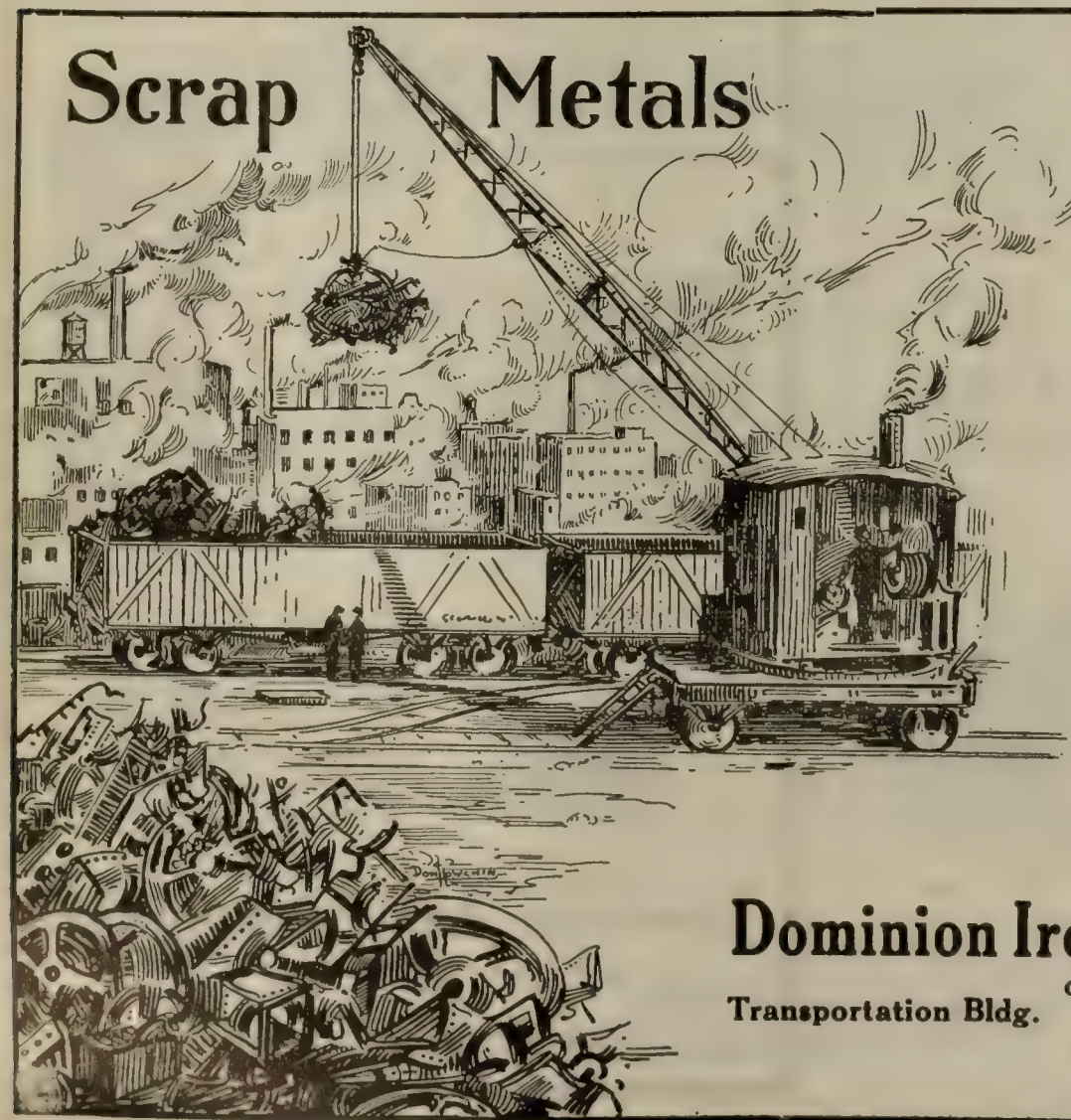


Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

Scrap Metals



Scrap Iron, Steel and Metals

No undertaking is too large for us. We are Scrap Metal Specialists, and can co-operate with you in the dismantling of railway equipment, bridges, plants, steamers, mills and will take your rails and machinery.

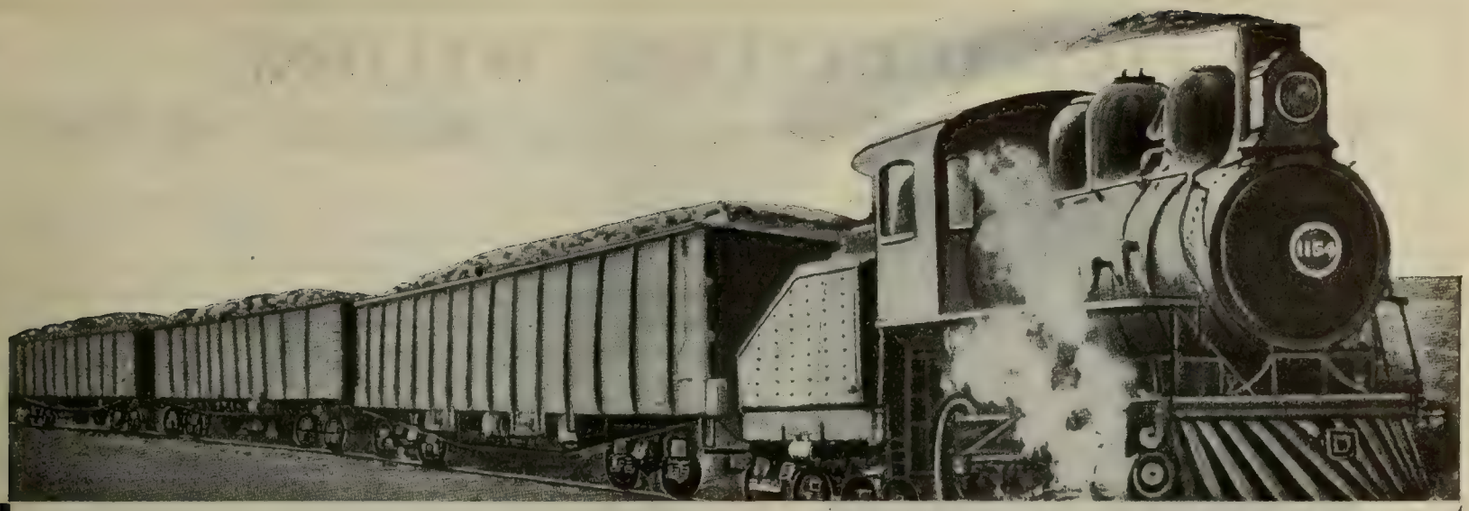
Shell Makers. We can take care of all your scrap materials, at highest prices.

Give us particulars and we will relieve you of all worry.

Dominion Iron & Wrecking Co.

LIMITED

Transportation Bldg. General Offices: Quebec, Que. Montreal, Quebec



A Trainload of Coke is Wasted in the Foundries of Your Territory Every Day

YOUR part of this waste is from 500 to 1,000 pounds or more PER DAY, depending on the size of your melt, UNLESS YOU know McLain's System of SCIENTIFIC MELTING. Challenge us to PROVE it—IT WON'T COST YOU A CENT, if we don't.

Say you only save 50 pounds of coke per ton of iron melted—on 15 tons per day—means 225,000 pounds or 112 TONS PER YEAR. If coke sells for $10 per ton—112 tons equals a saving of $1,120. Figure the SAVINGS on YOUR tonnage.

Expert advice is the key to business success and McLain's System is expert advice on mixing and melting

of gray iron and semi-steel with the practical application of our SPECIALIZED KNOWLEDGE—APPLIED TO YOUR LINE OF CASTINGS. It's worth our small fee to check your practice—YOU can't stop the increasing cost of materials—but you can learn how to make *big savings* using them. DISTANCE is no bar to the effectiveness of our work.

McLAIN'S SEMI-STEEL

is the CONNECTING LINK BETWEEN IRON AND STEEL—is better than gray iron at every point—25 to 60 per cent. stronger—surpasses steel castings in wearing qualities. NO BLOW HOLES—HARD SPOTS—SPONGINESS or OTHER DEFECTS. A clean, close-grained metal that machines easily—and costs less than gray iron. IT IS MADE IN YOUR REGULAR CUPOLA—REQUIRES LESS COKE—NO EXTRA EQUIPMENT.

DON'T EXPERIMENT—WE DID ALL THAT—McLAIN'S SYSTEM WILL SAVE YOU MONEY BECAUSE IT STANDS FOR BETTER PRACTICE—BETTER QUALITY AND SPECIAL ADVICE ON YOUR SPECIAL LINE OF WORK.

FULL INFORMATION FREE UPON RETURN OF COUPON.
NO OBLIGATION.

McLAIN'S SYSTEM, Inc.

810 Goldsmith Bldg., Milwaukee, Wis., U.S.A.

McLain's System, Inc., 810 Goldsmith Bldg., Milwaukee, Wis.

Send me full particulars of scientific melting and McLain's Semi-Steel.

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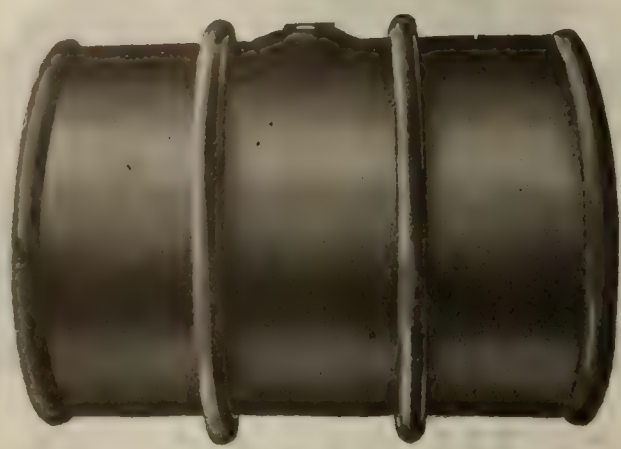
POSITION .....

11/17

If any advertisement interests you, tear it out now and place with letters to be answered.

OXY-ACETYLENE WELDING

A Maximum of Efficiency at a Minimum of Cost



Steel Barrel welded by Oxy-Acetylene Process.

All the essential characteristics that tend to greatest efficiency are embodied in Oxy-Acetylene Welding. The Process is simplicity itself. The Welded joint is of practically equal strength to the Metal adjacent, absolutely airtight, leakproof, and free from future trouble, and the cost of the article produced is less than obtained by the old-fashioned methods hitherto adopted.

Undoubtedly You Can Employ the Process to Advantage in Your Industry!!

Whether you wish to join light gauge sheet metal or reclaim a broken machine part or casting weighing tons, the Oxy-Acetylene Process is the solution. The more you enquire into its possibilities, the more you will be convinced of these truths.

Our Experience is Yours for the Asking

Attach this ad. to your letter head and mail to us. We are the Pioneers of the Process with world-wide experience covering years. A staff of experts are at your Service to instruct your representatives in the Process, to ensure its successful application to your Industry. Investigation incurs no obligation on your part.

Engine manifold welded by Oxy-Acetylene Process.

L'Air Liquide Society

Canadian Factories: TORONTO, MONTREAL, WINNIPEG.
HALIFAX, Under Construction.

WILLSON

Safety Flange Goggles with Super-Tough Plates

The surest protection for heavy chipping

Style SSG2N.

Adjustable, rustproof and can be worn over ordinary glasses. Equipped with Super-Tough glass plates and the patented Willson Safety Flange for minimizing eye risks even if a plate should be cracked. Other features include strong wire screen side-guards and an extra wide noserest which fits eye socket snugly and effectually prevents the entrance of dust. Fitted with elastic headbands or flexible cable earbows. Price per dozen, $15.00; price per pair, $1.75. Write for information regarding effective, comfortable protection for grinders, machinists, furnacemen, welders, etc.

T. A. Willson & Co., Inc., 23 Scott St., Toronto
Factory and Main Offices, Reading, Pa., U.S.A.

Chicago Mallers Bldg. | San Francisco Head Bldg. | London 9 Hatton Garden

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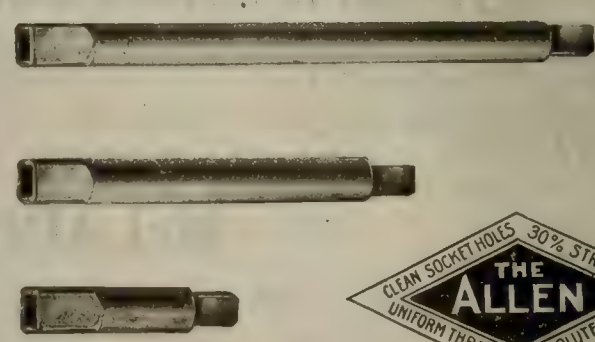


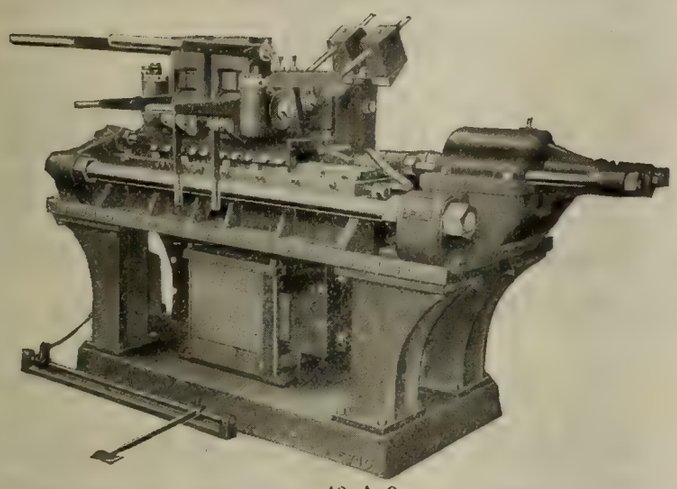
Tap Extensions

A small tap attached to our extension has the same value in strength and quality as a solid tap of similar length. Made in sets of three, two, four and six inches long, and can be combined to make six different lengths, ranging up to eleven inches. The sockets are formed by the Allen patent process and may be used on all standard taps. Special sizes made to order.

Write us for further particulars.

The Allen Mfg. Company
Hartford, nn. U.S.A.

Thomson Process
Electric Welding



40-A-9
Butt Welding Machine

Combination Foot Operated and Six Speed Gear Box. Belt Driven.
Type 177

Waste!

The Thomson System of Electric Welding eliminates waste. Big manufacturers who allow so much for spoiled work each day will find it far cheaper to buy a Thomson Butt Welder. The saving in six months will more than pay for the initial cost.

For welding automobile rims, brake rods, angle irons, pipe joints or whatever your problem might be there is a style of Thomson Butt Welder that will do it more economically than you are getting it done now.

Send for Bulletin B-4.

The Thomson Spot Welder makes more and better work possible

One firm writes, "One boy and a 'Thomson' can do more and better work than five men were able to do by the method we formerly used."

The Thomson Spot Welder is simple to operate. Just place the two pieces of metal to be welded between the copper die points—press the foot treadle and the pieces are united forever. No smoke, danger or dirt. No holes to punch. No rivets used.

There is a Thomson Spot Welder for your work. Let us have your requirements and we'll show you the machine.

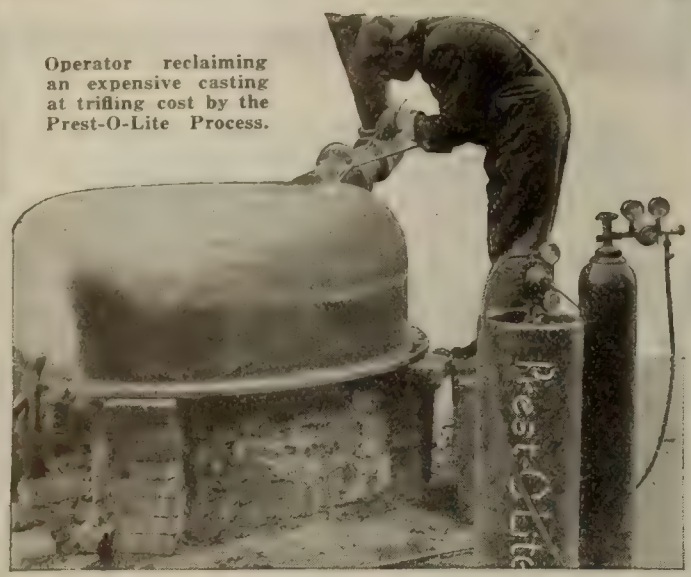
Send for Bulletin S-4.

Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

Oxy-Acetylene Welding and Cutting



Operator reclaiming an expensive casting at trifling cost by the Prest-O-Lite Process.

Meet the Higher Cost of Material by Cutting Out the Scrap Pile

In practically every line of metal manufacture and repair work oxy-acetylene welding means the conservation of time and material. Its savings are offsetting the increased cost of materials in many great factories.

Hundreds of thousands of dollars' worth of valuable castings, machine parts and tools are being reclaimed from the scrap heap by this process. Not only is oxy-acetylene welding of great value as a manufacturing process, but it effects big savings in repair work of all kinds—broken metal parts and castings quickly and inexpensively reclaimed for useful service—in factories, large and small, and in railroad shops, mines and thousands of repair shops.

Investigation may show a real need for welding in **Your** plant.

Prest-O-Lite PROCESS

employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene (ready-made carbide gas) is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Apparatus consists of an equal pressure blow pipe, automatic regulators and gauges, and all necessary equipment. Adaptable for oxy-acetylene cutting by the addition of special cutting blow pipe.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

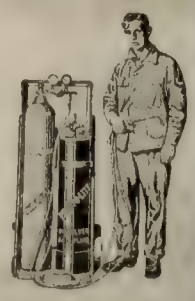
We will gladly send illustrated literature and interesting data showing actual instances of savings made by others. It may suggest valuable ideas to you. Write for it Address Department C-107.

THE PREST-O-LITE COMPANY INC.

CANADIAN GENERAL OFFICES:
913-14 C.P.R. Building TORONTO

Direct Factory Branches: Toronto, Ont: Montreal, Que.; Merritton, Ont.: Winnipeg, Man.

Canadian Plants: Toronto, Ont.: Merritton, Ont.: Winnipeg, Man.; Shawinigan Falls, Que.



World's Largest Makers of Dissolved Acetylene

Are Your Men Filing Away Time?

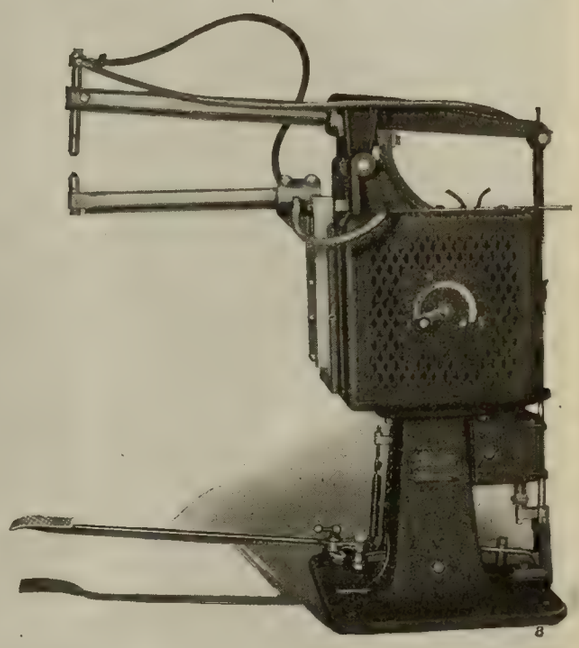
You pay for and expect to get results—with men as well as with tools.

A good mechanic working with a "Famous Five" file is the unbeatable combination for filing,

The file is hard, and sharp, and will last for a long time. The mechanic knows this and is encouraged to do his best work because he has a good tool.

Almost all purchasing agents now specify "Famous Five" Files when ordering. They are Standard quality tools.

Save Time and Labor by the Winfield Way



No matter what your work is---welding sheets, tubes, angle irons, etc.---there is a Winfield Welder for your shop that will show you the way to undreamed savings of time and labor.

Perhaps you operate a job shop and have occasion to rivet all manner of odd shapes and sizes. Perhaps you manufacture iron or wire fences, or steel lockers. An electric welder is indispensable to your equipment if you are to successfully compete in the present-day market.

The Winfield Way is the way to the solution of production problems. Winfield Welders are perfectly designed and constructed. They are simple of operation and consume little power. They heat rapidly and uniformly, and the patented water-cooled points guarantee long life to the electrodes as well as neater welds during their life.

We want to show you what a Winfield will do for *you*. When you see that one boy with a Winfield can do more and better work than five men using the old method, we will leave it to you to decide if you need one.

Just send us blue prints or a sketch of your work. Our proposition with facts and figures will be promptly submitted.

The Winfield Electric Welding Machine Co.

WARREN, OHIO **31 Ottawa Bank Bldg., MONTREAL, QUE.**

Welding by the Winfield Way at the plant of the Winnipeg Ceiling & Roofing Co., Winnipeg, Man.

Ask us to send "Electric Welding by the Winfield Way," which goes into details. Write to-day—now!

A GREAT MANY LARGE PLANTS ARE USING

COMMERCIAL ACETYLENE

on small work

Repairing a small cast iron bracket at a large shipbuilding plant. Our tanks are convenient, safe and guaranteed to hold quantity and quality gas.

Main Office:
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Commercial Acetylene Welding Co., Inc.
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BRASS Castings

The coupling of expert work with unexcelled equipment enables us to produce on a large scale Brass Castings of any size or alloy.

Our prices, too, are most reasonable; for our large purchases direct from the smelters command their every price favor.

For better Brass Castings at a money saving, send your orders to us. We promise that our work will please you.

The St. Lawrence Welding Company, Ltd., Montreal, P.Q.

Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, Etc. Electric Welders, Oxy-Acetylene Welders. Boiler Repairs. Lead Burning and Brass Foundry Work.

Office: 138 Inspector Street Works: 39 Olier Street Telephone: Office, Main 5779, Manager's Res., Westmount 3483

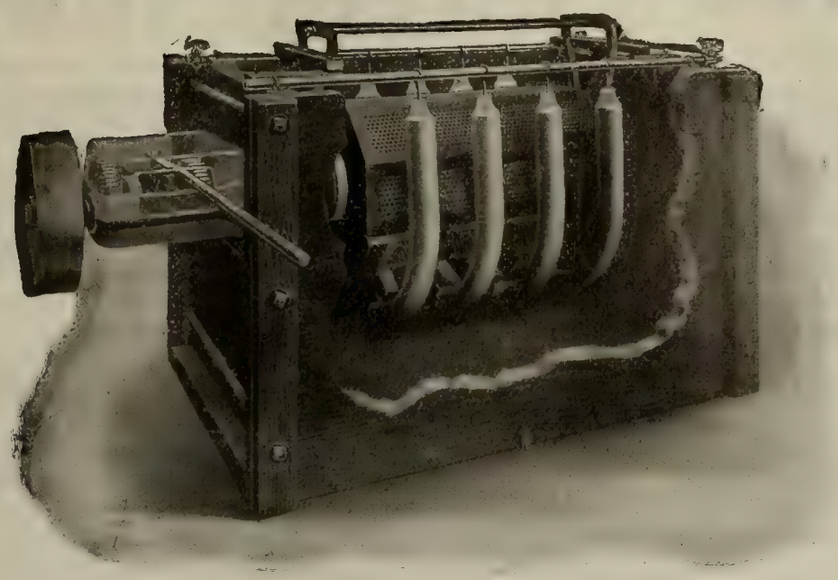
The Oven Equipment & Manufacturing Company
NEW HAVEN, CONN.
"CRAWFORD SECTIONAL" OVENS
Heated with our Enclosed Flame Gas Burners, or Electricity
FOR BAKING JAPANS AND OTHER FINISHES ON METAL.

Ovens carried in stock and built to meet requirements of manufacturers.

Builders of All-Steel Oven Trucks with Roller Bearings.

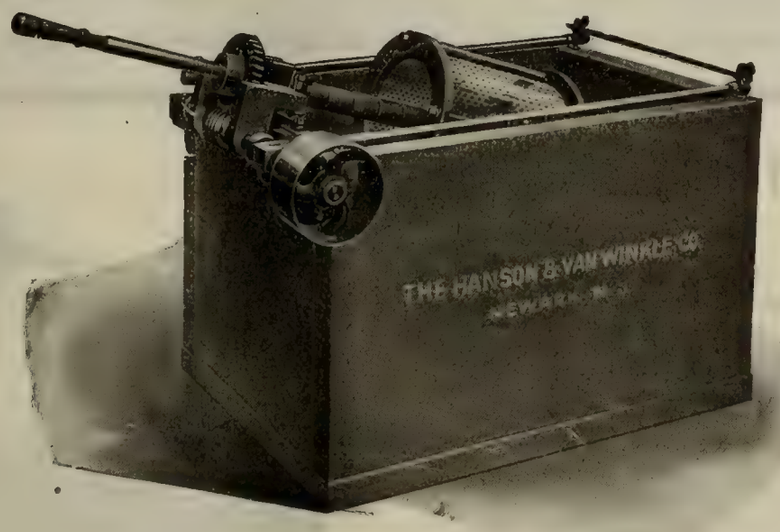
Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.
ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

Mechanical Electro-Plating Apparatus



The C. H. & V. W. Mechanical Electro-Plating Apparatus Type B. Gear Drive.

Modern in every detail, particularly adapted for electro-plating quantities of small work in bulk. Saves time labor and material. Write for Bulletin No. 113.



Oblique Plating Barrel Apparatus

These machines are made in four sizes; they are smaller and less expensive than the Type B. A wonderful aid in plating screws and other small articles. Write for Bulletin No. 116.

We manufacture everything for *Polishing and Plating of Metals.*

CONSULT US AND REDUCE YOUR COSTS

CANADIAN HANSON & VAN WINKLE COMPANY, LIMITED

TORONTO - - CANADA

To Shipbuilders and Steel Corporations

THE Radiagraph is one of the exclusive developments by the Davis Bournonville Company for mechanical cutting of steel plate, with the oxy-acetylene or oxy-hydrogen flame. With the radiagraph, steel plate and armor plate from 1 to 18 inches thick is smoothly cut at speed varying from 4 to 18 lineal inches a minute, according to thickness of steel. With the Oxygraph, another exclusive development, steel plate from 1 to 18 inches thick is readily cut in any direction, according to pattern or tracing, following straight or irregular lines, curves or sharp angles with equal facility. Extensively used by

Bethlehem Steel Company,
Youngstown Sheet & Tube Company,
Carnegie Steel Company,
Lukens Iron & Steel Company,
New York Shipbuilding & Dry Dock Company,
General Electric Company,
Westinghouse Electric,
Canadian Westinghouse,
American Locomotive,
Canadian Locomotive,
Lima Locomotive Company,
Marion Steam Shovel,
Camden Forge Company,
Pennsylvania Shipbuilding,
United States Navy Yards at Boston, Brooklyn, Philadelphia, Norfolk, Washington, San Francisco and Seattle.

We are demonstrating the Radiagraph and Oxygraph throughout Canada, and if you are interested we would be glad to forward catalogue and price lists. "Davis Apparatus" leads the World for Range, Efficiency and number of Users.

Carter Welding Co. of Toronto, Limited

Canadian Agents for Davis-Bournonville

9 SHEPPARD STREET - - - TORONTO, ONT.

One of the 120

BELLEVUE FURNACES

This, our semi-muffle design, is for heating, case-hardening and annealing. Perfected combustion precludes the formation of oxidizing elements. The flame, not visible in the muffle, does not come in contact with the material. Practically no scalding possible.

A remarkable fuel economizer, for it heats up rapidly and holds heat long after burners are shut off. Bellevue illustrated catalogue gives full particulars.

Write.

Representatives in Canada:

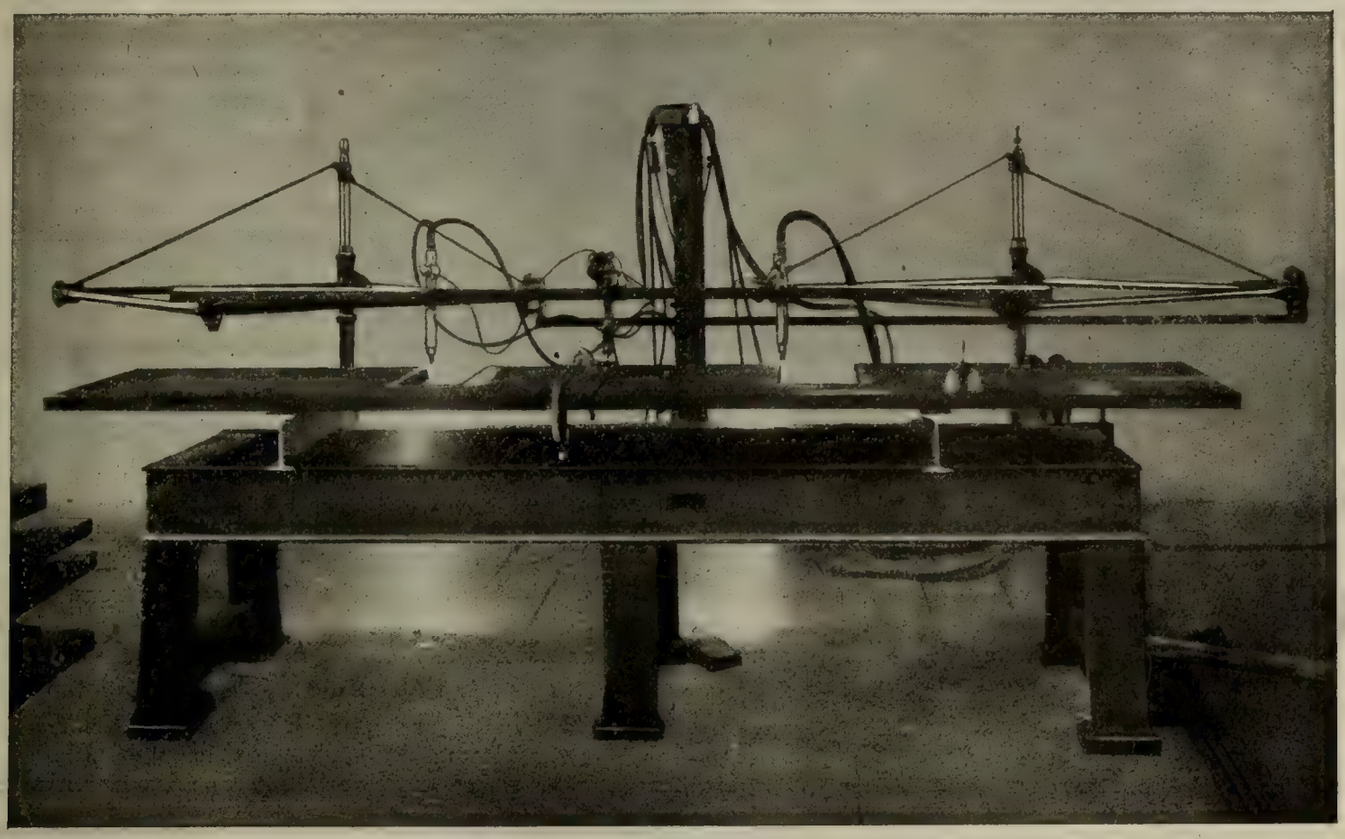
H. W. Petrie, Limited, Toronto, Canada

Bellevue Industrial Furnace Co.

703 Bellevue Ave. - Detroit, Mich.

JULIUS C. HINZ, Pres.

CUTTING STEEL PLATES With Oxy-Acetylene or Oxy-Hydrogen Torches



No. 2 OXYGRAPH

Cutting Plates ¼ to 20 inch thick. **Speed 4 to 15 inch per minute.**

This was one of the striking exhibits at the recent American Foundrymen's Convention in Boston.

The Oxygraphs, Nos. 1 and 2, and the Radiagraph, are exclusive Davis-Bournonville developments for mechanically cutting steel plate, ingots, billets and risers, with the oxy-acetylene and oxy-hydrogen flame. With the Oxygraph, steel plate up to 20-in. thick is cut in any direction, following pattern or tracing, along straight or angular lines, curves or sharp angles, with equal facility, at speeds varying from 4 to 15-in. or more per minute, according to thickness. The No. 2 Oxygraph is a heavy-duty machine, and with two torches, duplicate cuts are made, as in the illustration showing side frame being cut out for journal boxes. Frame of the machine moves back to permit service by shop crane.

Oxygraphs and Radiagraphs are extensively used by American Locomotive Co., Canadian Locomotive Co., Lima Locomotive Co., J. G. Brill Co., Lukens Iron & Steel Co., Bethlehem Steel Co., Carnegie Steel Co., Crucible Steel Co., Youngstown Sheet & Tube Co., Camden Forge Co., E. W. Bliss Co., Marion Steam Shovel Co., American Brass Co., United Shoe Machinery Co., General Electric Co., Westinghouse Electric & Mfg. Co., Canadian Westinghouse Co., New York Shipbuilding Corp., Newport News Shipbuilding & Dry Dock Co., Pennsylvania Shipbuilding Co., and in numerous other metal working plants, including United States Navy Yards at Boston, Brooklyn, Philadelphia, Norfolk, Charleston, Washington, San Francisco and Seattle.

Broad basic patents Nos. 1,059,329 and 1,118,183 cover cutting torches and mechanical means for supporting and propelling same at uniform and determined speed.

Manufactured and sold only by the Davis-Bournonville Company, which has developed the widest range of equipment made for utilizing the oxy-acetylene and oxy-hydrogen processes of welding and cutting, and **"Davis' Apparatus" leads the world for range, efficiency, and number of successful users.**

DAVIS-BOURNONVILLE COMPANY

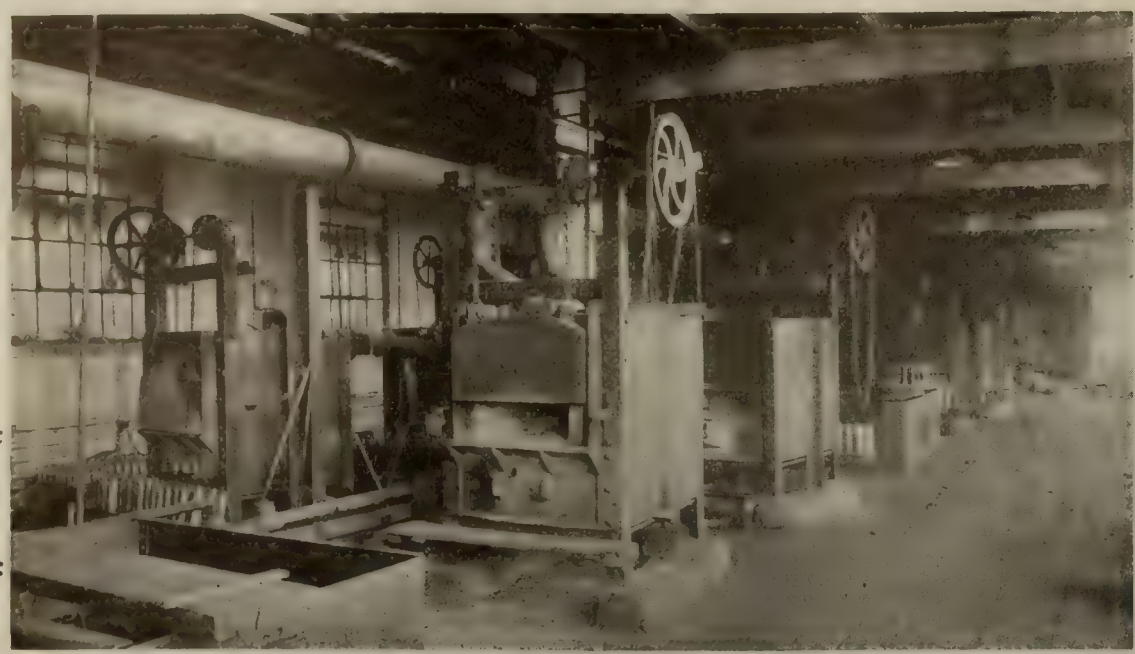
General Offices and Factory: JERSEY CITY, N.J.

CARTER WELDING COMPANY, GENERAL DEALERS TORONTO

Canadian Factory, NIAGARA FALLS, ONTARIO

New York	Boston	Chicago	Detroit
Philadelphia	Pittsburgh	St. Louis	Seattle
Cleveland	Cincinnati	San Francisco	Toronto

OXY-ACETYLENE WELDING DAVIS APPARATUS DAVIS-BOURNONVILLE CO. N.Y.

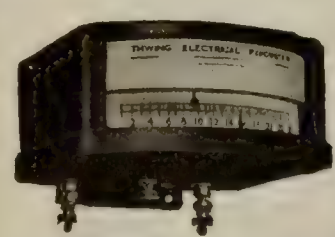


Annealing and Tempering Furnaces installed in the plant of the Canadian Vickers, Limited, Montreal.

"Mecol"

The installation of "Mecol" furnaces shown here is but one instance where a quality furnace was chosen to give maximum production. The furnace you may require is the one we desire to give you complete and full information about. Write us.

Mechanical Engineering Co.
Limited
THREE RIVERS QUE. CANADA



Insuring Accurate Temperature Measurements

THWING

HIGH RESISTANCE MULTIPLE RECORD

PYROMETERS

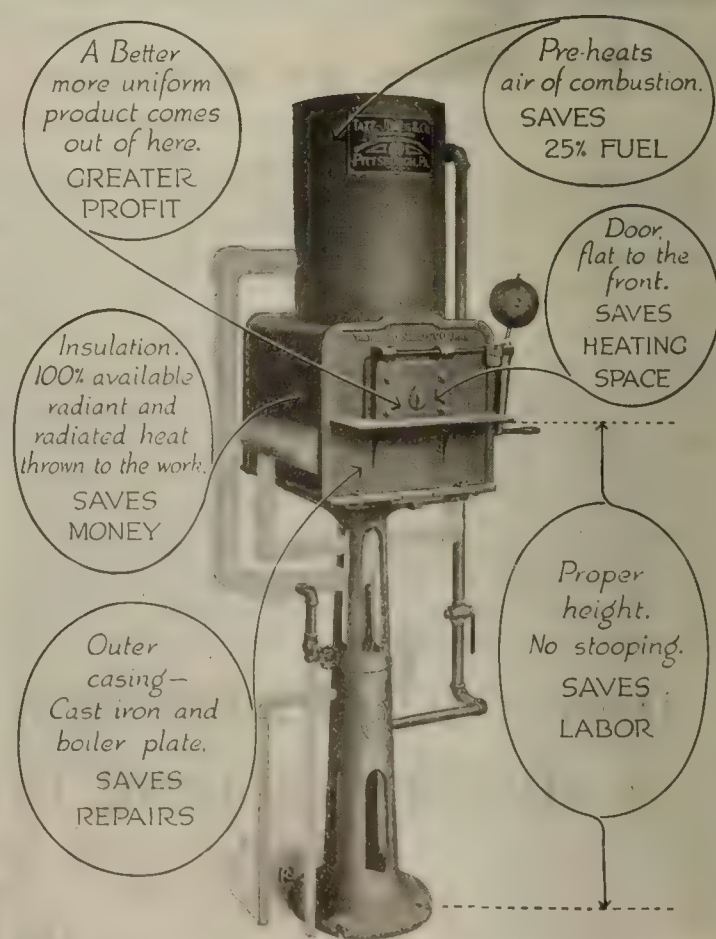
are instruments of exact precision. Yet they have the rugged durability to withstand hard usage in the toolroom, the steel mill, and similar places.

Thwing Instruments are furnished in either the Indicating or Recording style, giving as many as twelve readings on a single recorder.

Our New Catalog No. 8 covers the entire line. Send for copy.

Canadian Representative:
Mr. James DeVon, 227 Davenport Road, Toronto

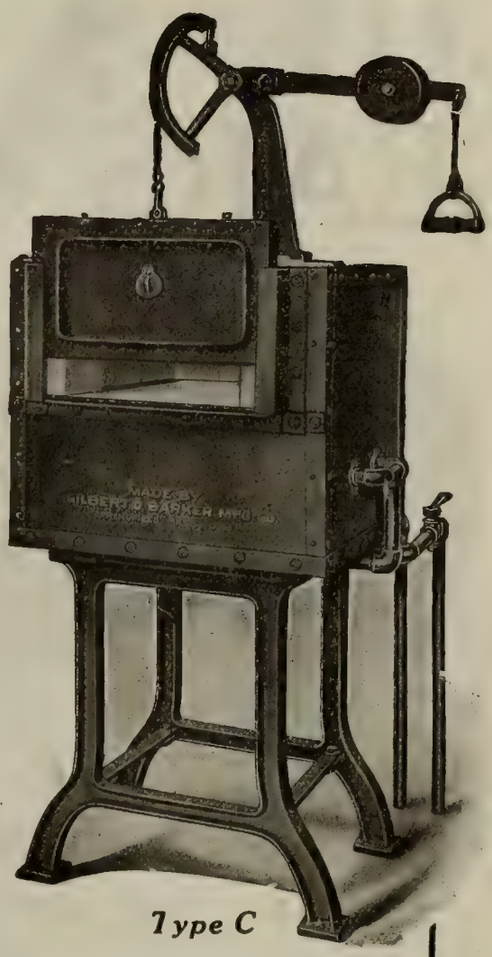
Thwing Instrument Co.
34th Street and Lancaster Ave.,
PHILADELPHIA, PA.



Six of the features that make this TATE-JONES RECUPERATIVE GAS OVEN FURNACE (Series A) a profitable one for the manufacturer. Write for full information to

Tate-Jones & Co., Inc., FURNACE ENGINEERS Pittsburgh, Pa.

There is a half-century of experience back of every G. & B. Installation



Type C

THE benefit of this long experience, which includes a thorough working knowledge of fuels, combustion and heat-treating methods is yours, whether you instal **one** Gilbert and Barker furnace or a **hundred.**

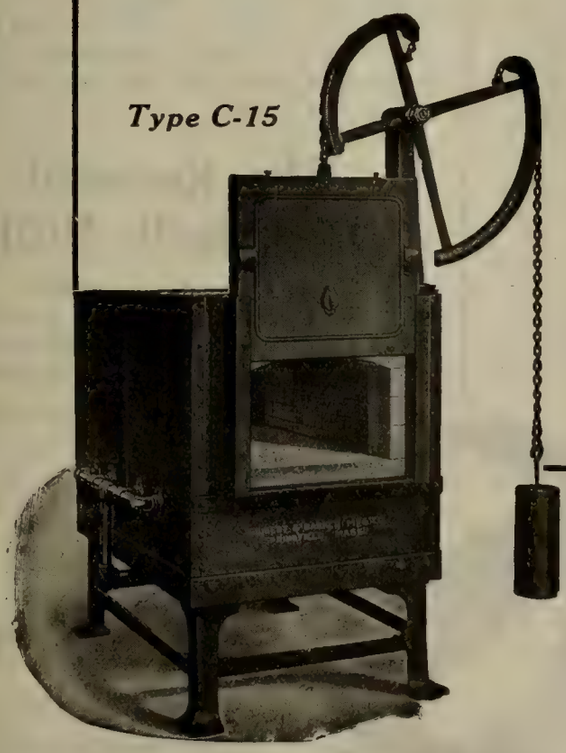
This should mean a great deal to you if you contemplate installing furnaces.

Gilbert and Barker furnaces are known for their dependability, wherever they are used. The experimental stage in their construction has been long passed. Year in and year out they give unequalled service to their users. It will pay you to investigate them. Our Engineering Department will gladly advise you.

We are now making delivery from stock on the smaller furnaces. All are made for either gas or oil fuel or can be furnished with combination gas or oil burners. Catalog 24 gives more details. You'll find it interesting.

GILBERT & BARKER MFG. CO. G&B SPRINGFIELD, MASS. U.S.A. EST. 1865

Type C-15



In Gilbert & Barker Furnaces, heat loss from radiation is cut down to the minimum. Heavy walls and the high quality of the fire brick used retain the maximum amount of heat.

Linings are made of the very best grade of Pennsylvania Fire Brick, Hard Baked.

None but the best grade materials used throughout.

Repairs, when necessary, are readily made without disturbing the general construction.

We make both Gas and Fuel Oil Burning Heat Treating Furnaces in more than 100 standard types.

Gilbert & Barker Mfg. Co.

WEST SPRINGFIELD, MASS.

Canadian Agents:

Williams & Wilson, Montreal, Que.

James DeVon, 227 Davenport Rd., Toronto, Ont.

CUT GEARS

Accurately cut gears run quietly and endure.

Poor gears are noisy in operation. Their life is short.

It is economy to buy HAMILTON GEARS—they are cut right.

Any Style Any Size
Any Quantity

Send your blue prints and specifications for prompt quotation.

Hamilton Gear & Machine Co.
Van Horne Street, TORONTO

Philadelphia GEAR Works

VINE STREET PHILADELPHIA, P.A.

Spur, Bevel, Herringbone, Spiral and Intermittent

Gears and Pinions

Made in all kinds of metals, rawhide and fibre

SPROCKET WHEELS made to order.

DIAMOND CHAINS for Power Transmission, Machinery, Motor Trucks, Motorcycles and Bicycles.

We ship gears to all parts of Canada.

Write us when you want good gears, good service.

STEEL, BRASS AND CAST IRON CUT RACKS IN STOCK AND MADE SPECIAL to ORDER.

Get our Gear Catalog "ALL ABOUT GEARS"

Convinced?

Probably the impartial opinion of a user—not our claim alone—has carried weight with you. Perhaps you're convinced—almost. For the sake of better pulley service throughout your plant, now is the time to give the Bernard a trial.

The Bernard Wood Split Pulley

in material and workmanship, in appearance and finish, is precisely what it looks—a wood split pulley built to serve both best and longest.

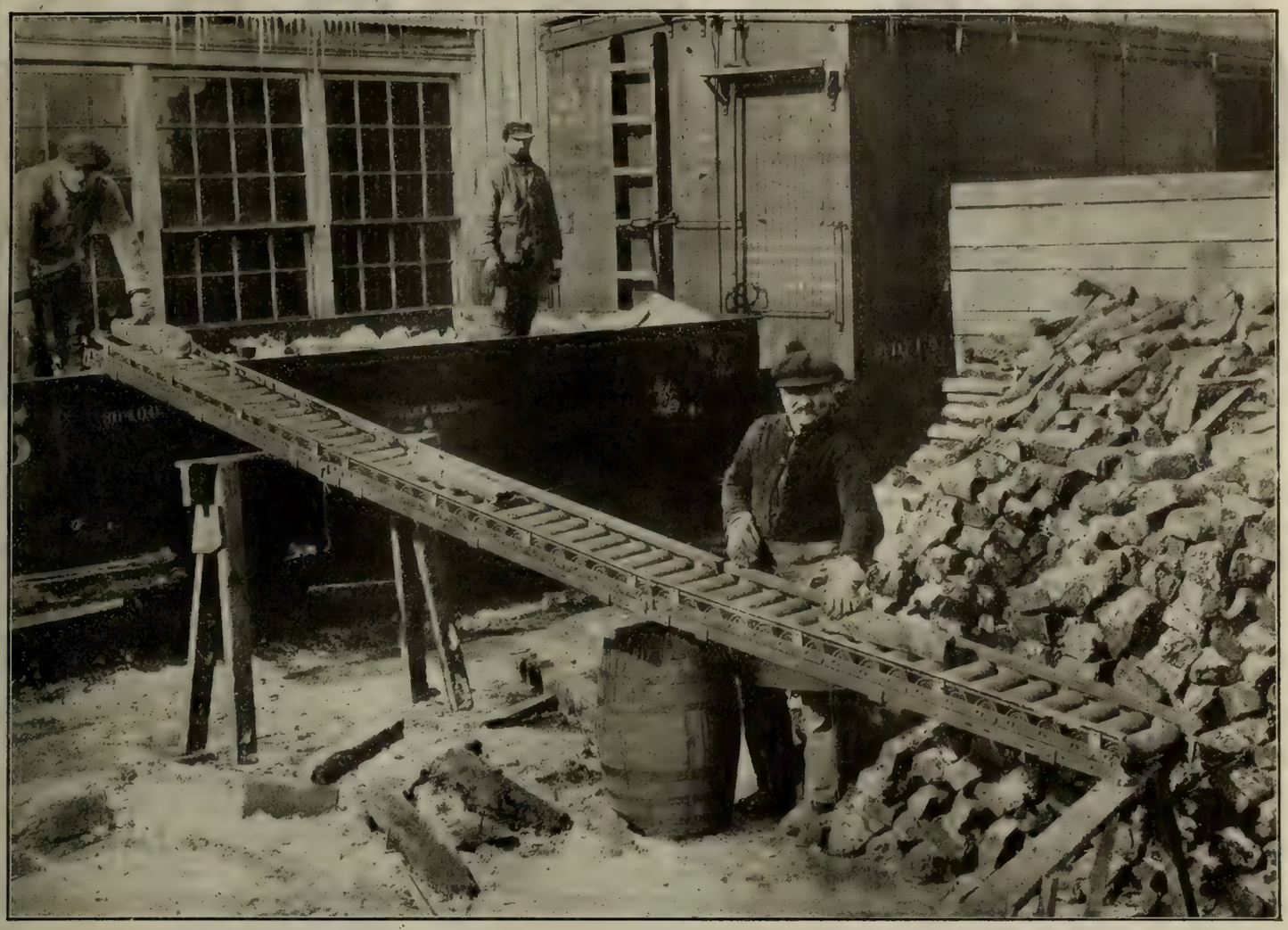
But a trial is more convincing than our claims or a user's opinion. For your own sake, we urge a trial; also because repeat orders so frequently follow trial orders.

Write for prices and full particulars.

The A. Bernard Industrial Company

Manufacturers of High Grade Power Transmission Appliances.

Office and Works:
FORTIER VILLE, QUE., CAN.



Do You Use or Handle Pig Iron?

If so, read the balance of this advertisement—it's worth your while.

The following were taken from letters written to us by **Canadian** users of our Pig Iron Conveyor:

"We might say we are getting good results from your Pig Iron Conveyor. We are sending to-day, to your Mr. Yates, an order for 30 ft."—(This is the second order.)

"In reply to your letter of June 21st, regarding the Pig Iron Conveyor which we purchased from you some time ago, we might say that it is a great success, and lightens the work of the men considerably."

"We are quite satisfied that in unloading Pig Iron from cars we have saved 50%."

Write for our Bulletin No. C

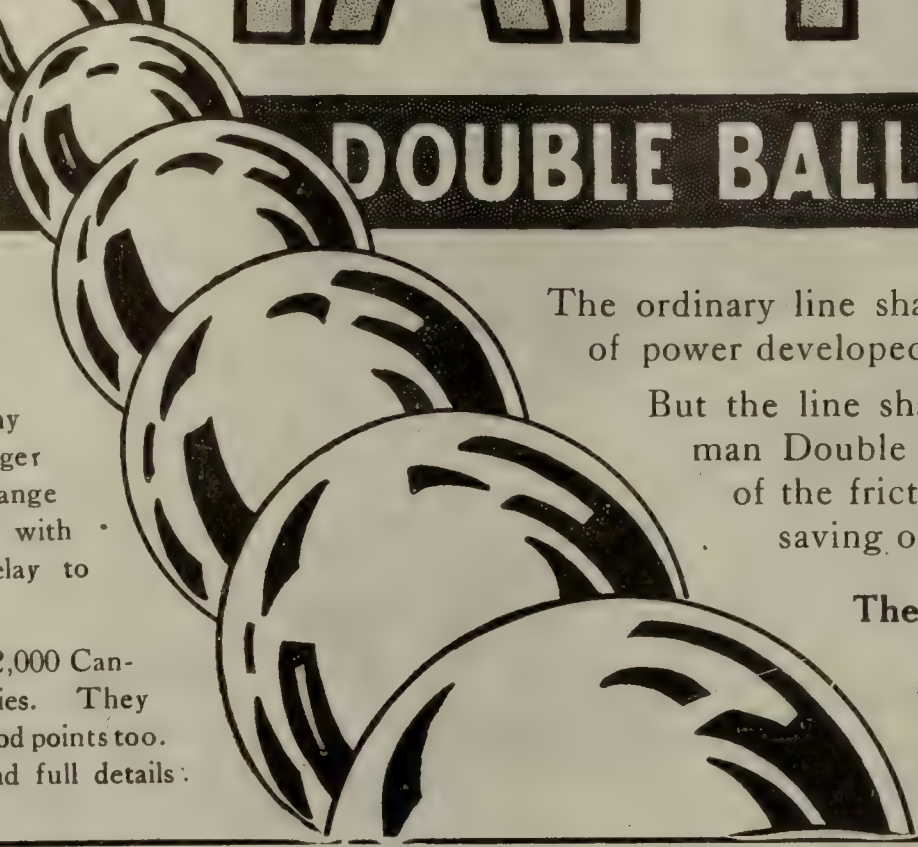
Canadian Mathews Gravity Carrier Co., Ltd.

484 Richmond Street West **TORONTO, ONT.**

If any advertisement interests you, tear it out now and place with letters to be answered.

CHAPMAN

DOUBLE BALL BEARINGS



Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

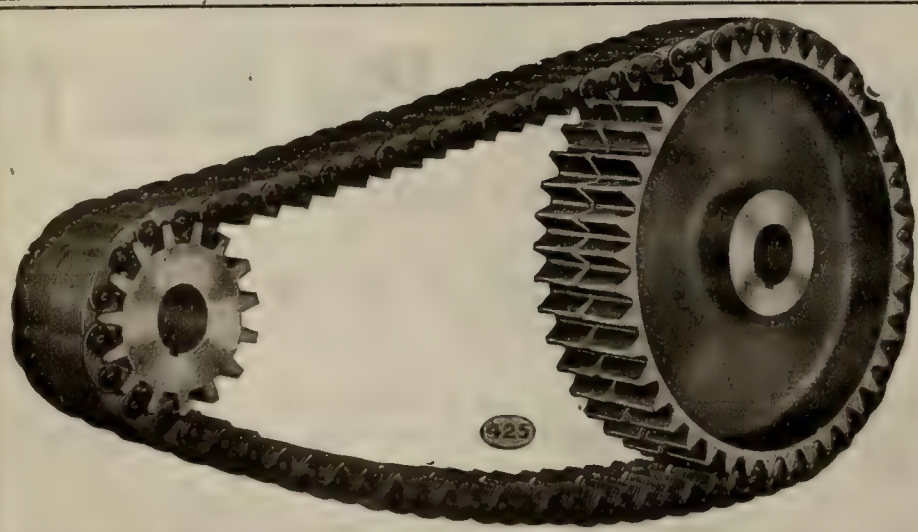
Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.



Jones & Glassco (Reg'd)

ENGINEERS
MONTREAL AND TORONTO

Specialists in
POWER TRANSMISSION CHAINS

CANADIAN AGENTS FOR
"RENOLD"
Patent Silent and Bush Roller Chains

"MORSE"
Rocker Joint Silent Chains

Chain Drives from ¼ H.P. to 5000 H.P. in successful operation

Write for particulars to

Head Office:
St. Nicholas Building
MONTREAL

Branch Office:
1204 Traders Bank Building
TORONTO

DEPENDABILITY

Has Made

HARRIS HEAVY PRESSURE

THE MOST POPULAR BABBITT METAL IN THE DOMINION

Manufactured by
THE CANADA METAL CO., LTD.
Hamilton, Montreal, TORONTO, Winnipeg, Vancouver

IT FLOWS FREELY

IT WILL NOT CRACK

IT IS COPPER COATED

IT IS COPPER HARDENED

TEN YEARS AGO AND TODAY

Old style Rotor permanently abandoned seven years ago.

Ten years ago—before we brought our Turbine to its present high degree of perfection—the manufacturing difficulties made it impossible to produce a solid rotor without semi-circular slots. These slots are acknowledged as highly undesirable and built-up rotors are never made with them. We finally invented and patented a process of manufacture whereby we were able to eliminate the slots and today unslotted buckets in solid rotor are AN EXCLUSIVE STURTEVANT FEATURE.

The unslotted bucket is obviously much stronger and permits of a thinner and more efficient vane. Furthermore it is self-evident that the slots encourage leakage from one bucket to the next and this further reduces the efficiency.

The unslotted bucket is just one of the superiorities of the Sturtevant steam turbine. The other advantages are given in detail in our catalogs 209 and 210, copies of which will be sent on request.

Improved Sturtevant Rotor—Cannot be duplicated due to patents.

B. F. Sturtevant Company

of Canada, Limited, Galt, Ontario

MONTREAL TORONTO WINNIPEG VANCOUVER

Selling Agents for Sanford Riley Stoker Co., Limited,
THE RILEY STOKER

Sturtevant

(TRADE MARK)

The Pulley of Maximum Efficiency

OVER 25,000 of these pulleys—the American Steel Split Pulley—are used in the plant of the Ford Motor Co. of Detroit.

More than 20,000 "Americans" are in use in the Western Electric Company's Chicago plant. Over 25,000 in the plant of the Cadillac Motor Car Company.

These marvelously efficient organizations use American Steel Split Pulleys for just one reason—*RESULTS.*

AMERICAN STEEL SPLIT PULLEYS

Transmit maximum power with minimum belt slip.
Are guaranteed for double belt duty.
Endure higher speeds than any other standard metal pulleys.

Write for Booklet "Pulley Efficiency."

The American Pulley Company, Philadelphia, Pa.

CANADIAN DISTRIBUTORS:

Williams & Wilson, Ltd., Montreal, Quebec; A. R. Williams Machinery Company, St. John, N.B.; A. R. Williams Machinery Company, Toronto, Ontario; A. R. Williams Machinery Company, Vancouver, B.C.; A. R. Williams Machinery Company, Winnipeg, Manitoba; H. W. Petrie, Ltd., Toronto, Ontario.

EMANCIPATE THESE PLANTS FROM THE SHORT WORKING DAY

The necessity for good light for the accomplishment of capacity production has made most of them slaves to the short hours of daylight. Now they are freed. Twenty-four hours are available and production and quality will be maintained.

In daytime skilled labor and high paid assistants perform their duties with accuracy and precision, but are you handicapping them during the dark hours and night shift by giving them insufficient artificial light?

Provide for your employees more hours of light in which to render efficient productions. Give them artificial light which will maintain their skilled capacity throughout the full eight-hour day or night shift.

Protect them against accidents and error risks and make their working vicinity bright and cheerful by using

LACO NITRO LAMP "The Light That Gives More Light"

This nitrogen gas-filled electric lamp will flood every nook and corner of your establishment with the equivalent of bright sunlight. It will increase the value of your floor space. It prevents damage to tools and machines and "jacks up" the speed of production.

Low in operating cost and high in efficient service. Uses less current and gives a clearer, brighter light than heretofore possible. Scientifically constructed with tungsten filament substantially suspended in nitrogen gas-filled bulb, thus securing long utility under severe usage.

INQUIRE FROM YOUR NEAREST DEALER.

CANADIAN LACO-PHILIPS COMPANY

LIMITED

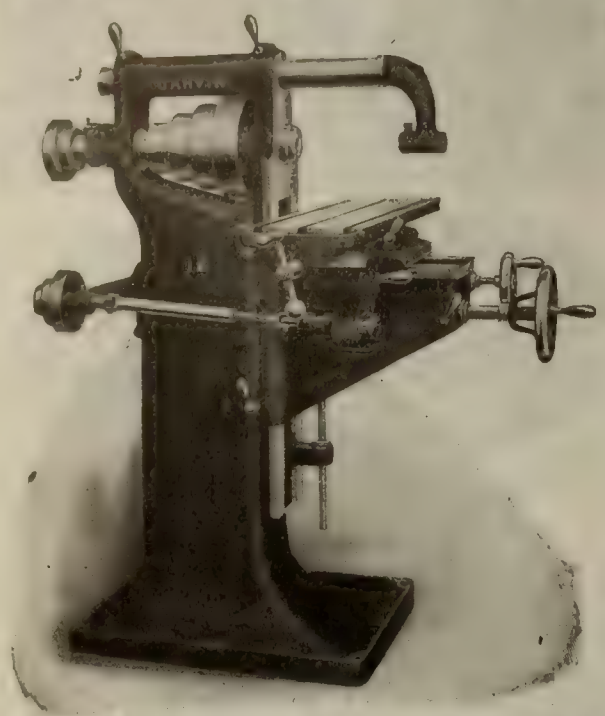
STOCKS AVAILABLE AT

MONTREAL TORONTO WINNIPEG VANCOUVER

GARVIN

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING



No. 12 Plain Milling Machine—Use Code Abrade

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rapidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments.....18 x 6 x 15 in.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

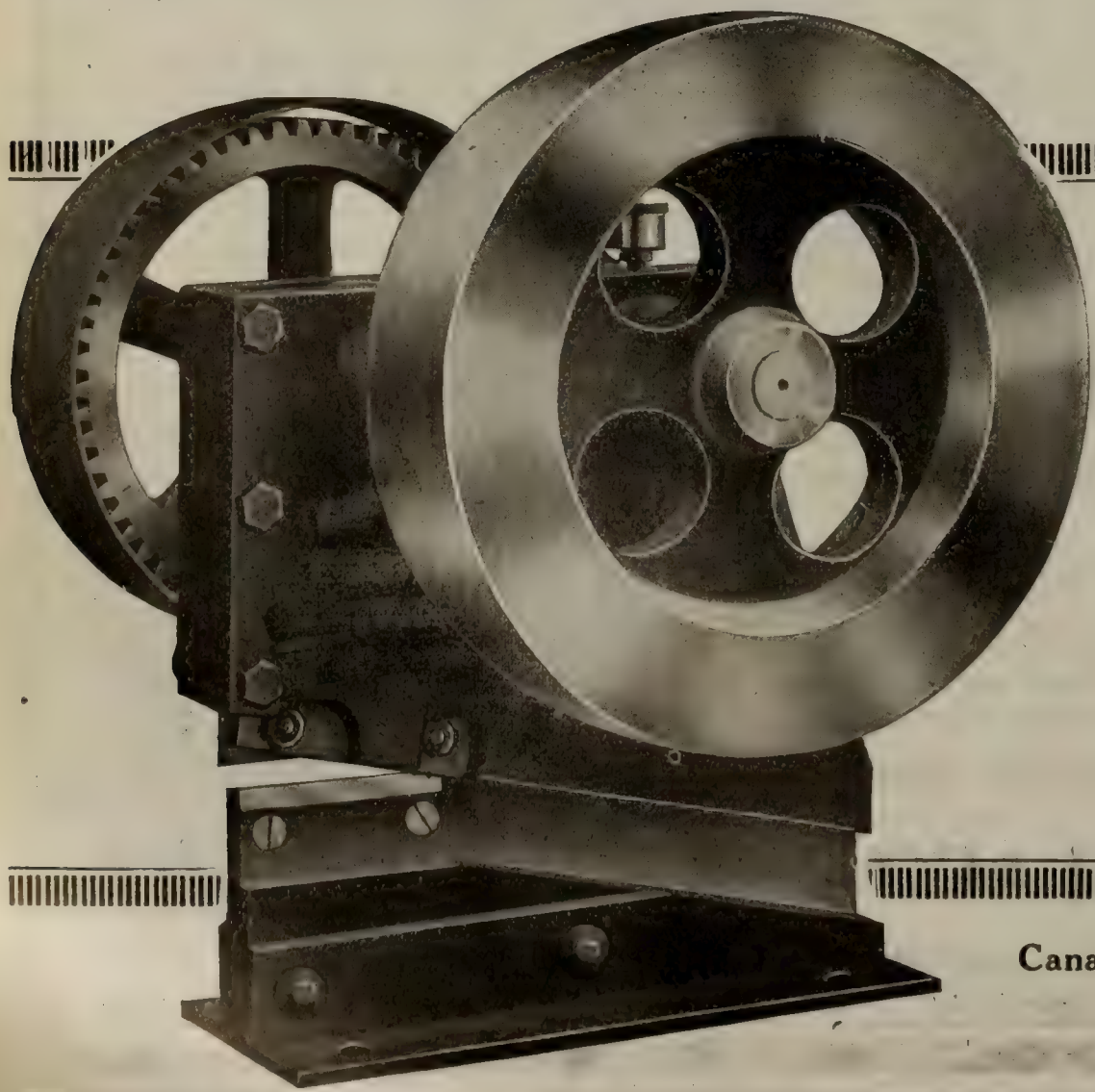
IMMEDIATE DELIVERIES

Send for Complete Catalog

Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City



The Smallest Power Shear Made

This baby shear is only one in the comprehensive line of Buffalo "Armor Plate" Shears and Punches.

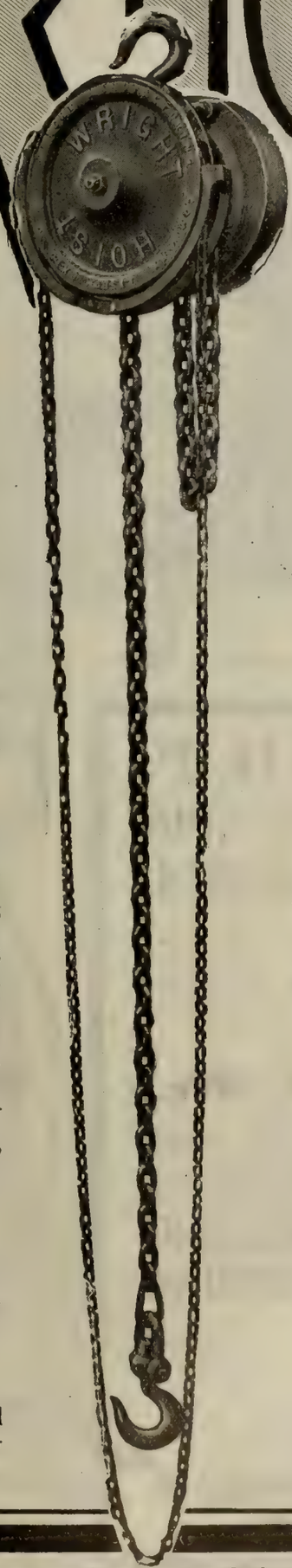
Stands only 17 inches high. You can anchor it on a work bench, shelf—in fact anywhere that convenience demands.

Cuts either flats, rounds or squares.

Ask for complete information —Dept. 16.

Canadian Blower & Forge Co.
Kitchener, Ont.

WRIGHT



High Speed STEEL Hoists

IN every working part, in every load-sustaining part, are strongest steel and malleable iron—*not* cast iron. That is why Wright Steel Hoists

NEVER BREAK

With ease and speed they raise or lower from any angle the heaviest loads, the Wright Non-Fouling Chain Guide preventing absolutely all jerking or clogging of the Chain.

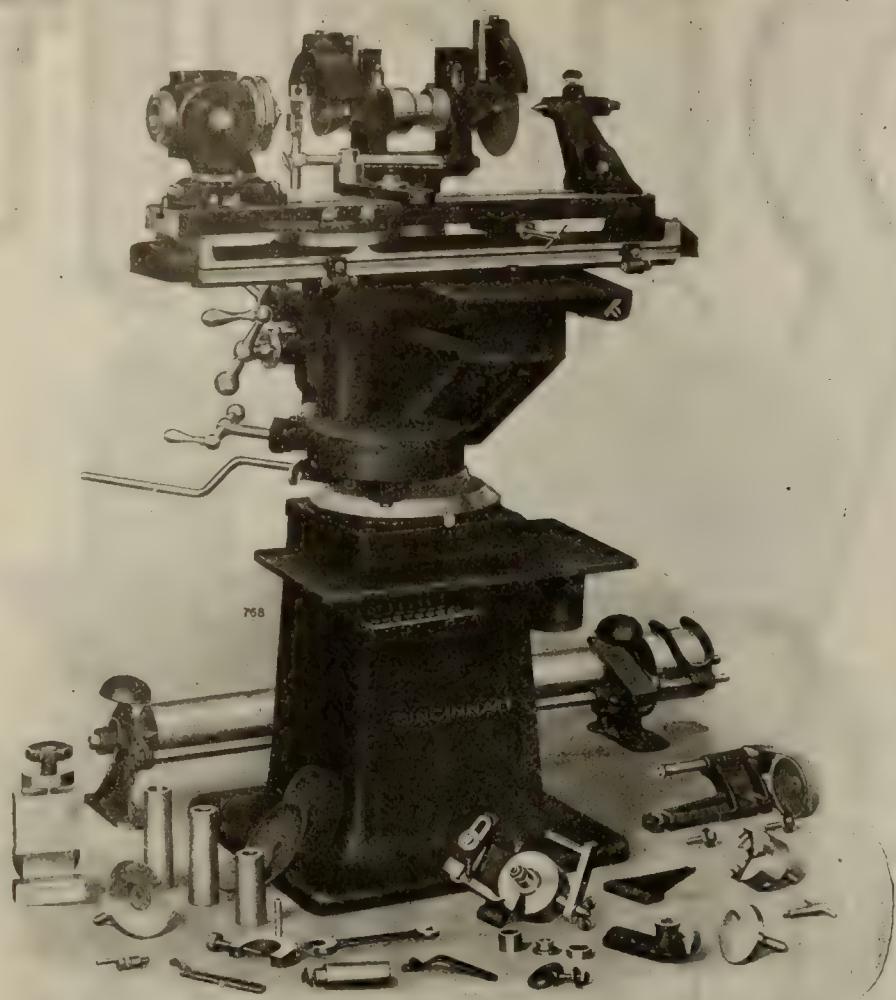
Wright Steel Hoists eliminate expensive repairs for parts broken, because they never break.

Write for Catalog.

Wright Mfg. Company
Lisbon, Ohio

Canadian Agents:
A. R. Williams Machinery Co., Limited
Toronto St. John, N.B. Winnipeg Vancouver

"Steel Hoists Never Break"



Investigate Your Cutter-Sharpening Facilities

Our wide experience in milling has proved the necessity of having exactly the correct clearance on cutters. But cutter grinders were too incomplete to insure reproduction of the right clearance on repeated grindings. We set ourselves the task of solving this difficulty. The 40 per cent., 50 per cent. or 60 per cent. increased output that proper clearance means was certainly worthy of our best efforts. In the No. 1½ UNIVERSAL CUTTER AND TOOL GRINDER we offer you the result—a simple, correct clearance angle feature.

The machine carries a graduated dial on its headstock spindle from which the clearance angle for all cutters may be read direct.

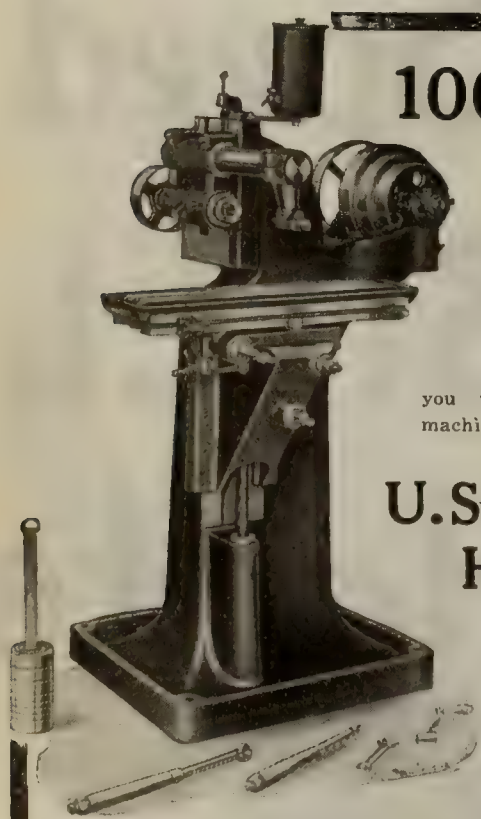
As a result of obtaining this correct clearance angle the feed may be greatly increased, the cutter cuts as it was designed to; the tendency to chatter is removed—and you get greater efficiency from your millers.

Send for the Bulletin and Get the Whole Truth of the Matter.

Cincinnati Milling Machine Co.

Cincinnati, Ohio, U.S.A.

Canadian Agents: H. W. Petrie, Ltd., Toronto, Ont.; H. W. Petrie of Montreal, Ltd., Montreal, Que.; Taylor Engineering Co., Ltd., Vancouver, B.C.; General Supply Co. of Canada, Winnipeg, Man.



1000 H. P. TO SPIN A SPOOL

does not sound logical. But in a sense it is what you are doing every time you utilize your big milling machines on little jobs.

U.S. Improved HAND and WEIGHT MILLING MACHINE

is a little giant on little jobs. Simple in adaptability. Wide in its range of usefulness. Users say it does work faster and more accurately than big machines and **at a cost-saving of almost half.** More power for its size than any other milling machine made.

We'd like to explain

The United States Machine Tool Co.

CINCINNATI, OHIO, U.S.A.

For Rapid Production and Accurate Work

USE THE

"BRIGGS"

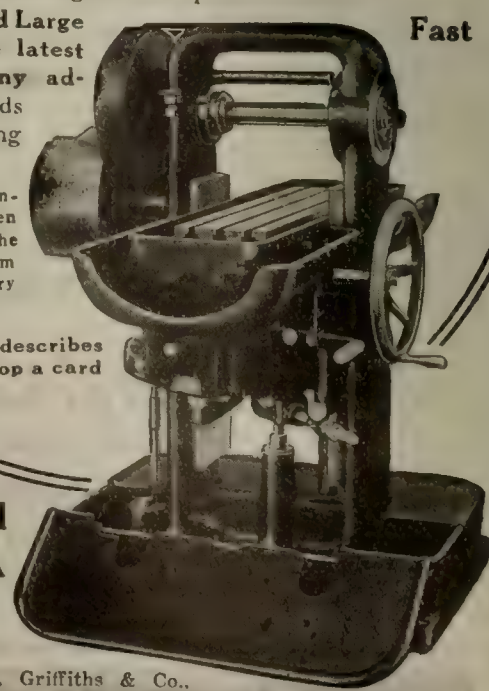
The Briggs Miller handles work no other machine of its size can touch. It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

The Base Tank and Large Gear Pump is the latest addition to its many advantages. Tank holds 20 gallons of cutting lubricant.

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

Fast

Our booklet describes fully. Drop a card for it.

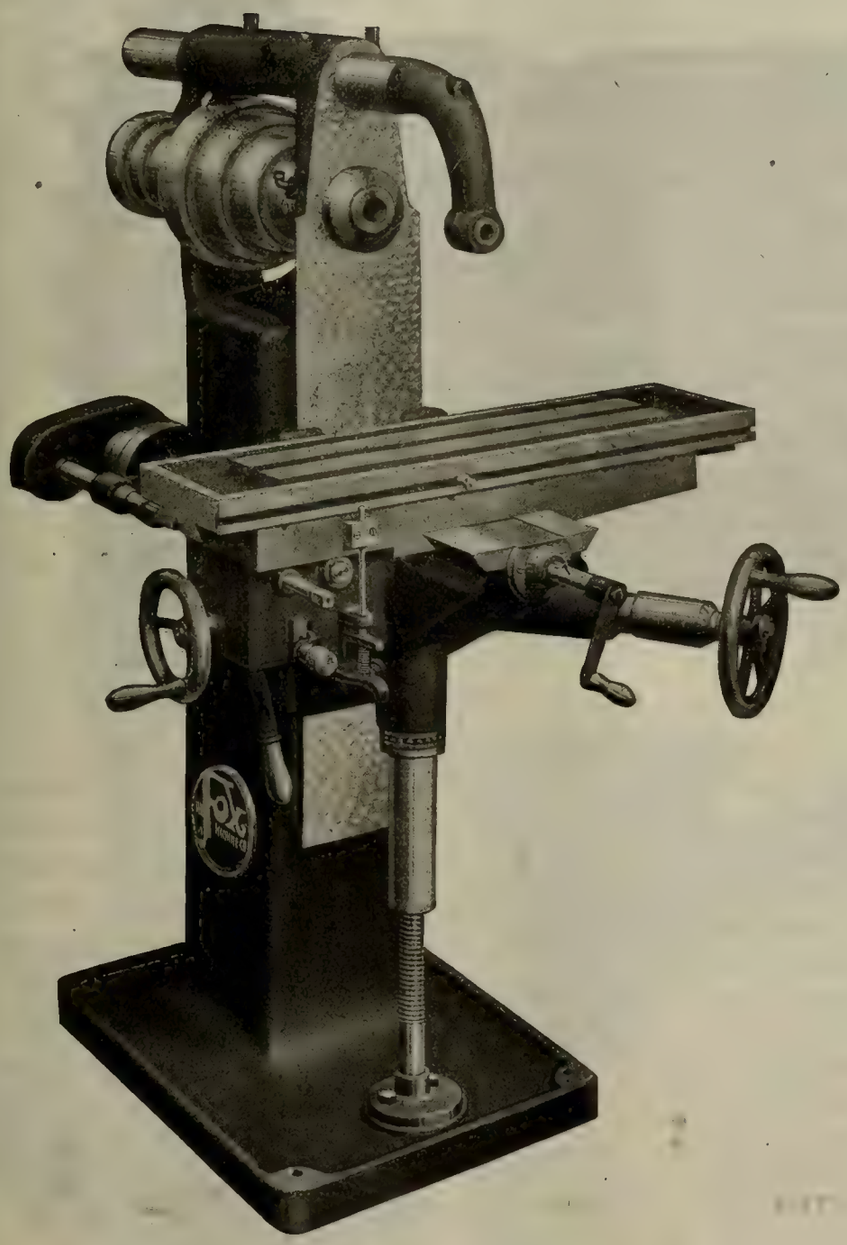


Gooley & Edlund Inc.

Cortland, N.Y., U.S.A

Foreign Agents: Allied America, France, Belgium, Italy, Switzerland, Machinery Company of Russia, Scandinavia, C. W. Burton, Griffiths & Co., London, Manchester and Glasgow; Barandiaran, Metivier, Gazeau & Cia, San Sebastian, Spain.

The Fox Milling Machine
For Intense Production



Fox
MILLING MACHINES
lead the field

Power Feed Milling No. 3

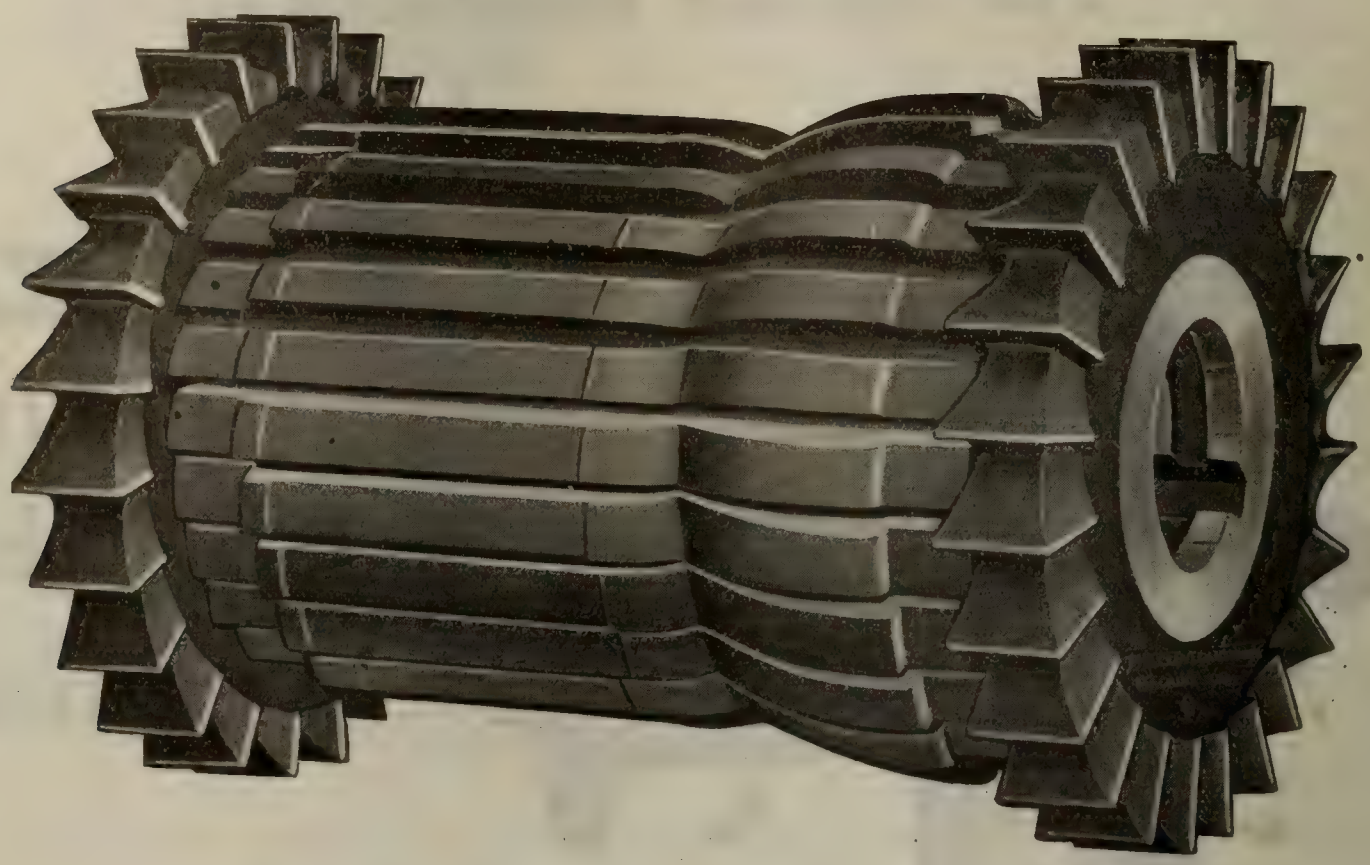
The Fox Milling Machines are ideal, as they are particularly adapted for just that sort of work.

Every machine is provided with micrometer dials on the vertical and transverse movements, thus insuring accuracy in every detail.

Write for full particulars.

FOX MACHINE COMPANY
1047 W. Ganson Street, Jackson, Michigan

This Tool Does Accurate Work!



This special Form Cutter is used in connection with the manufacture of rifle parts, and these parts must be so milled that they are interchangeable; consequently each part is severely gaged, both with respect to shape and size. These cutters must also produce parts in large quantities, and are therefore so made and heat treated as to allow maximum speeds and feeds with the fewest possible grindings, as it takes time and costs money to sharpen large gangs of Formed Cutters.

If you are having trouble in getting production from your cutters and find it difficult to make milled surfaces meet your gages, let the Cleveland Milling Machine Company take the responsibility. Intricately designed tools are a specialty with us and we have equipment that enables us to offer you good tools delivered quickly.

We solicit your orders for tools that are now proving troublesome to you.

A full line of standard cutters and formed tools

Cutters carried in stock by our agents, The Dale-Brewster Machinery Co.
547 Washington Blvd., Chicago, Ill. New York Office, 30 Church St., New York City, N. Y.

The Cleveland Milling Machine Company

18511 EUCLID AVENUE - - CLEVELAND, OHIO

Here's the Machine for Rapid Duplication of Parts

This shows one of the limited number of Becker machines in stock ready for prompt shipment. It is a small sturdy profiler, exceedingly well adapted for comparatively light work at quickest action. There is work in almost every line of manufacture that it can do best and with greater economy.

No. 2H BECKER PROFILER

Range, 16" x 8" x 16".

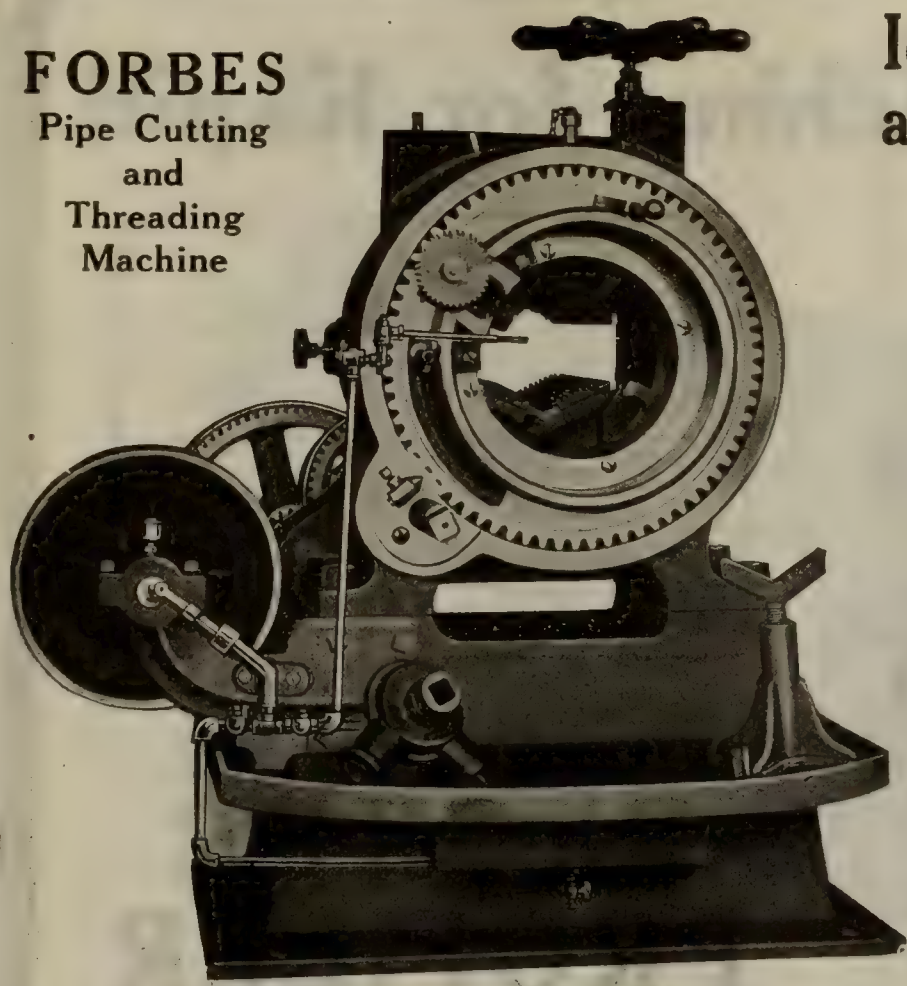
Greatest distance between spindle and table, 17". Greatest distance between spindle and neck, 15". Spindle adjustment, 2". Weight, net, 1150 pounds.

Besides this Becker Profiler we have also a limited number of the following machines which we can offer for prompt shipment. These are Nos. 1, 2, 2A, 3, 3H and 4B verticals. These machines are adapted to a variety of smaller class work from routing, die sinking and profiling to straight milling.

Full specifications and information gladly furnished on application.

Becker Milling Machine Co.
Hyde Park, Boston, Mass., U.S.A.

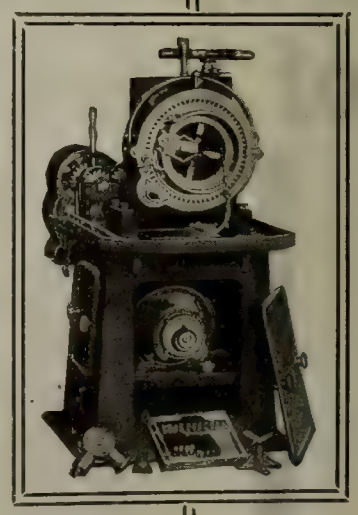
FORBES
Pipe Cutting and Threading Machine



Ideal Machine for all Kinds of Work

Especially Fine Work

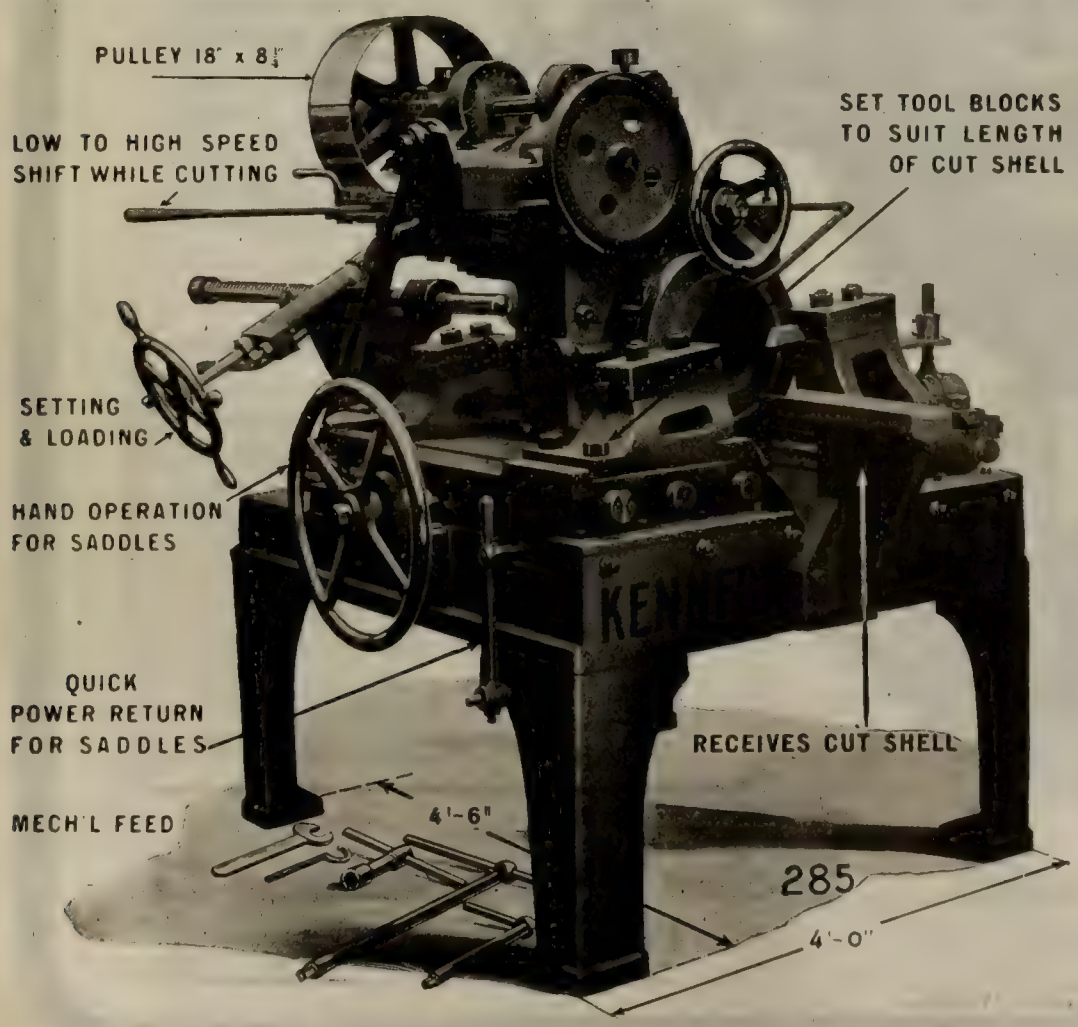
The "Forbes" is the ideal Pipe Cutting and Threading Machine for any job, but it is especially essential where the work in hand is of a high class order—where the reputation of your firm is at stake. Joints threaded by the Forbes Machines will bear the most critical inspection. They never leak.



It is the only machine on the market with receding gear which carries the dies into the pipe. It is also entirely self-contained, motor-driven and can be easily carried to its work.

Catalog on Request

Curtis & Curtis Co.
Garden St. Bridgeport, Conn.



CUTTING-OFF MACHINES

Cuts both ends at once

(xcept 8 in. and 9 in. sizes which cut one end only

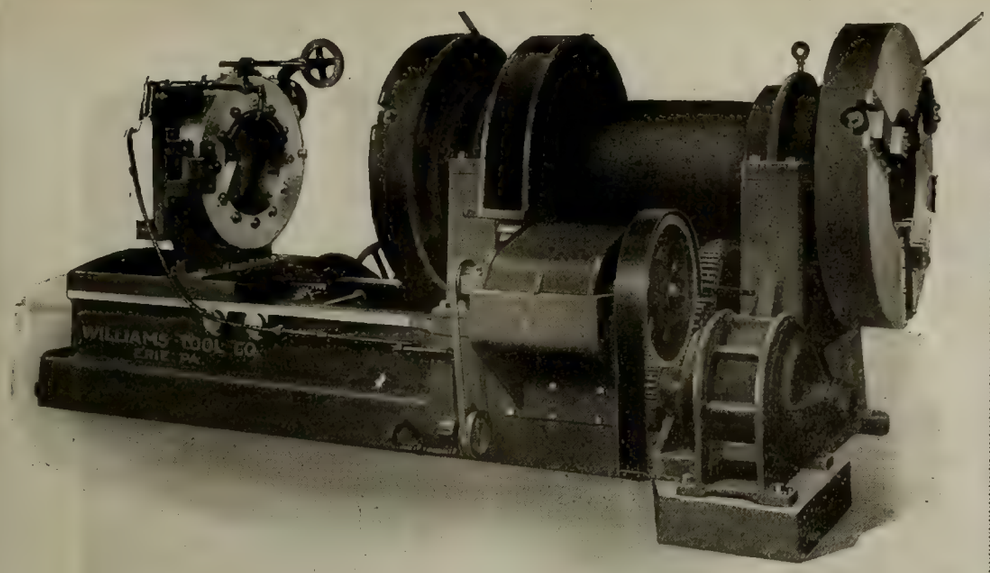
Forgings load in one end and discharge out the other when cut

A Girl can operate it

New quick power return for saddles

DELIVERIES REASONABLE

The Wm. Kennedy & Sons, Limited
Owen Sound



Highest Award Panama Exposition

Williams Tool Company

Erie, Penn., U.S.A.

Canadian Agents:
The A. R. Williams Machinery Co., Ltd., Toronto, Canada

European Agents:
Universal Machinery Corp. London, England

Pipe Machines

Threading

Cutting-off

Quality will tell in every test. At the Panama Exposition the Williams Cutting-off Machine was given the highest award. What does that mean to you?

It means that your pipe-threading and cutting-off operations will cease to give you any cause to worry if you are "Williams" equipped.

Made in 11 different sizes, each machine handling 8 to 10 consecutive sizes of pipe from ¼" to 18" dia.

Williams cutting-off machine is an investment, not an expenditure. It realizes exceptional dividends.

Write us at once!

HALL

Pipe Threading Machinery

AND

Shell Cutting-off Machines

This illustration shows the new No. 8 Hall Gear Box Driven Pipe Lathe. Regular Capacity 2½" to 8" inclusive.

The last word in Pipe Machine Construction

Let us give you full particulars of this machine which is only one of a large number having capacity ⅛" to 18" pipe.

Write us for catalog and prices on:

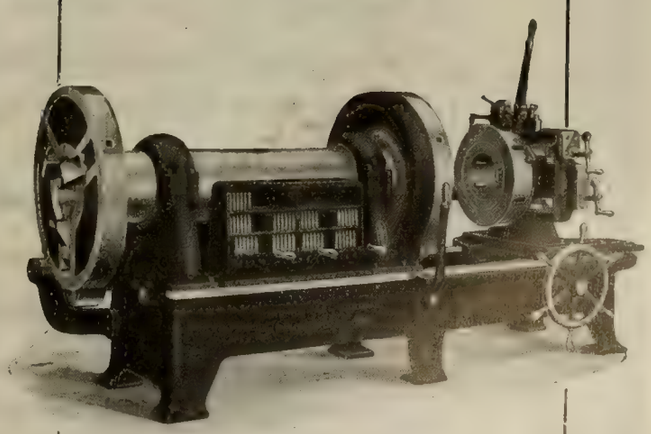
Pipe Threading Machines Nipple Threading Machines
Roller Pipe Cutters
or
Cutting-off Machine for shells or bar stock.
Any capacity ⅛" to 18".

John H. Hall & Sons, Ltd.

BRANTFORD, CANADA

EUROPEAN AGENTS:
Universal Machinery Corporation, Limited, London

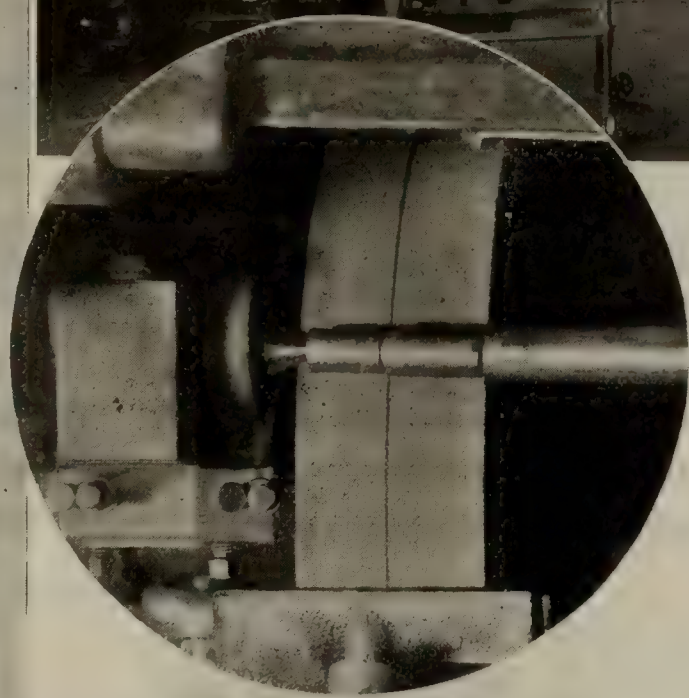
Made in Canada



Capacity

2½" to 8"

inclusive



How Aloxite Wheels Help To Keep Up Production Records

IN a big Toledo plant, making an automobile equipment, Aloxite Wheels are recognized as mighty big factors in keeping up production records. ¶One job for instance is grinding machine steel spindle bearings, a step wheel being used to grind two different diameters at one operation. ¶Aloxite Wheels grind 125 to 150 pieces at a dressing, finishing 100 to 125 per hour or from 800 to 1,000 in an eight hour day. ¶About .020 stock is removed and the work is done on a battery of Brown and Sharpe machines.

Again it's a case of Carborundum service—A case of studying every grinding phase and giving the right wheel in the right place.

Such grinding service is at your service.

The Carborundum Company, Niagara Falls, N. Y.

New York Chicago Philadelphia Cleveland Cincinnati Pittsburgh Boston Milwaukee Grand Rapids

NO DRAGGING BACK ON THE NON-CUTTING STROKE

To protect users of Racine High-Speed Metal-Cutting Machines, we carry a large stock of the famous Racine H.S. Tungsten Blades.

A patented device of this Racine High Speed Metal Cutting Machine automatically lifts the blade clear of the work on every return stroke.

In this feature alone the Racine increases both output and endurance of the blade 500 per cent.

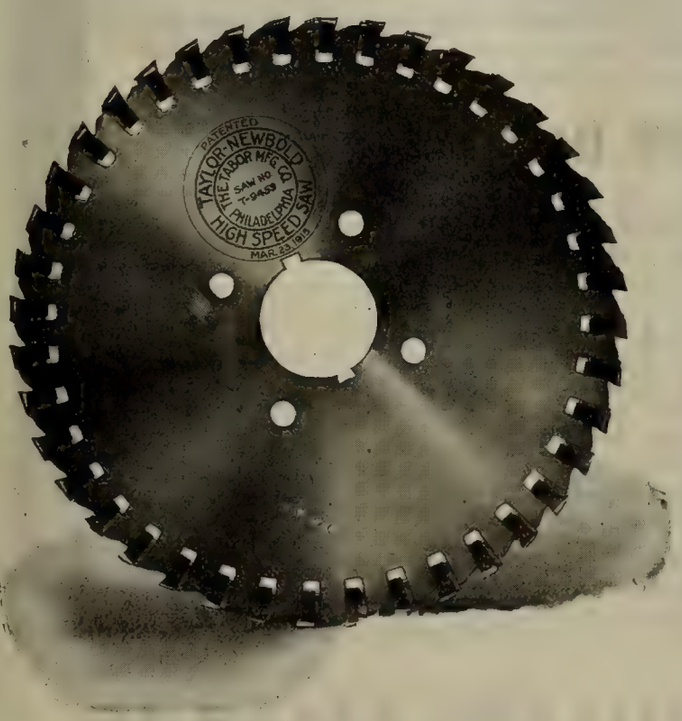
Therefore time saved—blades saved—would soon return to your pocket the reasonable cost of a Racine.

This fact—because it is a fact—could be proved to your satisfaction if you'd let us send you names of Canadian plants using Racines—one Montreal plant is using 168—or if you'd let us ship a Racine on trial terms that you consider fair.

Write us to-day.

RACINE TOOL & Machine Co., 15 Melbourne Ave., Racine, Wis., U.S.A.

THE IMPROVED
TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW
WRITE FOR BULLETIN T-S
Tabor Mfg. Co., Philadelphia, U.S.A.

DOUBLE SAVINGS

in cutting on PEERLESS HIGH-SPEED METAL SAWS; they save both Time and Material.

Supposing you save only 1/16 on each cut, 200 lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

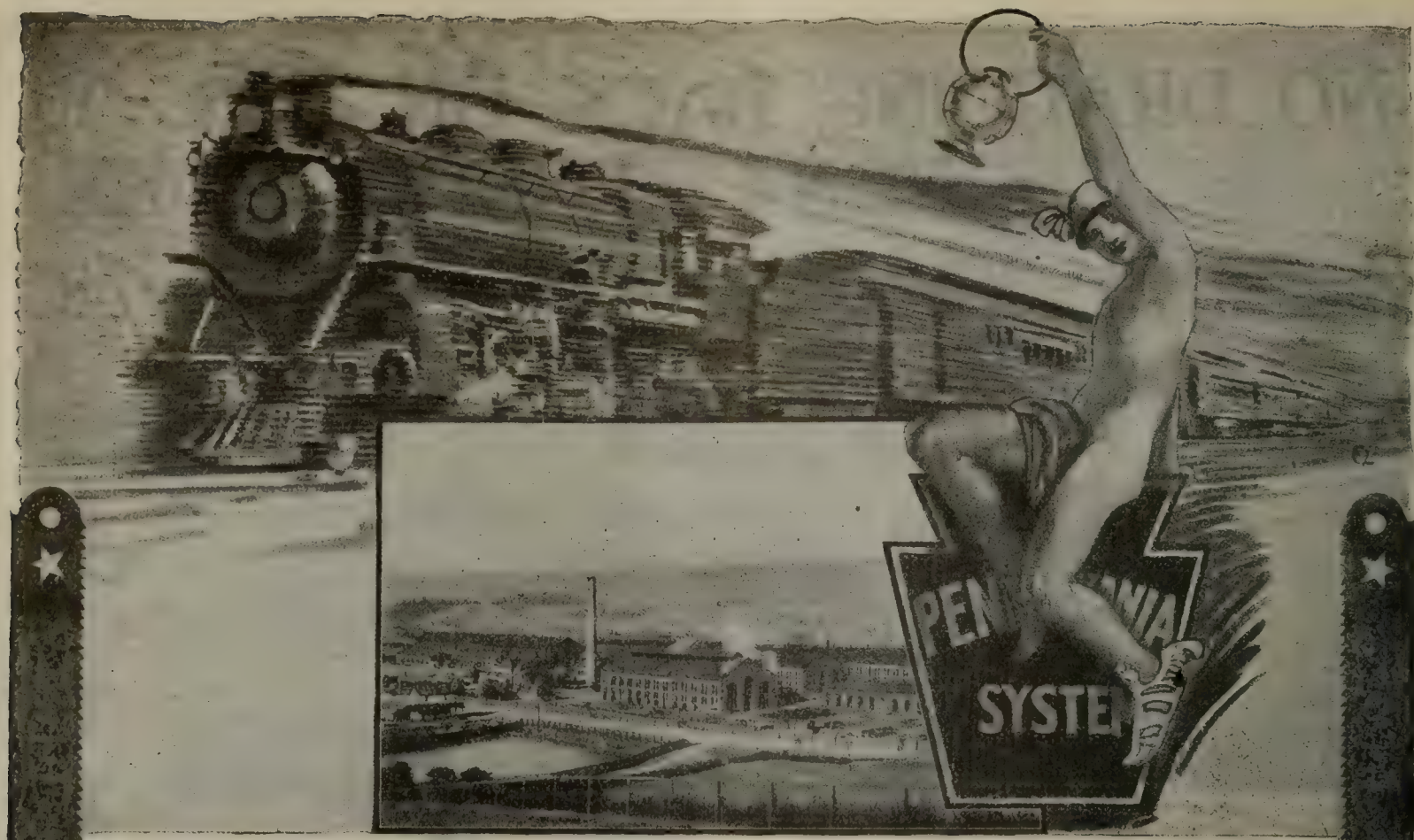
Have you ever stopped to consider the waste of material in wide cuts, especially at the present high cost, will pay for a PEERLESS in a remarkably short time.

This is only one of the reasons for so many repeated orders and large concerns having standardized the PEERLESS. The many other reasons can only be fully appreciated after comparative test.

Write for a list of users; some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

If any advertisement interests you, tear it out now and place with letters to be answered.



The Pennsylvania Uses Star Blades

The Pennsylvania Railroad, often called the greatest railroad system in the country, uses Star Hack Saw Blades. No higher endorsement than this could come from the big railroads which are famous for putting tool efficiency above every other consideration in shop equipment.

The largest hack saw users whose names are household words in Industrial America—have adopted Star blades after exhaustive tests and continued to use them year after year because Star blades give such unequalled service.

Whether your shop is large or small, if you want the greatest efficiency in metal sawing you must follow the example of these industrial leaders and use Star blades.

Make a comparative test yourself of hack saw blades, testing a number of each kind for a fair basis of judgment, and

STAR HACK SAW BLADES

will prove out first on any test—for endurance, for speed or for low-cutting cost. It couldn't be otherwise because more time and money and scientific effort have undoubtedly been put into the development and perfection of Star Blades than all other hack saws put together.

The standard steel composition and tempering used in the Star Blade—the relative gauge and dimensions—and the shape and setting of teeth for different kinds of cutting, have all been adopted after thousands of tests of all possible combinations.

At every stage the uniformity of Star Blades has been made absolutely certain by special automatic machinery with gauges to the finest limits that make the blades as nearly identical as is humanly possible. At the same time this special machinery gives us an enormous quantity production at a minimum factory cost.

The Star was the first blade and its thirty years of quality leadership has kept it the largest selling blade in all that time. To-day this quality is higher than ever before, as the most exacting tests or drastic use will prove.

If you are not satisfied with the metal-cutting results you are getting or need help in your cutting problems, write our Millers Falls office, 230 River St. Our Engineering Department and the results of our years of research are at your service.

$500 Contest Closes Soon.

Don't delay in sending your answer to our Hack Saw Testing Contest. It closes November 30th.

Our thirty years' experience has shown us how few users grasp the fundamentals of metal sawing efficiency and their application to varying conditions.

To stimulate a greater interest in this important subject, we have offered prizes of $500 in gold for the best statement of "How I Test Hack Saws." A literary production is not what we want.

Write us in your own way—What you look for in hack saw blades and why—How you decide which blade to buy—How you determine the most efficient way to use the blades on different kinds of material.

The answers that describe the simplest and most practical methods will win the prizes.

The names of winners and some of the best replies will be published in our advertising. Write for any further information desired.

Get your answer in at once. Contest closes in Millers Falls November 30th.

Manufactured By
CLEMSON BROS.
MIDDLETOWN, NEW YORK

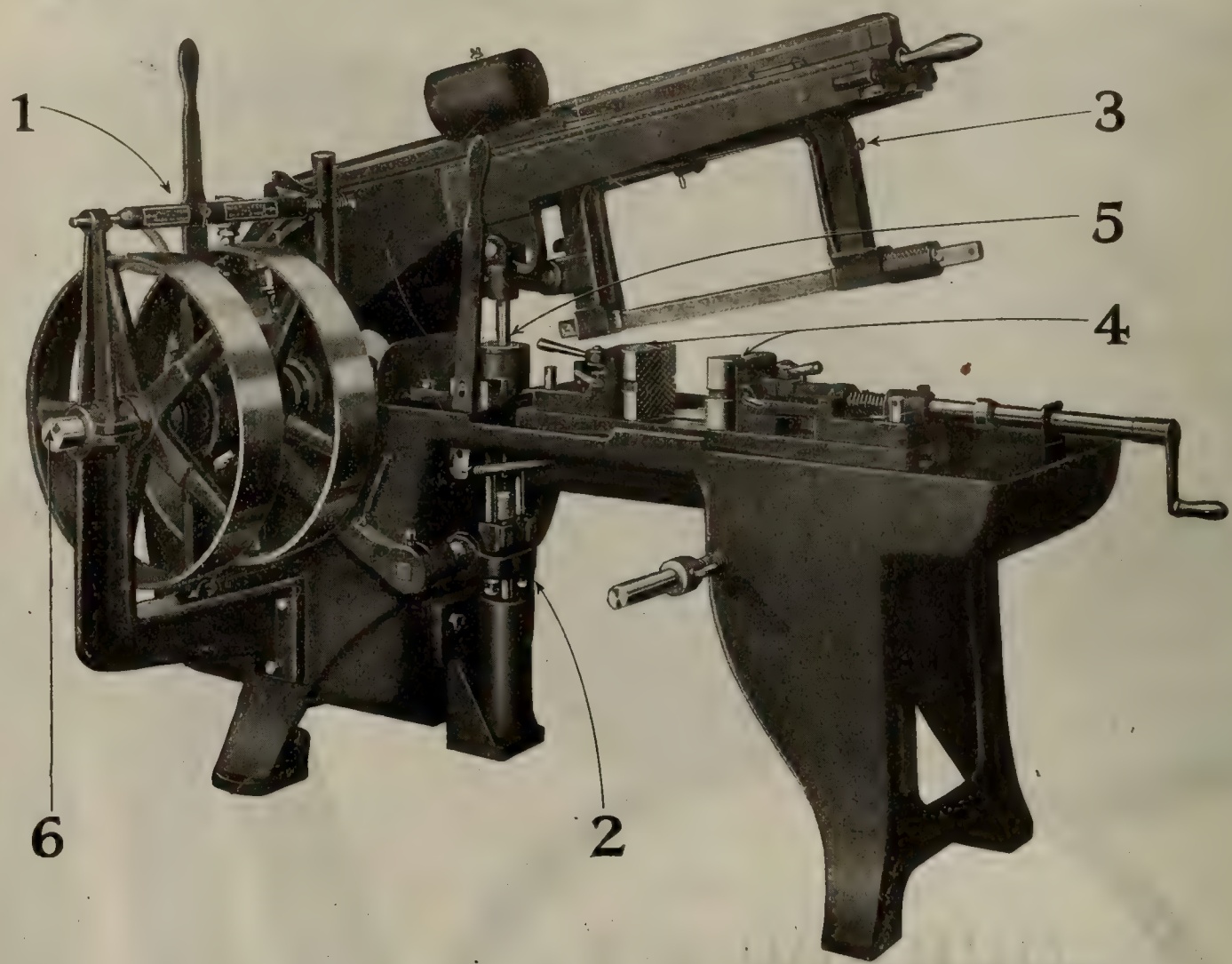
Sole Distributors
MILLERS FALLS CO.
MILLERS FALLS, MASS.

If any advertisement interests you, tear it out now and place with letters to be answered.

Distinctive Features

of the V.S.W. No. 5

High Speed Hack Saw Machine



DISTINCTIVE FEATURES

1. Two Speeds.
2. Shock Absorber.
3. Extension Frame.
4. Patent Swivel-Jawed Vise
5. Automatic Patent Lift.
6. Frame Swings on Shaft Center.
7. Rotary Pump.
8. Knock-off.
9. Frame Bearings.
10. Tank.
11. Perfect Blade Alignment.
12. Lubricating System.
13. Draw-Cut.

For Explanation of these and other features send for Circular

VICTOR SAW WORKS LIMITED

HAMILTON, CANADA

"STERLING" HACK SAWS

To-day the word EFFICIENCY means more to the manufacturer, than in any other industrial period that he has ever passed through.

It will mean a survival of the fittest. To get efficiency in manufacturing, the best tools are necessary.

Among metal workers in all lines a HACK SAW BLADE is indispensable.

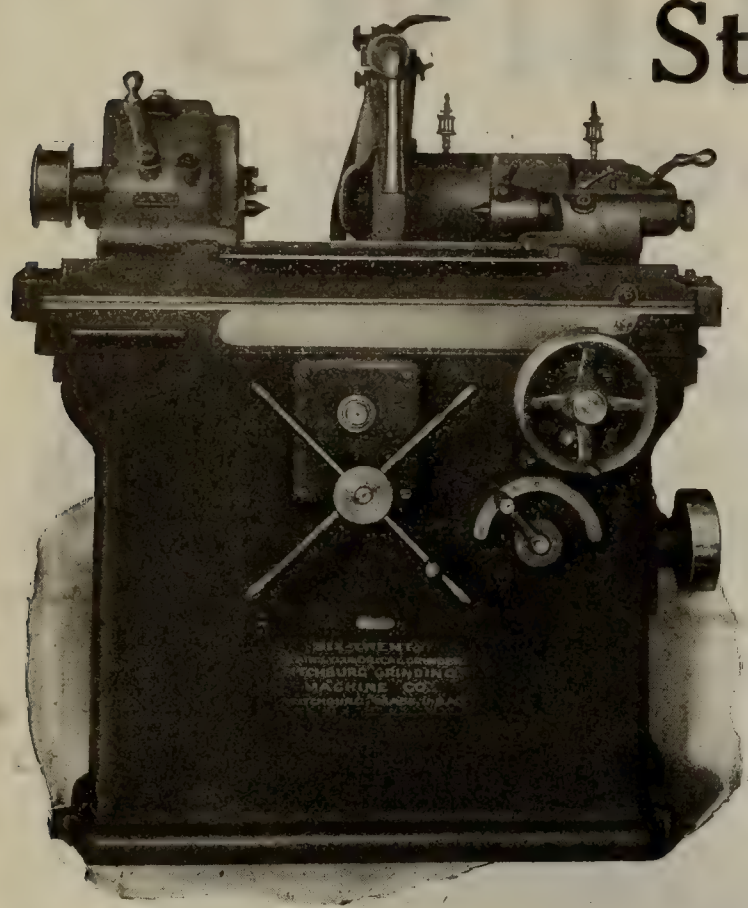
The "STERLING" Blade must be good, for its many users, the world over, say so.

MANUFACTURED BY

Diamond Saw & Stamping Works

BUFFALO, N.Y., U.S.A.

Specially Adapted for Grinding Straight or Tapered Shafts



The Fitchburg Grinder illustrated weighs about 4,100 pounds and occupies 52″ x 66″ floor space. In design it is conveniently compact; in build, uncommonly strong. It will save you price cost in the first place and repair cost later on. Occupies much less floor space, and, at the same time, does all the various grinding work with equal if not greater speed than machines of much larger capacity. **Write for interesting facts and Catalogue.**

Fitchburg Grinding Machine Co.
FITCHBURG MASS. U.S.A.

The *Greenfield*

Universal Grinder

For General Tool Room Work

This Grinder is furnished with attachments for grinding all sorts of milling cutters, reamers, counterbores, and other machine shop tools.

It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angles can be at once obtained.

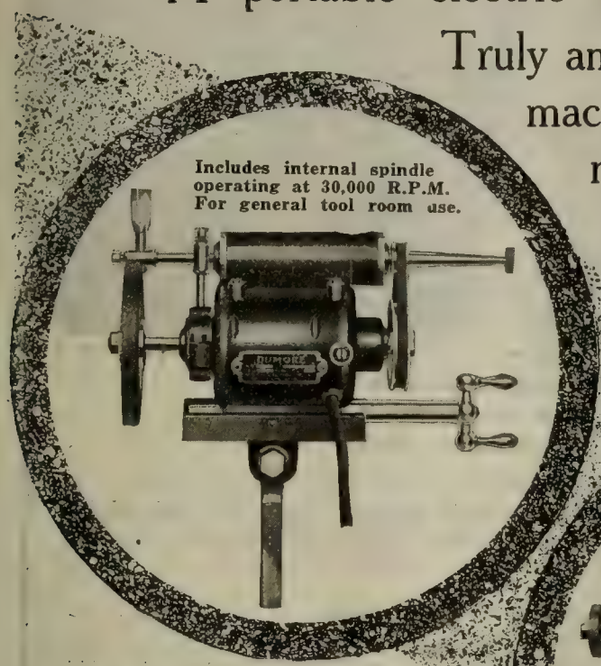
The whole machine is thoroughly well built, well finished and will be found a dependable, convenient grinder.

Greenfield Machine Company
Greenfield, Mass., U.S.A.

Accuracy-*with* Speed

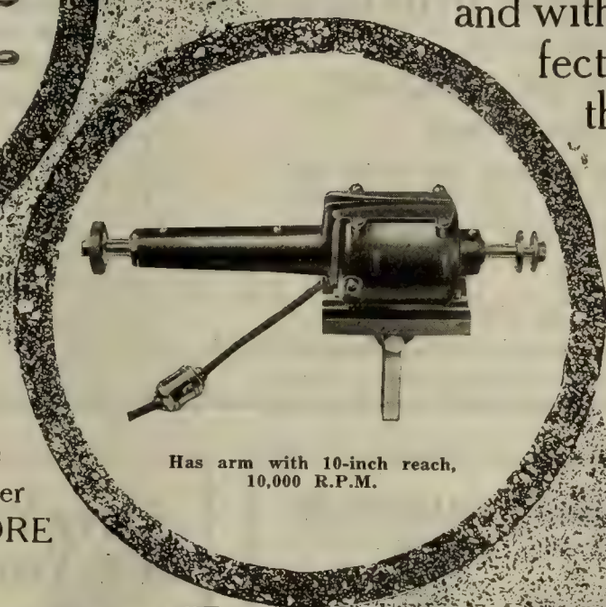
A portable electric grinder with a speed of 30,000 R.P.M.

Truly an achievement of the utmost importance to the machinery world---a speed at first declared by many to be an impossibility until they had seen the machine in operation.



Includes internal spindle operating at 30,000 R.P.M. For general tool room use.

Yet this intense speed would be useless if the grinder did not run smoothly and without vibration. Perfect running balance in the DUMORE is secured by dynamically balancing the armatures. This is done on a special balancing machine of our own design---all vibration is eliminated.

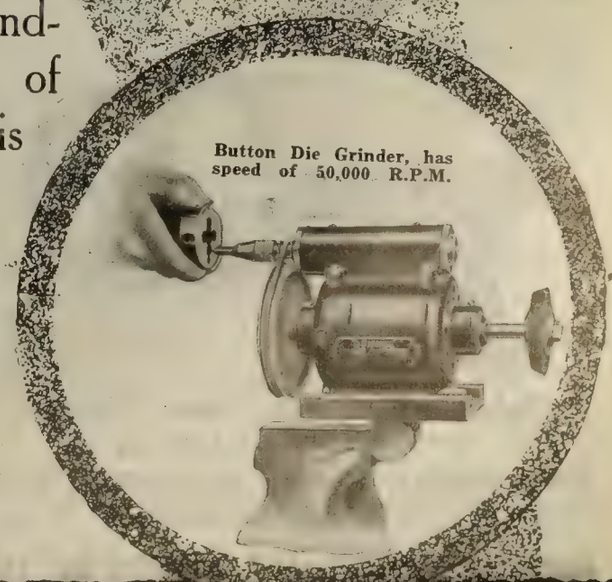


Has arm with 10-inch reach, 10,000 R.P.M.

The high speed gives even the smallest of emery wheels the correct cutting speed and prevents them from breaking down. Your work will be entirely free from chatter marks, taper or bell mouth if you use DUMORE Grinders.

DUMORE PORTABLE ELECTRIC GRINDER

is being used in hundreds of shops for grinding tools, dies and gages, and on scores of similar jobs where extreme accuracy is essential.



Button Die Grinder, has speed of 50,000 R.P.M.

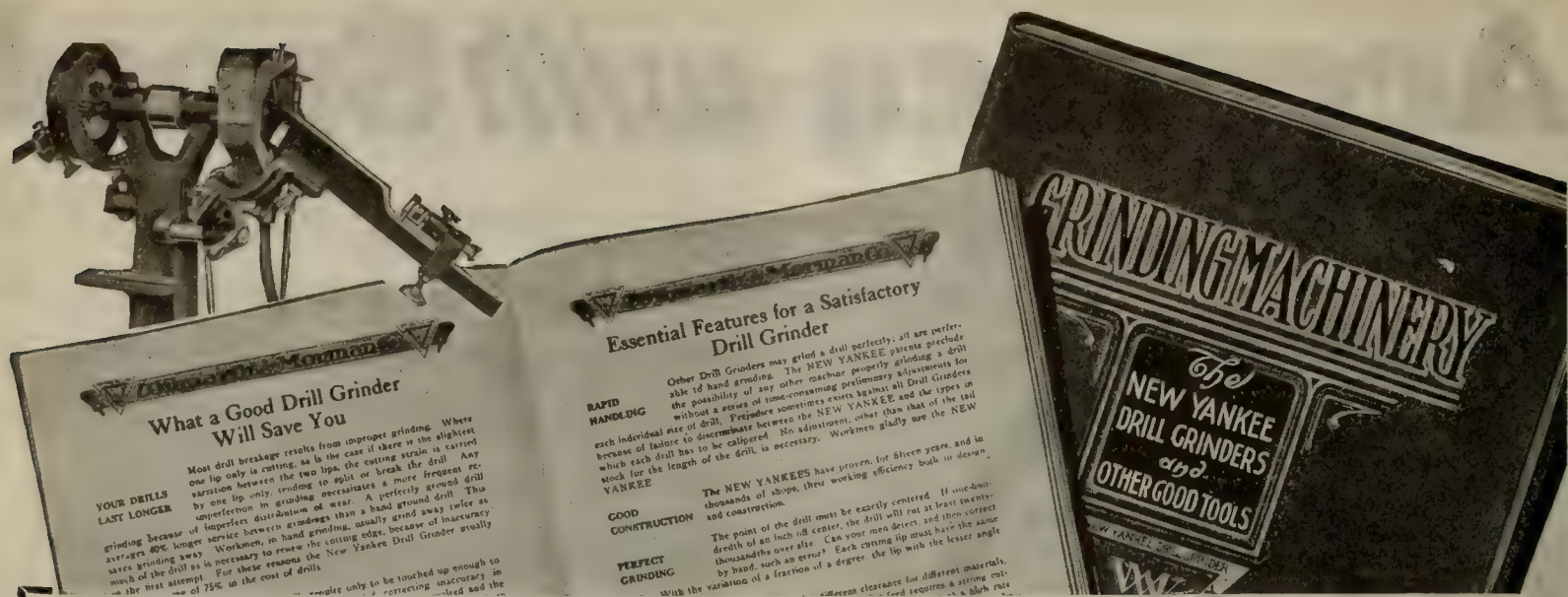
Let us send you a DUMORE Grinder on approval. That's the way they are sold. Operates on both direct and alternating current. When ordering state voltage of your current.

Write for illustrated literature.

Wisconsin Electric Company

1716 Dumore Building **Racine, Wis.**

Sold in England by Canadian-American Mchy. Co., Ltd., 8 Bouverie St., London, E.C., England.



10,000 New Yankee Drill Grinders

ARE SAVING

MILLIONS OF DOLLARS

For Their Users

Catalog No. 107 describes 100 styles and sizes of New Yankee Drill Grinders. Also W. & M. Surface Grinders and Universal Cutter and Tool Grinders. **It's free. Sign and mail coupon now.**

WILMARTH & MORMAN CO.

1200 Monroe Ave., N. W., Grand Rapids, Michigan, U.S.A.

Also Manufacturers of Surface and Universal Grinders

Wilmarth & Morman Co.,
1200 Monroe Ave. N. W.
Grand Rapids, Mich.

Gentlemen:

Please mail Catalog No. 107 and advise regarding New Yankee to meet our requirements.

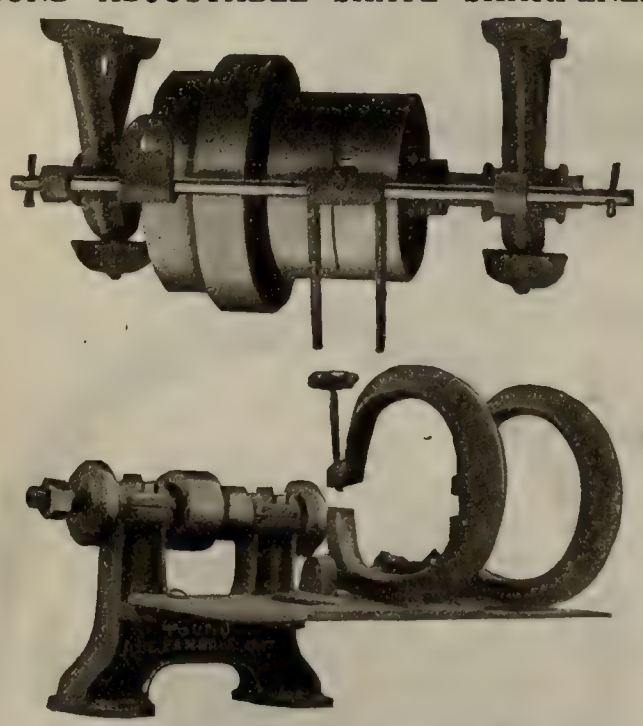
Our drills range from.....to.....

Name .....

Firm .....

Address..... Prov.....

BOND ADJUSTABLE SKATE SHARPENER



Suitable for 8 inch Emery Wheels

Babbitted and Reamed Bearings

Unnecessary to Remove Skates from Boots

Write for full information

Canadian Bond Hanger & Coupling Co., Ltd.

Alexandria, Ontario

Carry Your Grinder to the Work Not Your Work to the Grinder

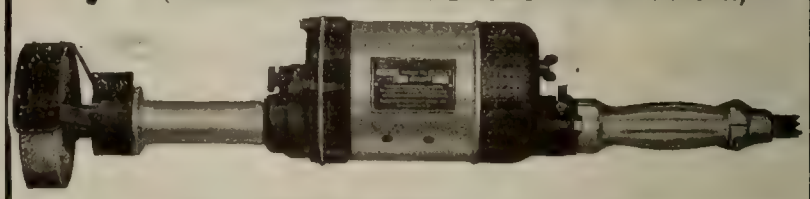
Thor

Portable Electric GRINDER

Equipped with Universal Motor for Operating on Direct or Alternating Current

110 TO 250 VOLTS

(Licensed Under Burke Universal Motor Patent.)



No. 6 Grinder-Wheel 4" x ¾" x ½"

ATTACH TO ANY LAMP SOCKET

Thor Portable Electric Grinder is equipped throughout with ball and roller bearings, and has a specially constructed motor, insuring speed, power, ease of operation and increased capacity.

IT RUNS AT 4,500 R.P.M.

Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.

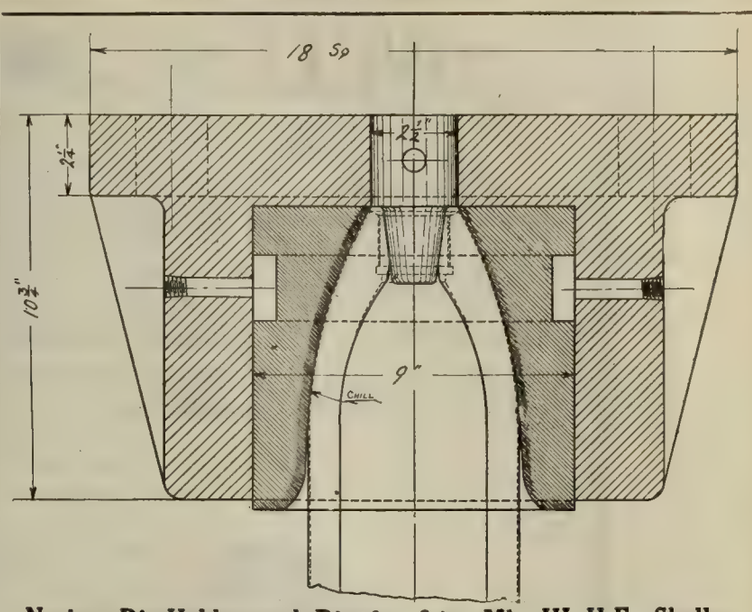
Toronto: 32 Front St. W.; Winnipeg: 123 Bannatyne Ave. E.; Vancouver: 1142 Homer Street

Why Are Over 50 Shell Factories

in Canada and the United States using our

Nosing Dies & Holders?

BECAUSE our experience of a quarter of a century in making Car Wheels, Crusher Jaws, etc., of special Chilling Iron Mixtures enables us to produce just the right mixture for each size of Die, consequently



Nosing Die-Holder and Die for 6-in. Mk. III H.E. Shells.

They are made right, and chilled to the right depth to give long life, without being too brittle. Nearly 2,000 have now been made to the satisfaction of the users. Are you one of them? Made for 4.5", 5", and 6" H.E. shells.

MARSH & HENTHORN, LIMITED

BELLEVILLE, ONTARIO

Keep Your Grinding Wheels in Trim---

The Diamo-Carbo Emery Wheel Dressrs

The Diamo-Carbo Dresser is being very generally adopted as a substitute for the expensive diamonds. Diamonds are becoming more scarce and quality is deteriorating. The quality of the Diamo-Carbo is uniform and in most places will do the same work as a diamond. They can be tried at our expense.

The Desmond Huntington No. 2 is the best dresser ever devised for use on large and coarse wheels.

We can make prompt deliveries of any type of Dresser desired.

THE CANADIAN DESMOND-STEPHAN MFG. CO.
HAMILTON, ONTARIO
Alfred Herbert, Limited, Coventry, Eng.
Agent for Great Britain

Stow Shell Grinders Increase Production

Suspended Pedestal Mounted on Truck

Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.

Binghamton, New York, U.S.A.

Oldest Portable Tool Manufacturers in America

If any advertisement interests you, tear it out now and place with letters to be answered.

"WELLS" UNIVERSAL GRINDER

is pretty sure to meet your requirements at a lower cost than does the machine you are now using. This Universal Grinder is the only low-priced machine having a swivel table with vertical adjustment, making possible the use of cup wheels. It is designed for grinding all ordinary sized tools. At a low price your every want is filled by this practical day-after-day-job machine.

Seven combinations of attachments enable the machine to meet the needs of every particular job.

By means of the Wells Locking Device the table may be raised or lowered at any angle without changing position.

Then, too, you can find no higher grade machine with regard to workmanship, accuracy and finish.

We will be pleased to tell the full story. Send us your questions.

For a complete description of its important features write to-day.

Machinery Division

Greenfield Tap and Die Corporation

GREENFIELD, MASS., U.S.A.

MODERN

SELF-OPENING and ADJUSTABLE DIE HEADS

The Die Heads that have made good on every threading operation, and which are constantly meeting the demand where Die Heads are required for accurate thread-cutting.

In purchasing "MODERN" Die Heads you have the assurance that you are getting tools of "quality," mechanically perfect in design and construction and uniformly efficient in all sizes.

Illustration shows an installation of "MODERN" Die Heads threading Shell Ogives, where the requirements are precision and large production.

Complete information regarding the use of "MODERN" Self-Opening Die Heads upon request.

MODERN TOOL COMPANY

Main Office and Works:
State and Peach Sts. - Erie, Pa., U.S.A.

Canadian Agents:
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F. WESLEY PARKER
Resident Engineer and Export Agent,
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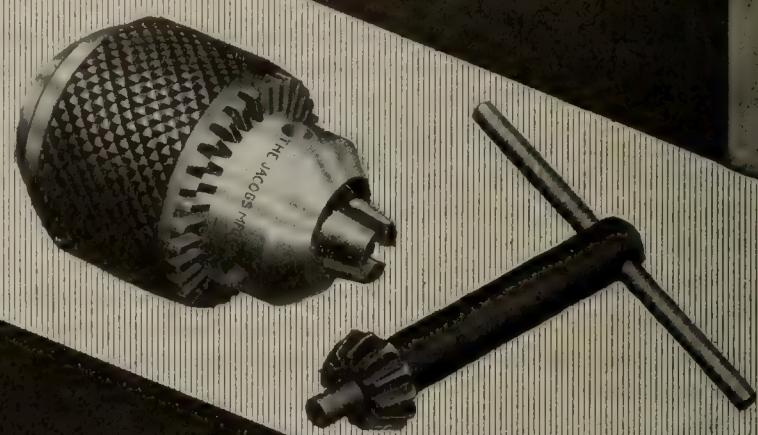
Jacobs
IMPROVED
Drill Chuck

A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

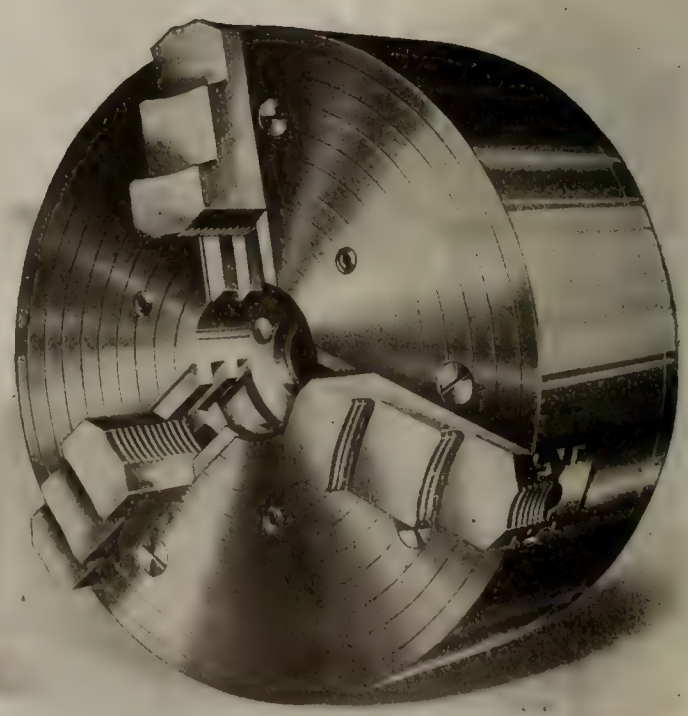
MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.



Think of it——
A 20 to 90% Increase in Production

THE M. E. C. Three-Jaw Air-operated Chuck shown herewith eliminates the waste usually experienced in ordinary chucking processes. It takes all classes of work of the hand-operated chuck, but grips much better and gives top-notch service day in and day out. Only the best materials obtainable go into its manufacture. It is made entirely of steel, including the body. A special process steel is used in making the actuating levers and all parts subjected to strain. The M.E.C. Three-jaw Chuck will do good work long after others have been discarded. Take it on thirty days' free trial.

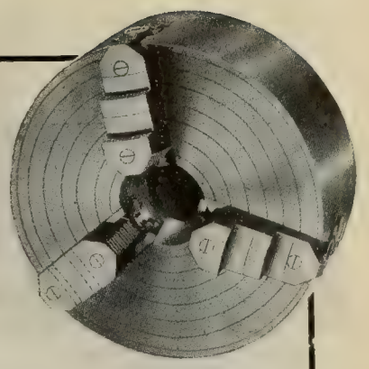
Write for catalog on all M.E.C. Labor-Saving Devices.



Manufacturers Equipment Co.
171 North Jefferson Street, Chicago, Ill.

Also makers of M. E. C. Two and Three-Jaw Air-Operated Chucks, Expanding Mandrels and Collapsible Taps

CANADIAN AGENTS:
J. R. Stone Tool & Supply Co., Goebel Bldg., Detroit, Mich.



Order on Trial Let it Prove its Own Case—You the Judge

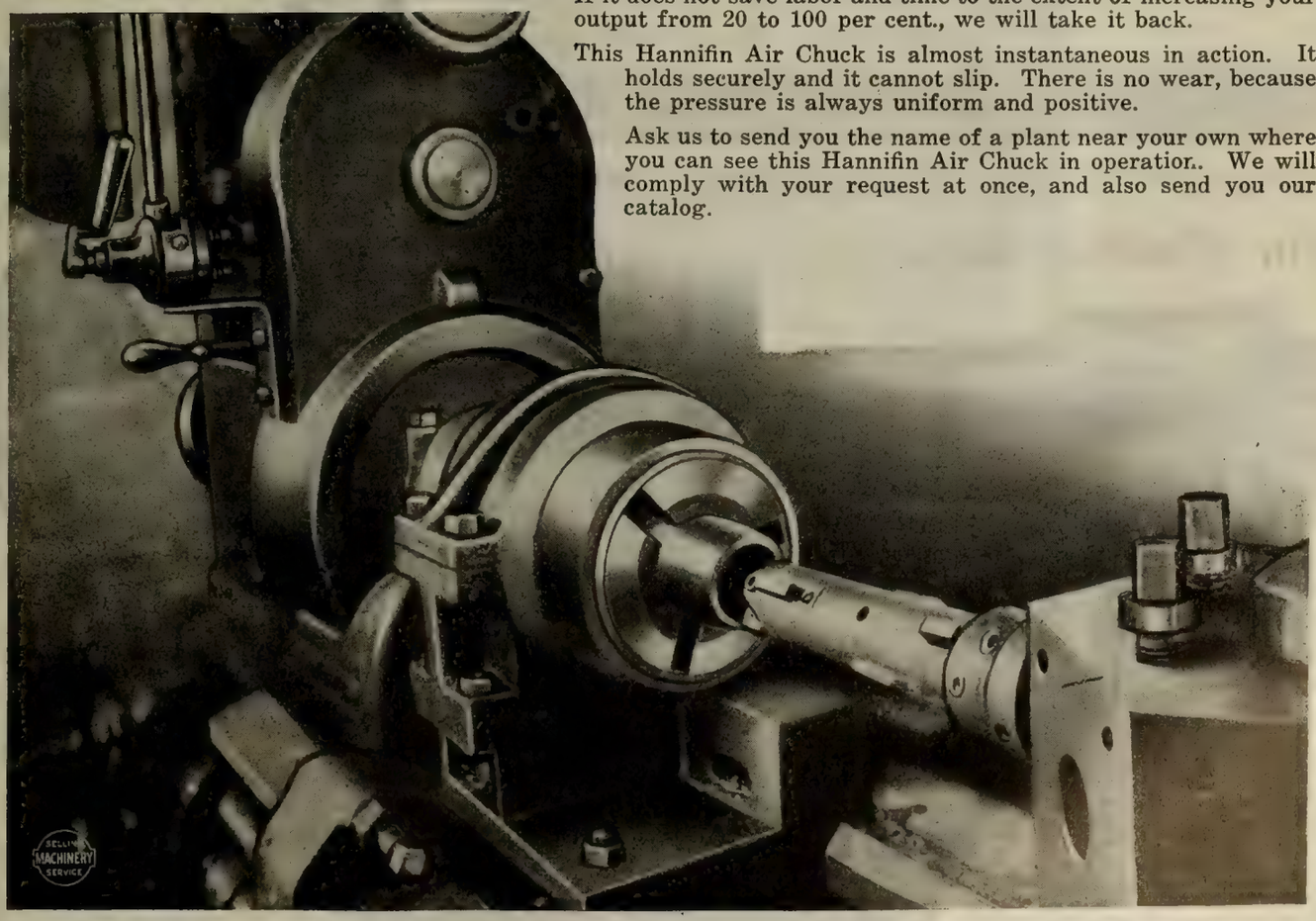
If we are over-confident, it is because we have never seen a Hannifin Chuck fail. On the other hand, in American and Canadian plants too numerous to mention here, we have seen the Hannifin Chuck increase output from 20 to 100 per cent. So we say to you: Order on trial

This HANNIFIN Air Chuck

If it does not save labor and time to the extent of increasing your output from 20 to 100 per cent., we will take it back.

This Hannifin Air Chuck is almost instantaneous in action. It holds securely and it cannot slip. There is no wear, because the pressure is always uniform and positive.

Ask us to send you the name of a plant near your own where you can see this Hannifin Air Chuck in operation. We will comply with your request at once, and also send you our catalog.



Hannifin Manufacturing Company

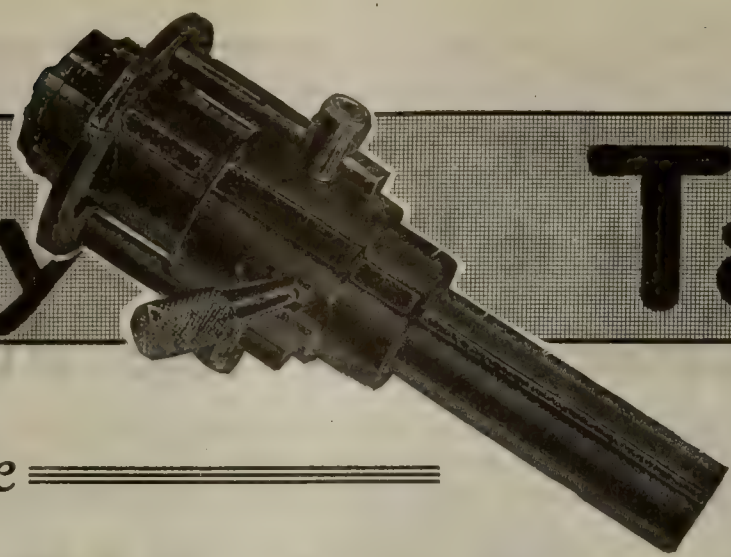
Representatives: The Canadian Fairbanks-Morse Co., Montreal; Knox-Andresen Co., Empire Bldg., Pittsburg, Pa. European Representatives: Coats Machine Tool Co., London; Fenwick, Freres & Co., Paris; Iznosskoff & Co., Petrograd.

Chicago

U.S.A.

Representatives; R. E. Ellis Engineering Co., Chicago; A. R. Williams Machinery Co., Toronto; Williams & Wilson, Montreal; C. C. Firmin, 602 Kerr Bldg., Detroit, Mich.; Carl Naumann, 411 Seitz Bldg., Syracuse, N.Y.

Murchey Taps



They are Collapsible

The only time they don't collapse or bend is under strain of heavy work and when in action. But for speedy adjustment, convenient, quick-acting operation, the collapsible and adjusting features stand prominently in the foreground.

The chasers are adjustable to compensate for any wear, and this feature enables the tap to maintain its minute accuracy, and adds to its general dependability.

The records performed by Murchey Taps on munitions work is equally prominent in general lines. They are built for service, and they give it.

We maintain a special chaser service for our clients that enable them to renew chasers at the minimum cost. Inquire immediately. Quick action means quick solution to your troubles.

The Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, S.W., England.
Fenwick Freres & Co., 16 Rue Fenelon, Paris, France.

Murchey Machine & Tool Co., 75 Porter Street, Detroit, Mich.

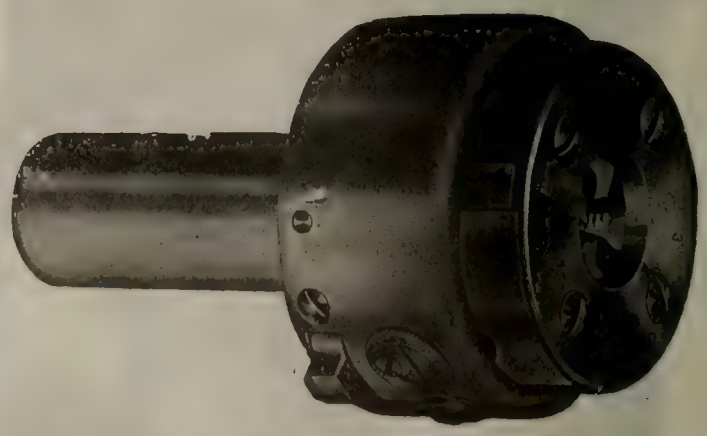
For Positive Accuracy—

and Big Time Saving

"Victor" Collapsible Taps are simple in construction; the few parts can be made large and strong; the body is machine steel, and the chasers are high-speed; screw adjustment from front end makes it easy to maintain close accuracy; trip is automatic; reset by means of lever. The above features—and others—make the "Victor" a time and money saver for severe service. It is being used by many shell manufacturers.

VICTOR Collapsible TAPS

Victor Tool Company
Waynesboro, Pa., U.S.A.



Desirable Threads

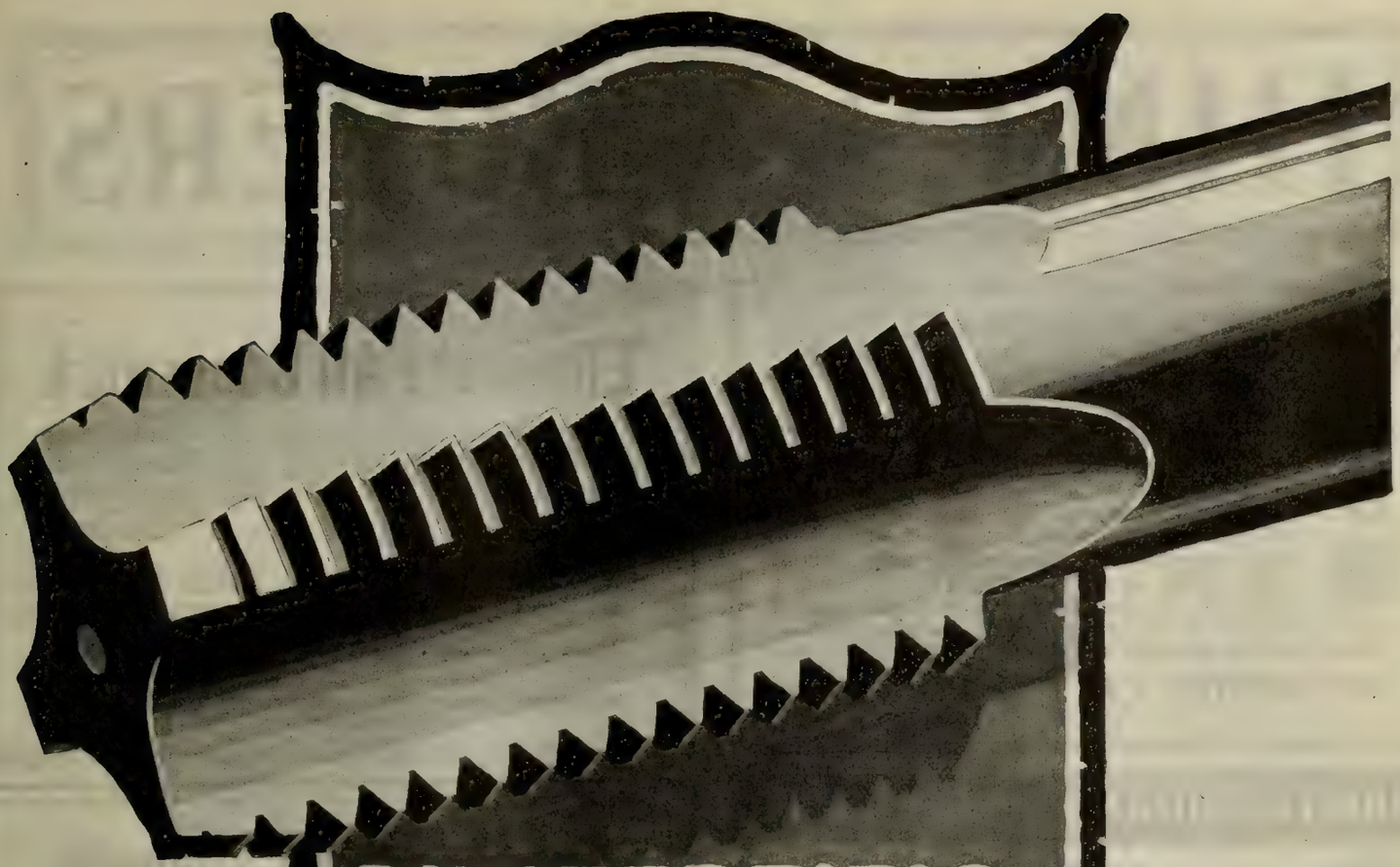
Are easily obtainable with an H. & G. Automatic Self-opening Die Head.

The Chasers are set and held in place by a steel cam which, once adjusted, locks. No stopping or changing required to keep to size. There are a good many other features on this Die Head.

"Write us!—write now."

Eastern Machine Screw Corp.
New Haven Conn., U.S.A.

H & G



BUTTERFIELD.

The name that means *quality* and *service*.

Butterfield Taps, Dies and Reamers are the finest development of many years' experience in tool making. Material design, workmanship—every detail is correct.

For the minimum of wear and breakage—Butterfield Tools.

Catalog No. 16 on request.

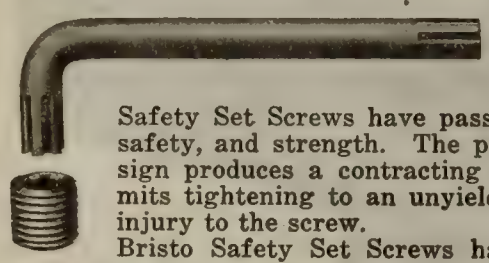
Butterfield & Company

Derby Line - Vermont, U. S. A.

New York—52 Reade Street
Canada—Rock Island, Que.
Chicago—11 S. Clinton St.
Detroit—56 Cadillac Sq.

HINTS TO BUYERS

BUILDERS OF MACHINERY
WHAT SET SCREWS DO YOU USE?



TRADE MARK
BRISTO
REG. U. S. PAT. OFF.

Safety Set Screws have passed every test for safety, and strength. The patented fluted design produces a contracting effect which permits tightening to an unyielding grip without injury to the screw.

Bristo Safety Set Screws have been adopted as the standard by many prominent machine builders. Ask for free samples and Bulletin I-809.

THE BRISTOL CO., Waterbury, Conn.
U. S. A.

Eliminate All Guesswork

Make sure you are getting the quality and standard you are paying for. Our International Bureau of Inspection, Tests and Consultations is at your disposal.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED
Head Office and Main Laboratories—MONTREAL
Branch Offices and Laboratories:
TORONTO, WINNIPEG, EDMONTON, VANCOUVER, NEW GLASGOW

"THISTLE" BRAND RUBBER BELTING

"Maintenance of Quality"
is our motto, and our experience in the manufacture of belting since the year 1856 should be invaluable to you. Let us tell you all about this friction faced belting. The price will appeal to you.
Write to-day.

J. C. McLAREN BELTING CO., LTD.
TORONTO, MONTREAL, WINNIPEG

Cut Boring Expenses

ACTUAL TESTS under trying circumstances have proven that boring expenses may be cut in half by using the DIXON PATENT BORING TOOL. License to make this tool may be purchased outright. Get in touch with me.

C. L. DIXON
278 Old Orchard Ave., N.D.G., Montreal, Que.

IS YOUR RIVETING PROFITABLY DONE?

Our Elastic Rotary Blow Riveting Machine does profitable work, because one machine will do the work of several hand riveters, and do it better.

Every head is perfectly formed, any shape, round, flat, oval, rectangular, etc.

Catalogue C tells more about it.

The F. B. SHUSTER COMPANY
New Haven, Conn.
Formerly John Adt & Son. Established 1866.
Also makers of Wire Straighteners and Cutter, Cotter Pin Machines, etc.

RIVETED STEEL TANKS FOR EVERY PURPOSE

OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
PNEUMATIC WATER SUPPLY TANKS - SMOKE STACKS
BOILER BREECHING - RIVETED STEEL PIPE - BINS & HOPPERS

WE MANUFACTURE RIVETS of every description, ½ inch. dia. and smaller

PARMENTER & BULLOCH CO., LTD.
GANANOQUE, ONT.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Save Money, Time and Worry

Get a

UNION TOOL CHEST

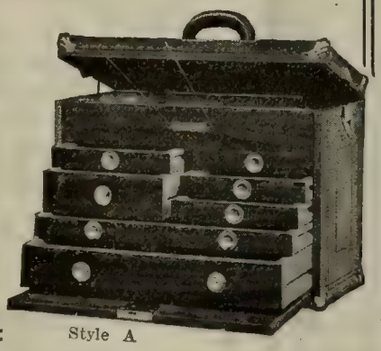
Save money, keep tools clean, safe, free from rust.

Save time—keep tools in place.

Save worry—you know immediately if one is borrowed or misplaced.

Built of selected plain or quartered oak. Some leatherette covered. Perfectly fitted drawers—19 styles and sizes. One for you.

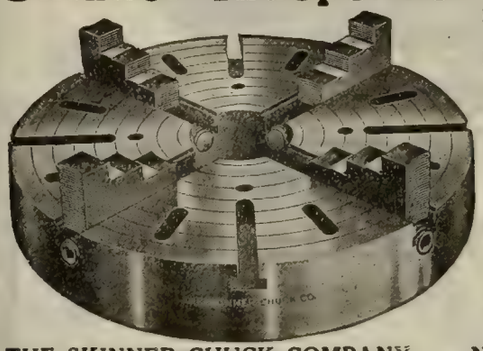
Write for our catalog and prices. Chest guaranteed to give entire satisfaction or money refunded.



Style A

Union Tool Chest Works
28 Railroad St., Rochester, N.Y.

Skinner Independent Chucks



FOR HIGH SPEED WORK

IRON OR STEEL BODY

The last word in chuck construction.

Wide jaws: hardened steel thrust bearings; adjusting screws of large diameter, threaded full length; jaws ground after hardening, etc.

Write us to-day for prices.

THE SKINNER CHUCK COMPANY, New Britain, Conn.

New York Office: 94 Reade St., N.Y.

Factory and Main Office: New Britain, Conn.

London Office: 149 Queen Victoria Street

San Francisco Office: Rialto Building.

Zenith Coal & Steel Products Limited

COAL COKE HACK SAW BLADES

CARBON STEEL MACHINERY STEEL

HIGH SPEED STEEL

Royal Bank Bldg., Toronto; McGill Bldg., Montreal, Que.

CLUTCHES

Combined Jaw and Friction. Friction only.

Gas Engine Clutches. Jaw Clutches.

Write for interesting printed matter.

The Positive Clutch & Pulley Works, Ltd., Canada

MONTREAL Factory: Aurora, Ont. TORONTO

Adjustoglas

TRADE MARK REGISTERED

Resistal reinforced glass is controlled by us.

THE STRONG, KENNARD & NUTT CO.
511 Schofield Bldg. Cleveland, Ohio

LANDIS MACHINE CO., INC.

WAYNESBORO, PENNA.

Manufacturers of BOLT and PIPE THREADING MACHINERY

Exclusive Canadian Agents:
Williams & Wilson, MONTREAL, CAN.

Write for Catalogue No. 22

For Hardness Testing

in shop and laboratory use the

Standard Scleroscope

Universally adopted; direct reading; inexpensive, and the only instrument that agrees with others of its kind in all parts of the world, thus solving problems of ordering materials to specification.

BOOKLET FREE.

THE PYROSCOPE

THE SCLEROSCOPE (Set)

Heat Indication

by optical means is fast becoming the correct thing. The PYROSCOPE has solved the problem. Perfect constancy, inexpensive, no electricity used. Built to stand rough usage and upon common-sense lines. Used by the Government and best firms.

Shore Instrument & Mfg. Co. 555-7 W. 22nd St. New York

Agents for Canada: A. R. Williams Machy. Co., Ltd., Toronto, Can.

Industrial Cars and Portable Steel Track

Hammant Steel Car & Engineering Works

HAMILTON, ONTARIO

You want Tool Holders that have made good

ARMSTRONG TOOL HOLDERS

Won The

GRAND PRIZE

THE HIGHEST POSSIBLE AWARD AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

THEY ALWAYS MAKE GOOD

Write for Catalog.

Armstrong Bros. Tool Co.

"The Tool Holder People"

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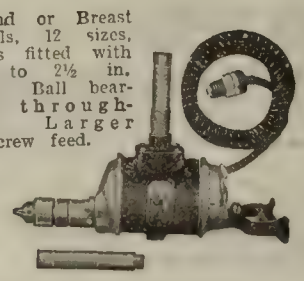

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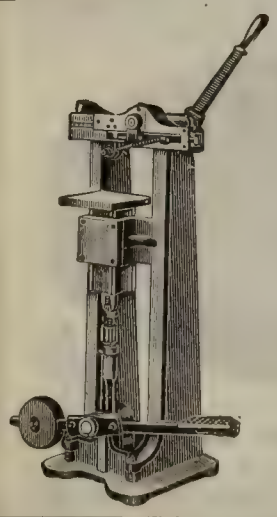

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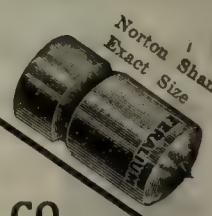

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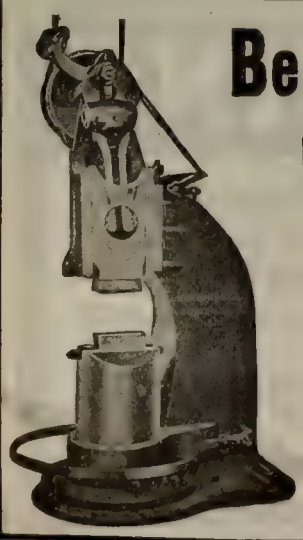

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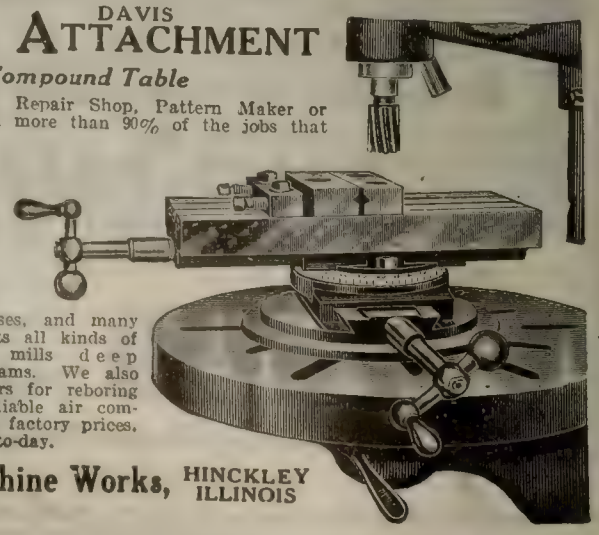

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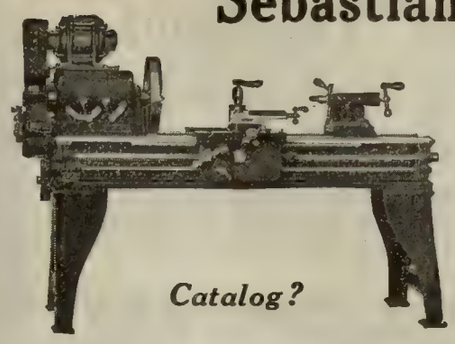

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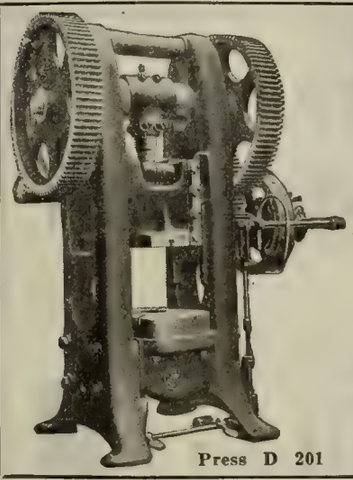

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Special Machines.

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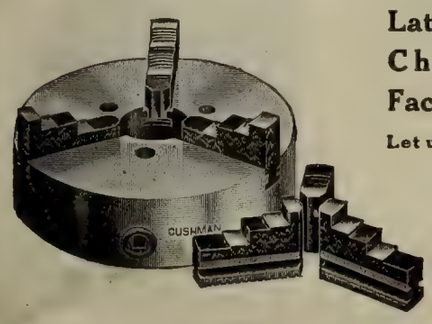

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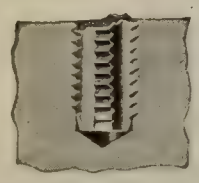
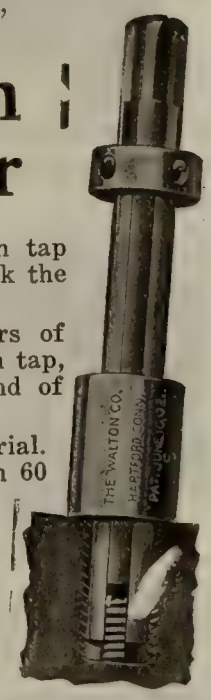
3 Minutes to back it out



Not a fraction of an inch to grip, and you must not injure the thread. Even so,

The Walton Tap Extractor



in your hands will back out this broken tap in three minutes and not so much as mark the threads.
You simply drop its strong, slim fingers of crucible steel into the flutes of the broken tap, apply a wrench to the squared outer end of the Extractor—and turn.
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Write to-day for descriptive circular.

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The thousands of concerns—both large and small—who use the

Morehead Back to Boiler SYSTEM

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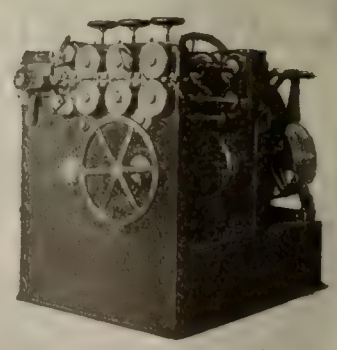

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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.
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Hull Iron & Steel Foundries, Ltd., Hull, Que.

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Gardner, Robt., & Son, Montreal.
Petrie, Ltd., H. W., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

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John Bertram & Sons Co., Dundas.
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Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

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Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Wright Mfg. Co., Lisbon, Ohio.

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Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

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Union Tool Chest Works, Rochester, N.Y.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.
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John Bertram & Sons Co., Dundas, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
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Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
D. E. Whiton Machine Co., New London, Conn.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, MAGNETIC
H. E. Streeter, 523 New Birks Bldg., Montreal.

CHUCKS, RING WHEEL
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Gardner Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

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New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

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Hardinge Bros., Inc., Chicago, Ill.

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Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.

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Zenith Steel & Coal Products, Montreal, Que.

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COLLECTORS, PNEUMATIC
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Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.

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Can. Ingersoll-Rand Co., Sherbrooke, Que.
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Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
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Taylor Instrument Co., Rochester, N.Y.

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Niles-Bement-Pond Co., New York.

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Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.

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Bernard Industrial Co., The A., Fortierville, Que.

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Garlock-Walker Machinery Co., Toronto, Ont.
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Monarch Brass Mfg. Co., Toronto, Ont.
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Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
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John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
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Standard Mchy. & Supplies, Ltd., Montreal, Que.
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Modern Tool Co., Erie, Pa.
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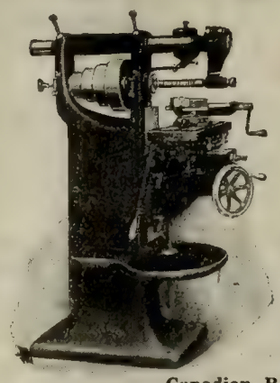

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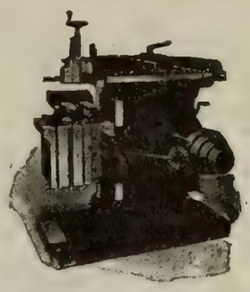

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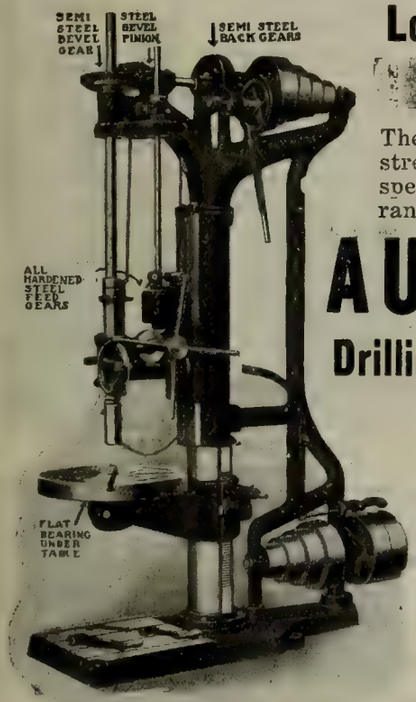

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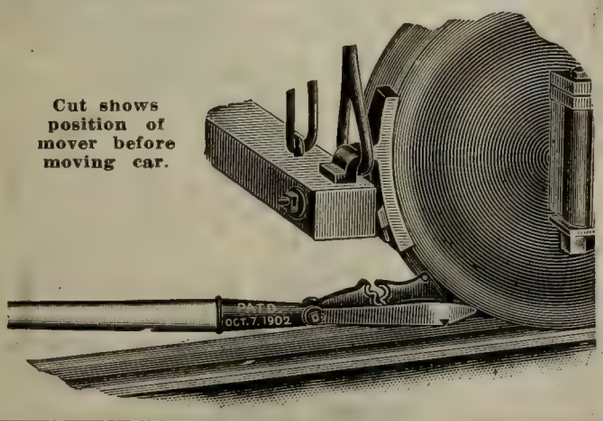

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Cleveland Twist Drill Co., Cleveland.
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Osborn (Canada), Ltd., Sam'l, Montreal, Que.
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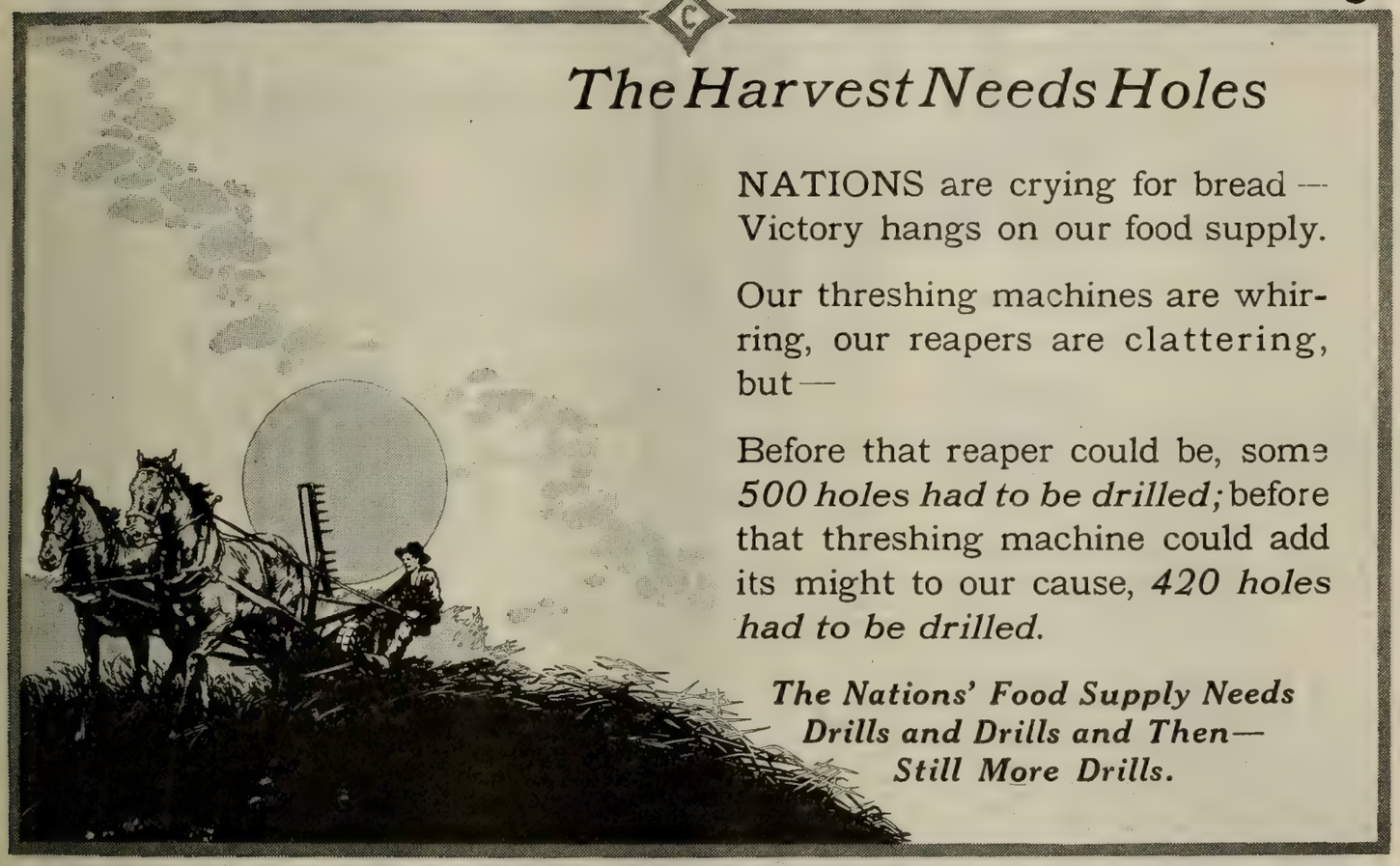

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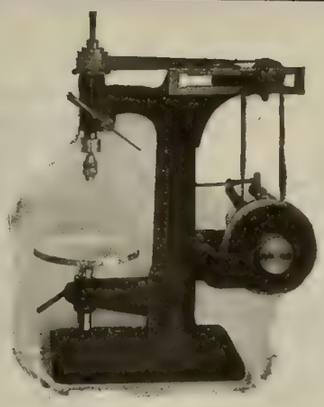

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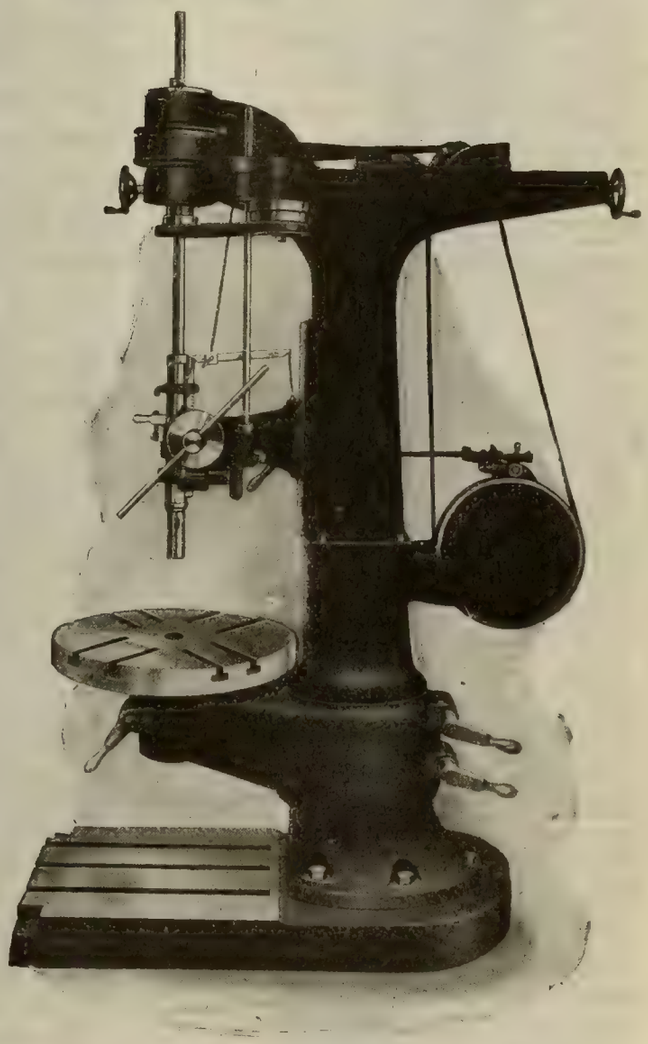

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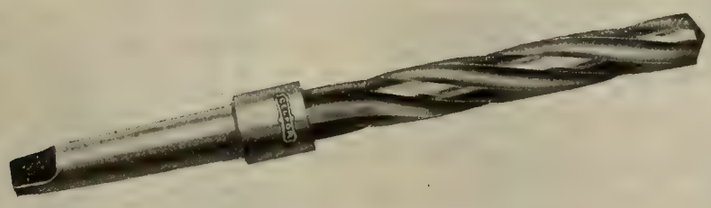

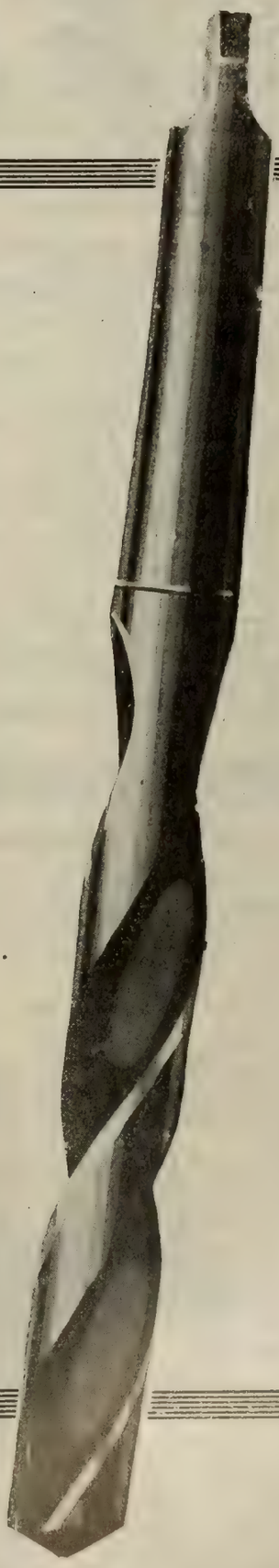

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William R. Perrin, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo.
West Tire Setter Co., Rochester, N.Y.
A. R. Williams Machy. Co., Toronto.

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Brown, Boggs Co., Ltd., Hamilton, Canada.
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Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
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Riverside Machinery Depot, Detroit, Mich.
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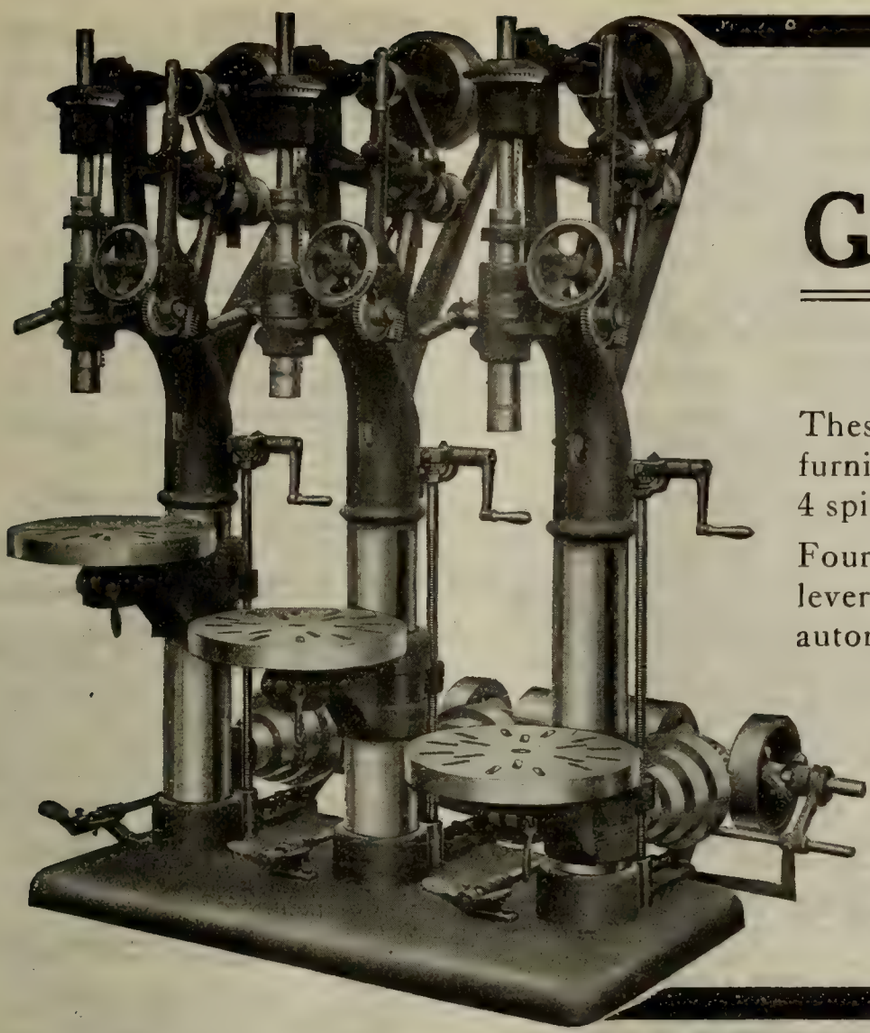

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Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
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Smart-Turner Mach. Co., Hamilton.

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Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Mach. Co., Hamilton.
Sturtevant Co., B. F., Galt, Ont.

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Petrie, Ltd., H. W., Toronto, Ont.
Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.

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William R. Perrin, Ltd., Toronto.

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Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
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Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
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Consolidated Press Co., Hastings, Mich.
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John Bertram & Sons Co., Dundas.
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E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Niles-Bement-Pond Co., New York.
W. A. Whitney Mfg. Co., Rockford, Ill.

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Can. Hoskins, Ltd., Walkerville, Ont.
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York City.
H. E. Streeter, New Birks Bldg., Montreal, Que.
Taylor Instrument Co., Rochester, N.Y.
Thwing Instrument Co., Philadelphia, Pa.

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Niles-Bement-Pond Co., New York.

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RAIL BENDERS
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RAILROAD TOOLS
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Cumming & Son, J. W., New Glasgow, Canada.
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Pratt & Whitney Co., Dundas, Ont.
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Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
McKenna Brothers, Pittsburgh, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

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Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

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Illinois Tool Works, Chicago, Ill.
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Steel Co. of Canada, Ltd., Hamilton, Ont.

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Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
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Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.

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High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.

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Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo, O.

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James Chesterman & Co., Ltd., Sheffield, Eng.
L. S. Starrett Co., Athol, Mass.

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SAFETY APPLIANCE GOGGLES
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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.

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SAW MILL MACHINERY
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Canada Machinery Corp., Galt, Ont.
Gardner, Robt., & Son, Montreal
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto

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Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (SEE HACK SAWS)

SAWS, INSERTED TOOTH
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Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, BAND AND COPING
Napier Saw Works, Springfield, Mass.

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H. E. Streeter, New Birks Bldg., Montreal, Que.

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SCREW MACHINE PRODUCTS
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Eastern Mach. Screw Corp., New Haven, Conn.

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Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York
Himoff Mach. Co., Inc., Astoria, L.I., New York.
A. B. Jardine & Co., Hespeler
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto

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Riverside Machinery Depot, Detroit, Mich.

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Galt Machine Screw Co., Galt, Ont.
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Wilkinson & Kompass, Hamilton, Ont.

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A. B. Jardine & Co., Hespeler
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Wells Bros. Co. of Canada, Galt, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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Pratt & Whitney Co., Dundas, Ont.

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Dominion Machinery Co., Toronto
Foss & Hill Machy. Co., Montreal
Hill, Clarke & Co., Chicago, Ill.
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Petrie, Ltd., H. W., Toronto, Ont.
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Stocker-Rumely-Wachs, Chicago, Ill.

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Escaped from Germany

AN escaped prisoner tells the story of his fearful experiences in Germany in MACLEAN'S MAGAZINE for November; and gives a vivid picture of conditions in Germany as he saw them. He got out by way of Holland after appalling perils and hardships. In Holland, he was photographed, but so altered was he that his wife quite failed to recognize him in this photograph. Read this story of this Canadian soldier's escape. It is gripping stuff—a rare tale.

Canadian Finances After the War

WILL business in Canada collapse when peace comes? It may. What do the big men say? What do they know? What do you think? Are your opinions well informed? The subject is of the greatest possible importance, and you will get light and leading by reading the contribution of Col. John Bayne Maclean, who has taken the trouble to get the opinion of the biggest and most highly placed men in Canada to help him prepare his article.

Back from the Arctic

WILLIAM THOMPSON, representing the American Geographical Society, was this year in the Arctic Regions. He went to the delta of the Mackenzie River, and took many excellent pictures of the country and its Eskimo inhabitants. He makes the November MACLEAN'S the vehicle of many of his pictures and for an account of his journey. Read what this Arctic scientist has to tell us about a remote part of our land.

Slackers and Conscription

WHAT is your attitude towards the draft? You have positive opinions, of course. How do they square with Miss Laut's as they are expressed in her ringing article on Slackers in the November MACLEAN'S?

The Nation's Business

THIS is a new feature—a fearless, well-informed survey of national affairs. What we all want is an outspoken—but not vindictive—and clear-visioned presentation of factors and facts affecting our national, political and economic welfare.

Sketches of Trench Life

By Gunner McRitchie

MCRITCHIE was a cartoonist on a Western Canada daily before he went overseas. He has done a number of sketches of trench life "On the Spot," and these he has sent home, for publication in MACLEAN'S MAGAZINE. They're interesting and good.

The Late Sir Mortimer Clark

BEFORE he died, a few weeks ago, the late Sir Mortimer Clark, eminent jurist and an ex-Lieutenant-Governor of Ontario, wrote for MACLEAN'S an article on "Safeguarding Your Heirs." It has to do with the functions, service and safety of Trust Companies as executors of estates. This article by a man so distinguished, so cautious, so able, and so wise a counsellor, can be of first-rate value to every man perplexed with the problem of how his estate can be safely and prudently administered after he, the testator, has passed from this life.

A Complete Novelette

By Peter B. Kyne

HIS story in the November MACLEAN'S is a thunderingly good story of lumbermen and lumbering. Red blood is in this tale of business. R. M. Brinkerhoff illustrates it.

Short Story

By Ethel Watts Mumford

THE writer of this short story—the first of a delightful series by this author to appear in MACLEAN'S—is very well known among short story writers. Delicate fancy, wholesomeness, freshness and finished workmanship characterize all her work.

Short Story

By W. A. Fraser

A MIGHTILY well-written story of India—the kind that we all delight in; tense, bewildering, and lots of action. Fraser never wrote a better short story than this. Ben Ward illustrates it.

Hendryx and Oppenheim

SERIALISTS

"THE Gun Brand," by Hendryx, comes to an end in the November issue. Oppenheim's greatest story, "The Pawns Count," is continued. Oppenheim's story is the biggest single feature ever secured by MACLEAN'S.

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for November At All News Dealers **15c.**

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Can. Fairbanks-Morse Co., Montreal.
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Dom. Forge & Stamping Co., Walkerville, Ont.
Homer & Wilson, Hamilton, Ont.

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Brown, Boggs & Co., Hamilton, Canada
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Ferracute Mach. Co., Bridgton, N.J.
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Noble & Westbrook Mfg. Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

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Can. Morehead Mfg. Co., Woodstock, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.
Sturtevant Co., B. F., Galt, Ont.

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Colonial Steel Co., Pittsburgh, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Zenith Coal & Steel Products, Montreal, Que.

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Union Drawn Steel Co., Hamilton, Ont.

STEEL DRUMS
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Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

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Armstrong Whitworth of Canada, Ltd., Montreal
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Century Steel Co. of America, New York
Colonial Steel Co., Pittsburgh, Pa.
H. A. Drury Co., Ltd., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Fairley Davidson Steel Co., New York, N.Y.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.
Zenith Coal & Steel Products, Montreal, Que.

STEELS, HIGH STRENGTH, HOT-WORKING, DIE, MAGNET
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Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

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Toronto Iron Works, Ltd., Toronto.

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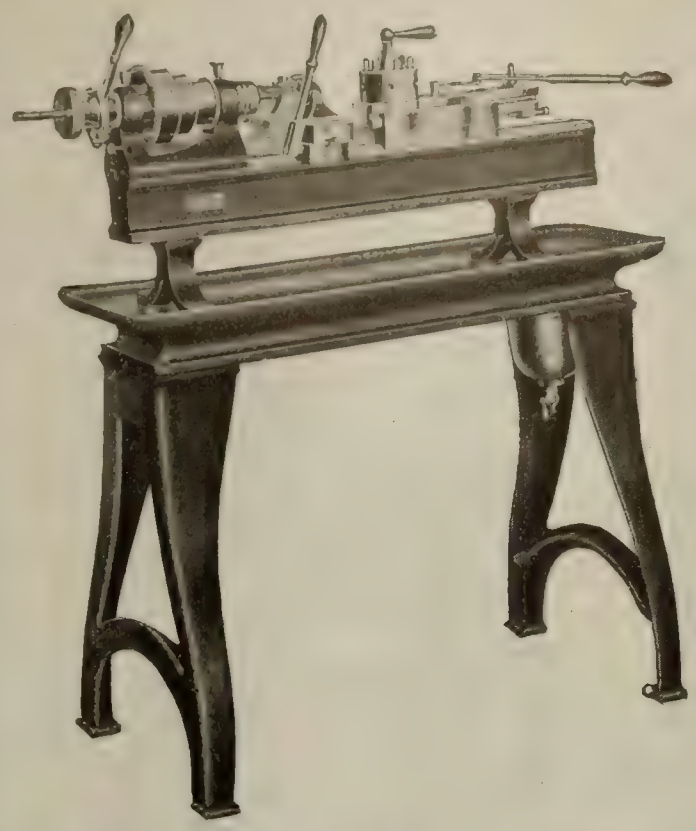

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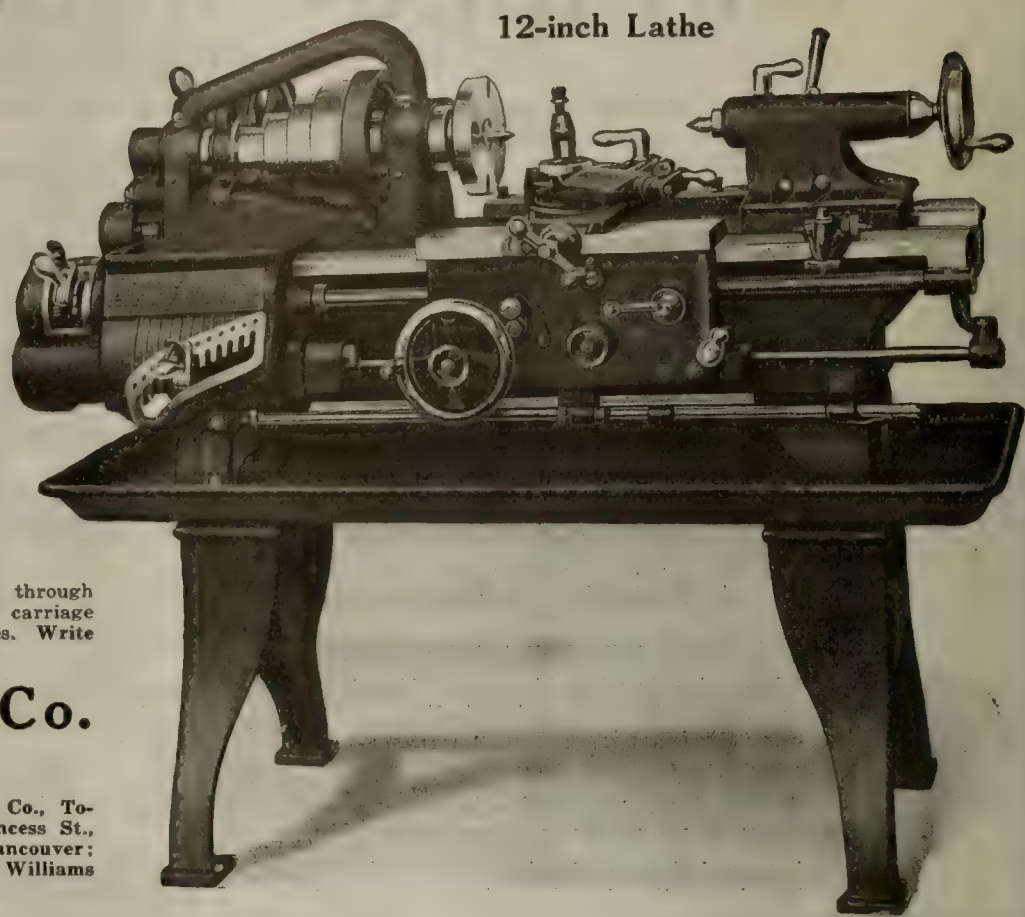
Mounted quick-change gearing was first made a commercial success on this type of Hendey Lathe. It got away to a good start and still maintains its initial advantages. Used more than any other quick-change lathe manufactured — its top-notch efficiency holds the field.

Thirty-six different threads and feeds are had through mounted change gearing. Automatic stop for carriage works in either direction. Has host of features. Write for full particulars.

Hendey Machine Co.
Torrington, Conn., U.S.A.

Canadian Agents: A. R. Williams Machinery Co., Toronto; A. R. Williams Machinery Co., 260 Princess St., Winnipeg; A. R. Williams Machinery Co., Vancouver; A. R. Williams Machinery Co., St. John, N.B.; Williams & Wilson, Montreal.


12-inch Lathe

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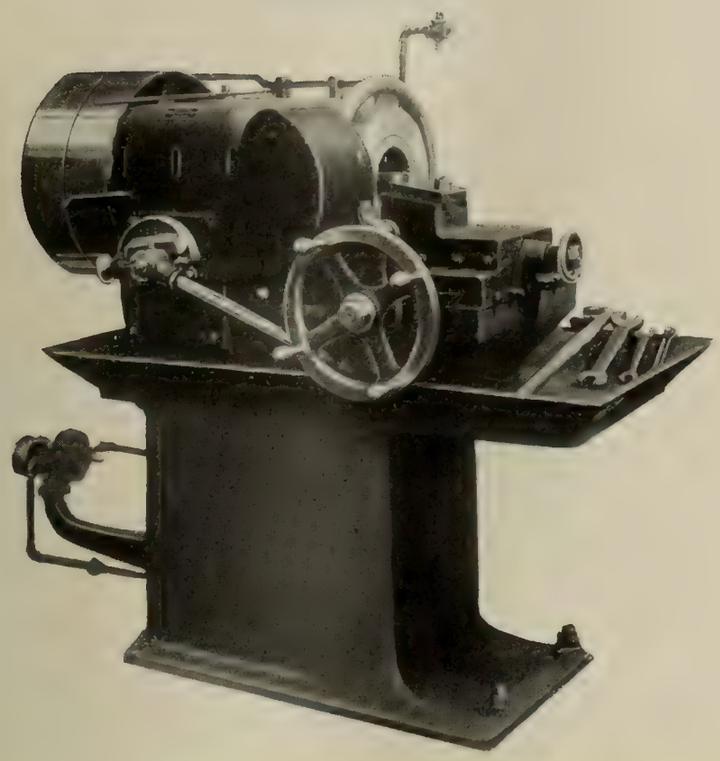
6″ Light
Base Facing
Machine



Another Worthy Victoria Product

THIS machine has proved itself a first-class investment.

Well-Designed
Carefully Built
Sturdy and Efficient

IT is a conclusive argument in favor of special purpose machines.

Space required 4x7 feet.
No countershaft required.
Approximate weight, 2000 lbs.

Victoria Foundry Company Limited

OTTAWA - - ONTARIO

In stock for immediate delivery

7—28 x 12 Boye & Emmes instantaneous, quick-change gear lathes. 3 step cone, double back gear, double plate apron.
1—24 x 12 Boye & Emmes instantaneous, quick-change gear lathe. 3 step cone, double back gear, double plate apron.
1—24 x 10 Milwaukee Lathe, double back gear, quick-change gear, 3 step cone.
6—20 x 10 Sidney Lathes, double back gear, quick-change gears, 3 step cone.
1—18 x 10 Sidney Lathe, double back gear, quick-change gears, 3 step cone.
1—18 x 8 Mueller Lathe, double back gear, quick-change gear, 3 step cone.
1—14 x 6 Mulliner Tool Room Lathe, quick-change gear, complete with oil pan, pump, taper attachment and draw-in collets.
4—21 x 8 Le Blond Heavy Duty Turret Lathes, quick-change gear box and air chuck.
6—21 x 8 Le Blond Turning Lathes, quick-change gear.
1—Foss Pulley Lathe, capacity 48 x 48.
4—Pulley Molding Machines, complete with patterns for making cast iron pulleys up to 60″.
1—No. 6 Foster Screw Machine, power feed to cut-off slide and carriage, complete with oil pan and pump.
1—No. 4 Foster Screw Machine, power feed to cut-off slide and carriage, complete with oil pan and pump.
1—1″ Hercules Screw Machine.
1—No. 1 Standard Hand Miller.
1—No. 2 Ford-Smith Plain Miller.
1—No. 3 Kempsmith Full Universal Miller.
1—No. 2 Brown & Sharpe Heavy Duty Plain Miller (used).
1—No. 1 Bertram Back Geared Miller, with dividing head.
1—No. 2 Bertram Universal Milling Machine, complete with dividing head and arbors.
1—12″ Garvin Dividing Head.
1—15″ Kelley Crank Shaper.
1—20″ Smith & Mills Back Geared Shaper.
1—20″ Ohio Heavy Duty Shaper.
1—20″ Ohio Standard Shaper.
1—20″ Queen City Back-Geared Shaper.
1—28″ Smith & Mills Triple-Geared Shaper, single pulley drive.
1—No. 2 Brown & Sharpe Vertical Chucking Machine.
2—No. 2 Oesterlein Universal Cutters and Tool Grinders.
2—No. 3 Oesterlein Universal Cutters and Tool Grinders.

The Foss & Hill Machinery Company

305 ST. JAMES ST., MONTREAL, QUE.

20" Quick Change Engine Lathe

WITH TURRET ON SADDLE

The strong, accurate turret on the saddle here illustrated is built from the best materials. It can be fitted to any C.M.C. Engine Lathe.

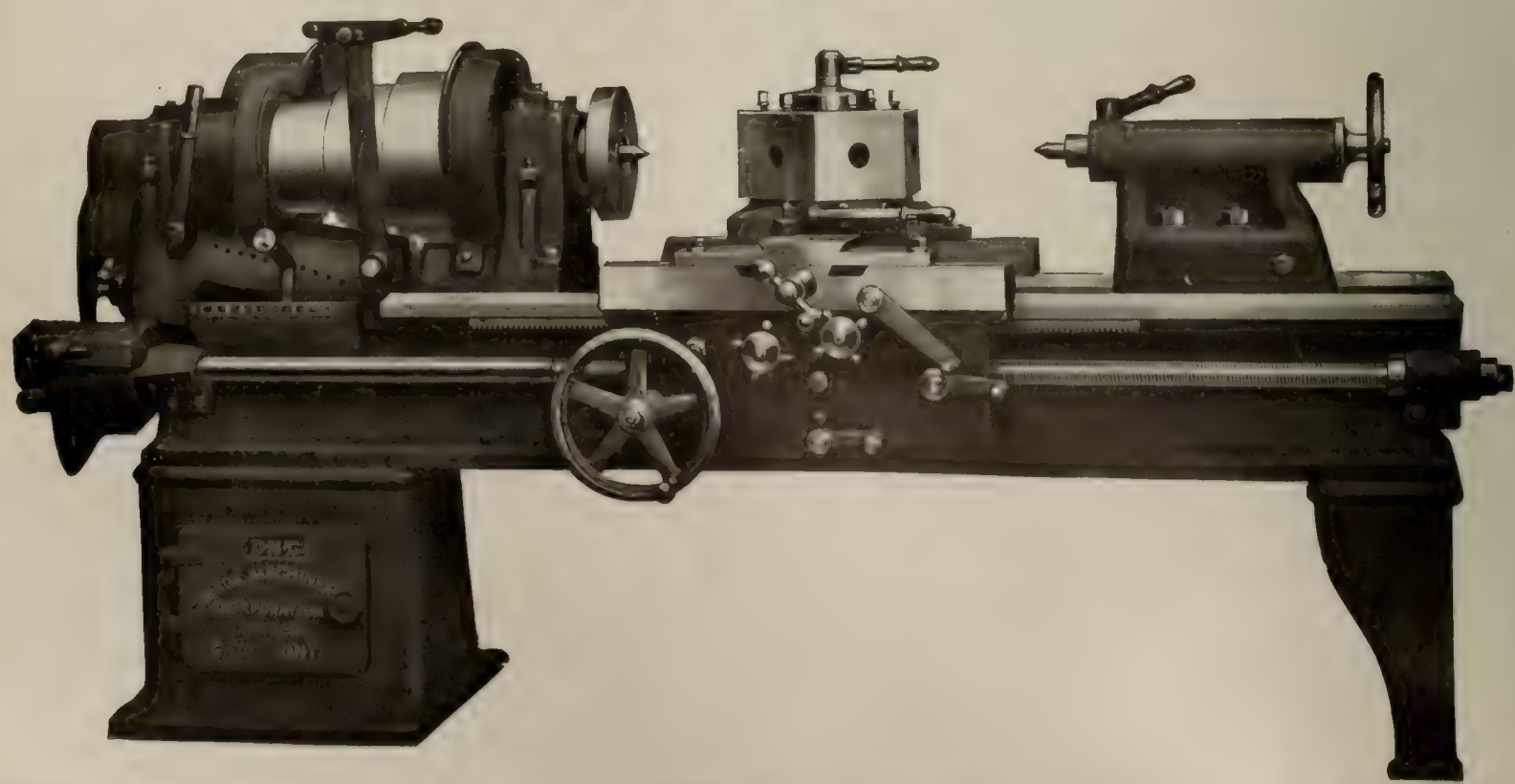
Details furnished on request.

CANADA MACHINERY CORPORATION
LIMITED

GALT ONTARIO CANADA

Toronto Office and Showrooms at Brock Avenue Subway

C.M.C.



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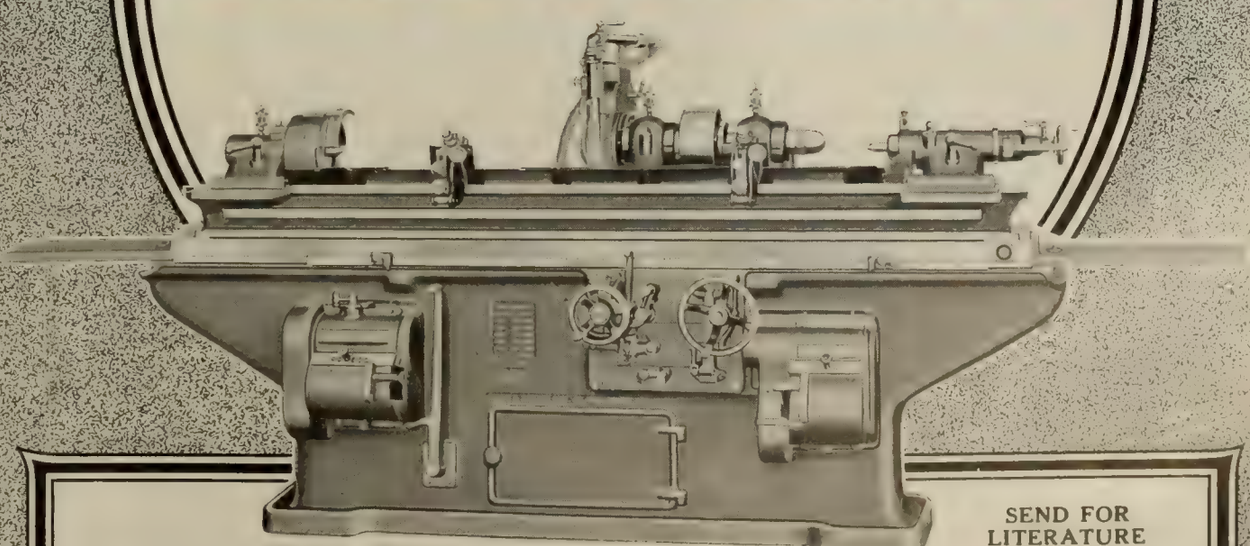
CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical, power, foundry and allied fields.
Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

Vol. XVIII—No. 19 Publication Office: Toronto, November 8, 1917 Subscription Price $3.00 per Year

FOR HEAVY SERVICE

BROWN & SHARPE PLAIN GRINDING MACHINES



SEND FOR LITERATURE

BROWN & SHARPE MFG. CO., PROVIDENCE, R.I., U.S.A.

Canadian Representative: CANADIAN FAIRBANKS-MORSE CO., LIMITED

TORONTO MONTREAL WINNIPEG CALGARY VANCOUVER ST. JOHN SASKATOON

SMALL TOOLS

P. & W. Die-Stock Set No. 4

These sets are furnished in various capacities for either U. S. Standard, S. A. E. Standard, Whitworth Standard or "V" Form. The Pratt & Whitney Policy of highest quality materials, together with the necessary refinement and accuracy, is maintained in all tools composing these sets.

PRATT & WHITNEY
Standards and Gauges
Accuracy Unequalled

PROMPT SERVICE

is assured at our nearest store where P. & W. Small Tools are carried in stock. Place your order there to-day.

PRATT & WHITNEY CO.

of Canada, Limited

Works: DUNDAS, ONTARIO

MONTREAL
723 Drummond Bldg.

TORONTO
1002 C.P.R. Bldg.

WINNIPEG
1205 McArthur Bldg.

VANCOUVER
B.C. Equipment Co.

BERTRAM MACHINE TOOLS

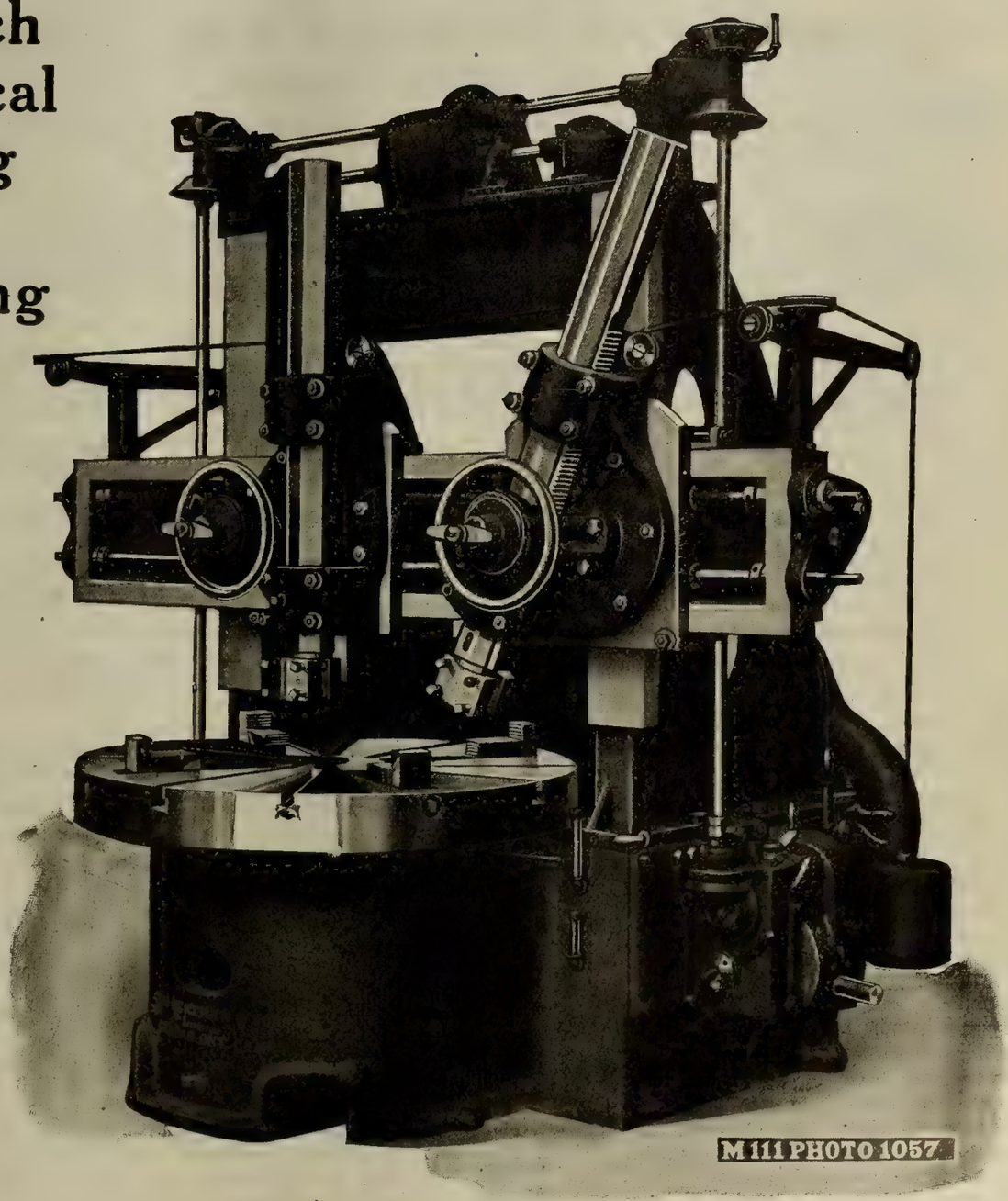
42-inch Vertical Boring and Turning Mill

Niles Type

Motor Driven Through Speed Box

Built in sizes from 42-inch to 100-inch Swing.

Drop us a line for Photographs and full particulars.



The John Bertram & Sons Company Limited

DUNDAS, ONTARIO, CANADA

MONTREAL 723 Drummond Bldg. | TORONTO 1002 C.P.R. Bldg. | VANCOUVER 609 Bank of Ottawa Bldg. | WINNIPEG 1205 McArthur Bldg.

The Publisher's Page

TORONTO November 8, 1917

The Economy of Business Paper Advertising

By H. E. CLELAND, NEW YORK

Awarded the Higham prize at the convention of Associated Advertising Clubs, at St. Louis, June 1917. This prize is given annually to the one delivering the most constructive address in the fewest words.

(Continued from last week)

SO, in a quiet, substantial, and most-times unheralded way, the business papers are leaders of progress in their respective industries and in this character they tie to them the progressive men of the industries. Only progressive men are worth while to advertisers. Therefore, the business papers not only aim directly at those industries where the advertisers' products may be sold, but they automatically select the men in each industry whose words carry weight of buying authority. But modern business papers—those which, for instance, are members of the Associated Business Press—go even further and put before the advertiser the exact number of each classification of subscribers. So that, in a technical industry, for instance, the advertisers are shown how many firms, executive officers, purchasing agents, superintendents, engineers, etc., are on the paid subscription list and from these the advertiser may estimate the buying power which each publication holds for his product.

In other words, the business papers are helping to put advertising closer to the status of an exact science.

And that, in turn, spells greater economy in advertising.

"BUYING POWER" THE TEST.

I said that the buying power per subscription in a business paper was greater than the buying power per subscription of any other medium because things are bought for business and not private consumption.

To illustrate this, one industry last year bought approximately $500,000,000 worth of goods and 90 per cent. of this industry is covered by two business papers having a total paid circulation of 22,000, or an average of material bought per subscriber of about $20,500.

Since it is a fact that less than five per cent. of our population has an income of over $4,000 per year, it may readily be seen that private and business consumption are far, far apart.

I quote from an industry with which I am familiar and not one picked because of its exceptional buying capacity. There are probably many which exceed it.

So, the thought is that each dollar invested in business paper advertising buys more potential sales results because each appeals to a greater buying power.

And that, too, is economy in advertising.

THE POTENT THING.

Now, all of you advertising men know that the really potent thing in advertising is cumulative effect. You know that even poor and mediocre advertising, persisted in, pays and pays handsomely.

You know, on the other hand, that sporadic advertising, even of the best kind, has only a temporary effect and that effect is seldom of sufficient force to pay.

The splurger makes his splash, the ripples die out and the surface becomes calm and serene. He loses because his advertising is too costly to be kept up continuously.

THERE IS NO SUBSTITUTE FOR CONTINUITY IN ADVERTISING.

It is possible, because of the low rates in business papers, for practically any manufacturer to advertise week in and week out or month in and month out, to hammer away until by sheer force of persistence he drives his claims home and sells his prospect.

It takes time to sway men the advertiser's way. It takes repeated effort to get the first return from advertising.

The advertising catacombs are filled too full of the bones of half-tried efforts.

There are publishers who permit and agents who induce advertisers to adopt "splurge" advertising, and these I charge with the crime of high treason against the cause of effective advertising.

Advertising which cannot reap the benefits of cumulative effect is not as profitable as it ought to be. Therefore, it is not as economical as it might be.

Business paper advertising is economical because, intensive circulation permits rates low enough to allow practically any manufacturer to advertise continuously.

FOLLOW THE SALESMAN'S METHODS.

That advertising is best which comes closest to the best in salesmanship.

What does the salesman do? Assume that he is selling steam engines, does he make a house-to-house canvass of say, Chicago? Not on your life. Aside from the utter insanity of that procedure, it takes twelve years and eight months for one man to make a house-to-house canvass of Chicago. He picks out steam power plants or plants in course of design or of building and goes to those and no others.

Does he make his sales talk to the office boys and stenographers in those plants? Not in one thousand years. He goes to the man who buys or recommends.

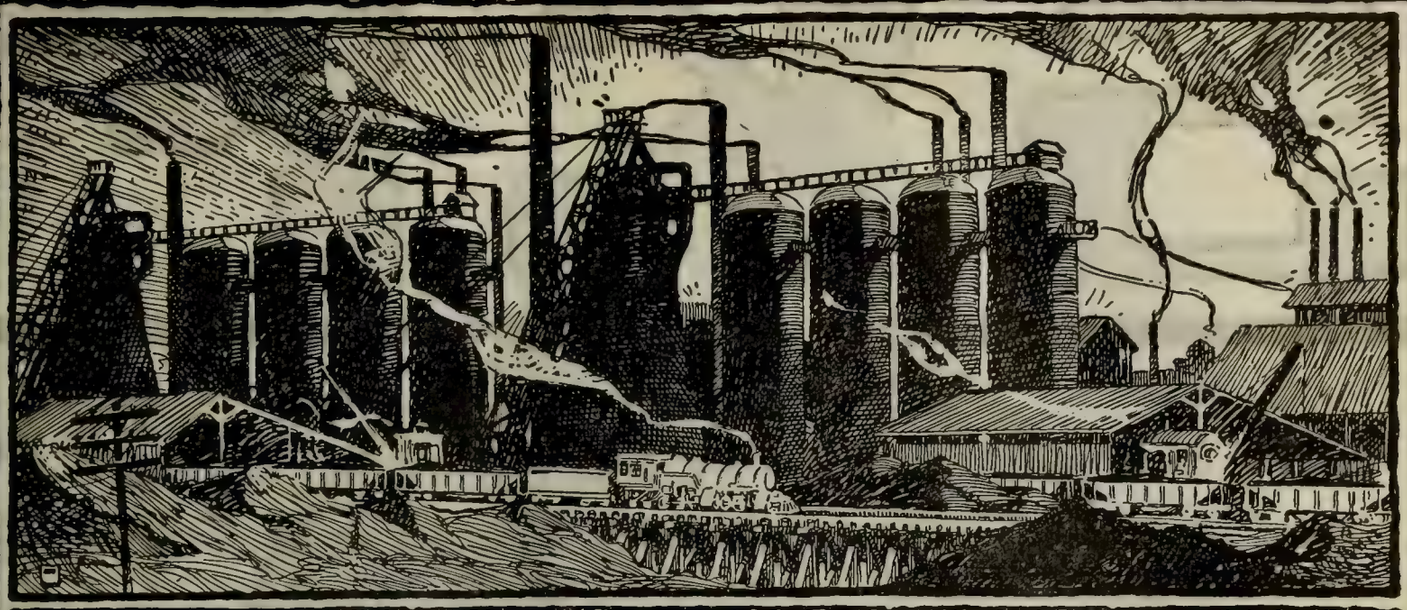
Does he talk to these men about steam calliopes or about steam engines? You know the answer.

Does he endeavor to show the economy and efficiency of the steam engine as a prime mover and does his talk resemble that of an engineer or a chauffeur? You know the answers to that, too.

Now, why does the salesman do these things? Because the efficient salesman knows how to follow the straight line—the shortest distance between two points—and because his concern will not pay for the super-expense of roundabout methods.

For precisely the same reason, the wise manufacturer uses the business papers to carry his advertising message.

(Concluded next week)



LITTLE WORDS WITH BIG MEANING

Quality

According to "Webster," Quality is "an excellence of character; natural superiority."

Service

Webster's definition of "Service" is; "The performance of labor for the benefit of another."

We use these words advisedly—fully understanding their definitions—and realizing the obligation we place upon ourselves by their continued use in connection with our products of Iron and Steel, and our attitude to the people we serve.

THE

STEEL COMPANY

OF

CANADA

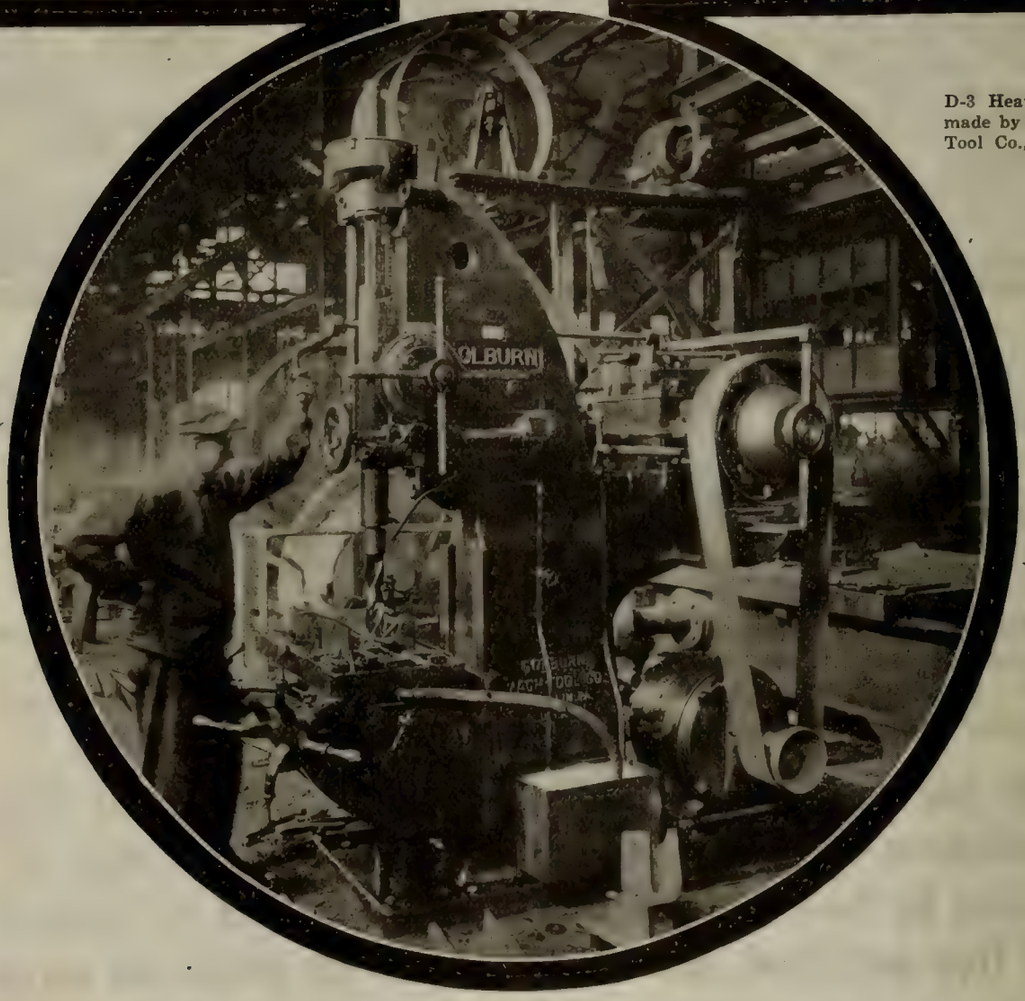
LIMITED

MONTREAL HAMILTON

Pig Iron,
Steel & Iron Bars,
Horse Shoes,
Steel and Iron Products.

Steel Billets,
Track Spikes &
Bolts, Forgings, Wire
of every description.

SKF



D-3 Heavy Duty Drill Press made by the Colburn Machine Tool Co., Franklin, Pa.

BALL BEARINGS

No. 3 of a Series of SKF Equipped Drilling Machines

THRUST

Bearings, to withstand the heavy thrust of the drill spindle, must needs be of high quality—able to withstand friction and without heating.

S K F Thrust Bearings are the logical choice. Manufacturers who build quality into every part of their machine recognize the value of high-class, accurate thrust bearings.

May we assist you in the design of your thrust mountings?

Canadian SKF Company, Limited

TORONTO, ONT., CANADA

"STELLITE" IN FRANCE

THE Fonderie des Gobelins, Paris, France, has increased its daily production of 155 mm. shells from 120 when high-speed steel was used to 200 when stellite was used. According to Metaux et Alliages, of Paris, the cost of stellite for finishing 1,000 shells of the size was about 6c per shell. With a cutting speed of 17 meters (about 56 ft.) the roughing of the shell and the finishing of the shell each took 21 min. with high-speed steel. When stellite was employed, the roughing out period consumed 11 min., while the finishing work required 4 min., the cutting speed in roughing being 25 meters (82 ft.) and in the finishing work 37 meters (121 ft.).

Deloro Smelting & Refining Co., Ltd.

Head Office and Work—DELORO, ONT.

TORONTO: 200 King Street, West.
MONTREAL: 315 Craig Street, West.

Reproduced from Canadian Machinery Oct. 11, 1917, Page 421

TRADE MARK

of the Famous

"WACO"

BRAND

HIGH SPEED STEEL

AND

TWIST DRILLS

"DOUBLE WACO" Quality

Specially Adapted for Munition Work

"TURTLE" BRAND

High Class Tool Steel, Files, etc., of all descriptions.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

Reliance Steel Works

SHEFFIELD, ENG.

TRADE MARK

"WACO"

TRADE MARK:

For particulars apply to our

Sole Representatives for Canada

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario

Steel Castings

No castings too small or too large for the capacity of our plant. Manganese, Vanadium, Titanium, Chrome, Nickel, castings for Marine, Railroad, Mill and hydraulic purposes are our specialty. Made true to specifications and pattern.

Illustration above shows Stern casting for Ice-Breaker, "John D. Hazen."

CANADIAN STEEL FOUNDRIES, LIMITED

Montreal, P.Q. Welland, Ont.

H. E. W. Service

Our ability to serve is limited by the demands of your organization. Repair work, special marine repairs, machinery built. Our air chucks which are performing such efficient service in the shell industry is but an evidence of our ability. We have a large and complete staff of expert workmen and thorough equipment. Consult us. We will gladly co-operate with you.

Hyde Engineering Co.

27 William Street
Montreal, Que.

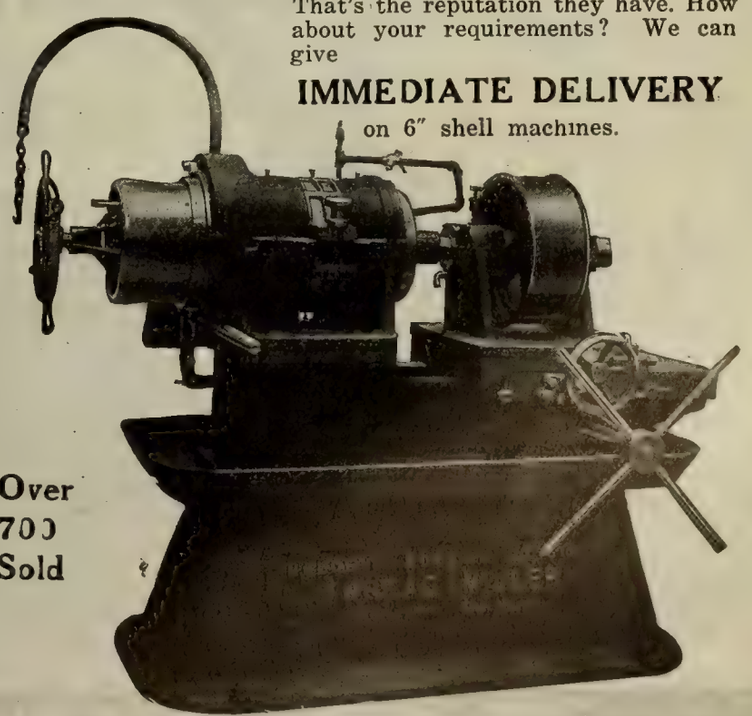
70 Holden-Morgans in One Plant

Another firm would not accept a contract until assured they could get HOLDEN-MORGANS.

That's the reputation they have. How about your requirements? We can give

IMMEDIATE DELIVERY

on 6" shell machines.



Over 700 Sold

THE A. R. WILLIAMS MACHINERY CO.
W. FRONT ST. (Limited) TORONTO

THE JOHNSON FRICTION CLUTCH

JOHNSON FRICTION CLUTCHES

STANDARD CLUTCHES

DIMENSIONS

SINGLE

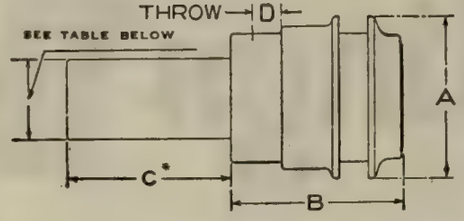


Fig. 8S

DOUBLE

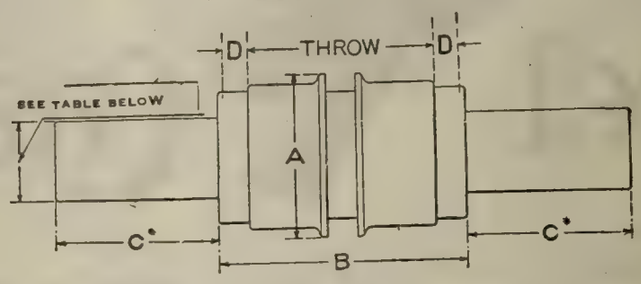


Fig. 9D

SINGLE AND DOUBLE

Clutch Size Number	H.P. at 100 R.P.M.	Max. Bore Inches	Dimensions, Inches A	B Single	B Double	*C	Throw to Engage Clutch D	Weight, Pounds Single	Weight, Pounds Double
0	½	1⅛	3 3-16	3¼	5	3	9-16	10	20
2	¾	1 7-16	4⅛	4 3-16	6 3-16	4	23-32	12	25
4	1	1 11-16	5	5 3-16	7½	5½	25-32	19	32
5	1½	1 15-16	5 3-16	5 5-16	8 1-16	6	13-16	27	43
6	2	2 3-16	6⅜	6⅛	8⅝	6½	1	35	54
8	3	2 7-16	6 11-16	6 13-16	11⅛	8½	1	53	96
10	3½	2 15-16	7⅝	5½	8½	8½	23-32	75	110
11	4	3 3-16	9 5-16	6⅞	10 9-16	8½	1 3-16	130	150

*Any length of hub furnished on special order. The diameter of hub *C is from 1 to 1¾ inches larger than the diameter of the shaft used, for standard clutches. It is usually from 1½ inches to 1¾ inches larger than the diameter of the shaft used, when equipped with a self-lubricating bearing of any style listed—see table below.

STANDARD CLUTCH HUB DIAMETERS

For Solid Iron, Steel or Wood Split Pulleys

Clutch Size Number	H.P. at 100 R.P.M.	Diameter of Shaft, Inches: 1	1 3-16	1 7-16	1 11-16	1 15-16	2 3-16	2 7-16	2 11-16	2 15-16	3	3 3-16
		Diameter of Clutch Hub, Inches										
0	½	1 15-16	2 3-16	2 7-16	.....	.....	.....	.....	.....	.....	.....	.....
2	¾	1 15-16	2 7-16	2 7-16	.....	.....	.....	.....	.....	.....	.....	.....
		1 15-16	2 3-16	2 7-16	2 11-16	.....	.....	.....	.....	.....	.....	.....
4	1	1 15-16	2 7-16	2 11-16	2 15-16	.....	.....	.....	.....	.....	.....	.....
		.....	.....	2 7-16	2 11-16	2 15-16	3 3-16	.....	.....	.....	.....	.....
5	1½	.....	.....	2 11-16	2 15-16	3 3-16	3 7-16	.....	.....	.....	.....	.....
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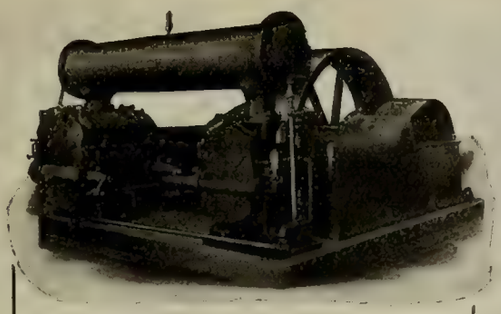
6	2	.....	.....	.....	.....	3 3-16	3 7-16	.....	.....	.....	.....	.....
		.....	.....	.....	.....	.....	3 11-16	3 11-16	3 15-16	4 3-16	4 7-16	.....
8	3	.....	.....	.....	.....	.....	3 15-16	3 15-16	4 3-16	4 7-16	4 7-16	.....
10	3½	.....	.....	.....	.....	.....	3 15-16	3 15-16	4 3-16	4 7-16	4 7-16	4 15-16
11	4	.....	.....	.....	.....	.....	3 15-16	3 15-16	4 3-16	4 7-16	4 7-16	4 15-16

Length of clutch hub ordinarily 1 inch longer than face of pulley used. Write for booklet "Clutches as Applied in Machine Building" and yellow data sheets.

Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal; Can. Fairbanks-Morse Co., Ltd., Toronto.
England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.

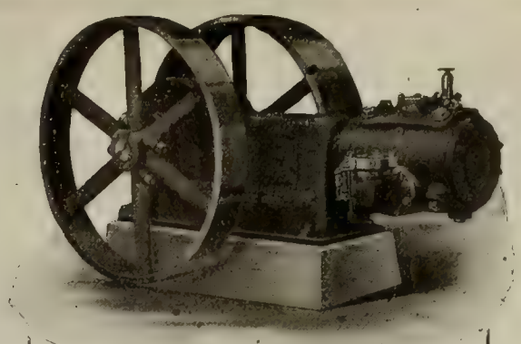
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



JENCKES CLASS DB-2 AIR COMPRESSOR

If you understand compressors look over the following outline. If you are not acquainted with these machines it would delight us to give you an introduction.

Inlet Valves are of the Corliss type, the outlet valves of the disc type; flood type lubrication, allowing a continuous flood of oil over bearings, crank pins, etc., while in motion. Machine of the enclosed type.



JENCKES CLASS CB-1 AIR COMPRESSOR

If your requirements do not justify either of the above machines, just bear in mind that we have a very comprehensive range that will cover all usual and unusual needs. The above is equipped with inlet and outlet disc valves; splash gravity lubrication system; extra large bearings; machine entirely enclosed.

The Jenckes Machine Company, Limited

Works: St. Catharines, Ont.
Works: Sherbrooke, Que.

SALES OFFICES: 710 C.P.R. Bldg., Toronto; 908 E.T. Bank Bldg., Montreal; West Chester Ave., St. Catharines; Cobalt, Ont.; Exchange Bldg., Vancouver.

STEEL *for*

Shrapnel Shells and Shell Blanks

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

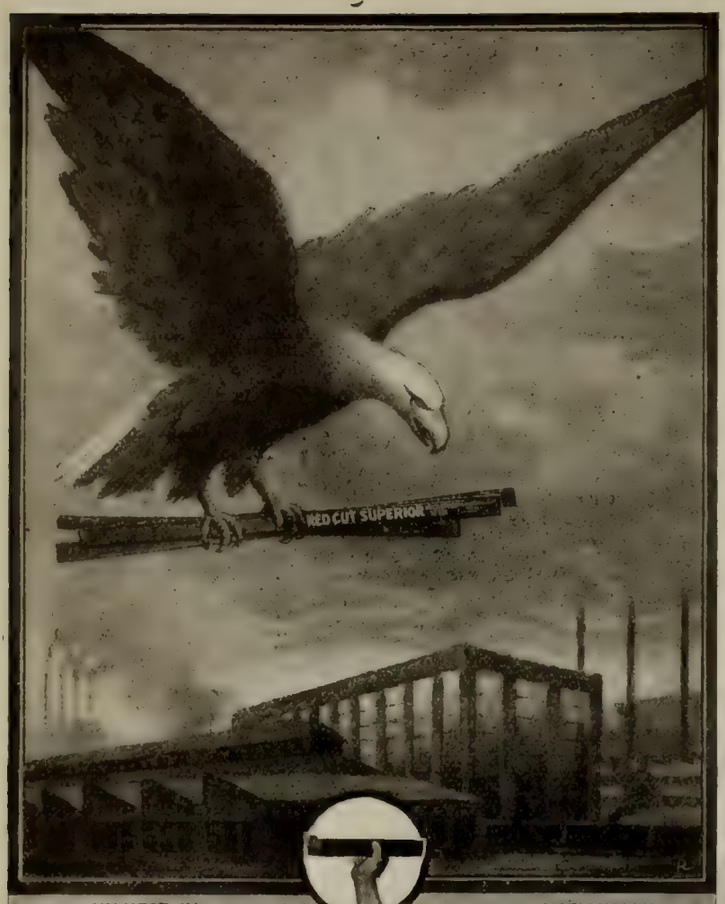
We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Steel Ingots
by the
HARMET
Liquid Process

Nova Scotia Steel and Coal Co., Limited

Head Office:
New Glasgow, N.S.

Western Sales Office:
Room 14 Windsor Hotel
MONTREAL



HIGHEST IN QUALITY

NATIONALLY KNOWN

OUR Country requires the extreme limit of production from every lathe, planer, miller or other machine tool.

BE PATRIOTIC

"Red Cut Superior"

The Nationally-Known First Quality

HIGH SPEED STEEL

Will enable you greatly to increase your output

"IT'S THE BEST FOR ALL MACHINE WORK"

VANADIUM-ALLOYS STEEL CO.

PITTSBURGH, PA. Works at LATROBE, PA.

CARRIED IN STOCK AT THESE WAREHOUSES:

E. T. WARD'S SONS 44 FARNSWORTH ST. BOSTON, MASS.

GEO. NASH CO. 304 HUDSON ST. NEW YORK, N. Y.

FIELD & CO., INC. 751 ARCH ST. PHILADELPHIA, PA.

VANADIUM-ALLOYS STEEL CO. PITTSBURGH, PA., AND LATROBE, PA.

GEO. NASH CO. 646 WASHINGTON BLV'D CHICAGO, ILL.

High-Speed STEEL

The tools that are made with "Wolfram" High Speed Steel are warranted to be super-keen at the edge and super-strong at the neck.

WOLFRAM

Embodies a true and permanent alloy of Tungsten, Chrome, Vanadium and Iron. No better High Speed Steel in the world.

VULCAN CRUCIBLE STEEL COMPANY

ESTABLISHED 1900

Aliquippa - Pa., U.S.A.

Represented in Canada by Messrs. Norton, Callard & Company, Montreal.

Electrite

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium—make this a steel of truly remarkably cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.

LATROBE, PA.

High Speed Steel

Uranium

The

Fairley Davidson Steel Co., Inc.

SPECIALISTS

	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
High Strength Steels	"Hehtemnd"
High Speed Steel	RUSHITOFF No. 6
Tool and Die Steels	"Fondwot" and "Giant"
Magnet Steels	Tungsten or Chrome
Non-Changeable Die Steel	Nugget "B" oil hardening

CHROME VANADIUM, oil hardening or case hardening

CHROME NICKEL, oil hardening or case hardening

Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

Canadian Agents:

THE FACTORY SUPPLY AND STEEL COMPANY

149 Craig Street West, Montreal, Canada

We carry a complete stock at our Montreal Warehouse

Uranium For Speed

If you want to speed up production in your Machine Tool Department—put Uranium High Speed Steel in your tool holders. You will find that your men will be able to make deeper cuts with greater speed—that they will spend more time at their machines and less at the grinders—that they will not be troubled with breaking tools, etc.

Uranium mixed with the best tungsten steel is the reason. Uranium—the element of toughness, strength and speed—should be helping your men to keep up with the demands of the production manager.

Consult your steel man or write us.

STANDARD ALLOYS COMPANY

Forbes and Meyran Avenues - - - - - PITTSBURGH, PENN.

"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

MANUFACTURED BY

Arthur Balfour & Co., Limited
Dannemora Steel Works,
Sheffield, England.

The Eagle & Globe Steel Company, Limited

Head Office and Warehouse, Canada and U.S. — 128 Craig Street West, Montreal
Ontario Office and Warehouse — 36 Colborne Street, Toronto
Winnipeg Stock — Dominion Equipment & Supply Co. Limited
Vancouver Stock — Frank Darling & Co.

W. A. BRADBURY, Agent, 128 Craig Street West, Montreal

Works: LONGUEUIL, QUE.

Armstrong, Whitworth of Canada Limited

Standard Sizes of
HIGH SPEED STEEL
Carried in Stock
CARBON AND ALLOY STEELS
Shop Tools, Gauges, etc.

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Branches: Dominion Bank Bldg., TORONTO
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Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

M.A. HANNA & Co.

Sales Agents, CLEVELAND

Canadian Office:
703 C.P.R. Bldg., Toronto

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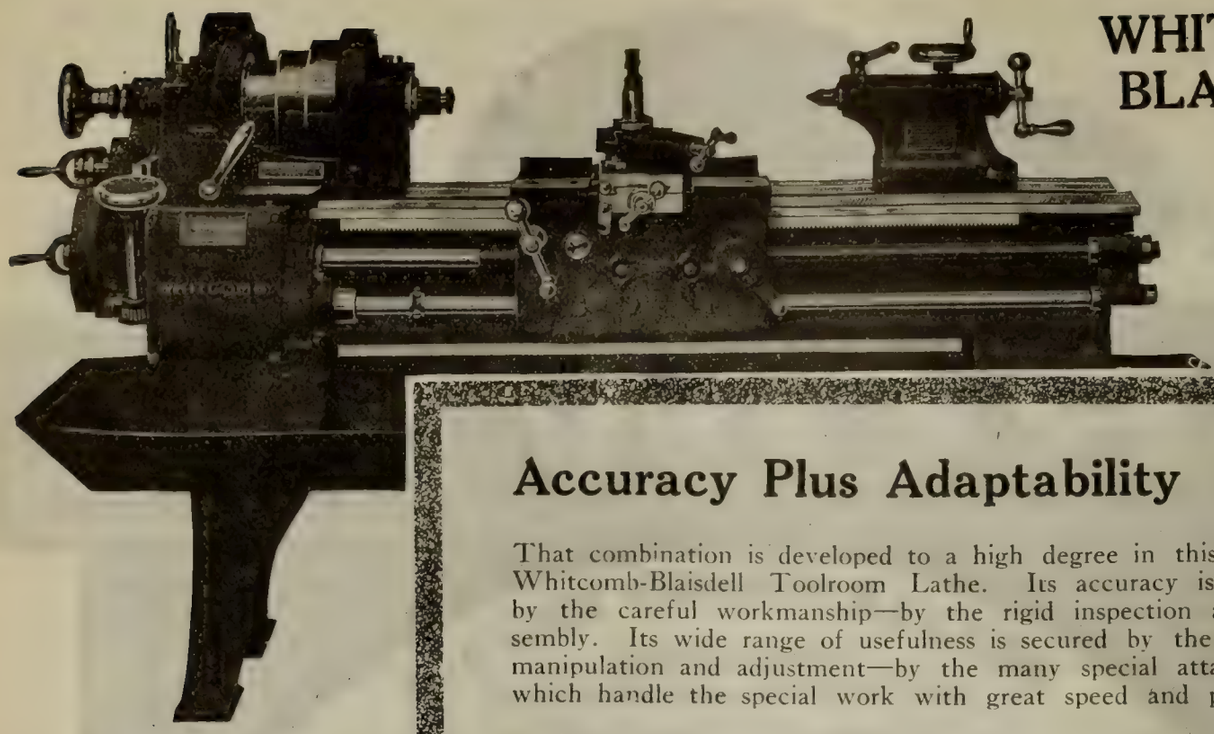


WHITCOMB-BLAISDELL

LATHES AND PLANERS

Accuracy Plus Adaptability

That combination is developed to a high degree in this 14-inch Whitcomb-Blaisdell Toolroom Lathe. Its accuracy is secured by the careful workmanship—by the rigid inspection after assembly. Its wide range of usefulness is secured by the ease of manipulation and adjustment—by the many special attachments which handle the special work with great speed and precision.

For the toolroom—for the shop which must turn out a wide variety of lathe work—this Whitcomb-Blaisdell is the ideal lathe equipment. Write for the Bulletin giving full details.

Whitcomb-Blaisdell Machine Tool Co.
Worcester, Mass., U.S.A.

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" **Tool Steels**

SISCO

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

James McKay Company
Pittsburgh, Penna., U.S.A.

Manufacturers of

Shell Forgings

We have the Equipment and Experience and can execute orders for

Nose Sockets Base Plates Adapter Plates

for any size shells. Can execute orders promptly.

SPECIAL FORGINGS—We can make any forgings that can be made under Drop Hammers.

CHAINS AND ACCESSORY FORGINGS—We have a complete line.

ADDRESS OUR REPRESENTATIVE:

JOHN A. BUCHANAN
King Edward Hotel, TORONTO

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6" shells.

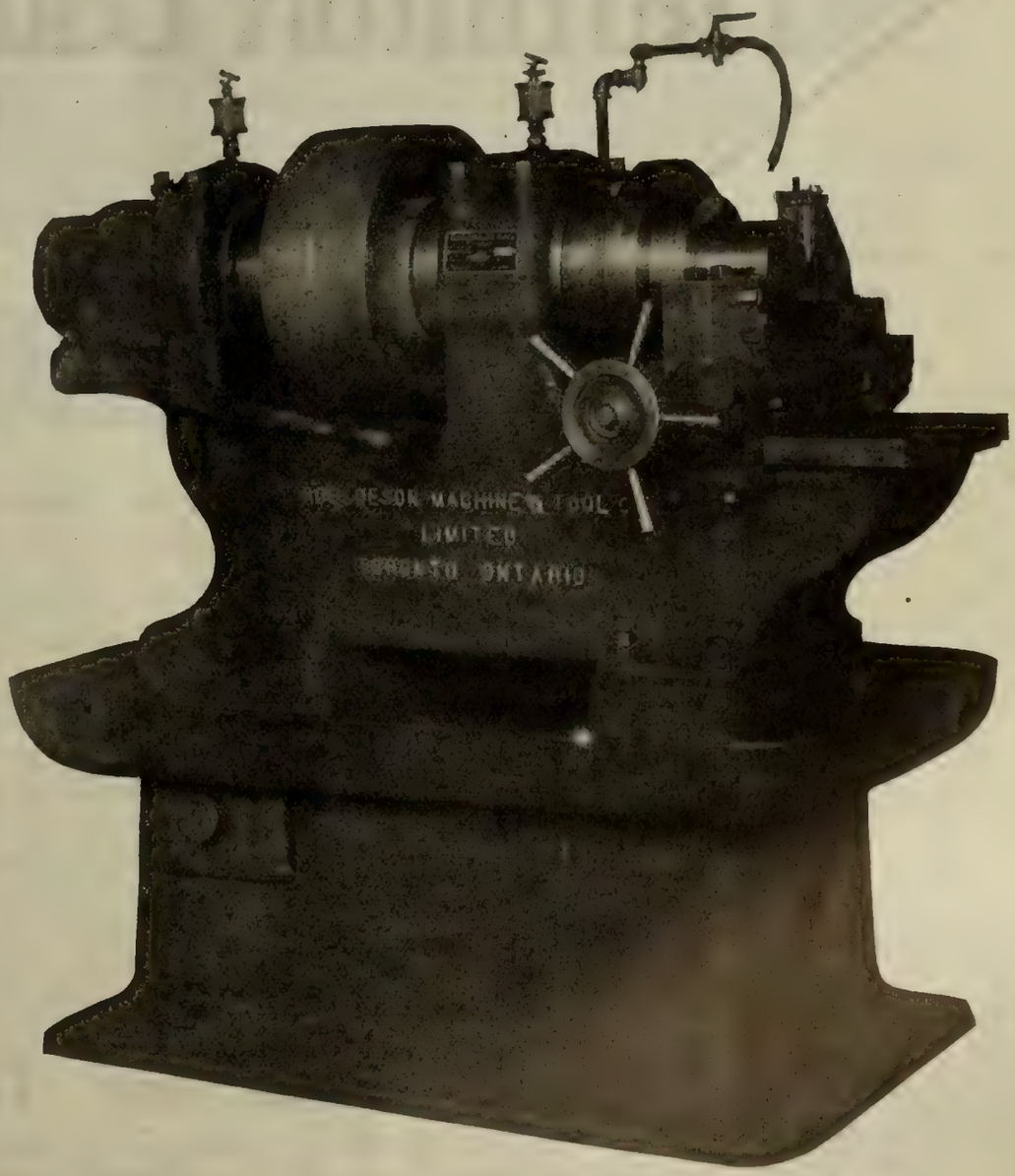
Roelofson Machine & Tool Co., Ltd.

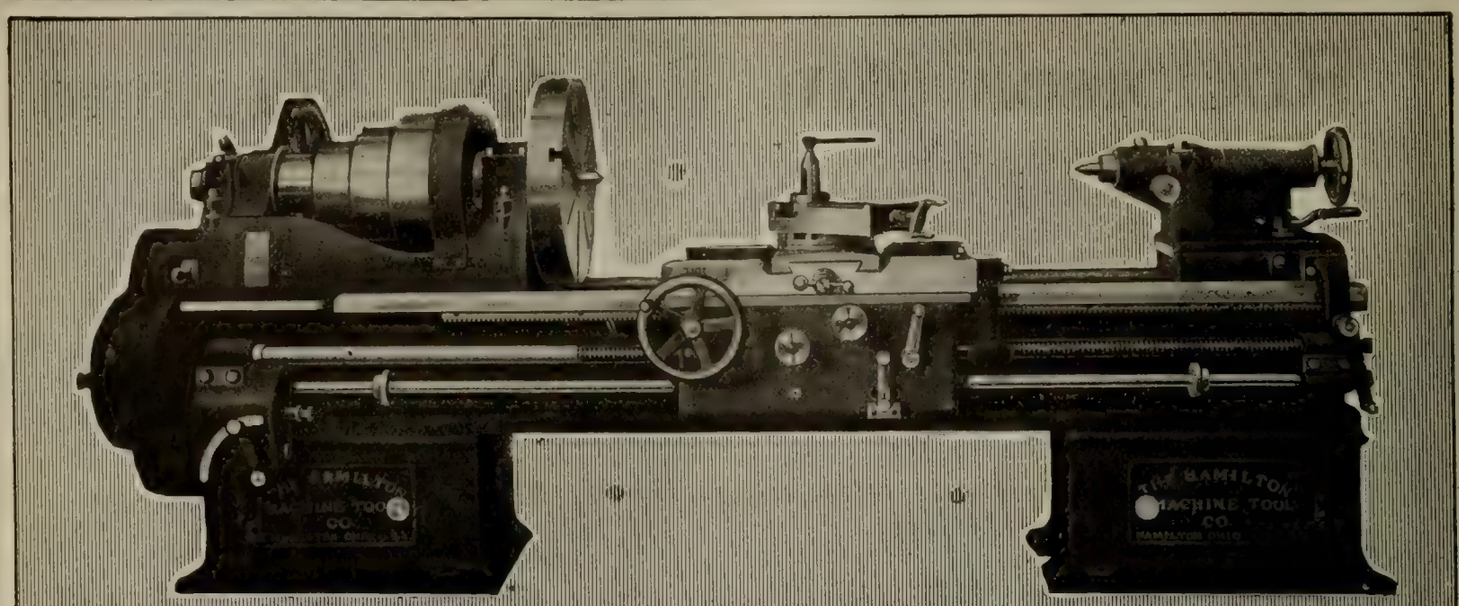
Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6" shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.





Hamilton Lathes

For 25 Years Makers of Fine Machine Tools

Rapid Production HAMILTON Machine Tools

The "Hamilton'' Line has a Reputation to Sustain.

THERE are two phases of production that require expert attention; those of *quality* and *quantity*. We have made a study of them for your benefit. The result is that we are able to offer you machine tools that give the highest efficiency and will still keep down the cost of production.

Illustrated here is one of our lathes. A close study on your part will partly reveal the care we have taken to give you a machine that is fitted to the needs of the day—greater production.

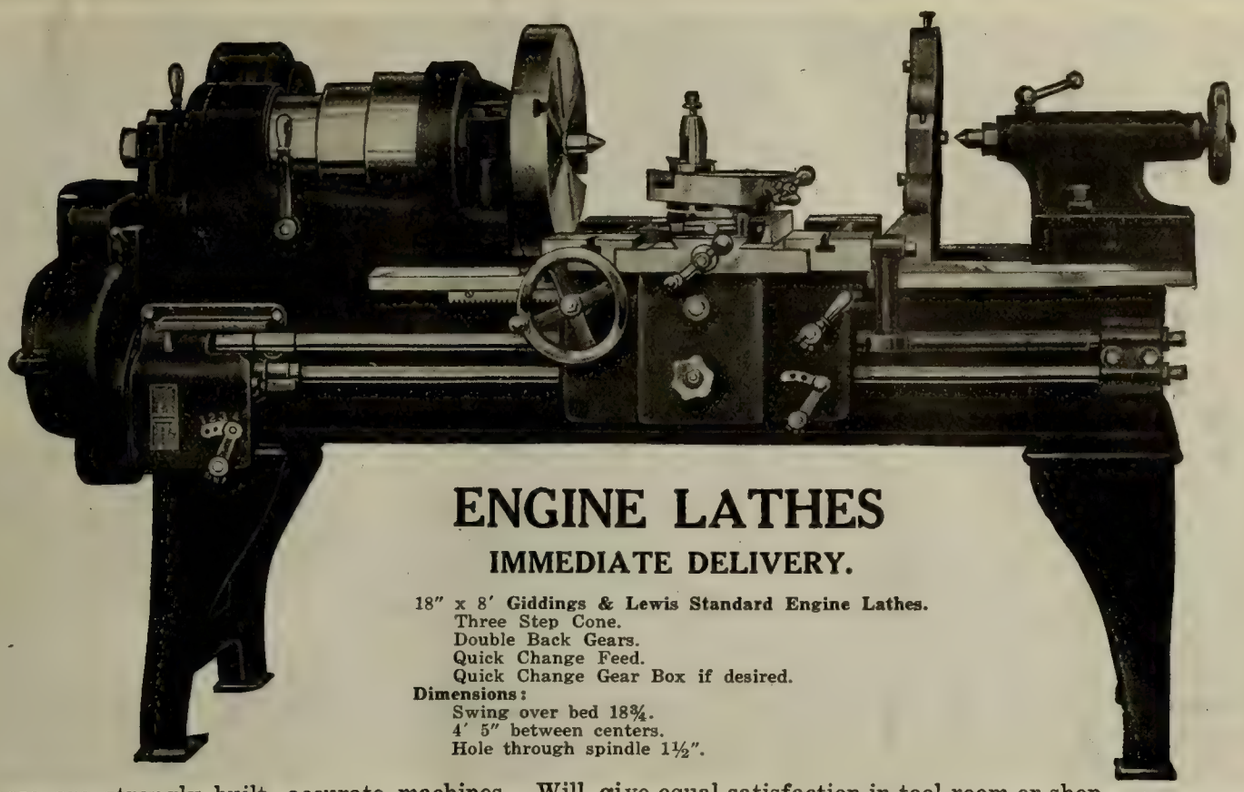
The "Hamilton Line" of machine tools is very complete and users are never tired of telling others of their features. A letter will command our immediate attention.

WRITE US TO-DAY.

The Hamilton Machine Tool Co.

HAMILTON *Sole Agents for Ontario:* **OHIO, U.S.A.**

H. W. PETRIE. LIMITED, TORONTO, ONT.



ENGINE LATHES

IMMEDIATE DELIVERY.

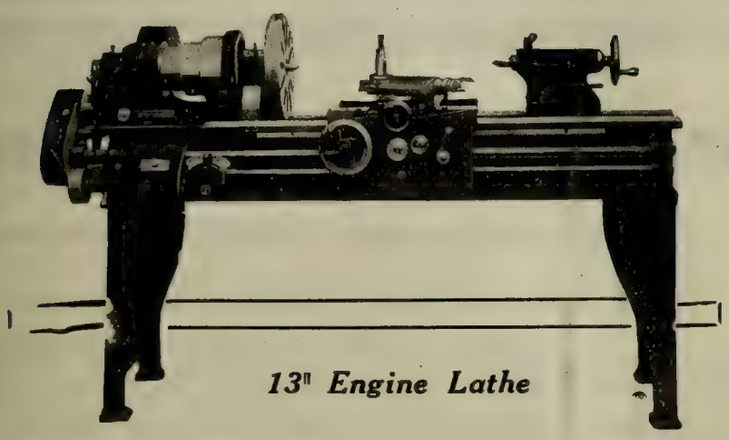
18" x 8' **Giddings & Lewis Standard Engine Lathes.**
Three Step Cone.
Double Back Gears.
Quick Change Feed.
Quick Change Gear Box if desired.

Dimensions:
Swing over bed 18¾.
4' 5" between centers.
Hole through spindle 1½".

These are strongly built, accurate machines. Will give equal satisfaction in tool-room or shop.
The following extras can be furnished if desired: Taper, Relieving or Draw-in attachment, Waving attachment, Hexagon turret on carriage, Pan Pump and piping.

Write for full specifications and prices.

Garlock-Walker Machinery Co., Ltd., 32 FRONT ST. WEST, Telephone MAIN 5346 **Toronto**



13" Engine Lathe

"Filsmith" Quality

This lathe has won its way through actual experience to be known distinctly as a quality lathe. For the swing it includes, its speed is something to be wondered at. Solid full webbed headstock; 50-point carbon crucible steel spindle; massive, rigidly clamped tailstock. A study of these features on the illustration will give you an idea of its construction. A letter from you would command our immediate attention and secure for you all specifications.

The Philip Smith Mfg. Company
Sydney Ohio. U.S.A.

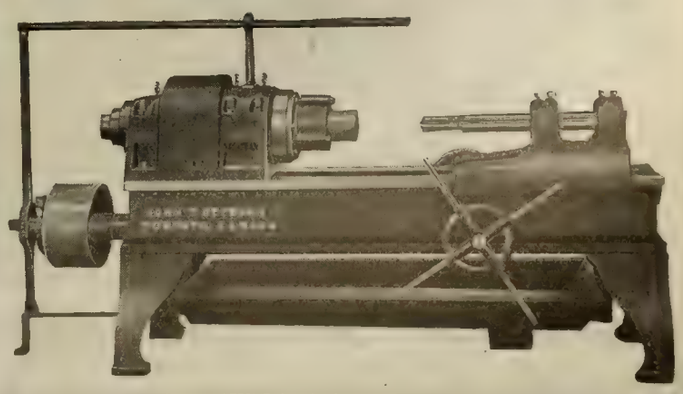
Hepburn---

the Lathe that stands the test

Shell work thoroughly tests the ability of a lathe. The **Hepburn Lathe** is making a wonderful record in the munitions plants of Canada in boring up to 6" shells. It has shown superior speed and superior quality of work and keeps right at it day in and day out. We also rebuild lathes embodying in them all latest improvements.

The Hepburn is the lathe for you.

JOHN T. HEPBURN, LIMITED
18-60 Van Horne Street **Toronto, Ontario**



If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

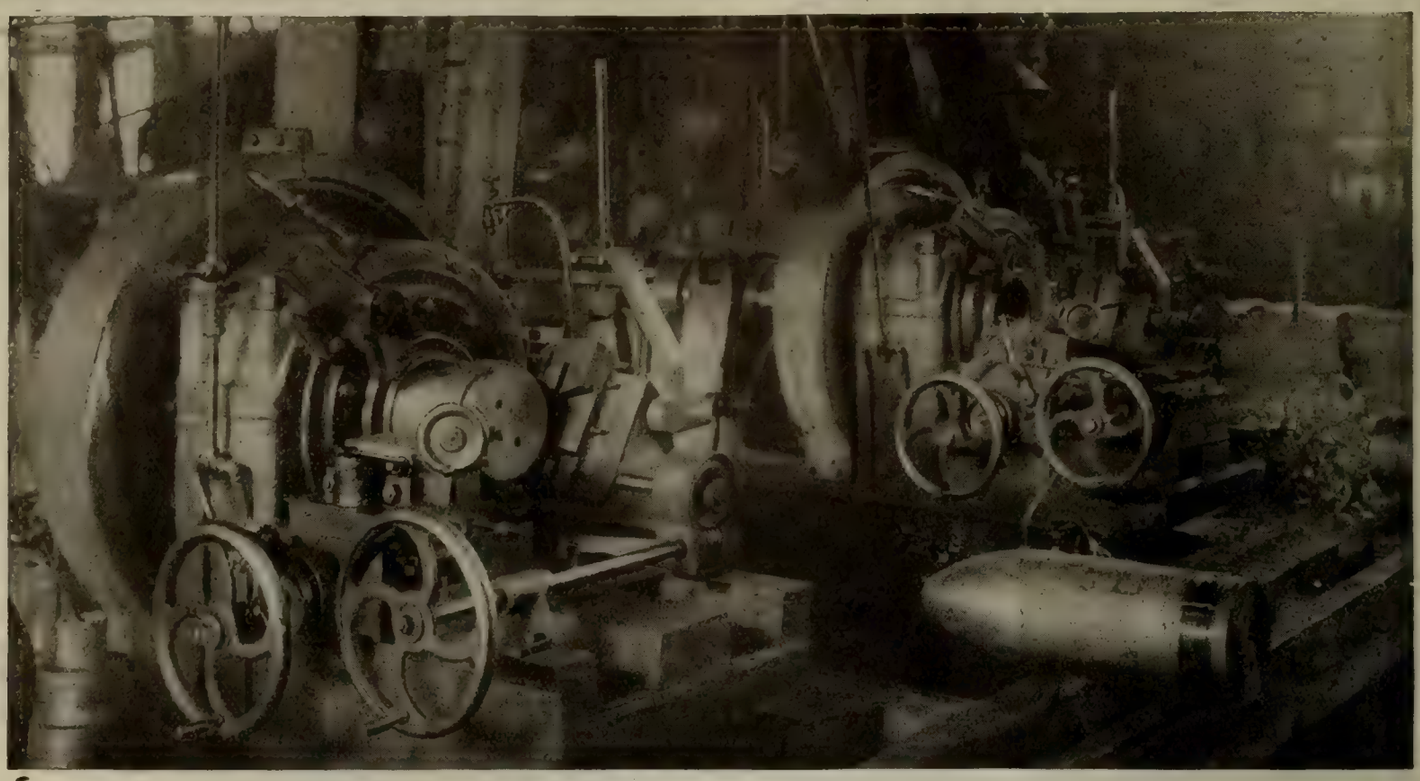
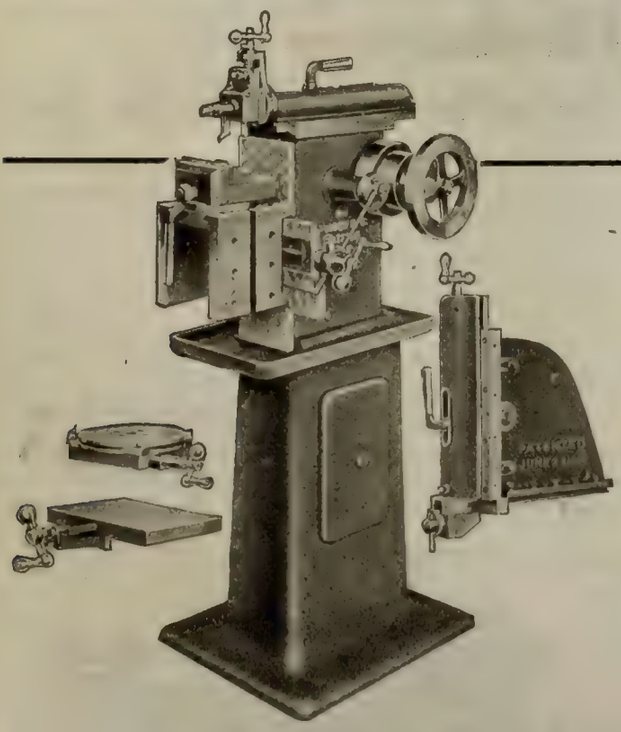


Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

These machines are built for turning bands on 8", 9.2" and 12" shells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. Write for full particulars and price.

Bennett Ave. **Warden King Limited** Maisonneuve, P.Q.

The Complete Machine



Patented—June 23, 1914

A machine whose efficiency can be added to by the quick and convenient changes shown here. Nothing cumbersome. A clean-cut machine that answers the most modern requirements in efficiency.

Designed especially for making tools, dies, models, and for slotting and shaping all classes of work.

Increased efficiency gives increased production which offsets increased costs and gives increased profits. A short but vital lesson on "increase." Think it over and write us.

The Rhodes Manufacturing Company, Hartford, Conn., U.S.A.

TEXTILE BELTING and PACKINGS

HIGH SPEED TWIST DRILLS

J.R. BAXTER & COMPANY LIMITED, MONTREAL

and GENERAL MACHINERY SUPPLIES

Two Cuts at One Time

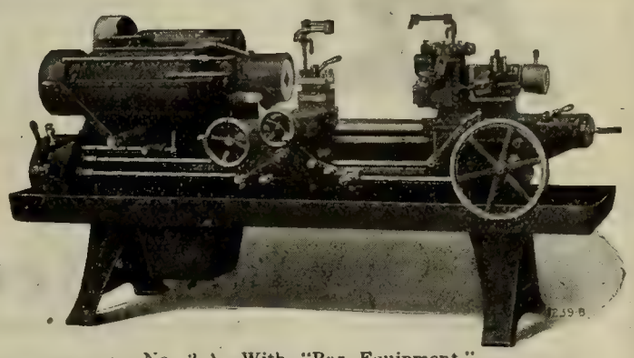
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

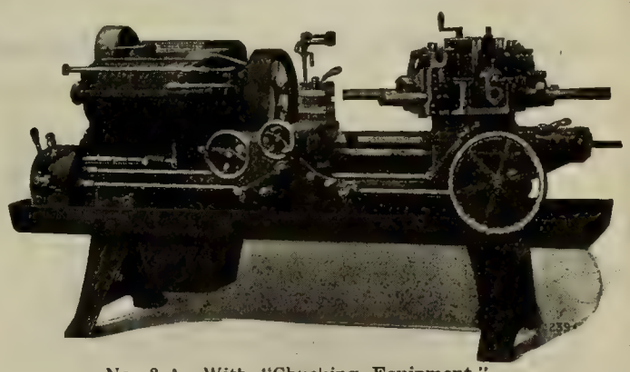
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."



No. 2-A—With "Chucking Equipment."

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal, Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

CUT YOUR SHOP COSTS

Nobody would think of putting 16-inch lathe work on a 30-inch lathe, then why leave small parts on a large Milling Machine?

A Steptoe Hand Miller or small power feed can be handled quickly and will cut your production cost. You will have less money invested in your Milling Machines and have more machines to do the work.

That same principle applied to your small planer work will cut the cost of planer work.

A Steptoe Shaper will do the work faster because it can be handled quicker.

The John Steptoe Company, CUMMINSVILLE CINCINNATI, OHIO, U.S.A.

Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.

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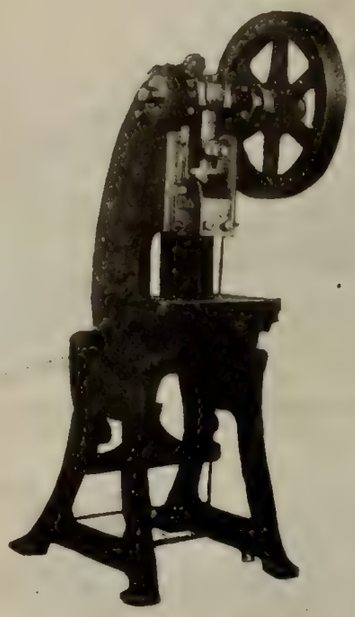


Consolidated Presses

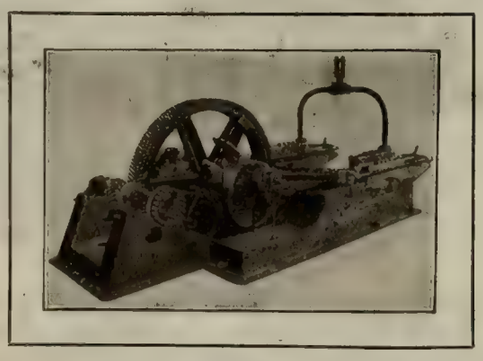
appeal to discriminating users because of the massive construction of all working parts, the generous crank shaft bearings, the increased diameter of crank pins, liberal crank cheeks, long and carefully fitted slide bearings, abnormally large connection screws, powerful gearing, and above all, the skill and care exercised in their construction.

These are features which should be considered when purchasing.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver



ELMES

18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217 No. Morgan Street CHICAGO, ILL.

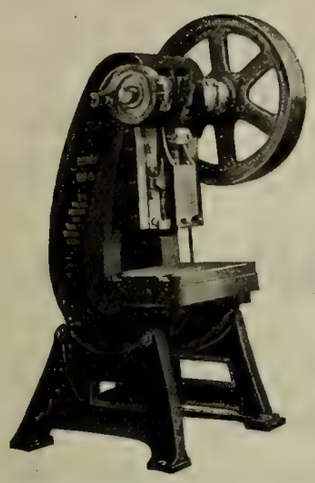
"ERIE" STEAM FORGING HAMMERS

are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U. S. A.

THE "TOLEDO"
OPEN BACK PRESSES



Notable for wide range of usefulness and durability.

Bodies embody the newest ideas in press construction with increased weight, larger bed area and die space.

Shafts are of large diameter and hammer forged from special steel.

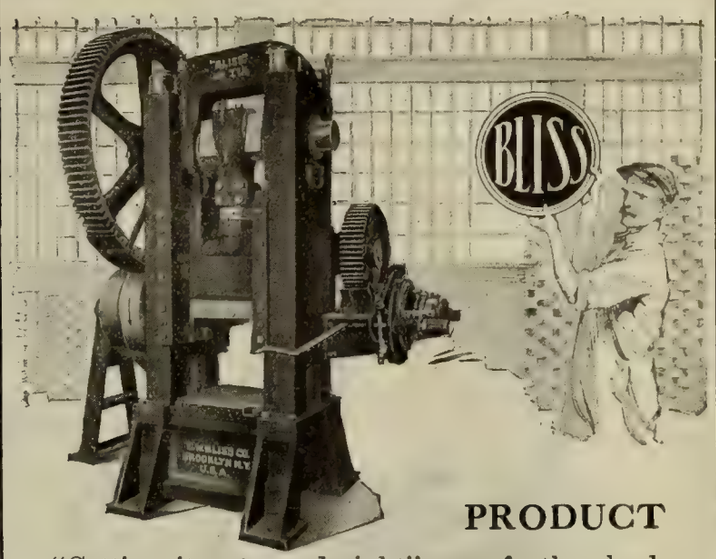
Connections and Pitman screw are high carbon steel forgings with the most effective clamping device in use.

Slides extra long, moving in long and heavy gibs.

Positive Inclining Attachment.

The Toledo Machine & Tool Co.
TOLEDO, OHIO

Representatives—Allied Machinery Co. of America, 19 Rue de Rocroy, Paris, France; Vie XX Settembre 12, Turin, Italy; 16 Seidengasse, Zurich, Switzerland.



PRODUCT

"Getting it out—and right" goes further back than the selection of the machine. It may go back 10 or 20 or 40 years to some point or problem solved in our 60 years' development of Presses that produce.

If you want machines with production capacity based on *longest* practical experience, buy "Bliss."

E. W. BLISS CO.
Brooklyn, N.Y., U.S.A.

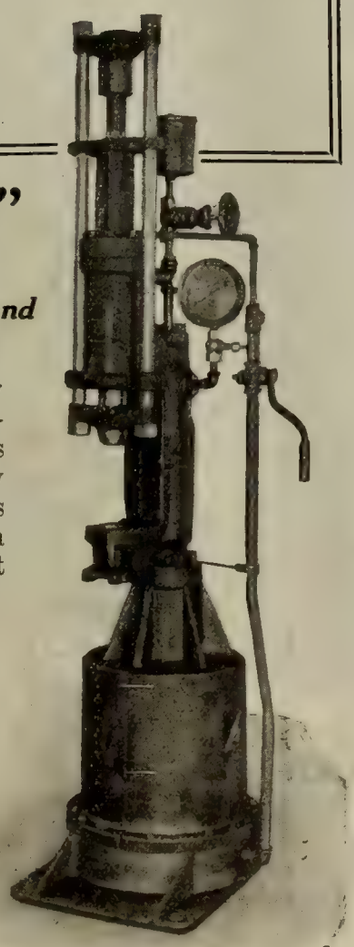
1857 1917

CHICAGO OFFICE People's Gas. Bldg.
DETROIT OFFICE Dime Bank Bldg.
CLEVELAND OFFICE - Union Bank Bldg.
LONDON, S. E., ENGLAND Pocock St., Blackfriars Road
PARIS, FRANCE 100 Blvd. Victor-Hugo St. Ouen

Triple Purpose
"METALWOOD"
COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.



Metalwood Mfg. Co.
Leib & Wight Sts., DETROIT, MICH. U.S.A.

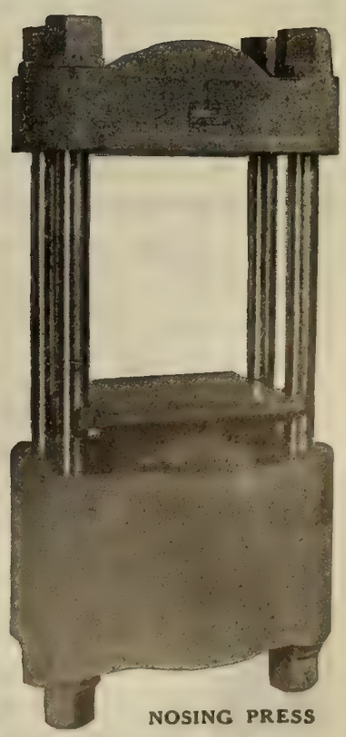
For Great Britain and Continent address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

PRESSES

Pumps and Accumulators

FOR ALL PURPOSES

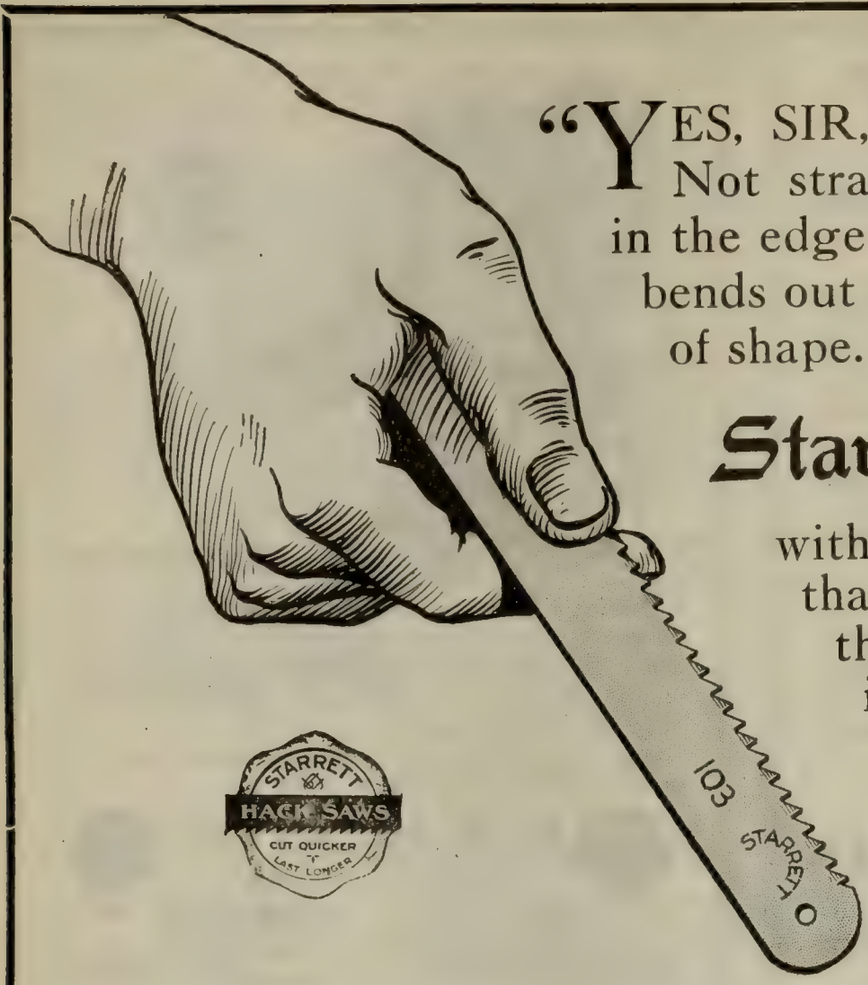
Made in Canada



NOSING PRESS

WILLIAM R. PERRIN, Limited
TORONTO

If any advertisement interests you, tear it out now and place with letters to be answered.



"YES, SIR, that's a real hack saw. Not strapping with notches cut in the edge. Not inferior steel that bends out of shape and stays out of shape. That's a

Starrett Hack-Saw

with snap and whip to it that means business from the time it gets its teeth in the metal until the cut is finished.

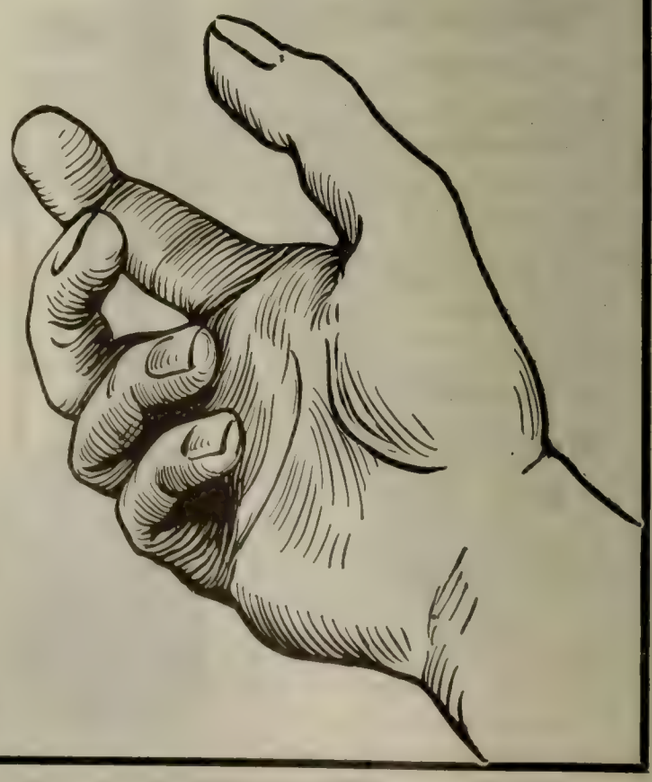
"Just a hack saw, you say. But this common name won't do for a tungsten steel blade like this. Why, every tooth in it is milled and set just as if this hack saw were to establish the Starrett reputation.

"And it fits its job, too. Maybe you don't think that's important, but try it yourself.

"You don't call in a grocer when you have a toothache. But there are some mechanics who try that stunt with hack saws—put a brittle, coarse-toothed blade on a piece of tubing and then wonder why it strips. Or use a fine-toothed saw on brass rod and wonder why the teeth clog and the blade snaps.

"You can't treat hack saws mean any more than you can people; and that's another reason why I like Starrett Hack Saws. You don't need to go wrong. The L. S. Starrett Company have got good saws and they know how to pick the one that does the work best. Guess that's why they say that Starrett Hack Saws **cut faster and last longer.** I know they do."

Send for catalog No. 21MA.



The L. S. Starrett Co.

The World's Greatest Toolmakers

ATHOL, MASS.

NEW YORK LONDON CHICAGO

42-738

THE BANFIELD PLUG MILLER

Patented in Canada and United States

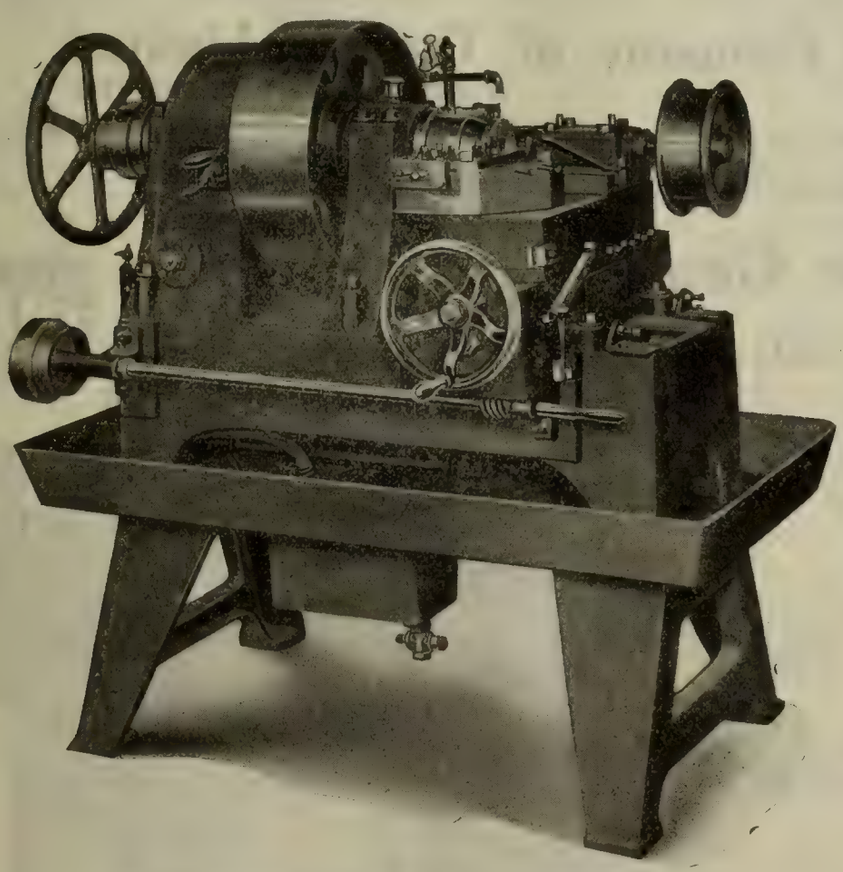
THE COMPLETE PLUG FINISHED IN SIX MINUTES BY UNSKILLED LABOR

A machine especially designed for finishing base plugs, turning the outside diameter, finishing the face with any camber desired and milling the thread—*all in one chucking.*

One man can operate two machines, considerably reducing your cost per plug.

The Banfield Plug Miller is equipped with quick draw in collet.

Drive pulley 18" x 6", with bronze bush having cut jaw clutch for turning and facing. Worm gear 100 to 1 ratio with jaw clutch for milling, driven by 10" x 1½" flanged pulley. The milling cutter is driven by an 8" x 2½" flanged pulley. Tool post carriage is equipped with power feed (two speeds), having automatic stop. Power feed pump with relief valve driven from worm shaft (all drives direct from main line shaft). Rigidly built; simple and economical to operate.



For Turning and Milling the Thread on Gas Check Plugs for 6-inch High Explosive Shells

Weight 1800 lbs.

For 18-pdr., 4.5 and 60-pdr. High Explosive Shells. Can furnish machines of same type, weighing 1250 lbs. Particulars on request. These machines are tooled up for finishing plain machined or bevel plugs if desired.

BASE PLUGS

Machined to Government Specification

Have in stock for immediate shipment machined base plugs for 4.5, 60-pdr., and 6" High Explosive Shells, either threaded or beveled.

Machine work subject to acceptance of Government inspector at your plant.

Capacity 4,000 *per day.* Write for prices.

EDWIN J. BANFIELD

STAIR BUILDING - - TORONTO, ONT.

This work was done by Davis-Bournonville apparatus and operators at

D. L. & W. SHOPS, SCRANTON, PA.

ENGINE NO. 584

To replace patch welded 40 ft. of ⅜" metal on both side sheets.
Time—20 hours.
Oxygen used—800 cu. ft.
Cost, including removing and replacing stay bolts—$48.71.
This patch applied by their old method would have cost $88.26, and same would not have lasted any length of time, therefore it would be necessary to apply two new side sheets, which would have cost $404.04.
This boiler was subjected to test of 275 lbs. water pressure without any leak apparent in the welds.
It is essential to use a positive mixture torch on work of this kind. Let us demonstrate the Davis-Bournonville Apparatus to you. No matter what other outfit you are using, we can cut your cost of operation, giving you a wider range of work.

Carter Welding Company of Toronto, Limited

Write us **9 SHEPPARD ST., TORONTO**

Bilton Automatic Gear Millers—Spur or Bevel Gears

CAPACITY

No. 1 - - 14 Pitch
No. 2 - - 10 Pitch
No. 3 - - 8 Pitch

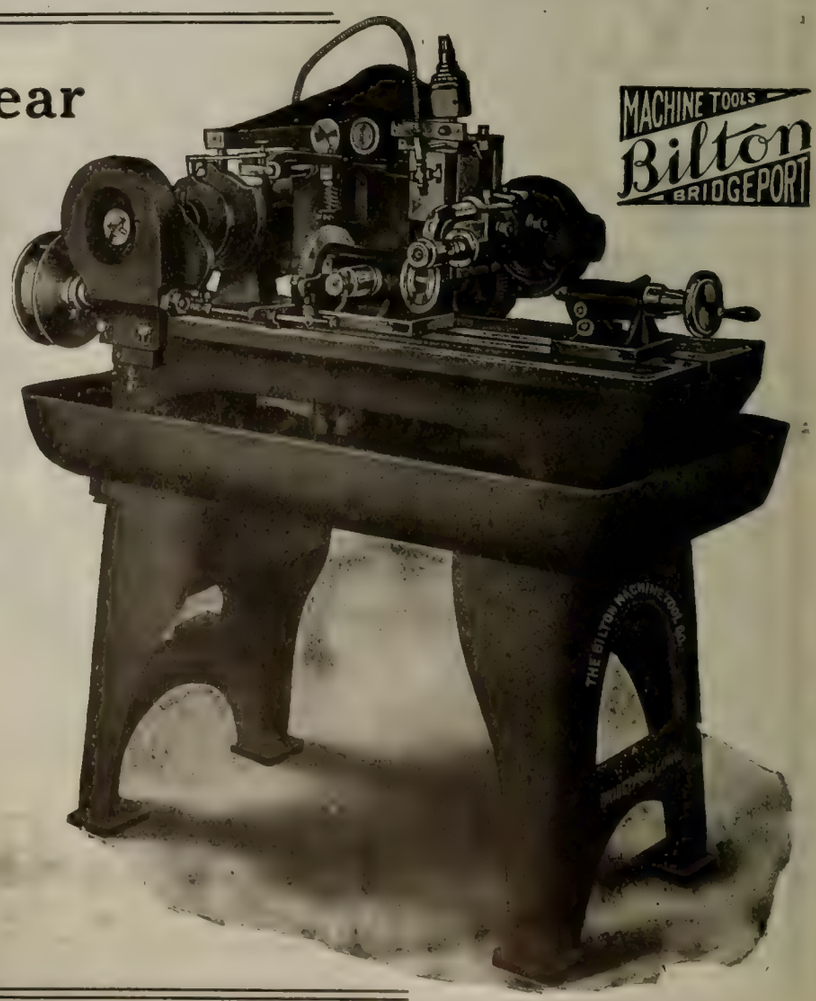
The Bilton Machine Tool Company

Succeeding The Standard Mfg. Company
Housatonic Ave., Bridgeport, Conn., U.S.A.

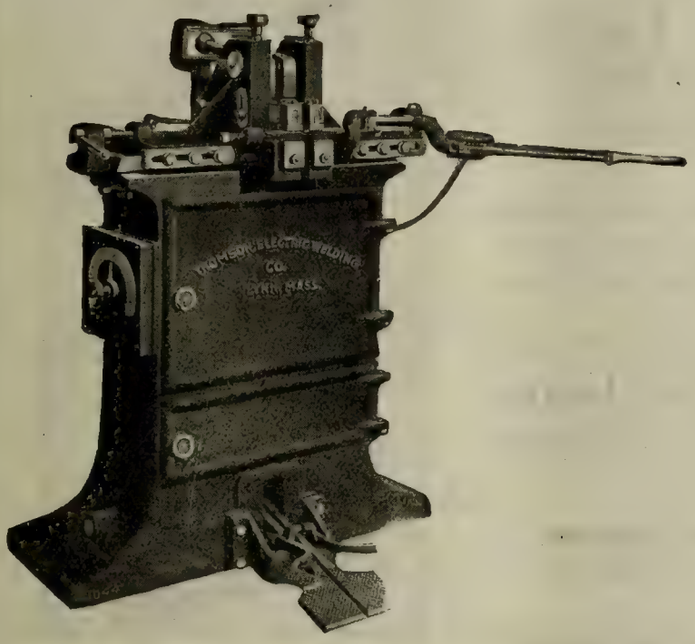
Also Manufacturers of —
Plain Horizontal Millers
Automatic Millers
Plain and Ball Bearing
Bench and Column Drills
Milling Cutters
Riveting Machines

Catalog 30 on request

Foreign Agents:
Alfred Herbert, Limited
M. Mett Engineering Company
Chas. Churchill Company, Limited



Thomson Process
Electric Welding



Adopt a "Thomson" For Your Work

We have shown thousands of manufacturers how to lower their costs and obtain better production by the use of Thomson Butt Welding Machines. No doubt there is work in your shop that could be handled faster and better by the "Thomson" Electric Welding Process.

Why not talk it over with us—let us give you actual facts on how we have saved other firms money and how we can benefit you? It costs nothing for the consultation. Get in touch with us to-day.

Write for Bulletin B-4.

Rivets Abolished—Time Saved

A Thomson Spot Welder will do your riveting and soldering 60% to 90% faster. No rivets or solder required, no holes to punch, and a boy can turn out as much work as five men using the old process. A thorough investigation will prove to you the merits of the Thomson Spot Welding Process and show you how to effect a big saving.

Write for Bulletin S-4.

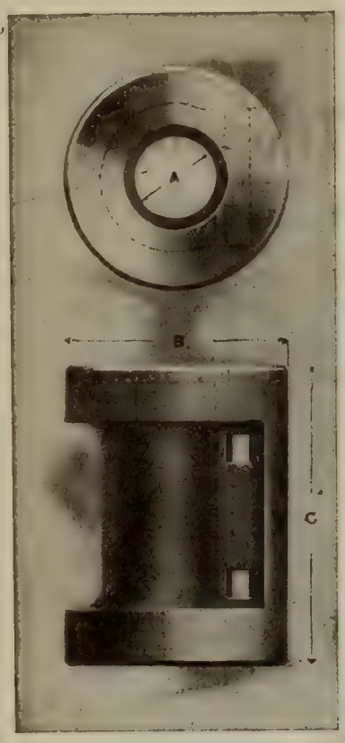
Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

If any advertisement interests you, tear it out now and place with letters to be answered.

Mining Machinery Parts



Two-key Tappet

Shoes and Dies, Tappets, Bosses, Cams and Stamp Heads

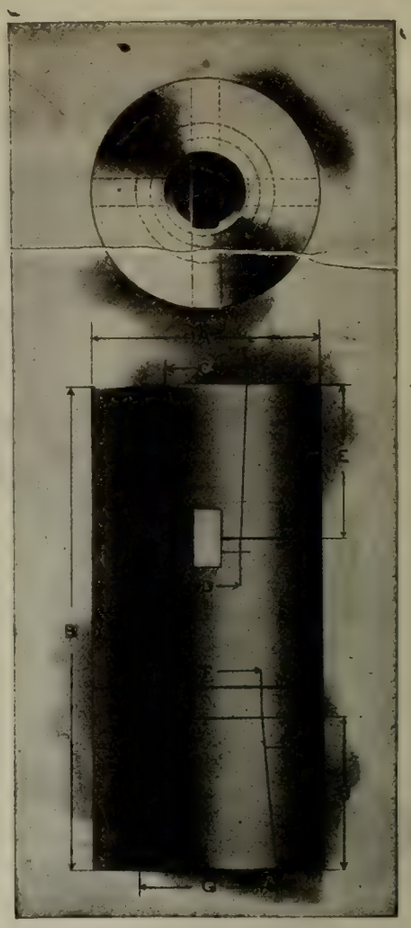
Also Manufacturers of Lining Plates for Ball and Tube Mills Concaves and Heads for Gyratory Crushers.

Machine Moulded Gears

Any size up to 18 feet in diameter. No patterns needed.

Send Us Your Specifications, We Do the Rest. Write—

Hull Iron & Steel Foundries, Limited
HULL, P.Q.

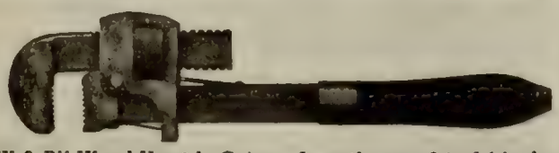


Stamp Head

"W & B" Pipe Wrenches the Only Pipe Wrenches

MADE IN CANADA

The line comprises all sizes from 6 to 48 inches



"W & B" Wood Handle Grips. Length open 6 to 14 inches

"W & B" STEEL Handle Grips. Length open 18 to 48 inches.

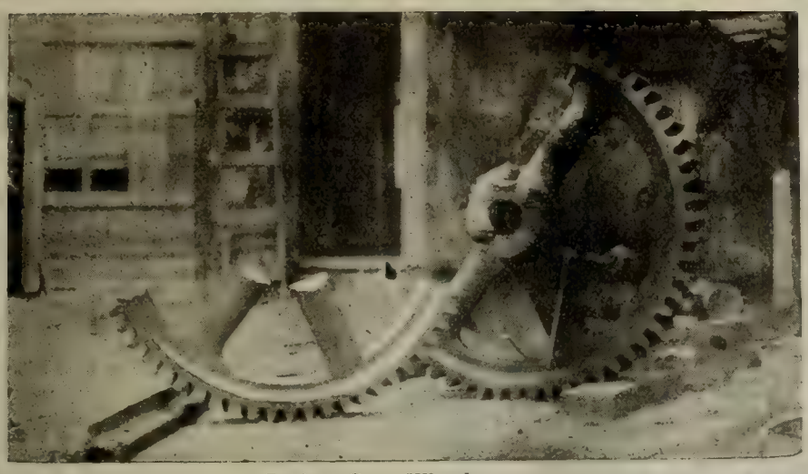
These Wrenches are extra strong frames well proportioned.

The Jaws are Drop Forged and tempered, giving them strength to resist the most severe strains.

Other patterns of "W & B" SCREW WRENCHES MADE IN CANADA at our St. Catharines factory, are our Machinists' Knife Handle, "Railroad Special," Regular (Agricultural Pattern). Adopt this established line as your standard CANADIAN-MADE WRENCHES.

Complete information and catalog No. 90 on request.

The Whitman & Barnes Manufacturing Company
ESTABLISHED 64 YEARS
ST. CATHARINES, ONT.



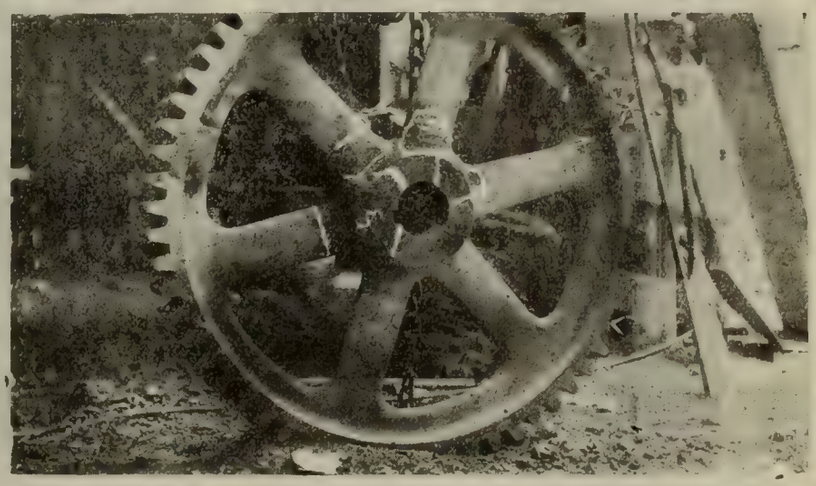
Broken Gear Wheel.

Saving the cost of a New Gear Wheel by Oxy-Acetylene Welding.

The Savings in Time and Money in cases of this nature are impossible to calculate, but it is illustrative of the unlimited money-saving possibilities of an Oxy-Acetylene Welding Outfit in your Plant, ready at all times to cope with Machinery "Tie-ups" and to restore the broken parts to use again—in a fraction of the time at a fraction of the cost of renewals.

The time saved soon pays the cost of an Outfit.

Reclaimed by Oxy-Acetylene Welding.



Courtesy Can. Welding Co., Montreal.

Let us tell you of the many ways by which you may benefit by Oxy-Acetylene Process.

There are innumerable uses for an Oxy-Acetylene Outfit—the reclamation of Broken Machine Parts; Joining Metals without laps or rivets, stronger, neater and cheaper; using up valuable material otherwise scrapped, and many other purposes. We shall be pleased to tell you how you can save money and increase the efficiency of your Plant. Write to-day—no obligation.

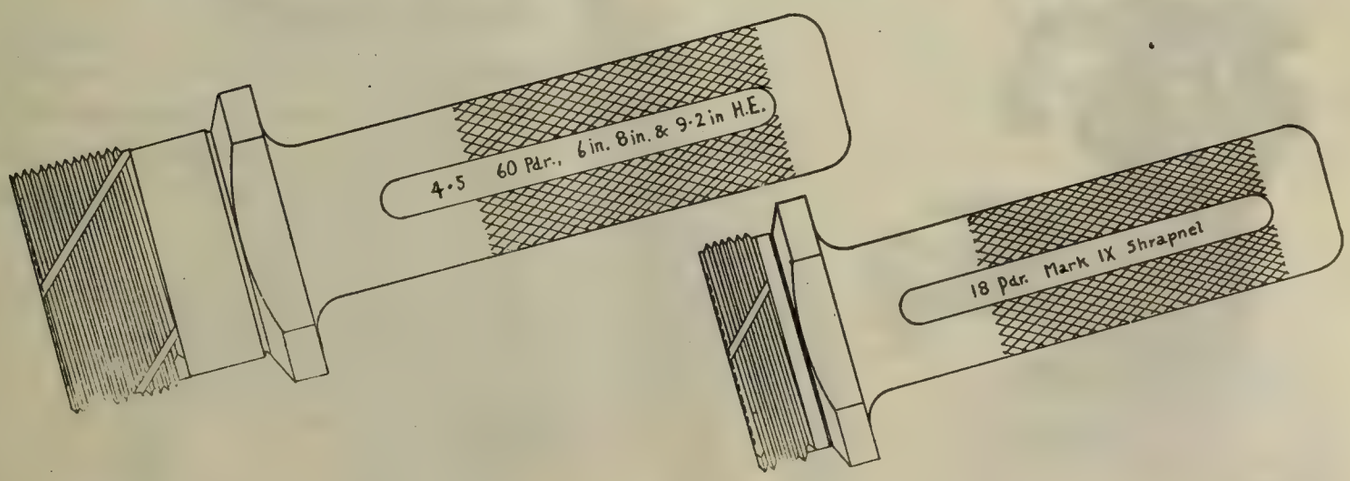
L'AIR LIQUIDD SOCIETY

The Pioneers of the Process. Factories the World over.

Canadian Factories:

TORONTO MONTREAL WINNIPEG HALIFAX

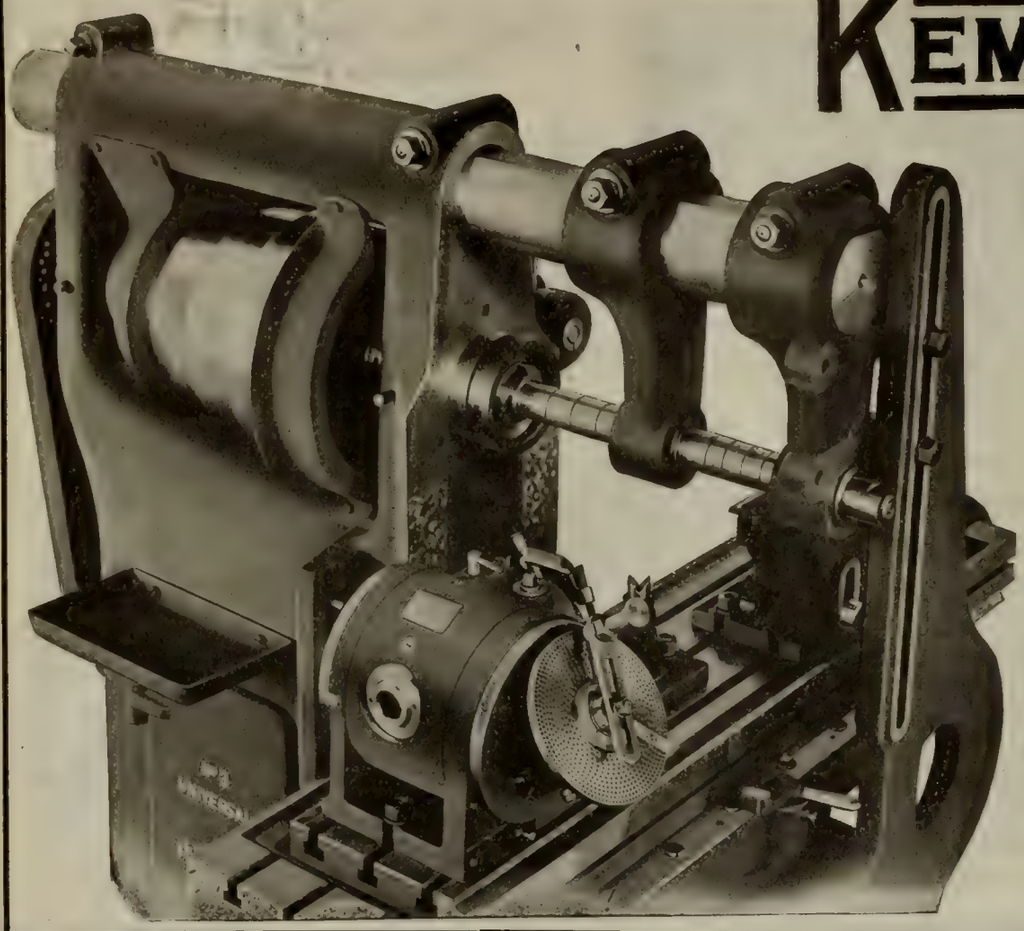
FUSE HOLE GAUGES



Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario



KEMPSMITH

Milling Machines

The Kempsmith Overhanging Arm provides for positive alignment of arbor or boring bar, and also holds the cutters positively up to the work. A valuable feature on a tool room machine.

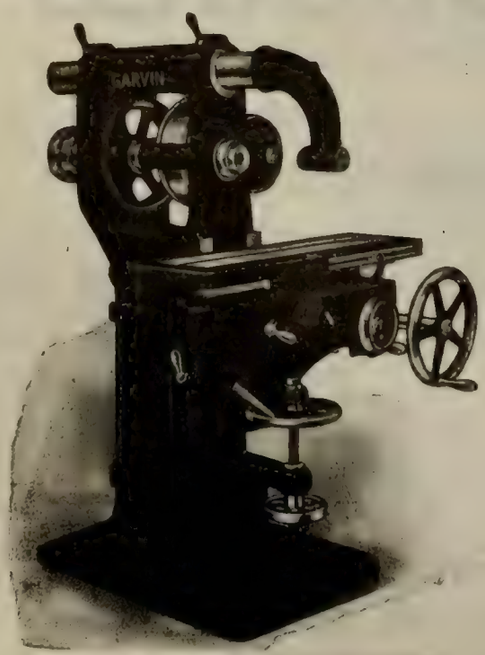
Note the compactness and solidity of the Kempsmith Universal Dividing Head shown in the accompanying illustration. The Kempsmith Dividing Head embodies simplicity, convenience, rigidity and accuracy. There is a notable absence of complicated parts. The Kempsmith Dividing Head is furnished as part of the regular equipment of our Universal Milling Machine.

Kempsmith Mfg. Company

Milwaukee, Wis., U.S.A.

GARVIN No. 21 Plain Miller

Back Geared



No. 21 B.G. PLAIN MILLING MACHINE
Back Geared
Use Code - Abject

For Plain and Gang Milling for general manufacturing, and is used mostly in gangs of 5 or 6 machines to one operator. Spindle runs in adjustable bronze boxes, and is driven by a 3" belt through back gears (3 to 1).

Knee is our improved solid top design, rigid and stiff to resist side pressure of heavy cuts.

DIMENSIONS:

Automatic Feed at Table	18 in.
Adjustment in line with Spindle	6 in.
Vertical adjustment under Spindle	13 in.
Table, inside Oil Pockets	6 x 10 in.
Changes of Speed	6
Changes of Feed	6
Net Weight, Skidded	1,575 lbs.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY

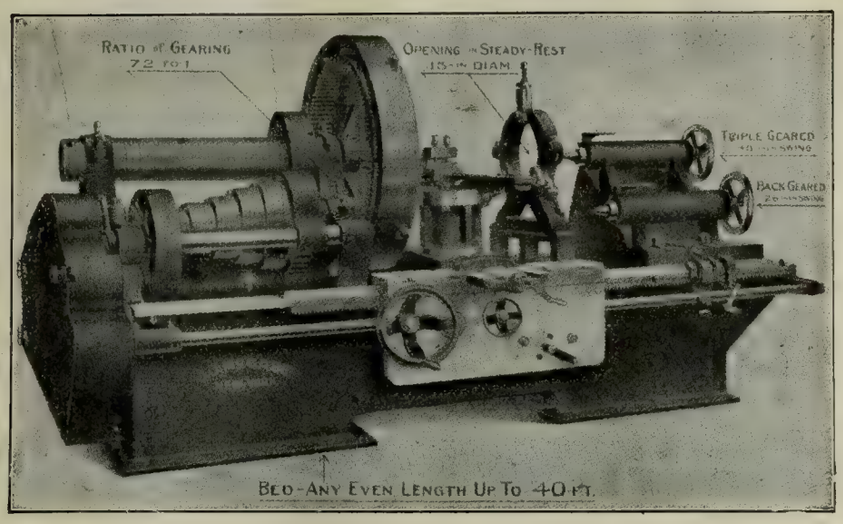
Spring and Varick Streets (*Visitors Welcome*) **50 Years New York City**

IMMEDIATE SHIPMENT

30-ft. BED
McCabe 2-in-1 Lathe

26 and 48-INCH SWING
TRIPLE-GEARED—RATIO 72 to 1

J. J. McCabe, 149 Broadway New York



Showing McCabe's Latest Heavy Type "2-in-1" Double-spindle Lathe—26/48-in. Swing.

48-in Swing. Triple Geared — ratio 72 to 1.

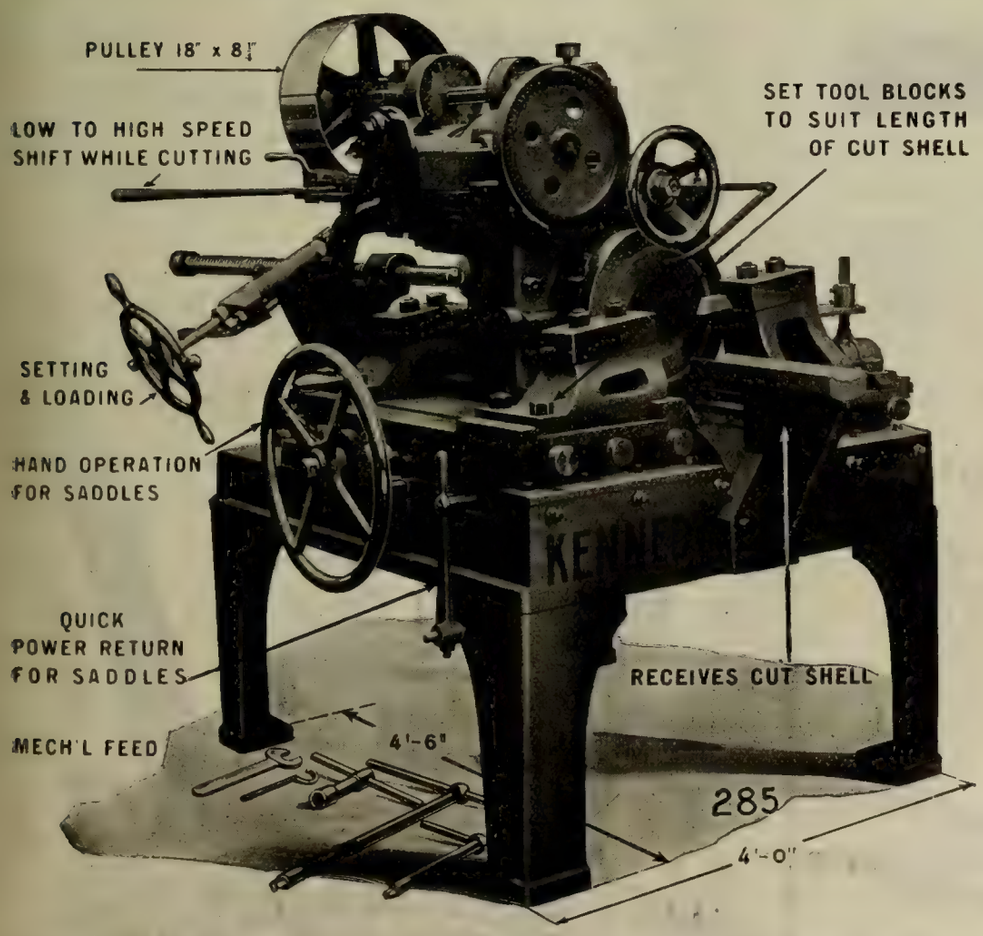
26-in. Swing. Back-geared.

Turns between centers—24 ft.

Swing over carriage on 48-in. Lathe is 40 in.

Prominent ship-builders are using McCabe Lathes on long beds.

Thousands in operation all over the world.



CUTTING-OFF MACHINES

Cuts both ends at once

except 8 in. and 9 in. sizes which cut one end only

Forgings load in one end and discharge out the other when cut

A Girl can operate it

New quick power return for saddles

DELIVERIES REASONABLE

The Wm. Kennedy & Sons, Limited Owen Sound

If any advertisement interests you, tear it out now and place with letters to be answered.

The Measure of Superiority of

The Threading Tool with lockable spring head will do roughing, finishing and threading at one setting of the tool post.

WILLIAMS' "AGRIPPA" Tool Holders

"THE HOLDERS THAT HOLD"

The Planing Tool has a serrated ring of improved steel which affords unequaled variety and rapidity of adjustment. The ring is correctly hardened to resist the wear of the cutter. The body of the holder receives a very different heat treatment that prevents breakage.

is the proportion in which they excel and endure.

You can verify our GUARANTEE of the exceptional resistance, adjustment, interchangeability, usefulness, life and economy by exhaustively testing them on own machines.

High Carbon Steel

Scientifically "heat treated"—

Ground accurately by machinery—

Cut with mathematical accuracy as to depth, number and position of teeth—

Make the

"Famous Five" Files

the standard tools of their class.

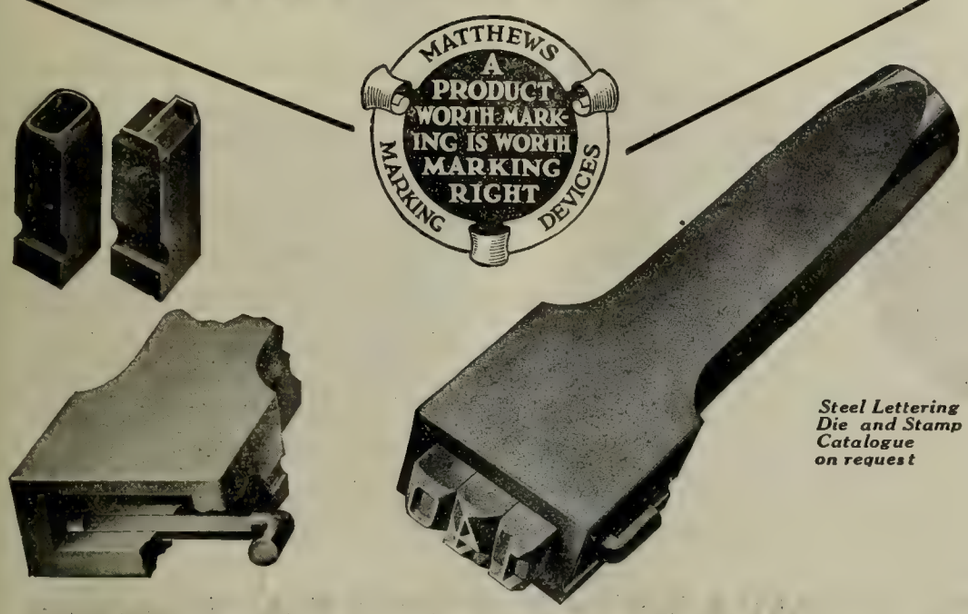
It is a pleasure for a mechanic to work with them—

Consequently they give good results economically.

Always specify them when ordering files.

If You Change Markings Often, Use CHAMPION HOLDERS

(Patented)



Steel Lettering Die and Stamp Catalogue on request

MATTHEWS' Improved Champion Steel Holders and Interchangeable Grooved Type were developed to simplify, and to economize the cost of interchangeable marking. Holders are made with spring attachment, which, combined with grooved type, keeps letters or figures securely in place, and insures accurate, straight line marking.

Three styles of holders, and three types of letters and figures.

Matthews' marking devices are the best that skill, 67 years' experience and modern equipment can produce. Matthews' deliveries are prompt and Matthews' prices are right. Any device you may require from a small rubber stamp to a steel stamp for marking shells. Send Matthews a trial order.

Jas. H. Matthews & Company, Forbes Field, Pittsburgh, Pa., U.S.A.
67 YEARS IN BUSINESS

Distributors for Canada: Canadian Fairbanks-Morse Company, Ltd,
St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary Vancouver, Victoria

For Grinding and Polishing Automobile Parts

ALUNDUM

Automobile manufacturers use ALUNDUM for polishing housings, steering columns, connecting rods, brakes, springs, electric starter parts and similar pieces.

Perhaps you have some operation in your plant that could be done at less cost and in less time by the use of ALUNDUM.

We are able to offer you IMMEDIATE DELIVERIES ON POLISHING GRAIN of any size.

TRADE MARK NORTON REGISTERED

NORTON COMPANY
WORCESTER, MASS., U.S.A.

Canadian Agents: THE CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. ANDREWS & SON, Quebec., Que. ELECTRIC FURNACE PLANTS, Niagara Falls, N.Y., Chippawa, Ont. Canada.

Let the ACORN DIE Cut Your Threads

Die and Holder

THE DIE

The adjustment is mechanically perfect—simply turn the cap and all the prongs of the die converge equally—a great advantage over the spring die.

The Acorn Die Holder is smaller in diameter than any other die holder of equal cutting size.

The float permits the die to follow its own lead.

The die projects slightly beyond the adjusting cap, making it admirably adapted for shoulder work—and the chips are thrown ahead of the work, so the die does not clog.

Will you try the Acorn Die on your own work—under your own conditions?

WELLS BROTHERS COMPANY OF CANADA, Limited

GALT - ONTARIO

SALES AGENTS: The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary

TRADITION

We have a great tradition to perpetuate. The British-made file has always been the standard of file efficiency. It has always had better steel in it, quicker cutting teeth, and been harder and straighter than the files of other nations. That is unchallenged the world over.

Founded on an ideal—the production of Canada's Finest Files—this corporation is entirely Canadian, therefore all-British, and our whole organization is saturated with the maxim—

QUALITY FIRST

P H

TRADE MARK

Quality Files

CANADA'S STANDARD

Made in Canada, by Canadians, for Canadians.

ARE YOU FILE-WISE?

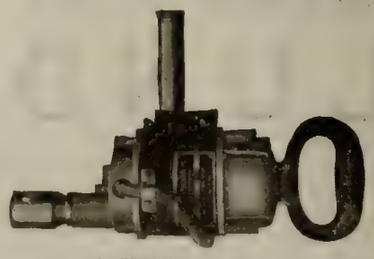
PORT HOPE FILE MFG. CO., LIMITED

Port Hope, Ontario

"Ask your jobber"

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES

3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.

⅞" and 1¼ Universal Motor DRILL.

For Sale By

The Canadian Fairbanks-Morse Co., Limited

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.

CINCINNATI, OHIO

Putting "Dominant Dollar-Value" in the New Hupmobile—

Many competent authorities have called the Hupmobile "the world's best four"—and certainly from a standpoint of sales and popularity Hupp holds an enviable position in the field of motordom.

It is also a fact that the Hupp factory organization is always "up on its toes" to keep mechanical production at top notch.

The grinding department is equipped with latest designs of *Norton Grinding Machines.* This particular job is a valve tappet bushing to be used in the Hupp engine. It is 2 inches long over all and 1.002 inches in diameter. The material is cast iron and the operation is straight cylindrical grinding over one inch of surface. Limits of + or — 0 are maintained and a production of 950 pieces a day is the output of one machine.

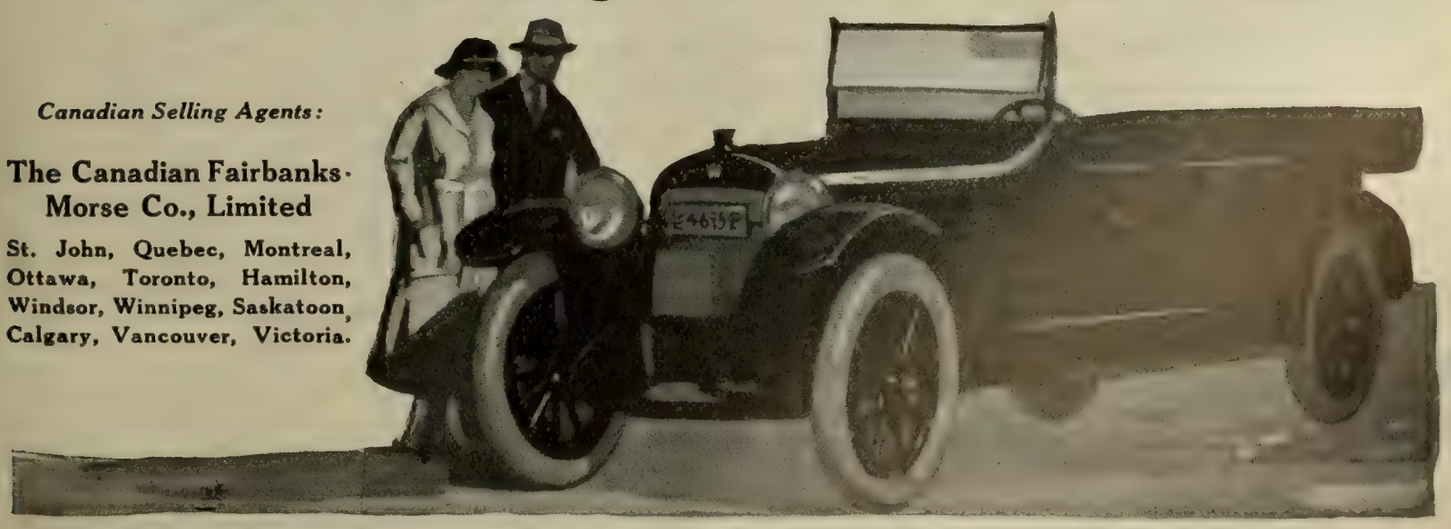
When you go into the problem of purchasing grinding machines make an investigation of Nortons—it will prove their superiority for your work.

Norton Grinding Co., Worcester, Mass.

Canadian Selling Agents:

The Canadian Fairbanks-Morse Co., Limited

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria.



Manufacturing Plant Equipment

Let your factory purchases be based on that ultimate efficiency so necessary to economical production.

Fairbanks-Morse lines are selected for their ability to make good under the most severe conditions. They are the kind to keep on giving satisfactory service when the other tool is in the scrap heap.

It isn't the first cost—but the cost per unit of production which counts.

Let our machinery and tool experts give you the advantage of their experience.

Let us quote on your requirements.

The Canadian Fairbanks-Morse Company, Limited

ST. JOHN, QUEBEC, MONTREAL, OTTAWA, TORONTO, HAMILTON, WINDSOR, WINNIPEG, SASKATOON, CALGARY, VANCOUVER, VICTORIA.

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

The Shell Industry in Canada from a Metallurgical Viewpoint*

By Hugh Lamont**

In the course of a resumé of Canada's early efforts to produce munitions in quantity and quality, the author mentions several features, more or less insignificant individually, but having, collectively, a vital influence on the ultimate success of the work. The microphotographs demonstrate convincingly the value of expert scientific knowledge, and how it may be applied to the solution of vital problems beyond the scope of ordinary factory routine.

IN the first days of August, 1914, when the European crisis seemed likely to lead Great Britain into hostilities, the Government of Canada, confident in the patriotism of the Canadian people, pledged the support of the Dominion to the Imperial authorities in case war could not be averted. Thus it was that Canada, as an integral part of the British Empire, found herself in a state of war when Britain's declaration of August 4th was issued. The greater part of the militia was called out—bridges, public utilities, strategic points had to be guarded; but the greatest task of all was the enlistment and the equipment of the first Canadian Expeditionary Force, which, amounting to 33,000 men, was mobilized early in September and sailed overseas early in October.

Since that date Canada's contributions in men have gone steadily forward, until to-day her armies at home and abroad are rapidly approaching the half-million mark, with effective measures provided for reinforcements as required—no small contribution from a country of about seven million population scattered over the area which Canada comprises.

But the war could not be won by men alone, and it was quickly demonstrated that the artillery arm of the service was to play a part hitherto undreamed of, and the call for munitions and more munitions was early heard. Britain's arsenals were entirely inadequate, and she quickly began converting her industrial plants into munition factories. The Canadian Government, knowing the need for munitions and hoping to stimulate Canadian business, asked the co-operation of the manufacturers in producing shells.

Initial Attitude

Naturally there was a certain amount of reluctance on the part of the Canadian manufacturers to engage in a business entirely new to them. Different causes contributed to this attitude. The specifications called for a degree of accuracy in machining and strength of metal in the finished product, which to say the least was imposing. But most of all, the size of the original orders and the uncertainty of renewals, in fact, the uncertainty of the war itself as to how long it would last, all tended to caution the manufacturer to go slow, for in every instance it was necessary for the manufacturer to expend considerable capital to equip his plant to handle the business.

The pioneer manufacturers were induced to go into the business, not by the hope of making profits, but rather by a patriotic desire to do their bit in helping to win the war. Then, too, there was the matter of financing which the Canadian Government had to contend with, and at the very outset the munition industry required a considerable outlay of capital. Canada, young and undeveloped, had all along been a borrowing nation, and just at the outbreak of the war was experiencing a period of trade depression brought on by the bursting of the most sensational land boom in her history.

However, the Canadian Government, acting as the agent of the British War Office, was successful in placing the first order for shells, some 200,000 shrapnel, with the Canadian manufacturers about the first week in September, one month after hostilities commenced. This order was split among some half dozen concerns. From that initial order in September, 1914, the business developed, so that by November, 1915, the munition industry was the most important in Canada, embracing in all 320 firms. By April, 1917, when the United States entered the war, 630 firms were engaged in the production of shells and shell parts, giving employment to over 225,000 operatives, and the business involved an expenditure of $5,000,000 a week, with a daily average output valued at $1,500,000.

During the first part of the war the purchase of munitions was entrusted to a body known as the Shell Committee, representing and responsible to the British authorities. Later on this committee was replaced by the Imperial Munitions Board, but the business is carried on practically on the same principles.

The steel billets or rolled stock are purchased by the board from the steel manufacturer; it is then allotted to the different forging companies, who are held responsible for each shell less those required for testing purposes. From the forging companies it is distributed to the machining and assembling companies, who in turn are required to turn back to the board an equal number of shells as they receive less those required for test. Provision is also made governing each manufacturer's responsibility, and, considering the extent of the business and the fact that in only a few instances are completed shells produced by any one firm, the very small number of misunderstandings arising speaks well for the way the business is conducted, and especially bears evidence to the efficiency each Canadian manufacturer has attained in the respective operations allotted to him.

Returning to the original orders which were issued early in September, 1914, the manufacturers interested immediately began to get their plants in shape to handle the work. Machines had to be rebuilt, or new machines bought, but the first orders were practically all turned out on old machines with the necessary machining accessories to cover the requirements. In the matter of heat treating, old equipment, if there was any at all, was not practical, and new equipment had to be purchased.

In these matters each manufacturer had access to the Dominion Arsenal at Quebec, the only plant in Canada manufacturing shells, and was assisted so far as possible by the men in charge of the various departments. As each manufacturer had his equipment installed a trial lot of shell forgings were supplied to him and the problem of meeting the specification began.

Shrapnel Material

In shrapnel this specification called for a yield point or elastic limit of 36 long tons, or 80,640 lbs. per square inch, and ultimate breaking strength of not less than 56 tons, 125,440 lbs. per square inch, with an elongation of not less than 8 per cent. in ⅝ in. The test specimen is taken from the shell when partly machined, and after receiving final heat treatment at a point where the maximum bursting strain occurs, and known as the set-up point. The forgings were made from 3½ in. rolled stock, plain carbon steel from 0.45 to 0.55 in carbon, under 0.05 in sulphur, under 0.06 in phosphorus, manganese from 0.50 to 1.00, and silicon under 0.30 per cent. In the bar the steel must show a yield of 19 tons, 42,560 lbs., ultimate breaking strength 35 tons, 78,400 lbs., and an elongation of 20 per cent. in 2 in.

As the shell received a final heat treatment no strict specification was issued concerning the physical properties of the steel in the forging. But in order to meet the specification for the finished shell recourse was necessary to the double heat treatment. This necessitated the installation of two furnaces and quenching tanks. Further, each shell had to be nosed, requiring still another furnace and nosing press. Add to this the changes necessary to existing machinery, and it is not surprising that the end of October was reached before installations anywhere were completed,

*A paper read before the Steel Treating Research Society of Detroit, Oct. 19, 1917.

**Manager, Toronto Testing Laboratory, Ltd., Toronto, Ont.

and the actual work of making shells that would be acceptable to the War Office begun.

Then came a period of trials and tribulations. The rough forging as received had first to be cut to length, rough turned inside and out, the recess for the copper rifling band cut and wave lines in the bottom of this recess formed before the final heat treatment was given, so that failure to pass specification not only entailed the loss of the shell forging with which the manufacturer was charged, but all the machine work done on it.

As machined for heat treatment the metal in the base of the shell would be ½ in. thick while the walls would be not more than ¼ in. Oil was used as a quenching medium though some water hardening was done, but on the whole it was found too severe and was frowned upon by representatives of the War Office. Pyrometers had been installed to keep accurate watch on the temperatures, scleroscopes to test the hardness after quenching and after tempering, but if the shells would not harden, they could not pass the physical requirements.

To enumerate all the difficulties that arose would be as easy to set down a list of Job's ailments. Sometimes it was the steel, sometimes the oil, next it would be the furnace that was at fault, and again the pyrometer. Expert and amateur suffered alike. Reputations were shattered and men lost faith in their fellowmen.

Growth Follows Success

By November 15, 1914, the government sent an urgent appeal for shells by November 30. Promises were made which unhappily could not be fulfilled and it was not until the latter part of December that shipment of Canadian shells began. Small at first, but they quickly grew in volume. Before the first orders were complete larger orders came and other manufacturers were preparing their plants to handle the business.

When it is considered that not only had changes in machinery to be made, but in many cases changes in plant layout, considering also the equipment that had to be added, and the general lack of knowledge concerning a business, as it were, hastily thrust upon him, the Canadian manufacturer is entitled to a great deal of credit in that he was shipping completed shells less than four months after receiving his initial order, and five months after war was declared.

To revert to some of the early troubles encountered in heat treating, as a rule the steel supplied was rather close to the lower limit both as to carbon and manganese, if not actually dropping below, though forgings really below specification were rare. But being close to the lower limit, especially in carbon, limited the range in which such shells should be quenched and tempered to get the required physical properties. The man in charge of the heat treating always aimed to carry his steel well past the critical range, but should the shell not show a proper hardness in quenching from that temperature, a higher temperature was tried, many cases of overheating resulting.

Microstructure of one of first shells heat treated in any Canadian plant is shown in Fig. 1.—carbon 0.47, manganese 0.53, magnified 100 diameters. Heated 1700 deg. F. quenched in oil, reheated to 1000 deg. F. cooled in air. Elastic limit, 34.7 tons, ultimate breaking strength 53.5 tons, elongation 19 per cent. Shells from this steel had previously been quenched from 1490 deg. F., reheated to 1100 deg. F. and failed. It was finally passed by quenching from 1550 deg. F. and reheated to 800 deg. F., the elastic limit reaching 39.6 tons, ultimate breaking strength 58.5 tons with an elongation of 14 per cent.

Whether or not the increased elastic limit and ultimate strength was altogether due to the lower temperature at which these shells were tempered is a question. The repeated heating may have refined the ferrite grain somewhat, the quenching temperature no doubt had an influence, but in the writer's opinion the tempering was the greatest factor.

In the early days numerous instances came under the writer's attention where shells, under 0.50 in carbon, which failed after being tempered at 1000 deg. F., were brought within specification by quenching from exactly the same temperature and reheating not over 800 deg. F., in some instances the ultimate strength being increased 6 tons, while the elongation in no instance went below 12 per cent.

The shrapnel shell being 9 in. deep with an inside diameter of 2½ in., it is obvious that success in hardening depends to a great extent on the manner in which the shell is lowered into the oil. The usual method of dipping base downward, allowing the oil to flow over the edge to the inside and swinging backwards and forwards was on the whole sufficient. An early installation provided for pumping cold oil into the interior of the shell as it was being lowered into the tank. This method proved very useful especially in low carbon, low manganese steels.

Quenching oils were another source of trouble especially in the early days. Some were justly condemned and some unjustly. Frequently an oil was accused of losing its life when the fault was due to a leak in the tank allowing water from the cooling system to penetrate, forming an emulsion, which as a quenching medium was far from being a success. In some cases the forgings were annealed at about 1200 deg. F. before machining. The better machining qualities were an offset to the extra operation, besides the steel was in better shape to receive final heat treatment.

Steel Makers Help

The steel companies were quick to recognize the value of a few extra points of carbon and manganese, so that as the work progressed less and less difficulty was encountered in hardening and in many cases, after quenching, it was necessary to reheat to a noticeable redness in order to sufficiently temper the steel.

Fig. 2 shows the microstructure of an average shrapnel shell recently made, carbon 0.52, manganese 0.75, magnified 100 diameters. The shell from which this specimen was cut was heated to 1550 deg., quenched in oil, reheated to 1000 deg., and cooled in air. Elastic limit 42 tons, ultimate breaking strength 70 tons, elongation 15 per cent.

Under a higher magnification the sorbitic condition of the steel is plainly seen. This is the condition which the manufacturer aims to produce. The temperatures in average practice vary from about 1450 deg. to 1600 deg. for quenching and from 800 deg. to 1100 deg. for tempering, depending on the carbon content. In ordinary furnace practice 20 minutes would be about the average time required to heat the shells for quenching with possibly a little longer time for tempering.

It would be about April, 1915, that the first orders for high explosive shells were placed in Canada. First came the 3 in. shell, in outer design the same as shrapnel, but with thicker walls. These shells were machined from bar stock and required no heat treating. Later came the 4.5 in., and 6 in. high explosive, and later still the 8 in. and 9.2 in., which cover the range of Canadian manufacture. All these shells had to be forged, and as the demand for high explosives grew rapidly, many new forging companies entered the field.

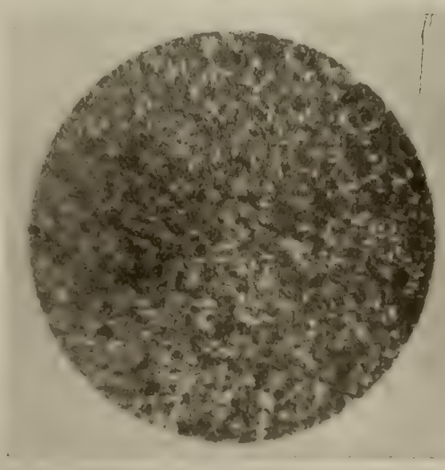


FIG. 1.

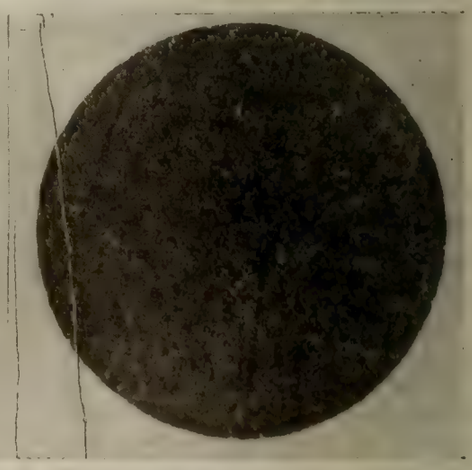


FIG. 2.

It being necessary for the shrapnel

shell to receive a final heat treatment, no strict specification covering the properties of the steel in the forging was required, whereas the high explosive shell not undergoing such treatment must possess the required physical properties before leaving the forging plant. The specifications covering this type of shell call for an elastic limit or yield of 19 tons, and ultimate breaking strength of not less than 35 tons, and not more than 50 tons, with an elongation in 2 in. of not less than 14 per cent. The maximum carbon content is 0.55 and while there apparently is no minimum the forging companies are not required to accept anything under 0.40 per cent. The minimum manganese content is 0.40 and maximum 1.00, sulphur and phosphorus under 0.05 and silicon under 0.30 per cent.

The shells are forged from either rolled or cast blanks; while many of the 4.5 in. and 6 in. shells have been forged from cast blanks, the tendency is to produce these types from rolled stock. The 6 in. and under are forged with a solid base. The 8 in. and 9.2 in. are forged with a solid nose, the blanks being cast with an tapered nose approximating the taper in the finished forging.

For the forging operation, the blanks are generally heated to a temperature of from 2000 deg. to 2200 deg., either in large continuous furnaces or in smaller batteries where the shells are all brought up to forging temperature together. The piercing, as a rule, is done in one operation and the shells cooled. The cooling is either retarded or accelerated according to the carbon content.

Where the carbon drops down to 0.40 per cent., accelerated cooling is necessary, whereas in the higher carbon steels the cooling must be retarded as much as possible. Practice in this respect varies in different plants and for the different types of shells. As a rule, low carbon heats are stacked in the open, considerable space being left between each shell for circulation of the air. High carbon heats are stacked closely, well protected from the air and may be covered with cinders or some similar medium to retain the heat. In no case is it permissible that the shells be in contact with each other during cooling. Test pieces are taken from each heat after forging, and any heats failing to pass the specifications are set aside to be normalized or annealed.

Failures and Their Treatment

Rejected heats may be either too weak or too strong and must be either brought up or toned down. Failures generally occur in those heats close to the minimum and maximum carbon content. Low carbon heats, showing a failure to reach the minimum breaking strength, low in elastic limit, and high in elongation, should be brought to a heat slightly above the critical range and cooling accelerated.

High carbon heats showing too great a strength and low elongation should be heated well up but not through the range and cooled slowly. It is not often that rejected heats fail to respond to the annealing treatment.

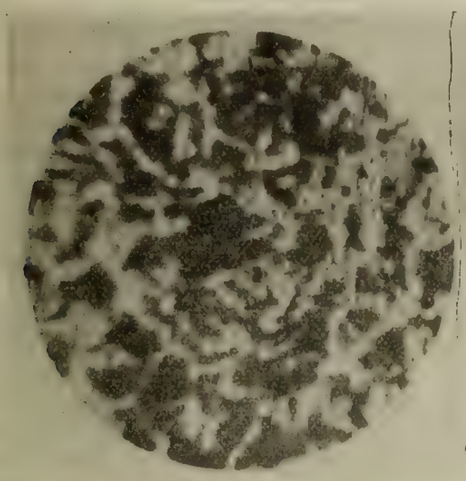


FIG. 3.

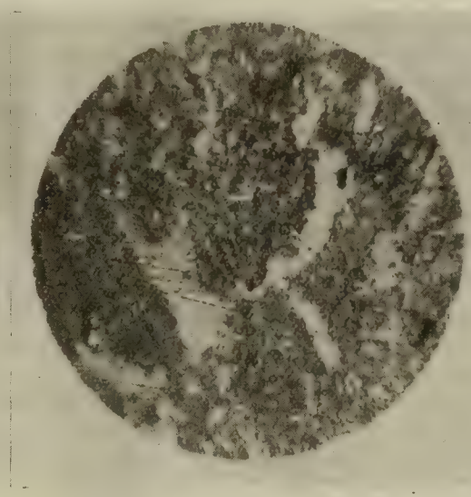


FIG. 4.

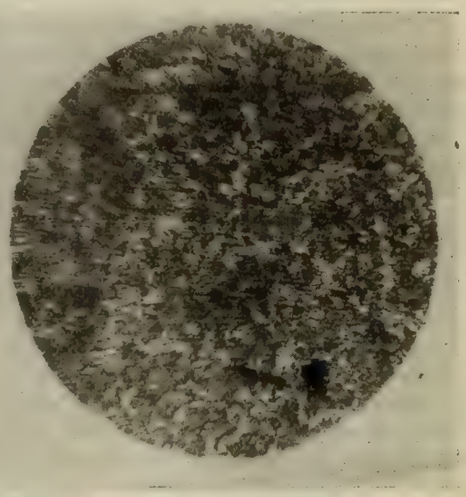


FIG. 5.

Some low carbon, low manganese heats, failing to respond to ordinary air cooling, have been brought up to strength by an air treatment which consists of forcing cold air into the interior of the shell, the exterior at the same time being subjected to similar treatment.

Fig. 3 shows the microstructure of a 0.40 carbon steel as forged which failed in the test, magnified 100 diameters. Yield, under 19 tons, ultimate breaking strength 34.5 tons, elongation 26.5 per cent.

Fig. 4 shows the same steel annealed at a temperature of 1400 deg. Magnified 100 diameters. In this specimen the heating has not been sufficient to break up the ferrite grain, yet the refining of the pearlite has added sufficient to the yield and ultimate breaking strength to pass specifications. Yield over 19 tons, ultimate breaking strength 38 tons, elongation 26 per cent.

Fig. 5, microstructure of a similar steel, 0.440 carbon, 0.76 manganese, heated to 1550 deg., cooling accelerated. Yield over 19 tons, ultimate breaking strength 48 tons, elongation 19 per cent. In this specimen the heating has been carried through the range, a new structure being formed.

Fig. 6 shows the structure of a 0.50 carbon steel as forged, and cooled quickly. Magnified 100 diameters. Failed too short.

Fig. 7, a similar steel as forged, cooling retarded. Magnified 100 diameters. The retarded cooling has permitted the normal amount of ferrite to separate out. This steel passed. Yield over 19 tons, ultimate breaking strength 38.7 tons, elongation 23 per cent.

While it is true that the munition industry in Canada has not developed anything new in heat treatment so far as the science is concerned, still the Canadian manufacturer has proven his ability to meet the demands made upon him. Eight hundred thousand completed shells

FIG. 6.

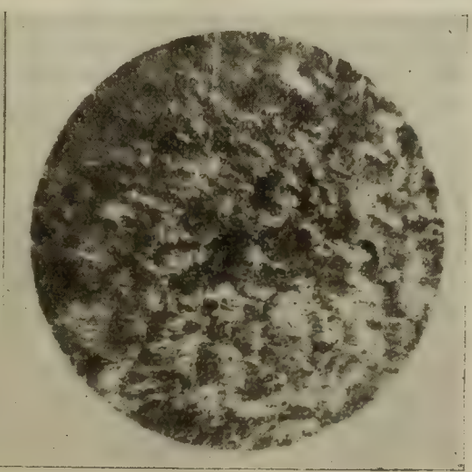


FIG. 7.

every week, a greater production of munitions than that of any nation before the war except Germany, is evidence of the part Canadian industry is playing in the Allied cause.

FUTURE DEVELOPMENT OF BRITISH INDUSTRIES

By L. E.

IT IS generally recognized that there must be at an early date a considerable expansion of the British manufacturing facilities, and it is very obvious that if British manufacturers are to be ready for the campaign after the war a great deal of preliminary work will have to be carried out. With the Englishman's inherent instinct of leaving till to-morrow what should be done to-day, very little actual scientific preparation has been even thought of, whilst little or nothing has been done.

It needs only a slight analysis of the position in shipbuilding, in the iron and steel trades, in textiles, in chemicals and other important branches of industry to demonstrate that great as may be the call upon a majority of these for war material the general demands of the world's markets, no less than the large requirements for reconstruction work in the vast territories devasted by the war, will make necessary an increase in output in all these departments of trade. If it be thought, for example, that the facilities for ship construction, which have been provided in the extension of existing and the new yards which have been put in operation since the outbreak of the war, will suffice to meet the demands of shipowners for new ships during the next few years, the idea should be dismissed. This applies to the iron and steel and other great industries.

It requires, however, an intelligent co-operation between the public authorities and land-owners in order that manufacturers seeking to find a factory site where the particular requirements of a branch of industry or business will be best met may be able to complete their arrangements with a minimum of trouble. At the present time, except for purposes of emergency war-work, no expenditure of either capital or labor can be made on the erection of new factories, but there is a great deal of preliminary work which it is absolutely necessary to carry out, including the acquisition of a suitable site, the preparation of plans, and the placing of contracts for construction and equipment in order that the factory may be ready for occupation at the earliest possible moment.

The railway companies have without exception created special departments to deal with questions arising out of the contemplated extension of manufacturing resources. Experience has shown that these new railway departments have served a very useful purpose, and that the information at their disposal has frequently enabled manufacturers to obtain sites in areas where the local conditions best satisfy the demands of particular trades. The attitude of the railway companies is easily understood. The attraction of new industries to the area served by them must result in additional sources of future traffic, and, as the majority of the principal railways are also port-owning authorities, they have a twofold interest in the transport side of commercial development.

On the other hand, only a few of the leading municipalities are taking a broad view of their responsibilities in this respect, and yet they can give immeasurable help to the manufacturer, but their general rule is to regard commercial development as being outside their sphere of influence. Perhaps the mistake lies in placing the sites-for-works branch of municipal activities in the hands of the town clerk or borough surveyor, who is usually overburdened with work and who naturally regards the new task thrust upon him as coming at the end of an interminable list of duties. The only sensible method is to create a new department entirely and to let it co-operate with the existing departments of municipal enterprise. Some action will soon be needed by all British municipalities to devise means whereby their vacant lands can be laid out to the best advantage to serve all the new manufacturing interests and the developments of the old ones, in the commercial struggle which looms ahead.

BOILER FAILURE DUE TO INCRUSTATION

THE formation of a hard boiler incrustation, consisting largely of silicates, was the apparent cause of a peculiar boiler failure, which was reported on recently in the "Chemiker Zeitung."

A series of boilers had for some years been installed in some works, and the boilers, which were in uninterrupted use, had been cleaned every three months. Under the pressure of work the cleaning had to take place at intervals of four or five months; then a crack developed in one of the boilers; the boiler was quickly repaired without much inquiry into the cause of failure, and then a second boiler failed, exactly in the corresponding spot. The boilers, which were combined with superheaters, were provided with two internal flues, which were corrugated in the front part; the cracks occurred in the straight flue near the corrugation. The examination proved that the iron was sound, but that the incrustation was locally abundant and of unusual composition.

Ten samples were taken of the deposit, which was hard in some parts and muddy near the superheater end, and which varied locally in composition to an extraordinary degree. The carbonates were always low, about 1 per cent.; the lime (CaO) percentage ranged from 1 up to 24, the magnesia (MgO) percentage from 2.7 to 25, the calcium sulphate from 2 per cent., up to 83 per cent., the silica (SiO_2) from 9 per cent. to 59 per cent., and the percentage of iron and aluminum oxides (together) from 0.2 to 59. The iron did not come from the water, but from the boiler plates, which were corroded near the superheater end. The silica percentage was high in general, highest in the muddy portion.

The hard scale, which seemed to be responsible for the local superheating and cracking of the plates, contained 36 per cent. of SiO_2, 2.4 per cent. of iron and aluminum oxide, 20 per cent. of CaO, 8.3 per cent. of MgO, 48 per cent. of $CaSO_4$, and had also a high percentage (6) of water of hydration. The feed water came from two sources, one of which was rich in silica; such feed water is not worth chemical softening sometimes, but may be used when the boilers are frequently cleaned. A further study on silicate boiler scales is to follow.

ELECTRIC STEEL MANUFACTURE IN DENMARK

A COMPANY has been formed in Denmark, with a capital of 600,000 kronen, for the manufacture of steel from scrap, which is being smelted and refined and a little new iron added. It is said to be the same process which the Krupp works use for the manufacture of their best guns. To commence with, the new undertaking will confine its work to the production of smaller articles, machine parts, etc., but it is proposed to extend it. ere long, also to comprise heavy ingots by the Siemens-Martin furnaces, of which so far only one has been in use in Denmark—in the Burmeister and Wain establishment. Scrap is said to be available in sufficient quantities, but up to now it has principally been exported to Sweden. The new company, consequently, is fairly independent of foreign supplies, which is a very important point under the present circumstances. The undertaking is backed by several prominent men, and the installations will ultimately be on a large scale. The foundry building is two-storied, and has a length of over 100 m. Operations will commence probably by the end of November, and work is expected to be in full swing in the beginning of the new year.

AMERICAN dyestuff manufacturers are now producing large quantities of toluidines, resorcin, xylidine, dianisidine, naphthylamine, diphenylamine, tolidine, benzidine, benzaldehyde, benzylchloride, nitrobenzol, nitrotoluol, H-acid, phthalic, metanilic, saulfanilic, and naphthionic acids, naphtholsulfo acids, naphthylaminsulfo acids, and amidonaphtholsulfo acids, Schaeffer's salt, paranitraniline, dimethylaniline, and numerous others.—United States Commerce Report.

A 10 per cent. aluminum bronze to which was added 1 per cent. of 30 per cent. manganese-copper had the following physical properties: Ultimate strength, 63,800 pounds per square inch; elastic limit, 19,700 pounds per square inch and elongation in two inches, 49.3 per cent.

Press Work Operations in Hospital Equipment Production-II.

By D. A. Hampson

Operations possessing marked features of economy, adaptability and lack of intricacy in the finished product are characteristic of the work described. The factors of labor cost, quantity production, necessary degree of accuracy, and cost of dies are related to each other in a manner which must receive careful consideration if successful results are to be obtained.

MANY articles of hospital equipment sent abroad must be shipped knocked down. This necessitates a construction that can be assembled by hand or with the use of hands and hammer only and to secure this end, various links and connecting pieces are required.

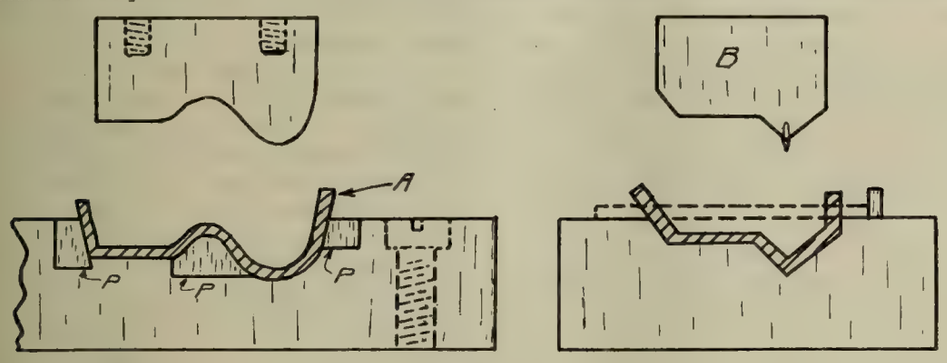


FIG. 1.

The piece "A" is a connection that is punched out of ⅛ in. iron and afterwards formed to shape. The upper and lower dies for this are shown. For some of the bent pieces, the smaller ones, the dies are made in one piece of tool steel but if the piece is large or of a shape that is likely to give trouble in hardening, the body is cut out of soft steel and hardened pieces inserted at the points of wear as at the points P, dotted in the drawing. Some trouble was experienced in controlling the action of the pieces being formed when between the dies, due to the slipping and sliding which is bound to occur. Clamps or spring holders could be used for this trouble but a better way is shown on the die B where the work draws away from the set position. Two points like prick punch ends are inserted in the upper die and they strike first, making impressions deep enough to prevent any drawing.

An Improvised Feed Attachment

Another piece was wanted by the twenty thousands, of a shape tapering from ⅜ in. to ⅛ in. made of 1/16 in. steel. This steel was purchased in ½ in. wide, strips 4 ft. long and was run under the punch between the usual guides and strippers. As the machine had no feed, the arrangement shown was attached to the ram to secure that even spacing which makes for economy and speed. The machine was speeded down to 40 revolutions per minute and the operator had no trouble in following it. A spring plunger was attached to the back of the ram, the plunger at its upmost position just nicely clearing the stock and coming down ahead of the punch. The operator shoved the strip under the plunger as soon as it was up but the latter immediately descended with the plunger inside the space and the operator had time to shove the strip through until it struck the plunger before the punch had reached its cutting position.

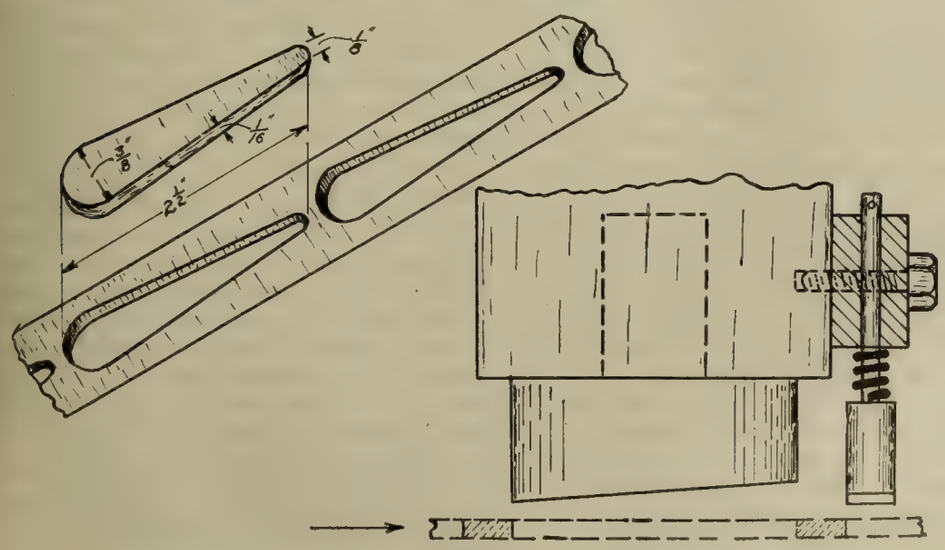


FIG. 2.

Pipe and tubing and rods enter largely into the construction of cots and operating tables etc. The rods are cut off in a punch with the punch and die shown. The construction of this is very like that of the angle cutter previously described. That pipe could be successfully cut off by shearing is doubted by most machinists until they see it done; they will naturally say that the upper half would collapse or that a piece would have to be used inside. Shearing does not make a real clean job but it makes one that answers the purpose in this case at least. The pipe does close up a little but not enough to be objectionable.

A further pipe job done on the punch is the closing of ends which are generally closed on the anvil. Such pieces are wanted for braces or ties and have a hole punched in the flattened ends for the rivet fastening.

Various Processes

Though having no connection with press work, the practice on some other jobs is of interest. The ⅜ in. and ½ in. iron rods which enter so largely into chair and stand and bed work are bought in coils. As wanted these are run through a straightening machine, which also cuts them off to length. There is thus no waste of stock and a saving is effected in buying the rods in coils as against mill length.

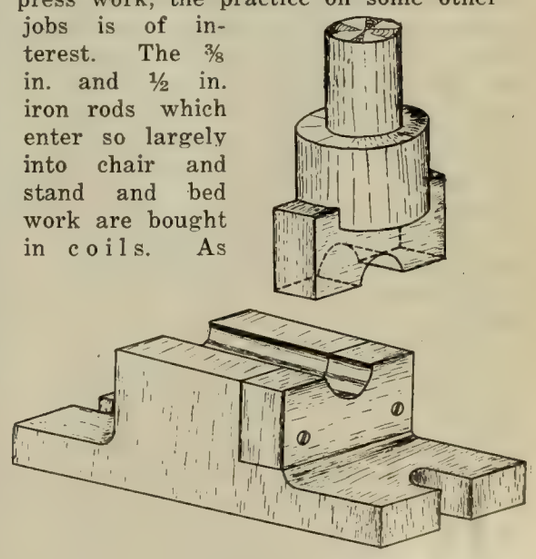


FIG. 3.

As in automobile body practice, stands and chairs and cots are dipped for painting. The process is usually continuous by means of an overhead conveyor system and the approaching chair is lowered in the tank of sanitary white enamel and raised, drips off on to a drain board as it goes, and passes into the oven.

The sockets for hospital beds are cast directly on the ends of the angles which form the side rails. To make the iron a

tight and staying part of the angle, a pin or some sort of projection has to be raised on the end being surrounded. One simple way to do this is to set the punch and die (previously described) so their vertical faces do not touch as in regular practice. As every press hand knows if they were separated from 1/32 in. to 1/16 in. they would slur or bend over the end of the piece being sheared. In this case, that is desirable and the burr forms all the grip required.

PERMANENT CAPACITY FOR AIRCRAFT MANUFACTURE A FUTURE NECESSITY

STUDENTS of events are being more and more impressed with the certainty which pertains to the future development of flying. Conditions and circumstances where this means of locomotion will be paramount are already foreseen; indeed, in certain quarters it is believed that the prospective permanent capacity of those aircraft plants which may remain in the business after the war will be entirely inadequate to meet demands. Certain parts of Canada have had ample opportunity of becoming familiar with aeroplane work, but geographical and social conditions in Europe point to an intense application of this latest art. At a recent discussion before the Aeronautical Society the commercial future of aircraft was discussed, and it was shown that by means of air services Paris can be brought within three hours of London, Rome within 12 hours, and Petrograd and Constantinople within a day's journey. With regard to the costs of running an aerial service, statistics have been compiled showing that it would be possible to commence an aerial service between London and Paris for total costs of 4s 8d per mile, and that such a service could be made to pay at a comparatively modest charge for passengers and mail traffic.

In any case, whether these estimates can be realised or not, it is certain that the aeroplane is going to be used by business men for business purposes. No other mode of transport can touch it. For mail services, it seems certain that the aeroplane can by virtue of speed and moderate cost per letter compete effectively with existing mail services. Specialised services of all sorts will also come into operation. The aeroplane will provide a means of communication for moderate-sized communities in the overseas Dominions pending the development of railway services, and will also act as a feeder for existing railways until development warrants their extension. The case for the extended use of aeroplanes for commercial purposes is quite sound, and needs no further argument.

Manufacturing Capacity

A point which needs to be borne in mind is, if the present manufacturing capacity, which has failed to provide for the full needs of the war, will be sufficient to meet the demands which will set in after the termination of hostilities for commercial aircraft. There is a general impression that it will not. Many of the works which are at present engaged in the production of aeroplanes and aeroplane engines or are acting as sub-contractors for the supply of parts, have only undertaken this branch of manufacture to meet the national emergency, and in very many instances, owing to the fact that it is emergency work for which their equipment is not well fitted will cease to participate in this industry after the war.

On the other hand, some of the firms now engaged in aircraft manufacture intend to make this their permanent business and are laying plans for considerable extensions either on new sites or adjacent to their present headquarters. This branch of business should lead to the development of many areas where there is ample land available not merely for the erections of works, but for the flying grounds which should be provided in conjunction therewith. One famous Midland town is already in negotiation for the establishment of a large new aircraft factory on a favorable site, and this is only one example of a tendency which is sure to be widely followed by those who are anxious to obtain a footing in what promises to be a lucrative branch of industrial enterprise.

Many of the smaller towns are admirably adapted for works of this description owing to the ample character of the sites available, and the price at which land can be acquired for aerodrome purposes. It is a department of manufacture which above all others ought to be specially catered for by those districts whose industrial importance is still in the making. Even apart from the great use which is certain to be made of the aeroplane for commercial purposes, the military demand is certain to be on a very large scale for many years to come. If there is one lesson of the war which emerges more plainly than any other it is that Great Britain must be as supreme in the air as she has always been on the sea.

Lines of Development

It might have seemed at one time as if the manufacture of aircraft would have been the natural heritage of motor car manufacturers, and although it is probable that many of the leading motor firms will be associated with the new developments the lines of progress are not identical, and the many problems which have to be attacked will lead to the establishment of an entirely independent industry. The aircraft engine of to-day is already as little like the standard motor car engine as that engine is akin to the variety used on a commercial motor vehicle or that installed in a motor boat. The aircraft engine is quite a disinct branch of the development of the internal combustion engine. Hence the need for independent factories where the problems to be solved can be approached free from influence connected with old practice, and quite divorced from any association with motor car manufacture, which is governed by very different conditions.

Industrial development committees who are giving attention to the question of sites for new works would do well to give special consideration to the needs of aircraft manufacture and endeavour to attract to their districts a branch of enterprise which is destined to progress by very rapid strides.

A NEW British-built magneto based on French designs, which will give a firing spark at exceedingly low turning speeds, is being made. Report states it cannot be injured by high revolutions, while at the same time it will furnish current for lighting the lamps. The *Commercial Motor* understands that the experimental model has been run well over 100,000 miles, and that the type will be shortly standardised on the cars of one of the oldest and largest manufacturers on the continent.

"BORRODISING" is the name given to a system of electro-deposition of zinc which has been introduced as a preventive against corrosion of the steel fittings of aeroplanes and seaplanes. It is described as a method of cold electro-galvanizing carried out in such a way that the zinc so unites with the underlying metal that only by extreme wear can the surface of the steel be exposed. As the metal is not subjected to the usual pickling bath prior to the galvanizing, it is claimed that there is no reduction in the strength of the metal after treatment.

BEFORE the war the Germans obtained annually about 900,000 tons of iron pyrites from Spain for the manufacture of sulphuric acid, and they themselves produced about 300,000 tons every year at Megen, in Silesia. In 1912 and 1913, however, they increased their purchases from Spain to 1,200,000 tons per annum. Owing to the stoppage of the Spanish supplies by the war, they had to look about for other sources, and have, no doubt, found some in occupied Poland, and small quantities also in Greece and Turkey. Besides this Germany has received about 400,000 tons of pyrites annually from Norway.

IT is said that the United States of America, as a result of the quiet but unceasing efforts of foreign buyers, have been stripped of their supply of seasoned spruce and walnut. The former is used in making the struts and braces of aeroplanes, while the propellers are almost exclusively manufactured of walnut wood. As it requires three years to properly "cure" this material, the United States aeroplane makers are confronted by a serious situation. The remedy suggested is Government purchase. It is proposed that the Government, through the Bureaus of Standards and of Forestry, should enter the market for sufficient quantity of the lumber to tide over the emergency, selling to the smaller manufacturers quantities of the stock as they may be required.

WHAT IS HARDNESS?

JUDGING from recent discussion of the subject, the peculiar property or combination of properties which constitute hardness in one substance, may be altogether different in another substance which would ordinarily be termed hard. In the great majority of engineering applications hardness is assumed to be indicative of resistance to wear by abrasion. In other cases where results have to be proven, it is utilized as an indication of strength in one or other of known aspects.

Just what qualities in a metal can be relied on as a guide to abrasive resistance can not be absolutely specified in a manner suited for general application, because of the lack of a precise definition of hardness. The matter is treated at some length in an editorial article in which "The Engineer" discusses Professor Turner's definition as advanced by him recently. The writer says, we may tentatively advance the view that hardness is not a separate property of a material as its density, specific heat, or elasticity is, and we would suggest that the definitions of hardness hitherto propounded fail, and the various means of measuring it are unsatisfactory, because the combination of properties that we call hardness in the case of one body is not always the same combination that gives us hardness in another. There are some grounds for thinking that there is not one scale of hardness, but many, and, therefore, that not one definition but several are required, and that one means of measuring hardness cannot be universally applicable to all materials.

Scratch Test

Among the different methods that have been proposed for determining "hardness" the scratch test, due in the first instance to Professor Turner, no doubt appeals to us as being most directly in keeping with our primitive conception of the property. It certainly has the sanction of immemorial custom. Yet, when we come to analyse what a scratch is we open a field of controversy from which but one fact clearly emerges, namely, that all scratches are not necessarily of the same nature. It is possible, as our readers can easily verify for themselves, to scratch vulcanite in at least two different ways. With a fairly blunt point and but little pressure the scratch is produced apparently by causing the material to flow from beneath the scratching point to either side. There is no perceptible removal of material in this case. With a sharper point, or with a greater pressure behind the blunt point, the scratch apparently is produced almost entirely by the removal of the material in a powdered form. Some materials scratch in one of these ways, others in the other. Thus, a scratch on lead can be made by causing the material to flow, while the mineral calcite is scratched by the direct removal of material in a powdered form. Now lead and calcite both possess what we call hardness. Yet from the radically different manners in which they scratch it seems obvious that their hardnesses, as determined by the scratch test, are not of the same nature. The "scratchableness" of lead—if we may use the word—seems to be due primarily to the viscosity of the metal, while the scratchableness of calcite appears to be due to a low degree of cohesion among its particles. Either then the scratch test does not measure "hardness" at all, or it really does, in which case we seem led to believe that hardness in lead is a radically different property from hardness in calcite. If this is so, it seems absurd to attempt to measure the two hardnesses by means of the same instrument, for it appears obvious that the two figures arrived at cannot be comparable.

Brinell Test

It is quite possible, of course, to measure the "hardness" both of lead and calcite by means of a scratch test instrument. That, however, is no proof that the two hardnesses are physically of the same nature. On the other hand, it is not possible to measure the "hardness" of both substances by means of the Brinell method. This method is suitable only for ductile materials like lead. It would fail entirely to give any result with a brittle material like calcite. If our theory is right the explanation is obvious. The Brinell test can only measure the hardness of a material if the hardness of that material is primarily due to the degree of viscosity that it possesses. We are aware that the Brinell ball test figure is very generally regarded as being a reflection of the yield point of the metal tested, and to suggest that it should properly be regarded as a measure of the viscosity of the solid material at normal temperature is to introduce something of a new—and possibly contentious—conception. That the phenomenon of viscosity exists in certain solids, including ductile metals, as well as in the classical examples of pitch and shoemaker's wax, is, however, admitted. That it is the cause of one form of hardness, and that it is measured when we measure the hardness of a ductile metal by the Brinell test, seems to be a reasonable suggestion, particularly when we note that both viscosity and hardness decrease with rise of temperature, and that viscosity and the Brinell ball test figure are both measured in terms of force per unit of area.

Hardness and Abrasion Resistance

If we admit that there are at least two important different kinds of hardness—one a viscous hardness, as measured by the Brinell test, and the other a cohesive hardness, as measured by the scratch test—some light can be thrown on the relationship existing between hardness and resistance to abrasion. In nine cases out of ten, in practical work, hardness in metals is desired because it is commonly accompanied by an enhanced resistance to wear or abrasion. In about nine cases out of ten, too, hardness and resistance to abrasion are regarded as synonymous. It is not possible at present to say what the relationship between these two properties is; but it is hard to believe that there is any difference other than one of scale between the resistance of a metal to abrasion and its hardness as measured by the scratch test, provided the metal is one to which the scratch test can properly be applied. In both cases a direct removal of material is involved. On the other hand, no simple rough connection can be traced between the viscous flow of a ductile metal under the Brinell ball and the resistance of the metal to abrasion. In one case there is not, in the other there is a direct removal of material, and it would indeed strike us as strange if a test that involved no removal of material could give any satisfactory indication of the result of another form of test that does.

Conclusion

Experiments, so far as we know, are lacking as to the relationship between resistance to abrasion and hardness as measured by the scratch test. It is otherwise in the case of the Brinell test. Dr. Stanton's experiments at the National Physical Laboratory show very definitely that the Brinell ball figure is absolutely worthless as an indication of the resistance of a metal to wear. The ratio between the Brinell hardness figure and the resistance to abrasion varies quite erratically from—in the series of steels tested—0.7 to as high as 64. On examination of the nature of the metals tested it will be found, we think, that in general they are not such as would be expected to owe their hardness to a high viscosity. They are manganese steels, gauge steels, and other steels that have been toughened or hardened by heat treatment or otherwise. We can readily believe that they owe their hardness to a high degree of cohesiveness among their particles, and we would, therefore, suggest that good agreement might be expected between their resistance to abrasion and their hardness as tested by the scratch method. Their hardness is the hardness of calcite and not that of lead. That a method and instrument which can take cognisance only of the latter type of hardness should be able to predict their resistance to abrasion is not, we think, to be expected.

IN co-operation with the Bureau of Mines, an investigation of the electric melting of brass is being conducted at Cornell University. The experiments indicate that the use of a suitable electric furnace will materially reduce melting losses and the Bureau of Mines now is testing an electric furnace built according to the design worked out by the laboratory tests. This furnace is of commercial size and is being tested with a view to ascertaining its suitability for such processes as are used for cartridge and shrapnel cases.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

NOTES ON THE MANUFACTURE OF CLAY CRUCIBLES

By G. C. White

THE manufacture of crucibles is an industry but lately developed in Canada. Its introduction has been necessitated by unprecedented consumption, high cost, and the difficulty of getting any quantity when required without any delay. Formerly those crucibles made from German clays were the best, and when it became necessary to use American clays the results obtained in the experimental stage will long be remembered as totally unsatisfactory.

It was found that although the analyses of clays resembled one another there was a vast difference in their resistence to heat and binding power, which two details are obviously the prime requisites of good crucibles. A simple test to establish these factors can be arrived at by making up patties in the laboratory, placing them on a piece of boiler plate, and applying heat. The relative shrinkage, bond, and fusibility can then be observed in a general way

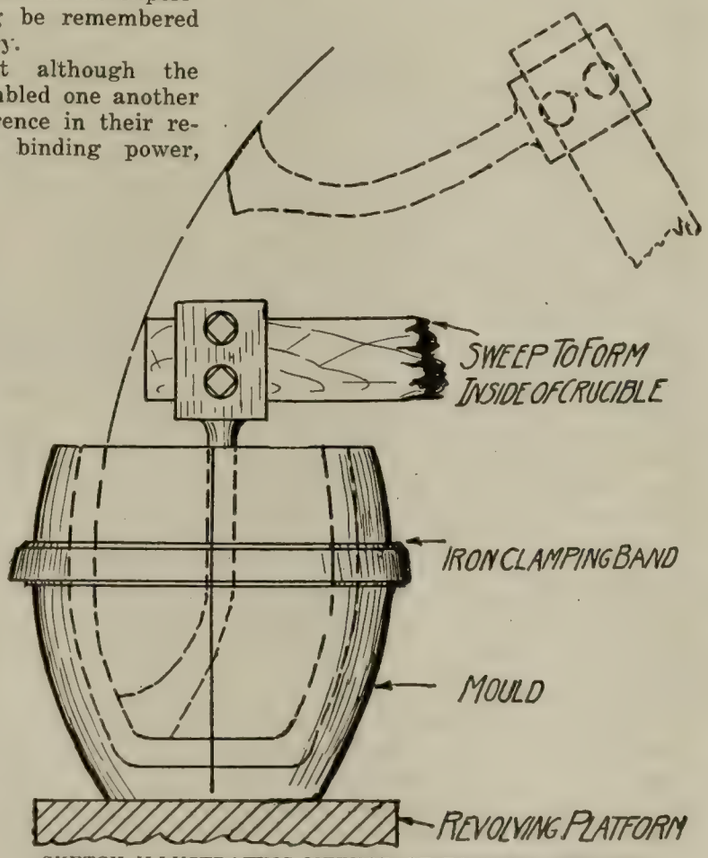
Composition

Like a commercial fireclay, the mixture for crucibles must be varied to suit the service conditions. For example, too much silica permits of crumbling—although it is fire resisting, it fluxes easily at sometimes low temperatures. Alumin is refractory and has good binding power, while magnesia, manganese, iron, lime, etc., are injurious. Slight additions of coke cut down the shrinkage during drying. The quantity of water present in the clay is important as it affects the general character of the structure of the clay. Its content should not be too low, about 10 per cent. being preferable. A few analyses collected from various sources will show the variations of clays from different localities.

	German	Bohemian	American	English
SiO_2	64.9	45.6	74.9	73.6
Al_2O_3	23.8	39.0	17.20	16.50
Fe_2O_3	0.8	0.5	0.79	0.27
CaO	...	0.6	0.29	1.17
MgO	0.5	0.1	0.46	0.21
Alkali	1.4	0.5	1.61	5.84
Water	8.4	13.6	5.44	2.45

The rational analyses of the above show that the clay substance varies from 100 to 33.5 per cent., quartz 0 to 40.72 per cent., and felspar 9 to 25.31 per cent.

In making the crucible the clay is proportioned and thrown into the mill which is in reality a mixer. The mill is a vertical cylinder split at the vertical center line to permit of cleaning. The mixer blades are helically inclined and tend to force the mixture to the bottom of mill where a conveyor screw forces the clay out through an orifice which forms an 8 inch diameter sausage. This sausage is put into a revolving mold which is split on the vertical center line. A sweep or arm, having the profile of the inside of the crucible desired to be formed, is now forced down through the center of the clay gradually shaping it, as shown in sketch. When the shape is satisfactory the mold is stood on a post and rocked to loosen crucible. The top of the post is the shape of the removable bottom, or else the mold is opened up, permitting the crucible to remain on the bottom of mold if this is more convenient. The molds are of wood, canvas, silk or jute, and lined and well oiled each time before they are used. A heavy black oil is satisfactory, such as car oil.



SKETCH ILLUSTRATING METHOD OF FORMING CRUCIBLE.

The drying time is approximately 2 months and the temperature is varied, increasing as the operation progresses and starting at 200 deg. Fahr. The preliminary heating is done with steam coils and must be very slow as on this heating and the moisture content depends the ultimate structure and strength of the product. Annealing must be done when the crucibles are to be used and the charge must be put in while the crucibles are hot. If the crucibles are allowed to cool after annealing they are useless for the purpose for which they were intended. This annealing is done at 1,300 deg. Fahr. and takes from 12 to 15 hours.

The life of a crucible depends to a large extent on the quality of the steel being melted, which in turn governs the quality of the slag. The slag line cuts into the interior of the crucible, at slightly above the middle, consequently the crucible is weakened at this point and, provided it is strong enough for another charge, the next one is figured so that the second slag line comes below the first slag line. The life is, therefore, from 1 to 3 heats. The absorption of carbon by the steel when made in a clay crucible is practically nil.

Several American companies have gotten away from their crucible troubles by melting in electric furnaces but the high cost of power in some localitities makes it necessary that Canadian manufacturers develop the manufacture of crucibles.

THE MANUFACTURE OF HARDENED THREAD GAUGES—II.*

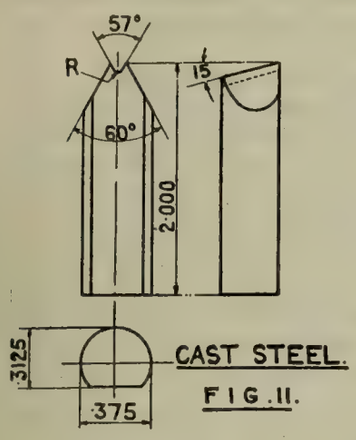
By G. Doorakkers.

THE operations on the male master tool are now proceeded with. Cut off a piece of 7/16 in. diameter silver steel 4.781 in. long, and after removing the tit, centre both ends with a ⅛ in. Slocomb combination centre. Then turn the diameter to .400 in.

Reduce both ends to .218 in. ¼ in. up, so that the middle part measures about 4.278 in. in length. Turn a nick in the middle with a 3/16 in. wide parting tool to about ¼ in. diameter, so that the length of the two large diameters is 2.045 in. Then mill a flat over the total length, so that the distance from the flat to the outside diameter measures .330 in., and rough mill the shape of the two 55 deg. points, taking care to run out with the cutter, so as to leave the centres in. Harden both points. Rough grind diameter to .380 in., and finish grind to .375 in. Then grind the flat to .3125 in. As the centres are now no longer wanted, the reduced ends can be ground off, and the points roughly ground to shape on a cutter grinder.

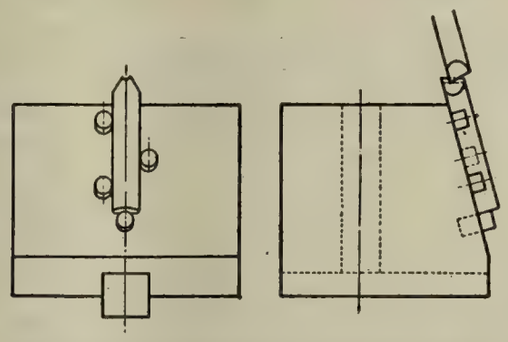
*Contributed to a recent number of The Engineer. No. 1 appeared Oct. 25.

The next operation, the grinding of the angle, is performed on the angle fixture (see Fig. 3). After this operation the two tools are parted with an elastic wheel, and the back of each tool is ground perfectly flat in a true solid chuck. The point is then rehardened, the diameter cleaned, and the flat lapped. The tool is then finally ground on the radius fixture, and the number of threads etched on.



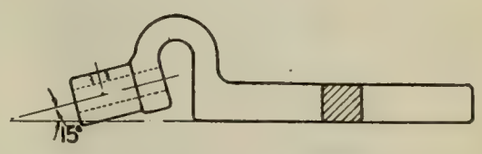
CAST STEEL.

FIG. 11.



FIXTURE FOR SHAPING FEMALE RADIUS TOOL.

FIG. 12.



SPRING TOOL HOLDER FOR SHAPING FEMALE RADIUS TOOL.

FIG. 13.

Female Master Tool

We have now obtained a tool which will cut the flanks and the radius at the bottom of a screwed plug, but we still want the tool which cuts the correct radius on the top of the thread.

Fig. 11 shows this female radius tool. It will be seen that the tangents to the radius have been taken at 57 instead of 55 deg., to ensure a blending of the radius with the flanks. The error caused by this difference is so small that it can be neglected. The radius is formed with a tool of the required shape, held in a special spring tool holder—Fig. 13—on a shaping machine. The female radius tool is held on a fixture—Fig. 12—and first roughed out. The special holder and tool are only used for the final shape of the radius. The tool used must have an included angle of 57 deg. and the correct radius. This 57 deg. tool can be ground on the radius fixture by changing the peg of diameter d into a new diameter d_1. The angle of the tool in the cutting edge is 57 deg., but the tool is again tilted at an angle of 15 deg. The tangent of half the angle in the vertical plane $= \dfrac{\tan 28\frac{1}{2}\text{ deg.}}{\cos 15\text{ deg.}}$ $= 29$ deg. 20 min. 26 sec. The angle a—see Fig. 8—of the existing radius fixture is 72 deg. Peg d is changed into d_1 by inserting a peg of the new diameter.

In Fig. 14

a = complement of 29 deg. 20 min. 26 sec. + b_1.

72 deg. = 60 deg. 39 min. 34 sec. + B_1

b_1 = 11 deg. 20 min. 26 sec.

$$\text{Sin } b_1 = \frac{\frac{1}{2}(D + d_1)}{R}$$

$$\text{Sin 11 deg. 20 min. 26 sec.} = \frac{\frac{1}{2}(D + d_1)}{R}$$

$$= \frac{.250\text{ in.} + \frac{1}{2}d_1}{2.4375}$$

$\frac{1}{2}\ d_1 = 2.4375 + \sin 11$ deg. 20 min. 26 sec. $- .250$ in. $= .47901 - .250 = .22931$

$d_1 = .45862$

The radius is measured on a gauge made in exactly the same way as the one shown in Fig. 9, except that the tool for locating the top plate is now 57 deg. The distance K G alters and also the distance from the sharp point to the top of the radius of the tool. The radius is, of course the same as for the standard 55 deg. tool = .137328 P—see Fig. 1.

$$\text{In Fig. 15: O A} = \frac{R}{\sin.\ 28\text{ deg. } 30\text{ min.}}$$

$$\text{A M} = R\left(\frac{1}{\sin.\ 28\text{ deg. } 30\text{ min.}} - 1\right) =$$

$1.09574 \times .137328\ P = .150475\ P.$

In Fig. 15

B = half the angle in section A C = 29 deg. 20 min. 26 sec. Assume again the distance from the back of the tool to the top of the radius equals O. Then O = L — (K G. + .150475 P), K G = K H — G H where K H is measured, and the calculation of G H is as follows:—

$$\text{A C} = \frac{d}{2 \sin 29\text{ deg. } 20\text{ min. } 26\text{ sec.}}$$

$$\text{A D} = \frac{\text{A C}}{\cos 15\text{ deg.}}$$

$$= \frac{d}{2 \times \cos.\ 15\text{ dg.} \times \sin.\ 29\text{ dg. } 20\text{m. } 26\text{s.}}$$

$$\text{E G} = \frac{d \tan 15\text{ deg.}}{2}$$

$$\text{G H} = \text{H F} + \text{A D} + \text{E G} - \frac{d}{2} + \frac{d}{2 \cos 15\text{ deg.} \times \sin.\ 29\text{ deg. } 20\text{ min. } 26\text{ sec.}} + \frac{d \tan 15\text{ deg.}}{2}$$

$$= \frac{1}{2} d \left(1 + \frac{1}{\cos.\ 15\text{ deg.} \times \sin 29\text{ deg. } 20\text{ min. } 26\text{ sec.} + \tan 15\text{ deg.}}\right)$$

At this point in the manufacture the gauge was again checked with a 3/16-in. and a ¼-in. ball.

The measured distance K H over the 3/16-in. ball was .6375.

The measured distance K H over the ¼-in. ball was .7431.

The calculated distance G H for the 3/16-in. ball was .3170.

The calculated distance G H for the ¼-in. ball was .4226.

The distance K G for the gauge in question is, therefore K H — G H = .3205.

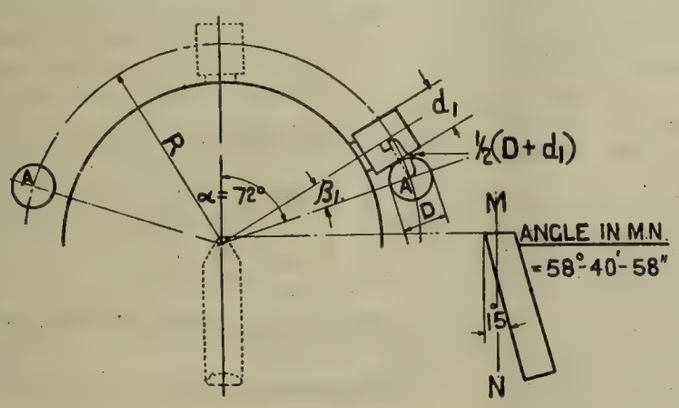


FIG. 14.

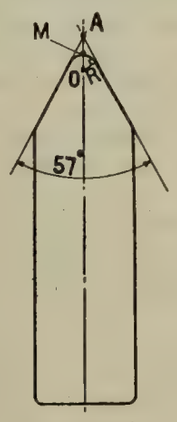


FIG. 15.

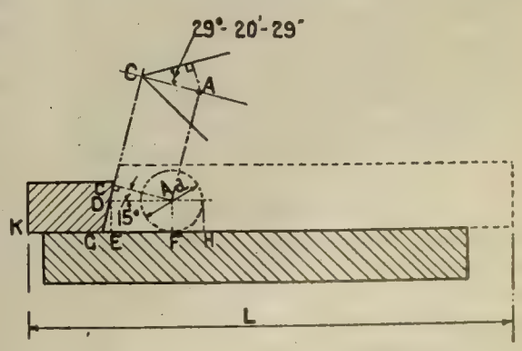


FIG. 15 B

That distance is again a constant, and can, therefore, be etched on the gauge.

First example.—The distance L for a fourteen thread 57 deg. tool measures 2.2700.

$$O = L - (K\ G + .150475\ P) = 2.2700 - (.3205 + .01075 = 1.93875.$$

Second example.—The distance L for a twenty-four thread 57 deg. tool measures 2.2687.

$$O = L - (K\ G + .150475\ P) = 2.2687 - (.3205 + .006269) = 1.9419.$$

The operations on the female master tool are as follows:—

Cut off, face one end, and centre that end with a Slocomb combination centre. The diameter of silver steel used is 7/16 in., and the length is 4.260 in. Face and centre other end to 4.250 in. length. Turn diameter to .390 in. Nick middle to .250 in. diameter and .187 in. wide, leaving two lengths of 2.031 in. Then mill a flat along the whole length to .330 in. and mark the number of threads on the flat. Rough grind diameter to .380 in. and finish grind to .375 in. Grind flat to .3125 in.; after grinding the flat the tools can be parted. The tool is now ready to be roughed out on a shaping machine. The radius is shaped as mentioned before, with the 57 deg. tool in the special tool holder. After that harden the point and clean.

Use of the Master Tools

We have now obtained our master tools, and with their help we can make our tools for cutting internal and external gauges. As it is essential to cut the thread upright a setting piece was made—see Fig. 16.

The cutting edges for both internal and external tools are 1/16 in. under centre, in order to obtain the relief which is necessary for all circular cutting tools. The shape of the thread; therefore, has to be correct 1/16 under centre, and the master tools have to be set that same distance under centre. The setting piece must, therefore, be cut away 1/16 in. under centre, and the angle must be 55 deg. in that section. In a section through the centre line the angle becomes slightly larger.

The calculation of the new angle is as follows:—In Fig. 17:

$$O\ A = 1.500 \text{ in. } O\ D = .065 \text{ in. } A\ B = C = .3750 \text{ in.}$$

$$A\ D = \sqrt{(1.5^2 - .6225^2)} = 1.4987.$$

$$B\ D = A\ D - A\ B = 1.4987 - .3750 = 1.1237.$$

$$O\ B = \sqrt{(B\ D^2 + O\ D^2)} = \sqrt{(1.1231^2 + .0625^2} = 1.1254.$$

$$C_1 = O\ A - O\ B = 1.500 - 1.1254 = .3746.$$

$$M\ L = C_1 \tan a = \frac{.1955}{M\ L} = \frac{.1955}{.3746},$$

$$a = 27 \text{ deg. } 33 \text{ min. } 35 \text{ sec.}$$

The included angle of the gauge is, therefore, 55 deg. 7 min. 10 sec.

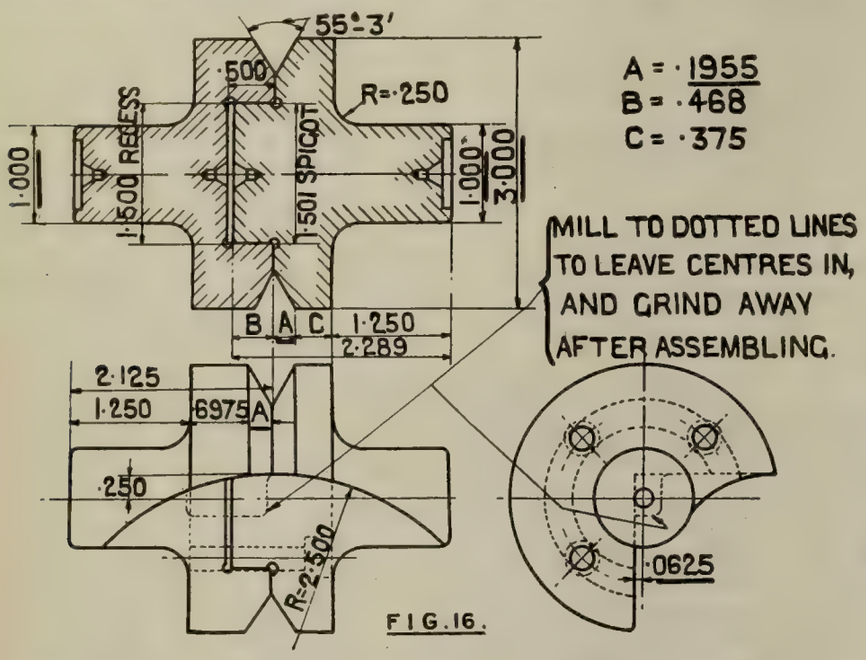


FIG. 16.

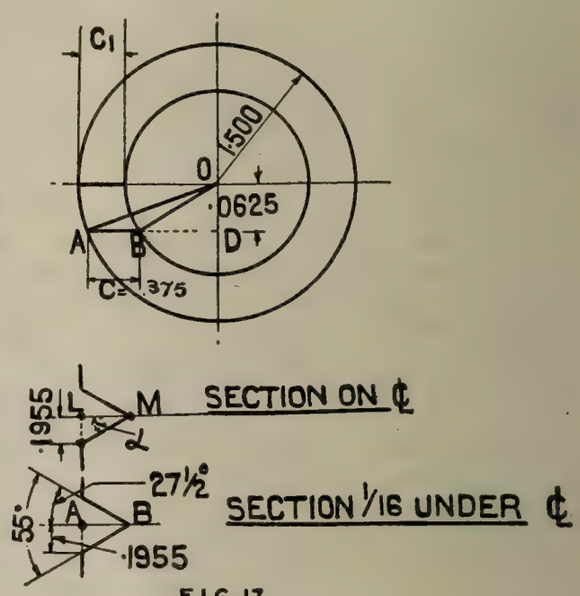


FIG. 17.

PATTERN-MAKING NOTES—TURNING

By J. W. Broadbent

WHY the average pattern shop should be the dumping ground for all the worn out lathes in the factory, is a difficult question to answer. Some manufacturers regard pattern-making as a total loss, and the loss indeed becomes real, when in the course of a few months enough time is wasted adjusting the tool rest and tailstock as would purchase a "good" lathe.

One pattern shop will have a lathe with a wooden bed, the tool rest support being secured to the bed with a hardwood wedge, and every time the lathe is started, it will have a tendency to take a flight across the room, owing to being too light for a speed lathe, and not securely fastened to the floor. Another again will have a bolt and nut for the clamping arrangement of the tool rest and tailstock which necessitates using a wrench—and the wrench is always missing from the lathe when wanted.

The lathe is the most indispensable machine in the pattern shop and it certainly pays to have one designed for the purpose, for there is no reason why pattern shop machinery should not be provided with labor saving devices which are so essential in the machine shop. The slide rest is useful for turning big work such as columns and pipes, but as it is not to be found in many shops we will confine this article to a description of the more common speed lathe and its accessories.

The Speed Lathe

The headstock spindle should extend through the bearing and be threaded so as to receive faceplates and chucks for turning work of large diameter, and the best arrangement is to have the small end of the cone towards the front of the spindle, Fig. 16, so that the back of a job on the faceplate can be turned to better advantage; the large end of the cone is then not in the way of the tools or operator's hands.

Owing to the necessary high speed of a wood turning lathe, there should be provided efficient means of lubricating the bearings, for when the bearings become worn and the lathe makes a noise like a steam hammer it is impossible to turn work accurately.

The headstock and tailstock spindles should be in perfect alignment and both have a taper hole to receive the centres and chucks.

All adjustments to the tool rest

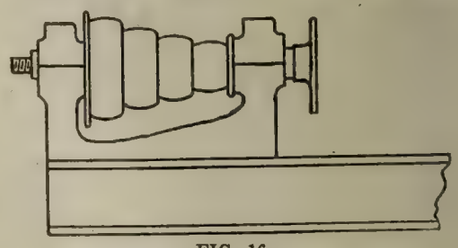


FIG. 16.

and saddle should be so devised that a wrench is not necessary, for during the process of turning a pattern the tool rest may have to be moved twenty times or more and the inconvenience of finding a wrench or adjusting a monkey wrench to fit each nut, not only is a waste of time but tries the temper of the operator.

Greater accuracy is required in pattern turning, than in ornamental wood turning, and although the tools and chucks required may not be so numerous, the building up process of the wood to

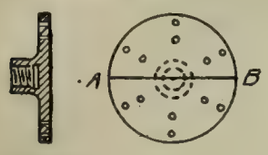


FIG. 17.

FIG. 18

be turned must be done in such a way that the finished pattern will keep its shape.

Precision Required

If the professional wood turner were turning—say—a bread board 12 in. in diameter, the purchaser would not measure the article with calipers to see that the size was correct because it would not make any appreciable difference if the board warped or shrunk. But when the pattern-maker is called upon to turn a pattern for a 10 in. threaded pipe flange from which fifty or more castings are wanted, and no preliminary turning has to be done to the casting before the tap is run through, it is easily understood that each casting will have to be the same size, and the pattern built up in such a way that it will keep its shape. It will also have to be turned as accurately as the nature of wood and the measuring tool employed will allow.

Accessories

Tool rests should be provided in different shapes, so that awkward corners may be turned with ease. There is no saving in having a tool rest made of cast iron for it is too easily broken; a wrought iron one will last longer, and it won't be necessary for the operator to count his fingers so frequently.

Fig. 17 shows the general style of faceplate used for pattern turning, the wood to be turned being fastened with wood screws. These should be provided in various sizes and if a line A B is scratched accurately across the centre of the face, it will be found a great convenience when turning patterns and core boxes in halves.

In the small size faceplate if a hole is drilled through the centre as in Fig. 18, so that a wood screw can be driven from the back into the piece to be turned, no other fastening is necessary, provided the pattern is small.

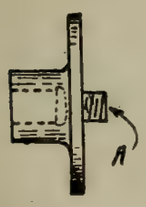


FIG. 20.

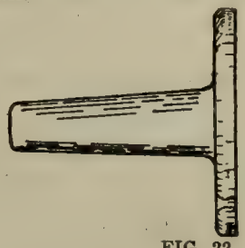


FIG. 22.

When using a centre screw face plate a hole should always be bored in the work a little smaller than the wood screw used; the neglect of this either splits the wood or breaks the screw.

A design for a screw centre chuck to fit the taper bore of the mandrel is shown in Fig. 19. The work to be turned is screwed onto the piece A, which in turn is screwed to the tapered centre B. The piece being turned may be removed

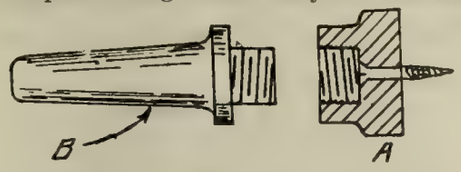


FIG. 19.

as many times as necessary without getting the work "out of true."

When turning gear blanks or other work where holes have to be bored to receive the shanks of core prints, the chuck shown in Fig. 20 is indispensable. The projecting screw A is ¾ in. diameter and is cut 8 threads to the inch, the thread having a sharp cutting edge which will cut easily into the wood.

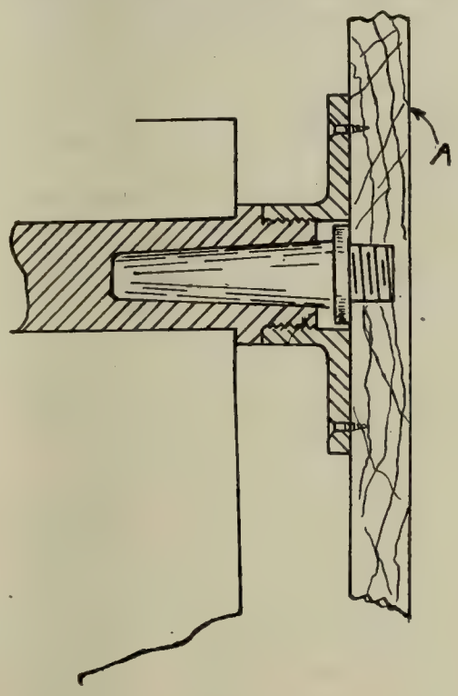


FIG. 23.

For small work fastening to the face plate with wood screws is not necessary, but for larger work where the centre screw is not enough support for the job, a combination of the tapered centre B Fig. 19 and a face plate as shown in section in the diagram Fig. 23 can be used, A representing the work to be turned.

When using this chuck the work will have to be centred first and the wood screws fastening it to the face plate driven in and taken out while the face plate

FIG. 21.

is on the mandrel. Fig. 21 shows a screw centre chuck which has given good service; the part A is of brass and the centre screw has a square head which is soldered into a hole bored into the brass face. Behind the face is a hexagonal shoulder to facilitate removing the work while fastened to the centre screw.

A face plate with a tapered shank to fit the bore of the mandrel Fig. 22 is useful for turning small patterns, the work being secured to the face with wood screw.

ANNEALING CAST IRON

THE detrimental effect on the strength of grey iron castings, due to annealing, is more or less known, and recent experiments by Sir Robert Hadfield have shown that disastrous effects on the strength of such may occur, the microstructure of treated samples affording a complete explanation.

The strength of grey cast iron depends largely upon the pearlite it contains; by annealing, part at least of the carbide in the pearlite becomes dissociated. Its carbon, thus rendered free, is drawn into positions alongside the already existing graphite plates, the consequent shelling of which further weakens the iron, already rendered weaker by the loss of its pearlite. Any advantage, therefore, which might occur by the lessening of initial stresses is more than counterbalanced by the severe deterioration of the quality of the material which takes place.

Some attempt is made to "anneal" important castings, such as large turbine casings, by subjecting them, by the means of steam, to as high, or to a slightly higher temperature, than they will be subjected to in use, before the final machining is done. It is found that by this means they do slightly change form, and so relieve some initial strains, and it is, of course, advisable that any change that will take place on heating should be dealt with before the final boring out, especially in view of the great precision of form which is required in turbine engines to permit sufficient, but not excessive, clearances of the numerous blades.

EXPERIMENTS to determine the effect of the atmosphere on different kinds of iron sheets have been made recently in the United States and show that the effects differ according to the atmosphere and kind of metal. Prepared pieces were exposed to atmospheric corrosion, and from the first the character of the rust formed on the different materials was found to differ considerably. Whereas on the Bessemer and open-hearth steel samples the rust was of a yellowish-red color and became loose rapidly, the rust on the others was dark in color and much more adherent; this adherent condition reached its maximum in the copper steels, where the rust was very dark and fine-grained. As a result of the tests it is concluded that copper-bearing steels are decidedly superior to pure iron, steel or charcoal iron. The addition of copper to pure iron increases its resistance to corrosion, but not to the same extent as similar additions to steel increase the resistance to corrosion of this material. Charcoal iron and pure iron are superior to steel as regards resistance to atmospheric corrosion.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

CLOSER RELATION BETWEEN THE EMPLOYER AND THE EMPLOYEE

By E. N.

IN approaching this subject the writer has in mind the much worn trail which deals with the human factor in obtaining better results. The human mind must be kept at ease in order to be properly efficient.

The modern cult of "efficiency" is "materialism run mad." Scientific investigation is doing away with idealism. It defines money as the main object of existence and includes many of the refinements which make life really worth while. It stunts the faculty of seeing the whole in relation to the part—man's vision for others in relation to his vision for himself.

Within the past few years managers of great organizations have awakened to the fact that men constitute a more important feature of industrial operations than machines or processes. This is somewhat due to the fact that the efficiency of many of the latter has almost reached its limit, whereas the efficiency of the worker's unit is lamentably low.

The day is past when rapid strides toward greater economy can be expected in labor saving machinery, and future progress must now depend more upon scientifically improving the human factor, which has been so much neglected in the past in the mad frenzy to accomplish man's work by machinery.

Men of to-day have merged from the plane of being "bullied." The standard of efficiency to-day, per capita, shows a steady increase over that of a few years ago. "You can lead a horse to water, but you can't make him drink." The man who is deserving should be allowed your confidence at least. In this environment, if you watch, you will see him broaden and gradually hit the stride where he will take an active interest in accomplishing results which his employer has always expected, but which were never attained, due to a missing link for which he was never able to account.

Proper surroundings are the first essential in arriving at the mark. Many employers have been actuated by far more than a selfish purpose in providing against industrial accidents and disease, compensation and better home conditions.

One may ask, To what purpose is this tremendous effort toward human efficiency? Is it the intention to incorporate the physical law of the survival of the fittest as a part of the ethics of industrialism? The product of all this endeavor is yet but a man-made machine, entirely lacking in character.

The average man must be given a responsibility and held accountable for it. In order for him to show his colors he must be free to accomplish the work laid out for him. His hands must not be tied by having to follow this or that command. He must be made to believe that his services are appreciated. Under reverse conditions he simply is unable to arrive at any point, because he is merely carrying out absolute commands of the man higher up, and then whose fault is it if results obtained are not to the employer's expectations? The power of suggestion is unlimited and oft times if the employee feels that he has the privilege of properly presenting his suggestions to his employer and he receives a slap on the back, instead of, as is general, getting no answer whatsoever, or a reply that such "is not in line with our custom," merely because the employer does not want to admit that the employee has a better idea than his own.

For in business no man can know of the better way and not tell another. Failure to do this is to destroy the mainspring of present-day business, which is efficiency.

DRAWING ROOM ILLUMINATION

By R. Hamilton

UPON putting the query as to what he considers the best method of artificial lighting for the drawing room, the average draughtsman will reply that he prefers the individual light placed a short distance above the board, the direct rays shielded from the eyes by means of a suitable shade. Where it is only necessary to use the light for a short time toward the close of the day, no serious eye strain may result, as the injurious effect is only of a temporary character. However, should the draughtsman be called upon to work at night, working several consecutive hours under artificial lighting conditions, he will eventually become cognizant of the additional eye strain. This may be partly accounted for by the increased period of time spent at the drawing board, but the eye strain in particular is largely due to the unsuitable lighting. While in some respects the individual unit may increase the illumination to a desired confined area, it is this localized brilliancy that is the primary cause of ultimate eye strain. With the eye fixed on the drawing, the sight is focussed for a certain strength of light, and when reference is made to a text book or other data—out of the direct rays of the lamp—the eye is forced to re-focus itself, often quite suddenly, to the darker surroundings of the general office. This may happen many times in the course of an hour, necessitating the enlargement and contraction of the pupil at each change of light.

Another objectionable feature of the low individual light is that its position is generally such as to cause the reflected light from the glossy surface of the tracing cloth to indirectly strike the eye. One of the arguments advanced in favor of the close light is that it is necessary to see the lines of the drawing. In answer to this it might be well to suggest the use of a slightly softer pencil that would produce a more distinct line, particularly on work that requires doing at night. For general office artificial lighting a well diffused light is most suitable, one where the distribution is practically uniform, and approximately one candle-power to each square foot of floor space, when the ceilings are of average height. While direct lighting from above is not wholly objectionable, the indirect lighting by means of reflectors is very much to be preferred, together with a ceiling that will assist reflection. Recruits to this method of lighting are not over enthusiastic at first, but in a short time admit that it is much better than the old practice.

STEAM VERSUS DIESEL

AN American sea-going engineer with first-hand knowledge of the service of both types says that while the modern steam engine is a wonderful machine, the Diesel motor is still more wonderful. The manual labor of handling the fuel is done away with altogether. Once the motor is started the fuel supply is kept up by pumps on the engine itself, delivered to the filter and from there to the cylinders, where combustion takes place. After it has done its work in the cylinders it passes off as waste gas to the atmosphere. All this takes place without manual labor, and to the engineer who has been with steam engines and then takes up the Diesel, the change appeals most forcibly, for with the machine developing its power within itself all that is necessary is the occasional manipulation of a valve. It is true, this engineer admits, that the Diesel has not yet reached the state of perfection at which the reciprocating steam engine has arrived, but considering the shortness of the time it has been employed in marine work, that could hardly be expected. There is not the slightest doubt, however, that in a few years' time it will be, in respect of reliability, in advance of the steam engine. At present there are motorships crossing the Atlantic with as great regularity as steamships, keeping as good, if not better, time, and coming through the heavy weather without a hitch. "I have," the writer declares, "spent a good few years on the Atlantic, and I would rather be with a Diesel engine in heavy weather than with a steam job."—Syren and Shipping.

PRESENT POSITION AND FUTURE PROSPECTS OF CANADA'S IRON AND STEEL INDUSTRY*

By D. H. McDougall**

IN reviewing the iron and steel industry in Canada, a clear distinction must be drawn between the position during war time, and the position that may be forecast after the war.

The present condition of the steel and iron industry is one of artificial stimulation, brought about by the action of numerous temporary factors, prominent among which are: Extraordinary demand for munitions steel; increased cost of transportation, accompanied by congested railroads, and shortage of shipping; an unparalleled coal shortage; and a severe and increasing shortage of labor.

These factors, all abnormal and arising out of war conditions, have rendered temporarily obsolete all hitherto accepted standards of economics, and they have been accompanied by an increased cost of living, large increases in wages, and increases in the selling prices of steel and steel products. No one can say how far these extraordinary conditions will extend, or how long they will last, but some day the world will resume its normal course, and the laws that govern normal times will again operate.

Therefore, in considering the after-war situation of the Canadian steel industry, we should see what the permanent essentials of a successful steel industry are, apart from present unusual and evanescent conditions.

Factors that favor success and permanence in steel and iron manufacture are:—

Geographical location, giving cheap access to world markets, and opportunities for the cheap assemblage of raw materials.

Close proximity of metallurgical coal, iron ore of good grade, and limestone deposits of suitable quality. All these raw materials should be accessible in large quantities, and so placed as to render mining costs and transportation reasonably cheap.

General conditions favoring the manufacture of steel in large tonnage.

A review of the iron ore and coal deposits of Canada will show that such a combination is to be found in very few places in Canada, and that already large steel and iron works exist at the localities where the manufacture of iron and steel is permitted by natural conditions to rest upon a permanent and commercial foundation.

The location of iron and steel plants in all parts of the world has been primarily determined by the proximity of coal, and it does not seem probable that any steel plant can exist and pay profits in normal times which has not to hand a plentiful and inexpensive supply of metallurgical coal. It is perhaps hardly an exaggeration to say that the steel industry is always an outgrowth of a coal mining industry.

Present conditions favor the commencement of small war industries. For example, the time is opportune for the opening up of small and easily accessible coal areas, the operation of which in normal times was not profitable; and in the same way, small smelting plants and small works for making munitions have been commenced and successfully worked because of the unbalanced state of demand and supply. These passing conditions, on the other hand, act to the disadvantage of large and long-established concerns, or at the most they offer merely an opportunity to get rid of the load of debt that is the legacy of the depression that preceded the war and persisted for some time after hostilities commenced.

After-war conditions will eliminate most of these small ventures, and in the days of financial stress that are surely coming the mainstay of industry and the hope of the country will be the large and long-established companies, who, if they are wise, will have stored financial reserves and expended profits on rehabilitation of plant, as a safeguard against the future.

Applying these general principles to specific cases, it would seem advisable that the energies of the country should be concentrated on ensuring the future of the large steel works on Sydney Harbor and on the Great Lakes, and that these existing works should be looked to for the production of steel and iron in large quantities, because in these places only is there available a sufficient quantity of coal, iron-ore and limestone.

For the treatment of steel in small quantities to produce tool-steels, crucible-steel and special alloyed steels, the electric furnace has a future, and industries of this kind will probably increase in the populous parts of Quebec and Ontario.

It is also advisable that any increase in the rolling and forging capacity of Canadian steel works should take place at the large and established plants referred to. These plants have hitherto regarded the manufacture of rails as their chief activity, but in the future, and with a view to after-war conditions, it seems probable that the rolling of ship-plates and other commercial shapes will become necessary. It is self-evident that the manufacture of finished steel products can nowhere be so satisfactorily and economically carried on as at the existing plants.

Considering particularly the question in what way it may be possible to obtain some considerable increase in the production of iron and steel in the future, that is, after the war, the first point to be determined is: Allowing for the rolling in Canada of steel shapes and forgings now finished outside of Canada, for all the export business obtainable, and for all Canada's own requirements in iron and steel, what tonnage of iron and steel over and above the existing capacity of Canadian works will be required?

Summarizing, and applying these principles, it would appear that the Canadian steel industry should be guided towards two main ends, namely:—

That the present abnormal demand for steel should be supplied as far as possible by the extension of existing plants.

That these existing plants should prepare to enlarge the variety of their finished products.

That should it then appear there was a necessity for greater production of iron and steel such as to require new plants, these plants should comply with the factors that have already been named as requisite to commercial permanence, and as giving ability to compete in world markets.

By following along these general lines, the existing plants will be extended, rehabilitated and modernized, and given an opportunity to accumulate financial reserves to carry them successfully through the troubled days ahead, and they will be placed in a position enabling them to enter world markets, and to compete with other countries, particularly the United States.

*Canadian Mining Institute Bulletin.
**General Manager Dominion Steel Corporation.

GRAPHITE LUBRICATION

IN a paper contributed to the Journal of the American Society of Mechanical Engineers, C. H. Bierbaum states that in 1913 some 30,000 tons of graphite were used for lubrication purposes. He states that both natural and artificial graphites commonly contain impurities in the shape of very hard abrasive materials, the effect of which he demonstrated by using a wooden lap fixed on the end of a high-speed shaft and coated with the graphite to be tested. On applying a glass slip to this rapidly revolving lap the scratches produced by the impurities could be easily seen on examining them through the microscope, using oblique illumination. In the paper a number of micrographs are given showing the results obtained. With thoroughly purified graphite there is no abrasion.

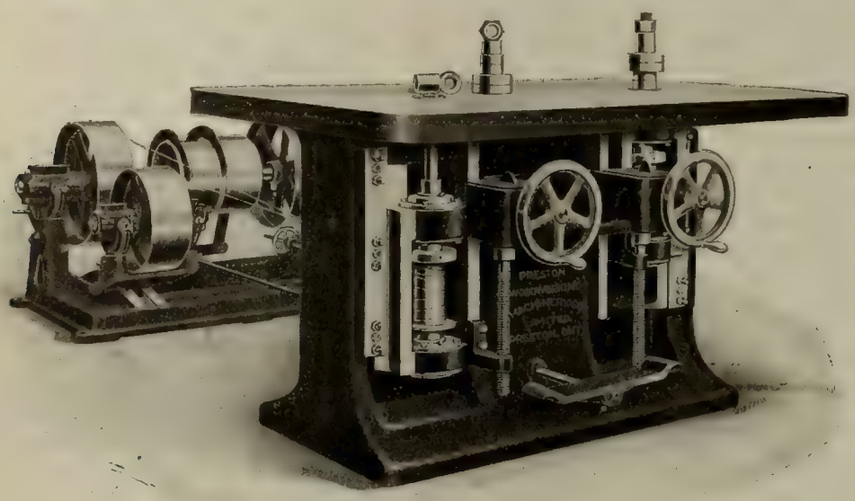
To obtain permanent suspension of graphite in oils or the like the particles of graphite must be less than one two-hundred-thousandth of an inch in diameter, and the oil must be free from acid or from any tendency to form acids by turning rancid. The author maintains that the use of these permanent suspensions of graphite is, however, undesirable, holding that with larger particles than are necessary for permanency of the suspension, the graphite is more effective as a lubricant. His view is that if the particles are large they will be caught and retained between the opposing surfaces of a bearing, should these approach near to each other owing to a failure of the oil film; whilst under similar conditions he asserts particles of the size necessary for forming a permanent colloidal suspension of the graphite would prove ineffective. The point, however, is obviously one to be settled by actual practical experience and not on a purely theoretical basis, and users of these colloidal suspensions do make the claim that, whatever the mechanism at work, their lubricated surfaces do, as a matter of fact, get loaded with graphite, notwithstanding the smallness of the particles.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

HIGH SPEED BALL BEARING SHAPER

THE shaper shown in the accompanying engraving is a recent product of the Preston Woodworking Machinery Co., Preston, Ont., and has been designed with a special view to increased output with less effort on the part of the operators.



HIGH-SPEED BALL-BEARING SHAPER.

The workmanship and material are of the usual high class necessary for the satisfactory operation of machines of this class, a feature of this machine being the use of SKF self-aligning ball bearings which enable a spindle speed of 7,000 rev. per min. to be maintained without any bearing trouble, and at the same time stand up under the increased output rendered possible thereby.

The spindle top diameter is 1¼ in., the table being 58 in. by 41 in., both table and main frame being of massive proportions and ample weight, which, combined with well balanced free running spindles, insures a high quality of work.

The machine, which weighs 2,700 lbs., has a front projection of 17 in., with a height of 35 in. The spindle diameter is 2 3/16 in., the spindles centres being spaced 28 in. apart. The power required is 3 horse-power, and the countershaft is completely equipped with tight and loose pulleys, idler pulleys and belt shipping gear.

MACHINE FOR TESTING SHEET METALS

THE desirability of having some method whereby the suitability of sheet metal for drawing operations can be determined in a reliable and accurate manner will be evident to operators of punching and drawing machinery, and the machine illustrated herewith has been recently introduced into England in connection with the Ericksen method of testing sheet metal. The apparatus is characterized by extreme simplicity, and the results obtained are claimed to be very reliable.

The machine is shown in Fig. 1, which, with the other illustrations, is reproduced by courtesy of *Engineering*. The principle of operation employs a plunger, 3, having a rounded point and tapering body, see Fig. 2, the shape being such that when the punch is pressed slowly against the centre of a test sheet, rupture will take place before the surface of the depression begins to contact with conical surface of the tapered portion of the punch. The diameter of the opening in the die, 1, is also determined from this standpoint. By observing the depth of depression at which rupture occurs, a measure of the drawing quality of the metal is obtained.

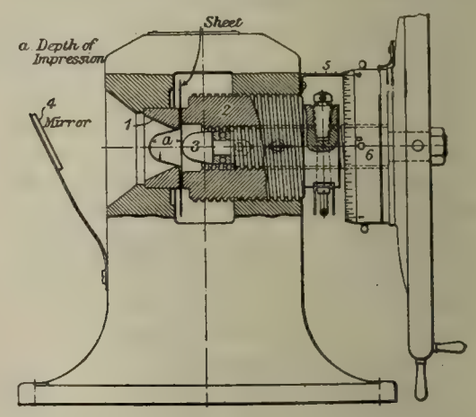
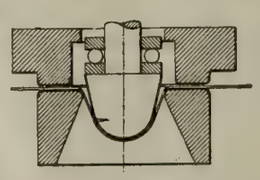


FIG. 1.

FIG. 2.



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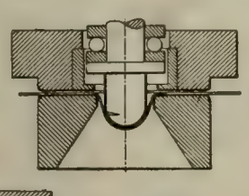

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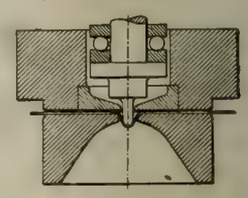


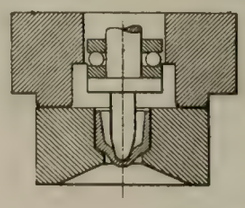


FIG. 5.

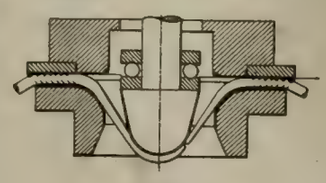


FIG. 6.

Pressure is applied to the plunger by a handwheel, operating a threaded shaft working in sleeve 2, the function of the sleeve being to clamp the test sheet against the die preparatory to making the test. In operation, the sleeve and the plunger shaft are locked together by the spring pin shown, so that their surfaces are exactly flush, and they are rotated together in the main frame of the machine until the sleeve clamps the sheet or test piece, which is 3½ in. by 3½ in. The thickness of the sheet is now indicated by the micrometer scale, and the sleeve is withdrawn .05 mm. to allow play to the metal as it is drawn into the die. The sleeve being now locked securely in position, and disengaged from the plunger, the plunger is forced forward until rupture takes place, the distance (a), being read off on scales 5 and 6.

A mirror, 4, is placed so that the behaviour of the metal can be observed during the operation, and the handwheel stopped immediately signs of rupture appear. Tests can be made quite rapidly, and it is claimed that an accuracy of one-hundredth of a millimetre can be obtained with slight practice.

Figs. 3 to 6 show the application of the machine to tests on flat strips, cartridge cups, and wire; it is also possible to make tests of the elasticity of sheets and strips. Numerous tests have enabled diagrams to be prepared showing the minimum depth of depression allowable in various metals used for stamped

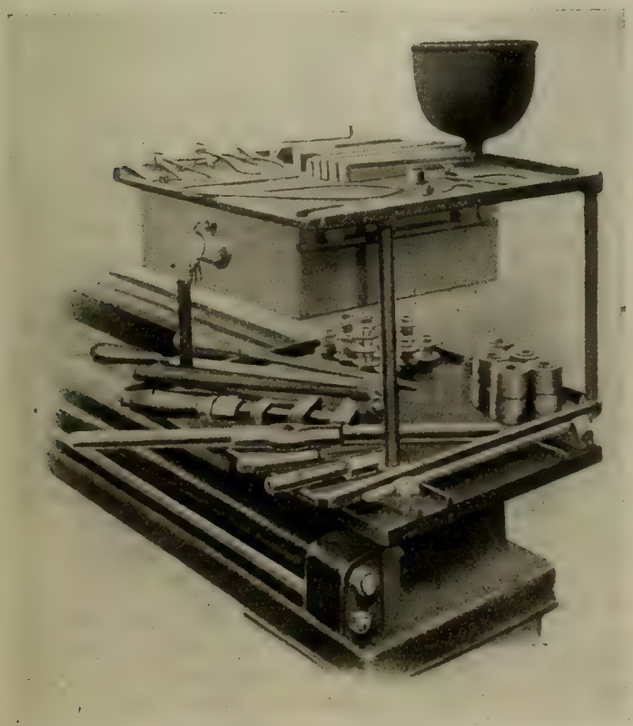
work in thicknesses from .02 mm. to 2 mm. Geo. H. Alexander, Coleshill St., Birmingham, Eng., is placing this apparatus on the market.

TOOL RACK FOR LATHES

THE provision of suitable accommodation for tools, accessories, and instruments used by lathe operators is, in the great majority of instances, left to the lathe hand, and various devices have come into use, the principal one being a couple of boards laid across the vees at the end of the bed. Such provision, however, is more or less of a makeshift, and the New Britain Machine Co., New Britain, Conn., have developed the lathe rack illustrated herewith, which marks a decided advance in equipment design, and contributes largely toward increased efficiency on the part of the operator.

This double-decked, fireproof rack consists of two cast iron trays, assembled on steel corner posts as shown, and flanged on sides and rear to prevent tools and articles from rolling off. Conspicuous features are, a cast iron bowl for holding waste, preventing it from becoming entangled with small articles and enhancing the neatness and general accessibility of the arrangement, and a tool drawer with lock, which is fitted below the upper shelf and provides safe keeping for micrometers and other valuable tools.

The device is adaptable to various widths of bed by means of fitting strips fastened to the lower shelf by set screws as shown; it may be slid along the ways to any convenient position without marring them. Trays are both 18 in. by 18 in. and height to upper tray is 14 in. The shipping weight is 115 lbs.



DOUBLE-DECK LATHE RACK.

WORLD'S MOST POWERFUL LOCOMOTIVE

IN the vicinity of Philadelphia the Pennsylvania Railroad Company has been testing the world's most powerful locomotive. This locomotive is capable of exerting a maximum horsepower of 7,000, and is intended for the mountain grade electrification between Johnstown and Altoona, Pa., around the famous horseshoe curve. During a recent test this locomotive hauled a train of 68 cars, and the regular large Mikado type of road locomotive. The steam locomotive, however, remained idle.

The mechanical parts of this electric engine were built by the Pennsylvania Railroad Company at their Juniata Shops at Altoona, Pa., and the electrical equipment supplied by the East Pittsburgh works of the Westinghouse Electric & Mfg. Company.

To equal the power of this locomotive it would take 100 trolley cars, or 14,000 horses, or 56,000 of the strongest men. Enough electric current is consumed by it to light over 200,000 25-watt electric lamps; and many a town of 25,000 people has an electric light plant of smaller capacity. This is possible because of the high voltage alternating current used in distributing the strong electric power.

Exerting its maximum pulling force this locomotive will develop 7,000 horse-power, which is greater than its closest electrical rival can do. This locomotive, which weighs 250 tons and is slightly over 76 feet in length, is the first of a type that will be used on the Altoona Grade Electrification of the Pennsylvania Railroad, between Johnstown and Altoona, around the famous Horse Shoe curve. Two of these locomotives are able to haul a 6,000-ton train up this mountain grade at a speed of slightly over 20 miles per hour, thus relieving, when necessary, the congestion that seems apparent in that freight traffic over this division now, which is unusually heavy, amounting to as much as 300,000 tons per day. In addition to the heavy grade over the Alleghany Mountains a long tunnel, which helps to form the "narrow neck in the bottle" in operating over this division, must be passed through.

By electrification the expense of grade reduction has been eliminated and the capacity of the division will be more than doubled.

THE MOST POWERFUL ELECTRIC LOCOMOTIVE IN THE WORLD.

The Westinghouse Electric equipment is so designed and built that these locomotives can haul the heavy trains up hill and coast down hill at the same speed of 20 miles per hour. By the motors becoming dynamos or generator in the latter case effective braking action results without the use of air brakes, which prevents runaways. This coasting speed can be regulated just as speed up-hill or under power. Air brakes are therefore not needed while coasting, and are simply held for emergency use and for bringing the train to a full stop.

FOR the protection of ironwork paint is generally used and provided that rusting has not commenced a paint composed of four parts of red lead, one part white lead ground in oil and at least five years old and sufficient raw linseed oil of good quality will be found very efficient if used when freshly made. No driers are needed, as the red lead is a very good oxidising agent, but the paint takes several days to dry and harden. For ironwork red oxide of iron also makes a good paint if no driers are used and the oil is good, but if driers are used the paint soon fails when exposed.

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A weekly newspaper devoted to the machinery and manufacturing interests.

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AN EARNEST OF SINCERITY

THE fourth Christmas of hostilities draws nigh and the prospect of customary methods of celebration once more occupies the minds of mankind. To us, who have counted these three critical years and watched their close, followed by a dawn, at present in sorrow and suffering for many of us and ours, the recurrence of this festival is touched with increasing solemnity.

Time, in this as in other trials of mankind, may either soften the blow or harden the resistance, and while we, as a nation, naturally repel the suggestion of unconscious indifference at this time, we should note that this Christmas is the first which our brethren across the line will spend as a combatant nation.

It is, therefore, to be expected that, in line with their systematic preparations, the magnitude and thoroughness of which is being gradually disclosed, some unique and characteristic action would be suggested whereby the vast number of firms, corporations and business concerns in general could express, in an unassuming but effective manner, their sincerity toward the Allied Cause.

Recent action, originating among Chicago concerns and subscribed to by firms of world-wide repute, is realizing such expectations. Their attitude toward the Red Cross has been stripped of Charity and clothed with Duty. According to their decision, they consider it sheer waste at this time of world war, when money is so sorely needed to alleviate suffering, reduce hunger and care for the sick and wounded, to spend money on greeting cards. The firms referred to, and many others whom they desire to influence, have customarily distributed engraved Christmas and New Year cards, but on this occasion will contribute the money to the Red Cross or other relief organizations where it will do real service. Extensive propaganda is now under way, and it is hoped to obtain very real and substantial results.

The solid merit of the idea warrants our presenting it to our readers. We decline to think that the efforts of our friends and relatives on the fighting line are less appreciated, or their sufferings less keenly sympathized with than are those of our big Ally.

Extraordinary appeals have been made and will continue to be made to our generosity for a long time, and the opportunity of furthering our efforts, at what is really no unusual cost to ourselves, should be grasped as thoroughly and vigorously here as anywhere else.

At first thought, the suggestion of diverting such a volume of business from a legitimate channel would seem to imply undue hardship on those who formerly benefited by it. Such argument must be judged by the necessity of the case. If we pursued personal promptings and cut out all unnecessary expenditure, the producers of this seasonal work could not validly object. Their profits would be non-existent, except in the possession of former customers. Instead of being overworked they could devote their efforts to staple lines and not suffer real hardship. The real sacrifice, and no good work can be sincere without some degree of sacrifice, would be that of the givers, who might not have given if they had so wished.

As an earnest of our sincerity, individually and otherwise, the suggestion has impelling strength and merit. Time is now short, and may not permit of an organized effort in the Dominion, but let not that thought delay our decision. Oneness of purpose, the maintenance of our Country, the triumph of the Allied Cause and, most of all, our duty to those in the field—these alone not only justify but imperatively demand this offering on our part—the sacrifice is by those whose sufferings call to us.

MUNITIONS AND MARINE CONTRACTS

RECENT developments have considerably improved the outlook for Canadian manufacturers, both in regard to munitions and also orders for marine equipment. The United States Government will place orders in Canada for 75-millimetre shells; the actual contracts only await the completion of necessary arrangements between the manufacturers themselves and the Imperial Munitions Board who are distributing the contracts on behalf of the United States Government. These new contracts in addition to the orders for British shells, now under way, will mean an extended period of increased activity in the munitions industry.

A notice was issued recently by the Government prohibiting the export of shell plants from Canada. From this it may be inferred that the Imperial Munitions Board will be distributing contracts for shells from time to time.

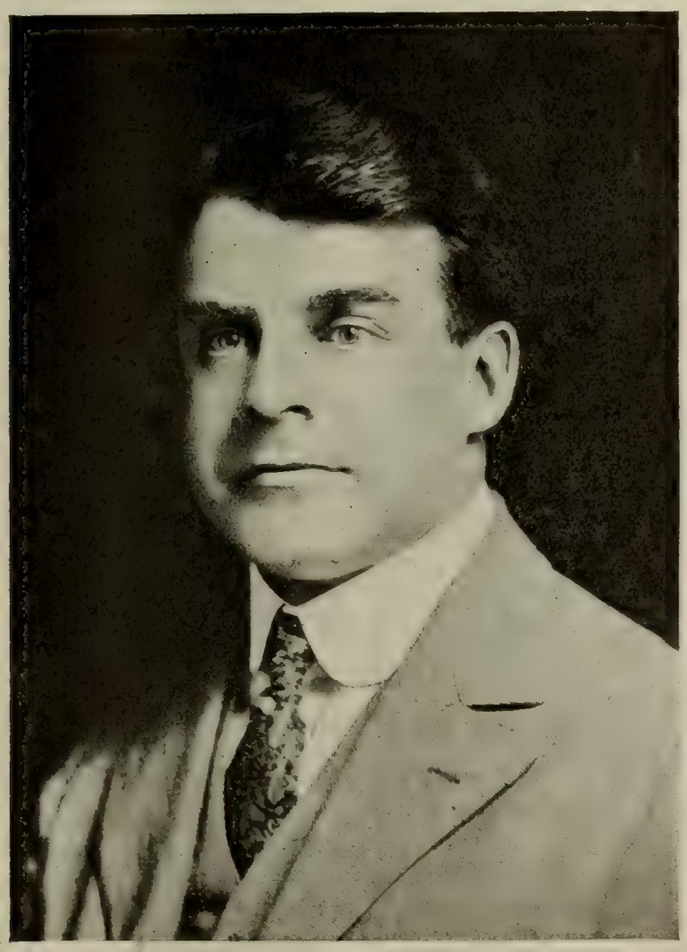
Firms in the United States having shipbuilding contracts welcome the aid of Canadian concerns in supplying ship deck machinery, main engines and auxiliary equipment. We are advised that specifications of requirements will be ready in a week or two and in the meantime would suggest that Canadian firms desiring to obtain orders should prepare detailed particulars of the lines which they are prepared to furnish, so that the United States firms will know exactly what they have to offer. The American firms insist on a delivery guarantee and hold the opinion that the Canadian Government or the Imperial Munitions Board should be responsible for the fulfillment of contracts on time.

Important developments are now under way and we strongly urge Canadian manufacturers to make a big effort to obtain contracts for munitions or marine work. A number of firms in Canada have for some time been engaged upon work of this kind and the opportunity is favorable for others to participate in these United States contracts.

INDUSTRIAL NOTABILITIES

WILLIAM McCULLOUGH ARNOLD, manager, Ottawa Car Mfg. Co., Ltd., Ottawa, Ont., was born in Ottawa, Oct. 26, 1879, son of William and Georgianna (Eaton) Arnold.

He was educated in Model and Public Schools, and subsequently attended Willis' Business College, Ottawa, after which he was employed by H. N. Bate



WILLIAM McCULLOUGH ARNOLD.

& Sons, 1895-1900; and T. Lindsay & Co., 1900-1907. Mr. McCullough was appraiser for Express Branch, Department of Customs, Ottawa, 1902-1911, and during the latter year was appointed purchasing agent for the Ottawa Car Mfg. Co.; assistant general manager, 1913; manager, 1914.

Mr. McCullough is a member Canadian Manufacturers' Association; and also of the following clubs: Canadian, Laurentian, Connaught Park Jockey, Westboro Lawn Tennis and Bowling.

His societies are: I.O.O.F.; A.F. & A.M.—his recreations are bowling and tennis—his politics, Liberal—and in religion he is Presbyterian.

Mr. McCullough's residential address is Westboro, Ont.

—Photo, courtesy British & Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	35 50
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

	Montreal	Toronto
Hamilton	....	....
Victoria	....	60 00

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	....
Tank plates, Pittsburgh	....
Structural shapes, Pittsburgh	....
Steel hoops, Pittsburgh	....
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	4 50
Structural shapes	5 00
Plates	7 00

FREIGHT RATES.

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22 1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$31 00	$32 00
Electro copper	31 00	32 00
Castings, copper	30 00	31 00
Tin	64 00	66 00
Spelter	10 50	10 50
Lead	9 00	8 50
Antimony	18 00	18 00
Aluminum	65 00	62 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$13 00	$13 00
Heads	13 30	13 30
Tank plates, 3-16 in.	13 10	13 25

WROUGHT PIPE.

Effective July 5, 1917.

Standard Buttweld. Size.	Black Per 100 feet	Galvanized Per 100 feet
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00

Standard Lapweld.		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	20 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	15 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	20 00	20 50
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	7 00	7 00
Tea lead	6 00	5 75
Aluminum	30 00	25 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up..	net
Coach and lag screws	25
Stove-bolts	55
Plate washers	List plus 20
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less..	10
Blank bolts	net
Bolt ends	net
Elevator bolts	5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank,	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	15
Boiler rivets, base ¾-in. and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	.72¼
Wood screws, O. & R., bright	.67½
Wood screws, flat, brass	.37½
Wood screws, O. & R., brass	.32½
Wood screws, flat, bronze.	.27½
Wood screws, O. & R. bronze	.25

MILLED PRODUCTS.

	Per cent.
Set screws	25
Eq. & Hex. Head Cap Screws.	20
Rd. & Fil Head Cap Screws	net
Flat ⅞ But. Hd. Cap Screws plus	net
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and semi-fin. nuts, over 1½ in., up to 2 in. plus	10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws...list plus	20
Collar screws ....list plus 30,	10
Thumb screws	20
Thumb nuts	65
Patch bolts add 40,	10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$
Open-hearth billets	
O.H. sheet bars	
Forging billets	
Wire rods	

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS.

Solder, strictly	0 35
Solder, guaranteed	0 37½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	16 55
Red dry lead, 100-lb. kegs, per cwt.	16 25
Glue, English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 78
Linseed oil, raw, single, bbls.	1 42
Linseed oil, boiled, single bbls.	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A. ..list plus	20
Emery Cloth .....list plus	33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila Rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto ..... net

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52.	30
S.S. drills, wire sizes, No. 53 to 80	net
Standard drills to 1½ in.	30
Standard drills, over 1½ in.	30
3-fluted drills, plus	10
Jobbers' and letter sizes	20
Bit stock	25
Ratchet drills	15
S.S. drills for wood	30
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 30
Bridge reamers	52½
Centre reamers	10
Chucking reamers	net
Hand reamers	10

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 35%; B and C, plus 25%; cast iron, net; standard bushings, 25%; headers, 60; flanged unions, 5; malleable bushings, 30; nipples, 45; malleable lipped unions, 40.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$ 9 50	$ 9 50
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	10 95
Premier, 10¾ oz.	13 85	11 25
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	40
Black Diamond	40
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	37½
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke	$
Connelsville Foundry Coke	
Steam Lump Coal	
Best Slack	

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bull-neck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.65
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THAT contracts for shells will be placed in Canada by the United States Government is now assured. The shell in question is the 75-millimetre type as used by the French Army. These contracts, together with those for the British Government, will keep a number of plants in Canada busy for at least six months. There is no improvement in conditions in the iron and steel trade and an acute shortage of these materials is likely. The abnormal demand for steel in the States renders the exportation of any considerable tonnage practically impossible. It is not expected that firms engaged upon war orders will be inconvenienced to any great extent, but other consumers relying on the States for their supplies of steel will suffer. No steel can come in for any purpose except under license, which will be difficult to obtain except when the material is required for war purposes or contributory thereto. All consumers are urged to exercise rigid economy in the use of iron and steel products. The situation in the pig-iron market is unchanged and prices are holding firm, due to the shortage in supply and high cost of coke, the scrap market is dull and business quiet. Consumers continue to hold off buying in the expectation of lower prices, which do not appear likely in the meantime. An advance in price of tin, due to scarcity, is the principal feature in the non-ferrous metal markets, otherwise prices are unchanged. The copper situation is unchanged and quotations are nominal. Indications point to a little more activity in the machine tool trade which has been rather quiet lately. Deliveries on imported tools are getting more backward owing to the activity in the States.

MONTREAL, Que., Nov. 5, 1917.—The most interesting feature in connection with the week's business has been the announcement from Ottawa that extensive orders for American shells may be expected to be distributed among the various Canadian plants that have during the past three years been engaged in shell production for the British Government. A definite statement has not yet been made, but this is looked for in the course of a few days or a week at the latest. In addition to the contracts that are likely to be placed for shells, it is reported that no small amount of marine work is being, or eventually will be, placed with Canadian firms.

Pig Iron

The market in pig iron continues to be affected by the conditions that prevail in the States, but a slight improvement has been noticed during the past week. The demands of the steel makers are still quite large and domestic customers are still uncertain as to their position under the regulations that are now in force. Under the assumption that furnaces are filled up until well into the new year, few producers can be found that will quote on early delivery. The trend appears to be that any revision of prices at the beginning of the year would probably be based on a higher level than that prevailing at the present time. The final regulation has been made on the Pittsburgh market for pig iron, this being for southern foundry, which is quoted at $37.55, subject to revision. Canadian situations remain unchanged, with producers still off the market.

Steel

The iron and steel situation is experiencing a quiet period following the recent price-fixing of the American Government on certain lines of steel and metals. These regulations have, however, been apparently suspended, and various interpretations are being put upon the delay in taking further action in this direction. The marking of time that seems to characterize the present attitude of the Government may only be temporary, partly due to the difficulties of the situation and partly to the possibility that the committee are for a voluntary adjustment of the remaining commodities on the basis of the regulations that have already been put in force. It is thought in some quarters that if the market is left to itself it will gradually assume a condition more in keeping with the wishes of the Government. On the other hand, the complications that have marked the general transactions of business since the inception of the price-fixing regulations, have not been conducive to an active market, as the difficulties and uncertainties that were so pronounced under the old order of things are still the chief factor in maintaining the unsettled conditions that continue to be the characterizing feature of the market. The domestic situation is still a waiting one, owing to the heavy requirements of the various Governments, and in addition producers are showing no anxiety for outside business at the prevailing figures. Canadian consumers of steel, unless such is specially required for war purposes, are practically prohibited from securing supplies, as the license system of obtaining steel has almost put a ban on export from the States. The feature of the week has been the decline announced in the Pittsburgh quotations on black and galvanized sheets. No definite action has been taken by the War Industries Board, but the fact that representatives of the sheet producers are in conference with the said board may account for the weakness that has developed in the sheet situation. The decline on the Pittsburgh market is 2c per lb., the base price on black and blue annealed sheets being 6c per lb., with galvanized sheets quoted at 7½c per lb. The quotation on cold rolled strip steel of 7½c shows a similar decline to that announced on sheets. Pending action on the subject of sheet prices will denote whether actual price-fixing has been deferred, or whether more time will be required to allow matters to adjust themselves. Nothing has transpired to indicate that developments in the States have assisted to relieve the acute situation that has been so marked in Canada for the past several months. The practical embargo that exists on steel has been one of the chief factors in the strength of the market, and it is not thought that the situation here will undergo any great change for some time to come, as manufacturers here are dependent on the States for supplies, and these at present are not obtainable. Dealers here report an unchanged market, with the demand good, but inability to secure shipment of domestic material. The Montreal quotation on 3/16-inch tank plates has declined ½ cent per lb., the current quotation being $13.10 per 100.

Metals

With the exception of tin, the metal markets have been devoid of features of any consequence. The American situation is still dominated by the attitude of the Government in relation to the fixing of prices, which at the present time seems to have been deferred for unforeseen reasons. Copper is very inactive, the only business that is passing being confined to Government requirements. Tin has jumped owing to the difficulties experienced in obtaining shipping permits. Spelter is demoralized and weaker. Lead has again reacted, and is becoming stronger. Antimony and aluminum are both quiet, with a weaker tendency.

Copper.—The situation in copper appears to be as confusing as ever. Instead of the price regulation clearing away the uncertainty that so unsettled the market a few months ago, the fixed price that controls the sale and distribution of the metal has had the tendency to increase the stagnation, particularly as regards the supply available to those consumers that are not directly engaged in the manufacture of war essentials. While it is supposed that the situation is gradually becoming clearer, there appears to be little outside indication that this is an actual fact, and inquiry at the smelters emphasizes the feature that dominates the market, that there is practically no metal for sale this year at the regulation price of 23½c per lb. Domestic consumers are anxiously awaiting further developments with the hope that an easier situation will be forthcoming, so as to enable them to cover their immediate and early future requirements. The local situation continues to be affected by the general conditions in the States and dealers report a market devoid of any features, with quotations unchanged at 31c and 30c per lb.

Tin.—A situation has developed in tin that tends to increase the uncertainty that for the past few weeks has shown some signs of clearing. The market has been looking forward to some relief following the attitude of the American Government in regulating the price of commodities on this side of the Atlantic. It was hoped that reciprocation would open the way to better conditions in respect to the obtaining of permits from the British Governments and thus result in making the situation here more tolerable. With the entrance of the States into the war the co-operation of the British authorities was expected to remove the acute conditions that marked the trading in tin before America was involved. The recent advance on the New York market has shown the essential need of a better understanding between the two Governments so as to eliminate such friction as is sure to follow the tight hand that seems to be controlling the shipments of tin from the British possessions. New York is quoting the nominal price of 66c for Straits tin, this being an advance over last week of 4c per lb. The situation locally is strong, with quotations 1c higher, the price asked being 64c per lb.

Spelter.—The dullness that features the situation in spelter has almost demoralized the market. The price of ore, especially to those smelters that are compelled to purchase their supply from an outside source, is on such a scale that it is becoming a very serious matter for those producers to continue operations, as invariably they are at a loss in so doing. Producers who are fortunate enough to control their own ore mines are still able to operate their smelters, but at very little profit. Unless early action is taken in connection with placing this metal on a better footing, it is expected that additional plants will have to curtail production or possibly discontinue operations entirely. A further decline on the New York market of ⅛c per lb. has lowered the quotation to 7¾c per lb. Dealers here report a very quiet market, but continue to quote last week's price of 10½c per lb.

Lead.—As was expected, a reaction has begun to develop in the lead situation and the market is becoming firmer. This is reflected in the fact that producers are showing increased reluctance to accept business at the price quoted last week. When sellers are approached, they generally have no metal to dispose of, or request the advanced price; and, while this is not the price asked by the Trust, several sales have been reported at the quotation of 6c per lb., and this may be recognized as the prevailing outside price. The Trust price is still quoted at 5½c, but the indications point to a stronger market. The local market has been quiet, but dealers have maintained their quotations at 9c per lb.

Antimony.—No improvement has been reported in the market. Production continues to outrun the demand, and the situation may be said to be very dull. Weakness on the New York market has resulted in a further decline in the current quotation, the price this week being 14c, ¼c lower than that of last week. Local dealers continue to quote 18c on a quiet market.

Aluminum.—An easier tone has developed in this market, with prices lower in New York. The local situation remains quiet and unchanged, with prices firm at 65c per lb.

Machine Tools and Supplies

The activity in the machine tool industry during the past week has not been very pronounced, although a fair amount of business has been reported. Increased inquiries have been received in connection with six-inch shell equipment, and prospects for improvement in general demand have become greater, following the report that American shell orders are to be placed in Canada. This is very encouraging news, and will renew the interest in machine equipment that has been on the wane ever since the curtailment for British shells was announced. To what extent this new activity will at-

tain is at present problematical, but indications are that the volume will be quite large. However, it is generally supposed that any business placed here will only be the overflow from the plants in the States, as it is only natural that orders will be placed there before recourse is made to the utilization of Canadian plants. However, interesting developments are not unlikely in the very near future. Apart from the supplies required for those plants that are engaged in the making of six-inch shells, the market in supplies has been exceptionally quiet, but price quotations in all particulars are well maintained.

Scrap

Nothing has developed to remove the uncertainty that still characterizes the old metal and scrap situation. Both dealers and consumers are patiently awaiting action on the part of the American Government in connection with their policy of price-fixing. The New York market, with few exceptions, has remained firm; the local situation is not active, but dealers are holding firm on last week's quotations.

TORONTO, Ont., Nov. 6.—A revival in the munitions industry is imminent, due to orders for shells which will be placed in Canada by the United States Government. Some orders have already been placed and negotiations for others which are pending will, it is fully expected, be closed very shortly. Representatives of Canadian shell manufacturers are negotiating with the Imperial Munitions Board in regard to prices and at least a dozen firms are expected to participate in the contracts. The shell covered in the contracts is the French 75 millimetre type which has been adopted by the United States Government for the army. It is a high explosive shell and is similar in design to the British 18 pdr. shrapnel. Quick delivery is doubtless the principal reason for these contracts coming to Canada. The Imperial Munitions Board who are assisting in the negotiations have appointed a prominent manufacturer, Lloyd Harris, to represent them in Washington.

Steel

Although the outlook is clearer in regard to conditions in the steel trade in Canada, the situation still remains serious by reason of the shortage of iron and steel. It is even possible that there will be a scarcity of steel required here for the manufacture of war equipment or articles contributory thereto, that is when steel produced in the States is needed for their manufacture. The reason for the tight situation is the abnormal demand for steel in the States. In fact the demand is so heavy that it may not be possible for mills in the States to supply steel for purely commercial purposes in Canada except in limited tonnages. F. C. T. O'Hara, Deputy Minister of Trade and Commerce, while in Washington recently made arrangements with the Priority Board which it is hoped will greatly assist the Canadian manufacturer to secure materials which he needs from the United States. In view of the serious situation, the Deputy Minister strongly urges rigid economy in the use of all metals for any purposes whatsoever; this implies a careful conservation of all scrap. The outlook for manufacturers not engaged on war orders is not particularly bright, but it is apparent that very little more can be done to improve their position. It is fortunate however, that Canadian mills will benefit under the new conditions by the elimination of considerable competition although they cannot supply all the different classes of material that will be required. It is here of course where the principal trouble lays, for this material must be imported from the States which is now a difficult matter on account of the embargo.

Prices of steel products continue stationary with the single exception of the lighter gauges of black sheets which have again declined. There is not a particularly heavy demand for this material, and prices at the time of the advance went up in sympathy with other materials rather than for any other reason. It appears to be the intention of the War Industries Board to leave the matter of price fixing in the hands of a sub-committee of the American Iron and Steel Institute who it is expected will announce in due course prices on products not yet fixed. The price regulations have not as yet been reflected in the situation here and the market continues firm. Business of late has not been sufficiently large in volume to really affect the market, the unsettled outlook having caused many consumers to hold off buying until conditions become more favorable. War orders continue to keep the steel trade very active. Considerable steel is being used in the manufacture of marine forgings, while the pending contracts for shells for the United States Government will absorb a large quantity of steel.

A large proportion of the output of steel in the United States is being utilized for war purposes. The shipbuilding branch of the industry alone is responsible for the largest bulk of the steel now on order. All the steel plants in the States are working at a capacity which is only limited by the equipment of the several shops in machinery and men. Prices of steel have a weaker tendency and appear to be gradually declining towards levels recently fixed. Business with the mills is largely for Government account and private consumers are not buying heavily. Price regulation has reached another stage, maximum prices having been fixed, subject to revision Jan. 1st, on certain steel articles including sheets, pipe, cold rolled steel, scrap iron, wire and tin plate. The prices for sheets range from $4.25 to $6.25 per 100 lbs. f.o.b. Pittsburg, according to grades. On ¾ inch pipe to 3 inch black steel pipe a discount of 52 and 5 and 2½% f.o.b. Pittsburg was fixed. The discount on cold rolled steel is 17 per cent.

Pig Iron

An important step towards more settled conditions in the market in the States has been made. A list of differentials has been issued by the American Iron and Steel Institute. The differentials are based on the base price of No. 2 foundry iron which was fixed at $33 per gross ton f.o.b. cars at furnace. The list is given in another section of this journal. The situation locally shows no improvement and prices continue nominally unchanged. The furnaces are well sold ahead and there is very little iron to be had. Production is not increasing and it is doubtful if it is keeping pace with the requirements. The coke situation has not improved materially. It is almost impossible to secure any desirable quantity for prompt delivery at the established price as operators claim that they can produce no more than is sufficient to fill contracts.

Scrap

The old material market continues dull but the outlook is improving owing to the scarcity of new materials. The volume of business is light as buyers are looking for lower prices and dealers are not anxious to sell at current values. There is not a great deal of scrap to be had and prices are consequently holding firm.

Machine Tools

Some renewed activity in the machine tool business may be expected following the placing of contracts in Canada for shells by the United States Government. The shell in question is the 75 mm. French pattern which has been adopted by the United States Government. It is a high explosive shell and is not unlike the British 18 pdr. shrapnel except of course that there are no bullets inside. The shell has to be heat treated on account of the high bursting pressure required. Machinery used for shrapnel will be suitable for the new shell. The French shell is made from a forging with comparatively thin walls and it is hardened and heat treated to increase its elastic limit and tensile strength. The bursting pressure is as high as 18,000 lbs. per square inch. It has no base plug as is common in British high explosive shells. A notice has been issued by the Dominion Government prohibiting the export of shell machinery except under license, which appears to indicate a continuance of shell contracts for the British Government.

Supplies

Prices of machine shop supplies continue firm with an upward tendency in some lines. The market is steadier however, and business active. Blacksmith's forges and blowers have advanced, one size, the 18 inch round riveted forge, is now quoted at 20 per cent. as against 40 per cent. off list. Blowers which were formerly 10 per cent. on list are now 40 per cent. on list. Iron rivets and burrs which were formerly 17½ per cent. are now 15 per cent. off list. Soldering coppers have declined 2c per pound. One

pound coppers are now quoted at 71c, 1¼ lb. at 68c; 2 lb. at 67c; 2½ lb. at 65c; 3 lb. and up 64c per pound.

Metals

An advance in the price of tin is the only feature of importance to note in an otherwise dull situation. The metal markets generally are quiet and signs of activity are wanting. The advance in tin is due to a scarcity of spot metal because of the difficulty which exists in regard to shipping permits. The copper situation is unchanged, a scarcity of spot metal being the principal feature of this market. Lead continues firm but spelter is dull and easy. Both antimony and aluminum are unchanged.

Copper.—The situation in the copper market continues somewhat obscure. While large consumers appear to be getting what they require the position of the dealers and smaller consumers dependent upon them is not yet clearly defined. The primary market is completely in the hands of the Copper Production Committee with deliveries and sales regulated according to consumers' needs and with a view to protect the United States Government and the Allies. Local prices are unchanged and nominal, lake and electrolytic being quoted at 32c and castings at 31c per pound.

Tin.—The development of an acute shortage in spot tin together with the uncertainty as to future supplies has caused the market to become active and higher. Unless the situation speedily improves the shortage threatens to interfere with important contract work for the Government and Allies. While this refers to the products of tin and its alloys in all forms, it especially applies to the manufacture of babbit metal which is of utmost importance in the construction of motors and machinery of almost every description, and into the composition of which tin enters to the extent of 25 to 95 per cent. Tin has advanced 3c and is now quoted at 66c per pound.

Spelter.—The market is dull and weak, although there has been no change in prices. Local quotation 10½c per pound.

Lead.—Although the Trust price of lead is unchanged at 5½c per pound the independent producers have raised the price, ranging from 6¼ to 6½c New York for spot metal. The market generally is firmer but little lead is offering. Local price firm at 8½c per pound.

Antimony.—The position of antimony shows no improvement, the market being weak and demand light, price 18c per pound.

Aluminum.—The market continues quiet and easy with quotations unchanged at 62c per pound.

NEW YORK, Nov. 5.—The American International Corporation has received a second contract from the Emergency Fleet Corporation to build additional cargo boats for the United States Government. The contract calls for 70 ships each of 8,800 tons deadweight and it is understood that the boats are to be completed in twenty-two months. The building of each of these standardized steel ships calls for 1,760 tons of plates and 1,173 tons of shapes, making a total of 195,310 tons of steel required for the 70 boats.

It will be recalled that the first contract placed with the American Co. covered the construction of 50 7,500 ton boats. In the last week, the company has placed contracts for the fabrication of some of the steel required in the construction of the first lot of 50 boats and in consequence the Priority Board has allowed certificates to be issued for some steel shipments. The most interesting fact connected with this latter transaction is that the fabrication of some of the steel will be done in Canada and as far west in the United States as Minneapolis. One contract has also been placed with the Penn Bridge Co., Beaver Falls, Pa.

UNITED STATES SHELL CONTRACTS FOR CANADA

We understand that orders are being placed in Canada by the United States Government for large quantities of 75 mm., 2 15/16 inches, high explosive shells, the same type as is used by the French Army. Several prominent Canadian manufacturers have been negotiating with the Imperial Munitions Board in connection with the contracts that are being placed. The Imperial Munitions Board are acting for the United States Government in the distribution of these contracts.

The Submarine Boat Co. is said to have placed its fabricated steel contracts, referred to last week, at $38.50 per ton, but the American Co. claims to have secured a lower rate from small shops. Most of the large fabricators whose shop capacity is now well sold consider $40.00 per ton on such work a low rate.

The American International Shipbuilding Corporation has purchased 25 locomotive cranes from the Industrial Works, Bay City, Michigan, for installation at the Government Hog Island shipyard and the Submarine Boat Corporation has ordered 5 overhead shop cranes for the Government shipyard at Port Newark. A large order for locomotive cranes has also been placed for the same plant and bids are now being taken on a number of radial drills for the shops now under construction.

The Federal Shipbuilding Co. has issued a list of ten shop cranes which are about to be purchased. The New York Shipbuilding Co. has placed a contract for 1,900 tons of steel with the American Bridge Co. for additional ship ways at Camden and continues to buy shop equipment. The Newburgh Shipyards Co., which has just received a contract to build four large ships for the Emergency Fleet Corporation at Newburgh, N.Y., is now buying machine tools. The Union Iron Works, San Francisco, which has thrown the whole of its energy into the building of torpedo boat destroyers, continues to buy shop equipment in the interior markets.

To Control Export of Tools

The War Industries Board, through its machine tool section, recently organized, has commandeered about 600 machine tools that were originally sold for export and awaiting shipment at New York, to relieve the pressing needs of American manufacturers of war munitions. Hereafter, the Government will permit the exportation of only such tools as are needed by the Allied governments to manufacture war material. All other tools will be diverted to home industries engaged in government work. Steps are also being taken to increase the output of machine tools and to utilize those already installed to the best possible advantage; consequently, future contracts for war munitions will probably be given only to manufacturers experienced in such work and whose shops are already equipped to make munitions.

The Emergency Fleet Corporation is understood to have virtually closed a $10,000,000 contract with the Allis-Chalmers Co. of Milwaukee to build marine turbine engines. Manufacturers holding government contracts for ordnance and shells are constantly in the market for machinery of various kinds. The Savage Arms Corporation, that is building Lewis machine guns, has placed contracts for $200,000 worth of tools to be installed at the Utica, N.Y., plant. The Taylor-Wharton Iron & Steel Co. is buying equipment for its Tioga plant to execute a contract for the Government. Shell makers in the central West are now actively in the market for tools of various kinds.

PITTSBURGH, PA., Nov. 3.—The rumors that the price-fixing programme at Washington had been halted, referred to in last letter, were followed by a semi-official statement that such was the case, but the statement meant nothing as there was no intimation how long the halt would continue. Last Wednesday and Thursday the various committees of the American Iron and Steel Institute were in session in New York and immediately afterwards the opinion was expressed by those who had attended the meetings that a batch of prices would be announced at Washington very shortly, covering some or all of the following items: Sheets, tin plates, wire products, tubular goods and scrap. Sheet and tin plate prices at least will probably have been announced before these words are printed.

If all the products just mentioned are set the major products of the steel industry will have been covered and further price-fixing would relate rather to manufactured goods, such as shafting, rivets, bolts and nuts, spikes, etc. These may or may not be taken in hand.

Pig Iron

The market has been fairly active and it has been moving smoothly. Furnaces are disposed to take care of the immediate needs of regular customers and generally are able to do so. Since the general agreement announced Sept. 24 the furnaces have been selling basic and foundry at $33 at furnace, in all districts, with valley Bessemer at 10 per cent. higher, or $36.30. A schedule covering details, including analyses, is just about to be promulgated by the American Iron and Steel Institute. Direct testimony to the activity of the market since prices were set is furnished by the monthly compilation of W. P. Snyder & Co. This compilation has been made monthly for years, and takes account of all valley basic and Bessemer sold in a month, in lots of 1,000 tons and over, showing the average price realized on the sales. This average is used in the adjustment of some contracts made on a sliding scale basis. The October averages showed the set price, but the important fact was that the total tonnage included in making up the averages was fully 100,000 tons, while in each of the three preceding months the tonnage reported sold was much less.

Steel Quiet

There has been very little market activity in unfinished steel and finished steel products. The mills are well sold up and buyers are well covered, while the general attitude is that business should not be done at this time for far forward deliveries. In most of the commodities little material is available for early deliveries, but sales when made are at the set prices, when there are any. Prices as announced are stated to be subject to revision Jan. 1 or later and the common view is that if revised the revision will be downwards. While it has seemed improbable, of late, that there would be any occasion to reduce prices, in the past few days this possibility has become less remote, as the curtailment in commercial consumption of steel, due to the country becoming more fully engaged, in sentiment and action, in the war, has become more conspicuous. In some quarters recognition of the changes war would effect has been somewhat tardy.

Decline in Sheets

The break in sheets recorded in last report has been followed by further declines. The existing conditions disclose clearly the fictitious nature of the sheet market in the past few months, something that was appreciated by some of the best posted consumers but certainly was not admitted by the mills. The break had carried the market in blue annealed and black sheets to a level of 6.00c a week ago. At the beginning of this week there were occasional sellers at 5.50c, while later in the week this quotation became common and quotations of 6.00c were not taken seriously by buyers. Two or three mills made occasional quotations of 5.25c on No. 28 gauge black, and it seemed clear that they were doing this merely to sell about a day's rolling each day. Some of them had practically run out of business. Last April the American Sheet & Tin Plate Company sold its second half output at 5.00c for blue annealed and 5.50c for black, with .25c extra for open-hearth, but the tonnage did not go around and independents immediately began selling at higher prices. Now the market is back to the old level, and the net result of the flight to 9.00c or thereabouts has been to make an extra profit for the mills on a relatively small tonnage and disorganize the business of many consumers whereby the consumption of sheets to-day is undoubtedly at a smaller rate than would be the case if the market had remained on a steady basis.

Coal Supplies Improving

Occasionally the steel mills have lost a little production through shortage of coal, and the majority of them have been on the ragged edge for weeks, with practically no stock piles. For the 24 hours of last Monday the priority order in favor of lake coal shipments was suspended and shipments to the line trade were heavy. Yesterday the priority order was removed entirely as relates to fully half the railroad divisions, as the lake shipping season is now nearing its close, and coal supplies promise to be decidedly better to mills and other important consumers. Effective last Monday morning the government coal prices were advanced 45 cents, this covering the wage advance arranged Oct. 6, and probably something in addition. The new prices for Pittsburgh district coal are $2.20 for slack, $2.45 for mine-run and $2.70 for screened, per net ton at mine, with 15c to be added by brokers when they make the sale.

Government Buying

Government buying is somewhat heavier, as the matter of shells is now receiving a great deal of attention. Some additional sheet tonnages are being allotted, making the sheet requirements somewhat larger than had been anticipated. There is no occasion to revise former guesses as to the total war steel requirements. For the Government and its Allies these promise to run next year at the rate of something like 1,000,000 gross tons per month, or, as stated formerly, between 30 and 40 per cent. of the total output.

Contract Abrogation

Recently the Federal Trade Commission distributed a questionnaire relating to the abrogation of contracts. The subject is up in connection with the iron and steel price regulation bill the commission is drafting for submission at the next session of Congress, convening Dec. 5. The steel producers are practically a unit against the idea and the suggestion is meeting a storm of protest. While the fixing of prices has doubtless placed some manufacturers in an awkward situation, through their having contracts to accept material at higher prices, it would seem that attempts to abrogate some or all contracts would make the remedy much worse than the disease.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

U. S. PIG IRON PRICES FIXED

E. H. GARY, Chairman of the Committee on Steel and Steel Products of the American Iron and Steel Institute, has issued the following statement:—"By agreement between the General Committee on Steel and Steel Products of the American Iron and Steel Institute and the War Industries Board, approved by the President, the base price of No. 2 foundry iron and also basic iron was fixed at $33 per gross ton, f.o.b. cars at furnace.

"From these base prices the sub-committee on pig iron, iron ore and lake transportation has reported to the general committee a list of differentials which the general committee believes as fair and reasonable and in accordance with the usages of the trade, and therefore recommends to the iron industry that the same be adopted to take effect immediately. It is hoped that there will be no hesitancy in accepting this recommendation.

"The grade of No. 2 foundry iron to be equivalent in analysis to: silicon, $1.75 to $2.25; sulphur, not over .05. No. 2 soft southern iron equivalent to No. 2 foundry of same silicon content.

"Differentials from the above base price for No. 2 foundry iron to be made for the following changes in specifications:—

"Forge or mill iron, $1 per gross ton under base.

"Foundry iron running silicon $1 to $1.75, .50 per gross ton under base.

"Foundry iron running silicon $2.25 to $2.75, .50 per gross ton over base.

"Foundry iron running silicon $2.75 to $3.25, $1.50 per gross ton over base.

"Foundry iron in excess of $3.25 silicon and $1 per gross ton for each ½ per cent. of silicon over the price for $3.25 silicon iron.

"Manganese, sulphur and phosphorus variations to be adjusted as formerly

customary in each district, having respect to the base price.

"Where iron is sold by fracture the usual grading prevailing in each district to continue.

"Malleable iron, .50 per gross ton above base.

"Bessemer iron, 10 per cent. per gross ton above base.

"Basic iron, base price.

"Charcoal iron—Southern or warm blast charcoal iron, a maximum of $10 per gross ton above base for iron ranging .40 to .60 phosphorus, and silicon $1 to $2.

"For grades running below these analyses corresponding reductions as usual to the trade to be made.

"Cold blast charcoal iron a maximum of $22 per gross ton above base, with customary reductions for lower grades, as recognized by the trade.

"Lake Superior iron $2.50 per gross ton above base for iron averaging $1.25 silicon. Other grades to be adjusted as per the custom of the trade, depending upon the silicon, phosphorus and manganese contents of the iron.

"All of these charcoal iron differentials to be considered in connection with the base price.

"High silicon or silvery iron—For iron containing 6 per cent. silicon, $7 per gross ton above base; 7 per cent. silicon, $9 per gross ton above base; 8 per cent. silicon, $11.50 per gross ton above base; 9 per cent. silicon, $14 per gross ton above base; 10 per cent. silicon, $17 per gross ton above base.

"Three dollars per gross ton advance for each 1 per cent. silicon for 11 per cent. and over.

"Bessemer ferro-silicon—For iron containing 10 per cent. silicon, $22 per gross ton above base; 11 per cent. silicon, $25.30 per gross ton above base; 12 per cent. silicon, $28.60 per gross ton above base.

"Low phosphorus iron—Iron containing phosphorus and sulphur not exceeding .04 and silicon not exceeding 2 per cent. For copper bearing iron, $17 per gross ton above base; for copper free iron, $20 per gross ton above base.

"A sliding scale of $1.50 per gross ton advance for each reduction in phosphorus of .005 per cent. below .04, and $1.75 per gross ton for each 1 per cent. of silicon in excess of 2 per cent."

FIRM WANTS CATALOGUES

IN the recent fire which destroyed the entire forging plant of the Cluff Ammunition Co., Ltd., Atlantic Avenue, Toronto, the firm's records were completely lost. They are anxious to renew their catalogue file, and would appreciate new copies of equipment, manufacturers' literature, etc.

THE largest hydraulic power installation in South Africa is at Barberton, and is capable of developing 3,000 horsepower. Only about 1.1 per cent. of the power of the Union is obtained from water.

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

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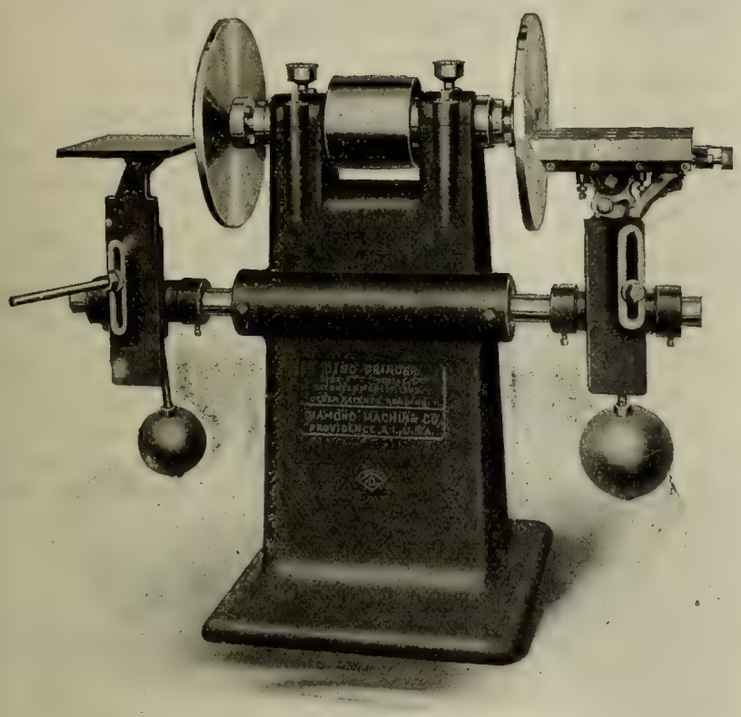

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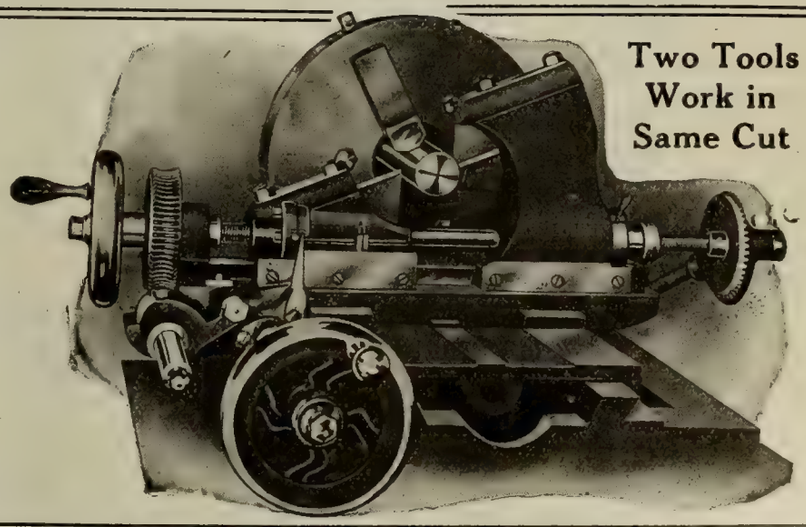

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Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Levis, Que.—The Dussault Co. will build and equip a machine shop.

Hamilton, Ont.—The Frost Wire Fence Co. will extend their factory here.

Bridgewater, N.S.—The Gray Marine Motor Co. may establish a plant here.

Welland.—The Canada Foundries & Forgings Co. have recently secured some important orders for marine forgings.

New Glasgow, N.S.—The Nova Scotia Steel & Coal Co. will make a number of extensions and improvements to their steel plant.

Sydney, N.S.—The Sydney Foundry & Machine Co., will build a foundry at Halifax, to cost $7,500. Wilfred Clarke is manager.

Sarnia.—The Holmes Foundry Co., a recently organized concern, will build a plant here. It is expected that construction work will commence shortly.

Orillia.—The dam at Ragged Rapids will be blown out on Nov. 10. Everything else is ready for starting up the new plant. Two units in the power house are completed, and ready for operation.

Watford, Ont.—The St. Andrews Wire Works of Canada, Ltd., has taken a building at Strathroy, Ont., which it will remodel and equip for the manufacture of wire products, etc. G. M. Haldane is local manager.

Port Arthur.—Work on the new plant of the Port Arthur Pulp & Paper Co. though held up by the advent of cold weather is progressing favorably. It is expected that the mill will be in operation early next month.

Nanaimo, B.C.—Coal was struck recently by Canadian Collieries and the new mine is being opened by them at South Wellington, four miles from this city. The seam was tapped by a stope 12 feet from the surface and development work will be rushed with all possible speed.

Hamilton, Ont.—The Dominion Foundries & Steel Co. has started operations at its new plate mill. In the meantime it is understood that the plates will be made from rejected shells. The mill will roll plates from ¼ inch to ¾ inch thick, 24 inches wide and any weight up to 500 pounds.

Trail, B.C.—Consolidated Mining and Smelting Co. of Canada has completed the purchase of the mines and mining properties in the Camp McKinney and Fairview districts of British Columbia and preparations are being made for production. About 2,000 acres in each camp is involved.

Toronto, Ont.—Fire believed to have been caused by spontaneous combustion early Saturday morning destroyed the forging plant of the Cluff Brothers Ammunition Co., of 28 Atlantic Avenue. The loss is placed at $200,000, all of which is covered by insurance. After the fire R. J. Cluff intimated that the plant would be rebulit as soon as possible.

Vancouver. — The West Kootenay Power & Light Co., a subsidiary of the Consolidated, is building a line from Cascade Station to Princeton, B.C., that will enter the McKinney and Fairview fields. The extension of the company's power lines to Princeton, B.C., where it is to furnish power for the Canada Copper Corporation, passes through the camps of McKinney and Fairview, which were abandoned on account of not being able to get the necessary cheap power to work them. Anticipating this extension, the Consolidated Mining & Smelting Co. have got control of these properties for a nominal sum, and with the cheap power available will now develop them.

GENERAL

Medicine Hat.—The Dominion Glass Co. has taken over the Alberta Bottle Works.

Tillsonburg, Ont.—A large gusher struck a few days ago near Port Burwell promises to be one of the richest gas wells in the district.

Three Rivers, Que.—La Manufacture de Seaux et Boites des Trois Rivieres is the name of a company which has just established a factory for the manufacture of pails of all sizes, butter boxes and packing cases in Three Rivers.

Whitby, Ont.—The United Rubber Mfg. & Reclaiming Co. propose establishing a factory here. The town will loan the company $25,000 and free light and water in return for which they will erect and equip a factory costing at least $50,000. A by-law will be submitted to the ratepayers on Nov. 26.

Georgetown, Ont.—One of the main buildings of the Provincial Paper Mills here was destroyed by fire on Oct. 29. It will take several weeks before repairs can be made and the plant put in full operation again. The cause of the fire is unknown. The loss is estimated at $25,000, covered by insurance.

ELECTRICAL

Chatham, Ont.—A movement has been inaugurated by the residents of Merlin to secure Hydro power for the village. Active measures are being taken so that the proposition can be decided on at the polls at the county elections.

Walkerton, Ont.—Mayor Johnston has had word from the District Hydro Electric Engineer that the Hydro is ready to go ahead with their proposition to supply Walkerton with power. The scheme is to take over the two plants of the Saugeen Electric Co. at Walkerton and to develop further power on tse Saugeen, to reinforce the Eugenia system.

MUNICIPAL

Sault Ste. Marie.—The City Council are building a pump house and installing new equipment.

Toronto.—The Rosedale section of the Bloor Street Viaduct has been completed, and officially taken over by the city. There was no ceremony in connection with the transfer.

BUILDING

Toronto.—A block of stores will be erected by Frank Stollery at the corner of Yonge and Bloor Streets at a cost of $100,000.

PERSONAL

Arthur Hatton has been appointed Chairman of the newly-organized Canadian Railway Association of National Defence.

J. J. Scullan, connected with the Toronto plant of Canadian Allis-Chalmers, has been appointed general superintendant of the company's branch at Bridgeburg, Ont.

Lloyd Harris, president of the Russell Motor Co., Toronto, has undertaken, at the request of the Imperial Munitions Board, the duty of representing the Board at Washington, D.C.

J. M. Pouliot, manager of the Gaspe and Baie des Chaleurs Navigation Co., owners of the coasting steamers Gaspesien and Percesien was drowned at Quebec on Oct. 29, by falling between the wharf here and the Gaspesien.

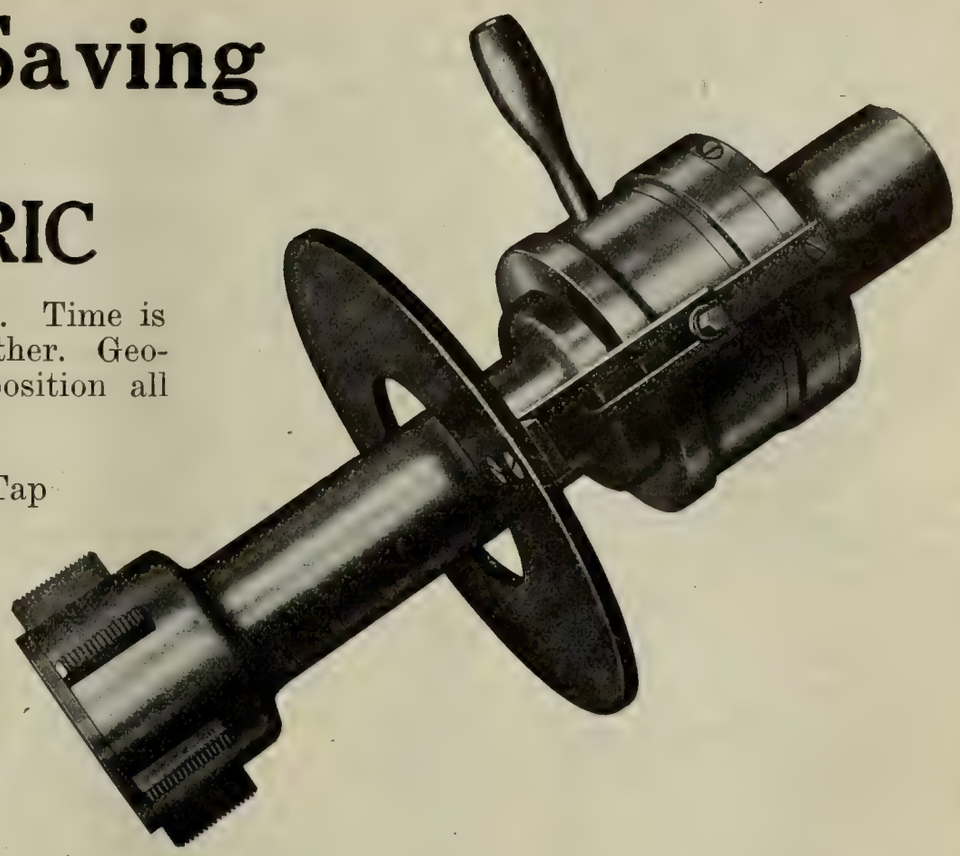
H. J. Fuller of New York, president of the Canadian Fairbanks-Morse Co., has been appointed to represent the Imperial Munitions Board in New York in connection with munitions and marine equipment contracts.

Horace S. Wilcocks, vice-president and managing director of the North American Chemical Co., and director of the Decalcomania Co. of Canada, died suddenly at his home, 34 Nina Avenue, Toronto, last week. Mr. Wilcocks was born at Kingsey, Que., in 1862.

J. Nelson Hunter, of the Combustion Engineering Corporation, New York, has joined the British Royal Flying Corps. Five other members of the Corporation's drafting-room staff have joined various branches of the service in the United States Army and Navy.

W. A. Kirkwood, for some years locomotive foreman on the Grand Trunk for the Stratford, Ont., district, has been promoted to the position of assistant master mechanic of the Allandale Division and will have under his supervision many of the larger places in that district, including Toronto, Fort Erie, Niagara Falls and several other places.

Daylight Saving
with a
GEOMETRIC



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This Geometric Collapsing Tap is specially arranged for deep tapping in Projectile Caps.

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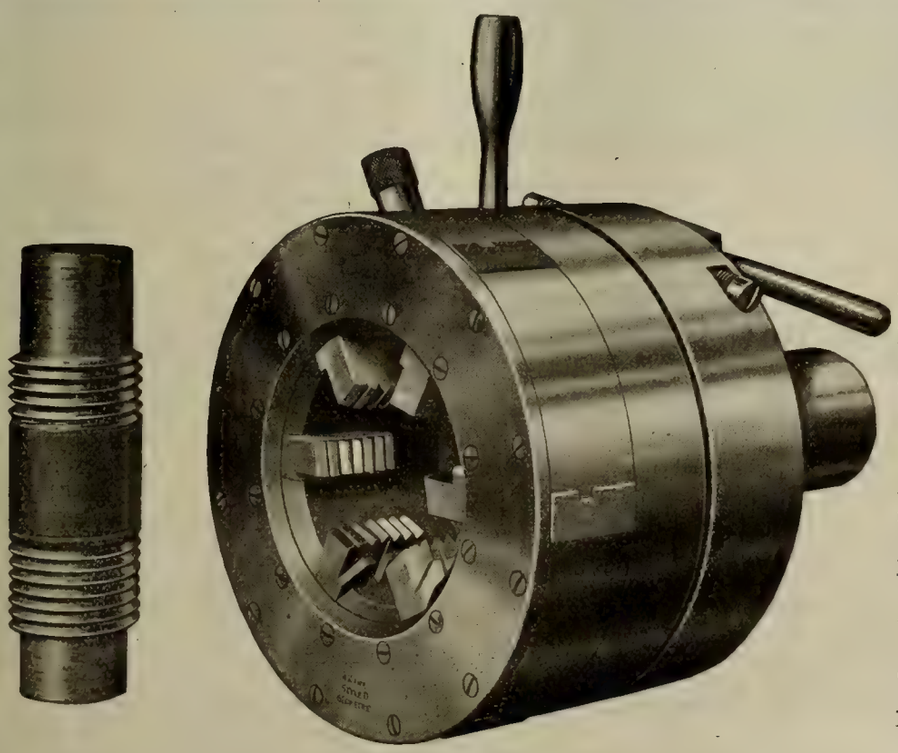

When it is an outside thread, Geometric Die Heads cut every style from 1/16-inch size up to greatest required diameter.

A U.S. Navy Yard is using this 4½-inch size Style "D" Geometric Die Head. United States Navy Yards accept no second quality.

Do your Screw Machines and Turret Lathes swing Geometrics?

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Mr. Kirkwood is succeeding J. B. Donnolly who is now on the pension list.

Lieut.-Col. Thomas C. Irving, Jr., D.S.O., of Toronto, Commanding Officer of the 1st Canadian Engineers, has been killed in action. Lieut.-Col. Irving went overseas with the first Canadian contingent as a captain with the Canadian Engineers. In October, 1915, he was gazetted major of the Second Field Co. Engineers. He was decorated with the D.S.O. for distinguished conduct on the field and later was promoted to a lieutenant-colonel. Before joining the C.E.F., Lieut.-Col. Irving was a member of the Moffat-Irving Steel Co., and vice-president of the C. W. Hunt Co., consulting and inspecting engineers of Toronto.

MARINE

Newcastle, N.B.—The International Shipbuilding Corporation has commenced the erection of an extensive plant for wooden vessels at Nordin, on the Miramichi River. The first keel will be laid shortly.

St. Johns, Nfld.—It is the intention of the Newfoundland Government to submit to the Legislature at its next session a bill to limit the class of vessels entitled to bounty from the Government under the present shipping bounty law. Hereafter bounty will be payable on vessels not exceeding 120 tons gross measurement. Vessels exceeding 120 tons gross will not qualify for any bounty whatever.

TENDERS

Vancouver.—Tenders are being received for material for the proposed C. N. R. depot here by the contractors, the Northern Construction Co., of Winnipeg.

Strathroy, Ont.—The Town Council are calling for tenders for a pump house and turbine pump. Full particulars may be obtained from the engineers, Kerry & Chace, Toronto.

Chapleau, Ont.—Tenders will be received by the town clerk until Thursday, Nov. 15, 1917, for turbine pump, 400 gallons capacity, operated by 40 h.p. motor. Specification, plan, etc., may be seen at the office of the town clerk at Chapleau, or at the office of Chipman & Power, Mail Building, Toronto.

Winnipeg, Man.—Tenders covering work that will represent an expenditure of approximately $1,250,000 are being called for by the Administrative Board of the Greater Winnipeg Water District, as follows:—Tenders for the gate house and intake at Shoal Lake will be received up to Nov. 16; for cast iron gate valves, air valves and sluice gates up to Nov. 26; for material to be used for the pipe line from the Red River to the McPhillips Street reservoir up to Dec. 3, and for the construction of the pipe line up to Dec. 3. Chief engineer, W. G. Chace; chairman, R. D. Waugh.

Halifax, N.S.—Tenders addressed to the Naval Store Officer, H.M.C. Dockyard, Halifax, N.S., will be received up to Thursday, Nov. 15, 1917, for the purchase of any or all of the following: Steel, various; iron, various; brass, copper, lead and metal, old; stoves, ranges; kettles, various; rubber boots and rubbers; rubber, old; hoses, rubber, rubber-lined and canvas; leather boots, belting and scrap leather; wash-stands, lockers, chairs, etc.; sacks, coal; files, old; cordage, old, paperstuff; wire-rope, old; bunting, old; hammocks, old; cable, old; bronze braided and electric; carpets and rugs; ship's boats; miscellaneous tools; diving gear; canvas, old; lamps and lanterns, oil and electric; clocks, telescopes, binoculars, barometers, logs, etc.; pipe elements, ex "Belleville" boilers, life belts, and cork, old; refrigerating plant, including vertical steam engine, copper and iron coils, etc.; rigging returned from patrol vessels; and steam launch, high speed, engine and boiler complete, including spare gear. Complete lists, with quantities offered for sale, may be had on application to the Naval Store Officer, H.M.C. Dockyard, Halifax, N.S.

WOODWORKING

Toronto.—W. Williamson will build an extension to his planing mill on Woodbine Avenue, at a cost of $3,500.

RAILWAYS & BRIDGES

Toronto.—The Ontario Railway and Municipal Board has issued an order authorizing the Toronto Street Railway to operate a regular street car service on the double tracks recently laid down, connecting the Queen Street line at the Don Bridge with the harbor improvements area.

Ottawa, Ont.—The new Pretoria Avenue bridge, erected at the joint expense of the city and the Dominion Government, is now ready for traffic. The construction of the bridge is complete, with the exception of railings on the north side, which have yet to be erected. Assistant City Engineer Askwith has caused a test to be made of the apparatus by which the centre of the bridge is lifted for the passage of boats in the canal. The lifting required only 45 seconds.

TRADE GOSSIP

Babcock & Wilcox, Montreal, have been awarded the contract for boilers for $50,000 addition to factory for the Springfield Milk Co. at Springfield, Ont.

Toronto.—The Russell Motor Co. of this city will build a factory at Buffalo, N.Y., for manufacturing war equipment for the United States Government.

The Nova Scotia Steel Co., New Glasgow, N.S., has attached to its staff Miss Whidden of Birmingham, Ala., to inaugurate social welfare work among the employees. Miss Whidden has had large experience in this class of work in the States.

Tungsten More Active.—Improvement is noted in the market for tungsten but the more active demand has not influenced the price which is unchanged at former quotations. Wolframite is quoted as to quality at $23 to $25 and Scheelite at $26 per unit for high grade on the basis of 60 per cent. metal or 30c per unit additional up to 5 per cent.

Concrete Steamer to be Launched.—The date set for launching the "Concretia" at Montreal has been decided for the 6th or the 8th of this month. The deck has been completed and they are now finishing the hatches. Work has been started on preparing the ways on which she will be launched. Tackle will be used to ease her down the incline.

Canadian Customs Receipts.—Custom receipts for the Dominion during the month of October totalled $13,722,883. This was an increase of $1,761,953 over the same month a year ago, when the receipts totalled $11,960,939. For the seven months of the fiscal year ending October 31 customs receipts totalled $102,375,295, as compared with $82,525,477 for the same period last year. This constitutes an increase of $19,849,817.

Export of Munitions Machinery Prohibited.—An order-in-council has been issued on the recommendation of the acting Minister of Customs ordering that the exportation to the United Kingdom, British possessions and protectorates and to all foreign countries, of plant, machinery and equipment of all kinds for the manufacture or production of munitions of war shall be and is hereby prohibited except under license from the Minister of Customs.

The Canadian Allis-Chalmers Co. has a contract for four 3,500-ton steel steamers for the British Government, to be built at Bridgeburg, Ont. It is understood that the British Government will be granted a long time credit for the full value of the vessels. The four steel freighters will cost the British Government three million dollars, but this sum will not have to be paid to the company for two years. In the meantime it will be carried as an ordinary book account by the big corporation, and without any security being required.

Regulate Ontario Power Output. — The Dominion Government has been asked by Sir Adam Beck, on behalf of the Provincial Government, the Hydro-Electric Commission and the municipalities interested in the Hydro movement to appoint under the War Measures Act a controller to regulate and govern the whole question of production and export of power in Ontario. Sir Adam made a strong plea for effective regulation of the power production, giving primary consideration to the needs of the munitions business and overcoming the difficulties which are encountered at present.

Substitute for Sheet Steel.—An asbestos-cement composition is being manufactured in England as a substitute for sheet steel for various purposes. Ground asbestos is mixed in the proportion of one to six with Portland cement and worked into a paste with water. A machine something on the order of those used in making paper forms it into sheets, which are trimmed to size and if desired corrugated for roofing purposes. After seasoning the material is ready for use. It is durable, resistant to climatic conditions, particularly acids in the atmos-

phere; fireproof and also a non-conductor of heat.

Brantford, Ont.—An announcement has been made from New York that the American Steel Products Corporation has been organized with a capital of one million dollars, the officers being W. P. Kellett, president; D. O. Johnston, vice-president; treasurer, M. M. McGraw; secretary, P. H. Secord; W. S. Brewster, of Brantford, and W. S. Tomlinson, Toronto, directors. All but the latter are Brantford men. The new organization will take in the Dominion Steel Products Co. of this city, and it is expected that as a result the local company will double its present plant. The local plant is now working on the line and propeller shafting for one hundred of the new ships being built in the United States.

New Steel Company Incorporated.—A new concern, the Alloy Steel Works, has been incorporated with an Ontario provincial charter to take over the steel plant on Front Street, Toronto, formerly operated by the Moffatt-Irving Steel Co. The new concern will continue to make steel castings by the electric furnace process which at this plant utilizes flue dust or fines for making steel. The company contemplates enlarging the capaccity of the plant by the installation of another furnace. John R. Russell and H. T. Armstrong of Toronto are interested in the new venture which is capitalized at $100.000.

Maximum Prices Fixed for Steel Supplies.—President Wilson at Washington on Monday approved an agreement made by the War Industries Board with the principal steel manufacturers of fixing maximum prices, subject to revision January 1, on certain steel articles, including sheets, pipe, cold rolled steel, scrap iron, wire and tin plate. The prices for sheets range from $4.25 to $6.25 per 100 pounds f.o.b. Pittsburgh, according to grades. On three-quarter-inch pipe to three-inch black steel pipe a discount of 52 and five and 2½ per cent. f.o.b. Pittsburgh was fixed. The agreement on cold rolled steel was 17 per cent.

Concrete Motor Ships.—The Committee of Lloyd's Register of Shipping, London, England, have during the last three months approved the plans for the construction of a number of non-propelling barges, some of them designed to carry 500 tons deadweight, and also of a motor vessel, to be built of ferro-concrete in the United Kingdom and in Norway for the British and Scandinavian coastal trades. These vessels will be built under the inspection of the society's surveyors with a view to classification in Lloyd's Register book. Plans of other ferro-concrete vessels of larger carrying capacity for certain sea trades are at the present moment under consideration.

Big Coal Production in B. C. and Alberta.—A gratifying report in connection with the output of coal in district 18, which comprises part of the Province of British Columbia and part of Alberta, has been received by the Dominion Minister of Labor at Ottawa from W. H. Armstrong, Director of Coal Operators in that section. Mr. Armstrong

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PORTABLE PLANERS
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After the war—
What?

Few can predict—yet all can prepare! Our present prosperity rests in part on an artificial basis which peace must remove. Now is the time to consolidate your position by regulating your expenditures—by husbanding the surplus—and by investing to the limit in Canadian War Loans, that help so much to maintain present prosperity.

The National Service Board of Canada

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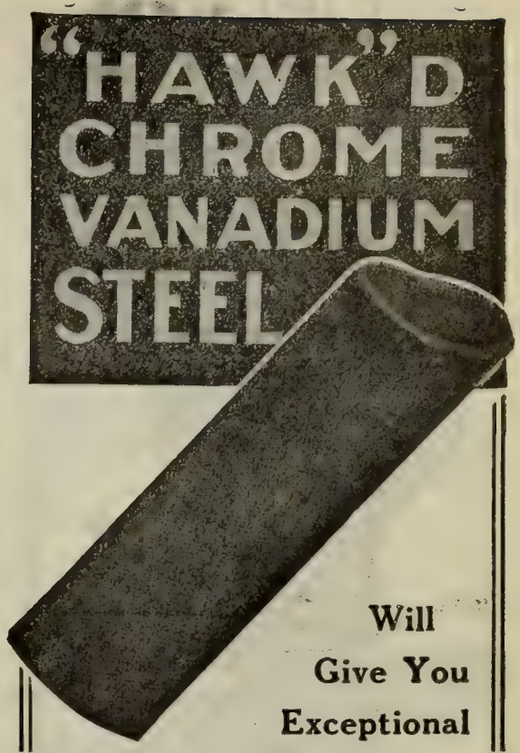

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It does not stick to the work.

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Owen Sound Ont.
Engineers
Boiler-makers
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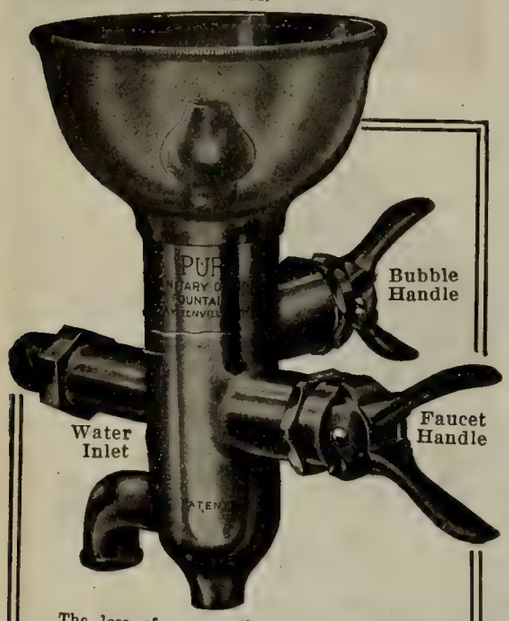
Tank Work
Smoke Stacks,
Grey Iron and Brass Castings,
Special Machinery Made to Order

I BELIEVE

In Safety First and always.
In providing for the Health of my Fellow Workmen.
In Light and Air and sanitary Working Conditions.
In clean, fresh drinking water for everybody.
In the Safety, Economy and Man-betterment.

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)



The loss of a man through impure drinking water is a crime that "the front office" must bear.

An ugly statement, isn't it? But true, absolutely.

When a man comes to work in your factory he puts his health in your keeping.

Are you willing to take chances on such a trust?

Impure drinking conditions are responsible for more tragedies than any machine ever built.

Apply the "Safety First" Principles to your water supply; don't deny your men a clean, fresh drink of water.

Conserve their health and they will improve your profits; make yourself as worthy of the name of "employer."

Install the Gold Medal winner Puro in your plant, office and shop alike.

The only Sanitary Drinking Fountain that is safe, sanitary, simple, automatic in control and easily attached.

Let us tell you just what it will cost you to

"PURO-FY"

YOUR WATER SUPPLY

Puro Sanitary Drinking Fountain Company
147 University Ave., Toronto, Canada

'Barnes-Made'
Springs

are unusual in service and wear.

They are the result of sixty years' experience, unsurpassed equipment and highly skilled workmanship.

A trial will convince you that "Barnes-Made" Springs are the best buy.

Established 1857.
THE WALLACE BARNES COMPANY
218 South St., Bristol, Ct., U. S. A.
Manfrs of "Barnes-made" Products
Springs, Screw Machine Products, Cold Rolled Steel and Wire

states that the total output in Alberta for the third quarter of the year is 1,324,452 tons, an increase over the same period last year of 335,384 tons. His statement does not include the output in the mines of South-eastern British Columbia.

Pneumatic Ash and Flue Dust Plant.—A pneumatic ash-handling plant installed by Ed. Bennis & Co., Ltd., Little Hulton, England, and described in *The Engineer*, London, has an auxiliary conveyor pipe for removing flue dust and soot from the flues, economizers, and chimneys entirely separate from the ash pipe, but joined to it at its foot leading up to the ash tank. The dust pipe main is provided with connections, to which may be attached lengths of flexible pipes, which can be taken about as desired and inserted into openings in the flues and economizer chambers, which are provided with cover plates for use when the dust is not being removed. Also a hand hole with an air-tight door, is located at each end of every bend of the ash pipe for removing any obstructions, which may accidentally become lodged in the pipes.

Wooden Ship Launched at Quebec.—The first wooden ship of its kind built in Quebec since the old days of the sailing vessel, when the ship-building industry flourished in the province, was launched on October 28 at St. Laurent, Island of Orleans. The vessel is a four-master, with auxiliary power and its length over all is 223 feet, 42 feet beam and the depth of hold is 20 feet. Its tonnage is figured at about 1,350, while the deadweight will be about 2,100 tons. The schooner was constructed by the Quebec Shipbuilding and Repair Co., and it was named the Martin Connolly, after the Quebec representative of the company, the head office of which is in Montreal. Mrs. Connolly performed the christening ceremony.

Enemy Patents for U. S. Manufacturers.—The vast store of German scientific information in the United States has been opened to American manufacturers, in regulations issued at Washington, D.C., by the Federal Trade Commission under which enemy-owned patents and copyrights will be licensed for manufacture by citizens of the United States. When the regulations had been made public the commission met a group of medical men to consider licensing the manufacture of certain drugs, principally salvarsan, used in virulent blood diseases, and non-toxic substitutes for local anaesthetics, of which the supply in this country has run dangerously low since the war interrupted commerce. Approximately 20,000 patented and copyrighted articles are said to be affected by the commission's order. These include dyestuff formulas of vital importance to American industries and mechanical devices of wide use.

Railway Board Will Recover Cars.—One of the first things which the Canadian Railway Association of National Defence will undertake is to recover more than 20,000 Canadian freight cars that are on American railways, this number being in excess of the number of American freight cars on Canadian railways, as the association claims that if these "lost" cars are obtained the freight car shortage in this country will be relieved. It is intended to ask either for the return of the Canadian cars or of an equal number of American cars, and if necessary a committee will go to Washington to arrange that there shall be no repetition of this condition. Thousands of tons of freight are delayed by the habitual under-loading of freight cars, so the association is starting an educational campaign to have shippers fully load cars and thus add about 25 per cent. to the freight cars available for service. Committees have been appointed in the various provinces to this end.

CATALOGUES

Electric Lamps—Bulletin No. 77, issued by the Cooper Hewitt Electric Co., illustrates and describes various types of Cooper Hewitt electric lamps for motion picture studios. Specifications and prices are given for each type of outfit.

The Perfect Machine Co., Galt, have issued a catalogue describing an interesting line of machine shop tools including lathes, drills, power hack saws, grinders, special machinery and tools, jigs, dies, etc. The capacity and dimensions of each tool illustrated are given together with the principal features of construction.

Woodworking Machines. — Bulletin issued by the Preston Woodworking Machinery Co., Preston, Ont., deals with the question of labor-saving and shows two woodworking machines in this connection. The machines are a high-speed ball bearing shaper and a veneer taping machine. An open letter to Canadian woodworking manufacturers is also a feature of this bulletin.

Conveyors and Elevators.—The Brown Portable Conveying Machinery Co., Chicago., have issued a new bulletin "The Cost Cutter" describing the "Brown Portable" modern money-making machines for piling packed material and also devoted to the economic handling of packed materials. In this bulletin the cost of piling is discussed and "Brown Portable" system fully described accompanied by a number of views showing the system in operation and featuring the wide field of application of these conveyors.

BOOK REVIEW.

International Mercantile Diary, 10 x 7¼ inches. Published by Syren & Shipping, Ltd., London, England. Price $1.25 net. This is a new publication which might also be called a commercial handbook or exporters' guide for it has been compiled with the object of giving in concise form as much information as possible which will be of value and assistance to those engaged in foreign trade. The book contains 250 pages in addition to the diary proper. A valuable feature in the first section of this publication is a series of very complete conversion tables of British sterling from and into foreign moneys at varying rates of exchange, which cover any money in the world at any rate. Having been calculated entirely in decimals, these tables are of equal value whether British currency remains after the war in its present form or be altered to a decimal

system with the pound sterling as the unit of value. In the same way the conversions of foreign weights and measures from and into British, also calculated in decimals, have been complemented with conversions from and into those of the metric system. The equivalents and conversion tables cover the weights and measures principally in use in all countries of the world. The third or international section of the diary contains much useful information on matters of general interest and special data concerning shipping, banking, postal, cable, financial facilities, etc., of each country.

RECORD CANAL TONNAGE

LAKE commerce carried through the American and Canadian waterways of Sault Ste. Marie last month aggregated 12,646,066 tons, and established a new high record for October, despite the fact that freighters were receiving slow despatch the latter part of the month due to frozen ore and shortage of cars at unloading ports.

The statistical report of canal traffic, completed by L. C. Sabin, general superintendent of the American canals, shows an eastbound freight movement of 9,899,660 tons and traffic westbound aggregating 3,645,021 tons.

The ore movement of 8,132,288 short tons fell short of the September showing of 9,298,814 tons, and was lighter also than in October last year. Shipments of soft coal were 2,586,849 tons compared with 3,001,490 tons in September and with 1,457,717 tons in October, 1916. Hard coal shipments of 357,639 tons also fell short of the September total of 402,324 tons, but exceeded the 279,350 tons carried through the canals in October, 1916.

Shipments of flour amounting to 1,204,9940 barrels compares with 918,650 barrels in September, but did not equal October last year, when total was 1,668,250 barrels. The eastbound movement of wheat was 34,714,844 bushels, more than quadrupling the September record of 8,565,177 bushels, and comparing with 18,444,833 bushels in October last year and with 65,387,356 bushels in October, 1915.

Vessel passengers for the month were 3,147, the total being fewer than in September when there were 3,265, or in October, 1916, when there were 3,253.

WHILE in London on a holiday a visitor went to have a look at the Thames near Wapping. There was a steam shovel at work in the river, and he was standing watching it. Suddenly he felt a tap on his shoulder and turned around to find a son of Erin standing there. "Say," said he, "isn't London a wonderful place? By gorry, now, just look at that thing goin' down there; now look at it, isn't that wonderful? But, say, ould man, I wouldn't want to be the cove at the bottom filling that thing up, would you?"

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Enameling and Varnishing Ovens heated by Gas, Electricity, Steam or Coal.
Write for Booklet.
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Brantford, Canada.

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TRADE MARK LANCO BALATA BELTING
FOR BIG SERVICE
Lanco Balata is as nearly stretchless as it is possible to have a good belt and is really waterproof.
Have you our Belting Book? Sent free on request.
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Engineers
Sciennes, EDINBURGH
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and
MACHINE TOOLS for IRON WORKERS
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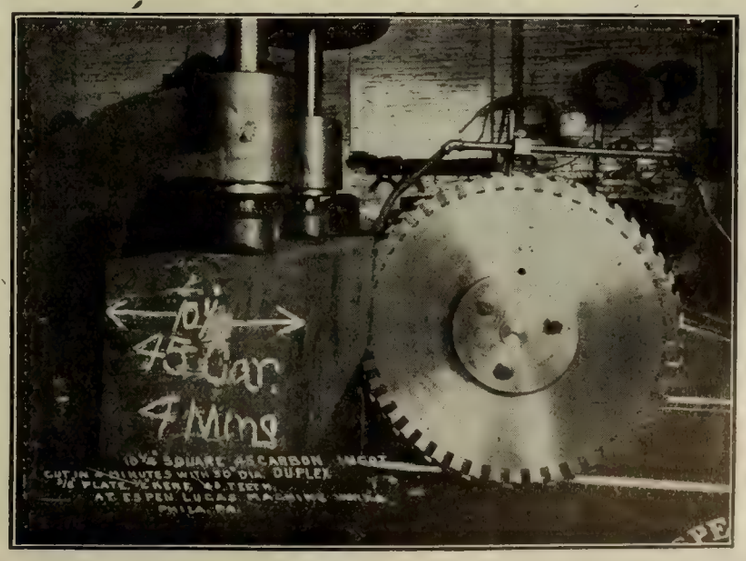

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Write for information
HUNTER SAW & MACHINE CO., Pittsburgh, Pa., U.S.A.

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FOR SALE

SIX COMPRESSORS FOR SALE — VERY cheap. The National Quarry, 81 St. Peter St., Quebec. c22m

BOILER FOR SALE—ONE HEINE SAFETY horizontal, single drum, water tube boiler, 120 H.P., 36" diam., 19 ft. long, 5-16" shell steam drum. Apply The Parkhill Mfg. Co., Limited, 400 St. Ambroise St., Montreal. c18m

FOR IMMEDIATE SALE—150 No. 1 AND 10 No. 7C Racine hack saw machines; in excellent condition. The Peck Rolling Mills, Limited, Montreal, Quebec. c19m

2 NORTON GRINDERS — 10" x 36"—IN FINE condition; complete with stock of Norton wheels. Price $1,400 each, f.o.b. Hamilton. The National Machinery & Supply Co., Ltd., Hamilton, Ont.

3 JONES & LAMSON TURRET LATHES, WITH Collet chucks; 3" x 36"; geared head machines in fine condition. Price $1,000 each, f.o.b. Hamilton. The National Machinery & Supply Co., Ltd., Hamilton, Ont.

FOR SALE—1 90-FT. THOMAS SPACING table complete, including one indicator carriage, one trolley carriage, stands, adjustable roller, racks, etc. Adjustable as to length. The Manitoba Bridge & Iron Works, Winnipeg, Man. c15m

AGENCIES WANTED

ENGINEER AND BUSINESS MAN WITH office in Manchester, England, is prepared to work for a good firm desiring representative in England. Would attend to the interests of a firm shipping munitions. Box 337, Canadian Machinery. c19m

AGENCIES WANTED—FRENCH ENGINEER having large established clientele, desires direct agency for France of labor-saving machinery of all kinds for wood and iron working, as well as factory equipment. Headquarters in hearts of Paris, near the Opera. Write E. A. B., Room 444, 14 Phillips Sqr., Montreal.

AGENTS WANTED

WANTED — LIVE REPRESENTATIVE TO handle good specialty; one who hasn't too many irons in the fire Apply Box 348, Canadian Machinery, stating lines you now represent and the ground you are prepared to cover. c23m

CANADIAN AGENTS WANTED FOR GOOD chuck, especially adapted for use in munition plants. Box 349, Canadian Machinery. c23m

SITUATIONS VACANT

WANTED — SUPERINTENDENT-FOREMAN, 6" British shells. Box 340, Canadian Machinery. c19m

SHOP SUPERINTENDENT—WANTED, MAN competent to take entire charge of machine shop solely engaged in manufacture of small tools. Must be thoroughly competent and have had some years' experience. Shop while small at present offers excellent opening for advancement. Apply, stating experience, salary, etc., to Box 339, Canadian Machinery. c17m

WANTED — FOREMAN BLACKSMITH FOR Montreal shop on general work. Six forges and 1,500-lb. steam hammer. Must be a hustler. Apply, in confidence, stating experience and wages expected, to Box 335, Canadian Machinery. c15m

WANTED — MECHANICAL DRAUGHTSMAN for engine, compressor, and general work. State experience and salary expected. Apply The Jenckes Machine Company, Limited, Sherbrooke, Que. c16m

WANTED—MACHINE SHOP FOREMAN FOR small shop doing general work, not munitions, near Toronto. State experience and salary expected. Give references. Box 345, Canadian Machinery. c20m

MARINE ENGINE ERECTOR:—WANTED FOR Canadian shop an experienced foreman to take charge of erecting 1500 H.P. marine engines. Apply Box 347, Canadian Machinery c21m

SITUATIONS WANTED

MECHANICAL AND CONSTRUCTION ENgineer desires change; twenty years' general experience; specialty steam power plants; knowledge pulverized coal. Box 343, Canadian Machinery. c21m

GENERAL SUPERINTENDENT DESIRES position with reliable firm. Possess years of practical machine shop experience as well as production methods, including shell work. Box 338, Canadian Machinery. c18m

GRADUATE MALE NURSE, AGE 32. HAVE established hospitals for three large manufacturing concerns. Familiar with social service, accident prevention and modern methods of employing. At present employed. Less than $2,400 not considered. Box 336, Canadian Machinery. c15m

MACHINE SHOP FOREMAN DESIRES change as shop foreman or master mechanic. Acquainted with scientific management; 26 years' experience. Box 328 Canadian Machinery. c11m

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States wants position as superintendent or general foreman. Large or small shop on ammunition or machinery; A1 references. Address Box 327, Canadian Machinery. c9m

WORKS MANAGER OR GENERAL SUPERintendent open for engagement—28 years' experience as machinist, toolmaker, inspector, superintendent of tool-making and tool-designing, experimental and development work, heat-treating and testing of steel in raw and finished state; shop superintendent, works manager. Experience has been on rifle work, electrical work, typesetting machines, lock-making and bridge-work. Correspondence solicited, and can furnish good references. Address Box 332, Canadian Machinery. c14m

SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto

WANTED

WANTED — SECOND-HAND CUPOLA AND other foundry equipment. State full particulars and price. Box 346, Canadian Machinery. c21m

WANTED—ONE No. 166 BLISS 2-SPINDLE automatic trimmer and beader, also 1 No. 156 single spindle trimmer, or machines of similar design. Must be in good condition. In replying state fully the name of maker of machines and lowest price, also where they could be seen. Box 342, Canadian Machinery. c18m

WANTED—ONE HORIZONTAL RE-DRAWING or reducing press, fitted with bottom knock-out, the general dimensions of which should be equal to Bliss No. 62. Must have flywheel not less than 725 lbs. weight and approximately 3 ft. 6 in. in diameter. Press must be in good working order. In replying, give all dimensions, also state name of maker and lowest price. Box 341, Canadian Machinery. c18m

WANTED TO PURCHASE TWO SECOND-hand lathes, 24" swing, 8' to 12' bed. Submit offers with cuts and full description to E. Langham, General Purchasing Agent, Canadian Northern Railway Company, Toronto. c19m

FOR SALE

4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 13 B. & S. Automatic Gear Cutter.

1—30" Newark Automatic Gear Cutter.

1—5 x 48 Pratt & Whitney Plain Grinder.

1—No. 2 Bath Universal Grinder.

1—12 x 60 Modern Plain Grinder, new.

2—Lees-Bradner Thread Millers.

1—30 x 30 x 8' Powell Planer, new.

Brownell Machinery Co.
Providence, R. I.

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15" three-jawed chuck.
1—Lathe, 28" swing, 8' bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22" Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15" three-jawed chuck.
1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 24" wheel.
1—Lathe, 14" swing, 6' bed.
2—Ford Smith Shell Grinders, complete.
1—17" LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
1—16" Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
1—Double End Painting Machine, with ¼ h.p. motor.
1—Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—5 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
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WANTED

Vertical Boring Mills, 50 to 60" swing.

Horizontal Boring Mills, 3 to 6" boring bar.

Hobbing Machine, for cuting worm wheels 42" diameter.

Spur Gear Cutter, 60", B. & S.

All for Government work. Machines must be in first-class condition. Wire prices and where machines can be inspected.

RUSSELL MOTOR CAR COMPANY, LIMITED
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FOR SALE

One 22" x 50" Wheelock Engine, left-hand, arranged for direct shaft coupling, with heavy balance wheel 8¼" x 14" x 17'—7" in dia.

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Good Used Equipment

TRAVELING CRANES.

20-ton Browning Trolley, 5 ton aux., 56½" ga. (new).
20-ton Shaw, 56' 3" span, 110 V.D.C., 3 motor.
10-ton P. & H., 48' span, 110 V.D.C., 3 motor.
20-ton Reading, 29' 6" span, hand.

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Single, 48" tht., cap. 3 x 1¼", Providence.
Single, 6" tht., cap. ⅞ x ⅞, Cleveland.
Single, 15" tht., cap. ¾ x ½" (hand), new Doty.
Double, 15" tht., cap. ¾ x ¾", Fischer.
Double, 12" blades, Bar Shear, cap. 2" sq., Cruc.
Univ. Plate Shear, 18" blades, cap. ¾", Cleveland, belted.
Univ. Plate Shear, 26" blades, cap. ½", Lewis, belted.
Lennox Rotary Splitting, 30" tht., cap. ½", belted.
Lennox Rotary Bevel, 5" tht., cap. ½", belted.
Guillotine Shear, cap. 2½" sq., belted, Perkins No. 6.
Guillotine Shears, No. 0 H. & J., 6 and 7" blades (2).
Guillotine Shear, Fisher, 21" blade, cap. 8 x 2".
Squaring Machine, United, 108", cap. ¼".

MISCELLANEOUS.

Blower, No. 5 Roots, Rotary Pressure.
Bolt Cutter, 2" Acme, Class A, single head, dies.
Boring Mill, 10' Niles, Vertical, 2 heads.
Forging and Upsetting Machine, 1½" Acme, with dies.
Forging and Upsetting Machine, 2½" Ajax.
Hammer, 300-lb. Johnson & Jennings, belt driven.
Hammer, 80-lb. Bradley Cushion Helve, belted.
Hammer, 40-lb. Bradley, belted (rebuilt).
Hammer, 35-lb. Maggowan & Finigan (Perfect), belted.
Rotary Planer, 36" Cleveland, belt driven.
Rotary Planer, 60" Cleveland, motor 60 cy., 440 v.
Milling Machine, No. 4 Oesterlein Universal.
Pipe Threading Machine, No. 4 Saunders.
Pipe Machine, 8", E. C. & B.

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16" x 5½' MacGregor, D.B.G. (2).
16" x 6' Pratt & Whitney, B.G.
18" x 10' Libby (2).
20" x 7' Fay & Scott.
22" x 8' Pratt & Whitney, B.G.
22" x 8' Martin, single purpose.
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
2" x 24" Stevens Screw Machines (2).
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

6" x 30" Dalton, B.G., bench.
13" x 6' Filsmith, D.B.G., comp. rest.
14" x 6' Lodge & Shipley, taper attachment.
15" x 6' Sebastian, B.G., comp. rest (3).
16" x 8' McDougall, B.G., comp. rest (2).
16" x 8' Porter, B.G., comp. rest.
18" x 8' C.M.C., D.B.G., comp. rest.
18" x 10' Putnam, back geared.
20" x 8' Fifield, B.G., plain rest.
21" x 8' Bawden, heavy duty (3).
24" x 11' Pond, B.G., comp. rest.
26" x 14' Gleason, D.B.G.
30" x 10' Ames, B.G., plain rest.
31" x 16' Fifield, back geared.

DRILLS

14" Excelsior, sliding head, lever feed (6).
15" Avey, high-speed, ball-bearing.
16" Barr, sliding head, lever feed.
20" Silver, back geared, power feed (2).
20" Barnes, 3-spindle, lever feed.
22" Barnes, back geared, power feed.
24" Kerkhoff, back geared, power feed.
26" Prentice, back geared, power feed.
40" Bickford, back geared.
46" Allfree, back geared, power feed.
No. 10a Baush, 16-spindle.
D-1 Colburn, back geared, heavy duty.

GRINDERS

10" x 30" Landis, universal.
No. 1 Cincinnati, universal (2).
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer.
24" Barnes, wet tool.
2¼" Yankee, twist drill.

IRON PLANERS

20" x 20" x 5' Bertram.
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Pond, two heads
40" x 40" x 12' New Haven, power feed.

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Bertram, plain.
Brown & Sharpe, power feed, plain.
Monarch, vertical.
Cataract, bench, hand feed.
No. 2 Ford-Smith, plain.
No. 4 Fox, universal.

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16" Petrie, back geared.
16" Canada Mach. Corp., back geared.
16" Cincinnati, back geared.
24" Gould & Eberhardt, back geared.
24" Bertram, back geared.
30" Morton, back geared, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6' Robertson Hack Saws.
4½" Martin Cutting-off Machine.
12" Hall Pipe Machine.
4" Oster Hand Power Pipe Machine.
No. 2 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 4 GA Brown & Boggs Punching Press.
No. 180 Brown-Boggs Power Presses.
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One 18"
One 20"

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Four 30" Bullard Vertical, turret head

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Gardam Vertical, 10 spindle
Baush Vertical, 8 spindle
Foote-Burt, 7 spindle
Barnes, 4 spindle
Rockford, 4 spindle
Foote-Burt, 2 spindle
32" Snyder, sliding head
32" Pratt & Whitney, sliding head
Three 24" Prentice, sliding head
Four 24" Baker Bros. High Speed
3½' Hilbert Radial
Two 3½' Prentice Radials
3½' Gang Radial
3' Fosdick Radial

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1—18 x 8 Springfield Standard Engine Lathe.
1—16 x 8 Springfield Q.C.G. Engine Lathe.
2—16 x 6 Springfield Q.C.G. Engine Lathes.
1—14 x 6 Springfield Geared Head Engine Lathe.
3—15" Springfield B.G. Shapers.
2—20" Springfield B.G. Shapers.
1—25" Springfield B.G. Shapers.
1—30 x 30 x 10' Wilson Two-head Planer.
3—14" Pierce Turret Lathes.
2—1 x 8 Pierce Hand Screw Machines.
3—No. 1½ American Milling Machines.
1—No. 20 Bliss O.B.I. Press.
1—No. 19 Bliss O.B.I. Press.
1—No. 18C Bliss O.B.I. Press.
1—No. 18 Bliss O.B.I. Press.
5—20" Buffalo B.G., P.F. Drill Presses.
3—20" Canedy-Otto B.G., P.F. Drill Presses.
2—20" Champion B.G., P.F. Drill Presses.
2—20" Champion Plain Drill Presses.
3—20" Silver Plain Drill Presses.
3—20" Canedy-Otto Plain Drill Presses.
2—14" Champion Plain Drill Presses.

USED MACHINERY

ENGINE LATHES.
1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—22 x 14 Putman Standard Engine Lathe.
1—22 x 10 Reed Standard Engine Lathe.
1—18 x 6 Jones & Lamson Standard Engine
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.
2—13 x 8 Barnes Engine Lathes.
1—13 x 5 Barnes Engine Lathe.
1—10 x 4 Sebastian Engine Lathe.

TURRET AND SCREW MACHINES.
2—No. 6-A Potter & Johnston Automatic Lathes.
1—4¼" Gridley Automatic Screw Machine, motor driven.
2—4" Foster F.G.H. Hand Screw Machines.
1—5" Pierson F.G.H. Hand Screw Machine.
4—12" Warner & Swasey Turret Lathes with air chucks.
4—16" Warner & Swasey Turret Lathes with air chucks.
2—2" Cleveland Automatic Screw Machines, jigger feed.
1—⅝-¾ Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND GRINDERS.
1—No. 2 Hendey Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drilling Machines.
3—Fox Milling Machines.
1—Garvin Hand Miller.
1—No. 2½ Bath Universal Grinder.
1—No. 12 Modern Plain Grinder.
1—No. 1 Landis Internal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.
1—Miami Valley Universal Cutter Grinder.

DRILL PRESSES.
1—6' Mueller Plain Radial Drill, old type.
1—28" Niles, Bement, Pond B.G., P.F. Drill Presses.
1—3-spindle 8" overhang Henry & Wright High speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.

SHAPERS AND PLANERS.
1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
1—36 x 36 x 10' New Haven Planer, S.H.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS.
1—Waterbury Farrel O.B.I. Press, geared.
1—No. 30 Perkins Drawing Press.
3—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—600-lb. P. & W. Roll Board Hammer.
1—160-lb. Bradley Steap Hammer.
1—25-lb. Fairbanks Belt Hammer.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machine tools, both large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

USED MACHINERY

IMMEDIATE DELIVERY

DRILLING MACHINES.

20" Mechanics.
22" Sibley, S.H., B.G., P.F.
30" Lodge & Davis, S.H., B.G., P.F.
2½' Gang Plain Radial.
3½' Hamilton Plain Radial, tapping attachment.
4' Mueller Plain Radial.
4—No. 310 Baker Heavy Duty.
3-spindle Rockford.
4-spindle Rockford.
4-spindle Washburn, with power feed.
4-spindle Allen.
No. 11 Pratt & Whitney, 10 spindles.

GEAR CUTTERS.

24" x 7" G. & E., spur gears.
No. 3—26" B. & S., spur gears.
No. 4—48" B. & S., spur gears.
No. 13—B. & S., spur gears.
30" x 9" G. & E., spur and bevel gears.
36" x 9" G. & E., spur gears.
36" Walcott, spur gears.
24" Gleason Gear Planer.

GRINDERS.

No. 1 B. & S. Universal.
No. 2 Woods Tool and Cutter.
Brainard Cutter.
Leland Universal, with power feed.
No. 2 Landis Universal.
No. 21 Landis Plain.
No. 1 Gardner Disc.
No. 24 Gardner Disc.
No. 6-A Diamond Universal.

LATHES.

14" x 6' Rockford, C.R.
15" x 6' Rockford Tool Co., C.R.
16" x 8' Bradford, C.R.
18" x 6' Bradford, C.R., taper attachment.
18" x 8' Lodge & Shipley, pat. head, C.R., taper attachment.
18" x 10' Fitchburg, C.R.
20" x 14' Blaisdell, C.R.
21" x 12' New Haven, C.R.
36" x 18' Schumacher & Boye, T.B.G., Q.C.G.
36" x 20' American, T.B.G.
38" x 16' Fifield.
42" x 28' Hamilton, T.B.G., raising blocks to swing 54".

PLANERS.

24" x 24" x 6' American, one head.
26" x 26" x 6' Gray, one head.
26" x 26" x 8' Pease, one head.
30" x 30" x 8' Cincinnati, two heads.
30" x 30" x 8' Woodward & Powell, one head.
36" x 36" x 14' Sellers, one head.
39" x 39" x 12' New Haven, one head.
48" x 48" x 10' Woodward and Powell, two heads.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES.

No. 2 P. & W., friction head.
No. 2 Foster, plain head, A.C. and W.F.
No. 3 Bardons & Oliver, plain head, A.C. and W.F.
No. 4 Pearson, friction head, A.C. and W.F.
No. 5 Foster, geared friction head, auto. chuck, power feed to turret slide and power feed to cross slide.
No. 5 Foster, all geared head, auto. chuck and wire feed, power feed to turret slide.
1¾" Gridley, 4-spindle Automatic.
2¾" Cleveland Automatic.
3¼" Gridley 1-spindle Automatic.

TURRET LATHES.

No. 2 Foster-Kimball, plain head.
No. 22 Garvin, plain head.
16" Lodge & Davis, back geared.
16" Warner & Swasey, friction head.
2 x 24 J. & L., cone head.
24" Gisholt, 4¼" spindle hole, taper attachment.
No. 3A Warner & Swasey, bar attachment.

PUNCHES AND PRESSES.

No. 74½ Bliss, straight sided, geared.
Blake & Johnson Embossing.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾", 12" throat; new.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾", 18" throat; new.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾," 24" throat; new.

MISCELLANEOUS.

24" Bullard Vertical Turret Lathe, turret head and one side head.
No. 00 Baker Keyseater.
No. 3 B. & S. Universal Miller, with vertical and rack cutting attachments.
6" x 48" P. & W. Thread Miller.
4-spindle Warner & Swasey Valve Milling Machine.
No. 3 Cincinnati Vertical Milling Machine.
No. 3 Burr Cold Saw.

STOCKER-RUMELY-WACHS COMPANY
117-121 NO. JEFFERSON STREET CHICAGO, ILLINOIS

BIG MILLING MACHINE

1 No. 4. LeBlond Plain Milling Machine D. B. Gear, Power Feeds in all directions

Riverside Machinery Depot
29 St. Aubin Ave. - Detroit, Mich.

Gridley Automatic

1-4¼" Gridley Single Spindle Motor Driven Automatic. Motors 220 volt, direct current.

Riverside Machinery Depot
29 St. Aubin Ave. DETROIT, MICH.

Immediate Shipment

LATHES.

1—32" x 32' BERTRAM ENGINE LATHE, new, double back gear, quick-change gear.

1—42" x 20' PITTSBURGH TRIPLE GEARED ENGINE LATHE, new, quick-change gear and regular equipment, takes 12' between centers.

1—42" x 24' BERTRAM TRIPLE GEARED LATHE, with raising blocks to raise head and tailstock to swing 60". This machine has hollow spindle, compound rest rod and screw feed, and is in excellent working condition.

PLANERS.

1—36" x 36" x 12' McDOUGALL PLANER, used, with two heads on cross rail and one side head, has elevating device for cross-rail and is in excellent condition.

1—62" x 62" x 16' CANADA TOOL WORKS PLANER, with two heads; in excellent condition.

BORING MILLS.

1—48" used COLBURN VERTICAL BORING MILL, equipped with two swivel heads, gear box feed; in first-class condition.

1—30" ROGERS BORING MILL, equipped with swivel head, box cone drive and face plate jaws; in good working order.

1—10' NILES BORING MILL, takes 43" under the cross-rail, width of rail 19", two swivel heads, tool bar 6" round by 25" travel, power friction feeds drive, six-step cone for 4" belt; in absolutely first-class condition.

1—BERTRAM HORIZONTAL BORING MACHINE, cone type, headstock, four-step cone for 4" belt, spindle 4", diameter 36", feed slotted adjustable table 48" wide by 36" long.

RADIAL DRILLS.

1—6' BERTRAM HEAVY DUTY RADIAL DRILL, single pulley drive, four speeds in speed box, tapping attachment in spindle, plain box table; excellent condition.

1—6' LONDON DRESES PATTERN HEAVY DUTY RADIAL DRILL, round column type, speed box drive, arranged for motor drive; in first-class working order.

The A. R. Williams Machinery Co., Limited
64 FRONT STREET WEST TORONTO, ONTARIO

MACHINE TOOLS—WHAT DO YOU NEED?

BORING MACHINES—Vertical.

2—32" Bullard, 1 turret head.
1—NEW 36" Gisholt, one swivel turret head; motor driven.
1—42" King, 2 swivel heads; almost new.
1—42" Baush, 2 swivel heads, quick change.
1—NEW 8' Bickford, 90" table, 2 swivel heads; Feb. delivery.
1—10' Niles, 2 swivel heads.
1—10' Betts, 2 swivel heads, gear feed.

BORING MACHINES—Horizontal

1—Niles 2½" bar, knee type.
1—No. 2 Barrett, 5" bar.
1—London 6" bar.
1—Beaman & Smith, 7" spindle.

BULLDOZERS

1—No. 9 Williams & White, belt drive.
1—No. 12 Ajax, single pulley drive.
2—No. 23 Williams & White, belt drive.
1—No. 26 Williams & White, belt drive.
1—No. 29-U Williams & White, arranged for motor drive.

CRANES—Traveling.

1—10-ton Maris, 55' span, hand operated.
2—10-ton Electric, 47' span, 25' lift, 3 motors.
3—10-ton P. & H. Electric, 72' span.
1—10-ton Niles, 72' span.
1—10-ton Whiting, 3 motors, 24' span.
1—50-ton Niles, 61' span.

CRANES—Locomotive.

3—10-15-ton McMyler, broad gauge, steam locomotive, 60' boom, bucket, 3 drums.
1—15-ton Industrial Locomotive, 8 wheel, 40' boom, bucket.
1—15-ton Brown Hoist Locomotive, 36' boom, bucket, 8 wheels.
1—20-ton Orton & Steinbrenner Steam Locomotive, 8 wheel, double drum, 37' boom, bucket.

CUTTING-OFF MACHINES

1—NEW 4¼" Davis.
30—Davis 4½"
10—4½" Williams.
2—NEW 6" Davis.

DRILLING MACHINES—Radial

6—NEW 3' Mueller, speed box drive, Dec. del.
3—NEW 3' American, sensitive tapping attachment.
2—4' Mueller Plain, speed box drive
1—4½' Full Universal, cone drive.
1—NEW 5' Western, plain, with motor.
1—NEW 5' Niles Universal, with motor.
1—5' Fosdick, plain.
6—NEW 5' Mueller, speed box drive, Dec.' del.
1—6' Pond, cone drive.
1—NEW 6' Triumph, motor drive; Dec. delivery.

DRILLING MACHINES—Heavy Duty

2—NEW No. 2 Colburn
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
4—No. 310 Baker Single Pulley Drive, late type

DRILLING MACHINES—Sliding Head.

2—NEW 24" Barnes Drills and Tappers.
5—NEW 24" Barnes Drills.
5—NEW 28" Sibley.

DRILLING MACHINES—Multiple Spindle

1—4-spindle 20" Barnes, all geared.
1—No. 5 Fox, 12-spindle, capacity 1".
1—Baush, 12-spindle, capacity 1¼", 30" circle, motor driven.

GEAR CUTTING MACHINES

1—NEW No. 3 Bickett Gear Rack Planer, delivery 60 days.
5—No. 3 Brown & Sharpe Auto. Gear Cutter, spur.
2—No. 4 Brown & Sharpe, latest model, cap. 48" x 10".
1—NEW 6" Standard Gear Cutter, spur.
1—15" Gleason Bevel Gear Planer
1—20" Grant-Lees Gear Hobber, bevel spur and spiral attachment.
1—24" Becker-Brainard.
1—24" Fellows Gear Shaper
2—NEW 30" Flather, Solid Pattern.
3—36" Fellows Gear Shapers.

GRINDERS—Universal, for Cutters, Drills, Reamers, etc.

6—NEW No. 190 Wells.
4—No. 1 Cincinnati.
1—NEW Premier Universal.
1—NEW Wilmarth & Morman, Style B.K.
1—NEW Walker, No. 1 Outfit B
1—NEW No. 1 Wood Universal.
5—NEW No. 2 Wood Universal.
1—NEW Walker, No. 2 Outfit K (capacity 9" x 26")
2—NEW No. 2 Osterlein Universal.
7—NEW LeBlond.

GRINDERS—Cylindrical—Plain

2—NEW 8" x 18" Modern, self-contained.
3—NEW 8" x 30" Modern, self-contained.
2—NEW 12" x 24" Modern, self-contained.
6—12" x 36" Modern, self-contained.
2—12 x 42" Landis, self-contained.
5—12" x 48" Modern, self-contained.
7—NEW 10" x 50" Norton; October delivery.
1—14" x 50" Norton.
1—NEW 10 x 72 Norton, plain.
1—12 x 96" Springfield.

GRINDERS—Cylindrical—Universal.

2—NEW No. 2 Bath, 9" x 20".
1—NEW No. 2 Walker, 9" x 26"
1—NEW No. 2½ (10" x 36") Bath
1—NEW Thompson, 10 x 36.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis
1—No. 4 Cincinnati, capacity 12 x 72"

GRINDERS—Internal

1—NEW No. 6 Modern, capacity 10" x 10".
1—No. 70 Heald
1—No. 75 Heald.

GRINDERS—Cylindrical.

1—No. 60 Heald, single pulley drive

GRINDERS—Profile

1—NEW Cleveland
5—Fisher Profile Grinders.

GRINDERS—Surface

1—NEW No. 1 Wilmarth & Morman
1—NEW No. 1½ Walker's, complete.
2—NEW No. 2 American with Walker No. 1¾ plain flat mag. chucks.
4—NEW No. 2 Reid (same as B. & S.)
3—No. 2 Brown & Sharpe.
1—3' Pratt & Whitney Vertical, magnetic chuck.

HAMMERS—Board-Lift, Drop.

1—No. 4 Standard Machinery Co., 400 lb.
1—E. W. Bliss, 800 lb.
1—1500-lb. Toledo.

HAMMERS—Steam Forging

1—450-lb. Bell.
1—800-lb. Niles, Single Frame.
2—3,500 lbs. Chambersburg Steam Drop Hammer.
2—5,000 lbs. Chambersburg Steam Drop Hammer.
1—7,000-lb. Morgan Special Double Stand.

KEYSEATERS

2—NEW No. 1 Davis.
1—NEW No. 2 Davis.
1—No. 2 Mitts & Merrill.
1—No. 2 Knowles, 60" stroke.
1—Colburn, 4" capacity, 43" stroke.

LATHES—Manufacturing, Not Screw Cutting.

2—NEW No. 3 Harding Bros.' Bench Lathe.
3—16" x 8' Fairbanks-Morse, heavy duty.
70—NEW Simplex, 16" x 8'.
14—Reed-Prentice Shell Lathes for 4" or 18 lbs. American shells.
2—25" Barrett Heavy Duty Boring Mill.
50—20" x 10' Hindman, high duty.
7—36" x 20' Heavy Duty N.B.P., projectile boring, motor driven; almost new.

LATHES—Engine

3—NEW 14" x 6' Bradford, quick change.
14—NEW 15" x 6' Rockford.
1—NEW 14" x 6' Hendey, geared head.
3—NEW 16" x 8' Cleveland Tool Room Lathes.
4—NEW 16" x 8' Bradford, quick change.
1—NEW 17" x 8' National, quick change gears.
12—NEW 17" x 8' LeBlond, pan bed, quick-change gears.
1—18" x 10' Hendey, quick-change gear, 14" chuck.
5—NEW 20 x 10 Bradford, quick change.
1—NEW 20" x 10' Cleveland Geared Head
3—NEW 20" x 12' Bradford, quick change.
19—NEW 21" x 10' Porter, S.B.G.
9—22" x 10' Putnam, oil pan and pump.
1—NEW 24" x 10' Bradford, quick change.
5—NEW 24" x 12' Bradford, quick change.
1—NEW 24" x 12' American.
3—24" x 14' American, quick change.
1—24" x 22' Bullard, triple geared, taper attachment.
1—NEW 26" x 48" x 12' McCabe, Double Spindle.
1—New 26" x 48" x 22' McCabe, Double Spindle.
8—NEW 28" x 12' Conradson, duplex helical drive, screw cutting type.
1—NEW 30" x 14' American Double Back-Geared, Quick-Change
1—30" x 14' Lodge & Shipley, single pulley drive, quick change.
1—NEW 32" x 12' Pittsburg Pattern.
8—NEW 36" x 24' Putnam, triple-geared
1—NEW 42" x 24' Triple-geared Houston, Stanwood, heavy duty.
1—42" x 28' Hamilton, triple geared, quick change, raising blocks to 54".
1—50" x 24' Prentiss.
1—NEW 66" x 46' Putnam, triple geared, face plate drive, 5-step cone, 6½" belt; October delivery.
1—71" x 20' Fifield, triple-geared.
1—84" x 18' Special Boring Lathe.

LATHES—Turret

8—NEW 21" Gisholt, H-21.
2—NEW 24" Gisholt, I-24.
5—2 x 24" Jones & Lamson
1—NEW 18" Libby.
3—24" Libby, universal facing head, 3-jaw chuck.
1—20" Steinle, almost new.
18—6-A Potter & Johnson.

MILLING MACHINES—Knee Type—Universal

1—No. 2 Kempsmith, vertical attach.
1—No. 2 Kempsmith, 13" dividing head.
1—NEW No. 2 Rockford High Power.
2—NEW No. 2 Garvin.
1—No. 2 LeBlond.
10—NEW No. 3 Owen.
1—No. 3 Cincinnati Full Universal.
1—No. 3-H LeBlond Heavy Duty, almost new.
1—No. 25 Osterlein.
1—NEW No. 34 Oesterlein, heavy duty, latest type.

MILLING MACHINES—Knee Type—Plain

9—NEW No. 0 Rockford.
2—NEW No. 1 Kempsmith.
2—NEW No. 1½ American back gear
2—NEW No. 2 Rockford
10—NEW No. 2 Owen; November delivery.
1—No. 3 LeBlond
2—No. 3 Kempsmith.
5—NEW No. 3 Conradson, single pulley drive.
4—NEW No. 3-H LeBlond.
10—NEW No. 3 Owen.
1—NEW No. 4 LeBlond.

MILLING MACHINES—Hand.

3—NEW No. 1 Rockford, without column.
3—NEW No. 2 Rockford, on column.
2—NEW No. 3 Rockford, on column.
3—NEW No. 3 Rockford, on column, power feed.

MILLING MACHINES—Vertical

1—NEW Bickett, No. 0
1—No. 3 Brown & Sharpe.
2—NEW No. 4-B Becker.
3—NEW No. 5-B Becker, rotary table.
1—NEWTON Vertical, continuous, motor driven, for shell work.

MILLING MACHINES—Planer Type

1—No. 2 Beaman & Smith.
1—Ingersoll Slab, 16" x 48" cap.
1—NEW 17" x 5' Eynon, planer type.
1—30" x 30" x 8' Ingersoll No. 928, single spindle, with motor.

MILLING MACHINES—Lincoln Type.

1—NEW No. 1 Gooley & Edlund, Briggs type.
3—NEW No. 1 American.
18—NEW Sellers Auto., quick return.

PLANERS

4—NEW 24" x 24" x 6' Powell, Single Head.
1—26" x 26" x 10' Gray, 1 head.
1—30 x 30 x 8' Gray, one head.
1—30" x 30" x 8' Ohio Machine Tool Co., 2 heads.
1—36" x 36" x 10' American, two heads.
1—36" Rotary Planer, motor driven.
1—36" x 36" x 8' Gray, 1 head.
1—40" x 40" x 11' Niles, four heads
1—42" x 42" x 12' Butler, high speed, 3 heads; almost new.
1—44" x 44" x 12' Cleveland Openside, 3 heads, arranged for motor drive.
1—48" x 12' Pedrick, open side, one head.
1—48" x 48" x 12' Scott, heavy type, milling attachment on rail.
1—50" x 50" x 16' Pond, 2 heads on rail
1—52" x 48" x 15' Betts, 2 heads.
1—60 x 60 x 20' Pond, motor driven, 4 heads; very good condition.
1—72" x 56" x 16' Gray, 4 heads; A1 condition.
1—72" x 60" x 14' Smith Globe, 2 swivel heads.
1—72" x 72" x 20' McKechtim & Bertram, 4 heads.

SCREW MACHINES—Hand.

4—NEW No. 2 Foster, geared friction head.
1—NEW No. 4 Foster, geared friction head, power feed to turret slide.
2—NEW No. 5 Foster, all geared, power feed to turret slide.
3—NEW No. 5 Foster, all geared head, power feed to turret, power cross feed.
2—NEW No. 6 Foster, geared friction head, power feed to turret, power cross feed.
5—NEW No. 7 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW No. 10 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW 2¼" Dreses, F.G.B., power feed.

SCREW MACHINES—Automatic

2—NEW ⅝" Cleveland, Model A.
1—NEW ¾" Gridley Mult. Spindle, belt driven.
2—NEW 1¼" Gridley Mult. Spindle, belt driven.
2—NEW 1¾ Gridley, mult. spindle, belt driven.
1—NEW 2¼" Gridley Mult. Spindle, belt driven.
1—NEW 3¼" Gridley Single Spindle, belt driven.
2—No. 0 Brown & Sharpe.
1—No. 2-G Brown & Sharpe.
1—No. 515 National Acme.

SHAPERS

1—NEW 16" Springfield
1—16" Motor Driven Rockford
5—NEW Barker, 24".
2—NEW 24" Milwaukee.
2—NEW 24" Potter & Johnson, universal rotary table.
1—25" Springfield.
2—30" Morton Draw Cut

SLOTTERS.

1—NEW 8½" Betts, heavy model, vertical geared crank slotter.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 549 Washington Blvd. | CINCINNATI, OHIO Union Central Life Bldg. | CLEVELAND, OHIO Leader News Bldg. | NEW YORK CITY Singer Bldg.

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Special Machinery, Gears, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Etc.

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Shell Manufacturers

Get our Prices on Gauges, Boring Bars Rough Turn Drivers, Etc., for 6 in. SHELL.

GENERAL MACHINE WORK

Brass and Aluminum Castings

Prompt Delivery

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MONARCH BRASS MFG.

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GEARS

CUT GEARS

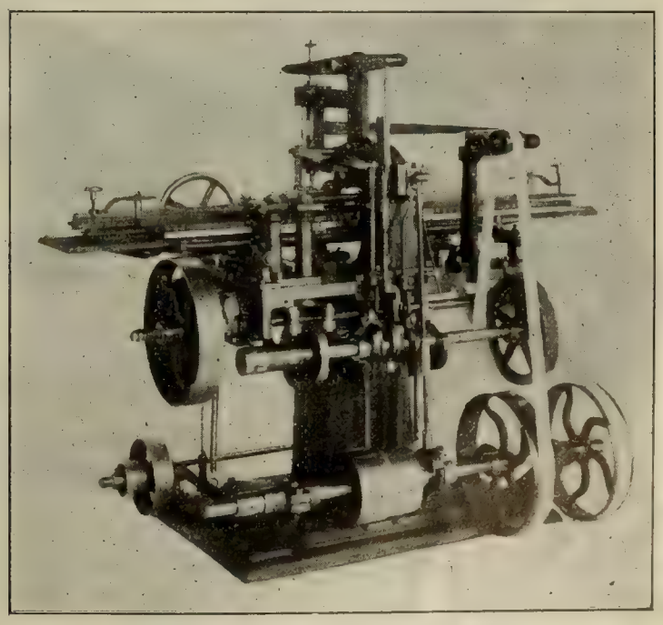
HAMILTON

GEAR & MACHINE CO.

Cor. Concord & Van Horne TORONTO

ACCURACY IN CUTTING makes SILENT POWER

We will show here from time to time some machines we build that you may judge our capabilities in this line.



Balan e Rail and Keyframe Boring Machine

Manufactured Solely By

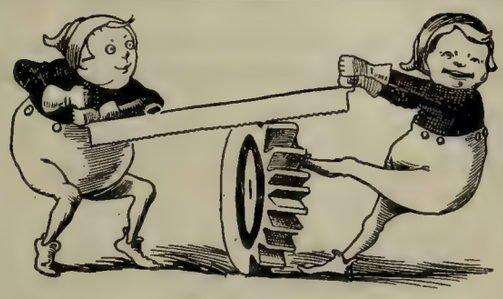
TORONTO TOOL CO.,

TORONTO, ONT.

516 Richmond St., West Phone Adel. 1181

We Cut Gears

Rawhide, Steel, Iron, Brass.



We Make Grinder Heads, Power Hack Saws, Friction Pulleys, Index Heads.

DESIGN AND BUILD SPECIAL MACHINERY

WINNIPEG GEAR & ENGINEERING Co.

197-199 PRINCESS ST., WINNIPEG

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CHAPMAN

DOUBLE BALL BEARINGS

Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
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TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.

How Many of Your Shells Are Being Rejected ?

Water Jacket for Nosing Furnace

This STEEL jacket holds a large amount of water, which keeps the body of shell cold, and permits of proper heating of the nose for nosing operations. Being made of steel, it stands contraction and expansion—not possible with cast iron.

It is indestructible and fool-proof. Made for all sizes of shells. We can make this jacket to any special dimensions, with any desired attachments. No patterns are required—specifications all that are necessary.

Tested and Guaranteed.

IMMEDIATE DELIVERY.

Canadian Welding Works, Ltd., 51 Montfort Street **Montreal, P. Q.**

BRASS Castings

The coupling of expert work with unexcelled equipment enables us to produce on a large scale Brass Castings of any size or alloy.

Our prices, too, are most reasonable; for our large purchases direct from the smelters command their every price favor.

For better Brass Castings at a money saving, send your orders to us. We promise that our work will please you.

The St. Lawrence Welding Company, Ltd., Montreal, P.Q.

Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, Etc. Electric Welders, Oxy-Acetylene Welders. Boiler Repairs. Lead Burning and Brass Foundry Work.

Office: 138 Inspector Street Works: 39 Olier Street Telephone: Office, Main 5779, Manager's Res., Westmount 3483

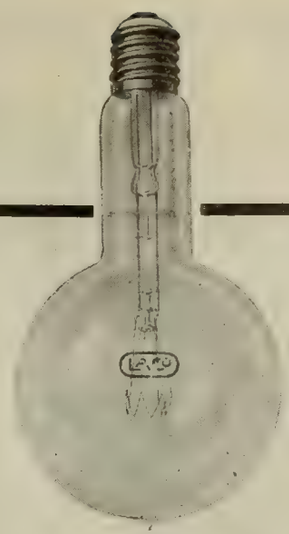
IF self-interest be the mainspring of a man's actions, then you should act at once, because the "Clipper" Belt Lacer saves money for you.

Each time a belt breaks from 1 to 150 men and machines are idle.

"Clipper" lacings have been made in 45 seconds. The maximum time required is only three minutes. How long are *your* men and machines idle when a belt breaks?

Clipper Belt Lacer Company

976 Front Avenue Grand Rapids, Mich.



LACO NITRO

LAMPS

Assist Accurate Production

Everyone admits the necessity for good light in the successful performance of all kinds of work. The better the light the greater production and elimination of accidents and spoilage. For you it is simply a matter to choose the best light for your purpose.

LACO NITRO LAMP "The Light that gives more Light"

is daily winning greater popularity throughout Canadian shops, mills, factories, etc., because it fully meets the demands of these places.

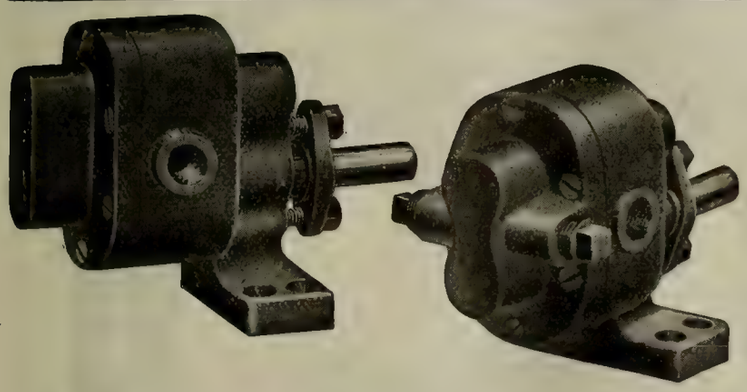
It is a tungsten electric bulb filled with nitrogen gas thus producing a pure white light of greater candle-power per watt than any other type lamp.

All sizes from 60 watt to 1000 watt in one quality—the best.

Inquire from your nearest dealer

Canadian Laco-Philips Company, Ltd.

MONTREAL, TORONTO, WINNIPEG and VANCOUVER



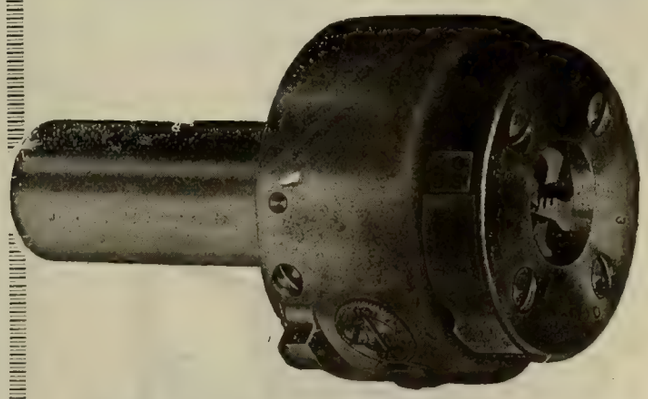
Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.

Hopedale : Mass. : U.S.A.



Thread Accuracy

Are you satisfied with your threads? Are they all you desire? Do you wish to get better results?

That last question interests us vitally. Our Self-Opening Automatic Die Head will chase your troubles. Its quick release feature not only insures the cutting of the thread to a given point every time, but permits cutting right to the shoulder where required.

Our booklet will tell you about other features.

Eastern Machine Screw Corp.

New Haven, Conn., U.S.A.

H & G

The Right Heat

is the only heat to work with if you are going to turn out good work.

An ordinary mechanic can keep a Gilbert & Barker Furnace steady and even, insuring a uniform temperature.

G. & B. are built right—from the ground up. The built-up construction with heavy sheet metal is reinforced with heavy angle iron straps riveted and bolted. The counter-balanced door clears the opening to full height, admitting the heaviest charge. Fire brick chamber lining, door lining and floor tile are of best quality.

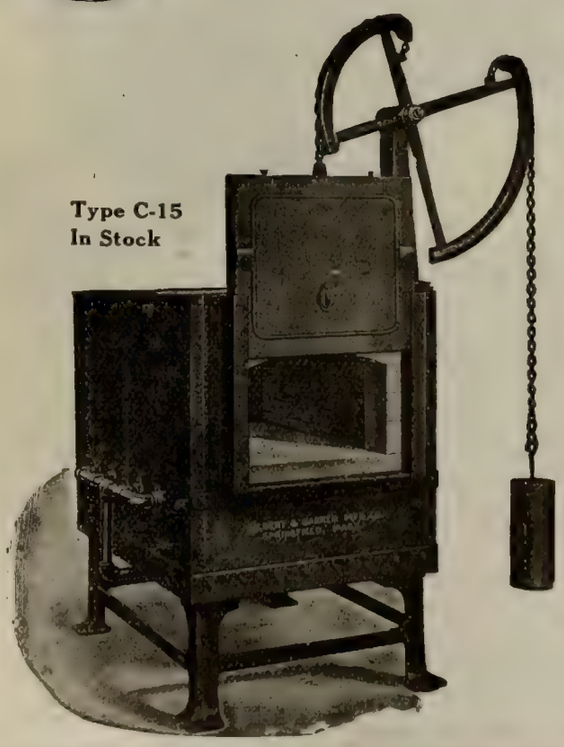
And in every G. & B. furnace you get the benefit of 52 years of experience and study with gaseous and liquid fuels. Our line includes more than one hundred types of furnaces.

At present we are making prompt delivery on many types. Stock list 24 describes them all.

Gilbert & Barker
Manufacturing Company
West Springfield, Mass.

Canadian Agents:
WILLIAMS & WILSON, LIMITED
Montreal, Que.
JAMES DEVON,
227 Davenport Rd., Toronto, Ont.

GILBERT & BARKER MFG. CO. G&B SPRINGFIELD, MASS. U.S.A. EST. 1865



Type C-15
In Stock

PRACTICALITY

AFTER fifteen years' study of the Miner's and Lumberman's wants, we know just what is and what is not required in tools for them.

Practicality has been the keynote of our organization. Experience has aided us in eliminating all unnecessary parts and in perfecting the design of our tools.

The use of best material and finest workmanship enable us to manufacture tools that are unexcelled.

We make a complete line.

Write us for prices.

J. W. CUMMING & SON, LTD.
NEW GLASGOW, - - CANADA

Wood or Steel, let Cummings make it.

Built For *Service*

This BLOUNT Motor-driven Lathe is well adapted to all speed lathe uses. It is of late design, and has a number of features in which you will be interested. Provided with constant-speed motor. Lathe spindle made of hollow, high-carbon steel, ground to size and bored for Morse taper. Runs in self-oiling bronze bearings.

J. G. Blount Co., Everett, Mass., U.S.A.

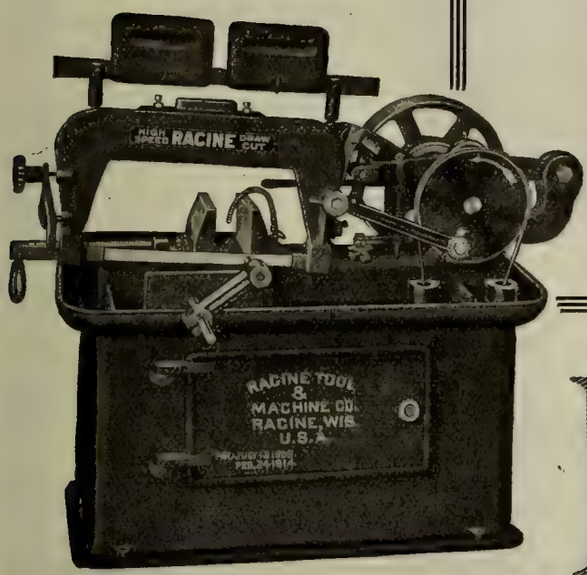
Known the World Over
Admitted to be Superior

The Racine for Scientific Metal Cutting

Demonstrate the value of this machine in your own shop, on your own work. Our confidence in the ability of this machine is such that we will send it to you on *trial.* This will give you ample opportunity to study the machine from close quarters; to verify our statements regarding simple construction and operation, accuracy and speed, features that stamp our machine in a class by itself.

We invite your inquiries for full information and installation

Racine Tool & Machine Co.
15 Melbourne Ave. **Racine, Wis., U.S.A.**



RACINE

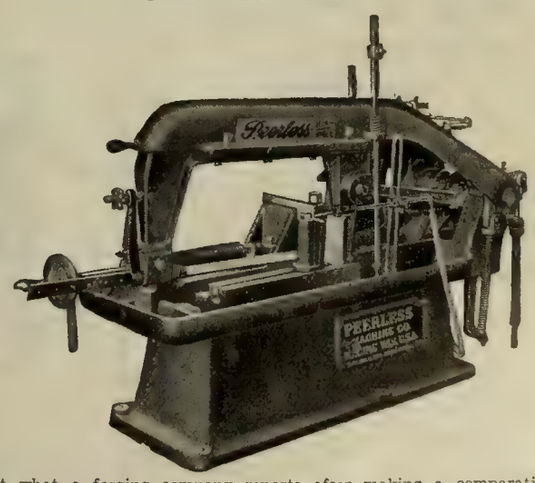
SHEET METAL STAMPINGS

The quality of our production is one grade — THE BEST. Our facilities and equipment enable us to give a very attractive price and prompt service.

Dominion Forge and Stamping Co., Limited
WALKERVILLE, ONTARIO

DROP FORGINGS

"5 Times More Work from Blades. 3 CUTS TO 1"



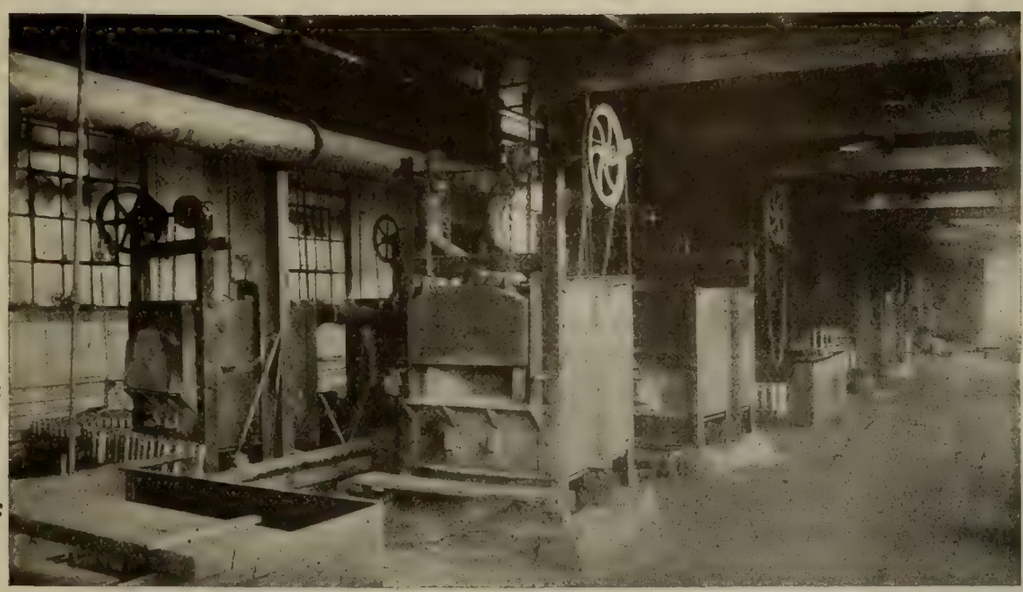
Just what a forging company reports after making a comparative test on Peerless High Speed Saw, cutting 9¾ in. steel; test made on our 13 x 16 machine under equal conditions. We would be glad to furnish complete copy of this report and others, some of these tools may be working in your vincity.

Here are facts that will substantiate this report. This firm has repeated their order from time to time, fourteen machines have been shipped them by express. The express charges on these shipments amounted to about $450.00. At the same time they could secure from stock other makes and cheaper tools.

When a firm is urgently in need of a tool and will delay production several days awaiting delivery on a certain make, and go to such an enormous additional expense, when others could be had from stock, such evidence ought to influence your investigating the Peerless High Speed Saw before deciding on any other equipment.

From the reports and repeated orders received would indicate this tool has revolutionized all metal cutting standards. We are, therefore, very anxious to install them on thirty or sixty days' free trial; this will allow you to thoroughly test and examine same before deciding to purchase.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.



Annealing and Tempering Furnaces installed in the plant of the Canadian Vickers, Limited, Montreal.

"Mecol"

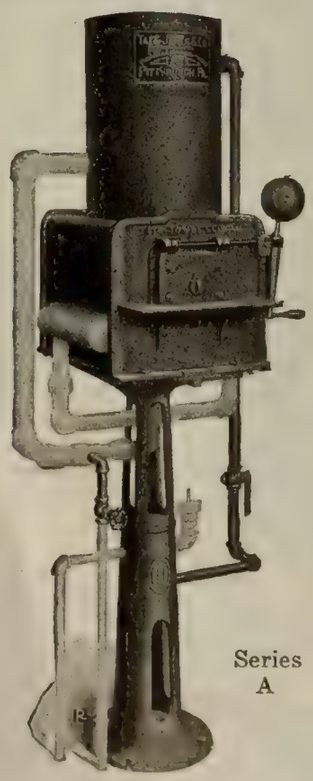
The installation of "Mecol" furnaces shown here is but one instance where a quality furnace was chosen to give maximum production. The furnace you may require is the one we desire to give you complete and full information about. Write us.

Mechanical Engineering Co.
Limited
THREE RIVERS QUE. CANADA

This is a TATE-JONES Improved Portable Recuperative Gas Oven Furnace

For heats, 900 deg. to 1600 deg. Fahr. For hardening carbon steel, preheating or reheating high speed steels, annealing, etc., for artificial or natural gas.

For the plant requiring a small furnace that can be quickly brought up to the proper heat; that delivers a uniform product; that saves time and money—this is the furnace to use.



Series A

Tate-Jones & Co.
Incorporated
FURNACE ENGINEERS
Pittsburgh - Pa., U.S.A.

Cut Out the "Rule of Thumb" in your Heat Treating Methods.

It was, is, and always will be risky. To-day—the day of necessary high efficiency and conservation of time, you dare not run any unnecessary risks in output.

Aside from its demonstrated money-saving features (which we will explain upon request), it gives your workmen the opportunity of knowing what the furnace will deliver even before the heat is started.

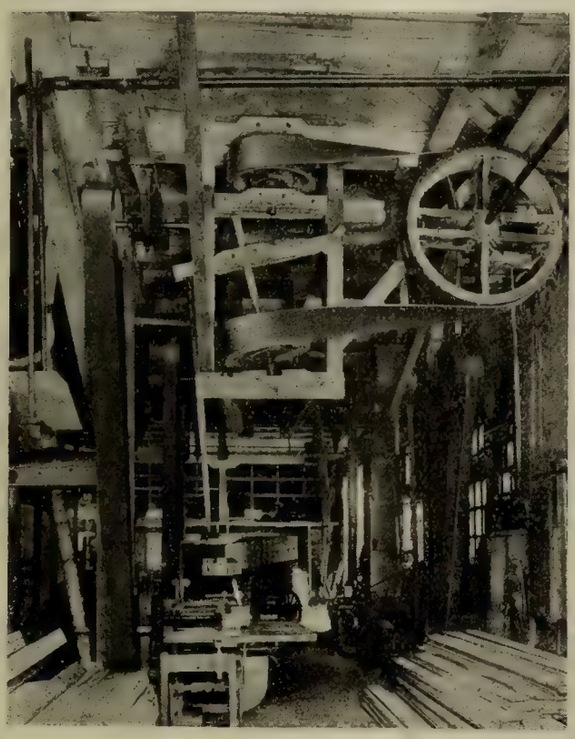
The illustration shows but one of the many styles of furnaces, large and small, made by Tate-Jones Company, of Pittsburgh.

Mention your line of work and we will send information to cover your particular requirements.

Have You A Troublesome Drive?

IN every plant there is a power drive that is a bugbear. A drive that is hard on belts. A drive that is costly and troublesome. Try Extra Power on that drive in your plant.

Almost daily we hear from some customer whose hardest belting problem has been solved by Extra Power. It may be a "wet" drive. It may be a high speed drive. Or a drive with turns. Or just a long, hard pull.



Extra Power is efficient and economical on all kinds of drives—large and small, continuous and intermittent. But it is built good enough for the hardest drives. It has features of construction that make it a superbelt. And the harder the drive, the more enthusiastic is the Extra Power user.

With its fine friction surface Extra Power cuts down power wastage. It works successfully against shifters and on multiple pulley drives. Free from stretch and ply separation, it saves trouble, time, money — lowers operating costs, yields better transmission, lasts longer.

It is a belt whose record for better service qualifies it for use on every kind of drive.

The next time that troublesome drive bobs up, phone or write for a Goodyear belting man. The nearest branch has a man trained in solving such problems as yours.

The Goodyear Tire & Rubber Co. of Canada, Limited

BRANCHES: Halifax, St. John, Montreal, Ottawa, Toronto, Hamilton, London, Winnipeg, Regina, Calgary, Edmonton, Vancouver

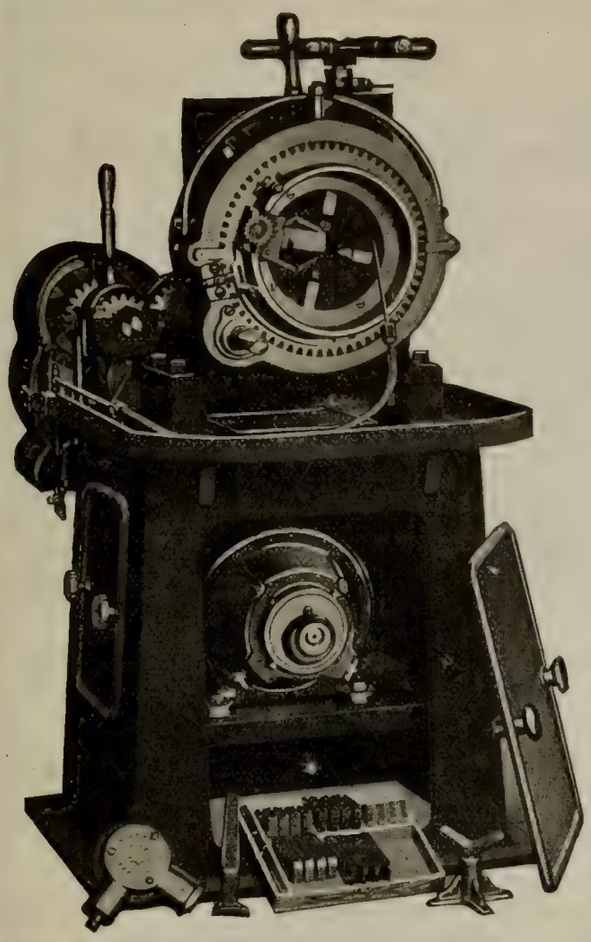
SERVICE STOCKS IN SMALLER CITIES

EXTRA POWER FRICTION SURFACE BELTING

"We might say unsolicited on your part that our factory foremen all speak very highly of the Extra Power belting that you have been supplying us, and it is getting such a reputation in our shop that whenever they need a new piece of belt they come in and ask for this particular brand. It might be some satisfaction to know that your belting so far has been very satisfactory indeed."

Yours truly, KEENAN WOODENWARE MFG. CO., LTD.

By J. H. Baskette, Secretary.



Take It To The Job

ONE man with a Forbes can do more than six men using the old stock and die method of cutting. The Forbes is easily portable and can be carried right to the job. Saves time and labor by eliminating the carrying to and fro of heavy pieces of pipe. Is operated by a self-contained motor, or can be easily operated by hand where no power is available. There are no belts, no countershafts—it is a compact and sturdy machine built to do all kinds of pipe-cutting and threading, and do it well.

It has many features that will interest you. Our catalog explains them all. Write for your copy to-day.

The Curtis & Curtis Co.
115 Garden St., Bridgeport, Conn.

MAKE NAILS! NOT NOISE!

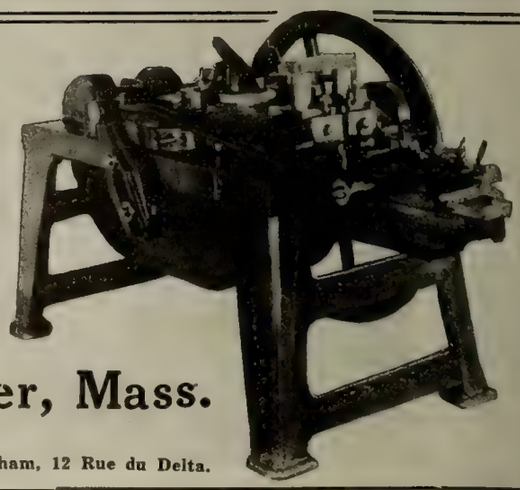
We offer the trade new types of

WIRE NAIL MACHINES

QUIET IN OPERATION; WITH VERY HIGH OUTPUT; ALL PARTS ACCESSIBLE; DECREASED MAINTENANCE COSTS; GREAT CAPACITY; OCCUPYING SMALL FLOOR SPACE.

Smoothly running machines, with balanced mechanical motions and no rotating cams. Built in 5 sizes, handling wire from No. 17 to 3/8" diam.

PRACTICALLY NOISELESS IN OPERATION



Sleeper & Hartley, Inc., Worcester, Mass.

CANADIAN BRANCH, COATICOOK, P.Q.

London, England, F. A. Perry, 63 Queen Victoria Street, E.C. 4. Paris, France, Edgar Bloxham, 12 Rue du Delta.

DEPENDABILITY

Has Made

HARRIS HEAVY PRESSURE

THE MOST POPULAR BABBITT METAL IN THE DOMINION

Manufactured by

THE CANADA METAL CO., LTD.

Hamilton, Montreal, TORONTO, Winnipeg, Vancouver

IT FLOWS FREELY

IT WILL NOT CRACK

IT IS COPPER COATED

IT IS COPPER HARDENED

Murchey

EQUALS 10 SOLID TAP LIVES

That point alone is sufficient to stamp Murchey adjustable taps as the undisputed leader of its class.

The point is this: when a chaser on a Murchey Tap is ground it can be adjusted to compensate for wear; with a solid tap this cannot be done with the fineness, the finish, the absolute accuracy that characterizes our adjustable taps. A solid tap will lose its accuracy, and the more grindings the greater the inaccuracy. We maintain a special chaser service for our clients.

The Murchey Adjustable Tap has other features which we will gladly furnish upon request.

MURCHEY MACHINE & TOOL CO.

75 Porter St. Detroit, Mich.

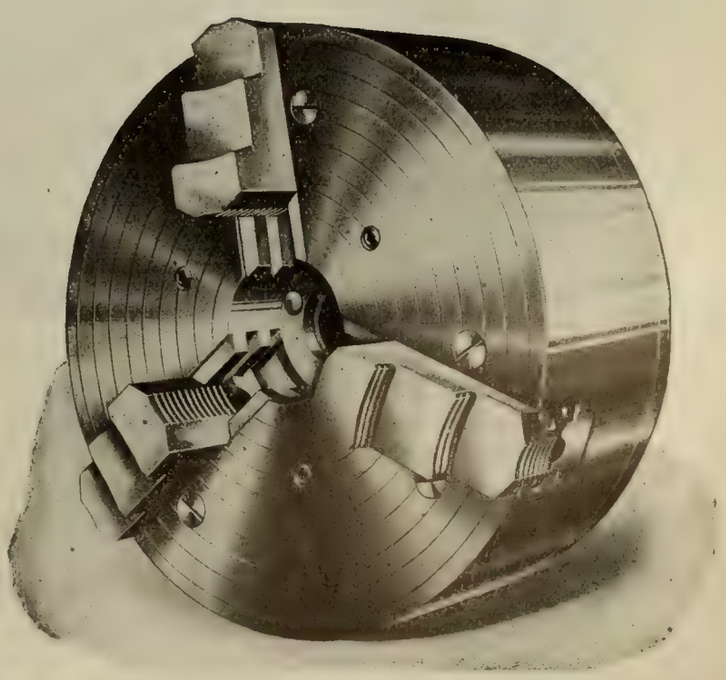
The Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, S.W., England
Fenwick Freres & Co. 16 Rue Fenelon Paris, France

Think of it——

A 20 to 90% Increase in Production

THE M. E. C. Three-Jaw Air-operated Chuck shown herewith eliminates the waste usually experienced in ordinary chucking processes. It takes all classes of work of the hand-operated chuck, but grips much better and gives top-notch service day in and day out. Only the best materials obtainable go into its manufacture. It is made entirely of steel, including the body. A special process steel is used in making the actuating levers and all parts subjected to strain. The M.E.C. Three-jaw Chuck will do good work long after others have been discarded. Take it on thirty days' free trial.

Write for catalog on all M.E.C. Labor-Saving Devices.



Manufacturers Equipment Co.

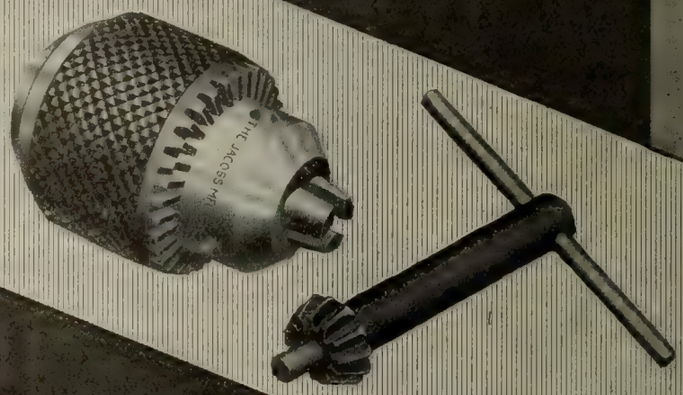
171 North Jefferson Street, Chicago, Ill.

Also makers of M. E. C. Two and Three-Jaw Air-Operated Chucks, Expanding Mandrels and Collapsible Taps

CANADIAN AGENTS:

J. R. Stone Tool & Supply Co., Goebel Bldg., Detroit, Mich.

Jacobs
IMPROVED
Drill Chuck

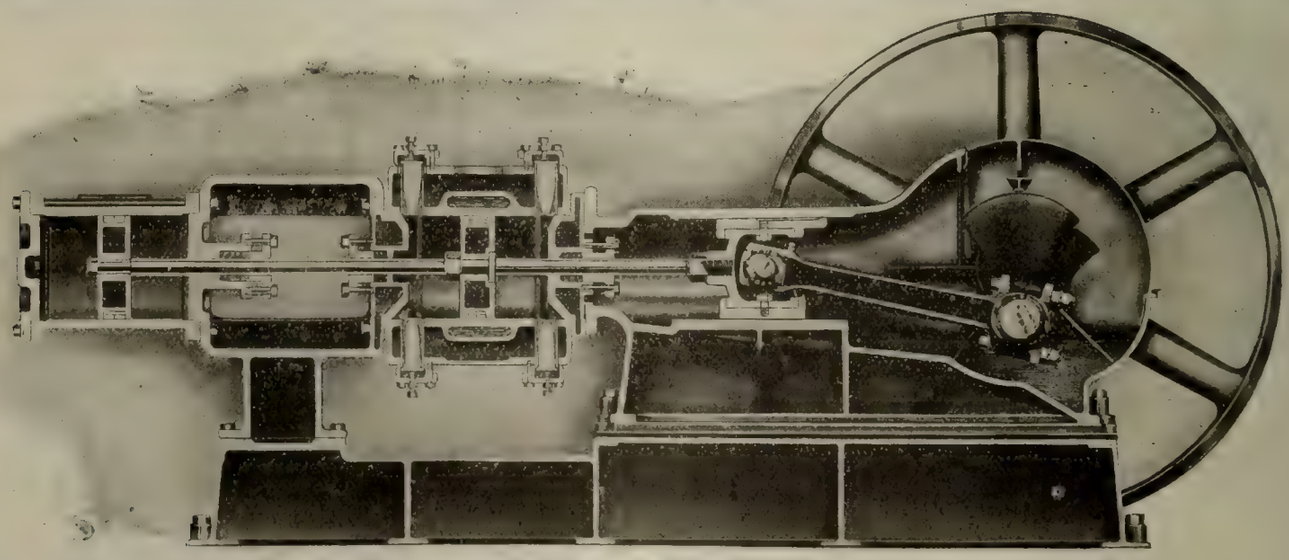


A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.



Sectional view of "FL-1" Steam Driven, Single Stage, Straight Line Air Compressor

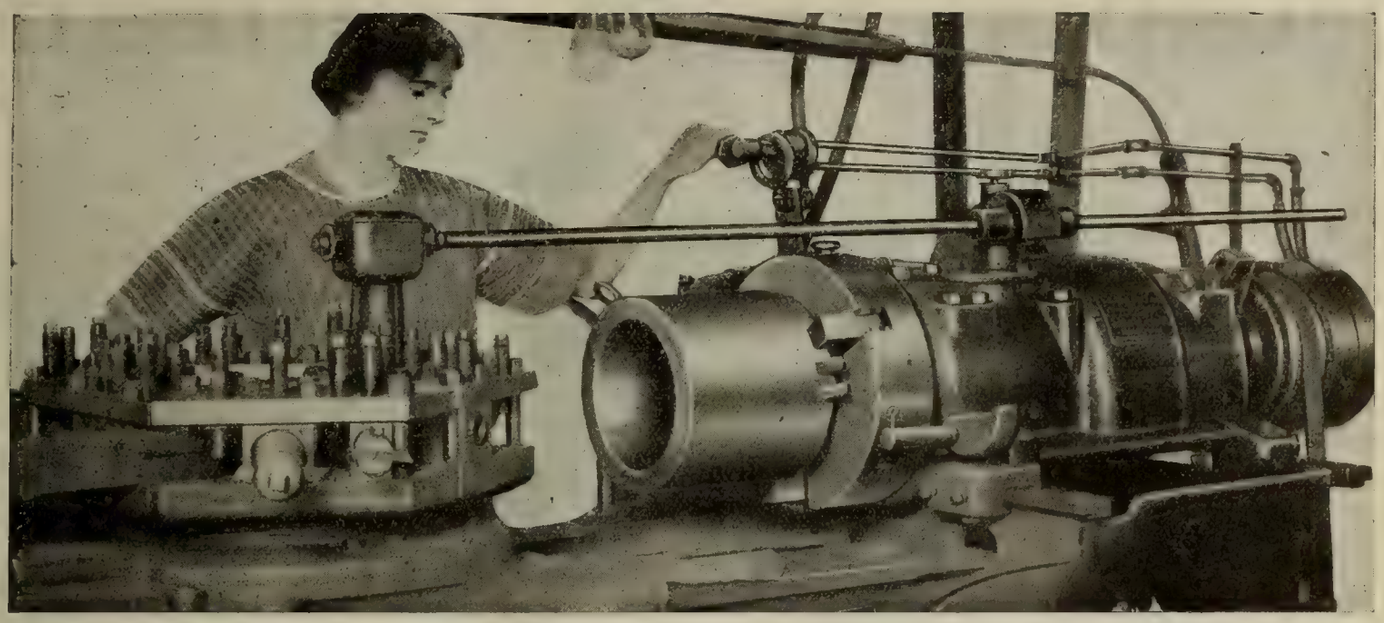
This view shows the simple, compact construction of this class of compressor. Thorough lubrication and thorough water-jacketing are strong features of this machine.

The location of the steam cylinder enables the machine to be readily converted to belt drive should conditions require it, by disconnecting the valve gear and removing the steam piston. If necessary later on, the machine may be changed back to the steam-driven type. Bulletin K-302 describes the machine fully. Write our nearest branch.

CANADIAN INGERSOLL-RAND COMPANY, LIMITED

COMMERCIAL UNION BUILDING
MONTREAL - - CANADA

Branches: SYDNEY SHERBROOKE MONTREAL TORONTO COBALT TIMMINS WINNIPEG NELSON VANCOUVER

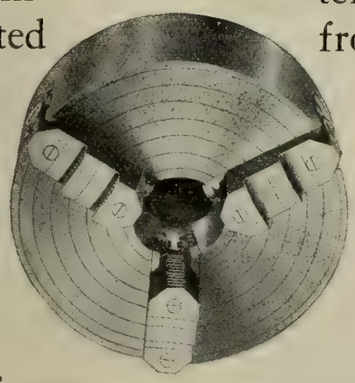


Unskilled for Skilled and Results Better

Expecting nothing more than a lightening of the load, for the sake of their new and unskilled help, many manufacturers installed Hannifin Air-Operated

AIR

Hannifin



Chuck

Labor-Saving Devices. Imagine then their satisfaction when they found the work bettered and production increased from 20 to 100 per cent.

Satisfaction PLUS explains the reason for so much favorable talk about the Hannifin air-operated chuck in all lines of manufacture.

Just the turning of a lever chucks the work—rigidly grips it. Another turn releases.

Always the Hannifin chucks with uniform pressure. It never slips. And there's nothing about it to wear. It is superior in every way to any chuck you have ever used, and there is no mystery about the reason why. The Hannifin catalogue goes into every detail.

Write us to-day.

HANNIFIN MFG. COMPANY, Chicago

REPRESENTATIVES.—R. E. Ellis Engineering Co., Chicago; C. C. Firmin, 602 Kerr Bldg., Detroit; Knox-Andersen Co., Empire Bldg., Pittsburgh; Carl Naumann, 411 Seitz Bldg., Syracuse; A. R. Williams Machinery Co., Toronto; Williams & Wilson, Ltd., Montreal; The Canadian Fairbanks-Morse Co., Montreal.

EUROPEAN REPRESENTATIVES.—Coats Machine Tool Co., Ltd., London; Fenwick-Freres Co., Paris; Iznosskoff & Co., Petrograd.

Escaped from Germany

AN escaped prisoner tells the story of his fearful experiences in Germany in MACLEAN'S MAGAZINE for November; and gives a vivid picture of conditions in Germany as he saw them. He got out by way of Holland after appalling perils and hardships. In Holland, he was photographed, but so altered was he that his wife quite failed to recognize him in this photograph. Read this story of this Canadian soldier's escape. It is gripping stuff—a rare tale.

Canadian Finances After the War

WILL business in Canada collapse when peace comes? It may. What do the big men say? What do they know? What do you think? Are your opinions well informed? The subject is of the greatest possible importance, and you will get light and leading by reading the contribution of Col. John Bayne Maclean, who has taken the trouble to get the opinion of the biggest and most highly placed men in Canada to help him prepare his article.

Back from the Arctic

WILLIAM THOMPSON, representing the American Geographical Society, was this year in the Arctic Regions. He went to the delta of the Mackenzie River, and took many excellent pictures of the country and its Eskimo inhabitants. He makes the November MACLEAN'S the vehicle of many of his pictures and for an account of his journey. Read what this Arctic scientist has to tell us about a remote part of our land.

Slackers and Conscription

WHAT is your attitude towards the draft? You have positive opinions, of course. How do they square with Miss Laut's as they are expressed in her ringing article on Slackers in the November MACLEAN'S?

The Nation's Business

THIS is a new feature—a fearless, well-informed survey of national affairs. What we all want is an outspoken—but not vindictive—and clear-visioned presentation of factors and facts affecting our national, political and economic welfare.

Sketches of Trench Life

By Gunner McRitchie

MCRITCHIE was a cartoonist on a Western Canada daily before he went overseas. He has done a number of sketches of trench life "On the Spot," and these he has sent home, for publication in MACLEAN'S MAGAZINE. They're interesting and good.

The Late Sir Mortimer Clark

BEFORE he died, a few week ago, the late Sir Mortimer Clark, eminent jurist and an ex-Lieutenant-Governor of Ontario, wrote for MACLEAN'S an article on "Safeguarding Your Heirs." It has to do with the functions, service and safety of Trust Companies as executors of estates. This article by a man so distinguished, so cautious, so able, and so wise a counsellor, can be of first-rate value to every man perplexed with the problem of how his estate can be safely and prudently administered after he, the testator, has passed from this life.

A Complete Novelette

By Peter B. Kyne

HIS story in the November MACLEAN'S is a thunderingly good story of lumbermen and lumbering. Red blood is in this tale of business. R. M. Brinkerhoff illustrates it.

Short Story

By Ethel Watts Mumford

THE writer of this short story—the first of a delightful series by this author to appear in MACLEAN'S—is very well known among short story writers. Delicate fancy, wholesomeness, freshness and finished workmanship characterize all her work.

Short Story

By W. A. Fraser

A MIGHTILY well-written story of India—the kind that we all delight in; tense, bewildering, and lots of action. Fraser never wrote a better short story than this. Ben Ward illustrates it.

Hendryx and Oppenheim

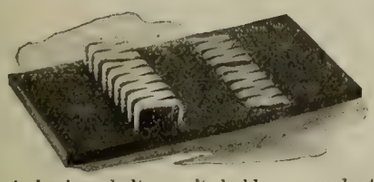
SERIALISTS

THE Gun Brand," by Hendryx, comes to an end in the November issue. Oppenheim's greatest story, "The Pawns Count," is continued. Oppenheim's story is the biggest single feature ever secured by MACLEAN'S.

MACLEAN'S MAGAZINE

for November At All News Dealers **15c.**

HINTS TO BUYERS



MAXIMUM EFFICIENCY IN BELTLACING

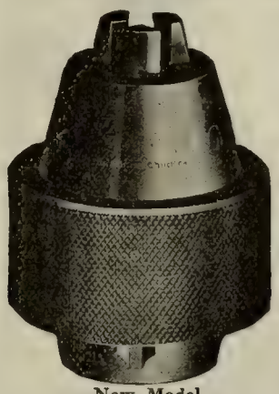
A broken belt won't hold up production long if you repair it with

Patent Steel BRISTOL'S Belt Lacing

Pronounced the most efficient, because it is the easiest, the quickest and the best to apply.
No special tool is required. Simply a hammer and a soft block of wood to drive the sharp, staggered steel prongs through the belt in double rows and to clinch the points. The belt is gripped firmly without danger of cutting or weakening.
Send for samples and Catalog I-707.

THE BRISTOL CO., Waterbury, Conn.

SKINNER DRILL CHUCKS



New Model

THE LARGEST ASSORTMENT Made By Any Manufacturer

The "New Model" is especially adapted to rapid, sensitive drilling. It is accurate, light, strong and hand operated. The price is surprisingly low. Illustrations of complete line on request.

THE SKINNER CHUCK CO.
Main Office and Factory
NEW BRITAIN, CONN.
New York Office—94 Reade St.
London Office—149 Queen Victoria St.
San Francisco Office—Rialto Building.

THOUSANDS of Dollars are saved every year by our clients, because we have experts who are trained to make exhaustive tests of all the material you are purchasing, whether raw material or finished products.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED
Head Office and Main Laboratories—MONTREAL
Branch Offices and Laboratories:
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STEEL CASTINGS

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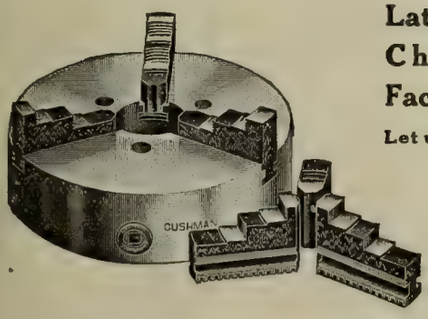

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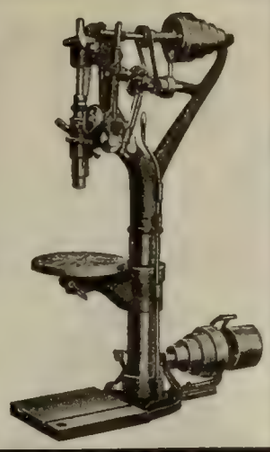

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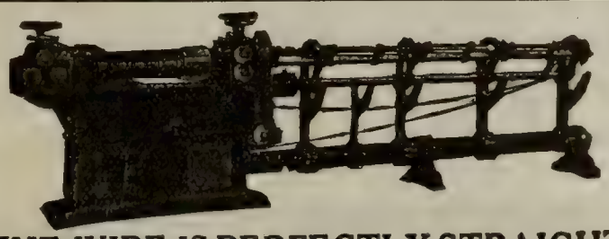

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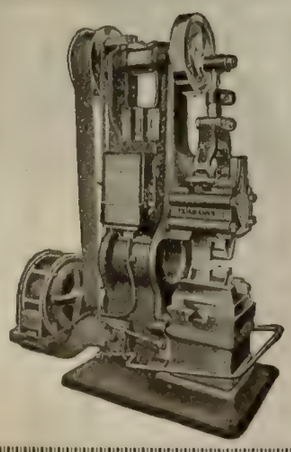

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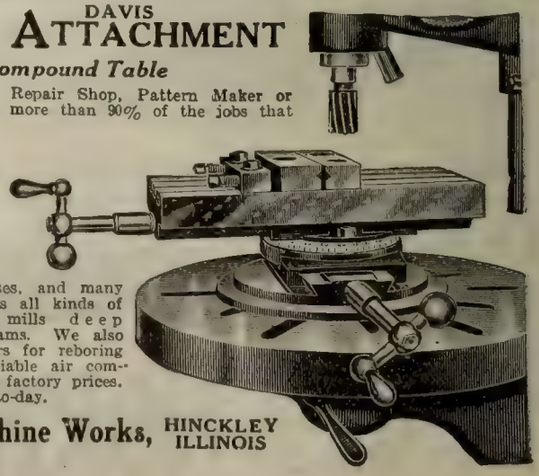

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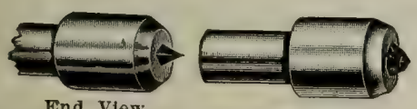

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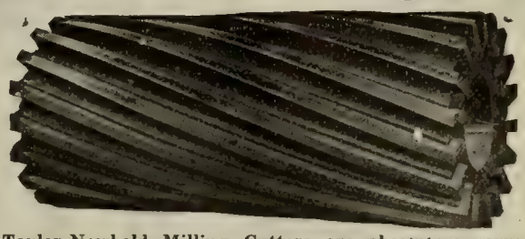

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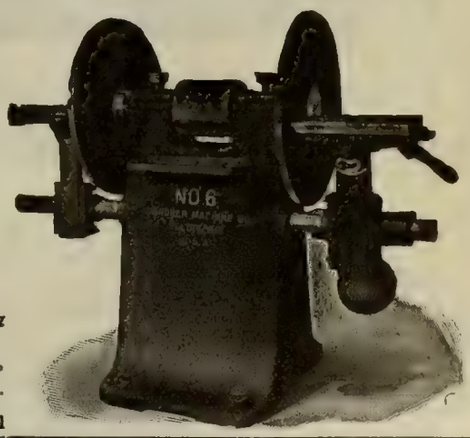

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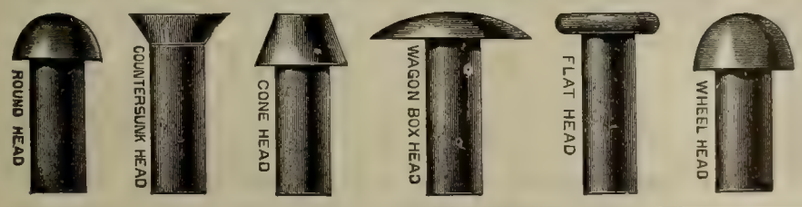

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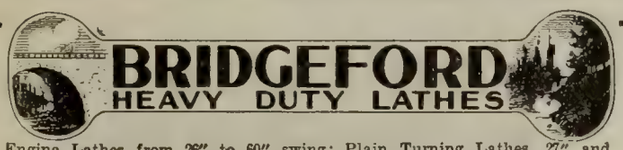

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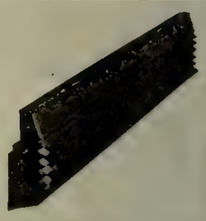

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Ferracute Mach. Co., Bridgeton, N.J.
Brown, Boggs & Co., Hamilton, Can.
Prest-O-Lite Co., Inc., Toronto, Ont.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Can.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CAR MOVERS
Dillon Mfg. Co., Oshawa, Ont.

CARTRIDGE MAKING MACHINERY
Blackall, Fred. S., Woolworth Tower, New York.
Bliss Co., E. W., Brooklyn, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.

CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER
Cumming & Son, J. W., New Glasgow, Canada.
Alexander Fleck, Ltd., Ottawa.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, GRAY IRON
Bernard Industrial Co., The A., Fortierville, Que.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Steel Foundries, Ltd., Montreal, Que.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Can. Steel Foundries, Ltd., Montreal, Que.
Dominion Steel Foundry Co., Ltd., Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
Can. Steel Foundries, Ltd., Montreal, Que.
Cumming & Son, J. W., New Glasgow, Canada.

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.

CEMENT MACHINERY
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.
Petrie, Ltd., H. W., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Wright Mfg. Co., Lisbon, Ohio.

CHEMISTS
Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

CHESTS, TOOL
Embree, Ira, 281 Emerald St. N., Hamilton, Ont.
Union Tool Chest Works, Rochester, N.Y.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
John Bertram & Sons Co., Dundas, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
D. E. Whiton Machine Co., New London, Conn.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, MAGNETIC
H. E. Streeter, 523 New Birks Bldg., Montreal.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

CHUCKING MACHINES
Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

CLOCKS, WATCHMAN, PORTABLE
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Que.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto.

COAL HANDLING MACHINERY
MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

COILING MACHINERY, WIRE AND SPRING
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

COLLARS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

CONTRACT WORK
Welland Motor & Machine Co., Welland, Ont.

CONTROLLERS AND STARTERS, ELECTRIC MOTORS
Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, STEEL SLIDE-BLOW
Whiting Foundry Equipment Co., Harvey, Ill.

COPING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

COUNTERSHAFTS
Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.

COUPLINGS, PLAIN AND FLEXIBLE
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES, LOCOMOTIVE
Northern Crane Works, Walkerille.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.

CUTTER GRINDERS AND ATTACHMENTS
Cincinnati Milling Machine Co., Cincinnati.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining & Mfg. Co., Toronto.
Elm Cutting Oil Co., Toronto.
Racine Tool & Machine Co., Racine, Wis.

CUTTING-OFF MACHINES
Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machinery Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass.
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Mchy. & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

CYLINDERS, AIR
Manufacturers Equipment Co., Chicago, Ill.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.

DAMPER REGULATORS
Canadian Fairbanks-Morse Co., Ltd., Montreal.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

DIAMONDS, BLACK AND ROUGH
Geo. A. Joyce Co., Ltd., New York.

DIAMOND TOOLS
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Banfield, W. H., & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Ltd., Montreal.
Wells Brothers of Canada, Galt, Ont.

DIES FOR BIT BRACE USE
Wells Brothers Co. of Canada, Galt, Ont.

DIES, NOSING
Marsh & Henthorn, Ltd., Belleville, Ont.

DIES, PIPE THREADING
Landis Machine Co., Waynesboro, Pa.

DIE SINKERS
Becker Milling Machine Co., Boston, Mass.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Landis Machine Co., Waynesboro, Pa.
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Geometric Tool Co., New Haven.
Ideal Tool & Mfg. Co., Beaver Falls, Pa.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
Wells Brothers Co. of Canada, Galt, Ont.

DIES FOR SCREW PLATES
Wells Brothers Co. of Canada, Galt, Ont.

DIES, SHEET METAL WORKING
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Illinois Tool Works, Chicago, Ill.
Worth Engineering Co., Toronto, Ont.

DISCS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

DIES, SCREW AND THREAD
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Brothers Co. of Canada, Galt, Ont.

DRAFT, MECHANICAL
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

DISCS, LEATHER
Graton & Knight Mfg. Co., Montreal.

DRESSERS, GRINDING AND EMERY WHEEL
Can. Desmond-Stephan Mfg. Co., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, O.
A. R. Williams Machinery Co., Toronto.

DRILLING MACHINES, BENCH
Bilton Mach. Tool Co., Bridgeport, Conn.
Martin Machine Co., Greenfield, Mass.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Hespeler, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Mach. Co., Rockford, Ill.

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.

DRILLING MACHINES, SENSITIVE
Aikenhead Hardware Co., Toronto, Ont.
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
De Mooy Machine Co., Cleveland, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
D. McKenzie Machinery Co., Guelph, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, Ohio.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto, Ont.
W. F. & John Barnes Co., Rockford, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Millers Falls Co., Millers Falls, Mass.
Pratt & Whitney Co., Dundas, Ont.
United States Electrical Tool Co., Cincinnati.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.

DRILLS, ELECTRIC AND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.

DRILLS, HIGH SPEED
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Can. B. K. Morton, Toronto, Montreal.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Foss & Hill Machy. Co., Montreal.
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McKenna Brothers, Pittsburgh, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
W. F. & John Barnes Co., Rockford, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

DRILLS, MULTIPLE SPINDLE
Henry & Wright Mfg. Co., Hartford, Conn.
Niles-Bement-Pond Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Niles-Bement-Pond Co., New York.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Millers Falls Co., Millers Falls, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Foss & Hill Machy. Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Cleveland Twist Drill Co., Cleveland.
Clark Equipment Co., Buchanan, Mich.
Foss & Hill Machy. Co., Montreal.
Morse Twist Drill & Mach. Co., New Bedford.

DRILLS, TWIST
Atkins & Co., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

DRINKING FOUNTAINS
Puro Sanitary Dk'g. Fountain Co., Haydenville Mass.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sheldons, Ltd., Galt, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
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MacKinnon, Holmes & Co., Sherbrooke, Que.

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Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

DUST ARRESTERS (FOR TUMBLING MILLS)
Northern Crane Works, Walkerville.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

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Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
A. R. Williams Machy. Co., Toronto.

ELEVATOR ENCLOSURES
Canada Wire & Iron Goods Co., Hamilton, Ont.

ELEVATORS AND BUCKETS
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Whiting Foundry Equipment Co., Harvey, Ill.

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Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Ford-Smith Mach. Co., Hamilton, Ont.
Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.

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Plessisville Foundry Co., Plessisville, Que.

ENGINES, STEAM, GAS, GASOLINE
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Johnson Mach. Co., Carlyle, Manchester, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.

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Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

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Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

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Puro Sanitary Dk'g. Fountain Co., Haydenville, Mass.

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Canada Wire & Iron Goods Co., Hamilton, Ont.

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Atkins & Co., Wm., Sheffield, Eng.
Can. B. K. Morton Co., Toronto, Ont.
Delta File Works, Philadelphia, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
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Wilkinson & Kompass, Hamilton, Ont.

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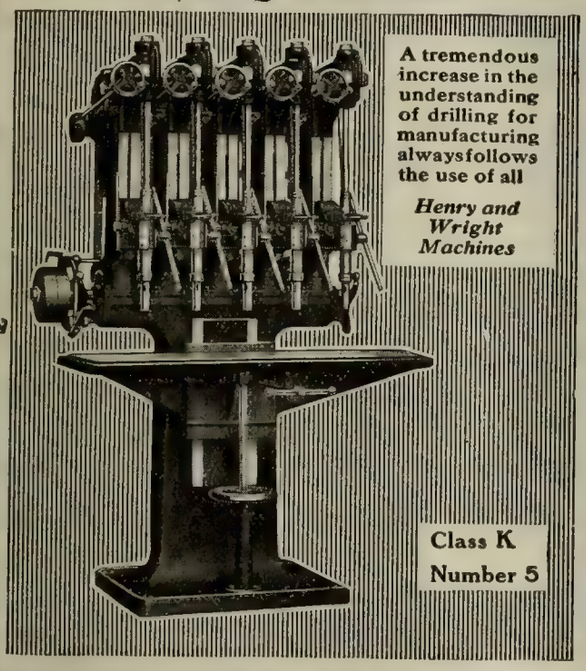

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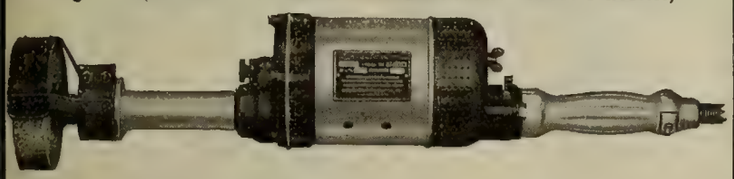

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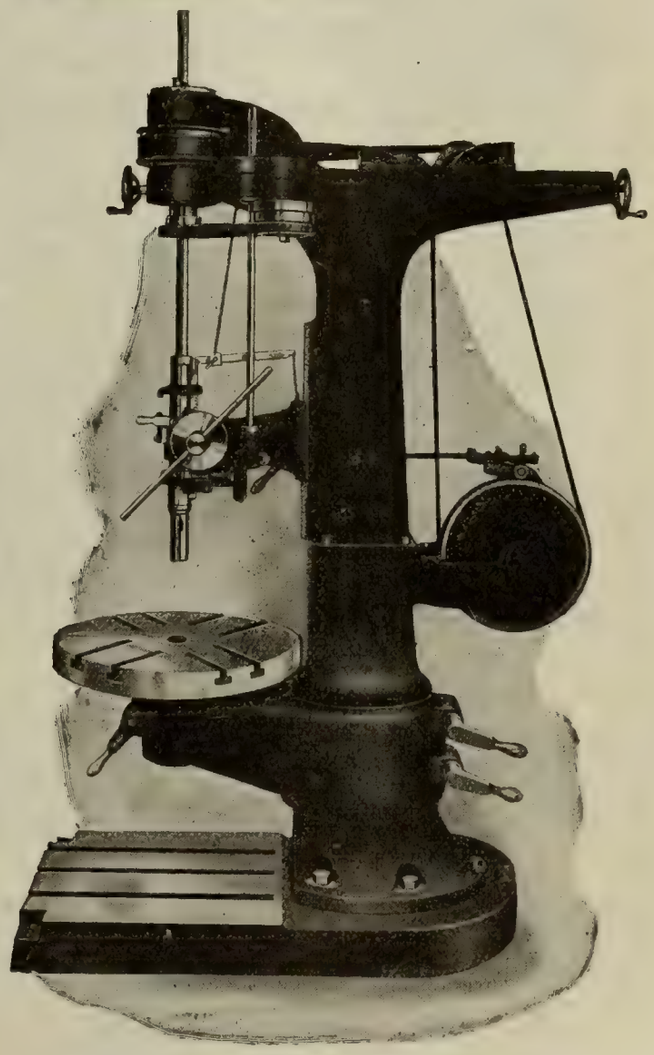

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Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
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Garlock-Walker Machinery Co., Toronto, Ont.
Hamilton Gear & Machine Co., Toronto.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
Petrie, Ltd., H. W., Toronto, Ont.
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D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.

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Himoff Mach. Co., Inc., Astoria, L.I., New York.

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Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Foundries, Ltd., Hull, Que.
Illinois Tool Works, Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
The Smart-Turner Machine Co., Hamilton.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

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Gardner, Robt., & Son, Montreal.
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Garlock-Walker Machinery Co., Toronto, Ont.

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Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
New Britain Machine Co., New Britain, Conn.
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Stow Mfg. Co., Binghamton, N.Y.
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LeBlond Mach. Tool Co., R. K., Cincinnati, O.
Norton Grinding Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wilmarth & Morman, Grand Rapids, Mich.

GRINDERS, DIE AND CHASER
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

GRINDERS, DRILL
Aikenhead Hardware Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Garvin Machine Co., New York.
United States Electrical Tool Co., Cincinnati, O.
Wilmarth & Morman, Grand Rapids, Mich.

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Foss & Hill Machy. Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
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Brown & Sharpe Mfg. Co., Providence, R.I.
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Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
United States Electrical Tool Co., Cincinnati, O.
A. R. Williams Machy. Co., Toronto.
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GRINDERS, TOOL AND HOLDER
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Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
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Ford-Smith Mach. Co., Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
LeBlond Mach. Tool Co., R. K., Cincinnati.
Niles-Bement-Pond Co., New York.
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Wilmarth & Morman, Grand Rapids, Mich.
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Can. B. K. Morton, Toronto, Montreal.
Carborundum Co., Niagara Falls.
Ford-Smith Mach Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
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Norton Co., Worcester, Mass.
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Ford-Smith Machine Co., Hamilton, Ont.
New Britain Mach. Co., New Britain, Conn.
Stow Mfg. Co., Binghampton, N.Y.

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Ford-Smith Machine Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Millers Falls Co., Millers Falls, Mass.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.
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Racine Tool & Machine Co., Racine, Wis.
L. S. Starrett Co., Athol, Mass.
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Millers Falls Co., Millers Falls, Mass.
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Brown, Boggs Co., Ltd., Hamilton, Canada.
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Erie Foundry Co., Erie, Pa.
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The New Cleveland is shorter over all. Hits a harder blow, and uses less air than any hammer made.

The New Cleveland has a higher speed with less recoil in operation than any riveter on the market.

We can prove it in your shop

THE NEW CLEVELAND is made in 15 sizes with Outside or Inside Latch, and is adapted to all classes of work upon which Riveting Hammers can be used.

THE NEW CLEVELAND has a driving range in rivets from ¼-inch to 1½-inches, and is especially adapted for heavy riveting in Boiler or Structural Work.

IN STOCK: Riveting Hammers, Chipping Hammers, Air Drills for Reaming and Tapping, Breast Drills, Sand Rammers—Floor and Bench, Corner Drills, Portable Air Grinders, Bowes Air Hose Couplings, etc.

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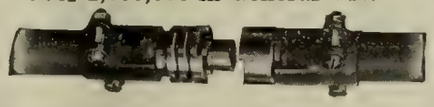

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Shows Never-Slip Hose Clamps Attached to Bowes Couplings

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HIGH SPEED HAMMERS

For High Speed Work

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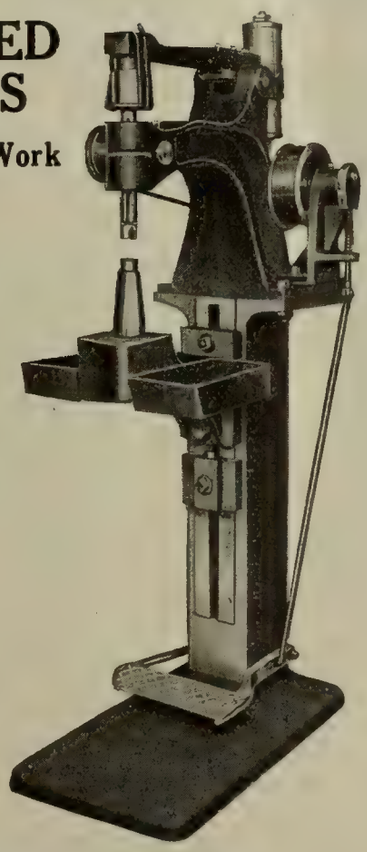

Economy in floor space, elimination of weight and a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushings are used throughout.

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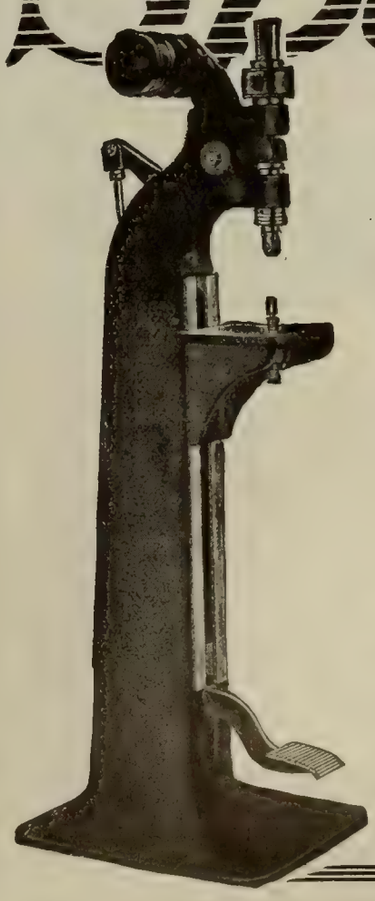
Sales Agents: The A. R. Williams Machinery Company, Limited, Toronto, Ontario.

Speed



When the quality of the work is the best obtainable, the next item is speed. For upon speed depends your costs.

One rivet per second is the speed this machine will maintain indefinitely. Adapt that speed to your requirements and find out the value the Grant Riveter would be to you.

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Grant Mfg. & Machine Company

Bridgeport, Conn., U.S.A.

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Canada Machinery Corp., Galt, Ont.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.

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HINGES
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HOBS
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Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

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Can. Matthews Gravity Carrier Co., Toronto, Ont.
Jenckes Mach. Co., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Northern Crane Works, Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

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Garlock-Walker Machinery Co., Toronto, Ont.
Ford Chain Block & Mfg., Philadelphia, Pa.
Independent Pneumatic Tool Co., Chicago, Ill.
Jenckes Mach. Co., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Northern Crane Works, Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
Wright Mfg. Co., Lisbon, Ohio.

HOISTS, ELECTRIC
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Kennedy & Sons, Owen Sound, Ont.
Northern Crane Works, Walkerville, Ont.
Winnipeg Gear & Engrng Co., Winnipeg, Man.

HOLDERS, STEEL DIE FOR MARKING
Matthews, Jas. H., & Co., Pittsburgh, Pa.

HOPPERS
Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.

HOSE, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Goodyear Tire & Rubber Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Wells Bros. Co. of Canada, Galt, Ont.

HYDRAULIC MACHINERY
Charles F. Elmes Eng. Works, Chicago.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

INDICATORS, SPEED
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
L. S. Starrett Co., Athol, Mass.

INDEX CENTRES
Fred C. Dickow, Chicago, Ill.
Garvin Machine Co., New York.

INDICATING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

IRON ORE
Hanna & Co., M. A., Cleveland, O.

JACKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Petrie, Ltd., H. W., Toronto, Ont.

JACKS, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago.

JACKS, PNEUMATIC
Northen Crane Works, Walkerville.

JACKS, PIT AND TRACK
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.

JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.

JIGS, TOOLS, ETC.
Brown Engineering Corp., Toronto, Ont.
Homer & Wilson, Hamilton, Ont.
Illinois Tool Works, Chicago, Ill.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Toronto Tool Co., Toronto, Ont.

KEY SEATERS
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich.
A. R. Williams Machy. Co., Toronto.

KEYS, MACHINE
Whitney Mfg. Co., Hartford, Conn.

KILNS
Can. Blower & Forge Co., Kitchener, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Sheldons, Limited, Galt, Ont.

LABELS AND TAGS
Matthews, Jas. H. & Co., Pittsburgh, Pa.

LABORATORIES, INSPECTION AND TESTING (SEE CHEMISTS)

LADLES, FOUNDRY
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

LAMPS, INCANDESCENT AND NITROGEN
Can. Laco-Philips Co., Toronto, Ont.

LAMPS, TUNGSTEN (Vacuum and Gas Filled)
Can. Laco-Philips Co., Toronto, Ont.

LATHES, BENCH
H. E. Streeter, New Birks Bldg., Montreal, Que.

LATHES, CHUCKNG
Acme Machine Tool Co., Cincinnati, Ohio.

LATHE CHUCKS (SEE CHUCKS)

LATHE DOGS AND ATTACHMENTS
Armstrong Bros. Tool Co., Chicago.
Curtis & Curtis Co., Bridgeport, Conn.
Hendey Machine Co., Torrington, Conn.
Rivett Lathe & Grinder Co., Boston, Mass.
Williams & Co., J. H., Brooklyn, N.Y.
Winnipeg Gear & Engrng Co., Winnipeg, Man.

LATHES, AXLE
Bridgeford Mach. Tool Works, Rochester, N.Y.

LATHES, PRECISION, BENCH
W. F. & John Barnes Co., Rockford.
Blount, J. G., & Co., Everett, Mass.
Can Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hardinge Bros., Chicago, Ill.
New Britain Mach. Co., New Britain, Conn.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.

LATHES, BAND TURNING
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Roelofson Machine & Tool Co., Toronto, Ont.
Warden King Co., Montreal, Que.

LATHES, BRASS
Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Inc., Chicago, Ill.

LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, Ohio.
John Bertram & Sons Co., Dundas.
Bridgeford Mach. Tool Works, Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Iron & Steel Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Mach. Tool Co., Hamilton, Ohio.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
McCabe, J. J., New York, N.Y.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Sebastian Lathe Co., Cincinnati, Ohio.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

LATHES, JOURNAL TRUEING
Bridgeford Mach. Tool Works, Rochester, N.Y.
McCabe, J. J., New York, N.Y.

LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McCabe, J. J., New York, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.

LATHES, SINGLE PURPOSE
Bertram, John, & Sons Co., Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Mfg. & Mach. Co., Toronto, Ont.
Hepburn, John T., Ltd., Toronto.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McCabe, J. J., New York, N.Y.
Roelofson Mach. & Tool Co., Toronto, Can.

LATHES, SCREW CUTTING
Bertram, John, & Sons Co., Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto.
McCabe, J. J., New York, N.Y.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

LATHES, SPINNING
Bliss, E. W., Co., Brooklin, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
McCabe, J. J., New York, N.Y.

LATHES, TURRET AND HAND
Acme Machine Tool Co., Cincinnati, Ohio.
John Bertram & Sons Co., Dundas.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto, Ont.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
McCabe, J. J., New York, N.Y.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
National-Acme Co., Cleveland, Ohio.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
H. W. Petrie, Toronto.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.

LEAD BURNING
St. Lawrence Welding Co., Montreal, Que.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, Mass.

LIFTS, PNEUMATIC
Whiting Foundry Equipment Co., Harvey, Ill.

LINK BELTING
Can. Fairbanks-Morse Co., Montreal.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

LIQUID AIR
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

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Canada Wire & Iron Goods Co., Hamilton, Ont.

LUBRICANTS
Cataract Refining & Mfg. Co., Toronto.

LUBRICATORS
Roper, C. F., & Co., Hopedale, Mass.
Trahern Pump Co., Rockford, Ill.

MACHINERY DEALERS
Baird Machy. Co., W. J., Detroit, Mich.
Can. Fairbanks-Morse Co., Montreal.
Dickow, Fred C., Chicago, Ill.
Garlock-Walker Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Petrie, Ltd., H. W., Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

MACHINERY GUARDS (SEE GUARDS)

MACHINERY REPAIRS
Prest-O-Lite Co., Inc., Toronto, Ont.
Sumbling Mach. Co., W. H., Toronto, Ont.

MACHINISTS' SCALES, SMALL TOOLS AND SUPPLIES
Can. Fairbanks-Morse Co., Montreal.
Frank H. Scott, Montreal.
J. H. Williams & Co., Brooklyn, N.Y.

MACHINISTS
Welland Motor & Machine Co., Welland, Ont.

MANDRELS
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Hannifin Mfg. Co., Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Manufacturers Equip. Co., Chicago, Ill.
Monarch Brass Mfg. Co., Toronto, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

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Pritchard-Andrews Co. of Canada, Ottawa, Ont.
Matthews, Jas. H., & Co., Pittsburgh, Pa.

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Brown, Boggs Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Martin Machine Co., Greenfield, Mass.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Perrin, Wm. R., Toronto.

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Pratt & Whitney Co., Dundas, Ont.

MEASURING TAPES AND RULES
James Chesterman & Co., Ltd., Sheffield, Eng.

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Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Ltd., Toronto.

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Dom. Iron & Wrecking Co., Ltd., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.

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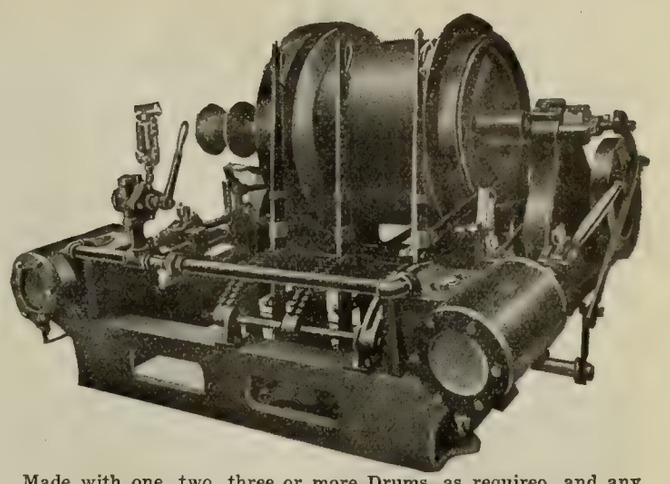

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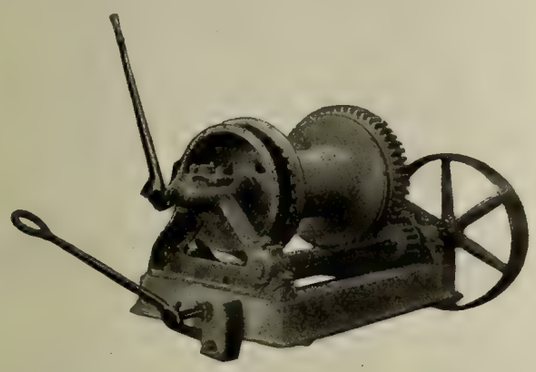

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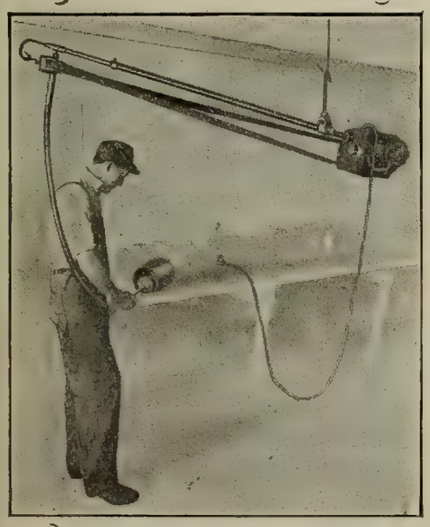

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Cleveland Milling Mach. Co., Cleveland, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.

MILLING MACHINES, HAND
Hardinge Bros., Inc., Chicago, Ill.
United States Mach. Tool Co., Cincinnati, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Whitney Mfg. Co., Hartford, Conn.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Becker Milling Machine Co., Boston, Mass.
Brown & Sharpe Mfg. Co., Providence.
John Bertram & Sons Co., Dundas.
Cleveland Milling Machine Co., Cleveland, Ohio.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.
Steptoe, The John Co., Cincinnati, Ohio.
United States Mach. Tool Co., Cincinnati, Ohio.
Whitney Mfg. Co., Hartford, Conn.
A. R. Williams Machy. Co., Toronto.

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Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

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Brown & Sharpe Mfg. Co., Providence.
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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.

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Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Tabor Mfg. Co., Philadelphia, Pa.

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Cummings & Son, J. W., New Glasgow, Canada.
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
Marsh & Henthorn, Belleville, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Jenckes Mach. Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

MITTENS
Hickory Steel-Grip Glove Co., Chicago, Ill.

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Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Mach. Co., New Britain, Conn.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
A. R. Williams Machy. Co., Toronto.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Can.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
John H. Hall & Sons, Ltd., Brantford, Ont.
Landis Machine Co., Waynesboro, Pa.

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Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

NOSE SOCKETS
Jas. McKay Co., Pittsburgh, Pa.

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Canadian B. K. Morton, Toronto, Montreal.
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton, Ont.

NUT BURRING MACHINES
National Machy. Co., Tiffin, O.

NUT MACHINES (HOT)
National Machy. Co., Tiffin, O.

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Garvin Machine Co., New York.
National Machy. Co., Tiffin, O.
Victor Tool Co., Waynesboro, Pa.

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John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
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Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.

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MacKinnon, Holmes & Co., Sherbrooke, Que.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

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Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.

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Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

OXYGEN (SEE ACETYLENE)
L'Air Liquide Society, Montreal, Que.

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New Britain Mach. Co., New Britain, Conn.

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PAPER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

PATTERN SHOP EQUIPMENT
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Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.

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Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Petrie, Ltd., H. W., Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
A. R. Williams Machy. Co., Toronto.

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Wells Bros. Co. of Canada, Galt, Ont.

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Armstrong Bros. Tool Co., Chicago.

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Canada Machinery Corp., Galt, Ont.
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Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

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Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

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Canadian Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Conn.

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Hannifin Mfg. Co., Chicago, Ill.
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PRESSES, BROACHING, FORGING AND FLANGING
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E. W. Bliss Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, CAM, TOGGLE, EYELET
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Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
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PRESSES FOR SHELLS
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Bliss Co., E. W., Brooklyn, N.Y.
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Ferracute Machine Co., Bridgeton, N.J.
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Metalwood Mfg. Co., Detroit, Mich.
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West Tire Setter Co., Rochester, N.Y.

PRESSES, FILTER
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E. W. Bliss Co., Brooklyn, N.Y.
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Charles F. Elmes Eng. Works, Chicago.
Can. Fairbanks-Morse Co., Montreal.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
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Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo.

PRESSES, HYDRAULIC
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Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo.
West Tire Setter Co., Rochester, N.Y.
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Toledo Machine & Tool Co., Toledo.

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E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
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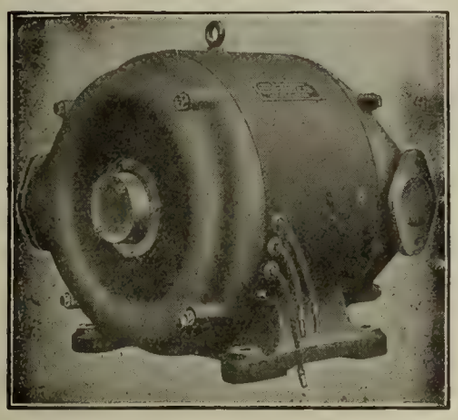

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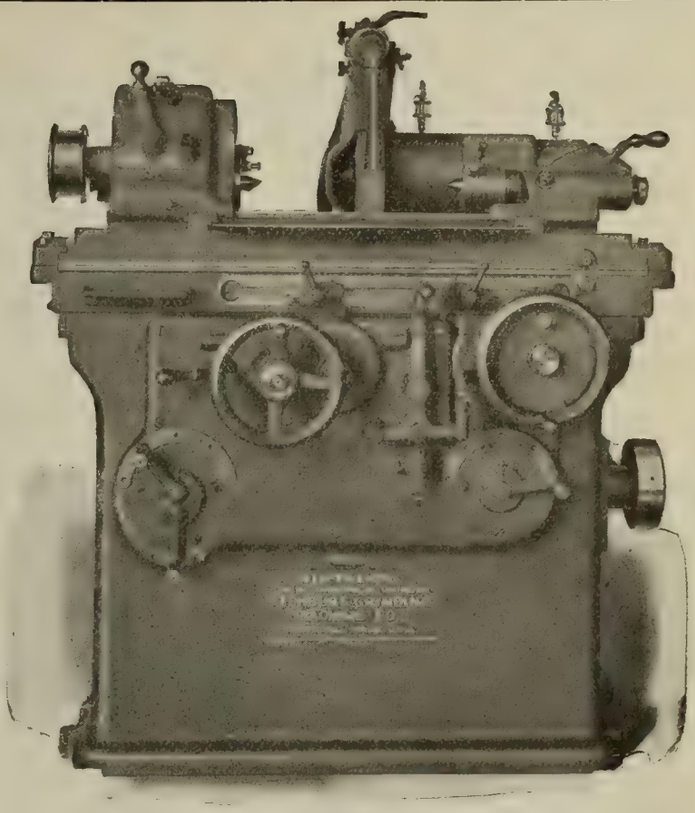

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Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Petrie, Ltd., H. W., Toronto, Ont.
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National Machinery Co., Tiffin, O.

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Steel Co. of Canada, Ltd., Hamilton, Ont.

RIVETS, IRON, COPPER AND BRASS
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ot.

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Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.

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High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.

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Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo, O.

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James Chesterman & Co., Ltd., Sheffield, Eng.
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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.

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SAW MILL MACHINERY
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Canada Machinery Corp., Galt, Ont.
Gardner, Robt., & Son, Montreal
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Eastern Mach. Screw Corp., New Haven, Conn.

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Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York
Himoff Mach. Co., Inc., Astoria, L.I., New York.
A. B. Jardine & Co., Hespeler
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Rivett Lathe & Grinder Co., Brighton, Mass.
Warner & Swasey Co., Cleveland, O.
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Morse Twist Drill & Mch. Co., New Bedford, Mass
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Wilkinson & Kompass, Hamilton, Ont.

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Foss & Hill Machy. Co., Montreal
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McCabe, J. J., New York, N.Y.
New York Machinery Exchange, New York
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Strelinger Co., Chas. A., Detroit, Mich.
Stocker-Rumely-Wachs, Chicago, Ill.

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Allen Mfg. Co., Hartford, Conn.
Wilkinson & Kompass, Hamilton, Ont.

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Foss & Hill Machy. Co., Montreal
Gardner, Robt., & Son, Montreal
Hendey Machine Co., Torrington, Conn.
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Mr. Bruce's Counsel

SPECIFICALLY APPLIED, MR. BRUCE'S COUNSEL may be said to recommend that business men should read every week THE FINANCIAL POST OF CANADA, to inform themselves concerning current events in the realm of Canadian business and public affairs.

Frank E. Mutton, Vice-President of the International Time Recording Company, of Canada, wrote the following letter to the publishers of THE POST:

Attention, Editor:

Recently we sent you a subscription covering the delivery of THE FINANCIAL POST to each of our Sales Agents and Salesmen throughout Canada. This was prompted by the fact that, in our opinion, your paper is the best barometer in Canada of what is going on in the different industries from one ocean to the other in this country. Your paper contains information invaluable to any traveling representative of any firm.

(Signed) F. E. MUTTON.

Dated Oct. 12, 1917.

IN effect, THE FINANCIAL POST represents a Current Events Club, met weekly for the consideration and study of current affairs in Canada in relation to itself and the world at large. It represents the assembly of many, many surpassingly well-informed contributors who discuss intelligently, lucidly and proportionately, Canada's public and business affairs. No more stimulating and worth-while paper is published in Canada for the man who wants to be able to talk confidently, at the club, luncheon, board meeting, business council, public meetings, about Canadian public affairs.

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Talk Current Events

A Talk by H. Addington Bruce, Author of "The Riddle of Personality," "Psychology and Parenthood," Etc.

WHAT do you know about the doings in this great world wherein we live?

Do you try to form a really intelligent and well-considered opinion regarding events the world over?

Do you ever discuss their significance with friends and neighbors?

If asked what you think of any particular event, you are perhaps ready with an answer. Is your answer anything but a snap judgment, determined by prejudice rather than by reasoning analysis?

I put these questions not to be disagreeable, but because, if necessary, I want to spur you to appreciate the value that there is in discussion of current events.

Many people, fortunately, appreciate its value instinctively. Perhaps you are one of these. Many others are beginning to appreciate it.

This is shown by the growing popularity of clubs and classes on current events.

Only a few years ago such clubs and classes were almost unheard of. To-day most of our bigger cities have half a dozen of them or more.

In one city—Boston—a talented woman of my acquaintance draws an income of thousands of dollars a year from her leadership of current events classes.

Other men and women have similarly discovered that interest in current events is increasing so rapidly that they can well afford to organize classes like those conducted by the Boston woman.

Still, there remain many people—thousands of people—who never discuss current events. Many thousands more discuss only such events as come under the headings of "crime," "the theatre," and "sports."

These are the people I want to reach. They are the people I want to rouse to recognition of the practical helpfulness they will find in discussion of current events in general.

Current events clubs and classes might well be organized in every neighborhood, with weekly meetings to take up the outstanding happenings in international affairs, national politics, literature, art, music, science and industry.

Regular attendance at, and active participation in, these meetings will prove to be an education in itself.

It will enlarge the mental horizon and broaden the moral sympathies. By disciplining the mind to active thought it will raise the level of workaday efficiency.

It will make for a more alert, a more conscientious citizenship. It will give zest and color to a life which perhaps has hitherto been pathetically drab.

Unsuspected powers will be awakened. With a better grasp on the realities of life, the whole personality will expand.

One evening a week is certainly not too much to give to a discussion of the day-to-day developments in our wonderful world.

It may mean doing without an evening at cards or at the musical comedy, or at the dance hall. But this, after all, is not a terrible sacrifice.

And from the occasional talk over current events will come more profit than could possibly come from any number of evenings spent in card-playing, dancing, or listening to musical comedies.—Reprinted from the Toronto Daily Star.

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SILVER SOLDER
Geo. H. Lees & Co., Hamilton, Ont.

SKATE SHARPENERS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SLOTTERS
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York
Rhodes Mfg. Co., Hartford, Conn.

SMOKESTACKS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
J. H. Williams & Co., Brooklyn, N.Y.

SOCKET HEAD CAP SCREWS
Allen Mfg. Co., Hartford, Conn.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Canada

SOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Banfield, W. H., & Sons, Toronto.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Brown Engineering Corp., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
Grant Mfg. & Machy. Co., Bridgeport, Conn.
Gray Mfg. & Mach. Co., Toronto, Ont.
John H. Hall & Sons, Brantford.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McClean & Son, F. W., Niagara Falls, Ont.
National-Acme Co., Cleveland, Ohio.
D. McKenzie Machinery Co., Guelph, Ont.
Mulliner & Enlund Tool Co., Syracuse, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Sleeper & Hartley, Inc., Worcester, Mass.
Smart-Turner Machine Co., Hamilton, Ont.
T. C. M. Mfg. Co., Harrison, N.J.
Victoria Foundry Co., Ottawa, Ont.
Welland Motor & Machine Co., Welland, Ont.
William R. Perrin, Ltd., Toronto.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

SPRINGS, MACHINERY
Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele, Ltd., Guelph, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

SPIRAL CONVEYORS
Can. Matthews Gravity Carrier Co., Toronto, Ont.

SPROCKETS, CHAIN
Grant Gear Works, Boston, Mass.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

SOLDER
Jobborn, Geo. A., Hamilton, Ont.

SPROCKET WHEELS, CAST
Perrin, Wm. R., Toronto.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS
Dillon Mfg. Co., Oshawa, Ont.
Dom. Forge & Stamping Co., Walkerville, Ont.
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Canada Machinery Corp., Galt, Ont.
Ferracute Mach. Co., Bridgton, N.J.
Noble & Westbrook Mfg. Co., Hartford, Conn.

STAMPS, STEEL ALPHABET, FIGURES
Matthews, Jas. H. & Co., Hartford, Conn.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.
Can. Morehead Mfg. Co., Woodstock, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.
Sturtevant Co., B. F., Galt, Ont.

STEEL ALLOY (SEE ALLOY STEEL)

STEEL BENDING BRAKES
Steel Bending Brake Works, Ltd., Chatham, Ont.

STEEL FOR AXES, PLOWS, SAWS, DRILLS, ETC.
Colonial Steel Co., Pittsburgh, Pa.

STEEL, CARBON, FERRO-TUNGSTEN
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Zenith Coal & Steel Products, Montreal, Que.

STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

STEEL DRUMS
Smart-Turner Machine Co., Hamilton, Ont.

STEEL PRESSURE BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Century Steel Co. of America, New York
Colonial Steel Co., Pittsburgh, Pa.
H. A. Drury Co., Ltd., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Fairley Davidson Steel Co., New York, N.Y.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.
Zenith Coal & Steel Products, Montreal, Que.

STEELS, HIGH STRENGTH, HOT-WORKING, DIE, MAGNET
Fairley Davidson Steel Co., New York, N.Y.

STEEL, VANADIUM
Drury, H. A., Co., Montreal, Que.
Standard Alloys Co., Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STELLITE, HIGH-SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.

STOCK RACKS FOR BARS, PIPING, ETC.
New Britain Machine Co., New Britain, Conn.

STOCKS, PIPE
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.

STOOLS, STEEL, SHOP
New Britain Machine Co., New Britain, Conn.

STRAIGHTENING MACHINERY
Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

TACK (DOUBLE POINT) MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

TANKS, GASOLINE AND OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Dominion Forge & Stamping Co., Walkerville.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.

TANKS, STEEL, WATER PRESSURE
Bowser & Co., Inc., S. F., Toronto, Ont.
Can. Welding Works, Montreal, Que.
Jenckes Machine Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TANK WAGONS
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.

TAPPING MACHINES (PENUMATIC)
Cleveland Pneumatic Tool Co. of Can., Toronto.

TAPPING MACHINES AND ATTACHMENTS
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Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
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Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.

TAPS, ADJUSTABLE
Baxter Co., Ltd., J. R., Montreal, Que.
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.

TAPS, COLLAPSIBLE
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

TAPS, DIES AND WRENCHES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wells Bros. Co. of Canada, Galt, Ont.

TAP EXTENSIONS
Allen Mfg. Co., Hartford, Conn.

TESTING INSTRUMENTS METALLURGICAL
Shore Instrument & Mfg. Co., New York City.

THERMOMETERS, ALL KINDS
Taylor Instrument Co., Rochester, N.Y.
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TESTING LABORATORIES
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

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Cleveland Twist Drill Co., Cleveland.
Armstrong Bros. Tool Co., Chicago.
Can. B. K. Morton, Toronto, Montreal.
Deloro Smelting & Refining Co., Toronto, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOL STEEL
Atkins & Co., Wm., Sheffield, Eng.
Armstrong, Whitworth, Ltd. of Canada, Montreal.
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
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Deloro Smelting & Refining Co., Toronto, Ont.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.

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Swedish Steel & Importing Co., Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

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United States Elec. Tool Co., Cincinnati, O.

TOOLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

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Armstrong, Whitworth of Canada, Ltd., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.

TRACK SYSTEMS
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Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
A. R. Williams Machinery Co., Toronto.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
The Smart-Turner Machine Co., Hamilton.

TRANSMISSION TOWERS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TROLLEYS
Wright Mfg. Co., Lisbon, Ohio.

TRUCKS, FACTORY, FREIGHT, ETC.
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

TRUCKS, LUMBER AND KILN
Sheldons, Ltd., Galt, Ont.
Northern Crane Works, Walkerville.

TUBING, SEAMLESS, BRASS & COPPER
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TUBING COILERS, FLEXIBLE METAL
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TUMBLING BARRELS
Baird Machine Co., Bridgeport, Conn.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TUNGSTEN FILAMENT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

TURNBUCKLES
Canadian Billings & Spencer, Ltd., Welland.

TURNTABLES
Whiting Foundry Equipment Co., Harvey, Ill.

TURRET MACHINES
Brown & Sharpe Mfg. Co., Providence
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney, Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURBINE WATER WHEELS
Jenckes Mach. Co., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.

UPSETTING AND BENDING MACHINERY
John Bertram & Sons Co., Dundas
Brown, Boggs Co., Ltd., Hamilton, Canada.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Jenckes Mach. Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

VACUUM PUMPS
Can. Blower & Forge Co., Kitchener, Ont.
Smart-Turner Machine Co., Hamilton, Ont

VALVE LEATHERS
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Graton & Knight Mfg. Co., Montreal.

VALVE GRINDERS (PNEUMATIC)
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VALVES, FOOT
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VALVES, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

VALVES, BACK PRESSURE, STEAM
Sheldons, Limited, Galt, Ont.

VENTILATING APPARATUS
Brantford Oven & Rack Co., Brantford, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.
A. R. Williams Machy. Co., Toronto.

VISES, AIR OPERATED
Hannifin Mfg. Co., Chicago, Ill.

VISE STANDS, PORTABLE
New Britain Machine Co., New Britain, Conn.

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Cleveland Milling Machine Co.
Foss & Hill Machy. Co., Montreal.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.

VISES, PIPE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.
J. H. Williams & Co., Brooklyn, N.Y.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Barnes, Wallace, Co., Bristol, Conn.
Dillon Mfg. Co., Oshawa, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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Wm. B. Scaife & Sons Co., Pittsburgh, Pa.

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Whiting Foundry Equipment Co., Harvey, Ill.

WATER JACKETS
Can. Welding Works, Montreal, Que.

WATER TOWERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

WATER WHEELS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.

WELDING, ELECTRIC, SPOT, BUTT, ETC.
St. Lawrence Welding Co., Montreal, Que.

WELDING MASKS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

WELDERS, ELECTRIC, SPOT, BUTT, ETC.
National Electric Welder Co., Warren, O.
Tabor Mfg. Co., Philadelphia, Pa.
Thomson Electric Welding Co., Lynn, Mass.
Winfield Electric Welding Mach. Co., Warren, Ohio.

WELDING, WORK AND SUPPLIES (Autogenous and Oxy-Acetylene) see OXY-ACETYLENE

WINCHES
John H. Hall & Sons, Brantford.
Kennedy & Son, Wm., Owen Sound, Ont.
Northern Crane Works, Walkerville.

WIRE COILING AND POINTING MACHINERY
Baird Machine Co., Bridgeport, Conn.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE CLOTH AND PERFORATED METALS
Canada Wire & Iron Goods Co., Hamilton.

WIRE FORMING AND STAMPING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
McClean & Son, F. W., Niagara Falls, Ont.
F. B. Shuster Co., New Haven, Conn.

WIRE NAILS
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

WIRE STEEL, BRASS, COPPER, BRONZE
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE RAILS
Sleeper & Hartley, Inc., Worcester, Mass.

WOOD BORING MACHINES
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

WIRE STRAIGHTENERS AND CUTTERS
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WOODWORKING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machy. Co., Toronto.

WOOD LATHES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
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WORKS STANDS, PORTABLE
New Britain Mach. Co., New Britain, Conn.

WRENCHES
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canadian Billings & Spencer, Ltd., Welland.
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Peck, Stow & Wilcox Co., Southington, Conn.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Keystone Mfg. Co., Buffalo, N.Y.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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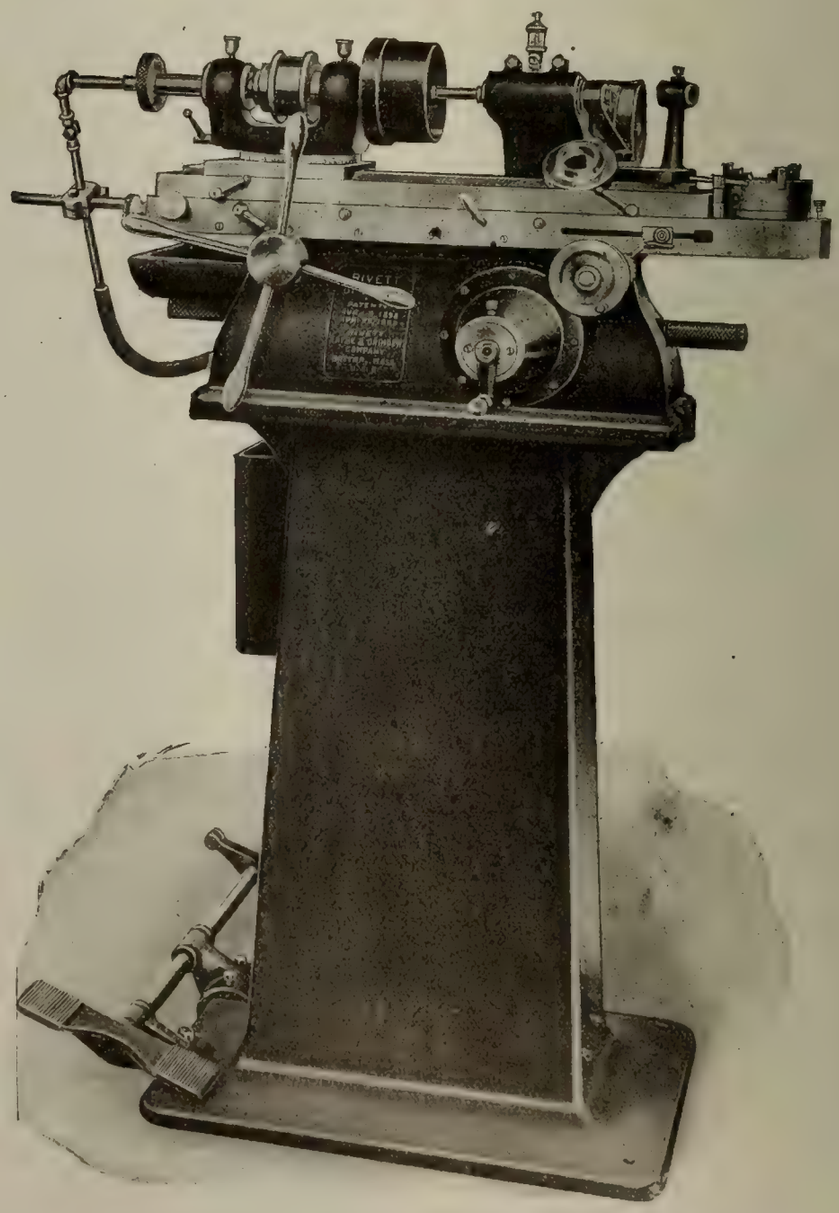

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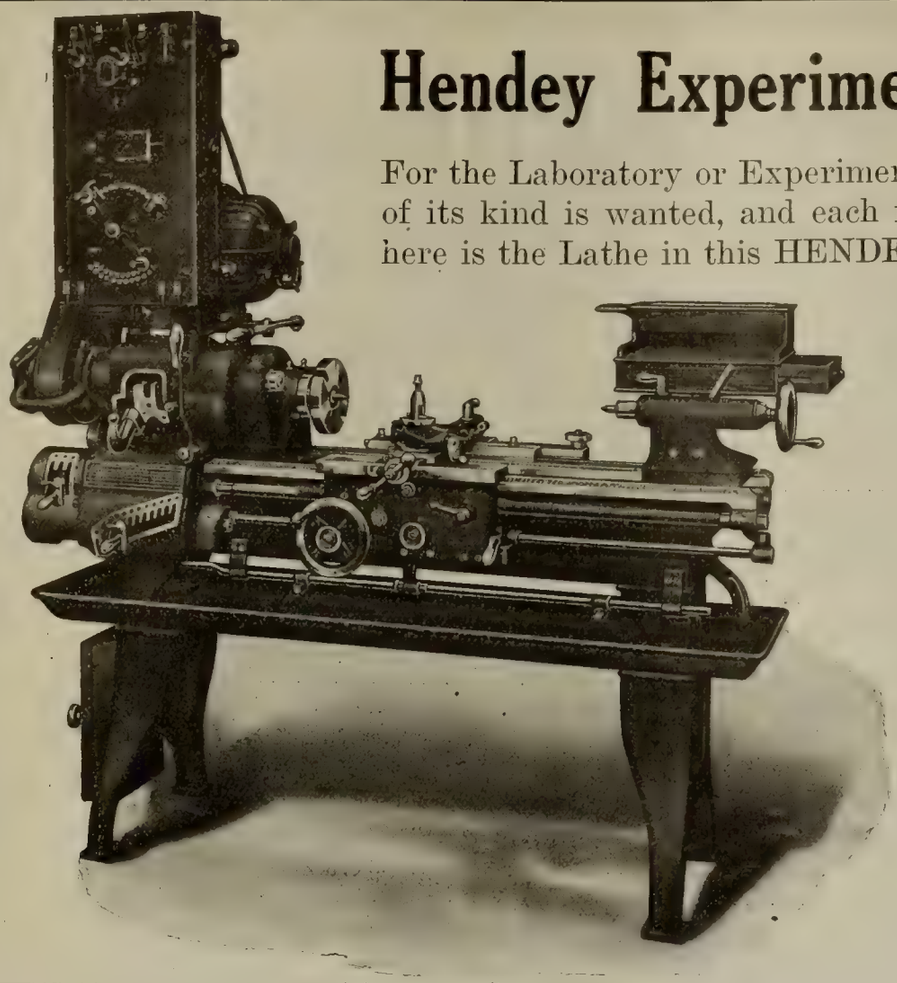

Hendey Experimental 12" Lathes

For the Laboratory or Experimental Department where the best of its kind is wanted, and each machine must be motor-driven, here is the Lathe in this HENDEY 12".

In addition to its complete regular equipment it has Small Tool Cabinet for operators' fine tools, also gear closet for extra gears to cut special threads.

Write for Descriptive Matter

THE

Hendey Machine Co.

Torrington, Conn., U.S.A.

Canadian Agents: A. R. Williams Machinery Co., Toronto, Ont.; A. R. Williams Machinery Co., 260 Princess St., Winnipeg; A. R. Williams Machinery Co., Vancouver; A. R. Williams Machinery Co., St. John, N.B.; Williams & Wilson, Montreal.

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McDougall Shapers

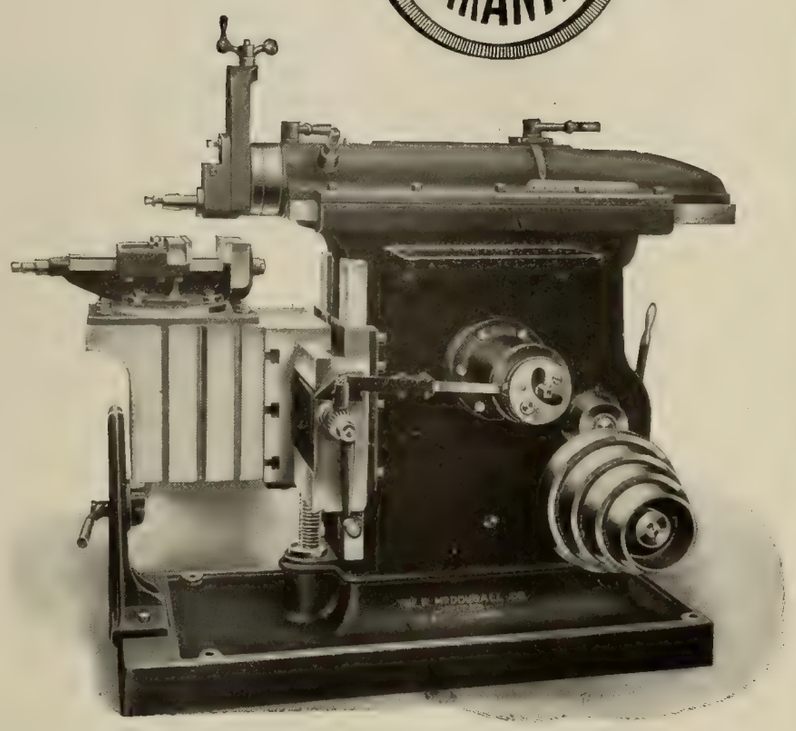
ARE-MAC-DEE IS A GUARANTEE

These are up-to-date Shapers, designed for modern shop production.

They are plain in design, yet embody all essential features necessary for efficient work.

Every adjustment is convenient for the operator and fine for the most accurate work.

Let us have your inquiry.



The R. McDougall Company Limited

Manufacturers

GALT, ONTARIO, CANADA

The Canadian Fairbanks-Morse Company, Limited
Sales Agents

In stock for immediate delivery

7—28 x 12 Boye & Emmes instantaneous, quick-change gear lathes. 3 step cone, double back gear, double plate apron.
1—24 x 12 Boye & Emmes instantaneous, quick-change gear lathe. 3 step cone, double back gear, double plate apron.
1—24 x 10 Milwaukee Lathe, double back gear, quick-change gear, 3 step cone.
6—20 x 10 Sidney Lathes, double back gear, quick-change gears, 3 step cone.
1—18 x 10 Sidney Lathe, double back gear, quick-change gears, 3 step cone.
1—18 x 8 Mueller Lathe, double back gear, quick-change gear, 3 step cone.
1—14 x 6 Mulliner Tool Room Lathe, quick-change gear. complete with oil pan, pump, taper attachment and draw-in collets.
4—21 x 8 Le Blond Heavy Duty Turret Lathes, quick-change gear box and air chuck.
6—21 x 8 Le Blond Turning Lathes, quick-change gear.
1—Foss Pulley Lathe, capacity 48 x 48.
4—Pulley Molding Machines, complete with patterns for making cast iron pulleys up to 60″.
1—No. 6 Foster Screw Machine, power feed to cut-off slide and carriage, complete with oil pan and pump.
1—No. 4 Foster Screw Machine, power feed to cut-off slide and carriage, complete with oil pan and pump.
1—1″ Hercules Screw Machine.
1—No. 1 Standard Hand Miller.
1—No. 2 Ford-Smith Plain Miller.
1—No. 3 Kempsmith Full Universal Miller.
1—No. 2 Brown & Sharpe Heavy Duty Plain Miller (used).
1—No. 1 Bertram Back Geared Miller, with dividing head.
1—No. 2 Bertram Universal Milling Machine, complete with dividing head and arbors.
1—12″ Garvin Dividing Head.
1—15″ Kelley Crank Shaper.
1—20″ Smith & Mills Back Geared Shaper.
1—20″ Ohio Heavy Duty Shaper.
1—20″ Ohio Standard Shaper.
1—20″ Queen City Back-Geared Shaper.
1—28″ Smith & Mills Triple-Geared Shaper, single pulley drive.
1—No. 2 Brown & Sharpe Vertical Chucking Machine.
2—No. 2 Oesterlein Universal Cutters and Tool Grinders.
2—No. 3 Oesterlein Universal Cutters and Tool Grinders.

The Foss & Hill Machinery Company

305 ST. JAMES ST., MONTREAL, QUE.

C.M.C.

Our 26" Engine Lathe

A Marvel of Power, Range, Accuracy and Speed

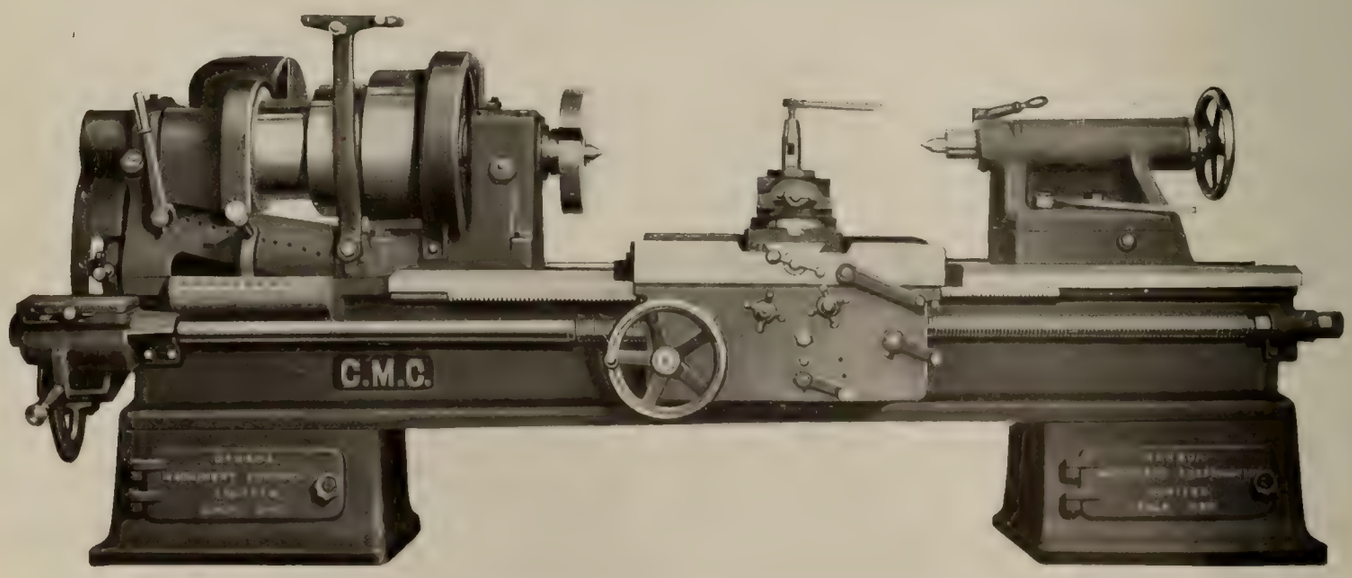
Since the beginning of the war Canada has surprised the world by her industrial achievements. Machine Tools like our 26" Lathe have materially contributed to what Canada has accomplished. Our 26" Lathe fairly represents our line of lathes ranging from 14" to 42".

Bulletins illustrating and fully describing our machine tools gladly furnished on request.

CANADA MACHINERY CORPORATION
LIMITED

Galt **Ontario** **Canada**

Toronto Showrooms at Brock Avenue Subway opened for the convenience of the Trade.



CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical, power, foundry and allied fields.
Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

Vol. XVIII—No. 20 Publication Office: Toronto, November 15, 1917 Subscription Price $3.00 per Year

Just a Handful-But!

TRADE MARK

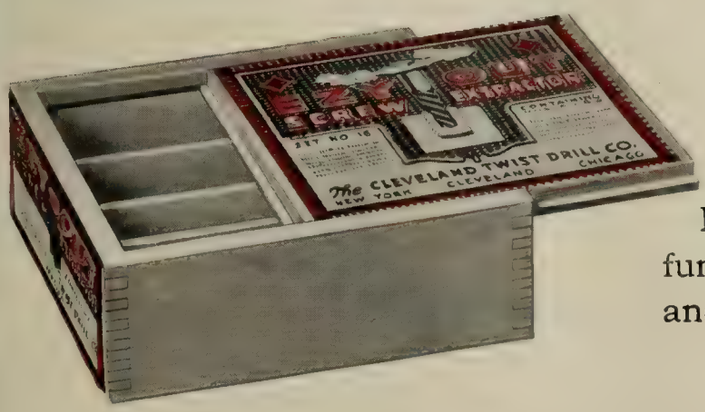
No. 16 Set

When a set or cap-screw, stud, stay-bolt, or pipe-fitting breaks, it's the *only* tool that will remove the broken section *quickly* and *easily*—

EZY-OUT

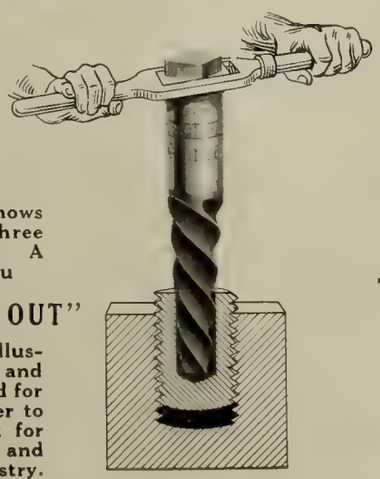
SCREW EXTRACTOR SET

(Pat. 1914)



No longer do you need to fuss and fume and sweat over files and punches and such makeshift tools.

Just drill a hole in the broken section, insert "Ezy-Out," slap on a tap wrench and *twist* and out comes the broken part in the merest fraction of the time hitherto required repaying the cost of "Ezy-Out" many times over in time, tools and production saved.



The illustration shows but one of the three "Ezy-Out" Sets. A postal will bring you

"THE BEST WAY OUT"

It describes and illustrates all these new and needed tools. Send for it or ask your dealer to show you the set for you. There's a set and size for every industry.

Keep Your Men on Profit-Making Work
Have an "Easy-Out" Screw Extractor Handy

THE CLEVELAND TWIST DRILL COMPANY

· Cleveland · New York · Chicago ·

The Gift of Freedom is Bought with Blood, but Money will help preserve it.

Let this great truth burn itself into your soul—the Gift of Freedom cannot be bought with money, but money will help to preserve it.

From the four corners of the earth those who love Freedom have united to defend it from enslavement by Germany.

Millions of free men have already sacrificed their lives on Freedom's altar.

Still other millions stand ready to make the supreme sacrifice.

Noble women have sent loved ones to Freedom's service with an anguish harder to bear than death.

Still other millions have yielded their entire resources in service or in money to the need of their countries.

Canada proudly claims her full share of these noble souls.

And now, for their sakes, asks her citizens (men and women) to support with money Canada's part in the mighty efforts of the free peoples of the earth to save themselves from the ghastly crucible into which the Hun would pour and then remould mankind.

To prevent this, brave men are giving their lives. Will you hesitate to lend your money?

Canada must raise more money in order to continue to play her great part in the prosecution of the war.

This money must come from the people of Canada. Outside financial markets are closed, and it is in the interests of Canada that as much as possible of our war indebtedness should be held within the Dominion and interest upon it paid to our own people. The money is here. The only question is, will Canadians, now that they know the need, respond magnificently to this appeal? They will!

Get Ready to Buy Canada's Victory Bonds

Issued by Canada's Victory Loan Committee in co-operation with the Minister of Finance of the Dominion of Canada.

This space contributed by Messrs. PRATT & WHITNEY CO., Limited

Why Canada Needs More Money

UP to date the war has cost Canada about $700,000,000.
Canada has spent in Canada over $400,000,000 on her own account.
Canada has spent in Canada on behalf of Great Britain over $300,000,000.
What Canada spends for Great Britain is really loaned to Great Britain and will be repaid or credited to Canada later on.

Great Britain needs so much ready cash to finance her own expenditures at home for herself and for our Allies that she must buy on credit from Canada, and from every other country where she can get credit.

Of course Great Britain's credit is so good that other countries, in order to get her trade, are quite as willing to give her credit as we are in Canada.

Canada wants to help Great Britain not only because Canada wants Britain's trade but because we are Canada and she is Great Britain—both members of the same great Empire, kin of our kin, our motherland.

For Canada it is both a filial and patriotic duty to supply Great Britain's war needs and, remember, her needs are our needs. Also it is in Canada's self-interest to supply those needs and thus keep open a market for our products.

* * *

Now, Britain needs our wheat, our cheese, cattle, hogs, and many manufactured articles.

Canada also needs many of these things—between the two it amounts to more than a million dollars a day in cash.

And the producers must be paid in cash.

Neither Canada nor Great Britain could go to a Canadian farmer and buy his wheat or his cattle on credit.

The farmer and all other producers might be ever so willing to give their country credit but they could not do it because they have to pay cash for wages, for rent, materials, etc. They must be paid in cash, or its equivalent.

So Canada says to Great Britain:—"I will lend you the money so that you can pay cash to Canada's producers for what you want.

"I will borrow this money from our own people just as you borrow money from your people.

"I will also borrow from the people of Canada money to pay cash for all the products that Canada, as well as Great Britain, needs in Canada."

That is Canada's practical, patriotic part in helping to win the war.

Without this credit the Canadian producer could not sell to Great Britain, and without these Canadian products the war would be prolonged.

So it is necessary for Canada to give to Great Britain the credit in order that Canada's own producers, who need a market, will have one; and in order that Great Britain which needs the products to win the war, will get them.

* * *

Now how does Canada get the money by which both Canada and Britain can pay cash for Canada's products?

By borrowing it from the people of Canada through the sale of Canada's Victory Bonds.

That is why Canada's Victory Bonds are offered to the people—to raise money to help to finish the war.

"Canada must keep her shoulder to the wheel even though it be a chariot of fire," and the way for Canada to keep her shoulder to the wheel is by buying

Canada's Victory Bonds

Issued by Canada's Victory Loan Committee in co-operation with the Minister of Finance of the Dominion of Canada

This space is contributed by
John Bertram & Sons Company Limited
Dundas, Ontario

The Publisher's Page

TORONTO November 15, 1917

The Economy of Business Paper Advertising

By H. E. CLELAND, NEW YORK

Awarded the Higham prize at the convention of Associated Advertising Clubs, at St. Louis, June 1917. This prize is given annually to the one delivering the most constructive address in the fewest words.

(Continued from last week)

THE time is coming when the principle of intensive advertising will be universally recognized and followed.

Manufacturers of machines and material and equipment which are sold direct to the consumer in technical fields will advertise them in technical papers.

Manufacturers of merchandise sold through retailers will advertise in trade papers first and will no longer be lured into attempting to sidestep the dealer. They will do the first thing first.

Manufacturers of merchandise selling to the general public will establish consumer demand (after distribution has been properly taken care of) by the zone system, using newspapers and outdoor advertising.

Advertisers to the general public with a thoroughly established distributing system will use newspapers and national mediums of many different kinds.

And advertising will reach the high plane that it is destined for only when all advertising men place their business along these lines, and only when the salesmen of different branches of advertising recognize that predatory invasion of the other man's field is the deadliest way to destroy confidence in all advertising.

We cannot force the super-tax of advertising extravagance upon the manufacturers of the world without eventually paying for it ourselves.

No wise salesman knowingly overstocks a dealer. No wise manufacturer of machinery ever recommends the use of his machine in order to make a sale if that machine will not fit the consumer's conditions. No up-standing and honest and far-seeing man will make a contract that does not benefit his customer as well as himself.

Advertising men must follow these methods or kill the goods.

Therefore, advertising men will advocate the use of mediums that present the utmost in efficient economy for the advertiser.

Which means that for certain classes of services, machinery, material, equipment and merchandise, the business papers will be used to their fullest extent. They must be used up to but not beyond the line of their efficiency.

And the business papers must continue the practice that all of the worth-while of them follow now—they must decline advertising which is not in the business line of the paper. To do otherwise is to destroy the principle of the specialized publication.

For those things which "belong" in a business paper—but for no others—the business paper presents the most economical method of efficient advertising.

If any advertisement interests you, tear it out now and place with letters to be answered.

Help Win the War

USE

STELLITE

Increase Your Production

The Hardest, Toughest, Fastest Cutting Metal Known

We shall be glad to send Demonstrator to show you how you can increase your production by using

STELLITE

Deloro Smelting & Refining Co., Limited

Head Office and Works: DELORO, ONT.

Toronto, 200 King St. W. **Montreal, 315 Craig St. W.**

TRADE MARK

of the Famous

"WACO"

BRAND

HIGH SPEED STEEL

AND

TWIST DRILLS

"DOUBLE WACO" Quality

Specially Adapted for Munition Work

"TURTLE" BRAND

High Class Tool Steel, Files, etc., of all descriptions.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

TRADE MARK

"WACO"

Reliance Steel Works

SHEFFIELD, ENG.

TRADE MARK:

For particulars apply to our

Sole Representatives for Canada

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario

UNIFORMITY

USED THE WORLD OVER

SATISFACTION

Atlas Babbitts

MADE IN CANADA

AMACOL
ADAMUS

TENAXAS
ATLAS

DURASTIC
MASCOT

TIN-TOUGHENED
W. E. W. BABBITT

These Babbitts are the result of years of experience and have a world-wide reputation for uniformity and reliability.

No Shock Too Severe No Load Too Heavy No Speed Too Great

ATLAS METAL & ALLOYS COMPANY OF CANADA, LIMITED, MONTREAL

Sales Agents:

The Canadian B. K. Morton Co., Limited

MONTREAL: 49 Common Street. **TORONTO: 86 Richmond Street East.**

Put Uranium to Work

Let Uranium High Speed Steel increase your production, cut your cost of cutting tools, save your men's time on the grinder and put that time on their machines.

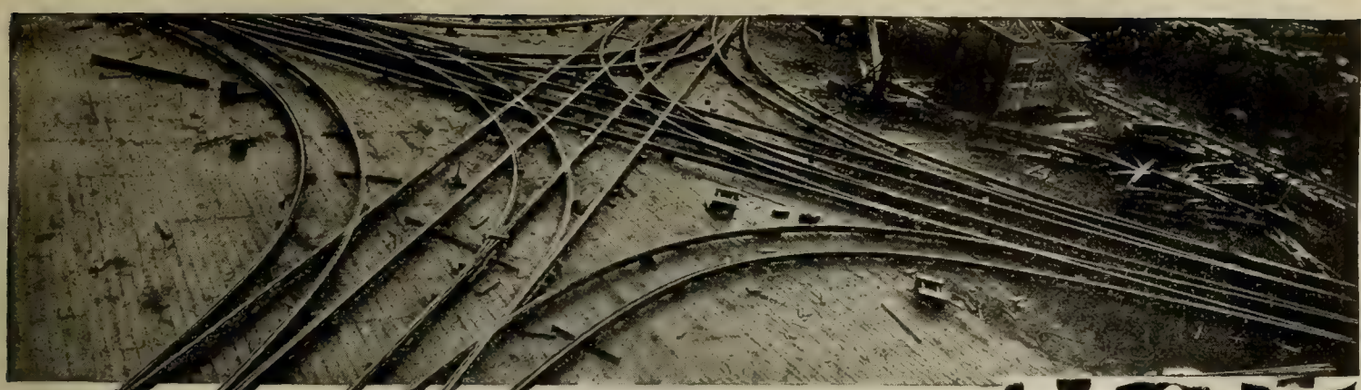
Put Uranium in the form of Uranium High Speed Steel to work for you to-day—your production record sheets will show the results immediately.

Consult your steel man or write us.

STANDARD ALLOYS COMPANY

Forbes and Meyran Avenues **PITTSBURGH, PENNA.**

Uranium
High Speed Steel



Solid Manganese Steel Intersection for Montreal Tramways Company.

Steel Castings

For Hydraulic, Mill Gear, Locomotive, Rolling Stock, Marine—in fact we make castings of any size and any kind—Manganese, Vanadium, Titanium, Chrome, Nickel, etc. Dependable products always.

Canadian Steel Foundries, LIMITED

MONTREAL WELLAND

H. E. W. Service

Our ability to serve is limited by the demands of your organization. Repair work, special marine repairs, machinery built. Our air chucks which are performing such efficient service in the shell industry is but an evidence of our ability. We have a large and complete staff of expert workmen and thorough equipment. Consult us. We will gladly co-operate with you.

Hyde Engineering Co.

27 William Street
Montreal, Que.

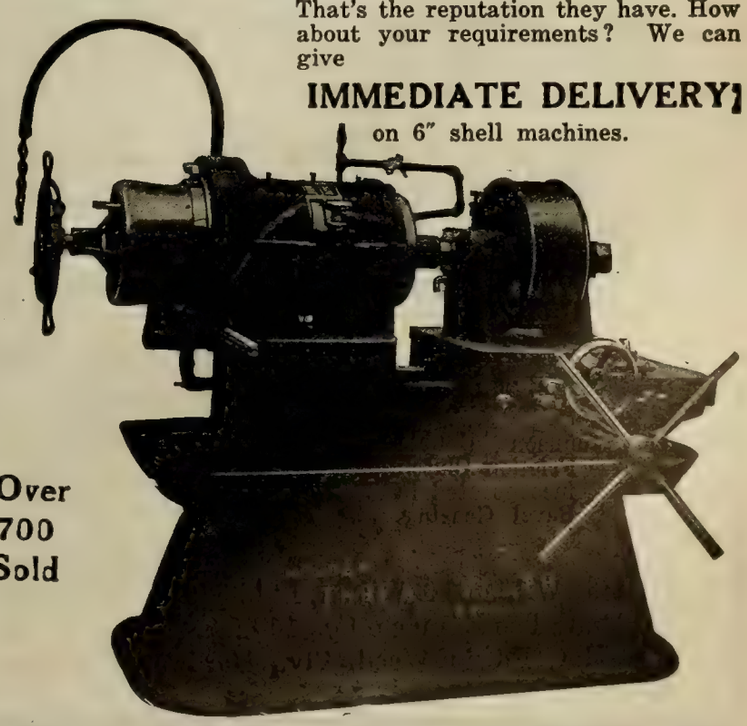
70 Holden-Morgans in One Plant

Another firm would not accept a contract until assured they could get HOLDEN-MORGANS.

That's the reputation they have. How about your requirements? We can give

IMMEDIATE DELIVERY

on 6" shell machines.



Over 700 Sold

THE A. R. WILLIAMS MACHINERY CO.

W. FRONT ST. (Limited) TORONTO

THE JOHNSON FRICTION CLUTCH

DOUBLE TYPE

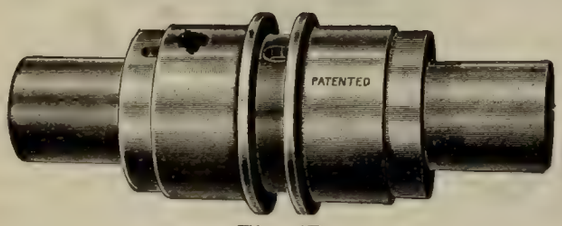


Fig. 4D
Double Clutch Exterior

The double clutch requires but little more space than the single, and has two friction cups with hubs, on which can be mounted pulleys, cones, gears, sprockets, etc., of any diameter and face.

The double clutches are constructed on the same principle as the single clutches, and have the same general characteristics.

For countershafts, the advantages of JOHNSON FRICTION CLUTCHES are obvious. They operate smoothly at any speed, without bang or clatter, have no projections to catch anything, thus avoiding accidents so common with the ordinary clutches, and save space by their compactness.

By using a double clutch on the countershaft, as illustrated, Fig. 5D, with two pulleys, one with an open belt and one with a crossed belt, any machine can be run forward or reverse. This arrangement is especially desirable in running all machines requiring a reverse motion.

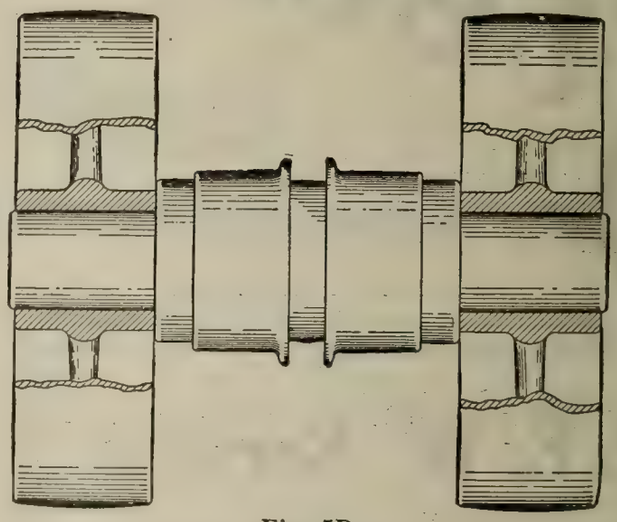


Fig. 5D
Double Clutch Mounted on Countershaft

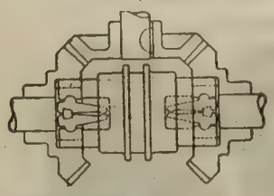


Fig. 6D
Clutch in Nest of Gearing

Johnson Double Friction Clutch incorporated in Bevel Gearing.

Hubs are made to suit requirements as to diameter and length, so that ordinary stock pulleys can be used.

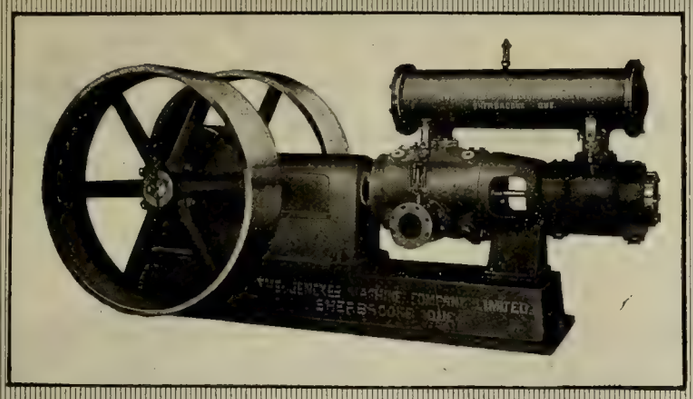
The advent of high-speed steel demands better and more powerful clutches on countershafts. The JOHNSON FRICTION CLUTCH is highly endorsed for this purpose and is being widely adopted.

DOUBLE JOHNSON CLUTCHES can be used in nests of gearing in place of positive clutches, in order to obtain more flexibility at any point and to make operating easier.

Send for our Booklet, "Clutches as applied in Machine Building" and yellow data sheets.

Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal; Can. Fairbanks-Morse Co., Ltd., Toronto.
England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



Compressors

CB-2 AIR COMPRESSORS

Straight-line, two-stage, belt-driven, equipped with disc inlet and outlet valves, ensuring high efficiency and noiseless operation. Designed and built for severe and continuous service.

The
Jenckes Machine Co., Ltd.

Works:
Sherbrooke, Que. St. Catharines, Ont.

Offices—Sherbrooke, Montreal, St. Catharines, Toronto, Cobalt, South Porcupine, Vancouver.

"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

MANUFACTURED BY

Arthur Balfour & Co., Limited
Dannemora Steel Works,
Sheffield, England.

The Eagle & Globe Steel Company, Limited

Head Office and Warehouse, Canada and U.S. 128 Craig Street West, Montreal
Ontario Office and Warehouse 36 Colborne Street, Toronto
Winnipeg Stock Dominion Equipment & Supply Co. Limited
Vancouver Stock Frank Darling & Co.

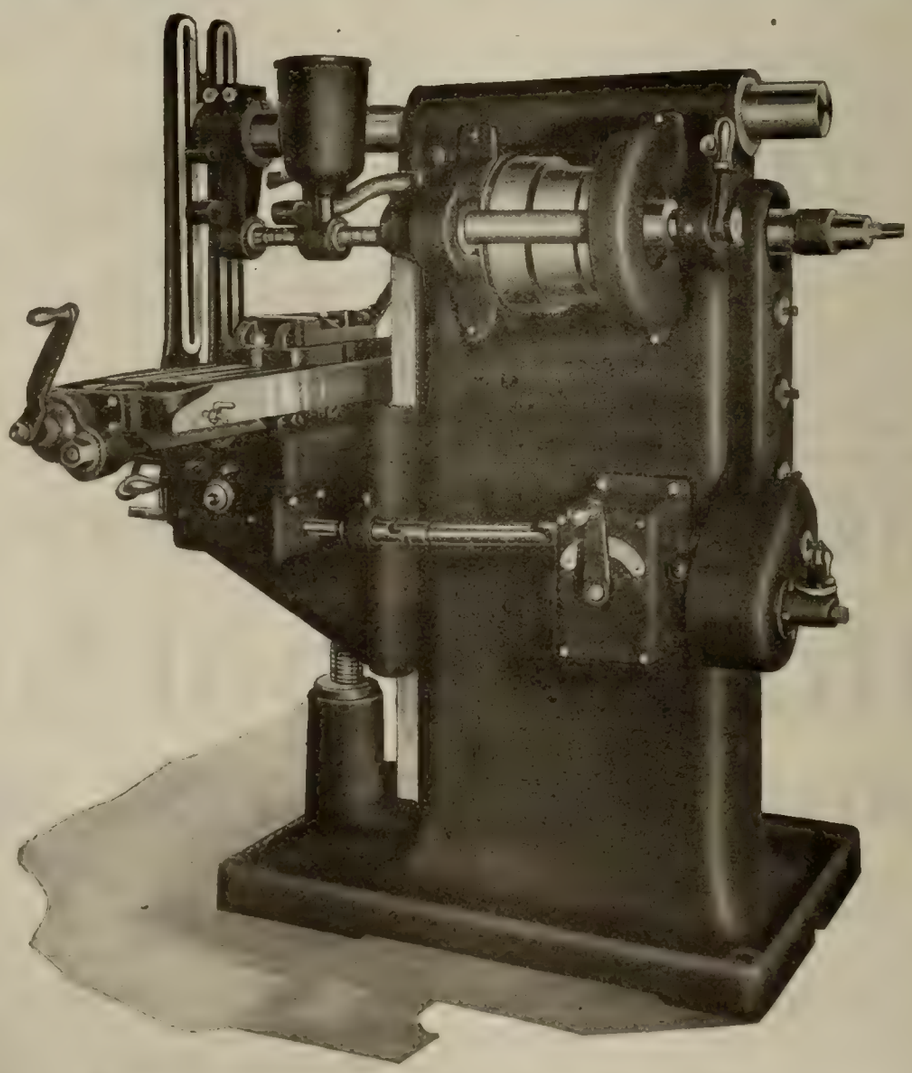
W. A. BRADBURY, Agent, 128 Craig Street West, Montreal

The Ford-Smith Machine Company

Adv't. No. 8 MILLER SERIES

DELIVERIES :

So far we have talked only of points of merit in our Machines, now let us tell you of our deliveries. At present we can offer Interesting Deliveries---and at any other time---even when up to our eyes in work---we always aim to give our customers the very best delivery possible.



We find this policy pays---not only to us, but to the purchaser and if in need of a proven Manufacturing Miller you better write us now so that you may secure the best time of delivery possible.

The Ford-Smith Machine Company, Limited
HAMILTON ONTARIO CANADA

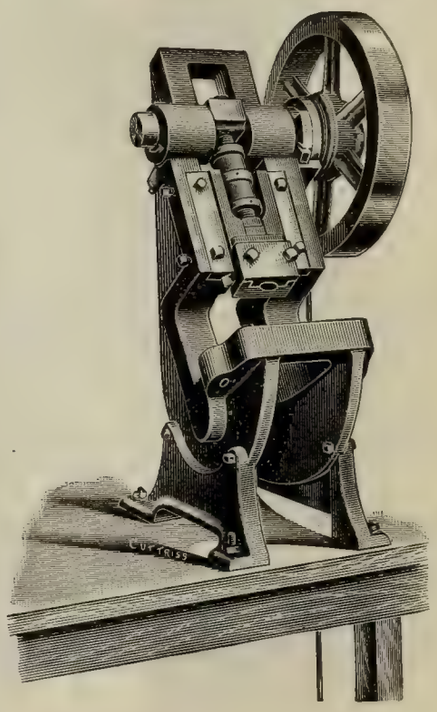
WHY A "B. B.?"

Experience has proved
that

B.B. PRESSES

qualify for

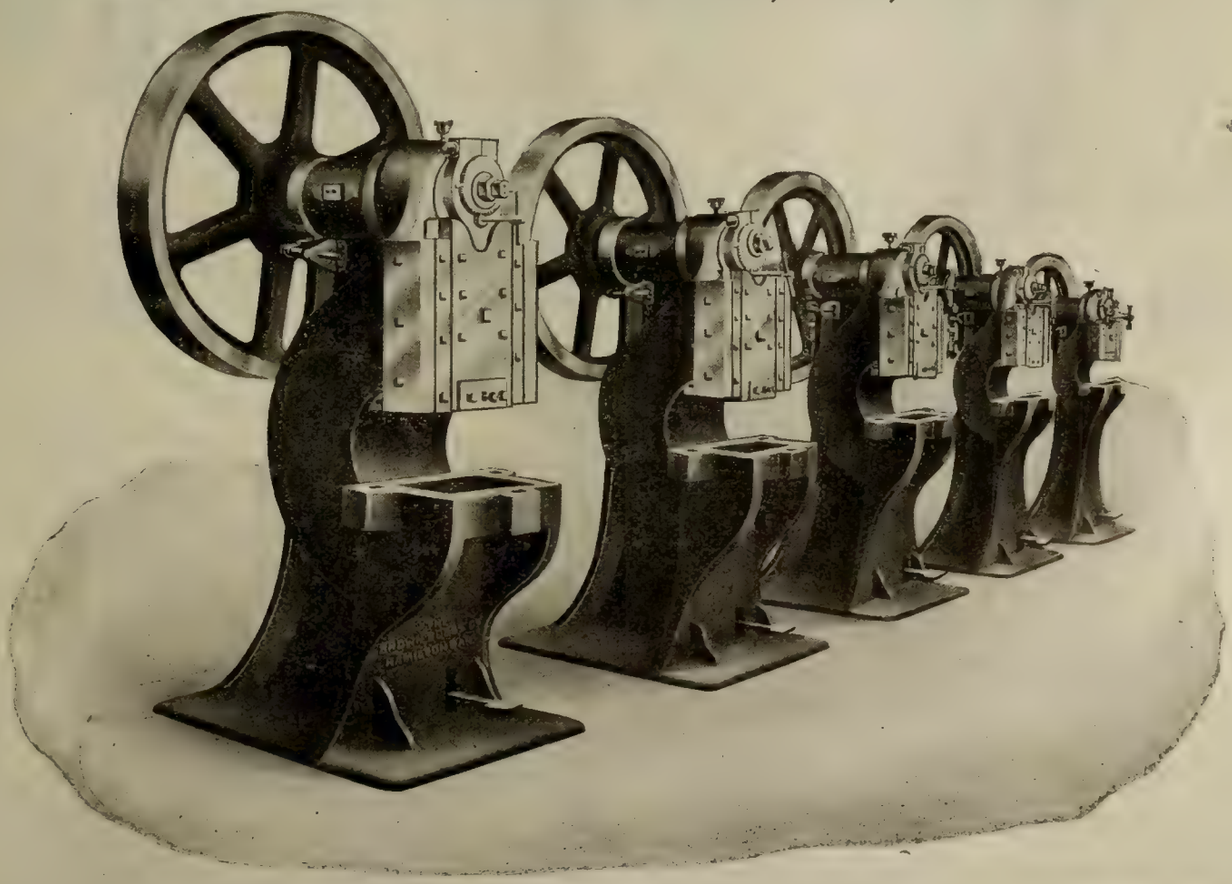
Economy
Durability
Speed



The Brown, Boggs Co.,

LIMITED

HAMILTON, ONT., CANADA



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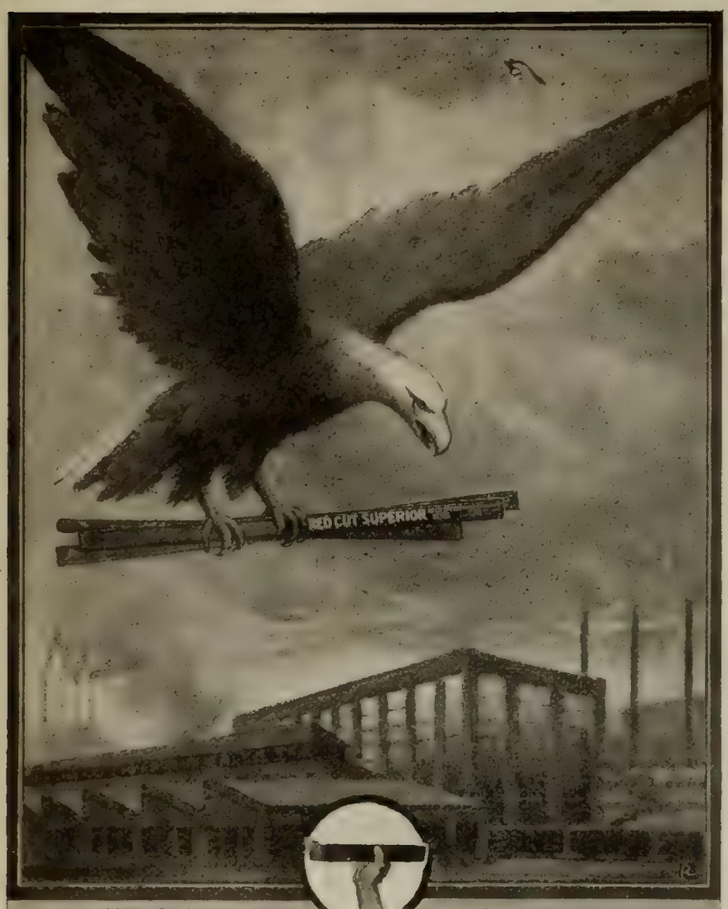


HIGHEST IN QUALITY

NATIONALLY KNOWN

OUR Country requires the extreme limit of production from every lathe, planer, miller or other machine tool.

BE PATRIOTIC

"Red Cut Superior"

The Nationally Known First Quality

HIGH SPEED STEEL

Will enable you greatly to increase your output

"IT'S THE BEST FOR ALL MACHINE WORK"

VANADIUM-ALLOYS STEEL CO.

PITTSBURGH, PA. Works at LATROBE, PA.

CARRIED IN STOCK AT THESE WAREHOUSES:

E. T. WARD'S SONS, 44 FARNSWORTH ST, BOSTON, MASS. — GEO. NASH CO., 304 HUDSON ST., NEW YORK, N. Y. — FIELD & CO., INC., 731 ARCH ST., PHILADELPHIA, PA. — VANADIUM-ALLOYS STEEL CO., PITTSBURGH, PA., AND LATROBE, PA. — GEO. NASH CO., 848 WASHINGTON BLV'D, CHICAGO, ILL.

ELECTRITE-URANIUM

High-Speed Steel

Will amaze you in its ability to remove metal

The introduction of this rare element—"URANIUM"—into the mixture of our already superb cutting product, has supplied the final perfection of the qualities of toughness and durability which has been the hitherto impossible goal of metallurgical hopes.

Electric Furnaces, Automatically regulated, produce inevitably similar results at every melt.

We are ready to assist your inquiry in every way possible.

Write

Latrobe Electric Steel Company
Latrobe, Pennsylvania

LESCO

DOUBLE

MUSHET

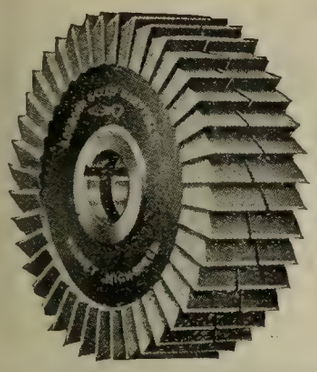
High Speed Steel

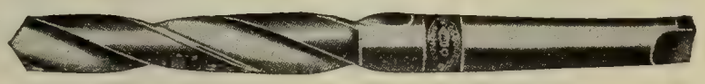
Carbon Steel

Gauge Steel

Alloy Steels

SOLE MAKERS
Samuel Osborn & Co. Ltd.
SHEFFIELD





Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)
Limited
Head Office and Works: Montreal, P.Q.
Branch Office: Toronto, Ontario

Works: LONGUEUIL, QUE.

Armstrong, Whitworth of Canada Limited
Standard Sizes of
HIGH SPEED STEEL
Carried in Stock
CARBON AND ALLOY STEELS
Shop Tools, Gauges, etc.
HEAD OFFICE: 298-300 St. James St., Montreal
Branches: Dominion Bank Bldg., TORONTO
27 King William Street, HAMILTON
McArthur Bldg., WINNIPEG, MAN.

Coal
Coke
Iron Ore

Pig Iron

Victoria FOUNDRY & MALLEABLE
Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

M.A. HANNA & Co.
Sales Agents, CLEVELAND
Canadian Office:
703 C.P.R. Bldg., Toronto

STEEL

FOR SHRAPNEL SHELLS AND SHELL BLANKS

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.'

Nova Scotia Steel and Coal Company
Limited

Head Office: NEW GLASGOW, N.S.

Western Sales Office:
Room 14, Windsor Hotel, MONTREAL

James McKay Company
Pittsburgh, Penna., U.S.A.

Manufacturers of

Shell Forgings

We have the Equipment and Experience and can execute orders for

Nose Sockets Base Plates Adapter Plates

for any size shells. Can execute orders promptly.

SPECIAL FORGINGS—We can make any forgings that can be made under Drop Hammers.

CHAINS AND ACCESSORY FORGINGS—We have a complete line.

ADDRESS OUR REPRESENTATIVE:

JOHN A. BUCHANAN
King Edward Hotel, TORONTO

We guarantee shipment within 24 hours of receipt of order

SISCO

"Extra" "Special" "High Speed" **Tool Steels**

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Dril Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

Dominion Cast Steel Parts

We are also prepared to furnish steel plate to 20″ wide—for prompt delivery.

We have recently increased the capacity of our plant and can guarantee quick delivery on castings weighing anywhere from 100 lbs. to 50,000 lbs.

Open Hearth Products

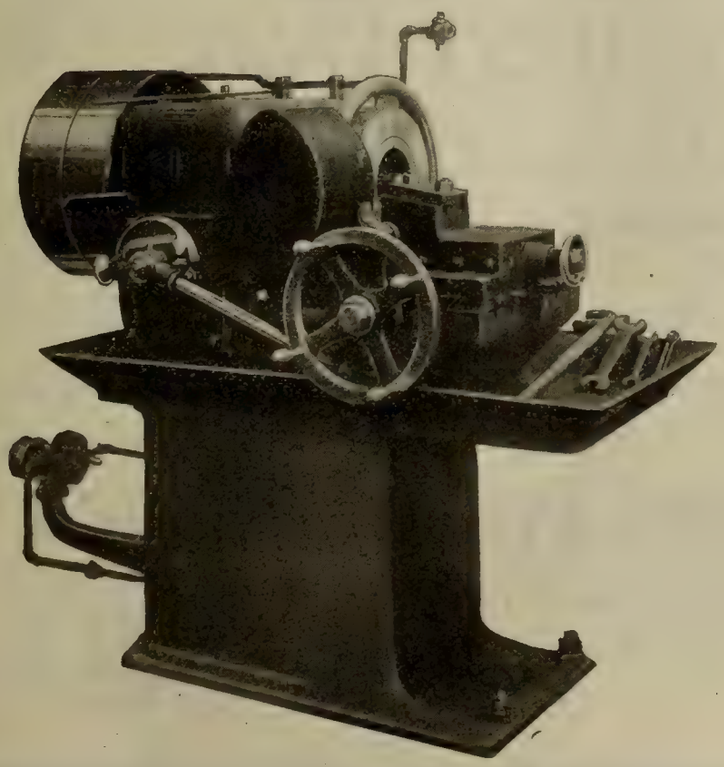
Machinery Castings of all kinds, Motor Frames, etc., for electrical trade, Pedestal and Miscellaneous Bridge Work, Rolling Mill and Blast Furnace Castings, Gears and Gear Blanks.

Quick Deliveries

Quality and Economy

DOMINION STEEL FOUNDRY COMPANY, Limited
HAMILTON - - ONTARIO

6″ Light Base Facing Machine



Another Worthy Victoria Product

THIS machine has proved itself a first-class investment.

Well-Designed
Carefully Built
Sturdy and Efficient

IT is a conclusive argument in favor of special purpose machines.

Space required 4x7 feet.
No countershaft required.
Approximate weight, 2000 lbs.

Victoria Foundry Company Limited
OTTAWA - - ONTARIO

One of the

Steels of the Century

Centurion High-Speed

Made from the BEST Materials

Iron, Tungsten, Chrome, Vanadium

Melted by the BEST Process

The Crucible Furnace Method

Handled by the BEST Workmen

Melters, Forgemen, Annealers, Metallurgists

CONSEQUENTLY

Will do the BEST Work

Quality ***Delivery*** ***Service***

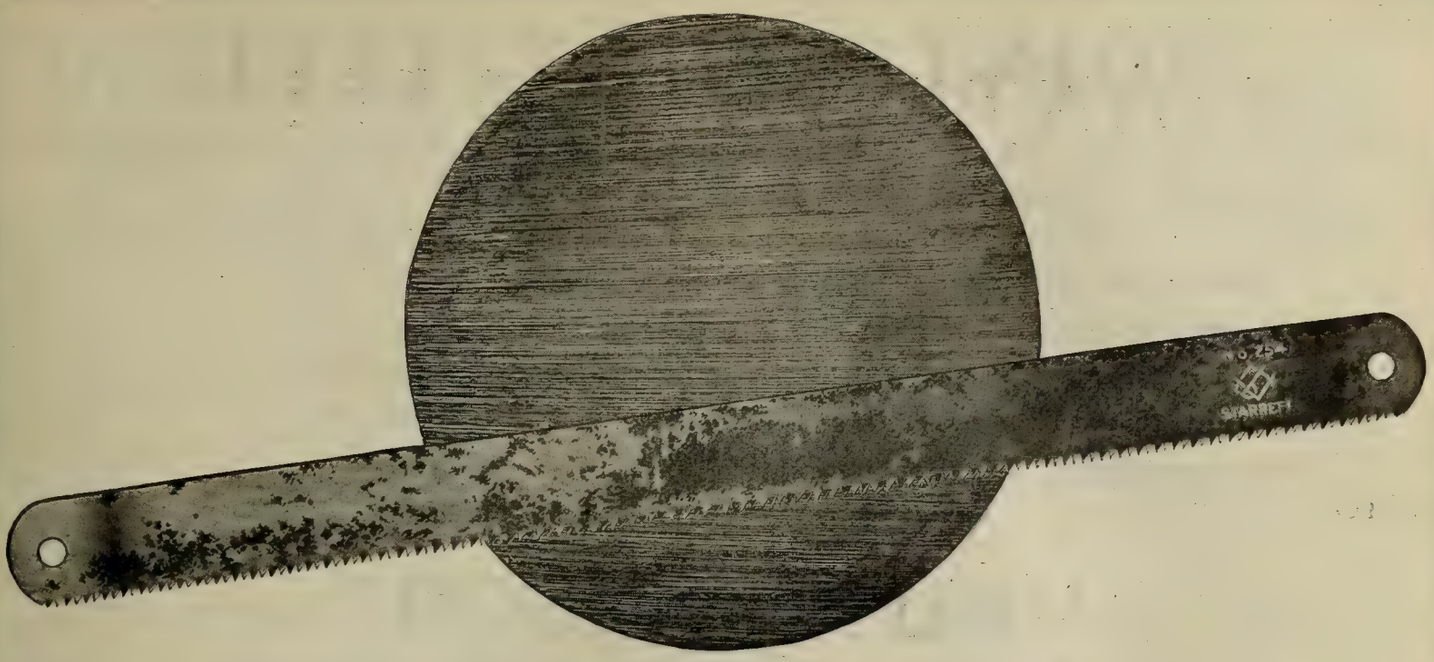
We have a catalog waiting for you. Write for it.

THE CENTURY STEEL CO. OF AMERICA

MANUFACTURERS OF HIGH-GRADE CRUCIBLE STEELS

General Office and Works:
POUGHKEEPSIE, N.Y.

Sales Offices:
120 BROADWAY, NEW YORK



LET STARRETT TESTS PICK YOUR BLADE

Hack saw tests **are** important; they save blades, and the mechanic's valuable time. Every-day experience proves this.

Two mechanics were comparing their abilities:

One said that he could cut machinery steel four times as fast as the other.

The challenge was accepted. The challenger snapped a blade into his frame and set to work. But the other turned to the hack-saw rack. Before he had made up his mind to use a given blade, his friend had cut an inch into the steel—but he was changing his dulled blade. Because of breakage and dulling, the blade was replaced five times, while the man who tested and picked the

Starrett Hack Saw

suited to the work had cut the bar four times.

The facts of this story are vouched for.

Moral—It pays to pick the right blade. It pays to test hack saw blades. But we have done the testing for you, to save your time. Our Catalog No. 213 tells you what Starrett Hack Saw to use on the job.

Starrett Hack Saws are unexcelled, just as Starrett Fine Tools are unexcelled.

STARRETT HACK SAWS CUT QUICKER LAST LONGER

The L. S. Starrett Company

THE WORLD'S GREATEST TOOL MAKERS

ATHOL, MASS.

NEW YORK LONDON CHICAGO

BY INVITATION MEMBER OF

42-740

POINTS THAT TELL

WHO wants to buy a Lathe so complicated that it takes a chart to run it; a skilled mechanic to operate it?

WHO wants to buy a Lathe that is heavier than any other Lathe on account of a preponderance of cast iron?

WHO wants to buy a Lathe that is good to-day, gone to-morrow?

WHO wants to buy a Lathe that is not uniformly proportionate?

WHO wants to buy a Lathe that is pretty, yet not powerful?

WHO wants to buy a Lathe that will swamp you in repairs?

THEREFORE WE SAY

"BUY A CISCO"

Built in 14", 16", 18", 24" Engine and Tool Room with all Necessary Attachments

THE LATHE WITH THE PULL
THE LATHE OF SIMPLIFIED ACCURACY

Sold in Canada by
The A. R. Williams Machinery Co., Limited

Made in U.S.A. by
The Cincinnati Iron & Steel Co.

WHITCOMB - BLAISDELL

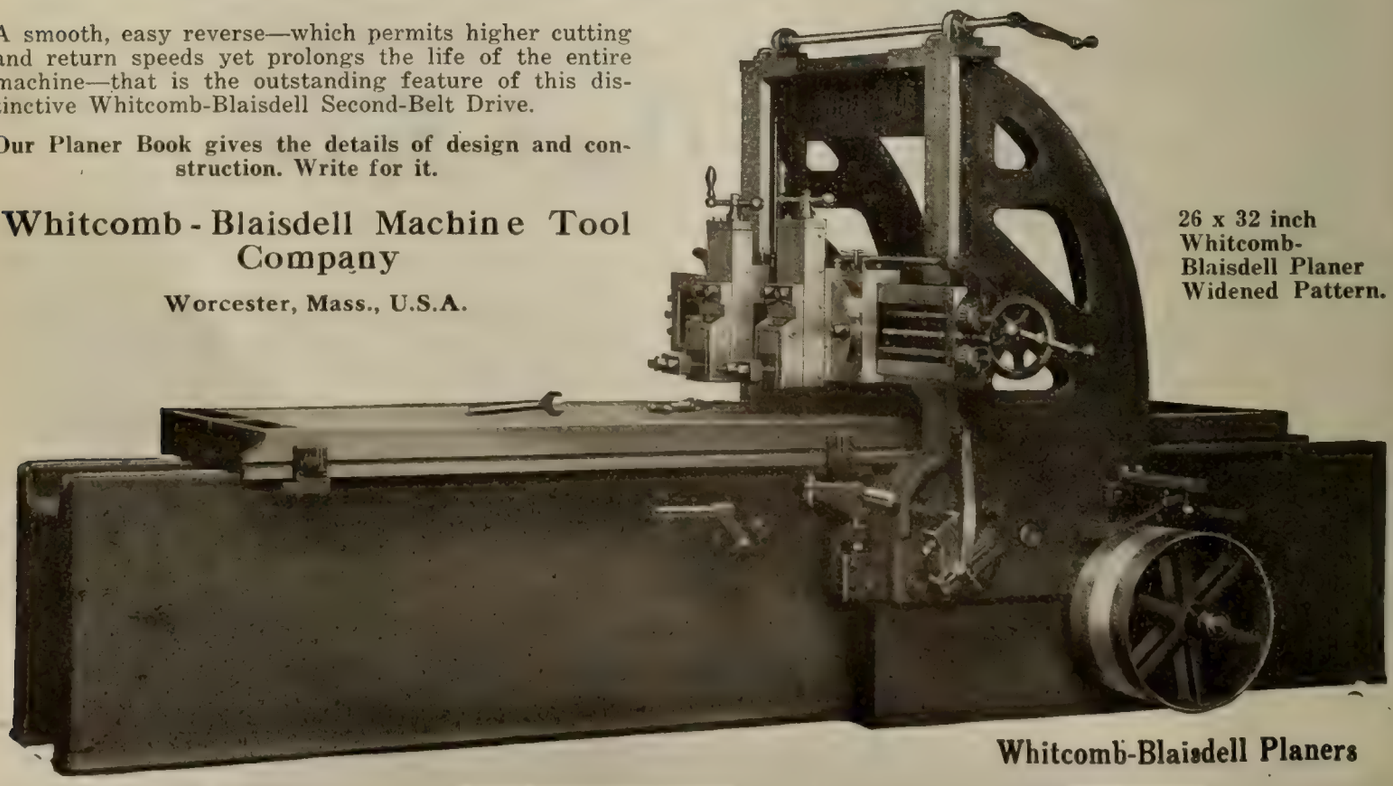
The Planer With the Second-Belt Drive

A smooth, easy reverse—which permits higher cutting and return speeds yet prolongs the life of the entire machine—that is the outstanding feature of this distinctive Whitcomb-Blaisdell Second-Belt Drive.

Our Planer Book gives the details of design and construction. Write for it.

Whitcomb - Blaisdell Machine Tool Company

Worcester, Mass., U.S.A.



26 x 32 inch Whitcomb-Blaisdell Planer Widened Pattern.

Whitcomb-Blaisdell Planers

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6″ shells.

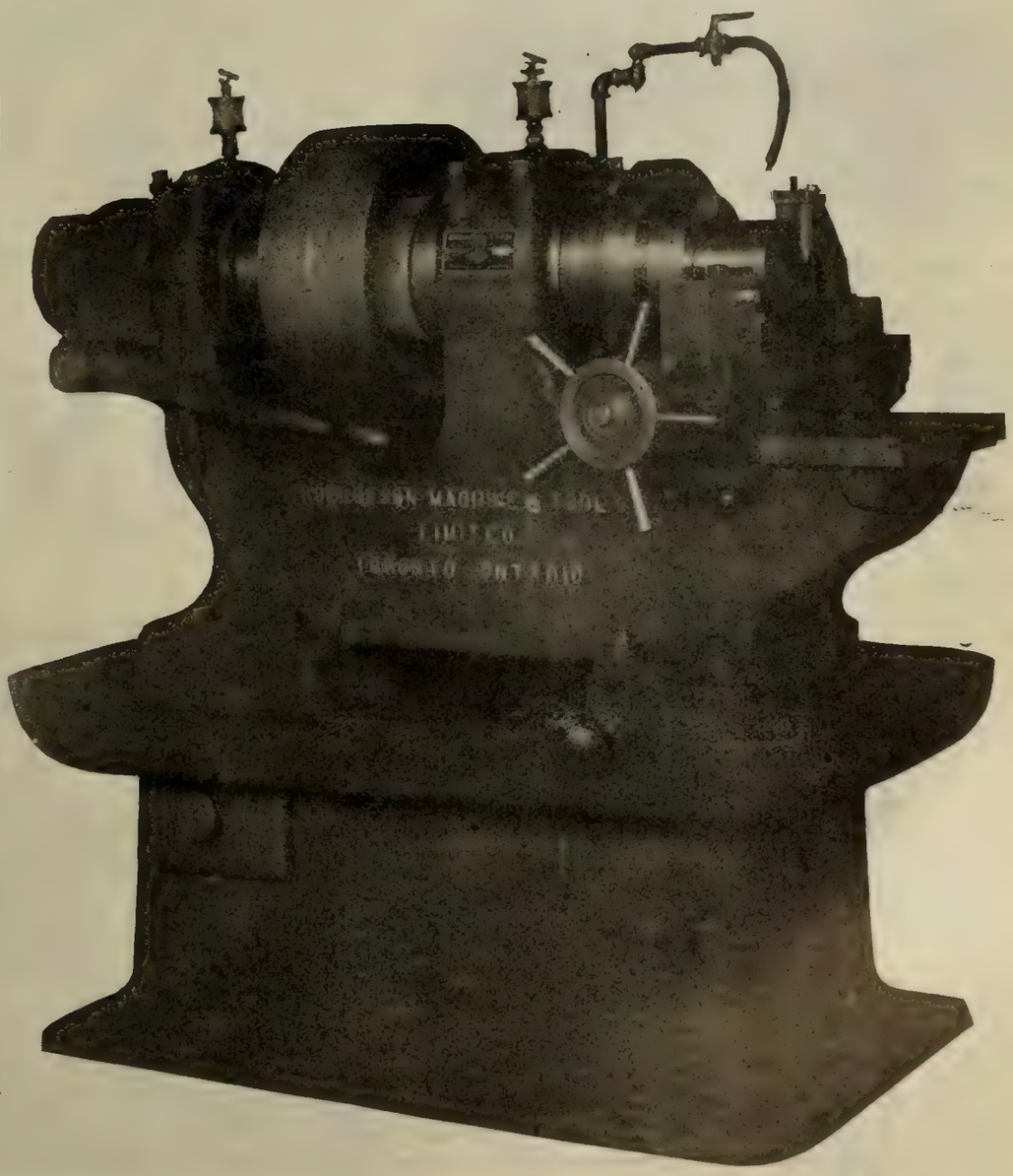
Roelofson Machine & Tool Co., Ltd.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6″ shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.



If any advertisement interests you, tear it out now and place with letters to be answered.

GRINDING SEED WHEAT

WOULD YOU DO IT?

To grind seed wheat would be to deprive the future. It would rob men of fighting strength and those at home of bread.

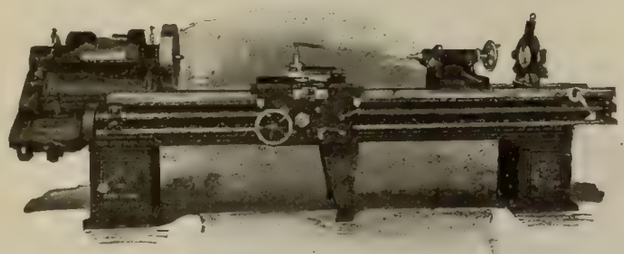
To stint and save in the purchase of a machine that is to be depended upon to produce fighting and farming tools speedily and accurately is like grinding seed wheat—it deprives the future of materials that men will need badly.

A suggestion: before you buy lathes, carefully examine the merits of the high-quality "Sidney for Service" line which are sold in Canada by—

Foss & Hill Machinery Co.
MONTREAL, QUEBEC.

AND

H. W. Petrie, Ltd.
TORONTO, ONTARIO



TRADE SIDNEY FOR SERVICE MARK

The Sidney Tool Company
SIDNEY, OHIO, U.S.A.
WRITE FOR BULLETIN 30

LANDIS

DIAMOND

NORTON

All sizes, finest quality, awaiting your command, stones

"THAT SUIT"

either unmounted or mounted in our improved (any style) CAST STEEL MOUNTING;

GUARANTEED TO BRING RESULTS.

"MADE IN CANADA"

WHEEL TRUEING TOOL CO.

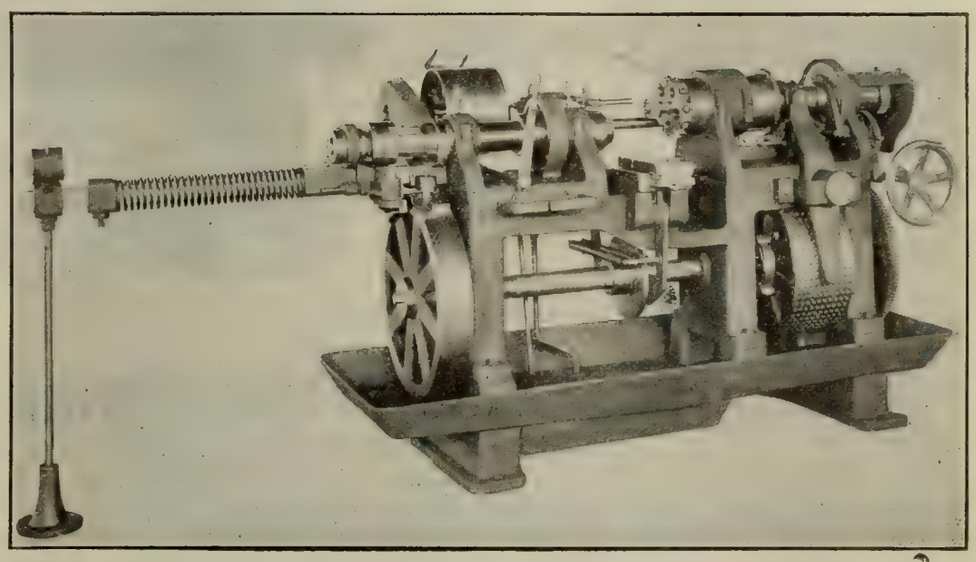
88 WEST PITT STREET WINDSOR, ONTARIO

Power is Costly--- Don't Waste It

John MacNab Machinery Co.
90 West St., New York
John MacNab, Hyde, England

A STRIKING feature of the Chicago Automatic is the 100 per cent. utilization of power. Operated by a single belt run direct from the lineshaft, troublesome overhead belting and countershafts, with the power they waste, are eliminated, making it easy to install one or a battery of these machines.

Equally as important is the general simplicity of construction; there is no reversing or belt shifting, no complicated mechanisms, and all parts are readily accessible. Action is positive, results unvaryingly uniform and accurate. The machine is extremely well built in every particular and produces fine work at very low costs. Made in ¾", 1¼", 1⅝", 2" sizes. Catalog for full particulars.

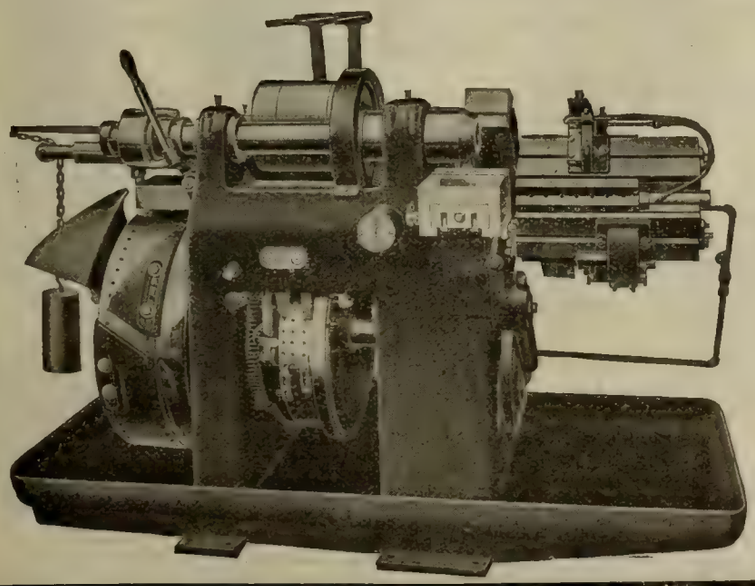


GRIDLEY SINGLE SPINDLE AUTOMATIC

For the plant with limited equipment, it is a machine capable of a wide range of work with little idle time, due to its adaptability for quick set-ups.

For the large plant with specialized equipment it is economical on long runs of a single kind because speed is backed with durability of construction in every particular.

FOR BOTH
DURABILITY—ECONOMY IN OPERATION—
ACCURACY AND UNIFORMITY OF OUTPUT.



Gridley Automatic Turret Lathe
Chuck Capacities 2¼"-3¼"-4¼"-5"
Multiple Spindle up to 2¼".

The National Acme Company

WINDSOR, VERMONT

MAIN OFFICE - - - - - - CLEVELAND, OHIO
CANADIAN SCREW PLANT - - MONTREAL, P.Q.

Branch Offices
NEW YORK BOSTON CHICAGO DETROIT
ATLANTA SAN FRANCISCO
WAREHOUSES: NEW YORK AND CHICAGO

FOREIGN REPRESENTATIVES

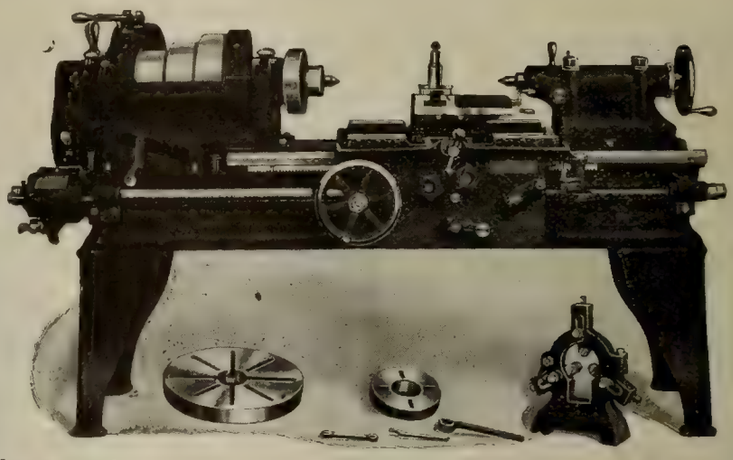
Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vt., and Acme Automatics, Threading Dies and Screw-Machine Products at Cleveland, Ohio.

LOOK—Lodge and Shipley Engine Lathes

FOR SHIPMENT IN 10 DAYS

SIZE
14" x 6' or 8' Bed.

Double Back Gears and Quick Change Gear Box.

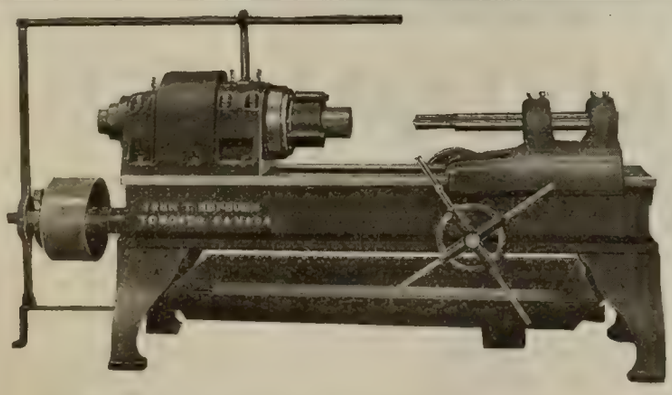


If *you* can use this size lathe, write for specifications and prices. Remember these are the highest quality tools manufactured.

GARLOCK-WALKER MACHINERY CO., LTD.

32 FRONT STREET WEST, TORONTO, ONT.

"EVERYTHING IN MACHINERY"



Go into the Munitions Plants of Canada for its Unbeaten Record.

You will hear sincerely spoken praise for this NEW STYLE BORING LATHE.

Hepburn Lathe

It has made for itself a record for speed and unfailing accuracy that merits your investigation. All particulars will be sent if you ask.

Ship us your old lathe if it needs repairs. Rebuilt by us it would be as good as most new lathes.

JOHN T. HEPBURN, LIMITED

18-60 Van Horne Street **Toronto, Ontario**

For Rapid Production and Accurate Work

USE THE

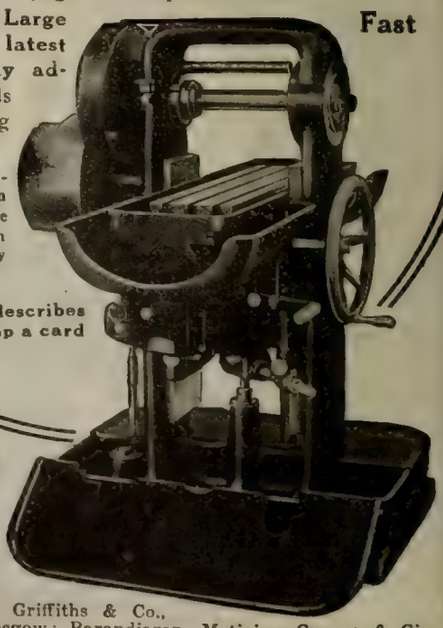
"BRIGGS"

The Briggs Miller handles work no other machine of its size can touch. It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

The Base Tank and Large Gear Pump is the latest addition to its many advantages. Tank holds 20 gallons of cutting lubricant.

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

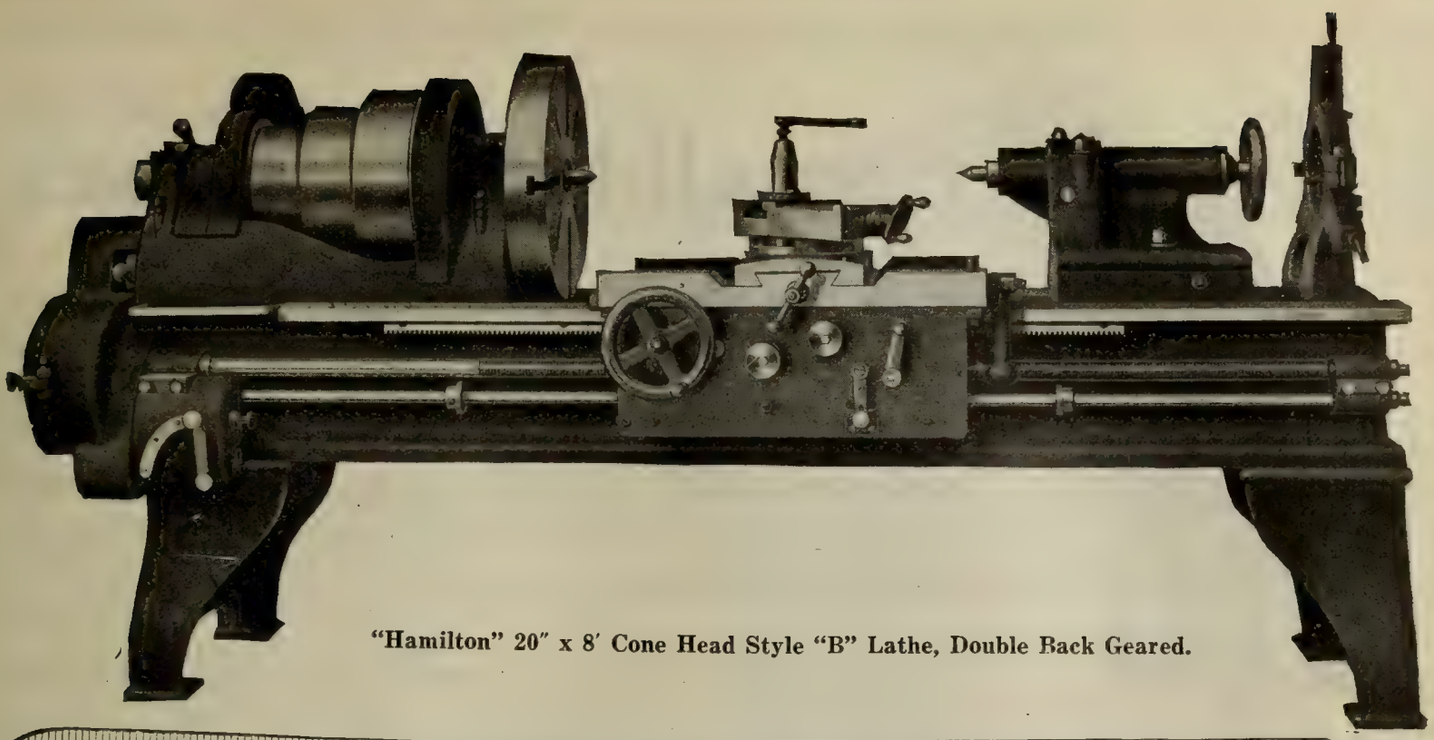
Fast



Our booklet describes fully. Drop a card for it.

Gooley & Edlund Inc.
Cortland, N.Y., U.S.A

Foreign Agents: Allied America, France, Belgium, Italy, Switzerland, Machinery Company of Russia, Scandinavia, C. W. Burton, Griffiths & Co., London, Manchester and Glasgow; Barandiaran, Metivier, Gazeau & Cia, San Sebastian, Spain.



"Hamilton" 20" x 8' Cone Head Style "B" Lathe, Double Back Geared.

HAMILTON LATHES

MERIT

Year after year "HAMILTON" tools have been building their reputation—it has long since been established. To-day it is maintained just as it was built—through merit alone.

Hamilton Machine & Tool Co. mechanics have combined their skill in the construction of this Lathe, and in it have achieved a distinct triumph. Turns out work with unrivalled rapidity and it turns it out to finish style—work that you may well be proud of.

It is a most modern lathe, substantially constructed—built to meet the conditions of to-day for speed and reliability.

You make no mistake when you buy a Hamilton Lathe.

It will Produce.

HMT Co

For 25 Years Makers of fine Machine Tools

The Hamilton Machine Tool Co.

HAMILTON, OHIO

Sole Agents for Ontario:

H. W. PETRIE, Limited - Toronto, Ontario

Consolidated Presses

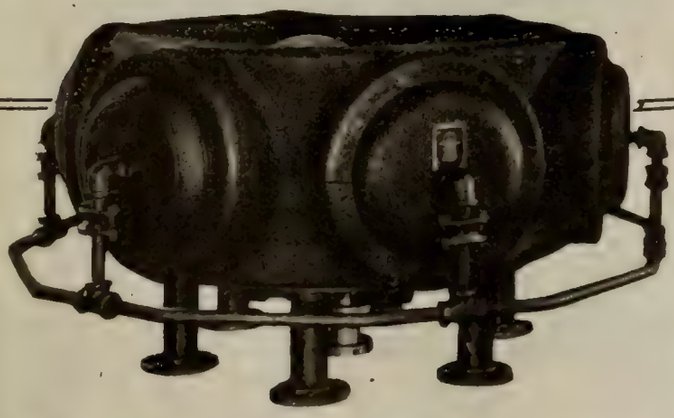
appeal to discriminating users because of the massive construction of all working parts, the generous crank shaft bearings, the increased diameter of crank pins, liberal crank cheeks, long and carefully fitted slide bearings, abnormally large connection screws, powerful gearing, and above all, the skill and care exercised in their construction.

These are features which should be considered when purchasing.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* **MICHIGAN**

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver



Banding 6" to 12" Shells

Its sturdy construction allows it to stand up under severe service. This is the reason for its higher price. Such extra care, better material and expert workmanship are required that the results warrant the high cost.

It has six 11" semi-steel rams which move ½" or more if necessary. All rams returned by levers on plates with heavy Vanadium Steel Springs. Cylinder removable of alloy steel.

Hydraulic inlet to cylinder 1¼ pipe. Distributing ring 2". All pipe of Seamless Steel Tubing. All fittings dropped forged steel. All parts under strain, alloy steel castings and forgings.

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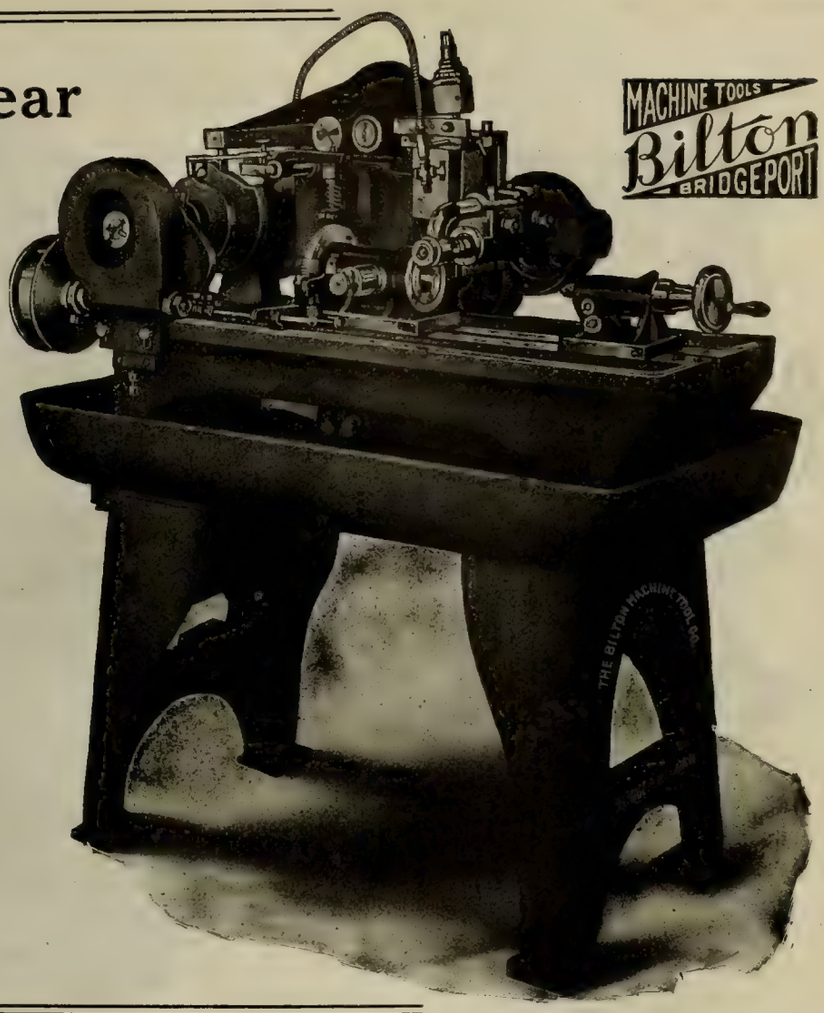

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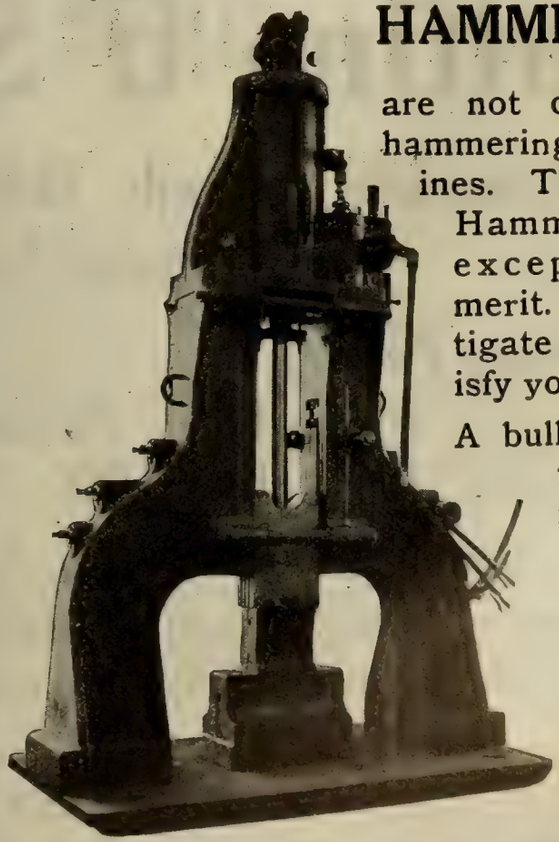

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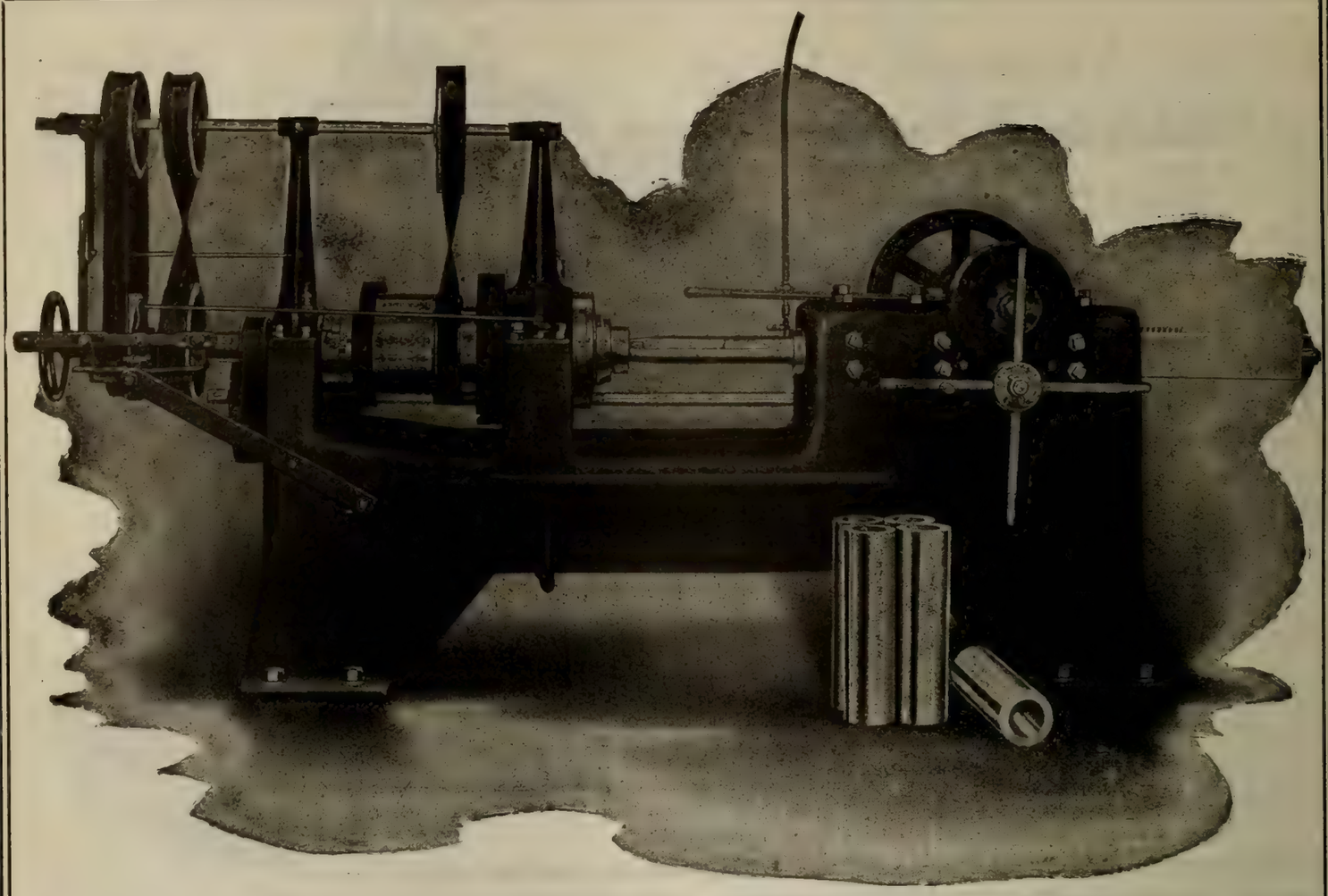

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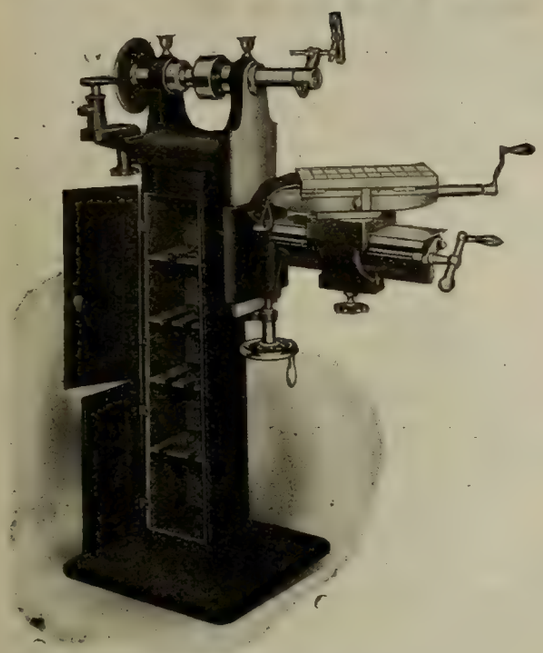

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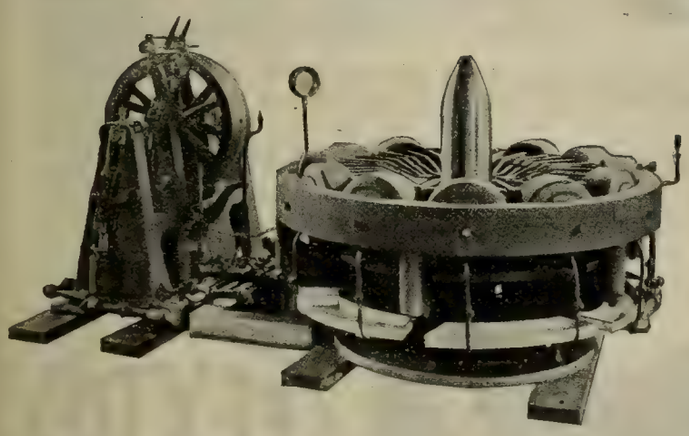

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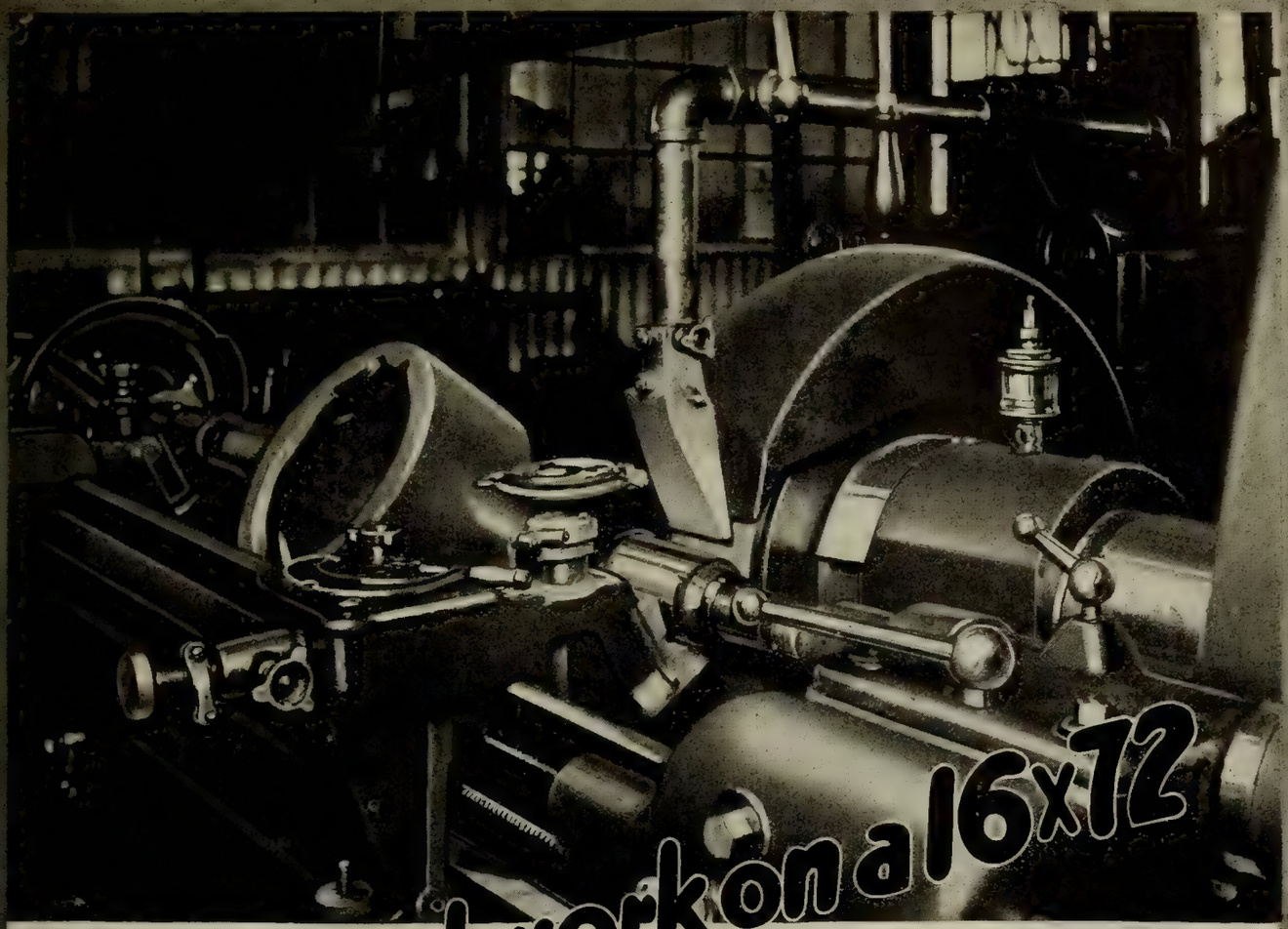

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The splendid possibilities, both in production and in accuracy, of this class of grinding are found in the plant of the Anderson Electric Car Co., at Detroit, Michigan. The work shown is a rear end and gear housing being ground in a

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The length of the ground bearing is 4¾ in., and its diameter is 3⅛ in. Material, pressed sheet steel containing 15 to 20% carbon. The wheel is 20 x 5 x 12½ cup type, remitting the entire grinding without traverse motion.

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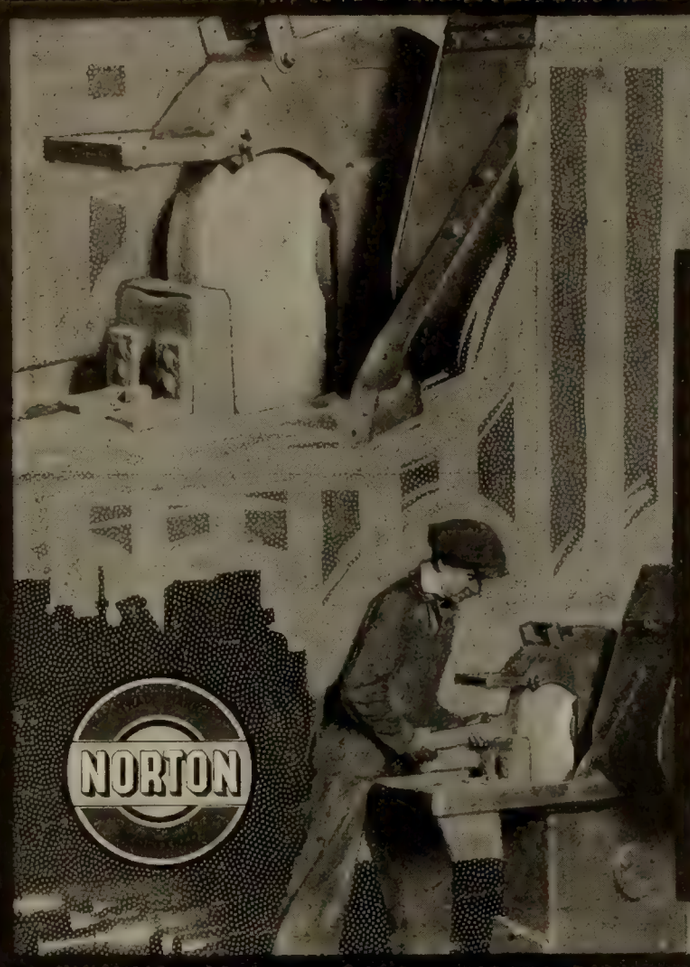

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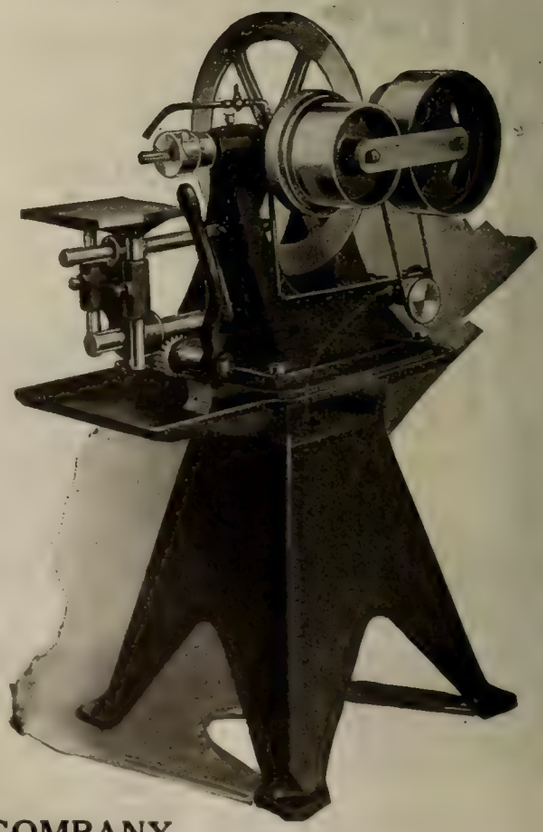

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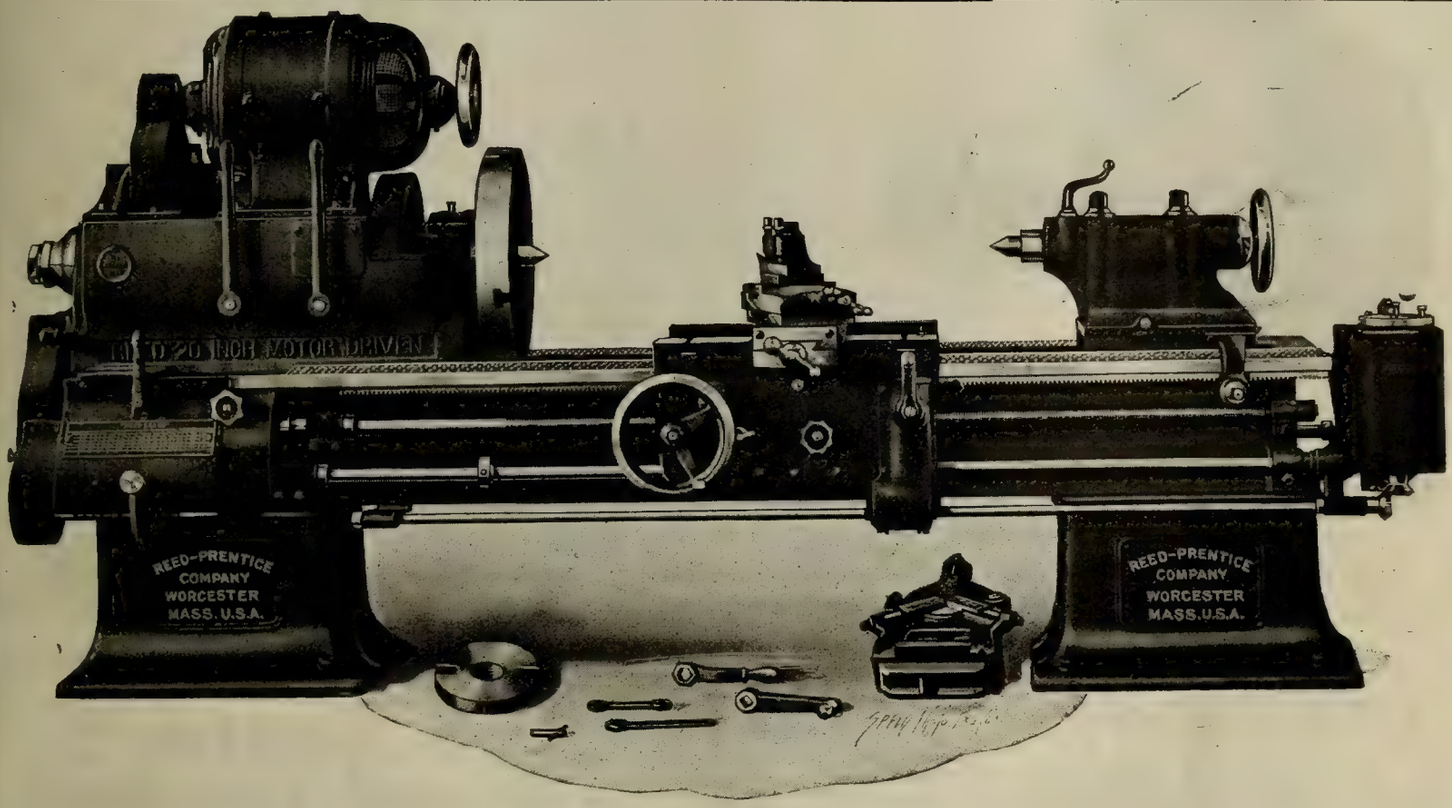

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CUT PERFECT SCREW THREADS

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has both face and hand trip

The Wells Self-Opening Die cuts the thread with a fine shearing cut, then opens with a quick, positive snap.

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The Wells Self-Opening Die can be used on screw machines, lathes, automatics, drill presses and bolt cutters.

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The Wells Self-Opening Die embodies an entirely new principle of design. The chasers are about four times as long as the threaded portions and are supported throughout their entire length and width by the solid sides of the slots in the body. They cannot squirm away from the work. Wear is reduced to a minimum throughout. Adjustment is simple, positive and accurate.

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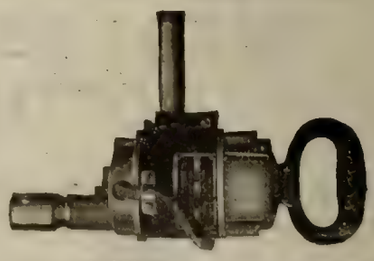

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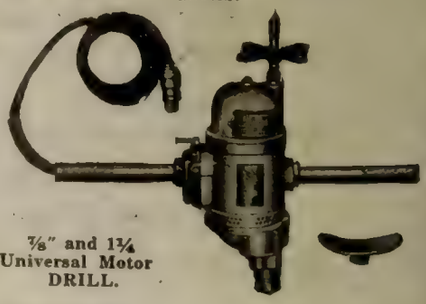

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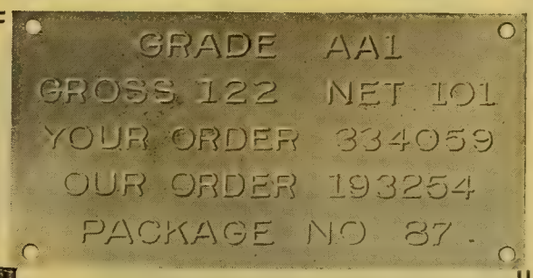

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Rapidly embosses names, addresses, weight numbers, order numbers, etc., on tin or zinc tags of various sizes, quickly making any change in reading matter desired.

Used by a number of manufacturers who believe it desirable to use metal tags in place of linen tags for labeling, identifying and addressing export or domestic shipments.

Established 1850

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Marking Devices

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Foot press as illustrated. Steel holders, and interchangeable type constitute this equipment. Easy and economical to operate.

Write now for a copy of our complete book illustrating this machine and list of firms using it; also our complete line of steel lettering dies and stamps.

Just What You Need For Export Shipments

Metal tags are naturally more durable than linen and not as easily lost in transit—then again they are just as cheap as linen tags in the long run.

Any inexperienced boy can quickly learn to operate this machine and make the necessary tags for your shipments. Further particulars gladly furnished on request.

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SKF Ball Bearings succeed because they save power, 20 to 35% — because they save lubricant, 80%—because they save maintenance, 80%—and because they eliminate the numerous troubles encountered where plain bearing boxes are used.

It will repay you to investigate SKF Ball Bearing Hangers and Pillow Blocks. A trial will convince you of their sterling merit. And the more you use them the more apparent will this merit be.

Numberless installations in Canada and the States are proving their reliability day after day. We would welcome the opportunity of discussing SKF with you. May we send you our Hanger Catalog?

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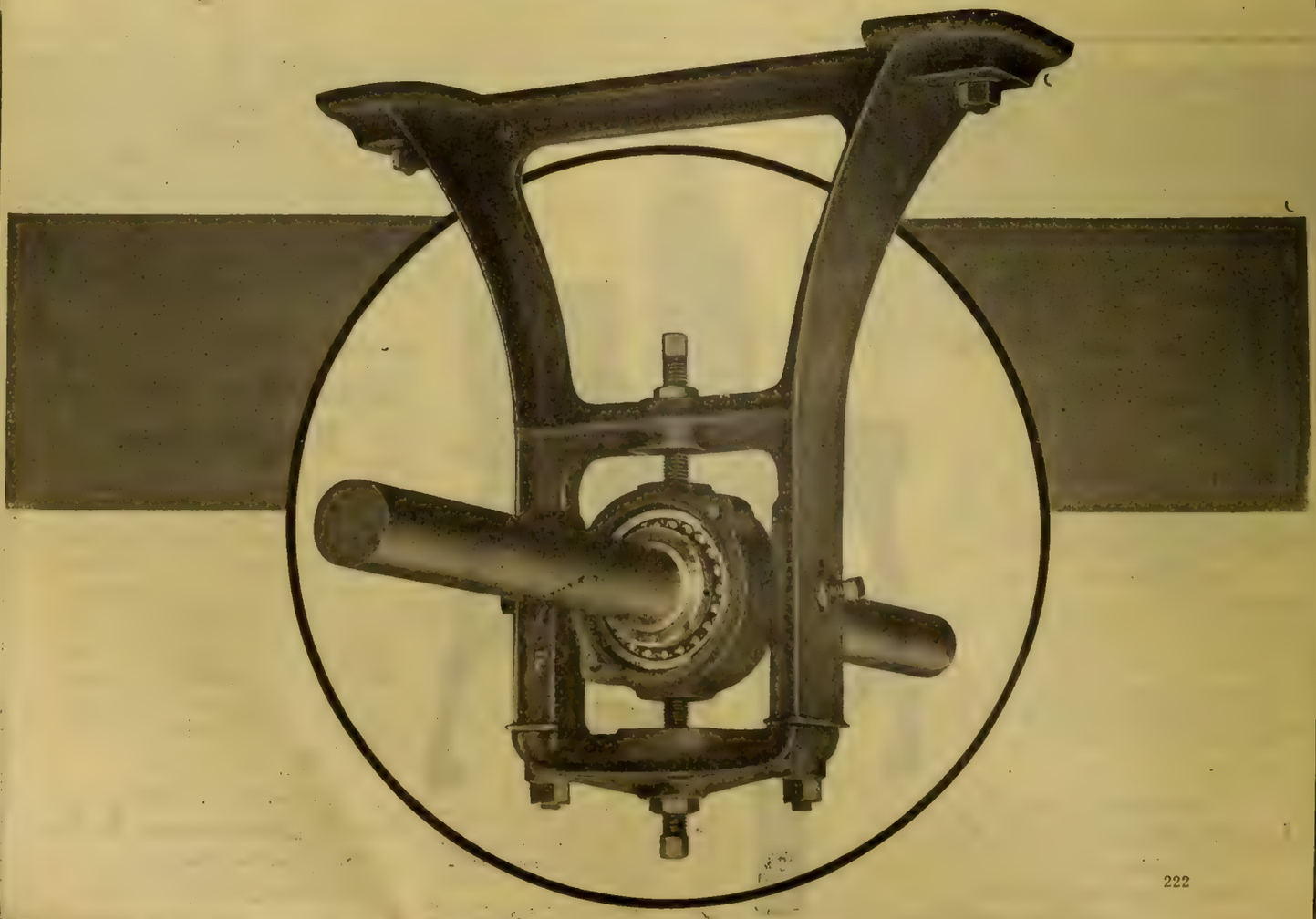

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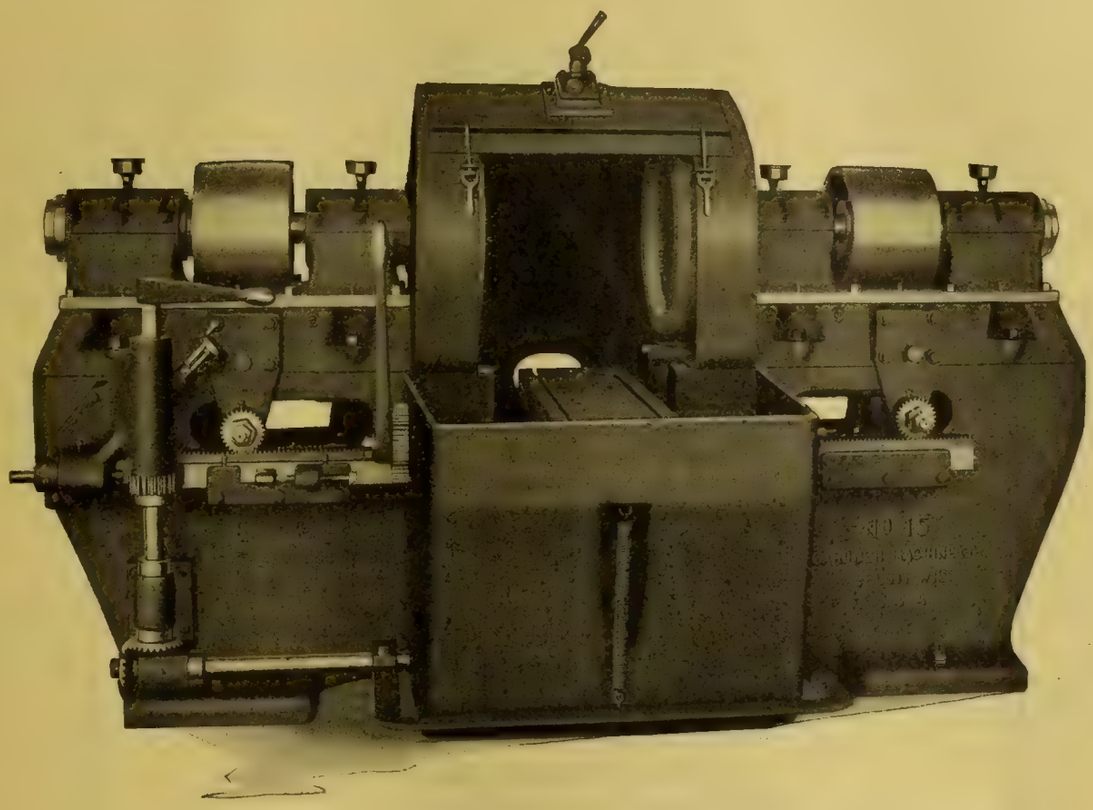

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This No. 15 Double Spindle Grinder is but one of a great number we manufacture. It is specially adapted for builders of guns, ammunition and motor cars. It carries 24″ disc wheels or 2″ ring wheels. It has 8½″ face pulleys, giving abundant driving capacity and all other dimensions are proportionately large and powerful. Both types of grinding wheels are interchangeable. Get in touch with us on any grinding problem. Give our Service Department a test.

GARDNER MACHINE COMPANY

Beloit, Wisconsin, U.S.A.

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IN FLANDERS' FIELDS

Two men were arguing. One claimed he had heard in Calgary the most stirring appeal for the Victory War Loan. The other said he had heard a better—in Sherbrooke, P.Q. A third man, taking his cigar from his mouth, said: "No, the best appeal for Victory Bonds doesn't once mention their name. Listen"; and he read from a clipping the poem by John McRae, of Montreal:

In Flanders' fields the poppies blow
Between the crosses, row on row,
  That mark our place, and in the sky
  The larks, still bravely singing, fly,
Scarce heard amid the guns below.

We are the dead; short days ago
We lived, felt dawn, saw sunset glow,
Loved and were loved, and now we lie
  In Flanders' fields.

Take up our quarrel with the foe!
To you from failing hands we throw
  The torch; be yours to hold it high!
  If ye break faith with us who die
We shall not sleep, though poppies grow
  In Flanders' fields.

Issued by Canada's Victory Loan Committee, in co-operation with the Minister of Finance of the Dominion of Canada

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CANADIAN FAIRBANKS-MORSE CO. LIMITED

Press Work Operations in Hospital Equipment Production-III.

By D. A. Hampson

Operations possessing marked features of economy, adaptability and lack of intricacy in the finished product are characteristic of the work described. The factors of labor cost, quantity production, necessary degree of accuracy, and cost of dies are related to each other in a manner which must receive careful consideration if successful results are to be obtained.

IN THE earlier stages of the war, if not later, the orders for hospital equipment were not of a size to warrant any great tool expenditure and, to break even, manufacturers had to adopt some crude devices. Punch and die work does not come very cheap as a rule, but in this one shop it was done pretty reasonably because of clever "design." As an example may be cited the diaphragm shown in the drawing which

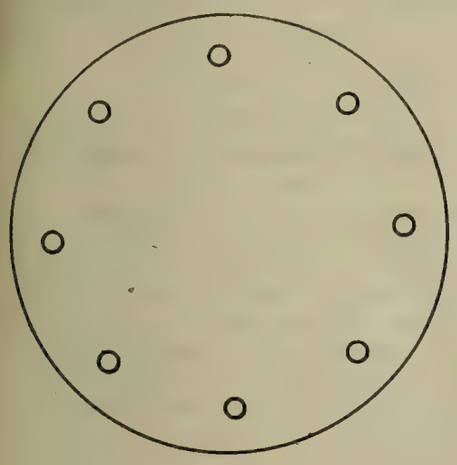


FIG. 1.

went into a patented article of operating room equipment and of which there were required five hundred. Cheap tools were essential, but that did not prevent their being well made, so well that when subsequent orders for six thousand came in, not the slightest change in them was made.

Punching a Diaphragm

The diaphragm, Fig. 1, was made from .50% carbon steel, 1-32 inch thick. The

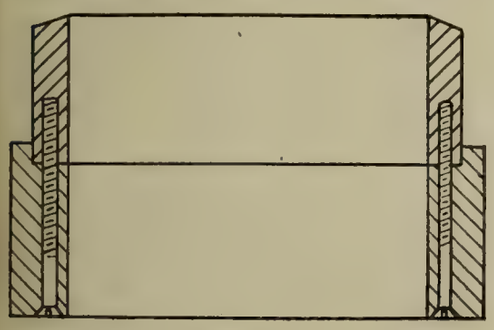


FIG. 4.

discs were first blanked out and the holes were punched in the second operation. The tools made up for both operations are shown in Fig. 2 and Fig. 3 respectively. Cast iron entered largely into their construction and tool steel and machine work very little. As will be seen from the drawing of the blanking punch, it was turned up from a casting and the cutting portion formed by screwing on a ¼-inch tool steel plate—less expensive construction would be hard to find.

Quite naturally no great stock of tool steel was kept and in some cases where time was a factor it became necessary to design the tools to suit whatever steel

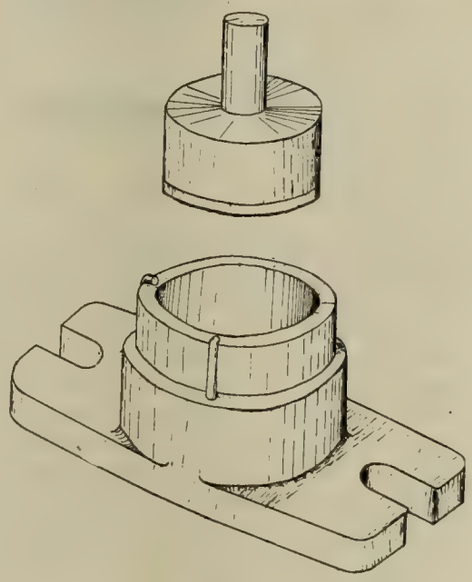


FIG. 2.

was at hand rather than wait to get the right piece from the distant warehouses. Such was the case with the blanking die though it must be admitted that it suffered no loss in efficient working through the makeshift. A ring of tool steel was required and the only thing of that shape available was a discarded automobile gear. This was annealed, the teeth ground off, and the die turned out of that "blank." It was set in a shallow groove in the bolster and fastened by screws as shown in the section, Fig. 4.

A cast iron bolster with a ¼-inch tool steel plate on top and a stripping plate composed the die for punching the nine holes. The holes were laid out and drilled in the plate and after it had been given clearance and was hardened, it was used as a template to drill the punch body for the punches. Cast iron was the material for the punch body and in it were set the punches which were made of lengths of ¼-inch drill rod and held in place by set screws. The punches did not come through the body and no adjustment was provided.

Riveting Without Holes

In a hospital stand, a shelf is made of a piece of 1/32-inch sheet steel flanged over front and back and set in the cast iron blocks cast on the four posts of pipe. An ingenious way of fastening this shelf in place is shown in the Fig. 5. A slot is cast in each of the blocks—a slot wide enough to take in the sheet and a filler piece, which also has another function. No attempt at close fitting is made or required. The casting is drilled through both sides of

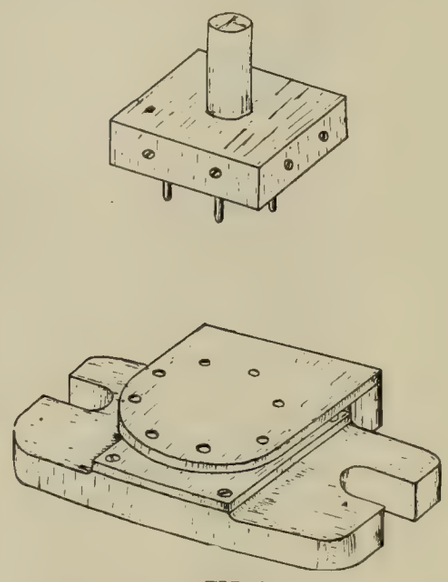


FIG. 3.

the slot for 3/16-inch rivets, but the sheets are neither drilled nor punched, for the castings and posts cannot well be accurately made. A quick way of getting the holes in the sheets in exact position was discovered by accident and has proved a good trick—the filler and sheet are set in place and the rivet inserted from the top, then a sharp blow with a hammer and the rivet has cut its way through the sheet steel.

Notching Tubes

Some rectangular tubing was notched

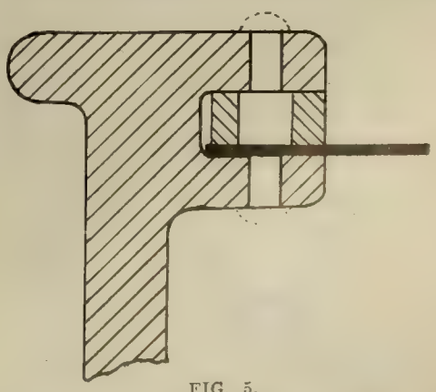


FIG. 5.

across the ends as shown, Fig. 6. This work was done on a small press that had a stroke of ½ inch and so was just suited for it. The punch and die for this job are shown in Fig. 7 as well as

a section through the die and the tube in place for notching. The method adopted is to have the punch extended inside the tube and punch from the inside out, punching one side at a time and

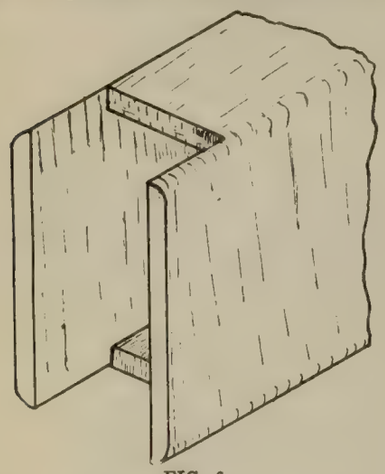


FIG. 6.

turning the tube over for the other. The business end of the punch is short enough to travel up and down within the tube. A stop is formed by a hook end on one of the guides.

Press Work

An oval shaped washer is used in quantities as a sort of lock washer, the ends of it being turned over to form the lock or fastening when cots are finally erected at their destination. The hole is punched as a second operation,

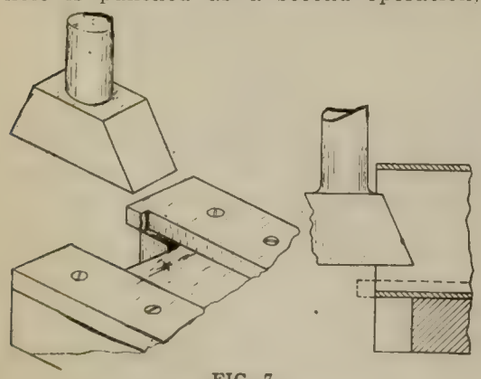


FIG. 7.

and as a safety feature the workman never gets his hands within three inches of the punch and die. As shown in Fig. 8, a sliding piece moves in a runway in front of the die and at its inner position strikes the stop which brings the washer in proper position for punching. The sliding piece has an opening in it the size of the blanks and the operator

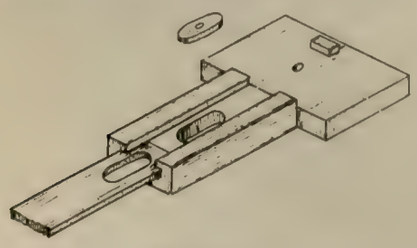


FIG. 8.

drops one in on each return movement. In the drawing the slide is almost out to show the hole in the bottom through which the punched washer drops as the slide is pulled back. A box catches the washers. The operator takes a number of blanks in his left hand and feeds from them while his right hand does nothing but move the slide in and out.

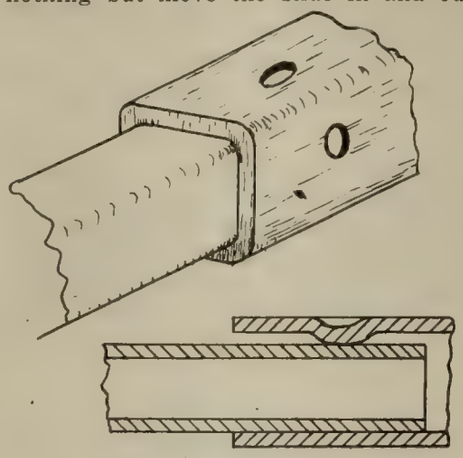


FIG. 9.

A very satisfactory rate of production is obtained.

A kink in connection with telescoping tubing is shown in the last figure. An open and close device, as for instance the adjustable legs of a special table or bed, is thus made of tubing or pipe, usually the former. But as nicely fitting sizes cannot always be obtained, nor are they desired at times, there is more or less play between the inner and outer members. To make a more rigid assembly, some means of closing the mouth of the outer tube is imperative and this plant does it as shown in Fig. 9 by forming an internal button on one or two sides. This takes up the difference in size at the mouth and leaves the interior as loose as before to telescope without bind. The button is put on in a small hand press and the assembler trys the fit as he goes along, no stop or depth gauge being provided owing to the varying sizes in use.

RIVETS IN SHIPS

IT is rather curious that riveting, one of the most troublesome processes in shipbuilding of the present day, is carried out on the same principle as it was when iron ships were first constructed. Not only do rivets form an undesirable method of connecting together ship plates and angles, but the labor troubles in connection with them are more acute than in any other trade. At their best riveted joints are crude, and while constant use has made shipbuilders accept all the troubles connected with them as a matter of course, these troubles are very numerous. Apart from the ordinary troubles with riveters themselves, as ships increase in size rivets become larger and larger until they are extremely difficult to handle by manual labor at all. Their employment leads to the addition of a multitude of small weights due to laps, butt straps, angle bars, doublings, corner pieces, etc., and at the same time there is created a non-uniformity of strength and elasticity throughout the whole structure. Further, since a plate is weakened by a line of rivets, the main part of it must be made much stronger than is really necessary, and if there were no weakness the whole of the scantlings could be reduced. In working up the strength of a ship, deductions are made for the weakening of the structure brought about by the rivet connections, and actually it represents quite a fair percentage. A good deal of attention has been given in the past few years to welding processes with iron and steel, but in ships their use has been limited to welding landing edges of leaky seams, bulb frames, and cracks in stern and rudder posts, and to building up worn rudder pintles. These processes, however, do not touch the main problem, and while it seems at present quite out of the range of practical politics to dispense with rivets, there is undoubtedly a large field here for reasearch work which might well be taken up by the shipbuilders and shipowners of this country.

MOTIVE POWER IN NORWAY

By L. E.

THE industries of Norway have been very seriously affected by the coal shortage and the restricted imports from Great Britain, and have been compelled to solve the most difficult of many problems with which they have been faced by utilizing the natural resources of the country. Considerable attention has therefore been concentrated on the development of plants for the generation of electricity by waterpower. The future of Norway as an industrial country will depend, next in importance to the cheapness and abundance of the water power and shipping facilities, on the supply of raw materials, or to what extent the electric power used by the industries will make Norway independent of importing raw materials necessary for the industrial life of the country. Norway has no coal deposits, and is therefore absolutely dependent on the import of this raw material for its industries. As a producer of heat units coal has hitherto provided all industries, and it is here where the electric furnace as a producer of motive power will take the place of coal.

Use of Electricity

One of the most important experiments which has been under discussion and has been tried on a large scale is the replacement of the old blast furnaces, with their large consumption of coal, by the electric furnace in the manufacture of pig iron. Two-thirds of the coal consumed in the manufacture of pig-iron is used for obtaining the necessary temperature for the reaction, whilst one-third of the coal is consumed purely as a chemical agent for the reduction of the iron-oxides. By the use of electricity it would therefore appear that two-thirds of the coal consumption should be saved. Although the use of electric furnaces for the manufacture of pig iron has been fairly successful

in Sweden, the attempt in this direction in Norway was a failure.

As to the cause of the failure there exists a great difference of opinion amongst experts, some giving the lean iron ore as the cause, some the construction of the furnace and the electric arrangements in connection with the same, whilst others are of the opinion that for electric pig-iron manufacture it will be necessary to use the high-grade, comparatively scarce, and expensive charcoal instead of coke, which last one will, so far as Norway is concerned, have to be the necessary kind of coal. By the use of the electric furnace in the manufacture of pig-iron and steel, there will, however, always be need for the use of coal, as the electrical heat replaces only the coal used for obtaining the heat, whilst still one-third of the coal consumed in the blast furnace will be consumed in the electric furnace doing the chemical work.

Coal Not Displaced

Although the use of electricity will play a great part in this manufacture, the consumption of coal will not entirely be replaced by electricity, and Norway will in this line of industry be dependent upon import of one of the raw materials. The consumption of coal, as now practiced in the copper blast furnaces, can be wholly replaced by the electric current. Norway has abundant deposits of copper pyrites, the mining of which is Norway's most important mining industry. The use of coal in smelting the copper pyrites is solely for the purpose of furnishing heat, and the electric smelting of copper ores is nothing more than the substitution of electric heat for the heat derived from the combustion of coal.

GO SLOW ON OIL FUEL

OIL as fuel for ships possesses some wonderful advantages over coal, but until much larger known reserves of oil are made evident marine experts point out that the age of oil cannot succeed the age of coal. That is, the world's known oil supply does not warrant the transition from coal to oil on too large a scale in the propulsion of ships, as present-day estimates place the total quantity of oil produced at only about 5 per cent. the weight of the coal mined. In this connection it is interesting to note that David T. Day, of the United States Geological Survey, has come to the conclusion that if we figure that the American output of petroleum will continue its present rate of increase, the known oil fields will be exhausted by 1935. If no increase in production took place, the exhaustion of the oil fields would be postponed until the year 2000. The chances are, however, that the present known American oil fields will be exhausted before 1935, and when it is remembered that the United States produces 60 per cent. of the oil supply of the whole world, some idea of how uncertain the world's oil supply is may be imagined.

SIBERIAN TRADE REQUIREMENTS IN OIL ENGINES AND MARINE MOTORS

L. D. WILGRESS, Canadian Trade Commissioner for Siberia, sends the following particulars from Omsk regarding trade in Siberia in oil engines and marine motors. It is hoped that these particulars will assist Canadian manufacturers of the products in question to determine the prospects for developing business with this market.

Trade in Engines

A considerable demand was created in Western Siberia before the war for oil engines designed for various farm uses, such as the operation of flour mills, threshing, the pumping of water, etc. Previously the demand in this branch of trade was chiefly for portable steam engines with colonial fireboxes, enlarged especially for burning wood. With the amount of wood available for fuel purposes, this was considered the engine most suitable for use in Siberia. The rise in the price of wood, the prevalence of alkaline water in certain districts and particularly the campaign conducted by Swedish and other manufacturers, gradually created a demand for oil engines, with the result that the number of portable steam engines sold each year remained stationary, while the trade in the former greatly increased. Lately the business in steam engines has been largely confined to dealers in power-threshing outfits. These have been chiefly of British and German manufacture, the largest sale being in sets with a nominal 10 horse-power, but an actual 36 horse-power.

Type of Oil Engine in Demand

The oil engines sold in Western Siberia previous to the war were chiefly of Swedish and Russian manufacture, supplemented by a limited import from Germany and Great Britain. These engines were either sold to co-operative societies for the operation of flour mills, creameries, etc., or to individual peasants for general farm purposes. For the operation of flour mills and similar heavy purposes, the most usual size required is from 32 to 40 horse-power. The largest demand, however, is for one-cylinder vertical motors of from 10 to 16 horse-power size, suitable for operating threshers, small flour mills and for other farm uses. During the summer the farmers use their engines for threshing grain and other purposes, while during the winter they grind the grain by operating small unit flour mills, using their oil engines for power. There is also a considerable sale of the smaller sizes of engines of from 4 to 8 horse-power, which are used for pumping water, operating threshers, etc. The tendency has been, however, for a greater number of the larger sizes of engines to be sold each year, since the economy of purchasing a somewhat larger engine is becoming recognized.

The fuel used for oil engines in Western Siberia is either kerosene or what is locally known as "naphtha." This latter is similar to what is sometimes referred to in America as crude oil and is practically kerosene before the benzine is extracted from it. Gasoline is too dear to permit of its use for fuel purposes in Siberia. Since the outbreak of the war the high cost of kerosene and naphtha has placed the owners of oil engines at a disadvantage.

The requirements of the market call for an engine which is above all things simple to operate. This is one of the objections held against certain engines of the North American type as compared with those manufactured in Sweden and Germany. There is also a prejudice among the Siberian peasants against the horizontal motor, it being held that the friction is greater than in engines of the vertical type. The accompanying illustration shows a 10 horse-power engine manufactured by a well-known German firm. This oil engine is of the type which has enjoyed the largest sale in this market. The retail price of this particular motor before the war was 1,800 roubles. A 5 horse-power engine manufactured by the same firm sold for 750 roubles. These prices may be taken as representative of the prices paid for oil engines in Western Siberia previous to the outbreak of the war.

Marine Motors

There should be an opening for the sale of Canadian marine motors in the Russian Far East. The development of the fishing industry of Eastern Siberia has led to an increased use of motor-propelled boats, while sailing vessels with auxiliary motor-power have proved to be the best suited for the trade along the coast where the population is very scattered. Motor-boats are also beginning to be used to a greater extent on the principal rivers of Siberia for purposes of communication and in connection with the fisheries. Motor-boating for pleasure is still in its infancy, although the sport appears to have gained a foothold in the principal towns. Motors of Swedish manufacture are chiefly to be seen, but it is reported that the sales of American motors are increasing in Eastern Siberia, where the conditions of competition are more favorable to Canadian and United States manufacturers. Kerosene is the principal fuel used, gasolene being too dear for general use. The type of marine motor required in Siberia is one of strong construction and simple design. All sizes are in demand varying according to the purposes for which the motors are to be used. The names of some of the principal dealers in Vladivostok may be obtained on application to the Department of Trade and Commerce, Ottawa.

THE largest suction gas plant is in South Africa. It is of 575 brake horse-power capacity, and with bituminous South Rand coal of 10,912 B. Th. U.'s per lb., and containing 60.7 per cent. fixed carbon, the consumption comes out at 1.146 lb. per brake horse-power hour with a low load factor.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

NAMING MACHINE PARTS

By J. Edwin

THERE has been considerable discussion in recent years in regard to the names of machine parts, and more or less effort has been made to standardize these; or where certain parts are called by several different names, the aim has been to eliminate these and substitute one name only for any given piece. When is a bolt a screw, a screw a stud, a stud a pin or plug? are queries often asked, and this, to many, seems one of the reasons why these terms should be settled or standardized in order to avoid confusion in this respect.

It is not known just what success has been achieved in this direction; but an important point seems to be overlooked by those well-intentioned in this agitation, that, while it is easy enough to designate names of parts as applied to simple forms or designs of machines, it is another matter in making up names on machinery of automatic and complicated construction. The problem presents many difficulties, because it calls for a good deal of originality, and one in which no two persons are very likely to agree as to what names are suitable or unsuitable.

Obscure Origin

The origin of many common names, applied to machine parts still in use, and having no sense or relation to the parts so named, like old names that are still adhered to on improved types of machines, has been lost, and may be said to be like "Topsy," they "never was born," they "just growed up." The term, "tool-post," is an instance of this class. Formerly applied to the tool-holder in a lathe-carriage, the name still sticks to tool holders which are not a post in shape or form. Some are flat, some box-shaped, attached to turretheads or joined to reciprocating parts that are rocking or lever-like in their motions.

It is really no disadvantage to anyone because this term is still adhered to. Even outside the machine industry there are many similar cases. A stopper in a bottle, though made from manufactured composition, glass, or other than cork material is still referred to as a cork—because it is convenient to do so. Similarly, with many classes of names of machine parts, their terms are a convenience, easily understood.

There is no hard and fast rule that can be followed in naming parts. However, a practical solution to this end may be found in the few suggestions here given; while encouraging the use of terms already known, it will prevent a misunderstanding as to just what these are and where located. The rule is adaptable both to simple and compound machine types. A machine for making rivets, or what is called a cold-heading machine, will be used to illustrate our purpose. Whether one is acquainted with its construction or mechanism matters little.

The task is made simple by stating that this machine is made, in what we will call divisional parts, each of these parts performing certain functions in order to produce rivets. The "feed-stand" whose assembled parts feed in the wires; a "die-block" which holds the wire; a "cut-off-box" that shears the wire; a "punch-block" which forms a head on the rivet; a crank- shaft and fly-wheel which supply the power, etc.

Thus divided, we have these assembly divisions; a feed-stand, die-block, cut-off-box, punch-block, etc. Now any given name applied to a part would have any one of these divisional terms, thus; feed-stand bolt, cut-off box stud, etc. Assuming any one of these having several studs, bolts, in its assembly, confusion is avoided by giving these a name of the sub-divisional part they are attached to. For illustration, a stud holds the cut-off-box to the bed. Another stud is used in the box, but this is attached to the slide in the box. The name cut-off-box, slide stud, or cut-off slide stud for short, eliminates the possibility of confusion and denotes plainly which stud is referred to when spoken of.

Procedure to Follow

Herein we see the principal order to follow in creating names, namely, dividing and sub-dividing the parts referred to. The feedstand has two shafts. We can call these the upper and lower, or short and long feed-shafts, just as convenience suits us.

Whenever parts are similar, whether attached to a division or sub-division, we have to make a choice in order that these may be understood clearly. A cap is fastened to the fly-wheel with a bolt or screw; also a bolt or screw fits in the cap itself. To the smaller one is given the name of cap-screw; to the larger, cap-bolt.

It sometimes happens that a part is designed for which no suitable mechanical term is available. Here then is the opportunity to create one entirely new, even though the name may not have any direct relation to its form or use. A case in point is known where a short lever-like piece was made for holding a spring. No suitable name could at the time be thought of for this, when someone hit upon the idea of calling it "a dinkey" and the name has since stuck. One would look long for its derivation, though it is sometimes applied to small locomotives.

The main consideration in adopting names is to have them as short as possible. Many of these contain extra or needless syllables, which in no way add to their value, and are just as easily understand without these. For instance, the term sliding-shaft, could be called slide-shaft; leader-gear, lead-gear, etc. This saves space in printing names on drawings or record-cards, etc. The shorter the word the better in every way.

Whenever a machine contains several different parts of a kind, it is a good idea to express these into as many various terms as possible. A rod in one place may be called a stem in another. A box, a bushing or bush. A protruding pin, a peg. A wrist, a joint or knuckle, and so on.

Long Usage a Strong Factor

As already stated, the tendency is to change and standardize names and have them conform to the shape and function of the machine parts for which they are adapted. No matter how well intentioned, it seems a step in the wrong direction to cast aside names and terms with which nearly everyone is familiar, unless these are to be shortened or simplified in the process. The different mechanical terms, as we know them, are the outcome of long and steady industrial growth. And progress is not hindered, in fact its strides are just as rapid in adhering to old names, as in adopting any new or unfamiliar terms.

The question, when is a bolt a screw, a screw a stud? is about as easy to answer, as to which was first, the hen or the egg? It is in applying these separate terms as convenience requires to assembled machine divisions, that a practical solution to the problem of naming machine parts will be found.

CO-OPERATION OF THE SALESMAN AND THE ENGINEER

By J. H. R.

ENGINEERS as a rule are the deciding factor in the designing and construction of machine tools, but a feature that deserves more than ordinary attention is the opinion of the salesman whose duty it is to interview the user of these tools, and probably be called upon at a later date to explain the why and the wherefore of certain details. Salesmen of today—particularly those who handle machine tools and engineering specialties—are generally qualified to judge of the merits of the goods they are offering to the buyer, and the very character of their work brings them into contact with actual shop requirements with which the construction engineer is doubtless less familiar. In the case of a customer making inquiries as to the possibility of a special machine to do a cer-

tain class of work, it is invariably the salesman that is first approached for the desired information. Hasty action on the part of the salesman should not be taken without first consulting the designing engineer, otherwise obligations may be accepted by the former that might create a difficult situation when the subject is placed before the engineers. The salesman however, is often the medium through which the customer makes his specific wants known to the manufacturer; sometimes these wants may be whimsical, but then again they may originate from characteristic shop conditions or certain local experiences. It is therefore well to consider the viewpoint of the customer, either directly or through the knowledge acquired by the travelling salesman; at the same time seeing that the general efficiency of the machine is not reduced by so doing. Any suggestions made by the user, so long as they do not interfere with the character or range of the work desired from the machine, should be given favorable consideration.

BRASS AND OTHER COPPER ALLOYS USED IN MARINE ENGINEERING*

By J. T. Milton

SINCE reading the paper on the above subject, my attention has been drawn by one of its authors to a paper upon the Inspection of Brass and Bronze, presented in June last to a meeting in America of the American Society for Testing Materials by Messrs. Alfred D. Flinn and Ernst Jonson. Also to two papers by Mr. Flinn upon experiences with brass in civil engineering works. One of these latter was read at a meeting of the Municipal Engineers of the city of New York in November, 1914, the other at a meeting of the American Institute of Metals in October, 1915.

Mr. Flinn is deputy chief engineer of the board of water supply of the city of New York, and Mr. Jonson is an engineer inspector of the same board.

It is considered that the papers are the most remarkable and most valuable of any which have been published on the subject of "Brass."

Both of these latter papers contain descriptions of the brass-work used in the construction of the new water works of New York City, commonly referred to as the Catskill Aqueduct, and they record some of the experiences with the brass from 1908 onwards.

Mr. Flinn states that in America, as is the case here also, considerable confusion exists to the use of the terms "brass" and "bronze" to describe alloys of copper, and it is worthy of note that in the title of his paper he uses the word brass, and in general refers to the metals of which he recounts the experience as "brass," whereas the great bulk of the metal used was manganese bronze, and was termed "bronze" in the specifications.

In arranging for the enormous works in connection with the water supply of New York City it was necessary to use immense weights of some strong incorrodible material, and very great consideration was given not only to the designs of details, but also to the composition of the metal used. There were castings to be employed ranging from a weight of a few ounces each to 22,000 lbs. (say, ten tons). Altogether there were about 2,000,000 lbs. of copper alloy castings and about 1,000,000 lbs. of bolts and other parts. Some of the pieces were forgings, ranging from small bolts up to valve rods 6 inches diameter, 31 feet long, weighing 3,200 lbs. The castings included valve chests for valves 72 inches diameter, some of them weighing 44,000 lbs. each when completed with covers, etc. The total expenditure for the purchase of brass was approximately 1,000,000 dollars.

Before ordering this vast amount of metal for one undertaking, several alloys, such as manganese bronze, naval brass, phosphor bronze, etc., were all investigated. Information was sought from responsible metallurgists and experienced engineers regarding designs and specifications, and, as a result, "manganese bronze" was selected for general use, but not to the exclusion of all other alloys. All the articles were obtained under specification and were carefully inspected. Most of the work was carried out by very experienced manufacturers by their own methods, some of the firms having had experience for a very large number of years. Whenever possible hydrostatic and other tests were made, in addition to the customary tensile and bend tests. The specifications stipulated the desired physical qualities, but not methods, of production, nor metallurgical composition.

The following extracts from the specifications are taken from Mr. Finn's papers:—

The Bronze Castings.—All bronze castings shall be made of new metal, shall be free from objectionable imperfections, and shall conform accurately to patterns. When the castings are being machined, if the metal shews signs of imperfect mixing, they shall be rejected. Unless otherwise called for in the specifications, or on the drawings, bronze where indicated upon the drawings shall mean manganese bronze.

Manganese Bronze.—All manganese bronze shall be equal to Spare's, Parson's or Hyde's manganese bronze, and shall have a tensile strength of not less than 65,000 lbs. per square inch, an elastic limit of not less than 45 per cent. of the ultimate tensile strength and an elongation of not less than 25 per cent. in two inches.

Brass Rivet Rod.—Tensile strength of brass rivet rods shall be not less than 55,000 lbs. per square inch. The elastic limit shall be not less than 30,000 lbs. per square inch and the elongation not less than 20 per cent.

Stems.—The main gate stem shall be of manganese bronze or other bronze of approved composition, of such dimensions that when placed in tension under a load in pounds, equal to the area of the valve opening in square inches, multiplied by 125, the minimum cross section of the stem shall have a resultant unit stress not exceeding two-thirds the elastic limit of the material used. These stems shall be turned straight and true, and shall have all threads lathe-cut.

Rolled Bronze.—Whenever the term bronze is used in these specifications in a general way or on the drawings without qualification it shall be manganese or vanadium bronze or monel metal. Whenever the characteristics of any material are not particularly specified such material shall be used as is customary in first-class work of the nature for which the material is employed.

The minimum physical properties of bronze shall, except as otherwise specified, be as follows:—

Castings—	
Ultimate tensile strength...	65,000 lbs. sq. in.
Yield point	32,000 " " "
Elongation	25 per cent.
Rolled material, thickness one inch and below—	
Ultimate strength	72,000 lbs. sq. in.
Yield point	36,000 " " "
Elongation	28 per cent.
Rolled material, thickness above one inch—	
Ultimate strength	70,000 lbs. sq. in.
Yield point	35,000 " " "
Elongation	28 per cent.

After being forged into a bar, rolled, or forged bronze shall stand: First, hammering hot to a fine point. Second, bending cold through an angle of 120 degrees to a radius equal to the thickness of the bar.

Bronze Pipes.—The pipe shall be seamless drawn, semi-annealed, iron-pipe-size tubing of the sizes shewn on the contract drawings or ordered. It shall be made of the bronze specified in the general sections or of an approved commercial bronze. All pipe furnished under this item shall be free from season cracks, surface cracks or other defects.

When the pipe is finished, ready for shipment, the engineer will subject about 1 per cent. of the lot, taken at random, to the following tests:—

1st.—Each test pipe shall stand threading perfectly, with a die with the usual thread for the size of pipe.

2nd.—After annealing, the end of each test pipe shall stand being flattened by hammering until the sides are brought parallel with a curve on the inside of the ends not greater than twice the thickness of the metal, without shewing cracks or flaws.

3rd.—After annealing, each test piece shall have a piece 3 inches long cut from it, which, when split, shall stand opening out flat without shewing cracks or flaws.

TYPICAL RESULTS OF PHYSICAL TESTS OF BRASSES USED ON THE CATSKILL AQUEDUCT.

Yield Pt. lbs. sq. in.	Ultimate Stren. lbs. sq. in.	Ratio of Yield to Net	Elongation per cent.	Reduc. of area per cent.	Fracture
Forgings					
36.500	73.150	50	41.5	46.8	Irregular
37.500	75.750	50	35.5	43.9	"
38.250	76.900	50	35.5	46.8	"
52.500	77.100	68	31.0	...	Irreg. Silky
49.300	76.150	54	33.5	...	Silky Cup
50.000	75.350	67	31.0	...	Irreg. Silky
43.500	70.000	62	34.0	47.0	Irregular
36.000	67.500	53	40.5	43.5	"

*Being the author's contribution to the discussion on paper read before the Institute of Marine Engineers. Appeared Nov. 1.

Castings

39,650	66,000	60	40.0	...	Irreg. Grain
43,100	68,850	53	25.0	...	" "
39,950	68,050	59	29.0	...	" "
33,000	66,250	50	25.0	25.4	"
32,750	67,500	48	30.0	27.7	"
32,250	67,200	48	36.0	34.1	"
39,500	69,100	57	39.0	...	Irreg. Silky
47,500	71,000	67	40.5	...	" Gran.
50,000	70,000	71	34.0	...	Ang. Slky
33,250	73,000	45	30.0	28.5	Irregular
33,000	73,500	45	35.0	34.0	"
34,500	73,250	47	40.0	36.5	"
43,250	69,950	62	40.5	...	Ang. Silky
44,000	70,050	63	34.0	...	Irreg. Cup
42,500	69,500	61	37.5	...	Ragged Cup
46,000	69,850	66	33.0	...	Ang. Cup
44,000	69,600	63	40.5	...	Ag. Fine Gr.
41,500	72,350	57	36.5	...	Irred. ½-Cp
40,000	68,000	59	38.0	...	Forked Silky
42,000	67,000	63	37.0	...	Ang. Silky
43,750	69,050	63	37.0	...	Forked Silky

Mr. Flinn states that in spite of the care exercised, the brass furnished proved to be distinctly unsatisfactory in most of the uses to which it was put. No suspicions of definite troubles developed until late in 1913, when numerous bolts and rods were found to be cracked, and since early in 1915 some of the castings from at least three different foundries have also been found to be cracked. All these castings had, before acceptance, been subjected to hydrostatic pressures of 200 and 300 lbs. per square inch for a half-hour or more, yet some months later, after having been erected in position, they leaked under pressure of only a few pounds. In some castings the cracks have extended since they were first observed, and in some additional cracks have been discovered as time has elapsed. In nearly all of the cases of the cracked castings the defects appeared to be close to or in a repair made by "burning."

In the case of defects in plates, bolts, rods, sides and rungs of ladders, etc., some of the articles had not been taken out of their packing cases. In some cases the cracks were fine and superficial, but in others they were deep. In some cases in bolts from ½ inch to 2¼ inches in diameter the whole cross section was affected, some of the bolts being found to be severed. Two or three years have passed in some cases before the defects developed sufficiently to be detected.

Mr. Flinn states that but for the seriousness of the matter "bronze" or "brass" would be but a laughing-stock among the engineers of the aqueduct.

In the 1914 paper Mr. Flinn mentions that only a few small brass pipes had failed. He says, indeed, that there is but small excuse for supplying other than dependable brass pipe nowadays, as correct methods of manufacture are well known in the trade; but in the 1915 paper he states that serious failures had been experienced with pipes also.

He states that the defects were found to be so general and so distributed through the output of various manufacturers, and were so common in the different kinds of brass that all wrought brass fell under suspicion. After the first discovery of the cracking, replacements were made with brass produced by methods avoiding cold working in the hope that by this further trouble would be avoided, but unfortunately this did not prove to be the case.

It was well known that cold working produced initial strains in the material, and after the discovery of the defects it was decided to use plain, extended or hot rolled rods wherever practicable and to anneal all material which had to be drawn or rolled cold, in the hope that further trouble would not occur, but, as stated, this hope was not realised, as plain extended, hot forged and annealed brass rods, supposedly free from initial strains, have also failed in disturbingly large quantities.

It is noteworthy that at the time of reading the paper in 1915 Mr. Flinn was able to state that large forgings, which include chiefly the items for large sluice gates and valves, have shewn no sign whatever of failure. He states: No brand or make of brass or bronze has wholly escaped. Manganese bronze, naval brass (including a well-known bronze and its imitation) and Muntz metal from all the manufacturers who have furnished any considerable quantity, all have failed.

Mr. Flinn makes some very drastic remarks as to the want of such knowledge of the physical characters and capacities of this group of alloys as is required to be a safe and dependable guide to their manufacture, inspection and use. As his investigations and experience progressed, he found not only unfortunate foundry and shop ignorance of important details of the manufacture of copper alloys, but also seemingly a lack of definite and complete knowledge of some of the fundamental characteristics of these alloys. He says: Before civil and mechanical engineers can venture to use brass extensively for important works where it would be subjected to other than very low stress, some questions will have to be conclusively answered by manufacturers and experts. The following are the questions he submits:—

Can brass or bronze of high tensile strength be reliably produced which can be used safely for important permanent structures in such parts as bolts and other rolled, drawn, extruded or forged shapes?

What should be the specifications for such brasses or bronzes?

What inspection methods and tests should be used?

By what tests can the tendency to subsequent failure be detected at any time after manufacture?

What working stresses can be safely used for these various alloys?

Will these brasses or bronzes deteriorate by reason of constantly applied or frequently repeated stress—i.e., will they fail from fatigue?

Can large hollow manganese bronze castings be made of such forms as water and steam valves?

If manganese bronze is not suitable for such castings, what composition can be used?

Can any repairs of brass castings to be subjected to hydrostatic pressure be safely made by any process of "burning in" or welding now commonly used? If so, what relation has the shape and size of the casting to the methods and means to be employed?

What tests can be applied to prove that such repair has been successfully made, and that later a crack will not develop because of it?

Mr. Jonson made some experiments to show that cold worked brass was always in a state of initial stress. He subsequently found that very similar methods of test had been adopted by Professors Heyn and Martens in Germany. An account of these latter was given by Professor Heyn in his May lecture to the Institute of Metals in 1914. Mr. Jonson in one set of experiments took 6-inch lengths of round rods, faced their ends into parallelism and accurately measured their length. He then reduced the diameter of 4 inches of the length by successive steps of ⅛ inch, measuring the length of the turned specimen. This became longer at each turning, until a small central core only was left. The experiments shewed that initially the outer parts of the piece were in tension and the centre in compression. As the portions in tension were successively turned off, the compression became somewhat relieved, and the piece consequently elongated.

Messrs. Martens and Heyn developed a method for determining the tendency of brass to crack by immersing specimens in a solution of a mercury salt. In much strained samples cracks would then occur in a short time, but in other samples, presumably not so much stressed, the cracks would occasionally not become apparent for a number of days. This method was found to be useful, but not infallible, as some rods which within a reasonable period of observation developed no cracks by the application of the mercury solution subsequently spontaneously cracked.

This method of test was thought to depend upon the corrosion of the surface, and many experiences indicated that corrosion had much to do with the cracking under some circumstances. This was amply proved by some experiments upon samples, which were subjected to considerable strain and then submitted to corrosive influences. Some pieces of old corroded brass rods were also tested. They would stand bending only 45 degrees to 80 degrees before fracture, but other pieces of the same rod, when cleaned with emery cloth could be bent through 160 degress, or even flat on themselves without breaking. On the other hand, to show that corrosion is not a necessary factor in the cracking of brass, it is only necessary to recall that many specimens were found to be cracked when they were removed from the packing cases before being placed in use.

Mr. Flinn, in both papers, states that the trouble experienced may be classified as follows:—

1.—Breaks from stress, (a) initial stress due to methods of manufacture and (b) applied stress due to use.

2.—Damage by wrong heat treatment as in forging, bending, flanging, upsetting and annealing.

Damage of class 2 results entirely from lack of skill, knowledge or care on the part of the manufacturer.

Damage of class 1 (b) is dealt with in the joint paper of Messrs, Flinn and Jonson. They point out that manufacturers claimed for some of their special bronzes greater strength and toughness than steel possesses, besides being so much less liable to deterioration from corrosion. Ultimate strength and ultimate extension, however, are not the qualities which should determine the greatest stress which might be used in structures; this should be determined by the yield point of the material, the ultimate strength having little to do with the safe working stress when comparing different sorts of material.

The authors, however, are careful to refer to the "true" yield point of the metal, and state that a high yield point signifies nothing unless it is known what portion of this yield point is cancelled by initial stress, and, therefore, not available for working stress. They point out that if a test piece is continuously stretched by a gradually increasing load, when the true yield point is reached the metal flows until it is sufficiently hardened to carry the load. This, of course, is well known to be so in the case of all ductile materials. If a piece of ductile metal, whether it is a test piece or a piece of structural material, is subjected to a stress which deforms it, its yield point as regards further deformation due to the same kind of stress is raised, and it will not further deform until it is subjected to a greater stress than that initially put upon it. When it is seen that in the tests of the material used in the aqueduct work quoted in Mr. Flinn's papers that the ratio of yield point to ultimate strength ranges from 50 to 68 per cent. in the case of forgings, and from 45 to 71 per cent. in castings, one is forced to conclude that some of the results were obtained from specimens which were either subjected to high initial stresses or which had been submitted to high stress before test, and that, therefore, the recorded yield points were not "true." It is precisely this difficulty which has led our engineers to omit conditions as to yield point from acceptance specifications for ordinary steel for constructive purposes.

The authors of the paper upon the Inspection of Brass and Bronze consider that acceptance tests should include measurements of initial stress, and they suggest methods for determining this. They state that initial stress may be relieved in two ways: either by stretching the metal near the surface by mechanical work or by temporarily reducing its elastic limit by heating, and thus allowing it to be stretched by the compressive stress of the interior of the metal. The mechanical working used for the purpose is either squeezing between the rolls of a straightening machine or bending the bar successively in four directions at right angles to one another. This operation in America is given the name of "springing." Annealing, however, appears to be the more reliable method. They state that it has been proved that if sufficient time is allowed for annealing the temperature need not be so high as is required where initial stress has to be eliminated by quick annealing so that it is possible to eliminate initial stress by slow annealing without appreciably lowering the yield point given by cold drawing.

The question of "burning on" tips of propeller blades was referred to when the previous paper on brass was read at this institute. In this connection the remarks of Messrs. Flinn and Jonson upon foundry repairs will be of considerable interest.

They say that as brass and bronze castings are expensive to make it is not desirable to reject such castings on account of defects which can be remedied. Minor leaks in a casting may be stopped by peening. Which, however, they consider to be a questionable method of treatment. For very small defects they prefer to drill, and then to screw in a plug of the same metal as the casting. If this is not practicable the defective portions should be cut out by chisel or drill till all the defective metal is removed and the cavity then filled by pouring in metal from a crucible in such a way that the entire surface of the cavity is melted, and then consolidated by the added metal. If a gas flame is used for this there is a risk of the filling not being solid, besides the possibility of oxidation. When this method is adopted the cooling of the metal will be accompanied by contraction, which sets up severe tensile stresses in the added metal and in its surroundings. Further, the rapid cooling of the added metal makes its elastic limit higher than that of the neighboring portions. The state of tension so set up may be so severe that after a time cracks will appear.

The stresses may be lessened by keeping the casting heated to a high temperature while the repair is being made, but the best way to prevent cracking is to anneal the casting immediately the repair has been made. The annealing temperature should be maintained for several hours, so as to give the metal time to flow. This, they say, is the only way to insure safety in castings in which "burning in" has been adopted.

On the *Engineering Record* of August 12th, 1914, there appeared a communication from Mr. L. D. Van Aken, the Superintendent of the National Brass and Copper Tube Company, of Hastings-on-Hudson, New York, on the subject of the cracking of brass and bronze. He states that the frequency of these cracks has alarmed metallurgists, engineers, etc., and he attributes the failures mainly to what he terms the greed for higher tensile strength, which has led to a disregard for safety. He mentions that the U. S. Navy has adopted reasonable specifications for the elimination of the trouble. He records some experiments which he had made upon a brass having a composition of copper 61.33, zinc 37.66, lead 0.16, tin 0.83, iron 0.02. (This is very nearly the composition of our well-known Naval brass.) This was first made into an extruded rod 1⅛ inch diameter, allowed to cool slowly in the air and then tested. The result is given as No. 1. The rod was then cold drawn to 1 inch diameter, with the result given as No. 2. After this the cold drawn rod was annealed at 1,300 deg. F. for 30 minutes, and then allowed to air cool; the results of tests in this condition are given as No. 3. A portion of the rod after the same annealing was quenched in cold water instead of being allowed to cool in the air; the results are given in No. 4. Mr. Van Aken states that the annealing as in No. 3 is sufficient to prevent crackage of any description.

No.	Ultimate stren. lbs. per sq. in.	Elas. limit lbs. per sq. in.	Rat. Elas. to Ult. %	Elon-gat. in 2" %	Re-duction of Area %	Hardness Scleroscope
1	58,000	26,550	46	57.5	59.5	23.
2	73,100	70,100	96	27	45.2	29½, sur. 53
3	58,000	27,200	47	53	81.5	20.
4	63,800	29,900	47	38	38.5	20.

It will be noticed how enormously the cold drawing has affected the tensile strength, and more especially the elastic limit, and that the cold worked material still possesses as much ductility as measured by the extension and by the reduction area as would be shewn by a sample of a mild steel forging. Judged from the tensile test, it might be thought to be an excellent constructive material. Its high tensile strength, however, is dearly bought if it is accompanied by the tendency to spontaneously crack. The tests show also that annealing has restored the qualities of the metal to their original amounts.

It is to be noted that Mr. Van Aken only tested extended rods. In Mr. Flinn's papers extended rods are mentioned in such a way as to lead to the inference that extruded metal may be received with the same confidence as rolled or forged material. However, no comparative tests are given of the results of the two methods of manufacture. It is extremely desirable that some exhaustive experiments should be undertaken with different compositions of metals to show the effect upon the metal of the different processes, viz., casting pure and simple, forging, hot rolling, extrusion and also cold work, say, by drawing. These tests should include the effects of annealing. They should also include the resistance to repeated applications of stress commonly called fatigue tests. In fact, this kind of test is of greater importance than any other. It is evident that at present there is a lack of knowledge of the physical properties of many of the much used special alloys, although we have been using them for many years for very important structural purposes.

In the same volume of Transactions of the American Institute of Metals, which contains Mr. Flinn's paper, there is another communication by Dr. P. D. Merica and Mr. R. W. Woodward upon "The Failure of Structural Brasses." Dr. Merica is a Physicist of the Bureau of Standards, Washington.

In this paper there is a description of some work done in the Bureau of Stan-

dards in investigating the causes of spontaneous cracking in brass. The authors consider that failures are due primarily to the presence of internal stresses, and state that manufacturers should endeavour to produce material free from these stresses, and yet possessing the physical properties produced by the mechanical treatment which is responsible for these stresses. They state that it is possible, for instance, to make naval brass practically free from internal stress and yet having an ultimate strength of 60,000 lbs. and an elastic limit of from 30,000 to 35,000 lbs. per square inch.

The paper gives the results of numerous tests made with samples, some of which were new material, and others of brass which had been put into service. The authors tested these samples for internal stresses by Heyn's method. They state that their results may be relied upon to have a maximum error of not more than 1,000 to 2,000 lbs. per square inch, or 5 per cent.

The figures they give showed that all the samples they tested were more or less initially stressed, some of them to an enormous extent. Some of the samples have tension stresses on the surface, and others compression stresses.

They investigated the method of testing for initial stress by immersing the samples in solutions such as mercuric chloride, mercurous nitrate, ammonium hydroxide, etc. Cracks were often produced, sometimes in two minutes, sometimes in 24 hours. They found, however, that while those samples which had a high tension on the surface cracked, those which had large compressive stresses did not. This test, therefore, is not a sufficient one to enable defective material to be detected.

The following are the main conclusions arrived at by the authors:—

1. Failures occur, so far as is known, only in brass which has been worked, i.e., forged, hot or cold rolled, drawn, or extruded.

2. These failures are independent of composition.

3. The fractures occur, in general, transversely to the direction of working.

4. Failures occur in brass materials which are under initial stress provided these stresses average over 5,000 to 6,000 lbs. per square inch.

5. These stresses can be almost entirely removed by annealing at temperatures of about 300 deg. C. to 400 deg. C., which temperatures do not affect sensibly the ordinary physical properties.

6. No certain indication of the magnitude, or even the presence, of such stresses has been found in studies of the structure or of etching or corroding agents.

7. Brass may be manufactured practically free from stresses and still retain excellent mechanical properties, i.e., will not be too soft.

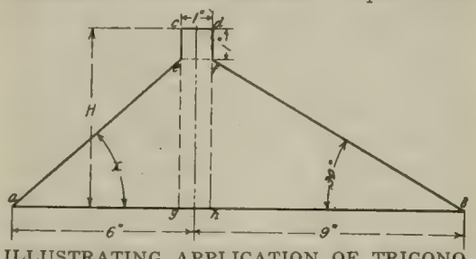
Dr. Merica stated that investigations are being continued at the Bureau of Standards, and invited the co-operation of both manufacturers and users of brass.

It will be noticed that neither in this present communication nor in the former paper has any reference been made to corrosion in general. This is, of course, a very important matter, and so far as condenser tubes are concerned is the subject of research by a committee of the Institute of Metals, assisted by a Government grant. Without wishing to detract from this very useful work, it is thought that the subject of the physical properties of copper alloys, especially as regards their reliability and their adaptability for use for important structural purposes, is quite as worthy of a thorough research as is that of corrosion.

TRIGONOMETRY APPLIED TO SHOP PROBLEMS

By J. H. R.

MECHANICS are often called upon to perform work that requires considerable figuring, or mental calculation, before the same can be successfully accomplished. The inability of many men to apply the knowledge that is necessary for the solution of certain shop problems results in the workmen adopting methods that are more or less guess work, or cut and try practice. The mention of formulae or trigonometry to the average mechanic is often sufficient to put them



ILLUSTRATING APPLICATION OF TRIGONOMETRY TO SHOP WORK.

on the defensive, as few men are willing to apply themselves to the brief study that would be required to fit them for mastery of these technical but none-the-less essential details.

The practical application of trigonometry to the more accurate production of shop work is shown in the accompanying cut and description. This piece has a base of 15 in., the angle B to be 30 deg.; and the dimensions of the raised portion C D E F to be 1 in. square. It is required to find the height H and the angle X; the proportion of the base in relation to the center of the top being 6 and 9 in. as shown. The tangent of the angle B is equal to the length F H divided by the length B H; or by conversion. F H equals tangent of B multiplied by B H. As the tangent of angle B—taken from a table of trigonometric functions—is .57735, the question becomes: F H equals .57735×8.5 equals 4.907 in. Therefore the height H will be 4.907 in. plus 1 in., or 5.907 in. The angle A can be found by using the same formula; thus, tangent A equals

$$\frac{E\ G}{A\ G} \text{ equals } \frac{4.907}{5.5} \text{ equals } .89227, \text{ and}$$

the angle corresponding to this value will be found to be 41 deg. 44 min.; this will be the angle of X.

A BRONZE mixture suitable for propellers and other marine castings consists of the following: Copper, 58 per cent.; tin, 0.25 per cent.; zinc, 39 per cent.; iron, 1.50 per cent.; manganese, 0.50 per cent., and aluminum, 0.75 per cent.

LATEST statistics show that twenty-three new steamships and thirteen sailing vessels were built in Holland during the first six months of this year, as compared with sixteen steamships and eight sailing craft during the same period in 1916. The total number of new vessels for the Dutch flag built up to July 1 this year was thirty-eight, twenty-four steam and fourteen sail, having an aggregate tonnage of over 81,000 tons, as compared with 54,000 tons built in 1916.

PORTLAND cement, a constantly growing necessity, was first made in England in 1824. The name is taken from the resemblance of the mortar to the oolitic limestone of Portland Island, in the English Channel. The industry was later taken up in Germany. In both countries it grew enormously, and at the beginning of the present war the output in Germany amounted to 20,000,000 barrels annually, and that of England about half as much. Portland cement was first made in the United States at Coplay, Pa., in 1878, and since then works have been established in nearly every State in the Union. The growth of the industry is perhaps the most marvellous thing in the whole industrial development of this country. No farther back than 1894 the product was small. Since then the output has increased enormously, over 100 per cent. in a single year, and the annual output now exceeds that of England and Germany combined.

IN a recent paper read before the Yorkshire Junior Gas Association, Mr. E. A. Leask stated that considerable progress had been made in the use of town gas for melting brass, copper, etc., and some installations will deal with upwards of two tons of metal per day. Air-blast crucible furnaces are used; and the tilting type is now becoming popular owing to the convenience with which large quantities of metal may be handled. Several tilting furnaces of 600 lb. brass capacity have been installed. Under working conditions the gas consumption for brass melting is 3 to 4 cubic feet per pound, and for copper 4 to 4½ cubic feet of gas per pound melted. The life of the crucible is much longer with gas firing than with solid fuel. At a low estimate twice the number of heats may be obtained. The great advantage of gas for crucible furnaces is, however, the speed with which the metal may be melted. With a 100 lb. capacity furnace of the pit type, a melt may be obtained every hour, and in a foundry working a little overtime twelve melts have been obtained in one day, which is double the output of a coke-fired furnace of the same size under similar conditions.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

REDUCING TOOL ROOM COSTS

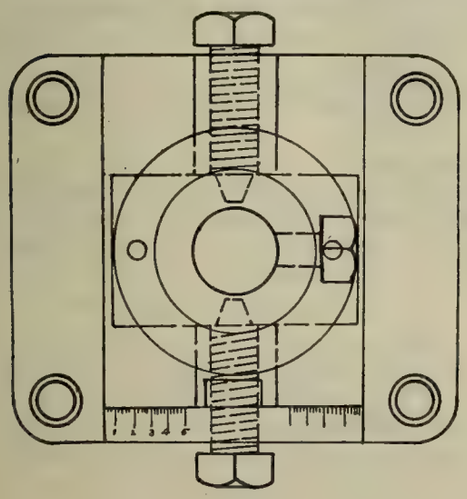
By G. C. White.

TOOL room costs have perhaps been heaviest indirect labor charges that manufacturers of munitions have had to bear. To say the least, they have been a necessary evil. Managements have striven, not in vain, to eliminate this burden by converting tool work into regular production jobs. Tools have been made in hundred lots, and by careful supervision unskilled labor has been used, leaving only the very best classes of the work for the tool-maker.

Once a jig has been made and the part gauged correctly and found O.K., it has been possible to use this part to produce other jigs and eliminate a lot of expensive locating work. This does not, of course, appeal to a high-class jig man, but the method helps to pay dividends.

Selected Help Necessary

The use of carefully-selected men for



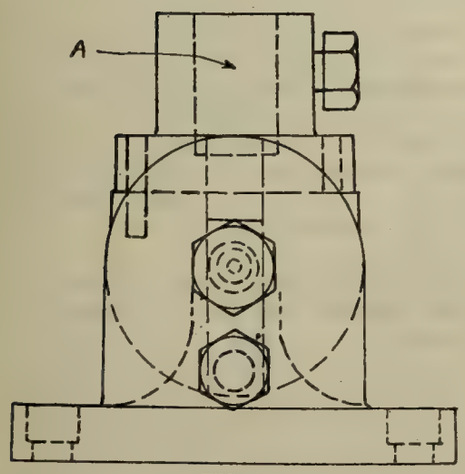


FIG. 2.

tool setters and having them, and them only, adjust the tools, has achieved results not previously thought possible. A good general machinist in each department, who could coach the tool setters and do such repairs as might be possible without a great many tools, has kept much work out of the tool room, and at the same time the men on the machines have more fully realized their responsibilities.

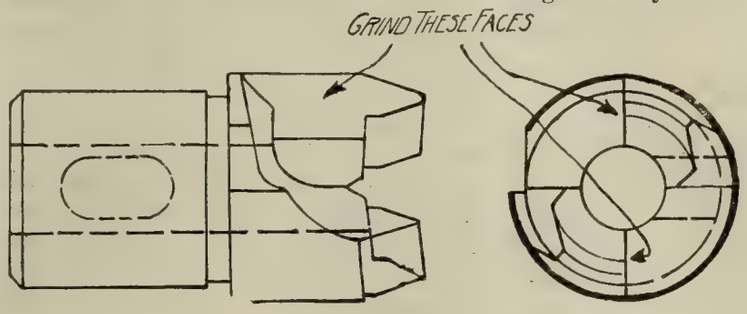


FIG. 1.

On one particular line of special purpose chucking machines one tool setter adjusted all the slides, while other two men looked after the tools, an arrangement which increased the output 100 per cent. Operators were not allowed to grind their own tools, but a plentiful supply was always in the tool setter's possession. Operators when allowed to grind their tools would change the clearances, and on circular form tools change the gauge sizes and grind away unnecessarily an expensive tool; while so doing the machine was idle. The grinding was afterwards done by a specialist, who gave all his time to this work.

The changes necessary to bring about these conditions were made gradually and sympathetically, so that the cooperation of the men was secured and at the same time the output increased and a saving in tools was effected.

Testing Hardness Before Grinding

Great care was exercised in the hardening room and every tool used was tested for relative hardness before putting it into the rack. Previously it was found that a $15 form tool would be occasionally thrown into the scrap box because it was soft, or was ground to size first and then found to be too soft for use.

All form tools were made to templets, and on account of them being carbon steel it was possible to finish the circular ones with a spring form master tool, thereby eliminating much time usually taken by the tool-maker in measuring with wires, etc. An endeavor was also made to divide the work so that each man handled the one type of cutter, and was familiar with all the details of their manufacture.

Keeping Chasers in Shape

A chaser grinder which was in the tool room was moved to the department where the die heads were used, and one man cared for all this work in addition to grinding the counterbores on this machine. In caring for the chasers it was found that a study of the form tools and material being cut was necessary for the intelligent grinding of the chasers. The angle left by the form tool which was to act as a lead for the threading operation was important, also that the chasers should have the lead ground so that there will be a gripping instead of a butting up solid action, as there would be if the angle on the work were the same as the angle on the chaser, which should be gradual and extend two threads. The diameter of the wheel which grinds the angle should be slightly larger in diameter than the diameter of the work.

The grinding of the counterbores, Fig. 1, was accomplished by using a fixture

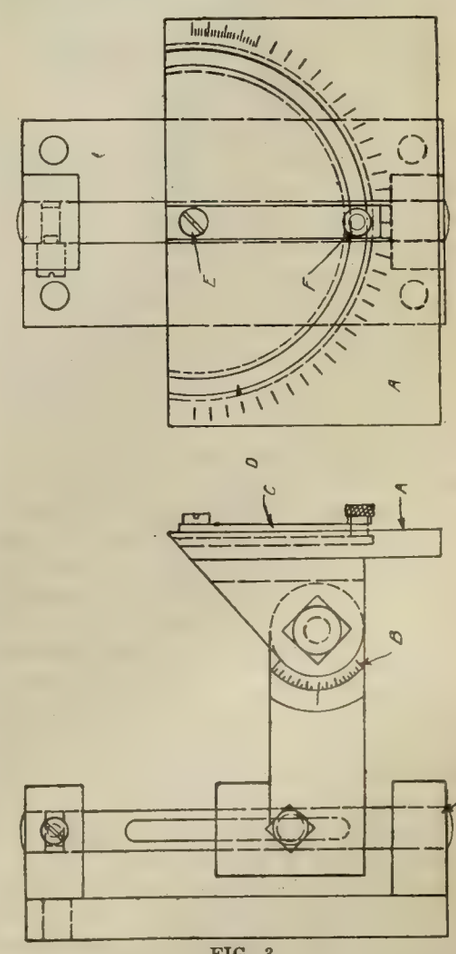


FIG. 3.

shown in Fig. 2, which only necessitated placing the tool in the hole A and tightening the set screw.

It was found that in order to use un-

skilled labor for grinding that the fixtures must be fool-proof. This jig was graduated and a table was made showing what angle was required for each tool, which had its own number clearly stamped on it.

An ordinary bench type 12-in. grinder was equipped with an angle adjustment fixture, which did excellent work grinding flat form tools. This fixture and the emery wheel housing were mounted on a flat cast iron plate and correctly located. The tools were placed on the platen A,

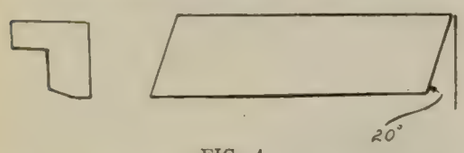


FIG. 4.

Fig. 3, which had been previously tilted the necessary number of degrees to give clearance. The graduations shown at B were used for this purpose. The angles on the platen were used to make the angle 20 deg., as shown on the sketch of the type of tool ground, Fig. 4.

A No. 5½, grade 36, disc wheel, 10 in. dia., was used on the arbor extension, and the tool was held down by hand, the platen being moved past the face of the wheel by revolving to and fro about the pivot shaft G.

The tool is held up against the strip C, which pivots on screw E, and is locked by thumb nut F, which slides in the T slot D.

GEAR TRAINS FOR THREAD CUTTING

By R. Hamilton.

ONE of the chief elements of error in any line of activity is the ever present factor of chance, and even the most experienced are not entirely free from this destructive agency. The advance of engineering, however, is gradually eliminating the possibilities of mistake in the operation of mechanical equipment, and, as machinery to-day is practically an essential in every line of manufacture, the chances of error are becoming less and less pronounced in every direction. Modern machine tool equipment, that comprises an important part of every metal working establishment, exemplifies the progress that has been achieved in this particular branch of engineering. The experience and knowledge acquired in past years, in addition to being preserved in book form, is constantly being incorporated into the design and construction of all classes of machinery, so that the ideas of engineers and scientists are continually being placed in a concrete form for the universal benefit of mankind.

Modern Methods Labor Saving

The cutting of screw threads has always been an important branch of machine shop practice; probably no other detail has received greater thought and attention. This operation still requires considerable ability on the part of the workman, but the methods adopted for this purpose have removed much of the difficulty that characterized its accomplishment fifteen or twenty years ago. Dies, specially constructed, have almost entirely eliminated the single point cutting of threads on bolts and small interchangeable parts of machinery; the forming of threads by the use of the thread milling machine has also materially reduced the necessity of cutting a helical groove by the primary method of the single point tool. Nevertheless, it is very improbable that the cutting of threads by means of the engine lathe will ever become extinct, owing to its ready and rapid adaptation to varied and special requirements. It is also true, however, that an engine lathe operator works under better conditions and more advantages to-day than his predecessor of a score of years back. The actual cutting of the thread may show little or no variation, but the changes that have been made in the design and construction of the lathe, together with the different attachments that are now available, makes the problem of screw cutting much easier; confining the difficulties to the nature of the material, the condition of the cutting tools, and the ability of the workman.

A feature in the average make of modern engine lathe that assists in their manipulation for cutting threads, but one that also tends to lessen the mental qualifications of the operator, is the improvements that have been made in the application of the change gears for moving the carriage at various speeds for cutting the different pitches of threads. To set a modern engine lathe to cut a certain thread, all that is required of the operator is to move one or more levers to indicated positions, and in many instances it is doubtful whether the workman could tell or even figure out the gears that are in train when cutting any particular thread. For the convenience of those that are not very familiar with the necessary calculations that are involved in the solution of problems of this nature the accompanying chart and data have been prepared.

Odd and Even Gearing

As the cutting tool is practically a unit with the carriage upon which it is secured, it is obvious that the lead screw must revolve in a certain relation to the work in order to cut the thread desired. With few exceptions, all engine lathes are so geared that if gears with the same number of teeth were placed on the spindle (or stud), and also on the lead screw, the work would turn at the same speed as the lead screw, and likewise a thread of the same pitch would be cut. This is termed "even" gearing. On those lathes where "odd" gearing is used it is the general practice to determine the ratio of variation and, after finding it, to consider the found value as the working pitch of the lead screw. For ordinary conditions, however, it will be sufficient to deal with the "even" geared lathe. The essential consideration in the gearing of a lathe is to obtain the proper ratio between the revolutions of the work with that of the lead screw. As before mentioned the speed will be the same if the pitch of the thread corresponds with that of the lead screw. It is, therefore, obvious that if a pitch is desired that is greater than the lead screw the speed of the latter must be faster than that of the work, and if a fine thread is required, the lead screw must necessarily revolve slower than the work. Generally when cutting threads of less than 20 the practice is to use a simple train; finer threads than this often require a compound train to obtain the desired ratio. In figuring for the gears to cut a certain thread, it should always be remembered that the movement of two couples must be the same; that is, the product of the gear on the spindle and the number of threads per inch on the work must equal the product of the gear on the lead screw and the number of threads on the lead screw. In other words, the ratio of the gears will be in indirect proportion to the respective threads; thus, with (t) representing the threads per inch on the lead screw, T the number of threads per inch on the work, S the gear on the spindle, and G the gear on the lead screw, the proportion becomes: $t : T :: S : G$. To illustrate by example: suppose it is required to cut a thread of six threads per inch on a lathe with a "four-thread lead screw." Using the above formula the solution is: $t : T :: S : G$—that is, $4 : 6 :: S : G$. Taking 30 as the gear for the stud, the equation becomes $4 : 6 :: 30 : G$. Then

$$G = \frac{6 \times 30}{4} = 45$$ for the gear to place on the end of the lead screw. As the various formulæ on the chart are quite clear and are just transpositions of each other, they will be readily understood without further explanation.

Compound Gearing

The principle of compound gearing is the same as that for the simple train, with the addition of an extra "couple," and in extreme cases two pairs of intermediate gears may be required. The important detail to remember in the use of compound trains is that the number of threads per inch on the work multiplied by the various driving gears must equal the product of the driven gears with the number of threads per inch on the lead screw. Suppose it is desired to cut a thread of 1/32 inch pitch on a lathe with a lead screw of 4 threads per inch, with a pinion of 24 teeth on the spindle the gear required for a simple train would be by formula $G = \frac{T \times S}{t} = \frac{32 \times 24}{4} =$ 192. This, however, is greater than any gear supplied with the lathe, and it is necessary to use an intermediate "couple" to obtain the required train. Dividing 192 by 2 and we get 96; use this for the gear on the lead screw, and use any pair for the intermediate "couple" that has a ratio of 2 : 1, such as 36 and 72, 40 and 80, etc. To prove the accuracy of the train thus found use the equation $t \times G \times A = T \times S \times B$, or by the above example, $4 \times 96 \times 80 = 32 \times 24 \times 40 = 0$, thus showing that the train is correct.

Use of Chart

The accompanying chart has been prepared more as a guide for quickly determining the different values in the solution of gear trains than as an infallible method for calculation, the object being to find the required gears and then to apply the necessary formulæ to prove the result thus found. To use the chart, lay a scale on so that the edge will coincide with a suitable pinion for the stud or spindle, and intersecting with the number of threads that is desired on the work; where the straight edge intersects the heavy line will show the gear that is to be used on the lead screw. The heavy line in the right-hand column is the base line and was graduated for a lead screw of 4 threads per inch; the two lighter lines on either side being for lead screw with 2 threads per inch and 6 threads per inch respectively, those on the left graduated for gears having an increase of 4 teeth for each succeeding gear, and those on the right for gears varying by 5 teeth. To use the chart for threads with a finer pitch than 1/30, divide the number of threads by a convenient small number, as 1.5, 2, 2.5, or 3, and use the result for finding the gear for the lead screw; then use a "couple" having a ratio corresponding to the divisor used. Suppose we wish to find the gears to use to cut 36 threads per inch with a lead screw of 4 to the inch, and the pinion on the spindle is 20 and the wheels advance by five. Laying on the scale across 20 on column x and 18 on column y (half of 36) we find the intersection to be 90 on column z (when 2 has been used as a divisor). Then use 90 for the gear on the lead screw and any pair with a ratio of 2 : 1 for the intermediate "couple."

MODERN BENCH CONSTRUCTION

IN many shops the design and construction of bench equipment is left to the carpenter or to any handy man qualified to operate a hammer and saw, the efficiency of the resulting article not al-

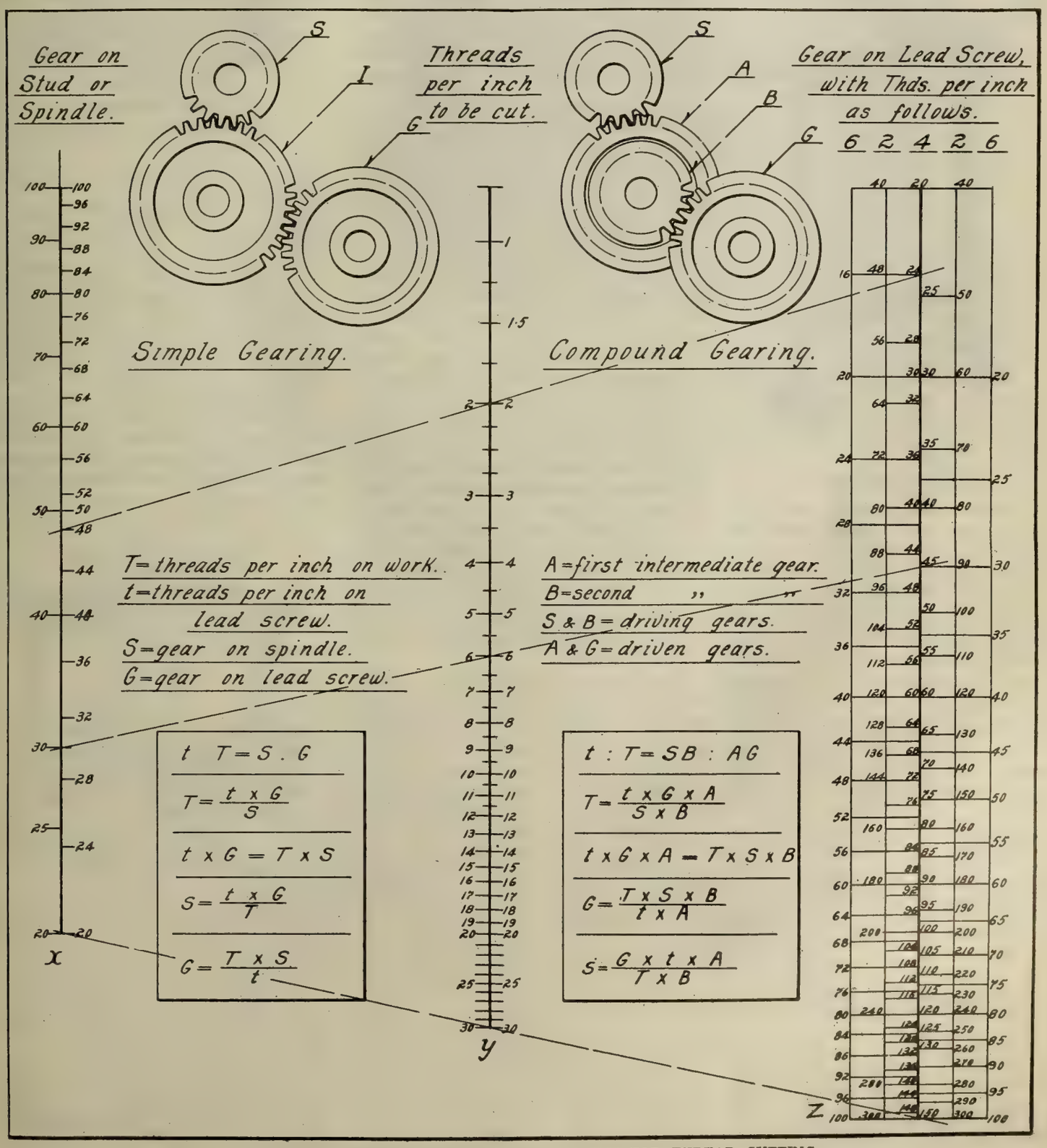


CHART FOR DETERMINING GEAR TRAINS FOR THREAD CUTTING.

ways being in keeping with the good intentions of the builder. The most frequent characteristics of the improvised article are heavy mission design legs, longitudinally arranged planks for the rear half, and the absence of a retaining back board.

Such a bench, when first completed, looks passing fair, but after having been in use a few months its inherent defects show up. During construction, the boss —if it be a small shop—may look it over once and say to the man with the hammer and saw, "That's good enough—

FIG. 1. PRESSED STEEL BENCH LEG.

never mind a board there,—we'll put these on later—don't trouble about the other thing," etc. Such a bench is a familiar article to many mechanics. Who has not had a nice array of parts sent flying in all directions when the man at the next vice turns a heavy casting over on its back? The springy unsupported planks deceive the thoughtless one, and respond to the bump with all the vigor of a cheap automobile spring. Green timber has shrunken since the bench was built, nails have slackened up, and the small work so carefully placed in position by the anxious toolmaker is either thrown off

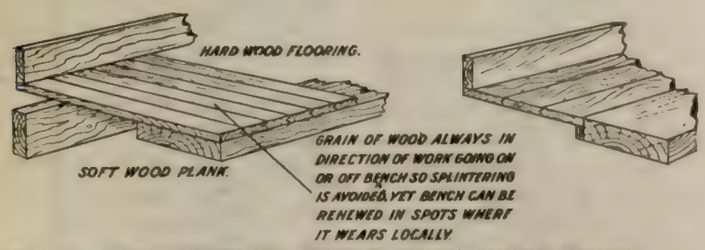


FIG. 2. LEFT, APPROVED METHOD OF PLANKING BENCH. RIGHT, CONVENTIONAL DESIGN OF PLANKING.

the front of the bench on to his feet, falls through the open joints, or rolls over the back where the retaining board was going to be placed—later!

The joys of scrambling around with a match looking for 3-16 in. headless set screws in a dark corner under the bench need not be enlarged upon. If the boss himself had to suffer these inconveniences, things would soon be different—likewise if he figured the amount of toolmaker's time rendered unproductive through inefficient design and cheap construction of workshop benches.

Cast iron legs have been marketed for many years and are gradually meeting with increased recognition, but the simple adoption of them, without due consideration to the design as a whole, will not eliminate the objectionable features referred to above. In endeavoring to perfect bench construction so far as materials and conditions permit, the use of pressed steel legs has received considerable attention from the New Britain Machine Co., New Britain, Conn., and methods of planking have been studied with a view to improvement in this matter also.

The accompanying illustrations show complete details—the pressed steel leg being built up of formed sections, electrically-welded without any riveting whatever. The resulting structure retains the stiffness and rigidity of its cast-iron prototype but without excessive weight and liability to breakage.

Essential qualities in a bench leg are: to make possible a stiff bench construction, without any dependence on the wall; to support underneath shelf and bin construction where required; to allow heating pipes in the rear where necessary; and to permit of a change of bench location without loss or damage.

A prominent feature of the bench construction developed by this firm is the patented longitudinal stringer which imparts great rigidity, prevents deflection, and assists in preventing end sway. This stringer is shown in place in Fig. 1, where a pressed steel bracket for supporting the back board is shown attached to it. It also forms the rear support for flooring strips when built as at left of Fig. 2. Wide spacing of legs—8 ft. on the average—is possible through the use of this stringer, resulting in economy of leg cost.

The pressed steel legs are of U-shaped section, with the U's facing each other enabling the underneath support for shelving and bins to be inserted between the flanges of the leg and securely retained in place. The arrangement of the back board provides ample space for heating pipes along the wall, back of the leg, while the shape of the floor supports gives ample bearing surface and allows of easy cleaning. The following directions while applying particularly to New Britain benches, are applicable to bench construction generally:

The legs may be set 8 ft. apart, center to center, and are usually placed to allow 3 in. clear space between backboard of bench and the wall. (In case of fire this allows water to follow down the wall and reach any fire under the bench.) Rear upright of leg will then be 9¼ in. from the wall.

After setting the two end legs in a length of bench to be put up, a line stretched along the back of leg where

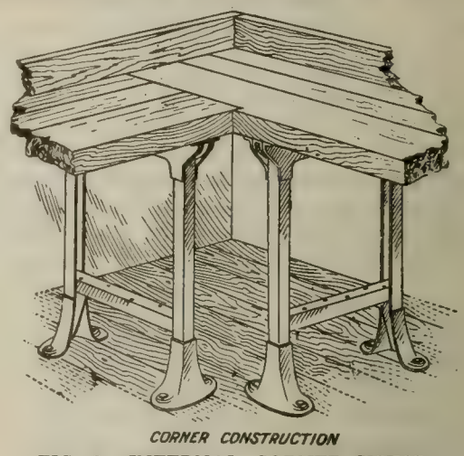


FIG. 3. INTERNAL CORNER USING LONGITUDINAL PLANKING.

stringer goes will accurately locate all intermediate legs.

Fasten legs to floor with lag screws, if floor is wood, or with expansion bolts, if of concrete.

Front plank, either 12 in. or 14 in. wide and 3 in. thick (2¾ in. dressed) is usually obtained in 16 ft. lengths, so that joints will come on every other leg. Lap joints are made where shorter lengths must be used and where joints do not come on the leg.

Place front plank on legs, and mark up through holes in leg for bolts. Planks should then be removed and bored for bolts. Replace plank and start bolts, being sure that bolts are carried well to the front of slots, to allow for the in-

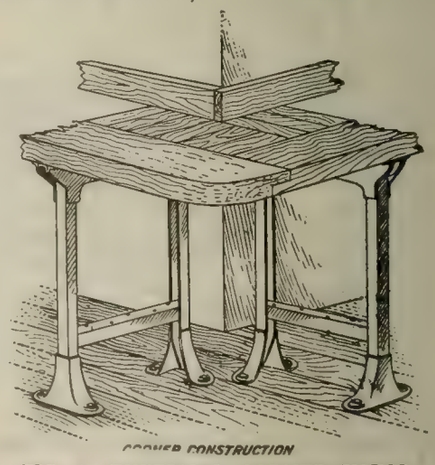


FIG. 4. EXTERNAL CORNER USING TRANSVERSE BOARDING.

evitable shrinking of plank and to compel the shrinkage to draw from front to back. Bolt will then follow in slot and plank will not be so likely to split.

When plank is properly aligned, tighten up bolts, then tack batten strips on back edge of plank, just enough below the top surface to let flooring come flush with top of plank.

Stringer may then be put on back of legs with top lined up with batten strips. Mark stringer for bolts, while held in right alignment, then remove and bore for bolts.

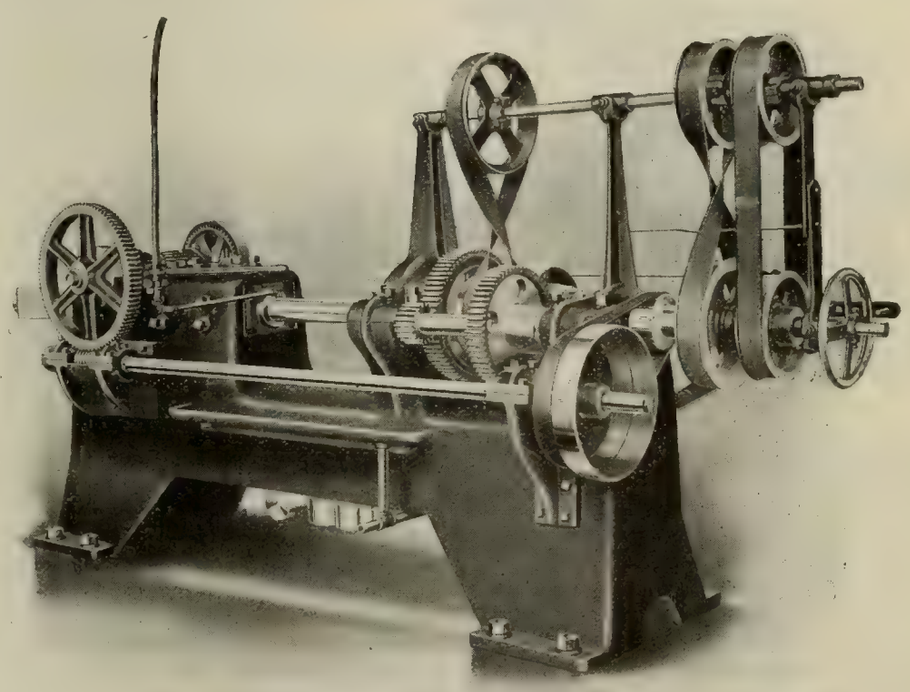
PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

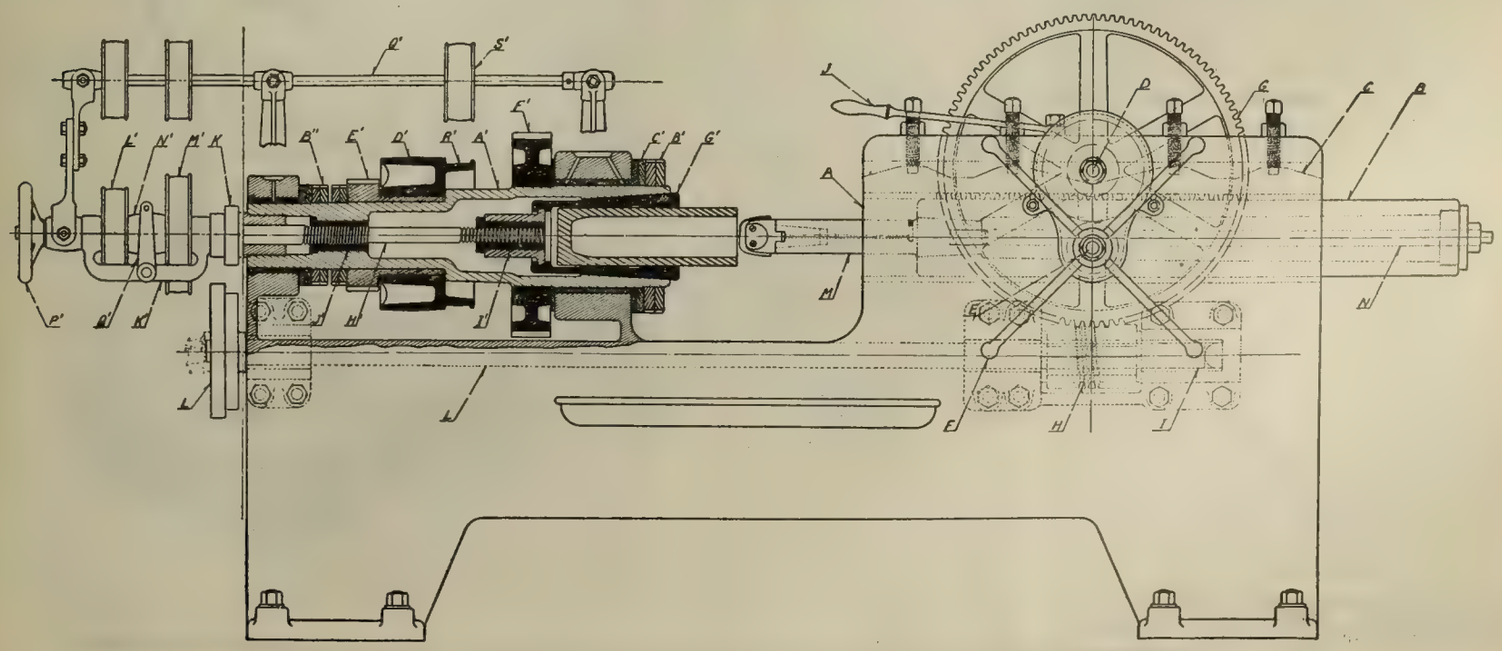
NEW DESIGN HEAVY DUTY SINGLE PURPOSE LATHE

PLANT efficiency and maximum production, in relation to munitions manufacture during the past three years, has undoubtedly been largely due to the adoption of the single purpose machine, specially designed for specific operations. In many instances, this type of equipment has been developed from the multitude of special devices and attachments that characterized the production methods of the incipient stages of shell making. The growth of the single purpose machine has revolutionized the manufacture of shells; not so much in the actual machining details, but in the rapidity with which these operations are accomplished. The accompanying illustration and line drawing shows a special single purpose heavy duty boring lathe recently designed by A. Villeneuve and constructed by the Plessisville Foundry Company, Plessisville. Que. Several interesting features are incorporated in the design which are of interest to munition manufacturers. The lathe here shown has been built for operating on 6-in. shells, and is equipped with a special design automatic screw chuck. A feature that has frequently prevented maximum efficiency in the boring of shells is the presence of vibration and lack of rigidity in the boring bar support; where a movable carriage is used upon which a turret is placed, the possibility of trouble due to an oscillating cutter is very pronounced.

The design of the boring bar support in the lathe here shown practically eliminates such objectionable features; experience has demonstrated its remarkable stability under the severest conditions. The tail stock A, which is integral with the bed, is the full width of the machine and has a length of 42 in. Central with the lathe spindle, the tail stock is cored out to receive the cast steel traverse bar B, 6 in. square. This bar is supported upon a heavy babbit base and is maintained in accurate alignment by two side and one top gib, running the entire length of the tail stock housing. Top gib C is reinforced for the adjusting screws, and is also relieved along the center of the lower face so that the bearing contact comes on either side of the forged steel machine-cut rack, which is fitted into a slot cut in the top of the traverse bar. This rack meshes with the small pinion located in the center of the cross shaft D, the near end of which carries the large gear of the hand operating train, the pinion of this train being fitted to the lower shaft E, upon which the hand operating wheel F is secured. On the rear end of the cross shaft D is secured the large worm gear

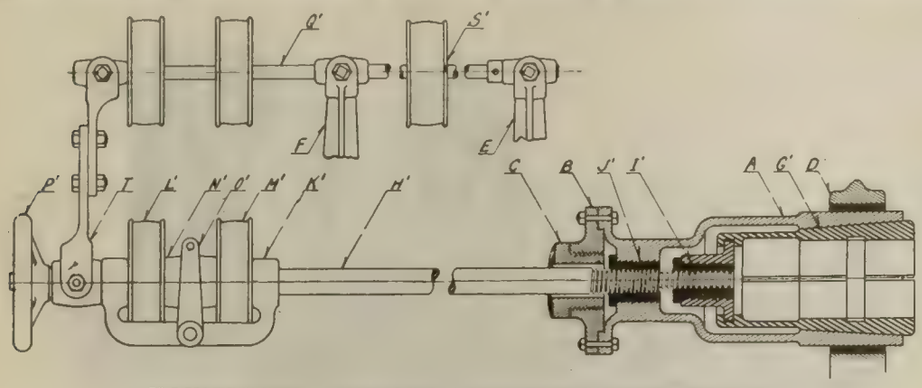


REAR VIEW OF SINGLE PURPOSE LATHE, SHOWING INTEGRAL TAILSTOCK WITH WORM FEED GEAR.



ELEVATION OF LATHE SHOWING SPINDLE, BEARINGS AND CHUCK IN SECTION.

G that in turn engages with the worm H located in the thrust bracket bolted to the back of the lathe bed; this large worm wheel is made of cast iron, having a diameter of 24 in. and a width of face of 3 in. An ample thrust bearing I is provided to take care of the lateral pressure of the worm shaft, this being assist-



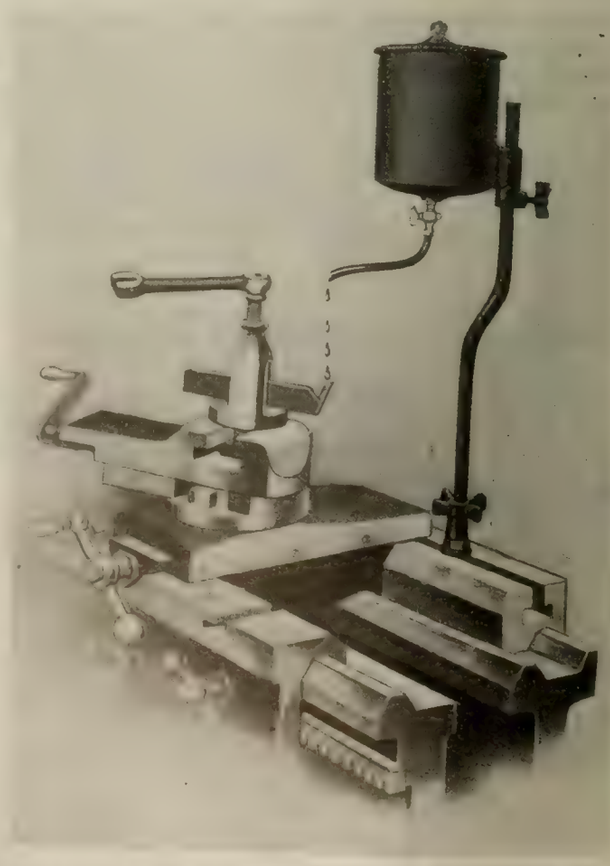
ILLUSTRATING OPERATION OF CLUTCH COUNTERSHAFT.

ed by the hub on the food cone L. The power feed is engaged by means of the lever J that operates a positive clutch acting on the hub of the large worm wheel G. The power feed is obtained from the small pulley fitted to the rear end of the main spindle, and is belted to the larger pulley on the end of the worm shaft L; the cone ratio provides a feed per revolution of 1/16 in. and ⅛ in.; this feed, however, can be easily altered to suit the operation being performed. The boring bar M that carries the forming or boring cutter is supported in the forward end of the heavy traverse bar by a suitable taper, and in addition to being keyed to position, is held to its seat by the pull of the tension rod N, 1¼ in. dia., that passes completely through the bar.

Apart from the special design of tailstock, this lathe is equipped with an automatic screw chuck that provides a maximum degree of gripping power on the outer surface of the shell, which has previously been rough turned. This type of chuck has no claim of paramount superiority over that of the pneumatic type, but, what is often an essential factor of installation problems, overcomes the necessity of putting in an air compressor for the operation of such equipment. This chuck, however, has certain features that permit of as rapid action as that of an air chuck, and yet eliminates the physical effort, on the part of the operator, that is so pronounced in the hand-operated chuck. The main spindle A', which is made from a steel casting, is 12 in. dia. on the front end and 7 in. dia. at the rear bearing, the respective lengths being 9 and 6 in. The spindle is also provided with double thrust collar bearings, one of which is located on the forward end of each main bearing, the adjustable nuts B' being used to take up the lateral play and provide a wide bearing on the phosphorus bronze washer C', the total area of these two thrust bearings being approximately 172 sq. in.

The driving pulley D' that carries a 6 in. double belt is 14 in. dia., and is threaded to the main driving pinion E', the bore of which revolves freely on the main spindle. Through the back gears the spindle is driven by means of the large gear F', which is also screwed to a permanent position on the main spindle. The jaws G' of the collet chuck are of the ordinary type, made from steel castings, but have a length of bearing on the shell of about 15 in. The draw rod H' that controls the operation of the chuck is a feature of special interest, as it is provided with two different pitch threads that allow of rapid action and yet retains the advantage of the power exerted by the thin wedge resultant of the two fine pitches. The thread on the forward end has a pitch of ¼ in. and a diameter of 1⅛ in., while the rear screw has a pitch of 1/6 in. and a diameter of 1⅜ in., both threads being of the Acme type. The forward nut I' has a lateral movement equal to the travel of the jaws, but the rear nut J' is permanently fixed in the body of the lathe spindle. This means that the lateral travel of the draw rod H' is governed by the number of revolutions of the draw rod, plus or minus that of the main spindle, while the movement of the chuck jaws, in an axial direction, is governed by the joint lead of the two threads. The bracket K' that provides afulcrum for the bell crank clutch lever O', and also furnishes a support for the tail end of the draw rod, is secured in position by stay rods bolted to the machine bed or to the floor. The loose pulleys L' and M'—one for advance and the other for reverse—are driven from the overhead pulleys located on the countershaft, this being supported on suitable brackets about three feet above the lathe spindle. This countershaft receives its power from a belt passing over a narrow pulley that is integral with the main driving pulley. The clutch N' that controls the chuck action is keyed to a bronze bush upon which the loose pulleys revolve, this bush in turn being feathered to the draw rod. The clutch is operated by means of a hand lever located on the forward main spindle bearing and in a convenient position for the machine operator, a suitable rod connecting this lever with the bell crank lever O'. The automatic operation of the chuck is obtained by the small hand wheel P', which is adjustable to any desired position on the extreme outer end of the draw rod H'. Extending from the bracket K' is an adjustable rod, or shifter, that carries a pin which engages with the side of the wheel P' when the chuck has been fully released, and thus throwing the clutch out of gear and into a neutral position. A similar action takes place when the chuck is being tightened on the shell.

The clutch operating countershaft runs in the opposite direction to that of the lathe spindle, so that the open belt on the rear is used for tightening the collet, as the threads on the draw rod are left hand. When gripping the shell, it is obvious that the central rod is running in the opposite direction to the spindle, resulting in rapid action. On the other hand, when the clutch is thrown into release the rear cross belt is in action, thus revolving the draw rod in the same direction as the spindle, but at increased speed, resulting in a more gradual opening of the chuck jaws. The machine has a floor support of 9 ft. and an over-all length, when traverse bar is fully back, of about 15 ft.; the shipping weight is upwards of 8,000 lbs.



APPARATUS FOR FEEDING CUTTING COMPOUND ON LATHES, ETC.

COMPOUND FEEDER FOR MACHINE TOOLS

THE device illustrated in the accompanying engraving for feeding oil, soda water, or other lubricant to cutting tools, is one of a line of machine shop accessory equipment produced by the New Britain Machine Co., New Britain, Conn. It is designed to afford the maximum of convenience and economy in use, and in cost it is frequently lower than many extemporized or home-made arrangements.

The cast iron bowl is carried on an upright support which has an offset so that, by turning it around, the bowl can be quickly adjusted in a horizontal direction. The bowl is fixed at the desired height by means of collar and set screw, the collar having V-shaped projections which fit into corresponding notches on the underside of bowl socket; the bowl may thereby be replaced after filling in exactly the same position as before.

A cast iron cover prevents access of dust and foreign matter. The outlet is fitted with a brass cock to regulate the flow of lubricant. The upright which carries the bowl is designed to fit the T-slot in the lathe carriage, and can likewise be adapted for use on milling or drilling machines. Bowls are furnished in two capacities—five pints and one gallon, the respective weights in shipping order being 27 and 35 lbs.

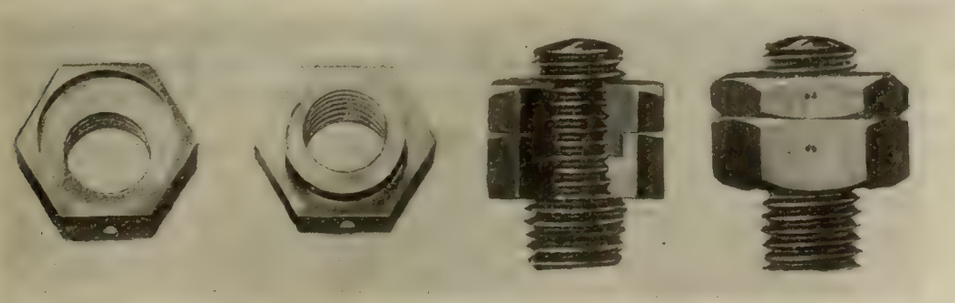
ECCENTRIC LOCKNUT

INHERENT defect in design, resulting in shortcoming or weakness sufficient to prevent its good points from being properly availed of has been the cause of failure in many types of locknuts which from time to time have been evolved with an aim to supplanting the ordinary slotted or castle nut with a spring washer or split pin. High cost, complicated construction, necessity for special tools to operate, damage to bolt threads and impossibility of re-use have variously operated against the complete success of any one locknut.

In an effort to overcome these objections, the Ross Locknut has been developed and is now being marketed by the Ross Locknut Co., 117 Leadenhall St., London, Eng., who have had it subjected to severe tests, including aeroplane service. This device derives its efficiency from the operation of a double eccentric the formation of which is shown in the accompanying illustration. The threaded holes are eccentric with the body of the nut, and the counterbore on one piece and the projecting portion of the other, while of the same diameter, are so disposed that when guide marks on two of the flats are brought together, the threaded holes are directly in line with each other and the nut turns freely.

The wrench embraces both parts while tightening up, after which the upper section is turned by itself so that its threaded bore tends to become eccentric with that of the lower section, due to the wedging action of the eccentric and the counterbore. The outer section may be turned in either direction to lock, and is unlocked by turning back again till the guide marks are in line.

This lock nut requires no tool other than the ordinary wrench; no drilling in the bolt; does not impair its own or the bolt threads; and can be re-used as often as required.

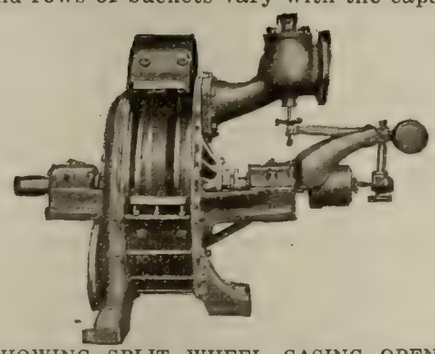


TWO-PART LOCKNUT UTILIZING ECCENTRIC PORTIONS TO OBTAIN LOCKING EFFECT.

CURTIS STEAM TURBINE FOR FANS, BLOWERS AND PUMPS

THE Canadian General Electric Company is offering a Curtis Steam Turbine in a wide variety of capacities to drive fans, blowers and pumps for boiler feeding and circulating systems.

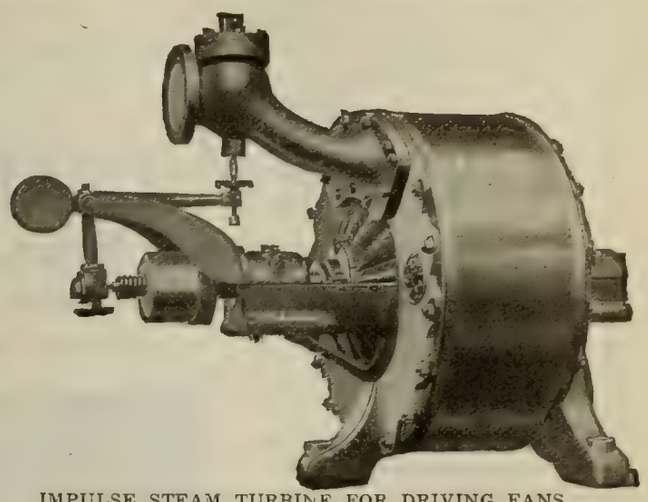
It is called the type L and is of the impulse type. The number of stages and rows of buckets vary with the capacity. The principles used and mechanical practice evident in the construction are the result of the vast experience of the manufacturers in producing turbines for practically every class of service.



SHOWING SPLIT WHEEL CASING OPENED FOR INSPECTION.

A split wheel casing is used to permit ready inspection of the buckets which are of bronze securely dovetailed into the rim of the wheel. The exhaust steam is free from oil and is well suited for heating feed water.

Speed regulation is close and reliable and the speed may be changed by hand wheel adjustment while the turbine is in operation. A constant running speed is maintained by a simple and powerful speed governor mounted directly on the shaft and controlling a double balanced piston valve type throttle.



IMPULSE STEAM TURBINE FOR DRIVING FANS, BLOWERS AND PUMPS.

The main shaft carrying the turbine and governor runs on babbitted bearings with renewable linings, and is fitted with readily accessible packing glands.

Three feet support the rigid frame of the turbine to insure the bearings always being in line. The wheel casing is neatly lagged with planished iron.

IN alloying a pot of bronze it is a good plan to leave out a small piece of zinc, say two or three pounds, until you have broken your test bar and noted the grain, says Brass World, for sometimes the grain is a little coarse if all the charge is put in at once, due to the scales or the man weighing not being accurate, or due to other causes. Nine out of ten times the grain will be all right, but the tenth time it will be a little under or a little over. Then it requires that either part or all of the zinc left out should be put in, or if overgrained a small piece of copper, and another test made. The leaving out of the piece of zinc is very beneficial when alloying two or more pots and trying for the same grain.

A hundry young cyclist had put up for the night at a wayside inn, and found the supper rather scanty, the most substantial part of it being a single sausage-roll. With a fault-finding look and gesture, he called the innkeeper to his side.

"Is that the best you can do in the way of sausage-rolls?" he asked.

"Why," said the host, "isn't it good?"

"Oh, it's good enough, perhaps, but the ends of it do'nt suit me!"

"The ends? What's the matter with them?'

"Too near together, said the hungry youth, and the innkeeper took the hint.

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CANADA TO AID UNITED STATES

LATE hour advices from authoritative sources confirm the expectations already forecast in these columns that all Canadian plants, equipped to produce munitions and supplies to aid in the prosecution of the war, are on the eve of a revival of activity which may, before the lapse of many months, equal, if not very much exceed, the strenuous days of a year or so ago.

CANADIAN MACHINERY is in a position to state that United States shell contracts approximating $50,000,000 in value are now being placed in Canada. Expectations that the orders will be placed by the Imperial Munitions Board, acting for and in conjunction with the United States Government and Army Department officials concerned, are confirmed. A conference has been held at Ottawa between the Imperial Munitions Board and Canadian manufacturers, while representatives of several factories are in New York and Washington conducting negotiations in person.

Just as the various phases of the war and its ever-increasing demands have time and again exceeded the most sanguine hopes, so they would seem to render futile any attempt to forecast accurately the extent to which United States requirements will draw upon Canadian resources. Some slight idea may be gained from the statement that when the United States authorities were ready to place contracts for thirty-three million 75-millimetre shells, the utmost capacity available there only totalled eleven and a half million, based on delivery by Oct. 1, 1918. The urgency of the situation caused immediate consideration to be given to Canadian capacity, much of which was dormant or running at reduced output.

The total preliminary requirements in United States shells are 50,000,000, so that our former shrapnel capacity, immense though it was, will be hard put to it to supply demands from over the border. A feature which will contribute largely to the success of our pending efforts is that of supplies of material. Delays formerly experienced through shortage of raw material for forging plants, and of rough forgings for finishing plants, should, under the changed circumstances, be more or less rare, the initial sources of the material which will be shipped here for manufacture being subject to control by the United States authorities in the matter of priority of delivery.

The 75-mm. shell, which is approximately the same size as the British 3.3 in., is of the high explosive type, and this size has, in view of the location of the United States front in France, been adopted for use, in this war at any rate, as the United States standard. The degree to which France's gun production has been expanded, and the fact that shells can be obtained rapidly and in great excess of the corresponding American gun production are obvious factors influencing the decision to use this shell.

Just here the value of our past experience in shell making becomes apparent. Not a few factories changed from 18-pdr. shrapnel to 18-pdr. high explosive and then back again to shrapnel. The trouble involved, however unpleasant at the time, is now proving its own recompense. The attitude of the American Government is thus expressed by certain individuals in close touch with developments: "The Canadian manufacturer can get all the 3 in. high explosive shell orders from the United States that he can undertake; they will insist on deliveries right to the day; and the only basis for orders will be past performances." The intention of Washington authorities is, we understand, to put Canadian orders on a fair business basis, our information being to the effect that "they would certainly favorably consider a Canadian firm who had a plant already equipped before placing an order with an American or any other firm who were not equipped."

On Nov. 9, a special telegram from Washington stated: "American firms insist on delivery guaranteed, and think Canadian Government or Imperial Munitions Board should be responsible for fulfilment of contracts on time." Later developments have confirmed this announcement, and the close touch maintained by the Imperial Munitions Board with the numerous shell factories in the Dominion since the slowing down of production will insure the immediate placing of very many contracts in the most suitable and desirable quarters.

Of almost equal importance to munitions production is that of building engines, boilers and marine auxiliary equipment for the gigantic output of ships now rapidly assuming shape in the States. Demands on firms capable of handling general engineering work are growing in insistency, as evidenced by several American firms now building vessels for the Emergency Fleet Board, and who are now in a position to let sub-contracts to Canadian firms for equipment. Nautical instruments are also included in the equipment for which the Board is now in the market, so that the field is wide enough to include almost all varieties of our metal-working plants.

An important point, and one which will influence and also greatly facilitate the securing of contracts, is that, whether negotiating with the individual builders referred to, or with the Board direct, our manufacturers should state clearly and completely, in the first instance, the particular specialty or specialties they are prepared to furnish. Failing this, and in the absence of specific knowledge of marine requirements, a full statement of past activities and type of product, together with such evidence as will convince the contractors of the firm's ability to meet new and varied demands, should be submitted without delay.

Official announcement is pending regarding the reported transfer of 400,000 tons of Japanese shipping to the Atlantic Ocean. This fact alone indicates the gravity of the situation, the necessity for speeding up everything beyond all preconceived limits, the possible extent to which Canada must yet exert herself, and the impossibility of considering any other than a successful termination to hostilities.

Now, more than ever, the time is ours to help. The spirit of the States was voiced thus by Secretary Lane: "Beat the Kaiser or America dies." And if America, Canada also.

INDUSTRIAL NOTABILITIES

WALLACE HAVELOCK ROBB, president, Canuck Supply Co., Ltd., Montreal, Que., was born in Belleville, Ont., May, 1888, son of W. D. and Catherine (Black) Robb, and received his education in public and high schools of Belleville.

He began his business career with Canadian Bronze Co., Montreal, 1906-1909; and during 1910 engaged in business with his brother, J. D. Robb, under their own name, the present organization being established in 1911.

WALLACE HAVELOCK ROBB.

Mr. Robb served with No. 1 Heavy Artillery as Lieutenant, 1914, to February, 1915, going overseas with the first contingent. On his return in the early part of 1915 he, with several others, organized the Spartan Machine Co., Ltd., for the purpose of manufacturing shells for the Imperial Munitions Board; the two organizations employing about four hundred operatives.

Mr. Robb's clubs are: Engineers'; St. George's Snow Shoe; Kawanaki Golf. He is also affiliated with the following societies: A.F. & A.M. (Mount Royal Lodge); Carnarvon Chapter, Royal Arch Masons.

His principal recreations are golf and camping. In politics he is Conservative, and in creed Presbyterian.

Mr. Robb married Edna Ilene Burrows, daughter of S. Burrows, of Belleville, June 4, 1913, and has one son. His residence is 185 Belgrave Avenue, Montreal.

—Photo, courtesy British & Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	35 50
Standard low phos., Philadelphia	*....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

*Government prices.

	Montreal	Toronto
Hamilton	....	.....
Victoria	....	60 00

FINISHED IRON AND STEEL

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3/16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	....
Tank plates, Pittsburgh	.....
Structural shapes, Pittsburgh	....
Steel hoops, Pittsburgh	....
F.O.B., Toronto Warehouse	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	4 50
Structural shapes	5 00
Plates	7 00

FREIGHT RATES

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Lake copper	$32 50	$32 00
Electro copper	32 50	32 00
Castings, copper	31 50	31 00
Tin	67 50	72 00
Spelter	10 50	10 50
Lead	9 50	8 50
Antimony	17 00	18 00
Aluminum	60 00	62 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ¼ to ½	$13 00	$13 00
Heads	13 30	13 30
Tank plates, 3-16 in.	13 10	13 25

WROUGHT PIPE

Effective July 5, 1917.

Size	Black Standard Buttweld Per 100 feet	Galvanized Standard Buttweld Per 100 feet
⅛ in.	$5 00	$6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00

Standard Lapweld

2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ ins.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 45%.

4½" and larger, 40%.

4" and under, running thread, 25%.

Standard couplings, 4" and under, 35%.

4½" and larger, 15%.

OLD MATERIAL

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	21 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	15 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	20 50
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	6 00	7 00
Tea lead	5 00	5 75
Aluminum	28 00	25 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up.	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 20
Elevator bolts	5
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less.	10
Blank bolts	net
Bolt ends	net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	15
Boiler rivets, base ¾-in. and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	72½
Wood screws, O. & R., bright	67½
Wood screws, flat, brass	37½
Wood screws, O. & R., brass	32½
Woodscrews, flat, bronze	27½
Wood screws, O. & R., bronze	25

MILLED PRODUCTS

	Per cent.
Set screws	25
Eq. & Hex. Head Cap Screws	20
Rd. & Fil Head Cap Screws	net
Flat ⅞ But. Hd. Cap Screws plus	net
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and semi-fin. nuts over 1½ in., up to 2 in.	plus 10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4 50
Cold pressed nuts over 1½ in.	add $7 00

BILLETS

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	....
Wire rods	57 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$5 50	$5 45
Cut nails	5 70	5 80
Miscellaneous wire nails	60%	
Spikes, ⅜ in. and larger	$7 50	
Spikes, ¼ and 5-16 in.	8 00	

MISCELLANEOUS

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drums	4 75
White lead, pure, cwt.	16 55
Red dry lead, 100-lb. kegs, per cwt.	16 25
Glue, English	0 38
Tarred slater's paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 78
Linseed oil, raw, single bbls.	1 42
Linseed oil, boiled, single bbls.	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery cloth	list plus 33 1-3
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Drilling cables, Manila	0 41
Plumbers' oakum, per lb.	0 09
Packing, square braided	0 34
Packing, No. 1 Italian	0 40
Packing, No. 2 Italian	0 32
Pure Manila rope	0 39
British Manila Rope	0 33
New Zealand Hemp	0 33
Transmission rope, Manila	0 45
Cotton Rope, ¼-in. and up	0 47

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

CARBON DRILLS AND REAMERS

	Per Cent.
S.S. drills, wire sizes up to 52	30
S.S. drills, wire sizes, No. 53 to 80	net
Standard drills to 1½ in.	30
Standard drills, over 1½ in.	30
3-fluted drills, plus	10
Jobbers' and letter sizes	20
Bit stock	25
Ratchet drills	15
S.S. drills for wood	30
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 30
Bridge reamers	52½
Centre reamers	10
Chucking reamers	net
Hand reamers	10

COLD ROLLED SHAFTING

At mill ..... list plus 40%

At warehouse ..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Canadian malleable, A, add 35%; B and C, plus 25%; cast iron, net; standard bushings, 25%; headers, 60; flanged unions, 5; malleable bushings, 30; nipples, 45; malleable lipped unions, 40.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$9 50	$9 50
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	10 95
Premier, 10¾ oz.	13 85	11 25
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

1/8 in.	$15 50
3-16 in.	11 70
1/4 in.	8 40
5-16 in.	7 40
3/8 in.	6 35
7-16 in.	6 35
1/2 in.	6 35
5/8 in.	6 35
3/4 in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	40
Black Diamond	40
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	37½
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke	
Connelsville Foundry Coke	
Steam Lump Coal	
Best Slack	

Net ton f.o.b. Toronto.

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun, Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White.	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16
Colored.	
Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14 x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base	64 00	60 00
Braziers', in sheets, 6 x 4 base	55 00	52 00

BRASS.

Brass rods, base ½ in. to 1 in. rod	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	06
Emery glue	15 to 20
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt, sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

Market Condition and Tendency

New Shell Contracts and War Loan Revive Shell Industry—Pig-Iron and Steel Show Weakness.

THE revival in the munitions industry is the most important development in industrial circles in some time. It is generally believed that the orders for the 75-mm. shells which have come from Washington are preliminary to further contracts from the same source. A considerable portion of the new war loan will doubtless be expended in munitions for the British Government which is a further assurance of activity in the munitions industry. Practically all the Canadian plants and their organizations are intact, so little time need be lost in commencing production which is a very essential feature. As a result of the new shell orders, increased activity is expected in the machine tool business which has been quiet for some time. Canadian machine tool builders will benefit and a further spell of good trade seems assured. An important development in the domestic pig-iron market is a decline in the price of foundry iron due to the situation in the States where the market is easier on account of the recent regulation of prices. A sharp advance in the price of tin due to a scarcity is the principal feature in the metal markets. As a result solders have advanced one cent, but all other prices are unchanged. Copper continues quiet and position unchanged. No activity is looked for in copper in spite of the big demand as the price has been fixed and distribution regulated. There is no change in the situation in the steel trade, but prices have a weaker tendency in sympathy with the market in the States. The shortage of steel continues to restrict manufacturing operations.

MONTREAL, QUE., Nov. 12, 1917.—Stimulus has been given to the Canadian industrial situation by the recent placing of considerable business by the American Government for comparatively large quantities of shells. The business is, however, being distributed only among those firms who are in a position to guarantee delivery in a certain time, and the Canadian firms that are expected to participate in the production of these shells are those whose equipment can be best adapted, and in the shortest possible time, to the type of shell required. It is further anticipated that the volume of American shells of the heavier calibre that will be required will overtax the capacity of the plants in the States and it is thought that orders for shells of the heavier sizes may eventually be placed in Canada, provided those firms that are favorably equipped will be permitted to accept this business. The latter policy may largely depend on the future program of the Imperial Munitions Board. The feature of the week is the inauguration of the Victory Loan, the success of which will not only increase the confidence of the people and the Government, but provide means of financing orders during the coming winter.

Pig Iron

The American pig iron situation has been relieved of much of the tension that has characterized the market during the

past few weeks, by the further regulation in connection with the various grades of iron, the result being to stimulate the producers to greater activity, so that the effect has been a notable increase in the output of the furnaces. The abnormal Government requirements, however, continue to place the domestic consumer in a position where it is very difficult to find a furnace that will accept new business at the present prevailing price as fixed by the Board. The feeling is general that the near future will experience an easier situation in regard to the acceptance of business for the first half of 1918. The Canadian situation is devoid of features, with producers virtually out of the market.

Steel

Recent developments have not had the effect of materially changing the steel situation here in Canada and the trade is still suffering under the embargo that practically exists in connection with the shipment of steel from the States. As a result of recent negotiations on the part of the Deputy Minister of Trade and Commerce with the Government at Washington, it is hoped that some relief will be given to the Canadian situation; this, however, will apply more to war essentials than to domestic business. During the past week large orders have been placed in Canada for American shells and it is understood that the steel for these munitions will be forwarded from the States to enable the various firms to work with all speed in their production. Further price regulations by the American Government have been made, which have been immediately followed by corresponding adjustments by the producers themselves on such lines as would naturally be affected by recent changes. Rolling billets are now among the lines that are controlled by the Government price, this having been fixed at from $47.50 to $51 per ton. General satisfaction is expressed over the adjustments that have been made in the ruling price on sheets, and with the exception of galvanized goods, the regulations are about what has been looked for by the trade. Galvanized sheet mills that are accustomed to produce their own black sheets will experience little difficulty in meeting the requirements, but others will necessarily be restricted to small profits owing to the market conditions. The new prices are based on the base price Pittsburgh, of 4½c per lb., this being 1¾c below that recently quoted on the open market. The regulation price on galvanized sheets is now 6½c per lb., Pittsburgh, this being 1¼c below that of last week's open market. Following the announcement that the Government has fixed the price of plain wire at a base price of 3½c, Pittsburgh, the producers have voluntarily adjusted other lines of wire products on a corresponding scale. The quotation on railroad spikes has shown a decline of 1½c during the past week, with the price ranging from 6 to 6½c per lb. The discount on cold rolled shafting has been officially set at 17 per cent. Plate mills are working to capacity, but orders are mostly confined to war requirements. The Canadian situation has been affected very little by the developments, but efforts have been made to increase the shipments of steel from the States and thus relieve the tension under which manufacturers are operating at the present time. The local situation is still characterized by the difficulty experienced in obtaining delivery on steel from the States, and this condition maintains the market in a very strong position, making it very unlikely that quotations here will be materially affected by developments across the line, particularly while American war requirements absorb the bulk of the material produced.

Metals

Variable interest is displayed throughout the metal market owing to the developments and the uncertainties that mark the progress of events across the line. The copper interests are still in the dark as to the intentions of producers in supplying the trade with supplies at the regulation price. Tin is still unsettled, but has an undertone of stability. Spelter is quiet, awaiting action of the Government. Lead has again returned to a stronger position, Antimony is weaker and quiet. Aluminum is quieter and lower.

Copper.—The general copper situation is still obscure, with consumers unable to define the attitude of the producers, who still maintain that they are not in a position to supply the demands of the trade in face of the abnormal requirements for war necessities. It is, however, felt that the present complex situation is largely resultant from the regulations that control the sale of the metal at the price fixed by the Government, which is having the tendency to restrict the output. It is reported that with a better price set for the outside market the producers would be inclined to increase production to the point where the needs of the domestice consumer could be readily supplied. It is not considered an impossibility that some arrangement may be made in the near future whereby the refineries will be permitted to ask a higher price for copper sold in the open market. Present conditions are, however, not conducive to maximum production and this has had the effect of placing the Canadian consumer in a very embarrassing position, as he has to rely on the American producer to a large extent for his copper requirements. Dealer's stocks here are being depleted and they are, therefore, conserving the available supply for essential needs. Locally the price of copper has been advanced 1½c per lb., the quotations being now 32½c for lake and electro, and 31½c for castings.

Tin.—The situation in tin has shown a tendency to improve, but so far has not developed into a tangible form, as the authorities at Washington are still endeavoring to make a satisfactory arrangement with the British Government in respect to the shipments of tin from the source of supply. It is essential that the present crisis be remedied as soon as possible to avoid further disorganization of the market as the trade here is showing the effect of the recent shortage resulting from the inability to get permits for sufficient requirements to cover the needs of the situation. American conditions are reflected in the Canadian market and quotations have necessarily been advanced to meet the urgent cry for metal. The New York quotation of 71c shows an advance of 5c per lb. on the week. Prices here are now 67½c, an advance over last week of 3½c per lb.

Spelter.—Inactivity marks the situation in spelter, as the trade is marking time while awaiting the decision of the Government in connection with their attitude on the fixing of prices for spelter. Just what arrangements will be made is not definitely known, but it is hoped that a price will be set that will satisfy producers and remove the uncertainty that has been a characteristic feature of this metal for many months. New York has been weak and inactive, and this condition also prevails in the local market with prices, however, holding comparatively firm at the nominal quotation of 10½c per lb.

Lead. — With the return of higher prices the activity of the market has apparently been resumed with business showing some of the briskness of a few months back. Producers are, however, showing a little reluctance to accept orders freely which may indicate that a higher market may be announced in the near future. The Trust price of 6¼c shows an advance of ¾c per lb., while the quotation of the independents is now 6½c, this being ½c higher than last week. Dealers here report a more active market with quotations stronger prices asked being 9½c per pound, an advance on the week of ½c per lb.

Antimony.—This metal has developed a weaker tendency on a poor demand; the local situation is marked by a decline of one cent, the quotation being 17c per lb.

Aluminum.—The situation has taken on an easier tone on the New York market and in consequence the market here has been affected, the local demand having shown a slight falling off and quotations are declining; prices this week are about 60c per lb., a decline on the week of 5c per lb.

Machine Tools and Supplies

Owing to the developments that have recently taken place in the munitions activity, renewed interest has been shown throughout the machine tool industry. Many inquiries have been made regarding equipment suitable for the production of the type of shell that will soon be produced here for the American Government. Orders for large numbers of these shells have already been placed, and while many plants will be able to utilize their existing equipment it is expected that others will require to purchase additional machinery in order to meet the requirements of the new type of shell. The actual sale of new machinery for this purpose has not yet reached very large proportions, and it is not expected that the number required will be such but what dealers will be able to fill the orders within a reasonable time. Where deliveries must be made from the States the difficulties will

materially affect the speedy equipping of a plant, as shipments from the American market are available only on five to eight months' advance order. General activity in machine tools has improved somewhat over the quiet period of the past few weeks and the near future promises additional improvement in this connection. The increased demand for machine shop supplies indicates renewed interest and activity throughout the industrial field, both as regards war requirements and general business. Prices of supplies on the Canadian market reflect the strength of the situation, as little effect has been noted here by the price regulations that are now in force on the American markets.

Scrap

Although the old metal market is still an open one, certain regulations have been recommended by the Government that will act as a guide in the future transactions of dealers. The present situation is fairly active, but is still influenced by the unsettled condition of the market generally. There are no interesting features in the market which is more or less unstable. The New York and Pittsburgh situation is unsettled, but the local market is firm and steady. Machine composition, heavy melting steel and malleable scrap are stronger, each showing an advance of one cent per lb., the quotations being 21c per lb. in each instance. Old leads have weakened, a decline of one cent placing the current quotations at 6c for heavy and 5c for tea lead. Aluminum on a decline of 2c is quoted at 28c per pound.

Toronto

TORONTO, Nov. 13.—It is not unlikely that further orders for munitions will be placed in Canada by the U.S. Government in addition to those for the 75 millimetre shells already arranged for. There are a number of plants equipped for this work at present doing nothing that could with mutual advantage be utilized. A considerable part of the new war loan will doubtless be appropriated for munitions for the British Government, which in addition to the contracts already placed will mean great activity in the munitions industry. Judging from past experiences any new contracts will likely consist largely of 6 in. shells, but there is also a probability that more orders for shrapnel will be distributed.

Steel

Nothing of importance has occurred locally during the week to affect conditions in the steel trade although recent developments in the United States may ultimately affect the market in Canada. The high prices and uncertainty of the last few months have had a detrimental effect on business with the result that the situation at the mills is easier in regard to their unfilled tonnage commitments; they still have however considerable business on hand and the outlook continues favorable. According to reports, the steel for the 75 millimetre shells to be made in Canada will be shipped here from the States. The mills in this country will therefore not benefit from their orders. However, it is highly probably that in the near future the Imperial Munitions Board will be in a position to place large orders for shells in Canada on behalf of the British Government which will mean more business for the steel makers. There have been no further developments in regard to the embargo. There does not appear to be any difficulty in getting steel from the States for shipbuilding and war purposes generally, but for ordinary commercial purposes it is difficult to obtain a license. In view of what is happening in the States such a condition is only what might be expected and it is unlikely that there will be any improvement in this respect. There is a shortage of steel for commercial purposes which threatens to become more acute as time passes owing to the increase in demand for purely war purposes. Now that prices on the principal steel products have been fixed at Washington, the market has become more settled, although consumers are not as yet buying at all heavily as they look for lower prices.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Government buying continues to dominate the market in the United States, war orders superseding all other demand. Private consumers are unable to get promise of delivery within any definite time and consequently comparatively few orders are being placed for steel or for ordinary purposes. Manufacturers thus placed are accepting the situation as they find it and meeting it as best they can. The mills are crowded with government work, but output is being curtailed owing to lack of fuel and labor, they have thus great difficulty in meeting the demand. The decline in domestic demand is indicated in the unfilled tonnage decrease of the U.S. Steel Corporation for October. The unfilled orders of the Corporation on October 31 last were 9,009,650 tons, representing a decrease of 623,802 tons from the orders of Sept. 29.

Pig Iron

After a stationary period extending over several weeks, prices of domestic foundry iron have declined, the new price being $50. The decline is due to outside influences rather than to any change in the situation in the trade. That is to say there has not been as yet any decline in prices of raw materials entering into the production of pig iron in Canada, but the lower tendency in the States following on the recent price fixing policy has been reflected locally. There is a shortage of coke reported from across the line owing to the unsatisfactory car situation and pig iron output is being restricted.

Scrap

The scrap market continues very dull with little business offering. Prices are unchanged and practically nominal. Both dealers and consumers are awaiting developments and little change in the market may be expected until the situation clears up.

Machine Tools

A revival of interest is noticeable in the machine tool business following the placing of contracts for the 75 mm. shells in Canada. It is not at all unlikely that the U.S. Government will take advantage of the fully equipped plants in Canada and place further munitions orders here. It is also probable that large orders for British shells will be placed here, as a considerable proportion of the new war loan will be appropriated for munitions. All indications point to a further period of activity in the machine tool business.

Supplies

There are no price changes of importance to note this week although it cannot be said that there is at present any indication of weakness in the market. Although iron and steel are showing a weaker tendency, such materials as leather, cotton, and felt are holding firm. Business continues fairly brisk with a promise of some improvement following the revival in munitions activity.

Metals

A further advance in tin is the principal feature of interest in the metal markets this week. The advance is due to a scarcity of all grades of tin owing to the difficulty that is being experienced in obtaining shipping permits from London. Lead has been active but the price is unchanged. The copper market is quiet with no change in the situation. Spelter, antimony, and aluminum are unchanged but solders have advanced one cent per pound.

Copper.—The position of copper remains unchanged and recent developments in the primary market indicate that a regulated market may be expected for an indefinite period. It is understood that the producers are pooling their output and distributing it as far as it will go after Government needs

have been provided for. It is generally believed that there will be enough copper to meet the demand, but some inconvenience may be caused occasionally through more or less irregular delivery. Lake and electrolytic are unchanged at 32c and castings at 31c per pound.

Tin.—The scarcity of tin is getting more acute and prices have advanced in all markets. It appears that the shortage is due to a complicated permit situation as a result of regulations enforced by the British Government. Some grades of tin are almost entirely off the market while others are in short supply. Tin has advanced 6c locally and is now quoted at 72c per pound.

Spelter.—The situation in the primary market is expected to materially improve as heavy buying is likely to follow placing of contracts for shells by the U.S. Government. The market in the meantime is dull and easy. Spelter is quoted locally at 10½c per pound.

Lead.—The market continues firm and unchanged locally although in New York the Trust has advanced the price ¼c to 6½c per lb. The independents are also quoting 6½c. Local price 8½c per pound.

Antimony.—There is no change in the position of antimony although a revival of interest in the primary market is loked for in connection with the shell contracts, which will be placed by the U.S. Government, calling for considerable quantities of this metal. Local price 18c per pound.

Aluminum.—The demand shows some improvement, but the market is easy and unchanged at 62c per pound.

Solder.—Prices of solders have advanced on account of the higher cost of tin. Guaranteed is now quoted at 38½c and strictly at 36c per pound.

Washington

WASHINGTON, D.C., Nov. 10.—Evidence of the myriad activities of the United States war preparation and effort permeates every phase of the domestic, social, and business life of the Capital. The army, navy, shipping, food, and trade and commerce departments, with largely augmented staffs, are operating at high pressure, the various executives spending long hours at their offices so that the mass of routine and detail inseparable from a war undertaking so gigantic and urgent shall not fail each day to be effectively and expeditiously dealt with, and the structure of the nation's big fighting machine be sound and substantial from the foundation up.

Merchant Shipbuilding

Roughly speaking, over half a hundred plants are now engaged on the construction of wood and steel vessels, the former some 280 feet long, of 3,500 tons deadweight capacity, and the latter of from 5,000 to 10,000 tons deadweight capacity. These vessels have been ordered by and are being built under the supervision of the Emergency Fleet Corporation, an adjunct of the U. S. Shipping Board, and while the exact number is for obvious reasons here withheld, some idea may be had of the scope of the enterprise when we state that some firms have well-nigh a score of ships under contract.

Very satisfactory progress is being made with construction, notwithstanding the labor scarcity, and when plans now being developed become operative to relieve the latter, a much accelerated output may be looked for. The submarine menace is without doubt more fully appreciated in the United States than it is in Canada, hence the contrast between the steps being taken to combat it by the former as compared with the latter.

Many American shipyards are engaged on vessel construction to order other than the Shipping Board; in a word, capacity contracts for several years to come were booked by them before that body came into existence. A number of these are wholly engaged on warship construction, while others again are turning out ocean-going freighters. These latter have, of course, been commandeered by the Board, so that as each vessel is completed she automatically comes under its supervision and direction relative to service. Official announcement is shortly expected to the effect that 400,000 tons of Japanese shipping will be transferred to the Atlantic service, on Shipping Board charter, in return for which the embargo on American steel to Japan will be lifted, an added proviso being that a certain percentage of new Japanese construction to be undertaken shall come under charter also to the U. S. Shipping Board for Atlantic service.

Of the vessel contracts already placed by the Board, builders in most cases are altogether responsible for their completion in every respect. In other instances, the Board have placed the propelling, engine room auxiliary, and ship deck machinery contracts separate from those of the hulls. Canadian metal-working plants interested in supplying such equipment should, therefore, not only communicate with individual builders, whose names have been made available to us, but should get directly in touch as well with the U. S. Shipping Board, 1319F, N.W., Washington, D.C., stating what they are prepared to furnish, thereby placing themselves in line to receive specifications of equipment and materials for vessel construction now in progress, and for that to be given out from time to time of a supplementary nature. We are in a position to state that such action will be appreciated by the Board, and where embargoes such as meantime exist militate against contract acceptance, the influence and effort of the Board will be directed towards relief of the necessary material.

Navy Department Contracts

The U. S. Navy Department have been large purchasers in the Canadian market of late, securing heavy socks, blankets, gloves, mitts, etc., for officers and seamen. Optical and nautical apparatus of every description, also anchors, chain, etc., are lines of requirement carrying more or less appeal to Canadian manufacturers. Correspondence should be addressed Navy Department, Bureau of Supplies and Accounts, Washington, D.C., requesting to be put on mailing list to receive advance notices of specifications to be given out.

Munitions

Contracts, we understand, were recently placed in Canada on behalf of the U. S. Army Department for shell closely approximating in size that of the 6-inch British projectile, and satisfactory progress has been made with negotiations towards the placing of a large order of smaller size shell, for the production of which Canadian experience of the past two and a half years on a somewhat similar shell admirably fits in. Negotiations are being conducted with the U. S. authorities, through the joint instrumentality of the British Munitions Ministry, Munsey Building, Washington, D.C., and the Imperial Munitions Board, Ottawa, Mr. Lloyd Harris, of Toronto, representing the latter at the American Capital. Mr. Harris was in Washington for a few hours yesterday in connection with the matter.

The immediate outlook here is that Canadian firms have many opportunities to pick up overflow American war business; and that such assistance as they are prepared to render along that line will be welcomed.

New York

NEW YORK, Nov. 10.—The steel trade was vitally interested this week in the placing of huge contracts for war munitions by the United States Government calling for the expenditure of several hundred millions of dollars and the consumption of one-half million tons of steel. Other large contracts are in the process of distribution, which will mean the rolling of over 1,000,000 tons of steel and a further draft upon the United States Treasury for $300,000,000.

Temporarily, the placing of orders for high explosive and 3-in shells overshadows activities of the War Industries Board in the placing of additional contracts for railroad equipment and eclipses for the time being the negotiations of the Emergency Fleet Corporation covering the building of 230 more merchant boats.

The ordnance department of the Government has signed contracts with five manufacturers of munitions to furnish the army with 5,000,000 six-inch shells, 1,000,000 of which will be manufactured by the American Car & Foundry Co. and another 1,000,000 by the New York Airbrake Co., the other 3,000,000 are understood to be equally divided among three other manufacturers already equipped for such work. The cost of these shells to the Government will be over $100,000,000.

The War Industries Board has allotted the rolling of 375,000 tons of steel for the manufacture of these shells to independent steel mills. It is understood that other contracts for six-inch shells, calling for nearly 488,000 tons of steel, have been virtually closed and negotiations are active on 10,000,000 to 12,000,000 large size

shells—8 to 12 inches—that will require the distribution of orders for 390,000 tons of steel forgings.

The greatest interest, however, is centered in the distribution of contracts for 33,000,000 three-inch shells the production of which will require nearly 250,000 tons of steel bars. Nearly every automobile manufacturer in the country is expected to take a share in these orders. It is understood that some of these manufacturers informed the Government that they could operate their plants to better advantage in their regular line of work, but this claim was met by the announcement that steel would not be available for more than 40 per cent. of the capacity of automobile shops, which is tantamount to suggesting that 60 per cent. of automobile factory capacity will be employed in the manufacture of shells.

The Government has signed contracts with twelve car builders for the construction of 4,975 freight cars for service on the railroad that is serving exclusively the United States expeditionary army in France. Other contracts for 10,000 cars are understood to have been distributed, but are not yet officially consummated. The building of this rolling stock will call for 150,000 tons of steel. The United States Government has now given orders to American shops for 50,000 cars to be put into service in France.

According to Washington reports, the Submarine Boat Co. has been offered additional contracts for the building of seventy-five 7,500-ton merchant boats by the Emergency Fleet Corporation, but the Submarine Co. has made it plain to the Government that all interests concerned would be best served by carrying out the original intention to build two hundred 5-000-ton boats at Port Newark. The American International Shipbuilding Co. has placed orders for large derrick towers to be constructed at Hog Island requiring 6,000 tons of steel.

The War Department has placed several large orders for heavy machine tools to be installed at the Watertown arsenal, which is being greatly extended for the manufacture of large guns. The Stone & Webster Engineering Corporation, that is building the new shops at Watertown, have placed a $300,000 order for 46 electric travelling cranes, and one order for machine tools amounting to $200,000 has been placed directly by the Government. Machinery makers have also received a list of tools required for equipping the gun-making shops at the Watervliet arsenal.

The paucity of commercial orders for steel products being taken by the mills is reflected in the October statement of the United States Steel Corporation issued to-day. The indication is that the subsidiary companies of the Corporation last month took new business aggregating only 376,198 tons. This is based upon estimated shipments of 1,200,000 tons of rolled steel and a decrease of 823,802 tons in unfilled orders. Operations averaging 92 per cent. of capacity resulted in a production of approximately 1,675,000 tons of ingots and 1,256,000 tons of rolled steel products.

Pittsburgh

PITTSBURGH, PA., Nov. 10.—Monday evening, Nov. 5, basis prices were announced at Washington for sheets, tin plates, wire products, pipe, shafting and scrap.

The sheet prices announced were: Black sheets, 28 gauge, 5.00c; blue annealed sheets, 10 gauge, 4.25c; galvanized sheets, 28 gauge, 6.25c, all f.o.b. Pittsburgh. It is understood that the manufacturers will adhere to the same gauge differentials as formerly, but as these differentials would make 16 gauge blue annealed 4.45c and 16 gauge black 4.75c it is possible that the heavy gauges of black will sell at less than the permissible maximum. While these prices would have been considered quite unsatisfactory 30 days ago, on account of the break that has since occurred they are rather satisfactory, except that the differential between black and galvanized is considered too low. It barely covers the cost of coating, with spelter at 7.50c to 8.00c.

The tin plate price is $7.75, for 100-pound cokes, Pittsburgh. This price is eminently satisfactory to the tin plate mills, and it is evident that the Washington authorities were rather liberal, for various possible reasons, to stimulate production, to recognize the sacrifices the mills have made in the past season in diverting their product towards the food crops so fully when there was an attractive market outside, and to recognize the uncertainties in the pig tin supply.

The American Sheet & Tin Plate Co. will probably open its books in the near future for first half contracts, with regular customers who are manufacturing consumers. It is probable that no sales will be made to jobbers at this time. The independents may follow the example of the leading interest. At present they are selling for early deliveries, in some cases through January, and there is rather a heavy demand.

The only price on wire products announced is 3.25c. As this is the price to which the leading interest recently advanced the prospect is that the full schedule will be in accordance: Plain wire, 3.25c; galvanized wire, 3.95c; wire nails, $3.50; painted barb wire, 3.65c; galvanized barb wire, 4.35c.

The steel pipe price announced was 52, 5 and 2½ per cent. off list, on sizes ¾ to 3-inch. This means a 51 per cent. card, and the mills have accordingly issued lists dated November 6. Oil country goods, O. D. pipe and line pipe have been adjusted to this basis, and a boiler tube list is to be issued as soon as details can be figured out. The wrought iron pipe mills have issued lists dated November 6, but they conform precisely to their list of July 2, and it is a question whether this will suit Washington.

The shafting discount is 17 per cent., the market having previously been 10 to 5 per cent. off list.

Scrap prices announced are: Heavy melting steel, $30; cast borings, $20; wrought turnings, $20; No. 1 railroad wrought, $35, delivered at consuming point. On the whole these limits are somewhat above the open market prevailing and it is not likely the market will change materially.

Trade to Arrange Details

It is officially announced that this price fixing, together with that of October 11 and September 24, is intended to complete the iron and steel price fixing program by the War Industries Board and that the trade is to work out all details so as to make everything in conformity. This work will be done largely by committees of the American Iron and Steel Institute, covering extras, differentials, analyses, etc. Manufactured products generally are to be made in keeping with the raw materials purchased from the steel mills, including such manufactures as bolts and nuts, rivets, spikes, chain, etc.

Coke Prices Fixed

Recent reports that the Fuel Administration would reduce the price of coke are set at rest by the Fuel Administration last night that it had set prices of $6 on furnace and $7 on foundry coke, per 2,000 lbs. at ovens east of the Mississippi River, to cover coke made in ovens without recovery of by-products. This apparently excludes gas house coke, and possibly leaves room for a lower price to be set on by-products coke. Brokerage, if any, is to be paid by the seller, representing a different rule than obtains with coal, as a 15-cent brokerage is allowed on coal, to be charged the buyer.

Steel Makers Pleased

The steel producing trade is well pleased that the price fixing operation is now practically concluded, and they are also pleased at the price basis established. On a general average the prices are substantially equal to those that have lately ruled on actual shipments, the great bulk of which have been, of course, against contracts made long ago and before the latter part of the great rise in market prices. The mills are quite ready to take hold in the market and sell such material as they can furnish for early delivery. Except in the case of sheets and tin plates it is improbable that there will be much selling for extended deliveries.

The one great disturbing element in the atmosphere is the proposal of the Federal Trade Commission to incorporate in the bill it is preparing for submission to Congress upon its reconvening early next month a proviso for the abrogation of some or all contracts. This is very strongly opposed. and largely on moral or sentimental grounds. While the mills would lose some business thereby, the idea is opposed strongly by mills that would not be affected financially at all. The probability is that the proposal will be dropped as it is meeting with such general condemnation.

Unfilled Tonnage Decreases

The Steel Corporation's unfilled ton-

nage at the end of October, announced to-day, was 9,009,675 tons, representing a decrease during October of 823,802 tons against decreases averaging about 500,000 tons a month in the preceding four months. It may be estimated that shipments were about 1,250,000 tons in October, which would indicate that bookings were only about 425,000 tons, or less than one-third of capacity. However, the establishment of a controlled market means that sales are not to be made for far forward delivery and thus the trade is in a transitionary period, in which, naturally enough, the tonnage on books decreases rapidly.

Production Increase

Production was somewhat heavier in October, pig iron being produced at the rate of 39,250,000 tons a year, against a rate of 38,500,000 tons in September. The average rate since January 1 is about 39,250,000 tons against actual production in 1916 of 39,434,797 tons.

Monthly production of steel ingots is reported for the first time. The October output was larger than the average of preceding months, being at the rate of about 43,600,000 tons a year, while the estimated production for the year is 42,600,000 tons, against 40,400,000 tons in 1916. Capacity is not fully employed in the case of either blast furnaces or steel mills, by reason of the shortage of coke.

FOG WARNINGS BY RADIOPHONE

THE utility of the radiophone as a fog warning device is being investigated in some recent lighthouse installations, pending its general adoption should the results prove favorable.

The instrument, which will be operated during fog, mist, rain, and falling snow, repeats the name of the light it represents, at five second intervals and the warning is transmitted to the maximum range, which limit is judged to be about eight miles. A second message worded "you are getting closer; keep off," is radiated after every third repetition of the first, but with a range limit of about two miles.

No special receiving apparatus other than ordinarily used in the ship's wireless is required to pick up the messages. Crystal detectors may be used and the receiving station tuned to the wave length which varies continuously between 500 and 650 metres.

"The apparatus will be of use to commanding officers in picking up the light in thick weather, as experience has shown that operators can judge to some extent the distance according to strength of signals with a known normal range. Although measurements have been taken to determine the limit of the range of this apparatus, too much reliance should not be placed in it until its worth has been proved under service conditions.

BRASS is turned grey by using a solution of ½ ounce of potassium sulphide in 1 gallon of water applied when the work is cold. If the brass is heated to a temperature of 100 deg. F. the color begins to darken and at 180 deg. F. it changes to black.

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

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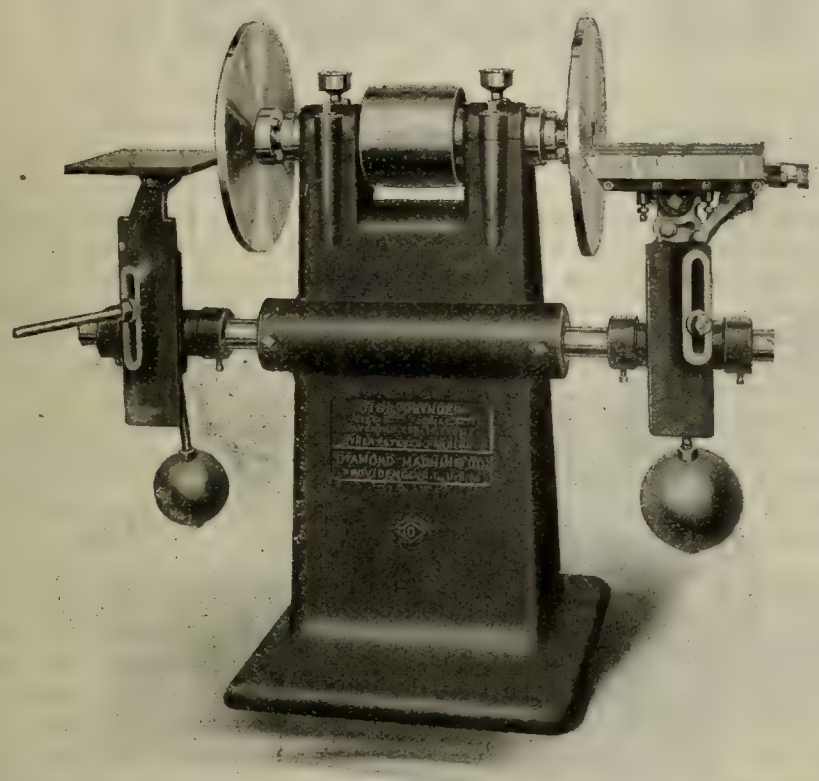

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Universal lever table on R.H. side

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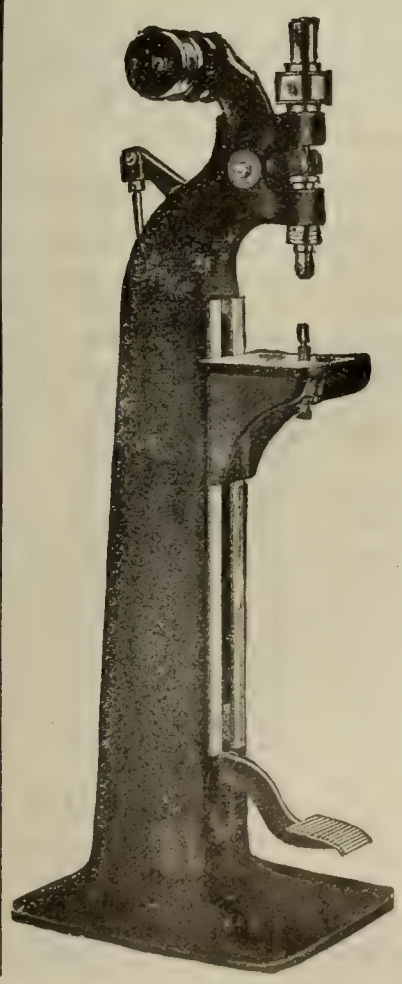

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Instead of nerve-racking, hammer-like blows; with this Grant Rotary Rivet Spinning Machine there is absolute quiet. Noiseless twin rolls, revolving independently of each other, roll heads on the rivets under pressure. One rivet every second, and never a bent shank, whether rivets are soft brass or hard steel. Heads finished perfectly smooth, show no mark of the riveting tool.

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INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Toronto, Ont.—The Bawden Machine Co. are building an extension to their plant on Sterling Road.

Levis, Que.—The Dussault Co. has completed plans and will start work at an early date on the erection of a machine shop at St. Romauld, Que., to cost $50,000. M. J. Et. Dussault, Levis, is president.

Toronto, Ont.—The Cluff Ammunition Co. has made application for a permit for the rebuilding of its factory on Atlantic Avenue, recently destroyed by fire. The plans submitted to the City Architect's Department call for the erection of a new structure estimated to cost $20,000. The forging presses, pumps and furnaces, etc., were not badly damaged and will be used in the new plant.

Kirkland Lake, Ont.—The new mill building for the 80-ton mill at the Lake Shore Mine will be completed shortly. The foundations on which the machinery will be placed in readiness and the installation of the equipment for the production of bullion will begin immediately. No delay will be experienced in this work as a good deal of this machinery is now on the ground. By the end of the current year the mill should be well on towards completion.

Montreal, Que.—The organization of the Consumers' Glass Co., a new glass industry in Canada which will be in operation early in the new year, is announced. Frank P. Jones, vice-president and general manager of the Canada Cement Co., has been chosen as president, and Henry Jonas vice-president. The directors are Arthur Lyman, J. A. Kirkpatrick and M. E. Williams. The new glass company is capitalized at $1,000,000. The new company has fallen heir to an excellent factory in Ville St. Pierre, a suburb of Montreal, with 700,000 square feet of property and connection with the C.P.R., the Grand Trunk and the Lachine Canal.

GENERAL

St. John, N.B.—J. Fred Belyea proposes erecting a sardine canning plant at West St. John, to cost $90,000.

Regina, Sask.—The Saskatchewan Co-operative Elevator Co. will rebuild the elevators at Maryfield and Raymore, which were destroyed by fire.

St. Catharines, Ont.—A portion of the Kinleith Paper Co.'s mill was seriously damaged by fire on Nov. 6, which was discovered in the stock or finishing-room. A large quantity of finished stock was destroyed by fire and water. The loss is covered by insurance.

Lindsay, Ont.—H. E. Hunt, of Chicago, Ill., has been here for the purpose, it is said, of looking over the town with a view to establishing a Canadian factory for the manufacture of a special brand of leather for use in automobiles, upholstering, etc. A factory will also be established in the United States.

St. John, N.B.—The grain elevator being built by the Fegles-Bellowes Co. for the Canadian Government Railways, is approaching completion. The concrete substructure is practically complete, and the workmen are now employed on the steel super-structure, which will be 100 feet in height. The capacity of the first unit of this elevator will be 500,000 bushels. The re-building of No. 5 warehouse on the western side of the harbor is being proceeded with by Kane & Ring, contractors.

MUNICIPAL

Lethbridge, Alta.—The City Council contemplate the installation of power plant equipment costing $63,000.

Bienville, Que.—The Town Council will call tenders for turbine pump for waterworks.

Delta, B.C.—The council is considering the installation of an electric pump and pump-house in East Delta. Estimated cost, $12,000.

Ottawa, Ont.—The tender of the Otis Fensom Elevator Co., $1,862, was the lowest received on the supply of an elevator for the city workshop on Chamberlain Avenue. The tenders were referred to the engineer.

Toronto, Ont.—The City Council has given the Toronto Board of Harbor Commissioners authority to sell industrial sites, covering 139 acres, on the northerly part of Ashbridge's Bay industrial area, east of Leslie Street. The sale of four acres in this section at $15,000 to the Imperial Oil Co. has been confirmed by the Council.

Orillia, Ont.—The Ragged Rapids dam, on the Severn River, from which Orillia has been supplied with power for fifteen years, was blown up recently. Four tons of dynamite was used in the operation. It cost about $65,000. It is part of the plan for canalizing the Severn River as part of the Trent Canal waterway, and a modern new dam and power-house has been built by the Department of Railways and Canals at the Swift Rapids, about a mile further down the river. In this power-house Orillia has installed new hydraulic and electrical machinery and equipment with a capacity of 6,000 horse-power, which will give her abundance of power for her industries, at a cost of over $150,000.

PERSONAL

R. W. Gifford, head of the shell department of the Massey-Harris Co., Toronto, has been appointed superintendent of the Toronto plant.

Michael McAuliffe, one of the pioneer dredging contractors of Canada, died at Welland, Ont., on November 11, aged 73. He was at one time a member of the Weddell Dredging Co., and in more recent years the Manly Dredging Co.; his contracts extended from Chicago along the lakes to the Lower St. Lawrence.

Graham A. Bell, Financial Comptroller of the Department of Railways, has been appointed Government Director of the Canadian Northern Railway Board in succession to Senator H. A. Richardson, who resigned upon his appointment to the Upper House. Mr. Bell will bring to the board fifteen years' experience in railway financing.

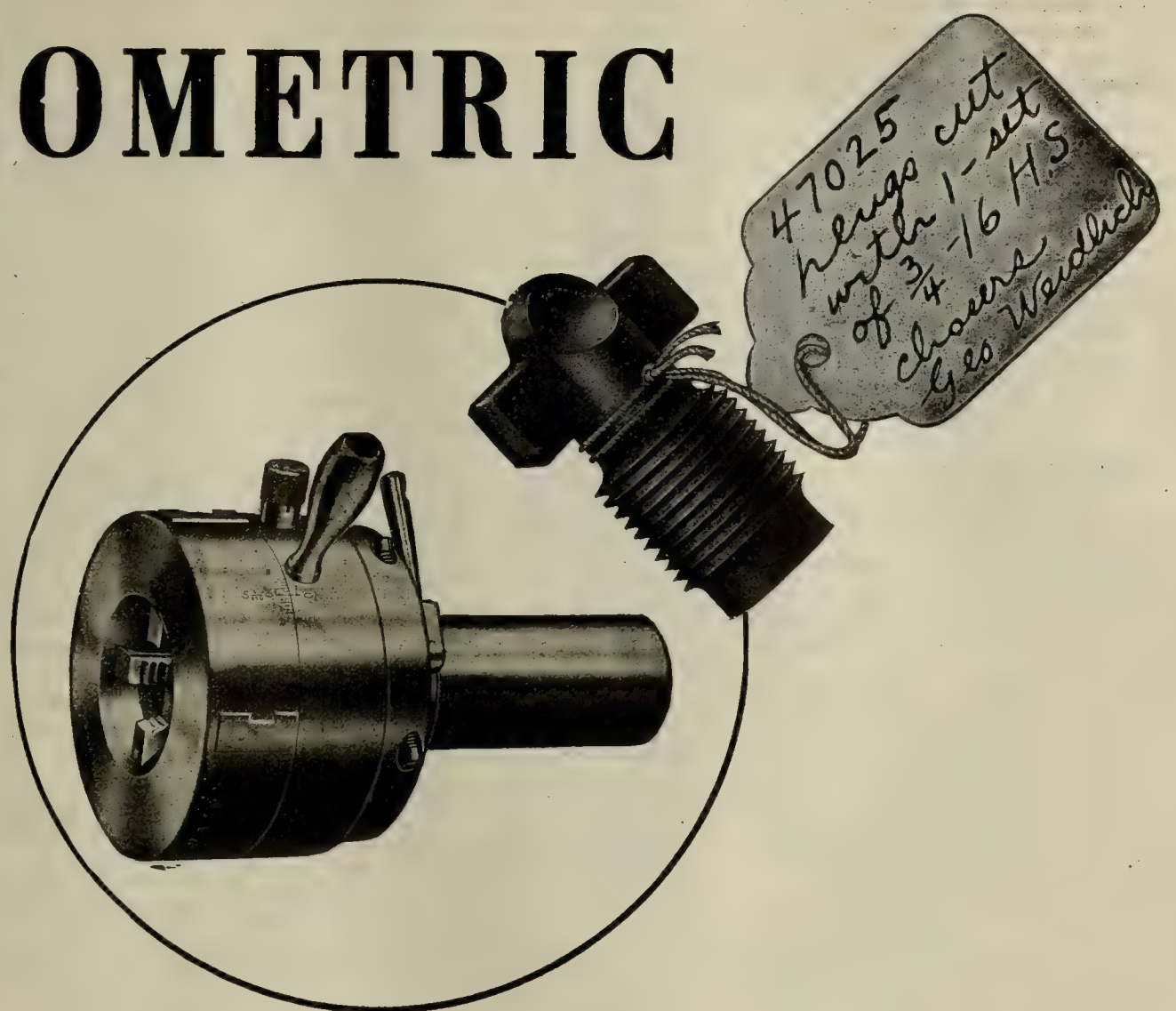
R. A. Pringle, K.C., Government commissioner enquiring into the cost of newsprint, has been appointed Controller of Newsprint and Bookprint for Canada. His duties will include fixing of both quantities and prices of news and book-print to be sold in the Dominion, and he will co-operate with the United States authorities in securing adequate newsprint supplies.

William Pearson Gundy, vice-president and general manager of W. J. Gage & Co., of Toronto, has been appointed a member of the War Purchasing Commission, succeeding Sir Edward Kemp, who is said to be going overseas. Colleagues of Mr. Gundy on the War Purchasing Commission will be F. Galt, of Winnipeg, and H. A. Laporte, of Montreal. Mr. Gundy was born at St. Catharines, Ont., in 1858, and began his business career with W. J. Gage & Co. in 1881.

Sir Henry Drayton, Chairman of the Dominion Board of Railway Commissioners, has been appointed controller of the production and distribution of electrical energy by companies generating or distributing electrical energy in the Province of Ontario. The controller will "determine preferences and priorities in the supply of such electrical energy to the end that a sufficient supply shall be furnished to factories and users engaged, directly or indirectly, in munition work or work for any of the allied governments, and also for municipal and public utility requirements."

Samuel J. Hungerford has been promoted to the office of general manager of eastern lines, Canadian Northern Railway, to succeed L. C. Fritch, resigned. Mr. Hungerford has been in charge of the rolling stock of the company since May 1, 1915. He was born near Bedford, Que, on July 16, 1872. Mr. Hungerford was with the C.P.R. for a number of years, eventually being appointed superintendent of locomotive shops at Winnipeg in 1904. In January, 1908, he was made superintendent of shops for the C.P.R. There he remained until March, 1910, when he joined the C. N. R. at Winnipeg as superintendent of rolling stock

GEOMETRIC



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for the C.N.R. and Duluth, Winnipeg and Pacific Railways. In May, 1915, he was moved to the head office and his jurisdiction extended to include the rolling stock on the 10,000 miles of trackage of the Canadian Northern. His office will be at Toronto.

TRADE GOSSIP

The Winnipeg Tool & Forging Co., Winnipeg, Man., is being reorganized. The company manufacture a line of mechanical tools, mason's tools and wrecking bars, etc.

New Rapid Tanning Process.—An Australian says he has discovered a new rapid tanning process with which sole leather can be tanned in seven days, calfskins in six hours, and other skins proportionately quickly.

U. S. Steel Orders Decrease.—Unfilled orders of the United States Steel Corporation on October 31 last were 9,009,675 tons, according to the monthly report issued. This is a decrease of 823,802 tons from the orders of September 29, and is the sixth successive monthly decrease.

All U.S. Lake Boats for the Atlantic.—A report from Sault Ste. Marie, Mich., states that it was recently announced by a prominent official of the United States Engineering Department that all Government boats now in northern waters are to be withdrawn immediately and placed in the Atlantic service.

Mineral Production in N.B.—During the calendar year 1916, New Brunswick produced $878,446 worth of minerals. The coal values aggregated $367,041, against $309,612 in 1915 and $241,075 in 1914. New Brunswick produced in 1916, 610,118 thousand cubic feet of natural gas, valued at $79,628. The production of petroleum in the province last year was 1,345 barrels, as against 1,020 in 1915.

U. S. Build 8,000-Ton Vessels.—The American International Corporation has received an order from the Emergency Fleet Corporation for seventy 8,000-ton vessels, to be built within one year of the completion of its plant at Hog Island. This is in addition to the previous order for fifty 7,500-ton vessels. The new contract involves about $100,000,000. The Hog Island plant is scheduled to be finished on December 1.

The Canadian Link-Belt Co. announces its ability to again furnish "Link-Belt" mono-rail electric hoists for quick shipment. These machines are made at the Philadelphia plant, where a large additional building is rapidly nearing completion and the already excellent manufacturing facilities are being greatly increased. Both types C-1 and C-2 can be furnished, the safe lifting capacities ranging from 1,000 lbs. to 6,000 lbs. They can be adapted for either direct or alternating current and fitted with plain hand-geared cord operated motor, or a cage operated motor trolley.

Montreal, Que.—The first deliveries on the Canadian Government railway car order recently placed with the Canadian Car and Foundry Co. will be made within the next two weeks. Some delay was caused through the inability of the car company to obtain steel for this business, but both the Nova Scotia Steel Co. and Steel Company of Canada are now making regular deliveries, and within the next month the company will be turning out fifty cars per day. The Fort William, Montreal and Amherst plants are all engaged on this order, the output of the Amherst plant having increased from two to ten stock cars per day during the past few weeks.

Oil-Burners Must Use Coal.—Increased demand for fuel oil in the war on the Atlantic, which makes the liquid much less plentiful than on the Pacific Coast, has resulted in a decision to remove oil burners from the Cunarder War Viceroy and convert the furnaces into coal burners. The ship is now in the north, and as soon as it returns to its home port the change will be effected. Conditions are now practically the reverse to what they were a few years ago, when many of the steamship lines were outfitting their coal-burning vessels with facilities for using oil as a power medium. In view of the war conditions, it is thought that all of the steamers building on the Pacific Coast that are intended for service on the Atlantic will be coal burners, while the wooden vessels in the Pacific will use oil.

Oil and Gas Development in N.B.—The oil and natural gas development in Westmoreland County, New Brunswick, is making satisfactory progress. During the past year several of the wells were deepened and increased flow obtained. The natural gas is sold under contract to a Moncton corporation, which acts as distributing agent. The total number of domestic consumers of the gas in Moncton and adjoining territory last year was 2,824. The gas is also used by the Canadian Government Railways for their gas engines and forges at the Moncton shops, and by the Plaster Works of the Albert Manufacturing Co., of Hillsboro. The value of the gas produced last year is estimated at $7,936.37. Arrangements have been about completed for the sale of all the company's crude oil to a manufacturing plant at New Glasgow, N.S.

Tungsten Production in N.B.—A very interesting development of wolframite or tungsten is in progress at Burnt Hill on the South West Miramichi, New Brunswick. This metal is extensively employed in the manufacture of high speed steel and armor plate. As the Imperial Government has commandeered for its own use all of the metal of this kind in the empire, the successful development of this provincial prospect possesses more than local interest. The company has erected a concentrating mill at the water's edge of the Miramichi River, for the treatment of the ore as it is taken from the mine. A shaft 65 feet deep has been opened up to follow the vein in two directions. The mine is equipped with steam hoisting apparatus, and air compressor for the drills. The vein of ore is about four feet in thickness and is nearly vertical.

Building Sternwheelers at Yarrows.—The steel sternwheelers which have been built for delivery in India by the Esquimalt branch of Yarrows, Ltd., have given such satisfaction that another contract for a vessel of similar type has been placed with the concern by another company. Yarrows, Ltd., is already working on a contract for four sternwheelers, two having been finished and put into service, while the other two are under construction. After being fully assembled at the Esquimalt yards and placed in readiness for the water, the vessels, which are of extremely light draught and practically flat-bottomed, are "knocked down" and the parts shipped to the Orient, where they are re-assembled and put in running order again. They are used almost entirely for river navigation. The latest contract is for a vessel 185 feet long, with a 37-foot beam.

MARINE

Dartmouth, N.S.—It is reported that the Kent Shipbuilding Co. of St. John, N.B., is interested in another concern which proposes establishing a shipbuilding plant at Tuft's Cove near here.

St. John, N.B.—D. A. Saker & Co., who acquired the Warner property on the Strait Shore, are making preparations for the building of a number of wooden sailing craft. This firm anticipates taking up steel shipbuilding when the time is opportune.

St. John, N.B.—The St. John Shipbuilding Co., of which Thomas Nagle is manager, and which numbers among its directors some of the wealthiest men of Eastern Canada, have negotiated for a yard site on Courtenay Bay adjacent to the Grant & Horne yard, and are now having it surveyed by marine engineers. This company propose building ships of both wood and steel.

St. John, N.B.—Grant & Horne, Courtenay Bay, have laid the keel for a large wooden steamer with a carrying capacity of 3,000 tons, and about 200 men are rushing the work of construction. The keel, composed of British Columbia fir, is 250 feet long. Native timber will be largely used in the building of this steamer. A second steamer will be put on the stocks immediately upon the completion of the present ship. This yard is now well equipped with building plant.

Vancouver, B.C.—It is probable that some 500-ton sea-going schooners will be built on the British Columbia coast entirely of British Columbia timber. There will be no nails, no metal of any kind. Perhaps some of the standing gear will be sheathed in leather, but even the leather will be from British Columbia animals, the thick-hided walrus. A well-known Japanese shipbuilder is on the coast now making inquiries into the possibilities of construction of wooden ships by the Japanese method.

War Dart Launched at Port Arthur.—The freighter War Dart was successfully launched at the Port Arthur Shipbuilding Co.'s plant on November 3, before a large gathering of citizens. The launching ceremonies were conducted by

Aikenhead's

Automatic in every action—almost as quick as thought—is this Wahlstrom Chuck. With it make your tool changes in less than two seconds and never mind about centering.

Tool Automatically Centres Itself

Drills are perfectly centered; the shanks are not torn and chewed. Consequently accurate drilling is certain every day and every hour.

For greater speed—because tool slippage is impossible.

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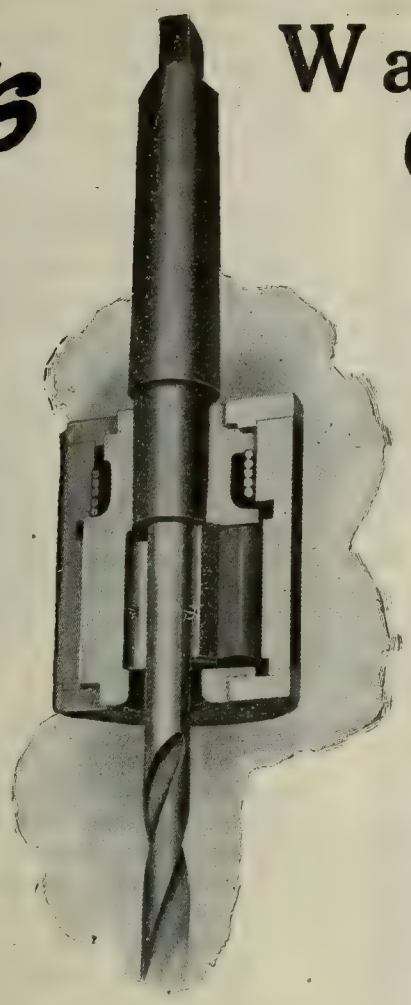

Wahlstrom Chuck

Will increase your output and better it. It will save your tools and your time.

One type of the Wahlstrom Automatic is for straight shank tools. Another type is for Nos. 1, 2 and 3 Morse taper shank tools.

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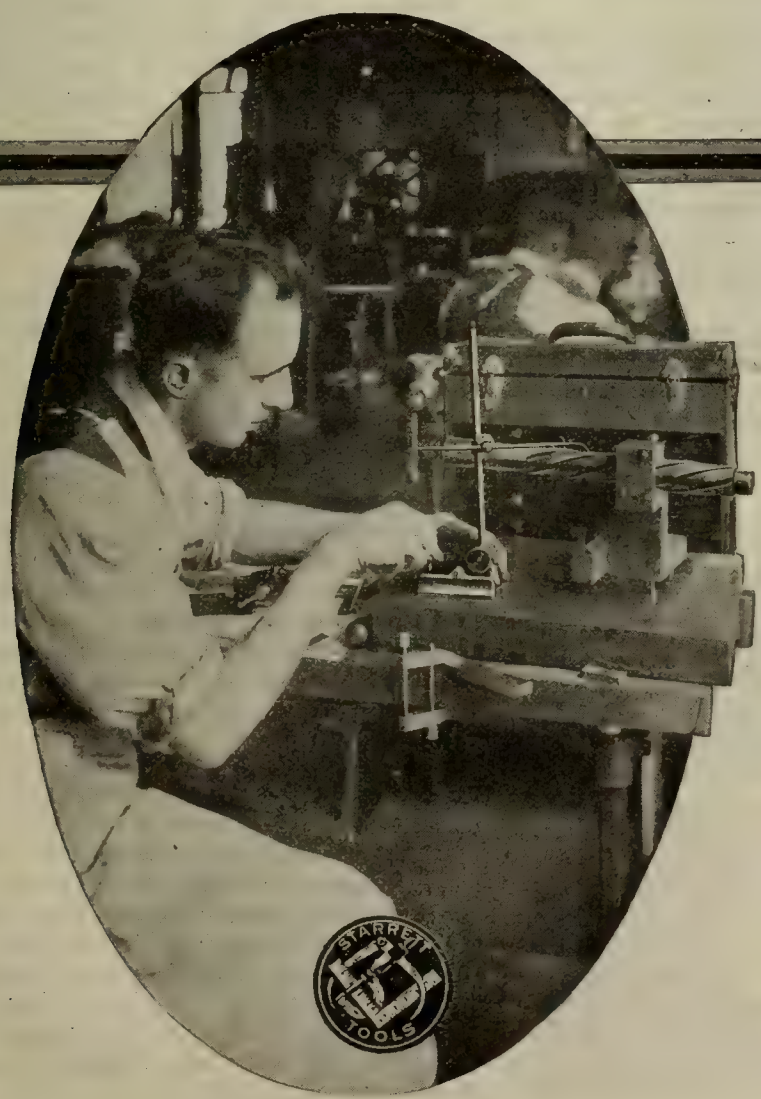

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Of the 2100 styles and sizes of micrometer calipers, vernier height gages, depth gages, caliper squares, rules, squares, calipers, test indicators, etc., made by the L. S. Starrett Company, not all, but every size and style *you* need is in our stocks.

Write for booklet and prices.

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Mrs. P. G. Chase, wife of the vice-president of the Port Arthur Shipbuilding Co. The War Dart will be rushed in final stages of construction in order that she may be able to clear from this port before the freeze-up. J. Miller, superintendent of construction, was in charge of the launching.

Esquimalt, B.C.—It will take about a month to complete the repairs to the Victoria Whaling Co.'s steamer Grey, which ran aground a few days ago near Cape Calvert and is now on the ways of Yarrows, Ltd., Esquimalt. The official survey revealed that the damages to the vessel were considerably more serious than was at first believed. There are about twenty-eight shell plates affected, and practically all of these will have to be renewed. A similar number of frames were also damaged, and the deck port and starboard stringer plates will have to be renewed as well. The stern frame is cracked and will have to be removed, welded and refitted, while about forty feet of fender guard on both sides will have to be replaced by new ones.

TENDERS

Ottawa, Ont.—Assistant City Engineer Askwith has been given permission to call for tenders on the supply of an apparatus for thawing out city water pipes. The style of apparatus the engineer desires is gasoline-driven and mounted on sleighs. The estimated cost is $3,500.

Armagh, Que.—Gauvin & Beauchemin, civil engineers, Quebec, Que., are preparing plans and specifications for power development at Armagh, County Bellechasse, on River Fourche-du-Nord-Ouest, and will receive tenders for water turbines, dynamos, sluice-gates, penstock and wooden pipes, etc.

Winnipeg, Man.—Tenders will be received by the Commissioners of the Greater Winnipeg Water District up to Monday, Nov. 26, 1917, for the following:—Construction of tunnel, shafts and well at the Red River crossing; supply of cast iron gate valves, air valves and sluice gates, construction of gate house and intake at Waugh, Man. Specifications may be obtained on application at the office of the District, 501 Tribune Bldg., Winnipeg. R. D. Waugh, Chairman of Commissioners.

Winnipeg, Man.—Tenders will be received up to Monday, Dec. 3, 1917, by the Commissioners of the Greater Winnipeg Water District for the following: Construction of a pressure pipe line from Red River to McPhillips Street Reservoir; manufacture and supply of 48-inch pre-moulded reinforced concrete pressure pipe; supply of cast iron pipe and specials. Specifications may be obtained on application at the office of the District, 501 Tribune Bldg., Winnipeg. R. D. Waugh, Chairman of Commissioners.

Port Arthur, Ont.—Tenders will be received until Monday, November 26, 1917, for the construction of a temporary pile protection breakwater at Port Arthur, District of Thunder Bay and Rainy River, Ont. Plans and forms of contract can be seen and specifications and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the District Engineers, Equity Building, Toronto, Ont.; Sault Ste. Marie, Ont., and Port Arthur, Ont.

INCORPORATIONS

Lee Puncture Proof Tire Co. of Canada, Ltd., has been incorporated at Ottawa with a capital of $50,000 to manufacture tires, automobiles and trucks, etc., with head office at Montreal. The incorporators are Albert A. Garthwaite of Conshohocken, Pa., Julian McK. Scott and Gordon G. Grant of Montreal.

The Davis-Durkin Corporation of Canada, Ltd., has been incorporated at Ottawa with a capital of $100,000 to manufacture explosives, fertilizers and chemicals at Trenton, Ont. The incorporators are Gordon D. Oulster, William Brown and John G. McHattie, all of Ottawa.

Mount Royal Milling & Mfg. Co., has been incorporated at Ottawa with a capital of $1,000,000 to acquire and take over the Mount Royal Milling & Mfg. Co. of Montreal, oil and rice millers. The incorporators are Gordon W. MacDougall, Lawrence Macfarlane and James G. Cartwright, all of Montreal.

WOODWORKING

Fergus, Ont.—James Wilson & Sons will build a sawmill at a cost of $50,000, and will require machinery and equipment.

St. John, N.B.—The lumber manufacturing plant owned by John E. Moore, at South Bay, valued at more than $100,000, was totally destroyed by fire on Nov. 6. The pail factory, the saw and stave mill, the power house and other outhouses and office were all destroyed.

CATALOGUES

Brass Foundry Equipment.—Catalogue No. 128 illustrates and describes a line of equipment for brass foundries, such as furnaces, tumblers and tongs, etc. The catalogue is fully illustrated and includes tables of sizes.

Insulating Bricks for Boilers.—The Armstrong Cork & Insulation Co., Pittsburgh, Pa., have issued a folder, just off the press, bearing the title "Nonpareil Insulating Brick for Boiler Settings." The folder states what this type of brick is composed of, and also gives particulars of tests. Copies of this folder may be had free of charge on request.

The Whiting Converter is the title of a new catalogue No. 129 issued by the Whiting Foundry Equipment Co., Harvey, Ill. The catalogue deals with the construction and principal features of the Whiting side-blow steel converter, and also describes the process of making steel castings by this method. The catalogue is fully illustrated, showing a number of installations.

Adjustable Speed Motors.—Bulletin No. 41021, issued by the Canadian General Electric Co., Toronto, deals with the R.F. adjustable speed motors. The principal characteristics and other important features embodied in this line of motors are given in detail, accompanied by illustrations showing various types and details of parts. A table of dimensions covering the various sizes is also included.

BOOK REVIEWS

First Aid Instructions for Miners, a booklet, pocket size, issued by the Bureau of Mines, Department of the Interior, Washington, D.C. This handbook contains a report on standardization of advanced first aid instructions for miners, compiled by a committee of surgeons appointed to formulate in detail methods of giving first aid instruction to miners for the various classes of injury that were likely to take place in mines. The handbook contains much valuable information on this important subject, presented in a clear and concise manner. The handbook contains 163 pages, 65 illustrations and a complete index. Copies with paper covers may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D.C., for 20c. An edition in stiff covers has been issued at 35c per copy.

Rural Planning and Development.—The latest report of the Commission of Conservation deals with the important subject of the planning and development of rural districts and small towns in Canada. It has been prepared by Thomas Adams, Town Planning Adviser of the Commission, who has made a close study of the problems of rural development in this country during the past three years, following twenty-five years experience in farming, land surveying and town planning in other countries. The report deals comprehensively with the social conditions and tendencies in rural areas and the prevailing systems of land settlement and development. It indicates the rural problems requiring solution in order to secure the proper development and economic use of land for purpose of efficiency, health, convenience, and amenity. The great injury which land development in Canada suffers, from speculation, neglect of public health, and want of expert business administration of land settlement, is considered. Incidentally, the problem of returned soldiers is dealt with, and the connection between land development and such questions as taxation, unemployment, and high cost of living is clearly shown. Having regard to the need for more attention being given to production in Canada, to the extent to which production is impaired by speculation in land, by neglect of public health, and by haphazard systems of development; to the importance of increasing the supply of human skill and energy and of capital derived from production instead of by borrowing, the problems dealt with in this report are of vital and current interest to the people of this country.

TO PROVIDE POWER FOR MUNITION WORK

SOME improvement in the power situation in Ontario is expected to follow the appointment of Sir Henry L. Drayton as "controller of the production and distribution of electrical energy by companies generating or distributing electrical energy in the Province of Ontario."

His duties as defined in the order-in-Council will be "to determine preferences and priorities in the supply of such electrical energy to the end that a sufficient supply shall be furnished to factories and users engaged, directly or indirectly, in munition work or work for any of the allied Governments, and also for municipal and public utility requirements."

As much of the electricity now exported from Canada to the United States is used in connection with the war requirements of the two countries and their allies, the British Ambassador at Washington will be asked to arrange for a conference between Sir Henry Drayton and the proper authorities in the United States with a view to insuring co-operation between the two countries in the generation and utilization of electric energy on both sides of the international boundary to the end that the maximum efficiency may be obtained.

Sir Henry Drayton's appointment follows his investigation of a serious power shortage in Ontario, disclosed to the Government by the Hydro-Electric Power Commission. Sir Henry was appointed a Royal Commissioner to make an enquiry into the extent to which electricity was exported by the generating companies at Niagara Falls, and the extent of the demand in Ontario. His report was considered by a sub-committee of the Cabinet and was discussed at a conference between the committee, Sir Adam Beck and representatives of the power companies. At the conference the basis of an order-in-council was agreed upon. That order recognized the desirability of maintaining the suppply of electricity for munition plants on both sides of the international boundry, some of which were complaining of shortages of motive power. It also recognized the necessity of providing for the demand from municipal utilities. The order will apply to the Canadian Niagara Power Co., the Electrical Development Co., and also to the Ontario Power Co. which, although acquired by the Hydro-Electric Power Commission, still retains its corporate entity.

Sir Henry was authorized by his Commission to report upon the status rights and obligations of the companies operating at Niagara Falls; the amount of power available for distribution by those companies at Niagara Falls; the extent of the demand for power in Canada; the amount of power in the past exported by the companies and the present demands of the United States customers. He finds that the Ontario Power Company, recently acquired by the Hydro-Electric Power Commission

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Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

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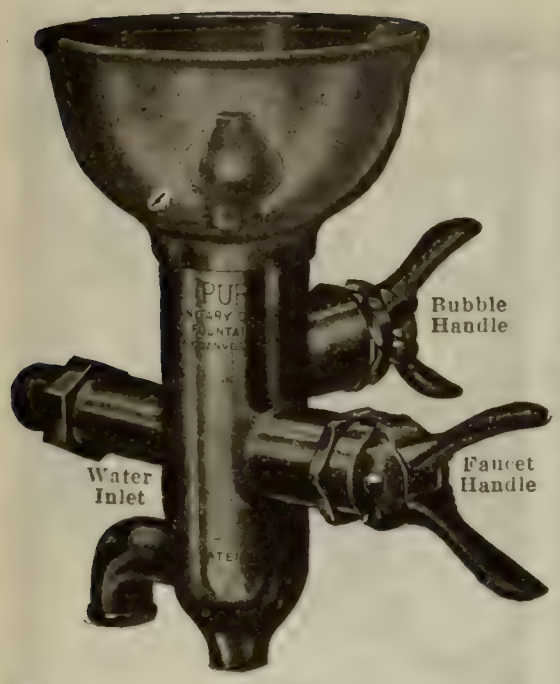

Saving or Wasting?

The manner in which you handle the drinking water problem in your plant may seem to be a small matter to you —but investigate. The results will be surprising.

The old-time faucet is costly. Running hour after hour, day after day, its ceaseless flow is costing you money, yet without any better service.

Puro Saves 35%

A Puro Sanitary Drinking Fountain will cut that water bill 35%. We can prove that it has done that for others.

It will give every employee a safe, saner draught of bubbling water free from the contamination of the common drinking cup.

In a word, it is the only sanitary Drinking Fountain that is really safe, sanitary, simple, automatic in control, and easy to attach.

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(MADE IN CANADA)
YOUR WATER SUPPLY

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"Barnes-made" SPRINGS

are the result of over sixty years' experience in spring making, combined with unsurpassed equipment and the workmanship of men who have been with us, ten, twenty and in some cases thirty years.

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THE WALLACE BARNES COMPANY
218 South St., Bristol, Ct., U.S.A.
Manfrs of "Barnes-made" Products
Springs, Screw Machine Products, Cold Rolled Steel and Wire

of Ontario was authorized to export power to the United States, subject to a requirement to retain one-half of the electricity, it generated, for sale in Canada at prices not to exceed those charged to customers in the United States.

BRITAIN'S TRADE DURING THE WAR

REVIEWING the trade of Great Britain during 1916, U. S. Consul-General Skinner, at London, says:

"The value of British import trade during 1916 greatly exceeded that of the last year of peace, and the value of British exports was only slightly less than in 1913; but it must be remembered both as to imports and exports that prices have risen materially since 1913, and although the values indicate truly enough the purchasing power of a people, quantities only, and these now are unknown, accurately depict their needs.

Totals for Four Years

"The following table shows the total value of British trade during the last four years:

Year.	Imports.
1913	$3,741,047,607
1914	3,390,174,777
1915	4,154,804,931
1916	4,619,051,512

Year.	—Exports— Products of United Kingdom	Foreign and Colonial products	Total.
1913	$2,556,106,197	$533,246,917	$3,089,353,114
1914	2,096,105,483	464,625,029	2,560,730,512
1915	1,871,886,260	482,086,104	2,353,972,364
1916	2,465,107,140	475,011,775	2,940,118,915

Figures Considered Surprising

"When it is considered that the 1916 total was reached without the large exports and imports of former times to and from Germany, Austria-Hungary, Turkey, and Bulgaria, and when it is further remembered that both imports and exports are affected by many war restrictions, the figures are surprising. The complete control of all the activities of this country by the Government, which began with the outbreak of war, was extended and perfected during 1916.

Ships and Goods Under Control

"In order to make the most complete use possible of the declining quantities of shipping space, it was decided not only to place all British shipping itself under Board of Trade control, but further to restrict the importation of goods not strictly necessary under the circumstances. There has been general acquiescence in the principle of restricting imports, as the reasons for this course are manifest.

"It became evident early in 1916 that the supply of shipping space available for ordinary trade was so reduced that the free use of the remaining tonnage could not be continued.

"How necessary was this decision is apparent from the figures showing the tonnage with cargo which has entered and cleared at British ports during the last four years:

Years.	British Tons	Foreign Tons
Entered—		
1913	32 292 343	16 771 890
1914	28 928 898	14.131 890
1915	22 861 738	10 862.166
1916	20.217,334	9,842.094
Cleared—		
1913	40 101 232	27.718.469
1914	32 515 814	23 452 755
1915	20 380 530	19 148 832
1916	17,751,953	17,844,801

"The British order-in-council of March 11, 1915, provided for the blockade of Germany, but the British Government on April 24, 1916, took pains to state that a blockade which was limited to the direct traffic with enemy ports would have but little, if any, effect upon enemy commerce on account of the geographical position of Germany. Thereupon various rules were put into effect whereby strict control is exercised over all goods shipped to or from Holland, Sweden, Denmark, and Norway. During the first year of the blockade this control tended in the main to check merely the forwarding of goods clearly intended for Germany or coming out of Germany, but after British statisticians had ascertained the normal requirements of the neutral countries bordering upon Germany all goods whatsoever shipped to these countries in excess of such requirements were detained.

"The blockade as now enforced covers not only articles of German origin and those goods which reasonably may be supposed to be intended eventually for Germany, but extends also to other commodities, and to raw materials which, if they reached their neutral destination, might release domestic stocks in those countries for exportation to Germany. For example, when Holland, in 1916, permitted domestic apples to be sold in Germany, as they did not possess keeping qualities, an order was issued preventing the importation of fresh American apples into the Netherlands, although the intended imports from the United States were undoubtedly for Dutch consumption. Similarly when Norwegian leather was believed to be entering Germany somewhat freely, while American shoes were being imported extensively into Norway, it was decided to make it impossible to export Norwegian leather to Germany by the simple expedient of restricting the import of American shoes into Norway.

"The year 1916 was remarkable for the record freights charged and the profits made by shipowners. Although the dividend on capital averages 18.50 per cent., it would be nearer 33 per cent. if the normal depreciation had been charged off instead of the large sum of £3,347,577."

ADVANTAGES OF OIL FUEL LOCOMOTIVES

By O. C.

IN the case of a locomotive burning oil fuel, the fire can be instantaneously adjusted to suit the load, which varies almost from minute to minute with the speed and gradient. So perfect is the control that the steam pressure can be maintained inside a total variation of five pounds with changes in load of 50 per cent. and over. An important feature is the rapidity with which a head of steam can be obtained; an engine can be moved under her own steam within 35 minutes of the full oil-burners being lighted. The practice on railways using oil is to have a stationary boiler always in steam at each round house, from which connection is made to the dead engine through a three-way cock in the steam pipe leading from the steam stand on top

of the fire-box to the burner. By this means the burner can be started from cold until there is sufficient steam generated in the engine itself to keep the burner going.

The advantages of the use of oil are specially noticeable in the round house or shed when squaring up after a day's work. There are no fires to be raked out; no flues or soot boxes to be cleaned; no coal to be stacked, weighed or otherwise handled. A saving in cost of equipment is represented in the absence of fire-rakers, flue brushes and shovels all of which are unnecessary on an oil-burning locomotive. Further, when engines are engaged in switching and shunting operations, they frequently have to stand idle under steam for hours at a time. The burners in such cases can be cut down to the minimum, or even extinguished, as an engine will always retain sufficient steam to start up the burners again when required.

A UNIQUE STEEL

RECENT advances in British steel manufacture are indicated by the description of a certain steel which now forms part of the regular product in a Sheffield works. The two properties of toughness and hardness are combined in a hitherto almost unknown degree; the material is so hard that no cutting tool will act on it and so tough that a rod may be bent double while cold without fracture. Any shaping or finishing required must be done by grinding. It is made in castings, rolled bars and sheets, and forgings. It is mainly used for crusher jaws and rolls, dredger bucket lips, screening bars, gears, pins and bushes, and points and crossings of railways and tramways. It is also used now for light body armour such as helmets and shields, and for car and machine gun armour plating. A great many more uses will be found for this material. Its strength is 55 tons tensile and elongation 40 per cent. in 4 in.

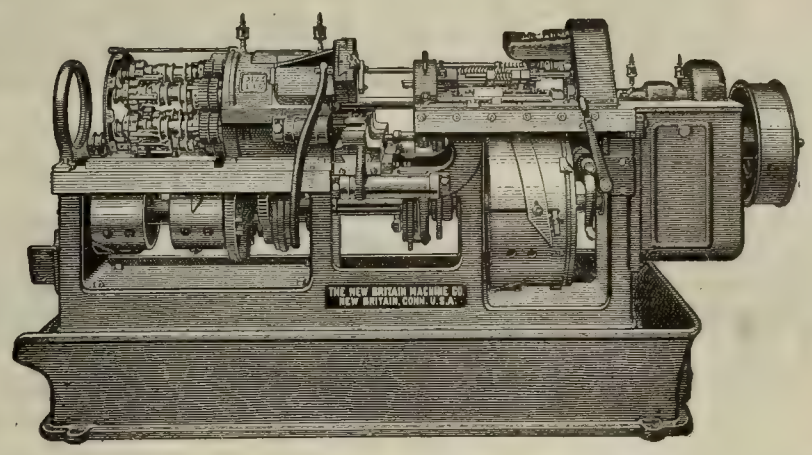
TRADE ENQUIRIES

THE following trade enquiries have been received by the Department of Trade and Commerce, Ottawa, from which further particulars may be obtained:

1425. **Wood-pulp.**—An English correspondent states that he is desirous of using the great opportunities he now has of adding wood-pulp to his present business and is looking out for some good firm or firms in Canada who desire to do a direct trade with British papermakers. He is prepared to work on commission terms only, and can produce the very highest references as to ability and integrity.

1433. **Chains, bolts and nuts, etc.**—A Glasgow firm wishes to get into touch with exporters of the above lines.

1434. **Wire, bright, annealed, galvanized, plain or barbed, and wire nails of all descriptions.**—A Glasgow firm wishes to get into touch with shippers of the above.



Screw Machine Queries:

"Standard or Special Tools?"

Let this be one of your questions when considering the purchase of an automatic.

You know the cost of tooling for a piece requiring a variety of operations is no small item—whether you use a multiple-spindle automatic, single-spindle or perform the individual operations on different machines.

You also know left-hand drills, reamers, etc., cost more than right-hand.

The question of right- or left-hand tools is a question of direction of spindle rotation.

The "New Britain" Automatic is designed to employ right-hand tools.

Are you acquainted with the many other features of "Six-Spindle" superiority? Bulletin upon request.

The New Britain Machine Company
—Automatic Screw and Chucking Machines—
New Britain, Conn., U.S.A.

BLACK DIAMOND OVENS

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Enameling and Varnishing Ovens heated by Gas, Electricity, Steam or Coal.
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BLACK DIAMOND OVENS

BERTRAMS LIMITED
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PAPER MILL MACHINERY
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MACHINE TOOLS for IRON WORKERS
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You've been going to send in that ad for weeks, so why not mail it now for next week's issue?
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MORTON MANUFACTURING CO.
PORTABLE PLANERS
DRAW CUT SHAPERS
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BOILER FOR SALE—ONE HEINE SAFETY horizontal, single drum, water tube boiler, 120 H.P., 36" diam., 19 ft. long, 5-16" shell steam drum. Apply The Parkhill Mfg. Co., Limited, 400 St. Ambroise St., Montreal. c18m

FOR IMMEDIATE SALE—150 No. 1 AND 10 No. 7C Racine hack saw machines; in excellent condition. The Peck Rolling Mills, Limited, Montreal, Quebec. c19m

2 NORTON GRINDERS — 10" x 36"—IN FINE condition; complete with stock of Norton wheels. Price $1,400 each, f.o.b. Hamilton. The National Machinery & Supply Co., Ltd., Hamilton, Ont.

3 JONES & LAMSON TURRET LATHES, WITH Collet chucks; 3" x 36"; geared head machines in fine condition. Price $1,000 each, f.o.b. Hamilton. The National Machinery & Supply Co., Ltd., Hamilton, Ont.

AGENCIES WANTED

ENGINEER AND BUSINESS MAN WITH office in Manchester, England, is prepared to work for a good firm desiring representative in England. Would attend to the interests of a firm shipping munitions. Box 337, Canadian Machinery. c19m

AGENCIES WANTED—FRENCH ENGINEER having large established clientele, desires direct agency for France of labor-saving machinery of all kinds for wood and iron working, as well as factory equipment. Headquarters in hearts of Paris, near the Opera. Write E. A. B., Room 444, 14 Phillips Sqr., Montreal.

AGENTS WANTED

WANTED — LIVE REPRESENTATIVE TO handle good specialty; one who hasn't too many irons in the fire Apply Box 348, Canadian Machinery, stating lines you now represent and the ground you are prepared to cover. c23m

CANADIAN AGENTS WANTED FOR GOOD chuck, especially adapted for use in munition plants. Box 349, Canadian Machinery. c23m

SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto

SITUATIONS VACANT

WANTED — SUPERINTENDENT-FOREMAN, 6" British shells. Box 340, Canadian Machinery. c19m

SHOP SUPERINTENDENT—WANTED, MAN competent to take entire charge of machine shop solely engaged in manufacture of small tools. Must be thoroughly competent and have had some years' experience. Shop while small at present offers excellent opening for advancement. Apply, stating experience, salary, etc., to Box 339, Canadian Machinery. c17m

WANTED — MECHANICAL DRAUGHTSMAN for engine, compressor, and general work. State experience and salary expected. Apply The Jenckes Machine Company, Limited, Sherbrooke, Que. c16m

WANTED—MACHINE SHOP FOREMAN FOR small shop doing general work, not munitions, near Toronto. State experience and salary expected. Give references. Box 345, Canadian Machinery. c20m

MARINE ENGINE ERECTOR:—WANTED FOR Canadian shop an experienced foreman to take charge of erecting 1500 H.P. marine engines. Apply Box 347, Canadian Machinery c21m

SITUATIONS WANTED

MECHANICAL AND CONSTRUCTION ENgineer desires change; twenty years' general experience; specialty steam power plants; knowledge pulverized coal. Box 343, Canadian Machinery. c21m

GRADUATE MALE NURSE, AGE 32. HAVE established hospitals for three large manufacturing concerns. Familiar with social service, accident prevention and modern methods of employing. At present employed. Less than $2,400 not considered. Box 336, Canadian Machinery. c15m

GENERAL SUPERINTENDENT DESIRES position years of machine shop and toolroom experience, efficient production methods, as well as extensive experience with various sizes of shells. Box 350, Canadian Machinery. c22m

PRACTICAL WORKS MANAGER AND MEchanical expert with years of experience in Scotland and Canada, a specialist in marine engines and winches, open for engagement; best of references. Apply Box 351, Canadian Machinery. c23m

FOR SALE

One 22" x 50" Wheelock Engine, left-hand, arranged for direct shaft coupling, with heavy balance wheel 8¼" x 14" x 17'—7" in dia.

Merchants Rubber Factory
KITCHENER, ONTARIO
c20m

SITUATIONS WANTED

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States wants position as superintendent or general foreman. Large or small shop on ammunition or machinery; A1 references. Address Box 327, Canadian Machinery. c9m

WANTED

WANTED — SECOND-HAND CUPOLA AND other foundry equipment. State full particulars and price. Box 346, Canadian Machinery. c21m

WANTED—ONE No. 166 BLISS 2-SPINDLE automatic trimmer and beader, also 1 No. 156 single spindle trimmer, or machines of similar design. Must be in good condition. In replying state fully the name of maker of machines and lowest price, also where they could be seen. Box 342, Canadian Machinery. c18m

WANTED—ONE HORIZONTAL RE-DRAWING or reducing press, fitted with bottom knockout, the general dimensions of which should be equal to Bliss No. 62. Must have flywheel not less than 725 lbs. weight and approximately 3 ft. 6 in. in diameter. Press must be in good working order. In replying, give all dimensions, also state name of maker and lowest price. Box 341, Canadian Machinery. c18m

WANTED TO PURCHASE TWO SECOND-hand lathes, 24" swing, 8' to 12' bed. Submit offers with cuts and full description to E. Langham, General Purchasing Agent, Canadian Northern Railway Company, Toronto. c19m

FOR SALE

4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 13 B. & S. Automatic Gear Cutter.

1—30" Newark Automatic Gear Cutter.

1—5 x 48 Pratt & Whitney Plain Grinder.

1—No. 2 Bath Universal Grinder.

1—12 x 60 Modern Plain Grinder, new.

2—Lees-Bradner Thread Millers.

1—30 x 30 x 8' Powell Planer, new.

Brownell Machinery Co.
Providence, R. I.

Immediate Shipment

LATHES.

1—32" x 32' BERTRAM ENGINE LATHE, new, double back gear, quick-change gear.

1—42" x 20' PITTSBURGH TRIPLE GEARED ENGINE LATHE, new, quick-change gear and regular equipment, takes 12' between centers.

1—42" x 24' BERTRAM TRIPLE GEARED LATHE, with raising blocks to raise head and tailstock to swing 60". This machine has hollow spindle, compound rest rod and screw feed, and is in excellent working condition.

PLANERS.

1—36" x 36" x 12' McDOUGALL PLANER, used, with two heads on cross rail and one side head, has elevating device for cross-rail and is in excellent condition.

1—62" x 62" x 16' CANADA TOOL WORKS PLANER, with two heads; in excellent condition.

BORING MILLS.

1—48" used COLBURN VERTICAL BORING MILL, equipped with two swivel heads, gear box feed; in first-class condition.

1—10' NILES BORING MILL, takes 43" under the cross-rail, width of rail 19", two swivel heads, tool bar 6" round by 25" travel, power friction feeds drive, six-step cone for 4" belt; in absolutely first-class condition.

1—BERTRAM HORIZONTAL BORING MACHINE, cone type, headstock, four-step cone for 4" belt, spindle 4", diameter 36", feed slotted adjustable table 48" wide by 36" long.

RADIAL DRILLS.

1—NEW 2½' FOSDICK HEAVY DUTY, speed box drive, plain box table.

1—[illegible] SPEED PRENTICE HEAVY DUTY, speed box drive, tapping attachment, plain box table.

1—6' BERTRAM HEAVY DUTY, single pulley drive, four speeds in speed box, tapping attachment in spindle, plain box table; excellent condition.

1—6' LONDON DRESES PATTERN HEAVY DUTY, round column type, speed box drive, arranged for motor drive; in first-class working order.

The A. R. Williams Machinery Co., Limited

64 FRONT STREET WEST TORONTO, ONTARIO

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15" three-jawed chuck.
1—Lathe, 28" swing, 8' bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22" Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15" three-jawed chuck.
1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 24" wheel.
1—Lathe, 14" swing, 6' bed.
2—Ford Smith Shell Grinders, complete.
1—17" LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
1—16" Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
1—Double End Painting Machine, with ¼ h.p. motor.
1—Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—5 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.

Sherbrooke, Que.

Chas. A. Strelinger Co.,

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DETROIT - MICH.

Machine Tools In Stock For Immediate Delivery

DRILLING MACHINES.

No. 0 Burke Bench Drills.
12" Albany H.S. B.B. Drill.
15" Barnes Drill.
No. 150 Buffalo Blacksmith Post Drill.
3' American Sensitive Radial, with tapping att.
No. 1-S Garvin B.G. Horiz. Drill, with oil pump.

GRINDING MACHINES.

No. 1¼ "T" Webster & Perks Grinder, with cst.
No. 2 Diamond Wet Tool Grinder, with wheel truing device.
14" Blount Wet Tool Grinder.
No. 1 La Salle Surface Grinder.
No. 2 Diamond Aut. Surface Grinder, belt-driven.
Style "JB" Point Wilmarth & Morman Drill Grinder.
Model "B" Hand-feed Fitchburg Grinder.
Geometric Chaser Grinder, with cst.
No. 3 Gardner B.B. Polishing Lathe.

LATHES.

No. 5½ Sloan & Chace Precision Bench Lathe.
13" x 5' Blount Speed Lathe, with hd. rest.
14" x 6' Monarch, Q.C., D.B.G. Engine Lathe, with taper att.
16" x 6' Monarch Q.C., D.B.G. Engine Lathe.
16" x 8' Monarch Q.C., D.B.G. Engine Lathe.
18" x 8' Monarch Q.C., D.B.G. Engine Lathe.
16" x 7' Oliver Q.C., D.B.G. Engine Lathe, with oil pump.
17" x 8' Sidney Q.C., D.B.G. Engine Lathe.
17" x 6' Wickes Single Purpose Lathe, with oil pan and cst.

MISCELLANEOUS.

No. 0 Foster Pl. Hd. Screw Machine, with Aut. Chuck and Wire Feed.
No. 3 Foster Pl. Hd. Screw Machine, with Aut. Chuck and Wire Feed.
No. 3 Foster Friction Head Universal Turret Lathe.
No. 4 Foster Friction Head Screw Machine, with Aut. Chuck.
Niagara 30" Queen City Squaring Shears.
No. 2 Quickwork Rotary Shear.
No. 30 Quickwork Universal Machine.
¾" Geometric Threading Machine with 1" die head.
No. 38 Curtis & Curtis Hand Power Pipe Machine.

PETRIE'S LIST of New and Used Machine Tools

In Stock for Immediate Delivery

TURRET LATHES AND SCREW MACHINES

16" x 5½' MacGregor, D.B.G. (2).
16" x 6' Pratt & Whitney, B.G.
18" x 10' Libby (2).
20" x 7' Fay & Scott.
22" x 8' Pratt & Whitney, B.G.
22' x 8' Martin, single purpose.
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
2" x 24" Stevens Screw Machines (2).
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

6" x 30" Dalton, B.G., bench.
13" x 6' Filsmith, D.B.G., comp. rest.
14" x 6' Lodge & Shipley, taper attachment.
15" x 6' Sebastian, B.G., comp. rest (3).
16" x 8' McDougall, B.G., comp. rest (2).
16" x 8' Porter, B.G., comp. rest.
18" x 8' C.M.C., D.B.G., comp. rest.
18" x 10' Putnam, back geared.
20" x 8' Fifield, B.G., plain rest.
22" x 8' Pond, B.G., plain rest.
24" x 11' Pond, B.G., comp. rest.
26" x 14' Gleason, D.B.G.
30" x 10' Ames, B.G., plain rest.
31" x 16' Fifield, back geared.

DRILLS

14" Excelsior, sliding head, lever feed (6).
15" Avey, high-speed, ball-bearing.
16" Barr, sliding head, lever feed.
20" Silver, back geared, power feed (2).
20" Barnes, 3-spindle, lever feed.
24" Kerkhoff, back geared, power feed.
26" Prentice, back geared, power feed.
32" Cincinnati, heavy duty.
40" Bickford, back geared.
46" Allfree, back geared, power feed.
No. 10a Baush, 16-spindle.
D-1 Colburn, back geared, heavy duty.

GRINDERS

10" x 30" Landis, universal.
No. 1 Cincinnati, universal (2).
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer.
24" Barnes, wet tool.
2¼" Yankee, twist drill.

IRON PLANERS

20" x 20" x 5' Bertram.
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Pond, two heads
40" x 40" x 12' New Haven, power feed.

MILLING MACHINES

Bertram, plain.
Brown & Sharpe, power feed, plain.
Monarch, vertical.
Cataract, bench, hand feed.
No. 2 Ford-Smith, plain.
No. 4 Fox, universal.

SHAPERS

16" Petrie, back geared.
16" Canada Mach. Corp., back geared.
16" Cincinnati, back geared.
24" Gould & Eberhardt, back geared.
24" Bertram, back geared.
30" Morton, back geared, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6' Robertson Hack Saws.
4½" Martin Cutting-off Machine.
12" Hall Pipe Machine.
No. 2 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 4 GA Brown & Boggs Punching Press.
No. 18 Can. Hanson & Van Winkle Power Press.
No. 180 Brown-Boggs Power Presses.
No. 3 Goldie & McCulloch Hydraulic Banding Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
7' Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.

FRONT STREET WEST, TORONTO

Good Used Equipment

Traveling Cranes.

20-ton Browning Trolley, 5-ton zux., 56½" ga. (new).
20-ton Shaw, 56' 3" span, 110 V.D.C.
10-ton Case, 58' 3" span, 220 V.D.C.
20-ton Box, 49' span, 220 V.D.C.
10-ton P. & H., 48' span, 110 V.D.C.

Punches and Shears.

Single 48" tht., cap. 3 x 1¼", Providence.
Single 6" tht., cap. ⅞ x ⅞", Cleveland.
Single 15" tht., cap. ¾ x ½" (hand) new Doty.
Double 15" tht. cap. ¾ x ¾" Fischer.
Double 12" blades, bar shear, cap. 2" sq., crucible.
Univ. Plate Shear, 18" blades, cap. ¾", Cleveland belted.
Univ. Plate Shear, 26" blades, cap. ½", Lewis belted.
Guillotine Shear, cap. 2½" sq., belted, Perkins No. 6.
Guillotine Shear, No. O. H. & J., 6 and 7" blades (2).
Guillotine Shear, Fisher, 21" blade, cap. 8 x 2".
Squaring Machine 20", cap. 3/16".

Miscellaneous.

Bolt Cutter, 1½" Reliance, single head.
Bolt Cutter. Acme 2", Class A, single head. dies.
Boring Mill, 10' Niles, Vertical, 2 heads.
Forging and Upsetting Machine, 1½" Acme. with dies.
Forging and Upsetting Machine, 2½" Ajax.
Hammer, 300-lb. Johnson & Jennings, belted.
Hammer, 80-lb. Bradley, Cushion Helve.
Hammer. 40-lb. Bradley, belted (rebuilt).
Hammer. 35-lb. Maggowan & Finigan (Perfect), belted.
Rotary Planer, 36" Cleveland, belt driven.
Rotary Planer 60" Cleveland, motor 60 cy., 440 V.
Milling Machine, No. 24 Osterlein Universal.
Pipe Threading Machine, No. 4 Saunders.
Pipe Machine, 8" E. C. & B.

GOOD CONDITION.
PROMPT SHIPMENT.

McCoy-Brandt Machinery Co.
216-18 Penn Ave.
PITTSBURGH, PA.

"New York's Greatest Clearing-house—
New York's Lowest Prices—J. J. McCabe"

McCabe's Used Tools have been "Over there"—and keep "Going over" right along—

Canada—England—France—Japan—Italy—and Russia have them, and we are Shipping more continually

The RELIABILITY of McCabe's Used Tools is known the world over

42" PLANER

Double Web Housings.
Putnam Machine Co.'s 42" wide, 42" high, table 10' in length inside pockets—with 2 heads on crossrail, having usual automatic feeds, C-shaft and full equipment. In thoroughly good condition ready for immediate service.

36" PLANER

Heavy Double Web Housings.
Flather Co.'s Planes, 36" wide, 36" high, table 8' in length inside pockets, with 2 heads on crossrail, C-shaft and full equipment. In thoroughly good condition ready for immediate service.

34" PLANER

Heavy Double Web Housings.
Pond Co.'s Planes, 34" wide, 34" high and 9' in length, with three threads—two on rail and one on housing. C-shaft and regular equipment. In thoroughly good condition.

26" PLANER

Heavy Double Web Housings.
Pond Co.'s Planes, 26" wide, 26" high and 8' in length, with two heads on crossrail, C-shaft and regular equipment. In thoroughly good condition.

24" PLANER

Heavy Double Web Housings.
American Tool Works Planes, 24" wide, 24" high, table 6' in length inside pockets, with one head on crossrail, C-shaft and full equipment. In thoroughly good condition ready for immediate service.

PLANER TYPE MILLING MACHINE

Heavy Double Web Housings.
Bement-Miles, 24" wide, 24" high, table 8' in length inside pockets. With horizontal spindle, C-shaft and full regular equipment. In thoroughly good condition.

PLANER TYPE MILLING MACHINE

Heavy Double Web Housings (Adjustable). Becker-Brainard, 52" wide, 26" high, table 11' long inside pockets, with horizontal spindle. Arranged for motor drive (no motor. In thoroughly good condition.

VERTICAL MILLING MACHINE

No. 3 Becker-Brainard, in thoroughly good condition.

UNIVERSAL GRINDER

Landis Co.'s, capacity 12"x66" complete. In thoroughly good condition.

LARGE LATHES

60" Swing, 12' Bed, Putnam.
48" Swing, 20' Bed, Putnam.
36" Swing, 20' Bed, Putnam.
48" Swing, Double Head Pulley Lathe.

LARGE TURRET LATHE

40" Swing, American, weighing about 22,500 lbs. Hollow spindle, 3¾" hole for handling work up to 6'9" between chuck and turret. Main turret, 5 tools. Supplementary turret, 4 tools.

FIVE NEW RADIAL DRILLS

2½' Arm, latest heavy pattern, speed box style. with back gears direct on spindle, full automatic feeds, complete. Improved construction.

OTHER TOOLS

PLANERS

36" x 6' Pond, 1 head.
36" x 8' Whitcomb, 1 head.
36" x 12' Niles, 2 heads.

LATHES

16" swing to 60" with beds of various lengths.

STEAM HAMMER

2,500 lbs. single frame, Bement-Miles.

DROP HAMMER

900 lbs., with belt lifter, Williams & White.

J. J. McCabe--149 Broadway

USED MACHINERY

IMMEDIATE DELIVERY

DRILLING MACHINES.

20" Mechanics.
22½ W. F. & J. Barnes, B.G., P.F.
30" Lodge & Davis, S.H., B.G., P.F.
3½' Hamilton Plain Radial, tapping attachment.
4' Mueller Plain Radial.
Four No. 310 Baker Heavy Duty.
3-spindle Rockford.
4-spindle Rockford.
4-spindle Washburn, with power feed.
4-spindle Allen.
No. 11 Pratt & Whitney, 10 spindles.

GEAR CUTTERS.

24" x 7 G. & E., spur gears.
No. 13 B. & S., spur gears.
30" x 9" G. & E., spur and bevel gears.
36" x 9" G. & E., spur and bevel gears.
36" Walcott, spur gears.
No. 1 Shuchardt & Schutte Gear Hobber.

GRINDERS.

No. 1 Cincinnati Universal Tool and Cutter.
No. 2 Woods Tool and Cutter.
Brainard Cutter.
Leland Universal, with power feed.
No. 2 Landis Universal.
No. 21 Landis Plain.
No. 1 Gardner Disc.
No. 24 Gardner Disc.
No. 6-A Diamond Universal.
10" x 36" Landis Plain (new).

LATHES.

14" x 6' Rockford, C.R.
15" x 6' Rockford Tool Co., C.R.
16" x 8' Bradford, C.R.
18" x 6' Bradford, C.R., taper attachment.
18" x 8' Lodge & Shipley, pat. head, C.R., taper attachment.
20" x 14' Blaisdell, C.R.
21" x 12' New Haven, C.R.
36" x 18' Schumacher & Boye, T.B.G., Q.C.G.
36" x 20' American, T.B.G.
36" x 16' Fifield.
42" x 28' Hamilton, T.B.G., raising blocks to swing 54".

PLANERS.

24" x 24" x 6' American, one head.
26" x 26" x 6' Gray, one head.
26" x 26" x 8' Pease, one head.
30" x 30" x 8' Woodward & Powell, one head.
36" x 36" x 14' Sellers, one head.
39" x 39" x 12' New Haven, one head.
48" x 48" x 10' Woodward & Powell, two heads.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES.

No. 1 Warner & Swasey, plain head.
No. 2 P. & W., friction head.
No. 2 Foster, plain head, A.C. and W.F.
No. 3 Bardons & Oliver, plain head, A.C. and W.F.
No. 4 Pearson, friction head, A.C. and W.F.
No. 5 Foster, geared friction head, A.C., P.F. to turret slide, and P.F. to cross slide.
No. 5 Foster, all geared head, A.C. and W.F., P.F. to turret slide.
1—¾" Gridley, 4-spindle automatic.
3—¼" Gridley, 1-spindle automatic.

TURRET LATHES.

No. 2 Foster-Kimball, plain head.
No. 22 Garvin, plain head.
16" Lodge & Davis, back geared.
16" Warren & Swasey, friction head.
2" x 24" J. & L., cone head.
24" Gisholt, 4¼" spindle hole, taper attachment.
No. 3-A Warner & Swasey, bar attachment.

PUNCHES AND PRESSES.

No. 74½ Bliss, str. side, geared.
Blake & Johnson Embossing.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾", 12" throat (new).
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾", 18" throat (new).

MISCELLANEOUS.

24" Bullard Vertical Turret Lathe, turret head and one side head.
No. 00 Baker Keyseater.
6" x 48" P. & W. Thread Miller.
Industrial Gas Hardening Furnace with blower and pyrometer.
No. 2 B. & S. Plain Milling Machine.
No. 3 Cincinnati Vertical Milling Machine.
20 H.P. Nash 2-Cylinder Vertical Gas Engine.
6 H.P. Fairbanks-Morse Horizontal Gas Engine.

STOCKER-RUMELY-WACHS COMPANY
117-121 NO. JEFFERSON STREET CHICAGO, ILLINOIS

MACHINERY FOR SALE

List of Machinery at Empire Tobacco Company, Granby; Prices are for Apparatus on Skids in Company's Yard.

	Machine	Maker	H.P.	Press	Size	Grate	Remarks	Price
H.R.	Tubular Boiler	W. C. White, Montreal	80	100	5'0"x14'0"	5'0"x5'0"	Installed 1900 single lap joints	$490.00
"		Jenckes Machine Co., Sherbrooke, Que.	125	100	6'0"x16'0"	6'0"x6'0"	Installed 1905	800.00
"		Jenckes Machine Co., Sherbrooke, Que.	125	100	5'6"x16'0"	5'6"x5'6"	Installed 1905	800.00

These boilers are without grates, but have fronts, gauges and cocks.

	Machine	Maker	H.P.	R.P.M.	Size	Pulley	Remarks	Price
(1)	Fan	Sheldon & Sheldon, Galt	8	480	48"			$ 34.00
(1)	Horizontal Corliss Valve Engine	Laurie Engine Co., Montreal	85	72	12"x36"	108"x16"	Installed 1905	600.00
(1)	Horizontal Slide Valve Engine	Robb Engineering Co.	12	200	6"x10"		Installed 1905	140.00
(1)	Horizontal Whoolock and Engine	Goldie & McCullough	55	65	10"x30"	96"x16"	Installed 1896	500.00

	Machine	Maker	Press	Size	Remarks	Price
(2)	Vertical Belt-driven Triplex Hydraulic Pump	John H. McGowan, Cincinnati	6000-lb.	1'x⅝"x3"	Installed 1900	$225.00
(1)	Horizon. Belt-driven Duplex Hydraulic Pump	Pontbriand & Freres, Ltd., Sorel	6000-lb.	¾x½x2½	Installed 1907	75.00
(1)	Vertical Belt-driven Duplex Hydraulic Pump	Laidlaw, Dunn & Co., Cincinnati	3000-lb.	1¼x¾x4"	Installed 1895	140.00
	Vertical Triplex Hydraulic Pump	J. T. McGowan, Bliss		1"x⅝x3"	Installed 1896	250.00
(1)	Fan—Height, 110"; base, 3'8½"x6'9½"; inlet, 3'0"-11"; outlet, 3'6"x3'0"; pulley, 22"x9½"; shaft, 2 9/16"; runner, 5' 6";				Sturtevant	350.00

APPLY

IMPERIAL TOBACCO CO. OF CANADA, LTD.
900 St. Antoine St., MONTREAL

FOR SALE

Planer, Punch and Shear.

Jones & Lamson Chucking Machines.

Norton Grinders.

1—36" x 36" x 10' Bertram & Sons Iron Planer, with one head on rail and one side head.
Price $3,000.00

1—30" Bertram & Sons Heavy Single End Punch and Shear, capacity 1¼" x 1", shear blades and punching block complete.
Price $2,500.00

5—Jones & Lamson 3 x 36" Late Pattern Chucking Machines.
Price ..... $1,800.00 each

2—10 x 36" Norton Grinders, Plain, in good condition.
Price ..... $1,800.00 each

All F.O.B. Hamilton, Ont.

GARLOCK-WALKER MACHINERY CO., LTD.
32 Front Street West
Toronto, Ont.
TELEPHONE—Main 5346.

A MAN was wanted as Tool-room Foreman. He was found by a condensed ad. in

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Ave., Toronto

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

New York's Greatest Stock

(PARTIAL LIST)

BULLARD VERTICAL TURRET LATHES.

One 18".
One 20".

BORING MILLS.

No. 2 Barrett Horizontal Cylinder, 5" bar.
Four 30" Bullard Vertical, turret head.

MISCELLANEOUS.

No. 60½ Bliss REDUCING PRESSES, rack and pinion movement, adjustable stroke from 4" to 42", especially adapted for drawing shells and tubes up to 21"
Four 48" Newton Automatic Gear Cutters or Hobbing Machines.
36" Brown & Sharpe Automatic Hob and Spur Gear Cutter.
24" Brown & Sharpe Automatic Spiral Gear Cutter.
24" Morton Keyseater.
24" Baker Bros. Keyseater.
36" x 36" x 12' HEAVY DUTY HORIZONTAL SLAB MILLING MACHINE, adjustable rail.
Ingersoll Slab Miller, 23" between housings, table 20" x 60".
Beaman & Smith 2-spindle Vertical Slab Miller, table 24" x 48".
Two No. 5 Brown & Sharpe Vertical Millers.
No. 4 Brown & Sharpe Plain Miller.
No. 2 Cincinnati Universal Miller.
No. 2 Cincinnati Plain Miller.

NEW SHAPERS IN STOCK.

New 24" Hollingworth Improved Triple Geared Crank.

New York Machinery Exchange, Inc.

50 Church Street . . . New York City

MACHINE TOOLS IN STOCK

No. 4 Cincinnati Universal Miller with vertical attachment and power feed Rotary Table.
No. 3 LeBlond Universal Miller.
No. 1½ NEW American plain Millers.
5—No. 0 NEW Steptoe Hand Millers.
1" x 15" Pratt & Whitney Screw Machine.
28" x 16' Reed Lathe.
24" x 10' NEW Carroll-Jamieson heavy duty lathe.
20" x 6' Davis lathe.
20" x 10' Hamilton lathe.
6—19" x 8' NEW, Sidney D.B.G. quick change lathes, swing 21" over V's.
3—17" x 8' NEW, Sidney D.B.G. quick change lathe, swing 19" over V's.
15" x 6' NEW, Sidney D.B.G. quick change lathe, swings 17" over V's.
12—17" x 8' NEW, National quick change.
15" x 6' NEW, Carroll-Jamieson, quick change.
48" Harrington plain Radial Drill.
36" Dresses plain Radial Drill.
D-4 Colburn high duty Drills.
3—20" Rockford high duty Drills.
16" Queen City B.G. Shaper.
400 lb. Single Frame Steam Hammer.
125 lb. Dupont Belt Hammer.
30 Ton Watson & Stillman Hydraulic Press.

FRANK TOOMEY, INC.

127-131 North Third St., PHILADELPHIA, PA., U.S.A.

We Have for Immediate Delivery the Following Second-hand Machinery in Good Operative Condition

1 Landis No. 3 Universal Grinder 12" x 42", complete equipment, less internal grinding attachment. . $1,500

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $2,200

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $1,800

These machines are particularly good value, and may be seen at our works.

A. B. JARDINE & COMPANY, Ltd.

HESPELER, ONT.

LOOK HERE FOR WHAT YOU WANT

BORING MACHINES—Vertical.

2—32" Bullard, 1 turret head.
1—NEW 36" Gisholt, one swivel turret head, motor driven.
2—38" Bausch, 2 heads.
1—42" Bausch, 2 swivel heads, quick change.
1—42" Bullard, 2 swivel heads.
1—84" Betts, 2 heads, rapid traverse, latest model.
1—NEW 8' Bickford, 90" table, 2 swivel heads; Feb. delivery.
2—10' Niles, 2 swivel heads.

BORING MACHINES—Horizontal

1—Niles 2½" bar, knee type.
1—No. 2 Barrett, 5" bar.
1—London 6" bar.
1—Beaman & Smith, 7" spindle.
1—Barrett, 8" bar.

BULLDOZERS

1—No. 9 Williams & White, belt drive.
1—No. 12 Ajax, single pulley drive.
2—No. 23 Williams & White, belt drive.
1—No. 26 Williams & White, belt drive.
1—No. 29-U Williams & White, arranged for motor drive.

CRANES—Traveling.

1—10-ton Maris, 55' span, hand operated.
2—10-ton Electric, 47' span, 25' lift, 3 motors.
3—10-ton P. & H. Electric, 72' span.
1—10-ton Niles, 72' span.
1—10-ton Whiting, 3 motors, 24' span.
1—50-ton Niles, 61' span.

CRANES—Locomotive.

3—10-15-ton McMyler, broad gauge, steam locomotive, 60' boom, bucket, 3 drums.
1—15-ton Industrial Locomotive, 8 wheel, 40' boom, bucket.
1—15-ton Brown Hoist Locomotive, 36' boom, bucket, 8 wheels.
1—20-ton Orton & Steinbrenner Steam Locomotive, 8 wheel, double drum, 37' boom, bucket.

CUTTING-OFF MACHINES

1—NEW 4½" Davis.
30—Davis 4½"
10—4½" Williams.
2—NEW 6" Davis.

DRILLING MACHINES—Radial

6—NEW 3' Mueller, speed box drive, Dec. del.
3—NEW 3' American, sensitive tapping attachment.
2—4' Mueller Plain, speed box drive
1—4½' Full Universal, cone drive.
1—NEW 5' Western, plain, with motor.
1—NEW 5' Niles Universal, with motor.
5—NEW 5' Mueller, speed box drive; Dec. delivery.
1—6' Pond, cone drive.
1—NEW 6' Triumph, motor drive; Dec. delivery.

DRILLING MACHINES—Heavy Duty

2—D-4 Colburn Heavy Duty, 3½' cap., arranged for motor drive.
6—Foote-Burt Heavy Duty, 2½" capacity.
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.
10—No. 310 Baker, single pulley drive, late type, arranged for motor drive.

DRILLING MACHINES—Sliding Head.

2—NEW 24" Barnes Drills and Tappers.
5—NEW 24" Barnes Drills.
5—NEW 28" Sibley.

DRILLING MACHINES—Multiple Spindle

1—4-spindle 20" Barnes, all geared.
1—No. 5 Fox, 12-spindle, capacity 1".
2—6-spindle Rockford, Economy type.

GEAR CUTTING MACHINES

5—No. 3 Brown & Sharpe Auto. Gear Cutter, spur.
1—36" Newark.
2—No. 4 Brown & Sharpe, latest model, cap. 48" x 10".
1—NEW 6" Standard Gear Cutter, spur.
1—15" Gleason Bevel Gear Planer
1—20" Grant-Lees Gear Hobber, bevel spur and spiral attachment.
1—24" Becker-Brainard.
2—NEW 30" Flather, Solid Pattern.
3—36" Fellows Gear Shapers.
1—NEW 37" Gleason Gear Bevel Planer; Feb. delivery.

GRINDERS—Universal, for Cutters, Drills, Reamers, etc.

5—NEW No. 190 Wells.
4—No. 1 Cincinnati.
1—NEW Premier Universal.
1—NEW Wilmarth & Morman, Style B.K.
1—NEW Walker, No. 1 Outfit B
1—NEW No. 1 Wood Universal.
5—NEW No. 2 Wood Universal.
1—NEW Walker, No. 2 Outfit K (capacity 9" x 26")
2—NEW No. 2 Osterlein Universal.
7—NEW LeBlond.

GRINDERS—Cylindrical—Plain

2—NEW 8" x 18" Modern, self-contained.
3—NEW 8" x 30" Modern, self-contained.
2—NEW 12" x 24" Modern, self-contained.
6—12" x 36" Modern, self-contained.
2—12 x 42" Landis, self-contained.
5—12" x 48" Modern, self-contained.
7—NEW 10" x 50" Norton; October delivery.
1—14" x 50" Norton.
1—NEW 10 x 72 Norton, plain.
1—12 x 96" Springfield.

GRINDERS—Cylindrical—Universal.

2—NEW No. 2 Bath, 9" x 20".
1—NEW No. 2 Walker, 9" x 26"
1—NEW No. 2½ (10" x 36") Bath
1—NEW Thompson, 10 x 36.
1—No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis
1—No. 4 Cincinnati, capacity 12 x 72"

GRINDERS—Internal

1—NEW No. 6 Modern, capacity 10" x 10".
1—No. 70 Heald
1—No. 75 Heald.

GRINDERS—Cylindrical.

1—No. 60 Heald, single pulley drive

GRINDERS—Surface

4—NEW No. 1 La Salle, plain with micro. adj.
1—NEW No. 1½ Walker's, complete.
2—NEW No. 2 American with Walker No. 1¾ plain flat mag. chucks.
6—NEW No. 2 Reid (same as B. & S.).
1—3' Pratt & Whitney Vertical, magnetic chuck.

HAMMERS—Board-Lift, Drop.

1—No. 4 Standard Machinery Co., 400 lb.
1—E. W. Bliss, 800 lb.
1—1500-lb. Toledo.

HAMMERS—Steam Forging

1—450-lb. Bell.
1—800-lb. Niles, Single Frame.
2—3,500 lbs. Chambersburg Steam Drop Hammer.
2—5,000 lbs. Chambersburg Steam Drop Hammer.
1—7,000-lb. Morgan Special Double Stand.

KEYSEATERS

2—NEW No. 1 Davis.
1—NEW No. 2 Davis.
1—No. 2 Mitts & Merrill.
1—No. 2 Knowles, 60" stroke
1—Colburn, 4" capacity, 43" stroke.

LATHES—Manufacturing, Not Screw Cutting.

2—NEW No. 3 Harding Bros.' Bench Lathe.
3—16" x 8' Fairbanks-Morse, heavy duty.
70—NEW Simplex, 16" x 8'.
14—Reed-Prentice Shell Lathes for 4" or 18 lbs. American shells
2—25" Barrett Heavy Duty Boring Mill.
50—20" x 10' Hindman, high duty.
7—36" x 20' Heavy Duty N.B.P., projectile boring, motor driven; almost new.

LATHES—Engine

3—NEW 14" x 6' Bradford, quick change.
14—NEW 15" x 6' Rockford.
1—NEW 14" x 6' Hendey, geared head.
3—NEW 16" x 6' Cleveland Tool Room Lathes; complete equipment.
4—NEW 16" x 8' Bradford, quick change.
1—NEW 17" x 8' National, quick change gears.
12—NEW 17" x 8' LeBlond, pan bed, quick-change gears.
1—18" x 10' Hendey, quick-change gear, 14" chuck.
5—NEW 20 x 10 Bradford, quick change.
1—NEW 20" x 10' Cleveland Geared Head
3—NEW 20" x 12' Bradford, quick change.
19—NEW 21" x 10' Porter, S.B.G.
9—22" x 10' Putnam, oil pan and pump.
1—NEW 24" x 10' Bradford, quick change.
5—NEW 24" x 12' Bradford, quick change.
1—NEW 24" x 12' American.
3—24" x 14' American, quick change.
1—24" x 22' Bullard, triple geared, taper attachment.
1—NEW 26" x 48" x 12' McCabe, Double Spindle.
1—New 26" x 48" x 22' McCabe, Double Spindle.
8—NEW 28" x 12' Conradson, duplex helical drive, screw cutting type.
1—NEW 30" x 14' American Double Back-Geared, Quick-Change
1—30" x 14' Lodge & Shipley, single pulley drive, quick change.
1—NEW 32" x 12' Pittsburg Pattern.
8—NEW 36" x 24' Putnam, triple-geared
1—NEW 42" x 24" Triple-geared Houston, Stanwood, heavy duty.
1—42" x 28' Hamilton, triple geared, quick change, raising blocks to 54".
1—50" x 24' Prentiss.
1—54" x 22' Worcester, triple geared.
1—NEW 66" x 46' Putnam, triple geared, face plate drive, 5-step cone, 6¼" belt; October delivery.
1—84" x 18' Special Boring Lathe.

LATHES—Turret

8—NEW 21" Gisholt, H-21.
2—NEW 24" Gisholt, I-24.
5—2 x 24" Jones & Lamson
1—NEW 18" Libbey.
3—24" Libbey, universal facing head, 3-jaw chuck.
1—20" Steinle, almost new.
18—6-A Potter & Johnson.
1—No. 24 New Britain, arranged for motor drive; almost new.

MILLING MACHINES—Knee Type—Universal

1—No. 2 Kempsmith, vertical attach.
1—No. 2 Kempsmith, 13" dividing head.
1—NEW No. 2 Rockford High Power.
2—NEW No. 2 Garvin.
1—No. 2 LeBlond.
10—NEW No. 2 Owen.
2—NEW No. 3 Cincinnati, high power.
1—No. 3-H LeBlond Heavy Duty, almost new.
1—No. 25 Osterlein.
1—NEW No. 34 Oesterlein, heavy duty, latest type.

MILLING MACHINES—Knee Type—Plain

9—NEW No. 0 Rockford.
2—NEW No. 1 Kempsmith.
2—NEW No. 1½ American back gear
2—NEW No. 2 Rockford
10—NEW No. 2 Owen; November delivery.
1—No. 3 LeBlond
2—No. 3 Kempsmith.
5—NEW No. 3 Conradson, single pulley drive.
4—NEW No. 3-H LeBlond.
10—NEW No. 3 Owen.
1—NEW No. 4 LeBlond.

MILLING MACHINES—Duplex.

1—No. 1½ Van Norman; almost new.
1—No. 2 Garvin, spiral drive.

MILLING MACHINES—Hand.

3—NEW No. 1 Rockford, without column.
3—NEW No. 2 Rockford, on column.
2—NEW No. 3 Rockford, on column.
3—NEW No. 3 Rockford, on column, power feed.

MILLING MACHINES—Vertical

2—NEW No. 4-B Becker.
3—NEW No. 5-B Becker, rotary table.
1—NEWTON Vertical, continuous, motor driven, for shell work.

MILLING MACHINES—Planer Type

1—No. 2 Beaman & Smith.
1—Ingersoll Slab, 15" x 48" cap.
1—NEW 16" x 5' Eynon, planer type.
1—30" x 30" x 8' Ingersoll No. 928, single spindle, with motor.

MILLING MACHINES—Lincoln Type.

1—NEW No. 1 Gooley & Edlund, Briggs type.
3—NEW No. 1 American.
18—NEW Sellers Auto., quick return.

PLANERS

4—NEW 24" x 24" x 6' Powell, Single Head.
1—26" x 26" x 10' Gray, 1 head.
1—36" x 36" x 10' American, two heads.
1—36" x 36" x 14' Cincinnati, 2 heads; fine condition.
1—36" Rotary Planer, motor driven.
1—36" x 36" x 8' Gray, 1 head.
1—40" x 40" x 11' Niles, four heads
1—42" x 42" x 12' Butler, high speed, 3 heads; almost new.
1—48" x 48" x 12' Scott, heavy type, milling attachment on rail.
1—50" x 48" x 15' Betts, 2 heads.
1—60" x 60" x 16' Betts, 2 heads.
1—60" x 60" x 20' Pond, motor driven, 4 heads; very good condition.
1—72" x 60" x 14' Smith Globe, 2 swivel heads.

SCREW MACHINES—Hand.

4—NEW No. 2 Foster, geared friction head.
1—NEW No. 4 Foster, geared friction head, power feed to turret slide.
2—NEW No. 5 Foster, all geared, power feed to turret slide.
3—NEW No. 5 Foster, all geared head, power feed to turret, power cross feed.
2—NEW No. 6 Foster, geared friction head, power feed to turret, power cross feed.
5—NEW No. 7 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW No. 10 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW 2¼" Dreses, F.G.B., power feed.

SCREW MACHINES—Automatic

2—NEW ⅝" Cleveland, Model A.
1—NEW ¾" Gridley Mult. Spindle, belt driven.
2—NEW 1¼" Gridley Mult. Spindle, belt driven.
2—NEW 1¾" Gridley, mult. spindle, belt driven.
1—NEW 2¼" Gridley Mult. Spindle, belt driven.
4—4¼" Gridley Single Spindle, arranged for motor drive.
3—No. 0 Brown & Sharpe.
1—No. 2-G Brown & Sharpe.
9—No. 56 National Acme, arranged for motor drive.

SHAPERS

1—NEW 16" Springfield
1—16" Motor Driven Rockford
5—NEW Barker, 24".
2—NEW 24" Milwaukee.
2—NEW 24" Potter & Johnson, universal rotary table.
1—25" Springfield.
2—30" Morton Draw Cut.

SLOTTERS.

1—20" Sellers, heavy duty.

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WRITE OR WIRE OUR NEAREST OFFICE FOR QUOTATIONS
THIS IS ONLY A PARTIAL LIST OF AVAILABLE MACHINES

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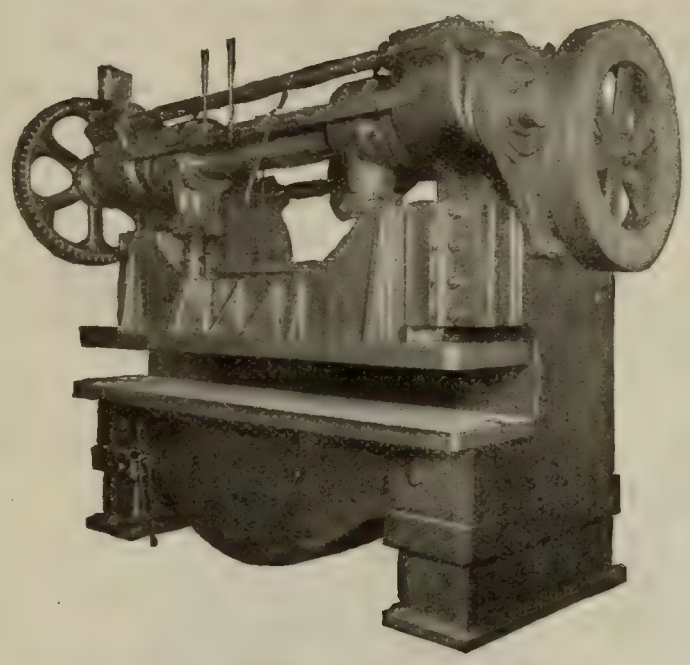

Large Blanking Press

76" between housings, 8" shaft,
3½" stroke, 8¾" die space.

Very good condition and for immediate delivery.

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There's a man

advertising on page 72 for a position.

Have you a position open that he could profitably fill? If you have, write him. If you have the position and don't think he can fill it, advertise for one who can.

Canadian Machinery

Classified Advertising Section

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It may not knock for *you* this week, but read these pages regularly and grasp the opportunity when it presents itself. Every ad here is an opportunity for someone! Your time is coming. If you think the time is ripe to spring that little proposition of yours, send in your copy now for the next issue. If it is of interest to our readers, rest assured it will get attention.

CANADIAN MACHINERY

Classified Advertising Section

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TOOL GRINDING CHART

Showing clearance and rake angles for cutting tools. 17 x 27½ inches, printed in two colors on heavy manilla stock.

A splendid thing for any tool room. One large engineering firm, in acknowledging this chart, stated that they would like two additional copies as they intended adopting it as standard in their tool room.

We would like these charts placed in every shop in the Dominion and if there is not one in YOUR tool room, write for your copy at once. IT'S FREE.

CANADIAN MACHINERY,
153 University Avenue, Toronto.

Please send me/us free, one of your tool grinding charts.

Signed.....

Firm Name.....

St. Address.....

City.....

Prov.....

RIVERSIDE Machinery Depot

We Own Every Tool Offered

NEW MACHINE TOOLS

For Immediate Delivery

1—18 x 8 Springfield Standard Engine Lathe.
2—16 x 8 Springfield Q.C.G. Engine Lathes.
1—16 x 6 Springfield Q.C.G. Engine Lathes.
2—16" Springfield B.G. Shapers.
2—20" Springfield B.G. Shapers.
1—25" Springfield B.G. Shapers.
3—14" Pierce Turret Lathes.
2—1 x 8 Pierce Hand Screw Machines.
3—No. 1½ American Milling Machines.
1—No. 20 Bliss O.B.I. Press.
1—No. 19 Bliss O.B.I. Press.
1—No. 18C Bliss O.B.I. Press.
1—No. 18 Bliss O.B.I. Press.
5—20" Buffalo B.G. P.F. Drill Presses.
3—20" Canedy-Otto B.G., P.F. Drill Presses.
2—20" Champion B.G., P.F. Drill Presses.
3—20" Champion Plain Drill Presses.
3—20" Silver Plain Drill Presses.
3—20" Canedy-Otto Plain Drill Presses.
2—14" Champion Plain Drill Presses.

USED MACHINERY

ENGINE LATHES

1—22 x 14 Putnam Standard Engine Lathe.
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Springfield Standard Engine Lathe.
1—14 x 6 Prentiss Standard Engine Lathe.
1—14 x 6 Sebastian Standard Engine Lathe.
2—13 x 8 Barnes Standard Engine Lathe.
1—13 x 5 Barnes Standard Engine Lathe.
1—10 x 4 Sebastian Standard Engine Lathe.

TURRET AND SCREW MACHINES

2—No. 6-A Potter & Johnston Automatic Lathes.
1—4¼" Gridley Automatic Screw Machine, motor driven.
2—No. 4 Foster F.G.H. Hand Screw Machines.
2—No. 3 Foster F.G.H. Hand Screw Machines.
1—No. 5 Pierson F.G.H. Hand Screw Machine.
4—12" Warner & Swasey Turret Lathes with air chucks.
4—16" Warner & Swasey Turret Lathes.
2—2" Cleveland Automatic Screw Machines, jigger feed.
1—⅝-¾" Cleveland Automatic Screw Machine.

MILLING MACHINES AND GRINDERS

1—No. 4 LeBlond Plain Milling Machine.
1—No. 2 Hendey Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drilling Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
1—No. 2½ Bath Universal Grinder.
1—No. 12 Modern Plain Grinder.
1—No. 14 Modern Plain Grinder.
1—No. 1 Landis Internal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.

DRILL PRESSES

1—5' Mueller Plain Radial Drill, old type.
1—31" Barnes B.G., P.F. Drill Press.
1—3-spindle 8" overhang Henry & Wright High Speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.

SHAPERS AND PLANERS

1—18" Hendey Geared Shaper.
1—36 x 36 x 10' New Haven Planer, S.H.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS

1—Waterbury Farrell O.B.I. Press, geared.
1—No. 10 Perkins Drawing Press.
3—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—150-lb. Bradley Strap Hammer.

AIR COMPRESSORS

1—9 x 11 Chicago Pneumatic Belt-driven Air Compressor.
1—8 x 8 Fairbanks-Morse Belt-driven Air Compressor.
1—8 x 8 Gardner Single Belt-driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt-driven Air Compressor.
1—8 x 6 Westinghouse Steam Air Compressor.
1—6 x 6 Ingersoll-Rand Belt-driven Air Compressor.

We also carry a large assortment of Steam Engines, Steam Pumps and Electrical Equipment of all kinds. We are in the market to purchase machine tools, large and small.

RIVERSIDE MACHINERY DEPOT
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Special Machinery, Gears, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Etc.

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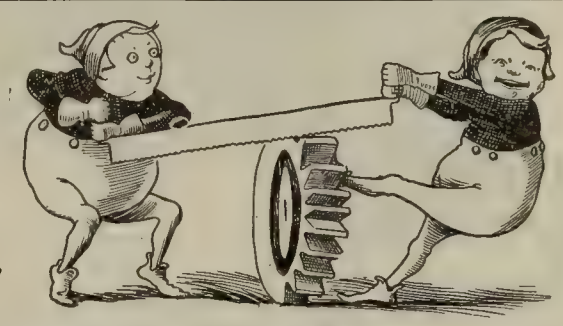
We Cut Gears

Rawhide, Steel, Iron, Brass.



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Builders of Special Machinery.

JIGS, GAUGES AND SPECIAL TOOLS.

General Machine Shop Work of all Descriptions.

Bids Submitted on all Classes of Contract Work.

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Get our Prices on Gauges, Boring Bars Rough Turn Drivers, Etc., for 6 in. SHELL.

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Brass and Aluminum Castings

Prompt Delivery

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Send us your rush orders for Screws and Nuts. We ship from a stock where "Accuracy" is all important.

Prompt service and "GALT" quality goods only.

Specialists in Gap and Set Screws.

THE

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Eastern Representatives: The Canadian B. K. Morton Company, Limited, 49 Common St., Montreal, Que.

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Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

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PRODUCE THE STAMPINGS

Let us quote on your requirements.

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By Using Parts Made in the Punch Press

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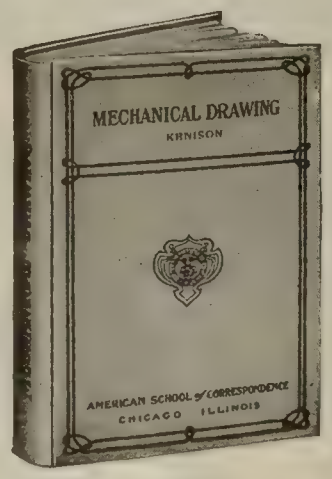
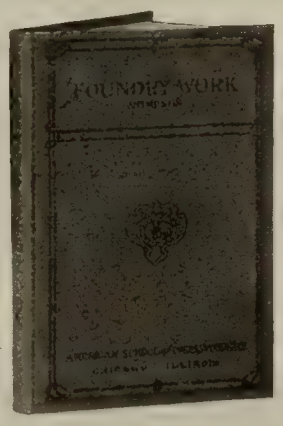
If you are desirous of improving yourself in your trade and so putting yourself in the position of making more money, these Mechanical Engineering Books will be found helpful.

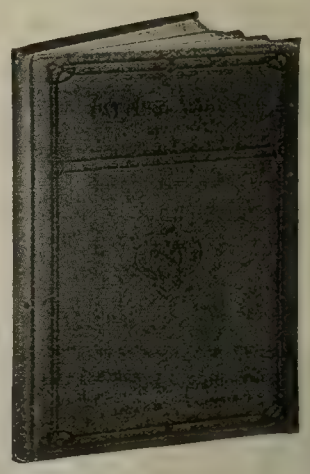
MACHINE-SHOP WORK. By Frederick W. Turner, Instructor in Machine-Shop Work, Mechanics Arts High School, Boston. 208 pp., 241 illus. Cloth binding. The use of various hand tools is explained, followed by a comprehensive discussion of the lathe and lathe tools, with the methods of screw cutting, taper and eccentric turning, etc. The way to figure compound gears for screw cutting; drilling; boring; planers; shapers; slotters; milling machines and cutters; how to cut spirals, gears, cams, etc.; grinding; the operation of automatic machines. Price **$1.50**



MECHANICAL DRAWING. By Ervin Kenison, S.B., Assistant Professor of Mechanical Drawing. Massachusetts Institute of Technology. 176 pp., 120 illus. Cloth binding. Gives a course of practical instruction in the art of Mechanical Drawing, based on methods that have stood the test of years of experience. Includes orthographic, isometric and oblique projections, shade lines, intersections and developments, lettering, etc., with abundant exercises and plates. Price...**$1.00**



FOUNDRY WORK. By Wm. C. Stimpson, Head Instructor in Foundry Work and Forging, Department of Science and Technology, Pratt Institute. 160 pp., 142 illus. Cloth binding. A practical guide to modern methods of moulding and casting in iron, brass, bronze, steel, and other metals, from simple and complex patterns, including many valuable hints on shop management and equipment, useful tables, etc. Price **$1.00**



PATTERN MAKING. By James Ritchey, Instructor in Wood Working, Armour Institute of Technology. 160 pp., 250 illus. Cloth binding. Shows the reader how to take the blueprint and from it make the pattern for any kind of casting under any condition. The allowances for shrinkage, draft, and finish are explained. Simple and built-up patterns of all kinds are clearly treated. Various special cases are taken up, such as pulleys, cranks, pipe connections, valves, etc. Price **$1.00**

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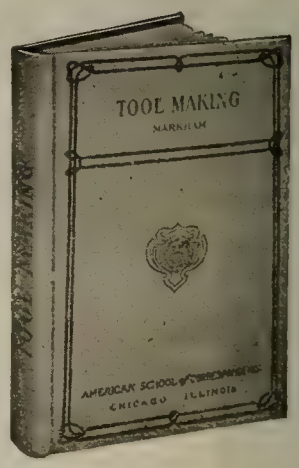

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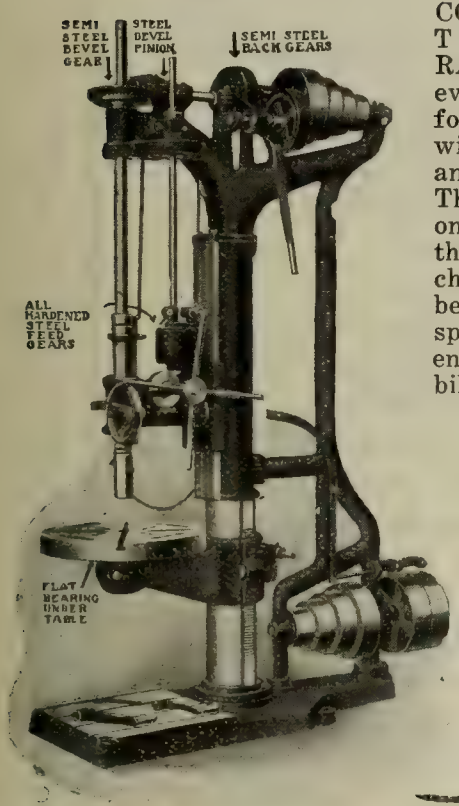

COVER AN EXCEPTIONALLY WIDE RANGE OF WORK, and every provision is made for handling this work within closest time limits and at lowest labor costs. They will save you money on any work in your shop that's suitable for machine tools of this kind because of their unusual speed, accuracy, convenience, strength and durability.

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Stationary Head, sizes 20"-21"

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Complete line. 8-inch to 50-inch swing

Gang Drills.—Horizontal Drills.

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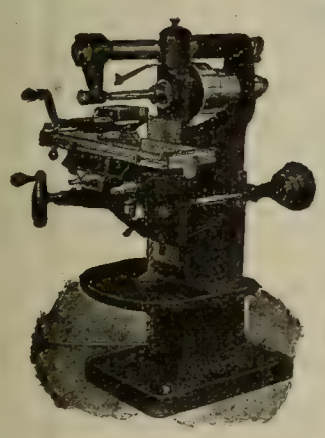

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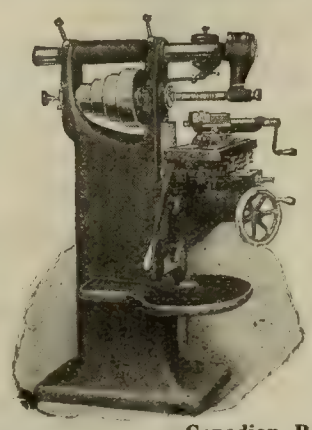

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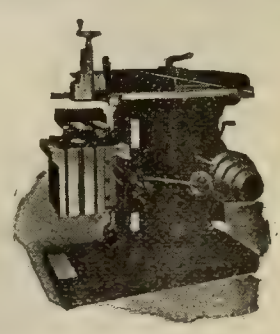

Will result in increased production; less money invested in machinery, and increased profits.

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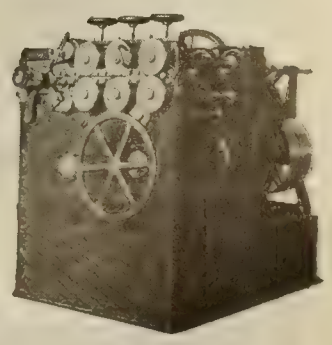
Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.

The Machines that put the "Rings" in Springs!



More Than Forty Standard Spring Making Machines.

High-Speed Automatics for Making Fuse and Small Arms Springs.

Flexible Metallic Tube and Casing Coilers.

Sleeper & Hartley, Inc., WORCESTER, MASS. and COATICOOK, P.Q.

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The Importance of "Arch Design" in Furnace Construction

Heat and light act and move strictly in accordance with certain natural laws. These laws cannot be changed or altered by man. If heat is permitted to act in accordance with the known law of reflection (identical with light reflection), the maximum benefits can be derived from it.

In the construction of furnaces for the heat treatment of metals, it is necessary that the laws of heat be respected in order that the radiant heat can be completely used.

This brings us to the subject of ARCH DESIGN. We show here, comparison between properly and improperly designed arches. By referring to figure 1, which is a diagram of the arch of Tate-Jones Furnaces (Series A and H), you can see that all the radiant heat rays reached the hearth because of the properly shaped reflecting surface of the arch, combined with properly designed flue area. The lines representing radiant heat rays are drawn strictly in accordance with the law of heat reflection. (Of course, similar rays would be reflected from the opposite side of the furnace.)

It is plainly seen that all of this heat reaches the hearth and that all of the hearth is heated. It follows then that the work, no matter where placed on the hearth, will receive the full benefit of the heat. All of the available radiant heat is used. This is economy. It means speed. It means a uniform finished product.

Size and shape of combustion chamber also size of flues contribute to the successful results. Flues, in this case, are the spaces between the hearth and the side walls.

Figure 2 represents the interior of a furnace in which the arch and flues are improperly designed. The lines representing the radiant heat rays are drawn in accordance with the law of heat reflection. The law of heat reflection works in this case identically as in the former. But—the arch being improperly designed, reflects the rays not only on the hearth, but beyond it. Thus the work does not receive the full benefit of the radiant heat.

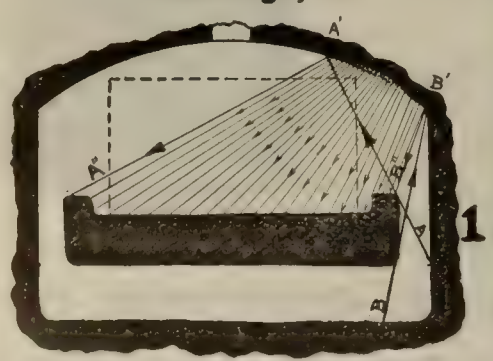
Figure 3 represents the interior of yet another furnace. Here again, the radiant heat rays are represented by lines drawn in accordance with the law of heat reflection. As can be readily seen, the hearth does not receive the full benefit of the reflected heat as the greater portion of the heat is reflected directly back upon its original source and therefore lost. This results in a great waste of gas.

These furnaces, Series A and H, are for the hardening, annealing and heat treating of small tools, dies, parts, etc.

All of the illustrations shown here are of actual furnaces. Number 2 and number 3 having been tested in our laboratories in comparison with our own. We will be glad to send anyone interested, full information concerning the

Tate-Jones Gas Oven Furnaces

TATE-JONES & CO., Inc.
Established 1898
Furnace Engineers
Pittsburgh, Pa.



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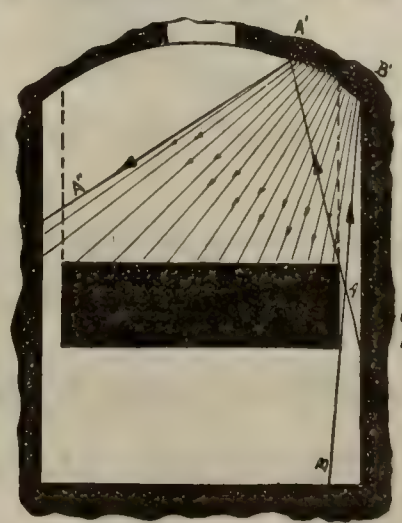

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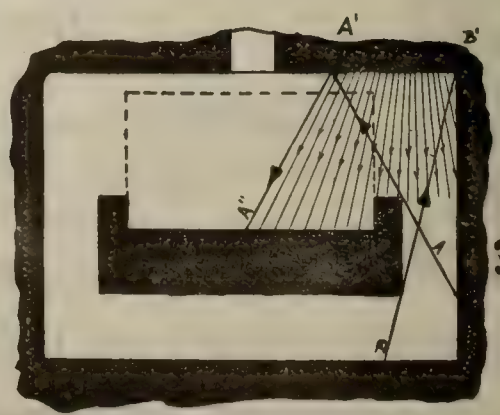
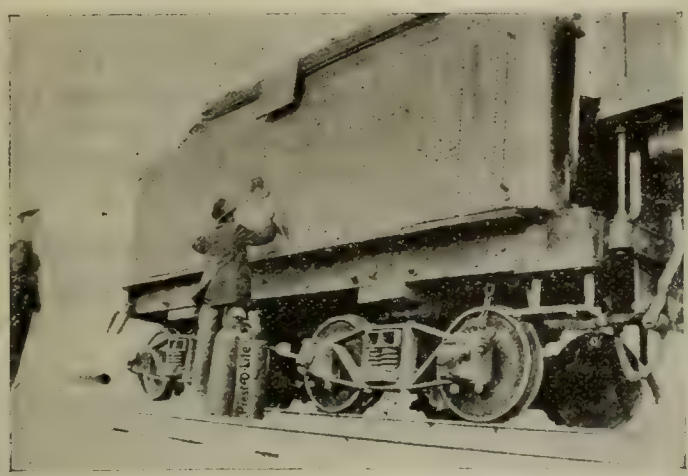


3

Oxy-Acetylene Welding and Cutting



RAPID REPAIRING "ON THE SPOT"

THIS illustration shows an operator repairing a leaky tank car right on the track, at a trifling expense, by the Prest-O-Lite Process of Oxy-Acetylene Welding. Thousands of Railroads, Mines, Factories and Machine Shops have adopted this process, and are saving hundreds of thousands of dollars annually.

Costly tie-ups are avoided—valuable castings and machine parts are saved from the scrap pile—and many economies and improvements are effected both in repairing and manufacturing

Prest-O-Lite PROCESS

employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene (ready-made carbide gas) is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Apparatus consists of an equal pressure blow pipe, automatic regulators and gauges, and all necessary equipment. Adaptable for oxy-acetylene cutting by the addition of special cutting blow pipe.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

We will gladly send illustrated literature and interesting data showing actual instances of savings made by others. It may suggest valuable ideas to you. Write for it. Address Department C-107.

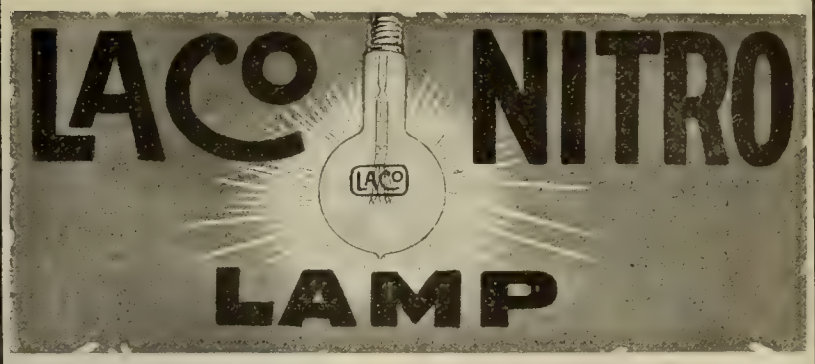
THE PREST-O-LITE COMPANY INC.

CANADIAN GENERAL OFFICES:
913-14 C.P.R. Building TORONTO

Direct Factory Branches: Toronto, Ont: Montreal, Que.; Merritton, Ont.: Winnipeg, Man.

Canadian Plants: Toronto, Ont.: Merritton, Ont.: Winnipeg, Man.; Shawinigan Falls, Que.

World's Largest Makers of Dissolved Acetylene



LIGHT IS AN ASSET

Capacity production and maintenance of quality demand skilled and efficient labor. But are you putting a handicap in their way by giving inadequate light during the late fall and winter afternoons?

Just note the advantages of flooding your factory, mill or shop with the equivalent of sunlight. It makes possible the use of every nook and corner—it gives you full floor space. It eliminates many of the dangers of error, accident and spoilage. It gives larger production. It protects against breakage and damage to your costly machines and tools. It helps to keep your employees bright and alert.

Provide for your employees more hours of light in which to render efficient production. Give them artificial light which will maintain their skilled capacity throughout the full eight-hour day or night shift.

Protect them against accidents and errors and make their working vicinity bright and cheerful by using

LACO NITRO LAMP "THE LIGHT THAT GIVES MORE LIGHT"

This lamp is gaining daily in popularity because of its many superior merits over other type lamps.

Low in operating cost and high in efficient service. Uses less current and gives a clearer, brighter light than heretofore possible. Scientifically constructed with tungsten filament substantially suspended in nitrogen gas-filled bulb, thus securing long utility under severe usage.

Inquire From Your Nearest Dealer.

CANADIAN LACO-PHILIPS COMPANY, LIMITED

Stocks available at
MONTREAL, TORONTO, WINNIPEG, VANCOUVER

If any advertisement interests you, tear it out now and place with letters to be answered.

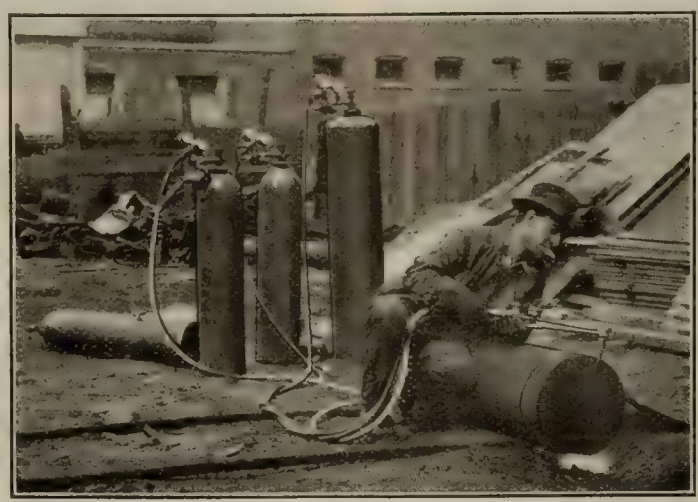
Cutting Steel 18 inches in diameter in 14 minutes
by Oxy-Acetylene Process

The material cut was cold rolled shafting which had been lying in the open for some time and had a thick coating of scum on it. Problems like this are easily solved by Oxy-Acetylene Process.

When time is valuable and labor scarce, Cutting Iron and Steel by the Oxy-Acetylene Process offers incalculable advantages, which have to be investigated to be thoroughly appreciated.

When you have a problem of this nature to solve

Be prepared for it. The cost of an Oxy-Acetylene Equipment is so small that it should have a place in every well equipped Plant. Once its value has been established innumerable uses can always be found for it, and it will pay its initial cost hundreds of times over in saving time and labor alone. In many instances it is the only practical method to employ.



The Advantages of the Process to you are manifold

In every Plant there is always the probability of a serious "break-down." Replacements are difficult to effect and expensive to procure. There are also innumerable small breakages, and waste material than can be all used up. Oxy-Acetylene Welding saves this waste and obviates the risk of a "tie-up," reclaiming all broken parts and joining metals otherwise useless, at a very small cost.

Why not see in how many ways you can save money?

With "A.L.S." Service backing "A.L.S." Equipment, there is no risk that the investment you make will prove unprofitable. We shall be pleased to advise you as to how you may benefit by the Process, and your interest will be appreciated. Write to-day.

The Pioneers of the Process **L'AIR LIQUIDE SOCIETY** **Factories the world over**

Canadian Factories: TORONTO MONTREAL WINNIPEG HALIFAX: Under Construction

COMMERCIAL ACETYLENE IS USED IN LARGEST SHIPBUILDING PLANTS

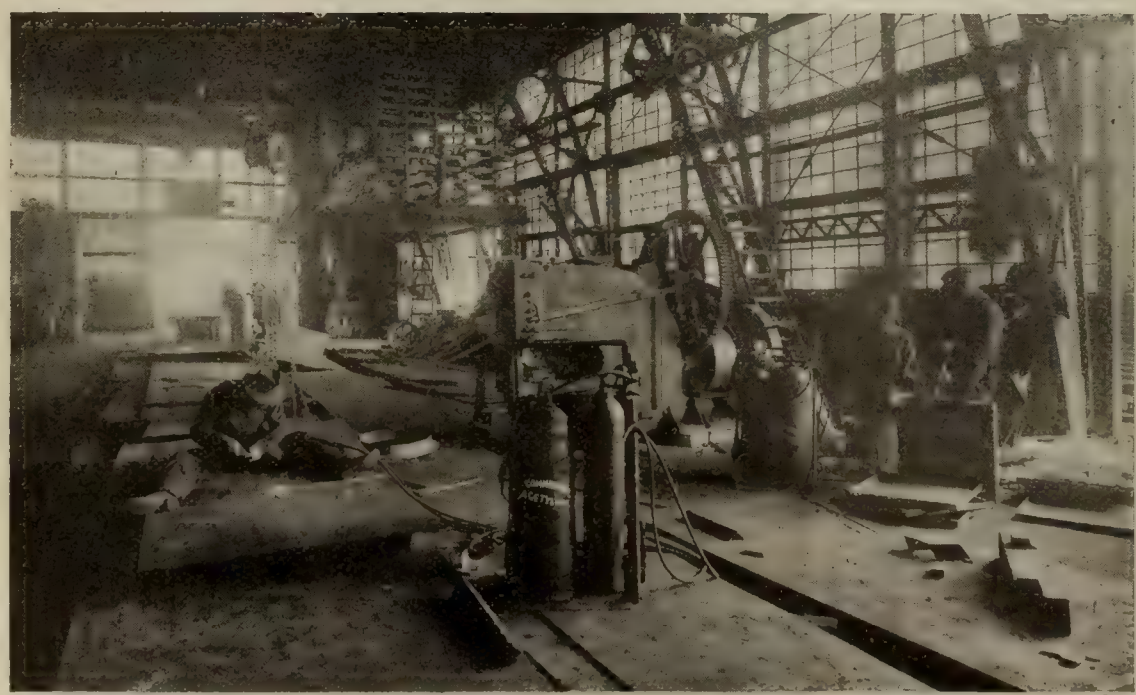


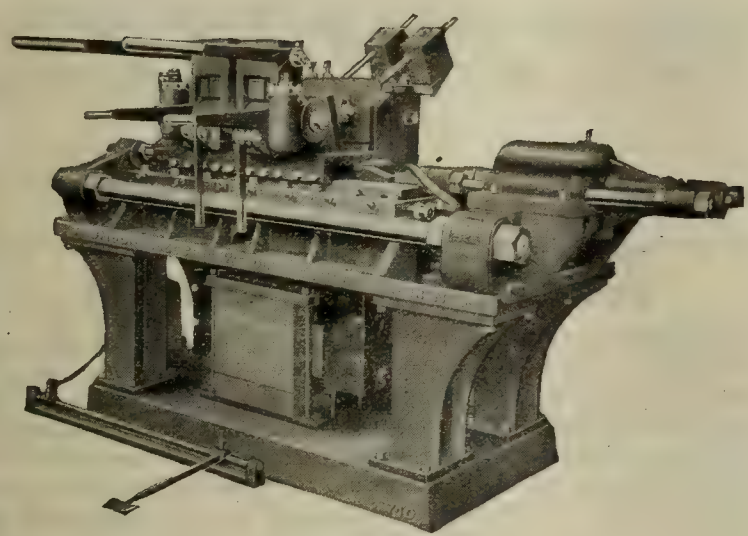
Illustration shows Commercial Acetylene cutting ship plates in one of the largest shipbuilding plants in Canada. We guarantee both quantity and quality of Commercial Acetylene. Write our nearest office about your supply.

MAIN OFFICE:
80 Broadway, New York
BRANCHES:

ATLANTA, GA.
AURORA, ILL.
BOSTON, MASS.
BOUND BROOK, N.J.
EAST DEERFIELD, MASS.
SAN FRANCISCO, CALIF.
MOBERLY, MO.
W. BERKELEY, CALIF.

COMMERCIAL ACETYLENE WELDING CO., INC.
103 BAY STREET, TORONTO

Thomson Process
Electric Welding



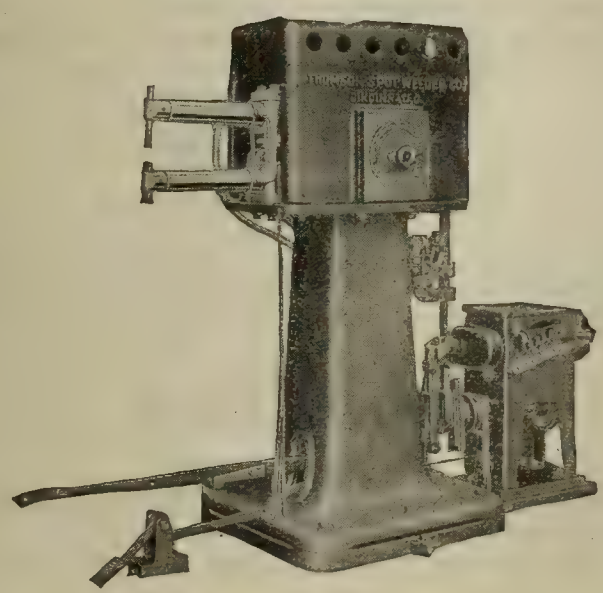
40-A-9
Butt Welding Machine

Waste!

The Thomson System of Electric Welding eliminates waste. Big manufacturers who allow so much for spoiled work each day will find it far cheaper to buy a Thomson Butt Welder. The saving in six months will more than pay for the initial cost.

For welding automobile rims, brake rods, angle irons, pipe joints or whatever your problem might be there is a style of Thomson Butt Welder that will do it more economically than you are getting it done now.

Send for Bulletin B-4



Combination Foot Operated and Six Speed Gear Box. Belt Driven.
Type 177

The Thomson Spot Welder makes more and better work possible

One firm writes, "One boy and a 'Thomson' can do more and better work than five men were able to do by the method we formerly used."

The Thomson Spot Welder is simple to operate. Just place the two pieces of metal to be welded between the copper die points—press the foot treadle and the pieces are united forever. No smoke, danger or dirt. No holes to punch. No rivets used.

There is a Thomson Spot Welder for your work. Let us have your requirements and we'll show you the machine.

Send for Bulletin S-4.

Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

If any advertisement interests you, tear it out now and place with letters to be answered.

Escaped from Germany

AN escaped prisoner tells the story of his fearful experiences in Germany in MACLEAN'S MAGAZINE for November; and gives a vivid picture of conditions in Germany as he saw them. He got out by way of Holland after appalling perils and hardships. In Holland, he was photographed, but so altered was he that his wife quite failed to recognize him in this photograph. Read this story of this Canadian soldier's escape. It is gripping stuff—a rare tale.

Canadian Finances After the War

WILL business in Canada collapse when peace comes? It may. What do the big men say? What do they know? What do you think? Are your opinions well informed? The subject is of the greatest possible importance, and you will get light and leading by reading the contribution of Col. John Bayne Maclean, who has taken the trouble to get the opinion of the biggest and most highly placed men in Canada to help him prepare his article.

Back from the Arctic

WILLIAM THOMPSON, representing the American Geographical Society, was this year in the Arctic Regions. He went to the delta of the Mackenzie River, and took many excellent pictures of the country and its Eskimo inhabitants. He makes the November MACLEAN'S the vehicle of many of his pictures and for an account of his journey. Read what this Arctic scientist has to tell us about a remote part of our land.

Slackers and Conscription

WHAT is your attitude towards the draft? You have positive opinions, of course. How do they square with Miss Laut's as they are expressed in her ringing article on Slackers in the November MACLEAN'S?

The Nation's Business

THIS is a new feature—a fearless, well-informed survey of national affairs. What we all want is an outspoken—but not vindictive—and clear-visioned presentation of factors and facts affecting our national, political and economic welfare.

Sketches of Trench Life

By Gunner McRitchie

MCRITCHIE was a cartoonist on a Western Canada daily before he went overseas. He has done a number of sketches of trench life "On the Spot," and these he has sent home, for publication in MACLEAN'S MAGAZINE. They're interesting and good.

The Late Sir Mortimer Clark

BEFORE he died, a few weeks ago, the late Sir Mortimer Clark, eminent jurist and an ex-Lieutenant-Governor of Ontario, wrote for MACLEAN'S an article on "Safeguarding Your Heirs." It has to do with the functions, service and safety of Trust Companies as executors of estates. This article by a man so distinguished, so cautious, so able, and so wise a counsellor, can be of first-rate value to every man perplexed with the problem of how his estate can be safely and prudently administered after he, the testator, has passed from this life.

A Complete Novelette

By Peter B. Kyne

HIS story in the November MACLEAN'S is a thunderingly good story of lumbermen and lumbering. Red blood is in this tale of business. R. M. Brinkerhoff illustrates it.

Short Story

By Ethel Watts Mumford

THE writer of this short story—the first of a delightful series by this author to appear in MACLEAN'S—is very well known among short story writers. Delicate fancy, wholesomeness, freshness and finished workmanship characterize all her work.

Short Story

By W. A. Fraser

A MIGHTILY well-written story of India—the kind that we all delight in; tense, bewildering, and lots of action. Fraser never wrote a better short story than this. Ben Ward illustrates it.

Hendryx and Oppenheim

SERIALISTS

"THE Gun Brand," by Hendryx, comes to an end in the November issue. Oppenheim's greatest story, "The Pawns Count," is continued. Oppenheim's story is the biggest single feature ever secured by MACLEAN'S.

MACLEAN'S MAGAZINE

for November At All News Dealers **15c.**

BRASS Castings

The coupling of expert work with unexcelled equipment enables us to produce on a large scale Brass Castings of any size or alloy.

Our prices, too, are most reasonable; for our large purchases direct from the smelters command their every price favor.

For better Brass Castings at a money saving, send your orders to us. We promise that our work will please you.

The St. Lawrence Welding Company, Ltd., Montreal, P.Q.

Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, Etc. Electric Welders, Oxy-Acetylene Welders. Boiler Repairs. Lead Burning and Brass Foundry Work.

Office: 138 Inspector Street Works: 39 Olier Street Telephone: Office, Main 5779, Manager's Res., Westmount 3483

The Heat in Your Steam Condensation

What Are You Doing With It?

A big *economy* or a big *waste?*
A big *saving* or a big *loss?*
Which is it in your plant?

Are you returning the condensation in your steam lines *immediately* back to the boilers as pure hot feed water—or are you allowing it to clog up your apparatus and slow down the operation of your plant.

The thousands of concerns—both large and small—who use the

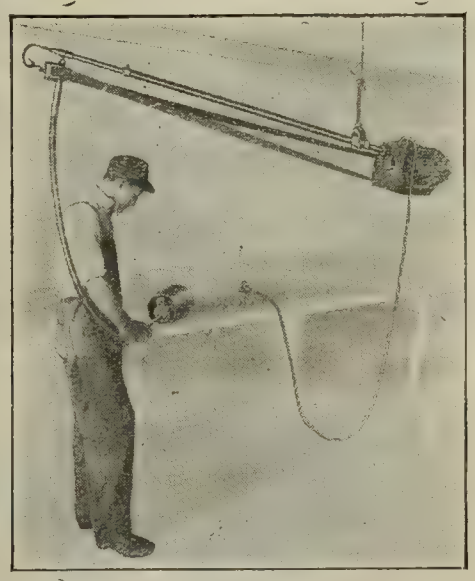
Morehead Back to Boiler SYSTEM

turn the water of condensation right back to the boilers at from 270 to 312 Degrees F.—save from 8% to 10% in coal over the wasteful steam pump—and at the same time keep every inch of heating surface on their equipment working at the highest possible thermal efficiency.

If you are still depending upon steam pumps or other makeshifts for handling the condensation in your plant you can convert a big loss into a big saving by investigating the Morehead System at once. For complete particulars address

CANADIAN MOREHEAD MFG., CO.
Dept. "L"
WOODSTOCK, ONTARIO

Stow Shell Grinders Increase Production



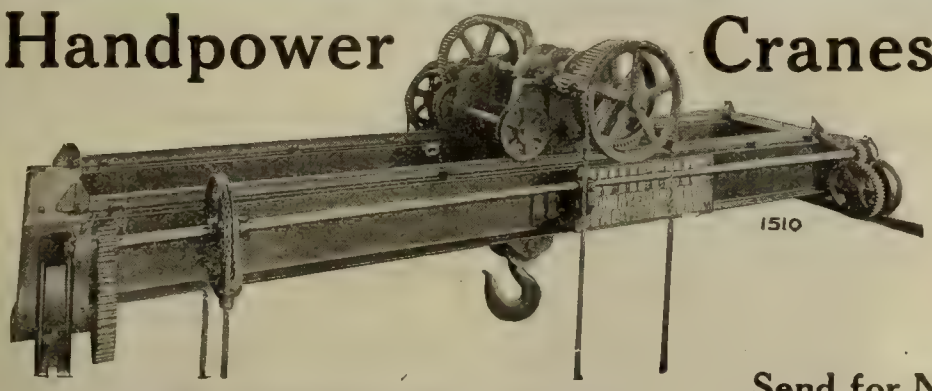
Suspended Pedestal Mounted on Truck

Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.
Binghamton, New York, U.S.A.
Oldest Portable Tool Manufacturers in America

Handpower Cranes for quick delivery



Can make quick shipment of short span handpower cranes of medium and light capacity, single or double I-beam.

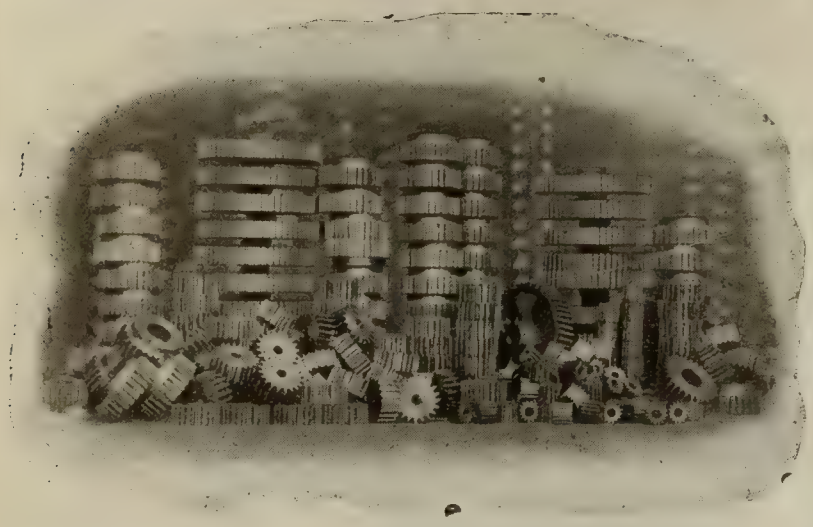
Our rope-drum trolley has two speeds and automatic brake. Load held at all times. Floor control.

Complete Foundry Equipment
CRANES OF ALL TYPES

Send for New Catalog No. 130

WHITING FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB.

CUT GEARS



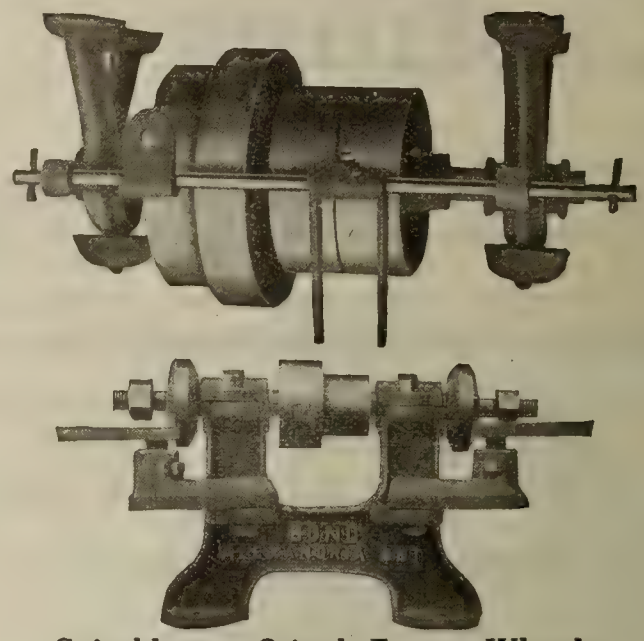
Years of experience as cut gear specialists, with a force of trained workmen, and the special facilities of the largest gear shop in Canada, enable us to make faultless cut gears at reasonable prices.

All Types All Sizes
Any Quantity

Send your blue prints and specifications for prompt quotation.

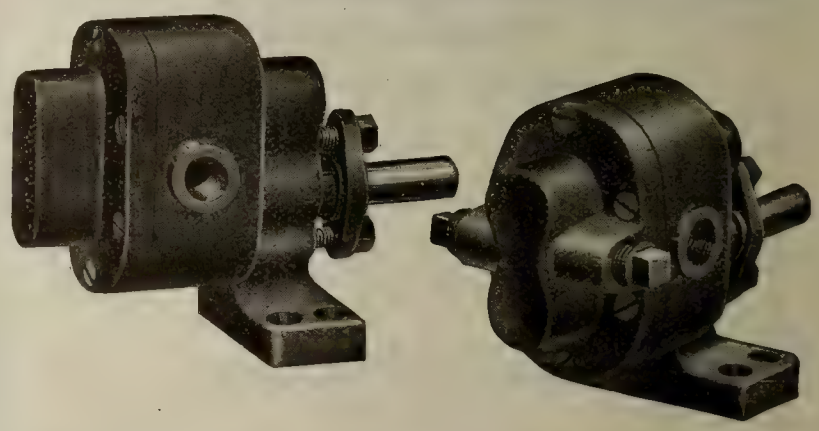
Hamilton Gear & Machine Co.
Van Horne Street, TORONTO

"Bond" Bench Grinder
with Countershaft



Suitable for 8-inch Emery Wheels
Babbitted and Reamed Bearings
Write for prices and full information

Canadian Bond Hanger & Coupling Co., Ltd.
Alexandria, Ontario



Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.

CHAPMAN

DOUBLE BALL BEARINGS

Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.

DEPENDABILITY

Has Made

HARRIS HEAVY PRESSURE

THE MOST POPULAR BABBITT METAL IN THE DOMINION

Manufactured by

THE CANADA METAL CO., LTD.

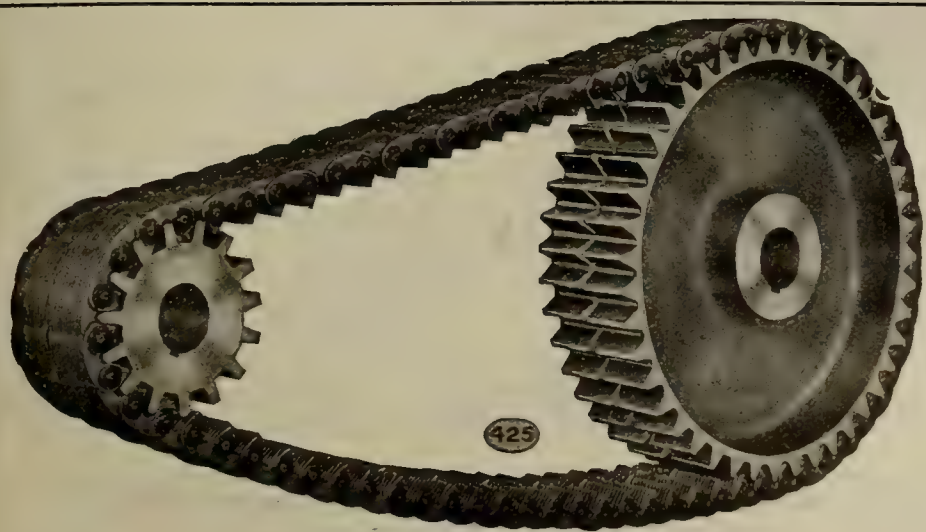
Hamilton, Montreal, TORONTO, Winnipeg, Vancouver

IT FLOWS FREELY

IT WILL NOT CRACK

IT IS COPPER COATED

IT IS COPPER HARDENED



Jones & Glassco (Reg'd)

ENGINEERS

MONTREAL AND TORONTO

Specialists in

POWER TRANSMISSION CHAINS

CANADIAN AGENTS FOR

"RENOLD"

Patent Silent and Bush Roller Chains

"MORSE"

Rocker Joint Silent Chains

Chain Drives from ¼ H.P. to 5000 H.P. in successful operation

Write for particulars to

Head Office: St. Nicholas Building MONTREAL

Branch Office: 1204 Traders Bank Building TORONTO

DOUBLE SAVINGS

in cutting on PEERLESS HIGH SPEED METAL SAWS
They save both Time and Material.

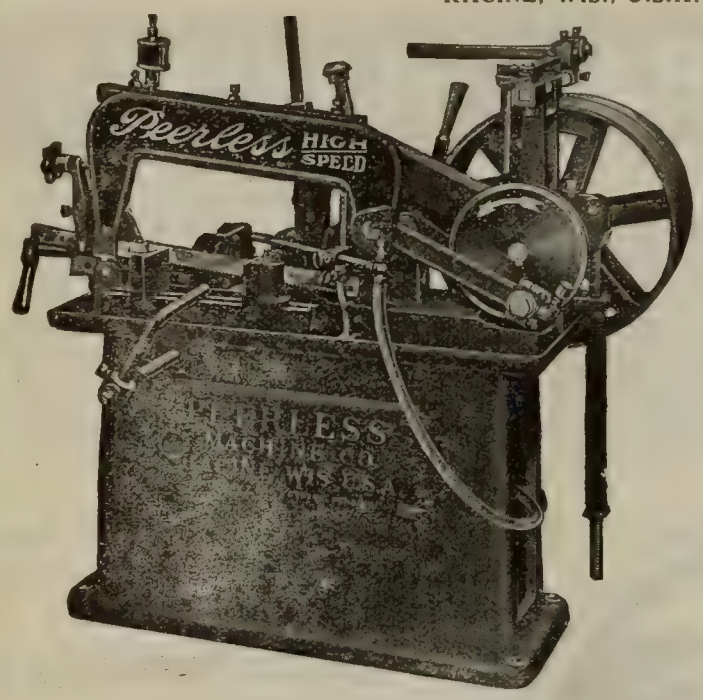
Supposing you save only 1/16 on each cut, 200 lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

Have you ever stopped to consider the waste of material in wide cuts, especially at the present high cost, will pay for a PEERLESS in a remarkably short time.

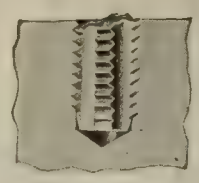
This is only one of the reasons for so many repeated orders and large concerns having standardized the PEERLESS. The many other reasons can only be fully appreciated after comparative test.

Write for a list of users; some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.



3 Minutes to back it out



Not a fraction of an inch to grip, and you must not injure the thread. Even so,

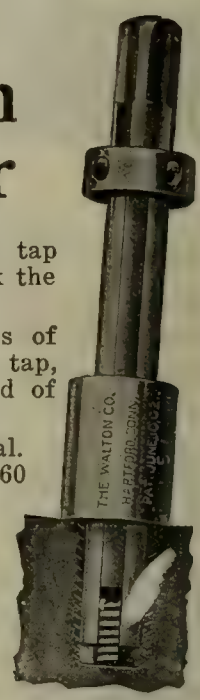
The Walton Tap Extractor

in your hands will back out this broken tap in three minutes and not so much as mark the threads.

You simply drop its strong, slim fingers of crucible steel into the flutes of the broken tap, apply a wrench to the squared outer end of the Extractor—and turn.

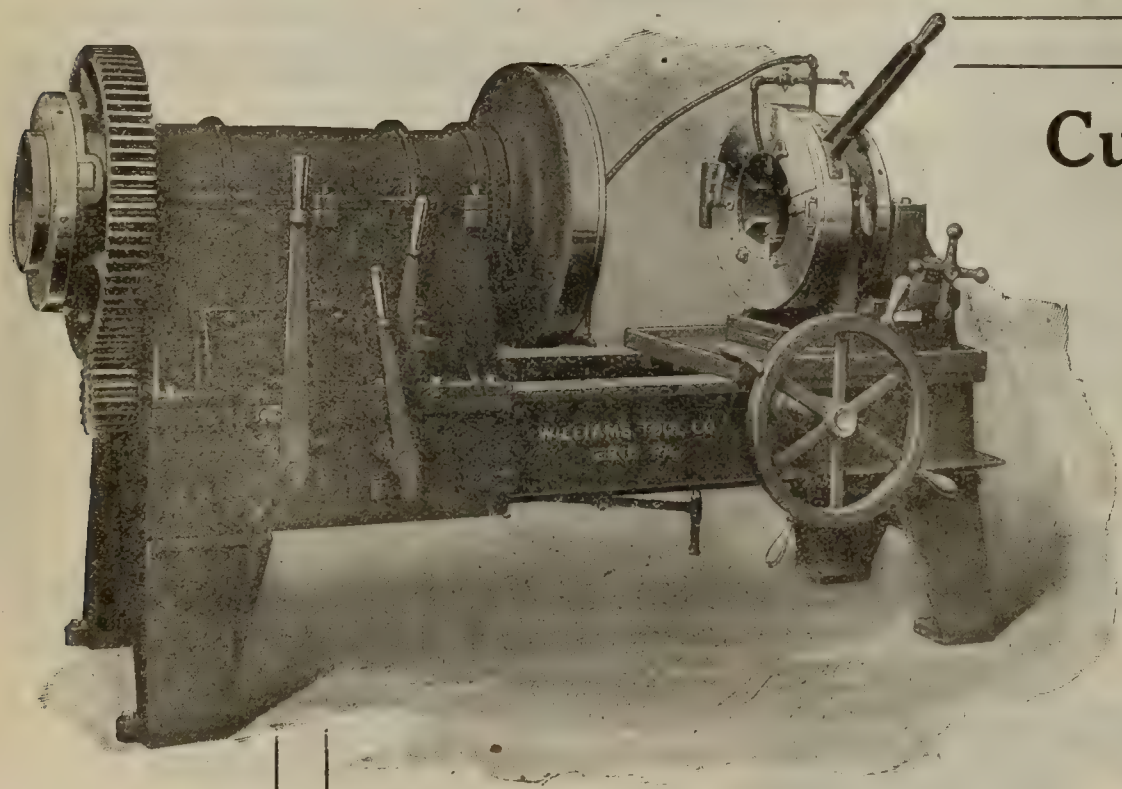
Take this Walton Tap Extractor on trial. If it doesn't more than pay for itself in 60 days, send it back.

Write to-day for descriptive circular.



The Walton Co.

Hartford, Conn.



Cutting-off and Threading

By the decree of expert judges Williams Cutting-off Machine has been declared the most **efficient.**

We have made this claim all along and this judgment only verifies it.

Made in 11 sizes and each size has a range of 8 to 10 consecutive sizes between 1/4" and 18" diameter.

Write us about them. They will save you money, time, and increase the quality of your product.

Williams Tool Company

Erie, Penn., U.S.A.

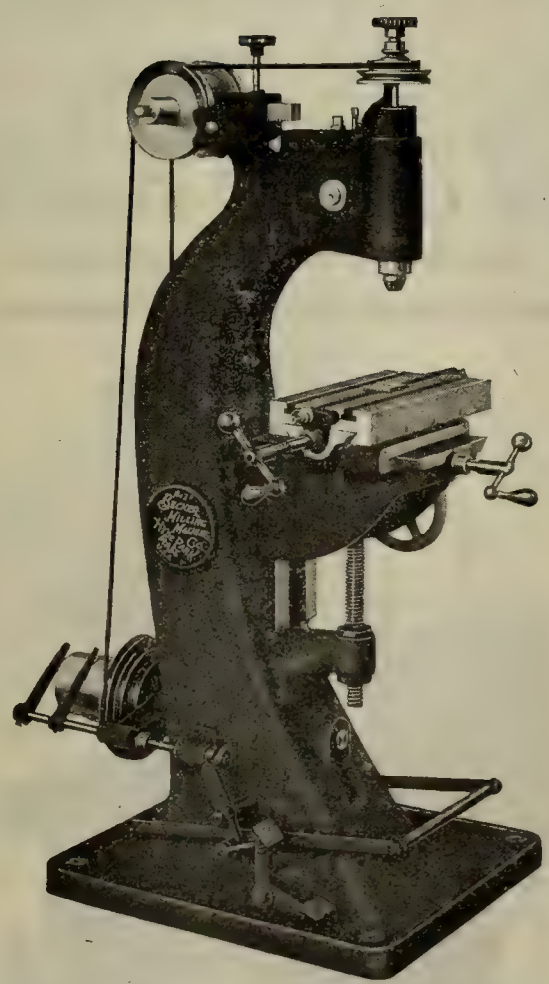
Canadian Agents:
The A. R. Williams Machinery Co., Ltd., Toronto, Canada

European Agents:
Universal Machinery Corp. London, England

BECKER

Smaller Type Vertical Millers Now Ready for

QUICK DELIVERY



NO. 1 BECKER VERTICAL MILLER
Cone Drive.

Range, 11″ x 8″ x 7″.
Greatest distance between spindle and table, 15″.
Greatest distance between spindle and neck, 11½″.
Spindle adjustment, foot lever control, 2″.
Weight, net, 800 lbs.

We make this announcement with a certain sense of pride. It speaks so well of the modern production methods of the Becker Plant.

Here are the models we can ship from stock:

Becker Standard Vertical Miller
Types No. 1, 2, 2A and 4B

Becker Profiler
Type No. 2H

Becker Plain Horizontal Miller
Type No. 25

And the following within from two to six weeks:

Becker Standard Vertical Miller
Type No. 3

Becker High Power Vertical Miller
Types AB and AB1

The Becker Standard Belt-Driven Vertical Miller illustrated is built to run at extreme high speed.

For light engraving and die-sinking to be done at high speed, this Becker Miller is everything desired, and especially recommended where space is an important factor. The spindle, with main bearing hardened and ground, is adapted for use with spring collets; spindle adjustment is controlled by foot lever. Regular equipment: Cone drive, 2 V belts (short and long), vise jaws, 3 collets, draw-bar and wrenches. Can be arranged for ½ H.P. motor drive. For illustrated catalog, complete specifications and reasonable price

WRITE OR WIRE

Becker Milling Machine Company, Hyde Park, Mass., U.S.A.

The "Feel" of a Good File

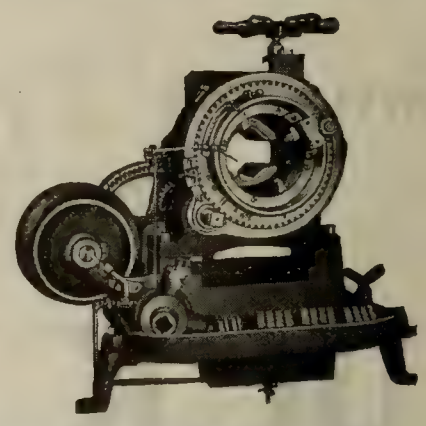
Did you ever watch a really capable mechanic test a file? He has a way of passing a sensitive thumb over its teeth. Instinctively, unfailingly, he thereby determines whether it is fit for use.

This man always chooses a "FAMOUS FIVE." He never buys blindly. He can "feel" that a "FAMOUS FIVE" is right. He can "feel" its sharp, keen-cutting teeth, arranged in rows of perfect uniformity. There is no doubt in his mind. He buys "FAMOUS FIVE." He makes sure of satisfaction.

Specify "FAMOUS FIVE" files when ordering.

No Leaky Joints

when the Forbes does the threading

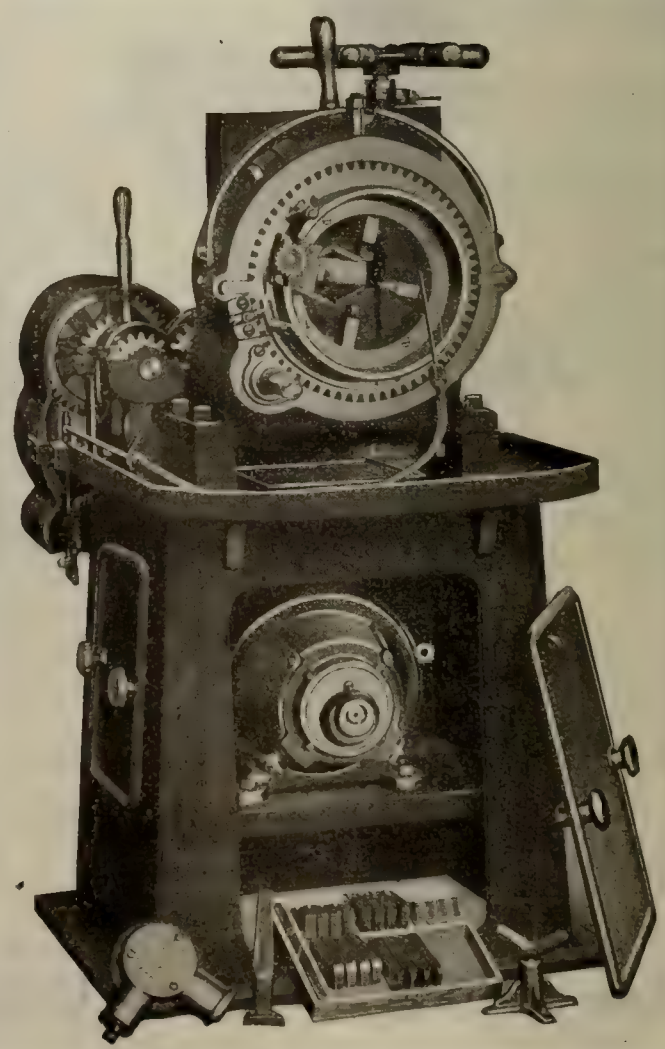


FORBES Pipe Cutter and Threader is the machine you take right to job and save carrying heavy pipe to and fro. Powerful and compact. Saves labor of 2 and 6 men over old stock and die method.

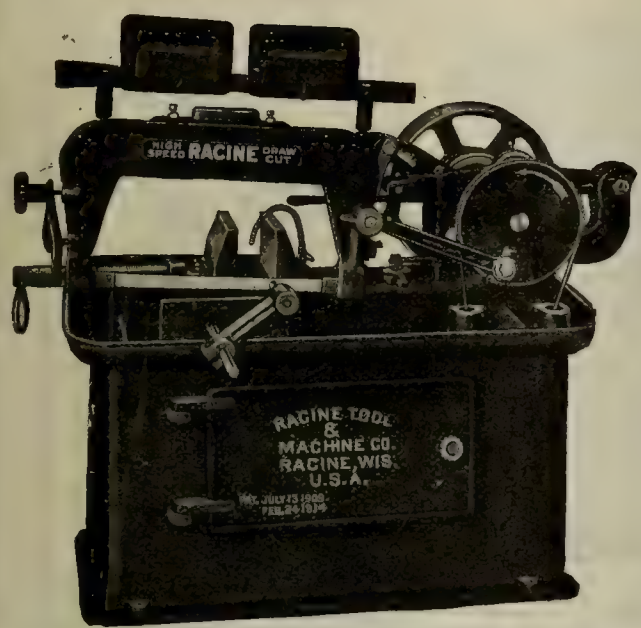
The Forbes is the only machine equipped with receding gears carrying the dies on to the pipes and also with shell adjustable, to compensate for wear. And instead of turning the heavy length of pipe in the dies, as is usual, it turns the comparatively light dies around the pipe.

The Curtis & Curtis Co.

Garden Street, Bridgeport, Conn.



NO DRAGGING BACK ON THE NON-CUTTING STROKE



To protect users of Racine High-Speed Metal-Cutting Machines, we carry a large stock of the famous Racine H.S. Tungsten Blades.

A patented device of this Racine High Speed Metal Cutting Machine automatically lifts the blade clear of the work on every return stroke.

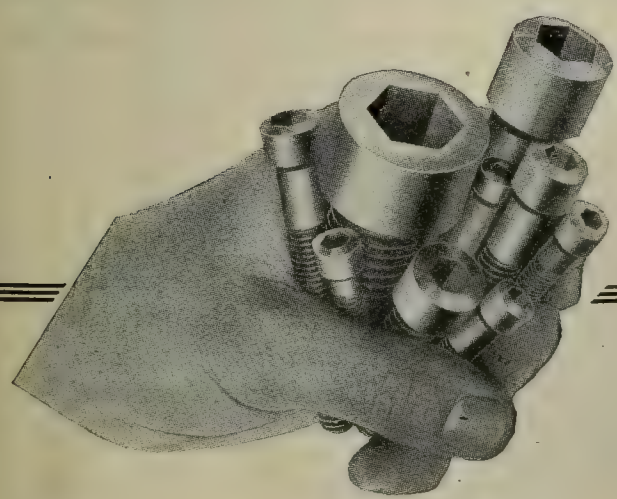
In this feature alone the Racine increases both output and endurance of the blade 500 per cent.

Therefore time saved—blades saved—would soon return to your pocket the reasonable cost of a Racine.

This fact—because it is a fact—could be proved to your satisfaction if you'd let us send you names of Canadian plants using Racines—one Montreal plant is using 168—or if you'd let us ship a Racine on trial terms that you consider fair.

Write us to-day.

RACINE TOOL & Machine Co., 15 Melbourne Ave., Racine, Wis., U.S.A.



Safety and Strength

The value of this socket head cap screw is readily observed. The point that remains to be settled is the strength. The socket shown does not lessen the strength of the screw, the hexagon shape remedies any weakness. A surer and stronger grip is obtained by this method. It will add a decided safety factor to your machine, also better appearance.

The Allen Mfg. Company
Hartford, Conn., U.S.A.

"STERLING"

Hack Saws

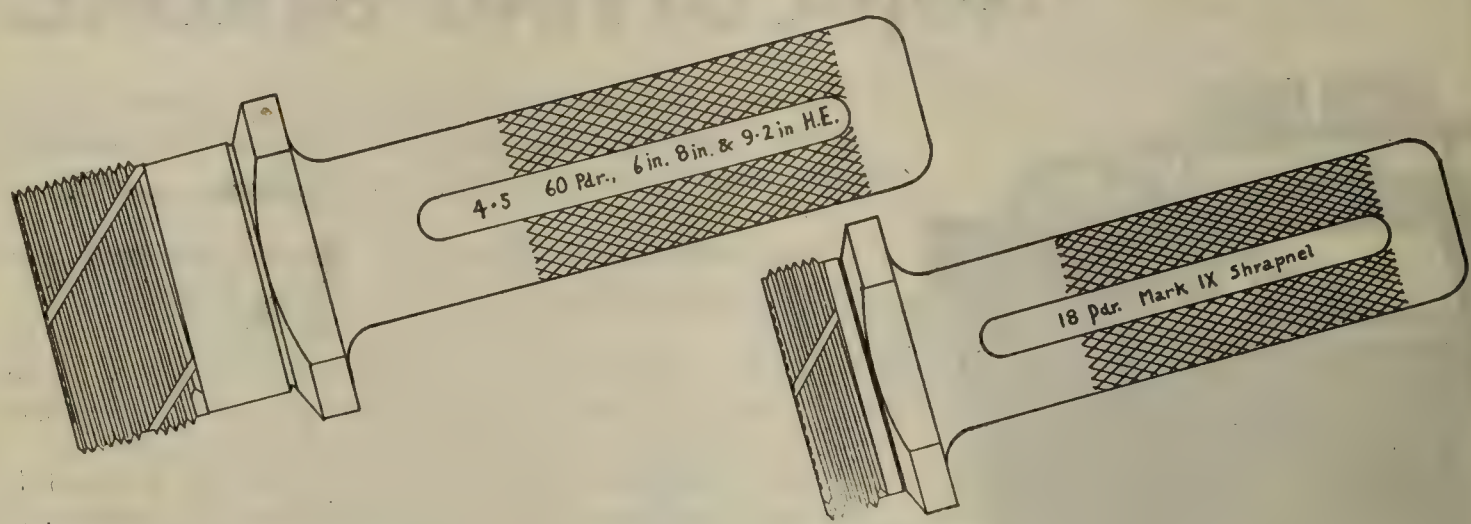
Will prove an economical investment and should be used in every machine shop.

If you care to save money. use "Sterling" Blades.

MANUFACTURED BY
DIAMOND SAW & STAMPING WORKS
BUFFALO, N.Y., U.S.A.

If any advertisement interests you, tear it out now and place with letters to be answered.

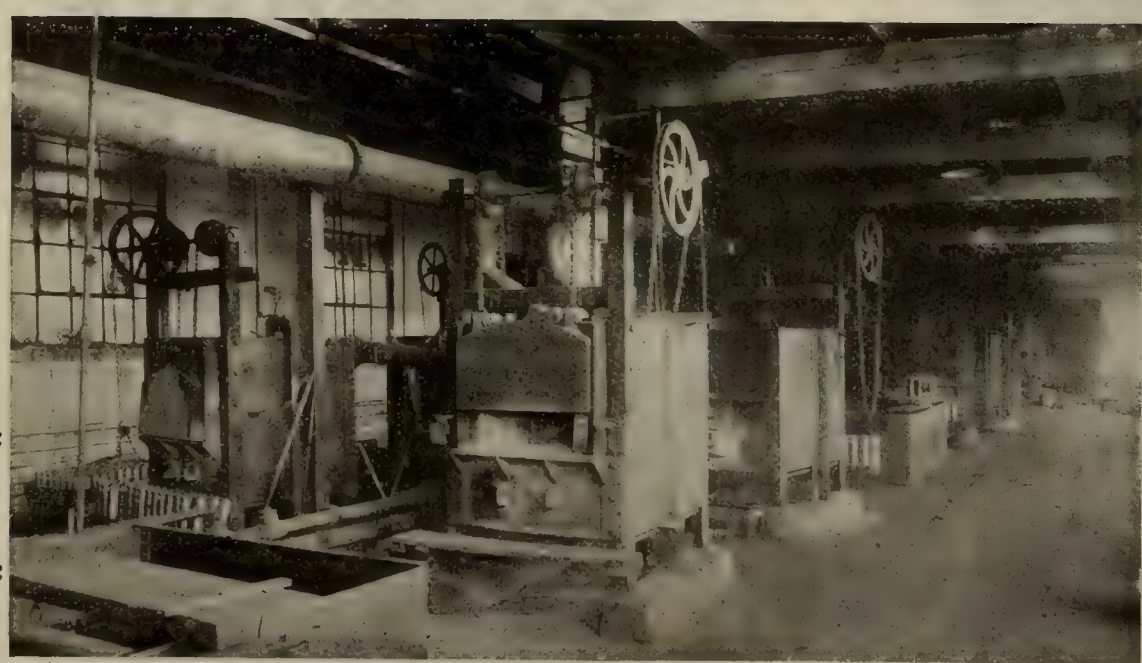
FUSE HOLE GAUGES



Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario



Annealing and Tempering Furnaces installed in the plant of the Canadian Vickers, Limited, Montreal.

"Mecol"

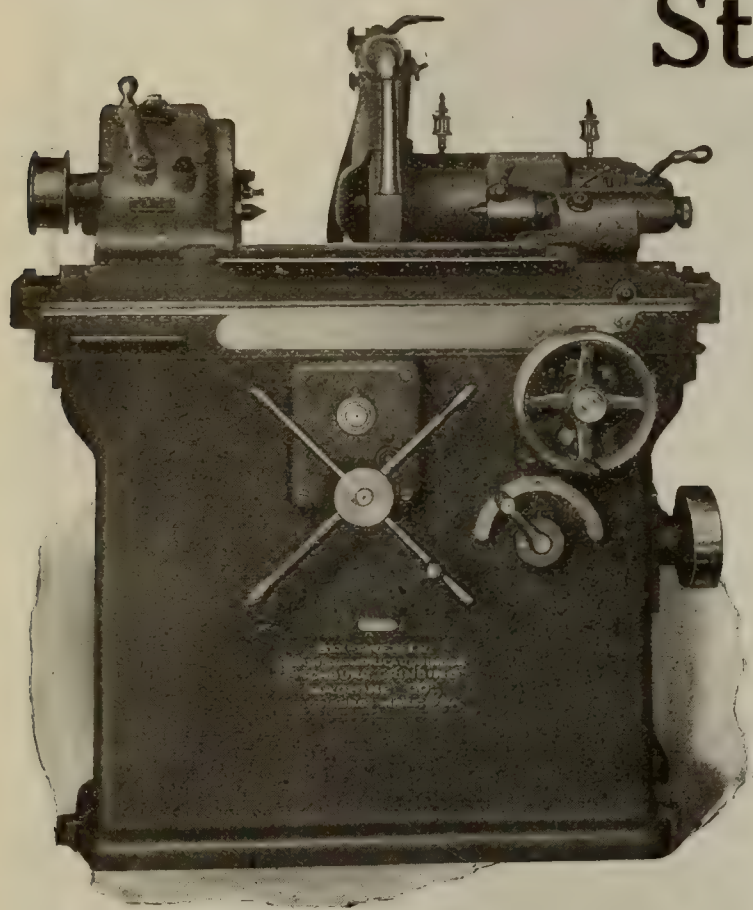
The installation of "Mecol" furnaces shown here is but one instance where a quality furnace was chosen to give maximum production. The furnace you may require is the one we desire to give you complete and full information about. Write us.

Mechanical Engineering Co.
Limited
THREE RIVERS QUE. CANADA

VICTOR SAW WORKS LIMITED

HAMILTON, CANADA

Specially Adapted for Grinding Straight or Tapered Shafts



The Fitchburg Grinder illustrated weighs about 4,100 pounds and occupies 52″ x 66″ floor space. In design it is conveniently compact; in build, uncommonly strong. It will save you price cost in the first place and repair cost later on. Occupies much less floor space, and, at the same time, does all the various grinding work with equal if not greater speed than machines of much larger capacity. **Write for interesting facts and Catalogue.**

Fitchburg Grinding Machine Co.
FITCHBURG, MASS., U.S.A.

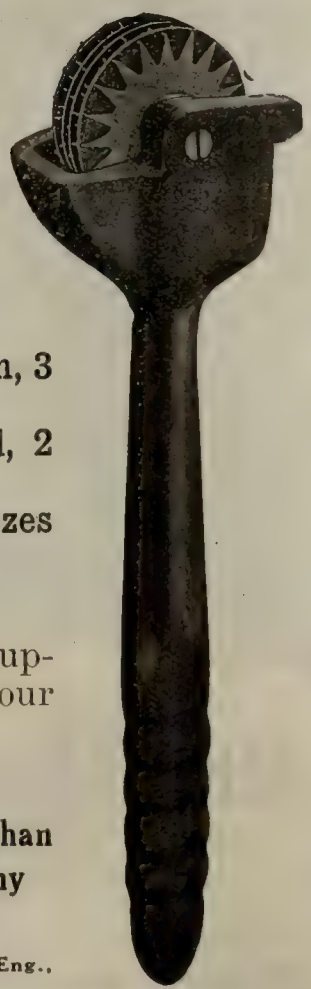
Grinding Wheel Dressers

We are specialists in Grinding Wheel Dressers and can recommend the best types for any particular needs.

Our Dressers are:

Diamo-Carbo
Desmond Huntingdon, 3 sizes
Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

We can promptly supply your needs from our stock.



The Canadian Desmond-Stephan Manufacturing Company
HAMILTON, ONTARIO

Alfred Herbert, Ltd., Coventry, Eng., Agent for Great Britain.

"WHITNEY"
KEY-SEAT CUTTERS

For the Woodruff System of Keying

GET OUR PRICES

Either carbon or high-speed steel.
Material the best obtainable.
Unsurpassed in efficiency and durability.
Centred at both ends.
Unsurpassed in accuracy and finish.
Large quantities carried in stock.

The Whitney Mfg. Co., Hartford Conn.

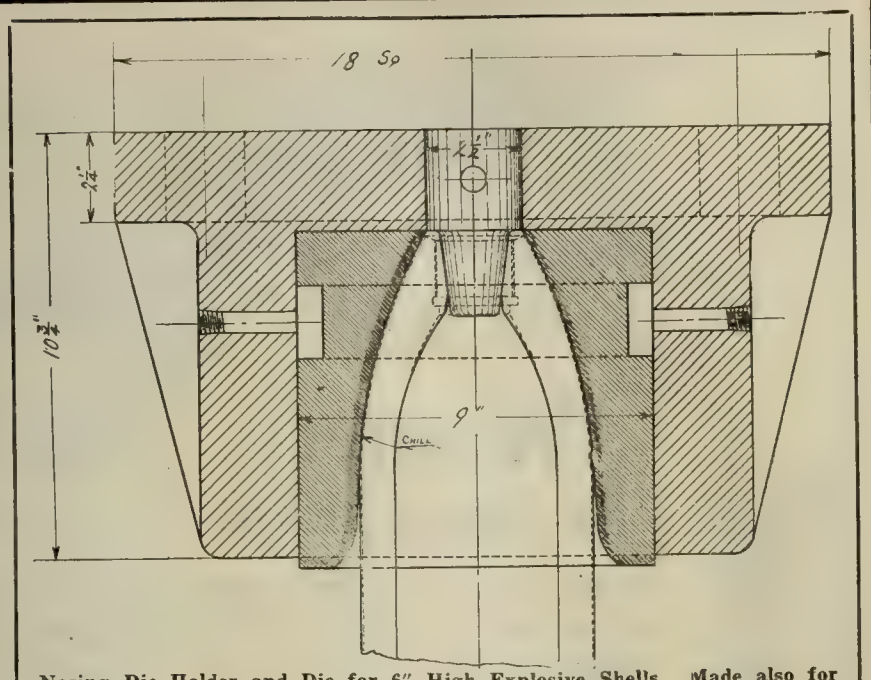
Chains, Keys and Cutters, Hand Milling Machines

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Why Chilled Iron

is the Best Material for

NOSING DIES



Nosing Die Holder and Die for 6" High Explosive Shells. Made also for 4.5" H. E. Shells and 18-pound Shrapnel.

Because Chilled Iron is harder than Tempered Steel.

It does not crush or flow under heavy strains as do other materials.

It has been adopted as the best material yet discovered for Railroad Car Wheels.

Back of the Chilled wearing surface the iron is soft and tough. Therefore the casting is easily machined and resists well the temperature stresses to which Nosing Dies are subjected in use.

No other metal possesses this graded hardness of structure; consequently over Fifty Shell Factories in Canada and the United States have proven the worth of the Marsh & Henthorn Nosing Dies and Holders.

MARSH & HENTHORN, LIMITED

BELLEVILLE, ONTARIO

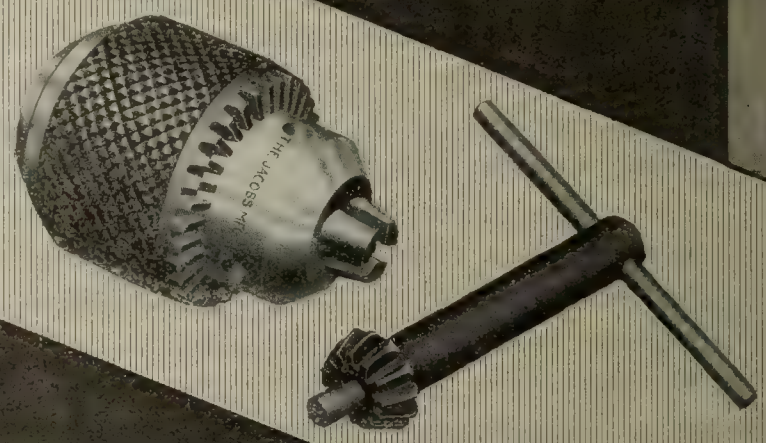
WILLIAMS "AGRIPPA"
TOOL HOLDERS
Headless Cam
Hex. Head Cam
"THE HOLDERS THAT HOLD"

save the most time and need the least shifting

We will ship them promptly if your dealer can't supply you from stock

If any advertisement interests you, tear it out now and place with letters to be answered.

Jacobs
IMPROVED
Drill Chuck



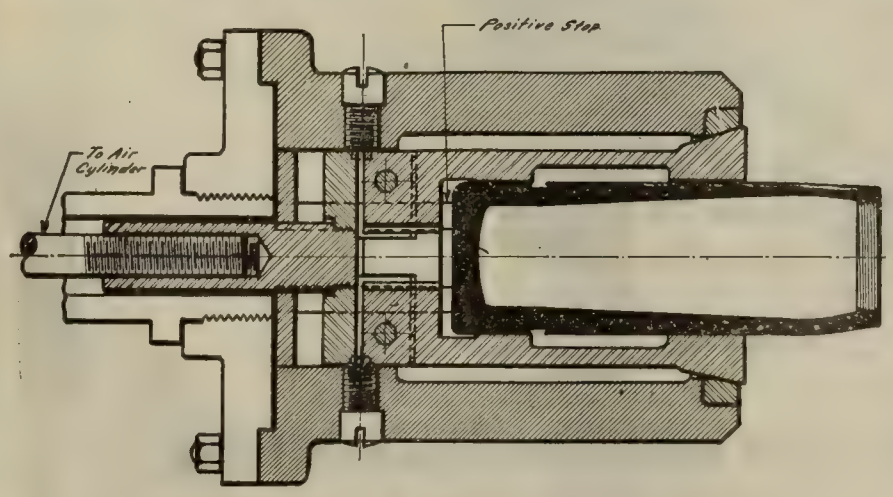
A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.

EVERY MINUTE EVERY DAY PRODUCTION SPEEDED



M. E. C. THREE JAW HINGED COLLET CHUCKS

with steel body are almost everlasting. Not one complicated part to get out of order. Grip firm and positive, their simple air valve control greatly facilitates the quick insertion or withdrawal of work.

Instead of wasted minutes chucking with slow hand-operated chucks, do the same work in seconds, and do it better, with M. E. C. Three Jaw Chucks—compressed air operated.

M. E. C. Chucks
Air Operated

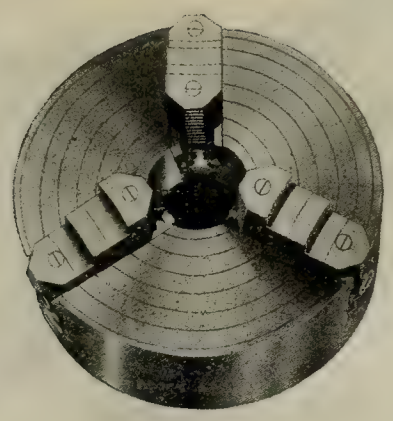
are 100% efficient wherever rapid manufacturing and absolute accuracy are the demands.

Know what great helps to speed production M. E. C. Chucks and Air Cylinders have proved themselves. Write to-day for our catalogue and 30-day free trial plan.

Manufacturers Equipment Company

175-179 North Jefferson St., CHICAGO, ILL.

CANADIAN AGENTS: J. R. Stone Tool and Supply Co., Detroit, Mich.
New York: J. R. Stone Tool and Supply Co., 30 Church St.



Ask a User of

HANNIFIN AIR CHUCKS

Know that it Pays to Chuck with Air

Near your own plant—probably within local telephone call — another plant is using Hannifin Air Operated Chucks. Ask the owner or the superintendent if an increase in production of from 20 to 100 per cent. has been realized since the change to Hannifin.

Hannifin Air Chucks are practically instantaneous in action. Work is chucked to stay by the turn of a lever; by another turn, instantly released. There is never a slip when setting up, for the pressure is uniform all the time. As for wear, there is none.

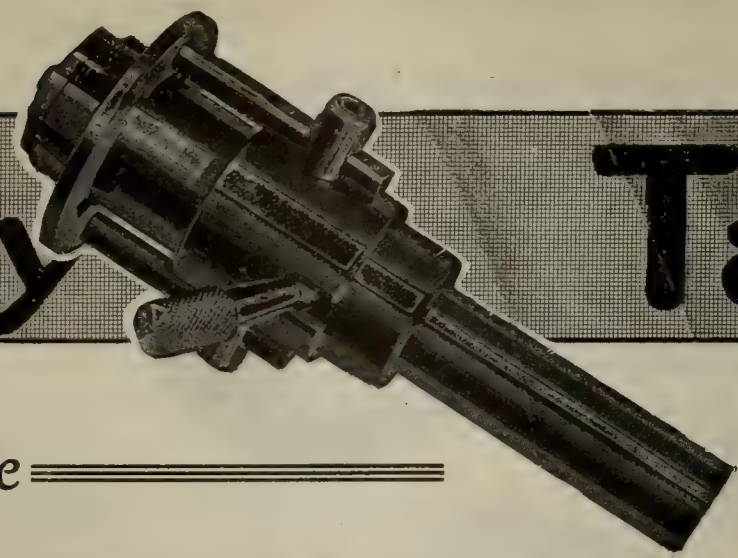
A copy of the Hannifin catalogue, describing in detail our Air Operated Chucks and Clamping Equipment, needs your name.

HANNIFIN MFG. COMPANY, Chicago

REPRESENTATIVES.—R. E. Ellis Engineering Co., Chicago; C. C. Firmin, 602 Kerr Bldg., Detroit; Knox-Andersen Co., Empire Bldg., Pittsburgh; Carl Naumann, 411 Seitz Bldg., Syracuse; A. R. Williams Machinery Co., Toronto; Williams & Wilson, Ltd., Montreal; The Canadian Fairbanks-Morse Co., Montreal.

EUROPEAN REPRESENTATIVES.—Coats Machine Tool Co., Ltd., London; Fenwick-Freres Co., Paris; Iznosskoff & Co., Petrograd.

Murchey Taps



They are Collapsible

The only time they don't collapse or bend is under strain of heavy work and when in action. But for speedy adjustment, convenient, quick-acting operation, the collapsible and adjusting features stand prominently in the foreground.

The chasers are adjustable to compensate for any wear, and this feature enables the tap to maintain its minute accuracy, and adds to its general dependability.

The records performed by Murchey Taps on munitions work is equally prominent in general lines. They are built for service, and they give it.

We maintain a special chaser service for our clients that enable them to renew chasers at the minimum cost. Inquire immediately. Quick action means quick solution to your troubles.

The Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, S.W., England.
Fenwick Freres & Co., 16 Rue Fenelon, Paris, France.

Murchey Machine & Tool Co., 75 Porter Street, Detroit, Mich.

THREE FEATURES

Self-opening. Cut right up to a shoulder. The chasers. These features work together and by so doing make a die head that is unbeatable. The chasers are held in position by a cam, which locks when adjusted. They can be released from the thread at any given point.

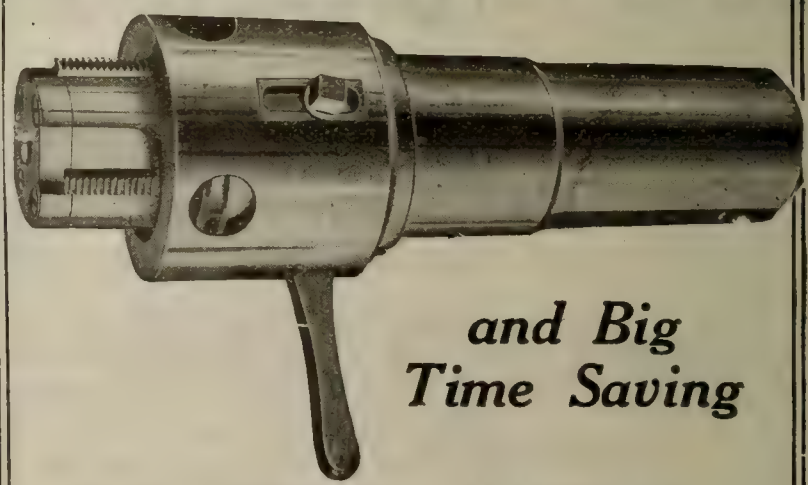
You can get up to the maximum with an "H & G" and stay there.

An inquiry will command our immediate attention.

Eastern Machine Screw Corp.
New Haven, Conn., U.S.A.

H & G

For Positive Accuracy—



and Big Time Saving

"Victor" Collapsible Taps are simple in construction; the few parts can be made large and strong; the body is machine steel, and the chasers are high-speed; screw adjustment from front end makes it easy to maintain close accuracy; trip is automatic; reset by means of lever. The above features—and others—make the "Victor" a time and money saver for severe service. It is being used by many shell manufacturers.

VICTOR Collapsible TAPS

Victor Tool Company
Waynesboro, Pa., U.S.A.

Every Butterfield Tap comes to you ready for long, hard service.

It is made by expert workmen—from the finest materials obtainable—and thoroughly tested before shipment.

For the tap that is uniformly dependable in service — specify Butterfield.

Butterfield & Co., Inc.
Rock Island :: Quebec

Toronto Office:
1505 Traders Bank Building : Phone Main 1382
H. A. HARRISON, Manager

Catalog No. 16 containing the complete line of Butterfield Tools awaits your request.

BUTTERFIELD

HINTS TO BUYERS

For Hardening High-Speed Steel

The price of high-speed hitting the high spots at the present time makes pyrometer practice very essential. Only by following very closely the various temperatures can accurate results be obtained.

TRADE MARK
BRISTOL'S REG. U.S. PAT. OFFICE.
ELECTRIC PYROMETER
High Resistance Model

is especially suited for treating high-speed steel. Equipped with the famous Weston Milli-Voltmeter movement and Heraeus Thermo couple for measuring temperatures up to 3,000 deg. Fahr.

Write for Bulletin I-205.

The Bristol Company, Waterbury, Conn., U.S.A.

We guard your purchases and tell you if you are getting what you are supposed to get.

Once you have formed the habit of consulting us for expert advice you wonder how you got along without our service.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED

Head Office and Main Laboratories—MONTREAL

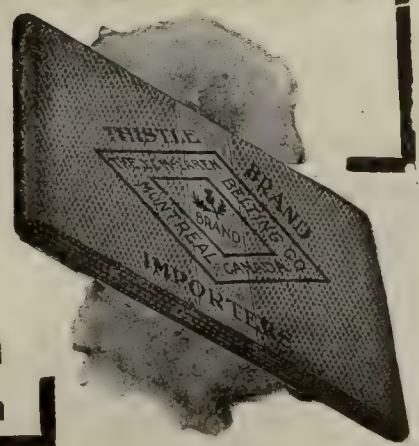
Branch Offices and Laboratories:
TORONTO, WINNIPEG, EDMONTON, VANCOUVER, NEW GLASGOW

"THISTLE" BRAND RUBBER BELTING

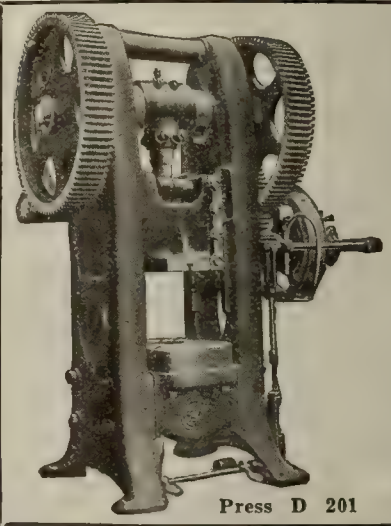
"Maintenance of Quality"

is our motto, and our experience in the manufacture of belting since the year 1856 should be invaluable to you. Let us tell you all about this friction faced belting. The price will appeal to you.

Write to-day.



J. C. McLAREN BELTING CO., LTD.
TORONTO, MONTREAL, WINNIPEG

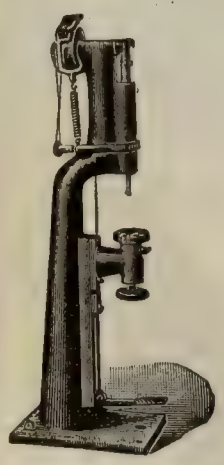

Press D 201

PRESSES

FOR

CUTTING
FORMING
DRAWING
PUNCHING
STAMPING
EMBOSSING
and COINING
BAR and SHEET METAL

Ferracute Machine Co.
Bridgeton, N. Jersey, U.S.A.



IS YOUR RIVETING PROFITABLY DONE?

Our Elastic Rotary Blow Riveting Machine does profitable work, because one machine will do the work of several hand riveters, and do it better.

Every head is perfectly formed, any shape, round, flat, oval, rectangular, etc.

Catalogue C tells more about it.

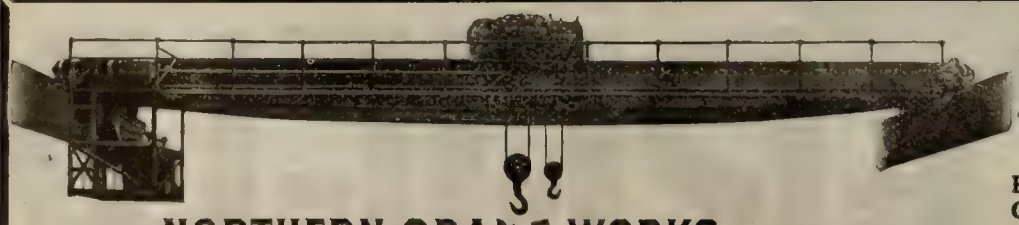
The F. B. SHUSTER COMPANY
New Haven, Conn.

Formerly John Adt & Son. Established 1866.

Also makers of Wire Straighteners and Cutter, Cotter Pin Machines, etc.

RIVETED STEEL TANKS FOR EVERY PURPOSE

OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
PNEUMATIC WATER SUPPLY TANKS - SMOKE STACKS
BOILER BREECHING - RIVETED STEEL PIPE - BINS & HOPPERS



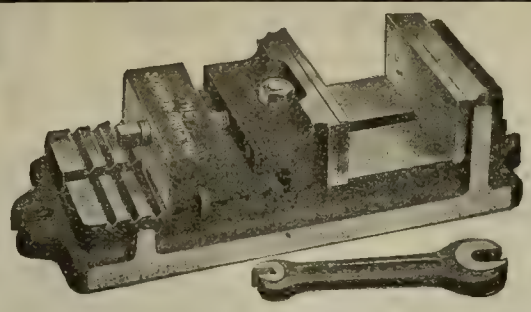
NORTHERN CRANE WORKS LIMITED
WALKERVILLE, ONTARIO

"MADE IN CANADA"

NORTHERN CRANES

Electric Traveling Cranes, Hand Cranes, Electric Hoists, Air Hoists, Foundry Equipment, Cupolas, Ladles, Etc., Etc.

SKINNER DRILL PRESS VISE



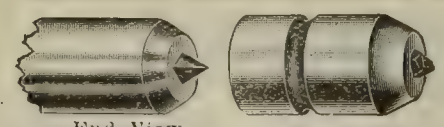
A substantial, durable tool which will pay for itself in short order in any machine shop. Four sizes to accommodate a wide range of work. Try one and you'll buy more.

Printed matter promptly mailed on request.

THE SKINNER CHUCK COMPANY

New York Office, 94 Reade Street — London Office 149 Queen Victoria St. — San Francisco Office Rialto Bldg.

Factory and Main Office, New Britain, Conn., U.S.A.



End View

FRANCIS

Diamond Grinder Tools

for truing emery and carborundum wheels are giving great satisfaction everywhere because of the hard and high quality diamonds used. They will keep your abrasive wheels in good cutting condition.

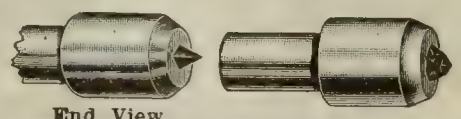
Ask for descriptive circular and let us send you an assortment for selection.

FRANCIS & COMPANY

50 State St., Hartford, Conn., U. S. A.

Established in 1799

First National Bank Bldg.



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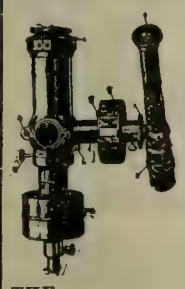
For Hardness Testing

in shop and laboratory use the

Standard Scleroscope

Universally adopted; direct reading; inexpensive, and the only instrument that agrees with others of its kind in all parts of the world, thus solving problems of ordering materials to specification.

BOOKLET FREE.



THE PYROSCOPE

THE SCLEROSCOPE (Set)

Heat Indication

by optical means is fast becoming the correct thing. The PYROSCOPE has solved the problem.

Perfect constancy, inexpensive, no electricity used. Built to stand rough usage and upon common-sense lines. Used by the Government and best firms.

Shore Instrument & Mfg. Co. 555-7 W. 22nd St. **New York**

Agents for Canada: A. R. Williams Machy. Co., Ltd., Toronto. Can.

Greenfield

Trade Mark Reg. U. S. Pat. Office

A universal grinder. A grinder with all attachments. A grinder that will handle all kinds of tool-sharpening as well as cylindrical, internal and surface grinding. An all-around machine for your tool-room.

Catalog No. 6.

Greenfield Machine Co.

Greenfield, Mass., U.S.A.

You want Tool Holders that have made good

ARMSTRONG TOOL HOLDERS

Won The

GRAND PRIZE

THE HIGHEST POSSIBLE AWARD AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

THEY ALWAYS MAKE GOOD

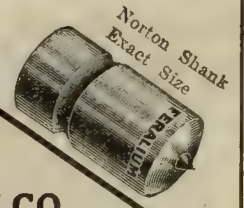
Write for Catalog.

Armstrong Bros. Tool Co.

"The Tool Holder People"

306 N. Francisco Ave., CHICAGO, U.S.A.

FERALIUM THE ULTIMATE IN DIAMOND SETTING IT IS GUARANTEED



Norton Shank Exact Size

Finest Diamonds and Diamond Tools

THE GENERAL SUPPLY CO. of Canada, Limited

OTTAWA — 356 Sparks St.; TORONTO — 125 Adelaide St. W.; MONTREAL — 408 McGill Bldg.; WINNIPEG — 85 Water St.

Sole Canadian Agents for

GEO. A. JOYCE CO., Ltd.

NEW YORK LONDON

Landis Shank Exact Size

Our Ballas Diamonds Give Excellent Service

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Cold Drawn, Turned and Polished Steel, Rounds, Squares, Hexagons and Flats, Steel Piston Rods, Pump Rods.

Special facilities for Keyseating up to 6 in. diameter.

THE **Canadian Drawn Steel Co.** LIMITED

HAMILTON CANADA

Metal Testing Instruments

The Brinell Meter
for determining the hardness of metals and metal products.

The Erichsen Machine
for testing metal sheets and strips.

— WRITE FOR CATALOGUES —

Herman A. Holz, 1 Madison Ave. N.Y.

THE DAVIS MILLING ATTACHMENT
and Compound Table

For the Die Maker, Repair Shop, Pattern Maker or Garage; will perform more than 90% of the jobs that come up.

For any Drill Press 14" to 42" swing. Big Economy — Big Convenience— Small Price. It relieves your large millers, comes in handy spotting castings, milling ends of bosses, and many other odd jobs. Cuts all kinds of keyseats perfectly; mills deep grooves, slots and cams. We also make cylinder reamers for reboring Ford car, and a reliable air compressor—all at special factory prices. Write for circulars to-day.

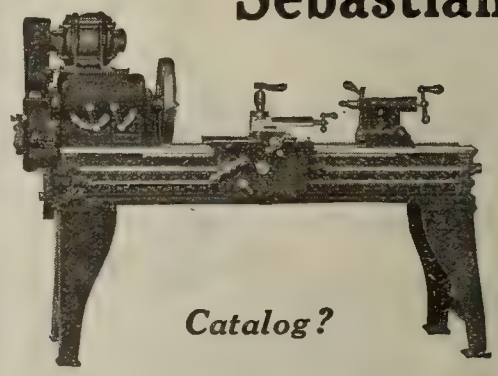
Hinckley Machine Works, HINCKLEY ILLINOIS

NORTON JACKS
FOR ALL KINDS OF HEAVY LIFTING

Send for complete catalogue showing 50 styles 10 to 100 tons capacity.

Made only by **A. O. NORTON, Limited**
Coaticook, Prov. Quebec, Canada

Sebastian



Catalog?

—The Standard, Medium - Priced Tool for over 30 years is offered in either Geared Head, Motor Drive, Cone Head, Quick Change or Plain Change Gear.

As a Money-Saving Tool you should investigate its merits before purchasing a lathe.

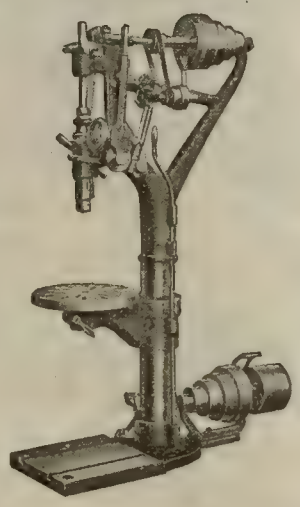
THE SEBASTIAN LATHE COMPANY
158 Culvert Street, Cincinnati, Ohio, U.S.A.

Oxy-Acetylene Welding and Cutting Apparatus

OXY-ACETYLENE WELDING DAVIS APPARATUS DAVIS-BOURNONVILLE CO. N.Y.

Carter Welding Co., General Dealers **Toronto**
For Davis-Bournonville Oxy-Acetylene Apparatus
General Office and Factory, Jersey City, N.J.
Canadian Factory, Niagara Falls, Ont.
Sales Offices: New York, Boston, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, Detroit, St. Louis, San Francisco, Seattle.

SILVER DRILLS



A substantial increase in production and a lowering of costs always follows the installation of Silver Drills.

Made singly or in 2, 3 or 4 spindle gangs. Write us for complete information and Catalogue No. 62; also for particulars on our new 25" Drilling Machine.

The Silver Mfg. Company
Box 290 - SALEM, OHIO

CLUTCHES

Combined Jaw and Friction. Friction only.
Gas Engine Clutches. Jaw Clutches.
Write for interesting printed matter.

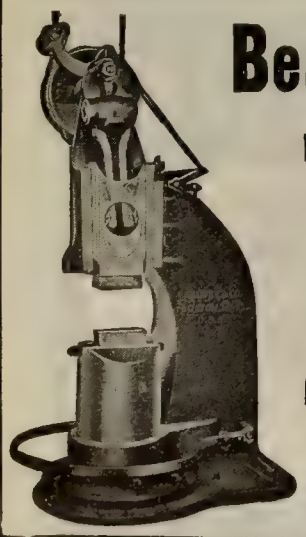
The Positive Clutch & Pulley Works, Ltd., Canada
MONTREAL Factory: Aurora, Ont. TORONTO

LANDIS MACHINE CO., INC.
WAYNESBORO, PENNA.

Manufacturers of BOLT and PIPE THREADING MACHINERY

Exclusive Canadian Agents:
Williams & Wilson, MONTREAL, CAN.

Write for Catalogue No. 22



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Your second-hand machinery.

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Another Tool Gone

How many times has this same thing happened? Buy a

UNION TOOL CHEST

Your tools are always at your finger-tips, in the same place. You know immediately if they are borrowed or misplaced. Saves time and money because it keeps tools clean, free from moisture and bangs.
Write for our catalog and prices. If we haven't a dealer near you, get our special offer.
UNION Tool Chests are guaranteed to give entire satisfaction or money refunded.

Style D—3 Sizes. Built of selected quartered oak, or leatherette covered Highly finished—perfectly fitted drawer.

6 other styles, many sizes.

Union Tool Chest Works
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TOOL CASES

Something New, Different and Better

Mechanics who have seen and used these new tool cases say they're the most serviceable yet introduced. Comprise five designs in oak or leather-covered.

Made of selected material, drawers have lock corners and oak cases are nicely dovetailed, a feature not found on most cases of other manufacture. Every mechanic should have one, as they are moderate in price. Write for price list.

IRA EMBREE, Hamilton, Canada

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COAL COKE HACK SAW BLADES
CARBON STEEL MACHINERY STEEL
HIGH SPEED STEEL

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Cuts Off In Half The Time

The Hurlbut-Rogers Cutting-Off and Centering Machine is a big producer because there are TWO TOOLS instead of one, working in the same cut.
VERY POWERFUL, RIGID AND ACCURATE.
Pays its cost in savings effected in very few months.
ASK FOR FULL DETAILS.

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Metal and Wire Forming Machines.
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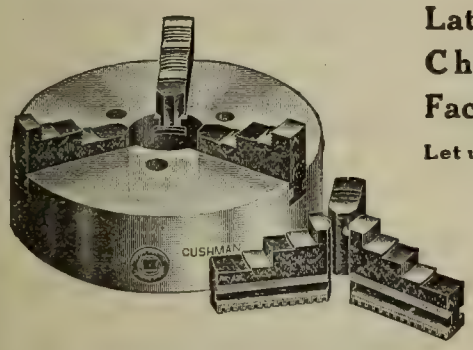
Burnishing Machines. Grinders.
Special Machines.

Baird Machine Co., Bridgeport, Conn., U.S.A.

Cushman Chucks



Lathe Chucks, Drill Chucks, Portable Face Plate Jaws.

Let us send you our catalog.

The Cushman Chuck Co.
Hartford, Conn., U.S.A.

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TORONTO HAMILTON WINNIPEG

IRON AND STEEL
HEAVY HARDWARE
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WE SHIP PROMPTLY

YOU'LL FIND WHAT YOU WANT

In the Classified Advertising Section of Canadian Machinery. Watch it each week for all kinds of new and used machinery.

YOU MAY WANT WHAT YOU FIND.

WE MANUFACTURE RIVETS of every description, ½ inch. dia. and smaller

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GANANOQUE, ONT.

Babbitt Costs Lowered

The use of "Frost King" invariably reduces babbitt expenses. Its efficiency and splendid performance under heavy duty have made it an international favorite.

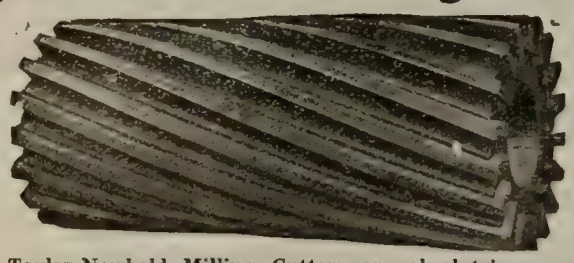
"Frost King" is an all-round babbitt perfected after 40 years' experience and experiment.

The constant use of "Frost King" will lower your expenses.

HOYT METAL COMPANY

EASTERN AVE. and LEWIS ST., TORONTO, CANADA
New York, N.Y. London, Eng. St. Louis, Mo.

Taylor-Newbold Milling Cutters



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Write for Bulletin R-P and 30-day trial offer.

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They cut straighter.
They last longer.

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WITH
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Manufacturers of Drill Grinders, Surface Grinders, Universal Grinders

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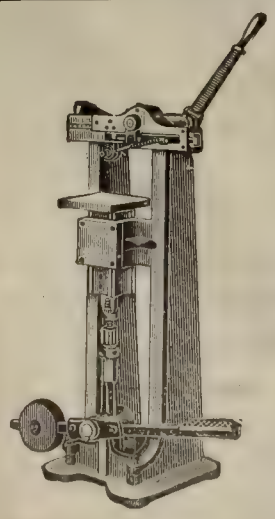

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or they will mark any article, either round or flat. Power or Hand Machines recommended.
Steel Stamp and Die Cutting by expert engravers.

Send for Catalogue.

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L'Air Liquide Society, Montreal, Toronto
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Pratt & Whitney Co., Dundas, Ont.
Roelofson Machine & Tool Co., Toronto, Can.
A. R. Williams Machy. Co., Toronto

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MacKinnon, Holmes Co., Sherbrooke
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Sturtevant Co., B. F., Galt, Ont.

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L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

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Canada Machinery Corp., Galt, Ont.
Landis Machine Co., Waynesboro, Pa.
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Cumming & Son, J. W., New Glasgow, Canada
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New Britain Mach. Co., New Britain, Conn.

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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke

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Ferracute Mach. Co., Bridgeton, N.J.
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Marsh & Henthorn, Belleville, Ont.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

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Dillon Mfg. Co., Oshawa, Ont.

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Bliss Co., E. W., Brooklyn, N.Y.
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Sterling Engine Works, Winnipeg, Man.
St. Lawrence Welding Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton.

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Brown, Boggs Co., Ltd., Hamilton, Canada.
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Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
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CASTINGS, NICKEL STEEL
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CENTERING MACHINES
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Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
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Canadian Fairbanks-Morse Co., Ltd., Montreal.
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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Wright Mfg. Co., Lisbon, Ohio.

CHAIN DRIVES
Jones & Glassco, Montreal, Que.

CHEMISTS
Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

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Embree, Ira, 281 Emerald St. N., Hamilton, Ont.
Union Tool Chest Works, Rochester, N.Y.

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Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

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Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
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Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Skinner Chuck Co., New Britain, Conn.
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Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.

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Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

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H. E. Streeter, 523 New Birks Bldg., Montreal.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
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Hardinge Bros., Inc., Chicago, Ill.

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Jones & Glassco, Montreal, Que.

CLUTCHES, FRICTION AND PULLEY
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Johnson Machine Co., Carlyle, Manchester, Conn.
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Positive Clutch & Pulley Works, Ltd., Toronto.

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MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

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Sleeper & Hartley, Inc., Worcester, Mass.

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Zenith Steel & Coal Products, Montreal, Que.

COLLARS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

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Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.

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Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

CONTRACT WORK
Welland Motor & Machine Co., Welland, Ont.

CONTROLLERS AND STARTERS, ELECTRIC MOTORS
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A. R. Williams Machy. Co., Toronto.

CONTROLLING INSTRUMENTS
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CONVERTERS, STEEL SLIDE-BLOW
Whiting Foundry Equipment Co., Harvey, Ill.

COPING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

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Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

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Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.

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Bernard Industrial Co., The A., Fortierville, Que.

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Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

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Northern Crane Works, Walkerille.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

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Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, PORTABLE
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Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

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Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto, Ont.
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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
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Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

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Cataract Refining & Mfg. Co., Toronto.
Elm Cutting Oil Co., Toronto.
Racine Tool & Machine Co., Racine, Wis.

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John Bertram & Sons Co., Dundas.
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Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machinery Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass.
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
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Prest-O-Lite Co., Inc., Toronto, Ont.
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Standard Mchy. & Supplies, Ltd., Montreal, Que.
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Manufacturers Equipment Co., Chicago, Ill.

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Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
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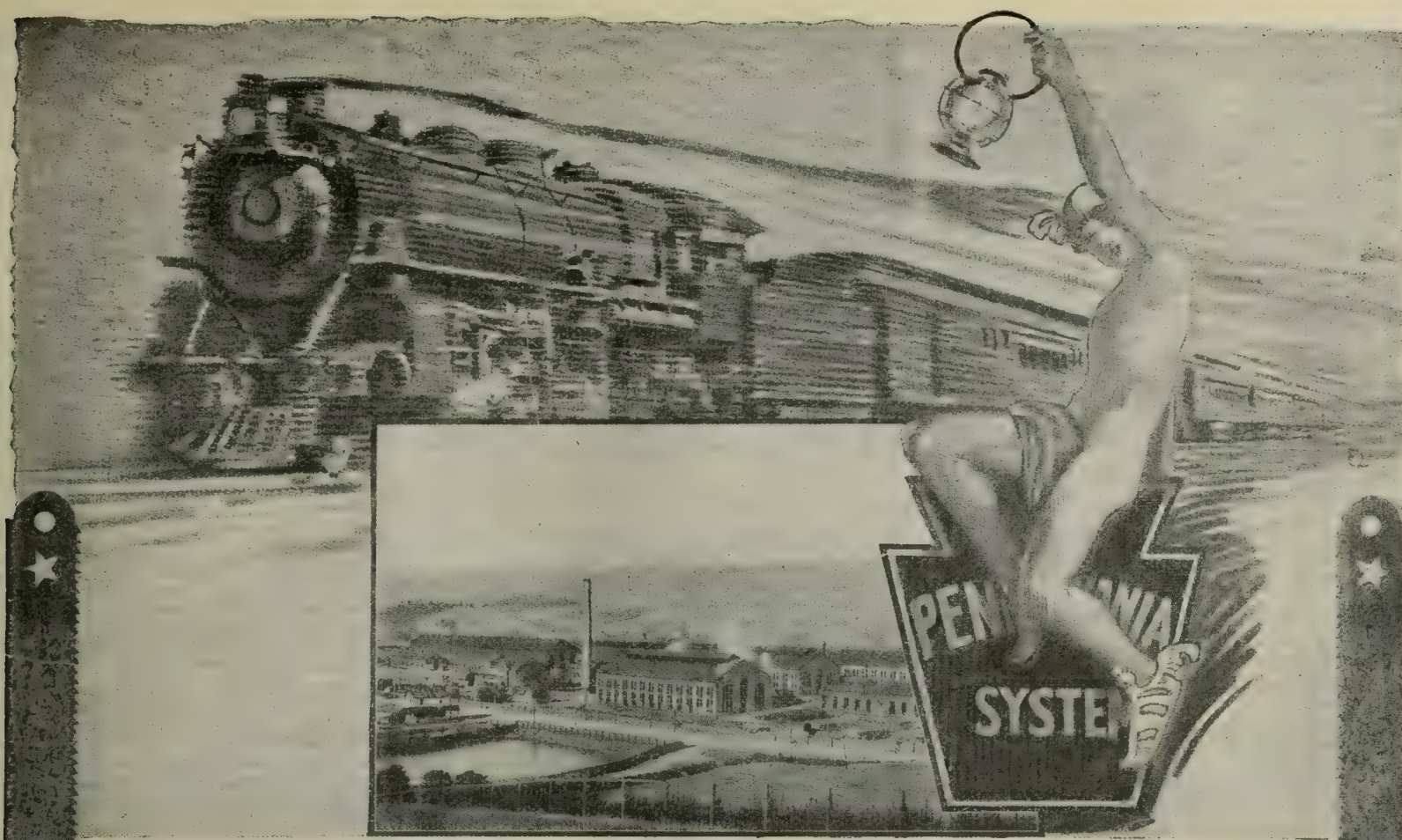

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The Pennsylvania Railroad, often called the greatest railroad system in the country, uses Star Hack Saw Blades. No higher endorsement than this could come from the big railroads which are famous for putting tool efficiency above every other consideration in shop equipment.

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Don't delay in sending your answer to our Hack Saw Testing Contest. It closes November 30th.

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The names of winners and some of the best replies will be published in our advertising. Write for any further information desired.

Get your answer in at once. Contest closes in Millers Falls November 30th.

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Garlock-Walker Machinery Co., Toronto, Ont.
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Morse Twist Drill & Mach. Co., New Bedford.

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Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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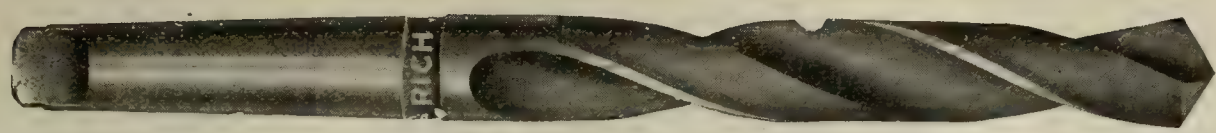

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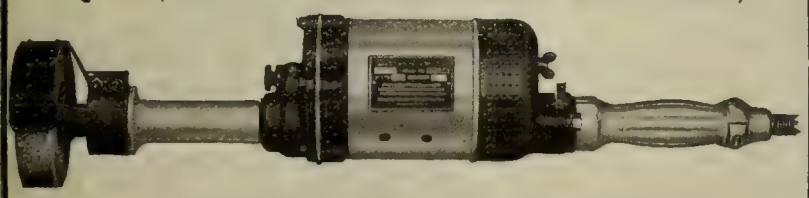

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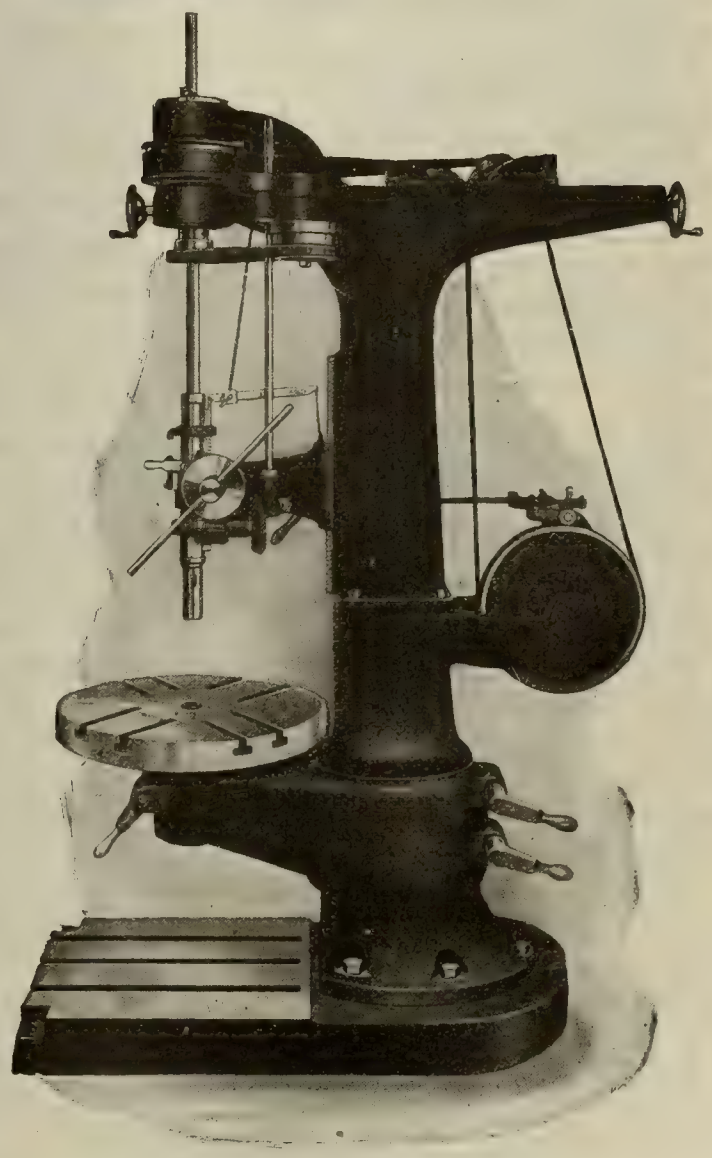

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Garlock-Walker Machy. Co., Toronto, Ont.
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McCabe, J. J., New York, N.Y.
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Garlock-Walker Machy. Co., Toronto, Ont.
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Himoff Mach. Co., Inc., Astoria, L.I., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McCabe, J. J., New York, N.Y.
Roelofson Mach. & Tool Co., Toronto, Can.

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Foss & Hill Machy. Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto.
McCabe, J. J., New York, N.Y.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
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Riverside Machinery Depot, Detroit, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

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Bliss, E. W., Co., Brooklin, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
McCabe, J. J., New York, N.Y.

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Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto, Ont.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
McCabe, J. J., New York, N.Y.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
National-Acme Co., Cleveland, Ohio.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
H. W. Petrie, Toronto.
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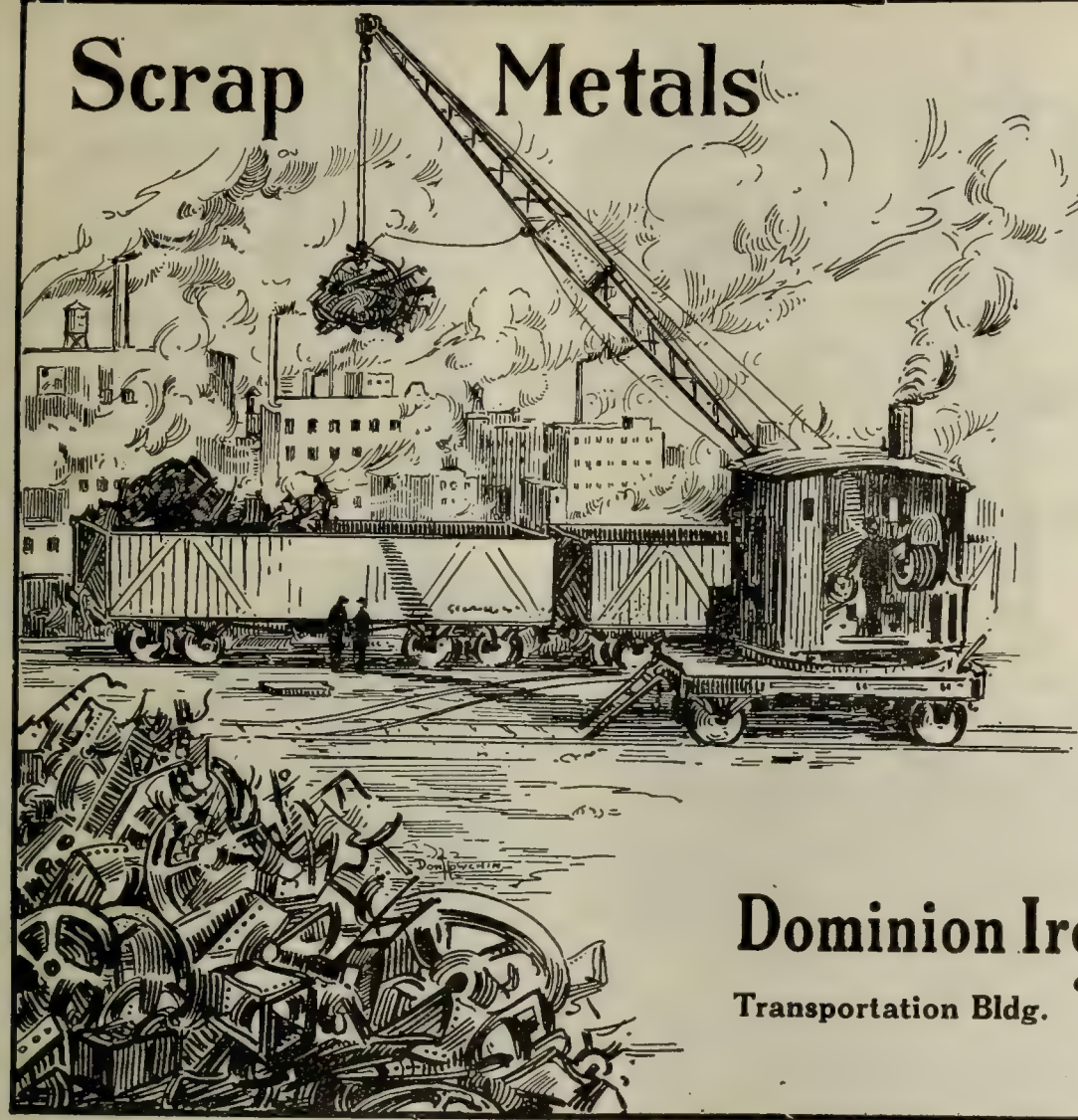

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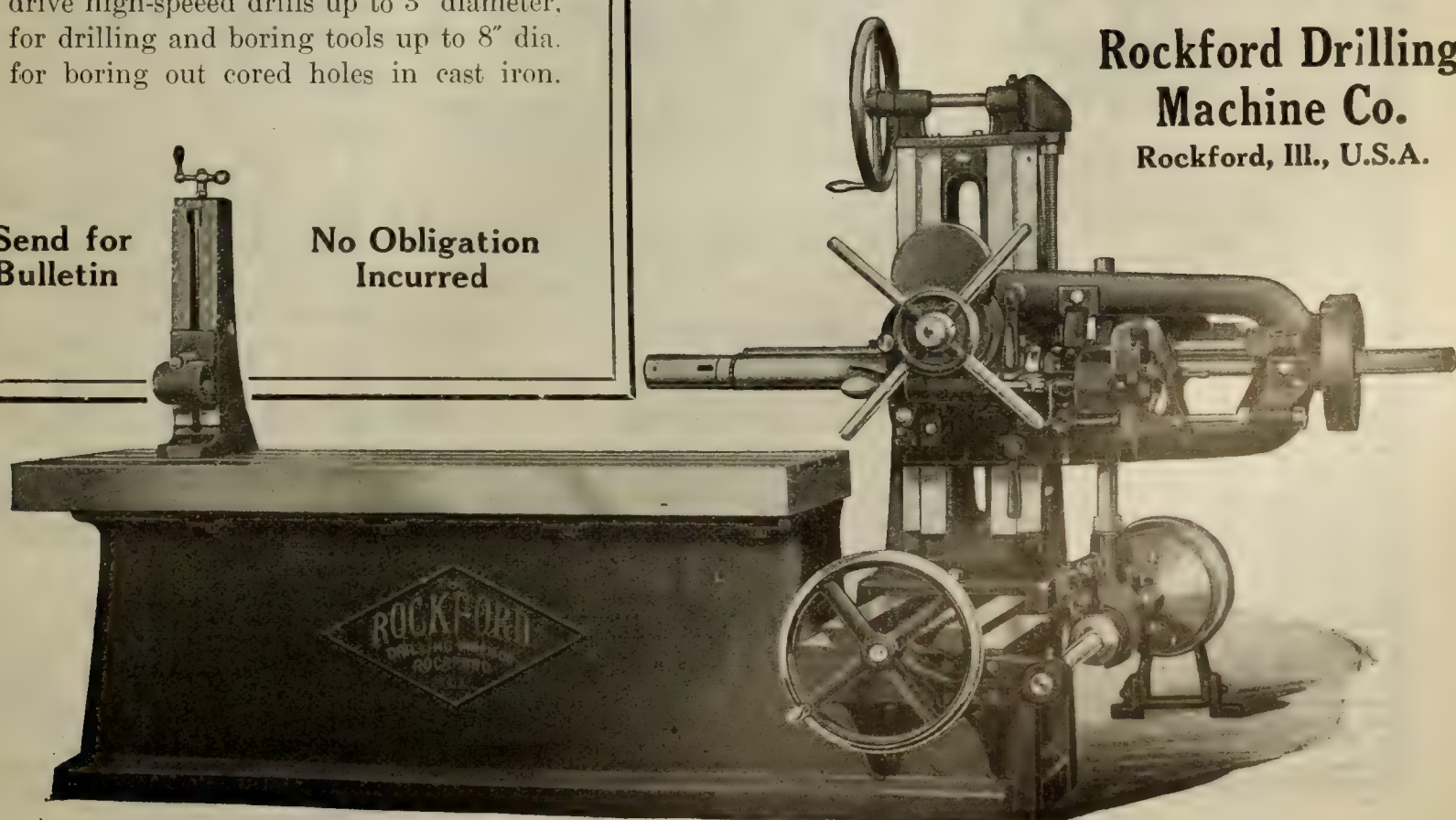

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Fox Machine Co., Jackson, Mich.
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National Machy. Co., Tiffin, O.
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Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.

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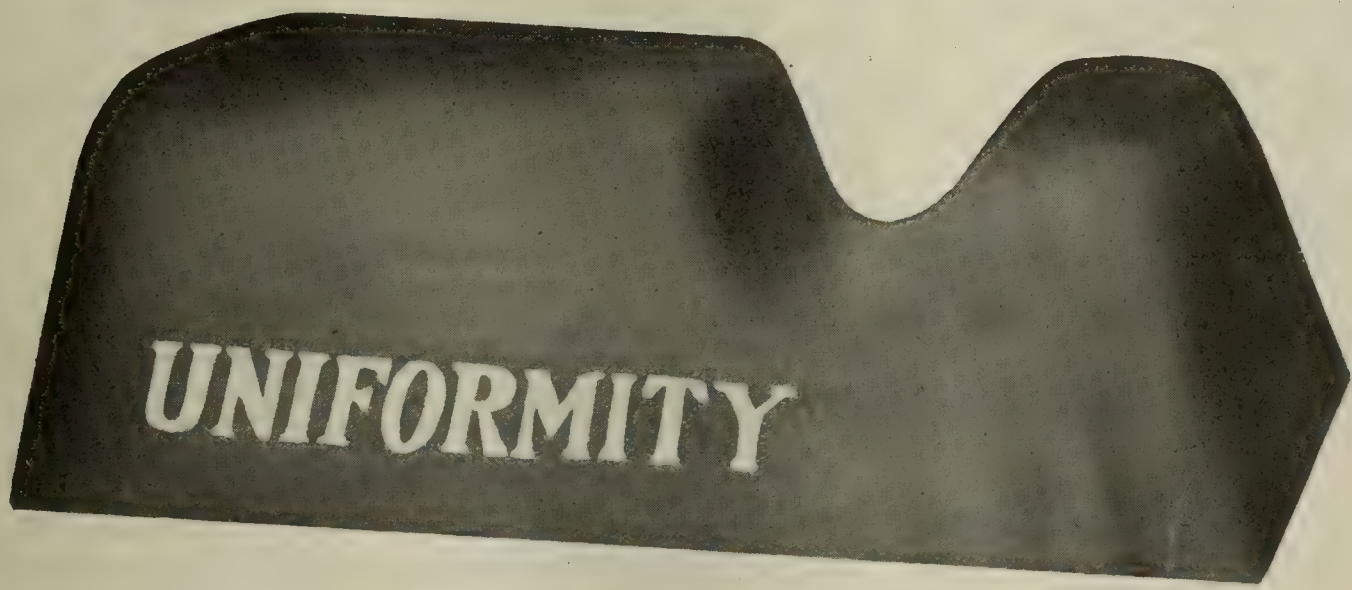

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PUMPS, HYDRAULIC
Blake Pump & Condenser Co., Fitchburg, Mass.
Charles F. Elmes Eng. Works, Chicago.
Metalwood Mfg. Co., Detroit, Mich.
Smart-Turner Mach. Co., Hamilton.
William R. Perrin, Ltd., Toronto.

PUMPS, LUBRICANT, OIL
Bellevue Industrial Furnace Co., Detroit, Mich.
Bowser & Co., Inc., S. F., Toronto, Ont.
Roper, C. F., Co., Hopedale, Mass.
Trahern Pump Co., Rockford, Ill.

PUMP LEATHERS
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.

PUMPS, ROTARY, POWER DRIVEN
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Trahern Pump Co., Rockford, Ill.

PUNCHES AND DIES
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E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Kitchener, Ont.
Ferracute Mach. Co., Bridgeton, N.J.
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Toledo Machine & Tool Co., Toledo, O.

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E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Ferracute Mach. Co., Bridgeton, N.J.
Niles-Bement-Pond Co., New York.

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John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Niles-Bement-Pond Co., New York.
W. A. Whitney Mfg. Co., Rockford, Ill.

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Scaife & Sons Co., Wm. B., Pittsburgh, Pa.

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Can. Hoskins, Ltd., Walkerville, Ont.
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York City.
H. E. Streeter, New Birks Bldg., Montreal, Que.
Taylor Instrument Co., Rochester, N.Y.
Thwing Instrument Co., Philadelphia, Pa.

QUARTERING MACHINES
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

RAILING, IRON AND BRASS (SEE GUARDS)

RAIL BENDERS
Niles-Bement-Pond Co., New York.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
Niles-Bement-Pond Co., New York.

RAILS, STEEL
Cumming & Son, J. W., New Glasgow, Canada.

RATCHETS
Keystone Mfg. Co., Buffalo, N.Y.

RAW HIDE PINIONS (SEE GEARS)

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

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Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
H. E. Streeter, New Birks Bldg., Montreal, Que.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
McKenna Brothers, Pittsburgh, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, PIPE, CYLINDER AND LOCOMOTIVE
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Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

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Garlock-Walker Machinery Co., Toronto, Ont.

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Taylor Instrument Co., Rochester, N.Y.

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Taylor Instrument Co., Rochester, N.Y.

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Can. Blower & Forge Co., Kitchener, Ont.
Grant Mfg. & Machine Co., Bridgeport, Conn.
National Machinery Co., Tiffin, O.

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Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

RIVETS, IRON, COPPER AND BRASS
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
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Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York
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High-Speed Hammer Co., Rochester, N.Y.
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Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York
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Bertrams, Ltd., Edinburgh, Scotland

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Brown & Sharpe Mfg. Co., Providence
James Chesterman & Co., Ltd., Sheffield, Eng.
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SAW MILL MACHINERY
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Canada Machinery Corp., Galt, Ont.
Gardner, Robt., & Son, Montreal
Curtis Pneumatic Machy. Co., St. Louis, Mo.
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A. R. Williams Machy. Co., Toronto

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Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (SEE HACK SAWS)

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Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, BAND AND COPING
Napier Saw Works, Springfield, Mass.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York City
H. E. Streeter, New Birks Bldg., Montreal, Que.

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Johnson Mach. Co., Carlyle, Manchester, Conn.

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Eastern Mach. Screw Corp., New Haven, Conn.

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Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York
Himoff Mach. Co., Inc., Astoria, L.I., New York.
A. B. Jardine & Co., Hespeler
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto

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Riverside Machinery Depot, Detroit, Mich.

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Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wells Bros. Co. of Canada, Galt, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SCREW SLOTTERS
Garvin Machine Co., New York
Pratt & Whitney Co., Dundas, Ont.

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Dominion Machinery Co., Toronto
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Hill, Clarke & Co., Chicago, Ill.
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Petrie, Ltd., H. W., Toronto, Ont.
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Strelinger Co., Chas. A., Detroit, Mich.
Stocker-Rumely-Wachs, Chicago, Ill.

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Wilkinson & Kompass, Hamilton, Ont.

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Foss & Hill Machy. Co., Montreal
Gardner, Robt., & Son, Montreal
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Steptoe Co., John, Cincinnati, Ohio

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Can. Fairbanks-Morse Co., Montreal
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
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Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
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Strelinger Co., Chas. A., Detroit, Mich.
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Wilkinson & Kompass, Hamilton, Ont.

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Norton Co., Worcester, Mass.

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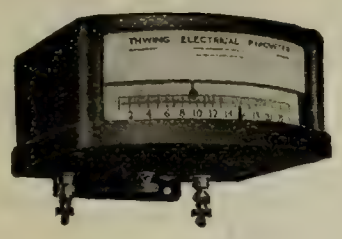
Sheldons, Ltd., Galt, Ont.



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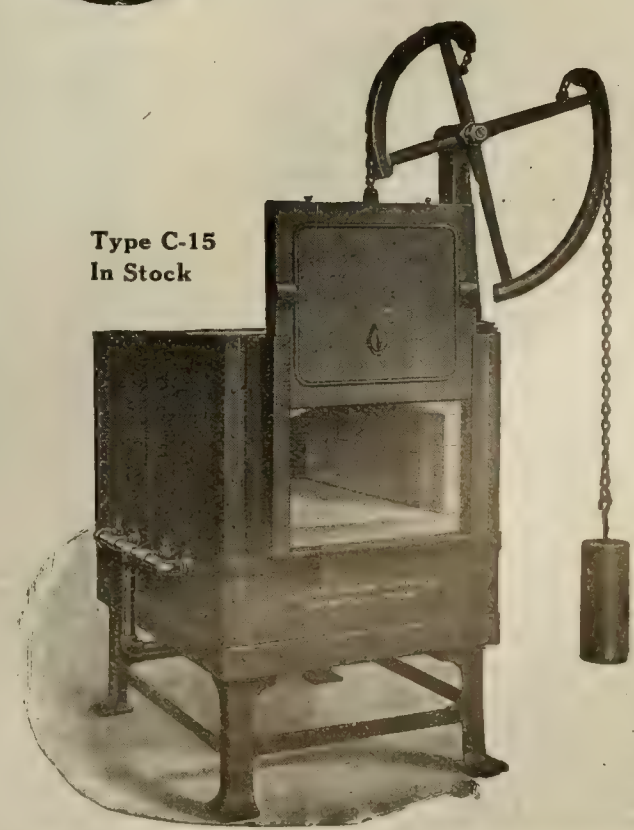

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Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo

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SHEARS, SQUARING
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Brown, Boggs & Co., Hamilton, Canada
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Niles-Bement-Pond Co., New York
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Mulliner & Enlund Tool Co., Syracuse, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
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Fairley Davidson Steel Co., New York, N.Y.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
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Vanadium-Alloys Steel Co., Pittsburgh, Pa.
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A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.
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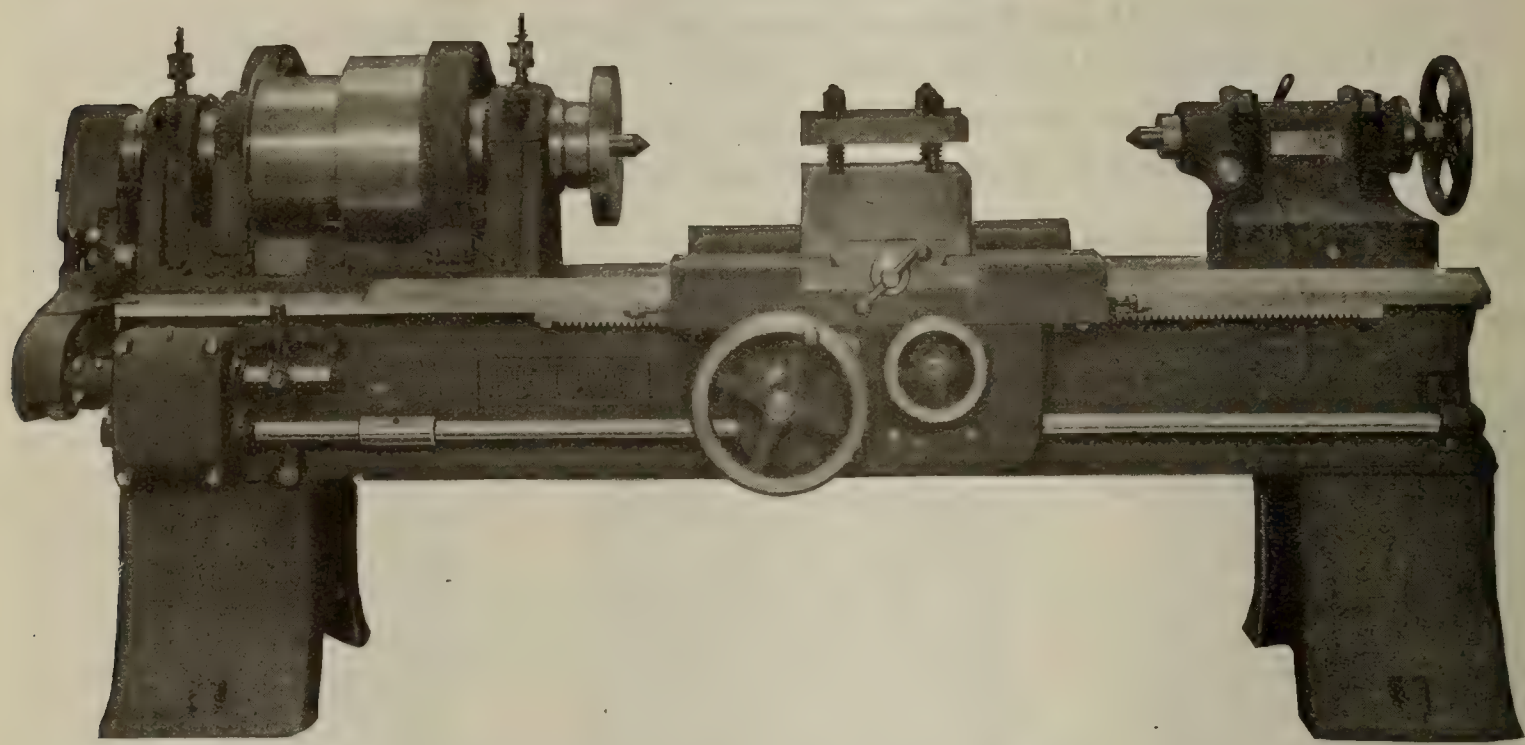

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DESCRIPTION

HEADSTOCK All Headstock journals are provided with well lubricated, renewable bronze bearings. Alternate heat treated steel and bronze washers take the end thrust and a simple adjustment is provided to take up wear. All gears are covered with neat and substantial cast iron guards that may be quickly removed when desired.

BED The Bed is of deep construction and width to give the greatest rigidity under heavy cuts. The shears are made extremely massive and the bed walls extra thick, providing the necessary mass of metal to absorb the vibration and shocks incident to heavy turning at high speeds. Heavy box girths tie the front and rear walls of the bed together at close intervals. Improved type wide angle V on front shear to take thrust of cutting tool. The rear bearing of carriage on bed is flat instead of V-shaped. At the rear of the bed planed pads are provided for attaching Taper and Forming Attachments.

CARRIAGE The bridge is very wide and extraordinarily deep; it will not spring under the heaviest cuts. The carriage is gibbed to the bed at the rear on the outside and will not lift under any conditions.

APRON The apron is of heavy double plate type affording a support or bearing to both ends of all shafts. Apron is tongued and grooved to the carriage, also bolted and dowelled. The feed friction has a greatly increased diameter and will pull the heaviest feeds and cuts without slipping. For engaging the friction a hand wheel several inches in diameter is provided and seats the friction firmly with very small effort on the part of the operator. All studs in apron revolve and simple but adequate oiling facilities are provided.

FEEDS Positive Gear drive through headstock spindle, steel gears in gear box, three rates of feed are provided for through sliding key type. Feeds per revolution of spindle being ⅛ in., 1-16 in. and 1-32 in. All gears in the feed train are fully guarded.

TAILSTOCK The tailstock is a massive casting, rigidly braced internally, and is provided with a long nose, making it unnecessary to extend the tailstock spindle for ordinary work. It is clamped to the bed by four large locking bolts operated at the top of the barrel. A simple binder locks the tailstock spindle in correct alignment; this clamp is located at the extreme front end, where it grips the spindle with the utmost rigidity and absolutely does away with distortion of any kind. The screw is unusually large to resist any buckling tendency. Suitable screws are provided for setting over for Taper Work.

EQUIPMENT Unless otherwise specified Lathes are furnished with 8 ft. bed, one driving plate, hand cross feed, heavy duty plain rest, necessary wrenches, and two-speed tight and loose countershaft. Forming attachment, turret tool post, hand or power feed bed turret, oil pan, pump, and connections can be furnished as extras when desired.

DIMENSIONS

Swing over bed	20 in.
Swing over carriage	11 in.
Length of Bed Standard	8 ft.
Distance between centres 8 ft. bed	40 in.
Width of bed overall	19½ in.
Height from floor to centres	40 in.
Dimensions of front spindle bearing	4 15/16 in. x 6¾ in.
Dimensions of rear spindle bearing	4 in. x 5½ in.
Diameter Nose of spindle	4 in.
Hole through spindle	1 5/16 in.
Diameter Tailstock spindle	3⅜ in.
Travel of Tailstock spindle	6 in.
Morse Taper—Centers	No. 5
Width of Tool Slide	12 in.
Diameter of Headstock Cones	11 in. and 14 in.
Belt Width	6 in.
Number of Feed Changes	3
Feeds per Revolution of Spindle	⅛ in., 1/16 in., 1/32 in.
Speed of Countershaft	110 R.P.M.
Size of Tight and Loose Pulleys	16 in. x 6¼ in.
Ratio of Back Gearing	6.7 to 1
Face of Back Gears	2¾ in. and 2¼ in.
Length of Carriage Bearing	30 in.
Width of Carriage Bridge	12 in.
Number of Spindle Speeds with Two-Speed Countershaft	8
Weight—Approximately, 8 ft. Bed	5,300 lbs.

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CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

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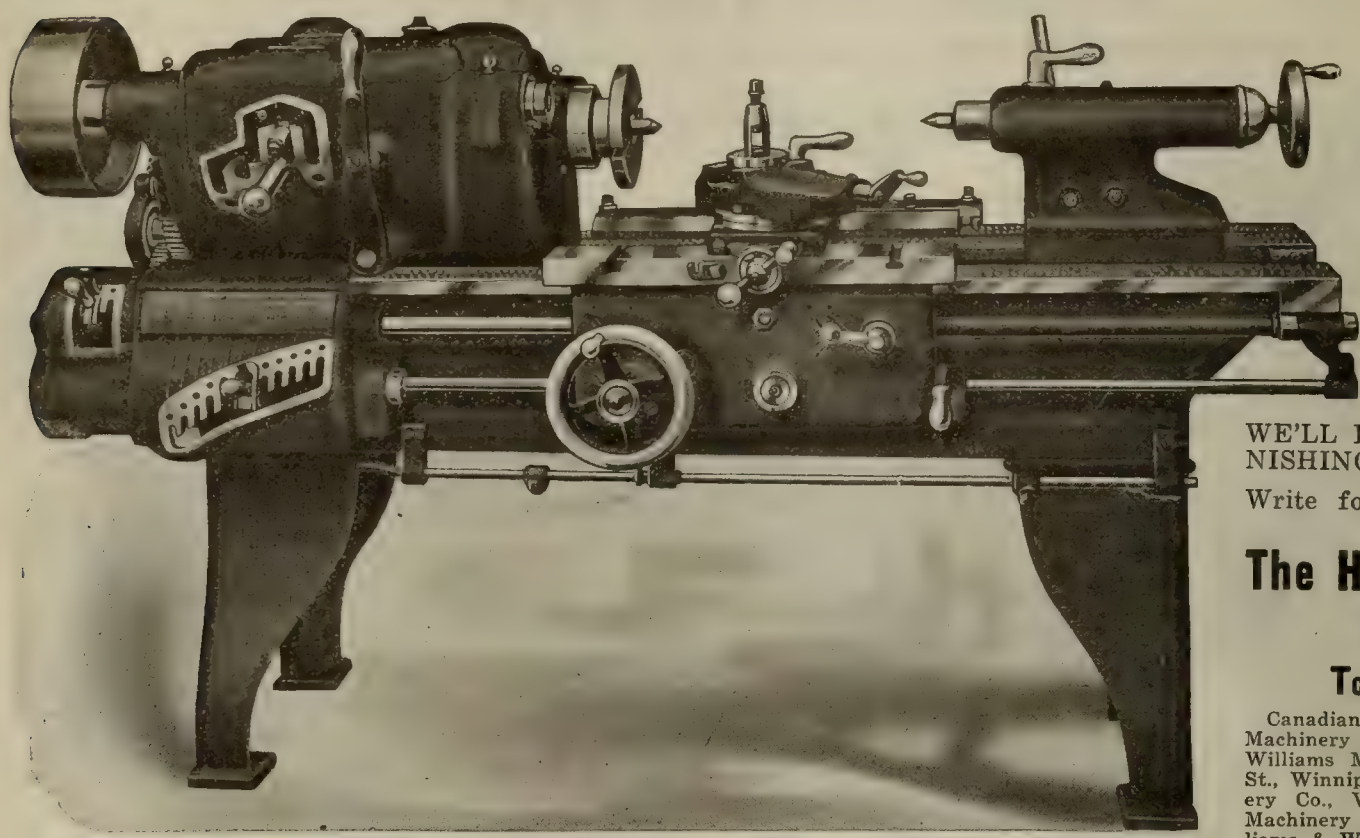
8 mechanical changes of speed for spindle with driving shaft running at constant speed, 4 direct and 4 through back gears.



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These are up-to-date Shapers, designed for modern shop production.

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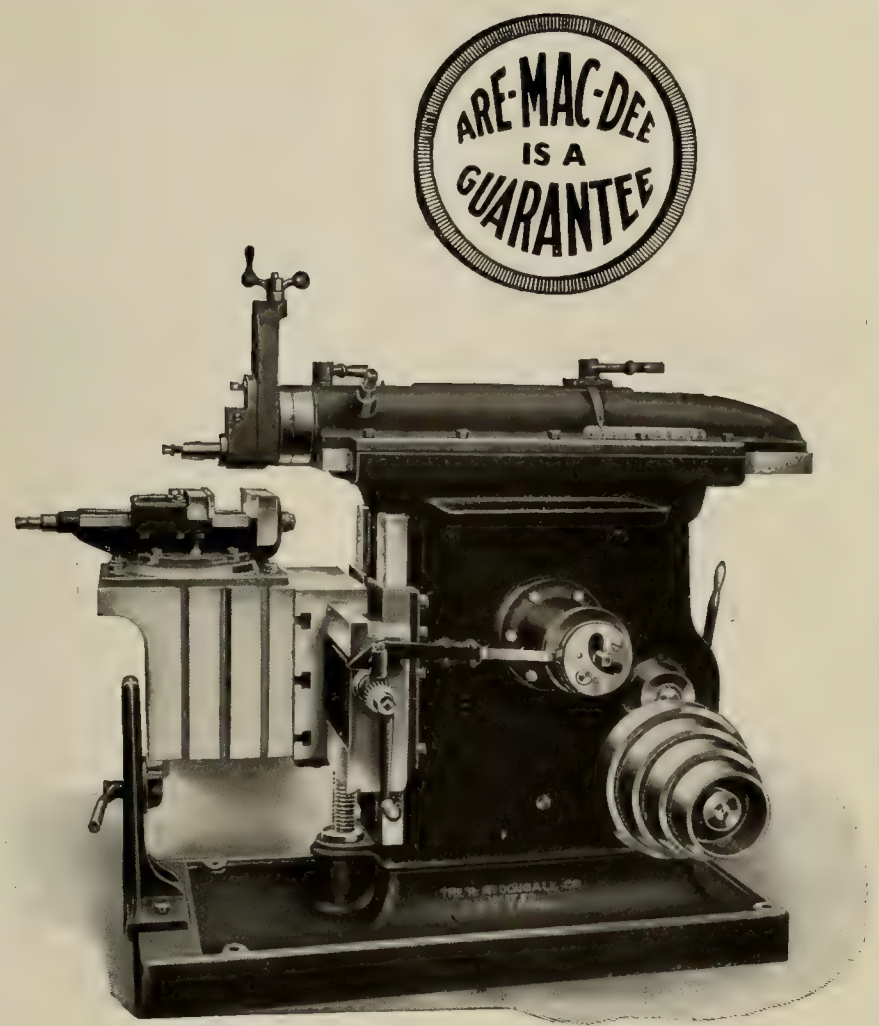
Every adjustment is convenient for the operator and fine for the most accurate work.

Let us have your inquiry.



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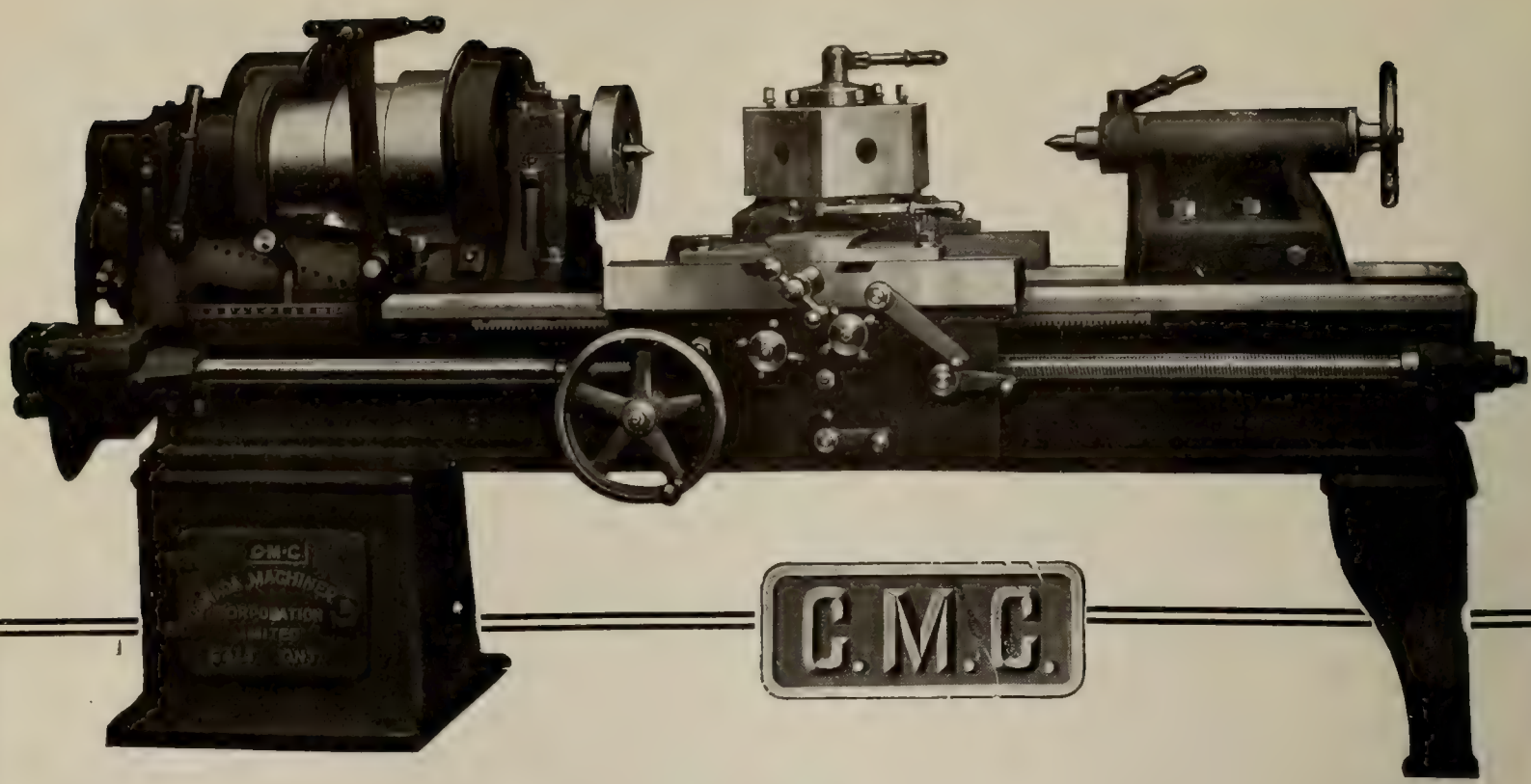

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Equipped with Turret on Saddle

If you are considering the purchase of

A LATHE that will stand the strain of severe service,
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A LATHE that is convenient to operate,
A LATHE that will "come through" with reserve power when the occasion demands,

You could make no better purchase than this 20" **C.M.C.** Quick-change ENGINE LATHE.

The strong, accurate turret on the saddle here illustrated is built from the best materials. It can be fitted to any C.M.C. Engine Lathe.

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CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical, power, foundry and allied fields.
Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

Vol. XVIII—No. 21 Publication Office: Toronto, November 22, 1917 Subscription Price $3.00 per Year

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Don't be satisfied by selecting "Starrett" until you also select a numbered Starrett.

While it is true that

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are unexcelled—made of the best material and all that—it's equally true that the hack saw that will do the best work, and do it most economically, is one suited to the job; in short, a "Starrett" of the right number. The numbers on the Starrett Saws show what they should be used for. What the numbers mean and how they are used to spell economy is explained in Catalog No. 213.

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When History Opens The Purple Testament of Bleeding War . . . . .

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Your name may not be writ among those of the immortals—

But for honour's sake see to it that it is writ on the Scroll with those who at least placed their money at the service of their country.

Shall it be said that Canada spares not her sons from the sacrifice of death, yet withholds her dollars needed to give them Victory?

Buy Victory Bonds

This Space Donated by Pratt & Whitney of Dundas.

Greater Love Hath No Man Than This

Half hidden in the files of the London Gazette, where it is set forth with all the ponderousness of official language, is a story of self-sacrifice that stands out pre-eminently, even in this age of deeds of superlative courage and super-chivalry.

The record is contained in the announcement of the award of the Albert Medal of the First Class to Lance-Corporal Charles Henry Anderson, late of the 1-14th Battalion of the London Regiment, who lost his life in France in November last. The official narrative is as follows: On November 28, 1916, Lance-Corporal Anderson was in a hut in France, with eleven other men, when, accidentally, the safety-pin was withdrawn from a bomb. In the semi-darkness he shouted a warning to the men, rushed to the door, and endeavored to open it so as to throw the bomb into a field.

Failing to do this, when he judged that the five seconds during which the fuse was timed to burn had elapsed, he held the bomb as close to his body as possible with both hands in order to screen the other men in the hut. Anderson himself and one other man were mortally wounded by the explosion, and five men were injured. The remaining five escaped unhurt. Anderson sacrificed his life to save his comrades.

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The Nation's Guarantee for Safety

If patriotism means what it should to us to-day there will be quick and hearty response to Canada's call for money—more money to win the War.

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The Publisher's Page

TORONTO November 22, 1917

Value of Business Newspapers

EDWIN N. HURLEY, the financier and successful manufacturer, who recently retired as chairman of the Federal Trade Commission in the United States, but has just been persuaded to return to the public service, as chairman of the Shipping Board, says regarding trade and technical journals in his book, "The Awakening of Business":—

"Business men do not realize the value which trade newspapers and technical magazines may be to them in increasing the efficiency of their factory and giving them a broad, comprehensive view of their business.

"Our trade journals and technical papers should be encouraged and supported by our business men.

"Copies should be placed where employees can see them, and they should be urged to read and study them.

"These papers are preaching the gospel of sound business on practical lines, and are helpful, not only to business, but to the country as a whole."

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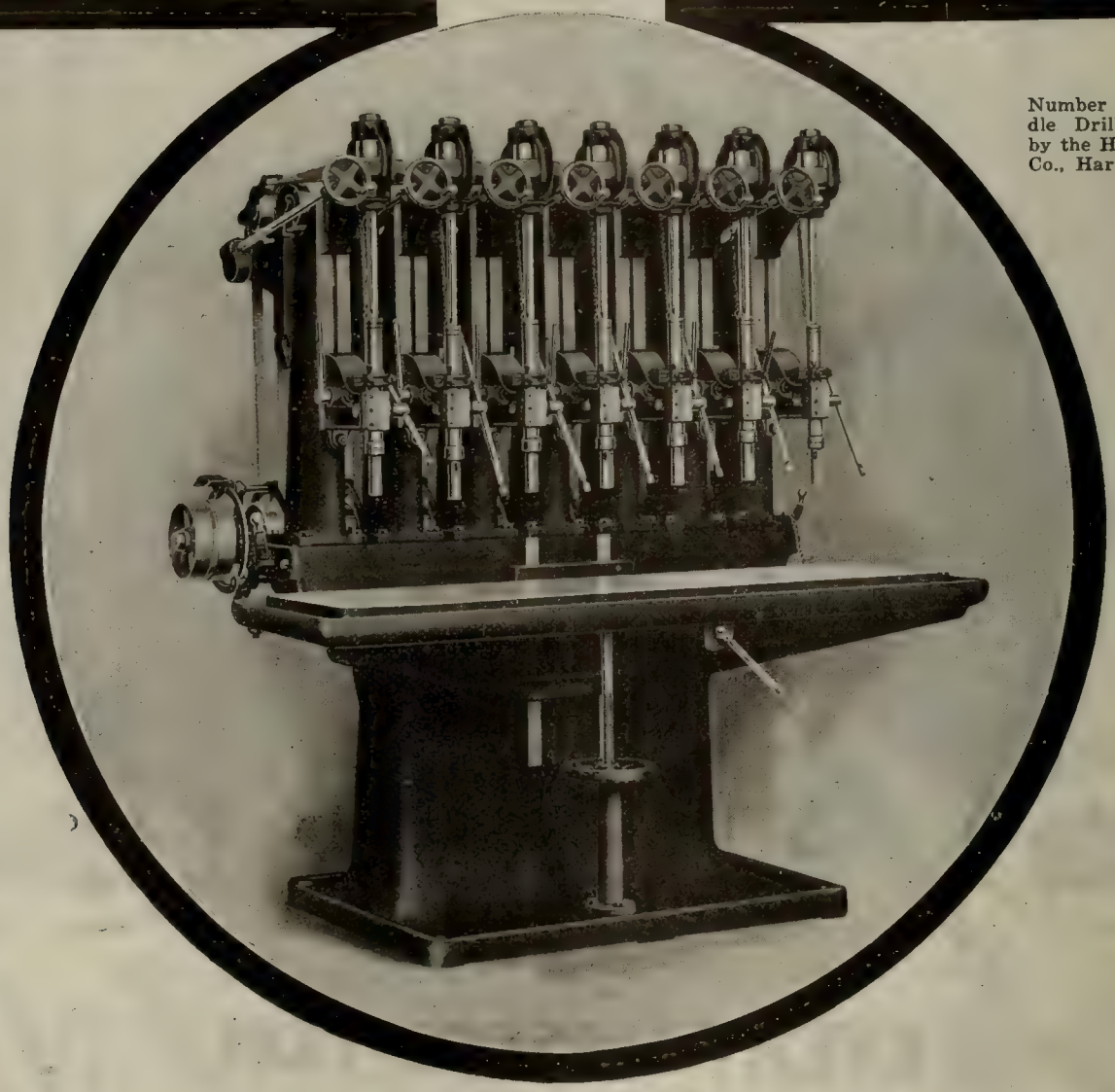
SKF



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Bearing reliability is in a great measure responsible for high speed drill success.

S K F in your drilling machine insures reliability at high speed and under continuous service. The common ailments of the high speed drill—wear, heating and binding are reduced, by the installation of S K F, to a minimum.

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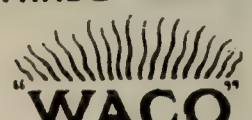

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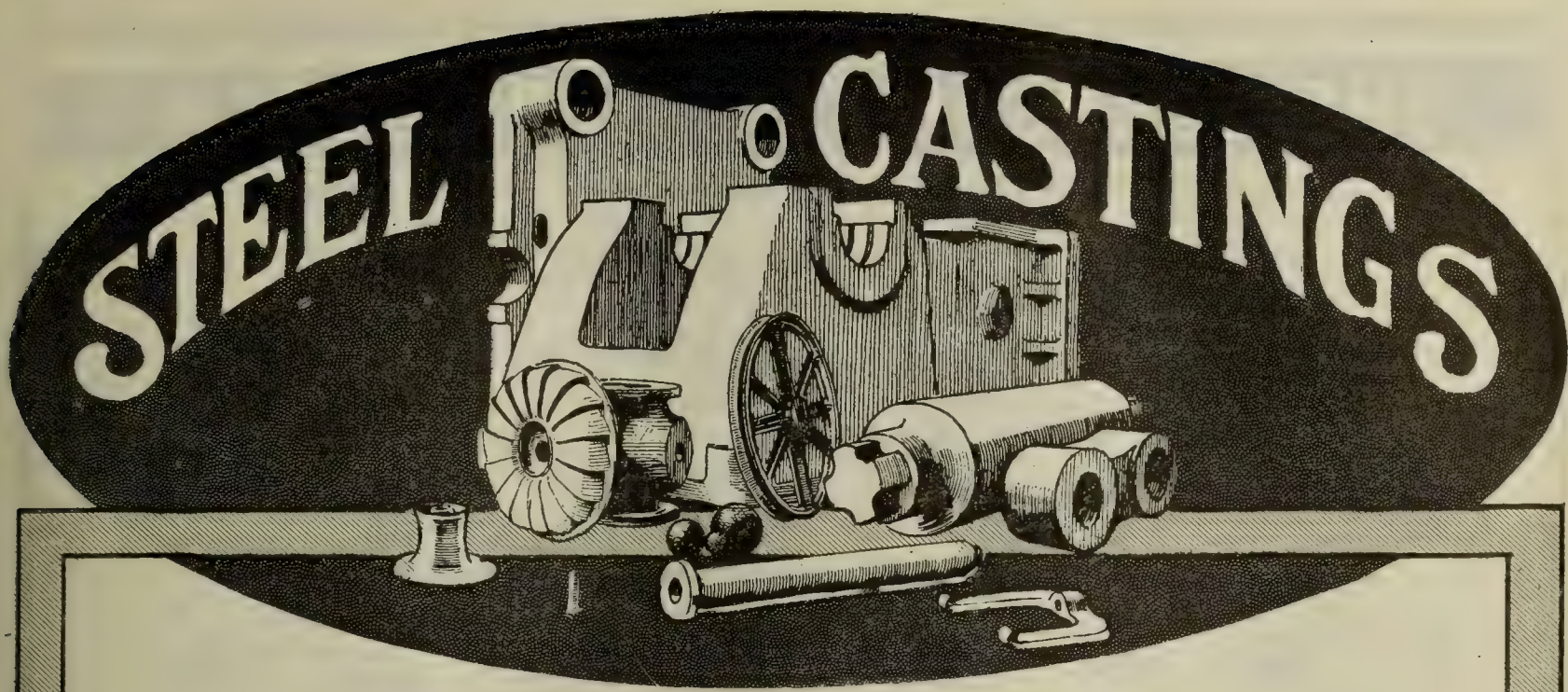

Manganese, Vanadium, Titanium, Chrome, Nickel Castings made in sizes from 1 lb. to 50 tons. Made to specifications and true to pattern. You can thoroughly depend on our products.

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Another firm would not accept a contract until assured they could get HOLDEN-MORGANS.

That's the reputation they have. How about your requirements? We can give

IMMEDIATE DELIVERY

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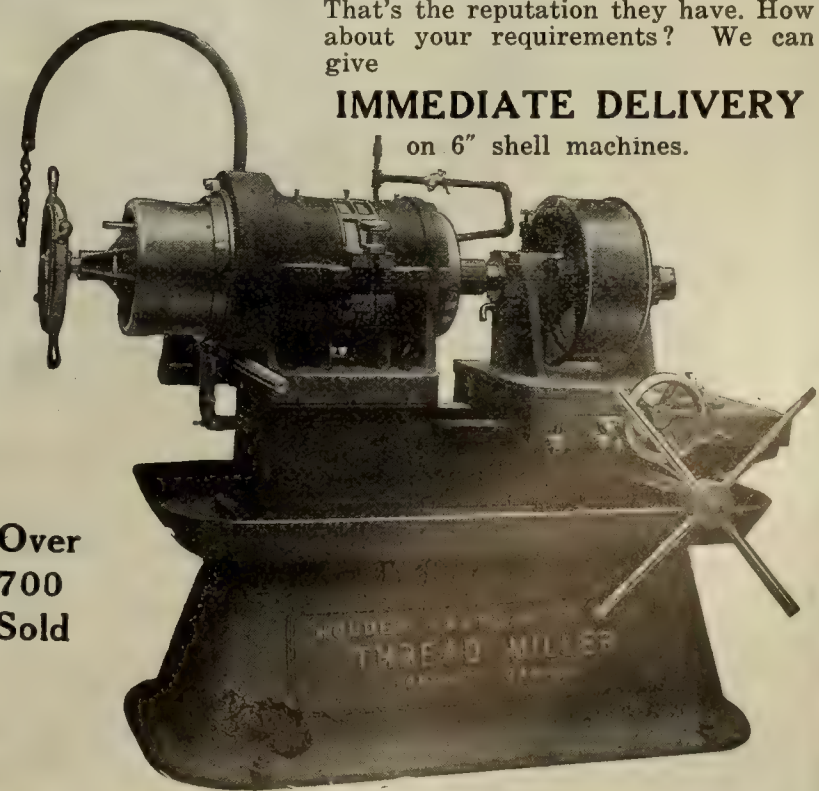

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THE JOHNSON FRICTION CLUTCH

STYLE A SHIFTER

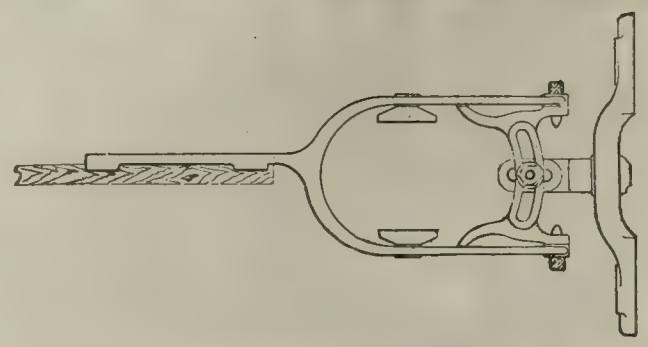

Fig. A

STYLE B SHIFTER

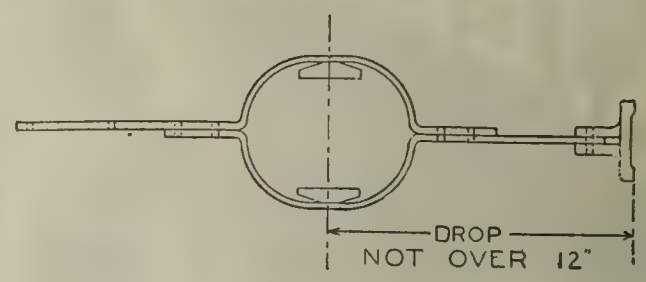

Fig. B

STANDARD SINGLE CLUTCHES WITHOUT PULLEY

Clutch Size Number	PRICE, EACH: With Style A Shifter	With Style B Shifter	Without Shifter	PRICE, SPECIAL PARTS PER CLUTCH: Driving Collar	*Self-lubricating Cast Iron Bearing	Plain Bronze Bearing	*Self-lubricating Bronze Bearing
0	$23.00	$22.00	$21.00	$ 4.00	$ 4.00	$10.00	$12.40
2	26.50	25.00	24.00	4.80	4.80	12.00	14.40
4	30.00	28.50	27.50	6.00	6.00	15.60	18.00
5	34.00	32.50	31.50	6.60	6.60	18.00	20.40
6	38.00	36.25	35.00	7.20	7.20	20.40	22.80
8	48.00	46.25	45.00	8.40	8.40	21.60	24.00
10	60.00	57.25	55.00	10.40	10.40	23.40	25.80
11	80.00	76.25	73.00	12.40	12.40	25.40	27.80

Prices for bearings cover one bearing, the length of the standard clutch hub. Prices including any style pulley on application.

STANDARD DOUBLE CLUTCHES WITHOUT PULLEYS

Clutch Size Number	PRICE, EACH: With Style A Shifter	With Style B Shifter	Without Shifter	PRICE, SPECIAL PARTS PER CLUTCH: *Self-lubricating Cast Iron Bearing	Plain Bronze Bearing	*Self-lubricating Bronze Bearing
0	$38.50	$37.50	$36.50	$ 8.00	$20.00	$24.80
2	41.50	40.00	39.00	9.60	24.00	28.80
4	45.00	43.50	42.50	12.00	31.20	36.00
5	51.50	50.00	49.00	13.20	36.00	40.80
6	58.00	56.25	55.00	14.40	40.80	45.60
8	70.00	68.25	67.00	16.80	43.20	48.00
10	82.00	79.25	77.00	20.80	46.80	51.60
11	102.00	98.25	95.00	24.80	50.80	55.60

Prices for bearings cover two bearings the length of the standard clutch hubs. Prices including any style pulley, on application.

DIRECTIONS FOR ORDERING

Give exact diameter of shaft (necessary to determine size of clutch required). Is single or double clutch required? Speed to run (necessary to determine whether self-lubricating bearing is required). Approximate horsepower (necessary to determine size of clutch required). Style of shifter. Drop of hanger. How to ship.

IMPORTANT: If drop of hanger in Style A or Style B shifters is more than 12 inches, block down from ceiling to shifter base.

The drop from the center of the shaft to the ceiling should never be made more than 12 inches. In all cases make it less if possible. Shifter handle length should be 6 times the length of drop.

*Made to use oil (low speeds) or grease (high speeds).

Write for booklet "Clutches as Applied in Machine Building," yellow data sheets and discount.

Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal; Can. Fairbanks-Morse Co., Ltd., Toronto.
England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.

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The greatest evidence of the value of any article is the demand for it after investigation and trial. Below are four carloads of our compressors which fills one order to a large concern in Canada. Our line of compressors is very large.

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Automatic Lubrication.

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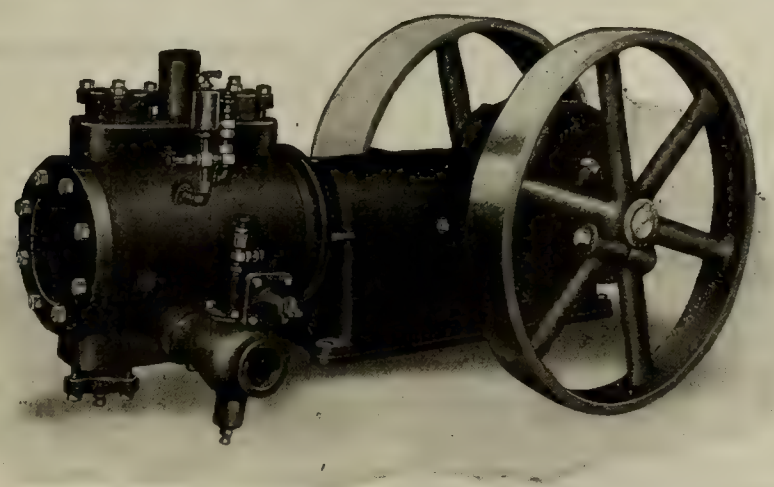

Speedy Installation.

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No Valve Gear.

Parts Easily Replaced.

Low Repair Cost.

Class "EL-1" Power-Driven, Single-Stage, Straight Line Air Compressor.

The simplicity of this machine, and the very small amount of attention it requires, make it particularly useful to machine shops requiring small or medium size compressors.

Bulletin K-300-A describes this type of compressor fully. Our nearest Branch will be glad to mail you a copy.

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Branches: SYDNEY SHERBROOKE MONTREAL TORONTO COBALT TIMMINS WINNIPEG NELSON VANCOUVER

BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

ONE Shot—
properly placed, may decide the engagement.

One or several Machine Tools constantly lagging behind the others will play havoc with production.

Trained men are none too plentiful—can you afford to waste their time grinding, treating, or otherwise trying to make good tools from inferior steel? The history of

"Red Cut Superior"

The Nationally Known
First Quality

HIGH SPEED STEEL

is allied with the history of men whose lives have been devoted to research and specializing in the manufacture of high grade steels. These men insist that each bar of *Red Cut Superior* must contain the purest materials possible for money and brains to produce—and in addition to careful workmanship, every bar must undergo a rigid searching inspection.

We guarantee our customers that so far as it is humanly possible to make it so *Red Cut Superior* is the highest in quality since high speed steel was first introduced.

VANADIUM-ALLOYS STEEL CO.

PITTSBURGH, PA. Works at LATROBE, PA.

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The tools that are made with "Wolfram" High Speed Steel are warranted to be super-keen at the edge and super-strong at the neck.

WOLFRAM

Embodies a true and permanent alloy of Tungsten, Chrome, Vanadium and Iron. No better High Speed Steel in the world.

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Represented in Canada by Messrs. Norton, Callard & Company, Montreal.

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Electric furnaces, automatically regulated, the most modern methods, and **the introduction of Uranium**—make this a steel of truly remarkably cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

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The

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SPECIALISTS

	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
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CHROME VANADIUM, oil hardening or case hardening

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High Speed Steel

STRENGTH

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Uranium high speed steel cutting tools are TOUGH. They are hard. They have ductility. They retain their cutting edge much longer than ordinary steel.

Why are they so strong? Because they contain Uranium—the alloy of strength and toughness in them.

Get in touch with us to-day. Try out Uranium on your hardest job—the harder the test the better.

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Building Up and Preserving Worn or Broken Parts by Oxy-Acetylene Welding

Why have hundreds of dollars' worth of machinery idle?

With an Oxy-Acetylene Welding Outfit as part of the equipment of your Plant, "breakages" can be quickly and cheaply repaired as they occur. There is absolutely no reason why your Production should decrease to any appreciable extent because an important machine part has broken and you cannot get a replacement. A Welding Outfit will take care of all "breaks," big or little, and keep your equipment in constant service.

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Why not keep your Plant 100 per cent. efficient?

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Manufacturers of Oxygen and Dissolved Acetylene, Welding and Cutting Plants.

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"Extra" "Special" "High Speed" **Tool Steels**

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Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

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MONTREAL, QUE.

James McKay Company

Pittsburgh, Penna., U.S.A.

Manufacturers of

Shell Forgings

We have the Equipment and Experience and can execute orders for

Nose Sockets Base Plates Adapter Plates

for any size shells. Can execute orders promptly.

SPECIAL FORGINGS—We can make any forgings that can be made under Drop Hammers.

CHAINS AND ACCESSORY FORGINGS—We have a complete line.

ADDRESS OUR REPRESENTATIVE:

JOHN A. BUCHANAN

King Edward Hotel, TORONTO

STELLITE

WELDING COMPOUND

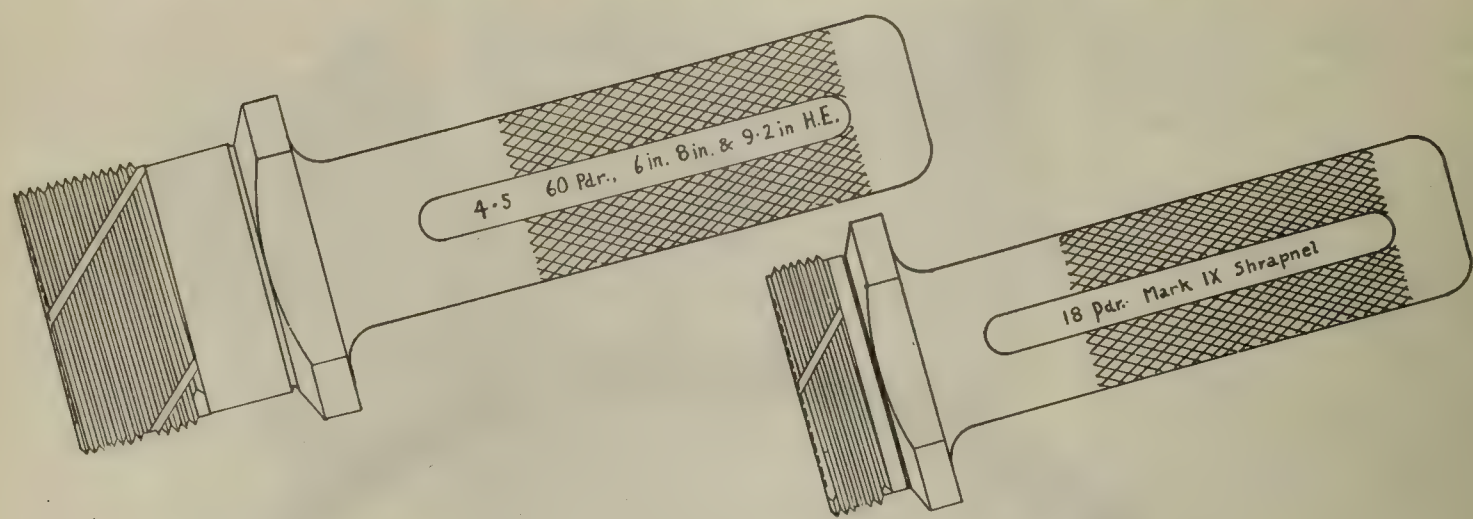
"We have been using 'Stellite' Welding Compound for the past month, obtaining excellent results. We have tried other compounds for tipping and are pleased to report that to date best results have been obtained from the use of 'Stellite' Welding Compound."—**Canadian Linderman Co., Limited**

DELORO SMELTING & REFINING COMPANY, Limited

Head Office: DELORO, ONTARIO

TORONTO MONTREAL

FUSE HOLE GAUGES



Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

STEEL *for*

Shrapnel Shells and Shell Blanks

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Steel Ingots
by the
HARMET
Liquid Process

Nova Scotia Steel and Coal Co., Limited

Head Office:
New Glasgow, N.S.

Western Sales Office:
Room 14 Windsor Hotel
MONTREAL

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6″ shells.

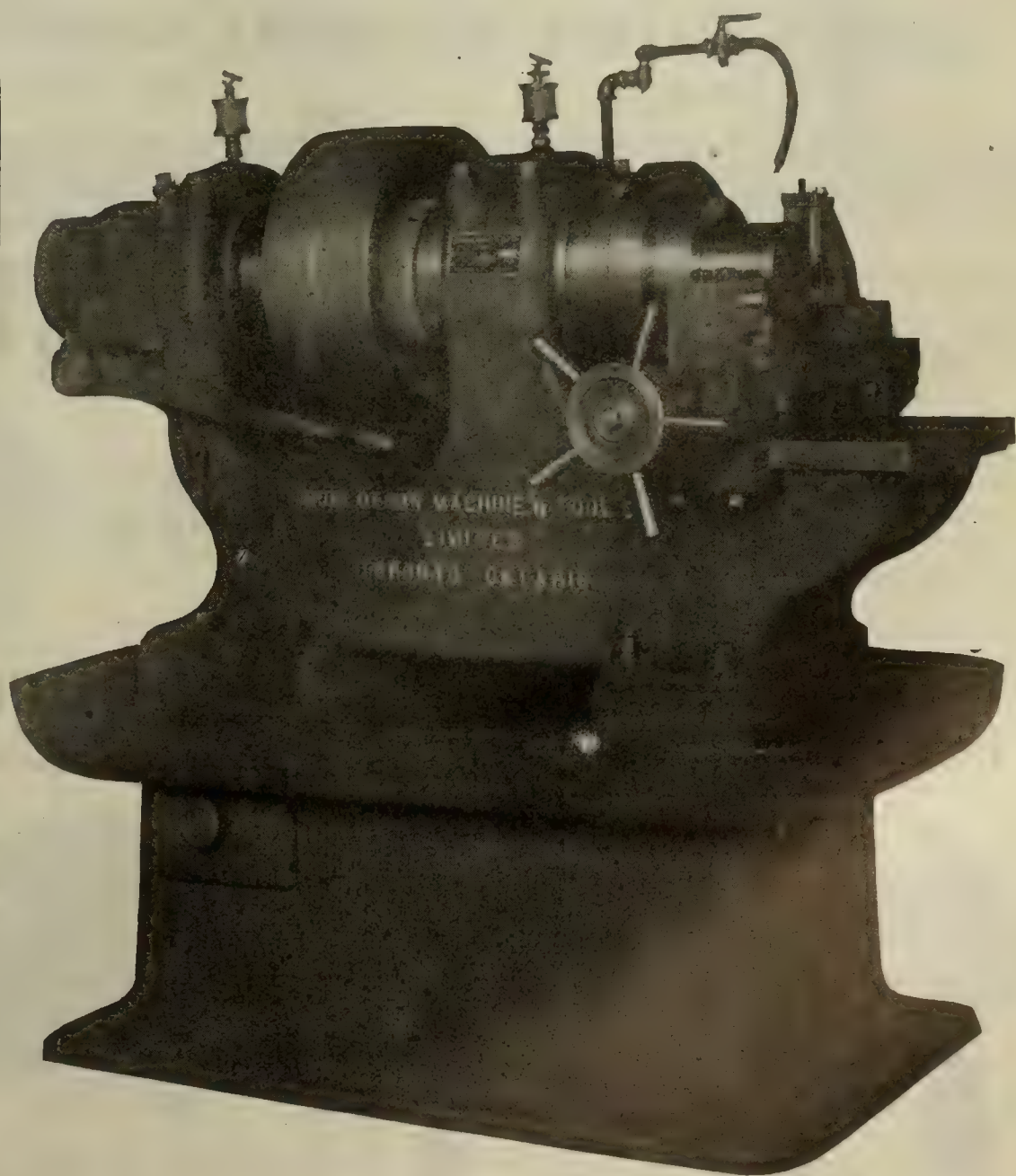
Roelofson Machine & Tool Co., Ltd.

Head Office 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6″ shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.



GARLOCK-WALKER MACHINERY CO. LIMITED

G&W MACHINERY

32 FRONT ST. WEST, **TORONTO** TELEPHONE MAIN 5346

EQUIPMENT FOR { 75 mm { AMERICAN / FRENCH ; 18 pdr. BRITISH SHRAPNEL }

FOR either complete outfit, or individual machines to balance equipment already installed, for any of the above shells.

FOR additional machines on any other size projectiles.

FOR Standard equipment — Engine Lathes, Turrets, Screw Machines Drills, etc.

FOR Good used machine tools.

SEE

GARLOCK-WALKER MACHINERY COMPANY, LIMITED

32-34 [illegible] NTO, ONTARIO

METAL and WOODWORKING MACHINERY of all Kinds

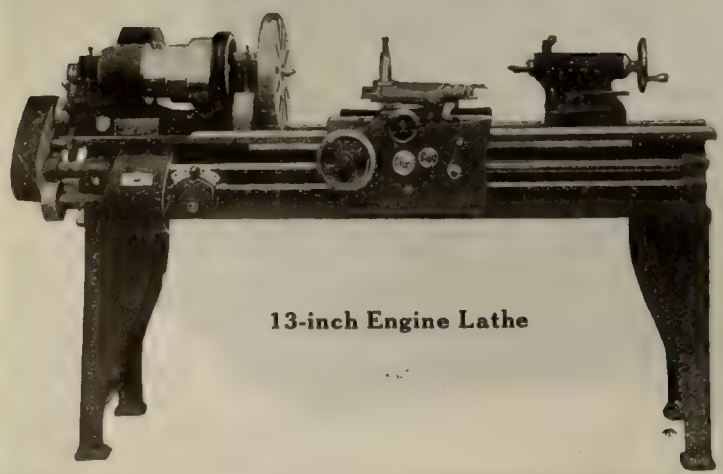
Decidedly Quality

That is the verdict of our clients.

In construction, operation and results, quality is evident. That is the reason why Filsmith has occupied the foreground in lathedom. In Canada and United Staes you will find Filsmith quality is based on what it is now doing, not on history. Full webbed headstock, 50-point carbon steel spindle, and rigidly clamped tailstock.

An enquiry will secure you full information.

THE PHILIP SMITH MFG. CO.
SIDNEY, OHIO, U.S.A.



13-inch Engine Lathe

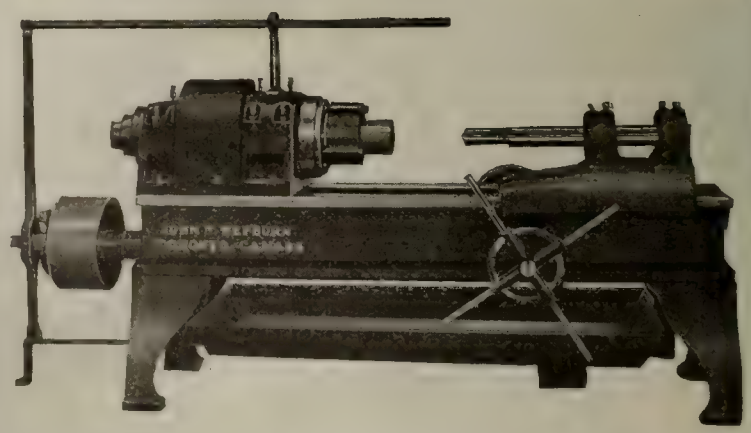
Boring 6" Shells

with

Perfectly accurate boring and far greater speed go into your shop the day you open the door to a Hepburn Single Bar Boring Lathe of rigid build. No lathe in your shop or any shop other than a Hepburn Lathe is its equal on 6" shell work. Write for its record.

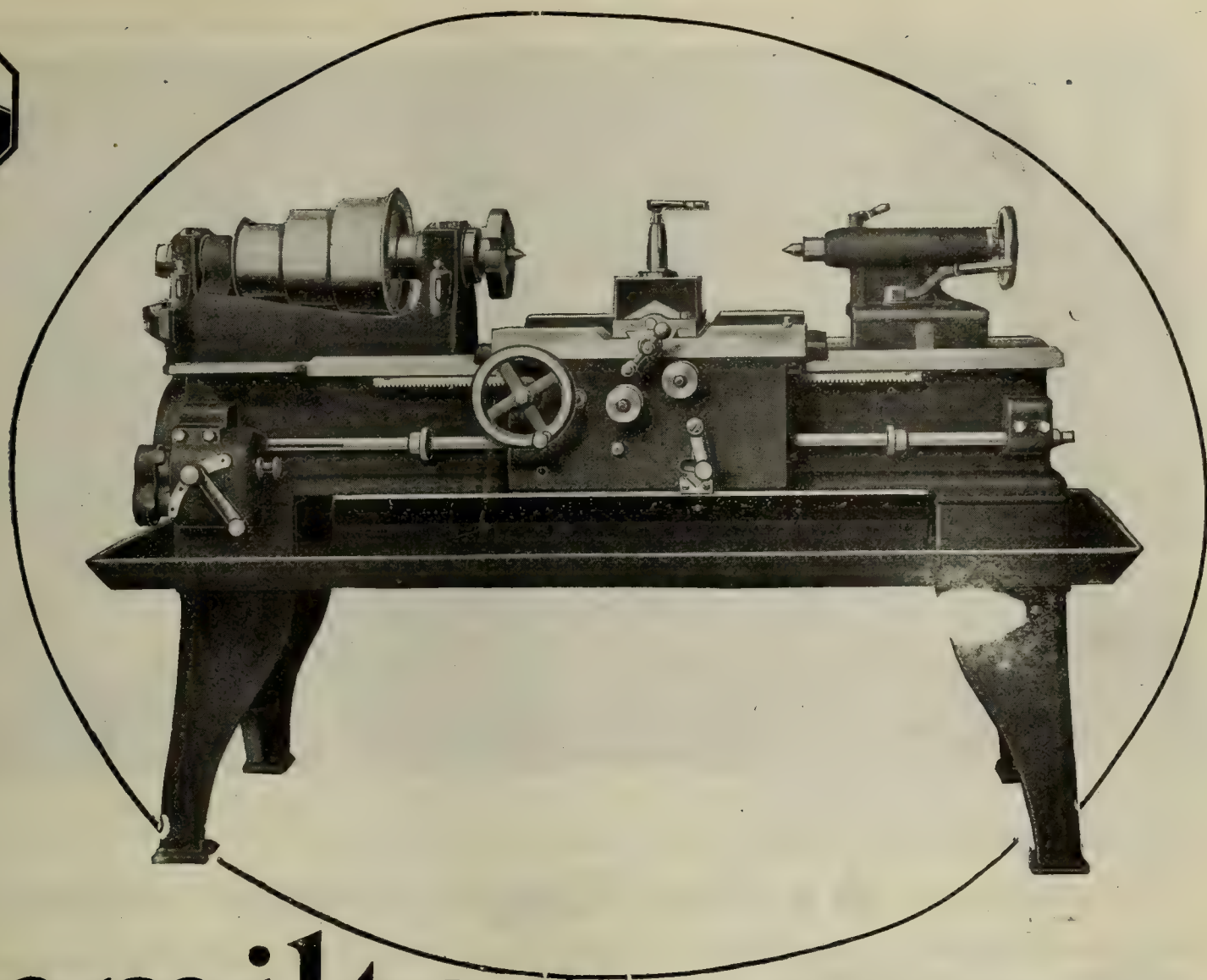
Your old lathe rebuilt by us will be as efficient as new for all lathe work. Ask for particulars.

Hepburn Lathes



John T. Hepburn, Limited
18-60 Van Horne Street Toronto, Ontario

Rapid Production HAMILTON Machine Tools



Hamilton Lathes

Equipped with a complete range of feeds with quick changes. Automatic Stop and other Hamilton features which make it an indispensable lathe for the shop in need of a speedy, cost-cutting, efficient machine.

Its simplicity of design to ensure ease of operation is a big factor in favor of this lathe.

For long runs on duplicate pieces we highly recommend this New Hamilton Lathe, built for plain turning, boring, etc. This machine meets the popular demand for a single-purpose machine for automobile and manufacturing of a like nature.

They can be converted and adapted to a wide range of operations by equipping with back gears, screw-cutting mechanism, etc. 14, 16 and 18-inch sizes. Bulletin with full descriptions on request.

Ask to-day.

The Hamilton Machine Tool Co., Hamilton, Ohio

Sole Agents for Ontario: H. W. Petrie, Limited, Toronto, Ontario

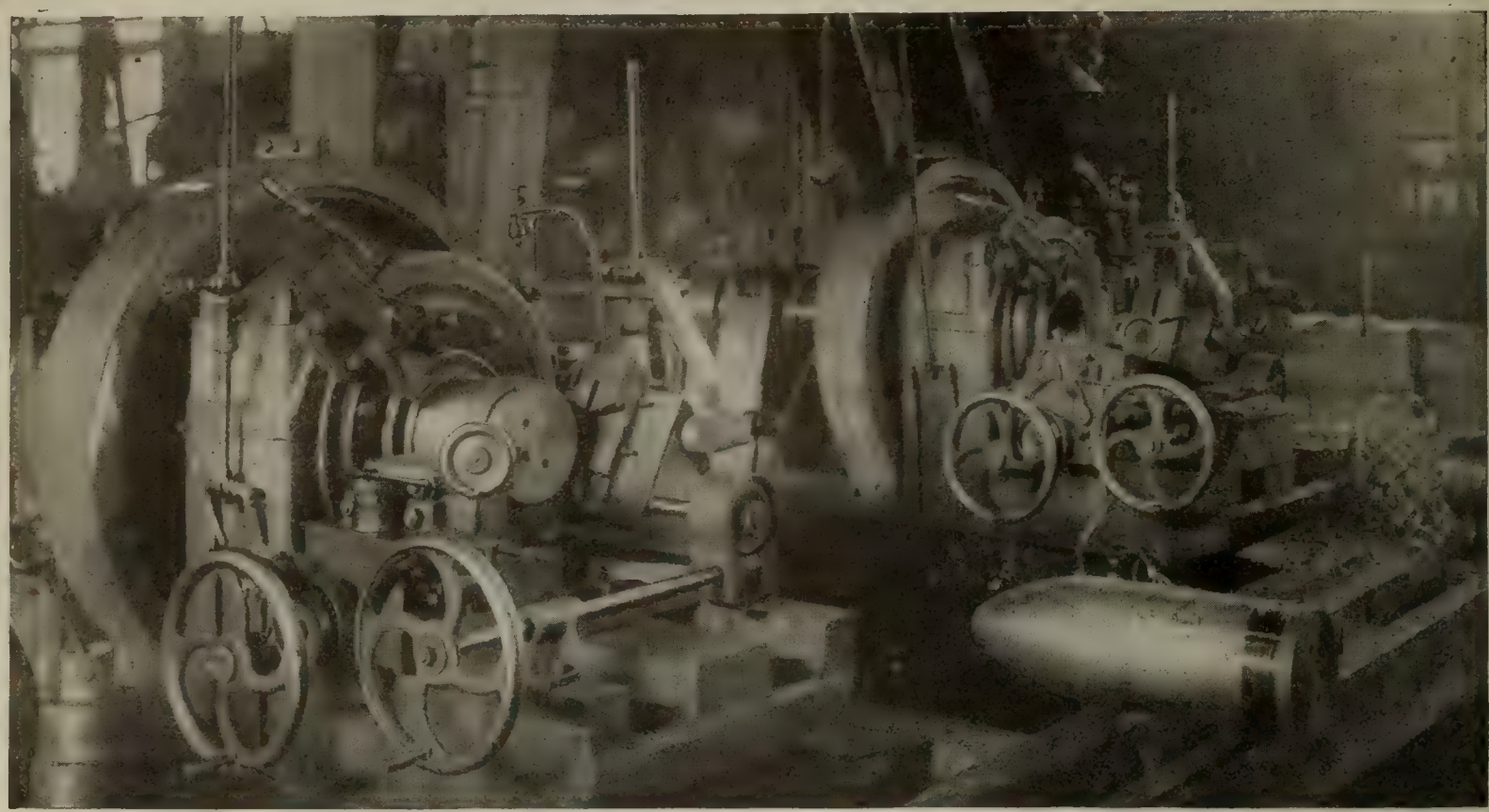
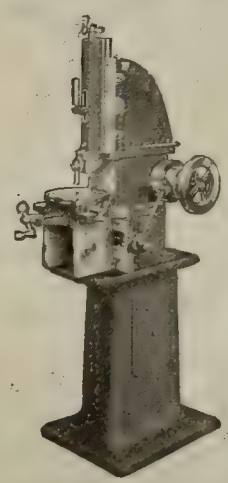


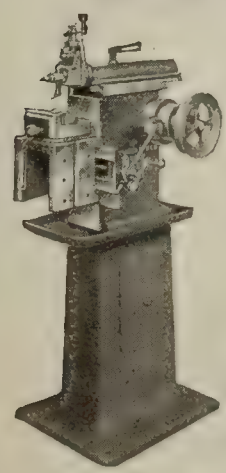
Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

These machines are built for turning bands on 8", 9.2" and 12" shells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. **Write for full particulars and price.**

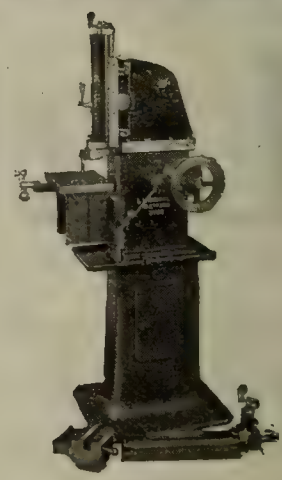
Bennett Ave. **Warden King Limited** **Maisonneuve, P.Q.**



3½-inch



7-inch



Combination

Three of the machines that by their cost-reducing features have established themselves "solid" with the home users and by these same merits are reaching out in foreign countries. A silent, but powerful message of the Rhodes efficiency.

Their capacity is greatly promoted by the adjustments which may easily and quickly be attached. For shaping, slotting, die making, tool making, etc., these machines stand paramount. An inquiry on your stationery will receive prompt attention.

The Rhodes Mfg. Company

Hartford, Conn., U. S. A.

TEXTILE BELTING and PACKINGS

HIGH SPEED TWIST DRILLS

J. R. BAXTER & COMPANY LIMITED, MONTREAL

and GENERAL MACHINERY SUPPLIES

Two Cuts at One Time

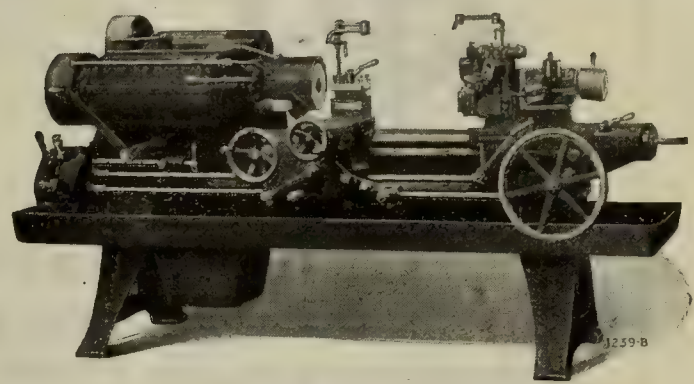
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

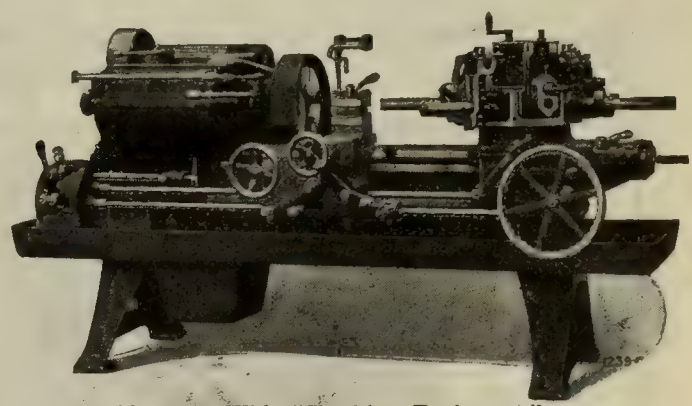
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."

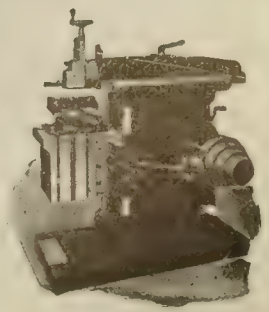


No. 2-A—With "Chucking Equipment."

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal, Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

CUT YOUR SHOP COSTS



Nobody would think of putting 16-inch lathe work on a 30-inch lathe, then why leave small parts on a large Milling Machine?

A Steptoe Hand Miller or small power feed can be handled quickly and will cut your production cost. You will have less money invested in your Milling Machines and have more machines to do the work.

That same principle applied to your small planer work will cut the cost of planer work.

A Steptoe Shaper will do the work faster because it can be handled quicker.

The John Steptoe Company, CUMMINSVILLE CINCINNATI, OHIO, U.S.A.

Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.

A time saver
Can you beat it?

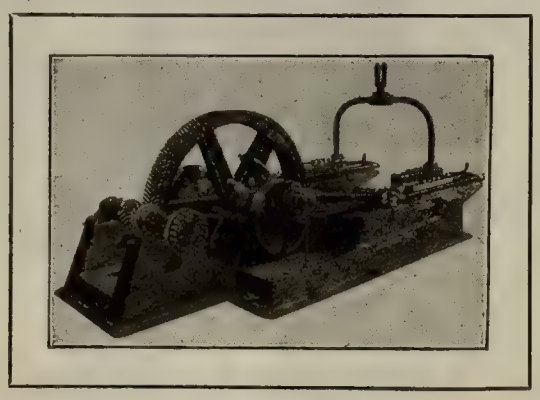
HAVE you noticed the Consolidated Clamp Connection on all Consolidated Presses, grips like a vise and stays put, one of the bull-dog kind, which, when properly tightened, will not break away, or slip.

If you break it we will furnish a new one free of charge.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver



ELMES

18" Stroke Hydraulic Pump

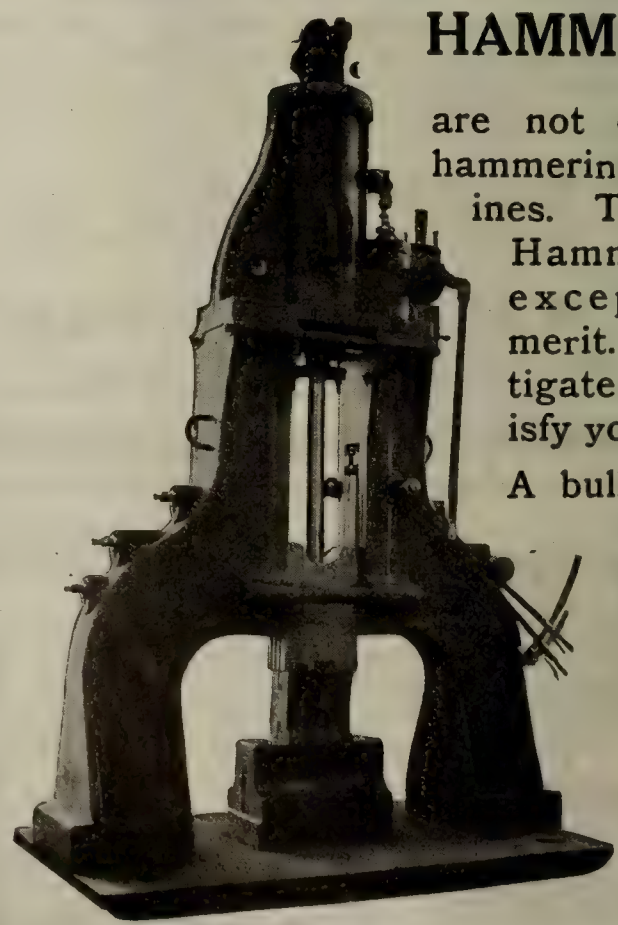
for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217 No. Morgan Street CHICAGO, ILL.

"ERIE" STEAM FORGING HAMMERS



are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U. S. A.

A Woman Operates

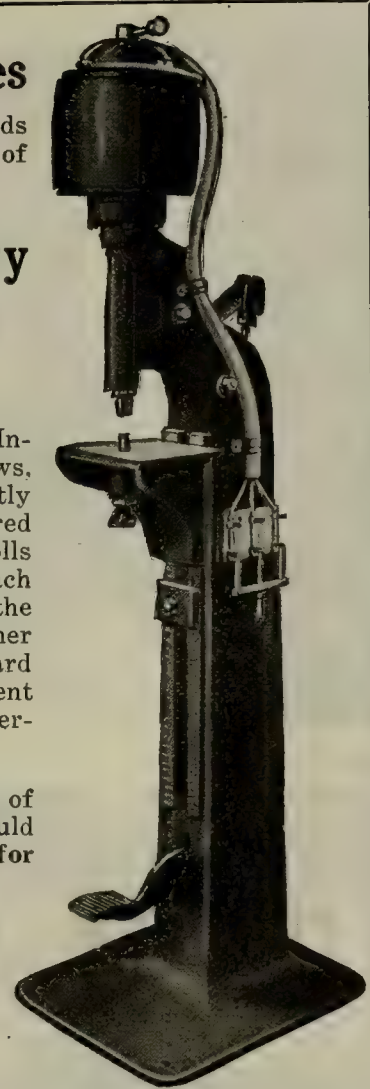
this noiseless riveter. She feeds the work to it with the ease of rocking a cradle.

The Grant Rotary Rivet Spinning Machine

is the **no**-nerve-racking way. Instead of by hammering blows, the rivet shank is silently swedged into the form desired by specially shaped twin rolls revolving independently of each other at the lower end of the revolving spindle. Whether rivets are soft brass or hard steel, the shanks are never bent and the heads are finished perfectly smooth.

One firm reports a saving of $4,368 annually. You should investigate to-day. **Write for catalogue.**

GRANT MFG. & MACHINE CO.
HOLLAND AVE.
BRIDGEPORT, CONN.



LABOR SAVING DEVICES

Waiting Your Request

Is the M.E.C. illustrated catalog. It describes minutely the most dependable labor-saving devices including these deservedly famed

M E C Air Cylinders, Air-Operated 2 and 3 Jaw Chucks, M.E.C. Master Hinge Collet Chucks and Collapsible Taps.

In your hands it will point the better way to compensate for any shortage of skilled labor with which you may be contending. Write to-day for your copy.

MANUFACTURERS EQUIPMENT COMPANY
175-179 N. JEFFERSON STREET, CHICAGO, ILL.

Canadian Agents: J. R. Stone Tool and Supply Co., Detroit, Mich.
New York: J. R. Stone Tool and Supply Co., 30 Church Street

Triple Purpose
"METALWOOD"
COMBINATION

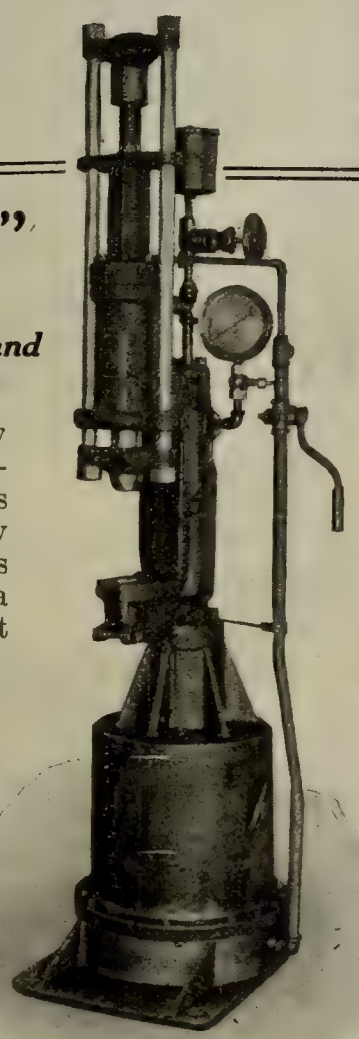
Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.

Metalwood Mfg. Co.

Leib & Wight Sts., DETROIT, MICH. U.S.A.

For Great Britain and Continent address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.



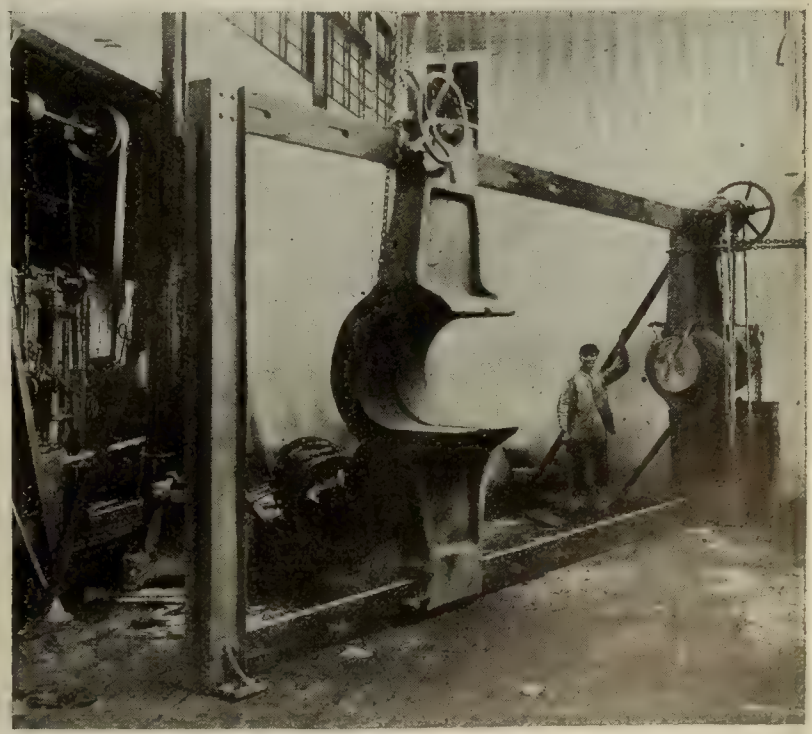
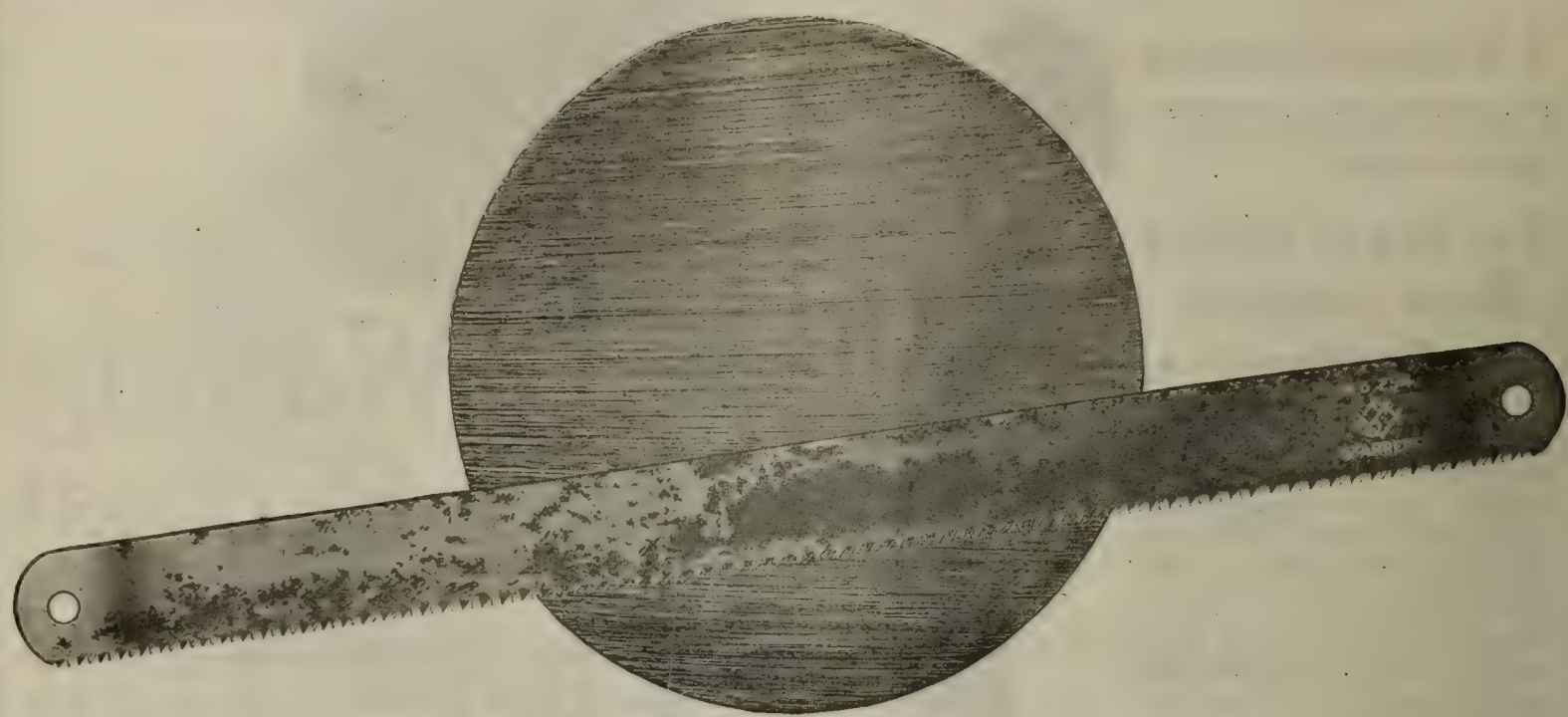


Illustration shows Hydraulic Press for Government Shipbuilding Plant, Sorel, Que.

Hydraulic Presses, Pumps and Accumulators for all Purposes.

Write for Prices and Deliveries.

WM. R. PERRIN, LIMITED
TORONTO, CANADA.



LET STARRETT TESTS PICK YOUR BLADE

Hack saw tests **are** important; they save blades, and the mechanic's valuable time. Every-day experience proves this.

Two mechanics were comparing their abilities:

One said that he could cut machinery steel four times as fast as the other.

The challenge was accepted. The challenger snapped a blade into his frame and set to work. But the other turned to the hack-saw rack. Before he had made up his mind to use a given blade, his friend had cut an inch into the steel—but he was changing his dulled blade. Because of breakage and dulling, the blade was replaced five times, while the man who tested and picked the

Starrett Hack Saw

suited to the work had cut the bar four times.

The facts of this story are vouched for.

Moral—It pays to pick the right blade. It pays to test hack saw blades. But we have done the testing for you, to save your time. Our Catalog No. 213 tells you what Starrett Hack Saw to use on the job.

Starrett Hack Saws are unexcelled, just as Starrett Fine Tools are unexcelled.

STARRETT HACK SAWS CUT QUICKER LAST LONGER

The L. S. Starrett Company

THE WORLD'S GREATEST TOOL MAKERS

ATHOL, MASS.

NEW YORK LONDON CHICAGO

BY INVITATION MEMBER OF

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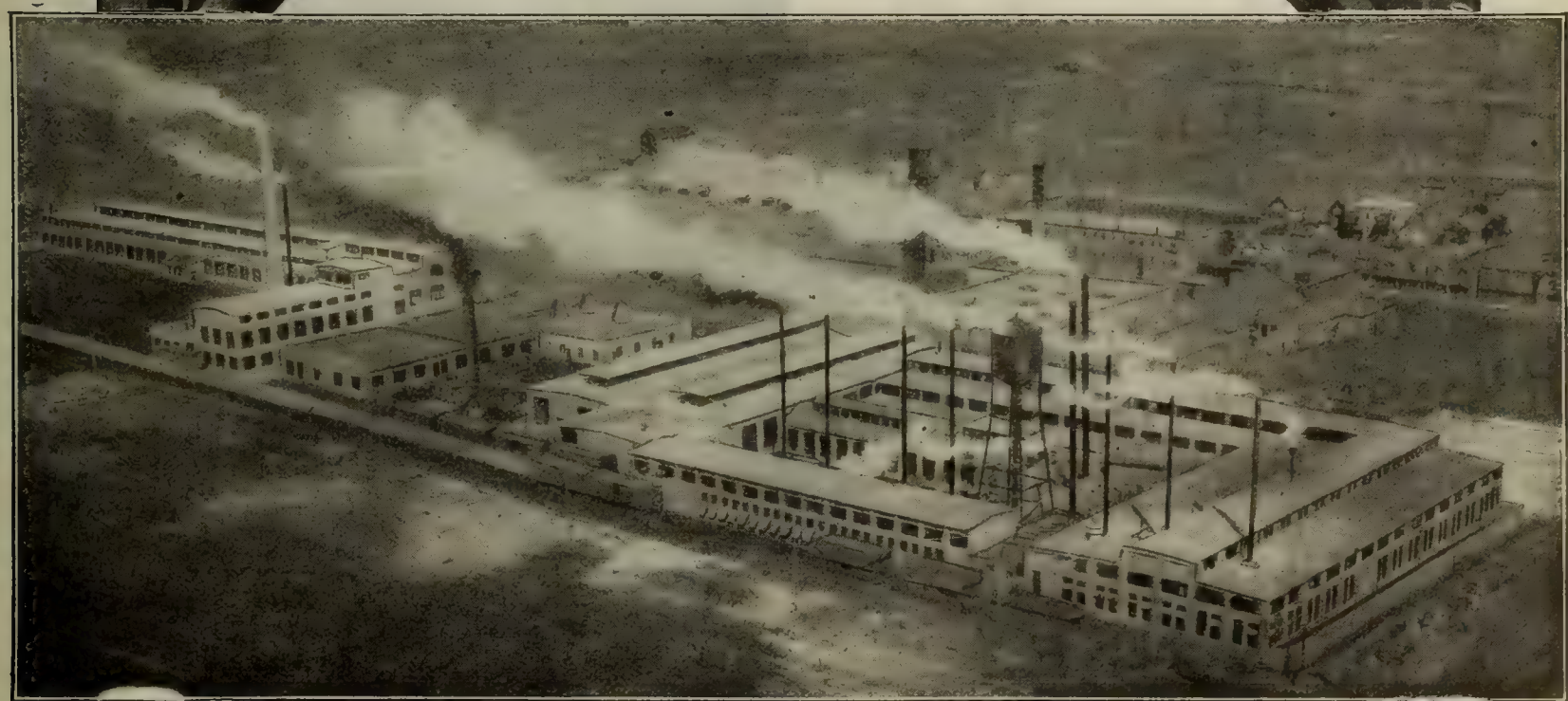
BROWN'S

BEAVER BRAND METALS

BRASS BRONZE
CANADA SILVER and GILDING METAL
In Sheets, Rolls, Plates and Rods



Brown's Copper & Brass Rolling Mills, Limited

General Offices and Works:
New Toronto, Ontario, Canada

COPPER & BRASS
BROWN'S
QUALITY
ROLLING MILLS

Bilton Automatic Gear Millers—Spur or Bevel Gears

CAPACITY

No. 1 - - 14 Pitch
No. 2 - - 10 Pitch
No. 3 - - 8 Pitch

The Bilton Machine Tool Company

Succeeding The Standard Mfg. Company

Housatonic Ave., Bridgeport, Conn., U.S.A.

Also Manufacturers of —
Plain Horizontal Millers
Automatic Millers
Plain and Ball Bearing
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Milling Cutters
Riveting Machines

Catalog 30 on request

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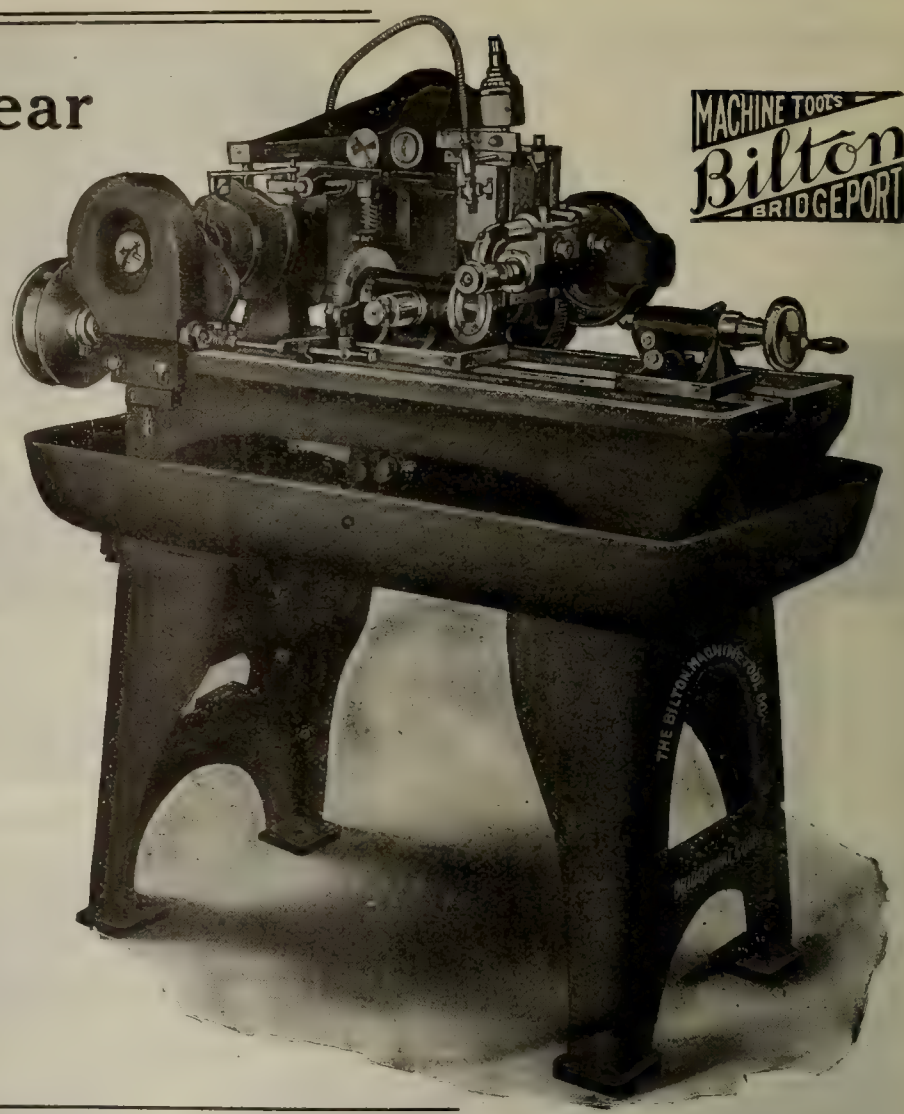
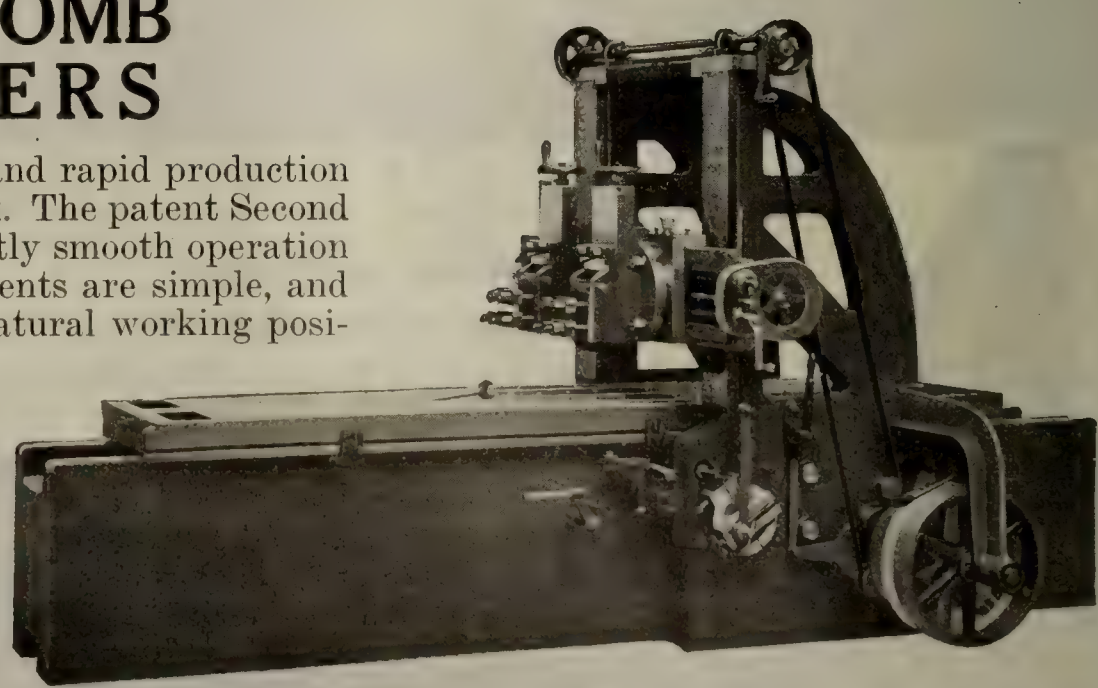


Powerful, Sturdy and Productive

The ability to run without shock or injurious vibration under heavy driving has placed

WHITCOMB PLANERS

in the lead for accuracy and rapid production over a wide range of work. The patent Second Belt Drive insures perfectly smooth operation at all times. All adjustments are simple, and quickly made from the natural working position of the operator.



WRITE FOR CATALOG

Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass.

ENGINE LATHES
METAL PLANERS

"W & B" Pipe Wrenches the Only Pipe Wrenches

MADE IN CANADA

The line comprises all sizes from 6 to 48 inches

"W & B" Wood Handle Grips. Length open 6 to 14 inches

"W & B" STEEL Handle Grips. Length open 18 to 48 inches.

These Wrenches are extra strong frames well proportioned.

The Jaws are Drop Forged and tempered, giving them strength to resist the most severe strains.

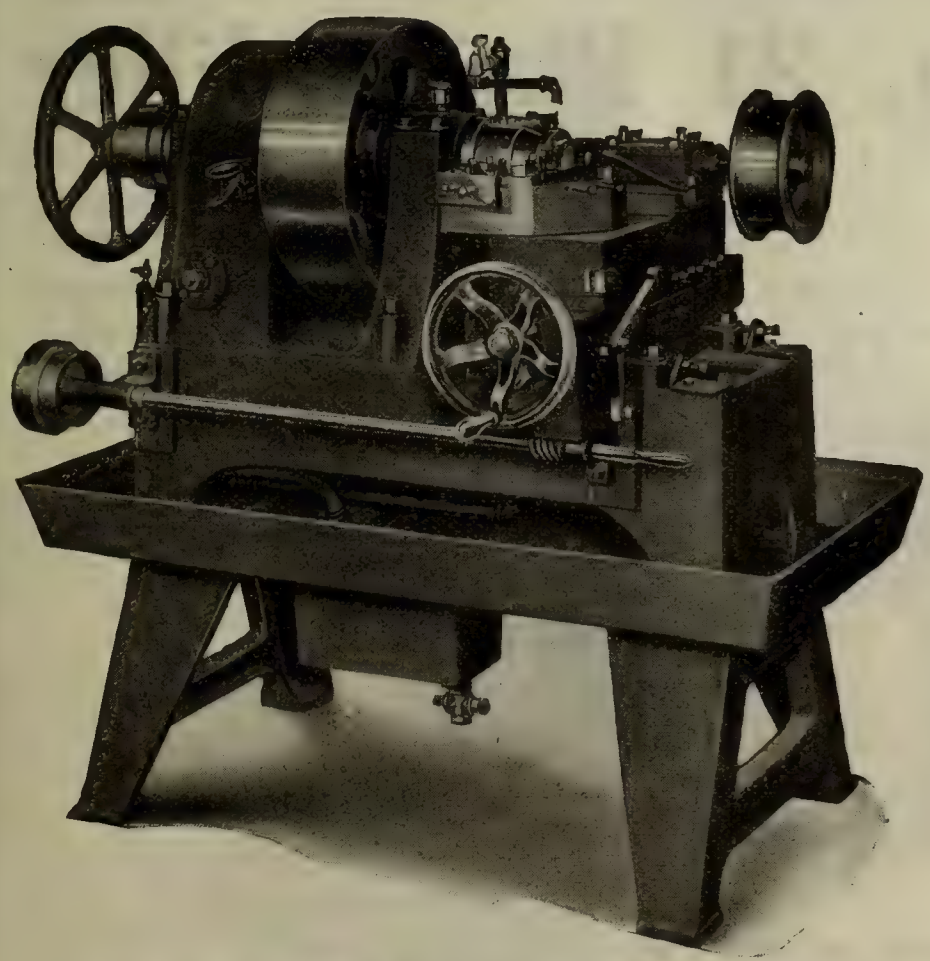
Other patterns of "W & B" SCREW WRENCHES MADE IN CANADA at our St. Catharines factory, are our Machinists' Knife Handle, "Railroad Special," Regular (Agricultural Pattern). Adopt this established line as your standard CANADIAN-MADE WRENCHES.

Complete information and catalog No. 90 on request.

The Whitman & Barnes Manufacturing Company

ESTABLISHED 64 YEARS

ST. CATHARINES, ONT.



For Turning, Facing and Milling the thread on Gas Check Plugs for 6-inch High Explosive Shells.

THE BANFIELD PLUG MILLER

Patented in Canada and United States

THIS machine is especially designed for finishing base plugs, turning the outside diameter, finishing the face with any camber desired, and milling the thread, all in one chucking, the complete plug being finished in six minutes by unskilled labor.

The machine is equipped with quick draw-in collet. Drive pulley 18" x 6", with bronze bush having cut jaw clutch for turning and facing. Worm gear 100 to 1 ratio, with cut jaw clutch for milling, driven by 10" x 1½" flanged pulley. The milling cutter is driven by an 8" x 2½" flanged pulley. Tool post carriage is equipped with power feed (two speeds) having automatic stop. Power feed pump with relief valve driven from worm shaft (all drives direct from main line shaft). Rigidly built, simple and economical to operate.

Weight 1,800 lbs.

For 18 pdr., 4.5 and 60 pdr. High Explosive Shells. Can furnish machines of same type, but somewhat lighter in construction. Particulars on request. These machines are tooled up for finishing plain machined or bevelled plugs, if desired.

Write for prices and deliveries.

Prompt Shipment

BUILT EXCLUSIVELY BY

Edwin J. Banfield

STAIR BUILDING, TORONTO, ONT.

KEMPSMITH

UNIVERSAL MILLING MACHINES

Every Kempsmith Milling Machine of whatever size, is provided with a slotted spindle nose for positive drive of arbor and for positive drive of face milling cutter in either direction.

Every machine is equipped with our patented keyed overhanging arm which insures positive alignment of arbor and boring bar and also prevents the cutter being pounded out of line under cut.

Kempsmith machines are heavy, with weight well distributed and their accuracy is guaranteed within very close limits.

Send for Illustrated Catalogue.

Kempsmith Manufacturing Co.
MILWAUKEE, WIS., U.S.A.

AGENTS:
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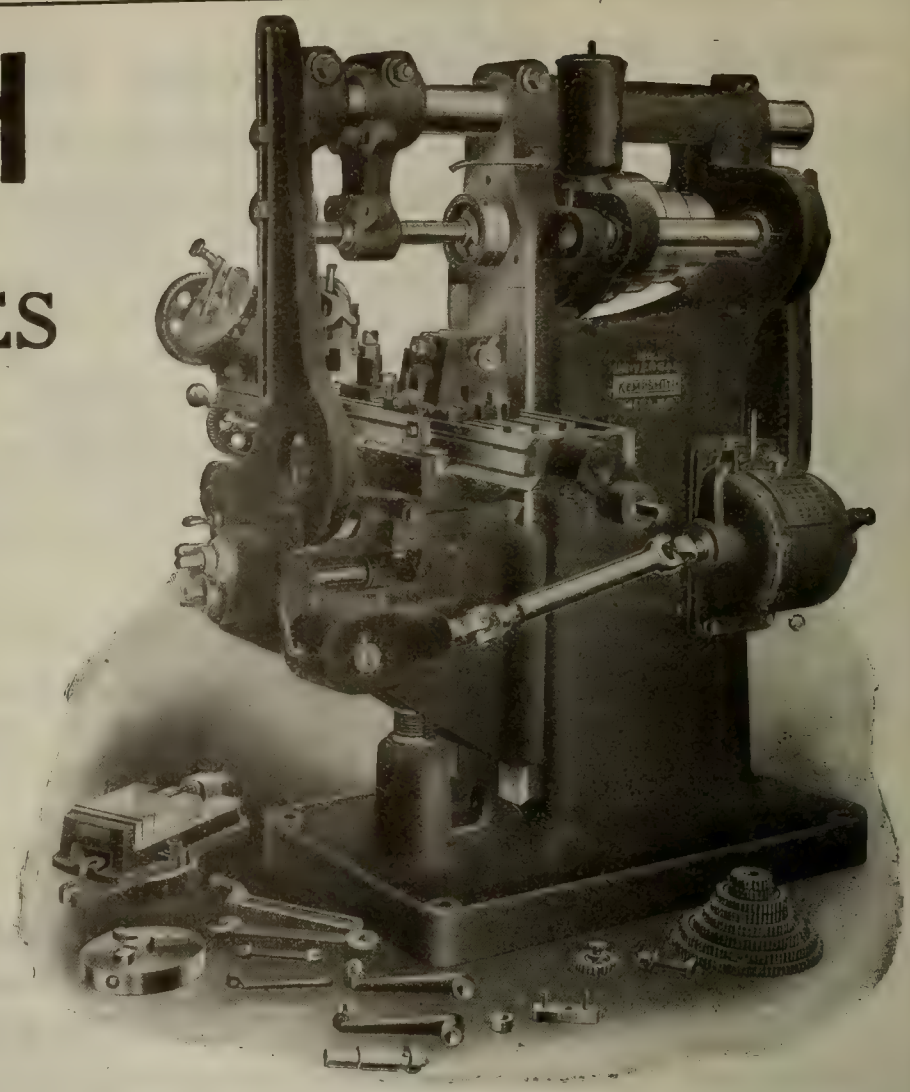
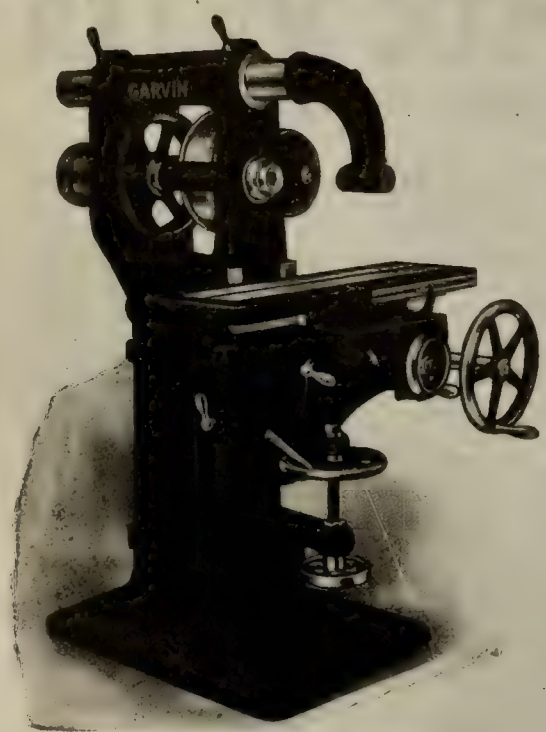
General Supply Company, Toronto and Ottawa.
Canadian Western Foundry & Supply Co., Calgary, Alta.



GARVIN No. 21 Plain Miller

Back Geared



No. 21 B.G. PLAIN MILLING MACHINE
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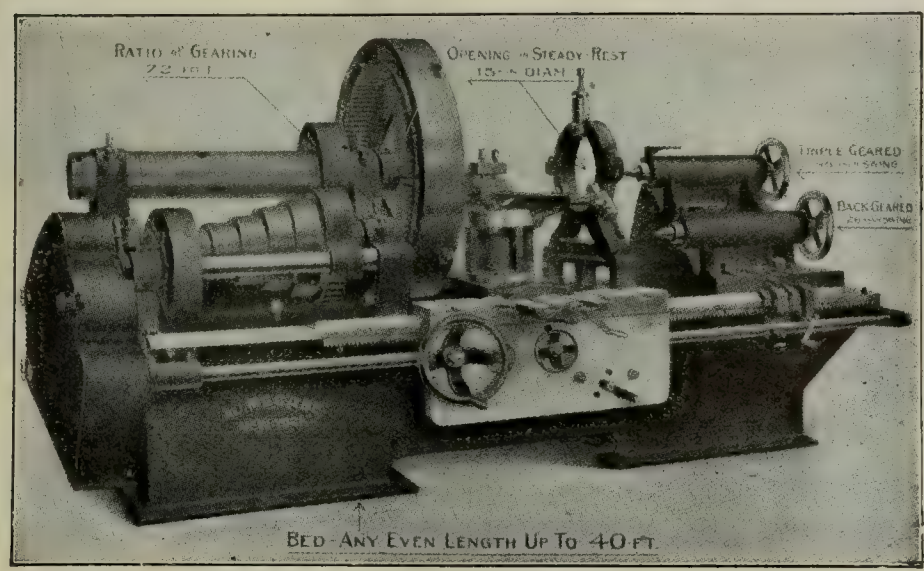

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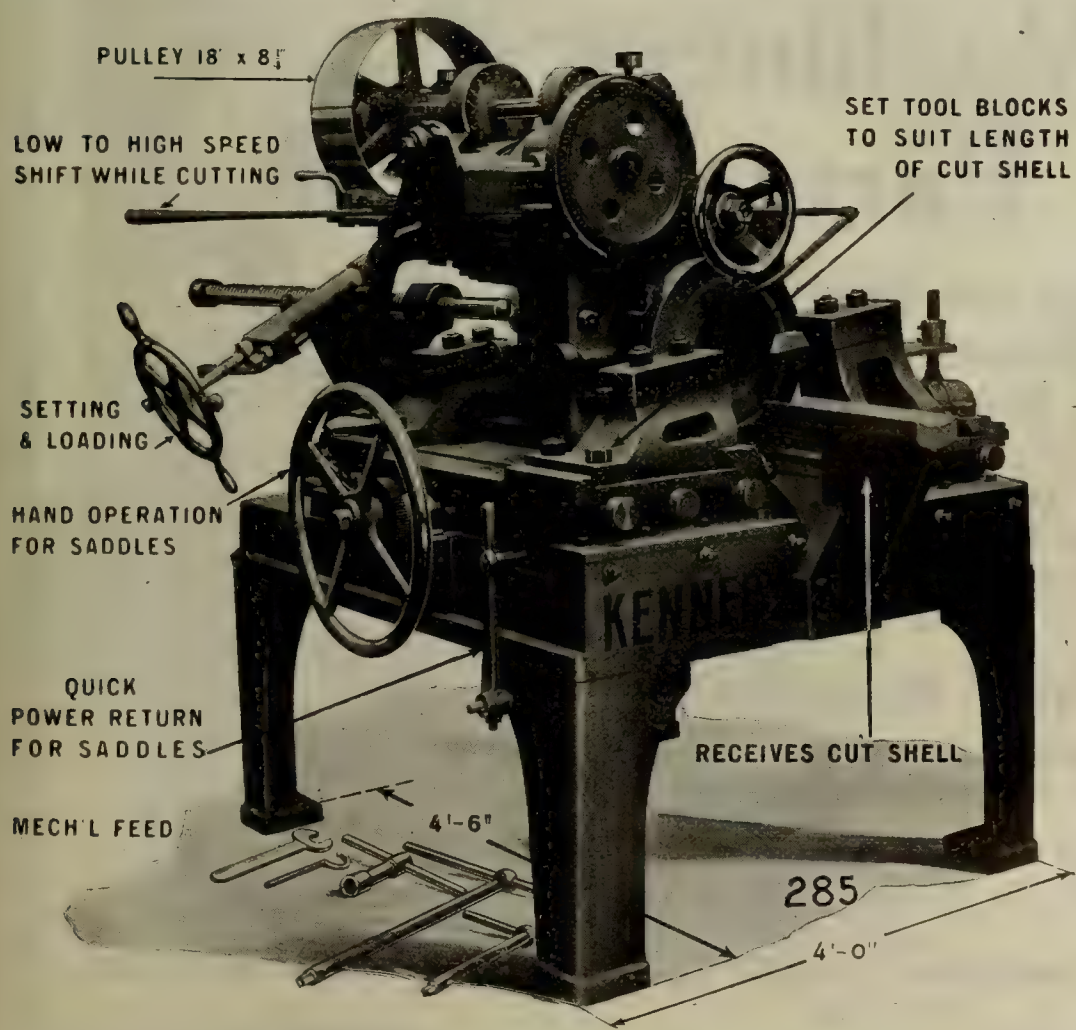

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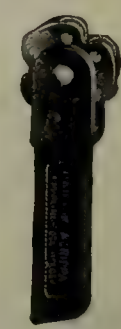

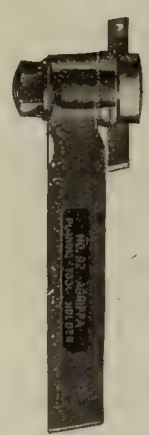

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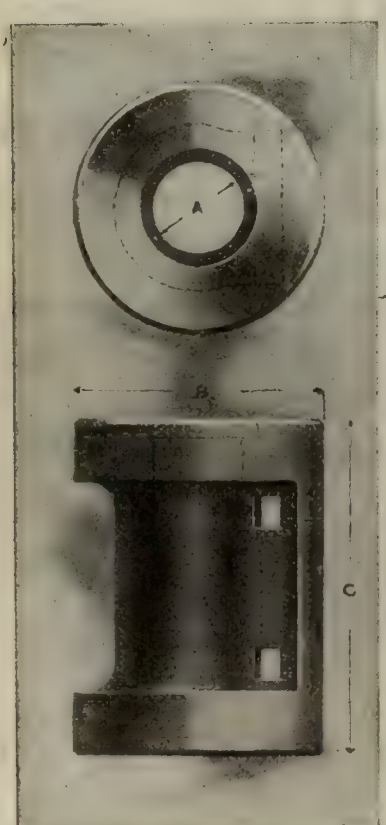

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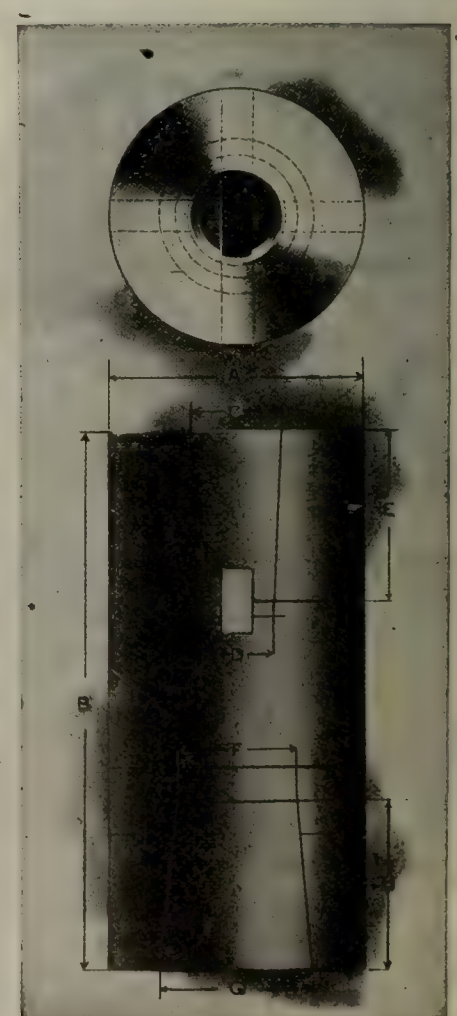

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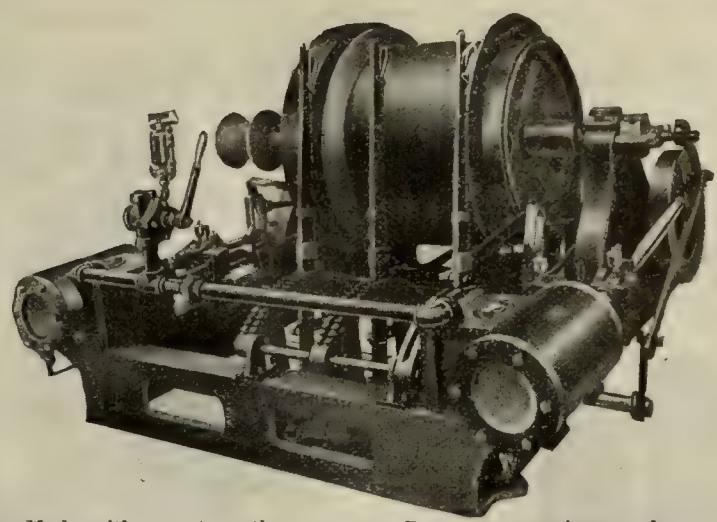

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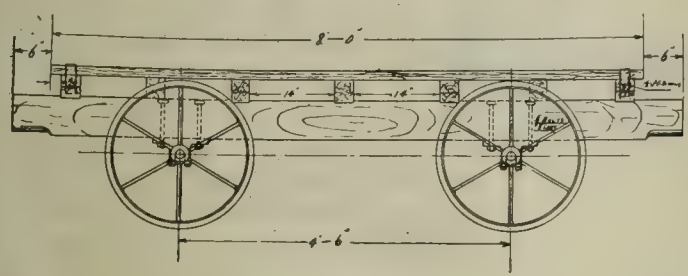

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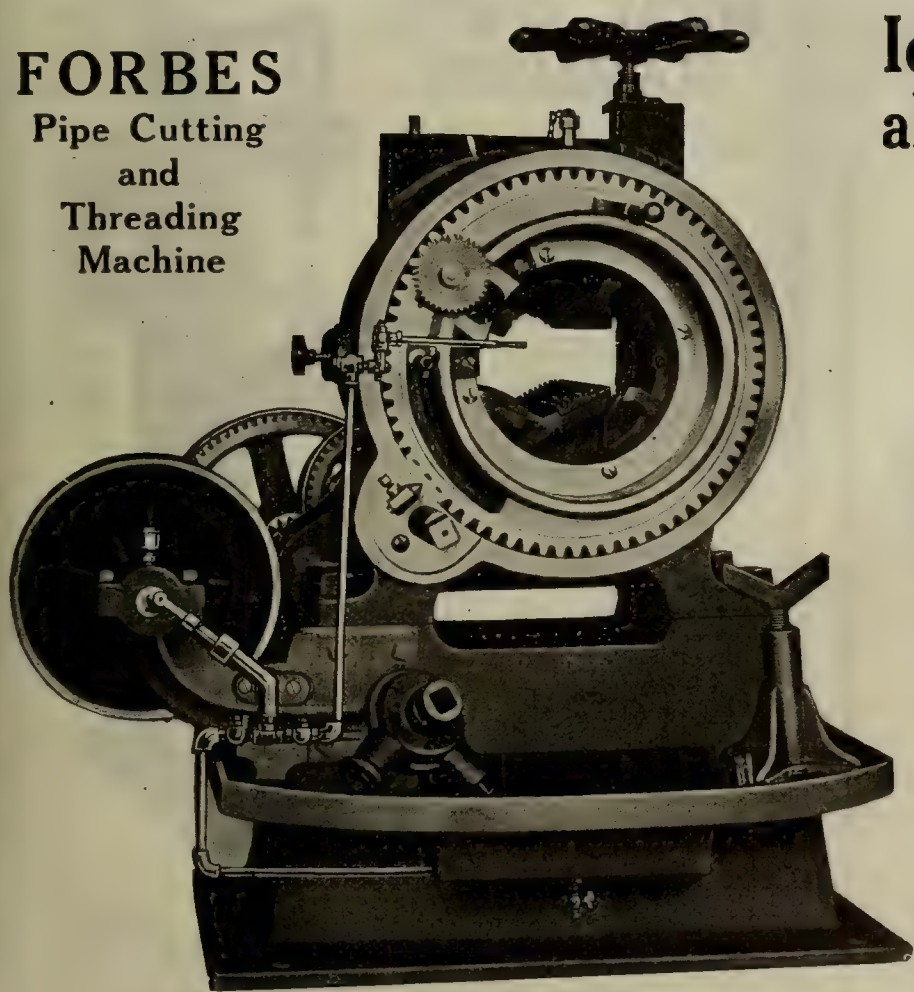

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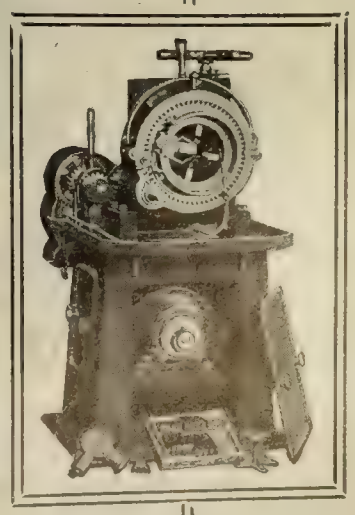

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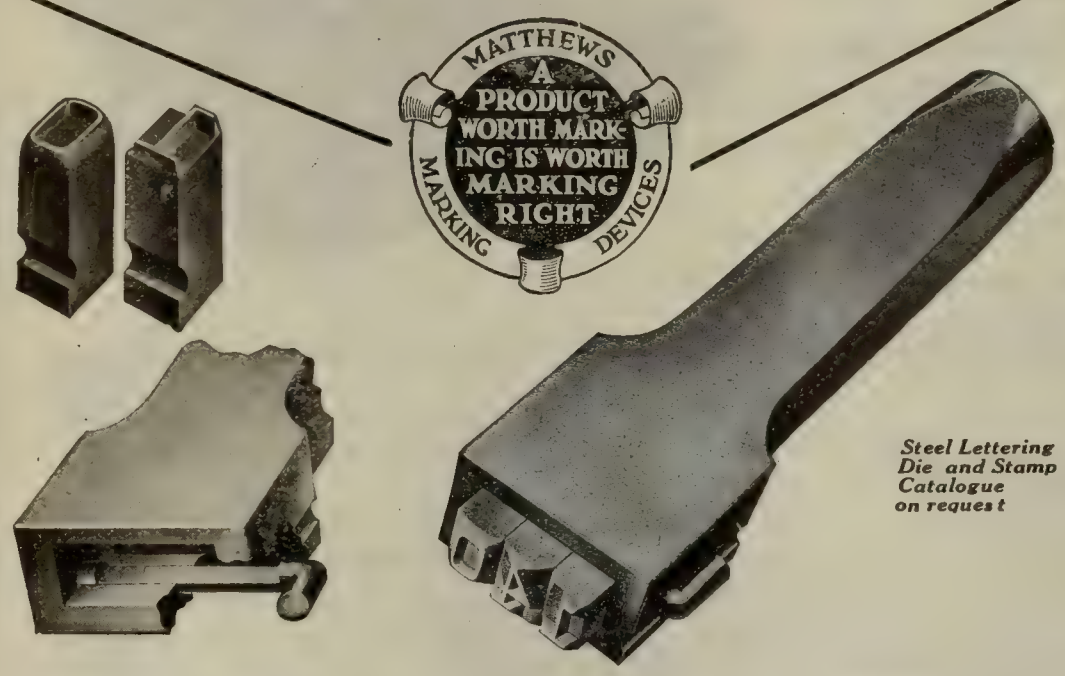

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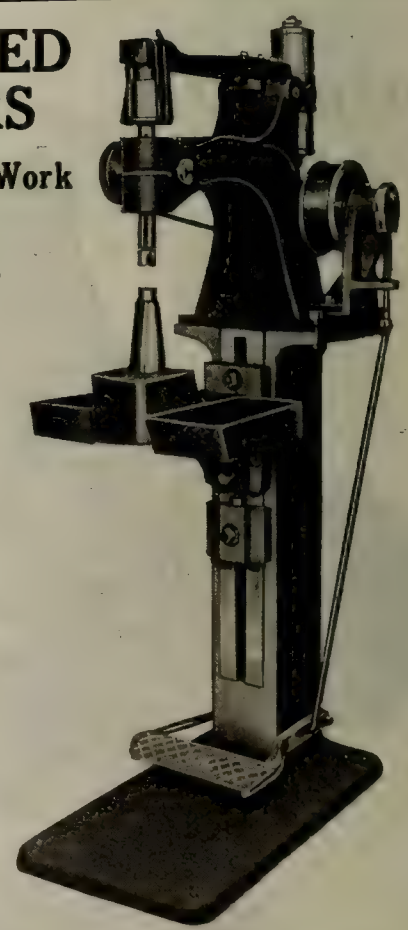

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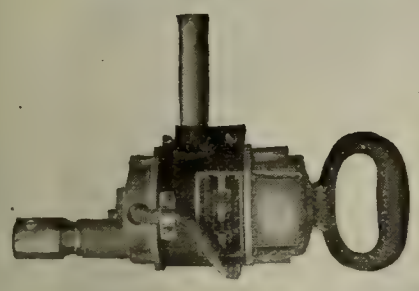

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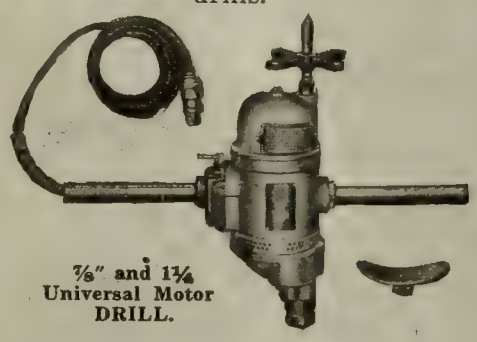

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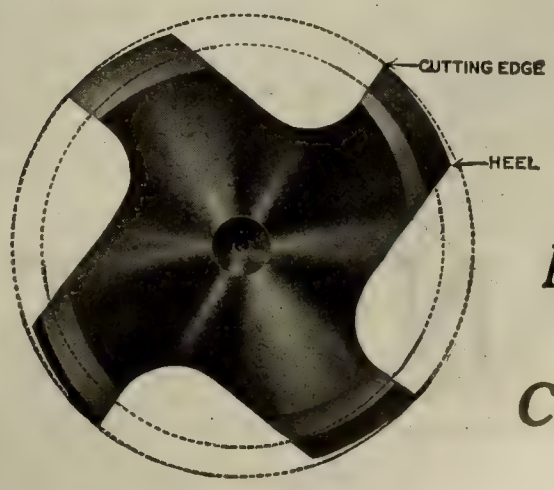

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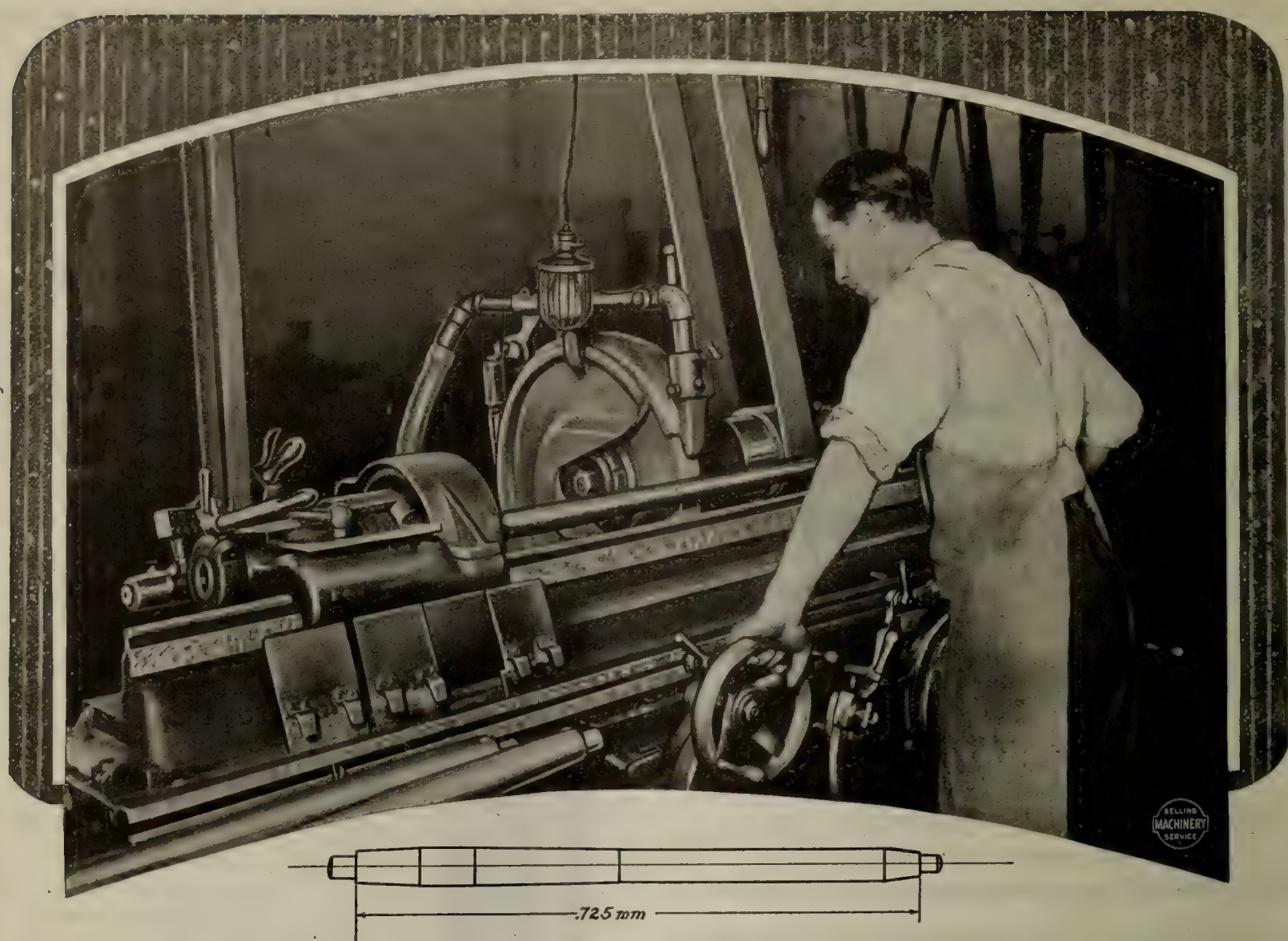

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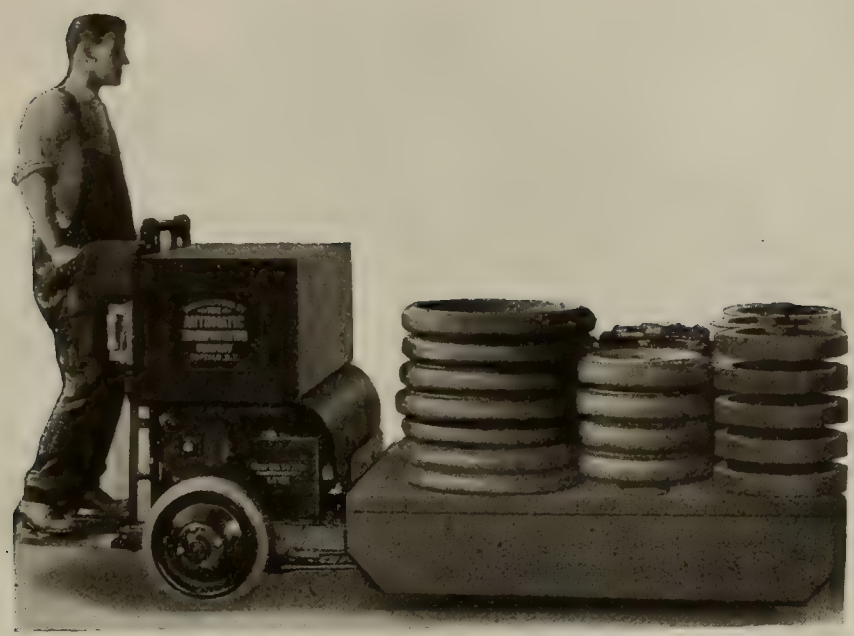

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Fuel Economy Possibilities in Brass Melting Furnaces*

By L. C. Harvey

Developments in the production of ships' fittings and similar equipment have resulted in greatly increased use of brass in various forms. Despite the urgency of the demand, the cost of production warrants close attention to all opportunities for economy, and the experiences of the author are thereby of more than passing interest at this time.

FUEL economy is a very engrossing proposition, and one in regard to which it is to be hoped that the future will furnish ideas and methods that will make past efforts in this direction appear very primitive and inefficacious.

Let us consider, first of all, the amount of coal mined in the world for one year, and the possible extent of the wastage of that year's supply of coal. For 1910 the amount was about 1,300,000,000 tons, and it is improbable that anything like 5 per cent. of this fuel was ever turned into actual useful work. This means that 1,235,000,000 tons of coal were mined only to be wasted in heat radiation and other losses; this represents enough fuel to melt and superheat 2,500,000,000 tons of brass to 10 per cent. above its melting temperature.

Until petroleum becomes available in bountiful quantities, and its price in consequence is brought down to reasonable limits, the only fuel to consider is coal. Now coal should be used as mined, in the furnaces direct, or in gas-producers adjacent to the furnaces. The process of coking the coal is only a means to obtain a clean, smokeless fuel, of intense heat value, at the expense of considerable wastage during this costly process of coke manufacture.

Scope of Paper.

This paper has been written in the hope of encouraging progress in the direction of economy in fuel. It relates only in a very superficial degree to the quantities of fuel used in the melting of brass, but it is hoped that the points brought out will be accepted as of such national importance—apart from individual interest—that close investigation will be made generally into fuel consumptions in brass foundries.

Considerable quantities of copper, brass and bronze used for gun-mountings, heavy plate, stern tube liners, propellers and other products are melted in reverberatory furnaces, chiefly for the reason that very heavy castings are required; but these furnaces consume several times the amount of fuel that would be used to melt the same amount of metal in crucible furnaces. Reverberatory furnaces are, therefore, greater fuel wasters even than crucible furnaces, which are themselves extremely inefficient. It is not an uncommon occurrence for a reverberatory furnace to burn twice as much fuel per ton of metal melted as the quantity that would be used in the usual types of crucible pit furnaces, and six times the amount of fuel required for tilting furnaces.

The amount of metal melted and the weight of fuel used in these reverberatory furnaces have not, however, been taken into account in this paper, so that the estimates I mention refer only to crucible melting plants. It is quite impossible for anyone to give exact figures for tonnage output of metals melted in crucibles under the present conditions without full access to Government and trade statistics, but it can be definitely accepted that whereas the assumed figure for the quantity of brass melted in this country during 1916 is one that probably falls a good way short of the real collective output of the brass foundry trade, the deductions arrived at in regard to fuel used are under-estimations.

I have been closely associated with melting and casting-shop practice for many years, and on behalf of the Morgan Crucible Company have been privileged to design the crucible melting plants supplied to most of the large Government and private undertakings which have been instrumental in producing the enormous quantities of metal—notably brass for fuse rod and cartridge strip—that have been required by the Government during the past three years. In order to keep a clear issue under consideration, the calculations given in this paper refer only to the melting of this class of metal.

Low Efficiency of Present Practice

Though much thought and ingenuity have been expended during recent years upon the equipment of coal-consuming plants with more efficient types of boilers, fuel economizers, mechanical stokers, feed-water heaters, etc., with one ultimate end—the saving of fuel—in the brass foundry, it is still the general practice to melt metals in small uneconomical coke-fired crucible furnaces of the pit type, having heat efficiencies of only 2 per cent. to 6 per cent. This is the range of efficiency for the general type of coke-fired natural draught crucible brass-melting furnace, and unfortunately more often than not it falls to the lower figure.

Assuming, for sake of argument, that the output of brass for the above-mentioned purpose during the war rose to 2,000,000 tons in 1916 for Great Britain alone, the amount of coke required to melt this quantity of metal in small pit furnaces of 5 per cent. heat efficiency would have been 800,000 tons.

This presupposes that the coke has a calorific value of 12,960 British thermal units per pound, and that 261 British thermal units are required to melt brass of, say, 70:30 mixture and to superheat the alloy to 10 per cent. above its melting point.

In other words, the total amount of heat imparted to the metal would be 1,169,280,000,000 British thermal units, representing 41,714 tons of coke, which means that the balance of 758,286 tons of coke would be wasted in radiation and flue losses. This amount of useless fuel at 35s. per ton would cost £1,327,000, and the total amount of 800,000 tons £1,400,000.

The relatively large capacity crucible tilting furnace had fortunately been developed during the ten years previous to the outbreak of war, and very large plants of this type were immediately put down. So far was this the case that, taking into consideration the tilting furnaces existing prior to August, 1914, together with the new plants put down especially for war work, it can be accepted that of the quantity of brass mentioned —2,000,000 tons for 1916—one-third of this total was melted in tilting furnaces.

Now the average all-round working heat efficiency of the coke-fired crucible tilting furnace on 70:30 brass is about 15 per cent.

If, therefore, the whole of this assumed 2,000,000 tons of metal had been melted in tilting furnaces, the amount of fuel used would have been reduced to one-third, say, 266,666 tons of coke, of which the heat value of 41,714 tons would have been imparted to the metal and that of 224,952 tons of coke wasted in furnace and flue losses. In money this would mean £393,666 spent on useless fuel in tilting furnaces as against £1,327,000 in pit furnaces. Assuming that 2,000,000 tons of brass were cast in 1916, of which one-third was melted in tilting furnaces, these plants were responsible for saving the nation approximately 178,000 tons of coke, having a total value of £311,500.

This, however, is not the whole story, for the coke used in melting furnaces has to be made from coal, in which process there is a further wastage. Gases and volatile constituents which could be utilized in the melting chambers of furnaces are lost in the coke ovens. That "metallurgical" or "foundry" coke is necessary for cupola work is undisputable; but this high-grade fuel for brass melting is not essential if systems can be modernized and improved so that coal can be used direct instead of having first to convert it into coke.

This can be done in two ways, by the use of—

*A paper read before the Institute of Metals, London, September, 1917.

(a) Powdered coal, which is the most efficient way of using solid fuels.

(b) Unscrubbed producer gas, a compromise, but still a more or less direct application of solid fuel.

The first system is the ideal one, resulting in no loss of heat prior to burning in the furnace.

The second method is a convenient one where large plants are concerned, but it is not so readily applicable to the small foundry, and in any case there are producer losses which are absent in the first system. These losses, however, probably counterbalance the energy required to grind coal to the powdered state.

Powdered coal can be applied and burnt as readily as liquid fuel or gas, and it has many of the important advantages of these fuels in so far as running costs for crucibles, linings, labor, etc., are concerned. It is well known that these costs are much below those for coke-fired furnaces.

Referring again to the figures mentioned above, we will consider what this means in quantities and cost of coal, if used direct in powdered form.

For the 2,000,000 tons of brass, if melted in pit furnaces, 800,000 tons of "metallurgical" or "foundry" coke were required. In terms of coal this would mean about 1,143,000 tons of coal. On the other hand, if crucible tilting furnaces had been used entirely the overall amount of coal burnt as powdered coal, leaving the efficiency of the furnace still at 15 per cent., would have been approximately the same as the figure given for coke, viz., 266,666 tons, or a saving of 733,334 tons of coal for 1916, if the powdered coal system had been available. A very small amount of this gross saving of fuel would have been used in supplying air under a slight pressure for burning the powdered coal.

This, again, is still allowing for a relatively low furnace efficiency of 15 per cent., but it is inconceivable that heat efficiencies of crucible melting furnaces cannot be raised to 30 per cent. and 40 per cent. by careful study and application of improved methods of combustion and utilization of the heat carried off in the waste gases. Electric crucible furnaces have actual heat efficiencies of 50 per cent. to 75 per cent., but this is exclusive of previous wastage in current generation and distribution. If the overall losses of steam and current generation, resistance losses in mains, etc., are taken into account, an efficiency of 50 per cent. in the electric-heated furnace drops down to about 10 per cent.

Use of Gas Fuel

During the past three or four years town gas has been very successfully employed in crucible melting furnaces from the standpoint of cleanliness, convenience, and especially life of crucibles, viewed from which this system has many important claims. But as a fuel economizer it has none. Let us briefly consider this question on similar lines to those followed in the case of coke furnaces.

TABLE II.—APROXIMATE RELATIVE HEAT VALUES AND FLAME TEMPERATURES OF FUELS

	Heat Value of Cold Gas or Fuel	Theor. Max. Flame Temp. Air at 0 deg. C.	Theor. Max. Flame Temp. Air at 300 deg. C.
Coke pro. gas (B.T.U.)	(143 gross (136 net)	1,600	1,700
Dowson soft coal gas	(148 gross (139 net)	1,600	1,700
Mond soft coal gas....	(159 gross (145 net)	1,530	1,630
Wood producer gas....	(161 gross (153 net)	1,600	1,700
Riche wood retort gas.	(385 gross (349 net)	1,860	1,990
Anthracite produc. gas	(173 gross (161 net)	1,670	1,780
Water gas.....	(317 gross (294 net)	2,030	2,160
Town gas.....	(600 gross* (550 net*)	2,000	2,100
	B.T.U. per lb.		
Metallurgical coke.....	12,960	2,090	2,250
Bituminous coal.....	14,000	1,990	2,160
Petroleum (water-free)	19,700	2,160	2,310

* Maximum values (pre-war).

The overall working efficiency of small gas-fired pit-type crucible furnaces is approximately the same as for the larger tilting type, and can be taken at 15 per cent. Assuming the calorific value of town gas to be 550 British thermal units per cubic foot, then 2,126,000,000 cub. ft. of gas would be required to melt and superheat the 2,000,000 tons of brass. In pit furnaces and tilting furnaces the total amount of gas burnt for this quantity of brass would have been 14,336,000,000 cub. ft.

In terms of coal, assuming 1 ton to yield 12,000 cub. ft. of gas, this would mean approximately for either the pit furnace or tilting furnace 177,166 tons used for useful purpose and for the production of 106,000 tons of gas coke, and 1,194,666 tons of coal wasted in heat radiation and flue losses, and production of 717,000 tons of gas coke. It will therefore be seen that, apart from leakage in the gas mains, which may be considerable, pit furnaces and tilting furnaces take a maximum quantity of 1,371,832 tons of coal as gas: 1,143,000 tons of new coal as coke (800,000 tons of coke), at a value of, say, £1,143,000 (taking coal at £1 per ton); or £1,400,000 as coke (at 35s. per ton).

On the other hand, tilting furnaces would take 380,951 tons of new coal as coke (266,666 tons of coke), at a value of £380,951, as against 1,371,832 tons of coal for making gas (60 per cent. gas-coke production would equal 823,300 tons of this by-product, which can be re-used in gas producers).

These costs, however, bear a more striking significance if they are considered in relation to the usual charge for gas at prices charged for town supply. Say this is 2s. per 1,000 cub. ft., then the cost alone for melting the 2,000,000 tons of brass would be £1,433.600.

The suggestion therefore arises that gas, if used, must be produced upon the site, and this brings us to the second proposition already mentioned—producer

TABLE I.—RELATIVE QUANTITIES OF COAL USED IN VARIOUS TYPES OF CRUCIBLE FURNACES.

Type of Furnace.	Pit Furnace	Tilting Furnace	Tilting Furnace	Single Crucible Pit Furnace or Tilting Furnace		Multiple Crucible Pit Furnace, or Single Crucible Tilting Furnace	Pit Furnace	Tilting Furnace
Fuel	Coke	Coke	Powdered coal	Town gas		Producer gas	Oil	Oil
Heat efficiency	5%	15%	15%	15%		10%	5%	14%
Tons, or cubic feet of fuel used for an output of 2,000,000 tons of brass....	800,000	266,666	.....	14,336,000,000 cu. ft.		.....	530,000	200,000
British thermal units value per pound or cubic foot.	12,960	12,960	12,960	550		135	19,700	19,700
Tons, or cubic feet of fuel used to useful purpose (net)	41,714	41,714	41,714	2,126,000,000 cu. ft.		8,661,000,000 cu. ft.	26,497	26,497
Tons, or cubic feet wasted in losses (net)	758,286	224,952	224,952	12,210,000,000 cu. ft.		89,600,000,000 cu. ft.	503,503	175,303
Coal Values (Coke and Gas in Terms of Coal.)								
Tons of coal used.....gross	1,143,000	380,951	266,666	†1,371,832	‡548,734	733,267	§805,633	§304,012
Tons of coal usefully employed* .....gross	60,735	60,735	41,714	†177,166	‡70,867	70,960	.....	.....
Tons of coal wasted.....	1,083,265	320,216	224,952	†1,194,666	‡477,867	662,307	.....	.....
Ratio of net coal or oil utilized to useful purpose to gross fuel mined	1 to 27	1 to 9	1 to 6	†1 to 32	‡1 to 13	1 to 12	1 to 19	1 to 7
+Saving over coke fuel pit furnaces in terms of coal used to melt and superheat 2,000,000 tons of ordinary brass	.....	+702,049	+876,334	—†228,832	+‡594,266	+409,733	.....	.....

*Allowing for losses in production of coke, etc. †Inclusive coke produced. ‡Exclusive coke produced.
§Heat equivalent value of oil in terms of coal.

NOTE.—Figures given above for "gross" tons of coal used in the case of "town gas" include the by-products gas-coke, coal-tar, etc., the commercial value of which would be deducted before arriving at a final efficiency figure for this system of heat development and application.

gas. Producer gas cannot be economically generated for very small plants, but for the larger capacity melting furnaces, even when only one or two units are installed, the producer-gas system presents a very convenient arrangement; and I believe a simple and efficient producer for small melting plants will shortly appear upon the market. Assuming for sake of argument that producer gas had been used for melting the 2,000,000 tons of brass, the following figures show the approximate costs of this system.

Brass can be melted with a consumption of about 20 cub. ft. of 135 British thermal units gas per pound of brass in tilting furnaces, and with about the same consumption in multiple crucible pit furnaces (it is no use considering single crucible pit furnaces for low-power gas). For this producer gas 1 lb. of coal will yield, say, 60 cub. ft. of gas, so that the tonnage of coal required for pit and tilting furnaces would be about 666,607 tons, costing £666,607 for fuel alone to melt and superheat the brass, and 10 per cent. at least can be added for losses in the producer, which brings the coal consumption and value to 733,267 tons and £733,267. Thus we have a virtual saving of, roughly, 40 per cent. in quantity of coal, and 50 per cent. in cost of fuel when gas is made in producers instead of taken from the town mains.

Fuel Oil Applications

Fuel oil would have been very generally taken up had it been possible in past years to rely upon constant supply at a reasonable price; but it is fortunate for the nation that these doubtful factors prevented the wide adoption of this fuel. Shortage and ultimate discontinuance of supply would have been disastrous.

Up to some few years ago compressed air or steam had to be employed for efficiently pulverizing the relatively small quantities of oil for crucible furnaces. Compressed air is in every way preferable to steam as a means of pulverizing liquid fuel to be burnt in contact with plumbago crucibles, and it is especially so for high heat generation, but considerable power is necessary to drive the air compressor.

Some years ago I designed a low-pressure air-blast burner, which has now been fitted to some hundreds of crucible furnaces, and this gives just as satisfactory results as does the high-pressure system; yet this is not the ideal method, and it is hoped that it will not be long before a more efficient system of burning oil with natural-draught burners replaces all the old methods which employ compressed air, steam or forced draught.

It may therefore be interesting to complete this survey of fuel costs by the inclusion of those for fuel oil, but a figure bearing some relation to the prices taken for coal and coke must be assumed. Fuel oil has been quoted recently at 160s. per ton, but in order to bear some relation to coal and coke at the prices taken, the cost of oil must be reduced to, say, 80s. per ton.

The heat efficiencies of single crucible pit furnaces and tilting furnaces are, roughly, 5 per cent. and 14 per cent. respectively. Taking the calorific value of fuel oil at 19,700 British thermal units per pound, pit furnaces will require 530,000 tons at a cost of £2,120,000, and tilting furnaces 200,000 tons at a cost of

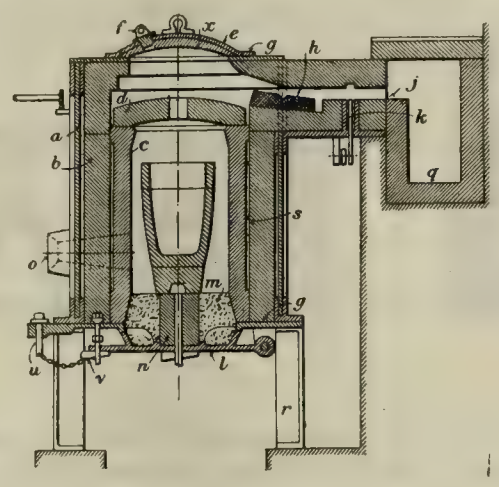


FIG. 1. SECTIONAL ELEVATION OF SUGGESTED FURNACE.

£800,000. Leaving out of account the small home production of fuel oil this large quantity of oil would have to be brought from abroad, and if used in pit furnaces 503,503 tons, and in tilting furnaces 175,503 tons of the fuel would be shipped to this country only to be converted into heat to be dissipated in radiation and flue losses.

I have confined my figures to the melting of brass alone, and they do not include the fuel used for melting the large quantities of malleable iron, certain steels, aluminum, special alloys, cupronickel, etc., that are melted in crucibles.

The furnace efficiencies given above are those for general all-round work. Actual test efficiencies would be somewhat higher.

Comparative Efficiencies

From a point of view of overall working heat efficiencies there is therefore not much to choose between crucible tilting furnaces for any class of fuel—coal, coke, oil, town gas, or producer gas—if the most economical size and type is taken for each fuel; but where pit furnaces are concerned there is a very marked difference, and those fired by means of town gas now hold the palm. For convenience of comparison the quantities of fuel and their costs, and also the heat efficiencies of furnaces for different kinds of fuel, are given in Table I. (above). Table II. (above) shows the approximate heat values of different fuels.

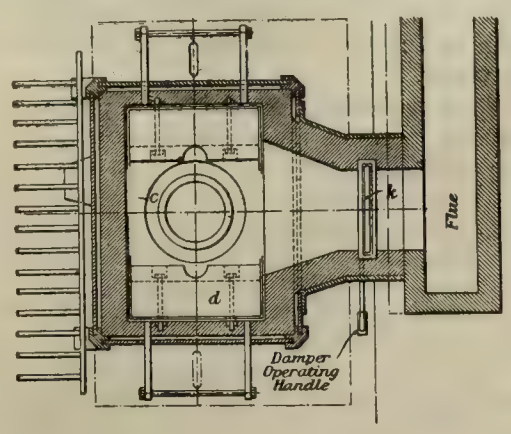
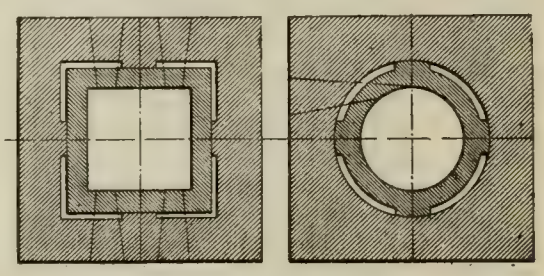


FIG. 2. PLAN OF SUGGESTED FURNACE.

The reason why tilting furnaces have so much higher heat efficiencies than pit furnaces is in a measure due to the elimination of many of the absurdities of the pit type, but chiefly is it due to the higher grade and quicker-heating crucibles used in the former when taken in conjunction with the larger capacities of the crucibles. For output and cost of melting it is undisputed that the tilting furnace plant is a long way ahead of pit furnaces, but on the question of quality of alloy made the tilting furnace has not definitely proved that it possesses this feature. Experts seem still to maintain that the pit furnace taking smaller crucibles has not yet been superseded as far as quality of metal is concerned.

It is quite conceivable that this is so, and as the efficiency of the present-day pit furnace is so very low it becomes more than ever necessary to see whether the design cannot be improved. With this end in view I have suggested a furnace as illustrated in Figs. 1 and 2.

In this furnace it is intended that the lining shall be thick, in order to reduce the amount of heat radiation. An air insulating cavity is suggested between



FIGS. 3 AND 4. SHOWING AIR INSULATING CAVITY BETWEEN INNER AND OUTER LINING.

the inner and outer firebrick lining (Figs. 3 and 4), or this cavity can be packed with zirconia earth. The outside of the furnace to be fitted with expanded metal for lagging. The flue outlet to be central, and the flame issuing to be at any time visible to the operator. The secondary flue opening to the main flue to be controlled by means of a damper, and a preheating hearth to be arranged in this flue passage. The furnace to have an outside metal cover, so that all products of combustion and zinc smother will be drawn into the main flue. The bottom to be in the form of a hinged pan for collection of spilled metals and the space above filled with quartz nodules into which slag can soak below the level of useful fuel (in coke-fired furnaces) and away from the burner inlet of oil or gas-fired furnaces.

When it is essential to use small capacity crucibles a greater degree of economy can always be obtained in multiple crucible furnaces. Very useful types of gas-fired furnaces have recently been described—notably the Hermansen furnace and the Parsy furnace, both of which are on the self-contained producer principle.

A type of oil-fired multiple crucible furnace that I designed some years ago has given, I believe, very good results. The difficulty I had to contend with was

the absence of control of any one crucible in a multiple crucible furnace having one large melting chamber. Figs. 5 and 6 show a furnace which entirely gets over this difficulty.

It has a common melting chamber at the base of the crucibles, but the upper portion is divided off into separate compartments, each with its own flue outlet.

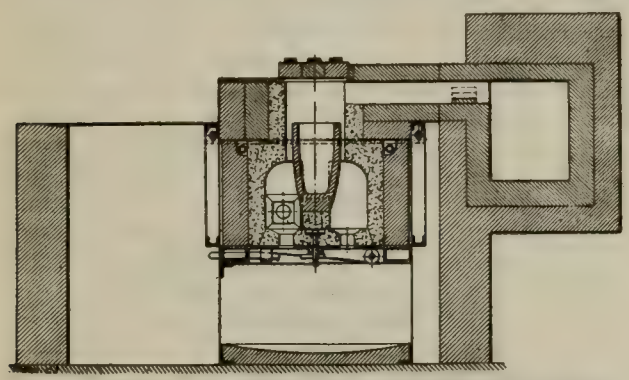


FIG. 5. SECTIONAL VIEW OF MULTIPLE CRUCIBLE FURNACE FOR OIL, GAS, OR POWDERED FUEL.

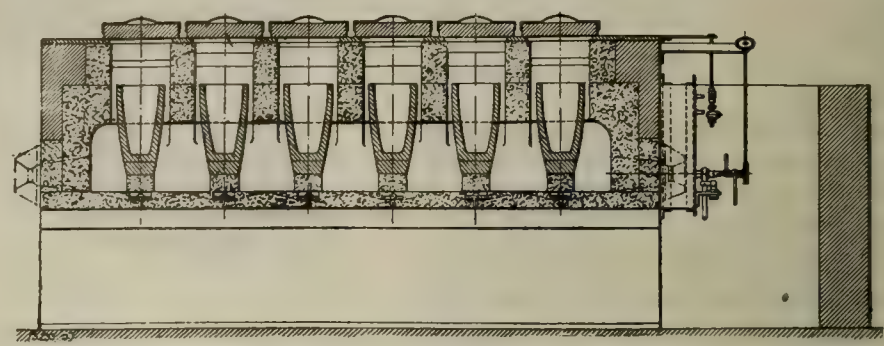


FIG. 6. SHOWING ARRANGEMENT OF CRUCIBLES IN FIG. 5 AND LOCATION OF FUEL BURNERS.

It is found that the removal of any one cover in no way affects the actual melting conditions in the other chambers. This design makes it possible to use two oil fuel burners for a six-crucible unit instead of six burners for separate furnaces. The working efficiency of this type of furnace is about 10 per cent., as compared with 5 per cent. in single crucible furnaces. There is a saving of 50 per cent. of fuel in favor of the multiple crucible furnace.

Waste Due To Poor Refractories

The relatively poor qualities of refractories used as linings are in a great measure responsible for ever-varying fuel consumptions.

When a furnace is newly lined it has the highest heat efficiency, but as the lining becomes worn or broken away the fuel consumption can well be double the amount used when the lining is new. In order to overcome this trouble to some extent in tilting furnaces, and so keep the fuel consumption at a more uniform level, I have suggested the special form of grate pan shown in Fig. 7. It is found that more or less liquid slag at the end of a heat moves to the front of a tilting

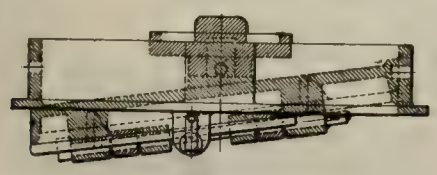


FIG. 7.

furnace as the metal is poured, becomes set round the front of the crucible and obstructs the passage of air at this point. The result is that the lining is cut away by the inrush of air and intense heat at the back and round the sides of the coke space, and the fuel space becomes greatly increased at these points. It is hoped that with the new form of bottom grate pan the slag will accumulate below the useful fuel line, thereby saving the life of the lining and reducing fuel consumption.

Radiation losses can be reduced to a certain extent by providing composite linings. It is well known that the most refractory materials, such as carborundum, are at the same time good conductors of heat. In the *Foundry Trade Journal* for July 12, 1912, certain facts bearing upon this were noted; for instance, a firebrick of moderately good quality, although relatively inferior as a refractory material, was shown to have radiated much less heat than the higher-grade refractories—silica, alundum, silicon carbide, magnesia—whereas the ordinary red building brick showed undoubtedly the best insulating properties. An inch of lagging on the outside of the furnace also reduced heat radiation losses by more than 50 per cent.

The greatest loss of heat in a melting furnace occurs in the waste gases, and it has been proposed that CO_2 recorders should be used as a guide to the state of combustion. This is more or less impracticable, owing to the number of furnaces often installed.

Suppose there are 50 pit fires connected to one main flue, it would then be necessary to fit a CO_2 recorder in each individual branch flue. An analysis of gas in the main collective flue would not indicate which furnace was working inefficiently. Besides, in coke-fired furnaces the constituents of waste gas vary momentarily, and when fresh fuel is added there is a high percentage of CO, which passes straight into the flue. Only when gas or oil-fired furnaces are used can the combustion be confined within economical limits. A visual flame issuing from the central furnace flue outlet then indicates the state of combustion with sufficient clearness for all practical purposes.

These suggestions are only put forward as possible means of improving the heat efficiencies of pit-fire furnaces for coke, oil or gas, but the real question remains still unsolved, viz., how to utilize the major portion of the heat contained in fuel. The satisfactory application of powdered coal certainly offers an alluring proposition.

In conclusion I would express my indebtedness to the Morgan Crucible Company, Limited, for permission to submit this paper to the Institute of Metals, and for the information which has enabled me to estimate the output of brass for 1916 within probable limits.

The paper has been written almost at the last minute; but if members consider that it is incomplete and inconclusive, I hope that it will serve as an incentive to others to continue this research, and at the next meeting perhaps there may be given a really valuable treatise upon this subject.

BRITAIN TO USE CANADIAN MATERIALS

AN announcement from London, England, states that the Executive Council of the Imperial Institute has constituted an Advisory Committee for Canada. This committee consists of Sir George Perley, K.C.M.G., High Commissioner for Canada, chairman; Sir Robert Kindersley, K.B.E., governor Hudson's Bay Company; J. G. Colmer, C.M.G., former secretary, High Commissioner's office in London; J. H. Plummer, Dominion Steel Corporation, and Sir Keith Price, of the Ministry of Munitions.

One of the most important matters on which action is being taken by the committee is that of the more extensive utilization of Canadian timbers in the United Kingdom. The Imperial Institute Advisory Committee on Timbers has been taking evidence on this subject. Arrangements have been made for a series of practical trials of selected British Columbia timbers to be carried out by H. M. Office of Works, with a view to the inclusion of these timbers in official specifications.

There will probably be a considerable demand by tanners in the Dominion for Indian cowhides (kips), which before the war were mostly taken by Germany and Austria. Small trial consignments of the kips have been supplied by the Hides Committee to Canadian tanners, and several firms have expressed a desire to see larger samples. The committee has sent a representative collection of Indian cowhides to Canada, and the Department of Trade and Commerce has undertaken to arrange for these to be exhibited at a number of convenient centres in the Dominion.

The outbreak of war caused a very large increase in the demand in the United Kingdom for special steels containing molybdenum and other comparatively rare metals. The British Government finally took control of the supplies of molybdenum ore and the Imperial Munitions Board at Ottawa was commissioned to purchase Canadian ore on their behalf. Considerable quantities of molybdenite ore are now being produced in Canada, largely through the special assistance given by the Canadian Department of Mines.

DEVELOPING FOREIGN MARKETS FOR BRITISH PRODUCTS

C. HAMILTON-WICKES, H.M. Trade Representative in Canada, in a recent address before the Engineers' Club of Manchester, discussed the question of how best to develop the manufacturing industry of Great Britain and distribute its product.

Emphasis was made on the importance to British manufacturers of developing a retail market for their product both at home and abroad, if they would meet the competition which would develop after the war.

In conclusion, the following constructive recommendations were advanced:—

(1) To take stock of present productions, their character and uses, the markets which consume them and why, and the channels whereby the consumers are supplied.

(2) To consider the necessity for the employment of efficiency and component engineers and efficient methods of "costing," the scrapping and replacing of out-of-date plant and equipment, with the possibilities of turning to commercial use machinery now employed in making munitions.

(3) The advisability of having on the board of direction the men responsible for running the works, and as well, those charged with the distribution of its products.

(4) To ascertain how far and in what direction advantage may be taken of the recently organized bank under Lord Faringdon, Mr. Dudley Docker, and others; to ascertain the extent and direction in which the information secured from the freshly consolidated departments for the Imperial Commercial Intelligence Service can be utilised.

(5) The organization of an Export Sales Department as distinct from the Home Sales Department; the training of commercial engineers.

(6) The consideration of the question of absolute merger or combination with other firms, or the cartel system, i.e., a merger limited in time.

POSTAL CENSUS OF MANUFACTURERS

THE postal census of the manufacturers of Canada, taken in 1916, for the calendar year 1915, just issued, shows a general expansion in the manufacturing business of the Dominion. The number of establishments in operation was 21,306, representing an invested capital of $1,994,103,272, employing 52,683 persons on salaries and 462,200 persons on wages, and producing goods to the value of $1,407,137,140 from raw materials valued at $802,135,862.

During the decade 1905-15 the number of establishments increased by approximately 34 per cent., capital 135 per cent., employees on salaries 44 per cent., employees on wages 29 per cent., salaries 96 per cent., wages 70 per cent., and the value of products 95 per cent.

The value of the products of factories in 1915 was $1,407,137,140, as compared with $718,352,603 in 1905, an increase of $688,537, while wages paid totalled $229,456,210, an increase of $95,080,285.

There were in Canada during the year covered by the statistics 65 establishments employing 500 hands, 25 employing over 1,000, nine employing over 2,000, five employing over 3,000, and three employing over 4,000. Of these three establishments two employed over 5,000 hands.

During the five-year period, 1910-1915, the capitalization of Canadian industrial enterprises increased by $746,520,663, or about 60 per cent.

SMOKELESS COMBUSTION PROBLEMS

THE results of recent investigation into the smokeless combustion of fuel in steam boiler furnaces were the subject of a communication by Osborne Monnett,

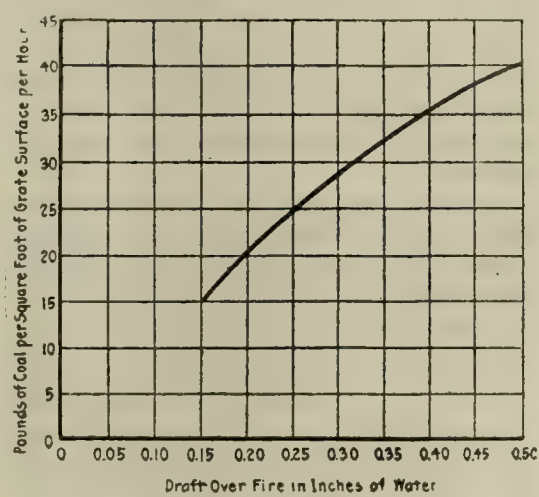


CHART SHOWING RELATION OF DRAFT TO FUEL CONSUMPTION.

formerly chief smoke inspector of Chicago, before the Engineers' Society of Western Pennsyvlania.

The investigation developed a rough rule that 0.1 in. of draft was necessary over the fire per pound of coal burned per square foot of grate surface per hour. The limiting rate for successful smokeless combustion for hand-fired furnaces is about 28 lb. of coal per square foot of grate surface per hour.

In studying the smoke problem in Chicago, it was found that a firebrick arch directly over the fire increased the amount of smoke due to the fact that there was not only the normal distillation of volatile matter, but also an artificial distillation due to the high temperature of the heat radiated from the arch over the fire. This secondary distillation results in dense smoke despite all efforts to prevent it. The removal of the arch from directly over the fire diminished the rate of distillation of volatile matter and eliminated the production of smoke.

GANISTER AND ITS USE

GANISTER is supplied in finely crushed or ground form and when properly used stands heat well, but, of course, under certain conditions it fuses and runs to slag, particularly where another material which acts as a flux is being used in the furnace. For cupola work rather a coarse form of ganister is used, especially where the whole of the furnace is rammed up with this material, but for brass and other crucible furnaces a finely powdered ground ganister should be used. In preparing any form of ganister for use it has to be damped down and trodden and kneaded into a putty-like mass; the tougher it is made the more durable it becomes in the presence of direct fire-heat. For patching and daubing up furnaces where the fire-brick is burnt away, about the best material to use is finely ground ganister of the quality selected for steel furnaces. In making repairs all clinker should be chipped off the bricks, and then a wash of good clay slurry applied. While this is still damp, the ganister, trodden and kneaded stiff like putty, should be put in and beaten smooth with a mallet or other suitable implement, as smooth a surface as possible being secured. This material, well put on, will stand for a considerable time, and as it is not specially costly can be used with freedom.

EFFECT OF OIL ON ROUGH WATER

By T. J.

WAVES in mid-ocean are caused entirely by the action of the wind. The adhesion between the rapidly moving particles of air which compose the wind and the surface particles of the water causes the water's surface to be dragged along with the air. Small ripples are immediately formed, and these soon overtake others near them. They unite, and, due to the friction between the water particles, each succeeding ripple piles up on the top of the previous ones. Just as soon as oil is spread on the water, however, the size of the waves is reduced like magic. The reason for this is interesting. Oil, unlike water, has very little internal friction between its particles. The ripples of oil formed by the wind, therefore, cannot pile upon each other to any considerable height; hence water waves cannot grow in an area of oil placed about a steamer. They begin to fall down instead. By the time these waves reach the boat they will have lost their formative ripples, and the result is a perfectly calm surface over the portion of the sea through which the boat is making its way.

IN co-operation with the Bureau of Mines, an investigation of the electric melting of brass is being conducted at Cornell University. The experiments indicate that the use of a suitable electric furnace will materially reduce melting losses and the Bureau of Mines now is testing an electric furnace built according to the design worked out by the laboratory tests. This furnace is of commercial size and is being tested with a view to ascertaining its suitability for such processes as are used for cartridge and shrapnel cases.

THE REASON WHY

By Chief Examiner.

SHELL makers, especially makers of high explosive shells, be they bosses or operators, often feel opposed to the restrictions placed upon them by the Government inspector. They chafe against what they think is red tape, faddism, finnickiness, or snobbishness and autocracy. In many instances it would be much better if an inspector would give his reasons, instead of simply demanding a thing to be done. The trouble is, however, that if he did so an argument would surely arise and time would be wasted. Here are a few of the "reasons why" a high explosive shell must be made correctly.

Let me first mention the "bore"—one of the principle "bones of contention." The bore must be perfectly smooth. When the high explosive, T.N.T., lyddite, or whatever else is used—is first put into the shell, it is in a liquid or semi-liquid state, about the consistency of thin porridge.

It is then stirred slowly; sometimes a highly-polished steel rod is used, and in other cases a glass rod. As it is stirred, it slowly hardens, and just before it "sets" the "form" for the "exploder container" is inserted. To explain the extreme danger of this stirring operation, it may be mentioned that a few years ago a piece of grit got between the explosive as it was "setting" and the steel rod and ——, one of the buildings at Woolwich Arsenal and 27 men were annihilated. The annihilation was so complete that a button and an ankle inside a boot were all that was found of the men. The boot was discovered more than half a mile away.

Internal Happenings

When the shell is fired it receives a blow behind it of something over two hundred tons. It immediately begins to revolve at the rate of 3,000 revolutions per minute. Remember it attains this speed not slowly but instantaneously, and leaves the muzzle of the gun with a velocity of approximately 2,600 feet per second. These figures are for a 4.5 in. shell. The larger ones, of course, require a heavier blow and do not travel quite as fast, the difference, however, being slight. Now imagine for a moment what would happen if the bore had any roughness in it—you might just as well hold a match to an emery wheel, because when the blow is delivered the hardened explosive separates from the sides or wall of the shell and forms a core. The steel being heavier and more solid than the explosive, attains the high speed before the core.

To ensure, or make doubly sure, that the bore is smooth, it is varnished, and the varnish must be a perfect coat without any overlapping, ridges, or lumps of hard varnish sticking to it. This varnishing has other purposes, one being to prevent the explosive from touching the steel. Not even the minutest pin hole in the varnish is allowed to pass. When the two opposing elements, explosive and steel, touch each other, "Picric," the most explosive of all, is at once generated in the form of a gas or acid. The shell loaded might be laid aside for storage, and this picric might form, owing to imperfect varnishing, and go on forming, till the shell, receiving a slight jar, would "go off" and quite possibly set off every loaded shell in its vicinity. The varnish must be perfect in every way. For this reason, air-drying varnish has been done away with, and only baking is allowed to be used. There are hundreds of shells lying buried under the sod in Flanders unexploded, some of which are almost sure to have faulty varnish. Some day a heavy wagon may rumble over one of them, or a plow share strike another. If it does—then goodbye the outfit.

Base Defects

There are often grumbles and grouches because the inspector requires that tool cuts and "pit marks" in the bottom of the bore be removed. The explosive fills up the indentation, and when the blow comes and the shell begins to revolve, the portion of the explosive in the hollow breaks off from the rest, and—well rub one match against another and see what happens.

Another bad fault in the bottom of the bore is little black holes, which may or may not be "piping." It is absolutely necessary that all traces of such be removed. Piping in the base is almost sure to cause a premature explosion of the shell because of the weakness it leaves.

A very interesting point about a high explosive shell—or any other shell where the walls are of a uniform thickness—is the "set up" and "set down." The steel has a certain tensile strength, and this must conform to the limits set by the inspection department of the Imperial Ministry of Munitions. When the blow hits the shell behind, the back half tends to overtake the front half, with the actual momentary result that the walls bulge outwards and at once return to the original form—if the tensile strength of the steel is correct. If it is not correct, the walls will not return, the shell will jamb in the gun, and in all probability the gun will burst. If it does not burst, it will be lifted sheer back on the top of its own men.

The same result will happen if there are any flaws, seams, or ghost lines in the steel. It is, therefore, most important that the visual examination, both internal and external, be minute and exhaustive.

A Band Performance

The driving band, too, is of the utmost importance, because it is due to this being gripped by the rifling in the bore of the gun that the rotary motion is given to the shell. The band must be absolutely down in its groove and pressed right home in the undercuts and on the wave ribs. If the band were to slip or tear the shell would not go through the air in a straight, swift manner, but would "wobble" and might hit the ground anywhere but the point it was intended for.

A friend of the writer was at the front in the earlier days at Ypres and relates how a shell with an imperfect band had fallen "short" into our own lines. Half the band had been torn out of its groove, and this portion caught one of his comrades and sheared the flesh off his leg from the knee upwards. He told how all the boys around cursed the inspector who had passed that shell.

The threads in the nose must be right, because if the diameter be too large the fuse will be loose when screwed in, and if the threads of the fuse do not engage the nose threads of the shell, the former will simply blow out and the shell will not explode perfectly, thereby failing to do its duty. If, on the other hand, the diameter is too small, the fuse will not screw home, and that is also a source of great danger.

One must remember that on the field of battle there is not time to repair those things. It is often a matter of life and death to hundreds of our brave boys to have things working right, and they have but one thought—to get the shell into the gun and on its way to protect them. When one stops to think a moment of the awful seriousness of making a shell properly, one begins to realize what criminals those men are who try to get bad work past the inspectors.

Not to be Mentioned

The writer could tell of fearful things that have been attempted, simply in order to ring in the dollars and cents—but that would not do, because those who are innocent and free from the bad thoughts and actions which some have yielded to would perhaps learn too much. The least said the soonest mended in that respect. For the sake of our boys at the front, let me implore all those who are making shells to forget their silly ideas about "red tape" and make their shells properly; cheerfully yield to the wishes of the inspector on the job, and try to help him instead of hindering him and making life miserable for him. They will then make a good name for themselves and gain the gratitude of those who are fortunate enough to return from the desolate plains and wasted ridges of Flanders.

RECENT experiments have shown that one coat of paint, properly applied, is a better preventative of rust on metal than are several coats. The "Bulletin de la Societe des Ingenieurs Civils de France" states that iron plates well cleaned and polished were coated, some with one coat and some with two, three or more coats of paint, and then exposed to the action of steam for a whole day, after which the paint was removed and the plates were examined. The first was as bright as it was before exposure to steam, the second showed a few rust spots, the third was still more attacked, and the fourth entirely so. This result is due to the fact that the deeper layers dry badly and tend to dissolve the uppermost coating, increasing its porosity to air and moisture. It is, therefore, advisable to cover the plates with one coating only of paint or varnish and completely to remove any old paint before doing so.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

THE MANUFACTURE OF HARDENED THREAD GAUGES—III*

By G. Doorakkers

THE tool for cutting external gauges, which is made out of the best cast steel obtainable, is shown in Fig. 18.

Tool for Cutting External Gauges

As previously mentioned, the tool is cut away 1/16 in. under centre, and in that section has to cut the correct shape of thread. The master tools have therefore to be set 1/16 in. under centre, which can be done by inserting a ⅛ in. mandril between the centres. To ensure the thread being upright the setting piece—Fig. 16—is used. The cutting edge of the tool must be horizontal, and is tested with a good small spirit level or with a straight edge. In the first case the bed of the lathe must be tested for horizontality.

The re-grinding of the master tool is done on an angle piece on the magnetic chuck of a surface grinder, and the tool is clamped against the flat, so that the new cutting edge lies in a plane which is perfectly parallel to the original cutting edge. The width of the threaded portion is turned to about four threads to make it convenient for measuring purposes, and is afterwards turned away to one full thread following the lead of the screw.

To enable the form tool to cut freely, the thread of the tool must be cut the opposite hand to the thread on the work, and the helix angle of both tool and work must be approximately the same. If the work is either larger or smaller than the tool the thread on the tool cannot be a continuous spiral, but every thread has to be cut separately, running out into the gap, and the pitch is obtained by using a micrometer stop.

Fig. 19 shows the tool laid out for operation. The four principal dimensions—see Fig. 18—are the outside diameter, the dimension over three wires A, and the depth of the thread, or rather the dimension from top to root, B. The calculations of these dimensions are as follows:—In Fig. 20:

M B = 1.000 in.

M E = .0625 in.

B E = $\sqrt{(1 - 1/16^2)}$ = .99804

B D = B + C in Fig. 1 = .16008 P + .64032 P = .8004 P.

D E = B E — B D = .99804 — .8004 P.

D M = $\sqrt{(D E^2 + 1/16^2)}$ = $\sqrt{[(.99804 - .8004 P)^2 + 1/16^2.]}$

A E = B E + .16008 P = 99804 + .16008 P.

A M = $\sqrt{(A E^2 + 1/16^2.)}$

F G = A M — D M. The angle a can be found from $\tan a = \frac{\frac{1}{2} P}{F G}$

The depth of the thread = H J; H J = M C = $\sqrt{(C E^2 + 1/16^2)}$ where C E = M B — M C where M B = 1.30 and D E + .106008 P.

The dimension B in Fig. 18 is therefore 2 in. — H J.

Angle a in Fig. 20 being known, the distance over the three wires can be calculated as follows:— In Fig. 21: in triangle A B C,

$$A C = \frac{\frac{1}{2} d}{\sin a}$$

$$A H = A C + \frac{1}{2} d = \frac{\frac{1}{2} d}{\sin a} + \frac{1}{2} d$$

The distance of the wire above the top of the thread X = A H — K, where K = 1in. — M D—see Fig. 20.

$$x = \frac{\frac{1}{2} d}{\sin a} + \frac{1}{2} d - (1in. - M D) =$$

$$\frac{1}{2} d \left(\frac{1}{\sin a} + 1\right) - 1in. + M D.$$

Dimension A in Fig. 18 = 2 in. + 2 x.

The helix angle for the tool must be approximately the same as for the work. This angle is the tangent on the screw line at a point of the circle going through half the depth of the thread.

Assume the outside diameter of the work = W, then the circle to be considered has a diameter W — C (C is taken from Fig. 1). Now the outside diameter of the form tool = 2 in., and the depth of the thread is H J = 1in. — M C — see Fig. 20. The diameter of the form-tool to be considered is therefore: 2 in. — (1in. — M C) = 1in. + M C. In Fig. 21A, in triangle A B E, A B = pi (W — C).

$$B E = \frac{1}{2} P. \quad \tan a = \frac{B E}{B A} = \frac{P}{2 \text{ pi } (W - C)}.$$

Angle a, being the helix angle, should be the same for the form-tool.

In triangle F G H, F G = pi (1in. + M C).

G H is one-half of the new pitch.

$$G H = F G \tan a = \frac{(1in. + M C) \times P}{2 (W - C)}$$

This value is expressed in the nearest number of threads per inch we can cut with the lathe. Assume the number of threads per inch = N, then $N = \frac{1}{2 G H} = \frac{W - C}{(1in. + M C) \times P}$

Example.—A twenty-four thread circular tool for external gauges of .880, and .883, .886 diameter is wanted. The diameter of the wire = .025 in. The outside diameter is 2.000. The dimension from the top of the thread on the one side to the root of the thread on the other side is B, where B = 2 in. — H J.

H J = 1in. — M C.

M C = $\sqrt{(C E^2 + 1/16^2)}$

C E = D E + .16008 P.

D E = B E — B D

B E = .99804.

$$B D = \frac{.8004 \times 1}{24} = .03335.$$

D E = .99804 — .03335 = .96469.

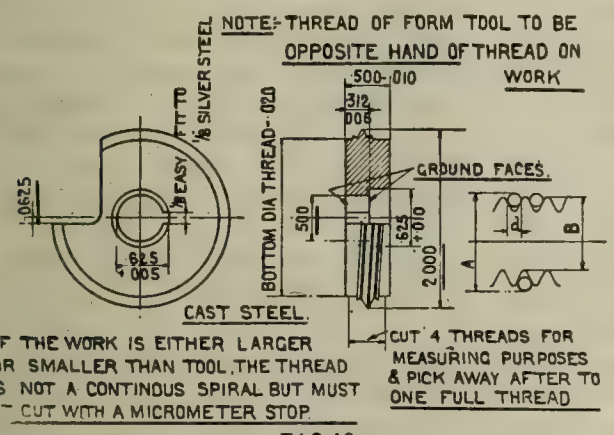


FIG. 18.

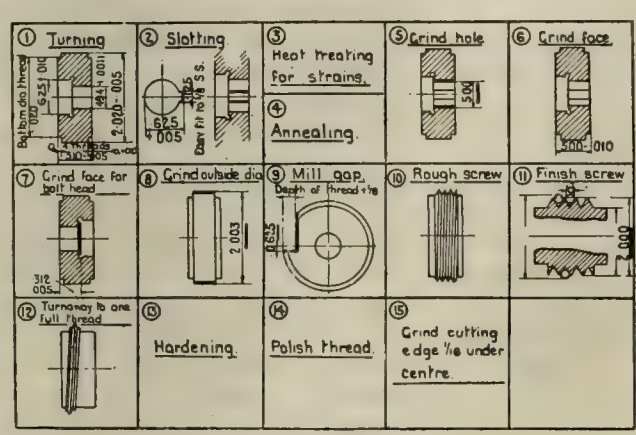


FIG. 19.

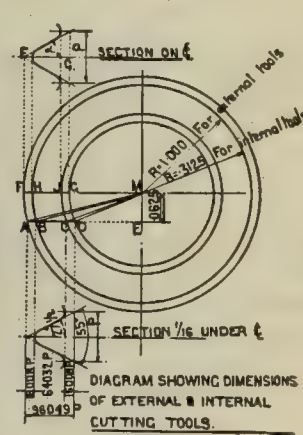


FIG. 20.

*Contributed to a recent number of The Engineer. No. 2 appeared Nov. 8.

C E = D E + .16008 P = .96469 + .006669 = .971359.
M C = $\sqrt{(.971359^2 + 1/16^2)}$ = .973367.
H J = 1in. — M C = 1.000 — .973367 = .026633, and B = 2 in. — H J = 1.973367.

The dimension over the three wires = A.
A = 2 in. + 2 x.

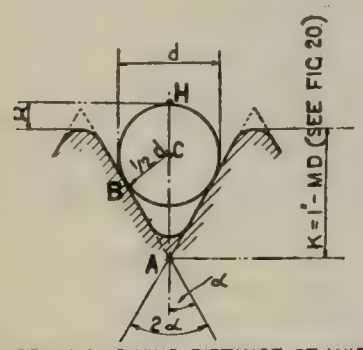


DIAGRAM SHOWING DISTANCE OF WIRE ABOVE TOP OF THREAD, FOR EXTERNAL SCREWING TOOLS

FIG. 21

$$x = \tfrac{1}{2}\, d \left(\frac{1}{\sin a} + 1\right) - 1 + M\,D,$$

where d = .025.
M D = $\sqrt{(D\,E^2 + 1/16^2)}$ = $\sqrt{(.96469^2 + 1/16^2)}$ = .966712.

$$\text{Tan } a = \frac{\tfrac{1}{2} P}{F\,G}$$

F G = A M — D M.
A M = $\sqrt{(A\,E^2 + 1/16^2)}$
A E = B E + .16008 P = .99804 + .006669 = 1.004709.
A M = $\sqrt{(1.004709^2 + 1/16^2)}$ = 1.00665.
F G = 1.00665 — .966712 = .039938.

$$\text{Tan } a = \frac{.02083}{.039938} = .521559.$$

a = 27 deg. 32 min. 40 sec.
x = .0125 [(1 ÷ .4624365) + 1] — 1 + .966712 = .0062428.
A = 2.000 + .0124856 = 2.0124856.

C = .026675.
M C = .973367.
P = .04166.

$$N = \frac{.883 - .026675}{1.973367 \times .04166} = 10.4 \text{ threads}$$

per inch.

With reference to the wires it is very important that these wires should be of the same diameter and perfectly round, as a difference in the diameter is multiplied about three times in the dimension over the three wires, owing to the wedge shaped form of the thread. The best diameter of wire to use is the diameter that touches the flanks about half way down the depth of the thread. In the calculation of the distance over the three wires—Fig. 21—a small error is introduced owing to the helix angle which allows the wire to drop down to a slightly larger angle. This error, however, is so small that it can be neglected entirely, except in the case of a small diameter compared with a coarse pitch. It need hardly be mentioned that micrometers and other measuring instruments employed must be thoroughly tested and adjusted before using.

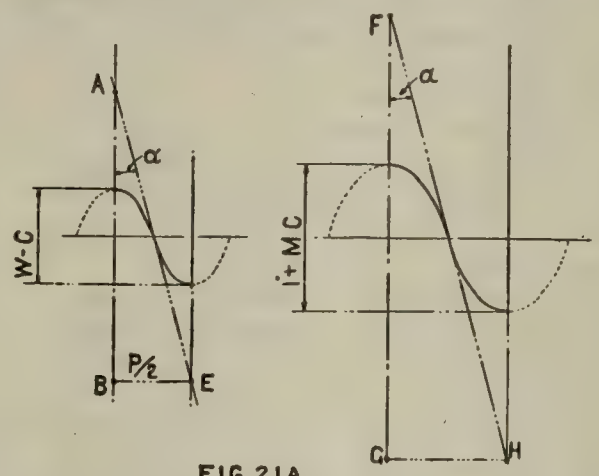


FIG. 21A

The depth of the thread is measured with a micrometer attachment, shown in Fig. 22. This attachment is clamped on to the anvil of the micrometer. It is important that the face fitting on the face of the anvil be perfectly flat, and the knife edge must be perfectly parallel to that bottom face. The best way to produce that part of the attachment is to lap the face carefully after hardening, and then grind the knife edge parallel on a true magnetic chuck, afterwards stoning the sides again to an edge. The results obtained with the attachment were quite as good as with the three triangular pieces, and, moreover, much more quickly obtained. The master tools are held in a special tool box—Fig. 23—of the solid type. The spring holder might possess certain cutting advantages, but leads sometimes to slightly elliptical work. The special tool box is provided with a vertical adjustment by means of a taper wedge a which is moved by the screws b. The plane of the cutting edge of the tool can be brought horizontal by means of the screws c, which move the lever d in the required direction.

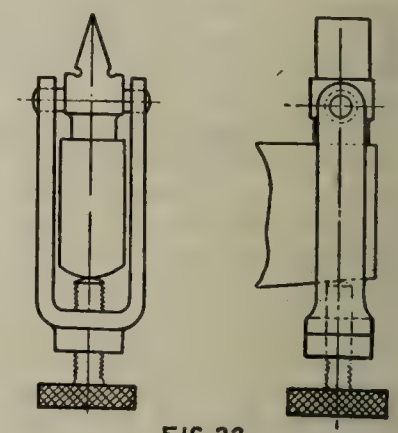


FIG. 22.

The circular form-tool for cutting external gauges is again held on a solid type of tool box—Fig. 24. The bottom face of the box is ground, and the face A is ground square to the bottom face. The bolt hole is bored true to both faces. The face of the form tool can be used for setting the tool to ensure that the thread is upright.

Tools for Cutting Internal Gauges

Fig. 25 shows the tool for cutting internal or female screw gauges. It is made of cast steel, and cuts again 1/16 in. under centre. The true shape of the thread therefore 1/16 in. under centre, and the calculation of the shape is similar to that made for external gauges. What was said about the helix angle for

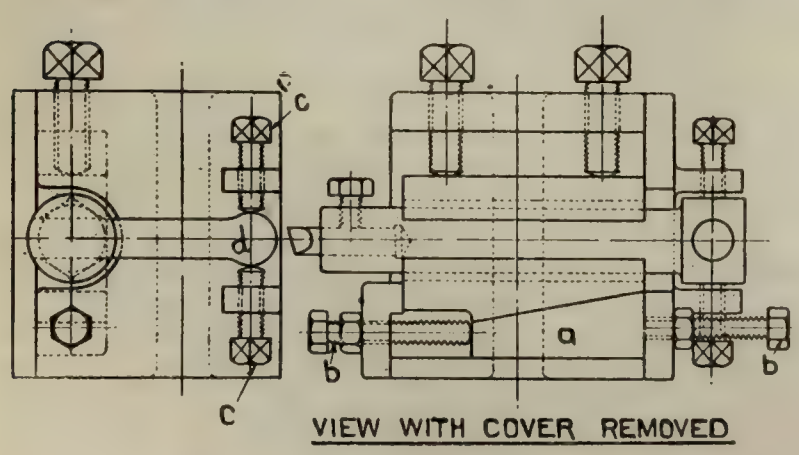


FIG. 23.

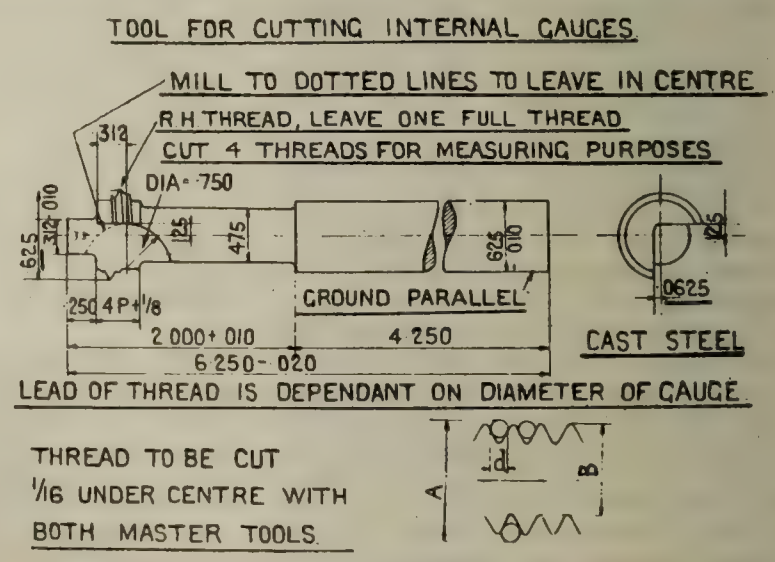


FIG. 25

The number of threads per inch of the form-tool

$$N = \frac{W - C}{(1\text{in.} + M\,C)\,P}$$

$$W = \frac{.880 + .886}{2} = .883.$$

external tools also applies in this case.

For calculation purposes we can use again Fig. 20 by substituting for M B = .3125 instead of 1in.

M = .3125.

M E = .0625.

B E = $\sqrt{(5/16^2 - 1/16^2)}$ = .306186.

B D = .8004 P.

D E = B E — B D = .306186 — .8004 P.

D M = $\sqrt{(D E^2 + 1/16^2)} = \sqrt{[(.306186 - .8004 P)^2 + 1/16^2]}$

A E = B E + .16008 P = .306186 + .16008 P.

A M = $\sqrt{(A E^2 + 1/16^2)}$

F G = A M — D M.

The angle a can be found from tan a = $\frac{\frac{1}{2} P}{F G}$

The depth of thread = H J.

H J = M B — M C, where M B = .3125.

M C = $\sqrt{(C E^2 + 1/16^2)}$ where C E = D E + .16008 P and H J = .3125 — M C; therefore in Fig. 25 B = .625 — H J.

Angle a in Fig. 20 being known, the distance over the three wires can be calculated as follows:—In Fig. 21, in triangle A B C:

$$A C = \frac{\frac{1}{2} d}{\sin a}$$

$$A H = A C + \frac{1}{2} d = \frac{1}{2} d \left(\frac{1}{\sin a} + 1\right)$$

x = A H — K, where K = .3125 — M D (see Fig. 20).

$$x = \frac{1}{2} d \left(\frac{1}{\sin a} + 1\right) - .3125 + M D.$$

Dimension A in Fig. 25 = .625 + 2 x.

The helix angle should again be approximately the same for the tool and the work.

Assume again W, the outside diameter of the thread of the internal gauge. The diameter to be considered is W — C. The outside diameter of the form-tool is .625, and the depth of the thread is .3125 — M C—see Fig. 20. The required diameter is therefore .625 — (.3125 — M C) = .3125 + M C.

In Fig. 21 A, in triangle A B E:

A B = pi (W — C).

B E = ½ p.

$$\text{Tan } a = \frac{B E}{A B} = \frac{P}{2 \text{ pi } (W - C)}$$

Angle a is the same for the form-tool.

In triangle F G H, F G = pi (.3125 + M C). G H is one half of the new pitch.

$$G H = F H \tan a = \frac{(.3125 + M C) \times P}{2 (W - C)}$$

This value is again expressed in the nearest number of threads per inch: N

$$= \frac{1}{2 G H} = \frac{W - C}{(.3125 + M C) \times P}$$

Example.—A fourteen thread circular form tool for internal gauges of 1.998, 2.004, 1.996, and 1.991 diameter is wanted. Diameter of wire d = .040.

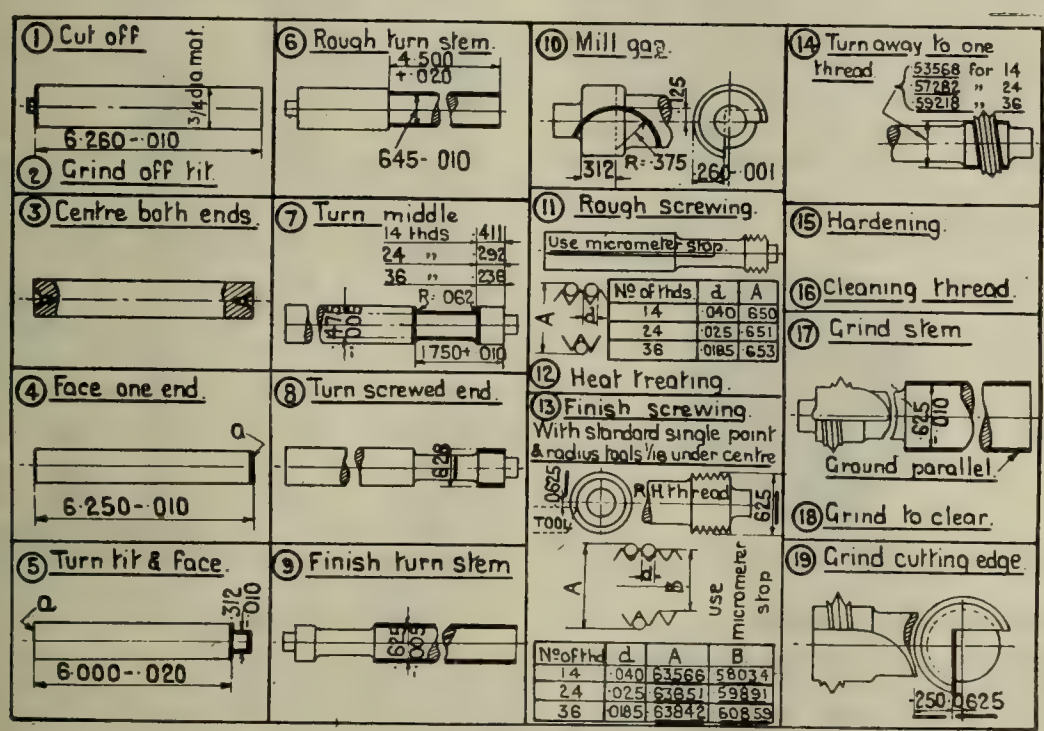


FIG. 26.

The outside diameter = .625 in. The dimension from the top of the thread on the one side to the root of the thread on the other side is B, where

B = .625 — H J.

H J = .3215 — M C.

M C = $\sqrt{(C E^2 + 1/16^2)}$

C E = D E + .16008 P.

D E = B E — B D, where B E = $\sqrt{(5/16^2 - 1/16^2)}$ = .3061862 and B D

$$= \frac{.8004 \times 1}{14} = .057171.$$

D E = .3061862 — .057171 = .2490152.

C E = .2490152 + .011434 = .260449.

M C = $\sqrt{(.260449^2 + 1/16^2)}$ = .2678427.

H J = .3125 — .2678427 = .04466.

B = .625 — .04466 = .58034.

The dimension over the three wires = A.

A = .625 + 2 x.

$$x = \frac{1}{2} d \left(\frac{1}{\sin a} + 1\right) - .3125 + M D,$$

where d = .040.

M D = $\sqrt{(D E^2 + 1/16^2)}$ = $\sqrt{(.2490152^2 + 1/16^2)}$ = .2567389.

$$\text{Tan } a = \frac{\frac{1}{2} P}{F G}$$

F G = A M — D M.

A M = $\sqrt{A E^2 + 1/16^2}$

A E = B E + .16008 P = .3061862 + .02243419 = .3176204.

A M = $\sqrt{.3176204^2 + 1/16^2}$ = .3237112.

F G = .3237112 — .2567389 = .0669723.

$$\text{Tan } a = \frac{.035714}{.0669723}$$

a = 28 deg. 4 min. 10 sec.

x = .020 [(1 ÷ sin 28 deg. 4 min. 10 sec.) + 1] — .3125 + .2567389 = .006743.

A = .625 + .013486 = .638486.

The number of threads per inch of the form-tool:

$$N = \frac{W - C}{(.3125 + M C) \times P}$$

$$W = \frac{1.991 + 2.004}{2} = 1.9975.$$

C = .04574.

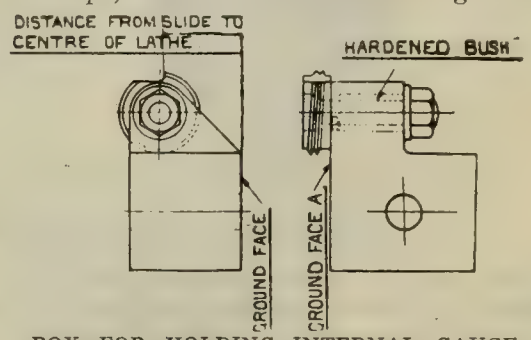
M C = .2678427.

P = .071428.

$$N = \frac{1.9975 - .04574}{.5803434 \times .071428} = 47 \text{ threads}$$

per inch.

Fig. 26 shows the tool for cutting internal gauges laid out in operations of manufacture. When in use the tool is held in a square tool box between two V-strips, and as the shank is ground parallel off the centres that shank can be used for setting purposes.



BOX FOR HOLDING INTERNAL GAUGE TOOL.

We have now obtained the necessary tools to start making gauges, except small female gauges. These have to be screwed with taps. The taps have to be very accurate, and must be screwed to gauges or useful results will not be obtained.

DIMENSION CONVERSION

IN order to conform to the practice of certain shops it is often necessary for the mechanics to convert fractional dimensions to their decimal equivalents, or decimal measurements to the corresponding fractional value, generally in thirty-seconds or sixty-fourths. Various tables have been compiled for this purpose, but it is not always that these are available when desired. To convert a fraction to a decimal equivalent all that is necessary is to divided the numerator (the upper term of the fraction) by the denominator or lower term. Hence to find the value of 7/64 in the form of a decimal, divide 7 by 64 = .109375.

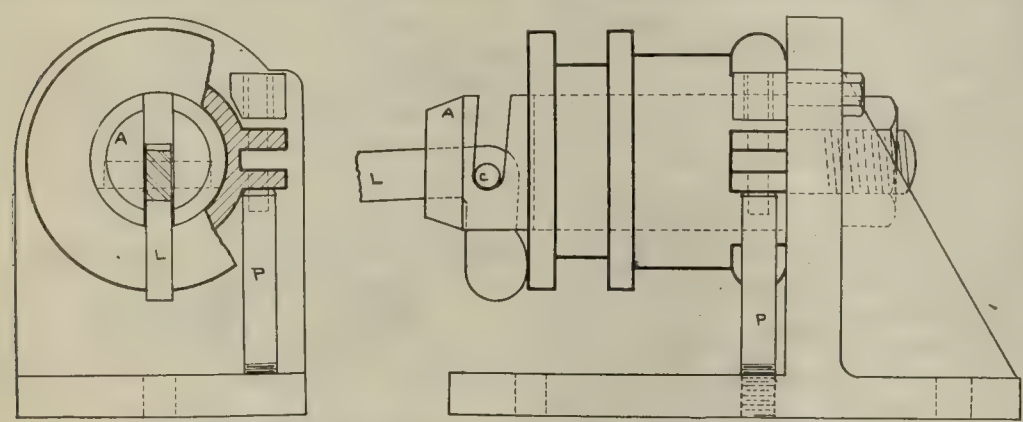
Suppose it is desired to find how many 64ths are contained in the fraction 63/96. This can be calculated in two ways; by converting the fraction to a decimal and then multiplying by 64, thus 63 divided by 96 equals 0.65625 and multiplying by 64 gives 42, or 42/64; or by multiplying the fraction directly by 64 we get the same result. To convert a decimal to an equivalent fraction multiply the decimal by the denominator of the desired fraction. Thus, to change .3215 to the nearest 28th, we get 9.002, which is just 2/1000 over 9/28. To find the number of 64ths contained in the decimal 0.203125, multiply by 64 and the integer of the product will be the desired number of 64ths; thus, 0.203125 x 64 equals 13, therefore the equivalent of the decimal is 13/64.

DRILLING CLUTCH SLEEVES

By D. S. Mann.

THE clutch sleeve shown in the accompanying drawing and used in connection with gas engine clutches was provided with four double ears at the one end, into which fitted the toggle connections to the shoes. As the clutch was self-locking, these holes must be drilled the correct distance from the end. The main body of the jig was of angle plate form and the arbor A, three inches in diameter, was turned down and held by the nut at the back. The sleeves were slipped on this arbor and the lower ear rested on the post P, which was adjustable in height. A hole was drilled in the end of this post sufficiently large so that the regular drill would enter.

The sleeves were held in position while drilling by the lever L, which was about eighteen inches long and bent so that the heel rested against the sleeve at the lower side. Due to the long leverage, a powerful pressure could easily be applied, though this was not necessary. When desired to index the sleeve one-quarter revolution the handle was merely raised at the end, turning about the pin C. The sleeve could then be pulled back with the other hand, sliding completely over the bend in the lever, turned and slid back into position. When all the holes were drilled, the handle was merely lifted out and the piece slid off. The pin C was, of course, fastened in the handle L. It would be difficult to devise a much quicker method of handling these pieces, as the clamping time was practically nothing.

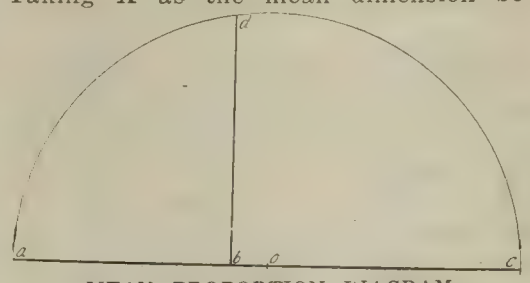


QUICK-ACTING FIXTURE FOR DRILLING CLUTCH SLEEVES.

MEAN PROPORTION

By J. H. R.

IT is sometimes required to find the mean proportion between the lengths of two lines. This can be done either by calculation or by the graphic method. Taking X as the mean dimension between A and B, the proportion would be A : X : : X : B, or $X^2 = A\ B$. Suppose it is desired to find the mean proportion between two lines 3 and 4 inches long. Using the above proportion we have 3 : X : : X : 4, or $X^2 = 4 = 12$. Hence, $X = \sqrt{12} = 3.464$ inches. Proof:—the product of the two extremes of any direct proportion must equal the product of the two means; thus, 3 : 3.464 : : 3.464 : 4, and $3 \times 4 = 1^2$, while $3.464 \times 3.464 = 11.9993$. The slight difference in the two values is due to the number of decimal places.



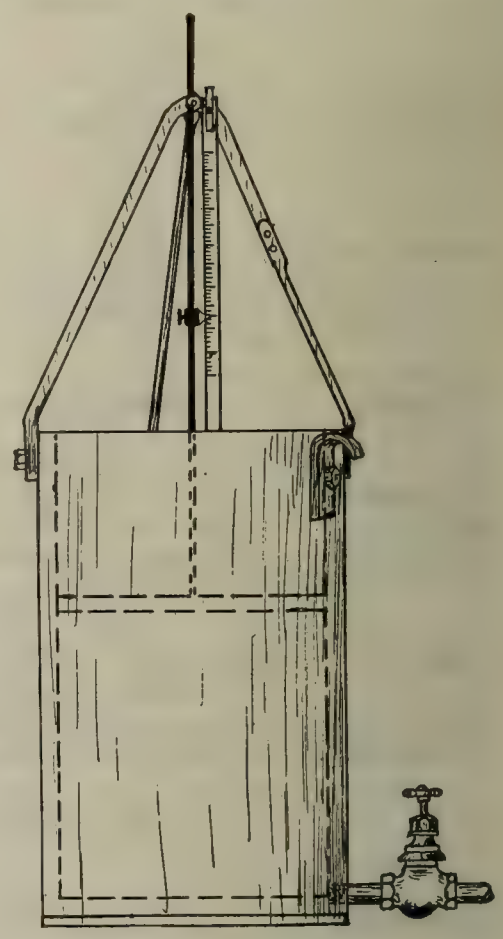
MEAN PROPORTION DIAGRAM.

To find the mean proportion by the graphical method, proceed as follows: On a straight horizontal line lay off the lengths of the two known lines A-B and B-C. Bisect the total length A-C at the point O; from this point, with a radius O-A or O-C, describe the semi-circle shown. The perpendicular line B-D drawn from the juncture of the other two lines will be the mean proportional length.

FUEL MEASURING TANK

By D. O. Barrett.

IN taking fuel consumption tests of internal combustion engines, the writer has found the tank shown in the cut to be the most satisfactory method of measuring the amount of fuel used. The tank is a cast iron cylinder accurately bored and the measurement taken. A float is provided in the tank, three arms being attached to the float, so that it will remain central and prevent the rod attached to the float being bent when the tank is moved. To this rod is attached an indicator moving along a 24-in. steel scale graduated in hundredths, this scale being supported by the brackets shown. The tank being rather heavy, hooks were provided so that it could be easily lifted by the crane. The size of the tank to be used, of course, depends upon the size of engines to be tested, but should be large enough so that any ordinary run may be made without the necessity of refilling. The one shown was bored to 15.995 in., so that each inch in height represented 0.867 U. S. gallons. Readings being made on the scale graduated to hundredths could thus be made very accurately and easily. These readings could be transferred to pounds after determining the gravity of the oil. This method is much more accurate and quicker than when the fuel is weighed, as the average scales are not accurate and then a balance must be taken each time.



FUEL MEASURING TANK.

OXYACETYLENE welding played an important part in repairing the damage done by the German crews of the ships recently taken over by the United States Government. Its inspectors discovered that extensive use had been made of oxyacteylene cutters to partially cut through the joints and hull-plate seams. In almost all the ships interned in New York harbor this had been surreptitiously, but skilfully, done, and the sections cut had been carefully painted over, so that all traces of the work were obliterated. The purpose evidently was so to weaken the hulls and supports as practically to assure the sinking of the steamers when they again put to sea. Fortunately, the damage was discovered, and it is gratifying to know that the scientific welder can thoroughly repair every part injured. The steamer which sustained the most damage was the best of the fleet, the Vaterland, valued at ten million dollars.

The Rusting of Iron Pipe in Service: Theory and Practice*

By Harry Y. Carson

The factors which make for rust resistance of metal pipe have heretofore been given very little consideration in most discussions on the subject. The author believes that the extraordinary qualities of cast iron pipe and fittings can best be explained on the basis of heat treatment as being the only explanation of observed corrosion phenomena.

THE history of pipe is the history of civilization. Upon no other single product have the great cities of the world depended in such large measure for their health and comfort. The modern city is dependent upon pipe as we are dependent upon arteries, veins and capillaries in human bodies. Let us compare our modern buildings to the individual cells in our body. These cells receive their life-renewing supply of wholesome water through multitudinous pipes, permeating every wall and corridor. After the water has supplied life, bathed and cleansed to its utmost, it carries off the waste products through other capillaries, collecting into larger and still larger main trunk arteries. We are taught that man has a natural life of three score and ten years, but would he not have a life of only five years if his capillaries were constructed to last but that long? If his capillaries were built on the century basis and his arteries on the ten-year basis, what would be the ultimate result?

Cast-Iron and Wrought Pipe Compared.

Pipe made in a rolling mill does not resist corrosion in service so well as pipe made in a foundry. Both kinds of pipe may have been made from the same quality of iron ore: both are smelted and both may have been treated in the same manner up to a certain point in their refinement, known as the "pig iron" stage. The iron which passes through a tube mill must first of all be rendered comparatively free from carbon, silcon, sulphur, phosphorus and manganese before it can be manipulated into thinly rolled sheets for the purpose of making wrought pipe. Paradoxical as it may seem to the layman's mind, the question of chemical refinement plays small part in comparison to other factors. These factors which make for rust resistance of metal pipe have heretofore been given little consideration in the many discussions that have taken place on this subject. Pipe or fittings made of cast steel last quite as well as ordinary gray cast iron in service, but conversely the pipe which may have been rolled out from a cast steel ingot lasts not one-tenth as long as the cast product. Now why should this be so?

Perhaps further light on this very involved question can be found in a recent investigation by a prominent tin plate manufacturer, who tried to ascertain the reason why the old iron links of the suspension bridge at Newburyport, Mass., have so successfully withstood the elements of wind and rain for more than one hundred years, little attention having been given to painting or protecting the metal. In reference to this, the following statement is made in The Corrosion of Iron, a book published in 1916 by L. C. Wilson:

> To explain how or why these (links) have so successfully withstood the attacks of air and moisture for so many years is not as easy as it might seem for apparently some of our commonly accepted notions and theories as to what a good iron should and should not be do not hold, or at least are offset by other conditions. For instance, some of the links of the Newburyport bridge have been examined and found to be of very ordinary purity and of a most heterogeneous structure, segregation of the impurities being decidedly noticeable. The question of any inherent superiority in the iron itself was settled by heating and rolling one of the links into a sheet and exposing it to the weather, when it was found that it corroded quite as readily and extensively as the rolling mill product of to-day.

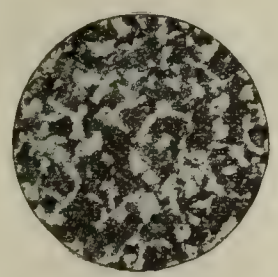


FIG. 1. PHOTOMICROGRAPH OF CAST IRON SHOWING BONDING OF CRYSTALS.

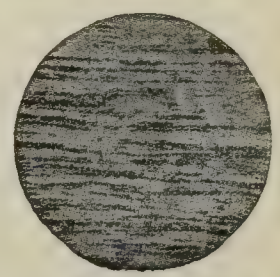


FIG. 2. PHOTOMICROGRAPH OF COLD ROLLED METAL SHOWING LAMINATED STRUCTURE.

Structure of Cast Iron and Rolled Iron

At the top of the chart (not shown), which is a drawing reproduced from a standard text book on metallography, there are indicated the various commercial grades of iron products which are familiar to all. Beginning with the pig iron on the extreme right, it will be noted that the carbon content is greater than 4 per cent. Next comes gray iron, with a carbon content of 3.2 to 4.6 per cent. White iron is next, with a carbon content of 2.2 per cent. to 3.2 per cent. The iron which has a carbon content less than 2 per cent. is known as steel, and this material may be rolled or manipulated, while all other classes of iron must be cast into the desired shapes or objects. Glancing at the extreme left hand side of the chart, the various temperatures at which iron melts and freezes or solidifies may be observed. These temperatures are somewhat lower for gray iron than for steel, and are yet higher for pig iron than for gray iron. However, these very high temperatures, above 2200 deg. F., apply only to the cast irons and cast steels, for when we begin to investigate the temperatures at which steel pipe and wrought iron pipe are made, we must confine our attention to that part of the chart below 1600 deg. F. and between the limits 0 and 0.1 per cent. carbon. This metal is worked at more than 1000 deg. F. below its freezing temperature, and hence does not attain its full crystal growth which can be restored to the internal structure of the pipe only by remelting.

As a result, the pipe so made displays a form of flaking or exfoliation of its particles under the corrosive influence of ordinary service conditions. A very good analogy to iron rusting can be found in the geological structure of various grades of stone found on the earth's surface. Those stones, such as granite, which were molded or "cast" ages ago at a very high temperature are far more durable than such materials as sandstone, which were laid down and cemented together after the earth's surface had cooled to a low temperature. Both kinds granite, if we but supply a sufficient amount of heat to fuse together the aggregate mass of silica crystals. Figure 1 is a photomicrograph of cast iron, showing the bonding of the crystals.

Contrary to what has so often been stated with regard to cast iron owing its life altogether to a "skin" resulting from the casting process, the author must diametrically disagree for the simple reason that castings have been in service for more than two hundred and fifty years and have shown no greater loss wherever the original casting skin has been totally absent.

The effect of rolling and re-rolling is even more noticeable under the microscope than is the effect upon the internal structure of rolled steel. A bar of metal which is rolled or drawn "cold" will, if the process be carried to the extreme, present a structure viewed parallel to the direction of drawing, like the photomicrograph shown in Figure 2. However, the pipe made from wrought iron is made at a final heat treatment of approximately 1200 deg. F. which gives a

*Read before the American Water Works Association at New York.

fair degree of fusion to the gross slag particles distributed through the skelp from which the pipe is made. The inhibiting properties of this slag, when carefully distributed through the wall section of the pipe, compensates for the low temperature at which wrought iron pipe is rolled. Nevertheless both wrought iron and steel pipe last approximately the same under like conditions of service.

The author believes that the extraordinary qualities of cast iron pipe and of cast iron fittings can best be explained on the basis of heat treatment At least it is the only explanation that seems to coincide with all of the observed corrosion phenomena which are incidents in the rusting of pipe in service.

Theories of Corrosion

The many experimenters who have investigated this subject have evolved at least three different theories of iron pipe corrosion.

The hydrogen-peroxide theory explains the phenomena of rusting by assuming that when iron, water and oxygen are in contact, a chemical reaction takes place in which ferrous oxide, FeO, and hydrogen peroxide, H_2O_2 are formed. Then the ferrous oxide is supposed to react with a portion of the hydrogen peroxide to form a basic or hydrated oxide; rust, an insoluble basic oxide, is the final product.

A second theory, known as the carbonic acid theory, holds that rusting is always started by an acid. It assumes that even a very weak carbonic acid will first convert a portion of the iron into a ferrous salt, with the escape of hydrogen. Under the influence of exygen and water, the ferrous salt is oxidized to ferric hydroxide $2Fe(OH)_3$. The ferric hydroxide is insoluble and upon precipitation the original carbonic acid is liberated. The carbonic acid is then free to attack more iron and to repeat the process of reducing the iron to rust.

The third, and perhaps most important, theory of iron corrosion is known as the electrolytic theory. It rests on the assumption that when water comes into contact with an iron surface, a certain amount of the iron goes into solution. This small amount of iron carried in solution in the water produces an electrolyte. The process of rusting is then explained by the familiar galvanic electrolysis which takes place between the points of high and low potential on the surface of the metal. The modern conception of the reactions which take place holds that they are accompanied by certain readjustments of the electrical state of the reacting irons and the iron must go into solution as a ferrous iron before it becomes oxidized.

If it were possible to summarize all of the painstaking research that has been carried on by investigators since 1880, we would probably find that one common point has always been mutually agreed upon. It has always been admitted that the iron particles must be in direct contact with oxygen and moisture before rusting can take place. In all likelihood, it is probably close to the truth to say that under varying conditions of service for iron pipe, any one or all of the corrosion theories actually apply during the process of rusting. As for inhibiting or preventing the rusting of an iron pipe line, the problems, both theoretical and practical, seem to sum up in the one proposition of keeping moisture and oxygen from reaching the iron itself. Expressed in different terms, it is the old question of getting a protective coating on all exposed parts of the pipe.

Protective Skin on Cast Iron

There is an entirely different kind of surface rust formation on cast iron pipe than is to be found on the surface of a pipe made of rolled iron and steel. On the surface of a cost iron pipe, whether machined or fractured or not, may be observed a reddish-brown coloured iron oxide which is very hard, and so tenaciously covers the surface of the pipe that it penetrates down between every surface crystal and forms a perfectly impervious coating which is not penetrated by the moisture and oxygen. Hence galvanic action stops on such a surface and the life of the pipe is insured by the very virtue of the oxide itself contained on the surface.

On the other hand, let us observe the surface of a piece of wrought iron pipe or a piece of steel pipe. In this case we see a loose scaling formation of rust which is soft and pervious to moisture and oxygen. These flakes of rust are very readily removed with a pen-knife or the thumb nail from the surface of the pipe. Once the rust scale drops away, the fresh bright particles of the iron are exposed to the oxygen and moisture so that further rusting takes place on each fresh surface until the entire wall thickness of the pipe has been destroyed. The surface scales on wrought iron materials accelerate galvanic action, whereas the rust formation on cast iron has just the reverse quality, namely, the prevention of galvanic electrolysis. The cause for the gradual slowing up of rust action on cast iron seems, therefore, to be thoroughly explained by the quality of the surface oxide.

Plumbing and Wasted Water

The part which bad plumbing plays in the enormous waste of public water is a very significant reason why water works officials should pay more attention to the details of the piping installed in the buildings. The habit has been too common of thinking that the responsibility ends at the corporation cock on the street main or at the meter. That responsibility should not end short of the spigot on each plumbing fixture.

The New England Water Works Association received last year an excellent report on service pipes, in which the following table was given to show the comparative life of some materials which have been used:

	Years Before Trouble Begins	Life of Pipe Years
Plain iron or steel pipe.....	12	16
Galvanized pipe	15	20
Lead pipe	10	35
Lead lined pipe	10	23
Cement lined pipe	14	28

These data are valuable as giving some idea of the amount of water wasted from steel and wrought iron service pipes, which wastes through rust holes in the pipe long before the trouble is detected. Moreover, it becomes difficult to learn the amount of wastage until the line is torn up and replaced. The table also shows that galvanized pipe is little better than black pipe.

Cast iron pipe for service line in the streets as well as for the mains has been installed at low cost, and perfect results can be obtained provided satisfactory joints are used. The minimum size should be 2 inch internal diameter, and this can be laid at approximately the same cost per foot as 1 inch lead service pipes. Nothing will ever reduce the economic loss from wasted water, amounting to $4,000,000 in the United States annually, so much as the general adoption of cast iron pipe with joints capable of remaining permanently tight. Such piping should begin at the pumping station and continue as far as the plumbing fixtures in the buildings. For pipes less than 2 inches internal diameter the material should consist of brass or copper. The general rule should be to use 2-inch cast iron service pipes, but it is not necessary to provide more than a ¾ or 1-inch tapping on the main. The meter may also be of 1-inch size on a 2-inch service pipe without causing any appreciable pressure loss due to friction.

In connecting the service pipe to the street main the present practice of using a short lead gooseneck between the cast iron pipe and the brass corporation cock should be followed in order to provide for settlement and expansion. The service piping must have joints which are flexible as well as tight against pressure. Such a joint is on the market.

The bell and spigot ends of the pipe are machined at slightly different tapers and bolts are used for assembling the joint. When the joints have been made tight against pressures the bolts are usually loosened off, and this construction remains permanently tight, as there is no chance of deterioration either at the joint or at any part of the pipe system. The Underwriters' Laboratories have tested and approved for high-pressure fire service the cast iron piping having this joint.

THE European war is materially affecting certain phases of the industrial safety problem in Great Britain. For example, the closing of the ports of the Baltic and the shortage of labor in the neighborhood of Bordeaux have greatly reduced the supply of timber used for props in British mines, a considerable part of which has been obtained, heretofore, from Russia and southwestern France. Shipments from Norway and Sweden are not practicable at the present time. The situation has already become serious, and mining engineers are giving it careful attention. One colliery uses props made from old steel pipes, filled with pieces of wood to strengthen them against collapse. It has been suggested, also, that old steel rails be used.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

DOES A PISTON STOP AT REVERSAL?

A PISTON does stop at reversal and I believe it is possible to slow an engine down so slow that every one will admit that it does. Of course, external power would need to be used to run it at such a speed. Now if it actually stops while the fly wheel is turning very slowly, it must also do so at faster speeds. The fly wheel and shaft upon which it revolves have different motions. The outside edge of the wheel travels the faster, but in a constantly changing direction. The speed decreases from the edge to the centre of the shaft where there is no speed but a constantly changing of position, so no matter how slow the wheel moves no part of it or the shaft to which it is firmly fixed can be said to have stopped.

Move a wagonwheel over a knife-edge, and although there is no motion where the wheel is in contact with the knife edge, there is a constant changing of position the same as in the centre of the shaft, so that no part of the wagon wheel can be said to have stopped.

If a solid body does not change its shape, it is impossible to move one part without moving the whole. One end of a spring can be held at rest while the other part moves. So also with an auto tire, when a given point on the face of the tire comes in contact with the ground the spring of the tire allows that point to stop while other parts are in motion. Some part of an auto tire therefore is at rest all the time while no part of a steel wagon tire rests as long as the wagon moves.

W. D. BOOKER.

EFFICIENCY AND PRODUCTION

By R. Hamilton

IN the drawing up of a contract it is essential that the parties involved be agreed on the terms, otherwise there is no contract. Mutual understanding is necessary before an agreement can be successfully carried out, and it is only by the meeting of minds that the interests of the several parties can be properly safeguarded. The extension of this principle, which in the past has been largely confined to the actual drawing up of contracts, must eventually spread to the operation of industrial plants, not alone as regards the duties of the chief executives, but also to the heads of the different departments and their various assistants. A contract is often entered into and afterwards regretted by either of the contracting parties; not that one or the other is at fault but because local disorganization is sometimes created by the methods adopted to achieve a certain result. Essential as the formation of a contract may be, it is equally important that this fundamental principle —the meeting of men and minds—be extended to the actual production of manufacturing. It is not reasonable to believe that the brains of any establishment are contained in the head of any one man, no matter what position he may hold; while it is also understood that a chief executive is indispensable, together with the heads of the various departments. It is this very important feature of plant management that emphasizes the necessity of periodical meetings or conferences of the different department heads, so that all may be advised, in a general way, of the efficiency of each division, together with the difficulties that often arise in operating details. The highest efficiency is only attainable when perfect harmony exists throughout every department.

Factors Necessary To Success

Three essentials are required to maintain a state of equilibrium in any line of manufacture; the designer or construction engineer must be familiar with the plant equipment so as to avoid complications in productions: the building or producing staff should be acquainted with the purposes of the designing engineers; and the product must conform to the wishes or specifications of the user or consumer. Like the sides of an equilateral triangle these three factors are fundamental to the stability of the whole; each section performing its own particular function, but the three united and acting in harmony to maintain equilibrium. Designs are often prepared in the drawing office for certain work without a thought as to the facilities that are available for the actual production of the piece; patterns may be made, parts may be cast or forged, and not until they have reached the machine shop will it be discovered that the shop equipment is not suitable for the effective production of the work. In a large establishment such contingencies are not so pronounced owing to the wide range of machine equipment; but in the smaller plant it often happens that additional expense is entailed by the lack of sufficient forethought or mutual understanding between the designing and production departments. Too frequently the designer will concentrate his efforts on the use a certain part is to be put to, without due consideration to the machines that are available for the production of the piece.

A case in point was that of several hand wheels that had been designed with a side boss, the end of which extended an inch and a half beyond the outside diameter of the rim. The diameter of the wheel proper was 13 in., but with the boss it required a lathe with a swing of 16 in. to allow the protruding section to clear the shears of the bed. The shop was equipped with one 20-in. and several 15-in. lathes, but the large machine was over-supplied with work, while insufficient jobs kept the 15-in. lathes idle part of the time. The first six of these hand wheels were finished in the larger lathe, but before casting any more, enough of the extending boss was removed from the pattern to allow of using the smaller lathes for the succeeding wheels. This is only one of many instances that might be recorded to demonstrate the lack of co-operation on the part of plant organizations to attain that state of maximum efficiency that is frequently tried for, but seldom achieved. This desired objective, however, may be more fully realized by the regular and conscientious meeting of department foremen and plant executives, so that mutual discussions will enlighten each other as to the important shop features that are fundamentally essential to the successful operation of any industry.

ENCOURAGING THE PRACTICAL

By J. H. R.

ONE can very well understand that world conditions as they exist to-day are productive of inventive epidemics. The patent offices are crammed with applications for patents or protection on thousands of devices and processes; the bulk of those submitted during the past two or three years being in connection with defensive or offensive war appliances. While many of these "inventions" are no doubt of practical value, the greater number might be classed as fantasies of a fevered brain—visionary possibilities devoid of the essential requirements necessary to achieve the realizations of their specified claims. On the other hand, there must be many of those submitted, not only to the patent office, but to such boards as are appointed to investigate such matters and pass upon their merits or demerits, that are subsequently given favorable consideration, as being likely to fulfil the claims advanced in the specifications. It is probably true that a great deal is being done to accept and apply any suggestion or idea that will aid in combating the efforts of the opposing parties, but is every possible method being adopted to rapidly perfect those ideas that are deemed worthy of serious consideration? Is it sufficient for a board of selected men to pass on the merits of a certain invention, without consulting and obtaining further details from the originator of the idea? A wrong conception hastily taken may sometimes condemn a highly efficient device; or the want of accurate knowledge pertaining to certain mechanisms may place the "idea" on the shelf for an indefinite period.

Recently a highly efficient technical and practical engineer perfected a cer-

tain device for war purposes, and in addition to submitting plans and specifications, had constructed a working model that had been thoroughly tried and found entirely satisfactory. The interesting part in connection with the matter was the reply received from the investigation board, which, by the way, was a printed form—stating that his communication had received careful consideration, but for stated reasons was deemed impracticable: and in addition, he was credited with sending an invention that did not conform with what he actually did submit. From this, one might imagine that the boards are not properly equipped with the skilled information necessary to thoroughly investigate the possibilities of such devices.

Present circumstances will not allow of any delay in developing, as rapidly as possible, any idea that looks reasonably certain of success. Under these conditions every facility should be given to the originator of a practical idea to develop it to the point where it will demonstrate its practical worth. The cost of equipping a plant and allowing the actual inventor to perfect the original and often crude conception of what his mind or hand has accomplished would not be prohibitive, and the returns would undoubtedly repay the expenditure involved. The number of "possible" inventions would not be so large but that the Government could well afford the outlay necessary.

INDUSTRIAL ALCOHOL

THE problem of a future supply of gasoline is yearly becoming more acute, in fact the question of finding a substitute for petroleum itself is recognized as being a matter of a few years only. Just when circumstances will justify efforts to establish an alcohol industry cannot be very well decided till the influence of war conditions has been removed. Discussing the prospects of producing industrial alcohol in this country, W. J. Dick, writing in the Canadian Mining Institute Bulletin, states that imports of petroleum and petroleum products into Canada have been rapidly increasing, while the domestic production has been decreasing. The imports of petroleum, crude and refined, during the calendar year 1914 totalled nearly 244½ million gallons valued at over $11,000,000. As our crude petroleum production in 1914 amounted to about 7½ million gallons, valued at about $344,000, it can be seen that Canada is dependent upon foreign sources for her supplies of petroleum and petroleum products. The production of crude petroleum has come almost solely from Ontario and is steadily but surely declining in spite of attempt being made by drilling to enlarge the areas of producing fields, or to find new ones.

In considering the development of a substitute for petroleum for certain purposes such as illumination, cooking and for use in internal combustion engines, industrial alcohol, which is used to a considerable extent in Germany and Great Britain, is suggested.

In 1914, the imports of refined and illuminating oils amounted to over 12,800,000 gallons, valued at $970,000; during the same year 24,400,000 gallons of gasoline, valued at $2,747,000 were imported. If industrial alcohol could be produced economically in Canada so as to replace these products there would be a saving of over 3½ million dollars worth of imports. On account of the rising price of gasoline it has been reported that many tractors have been rendered idle in the Prairie Provinces, thus reducing the acreage to be sown. Some people are of the opinion that the high cost of gasoline is occasioned by the present war, but the Director of the United States Bureau of Mines declares that the prevailing prices may not only continue for some time, but will undoubtedly reach higher levels before there is any permanent relief. He states that the United States Government will, during the next fiscal year, pay 31½ cents for its gasoline. He, therefore, concludes that, if the United States, using such vast quantities, is compelled to pay this high price, the private consumer will have to pay much more. Furthermore, at the present rate of production, the known supply of crude oil in the United States, from which we are getting our present supply of gasoline, will be exhausted in 27 years.

In considering the establishment of an alcohol industry in Canada, it is necessary to distinguish war conditions from those obtaining in normal times. As alcohol is essential in the manufacture of smokeless powder, present prices are abnormally high; whereas, under normal conditions, there is not the great demand for alcohol for this special purpose and it would then have to compete with kerosene and similar products.

The raw materials used elsewhere than in Canada for the manufacture of industrial alcohol are potatoes, sugar beets, molasses, and sawdust.

The present price and yield of potatoes in Canada are not such as would warrant the founding of a potato alcohol industry in Canada. The British Committee on Industrial Alcohol reported that it would not be possible to establish potato-alcohol industry in Great Britain unless potatoes were less than 29 cents per bushel. W. T. Macoun, Dominion Horticulturist, states that, if best methods are followed, 300 bushels of potatoes per acre can be produced. He estimates the cost of production and marketing such a crop of 20½ cents per bushel but says that this will be reduced on large areas where the most modern machinery is used. *The Census and Statistics Monthly* states that the profit per acre, in 1913, for spring wheat grown in Manitoba, Saskatchewan and Alberta was $2.65, $1.72 and $2.09 respectively, so that it is evident that if potatoes were sold at 21½ cents per bushel there would be a greater profit to the farmer than growing wheat in these provinces.

Potatoes used in the manufacture of alcohol need not be sacked and may be shipped frozen with but a trifling loss.

The establishment of an alcohol industry on a suitable scale would be, as outlined previously, a means of carrying on profitable agriculture in areas otherwise unsuited to crop growing; the feeding of the spent mash to cattle would encourage live stock growing and the alcohol produced could be consumed by the farmers as illuminant, for cooking and heating purposes, and as a source of motor fuel.

U. S. POLICE TO PREVENT FACTORY OUTRAGES

THE serious losses sustained by the Allies through incendiarism has proved an incentive for the recent enactment of legislation by the United States Congress, designed to cope with the situation.

The Bureau of Mines, Department of the Interior, has been charged with the enforcement of the principal clause in the war measure, which deals with the possession of high explosives and is substantially as follows:

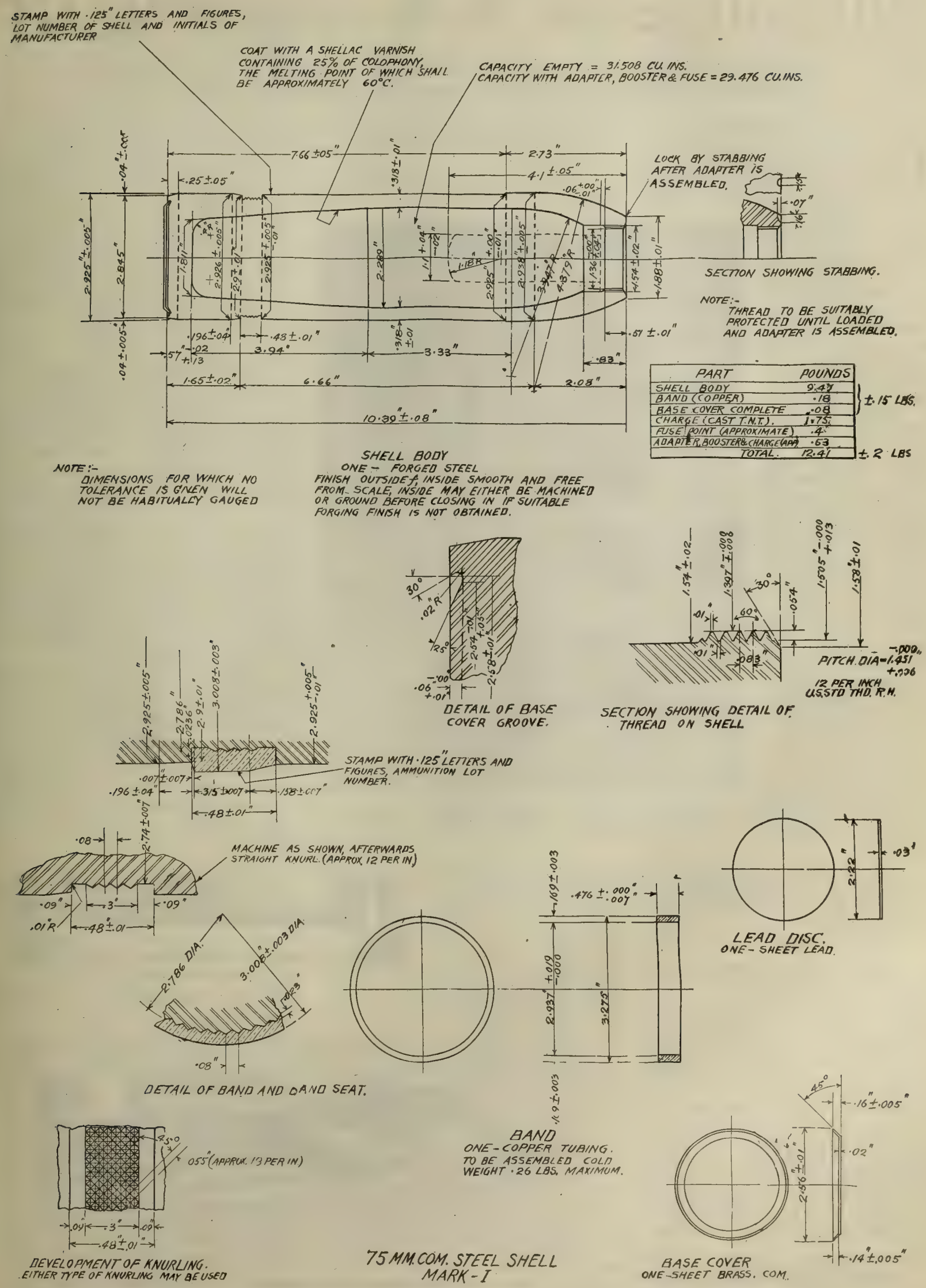
Any person in the United States found with explosives in his possession after November 15 and who does not have a license issued by the Federal Government stating the purpose for which the explosives are to be used, will be at once arrested and fined not more than $5,000 with the alternative of imprisonment for one year. If the circumstances warrant the person may be fined and in addition given the one year in prison.

The co-operation of the organized police of the country is enlisted in the work, and they are authorized not only to look after the enforcement of the law, but also to make thorough investigation of all dynamite outrages and fires in factories, warehouses, etc., and to make their reports to the Director of the Bureau of Mines.

75 MM. U. S. SHELL

ON the following page is reproduced a line drawing of the U. S. 75-millimetre high explosive shell, giving all the constructional dimensions required to enable prospective manufacturers to consider the production problems involved. The provision of a base protecting plate, walls of comparative thinness, a nosed-in mouth, and the acceptance of a forged interior finish are among the principal features of the design. The knurled band seat is already familiar to many of our readers through Russian work.

The design may be accepted as representing the most complete compromise between ease of production and efficiency in use. The thinner walls increase the explosive containing capacity—the forged construction economizes metal in manufacture, and, when sufficiently high grade to dispense with interior finish, will result in a considerable saving of time in machining. Knurling and absence of undercutting on band groove simplify tooling equipment and reduce upkeep. The extra operation of nosing, as compared with the British shell, is not objectionable in view of the other features referred to.



PART	POUNDS	
SHELL BODY	9.47	±.15 LBS.
BAND (COPPER)	·18	
BASE COVER COMPLETE	·08	
CHARGE (CAST T.N.T.)	1.75	
FUSE POINT (APPROXIMATE)	·4	
ADAPTER, BOOSTER & CHARGE (APP.)	·63	
TOTAL	12.41	±.2 LBS

CONSTRUCTIONAL DETAILS OF THE UNITED ST ATES 75-MILLIMETRE HIGH EXPLOSIVE SHELL.

PROGRESS IN NEW EQUIPMENT

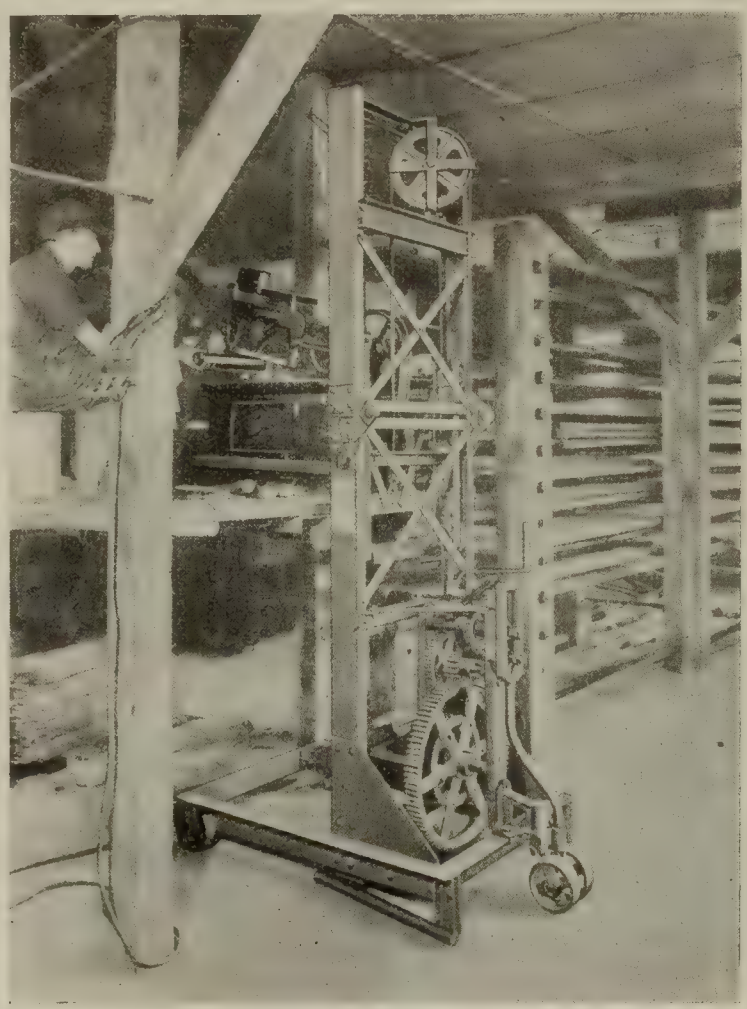
A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

FOR STOCK ROOM USE

THE inconvenience and labor involved in handling long lengths of shafting between storage racks and the hack saw are well known particularly in the case of plants where the frequent cutting off of pieces of various sizes is called for, the total time and labor for the work amounting to a considerable expense item.

The Mechanical Appliance Co., Milwaukee, Wis., manufacturers of Watson electric motors, have devised a machine for use in their own shops which avoids the removal of the shafting from the racks by bringing the motor-driven hack saw to the pile of shafting.

A standard tiering machine, shown in the accompanying engraving, is utilized for raising the platform which carries the saw to the correct level of the shafting. One operator is able by means of this arrangement to take care of the complete cutting-off of the shafting. As many as six men were formerly employed to carry long pieces of the heavier sizes of shafting to the saw.



UNIQUE ADAPTATION OF TIERING MACHINE AND HACK SAW FOR THE ECONOMICAL CUTTING OF SHAFTS WITHOUT REMOVING FROM STOCK RACKS.

Its use has effected considerable saving in time and money, the economy and adaptability of the apparatus to many plants being obvious.

PLAIN VISE FOR MILLING MACHINES

THE plain vise shown in the accompanying engravings is a product of the Cleveland Milling Machine Co., Cleveland, O., who have endeavored to eliminate certain objectionable features of previous vise construction.

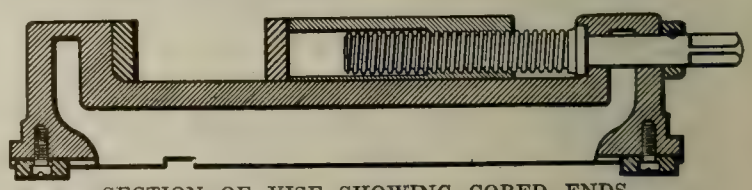
To facilitate the interchanging and settling of vises when used as jigs or fixtures on milling machines, the tongue slot in all vises is accurately milled an exact distance from the face of the solid jaw, thus allowing one vise to be loaded or unloaded while the cutters are working on the piece or pieces in the other vise.

Ample clamping surface is provided by a machine-finished flange on all four edges of the vice which permits of a low built vise without sacrificing strength and rigidity.

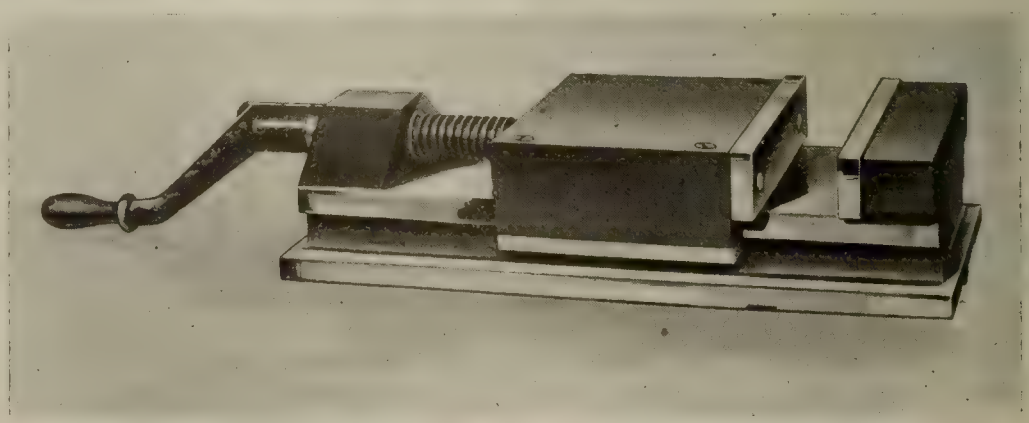
The jaws which are of steel are capable of being removed for the purpose of inserting special jaws for holding irregularly shaped pieces. The movable jaw is gibbed around the outside and the diameter of the screw is as large as is consistent with the height of the vise.

In casting the base of the vise, cores are set in the end pieces—the solid jaw and screw bearing parts—and this practice effectually eliminates the shrinkage which occurs when the comparatively large amount of metal cools in a solid casting, and hence reduces the liability of cracking at these points of stress.

The regular equipment comprises one pair of clamps and bolts, one crank handle and hardened and ground tongues, the complete outfit in shipping form weighing 60 pounds.



SECTION OF VISE SHOWING CORED ENDS.



PLAIN MACHINE VISE OF LOW DESIGN WITH MACHINED FLANGE.

TWO-SPEED CHAIN HOIST

THE accompanying illustrations show the mechanical construction of the Simplex chain hoist, one of a line of hoisting specialties manufactured by J. G. Speidel, Reading, Pa., a novel feature of the apparatus being the simple and ingenious method of securing two speeds.

An endless hand chain is laid over the large chain wheel, which, in connection with a pinion and a brake wheel with ratchet teeth in the outer rim, form the automatic brake, which keeps the load from running down. These three parts, when put together, are handled like one piece, and turn loose on the reduced extension of the main shaft.

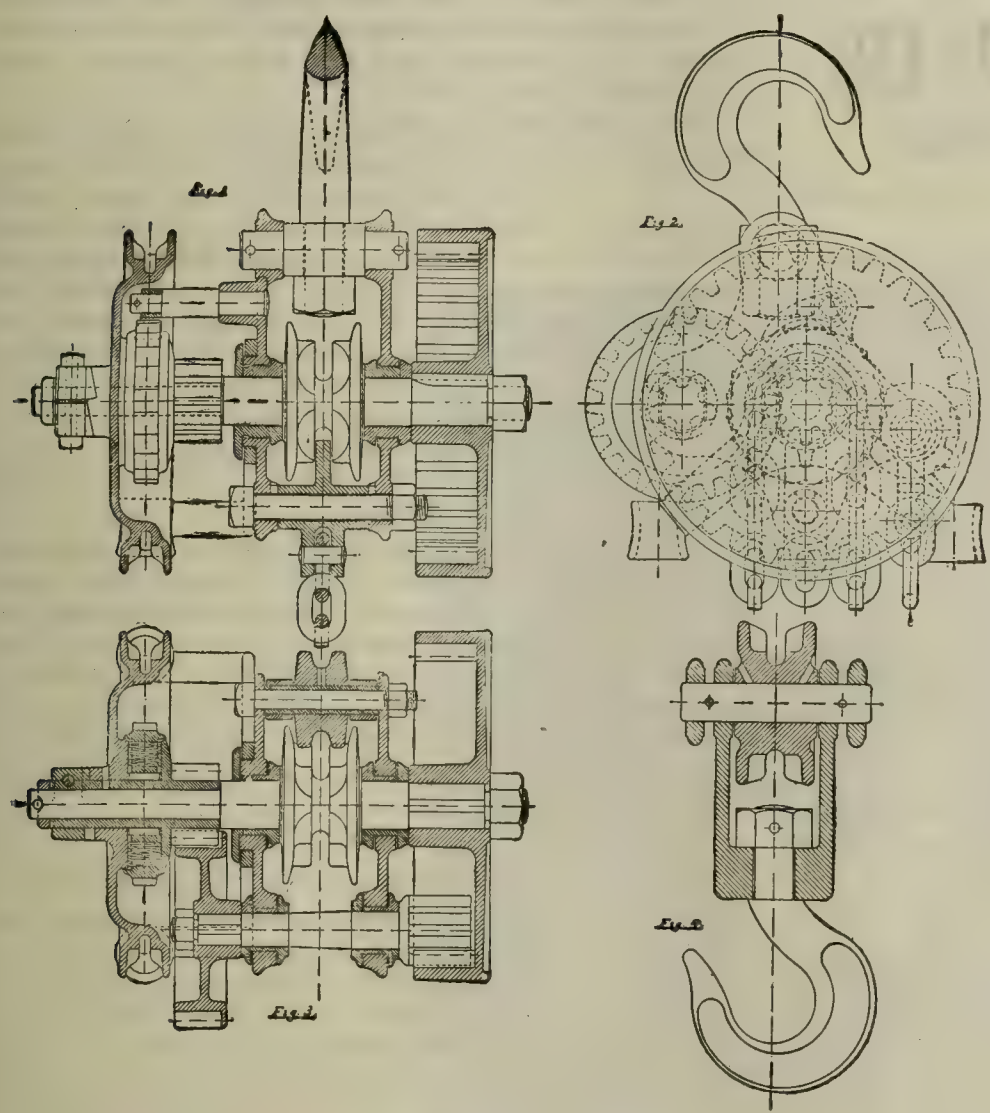
The pinion attached to the hand chain wheel drives a spur gear, which is keyed to a second shaft, at the end of which is another pinion, which engages with the teeth of an internal spur gear, which is keyed to the opposite end of the main shaft, to which is attached the lift chain wheel. Thus, by means of two pairs of spur gearing, motion is transmitted from the hand chain to the lift chain. By pulling on the hand chain, in one or the other direction, the load is either lifted or lowered.

In hoisting the load the brake wheel, with its ratchet teeth on the outer rim, revolves freely with the hand chain wheel and pinion, not causing any resistance, the ratchet pawl running freely over the teeth. As soon as the pull on the hand chain ceases, the pawl engages with the ratchet teeth on the brake wheel, keeping it from running backward, and so keeping the load suspended.

In lowering the load the hand chain is pulled in the opposite direction, and a slight pull is sufficient to overcome the friction of the automatic brake, thus allowing the load to descend and holding the same suspended again as soon as the operator stops pulling on the hand chain. By a continuous pull on the hand chain the load can be lowered at a good speed.

Features of the design which make for positive action and flexibility of control are as follows: A pawl arrangement in the lower block, which locks the hoisting chain to the sheave, allowing light loads to be hoisted at double the speed used when working to capacity load; the guides through which the hand chain passes are closed rings attached to a swinging frame, which permits them to take up the position of least resistance when the chain is pulled at any angle, thus allowing the operator to stand well out from beneath the hoist without imposing undue wear on the chain and guides; the lift chain is prevented from jumping over the sprocket of the lift chain wheel by means of a guide roller, and a stripper, which runs up through the narrow groove of the lift chain wheel prevents the chain from sticking to the wheel.

This hoist is supplied in capacities ranging from 1,000 pounds up to 40,000 pounds, and it is claimed that one man can lift any load up to 16,000 pounds, above which two men are required.



TWO-SPEED CHAIN HOIST.

DOMINION REVENUE INCREASE

THE Dominion revenues for the seven months of the fiscal year ending Oct. 31, totalled $145,719,060. For the same period last year they were $121,767,808. The increase was largely due to customs collections, which jumped from $75,191,250 to $91,763,123. Expenditures on ordinary account for the seven months totalled $66,644,227 as against $57,561,116 in 1916. Expenditures on capital account reached the sum of $144,213,352, of which $133,254,798 was due to the war, and $10,599,242 was on account of public works. Last year the war expenditure for the same period was $127,487,147, and the public works expenditure $13,540,236. The total for same period last year was $141,390.862. The war expenditure for the month of October was $45.481,940. The total net debt of the Dominion on Oct. 31 was $948,236,872, an increase of $47,227,371 for the month of October.

Screenings

The latest story about the Bishop of London concerns a week-end he spent recently at a friend's house in the country.

On the Monday morning he was playing tennis with his host's son, a young officer home on short leave from the front, with whom he had frequently played before.

Usually the Bishop more than held his own with him, but on this occasion it was not so.

Between games he remarked to his opponent:

"I simply can't stand your service today."

"Then we're quits," was the cheeky reply. "I couldn't stand yours yesterday."

"AN' hoo's the guid wife, Sandy?" said one farmer to another as they met at the market and exchanged snuff-boxes.

"Did ye no' hear that she's dead and buried?" said Sandy solemnly. "Dear me!" exclaimed his friend sympathetically, "surely it must have been sudden?" "Oh, ay, it was sudden," returned Sandy. "Ye see, when she turned ill we had nae time tae send for a doctor, sae I gied her a bit of medicine I had lying in a drawer for a year or two, an' that I had got frae the doctor for myself', but hadna ta'en. It's a sair loss tae me, but it's something tae be thankfu' for I didna tak' the medicine myself'!"

A zealous policeman caught a cab driver in the act of driving recklessly. The officer stopped him and said:

"What's yer name?"

"Ye'd better try and find out," said the driver peevishly.

"Sure, and I will," said the policeman as he went round to the side of the cab where the name ought to have been painted; but the letters had been rubbed off.

"Aha," cried the officer. "Now ye'll git yersel' into worse disgrace than ever. Yer name seems to be obliterated."

"You're wrong!" shouted the driver triumphantly, " 'Tis O'Sullivan."

The steamer was just putting off from the pier when a stout gentleman came tearing along, flourishing his stick and shouting excitedly:

"Stop! Put her back—put her back! There's a party—between 60 and 70—wanting to go."

The captain, seeing that there were very few passengers aboard, thought it worth while to "put back."

The old gentleman thereupon stepped on board and collapsed into the nearest deck chair and wiped his steaming brow.

The captain waited, with his eyes scanning the pier.

"How long are they going to be?" he asked. "Where is your party of 60 or 70?"

The heated gentleman looked up in mild surprise.

"Oh," he said. "I'm the party. I'm 65 to-day, sir."

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Vol. XVIII. NOVEMBER 22, 1917 No. 21

INDUSTRIAL ACTIVITY ANTICIPATES "VICTORY LOAN" SUCCESS

ON every hand, the duty of investing their savings in Victory Bonds is being so strongly impressed on our people that it is almost superfluous for us to add a further word of exhortation. A selling organization unparalleled in the history of the Dominion, supported by the leading business and financial personalities of the latter and backed by the most effective publicity methods—direct and indirect—is carrying the crusade to the most remote corners of the land with conviction to each citizen individually of the necessity of raising the millions aimed at to bring to a successful and speedy termination the world war in which we with our Allies are so deeply involved.

We would like to impress upon our readers, however, apart altogether from motives of duty, the pecuniary advantages to be derived from participation in the loan. As a cold business proposition, investment in Victory Bonds is a most desirable venture, furnishing an opportunity of rarest occurrence and of extraordinary possibilities. The yield, indeed, on these Victory Bonds is so high that some patriots will be inclined to question its necessity. High yields are doubtless desirable in order to make sure of an overwhelming success, but, even so, it is being asked whether, with such a strong selling organization in existence, the loan could not have been floated to quite as good advantage at a less cost to the Government. Be this as it may, the fact remains that the return on the bonds is admittedly high and he would be a foolish investor who would hesitate to take every possible advantage of the opportunity to put out his money on these alluring terms.

There is another side to the Victory Loan. It has been brought home to us in recent months that for the duration of the war at least the wheels of industry in Canada must needs revolve through the power medium of money supplied by her own people. In a word, much business is available for our manufacturing plants—metal-working and otherwise; same is procurable, however, for the most part, only if we bear its financing on our own shoulders in the shape of credit to the Imperial Government.

Munitions making in Canada has for several months been ebbing, and until quite recently had every appearance of becoming a more or less negligible quantity. Realization of the imminence of such a possibility was, needless to say, little relished by our business interests. Investigation of the situation disclosed the fact that financing of munitions orders was the chief obstacle in the way, as a result effort was at once directed to satisfactorily overcome the trouble. Flotation of a Victory Loan of at least $150,000,000 was planned, and while the amount secured to date, with the subscription campaign little more than half way through, is several millions short of the minimum aimed at, ultimate success is already assured, and what is perhaps of greatest importance, the flow of shell contracts on behalf of the Imperial Government has been resumed, and our metal-working plants are beginning to hum with the activity that marked their operation for many months previous to the early spring of this year.

Not only has shell-making been resumed on behalf of the Imperial Government, but contracts of considerable value covering 75 and 155 millimetre shells have been placed in Canada by the U.S. Government. Airplane engine manufacture is a further development of the industrial situation in Canada, and doubtless is also a result of our undertaking the financing of Allied Government contracts. A prominent Toronto firm of automobile manufacturers has secured an Imperial Government order to the value of $5,000,000, covering the supply of Sunbeam "V" type, 8-cylinder, 200 horsepower, airplane engines, and is now busily engaged installing the necessary equipment, which by the way is readily available.

An interesting and added feature of the market section of this and succeeding issues of our journal will be found in our Washington, D.C., letter. Special attention is drawn to same on this occasion, particularly that paragraph referring to the paucity of bids received from United States firms for the supply of 5-inch projectiles. It would appear that opportunities to participate in the distribution of U.S. Government orders are in no sense impossible of being secured, judging from the above.

RAILROAD RATES AND SERVICE EFFICIENCY

THE case of the American railroads—the demand of the carriers for the 15 per cent. increase—has reopened at Washington. Opposition is crumbling under the fire of the fact-proven demands of the carriers that they must have higher profits in order that they may give efficient service. In fact the question now appears to be: How much more than the 15 per cent. will the roads have to be allowed in order that they may play their part in winning the war?

The United States has been in the war a few months. The place of the railroads in the national organization for war-time efficiency is being recognized. Canada has been in the war for more than three years and the Railway Commission, despite arguments that must long ago have overcome any intelligent objections, sits passive while the systems are being so run down that there is serious danger of the whole national machine being seriously interfered with.

If it has been because the advance was refused in the United States that the Canadian Commission has held its hand, that excuse will soon be removed. Canadian business, Canadian manufacturing and Canadian agriculture —although they may be too near sighted to see it—need the maximum of efficiency in transportation service at this time and the starvation of the railroads must cease if they are to give that service.

The high cost of materials of construction of every kind, and the increased wages being paid operators make it a sheer impossibility now to maintain a high standard of efficiency in rolling stock and roadbed equipment, and little doubt is entertained that with a reasonable rate increase, a stimulus will be given railroad betterment, which would be otherwise unobtainable for the duration of the war, and perhaps for many months thereafter.

INDUSTRIAL NOTABILITIES

WALTER LAURIE, vice-president and general manager Laurie Machinery Co., Ltd., distributors of general machinery of all kinds, 335A Craig Street west, Montreal, Que., was born in that city, May 14, 1865, son of John and Jane (Thompson) Laurie. He was educated at the Montreal High School,

WALTER LAURIE.

following which he began his business career with the Laurie Engine Co., Ltd., Montreal, serving them in various capacities from 1882 to 1907. He organized and established the present business in 1907, and has had active charge of its administration and operation since that date.

Mr. Laurie married Elizabeth Tucker, of Newfoundland, 1905. His clubs are confined to the Engineer's, Montreal, and his societies to the A. F. & A. M. (Shriner). The family residence is at 2461 Hutchison Street, Montreal, Que.

—Photo, courtesy British & Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

Government prices.

	Montreal	Toronto
Hamilton	....	50 00
Victoria	....	50 00

FINISHED IRON AND STEEL

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3/16 in.	13 20
Chequered floor plate, ¼ in.	13 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	*2 90
Tank plates, Pittsburgh	*3 25
Structural shapes, Pittsburgh	*3 00
Steel hoops, Pittsburgh	3 50

F.O.B., Toronto Warehouse

Steel bars	5 50
Small shapes	5 75

F.O.B. Chicago Warehouse

Steel bars	4 50
Structural shapes	5 00
Plates	7 00

*Government prices.

FREIGHT RATES

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Lake copper	$32 50	$32 00
Electro copper	32 50	32 00
Castings, copper	31 50	31 00
Tin	70 00	72 00
Spelter	10 50	10 50
Lead	9 50	8 50
Antimony	17 00	18 00
Aluminum	60 00	62 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ¼ to ½	$13 00	$12 00
Heads	13 30	12 30
Tank plates, 3-16 in.	13 10	12 10

WROUGHT PIPE

Effective July 5, 1917.

Standard Buttweld

Size	Black Per 100 feet	Galvanized Per 100 feet
⅛ in.	$5 00	$6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00

Standard Lapweld

2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ ins.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 45%.

4½" and larger, 40%.

4" and under, running thread, 25%.

Standard couplings, 4" and under, 35%.

4½" and larger, 15%.

OLD MATERIAL

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	21 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	15 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	20 50
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	6 00	7 00
Tea lead	5 00	5 75
Aluminum	28 00	25 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up.	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 20
Elevator bolts	5
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	15
Boiler rivets, base ¾-in. and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	72½
Wood screws, O. & R., bright	67½
Wood screws, flat, brass	37½
Wood screws, O. & R., brass	32½
Woodscrews, flat, bronze	27½
Wood screws, O. & R., bronze	25

MILLED PRODUCTS

	Per cent.
Set screws	25
Eq. & Hex. Head Cap Screws	20
Rd. & Fil Head Cap Screws	net
Flat ⅞ But. Hd. Cap Screws plus	net
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and semi-fin. nuts over 1½ in., up to 2 in.	plus 10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4 50
Cold pressed nuts over 1½ in.	add $7 00

BILLETS

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$5 50	$5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		$7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drums	4 75
White lead, pure, cwt.	16 55
Red dry lead, 100-lb. kegs, per cwt.	16 25
Glue, English	0 38
Tarred slater's paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 78
Linseed oil, raw, single bbls.	1 42
Linseed oil, boiled, single bbls.	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery cloth	list plus 33 1-3
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Drilling cables, Manila	0 41
Plumbers' oakum, per lb.	0 09
Packing, square braided	0 34
Packing, No. 1 Italian	0 40
Packing, No. 2 Italian	0 32
Pure Manila rope	0 39
British Manila Rope	0 33
New Zealand Hemp	0 33
Transmission rope, Manila	0 45
Cotton Rope, ¼-in. and up	0 47

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

CARBON DRILLS AND REAMERS

	Per Cent.
S.S. drills, wire sizes up to 52	30
S.S. drills, wire sizes, No. 53 to 80	net
Standard drills to 1½ in.	30
Standard drills, over 1½ in.	30
3-fluted drills, plus	10
Jobbers' and letter sizes	20
Bit stock	25
Ratchet drills	15
S.S. drills for wood	30
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 30
Bridge reamers	52½
Centre reamers	10
Chucking reamers	net
Hand reamers	10

COLD ROLLED SHAFTING

At mill ..... list plus 40%

At warehouse ..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Canadian malleable, A, add 35%; B and C, plus 25%; cast iron, net; standard bushings, 25%; headers, 60; flanged unions, 5; malleable bushings, 30; nipples, 45; malleable lipped unions, 40.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$9 50	$ 9 00
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	10 20
Premier, 10¾ oz.	13 85	10 50
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	40
Black Diamond	40
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	37½
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke	
Connelsville Foundry Coke	
Steam Lump Coal	
Best Slack	

Net ton f.o.b. Toronto.

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun, Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White.	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

Colored.	
Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14 x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base	64 00	60 00
Braziers', in sheets, 6 x 4 base	55 00	52 00

BRASS.

Brass rods, base ½ in. to 1 in. rod	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	06
Emery glue	15 to 20
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt, sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

Market Condition and Tendency

MORE orders for shrapnel have been placed by the Imperial Munitions Board, which is additional evidence that the revival in the munitions industry is an assured fact. Further orders for 6-inch shells are likely to be placed by the Board within the next few months. The machine tool business has brightened up considerably and there is a good demand for equipment for shell plants. There have been more enquiries for second-hand tools and the market is again being cleaned up of this class of equipment. The Dominion Government has prohibited the exportation of iron and steel except under license from the Customs department on account of the serious shortage. This step had to be taken in order to relieve, as far as possible, what has developed into a serious situation intensified by the embargo on iron and steel from the States. The Canadian embargo affects pig-iron, steel ingots, billets, blooms, rods, bars and shapes. Prices of black sheets in the lighter gauges and galvanized sheets have again declined, while steel plates are also lower due to the easier situation in these materials in the States. Prices of other steel products are unchanged and remain firm in the meantime. The pig-iron market remains firm and situation unchanged. The position of the non-ferrous metals is practically the same as last week. In spite of the heavy demand for copper there appears to be enough of the red metal to satisfy the demand, although the smaller consumers are having some difficulty in obtaining supplies due to the delay in distribution. The scrap situation is unchanged: both buyers and sellers are exhibiting a disposition to await developments owing to the unsettled condition of the market.

MONTREAL, QUE., Nov. 19, 1917.—Every effort is being put forward to make the present Victory Loan one of the greatest financial achievements in the history of the Dominion. Every branch of commercial and industrial activity is engaged in the task of making this undertaking a huge success; the Canadian metropolis has just experienced the greatest patriotic demonstration since its inception as a city—and, if enthusiasm is any indication of material backing, the success of the loan is already assured. The appropriation of the money raised will eventually mean greatly increased industrial activity and we trust be the means to a more speedy ending of present hostilities.

Steel

The steel situation is practically unchanged, the market being still influenced by the effect of the recent price fixing, which has now been made on nearly every important commodity or raw material. Price regulations for the past week were those on iron bars and rivets, the quotation on the former being set at 3½ cents per lb., Pittsburgh; this being a decline of 1¼ cents on the prices recently quoted on the open market. The adjusted price on rivets, both structural and boiler, is now $4.65 per hundred lbs.

Interest at present is centred in the munitions contracts being placed in Canada for large quantities of American shells. It is expected, however, that the steel required for these orders will come from the States. Hopes are entertained that the success of the Victory loan will place sufficient funds at the disposal of the Canadian Government to ensure that the production of British

munitions will be materially revived, and renewed stimulus be given to the industrial activity of the Dominion. Such action would again renew the demand upon Canadian steel mills and foundries. American Government requirements dominate the steel situation to the extent that material for domestic purposes is almost impossible to obtain. The Canadian situation shows no new developments, dealers reporting firm but unchanged quotations.

Metals

The market generally has no features of interest as complex conditions tend to place consumers and dealers in a passive mood, awaiting further developments. Copper conditions are still shrouded in mystery, with outsiders uncertain of their position. Tin is scarce and higher. Spelter is quiet but firm. Lead is steady with a stronger tone. Antimony and aluminum are both unchanged.

Copper.—A complex situation still features the copper market, with producers claiming that the available supply is inadequate to the demands from all quarters. The requirements of the American Government are receiving the first consideration and domestic consumers are still in the dark regarding the possibility of obtaining sufficient metal to meet their immediate needs. It is expected that the acute situation may be relieved by the first of the year, when production will have been considerably increased. An interesting sequel is looked for out of chaos that now prevails. Local dealers are maintaining last week's quotation of 32½ cents for lake and electro, and 31½ cents for castings, with the market very firm.

Tin.—The inability to secure permits has placed the market in a very strong but indefinite position. British co-operation must be given on a better basis to relieve the situation now developing. It is almost impossible to obtain prompt metal, and nothing definite is promised for first quarter metal. The New York quotation of 74 cents shows an advance over last week of 3 cents per lb. The local market has been influenced by American conditions and the shortage of stocks has resulted in dealers advancing prices to 70 cents per lb., 2½ cents higher than past week.

Spelter.—The market is still devoid of feature and continues quiet and unchanged, but relatively firm. The price recently fixed for galvanized sheets has not given much inducement for galvanizers to become actively interested, owing to the small margin of profit on the coating of black sheets. The demand is light but the undertone is one of early strength. New York's quotation of 8⅛ cents shows an advance of ⅜ cents per lb. The market here is not active but continues firm with prices strong at 10½ cents per lb.

Lead.—The situation has maintained its recent strength and quotations remain firm. This week's demand has not been so heavy but business is of a steady character. New York is a little firmer and local dealers report a strong but unchanged market with quotations firm at 9½ cents per lb.

Antimony.—The demand is irregular and a weaker market has resulted. The situation here is inactive but prices are well maintained; dealers quote 17 cents per lb.

Aluminum.—A slightly better tone has been evident during the past week but no features have developed. Quotations are steady at 60 cents per lb.

Machine Tools and Supplies

Renewed interest has been given to the machine tool industry by the placing of American contracts for 75 mm. and probably six inch shells in Canada. While this business will go to those plants that are well equipped with machinery for the purpose, it is very likely that much additional machinery will be required to meet the production of the new shells. Inquiries are already of an encouraging character, and dealers report increased activity in munitions orders and also general equipment. The near future may also see a renewal of activity in the production of British shells which has recently shown a falling off. Delivery on machinery coming from the States is very uncertain owing to the abnormal conditions existing there. Quotations on supplies have shown a tendency to steady under the price regulations on raw materials.

Scrap

Nothing of interest has transpired to alter the general tone of the old metal market and, while minor fluctuations have taken place during the week, the present quotations are the same as last week. Dealers here report a steady market with prices firm and unchanged.

Toronto

TORONTO, Ont., Nov. 20.—The revival in the munitions industry has already been reflected in the machine tool business, and the demand is more active now than it has been for some months. Further contracts for shrapnel have been placed by the Imperial Munitions Board, which, together with the 75 mm. shells, will keep a number of manufacturers actively engaged for some time to come. The 75 mm. contract is believed to be for seven million shells. A busy winter is anticipated in the shell industry. Mention was made in these columns some time ago of a plant being equipped for making airplane engines. This factory is now practically completed, and the manufacture of the "Sunbeam" motor will commence shortly. The firm in question is the Willys-Overland Co. of this city, and they have secured a contract for this engine, which will run into over $4,000,000. The Sunbeam is a "V" type motor with eight cylinders, and is rated at 200 h.p.

Steel

The latest development in the steel trade is an embargo which has been placed on the exportation of iron and steel from Canada. The exportation of certain forms of steel and iron has been prohibited except under license from the Customs Department. The products covered by the embargo include pig iron, steel ingots, billets, blooms, rods, bars, plates and shapes. Such action by the Dominion Government is not altogether a surprise in view of the serious shortage of steel and iron in the Dominion, which was intensified by the restrictions placed on the export of iron and steel a few weeks ago from the United States. The restriction of exports from Canada is largely a precautionary measure to conserve resources, and will not materially affect the export trade, as comparatively little tonnage in the above mentioned materials has been sent abroad. The export trade has consisted principally of a few steel products which are not included in the embargo. The fact that the exportation of steel has been prohibited proves emphatically that there is a shortage, and that there must be strict economy in the use of iron and steel. There is a report going the rounds that the embargo on steel from the States will be raised owing to the delay occasioned in obtaining shipping permits. In view of the heavy demand in the States for steel, this hardly seems likely, as the necessity of conserving supplies of steel for war purposes is paramount. The matter as it stands at present is as follows: The Priority Board will give precedence to requests for steel for munitions and other war supplies and for shipbuilding. It will then consider the needs of railways and their equipment and farming machinery.

There has been a further decline in No. 28 gauge black sheets, which are now quoted at $9 per 100 lbs., while prices of galvanized sheets are also lower, Premier No. 28 gauge being now quoted at $10.20 and 10¾ ozs. at $10.50 per 100 lbs. Weakness has developed in prices of steel plates, due to the easier market in the States following Government price regulation. Prices are down 1c per pound, and local quotations are now as follows: Plates, ¼ to ½ inch, $12; heads, $12.30, and tank plates, 3/16 inch, $12.10 per 100 lbs. A further decline in plates may be looked for in the near future. Apart from the above mentioned products, there have been no changes and prices are holding firm in the meantime. There is no indication of a decline in prices of bars or shapes just at present in spite of the easier situation in these products across the line.

Pig Iron

The embargo on the export of Canadian pig iron will not materially affect the market, as no pig iron is being exported. There is some "Hamilton" foundry iron now on the market at $50 per ton, which is the same price as "Victoria" iron. The market is a little firmer this week, due to the tight coke situation. In the States there is a scarcity of pig iron, and many steel companies are being forced into the market to purchase basic, Bessemer and low phosphorus pig iron because of the inadequate supply of coke, which has com-

pelled the banking and blowing out of their own blast furnaces. The coke situation is growing worse on account of the congestion of freight on the railways. There is practically no $6 furnace coke being offered on the market, so lower prices on this material are apparently unlikely for some time.

Scrap

There is no change in the situation in the scrap metal market, and prices are being quoted on the basis of quotations given last week. There seems to be a general disposition on the part of both buyers and sellers to await developments, as the market continues in an unsettled condition.

Machine Tools

The machine tool market is again active, and the outlook for business has improved considerably. More orders for shrapnel are being placed by the Imperial Munitions Board, which has resulted in inquiries for machine tools from plants which had disposed of some of their equipment. All indications point to great activity in the munitions industry this winter, as further orders for shells will likely be placed by the Munitions Board. One or two more firms have recently secured orders for 75 mm. shells from the United States Government, but further activity in this direction will likely be limited unless the present intentions of the United States Government undergo a change.

Supplies

Business in machine shop supplies is more active and prices are holding firm for most lines. Deliveries are no better, particularly on imported supplies, owing to the big demand in the States. Local supply houses seem pleased with the situation, the only complaint being in the matter of deliveries and shortage of some lines.

Metals

There is no change to speak of in the metal markets this week. A great scarcity of tin is reported from New York, although this does not appear to be the case locally, as some dealers report tin as being readily obtainable. There is nothing new to report as to copper, while the general position of other metals is also unchanged. The outlook in the market has improved owing to the revival in the munitions industry.

Copper.—The position of copper remains unchanged. Reports from the primary market indicate that larger consumers having contracts are well provided for, but others are not in such a favorable position. It is generally believed that there will be enough copper to go round, even after Government needs have been provided for. Lake and electrolytic copper are quoted at 32c and castings at 31c per pound.

Tin.—The price of tin continues high and the situation unchanged in the primary market. There is reason to believe that the shortage of tin in the States will become less acute in the near future, as an effort is being made by the authorities to relieve the situation. Tin is quoted locally at 72c per pound.

Spelter.—The spelter situation is more satisfactory and the demand is fairly good, although prices have not changed. Local price, 10½c per pound.

Lead.—There is still a fairly good demand for lead, which is holding the market firm. The undertone of the market is firm, with the possibility of higher prices. Local price, 8½c per pound.

Antimony.—The market remains weak owing to there being little demand, but a firmer market is looked for later. Antimony is quoted locally at 18c per pound.

Aluminum.—The market is firmer owing to a slight improvement in demand, but quotations are unchanged at 62c per pound.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.

Washington

WASHINGTON, D.C., Nov. 19.—The United States Shipping Board has done away with the system of calling bids when placing its contracts for ship equipment and ship deck machinery. A survey of the market of available equipment is undertaken and purchases made in the open market where the best prices are quoted. This system has been adopted because it has been found that the calling of bids consumes too much time and delays the shipbuilding programme. Manufacturers who desire to compete for business should send their price schedules to F. H. Brown, purchasing agent, Emergency Fleet Corporation, Washington, D.C.

Vessels Under Construction

The Shipping Board now has under construction 1,200 ships, with a total tonnage of 7,500,000. There are 400 wooden and concrete ships building, with a total tonnage of 1,500,000 tons; 400 steel ships, with a tonnage of 3,000,000 tons; and 400 vessels taken over from private constructors with a total tonnage of 3,000,000. The Henry Ford automibile factory in Detroit has been turned over to the U. S. Government, and arrangements are now being made for the construction there of some of the equipment needed by the Emergency Fleet Corporation.

Changes in the Emergency Fleet Corporation have taken place with the entrance of Charles Piez, of Chicago, as vice-president. Admiral W. L. Capps, while still the general manager of the Fleet Corporation, has delegated the most of his power to Mr. Piez. From now on Admiral Capps will have supervision only over actual construction. Matters of policy and business will be controlled by Mr. Piez.

Requisitioning of Sailing Vessels

Possibility of the requisitioning of one million tons of sailing vessels now looms up. Thomas A. Edison, American inventor, has proposed a plan for the installation of engines in these craft, with twin screw propellers. Such vessels could be sent into the war zone, according to Edison. Naval constructors are now considering the practicability of the plan.

Navy Department Specifications

The Bureau of Supplies and Accounts of the Navy Department has asked for bids on the following articles:—Cocks, air; cocks, steam and water; cocks, stop; fittings, pipe bends; fittings, pipe unions; gauges for forced draft and forced lubrication; bronze automatic and non-automatic water gauges; pressure reducing valves; radiator and relief valves; brass steam and water valves. Manufacturers desiring to offer bids should write to the Bureau of Supplies and Accounts of the Navy Department, Washington, D.C., requesting schedules 1562, 1563, 1564, and 1565.

The War Trade Board has issued a new ruling prohibiting the exportation of tin plate from the United States except as containers for food products.

Curtailment of Motor Car Manufacture

Reports of the Department of Commerce show that exportation of motor cars to Canada during the month of September were as follows:— Sixty-two commercial cars valued at $90,445; 595 pleasure cars valued at $553,316. In view of this fact it appears that the War Industries Board proposed curtailment of the manufacture of pleasure cars in the United States will have a decided affect upon Canada. The present program for curtailment will reduce the manufacture of pleasure automobiles in the United States about sixty per cent. in the next six months.

Eight of the principal express companies in the United States have petitioned the Interstate Commerce Commission for a flat increase of ten per cent. upon express between the United States and Canada.

In order to facilitate the American merchant marine program the Railroads War Board has been concentrating flat cars for moving lumber to the shipyards. During the past week 1,500 flat cars have been rushed to lines operating between the lumber districts and the shipyards.

Director of Steel Supply Appointed

J. L. Replogle, vice-president of the American Vanadium Co., has been appointed director of the steel supply for the Council of National Defense. All demands for steel will pass through the hands of Replogle, working with the War Industries Board. It is the plan of the Council to name a number of such direc-

tors to control the various manufacturing products and thereby cut down the activities of the non-essential manufactories.

U.S. Firms Indifferent About Shells

Manufacture of shells seems to hold little attraction for the American manufacturer; but two firms offered bids on a recent war department contract for 336,000 five-inch projectiles, estimated to cost $4,000,000. Deliveries will be begun in May next at the rate of 1,000 a day.

Judge Robert Lovett of the War Industries Board has given notice that a new ruling on priority orders will be issued shortly which may curtail non-essential industries. The priority order will virtually cut off transportation facilities from non-essential factories.

Henry Ford has been added to the organization of the Shipping Board in an advisory capacity.

New York

NEW YORK, Nov. 17.—The most encouraging development in the steel trade this week was the announcement that orders for commercial steel taken by the mills since Nov. 1 have been double the tonnage of the acceptances during the first half of October. This is an indication that the steel companies feel assured that so-called peace bookings will not interfere with the prompt execution of war orders for the United States and the Allied Governments.

Munitions Contracts Placed

The War Department has distributed orders for about 21,000,000 of the 33,000,000 shell referred to last week among various manufacturers in the United States and Canada. It is estimated that about one-third of such orders went to manufacturers in the latter country. It is estimated that about 150,000 tons of steel bars will be ordered by the Government to be shipped to munition makers. Nearly all of the above shell are for anti-aircraft guns and 75-mm. field pieces. Expenditures of between $225,000,000 and $250,000,000 on these contracts will be necessary.

It is understood that the T. H. Symington Co., the American Can Co., the American Car & Foundry Co., the New York Air Brake, the General Electric Co., and the Worthington Pump & Machinery Co. are among the companies to whom the principal shell awards were made. Some of these concerns have been actively buying machine tools for employment on Government work. Several other munition manufacturers have also placed contracts for machinery including the Osgood Mfg. Co. of Marion, Ohio., the International Fuse & Arms Corporation, of Bloomfield, N.J., and the Bartlett Hayward Co. of Baltimore. The latter company's purchases of tools has amounted to $300,000. The Twin City Forge & Foundry Co. of Stillwater, Minn., has a $3,000,000 contract for 6-inch shells.

Equipment for Gun Mechanisms

Dodge Bros., of Detroit, who have a $30,000,000 contract to manufacture recoil gun mechanisms, are now in the market for 60 planers and the Midvale Steel & Ordnance Co. has been buying similar tools for its ordnance plant. The Wellman-Seaver-Morgan Co., of Cleveland, has been awarded two large contracts, amounting to $5,000,000, for condensers, steering engines and for other equipment for submarine destroyers and has placed a contract for the building of a machine shop at its Akron, Ohio, plant, where most of the steering engines will be manufactured.

The Navy Department has taken bids on three large hammer-head cranes for installation at navy yards. The cranes to be purchased are the largest of this type that have ever been built and will cost approximately $2,000,000. The Government is also negotiating for a large number of locomotive cranes to be put into service at railroad terminals along the Atlantic seaboard. The cost of these cranes will be about $18,000,000. Purchases of tools continue to be made for equipping the Watertown and Rock Island arsenals and buying of tools for the Watervliet arsenal is expected to begin this week.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Shipbuilding Contracts

The Emergency Fleet Corporation has placed a contract with the Federal Shipbuilding Co. for ten 9,400-ton merchant vessels, the building of which will require about 36,000 tons of shapes and plates. The American Bridge Co., which will do the fabrication for its sister subsidiary company, has already shipped the keel for the first boat to the plant in the Hackensack Meadows. The keel is being laid to-day and the keels for four other boats will be laid down at the same plant within the next two weeks.

The Dominion Bridge Co. of Montreal, Toronto, etc., has secured a second large order for the fabrication of the steel for some of the boats to be built at the Hog Island plant of the American International Shipbuilding Co. The Toronto and Montreal shops have capacity sold for ten months, indicating orders for 40,000 tons. Six shipbuilding companies on the Atlantic and on the Pacific coasts have placed additional large orders for machine tools this week.

Pittsburgh

PITTSBURGH, Pa., Nov. 17.—Details as to how much shell steel tonnage has been allotted against the Government's programme of placing 1,500,000 tons are not available, but it is thought that more than half the tonnage has been definitely placed. It is evident that in a short time the United States will be producing considerably more shell steel than ever before, as orders are being placed in Canada, and the United States is being canvassed to find additional plants that can be utilized for shell manufacture, while at the same time exports of shell steel are being continued at substantially the rate of 1916. September exports, just reported, show 148,932 gross tons of billets, blooms, ingots, etc., and 47,577 tons of steel bars, the bulk of the tonnage in each case being doubtless shell steel. The total iron and steel exports in September were 489,415 tons, exports for the nine months being 4,525,971 tons.

Export Prices

There has been some divergence of opinion as to what prices would rule in the case of iron and steel exported under the general principle known as "one price for all." That has customarily been stated as being one price for the Government, its Allies, and the public. Some held that this meant all sales, others contending "the public" meant only the public of the United States. There was a further question, also, as to sales to "The Allies," as that might mean the governments of the allied countries, or the countries themselves.

Gradually the situation has been clearing until now the common understanding is that the one price must apply to steel that is destined directly or indirectly for the war, while purely commercial steel, such as would be exported to South America, can be sold at any price. The real power in the matter is the bureau that grants export licenses. The understanding of those closest to the bureau is that Washington is going to be very strict in the direction that steel intended, even quite indirectly, for war use must go at not above the set prices.

Institute Announces Prices

The American Iron and Steel Institute has this week published a long statement pertaining to prices, extras, differentials, etc. This is in conformity with the arrangement between it and the War Industries Board, whereby the latter has set basis prices for various commodities and looks to the trade to develop prices in detail that will conform with the basis prices. The Institute committees work with the manufacturers in the various lines, but it does not follow that every price or regulation the Institute promulgates has the full sanction of the great majority

of the manufacturers involved. The Institute is under the necessity of eventually satisfying the War Industries Board that the prices and regulations are all in keeping.

Some of the prices announced by the Institute are:—Forging billets, base, $60 per gross ton; lapweld steel boiler tubes, basing discount, 34 per cent. off list; iron, 12½ per cent. off list, both on carload lots, 3½ to 4½-inch; rivets, 4.65c, base; iron bars, 3.50c, at mill; wire nails, $3.50 per keg.

It is prescribed for jobbers that they add to the mill price plus freight to warehouse a margin not greater than 1.00c for bars, shapes, plates and blue annealed sheets 16 gauge and under, and not more than 1.25c on black sheets, 18 gauge and lighter, and all galvanized sheets, while on shafting the margin is 25 points, equal to 1.25c on base sizes, the producers' discount being 17 per cent. off list.

Sheets Active

The sheet market has been rather active since the Government prices were announced November 5, 4.25c on blue annealed, 10 gauge; 5.00c on black sheets, 28 gauge; and 6.25c on galvanized, 28 gauge. Some of the mills had practically run out of orders, or at least enough to keep them fully engaged, while on the other hand consumers had been delaying purchases awaiting the Government prices. There has been a very fair tonnage done for the remainder of this year, with some deliveries running into January. Without formal opening of books, the American Sheet & Tin Plate Co. is now allotting first half tonnage in blue annealed and black sheets to regular customers, and first quarter tonnage in galvanized sheets. It does not appear, however, that sales are being made to jobbers at this time.

Tin plate for next year is also being booked, though this is hardly ordinary commercial activity, the distribution of the tin plate being so much under Government supervision. About 500,000 boxes are being allotted for export to Allied countries, all of this being tin plate calculated to help prosecute the war.

Generally speaking, the iron and steel markets are quiet, producers usually being well sold up and being indisposed to take on new business. Regular customers, it is constantly asserted, are being taken care of as well as possible.

Coke Supplies Inadequate

The Fuel Administration is paying more attention to the coke situation, but thus far without any material results developing. An order has been issued to ship furnace coke in preference to foundry, as the blast furnaces, insufficiently supplied for many months, are having a harder time than ever, but the tonnage of foundry coke is so small that its replacement by furnace coke cannot help a great deal, and of course foundries will have a still harder time. The chief trouble at present is with the railroads, which have furnished a poorer car supply the past week than for weeks past, the congestion at yards and sidings having grown worse.

More Ship Plates

In the past week or two the Illinois Steel Co. has put in operation the new 90-inch plate mill at the South Works, while the 160-inch plate mill at the Gary plant has just been put in operation. These two new plate mills follow the "Liberty Mill," 110-inch, built by the Carnegie Steel Co. at the Homestead works and put in operation last month. The three mills can produce, if it is possible to operate them at capacity, about 450,000 tons of ship plates a year, against not over 1,800,000 tons of plates of ship character produced in 1916. Some other plate capacity has been completed since the first of the year, and more is coming, and it is possible that in a few months the production of ship plates will be at a rate double the average rate of last year.

Sydney

SYDNEY, N.S., Nov. 16.—Matters affecting the labor and wages questions, and political and patriotic activities are monopolizing public attention in coal and steel circles in Cape Breton.

The Dominion Steel Co. announced an increase of ten per cent. to its employees effective November 1. This is the fifth wage increase given to the steel employees since January 1916, during which period the rate of common labor has increased from 14 cents per hour to 24 cents per hour. The increase given to common labor has been much greater than that given to the higher paid and more skilled workmen, because it is upon this class that the increase in the cost of living bears most heavily.

Coal Output Threatened

The Amalgamated Mine Workers of Nova Scotia met in convention in Sydney and passed a number of resolutions, some of which were of a rather extraordinary nature. A demand was made upon the Dominion Coal Co. and the provincial Government for the dismissal from their present official positions and cancellation of the certificates of the deputy inspector of mines for the Waterford District, and the superintendent and manager of Dominion No. 12 Colliery, because of their alleged responsibility for the explosion which took place at that mine in July last. Later, these officials were indicted by the Grand Jury for manslaughter in the same connection, and were committed for trial. This incident, so far as is known, is without precedent, and has aroused much feeling. The Waterford Local of the A. M. W. of Nova Scotia repudiated the action of the convention in its entirety, and similar action was taken by other locals. The leaders of the A. M. W. stated that if their demand was not complied with the mines of Nova Scotia would not work on two days in each week. This threat was however beyond the power of the leaders to enforce, as the workmen were out of sympathy with any attempt to stop work under war conditions, and the leaders have now announced that in view of the action of the Grand Jury they will not ask the men to take the extreme action advised by the resolution.

Coal Lease Boundaries and Production

The A. M. W. also demanded the rectification of the boundaries of the coal leases of the Dominion Coal Company and the Nova Scotia Steel & Coal Company, and asked the intervention of the Fuel Controller, making the unwarrantable assertion that if the Soctia Company were given access to certain areas of the Dominion Coal Company lying adjacent to the Scotia areas the production of coal could be increased one thousand tons per day. This is not the case, as altogether apart from the question of interfering with boundaries, the limitation on coal production in Cape Breton is entirely a question of labor supply. Both the Nova Scotia Steel & Coal Co. and the Dominion Coal Co. could increase their present outputs by 30 or 40 per cent. were men available, without any increase in mine territory.

Sickness Relief Fund Contributions

The A. M. W. have further demanded from the local Legislature that the Companies be compelled to contribute to the sickness relief funds at the collieries in the ratio of 80 per cent. from the Government and the Companies, and 20 per cent. from the employees. Up to the present time the men have maintained their own sickness relief funds, assisted to a moderate extent by the Government and the Companies.

In this respect the miners have been favored more than any other workmen in Nova Scotia, or for that matter in North America. In January, 1917, the Government passed a Workmen's Compensation Act which has trebled the cost to the coal companies of their previous contributions to sickness and workmen's compensation payments. Notwithstanding this tremendous increase on previous costs, the Dominion Coal Co. has offered to contribute 25 cents per month per man to the sickness funds, but in view of the intemperate attitude of the A. M. W. this offer has been withdrawn, and the Sickness Society has been compelled to cease its operations.

Wage Agreement Expiring

The wage agreement between the Dominion Coal Company and its workmen ceases at the end of 1917, and negotiations are now pending for its renewal. Much will depend on the attitude of the A. M. W., and it is to be hoped the demands which will be made by this organization will not be such that it is impossible for the companies to meet them. A similar condition exists in the case of the Nova Scotia Steel & Coal Co. collieries.

The A. M. W. is a new organization resulting from the amalgamation of the Provincial Workmen's Association and the U. M. W. of Nova Scotia, these two bodies representing respectively the moderates and radicals among the unionists. Latterly the radical element seems

to have dominated the actions of the A. M. W., and the organization is largely on its trial before public opinion, which is not inclined to tolerate any interference with coal production at this juncture.

The A. M. W. is nominating two labor candidates for the forthcoming elections, who have adopted the political platform of the I. L. P. of Ontario, which among other things calls for nationalization of industries and alteration of the British North America Act.

N. S. Victory Loan Campaign

The Victory Loan Campaign has been attended with great success. The Dominion Steel Co. has somewhat under 5,000 employees, and during five days these men have contributed $312,000.00 to the loan. It is expected that before the campaign closes an amount of $400,000.00 will have been subscribed by the Steel Co. employees. The Coal Co. campaign is not so far advanced, but the amount from that source should approach the Steel Co. total. An interesting contest is taking place between the two companies, and the patriotic spirit which is evident in this emulation goes far to assure the observer that the sentiments and the spirit of the coal and steel workers in Cape Breton are thoroughly sound, notwithstanding the effervescence of a small number of radicals who no more represent the men of Cape Breton than the Bolsheviki represent Russia.

EMBARGO IS PLACED ON IRON AND STEEL

EXPORTATION from Canada of iron and steel in unfinished or semi-finished forms, suitable for use in manufactures, will be prohibited by the Dominion Government, except under license from the Department of Customs. The classes of iron and steel goods upon the sale of which outside the Dominion an embargo is placed include pigs of iron, steel, ingots, billets, rods, shapes, angles and plates.

The prohibition of exportation is due to the serious shortage of iron and steel for munition making, shipbuilding and other manufactures. The United States Government has placed restrictions upon the exportation of iron and steel from that country, and has established a priority board to pass upon applications for export licenses. That board will give precedence to requests for steel for munition and other war supplies and for shipbuilding. It will then consider the needs of railways, railway car and locomotive building firms, and other industries.

Canadian manufacturers have conferred together with a view to laying their requirements before the United States priority board. It has been felt that at a time when Canada is applying to the United States for iron and steel it should itself take steps to conserve the domestic output of such material for domestic uses. Export licenses will be granted by the Customs Department only for very special reasons.

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

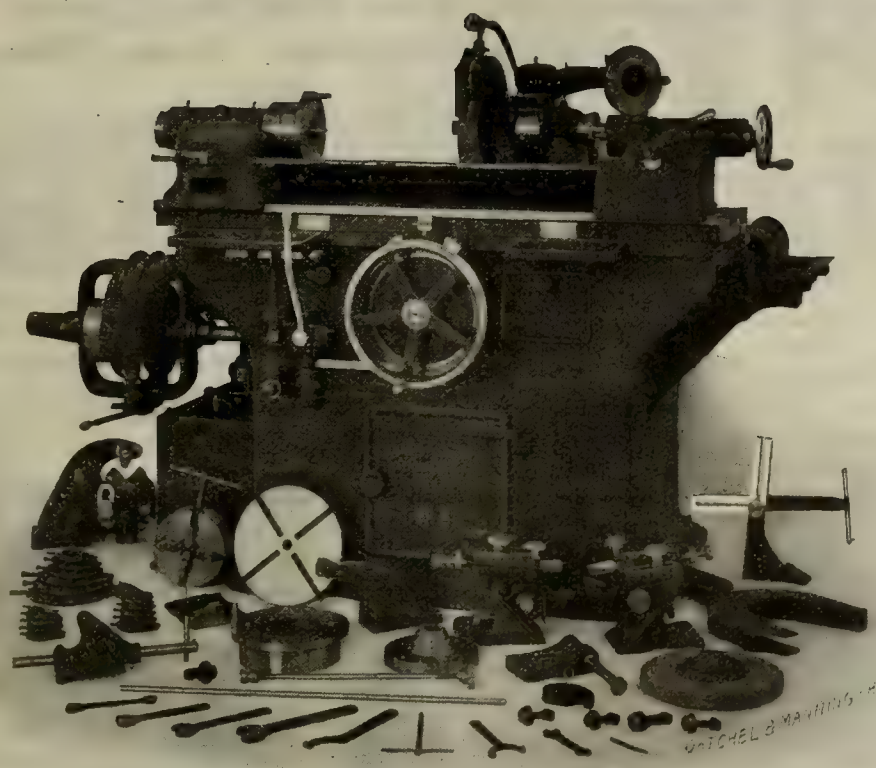
NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

Landis Grinders *for* Production



12" x 36" Plain, Self-contained.

Immediate.

12" x 52" Plain, Self-contained.

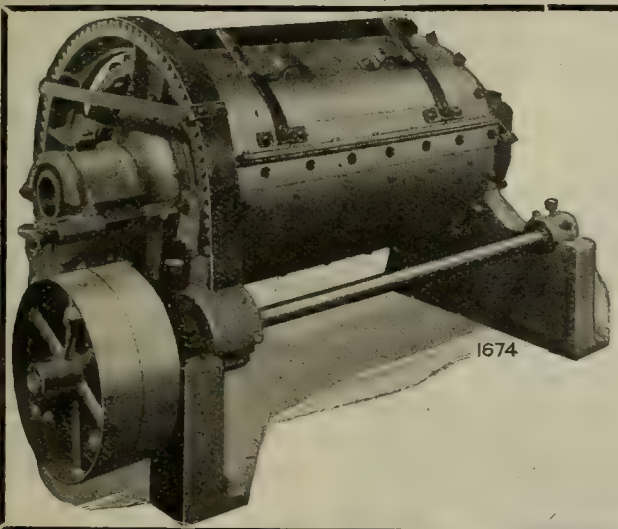
2 Weeks' Shipment.

No. 3 Universal 12" x 42".

January Shipment.

Write for Bulletin giving detailed description.

A. R. WILLIAMS MACHINERY CO., LIMITED WEST FRONT STREET TORONTO



Whiting Tumblers

Correct design and heavy construction enable Whiting Tumblers to last for years under the daily grind of the cleaning room.

All wearing parts quickly replaced at small expense.

No studs used.

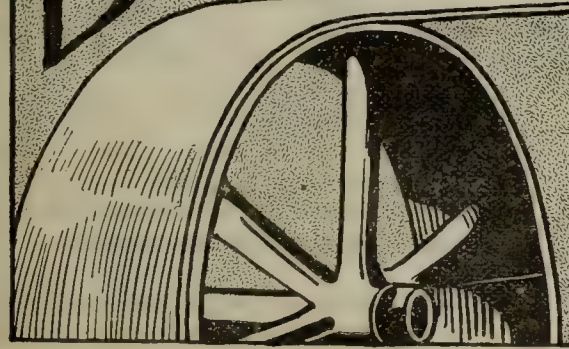
Write for New Catalog No. 132.

Complete Foundry Equipments

WHITING FOUNDRY EQUIPMENT CO. HARVEY-ILL. U.S.A. CHICAGO SUBURB.

Cranes of all Types

Scandinavia Belts



Can be used anywhere that leather can be used.

Scandinavia Belting is a solid woven cotton belt, made of long fibre cotton. It is impregnated to give further solidity, and the impregnation also acts as a moisture resistant. For direct drives where atmospheric conditions remain approximately the same, this belt is probably the best on the market to-day.

It stands up well on shifters.

W. P. BENNETT

51 Montfort Street, Montreal, P.Q.

Belting *Packings* *Asbestos*

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Lindsay, Ont.—The G.T.R. will build and equip a machine shop here.

Toronto.—The Dunlop Tire & Rubber Co. propose building an extension to the power house.

Coleraine, Que. — The Bennet-Martin Asbestos Mines, Ltd., propose installing an electric power plant here.

Toronto.—The Cluff Ammunition Co. have started rebuilding operations at the plant which was recently destroyed by fire.

Montreal.—The Dominion Bridge Co., contemplate installing a forging plant at Lachine for the production of marine forgings.

Toronto.—A permit has been issued to the John Inglis Co., 14 Strachan Ave., for the construction of a concrete tunnel to cost $2,150.

Toronto. — Creber Bros. have been granted a building permit for a frame workshop for a stonecutter's plant at 204 Kingston Road, to cost $1,200.

Parkhill, Ont.—A by-law will be voted on by the ratepayers on November 26 to raise $12,000 to provide for the cost of a plant to distribute hydro-electric power.

Hamilton.—The Steel Co. of Canada has started construction of its by-product coke oven plant which will have a capacity of between 300,000 and 400,000 tons per year.

Renfrew, Ont.—It is understood that the International Molybdenum Co. will move their plant from Orillia to Renfrew when the Calabogi Light & Power Co. have their power plant in operation.

Toronto, Ont.—Damage estimated in the neighborhood of $10,000 was caused by fire of unknown origin which broke out at an early hour on Saturday morning in the St. Clair Foundry, on the Esplanade.

Toronto. — The Queen City Foundry Co. at Ashbridge's Bay, has been purchased by the Bond Foundry and Machine Co., of Manheim, Pa., and will be operated as the Bond Engineering Works, Ltd. It manufacturers grey iron castings.

Sarnia.—The Holmes Foundry, which recently purchased a large tract of land on Exmouth street, in the Village of Point Edward for the building of a large foundry to manufacture automobile goods and other foundry material, will not just at present erect the plant. The high cost and difficulty of getting steel is the reason for the delay in starting construction of the plant.

Montreal.—It is reported that the Dominion Bridge Co. have secured a large order from the American International Shipbuilding Corporation of New York for structural steel to be used for building cargo vessels for the United States Government. This together with a previous order amounts to 40,000 tons of steel plates and shapes which will be fabricated in the Montreal and Toronto plants.

GENERAL

Owen Sound.—The Union Cement Co., propose establishing a cement plant here.

Weston, Ont.—A new concern, The K & S Canadian Tires, Ltd., propose establishing a factory here for manufacturing drug supplies of rubber texture and later rubber tires. The town has offered a fixed assessment of $2,500 for five years.

MUNICIPAL

Delta, B.C.—Municipal Council contemplate the erection of a pump house and installation of an electric pump costing $12,000.

Whitby, Ont.—A by-law will be submitted to the ratepayers on November 26 to authorize a loan of $26,000 to the United Rubber Manufacturing & Reclaiming Co., who propose establishing a factory here.

PERSONAL

Lieut. Hugh A. Kennedy, eldest son of Colin R. Kennedy, vice-president and manager of the A. R. Williams Machinery Co., of Vancouver, was killed in action in France on Nov. 16.

Major Gordon D. Powis, at one time representative of the Canadian Westinghouse Co., at Edmonton, has been killed in action. Major (then Captain) Powis went overseas in April, 1916, with the 63rd Battalion but was later transferred to another unit.

J. E. Dobson, late Scottish representative of Bruce Peebles & Co., Edinburgh, has been appointed London, (Eng.) office manager to the company in place of the late R. W. Gauntlett, and has now taken up his new duties at Hastings House, Norfolk Street, Strand.

C. Price-Green has been appointed Industrial Commissioner for the Canadian Northern System with headquarters at Toronto. The appointment is made in anticipation of the industrial reorganization and development which will follow the conclusion of peace in view of the great number of industrial opportunities on the lines of the Canadian Northern system. The aim of the department is to locate industries and to develop the natural resources along the company's lines.

TENDERS

Ottawa. — Assistant City Engineer Askwith has been given permission to call for tenders on the supply of an apparatus for thawing out city water pipes. The style of apparatus the engineer desires is gasoline-driven and mounted on sleighs. The estimated cost is $3,500.

Armagh, Que.—Gouvin & Beauchemin, civil engineers, Quebec, are preparing plans and specifications for power development at Armagh, County Bellechasse, on River Fourche-du-Nord-Ouest, and will receive tenders for water turbines, dynamos, sluice-gates, penstock and wooden pipes, etc.

Port Arthur.—Tenders will be received until Monday, November 26, 1917, for the construction of a temporary pile protection breakwater at Port Arthur, District of Thunder Bay and Rainy River. Plans and forms of contract can be seen and specifications and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the District Engineers, Equity Building, Toronto; Sault Ste. Marie, and Port Arthur.

Winnipeg.—Tenders will be received by the Commissioners of the Greater Winnipeg Water District up to Monday, Nov. 26, 1917, for the following:—Construction of tunnel, shafts and well at the Red River crossing; supply of cast iron gate valves, air valves and sluice gates, construction of gate house and intake at Waugh, Man. Specifications may be obtained on application at the office of the District, 501 Tribune Bldg., Winnipeg, R. D. Waugh, Chairman of Commissioners.

Winnipeg.—Tenders will be received up to Monday, Dec. 3, 1917, by the Commissioners of the Greater Winnipeg Water District for the following: Construction of a pressure pipe line from Red River to McPhillips Street Reservoir; manufacture and supply of 48-inch pre-moulded reinforced concrete pressure pipe; supply of cast iron pipe and specials. Specifications may be obtained on application at the office of the District, 501 Tribune Bldg., Winnipeg, R. D. Waugh, Chairman of Commissioners.

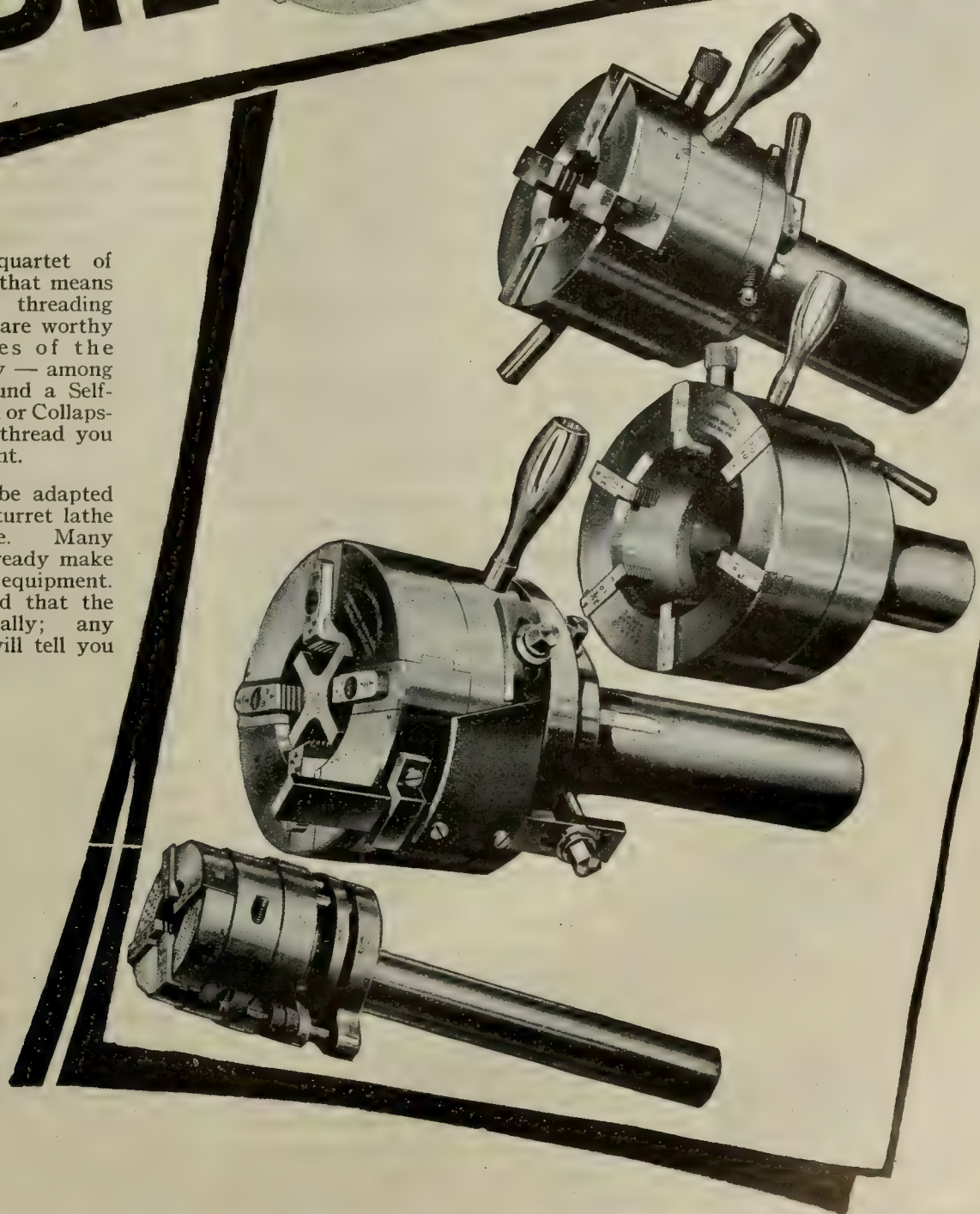
MARINE

Kingston, Ont.—The steamer Turbinia, which has been used in the passenger trade between Toronto and Hamilton for some time, was in port here recently, on her way to the coast, where she will be used for special work.

Toronto.—The Dominion Shipbuilding Co. has completed negotiations with the Harbor Commission, and will commence work almost immediately on a factory to be situated between Spadina avenue and Queen's Wharf, on a site comprising slightly over 15 acres. The agreement has been ratified by the Harbor Board. It is understood that shipbuilding will be carried on by the company on a large scale.

Mahone Bay, N.S.—McLean Brothers shipyard has been leased to Montague

GEOMETRIC DIE-HEADS



HERE'S a quartet of die heads that means death to threading trouble. They are worthy representatives of the Geometric family — among which can be found a Self-Opening Die Head or Collapsing Tap for any thread you could possibly want.

These tools can be adapted to any make of turret lathe or screw machine. Many manufacturers already make them standard equipment. We are convinced that the rest will, eventually; any Geometric user will tell you why.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

Mahaffy and the yard is now being extended so that three ships can be built at once. A new mill has been erected, and heavier machinery and air compressors for driving pneumatic tools have been added. The class of vessels to be built is the fast sailing West Indian, freighter type—the ships will have three masts, will be schooner rigged and have gasoline engines for hoisting the anchors, sails and cargo. The first vessel is well under construction and the keel is now being laid for a larger ship.

TRADE GOSSIP

Ontario's Metal Ouput.—The Ontario Bureau of Mines reports that in the nine months ended September 30 last the province produced 31,064 tons of nickel, valued at $15,532,000, and 15,928 tons of copper, valued at $6,371,200.

Hamilton, Ont.—James Small, of the Hamilton Welding Co., will again take charge of the course in autogenous welding at the Technical School and L'Air Liquide Society will furnish the necessary equipment and gas for class work.

Patriotic Offer Accepted.—The Canadian Cartridge Co., of Hamilton, has made an offer to the British Government to manufacture munitions or any other war material at cost under Government supervision. The offer has been accepted.

Lake Navigation is Near Its Close.—A sign of the approach of the close of navigation on the Great Lakes and St. Lawrence route to the sea is the notice of the Marine Department that the buoys on the St. Lawrence will be removed on November 22. The lights will be kept burning, however, until December 4 or 5.

First Cement Boat Nearly Ready.—The launching of the first cement ship built in Montreal by the Montreal Drydock & Ship Repairing Co., which was to have taken place on November 14, has been delayed for a few days. The vessel is 126 feet long, has a draft of 11 feet, and a cargo capacity of 400 tons. She is intended for ocean trade.

British Inquiry for Marine Engines.—Further information may be obtained from the British Trade Commissioner in Canada, 363 Beaver Hall Square, Montreal, relative to the following inquiry: An English firm, builders of marine engines, etc., desires to get in touch with a Canadian representative who can sell their manufactures. (British Trade Inquiry Reference No. 1996.)

Terms of Embargo on Iron and Steel.—The terms of the order-in-Council prohibiting the exportation of iron and steel products from Canada to countries other than Great Britain and British possessions and protectorates have been made public. The prohibition extends to pig-iron, steel ingots, billets, blooms, bars and slabs; iron and steel plates; iron and steel shapes, comprising beams, channels, angles, tees and zees; iron and steel fabricated for structural work and shipbuilding.

New Storm Signal on Georgian Bay.—Notice is given by the Department of Marine and Fisheries of Canada that a storm signal station has been established 80 feet south-west of Cabot Head lighthouse, west side of Georgian Bay. The bearings of the station are:—Latitude north 45 degrees 14 minutes 45 seconds; longitude west 81 degrees 17 minutes and 25 seconds. Storm signals will be hoisted on an arm projecting from a steel skeleton framework tower sixty feet high. The tower is square and has sloping sides. The signals are visible from all points of approach by water.

To Keep Chilean Nitrates for Allies.—A despatch from Valparaiso, Chile, states that a Parliamentary Commission has presented to Congress a draft law for the formation of the trust of nitrate producers. With Government intervention the law proposes to oblige the producers to enter the trust by doubling the nitrate export duties for outsiders. The measure is the result of a situation caused by the formation of the control of purchases for the allies. It is probable that the German producers will be able to continue to accumulate new stocks of nitrate, as they are able to obtain quantities of fuel oil from the petroleum companies contracting for fuel on this coast.

Lake Carriers' Association to Mobilize Tonnage.—The Lake Carriers' Association of Cleveland, Ohio, by a large majority have voted in favor of mobilizing the tonnage. That the plan will be adopted by practically all the members the officials of the association are quite certain, and an executive committee of five members will be elected to handle the fleet. The shippers and the independent owners will be represented on the committee, which will be composed of managers. Under the new plan the owners will direct the movement of their vessels very largely as heretofore, and the pooling, it is figured, will greatly improve despatch, and to a very large extent do away with the bunching of freighters at the loading and unloading ports.

Scientific Council Oppose Export of Power.—The Dominion Advisory Council for Scientific and Industrial Research has passed a resolution, which has been forwarded to the Minister of Public Works, expressing disapproval of the proposal to construct a dam at the foot of the Coteau Rapids, on the St. Lawrence River. The resolution declares that "when power is exported to a foreign country, vested interests, if not vested rights, are thereby threatened, which makes it extremely difficult to recover, at a later date, the power then exported, without the danger of creating a grave international situation." It is also recommended "that regulations be enacted under which no further Canadian hydro-electric power be exported, but that this be retained as a national asset for the development of industries in the Dominion."

CONTRACTS

Toronto.—The Board of Control has adopted the report of the Fire Chief in awarding contracts for this year's supply of fire hose. Gutta Percha & Rubber Co., 1,750 feet; Goodyear Tire & Rubber Co., 1,000 feet; Dunlop Rubber & Tire Co., 1,750 feet, and Canadian Consolidated Rubber Co., 500 feet. The price was $1.15 per foot with the exception of the Goodyear hose which was $1.05 per foot.

INCORPORATIONS

The Dominion Shipbuilding Co. has been incorporated at Toronto with a capital of $1,000,000 to carry on the business of shipbuilders at Toronto. The provisional directors are J. Max Bullen, Harold L. Steele and James H. Fraser, all of Toronto.

The Union Box & Shook Mills has been incorporated at Ottawa with a capital of $150,000 to manufacture boxes, shooks and articles made of wood at Pembroke, Ont. The incorporators are John H. Reeves, James R. Lockhart and William F. Behan, all of Pembroke.

La Campagnie d'Engine-Turbine Revolution has been incorporated at Ottawa, with a capital of $100,000 to manufacture engines, aeroplanes, motor vehicles etc., at Montreal. The incorporators are C. J. E. Charbonneau, D. Pelletier and J. P. Lamarche, all of Montreal.

The Great West Chemical Co. has been incorporated at Toronto with a capital of $1,500,000 to acquire and develop mineral deposits, smelt and refine minerals of all kinds. The head office is at Port Arthur, Ont., and provisional directors are R. J. Allman, A. Plenty and S. A. Wilson, all of Toronto.

The Harrington Pick & Tool Co. has been incorporated at Ottawa, with a capital of $50,000 to manufacture tools, implements and machinery of all kinds. The head office is at Toronto and the incorporators are Frank S. Harrington of New York City, also J. M. Blackhall and W. P. Crow of Toronto.

The Woodstock Cotton Spinning Co. has been incorporated at Ottawa with a capital of $50,000 to carry on the business of spinners of cotton yarns and manufacturers of cotton goods at Woodstock, Ont. The incorporators are Edwin Holden of Woodstock, and Andrew McGladrey and Archibald Holm of Guelph.

CATALOGUES

Machine Tools.—The Canadian Fairbanks-Morse Co. have issued a stock list of machinery for November.

Bennis Stookers.—Edward Bennis & Co., Little Hulton, Bolton, England, have issued a catalogue containing a few concise descriptions of "Bennis" stookers and furnaces installed in boiler houses of leading firms. The catalogue contains views of these installations as applied to various types of boiler, accompanied by a brief description of each.

Saws Sammy Showme Saw is the title of a new monthly publication issued by the Simonds Mfg. Co., Fitchburg, Mass. In a series of twelve reels, the investigations of "Sammy Showme," at various plants where Simonds' saws are in operation, are related together with illus-

trations showing the product and pictorial reference to "Sammy."

The Cleveland Milling Machine Co., Cleveland, O., have issued a 35 page booklet called "Stock List of Cutters," published on the fifteenth of each mouth. This is a handy little booklet and contains a list of standard cutters which are in stock and from which immediate shipment can be made. Copies of the booklet may be had for the asking.

"Labor Saving Devices" is the title of a catalogue issued by the Manufacturers Equipment Co., Chicago, Ill. The devices in question comprise an interesting line of special tools, including air operated chucks and collapsible taps designed for various classes of work where quick action is desirable. The various styles of M. E. C. aero chucks, air cylinders, collapsible taps, etc., are fully described, accompanied by exterior and sectional views showing the details of construction. Other devices described and illustrated include the M. E. C. air valves, air vises, overshot box tools blow valves, etc. This catalogue contains fifty pages and is gotten up in an attractive manner.

BOOK REVIEWS

Effects of Storage Upon the Properties of Coal.—A series of experiments, started in 1910, to determine the effects of storage upon the properties of bituminous coal has recently been completed by the Engineering Experiment Station of the University of Illinois. The object has been to devise methods of storing which will avoid the risk of spontaneous combustion and to determine the extent to which coal deteriorates in storage. Professor S. W. Parr, under whose direction the tests have been conducted, summarizes the results in Bulletin No. 97 of the Engineering Experiment Station. It is shown that, if properly sized and carefully handled, coal may be stored without danger of spontaneous combustion; that the actual loss of heat value, or deterioration, resulting from storage is slight; and that underwater storage eliminates entirely all risk of spontaneous combustion or of deterioration. The extent of the waste and economic loss incident to the present method of seasonal production, with its attendant abnormal demands upon transportation facilties is discussed, and it is estimated that the lack of storage facilities in large distributing centers necessitate a capital investment in mines and railroad cars of $500,000,000 in excess of the amount which would be required if production could be maintained at a uniform rate throughout the year. Copies of Bulletin 97 may be had without charge by addressing C. R. Richards, Director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

TRADE INQUIRIES

THE following inquiries have been received by the Department of Trade and Commerce, Ottawa, from which further particulars may be obtained:

1146. **Pumps.**—A commission agent in

METAL STAMPINGS

We are manufacturers of stamped parts for other manufacturers.

We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.

We can finish steel stamping in Nickel, Brass or Copper.

Send us a sample order.

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PORTABLE PLANERS
DRAW CUT SHAPERS
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"Shall we be more tender with our dollars than with the lives of our sons?"

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Will Give You Exceptional

Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

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Successors to
Owen Sound Iron Works
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Engineers
Boiler-makers
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Machinists
Tank Work
Smoke Stacks,
Grey Iron and Brass Castings,
Special Machinery Made to Order

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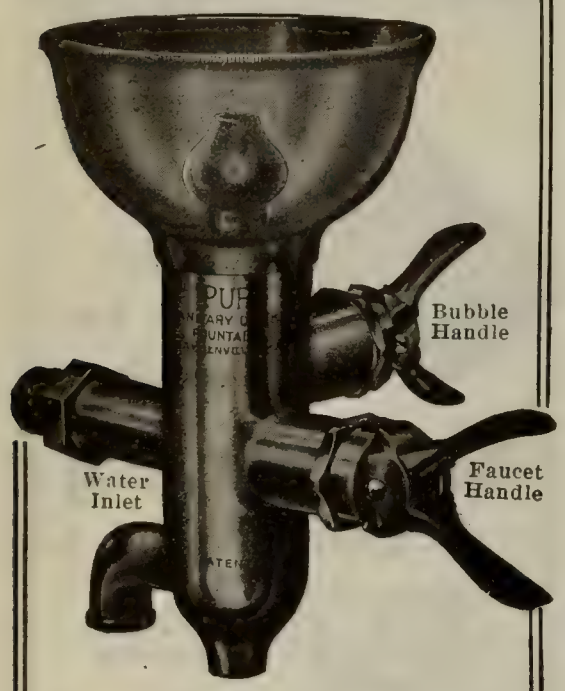
(MADE IN CANADA)
Saves Dollars
Why let that old-fashioned faucet go on year after year wasting water—MONEY?
Why more drinking cups and glasses, only to become unsanitary—lost, broken or carried away? Puro Sanitary Drinking Fountain stops all this needless waste. Puro saves you 35% on the water bill alone. Puro saves you all that money you spend for cups. YET Puro is always ready with a clear, cool drink with dollars in the bank.



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You don't have to wait years to get back the small investment you have tied up in Puro equipment—
You start cashing in at once—not only on your water bill saving, but on the increased efficiency of your workers as well.
Men like PURO—it's clean. No danger of deadly germs lurking in its sparkling bubble.
Write us—tell how many men, how many departments, and we'll tell you how much the cost will be to
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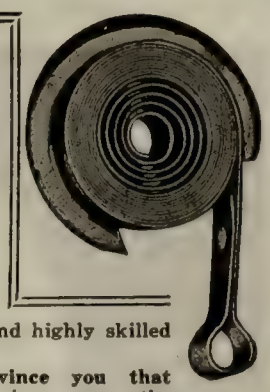
'Barnes-Made'
Springs
are unusual in service and wear.
They are the result of sixty years' experience, unsurpassed equipment and highly skilled workmanship.
A trial will convince you that "Barnes-Made" Springs are the best buy.



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218 South St., Bristol, Ct., U. S. A.
Man'frs of "Barnes-made" Products
Springs, Screw Machine Products, Cold Rolled Steel and Wire

Omsk, Siberia, is desirous of receiving quotations from Canadian manufacturers of pumps.

1448. **Flour mill machinery.**—A party doing business in Omsk, Siberia, would be glad to receive quotations from Canadian manufacturers in a position to supply roller flour-milling machinery of a size 14 feet diameter and 32 feet in length.

1449. **Fibre-board.**—A London manufacturing company wishes to get into touch with Canadian manufacturers of fibre-board with a view to business after the war.

1451. **Machinery.**—A Cape Town firm of manufacturers asks for catalogues and price lists of starch-making machinery, tartaric acid machinery, and grain alcohol machinery.

1452. **Agencies.**—A Johannesburg engineer, with established selling connections on the Rand, is prepared to take up the representation for Canadian manufacturers of mining machinery, mining material and supplies of all kinds.

1453. **Agencies.**—A firm in Johannesburg with established connections is prepared to handle general engineering articles and supplies, including refrigerating machinery of all kinds.

1455. **Mining supplies.**—A firm of South African manufacturers, who are members of the Johannesburg Commercial Exchange, request correspondence from Canadian manufacturers of lubricating oils, belting, drill steel, paints, picks, shovels, rubber conveyor belting and rubber goods in general.

1456. **Carbon.**—A firm of engineers in Johannesburg are prepared to take up the agency for Canadian-made carbon, brushes, dry cells, arc lamps, carbons, bioscope and projector carbon. Other details on file at Department of Trade and Commerce, Ottawa.

MACHINERY PARTS FOR BRAZIL

THERE is felt, in practically all departments of the machinery trade of Brazil, the want of certain equipment, such as shafting, pulleys, gearing, hangers, couplings and bearings. The demand is not only insistent among factories and railway workshops, but the Government departments are as short of supplies as any other class of consumer. The current demand is but indifferently supplied from the United States, the factories of North America being principally engaged upon work for the Allies. In normal times Brazil is a fine market—perhaps one of the finest in the whole of Latin America—for machinery supplies, tools, etc., all the principal dealers carrying permanently large stocks which are continually in need of replenishment. The many gas, electric light, water, and other corporations carrying out their own repairs and construction, the several railway shops, both Government and privately owned, the retail establishments, etc., are always in the market for supplies. Some idea of the extent of the requirements in the direction of small machinery and tools may be gathered when it is known that Brazil to-day maintains no fewer than 2,292 manufacturing establishments of some importance, for the industries of this character have always received support and encouragement from the Federal and State Governments. The most numerous industrial plants are to be found, of a necessity, in the Federal district (containing the capital), where there are some 584 factories, employing 30,490 hands and having an annual production worth between £12,000,000 and £13,000,000. The State of Minas Geraes comes next with 551 establishments, employing, however, only 8,850 men; the State of Sao Paulo, although possessing but 323 establishments, finding employment for 23,007. It is in this city that are found the most successful railway and railway shops in the country, those of the Sao Paulo Railway Company, a British-owned enterprise. Other States where large numbers of factories are to be met with are Rio Grande do Sul, employing 10,490 hands, and having an annual output worth £3,000,000; Santa Catharina, employing 1,600 hands in 125 different factories; and Rio de Janeiro, with 190 factories and employing 11,700 men. Taking the whole of the industrial establishments, together numbering, as above mentioned, nearly 2,300 different factories, there are engaged upon manufacturing work 123.950 employees, representing a capital of £32,563,540 sterling, and producing to the value of £37,326,600 annually. The worth of this market to manufacturers of machinery and supplies of all kinds need not be emphasized. It is only necessary to add that, large and attractive as it is, every day sees it become wider and more insistent on receiving supplies from Europe.—*The Times Trade Supplement.*

STEEL FREIGHTERS FOR THE BRITISH GOVERNMENT

THE steel cargo steamers which the Canadian Allis-Chalmers will build for the British Government at Bridgeburg will have a capacity of 3,500 tons each. They will be 261 feet long over-all, 43 ft. 6 in. breadth moulded and 23-foot depth moulded, of steel construction throughout, and are to class 100 A1 with British Lloyd's Register of Shipping. They will be of the usual bulk-cargo type, but with special features adapting them for use during the present war-time conditions, being provided with appliances to protect the vessels against submarine attacks, in addition to being arranged with a view to evade visibility and identification. The steel entering into the construction of these steamers will be furnished by the British Government through the Cunard Steamship Co., and it is understood that a considerable tonnage of this steel will be available for delivery this year, enabling the builders to start operations immediately.

The propelling machinery will be constructed at the Davenport Works, Toronto. The main engine will be of the triple expansion type, the size being 20

in., 33 in., and 54 in. by 40-in. stroke and of the surface condensing type. The boilers will be two in number, 14 feet diameter and 12 feet long, constructed for a working pressure of 180 pounds. They will be fitted, for economical working, with the Howden forced draught system.

The coal bunkers will be located under the bridge deck and in the wings of the boiler space and will hold over five hundred tons.

The cargo holds will be three in number: Nos. 1 and 2 holds to have one cargo hatch each and the No. 3 hold abaft the engine room being provided with two cargo hatches. Each cargo hatch will be served by two independent cargo derrick booms, each of five tons capacity, and each boom with its independent cargo winch. The steam steering engine will be located on the upper deck in a special house abaft of the engine casing. The life-saving equipment will include two 26-foot lifeboats and one 18-foot working boat. The water ballast tanks, 3 feet deep amidships, will extend the entire length from the collision bulkhead forward to the peak tank aft. The accommodations throughout the ship will be steam-heated and the lighting throughout will be by electricity.

BRITAIN IMPORTS MORE CANADIAN ASBESTOS

THE publication of the annual statement of the trade of the United Kingdom for 1916 shows a remarkable increase in imports of Canadian asbestos. During the three years 1914-15-16 remarkable increases are reported in the quantities and values of Canadian raw asbestos imports into Great Britain. In 1912 the imports were 74,043 cwts., valued at $200,750; in 1916 they advanced to 244,932 cwts., valued at $922,590. The high-water mark appears to have been reached in 1915, however, with a total quantity of 349,863 cwts., valued at $1,048,500. The total imports of the United Kingdom from all sources in 1916 were the highest on record, 534,237 cwts., valued at $2,687,000. The main source of supply continues to be Canada, although supplies have considerably increased from the United States, Portuguese East Africa, and the Cape of Good Hope.

EXPORT OF CANADIAN COPPER TO BRITAIN INCREASES

A LARGE increase in imports of Canadian copper and zinc into Great Britain is shown in the annual statement of the trade of the United Kingdom for 1916. Exports of copper regulus and precipitate from Canada to Great Britain rose from 800 tons in 1912 to 6,071 tons last year. The respective values were $120,000 and $919,000. Exports of crude zinc, in cakes, from Canada, advanced during the comparative period from 997 tons, valued at $98,500 to 1,236 tons, valued at $539,100.

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OVENS
Enameling and Varnishing Ovens heated by Gas, Electricity, Steam or Coal.
Write for Booklet.
Brantford Oven & Rack Co., Ltd.
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TRADE MARK LANCO BALATA BELTING
FOR BIG SERVICE
Lanco Balata is as nearly stretchless as it is possible to have a good belt and is really waterproof.
Have you our Belting Book? Sent free on request.
Federal Engineering Co., Limited
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MACHINE TOOLS for IRON WORKERS
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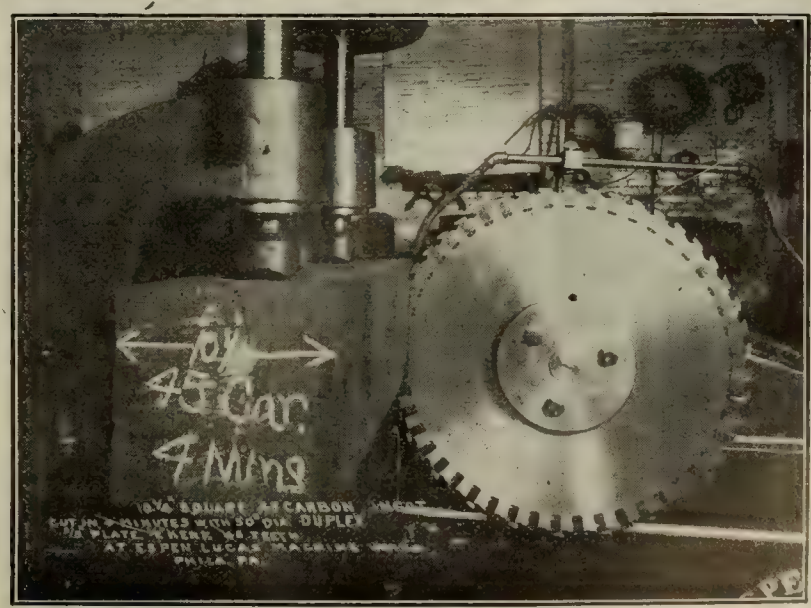

Circular Metal Cutting Saw Blades for Any Type of Machine

Let us demonstrate what a saving can be made by installing a
HUNTER "DUPLEX" Inserted Tooth Blade
Write for information
HUNTER SAW & MACHINE CO., Pittsburgh, Pa., U.S.A.

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Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

FOR SALE

SIX COMPRESSORS FOR SALE — VERY cheap. The National Quarry, 81 St. Peter St., Quebec. c22m

BOILER FOR SALE—ONE HEINE SAFETY horizontal, single drum, water tube boiler, 120 H.P., 36" diam., 19 ft. long, 5-16" shell steam drum. Apply The Parkhill Mfg. Co., Limited, 400 St. Ambroise St., Montreal. c18m

FOR IMMEDIATE SALE—150 No. 1 AND 10 No. 7C Racine hack saw machines; in excellent condition. The Peck Rolling Mills, Limited, Montreal, Quebec. c19m

AGENCIES WANTED

ENGINEER AND BUSINESS MAN WITH office in Manchester, England, is prepared to work for a good firm desiring representative in England. Would attend to the interests of a firm shipping munitions. Box 337, Canadian Machinery. c19m

AGENCIES WANTED—FRENCH ENGINEER having large established clientele, desires direct agency for France of labor-saving machinery of all kinds for wood and iron working, as well as factory equipment. Headquarters in hearts of Paris, near the Opera. Write E. A. B., Room 444, 14 Phillips Sqr., Montreal.

AGENTS WANTED

WANTED — LIVE REPRESENTATIVE TO handle good specialty; one who hasn't too many irons in the fire Apply Box 348, Canadian Machinery, stating lines you now represent and the ground you are prepared to cover. c23m

CANADIAN AGENTS WANTED FOR GOOD chuck, especially adapted for use in munition plants. Box 349, Canadian Machinery. c23m

SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto

MANUFACTURERS' OPPORTUNITY

A responsible American Concern desires to arrange with a reliable Canadian Machinery Manufacturer for the production in quantities of a small Marine Motor, for the Canadian and Export Trade. A modern equipment, with knowledge of economical production of interchangeable machinery and parts, and good shipping facilities essential. To such party a very favorable, if not continuous, contract is offered. Address Box 353, Canadian Machinery. (c22m)

SITUATIONS VACANT

WANTED — SUPERINTENDENT-FOREMAN, 6" British shells. Box 340, Canadian Machinery. c19m

WANTED — MECHANICAL DRAUGHTSMAN for engine, compressor, and general work. State experience and salary expected. Apply The Jenckes Machine Company, Limited, Sherbrooke, Que. c16m

WANTED—MACHINE SHOP FOREMAN FOR small shop doing general work, not munitions, near Toronto. State experience and salary expected. Give references. Box 345, Canadian Machinery. c20m

MARINE ENGINE ERECTOR:—WANTED FOR Canadian shop an experienced foreman to take charge of erecting 1500 H.P. marine engines. Apply Box 347, Canadian Machinery c21m

WANTED

WANTED — SECOND-HAND CUPOLA AND other foundry equipment. State full particulars and price. Box 346, Canadian Machinery. c21m

WANTED—ONE No. 166 BLISS 2-SPINDLE automatic trimmer and beader, also 1 No. 156 single spindle trimmer, or machines of similar design. Must be in good condition. In replying state fully the name of maker of machines and lowest price, also where they could be seen. Box 342, Canadian Machinery. c18m

WANTED—ONE HORIZONTAL RE-DRAWING or reducing press, fitted with bottom knockout, the general dimensions of which should be equal to Bliss No. 62. Must have flywheel not less than 725 lbs. weight and approximately 3 ft. 6 in. in diameter. Press must be in good working order. In replying, give all dimensions, also state name of maker and lowest price. Box 341, Canadian Machinery. c18m

WANTED TO PURCHASE TWO SECOND-hand lathes, 24" swing, 8' to 12' bed. Submit offers with cuts and full description to E. Langham, General Purchasing Agent, Canadian Northern Railway Company, Toronto. c19m

WANTED—VERTICAL MILLING MACHINE with table not less than 26" x 10", minimum distance centre of spindle to face of column 14". Reply, giving full particulars, price and where machine can be inspected. Box 352, Canadian Machinery. c21m

SECOND-HAND RADIAL DRILL WANTED—in good condition; 4 ft| to 6 ft. swing. Give full particulars. The Volta Manufacturing Co., Welland, Ont. c21m

SITUATIONS WANTED

MECHANICAL AND CONSTRUCTION ENgineer desires change; twenty years' general experience; specialty steam power plants; knowledge pulverized coal. Box 343, Canadian Machinery. c21m

GRADUATE MALE NURSE, AGE 32. HAVE established hospitals for three large manufacturing concerns. Familiar with social service, accident prevention and modern methods of employing. At present employed. Less than $2,400 not considered. Box 336, Canadian Machinery. c15m

GENERAL SUPERINTENDENT DESIRES position—years of machine shop and toolroom experience, efficient production methods, as well as extensive experience with various sizes of shells. Box 350, Canadian Machinery. c22m

PRACTICAL WORKS MANAGER AND MEchanical expert with years of experience in Scotland and Canada, a specialist in marine engines and winches, open for engagement; best of references. Apply Box 351, Canadian Machinery. c23m

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States wants position as superintendent or general foreman. Large or small shop on ammunition or machinery; A1 references. Address Box 327, Canadian Machinery. c9m

FOR SALE

2—16" x 5' Reed Lathes, elevating rest.

1—16" x 6' Reed Engine Lathe, plain rest.

1—16" x 6' Reed Engine Lathe, R. and F.

1—18" x 8' Davis Engine Lathe, D.B.G.

1—18" x 8' Porter Engine Lathe.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 3 Brown & Sharpe Automatic Gear Cutter.

1—30" old-style Brainerd Automatic Gear Cutter.

1—5" x 48" Pratt & Whitney Plain Grinder.

1—No. 3 Lees-Bradner Thread Miller.

1—15" Jungst Shaper.

2—24" x 24" x 6' Powell Standard Planers.

2—30" x 30" x 8' Powell Standard Planers.

Brownell Machinery Co.
Providence, R. I.

"Williams" Condensed List Machine Tools

NEW LATHES.

1—16" x 6' CISCO Q.C.G., Comp. rest.
1—16" x 8' CISCO S.B.G., quick change.
1—18" x 8' SOUTH BEND.
3—18" x 10' CISCO D.B.G., quick change.
5—19" x 10' LeBLOND D.B.G., Q.C.
2—21" x 8' LeBLOND D.B.G., Q.C.
1—25" x 10' LeBLOND D.B.G., Q.C.

USED LATHES.

1—14" x 6' LeBLOND tool room equipment.
1—16" x 6' CINCINNATI D.B.G., Q.C.G.
2—20" x 10' LODGE & SHIPLEY geared head.
1—27" x 16' REED-PRENTICE geared head.

PLANERS.

1—36" x 36" x 11' INDUSTRIAL ENG. WKS., one head.
1—38" x 38" x 8' LONDON one head; fine condition.
1—52" x 52" x 16' McKECHNIE BERTRAM one head.
1—62" x 62" x 20' CANADA TOOL WORKS two heads.
1—36" x 36" x 12' McDOUGALL, three heads.

SHAPERS.

2—New 24" GOULD & EBERHARDT shapers.
1—New 28" GOULD & EBERHARDT "INVINCIBLE" type shaper.
1—14" SMITH & MILLS single geared.
3—16" SMITH & MILLS back geared.
2—20" SMITH & MILLS back geared.
1—16" KELLY back geared.
3—20" KELLEY back geared.
2—24" KELLEY back geared.

SLOTTERS AND KEYSEATERS

1—20" SELLERS.
1—9" BERTRAM.
1—18" MORTON keyseater.
1—No. 2 DAVIS keyseater.

RADIAL DRILLS.

1—6' BERTRAM heavy duty speed box.
1—5' REED-PRENTICE heavy duty speed box.
1—3' DRESES MUELLER round column cone type.
1—2½' FOSDICK round column speed box.

UPRIGHT DRILLS.

16" LINGREN, 14" CHAMPION, 20" SILVER.
20" BARNES B.G., 22½" BARNES B.G.
26" BARNES sliding head, 28" BARNES sliding head, 30" SIBLEY sliding head.
D1 COLBURN No. 310 BAKER heavy duty.

BORING MILLS

10' NILES two swivel heads, takes 43" under the cross rail width of rail 19" tool bar 6" round by 25", travel power friction feeds drive six-step cone for 4" belt, in absolutely first class condition.
BERTRAM HORIZONTAL BORING MACHINE, cone type headstock, four-step cone for 4" belt, spindle 4", diameter 36", feed slotted adjustable table 48" wide by 36" long.

MILLERS

Nos. 2H and 3H LeBLOND Universal.
No. 2 FORD-SMITH plain and universal.
No. 2 CINCINNATI, No. 2 MILWAUKEE, Universal.

PUNCHES AND SHEARS.

No. 4 C.M.C. single end, 18" throat.
No. 3 BERTRAM single end, 30" throat.
No. 3 BERTRAM single end shearing machine, 8" depth of throat.
BERTRAM Horizontal Punch, 10" depth of throat.
No. 5 C.M.C. double end, 18" throat.
ROCKRIVER single end, 48" throat, 1¼" hole.
ROCKDRIVER single end, 36" throat, 1¼" hole.
BERGUE auto. multiple punch, 26' long by 6' 6" wide, fitted with 18 punches to punch ⅞" diameter holes through ⅝" plate, including eighteen ⅞" punches and one set of twenty-seven ⅝" punches.

The A. R. Williams Machinery Co., Limited
64 FRONT STREET WEST TORONTO, ONTARIO

MACHINERY FOR SALE

List of Machinery at Empire Tobacco Company, Granby; Prices are for Apparatus on Skids in Company's Yard.

	Machine	Maker	H.P.	Press	Size	Grate	Remarks	Price
H.R.	Tubular Boiler	W. C. White, Montreal	80	100	5'0"x14'0"	5'0"x5'0"	Installed 1900 single lap joints	$400.00
"		Jenckes Machine Co., Sherbrooke, Que.	125	100	6'0"x16'0"	6'0"x6'0"	Installed 1905	800.00
"		Jenckes Machine Co., Sherbrooke, Que.	125	100	5'6"x16'0"	5'6"x5'6"	Installed 1905	800.00

These boilers are without grates, but have fronts, gauges and cocks.

	Machine	Maker	H.P.	R.P.M.	Size	Pulley	Remarks	Price
(1)	Fan	Sheldon & Sheldon, Galt	8	480	48"			$ 34.00
(1)	Horizontal Corliss Valve Engine	Laurie Engine Co., Montreal	85	72	12"x36"	108"x16"	Installed 1905	600.00
(1)	Horizontal Slide Valve Engine	Robb Engineering Co.	12	200	6"x10"		Installed 1905	140.00
(1)	Horizontal Wheelock and Engine	Goldie & McCullough	55	65	10"x30"	96"x16"	Installed 1896	500.00

	Machine	Maker	Press	Size	Remarks	Price
(2)	Vertical Belt-driven Triplex Hydraulic Pump	John H. McGowan, Cincinnati	6000-lb.	1'x⅝"x3"	Installed 1900	$225.00
(1)	Horizon. Belt-driven Duplex Hydraulic Pump	Pontbriand & Freres, Ltd., Sorel	6000-lb.	¾x½x2½	Installed 1907	75.00
(1)	Vertical Belt-driven Duplex Hydraulic Pump	Laidlaw, Dunn & Co., Cincinnati	3000-lb.	1¼x¾x4"	Installed 1895	140.00
	Vertical Triplex Hydraulic Pump	J. T. McGowan, Bliss.		1"x⅝x3"	Installed 1896	250.00
(1)	Fan—Height, 110"; base, 3'8½"x6'9½"; inlet, 3'0"-11"; outlet, 3'6"x3'0"; pulley, 22"x9½"; shaft, 2 9/16"; runner, 5' 6";				Sturtevant	350.00

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IMPERIAL TOBACCO CO. OF CANADA, LTD.
900 St. Antoine St., MONTREAL

A MAN was wanted as Tool-room Foreman. He was found by a condensed ad. in

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Classified Advertising Section
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In Stock for Immediate Delivery

TURRET LATHES AND SCREW MACHINES

16" x 5½' MacGregor, D.B.G. (2).
16" x 6' Pratt & Whitney, B.G.
18" x 10' Libby (2).
20" x 7' Fay & Scott.
22" x 8' Pratt & Whitney, B.G.
22" x 8' Martin, single purpose (2).
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
2" x 24" Stevens Screw Machines (2).
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

6" x 30" Dalton, B.G., bench.
13" x 6' Filsmith, D.B.G., comp. rest.
14" x 6' Lodge & Shipley, taper attachment.
15" x 6' Sebastian, B.G., comp. rest (3).
16" x 8' McDougall, B.G., comp. rest (2).
16" x 8' Porter, B.G., comp. rest.
18" x 8' C.M.C., D.B.G., comp. rest.
18" x 10' Putnam, back geared.
18" x 6' Barker, B.G., comp. rest.
20" x 8' Fifield, B.G., plain rest.
22" x 8' Pond, B.G., plain rest.
24" x 11' Pond, B.G., comp. rest.
26" x 14' Gleason, D.B.G.
30" x 10' Ames, B.G., plain rest.
31" x 16' Fifield, back geared.

DRILLS

14" Excelsior, sliding head, lever feed (6).
15" Avey, high-speed, ball-bearing.
16" Barr, sliding head, lever feed.
20" Silver, back geared, power feed (2).
20" Barnes, 3-spindle, lever feed.
24" Kerkhoff, back geared, power feed.
26" Prentice, back geared, power feed.
32" Cincinnati, heavy duty.
40" Bickford, back geared.
46" Allfree, back geared, power feed.
No. 10a Baush, 16-spindle.
D-1 Colburn, back geared, heavy duty.

GRINDERS

10" x 30" Landis, universal.
No. 1 Cincinnati, universal (2).
No. 1 Barkey, pedestal.
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer.
24" Barnes, wet tool.
2¼" Yankee, twist drill.

IRON PLANERS

20" x 20" x 5' Bertram.
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Pond, two heads
40" x 40" x 12' New Haven, power feed.

MILLING MACHINES

Bertram, plain.
Brown & Sharpe, power feed, plain.
Monarch, vertical (2).
No. 2 Ford-Smith, plain.
No. 4 Fox, universal.

SHAPERS

16" Petrie, back geared.
16" Canada Mach. Corp., back geared.
16" Cincinnati, back geared.
24" Gould & Eberhardt, back geared.
24" Bertram, back geared.
30" Morton, back geared, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6' Robertson Hack Saws.
4½" Martin Cutting-off Machine.
No. 2 Grant Rotary Riveting Hammer.
No. 4A High-speed Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 4 GA Brown & Boggs Punching Press.
No. 18 Can. Hanson & Van Winkle Power Press.
No. 180 Brown-Boggs Power Presses.
No. 3 Goldie & McCulloch Hydraulic Banding Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.
FRONT STREET WEST, TORONTO

Say you saw it in Canadian Machinery

RIVERSIDE Machinery Depot

We Own Every Tool Offered

NEW MACHINE TOOLS

For Immediate Delivery

1—18 x 8 Springfield Standard Engine Lathe.
2—16 x 8 Springfield Q.C.G. Engine Lathes.
1—16 x 6 Springfield Q.C.G. Engine Lathes.
2—16" Springfield B.G. Shapers.
2—20" Springfield B.G. Shapers.
1—25" Springfield B.G. Shapers.
3—14" Pierce Turret Lathes.
2—1 x 8 Pierce Hand Screw Machines.
3—No. 1½ American Milling Machines.
1—No. 20 Bliss O.B.I. Press.
1—No. 19 Bliss O.B.I. Press.
1—No. 18C Bliss O.B.I. Press.
1—No. 18 Bliss O.B.I. Press.
5—20" Buffalo B.G. P.F. Drill Presses.
3—20" Canedy-Otto B.G., P.F. Drill Presses.
2—20" Champion B.G., P.F. Drill Presses.
3—20" Champion Plain Drill Presses.
3—26" Silver Plain Drill Presses.
3—26" Canedy-Otto Plain Drill Presses.
2—14" Champion Plain Drill Presses.

USED MACHINERY

ENGINE LATHES

1—22 x 14 Putnam Standard Engine Lathe.
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Springfield Standard Engine Lathe.
1—14 x 6 Prentiss Standard Engine Lathe.
1—14 x 6 Sebastian Standard Engine Lathe.
2—13 x 8 Barnes Standard Engine Lathe.
1—13 x 5 Barnes Standard Engine Lathe.
1—10 x 4 Sebastian Standard Engine Lathe.

TURRET AND SCREW MACHINES

2—No. 6-A Potter & Johnston Automatic Lathes.
1—4¼" Gridley Automatic Screw Machine, motor driven.
2—No. 4 Foster F.G.H. Hand Screw Machines.
2—No. 3 Foster F.G.H. Hand Screw Machines.
1—No. 5 Pierson F.G.H. Hand Screw Machine.
4—12" Warner & Swasey Turret Lathes with air chucks.
4—16" Warner & Swasey Turret Lathes.
2—2" Cleveland Automatic Screw Machines, jigger feed.
1—⅝-¾" Cleveland Automatic Screw Machine.

MILLING MACHINES AND GRINDERS

1—No. 4 LeBlond Plain Milling Machine.
1—No. 2 Hendey Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drilling Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
1—No. 2½ Bath Universal Grinder.
1—No. 12 Modern Plain Grinder.
1—No. 14 Modern Plain Grinder.
1—No. 1 Landis Internal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.

DRILL PRESSES

1—5' Mueller Plain Radial Drill, old type.
1—31" Barnes B.G., P.F. Drill Press.
1—3-spindle 8" overhang Henry & Wright High Speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.

SHAPERS AND PLANERS

1—18" Hendey Geared Shaper.
1—36 x 36 x 10' New Haven Planer, S.H.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS

1—Waterbury Farrell O.B.I. Press, geared.
1—No. 10 Perkins Drawing Press.
3—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—150-lb. Bradley Strap Hammer.

AIR COMPRESSORS

1—9 x 11 Chicago Pneumatic Belt-driven Air Compressor.
1—8 x 8 Fairbanks-Morse Belt-driven Air Compressor.
1—8 x 8 Gardner Single Belt-driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt-driven Air Compressor.
1—8 x 6 Westinghouse Steam Air Compressor.
1—6 x 6 Ingersoll-Rand Belt-driven Air Compressor.

We also carry a large assortment of Steam Engines, Steam Pumps and Electrical Equipment of all kinds. We are in the market to purchase machine tools, large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

Good Used Equipment

Traveling Cranes.

20-ton Browning Trolley, 5-ton zux., 56½" ga. (new).
20-ton Shaw, 56' 3" span, 110 V.D.C.
10-ton Case, 58' 3" span, 220 V.D.C.
20-ton Box, 49' span, 220 V.D.C.
10-ton P. & H., 48' span, 110 V.D.C.

Punches and Shears.

Single 48" tht., cap. 3 x 1¼", Providence.
Single 6" tht., cap. ⅞ x ⅞", Cleveland.
Single 15" tht., cap. ¾ x ½" (hand) new Doty.
Double 15" tht. cap. ¾ x ¾" Fischer.
Double, Queen City, 12" thts., cap. ⅝" x ⅝".
Double 12" blades, bar shear, cap. 2" sq., crucible.
Univ. Plate Shear, 18" blades, cap. ¾", Cleveland belted.
Univ. Plate Shear, 26" blades, cap. ½", Lewis belted.
Guillotine Shear, cap. 2½" sq., belted, Perkins No. 6.
Guillotine Shear, No. O. H. & J., 6 and 7" blades (2).
Guillotine Shear, Fisher, 21" blade, cap. 8 x 2".
Squaring Machine 120", cap. 3/16".

Miscellaneous.

Bolt Cutter, Acme 2", Class A, single head, dies.
Boring Mill, 10' Niles, Vertical, 2 heads.
Forging and Upsetting Machine, 1½" Acme, with dies.
Forging and Upsetting Machine, 2½" Ajax.
Hammer, 80-lb. Bradley, Cushion Helve.
Hammer, 35-lb. Maggowan & Finigan (Perfect), belted.
Rotary Planer, 36" Cleveland, belt driven.
Rotary Planer, 60" Cleveland, motor 60 cy., 440 V.
Milling Machine, No. 24 Osterlein Universal.
Pipe Machine, 8" E. C. & B.
Pipe Machine, No. 11 Jarecki.

GOOD CONDITION.
PROMPT SHIPMENT.

McGoy-Brandt Machinery Co.
216-18 Penn Ave.
PITTSBURGH, PA.

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15" three-jawed chuck.
1—Lathe, 28" swing, 8' bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22" Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15" three-jawed chuck.
1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 24" wheel.
1—Lathe, 14" swing, 6' bed.
2—Ford Smith Shell Grinders, complete.
1—17" LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
1—16" Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
1—Double End Painting Machine, with ¼ h.p. motor.
1—Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—5 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
Sherbrooke, Que.

Long-distance messages---telegrams

are frequently received in answer to ads in this section. Readers realize the importance of getting in touch with advertisers at once. And again, this illustrates how closely the section is followed.

Have you any proposition that will interest our readers? Do you want equipment or help? If you do, here is the place to make your wants known. Your ad will get the attention of the men in the office and the men in the shop.

Mail your copy now for next week's issue.

Canadian Machinery
Classified Advertising Section
143 University Ave., Toronto, Ont.

Machine Tools—Look Here For Your Wants

BORING MACHINES—Vertical.
2—32" Bullards, 1 turret head.
1—NEW 36" Gisholt, one swivel turret head, motor driven.
2—37" Baush, 2 heads.
1—42" Bausch, 2 swivel heads.
1—42" Bullard, two swivel heads.
1—NEW 8' Bickford, 90" table, 2 swivel heads; Feb. delivery.
2—10' Niles, 2 swivel heads.

BORING MACHINES—Horizontal.
1—No. 2 Barrett, 5" bar.
1—London, 6" bar.
1—Beaman & Smith, 7" spindle.
1—Barrett, 8" bar.

BULLDOZERS.
1—No. 9 Williams & White, belt drive.
1—No. 12 Ajax, single pulley drive.
2—No. 23 Williams & White, belt drive.
1—No. 26 Williams & White, belt drive.
1—No. 29-U Williams & White, arranged for motor drive.

CRANES—Traveling.
1—8-ton Chesholm & Moore, 13½' span, hand power.
2—10-ton Electric, 47' span, 25' lift, 3 motors.
1—10-ton Niles, 72' span.
1—10-ton Whiting, 3 motors, 24' span.
1—60-ton Niles, 61' span.

CRANES—Locomotive.
3—10-15-ton McMyler Broad gauge Steam Locomotive, 60' boom, bucket, 3 drums.
1—15-ton Industrial Locomotive, 8-wheel, 40' boom, bucket.
1—15-ton Brown Hoist Locomotive, 36' boom, bucket, 8 wheels.
1—20-ton Orton & Steinbrenner, steam locomotive, 8-wheel, double drum, 37' boom, bucket.

CUTTING-OFF MACHINES.
1—NEW 4½" Davis.
30—Davis, 4½".
10—4½" Williams.
2—NEW 6" Davis.

DRILLING MACHINES—Radial.
6—NEW 3' Mueller, speed box drive; Dec. del.
3—NEW 3' American, Sensitive, tapping attachment.
2—4' Mueller, plain, speed box drive.
1—4½' Full Universal, cone drive.
1—NEW 5' Western Plain, with motor.
1—NEW 5' Niles Universal, with motor.
5—NEW 5' Mueller, speed box drive; Dec. delivery.
1—NEW 5' Baush; January delivery.
1—NEW 6' Baush; January delivery.
1—6' Pond, cone drive.
1—NEW 6' Triumph, motor drive; Dec. delivery.

DRILLING MACHINES—Heavy Duty.
2—D-2 Colburn Heavy Duty, 3½" cap., arranged for motor drive.
6—Foote-Burt Heavy Duty, 2½" capacity.
10—No. 310 Baker, single pulley drive, late type; arranged for motor drive.
10—Moline Hole Hogs, heavy duty, 2½" cap.

DRILLING MACHINES—Sliding Head.
2—NEW 24" Barnes, Drills and Tappers.
5—NEW 24" Barnes, Drills.
5—NEW 28" Sibley.

DRILLING MACHINES—Multiple Spindle.
1—4-spindle 20" Barnes, all geared.
1—No. 5 Fox, 12-spindle, 1" capacity.
2—6-spindle Rockford; Economy type.

GEAR CUTTING MACHINES.
5—No. 3 Brown & Sharpe Auto Gear Cutter.
1—36" Newark.
2—No. 4 Brown & Sharpe, latest model, cap. 48" x 10".
1—NEW 6" Standard Gear Cutter, spur.
1—15" Gleason Bevel Gear Planer.
1—20" Grant-Lees Gear Hobber, bevel spur, and spiral attachment.
1—24" Becker-Brainard.
2—NEW 30" Flather, solid pattern.
3—36" Fellows Gear Shapers.
1—NEW 27" Gleason Gear Bevel Planer; Feb. delivery.
1—72" Gould & Eberhardt, for spur and bevel.

GRINDERS—Universal for Cutters, Drills, Reamers, Etc.
5—NEW No. 190 Wells.
4—No. 1 Cincinnati.
1—NEW Premier, Universal.
1—NEW Wilmarth & Morman, style B.K.
1—NEW Walker No. 1, outfit B.
1—NEW No. 1 Wood Universal.
5—NEW No. 2 Wood Universal.
1—NEW Walker No. 2, outfit K, capacity 9"x26".
2—NEW No. 2 Oesterlein Universal.
7—NEW LeBlond.

GRINDERS—Cylindrical. Plain.
2—NEW 8" x 18" Modern Self-contained.
3—NEW 8" x 30" Modern Self-contained.
2—NEW 12" x 24" Modern Self-contained.
6—12" x 36" Modern Self-contained.
2—12" x 42" Landis Self-contained.
5—12" x 48" Modern Self-contained.
7—NEW 10' x 50" Norton.
1—14 x 50 Norton.
1—NEW 10 x 72 Norton; Plain.
1—42 x 96" Springfield.

GRINDERS—Cylindrical, Universal
2—NEW No. 2 Bath. 9" x 20'.
1—NEW No. 2 Walker; 9" x 26".
1—NEW 2½ (10" x 36" Bath.)
1—NEW Thompson 10 x 36".
1—No. 3 (12" x 40" Brown & Sharpe).
1—12" x 42" Landis.
1—No. 4 Cincinnati; capacity 12 x 72".

GRINDERS—Internal
1—NEW No. 6 Modern, capacity 10" x 16".
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—Cylindrical.
1—No 60 Heald, single pulley drive.

GRINDERS—Surface.
4—NEW No. 1 La Salle, Plain.
1—NEW No. 1½ Walker's, complete.
2—NEW No. 2 American with Walker No. 1¾ Plain Flat Mag. Chucks.
6—NEW No. 2 Reid (Same as B. & S.).
1—3' Pratt & Whitney Vertical, Magnetic Chuck.

HAMMERS—Board Lift Drop.
1—No. 4 Standard Machinery Co., 400-lb.
1—E. W. Bliss, 800-lb.
1—1500-lb. Toledo.

HAMMERS—Steam Forging.
1—450-lb. Bell.
1—800-lb. Niles, single frame.
2—3500-lb. Chambersburg Steam Drop Hammers.
2—500-lb. Chambersburg Steam Drop Hammers.
1—7000-lb. Morgan Special Double Stand.

KEYSEATERS.
1—NEW No. 2 Davis.
1—No. 2 Mitts & Merrill.
1—Colburn 4", capacity 43" stroke.
1—No. 2 Knowles, 60" stroke.
2—NEW No. 1 Davis.

LATHES—Manufacturing, not Screw Cutting
2—NEW No. 3 Harding Brothers, Bench Lathes.
3—16" x 8' Fairbanks-Morse, Heavy Duty.
70—NEW Simplex 16" x 8'.
14—Reed-Prentice Shell Lathes for 4" or 18-lb. American Shells.
2—25" Barrett Heavy Duty Boring Mill.
5—20" x 10' Hindman, High Duty.
7—36" x 20' Heavy Duty N.B.P. Projectile Boring, Motor Driven; almost new.

LATHES—Engine.
3—NEW 14" x 6' Bradford Quick Change.
14—NEW 15" x 6' Rockford.
1—NEW 14" x 6' Hendey, Geared Head.
3—NEW 16" x 6' Cleveland Tool Room Lathes, complete equipment.
4—NEW 16" x 8' Bradford Quick Change.
1—NEW 17" x 8' National Quick Change Gears.
12—NEW 17" x 8' LeBlond Pan Bed, Quick Change Gears.
1—18" x 10' Hendey, quick-change gear, 14" chuck.
5—NEW 20 x 10 Brandford Quick Change.
1—NEW 20" x 10' Cleveland Geared Head.
3—NEW 20" x 12' Bradford Quick Change.
19—NEW 21" x 10' Porter, S.B.G.
9—22" x 10' Putnam, Oil Pan and Pump.
1—NEW 24" x 10' Bradford Quick Change.
5—NEW 24" x 12' Bradford, Quick Change.
1—NEW 24" x 12' American.
3—24" x 14' American, Quick Change.
1—24" x 22' Bullard, Triple Geared; Taper Attachment.
1—NEW 26" x 48" x 12' McCabe Double Spindle.
1—NEW 26" x 48" x 22' McCabe Double Spindle.
8—NEW 28" x 12' Conradson Duplex Helical Drive, Screw Cutting Type.
1—NEW 30" x 14' American Double Back Geared, Quick Change.
1—30" x 14' Lodge & Shipley Single Pulley Drive, Quick Change.
1—NEW 32" x 12' Pittsburg Pattern.
1—NEW 42" x 24' Triple, Geared, Houston, Stanwood, Heavy Duty.
1—42" x 28' Hamilton, Triple Geared, Quick Change, raising blocks to 54".
1—50" x 24' Prentiss.
1—52" x 22' Worcester, Triple Geared.
1—58" x 18' 6" Dodge Lathe, Very Heavy.
1—NEW 66" x 46 Putnam Triple Geared, Face Plate Drive 5-step Cone; 6½" belt.
1—84" x 18' Special Boring Lathe.

LATHES—Turret.
8—NEW 21" Gisholt H-21.
2—NEW 24" Gisholt I-24.
5—2 x 24 Jones & Lamson.
1—NEW 18" Libby.
3—24" Libbey, Universal Facing Head, 3-jaw chuck.
1—20" Steinle, almst new.
17—6A Potter & Johnson.
1—No. 24 New Britain, arranged for motor drive; almost new.

MILLING MACHINES—Knee Type, Universal.
1—No. 2 Kempsmith, Vertical Attachment.
1—No. 2 Kempsmith 13" Dividing Head.
1—NEW No. 2 Rockford High Power.
2—NEW No. 2 Garvin.
1—No. 2 LeBlond.
1—NEW No. 3 Owen.
2—NEW No. 3 Cincinnati High Power.
1—No. 3-H LeBlond Heavy Duty; almost new.
1—No. 25 Oesterlein.
1—NEW No. 34 Oesterlein Heavy Duty; latest type.

MILLING MACHINES—Knee Type, Plain.
2—NEW No. 1 Kempsmith.
2—NEW No. 3½ American, Back Gear.
2—NEW No. 2 Rockford.
3—NEW No. 2 Kempsmith.
1—No. 3 LeBlond.
1—NEW No. 3 Cincinnati.
2—No. 3 Kempsmith.
10—NEW No. 3 Owen.

MILLING MACHINES—Duplex.
1—No. ½ Van Norman; almost new.
1—No. 2 Garvin Spiral Drive.

MILLING MACHINES—Hand.
3—NEW No. 1 Rockford without column.
3—NEW No. 2 Rockford on column.
2—NEW No. 3 Rockford on Column.
3—NEW No. 3 Rockford on column, power feed.

MILLING MACHINES—Vertical.
1—No. 2 Pratt & Whitney.
1—No. 3 Cincinnati Heavy Duty.
2—NEW No. 4 B. Becker.
3—NEW No. 5 B. Becker; Rotary Table.
1—Newton Vertical, Continuous, Motor Driven, for shell work.

MILLING MACHINES—Planer Type.
1—No. 2 Beaman & Smith.
1—Ingersoll Slab 16" x 48" capacity.
1—NEW 17" x 5' Eynon Planer Type.
1—30" x 30" x 8' Ingersoll No. 928, Single Spindle with Motor.

MILLING MACHINES—Lincoln Type.
1—NEW No. 1 Gooley & Edlund, Briggs Type.
3—NEW No. 1 American.
18—NEW Sellers Auto. Quick Return.

PLANERS.
4—NEW 24" x 24" x 6' Powell, Single Head.
1—26" x 26" x 10' Gray; 1 Head.
1—36" x 36" x 10' American; 2 Heads.
1—36" x 36" x 14' Cincinnati; 2 Heads ;fine condition.
1—36" Rotary Planer, Motor Driven.
1—36" x 36" x 8' Gray; One Head.
1—40" x 40" x 11' Niles; Four Heads.
1—42" x 42" x 12' Butler, High Speed; 3 Heads; almost new.
1—48" x 48" x 12' Scott; Heavy Type; Milling Attachment, on Rail.
1—52" x 48" x 15' Betts; 2 Heads.
1—60" x 60" x 16' Betts; 2 Heads.
1—60" x 60" x 21' Pond; 3 Heads.
1—72" x 60" x 14' Smith Globe; 2 Swivel Heads.
1—62" x 62" x 20' Canada Tool Works Planer; 2 Heads.

SCREW MACHINES—Hand.
3—No. 0 Brown & Sharpe.
4—NEW No. 2 Foster Geared Friction Head.
1—NEW No. 4 Foster Geared Friction Head, Power Feed to Turret Slide.
2—NEW No. 5 Foster All Geared Power Feed to Turret Slide.
3—NEW No. 5 Foster All Geared Head, Power Feed to Turret; Power Cross Feed.
2—NEW No. 6 Foster Geared Friction Head, Power Feed to Turret; Power Cross Feed.
5—NEW No. 7 Foster Geared Friction Head, Power Feed to Turret; Power Cross Feed.
2—NEW No. 10 Foster Geared Friction Head, Power Feed to Turret; Power Cross Feed.
2—NEW 2¼" Dreses F.G.B. Power Feed.

SCREW MACHINES—Automatic
2—NEW ⅝" Cleveland, Model A.
1—NEW ¾" Gridley Mult. Spindle, Belt Driven.
2—NEW 2¼" Gridley Mult. Spindle, Belt Driven.
2—NEW 1¾" Gridley Mult. Spindle, Belt Driven.
1—NEW 2¼" Gridley Mult. Spindle, Belt Driven.
1—NEW 3¼" Gridley Single Spindle, Belt Driven.
2—No. 0 Brown & Sharpe.
1—No. 2 G. Brown & Sharpe.
1—No. 515 National Acme.

SHAPERS.
1—NEW 16" Springfield.
1—16" Motor Driven Rockford.
5—NEW Barker 24".
2—NEW 24" Milwaukee.
2—NEW 24" Potter & Johnson Universal Rotary Table.
1—25" Springfield.
2—30" Morton Draw Cut.

SHEARS.
1—Waterbury-Farrell Aligator, capacity 2½".
1—Cincinnati Gap. 17" gap, 78" blade; ¼" capacity.
1—No. 411-G Toledo Squaring, capacity 97", weight 12,600 lbs.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 549 Washington Blvd. | **CINCINNATI, OHIO** Union Central Life Bldg. | **CLEVELAND, OHIO** Leader News Bldg. | **NEW YORK CITY** Singer Bldg.

WRITE OR WIRE OUR NEAREST OFFICE FOR QUOTATIONS
THIS IS ONLY A PARTIAL LIST OF AVAILABLE MACHINES

New York's Greatest Stock

(Partial List)

REDUCING PRESSES

Four No. 60½ Bliss, with rack and pinion movement, adjustable stroke from 4″ to 42″; **especially adapted for drawing shells up to 21″ in length.**

NEW SHAPERS

24″ Hollingsworth Improved Triple Geared Crank

PIPE MACHINES

16″ Saunders, 8″ to 16″ capacity
10″ Cox, 2½″ to 10″ capacity
8″ Saunders, 2″ to 8″ capacity
8″ Eaton-Cole-Burnham, 2½″ to 8″ capacity
6″ Stoever, 1¼″ to 6″ capacity
Two 6″ Curtis & Curtis, 2½″ to 6″ capacity
Two 4″ Morris, 2½″ to 4″ capacity
4″ Armstrong, 2″ to 4″ capacity
2″ Borden, ½″ to 2″ capacity
2″ Jarecke, ¾″ to 2″ capacity

MISCELLANEOUS

36″ x 18′ Farrell Foundry Engine Lathe, face plate drive
32″ x 22′ Gleason Engine Lathe, raising blocks to swing 66″, double back geared
2¼″ x 24″ Jones & Lamson sliding head Flat Turret Lathe, bar equipment
2″ x 24″ Jones & Lamson cone head Flat Turret Lathe
21″ Gisholt Lathe
18″ Gisholt Lathe
3½″ Acme Bolt Cutter
36″ x 36″ x 12′ Ingersoll heavy duty Horizontal Slab, adjustable rail
No. 2 Barrett Horizontal Cylinder, Boring Machine, 5″ bar
No. 73½ Bliss Straight Sided Geared Press, 4″ stroke
Four 48″ Newton Automatic Gear Cutters or Hobbing Machines

New York Machinery Exchange, Inc.

50 CHURCH STREET - NEW YORK CITY

Shell Manufacturers

Who expect **New Shell Orders** either from **Canada** or the **United States,** may need some of their shell equipment **overhauled** and **repaired** or **rebuilt.** We can handle it **completely, satisfactorily** and **promptly.**

NOW IS THE TIME.

The

Preston Machinery Co., Ltd.

PRESTON :-: ONTARIO, CANADA

There's a man

advertising on page 68 for a position.

Have you a position open that he could profitably fill? If you have, write him. If you have the position and don't think he can fill it, advertise for one who can.

Canadian Machinery

Classified Advertising Section

143 University Avenue, Toronto

IMMEDIATE DELIVERY

DRILLING MACHINES

Leland H.S., B.B., bench type.
No. 1½ Knight Driller and Miller.
32" Hamilton, s.h., b.g., p.f.
32" W. F. & J. Barnes, s.h., b.g., p.f.
20" W. F. & J. Barnes, 4 spindle.
No. 11 P. & W. Multiple, 10 spindles.
3' W. E. Gang Plain Radial.
3½' W. E. Gang Plain Radial.
4' Mueller Plain Radial.
Pawling & Harnischfeger Horizontal Driller.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. automatic.
30" x 9" G. & E. auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3—26" B. & S. for spur.
36" Walcott for spur.

GRINDERS

Yankee Drill.
No. 1-½ Cincinnati Cutter and Tool.
No. 2 Woods Universal Cutter and Tool.
No. 23 B. & S. Gear Cutter.
No. 1 Brown & Sharpe Universal.
14" x 20" B. & S. Plain.
Garvin hole grinder.
Gisholt tool grinder.
No. 5 Diamond water tool.
No. 16 Gardner disc grinder.
No. 24 Gardner disc grinder.

LATHES

13" x 5' P. & W., c.r., taper.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
18" x 8' L. & S. pat. head, c.r. taper.
18" x 10' Fitchburg, c.r.
18" x 12' Barker, c.r.
20" x 14' Blaisdall, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
36" x 20' American, t.b.g.
36" x 22' New Haven, t.b.g.

PLANERS

24" x 24" x 4' Gray, one head.
24" x 24" x 8' Cincinnati, one head.
26" x 26" x 8' Pease, one head.
30" x 30" x 8' Woodward & Powell, one head.
30" x 30" x 8' Cincinnati, two heads.
36" x 36" x 14' Sellers, one head.
40" x 38" x 14' Putnam, one head.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES

No. 1 Foster, Plain, A.C. and W.F.
1" B. & S. Plain.
16" P. & W. Plain.
No. 2 Costello, plain head.
No. 2 P. & W. friction head.
No. 4 Pearson, geared head.
No. 3 Bardons & Oliver, plain head.
⅞" Cleveland, automatic.

TURRET LATHES

No. 22 Garvin.
16" Lodge & Shipley.
25' Niles.
2 x 24" Jones & Lamson.
3 x 36" Jones & Lamson, chucking equipment.
3 x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt turret lathes, taper attachment.

PUNCHES AND SHEARS

No. 3 American Can.
No. 3 Bauroth, O.B.I.
No. 5 Bauroth Geared, O.B.I.
No. 6 N. American Can.
No. 2 L. & A. Angle Iron Shears, 5"x5"x½" (new).
No. 5 L. & A. Double Punch & Shear, ⅝"x⅝", 3"x⅝", 1⅛ rd. (new).
No. 1 L. & A. Multiple Punch (new).
No. 1 L. & A. Horizontal Punch, ½" in 1" (new).

MISCELLANEOUS

No. 0 Mitts & Merrill Keyseater.
50-lb. Bradley Strap Hammer.
¾" Acme Forging Machine.
52" Niles car wheel boring mill.
3" Stover Pipe Machine.
6" x 14" P. & W. Thread Miller.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-ton Yale Duplex Hoist.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., CHICAGO, ILL.

PRACTICALITY

AFTER fifteen years' study of the Miner's and Lumberman's wants, we know just what is and what is not required in tools for them.

Practicality has been the keynote of our organization. Experience has aided us in eliminating all unnecessary parts and in perfecting the design of our tools.

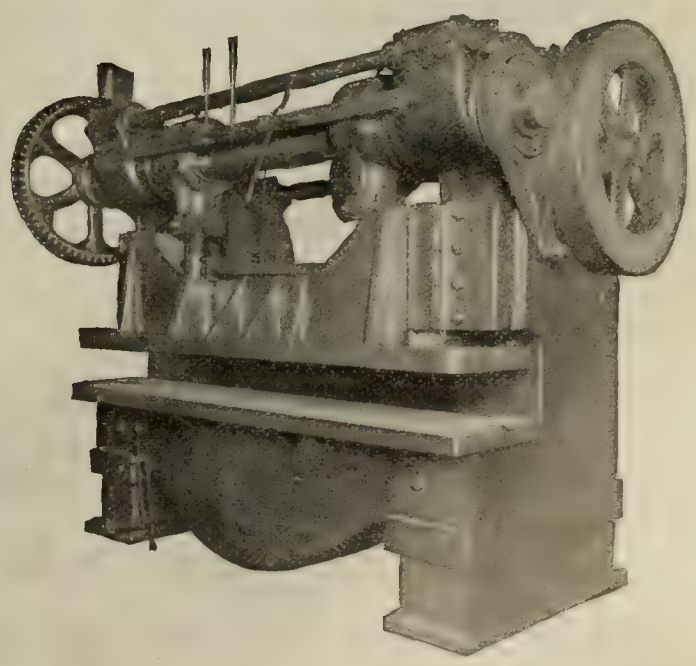
The use of best material and finest workmanship enable us to manufacture tools that are unexcelled.

We make a complete line.

Write us for prices.

J. W. CUMMING & SON, LTD.
NEW GLASGOW, - - CANADA
Wood or Steel, let Cummings make it.

FOR SALE



Large Blanking Press

76" between housings, 8" shaft,
3½" stroke, 8¾" die space.
Very good condition and for immediate delivery.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Ave. - - DETROIT, MICH.

Canada is Now a Creditor Nation

Help Her to Maintain this Position By Subscribing for Large Blocks of

Canada's Victory Bonds

It is for you, manufacturers and merchants, to give the lead to those whose daily lives you influence, by subscribing for a substantial block of Canada's Victory Bonds.

The simple fact is, Canada must have more money to carry on her part in the war and extend credit to Great Britain and our Allies.

This Canada must do if our industrial, commercial and agricultural activity is to be maintained.

Since Canada can no longer borrow abroad, the money must be secured here.

Fortunately the money is here. It only remains to get the hundreds of thousands of people with savings to realize what it means to Canada—to them—to you—to insure the success of the Loan.

By subscribing for Canada's Victory Bonds yourself, and tactfully explaining their merits to your employees—you can insure the Bond issue becoming an overwhelming popular success. This Canada relies upon you and every other manufacturer and merchant to do.

So surely as Canada's Soldiers in the Front line trenches are fighting for Freedom, so in a lesser degree do they fight who lend their money to support Canada's Armies in the field.

Money fights to-day, and it is the bounden duty of every Canadian to back Canada's part in the war by buying Canada's Victory Bonds.

Decide now that your concern will take a big block of Canada's Victory Bonds and that your whole establishment will be organized in support of the Loan.

Issued by Canada's Victory Loan Committee
in co-operation with the Minister of Finance
of the Dominion of Canada.

61

SPECIAL MACHINERY

Special Machinery, Gears, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Etc.

CONTRACT WORK

Shell Manufacturers

Get our Prices on Gauges, Boring Bars Rough Turn Drivers, Etc., for 6 in. SHELL.

GENERAL MACHINE WORK

Brass and Aluminum Castings

Prompt Delivery

THE

MONARCH BRASS MFG.

COMPANY, LIMITED

71 Brown's Ave., - Toronto, Ont.

GEARS

CUT GEARS

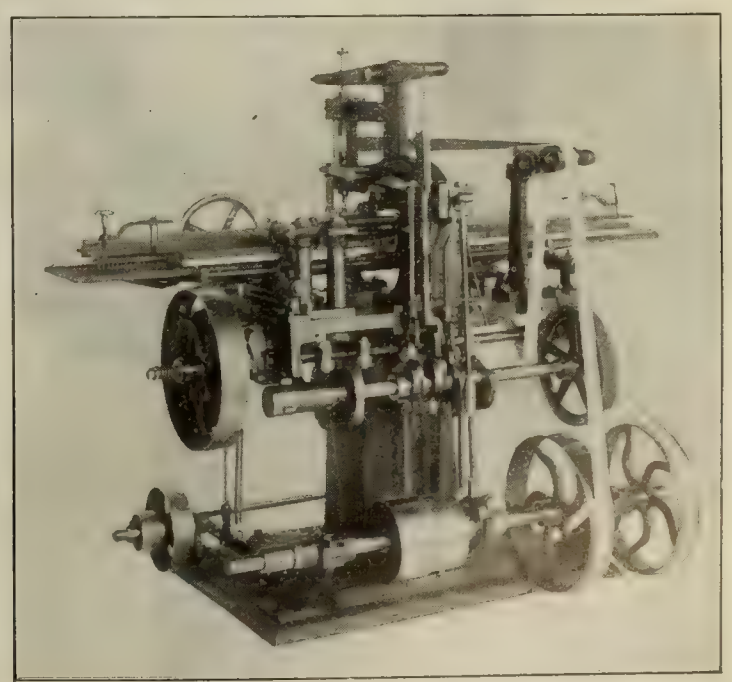
HAMILTON

GEAR & MACHINE CO.

Cor. Concord & Van Horne **TORONTO**

ACCURACY IN CUTTING makes SILENT POWER

We will show here from time to time some machines we build that you may judge our capabilities in this line.



Balance Rail and Keyframe Boring Machine

Manufactured Solely By

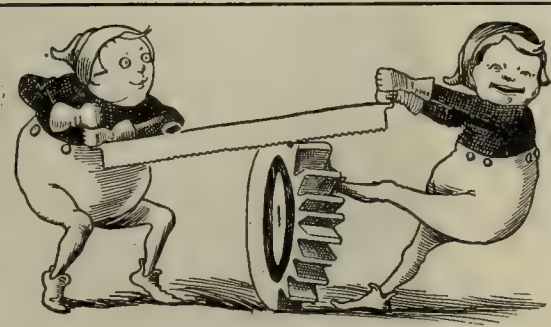
TORONTO TOOL CO.,

TORONTO, ONT.

516 Richmond St., West Phone Adel. 1181

We Cut Gears

Rawhide, Steel, Iron, Brass.



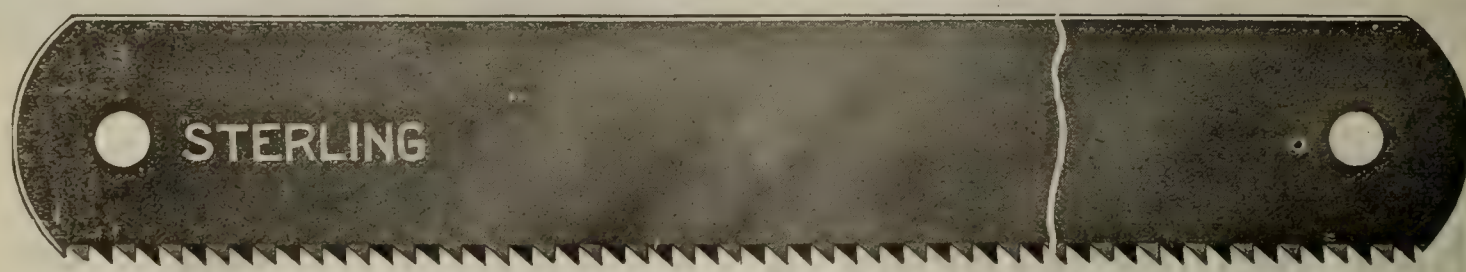
We Make Grinder Heads, Power Hack Saws, Friction Pulleys, Index Heads.

DESIGN AND BUILD SPECIAL MACHINERY

WINNIPEG GEAR & ENGINEERING Co.

197-199 PRINCESS ST., WINNIPEG

"STERLING"
HACK SAW BLADES



A brand once adopted, difficult to replace.

REASONS—High quality of material used, mechanical construction, and special heat treatment.

RESULTS—Economy which means satisfied customers.

Write for information and prices.

DIAMOND SAW & STAMPING WORKS
BUFFALO, N.Y., U.S.A.

More and Better Work

That's the news we get from shops which have introduced

BLOUNT'S GRINDING MACHINES

Cut shows machine for wheels 16" x 2½" x 1¼".

Has self-oiling, line-reamed, babbitted bearings.

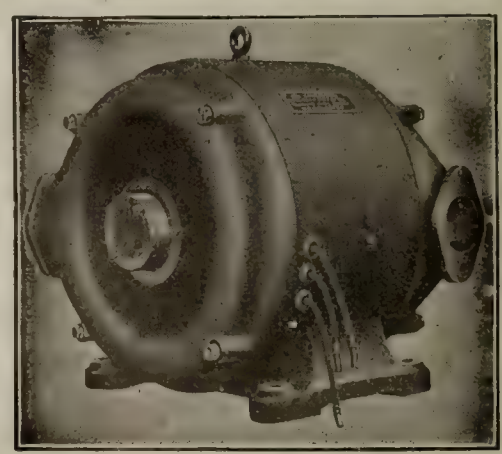
Caps milled to lock on to boxes, and parts of uniform dimensions. Spindle made of high-grade steel and bearings and wheel No. 5, with self-oiling guards.

Write for catalog giving complete description of grinders and lathes.

J. G. Blount Co., Everett, Mass.

The Lancashire Dynamo & Motor Company, of Canada, Limited
107-109 Duke Street, TORONTO

ELECTRICAL MACHINERY for all Purposes.
ELLIOTT BROS'. { INSTRUMENTS / RECORDING GAUGES



PIPE VENTILATED A C MOTOR
FOR VERY DIRTY PLACES

CHAPMAN

DOUBLE BALL BEARINGS

Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
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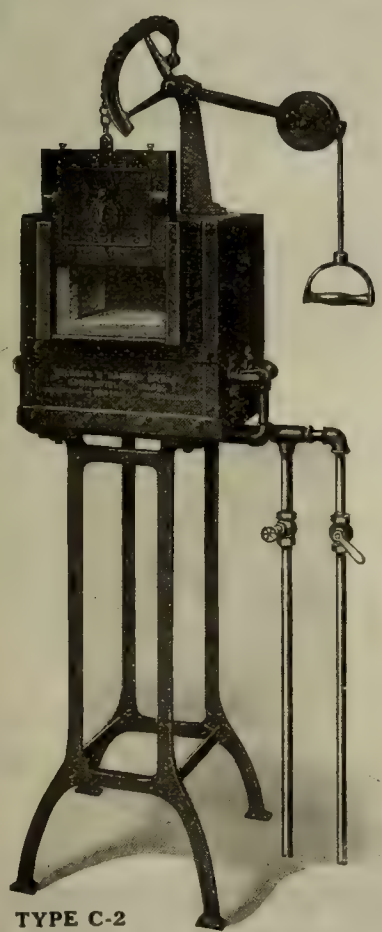
TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.

The Right Furnace For
Every Purpose



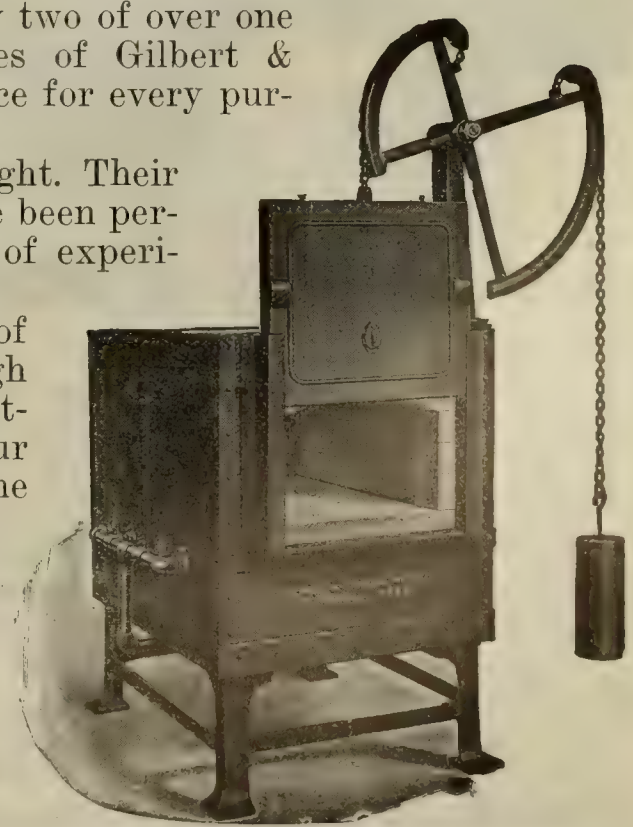
TYPE C-2

THE types shown are only two of over one hundred types and sizes of Gilbert & Barker Furnaces — a furnace for every purpose.

G. & B. Furnaces are built right. Their construction and design have been perfected by our half century of experience.

We offer you the benefit of this experience and thorough knowledge of modern heat-treating methods through our engineering department. The service is free. Put your problems up to us.

Just now we are making prompt delivery of these two types and many others. Send for stock List 24.



TYPE C-15

Gilbert & Barker Mfg. Co. West Springfield, Mass.

Canadian Agents:
James DeVon, 227 Davenport Rd., Toronto, Ont. Williams & Wilson, Montreal, Que.

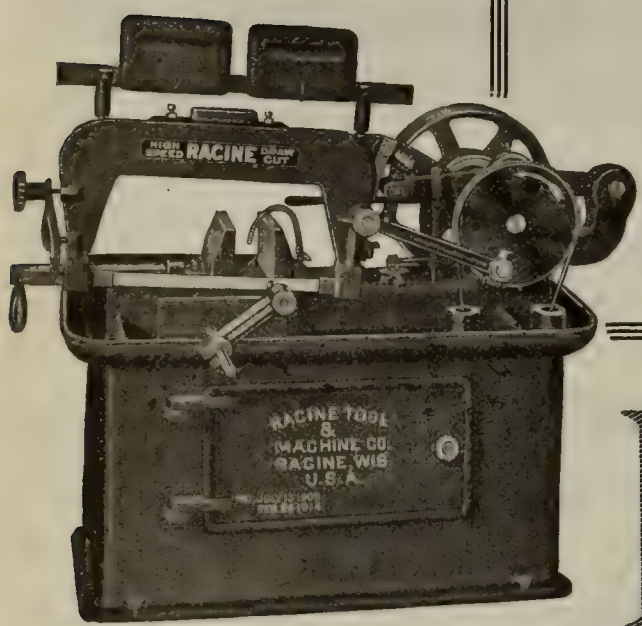
Known the World Over
Admitted to be Superior

The Racine for Scientific Metal Cutting

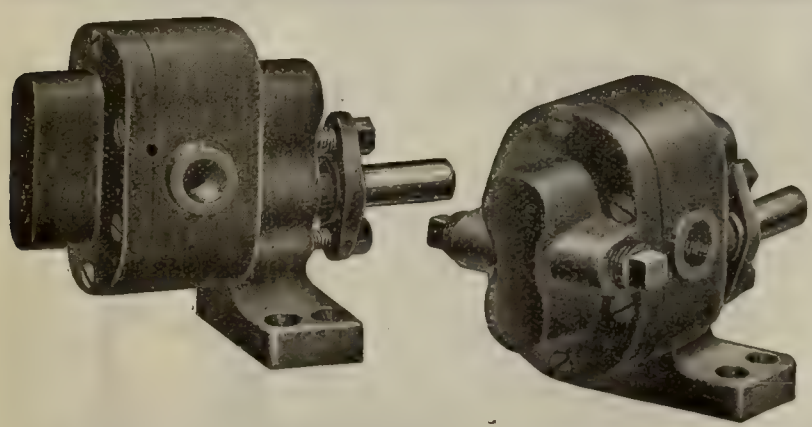
Demonstrate the value of this machine in your own shop, on your own work. Our confidence in the ability of this machine is such that we will send it to you on *trial.* This will give you ample opportunity to study the machine from close quarters; to verify our statements regarding simple construction and operation, accuracy and speed, features that stamp our machine in a class by itself.

We invite your inquiries for full information and installation

Racine Tool & Machine Co.
15 Melbourne Ave. **Racine, Wis., U.S.A.**



RACINE



Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.

SHEET METAL STAMPINGS

The quality of our production is one grade — THE BEST. Our facilities and equipment enable us to give a very attractive price and prompt service.

Dominion Forge and Stamping Co., Limited
WALKERVILLE, ONTARIO

DROP FORGINGS

IF self-interest be the mainspring of a man's actions, then you should act at once, because the "Clipper" Belt Lacer saves money for you.

Each time a belt breaks from 1 to 150 men and machines are idle.

"Clipper" lacings have been made in 45 seconds. The maximum time required is only three minutes. How long are *your* men and machines idle when a belt breaks?

Clipper Belt Lacer Company

976 Front Avenue Grand Rapids, Mich.

STOP THE SPOILAGE

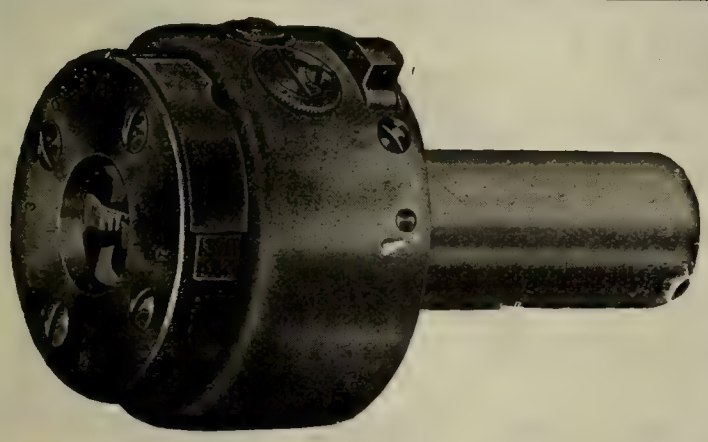
One of the most disheartening problems of shop and mill is the spoilage of material and loss of labor time. Darkness increases the chances of larger errors, and tends to handicap your production.

LACO NITRO LAMP "THE LIGHT THAT GIVES MORE LIGHT"

is the solution to this "profit losing" question. It will give you 24 hours of bright, white light, assisting skilled labor to render better work with less spoilage and errors.
These Nitro Laco Lamps produce more and better light per watt than any other type of lamp. We guarantee their long service.

Inquire from your nearest dealer

Canadian Laco-Philips Company, Limited
MONTREAL, TORONTO, WINNIPEG and VANCOUVER



Automatic Die Heads

The chasers are set and held in place by a steel cam which, when adjusted, locks, no stopping or changing necessary.

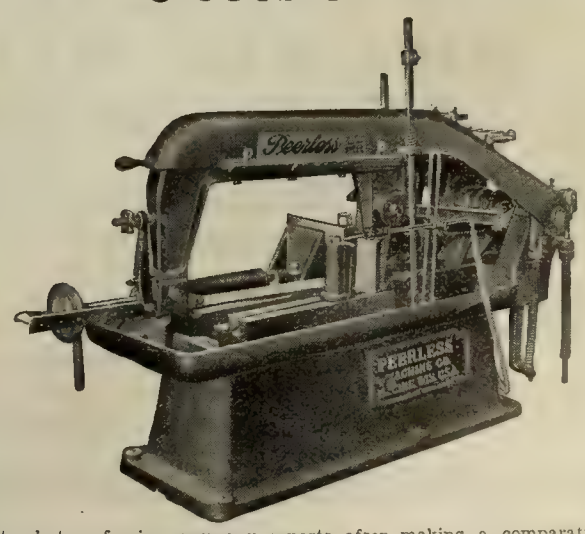
The quick release will allow cutting right up to a shoulder when necessary.

These features are distinctly an H. & G. Automatic Self-Opening Die head quality that makes it desired among other tools of similar nature.

We will gladly furnish you with our booklet.

Eastern Machine Screw Corp.
New Haven, Conn., U.S.A.

"5 Times More Work from Blades. 3 CUTS TO 1"



Just what a forging company reports after making a comparative test on Peerless High Speed Saw, cutting 9¼ in. steel; test made on our 13 x 16 machine under equal conditions. We would be glad to furnish complete copy of this report and others, some of these tools may be working in your vincity.

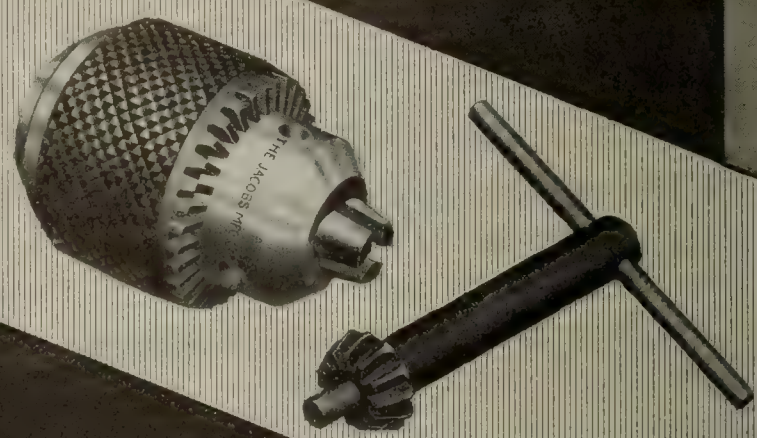
Here are facts that will substantiate this report. This firm has repeated their order from time to time, fourteen machines have been shipped them by express. The express charges on these shipments amounted to about $450.00. At the same time they could secure from stock other makes and cheaper tools.

When a firm is urgently in need of a tool and will delay production several days awaiting delivery on a certain make, and go to such an enormous additional expense, when others could be had from stock, such evidence ought to influence your investigating the Peerless High Speed Saw before deciding on any other equipment.

From the reports and repeated orders received would indicate this tool has revolutionized all metal cutting standards. We are, therefore, very anxious to install them on thirty or sixty days' free trial; this will allow you to thoroughly test and examine same before deciding to purchase.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

Jacobs
IMPROVED
Drill Chuck



A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.

MAKE NAILS! NOT NOISE!

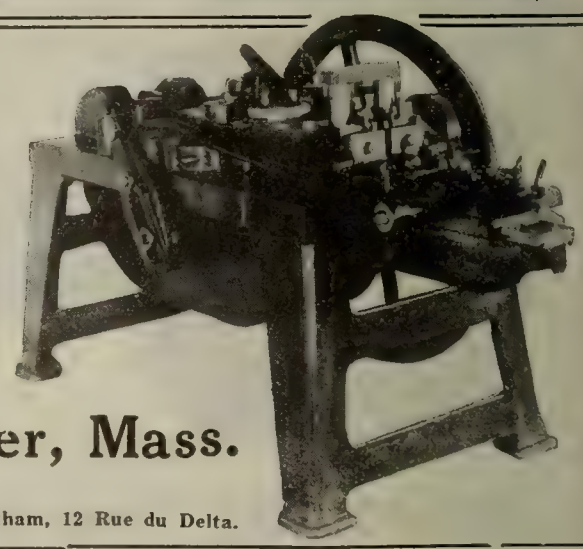
We offer the trade new types of

WIRE NAIL MACHINES

QUIET IN OPERATION; WITH VERY HIGH OUTPUT; ALL PARTS ACCESSIBLE; DECREASED MAINTENANCE COSTS; GREAT CAPACITY; OCCUPYING SMALL FLOOR SPACE.

Smoothly running machines, with balanced mechanical motions and no rotating cams. Built in 5 sizes, handling wire from No. 17 to ⅜" diam.

PRACTICALLY NOISELESS IN OPERATION



Sleeper & Hartley, Inc., Worcester, Mass.

CANADIAN BRANCH, COATICOOK, P.Q.

London, England, F. A. Perry, 63 Queen Victoria Street, E.C. 4. Paris, France, Edgar Bloxham, 12 Rue du Delta.

DEPENDABILITY

Has Made

HARRIS HEAVY PRESSURE

THE MOST POPULAR BABBITT METAL IN THE DOMINION

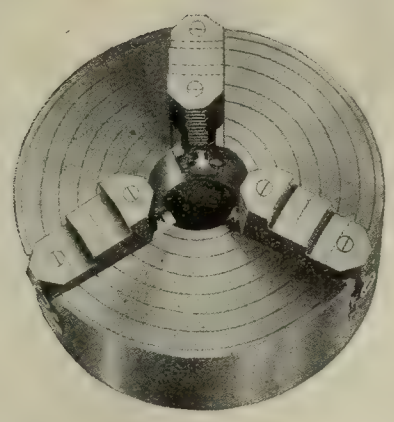
Manufactured by
THE CANADA METAL CO., LTD.
Hamilton, Montreal, TORONTO, Winnipeg, Vancouver

IT FLOWS FREELY

IT WILL NOT CRACK

IT IS COPPER COATED

IT IS COPPER HARDENED



Ask a User of

HANNIFIN AIR CHUCKS

Know that it Pays to Chuck with Air

Near your own plant—probably within local telephone call — another plant is using Hannifin Air Operated Chucks. Ask the owner or the superintendent if an increase in production of from 20 to 100 per cent. has been realized since the change to Hannifin.

Hannifin Air Chucks are practically instantaneous in action. Work is chucked to stay by the turn of a lever; by another turn, instantly released. There is never a slip when setting up, for the pressure is uniform all the time. As for wear, there is none.

A copy of the Hannifin catalogue, describing in detail our Air Operated Chucks and Clamping Equipment, needs your name.

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Probably you never heard a finer business story than the substantiated facts about Murchey Collapsing Taps, Hand-Sizing Taps and Automatic, Self-Opening Dies—what they have done, are doing, and why. In England, France and Russia, but little less than here at home, they have opened wise eyes to unthought of possibilities. With their whole story before you—the exact facts in respect to production increases and unmatched economies attained—you will also conclude that Murchey Tools are simply indispensable to absolute accuracy and greatest profits.

Write to-day for your copy.

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The process by which these screws are made increases their strength over 30%. Allen Screws are guaranteed.

CAP SCREW

SET SCREW

United States Standard and V Threads carried in stock. Sizes from 1-4" to 1½" in diam. Catalog and samples free.

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Help your Country. Buy Victory Bonds.

HAMILTON MOTOR WORKS, LTD.

HAMILTON - - CANADA

BRASS Castings

The coupling of expert work with unexcelled equipment enables us to produce on a large scale Brass Castings of any size or alloy.

Our prices, too, are most reasonable; for our large purchases direct from the smelters command their every price favor.

For better Brass Castings at a money saving, send your orders to us. We promise that our work will please you.

The St. Lawrence Welding Company, Ltd., Montreal, P.Q.

Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, Etc. Electric Welders, Oxy-Acetylene Welders. Boiler Repairs. Lead Burning and Brass Foundry Work.

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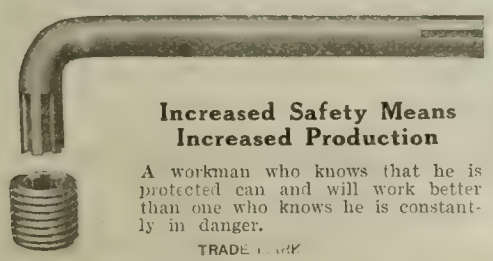

Increased Safety Means Increased Production

A workman who knows that he is protected can and will work better than one who knows he is constantly in danger.

TRADE MARK

BRISTO

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SAFETY SET SCREWS

Protect the workman. Free from the need of watching projecting screws which might catch his clothing, he has more time to devote to his work. You yourself will be freed from worry over the safety of your men. And you will be free from law suits, too.

Write for samples and Bulletin I-809.

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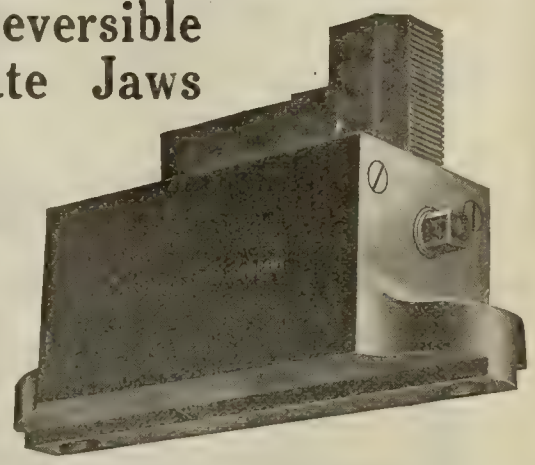
Skinner Reversible Face Plate Jaws

Everything in the line of Chucks.

Write for illustrated catalog.

Iron or Steel Body, Single Rib for Large Lathes and Double Ribs Boring Mills



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Factory and Main Office: New Britain, Conn.

New York Office: 94 Reade St. San Francisco Office: Rialto Bldg. London Office: 149 Queen Victoria St.

We guard your purchases and tell you if you are getting what you are supposed to get.

Once you have formed the habit of consulting us for expert advice you wonder how you got along without our service.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED

Head Office and Main Laboratories—MONTREAL

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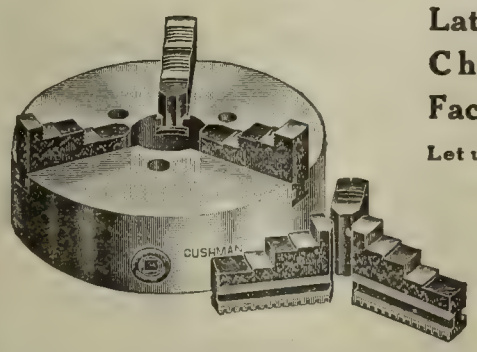
TORONTO, WINNIPEG, EDMONTON, VANCOUVER, NEW GLASGOW

STEEL CASTINGS

We are well equipped to make all kinds of steel castings, 100 lbs. to 50,000 lbs.

Dominion Steel Foundry Co.
LIMITED
Hamilton Ontario

Cushman Chucks



Lathe Chucks, Drill Chucks, Portable Face Plate Jaws.

Let us send you our catalog.

The Cushman Chuck Co.

Hartford, Conn., U.S.A.

RIVETED STEEL TANKS FOR EVERY PURPOSE

OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
PNEUMATIC WATER SUPPLY TANKS - SMOKE STACKS
BOILER BREECHING - RIVETED STEEL PIPE BINS & HOPPERS

NORTHERN CRANE WORKS LIMITED
WALKERVILLE, ONTARIO

"MADE IN CANADA"

NORTHERN CRANES

Electric Traveling Cranes, Han Cranes, Electric Hoists, Air Hoist,, Foundry Equipment, Cupolas, Ladless Etc., Etc.

Speed up Your Drilling

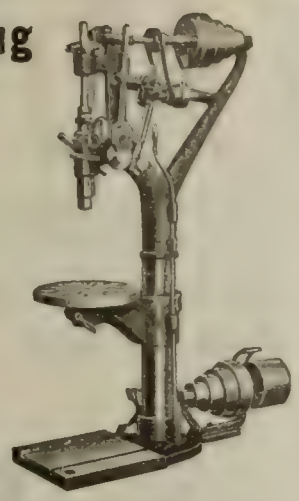
You can drill holes efficiently and at a cost-cutting speed with

SILVER DRILLS

Furnished in gangs of 2, 3 and 4 spindles as well as single spindle. Ask about our new 25" drill.

Orders promptly filled.

Silver Manufacturing Co.
290 Broadway, Salem, Ohio



Greenfield

Trade Mark Reg. U. S. Pat. Office

A Universal Grinder with a Complete set of attachments for handling all kinds of tool sharpening, cylindrical, internal and surface grinding. STURDY, DEPENDABLE, ACCURATE, RAPID. Catalog No. 6 on request.

Greenfield Machine Co.
Greenfield, Mass., U. S. A.

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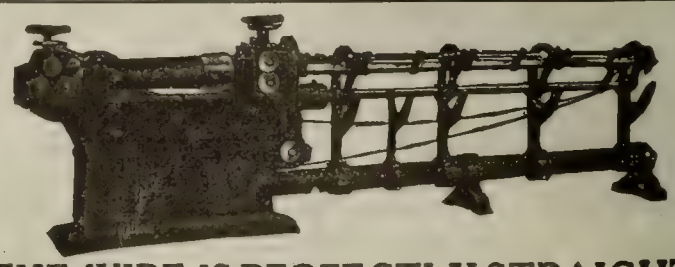

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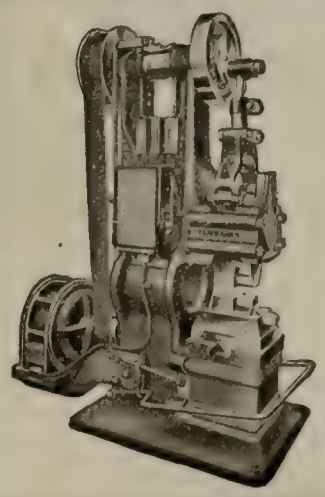

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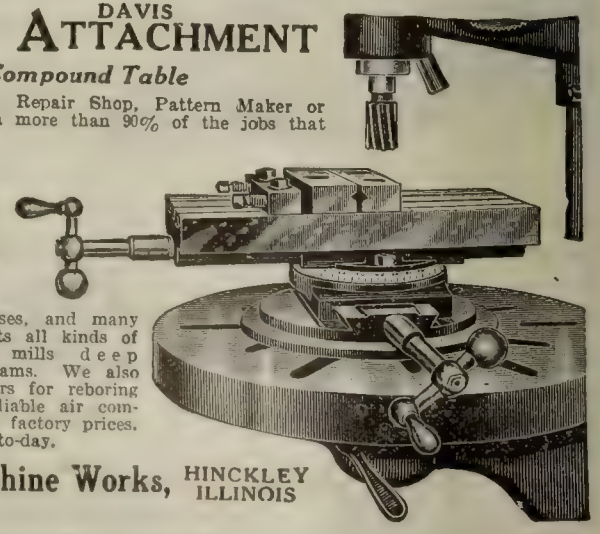

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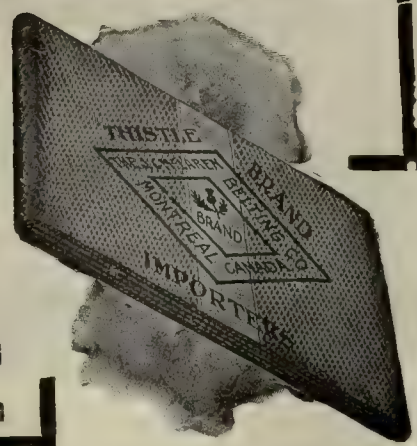

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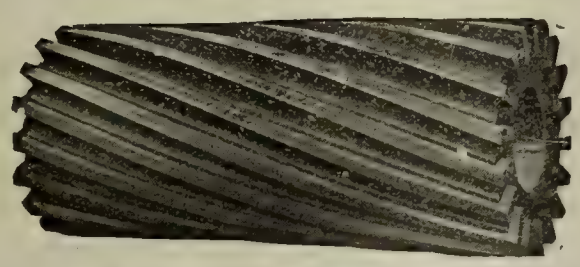

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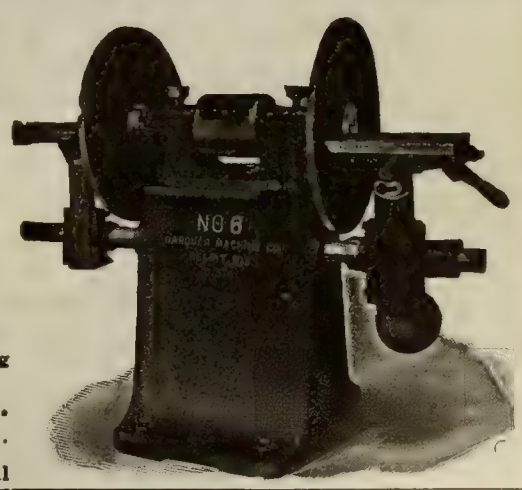

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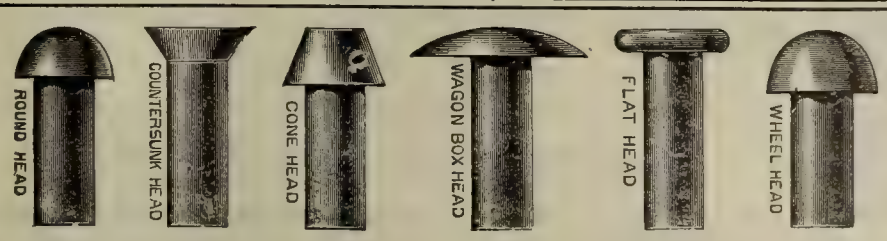

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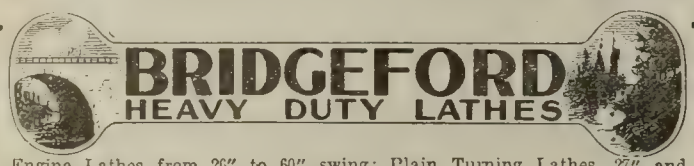

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Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Marsh & Henthorn, Ltd., Belleville, Ont.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.
Sterling Engine Works, Winnipeg, Man.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Can. Steel Foundries, Ltd., Montreal, Que.
Dominion Steel Foundry Co., Ltd., Hamilton, Ont
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
Can. Steel Foundries, Ltd., Montreal, Que.
Cumming & Son, J. W., New Glasgow, Canada.

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.

CEMENT MACHINERY
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.
Petrie, Ltd., H. W., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

CHAIN DRIVES
Jones & Glassco, Montreal, Que.

CHEMISTS
Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

CHESTS, TOOL
Embree, Ira, 281 Emerald St. N., Hamilton, Ont.
Union Tool Chest Works, Rochester, N.Y.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
John Bertram & Sons Co., Dundas, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Skinner Chuck Co., New Britain, Conn.
D. E. Whiton Machine Co., New London, Conn.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, MAGNETIC
H. E. Streeter, 523 New Birks Bldg., Montreal.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

CHUCKING MACHINES
Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

CLOCKS, WATCHMAN, PORTABLE
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Jones & Glassco, Montreal, Que.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Que.
Johnson Machine Co., Carlyle, Manchester, Conn.
Jones & Glassco, Montreal, Que.
Positive Clutch & Pulley Works, Ltd., Toronto.

COAL HANDLING MACHINERY
Marsh & Henthorn, Ltd., Belleville, Ont.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

COILING MACHINERY, WIRE AND SPRING
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

COLLARS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

CONTRACT WORK
Welland Motor & Machine Co., Welland, Ont.

CONTROLLERS AND STARTERS, ELECTRIC MOTORS
Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, STEEL SLIDE-BLOW
Whiting Foundry Equipment Co., Harvey, Ill.

COPING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

COUNTERSHAFTS
Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.

COUPLINGS, PLAIN AND FLEXIBLE
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES, LOCOMOTIVE
Northern Crane Works, Walkerille.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.

CUTTER GRINDERS AND ATTACHMENTS
Cincinnati Milling Machine Co., Cincinnati.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining & Mfg. Co., Toronto.
Elm Cutting Oil Co., Toronto.
Racine Tool & Machine Co., Racine, Wis.

CUTTING-OFF MACHINES
Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machinery Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Mchy. & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

CYLINDERS, AIR
Manufacturers Equipment Co., Chicago, Ill.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.

DAMPER REGULATORS
Canadian Fairbanks-Morse Co., Ltd., Montreal.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Marsh & Henthorn, Ltd., Belleville, Ont.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

DIAMONDS, BLACK AND ROUGH
Geo. A. Joyce Co., Ltd., New York.

DIAMOND TOOLS
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Banfield, W. H., & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Ltd., Montreal.
Wells Brothers of Canada, Galt, Ont.

DIES FOR BIT BRACE USE
Wells Brothers Co. of Canada, Galt, Ont.

DIES, NOSING
Marsh & Henthorn, Ltd., Belleville, Ont.

DIES, PIPE THREADING
Landis Machine Co., Waynesboro, Pa.

DIE SINKERS
Becker Milling Machine Co., Boston, Mass.
Garvin Machine Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

The Appearance of Some Things
Is Their Chief Selling Point
—BUT NOT WITH MACHINE TOOLS

WITH THEM IT IS ALWAYS A QUESTION OF PERFORMANCE, OF HOW WELL THEY CAN WORK AND HOW LONG THEY CAN CONTINUE TO DO SO. THAT IS WHY SO MANY MEN INTERESTED IN PRODUCTION PROBLEMS ARE SPECIFYING "MORSE" DRILLS, THE TOOLS WITH A PROVEN ABILITY TO WORK WELL AND LONG.

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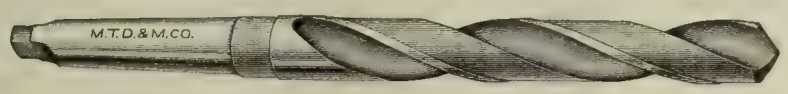

Morse Twist Drill & Machine Company

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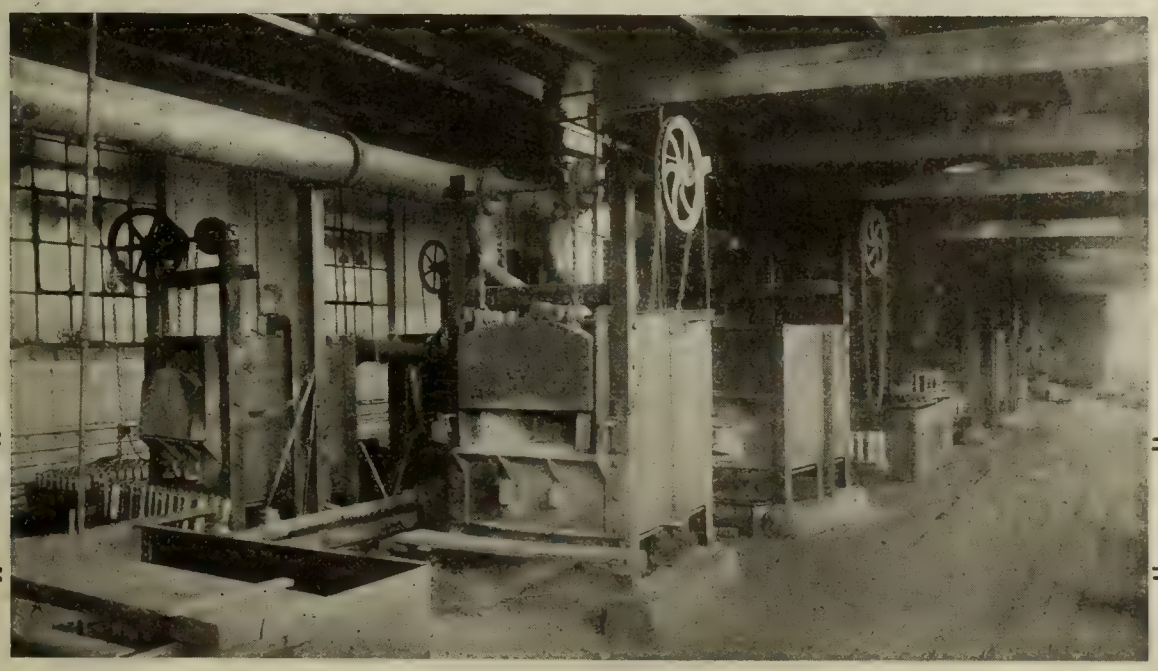

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Geometric Tool Co., New Haven.
Ideal Tool & Mfg. Co., Beaver Falls, Pa.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
Wells Brothers Co. of Canada, Galt, Ont.

DIES FOR SCREW PLATES
Wells Brothers Co. of Canada, Galt, Ont.

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Brown, Boggs & Co., Hamilton, Canada.
Illinois Tool Works, Chicago, Ill.
Worth Engineering Co., Toronto, Ont.

DISCS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass

DIES, SCREW AND THREAD
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Brothers Co. of Canada, Galt, Ont.

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W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

DISCS, LEATHER
Graton & Knight Mfg. Co., Montreal.

DRESSERS, GRINDING AND EMERY WHEEL
Can. Desmond-Stephan Mfg. Co., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, O.
A. R. Williams Machinery Co., Toronto.

DRILLING MACHINES, BENCH
Bilton Mach. Tool Co., Bridgeport, Conn.
Martin Machine Co., Greenfield, Mass.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Hespeler, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rockford Drilling Mach. Co., Rockford, Ill.

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.

DRILLING MACHINES, SENSITIVE
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Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
De Mooy Machine Co., Cleveland, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
D. McKenzie Machinery Co., Guelph, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, Ohio.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto, Ont.
W. F. & John Barnes Co., Rockford, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Millers Falls Co., Millers Falls, Mass.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
United States Electrical Tool Co., Cincinnati.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.

DRILLS, ELECTRIC AND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.

DRILLS, HIGH SPEED
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Can. B. K. Morton, Toronto, Montreal.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Foss & Hill Machy. Co., Montreal.
Marshall & Co., Geo. A., Toronto, Ont.
McKenna Brothers, Pittsburgh, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
W. F. & John Barnes Co., Rockford, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

DRILLS, MULTIPLE SPINDLE
Henry & Wright Mfg. Co., Hartford, Conn.
Niles-Bement-Pond Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Niles-Bement-Pond Co., New York.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Millers Falls Co., Millers Falls, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Foss & Hill Machy. Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Cleveland Twist Drill Co., Cleveland.
Clark Equipment Co., Buchanan, Mich.
Foss & Hill Machy. Co., Montreal.
Morse Twist Drill & Mach. Co., New Bedford.

DRILLS, TWIST
Atkins & Co., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

DRINKING FOUNTAINS
Puro Sanitary Dk'g. Fountain Co., Haydenville Mass.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sheldons, Ltd., Galt, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

DUST ARRESTERS (FOR TUMBLING MILLS)
Northern Crane Works, Walkerville.
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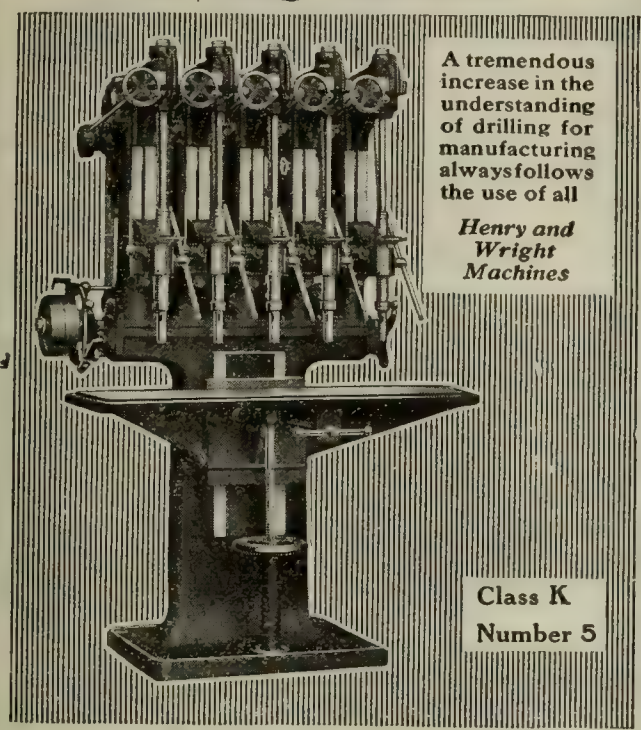

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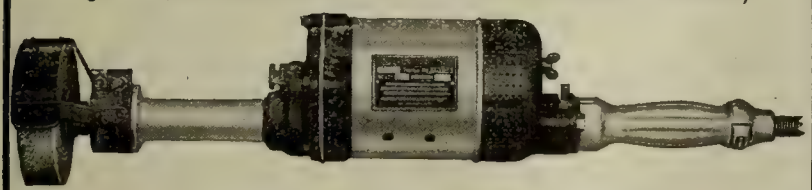

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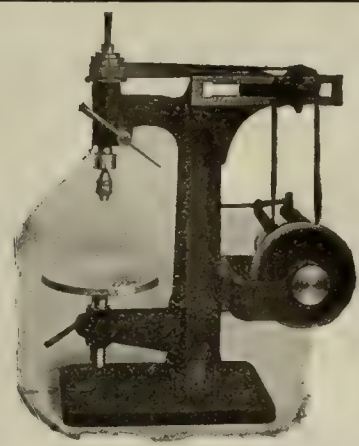

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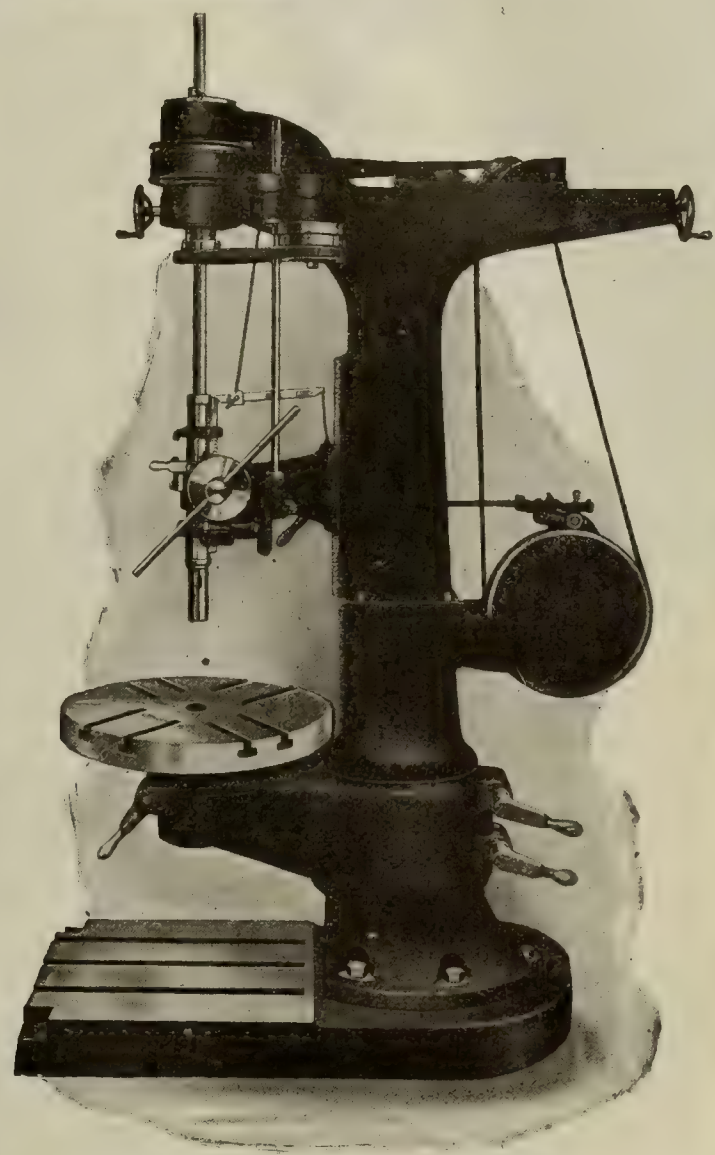

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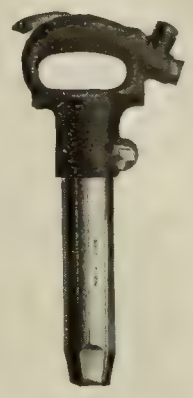

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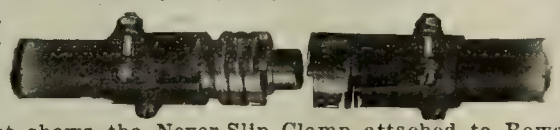

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Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Niles-Bement-Pond Co., New York.

PLIERS
Aikenhead Hardware Co., Toronto.
Canadian Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Conn.

PRESSES, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Hannifin Mfg. Co., Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
E. W. Bliss Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES FOR SHELLS
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
West Tire Setter Co., Rochester, N.Y.

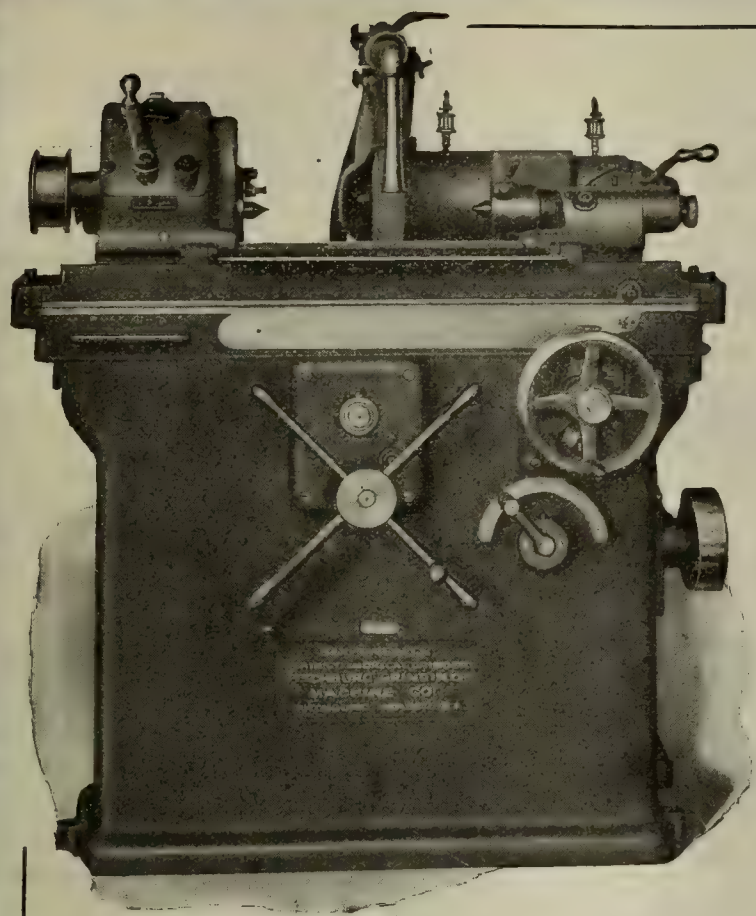
PRESSES, FILTER
William R. Perrin, Ltd., Toronto.

PRESSES, DROP AND FORGING
W. H. Banfield & Son, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Charles F. Elmes Eng. Works, Chicago.
Can. Fairbanks-Morse Co., Montreal.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Toledo Machine & Tool Co., Toledo.

PRESSES, HYDRAULIC
John Bertram & Sons Co., Dundas.
Charles F. Elmes Eng. Works, Chicago.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Toledo Machine & Tool Co., Toledo.
West Tire Setter Co., Rochester, N.Y.
A. R. Williams Machy. Co., Toronto.

PRESSES, PNEUMATIC
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Toledo Machine & Tool Co., Toledo.
A. R. Williams Machy. Co., Toronto.



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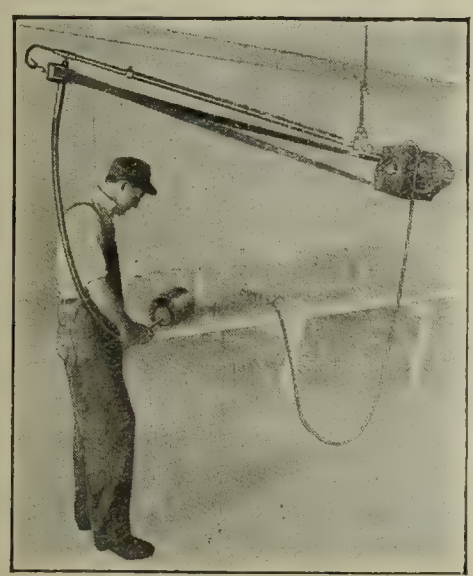

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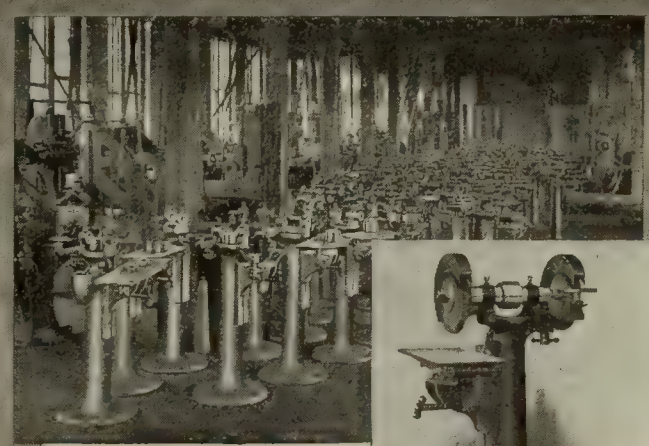

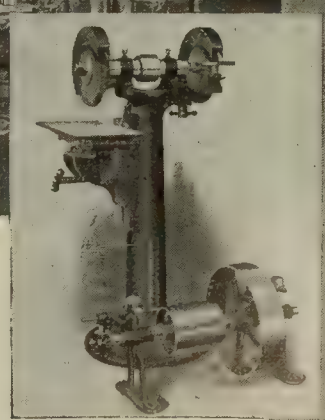

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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Standard Machy. & Supplies, Ltd., Montreal, Que.
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Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
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Can. Ingersoll-Rand Co., Sherbrooke, Que.
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Pratt & Whitney Co., Dundas, Ont.
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Sturtevant Co., B. F., Galt, Ont.
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Smart-Turner Mach. Co., Hamilton.
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Graton & Knight Mfg. Co., Worcester, Mass.
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Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Toledo Machine & Tool Co., Toledo, O.
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Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Ferracute Mach. Co., Bridgeton, N.J.
Niles-Bement-Pond Co., New York.
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Taylor Instrument Co., Rochester, N.Y.
Thwing Instrument Co., Philadelphia, Pa.
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Niles-Bement-Pond Co., New York.
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RAIL BENDERS
Niles-Bement-Pond Co., New York.
RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
Niles-Bement-Pond Co., New York.
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Cumming & Son, J. W., New Glasgow, Canada.
RATCHETS
Keystone Mfg. Co., Buffalo, N.Y.
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Garvin Machine Co., New York.
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
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Whitman & Barnes Mfg. Co., St. Catharines, Ont.
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Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
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Can. Fairbanks-Morse Co., Montreal.
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Pratt & Whitney Co., Dundas, Ont.
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Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.
RIVETS, IRON, COPPER AND BRASS
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Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ot.
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Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
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Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
RIVETING MACHINES, ELASTIC ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport, Conn.
High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.
ROLLER CHAINS
Jones & Glassco, Montreal.
ROLLS, BENDING AND STRAIGHTENING
John Bertram & Sons Co., Dundas
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo, O.
ROLLS, CRUSHING
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
RUBBER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland
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Brown & Sharpe Mfg. Co., Providence
James Chesterman & Co., Ltd., Sheffield, Eng.
L. S. Starrett Co., Athol, Mass.

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SAFETY APPLIANCE GOGGLES
T. A. Wilson, Reading, Pa.
SAND BLASTS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
SANDING MACHINES
Canada Machinery Corp., Galt, Ont.
SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Gardner, Robt., & Son, Montreal
Curtis Pneumatic Machy. Co., St. Louis, Mo.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto
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Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.
SAWS, HACK (SEE HACK SAWS)
SAWS, INSERTED TOOTH
Hunter Saw & Mach. Co., Pittsburgh, Pa.
Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.
SAWS, BAND AND COPING
Napier Saw Works, Springfield, Mass.
SCLEROSCOPES
Shore Instrument & Mfg. Co., New York City
H. E. Streeter, New Birks Bldg., Montreal, Que.
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Johnson Mach. Co., Carlyle, Manchester, Conn.
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Galt Machine Screw Co., Galt, Ont.
Eastern Mach. Screw Corp., New Haven, Conn.
SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York
Himoff Mach. Co., Inc., Astoria, L.I., New York.
A. B. Jardine & Co., Hespeler
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto
SCREW MACHINES, AUTOMATIC, MULTIPLE SPINDLE
New Britain Machine Co., New Britain, Conn.
Riverside Machinery Depot, Detroit, Mich.
SCREWS
Can. B. K. Morton, Toronto, Montreal
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.
SCREW PLATES
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wells Bros. Co. of Canada, Galt, Ont.
Wilkinson & Kompass, Hamilton, Ont.
SCREW SLOTTERS
Garvin Machine Co., New York
Pratt & Whitney Co., Dundas, Ont.
SECOND-HAND MACHINERY
Davis Machine Tool Co., W. F., New York
Dominion Machinery Co., Toronto
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McCabe, J. J., New York, N.Y.
New York Machinery Exchange, New York
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
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Foss & Hill Machy. Co., Montreal
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Hamilton Mach. Tool Co., Hamilton, Ohio
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rhodes Mfg. Co., Hartford, Conn.
Steptoe Co., John, Cincinnati, Ohio
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Can. Fairbanks-Morse Co., Montreal
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
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Strelinger Co., Chas. A., Detroit, Mich.
A. R. Williams Machy. Co., Toronto
Wilkinson & Kompass, Hamilton, Ont.
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John Bayne Maclean

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Canada Machinery Corp., Galt, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Montgomery, Smith & Co., Keynsham, Somerset, Eng.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo

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John Bertram & Sons Co., Dundas
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Ferrachute Machine Co., Bridgeton, N.J.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Toledo Machine & Tool Co., Toledo

SHEARS, PNEUUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Canada

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Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Peck, Stow & Wilcox, Southington, Conn.
Steel Bending Brake Works, Ltd., Chatham, Ont.

SHEET METAL STAMPINGS
Dominion Forge & Stpg. Co., Walkerville, Ont.

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Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., W. R., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

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Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

SHELL RIVETERS
Grant Mfg. & Machine Co., Bridgeport, Conn.
High Speed Hammer Co., Rochester, N.Y.

SHELL TOOLS
Marsh & Henthorn, Ltd., Belleville, Ont.

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Noble & Westbrook Mfg. Co., Hartford, Conn.

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Armstrong Bros. Tool Co., Chicago.
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton, Toronto, Montreal.

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Strong, Kennard & Nutt Co., Cleveland, Ohio.

SILENT CHAINS
Jones & Glassco, Montreal.

SILVER SOLDER
Geo. H. Lees & Co., Hamilton, Ont.

SKATE SHARPENERS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SLOTTERS
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York
Rhodes Mfg. Co., Hartford, Conn.

SMOKESTACKS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.
Marsh & Henthorn, Ltd., Belleville, Ont.

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
J. H. Williams & Co., Brooklyn, N.Y.

SOCKET HEAD CAP SCREWS
Allen Mfg. Co., Hartford, Conn.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Canada

SOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Banfield, W. H., & Sons, Toronto.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Brown Engineering Corp., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
Grant Mfg. & Machy. Co., Bridgeport, Conn.
Gray Mfg. & Mach. Co., Toronto, Ont.
John H. Hall & Sons, Brantford.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McClean & Son, F. W., Niagara Falls, Ont.
National-Acme Co., Cleveland, Ohio.
D. McKenzie Machinery Co., Guelph, Ont.
Mulliner & Enlund Tool Co., Syracuse, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Sleeper & Hartley, Inc., Worcester, Mass.
Smart-Turner Machine Co., Hamilton, Ont.
T. C. M. Mfg. Co., Harrison, N.J.
Victoria Foundry Co., Ottawa, Ont.
Welland Motor & Machine Co., Welland, Ont.
William R. Perrin, Ltd., Toronto.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

SPEED REDUCING GEARS
Jones & Glassco, Montreal.

SPRINGS, MACHINERY
[illegible]es, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele, Ltd., Guelph, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

SPIRAL CONVEYORS
Can. Matthews Gravity Carrier Co., Toronto, Ont.

SPROCKETS, CHAIN
Grant Gear Works, Boston, Mass.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

SOLDER
Jobborn, Geo. A., Hamilton, Ont.
Jones & Glassco, Montreal.

SPROCKET WHEELS, CAST
Perrin, Wm. R., Toronto.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS
Dillon Mfg. Co., Oshawa, Ont.
Dom. Forge & Stamping Co., Walkerville, Ont.
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Canada Machinery Corp., Galt, Ont.
Ferracute Mach. Co., Bridgton, N.J.
Noble & Westbrook Mfg. Co., Hartford, Conn.

STAMPS, STEEL ALPHABET, FIGURES
Matthews, Jas. H. & Co., Hartford, Conn.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.
Can. Morehead Mfg. Co., Woodstock, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.
Sturtevant Co., B. F., Galt, Ont.

STEEL ALLOY (SEE ALLOY STEEL)

STEEL BENDING BRAKES
Steel Bending Brake Works, Ltd., Chatham, Ont.

STEEL FOR AXES, PLOWS, SAWS, DRILLS, ETC.
Colonial Steel Co., Pittsburgh, Pa.

STEEL, CARBON, FERRO-TUNGSTEN
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa
Zenith Coal & Steel Products, Montreal, Que.

STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

STEEL DRUMS
Smart-Turner Machine Co., Hamilton, Ont.

STEEL PRESSURE BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Century Steel Co. of America, New York
Colonial Steel Co., Pittsburgh, Pa.
H. A. Drury Co., Ltd., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Fairley Davidson Steel Co., New York, N.Y.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.
Zenith Coal & Steel Products, Montreal, Que.

STEELS, HIGH STRENGTH, HOT-WORKING, DIE, MAGNET
Fairley Davidson Steel Co., New York, N.Y.

STEEL, VANADIUM
Drury, H. A., Co., Montreal, Que.
Standard Alloys Co., Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STELLITE, HIGH-SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.

STOCK RACKS FOR BARS, PIPING, ETC.
New Britain Machine Co., New Britain, Conn.

STOCKS, PIPE
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.

STOOLS, STEEL, SHOP
New Britain Machine Co., New Britain, Conn.

STRAIGHTENING MACHINERY
Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

TACK (DOUBLE POINT) MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

TANKS, GASOLINE AND OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Dominion Forge & Stamping Co., Walkerville.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.

TANKS, STEEL, WATER PRESSURE
Bowser & Co., Inc., S. F., Toronto, Ont.
Can. Welding Works, Montreal, Que.
Jenckes Machine Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TANK WAGONS
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.

TAPPING MACHINES (PENUMATIC)
Cleveland Pneumatic Tool Co. of Can., Toronto.

TAPPING MACHINES AND ATTACHMENTS
Bertram, John, & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rickert-Shafer Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.

TAPS, ADJUSTABLE
Baxter Co., Ltd., J. R., Montreal, Que.
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.

TAPS, COLLAPSIBLE
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

TAPS, DIES AND WRENCHES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wells Bros. Co. of Canada, Galt, Ont.

TAP EXTENSIONS
Allen Mfg. Co., Hartford, Conn.

TESTING INSTRUMENTS METALLURGICAL
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York City.

THERMOMETERS, ALL KINDS
Taylor Instrument Co., Rochester, N.Y.
Bellevue Industrial Furnace Co., Detroit, Mich.

TESTING LABORATORIES
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

THREADING TOOLS
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.

THREAD MILLING MACHINES
Gray Mfg. & Mach. Co., Toronto, Ont.
Taft-Peirce Co., New York, N.Y.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Peck, Stow & Wilcox, Southington, Conn.

TIRE SETTING MACHINES, HYDRAULIC
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES
Embree, Ira, 281 Emerald St. N., Hamilton, Ont.
Union Tool Chest Works, Rochester, N.Y.

TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Armstrong Bros. Tool Co., Chicago.
Can. B. K. Morton, Toronto, Montreal.
Deloro Smelting & Refining Co., Toronto, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

The Oven Equipment & Manufacturing Company
NEW HAVEN, CONN.
"CRAWFORD SECTIONAL" OVENS
Heated with our Enclosed Flame Gas Burners, or Electricity
FOR BAKING JAPANS AND OTHER FINISHES ON METAL.
Ovens carried in stock and built to meet requirements of manufacturers.
Builders of All-Steel Oven Trucks with Roller Bearings.
Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.
ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

TOOL STEEL
Atkins & Co., Wm., Sheffield, Eng.
Armstrong, Whitworth, Ltd. of Canada, Montreal.
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Deloro Smelting & Refining Co., Toronto, Ont.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Toronto, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.
Swedish Steel & Importing Co., Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago, Ill.
Stow Mfg. Co., Binghamton, N.Y.
A. R. Williams Machinery Co., Toronto.
United States Elec. Tool Co., Cincinnati, O.

TOOLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

TORCHES, STEEL
Armstrong, Whitworth of Canada, Ltd., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.

TRACK SYSTEMS
Dillon Mfg. Co., Oshawa, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
A. R. Williams Machinery Co., Toronto.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
The Smart-Turner Machine Co., Hamilton.

TRANSMISSION ROPE
Jones & Glassco, Montreal, Que.

TRANSMISSION TOWERS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TROLLEYS
Wright Mfg. Co., Lisbon, Ohio.

TRUCKS, FACTORY, FREIGHT, ETC.
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

TRUCKS, LUMBER AND KILN
Sheldons, Ltd., Galt, Ont.
Northern Crane Works, Walkerville.

TUBING, SEAMLESS, BRASS & COPPER
Standard Tube & Fence Co., Woodstock, Ont.

TUBING COILERS, FLEXIBLE METAL
Sleeper & Hartley, Inc., Worcester, Mass.

TUMBLING BARRELS
Baird Machine Co., Bridgeport, Conn.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TUNGSTEN FILAMENT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

TURNBUCKLES
Canadian Billings & Spencer, Ltd., Welland.

TURNTABLES
Whiting Foundry Equipment Co., Harvey, Ill.

TURRET MACHINES
Brown & Sharpe Mfg. Co., Providence
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney, Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURBINE WATER WHEELS
Jenckes Mach. Co., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.

UPSETTING AND BENDING MACHINERY
John Bertram & Sons Co., Dundas
Brown, Boggs Co., Ltd., Hamilton, Canada.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Jenckes Mach. Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

VACUUM PUMPS
Can. Blower & Forge Co., Kitchener, Ont.
Smart-Turner Machine Co., Hamilton, Ont

VALVE LEATHERS
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Montreal.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

VALVES, FOOT
Smart-Turner Machine Co., Hamilton, Ont.

VALVES, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

VALVES, BACK PRESSURE, STEAM
Sheldons, Limited, Galt, Ont.

VENTILATING APPARATUS
Brantford Oven & Rack Co., Brantford, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.
A. R. Williams Machy. Co., Toronto.

VISES, AIR OPERATED
Hannifin Mfg. Co., Chicago, Ill.

VISE STANDS, PORTABLE
New Britain Machine Co., New Britain, Conn.

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Cleveland Milling Machine Co.
Foss & Hill Machy. Co., Montreal.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

VISES, PIPE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.
J. H. Williams & Co., Brooklyn, N.Y.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Barnes, Wallace, Co., Bristol, Conn.
Dillon Mfg. Co., Oshawa, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

WATER PURIFYING AND SOFTENING APPARATUS
Wm. B. Scaife & Sons Co., Pittsburgh, Pa.

WATER CINDER MILLS
Whiting Foundry Equipment Co., Harvey, Ill.

WATER JACKETS
Can. Welding Works, Montreal, Que.

WATER TOWERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

WATER WHEELS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.

WELDING, ELECTRIC, SPOT, BUTT, ETC.
St. Lawrence Welding Co., Montreal, Que.

WELDING MASKS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

WELDERS, ELECTRIC, SPOT, BUTT, ETC.
National Electric Welder Co., Warren, O.
Tabor Mfg. Co., Philadelphia, Pa.
Thomson Electric Welding Co., Lynn, Mass.
Winfield Electric Welding Mach. Co., Warren, Ohio.

WELDING, WORK AND SUPPLIES (Autogenous and Oxy-Acetylene) see OXY-ACETYLENE

WINCHES
John H. Hall & Sons, Brantford.
Kennedy & Son, Wm., Owen Sound, Ont.
Marsh & Henthorn, Ltd., Belleville, Ont.
Northern Crane Works, Walkerville.

WIRE COILING AND POINTING MACHINERY
Baird Machine Co., Bridgeport, Conn.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE CLOTH AND PERFORATED METALS
Canada Wire & Iron Goods Co., Hamilton.

WIRE FORMING AND STAMPING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
McClean & Son, F. W., Niagara Falls, Ont.
F. B. Shuster Co., New Haven, Conn.

WIRE NAILS
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

WIRE STEEL, BRASS, COPPER, BRONZE
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE RAILS
Sleeper & Hartley, Inc., Worcester, Mass.

WOOD BORING MACHINES
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

WIRE STRAIGHTENERS AND CUTTERS
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WOODWORKING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machy. Co., Toronto.

WOOD LATHES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

WORKS STANDS, PORTABLE
New Britain Mach. Co., New Britain, Conn.

WRENCHES
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canadian Billings & Spencer, Ltd., Welland.
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, AUTOMOBILE NARROW JAW AND MONKEY
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, PIPE, MONKEY, TAP
Aikenhead Hardware Co., Toronto, Ont.
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Peck, Stow & Wilcox Co., Southington, Conn.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, RATCHET AND BASIN
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Keystone Mfg. Co., Buffalo, N.Y.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, SOCKET
Allen Mfg. Co., Hartford, Conn.

MACLEAN'S

for DECEMBER

∵ ∴ MACLEAN'S MAGAZINE GETS BETTER ALL THE TIME ∴ ∵

Snipers and Sniping—*by a Sniper*

A SNIPER is back in Canada—a star sniper, who has 34 marks on his rifle, every mark meaning a German life. Most of us know absolutely nothing of the work of the sniper, but the story—a remarkable one—is told in the Christmas (December) MACLEAN'S by the champion sniper of the Canadian Expeditionary Forces. This man was buried by a shell-explosion, was dug out by two comrades, and he has lived to tell us his wonderful story, in MACLEAN'S. It's worth 15c to get this story alone.

"Politics From Within"

--Leacock, of Course

TRUST Leacock to see a chance for his witty and humorous pen. He deals with the humorous phases of electioneering in Canada in his usual vein.

Why Laurier sent Troops to South Africa

THIS contribution, by Col. John Bayne Maclean, goes backward many years—to the time of the South African War in 1899-1900. That was when Canada first took up arms for the Empire. Politics, of a high order, was back of the decision to send Canadian troops to the Antipodes. It is "inside" history.

Oppenheim—Allenson—McBeth—Mumford

A LONG instalment of **Oppenheim's** absorbing story, The Pawns Count, is given in the December MACLEAN'S. A short story, by A. C. Allenson is seasonable. Madge McBeth contributes a complete novelette, The Man Who Wasn't. And Ethel Watts Mumford, teller of delightful tales, delicately told, gives us the first of a series of short stories—Love and the Locksmith.

The Usual Popular Departments

THE Business Outlook, The Nation's Business, Women and Their Work, and the Review of Reviews—all are present in strong way in the December MACLEAN'S.

At All News-Stands 15c.

Gadsby's Story of the Union Government

GADSBY is saturated with Ottawa knowledge—much of it of the inside variety. He pokes about, talks with big men; and big men, and lesser ones, talk with Gadsby. Useful sort of man, is Gadsby. What he hears and learns he writes about for MACLEAN'S; and in this story of his about the new Union Government, he reveals the undercurrents on the movement that developed into negotiations, and which finally resulted in a Union Government. Gadsby adds interesting biographical information to his brilliant study.

Robt. W. Service is back again

BACK in MACLEAN'S, that is—in body, he is still in Flanders—where the fighting grows uglier all the time. Service has taken time to write verse for MACLEAN'S. You know well the virility of his style, and the gripping, human character of his verse. It is about life and men in the trenches he writes—about our boys far from us. It is worth something to see our boys as Service sees them. Read "The Shape at the Wheel" in the December MACLEAN'S.

Arthur Stringer writes a Beautiful Christmas Poem

STRINGER is a wonderful man—wonderfully versatile, wonderfully human. He is a master of the short-story and of the detective and mystery type of story; and he can climb the heights of literary endeavor, as he has in this passing sweet poem—Christmas Bells in War-time. Your heart is tender these times of horrible slaughter and of heroic achievement, and you'll be grateful to Stringer for putting beautifully your innermost thoughts and feelings.

CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XVIII. TORONTO, NOVEMBER 22, 1917 No. 21

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JOHN BAYNE MACLEAN, Pres. H. T. HUNTER, Vice-pres. H. V. TYRRELL, Gen. Man.

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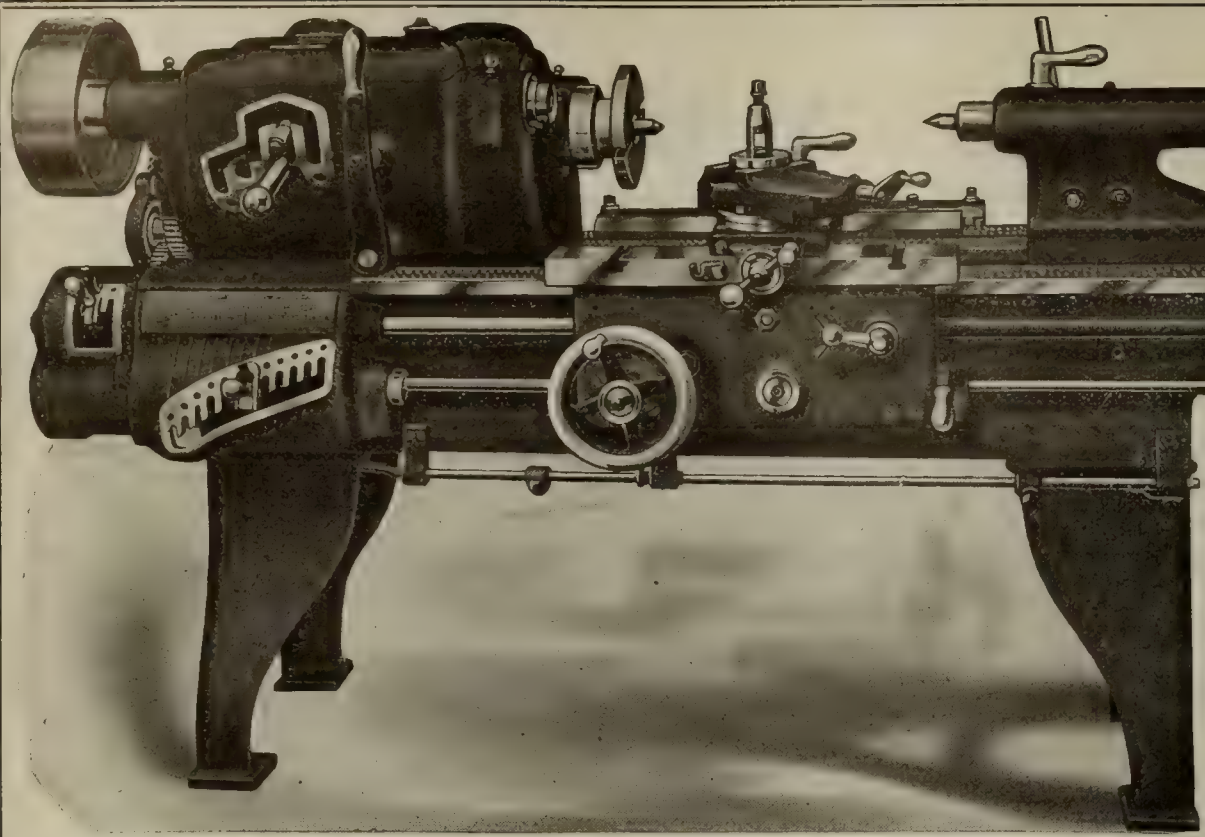

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18-inch
Geared
Head Lathe

A good point in this lathe lies in its eight mechanical changes of speed for spindle with driving shaft running at constant speed — four direct and four through back.

Write for descriptive circular.

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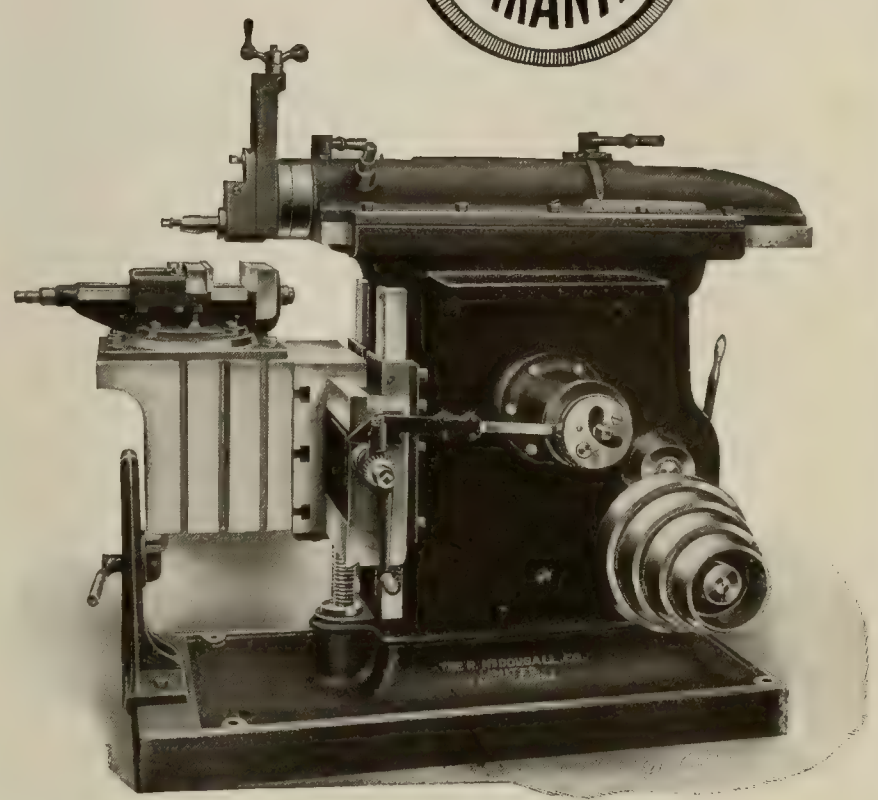

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The Foss & Hill Machinery Company

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What Will Canada's Answer Be?

CANADA'S Victory Loan campaign is on. The eyes of the world will be on Canada. Great Britain, the United States, all the other Allies—our own boys in France—all, are expectantly waiting for the answer this young giant among the nations will give to the call of his kin for help and support.

That answer will be no more, no less than the response of each individual Canadian—you and each one of us—to the call to buy Victory Bonds.

Shall it be said that Canada spares not her sons from the sacrifice of battle, yet witholds her dollars to give them victory?

Rather will it be said that Canada once again, for the fourth time in three years, cheerfully puts up her millions upon millions for the cause of freedom, righteousness and justice—that the Canadian hand to the plow of victory holds steadfast and firm.

Canada's answer must be,
—that Canada is in deadly earnest when she says "the last man and the last dollar."

That is the answer Canada will give our boys in the trenches, our kinsmen in Britain and our Allies everywhere.

That is the answer we will give to the Huns who thought and said that Canada would desert the Empire before she would fight or pay.

Let us Canadians proclaim to a watching world by a record-breaking purchase of Victory Bonds, that Canada can and will see the war fought to a victorious finish.

Let us by an irresistible flood of dollars declare that:
—our boys in France are to be supplied with everything needful to win the war,
—their kinfolk at home are to be cared for and sustained while they are fighting for us in France,
—production in Canada shall not cease till the last needed bushel of grain, the last quarter of beef has been raised and shipped, the last gun, machine and shell have been made and sent to support our fighting forces.

Put aside all else until you get your application in.

Let this campaign bring forth positive proof that Canada stands in the great world's struggle—actually and truly "to the last man and the last dollar."

Buy Victory Bonds

DONATED BY CANADA MACHINERY CORPORATION

SUPPORT THE VICTORY WAR LOAN

EDITORIAL INDEX—PAGE 127. BUYERS' DIRECTORY—PAGE 111. ADVERTISING INDEX—PAGE 126.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical, power, foundry and allied fields.
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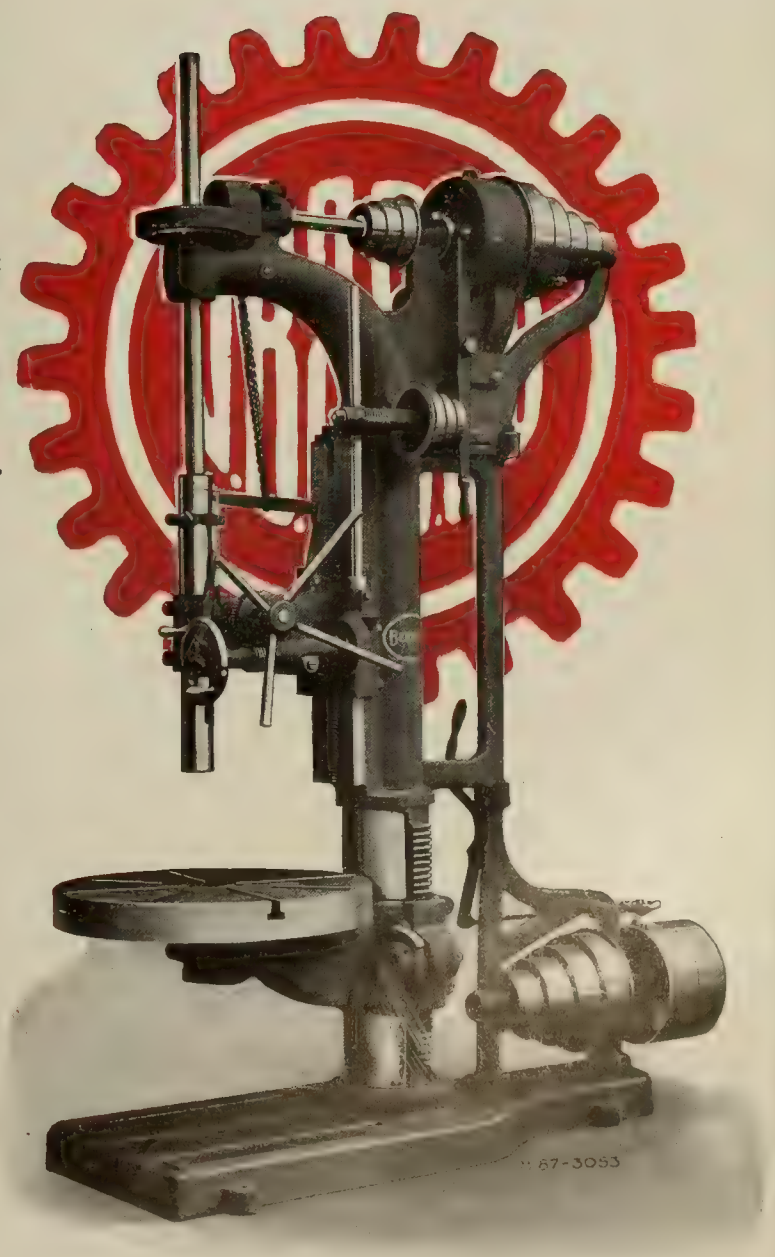

"Carry On"

Let your money help win the war

"CARRY ON"—That is the watchword of this war. It is the watchword in the trenches; it must be the watchword at home. It is in order to CARRY ON that Canada is floating the Victory Loan. It is to be a People's Loan, available in "small portions," so that every citizen may share in it. And the citizen who subscribes, no matter how much or how little, will be assured of these three great advantages: 1. A high rate of interest. 2. Quick sale for his holding if he later wishes to turn them into cash. 3. Unimpeachable security for his money in the shape of the whole wealth and resources of Canada. But, best of all, by *Lending His Bit* he will be *Doing His Bit* and helping the Dominion to CARRY ON.

Buy Victory Bonds

BUY MORE VICTORY BONDS

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Canada's Victory Bonds

Better than Money in Your Pocket

A Victory War Loan Bond is real money—just as real as the Bank notes you carry in your pocket. The $5 Bill in your pocket is nothing but a Bond—the government's promise to pay five dollars in gold. The only difference is that a Victory Bond is live, working money, earning 5½ per cent. which the Bank note in your pocket does not do.

Remember, too—that Victory War Loan Bonds are exchangeable dollar for dollar, for any later Bond which the Government may issue during the war which pays a higher rate of interest than 5½ per cent.

Some people have the idea that to invest in a Victory Bond is to tie the money up—that is not so. Victorys are readily saleable anywhere—at any time. If you ever are in need of your money take your Victory Bond to any Bond Dealer—he will sell it for you for cash.

Buying Victory War Loan Bonds is the strongest and safest investment one could make. All Canada is your backer—the entire resources of the country are your security. It gives you an opportunity to express the highest ideas of patriotism—save your money and serve your Empire at the same time—your plain duty lies straight ahead.

Buy Victory Bonds To-Day.

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The Publisher's Page

TORONTO November 29, 1917

To Maintain Industrial Activity Subscribe Liberally for Canada's Victory Bonds

IF for no other reason than that of self-interest, it is of the utmost importance to every manufacturer and merchant that the fourth War Loan of the Dominion of Canada (known as Canada's Victory Loan and now being offered) be fully subscribed.

The further extension of credits to our Allies is imperative if Canada's manufacturers wish them to continue buying here. And there can be no question about that, because upon their purchases will depend our industrial and agricultural prosperity.

Then, too, the money subscribed will be spent in Canada.

The money must come from our entire people, but a good lead from manufacturers and merchants is absolutely essential and will encourage the multitude of smaller investors. The bonds are an excellent investment. Money is not tied up in them, because they are readily saleable and because of their value as collateral.

Apart from all business and financial reasons, however, the great fact remains that Canada must have more money to carry on her part in the war.

Every ounce of our financial, as well as fighting strength, is needed.

Great Britain must now purchase where she can get credit. If Canada grants the credit---she will get the business.

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OF EVERY DESCRIPTION
FROM ORE
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Canadian SKF Company, Limited
TORONTO, ONT., CANADA

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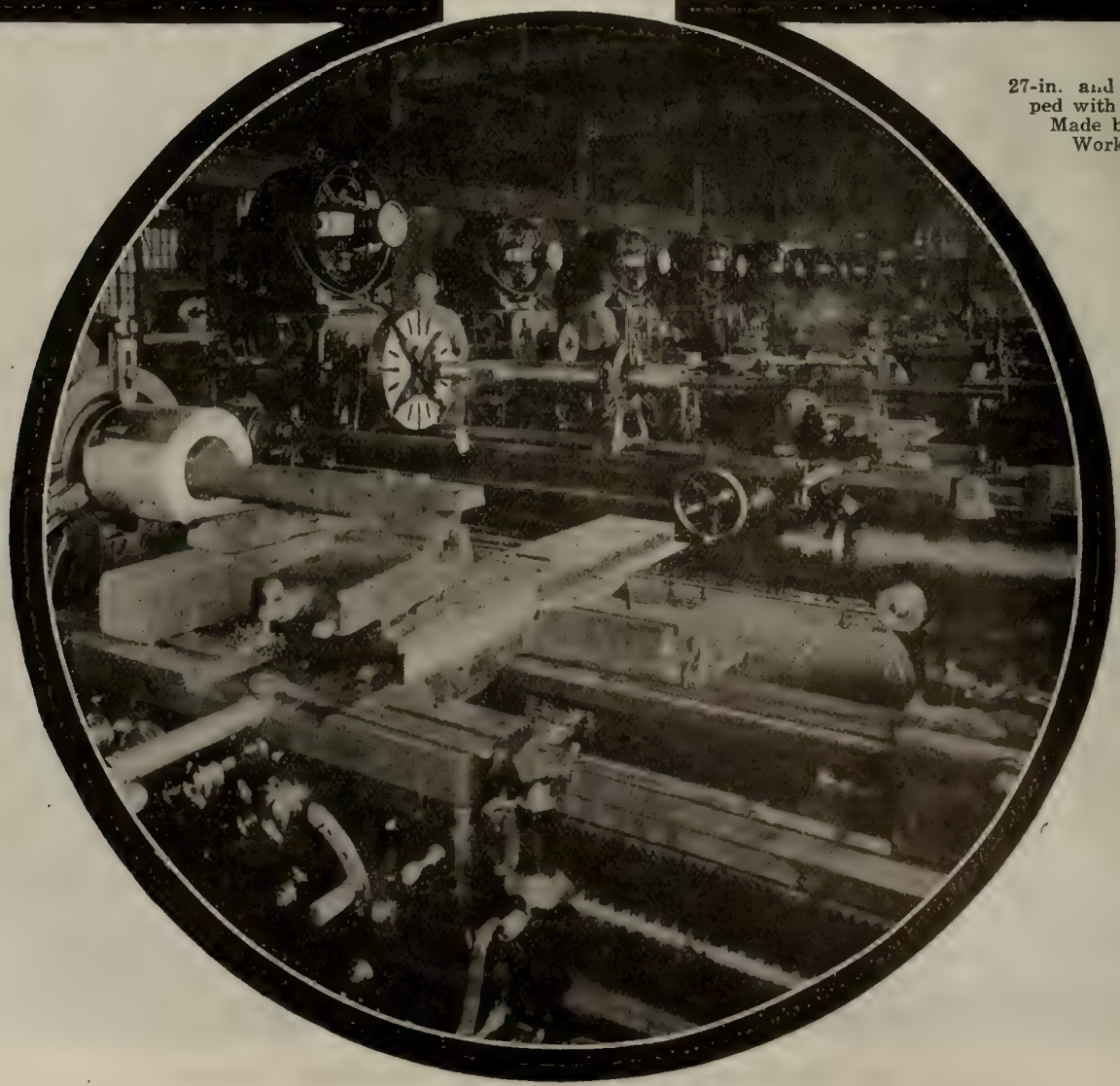

27-in. and 30-in. Lathes equipped with S K F Ball Bearings. Made by the American Tool Works Co.

BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

STELLITE

WELDING COMPOUND

"We have been using 'Stellite' Welding Compound for the past month, obtaining excellent results. We have tried other compounds for tipping and are pleased to report that to date best results have been obtained from the use of 'Stellite' Welding Compound."—**Canadian Linderman Co., Limited**

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will spend a minimum of $350,000,000 for Destroyers—when these are built the American Navy will lead the world in boats of this type and the submarine is doomed.

Nothing but the best materials will enter into the construction of these vessels. *This is also true of*

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The Nationally Known First Quality

HIGH SPEED STEEL

The greatest vigilance is observed in every detail of its manufacture—we spare no expense to insure the highest quality in every bar. No better all purpose High Speed Steel has as yet been produced.

It's best for all machine work.

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This is the type that is now aiding the British and French navies in wiping out the submarine menace. They are doing great work in lessening the effectiveness of the submarine warfare.

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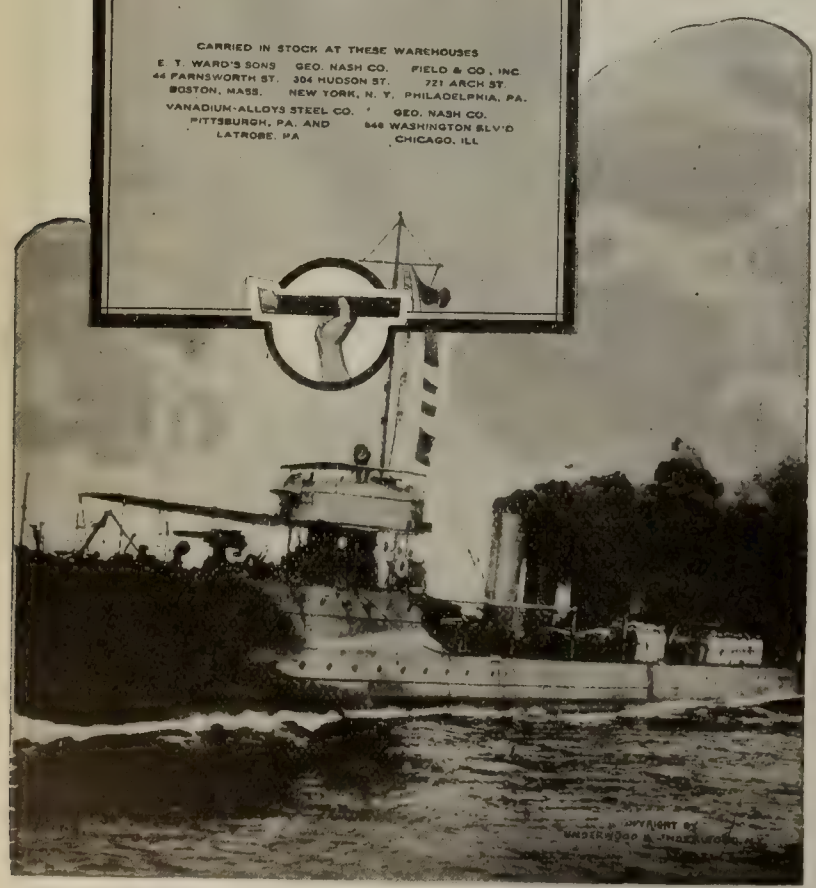

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Uranium

MALLEABLE CASTINGS

Capacity

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That's the reputation they have. How about your requirements? We can give

IMMEDIATE DELIVERY

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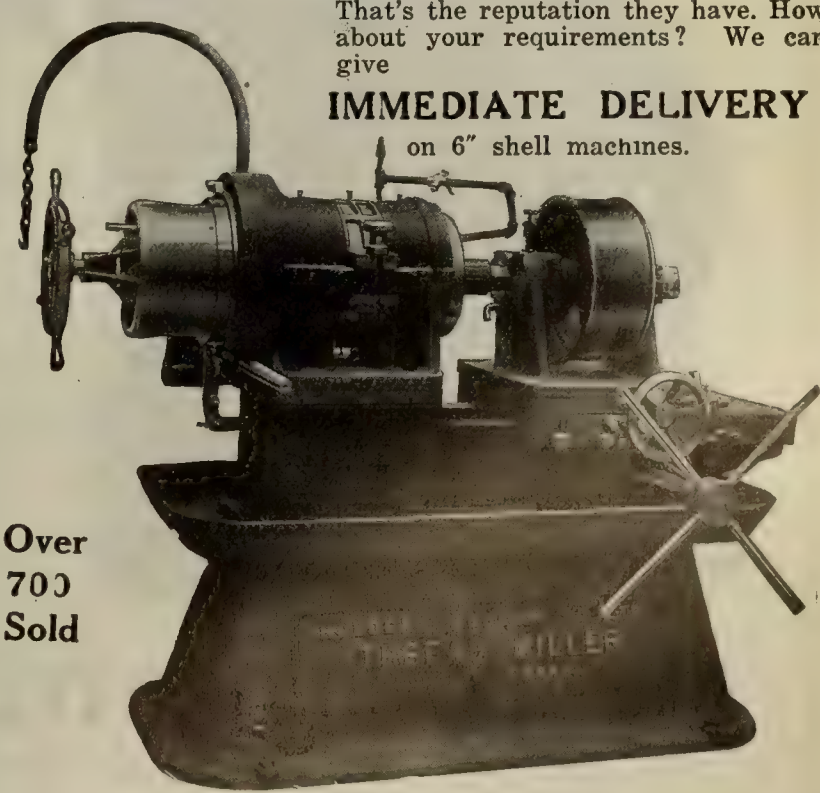

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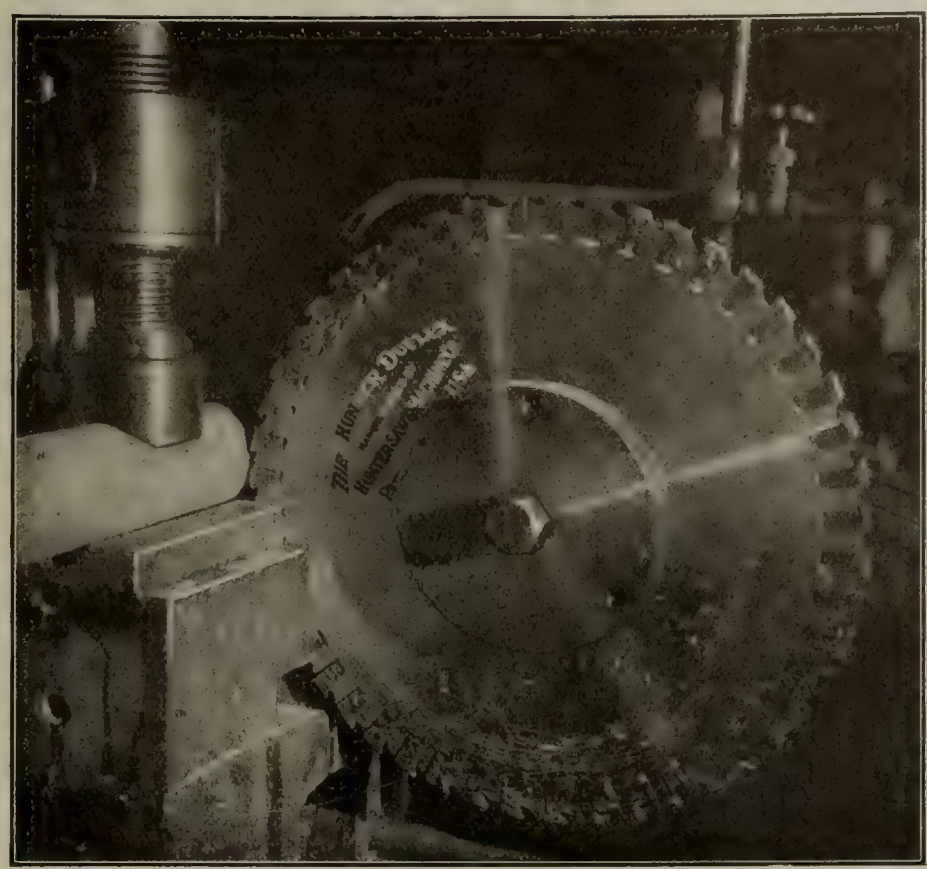

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2 MINUTES

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We will Fill Your Requirements *Send Us Your Inquiries*

Air Compressor Evidence

The greatest evidence of the value of any article is the demand for it after investigation and trial. Below are four carloads of our compressors which fills one order to a large concern in Canada. Our line of compressors is very large.

Write us and explain your requirements

The Jenckes Machine Company, Limited

CANADIAN SALES OFFICES:

WORKS: Sherbrooke, Que.

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HIGH SPEED STEEL

We have often been asked, "What gives Uranium High Speed Steel the toughness and strength not found in the ordinary high speed steel?" The answer is that by combining the proper amount of uranium to our mixture a high speed steel of the finest quality is produced—a steel that works at greater speeds, takes deeper cuts and lasts longer.

Consult your steel man or write us for full details.

STANDARD ALLOYS COMPANY

FORBES AND MEYRAN AVES.

PITTSBURGH, PENNA.

"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

MANUFACTURED BY

Arthur Balfour & Co., Limited
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Shrapnel Shells and Shell Blanks

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

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by the
HARMET
Liquid Process

Nova Scotia Steel and Coal Co., Limited

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Fairley Davidson Steel Co., Inc.

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	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
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High Speed Steel	RUSHITOFF No. 6
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CHROME VANADIUM, oil hardening or case hardening

CHROME NICKEL, oil hardening or case hardening

Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

Canadian Agents:

THE FACTORY SUPPLY AND STEEL COMPANY

149 Craig Street West, Montreal, Canada

We carry a complete stock at our Montreal Warehouse

James McKay Company

Pittsburgh, Penna., U.S.A.

Manufacturers of

Shell Forgings

We have the Equipment and Experience and can execute orders for

Nose Sockets Base Plates Adapter Plates

for any size shells. Can execute orders promptly.

SPECIAL FORGINGS—We can make any forgings that can be made under Drop Hammers.

CHAINS AND ACCESSORY FORGINGS—We have a complete line.

ADDRESS OUR REPRESENTATIVE:

JOHN A. BUCHANAN

King Edward Hotel, TORONTO

We guarantee shipment within 24 hours of receipt of order

SISCO

"Extra" "Special" "High Speed" **Tool Steels**

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.

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USED THE WORLD OVER

SATISFACTION

Atlas Babbitts

MADE IN CANADA

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ATLAS

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TIN-TOUGHENED
W. E. W. BABBITT

These Babbitts are the result of years of experience and have a world-wide reputation for uniformity and reliability.

No Shock Too Severe No Load Too Heavy No Speed Too Great

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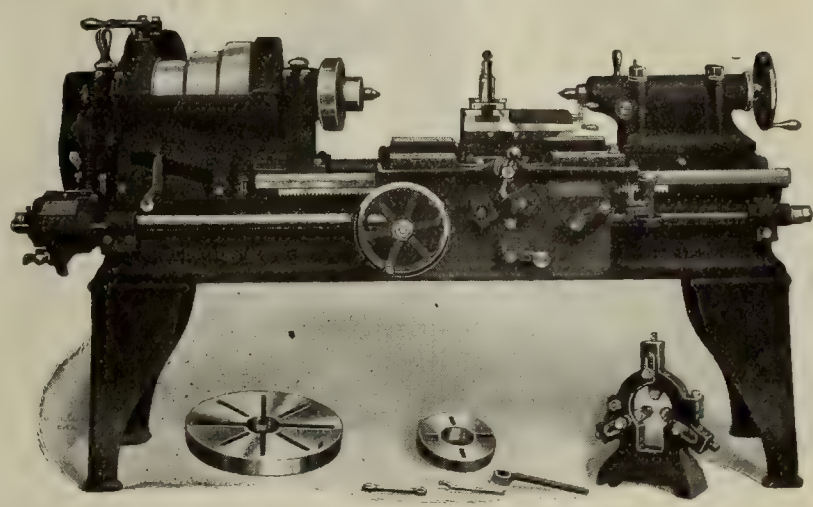
BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

LOOK—Lodge and Shipley Engine Lathes

IMMEDIATE SHIPMENT

SIZE
14" x 6' or 8' Bed.

Double Back Gears and Quick Change Gear Box.



If *you* can use this size lathe, write for specifications and prices. Remember these are the highest quality tools manufactured.

GARLOCK-WALKER MACHINERY CO., LTD.

32 FRONT STREET WEST, TORONTO, ONT.

"EVERYTHING IN MACHINERY"

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High Speed Steel

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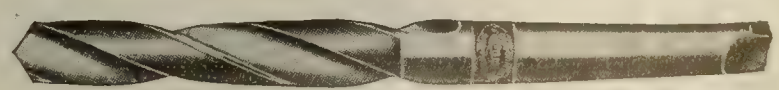

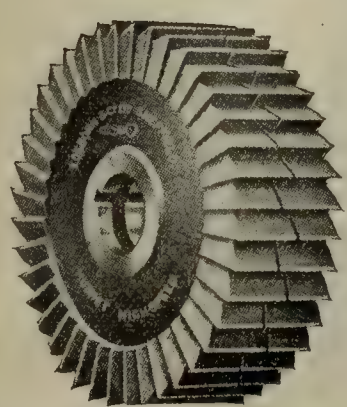

Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)
Limited

Head Office and Works: Montreal, P.Q.

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IF YOU WANT THE

BEST BASE PLUGS, BUY BANFIELD'S

Have in stock for immediate shipment either threaded or bevel Plugs for 4.5", 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. *Write for prices.*

EDWIN J. BANFIELD

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Manufacturer of Plug Milling Machines for above size shell. Prices and deliveries on application.

IMMEDIATE SHIPMENT

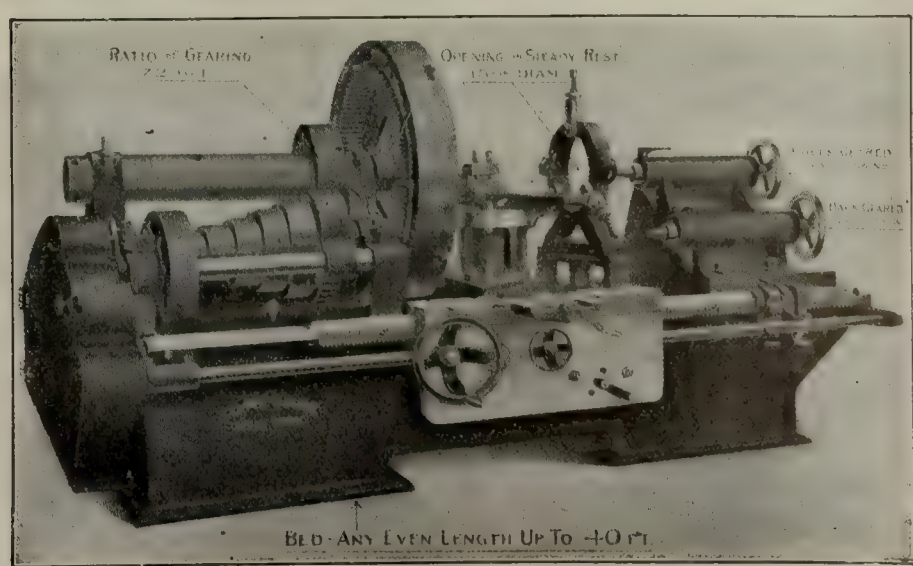
30-ft. BED

McCabe 2-in-1 Lathe

26 and 48-INCH SWING

TRIPLE-GEARED—RATIO 72 to 1

J. J. McCabe, 149 Broadway, New York



Showing McCabe's Latest Heavy Type "2-in-1" Double-Spindle Lathe—26/48-in. Swing.

48-in. Swing. Triple Geared — ratio 72 to 1.

26-in. Swing. Back-geared.

Turns between centers—24 ft.

Swing over carriage on 48-in. Lathe is 40 in.

Prominent ship-builders are using McCabe Lathes on long beds.

Thousands in operation all over the world.

TRADE MARK

of the Famous

"WACO"

BRAND

HIGH SPEED STEEL

AND

TWIST DRILLS

"DOUBLE WACO" Quality

Specially Adapted for Munition Work

"TURTLE" BRAND

High Class Tool Steel, Files, etc., of all descriptions.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

Reliance Steel Works

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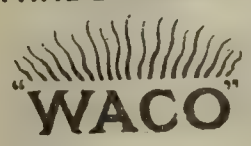

For particulars apply to our
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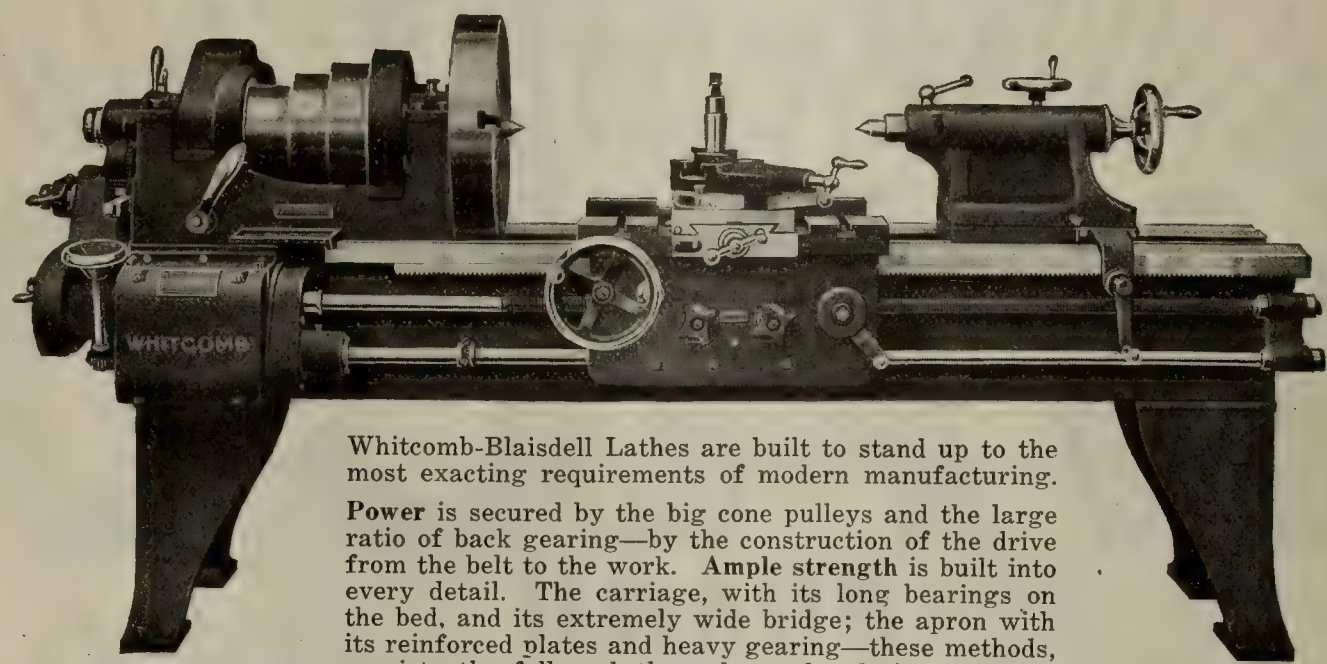
With Strength and Pulling Power

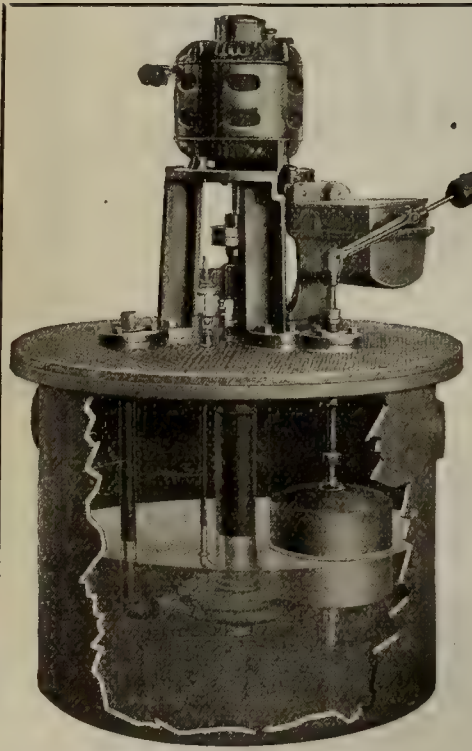


Whitcomb-Blaisdell Lathes are built to stand up to the most exacting requirements of modern manufacturing.

Power is secured by the big cone pulleys and the large ratio of back gearing—by the construction of the drive from the belt to the work. **Ample strength** is built into every detail. The carriage, with its long bearings on the bed, and its extremely wide bridge; the apron with its reinforced plates and heavy gearing—these methods, consistently followed throughout the design, build a powerful. durable machine tool.

Write for Catalog giving full details.

Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass., U.S.A.



We will appreciate an opportunity to figure on your

PUMP

requirements.

Vertical and Horizontal Steam and Power

Come to the help of your Country by buying Victory Bonds.

The Smart-Turner Machine Co.

Limited

HAMILTON, CANADA

Decidedly Quality

That is the verdict of our clients.

In construction, operation and results, quality is evident. That is the reason why Filsmith has occupied the foreground in lathedom. In Canada and United Staes you will find Filsmith quality is based on what it is now doing, not on history. Full, webbed headstock, 50-point carbon steel spindle, and rigidly clamped tailstock.

An enquiry will secure you full information.

THE PHILIP SMITH MFG. CO.

SIDNEY, OHIO, U.S.A.

13-inch Engine Lathe

BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6" shells.

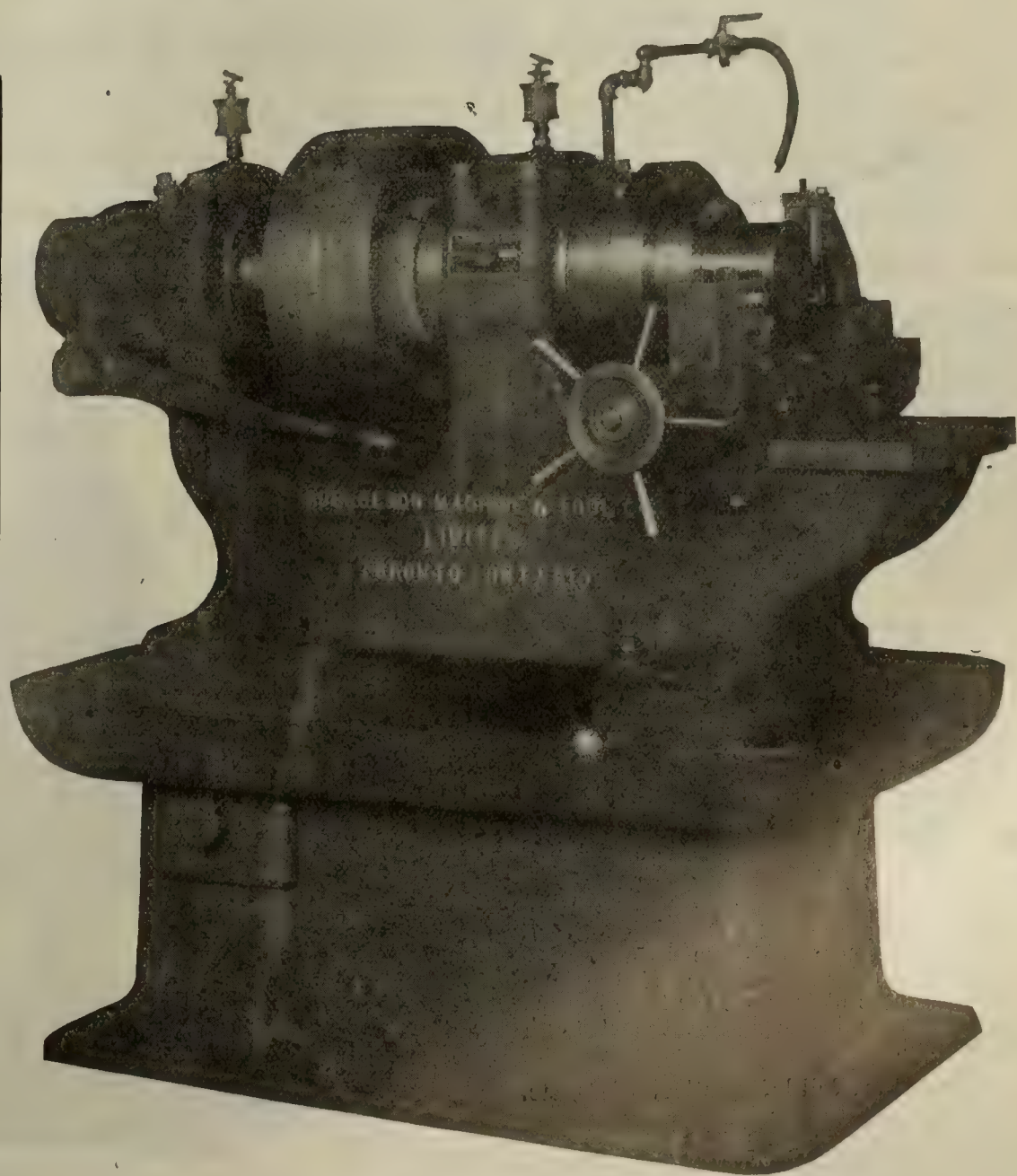
Roelofson Machine & Tool Co., Ltd.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6" shells, our ability to make **immediate delivery** should be of especial interest.

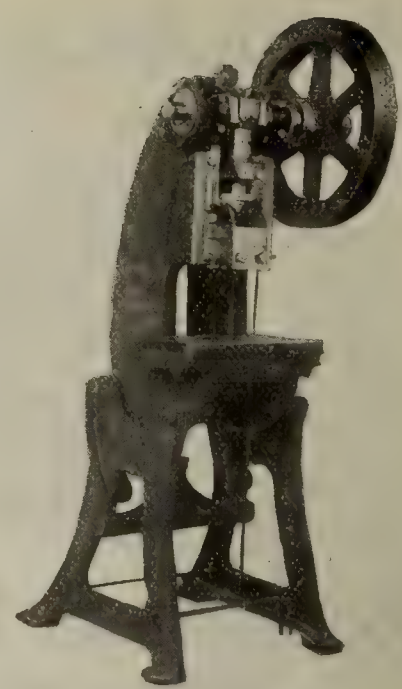
And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.



HAVE you examined the patented Ball Joint Connection on the smaller Consolidated Presses? This ball joint is instantly adjustable for wear, all lost motion can be eliminated by loosening the locking screws and adjusting the ball cap downward—no machining or filing required.

There is another important feature in considering this connection. The ball cap and adjustable split bushings can be removed from the connection screw without removing the screw from the connection or disassembling any other parts.

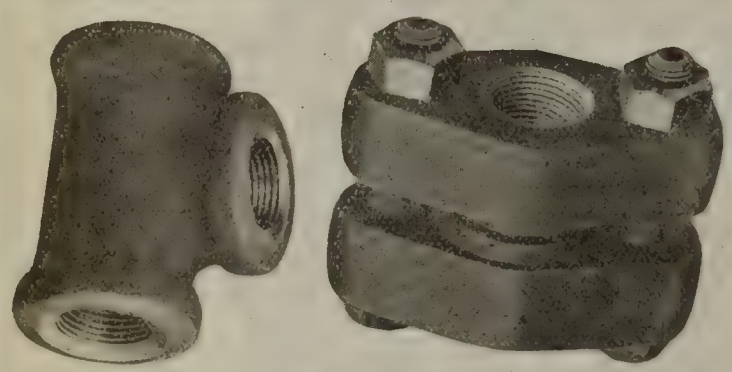
That is economy that cannot be overlooked.



Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver



ELMES' Forged Steel High-Pressure Fittings

They are made after a thorough study of the requirements of these fittings. Our manufacturing knowledge of the machines these fittings are for has given us an intimate knowledge of the strength required.

Write us for full information, prices, etc.

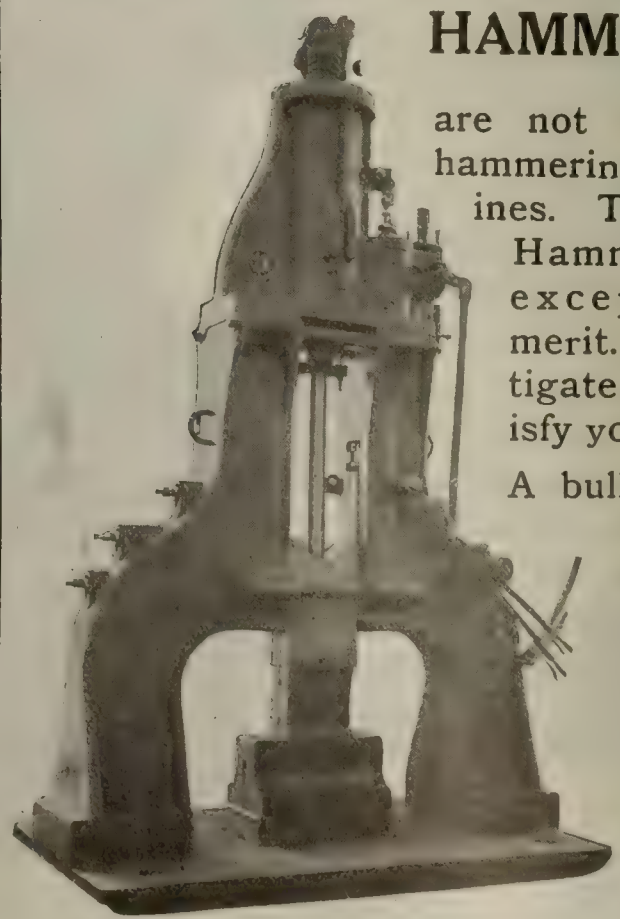
Charles F. Elmes Engineering Works

217 N. Morgan St. - Chicago, U.S.A.

"ERIE" STEAM FORGING HAMMERS

are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.



ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U. S. A.

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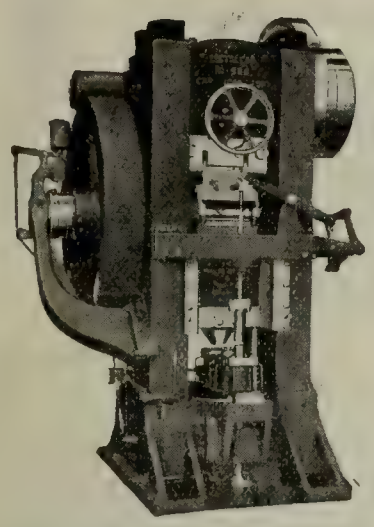
"THE TOLEDO"

Knuckle-Joint Embossing and Coining Presses



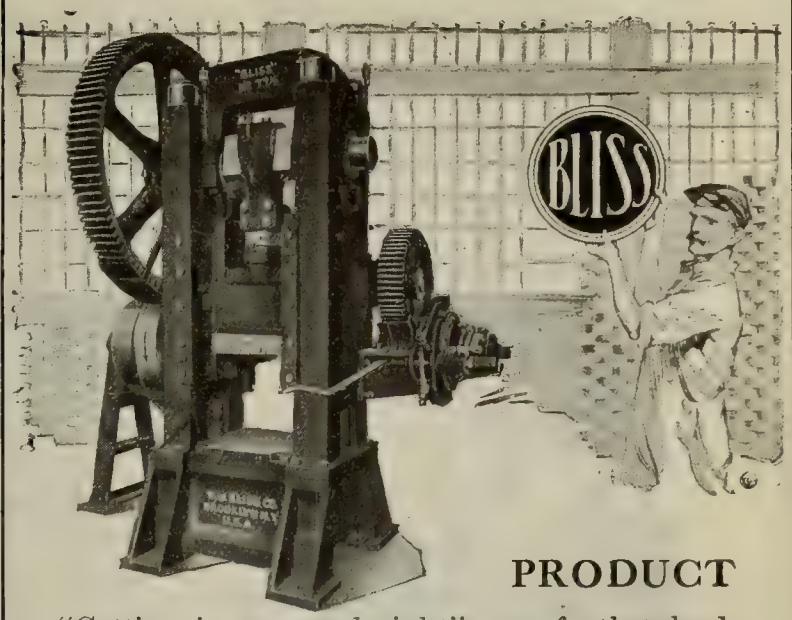
For heavy embossing and swaging on coins, medallions, watch cases, name plates, hardware specialties, cold forging and other work requiring a slow, powerful pressure.

Toggle links so actuated that pressure comes against solid metal, relieving the gibs of all side strain and guiding the dies with great accuracy. We make a study of each particular problem and fit the press to the needs.

The Toledo Machine & Tool Co.

Toledo, Ohio

Representatives—Allied Machinery Co. of America, 19 Rue de Rocroy, Paris, France; Via XX Settembre 12, Turin, Italy; 16 Seidengasse, Zurich, Switzerland.



PRODUCT

"Getting it out—and right" goes further back than the selection of the machine. It may go back 10 or 20 or 40 years to some point or problem solved in our 60 years' development of Presses that produce.

If you want machines with production capacity based on *longest* practical experience, buy "Bliss."

E. W. BLISS CO.

Brooklyn, N.Y., U.S.A.

1857 1917

CHICAGO OFFICE People's Gas. Bldg.
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TEST PRESSES

For Applying Internal Pressure Physical Test to Shells

BANDING PRESSES

For Pressing in Copper Rotating Bands on Shells.

Metalwood Manufacturing Co.

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Designers and Builders of High Speed Hydraulic and Special Machinery for all Purposes

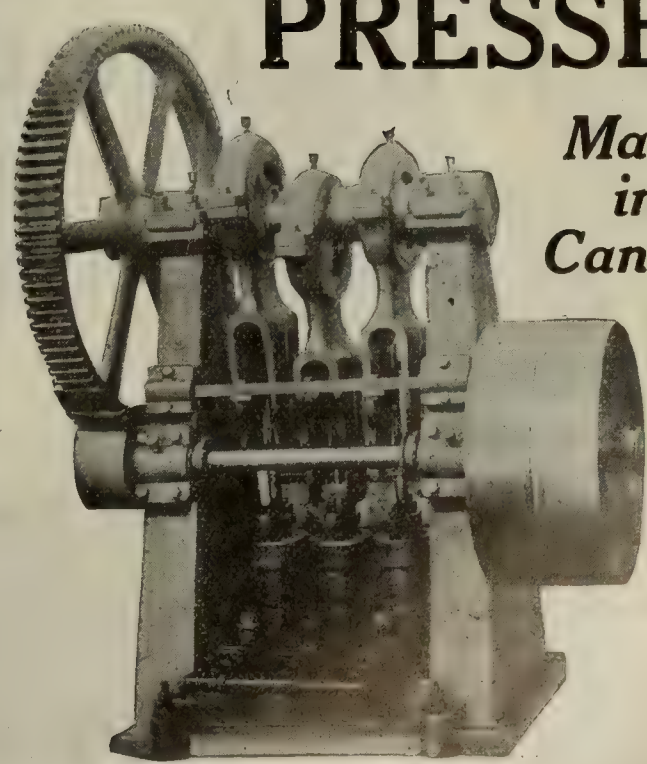
Complete Hydraulic Installations

Canadian Fairbanks-Morse Co., Ltd., Sales Representatives for Canada

R. E. Ellis Engineering Co., 549 Washington Blvd., Chicago, Ill., Sales Representatives. For Great Britain and Continent, address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

PRESSES

Made in Canada



Hydraulic Presses, Pumps and Accumulators for all purposes

WRITE FOR PRICES AND DELIVERIES

WILLIAM R. PERRIN, Limited

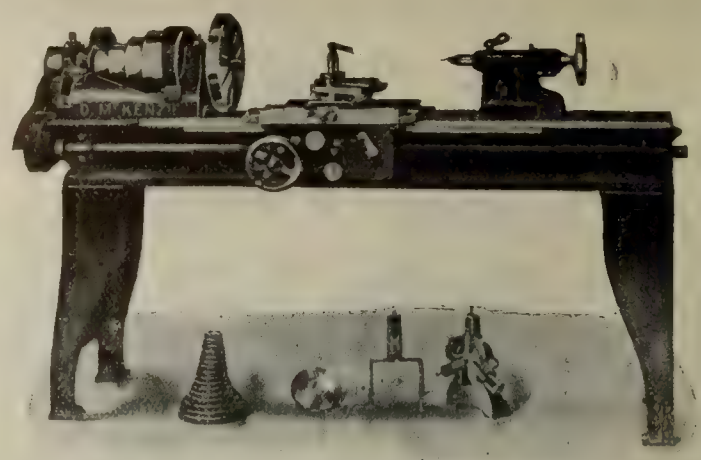
TORONTO, CANADA

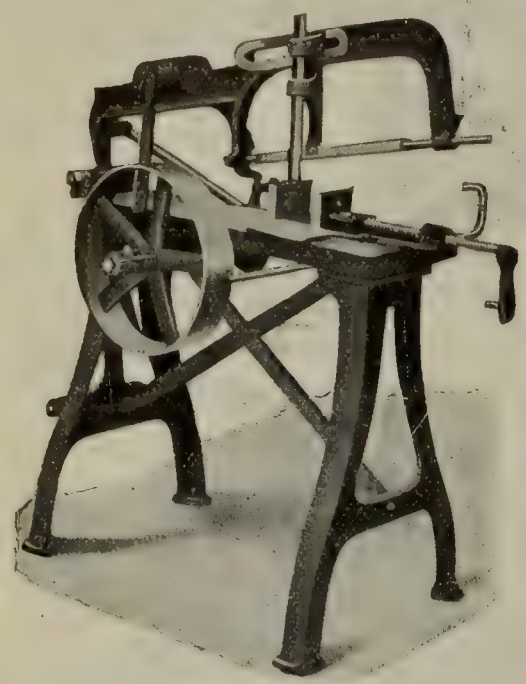
The "McKenzie" Engine Lathe

The Standard of Accuracy

Made from new patterns, of improved design, and constructed of the very best material by expert workmen. Every part is mechanically perfect and excellently finished. Its accuracy and durability mean a big saving of money to you.

Let us put full details before you. Write!





The Improved Power Hack Saw

will cover its cost many times over with the money it saves through long, efficient service.

Saws bars 6 x 6 in., either round or square, and is so constructed as to require no attention after work is put in vise, and stops automatically when piece is cut off.

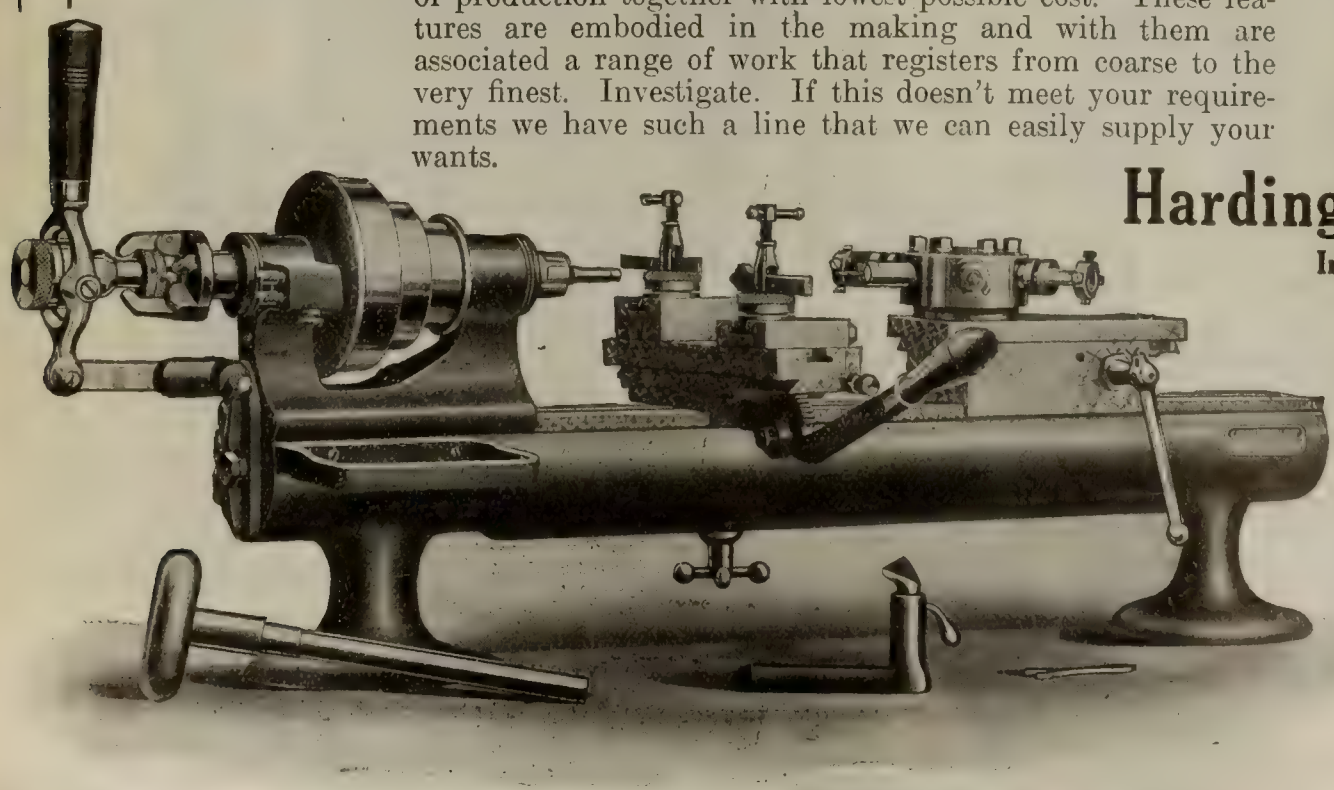
The Improved Saw Guide is a Special Feature — it keeps the saw perfectly in line at all times.

The D. McKenzie Machinery Co.

Guelph, Ontario

If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.



Hardinge Bros.

Inc.

1770 Berteau Avenue,

CHICAGO, ILL., U.S.A.

GARVIN

No. 12 Plain Milling Machine—Use Code Abrade

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rapidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments.....18 x 6 x 15 in.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City

Two Cuts at One Time

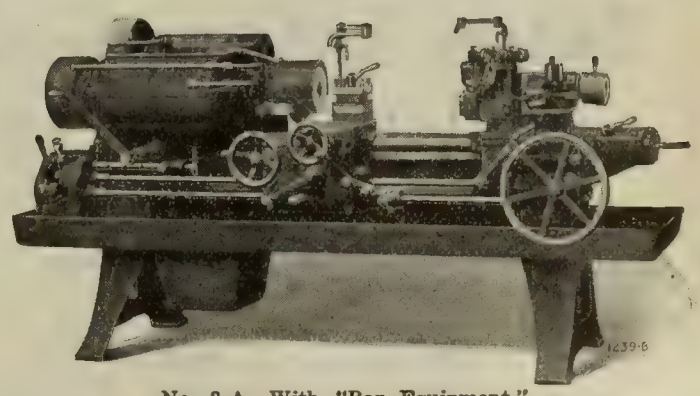
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

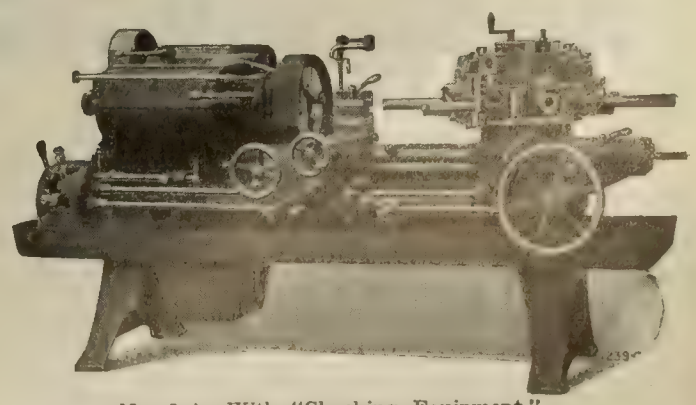
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."



No. 2-A—With "Chucking Equipment."

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal, Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

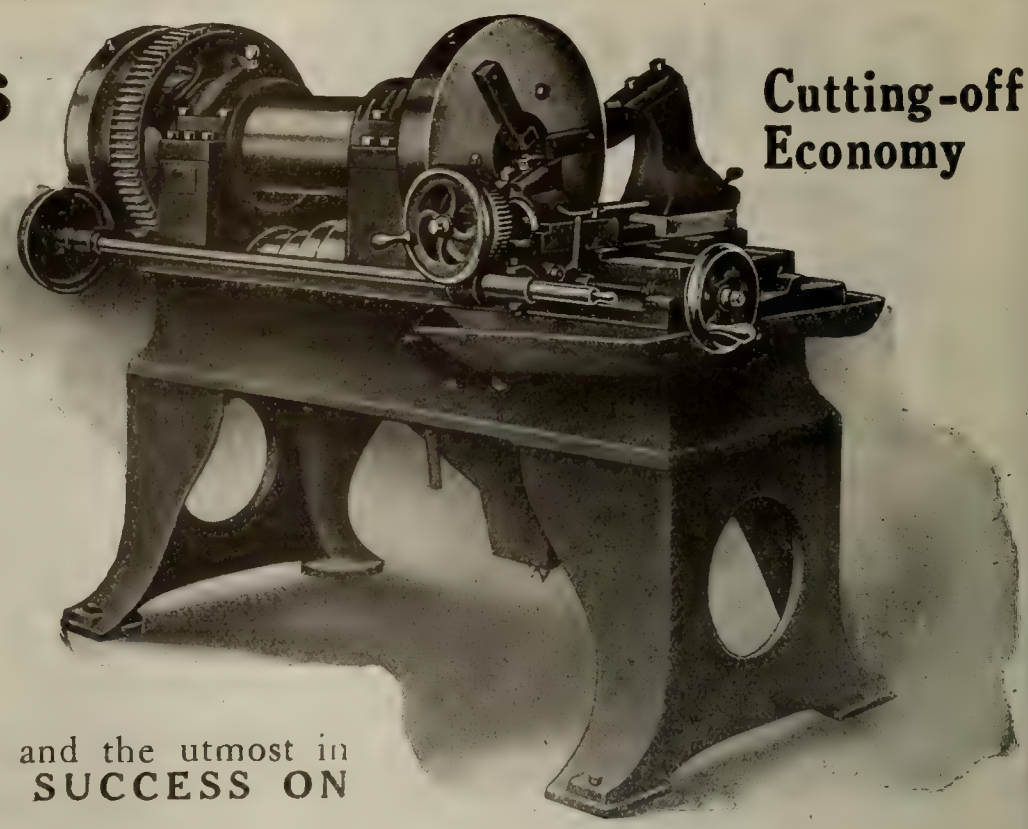
Two Cuts Simultaneously

One up, the other down. This is what makes the **Hurlbut-Rogers Cutting-Off and Centering Machine** virtually double the output and reduce the cost per piece about one-half.

The Hurlbut-Rogers Machine gives you capacity of two machines at the expense and in the floor space of one machine.

We build them for hard work and the utmost in accuracy—and their **GREAT SUCCESS ON SHELLS** shows it.

Let us go into details.



Cutting-off Economy

5-inch Cone-Driven Machine

HURLBUT-ROGERS MACHINERY CO., South Sudbury, Mass.

FOREIGN AGENTS—England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow and Newcastle-on-Tyne. H. W. PETRIE, TORONTO, CANADA.

Bilton Automatic Gear Millers—Spur or Bevel Gears

CAPACITY

No. 1 - - 14 Pitch
No. 2 - - 10 Pitch
No. 3 - - 8 Pitch

The Bilton Machine Tool Company

Succeeding The Standard Mfg. Company

Housatonic Ave., Bridgeport, Conn., U.S.A.

Also Manufacturers of —
Plain Horizontal Millers
Automatic Millers
Plain and Ball Bearing
Bench and Column Drills
Milling Cutters
Riveting Machines

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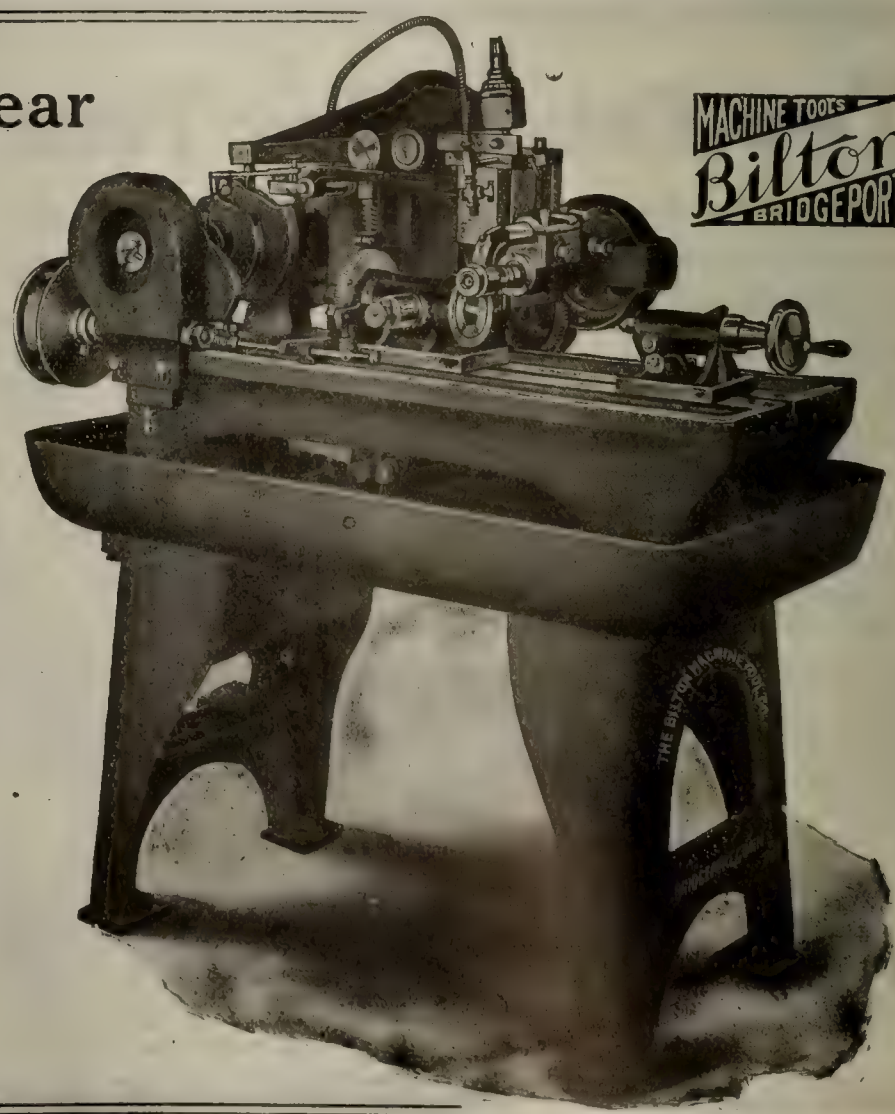

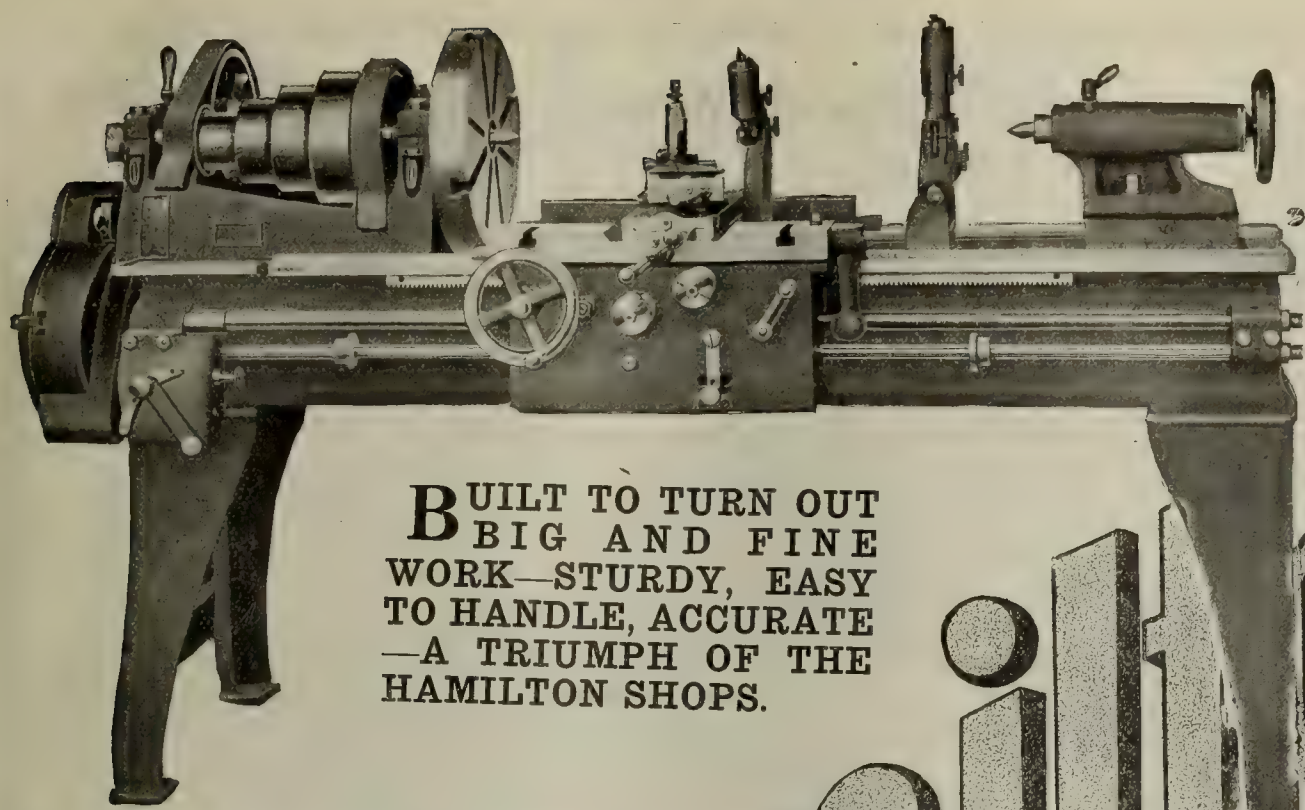

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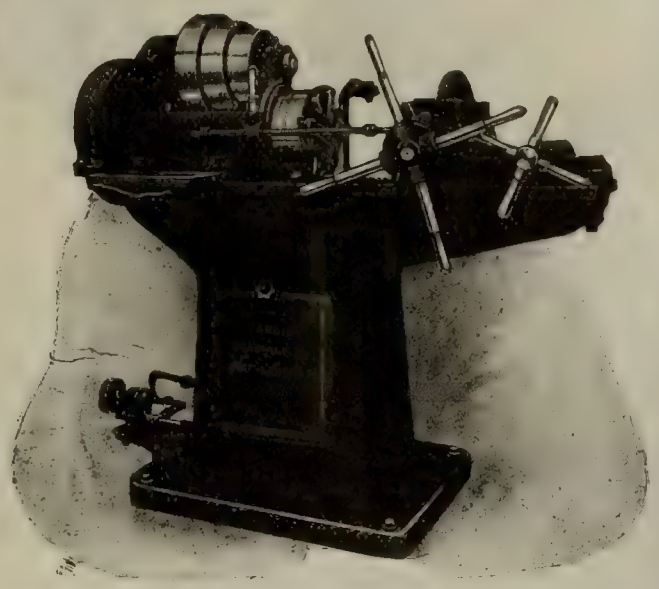

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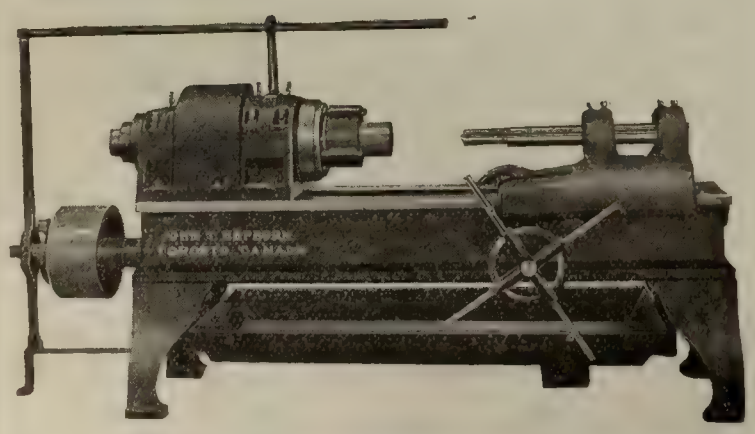

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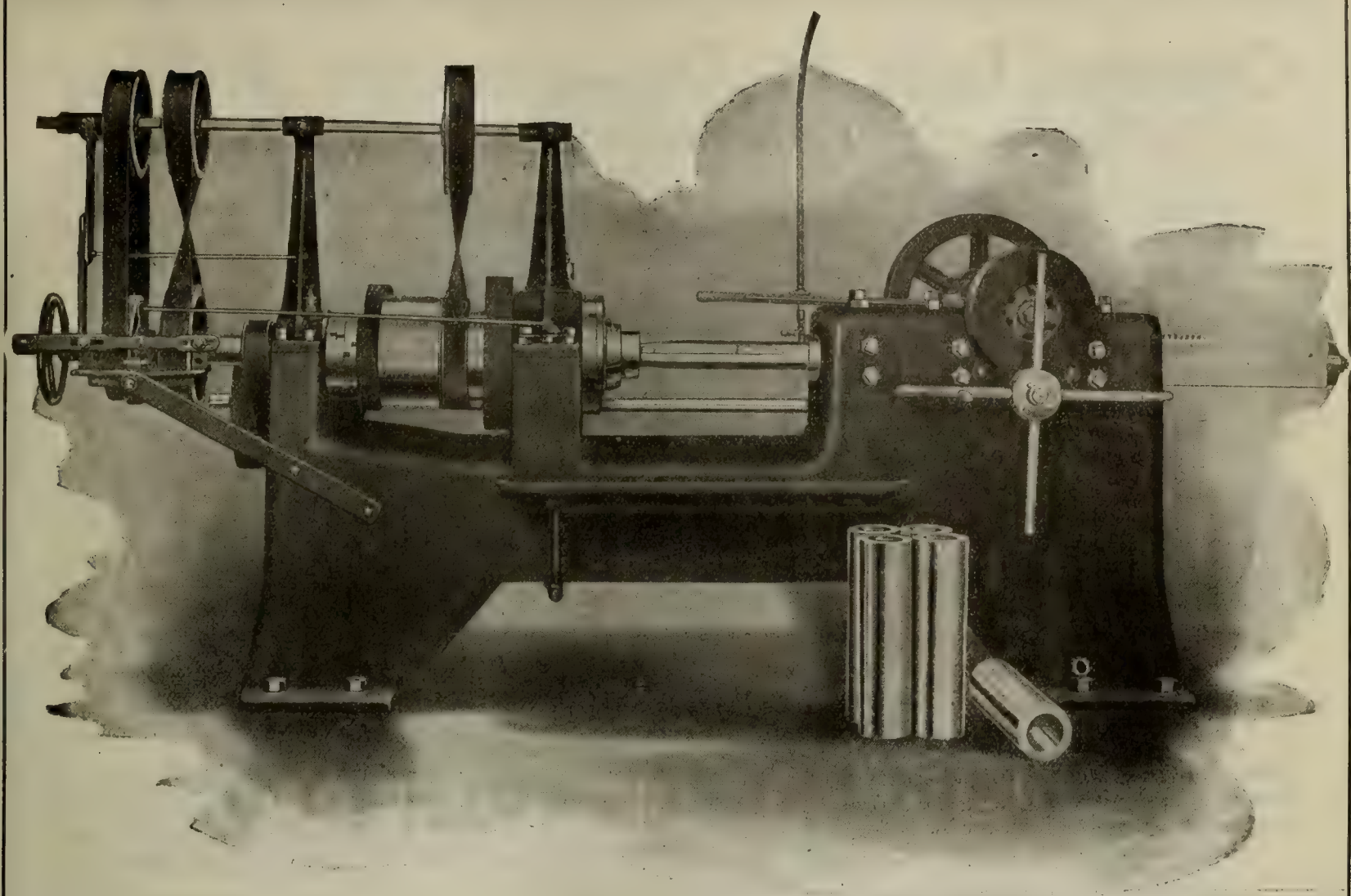

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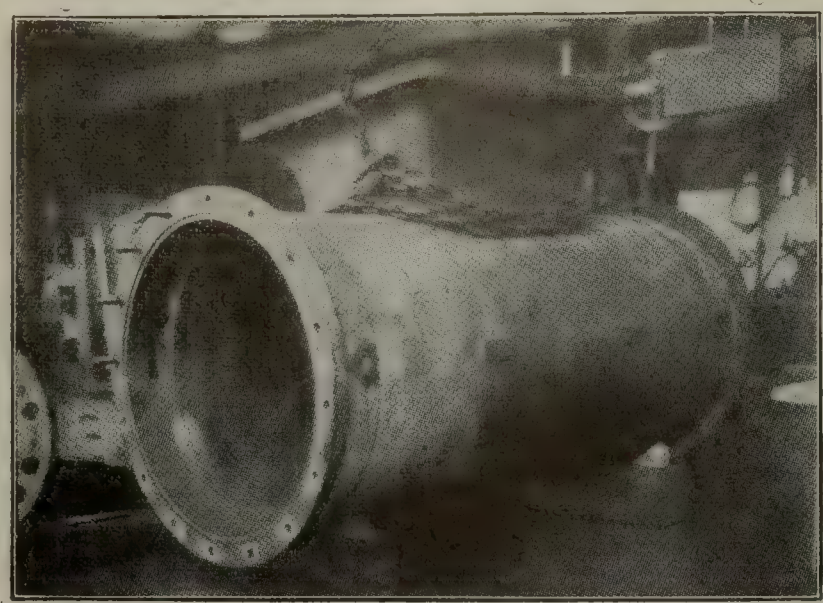

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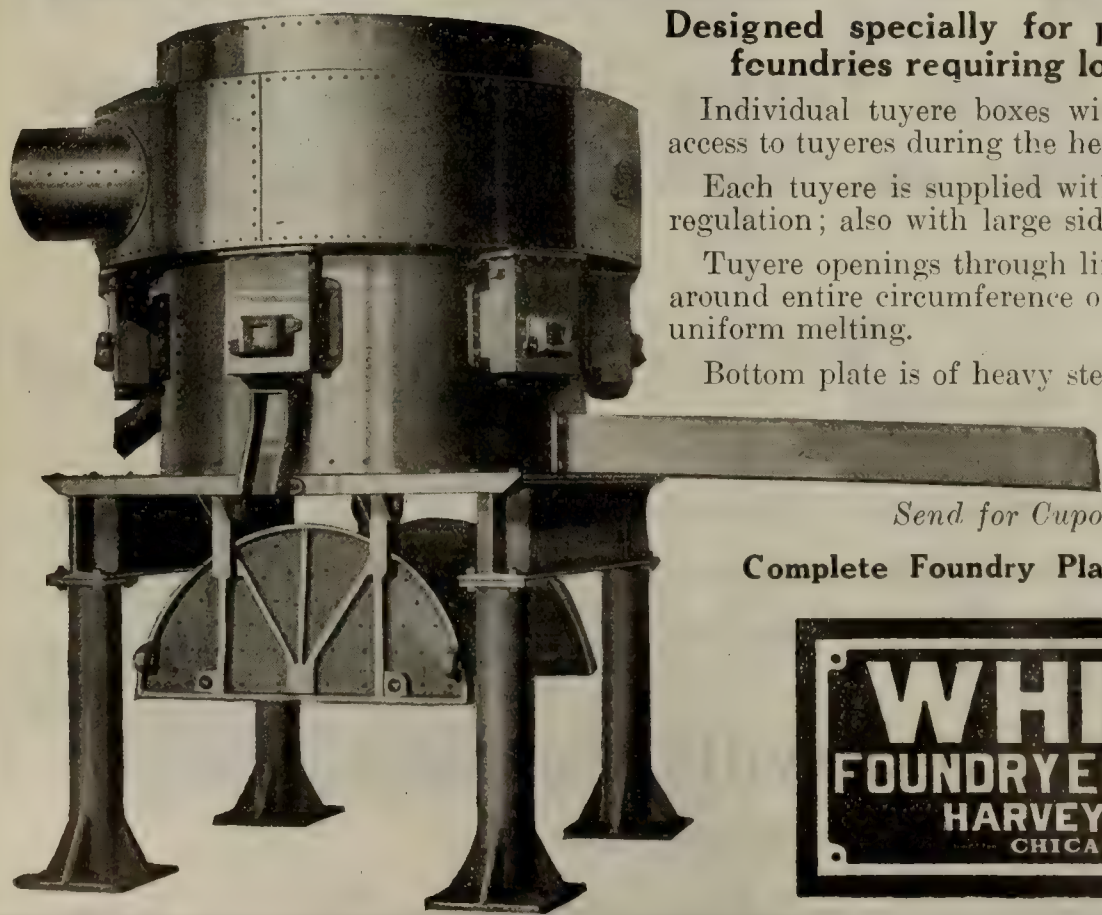

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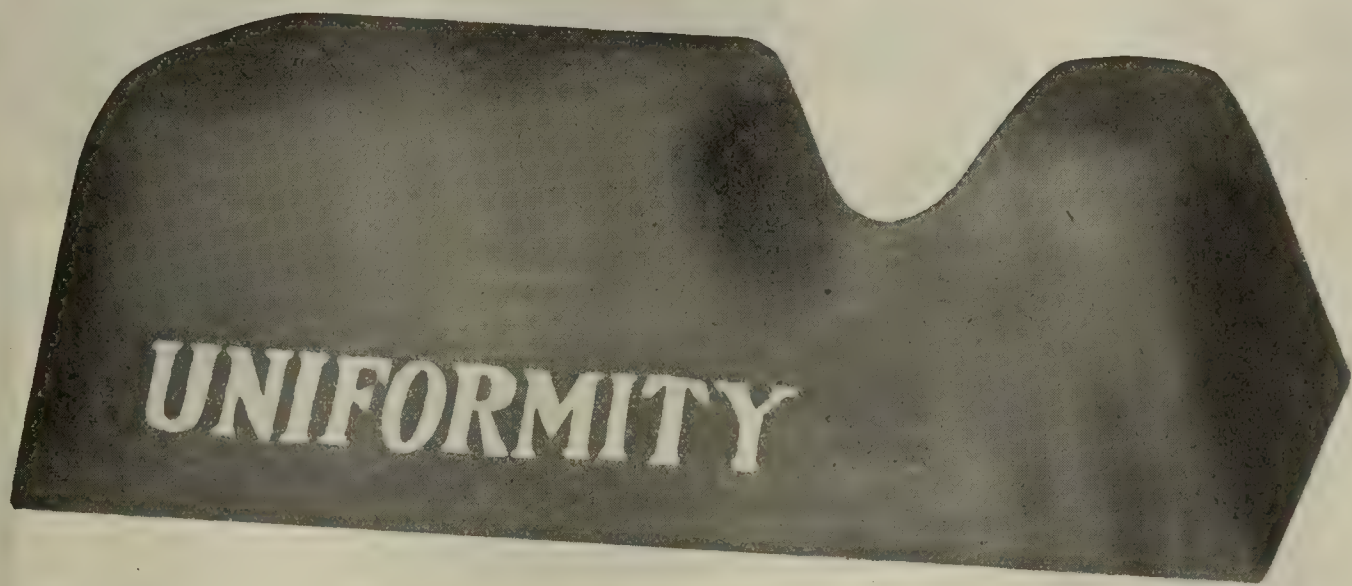

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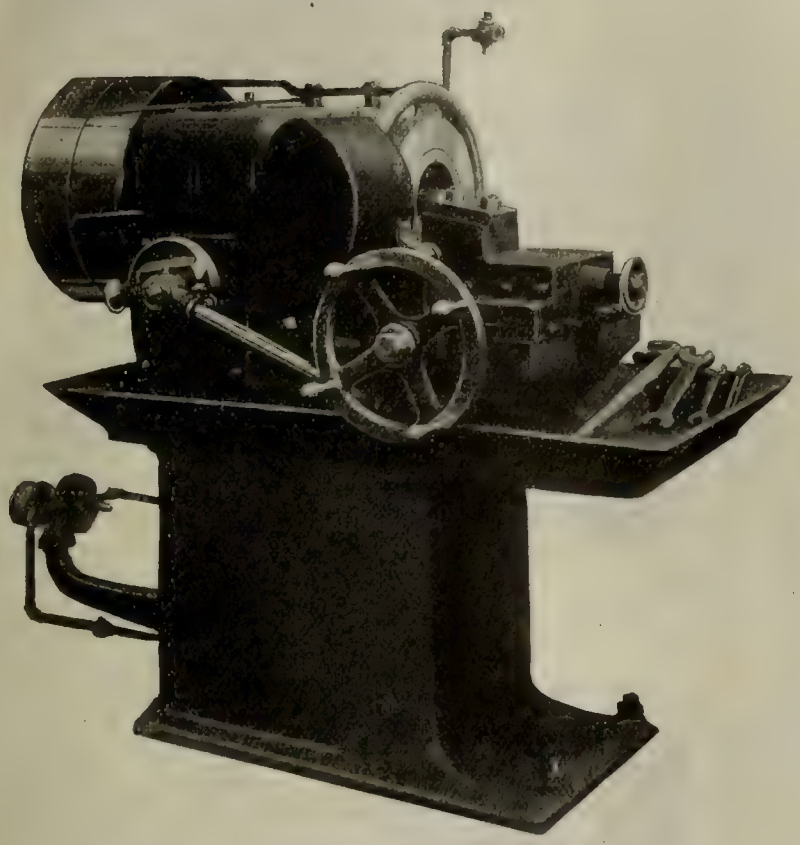

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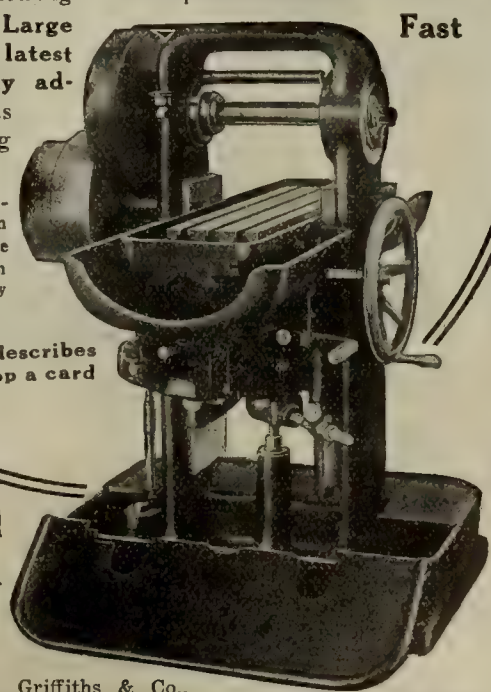

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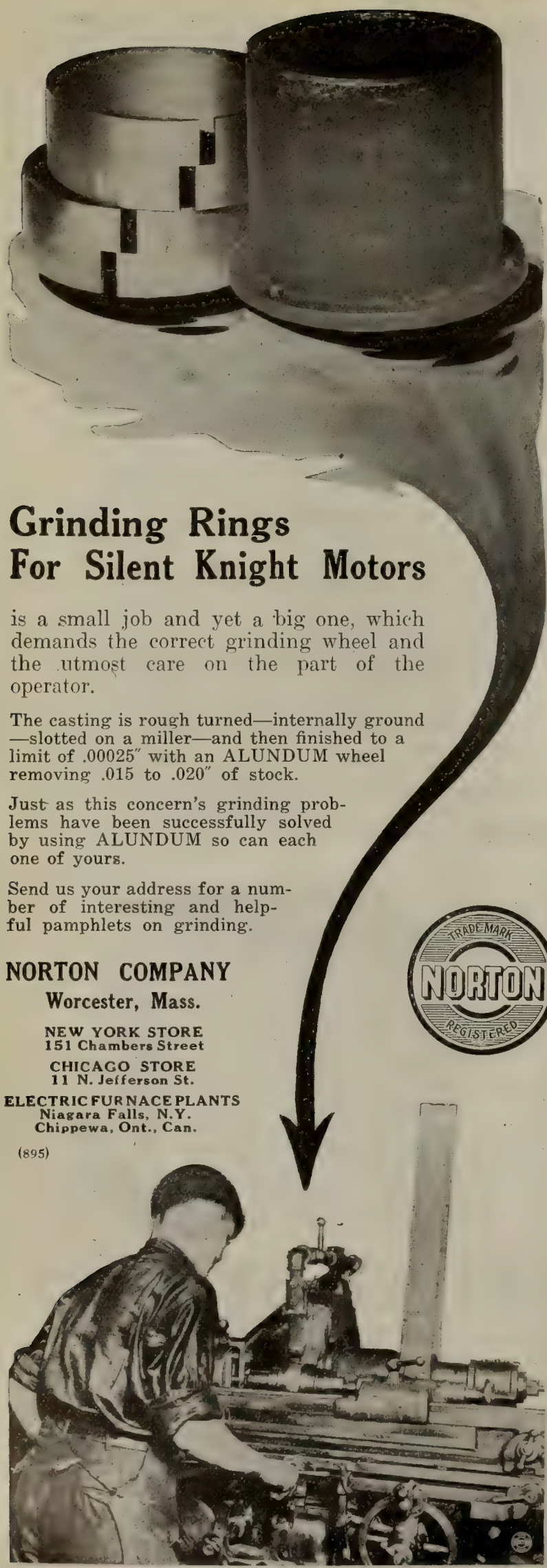

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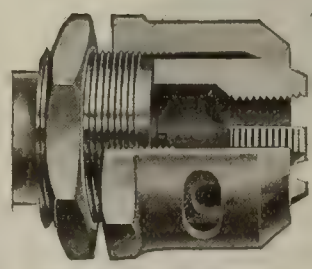
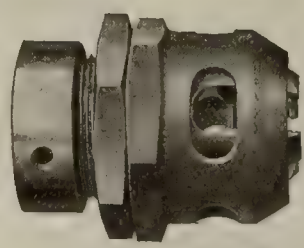
The Acorn Die in the Regular Holder

THE ACORN DIE

The Die



Sectional View Showing Adjustment



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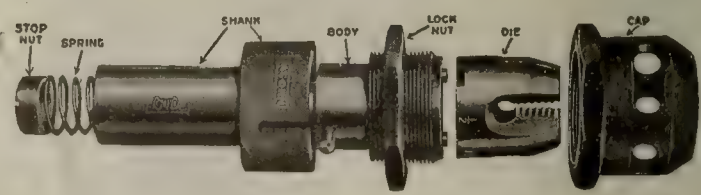
Accurate adjustment of the ordinary spring or round die is impossible. Some lands will do more cutting than others. You know the result—threads rough and inaccurate in lead and diameter.

With the Acorn Die all this is overcome by a new method of adjusting. Very accurate adjustment can be obtained by simply turning the cap, which threads on to the body, on or off part of a turn. This cap is bevelled on the inside and fits a corresponding bevel on the nose of the die, so that when the cap is turned all four prongs are forced in or allowed to spring out an equal distance. Thus each land does its share of cutting and a smooth, true thread is the result.

Other advantages are: Less wear, consequently smaller cost per die and less time spent in grinding and changing dies on the machine.

Investigate this die at once. Now! while it's on your mind. Send for illustrated booklet.



Parts of Regular Holder

Wells Bros. Co. of Canada, Ltd.

Galt, Ontario

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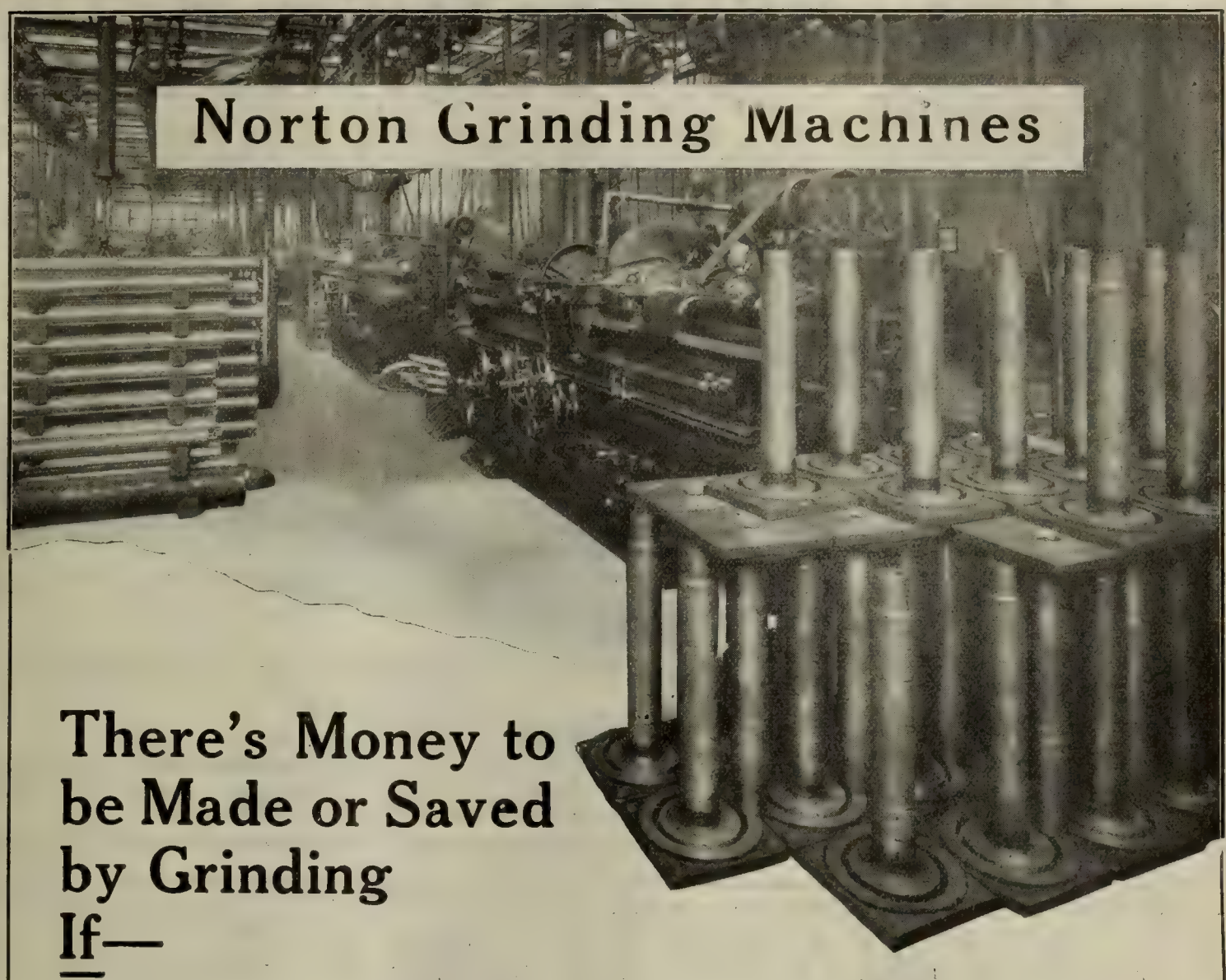

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There is money to be made, or saved, by grinding nowadays if you will eliminate from your mind all your previous ideas of grinding and consider the subject from the modern point of view.

There are two classes of shop men who particularly need to "brush up" on present-day grinding practice.

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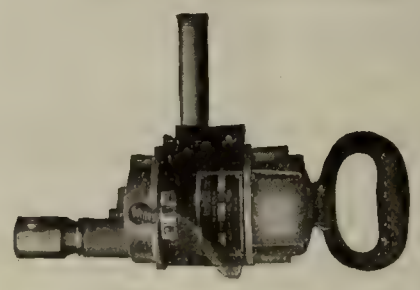

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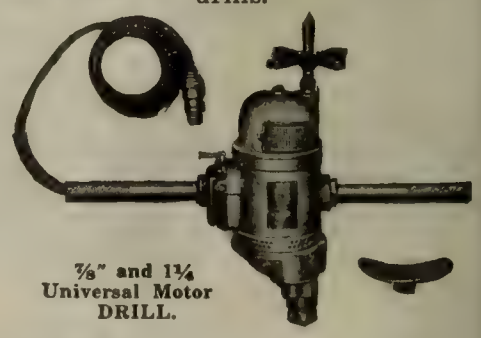

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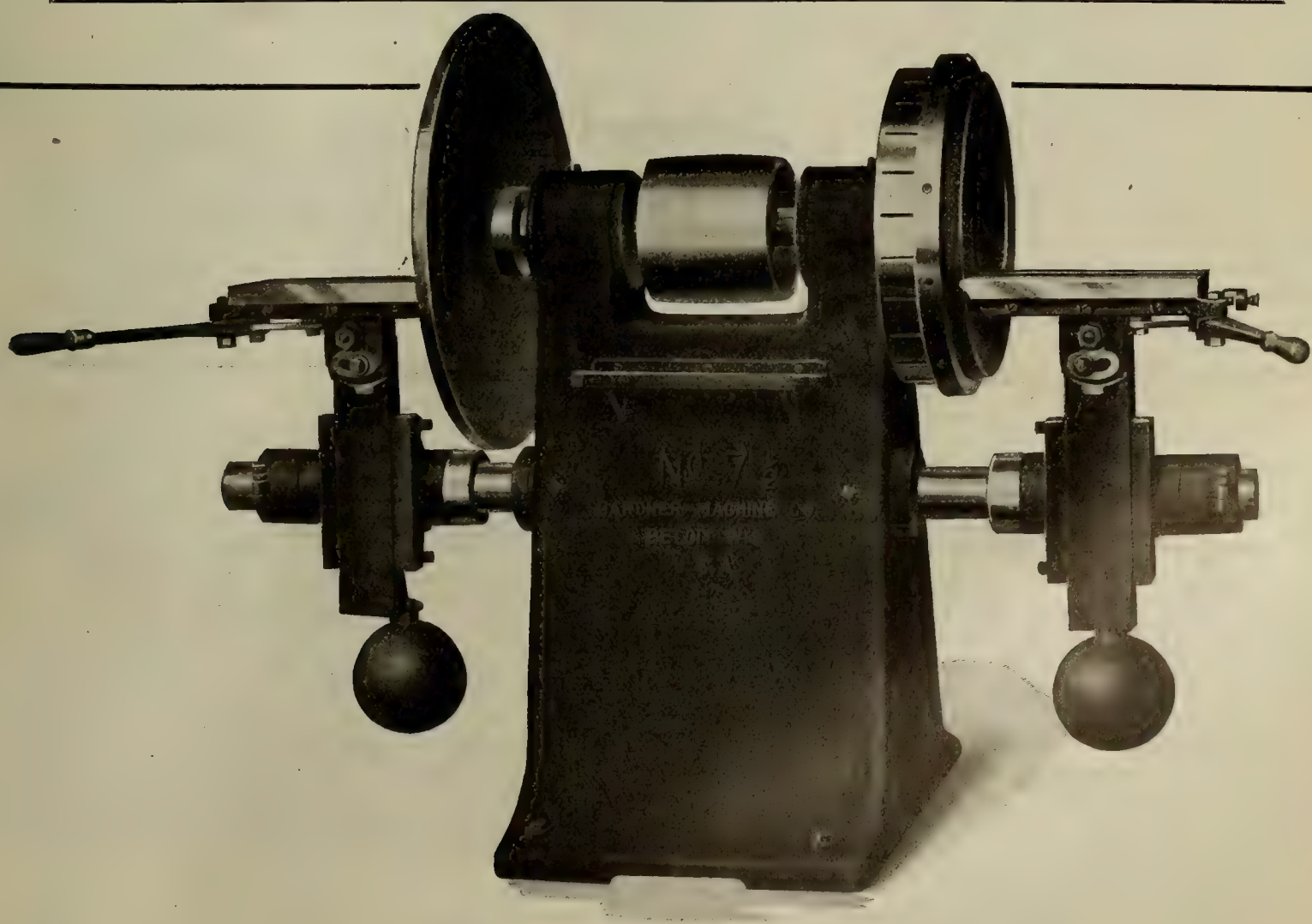

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Some of your men will be taken for Military Service.

Labor-Saving Machinery will keep up your production.

Fewer men will be needed for handling of materials if you use

Automatic Storage Battery Industrial Trucks

Four times the load—Ten times as fast. They will save men —handle heavier loads, and do it faster.

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Application of Electric Arc Welding to Machine Shop Uses

Staff Article

In all branches of industrial progress the initial steps in the commercial development of a particular art or science have always to be taken by a small minority of pioneers whose keenness of perception and breadth of vision have enabled them to grasp the salient facts at an early stage. The installation described in the following article is a recent example of progressive action which falls within the aforementioned category.

THE use of electricity, as a means of heating metals to the point of fusion thereby enabling different objects to be welded together, has been in existence for several years. The manufacture of welded tubes and the joining together of wire coils in wire-drawing plants were amongst the earlier applications of electric welding to manufacturing work. Such applications, however, were of a more or less specialized nature. In recent years considerable progress has been made in the development of equipment and methods of use, and now electric welding is recognized as a standard manufacturing process, capable of doing sound, reliable work in various metals. It can be utilized under all conditions and has been found to yield economical and efficient results in many widely varying fields of metal working activity.

Autogenous and Incandescent Welding

The term, "autogenous welding," frequently used in connection with blow pipe as well as with electric welding, refers definitely to the fusing together of two metals by the application of heat without pressure, while the union of two metals by means of blows or pressure while in a heated state is classed as incandescent welding. This latter class, therefore, includes butt welding and spot welding, in both of which the pieces to be united are pressed together more or less firmly, while arc welding, like blow pipe welding, relies entirely on the attainment of a temperature sufficiently high to melt the metals, so that they mix together in a liquid state and, when cool, form a thoroughly homogeneous junction.

FIG. 1.—GROUP OF MACHINE SHOP TOOLS WITH TOOL STEEL TIPS WELDED ON ELECTRICALLY.

Electric welding equipment of a type and capacity suited for use on the majority of jobs met with in modern machine shop practice has been installed recently in the plant of the Hamilton Gear & Machine Company, Toronto, and has already been the object of considerable attention from manufacturers in allied lines.

The principal use to which the process has been applied by this firm is the salvaging of high-speed steel and stellite from the scrap heap. The method employed is that of arc welding scrap bits of high-speed tool steel and stellite to shanks of cheap mild steel, thus producing useful cutting tools for lathe, planer, shaper, etc. That great savings can be effected by this system is perfectly apparent.

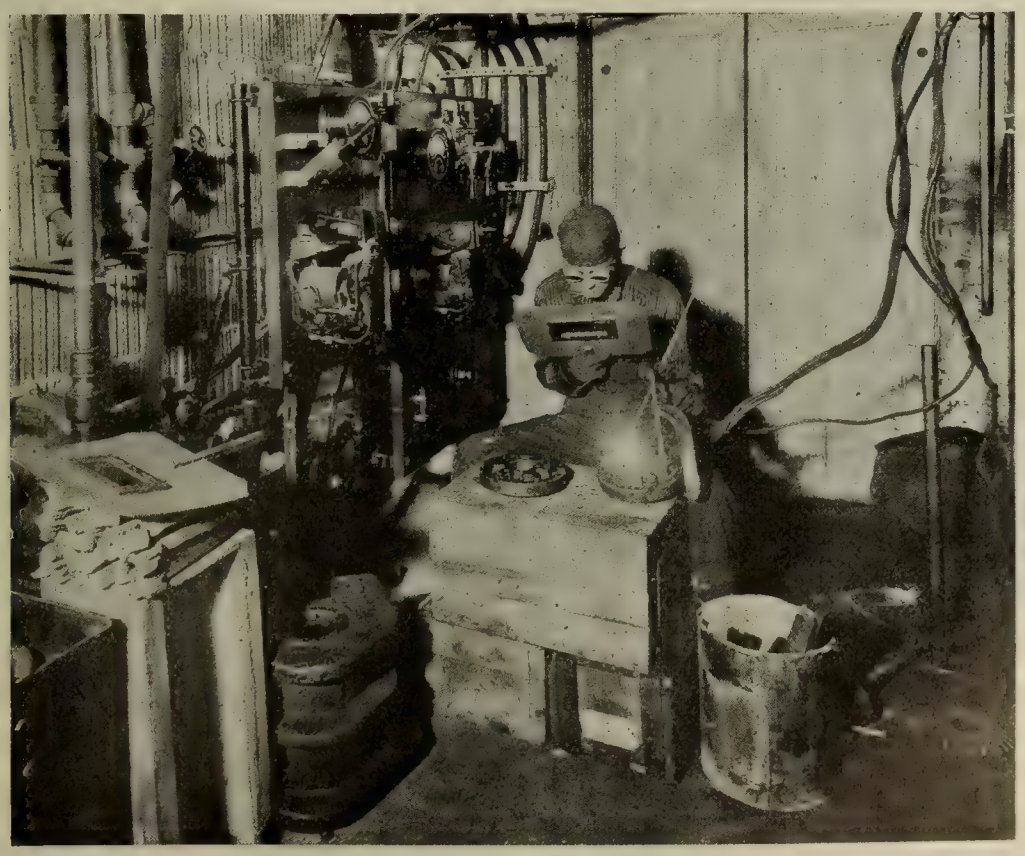


FIG. 2.—VIEW OF WELDING INSTALLATION, SHOWING CONTROL PANELS AND OPERATOR WORKING ON ARTICLES SHOWN IN FIG. 4.

The group of tools illustrated in Fig. 1 indicates the wide range of shapes possible in tools for lathe, shaper and planer work, while a special application is shown in Fig. 3, which is a profile tool for accurately forming the outline of the bevel gear blanks in the foreground. The width of cutting edge on the latter tool, combined with the large amount of overhang, produces a condition not at all conducive to the maintenance of the cutting edge, and the percentage of scrap involved after frequent grindings would be considerable. By using ordinary steel plate with a high-speed steel cutting edge of suitable proportion the cost of this tool is reduced to a fraction of what it would be if made completely of high-speed steel. The cutting edge may be renewed indefinitely and the reduced liability to fracture by vibration due to the use of the soft steel plate insures a desirable economy in upkeep.

The tools shown in Fig. 1 are of familiar types; and here again the economy of material and variety of shape obtainable are immediately apparent.

At the left is a round-nosed lathe tool ground and ready for use; next to it is a similar tool in the rough. The two flat forming tools in the foreground were four scrapped tools before welding. The two large tools in the centre and the two at the right are wide-faced tools of straight and side cutting design. In all of these the cutting edge is of high-speed tool steel selected from the scrap heap. The shanks are of cheap, mild steel.

Two Electric Methods

There are two methods of electric arc welding. One where a metal electrode

is used, and one where a carbon electrode is used.

Metal electrode welding requires a wire or rod of suitable material, which forms the negative terminal of the electric circuit; the article being welded is made the positive terminal. The arc is formed by touching the work and quickly withdrawing the electrode to a distance of about 3/16 in. or less. The heat generated by the arc melts the metal at the point of application, and the electrode itself melts, furnishing the molten metal for joining or building up the welded parts.

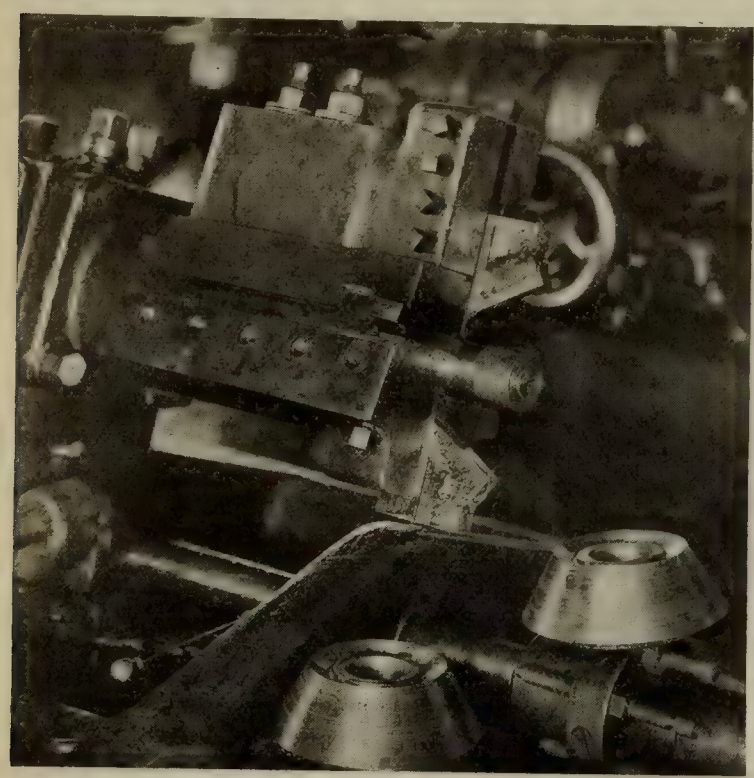


FIG. 3.—FLAT CUTTER WITH LONG WELDED TOOL STEEL EDGE, FINISHING BEVEL GEAR BODIES IN TURRET LATHE.

With the carbon electrode system a carbon pencil or rod is used for the electrode, and is made the negative terminal as with the metal electrode. The heat which can be obtained with the carbon electrode is practically unlimited, and the metal can, therefore, be melted very rapidly. In welding with the carbon electrode the filling material must be supplied in the form of a separate rod or bar.

The question might be asked: Do not carbon particles enter the weld and cause a very hard quality of iron at the joint? The logical answer is yes, but if the carbon electrode is held far enough away from the weld, particles of carbon are not carried into it, and, with ordinary care, joints which are soft enough to be machined can always be made in steel. In cast iron it is much more difficult to produce a soft weld.

Relative Advantages

The relative merits and advantages of the two processes depend on the class of work to be done. The carbon arc for average work usually requires from 150 to 400 amperes, with a voltage of from 40 to 60. The current required with the metal electrode is approximately from 60 to 100 amperes, with a voltage of from 25 to 30. A resistance is used in series with the arc in each type to steady it. Obviously, of the two methods, the carbon would lend itself better to heavy cutting or applying large quantities of metal quickly and is the more frequently used in such classes of work. The comparatively slow rate of deposit by the metallic method makes for a smoother, more uniform and better-looking weld, and hence is used in lighter service, such as general repair work, etc. The temperature of the arc with the metallic electrode is considerably less than with the carbon, and with care the metal need hardly be raised above the melting point.

Although the current for welding may be taken from any direct current system, providing suffiicient resistance be used to reduce the voltage to that required at the arc, it is economical to use a specially-designed low voltage generator, independently driven. This is the system employed at the plant described; the compound wound generator has a capacity of 300 amperes at 60 volts, and is wound for constant voltage.

The motor-generator set is mounted in a room separate from the welding station, which latter is shown in Fig. 2. The control equipment consists of a main generator panel, ammeter, volt melter, overload circuit breakers, field control switch, and rheostat, together with the welding circuit control apparatus. This consists of an automatic switch with its relay, and a hand-operated rheostat switch in series with each welding circuit. The small panel nearest the observer in Fig. 2 controls an auxiliary welding circuit, so that two operators can be supplied with current from the one generator at the same time. Once the series resistance is set no further adjustment is needed by the operator, but, should the current become excessive, the series relay permits the magnetic contactor to drop open and break the circuit. When the arc is thus broken the circuit is automatically restored by the relay, so that the arc can be drawn afresh by the operator for a new start.

Additional Applications

Besides the uses mentioned, there are many other industrial applications where electric welding may be used to advantage. Fig. 4 shows how broken castings may be repaired by welding on new metal. The pieces shown are the backs of scroll chucks put out of commission by the breakage of small lugs which had worn thin. Welding restored these at a cost of a few cents. Often it is possible to reclaim castings, where large blowholes are found in the course of machining, by filling up the hole without removing the casting from the machine.

Another application which has proved satisfactory in foundries and steel works is the opening of tap holes and tuyeres in furnaces. The furnace is made the positive terminal of the circuit, and the negative is a solid carbon rod, 2 inches in diameter and 4 ft. long, fitted into one end of a wrought-iron pipe, which is provided with a wooden handle at the other end. But perhaps its largest field has been in railroad and marine repair work. Repairs on boilers are made quickly and with no tendency to develop strains in cooling, because the heating is almost entirely localized, thus practically avoiding such strains after the weld is completed.

The cost of an electric welding outfit such as described is many times that of an oxy-acetylene or other system; but for such work as it is best adapted to it can be operated at from one-half to one-fifth that of any other known welding method. The plant of the Hamilton Gear & Machine Company is the first of its kind to be installed in Toronto for general commercial work.

FIG. 4.—CHUCK BODY WITH BROKEN WALLS ON PINION SOCKETS. LEFT, DAMAGED BODY. RIGHT, BUILT UP ELECTRICALLY, SAVING LOSS OF ARTICLE.

Montreal, Que.—The Canada Cement Co., it is understood, contemplates installing a plant for producing potash as a by-product of the cement industry.

A HANDY LOAD COMPUTING CHART

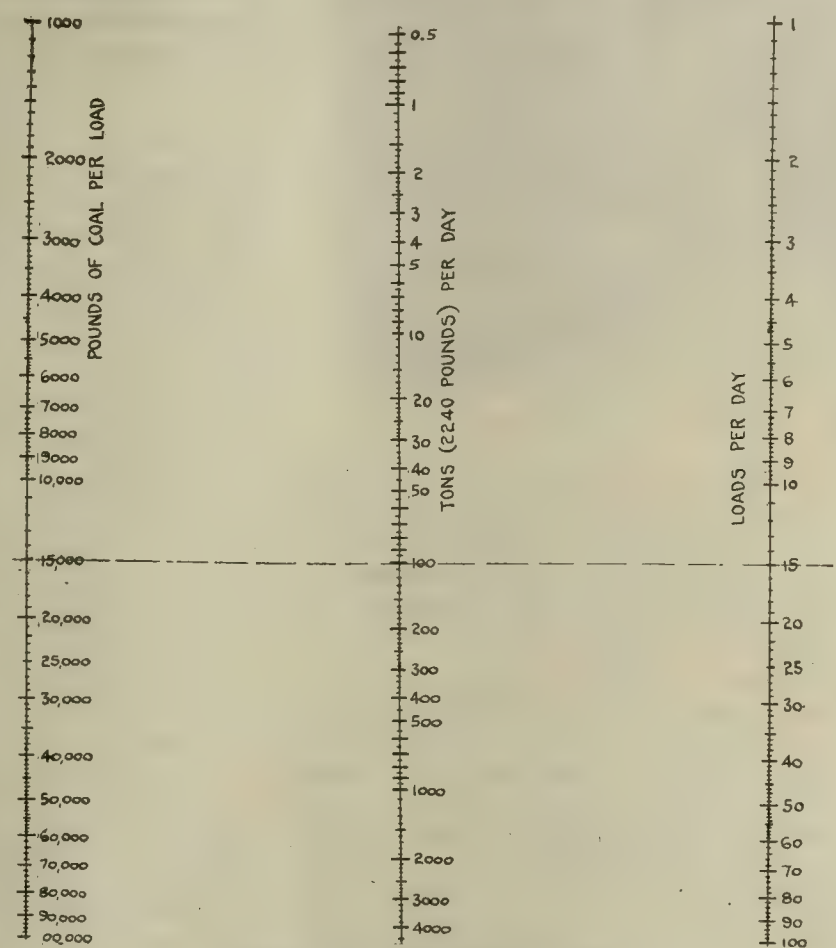
By N. G. Near.

THE accompanying chart will be found useful in making load computations. You don't have to use a pencil at all, nor do you have to work it out mentally. Just stretch a thread or string across from known point to known point and the problems solved.

For example, if you have a truck that will carry 15,000 pounds, and the truck can haul 15 loads per day, how many tons (of 2,240 pounds) will it haul per day? The dotted line drawn across the chart shows in the middle column that the truck will carry 100 tons per day.

The chart can be used in various ways. If, again, you want to carry 100 tons per day, and your truck will hold 15,000 pounds, the same straight line will show you that you will have to make at least 15 trips per day to haul that much.

It will be noted that the range of the chart is very wide. It can be used in connection with carload lots as well as with wagon or truck load lots.



HANDY LOAD COMPUTING CHART.

PERSEVERANCE AND HABIT

A LOCOMOTIVE starting a long train of freight cars is a familiar sight, and the first thought that it suggests is that a vast amount of energy is being expended in proportion to the results. The driving wheels, losing their grip on the rails, whirl round at high speed, and deafening noises come from the exhaust pipe and from clanking side-bars and couplings, creaking wheels, and other sources. These evidences of wasted energy continue for only a short time, however. The engineer sands the rails, the driving wheels "bite," and the train gets away; and unless engine troubles develop, or steep grades are encountered, the locomotive has little difficulty in keeping the train moving after the first inertia has been overcome.

There is a striking similarity between this and accident-prevention work. We are all creatures of habit, and history shows that bad habits are easily formed and hard to break, while good ones are often hard to achieve and easy to break. This fact has a decided bearing on accident prevention. It is generally agreed among men engaged in safety work that in making a shop safe, mechanical safeguards, while important, do not have as great an influence as careful workmen. "Careful workmen" are men who have given serious thought to the proper and safe way of doing their work, and have consequently formed the habit of being careful at all times. There may have been temptations to take chances, but perseverance in doing the right thing soon developed the safety habit; and—here is where the example of the locomotive and the freight train comes in—once the habit became well started, the man found it easier to keep on than to stop.

On the other hand, a man who is given to taking chances, and has thus far escaped injury, will either fail to see the logic of exercising care, or else, perceiving the wisdom of carefulness, will find the chance-taking habit so ingrained in him that being careful at all times is next to impossible. Each time he knowingly takes a chance and escapes injury his determination to be careful will be weakened. A man who will avoid standing or passing under a crane load, and five minutes later will creep between railway cars rather than walk around them, cannot be considered a careful man. It cost him little effort and perhaps no loss of time to avoid the crane load, but walking around the freight cars might take a couple of minutes. He preferred the short cut between the cars, with the attendant chance of inquiry, rather than the assured safety gained by walking around the train. This man is inconsistent, and yet he is typical of thousands of workmen, who either fail to start right or fail to keep going after they have set their feet in the safe path.

Accident prevention resolves itself into a continuous, competently-directed campaign to inculcate the habit and thought of carefulness in the workmen. The head of a plant must not falter in rendering moral and material assistance while starting and continuing such work. A lack of interest on his part, or on the part of his immediate subordinates, will have the same effect on accident-prevention work that shutting off the steam from the locomotive will have on the freight train. Steady, forward progress is supplanted by the slackening motion due to mere inertia, the energy expended in starting the freight train or the safety habit is largely wasted, and an equal amount of energy must be expended to get the work going again.

Neither the freight train nor the safety habit is automatic or self-sustaining. There must be a constant supply of fuel,—coal in the case of the locomotive, and supervision and direction in the case of the safety work. There are many difficulties to be overcome, chief among them being proving, to the full satisfaction of the workmen, the folly of careless ways, and arousing their unwavering faith in the benefits of caution. But persistence and perservance along these lines will gradually develop careful methods among the men, and lead them to substitute careful habits for chance-taking or careless ones. Those addicted to the chance-taking habit are sure to be injured some time, while the men of careful habits are reasonably certain of freedom from injury.—The Travelers Standard.

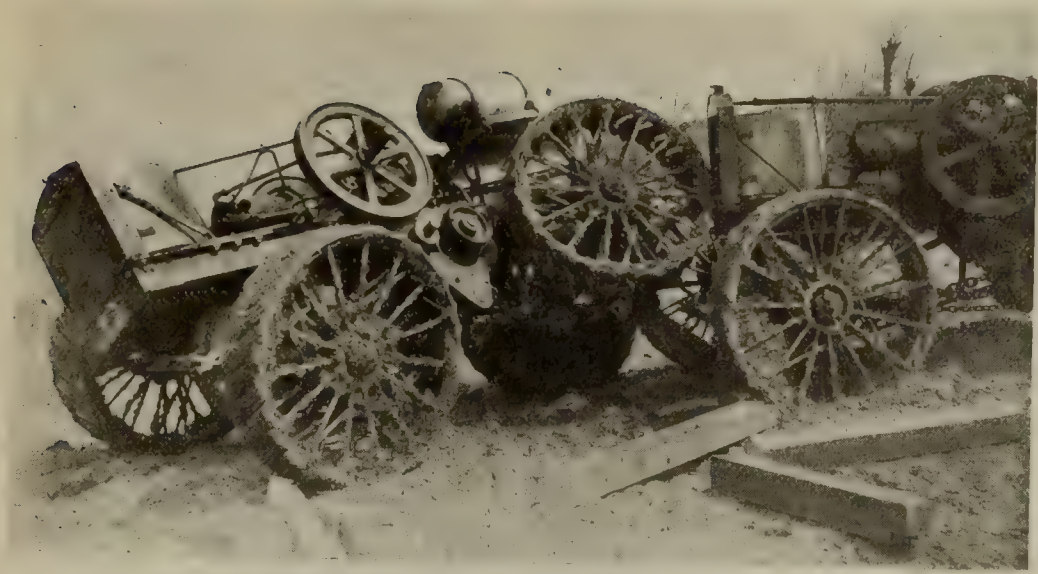
AN UNUSUAL ACCIDENT

By A. L. Loy.

THE plant manufacturing the four-wheel-drive tractor shown in the accompanying photo was located quite close to a medium-sized river, which was in the habit of overflowing its banks quite often, and when this occurred it was necessary to move everything possible to a safe distance. In one instance the river came up rather suddenly and it was necessary to run to a safe distance quite a number of these tractors.

The tractor at the right had been run safely up on the side of a small hill and left there, while the operator went for another. In backing up the second tractor, he either became confused, as might be expected in such a case, or else failed to see it entirely. In either case the tractor was coming at full speed, and when the rear driver struck the stationary tractor it simply climbed right up the front end, and when stopped the wheel and, consequently, the greater portion of the weight of that end, was hanging on a five-eighths inch nut on the front end of the frame.

When the collision occurred the operator had presence of mind enough to pull out the clutch before he was thrown off the outfit to the one side. The first tractor was uninjured in any way, although the lugs on the wheel were within a frac-



PECULIAR RESULT OF COLLISION BETWEEN TWO TRACTORS.

tion of an inch of the radiator. Practically the only damage done to the moving tractor was the breaking of a ball-and-socket joint over the front axle. The machines steered from both axles as well as having the power applied to all four wheels. The state of the ground through which the tractors had been moved may be judged from the condition of the wheels.

THE FIRST HEINE BOILER

AFTER a fire which destroyed the National Guard Armory in St. Louis, Mo., a few months ago, the Heine Safety Boiler Co., of that city, obtained possession of the first Heine boiler ever built, which was installed at the armory in 1881. It has 24 tubes about 10 ft. long; the heating surface is approximately 250 sq. ft., making the rating of the unit 25 h.p. The boiler was built in the shop of Richard Garstang, St. Louis. The original pressure for which it was designed was about 100 lbs. and an inspection certificate from the Fidelity & Casualty Co. has been received to the effect that they will certify this boiler to carry 80 lbs. pressure at the present time.

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GAS VERSUS STEAM POWER

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When the gas engineer has also turned his heat into work he will find that only about 20 per cent. of the heat in the coal has been turned into useful work. The comparison therefore is that a gas engineer producing power from coal will convert about 20 per cent. of the heat of the coal into useful work in a good gas engine, whereas a small steam engine will convert 7½ per cent. of the heat into useful work. Large modern steam turbines are now converting from 16 to 20 per cent. of the heat in the coal into useful work, and thus compare very favorably with gas engines. In addition, steam turbines have been built in single units up to 50,000 kilowatts, are cheaper in first cost and in cost of maintenance, being thus in general more suitable for central power plants.—J. W. Kershaw.

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When molten ferro-manganese is employed, little or no carbon will be separated out, and both the manganese carbides and the metallic manganese will be dissolved in the other metals forming the alloys, the influence exerted by the carbides being limited to the fact that their presence imparts a greater degree of hardness to the resulting metallic alloys than would be the case were manganese free from carbon employed.

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Press Work Operations in Hospital Equipment Production IV.

By D. A. Hampson

Operations possessing marked features of economy, adaptability and lack of intricacy in the finished product are characteristic of the work described. The factors of labor cost, quantity production, necessary degree of accuracy, and cost of dies are related to each other in a manner which must receive careful consideration if successful results are to be obtained.

An observer will have noticed that iron bedsteads are made with the rods that go to make up the ornamental heads and feet set in cast iron rings or blocks according to the particular design. These rods are laid in the moulds and the iron run around them securing all in one piece: the practice generally followed is to have a loop or hair pin turn of the rod come within the mould—in other words, where we see two rods entering the cast piece from different directions, it is in reality the same rod and the bend is concealed by the mass of cast iron. Such a construction is separable only by actual breakage.

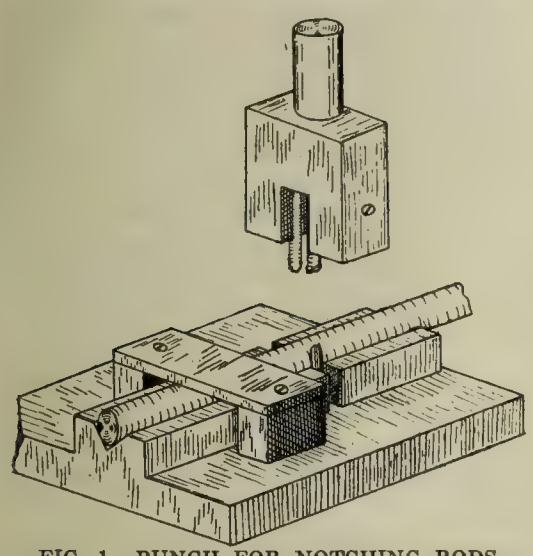

FIG. 1. PUNCH FOR NOTCHING RODS.

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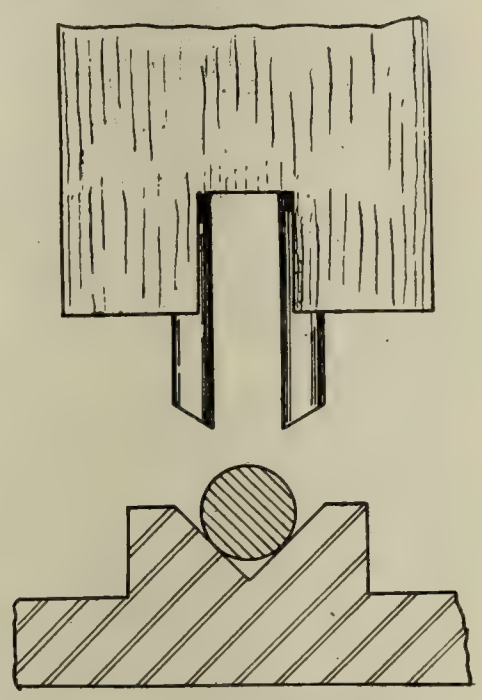


FIG. 2. END VIEW OF FIG. 1.

The notching scheme was an adaptation of one long in use for an entirely different purpose and is shown by the drawing Fig. 1. A punch with two cutting ends is employed and they take a piece from each side of the rod at the same time, the cut is perfectly balanced and there is no tendency to turn. It will be observed that the puches are well backed up—this makes breakage very little and consequently the upkeep is slight. The work, naturally, is done in the shortest space of time that any method could consume.

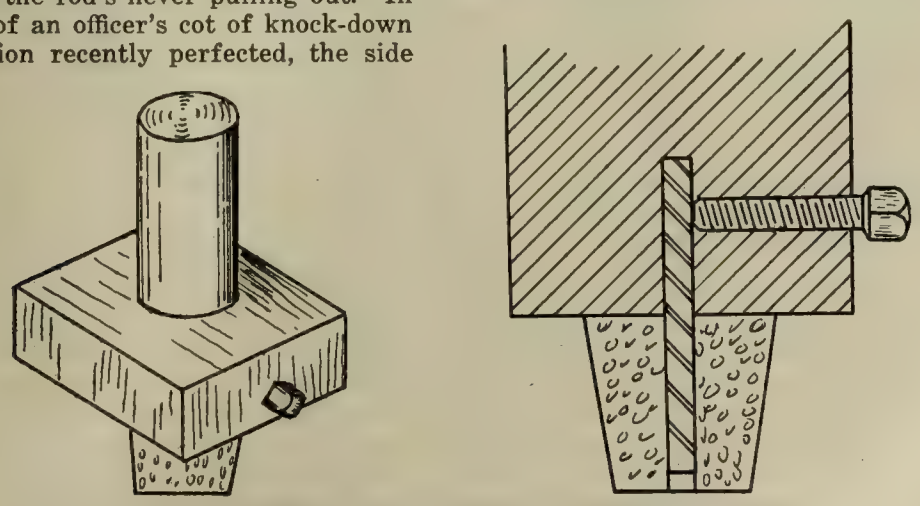


FIG. 3. PUNCH STRIPPER MADE FROM AN ORDINARY CORK.

There are very few punch and die jobs that do not require some sort of a stripper to pull the sheet or blank off the punch. In this shop the simplest stripper the writer has ever seen was employed. It was nothing but a cork slipped over the punch, as illustrated in Fig. 2, and it was used on all punches up to ⅜ in., punching holes in light sheet metal.

A form of clip used as a field assembly piece has already been illustrated with the tools for bending. Another one is shown in Fig. 3(C). This is made from the heaviest gauge of sheet tin and is designed to join several pieces when finally clinched over with a hammer. The size and shape of the piece are shown. A neater job would have been turned out if the piece had been blanked first and formed by a second operation or the work done on a double action press. But the only machine available was an old single action press and the work was not particular—not as particular as keeping the tool cost down. The sectional die and the punch are detailed in the drawings Fig. 4(A) and (B).

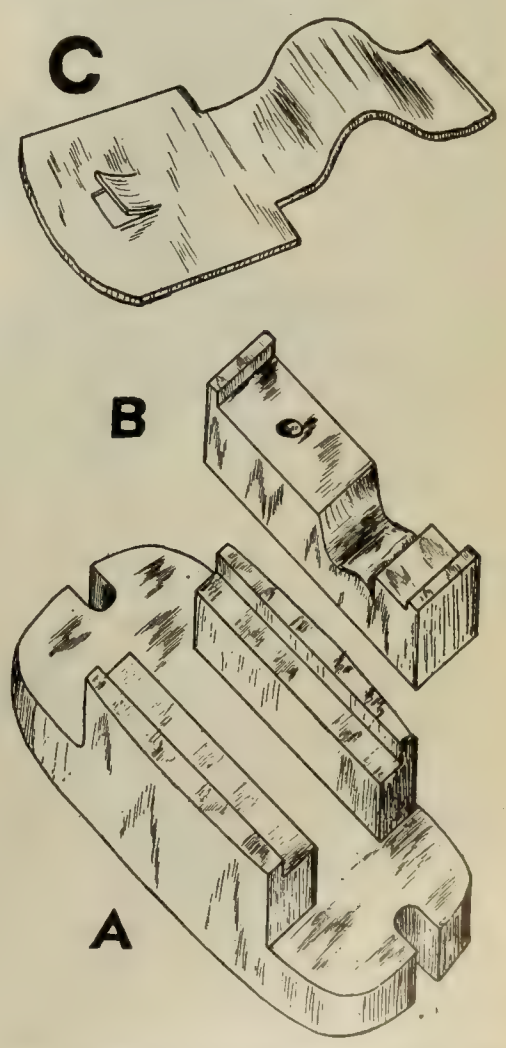
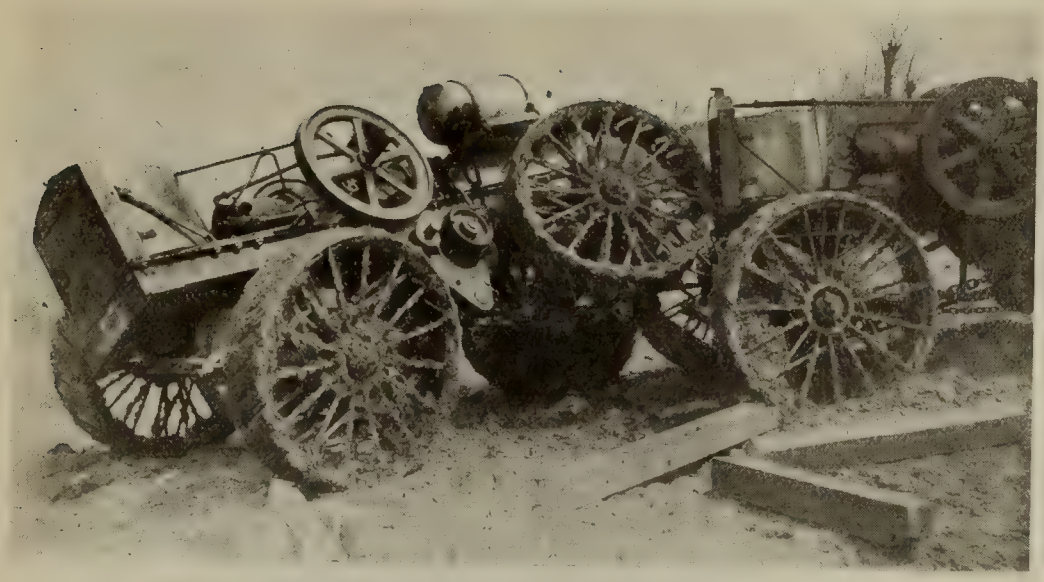


FIG. 4. DETAILS OF STAMPING AND DIE PARTS FOR SAME.

Sectional Die

As the stock was tin, the forming mem-



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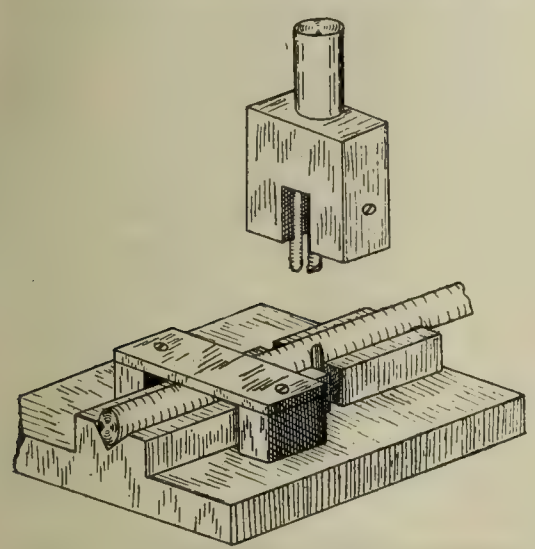

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Notching Rods

There are cases, however, where a rod ends with the mould and then it is customary to make some sort of a rough bend to insure the rod's never pulling out. In the case of an officer's cot of knock-down construction recently perfected, the side rails were dispensed with and in their place a sort of truss constructed of two ⅜ in. iron rods which in the setting up were drawn taut with a cast iron turn buckle, the other end of the rods being set in cast pieces. Of course, this put considerable strain on the rod end and instead of bending, the quicker expedient was adopted of cutting two notches across the rod.

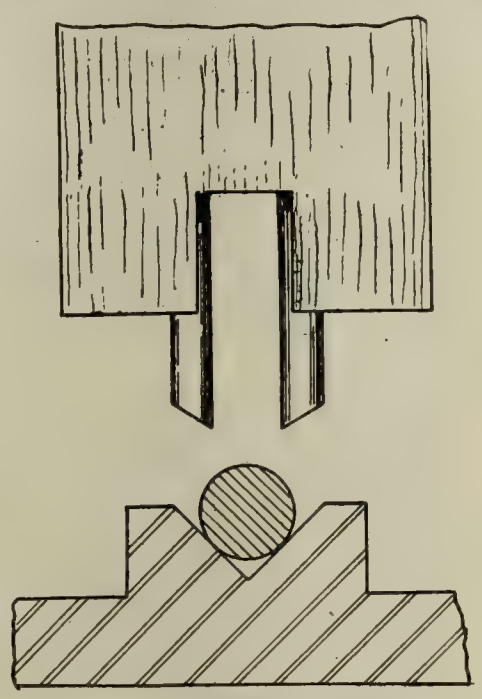


FIG. 2. END VIEW OF FIG. 1.

The notching scheme was an adaptation of one long in use for an entirely different purpose and is shown by the drawing Fig. 1. A punch with two cutting ends is employed and they take a piece from each side of the rod at the same time, the cut is perfectly balanced and there is no tendency to turn. It will be observed that the puches are well backed up—this makes breakage very little and consequently the upkeep is slight. The work, naturally, is done in the shortest space of time that any method could consume.

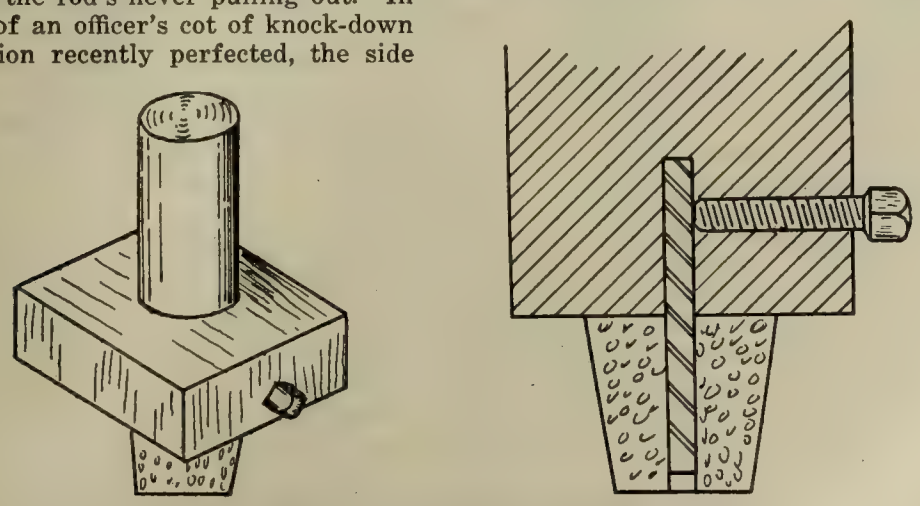


FIG. 3. PUNCH STRIPPER MADE FROM AN ORDINARY CORK.

There are very few punch and die jobs that do not require some sort of a stripper to pull the sheet or blank off the punch. In this shop the simplest stripper the writer has ever seen was employed. It was nothing but a cork slipped over the punch, as illustrated in Fig. 2, and it was used on all punches up to ⅜ in., punching holes in light sheet metal.

A form of clip used as a field assembly piece has already been illustrated with the tools for bending. Another one is shown in Fig. 3(C). This is made from the heaviest gauge of sheet tin and is designed to join several pieces when finally clinched over with a hammer. The size and shape of the piece are shown. A neater job would have been turned out if the piece had been blanked first and formed by a second operation or the work done on a double action press. But the only machine available was an old single action press and the work was not particular—not as particular as keeping the tool cost down. The sectional die and the punch are detailed in the drawings Fig. 4(A) and (B).

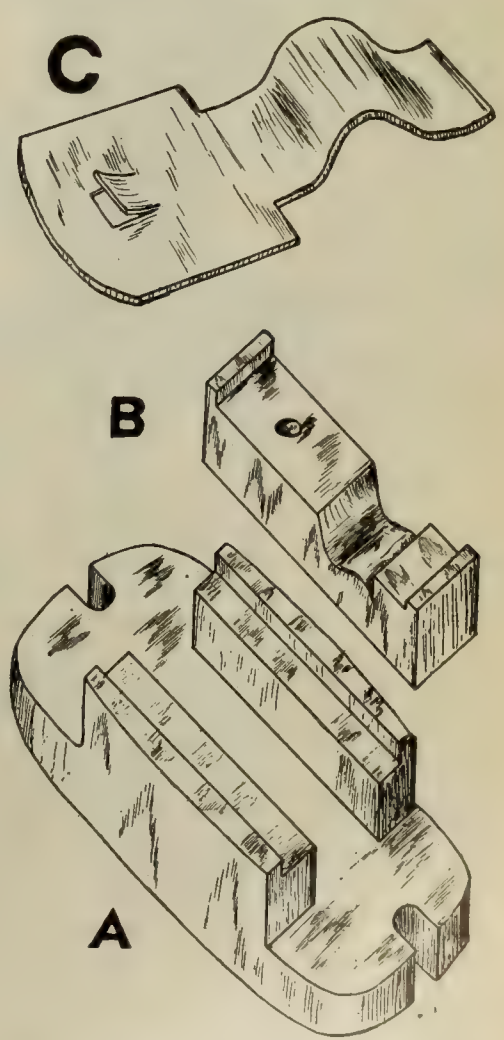


FIG. 4. DETAILS OF STAMPING AND DIE PARTS FOR SAME.

Sectional Die

As the stock was tin, the forming mem-

ber of the die was made of soft steel and left soft. The cutting part of the die was built up of tool steel strips as being cheaper than the cut-out form and having

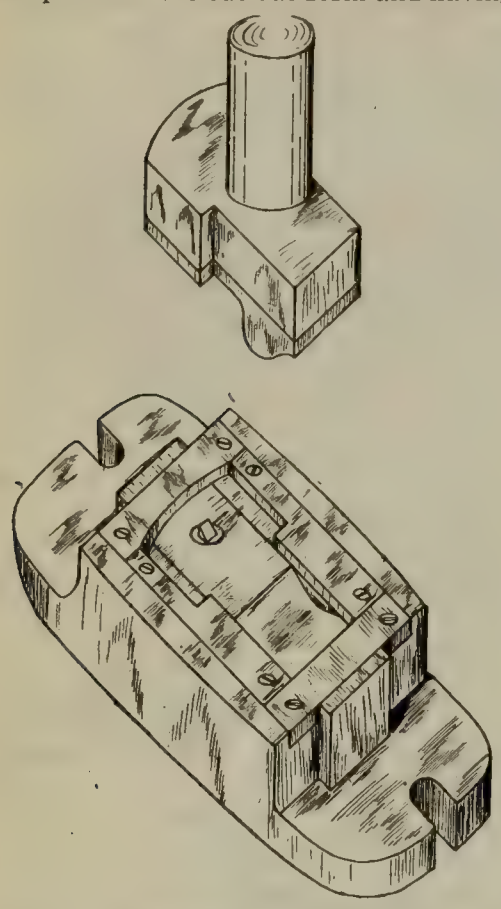


FIG. 5. ASSEMBLED DIE WITH FORMING PUNCH FOR 4C.

the advantage of a limited adjustment (punch and die were fitted closely for this thin stock and this was the only set in the plant so made). Inserted pieces formed the little tab near one end. The guides and stop are omitted for the sake of clearness. As one familiar with such work may imagine, there was a certain amount of pucker on the finished piece due to the forming commencing before the blank was cut free from the sheet, but on this job it was of no importance and the production and its cost were considered very satisfactory.

WELDING EQUIPMENT AT PANAMA

THE following description of welding plant and methods, published in a recent number of the *Canal Record,* indicates the completeness of detail with which this great undertaking is operated. It will be noted that oxy-acetylene, oxy-hydrogen, and electricity are all utilized.

The acetylene generating and compressing plant consists of two Navy-type acetylene generators, each having a capacity of 200 pounds of calcium carbide at a single filling and generating 200 cubic feet of acetylene gas per hour. This outfit includes a 100-cubic foot gasometer, a purifying and drying apparatus, Chatillon and Osgood weight scales, and an acetone charging apparatus, a gas meter, a 3-stage compressor, and a tank charging rack, with especially prepared cylinders to contain compressed acetylene gas.

The special acetylene cylinders are used for supplying gas for coast and range lights for the Marine Division, the Republic of Panama, Nicaragua, and Costa Rica. There also are acetylene gas cylinders used for welding and cutting purposes at Balboa, Cristobal, Paraiso, and other points along the Canal Zone. This plant supplies also gas for tanks for lighting purposes on automobiles and motorcycles.

There are about 18,000 pounds of residue per month which is a by-product in the manufacture of acetylene gas. It is turned over to the Balboa storehouse and is used for fertilizer and whitewashing purposes on the Canal Zone.

Acetylene gas manufactured in this plant during the year ending June 30, 1917, amounted to 606,649 cubic feet.

The oxygen and oxy-hydrogen generating and compressing plant consists of a 50-horsepower motor-generator set, a 30-horsepower motor-generator set, 45 electrolytic cells, two gas meters, a 100-cubic foot oxygen gasometer, a 100-cubic foot hydrogen gasometer, a gas testing apparatus, a gasoline apparatus, three retorts, three scrubbers, a water distilling outfit, hydrogen compressor, two oxygen compressors, with cylinders to contain compressed oxygen and compressed hydrogen.

Oxygen is the combustion agent used in oxy-acetylene and oxy-hydrogen welding and cutting. It is used also by the chemical laboratory and Ancon Hospital for medical purposes. It is manufactured in building No. 16, Balboa Shops, by two methods—the electrolysis of water process and the chemical process.

The electrolytic method of manufacturing oxygen and hydrogen is by decomposing water to which caustic soda has been added. The operation is carried out by means of electricity, the water being divided into its elements (H_2O) and the two gases collected separately and conveyed to gasometers. The electrolytic outfit is running 24 hours per day, producing about 4,000 cubic feet of oxygen and 8,000 cubic feet of hydrogen per day.

The chemical process of manufacturing oxygen is by mixing potassium chlorate with about one-eighth of its weight of manganese dioxide. This is put into air-tight retorts and heated by a gasoline apparatus until the oxygen is driven out and into the oxygen gasometer; the residue remaining in the retorts is taken out and shipped to the United States, where it is sold. If necessary 4,500 cubic feet of oxygen can be produced in 24 hours by the chemical process, but on account of its being much more expensive than the electrolytic process the chemical method is used only when enough oxygen can not be secured by the electrolytic method to carry on the work. Oxygen manufactured at this plant during the year ending June 30, 1917, amounted to 1,099,378 cubic feet.

The oxy-acetylene process is used in cutting and welding work in general, such as cutting steel and wrought iron plates, rivets, cutting out rivet holes, cutting ov lengths; to mitre or bevel any section of steamships, barges, dredges, dipper sticks, spuds, buckets, impellers, and iron and steel scrap; welding cast iron, steel, aluminum, brass, copper, and malleable iron, as in welding together broken ship machinery, foundry castings, cracked cylinders, propellers, dredge buckets, spuds, dippers, pipe, and shop machinery.

Oxy-hydrogen is also used at Balboa Shops for cutting, but not as extensively as the oxy-acetylene process. Oxygen removes carbon from gas engine cylinders in a few minutes and more effectively than any other method.

Electric arc welding outfits used by the Mechanical Division are portable machines, one being stationed at Balboa Shops and one at Christobal Shops. The equipment used for this line of work is especially suitable for marine and locomotive boiler work, heavy steel castings, plate work, patches, and heavy frame work.

In oxy-acetylene and electric welding, each has its special advantages and in cases in which either process can do the work the point of quality and economy decides the method. The great saving of time and labor is seen when it is stated that it would require 4 men with pneumatic air tools to cut off as many rivet heads on ships, dredge buckets, or spuds as one oxy-acetylene cutter could do in the same length of time. Broken parts may be welded together in a few hours that would require days to have made at a foundry or weeks if parts had to be ordered from the United States. Repairs can be made by the electric welding process on steamships and locomotive boilers in a day that would require five or six days by other methods.

AEROPLANE LIMITS

IT is a commonplace of bridge engineering that there is a fixed limit to the length of span possible with a given type, since the weight of the structure goes up rapidly as the span is increased, and at some limit of span becomes so large that the bridge would break down under its own deadweight acting alone, even without the added burden of the traffic to be accommodated. The limiting useful span is that at which the stresses due to the weight of the structure plus that of the traffic reach the safe limit, and an increase of span beyond this is impracticable without a change either in the type of bridge or in the materials with which it is made. The supporting surfaces of an aeroplane are subject to the same law—that their weight increases with increase of dimensions more rapidly than their strength does, and this would in itself suffice to fix a limit to the possible size of aeroplanes. Matters are, however, still worse when allowance is made for the fact that level flight is impossible without engine power, and hence, before the wings can carry any useful load whatever they must be able to support not only their own weight and that of their essential structural elements and connections, but also that of the engine. It is thus only the balance of sustentation left after deduction for these that is available for supporting the useful load, which will include the weight of the crew and of all other weights which are not in the shape of fixtures or engine supplies.—*Engineering.*

Principles and Methods of a New System of Gas Firing*

By A. C. Ionides

The researches of the author into combustion processes have yielded many valuable facts and the inception and development of the furnace described by him are particularly interesting. Not only the simplicity and ingenuity of the finished apparatus, but the economy of results obtained indicate the desirability of full development being accorded it.

THE author's method of heating with gaseous fuel dates from June, 1909, when he was carrying out an experiment preliminary to constructing a calorimeter for testing the calorific value of petrol air-gas. The experiment was to ascertain whether or not the flues could be downwardly displaced in a calorimeter, in order to avoid any possible loss of heat.

At that time silica glass was a new material, and it so happened that a little prior to this date this material was exhibited for the first time at the Royal Institution. A test tube, about ½ in. inside diameter and 6 in. long, and a piece of 1-16 in. bore silica glass tube about 8 in.

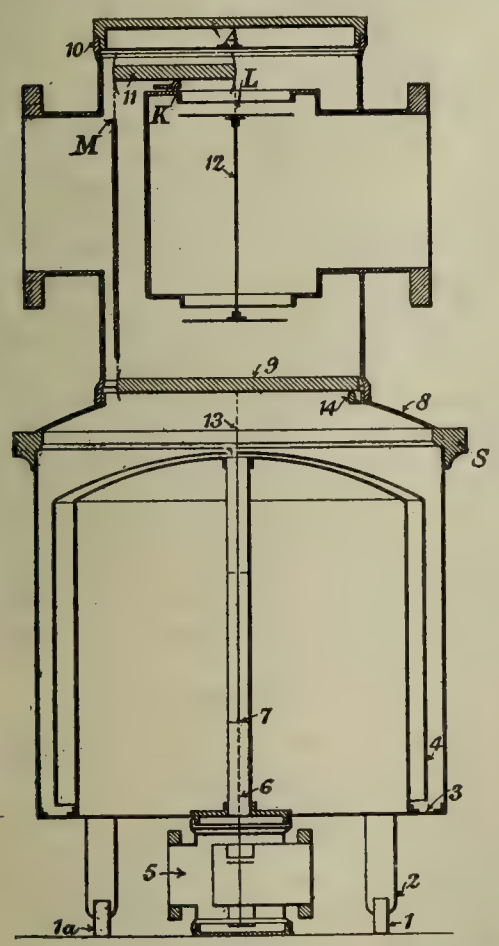


FIG. 1.—MIXING BALANCE. 1, 1a, levelling screws; 2, feet; 3, bell container; 4, sensitive bell; 5, gas-valve box; 6, gas connection to bell; 7, bell-rod guide; 8, cover to container; 9, main beam; 10, cover to air-valve box; 11, secondary beam; 12, double-beat air valve; 13, chain attachment to beam; 14, fulcrum for main beam.

long were acquired. Connecting one end of the silica-glass tube to the petrol air-gas by means of rubber tubing, the author ignited the mixture, and was astonished to find that it burnt, and continued to burn, in the upper end of the inverted test tube. Moreover, as the silica glass became hot, the flame either disappeared or became invisible, and the character of the combustion altered. The changed state of combustion continued indefinitely, and suggested that there should be no difficulty in transmitting the greater part of the heat units of the gas to the object to be heated. This experiment may be said to have established the fact that flues may with advantage be downwardly displaced.

The first problem that presented itself in applying this new principle was the difficulty of establishing and maintaining a constant mixture. There are three main variables to be dealt with as regards mixture: (1) The inlet pressure of the air; (2) the inlet pressure of the gas; (3) the variation in consumption of either air or gas that may occur in any given installation.

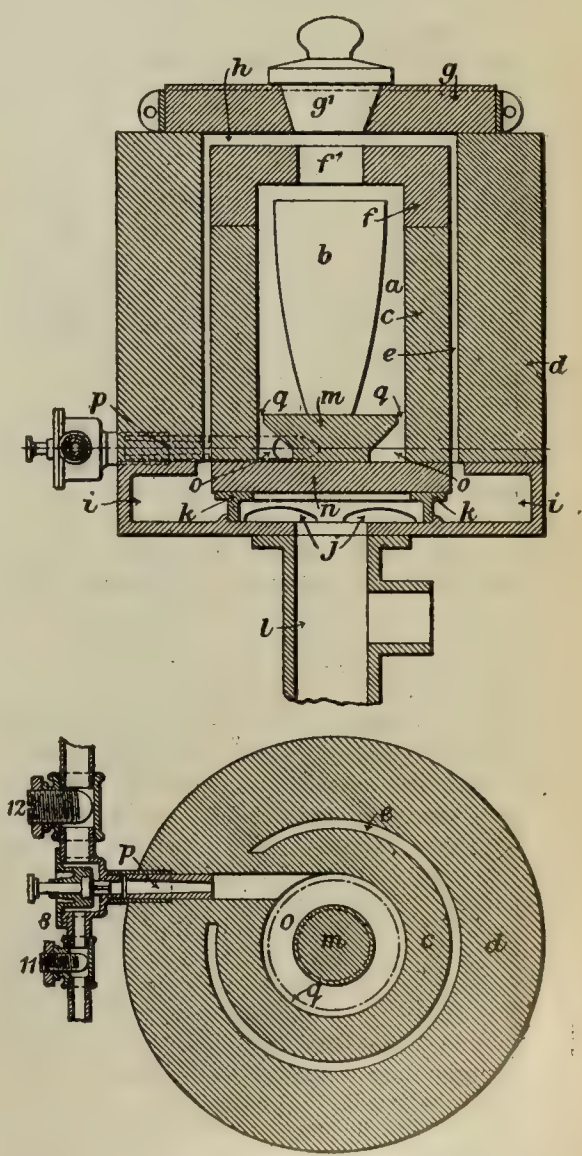
Control Device for Pressure

This first problem was most difficult of all to solve, since, for domestic purposes, etc., it was necessary to deal with differences of pressure sometimes involving a consumption of, say, 2.7 cub. ft. of gas per hour. Nevertheless, after a lapse of four years, this problem was solved by the construction of a device now known as a pressure balance.

It has been suggested that a better name would be a "mixing balance," and the author concurs in this view. This balance (Fig. 1) consists of a sensitive bell 4, with a requisite length of seal. The inside of this bell is subjected to the static pressure of the gas, and the outside to the static pressure of the air. It will be seen from the figure that when the static pressure of the gas increases, the arrangement is such that the flow of gas cuts itself off, and the flow of air is, to some extent increased; and likewise, when the static pressure of the air above increases it shuts itself off, and opens the gas correspondingly, and *vice versa* when the gas and air are decreased. And, it is to be observed, a similar cycle of operations takes place when the consumption of the one or the other is increased or decreased. Therefore, by such a device the pressures of gas and air are always held in a constant ratio, whatever be the variation of either the inlet pressure of gas or air, or the consumption.

If a mixture of gas and air be rich in gas, the flame is correspondingly lengthened. On the other hand, if the proportions approach 6 or 7 volumes of air to 1 of gas (according to the quality of the gas), it is quite possible, given silica or any other good catalyzer, to have no flame at all, but merely surface combustion. Now these conditions present great difficulties in heating with a neutral mixture —one which may be said to be neither oxidizing nor reducing—because of the tendency to local heating; and before this was finally and satisfactorily solved another three years had passed.

Should a good catalyzer be placed at right angles to a stream of well-proportioned mixture, a glowing disc will be observed. On the other hand, if all catalyzers in front of this stream are avoided, the combustion can be spread out to a very considerable length. The author has proved by experience that with a ¾-in.



FIGS. 2 AND 3.—CRUCIBLE FURNACE. A, furnace chamber for containing a crucible; b, crucible; c, inner walls; d, outer jacket; e, flue space in between outer and inner jacket; f, collar with central aperture f1; g, cover with movable plug g1, resting on outer jacket d; h, space between f and g forming a communication through the aperture f1, so that the combusting gases vent themselves downwards through the annular space e, and pass thence through the hollow platform i, by way of the aperture j in the central supporting ring k, to the downward discharge pipe l.

injector, or even with one of ½ in., it can be spread out to a length of 3 ft. of almost homogeneous combustion, by putting the injector into a channel of firebrick opened at the top, as in Fig. 2. In this way the heat units can be distributed in a furnace,

*Paper read before the Institute of Metals, London, September, 1917.

or boiler, or any other heating apparatus, in a very satisfactory manner.

Effect of Temperature Increase

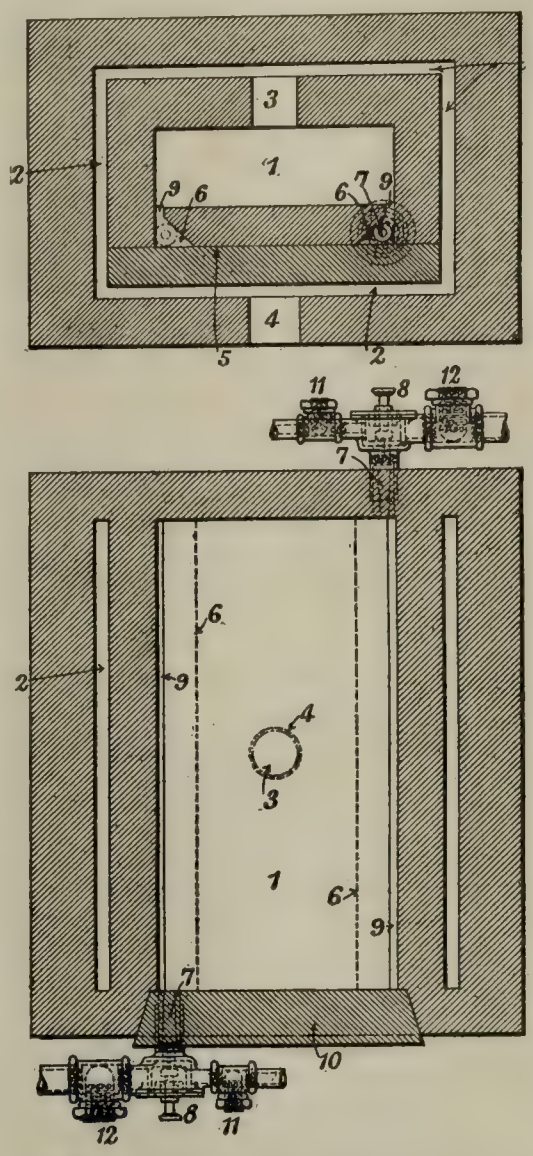
The third point in the system under description resulted from an observation that the hotter the furnace grew the less was the consumption of gas. By taking into consideration the expansion of gases by combustion, some light is thrown on this phenomenon. What happens if the mixture enter the furnace at, say, normal temperature, 15 deg. C.? Obviously, if it act as a perfect gas, it will have expanded 1,700 ÷ (273 + 15), or 5¾ times its initial volume.

If the waste gases, instead of passing into a chimney open at the top, are displaced downwardly through a contracted exit of predetermined cross-sectional area, this will cause a resistance to the flow of incoming gases and provide the elements of the most refined thermostat, without any working parts. In fact, by these means the temperature to be maintained can be predetermined with a pencil and a piece of paper.

The fourth problem was how to determine the mixture. After many trials it would seem that the simplest plan is to fit an ordinary gas cock with a piece of copper tubing bent with an easy bend and enlarged at the farther end, and screwed into the injector in such a manner that the enlarged opening at the end of the copper tubing faces the central axis of the delivery pipe, in this way avoiding stream lines. Now, if a piece of india-rubber tubing and an incandescent mantle be fed with this mixture, the light will indicate the character of the mixture. If the meshes of the mantle are visible, it means an oxidizing mixture. If, however, the mantle is at its most brilliant point, the mixture will be very near the neutral point. On the other hand, if any unburnt gas is seen to escape from the mantle in the shape of a blue flame, the mixture will be an excessively reducing one. There is a further variable to which reference has not yet been made, and that is the quality of the gas. This can be provided for by external distribution. Let it be assumed that there is a mixing balance on the air and gas mains entering into a factory, and that all the injectors in the factory are properly calibrated and set for their various functions—brass-melting, steel-heating, illuminating, etc. When an unwelcome change in the quality of the gas occurs it is immediately visible on one of the lights. A regulating cock on the air main (preferably a screw-down tap) will at once put this right, and the whole of the factory will be compensated for this change in the quality of the gas.

Advantages of Employing These Principles

From what has already been said, it will be readily seen that the conditions of conducting heat operations of many kinds on these principles are cleanly, and extremely economical in fuel. But the economy is not only in fuel, but also in forgings. There is specially notable the facility with which a reducing or an oxidizing flame can be established and maintained, thus ensuring a consequent absence of scaling. Manufacturers have informed the author that they often have to scrap as much as 90 per cent .of their steel forgings owing to scaling. The figures given by perhaps the largest users of furnaces for steel forging in Europe,



FIGS. 4 AND 5.—RECTANGULAR BARREL FURNACE. A heating chamber 1, having a door 10 at the front, is provided above and below, and, upon the greater portion of its sides, with jacketing flue spaces 2. The chamber 1 communicates by one or two central apertures 3 with the top flue space, and the heating elements passing through the said apertures pass downwards through the flues 2, and are finally discharged through the outlet pipe 4. In the bricks 5, forming the floor, there is provided along each of the two long sides a narrow combustion chamber 6, into which a nozzle 7 delivers mixture from a mixing device 8, provided with gas and air-adjusting means, 11 and 12. The long combustion chambers 6 each deliver the products of combustion by a long narrow slot 9 into the furnace chamber 1. The nozzle is positioned at one end of the long combustion chamber, so that the heating elements, due to their travel along the chamber and their upward motion to escape through the slot 9, enter the furnace chamber 1 with a diagonal movement parallel to the wall thereof. The gases passing along the wall will tend to turn at the angle when meeting the adjacent wall, and thus a whirling motion of the gases round the walls of the chamber will be created. If the nozzles for the two combustion chambers are arranged at opposite ends of the furnace, as shown, this whirling will be accentuated, the gases being gradually drawn inward across the roof of the furnace chamber on their way to escape at the outlet aperture 3.

after testing, for five months, a furnace for forging machine-gun barrels, were:—

Saving, 50 per cent. to 55 per cent.

Scaling, negligible.

Therefore, it is perhaps unnecessary to state that, even if there were no economy in fuel, there would still be a great saving with regard to steel forgings. A half-ton billet heating furnace has been made, and the figures given with respect thereto were—

Gas consumption, 1.3 cub. ft. per pound for full forging heat.

Scaling, negligible.

In Table I. is given a list of figures relating to 70:30 brass, melted in a 20-lb. crucible furnace. These figures speak for themselves, and show that in brass-melting an economy analogous to that afforded in steel forging can be effected. It might be added that Messrs. Vickers applied this system to a barrel-heating furnace 36 in. by 12 in. by 3 in. inside, which resulted in their coming to an agreement to establish this system throughout their works.

TABLE I.—GAS CONSUMED IN A 20-LB. CRUCIBLE FURNACE MELTING

70:30 BRASS.

lb. of 70:30 brass melted	From Cold C. Ft. Gas used	C. Ft. per lb.	Second Heat C. Ft. Gas used	C. Ft. per lb.	Third Heat C. Ft. Gas used	C. Ft. per lb.
12.56	42.0	3.36	...	...	...	...
15.0	51.0	3.4	...	...	...	...
16.0	52.0	3.25	...	...	...	...
20.0	66.0	3.3	...	...	...	...
16.0	60.0	3.75	...	...	...	...
19.0	55.5	2.89	...	...	...	...
20.0	55.0	2.75	...	...	...	...
19.75	...	...	40.0	2.1	...	...
14.0	...	...	...	...	27.0	1.92
20.0	58.0	2.9	...	...	...	...
20.0	53.0	2.65	...	...	...	...
20.0	...	...	36.0	1.8	...	...
14.0	...	...	...	...	...	2.08
20.0	56.0	2.8	...	...	...	...
20.0	...	...	41.8	2.09	...	...
19.5	77.5	3.98	...	...	...	...
20.50	...	2.83	19.25	2.0	18.50	1.86
20.0	...	...	28.5	1.4	...	...
20.0	56.0	2.8	...	...	...	...

As an indication of the correctness of the principles employed, the author would point out that a light worked by means of a pressure balance feeding a small incandescent mantle will produce 130 c.p. to 150 c.p., with a consumption of under 3 cub. ft. per hour of town gas of standard calorific value; whereas it can be stated, on the authority of Mr. J. G. Clark, that the highest candle-power light obtainable at this pressure by other systems averages 22 c.p. per cubic foot of gas consumed (variable, of course, owing to the atmospheric burner).

Economy Possibilities

To show the saving to the country that would be brought about by use of these devices, it may be recorded that:—

1. A 3-in. pressure balance saves 50,000 cub. ft. of gas, or 5 tons of coal per 10-hour day, compared with a Brown and Sharp furnace, which is considered by all small arms factories to be the best on the market.

2. One thousand of these devices, in the manufacture of which 240 tons of combined iron castings and steel sheeting would be required, would save in six months—*i.e.*, 180 ten-hour days—the gas distilled from 900,000 tons of coal.

3. Should the barbarous use of raw coal as fuel, which in itself is most wasteful, be discontinued, and this system be found to be equally economical with all forms of producer-gas as with town gas, then in this country alone, where 250,000,000 tons of coal are raised every year, these devices would save half this coal; or, in other words, they would double the industrial possibilities of England.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

RECLAIMING FUSE PARTS

By G. C. White

IN spite of the usual care and precautions taken in the manufacture of munitions, a certain proportion of defects are bound to occur. Often, in the case of fuse parts, the injury may be of such a minor nature as to allow it to be rectified at a profit. The following is an outline of some particular operations and tools which are commonly employed in reclaiming fuse parts.

Primarily when starting on work of this nature and when laying out the shop manufacturing tolerances, due thought should be given to the way in which the drawings are dimensioned and allowances made to permit of rectification. In manufacturing it is generally only possible to take metal off, or if one dimension is low the adjacent dimension must be made correspondingly low. Metal may of course be pressed to suit a small tolerance and the spot from which this metal is deflected may have sufficient tolerance to permit of this. It must also be determined how much labor can be placed upon a piece which is to be reclaimed and yet make a profit. In estimating, the difference between the value of the raw material and the scrap value of such must be considered.

There are many points about the fuse which are not vital and yet, in reclaiming, it is advisable to state to the inspection department what you purpose doing and what it will affect before you start. Many failures have resulted from and much money has been lost by lack of co-operation between the government representatives and the manufacturers.

Adaptability of Brass

The comparative ductibility of brass is a particularly useful feature in fuse manufacture and a few examples are given hereunder which will serve to illustrate the range of operations possible and their application to fuse rectification—their success being dependent on the facility with which brass may be bent, drawn, expanded and compressed.

Suppose the inside of bore is important and the outside measurement of the

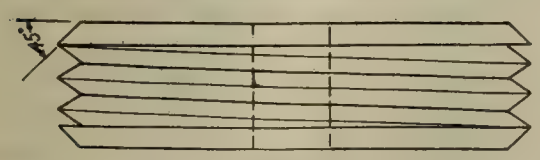


FIG. 1.

wall surrounding is of no consequence. Then a tool can be made which will turn the metal from the outside to the interior. If the outside is important, then the wall thickness will have to be increased by compression from the high length dimension to the low length dimension. Compression will distort the form so that after this is done it will be necessary to remachine, setting the tools to the correct limit by means of set blocks, which is the only way to set

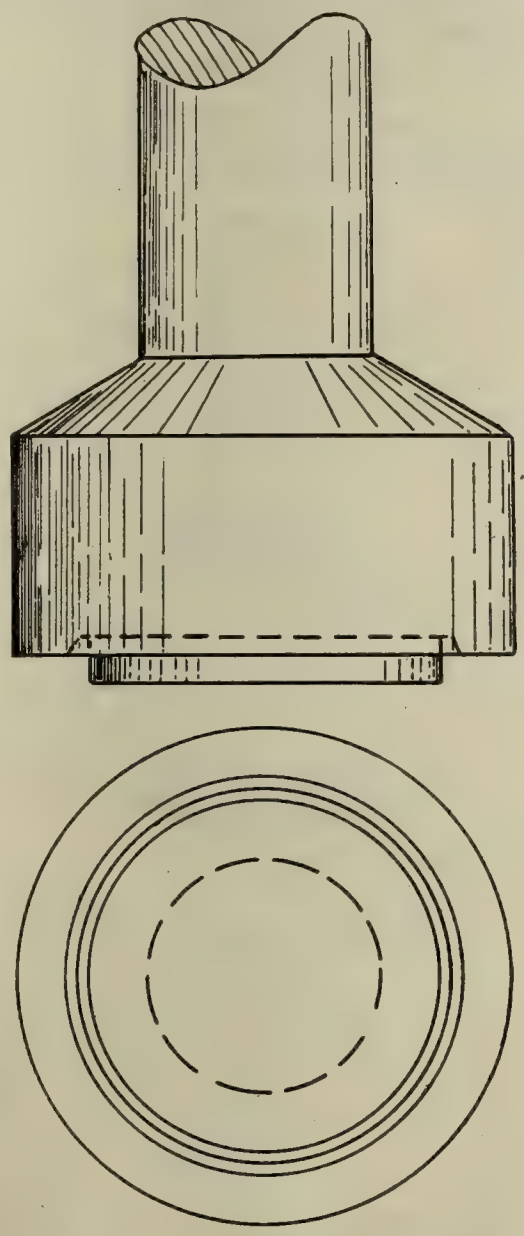


FIG. 2.

gang tools when some are set to the high gauge limits and some are set to the low gauge limits at the same operation.

Main threads are sometimes low, particularly when plain no-go ring gages are used, and when chaser thread millers are used there is a likelihood of a flat spot where the cutters start and finish. These low threads can be rolled up or the base of fuse can be compressed or hammered if there is enough metal there to permit of re-machining.

Regarding Rolling

Rolling is a relatively slow operation requiring some little time, depending on the ductility of the brass. About 10 minutes is sufficient for a relatively hard material and half this amount for soft material. The angle of the thread on the roll, as shown in Fig. 1, must be more acute than the angle of the thread to be rolled. The thread should be a sharp V and not have a flat top, as a flat head requires too much pressure and will not make a good smooth job. Coal oil should be used as a lubricant to prevent discoloration, which will occur if ordinary lubricating oil is used. After hardening, the roll should be polished with emery on a circular brush to remove the oil and any roughness.

The speed of roll should be so regulated and the diameter such that there will be a minimum of slippage, which cuts away the brass. The roll should revolve of itself freely through contact with the work. Generally the diameter of the roll blank should equal the pitch diameter of the threads on the work. Two and one-half threads to the roll is about all that can be used, as considerable pressure is required, and an ordinary man cannot exert any more pressure with a lever feed than a roll of this size requires. On automatic screw machine work one thread to the roll is the most satisfactory, but for reclaiming work 2½ threads have been found to give the best results. The last thread of the roll tends to break off if there is no provision made for support, and an angle of about 45 degrees is sat-

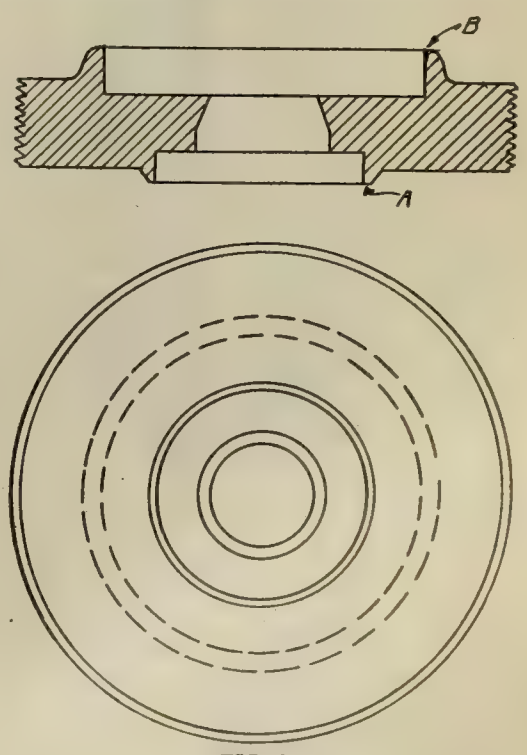


FIG. 3.

isfactory. Nickel steel containing 3% nickel and .12% carbon should be used, but good results have been gotten with Paragon steel. For a right hand thread the rolls should be cut left hand, that is, the thread on the roll should be the opposite hand to the thread on the work.

Another form of rolling or burnishing tool is shown in Fig. 2. It has been used successfully on the fine lip A shown in Fig 3 as a sample of work which required reclaiming and which easily be-

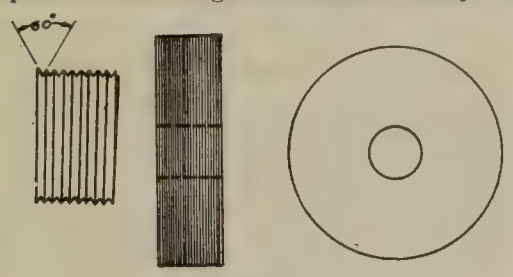


FIG. 4.

came dented when handled carelessly. The freer the material is from oxide and dross, the easier can the operation be performed. A light lubricating oil is put on with a brush and pressure lightly applied while the tool is revolving in a drill press at about 1,800 r.p.m. Care must be taken to see that the tool is very smooth or the lip will be torn.

Still another form of rolling tool is shown in Fig. 4. This tool makes a series of grooves in the metal and forces it between the grooves of roll which are only concentric and not helical as in a roll revolves by contact with the work. The roll is not allowed to break contact after the cutting operation has commenced, because it was found that by so doing the metal would be torn and

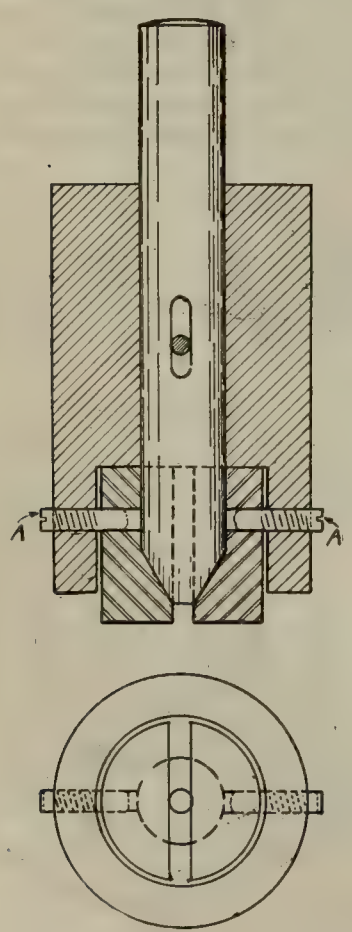


FIG. 5.

cut, as there is a small amount of creep or angularity to the roll due to the slack in the machine or tool holder. Coal oil or kerosene is used as a lubricant. After the part has been serrated, the tops of the serrations are bent over, making a smooth appearance except for evenly spaced light concentric lines, making the part appear as though it were made of discs. The tool which bends over the tops of the serrations is only moved in the one direction, the pressure being relieved before moving the cross slides of the lathe for another bending or burnishing operation. The burnishing tool is an ordinary piece of tool steel rounded on the deep side and the corner left stoned off, so that it will not cut. It is possible to put on .004 inches in this manner if the material is soft brass. An operation of this nature has been performed on steel with satisfactory results, but the roll was made with a inch is satisfactory.

An expansion tool (Fig. 5), which is used for expanding the rib B (Fig. 3), is shown with leaves which will not loose

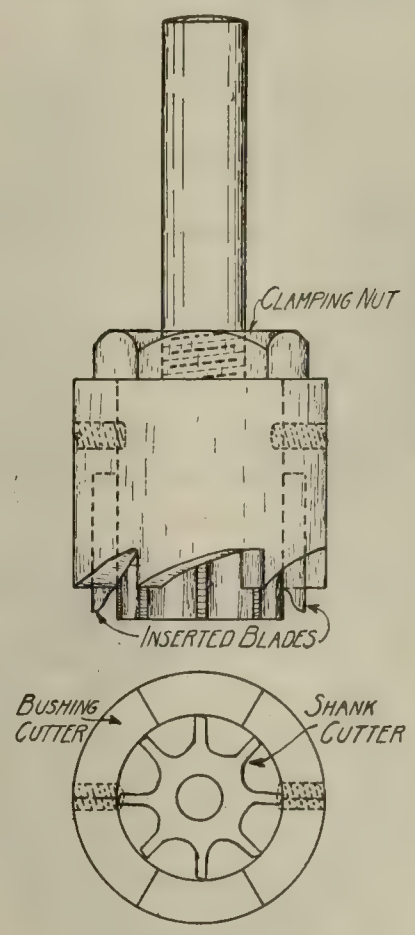


FIG. 6.

their spring, become distorted or break. These leaves are held in place by pins shown at A. After expanding with this little tool the shape may not be satisfactory, and it is necessary to go over the form with a form cutter (Fig. 6) which eliminates any possibility of a mistake.

Another form of expansion tool for bending out the dents in the rims of bodies is shown in Fig. 7. This tool is operated by hand and a girl can repair 2,500 dents in 10 hours. The small gib which does the work is operated by a handle which has an eccentric on the end. Very heavy dents are roughly straightened as much as possible and they are further shaped with a hammer, a flat piece of steel being wedged in behind the rim to form the brass to, and to act as backing. If the dent should be so heavy as to damage the graduations, the body must be filed after hammering and then engraved. So numerous are these defects in a production of, say, 15,000 in 9 hours that one operator could be kept busy all the time on this work. The engraving tool was made from a piece of three-cornered steel and a production of from 500 to 1,000 was ob-

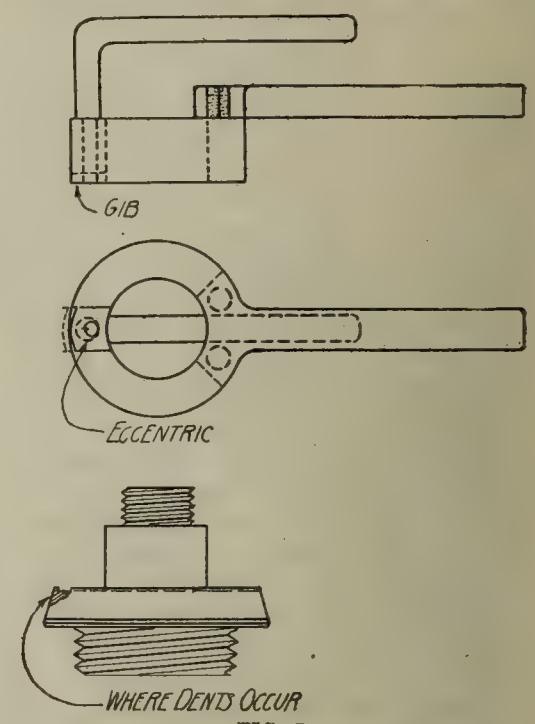


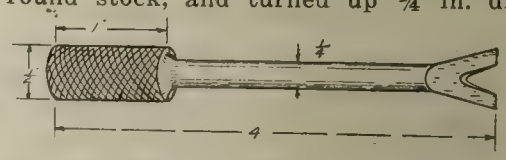
FIG. 7.

tained, depending on the fact that the repairs may be heavy or light, for the whole day.

A THUMB-TACK LIFTER

By E. Bailey

TO prevent thumb-tacks from obstructing the tee-square, it is necessary that the heads be perfectly flat on the drawing-board. The pressure of the thumb is not always sufficient to force these down deep enough, and they then require to be hammered down. In the accompanying sketch is shown a simple tool, used both for pounding down and lifting out the tacks. It is made from ½ in. round stock, and turned up ¼ in. dia.



within one inch of the end. The small end is then flattened out for a claw. The hammer end is knurled as shown.

CAUSES OF SHORT FEEDING ON AUTOMATIC SCREW MACHINES

By D. A. Hampson

ONE of the most vexatious things an automatic screw machine operator has to contend with is "short feeding" or not feeding at all. The operator of limited experience who has to rely on his own resources is often very much puzzled as to why the bar does not move out on certain occasions while it does at others with the conditions apparently the same. There is a strong temptation to resort to springs and expedients of the contraption sort to overcome the feeding

troubles when the real source of trouble is not evident after a careful study, but it must always be borne in mind that the machine has worked all right and will continue to do so when some little overlooked point is discovered and the hitch removed. Feeding troubles may be divided into three divisions, those arising from the chuck mechanism, from the feed tube mechanism, and from the stock and rack.

Chuck Troubles

The collet does not have spring enough —it is either too light or has not been spread open enough when hardened to make it force itself back and (in the push type) with it the push tube.

The nose piece may have become roughened on the inside and thus prevent the collet from opening.

The nose piece may be just a little soft which is a cause of the collet dragging in opening.

The collet push, or closing, tube may be stuck or gummed up, thus offering too much resistance to the spring of the collet.

Collet rough on the outside causing it to stick in the nose piece.

Collet soft on the tapered or front end causing sticking.

Collet rough on the inside, rough enough to retard the forward movement of the stock.

Collet may be hard outside but soft on its gripping surface and become burred up, thus retarding the stock.

Construction of chuck is such that the collet cannot open wide enough to take care of the variation in size of the rough stock being run.

Dirt between collet and nose piece preventing free movement.

Feed Tube Troubles

Grip of feed finger too light to overcome frictional resistances of the bar: either the finger has not been hardened with the jaws closed or the split is not wide enough to let them close.

Feed finger may have come unscrewed from the feed tube.

Draw back cam may be set to feed just the length of the piece to be made and no allowance made for the inevitable losses.

Feed tube may stick through being bent, and has shifted the cam.

Feed tube and bar in it stops revolving —it is sometimes found advisable to provide means of positive rotation.

Feed tube soft and wear has lessened its grip.

Stock Troubles

Bar may nearly fill the tube of the stock rack and the latter not being quite straight, the bar sticks allowing the feed finger to slide right over it without feeding full amount.

Bends in the bar of stock—no machine will feed satisfactorily on stock that has crooks in it.

Bar is too big and collet is not quite free of it when opened.

Bar is so rough, scaly, or bruised that it sticks at certain spots.

If a careful examination is made with a view of eliminating all the troubles above or any one of them which may exist undiscovered, it is a practical certainty that no feeding troubles will then bother. Whether the work is run wet or dry, it is a good plan to put slips of rubber between the jaws of the collet to keep out the chips and coolant which sooner or later find their way inside the chuck and necessitate cleaning out to insure proper feeding. The rubber also adds spring to the collet.

PATTERN-MAKING NOTES

By J. W. Broadbent.

FOR turning work between centres the spur and cup centres, Figs. 24 and 25, are the best to use. The ordinary 60° centres are sometimes used, but unless large heavy patterns are being turned, and a centre plate is put on each end of the job, these centres are better left on the metal turner's lathe. When used on split patterns, the 60° centre has a tendency to force the joint apart.

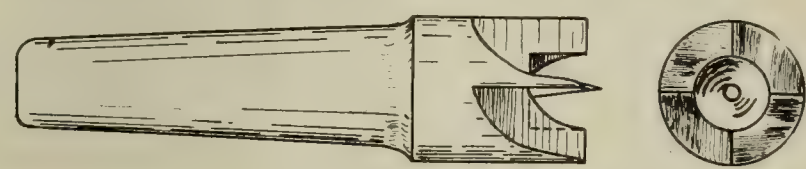


FIG. 24.

Lathe Centres

The spur centre, Fig. 24, is the driving centre. It has a central point and four spurs. By making one spur narrower than the remainder, work which has to be taken out of the lathe can be put back again so that it will run true and occupy its former position.

The cup centre, Fig. 25, is the dead centre, having a central point surrounded by a wedge-shaped ring with a sharp edge. The cup centre should be provided with an oil hole as shown, and when the centre is put in the lathe this hole should always be at the top.

FIG. 25.

A very effective method of lubricating the tail centre is to fill the inside of the cup with grease before placing the work between centres; grease being thicker than oil, does not soak into the wood so readily.

The central points may either be turned out of the solid metal or inserted separately into a hole bored in the centre, the latter method being preferable, for when the points become worn or battered they are easily renewed. The only reason for these centre points is to locate the centre of the piece to be turned; they do not in any way support or drive the work, being too light for this purpose.

Keep Centres Sharp

When turning patterns in halves it is necessary that the exact centre be located, and this cannot be done with a blunt centre. A sufficient angle is 20°, and the point should project beyond the end of the spurs and in the cup centre beyond the ring.

The ring of the cup centre should be bevelled on the inside, as shown in Fig. 25, not on the outside, as is often found to be the case. It can easily be seen that when work is being turned in halves the inside bevel will have a tendency to clamp the pieces tighter together. When the bevel is on the outside of the ring the tendency is to force the two halves apart.

Fig. 26 shows a driving centre, having a centre point and two wings, one wing being curved, so that work may be replaced in the lathe to occupy its former position.

This centre is useful for turning solid work, but for split patterns the spur centre, Fig. 24, is to be preferred.

Patterns in Halves

When turning patterns in halves, the two halves must be secured firmly so that there is no danger of their coming apart in the lathe.

It is often necessary during the process of turning to take the pattern apart, and in such cases the best method is to leave the stock longer at each end and secure the two halves with wood screws placed in this waste wood. Long slender work will require screws to be placed at intermediate points between the two ends; they should be well countersunk below the surface, so that the turning tools will not strike them.

Another method is to leave the stock longer than required for the pattern and glue the ends for a distance of about ½ in., allowing the glue to set hard before turning.

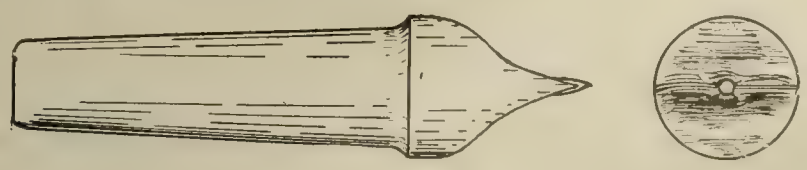


FIG. 26.

The glue will form a hard joint at each end, and great care must be taken when centreing the work so that the centre will not run into the softer wood.

Centreing the Work

A fine centre punch is the best tool to use for centreing work. Pounding the lathe centres into the ends of a job is destructive as far as the lathe centres are concerned, and unnecessary as a means of forcing the spurs of the centre into the wood. Advancing the tail screw when the work is placed between the

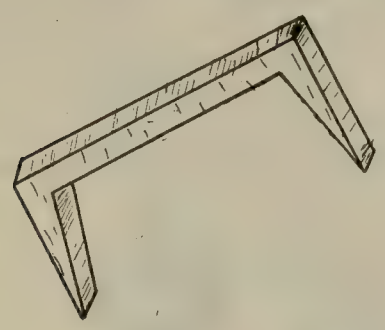


FIG. 27.

centre points gives sufficient pressure to force the spurs into the wood.

Fig. 27 shows the pinch dog which is often used for clamping the two halves of a pattern together while being turned. The corrugated pieces of steel, Fig. 28,

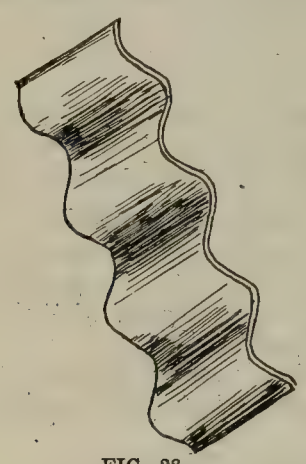


FIG. 28.

used by box manufacturers, are the handiest devices for holding small split patterns. They are driven at right angles into the end grain of the wood. Fig. 29 illustrates the method of using the pinch dog and corrugated clamps.

Driving Centre

When turning large work in halves the spurs of the centre, Fig. 24, would not have sufficient bearing to drive the job; the cutting tools employed would just prevent the wood from revolving and the centre would cut a groove in the end of the job.

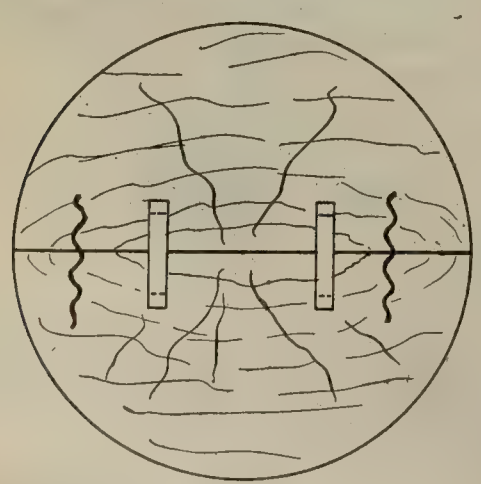


FIG. 29.

Fig. 30 shows a device made of iron to be used with the 60° centres. There is a centre line A B scratched across the face and a small hole is drilled at C.

On the driving end is a projection D shown by the broken line, which engages with a slot cut into the face plate.

For the tailstock end a hardwood plate is preferable to an iron one, lignum vitæ being the best wood to use, as it is hard and has an oily surface, thus making it run freely on the tail centre.

When hard wood is used for the tail end, either the 60° centre or the cup centre, Fig. 25, may be used.

There are many devices which will suggest themselves to the practical mind, both for saving time and doing better work in the lathe; some of these will be described as occasion demands when dealing with the construction of different patterns.

NAILS IN MOULDS

WHERE there is danger of angles washing away with the flow of the molten metal, it is a good plan to put in a few thin wire nails to reinforce the sand, nails which have fairly large heads being chosen. The heads of the nails should be slightly rusted by dipping into a not too strong solution of sal-ammoniac and water, and after drying they should be coated with a mixture of equal parts of clay and plumbago reduced to a paint with water. By pressing the heads well into the mould where they are likely to touch the metal, and dressing that part of the mould with plumbago, and sleeking down smoothly, chilled spots will be avoided in the casting. In no case, however, may rusty nails come into contact with the molten metal, or a faulty casting will result.

WEIGHING ZINC COATS

IN determining the actual weight of deposit of various zinc finishes the procedure will vary somewhat. The simplest way for hot dipped and sherardized parts is to strip them in strong hot caustic soda or potash, taking the weight before and after stripping. The area of the bare portion should be calculated and by dividing the loss in weight by the area in square inches the result is

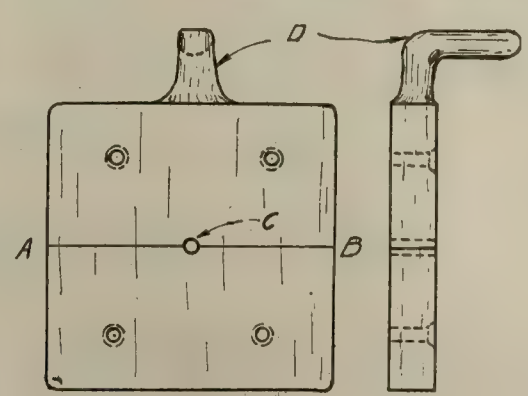


FIG. 30.

expressed in milligrams per square inch. If for any reason it is not possible or desired to strip the entire part, one or more small pieces may be sawed out and tested, says Metal Industry.

When examining electro-galvanized parts it will probably be advisable to determine the deposit on various surfaces. This may be done either by sawing out small pieces, as in the case of hot dipped or sherardized parts, or by coating the entire surface with wax, removing this at any desired place and taking the zinc off with dilute hydrochloric acid. Copper plating the part previously to applying the zinc will aid in telling when all of the latter is removed. It must be remembered that beeswax is very easily saponified by caustic alkalis; therefore, it is not possible to employ such agents in place of acid when stripping certain areas, the rest of the part being covered with wax.

After the zinc is in solution it may be determined either by the ferrocyanide or electrolytic methods, given above. In any case the solution will contain more or less iron, which must be taken out. To do this add a few drops of strong nitric acid and boil for several minutes. Now add a gram or two of ammonium chloride, sal ammoniac, and an excess of ammonia water, which will bring the iron down as a voluminous red precipitate. Heat the solution a few minutes, let settle and then filter, washing the tion containing 10g. ammonium chloride and 5 c.c. ammonia per 100 c.c. of water.

The filtrate, the liquid which runs through the filter, should now be evaporated to hard dryness over a hot plate, the residue moistened with strong hydrochloric acid and evaporated again. This should be repeated, then, if the ferrocyanide method is to be employed, two or three cubic centimeters of the acid and about 75 c.c. of hot water added and boiled if necessary to take everything in solution. It may now be neutralized with ammonia, then acidify slightly with hydrochloric acid and add three cubic centimeters excess, after which it is ready to be diluted, heated and titrated as before.

If it is desired to use the electrolytic method, the procedure is the same up to the point of addition of acid after evaporation to dryness. In this case strong sulphuric acid should be added instead and the whole carefully heated until dense, white fumes are given off.

Allow to cool, then add a few drops of the acid and about 75 c.c. of water and boil. Let cool, neutralize carefully with sodium carbonate and proceed with the analysis as given above.

BROWNS are produced in different shades on copper depending upon the length of time the work is immersed. Excellent results are obtained by using ¼ ounce of potassium or sodium sulphide mixed with 1 gallon of clean water. After immersing, the work should be dipped in a solution of nitric acid in order to set the color.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

ELLIPTICAL LATHE WORK

By R. Hamilton.

THE general practice of irregular turning is not very frequently met with in the work of the average machine shop. Work of such a character invariably necessitates the adoption of specially designed machines or attachments to accomplish the desired purpose. The duties of a lathe, even those of the most modern type, are usually supposed to be the performing of such jobs that require turning or boring—in whole or in part—to an accurate cylindrical form; or for work of irregular shapes but with the various sections concentric with the central axis. Where the machine surfaces are not generated from a common center in the turning of ovals, ellipses, or various shaped cams, the use of a special device or attachment is necessary. Master forms or cams are the means generally adopted in the making of odd-shaped pieces; but broadly speaking, each specific shape requires a master cam of suitable form and dimensions from which the work is developed.

A job closely allied to cylindrical work done by lathes is the production of oval shaped pieces, such as elliptical dies for various sheet metal purposes. In the ordinary eccentric the characteristic features are the two separate cylindrical portions, each having its own distinct center or axis. In the development of the ellipse the peculiarity rests in the fact that the perimeter is derived from what might be termed the continual changing of the location of the two centers from which the outline is developed. In a true ellipse the diametrically opposite radii which pass through the intersection of the major and minor axis are always of equal length. An ellipse is derived from the cross section of a cylinder cut at an angle—other than a right angle—with the axis of the cylinder; or the mechanical projection of a circle tilted at an angle to the plane of projection. The dimensions of an ellipse are governed by the angle of inclination with the plane of vision.

Graphic Generation

Fig. 1 illustrates a common method of generating an ellipse by the graphical process; the accuracy of which depends upon the number of divisional points on the generating circles, and upon the skill of the operator in tracing the irregular curve. There are several geometrical methods of constructing a true elliptical outline, and still others that are more speedy, but not quite so accurate. The principle here shown is the development of the curve through vertical and horizontal intersections drawn from the equidistant divisional points on the generating circles; these circles being struck with radii equal to one half the length of the major and minor axis respectively. As a lathe spindle revolves at a uniform speed about its own axis it is obvious that a reciprocating movement must be given to the tool or to the work, in order that shapes—other than circles—can be turned. It will be seen by reference to Fig. 1 that each angular division having X as a center will be traversed in the same period of time, but the radial distance of the desired outline will require to be constantly varied to develop the curve.

Turning Device

A device that has been used for a number of years in a large sheet metal working plant in Central Ontario, for the production of elliptical dies for tin can the device, the lathe chuck or face plate is removed from the nose of the spindle and the piece A screwed on; the outed on; the outer portion of this piece has a length equal to about 2½ times its width, and is dovetailed on its length to fit the outer piece B, the nose of which is fitted with a thread-making, is illustrated in Fig. 2. This attachment can be designed for any make of lathe, but must be constructed to suit the dimensions of the machine upon which it is to be used, as the centre height is an important factor in its successful operation. To apply ed portion to carry the chuck or face plate of the lathe. The main support D that provides adjustment for the variable diameters of the work is firmly secured to the shears of the lathe so that the slide on the extending arms is in a central horizontal position. The piece E, that governs the dimensions of the ellipse, is adjustable in a horizontal direction, the center having no vertical movement. The bore of the bronze bush F is a neat revolving fit on the projection of the piece E, but the outer edges of the bush are in the form of an oblong, the longer side fitting into the slide on the back of the outer slide B. A gib G is fitted to either side and is accurately adjusted for friction and position by means of the set screws H. A gib I is also provided for similar adjustment on the sliding portion of A and B.

The operation of the device is as follows:—After the face plate has been removed from the nose of the spindle, the attachment is placed on the ways of the lathe and the piece A screwed firmly to position—when doing this it is best to have the parts D and E located centrally, as the movement of the slides has no appreciable reciprocating travel. When the piece A is in position on the spindle nose, the support D is secured to the shears of the lathe, care being taken that the projection of the piece E bears against the back of the piece A, but not too tightly to interfere with the free movement of the device. The piece E is then moved forward to a position off center equal to one half the difference between the major

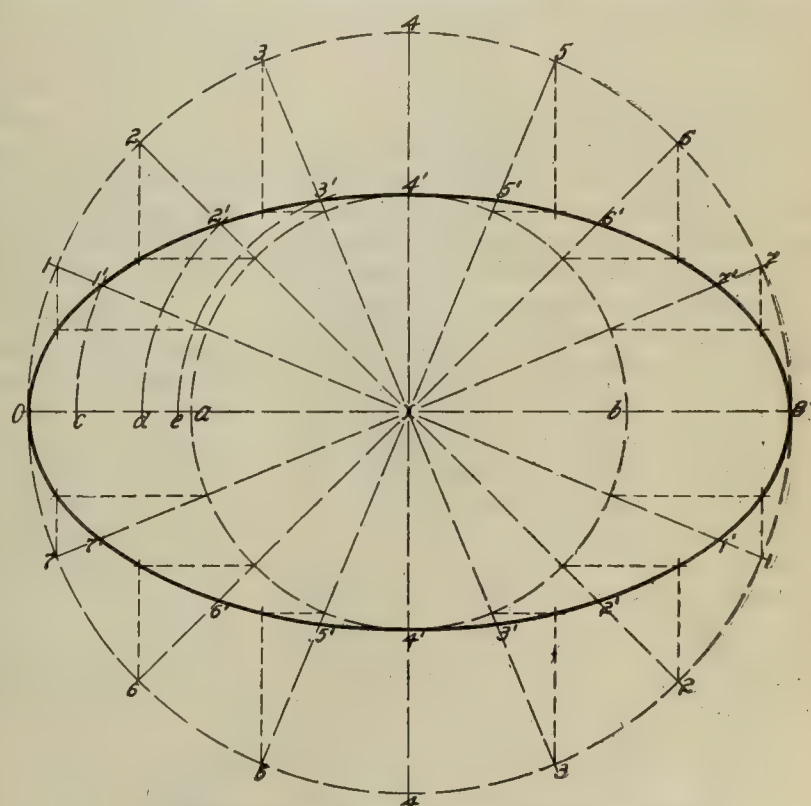


FIG. 1. GRAPHIC METHOD OF GENERATING ELLIPSE.

and minor axis of the ellipse to be turned; this distance being represented by the line O-A in Fig. 1. The face plate that is to carry the work is then screwed to position on the front of the piece B. When fitting the face plate it is advisable to have the slots come in a position corresponding to the action of the respective slides as it makes it more convenient when clamping on the work. With the work in position and the lathe started, the movement of the spindle is transmitted to the work, but in addition to the latter having a circular motion it also has a reciprocating motion in a horizontal direction. By a study of Fig. 2 it will be seen that the piece A will revolve B, the latter in turn sliding along A and also at right angles to A along the parallel portion of the bush F, so that when the device has turned through

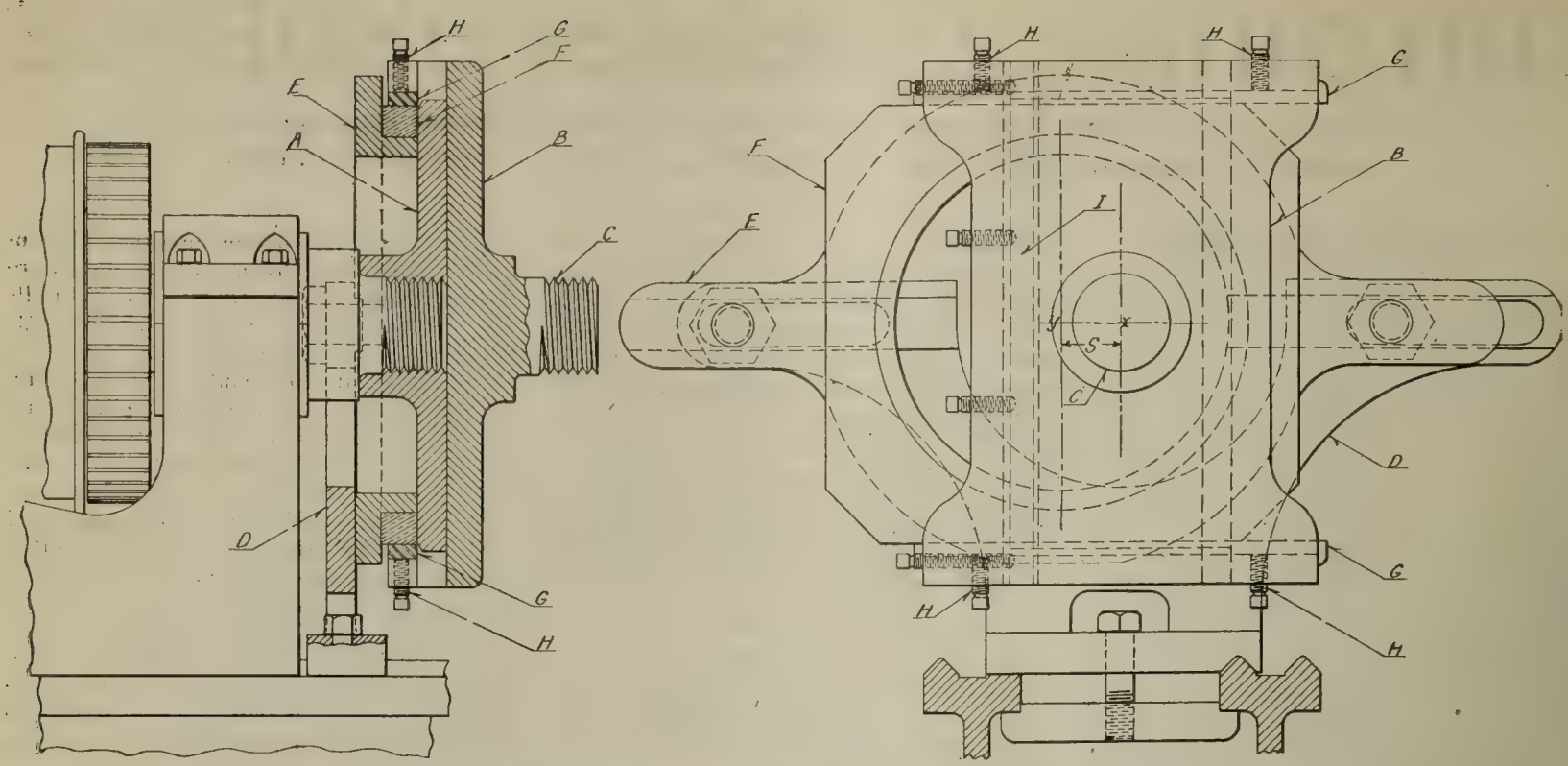


FIG. 2. DEVICE FITTED TO LATHE FOR TURNING ELLIPTIC FORMS.

an angle of 90 deg., the center X will be at the point Y in the same horizontal line. The triple motion, that of revolving and sliding in the two directions causes the cutting tool to trace the irregular curve 0-1'-2'-3'-4". During the next period of 90 deg., the reverse action takes place until the point 8 is reached; this cycle of operations being continued while the lathe is in motion. It will be noticed that the piece A is free to slide clear of the ends of the piece B when the tool is working at or near the minor axis; the gib G extending across the gap and retained in position by the end lugs shown.

EDITORIAL NOTE.—Several readers are doubtless familiar with similar devices more or less complicated than that shown by our correspondent. The need for turning ovals, when it does arise, is usually urgent, and the desirability of being familiar with existing methods and their adaptability to such occasional requirements would impart more than passing interest to such devices as other readers are familiar with.

HOW TO SAVE COAL

ON several occasions since the war broke out Governor Whitman of New York State has sought the advice, by conference, with the editors of the leading trade and technical papers on important business, manufacturing and economic problems.

Recently at his request a committee of editors of technical papers prepared a list of suggestions to manufacturers and business men and the public generally on the saving of coal. The Governor pointed out that the production of anthracite and bituminous coal would doubtless be greater than ever before, but on the other hand the consumption far exceeds the requirements of past periods, and he insists that the American people can avoid distressful conditions this winter only by exercising the greatest care and intelligence in the use of coal. The following are the suggestions which the committee prepared for the Governor.

Suggestions to Public.

The suggestions which the committee requested the Governor to make public follow:

Don't burn coal in an open grate, for in such a practice 75 per cent. or more of the heat goes up the chimney.

It isn't necessary to have every room heated. Most people would be healthier if they slept in cold bedrooms. Close off spare rooms.

Examine furnace and see that there are no cracks at floor line to permit air leakage into the ash pit. Make sure that all firing, ash pit and cleanout doors are airtight when closed.

Endeavor to keep the entire fuel space of your range or furnace filled, heaping the coal slightly in the centre. Steam or hot water boilers should be filled so that the coal is level with the bottom of the feed door opening. Don't let the fuel bed burn down too low. Thin fires mean waste. Break lumps to about egg size.

Frequent Feeding Wasteful

Feed the fire and shake the grate at regular intervals. Two or three times daily is generally sufficient unless the plant is inadequate for the service required. Frequent feeding and shaking are uneconomical. Shake down the ashes before adding fresh coal and stop shaking the moment the first bright spot appears under the grate. In mild weather let some ashes accumulate on top of the grate; in severe weather have only a very thin layer of ashes on it.

If, however, the fire has burned very low and more heat is desired open damper in the ashpit and add a small quantity of coal. In this particular case do not shake the grate until this fresh coal is well ignited, then shake down the ashes and again add fuel.

Don't leave feed door draughts open and admit cold air over a glowing fuel bed at any time. The feed door damper should be opened only to admit air over a fresh fire. Air for combustion should be drawn through the burning bed of coal and, as a general rule, all checking of draught should be accomplished by closing the ashpit damper and opening the check damper in the smoke pipe. The check damper should never be opened until the ashpit damper is closed. The shutoff damper in the smoke pipe may be closed partially in case of an unusually strong draught or to check the fire in mild weather, but, as a rule, this damper should be touched very seldom. Never check by leaving the firing door open.

Before feeding a furnace see that the shutoff damper in the pipe is open and close the check damper. This prevents the escape of dust through the feed door into the cellar.

Keep the ashpit empty. Ashes banked up under the grate prevent necessary air circulation, hinder combustion and tend to warp the grate bars. Remove ashes at least once daily, and be sure to sift all ashes to recover the good coal that has dropped through the grate.

Serious fuel wastes result from allowing soot or ashes to be deposited on the interior heating surfaces. This prevents utilization of the heat in the smoke and gases. Clean flues frequently; with soft coal every other day is none too often to give the furnace a brushing down. One-eighth inch of ashes and soot on boiler surfaces retards heat transfer 25 per cent.

MAKING GREATER STRIDES

By J. E. Cooley

ACROSS the twenty centuries reaching down to the present day, we know that the human race as a whole has never measured up even to the slightest degree of its possibilities; that men still live and die in primitive surroundings, in huts, in hovel-like structures as in times past; that few living beings aspire to the highest progressive state that it is possible for each one to reach. The distance which we have progressed thus far, it was possible to arrive at a hundred years ago; and it is possible now to so energize ourselves, as to, in the present time, attain that state to which, a hundred years hence, mankind will have then advanced.

Our great drawback is our blind indifference, our disinterestedness and neglect to do what pertains to our betterment and our own human good. Our boastfulness far exceeds our accomplishments, and much time is wasted and spent in preparing to do the things that we never even begin, or least of all never finish. We tend toward a don't-care, undefined sort of individualistic growth. We fall easily down on each job. We lack the gripping force to make what we do count in any extraordinary degree. A little exertion tires us. A little sweat on the forehead wilts us. It is not of any particular consequence that man should labor by the sweat of his brow. But his sweat, his perspiration, should emerge from every pore in his body.

Do We Profit By Experience?

Oh, for a race of alert human beings, A race of which we could be honestly proud! A A class of mortals that no age has even dreamed or thought possible! We step into each new day, leaving behind us the yesterdays in which we have lived; forgetting all we have thought and talked about in the day before; coupling little or making no connections with what we have experienced and planned; in a word we die daily, we drag out of one day into another. The mudfly is born at sunrise and dies at sunset, and we would follow the same course, but for a fortunate circumstance of our natures we are given a longer duration of existence. But nevertheless, we in vast numbers fulfil no greater office than the mud-fly. For the reason that our inaction and the unprofitableness of our forgotten yesterdays are going to be repeated in our to-days and to-morrows.

A man should be so developed, so strong, and so energized, that he should be capable of making greater strides of such constructive ability as has never hitherto been displayed by any known type of human mortal. His scope of action should be extended beyond the mere drivelling, monotonous tasks he pretends to be daily doing. He should with apparent ease handle a hundred irons in the fire. His reach should outstretch a hundred miles instead of that number in square feet. Instead of one small vicinity he could be ruler of a hundred. Instead of being one human being he could be several unto himself. His capabilities, his lines of action, instead of being the stunted and half-hearted common everyday sort, could expand to proportions that might girdle the earth.

Few of us realize the great encircling distance of this globe on which we live and move and are capable of acting. We have not even yet begun to train our imagination to the point of realizing the things of earth and sky, from where we stand in our present surroundings. We make little effort to penetrate in any clear searching manner the big things of life. Nor do we attempt to dissect down to the smallest detail the things that concern us most.

The Need of the Hour

It is just this penetrating power, this dissecting process, that we are so much in need of in the present hour. It is utterly useless to make any attempt to undertake any particular task, if we do not know beforehand exactly what we are to do; if we have not beforehand carefully planned it all out, putting detail beside detail, moving things in a thoroughly progressive order without deviating one iota from our prescribed course.

A great deal is said about concentration. Concentration is, or it may be likened to, some little shifting free acting molecule that has its abode in the brain of each one's cranium. Innumerable attempts have been made to hold it steadily in place to serve one's purpose, to keep it composed and directed on some particular aim or task. But too often does it deflect or wander off away from that on which it is attentively needed. And it is for this reason that we fail to carry forward from one day to another, or from hour to hour even, our feeling of energy, of enthusiasm, and pursue steadily onward the task we have it hand.

We all admit that lagging and laziness exceed the pushing power contained in each one of us. And this is because we have not practised to any great degree how to make our actions or efforts more stable. That is, we have not cultivated more steady staying power in ourselves; more rhythm in our movements; overcoming tiredness with tirelessness; being brief and short and sure-hitting in place of our present state of lagging, dragging and uncertainty.

Usefulness of Aim Essential

We should all of us be daily engaged in working for some permanent and useful end. Each on some interesting separate task. All the force of concentration should be trained and directed without any dodging, side-stepping or backing against the ropes. We should weld our actions of yesterday into those of to-day. There should be no disconnecting link, but one onward and upward steady growth and development till the thing we are engage in doing is accomplished into one perfect whole.

No man, woman, or child should be exempt from being made to move forward, to outgrow the present status and forms of disinterestedness and neglect on the one hand, and shiftlessness and carelessness on the other. We overdo the art of teaching babies to prattle and lisp, instead of to talk, and children to play instead of practising useful pursuits. Not until we come to realize the necessity for this, are we going to develop a race of men and women, having more sense and saneness, and less of the spirit of lethargy and helplessness that the most of them now possess.

ACCIDENTS ON OVERHEAD TRAVELING-CRANE RUNWAYS

ENGINEERS and designers have devoted a great deal of effort to the design and construction of cranes with the idea of producing machines that are both efficient and safe, and while their work has materially reduced the hazards in crane operation there are still a great many accidents that result from the daily use of equipment of this kind. This fact is easily demonstrated by the accident reports from plants equipped with the latest types of cranes and safeguards, and the trouble can be largely attributed to the "human element" which must always be considered. Accident prevention in the case of cranes must rest to a certain extent with the workmen, and they should protect themselves by taking every possible precaution.

Most users of cranes are familiar with the causes of the commoner accidents and provide the necessary safeguards for such, but some of the rarer and less obvious causes are equally important, although because of their seeming improbability they are usually lost sight of or are neglected. Discussing these less frequent accidents, the *Travelers' Standard*, in a recent article, considers the most common cause of accidents on crane runways.

Most of the commoner accidents that are likely to occur in the use and operation of cranes have been discussed in previous issues of that publication, but some of the rare ones are equally important. It is only natural to properly safeguard those places or machines which are productive of frequent accidents, but those in connection with which accidents are seemingly improbable are usually lost sight of, or are neglected. In this article, it is our purpose to call attention to some of these more or less infrequent accidents which occur in crane work.

Possibly the most common cause of accidents on crane runways consists in men working on the runways without taking sufficient precautions for their own safety. This trouble was not considered serious with the older type of noisy steam crane which gave plenty of warning of its approach, but the introduction of electric cranes has altered this condition. Workmen are quite often run down or knocked off the runway by the crane bridge or trucks.

At first thought, it would seem that the crane operator would be able to safeguard workmen on runways from these

dangers. But his entire attention is required in watching the load and observing the floorman below for signals, and as a result he can give little heed to the conditions on the runway. Even if the workmen were thoughtful enough to advise the craneman of their intention to work on the runway, it is easily possible for him to forget their presence, or he may misjudge the speed or distance and so run the crane against them.

One way of eliminating such dangers is to discourage as much as possible the unnecessary use of crane runways by the workmen. The runway should not be used as a walk for carrying parts, tools, and other objects needed for the repair of a crane. In making repairs or additions to old equipment, or in the installation of new equipment, the use of a portion of the runway as a place to stand or walk should not be allowed, if it is possible to do the work in some other way, even though some inconvenience may be caused. Do not use the runway in climbing from one part of the building to another. If these precautions were heeded a great many of the difficulties would be overcome. Occasionally, of course, men must be upon the runway,—as for example, in the repair of the runway itself, which would require the service of the men on or near this source of danger. At such times other means of protection would have to be sought.

The safest practice would be to stop all operations of the crane, anchoring it or blocking it so that it cannot move. This, however, does not meet with general favor because the importance of the work for which the runway was being used might hardly warrant a shut-down. Therefore, when a man is obliged to work on a runway he should first of all notify the craneman. A warning flag should be hung from a near-by column in plain sight of the craneman; or track torpedoes, placed on the rails at suitable locations, may be used for the same purpose. In addition to the use of danger flags or torpedoes, portable rail stops or buffers should be clamped to the crane rails a few yards from the point where the runway is being used. This procedure will isolate that section of the runway on whics acidents might occur, and if the crane operator forgets the man on the runway, or fails to note the warning flag or the torpedo, the buffers will insure the safety of the workmen.

Track stops or buffers, although strongly recommended as a means of protection, are often cast aside. If they are supplied, they are often at some inconvenient place, or their whereabouts are unknown. The men frequently object to them, too, on the ground that time and labor are required to install and remove them. Often workmen who are to be on the runway only a short time would rather go unprotected than take the trouble to attach the buffers. These conditions should be improved, and in case the buffers are not supplied, the workmen should have a stout rope safely fastened in some convenient place, so that they may easily slip down to the floor in case of danger.

The electrical hazards which may be encountered by workmen upon runways are very serious as the trolley wires are necessarily uninsulated, and the voltage carried is comparatively high. Under these conditions there is not only the possibility that men may be electrocuted, but also that they may fall from the runway as a result of slight electrical shocks. If for any reason workmen are required to use any part of the runway where this danger is present, the power to the trolley should be effectively disconnected by means of a safety switch provided with a locking device so that the current cannot be turned on again until the workmen are safely away.

In addition to substantial stops or buffers secured at the extreme ends of all runways to prevent the crane from leaving the track at these points, each runway should be provided with a suitable and substantial walk, properly guarded by railings and toe-boards, extending along its entire length on the motor side. A walk of this kind should be at least 6½ feet below the bottom of the overhead trusses. This addition, which may not be feasible on some existing installations, should be provided for all new runways. Such a walk would offer a safe retreat for workmen, and would be found convenient in making various repairs to the crane itself.

The failure of crane supports may be due to several causes which would include abuse, lack of attention, overloading, and inferior design, material, or workmanship. While each one of these causes may be, in itself, capable of producing a mishap, crane failures, like accidents of many other types, are not necessarily due to any one single cause, but to a series or combination of causes, all tending to a common end. It is for this reason that a great many failures cannot be satisfactorily explained. The following account of an accident will serve to illustrate this fact.

The accident occurred in a shop doing general foundry work. The building in which the castings were poured was adjacent to the yard in which the heavy flasks and castings were stored, so that the crane runway, which extended into the yard, served both for the building and the yard. Two cranes were used, and at the time of the accident one crane had just delivered its load to the yard and was standing on the outside runway. The second crane, with its load, had just come out of the building and was preparing to lower its load to the yard. Due to some cause, the runway under the second crane began to give way. This made a depression into which the first crane rolled. The additional stress at the defective point caused the collapse of the runway, and both cranes dropped into the yard, taking with them practically all of the outside structure.

No satisfactory explanation of the failure was ever made. Some said that the second craneman "plugged" or suddenly stopped his motor, producing such an exceptional stress that the runway was broken down. Others thought it was due to an eccentric loading on the columns which failed.

The runway had been in service for about ten years, and the bases of the columns were badly rusted, especially where they rested on their foundations. It was said that the outside runway swayed quite perceptibly when the crane was in operation. In all probability a failure of this kind would be due to a combination of causes; and in order to prevent other similar accidents it would be necessary to take special precautions to eliminate each of the various possible causes.

Defective material, inferior workmanship, and poor design are usually not serious hazards in our present day manufacturing methods. Rigid specifications and practical designs, accompanied by thorough inspection and tests of the materials during manufacture and erection, have practically eliminated all dangers from these sources. It is true that this will not always hold good, but the spirit of honesty in our American manufacturing methods has resulted in the production of exceptionally reliable products. Accidents from the failure of members of a structure are nearly always produced by other causes.

The crane runway is designed to carry certain specified loads, and if its safe capacity is exceeded some of the members may break, causing serious damage. The safe allowable load of the crane should be plainly marked on both sides, using figures large enough to be seen and read from the floor. While this is intended to prevent overloading of the crane itself, it will also tend indirectly to protect the crane runway. When two or more cranes are used on the same runway, it is never good practice to bring these cranes, if loaded, too near each other. This concentrates the weight, and may overload the runway in case it is not designed for such conditions. This precaution would be especially desirable where the original equipment consisted of but one crane, and where, because of increased demands, additional cranes were installed to operate on the original runway.

The proper care in the handling of the loads is a point that is quite frequently neglected by cranemen. When loads are suddenly stopped or started, or are carried in a jerky, swinging manner, an excessive strain is exerted upon the crane which in turn transmits it to the runway. Such conditions may easily cause strains equal to double the weight of the load that is being carried, and under conditions of extreme shock would cause the stresses to be increased indefinitely. Careful operators may easily overcome these dangers by properly adjusting the load, using care in taking up the slack of the slings and hoisting cables, in starting and stopping the crane gradually (not "plugging" or reversing the motor to produce a sudden stop), and in preventing the load from swinging.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

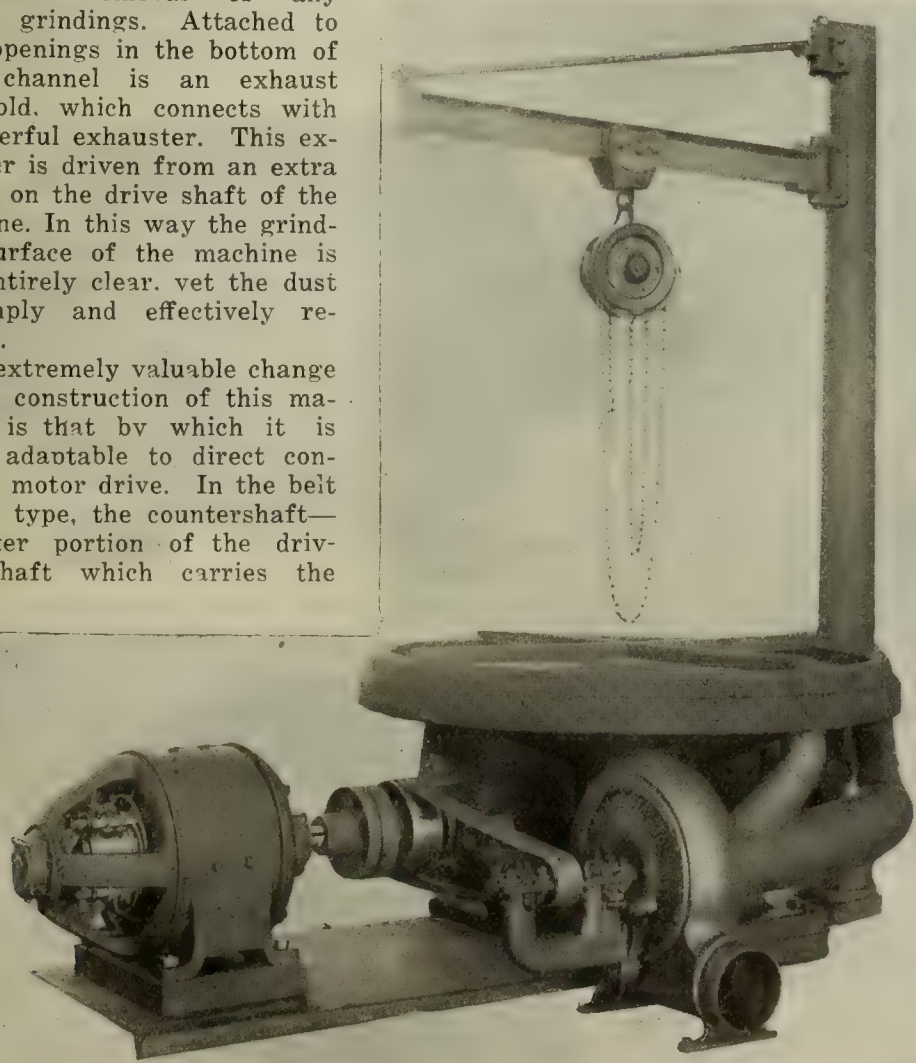
MOTOR DRIVEN, BALL BEARING VERTICAL DISC GRINDER.

THE Gardner Machine Company, of Beloit, Wisconsin, are now building a new vertical spindle disc grinder, which embodies several interesting features. Most conspicuous of these, as shown in the accompanying illustration, is the hoisting attachment, designed to handle the heavy pieces which this machine is built to grind, also to apply and remove pressure weights used in grinding lighter castings.

The attachment consists, briefly, of a one ¼ ton hand chain hoist, mounted on a trolley and swinging jib. A crane column to which this jib is attached is rigidly fixed on the base of the machine. By means of this arrangement, any heavy parts can easily be lifted from the floor and swung on to the surface of the grinding wheel. Another feature of this machine is the dust exhaust system, which is claimed by the makers to practically eliminate the dust problem. A channel is cast into the base of the machine just below and around the edge of the disc wheel. Above this and just over the edge of the disc wheel is fixed a detachable guard ring, which permits the occasional removal of any coarse grindings. Attached to four openings in the bottom of dust channel is an exhaust manifold, which connects with a powerful exhauster. This exhauster is driven from an extra pulley on the drive shaft of the machine. In this way the grinding surface of the machine is left entirely clear, yet the dust is simply and effectively removed.

An extremely valuable change in the construction of this machine is that by which it is made adaptable to direct connected motor drive. In the belt driven type, the countershaft—or outer portion of the driving shaft which carries the tight and loose pulleys—is connected to the driving shaft proper by a flange coupling. By removing this countershaft, and the outer bearing, a motor may be mounted on a plate bolted to the sub-base, as shown in the illustration. The rotor shaft of the motor is connected to the driving shaft by means of a flexible coupling. Thus the necessity of mounting the motor on a side bracket, and driving the shaft through sprockets and chain is eliminated. The direct connection with the driving shaft does away with all lost motion and friction incidental to the old type, reduces the number of wearing parts, and produces a more compact and efficient machine. Also the interchangeable feature may appeal to those who contemplate a change to motor driven machinery at some future time.

The design and construction of the whole machine is such as makes it suitable for heavy grinding operations. The 53 in. disc wheel is carried on a spindle 3⅝ in. diameter, and is supported by a heavy cast iron flange, 20 in. diameter by 1⅜ in. thick. The spindle is mounted in two self-aligning radial ball bearings and the end thrust is taken on an exceptionally heavy thrust bearing, the balls of which are 1⅛ in. diameter. The equipment has been made ball bearing throughout, being a complete change from the old type and one which insures smooth running qualities and a marked saving in power. The spindle has a speed of 500 rev. per min., and is driven by means of a pair of hardened steel bevel gears, having a ratio of 2.4 to 1. These gears are enclosed in a dust protected housing and provision is made for ample lubrication. The entire weight of this equipment is 4,600 pounds.



MOTOR-DRIVEN, BALL-BEARING VERTICAL DISC GRINDER.

DRUM REVERSE SWITCH

ONE of the latest products of the Westinghouse Electric & Mfg. Co. is a small drum reverse switch (Type 810), for operating motors in machine tool, woodworking and other services requiring reversing of the motors. The small size and neat appearance of this reverse switch make it especially adapted for mounting directly on the machine. Not withstanding its small size this switch is exceptionally rugged and has proven successful on the most severe services.

A terminal board of heavy micarta forms the back of the switch, and on the front side of this board are mounted the stationary contracts. The movable contacts are mounted on cast brass brackets clamped on the shaft, from which they are thoroughly insulated. Good contact is insured by phosphor-bronze springs, on the movable contacts, these being protected by copper shunts.

DRUM REVERSE SWITCH SUITED FOR MOUNTING DIRECTLY ON MACHINES.

Heavy barriers of asbestos lumber separate adjacent sets of contacts so that cross-arcing is impossible. All live parts are protected from exposure by an enclosing cover of sheet steel, lined with asbestos, and held in place by two ring latches, which permit its easy removal for inspection or renewal of contacts.

These switches are made for alternating-current or direct-current circuits. For alternating-current service and for direct-current service without dynamic braking, they are provided with "Forward," "Off" and "Reverse" positions. For alternating-current service the

motor is connected directly across the line.

For direct-current applications with dynamic braking, the switch handles have five positions as follows: "Forward," "Drift" "Off and Brake," "Drift,"

SWITCH WITH COVER REMOVED AND CONSTRUCTION EXPOSED.

and "Reverse. They may be used with automatic starters for shunt and compound-wound motors. With compound-wound motors having heavy series winding for tail-stock and cross-rail service, they may be used to connect the motor directly to the line, either with or without resistors permanently connected in series with the armature.

When remote mechanical control is desirable, both alternating-current and direct-current switches can be furnished with extended shaft, permitting either gear or sprocket operation.

AUTOMATIC SURFACE GRINDER

THE machine illustrated herewith has recently been developed and brought out by the Noble & Westbrook Mfg. Co., of Hartford, Conn. It is especially adapted for grinding flat surfaces where accuracy is required, and thoroughly modern in every detail. It is constructed with the best material and workmanship, all working parts being dust-proof. The device for raising and lowering the table is equipped with thrust ball bearings. The feed is graduated to thousandths and all slides and spindles have takeup bearings.

The cross slide is equipped with automatic stop, insuring safety both ways. The platen can be started or stopped instantly by use of hand lever at any desired position without stopping the spindle or other parts of the machine.

Capacity of machine, 8 in. x 20 in.; distance between bottom of 12 in. emery wheel and top platen, 7½ in.; size of spindle, 1 9-16 in. dia.; size of spindle between flanges, 1¼ in. dia.; size of emery wheel, 12 in. x ¾ in, dia.; size of bearings, 1 9-16 in. x 6 in.; size of counter drive pulley, 18 in. x 4 in. x 1⅜ in.; size of counter tight and loose pulley, 7 in. x 4 in. x 1⅜ in.; steel self-oiling hangers are regularly supplied and the machine can be furnished with or without magnetic chuck.

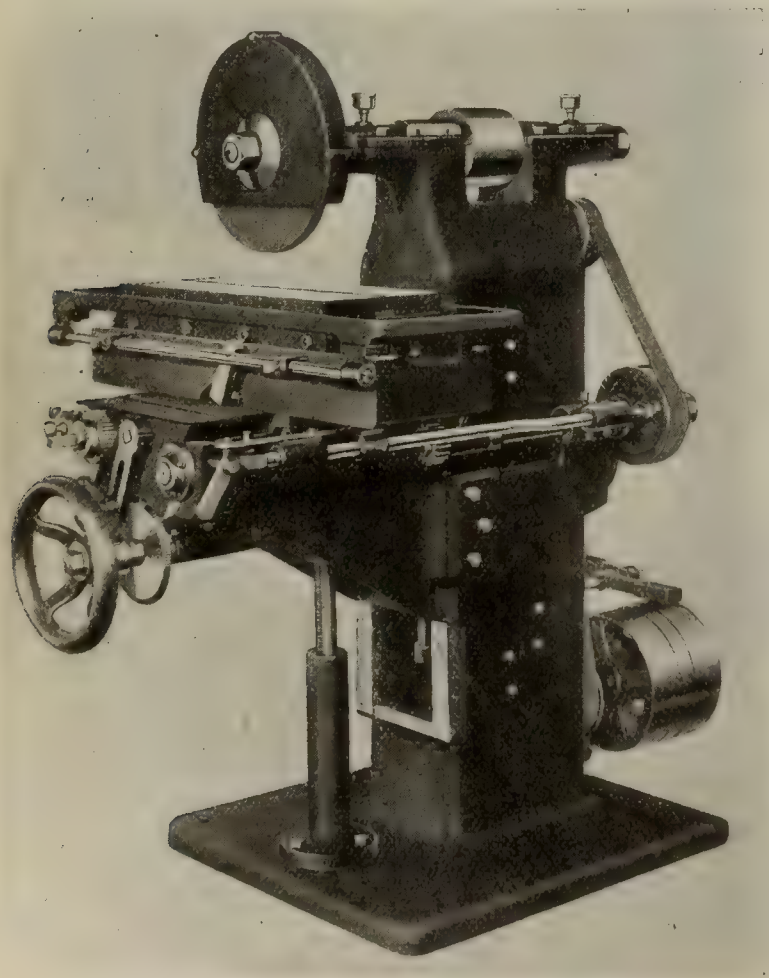
ADJUSTABLE SPEED MOTORS

PAST applications of interpole motors to machine tool operation have made apparent the limitations of this type of motor and suggested changes in design wherein the operating characteristics might be further improved. The principal factor in these limitations is the distortion by the armature reaction of the flux distribution in the main air gap. The amount of this distortion is dependent upon the relative values of the armature and field magnetizing forces, and is, therefore, greatest when the motor is operating at high speed or weak field. This distortion is effective in producing instability, poor commutation, high voltage between adjacent commutator segments and large load losses at weak field.

A commutating pole motor, in which this undesirable field distortion is to a large extent eliminated, has been designed and produced by the General Electric Co., Schenectady, N.Y., and is marketed in Canada by the Canadian General Electric Co. The principle is to distribute the compensating winding instead of concentrating it at the pole faces of the commutating poles, the magnetizing strength of the distributed winding being equal and opposite in direction to the magnetizing force of the armature.

Commutating Advantages

The design of the type R.F. motor, as it is styled, further provides a concentrated commutating winding, the effect of which is to widen the neutral or commutating zone and so insure sparkless commutation over the entire speed range of the motor. This makes for freedom from commutator troubles under the most severe conditions of service and considerably simplifies the control and protective apparatus required when applied to machine tool operation. Therefore, for ordinary classes of work, such as driving shapers, slotters, lathes, etc., a simple type of drum controller can be used, allowing the operator full control of starting, stopping, reversing and speed of the motor by means of a single



AUTOMATIC SURFACE GRINDER.

FIG. 1—MOTOR WITH OPEN END SHIELD.

FIG. 2—ENCLOSED VENTILATING TYPE.

FIG. 3—MAGNET FRAME SHOWING CONSTRUCTION AND ARRANGEMENT OF POLE PIECES.

handle. It also provides a design of motor with which, for such service as planer operation, pipe threading, tapping, vertical slotting, or for driving any machine, in which the machine itself may automatically repeat its cycle of operation, magnetic control of a very much simpler type than that used with the conventional commutating pole type of motor can be employed without sacrificing excellence of commutation. The current peaks, even under abnormal operating conditions, are limited by the inherent characteristics of the motor itself. This motor may be accelerated from low speed to high speed, when connected to a friction load corresponding to rated output at high speed, by inserting total field resistance in one step. The current taken from the line under this condition will be well within the ordinary setting of protective devices.

The motor is rated on a basis of the allowable heating in a two-hours' continuous load at full field speed, its heating under this condition being assumed as equivalent to that attained by the motor under all day load conditions in actual service. The main field coils, as shown in Figs. 3 and 4, are so designed as to withstand without injury full potential continuously with the armature at rest. This insures low temperature rise in field coils under all day operation of the motor with the armature running, and in addition protects the motor against injury when the careless workman inadvertently leaves his work with the line switch closed and the motor at rest.

The construction of the motor is in keeping with the service conditions, the diameter of the armature being kept as small as possible to diminish its flywheel effect, and the frame, end shield and housing assembly being conspicuously rugged and compact. The arrangement of the compensating coils on the laminated poles is shown in Fig. 5, and the method of bolting the poles to the magnet frame in Fig. 3.

It is often desirable to protect the motor from chips, flying particles, etc. This can best be done by equipping the motor either before or after installation with a set of either perforated or solid metal covers, divided in halves so that the top half or all the opening may be enclosed. In the majority of cases the top set of covers will provide ample protection and not cause sufficient extra heating to affect the rating. However, if the machine is completely enclosed, as in Fig. 2, an air pipe connection for forced ventilation should be provided if the motor is to run at normal rating.

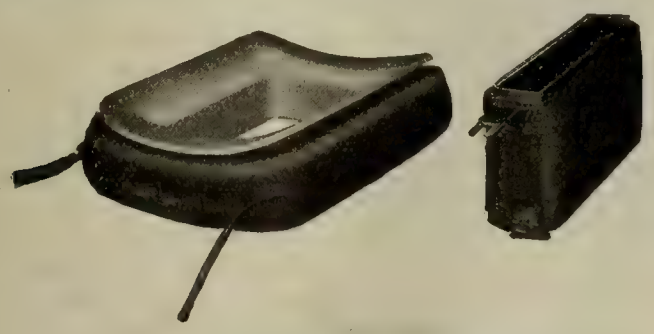


FIG. 4—SHUNT FIELD COIL ON ALUMINUM, ALSO INTERPOLE COIL.

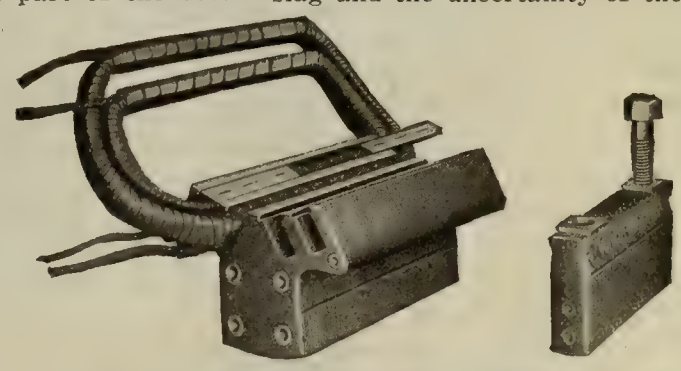


FIG. 5—LAMINATED MAIN POLE AND INTERPOLE WITH COMPENSATING COILS IN PLACE.

STEEL FAMINE FEARED IN BRAZIL

UNITED STATES Consul General Gotschalk, at Rio de Janeiro, reports that interviews with several iron and steel importers of Rio de Janeiro disclose a general belief on the part of the best informed among them that within four or five months there will be a complete famine of structural iron and steel and of iron and steel goods generally in that city. Several of the more careful of these importers are quietly buying up all the old iron and steel they can find, with a view to facing this expected situation. It is interesting in this connection to observe that there is a noticeable revival of interests in certain projects which have been for a long time under consideration to establish a domestic steel industry.

A representative of an American concern recently arrived at Rio de Janerio, bringing with him machinery that had been ordered by the Government-owned Central Railroad of Brazil for a large steel plant to be erected at some point on the lines of the railroad.

TITANIUM.

TITANIUM is metallurgically somewhat in the position which aluminum occupied forty years ago. Very widely distributed, though not generally in large deposits, titanium might be utilized in various ways if the smelting difficulties could be overcome. Chemically titanium stands between carbon and silicon on the one side, and zirconium and the rare earths on the other. It occurs mostly as oxide, TiO_2, alone as rutile, or associated with iron as ilmenite, $FeO.TiO_2$. The chief European deposit is at Kragero, in Norway; very large deposits of ilmenite are found in the Quebec Province (near Rapid River and Saguenay River), in the United States, India, Ceylon, Nigeria, Queensland and South Australia. The titaniferous iron-sands abounding on the shores of Taranaki Bay, New Zealand, first attracted attention in the British Colonies; but they are unsuitable for the blast-furnace, and even the quite recent attempts at briquetting the ore and smelting it in electric and other furnaces have hardly been successful so far, as we see from the Bulletin of the Imperial Institute, vol. XV., No. 1, 1917, which contains a very instructive article on "The Distribution and Uses of Titanium Ores," amply stocked with references. The pig-iron from the titaniferous sands is too rich in phosphorus and sulphur. Earlier attempts made at Norton, in England, to smelt titaniferous iron ores were given up, owing to the pasty condition of the slag and the uncertainty of the ore supply. That uncertainty does not exist at Sanford Hill, in the Adirondacks (New York) and in the Iron Mountains of Wyoming; but the smelting is not prospering, and the replacement of the silicon in the iron by titanium is not liked. Yet rail steel is notoriously improved as to strength and abrasive resistance when about 1.7 lb. of titanium (as iron alloy) is added in the ladle per ton of steel; and ferro-titanium was much used for this purpose in the days of Bessemer steel, though the metal had to be reduced by the aid of aluminum. The action of titanium, which binds the nitrogen in iron to a nitride, is said to be less marked with open-hearth steel; but basic steel has been improved in this way at Osnabrück, at any rate.

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VICTORY FIRST, THEN—?

TO those who have listened to the appeals and exhortations from workers for the Victory Loan during the past few weeks, who have noted the presence in their midst of men prominent in the industrial world, who have studied the statements and weighed the remarks of those men with more than ordinary care and deliberation, one feature stands out above all other considerations and that is the unredeemable debt which every living soul in this country owes to each man and boy, yes and woman too, who have gone forth at the call of duty, and in many cases fulfilled it to the last.

Business men, manufacturers and others who could have stood back have gone amongst their workers and friends, and by virtue of their very earnestness and sincerity have influenced the indifferent and strengthened the willing to insure to the greatest possible extent the overwhelming success of Canada's Victory Loan.

Apart, however, from the sentiment of the situation and the disastrous effects which would have resulted had failure attended their efforts—a catastrophe which we now know is impossible—one feature which was given considerable prominence and which impressed many hearers hitherto unacquainted with it was the tremendous wealth of the Dominion in natural resources. To fully expound this phase of the country's effort would tax the powers of any student of political economy, but its true perspective at the moment can be faintly realized if one considers for a moment just how much visible wealth there is now in this country, both individual and corporate, and that such wealth, in case of emergency, would become national.

The immense sum represented by this is the result of approximately only half a century's development and is therefore but a fraction of what will be in existence in the next half century, yet all this that we call wealth is but evidence, some of it tangible, some of it intangible, of the value of this part of the North American continent as a habitation for mankind.

Rigours of climate, variations in the financial, industrial and economic life of the nation, all the trials which greater nations have gone through before us—these are part of our natural heritage, but they are ours to be overcome, not to be avoided.

Looking back over the past three years, can anyone say we are less great in any one respect, all circumstances considered, than we were three years ago? And in view of what has been accomplished during these and many previous years, can anyone say that we shall not accomplish many times as much in the immediate and not far distant future? And even then, if we can only realize it, the natural resources of our country will have been but scratched.

Considerations such as these are what strengthened our industrial leaders in their appeal to the public, and enabled them to place beyond all human doubt the question of security.

A point, however, which was untouched was the influence which such a loan, subscribed to in such a manner, must, in the aggregate, exert on all those who participate.

A plain realization by the worker, mill operative, factory hand and transportation worker whose efforts are directly connected with the expenditure of the loan, will make it apparent to him or her that any lack of efficiency by any individual means the loss of so much money,—money which has come out of their own and their neighbor's pocket. The textile worker who spoils a blanket or length of cloth, the shoe maker who scraps a pair of boots, the munition worker who spoils a shell, all through carelessness and lack of attention,—each one of these must feel that they have not only lost money for their country but for themselves.

Every ton of fuel consumed unnecessarily in steel making or transportation, every square foot of ship plate not utilized to the best advantage, every hour not spent in intense production means the nullification of so many dollars, dollars saved through years of economy and which must be repaid ultimately out of our natural wealth.

Our natural wealth! The very vastness of it staggers the mind and makes the dollar seem atomic in its smallness and yet in the same breath we are told that every dollar counts. And it is true.

While in some respects our country has been blessed through the absence of war's terrors, the fact of such immunity may be ultimately a handicap which will demand increased effort on our part to overcome. The demands of war have been felt most intensely and insistently in Britain and France, and later in the United States. The former countries, however, by reason of their previous dependency on Germany for many essential materials, were called upon to make efforts beyond comprehension at this distance, efforts which have resulted in many industrial developments that ultimately will more than compensate for the present strenuous times.

It is here that we, with our latent potentialities, must be fully alive and awake to the probabilities of the future. Much is said of our enormous water power resources, but when munitions and stores of war vanish from the factories, when nations cry aloud for the necessities of life, when efforts to make the world a place to live in are resumed on an unprecedented scale, shall we be willing and able to apply that wealth which is our present strength to the amelioration of the lot of those of our brethren whose bravery and sacrifice has been our present protection?

It is there that our future duty lies, not scarred with battle and torn with strife, but clothed with humble reward and a due appreciation of our debt to others. While our men and dollars are fighting let not our brains slumber. The race will be to the swift even as the fight is now to the strong.

INDUSTRIAL NOTABILITIES

LIEUT.-COL. CHARLES N. MONSARRAT, civil engineer, chairman and chief engineer of Board of Engineers appointed by Dominion Government to reconstruct the Quebec Bridge, was born in Montreal, July 2, 1871, son of the late Mark R. Monsarrat, of the Bank of Montreal, and Mary Monsarrat.

He commenced his career as a draughtsman with the Canadian Pacific Railway, Montreal, in 1890, becoming assistant engineer C.P.R., Montreal, 1895, and engineer of bridges C.P.R., Montreal, 1903, which post he filled some eight years before his appointment by the Government.

LIEUT.-COL. CHARLES N. MONSARRAT

As engineer of bridges he was responsible for the designing, construction and erection of all structures on the line of the C.P.R. from Jan. 1, 1903, to May 1, 1911, notable among which were French River Bridge, Lethbridge Viaduct, 5,327 feet long and 300 feet high; Edmonton High Level Bridge, St. Lawrence River Bridge at Lachine, Que.; St. Anne's and Vaudreuil bridges, replacement of Fraser River Cantilever Bridge and numerous other important structures.

Col. Monsarrat, as chairman and chief engineer of the Board of Engineers appointed by the Dominion Government to reconstruct the Quebec Bridge, was responsible to the Government for the specifications, designing, fabrication and erection of this bridge, including foundations, masonry and superstructure.

Lt.-Col. Monsarrat takes a keen interest in military as well as technical matters, having advanced in rank from lieutenant to officer commanding the 5th Royal Highlanders of Canada, and his societies include the Canadian Society of Civil Engineers; American Society of Civil Engineers; Railway Engineers' Association.

He married Mary Alice Foster, daughter of the late Robert Foster, Feb. 9, 1898, their family consisting of one son and one daughter.

His Clubs are: St. James'; Montreal Hunt; Beaconsfield Golf; Outremont Golf; and in creed he is Anglican.

The residence is 4189 Sherbrooke St. West, Montreal.

—Photo, courtesy British & Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

Government prices.

	Montreal	Toronto
Hamilton	....	50 00
Victoria	....	50 00

FINISHED IRON AND STEEL

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3/16 in.	13 20
Chequered floor plate, ¼ in.	13 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	*2 90
Tank plates, Pittsburgh	*3 25
Structural shapes, Pittsburgh	*3 00
Steel hoops, Pittsburgh	3 50

F.O.B., Toronto Warehouse

Steel bars	5 50
Small shapes	5 75

F.O.B. Chicago Warehouse

Steel bars	4 50
Structural shapes	5 00
Plates	7 00

*Government prices.

FREIGHT RATES

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Lake copper	$33 00	$32 00
Electro copper	32 00	32 00
Castings, copper	32 00	31 00
Tin	71 50	80 00
Spelter	10 50	10 50
Lead	9 50	8 50
Antimony	17 00	18 00
Aluminum	60 00	62 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ¼ to ½	$13 00	$12 00
Heads	13 30	12 30
Tank plates, 3-16 in.	13 10	12 10

WROUGHT PIPE

Effective July 5, 1917.

Size	Black Standard Buttweld Per 100 feet	Galvanized Standard Lapweld
⅛ in.	$5 00	$6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ ins.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 45%.

4½" and larger, 40%.

4" and under, running thread, 25%.

Standard couplings, 4" and under, 35%.

4½" and larger, 15%.

OLD MATERIAL

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	21 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	15 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	20 50
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	6 00	7 00
Tea lead	5 00	5 75
Aluminum	28 00	25 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up.	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 20
Elevator bolts	5
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	15
Boiler rivets, base ¾-in. and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	72½
Wood screws, O. & R., bright	67½
Wood screws, flat, brass	37½
Wood screws, O. & R., brass	32½
Woodscrews, flat, bronze	27½
Wood screws, O. & R., bronze	25

MILLED PRODUCTS

	Per cent.
Set screws	25
Eq. & Hex. Head Cap Screws	20
Rd. & Fil Head Cap Screws	net
Flat ⅞ But. Hd. Cap Screws plus	net
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and semi-fin. nuts over 1½ in., up to 2 in.	plus 10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4 50
Cold pressed nuts over 1½ in.	add $7 00

BILLETS

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$5 50	$5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		$7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drums	4 75
White lead, pure, cwt.	16 55
Red dry lead, 100-lb. kegs, per cwt.	16 25
Glue, English	0 38
Tarred slater's paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 78
Linseed oil, raw, single bbls.	1 42
Linseed oil, boiled, single bbls.	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery cloth	list plus 33 1-3
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Drilling cables, Manila	0 41
Plumbers' oakum, per lb.	0 09
Packing, square braided	0 34
Packing, No. 1 Italian	0 40
Packing, No. 2 Italian	0 32
Pure Manila rope	0 39
British Manila Rope	0 33
New Zealand Hemp	0 33
Transmission rope, Manila	0 45
Cotton Rope, ¼-in. and up	0 47

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

CARBON DRILLS AND REAMERS

	Per Cent.
S.S. drills, wire sizes up to 52	30
S.S. drills, wire sizes, No. 53 to 80	net
Standard drills to 1½ in.	30
Standard drills, over 1½ in.	30
3-fluted drills, plus	10
Jobbers' and letter sizes	20
Bit stock	25
Ratchet drills	15
S.S. drills for wood	30
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 30
Bridge reamers	52½
Centre reamers	10
Chucking reamers	net
Hand reamers	10

COLD ROLLED SHAFTING

At mill ..... list plus 40%

At warehouse ..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Canadian malleable, A, add 35%; B and C, plus 25%; cast iron, net; standard bushings, 25%; headers, 60; flanged unions, 5; malleable bushings, 30; nipples, 45; malleable lipped unions, 40.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$9 50	$ 9 00
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	10 20
Premier, 10¾ oz.	13 85	10 50
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	40
Black Diamond	40
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	37½
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke .....
Connelsville Foundry Coke.....
Steam Lump Coal .....
Best Slack .....

Net ton f.o.b. Toronto.

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun, Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White.	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

Colored.	
Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14 x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base	64 00	60 00
Braziers', in sheets, 6 x 4 base	55 00	52 00

BRASS.

Brass rods, base ½ in. to 1 in. rod	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	06
Emery glue	15 to 20
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt, sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

Market Condition and Tendency

Machine Tool Trade Benefits From Renewed Munitions Activity—Metal Prices Firm—Coke Scarce

THERE have been no further developments this week in regard to shell orders, but further contracts will likely be placed in due course. The revival in the munitions industry has caused great satisfaction and a large number of plants will continue to be engaged in this work. The machine tool business has already derived considerable benefit from this activity, particularly firms making special equipment. There is also a fair demand for machine tools for general purposes. The principal feature in the iron and steel market is the shortage of material for commercial purposes due to the heavy and increased demand for steel for munitions and war equipment generally. The situation in this respect appears likely to become more acute as time passes. The steel mills are behind on deliveries in spite of extraordinary efforts which have been made to meet the demand and the requirements are all the time increasing. The position of the private consumer is steadily getting worse and manufacturing activities are being restricted on account of the scarcity of iron and steel. Prices of steel products continue firm and unchanged. There is as yet no indication of a general recession in prices in spite of the lower tendency in the States. It is likely that the law of supply and demand will control the situation and keep prices up. Pig-iron prices unchanged and firm. The shortage of coke is becoming more acute due to the congestion of freight on the railways in the States and the production of steel is already being affected. A sharp advance in tin is the principal feature in the non-ferrous metal market, and is due to a serious shortage of spot metal. Prices of all other metals are firm and unchanged.

MONTREAL, Que., Nov. 26, 1917.—Industrial interest has again been revived by the renewal activity that is promised in munitions circles by placing of extensive business from States for 75 mm. shells. It is not anticipated that activities will be spread over such an area as characterized the production of the British shells, as the contracts have only been allotted to such firms as were reasonably well equipped to guarantee delivery within a specified time. Several firms are now actively engaged in arranging their plants, and manufacturing operations will be commenced in a very short time; one Montreal firm expects to be making 10,000 of these shells per day by the first of the year. In all probability additional orders will be placed for more British shells in the near future. The early closing of navigation will result in added pressure on railroad transportation, a factor that is generally a serious one during the winter, even in normal times.

Pig Iron

No marked change has taken place in the general situation here although the market in Canadian pig is less acute and there is apparently some indication that a surplus of home production may soon be available for domestic use. The American shortage has now become additionally emphasized owing to the inability of the smelters to secure sufficient raw materials to operate their plants at

capacity. The demand on American producers at the present time is exceedingly large owing to the unprecedented requirements for war purposes. All sales are now regulated by the U.S. Government prices, but few sales have been made on the open market at the prices now prevailing.

Steel

No developments have taken place to change the general tone of the steel situation here in Canada and conditions are still characterized by the inability to obtain sufficient steel for the needs of manufacturing and shipbuilding purposes. The recent restrictions that have been placed on the export of steel from Canada will have little effect on existing conditions, as practically no material of an essential character has been leaving the country for the past two years or more. The greatest difficulty that manufacturers are confronted with at the present time is the inability to secure much required supplies of steel from the States, owing to the abnormal demand for this class of material for local use.

A feature that tends to dislocate the trend of operations is the fact that production to a large extent is governed by the regulations that are now in force, often preventing mills operating at their maximum capacity, owing to the shifting of current requirements. Nearly all the leading lines of steel, both unfinished and manufactured, are now selling at the price as set by the Government, or where the prices have been voluntarily adjusted by the individual manufacturers. Further adjustments have been made during the past week relative to the price on iron at Philadelphia and New York, the respective quotations being 3.685 and 3.695 cents per lb. Steel hoops, Pittsburgh, are now quoted at 3½ cents, a decline on the most recent open quotation of 2 cents per lb. The recognized adjusted price on cold rolled strip steel is now 6½ cents, a drop of one cent on the open market price.

Local dealers still complain of the scarcity of certain classes of steel, more particularly plates for shipbuilding and general manufacturing purposes. It is understood that the material required for the production of the American shells here will be shipped in from the States in sufficient volume for the maximum amount of shells that the various plants can produce. The partial return to former activity in the shellmaking industry has increased the demand for high speed steel, which for some time back has shown a marked decline; quotations on this class of steel however are well maintained, the prices ruling being from $2.25 to $2.75 per lb. Conditions generally are unchanged and all steel quotations are nominally the same as those quoted last week.

Metals

With the exception of tin, the metal market generally is characterized by marked inactivity. The entire situation is influenced by the prevailing conditions in the States and the market continues to be an unsettled one. Copper is quiet but recent action on the part of the Government promises an early change. Tin has been the feature of the market and is exceptionally strong. Spelter is unsettled and quiet. Lead is quiet after recent activity. Antimony and aluminum are quiet but fairly firm.

Copper. — A slightly easier position has been given to the copper situation by the recent announcement of the American Government to the effect that jobbers will be allowed a commission of 5 per cent. for their efforts in handling the metal. This may give some relief to a situation that has been more or less marked by the absolute control of the producers, as the new regulations will enable the small dealers to take a more active interest in the market. Local dealers report a little stronger market, prices having been advanced ½ cent during the week, current quotations being 33 cents for lake and electro, and 32 cents for castings.

Tin.—The present high market has been the result of the scarcity of metal rather than the heavy consumption, the inability to obtain shipping permits being the main cause of the acute conditions. It had been generally expected that in the program of the regulation of prices of the various war materials, negotiation would be successfully consummated with the British authorities whereby sufficient tin would be forthcoming to supply all the requirements for war purposes, both directly and indirectly. It is, however, hoped that immediate steps will be taken to furnish relief to tin situation here and in the States; but conditions are such that some time must necessarily elapse before any relief would be apparent, owing to the disorganized state of the present market. New York is now quoting the record price of 80 cents, and even this quotation is only nominal, as little metal is available at the above price. The local quotation is nominal at 71½ cents, with dealers looking for still higher prices.

Spelter.—The market is still somewhat unsettled owing to the doubt existing as to the intentions of the American Government respecting the prices that are to govern the sale of this metal. New York quotations are a little weaker, but local dealers are holding firm at the quotation of 10½ cents per lb.

Lead.—This metal is less active than it has been for some time, as many of the large consumers are well covered for their early future requirements. The strength of the market is however well maintained and quotations are very firm. A difference of ⅜ cent per lb. exists between the quotations of the leading interests and the independents, the former being the easier at 6¼ cents per lb. Local dealers report a quiet but steady market with prices unchanged at 9½ cents per lb.

Antimony.—The activity of the market is quite normal with no features of importance to note. The New York situation has an undertone of strength; the situation here is unchanged with quotations firm at 17 cents per lb.

Aluminum.—The market is featureless on quiet demand and prices locally are unchanged but firm at 60 cents per lb.

Machine Tools and Supplies

Machine tool activity has shown considerable improvement since the placing of orders for American shells. Contracts accepted by Canadian firms call for maximum production and delivery within a specified time, and only those plants that can reasonably guarantee the output have been fortunate enough to obtain orders. This recent development in the shell industry has revived the waning interest of machine tool makers and dealers, and inquiries for equipment are of a very encouraging character, but where machines are required to be brought in from the States the dealers and manufacturers find it increasingly difficult to obtain delivery owing to the conditions that dominate the situation in the States.

The abnormal demands of the American Government for war necessities has almost confined the selling of machinery to war essentials, so that equipment for general domestic purposes or even war requirements of less importance is receiving very little consideration at the present time. In addition to the business that is now being placed from American sources, there is a probability that further contracts for British munitions may result from the appropriation of a certain percentage of the Victory Loan for war necessities. The sale of equipment for general purposes is of fair volume and on the whole present activity is better that it has been for several months. The demand for supplies, that for some time has not been very active, has received impetus from the acknowledged activity in other directions. Imported supplies however are still hard to obtain owing to the demand in the States.

Scrap

The apparent shortage of visible supplies of scrap has assisted in maintaining a firm market, although the general situation continues to be more or less unsettled due to the uncertainty that characterizes scrap trading. The New York situation has shown small fluctuations and is generally firm. Conditions here are firm but dealers report a certain nervousness that may react in either direction; prices are comparatively firm.

Toronto

TORONTO, Ont., Nov. 27.—The munitions business is adding its quota to the continued improvement in trade in this country, and the amount of money involved is greater than in any other industry. The large expenditure of money during the coming months will assist materially in maintaining a condition of prosperity in Canada. For the first six months of the fiscal year ending with October, the increase in trade was ap-

proximately $273,000,000. For the seven months the trade in the Dominion reached a total of $1,586,616,258, as compared with $1,313,189,951 for the corresponding period last year. For the month of October alone Canada's trade amounted to $238,834,321, as against $164,330,179 for the corresponding month in 1916. Manufactured goods to the value of $420,380,372 were exported, a big increase as compared with last year, when domestic manufactures to the value of $219,461,054 were shipped out of the country.

Steel

Nothing of particular importance has occurred during the week to materially change the situation in the steel industry. Artificial conditions, due to embargoes and fixed prices, have created an unusual situation in the steel trade, and one that will incline to dullness. Owing to the abnormal conditions prevailing, business has been somewhat disorganized and consumers of necessity have to be cautious in buying. Both merchants' and consumers' stocks are now very low and buying is of the hand-to-mouth order. This situation has been brought about by an extended period of high prices and more recently by the shortage of materials. Merchants say that inquiries are coming in freely, but that they cannot meet the demand owing to sold-up condition at the mills and resultant backward deliveries. The enormous demand for steel for war purposes precludes the possibility of any improvement in the situation for some time to come.

That the shortage of steel for commercial purposes will become more acute seems inevitable on account of the growing demand for war purposes. Manufacturing operations are being curtailed, and will continue to be so as long as present conditions prevail. Unfortunately there are no indications of any material improvement in the situation in spite of the embargo which has been placed on the export of steel from Canada. While the embargo will afford some relief, this will be largely offset by the difficulty in obtaining steel from the States for commercial purposes. One satisfactory feature of the situation is the steady increase in output of the Canadian steel mills. A statement recently issued by the Lake Superior Corporation covering the four months ending October 31 shows steel tonnage production of 165,477 tons of ingots, against 131,572 tons for the corresponding period last year, representing an increase in output of 33,905 tons. The unfilled orders on the above date were approximately 380,000 tons, which is equivalent to practically nine months' production. The shell orders which, it is expected, will be placed in the near future will require a large tonnage of steel, and will keep the mills operating at capacity for several months, with due allowance for labor shortage and climatic drawback expected in the winter season.

There have been no further price changes made during the week, and, with few exceptions in this respect, the market is firm. It is generally believed that prices in the United States of steel for commercial purposes will be a little above the prices agreed upon for Government work. It is not clear even yet what effect this price regulation in the States will have on the situation in Canada. Up to the present time prices, with very few exceptions, have not declined, and there has been nothing to indicate that there would be a general recession. It is not at all improbable that the law of supply and demand will continue to control the market to a considerable extent in spite of the price-fixing regulations, that is in so far as private consumers are concerned. The mills in the States have been operating at full capacity for months, and still the demand has not been met. During the past seven or eight months the demand has increased greatly, and it now remains to be seen what tonnage of iron and steel will be available for domestic consumption. Government orders must be filled first and what remains will be sold to private consumers. Under these conditions it is difficult to see how prices can be materially reduced.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.

Pig Iron

The situation in the Canadian pig iron market is unchanged and prices continue to be quoted on the basis as given last week. The coke situation, however, is causing much anxiety to furnaces in this province on account of a serious shortage in the States. The majority of blast furnace interests across the line are losing production and a number of furnaces have been banked pending an increase in coke supply. The reason for the trouble is a congestion of freight traffic on the railways. The situation in the States as to supplies of steel-making iron, particularly basic, is daily growing more acute and threatens to curtail the production of steel. There is also a continued scarcity of foundry coke, as coke producers are giving preference to furnace coke as against foundry coke.

Scrap

The scrap market continues stagnant and prices unchanged, but with a weaker tendency. Consumers continue to keep out of the market, as they anticipate lower prices, while dealers on the other hand look for an increase in values. Conditions prevailing in the market here are due to the unsettled situation in the States.

Machine Tools

The machine tool market continues active, due to the increased demand for equipment for munition plants. Special tools for shell work are in good demand, and trade generally is better than it has been for some months. A number of inquiries have been received by local machinery houses for used equipment for shell plants, while the demand for tools for general purposes is fairly active. War requirements dominate the machine tool market in the States, and it is now very difficult to obtain equipment in that country for shipment to Canada. Deliveries on most lines are more backward than ever, as the activity in the States is not confined to shell plants, but includes practically all industries.

Supplies

Business continues steady, with no feature of particular importance to note. Prices on practically all lines are well maintained, with an upward tendency in some cases. Stocks on hand are comparatively light, as some lines are difficult to obtain, deliveries being backward.

Metals

Another sharp advance in the price of tin is the chief feature of importance to note this week. There is an acute shortage of tin in New York, but hopes are entertained that some relief will be obtained in the near future. The copper situation is unchanged, the distribution of this metal being under Government control. Both lead and spelter are firmer, but quotations are unchanged. Antimony and aluminum are also quoted on the basis of last week's prices.

Copper.—The position of copper is unchanged in the primary market and no material change in the situation is expected as the market is under government control. An important matter has been settled by the Copper Producers' Committee, by allowing copper dealers to charge buyers a commission of 5 per cent. which is equivalent to a profit of 1¼c per pound, that is, they can sell at 24¾c per pound. The local situation is unchanged. Lake and electrolytic are quoted at 32c and castings at 31c per pound.

Tin.—The acute shortage of tin in New York and sharp advance in price has been reflected locally and this metal is now being quoted at 80c per pound. The Tin Committee in New York are endeavoring to make some arrangement for the distribution of tin which it is hoped may lead to a more liberal allotment for the United States. No immediate improvement in the situation is expected. Tin is now quoted nominally 80c per pound.

Spelter.—The tone of the market is firmer with a better demand, although there is some uncertainty in the primary market in regard to the favorable outcome of the Government price fixing regulations. Spelter is unchanged locally at 10½c per pound.

Lead.—The market is firmer on bet-

ter demand and the price is unchanged. An improvement in the lead situation is possible on account of the increased activity in the munitions industry. Lead is quoted locally at 8½c per pound.

Antimony.—The position of antimony is unchanged. The demand is quiet with prices holding steady at 18c per pound.

Aluminum.—A diminished demand for aluminum from the automobile industry is feared as a number of these factories are being turned over to the manufacture of war equipment. The market is steady and unchanged at 62c per pound.

Washington

WASHINGTON, D.C., Nov. 24. — The United States Shipping Board has now passed through its second reorganization. Rear Admiral W. L. Capps, general manager of the Emergency Fleet Corporation, has asked to be relieved of all duty on account of ill health. Rear Admiral A. W. Bowles, who has been assistant to Admiral Capps, will undoubtedly leave the Shipping Board. Despite the fact that Admiral Capps pleads ill health, it is an open secret in Washington for two weeks he has been without authority, although still retaining the title of general manager of the Emergency Fleet Corporation. The appointment of Charles A. Piez as vice-president of the Emergency Fleet Corporation robbed Admiral Capps of his power. Full authority was vested in Piez by the members of the Shipping Board and Capps was given jurisdiction only over matters of construction.

Admiral Capps has rendered a great service to the shipping programme of the United States. After the removal of General George Goethals as manager of the Fleet Corporation, Admiral Capps took up the work and really started the programme on its way. His hard labor at that time has broken down his health and made him unable to keep pace with the rapid movements, hence the appointment of Piez and the gradual loss of power by Capps.

Construction in 1918

Chairman Hurley of the Shipping Board has denied that the Board has promised 6,000,000 tons of ship construction during 1918. "We will do everything possible of course," Mr. Hurley declares, "but I will make no promise at this time." He announced that up to the present time 159,299 tons of bottoms under construction for foreign owners on American ways have been completed and commandeered by the Shipping Board. The first steel vessel of the new construction programme was launched November 24 at the Skinner-Eddy yards in Seattle, Wash.

To man the vessels of the United States Shipping Board a recruiting campaign has been set under way. One hundred thousand men are needed.

The Interstate Commerce Commission has set December 7 as the date when the four large American express companies will be given a hearing on their petition for a general increase of ten per cent. on all rates. These increases also include the rates between the United States and Canada.

U.S. Navy Requirements

The Bureau of Supplies and Accounts of the United States Navy Department has issued notice of proposed purchases of the following materials:—Heavy duty engine lathe; machine, boring and drilling, horizontal; machine, type testing, 300,000 pounds; planer and joiner, electrically driven; screws, machine, iron, round head; screws, machine, brass, flat head. Bidders desiring to submit proposals should write to the Bureau of Supplies and Accounts, Navy Department, Washington, D.C., asking for schedules 1569, 1567, 1568, and 1566.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Curtailment of Non-Essential Industries

Great unrest has been caused in the manufacturing circles of the United States by reports of governmental curtailment of non-essential industries. In order to set the minds of manufacturers at rest, Judge Robert S. Lovett of the Priority Board has issued formal notice that he does not at the present time contemplate any further issuance of priority orders with respect to transportation facilities for non-essentials. It is known that the curtailment of non-essentials will be practiced by the Government by cutting off supplies of coal and raw materials. This curtailment will be gradual however, and there will be no general order issued against non-essential industries. Factories making non-war goods will be dealt with individually and will be given an opportunity for a hearing before action is taken against them.

Fuel Situation

The United States Fuel Administration has lifted the priority order given to coal for the Great Lakes and Northwest, effective Nov. 30. It is maintained that there is sufficient supply in these districts now and that the New England territory must be taken care of. The Fuel Administration has set the following prices for coke:—By-product coke, run of ovens, $6 a ton; selected foundry, $7; crushed over 1-inch size, $6.50. The maximum price fixed for gas coke shall be the same as the maximum price fixed for anthracite coal in the same locality.

Conservation of Labor

The Ordnance Bureau of the War Department has issued a long statement to munitions manufacturers, working on Government contracts calling upon them to safeguard labor in all possible ways. The eight hour day is suggested, with time and one half for overtime, and half holidays on Saturdays. It is urged that every possible means be taken in order to maintain high standards of labor conditions and particular instructions are given for the protection of women in the war industries.

Daniel Willard, president of the Baltimore and Ohio railroad, has been named as chairman of the War Industries Board, succeeding Frank A. Scott, resigned. Willard is also a member of the Advisory Commission of the Council of National Defense and chairman of the committee on railroads of the Council. He is looked upon by manufacturers as a strong advocate of stern war measures. In public addresses he has expressed his opinion that all else must be subjugated to victory in the war, and for this reason leaders in war industries look for strict governmental supervision in the future.

Freight Congestion

In order to reduce the great freight congestion the Council of National Defense has named a Highways Transport Committee under Roy D. Chapin of the Hudson Motor Company. This committee will work out a system of short haul motor trucks lines to carry freight into terminal points. A transcontinental route is also being mapped out and 10,000 motor trucks to be manufactured in the middle west for use in France will be brought overland, with cargoes, to the seacoast.

Reports of the Department of Commerce show that imports into the United States from Canada, Mexico and Central America during the nine months ended September 30 were valued at $441,061,128 as against $483,895,646 in the same period in 1916.

In order to reduce the use of wool for civilian purposes, the Council of National Defence through the Commercial Economy Board has secured from the woolen manufacturers of the United States a voluntary agreement to reduce the amount of consumed wool from 30 to 40 per cent. during the next twelve months.

New York

NEW YORK, Nov. 24.—Great war orders calling for the expenditure of $250,000,000 by the United States Government have been placed in the last week. The largest single contract is for 40,000

trucks to be manufactured by the Continental Motors Corporation. It is understood that the contract price is not far from $150,000,000. These motors will be of a similar type to the Liberty motor that is designed for aircraft. The trucks are of two types. There will be 25,000 of type A, costing between $4,000 to $5,000 each, and 15,000 of type C, costing $3,500 to $4,000 each.

Large Forging Contracts Placed

Another huge contract is for forgings for the construction of battleships and torpedo boat destroyers. The contract was placed with the Pollak Steel Co. of Cincinnati, which will immediately make large extensions to its Queen City plant. The Ordnance Department has also placed a large contract with the same manufacturers for gun forgings and forgings for 9.5-in. projectiles. Recently the Pollak Co. also received an order from Great Britain for 1,000,000 forgings for 6-in. shell. The latter forgings will be machined by the Westinghouse Electric & Mfg. Co. The Pollak Co. has already fulfilled large contracts for forgings for Great Britain and for France.

Great Lakes Shipbuilding

The Emergency Fleet Corporation has given a $25,000,000 contract to the American Shipbuilding Co., which is to build thirty-six 3,500-ton ocean-going boats on the Great Lakes. Each boat will be 261 feet long and 43 feet beam.

The Groton Iron Works of New London, Conn., has been authorized by the United States Government to spend $3,000,000 to expand its plant in order to enable it to build steel and wooden merchant vessels for the Fleet Corporation. Large purchases of machine tools will be made to equip these shops.

The Singer Mfg. Co., which has a large Government contract for the manufacture of war munitions, has placed orders this week for the needed supplies, costing $20,000,000. The purchases have included 15,000 tons of pig iron as well as large amounts of copper and of rubber. This company's plant is already well equipped with machinery required for the manufacture of projectiles.

The War Department has decided to extend the Picatinny Arsenal, near Dover, N.J. Twenty 10-ton cranes have been purchased and large orders for machine tools will be placed next month for the new shops now under construction.

Machine Tools in Demand

There is great activity in the machinery industry in the interior, where manufacturers of war munitions are placing orders for shop equipment.

The Four Lakes Ordnance Co., Madison, in addition to buying $325,000 worth of machine tools, will build twenty large lathes of a special type required to manufacture three hundred 5-inch naval guns.

The International Harvester Co. has placed orders in Chicago for additional equipment for its Akron plant.

The American Brake Shoe & Foundry Co., which has a Government order for 6-inch shell, is now in the market for lathes to be installed in its Erie shops.

The F. B. Stearns Co., at Cleveland, manufacturing airplane motors, are buying 25 machines of various types.

The Snead & Co. Iron Works of Jersey City is buying tools to execute a shell order for one of the Allied Governments. Machine tool builders at Cincinnati are taking orders for equipping American repair shops in France. The United States Government has changed the shell contract recently awarded the International Arms & Fuse Corporation from 75 mm. to 6-inch projectiles.

Pittsburgh

PITTSBURGH, Pa., Nov. 24.—Were it not that there is a serious curtailment in the production of pig iron, due to an increased shortage of coke, it is probable that foundry iron would be more plentiful. The business of some foundries has greatly decreased on account of war conditions. One large interest, making goods used chiefly in building operations and normally consuming fully 50,000 tons of pig iron annually, is shipping practically nothing, has a stock of 20,000 tons of iron, and has instructed furnaces to suspend shipments of pig iron. One of its three plants is to be converted for shell manufacture.

Coke Situation Unsatisfactory

The coke situation is extremely unsatisfactory. All year the supplies from the Connellsville region have been poor, to such an extent that the country's pig iron production has fallen a trifle short of that in the corresponding period last year, when there are new furnaces sufficient to increase the production by between 5 and 10 per cent., while in the past fortnight the coke shipments have been still poorer. The majority of furnace interests have had to bank for longer or shorter periods during the past ten days. The result is that, while they had been making an earnest effort to make sales at the Government prices to regular customers, they have now had to withdraw from the market entirely, as they can hardly meet their contract requirements, and may have a worse time when winter weather arrives. It is estimated that one could readily sell 200,000 tons of steel-making pig iron to steel works in this vicinity for delivery up to April 1 if the iron could be furnished.

Railroad Congestion

Nearly all the railroad divisions in the Central West are congested, and in the case of some divisions handling chiefly coal and coke the congestion amounts to a blockade. No adequate relief is expected until the Washington authorities carry out the programme now being considered of curtailing activity in the industries deemed unessential to prosecution of the war. At the request of the authorities the railroads have compiled a list of 525 commodities which might be considered unessential, and some of these will probably be embargoed.

More Set Steel Prices

The American Iron and Steel Institute has made a further announcement as to iron and steel prices. Light rails, 25 to 45-lb., are set at 3c, or $67.20 per gross ton. Chain is set at 8c base for ⅜-inch proof coil chain. Cold rolled strip steel is set at 6.50c base. Some long lists of extras and differentials have been promulgated, including complete lists for small nails, brads, tacks, etc., as well as for wood screws.

More Steel in Market

Offerings of finished steel products for early deliveries have become somewhat more general, and regular customers of mills now find little difficulty in placing orders at the set prices against necessary requirements. While the mills in most cases are well sold up, the majority of them can furnish some additional steel to regular customers. The professional buyer or shopper still has his difficulties and is frequently forced to go to jobbers. The jobbers have been coming down to the set margins prescribed by the Institute, as detailed in last report, but a few have not yet completed the readjustment. In occasional instances warehouses operated by producers have quoted a few commodities, including bars, at less than the prescribed margin, but this practice seems to be exceptional.

Some nut and bolt makers have revised certain contracts to the set prices, having found that the contracts in question were not producing specifications, and specifications were needed. The average nut and bolt maker, however, claims he is sold up solidly for several weeks.

Conditions and Prospects

On the whole, the steel market presents a stronger aspect than it did a fortnight ago. During the progress of price fixing, now an accomplished fact as to nearly all commodities, the market turnover was very light and, while many observers attributed this condition to a sold-up or oversold condition of the mills, there really was much doubt as to whether the mills would have sufficient business to operate at capacity for more than a very few months. In the past fortnight, however, the commercial buying has been considerably heavier, and the Government requirements have been promising a larger tonnage. The mills now have more occasion for concern as to whether they will be able to maintain production in view of transportation difficulties and, to a lesser extent, labor shortage than occasion for concern as to whether they will receive orders.

Shell Steel Orders

The Government continue to place orders for shell steel, but only in occasional instances are any details available. With orders placed a few weeks ago, the total of shell steel orders for the use of the United States Government is expected to amount to 1,500,000 tons, and all for delivery by June 15, 1918. As output on a large scale is only commencing, the prospect is that the production will amount to more than 200,000 tons a month eventually; and this is apart from the shell steel requirements of our Allies.

Steel for Shipbuilding

With the arrangements that are being completed for speeding up the merchant

shipbuilding programme by the more complete use of standardized methods of construction, the requirements in plates will increase, but the mills have given assurance that all the plates that can be used will be forthcoming. In structural shapes there will be no difficulty, as building operations are relatively light, and last year's 3,000,000-ton output of structural shapes could doubtless be duplicated if prosecuting the war required.

With the great difficulty already experienced in maintaining output, the steel mills are hardly likely to get in easy position as to deliveries for several months to come at any rate. It is possible that the curtailment in unessential industrial operations may operate to decrease the demand for iron and steel, but in general the appraisal is that with few exceptions the industries to be curtailed are not large iron and steel consumers. Those that are, on the other hand, are likely to be given Government work, and that would help to make up. Some factories, indeed, may consume a larger tonnage of steel when on Government work than when plying their usual vocations. The production of passenger automobiles, for instance, is to be greatly reduced, but the shops will work largely on shells, aeroplane parts, motor trucks, etc.

DEVELOP WATER POWERS TO MAKE NITRATES

CANADA must, to a great extent, look to the electro-chemical and metallurgical industries for the beneficial utilization of its water-power resources. Particularly is this the case with our abundant northern water-powers, where many attractive sites afford natural facilities for low development costs and cheap production of power. While at present these sites are remote from settlement and transportation is sometimes difficult, their utilization appears feasible in some of the processes now being used for making nitric acid and nitrates from atmospheric nitrogen.

In this connection some of the principal features of the various methods at present in use are of interest. Nitric acid from the atmosphere can be produced with the aid of electricity in two different ways. One of these, the indirect method, is the only one so far employed in Canada, where works of considerable size have been in operation for some years. This method combines a number of separate operations, carried out in separate plants or factories. These operations comprise the making of calcium carbide from coke and lime, and a combination of the carbide with nitrogen gas to form calcium cyanamide. The latter may be used directly as a fertilizer, but for explosives or other industries using nitric acid the acid is obtained by a third operation involving a treatment with superheated steam and air.

In the direct method air is blown through a long electric flame, forming nitric oxide gas which, on cooking, takes up more oxygen and becomes nitrogen peroxide. When the latter is brought in

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

CHILE—Valparaiso, British Consul General.

COLOMBIA—Bogota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT—Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General..

INDIA—Calcutta, Director-General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul. Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul Gen- Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA—Caracas, British Vice-Consul.

BRAZIL—Bahia, British Consul. Rio de Janeira, British Consul General.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, 73 Basinghall Street, London, E.C.2, England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Anne's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

CANADIAN COMMERCIAL AGENTS.

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

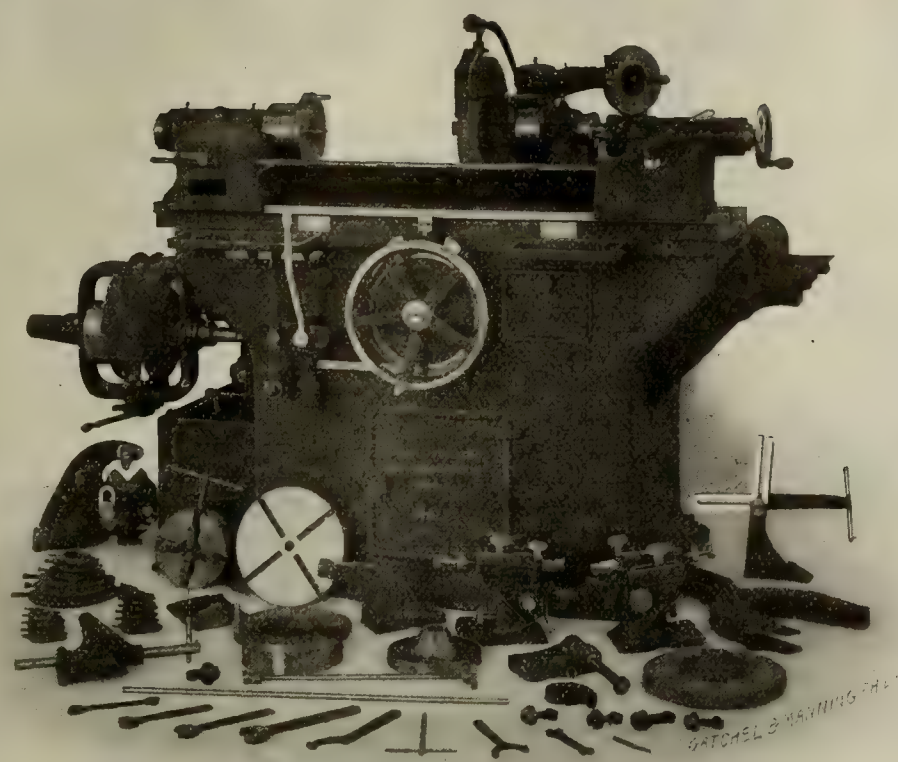
NORWAY AND DENMARK—C. E. Sontum, Grubbegd No. 4 Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE.

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

Landis Grinders *for* Production



12" x 36" Plain, Self-contained.

Immediate.

12" x 52" Plain, Self-contained.

2 Weeks' Shipment.

No. 3 Universal 12" x 42".

January Shipment.

Write for Bulletin giving detailed description.

A. R. W LLIAMS MACHINERY CO., LIMITED WEST FRONT STREET TORONTO

Don't Keep It--Sell It!

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor

or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Avenue TORONTO, ONT.

FOR SALE

1—60-ton Watson-Stillman Hydraulic Press, complete with four plunger automatic variable belt pump. $750.00.

1—Boring Lathe, 32" swing, length over all 19' 6", approximate weight 9 tons. $2750.00.

1—Turning Lathe, 32" swing, length over all 15' 10", approximate weight 8½ tons. $2750.00.

1—Murchey semi-automatic, double-head Nipple and Pipe Threading Machine with countershaft capacity ⅛ to ¾". $410.00.

1—Murchey semi-automatic, double-head Nipple and Pipe Threading Machine with countershaft capacity ½ to 2". $690.00.

1—Hall semi-automatic, double-head Nipple and Pipe Threading Machine with countershaft capacity ½ to 2". $640.00.

1—Hall double-head, semi-automatic Nipple and Pipe Threading Machine with countershaft capacity 1½ to 4". $1000.00.

20—Spicer Steel Trucks, 28 x 90", weight 400 lbs., capacity 2½ tons. Each $25.00.

2—24" Hoefer Stationary Head Drills, steel gears throughout, ball thrust bearings, 3 step cone. $159.00.

Shafting, Belting, Hangers, etc.

GREENFIELD CONDUIT CO., LTD.
331 KING ST., TORONTO, ONT.

contact with water it gives nitric acid. The process is a simple one, requiring only a single factory and a simple plant, and, as the raw materials consist merely of air and water, such works can be established in the most remote location, cheap electricity being the great essential.

It will be thus seen that for the indirect method raw materials and transportation facilities are important questions, while, as just stated, the only raw materials required in the direct method are air, water and cheap electric energy. It would, therefore, appear that much should be expected from this direct method in the utilization of our northern water powers.

Nor need this industry be confined to large organizations and the utilization of new water-power sites. Mr. E. K. Scott, after whom a nitrogen furnace of the direct type is named, suggests the erection of plants of as low as 1,300 h.p. size as adjuncts to central stations.

BRAZIL MACHINERY MARKETS

THE London *Times* Trade Supplement has the following to say in regard to machinery markets in Brazil:

Just as Pernambuco state forms the centre of the sugar industry, so is the state of Minas Geraes the centre of the great mining industry. Here are situated most of the gold-producing mines, although the precious metal is found—and worked in a greater or less degree—in practically all of the states of the Union. The future for mining plant in this state is enormous. It is estimated that there are in sight 500,000,000 tons of high-grade iron ore; it is usually in oxide of iron, and much of it is 50 or 70 per cent. pure iron. Already several English capitalists have determined, as soon as normal conditions are restored, to work these deposits upon a comprehensive scale, and as British machinery is acknowledged to be the best for the purpose, manufacturers should keep the fact in their minds.

There must also be arranged a continuous supply of coal, as the lack of this fuel has hitherto seriously interfered with the success of the Minas Geraes mining industry. In the same state, as well as in those of Matto, Grosso, Bahia, and others, are rich deposits of manganese ore (50 per cent. pure), consisting of oxides and silicate; already one large plant has been erected, that of Morro da Mina, having an average annual output of 60,000 tons. While the States are exporting between 150,000 and 250,000 tons every year, there are many millions of tons as yet untouched. Numerous machinery plants will be required to deal with them.

Evidence accumulates that the gold resources of Northern Ontario are extensive. Developments at Porcupine have been well up, and Kirkland Lake shows signs of being a good second. A satisfactory feature is that the newer gold camps are scattered over a wide area

Victory Loan Justifies Democracy

A brief address on Victory Bonds, their character and meaning, delivered by Wm. C. Noxon, the eminent bond expert, before the staff and employees of the MacLean Publishing Company.

"IN the first days of war," Mr. Noxon began, "Britain was able to raise all the money required to finance the war, herself, but when she had to advance money to the Allies it was necessary for Canada to do the bulk of her own financing in connection with the war. Something in the nature of a contra account was opened and now, while Britain pays our soldiers and looks after other expenses overseas, she charges them to us. In return we pay for Britain's purchases of wheat and manufactured goods in this country and charge them to her. That is why we must raise money here. If we are called upon for too great an amount Britain will provide the difference.

"We are helping to keep the industrial prosperity going and to help the Allies in the war. As an illustration of how this plan works out, Canada and the United States recently put up $400,000,000 between them to move the wheat crop, knowing that Britain would not want to send this money out.

"The Government and the people are bound together by the principle that underlies other institutions and it is this principle that is at stake. It is a question of whether 'might is right' or 'right is might.'

"This money is borrowed from the people by the people. A Government is only so strong and wealthy as its citizens character and wealth is good. An ordinary bank note you accept willingly and with complete confidence, and yet that note has behind it the same security as this bond. The difference is that the bill is payable on presentation at any time without interest, while the bond is a promise to pay at a specified time with interest.

"Every bond is an agreement, but bonds are different in character. The Government bond or debenture is a straight promise to pay gold for the paper when due. There are coupons attached stating that so much interest is payable at certain dates at the set rate. The bond with the coupons, is payable in most cases 'to bearer' in order to facilitate handling. If they are burned you can get new ones issued providing you have some evidence to show you possessed them. They are so designed that they can be passed through the ordinary channels of business with ease.

"Government security affords the highest possible security for borrowing purposes. The bank lends 90 cents on the dollar on government securities. That is value enough, and furthermore a bond is a recommendation. A man who owns government bonds is well thought of by the bank and it will help him in borrowing money.

"The most profitable bond from the standpoint of profit is the longest term bond. The most interest in the meantime is on the shortest term bond, because the Government gives every person a bonus which is not apparent on the face of it. On the 20 year bond you get 5.60 per cent. and on the five year bond you get 5.80 per cent."

Mr. Noxon pointed out that with money available at 4 per cent. under normal conditions, the owner of a Government bond at 5½ per cent. interest would be getting $5.50 per year on a $100 bond while the other money lender would be getting $4. On this basis, Mr. Noxon pointed out that the bond would sell at a premium of $112 at the end of ten years. With interest added to this it was evident that the bond repaid interest at the rate of 6¾ per cent. as compared with 5.80 per cent. on the five year bond.

"In the meantime" said Mr. Noxon "the money is not absolutely tied up, and the bond will sell better than any other securities. Wealthy corporations of the United States buy bonds from 100 to 200 years recognizing that the investment opportunity is so favorable."

Mr. Noxon stated that in his opinion Canada would recover quickly from the effects of the war and he pointed to the day when Canada would be one of the greatest countries in the world.

"It is desirable that all be done to end the war. We have no desire to prolong it, but to drop it now would be to return to worse conditions in a short time.

"We want to prove to every country of the world that democracy does not breed selfishness, but that it breeds wisdom, fellowship and self-sacrifice. If we cannot prove that we had better take an autocratic government.

"There is no question about what these bonds are worth. The purchaser rises in the opinions of his fellow people. And there is no question about the country needing it. Canada with 7,000,000 people should be able to put up $300,000,000. The greatest number of subscriptions will prove the strength of democracy.

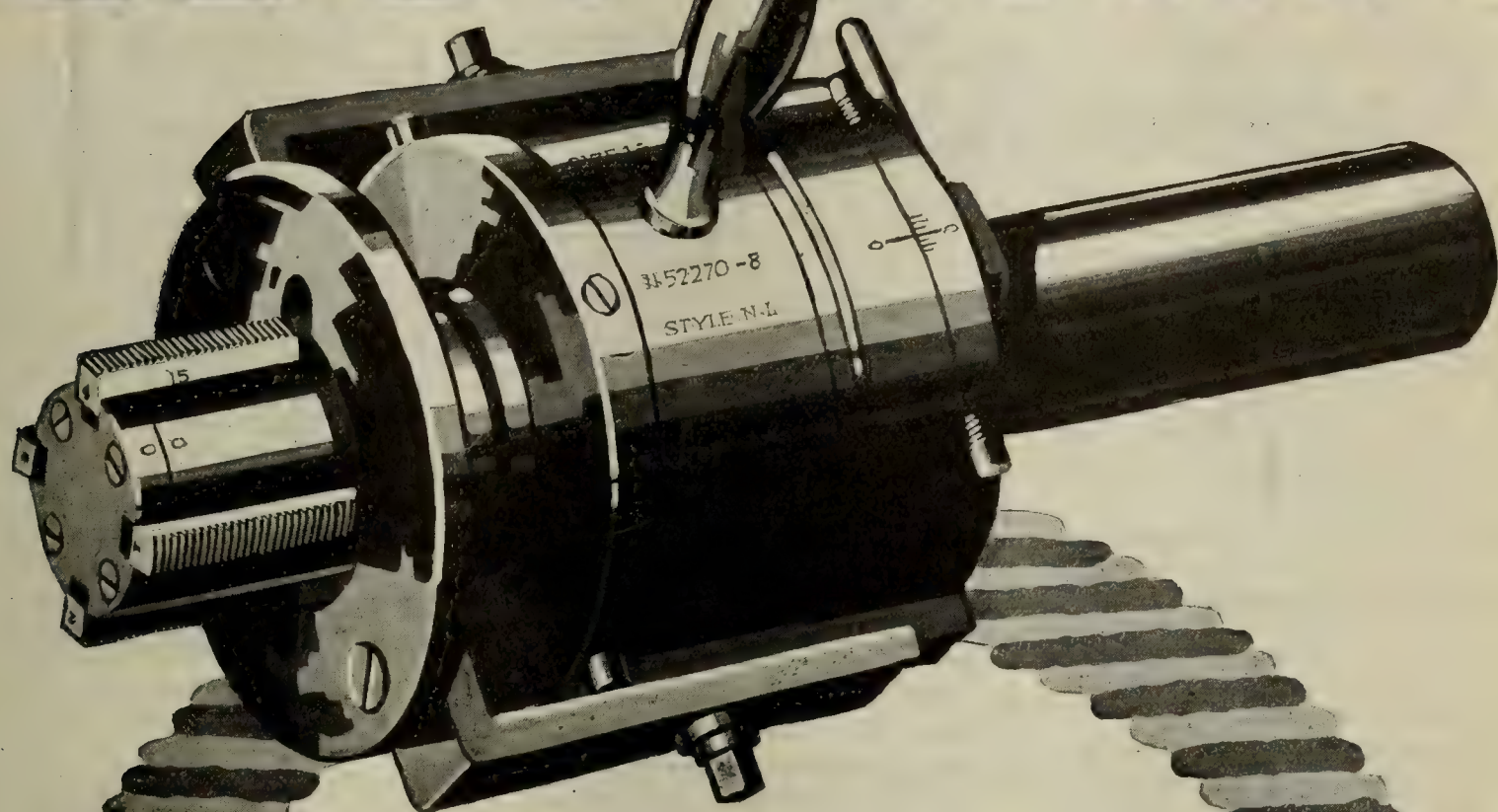
"Sacrifice is the highest form of patriotic privilege. The country is governed by principles so democratic that, being right, you feel you have to see this thing through to the end."

Answering a query as to what style of bond he would advise for a small investment, Mr. Noxon answered that a $50 bond would not have as good a market value for a long term as would the larger bond.

Mr. Noxon pointed out that the banks would not guarantee bonds against fire, but that nevertheless a good practice was to deposit the bond and get a receipt for it. The coupons are then put to the credit of the savings account of the owner as they come due.

"The highest compliment you can pay to the country is to buy a bond," said Mr. Noxon in conclusion.

GEOMETRIC



The Tap Famous For Good Work

Geometric Collapsing Taps share the popularity of Geometric Die Heads. They have the same good reputation for tapping inside threads that the Die Heads have for cutting outside threads. All objections of a solid tap are overcome in the Geometric Collapsing Tap. They are as rigid as solid taps while cutting, but collapse the chasers automatically when the required depth of thread has been cut. Are adaptable to Screw Machine, Turret Lathe or Live Spindle. Made in sizes suited to any diameter above ¾-inch in straight threads or standard pipe thread sizes.

Write for the Geometric Collapsing Tap Booklet.

The Geometric Tool Company

NEW HAVEN, CONN., U.S.A.

Canadian Agents:

Williams & Wilson, Ltd., Montreal

The A.R.Williams Machinery Co., Ltd. Toronto, Winnipeg and St. John, N.B.

BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Moncton, N.B.—The forge shop owned by P. Melanson, was destroyed by fire with a loss of $30,000.

Vancouver, B.C. — The Canadian Metals, Ltd., will equip a scrap yard and is in the market for shears, acetylene cutters and a magnet for lifting iron.

Port Arthur, Ont.—According to General Manager A. G. Pounsford, the Port Arthur Pulp & Paper Co. will be ready to commence active operations in about six weeks' time. There are about 2,500 cords of wood on hand and 70,000 cords have been contracted for.

Toronto, Ont.—The Bond Engineering Works, Ltd., who have recently taken over the Queen City Foundry, will make a line of power transmission specialties and will continue to make grey iron castings. The company contemplates making additions to the plant.

Drummondville, Que.—The Aetna Explosives Co. are again operating their plant which has been closed down for some months. The acid departments are being operated at capacity to manufacture sulphuric and nitric acids, and the output is at the rate of 3,000 tons monthly.

Brockville, Ont.—The G.T.R. engine shops narrowly escaped destruction on Sunday night by a fire which broke out in the oil room and spread to the northern annex, wherein were located the machine shop and the blacksmith shop. They was completely gutted and much valuable machinery was ruined. The loss will run into the thousands, and is covered by insurance.

Orillia, Ont.—The new electric power plant at Swift Rapids, on the Severn River, was formally opened last Thursday. The new plant succeeds the one at Ragged Rapids, which has done duty for many years. It is a mile and a half farther down the river, the change being necessitated by the construction of the Trent Valley Canal. The new dam has forty-five feet head of water, and the three electrical generators installed will give a total of 5,400 horsepower.

Hudson Bay Line Finished in Spring.—According to J. D. McArthur, head of the McArthur Construction Co., the Hudson Bay railway is now all graded from The Pas to Port Nelson, and steel laid to a point 92 miles south of Nelson, with a prospect of a complete line to the great inland sea early next spring. With respect to the Alberta and Great Waterways line, Mr. McArthur states that the rail head is now at Fort McMurray on the Athabasca river, 290 miles north of Edmonton, and so soon as the war is over and money gets a little easier, a boat service will be established between McMurray and the Arctic Ocean.

Hamilton, Ont. — The Robert H. Hassler Co., of Indianapolis, Ind., manufacturers of the Hassler shock absorber, have decided to locate their Canadian factory in Hamilton. Fred. Morris of the F. G. Morris, Ltd., Canadian distributors of the Hassler shock absorber, and Mr. Marsh, the Industrial Commissioner for Hamilton, have been instrumental in securing this new industry for the city. J. C. Piper will be managing director of the new company who have leased a building on Sherman Ave. N. for a factory.

MUCH SHELLMAKING ACTIVITY IN SIGHT

We are in a position to state that the Imperial Munitions Board, Ottawa, have received instructions from the British Government to issue contracts for shrapnel, 4.5 in. and 6-in. shell, to Canadian firms equipped for same, the volume of these contracts being such as to run well into the New Year.

INCORPORATIONS

Renfrew Refrigerator Co., has been incorporated at Ottawa by R. Handley, A. Blue and S. Moffatt all of Renfrew, Ont., to manufacture refrigerators and refrigerating appliances of all kinds at Renfrew, Ont., with a capital of $100,000.

Ker-Carb Ltd., has been incorporated at Ottawa by T. H. Spence, L. M. Heal and M. Lee all of Toronto to manufacture all kinds of motors, engines and accessories, etc., at Toronto, Ont., with a capital of $20,000.

Fraser Brace & Clarke Ltd., have been incorporated at Ottawa with a capital of $500,000 to build steamers, ships, dredges and boats of all kinds at Montreal. The incorporators are F. W. Sharp, A. Falconer and J. L. Reay, all of Montreal.

CONTRACTS

Toronto, Ont.—The Gutta Percha & Rubber Co. and the Dunlop Tire & Rubber Co. have been each awarded a tender for 2,500 feet of hose at $1.15 a foot by the Board of Control.

GENERAL

Paris, Ont.—Fire of unknown origin early on Sunday morning destroyed the plant of the Alabastine Company at Paris, with a total loss of $35,000, partially covered by insurance.

Brockville, Ont.—The Laing Produce & Cold Storage Co. has taken over the old Brockville brewery and is installing a plant for making condensed milk. The company has installed a cold storage and refrigerating plant.

TENDERS

Ottawa. — Assistant City Engineer Askwith has been given permission to call for tenders on the supply of an apparatus for thawing out city water pipes. The style of apparatus the engineer desires is gasoline-driven and mounted on sleighs. The estimated cost is $3,500.

Armagh, Que.—Gouvin & Beauchemin, civil engineers, Quebec, are preparing plans and specifications for power development at Armagh, County Bellechasse, on River Fourche-du-Nord-Ouest, and will receive tenders for water turbines, dynamos, sluice-gates, penstock and wooden pipes, etc.

Ottawa, Ont. — Tenders will be received until Tuesday, December 4, 1917, for the installation of freight elevators at the Government Printing Bureau, Ottawa. Plans and forms of contract can be seen and specification and forms of tender obtained at the offices of the Chief Architect, Department of Public Works, Ottawa, the Overseer of Dominion Buildings, Post-office, Montreal; and of the Clerk of Works, Postal Station "F," Yonge Street, Toronto.

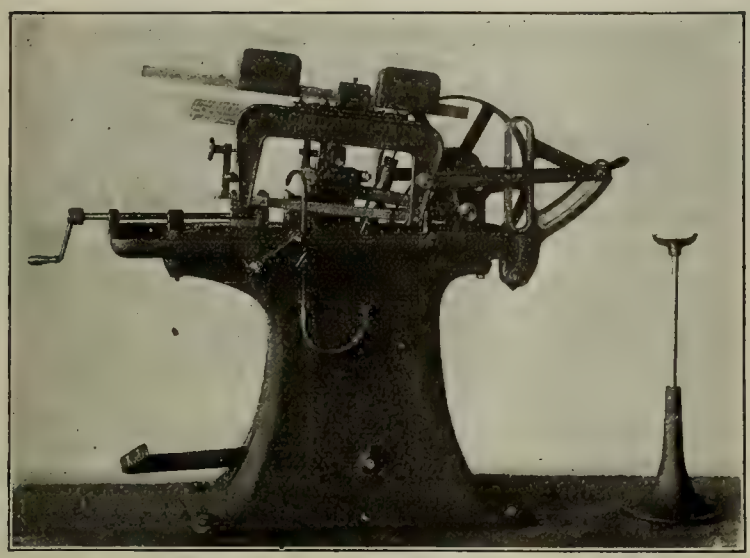
PERSONAL

H. M. Lee has been appointed manager of the Bond Engineering Works, Ltd., Toronto. This new concern is a subsidiary of the Bond Foundry and Machine Co., Manheim, Pa.

G. R. MacLeod, head of the sewer department of the City of Montreal, has been appointed by the Imperial Munitions Board to an important post in their organization now being established at Washington, D.C. Mr. McLeod has been granted leave of absence by the Board of Control for an indefinite period.

J. Frater Taylor, president of the Algoma Steel Corporation, Sault Ste. Marie, Ont., will retire from this position at the end of the present year. Mr. Taylor will still retain his association with the Soo industries in an advisory capacity as chairman of the Lake Superior Corporation. It is understood that W. C. Franz will succeed Mr. Taylor

Starrett METAL CUTTER



Starrett Hack Saws of finely tempered tungsten steel cut quickly—and they last. One is made for every purpose. Valuable information on the best blade for each class of work will be sent if you ask.

Built by world's greatest toolmakers and universally acknowledged the machine of super-efficiency.

Aikenhead's

can promptly ship.

Saw cannot drag on return stroke. Its full length is utilized in cutting from 1 to 6 inch stock. Quick-acting tightener ever holds it square.

Saw frame, adjustable to wear, locks at any height. Work is set with greatest convenience.

Machine started with frame up approaches the work, oil dash pot preventing the saw dropping and breaking or stripping teeth.

In finished workmanship equals a machine tool of Starrett make. Fast cutting at operating cost the least; built durably for service extraordinary.

Write Aikenhead's for Catalog.

AIKENHEAD HARDWARE LIMITED

17, 19, 21 Temperance Street - Toronto, Canada

New WAHLSTROM Chuck *Drills, Reams, Counterbores and Taps Without Stopping Spindle*

Automatic in action; of positive drive; it self-centers the tool. Chucks Morse Taper Shank Drills Nos. 1, 2 and 3, with or *without* a tang.

Get It At

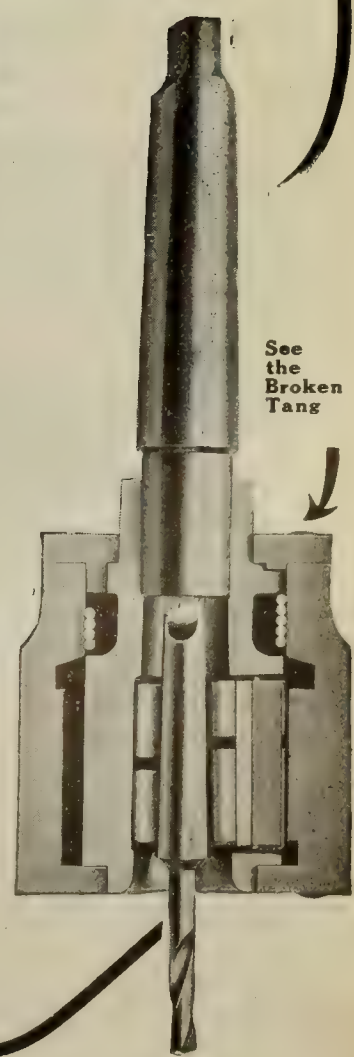
Aikenhead's

for Taper or Straight Shank Tools

Chuck in one hand, insert or remove drill with other—without stopping spindle. Drill any number of holes varying diameters, no matter how many spindles are in your drill press.

Wide in range—without collets, sockets or keys—the New Wahlstrom is the strongest, quickest Drill Chuck money can buy. It will save you 50% in actual labor, if not more.

Ask for Catalog.



Aikenhead Hardware Limited, 17, 19, 21 Temperance Street TORONTO - CANADA

as president of the Algoma Steel Corporation.

G. D. Perley, son of Vice-President Ward B. Perley, of the Canadian Steel Corp., Ltd., Ojibway, Ont., will become assistant on Jan. 1 to W. H. Knox, of the firm of W. H. Knox & Co., New York, importers and exporters. Mr. Perley has been connected with the Carnegie Steel Co., Youngstown, O., for several years.

Captain William McNeill, formerly commander of the Anchor-Donaldson Line steamship Letitia, died in Glasgow, Scotland recently. Capt. McNeill was commodore of the Donaldson Line fleet, having been a master in this company for the last twenty-four years, during which time he was in command of the Warwick, Lakonia, Amarynthia, Athenia and Letitia. He was one of the most popular captains coming to Canada.

MARINE

Kingston, Ont.—The steamer Beaverton, trading on the lakes for years, is to be used on the Atlantic Ocean in war work.

Amherstburg, Ont.—Grubb's Reef gas buoy, Lake Erie, has been replaced by a winter spar buoy, and the gas buoy has been removed to the Dominion dock.

WOODWORKING

Cranbrook, B.C.—The factory owned by the Cranbrook Sash & Door Co., was totally destroyed by fire recently with a loss of $40,000. It will be rebuilt and new machinery purchased.

TRADE GOSSIP

The Channel Chemical Co., Toronto has increased its capital stock to $150,000.

Britain Controls Output of Ball Bearings.—The British Minister of Munitions from November 1 forbids manufacture, sale, and delivery of ball bearings or roller bearings or any part thereof except under license.

Firm Changes Name.—The business formerly carried on under the name of Prack & Perrine, engineers and architects, Lumsden Building, Toronto, will hereafter be conducted by Bernard H. Prack, industrial architect and engineer.

U.S. To Control Tin Imports.—The American Iron and Steel Institute has at the request of the United States Government undertaken the control of the importation of tin from foreign countries into the United States.

Canadian Fairbanks-Morse Co., New Agency.—The Metalwood Manufacturing Co., of Detroit, Mich., have appointed the Canadian Fairbanks-Morse Co., sole representatives in the Dominion for the "Metalwood" line of hydraulic presses and equipment.

U.S. Coke Prices Are Fixed.—Basic prices for by-product coke have been fixed by the United States Fuel Administration as follows: Run of ovens, $6; selected foundry, $7, and crushed over one inch, $6.50. Prices for beehive coke already have been announced.

Great Britain Orders Ships in Canada.—A report from London, England, states that Great Britain has placed orders in Canada for twenty-two steel vessels of 3,400 to 8,000 tons, the total tonnage now under construction being 150,000. Orders for wooden ships to the value of $10,000,000 are also under consideration.

Tungsten Market Firm.—The market continues in a strong position owing largely to the demand of European buyers in South America. Arrivals in the New York market have been light. High grade Wolframite is held firm at $25, with sellers asking higher prices. Scheetlite is quoted at $26 with some sellers holding for a higher price.

The Richard Lloyd and Co., Galton Works, Steelhouse Lane, Birmingham, England, will be pleased to hear from Canadian firms manufacturing machines and small tools who are seeking agents in Great Britain. Richard Lloyd & Co. are large exporters and importers of high class engineers' tools and supplies, being also contractors to H. M. government departments and British railways.

Butterfield and Co., Rock Island, Que., have recently completed the erection of one of the most complete factories for the production of small tools in the Dominion of Canada, and are now in a position to take orders for all styles and kinds of twist drills and milling cutters, in high-speed or carbon steel, and are especially equipped to handle promptly any class of orders for drills, milling hobs, etc., used in the making of shells and other munitions.

Insurance Rate Down.—On account of the reduction in ships torpedoed during the past few weeks, the U. S. War Risk Bureau on November 23 lowered the insurance rate on vessels passing through the submarine zone from 5 to 4 per cent. This is the second reduction in cargo insurance rates made by Secretary McAdoo within the last two months. the rates having been lowered on October 6 from a 6½ per cent. maximum to 5 per cent.

The Turbine Equipment Co., Toronto, have recently received the following contracts: Brunner Mond, Ltd., Amherstburg, Ont., three De Laval pumps, each having a capacity of 3 million gallons per day against a total head of 200 feet. For the town of Pembroke, Ont., one 2-stage De Laval pump, having a capacity of 2-million gallons a day against 320 feet total head. The Dominion Steel Corporation, Sydney, N.S., one De Laval 2-stage motor-driven pump.

Lake Superior Steel Corp. Output.—The statement of the Lake Superior Corporation for the four months ended October 31 shows steel tonnage production 165,477 tons of ingots, against 131,572 for the corresponding period last year. Unfilled orders October 31 were approximately 380,000 tons. Blast furnace production was interrupted through labor troubles at the coke ovens. The steel output generally is gratifying and within recent weeks has shown a considerable and steady improvement.

Electric Steel Furnaces in Great Britain.—In Great Britain 131 electric steel melting furnaces are now operating or under construction or represented by application for permit, according to the London "Ironmonger" of October 20. They are distributed as follows:—Heroult, 48; Greaves Etchells, 33; Electro-Metals, 27; Rennerfelt, 7; Snyder, 6; Stassano, 4; Stobie, 3; Induction, 2; Girod, 1. Of the total, 70 are in Sheffield. This probably makes the largest number of such furnaces in any one centre in the world.

Dominion Bridge Gets Big Order From U. S.—The Dominion Bridge Co., Montreal, has received an additional order for 10,000 tons of fabricated steel from the American International Corporation. Some two weeks ago orders from the same source amounting to 40,000 tons were announced, so that the total has now been increased to 50,000. The American International Corporation will require 335,000 tons of steel for the construction of 130 boats, contracts for which have been received from the Emergency Fleet Corporation.

U. S. Zinc Production.—It is understood that the zinc production of the United States has dropped over 30 per cent. from the highest levels attained when all plants, old and new, were running at full. This would indicate a curtailment of approximately 240,000 tons in the annual rate. During the first half of 1917 zinc was turned out at the rate of over 722,000 tons per annum, while in the ensuing quarter it was cut down to a basis of about 626,000 tons a year. The higher figure represented the top notch of spelter production resulting from increasing capacity for existing plants and the construction of many new smelters throughout the West.

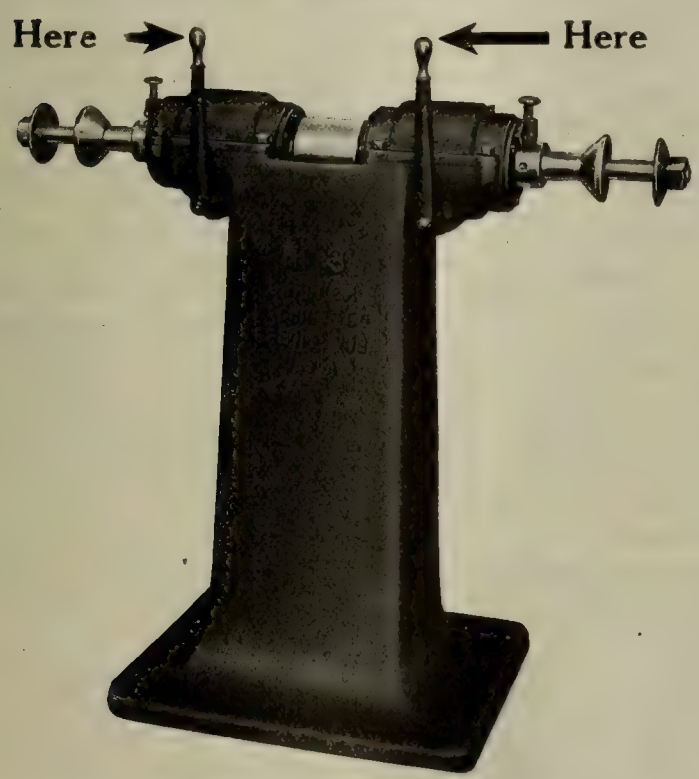
Big Ship Merger on Great Lakes.—Virtually all of the bulk freight ships on the Great Lakes, a fleet of approximately 400 ships carrying ores, coal and grain on the five inland seas, will be "mobilized" next season in the interest of efficiency, operated under one management. The Lake Carriers' Association, on approval so far of members holding 85 per cent. of the tonnage represented in the organization, has voted for the mobilization. The association's members own or control more than 90 per cent. of the bulk tonnage on the lakes. The committee which will have in charge the operation of the large fleet has been unanimously chosen, and this winter will outline in detail its work for the 1918 season.

Coal Gas in Motors.—The British Automobile Association has been in communication with the Ministry of Munitions concerning the use of coal gas on motor vehicles. The association asked for an official assurance that coal gas may be used on motor cars without restriction. The Minister of Munitions has replied that, so long as the gas is conveyed, as at present, in bags at or

The Johnson Friction Clutch Is Being Used As A Part Of This Machine

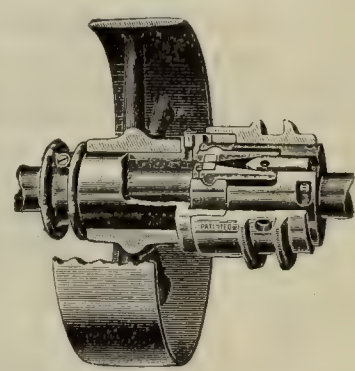
Efficient Service Won A Place

for the **Johnson Friction Clutch** on The Gardner No. 3 Ball Bearing Polishing Lathe. **The Johnson Friction Clutch** disengages the spindle and acts as a brake at the same time. **Think**—from full speed of 2,500 r.p.m. to locked position, or positive stop, in **five seconds.**



Gardner No. 32 Double Spindle Ball Bearing Polishing Lathe. Courtesy the Gardner Machine Co., Beloit, Wis.

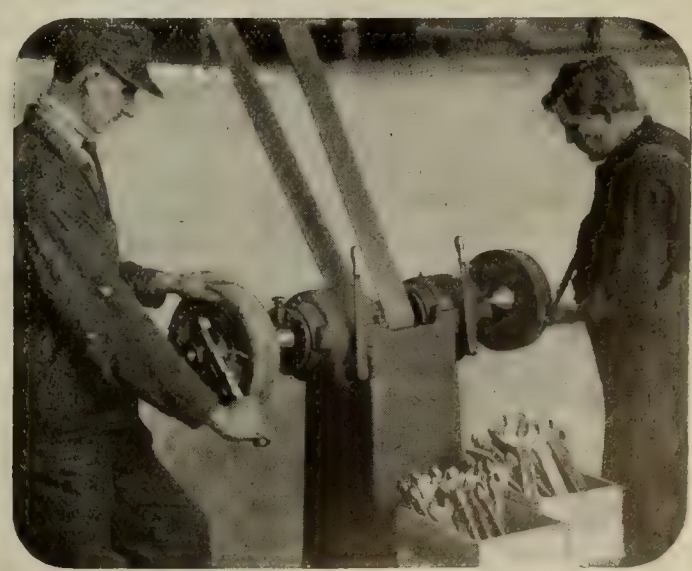
The double spindle polishing lathe is driven by one belt, still each spindle may be operated independently. HOW? Through the use of JOHNSON FRICTION CLUTCHES. In the polishing lathe shown single JOHNSON FRICTION CLUTCHES are incorporated in the head of the machine, one on each spindle and are operated by the hand levers.



Standard Single Clutch with Pulley.

Look! One employee polishing while the other is changing the polishing wheel. JOHNSON FRICTION CLUTCHES make this possible. Have you thought of Friction Clutches for your machine? Investigate the possibilities of JOHNSON FRICTION CLUTCHES on your machines. Write for full information TO-DAY.

Send for our Booklet "Clutches as Applied in Machine Building," and our Yellow Data Sheets.



Double Spindle in Actual Operation.

THE CARLYLE JOHNSON MACHINE CO.
MANCHESTER, CONN.

Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal; Can. Fairbanks-Morse Co., Ltd., Toronto. England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles. Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.

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DIES, TOOLS AND REPAIRS
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slightly above atmospheric pressure, and not compressed in steel cylinders, it is not considered that there is any need on general grounds for restricting the use of coal gas for motor purposes. At the same time it is pointed out that it might become necessary at some future time to impose restrictions.

U. S. Emergency Fleet Corp. Place Contract.—The United States Emergency Fleet Corporation, New York, has placed a contract for thirty-six 3,500-ton ocean-going boats with the American Shipbuilding Company, instead of with Robert Dollar. The construction of these boats will require about 1,165 tons of steel, or a total of nearly 42,000 tons of plates and shapes. The boats will be 261 feet long and 43 feet beam. The contract price is reported to be $700.000 for each boat, or a total of $25,200,000. Construction will be on the Great Lakes and deliveries will be made next July or August. At the South Chicago plant the American Company is building additional ways, which will give it a total of six berths in the near future.

Given Stern Sentence.—Five years at hard labor in the army disciplinary barracks at Governor's Island was the sentence of a courtmartial in the case of Charles E. Gerlach, of Brooklyn, second officer of an army transport, because he refused to serve as a lookout for submarines and torpedoes while his ship was in the European danger zone. This became known on November 23 when Judge Hand, of the United States District Court, granted a writ of habeas corpus on Gerlach's representation that his constitutional rights have been violated, in that he was a civilian and, therefore, not amenable to court-martial. His sentence began October 18. In compliance with the writ, Gerlach will be brought into court on December 3 by the officer in charge of the detention barracks.

Iron Ore Shipments on Great Lakes.—For the week ended November 11, the Committee on Lake Coal and Ore Movement reports 1,090,552 tons of iron ore received at lower lake ports, compared with 1,103,239 tons in the corresponding week of 1916. For the period from January 1 to November 11 ore shipments are placed at 32,008,899 tons, compared with 35,496,546 tons in the same period a year ago. The approximate amount of ore on the docks at the end of the week is placed at 8,028,643 tons. On the same date in 1916 the amount of ore on the docks was 8,409,843 tons. During the week there was an average daily car shortage for ore loading of 1,171 cars, compared with an average shortage of 987 cars in the corresponding week of 1916.

Machine Tools for France.—The regulations for the importation into France of certain machine tools and tools of other kinds are set forth in a report from United States Consul General Thackara at Paris. These requirements are to be complied with by the French importer before giving orders for goods from abroad, as in the case of practically all other imports in France at present, but they may be of interest to the American or Canadian exporter as illustrating the necessity of making arrangements for orders in advance. The regulations differ according to whether the goods are for resale or for use in connection with Government contracts. A copy of the report will be loaned upon application to the Bureau of Foreign and Domestic Commerce, Washington, D.C.

Annual Output of the Furnaces in the U.S.—The United States is fortunate in having the premier steel industry of the world to rely upon in time of war. The steel furnaces to-day are producing ingots at the rate of 43,500,000 tons annually. But the total production for the year, according to the estimate of the Iron and Steel Institute, will be 42,600,000 tons, which is approximately half of the total production of the world. When the war began, with the United States as a neutral country, the world's production of crude steel was at the rate of 75,000,000 tons annually, and about 55 per cent. of this tonnage was being produced by the nations at war. Before the United States became a belligerent, the production of crude steel had increased to the rate of nearly 85,000,000 tons per year, of which the Central Powers produced about 21,800,000 tons, and the Entente allies about 20,000,000 tons.

Buoys Will Be Discontinued.—The following notice has been issued to mariners regarding the discontinuance of buoys for the season:—

Detroit River—All gas buoys in east and west point channels, excepting East Channel gas buoy No. 2 and West Channel gas buoy No. 1, will be withdrawn about December 5. On or about the same date Livingstone Channel gas buoys 8A, 13A, 12A and 17A will be withdrawn.

Detroit River, Lake St. Clair and St. Clair River—All gas buoys in these waters, with the exception of those noted above, will be withdrawn about Dec. 8-12.

Lake Huron—Lake Huron light vessel will be withdrawn about December 15, but will be kept on station, however, until the latest practicable date.

Toronto-Hamilton Highway Open.—The Toronto-Hamilton Highway was officially declared open for traffic recently, when Sir William Hearst severed a ribbon with a pair of scissors presented to him for the occasion. The ceremony was held on the border line between the City of Hamilton and the adjoining county to the west. After brief speeches had been delivered, the party made a tour of the road, lunching at Hamilton, where they were greeted by Mayor Booker and his council. On behalf of the Toronto-Hamilton Highway Commission, George H. Gooderham, chairman of the commission, informed Hon. Findlay Macdiarmid, Minister of Public Works, that the road was ready for traffic, and Mr. Macdiarmid called upon the Provincial Premier to declare the road open. Mr. Gooderham stated that it is hoped to replace the Mimico,

Etobicoke, Port Credit and Bronte bridges just as early in the spring as weather conditions will permit. The erection of a high level bridge at Oakville and the completion of the Hamilton entrance are awaiting the convenience of the municipalities interested.

New Patents Registered.—The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout and Maybee, 59 Yonge Street, Toronto, from whom further particulars may be obtained: Herbert L. Roberts, life belt; Massey-Harris Co., Ltd., spring bearings for centrifugal separators; Louis E. Barton, methods of obtaining titanic oxid; Titanium Alloy Mfg. Co., methods of obtaining titanic oxid; Louis E. Barton, methods of producing basic titanic-sulphate products and pure titanic oxide therefrom; Herbert E. Haultain, processes of concentrating and separating minerals by flotation; E. N. Moyer Co., school desks and seats; Joseph H. Price, sights for rifles, pistols and like; Percy E. Correll, construction of headlamps; Edgar B. Jarvis, fountain brushes for washing dishes and the like; Wm. Wilkie, heated appliances for pressing the collars of articles of wearing apparel; Clarence H. Brockelbank, apparatus or devices to control safe night-landing of aeroplanes; Thomas D. Kelly, cementing materials and the manufacture of substances or compositions therefrom.

CATALOGUES

Machine Tools.—The Terminal Machine Co., Church Street, New York, have distributed to the trade their latest illustrated catalogue of new and used machine tools which they have in stock for immediate delivery. A leaflet bearing the title "The Individual and the War," is enclosed, being a personal appeal for sacrifice and service in support of the State for the successful prosecution of the war.

Machine Tools.—The Davis Machine Tool Co., Rochester, N.Y., have issued a general catalogue describing an extensive line of engine, turret and tool room lathes, cutting-off machines, keyseaters, shapers, drills. The lathes include sizes up to the 42-inch triple geared engine lathe, a complete specification being included for each size together with a table of principal dimensions and an illustration. The other machines are also illustrated and have detailed specifications and table of dimensions. The catalogue contains particulars of a number of attachments, illustrated, and also a babbitt melter.

Hagan Ash Conveyor. The George J. Hagan Co., Pittsburgh, Pa., has issued a new bulletin dealing with the Hagan steam jet ash conveyor. The title of the bulletin is "Twelve Reasons Why Your Choice Should be the 'Hagan,." By way of explaining these reasons, each page of which there are twelve, contains a description of some particular

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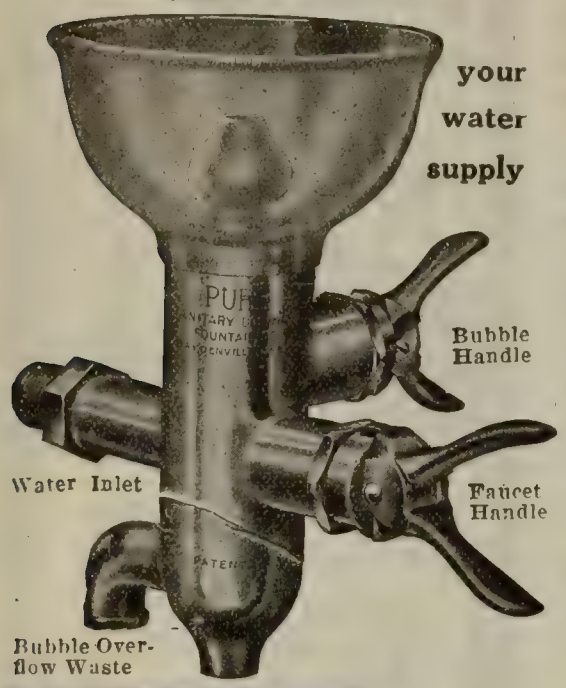

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feature of this appliance accompanied by an illustration showing the details of construction. Particular reference is made to the "Hagan" signal elbow and positive control of steam consumption. The illustrations have been reproduced from drawings and show clearly the essential features of the system.

The Whiting Cupola.—Catalogue No. 131 issued by the Whiting Foundry Equipment Co., Harvey, Ill., is a new edition of the cupola catalogue presenting new illustrations which show the latest developments in design of the Whiting cupola. The catalogue describes the special features of design of this cupola including the patent tuyere system. Other matter deals with economy of fuel, rapid continuous melting, practical hints on operations, etc., and also contains a table of sizes and capacities, and a useful telegraphic code which will be of great convenience to the company's patrons. The catalogue also contains descriptive matter, with illustrations of charging machines, charging cars and cinder mills, etc.

BOOK REVIEWS

Statistical Abstract of the United States, 1915. Published by the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D.C. A volume of condensed statistics covering imports, exports, manufactures, commodity and mineral production, railroads, highways, education, agriculture and many other subjects of national importance. The statistics are based upon official figures collated and published under the various laws of the United States or those of other countries to which they may relate. This volume is issued through the Government Printing Office, Washington, D.C.

"Extraction of Gasoline from Natural Gas by Absorption Methods," by George A. Burrell, P. M. Biddison, and G. G. Oberfell, issued by the U. S. Bureau of Mines, Washington, D.C. The extraction of gasoline from natural gas by compression and condensation has been an important and rapidly growing industry in recent years. In 1915 about 65,000,000 gallons were produced by such methods while in 1916 the estimated production was 100,000,000 gallons. This gasoline is of doubled importance in that it can be blended with naphthas. The absorption process is quite different from the older compression process and heretofore has not been described in literature. It is a method only recently commercially applied to natural gas yielding the same quality of gasoline and capable of being applied under conditions where the older process could not be employed profitably. In view of the present needs of gasoline for war and industrial purposes, this additional quantity of gasoline, heretofore a waste and source of expense, is of tremendous importance and may be considered as an excellent illustration of the results the Bureau of Mines is obtaining in its investigations for reducing wastes and increasing efficiency in the petroleum industry. Bulletin 120 treats fully the underlying principles of the absorption process, as well as the methods for testing natural gases for gasoline, the construction and operation of absorption plants, and records the results obtained by several plants of demonstrated commercial success.

INCREASED PRICES MAKE UP DEFICIT

HIGHER prices of metals rather than larger production will probably account for the considerably increased figures of the mining industry this year. The Ontario Bureau of Mines has given out an interesting result of the mining history of the province in the first nine months of the year. This includes the production of the metalliferous mines and works of Ontario and for purposes of comparison figures for the corresponding period of 1916 are also given.

Notwithstanding the falling off in the output of gold, silver and copper, the aggregate value for the nine months was some $2,000,000 more than for the same period in 1916. Higher prices for silver, copper and nickel are largely responsible for this increase.

Of the total gold production, the Hollinger Mine yielded 161,702 ounces, McIntyre 59,779 ounces, Dome 58,978 ounces.

Gold being the standard of value, and having a fixed price, was practically the only metal which did not share in the general increase of prices. Indeed, the high prices of labor and supplies have for the time being lowered the rate of expansion for this branch of the industry. The output for the first nine months of this year was some 20,000 ounces less than for the corresponding period of 1916.

IMPROVED LABOR CONDITIONS RESULT OF WAR

SIR ROBERT HADFIELD has recently stated in *The Observer* that before the war his firm employed 6,000 men and imported many things from Germany. They now employ 15,000 men and make everything previously imported. Working hours have been reduced, with, Sir Robert states, the most satisfactory results. The shorter hours make good men better and bring the medium workman up to something higher than the old-time average. Looking back over recent industrial history, he says that the fact becomes apparent that in the pre-war days we in England were very skilful in our efforts to impede our own progress. On one side the employers, and on the other side the men, devoted vast vital energy to the creation of great combines, each devised as if for the purpose of preventing its side from advancing. Had not Germany forced war upon us we might have had good reason to fear for the future. For years our employers had made an earnest and successful fight against the 48-hour week. Now, under war conditions, when it is necessary that we should produce at a maximum, we have turned to it as a means to just that

end and find it most efficient. The hostility of the men to various progressive things was as unfailing as, for instance, their opposition to labor-saving machinery. Now they have learned that the better the tools the better the workman, and that the better the workman he better his pay. An intelligent workman should have more self-respect than is indicated by willingness to do labor which a machine could do as well. In England workers are only now beginning to realize this. The fact that workmen are not themselves machines is not yet appreciated at its full value even in America, for if workers should be too proud to rank themselves as machinery, employers should be too wise thus to rank them All employers have been doing so.

WHALING OUTPUT VALUABLE

WHALE products in various forms have always commanded big prices. As an exceptional instance, a single lump of ambergris, a sort of wax discharged from the sperm whale, was not long ago picked up in Rose Harbor on the Pacific coast and sold for $85,000. This substance is largely used in France as a basis for perfumes and sells at about $40 an ounce.

The oils obtained are produced in four grades. No. 1 is a clear transparent oil; No. 2 is a somewhat clouded liquid, not so thoroughly refined as the first grade; No. 3 is a shade darker; while No. 4 is a deep, almost black, color, similar to the crude mineral oils ordinarily secured by boring.

The fleshy parts of the whale, after all the oil is extracted, is subjected to a process of cooking in great caldrons. The oil rises to the top, is skimmed off, and the residue then goes through a drying process in big rotary dryers. After passing through a crusher and blowers, it is emptied in a long shed and is there sacked and prepared for shipment.

The bones are treated in a similar way, and after being boiled and crushed it is dried out and makes a splendid fertilizer, selling on the market at $80 or more a ton.

There are three working and one idle station on the West Coast of the island, which during the catching season give employment to about 150 men, excepting the boat crews which aggregate about 200 men, who earn about $2 a day.

Every part of the whale is utilized, and almost each year science discovers some new purpose to which they can be put or some new process for their more practicable development.

TRADE ENQUIRIES

THE following trade enquiries have been received by the Department of Trade and Commerce, Ottawa. Further particulars may be obtained by writing.

1458. **Wood-pulp.** — A manufacturing firm in Havana, Cuba, which has for some time been buying about 3,500 tons of wood-pulp yearly from Norway and Sweden now desires to import it from Canada, if the required grades can be obtained here. Samples and particulars of the different grades required may be obtained on application to the Commercial Intelligence Branch, Department of Trade and Commerce, Ottawa.

1463. **Tools and handles.**—A Durban firm of wholesale merchants request samples when possible, catalogues and price lists, with particulars of packing, from Canadian manufacturers of shovels, spades, pickaxes, axes, farm tools, also pickaxe tools and broom handles.

1465. **Wire.**—A British company handling metals wish to act as European selling agents after the war for a Canadian wire-drawing factory able to supply copper, steel and nickel wire and similar products.

MAGNETO-MACHINES FOR POCKET LAMPS

THE war may be responsible for a revival in the popularity of electric pocket lamps fed with magneto currents instead of dry-cell currents. Karl von Dreger, of Budapest, has put several such lamps on the market. In the small-size lamps, weighing 450 grammes (1 lb.), one or several springs are put under tension by the repeated pressure of the thumb on levers; a lamp storing energy for 3 minutes would weigh 850 grammes, and a lamp giving a light for 10 minutes would require to be wound up with the aid of both hands, and would weigh 2,350 grammes (5 lbs.). In these lamps the armature is the revolving part. In the lamps of O. Pletscher, we see from the *Elektrotecnische Zeitschrift* of August 30 last, that the field, built of rings, rotates like a flywheel in ball bearings about the double T-armature; there is no collector, but slip rings and brushes are provided, and the gearing consists of toothed wheels.

These lamps weigh only 250 grammes; a large type, of 750 grammes weight, is designed for cycles. If a hand can be spared for turning a small magneto-machine, and a little more weight is not objected to, there is no difficulty, of course, about portable electric lamps.

The Canada Machinery Corporation will erect a steel and brick extension to their plant on Water Street, South. In view of the present high cost of structural steel and the difficulty of obtaining such material, the company are utilizing the building owned by them in Hamilton, this structure being dismantled and re-erected in Galt. The extension will give the company about 24,000 square feet additional floor space and will give employment to one hundred additional workmen.

GERMANY has refused to supply Dutch shipyards with steel save on conditions which will place all new construction in Dutch shipyards at the disposal of Germany and prevent any part of it from passing into the possession of the Allies.

Inferior tools and good mechanics don't co-operate—

In other words, you cannot get an A-1 production from a good man if you don't supply him with the best tools.

You will be sure of getting top notch file efficiency if you supply your mechanics with

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Delta Files fairly eat the metal, and they hold their keen cutting edge longer than other makes—a fact that we can easily prove.

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SIX COMPRESSORS FOR SALE — VERY cheap. The National Quarry, 81 St. Peter St., Quebec. c22m

FOR SALE — NEW ONE TURBO WING blower, twelve-inch; one Mason hydraulic damper regulator, No. 4; one ten-inch air cylinder and two-way valve for air chuck; one No. 3, two No. 5 Acme automatic steam engines, all new. Bargains; make bid. Reliance Machine Company, Toronto. (c24m)

FOR SALE, IN MANITOBA—ONE OF THE best equipped foundries in Western Canada for gray iron and brass casting, also machine shop, pattern shop and blacksmith shop (3 fires). Write for particulars to Box 355, Canadian Machinery. (c23m)

THREE TONS COLD ROLLED STRIP STEEL, drawing quality 8" wide, .065 thick. Dillon Manufacturing Co., Oshawa. c1m

PUNCHING MACHINE — POWERFUL BELT-driven geared multiple punching machine; capable of punching 30 holes ¾" dia. at 2½" pitch through ¾" plate; distance between housings 6' 0"; having two bed plates, one 24' long, fitted with adjustable screw-driven plate carriage for feeding plates to punch, and one 26' long, fitted with plain plate carriage, which is operated by hand-power draw winch; machine has large equipment, including punches and bolsters, for ½", ⅝", ¾" and ⅞", and one rack of fixed punches and bolsters 11-32" at 1¼" pitch; made by Hanna, Donald & Wilson; f.o.b. Glasgow. William C. Wilson & Co., 21 Camden Street, Toronto. c23m

AGENCIES WANTED

ENGINEER AND BUSINESS MAN WITH office in Manchester, England, is prepared to work for a good firm desiring representative in England. Would attend to the interests of a firm shipping munitions. Box 337, Canadian Machinery. c19m

AGENTS WANTED

WANTED — LIVE REPRESENTATIVE TO handle good specialty; one who hasn't too many irons in the fire Apply Box 348, Canadian Machinery, stating lines you now represent and the ground you are prepared to cover. c23m

WANTED—BY STEEL WORKS IN PENNSYLvania, United States, producing exclusively crucible cast steel, principally high speed steel, a representative in Canada who is thoroughly familiar with the tool steel business and will devote his entire attention to same. Reply Box 354, Canadian Machinery. c24m

MANUFACTURERS' OPPORTUNITY

A responsible American Concern desires to arrange with a reliable Canadian Machinery Manufacturer for the production in quantities of a small Marine Motor, for the Canadian and Export Trade. A modern equipment, with knowledge of economical production of interchangeable machinery and parts, and good shipping facilities essential. To such party a very favorable, if not continuous, contract is offered. Address Box 353, Canadian Machinery. (c22m)

CANADIAN AGENTS WANTED FOR GOOD chuck, especially adapted for use in munition plants. Box 349, Canadian Machinery. c23m

SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto

SITUATIONS VACANT

WANTED — SUPERINTENDENT-FOREMAN, 6" British shells. Box 340, Canadian Machinery. c19m

WANTED—MACHINE SHOP FOREMAN FOR small shop doing general work, not munitions, near Toronto. State experience and salary expected. Give references. Box 345, Canadian Machinery. c20m

MARINE ENGINE ERECTOR:—WANTED FOR Canadian shop an experienced foreman to take charge of erecting 1500 H.P. marine engines. Apply Box 347, Canadian Machinery c21m

WANTED

WANTED — SECOND-HAND CUPOLA AND other foundry equipment. State full particulars and price. Box 346, Canadian Machinery. c21m

WANTED—ONE No. 166 BLISS 2-SPINDLE automatic trimmer and beader, also 1 No. 156 single spindle trimmer, or machines of similar design. Must be in good condition. In replying state fully the name of maker of machines and lowest price, also where they could be seen. Box 342, Canadian Machinery. c18m

WANTED—ONE HORIZONTAL RE-DRAWING or reducing press, fitted with bottom knockout, the general dimensions of which should be equal to Bliss No. 62. Must have flywheel not less than 725 lbs. weight and approximately 3 ft. 6 in. in diameter. Press must be in good working order. In replying, give all dimensions, also state name of maker and lowest price. Box 341, Canadian Machinery. c18m

WANTED TO PURCHASE TWO SECOND-hand lathes, 24" swing, 8' to 12' bed. Submit offers with cuts and full description to E. Langham, General Purchasing Agent, Canadian Northern Railway Company, Toronto. c19m

WANTED—VERTICAL MILLING MACHINE with table not less than 26" x 10", minimum distance centre of spindle to face of column 14". Reply, giving full particulars, price and where machine can be inspected. Box 352, Canadian Machinery. c21m

Flat Braiders For Sale

Twenty-five---53 Spindles, No. 1 Make

New England Butt Co. and R.I. Braiders in perfect working condition. Write for particulars. Greenwood Braiding Co., Greenwood, R.I. (c23m)

SECOND-HAND RADIAL DRILL WANTED—in good condition; 4 ft. to 6 ft. swing. Give full particulars. The Volta Manufacturing Co., Welland, Ont. c21m

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MECHANICAL AND CONSTRUCTION ENgineer desires change; twenty years' general experience; specialty steam power plants; knowledge pulverized coal. Box 343, Canadian Machinery. c21m

GRADUATE MALE NURSE, AGE 32. HAVE established hospitals for three large manufacturing concerns. Familiar with social service, accident prevention and modern methods of employing. At present employed. Less than $2,400 not considered. Box 336, Canadian Machinery. c15m

GENERAL SUPERINTENDENT DESIRES position—years of machine shop and toolroom experience, efficient production methods, as well as extensive experience with various sizes of shells. Box 350, Canadian Machinery. c22m

PRACTICAL WORKS MANAGER AND MEchanical expert with years of experience in Scotland and Canada, a specialist in marine engines and winches, open for engagement; best of references. Apply Box 351, Canadian Machinery. c23m

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States wants position as superintendent or general foreman. Large or small shop on ammunition or machinery; A1 references. Address Box 327, Canadian Machinery. c9m

FOR SALE

2—16" x 5' Reed Lathes, elevating rest.

1—16" x 6' Reed Engine Lathe, plain rest.

1—16" x 6' Reed Engine Lathe, R. and F.

1—18" x 8' Davis Engine Lathe, D.B.G.

1—18" x 8' Porter Engine Lathe.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 3 Brown & Sharpe Automatic Gear Cutter.

1—30" old-style Brainerd Automatic Gear Cutter.

1—5" x 48" Pratt & Whitney Plain Grinder.

1—No. 3 Lees-Bradner Thread Miller.

1—15" Jungst Shaper.

2—24" x 24" x 6' Powell Standard Planers.

2—30" x 30" x 8' Powell Standard Planers.

Brownell Machinery Co.
Providence, R. I.

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A complete 4.5" shell plant

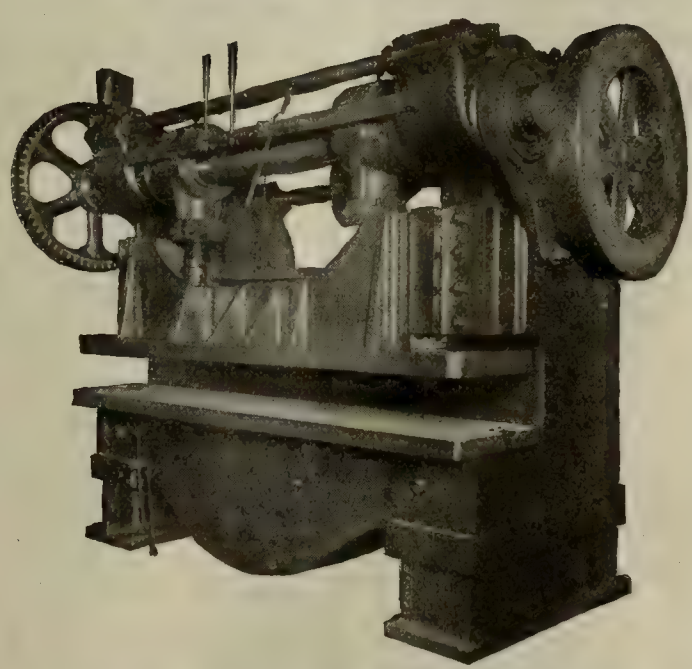
1—No. 6 HALL Cut-off Machine.
1—4.5" HAMILTON Heavy Cut-off Machine.
1—36" x 14' BERTRAM Engine Lathe for rough turning.
1—HAMILTON Single Purpose, Heavy Duty Rough Turning Lathe.
3—HAMILTON Single Purpose, Heavy Duty Boring Lathe, with collets.
4—DAVIS 24" Chucking Lathes for boring and tapping nose.
1—18" x 8' REED Lathe for finish turning.
1—16" x 8' BERTRAM Lathe for finish turning.
1—HAMILTON Single Purpose, Heavy Duty Lathe for facing base.
1—20" x 8' REED Lathe for waving and undercutting.
1—19" x 8' BERTRAM Lathe, with Bertram waving and undercutting attachment.
1—20" x 8' FLATHER Lathe, with turret on carriage, boring and tapping base.
1—28" x 8' LEBLOND Heavy Duty Lathe, turret on carriage, boring and tapping base.
1—HAMILTON Single Purpose Lathe, arranged for turning copper bands.
1—HAMILTON Single Purpose Lathe for facing base plate.
1—20" x 10' REED Lathe for seating and recessing fuse hole.
1—14" x 6' SEBASTIAN Lathe.
1—18" x 8' McGREGOR-GOURLAY Lathe, for rectifying.
1—HAMILTON Single Purpose Centering Lathe.
1—HAMILTON Single Purpose Re-centering Lathe.
1—HAMILTON Special Nose Milling Machine.
1—HAMILTON Special Pneumatic Base Plate Rivetting Machine.
1—HAMILTON Sand Blast Machine.
1—Electric-driven Painting Machine, 110 volts, 60 cycle.
1—HAMILTON Oil-burning Nosing Furnace.
1—HAMILTON [illegible] Hydraulic Press.
2—Triplex Pumps, 1" x 4".
1—Accumulator.
1—No. 3 CINCINNATI Universal Milling Machine.
1—24" x 6' PRATT & WHITNEY Engine Lathe.
1—GUSHOLT Tool Grinder.
1—STEWART Toolroom Gas-heated Bench Furnace.

All tooled up for British 4.5" High Explosive Shells. This equipment is all in good operating condition and can be inspected by appointment.

FULL DETAILS ON REQUEST.

The A. R. Williams Machinery Co., Limited
64 FRONT STREET WEST TORONTO, ONTARIO

FOR SALE



Large Blanking Press

76" between housings, 8" shaft,
3½" stroke, 8¾" die space.

Very good condition and for immediate delivery.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Ave. - - DETROIT, MICH.

PETRIE'S LIST of New and Used Machine Tools

In Stock for Immediate Delivery

TURRET LATHES AND SCREW MACHINES

16" x 5½' Pratt & Whitney, D.B.G. (3).
16" x 5½' MacGregor, D.B.G. (2).
16" x 6' Pratt & Whitney, B.G.
18" x 10' Libby (2).
22" x 8' Pratt & Whitney, B.G.
22" x 8' Martin, single purpose (2).
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
2" x 24" Stevens Screw Machines.
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

6" x 30" Dalton, B.G., bench.
13" x 6' Filsmith, D.B.G., comp. rest.
14" x 6' Lodge & Shipley, taper attachment.
15" x 6' Sebastian, B.G., comp. rest (3).
15¼" x 8' Carroll-Jamieson, D.B.G.
16" x 8' McDougall, B.G., comp. rest (2).
16" x 8' Porter, B.G., comp. rest.
18" x 10' Putnam, back geared.
20" x 8' Fifield, B.G., plain rest.
21" x 8' Bawden, heavy duty (4).
22" x 8' Pond, B.G., plain rest.
24" x 11' Pond, B.G., comp. rest.
26" x 14' Gleason, D.B.G.
30" x 10' Ames, B.G., plain rest.
31" x 16' Fifield, back geared.

DRILLS

14" Excelsior, sliding head, lever feed (5).
15" Avey, high-speed, ball-bearing.
16" Barr, sliding head, lever feed.
20" Barnes, 3-spindle, lever feed (2).
24" Foote-Burt, heavy duty.
24" Kerkhoff, back geared, power feed.
26" Prentice, back geared, power feed.
32" Cincinnati, heavy duty.
40" Bickford, back geared.
46" Allfree, back geared, power feed.
No. 10a Baush, 16-spindle.
D-1 Colburn, back geared, heavy duty.

GRINDERS

10" x 30" Landis, universal.
No. 1 Cincinnati, universal.
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer (2).
24" Barnes, wet tool.
2¼" Yankee, twist drill (3).

IRON PLANERS

20" x 20" x 5' Bertram (2).
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Pond, two heads
40" x 40" x 12' New Haven, power feed.
72" x 72" x 11' Canada, power feed.

MILLING MACHINES

Bertram, plain.
Brown & Sharpe, power feed, plain.
No. 2 Cincinnati, universal, cone type.
Monarch, vertical (2).
No. 2 Ford-Smith, plain.
No. 4 Fox, universal.

SHAPERS

16" Petrie, back geared (2).
16" Canada Mach. Corp., back geared.
16" Cincinnati, back geared (4).
24" Gould & Eberhardt, back geared.
30" Morton, back geared, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6' Robertson Hack Saws.
4½" Martin Cutting-off Machine.
No. 2 Grant Rotary Riveting Hammer.
No. 4A High Speed Riveting Hammer.
⅜" Garvin Vertical Tapping Machine.
No. 3½ Greenerd Arbor Press.
No. 180 Brown-Boggs Power Presses (2).
No. 18 Can. Hanson & Van Winkle Power Press.
No. 3 Goldie & McCulloch Hydraulic Banding Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.
FRONT STREET WEST, TORONTO

RIVERSIDE Machinery Depot

We Own Every Tool Offered

NEW MACHINE TOOLS

For Immediate Delivery

1—18 x 8 Springfield Standard Engine Lathe.
2—16 x 8 Springfield Q.C.G. Engine Lathes.
1—16 x 6 Springfield Q.C.G. Engine Lathes.
2—16" Springfield B.G. Shapers.
2—20" Springfield B.G. Shapers.
1—25" Springfield B.G. Shapers.
3—14" Pierce Turret Lathes.
2—1 x 8 Pierce Hand Screw Machines.
3—No. 1½ American Milling Machines.
1—No. 20 Bliss O.B.I. Press.
1—No. 19 Bliss O.B.I. Press.
1—No. 18C Bliss O.B.I. Press.
1—No. 18 Bliss O.B.I. Press.
5—20" Buffalo B.G. P.F. Drill Presses.
3—20" Canedy-Otto B.G., P.F. Drill Presses.
2—20" Champion B.G., P.F. Drill Presses.
3—20" Champion Plain Drill Presses.
3—20" Silver Plain Drill Presses.
3—20" Canedy-Otto Plain Drill Presses.
2—14" Champion Plain Drill Presses

USED MACHINERY

ENGINE LATHES

1—22 x 14 Putnam Standard Engine Lathe.
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Springfield Standard Engine Lathe.
1—14 x 6 Prentiss Standard Engine Lathe.
1—14 x 6 Sebastian Standard Engine Lathe.
2—13 x 8 Barnes Standard Engine Lathe.
1—13 x 5 Barnes Standard Engine Lathe.
1—10 x 4 Sebastian Standard Engine Lathe.

TURRET AND SCREW MACHINES

2—No. 6-A Potter & Johnston Automatic Lathes.
1—4¼" Gridley Automatic Screw Machine, motor driven.
2—No. 4 Foster F.G.H. Hand Screw Machines.
2—No. 3 Foster F.G.H. Hand Screw Machines.
1—No. 5 Pierson F.G.H. Hand Screw Machine.
4—12" Warner & Swasey Turret Lathes with air chucks.
4—16" Warner & Swasey Turret Lathes.
2—2" Cleveland Automatic Screw Machines, jigger feed.
1—⅝-¾" Cleveland Automatic Screw Machine.

MILLING MACHINES AND GRINDERS

1—No. 4 LeBlond Plain Milling Machine.
1—No. 2 Hendey Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drilling Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
1—No. 2½ Bath Universal Grinder.
1—No. 12 Modern Plain Grinder.
1—No. 14 Modern Plain Grinder.
1—No. 1 Landis Internal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.

DRILL PRESSES

1—5' Mueller Plain Radial Drill, old type.
1—31" Barnes B.G., P.F. Drill Press.
1—3-spindle 8" overhang Henry & Wright High Speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.

SHAPERS AND PLANERS

1—18" Hendey Geared Shaper.
1—36 x 36 x 10' New Haven Planer, S.H.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS

1—Waterbury Farrell O.B.I. Press, geared.
1—No. 10 Perkins Drawing Press.
3—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—150-lb. Bradley Strap Hammer.

AIR COMPRESSORS

1—9 x 11 Chicago Pneumatic Belt-driven Air Compressor.
1—8 x 8 Fairbanks-Morse Belt-driven Air Compressor.
1—8 x 8 Gardner Single Belt-driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt-driven Air Compressor.
1—8 x 6 Westinghouse Steam Air Compressor.
1—6 x 6 Ingersoll-Rand Belt-driven Air Compressor.

We also carry a large assortment of Steam Engines, Steam Pumps and Electrical Equipment of all kinds. We are in the market to purchase machine tools, large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

Good Used Equipment

Traveling Cranes.

20-ton Browning Trolley, 5-ton zux., 56½" ga. (new).
20-ton Shaw, 56' 3" span, 110 V.D.C.
10-ton Case, 58' 3" span, 220 V.D.C.
20-ton Box, 49' span, 220 V.D.C.
10-ton P. & H., 48' span, 110 V.D.C.

Punches and Shears.

Single 48" tht., cap. 3 x 1¼", Providence.
Single 6" tht., cap. ⅞ x ⅞", Cleveland.
Single 15" tht., cap. ¾ x ½" (hand) new Doty.
Double 15" tht. cap. ¾ x ¾" Fischer.
Double, Queen City, 12" thts., cap. ⅝" x ⅝".
Double 12" blades, bar shear, cap. 2" sq., crucible.
Univ. Plate Shear, 18" blades, cap. ¾", Cleveland belted.
Univ. Plate Shear, 26" blades, cap. ½", Lewis belted.
Guillotine Shear, cap. 2½" sq., belted, Perkins No. 6.
Guillotine Shear, No. O. H. & J., 6 and 7" blades (2).
Guillotine Shear, Fisher, 21" blade, cap. 8 x 2".
Squaring Machine 120", cap. 3/16".

Miscellaneous.

Bolt Cutter, Acme 2", Class A, single head, dies.
Boring Mill, 10' Niles, Vertical, 2 heads.
Forging and Upsetting Machine, 1½" Acme, with dies.
Forging and Upsetting Machine, 2½" Ajax.
Hammer, 80-lb. Bradley, Cushion Helve.
Hammer, 35-lb. Maggowan & Finigan (Perfect), belted.
Rotary Planer, 36" Cleveland, belt driven.
Rotary Planer, 60" Cleveland, motor 60 cy., 440 V.
Milling Machine, No. 24 Osterlein Universal.
Pipe Machine, 8" E. C. & B.
Pipe Machine, No. 11 Jarecki.

GOOD CONDITION.
PROMPT SHIPMENT.

McCoy-Brandt Machinery Co.
216-18 Penn Ave.
PITTSBURGH, PA.

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15" three-jawed chuck.
1—Lathe, 28" swing, 8' bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22" Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15" three-jawed chuck.
1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 24" wheel.
1—Lathe, 14" swing, 6' bed.
2—Ford Smith Shell Grinders, complete.
1—17" LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
1—16" Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
1—Double End Painting Machine, with ¼ h.p. motor.
1—Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—6 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
Sherbrooke, Que.

Chas. A. Strelinger Co.,

43-51 E. Larned St.
DETROIT - MICHIGAN

Machine Tools For Immediate Delivery

DRILLING MACHINES

No. 1-B 8" overhang Henry & Wright Sens. Drill.
No. 2-K 8" overhang Henry & Wright Sens. Drill.
No. 2-B 8" overhang Henry & Wright Sens. Drill.
14" Royersford Sensitive Drill.
No. 7-15" Barnes Upright Drill.
No. 5-20" Buffalo Drill with Power Feed.
No. 1-S Garvin B.G. Horizontal Drill with pump and piping.

GRINDING MACHINES

No. 2 Blount Double End Emery Grinder.
14" Diamond Grinder with countershaft and guards.
No. 1¼ Webster & Perks "T" Grinder with countershaft.
14" Blount Wet Tool Grinder.
No. 6 Gardner Pl. Bearing Disc Grinder with countershaft.
No. 3 Wilmarth & Morman Surface Grinder.
No. 2 Diamond Aut. Surface Grinder 36x12x12.
Geometric Chaser Grinder with countershaft.
No. 3 Gardner B. B. Polishing Lathe.

LATHES

11" x 5' Type "H" Dalton Lathe with taper and draw-in attachment.
No. 5½ Sloan & Chace Precision Bench Lathe.
14 x 6 Monarch Q.C., D.B.G. Engine Lathe, with taper attachment and oil pan.
16 x 8 Monarch Q.C., D.B.G. Engine Lathe.
16 x 7 Oliver Q.C., D.B.G. Engine Lathe with oil pump.
17 x 8 Sidney Q.C., D.B.G. Engine Lathe.

MISCELLANEOUS

21" Gisholt Turret Lathe.
No. 6 Whitney Hand Miller.
No. 1 Standard Hand Miller with oil pump.
No. 38-B Chicago Small Milling Machine.
Fischer Oil Groover.
No. 3 Niagara Inclinable Power Press.
Manhattan Type "A" No. 101 Screw Press.
No. 18 Lea-Simplex Cold Metal Saw.
Peerless H.S. Metal Hack Saw, capacity 6".
No. 5 Federal Pl. Hd. Turret Lathe.
No. 2-A Quickwork Rotary Shear.
No. 1 Garvin Screw Slotter.
¾" Geometric Threading Machine.
Type "A" Sioux Valve Seating Machine.

USED MACHINERY IMMEDIATE DELIVERY

DRILLING MACHINES.

30" Lodge & Davis, S.H., B.G., P.F.
3½' Hamilton Plain Radial, tapping attachment.
4' Mueller Plain Radial.
Four No. 310 Baker Heavy Duty.
3-spindle Rockford.
4-spindle Rockford.
4-spindle Washburn, with power feed.
4-spindle Allen.
No. 11 Pratt & Whitney, 10 spindles.

GEAR CUTTERS.

24" x 7" G. & E., spur gears.
No. 3 26" B. & S., spur gears.
No. 13 B. & S., spur gears.
30" x 9" G. & E., spur and bevel gears.
36" x 9" G. & E., spur and bevel gears.
36" Walcott, spur gears.
No. 1 Schuchardt & Schutte Gear Hobber.

GRINDERS.

No. 1 Cincinnati Universal Tool and Cutter.
No. 1½ Cincinnati Cutter and Tool.
No. 2 Woods Tool and Cutter.
Brainard Cutter.
Leland Universal, with power feed.
No. 2 Landis Universal.
No. 6-A Diamond Universal.
10" x 36" Landis Plain (new).

LATHES.

10" x 5' LeBlond, C.R., with chuck.
14" x 6' Rockford, C.R.
15" x 6' Rockford Tool Co., C.R.
16" x 8' Bradford, C.R.
18" x 6' Bradford, C.R., taper attachment.
18" x 8' Lodge & Shipley, pat. head, C.R., taper attachment.
20" x 14' Blaisdell, C.R.
21" x 12' New Haven, C.R.
24—27½" x 14' Lodge & Shipley, selective geared head, Q.C.G., 18" chuck, fitted.
24—27" x 12' Reed-Prentice, geared head, single pulley drive.
32" x 12' Schumacher & Boye, 28" chuck, fitted.
36" x 18' Schumacher & Boye, T.B.G., Q.C.G.
36" x 20' American, T.B.G.

PLANERS.

24" x 24" x 6' American, one head.
26" x 26" x 8' Pease, one head.
36" x 36" x 12' Rockford, 4 heads.
36" x 36" x 14' Sellers, one head.
39" x 39" x 12' New Haven, one head.

SCREW MACHINES.

No. 1 Warner & Swasey, plain head.
No. 2 P. & W., friction head.
No. 2 Foster, plain head, A.C. and W.F.
No. 3 Pratt & Whitney, B.G., double friction head, A. C. and W.F.
No. 3 Bardons & Oliver, plain head, A.C. and W.F.
No. 4 Pearson, friction head, A.C. and W.F.
No. 5 Foster, geared friction head, A.C., P.F. to turret slide, and P.F. to cross slide.
1—¾" Gridley, 4-spindle automatic.
3—¼" Gridley, 1-spindle automatic.

TURRET LATHES.

No. 2 Foster-Kimball, plain head.
No. 22 Garvin, plain head.
16" Lodge & Davis, back geared.
16" Warner & Swasey, friction head.
2 x 24" J. & L., cone head.
24" Gisholt, 4¼" spindle hole, taper attachment.
No. 3-A Warner & Swasey, bar attachment.

PUNCHES AND PRESSES.

No. 2 Rockford, O.B.I.
No. 3 Loshbough-Jordan, O.B.I.
No. 4 Rockford, O.B.I.
No. 74½ Bliss, str. side, geared.
Blake & Johnson Embossing.

MISCELLANEOUS.

4" Nutter & Barnes Cutting-off Machine.
6" x 48" P. & W. Thread Miller.
No. 3 Cincinnati Vertical Milling Machine.
20 H.P. Nash 2-cylinder Vertical Gas Engine.
6 H.P. Fairbanks-Morse Horizontal Gas Engine.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., CHICAGO, ILL.

AUCTION! AUCTION!

WE WILL SELL AT UNRESTRICTED AUCTION, COMMENCING ON

TUESDAY, DECEMBER 4th, 1917, AT 10.30 A.M.

AND CONTINUING UNTIL ENTIRE STOCK IS DISPOSED OF THE

REAL ESTATE, MACHINERY, EQUIPMENT, MERCHANDISE, TRUCKS AND FINISHED CARS

FORMERLY BELONGING TO THE

PULLMAN MOTOR CAR COMPANY, YORK, PA.

INVENTORY VALUE OVER $1,000,000.

Consisting of over 200 of the finest Machine Tools in the finest of shape, and consists of Cincinnati, Becker Brainard, Fox and Chicago Milling Machines, Steinle, Grenlee, Jones & Lamson Turret Lathes, Whitcomb, Blaisdell, Hendey, Reed, Pratt & Whitney, Springfield Lathes, Bardon & Oliver, Gridley Automatic Screw Machines, Cincinnati, Norton, Landis & Heald Grinders, Schuchardt & Schuette and Fellows Gear shapers and Hobbers, Pratt & Whitney Thread Millers, Avey, Henry & Wright, Barnes, Hamilton, Snyder, Quint Foote Burt Drills and Radials, La Pointe Broach, Toledo & Bliss Punch and Arch Presses, Greenard Arbor Presses, Ingersoll Air Compressors, Pettingill, Yoder, Bertsche Body Machines, etc.

Complete Body Plant, together with all the latest Machinery for Painting and Drying and Upholstering Department.

150 Allis Chalmers, Wagner, General Electric and Westinghouse Motors, ranging from ½ to 120 H. P., all 220-Volt, 3-Phase, 60-Cycle A. C., with Oil Starters.

$75,000 worth of the finest small shop Tools.

$300,000 Standard Automobile Material, such as Pumps, Batteries, Transmissions, Speedometers, Electric Gear Shafts, Spark Plugs, Nuts, Magnetos, Cable, Wire, Grease and Oil Cups, Screws, Shackle Bolts, Bodies, Axles, Springs, Starting Systems, Steering Gears, Radiators, and hundreds of other items too numerous to mention.

$75,000 Upholstering and Painting Material in Fabrikoid, Duck, Linoleum, Hair, Belting, Springs, Top Sockets, Clincher Buttons, Acme Fasteners, Straps, Leather, Varnish, Enamels, Paints, etc.

500 Ton Body, Sheet and Tin Plates, Ribbon Steel, Tool Steel, Cold Rolled, Hexagon and Flat.

200,000 feet Fine Selected Lumber in all Hardwood.

The entire stock will positively be sold at Public Auction in piece-meal lots only, and will not be put up as entirety at any time.

Parts will be sold December 4th.

Merchandise will be sold December 6th.

SAMUEL L. WINTERNITZ & COMPANY, Auctioneers

506 RECTOR BLDG., CHICAGO, ILL.

100 NEW LATHES Here at McCabe's for Immediate Shipment

These "High Duty" New Lathes will be installed in your shop with understanding there is nothing better built in workmanship — power and convenience in handling.

All-Steel Quick-Change Gear-box

3-step Cone—Double Back-Gears

26-in Swing	18-ft. Bed
26 " "	16 " "
26 " "	14 " "
26 " "	14 " "
24 " "	18 " "
24 " "	16 " "
24 " "	14 " "
24 " "	12 " "
21 " "	12 " "
21 " "	10 " "
18 " "	12 " "
18 " "	10 " "
18 " "	8 " "
16 " "	10 " "
16 " "	8 " "
16 " "	6 " "

(Get Bulletins with complete specifications.)

"McCabe" Double Spindle Lathes

26-48-in. SWING; 12-ft., 22-ft. and 24-ft. Beds in stock.

So many other Tools in Stock — you will have to get our latest Bulletin 283 — just issued — to get complete list of everything.

J. J. McCabe

149 BROADWAY - NEW YORK

MACHINE TOOLS IN STOCK

No. 4 Cincinnati Universal Miller with vertical attachment and power feed Rotary Table.
No. 3 LeBlond Universal Miller.
No. 1½ NEW American plain Millers.
5—No. 0 NEW Steptoe Hand Millers.
1" x 15" Pratt & Whitney Screw Machine.
28" x 16' Reed Lathe.
24" x 10' NEW Carroll-Jamieson heavy duty lathe.
20" x 6' Davis lathe.
20" x 10' Hamilton lathe.
6—19" x 8' NEW, Sidney D.B.G. quick change lathes, swing 21" over V's.
3—17" x 8' NEW, Sidney D.B.G. quick change lathe, swing 19" over V's.
15" x 6' NEW, Sidney D.B.G. quick change lathe, swings 17" over V's.
12—17" x 8' NEW, National quick change.
15" x 6' NEW, Carroll-Jamieson, quick change.
48" Harrington plain Radial Drill.
36" Dresses plain Radial Drill.
D-4 Colburn high duty Drills.
3—20" Rockford high duty Drills.
16" Queen City B.G. Shaper.
400 lb. Single Frame Steam Hammer.
125 lb. Dupont Belt Hammer.
30 Ton Watson & Stillman Hydraulic Press.

FRANK TOOMEY, INC.

127-131 North Third St., PHILADELPHIA, PA., U.S.A.

We Have for Immediate Delivery the Following Second-hand Machinery in Good Operative Condition

1 Landis No. 3 Universal Grinder 12" x 42", complete equipment, less internal grinding attachment. . $1,500

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $2,200

1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft $1,800

These machines are particularly good value, and may be seen at our works.

A. B. JARDINE & CO, LIMITED

HESPELER, ONT.

Machine Tools—We Give You Quality and Service

BORING MACHINES—Vertical.
2—32" Bullards, 1 turret head.
1—NEW 36" Gisholt, one swivel turret head, motor driven.
2—37" Baush, 2 heads.
1—42" Bausch; 2 swivel heads; quick-change.
1—42" Bullard, two swivel heads.
2—10' Niles, 2 swivel heads.

BORING MACHINES—Horizontal.
1—2½" bar, Niles.
1—No. 1 Cleveland, 2½" bar, quick-change; almost new.
1—No. 2 Barrett, 5" bar.
1—London, 6" bar.
1—Beaman & Smith, 7" spindle.
1—Barrett, 8" bar.

BULLDOZERS.
1—No. 9 Williams & White, belt drive.
1—No. 12 Ajax, single pulley drive.
2—No. 23 Williams & White, belt drive.
1—No. 26 Williams & White, belt drive.
1—No. 29-U Williams & White, arranged for motor drive.

CRANES—Traveling.
1—8-ton Chesholm & Moore, 13½' span, hand power.
2—10-ton Electric, 47' span, 25' lift, 3 motors.
1—10-ton Niles, 72' span.
1—10-ton Whiting, 3 motors, 24' span.
1—50-ton Niles, 61' span.

CRANES—Locomotive.
3—10-15-ton McMyler Broad gauge Steam Locomotive, 60' boom, bucket, 3 drums.
1—15-ton Industrial Locomotive, 8-wheel, 40' boom, bucket.
1—15-ton Brown Hoist Locomotive, 36' boom, bucket, 8 wheels.
1—20-ton Orton & Steinbrenner, steam locomotive 8-wheel, double drum, 37' boom, bucket.

CUTTING-OFF MACHINES.
1—NEW 4½" Davis.
3—Davis, 4½".
10—4½" Williams.
2—NEW 6" Davis.

DRILLING MACHINES—Radial.
6—NEW 3' Mueller, speed box drive; Dec. del.
3—NEW 3' American, Sensitive, tapping attachment.
2—4' Mueller, plain, speed box drive.
1—4½' Full Universal, cone drive.
1—NEW 5' Western Plain, with motor.
5—NEW 5' Mueller, speed box drive; Dec. delivery.
1—NEW 5' Baush; January delivery.
1—NEW 6' Baush; January delivery.
1—NEW 6' Triumph, motor drive; Dec. delivery.

DRILLING MACHINES—Heavy Duty.
2—D-2 Colburn Heavy Duty, 3½" cap., arranged for motor drive.
6—Foote-Burt Heavy Duty, 2½" capacity.
10—No. 310 Baker, single pulley drive, late type; arranged for motor drive.
10—Moline Hole Hogs, heavy duty, 2½" cap.

DRILLING MACHINES—Sliding Head.
2—NEW 24" Barnes, Drills and Tappers.
5—NEW 24" Barnes, Drills.
5—NEW 28" Sibley.

DRILLING MACHINES—Multiple Spindle.
1—4-spindle 20" Barnes, all geared.
1—No. 5 Fox, 12-spindle, 1" capacity.
2—6-spindle Rockford; Economy type.

GEAR CUTTING MACHINES.
5—No. 3 Brown & Sharpe Auto Gear Cutter, spur.
1—36" Newark.
1—36" Whiton, for spur gears.
2—No. 4 Brown & Sharpe, latest model, cap. 48" x 10".
1—No. 5 Brown & Sharpe, 60" capacity.
1—NEW 6" Standard Gear Cutter, spur.
1—15" Gleason Bevel Gear Planer.
2—26" Grant-Lees Gear Hobber, bevel spur and spiral attachment.
1—24" Becker-Brainard.
2—NEW 30" Flather, solid pattern.
3—36" Fellows Gear Shapers.
1—NEW 37" Gleason Gear Bevel Planer; Feb. delivery.
1—72" Gould & Eberhardt, for spur and bevel.

GRINDERS—Universal for Cutters, Drills, Reamers, Etc.
5—NEW No. 190 Wells.
4—No. 1 Cincinnati.
1—NEW Premier, Universal.
1—NEW Wilmarth & Morman, style B.K.
1—NEW Walker No. 1, outfit B.
1—NEW No. 1 Wood Universal.
5—NEW No. 2 Wood Universal.
1—NEW Walker No. 2, outfit K, capacity 9"x26".
2—NEW No. 2 Oesterlein Universal.
7—NEW LeBlond.

GRINDERS—Cylindrical. Plain.
2—NEW 8" x 18" Modern Self-contained.
3—NEW 8" x 30" Modern Self-contained.
2—NEW 12" x 24" Modern Self-contained.
6—12" x 36" Modern Self-contained.
2—12" x 42" Landis Self-contained.
5—12" x 48" Modern Self-contained.
7—NEW 10" x 50" Norton.
1—14 x 50 Norton.
1—NEW 10 x 72 Norton; Plain.
1—12 x 96" Springfield.

GRINDERS—Cylindrical, Universal
2—NEW No. 2 Bath, 9" x 20".
1—NEW No. 2 Walker; 9" x 26".
1—NEW 2½ (10" x 36" Bath.)
1—NEW Thompson 10 x 36".
1—No. 3 (12" x 40" Brown & Sharpe).
1—12" x 42" Landis.
1—No. 4 Cincinnati; capacity 12 x 72".

GRINDERS—Internal
1—NEW No. 6 Modern, capacity 10" x 10".
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—Cylindrical.
1—No 60 Heald, single pulley drive.

GRINDERS—Surface.
4—NEW No. 1 La Salle Plain, with Micro. Adj.
1—NEW No. 1½ Walker's, complete.
2—NEW No. 2 American with Walker No. 1¾ Plain Flat Mag. Chucks.
6—NEW No. 2 Reid (Same as B. & S.).
1—3' Pratt & Whitney Vertical, Magnetic Chuck.

HAMMERS—Board Lift Drop.
1—No. 4 Standard Machinery Co., 400-lb.
1—E. W. Bliss, 800-lb.
1—1500-lb. Toledo.

HAMMERS—Steam Forging.
1—450-lb. Bell.
1—800-lb. Niles, single frame.
2—3500-lb. Chambersburg Steam Drop Hammers.
2—5000-lb. Chambersburg Steam Drop Hammers.
1—7000-lb. Morgan Special Double Stand.

KEYSEATERS.
1—NEW No. 2 Davis.
1—No. 2 Mitts & Merrill.
1—Colburn 4", capacity 43" stroke.
1—No. 2 Knowles, 66" stroke.
2—NEW No. 1 Davis.

LATHES—Manufacturing, not Screw Cutting
2—NEW No. 3 Harding Brothers, Bench Lathes.
3—16" x 8' Fairbanks-Morse, Heavy Duty.
70—NEW Simplex 16" x 8'.
14—Reed-Prentice Shell Lathes for 4" or 18-lb. American Shells.
2—25" Barrett Heavy Duty Boring Mill.
50—20" x 10' Hindman, High Duty.
7—36" x 20' Heavy Duty N.B.P. Projectile Boring, Motor Driven; almost new.

LATHES—Engine.
3—NEW 14" x 6' Bradford Quick Change.
14—NEW 15" x 6' Rockford.
1—NEW 14" x 6' Hendey, Geared Head.
3—NEW 16" x 6' Cleveland Tool Room Lathes, complete equipment.
4—NEW 16" x 8' Bradford Quick Change.
1—NEW 17" x 8' National Quick Change Gears.
12—NEW 17" x 8' LeBlond Pan Bed, Quick Change Gears.
1—18" x 10' Hendey, quick-change gear, 14" chuck.
5—NEW 20 x 10 Bradford Quick Change.
1—NEW 20" x 10' Cleveland Geared Head.
3—NEW 20" x 12' Bradford Quick Change.
19—NEW 21" x 10' Porter, S.B.G.
9—22" x 10' Putnam, Oil Pan and Pump.
1—NEW 24" x 10' Bradford Quick Change.
5—NEW 24" x 12' Bradford, Quick Change.
1—NEW 24" x 12' American.
3—24" x 14' American, Quick Change.
1—NEW 26" x 48" x 12' McCabe Double Spindle.
1—NEW 26" x 48" x 22' McCabe Double Spindle.
1—NEW 30" x 14' American Double Back Geared, Quick Change.
1—30" x 14' Lodge & Shipley Single Pulley Drive, Quick Change.
1—NEW 32" x 12' Pittsburg Pattern.
1—36" x 13' Putnam, face plate drive.
1—36" x 17' Pond, triple geared, quick-change.
1—NEW 42" x 24' Triple Geared, Houston, Stanwood, Heavy Duty.
1—42" x 28' Hamilton, Triple Geared, Quick Change, raising blocks 54".
1—50" x 24' Prentiss.
1—54" x 22' Worcester, Triple Geared.
1—58" x 18' 6" Dodge Lathe, Very Heavy.
1—NEW 66" x 46 Putnam Triple Geared, Face Plate Drive 5-step Cone; 6½" belt.
1—84" x 18' Special Boring Lathe.

LATHES—Turret.
8—NEW 21" Gisholt H-21.
2—NEW 24" Gisholt I-24.
5—2 x 24 Jones & Lamson.
1—NEW 18" Libby.
3—24" Libbey, Universal Facing Head, 3-jaw chuck.
1—26" Steinle, almst new.
18—6A Potter & Johnson.
1—No. 24 New Britain, arranged for motor drive; almost new.

MILLING MACHINES—Knee Type, Universal.
1—No. 2 Kempsmith, Vertical Attachment.
1—No. 2 Kempsmith 13" Dividing Head.
1—NEW No. 2 Rockford High Power.
2—NEW No. 2 Garvin.
1—No. 2 LeBlond.
1—NEW No. 3 Owen.
2—NEW No. 3 Cincinnati High Power.
1—No. 3-H LeBlond Heavy Duty; almost new.
1—No. 25 Oesterlein.
1—NEW No. 34 Oesterlein Heavy Duty; latest type.

MILLING MACHINES—Knee Type, Plain.
9—NEW No. 0 Rockford.
2—NEW No. 1½ American, back gear.
2—NEW No. 2 Rockford.
3—No. 2 Cincinnati.
1—No. 3 LeBlond.
1—NEW No. 3 Cincinnati.
2—No. 3 Kempsmith.
1—NEW No. 3 Owen.

MILLING MACHINES—Duplex.
1—No. ½ Van Norman; almost new.
1—No. 2 Garvin Spiral Drive.

MILLING MACHINES—Hand.
3—NEW No. 1 Rockford without column.
3—NEW No. 2 Rockford on column.
2—NEW No. 3 Rockford on Column.
3—NEW No. 3 Rockford on column, power feed.

MILLING MACHINES—Vertical.
1—No. 2 Cincinnati, latest type with circular table; as good as new.
1—No. 2 Pratt & Whitney.
1—No. 3 Cincinnati Heavy Duty.
2—NEW No. 4 B. Becker.
2—NEW No. 5 B. Becker; Rotary Table.
1—Newton Vertical, Continuous, Motor Driven, for shell work.

MILLING MACHINES—Planer Type.
1—No. 2 Beaman & Smith.
1—Ingersoll Slab 16" x 48" capacity.
1—NEW 17" x 5' Eynon Planer Type.
1—30" x 30" x 8' Ingersoll No. 928, Single Spindle with Motor.

MILLING MACHINES—Lincoln Type.
1—NEW No. 1 Gooley & Edlund, Briggs Type.
3—NEW No. 1 American.
18—NEW Sellers Auto. Quick Return.

PLANERS.
8—NEW 24" x 24" x 6' Powell, Single Head.
1—20" x 20" x 10' Gray; 1 Head.
1—30" x 36" x 10' American; 2 Heads.
1—36" x 36" x 14' Pond; one head.
1—36" Rotary Planer, Motor Driven.
1—36" x 36" x 8' Gray; One Head.
1—42" x 36" x 14' American, 2 heads.
1—42" x 42" x 12' Butler, High Speed; 3 Heads; almost new.
1—48" x 48" x 12' Scott; Heavy Type; Milling Attachment, on Rail.
1—52" x 48" x 15' Betts; 2 Heads.
1—60" x 60" x 16' Betts; 2 Heads.
1—60" x 60" x 21' Pond; 3 Heads.
1—62" x 62" x 20' Canada Tool Works Planer; 2 Heads.
1—72" x 60" x 14' Smith Globe; 2 Swivel Heads.

SCREW MACHINES—Hand.
3—No. 0 Brown & Sharpe.
4—NEW No. 2 Foster Geared Friction Head.
1—NEW No. 4 Foster Geared Friction Head, Power Feed to Turret Slide.
2—NEW No. 5 Foster All Geared Power Feed to Turret Slide.
3—NEW No. 5 Foster All Geared Head, Power Feed to Turret; Power Cross Feed.
2—NEW No. 6 Foster Geared Friction Head, Power Feed to Turret; Power Cross Feed.
5—NEW No. 7 Foster Geared Friction Head, Power Feed to Turret; Power Cross Feed.
2—NEW No. 10 Foster Geared Friction Head, Power Feed to Turret; Power Cross Feed.
2—NEW 2¼" Dreses F.G.B. Power Feed.

SCREW MACHINES—Automatic
2—NEW ⅝" Cleveland, Model A.
1—NEW 3/8" Gridley Mult. Spindle, Belt Driven.
2—NEW 1¼" Gridley Mult. Spindle, Belt Driven.
2—NEW 1¾" Gridley Mult. Spindle, Belt Driven.
1—NEW 2¼" Gridley Mult. Spindle, Belt Driven.
1—NEW 3¼" Gridley Single Spindle, Belt Driven.
2—No. 0 Brown & Sharpe.
1—No. 2 G. Brown & Sharpe.
1—No. 515 National Acme.

SHAPERS.
1—NEW 16" Springfield.
1—16" Motor Driven Rockford.
5—NEW Barker 24".
2—NEW 24" Milwaukee.
2—NEW 24" Potter & Johnson Universal Rotary Table.
1—25" Springfield.
2—30" Morton Draw Cut.

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1—Waterbury-Farrell Alligator, cap. 2½".
1—Cincinnati Gap, 17" gap, 78" blade; ¼" capacity.
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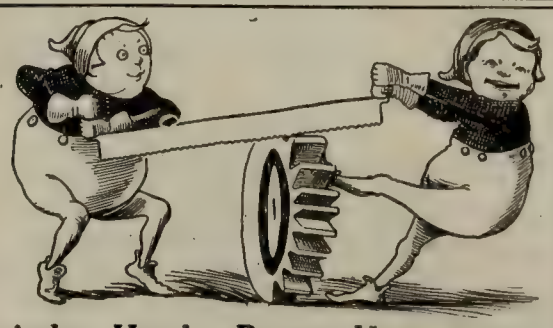

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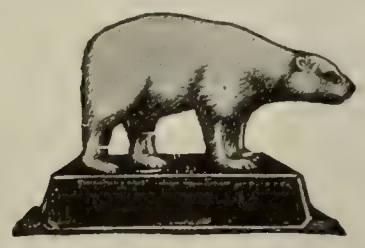

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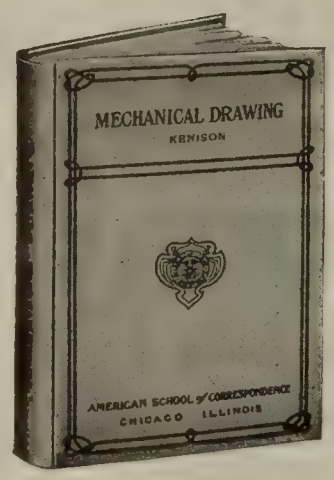

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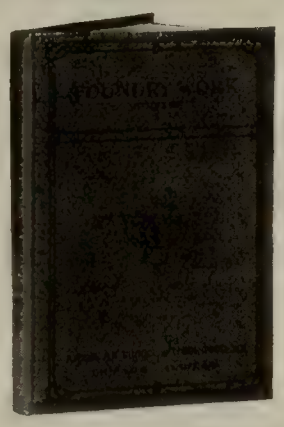

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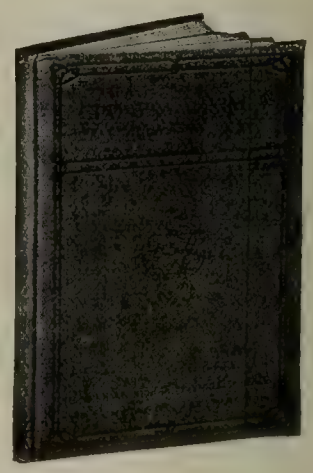

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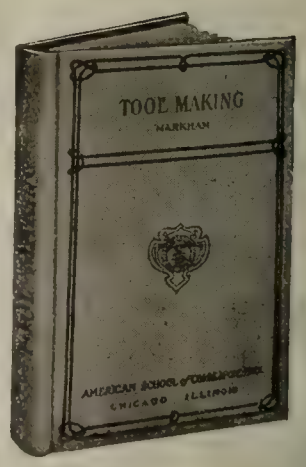

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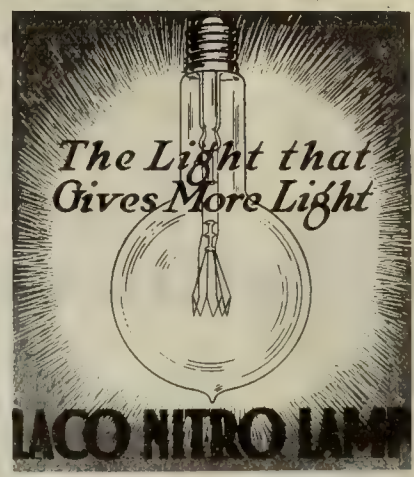

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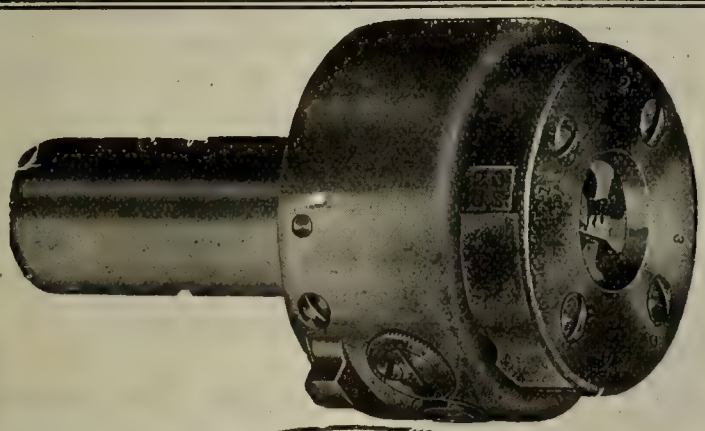

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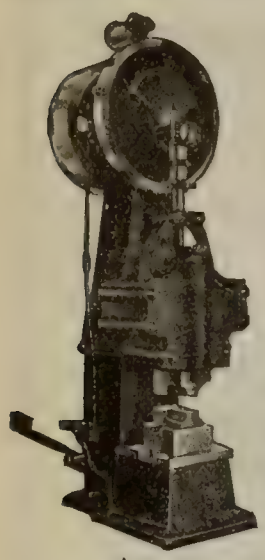

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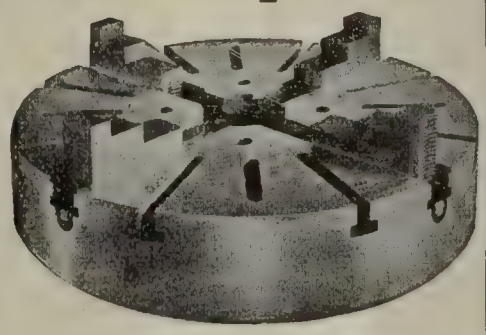

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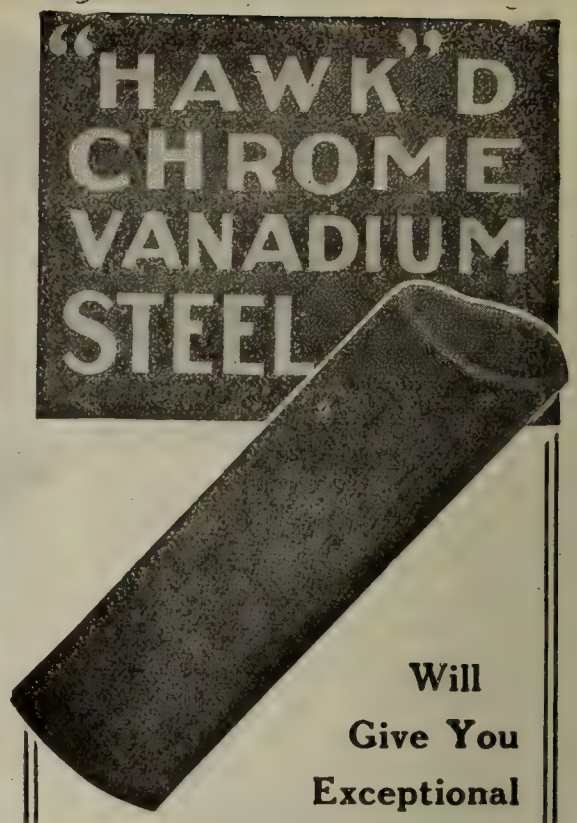

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We can finish steel stamping in Nickel, Brass or Copper.

Send us a sample order.

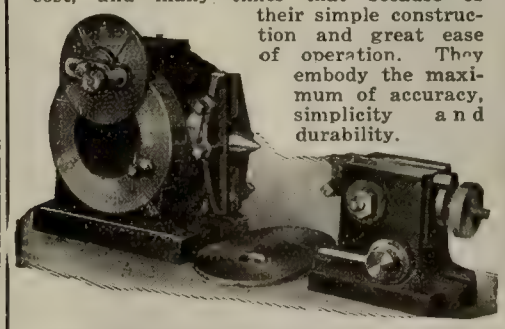
W. H. BANFIELD & SONS

372 Pape Avenue, Toronto, Can.

Quality Is Highest — Not The Price

Dickow's Guaranteed 10-Inch Universal Index Centers

YOU SAVE from $50 to $125 on first cost, and many times that because of their simple construction and great ease of operation. They embody the maximum of accuracy, simplicity and durability.



Get the Original—Beware of Imitators

Sold by all dealers. Write to-day for particulars

Fred. C. Dickow, 35 So. Desplaines St., Chicago, Ill., U.S.A

MAPLE LEAF STITCHED COTTON DUCK BELTING

DOMINION BELTING CO. LTD.
HAMILTON CANADA

THE IRON WORKS LIMITED

Successors to

Owen Sound Iron Works

Owen Sound, Ont.

Engineers

Boiler-makers

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Machinists

Tank Work
Smoke Stacks,
Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order

Frank Mutton, Salesman

and salesmanager of very brilliant record—has completely caught a point of view which we have been presenting for years and years, and latterly, most of all. This point of view is:

Men engaged earnestly in the affairs of business will and do find immense help and illumination from reading each week THE FINANCIAL POST OF CANADA.

THEY get wheat sifted from the chaff. They get news and information about the things that really count in the conduct and movements of business and Canadian public affairs. They get a clear interpretation of news, events, happenings and factors that determine present and future developments. They read what big men have written or said about Canadian business and public affairs, and what exceedingly well-informed men glean about securities, markets, tendencies and other phases of business and investments; they read a commercial newspaper most interestingly written, admirably edited, sane and unpartizan. When a newspaper of this type and quality is available, the wonder is that any business executive or salesman or salesmanager tries to get along without it.

If we had written this letter ourselves, we could not have put it better:

Attention, Editor

Recently we sent you a subscription covering the delivery of "The Financial Post" to each of our Sales Agents and Salesmen throughout Canada. This was prompted by the fact, that in our opinion, your paper is the best barometer in Canada of what is going on in the different industries from one ocean to the other in this Country. Your paper contains information that is invaluable to any travelling representative of any firm.

Yours very truly,
F. E. MUTTON,
General Manager,
International Time Recording Company of Canada, Limited.
Toronto, Oct. 12, 1917.

Prior to his connection with International Time Recording Company, Mr. Mutton was Canadian manager of National Cash Register Co.

NO salesman or salesmanager can do his best work without knowing the kind of news which THE FINANCIAL POST exists to provide. Anything that multiplies a salesman's or salesmanager's knowledge and ability required in the selling of goods and in meeting buyers and customers, is likely to be a cheap, cheap investment. Mr. Mutton was and is a success because he incorporated into himself and his organization outer forces of power. Read his letter again.

OUR POINT IS:

BUSINESS and salesmanagers can most profitably do what Mr. Mutton has done: Subscribe for a copy for each man able to use knowledge of current business and public affairs in Canada to increase sales, to buy wisely, to know when to extend or contract credit, and when to go slow or speed up production.

The Financial Post of Canada

.....1917

MACLEAN PUBLISHING CO., LTD.,
143-153 University Ave., Toronto.

Send me each week THE FINANCIAL POST. I will remit the price, $3.00 a year, on receipt of bill.

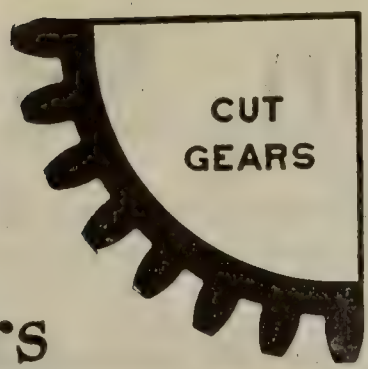
Signed.....

With.....
(Name of Firm)

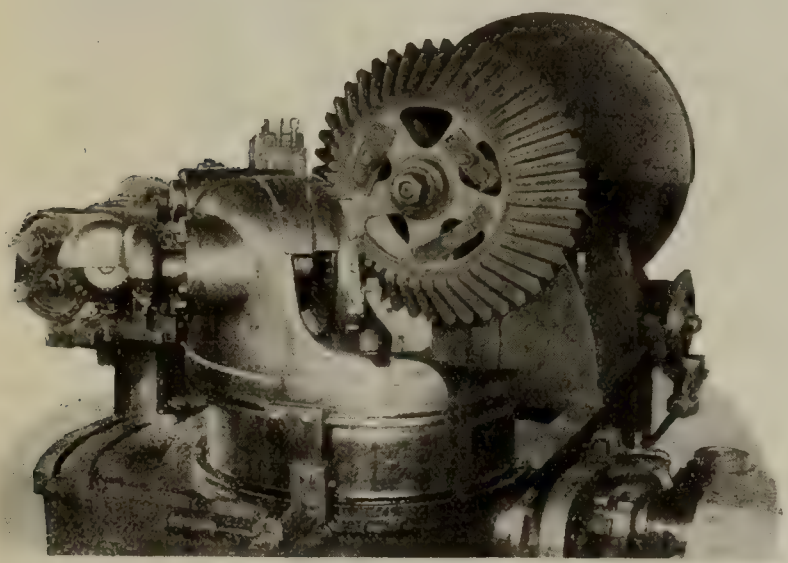
M.W.R.

Address.....

Good Cut Gears



Can not be made on makeshift machines.

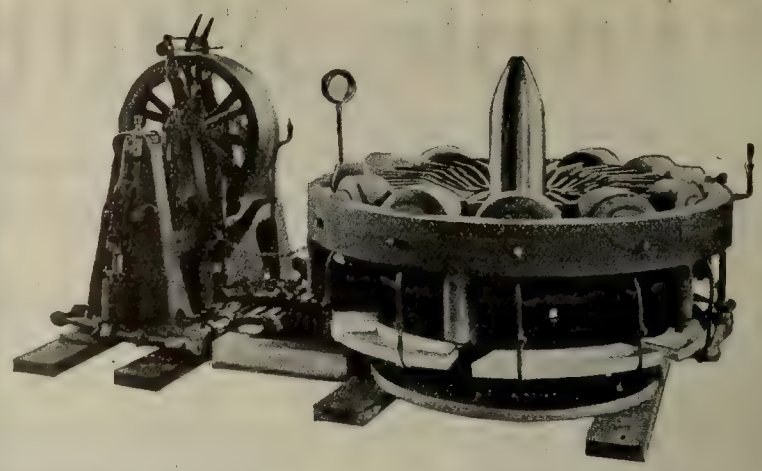


Our machines are modern —each the best of its kind. Expert workmen operate them, producing good cut gears.

Spurs, Bevels, Worms and Worm Gears, Helicals, Double Helicals and Sprockets, Racks and Internals.

Write us for quotations.

Hamilton Gear & Machine Co.
Van Horne Street - TORONTO



The New "West" Banding Press

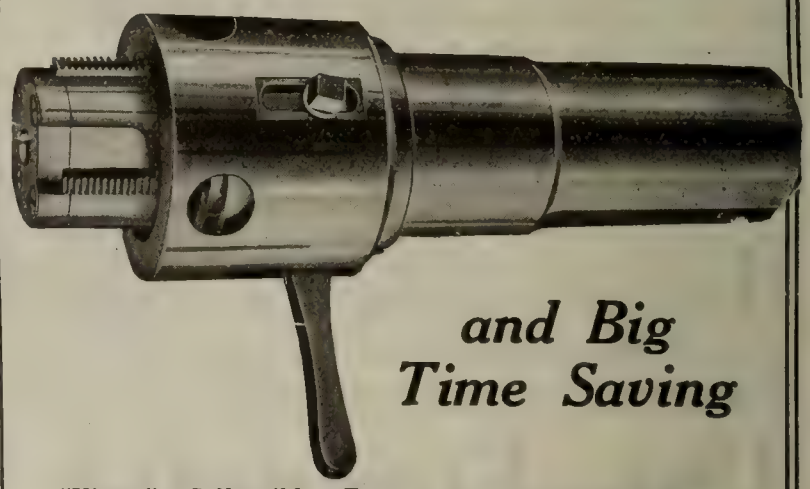
For 9.2" and 8" shells

12 Cylinders; Ample Power; Ample Strength; Reasonable Price.

NO ACCUMULATOR REQUIRED.

The West Tire Setter Co.
255 Mill Street, Rochester, N.Y.

For Positive Accuracy—



and Big Time Saving

VICTOR Collapsible TAPS

"Victor" Collapsible Taps are simple in construction; the few parts can be made large and strong; the body is machine steel, and the chasers are high-speed; screw adjustment from front end makes it easy to maintain close accuracy; trip is automatic; reset by means of lever. The above features —and others—make the "Victor" a time and money saver for severe service. It is being used by many shell manufacturers.

Victor Tool Company
Waynesboro, Pa., U.S.A.

TEXTILE BELTING and PACKINGS

HIGH SPEED TWIST DRILLS

J. R. BAXTER & COMPANY LIMITED, MONTREAL

and GENERAL MACHINERY SUPPLIES

The Lancashire Dynamo & Motor Company, of Canada, Limited

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ELECTRICAL MACHINERY for all Purposes.

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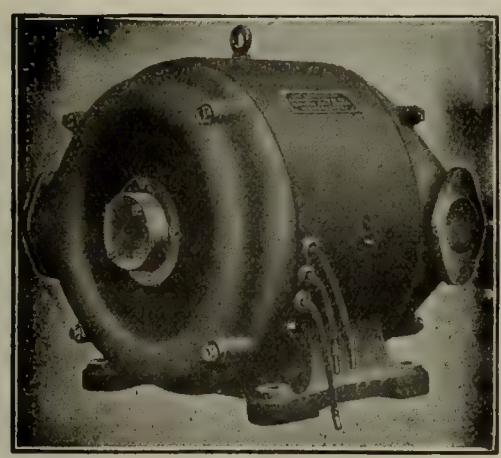

PIPE VENTILATED A C MOTOR

FOR VERY DIRTY PLACES

Wire Cloth of every description

TRADE MARK

We make Machinery Guards of all kinds.
Metal Lockers for Clothes
Steel Shelving for all purposes.

Drop a line for full details.

CANADA WIRE & IRON GOODS CO.

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BRASS Castings

The coupling of expert work with unexcelled equipment enables us to produce on a large scale Brass Castings of any size or alloy.

Our prices, too, are most reasonable; for our large purchases direct from the smelters command their every price favor.

For better Brass Castings at a money saving, send your orders to us. We promise that our work will please you.

The St. Lawrence Welding Company, Ltd., Montreal, P.Q.

Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, Etc. Electric Welders, Oxy-Acetylene Welders. Boiler Repairs. Lead Burning and Brass Foundry Work.

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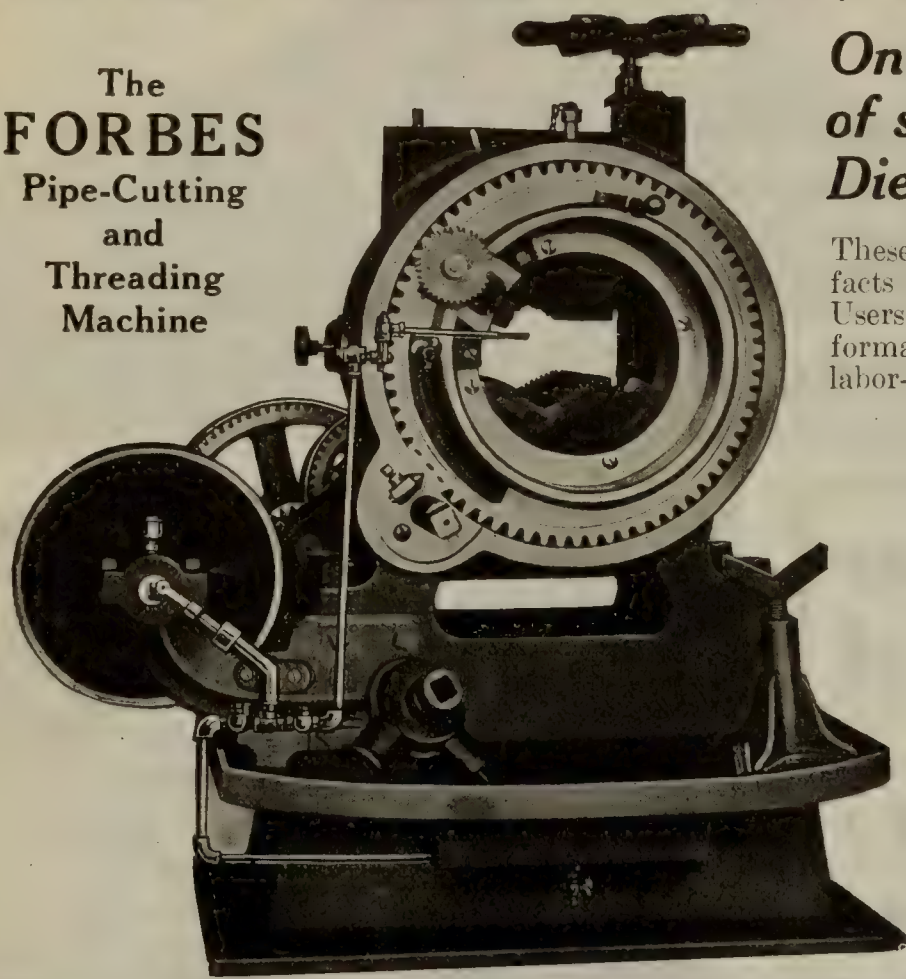
CUTS THREADS FAST, CLEAN and TRUE

The
FORBES
Pipe-Cutting
and
Threading
Machine



One man can do the work of six against old Stock and Die method of cutting

These are not exaggerated statements—they are facts that are being proven every day by Forbes' Users. Inquire for yourself. Investigate its performances closely and you can't help but admit its labor-saving, perfect-working value.

Inexpensive to Operate

It is simple, compact, self-contained, and all wearing parts are adjustable. One man can operate it and for heavy pipe work it can be taken right to the job.

Fitted with self-centering vise that holds the heavy pipe stationary, while the dies turn around it. The latter are clamped and released by a throw of the lever.

Write for our latest bulletin giving full details

THE CURTIS & CURTIS CO.

Garden Street

Bridgeport, Connecticut, - - U.S.A.

Handle 75-M/M Shells Just Once

Two Murchey Taps on your lathe completely finish this shell so that when it comes off the machine there is no more handling or re-sizing to do. Therefore

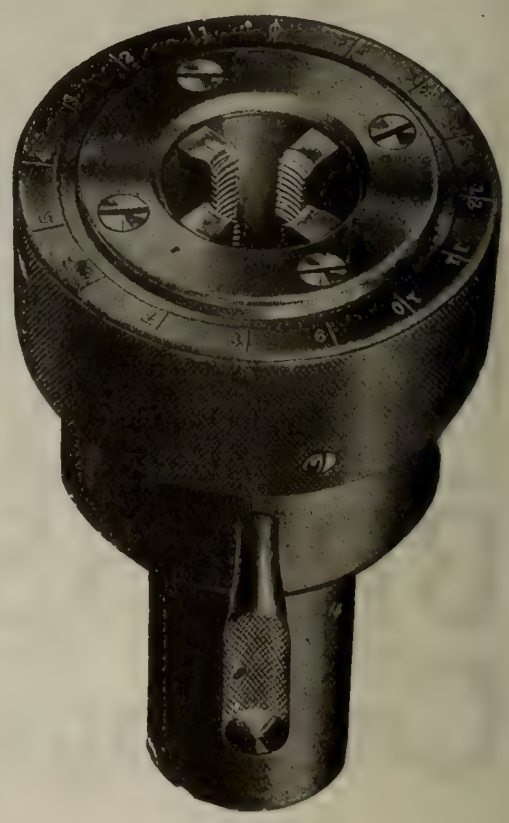
Murchey Tap Them

By using Murchey Collapsing and Adjustable Taps, you save two minutes or more on every 75-mm. Shell. Figure that in dollars for yourself!

Practically all the large plants of the United States are lining up with Collapsing Taps to thread the nose of this shell. No minute must be knowingly wasted.

Murchey Chasers are quickly adjusted to compensate for wear, and Murchey Adjustable Taps serve as long as ten solid Taps.

WRITE AT ONCE FOR ALL PARTICULARS.

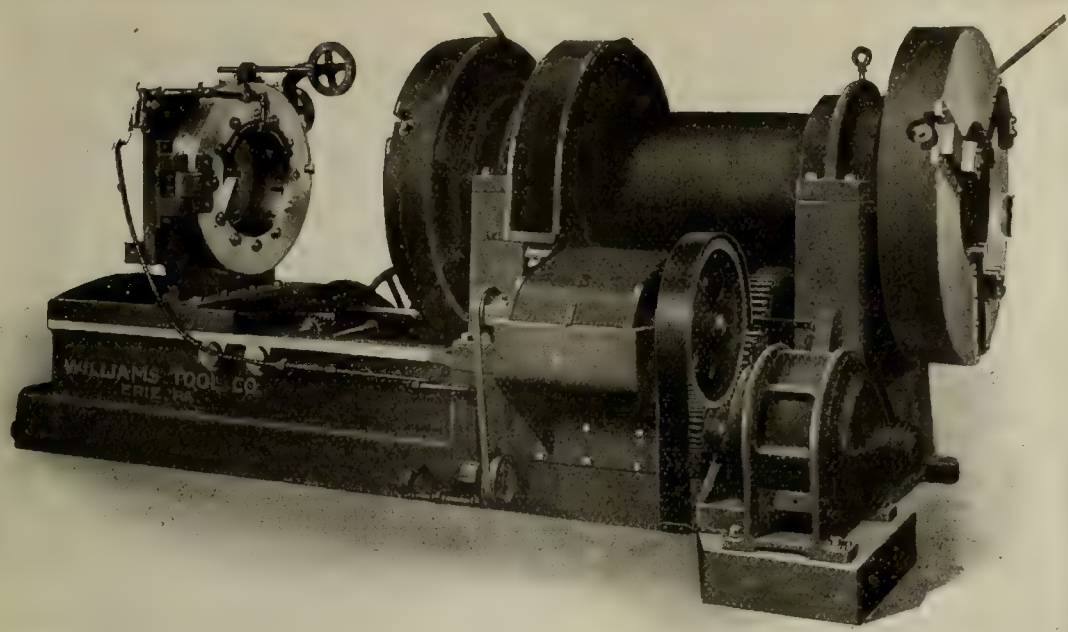


Lightning Deliveries
—That is Murchey Service

Murchey Machine & Tool Company

75 Porter Street, Detroit, Mich.

The Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, S. W., England, Glasgow, Newcastle-on-Tyne, and Fenwick Freres & Company, 15 Rue Fenelon, Paris, France



Highest Award Panama Exposition

Williams Tool Company

Erie, Penn., U.S.A.

Canadian Agents:
The A. R. Williams Machinery Co., Ltd., Toronto, Canada

European Agents:
Universal Machinery Corp. London, England

Pipe Machines

Threading

Cutting-off

Quality will tell in every test. At the Panama Exposition the Williams Cutting-off Machine was given the highest award. What does that mean to you?

It means that your pipe-threading and cutting-off operations will cease to give you any cause to worry if you are "Williams" equipped.

Made in 11 different sizes, each machine handling 8 to 10 consecutive sizes of pipe from ¼" to 18" dia.

Williams cutting-off machine is an investment, not an expenditure. It realizes exceptional dividends.

Write us at once!

A New Rockford

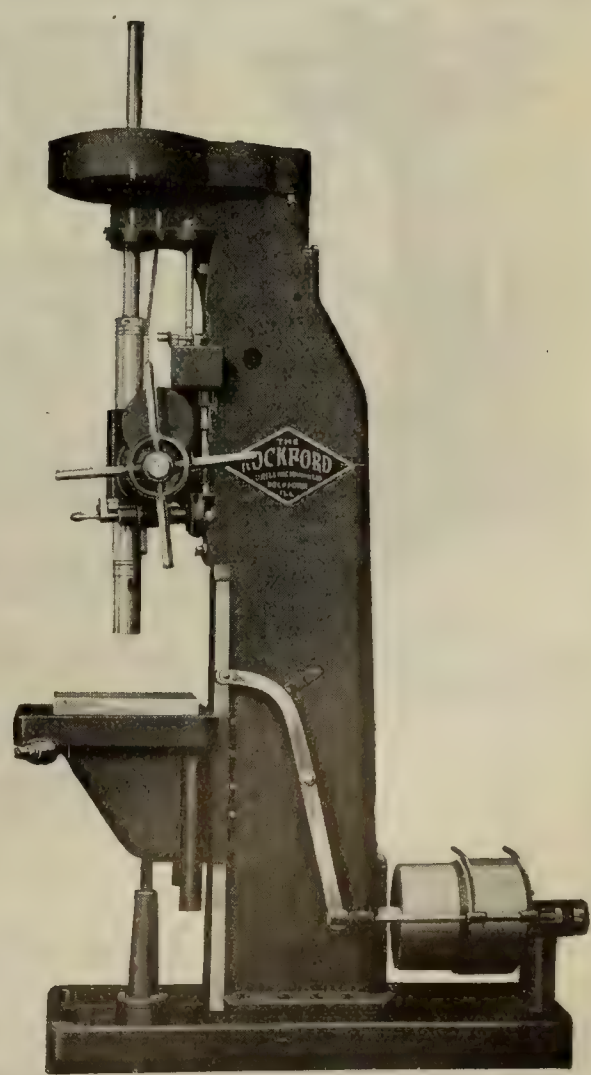
Column Type Machine

This High-Powered, Heavy Duty Rockford Drilling Machine—is our new box column type machine with capacity for driving high-speed drills up to 2½ inches diameter.

It is built in three styles, each possessing distinct constructive points that render positive rapid production, quality work and economy.

Just as powerful as it looks.

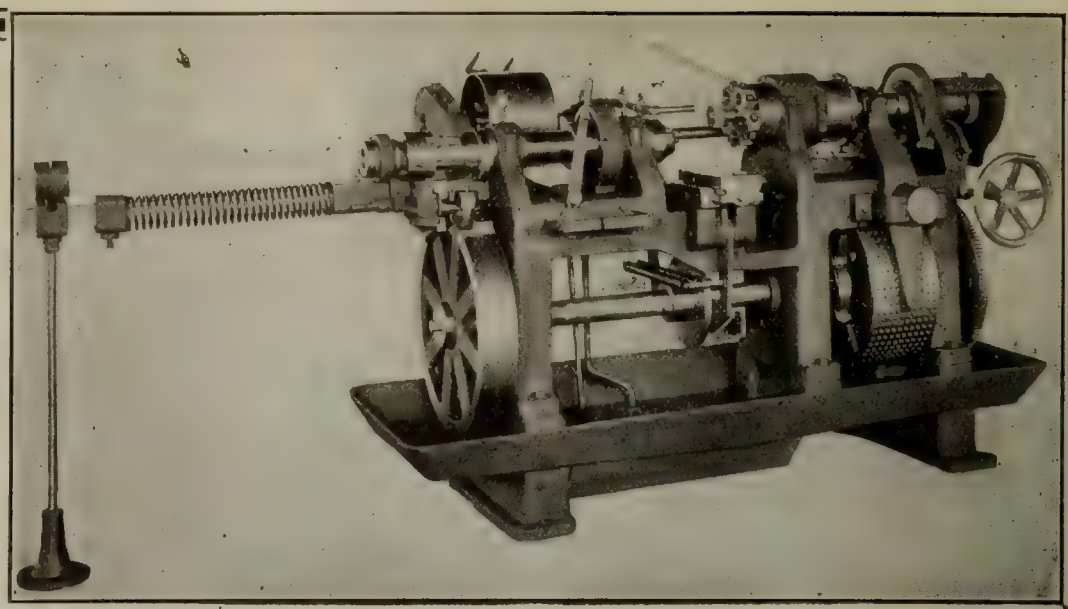
Investigate the New Rockford before you buy. Write us and get full particulars by return mail.



Rockford Drilling Machine Co.

Rockford, Illinois - - - U.S.A.

The Chicago Automatic Screw Machine



TEN YEARS OF EXTENSIVE MANUFACTURE OF ONE PRODUCT — AUTOMATICS — STAND BEHIND EVERY MACHINE.

No complicated mechanism or a system of cams that are difficult to determine and arrange on this machine.

The rigidity of the machine has not been sacrificed for the flexible features which are embodied in the Chicago Automatic. Alignment is correct and there are no parts where excessive wear takes place—therefore, accurate production is assured during the long life of the machine.

Spindle speeds suitable to different sizes and kinds of stock within the capacity of the machine are obtained by changing two gears on the spindle head.

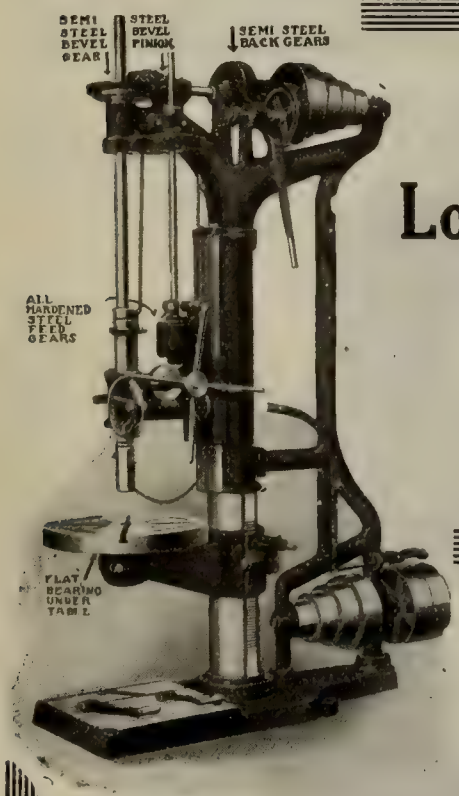
In less than six weeks we can place Chicagos in your plant ready for production.

They must satisfy you before we consider them sold. Write us about all the features now.

THE JOHN MACNAB MACHINERY COMPANY

NEW YORK CITY, U.S.A

European Representatives: John MacNab, Hyde, England



Lower Your Production Cost!

AURORA

Drilling Machine

Strength is the word that distinguishes this machine. Special care has been used in bringing this Drill up to its present point of efficiency. If you are in the market for drills which must have speed and accuracy, consult us. This is an ideal machine for HIGH EXPLOSIVE SHELLS. Inquire—we have the goods.

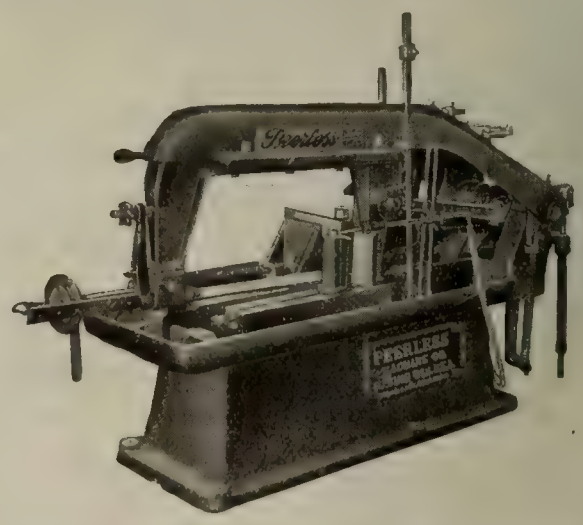
Stationary head sizes—20", 21".
Sliding head sizes—22", 24".

The Aurora Tool Works

AURORA, INDIANA, U.S.A.

DON'T be governed by World-Wide Reputations and Previous Records in selecting your next Cutting-Off Equipment. The NEW IMPROVED PEERLESS High Speed Heavy Duty Metal Cutting Saw has completely revolutionized and upset all metal cutting standards.

This statement is based entirely upon the reports and repeated orders received from concerns that had heretofore used tools such as referred to.



To induce investigation we will gladly ship one for a comparative test. If you do not consider it the best and most profitable tool you have ever purchased, you are under no obligations to keep it, and we will stand the freight charges both ways.

Would you like to see a list of large manufacturers that are continually repeating their orders? We have it ready for you.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

NO DRAGGING BACK ON THE NON-CUTTING STROKE

To protect users of Racine High-Speed Metal-Cutting Machines, we carry a large stock of the famous Racine H.S. Tungsten Blades.

A patented device of this Racine High Speed Metal Cutting Machine automatically lifts the blade clear of the work on every return stroke.

In this feature alone the Racine increases both output and endurance of the blade 500 per cent.

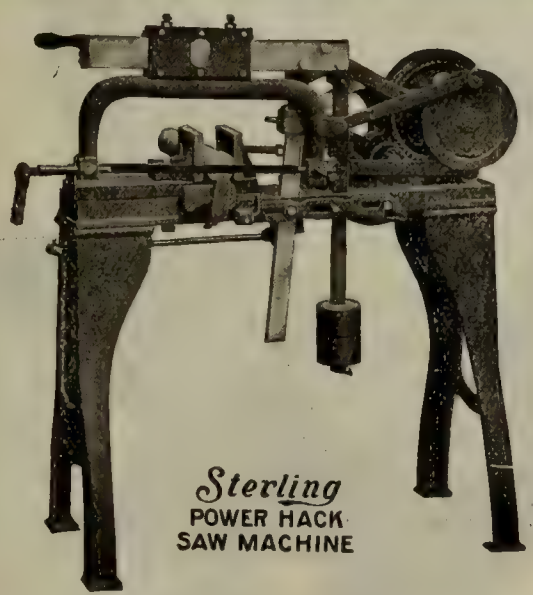
Therefore time saved—blades saved—would soon return to your pocket the reasonable cost of a Racine.

This fact—because it is a fact—could be proved to your satisfaction if you'd let us send you names of Canadian plants using Racines—one Montreal plant is using 168—or if you'd let us ship a Racine on trial terms that you consider fair.

Write us to-day.

RACINE TOOL & Machine Co., 15 Melbourne Ave., Racine, Wis., U.S.A.

"STERLING" HACK SAWS



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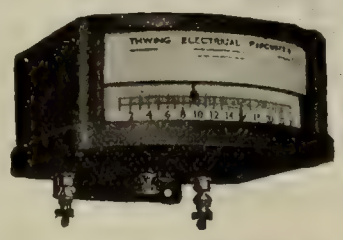
DIAMOND SAW & STAMPING WORKS

BUFFALO, N.Y., U.S.A.



Insuring Accurate Temperature Measurements

THWING

HIGH RESISTANCE MULTIPLE RECORD

PYROMETERS

are instruments of exact precision. Yet they have the rugged durability to withstand hard usage in the toolroom, the steel mill, and similar places.

Thwing Instruments are furnished in either the Indicating or Recording style, giving as many as twelve readings on a single recorder.

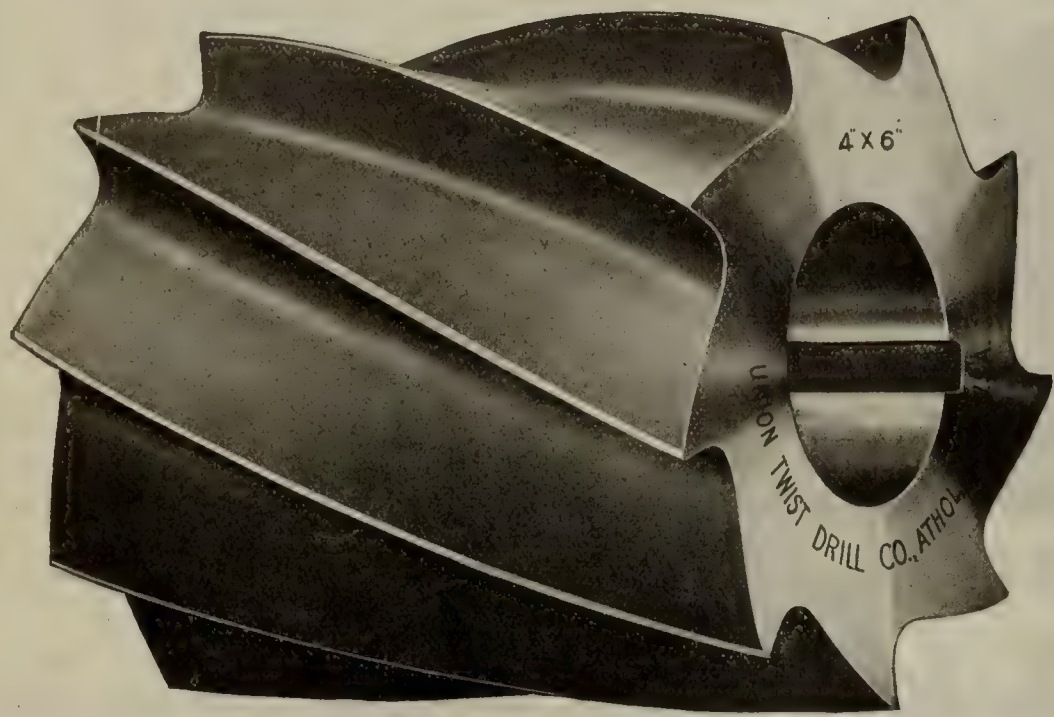
Our New Catalog No. 8 covers the entire line. Send for copy.

Canadian Representative:
Mr. James DeVon, 227 Davenport Road, Toronto

Thwing Instrument Co.

34th Street and Lancaster Ave.,
PHILADELPHIA, PA.

Butterfield



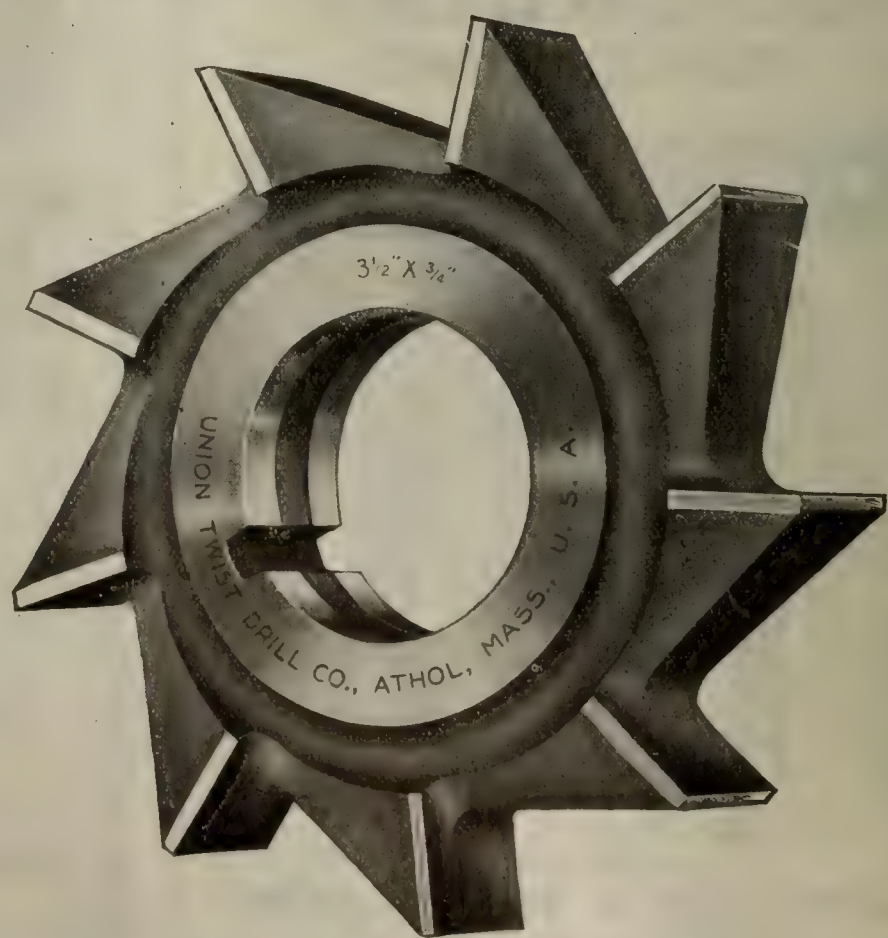
High Power Milling Cutters

Side Mills and End Mills

With Straight or Spiral Flutes, and Plain or Nicked Teeth.

We have the largest and most up-to-date factory in Canada, complete with the finest of special machinery and equipment for the manufacture of all kinds and styles of Carbon and High Speed Milling Cutters.

When you buy "Butterfield" Cutters you are assured of the same quality and accuracy put into our Taps, Dies and Reamers, and whether you require "Regulars" or "Specials," you will find our service prompt and efficient.



CATALOGUE?

Butterfield & Co.
Inc.
Rock Island, Que.
Canada

Butterfield

TWIST DRILLS

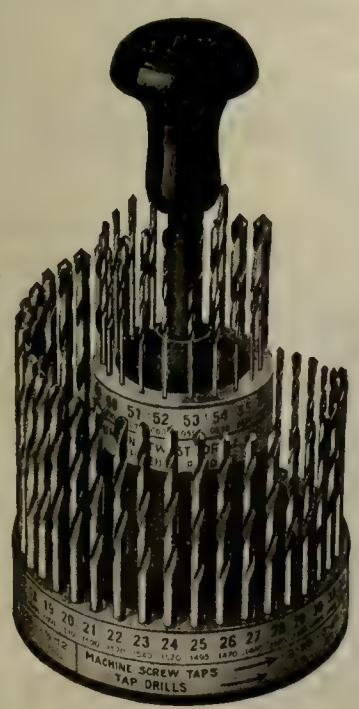
Carbon and High Speed
for Every Purpose

Butterfield Drills will give you the round, clean, accurate holes you have been looking for, with a minimum of grinding and absence of breakage.

Butterfield Drills are not an experiment. They are the result of long and careful investigation of the principles of "hole making."

To 99 men out of every 100 a twist drill is simply a tool for making holes; one is as good as another so long as the finish is equal. The beauty of a **Butterfield Drill** lies more than "skin deep," however.

Long and thorough research, combined with the most careful and exhaustive experimenting, has revealed to us the weak points in ordinary drill construction, and enabled us to produce a drill from which the faults and weaknesses of others have been eliminated.

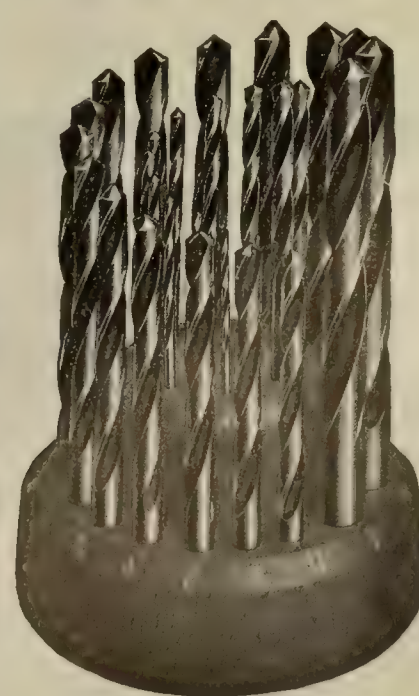


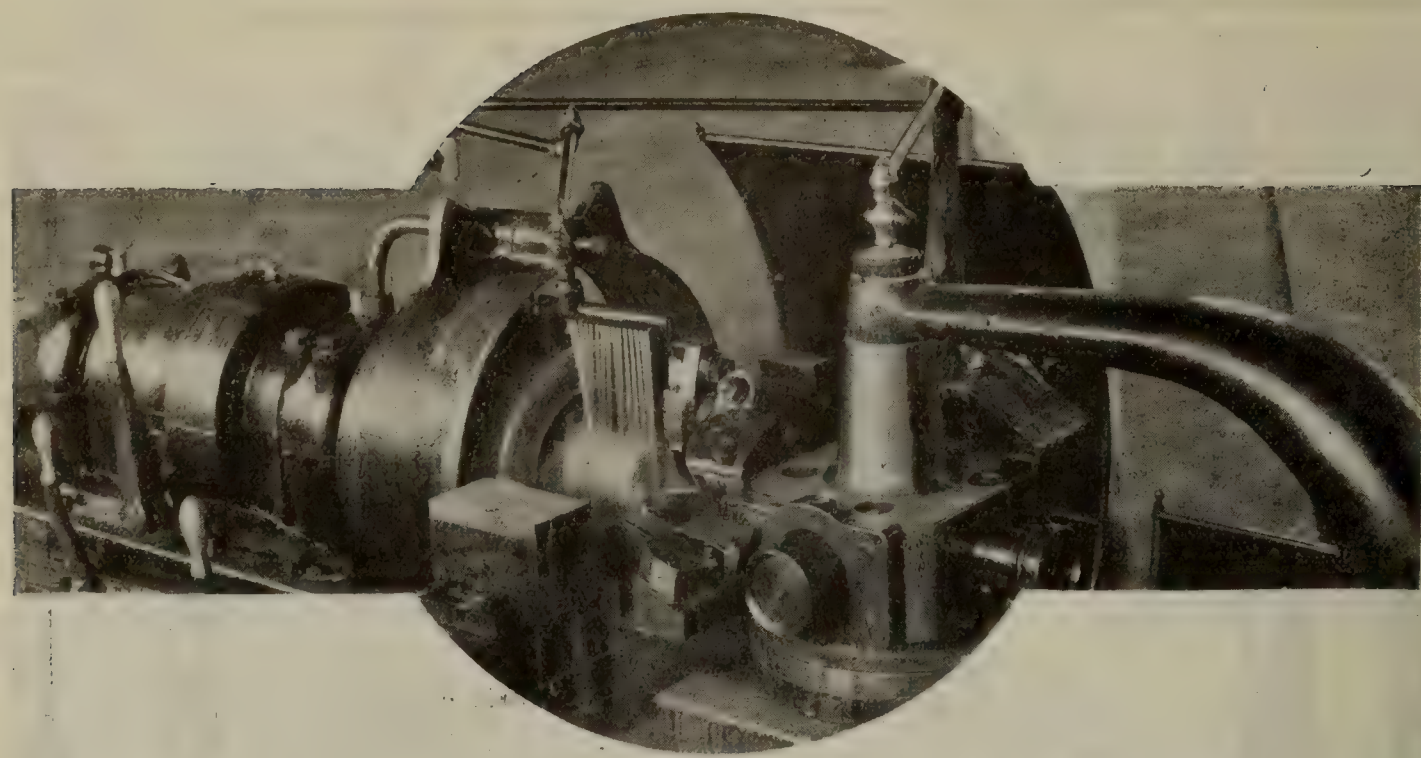
Butterfield Drills are manufactured on machines which embody the "last word" in mathematical accuracy and precision. Designed and used for the one purpose only, with the result that every finished drill is the nearest to perfection of any yet produced.

CATALOGUE?

Butterfield & Co.
Inc.

Rock Island, Que., Canada





MYSTIC CUTTING COMPOUND

A free-flowing, unsaponified animal oil lubricant. Does not separate in solution, grow rancid or cause rust. It is non-combustible and will not harm operator's hands.

Mystic Cutting Compound increases production and keeps tools in best of condition. Your machines need it. Your operators like it. Test it at our expense.

Cataract Refining Company, Limited - Toronto, Ontario

The Oven Equipment & Manufacturing Company

NEW HAVEN, CONN.

"CRAWFORD SECTIONAL" OVENS

Heated with our Enclosed Flame Gas Burners, or Electricity

FOR BAKING JAPANS AND OTHER FINISHES ON METAL.

Ovens carried in stock and built to meet requirements of manufacturers.

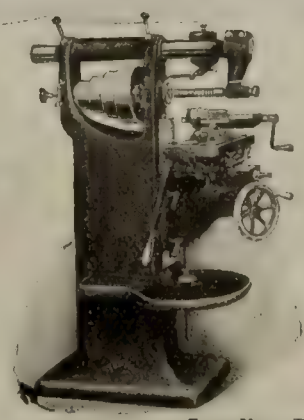
Builders of All-Steel Oven Trucks with Roller Bearings.

Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.

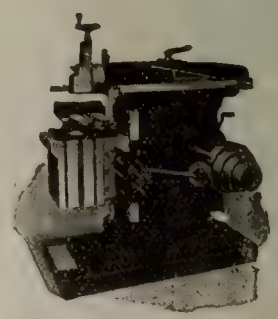
ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

Increased Production Means Increased Profits

Large Millers for large work —STEPTOE MILLERS for small work.



Large Planers for large work —STEPTOE SHAPERS for small work.



Will result in increased production; less money invested in machinery, and increased profits.

THE JOHN STEPTOE COMPANY

CUMMINSVILLE, CINCINNATI, OHIO, U.S.A.

Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.

The Right Heat

is the only heat to work with if you are going to turn out good work.

An ordinary mechanic can keep a Gilbert & Barker Furnace steady and even, insuring a uniform temperature.

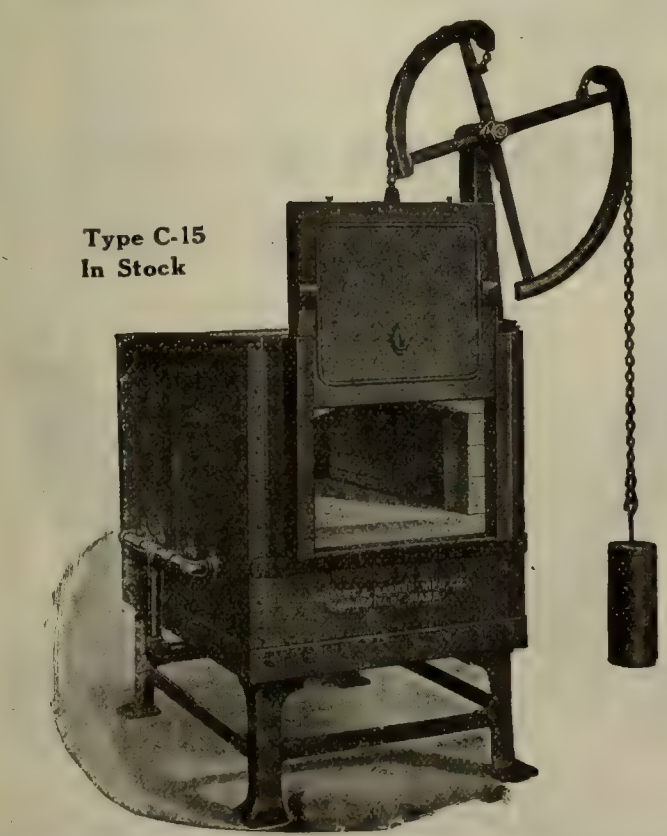
G. & B. are built right—from the ground up. The built-up construction with heavy sheet metal is reinforced with heavy angle iron straps riveted and bolted. The counter-balanced door clears the opening to full height, admitting the heaviest charge. Fire brick chamber lining, door lining and floor tile are of best quality.

And in every G. & B. furnace you get the benefit of 52 years of experience and study with gaseous and liquid fuels. Our line includes more than one hundred types of furnaces.

At present we are making prompt delivery on many types. Stock list 24 describes them all.

Gilbert & Barker
Manufacturing Company
West Springfield, Mass.

Canadian Agents:
WILLIAMS & WILSON, LIMITED
Montreal, Que.
JAMES DEVON,
227 Davenport Rd., Toronto, Ont.



Type C-15
In Stock

Accurate and Easily Controlled Temperatures

This is absolutely essential in heat treating—carbonizing, annealing. With the Tate-Jones furnace shown here, you have not only this, but ease and economy of operation and a large output of perfect work as well.

Uniform temperature is accurately controlled by the burners and dampers and can be maintained indefinitely. Extremely short time of preparation and for the heating process speeds up the output and saves fuel.

Made in car type and two types of stationary hearth—all firebrick and firebrick with cast iron bars imbedded in the top.

Complete information of these serviceable economical furnaces upon request.

We manufacture furnaces for all heat treating processes and allied operations.

TATE-JONES & CO. INC.
Established 1898
Furnace Engineers Pittsburgh, Pa.

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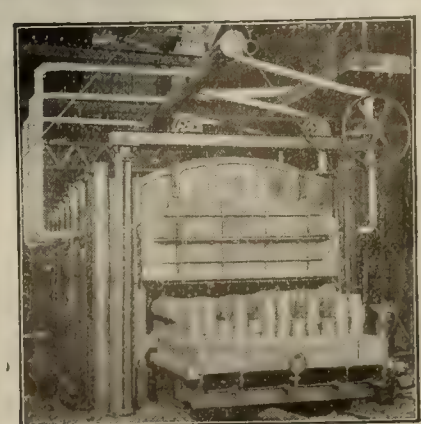

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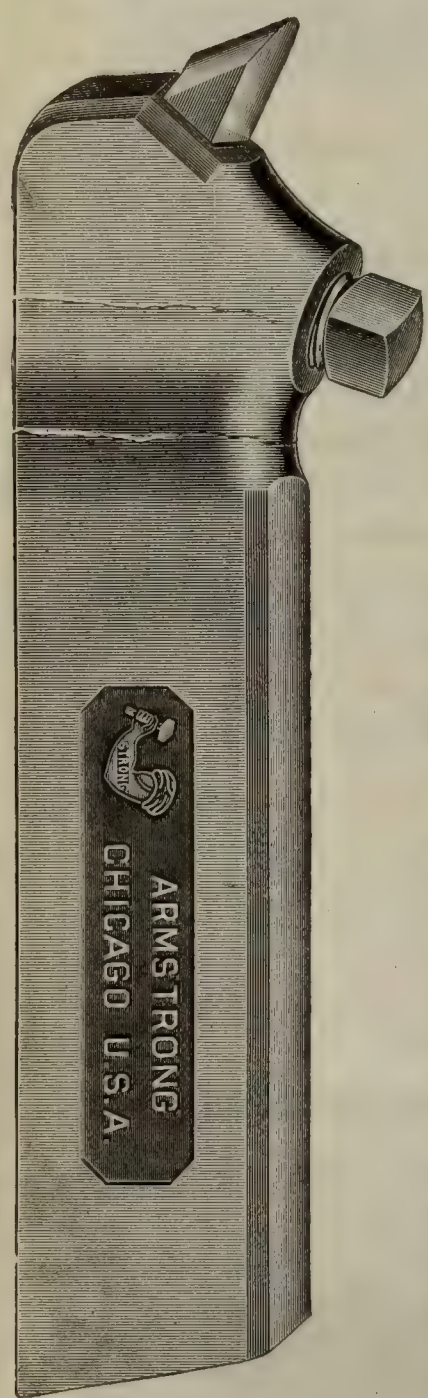

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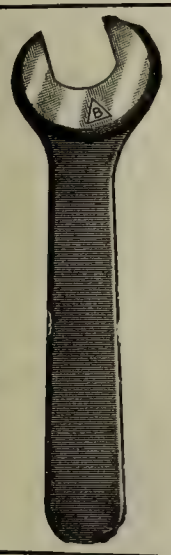

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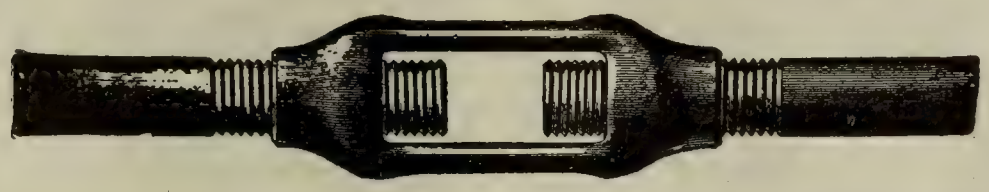

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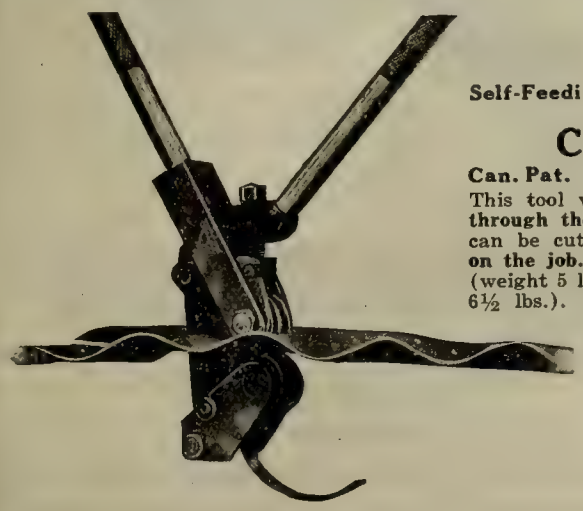

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CORRUGATED SHEETS

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This tool will cut sheets on any angle, limited curves and **through the centre** with **no distortion** of cut edges. Sheets can be cut to required shape when being **fixed in position on the job.** Made in two styles; as illustrated for 20 s.w.g. (weight 5 lbs.), with compound leverage for 18 s.w.g. (weight 6½ lbs.). Cuts 100% faster than any other hand method.

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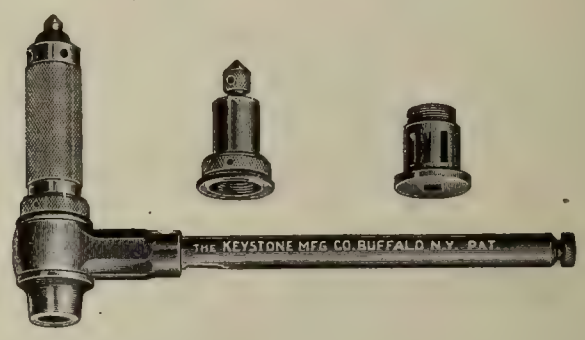
Supplied by better wholesale houses everywhere. Write for name of nearest dealer.



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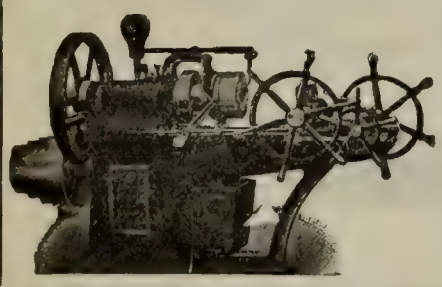

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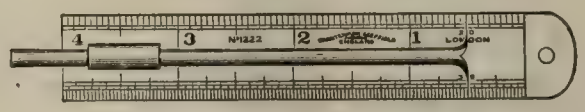

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"Clipper" lacings have been made in 45 seconds. The maximum time required is only three minutes. How long are *your* men and machines idle when a belt breaks?

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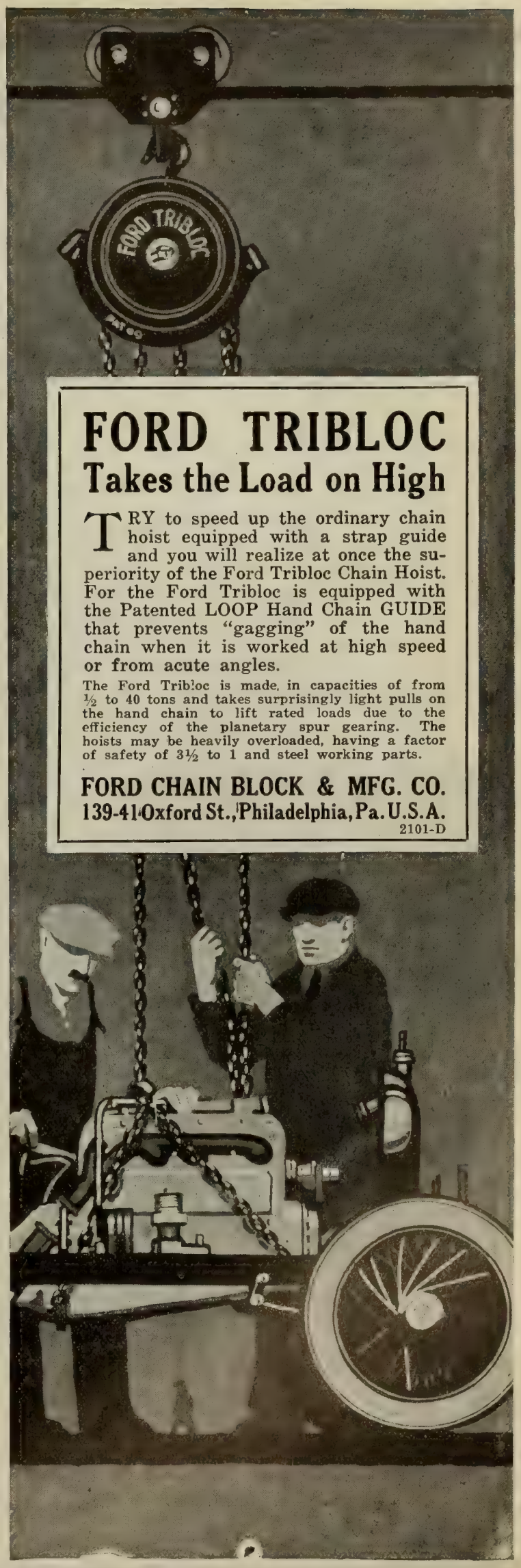

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TRY to speed up the ordinary chain hoist equipped with a strap guide and you will realize at once the superiority of the Ford Tribloc Chain Hoist. For the Ford Tribloc is equipped with the Patented LOOP Hand Chain GUIDE that prevents "gagging" of the hand chain when it is worked at high speed or from acute angles.

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Hanover, Ont.

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"The writer has no hesitation in saying that as far as his experience goes, there is no belt seems so well adapted for cement mill service as 'Extra Power.'"

GOODYEAR has claimed for Extra Power Belting many unusual advantages. These claims touch belting superiority at every angle.

To be specific—Goodyear has claimed that Extra Power has longer life and so reduces belting expense. Even on hard drives, this claim holds good. And we have claimed that, in addition, this new basis belt delivers more of the power the plant develops.

Extra Power has now been in use in every kind of factory, on small drives, ordinary drives, hard drives—long enough for all to know whether our unusual claims prove true.

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The testimony of The Hanover Portland Cement Co., given at the side of this advertisement, is but one sample of many recounting the same experience with Extra Power—lasting, more economical service.

The scientific, uniform construction of Extra Power makes its results so sure that we urge you, too, to adopt it.

Wouldn't it be good business to trust to Extra Power to prevent costly shut-downs and delays—to earn its cost by increasing production by yielding better transmission?

Let a trained Goodyear belting specialist call on you and discuss your belting problems. A postcard or telephone call to our nearest branch will bring him.

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MORSE
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Let MORSE Engineers Design Your New Drive

The Only 99% Efficient Power Transmission

FROM 1/4 H.P. TO 5000 H.P.
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The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

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IT WILL NOT CRACK

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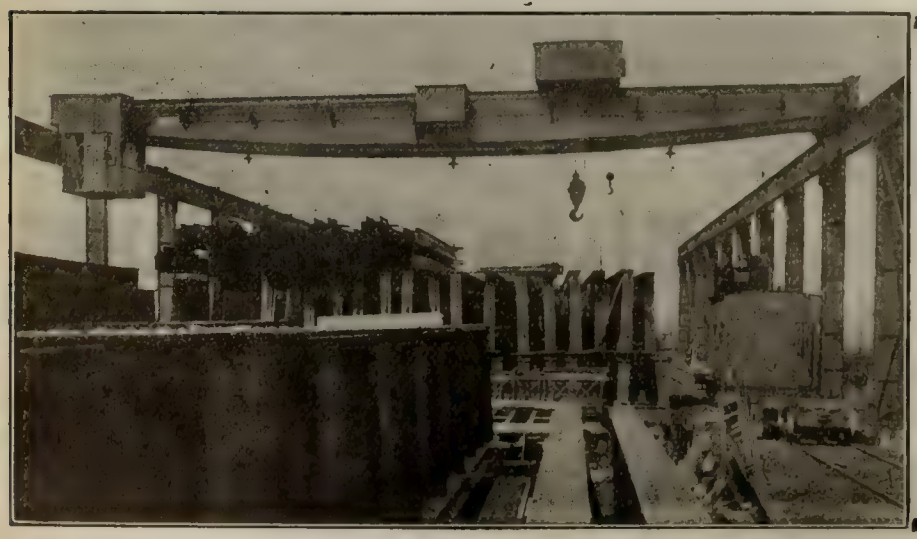

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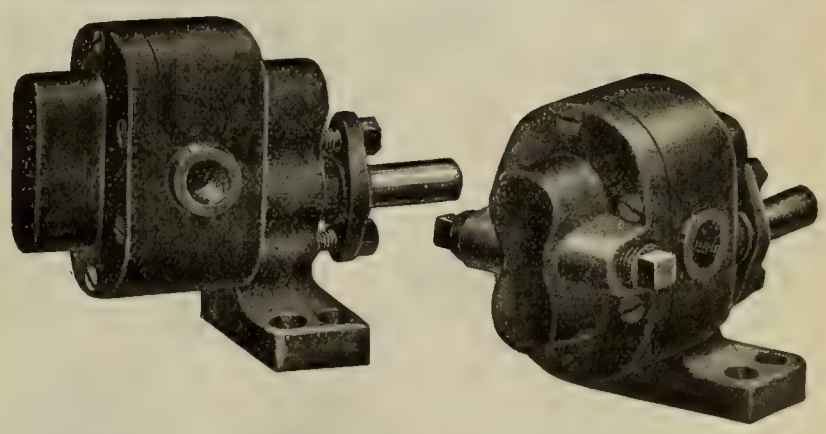

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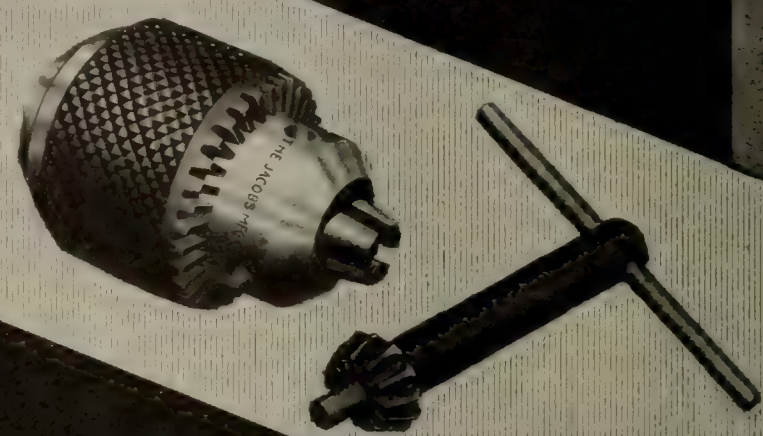

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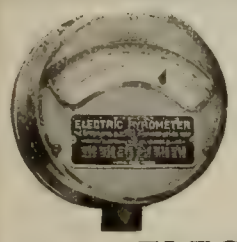

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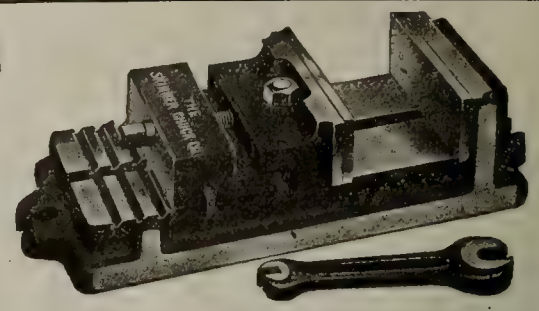

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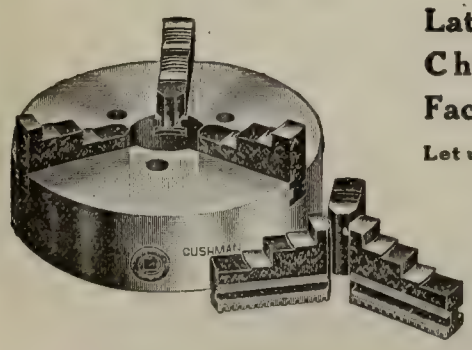

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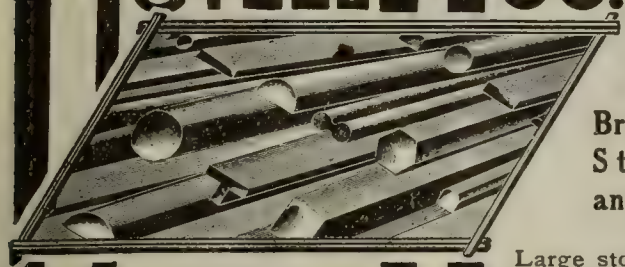

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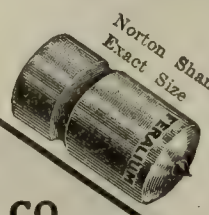

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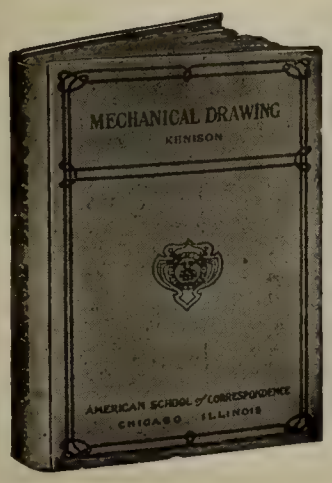

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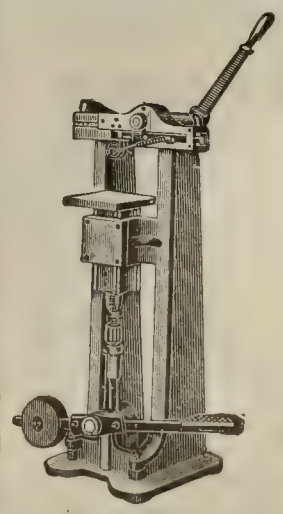

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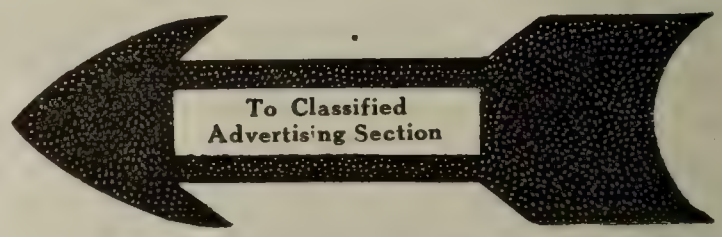

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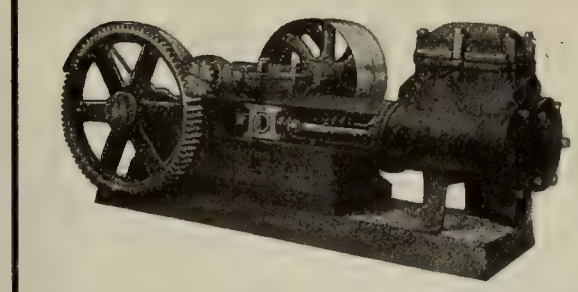

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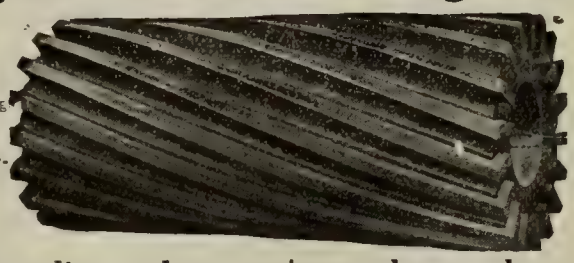

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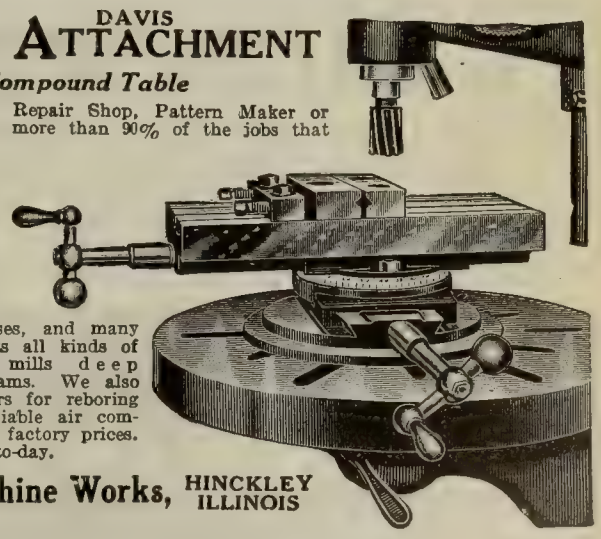

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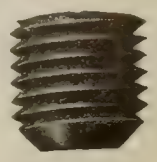

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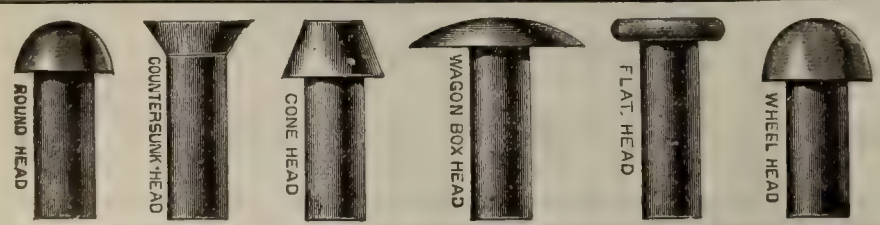

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Dominion Steel Foundry Co., Ltd., Hamilton, Ont
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
Can. Steel Foundries, Ltd., Montreal, Que.
Cumming & Son, J. W., New Glasgow, Canada.

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.

CEMENT MACHINERY
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.
Petrie, Ltd., H. W., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

CHAIN DRIVES
Jones & Glassco, Montreal, Que.

CHEMISTS
Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

CHESTS, TOOL
Embree, Ira, 281 Emerald St. N., Hamilton, Ont.
Union Tool Chest Works, Rochester, N.Y.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
John Bertram & Sons Co., Dundas, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Skinner Chuck Co., New Britain, Conn.
D. E. Whiton Machine Co., New London, Conn.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, MAGNETIC
H. E. Streeter, 523 New Birks Bldg., Montreal.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

CHUCKING MACHINES
Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

CLOCKS, WATCHMAN, PORTABLE
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Jones & Glassco, Montreal, Que.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Que.
Johnson Machine Co., Carlyle, Manchester, Conn.
Jones & Glassco, Montreal, Que.
Positive Clutch & Pulley Works, Ltd., Toronto.

COAL HANDLING MACHINERY
Marsh & Henthorn, Ltd., Belleville, Ont.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

COILING MACHINERY, WIRE AND SPRING
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

COLLARS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

CONTRACT WORK
Welland Motor & Machine Co., Welland, Ont.

CONTROLLERS AND STARTERS, ELECTRIC MOTORS
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A. R. Williams Machy. Co., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, STEEL SLIDE-BLOW
Whiting Foundry Equipment Co., Harvey, Ill.

COPING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

COUNTERSHAFTS
Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.

COUPLINGS, PLAIN AND FLEXIBLE
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES, LOCOMOTIVE
Northern Crane Works, Walkerille.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.

CUTTER GRINDERS AND ATTACHMENTS
Cincinnati Milling Machine Co., Cincinnati.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining & Mfg. Co., Toronto.
Elm Cutting Oil Co., Toronto.
Racine Tool & Machine Co., Racine, Wis.

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Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machinery Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Mchy. & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

CYLINDERS, AIR
Manufacturers Equipment Co., Chicago, Ill.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.

CUTTING AND WELDING PLANTS
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DAMPER REGULATORS
Canadian Fairbanks-Morse Co., Ltd., Montreal.

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Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Marsh & Henthorn, Ltd., Belleville, Ont.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

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Geo. A. Joyce Co., Ltd., New York.

DIAMOND TOOLS
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York.
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Matthews, Jas. H., & Co., Pittsburgh, Pa.

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Banfield, W. H., & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Ltd., Montreal.
Wells Brothers of Canada, Galt, Ont.

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Wells Brothers Co. of Canada, Galt, Ont.

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Marsh & Henthorn, Ltd., Belleville, Ont.

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Landis Machine Co., Waynesboro, Pa.

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Becker Milling Machine Co., Boston, Mass.
Garvin Machine Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
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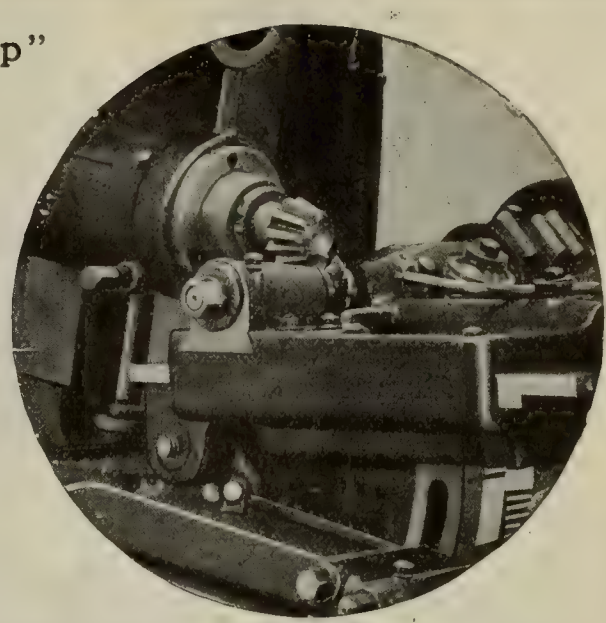

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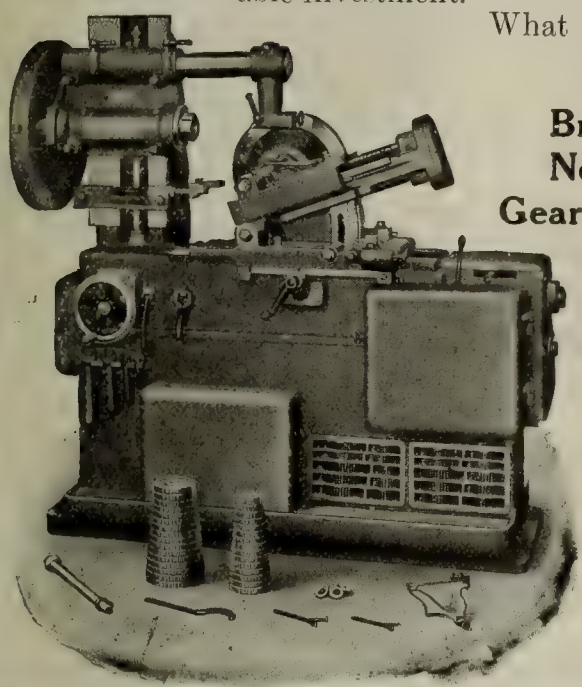

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DIES, SCREW AND THREAD
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Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
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Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

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Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, O.
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Bilton Mach. Tool Co., Bridgeport, Conn.
Martin Machine Co., Greenfield, Mass.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.

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Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Hespeler, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rockford Drilling Mach. Co., Rockford, Ill.

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Garlock-Walker Machinery Co., Toronto, Ont.
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Petrie, Ltd., H. W., Toronto, Ont.

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Canada Machinery Corp., Galt, Ont.
De Mooy Machine Co., Cleveland, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
D. McKenzie Machinery Co., Guelph, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, Ohio.

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Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto, Ont.
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Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Millers Falls Co., Millers Falls, Mass.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
United States Electrical Tool Co., Cincinnati.

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Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Foss & Hill Machy. Co., Montreal.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.

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Atkins & Co., Wm., Sheffield, Eng.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Can. B. K. Morton, Toronto, Montreal.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Foss & Hill Machy. Co., Montreal.
Marshall & Co., Geo. A., Toronto, Ont.
McKenna Brothers, Pittsburgh, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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W. F. & John Barnes Co., Rockford, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

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Niles-Bement-Pond Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Niles-Bement-Pond Co., New York.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Millers Falls Co., Millers Falls, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Foss & Hill Machy. Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Cleveland Twist Drill Co., Cleveland.
Clark Equipment Co., Buchanan, Mich.
Foss & Hill Machy. Co., Montreal.
Morse Twist Drill & Mach. Co., New Bedford.

DRILLS, TWIST
Atkins & Co., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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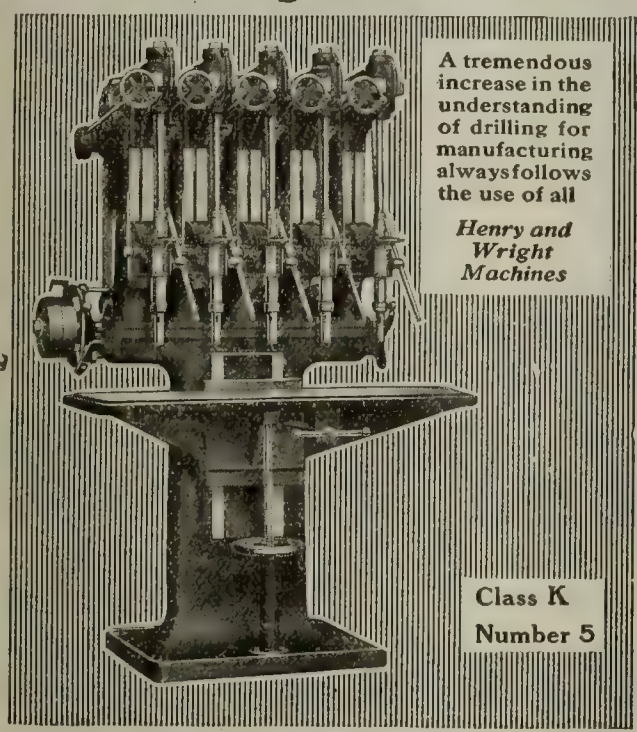

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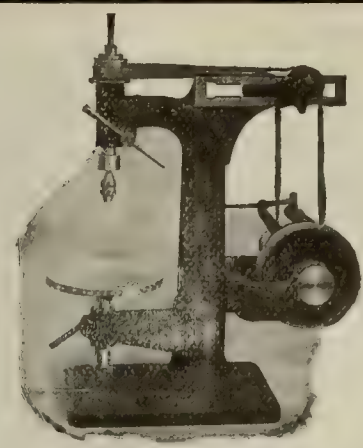

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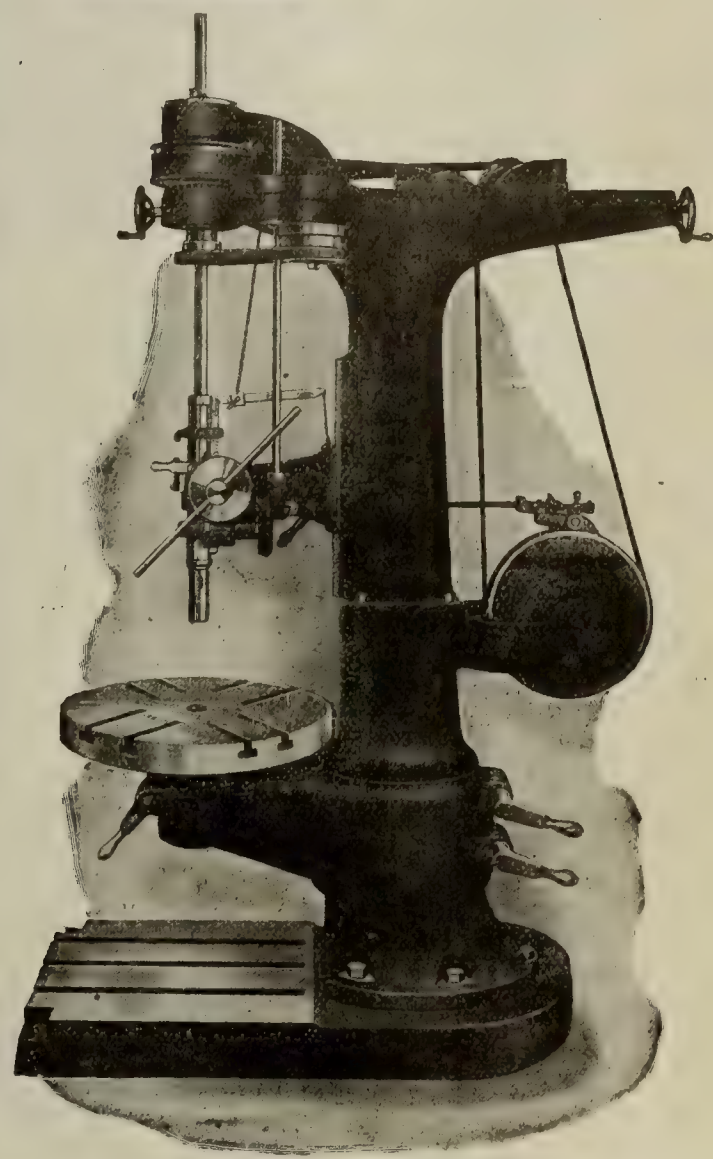

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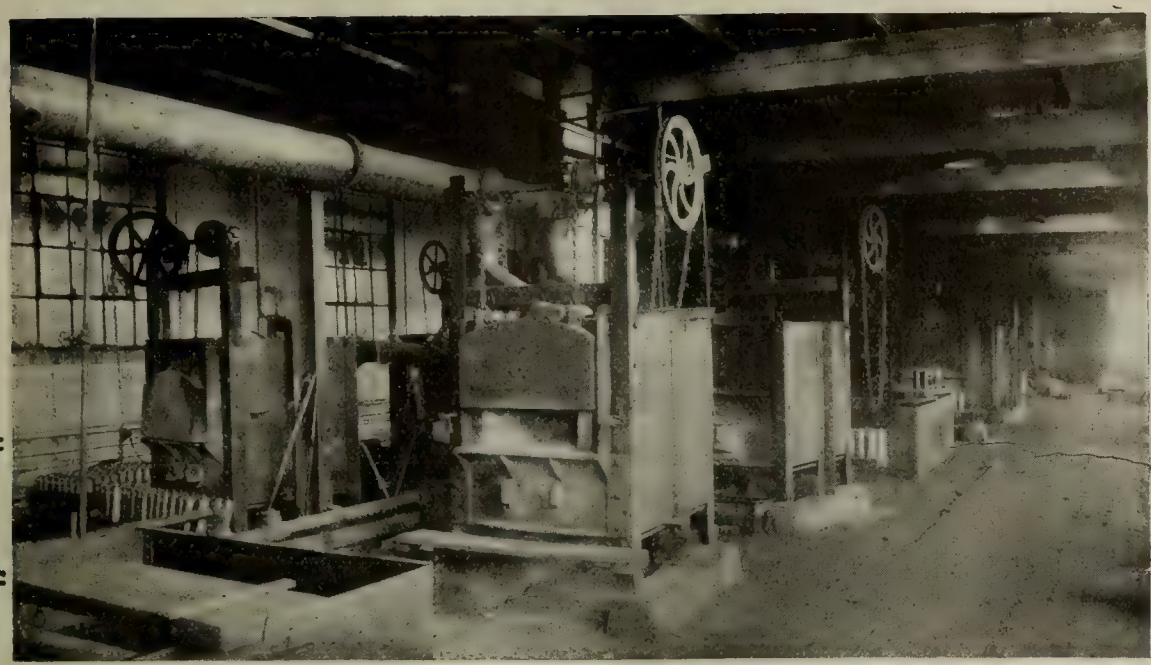

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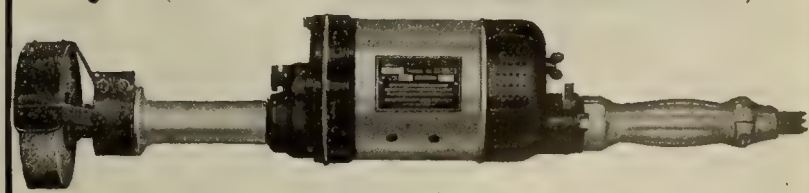

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London Bolt & Hinge Works, London, Ont.

HOBS
Illinois Tool Works, Chicago, Ill.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

HOISTING AND CONVEYING MACHINERY
Can. Matthews Gravity Carrier Co., Toronto, Ont.
Jenckes Mach. Co., Sherbrooke, Que.
Jones & Glassco, Montreal.
Marsh & Henthorn, Belleville, Ont.
Northern Crane Works, Walkerville, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Whiting Foundry Equipment Co., Harvey, Ill.

HOISTS, CHAIN AND PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
Ford Chain Block & Mfg., Philadelphia, Pa.
Independent Pneumatic Tool Co., Chicago, Ill.
Jenckes Mach. Co., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Northern Crane Works, Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
Wright Mfg. Co., Lisbon, Ohio.

HOISTS, ELECTRIC
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Kennedy & Sons, Owen Sound, Ont.
Northern Crane Works, Walkerville, Ont.
Winnipeg Gear & Engrng Co., Winnipeg, Man.

HOLDERS, STEEL DIE FOR MARKING
Marsh & Henthorn, Ltd., Belleville, Ont.
Matthews, Jas. H., & Co., Pittsburgh, Pa.

HOPPERS
Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.

HOSE, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Goodyear Tire & Rubber Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Wells Bros. Co. of Canada, Galt, Ont.

HYDRAULIC MACHINERY
Charles F. Elmes Eng. Works, Chicago.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

INDICATORS, SPEED
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
L. S. Starrett Co., Athol, Mass.

INDEX CENTRES
Fred C. Dickow, Chicago, Ill.
Garvin Machine Co., New York.

INDICATING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

INGOT METAL
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

IRON ORE
Hanna & Co., M. A., Cleveland, O.

JACKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Petrie, Ltd., H. W., Toronto, Ont.

JACKS, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago.

JACKS, PNEUMATIC
Northen Crane Works, Walkerville.

JACKS, PIT AND TRACK
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.

JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.

JIGS, TOOLS, ETC.
Brown Engineering Corp., Toronto, Ont.
Homer & Wilson, Hamilton, Ont.
Illinois Tool Works, Chicago, Ill.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Toronto Tool Co., Toronto, Ont.

KEY SEATERS
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich.
A. R. Williams Machy. Co., Toronto.

KEYS, MACHINE
Whitney Mfg. Co., Hartford, Conn.

KILNS
Can. Blower & Forge Co., Kitchener, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Sheldons, Limited, Galt, Ont.

LABELS AND TAGS
Matthews, Jas. H. & Co., Pittsburgh, Pa.

LABORATORIES, INSPECTION AND TESTING (SEE CHEMISTS)

LADLES, FOUNDRY
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

LAMPS, INCANDESCENT AND NITROGEN
Can. Laco-Philips Co., Toronto, Ont.

LAMPS, TUNGSTEN (Vacuum and Gas Filled)
Can. Laco-Philips Co., Toronto, Ont.

LATHES, BENCH
H. E. Streeter, New Birks Bldg., Montreal, Que.

LATHES, CHUCKNG
Acme Machine Tool Co., Cincinnati, Ohio.

LATHE CHUCKS (SEE CHUCKS)

LATHE DOGS AND ATTACHMENTS
Armstrong Bros. Tool Co., Chicago.
Curtis & Curtis Co., Bridgeport, Conn.
Hendey Machine Co., Torrington, Conn.
Rivett Lathe & Grinder Co., Boston, Mass.
Williams & Co., J. H., Brooklyn, N.Y.
Winnipeg Gear & Engrng Co., Winnipeg, Man.

LATHES, AXLE
Bridgeford Mach. Tool Works, Rochester, N.Y.

LATHES, PRECISION, BENCH
W. F. & John Barnes Co., Rockford.
Blount, J. G., & Co., Everett, Mass.
Can Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hardinge Bros., Chicago, Ill.
New Britain Mach. Co., New Britain, Conn.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.

LATHES, BAND TURNING
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Roelofson Machine & Tool Co., Toronto, Ont.
Warden King Co., Montreal, Que.

LATHES, BRASS
Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Inc., Chicago, Ill.

LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, Ohio.
John Bertram & Sons Co., Dundas.
Bridgeford Mach. Tool Works, Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Iron & Steel Co., Cincinnati, Ohio.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Mach. Tool Co., Hamilton, Ohio.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
McCabe, J. J., New York, N.Y.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Sebastian Lathe Co., Cincinnati, Ohio.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

LATHES, JOURNAL TRUEING
Bridgeford Mach. Tool Works, Rochester, N.Y.
McCabe, J. J., New York, N.Y.

LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McCabe, J. J., New York, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

LATHES, SINGLE PURPOSE
Bertram, John, & Sons Co., Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Mfg. & Mach. Co., Toronto, Ont.
Hepburn, John T., Ltd., Toronto.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McCabe, J. J., New York, N.Y.
Roelofson Mach. & Tool Co., Toronto, Can.

LATHES, SCREW CUTTING
Bertram, John, & Sons Co., Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto.
McCabe, J. J., New York, N.Y.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

LATHES, SPINNING
Bliss, E. W., Co., Brooklin, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
McCabe, J. J., New York, N.Y.

LATHES, TURRET AND HAND
Acme Machine Tool Co., Cincinnati, Ohio.
John Bertram & Sons Co., Dundas.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto, Ont.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
McCabe, J. J., New York, N.Y.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
National-Acme Co., Cleveland, Ohio.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
H. W. Petrie, Toronto.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.

LEAD BURNING
St. Lawrence Welding Co., Montreal, Que.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, Mass.

LIFTS, PNEUMATIC
Whiting Foundry Equipment Co., Harvey, Ill.

LINK BELTING
Can. Fairbanks-Morse Co., Montreal.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

LIQUID AIR
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Goods Co., Hamilton, Ont.

LUBRICANTS
Cataract Refining & Mfg. Co., Toronto.

LUBRICATORS
Roper, C. F., & Co., Hopedale, Mass.
Trahern Pump Co., Rockford, Ill.

MACHINERY DEALERS
Baird Machy. Co., W. J., Detroit, Mich.
Can. Fairbanks-Morse Co., Montreal.
Dickow, Fred C., Chicago, Ill.
Garlock-Walker Machy. Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

MACHINERY GUARDS (SEE GUARDS)

MACHINERY REPAIRS
Prest-O-Lite Co., Inc., Toronto, Ont.
Sterling Engine Works, Winnipeg, Man.
Sumbling Mach. Co., W. H., Toronto, Ont.

MACHINISTS' SCALES, SMALL TOOLS AND SUPPLIES
Can. Fairbanks-Morse Co., Montreal.
Frank H. Scott, Montreal.
J. H. Williams & Co., Brooklyn, N.Y.

MACHINISTS
Welland Motor & Machine Co., Welland, Ont.

MANDRELS
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Hannifin Mfg. Co., Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Manufacturers Equip. Co., Chicago, Ill.
Monarch Brass Mfg. Co., Toronto, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES
Pritchard-Andrews Co. of Canada, Ottawa, Ont.
Matthews, Jas. H., & Co., Pittsburgh, Pa.

MARKING MACHINERY
Brown, Boggs Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Martin Machine Co., Greenfield, Mass.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Perrin, Wm. R., Toronto.

MEASURING MACHINES
Pratt & Whitney Co., Dundas, Ont.

MEASURING TAPES AND RULES
James Chesterman & Co., Ltd., Sheffield, Eng.

METALLURGISTS
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Ltd., Toronto.

METERS, METAL TESTING
Holz, Herman A., 1 Madison Ave., New York.

METALS
Can. B. K. Morton, Toronto, Montreal.
Dom. Iron & Wrecking Co., Ltd., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.

METERS, OIL, WATER
Bowser & Co., Inc., S. F., Toronto, Ont.

MILL MACHINERY
Alexander Fleck, Ltd., Ottawa.

MILLING MACHINES, AUTOMATIC
Bilton Mach. Tool Co., Bridgeport, Conn.

MACLEAN'S

for DECEMBER

MACLEAN'S MAGAZINE GETS BETTER ALL THE TIME

Snipers and Sniping—*by a Sniper*

A SNIPER is back in Canada—a star sniper, who has 34 marks on his rifle, every mark meaning a German life. Most of us know absolutely nothing of the work of the sniper, but the story—a remarkable one—is told in the Christmas (December) MACLEAN'S by the champion sniper of the Canadian Expeditionary Forces. This man was buried by a shell-explosion, was dug out by two comrades, and he has lived to tell us his wonderful story, in MACLEAN'S. It's worth 15c to get this story alone.

"Politics From Within"

—Leacock, of Course

TRUST Leacock to see a chance for his witty and humorous pen. He deals with the humorous phases of electioneering in Canada in his usual vein.

Why Laurier sent Troops to South Africa

THIS contribution, by Col. John Bayne Maclean, goes backward many years—to the time of the South African War in 1899-1900. That was when Canada first took up arms for the Empire. Politics, of a high order, was back of the decision to send Canadian troops to the Antipodes. It is "inside" history.

Oppenheim—Allenson—McBeth—Mumford

A LONG instalment of Oppenheim's absorbing story, The Pawns Count, is given in the December MACLEAN'S. A short story, by A. C. Allenson is seasonable. Madge McBeth contributes a complete novelette, The Man Who Wasn't. And Ethel Watts Mumford, teller of delightful tales, delicately told, gives us the first of a series of short stories—Love and the Locksmith.

The Usual Popular Departments

THE Business Outlook, The Nation's Business, Women and Their Work, and the Review of Reviews—all are present in strong way in the December MACLEAN'S.

At All News-Stands 15c.

Gadsby's Story of the Union Government

GADSBY is saturated with Ottawa knowledge—much of it of the inside variety. He pokes about, talks with big men; and big men, and lesser ones, talk with Gadsby. Useful sort of man, is Gadsby. What he hears and learns he writes about for MACLEAN'S; and in this story of his about the new Union Government, he reveals the undercurrents on the movement that developed into negotiations, and which finally resulted in a Union Government. Gadsby adds interesting biographical information to his brilliant study.

Robt. W. Service is back again

BACK in MACLEAN'S, that is—in body, he is still in Flanders—where the fighting grows uglier all the time. Service has taken time to write verse for MACLEAN'S. You know well the virility of his style, and the gripping, human character of his verse. It is about life and men in the trenches he writes—about our boys far from us. It is worth something to see our boys as Service sees them. Read "The Shape at the Wheel" in the December MACLEAN'S.

Arthur Stringer writes a Beautiful Christmas Poem

STRINGER is a wonderful man—wonderfully versatile, wonderfully human. He is a master of the short-story and of the detective and mystery type of story; and he can climb the heights of literary endeavor, as he has in this passing sweet poem—Christmas Bells in War-time. Your heart is tender these times of horrible slaughter and of heroic achievement, and you'll be grateful to Stringer for putting beautifully your innermost thoughts and feelings.

MILLING ATTACHMENTS
Becker Milling Machine Co., Boston, Mass.
John Bertram & Sons Co., Dundas.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.

MILLING MACHINES, HAND
Hardinge Bros., Inc., Chicago, Ill.
United States Mach. Tool Co., Cincinnati, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Whitney Mfg. Co., Hartford, Conn.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Becker Milling Machine Co., Boston, Mass.
Brown & Sharpe Mfg. Co., Providence.
John Bertram & Sons Co., Dundas.
Cleveland Milling Machine Co., Cleveland, Ohio.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.
Steptoe, The John Co., Cincinnati, Ohio.
United States Mach. Tool Co., Cincinnati, Ohio.
Whitney Mfg. Co., Hartford, Conn.
A. R. Williams Machy. Co., Toronto.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Becker Milling Machine Co., Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

MILLING MACHINES, PROFILE
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Tabor Mfg. Co., Philadelphia, Pa.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Cummings & Son, J. W., New Glasgow, Canada.
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
Marsh & Henthorn, Belleville, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Jenckes Mach. Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

MITTENS
Hickory Steel-Grip Glove Co., Chicago, Ill.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Mach. Co., New Britain, Conn.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

MUNITION MACHINERY
Petrie of Montreal, Ltd., H. W., Montreal, Que.

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Can.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
John H. Hall & Sons, Ltd., Brantford, Ont.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

NOSE SOCKETS
Jas. McKay Co., Pittsburgh, Pa.

NUTS, SEMI-FINISH AND FINISHED
Canadian B. K. Morton, Toronto, Montreal.
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton, Ont.

NUT BURRING MACHINES
National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

NUT MACHINES (HOT)
National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machy. Co., Tiffin, O.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

OIL, DRAWING
Elm Cutting Oil Co., Toronto, Ont.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Machine Co., The, Hamilton.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford, Ont.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVENS FOR DRYING, TEMPER AND UNDER TRUCKS
Brantford Oven & Rack Co., Brantford, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.

OXY-ACETYLENE WELDING AND CUTTING
Can. Welding Works, Montreal, Que.
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.

OXY-ACETYLENE WELDING AND CUTTING PLANT
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

OXYGEN (SEE ACETYLENE)
L'Air Liquide Society, Montreal, Que.

PACKINGS, ASBESTOS
Bennett, W. P., 51 Montford St., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
New Britain Mach. Co., New Britain, Conn.

PACKINGS, LEATHER, HYDRAULICS, ETC.
Graton & Knight Mfg. Co., Worcester, Mass.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.

PAPER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.

PATENT SOLICITORS
Budden, Hanbury, A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

PATTERNS
Winnipeg Gear & Engr. Co., Winnipeg, Man.

PERFORATED METALS AND ORNAMENTAL IRON GOODS
Canada Wire & Iron Goods Co., Hamilton.

PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PIPE CUTTING AND THREADING MACHINES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Petrie, Ltd., H. W., Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
A. R. Williams Machy. Co., Toronto.

PIPE RIVETED STEEL
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
John H. Hall & Sons, Ltd., Brantford, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Wells Bros. Co. of Canada, Galt, Ont.

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Niles-Bement-Pond Co., New York.

PLIERS
Aikenhead Hardware Co., Toronto.
Canadian Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Conn.

PRESSES, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Hannifin Mfg. Co., Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
E. W. Bliss Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES FOR SHELLS
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
West Tire Setter Co., Rochester, N.Y.

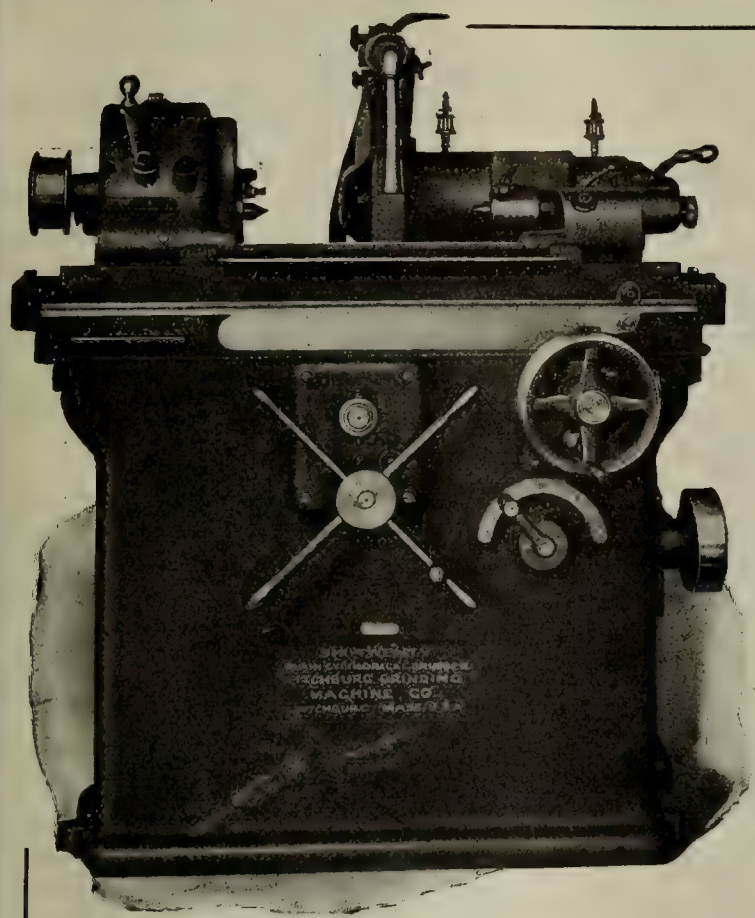
PRESSES, FILTER
William R. Perrin, Ltd., Toronto.

PRESSES, DROP AND FORGING
W. H. Banfield & Son, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Charles F. Elmes Eng. Works, Chicago.
Can. Fairbanks-Morse Co., Montreal.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Toledo Machine & Tool Co., Toledo.

PRESSES, HYDRAULIC
John Bertram & Sons Co., Dundas.
Charles F. Elmes Eng. Works, Chicago.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Toledo Machine & Tool Co., Toledo.
West Tire Setter Co., Rochester, N.Y.
A. R. Williams Machy. Co., Toronto.

PRESSES, PNEUMATIC
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Toledo Machine & Tool Co., Toledo.
A. R. Williams Machy. Co., Toronto.



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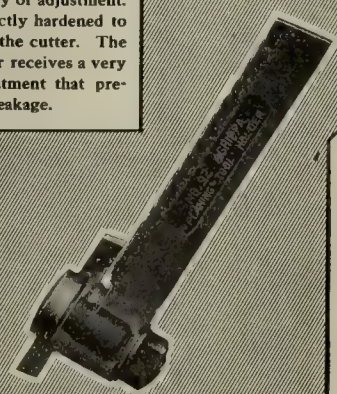

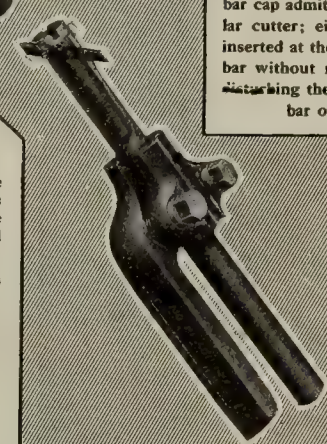

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Bliss Co., E. W., Brooklyn, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
William R. Perrin, Ltd., Toronto.
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Consolidated Press Co., Hastings, Mich.
Erie Foundry Co., Erie, Pa.
Ferracute Mach. Co., Bridgeton, N.J.
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Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Standard Machy. & Supplies, Ltd., Montreal, Que.
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Gardner, Robt., & Son, Montreal.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
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Consolidated Press Co., Hastings, Mich.
Ferracute Mach. Co., Bridgeton, N.J.
Niles-Bement-Pond Co., New York.
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Niles-Bement-Pond Co., New York.
RAILROAD TOOLS
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Cumming & Son, J. W., New Glasgow, Canada.
Niles-Bement-Pond Co., New York.
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Standard Machy. & Supplies, Ltd., Montreal, Que.
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Whitman & Barnes Mfg. Co., St. Catharines, Ont.
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Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Pratt & Whitney Co., Dundas, Ont.
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Can. Fairbanks-Morse Co., Montreal.
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Cleveland Twist Drill Co., Cleveland.
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Steel Co. of Canada, Ltd., Hamilton, Ont.
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Parmenter & Bulloch Co., Gananoque.
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Can. Ingersoll-Rand Co., Montreal.
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Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
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High-Speed Hammer Co., Rochester, N.Y.
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Niles-Bement-Pond Co., New York
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RUBBER MILL MACHINERY
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Canada Machinery Corp., Galt, Ont.
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Eastern Mach. Screw Corp., New Haven, Conn.
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Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York
Himoff Mach. Co., Inc., Astoria, L.I., New York.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
Warner & Swasey Co., Cleveland, O.
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Riverside Machinery Depot, Detroit, Mich.
SCREWS
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National-Acme Co., Cleveland, Ohio
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wells Bros. Co. of Canada, Galt, Ont.
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Garvin Machine Co., New York
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Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton, Ohio
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rhodes Mfg. Co., Hartford, Conn.
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- Base Boring Lathes
- Waving Lathes
- Band Turning Lathes
- Hydraulic Band Presses
- Shell Grinding Machines
- Shell Cleaning Machines
- Undercutting Machines
- Finish Tapping Machines
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We can supply any of the above complete, ready for use, at about half the cost of ordinary tools for the same purpose, or we can furnish you with **a complete set of castings** ready for you to machine and set up.

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Chilled Iron Dies are harder than tempered steel on the wearing surface, but soft and easily machined elsewhere.

Chilled Iron Dies last longer than steel dies in actual service. They will nose more shells than Dies made of any other material.

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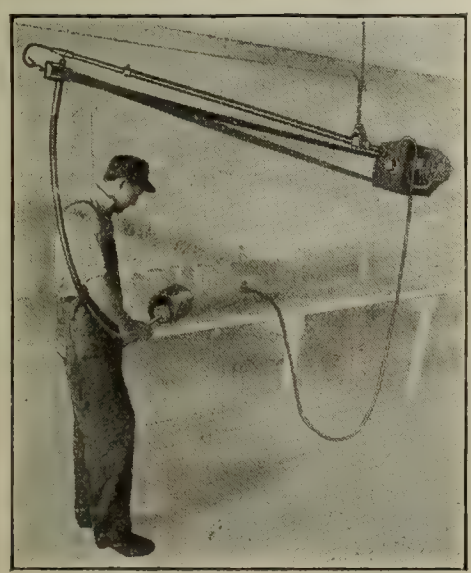

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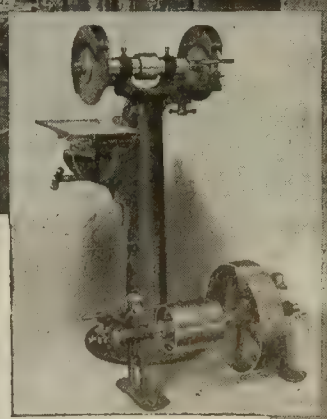

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Standardized Production enables us to offer this powerful **Waterbury Grinder** at such a low price. It grinds rapidly and accurately, all flat surfaces, dies, punches, planer, lathe, and other tools. Has adjustable table and tool rest with large radius of travel. Rigid, 3-point table supports giving great steadiness. A reliable, practical grinding outfit.

The Blake & Johnson Co., Waterbury, Conn.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas
Bertrams, Ltd., Edinburgh, Scotland
Canada Machinery Corp., Galt, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Montgomery, Smith & Co., Keynsham, Somerset, Eng.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo

SHEARS, POWER
John Bertram & Sons Co., Dundas
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Ferrachute Machine Co., Bridgeton, N.J.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Toledo Machine & Tool Co., Toledo

SHEARS, PNEUUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Canada

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Peck, Stow & Wilcox, Southington, Conn.
Steel Bending Brake Works, Ltd., Chatham, Ont.

SHEET METAL STAMPINGS
Dominion Forge & Stpg. Co., Walkerville, Ont.

SHELL BANDING MACHINES, HYDRAULIC
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., W. R., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

SHELL PAINTING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

SHELL RIVETERS
Grant Mfg. & Machine Co., Bridgeport, Conn.
High Speed Hammer Co., Rochester, N.Y.

SHELL TOOLS
Marsh & Henthorn, Ltd., Belleville, Ont.

SHRAPNEL SHELL MARKER
Brown, Boggs & Co., Hamilton, Canada
Noble & Westbrook Mfg. Co., Hartford, Conn.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton, Toronto, Montreal.

SIGNS, ENAMEL
Strong, Kennard & Nutt Co., Cleveland, Ohio.

SILENT CHAINS
Jones & Glassco, Montreal.

SILVER SOLDER
Geo. H. Lees & Co., Hamilton, Ont.

SKATE SHARPENERS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SLOTTERS
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York
Rhodes Mfg. Co., Hartford, Conn.

SMOKESTACKS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.
Marsh & Henthorn, Ltd., Belleville, Ont.

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
J. H. Williams & Co., Brooklyn, N.Y.

SOCKET HEAD CAP SCREWS
Allen Mfg. Co., Hartford, Conn.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Canada

SOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Banfield, W. H., & Sons, Toronto.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Brown Engineering Corp., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
Grant Mfg. & Machy. Co., Bridgeport, Conn.
Gray Mfg. & Mach. Co., Toronto, Ont.
John H. Hall & Sons, Brantford.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McClean & Son, F. W., Niagara Falls, Ont.
National-Acme Co., Cleveland, Ohio.
D. McKenzie Machinery Co., Guelph, Ont.
Mulliner & Enlund Tool Co., Syracuse, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Sleeper & Hartley, Inc., Worcester, Mass.
Smart-Turner Machine Co., Hamilton, Ont.
T. C. M. Mfg. Co., Harrison, N.J.
Victoria Foundry Co., Ottawa, Ont.
Welland Motor & Machine Co., Welland, Ont.
William R. Perrin, Ltd., Toronto.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

SPEED REDUCING GEARS
Jones & Glassco, Montreal.

SPRINGS, MACHINERY
[illegible]es, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele, Ltd., Guelph, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

SPIRAL CONVEYORS
Can. Matthews Gravity Carrier Co., Toronto, Ont.

SPROCKETS, CHAIN
Grant Gear Works, Boston, Mass.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

SOLDER
Jobborn, Geo. A., Hamilton, Ont.
Jones & Glassco, Montreal.

SPROCKET WHEELS, CAST
Perrin, Wm. R., Toronto.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS
Dillon Mfg. Co., Oshawa, Ont.
Dom. Forge & Stamping Co., Walkerville, Ont.
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Canada Machinery Corp., Galt, Ont.
Ferracute Mach. Co., Bridgton, N.J.
Noble & Westbrook Mfg. Co., Hartford, Conn.

STAMPS, STEEL ALPHABET, FIGURES
Matthews, Jas. H. & Co., Hartford, Conn.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.
Can. Morehead Mfg. Co., Woodstock, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.
Sturtevant Co., B. F., Galt, Ont.

STEEL ALLOY (SEE ALLOY STEEL)

STEEL BENDING BRAKES
Steel Bending Brake Works, Ltd., Chatham, Ont.

STEEL FOR AXES, PLOWS, SAWS, DRILLS, ETC.
Colonial Steel Co., Pittsburgh, Pa.

STEEL, CARBON, FERRO-TUNGSTEN
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Zenith Coal & Steel Products, Montreal, Que.

STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

STEEL DRUMS
Smart-Turner Machine Co., Hamilton, Ont.

STEEL PRESSURE BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Century Steel Co. of America, New York
Colonial Steel Co., Pittsburgh, Pa.
H. A. Drury Co., Ltd., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Fairley Davidson Steel Co., New York, N.Y.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.
Zenith Coal & Steel Products, Montreal, Que.

STEELS, HIGH STRENGTH, HOT-WORKING, DIE, MAGNET
Fairley Davidson Steel Co., New York, N.Y.

STEEL, VANADIUM
Drury, H. A., Co., Montreal, Que.
Standard Alloys Co., Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STELLITE, HIGH-SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.

STOCK RACKS FOR BARS, PIPING, ETC.
New Britain Machine Co., New Britain, Conn.

STOCKS, PIPE
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.

STOOLS, STEEL, SHOP
New Britain Machine Co., New Britain, Conn.

STRAIGHTENING MACHINERY
Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

TACK (DOUBLE POINT) MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

TANKS, GASOLINE AND OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Dominion Forge & Stamping Co., Walkerville.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.

TANKS, STEEL, WATER PRESSURE
Bowser & Co., Inc., S. F., Toronto, Ont.
Can. Welding Works, Montreal, Que.
Jenckes Machine Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TANK WAGONS
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.

TAPPING MACHINES (PENUMATIC)
Cleveland Pneumatic Tool Co. of Can., Toronto.

TAPPING MACHINES AND ATTACHMENTS
Bertram, John, & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rickert-Shafer Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.

TAPS, ADJUSTABLE
Baxter Co., Ltd., J. R., Montreal, Que.
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.

TAPS, COLLAPSIBLE
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

TAPS, DIES AND WRENCHES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wells Bros. Co. of Canada, Galt, Ont.

TAP EXTENSIONS
Allen Mfg. Co., Hartford, Conn.

TESTING INSTRUMENTS METALLURGICAL
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York City.

THERMOMETERS, ALL KINDS
Taylor Instrument Co., Rochester, N.Y.
Bellevue Industrial Furnace Co., Detroit, Mich.

TESTING LABORATORIES
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

THREADING TOOLS
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.

THREAD MILLING MACHINES
Gray Mfg. & Mach. Co., Toronto, Ont.
Taft-Peirce Co., New York, N.Y.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Peck, Stow & Wilcox, Southington, Conn.

TIRE SETTING MACHINES, HYDRAULIC
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES
Embree, Ira, 281 Emerald St. N., Hamilton, Ont.
Union Tool Chest Works, Rochester, N.Y.

TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Armstrong Bros. Tool Co., Chicago.
Can. B. K. Morton, Toronto, Montreal.
Deloro Smelting & Refining Co., Toronto, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.

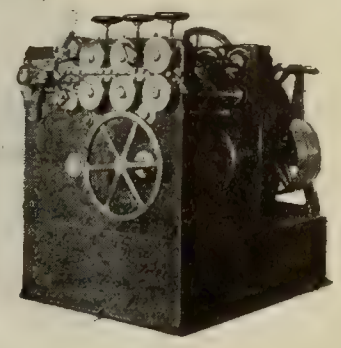
TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

The Machines that put the "Rings" in Springs!

More Than Forty Standard Spring Making Machines.

High-Speed Automatics for Making Fuse and Small Arms Springs.

Flexible Metallic Tube and Casing Coilers.



Sleeper & Hartley, Inc., WORCESTER, MASS. and COATICOOK, P.Q.

TOOL STEEL
Atkins & Co., Wm., Sheffield, Eng.
Armstrong, Whitworth, Ltd. of Canada, Montreal.
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Deloro Smelting & Refining Co., Toronto, Ont.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Toronto, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.
Swedish Steel & Importing Co., Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago, Ill.
Stow Mfg. Co., Binghamton, N.Y.
A. R. Williams Machinery Co., Toronto.
United States Elec. Tool Co., Cincinnati, O.

TOOLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

TORCHES, STEEL
Armstrong, Whitworth of Canada, Ltd., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.

TRACK SYSTEMS
Dillon Mfg. Co., Oshawa, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
A. R. Williams Machinery Co., Toronto.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
The Smart-Turner Machine Co., Hamilton.

TRANSMISSION ROPE
Jones & Glassco, Montreal, Que.

TRANSMISSION TOWERS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TROLLEYS
Wright Mfg. Co., Lisbon, Ohio.

TRUCKS, FACTORY, FREIGHT, ETC.
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

TRUCKS, LUMBER AND KILN
Sheldons, Ltd., Galt, Ont.
Northern Crane Works, Walkerville.

TUBING, SEAMLESS, BRASS & COPPER
Standard Tube & Fence Co., Woodstock, Ont.

TUBING COILERS, FLEXIBLE METAL
Sleeper & Hartley, Inc., Worcester, Mass.

TUMBLING BARRELS
Baird Machine Co., Bridgeport, Conn.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TUNGSTEN FILAMENT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

TURNBUCKLES
Canadian Billings & Spencer, Ltd., Welland.

TURNTABLES
Whiting Foundry Equipment Co., Harvey, Ill.

TURRET MACHINES
Brown & Sharpe Mfg. Co., Providence
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney, Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURBINE WATER WHEELS
Jenckes Mach. Co., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.

UPSETTING AND BENDING MACHINERY
John Bertram & Sons Co., Dundas
Brown, Boggs Co., Ltd., Hamilton, Canada.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Jenckes Mach. Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

VACUUM PUMPS
Can. Blower & Forge Co., Kitchener, Ont.
Smart-Turner Machine Co., Hamilton, Ont

VALVE LEATHERS
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Montreal.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

VALVES, FOOT
Smart-Turner Machine Co., Hamilton, Ont.

VALVES, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

VALVES, BACK PRESSURE, STEAM
Sheldons, Limited, Galt, Ont.

VENTILATING APPARATUS
Brantford Oven & Rack Co., Brantford, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.
A. R. Williams Machy. Co., Toronto.

VISES, AIR OPERATED
Hannifin Mfg. Co., Chicago, Ill.

VISE STANDS, PORTABLE
New Britain Machine Co., New Britain, Conn.

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Cleveland Milling Machine Co.
Foss & Hill Machy. Co., Montreal.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

VISES, PIPE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.
J. H. Williams & Co., Brooklyn, N.Y.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Barnes, Wallace, Co., Bristol, Conn.
Dillon Mfg. Co., Oshawa, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

WATER PURIFYING AND SOFTENING APPARATUS
Wm. B. Scaife & Sons Co., Pittsburgh, Pa.

WATER CINDER MILLS
Whiting Foundry Equipment Co., Harvey, Ill.

WATER JACKETS
Can. Welding Works, Montreal, Que.

WATER TOWERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

WATER WHEELS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.

WELDING, ELECTRIC, SPOT, BUTT, ETC.
St. Lawrence Welding Co., Montreal, Que.

WELDING MASKS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

WELDERS, ELECTRIC, SPOT, BUTT, ETC.
National Electric Welder Co., Warren, O.
Tabor Mfg. Co., Philadelphia, Pa.
Thomson Electric Welding Co., Lynn, Mass.
Winfield Electric Welding Mach. Co., Warren, Ohio.

WELDING, WORK AND SUPPLIES (Autogenous and Oxy-Acetylene) see OXY-ACETYLENE

WINCHES
John H. Hall & Sons, Brantford.
Kennedy & Son, Wm., Owen Sound, Ont.
Marsh & Henthorn, Ltd., Belleville, Ont.
Northern Crane Works, Walkerville.

WIRE COILING AND POINTING MACHINERY
Baird Machine Co., Bridgeport, Conn.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE CLOTH AND PERFORATED METALS
Canada Wire & Iron Goods Co., Hamilton.

WIRE FORMING AND STAMPING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
McClean & Son, F. W., Niagara Falls, Ont.
F. B. Shuster Co., New Haven, Conn.

WIRE NAILS
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

WIRE STEEL, BRASS, COPPER, BRONZE
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE RAILS
Sleeper & Hartley, Inc., Worcester, Mass.

WOOD BORING MACHINES
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

WIRE STRAIGHTENERS AND CUTTERS
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WOODWORKING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machy. Co., Toronto.

WOOD LATHES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

WORKS STANDS, PORTABLE
New Britain Mach. Co., New Britain, Conn.

WRENCHES
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canadian Billings & Spencer, Ltd., Welland.
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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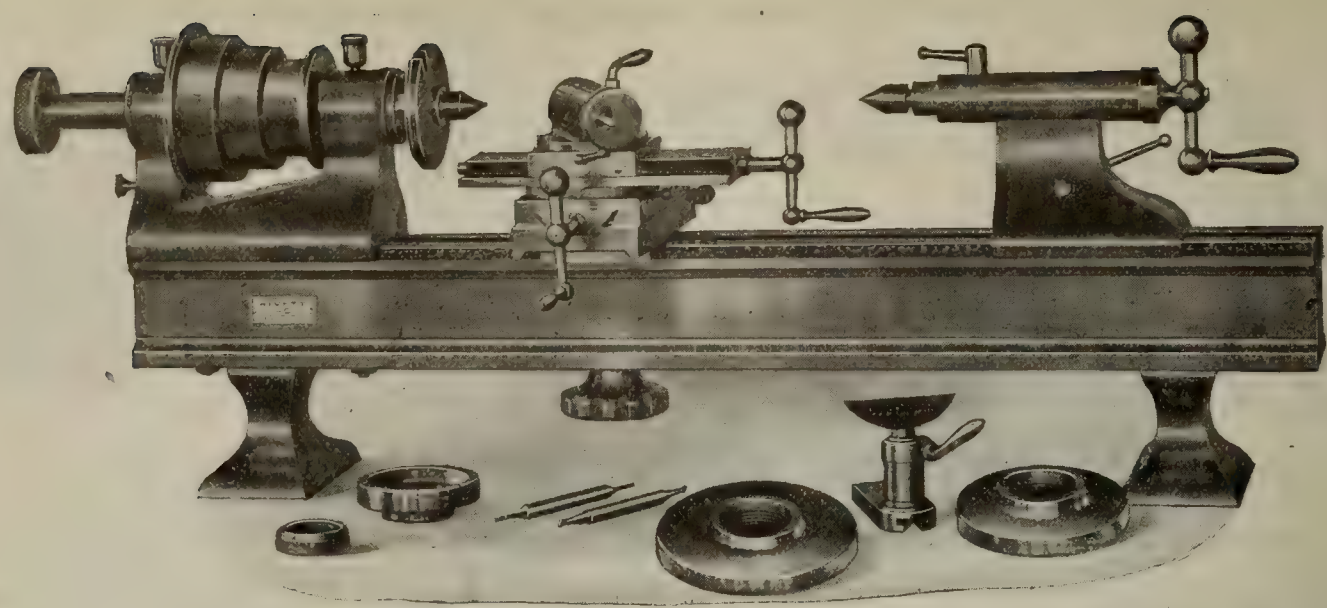

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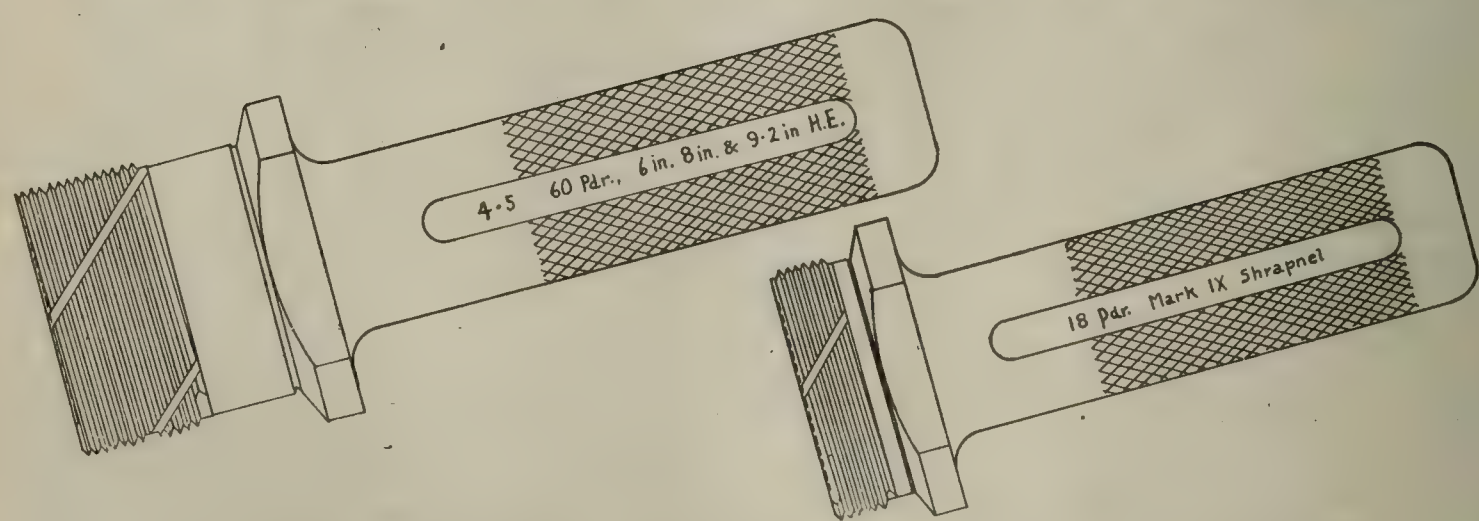

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A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XVIII. TORONTO, NOVEMBER 29, 1917 No. 22

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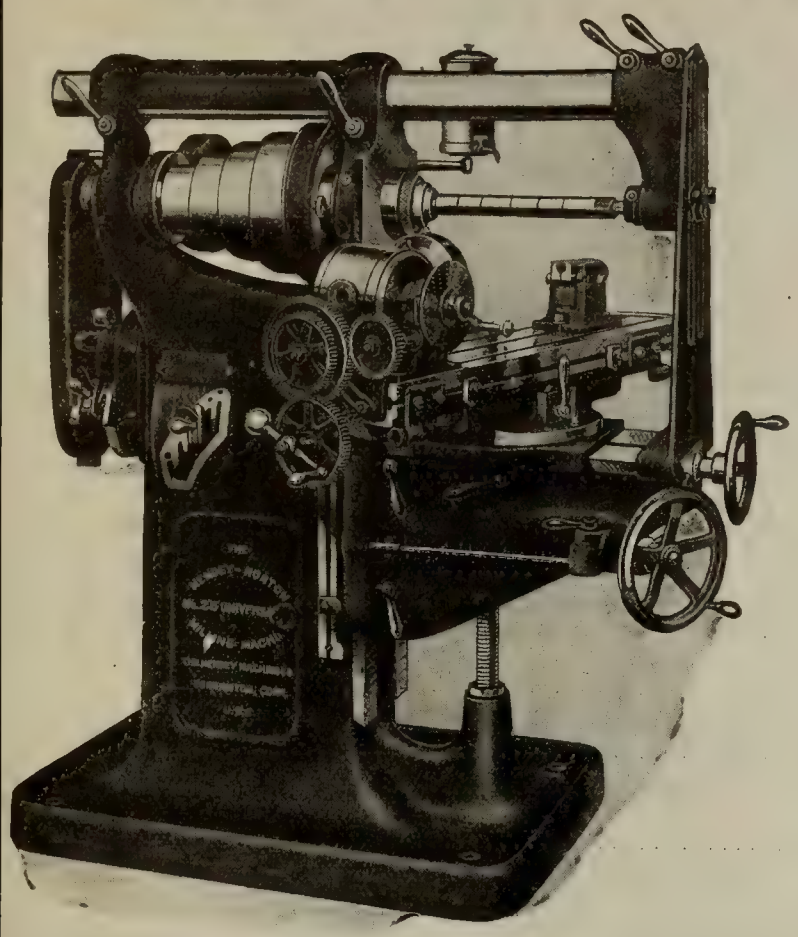

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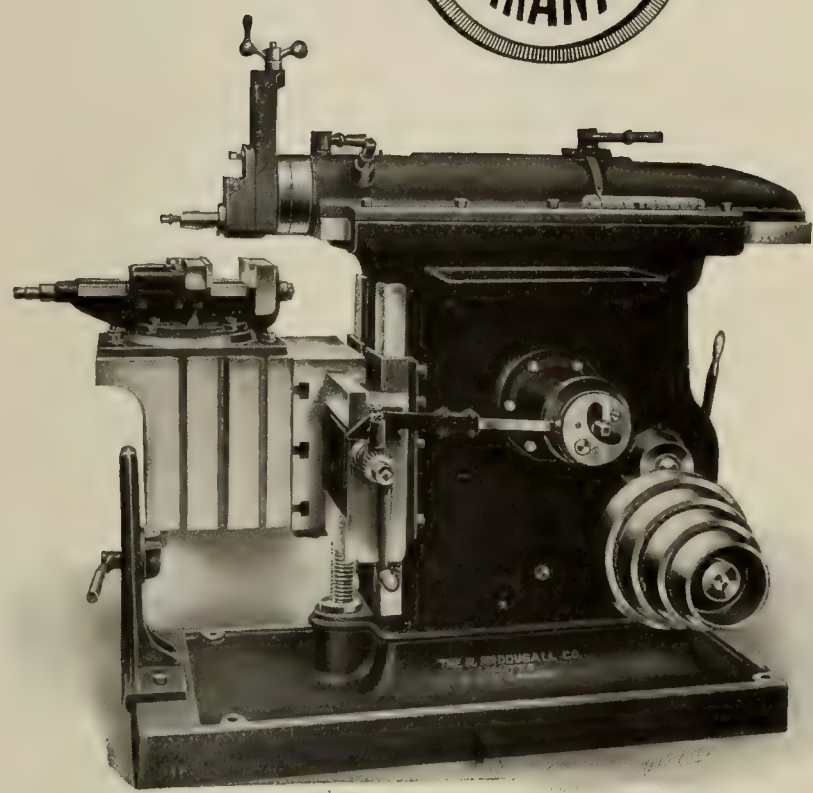

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A weekly newspaper covering in a practical manner the mechanical, power, foundry and allied fields.
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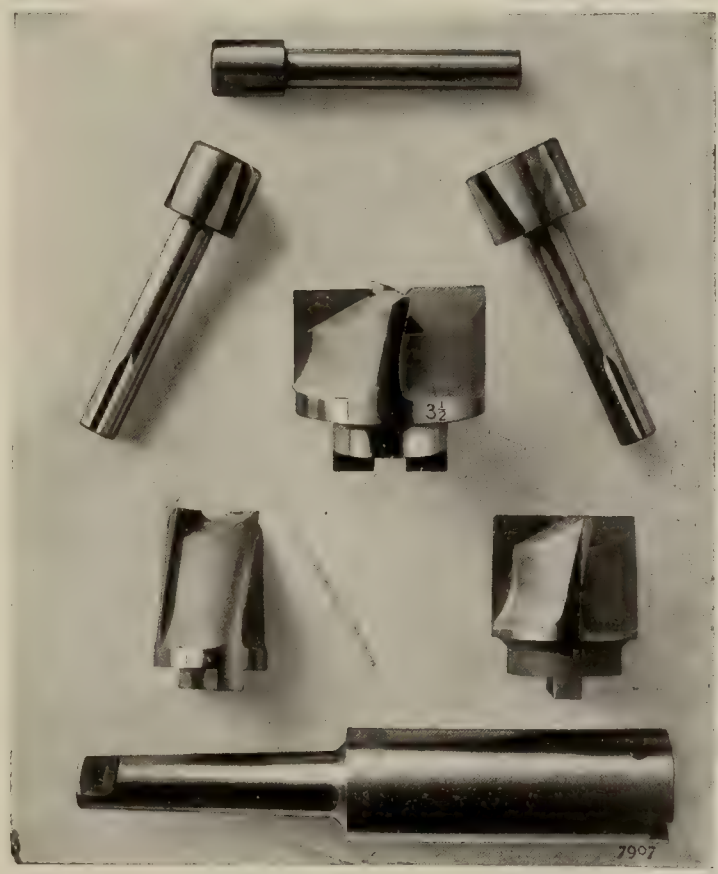

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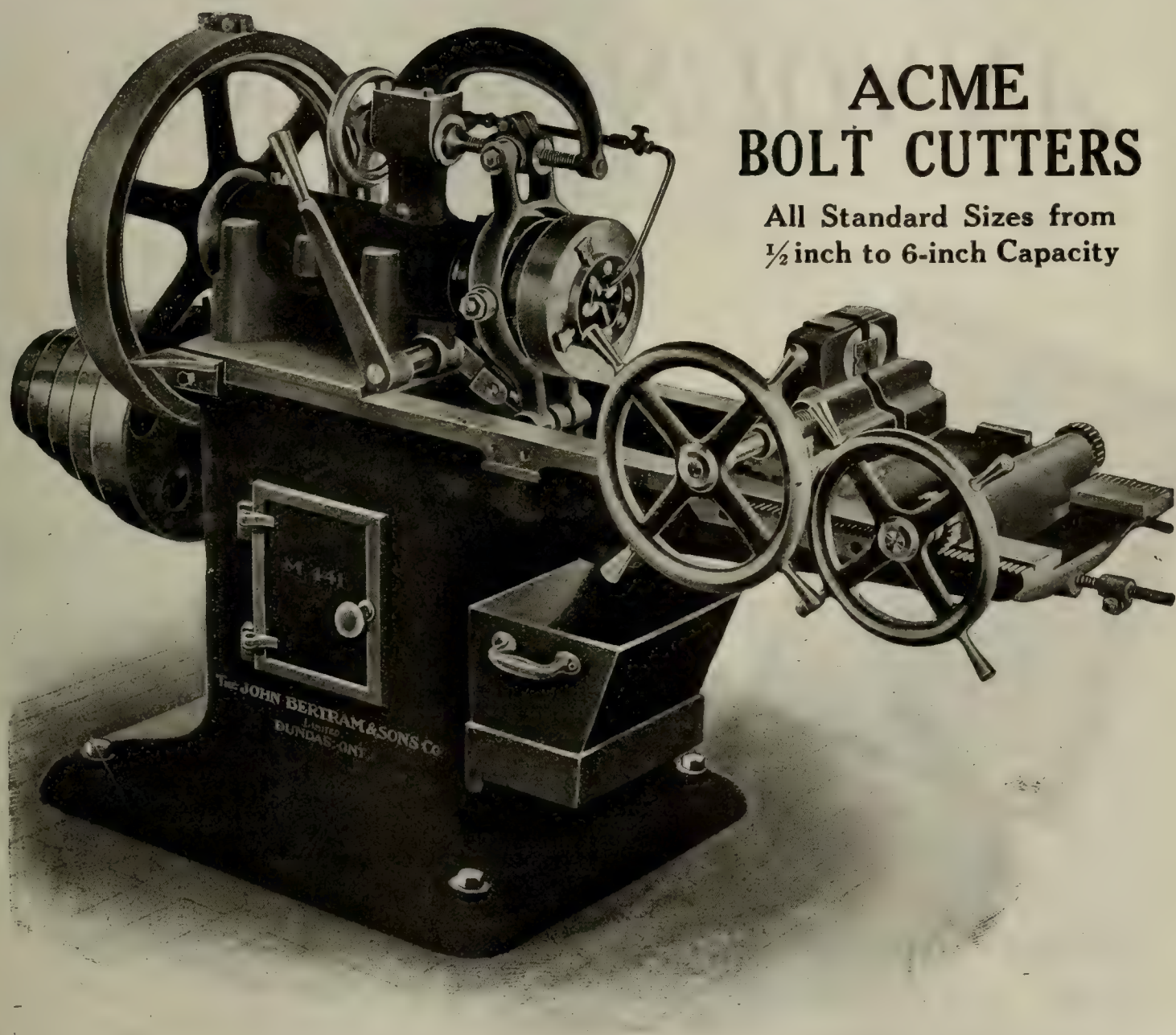

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The Publisher's Page

TORONTO December 6, 1917

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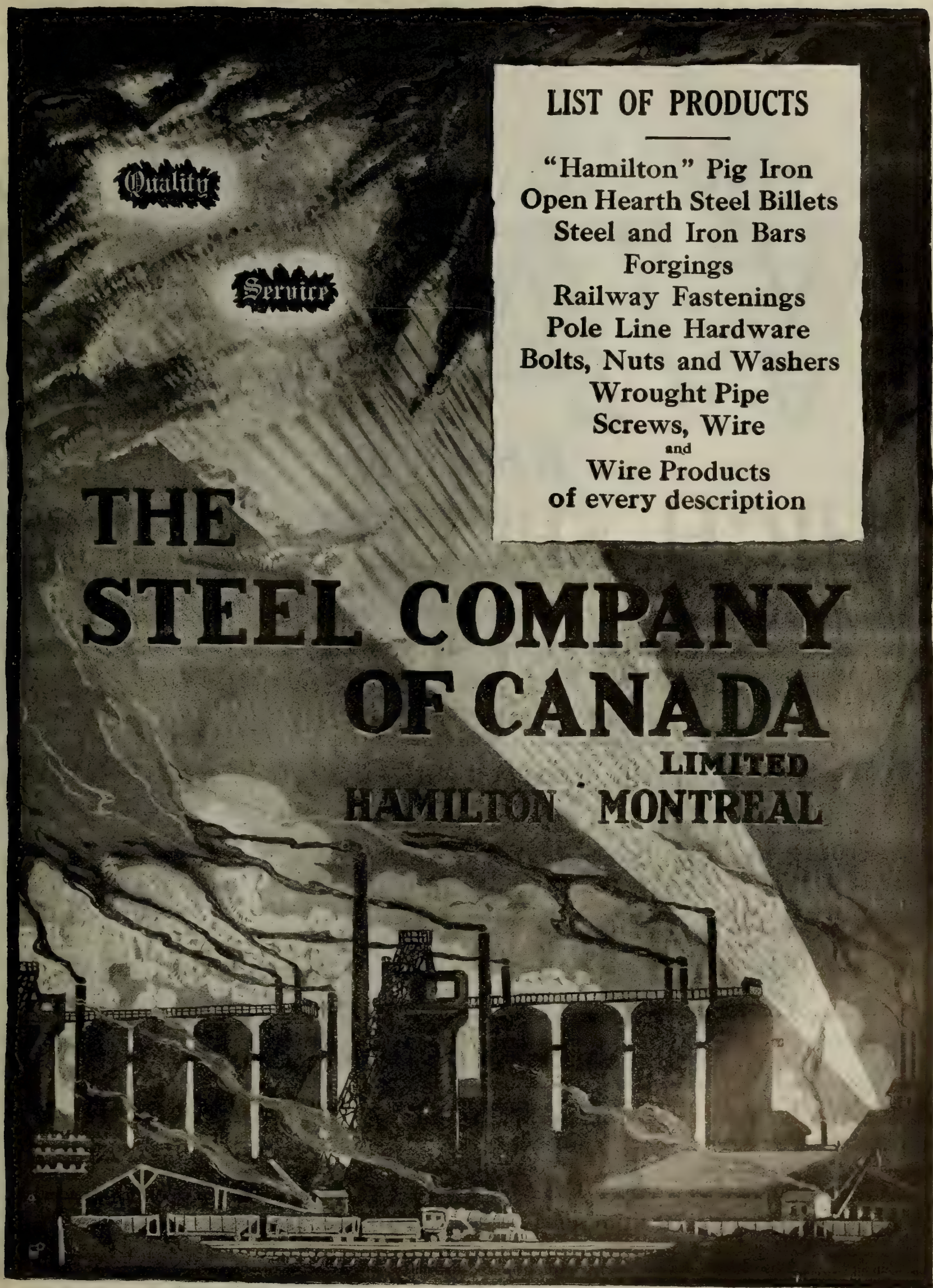

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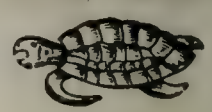

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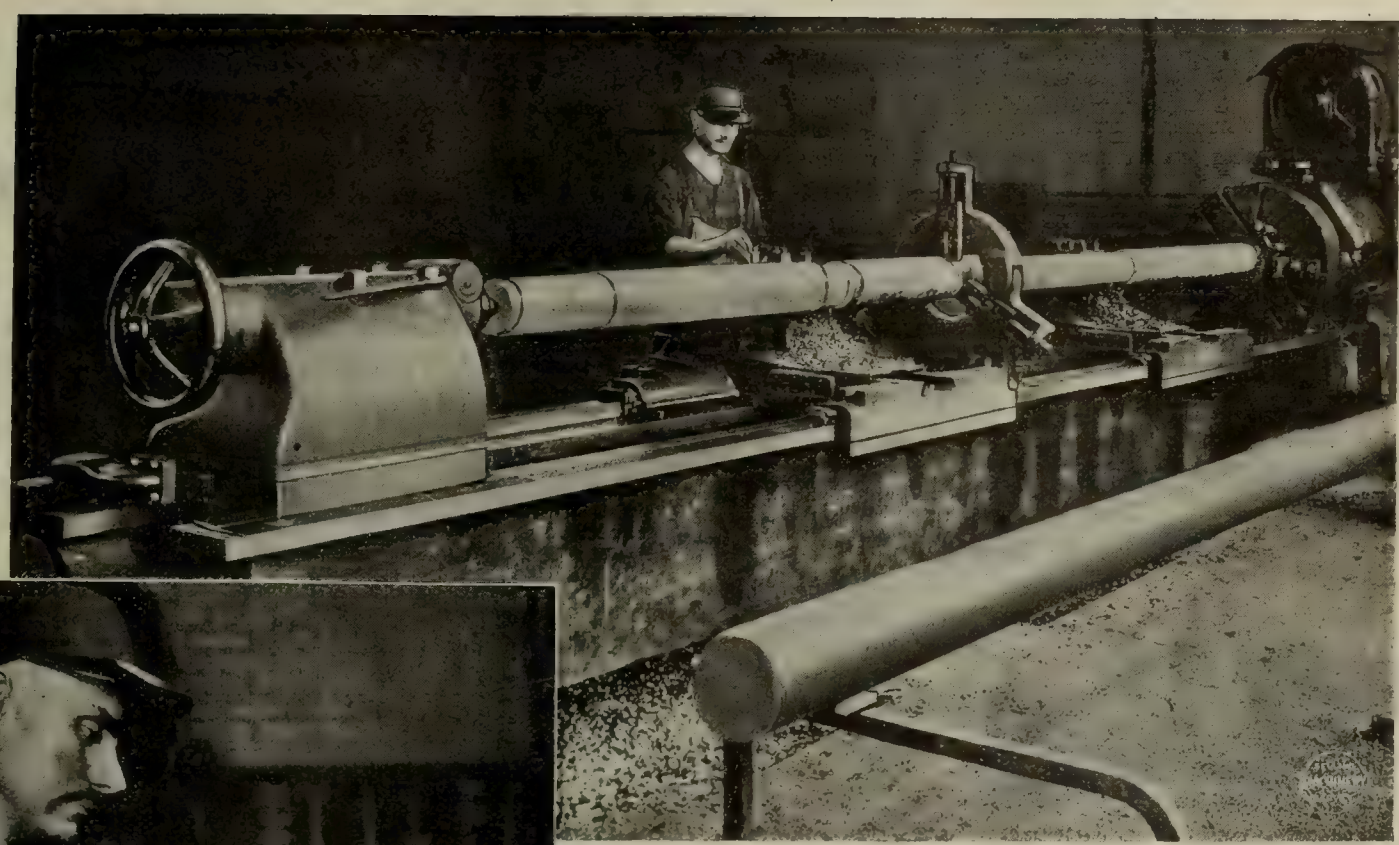

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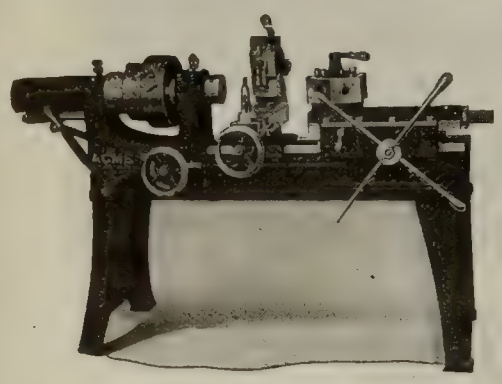

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Cincinnati, Ohio, U.S.A.
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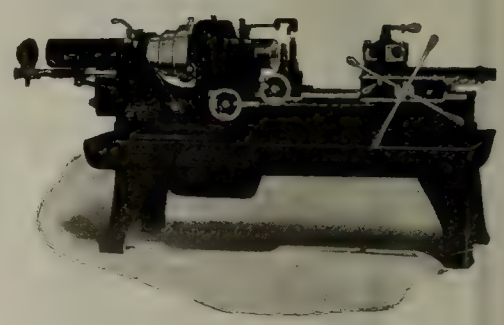

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"Extra" "Special" "High Speed" **Tool Steels**

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

James McKay Company
Pittsburgh, Penna., U.S.A.

Manufacturers of

Shell Forgings

We have the Equipment and Experience and can execute orders for

Nose Sockets Base Plates Adapter Plates

for any size shells. Can execute orders promptly.

SPECIAL FORGINGS—We can make any forgings that can be made under Drop Hammers.

CHAINS AND ACCESSORY FORGINGS—We have a complete line.

ADDRESS OUR REPRESENTATIVE:

JOHN A. BUCHANAN
King Edward Hotel, TORONTO

MALLEABLE CASTINGS

Capacity

Two Thousand Five Hundred Tons per Month

Our Prices, Quality and Delivery are Right

Send Us Your Inquiries.

THE PRATT & LETCHWORTH COMPANY, Limited

P.O. BOX 1630, MONTREAL

Works: BRANTFORD, ONTARIO

Air Chucks for 6" Shells in Stock

General Machine Work of All Kinds

Gear Cutting, Etc.

Hyde Engineering Works

27 William St., Montreal

P.O. Box 1185

Telephones: M. 1899 & M. 2527

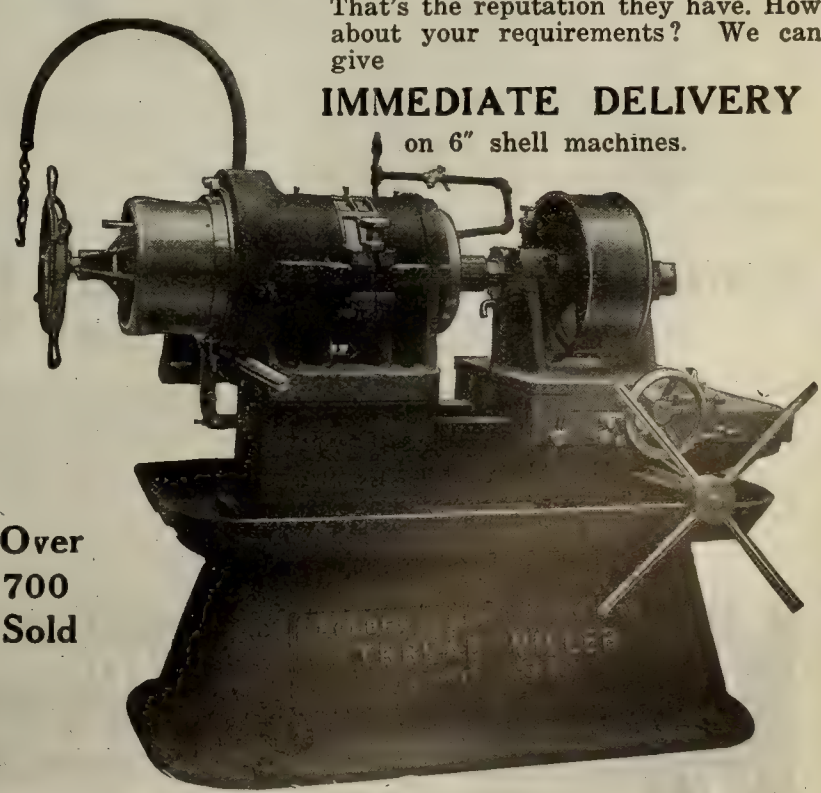
70 Holden-Morgans in One Plant

Another firm would not accept a contract until assured they could get HOLDEN-MORGANS.

That's the reputation they have. How about your requirements? We can give

IMMEDIATE DELIVERY

on 6" shell machines.



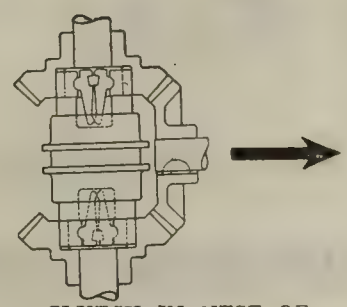
Over 700 Sold

THE A. R. WILLIAMS MACHINERY CO.

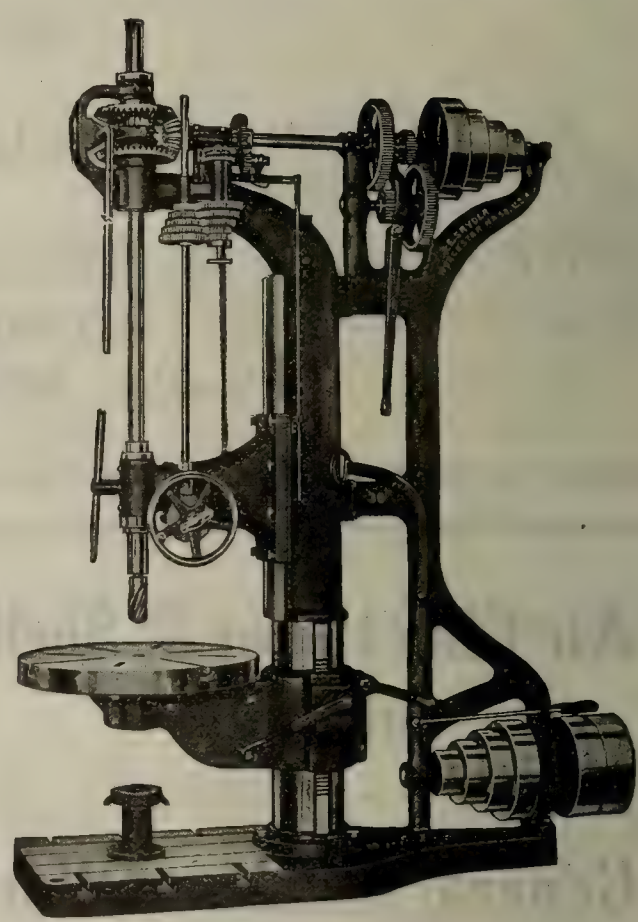
W. FRONT ST. (Limited) TORONTO

The Johnson Friction Clutch Is Being Used As A Part Of This Machine

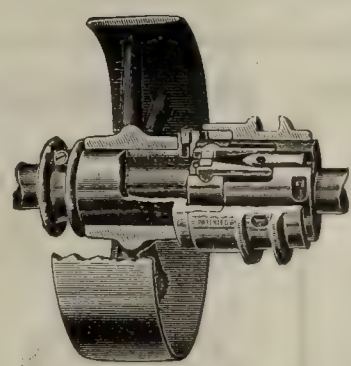
Follow the Arrow to the Snyder Drill Press



CLUTCH IN NEST OF GEARING.



A Double Johnson Friction Clutch is incorporated in the nest of gears indicated by the arrow.



CLUTCH WITH PULLEY MOUNTED ON HUB.

Johnson Friction Clutches are compactly constructed and are mechanically designed to meet the requirements as a tapping device on all types of drill presses. Machines equipped with a Johnson Friction Clutch do not need any other tapping device.

Courtesy of J. E. Snyder & Son, Worcester, Mass.

Consult Our Engineering Department for a Solution to Your Problems

There are a great many little problems that confront the machine tool designer. Why not consult our engineers and get the benefit of their years of experience in all branches of clutch application. This service is entirely free and is open to all without any obligation now or later.

Write for a copy of our yellow data sheets and latest booklet, "Clutches as Applied in Machine Building," to-day.

THE CARLYLE JOHNSON MACHINE CO.
MANCHESTER, CONN.

Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal; Can. Fairbanks-Morse Co., Ltd., Toronto.
England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.

We will Fill Your Requirements *Send Us Your Inquiries*

Air Compressor Evidence

The greatest evidence of the value of any article is the demand for it after investigation and trial. Below are four carloads of our compressors which fills one order to a large concern in Canada. Our line of compressors is very large.

Write us and explain your requirements

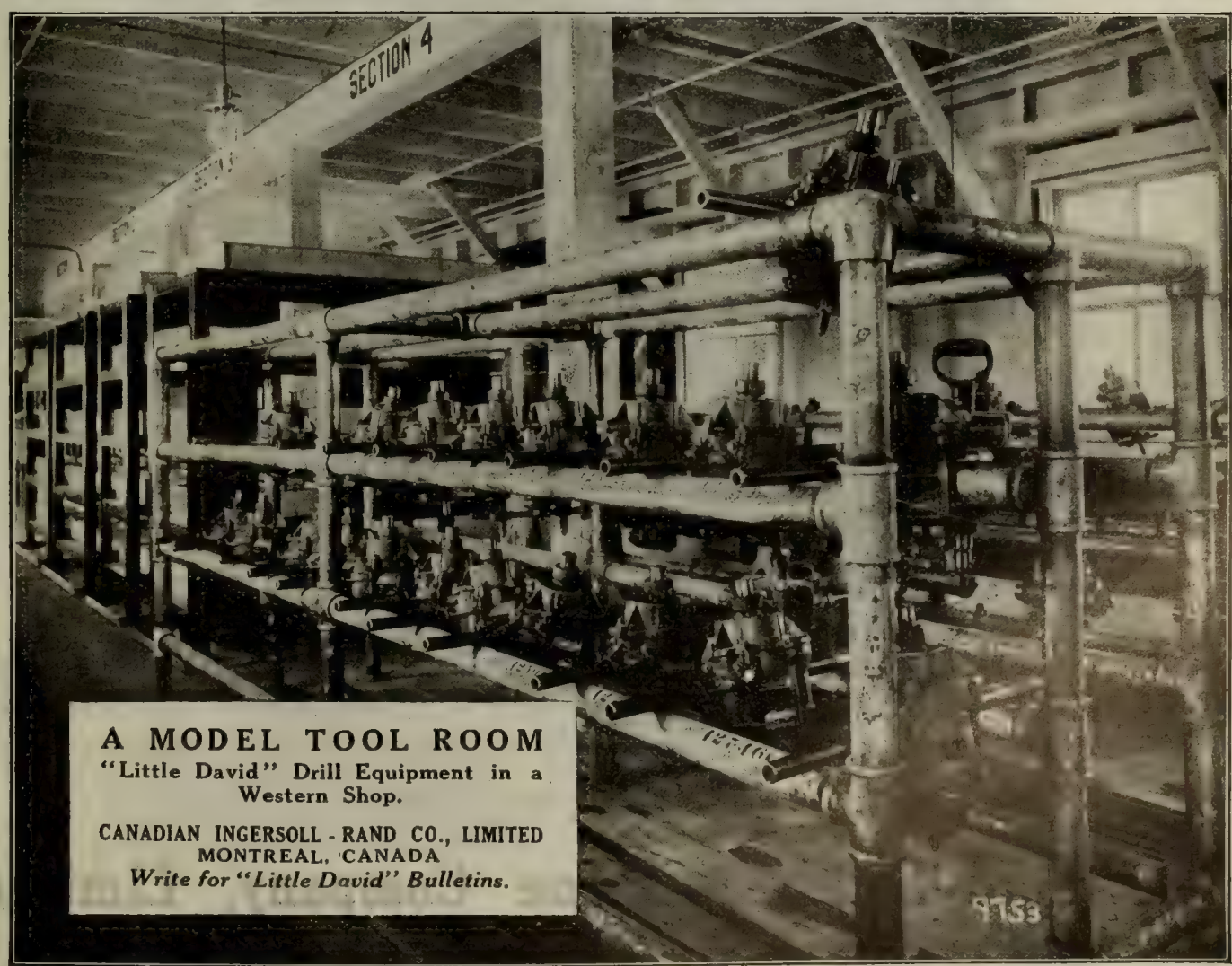
The Jenckes Machine Company, Limited

CANADIAN SALES OFFICES:

WORKS: Sherbrooke, Que.

Sherbrooke, Montreal, St. Catharines, Toronto
Cobalt, South Porcupine, Vancouver.

WORKS: St. Catharines, Ont.



A MODEL TOOL ROOM
"Little David" Drill Equipment in a Western Shop.

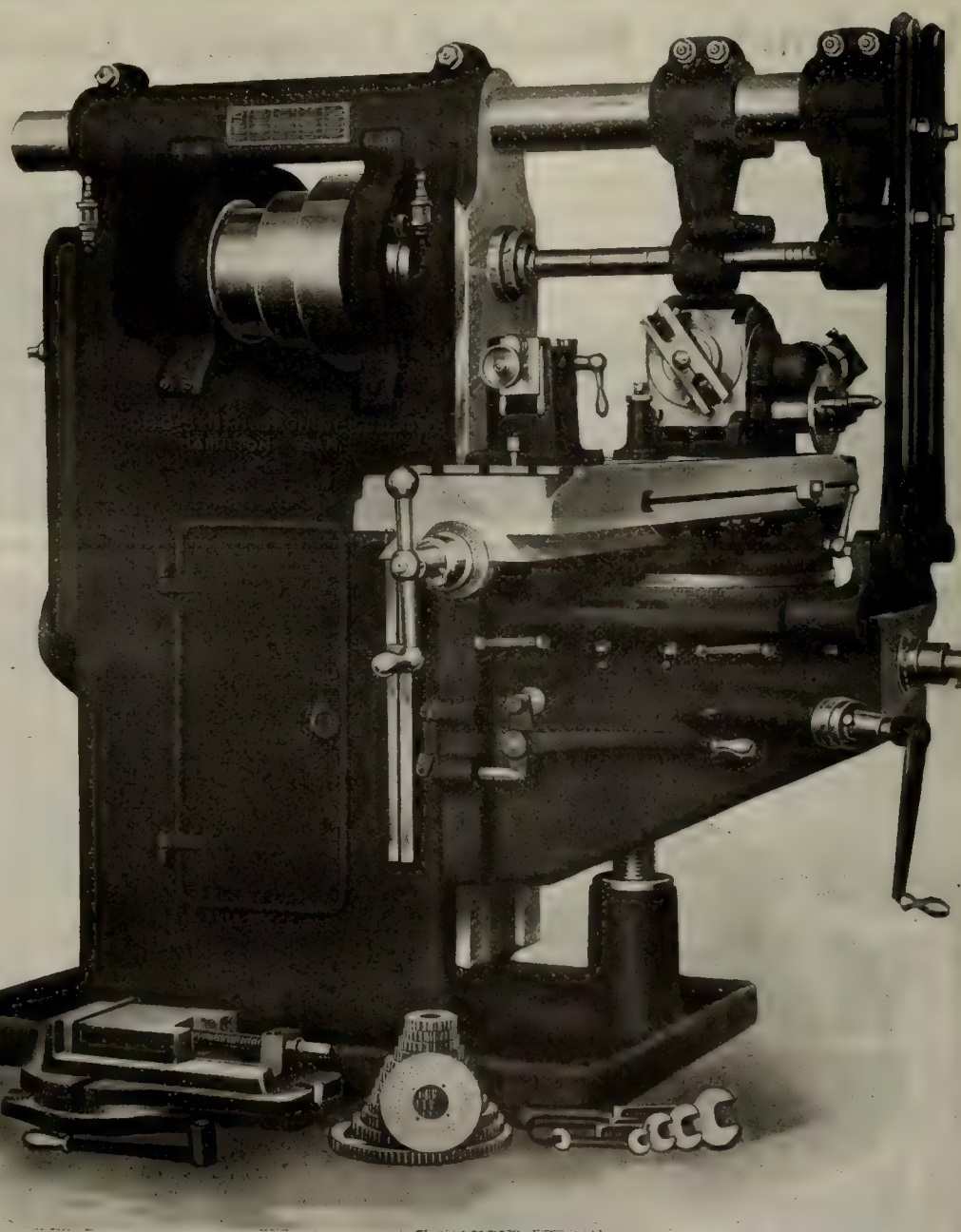
CANADIAN INGERSOLL - RAND CO., LIMITED
MONTREAL, CANADA
Write for "Little David" Bulletins.

The Ford-Smith Machine Company

Adv't. No. 9 MILLER SERIES

OUR UNIVERSAL MILLERS

In this issue we cover our Universal Millers only. Compactness and simplicity of design have been strictly adhered to. All the points of excellence and accuracy of our Plain Millers are embodied in our Universal Machines, with all the new advantages that a Universal Miller allows one to have.



Our best workmanship and material are as heretofore placed on these machines. Purchasing Agent, Manager, Superintendent or Tool Room Foreman, allow us to send you our Bulletin so you can learn further the details of these machines.

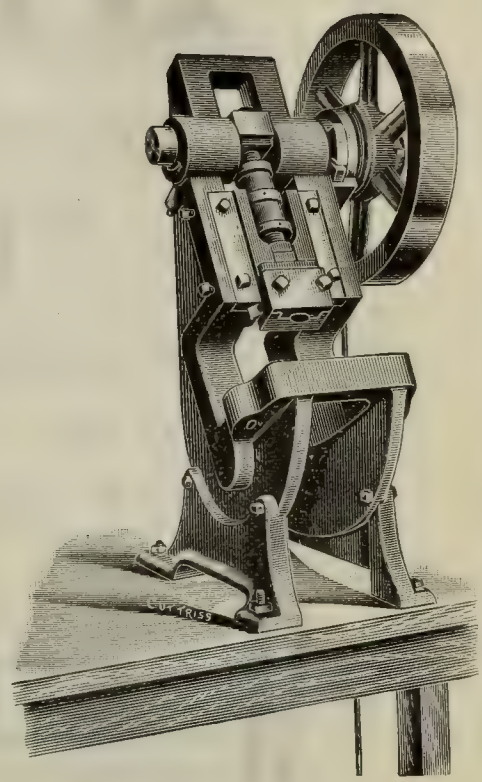
It will pay you in the end.

The Ford-Smith Machine Company, Limited

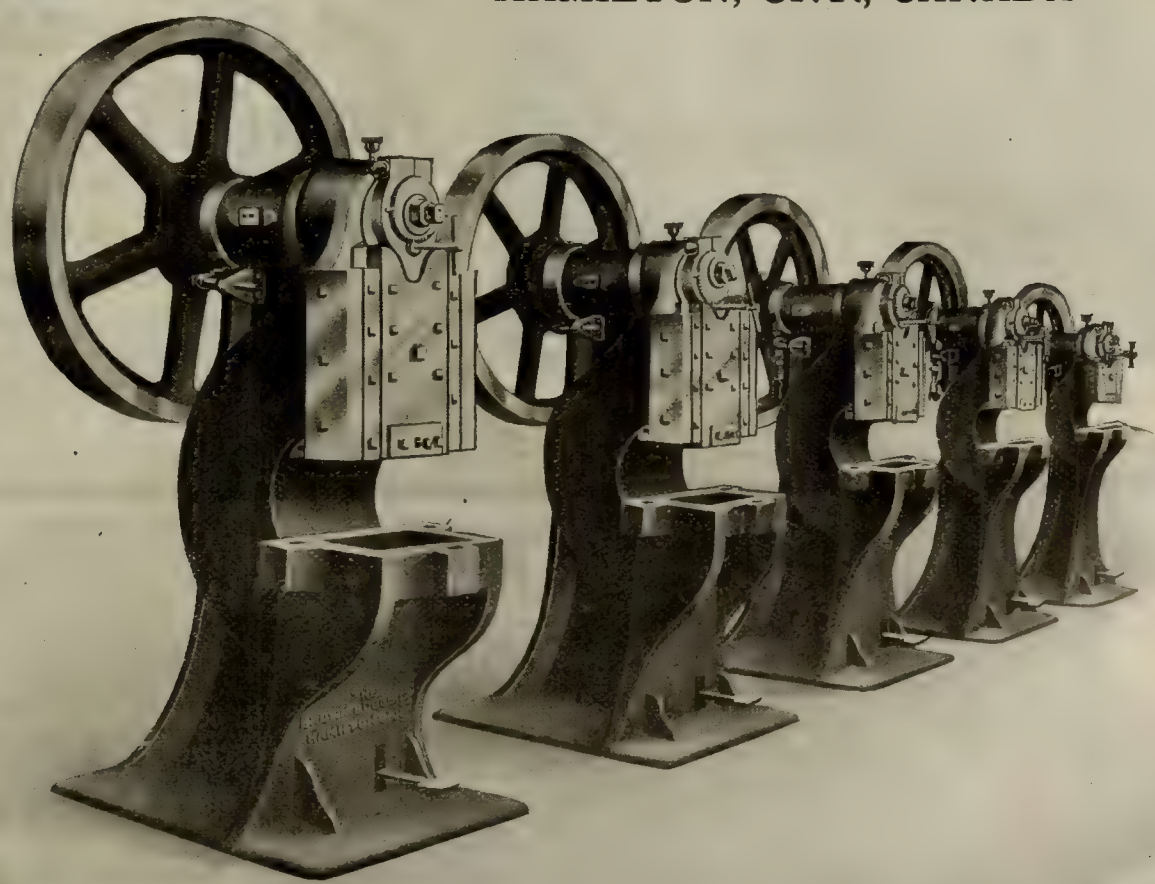
HAMILTON ONTARIO CANADA

WHY A "B. B.?"

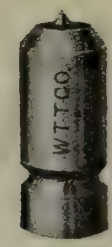
Experience has proved
that
B.B. PRESSES
qualify for
Economy
Durability
Speed



The Brown, Boggs Co.,
LIMITED
HAMILTON, ONT., CANADA



DIAMOND



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All sizes, finest quality, awaiting your command, stones

"THAT SUIT"

either unmounted or mounted in our improved (any style) CAST STEEL MOUNTING;

GUARANTEED TO BRING RESULTS.

"MADE IN CANADA"

WHEEL TRUEING TOOL CO.

88 WEST PITT STREET WINDSOR, ONTARIO

Works: LONGUEUIL, QUE.

Armstrong, Whitworth of Canada Limited

Standard Sizes of

HIGH SPEED STEEL

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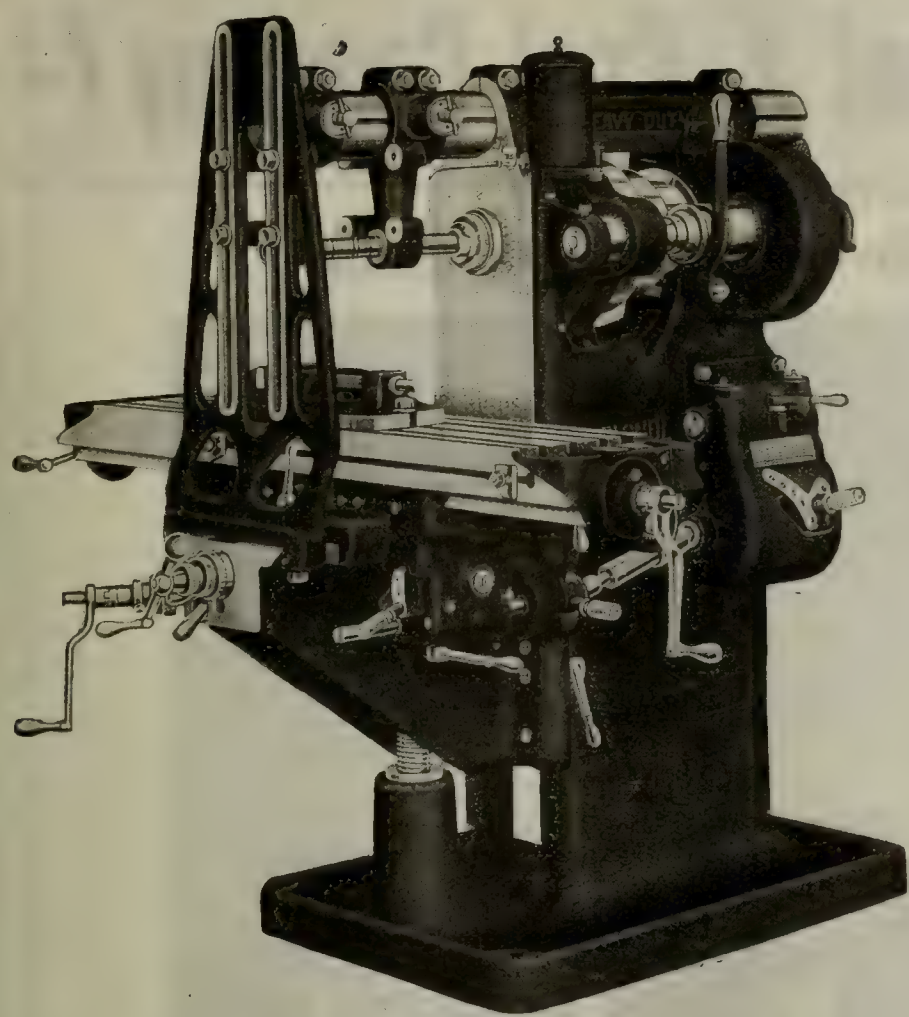

LeBLOND
Heavy Duty Milling Machines

Plain or Universal Types—Cone or Gear Drive. All commercial sizes No 0 to No. 5.

Adapted for the Heaviest Manufacturing or the most exacting tool room service. A suitable Range and Capacity for every class of milling.

Patent Self-Aligning Arbor Supports—Hardened Steel Spindle Bearings—Double-Friction Back Gears—and the simplest type of right-hand control, contribute to an increased production and longer life as a precision machine.

The R. K. LeBlond Machine Tool Company

CINCINNATI, OHIO, U.S.A.

URANIUM
HIGH SPEED STEEL
Improving High Speed Steel

When high speed steel was first produced it was so much better than carbon steel then in use that people thought it perfect. With the addition of Uranium to high speed steel, however, the combination was found to be stronger, tougher, held its cutting edge longer, especially on the higher speeds, and was more ductile than plain tungsten steel.

Repeated orders have shown what people think of Uranium Steel.

Consult your steel maker or write us.

STANDARD ALLOYS COMPANY

FORBES AND MEYRAN AVES.

PITTSBURGH, PENNA.

Nova Scotia Steel & Coal Company

Limited

New Glasgow, Nova Scotia, Canada

4,000 TON STEAM HYDRAULIC FORGING PRESS FOR MARINE AND OTHER HEAVY FORGINGS.

The product of a modern steam-hydraulic press is denser and more homogeneous than can be obtained with the steam hammer, due to the effect of the blow of the latter not penetrating to the centre, in contradistinction to the uniform kneading effect of the press; while the amount of work that can be done by the latter at one time with little variation in temperature, strongly tends toward a better product. The greater uniformity and reliability of steam hydraulic forgings make their use imperative wherever high-class products are required.

17 Years in the Service of Our Customers

You, as a user of TOOL STEEL, are vitally concerned with the Company manufacturing that steel. Obviously, for on it necessarily depend the quality of the Steel and the Service you receive.

THE VULCAN CRUCIBLE STEEL COMPANY was established in 1900 and has enjoyed a steady, normal growth—the result of satisfied customers. The personnel consists of experienced, executive and practical men who have worked together for years. The equipment of the plant is modern and complete, and assures you of prompt, dependable service. Natural gas, oil and electricity for melting; steam and electricity for mill driving, etc.

This Company has always conscientiously cared for the needs of its customers. In view of the conditions that have prevailed during the last two years, this is certainly a record of which to be proud.

These are some of the points that make relations with our customers so pleasant, and which are making the bonds of friendship and good-will stronger every day.

VULCAN CRUCIBLE STEEL COMPANY

MAKERS OF WOLFRAM HIGH SPEED STEEL

ALIQUIPPA *Established 1900* **PA., U.S.A.**

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Messrs. Norton, Callard & Company, Montreal, Que.

For Export and Import—

Iron — Steel — Metals

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A. G. KIDSTON & CO.

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and connections all over the civilized world, have exceptional advantages for the marketing of Canadian and other products. Enquiries invited and promptly handled.

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"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

MANUFACTURED BY

Arthur Balfour & Co., Limited
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OUR GOVERNMENT will spend a minimum of $350,000,000 for Destroyers—when these are built the American Navy will lead the world in boats of this type and the submarine is doomed. Nothing but the best materials will enter into the construction of these vessels. *This is also true of*

"Red Cut Superior"

The Nationally Known
First Quality

HIGH SPEED STEEL

The greatest vigilance is observed in every detail of its manufacture—we spare no expense to insure the highest quality in every bar. No better all purpose High Speed Steel has as yet been produced.

It's best for all machine work.

VANADIUM-ALLOYS STEEL CO.
PITTSBURGH, PA. Works at LATROBE, PA.

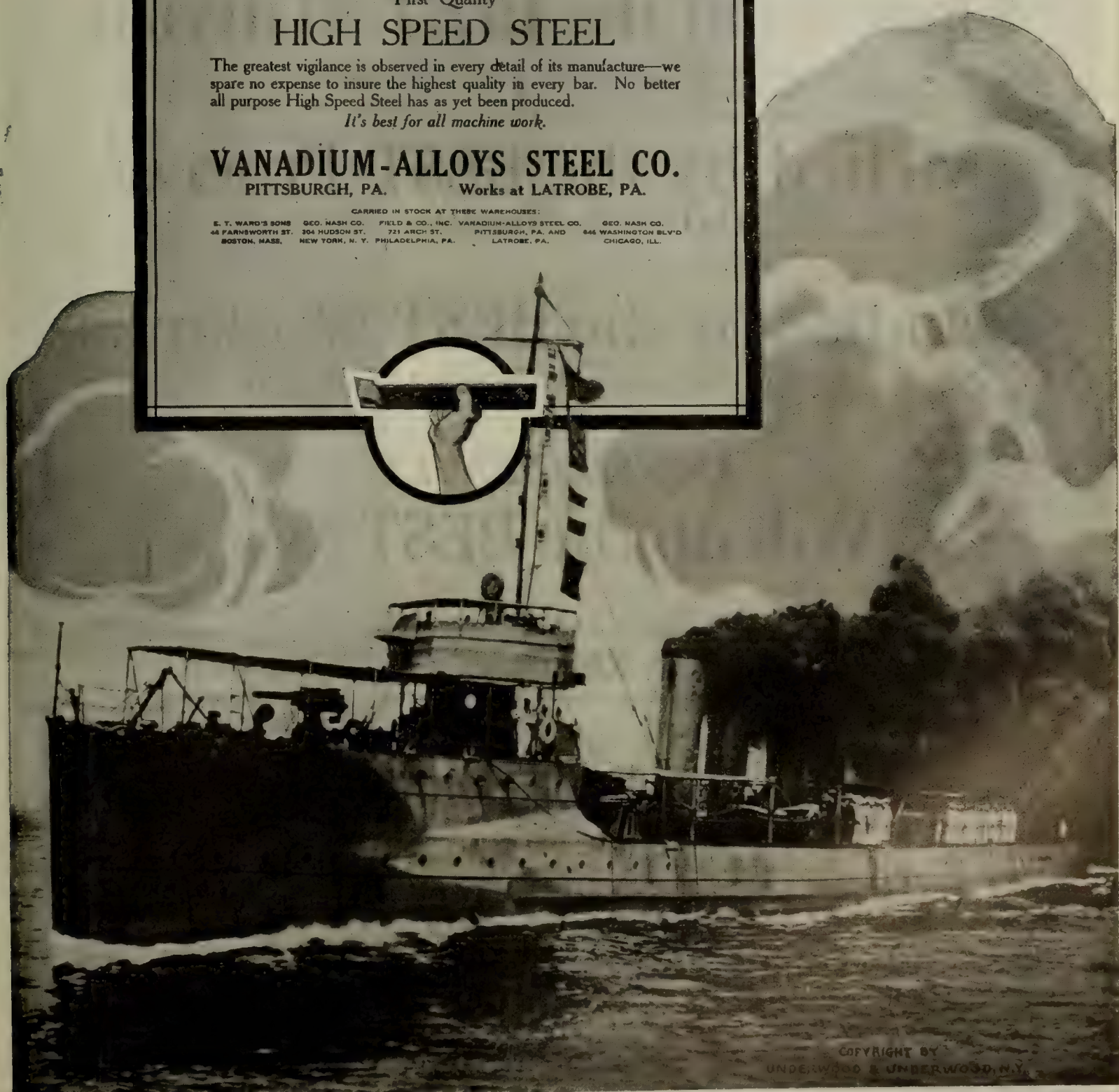
CARRIED IN STOCK AT THESE WAREHOUSES:

E. T. WARD'S SONS, 44 FARNSWORTH ST., BOSTON, MASS. — GEO. NASH CO., 304 HUDSON ST., NEW YORK, N. Y. — FIELD & CO., INC., 721 ARCH ST., PHILADELPHIA, PA. — VANADIUM-ALLOYS STEEL CO., PITTSBURGH, PA. AND LATROBE, PA. — GEO. NASH CO., 646 WASHINGTON BLV'D CHICAGO, ILL.

U. S. S. Warrington, torpedo boat destroyer, the type of vessel that safely escorted Major General Pershing and his staff to England.

This is the type that is now aiding the British and French navies in wiping out the submarine menace. They are doing great work in lessening the effectiveness of the submarine warfare.

Passed by the Censor



If interested in High Speed Steel and you care to receive our printed matter at intervals, send us your name and address for our mailing list.

One of the

Steels of the Century

Centurion High-Speed

Made from the BEST Materials

Iron, Tungsten, Chrome, Vanadium

Melted by the BEST Process

The Crucible Furnace Method

Handled by the BEST Workmen

Melters, Forgemen, Annealers, Metallurgists

CONSEQUENTLY

Will do the BEST Work

Quality ***Delivery*** ***Service***

We have a catalog waiting for you. Write for it.

THE CENTURY STEEL CO. OF AMERICA

MANUFACTURERS OF HIGH-GRADE CRUCIBLE STEELS

General Office and Works:
POUGHKEEPSIE, N.Y.

Sales Offices:
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THE FINEST QUALITY

HIGH-SPEED STEEL

IN EXISTENCE

BY using Uranium in our process of steel making, we have produced a truly remarkable combination of those two most desirable qualities, toughness and strength.

Through the consistent maintenance of quality, workmanship, and the exclusive use of automatically regulated furnaces, which eliminate all possible chance of human fallibility, we are able to produce a very high grade of High-Speed Steel.

"Electric-Uranium" has an exceptional cutting ability. It is increasing the users' output everywhere. Give it a trial.

We can make immediate deliveries on bars of regular sizes.

Latrobe Electric Steel Co.

LATROBE, PENNA.

ELECTRITE

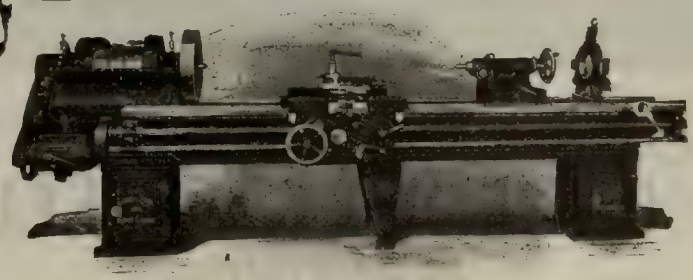
WATCH PRODUCTION CLIMB OUT OF LATHES

FAMOUS

When Sidney-for-Service Lathes go into a plant, Production begins to climb up to new "peaks". Ask any "Sidney" Operator—read the facts in Bulletin No. 30.

Watch Production climb out of Sidney-for-Service Lathes
Get in touch with a Canadian Agent now

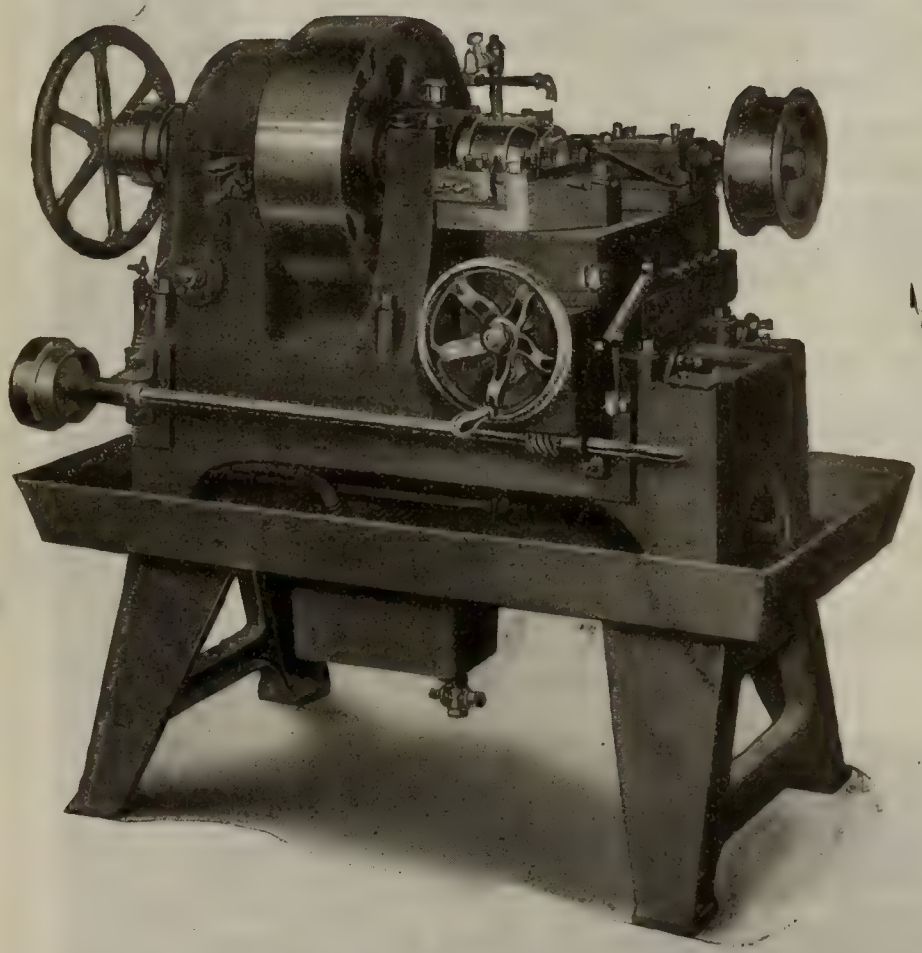
The Sidney Tool Co. - Sidney, Ohio



Represented in Canada by

Foss & Hill Machinery Co.
Montreal, Que.

H. W. Petrie, Limited
Toronto, Ont.



For Turning, Facing and Milling the thread on Gas Check Plugs for 6-inch High Explosive Shells.

THE BANFIELD PLUG MILLER

Patented in Canada and United States

THIS machine is especially designed for finishing base plugs, turning the outside diameter, finishing the face with any camber desired, and milling the thread, all in one chucking, the complete plug being finished in six minutes by unskilled labor.

The machine is equipped with quick draw-in collet. Drive pulley 18" x 6", with bronze bush having cut jaw clutch for turning and facing. Worm gear 100 to 1 ratio, with cut jaw clutch for milling, driven by 10" x 1½" flanged pulley. The milling cutter is driven by an 8" x 2½" flanged pulley. Tool post carriage is equipped with power feed (two speeds) having automatic stop. Power feed pump with relief valve driven from worm shaft (all drives direct from main line shaft). Rigidly built, simple and economical to operate.

Weight 1,800 lbs.

For 18 pdr., 4.5 and 60 pdr. High Explosive Shells. Can furnish machines of same type, but somewhat lighter in construction. Particulars on request. These machines are tooled up for finishing plain machined or bevelled plugs, if desired.

Write for prices and deliveries.

Prompt Shipment

BUILT EXCLUSIVELY BY

Edwin J. Banfield
STAIR BUILDING, TORONTO, ONT.

Help Win the War

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STELLITE

Increase Your Production

The Hardest, Toughest, Fastest Cutting Metal Known

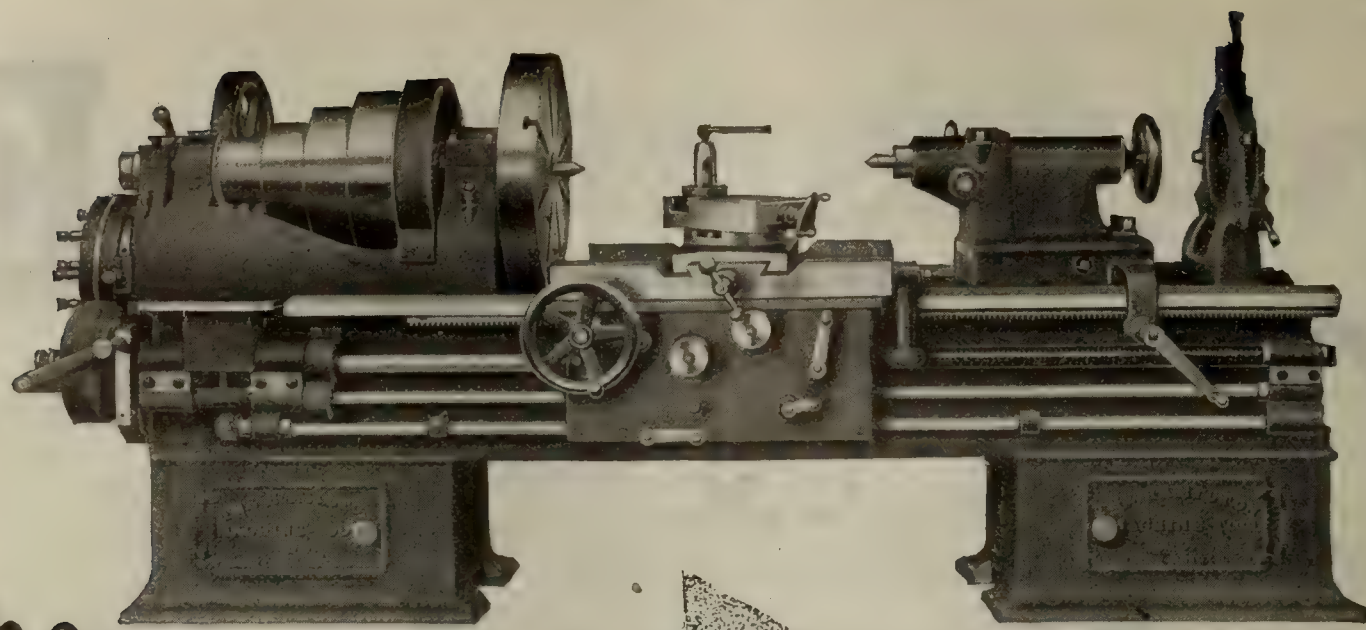
We shall be glad to send Demonstrator to show you how you can increase your production by using

STELLITE

Deloro Smelting & Refining Company, Limited

Head Office and Works: DELORO, Ont.

Toronto, 200 King St. W. Montreal, 315 Craig St. W.



The "HAMIL TON"

INSTALL the most modern machinery in your plant to meet the new conditions of to-day. You get it in Hamilton Lathes.

We are living in the greatest speed-up, cut-the-cost-of-production period of modern times. War time conditions demand speed and economy in the machine shop as well as in other institutions of commerce. Shops everywhere are now producing more work with the same force of men than before the war. The war has created a demand for the utmost efficiency and brought out the resourcefulness of the country in new machinery.

Hamilton Lathes represent the conditions in the machine shop and the spirit of the times with their speed, durability and accuracy.

Write now for Bulletins—yours for asking.

Speeds Production

The Hamilton Machine Tool Co.

HAMILTON, OHIO

Sole Agents for Ontario:

H. W. PETRIE, Limited - TORONTO, ONT.

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6" shells.

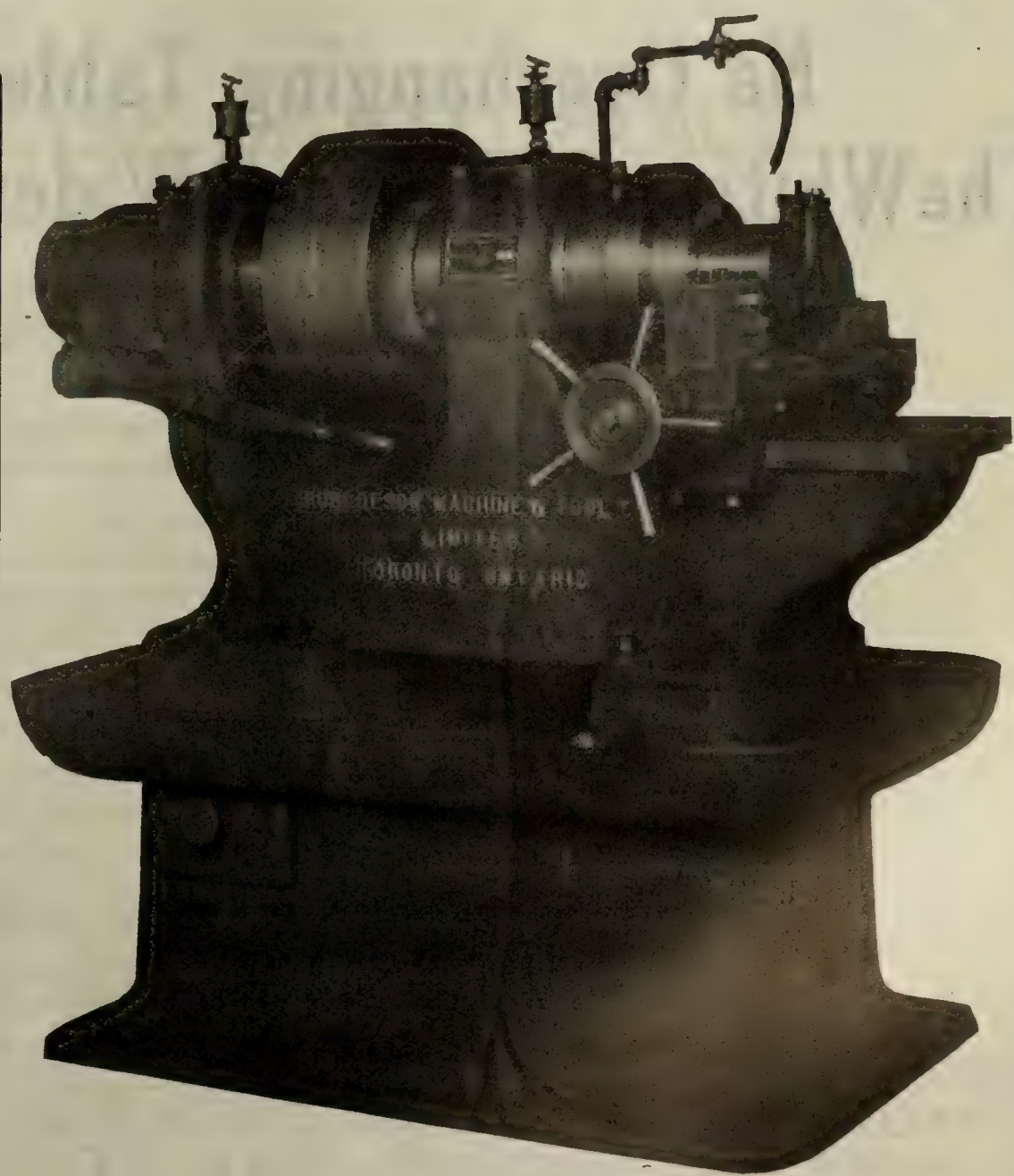
Roelofson Machine & Tool Co., Ltd.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

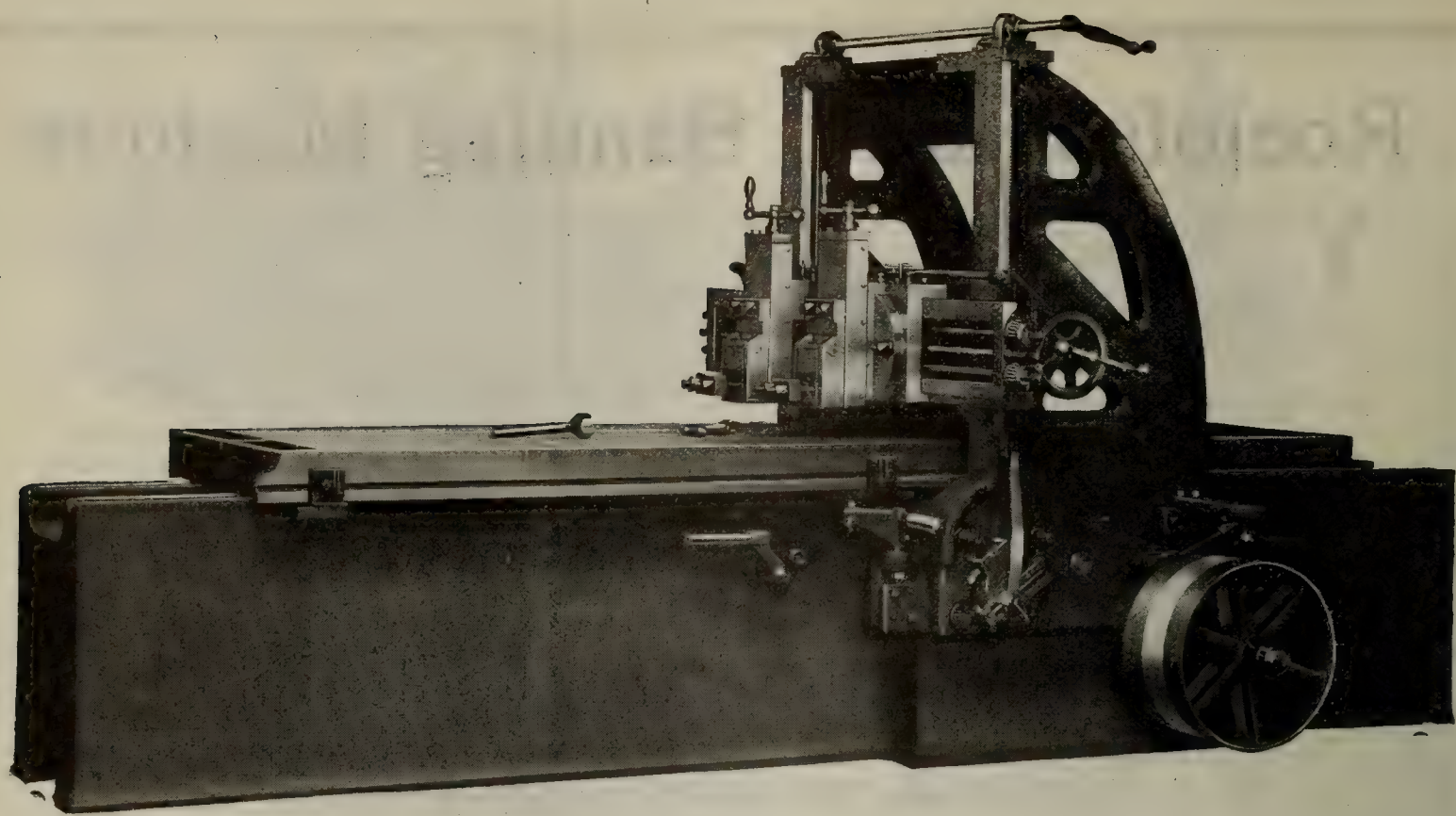
Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6" shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.



If any advertisement interests you, tear it out now and place with letters to be answered.



No Overhanging Table On The Whitcomb-Blaisdell Widened Planer

A great variety of planer work calls for unusual width between the housings, with but little height under the cross-rail.

This is the work for the widened pattern planer, rather than a standard machine. The former is easier to handle and capable of higher speeds.

The Whitcomb-Blaisdell Widened Planer has been developed to fill this need. Not a makeshift, built over from the standard size; but thorough and complete in design.

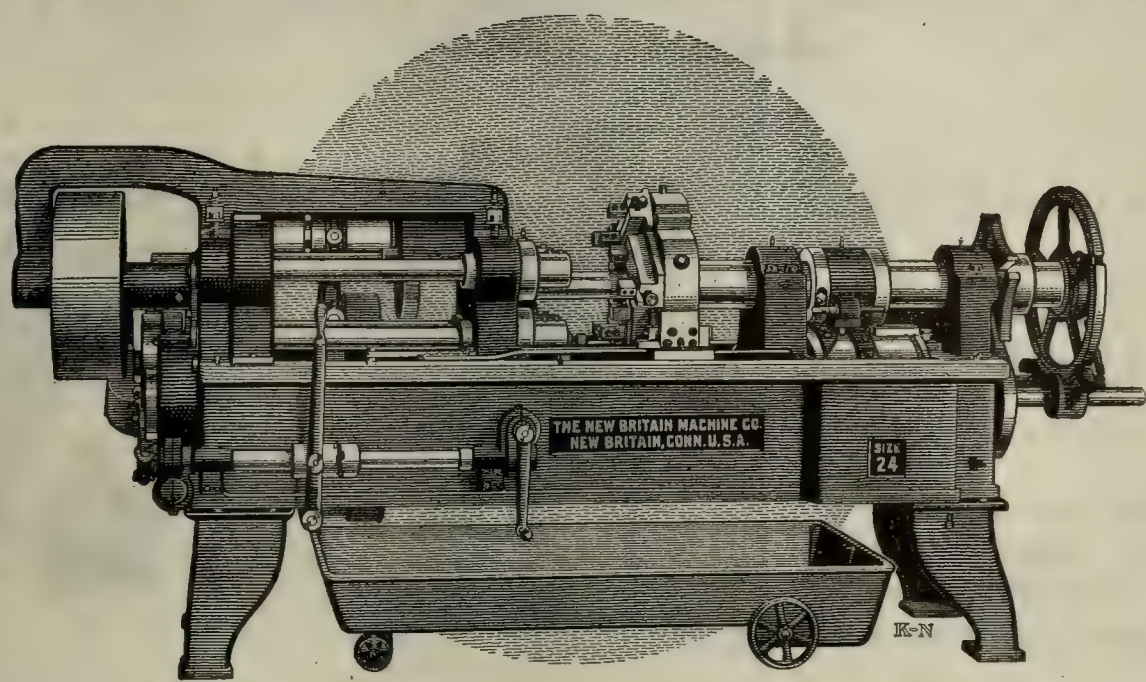
For instance the usual practice is to widen the bed and table without spreading the tracks thus causing overhang to the table. Whitcomb-Blaisdell design, however, widens the tracks as well. This is typical of Whitcomb-Blaisdell construction throughout. Every detail for production is built into these planers.

Write for the Whitcomb-Blaisdell Planer Book. Read all the details.

LATHES From 14" to 30" SWING

WHITCOMB-BLAISDELL MACHINE TOOL CO.
WORCESTER, MASS., U.S.A.

PLANERS From 17" to 48" WIDE



A CASE OF NO CHOICE

WHEN you buy a lathe—milling machine—or what not—you have a wide field with which to acquaint yourself.

One lathe is best for small work, another for large. This miller possesses an exclusive feature rendering it most efficient for one purpose, that one for another. And so on.

To buy intelligently you must be familiar with the individual characteristics of a considerable number of similar machines.

The selection of equipment for the common run of chucked work—whether castings, forgings, or second-operation bar work—is rendered easy by reason of the fact that there is one machine which stands out above all others, with a 300% to 500% production advantage.

That's the "NEW BRITAIN" MULTIPLE SPINDLE AUTOMATIC.

There's no choice!

The New Britain Machine Company

Automatic Screw and Chucking Machines

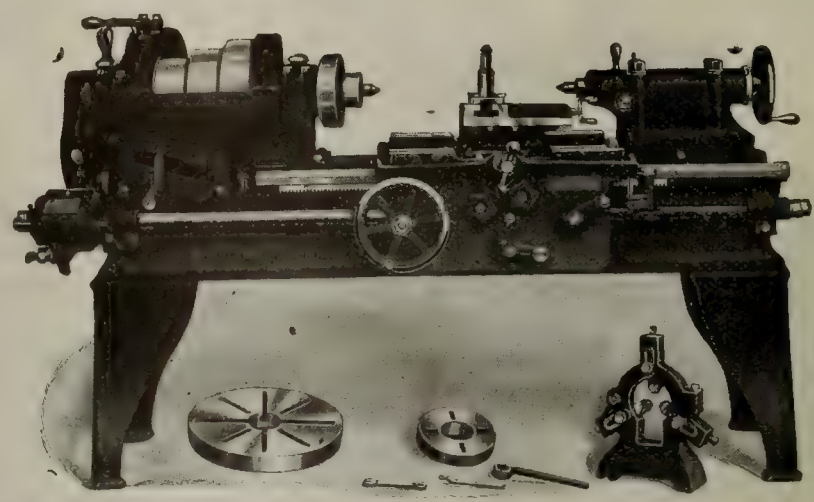
New Britain, Connecticut, U.S.A.

LOOK—Lodge and Shipley Engine Lathes

IMMEDIATE SHIPMENT

SIZE
14" x 6' or 8' Bed.

Double Back Gears and Quick Change Gear Box.



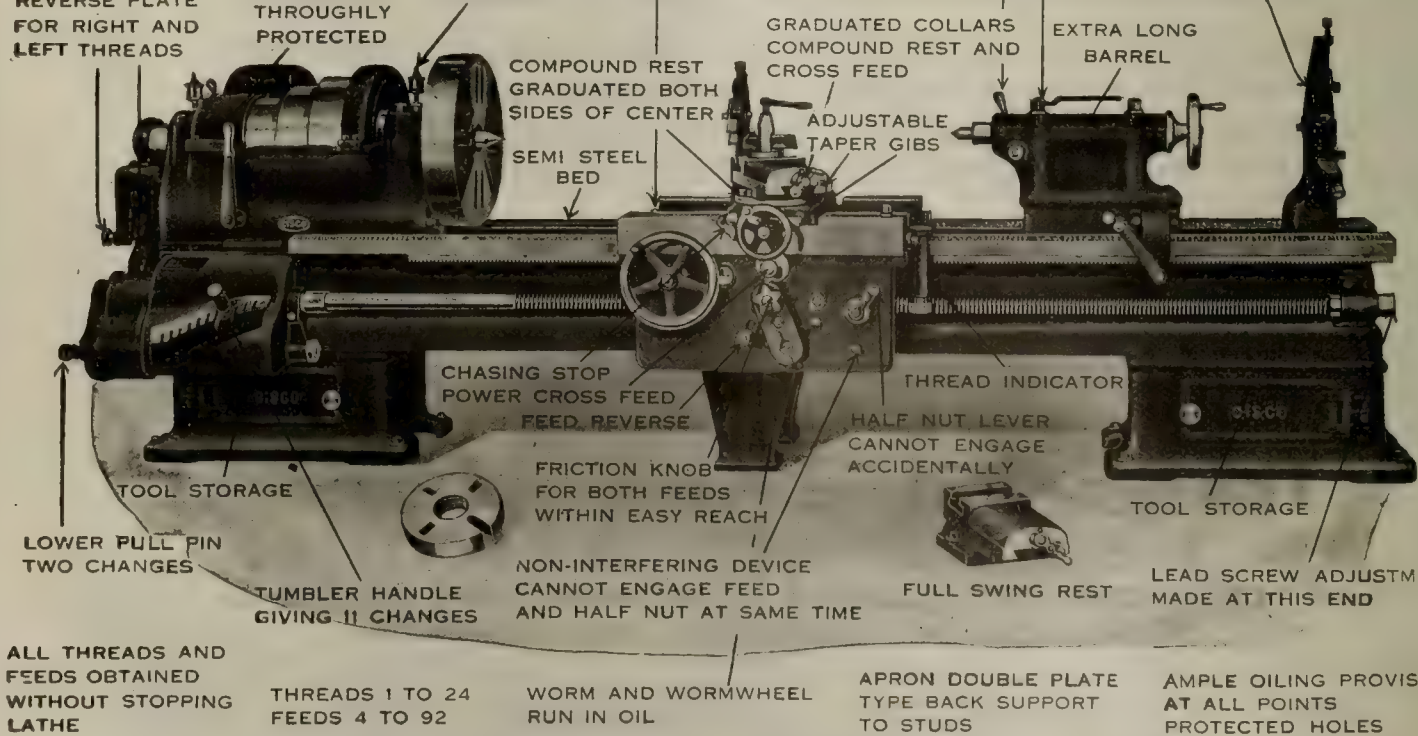
If *you* can use this size lathe, write for specifications and prices. Remember these are the highest quality tools manufactured.

GARLOCK-WALKER MACHINERY CO., LTD.

32 FRONT STREET WEST, TORONTO, ONT.

"EVERYTHING IN MACHINERY"

CISCO NEW 24"—THE LATHE WITH THE PULL



Ask Williams for circular and price on the best 24-inch lathe built, equal to any 30-inch.

THE CINCINNATI IRON & STEEL CO., Cincinnati, U.S.A., 14-in., 16-in., 18-in., and 24-in. Lathes

The

Fairley Davidson Steel Co., Inc.

SPECIALISTS

	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
High Strength Steels	"Hehtemnd"
High Speed Steel	RUSHITOFF No. 6
Tool and Die Steels	"Fondwot" and "Giant"
Magnet Steels	Tungsten or Chrome
Non-Changeable Die Steel	Nugget "B" oil hardening

CHROME VANADIUM, oil hardening or case hardening

CHROME NICKEL, oil hardening or case hardening

Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

Canadian Agents:

THE FACTORY SUPPLY AND STEEL COMPANY

149 Craig Street West, Montreal, Canada

We carry a complete stock at our Montreal Warehouse

DOUBLE

MUSHET

High Speed Steel

Carbon Steel

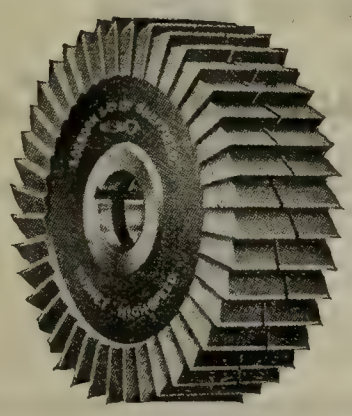
Gauge Steel

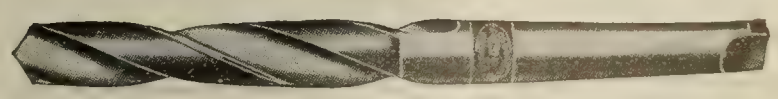
Alloy Steels

SOLE MAKERS

Samuel Osborn & Co. Ltd.

SHEFFIELD





Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)

Limited

Head Office and Works: Montreal, P.Q.

Branch Office: Toronto, Ontario

Where Shall We Send It?

Every Tool Room Man should have this booklet.

There are 40 pages full of good information on tool room grinding—cutters, reamers, drills, taps and dies, lathe and planer tools. It's yours for the asking. Just send us your address and a copy of this valuable little booklet will be mailed FREE of charge without any obligation to you.

Norton Company

Worcester, Mass.

ALUNDUM AND CRYSTOLON PLANTS:
CHIPPAWA, ONT. NIAGARA FALLS .N.Y.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B.; Winnipeg, Calgary, Saskatoon, Vancouver, Victoria; F. H. Andrews & Son, Quebec, Que.

Use coupon, letter or postcard. Ask for Booklet 835-D

Norton Company, Worcester, Mass.
Please mail my copy of Booklet 835-D to the following address:

Name.....

St. & No.....

City or Town.....

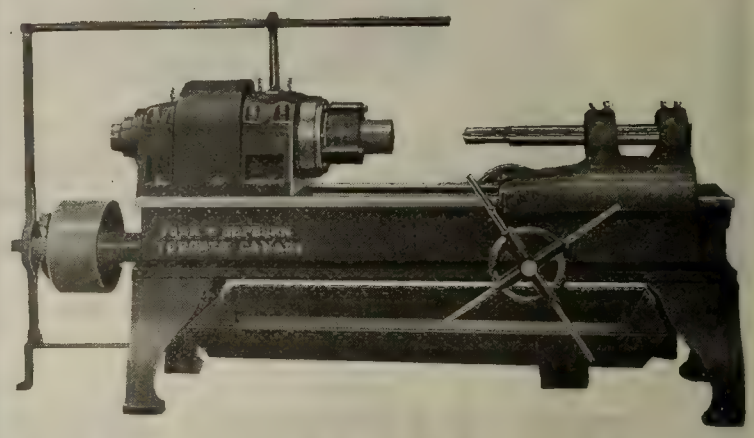
Boring 6" Shells

with

Perfectly accurate boring and far greater speed go into your shop the day you open the door to a Hepburn Single Bar Boring Lathe of rigid build. No lathe in your shop or any shop other than a Hepburn Lathe is its equal on 6" shell work. Write for its record.

Your old lathe rebuilt by us will be as efficient as new for all lathe work. Ask for particulars.

Hepburn Lathes



John T. Hepburn, Limited

18-60 Van Horne Street **Toronto, Ontario**

Reg. U. S. Pat. Office.

TEST PRESSES

For Applying Internal Pressure Physical Test to Shells

BANDING PRESSES

For Pressing in Copper Rotating Bands on Shells.

Metalwood Manufacturing Co.

Detroit, Michigan

Designers and Builders of High Speed Hydraulic and Special Machinery for all Purposes

Complete Hydraulic Installations

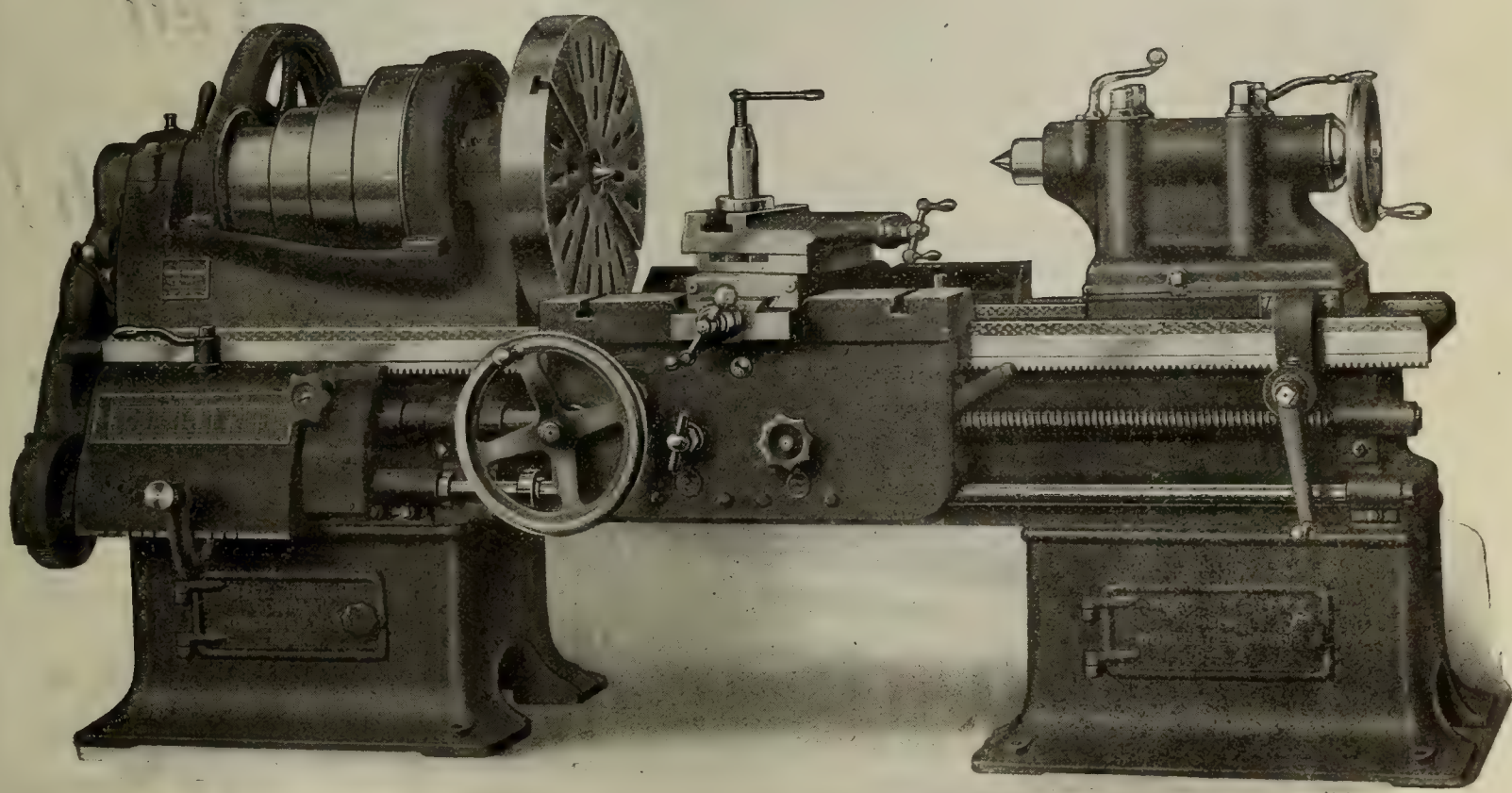
Canadian Fairbanks-Morse Co., Ltd., Sales Representatives for Canada

R. E. Ellis Engineering Co., 621 Washington Blvd., Chicago, Ill., Sales Representatives. For Great Britain and Continent, address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

REED-PRENTICE COMPANY

R-P Co

WORCESTER MASS. U.S.A.



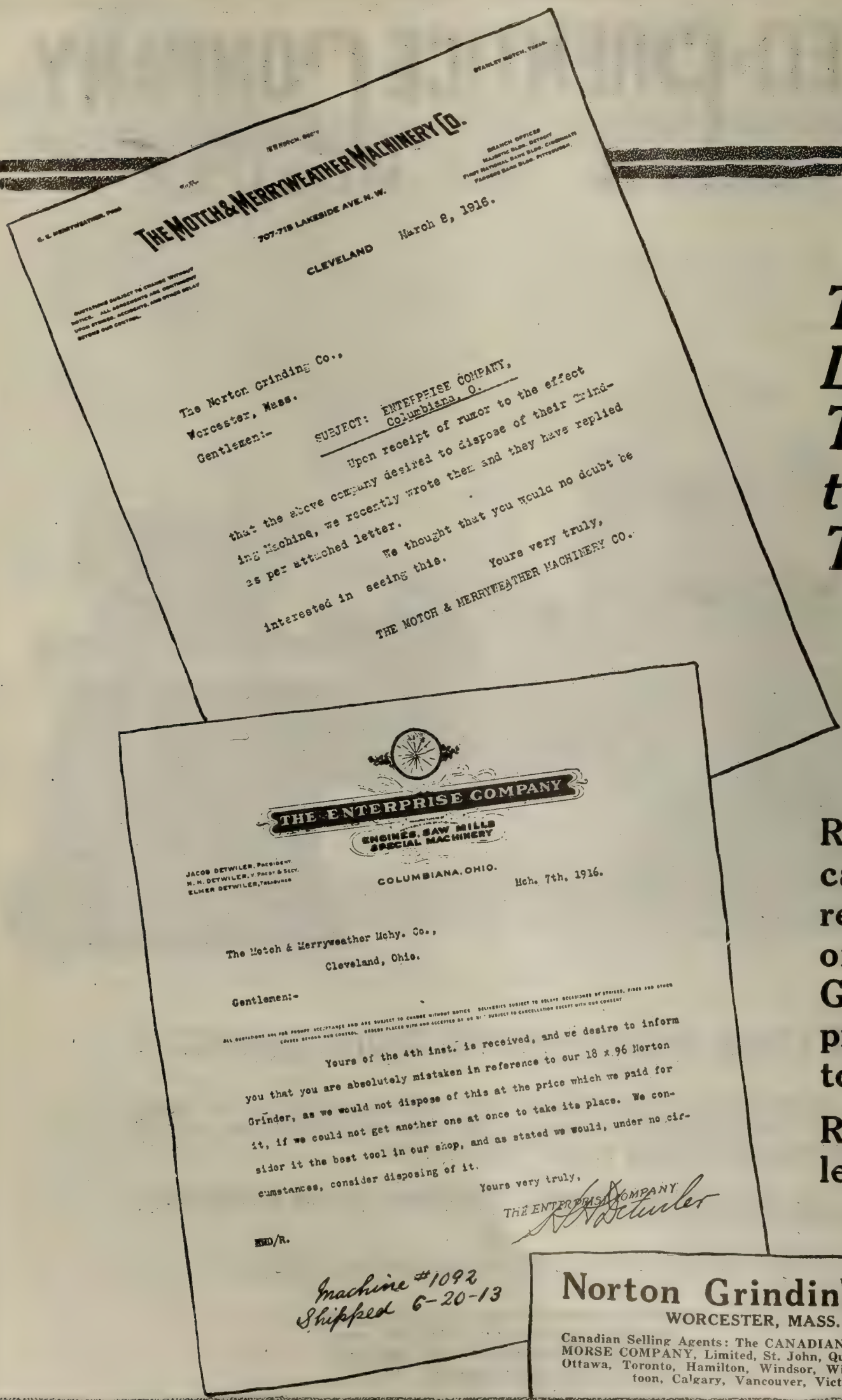
BETTER WORK—MORE CONVENIENTLY

THROUGHOUT THE YEARS THAT "REED" LATHES HAVE BEEN BUILT, THE IDEA OF ITS SPONSORS HAS BEEN TO MAKE IT ONE OF THE BEST TOOLS MONEY COULD BUY.

ITS REPUTATION BEARS TESTIMONY OF THE ATTAINMENT OF THIS IDEAL.

A FEW OF VARIOUS SIZES CAN BE HAD AT ONCE.

CANADIAN FAIRBANKS-MORSE CO., LIMITED
MANNING, MAXWELL & MOORE, INC.
ALLIED MACHINERY CO. OF AMERICA
FENWICK FRERES



THE MOTCH & MERRYWEATHER MACHINERY CO.

707-719 LAKESIDE AVE. N. W.

CLEVELAND March 8, 1916.

The Norton Grinding Co.,
Worcester, Mass.
Gentlemen:-

SUBJECT: ENTERPRISE COMPANY, Columbiana, O.

Upon receipt of rumor to the effect that the above company desired to dispose of their Grinding Machine, we recently wrote them and they have replied as per attached letter.

We thought that you would no doubt be interested in seeing this.

Yours very truly,
THE MOTCH & MERRYWEATHER MACHINERY CO.

THE ENTERPRISE COMPANY
ENGINES, SAW MILLS & SPECIAL MACHINERY

JACOB DETWILER, PRESIDENT.
H. H. DETWILER, V. PRES'T & SEC'Y.
ELMER DETWILER, TREASURER

COLUMBIANA, OHIO. Mch. 7th, 1916.

The Motch & Merryweather Mchy. Co.,
Cleveland, Ohio.

Gentlemen:-

Yours of the 4th inst. is received, and we desire to inform you that you are absolutely mistaken in reference to our 18 x 96 Norton Grinder, as we would not dispose of this at the price which we paid for it, if we could not get another one at once to take its place. We consider it the best tool in our shop, and as stated we would, under no circumstances, consider disposing of it.

Yours very truly,
THE ENTERPRISE COMPANY
R. H. Detwiler

HHD/R.

Machine #1092
Shipped 6-20-13

These Letters Tell the Truth!

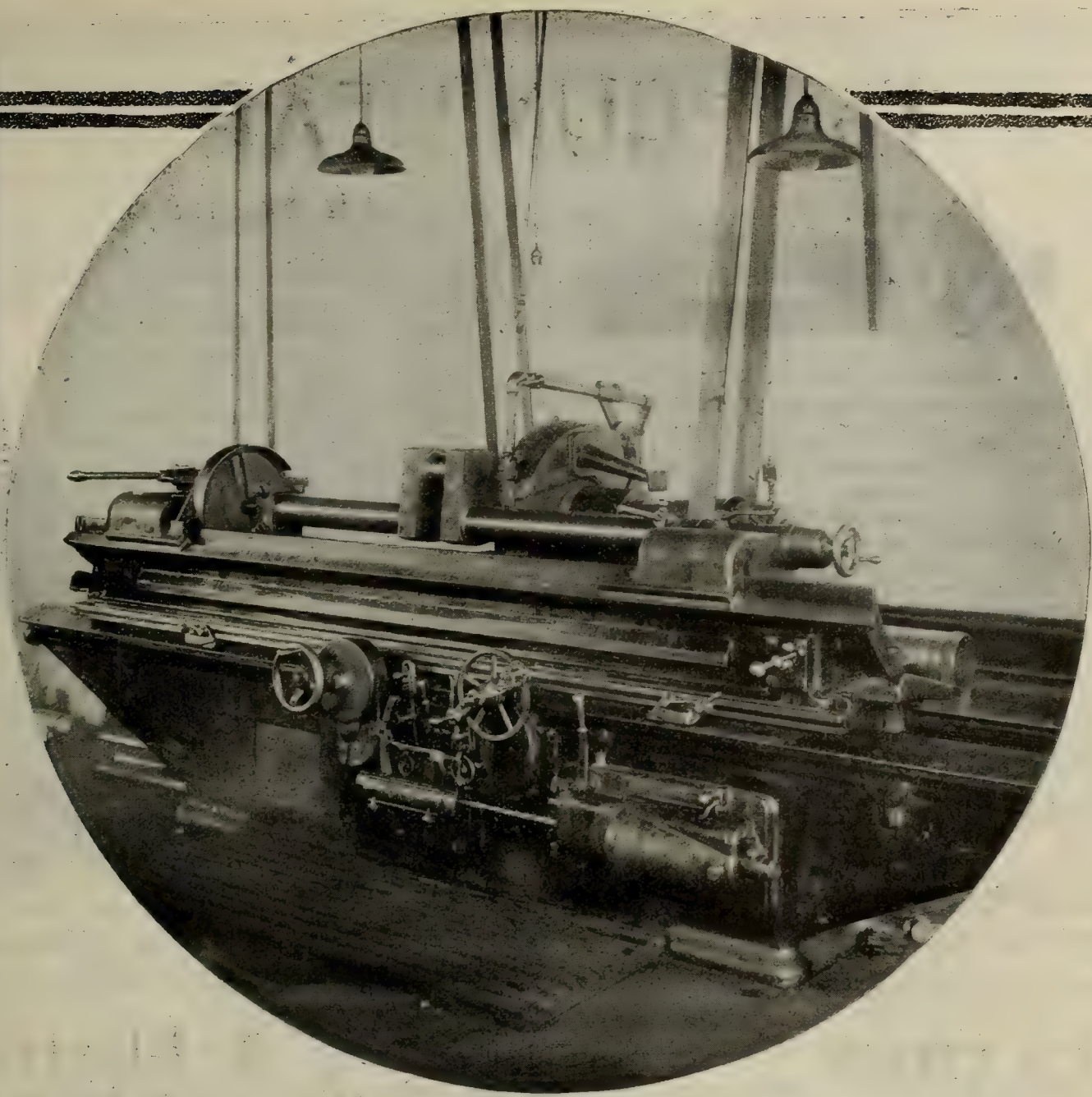
Rumor casting a reflection on a Norton Grinder proven to be false.

Read these letters.

Norton Grinding Co.

WORCESTER, MASS.

Canadian Selling Agents: The CANADIAN FAIRBANKS-MORSE COMPANY, Limited, St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria.



No sir, this Norton was not for sale-

We heard that The Enterprise Company of Columbia, Ohio, wished to dispose of an 18 x 96 Norton Grinding Machine which they had installed some years before. The abnormal demand for Nortons, new or used, led us to communicate with the Messrs. Motch & Merryweather, our Cleveland selling agents, asking that they investigate this rumor and if possible buy the machine at once and hold pending our orders.

Read the two letters on the opposite page—from the lower one it would seem, the rumor that The Enterprise Co. wished to sell was not well founded.

But the point we wish to bring out from their letter is the opinion they have of the Norton Grinder—"the best tool in our shop." Certainly you could ask for no broader endorsement of a machine tool.

NORTON GRINDING COMPANY **Worcester, Mass.**

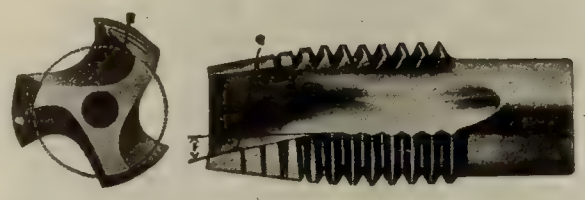
CANADIAN SELLING AGENTS:

The Canadian Fairbanks-Morse Company, Limited

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

If interested, tear out this page and keep with letters to be answered.

The "GUN" TAP



WHY IT IS CALLED "THE SHEAR CUTTING TAP."

The cutting edges at the point are ground at an angle to the axis (see illustration, F). This enables the Tap to cut with a shearing action and the angle deflects the chips, so that they curl out and **ahead** of the Tap and do not break up and collect in the flutes.

EASE OF CUTTING.

Note the hook on the cutting edge (G). This, combined with the shear-cutting action, makes the "Gun" Tap the easiest cutting Tap on the market.

On especially tough jobs—through layers of material of varying hardness it cuts hole after hole with perfect ease.

STRENGTH.

The flutes of the "Gun" Tap are less in number and shallower than those of the ordinary Tap—therefore, in itself is almost as strong as solid stock. Couple with this its easy-cutting qualities and you have a Tap that practically never breaks.

WELLS BROS. CO. of Canada, Limited
GALT, ONTARIO

Sales Agents:
THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED,
Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary.

"It Shears"

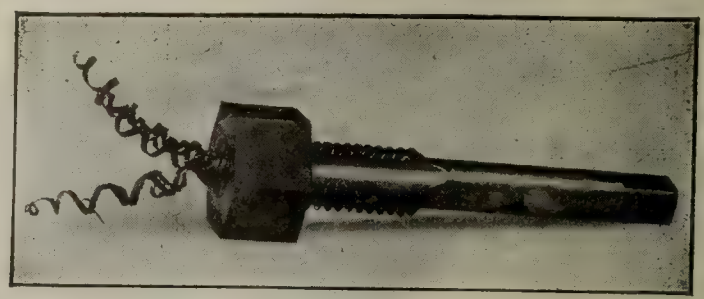
PRODUCTION.

In number of holes tapped in a given time the "Gun" Tap excels, not only because of the easy-cutting qualities and strength already described, but because there is no lost time due to removing broken Taps or frequently backing out the Tap from deep holes to clean collected chips from the flutes.

There will be a tremendous saving in your tapping costs if you let the "Gun" Tap do your work.

Send to day for the illustrated bulletin which goes into details regarding this remarkable Tap.

Three Fluted "Gun" Tap



Exactly the way chips are produced

AS A CHAIN

is only as strong as its weakest link, so a file can only be as good as the steel from which it is made.

The steel from which all P.H. Files are made is BEST CLAY CRUCIBLE CAST STEEL only. That is one point of superiority which

P H

TRADE MARK

QUALITY FILES

have over all other files made in Canada.

We will tell you others later.

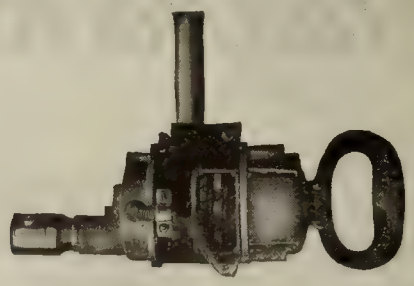
PORT HOPE FILE MFG. CO., LIMITED

Port Hope, Ontario

"Ask your jobber" (23.)

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

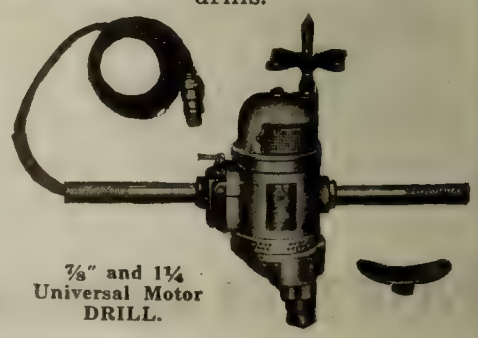
For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞" and 1¼ Universal Motor DRILL.

For Sale By

The Canadian Fairbanks-Morse Co., Limited

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.
CINCINNATI, OHIO

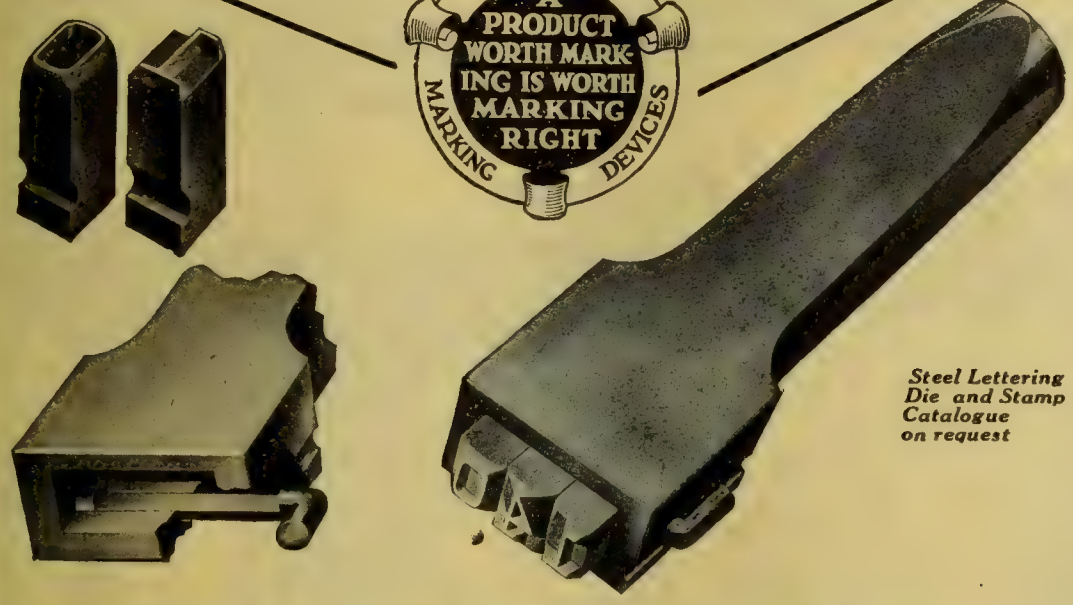
THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

If You Change Markings Often, Use CHAMPION HOLDERS

(Patented)

MATTHEWS A PRODUCT WORTH MARKING IS WORTH MARKING RIGHT MARKING DEVICES



Steel Lettering Die and Stamp Catalogue on request

MATTHEWS' Improved Champion Steel Holders and Interchangeable Grooved Type were developed to simplify, and to economize the cost of interchangeable marking. Holders are made with spring attachment, which, combined with grooved type, keeps letters or figures securely in place, and insures accurate, straight line marking.

Three styles of holders, and three types of letters and figures.

Matthews' marking devices are the best that skill, 67 years' experience and modern equipment can produce. Matthews' deliveries are prompt and Matthews' prices are right. Any device you may require from a small rubber stamp to a steel stamp for marking shells. Send Matthews a trial order.

Jas. H. Matthews & Company, Forbes Field, Pittsburgh, Pa., U.S.A.
67 YEARS IN BUSINESS

Distributors for Canada: Canadian Fairbanks-Morse Company, Ltd.
St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary Vancouver, Victoria

McDougall Shapers

ARE-MAC-DEE IS A GUARANTEE

These are up-to-date Shapers, designed for modern shop production.

They are plain in design, yet embody all essential features necessary for efficient work.

Every adjustment is convenient for the operator and fine for the most accurate work.

Let us have your inquiry.

The R. McDougall Company Limited

Manufacturers

GALT, ONTARIO, CANADA

The Canadian Fairbanks-Morse Company, Limited
Sales Agents

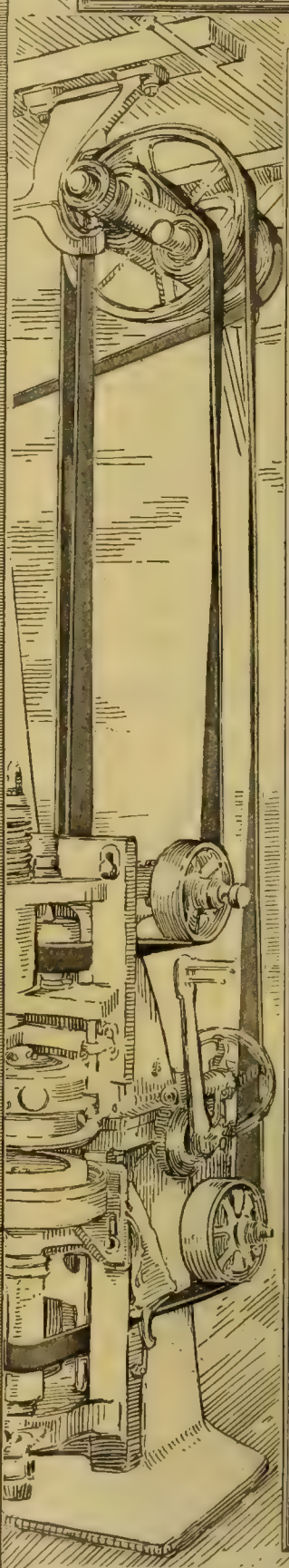
THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

GRATON & KNIGHT

Standardized Series LEATHER BELTING

Tanned by us for belting use



A Belting Catechism

What are the Advantages of Leather as belting?
Leather is the standard belting material. When properly tanned for belting its surface will grip the pulley in the most effective manner. Good leather belting is economical and reliable. It will transmit power with 98% efficiency.

How can leather belting be made uniform?
The manufacturer must first set up definite standards of quality—and strictly adhere to them. As he cannot secure belting leather in the open market of uniform quality, he must tan his own hides. He must tan them in sufficient quantity to enable him to select for each belt, pieces up to his standard. These pieces must be uniform in weight, stretch, texture, and quality.

Why should belts be rigidly graded?
A belt is no stronger than its poorest part. The quality of leather varies, and unless each belt is carefully graded, dissimilar qualities get into the same belt. Rigid grading *is* uniformity. Grading should be done by expert judges of belt leather quality, according to fixed standards.

Why is there such confusion in leather belting grades?
Because many belt makers have not standardized their belts, but give the buyer any kind of belt he demands. The result is chaotic.

What is Standardized Leather Belting?
Simply belting that is standardized to meet the needs of the different classes of power transmission—instead of being made to meet theoretical specifications. Transmission requirements can be classified into a comparatively few groups, and there is a standardized belt to fit each one. Standardization *can* be applied to belting just as to any other type of machine part or product. It is common sense in belting.

How does Standardized Leather Belting help the belt buyer?
It insures the selection of the proper belt required to speed up machines, to maintain production, to reduce operating expenses, which cannot be accomplished unless the belt user gets the maximum power through his belts. Standardized leather belting effects this for him and enables him to *know* that he is getting the right brand for highest efficiency and greatest economy—maximum service from every belt and every drive.

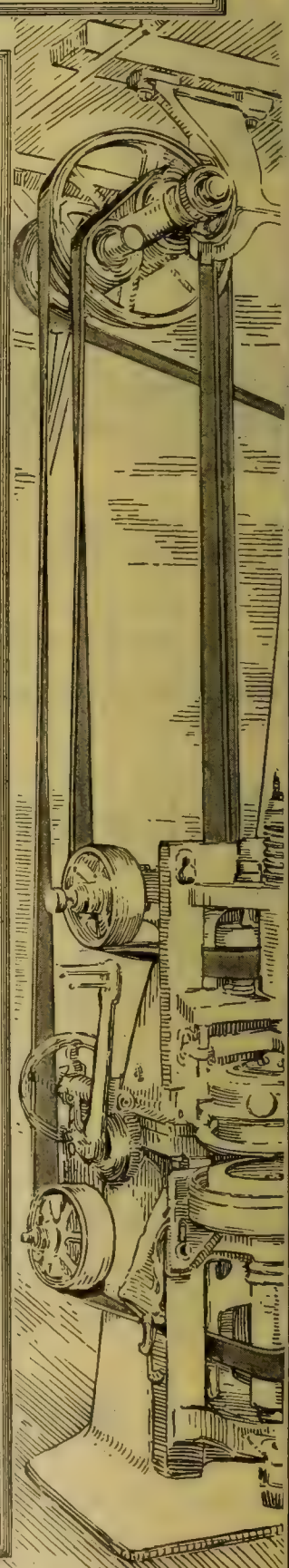
How does it work?
Let a Graton & Knight representative make an analysis of your belting requirements. Then get the standardized belt for your work, ordering your belting by work to be done rather than by specification. There is no obligation—there may be a great saving for you.

The Graton & Knight Mfg. Company

Oak Leather Tanners, Makers of Leather Belting, Lace Leather, Leather Packings and Sundries

WORCESTER, MASS., U.S.A.

Canadian Representatives: The Canadian Fairbanks-Morse Co., Limited, St. John, Montreal, Ottawa, Toronto, Hamilton, Quebec, Calgary, Edmonton, Vancouver, Windsor, Winnipeg, Victoria.



GRATON AND KNIGHT

Spartan Leather Belting on dry grinders. Hoover Steel Ball Co., Ann Arbor, Mich.

THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

SKF

FACTS

SKF will save power, lubricant, time, trouble and expense. Send for the SKF Transmission Catalog.

SALES AGENTS:
The Canadian Fairbanks-Morse Co., Limited
St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

CANADIAN SKF COMPANY
Limited, Toronto, Ont.

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED.

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

Fairbanks-Morse
Machine Shop Supplies

Cleveland Drills mean Holes.

Norton Wheels mean Grinding Service.

Yale Hoists mean Pound Feet.

Such considerations determined the selection of the lines we handle.

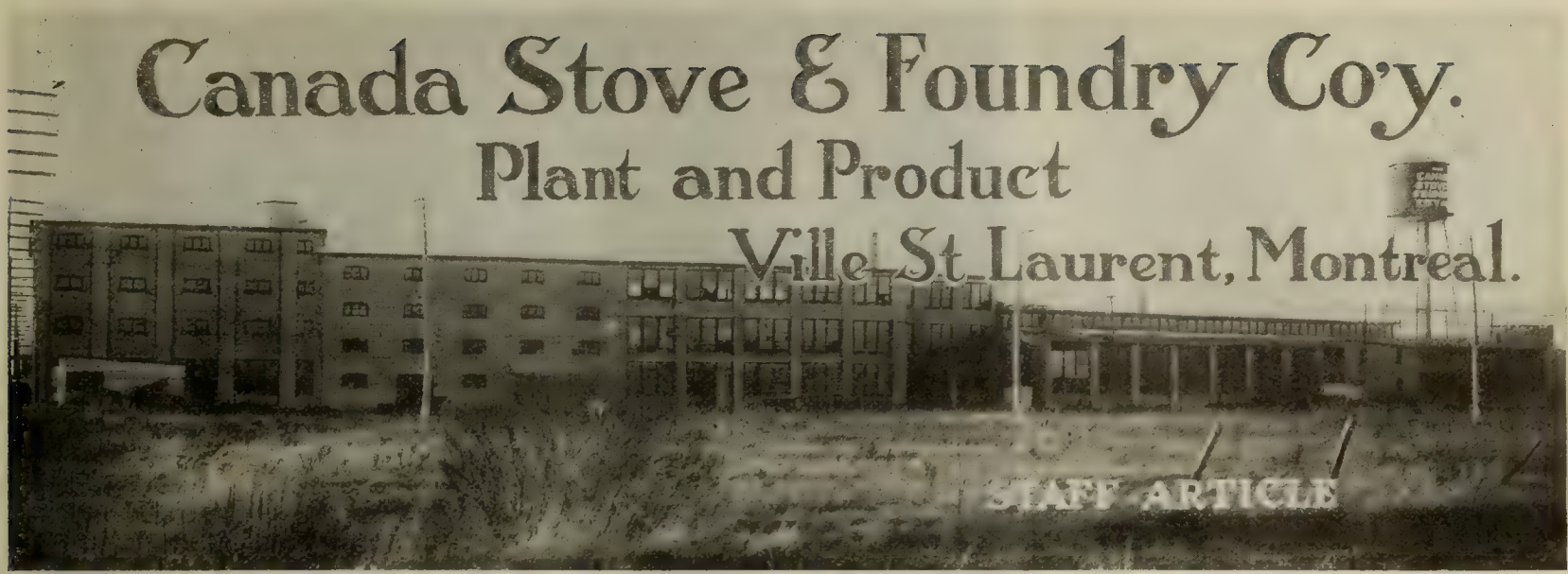
Cleveland Drills and Reamers; Mac-It Set Screws; Wells' Taps and Dies; Wells' Gauges; Brown & Sharpe Milling Cutters, Machine Tools, Micrometers; Yale & Towne Chain Blocks, Travelling Cranes and Trolleys; D. & W. Magnetic Chucks; Union Lathe Chucks; Williams' Tool Holders; Reed Vises; Buffalo Forges; Buffalo Blowers; Matthews' Dies; Universal Hack Saws; Keystone Ratchets, Drills and Reamers.

Send for your copy of the F.M. Book, our new 1,000 *page general catalogue.*

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED.

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

St. John Quebec Montreal Ottawa Toronto Hamilton Windsor
Winnipeg Saskatoon Calgary Vancouver Victoria



Times like the present have produced many contrasts, and few indeed are the factories whose products are not contributory to the arts of both peace and war. That the greater portion of this plant's activity should be devoted to developing the manufacture of peace-time products is a pleasing feature at this time, having in view the economic necessity of maintaining staple lines of industry in active readiness for the return of peace.

RAPID development of plants has been a notable feature of manufacturing activities throughout the Dominion during the past three years, but with few exceptions such expansion has resulted from the urgency of war requirements—directly or indirectly—rather than a marked extension in staple manufacturing. Domestic enterprise, even on a normal basis, has suffered extensively through the high cost of raw materials and the difficulty of obtaining such, except under restricted conditions. One of the few exceptions to these conditions is the plant of the Canada Stove and Foundry Company, Ltd., Ville St. Laurent, near Montreal. This company was incorporated in May, 1916, as successors to the Canada Stove and Furniture Company, the latter having been organized in 1905. Steady progress was made by that company until 1913, by which time the output had attained comparatively large dimensions, and the factory occupied a floor space of 50,000 sq. ft. The rapid growth of the business, however, during the next three years necessitated the building of extensive additions, and in the summer of 1916 the two storey mounting room, the warehouse and foundry were extended; later in the same year a four-storey building was erected for the manufacture of shells, and a storage warehouse.

An entirely new departure was decided on at this time, viz., that of enamelling sheet steel goods and cast iron hollow ware, and a suitable building was erected for this purpose on the property facing the main offices; these latter also being remodeled during the same period. The present floor space available for manufacturing purposes is about 200,000 sq. ft., and together with the adjoining property covers an area of 10 acres. The plant is ideally situated, being located about 7 miles from the city of Montreal, and adjacent to the main line of the G.T.R., with spur connections to both the C.P.R. and the C.N.R.

Foundry

The foundry has a length of 300 ft. and a width of 150 ft. and with the exception of a small section used for heavy pit work, the floor is constructed of concrete, this being considered an efficiency feature where light work predominates. The greater volume of work is connected with the manufacture of stoves and ranges, but considerable jobbing is also done; facilities having been installed to handle individual castings of about 3 tons in weight. A 66 in. Whiting cupola, with a capacity of over 30 tons per day, is located in a wing about midway of the shop length; a Piqua pressure blower being installed to supply the necessary blast. For small plate-moulding work, 50 lb. ladles are provided, and for the larger work several ladles ranging from 200 lbs. to about 4,000 lbs. are employed, these latter being transported about the shop by a monorail system. Pouring is continuous for about three hours each day.

VIEW IN ONE OF THE FOUR BAYS OF THE FOUNDRY.

The bulk of the light work is performed in moulding machines; the equipment consisting of 2 Pridmore rockover machines, 3 Arcades, 2 Webb and 3 Davenport power air squeezers, and 2 Adam's hand squeezers. For the baking of cores there has been installed one large Whiting and four small Millett core ovens. The foundry is well lighted, and heated by a forced hot air system with overhead piping, installed by the Canadian Sirocco Co. The remainder

of the factory is heated by means of steam coils.

Mill Department

For the cleaning of the castings 10 Sly steel mills are installed, these ranging from the large size of 4 ft. square and 50 in. long, to the small size of 18 in. dia. and 3 ft. long. Each mill is equipped with Sly dust arrestors, insuring the maximum degree of cleanliness possible in this dusty department. For the larger castings, and those that are too delicate to place in the tumbling mills, a sand blasting equipment has been provided. Adjoining the mill room is the stove parts stock department into which the castings are taken from the cleaning room and stored in suitably arranged bins so that the parts are at all times easily accessible.

Efficient Stock Record System

On the first floor of the stove mounting department is the steel stock and cutting room, the former so arranged and managed that it is possible to determine at any time, by reference to the stock sheets, the amount of material that is on hand and the exact number of stoves that could be made from the available supply. This system extends throughout the entire plant, so that when an order is placed for a large number of stoves, a few minutes checking of the different stock sheets advises the superintendent or his chief clerk just what is required to fill the order. Steps are immediately taken on the receipt of an order to arrange the production of the foundry and the purchase of the necessary stock and other accessory supplies, so that no department is handicapped through delay in receiving materials.

The more important machines in the cutting department are a Brown Boggs 8 ft. power squaring shear; a 42-in. double crank consolidated power press for body making and heavy formed work; one Michigan and one Excelsior power press; an automatic top grinding machine made by the Excelsior Tool Co.; a special vertical inside grinding machine for work on stove parts; and a number of smaller tools such as foot shears, harnd folders, and presses, together with all the other necessary shop equipment for the rapid and economic production of sheet metal operations. One section of the second floor is set apart for the nickeling of the numerous ornamental parts now found on nearly every make of cast iron or steel range or heater.

MACHINING DEPARTMENT FOR SMALL STOVE PARTS.

Nickeling and Polishing

The nickeling equipment is of the most modern type, a prominent feature being a Hanson and Van Winkle dynamo of 1,000 ampere capacity; all wiring is contained in conduits throughout. The polishing room, adjoining the nickeling department, contains 10 Hanson and Van Winkle polishing machines, driven from a shaft located below the floor; each machine is fitted with an exhaust head, and a Sheldon fan is employed to remove the dust from these machines. The blacking of the different cast iron stove parts is also performed on this floor, as is the wrapping and crating before going to the shipping department.

Gas Stove Mounting

The entire third floor is reserved for the gas stove department; one section is provided with the necessary pipe threading machines, presses and drills required for the different parts and the main portion of the room is used for the mounting of the various makes of stoves. An interesting feature in connection with this department is the drilling of the small holes in the various gas burners by means of multiple drill heads, as many as 72 holes being drilled in one type of burner at a single setting. The presses and multiple drill heads were supplied by the Michigan Press Co. of Ypsilanti.

All finished material for all makes of gas stoves is kept on this floor, the operation of this department being governed by the checking system already referred to. Four concentration points on this floor govern the supply and distribution of all material—the sheet metal stock room, the rough castings department, the general stores department, and the finished material stores. Daily records are kept of stock and orders so as to avoid the possibility of misunderstanding between the heads of the different departments.

The average output of stoves, ranges and heaters is about 100 per day, while the number of gas stoves turned out each day ranges from 50 to 75. The japanning room is equipped with an oil burning oven, maintained at a heat of about 350 deg. F. The interior of many of the gas stove ovens are given a coat of aluminum, sprayed on.

Like most of the large metal working establishments in Canada, this plant has been engaged in the manufacture of shells, having been working on the 4.5 in. size for upwards of two years. The output to date has been upwards of 250,000 shells.

VIEW IN ONE OF THE MACHINE MOULDING SECTIONS.

VIEW OF PART OF THE GAS STOVE MOUNTING DEPARTMENT.

Enamelling Department

The art of enamelling, or the fusion of quartz and chemical compounds to form a hard vitreous surface on metallic objects, either for the purpose of decoration or utility, is gradually assuming increased importance in the industrial developments of the country. Additional enterprise in this direction is the most recent departure of this firm.

The enamelling plant, located directly opposite the main offices, is of brick construction, 120 ft. by 60 ft., and is of single floor construction, with the exception of the front section of two floors, the upper one being used for chemical storage and decalcomania work. The ground floor is divided into three sections—one containing the smelting furnace and the grinding mills, a pickling department, containing acid baths for cleaning the sheet steel articles, and also a steam heated drying kiln, while the greater portion of the ground floor is reserved for the actual operations of enamelling the work.

Three oil-fired furnaces are installed, two being adapted for sheet work, while the third and largest is constructed to handle cast iron hollow ware. Of the two former, one is open hearth and the other muffled type. The fuel is kept in a 800-gal. tank adjacent to the building, and is supplied from the main 10,000-gal. reservoir provided for the operations of the furnaces in the shell machining department. Oil is delivered to the burners by means of a small centrifugal pump, and air for blast and combustion is supplied at a pressure of about 70 lbs. per sq. in. The other equipment of the shop consists of the various receptacles for holding the solutions and the necessary facilities for handling and transporting the work to and from the kilns and furnaces.

Preparing the Frit

The art of enamelling, like other processes of a similar nature, involves considerable knowledge of what are known as trade secrets, many of which are only attainable by actual experience and continual practice. The general features of the work, however, will be gathered from the following description:

The necessary compounds, such as the sedimentary rock and chemicals, are received in the form of shale or powder, and are first mixed and smelted in an oil-fired furnace, the proper proportions of the compound being determined by the particular formula in use. The furnace is divided into two sections—one reserved for colored and the other for white mixtures. The furnace is heated to about 1,600 deg. F., care being taken to avoid over-heating. When the heated mass of materials begins to bubble, the furnace is immediately tapped and the charge run out into a bath of cold water; instantaneous cooling is a very important factor, and to achieve this the frit, as the product is termed at this point, is allowed to flow out in a very fine stream and a current of cold water is played upon the molten substance as it falls into the bath, which is also kept cold by a continual overflow from the wooden tank beneath the pouring spouts. The sudden vitrifaction of the frit facilitates the operation of grinding to the desired degree of fineness, the calcined substance having a glassy appearance and being easily broken into smaller particles.

Grinding the Mixture

After the material is removed from the cooling bath, it is allowed to dry before being placed in the mills for grinding. In addition to the chemicals that are united in the fusing process, others are added preparatory to grinding. Two tumbling mills, 3 ft. dia. by 4 ft. long, and one about 2 ft. by 40 in. long, are provided for this purpose, the two larger being for wet mixtures and the smaller for dry mixtures. The mills are made with sheet steel bodies and cast iron ends, and are lined with a substantial layer of porcelain. The door is similarly lined, and when placed in position the inner wall coincides with the remainder of the cylinder, thus forming an undisturbed surface for the movement of the revolving mixture.

One of the very important requirements in connection with the preparation of the chemicals and various ingredients used in the art of enamelling is that every facility be adopted and the greatest care exercised to exclude the presence of foreign matter which would have a detrimental effect upon the ultimate results. The friction and impact required to grind any substance to powder entail the use of grinding mediums which must be much harder than the material being ground. Flint stones are generally used for the grinding of enamelling powders, as the wear upon them from the continual tumbling is imperceptible, and thus assures the powdered material being practically free from any substance other than those placed in the mill. Extreme care and cleanliness must be exercised in the preparation of the materials and their subsequent use in the enamelling process; and to eliminate trouble at a future stage of the work special attention is given to all these elementary factors.

After the charge in a mill has been ground to the desired grade of fineness, generally requiring from 5 to 6 hours, every particle of the powder, together

VIEW OF NICKEL PLATING DEPARTMENT SHOWING VATS AND DYNAMO.

with the flint stones, is removed from the interior, and the cylinder is thoroughly cleansed, while every stone is brushed with a wire brush and washed before being again placed in the mill. This practice is not only adopted when the proportions of the different formulæ vary, but also when one having the exact proportions of the mixture, just previously ground, is to be placed in the mill. Strict adherence to this principle is necessary to guarantee a mixture corresponding to the specified formula; it also acts as a positive check on subsequent operations.

Enamelling Sheet Stock

A peculiar characteristic in the enamelling of metal is that the process is somewhat varied for sheet work and castings, due to the difference in the chemical reaction. For operations on sheet work the mixture is prepared in the form of a wet solution, into which the parts are dipped; while the process for castings requires the application of the enamel in a powdered state distributed evenly upon the surface of the work. The primary essential in the enamelling of sheet metal is the selection and preparation of the material.

After the sheet iron has been cut and formed into the shape desired, the pieces are thoroughly cleansed in an acid bath and then well washed in hot and cold water, being afterwards immersed in a special solution and again washed in water to destroy further action of the acids. All trace of moisture is entirely removed by placing the treated work in a drying kiln, after which it is ready to receive the ground coat. In the general run of sheet steel work that is subjected to the enamelling process, particularly the class of work that is handled in this plant, the entire surface of the work is treated with a ground coat, this invariably being of a dark blue color. The enamel is in the form of a creamy solution contained in galvanized sheet steel tanks, into which the work is dipped and swung with a peculiar movement so as to insure an evenly distributed coating over the complete surface of the work. This is a very important detail, and the girls employed become very expert in the manipulation of the different shapes and sizes they are called upon to handle.

TWO OF THE FURNACES IN THE ENAMELLING DEPARTMENT.

Drying and Burning

After being arranged in rack trucks—the pieces being kept separate—they are moved into the drying kiln to remove all traces of moisture; when thoroughly dry, the work is ready for baking. Special facilities are provided at the front of the furnace for handling the work. The pieces are placed on bars provided with sharp prongs, so that only the points are in contact with the material; this method avoids serious marking of the under surface and also prevents distortion of the work. Several pieces are placed on this rack and the whole run into the furnace, which is kept at a temperature of between 1,500 and 1,600 deg. F.

Baking or burning, which constitutes the fusing of the enamel coating, occupies about one or two minutes, and when the work is taken out it is immediately removed and placed on a flat plate to retain the shape while cooling. When cold, the same sequence of operations is again followed for the succeeding coats. The general practice in this plant is to give the work one ground, one intermediate and one finishing coat; this gives a fairly flexible surface; a thicker enamel is liable to develop cracks.

For embossed work, such as lettering or ornamental designs, the plant is equipped with a spraying outfit, this being the only method that will insure equal distribution of the enamel solution. When work of this character is dipped the solution gathers about the raised impressions and destroys their prominence owing to the inability of the solution to drain freely from the irregular portions.

Process for Cast Iron

The method of enamelling cast iron differs to some extent from that used in coating sheet material. The application of the ground coat is accomplished in a similar manner, the piece being swabbed with a thin solution and then dried, after which the article is placed in the furnace and heated to a cherry red, when the work is removed from the fire chamber and sprinkled evenly over the entire surfact with finely powdered enamel and again placed in the furnace, allowing the powder to fuse and spread evenly over the surface; this process is continued until the desired coating is obtained. The surface of the iron must be perfectly clean and free from corrosion, as the chemical action of the rust will not allow the enamel to set properly, a blemish appearing wherever rusting has occurred.

In the preparation of the various formulæ the company have given special attention to those for cast iron hollow ware subjected to chemical reaction during the boiling or cooking of fruits and

SMELTING FURNACE AND GRINDING MILLS. NOTE TANK INTO WHICH MOLTEN FRIT IS RUN.

vegetables that contain a large percentage of acid. Enamel work of this character must withstand the severest acid test before it is permitted to leave the factory.

Ornamental Work

Floral and other ornamental designs for the decoration of signs, stove panels, etc., are included in the work of the enamelling department. Meyercord's process of enamel decalcomania is the method used in putting on the various designs; after being transferred to the previously enamelled surface, the articles are again baked in the furnace and the color design is burnt in and becomes part of the enamel coating.

The range of product manufactured by this firm includes wood burning cook stoves, cast iron and steel stoves and ranges for wood, coal and gas, and in addition specializes in numerous items of cast iron house and factory equipment, much of which is now being treated in the new enamelling department.

Owing to the semi-isolated position of the plant, special provision has been made for fire protection; in addition to a well trained fire-fighting force, the entire factory is equipped with a sprinkler system. Shop welfare and first aid departments are also features of the plant management. The executive consists of E. Panneton, managing director; J. A. St. Germain, secretary-treasurer; F. Lauer, general superintendent; and Chas. Watt, superintendent of the shell department.

WAR SERVICE BOARD FOR U. S. FOUNDRY INDUSTRY

IN order to maintain proper contact between the foundry industry and those departments of the United States Government which purchase castings a war service board of five members has been organized by the American Foundrymen's Association, the members being: R. A. Bull, chairman, Duquesne Steel Foundry Co., Pittsburgh; J. C. Haswell, Dayton Malleable Iron Co., Dayton, O.; G. H. Clamer, Ajax Metal Co., Philadelphia; H. D. Miles, Buffalo Foundry & Machine Co., Buffalo, and C. C. Smith, Union Steel Castings Co., Pittsburgh.

The personnel of this board is representative of every branch of the foundry industry, including gray iron, steel, malleable iron and non-ferrous metals. Furthermore, its members are affiliated with the leading organizations of casting manufacturers of the United States, as follows: American Foundrymen's Association, National Founders' Association, American Institute of Metals, American Malleable Casting Association, and the Steel Founders' Society.

In view of the tremendous task undertaken by this board, numerous sub-committees undoubtedly will be appointed to represent the various lines of each branch of the industry. A survey of the foundry trade of the country undoubtedly will be made to ascertain the class of work for which each shop is best adapted. The establishment of an office in Washington is being considered.

COAL FAMINE THREATENS SWITZERLAND

THE shortage of fuel threatens to develop into famine in some neutral countries, and the danger is being met in two ways, viz., by stringent official restrictions as to the uses of fuel, direct or indirect, and an increased exploitation of existing home supplies. Switzerland has perhaps felt the inconvenience more than most other countries, and the Government of the Canton of Zurich, for one, has just issued fresh restrictions. Private houses must not be heated, unless the temperature for three consecutive days has been below 10 deg. C. and on days when it has been only 5 deg. C. the previous evening. The temperature in residences, schools, offices and workshops is not to exceed 16 deg. C., in shops not above 14 deg. C., and in bedrooms not above 12 deg. C. Hot water appliances must only be used once a week and school baths only once a month. Other public baths may in the meantime be kept open except on Mondays and Tuesdays. In cafes, restaurants, etc., there must be no heating from 10 p.m. to 10 a.m., and no hot food must be served after 9 p.m. All offices are to close at 5 p.m. and museums, libraries, etc., must not be warmed at all. The schools are to save 35 per cent., churches and chapels 50 per cent., cafes and restaurants 35 per cent., shops and public buildings 25 per cent., elsewhere according to circumstances from 20 per cent. to 40 per cent. of the quantities of fuel hitherto used. In four-roomed residences only one room must be heated, in larger residences only two. On the other hand endeavors have quite recently been started to exploit possible deposits of coal, lignite, and even petroleum, but this work is still in its first stages. Borings for coal are taking place in Wallis and Jura, at Herdern, etc.; lignite deposits have been taken in hand at Grondiseril, Ufhusen and Zell; lignite has also been come upon at Fosytal. Some foreign capital is interested in this work, as, for instance, in the International Development Associated Mines Company at Sitten, for the exploitation of the Wallis deposits, where some anthracite, though not of the best quality, has been found.

GOVERNMENT CONTROLS BRITISH GUIANA BAUXITE

THE British Government is now taking a very firm stand with regard to the exploitation of the important bauxite discoveries in British Guiana, and is determined that the first call on this mineral, the source of aluminum, shall be reserved for the Empire. The British Empire Producers' Organization has already pointed out that no further applications for bauxite lands in British Guiana are to be granted till after the war. But it appears that the Government have gone further than this. A portion of the bauxite won by holders licensed before the above regulation came into force has to be placed at the disposal of the British Government at a certain price. The British Government, moreover, reserves the right to limit the export to countries other than British, and at its discretion to prohibit export altogether. Practice, moreover, has followed principle, and a large export shipment to a foreign country of British Guiana bauxite won by a company in which foreign interests are partly represented was recently, it is stated, held up. Such evidence of a determination to conserve in future the mineral wealth of the Empire for the Empire is highly encouraging.

TUNGSTEN PRODUCTION IN ENGLAND

THE manufacture of pure tungsten from its ores has now become an established industry of Great Britain, as since the inception of the war its production has been attempted by local firms and is being achieved on a scale which should render the country independent of the German product for all time and materially aid the tool steel and allied industries in retaining the markets of the world for high-speed steel.

In describing a plant and the processes involved, a recent number of *Engineering* says: When the war broke out the site of the works was waste ground, with the exception of a small building and a chimney; since the summer of 1914 a large group of buildings, has been erected on a six-acre site. These are filled with complicated mechanical appliances, the work-people have been trained to new and varied duties, and an uninterrupted output has been maintained. Extensive railway sidings are laid, but at present motor lorries are employed for the despatch of the finished product to the works of consumers, whose urgent need of tungsten makes the inevitable delay of railway transport serious. The company, it may be said, has not overlooked the comforts of the workpeople, both men and women, some of the processes being carried out by girls. Messrooms for the convenience of both have been provided. All the buildings are lofty and well ventilated and lighted, and none of the processes, nor any of the work, can be described as in any way unhealthy. A notable point is the absence of dust, although the processes are such as to give rise to large quantities; all plant producing it is enclosed. A repair shop is included among the buildings, consisting of a smithy and engineers' and joiners' shops, and a large block of offices facing the main road accommodates the management.

All the processes are arranged on the ground floor level, but some of them extend upwards as well, and are reached from several floors. Taking the processes in their order, the trucks bringing the ore, soda and other requisites are run alongside a staging in the warehouse, arranged at a convenient height for unloading, the wagons being handled by the

company's loocmotive crane. The ore is received broken into small cubes, which would readily pass through an inch mesh; it consists of tungsten oxide and waste material, and it has to pass through eight operations, each carried out in a separate department of the works. Of these eight operations six are necessary to isolate or separate the tungsten oxide from the other constituents of the ore and the remaining two operations to remove the oxygen, so as to obtain the pure metal. Some ores contain tin or bismuth of sufficient value to be recovered, and this is effected by magnetic separators, wolfram being slightly magnetic. The first step is to sample and assay the ore, which then is loaded into small trucks and elevated to a series of bins some 60 ft. above floor level. Parcels of ore requiring different methods of treatment are kept separate. From the bins the ore passes to grinding machines, and thence to calcining furnaces, magnetic separa tors or fine grinding mills, as its composition may require.

Only wolfram, finely ground and ready for treatment, passes forward to the regular process; and impure or mixed ores, which cannot be improved by mechanical or magnetic methods, go to a special department referred to later. The pure wolfram thus obtained is conveyed in trucks to bins placed over mixing machines, adjacent to a supply of soda. The finely ground ore and the soda, in accurately weighed proportions determined by analysis in the laboratory, are then fed into double-arm mixers, and the mixed product is discharged into trucks for conveyance to the melting furnaces, in which is performed operation two in the works department "B."

Scheelite, that variety of ore consisting of tungsten, calcium and oxygen, also known as calcium tungstate, as well as mixed wolfram-tin slimes, tin residue mixed with small quantities of tungsten ore and residues of other sorts, are treated in a separate plant, so that impure sodium tungstate may be isolated and purified before being passed on to the main process.

The next building contains a series of hand-fired reverberatory furnaces of special design, into which the ground ore and soda are fed and heated to a temperature of about 1,000 deg. C. and subjected to constant rabbling. The furnaces just mentioned are designed to economize floor space; they are fed on one side with ore and are stoked from the opposite side. Flues below the floor connect the furnaces with a centrally-placed chimney, 150 ft. in height and 9 ft. in diameter. Ore mixtures are carefully selected, so far as the restricted supply permits, to yield a uniform furnace product, and the charge is drawn into slag pots, which are wheeled to a convenient point for handling by an overhead electric travelling crane. These pots, when cool, are raised and tipped, the charge coming away in a solid lump, which is easily broken up by hammers to a size suitable for feeding a jaw breaker, in which the lumps are reduced to about 1-in. cubes. The melt produced is a great contrast to the fine powder fed into the furnaces. After having been broken up it has to be finely ground in order that it may be acted upon by the chemicals, these processes forming the third operation, carried out in department "C." The material is handled by an overhead crane, and the main shafting is run under the floor to give the crane a free passage.

In the fourth process, in the "D" department or building, the finely ground melt is placed in a number of steam-heated circular vats, in which the tungstate of soda, which is soluble, due to the soda, is extracted from the ground furnace melt. Mixers are provided in the vats, and the solution of sodium tungstate, carrying in suspension finely divided oxides of iron, manganese, lime and silica, is forced through filter presses. The resulting solution thus clarified contains essentially sodium tungstate, the purity of which depends upon the absence of sulphur, arsenic and other elements, which form soluble compounds with soda. Tin oxide, which occurs in many of the ores, under correct working conditions does not become soluble, and remains in the filter cake. The steam required for the "D" department is obtained from an adjoining boiler-house, containing two Lancashire boilers.

In the "E" department the fifth process is effected in a series of special vats on a raised platform. The tungstate of soda is treated with hydrochloric acid, which is elevated by compressed air, and results in the tungstate of soda being broken up into tungstic acid (WO_3) and sodium chloride, which remains in solution. The solution, with the WO_3 in suspension, is conveyed to another series of vats, in which it is washed by decantation, to rid it of the soda salts. As much water as possible has to be got rid of, and after the final wash the WO_3 is brought to a creamy consistency by the surplus water being syphoned off. This cream is then conveyed to a number of centrifugal machines, in which the WO_3 collects along the inner face as a thick, deep chrome-yellow paste. It is dug out with wooden spades and finally dried in a series of bottom-heated stoves. This drying process is the sixth, and is effected in the "F" department. The chemical processes may now be described as completed, as all that remains to be done is to obtain the pure metal from the oxide, which is an ordinary metallurgical operation, involving only heat and the presence of a suitable reducing agent, such as carbon, hydrocarbons, hydrogen, zinc, aluminum or others.

The seventh process, in the "G" department, is effected in a large roomy building containing a number of specially designed furnaces. The yellow paste is passed into the end of each furnace and raised to a high temperature to effect reduction, and the metal is thus obtained. The output of these furnaces is a black material, which is conveyed into the last, the eighth of the series of buildings, where is is ground to a powder, washed, dried and poured into tin cases about 1 cub. ft. each in size, containing 200 lb., and finally, after soldering, packed in wooden boxes or metal containers, ready for conveyance to the consumers.

FIRE LOSSES DURING OCTOBER

THE losses by fire in the United States and Canada during the month of October, compiled from the records of the New York *Journal of Commerce*, reached a total of $26,384,450, as compared with $17,701,375 in October last year and $14,465,850 for the same month in 1915. The unusually heavy October losses added to the already serious fire record thus far this year brings the total up to $221,002,315 for the first ten months of 1917, as compared with $189,481,220 for the same months in 1916 and $140,754,250 in 1915. The losses of October this year were increased by the large grain storehouse fire in Brooklyn involving $2,000,000 and the railroad dock fire at Baltimore involving $3,500,000, but aside from these there was an unusual number of fires resulting in losses anywhere between $200,000 and $750,000. The following table gives a comparison of the losses by months for the first ten months of this year with those of 1916 and 1915, together with the losses for the balance of those years:

	1915.	1916.	1917.
Jan.	$ 20,060,600	$ 21,423,350	$ 36,431,770
Feb.	13,081,250	24,770,770	29,587,660
March	18,786,400	38,680,250	17,523,000
April	18,180,350	12,681,050	18,597,225
May	11,388,450	15,973,500	24,968,800
June	10,893,950	12,247,500	15,513,270
July	9,006,800	23,013,800	16,143,050
Aug.	10,067,100	10,745,000	21,751,100
Sept.	14,823,500	12,244,625	14,101,450
Oct.	14,465,850	17,701,375	26,384,450
Total ten mos.	$140,754,250	$189,481,220	$221,002,315
Nov.	21,204,850	19,898,450	.....
Dec.	20,877,100	22,063,325	.....
Total for year	$182,836,200	$231,442,995	.....

Many Big Fires

During October this year there were some 270 fires, each causing an estimated property damage of $10,000 or over. This compares with 193 such fires in September, 211 in July, and 211 in August. The number of fires causing a loss of $10,000 or over since January 1, this year, reaches a total of 2,574. The October fires of $10,000 and over are classified according to their destructiveness and show the following results:

Estimated loss—	Number of fires.
$ 10,000 to $ 20,000	88
20,000 to 30,000	53
30,000 to 50,000	26
50,000 to 75,000	27
75,000 to 100,000	19
100,000 to 200,000	28
200,000 and over	29
Total	270

Fire underwriters are looking forward with some uneasiness to their annual statements for the year 1917, as between the abnormally heavy fire losses and the serious drop in security values many will show depleted surpluses.

The Economical Use of Grinding Wheels in the Foundry*

By W. T. Montague**

Next to a proper understanding of the grinding wheel as a cutting tool, the author points out the necessity of giving careful consideration to the castings to be ground, specially referring to their size and shape, the physical properties of the metal and the amount of grinding to be done. Weight and rigidity of machines, solidity of foundations, and suitability of bearings and lubricating arrangements are points of particular interest.

THE modern grinding wheel plays an extremely important part in the metal-working industries. Its great usefulness begins in the foundry just as soon as the newly-poured castings have become sufficiently cool to be removed to the cleaning floor. It is used in the alloy steel industry to remove seams, blisters and flaws from billets, prior to rolling them into commercial shapes. Large numbers are used later on to grind the various metal parts that are fashioned into machine tools, automobiles, aeroplanes, locomotives, war munitions and the multitude of steel tools that are also employed in cutting metals.

Realizing that the grinding wheel is practically indispensable to the foundryman, it is fair to assume that he is vitally interested in those factors that contribute to the economical use of this cutting tool. Although widespread publicity has been resorted to by some of the grinding wheel manufacturers, in order to demonstrate the methods of using and caring for grinding wheels to obtain maximum service at minimum cost, yet tsere are evidences that there is much to be learned in this direction.

To develop the modern grinding wheel into a tool of usefulness and dependability, has been the abrasive manufacturer's problem, but the problem is not solved when the wheel is produced. The grinding wheel maker must go further than this. He must educate the user so that he can take advantage of all the qualities that science and skill have put into the wheel.

Analysis of the Grinding Wheel Problem

The development of this paper will rest upon the following analysis of factors that will contribute to the economical use of grinding wheels in the foundry, if they are understood and taken into consideration:

1.—A thorough understanding of the grinding wheel as a cutting tool is the first essential.

2.—The castings to be ground must be carefully considered with special reference to their size and shape, the physical properties of the metal, and the amount of grinding to be done.

3.—The condition of the grinding machines must be satisfactory. This refers to weight and rigidity, solid foundations, adequate bearings and proper lubrication.

4.—The speed of the grinding wheel is of the utmost importance and must be held within certain limits if proper cutting action and economy in wheel consumption are to be obtained.

5.—The personal factor must be taken into consideration and allowances made for it.

6.—Adequate records of wheel consumption should be kept and if conditions warrant, industry and economy on the part of the workmen should be properly rewarded.

7.—The use of the grinding wheel should be made safe by proper protection devices.

The first portion of this paper will deal with the proven theories of cutting action. They will be gone into quite fully, as it is believed the information will be available to foundrymen who may be using grinding wheels.

It is a well-known fact that the amount of work one gets out of a machine, engine or tool, is often directly proportional to one's knowledge and understanding of that machine, engine or tool, granting, of course, that the tool is not defective or unsuited to the operation in the first place. This is particularly true of the grinding wheel, which is an aggregation of minute cutting tools bonded together so they can withstand the high rotative speed necessary to rapidly remove large quantities of metal.

The composition of the vitrified grinding wheel, which type is almost always used for snagging castings, is as simple as its manufacture is complex. It is made of abrasive grain, clay bond and water. Subsequent burning in a kiln and heat treatment vitrifies the bond and produces that quality termed "hardness."

The selection of abrasive material is almost entirely dependent upon the nature of the metal to be ground. There have been developed for cutting the metals used in castings to-day, two principal kinds of artificial abrasive—the aluminous group and the carbide of silicon group. Included in the former are alundum, aloxite, boro-carbone, adamite, and the like, and in the latter group crystolon, carborundum, carbolite, etc. Without going into the reasons therefore, we will simply state that experience has shown that for materials of high tensile strength, the aluminous abrasives prove the most efficient. This means that the various kinds of steel, wrought iron and annealed malleable iron, automatically call for an abrasive such as alundum. On the other hand, crystolon is chosen for cast iron, including gray and chilled iron, unannealed malleable iron, brass, bronze, aluminum and copper, which are materials of comparatively low tensile strength. This distinction is clear cut and quite easy to remember.

The Question of Grain Size

The question of what size of grain to use is not difficult to settle. The size of the wheel, amount of material to be removed, and the nature of the metal usually determine this very readily. Finish is seldom a consideration and so very coarse grits are used.

How hard to bond a grinding wheel is a point not so readily determined. The influencing factors are many, including:

1—Physical properties of the metal to be ground.
2—Shape and condition of the surface to be presented to the face of the grinding wheel.
3—Speed of the grinding wheel.
4—Condition of the grinding machine as to rigidity and steadiness of spindle.
5—Method of applying the work, that is, whether mechanically or entirely by hand.

In trying to serve our customers and meet their requirements, we are continually reminded that the question of what constitutes a "grade" or the degree of hardness of a grinding wheel is not fully understood. Grade is the word used to designate relative hardness of any given grinding wheel. By hardness, we do not in this instance refer to the hardness of the abrasive, which is fixed throughout any one wheel. We refer to the strength of the bond in retaining its grip on the cutting grains of the wheel. If the bond is of insufficient strength to hold the cutting particles in the face of the wheel until they have become dulled and worn from the cutting process, then we call the wheel too soft. On the contrary, an excessively "hard" wheel is one where the bond retains the grit long after it has become dulled and is therefore practically useless. The word "hardness" might almost be called a misnomer and perhaps the somewhat more clumsy phrase, "resistance to disintegration," ought to be substituted.

This resistance to disintegration, or grade, is actually determined by measuring another separate property of the wheel, namely, the resistance of the bond to the penetration of a hardened steel tool. However, it is known that each of these properties is a function of the other and to measure the force of resistance to disintegration in grinding wheels has been impossible on a commercial scale up to this time.

*Read before the annual meeting of the American Foundrymen's Association, Boston, September, 1917.

**With the Norton Co., Worcester, Mass.

The belief is quite common that a grade is an exact value. A grade is not an exact or a definite point in the scale of hardness. It is a range between limits and all wheels which test within this range carry the same grade letter.

One way to measure the strength of the bond is to revolve a grinding wheel at increasing speeds until it bursts. Knowing the bursting speed, the centrifugal force necessary to cause the bond to break down can be readily calculated.

In order to obtain this data a lot of wheels were speeded up to a point where the fiber stress, due to centrifugal force, exceeded the strength of the bond and breakage occurred. All of these wheels were of the same size, with the same grit, but of different degrees of hardness. The grade J broke when the stress was 1650 pounds per square inch, the grade K at 1750 pounds per square inch, and so on. Therefore, one might infer that all grade J wheels would burst when this same stress was reached.

Not an Exact Value

Now let us see what really happens when several wheels of supposedly the same grade are tested. We find that those that have been determined to be of grade J hardness will burst at stresses ranging from 1600 to 1700 pounds per square inch, grade M at from 1880 to 1790 pounds per square inch and so on. In other words, a grade represents a range of values between definite limits. An understanding of this point is most essential to the users of grinding wheels and will explain many seeming variations in grinding wheel action and life.

Assume a certain snagging operation is being performed, whereby all the factors combine to bring a pressure against the grain on the face of the wheel which causes a stress of a particular nature to be set up. Bear in mind that this is a tangential or peripheral stress, so to speak, not a stress due to centrifugal force. The wheel whose bond has a strength of sufficient magnitude will have a longer life than one not so constituted. This last wheel will not be bonded strong enough to withstand the grinding forces and will wear away quite rapidly, in fact, much more rapidly than the difference in strength or hardness would seem to warrant. This point has been developed in detail because an understanding of it will eliminate many questions arising between the wheel manufacturer and the wheel consumer. It is needless to say that there is a close limit to the allowable variation and the manufacturer who best keeps within these limits, deserves the greatest confidence of the consumer.

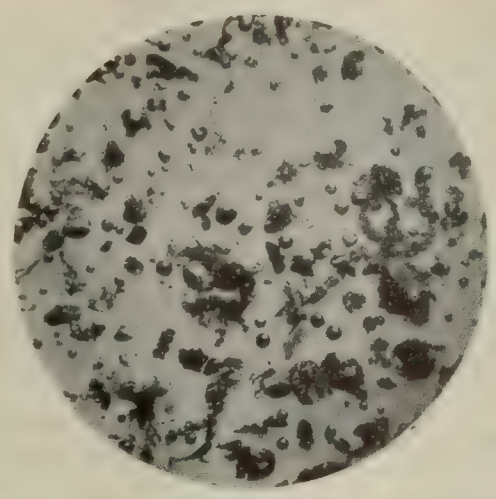


FIG. 1. CHIPS FROM WORK GROUND WITH AN UNSUITABLE WHEEL UNDER IMPROPER CONDITIONS.

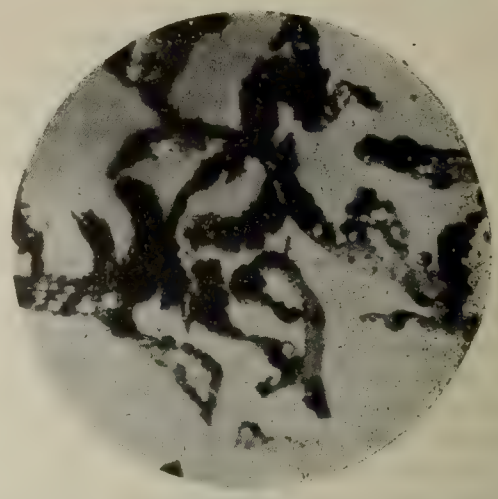


FIG. 2. A MODERN GRINDING WHEEL OF CORRECT SPECIFICATION PRODUCES REAL CHIPS LIKE A MACHINE CUTTER.

The old idea of grinding considered it as a wearing down of the metal by rubbing or friction. This is now our understanding of the lapping process and modern grinding has progressed far beyond this point. However, if a wheel is bonded too hard for the work at hand, or if the wheel is too fine or composed of an inferior abrasive, the metal is actually rubbed or burned off, as shown in Fig. 1.

The modern grinding wheel of correct specifications for the work produces chips like those shown in Fig. 2. Its action is similar to that of a steel milling cutter. On the face of the wheel are millions of cutting teeth at work every minute, and, although these teeth are not as large nor as strong as the teeth of a steel cutter, and cannot cut as deep, they are capable of working at a much greater speed.

In order for a wheel to cut fast and free, it is necessary for it to wear—that is, for the bond to release those grains that have become dulled and useless. From this it is seen that the grain, which has to the greatest degree the physical property of hardness (we refer to mineralogical hardness), combined with sharpness, is the most efficient and will do the greatest amount of useful work before dulling. It is these very qualities that make alundum superior to the softer and more impure abrasive, emery, which dulls very rapidly under cutting pressures.

A set of experiments recently was carried out, showing how the condition of the face of a grinding wheel affects its cutting action, its ability to remove metal and the power consumed in doing this. The results are shown in Fig. 3, which represents the curve traced by the stylus of a Westinghouse graphic wattmeter connected to a motor-driven grinding machine. Section A of the curve shows the no-load power. Then a bar of steel was applied to the wheel under a given pressure and this pressure was held constant throughout the tests. What happened? First, the power consumption climbed abruptly as the sharp cutting grain bit deeply into the metal. After two minutes of this rapid cutting, we reached the glazing point and the line C resulted. At D we were working with a wheel, the cutting points of which were nearly all worn down flat. The power consumption was low because there was practically no useful work being done. The smooth grain simply rubbed and slipped over the bar. At E, the steel began to heat up and get sticky, so that particles began to load and smear into the pores of the wheel face. These respective conditions of the grains are illustrated diagramatically from left to right above the curve. The power now climbed again, but still practically no useful work was being done. At F, or even before

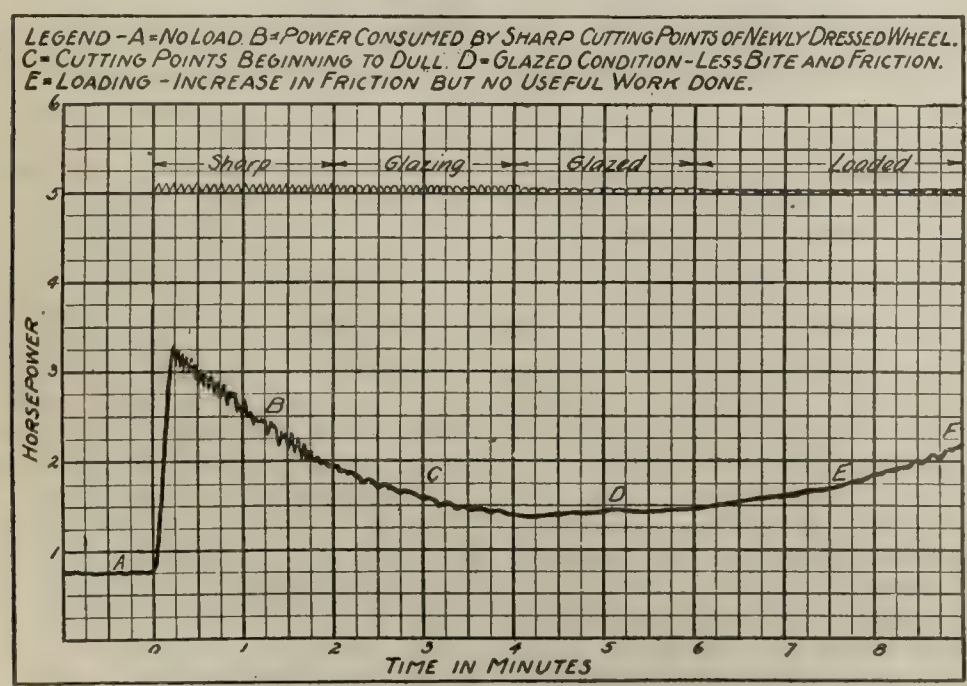


FIG. 3. POWER CONSUMPTION UNDER DIFFERENT WHEEL CONDITIONS.

this point was reached, the wheel should have been dressed or resharpened. This aptly illustrates the folly of using a wheel that is too hard or dense to cut freely without resorting to continual dressing.

Action of an Ideal Wheel

The action of the ideal wheel is pictured in Fig. 4. This shows that the glazing period is no sooner entered upon, than the bond suddenly gives way and releases the dulled teeth. New and sharp grains take their place and the cutting is resumed at very nearly the initial rate. A wheel of the correct grain and grade for the operation at hand can oftentimes be dressed by the additional application of pressure on the part of the operator, or by presenting the very sharpest fins on a casting to the wheel face under increased pressure. This means that useful work is being performed while sharpening the wheel, with practically no lost time or wear of dresser cutters. It is this condition that all should aim for in selecting snagging wheels and the workmen should be educated to this kind of grinding.

Some think that in order to make a wheel cut, you must force it exceedingly hard. This is not true, if the wheel is not excessively hard or fine for the work. A wheel of the correct grain and grade will cut faster if you do not force it too hard. If these points are clearly understood, it will enable you to direct the grinding end of your business intelligently. Failure to grasp the essentials will prove disastrous to economy.

The next factor of importance to economy in the use of the grinding wheel in the foundry is a knowledge of the effect of the physical properties of the metal to be ground. To say that a wheel is desired for malleable iron may not be enough. This expression sometimes covers the annealed malleable and sometimes the white iron before it has been annealed. If the iron is of the annealed variety, then alundum or an aluminous abrasive should be employed, but if the iron has not been annealed, then by all means use crystolon or some carbide of silicon abrasive. Furthermore, the white iron castings usually require wheels of much greater hardness than the annealed castings and this is readily understood when the difference in hardness, density and structure of these metals is known.

It is a common saying that the harder the metal, the softer should be the grinding wheel. Strictly speaking, this applies only to precision grinding, certainly not to the snagging of castings. Let us consider manganese steel, which, as everyone knows, can be machined economically only with abrasives. This material offers a high resistance to penetration and hence slightly finer grits are usually employed for snagging castings made of manganese steel than would be used for ordinary carbon steel. Coarser grits would require more manual effort than could be expected from the ordinary workman.

Soft, stringy materials generally call for comparatively coarse grits and medium hard grades. Dense, brittle materials require slightly finer grains and harder grades, sometimes one or both.

The following table may illustrate this to a little better advantage:

Metal	Grade of Wheel
Manganese Steel Castings	16-Q or R Alundum Vitrified
Carbon Steel Castings	10-U Alundum Vitrified
Brass Castings	24-Q Crystolon Vitrified
Chilled Iron Castings	16, 20 or 24-S, T or U Crystolon Vitrified

It is no doubt well understood that the harder the fins and the sharper the contact, the harder must be the grinding wheel. This is necessarry to counteract the dressing and tearing action of the projecting metal.

Grinding Steel Castings

In grinding steel castings, the breaking-off of gates and risers often leaves a very large volume of metal to be ground away. As the arc of contact thus increases there are increased loading tendencies, and sometimes a heavy, black oil is daubed on the metal, to keep the wheel open and thus reduce dressing. After much experimenting, a specially treated or filled wheel has been developed that automatically lubricates the cutting grains and often greatly lengthens the life of the wheel because of reduced dressing. This filling is not thrown out by centrifugal force; it increases the life of the wheel and many times causes faster cutting action because of the lubrication. In instances where the grinding is of a very rough, heavy nature, this special treated wheel shows up to very good advantage and it would not be economical to use anything else.

to pieces by the percussion set up by the castings on the face of the wheel.

A test conducted by an extensive user of grinding wheels for the purpose of determining whether or not it pays to install concrete foundations under the grinding machines may iterest you. This test was conducted with wheels of the same size and same grain and grade on the very same machines and indentical castings. One set of machines was mounted on concrete or solid foundations and the other on wood or shaky foundation. The results were as follows:

Average life of wheels on wood floor, days	113
Average life of wheels on concrete floor, days	188
Increase in life due to solid foundation, per cent.	65
Average saving a month per wheel on concrete floor	$ 2.00
Average yearly saving per wheel	24.00

Where many wheels are used, this saving is a decidedly large and important consideration. In this case, the concrete foundation paid for itself inside of two months and the saving in wheels will go on indefinitely. As it was, several hundred dollars were saved by this company the first year that concrete foundations were used.

Loose and insecure mooring is also detrimental to the life of the grinding wheel. Don't wait until the machine begins walking around the foundry floor before remedying matters.

Similar figures could be produced to show the saving effected by keeping bearings in good condition. Excessive radial play and end play destroy the wheel rapidly. Many times complaints received to the effect that grinding wheels are not standing up as they formerly did can be traced directly to bearing troubles. The introduction of harder grades, as for example, from grade S to

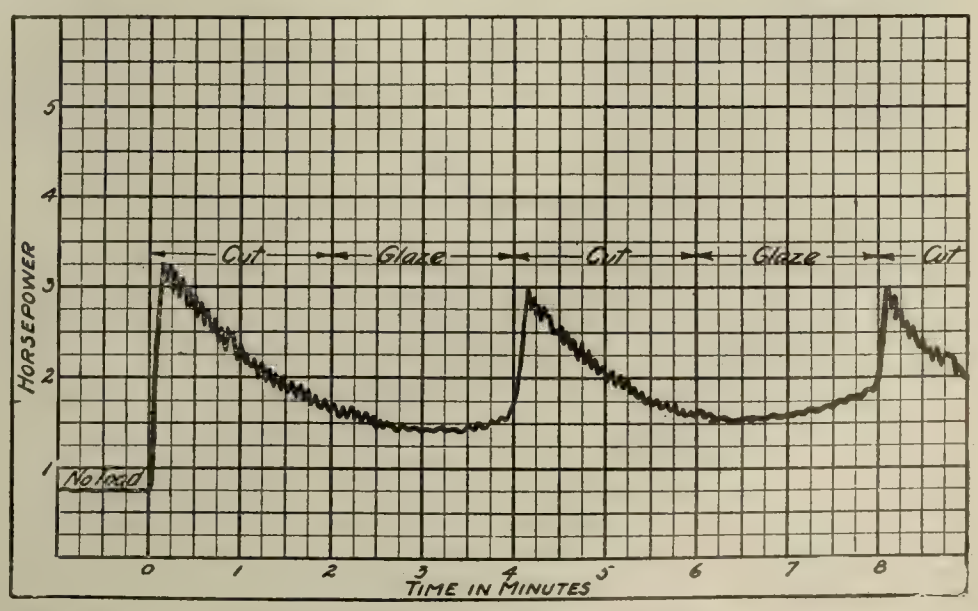


FIG. 4. ACTION OF AN IDEAL WHEEL.

We now come to the third factor which has an important bearing on grinding wheel economy, namely, the condition of the grinding machine. Economy cannot be expected if the machines are light and shaky, or if the foundations are not solid. A grinding wheel that vibrates or jumps from any of these causes is soon pounded

grade U, only partially remedies matters because the speed of cutting is sacrificed and the operator has to put forth greater effort to do the same amount of work.

Grinding Large Castings

In the case of the medium-sized or large steel foundry grinding quite a

variety of castings, it is important to have the grinding machines properly arranged and grouped, so the work may be ground with a minimum amount of handling.

Extremely large castings that must be ground in place should be gone over with wheels mounted on small portable electric, pneumatic or flexible shaft grinding machines. In the case of the electric machines, all that is needed is a convenient lamp socket or a wall terminal.

Next should come a battery of swing-frame grinding machines to handle the medium heavy castings such as drawbars, locomotive wheels and other similar heavy castings that cannot readily be handled. These machines should be located where prompt crane service is to be had. Then finally, the smaller castings that could be easily handled should be ground on floor stands conveniently arranged.

The proper grouping of machines, segregation of castings, and prompt crane service will make for general efficiency in the cleaning operation. This should be looked out for by a man of good judgment, who could also tell where to grind and where to chip. Much valuable time is lost in trying to chip off fins that could be ground off in a fraction of the time and with much less effort.

A table showing the horsepower required to drive various sizes of bench and floor stands might prove of some help at this point. The values shown in this table were measured under actual service conditions and may, therefore, be considered reliable guides in the selection of motors. The table follows:

	Machine.	No. of hangers	Friction H.P.	Total H.P.	Net H.P. consumed	Size of motor H.P.	Wheels used in test
¾"	Norton Bench Belt-Driven	12	1.08	1.87	0.81	2	2-10 x ¾ at 5000 S. F. P. M.
1¼"	Ransom Bench Direct-Connected	2	0.75	3.00	2.25	3	2-12 x 1¼ at 5000 S. F. P. M.
1½"	Norton Floor Belt-Driven	5	0.95	3.88	2.93	4	2-16 x 1½ at 5000 S. F. P. M.
2"	Norton Floor Belt-Driven	11	1.30	4.75	3.45	5	2-24 x 2½ at 5000 S. F. P. M.
10"x72"	Norton Cylindrical	2	2.50 to 3.00	10.00	7.50	10	1-18 x 2 at 5000 S. F. P. M.

Much has been said and written about proper operating speeds for grinding wheels, but perhaps some important phases of this subject have not yet been made thoroughly clear. Generally speaking, the correct speed ranges for the grinding wheels used in snagging castings lie between 5000 and 6000 surface feet per minute. This is fairly well established and quite generally accepted by the manufacturers of grinding wheels. This range was determined partly by long years of experience and partly by physical laws and the desire for an adequate factor of safety. The engineer building bridges, steel structures, machines and what not, recognizes the necessity for an adequate factor of safety and makes due allowance for it. Similarly, the engineer in making grinding wheels sees the great necessity for a factor of safety in operating speed. All snagging wheels made by reliable manufacturers are subjected to a speed test the last minute before being packed that generates a centrifugal stress many times in excess of the stress prevailing under the recommended operating speed. In the case of the Norton Co., this tested factor of safety runs from 2¼ to 3¼. This, then, is the first limiting factor to wheel speed.

Furthermore, it has been shown there is no appreciable gain from faster speeds, at least not enough gain to offset certain drawbacks. It should be further remembered that the grinding wheel is designed to operate at approximately the recommended speeds and any appreciable deviation calls for adjustments that are not always easy to make or conductive to efficiency.

Keep Surface Speed Constant

It is now common knowledge that it is necessary to keep the speed of the grinding wheel approximately within the recommended range if its productive capabilities are to be maintained. It has been demonstrated that if a wheel's speed is allowed to fall to a very low level, or if it is speeded up beyond a certain point, in both cases reduced cutting ability for the same amount of effort expended is the result. In the case of a sub-normal wheel speed, not only does the productive capacity fall off, but also, there is excessive wheel wear.

To illustrate this point, let us consider the case of an 18-inch wheel, 10 grade U alundum, used for snagging steel castings. At 1175 revolutions per minute its peripheral speed is 5500 surface feet per minute, and it cuts and wears satisfactorily. If the revolutions remain the same, at 11 inches diameter, the surface speed is reduced to 3500 feet. What is the result? Every cutting grain on the face of a revolving grinding wheel has a definite amount of energy stored up in it. It is the expenditure of this energy that enables the grain to do useful work and remove metal. Now the energy available varies as the square of the surface speed. Therefore, at 11 inches diameter, the cutting grains have only 40 per cent. of the energy that they had at 18 inches diameter and they cannot be expected, therefore, to grind as rapidly. Also, because of the decreased energy stored up in each grain of abrasive, it is less capable of withstanding the resistance offered by the steel and hence is more readily torn from its setting. This, then, explains the difficulty that will be encountered in attempting to grind at very low surface speed.

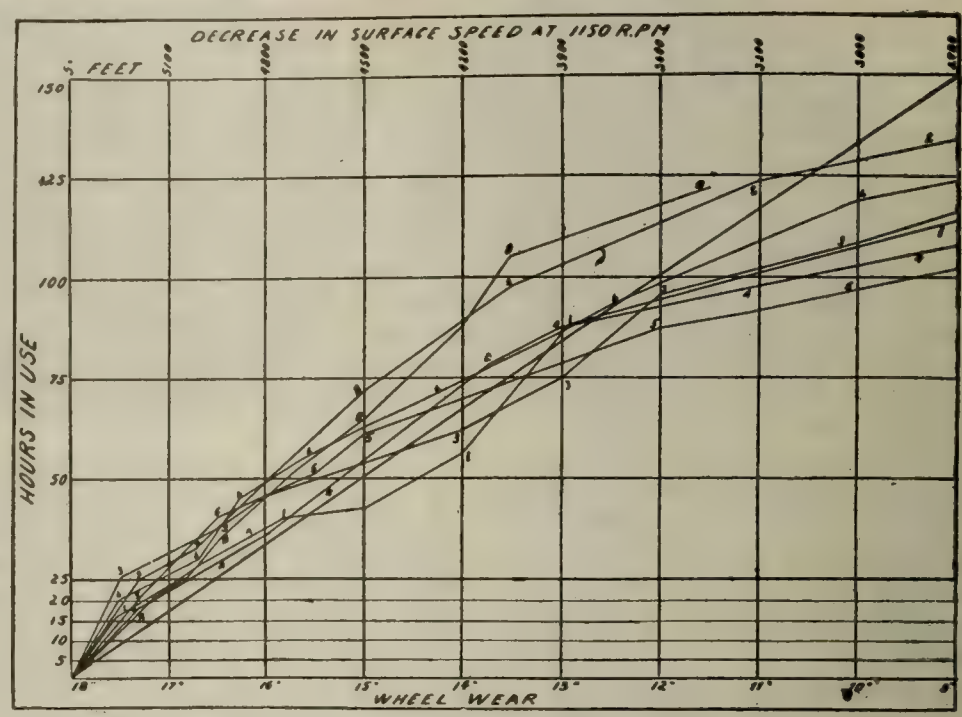


FIG. 5. RELATION OF LIFE OF WHEEL TO SPEED.

On the other hand, if this same 10 grade U alundum wheel was giving satisfaction at 5500 surface feet per minute, and an attempt were made to speed it up to 7000 surface feet, no greater production would be realized. This is due to the glazing effect resulting from the increased duty imposed on each abrasive grain.

Keeping a fairly constant surface speed by increasing the revolutions as the wheel wears down, is the proper procedure for maximum cutting ability with minimum wear. This relation of life of wheel to speed is perhaps more clearly indicated in Fig. 5, representing actual results of tests conducted in a large foundry. The curves show the rate of decrease in wheel life as the surface speed drops off. The continuous straight line is for a wheel lasting 150 hours, wearing uniformly from 18 inches to 9 inches in diameter. Surface speed at the start was 5400 surface feet per minute, and, the revolutions per minute being maintained constant at 9 inches diameter, the sur-

face speed was reduced to 2700 feet.

At 5400 surface feet per minute and full diameter, all of the wheels tested start off at a 200 or 250-hour pace. However, before the speed has been reduced 300 surface feet, we notice a change in the slope of the curve indicating reduced life. At 4000 surface feet per minute, 13 inches diameter, the falling off is most pronounced and instead of obtaining 150 hours of wheel life, it ranges all the way from 100 to 135 hours. Had these wheels been speeded up at 15 inches diameter and again at 12 inches, the 150 hours life would have been more nearly attained.

What Excessively Hard Wheels Lead to

When a user of grinding wheels wishes to avoid the trouble of maintaining fairly constant surface speed, he invariably tries to keep his wheel life up by using wheels of excessively hard grade. The immediate effect of this is increased power consumption and decreased speed of cutting, neither of which are desired. Fig. 6 shows that regardless of speed, successively harder grades require more and more power to remove the same amount of material.

It is, therefore, quite evident from the foregoing that economy in wheel life comes from maintaining fairly constant surface speed as the diameters of the wheels are reduced. This can be brought about by using variable speed motors, or having machines running at graded speeds, to which the worn wheels are shifted at given sizes.

The next point that requires careful consideration is the personal factor entering into the use of snagging wheels. No two men will get the same life or production from a grinding wheel, even though the work and conditions are identical. If the foundry is large and there is a constant duplication of work so that the piece rate can be used, then it is safe to say that harder wheels must be used than where day rate compensation is in force. However, the ideal condition that permits the wheelmaker to specify a free-cutting wheel, is where there is a premium paid for maximum production with minimum wheel wear.

Some men work the corners of the wheel hard, others are abusive in applying the castings, and still others think they must remove a quarter of an inch of abrasive in dressing, where a sixteenth of an inch would be ample. All of these factors have their effect, and must be allowed for. It is, therefore, important that some kind of a record should be kept, showing just how each grinder uses his wheels. Many times the grinding wheel manufacturer is blamed unjustly for apparent variations in wheel life and hardness. In some of these instances the true causes can be attributed to the operation of this personal factor. For instance, if a wheel should happen to be on the soft side of grade S and it should get into the hands of a grinder who was very hard on grinding wheels, a certain life and production would be obtained. Now, in the same lot of wheels, there might be one that varied slightly the other way or toward the hard side of grade S. Suppose that this was used by a man who was more careful in using his wheel. It is evident the wheel would last very much longer under these conditions and hence from a very slight and permissible variation in hardness of wheel we get a result that would indicate a wide variation, if the personal factor is not considered. This is not idle speculation. It is stated from observation of actual cases.

Where there is a constant duplication of work and the piece-rate is used, there is a very simple but serviceable method for computing the relative efficiency of various grinding wheels and operators. The operator's earnings on a given class of work per dollar cost of wheel may be considered, under these circumstances, as a very fair means of determining the efficiency of the particular wheel used. To encourage operators to use their wheels economically, a bonus or premium is sometimes paid for all earnings in excess of a given figure. This works out very satisfactorily and means that the competent grinder is rewarded for his competency. It also invariably means that free-cutting wheels will be used and hence maximum production is obtained.

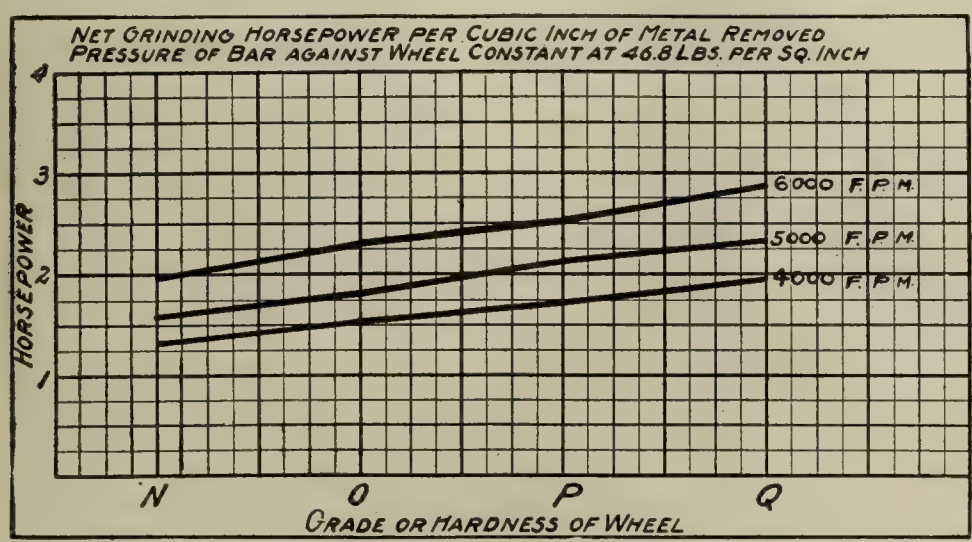


FIG 6. RELATION OF HARDNESS TO POWER CONSUMPTION.

Records on Snagging Castings

Here are some actual figures obtained from snagging wheels that are interesting:

Life Hours	Weight of Castings Pounds	Average Per Hour Pounds
127	26,543	208
157½	27,043	172

If no records were kept, the wheel with longer life and slightly greater total tonnage would undoubtedly have been picked as the more economical to use. However, the wheel with 127 hours life produced 20½ per cent. more castings a day and the profit on this increased production more than offset the slightly increased abrasive cost.

Another large consumer of snagging wheels keeps a tabular record on printed cards of the following: Date; pieces ground; weight, pounds; hours of grinding; earnings; and wheel loss on diameter. These figures permit the calculation of the abrasive cost per ton of castings ground, and the earnings per ton of castings ground. Manifestly, it is desirable to keep the abrasive cost as low as is consistent with satisfactory earnings per ton. Keeping such records as these makes it easy to pick out the correct grinding wheel, and enables the foundryman to tell just what each of his grinders are doing. He can also tell what the wheel manufacturer is sending him without guesswork or resorting to hearsay evidence from a few of the operators. This is decidedly practical and works for economy. It is time large foundrymen paid more attention to this phase of manufacturing cost, for nowhere is it easier to save or lose large sums than in the cleaning operations where grinding wheels are used.

Here is an example which shows that it is worth while to keep adequate grinding records. A certain large producer of draw-bars was using a hard wheel, 10-W alundum. It had fairly long life and turned out a large number of bars before it was used up. On the other hand, the grinders were continually complaining that they had to work too hard and dress too often. Finally the grinding wheelmakers were called into consultation and a test carried out with several different grains and grades of wheel. The result was the choosing of a 10-U alundum wheel, one grade softer than the W. The complaints ceased as soon as this wheel was put into general use in the foundry, and although the wheels were used up faster, the production was greatly increased and the overhead correspondingly reduced. A brief analysis of this will show up the facts to better advantage:

	Hard Wheel, 10-W Alundum	Soft Wheel, 10-U Alundum
Grinding cost per ton ground	$0.49	$0.55
Total number pieces ground	1800	800
Pieces ground per hour	8	10.2

The use of the softer wheel increased grinding cost 12 per cent., but increased production 27 per cent. and lowered overhead charges because of the increased tonnage turned out in the same time with the same equipment.

Every foundryman who operates a foundry of any size should try and work out a system that would apply to his par-

ticular conditions. Let him consult the wheelmaker if necessary and take advantage of whatever experience he has acquired in handling many similar problems. It does not cost very much to investigate, but it is decidedly expensive to continue operating year after year with inefficient and wasteful methods of snagging and cleaning.

Make Your Wheels Safe

A discussion of grinding wheel economy would hardly be complete without some mention, at least, of the necessity of making the use of this tool safe. It is not economy to allow the work to get jammed in between the wheel and the rest, because the wheel undoubtedly would be broken. This is prevented by keeping the rests adjusted close up to the face of the wheel. It is not economy to have one or more grinders going to the hospital every little while to have a foreign body removed from the eye. This can be prevented by supplying an approved type of glass goggle, making the men wear them while grinding. Much trouble also has been caused from flying pieces of chilled iron dresser cutters, which break in the dressing operation. This can be eliminated by using hooded dressers. State laws are beginning to call for closer attention to such features.

Apart from the humanitarian side of this question, it is undoubtedly more economical to employ safeguards where rapidly revolving grinding wheels are used than to trust to chance that there will be no accidents. The cleaning of castings is heavy and wearing work at best, and the least that the foundryman can do is to make the working condition as safe and bearable as possible.

LITTLE KNOWN FACTS ABOUT GRINDING

WHEN selecting a wheel for grinding it is important that the grain size in the wheel should be considered, so that sufficient room will be allowed between the grains held in the bond to allow the chips, which will be removed in the grinding operation, to escape and be freed from the grinding wheel. If the wheel is of just the proper grade and grain the face will always remain free-cutting and clear, retaining none of the metal particles as they are ground off the article. According to Howard W. Dunbar, in *Grits and Grinds*, the many varieties of materials which are now being finished in the grinding machine require considerable attention to be paid to this point.

The method of grinding employing the face or periphery of the wheel offers the least trouble or difficulty from this source; but with machines where the grinding is done on the rim of a cup or cylinder wheel it is not only necessary that the wheel grains be of such a size as permit room for the chips but also that the work itself be of such a form that the chips can free themselves as they pass by open spaces in the work. This, of course, relates more particularly to the grinding of castings or parts of irregular shape.

In a machine grinding with the periphery of the wheel the line of contact is so small that chips are less liable to be confined in the crevices between the grains. But on certain kinds of material, particularly those of a soft nature, the wheel is apt to take up little particles of the material, and finally crowd them in between the grains in the face of the wheel, which causes a great deal of heat, due to the increased friction of the wheel performing its grinding operation. Furthermore, they cause scratches in the work, the wheel acts hard and is very inefficient.

The grinding wheel can easily be compared to the milling machine in many respects. Deep cuts on the milling machine were not possible until milling cutters were made with coarse teeth to allow room for chips. Similarly, deep cuts in heavy roughing operations in the grinding machine are not possible unless there is room for the chips to free themselves and be carried away from the point of contact of wheel with work. We should, therefore, when deciding upon the method of grinding, and when selecting a wheel, remember that the more and larger the chips we remove, the more room we must provide for them.

PRECAUTIONS NECESSARY FOR THE MAINTENANCE OF CRANE RAILWAYS

Outside crane runways seem to be less rigid than inside runways, possibly because of the fact that the building itself provides some support and thus gives more rigidity to the columns or uprights. Outside runways are also exposed to all conditions of weather, and for this reason as well as because of the constant strains and vibrations, they should receive careful inspection. In case defective members are observed they should be immediately replaced or repaired. Any corrosion or rusting that is observed should be checked by scraping or cleaning off rust and applying a proper protective coating. Runaways that have been in service for a number of years often sway quite noticeably, and sometimes to such an extent that the additional stresses thus produced are dangerous. If this condition exists repairs should be made or reinforcements should be applied, sufficient to restore the runway to its original strength and rigidity.

Effective safety inspection would prevent many of these dangerous conditions, and it should be thorough, regular, and careful. The inspector should not only submit recommendations for the safeguarding of the machines, which is one of his special duties, but he should also consider the possible failure of weak crane structures, spreading or creeping rails and columns, uneven settling of column foundations, and any other trouble that might disturb the proper alignment of runway tracks.

CANADA'S TRADE BALANCE WITH UNITED STATES

STATISTICS of America's foreign trade, issued recently by the Bureau of Foreign and Domestic Commerce, make known Canada's trade relations with the United States to the end of September, 1917. Canada's "unfavorable balance" in these markets has assumed the impressive total of $340,161,166.

The August trade figures of the two neighbor countries showed that Canada was adding to this "unfavorable balance" at the rate of nearly 36 million dollars monthly. A substantial reduction from this extreme rate occurred during September, however. Canada cut her imports from 71 millions in August to 53 millions in September, and increased her exports from 34 millions in August to 37 millions in September.

In Second Place

Canada had climbed into second place on Uncle Sam's customers' list during August, but during September Canada was in her usual third place. The United Kingdom bought a total of 131 millions, and France 76 millions, against the Dominion's 53 millions. Exports to Canada constituted 11.6 per cent. of America's foreign trade for September; 13.6 per cent. for the nine months of 1917. Of the total imports of the United States from foreign countries during September, 15.7 per cent. came from Canada, and during the 9 months of 1917 16.7 per cent. This proportion will be increased now that Uncle Sam has gone to Canada for war supplies.

The reduction in the total of the U. S. imports to the Dominion of 17½ millions between September and August may be accounted largely due to the effect of the embargo on exports, at the direction of the President. Exports of 53 million dollars' worth of American goods to Canada compare with exports of 90 million dollars' worth in May and 94 million dollars' worth in June.

Dominion Trade in U. S.

The following table will illustrate Canada's trade position in the United States at the end of September and at the end of nine months of the calendar year. The figures drawn up give a synopsis of America's trade with the world, the trade done with Canada, and the relation which the Canadian figures bear to those of all nations combined:

	All Nations	Canada	%
	Sept., 1917.	Sept., 1917.	Can.
Exports	$ 467,005,947	$ 53,860,425	11.6
Imports	236,196,898	37,187,671	15.7
	$ 701,202,845	$ 91,048,096	12.9
	Sept., 1916.	Sept., 1916.	
Exports	$ 514,924,134	$ 52,148,637	10.1
Imports	164,038,614	22,649,345	13.8
	$ 678,962,748	$ 74,797,982	11.1
	9 mos. end. Sept., 1917.	9 mos. end. Sept., 1917.	
Exports	$4,616,621,558	$629,238,531	13.6
Imports	2,282,794,503	289,077,365	12.7
	$6,899,416,061	$918,315,896	13.3
	9 mos. end. Sept., 1916.	9 mos. end. Sept., 1916.	
Exports	$3,950,426,079	$427,102,449	10.8
Imports	1,831,174,668	260,794,840	14.2
	$5,781,600,747	$687,897,289	11.8

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Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

DOES A PISTON STOP AT REVERSAL?

By R. Hamilton

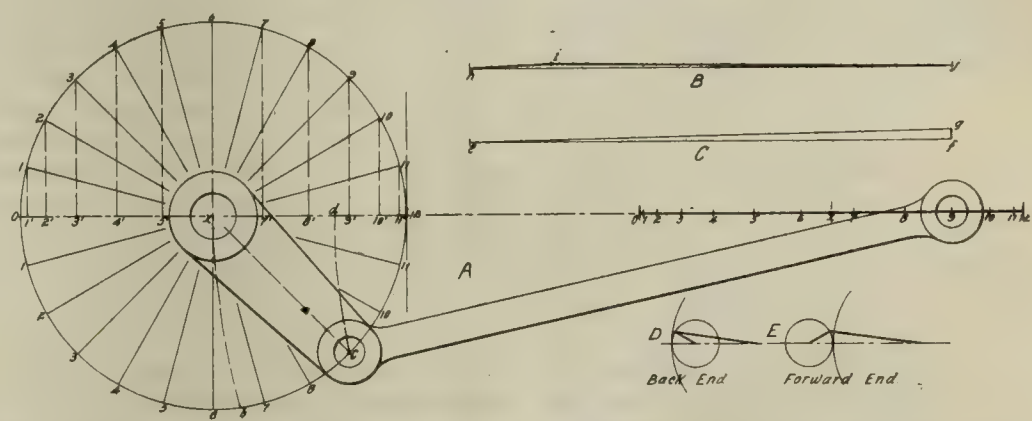
CONSIDERABLE interest has apparently been shown by many readers in the question, does a piston stop at reversal? This is one of those mechanical conundrums that, in itself, has little or no bearing on the actual operation of an engine, but one that will awaken the deepest curiosity in the majority of engineers or mechanics, once they are fairly confronted with the problem. An impromptu reply to this query would invariably be, that the piston does stop at each end of the stroke; but after a little study of the linkage involved, together with the underlying principles of geometry, many are forced to take a neutral stand regarding its proper solution. In the opinion of the writer there are reasonably two answers to the question; that is, theoretically—with absolutely no lost motion in the various connections—the piston does not stop at either end; practically, the piston does make an infinitesimal stop, owing to the fact that it is impossible to make a fit of two moving parts that will be entirely free from lost motion. This looseness, even though imperceptible, is nevertheless present.

On the basis of a theoretical solution, we must realize that if a stop is made it will be when the engine is on either of the dead-centers; that is, when the center of the crank, the center of the crank-pin and the center of the cross-head pin are in the same straight line. We know that this condition exists during each revolution of the crank; so the question now is, how long are these three centers in the same straight line? The geometrical definition of a line is that it has only one dimension, that of length. Therefore, if it has no thickness and the crank is in motion, there can be no stop on the line. The two extreme positions on this line constitutes the points known as the dead-centers of the engine. Again we are faced with the definition that a point indicates position only; it has neither length, breadth or thickness. As the circle described by the crank-pin is not a straight line, it is a logical conclusion that no portion of it is a straight line; so that it is quite obvious that, on the forward stroke the maximum distance between the center of the crank and that of the cross-head is not attained until the dead center is reached, when the action of the cross-head and other reciprocating parts, is immediately reversed.

A factor that should be thoroughly understood in the study of this problem, is that of the relative motion of the crank and cross-head pins. The uniform motion of the fly-wheel causes the crank-pin to pass through similar circumferential distances in the same period of time. When this rotary motion of the crank is converted—by means of the crank and connecting rod—into the reciprocating movement of the cross-head and piston, the action of the cycles are uniform, but each cycle of the reciprocating parts consists of a gradual accelerating and retarding motion, occurring twice in each revolution of the crank. By referring to the sketch it will be seen that the crank-pin circle is divided into a certain number of equal parts, illustrating the uniform action of the crank-pin. If the reciprocating motion were obtained by means of a slotted link, the corresponding positions of the cross-head or piston would be indicated by the points on the horizontal diameter derived from the vertical projection of the points on the crank-pin circle. However, with the general practice of using a connecting rod, as here shown, there is a slight variation in the acceleration at either end, due to the angularity of the connecting rod. This is clear from the arcs X-B and C-D. The graduations on the line O-12, to the right, represent the horizontal movement and position of the cross-head for the corresponding positions of the crank-pin.

The position of the cross-head can be readily determined when the crank is at any point in its path of travel. By using the length of the connecting rod as a radius and striking an arc from the center of the crank-pin to the horizontal diameter, this intersection will be the relative position of the cross-head between its extreme points of travel. The variation in the retarding or accelerating motion of the reciprocating parts may be better understood by referring to sketches D and E. When the crank-pin is approaching the back end dead-center, the crank and the connecting rod are overlapping, and the arcs that would be described by their outer ends would be tangent in the same direction, whereas on the forward end the opposite action evidently takes place, with the obvious result, that for the same arc traversed by the crank at either end, the speed of the reciprocating parts would be greater at the forward end, as indicated in the lengths O-1 and 11-12 on the graduated cross-head traverse line.

In order to form a triangle we know that the sum of two of the sides must be greater than the length of the third side. With the exception of the "dead-center" positions, this condition always exists in the constantly changing positions of the moving parts under discussion; therefore the solution of the "stop" query may rest on these facts. A skeleton diagram of the linkage approaching the forward "dead-center" is shown at B; 1 representing the crank-pin. Until the point 1 coincides with the straight line H-J, the triangle is still existent, and the length H-I-J must be greater than H-J; but, as a line has no magnitude, the time required for the crank-pin to pass over or through it must be nil—therefore no stop is possible (theoretically). Diagram C is an exaggerated skeleton sketch of the center line of the crank nearing a "dead-center;" E-F-G forms a right triangle, E-G being the hypotenuse, so that the latter must exceed the length E-F until it is in a direct line with it. Some of our readers might advance their arguments as to how long it takes the crank-pin to pass this "line."



ILLUSTRATING REMARKS BY R. HAMILTON WITH REFERENCE TO REVERSAL OF ENGINE PISTON.

MAGNESITE BRICKS NOW PRODUCED IN BRITAIN

By T. J.

IN THE search for highly refractory materials to resist the intense heat of the steel furnace the valuable properties of magnesia claimed early attention, and fire-bricks made of calcined magnesite took very high rank. The supply of magnesite, an impure carbonate of magnesia, the raw substance employed, was largely in the hands of foreigners, and

at the outbreak of war British steel manufacturers found that stocks of these bricks were becoming exhausted and prices rising to an alarming extent. In these circumstances the Government commandeered the magnesite, and steps were taken to regulate the trade in this material.

The best bricks from the continent were made of substances found in Styria, and entirely in Austrian hands, but very excellent magnesite is obtained from Greece, and first-rate bricks are now being made in England from the magnesite procured from Greece and the Levant. In some respects the English bricks are superior to those hitherto obtained abroad, but difficulties have arisen, owing to a tendency to "spall" or become chipped at the surface. This may be due to unequal contraction of the components of the brick, or to some defect in calcination. The Austrian bricks contained a larger percentage of iron in combination with the magnesia than those made from the Grecian magnesite, which is relatively much more pure, and it was hoped that by adding a sufficient amount of an iron compound to the raw material good results would be obtained. This has not hitherto been found to answer, but experiments are being made which already give promise of good results. Some kinds of bricks made from fireclay and pure silica show much the same defect in use as those prepared from the Grecian magnesite.

GOVERNMENT INSPECTION OF AIRPLANES

SPEAKING on this subject in the presidential address delivered before the Institution of Automobile Engineers, London, Oct. 10, 1917, Lieut.-Col. R. K. Bagnall-Wild succeeded in conveying to his hearers some idea of the magnitude of the task of properly inspecting every individual part entering into the construction of the machine and the necessity for a huge corps of skilled and meticulous inspectors, the better to serve the mutual interests of the manufacturers and Government. To quote the concluding remarks of the address:

"Inspection is essential to obtain efficient output. It is the only method whereby the directors of a company can ascertain the quality of the firm's output; it is their only safeguard that money, time and material are not being wasted in production of scrap; it is a check on their purchasing department; it is a check on their design and drawing office; it is even a check on their chief engineer to whom the inspection branch is responsible. Facts will always speak and the inspection department can at any moment produce figures showing rejections at any stage from the purchased raw material to the completed and finished article.

"It has been suggested that a full Government system of inspection is but a duplication of work. For a long time I have had available a record showing rejections by the firm and rejections by me. These figures, of course, also give the percentage rejections on the total output, and they must surely be of vital importance, not only from the output point of view, but financially. A little more money spent on inspection not only increases dividends but brings in more orders. The better the article, having due regard to cost, the greater its popularity with the purchaser.

"The inspector, as a rule, is nobody's friend. This is not always his fault, it is a fault of the whole system; he should be encouraged to be human. He must not be on unduly intimate social terms with the production staff, but he must be capable of dealing with them with tact and cordiality. I am certain that if more attention were paid and more encouragement given to the class of man employed by firms for this purpose, much better results would be obtained."

Some idea of the thoroughness of the inspection, the minute attention given to every detail and the continuous check on every operation may be gained from a perusal of the three inspection forms appended, relating to the cylinder, piston and crankshaft of the rotary engine, which formed part of the presidential address.

Cylinder

Ideal Firm's Inspection Procedure, with Reference to the Manufacture of a Cylinder for a Rotary Engine.—1. It is given that the specification for the material is mild steel, 0.4 to 0.5 carbon, to conform to R.A.F. Specification 29a.

2. The main contractor orders rough-machined stampings from the sub-contractor X (whose method of manufacture the main contractor has approved). These stampings are to be supplied in the annealed condition, and samples of the test pieces from the bar material of which the stampings are made to be supplied.

3. Sub-contractor X orders approved material from sub-contractor Y, who is a steel manufacturer, and quotes approximate analysis which he considers desirable to meet the conditions required in the manufacture of commercial stampings, and which will be in accordance with specification 29a. He also asks for a copy of a test certificate of the material taken at some approved test-house.

4. The stampings made by sub-contractor X are delivered to the main contractor, who arranges the machining of the stampings through various operations, until the cylinder is completed and ready for fitting to the engine. The inspection arranged for by an ideal firm in their own works, and in agreement with the sub-contractors in their works, would probably be as follows:—

(A) Steel Manufacturer Y. — The casts of the steel which the contractors propose to supply are analysed; each ingot of the steel is examined, and an inspector decides the amount of cropping necessary from each end. The cropped ingot is then passed through to the rolling mills, where it is hammered and rolled into suitable bars. Inspection of the bars is made for roakes, pipes or seams, and all defective material is rejected.

During the manufacture inspectors check and record the temperatures of rolling and working. A sample test piece is cut from the bar and forged down to the ruling dimension of the shell of the cylinder stamping. This test piece is then normalised, and tests are carried out at an approved test house; if all the bars are made from one cast, probably one or two test pieces only will be taken. A copy of the certificate will be forwarded to contractor X, with possibly some spare test pieces; the bars will then be delivered to the stamper.

(B) The stamper X, on receipt of material with certificate, will immediately put in hand the stamping of the cylinder shells; inspectors will arrange to check temperatures of working throughout the whole process.

On completion each cylinder shell will then be annealed, the temperatures being carefully checked and each stamping Brinelled. A sample of the material will be hammered down to the ruling dimension of the shell, and will be annealed at the same time as the stamping. This sample piece will then be machined as a test piece and Brinell and tensile tests taken. The Brinell numbers of all stampings should conform to a definite range, based on the test pieces, and, providing the tensile figures of the test pieces are satisfactory, the stampings will be approved.

The stampings will then be passed to the rough-machining shop, and the skin removed, care being taken to retain the identity numbers. After inspection for surface flaws and general dimensions they will be passed for delivery to the main contractors. In the main contractor's works the stampings will then be passed to the various machines for the remaining operations, inspection taking place between each operation as per the following schedule:—

(1) Rough turn on outside to chuck jaws, rough drill or bore, and face end.

(2) Rough counterbore working barrel, rough turn outside to chuck jaws, face end, rough bore valve-seat diameter, bore working barrel, finish internal-coned head, rough form outside taper.

(3) Rough bore and recess for valve thread, rough turn outside diameters, face to overall length, form top angular face.

(4) Mill flat for sparking plug boss.

(5) Rough form fins.

(6) Anneal and sand blast.

(7) Turn tops of fins, finish form first nine fins, finish tops of first nine fins, and polish same.

(8) Drill hole for sparking-plug boss.

(9) Chamber hole, and weld in sparking-plug boss.

(10) Finish bore working barrel, chamber mouth of bore.

(11) Form diameter at crank-case end, face shoulder and form grinding recess, form remainder of fins, finish valve-thread recess, polish remaining fins.

(12) Cut valve thread.

(13) Slot-mill keyway castellations.

(14) Drill oil holes.

(15) Grind crank-case register.

(16) Grind working bore.

(17) Balance cylinder.

Before final finishing the cylinders will be annealed to remove machining stresses. Final machining will be carried out in order to bring the cylinders within the standard weight limits and in addition to adjust the centre mass of the cylinder to the right position.

Inspection will be carried out on the finished cylinder for all final dimensions, weight and centre of mass. The inspection as arranged by a Government department, assuming that they have no control, or are not aware of the contractor's inspection, will be as follows:—

(a) The ingot from which the bars will be made at the steel manufacturer's would be inspected, and particulars of ingot and analysis of the cast taken. During the rolling of the material the temperatures of the rolling will be taken occasionally. The complete bars will be submitted for inspection, and will be checked for dimensions in accordance with the international standards or particulars of the order. One test piece for every 20 bars will be taken, and after working down will be normalised and a test carried out. Each bar will then be Brinelled, and if within a satisfactory agreement the bars will be passed on the results of the test piece, and a certificate and release note issued.

(b) On receipt of stampings the material will be inspected and checked against the release note. The operations on the stamping will be periodically inspected, the temperatures being checked from time to time. The samples of the material will be taken, and after working down to ruling dimensions will be heat-treated with the stampings by a test piece representing each batch of stampings. The stampings will then be inspected for dimensions in order to ensure that sufficient material is available to allow for cleaning up. Each stamping will then be Brinelled, and if the test piece is satisfactory, and the Brinells are reasonably consistent, the stamping will be passed after general inspection for flaws, etc.

(c) On receipt at the main contractor's the stampings will be checked by the release note, and released to the machine shops. No further inspection will be carried out beyond the transference on the stamping number. The finished cylinder can be identified with an individual stamping. The finished cylinder will be inspected for all dimensions, weight and centre of mass, and if satisfactory will be stamped and approved.

The action which a Government Inspection Department would probably take with the ideal firms would be as follows:—

(a) The checking of the analysis of the cast will be taken, periodic checking of the firm's own inspection would be made as regards rolling temperatures, working, etc. The test pieces would be pulled and material passed as usual procedures.

(b) At the stamper's periodic checking would be made of working temperatures, and a check test of the heat ment made periodically at random, and Brinell report for each stamping examined.

Cylinders will be selectively examined for flaws and general dimensions, and finally accepted and released to the main contractor.

The main contractor's inspection fixtures would be examined, periodic selective check testing be made between operations, and also of the finally finished article. Should any defects be discovered the whole of the batch concerned would be examined, otherwise only selective examinations would be made.

On final erection of the cylinders into the engine, check examination will be made to see that the various fits are satisfactory, and should any of these points show discrepancies, a detailed examination will be made of all stock in stores. All spares, unless erected in the engines at the main contractors, would be examined in detail for the dimensions affecting the fit, functioning, or the strength of the part.

System of Production of Cast Aluminum Piston

Material—Aluminum Alloy, to Specification of L. 8.—When casting, three test pieces are cast for every eight pistons. The pistons are numbered when taken from the sand, and the test pieces, removed in the fettling shop, are sent to the experimental departments for tensile test and chemical analysis. If these tests are satisfactory and approved by the A.I.D., the pistons are released and pass into the foundry view-room. Here they are inspected for blow-holes, and the inside diameter of the barrel callipered for size; the correctness of position of the gudgeon-pin hole is also tested on the surface table. If approved they pass from this room into the casting store.

The store issues them to the machine shop on a machining order, and in this shop they go through the following operations:—

(1) Rough machining outside, both on sides and crown. Viewed at site of lathe for blow-holes, etc.

(2) Finishing turning on sides and crown, leaving only enough metal for grinding operation.

(3) Bored at mouth and faced down to correct depth from inside crown.

(4) Rough drilling of gudgeon-pin hole to 1 in., and facing bosses inside.

(5) Cutting and rolling two ring grooves and scraper ring groove.

(6) Drilling hole for set pin.

They now pass into the grinding shop for—

(7) Grinding true to size on the outside diameter, and return to the machine shop for the following operations:—

(8) Finishing facing and rolling crown.

(9) Milling oil groove.

(10) Finishing boring gudgeon-pin hole, and then into the machine shop test-room, where

(11) They are tested under 10 lb. per square inch water pressure.

At this point they again return to the machine shop for—

(12) Burnishing gudgeon-pin hole.

(13) Drilling drain holes around scraper-ring groove.

(14) Number rolled on.

After all operations from the second to the fourteenth they are taken to the section view-table for inspection, and finally are weighed, have the weight stamped on them, and then are—

(15) Polished on crown.

This completes the machine shop operations, and they pass into the final view-room before going into the finished store, accompanied with view note. This view note bears the chief inspector's stamp, without which the pistons would not be inspected in the final view-room.

The finishing store then issues them to the erecting shop, where they are fitted to the connecting rods, etc., the operations being:—

(16) Rings fitted on and lapped.

(17) Assembling with connecting rods.

They are then finally viewed, tested for correct weight, and passed on to the charge hand, who again inspects them generally all over before he allows them to be assembled in an engine.

After assembling in the engine they pass on with the engine to the test bench, and then to the stripping shop, where they are very carefully examined for scoring and wear on rings, etc., and the gudgeons pins removed and replaced before they are again assembled with the engine for the final test. If this test is satisfactory the engine then passes on the despatch shop for despatch.

Engine Crankshaft

Material—Forged Steel, to Specification K. 1.—The crankshafts are stamped in Sheffield, have test pieces cut from the ends of the shaft, and are tested there before being approved and released by the A.I.D. for despatch to contractors.

They are issued by the stores at the contractors to the machine shop, on a machining order, where they go through the following operations:—

(1) Centre shaft.

(2) Saw off test pieces and stamp number in the presence of the A.I.D.

(3) Re-centre.

(4) Rough-turn journals, ends of shaft and faces of webs, leaving enough metal for grinding.

Viewed at View-table No. 1

(5) Number re-stamped on side of web.

(6) Milling sides of webs for locating purposes.

Viewed at section view table 1.

(7) Milling sides of webs parallel.

(8) Turning crank-pins and facing webs for grinding.

Viewed at section view-table 1.

(9) Form mill radius at crank-pin and journal ends.

(10) Grind radius.

Viewed in main view-room.

(11) Drilling and tapping holes through crank-pin.

(12) Drilling through centre of crankshaft.

Viewed in main view-room.

(13) Hand tap crank-pins for oil plugs.

(14) Turn journals and taper shaft for grinding.

(15) Turn chamfer on radius and cone inside ends of hole through shaft.

Viewed in main view-room.

(16) Grinding two ends of shaft for locating purposes.

(17) Grinding pins and faces of webs.

Viewed at section view-table 2.

(18) Number transferred to chamfer on radius.

(19) Grinding journals, taper end of shaft and faces of webs.

Viewed at section view-table 2.

(20) Grinding edges and radius of webs.

Viewed at section view-table 2.

(21) Milling castellations.

(22) Milling keyway on taper end of shaft.

(23) Filling castellations to fit gauge.

(24) Milling driving slot at end of shaft.

(25) Frazing webs.

Viewed in main view-room.

(26) Screw threads cut on both ends.

Viewed in main view-room.

(27) Drilling holes for balance weights.

(28) Drilling and countersinking oil holes in crankpins and journals.

Finally viewed all over in main view-room and component number stamped on.

The crankshafts now pass into the finished store on a view note, from whence they are issued to the erecting shop, where they undergo the following operations:—

(29) Tapping and plugging oil holes in journal ends.

(30) Plugs removed, oil holes drilled through them, replaced, and set pins inserted in ends of these oil holes.

(31) Balance-weights fitted.

Viewed for balance on section view-table 3, and numbered as viewed.

Oil-ways tested under pressure of 200 lb. per square inch with lubricating oil. Stamped with viewer's number.

(32) Key fitted to keyway in taper end.

Viewed for the taper and keyway at vice.

(33) Main ball races fitted.

(34) Bevel gear and locking nut fitted.

(35) Taper gear and ball race and locking nut fitted. Final viewing, length between housings of journal bearings gauged, and fitting of taper gear tested. Stamped with view mark.

(36) Split pin hole for castle nut at taper gear end of shaft drilled, also hole in sleeve nut drilled.

(37) Journals stoned for removal of frays, etc.

(38) Journals bedded in crank-case bearings.

Viewed at work bench, and stamped.

(39) Fitting connecting rods to pins and stamping recognition numbers on webs and connecting rods.

Viewed at bench for play in connecting rods.

This completes the actual operations of production on the crankshafts, and they pass on to the erectors' charge hand for assembling in an engine. This charge hand again generally inspects the whole shaft before allowing it to be assembled in an engine.

The engine then passes on to the test bench for a three hours' trial, after which it is stripped in the stripping shop, and the crankshaft minutely examined before reassembly, after which it undergoes the final running test on the test bench, and if satisfactory is sent to the despatch shop for despatch.

MACHINING A LARGE COMPRESSOR BED

By D. S. Mann

IN taking up the manufacture of a line of compressors in a shop which had previously been devoted to the production of smaller machinery it was found necessary to get out the first machine as there were no other shops in the town capable of handling the work, and it was absolutely impossible to obtain new tools in time. The largest lathe with which the shop was equipped was a 32 in. and the headstock was blocked up with the two sets of raising blocks. As the work was only boring and facing, which was comparatively light work, the extreme height of the headstock did not interfere with taking good, heavy cuts.

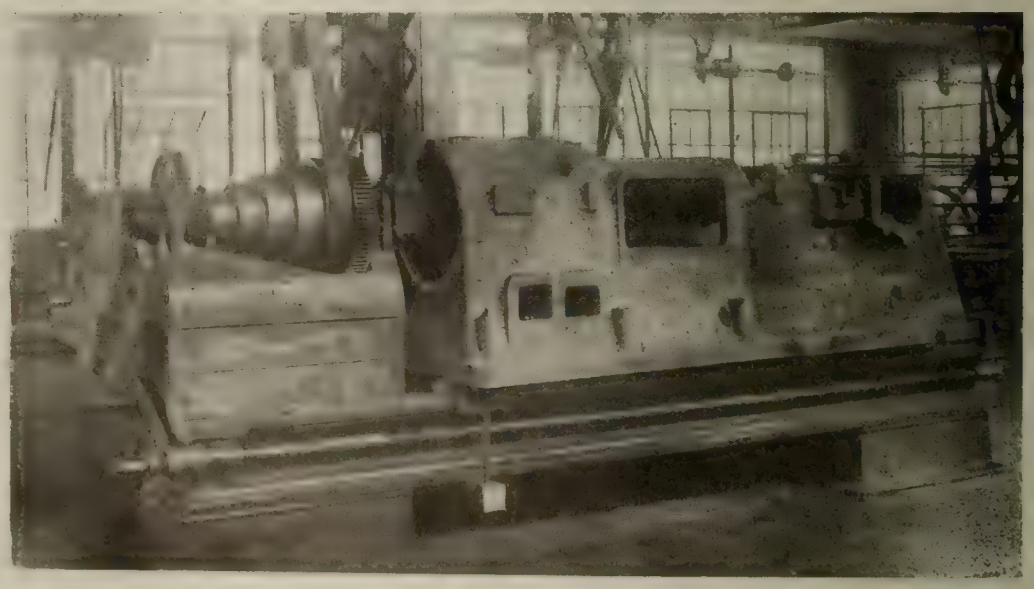
The tailstock and carriage were removed and the bed clamped directly to the ways, resting on metal pieces, bringing the center to the desired height. The boring bar screwed on the spindle and was provided with a travelling head carrying the boring tools. The travel of this head was controlled by a screw lying in a slot milled the entire length of the bar. The outer end of this screw carried a gear which engaged with a small pinion which rotated freely in the center, supporting the outer end of the bar. This pinion was milled on the end of a piece which extended back into the center and a hole was drilled both through the pinion shank and the center proper. When a pin was inserted through this hole the pinion was held stationary and the rotation of the boring bar about the center caused the gear on the end of the screw to also turn and thus move the boring head. To stop the feed, it was only necessary to remove the pin when the pinion in the center would turn freely.

It being impossible to provide any external support for the center, a casting was made which extended across the bed and was held to same by studs, the casting being provided with screws whereby it could be adjusted vertically to secure alignment with the boring bar. It was, of course, necessary to drill the holes for these studs after the bed was lined up on the lathe but this was a small matter with an electric drill. After boring out the bed for the crosshead the end was faced with the facing head shown at the inner end of the bar.

After getting the machine on the lathe, the actual boring and facing time was practically no longer than what it afterward was on a regular boring mill. Of course, it was rather awkward to line up properly and the operator was at a slight disadvantage due to the height of the work.

Unique Portable Drill

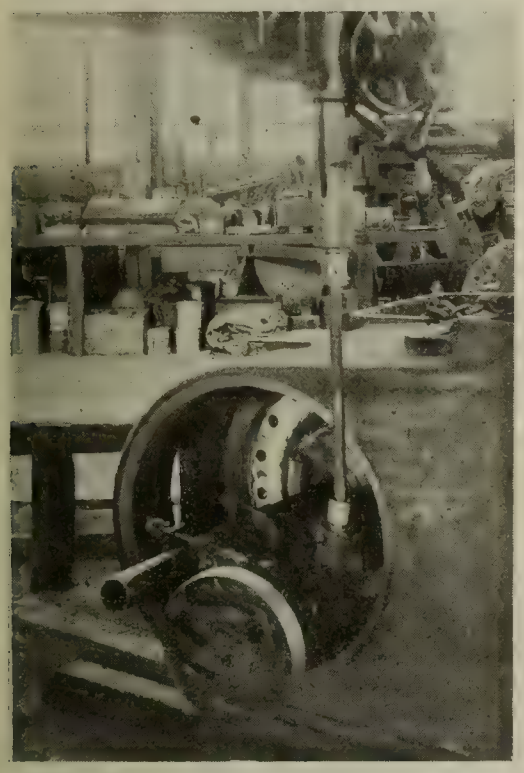
The cylinder was fastened to the bed by studs placed horizontally and the most logical machine for doing this work was, of course, a horizontal drill press, as the extreme weight of the casting made it practically impossible to place it on end in a pit and there was also no pit available at the time. An old blacksmith's drill head was obtained and mounted on the three-inch pipe attached to a central flange. A crude universal joint was arranged on each end of the bar from the radial which allowed sufficient range to drill several holes at the one setting. The drill was fed by the handwheel shown at the end. The distance from the center of the drill to the center of the pipe was, of course, the radius of the stud circle. In spite of this rather crude method of doing this work, it was completed in good time and with perfect satisfaction.



TEMPORARY ARRANGEMENT FOR MACHINING COMPRESSOR BED ON LATHE. NOTE BLOCKS UNDER HEADSTOCK.

Needless to say, machinery was pur-

chased to handle the above work in a more efficient and modern manner after the success of the first machine was assured, which was directly after being placed on the market, but the methods used only go to show the versatility of modern machine tools and operators as well.



UNIQUE APPLICATION OF BLACKSMITH'S DRILLING MACHINE DRIVEN BY UNIVERSAL SHAFT FROM RADIAL DRILL SPINDLE.

MISCELLANEOUS CARD RECORDS

By B. Orion.

THE accompanying card records do not represent the practice of any one firm nor are they connected in any particular sequence, but show different forms which the writer has seen used with success. No. 1 shows a time card which was used in a small shop in which there was absolutely no system whatever except what the foreman carried either in his head or private notebook. All estimates were based on guesswork, and in an endeavor to get some kind of cost on the main parts which went into engines, he used this card and filed

Symbol G.26. H. P. 15
TIME CARD
Date 4-27-13 Machine No 6
Name of part Piston
Operation Turn & Groove
Time Start 8:25 Time Finish 3:30
Elapsed Time 6:05-.6
Average Time per Piece 1.01
Operator's rate per Hr. 38¢ Cost per Piece 1.38
Operator Wilson Remarks Lost 15 min.
with lathe trouble

FIG. 1.

them according to symbol. The card was used only on those particular jobs on which he desired costs. To keep a record of purchases Nos. 2 and 3 were used in different instances.

A card index, containing card No. 4 was maintained in a certain pattern vault and only one man was allowed to either get out or return patterns. In this way the index was always kept up to date and there no patterns lying around, there being a place for each, and each in its

Name of Part Cylinder Head Part No. A39
Wood ✓ Metal H. P. 25
Rack A Tier 3 Shelf 7
Number Core Boxes 3
Number Used Per Engine 1
Other Sizes Used on ——
PATTERN RECORD

FIG. 4.

Symbol A39	Draw No. 1096	Book No.					
Name Cylinder Head.	HP	T	No.	HP	T	No.
Material C.I.	10			40		
Aver. weight 99.	15	Y	1	50		
Material cost $6.76	20			60		
Labor cost $10.18	25			80		
Total cost $16.94	30			100		
Last engine used on	35					

FIG. 6.

place. Should the patterns be taken out for purposes of repair and later returned, a record was kept on the reverse side.

A similar card, No. 5, was used in the tool room for jig storage. This contained

39	Cylinder Head	
A	25	1096
B	40	1138
C	50	1303

FIG. 8.

all information pertinent to that particular piece and came in useful when taking inventory as no jig or fixture was allowed to be placed on the shelves until a card was made out for same. When a jig became obsolete it was not destroyed for

PURCHASE COST CARD
Article Lubricators
Mfgr. Johnson Mfg. Co. Fig. No. 19 Size 6-Feed

FROM WHOM PURCHASED	List	Disc.	Net	Date	F.O.B.
Johnson	24.75	20-10	7.2	10-14-13	Fact

FIG. 2.

some time and the card was then transferred to the obsolete file. When the jig was finally destroyed, the card was sent to the office in order that the proper charge could be made. Where there was any possible chance for confusion a freehand sketch of the jig was made on the back of the card.

Nos. 6 and 7 were used in the drafting room as a record of tracings. They were filed according to both part and drawing number. In looking up a tracing number

Part No. A39 Jig No. 396
Bin No. A Shelf No. 3
Operation Milling Bosses
Type of Jig Box
Jig Made 3-21-16 By Brown
Total Actual Labor Cost. $10.46
Total Material Cost $3.18
Quit Using
Superseded by Jig No.
TOWER MFG. CO. JIG RECORD Sketch Over

FIG. 5.

Draw No. 1096 Book No. Date 7-3-13

Contents	Part No.	Contents	Part No.
Cylinder Hd.	A39		
Valves	A41		

Supersedes 10851 Superseded by
Changes valve Stem to 3 - 3-4-12

Copies to Stockroom 10-19-14 Retd
Copies to Stockroom Retd
Copies to Stockroom Retd

FIG. 7.

reference was almost always made to the part number. The costs on the card were supposed to be average and often came in useful when the question of redesigning or new methods of manufacture came up.

SYMBOL 57
NAME Cam Gear.
FOLIO NO. 6
DRAWING NO. 18
PART OF GROUP NO.
MATERIAL Steel Castg.
AVER. WEIGHT 7#.
WHERE BOUGHT Ill. Steel Co.
MATERIAL COST $1.05
LABOR COST .38
TOTAL COST $1.43
LAST ENGINE USED ON
CHANGES Lengthened Hub ½" Hole

WHERE USED	NO. PIECES	WHERE USED	NO. PIECES
A-1 H.P.		N-25 H.P.	
		P-40 H.P.	
		R-50 H.P.	
D-3 H.P.			
E-6 H.P.		S-2 H.P.V.	
G-8 H.P.		T-3 H.P.V.	
H-10 H.P.		V-5 H.P.V.	
J-12 H.P.			
K-14 H.P.		X-9 H.P.V.	
L-16 H.P.	1		
M-20 H.P.			
TOTAL			

FIG. 9.

No. 8 was used in the toolroom to locate the prints for handing out to the workman. A man called for print for part B39.

Form No. 3
QUOTATION RECORD
ARTICLE Ignition Coils.

DATE	BY	FILE	FROM	QUAN OR SIZE	LIST	PRICE DISC	PRICE NET	F.O.B. WHERE	TERMS	ORDERED DATE	ORDERED QUAN.
3/9/6			B. L. Keith Co.	#3	8.25	20	80	Milw.		6-10-16	6

FIG. 3.

Turning to card 39, shows that size B is a 40 H.P. and the print number is 1138.

A similar drafting room record is shown in No. 9. In this case the drawings were filed in large envelopes or folios. This is very similar to No. 6 except that there the prints were filed according to number only.

DO THE BIG THINGS, LIVE THE BIG LIFE

By James E. Cooley.

THE only difference between man and animal is a man thinks, an animal is guided by instinct. It is because of this fact that man calls himself a superior being. His superiority, however, must be judged by that of which he thinks; the way he thinks; and what his thoughts really amount to. Since the dawn of time, from the beginning of the world's history, from Noah's time and Flood, from Cæsar's day down to this, man has made but very little effort to develop his thinking powers, has given but little attention to real, genuine constructive thinking.

Man as a rule acts after he thinks; and that the depth and reach of his thinking has been feeble and of little extent is proven by the necessity (at least to him) of the constant repetition of wars and upheavals of revolutionary character. And because of this, because these things have been repeated over and over again, their uselessness and futility, the little gained by destruction instead of construction; while the tigress still exists in woman, the wolf in man, there is little to distinguish man as being above the grade of animal, or in being a superior actor on the world's stage.

When we say man is crude and is low on the scale of progress, and are asked to explain how and why, we can, in a manner, anticipate this same question by referring back to those who existed and took their turn at life a thousand years ago.

The plain truth is that with all our vauntings of intellectual superiority, and the little we have achieved and progressed, we still border on the pale of crudity. Insanitary practices that still exist, and neglect of that in which we are deeply calloused must, to a future race, stamp us as untutored, abnormal and crude, even as those who slew their game with jagged stones and roasted it on spikes are to us now. We call this an enlightened age, but our methods and refinements are no whit higher than those in the dark ages. Our fears are just as strong, our superstitions and ignorance just as deep; we are still as quick to quake before each thunder-clap or new celestial phenomenon as did our forbears in days of old.

The World Waits Not

The world propounds a new problem every hour. No waiting, no getting ready or taking our time method, is going to put any of us in a class fitted to probe and dissect with any degree of success in the solution of these. If we persist in moving at our old gait we will never rise from our condition, never enter the new era that is only waiting to materialize when our energizing forces are put into play. We are carelessly neglecting, putting off and leaving for some future generation of men and women to do that which we could readily do ourselves in the present day.

Out of the distant past we have slowly evolved—but all too slowly. Under a misconception we have dreamed of an Eldorado, a sweet by and by, a land flowing with milk and honey, which we would fall heirs to when we shed this mortal coil. The fact is, the city of the blessed with its streets of golden pavement and its crowns of glory could be easily brought down to us and established under a wise and select administration right here now if we would quit cheating ourselves with these uncultured notions, come right down to business and get busy. There should be no mis-spent years, no wasted lives, no moral weakness, no down-in-the-gutter type of human being. Every man should be strong; every woman should be strong; every child should be strong; there should be no reservation required on this earth for a weakling or a pigmy.

That we can become a higher and greater type; that our refinements and accomplishments can be surpassed beyond all that we at present can conceive; that we can attain to a state of unrivalling wealth and grandeur is no idle or delusive boast. And all it requires of us is persistent and energetic action on the part of every human being. No delayable, no-laying-aside-and-waiting-awhile kind of motion; but instead a vitalizing, constant perseverance, that gathers in, and gathers abundantly what we incessantly and determinedly must strive for. The earth should be a hive, and everyone a positive, strenuous bee-ing.

The Fruits of Labor

No labor should be too large, no task too small, no distance too great to compass, no depth too low to explore. Out of the bowels of the earth, out of the sea and air, could we bring untold treasures and substance, if we only would begin to stir up our energy. There is no plant or flower but would disclose its secret; no mineral or quartz but would yield forth its value; no sweeping wind, no atmospheric element but would extend and render its health and wealth to us striving mortals. Are you willing and wakeful to the splendor of these possibilities? Are you willing to move in all this grand assembly of earth's products? Are you willing to sharpen the edge of your intellect? Are you willing to plunge forward with powerful momentum? Are you willing to pass your hand through the shower of sparks that flit and fly from the anvil of life, forging a link to the chain of this steady movement from the morn's first ray to the evening's glow? Can you stand unpropped, unswayed by useless strifes and turmoils? Can you shoulder a load, solve a burden, bridge the gulf of ignoble pursuits and low aims? Have you the forwardness, the straightwayness to ends that are primed with vigor and push? If this be you, then come. Step forward where an, as yet uninhabited, arena awaits you. Come where your faith is worthy of your steel. Come unto your own. Unmindful of your comfort, your sleep or your meals. Make your existence worthy of the flesh that adorns you. Ascend a mountain peak, grasp a cloud, place guide-posts along ærial pathways, and become a satellite in the firmament of the heavens.

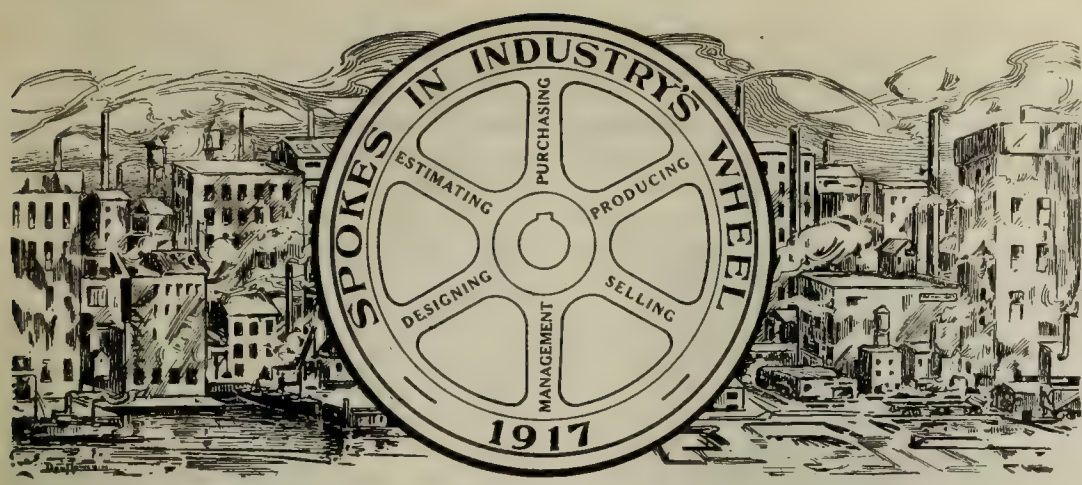
Awake to-day to your unfathomable possibilities. Feel the great stir within blood and sinew, in vein and ligament. Walk daily forth with constructive zeal — with constructive ideas — with indestructible calm. Over and over again repeat to yourself, that youth is nothing, that old age is nothing, that only live human activity is of consequential moment. Set your face towards the broad sunlight of unquenchable energetic fires, and do the big things and live the big life.

Under the vast dome of sky—over the wide expanse of earth—no matter where you are, move onward and forward in some great human endeavor. Be punctual to the second in your labor—unswervable, unconquerable and bristling with activity. Be zealous and unafraid! Wholly determined! Wholly invincible and energetic! Be a real, live human being, high in your aims, high in the service that calls you. Be of that faith which never wavers, falters nor halts. Be above the common order that shuns and shirks. Bowl down that which obtrudes. Stand firm where others weaken. Upheave the dens of darkness. Be a glittering light in unceasing action, a being of heroic mould.

DUTCH shipbuilders are required to give details not only of all ship construction and repair, but of the ultimate destination of the vessels. The shipbuilder or owner receiving German iron and steel must sign a contract, valid for five years after the war, that he will not sell any ship without giving Germany the right of refusal, and that during five years after the war he will not allow his ships to be employed, directly or indirectly, for the benefit of Germany's present enemies. The Dutch Government Iron and Steel Committee has advised builders and owners not to accept these last two conditions.

WHEN selecting a cooling liquid the matters which have to be considered are the nature of the material to be cut and the kind of tool used, the effect of the lubricant, its freedom from liability to gum and clog pipes, and, as important as either, its cost when a large establishment is concerned. But this is a relative matter, since if a costly oil or mixture be selected it may well prove more economical than a cheaper one if an efficient recovery plant is installed.

A TANK steamer is building in a shipyard on the Delaware whose engine-room, says *The Marine Journal*, will present the novelty of having no reciprocating machinery of any kind. The propelling engine will consist of a low and a high-pressure turbine geared to a single propeller, a surface condenser with a centrifugal pump driven by a turbine, two centrifugal hot-well pumps also driven by a turbine, and a rotary oil pump for the turbine and gears, driven from the main gears. This is the first instance, adds the journal, where rotary machinery has been used throughout a ship, which marks an epoc in shipbuilding history.



The constitution of industrial enterprise is largely departmental—"spokes in a wheel." This series of articles has for its object the featuring in a racy, interesting and instructive fashion, the training, experience and achievement of those who to-day are transmitting, effectively, energy in their capacity as "spokes in the wheels" of our metal-working establishments.

WILLIAM JAMES McSHANE

NOT the least prominent of those sections of the Dominion affected by the industrial activity of the past three years is the province of New Brunswick. While affected to a considerable degree by the demand for munitions, the urgency-inspired development of shipbuilding has, to a greater degree perhaps, been responsible for the present state of activity in this particular section of the busy East. When the influence of agricultural and allied interests in a generally prosperous district are considered, the ultimate demands on establishments doing a general engineering business are both large and varied. Considerable interest, therefore, attaches to the personality of the subject of these remarks, whose lifetime association with a leading New Brunswick engineering firm has resulted in his reaching a responsible and trusted position therewith.

Canadian born of Canadian parents, William James McShane first saw the light in St. John, in the year 1865, and to-day, after 35 years in the service of T. McAvity & Sons, discharges the duties of chief draftsman and patternmaking superintendent. While much of Mr. McShane's success is no doubt due to the guiding influence and tuition of his father who held the position before him, it is no disparagement to his parent to remark that the developments of recent years have brought greatly increased responsibilities and demanded a degree of judgment and resource largely exceeding the old days when our Spoke was absorbing the rudiments of his lifework.

The day schools of St. John were his source of knowledge until the start of his apprenticeship with McAvitys in 1883, at the age of eighteen. The regular 5-year period of training was gone through by Mr. McShane, and the fact that this formative period of his life was spent under the supervision of his father has doubtless been a matter of mutual benefit to our Spoke and his employers on many occasions since. Doubtless Mr. McShane reasoned that a part of the country which was good enough for a firm like McAvity (they had been established almost half a century when he joined them) was quite good enough for him, and the determination to do well whatever came to his hand accounts for his following the example of his employers and becoming also, so far as lay in his power, long established.

WILLIAM JAMES McSHANE.

The name of McAvity is a household word in the Maritimes, as will be gathered from the nature of their business. Established in 1837, they developed with the country, operating the Vulcan Iron Works and a separate plant devoted to brass work, producing plumbers', steam fitters' and engineers' supplies while recently a machine shop of considerable size has been rendered necessary to meet their requirements. The wide field of activity open to a studious, resourceful and energetic person in the position filled by our Spoke is apparent, and that Mr. McShane fully availed himself of the opportunities offered is evidenced by the numerous inventions, etc., in the various lines produced by McAvity. Numerous types of valves, fittings, electric railway semaphores and corporation specialties are the fruit of his efforts or bear the impress of his influence in some form or other.

The close attention to work necessary to insure such a record may account for the comparatively small amount of traveling done by Mr. McShane but the requirements of his position did not prevent him from following the advice contained in the old saying about "all work and no play, etc.," and his record in rowing matches and similar sports is evidence of his physical as well as mental ability.

Our Spoke is of the Liberal persuasion in politics, is Roman Catholic in creed, and beyond being a Knight of Columbus has few society affiliations. His belief in the value of temperance is well seconded by his efforts for the cause, and he acknowledges that much of his success has been due to his close ties with the Father Matthews Temperance Society. He has been bereaved through the death of his wife, and resides at 27 Duke St., St. John, N.B.

In speaking of his career, Mr. McShane attributes most of his success to having "acquired practical experience, at the same time developing the ability to back it up by the study of technical books and journals, the former to keep the rudiments of knowledge always fresh, and the latter to maintain close touch with recent developments in products and equipment, and acquire a knowledge of the methods and devices employed by others."

TENDENCY IN MACHINE TOOL DEVELOPMENT

THE effectiveness of any specific machine in the modern industrial establishment is measured by its ability to do work for which it is intendel with the greatest possible economy, while features of permanency and adherence to standard and approved design may be of secondary importance, according to Joseph Horner in an article in a recent number of "Engineering."

Various occurrences and movements of magnitude may contribute to render excellent machine tools antiquated in the sense of being no longer sources of profit, and this long before they manifest marked signs of wear. Conditions arise which result from changed views respecting methods of tooling. Others are caused directly by the advent of new industries. Both are largely responsible for many alterations in the designs of the later machine tools. Both have been extremely active during recent years. Each aspect would offer a tempting field for a more extensive treatment than can be ventured on in connection with the

present subject. Always the problem for solution comes back to that of the relative cost of the work done on machines of different kinds. One of the teachings of the machine shop of to-day is that of "other ways" of producing like results. Managers have larger resources at their command, more alternatives, a much wider range of selection of tools and appliances than their predecessors enjoyed. Naturally their resourcefulness has developed amid broader horizons. They have learned to abandon the narrow grooves of use and custom and to adopt methods of tooling which could not have been entertained when alternatives were limited as compared with those which are now available.

Hand Work Superseded

Thus there are now several diverse ways of producing cylindrical forms or plane surfaces of irregular outlines—the production of which once entailed much tedious correction by hand work and templet. Such are now machined readily with a sufficiently close approach to accuracy, and with uniformity, in any number of pieces. The milling and the grinding machines have changed practice profoundly, and have taken vast quantities of work away from other tools, performing it, if not always with finer results, yet with more rapidity than the rival machines were capable of accomplishing. Output is multiplied by the employment of multi-spindle machines, as drills, boring machines and some turret lathes, in which from four to half a dozen spindles are carried. It is also increased by the grouping of several tools in some modified designs of common lathes, and in many box tools in turret lathes, in vertical boring and turning mills carrying several tools, in crank and cam turning and grinding machines, and so on. In the selection of machines and methods immemorial practice does not count, but the ultimate results rather are visualized, and methods are subordinated to them. Times are carefully collated, with the object of saving minutes or even seconds. The expense of fixtures, and even the high cost of additional machines, are brought into their true perspective instead of being allowed to bar the way to the real economies of production. These changes are revolutionary in character, and they would impress the mind more powerfully than they do but for the fact that they are growing familiar to the generation that is being trained in them. But the older men, who witness the inevitable displacement of handicraft in which they were trained and exercised, marvel at the banishment of individual initiative in machine-tool methods by the automatic and semi-automatic systems, the cards, and the routing methods.

Influence of New Industries

Changes which arise directly out of the advent of new industries are even more prominent than are those that are consequent on divergent views of methods of tooling. The growth of new manufactures in a market already crowded with rival firms compels a keen inspection of methods which afford something more than a merely interesting study in alternative ways. Their adoption, or neglect, in their ultimate results may involve success, or loss, or even total failure. Not only are differences in times occupied by operations in question, but limits or degrees of inaccuracy are involved. Sometimes the attainment of the results desired will entail a larger expenditure of time, in others less, perhaps very much less. But the ultimate issue is the thing that matters. The conditions that are imposed, the results to be achieved, control the methods to be adopted.

The newer industries which are exercising most influence in controlling the work of the machine shop are chiefly those that are concerned with the manufacture of all kinds of internal-combustion engines, the manufacture of steam turbines, that of electrical machinery, and, now partly overshadowing these, of munitions of war, which includes mechanisms of many kinds made in vast quantities, many articles being ordered by the hundred thousand. For each of these many highly specialized tools, many absolutely unique designs of machines are employed in addition to large numbers of modified types of the kinds that are regularly standardized. The problems which have been exercising the manufacturers of motor engines and vehicles and aeroplane details have had to be faced under greater difficulties by the firms who have been engaged in munition work.

Single Purpose Results

One of the remarkable phases of the solution of the problem is the enormous development of what are termed the "single-purpose" machines, or those which are specialized to the last degree. Many of these only perform one operation, some include two or more operations which are identical or allied in character. Equally striking has been the effect of the extensive employment of fixtures and of jigs, and, again, the general use of the tools of high-speed steel. The influences which these three modern movements have on an accelerated output, and, in consequence, on the services of the machine tools, may be noted briefly.

The single purpose machines are big developments of an earlier movement. Their growth has been immensely quickened and favored by the intensive production of munitions. The problem of how to secure the most rapid output has been the paramount one, and any tools, however novel in design and without precedent, that might help to gain this end have been welcomed. These machines are justifying their existence, because they increase output by subdivision of tasks, and because they enable the large contingent of unskilled and semi-trained labor which the war has attracted to the shops to be utilized. This movement, which, though not new, has in its swift growth assumed the aspect of a novel phenomenon, is greatly exercising the judgment of those who have to accommodate shop arrangements to changed conditions. One might enumerate more than a hundred new designs of this class, the products of the last three years, for dealing with munitions alone, to perform only one or two, or a few, related tasks.

The influence which these single-purpose tools are exercising will not cease with the termination of the war. The question of the position which they may occupy in the future is of less importance than that of the retention or the abandonment of the system of which they are an essential element. Many of these machines, and others, embodiments of the same methods, might be readily enlisted in new services in the intensive industrial war that must supervene. They are essential if the dilution of labor is to be retained. The principal machines the work of which has been encroached on by the single-purpose machines are the lathes, followed closely by that of the drills. A few observations on the first-named will show why the single-purpose machines are, in the opinion of many competent judges, to be preferred to the more complicated general-purpose designs.

Unskilled Labor Unsuitable

At the commencement of the war there arose a huge demand for common turret lathes, which the supply was inadequate to meet. It was rightly believed that the possession of these would enable an immense output to be secured. But two requirements are essential if the best results are to be secured from such lathes—a supply of skilled tool makers and tool setters, and operators who have acquired some experience in their working. The supply of each of these requirements proving insufficient for the abnormal demands made afforded the opportunity and emphasized the necessity for the introduction of the single-purpose machines. These are vastly cheaper to produce than turret lathes are, and they exact the minimum amount of tool setting, and can be operated by new attendants after a very little instruction.

Although turret lathes are automatic or semi-automatic in their movements, an operator who is neglectful or insufficiently experienced may easily allow tools to become slightly displaced or damaged, and by continuing to use them while in these conditions spoil a considerable volume of work before the gaugers detect the fact. Especially is this the case with the more elaborated boxes of tools that are fitted with slides, setting-up screws, tightening screws, and often with multiple tools. The more numerous these fittings are, the more liable is trouble to result when a neglectful, inattentive or half-trained man is in charge. Another fact to be observed is that the time spent in preparing and setting up batteries of tools and the fixtures or boxes in which they are held is a large item, since many trials may have to be

(Continued on page 633.)

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

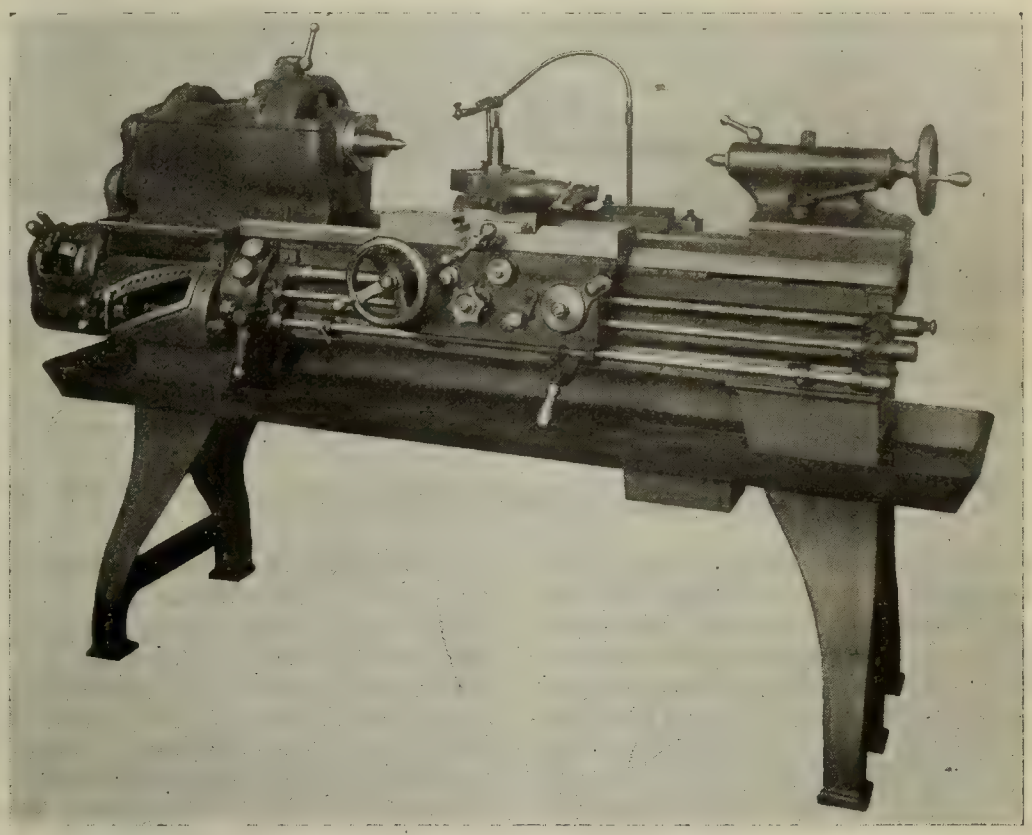
NEW DESIGN TOOL ROOM LATHE

IN the tool room lathe illustrated in the accompanying engravings the Davis Machine Tool Co., Rochester, N.Y., have incorporated refinements in design and construction which make it particularly capable of meeting the requirements of a modern tool room where accuracy, convenience, power and simplicity are demanded.

The headstock design involves the use of a heavy one-piece casting, having solid boxes with front and rear walls brought up to the centre line of the spindle, thus tying the whole head together in a most substantial manner. Gear guards are made to be integral with the head and form a cover for the cone which makes a safety device in conformity with the laws of most States. In the top of the gear guard is mounted a brake for stopping rotation of spindle, a device much appreciated by skilled operators.

The spindle made from high grade crucible steel is turned all over and ground to micrometer size, and runs in heavy phosphor bronze boxes scraped to fit and to accurate alignment. Large oil pockets are cored in the walls under the centre of each bearing, and the oil is distributed from them by rings, thus furnishing a constant and even lubrication.

Front spindle bearing is tapered, and wear is taken up by drawing spindle into taper. The rear bearing is keyed to and slides on spindle, and is adjusted by a collar on the end which draws same into taper bronze box. End thrust is taken by hardened steel washers and S. K. F. self-aligning ball bearings. A 1½ in. hole is bored entire length of spindle with front end bored to No. 8 Jarno taper.



TOOL ROOM LATHE HAVING HEAD WITH INTEGRAL GEAR GUARDS AND BACK GEARS ARRANGED BELOW SPINDLE.

The back gears are placed under the head stock at the front end of the spindle. This arrangement applies the drive from the cone through the gears without the long eccentric shaft and quill used on all cone-driven lathes, thus eliminating all torsional strains. Back gears are brought into mesh by a handle placed at the front of the lathe, making it unnecessary for the operator to reach over the cone as in the old construction.

REAR VIEW OF LATHE SHOWING THREE-POINT SUPPORT, TAPER ATTACHMENT, AND CLEAN APPEARANCE

The carriage has a bearing on the ways of 19¼ in., with a cross bridge of 6 in. wide, all surfaces being accurately scraped to bearings by surface plates. Compound rest swivel base is graduated and provided with four clamping bolts for locking some in position. This construction permits very heavy cuts to be taken without and deflection in the rest. Full length taper gibs are provided in both cross and compound slides with end screw and adjustment for taking up wear.

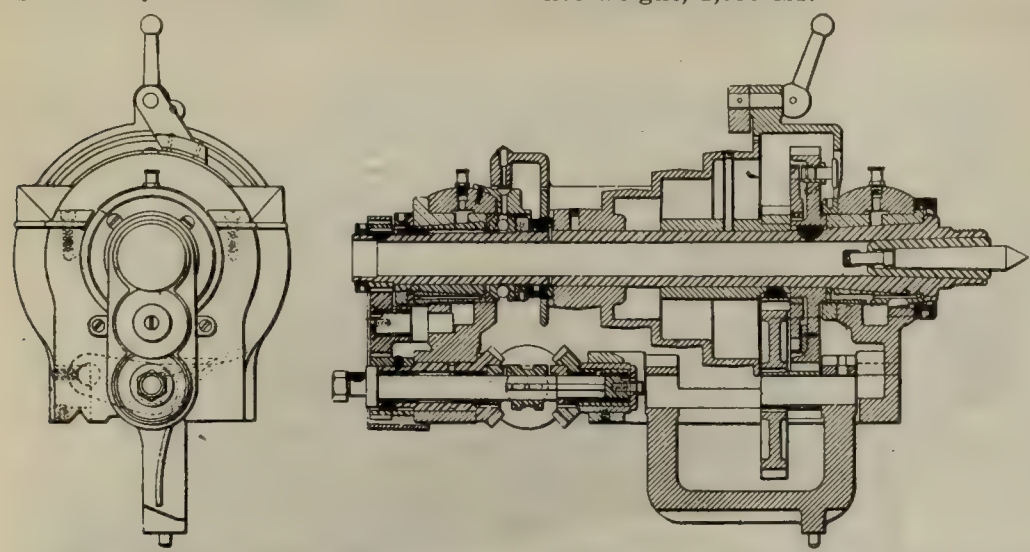
A double plate type of apron is used with two bearing supports for all shafts. Rack pinion stud can be withdrawn when lathe is used for screw-cutting. A central oil pocket is arranged to lubricate all bearings from one point. Longitudinal and cross feeds are controlled from apron and both can be instantly released under heaviest cuts, and an interlocking gear is provided to prevent both the feed and the half nut being engaged at the same time. Feeds are obtained through an independent feed rod and the quick change gear box, without the use of lead screw. They are 36 in number and vary from 4½ to 240. Feed rod can be locked in or out by means of clutch placed next to the gear box.

Screw-cutting equipment provides for a range of threads from 1½ to 80 per in., including 11½, instantly obtained through the quick change gear box. Thirty-six leads regularly supplied, but others can be cut by changing gears on the quadrant. Lead screw is made from machinery steel 1¼ in. diameter, turned all over, and is guaranteed for accuracy; the maximum error allowed being .001 in. in 12 in. All gears in gear box are cut from solid bar stock on a gear shaper.

Reverse mechanism for the carriage is operated by lever, placed at right hand of apron, which controls a sliding clutch under head stock giving right or left hand travel to the carriage through a set of accurately planed bevel gears. This arrangement permits spindle always to run forward, and thus doubles

the number of spindle speeds by driving both pulleys on countershaft in same direction. Duplicate or shoulder work can be performed by means of automatic stop and adjustable collars.

Principal dimensions are: Swing over bed, 14¼ in.; over carriage, 8¼ in.; between centres, 27⅞ in.; size of tool, ½ in. x 1¼ in.; floor space, 28 in. x 6 ft.; net weight, 1,450 lbs.



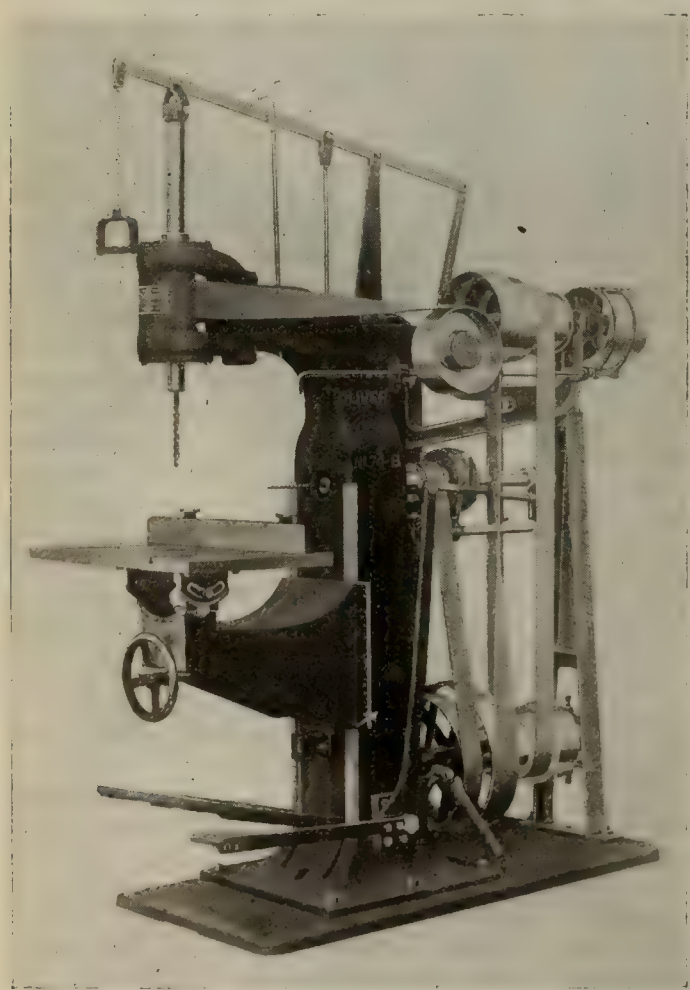
SECTION OF HEAD SHOWING BACK GEARS UNDER FRONT END OF SPINDLE, AND ARRANGEMENT OF BEVELS FOR FEED REVERSE.

To facilitate correct alignment, a foot is placed in the centre of the right leg so as to carry the lathe on a three-point support, the outer ends of this leg being supplied with adjusting bolts, which can be screwed down till they just touch the floor without taking any of the weight. Regular equipment with 5 ft. 6 in. bed consists of large and small face plates, compound and steady rests, one set of round centres, double friction countershaft and necessary wrenches. Special equipment of usual description can be furnished, including motor drive, taper attachment, relieving device, etc.

UNIVERSAL WOOD-BORING MACHINE

THE universal vertical and horizontal wood-boring machine shown in the accompanying engraving is the product of the Oliver Machinery Co., Grand Rapids, Mich. It is designed to meet the requirements of pattern-making and other wood-working shops, being adaptable to heavy boring work, as well as to a variety of jobs such as drilling holes in metals and doing the work of a routerk, shaper, buzz planer, when equipped with the proper cutters.

The column is a single casting about 8 ft. high, bolted to a sole plate and fitted with both horizontal and vertical spindles, each capable of drilling holes 3 in. dia. and under. The vertical spindle is 1⅞ in. dia. and slides in a sleeve formed by the projecting end of the driving pulley, which ends are fitted with ball bearings. The tool end of the spindle is bored to receive a ½ in. straight shank tool or may, when specified, be threaded to receive a 3-jawed chuck. The upper end of the spindle is connected through a thrust bearing and link to the lever arm which is operated by either foot treadle or hand pull to feed the tool to the work. The vertical travel of the spindle is 12 in.; its pulley dimensions 5 in. by 4½ in., and speed 3.000 rev. per min. when adapted for single speed only.



UNIVERSAL WOOD-BORING MACHINE.

The horizontal spindle and ball bearing arrangement is similar to the vertical, but is supported by means of a bracket attached to the column at a height of 16 in. above the table top, with the table at its lowest position. It is driven by a pulley 4½ in. by 4 in. at a speed of 3,000 R.P.M. if supplied with one speed only, and has a forward travel of 7 in. controlled by a foot treadle and coiled spring which latter returns it to normal position.

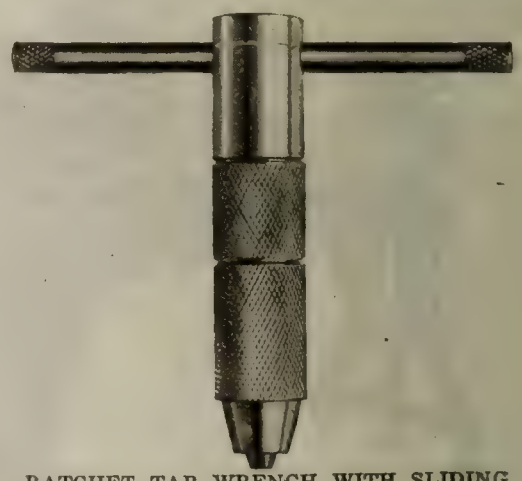
The 18 in. by 30 in. table has vertical adjustment of 17 in. obtained by hand wheel and feed screw. It is pivoted on both ends of a curved slide arranged at right angles to the pivots, the amount of tilt in either direction being such that the table can be inclined up to 40 deg. to or from the column and 30 deg. crosswise, the angle of setting being read from the graduated scale on the rockers.

Two types of this machine are supplied—single speed and four speed—which differ only in respect to the countershaft arrangement and both types may be furnished with from 3 to 5 h.p. motor drive as the work demands. Standard equipment consisting of five 6 in. twist bits of sizes, ¼ in., ⅜ in., ½ in., ⅝ in., and ¾ in. is supplied with every machine. The single speed machine occupies 70 in. by 38 in. floor space and weighs 2,000 pounds; the four speed belt driven machine occupies 73 in. by 38 in. floor space and weighs 2,300 pounds.

RATCHET TAP WRENCH

THE accompanying engraving illustrates a ratchet tap wrench which has recently been placed on the market by the Moss-Ochs Co., Cleveland, O. It is made in two sizes: No. 1, from 0 to ¼ in.; No. 2, from ¼ in. to ½ in.

The device is of strong and substantial construction and consists of a chuck mounted on a shank provided with a double acting ratchet. The T-handle fitted to the upper part of the shank is held centrally by means of a dog which automatically fits in a flat milled on the handle. When required for use in corners and other difficult or awkward situations, the handle slides to either end, which action, combined with the ratchet



RATCHET TAP WRENCH WITH SLIDING T-HANDLE.

movement, removes considerable worry from the operator, avoids to a great extent the breakage of small taps, and enables more accurate work to be produced.

The ratchet is immediately adjustable for right or left action by simply turn-

ing the milled sleeve shown above the chuck. All chuck and ratchet parts are carefully hardened while the workmanship throughout is of a high grade.

PROHIBITED IMPORTS INTO SOUTH AFRICA

W. J. EGAN, Canadian Trade Commissioner in South Africa, has notified the Department of the deletion of certain articles from the list of goods heretofore forbidden from being imported into South Africa.

The amended list, therefore, of prohibited imports at present is as follows: —Adding machines, advertising matter, automobiles for town use, unless required by medical practitioners or for other urgent purposes, books, canned food, cigars, clocks, clothing, condiments, confectionery, cutlery, cutting machinery, films, furniture, furniture polish, garden appliances, hops, jewellery (imitation), motorcycles, novelties, oil-cloth, ointment, phonograph goods, photographic goods, pictures, pianos, playing cards, printed matter, sauerkraut, scouring powder, shoe polish, slates, sporting firearms and ammunitions, sporting appurtenances, toilet requisites, tobacco, toys, vacuum flasks, watches.

MACHINE SHOP RESPONSIBLE FOR MARINE ENGINEERING PROGRESS

DESPITE the marked advantages of hydraulic and electrical transmission systems for ship propulsion, the use of mechanical gearing seems destined to become the most widespread on the all important grounds of economy and general applicability. The reasons for such a belief were advanced by Alexander Cleghorn in his presidential address to the Institution of Engineers and Shipbuilders in Scotland when he reviewed the main features of progress in marine propelling machinery during the past ten years.

Generally speaking, the reciprocating engine about a decade ago had given place to the direct turbine for warship, fast liner, and Channel types; had compromised with it for vessels of the intermediate class; and had refused to recognize it as having any claims on that extensive class comprising the low-speed types. But even under these conditions the solution to the problem of achieving the general applicability of the turbine had come into view through mechanical gearing. Ten years ago this was in little more than its embryonic stage; about three years later it had reached the experimental stage; then followed rapidly its promotion to the proposal lists and the stage of tentative application by the more courageous. Now it occupies the proud position of the standard type, demonstrating its universal application by the rapid displacement of the direct coupled turbine, the combination system and the reciprocator from the respective positions in which they had established themselves. Its superiority over all these types, in the essentials of economy, weight, and space, is unquestioned, and its reliability is at least as certain.

Concurrently the growth of the rival methods of hydraulic and electric transmission is seen, but while each of these systems has its particular advantages over the geared type, neither can meet it on the all important grounds of economy and general applicability. The mechanical system at present makes the pace and that pace at present seems likely to be rather too severe for the other forms.

But gearing in its rapid advance has hardly halted at the single spur and pinion drive. The double arrangement is now coming largely into use and this apparently minor development is obviously the special demand of the slow speed ship wherein the reduction ratio for suitable revolutions of the screw is very large, though its utility is not confined to the low power, low revolution equipment. There has also been a marked revival in the marine use of superheated steam. Thus the latest achievement of this period of restless progress in steam-propelling machinery is the superheated-geared-turbine equipment, transcending its forerunners in practically all respects and marking an epoch of advance without equal in marine engineering history.

TENDENCY IN MACHINE TOOL DEVELOPMENT

(Continued from page 630.)

made before everything is quite shipshape. This contrasts strongly with the simplicity of the equipment of the single-purpose machines.

Another aspect which concerns turret-lathe work that may not be neglected when comparisons are being made is this: In order that the lathe shall be worked at its fullest efficiency all the tools must complete their performances in a single cycle, or often, in small pieces, two cycles may be worked off in one revolution of the turret. But in making up combinations of tools, the speed is set by that of the operation which occupies the longest period, and the others lag. The multiple-spindle automatics are machines of general utility which have been pressed very largely into the service of shell work by the employment of special adaptations of tools. They labor under the same kind of disability which affects the ordinary turret lathes, namely, that the length of the major operation sets the pace for the others. Because of these facts the single-purpose machines have often been preferred to the turret lathes, even though some re-chucking and re-setting are entailed.

And thus, since every single item in a piece of work—a motor part, an engine detail, a shell section—may be the subject of alternative treatment, the individual selection of methods must ultimately be determined by the character of the machine tools which happen to be already available, or which can be obtained with the least delay; or, if the choice is not limited, by those which are most adaptable to the class of labor to be obtained and to the production of a maximum output.

Screenings

"Well, I'd be ashamed if I had as bald a head as you. Look at my head of hair!" "I just want to ask you one question." "Yes?" "Did you ever see grass growing on a busy street?"

Pat, who is "somewhere in France," had just received a letter from ould Ireland. Being unable to read, he called in the aid of the chaplain, who readily agreed to decipher it for him.

But Pat was not wholly happy. Drawing closer to the reverend gentleman, and lowering his voice to a whisper, he said:

"I hope it's not angry ye'll be, sorr, but as the matter is of a very private nature, do you moind puttin' your fingers in your ears, sorr, whilst you are reading it out?"

When Slapdash Jones went home for the holidays the first thing his mother took out of the trunk was an overcoat, and on it was pinned a pawnbroker's ticket he had inadvertently omitted to remove.

"Halloa! Ha, ha!" cried Slapdash. "They must have forgotten to take this off at the Smith dance when I left it in the cloak room. Eh—what?"

A moment later his mother took out his evening trousers. Unluckily, they, too, bore a ticket.

"Why, Slapdash, dear," she exclaimed, "you surely didn't leave these in the cloakroom, too?"

An officer, far from popular with his men, coming to camp one evening, was almost drowned in a river swollen by recent heavy rains. He was rescued by a private in his own regiment. The officer was duly grateful, and asked his preserver how he could reward him.

"The best way, sir," said the soldier, "is to say nothing about it."

"But why?" asked the astonished officer.

"Because, sir," was the reply, "if the other fellows knew I'd pulled you out, they'd chuck me in."

A penitent-looking man was on trial for vagrancy and disturbance of the peace. The judge seemed inclined to be lenient with him.

"What was the prisoner doing when you arrested him?" he said to the policeman.

"He was having a very heated argument with a cab driver, your honor?"

"But that doesn't prove that he was the worse for liquor," the judge said. "Many sober people have arguments with cab drivers."

"So they do, your honor," said the policeman, "but in this case there was no cab driver."

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OUR PRESENT AND FUTURE DUTY

FINAL reports coming to hand as these lines are written indicate that again, as on previous occasions, the Dominion has done what was expected of it, and, having assured the twofold success of the Victory Loan, may now turn to other than financial efforts with renewed energy and corresponding but long looked for success.

Beyond all question, the ultimate fate of every individual is hourly approaching final decision. Where the lives of nations are measured in thousands of years, of empires in hundreds of years, the months marking the duration of the present war are as days and weeks of battle as minutes. Viewed in retrospect in the yet distant future, the efforts now put forth by many of us will assume their true proportions in the struggle, and that, which in these few fleeting days seems worthy of admiration, may then well receive little more than scant acknowledgment at the hands of historians.

Much stress is laid by present-day economists on the necessity of being prepared for the era of reconstruction following the war, but these are all based on hypotheses of a more or less personal nature, and influenced entirely by the side of the opposing forces to which the theorist is allied. It is presumed, no doubt rightly, that industrial activity will continue unabated till desolation and destruction are replaced by habitation and production, but,—that which is destroyed in a day cannot always be replaced in a day, and what is more to be considered, as the war with its tremendous expense drags on, is,—the cost of the war will not cease when the last gun is fired.

When the most recent German war loan was floated it was observed that the amount of money necessary annually to pay the interest on the cost of the war to Germany, up to that time, would require four times the amount ordinarily raised in peace time by taxation of the people. Presuming then that Germany was preparing to carry out a program of reconstruction, is the German nation going to increase an already enormous cost of existence by assuming further obligations for the benefit of those whom she had overrun and pillaged? Why is it that circumstantial reports from generally reliable sources continue to give information regarding the systematic removal of industrial assets,—plant, machinery, raw materials, yes and human beings, too? Can this be the conduct of a nation whom we may again compete with in the world's markets without soiling our hands? Can we, least of all, again trade with this aggregation of monsters and handle, utilize, and perhaps eat the product of their country?

No! Not so long as an unredeemed Victory Bond remains in the possession of self-respecting Canadian workmen will the memory of present events permit such happenings. Great as will be the benefit to our country through the splendid efforts of all in making the loan a success, its effects on our national and individual policies in the future will be still greater, less spectacular, but more lasting, a constant reminder and incentive to each one of us that the best and only the best of what is in us must be given freely to justify the unparalleled safety and immunity in which we go about our business.

Efficiency, that oft-quoted word worn threadbare in its meaning through misuse and overuse, must become the motto of each bondholder. Production, not profits, must know no limits if our nation is to become an Apollo and carry its share of the world's burden in years to come. Credit sufficient to restore civilization to some semblance of its former self must be given and accepted freely by all, and the manner in which labor plays its part during the next decade or two will in large measure determine the rapidity and thoroughness of the world's recovery.

The necessity for proper government control of Victory Loan bonds will therefore be evident, in view of the number and disposition of individual subscribers, and the efforts of unprincipled parties to pull off profits through unscrupulous market manipulation cannot be too strongly condemned, especially in the interests of future loans. The faith of the small investor must remain unshaken always, and if such an undesirable development is permitted to occur, and small investors, who have been argued into buying by the assurance that they can get their money back at any time, find that they have been deceived, it will mean that many new investors will receive such a bad opinion of government bonds that they will not buy again.

The remedy is easy,—a prohibition of the sale of bonds under a certain fixed minimum. This regulation could be enforced as a war measure and it would work no hardship to anyone, except perhaps the unpatriotic few who are declining to buy now in the expectation that they can pick up the issue at bargain levels a little later on.

SHIPBUILDING ACTIVITIES INADEQUATE TO THE EMERGENCY

A LATE wire from Washington, D.C., covering the first annual report of the United States Federal Shipping Board, indicates that the present powers of the latter are totally inadequate to meet the existing ocean freight service emergency arising from German submarine activity. Additional powers, it is claimed, are necessary, so that control may be had of ocean freight rates, and the regulation and supervision of shipping generally. The Board declares that not the least of the problems confronting it is the threefold one of getting, keeping and training men for their respective tasks and duties.

Vessel tonnage of mammoth quantity is under construction and on order on or near every waterway, lake and ocean coast of the United States and Canada, yet there is little doubt that the work as a whole is not marked by that progress which is so desirable, because so urgent. The frank statement by the Shipping Board of its inability to cope with the situation without extended powers is in no sense a confession of weakness, rather is it a warning, originating from expert conviction to those whom it serves, that measures more drastic be enacted and become operative without delay.

INDUSTRIAL NOTABILITIES

VICTOR GARNET CURRY, director and vice-president, Canadian Car & Foundry Co., Ltd., Montreal, Que.; director, Canadian Steel Foundries Co., Ltd., Montreal; director, Pratt & Letchworth Co., Ltd., Brantford, Ont., was born at Amherst, N.S., Sept. 8, 1882, son of Senator N. Curry, LL.D., and Mary (Hall) Curry.

After receiving his education at Rothesay Collegiate School and Royal

CAPTAIN VICTOR GARNET CURRY.

Military College, Kingston, he started with Rhodes, Curry & Co., Ltd., Amherst, 1901, this company being amalgamated with the Canadian Car & Foundry Co. in 1909.

Capt. Curry joined the Victoria Rifles as lieutenant, 1910, and was promoted captain, 1913. He went overseas with the 14th Batt. (First Contingent) being second in command of No. 3 Company R.M.R., and was invalided home July, 1915.

Motoring, yachting, fishing and shooting are his principal recreations; he is also a member of the Engineers' Club and the Country Club. His society affiliation is A.F. & A.M.

In politics, Capt. Curry is Conservative and in religion Episcopalian. He married Maude Chapman, daughter of David T. Chapman, Sept. 14, 1905, and resides at 581 Sherbrooke St. W., Montreal, Que.

—Photo courtesy International Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

Government prices.

	Montreal	Toronto
Hamilton	....	50 00
Victoria	....	50 00

FINISHED IRON AND STEEL

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3/16 in.	13 20
Chequered floor plate, ¼ in.	13 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	*2 90
Tank plates, Pittsburgh	*3 25
Structural shapes, Pittsburgh	*3 00
Steel hoops, Pittsburgh	3 50

F.O.B., Toronto Warehouse

Steel bars	5 50
Small shapes	5 75

F.O.B. Chicago Warehouse

Steel bars	4 10
Structural shapes	4 20
Plates	4 45

*Government prices.

FREIGHT RATES

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Lake copper	$33 00	$32 00
Electro copper	32 00	32 00
Castings, copper	32 00	31 00
Tin	72 00	80 00
Spelter	10 50	10 50
Lead	9 50	8 50
Antimony	17 00	18 00
Aluminum	60 00	62 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ¼ to ½	$13 00	$12 00
Heads	13 30	12 30
Tank plates, 3-16 in.	13 10	12 10

WROUGHT PIPE

Effective July 5, 1917.

Size	Black Standard Buttweld Per 100 feet	Galvanized Standard Buttweld Per 100 feet
⅛ in.	$5 00	$6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00

Standard Lapweld

2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ ins.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 45%.

4½" and larger, 40%.

4" and under, running thread, 25%.

Standard couplings, 4" and under, 35%.

4½" and larger, 15%.

OLD MATERIAL

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	21 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	15 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	20 50
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	6 00	7 00
Tea lead	5 00	5 75
Aluminum	28 00	25 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up.	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 20
Elevator bolts	5
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	15
Boiler rivets, base ¾-in. and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	72½
Wood screws, O. & R., bright	67½
Wood screws, flat, brass	37½
Wood screws, O. & R., brass	32½
Woodscrews, flat, bronze	27½
Wood screws, O. & R., bronze	25

MILLED PRODUCTS

	Per cent.
Set screws	25
Eq. & Hex. Head Cap Screws	20
Rd. & Fil Head Cap Screws	net
Flat ⅞ But. Hd. Cap Screws plus	net
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and semi-fin. nuts over 1½ in., up to 2 in.	plus 10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4 50
Cold pressed nuts over 1½ in.	add $7 00

BILLETS

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$5 50	$5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		$7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drums	4 75
White lead, pure, cwt.	16 55
Red dry lead, 100-lb. kegs, per cwt.	16 25
Glue, English	0 38
Tarred slater's paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 78
Linseed oil, raw, single bbls.	1 42
Linseed oil, boiled, single bbls.	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery cloth	list plus 33 1-3
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Drilling cables, Manila	0 41
Plumbers' oakum, per lb.	0 09
Packing, square braided	0 34
Packing, No. 1 Italian	0 40
Packing, No. 2 Italian	0 32
Pure Manila rope	0 39
British Manila Rope	0 33
New Zealand Hemp	0 33
Transmission rope, Manila	0 45
Cotton Rope, ¼-in. and up	0 47

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

CARBON DRILLS AND REAMERS

	Per Cent.
S.S. drills, wire sizes up to 52	30
S.S. drills, wire sizes, No. 53 to 80	net
Standard drills to 1½ in.	30
Standard drills, over 1½ in.	30
3-fluted drills, plus	10
Jobbers' and letter sizes	20
Bit stock	25
Ratchet drills	15
S.S. drills for wood	30
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 30
Bridge reamers	52½
Centre reamers	10
Chucking reamers	net
Hand reamers	10

COLD ROLLED SHAFTING

At mill ..... list plus 40%

At warehouse ..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Canadian malleable, A, add 35%; B and C, plus 25%; cast iron, net; standard bushings, 25%; headers, 60; flanged unions, 5; malleable bushings, 30; nipples, 45; malleable lipped unions, 40.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$9 50	$ 9 00
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	9 70
Premier, 10¾ oz.	13 85	10 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B

¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

1/8 in.	$15 50
3-16 in.	11 70
1/4 in.	8 40
5-16 in.	7 40
3/8 in.	6 35
7-16 in.	6 35
1/2 in.	6 35
5/8 in.	6 35
3/4 in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	40
Black Diamond	40
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	37½
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke .....
Connelsville Foundry Coke.....
Steam Lump Coal .....
Best Slack .....
Net ton f.o.b. Toronto.

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun, Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White.	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16
Colored.	
Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14 x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base	64 00	60 00
Braziers', in sheets, 6 x 4 base	55 00	52 00

BRASS.

Brass rods, base ½ in. to 1 in. rod	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	06
Emery glue	15 to 20
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt, sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

Market Condition and Tendency

Success of Victory Loan will benefit Canadian industries. More shell orders to be placed. Steel and metal markets quiet.

THE astonishing success of the Victory Loan will be a source of gratification to the country at large and will assure a continuance of prosperity. Canadian industries will benefit through the expenditure of this vast sum of money as it will be all spent in Canada. The munitions industry will benefit to a greater degree perhaps than any other, as a considerable proportion will be appropriated for the manufacture of shells. Already arrangements have been made to place large orders for shrapnel, 4.5-inch and 6-inch shells, which will keep a number of plants actively employed for several months. As a result of these shell orders, another period of activity in the machine tool business may be looked for. The iron and steel trade is rather quiet just now due to the difficulty that is being experienced in obtaining material for any purpose other than that required in the production of war equipment. As a result private consumers are handicapped in their manufacturing operations and output is being restricted. The steel mills on the other hand have all the business that they can take care of and are enjoying great prosperity. Prices of steel products are holding firm with the sole exception of galvanized sheets which have declined. Prices of pig-iron are unchanged. In the States the shortage of pig-iron is becoming serious as it is curtailing the output of steel. The situation in the scrap metal market is unchanged. There is a fair demand for iron and steel scrap but copper and other non-ferrous metals are dull. Tin is still very scarce although some relief is looked for in the near future.

MONTREAL, Dec. 3, 1917.—The exceptional success of the Victory Loan has been the outstanding feature of the past week, and this latest indication of the people's optimism promises well for the activity that will be expressed in the distribution of the loan to the many requirements of the Government for the successful prosecution of the war during the next six months. The near approach of the final closing of navigation is demonstrated in the added pressure that is being felt by the various railroads, and already some congestion is being shown in certain directions. Plants that have received orders for 75mm. shell are actively engaged in rearranging their equipment to manufacture this new type, and it is expected that operations will be in full swing early in the New Year.

Pig Iron

The shortage in pig iron is becoming serious in the United States owing to the enormous demands that are made on the furnaces and the heavy requirements of the government; it would not be surprising to see this situation more acute in the very near future. The congestion of the railroads has delayed the delivery of coke and other raw materials with the result that production has been somewhat hampered. The situation here is virtually unchanged with

dealers reporting a strong market but little material available for general purposes. Very little Canadian pig is on the market and prices quoted are nominal.

Steel

No outstanding developments have taken place to alter the general tone of the steel situation and conditions that exist at the present time are more or less of an artificial character owing to the uncertain influence that dominates the entire market. The controlling factor is the attitude of the American Government in connection with the regulating of sale and production, and the subsequent distribution of nearly all classes of steel. The priority of war requirements is one of the chief features in the present acute position of the steel market, as it is practically impossible for manufacturers to obtain material unless a guarantee is given that the steel is to be used for essential war purposes.

With the increasing demands that will likely be made for certain phases of the war programme, it is anticipated that the domestic situation will become further disorganized. The progress of steel shipbuilding in Canada has suffered to a large extent by the inability to secure sufficient plate to carry out the work that had been planned in this connection. The increasing activity in this direction in the States makes it additionally difficult for plate consumers here to acquire material for their prospect we needs and this branch of industrial enterprise is feeling the effect of abnormal conditions more than any other. The acute condition at the present time is intensified by the difficulty that the trade is experiencing in the delivery of material owing to the lack of transportation facilities, the railroads being unable to cope with existing requirements.

With the approach of the new year some are looking forward to a revision of the prices that have recently been fixed by the government, but the general opinion seems to be that as the trade is just beginning to adapt itself to the new conditions, it is not thought that any changes now contemplated will seriously affect the quotations that are the ruling factor in general trading. Some consideration may be given to certain details to relieve the pressure in certain directions, but it is not expected that the general tone of the market will undergo any marked change with the coming of the New Year. Dealers here are still governing their operations by developments at Washington, but with the exception that steel shipments are harder to obtain from the States, the situation is unchanged and prices are well maintained; quotations being the same as given last week.

Metals

The general market in respect to metals is unchanged but recent developments have given a new tone to the situation. In an effort to better control the distribution of certain metals, the American Government have placed new regulations on the importation, to avoid anything of a speculative nature and so insure against the possibility of accumulation of surplus stocks. The feature of the week is the position of tin, which is still occupying the attention of the trade owing to the marked scarcity that has resulted from the inability to secure shipping permits. Copper is quiet but increased sales have been reported by small dealers. Spelter is unsettled with users awaiting government action. Lead is quiet and unchanged. Antimony is quiet but stronger. Aluminum is in less demand but firm.

Copper.—With the exception of the slight increase in activity that has developed out of the recent concession of the Government in connection with the 5 per cent. commission allowed to dealers on small transactions, no feature has arisen to change the general tone of the situation, and the market in copper is practically nil, trading being virtually in the hands of the government. Recent regulations are being strictly adhered to, but, outside of the demands that are made for war necessities, producers claim they have very little metal available for domestic consumers. The hope is entertained in some quarters that this condition will be relieved early in the New Year, but apparently nothing has as yet been done that would encourage the trade in this connection.

If war requirements are as large as reported, little relief can be expected by the consumer for some time, but with production proceeding at the present rate, some arrangement will likely be possible whereby the general trade will be more freely supplied with much needed metal. The local market is at present very strong and dealers report a difficulty in obtaining supplies. Quotations are unchanged but the market has a stronger tendency; lake and electro are quoted at 33 and castings at 32 cents per lb.

Tin. — This metal is retaining the center of interest in the metal situation owing to its abnormally strong position due to the pronounced scarcity in the States. The conditions in the United States have become so acute that the Government have commenced to commandeer all available supplies in warehouses, and this action is expected to proceed further. The result, as intended, has been to relieve the immediate need, but the ultimate effect will be to deplete the available supply for future requirements. Unless conditions as they exist at the present time show early signs of improvement, the situation will take on a very serious aspect and one that may well assume alarming proportions. Recent action taken by the American Government to regulate the importation of material, and require a license to this effect, will avoid the possibility of metal being hoarded for speculative purposes.

The American position of tin is very strong, the market being controlled by the highest quotations in the history of the trade. This week's market is one cent higher than that of last week, the current quotation being 81 cents per lb. Dealers here report a very strong market but, owing to considerable stock of metal, the situation has not been marked by the tension that characterizes the American market. Tin here has advanced one cent during the week and can be had for 72 cents per lb., to regular customers of the dealers.

Spelter.—In anticipation of early action being taken by the American Government regarding the fixing of prices, the trade in spelter has been quiet. Both producers and consumers are anxiously awaiting the next step of the regulating committee so as to be in a position to base their future operations on the changes that will be put in force. The present market is a little quiet but continues relatively firm. Local dealers are quoting 10½ cents on a steady but uneventful market.

Lead.—The situation in lead is uncertain and present activity is not pronounced. Consumers are not directly interested in the present situation as many are very well covered for their immediate requirements. Local conditions have taken on a better outlook owing to the developments in shrapnel shell orders, but so far no increase in activity has developed in connection with the sale of lead. Dealers continue to quote 9½ cents per lb.

Antimony.—No increase in the demand has been noted in this metal but considerable interest has been created by the recent action of the American Government in controlling the importation of antimony and kindred alloys by means of the license system. One outcome of this latest move has been the noticeable decline in the offerings, the tendency being to see what the developments will be before disposing of further metal. With the present quotation so close to the actual cost of producing the metal, sellers are taking advantage of every opportunity to put the market on a stronger footing. New York quotations show an advance of ⅜ cents on the week. Dealers here report a firm market with unchanged prices, but an undertone of strength. Current prices are maintained at 17 cents per lb.

Machine Tools and Supplies

Considerable improvement has developed in the machine tool market owing to the impetus that has been given by the renewal of munitions activity, and this is expected to be additionally pronounced in the near future, as prospects for more shell orders are very bright. The volume of inquiry for general equipment is not heavy but of sufficient importance to maintain the interest of dealers. Activity in the States is on the increase and this is making it increasingly difficult to obtain delivery of machinery from American concerns, owing to the urgent requirements for their own government purposes. The recent demand for all classes of supplies has shown an increase of late due to the renewal of activity in munitions manufacture.

Scrap

The market is in an unsettled condition owing to the conflicting reports that are current as to early future prospects. While some anticipate a weaker condition, others look for a stronger market, the natural outcome being an unchanged position for most lines of scrap and old materials. Local prices are firm and unchanged.

Toronto

TORONTO, Ont., Dec. 4.—The remarkable success of the Victory Loan will be gratifying to Canadians as well as to our Allies, not only because it shows a determination to "carry on" with the war, but also by reason of the benefit that will accrue to Canadian industries in the form of orders for war supplies. The munitions industry in particular will benefit by the success of the war loan, as a considerable proportion of the money will be appropriated for the manufacture of shell. Already arrangements have been made to distribute substantial orders for shrapnel, 4.5-inch and 6-inch shell, which will keep many plants actively employed for several months.

Steel

The iron and steel market is somewhat dull, the situation being practically unchanged. Business is on the quiet side owing to the difficulty that is being experienced in obtaining steel for any purpose other than for war equipment and munitions, etc. Judging from the number of inquiries received by local merchants, there is little doubt but that business would be brisk if all the material that is required could be obtained; this applies to imported steel as well as domestic material. The inquiries cover a variety of lines and come for the most part from manufacturers who are suffering from the shortage of steel. Manufacturing operations are being restricted on this account, which is creating a scarcity in a number of articles required for every day use. Manufacturers should place their orders for iron and steel goods required in their business well ahead of time and not allow stocks to become depleted before ordering fresh supplies, by this means avoiding delays in deliveries.

From all accounts the outlook for the steel companies is very favorable, the volume of orders on hand being as large as at any previous time. Production continues on a favorable basis, and a continuation of open weather will help considerably towards this end. Munition orders will continue to be an important factor in the steel trade, and will account for a considerable proportion of the output during the next six months.

Prices of steel products, with few exceptions, are holding firm, there being no changes to announce this week except in galvanized sheets, which have declined about 50c per 100 lbs. It is likely that there will be a further decline in prices of the lighter gauges of black sheets, although they are unchanged in the meantime. In the primary market inquiries for black sheets are heavy and manufacturers are making every effort to take care of their regular customers. Large requirements by the Government have made it necessary for producers to supply only consumers who are engaged in the manufacture of essentials.

Chicago warehouse prices are down, steel bars being now quoted at 4.10c; structural shapes, 4.20c, and plates, 4.45c. The steel market in the United States has been more active in the past week than at any time since prices were fixed, with some increase in private demand in nearly all lines and with many large Government contracts reported. It is believed that the unfilled tonnage statement for November will not show nearly as much of a decrease as the previous one.

Pig Iron

There has been no change in the domestic pig iron market this week, but the situation in the States is becoming more serious owing to the scarcity of fuel and labor. The shortage of fuel at the blast furnaces in the Pittsburgh district continues to be extremely acute and has resulted in an additional number of stacks being banked. The shortage of coke is curtailing the output of pig iron and in turn the production of steel. Steel companies in the United States have been buying low phosphorus iron recently in Canada, and notwithstanding the recent embargo placed on shipments by the Dominion Government, the metal has been released; but hereafter licenses will have to be secured to obtain Canadian material. On the other hand, the United States furnaces are in receipt of heavy inquiries from Canada for basic and Bessemer iron.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.

Scrap

The market for iron and steel scrap is fairly active at unchanged prices, which are holding firm. The supply of these materials is, however, none too heavy, which is keeping the market firm. Prices of copper and other non-ferrous metal scraps are weak and demand light.

Machine Tools

Business in the machine tool trade is gradually becoming more active and the outlook is brighter than it has been for some time. That further shell orders will be placed in Canada is assured by the announcement that the Imperial Munitions Board has received instructions from the British Government to issue contracts for shrapnel, 4.5-inch and 6-inch shell to all Canadian firms equipped to produce these sizes. The volume of these contracts, it is understood, will keep the plants actively engaged until well into the new year. This is all entirely new business, and is, therefore, additional to those contracts now being executed. New equipment will be required in a number of plants to increase production and also to replace worn-out tools. Canadian machine tool builders will benefit by this new business and another spell of activity is assured. Owing to the increasing activity in the United States, deliveries of machinery from across the line are becoming more backward, some classes of equipment being very difficult to obtain.

Supplies

The market for machine shop supplies is steady and prices are holding firm, although there are fewer changes being made now than formerly. A very fair demand is reported by dealers, who are looking for increased business from munition plants.

Metals

There is no material change in the situation in the metal markets and prices generally are holding firm at last week's levels. There is no change in the tin situation although some relief is expected shortly, in which case prices will probably decline. The copper situation is gradually being cleared up although there has recently been some confusion in the trade in the States in regard to jobbers' re-sale prices. The Sub-Committee, Washington, has made suggestions as to the fixed differentials between the various grades of spelter but did not make any suggestions in regard to the base price. The lead market is quiet and unchanged, as is also the antimony market. An improvement in the position of both these metals is looked for when the shrapnel contracts are placed.

Copper.—There is some confusion in the primary market over the resale price for jobbers but the situation is gradually being straightened out. The producers will supply copper after Jan. 1 at the established price of 23½c a pound which may be distributed in small lots to the smaller consumers at 24.675c per pound. The dealers propose to sell copper which they hold and which costs them more than 23½c at an advance over the original cost to them. It is figured that after January the smaller consumers may look for a price which must not exceed 23½c a pound plus 5% commission. About that time it is expected that the high priced copper will have disappeared. The local price is unchanged and market quiet. Lake and electrolytic are quoted at 32c and castings at 31c per pound.

Tin.—An improvement in the tin situation in New York is expected shortly as the Sub-Committee on tin, at Washington, has been given power to control the distribution of tin in the United States and has taken steps to supervise tin importations. The U.S. Navy Department has commandeered all tin in

New York warehouses. The Navy Departmnet action was prompted by the intense competition for tin, which has resulted in forcing up the price within a month from 54 cents to 80 cents a pound. Tin cannot be bought on the open market, because of British export restrictions, and it is said that firms having government contracts requiring the use of tin, including those manufacturing tinned foods for export to the Allies, will be in serious straits unless some action is promptly taken to remedy the situation. Local price firm and unchanged at 80c per pound.

Spelter.—The differentials for the U.S. Government prices between prime Western and the grades A. and B. have been fixed at an advance of ¼c to ½c for brass, 2c for grade B, and 3c to 3½c for grade A. The base price or the price of prime Western however has not been established. The market is dull and quotations unchanged at 10½c per pound.

Lead.—Prices are unchanged although there is a slightly easier tone to the market which is quiet. The position of lead will likely improve with the placing of further shrapnel contracts. Lead is quoted at 8½c per pound.

Antimony.—The market is showing more signs of lift due to heavier buying and the position of antimony has improved. The price is unchanged at 18c per pound.

Aluminum.—The market is firmer and dealers are expecting higher prices. There is no scarcity of metal on the outside market. Quotations are unchanged at 62c per pound.

Sydney

SYDNEY, N.S., Nov. 29.—The Victory Loan campaign closed with great success at the works of the Dominion Iron & Steel Co. A total sum of $420,000 was subscribed by 3,845 workmen. As there are not more than 4,800 workmen at the steel works altogether, and as among these there are included a great many men of alien enemy nationality, the number of subscribers reflects great credit on the rank and file generally, because the total of $420,000 did not include any really large subscriptions.

The contribution of the coal-workers has not been so generous as that of the steelworkers, this being to some extent due to the scattered nature of the collieries and the difficulty of arranging so effective a campaign as was made at the steel works. The Coal Company's men will probably contribute between $280,000 and $300,000 giving a combined total of not less than $700,000, to which has to be added $3,000,000 subscribed by the Dominion Steel Corporation, and credited half to Nova Scotia and half to Montreal.

Mine Workers Seek Further Wages Increase

As was feared the Amalgamated Mine Workers of Nova Scotia have made a demand for a wage increase upon the operators in the Sydney District that is quite impossible of fulfillment. The A. M. W. has asked an increase ranging from a minimum to 30 per cent. to 75 per cent. advance on existing rates. As such an advance on top of the increases given during the past two years is manifestly out of the question, it is probable the failure to agree will result in the appointment of a Conciliation Board.

The coal production of the Dominion Coal Company for November fell to 280,000 tons, the lowest during the war period.

The local tribunals are considering the application of the Dominion Steel Corporation for the exemption of its employees from military service on the ground of the national importance of their occupation in the production and transportation of coal and steel. It is expected that very general exemptions will be granted, as both the steel and coal companies are producing the major portion of their output to the direct order of the Imperial Munitions Board.

The season of navigation just closed has seen the smallest shipment of Nova Scotia coal to the Upper Provinces in the past 25 years. From a pre-war normal shipment of 2,000,000 tons to the St. Lawrence market, the Dominion Coal Co. export this year has fallen to 50,000 tons.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Washington

WASHINGTON, D.C., Dec. 2.—The fact that the Germans destroyed more British ships in the first ten months of unrestricted U-boat warfare than Great Britain or any other nation has ever built in a full year has just been made known. The revelation was made when Chairman Edward N. Hurley, of the United States Shipping Board, made public a letter he had written to Senator Gilbert M. Hitchcock, of Nebraska, on the subject. The Germans have sunk in ten months something over 900 British vessels of more than 3,000,000 tons deadweight.

Chairman Hurley said the greatest shipbuilding feat ever accomplished was that of England in 1913, when 688 vessels of 2,898,229 tons were completed. Japan in 1916, Mr. Hurley said, built forty-three ships of 192,993 tons. This was the biggest tonnage finished by any nation except Great Britain. The American programme, unless held up, will produce 6,000,000 tons by the end of 1918. About 5,000,000 tons will be completed in 1918, thus surpassing Great Britain's best effort by about a million tons.

The United States now has available for trans-Atlantic service 582 ships of a total of 3,721,806 tons, including oil-tankers and former German and Austrian vessels. German and Austrian ships operated by the Shipping Board number 105, of 688,960 tons. American citizens hold eleven more of these ships, totalling 63,915 tons, making the aggregate American holding of enemy vessels 752,875 tons.

New Yard Activities

In reply to questions regarding the activities of new shipyards, Mr. Hurley said all of them that have contracts now have the ground cleared and will have their buildings and ways completed early in 1918. The new yard at Hog Island, Pa., must deliver fifty ships before November 1, 1918, he said, and the Port Newark yard must finish seven in June. The new Bristol Point plant must have four ships ready for service in May.

"Have any British, French, Norwegian, Italian or Dutch authorities yet asserted that they are now building new ships as fast as the submarines are destroying them?" Chairman Hurley was asked. The reply was an emphatic "No." It will be up to the United States, he indicated, to produce new ships faster than the Germans sink them, providing losses are not pulled down by the Allied navies.

A table has been compiled by the Emergency Fleet Corporation showing the vessels under contract and pending contract, and vessels which have been requisitioned by the Fleet Corporation. The figures are: Wood vessels, 375; total deadweight capacity, 1,330,900 tons; composite vessels, 58,207,000 tons; steel, 451 vessels; 3,186,400 tons; total contracted for, 884 vessels; total deadweight capacity, 4,724,300 tons; contracts pending, 99; tonnage, 610,000; total requisitioned (all types), 426; tonnage, 3,029,508 tons. Grand total, 1,409 vessels; total deadweight capacity, 8,363,808 tons. This total includes requisitioned vessels completed and released—33 vessels; 257,575 tons.

Conservation of Coal

Canadian manufacturers will be interested in the news that Canada must place herself upon the same basis as the United States with reference to the conservation of coal. This has been made plain to the Dominion Government by the United States Fuel Administration. In an official communication to the Canadian Fuel Controller, Dr. Harry A. Garfield, Fuel Administrator, pointed out that Canada would be expected to resort to the same measures to save coal as are being adopted in the United States. Dr.

Garfield points out that an intensive campaign is being carried on in this country for fuel economy. It is suggested that Canada conduct a similar campaign for the limitation of the uses of coal and the co-operation of the United States Government in such a campaign is offered. Most of the Canadian coal supply is derived from the United States, and the Fuel Administration has undertaken to give Canada a pro rata share of the United States' supply on the same basis as the various States of the Union. The Fuel Administration, however, demands that Canada safeguard this supply by conservation measures in line with those undertaken in the United States.

The Banking Situation

The daily commerce report of the Department of Commerce publishes a report taken from the London "Statist" of November 3, presenting its customary annual review of the international banking situation, giving, among other data, a statement comprising those banking institutions whose deposits and current accounts exceeded £20,000,000 at the close of 1916. Eighty-four instiutions are listed and in this list are three Canadian institutions. Twenty-fourth on the list is the bank of Montreal with deposits and current accounts of £60,214,000. The Canadian Bank of Commerce is thirty-eighth, with £6,417,000, while the Royal Bank of Canada is forty-fourth, with £40,141,000.

Carbons for electricity may no longer be exported from France to the United States and allied countries without special license. A consular report from Paris says that the permits for such exportation which formerly modified the embargo of December, 1914, affecting these articles has been withdrawn by a ministerial decrease. Special applications must now be made for permission to export these goods to any country.

Navy Dept. Specifications

The Bureau of Supplies and Accounts of the Navy Department has issued notice of proposed purchases of various materials, as follows:

Schedule 1581, motor generators for various navy yards; schedule 1572, fifteen navigational, sounding, motor driven machines for the Brooklyn yard; schedule 1580 six portable ventilating sets for Portsmouth yard; schedule 1582, five lathes, engine, high-duty, universal, 12-inch, 5-foot bed, for the Annapolis naval academy.

The Bureau of Supplies and Accounts, the Navy's purchasing organization, has evidence that at least one commodity has been deliberately held for abnormally high prices. In the case of tin, the navy has commandeered 1,000 tons stowed in New York warehouse, but has turned over to the American Steel and Iron Institute the question of further adjustment of prices and supply. The navy had sufficient tin, through foresighted purchases last spring, to supply its own needs, but there was a prospect that if more tin were not given contractors, the navy destroyer program would actually be halted for want of machinery in which tin was used directly or as an alloy. One New York concern—a Dutch house—had a big supply of tin, from which the navy drew 800 tons. The manager, manifestly, was holding for high prices, for he did not even know what to charge when asked for a quotation. He informed the department he would have to consult his home office. This waiting on high prices was undertaken in the face of the fact that Holland would have no market here if the British had not permitted her to ship the goods in. Tools intended for South America have been seized because of the pressing need for them here.

The United States Tariff Commission anounce that it will hold hearings in the near future for the purpose of receiving information and suggestions from representatives of industry and commerce and labor and foreign trade on war disturbances and the plans for readjustment to peace times, which are being considered.

President Wilson has issued a proclamation under the authority of an act of Congress of October 6, 1917, forbidding the importation into the United States or its territorial possessions, from Great Britain, her colonies, possessions and protectorates, and from a long list of other countries, of various commodities, except under license granted by the War Trade Board in accordance with the regulations. The list of commodities includes vanadium, vanadium ore, nickel and nickel ore, chrome and chrome ore, titanium and titanium ore, etc., or any ferro-alloy or chemical extracted therefrom.

New York

NEW YORK, Dec. 1. — The United States Government is obligated to pay $3,000,000 for merchant ships, ordnance and ammunition. A little more than one half of this amount is for big guns and projectiles and a little less than half is for cargo boats. The official report of the United States Shipping Board issued last Monday shows that the Emergency Fleet Corporation has entered into contracts for 1,310 boats of various tonnages for which it will pay approximately $1,360,000,000 and contracts for 99 additional boats of an aggregate capacity of 610,000 tons are under negotiations which when placed will make the total obligations of the corporation $1,465,000,000 including the ships commandeered as well as those to be built and those already under construction or delivered.

Shipbuilding Steel Requirements

The building of the 1,409 boats, including 33 ships already completed and released, will require almost 2,300,000 tons of steel plates and shapes. The Navy Dep't is also building or having built battleships, cruisers, torpedo boat destroyers and other war craft that will require 450,000 tons of plates and shapes, or a grand total of 2,750,000 tons of steel to carry out the full program of the Shipping Board.

The 451 ships of steel construction of 3,186,400 tons deadweight will require 1,062,000 tons of steel, and the 426 ships of 3,029,508 tons capacity requisitioned require 1,009,508 tons of steel to build. The composite and wooden ships that are under contract require scarcely more than 25,000 tons of steel. Since the report, some of the 99 ships under negotiation have been placed under contract. These 99 boats will require 204,000 tons of steel.

The Submarine Boat Co. has taken additional orders from the government for 100 five thousand ton ships, making a total of 150 cargo boats to be built at Port Newark. The United States Steel Corp. has appropriated approximately $18,000,000 for its Southern subsidiary plants, half of which will be used in the construction of the Chickasaw Shipbuilding plant at Mobile and the other $9,000,000 will be expended for extensions to and the equipment of the Ensley plant of the Tennessee Coal, Iron & Railroad Co., made necessary to roll plates and shapes for the ships to be constructed at Mobile. It is estimated that about 10,000 tons of structural steel will be required for shipways, power plant, boiler, machine, metal, joinery and forge shops as well as for storehouses and office buildings at Mobile. Extensions at the Ensley plant will require between 8,000 and 10,000 tons of shapes.

The Steel Corporation originally appropriated only $6,000,000 for the Federal Shipbuilding plant in the Hackensack Meadows, but an additional $2,000,000 was appropriated about ten days ago and probably several more millions will be called for before construction and equipment there are completed.

Munitions Orders and Expenditures

The U.S. Ordnance Bureau has distributed additional orders for 1,250,000 shells which will require approximately 106,000 tons of steel rounds and forgings. The American Brake Shoe & Foundy Co. will manufacture 750,000 155 mm. shells and Westinghouse Electric & Manufacturing Co. and the McMyler-Interstate Co., of Cleveland, will manufacture 500,000 200 mm. shells. The Bureau is now distributing orders, also, for the machining of 900,000 240 mm. projectiles. It is understood that a large proportion of this business will go to the American Car & Foundry Co. and to the American Brake Shoe & Foundry Co.

Contracts for the forging of 2,150,000 shells have already been allotted among twelve steel companies and forge shops. Since the U.S. entered the war, it is estimated that the Ordnance Department has awarded contracts for 60,000,000 shells of various sizes and it is expected that contracts for 30,000,000 additional shells will be placed as soon as manufacturing capacity is prepared to execute the work for the Government. The War Industries Board has allotted orders for 50,000 tons of steel plates in-

cluding 22,000 tons for Italy, and 30,000 tons of steel sheets, of which 10,000 tons are for export to France and Italy. Railroad equipment shops have also placed orders for 50,000 tons of steel for the construction of cars and locomotives for U.S. roads.

Pittsburgh

PITTSBURGH, Pa., Dec. 1.—The finished steel market has been decidedly more active in the month just closed than in October. There has been a larger volume of specifications against old contracts and somewhat more new buying. The new buying is as a rule limited by the ability of mills to make early deliveries. Some of them can take on no new business at all, while none can take on more than limited tonnages.

Sheets Active

Easily the most active branch of the general finished steel trade has been the sheet market. It is estimated that the independent mills booked about 140,000 tons, in blue annealed, black and galvanized. Of this perhaps one-fourth was Government business, although no specific figures are obtainable. The bookings were about one-half greater than a month's output, deliveries running all the way from prompt to first half 1918. In all cases, so far as can be learned, the Government prices prevailed, on the basis of 4.25c for blue annealed, 5c for black and 6.25c for galvanized. The Government prices, however, do not necessarily apply to exports for peace purposes. Next in point of activity has been wire products. Activity in these lines was due chiefly to the simple circumstance that mills were less sold up, and buyers less well covered, than was the case with most other products, particularly the heavy rolled steel materials.

Market Tone Improved

There has been a further improvement in the general tone of the market. This doubtless arises in large part from the better financial situation and outlook, which is improved although not perfect. Some close observers date the inception of the improvement from the time Secretary McAdoo made his statement, early in November, that the Government's war expenditures would be much less than had been reported, or say about ten billion for the fiscal year. Some of the stiffening, however, is attributable to the further curtailment in iron and steel production that has occurred in the past three weeks, due to shortage of coke and coal, this being almost entirely a reflection of the traffic congestion, particularly in the Pittsburgh district.

Pig Iron Unobtainable

Except for occasional odd lots of foundry iron which furnaces consent to sell to needy and regular customers, no pig iron can be bought in this district. Reports from the east show a fairly large volume of business, and evidently the eastern districts are not suffering from coke shortage as much as the Pittsburgh and valley districts, and the Chicago district. The majority of merchant furnaces have been losing production, having to bank for longer or shorter periods on account of not receiving sufficient coke. One Shenango valley interest, with three stacks, had to bank two of them this morning. The steel works are suffering as much, as to their blast furnaces, as the merchant stacks. The Carnegie Steel Co. has been operating only 48 of its 59 blast furnaces, this being due entirely to traffic congestion, as it makes all its coke itself.

W. P. Snyder & Company, who compute monthly the average price obtained for Bessemer and basic iron at valley furnaces, including all sales of 1,000 tons or over, report November averages at $36.30 for Bessemer and $33 for basic, these being the set prices, and the same averages obtained for October, but while the total tonnage used in the October computations was about 100,000 tons, the November computations included only a very small tonnage.

Government Buying

The Government continues to allot large tonnages of steel, but details are withheld. The placing of shell steel business continues and additional allotments are being made of ship steel. A significant item is that while no public announcement has been forthcoming, the steel trade learns that a fresh canvass has been made of the plate situation, to determine the feasibility of placing orders for freight cars to relieve the railroads. It has been found that on account of the large increases in plate rolling capacity due to new construction, it will be possible to take care of the shipbuilding programme as being speeded up further, and still leave a considerable tonnage of plates for steel car building. It seems to be the intention to place some large orders, first for locomotives and then for cars, on behalf of the domestic roads, the filling of the orders to be speeded up under the Government's priority authority. The Russian situation makes it necessary to defer the filling of orders tentatively placed for Russian account, and this releases some locomotive and car-building capacity.

The Railroad Pool

Of much more immediate importance than the prospective placing of equipment orders for early delivery to the railroads is the agreement reached one week ago to-day to pool all the railroads east of Chicago. The operation of the pool is placed in the hands of seven railroad officials, known as the General Operating Committee of the Eastern Railroads. The committee reached Pittsburgh on Tuesday and opened offices in three rooms in the Union Arcade (where these letters are written). Wednesday it issued half a dozen orders to the railroads of sweeping significance. Next day, Thanksgiving Day, it kept at work. Friday it moved into larger quarters, ten rooms, and to-day, Saturday, it worked to 7.30 p.m., to resume work Sunday morning at 10 o'clock.

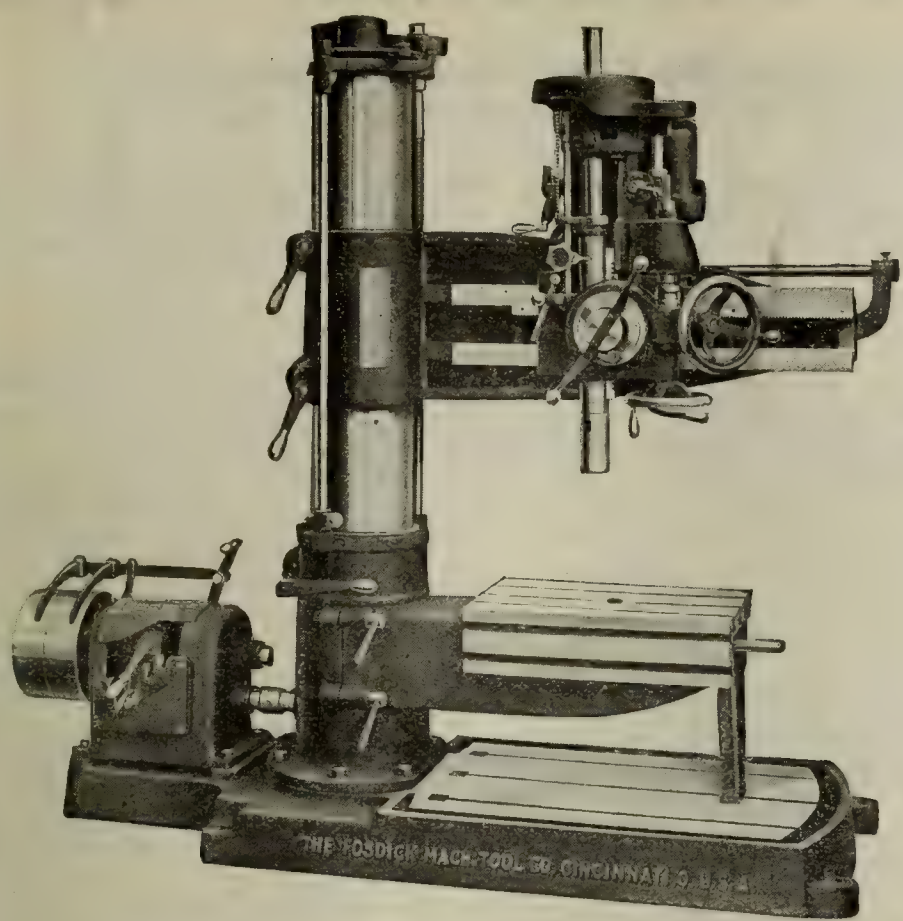
The early orders issued were directed chiefly to clearing the congestion in the Pittsburgh district, all through traffic east and west being embargoed and ordered to proceed by lines north or south of Pittsburgh. The Pennsylvania's "Broadway Limited," the crack 20-hour train between New York and Chicago, was ordered discontinued. The "Fast Freight" lines were ordered discontinued and put on regular freight schedules. Various other measures were taken.

These strenuous measures taken to relieve the situation in the "Pittsburgh gateway" may result in congestion elsewhere, but the significant thing is that it has been the congestion in the Pittsburgh district that has been the chief factor in curtailing iron and steel production below the physical capacity of furnaces and mills. The coke shortage has been almost entirely of Connellsville coke, and the major part of the Connellsville coke production should pass to or through the Pittsburgh district. As to coal shortage, this has been felt chiefly by steel mills in the Youngstown district, and most of the coal for those mills must pass through the Pittsburgh district.

Presumably the measures being taken by the General Operating Committee will have important results, and if there are results they will be chiefly by way of the congestion in the Pittsburgh district being relieved, and larger production of pig iron and steel should result very shortly.

EXPORTING TO THE ORIENT

THE Manitoba Rolling Mills Co., Winnipeg, recently secured a large order from the Orient for iron and steel bars. This is required for repair and upkeep of railway equipment, as well as in shipyards and engineering trades of China and Japan. This is the start of what will probably develop into a large export business between Western Canada and the Orient. The Manitoba Rolling Mill Co. have only been operating for the last eighteen months, and during that time their output has increased until to-day it approximates 2,000 tons per month of finished product. This company is rolling high quality bar iron and steel, rolling the steel from new electric steel billets. They are supplying considerable tonnage to be used in connection with wooden shipbuilding in Canada, for the upkeep of railway rolling equipment and engineering trades, as well as for use in the manufacture of agricultural implements. They have also disposed of large tonnages of reinforcing steel used in the construction of grain elevators and general building work. Further tonnages are shipped through wholesale hardware and blacksmith supply jobbers for general farm and blacksmith purposes.



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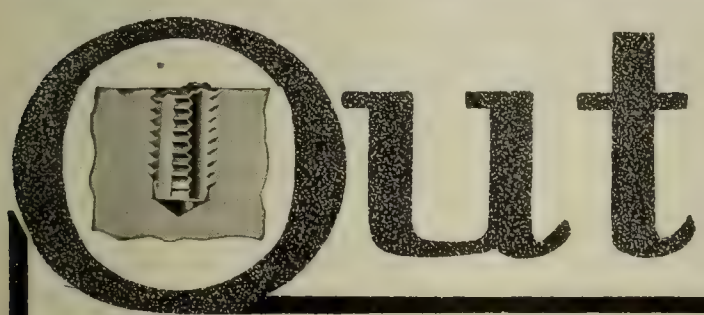

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INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Copper Cliff, Ont.—The Canadian Copper Co. are having plans prepared for $10,000 one-storey brick machine shop.

Amherst, N.S.—The International Engineering Co. contemplate the erection of a $4,000 addition to their moulding shop.

Arnprior, Ont.—It is reported that M. J. O'Brien, of Renfrew, contemplates establishing an industry here in the spring.

St. Anthony, N.B.—The forge shop owned by Philip Melanson was completely destroyed by fire with a loss of $25,000.

Toronto.—The Cluff Ammunition Co. has taken out a permit to build a steel store house at 27 Atlantic avenue, to cost $20,000.

Toronto, Ont.—The Dunlop Tire and Rubber Co. have been granted a permit to build an addition to the power house on Booth Ave., to cost $5,500.

St. Mary's, Ont.—W. W. Porter, Detroit, is looking for a site at St. Mary's, where he proposes to build a plant for the manufacture of farm tractors.

Strathroy, Ont.—The St. Andrew's Wire Works of Canada, Ltd., has secured a building at Strathroy, Ont., which it will remodel and equip for the manufacture of wire products, etc. G. M. Haldane is local manager.

Brantford.—Fire destroyed the brass foundry of Charles Lake, 46 West Street, at an early hour on November 30. The cause of the fire is unknown. The foundry, a frame and brick building, was burned to the ground.

Paris, Ont.—A bad fire occurred at the McFarlane Engineering Works here on Nov. 27, when damage to the amount of $5,000 was done. A large building was nearly destroyed, besides a considerable amount of machinery, electric motor, etc., being damaged.

Niagara Falls, Ont.—The building at Niagara Falls, jointly occupied by the Davis-Bournonville Co. and the Davis Acetylene Co., has been taken over by the former company and will be operated exclusively for the manufacture of oxy-acetylene apparatus for the Canadian trade.

Trenton, Ont.—An explosion at the British Chemical Co. plant here did considerable damage last Friday. The explosion occurred in a small separate building known as the "solvent recovery" department. What the cause was has not yet been ascertained, but it was probably due to chemicals forming an explosive compound.

Cobalt, Ont.—It is understood that plans are now under way for the development of electric power at Big Bend Falls to supply Gowganda and the new district of Matchewan. The Big Bend Falls are capable of developing between 5,000 and 6,000 horse-power, which would undoubtedly supply all the power that Gowganda will require for several years and take care of any mines developing in the Matchewan district.

Brockville, Ont.—The chief engineer of the Ontario Hydro-Electric Commission has informed the local utilities commission that Brockville will soon be linked up with the Ontario systems through the transmission of 10,000 horse power from the Cedar Rapids Transmission Co., which at present is developing and supplying from sixty thousand to eighty thousand horse power to aluminum and other works at Massena, N.Y.

Port Arthur, Ont.—It was announced recently that the property of the Conley Frog & Switch Works, Port Arthur, has been sold to the Terminal Land Co. This was the property on which the Conley company commenced the construction of a factory before the war and later ceased operations pending less troubled times. J. R. Smith, president of the Terminal Land Co., stated that important developments are planned on this property. It is understood Mr. Smith has acquired certain machinery with which he intends to equip the plant.

Niagara Falls, Ont.—Excellent progress is now being made on the Chippawa Hydro-electric Power Canal, and the preliminary work has got well under way. The construction railway which will carry away the material excavated has been completed from the Whirlpool to the power-house, and the rest of the line is being pushed forward. At the present time operations are being centred on the erection of a concrete bridge for the Niagara, St. Catharines & Toronto Railway tracks at Stamford. This is only one of about thirty bridges which will have to be built. The engineers are filling in a great many ravines around the Niagara River with the earth taken out in excavating the canal.

GENERAL

Quebec, Que.—The J. B. Drolet Co. will build a factory here to cost $20,000.

Orillia.—Fire on Nov. 25 destroyed the Carss Mackinaw Co's. factory, the total loss being estimated at $40,000.

Montreal, Que.—The A. R. Whittall Can Co. will build an extension to their factory at a cost of $25,000.

Port Arthur, Ont.—The Saskatchewan Co-operative Elevator Co. will construct a new elevator on the Port Arthur north and waterfront at a cost of $450,000. It is to be ready to handle the crop of 1918. The unloading capacity will be twelve cars per hour and shipping capacity to the boats 45,000 bushels per hour. The Canadian Northern Elevator "B" will be rebuilt during the winter at a cost of $500,000.

MUNICIPAL

Lethbridge, Alta.—The City Council contemplate the installation of power plant equipment costing $63,000.

Sarnia, Ont.—The Sarnia Gas Co. is notifying all industrial users that the supply will be shut off on December 15. The supply from the Tilbury and Dover fields is rapidly diminishing, and before long citizens as well as manufacturers may have to revert to coal and wood. The coal situation here at present is not encouraging.

Toronto.—Tenders, addressed to the Secretary-Treasurer, Board of Education, will be received until December 13, for all trades in the erection of a new 12-room school building, annex, at Queen Alexandra public school. Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, 155 College Street.

Montreal, Que.—The Board of Control has resolved to cancel the contract awarded to the Cook Construction Co., in July, 1913, for the enlargement of the city aqueduct at a cost of $2,232,000. The work is less than one-half completed. Both parties agreed to arbitrate their claims and counter-claims which, as originally submitted, amounted to one million and three quarters on each side.

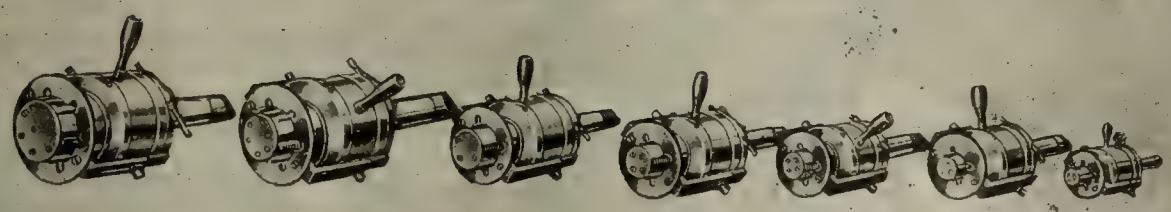
Toronto, Ont.—President S. A. Armstrong, of the Canadian Nu-Fuel Co., has submitted proposals to the Board of Control for utilizing the city garbage and refuse in the manufacture of fuel and other products. One proposal is that the city operate its own plant on a royalty basis and the other is to have the plant operated by the company, the city to furnish the garbage and other concessions to be the subject of an agreement. It was explained that cans and iron would be taken care of by a melting furnace, rags and cloth would be sterilized in an automatic laundry, all bottles would be washed and sterilized, broken glass will be ground and sold back to the glass manufacturers, grease would be extracted from free garbage, and the balance of the garbage manufactured into Oakoal.

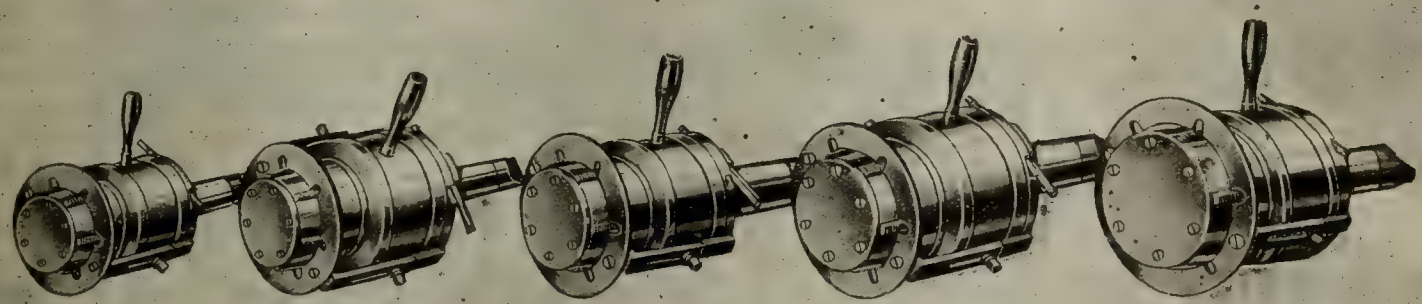
PERSONAL

B. J. Lanigan, secretary-treasurer of the Calgary Iron Works, was married recently to Miss Winnifred Colgan.

Captain George L. Magann, son of George P. Magann, railway supplies contractor, who resides on Dowling avenue, Toronto, has been wounded. He was

GEOMETRIC TAPS





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Machinery
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Order

formerly an officer in the 12th Battery, of which Col. Leonard of London was the officer commanding.

Walter C. Teagle, of Toronto, president of the Imperial Oil Co., has been elected president of the Standard Oil Co. Mr. Teagle was born in Cleveland, Ohio, in 1878. He was appointed president of the Imperial Oil Co. in 1913, and president of the International Petroleum Co. in 1915.

Flight-Lieut. Lloyd M. Archibald, Royal Flying Corps, No. 100 Squadron, France, is now a prisoner of war in Germany. He was formerly reported missing since Oct. 24. He went overseas in October, 1916, completing his training with the R. F. C. in England. For a time he was a night pilot, patrolling the North Sea, and about the 1st of October this year left for France, where he was a pilot, bombing at night. He is twenty-four years old, was born in Nova Scotia, but was educated in Toronto, and before enlisting was a coast to coast traveller with the Dart Union Co., Toronto.

TRADE GOSSIP

McLain System, Inc., 906 Goldsmith Building, Milwaukee, Wis., has changed its name to the McLain-Carter Furnace Co. Oil fired open-hearth and metal melting furnaces will be the company's specialties.

British Magneto Output.—Although before the outbreak of the war the output of British magnetos was not more than 100 a week, since the war no fewer than 165,000 magnetos are said to have been produced in Great Britain.

Tungsten Situation Unchanged.—Conditions in the tungsten market are not materially altered. Europe continues to be a buyer in the South American market, and is offering high prices. Wolframite ranges between $23 to $26 as to grade. Scheelite continues firm at $26.

Foss Machinery and Supply Co.—The firm of Foss & Hill Machinery Co., of Montreal, has been dissolved. Geo. F. Foss has bought out the interests of Mr. Hill who has been associated with the firm for the past 12 years. The new company will be known as the Foss Machinery & Supply Co.

The Calgary Iron Works, Calgary, have completed a contract for shells and are now engaged upon the production of parts for the "Bull" tractors. These parts include wheels, gears, pinions, pistons, etc., such as are used on the larger sizes of oil, gas and steam tractors.

To Fix Price of Silver.—Negotiations are proceeding in London between Great Britain and the United States with a view to fixing the price of silver for the year, according to Andrew Bonar Law, Chancellor of the Exchequer, who made an announcement to this effect in the House of Commons recently. He said he thought it possible an agreement would be reached.

Dominion Customs Revenue.—Customs receipts for the eight months of the fiscal year closing Nov. 30 aggregate $115,324,907, as compared with $94,728,997 for the corresponding period last year, an increase of $20,595,909. For November alone receipts were $12,949,612, an increase of $746,092, as compared with November, 1916.

New Metal From Nelson, B.C.—A Scottish scientist has discovered a new metal which is believed to belong to the platinum group. It is called by him canadium. He has obtained a few grams per ton in the pure state by treatment of certain rocks found in Nelson, B.C. There is some anticipation that the new metal will find industrial uses, especially by jewelers.

Blanket Insurance Expired.—On Dec. 2 at midnight all marine insurance of the blanket nature became void, but many companies continue to insure their boats by the trip. Many companies carry their own insurance, and these may operate until the ice closes the locks at the Soo. Vessel men, made optimistic by the unusually mild weather, are hoping for one or more round trips yet. The majority, however, of the small boats are now in winter quarters.

Two Vessels Launched at Polson's.—Two steel fishery protection vessels were launched at the Polson Iron Works, Toronto, on November 27. Although no invitations were issued, a large number of persons were present to witness the ceremony, which took place without any mishap. The engines and boilers are ready to be fitted up immediately, and it is anticipated the boats will be able to pass down the St. Lawrence before navigation closes. The vessels were not named, but are numbered T.R. 15 and T.R. 16 respectively.

New Zealand Wants Quicksilver.—The New Zealand Government has offered a bonus of 8 cents per pound for the first 100,000 pounds of retorted quicksilver that the mines of New Zealand produce, under the condition that at least one half of the quantity is produced on or before March 31, 1920, and the remaining half before March 31, 1921. It is reported that there are several rich deposits in the Dominion of Canada, but that little has been done as yet for lack of sufficient capital.

Freight Service Over Quebec Bridge.—The service of the car ferry steamer Leonard between Quebec and Levis was suspended on Monday, and freight cars will run over the Quebec bridge, which will greatly expedite shipments. It is stated that the steamer Leonard may be sold for service in the Straits of Canso. It is also announced that within two weeks passenger trains will be running over the bridge, and Canadian Government railroad schedules from Montreal eastward will be changed in consequence.

Economy in Tin-Plate.—Manufacturers of food products are warned by the Food Controller for Canada that the use of tin-plate must be curtailed in every possible way. So serious is the situation that the United States has prohibited exportation, except under license. No export licenses will be granted for uses other than for the manufacture of food-

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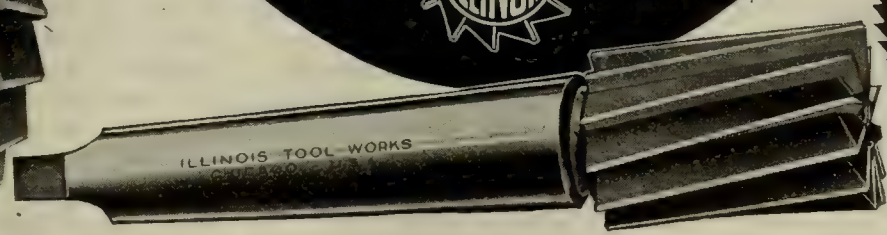

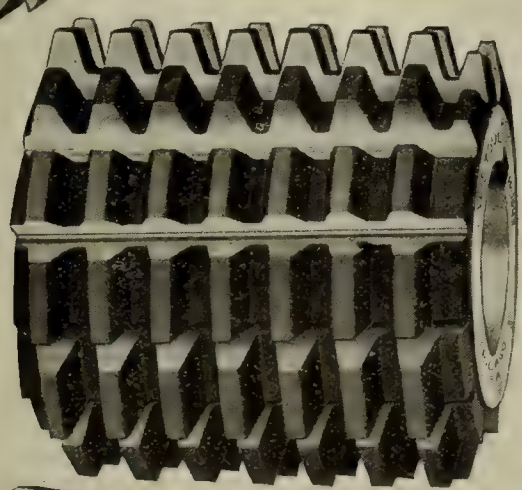

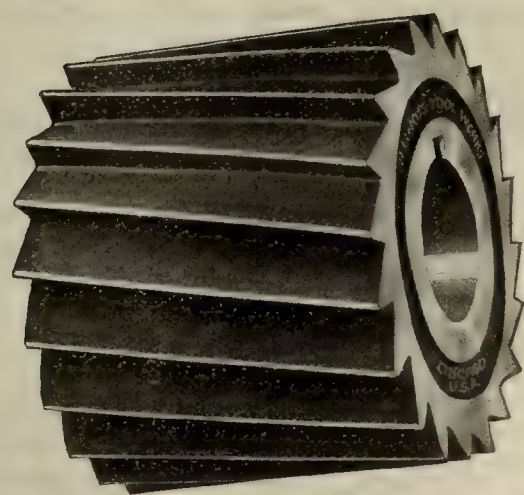

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containers, except on satisfactory evidence that the plate will be used in such a way as to fill the military needs of the Allies. Preference will be given to applications that have to do with war food contracts.

Stainless Steel-Making Stopped.—In view of the difficulties in getting supplies of ferrochrome in Great Britain, the manufacture of stainless steel for cutlery purposes has been prohibited by a regulation recently issued to manufacturers, according to U. S. Consul John M. Savage at Sheffield, England. The regulation goes on to state that ferrochrome must only be used in connection with high speed crucible carbon steel and alloy steel and in the case of the latter only where a priority certificate or other permit number has been obtained which will warrant the manufacture of the steel in question.

New Concern Develops Hematite Mines.—The prevailing high prices of hematite iron ore of good quality has stimulated this class of mining in Ontario and Quebec. One of the companies recently incorporated in Canada is the Canadian Union Iron Mines Corporation, Montreal, with a capital stock of $1,000,000, which intends opening deposits near Sutton, Que., where hematite iron ore has been uncovered analyzing 68 per cent. metallic iron. This company has already commenced operations at another mine near Perth, Ont., from which, it is said, there were several thousand tons of iron ore taken a few years ago.

Urges Survey of Power in Canada.—At the Dominion Conservation Commission annual meeting in Ottawa on Nov. 28, A. B. White, C.E., read a paper urging that nothing be done to alienate power rights on the St. Lawrence River until a comprehensive survey had been made. Sir John Kennedy, consulting engineer of the Montreal Harbor Commission, believed that a scheme of development should be agreed upon by an engineering commission and then handed over to a joint commission, such as the International Waterways Commission. He favored Government development. R. A. Ross, a Hydro-Electric engineer, from Montreal, agreed, and also advocated a scientific survey of the whole of Canada's power and undeveloped energy.

Lake Steamers for Overseas Trade.—An important part of the work of the Department of Marine and Fisheries at present is concerned with the transfer of steamers formerly employed in trading on the Great Lakes to the overseas trade. Some of the larger lake steamers had to be taken through the canals in two sections. It was announced recently by an official of the department that ten steamers hitherto employed in trading on the lakes have already gone or are going to the overseas trade. One steamer, of full canal size, built at the Polson Iron Works, Toronto, for Norwegian interests, is going out in a few days and another large steamer, built by the Thor Iron Works, also of Toronto, has been sold to France, and will be ready for ocean service shortly.

To Cut Down Non-Essential Trades in U. S.—The United States Government's first move toward curtailing non-essential industries during the war was made on Sunday when the fuel administration sent to coal producers a preferred list of consumers to serve as a guide in filling orders. The list establishes preferential shipment for Government orders of railway fuel, household requirements, public utilities, steel plants, coke ovens and munition plants. Facing a coal shortage of fifty million tons for the country, the fuel administration is determined that a radical step was necessary if essential industries and public utilities were to be kept running. It turned down suggestions that a list of non-essential industries and public utilities where coal should be denied and established instead the preferential list as less likely to injure the banking credit of concerns which it is considered certain will suffer.

TENDERS

Toronto, Ont.—Tenders will be received, addressed to the Chairman, Board of Control, City Hall, Toronto, up to January 15, 1918, for the construction of a drainage system (wrought iron pipe) for the Don Bridge, Bloor Street Viaduct. Specifications and forms of tender may be obtained upon application at the Bloor Street Viaduct Field Office, 89 Castle Frank Road.

Ottawa, Ont.—Tenders will be received until December 17 for the electric conduits, outlets and fittings required in the reconstruction of the Parliament Building. All tenders to be based on the supplying and delivering on the site of the quantities of the schedule of material for electric conduit, outlets and fittings, in strict conformity with the specifications and the samples submitted and to the satisfaction of the architect. Deliveries to commence so far as possible immediately after the signing of contract and to continue as directed in such quantities as to ensure complete delivery by March 1, 1918. The schedule of material, specification and any other information required can be obtained at the office of the P. Lyall & Sons Construction Co., Ottawa.

CONTRACTS

Brantford, Ont.—The Roelofson Elevator Co., of Galt, have been awarded the contract for a freight elevator by the Kitchen Overall & Shirt Co. of this city.

Toronto.—The Board of Education has awarded a contract to the Johnson Temperature Regulating Co., Toronto, for heat regulators at Perth Avenue school annex.

Toronto, Ont.—The Dominion Sewer Pipe Co., of Swansea, has been awarded, by the Board of Control, the contract for the ensuing year's supply of sewer pipe. The National Iron Works will supply the cast iron pipe.

Toronto, Ont.—The Hanover Portland Cement Co. has been awarded, by the Board of Control, the contract for sup-

plying the city with cement next year. Their tender was $2.45 a bag, with a discount of five cents a bag for prompt payment.

MARINE

Montreal. — The 7,000-ton steamer Porsanger, the largest ocean going vessel constructed in Canada, and built for a Norwegian concern, was launched from the shipbuilding slip of the Canadian Vickers Ltd., last Thursday.

Esquimalt, B.C.—The Victoria Whaling Co.'s steamer Gray, which has been on the ways of Yarrows, Ltd., Esquimalt, for the past three weeks, was placed in commission on Nov. 22, and will at once be placed in service for a cruise to the West Coast whaling stations. The damage which the Gray sustained when it ran on the reef at Cape Calvert about a month ago has been completely repaired, and the job took practically a week less than was at first expected.

BUILDINGS

Toronto. — Tenders recently received by the Board of Education for the construction of Perth Avenue school annex amounted to $92,432 as compared with an estimate of $55,000. Tenders will be called again for the ornamental ironwork as only one firm submitted a bid.

Toronto, Ont.—It is understood that the T. Eaton Co. will not proceed with the work in connection with the proposed store at the corner of Yonge and College Streets. It is said that the contract with the Dominion Bridge Co. for the steel work has been cancelled.

INCORPORATIONS

Laval Chemical Co. has been incorporated at Ottawa by C. F. Laurion, J. C. V. Roy and J. A. Guy to manufacture chemicals, alcohol, soap, etc. The company is capitalized at $100,000 and the head office is at Montreal.

Ottawa Paper Box Co. has been incorporated at Ottawa with a capital of $150,000 to manufacture pulp products, boxes, etc., at Ottawa, the incorporators are A. C. Fleming, W. S. Mackenzie and J. E. McVeigh, all of Ottawa.

Eagle Smelting & Refining Works, Ltd., have been incorporated at Ottawa by Peter Bercovitch, E. Lafontaine and N. Gordon, all of Montreal, to manufacture, smelt, refine babbitt, solder, brass, lead and zinc etc. The company is capitalized at $40,000 and the head office is in Montreal.

CATALOGUES

Bennis Machine Stoker is the title of a catalogue, on cheap steam and machine firing, issued by Ed. Bennis & Co., Little Hulton, Bolton, England. The introduction to the catalogue deals with cheap steam and smokeless chimney followed by a description covering the construction and operation of the "Bennis" patent machine stoker fitted with patent pneumatic gear and self clearing compressed air furnace. Views

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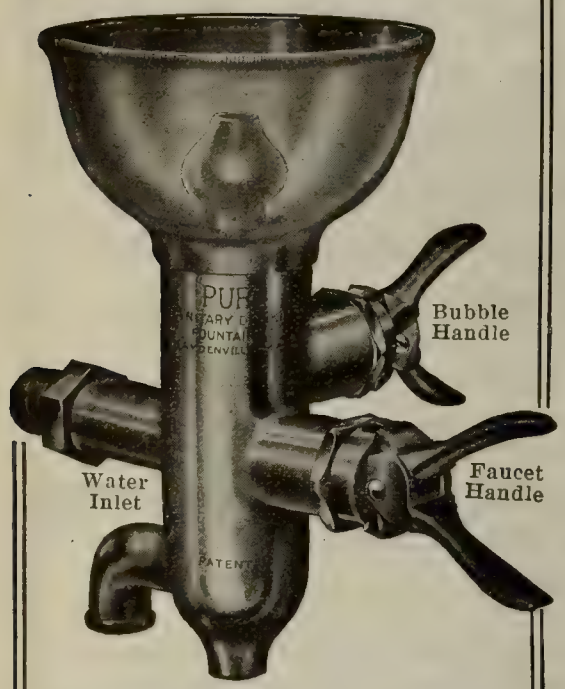

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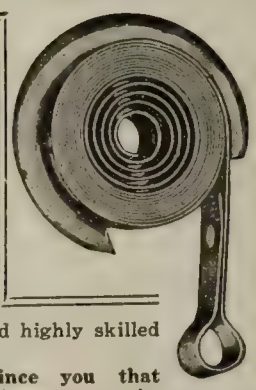

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are shown of the various parts, and also of installations. The application of the Bennis stoker under various types of boiler is shown by means of reproduction from sectional drawings which show the general arrangement of the stoker and furnace in each case. The catalogue also contains reports of two boiler tests with Bennis machine stockers installed.

Air Squeezers.—Bulletin distributed by the Berkshire Mfg. Co., Cleveland, Ohio, illustrates and describes the Berkshire air squeezer operated by hand or power. The machine is illustrated in various operating positions. The Berkshire vibrators, flask fittings and power rotary riddle are also mentioned in this bulletin.

Air Washer.—The Carrier Air Conditioning Co. of America, Buffalo, N.Y., has issued a folder entitled "Look Inside for Details" which is so made that it shows the actual construction both inside and outside of the carrier air washer. The folder also states the principal features of this air washer.

Ratchets and Wrenches.—The Keystone Mfg. Co., Buffalo, N.Y., have issued a catalogue and price list No. 25 dealing with an interesting line of ratchet drills, socket wrenches, tap wrenches and stud drivers, adjustable wrenches, taper sleeves, steel sockets, drilling posts, etc. The catalogue is fully illustrated.

Tumblers and Dust Arresters is the title of a new catalogue No. 132 issued by the Whiting Foundry Equipment Co., Harvey, Ill. The catalogue contains a detailed description covering the construction of one class of tumbler and briefly refers to other types. Dry and water cinder mills and dust arresters are also mentioned at some length. The catalogue is fully illustrated and contains tables of dimensions covering the products described.

BOOK REVIEW

Motor, Marine and Aircraft Red Book, 1917.—439 pages and numerous illustrations. Published by the Technical Publishing Co., London, England. Price 5/6, ($1.40). This is the seventh edition of a year book published under a new name more in keeping with its extended field. This volume contains an abundance of information pertaining to motor cars and their manufacturers, motorcycles, commercial and agricultural motors, marine motors, aircraft, etc., together with full information relating to the legislation necessitated by the war as affecting motor, aircraft and allied industries. The information has been collected and made easily accessible concerning internal combustion engines, steam engines and electric motors. Special attention has also been paid to the use of motors in agriculture and horticulture, and in the municipal and public services. The book contains nine sections and a dictionary of technical terms in five languages, the latter being introduced to further the interests of the export trade. It is not possible to give particulars of all important information contained in this volume which will prove of very great value to those interested in the motor industry and trade.

B.C. SPRUCE FOR AIRPLANES

The survey of the forest resources of British Columbia, upon which the Commission of Conservation has been engaged for the past four years, has proved of striking immediate value in the prosecution of the war. The Imperial Munitions Board, which has definitely taken in hand the organization of airplane manufacture, found itself in immediate need of large quantities of airplane spruce, and the Commission was able, as a result of its survey, to furnish the board with specific information as to the location and ownership of all the large bodies of spruce in British Columbia suitable for that purpose. The fact that this information had previously been collected enabled the Munitions Board to take up without delay the matter of securing the necessary supplies of this vitally important material.

Steps are being taken to increase the production of airplane spruce beyond all limits previously thought possible.

This is but another example of the vital importance of Canada's natural resources in winning the war. Many experts hold that the best prospect for definitely and overwhelmingly maintaining the supremacy of the allies is in connection with the war in the air. This involves the manufacture of many thousands of airplanes, toward which the most intense efforts of the Allies are being directed. The most suitable species of wood for this purpose is Sitka or silver spruce, of which great quantities are to be found on the Pacific coast of North America. Canada's share of this timber is very large, and is considered so important in the prosecution of the war that its export, except under license, has recently been prohibited by the Government to all destinations abroad other than the United Kingdom, British possessions and protectorates.

MINERAL CONSERVATION ADVOCATED

AT the annual meeting of the Dominion Commission of Conservation held in Ottawa last week Sir Clifford Sifton stated that: "No serious attempt has been made to grapple with the problem of preventing the serious and irreparable waste which is constantly going on in the mining of our coal areas. Provision for inspection to prevent the loss of human life has been made by the provinces; but the permanent waste of very large quantities of valuable coal still goes on."

The war has stimulated mineral production in many lines, including copper, nickel, asbestos, zinc, silver, lead, chromite, cobalt, pig iron and graphite.

"The establishment at Shawinigan Falls of an electrolytic process for recovering metallic magnesium from magnesite has greatly stimulated the production of this mineral. Magnesium

is used in connection with the war for the manufacture of star shells and flares, and as an alloy with aluminum in the manufacture of aeroplane parts.

CANADA'S TRADE GROWS RAPIDLY

AN increase of approximately $273,000,000 for the first seven months of the fiscal year ending with October, as compared with a similar period last year, is shown in the trade statement for October, just issued. For the seven months the trade in the Dominion totalled $1,586,616,258, as compared with $1,313,189,951 last year. For the month of October alone, Canada's trade amounted to $238,834,321. In October, 1918, it aggregated $164,330,179.

Exports of domestic goods for the seven months were to the value of $922,195,134, as compared with $622,049,481 last year. These figures include coin and bullion. Imports for the seven-month period amounted to $636,749,263. During the seven-month period last year imports aggregated $483,132,928. Dutiable goods were to the value of $346,108,703, on which the customs collections amounted to $102,106,365. Free goods imported were to the value of $281,992,997. During the same period in 1916, dutiable goods worth $204,530,818 were brought into Canada, and $82,177,312 was collected in customs duties. Free goods importations were valued at $207,630,667.

Manufactured goods to the value of $420,380,372 were exported, a big increase as compared with last year, when domestic manufactures to the value of $219,461,054 were shipped out of the country.

Agricultural products hold second place in value at $306,159,775, as compared with $233,448.260 last year. Animals and their products to the value of $101,681,970 were exported as against $67,101,478 for the seven-month period last year.

COAL-GAS IN AUTOMOBILES NOT TO BE RESTRICTED

THE British Minister of Munitions has informed the Automobile Association that so long as the gas is conveyed in bags, at or slightly above atmospheric pressure, and is not compressed in steel cylinders, it is not considered that at the present time there is any need on general grounds of restricting the use of coal-gas for motor purposes, though should motorists use coal-gas on any considerable scale it may, in the interests of national requirements, become necessary at some future time to impose certain restrictions on its use.

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BRASS is turned gray by using a solution of ½ ounce of potassium sulphide in 1 gallon of water applied when the work is cold. If the brass is heated to a temperature of 100 deg. F. the color begins to darken and at 180 deg. F. it changes to black.

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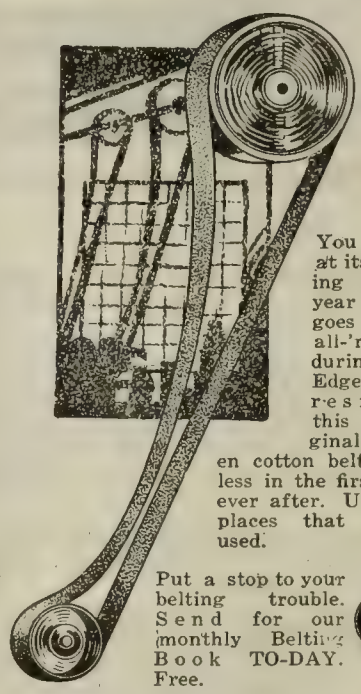

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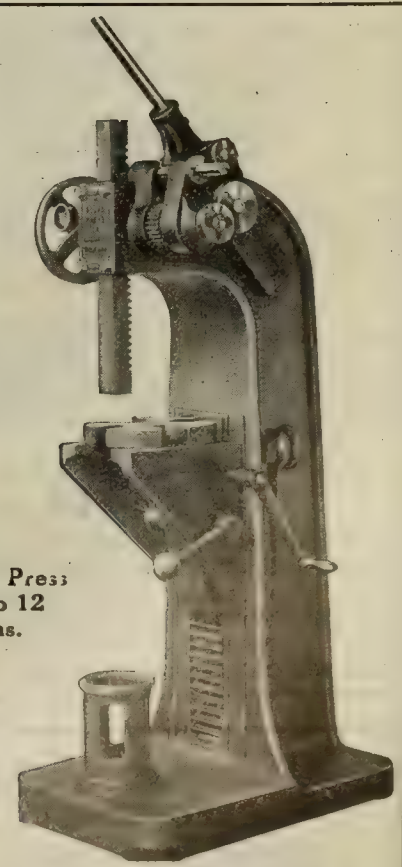

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No. 6 Warner & Swasey, friction head.

ENGINE LATHES

6" x 30" Dalton, B.G., bench.
13" x 6' Filsmith, D.B.G., comp. rest.
14" x 6' Lodge & Shipley, taper attachment.
15" x 6' Sebastian, B.G., comp. rest (3).
16" x 8' McDougall, B.G., comp. rest (2).
16" x 8' Porter, B.G., comp. rest.
18" x 10' Putnam, back geared.
20" x 8' Fifield, B.G., plain rest.
21" x 8' Bawden, heavy duty (4).
22" x 8' Pond, B.G., plain rest.
24" x 11' Pond, B.G., comp. rest.
26" x 14' Gleason, D.B.G.
30" x 10' Ames, B.G., plain rest.
31" x 16' Fifield, back geared.

DRILLS

14" Excelsior, sliding head, lever feed (5).
15" Avey, high-speed, ball-bearing.
16" Barr, sliding head, lever feed.
20" Barnes, 3-spindle, lever feed (2).
20" Baker, tapping attachment.
24" Foote-Burt, heavy duty.
24" Kerkhoff, back geared, power feed.
26" Prentice, back geared, power feed.
32" Cincinnati, heavy duty.
40" Bickford, back geared.
46" Allfree, back geared, power feed.
No. 10a Baush, 16-spindle.
D-1 Colburn, back geared, heavy duty.

GRINDERS

10" x 30" Landis, universal.
No. 1 Cincinnati, universal.
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer (2).
24" Barnes, wet tool.
2¼" Yankee, twist drill (3).

IRON PLANERS

20" x 20" x 5' Bertram (2).
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Pond, two heads
40" x 40" x 12' New Haven, power feed.
72" x 72" x 11' Canada, power feed.

MILLING MACHINES

Bertram, plain.
Brown & Sharpe, power feed, plain.
No. 2 Cincinnati, universal, cone type.
No. 2 Ford-Smith, plain.
No. 4 Fox, universal.

SHAPERS

16" Petrie, back geared (2).
16" Canada Mach. Corp., back geared.
16" Cincinnati, back geared (3).
24" Gould & Eberhardt, back geared.
30" Morton, back geared, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6' Robertson Hack Saws.
4½" Martin Cutting-off Machine.
No. 2 Grant Rotary Riveting Hammer.
No. 4A High Speed Riveting Hammer.
⅜" Garvin Vertical Tapping Machine.
No. 3½ Greenerd Arbor Press.
No. 180 Brown-Boggs Power Presses (2).
No. 18 Can. Hanson & Van Winkle Power Press.
No. 3 Goldie & McCulloch Hydraulic Banding Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.

FRONT STREET WEST, TORONTO

RIVERSIDE Machinery Depot

We Own Every Tool Offered

NEW MACHINE TOOLS

For Immediate Delivery

1—18 x 8 Springfield Standard Engine Lathe.
2—16 x 8 Springfield Q.C.G. Engine Lathes.
1—16 x 6 Springfield Q.C.G. Engine Lathes.
2—16" Springfield B.G. Shapers.
2—20" Springfield B.G. Shapers.
1—25" Springfield B.G. Shapers.
3—14" Pierce Turret Lathes.
2—1 x 8 Pierce Hand Screw Machines.
3—No. 1½ American Milling Machines.
1—No. 20 Bliss O.B.I. Press.
1—No. 19 Bliss O.B.I. Press.
1—No. 18C Bliss O.B.I. Press.
1—No. 18 Bliss O.B.I. Press.
5—20" Buffalo B.G. P.F. Drill Presses.
3—20" Canedy-Otto B.G., P.F. Drill Presses.
2—20" Champion B.G., P.F. Drill Presses.
3—20" Champion Plain Drill Presses.
3—20" Silver Plain Drill Presses.
3—20" Canedy-Otto Plain Drill Presses.
2—14" Champion Plain Drill Presses

USED MACHINERY

ENGINE LATHES

1—22 x 14 Putnam Standard Engine Lathe.
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Springfield Standard Engine Lathe.
1—14 x 6 Prentiss Standard Engine Lathe.
1—14 x 6 Sebastian Standard Engine Lathe.
2—13 x 8 Barnes Standard Engine Lathe.
1—13 x 5 Barnes Standard Engine Lathe.
1—10 x 4 Sebastian Standard Engine Lathe.

TURRET AND SCREW MACHINES

2—No. 6-A Potter & Johnston Automatic Lathes.
1—4¼" Gridley Automatic Screw Machine, motor driven.
2—No. 4 Foster F.G.H. Hand Screw Machines.
2—No. 3 Foster F.G.H. Hand Screw Machines.
1—No. 5 Pierson F.G.H. Hand Screw Machine.
4—12" Warner & Swasey Turret Lathes with air chucks.
4—16" Warner & Swasey Turret Lathes.
2—2" Cleveland Automatic Screw Machines, jigger feed.
1—⅝-¾" Cleveland Automatic Screw Machine.

MILLING MACHINES AND GRINDERS

1—No. 4 LeBlond Plain Milling Machine.
1—No. 2 Hendey Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drilling Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
1—No. 2½ Bath Universal Grinder.
1—No. 12 Modern Plain Grinder.
1—No. 14 Modern Plain Grinder.
1—No. 1 Landis Internal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.

DRILL PRESSES

1—5' Mueller Plain Radial Drill, old type.
1—31" Barnes B.G., P.F. Drill Press.
1—3-spindle 8" overhang Henry & Wright High Speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.

SHAPERS AND PLANERS

1—18" Hendey Geared Shaper.
1—36 x 36 x 10' New Haven Planer. S.H.
1—27 x 27 x 8' Cincinnati Planer. S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS

1—Waterbury Farrell O.B.I. Press, geared.
1—No. 10 Perkins Drawing Press.
3—No. 2-W Bliss Wiring Presses.
1—800-lb. B. & S. Roll Board Hammer.
1—800-lb. P. & W. Roll Board Hammer.
1—150-lb. Bradley Strap Hammer.

AIR COMPRESSORS

1—9 x 11 Chicago Pneumatic Belt-driven Air Compressor.
1—8 x 8 Fairbanks-Morse Belt-driven Air Compressor.
1—8 x 8 Gardner Single Belt-driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt-driven Air Compressor.
1—8 x 6 Westinghouse Steam Air Compressor.
1—6 x 6 Ingersoll-Rand Belt-driven Air Compressor.

We also carry a large assortment of Steam Engines, Steam Pumps and Electrical Equipment of all kinds. We are in the market to purchase machine tools, large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

Good Used Equipment

Traveling Cranes.

20-ton Browning Trolley, 5-ton zux., 56½" ga. (new).
20-ton Shaw, 56' 3" span, 110 V.D.C.
10-ton Case, 58' 3" span, 220 V.D.C.
20-ton Box, 49' span, 220 V.D.C.

Punches and Shears.

Single 48" tht., cap. 3 x 1¼", Providence.
Single 6" tht., cap. ⅞ x ⅞", Cleveland.
Single 15" tht., cap. ¾ x ½" (hand) new Doty.
Single, 9" tht., cap. 1 x 1", belted (3).
Single, 27" tht., cap. ¾ x ¾", belted.
Single, 32" tht., cap. 1 x 1", belted.
Double 15" tht. cap. ¾ x ¾" Fischer.
Double, Queen City, 12" thts., cap. ⅝" x ⅝".
Double 12" blades, bar shear, cap. 2" sq., crucible.
Univ. Plate Shear, 18" blades, cap. ¾", Cleveland belted.
Univ. Plate Shear, 26" blades, cap. ½", Lewis belted.
Guillotine Shear, cap. 2½" sq., belted, Perkins No. 6.
Guillotine Shear, No. O. H. & J., 6 and 7" blades (2).
Guillotine Shear, Fisher, 21" blade, cap. 8 x 2".
Squaring Machine 120", cap. 3/16".

Miscellaneous.

Bolt Cutter, Acme 2", Class A, single head, dies.
Boring Mill, 10' Niles, Vertical, 2 heads.
Forging and Upsetting Machine, 1½" Acme, with dies.
Forging and Upsetting Machine, 2½" Ajax.
Hammer, 80-lb. Bradley, Cushion Helve.
Hammer, 35-lb. Maggowan & Finigan (Perfect), belted.
Rotary Planer, 36" Cleveland, motor driven.
Rotary Planer, 60" Cleveland, motor 60 cy., 440 V.
Milling Machine, No. 24 Osterlein Universal.
Pipe Machine, 8" E. C. & B.
Pipe Machine, No. 11 Jarecki.

GOOD CONDITION.
PROMPT SHIPMENT.

McGoy-Brandt Machinery Co.
216-18 Penn Ave.
PITTSBURGH, PA.

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15" three-jawed chuck.
1—Lathe; 28" swing, 8' bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22" Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15" three-jawed chuck.
1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 24" wheel.
1—Lathe, 14" swing, 6' bed.
2—Ford Smith Shell Grinders, complete.
1—17" LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
1—16" Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
1—Double End Painting Machine, with ¼ h.p. motor.
1—Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—5 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
Sherbrooke, Que.

The same firms—time after time

sending in copy for this section is one of the most convincing proofs of its worth to anyone with machinery or machine shop equipment to dispose of.

These firms know a good thing when they see it—they have learned by using this section just what it can do for them.

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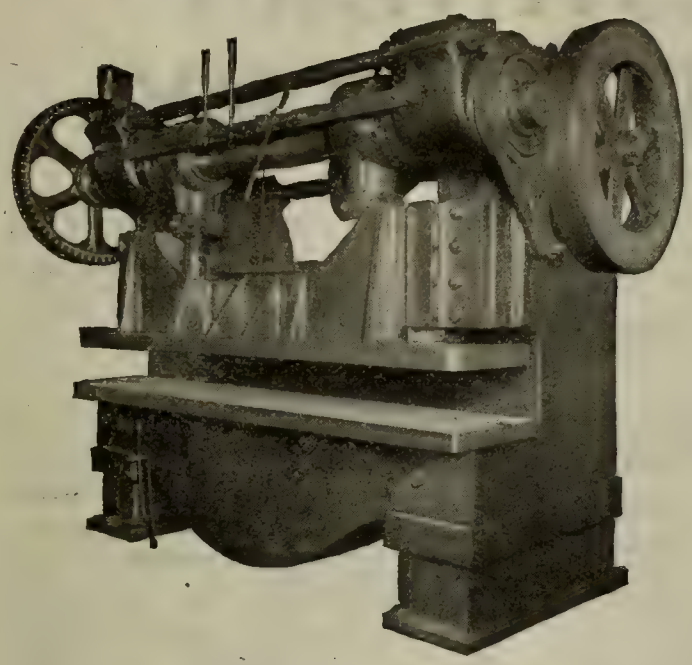
143 University Ave., Toronto, Ont.

FOR SALE



Large Blanking Press

76" between housings, 8" shaft,
3½" stroke, 8¾" die space.

Very good condition and for immediate delivery.

RIVERSIDE MACHINERY DEPOT

17-29 St. Aubin Ave. - - DETROIT, MICH.

FOR SALE

1—60-ton Watson-Stillman Hydraulic Press, complete with four plunger automatic variable belt pump. $750.00.

1—Boring Lathe, 32" swing, length over all 19' 6", approximate weight 9 tons. $2750.00.

1—Turning Lathe, 32" swing, length over all 15' 10", approximate weight 8½ tons. $2750.00.

1—Murchey semi-automatic, double-head Nipple and Pipe Threading Machine with countershaft capacity ⅛ to ¾". $410.00.

1—Murchey semi-automatic, double-head Nipple and Pipe Threading Machine with countershaft capacity ½ to 2". $690.00.

1—Hall semi-automatic, double-head Nipple and Pipe Threading Machine with countershaft capacity ½ to 2". $640.00.

1—Hall double-head, semi-automatic Nipple and Pipe Threading Machine with countershaft capacity 1½ to 4". $1000.00.

20—Spicer Steel Trucks, 28 x 90", weight 400 lbs., capacity 2½ tons. Each $25.00.

2—24" Hoefer Stationary Head Drills, steel gears throughout, ball thrust bearings, 3 step cone. $159.00.

Shafting, Belting, Hangers, etc.

GREENFIELD CONDUIT CO., LTD.

331 KING ST., TORONTO, ONT.

(24)

100 NEW LATHES

Here at McCabe's for Immediate Shipmen

These "High Duty" New Lathes will be installed in your shop with understanding there is nothing better built in workmanship — power and convenience in handling.

All-Steel Quick-Change Gear-box

3-step Cone—Doub e Back-Gears

(Get Bulletins with complete specifications.)

26-in	Swing—	18-ft.	Bed
26 "	"	16 "	"
26 "	"	14 "	"
26 "	"	14 "	"
24 "	"	18 "	"
24 "	"	16 "	"
24 "	"	14 "	"
24 "	"	12 "	"
21 "	"	12 "	"
21 "	"	10 "	"
18 "	"	12 "	"
18 "	"	10 "	"
18 "	"	8 "	"
16 "	"	10 "	"
16 "	"	8 "	"
16 "	"	6 "	"

"McCabe" Double Spindle Lathe

26-48-in. SWING; 12-ft., 22-ft. and 24-ft. Beds in stock.

So many other Tools in Stock — you will have to get our latest Bulletin 283 — just issued — to get complete list of everything.

J. J. McCabe

149 BROADWAY - NEW YORK

USED MACHINERY IMMEDIATE DELIVERY

DRILLING MACHINES.

30" Lodge & Davis, S.H., B.G., P.F.
3½' Hamilton Plain Radial, tapping attachment.
4' Mueller Plain Radial.
Four No. 310 Baker Heavy Duty.
3-spindle Rockford.
4-spindle Rockford.
4-spindle Washburn, with power feed.
4-spindle Allen.
No. 11 Pratt & Whitney, 10 spindles.

GEAR CUTTERS.

24" x 7" G. & E., spur gears.
No. 3 26" B. & S., spur gears.
No. 13 B. & S., spur gears.
36" x 9" G. & E., spur and bevel gears.
36" x 9" G. & E., spur and bevel gears.
36" Walcott, spur gears.
No. 1 Schuchardt & Schutte Gear Hobber.

GRINDERS.

No. 1 Cincinnati Universal Tool and Cutter.
No. 1½ Cincinnati Cutter and Tool.
No. 2 Woods Tool and Cutter.
Brainard Cutter.
Leland Universal, with power feed.
No. 2 Landis Universal.
No. 6-A Diamond Universal.
10" x 36" Landis Plain (new).

LATHES.

10" x 5' LeBlond, C.R., with chuck.
14" x 6' Rockford, C.R.
15" x 6' Rockford Tool Co., C.R.
16" x 8' Bradford, C.R.
18" x 6' Bradford, C.R., taper attachment.
18" x 8' Lodge & Shipley, pat. head, C.R., taper attachment.
20" x 14' Blaisdell, C.R.
21" x 12' New Haven, C.R.
24—27½" x 14' Lodge & Shipley, selective geared head, Q.C.G., 18" chuck, fitted.
24—27" x 12' Reed-Prentice, geared head, single pulley drive.
32" x 12' Schumacher & Boye, 28" chuck, fitted.
36" x 18' Schumacher & Boye, T.B.G., Q.C.G.
36" x 20' American, T.B.G.

PLANERS.

24" x 24" x 6' American, one head.
26" x 26" x 8' Pease, one head.
36" x 36" x 12' Rockford, 4 heads.
36" x 36" x 14' Sellers, one head.
39" x 39" x 12' New Haven, one head.

SCREW MACHINES.

No. 1 Warner & Swasey, plain head.
No. 2 P. & W., friction head.
No. 2 Foster, plain head, A.C. and W.F.
No. 3 Pratt & Whitney, B.G., double friction head, A. C. and W.F.
No. 3 Bardons & Oliver, plain head, A.C. and W.F.
No. 4 Pearson, friction head, A.C. and W.F.
No. 5 Foster, geared friction head, A.C., P.F. to turret slide, and P.F. to cross slide.
1—¾" Gridley, 4-spindle automatic.
3—¼" Gridley, 1-spindle automatic.

TURRET LATHES.

No. 2 Foster-Kimball, plain head.
No. 22 Garvin, plain head.
16" Lodge & Davis, back geared.
16" Warner & Swasey, friction head.
2 x 24" J. & L., cone head.
24" Gisholt, 4¼" spindle hole, taper attachment.
No. 3-A Warner & Swasey, bar attachment.

PUNCHES AND PRESSES.

No. 2 Rockford, O.B.I.
No. 3 Loshbough-Jordan, O.B.I.
No. 4 Rockford, O.B.I.
No. 74½ Bliss, str. side, geared.
Blake & Johnson Embossing.

MISCELLANEOUS.

4" Nutter & Barnes Cutting-off Machine.
6" x 48" P. & W. Thread Miller.
No. 3 Cincinnati Vertical Milling Machine.
20 H.P. Nash 2-cylinder Vertical Gas Engine.
6 H.P. Fairbanks-Morse Horizontal Gas Engine.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., **CHICAGO, ILL.**

For Sale—MODERN BRICK FACTORY BUILDING

14,000 SQUARE FEET OF FLOOR SPACE

Saw tooth construction; total of 2½ acres of ground located on railroad in prosperous central Ontario city. Ideal for munition factory. Considerable amount of shafting, motors, etc., in good condition.

ADDRESS **BOX 357, CANADIAN MACHINERY,** FOR TERMS

MACHINE TOOLS—At Your Command

BORING MACHINES—Vertical.
2—32" Bullards, 1 turret head.
2—37" Baush, 2 heads.
1—37" Bullard, 2 heads.
1—42" Bausch; 2 swivel heads; quick-change.
1—42" Bullard, two swivel heads.
2—10' Niles, 2 swivel heads.

BORING MACHINES—Horizontal.
1—2½" bar, Niles.
1—No. 2 Barrett, 5" bar.
1—Beaman & Smith, 7" spindle.
1—Barrett, 8" bar.

BULLDOZERS.
1—No. 2 Williams & White, 16" stroke.
1—No. 4 Ajax, 20" stroke.
1—No. 9 Williams & White, belt drive.
1—No. 12 Ajax, single pulley drive.
2—No. 23 Williams & White, belt drive.
1—No. 26 Williams & White, belt drive.
1—No. 29-U Williams & White, arranged for motor drive.

CRANES—Traveling.
1—8-ton Chisholm & Moore, 13½' span, hand power.
2—10-ton Electric, 47' span, 25' lift, 3 motors.
1—10-ton Toledo, 3 motors, 30' span.
1—10-ton Whiting, 48' 8" span.
1—10-ton Whiting, 3 motors, 24' span.

CRANES—Locomotive.
3—10-15-ton McMyler Broad gauge Steam Locomotive, 60' boom, bucket, 3 drums.
1—15-ton Browning, 8-wheel, 38' boom.
1—15-ton Brown Hoist Locomotive, 36' boom, bucket, 8 wheels.
1—20-ton Orton & Steinbrenner, steam locomotive 8-wheel, double drum, 37' boom, bucket.
1—20-ton Brown Hoist, 8 wheel, 40' boom, bucket.
1—20-25-ton Industrial, 8 wheel, 50' boom, bucket.
1—25-35-ton Myler, 8 wheel, 70' boom, bucket.

CUTTING-OFF MACHINES.
1—NEW 4½" Davis.
30—Davis, 4½".
10—4½" Williams.
2—NEW 6" Davis.

DRILLING MACHINES—Radial.
3—NEW 3' Mueller, speed box drive; January del.
3—NEW 3' American, Sensitive, tapping attachment.
2—4' Mueller, plain, speed box drive.
1—4½' Full Universal, cone drive.
1—NEW 5' Western Plain, with motor.
3—NEW 5' Mueller, speed box drive; January del.
2—6' Reed-Prentice, latest type, belt driven; January del.
1—NEW 6' Triumph, motor drive; January del.

DRILLING MACHINES—Heavy Duty.
2—D-2 Colburn Heavy Duty, 3½" cap., arranged for motor drive.
6—Foote-Burt Heavy Duty, 2½" capacity.
1—No. 310 Baker, single pulley drive, late type; arranged for motor drive.
10—Moline Hole Hogs, heavy duty, 2½" cap.

DRILLING MACHINES—Sliding Head.
2—NEW 25" Cleveland, high duty.
5—NEW 28" Sibley.
2—NEW 30" Sibley.
2—NEW 34" Barnes; December delivery.

DRILLING MACHINES—Multiple Spindle.
1—4-spindle 20" Barnes, all geared.
1—No. 5 Fox, 12-spindle, 1" capacity.
2—6-spindle Rockford; Economy type.

GEAR CUTTING MACHINES.
6—No. 3 Brown & Sharpe Auto Gear Cutter, spur.
1—No. 2A Newark, 2¾" x 8" capacity.
1—36" Newark.
1—36" Whiton, for spur gears.
2—36" x 9" Gould & Eberhardt, new type, spur gears.
1—NEW 6" Standard Gear Cutter, spur.
1—15" Gleason Bevel Gear Planer.
2—20" Grant-Lees Gear Hobber, bevel spur and spiral attachment.
1—24" Becker-Brainard.
1—28" Rhemania Gear Hobber, spur and worm gears.
2—NEW 30" Flather, solid pattern.
3—36" Fellows Gear Shapers.
1—NEW 37" Gleason Gear Bevel Planer; Feb. delivery.
1—72" Gould & Eberhardt, spur and bevel.

GRINDERS—Universal for Cutters, Drills, Reamers, Etc.
5—NEW No. 190 Wells.
2—No. 1 Cincinnati.
1—NEW Gisholt Universal.
1—NEW Premier, Universal.
1—NEW Wilmarth & Morman, style B.K.
1—NEW Walker No. 1, outfit B.
1—NEW Walker No. 2, outfit K, capacity 9"x26".
2—NEW No. 2 Oesterlein Universal.
3—NEW LeBlond.

GRINDERS—Cylindrical, Plain.
3—NEW 8" x 30" Modern Self-contained.
2—NEW 12" x 24" Modern Self-contained.
4—12" x 36" Modern Self-contained.
2—12" x 42" Landis Self-contained.
5—12" x 48" Modern Self-contained.
1—12 x 66" Landis.
1—NEW 16" x 48" Landis, crank shaft.
1—12 x 96" Springfield.

GRINDERS—Cylindrical, Universal
2—NEW No. 2 Bath, 9" x 20".
1—NEW No. 2 Walker; 9" x 26".
1—NEW 2½ (10" x 36" Bath.)
1—NEW Thompson 10 x 36".
1—12 x 36" Cincinnati.
1—No. 4 Cincinnati; capacity 12 x 72".

GRINDERS—Internal
1—No. 24 Bryant.
1—No. 70 Heald.
1—No. 75 Heald.

GRINDERS—Disc.
1—NEW No. 4 Gardner, including disc press, 23" disc.
3—No. 14 Besley, including ring, wheel, chucks.
1—NEW No. 17 Gardner, 30" disc.

GRINDERS—Cylindrical.
1—No 60 Heald, single pulley drive.

GRINDERS—Surface.
4—NEW No. 1 La Salle Plain, with Micro. Adj.
1—NEW No. 1½ Walker's, complete.
3—NEW No. 2 Reid (Same as B. & S.).
1—3' Pratt & Whitney Vertical, Magnetic Chuck.
12—Carrigus type, mag. chuck.

HAMMERS—Board Lift Drop.
3—300-lb. Williams.
1—No. 4 Standard Machinery Co., 400-lb.
1—E. W. Bliss, 800-lb.
1—1500-lb. Toledo.
1—3000-lb. Williams & White.

HAMMERS—Steam Forging.
1—600-lb. Niles, single frame.
1—1500-lb. Niles.
2—3500-lb. Chambersburg Steam Drop Hammers.
2—6000-lb. Chambersburg Steam Drop Hammers.
1—7000-lb. Morgan Special Double Stand.

KEYSEATERS.
1—No. 1 Catlin.
1—No. 2 Mitts & Merrill.
1—Colburn 4", capacity 43" stroke.
1—No. 2 Knowles, 60" stroke.

LATHES—Manufacturing, not Screw Cutting
2—NEW No. 3 Harding Brothers, Bench Lathes.
1—16" x 6' Prentiss, geared head, quick-change, taper attach.
70—NEW Simplex 16" x 8'.
14—Reed-Prentice Shell Lathes for 4" or 18-lb. American Shells.

LATHES—Engine.
14—NEW 15" x 6' Rockford.
1—NEW 14" x 6' Hendey, Geared Head.
3—NEW 16" x 6' Cleveland Tool Room Lathes, complete equipment.
1—NEW 17" x 8' National Quick Change, Double Back Gears.
10—17" x 6' LeBlond, heavy duty, auto. type, not screw cutting.
12—NEW 17" x 8' LeBlond Pan Bed, Quick Change Gears.
1—18 x 8 Prentiss, geared head, taper attachment, quick change.
3—20 x 8 Lodge & Shipley, quick change, turret on ways.
1—NEW 20" x 10' Cleveland Geared Head.
2—20" x 10' Lodge & Shipley, quick change.
19—NEW 21" x 10' Porter, S.B.G.
7—22" x 10' Putnam, oil pan and pump.
1—NEW 24" x 10' American, high duty, quick change.
2—24" x 10 Lodge & Shipley, quick change.
1—24" x 10' Schumacher & Boye, quick change, taper attachment.
1—NEW 26" x 48" x 12' McCabe Double Spindle.
1—NEW 26" x 48" x 22' McCabe Double Spindle.
1—NEW 26" x 14' Bridgeford pattern, geared head, heavy pattern.
3—27" x 12' Bridgeford Heavy Duty, plain turning, 2 carriages, motor driven.
1—NEW 30" x 14' American Double Back Geared, Quick Change.
1—30" x 14' Lodge & Shipley Single Pulley Drive, Quick Change.
1—NEW 32" x 12' Pittsburg Pattern.
1—36" x 13' Putnam, face plate drive.
1—36" x 17' Pond, triple geared, quick-change.
6—40" x 18' Pittsburg, quick change, gear, face plate drive.
1—NEW 42" x 24' Triple Geared, Houston, Stanwood, Heavy Duty.
1—50" x 24' Prentiss.
1—54" x 22' Worcester, Triple Geared.
1—58" x 18' 6" Dodge Lathe, Very Heavy.
1—NEW 66" x 46 Putnam Triple Geared, Face Plate Drive, 5-step Cone; 6½" belt; Oct. del.
1—84" x 18' Special Boring Lathe.

LATHES—Turret.
8—NEW 21" Gisholt H-21.
2—21" Gisholt, 18" chuck, quick traverse, taper attachment.
5—2 x 24 Jones & Lamson.
1—NEW 18" Libby.
3—24" Libbey, Universal Facing Head, 3-jaw chuck.
18—6A Potter & Johnson.
1—24" Brown & Sharpe Vertical, chucking mach.
1—No. 24 New Britain, arranged for motor drive; almost new.

MILLING MACHINES—Knee Type, Universal.
1—No. 2 Kempsmith, Vertical Attachment.
1—No. 2 Kempsmith 13" Dividing Head.
1—No. 1½ Cincinnati.
1—NEW No. 2 Rockford High Power.
2—NEW No. 2 Garvin.
1—No. 2 LeBlond.
2—NEW No. 3 Cincinnati High Power; Jan. del.
1—No. 3-H LeBlond Heavy Duty; almost new.
1—No. 25 Oesterlein.
1—NEW No. 34 Oesterlein Heavy Duty; latest type.

MILLING MACHINES—Knee Type, Plain.
1—No. 0 Cincinnati.
1—NEW No. 2B Brown & Sharpe, heavy type.
1—NEW No. 2 Rockford.
2—No. 2 Cincinnati.
1—No. 3 Cincinnati, single pulley drive.
1—No. 3 LeBlond.
1—NEW No. 3 Cincinnati.
2—No. 3 Kempsmith.
1—No. 15 Garvin.

MILLING MACHINES—Duplex.
1—No. ½ Van Norman; almost new.
1—No. 2 Garvin Spiral.

MILLING MACHINES—Hand.
1—No. 1 Bickett.
3—NEW No. 2 Pratt & Whitney.
2—NEW No. 3 Garvin.
10—NEW Becker, table 20" x 5½".

MILLING MACHINES—Vertical.
1—No. 2 Cincinnati, latest type with circular table; as good as new.
1—No. 2 Pratt & Whitney.
1—No. 3 Cincinnati Heavy Duty.
1—No. 3 Ingersoll.
3—NEW No. 5 B. Becker; Rotary Table.
1—Newton Vertical, Continuous, Motor Driven, for shell work.

MILLING MACHINES—Planer Type.
1—No. 2 Beaman & Smith.
1—Ingersoll Slab 16" x 48" capacity.
1—NEW 17" x 5' Eynon Planer Type.
1—30" x 30" x 8' Ingersoll No. 928, Single Spindle with Motor.

MILLING MACHINES—Lincoln Type.
2—Briggs type, high duty.
3—NEW No. 4 Sterling.
14—No. 7 Becker.

PLANERS.
8—NEW 24" x 24" x 6' Powell, Single Head.
1—25" x 8' Detrich & Harvey, open side.
1—26" x 10' Gray, 1 head.
1—36" x 36" x 10' American; 2 Heads.
1—36" x 36" x 14' Pond; one head.
1—36" Rotary Planer, Motor Driven.
1—36" x 36" x 8' Gray; One Head.
1—40" x 36" x 14' American, 2 heads.
1—42" x 42" x 14' Butler, high speed, 3 heads; almost new.
1—48" x 48" x 12' Scott; Heavy Type; Milling Attachment, on Rail.
1—60" x 60" x 16' Betts; 2 Heads.
1—60" x 60" x 21' Pond; 3 Heads.
1—62" x 62" x 20' Canada Tool Works Planer; 2 Heads.
1—72" x 60" x 14' Smith Globe; 2 Swivel Head.

PUNCH AND SHEARS.
1—Waterbury-Farrell Alligator Shears, cap. 2½".
1—Cincinnati Gap Shears, 17" gap, 78" blade, ¼" capacity.
1—No. 411-G Toledo Squaring Shears, capacity 97", weight 12,600 lbs.
1—Cleveland Punching Shear, 36" throat, capacity 1" x ½".
1—Providence Steam-driven Punch, 48" throat, cap. 3" through 1½"; almost new.

SCREW MACHINES—Hand.
3—No. 0 Brown & Sharpe.
1—1" Pierce.
10—NEW No. 2 Owens Kent, wire feed, automatic chuck, 1 1/16" capacity.
4—20" Cincinnati Acme, friction geared head.

SCREW MACHINES—Automatic
2—NEW ⅝" Cleveland, Model A.
3—1¼" Cleveland, Model B, full auto.
2—NEW 1¼" Gridley Mult. Spindle, Belt Driven.
10—1¾" Gridley, mult. spindle; good as new.
5—2¼" Gridley, mult. spindle, arranged for motor drive.
20—3¼" Gridley, single spindle.
4—4¼" Gridley, single spindle.
2—No. 0 Brown & Sharpe.
2—No. 1 Brown & Sharpe.
1—No. 2 Brown & Sharpe.
9—No. 56 National Acme, mult. spindle, 2¼" cap.

SHAPERS.
1—NEW 16" Springfield.
1—16" Motor Driven Rockford.
5—NEW Barker 24".
2—NEW 24" Milwaukee.
2—NEW 24" Potter & Johnson Universal Rotary Table.
1—25" Springfield.
2—30" Morton Draw Cut.

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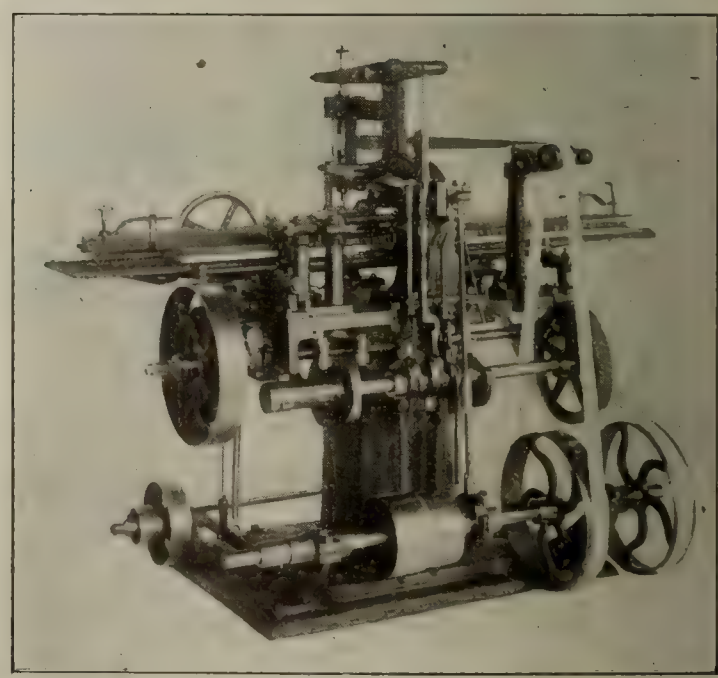
We will show here from time to time some machines we build that you may judge our capabilities in this line.



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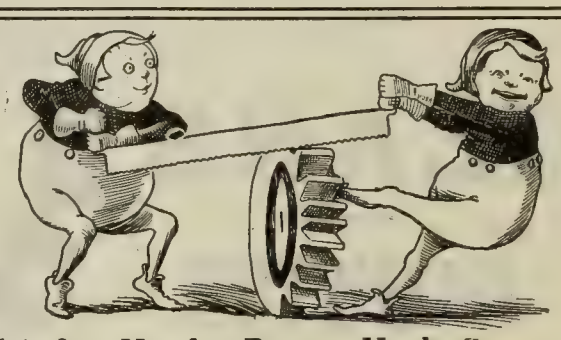

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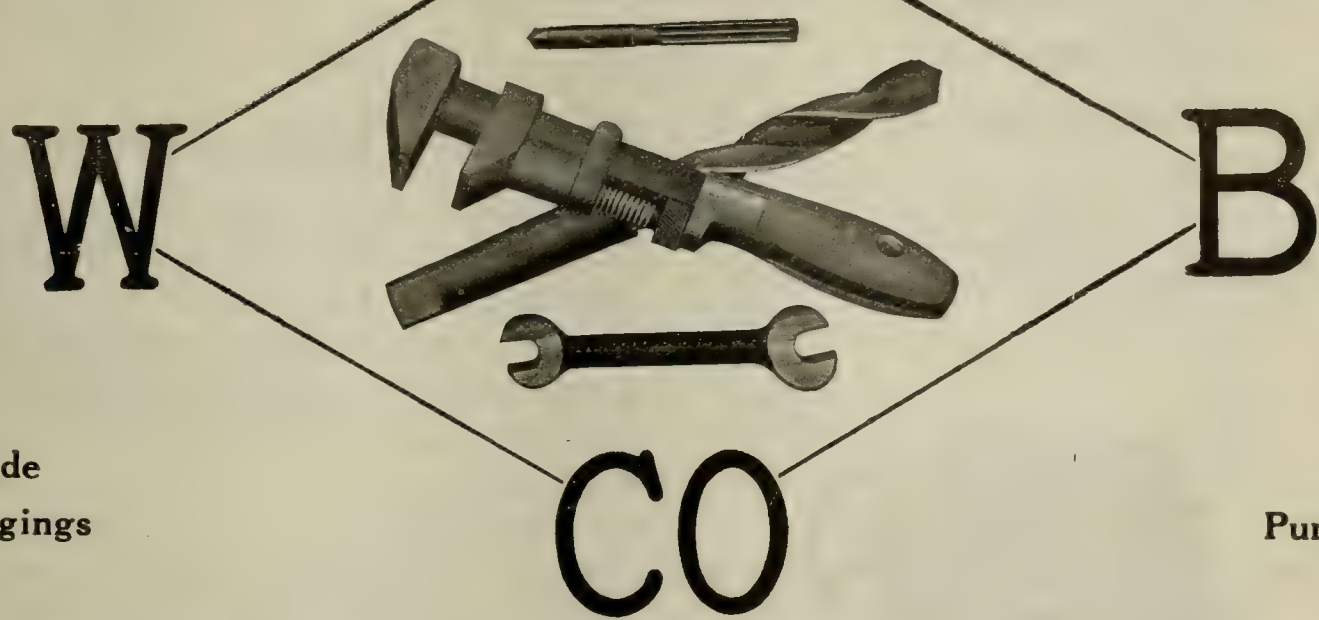

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to move them rapidly

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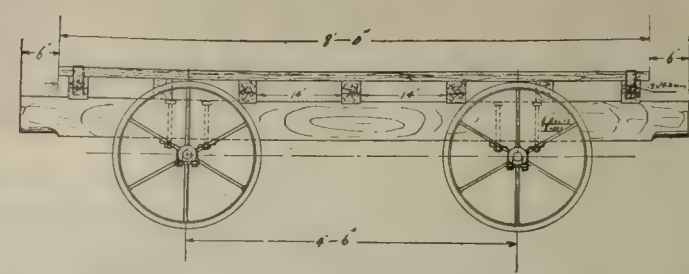
Made with one, two, three or more Drums, as required, and with any diameter Drum.



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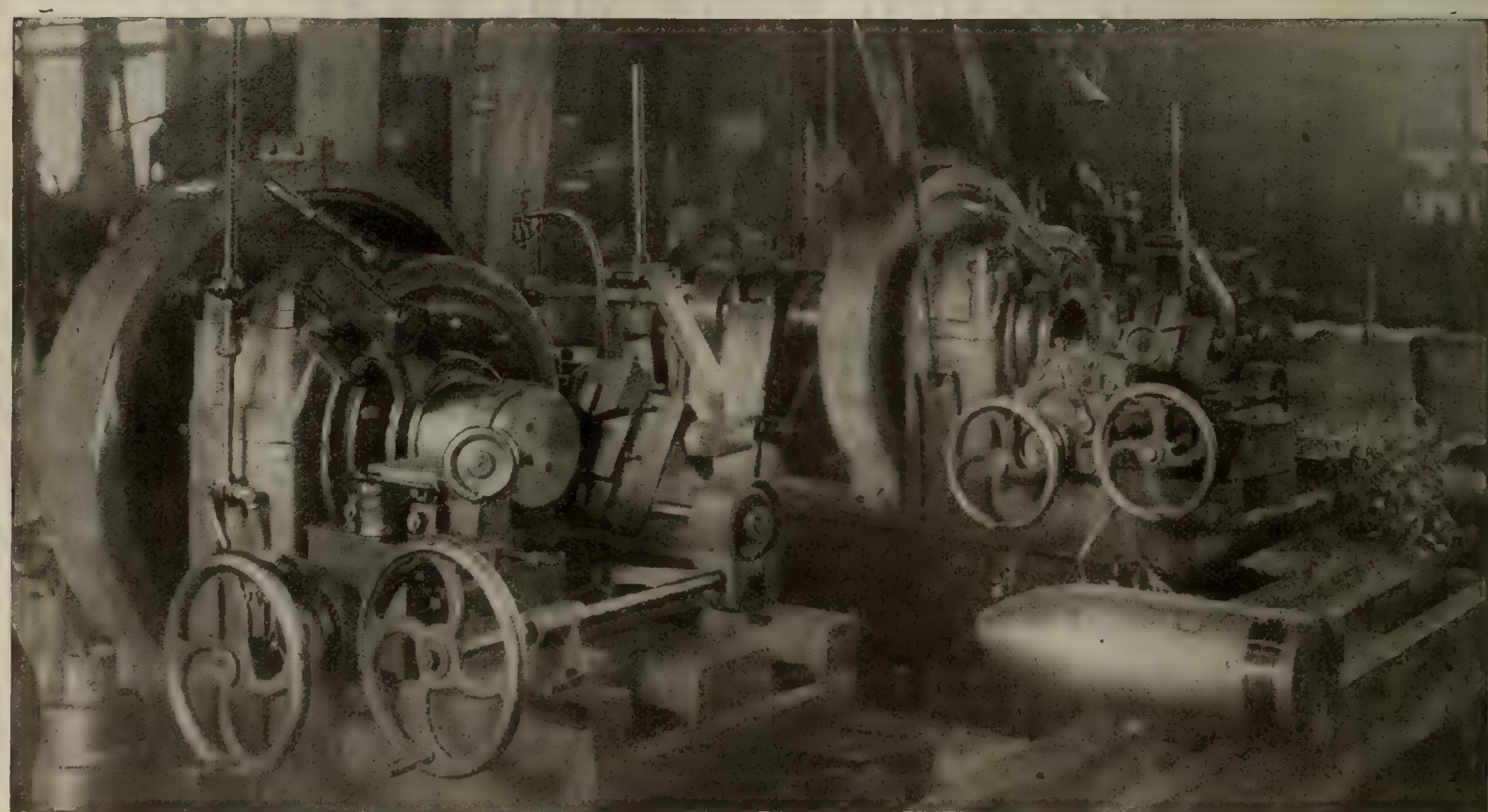

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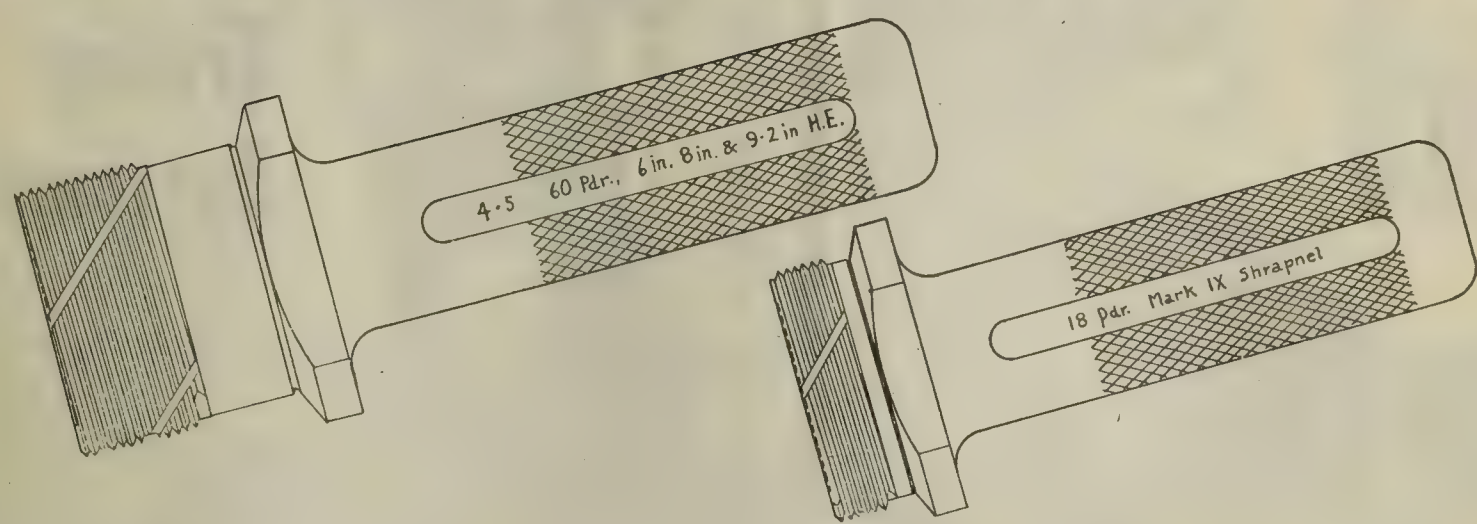

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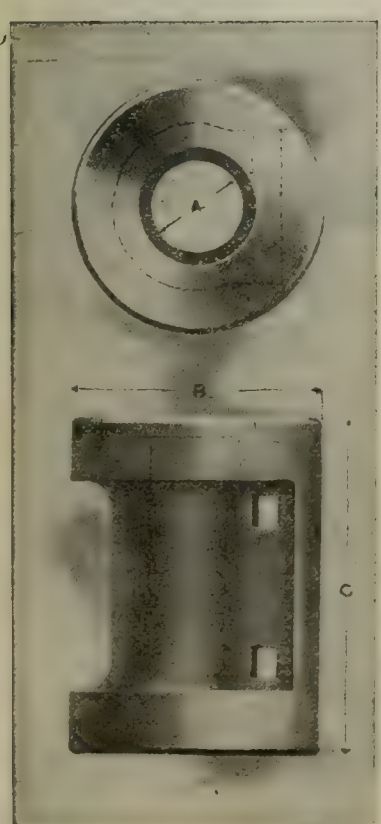

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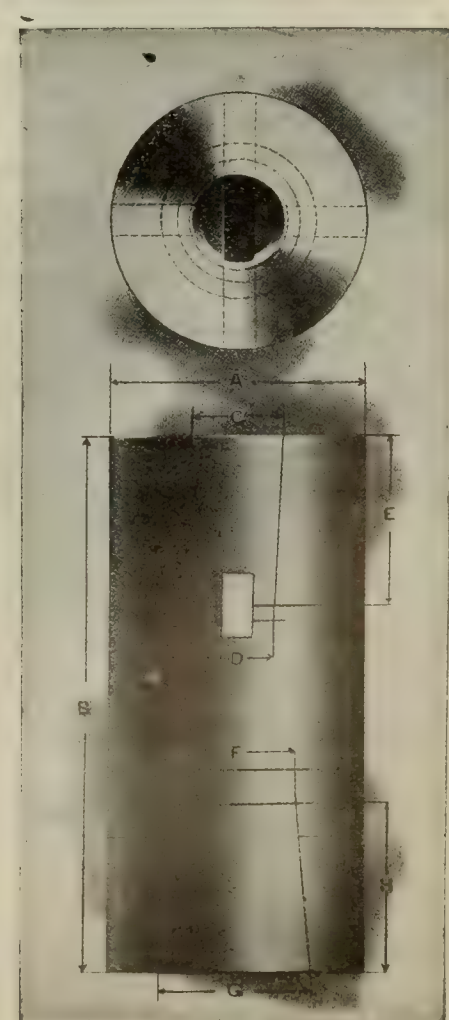

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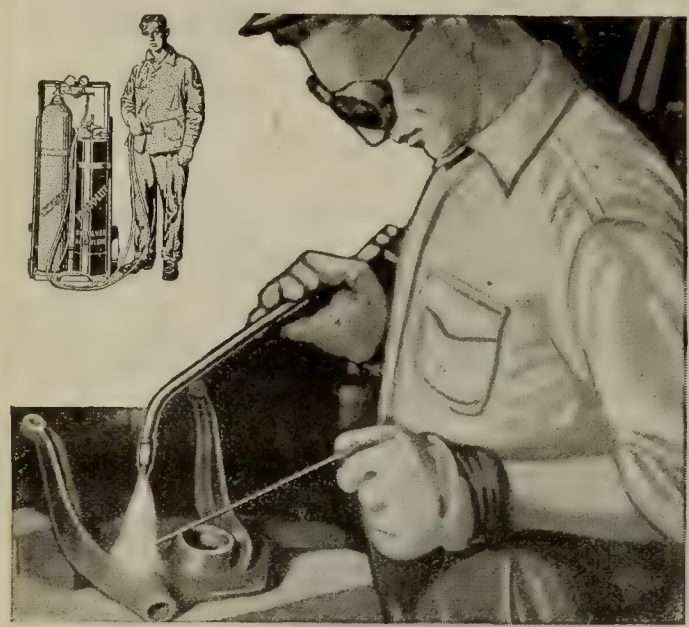

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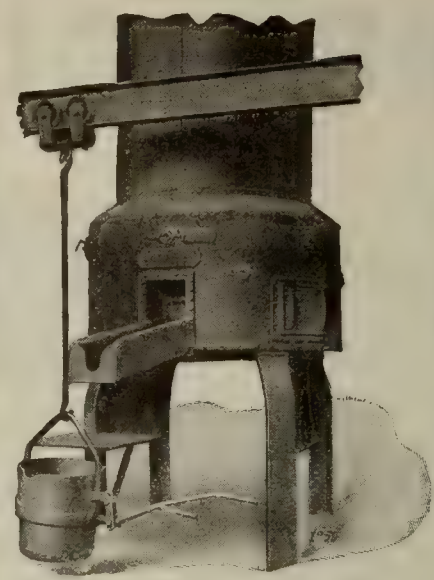

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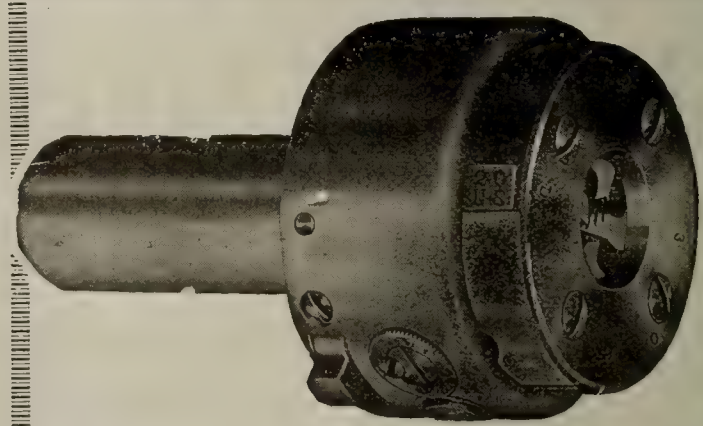

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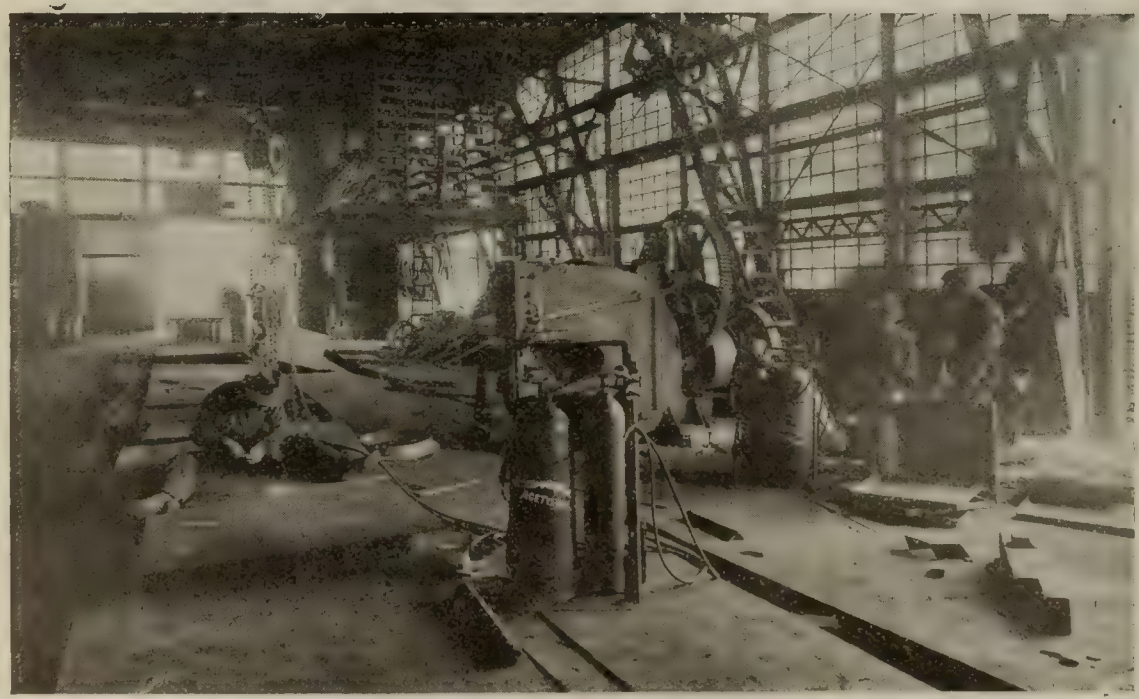

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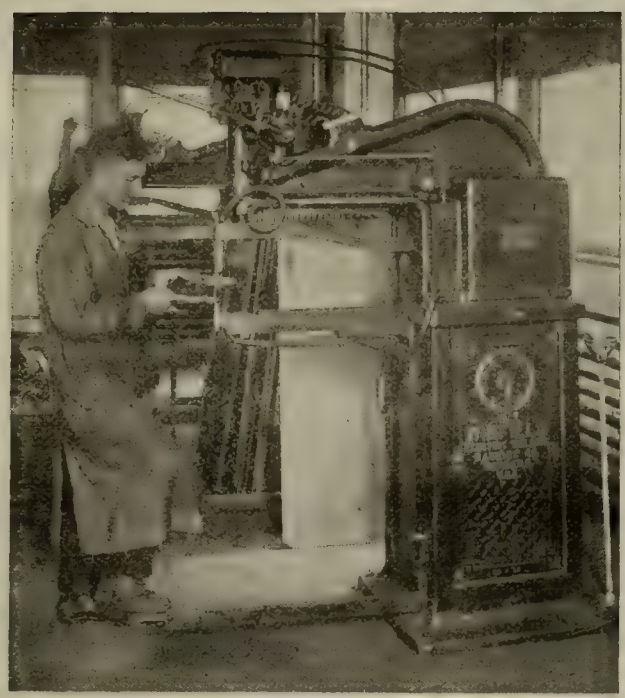

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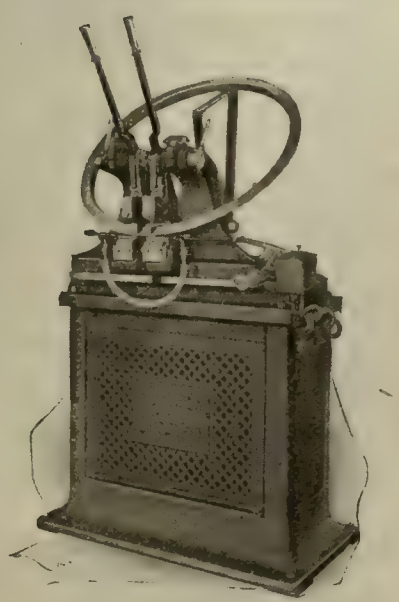
The Winfield Way Makes Good on Stoves and Office Furniture

AND the "Winfield Way" will make good for you, too,—no matter whether you weld sheets, tubes, angle irons, or what not—as it has made good for a host of satisfied customers.

Winfield Welders are made to make good! Their construction and design have been perfected by exhaustless experimentation. Their operation is simple; they consume little power, heat rapidly and uniformly and perform their work quickly and economically.



The range of work possible with a Winfield Welder can only be realized when you understand that we are able to offer a machine for every conceivable sort of metal spot or butt welding.

Whether you operate a small job shop where the work varies in form and shape, or a large shop where much duplication work is necessary, there is a Winfield Welder for you—ready to point the way to untold savings of time and labor.

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Mr. Bruce's Counsel

SPECIFICALLY APPLIED, MR. BRUCE'S COUNSEL may be said to recommend that business men should read every week THE FINANCIAL POST OF CANADA, to inform themselves concerning current events in the realm of Canadian business and public affairs.

Frank E. Mutton, Vice-President of the International Time Recording Company, of Canada, wrote the following letter to the publishers of THE POST:

Attention, Editor:

Recently we sent you a subscription covering the delivery of THE FINANCIAL POST to each of our Sales Agents and Salesmen throughout Canada. This was prompted by the fact that, in our opinion, your paper is the best barometer in Canada of what is going on in the different industries from one ocean to the other in this country. Your paper contains information invaluable to any traveling representative of any firm.

(Signed) F. E. MUTTON.

Dated Oct. 12, 1917.

IN effect, THE FINANCIAL POST represents a Current Events Club, met weekly for the consideration and study of current affairs in Canada in relation to itself and the world at large. It represents the assembly of many, many surpassingly well-informed contributors who discuss intelligently, lucidly and proportionately, Canada's public and business affairs. No more stimulating and worth-while paper is published in Canada for the man who wants to be able to talk confidently, at the club, luncheon, board meeting, business council, public meetings, about Canadian public affairs.

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Talk Current Events

A Talk by H. Addington Bruce, Author of "The Riddle of Personality," "Psychology and Parenthood," Etc.

WHAT do you know about the doings in this great world wherein we live?

Do you try to form a really intelligent and well-considered opinion regarding events the world over?

Do you ever discuss their significance with friends and neighbors?

If asked what you think of any particular event, you are perhaps ready with an answer. Is your answer anything but a snap judgment, determined by prejudice rather than by reasoning analysis?

I put these questions not to be disagreeable, but because, if necessary, I want to spur you to appreciate the value that there is in discussion of current events.

Many people, fortunately, appreciate its value instinctively. Perhaps you are one of these. Many others are beginning to appreciate it.

This is shown by the growing popularity of clubs and classes on current events.

Only a few years ago such clubs and classes were almost unheard of. To-day most of our bigger cities have half a dozen of them or more.

In one city—Boston—a talented woman of my acquaintance draws an income of thousands of dollars a year from her leadership of current events classes.

Other men and women have similarly discovered that interest in current events is increasing so rapidly that they can well afford to organize classes like those conducted by the Boston woman.

Still, there remain many people—thousands of people—who never discuss current events. Many thousands more discuss only such events as come under the headings of "crime," "the theatre," and "sports."

These are the people I want to reach. They are the people I want to rouse to recognition of the practical helpfulness they will find in discussion of current events in general.

Current events clubs and classes might well be organized in every neighborhood, with weekly meetings to take up the outstanding happenings in international affairs, national politics, literature, art, music, science and industry.

Regular attendance at, and active participation in, these meetings will prove to be an education in itself.

It will enlarge the mental horizon and broaden the moral sympathies. By disciplining the mind to active thought it will raise the level of workaday efficiency.

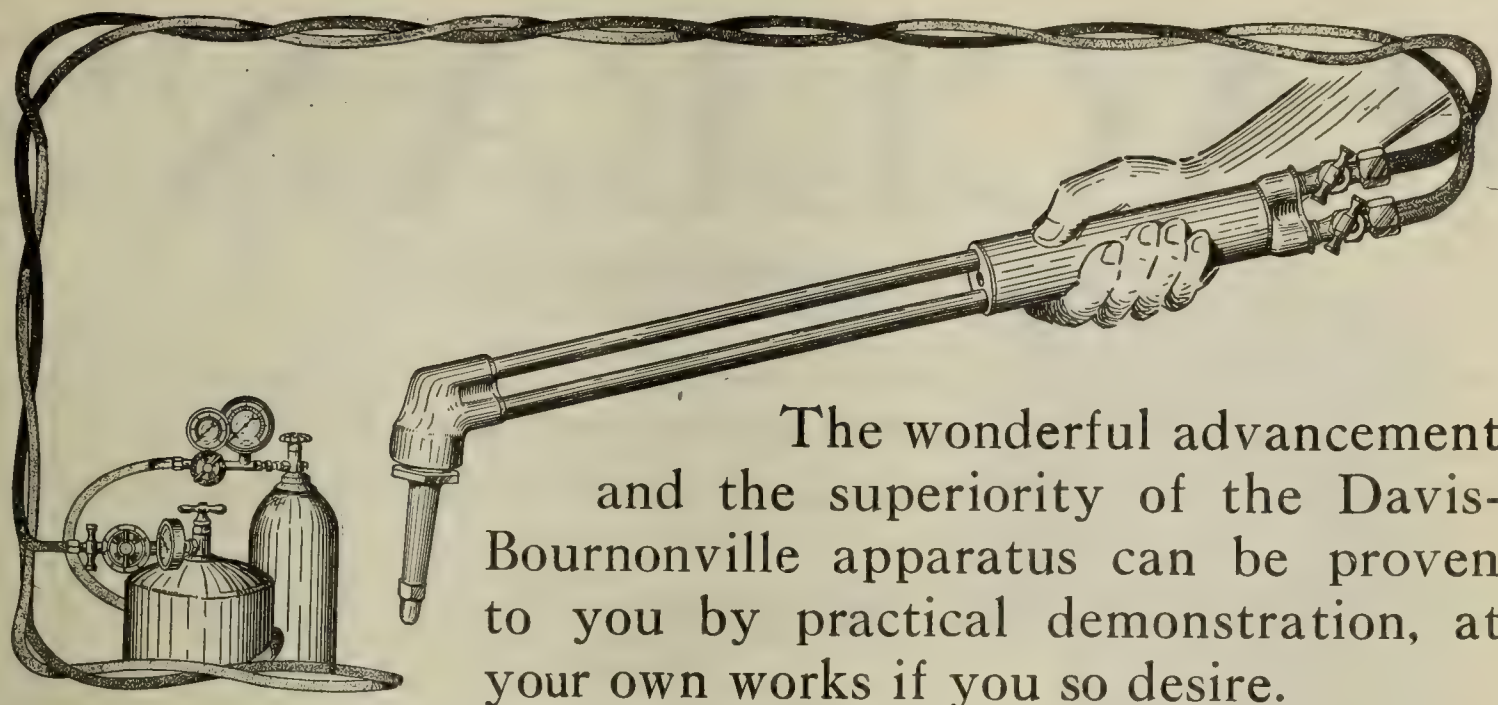
It will make for a more alert, a more conscientious citizenship. It will give zest and color to a life which perhaps has hitherto been pathetically drab.

Unsuspected powers will be awakened. With a better grasp on the realities of life, the whole personality will expand.

One evening a week is certainly not too much to give to a discussion of the day-to-day developments in our wonderful world.

It may mean doing without an evening at cards or at the musical comedy, or at the dance hall. But this, after all, is not a terrible sacrifice.

And from the occasional talk over current events will come more profit than could possibly come from any number of evenings spent in card-playing, dancing, or listening to musical comedies.—Reprinted from the Toronto Daily Star.



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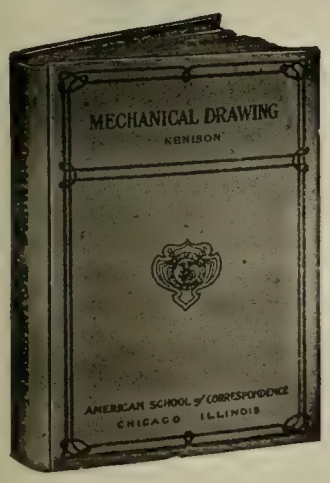

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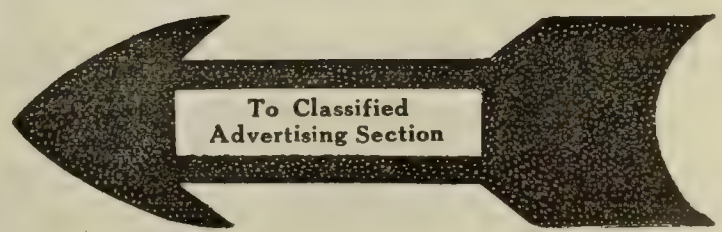

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MACLEAN'S

for DECEMBER

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Snipers and Sniping—*by a Sniper*

A SNIPER is back in Canada—a star sniper, who has 34 marks on his rifle, every mark meaning a German life. Most of us know absolutely nothing of the work of the sniper, but the story—a remarkable one—is told in the Christmas (December) MACLEAN'S by the champion sniper of the Canadian Expeditionary Forces. This man was buried by a shell-explosion, was dug out by two comrades, and he has lived to tell us his wonderful story, in MACLEAN'S. It's worth 15c to get this story alone.

"Politics From Within"

--Leacock, of Course

TRUST Leacock to see a chance for his witty and humorous pen. He deals with the humorous phases of electioneering in Canada in his usual vein.

Why Laurier sent Troops to South Africa

THIS contribution, by Col. John Bayne Maclean, goes backward many years—to the time of the South African War in 1899-1900. That was when Canada first took up arms for the Empire. Politics, of a high order, was back of the decision to send Canadian troops to the Antipodes. It is "inside" history.

Oppenheim—Allenson—McBeth—Mumford

A LONG instalment of **Oppenheim's** absorbing story, The Pawns Count, is given in the December MACLEAN'S. A short story, by A. C. Allenson is seasonable. Madge McBeth contributes a complete novelette, The Man Who Wasn't. And Ethel Watts Mumford, teller of delightful tales, delicately told, gives us the first of a series of short stories—Love and the Locksmith.

The Usual Popular Departments

THE Business Outlook, The Nation's Business, Women and Their Work, and the Review of Reviews—all are present in strong way in the December MACLEAN'S.

At All News-Stands 15c.

Gadsby's Story of the Union Government

GADSBY is saturated with Ottawa knowledge—much of it of the inside variety. He pokes about, talks with big men; and big men, and lesser ones, talk with Gadsby. Useful sort of man, is Gadsby. What he hears and learns he writes about for MACLEAN'S; and in this story of his about the new Union Government, he reveals the undercurrents on the movement that developed into negotiations, and which finally resulted in a Union Government. Gadsby adds interesting biographical information to his brilliant study.

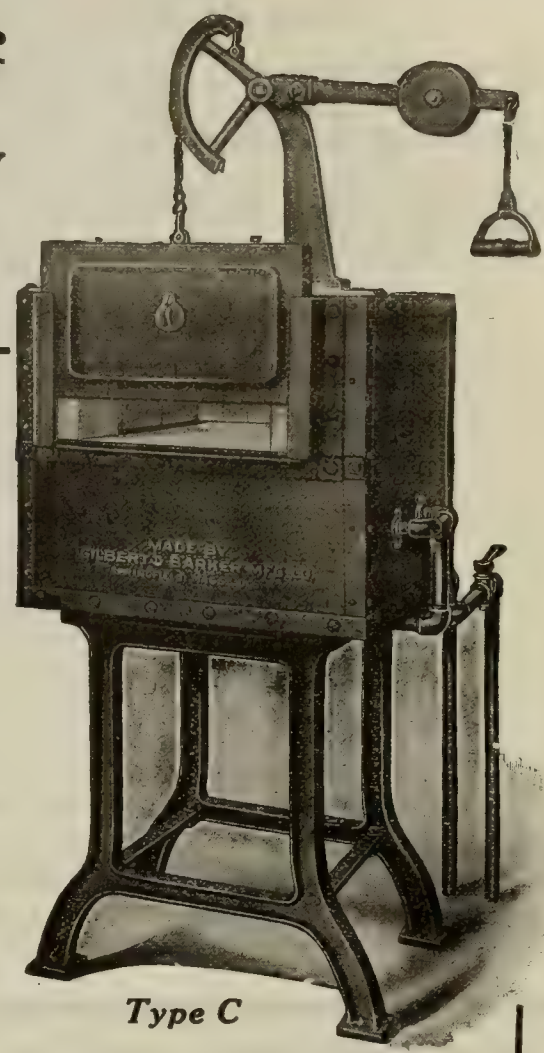
Robt. W. Service is back again

BACK in MACLEAN'S, that is—in body, he is still in Flanders—where the fighting grows uglier all the time. Service has taken time to write verse for MACLEAN'S. You know well the virility of his style, and the gripping, human character of his verse. It is about life and men in the trenches he writes—about our boys far from us. It is worth something to see our boys as Service sees them. Read "The Shape at the Wheel" in the December MACLEAN'S.

Arthur Stringer writes a Beautiful Christmas Poem

STRINGER is a wonderful man—wonderfully versatile, wonderfully human. He is a master of the short-story and of the detective and mystery type of story; and he can climb the heights of literary endeavor, as he has in this passing sweet poem—Christmas Bells in War-time. Your heart is tender these times of horrible slaughter and of heroic achievement, and you'll be grateful to Stringer for putting beautifully your innermost thoughts and feelings.

There is a half-century of experience back of every G. & B. Installation



Type C

THE benefit of this long experience, which includes a thorough working knowledge of fuels, combustion and heat-treating methods is yours, whether you instal **one** Gilbert and Barker furnace or a **hundred.**

This should mean a great deal to you if you contemplate installing furnaces.

Gilbert and Barker furnaces are known for their dependability, wherever they are used. The experimental stage in their construction has been long passed. Year in and year out they give unequalled service to their users. It will pay you to investigate them. Our Engineering Department will gladly advise you.

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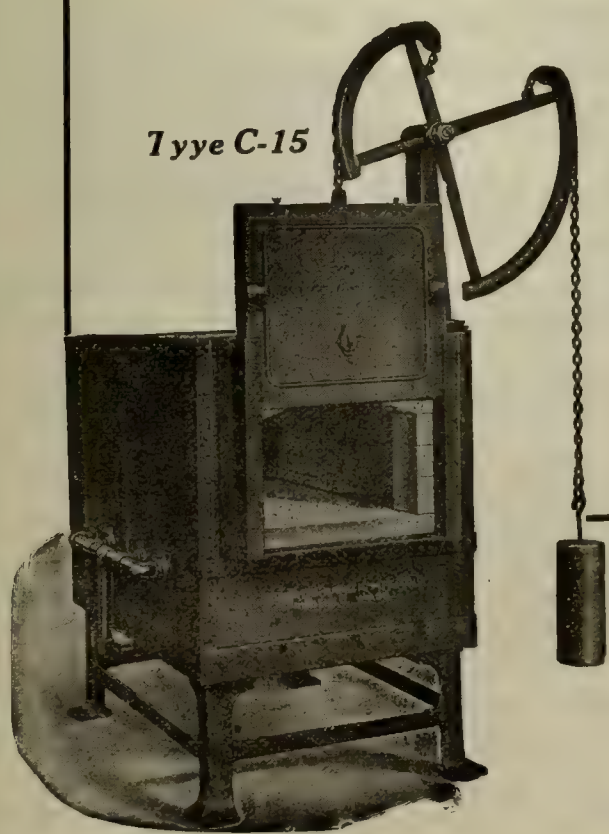
Tyye C-15



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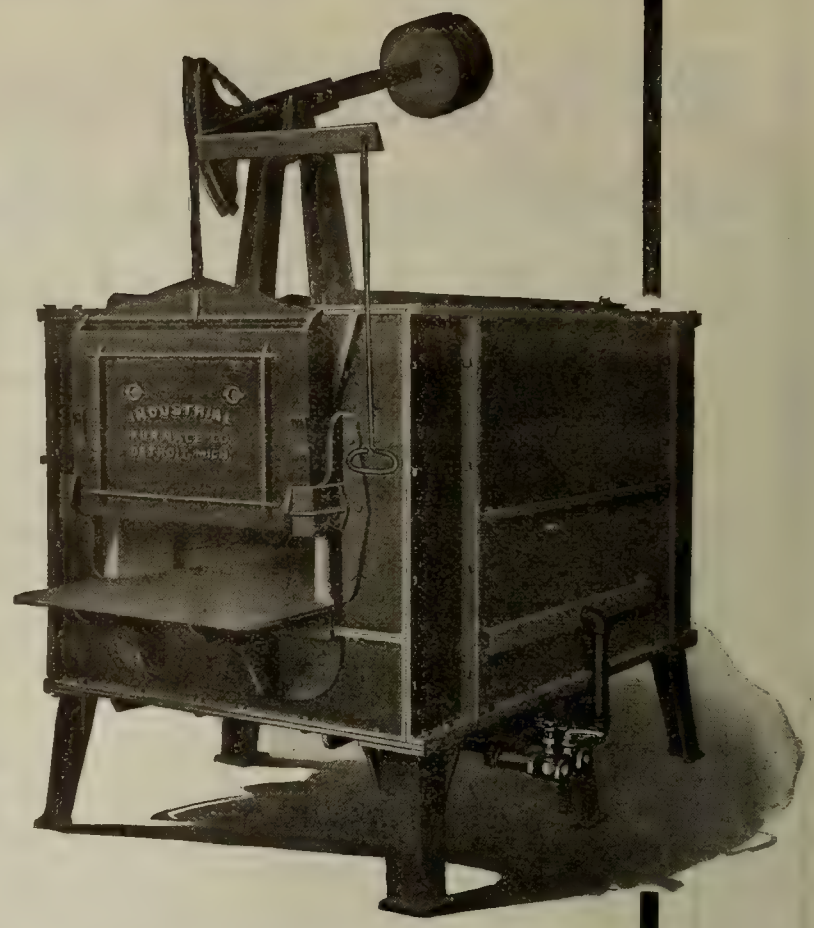

This, our semi-muffle design, is for heating, case-hardening and annealing. Perfected combustion precludes the formation of oxidizing elements. The flame, not visible in the muffle, does not come in contact with the material. Practically no scalding possible.

A remarkable fuel economizer, for it heats up rapidly and holds heat long after burners are shut off. Bellevue illustrated catalogue gives full particulars.

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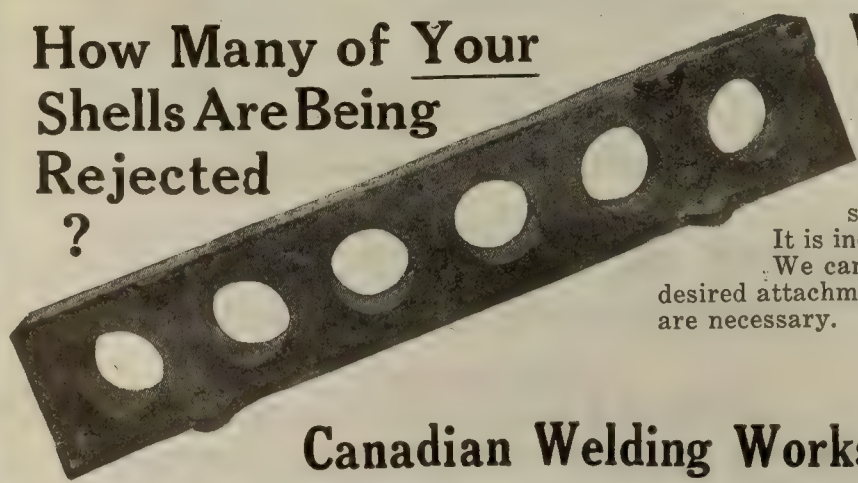

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It is indestructible and fool-proof. Made for all sizes of shells. We can make this jacket to any special dimensions, with any desired attachments. No patterns are required—specifications all that are necessary.

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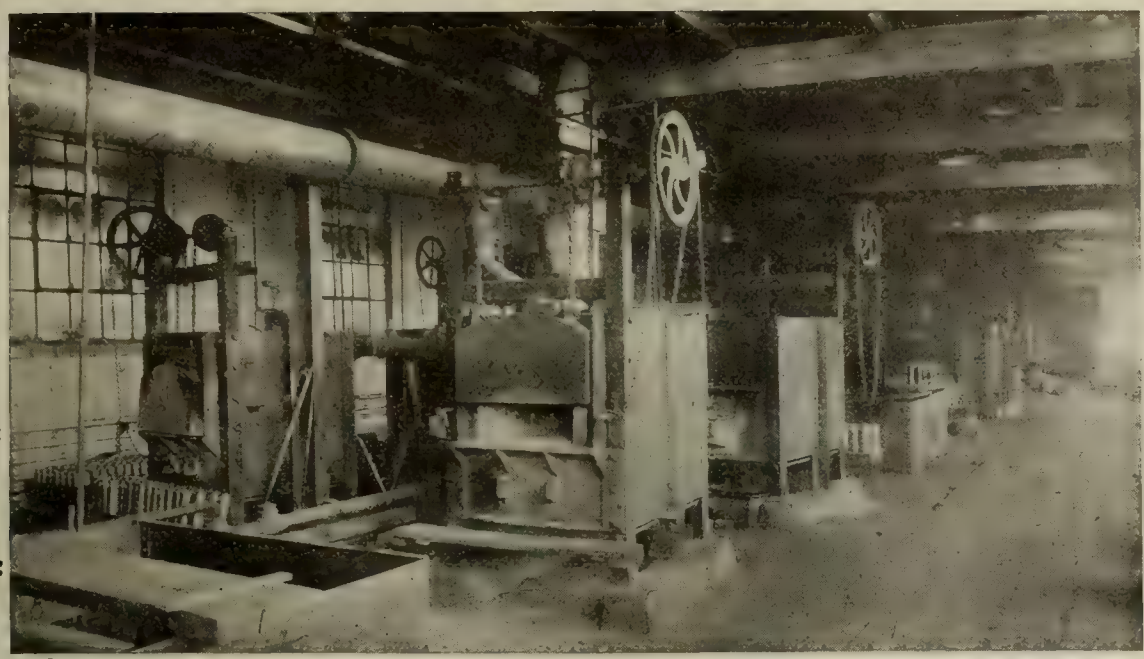

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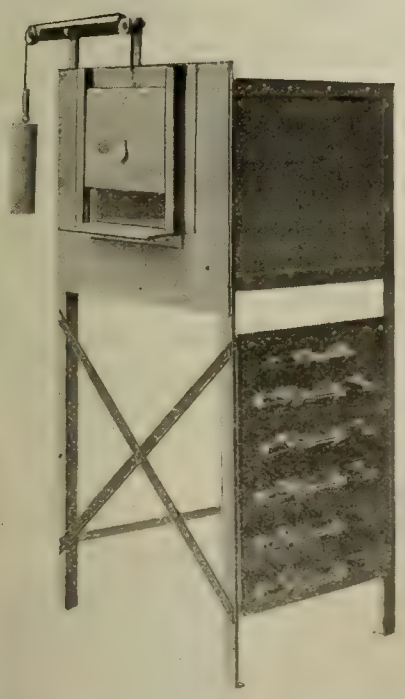

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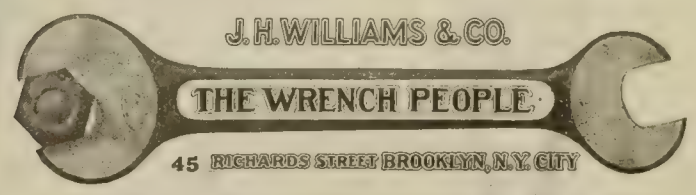
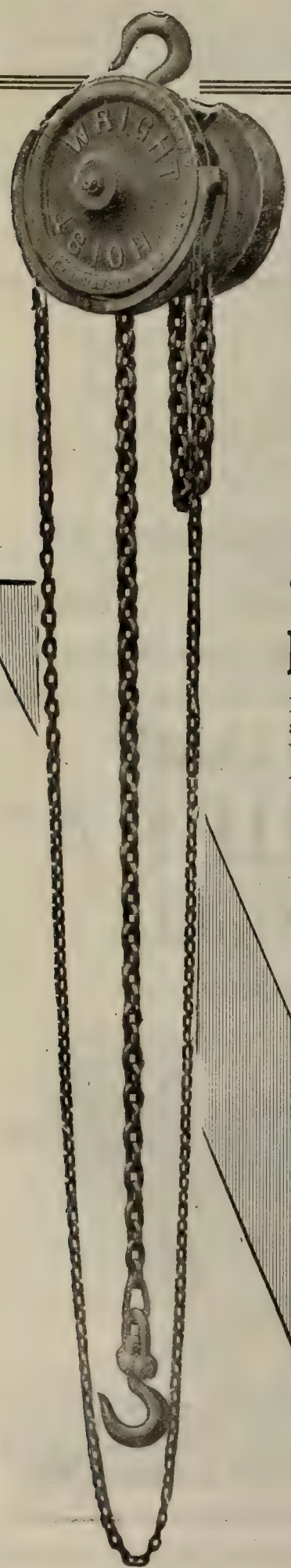
The Threading Tool with lockable spring head will do roughing, finishing and threading at one setting of the tool post.



Outlast and Outlift
Any Other Hoist



EVERY day Hoists are broken, materials and machines are damaged, time is wasted, money is lost, men are seriously injured—all because this or that man in charge did not know that **cast iron** for the working and load-lifting parts of a hoist is never reliable.

On the other hand, you probably know as well as we that the working and load-sustaining parts of a hoist must be **strongest malleable iron** and **strongest steel**—or danger is ever present.

Knowing this beforehand, to you doubly regretable would be a serious hoisting accident in your plant.

"Steel Hoists Never Break"

Ranging from 1 ton to 20, Wright Hoists are steel and malleable iron in every working and load-lifting part.

And the Wright Hand Chain pulled from any angle cannot foul or catch.

Do not pay Experience in money and regret for knowledge that is already yours. Instead, use Wright high-speed steel hoists that never break; that outlast and outlift any other hoist.

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High Speed Steel Hoists

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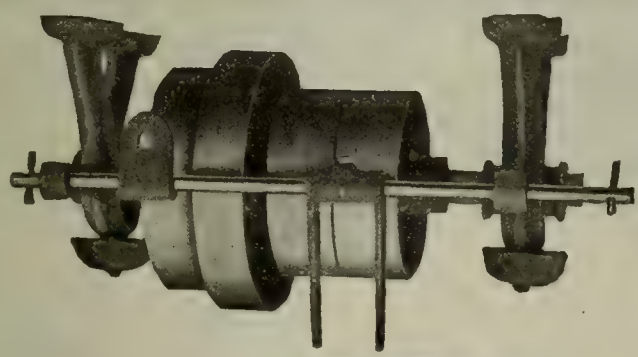

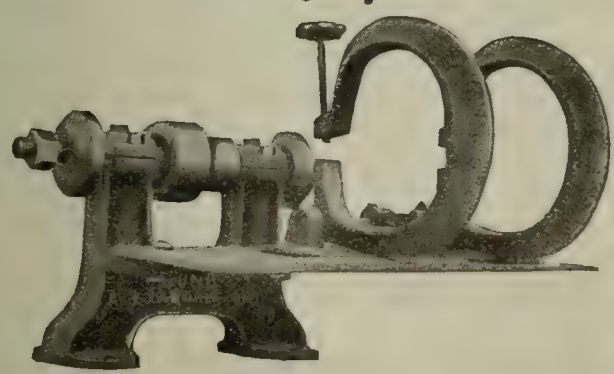

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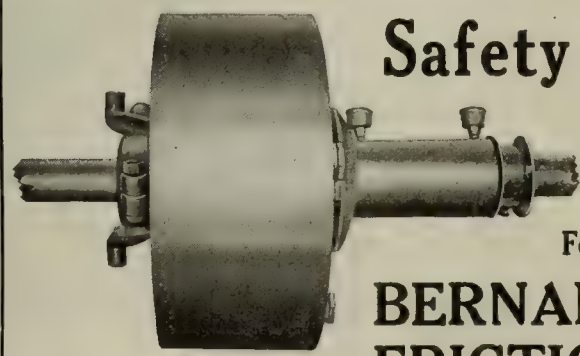

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Discard dangerous clutches that are a constant danger to life and limb of the workmen engaged in their vicinity. A safe, simple and reliable substitute will be found in the Bernard Friction Clutch—use it and you will be applying the good axiom "Safety First" in your shop.

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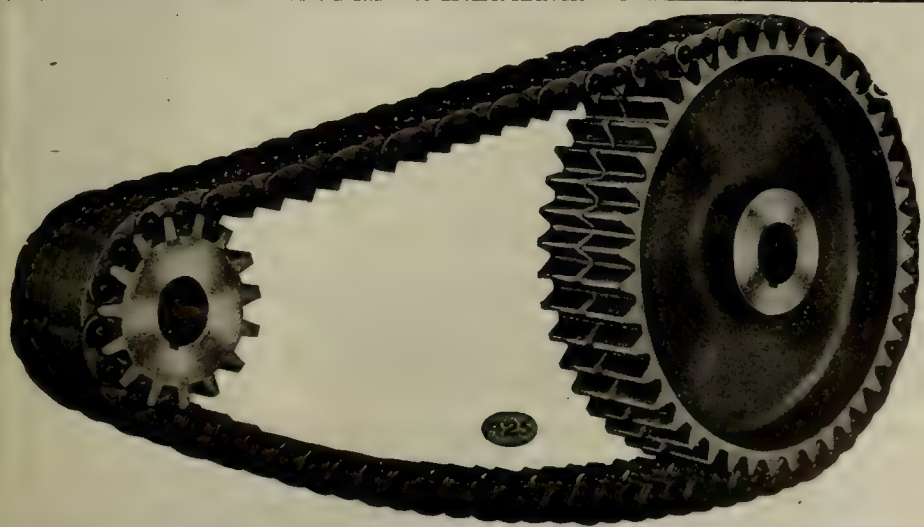

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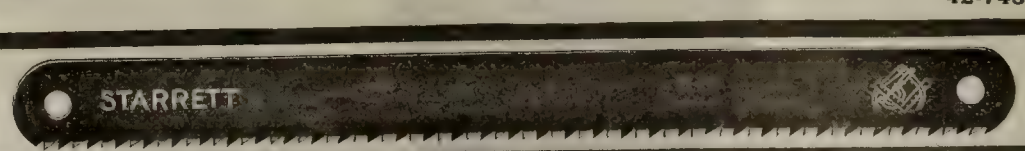

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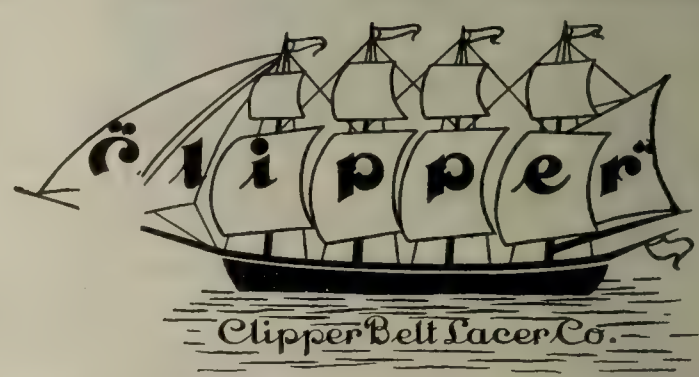

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Each day you put off sending for the "Clipper" Belt Lacer for 20 days' trial, you are running the risk of an expensive shut-down.

Three minutes is the maximum time required to lace a broken belt with the "Clipper" Belt Lacer.

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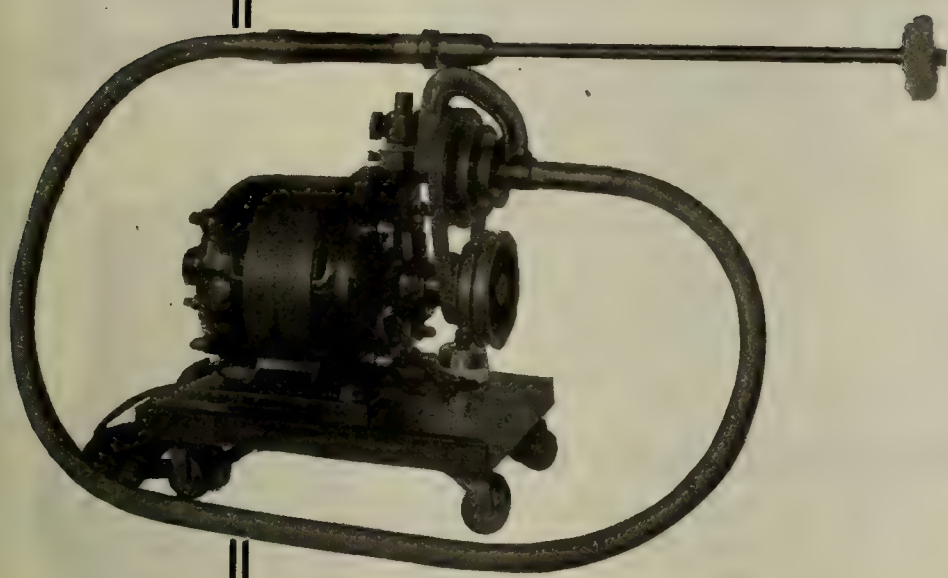
976 Front Avenue Grand Rapids, Mich.

Clean Out Shells



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Three-speed countershaft and belts prevent overloading of the motor.

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The Strand Flexible Shaft with metal casing outwears any other shaft and gives none of the trouble common to ordinary flexible shafts.

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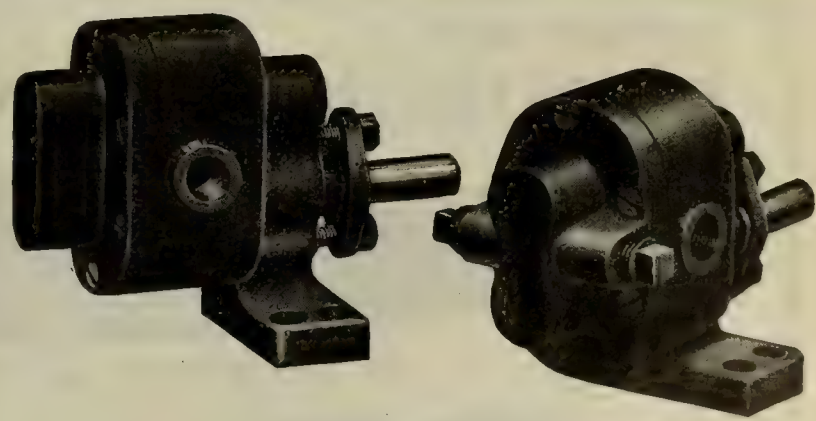
Wood or Steel, let Cummings make it.



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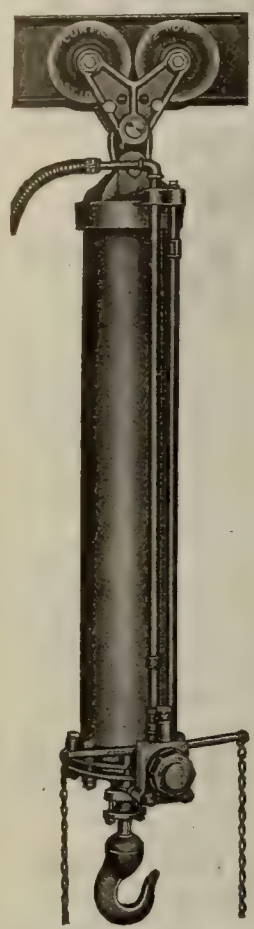
Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

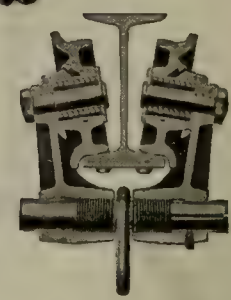
Inquire. You will get valuable information anyway.

C. F. ROPER & CO.

Hopedale : Mass. : U.S.A.

If interested, tear out this page and keep with letters to be answered.





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AIR COMPRESSORS — AIR HOISTS — TROLLEYS AND TROLLEY SYSTEMS—SAND BLASTS—PNEUMATIC AND HYDRO-PNEUMATIC ELEVATORS—JIB AND TRAVELING CRANES.

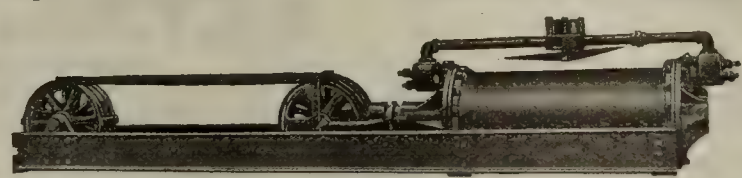
We have specialized for over 22 years on pneumatic machinery. We have developed the simple air cylinder into a straight line motor with wonderful speed control and dependability capable of the widest application to hoisting problems.

Our new controlled-splash oiling system with regulatable sight feed cylinder oiling is something entirely new in air compressor design.

Complete catalogs and descriptive circulars on our entire line furnished on request.

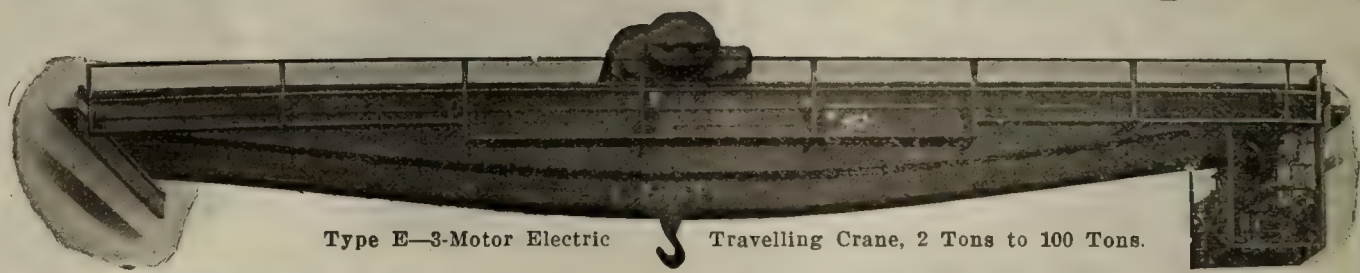
Curtis Pneumatic Machinery Co.

1585 Kienlen Avenue - St. Louis, U.S.A.
New York Office - 532F Hudson Terminal



CANADIAN MADE **CANADIAN MADE**

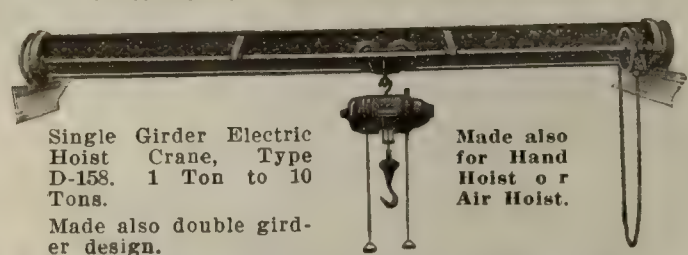
Electric and Hand Traveling Cranes



Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons.

Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons.

Made also double girder design.

Made also for Hand Hoist or Air Hoist.

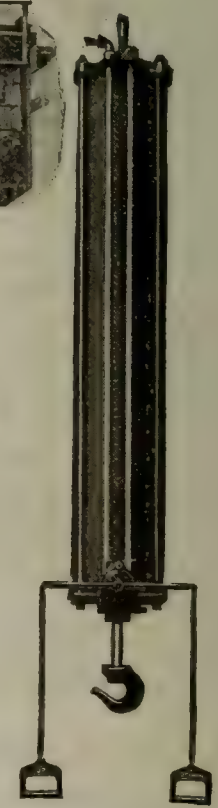
Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

Type D Electric Hoists —½ to 10 Tons.

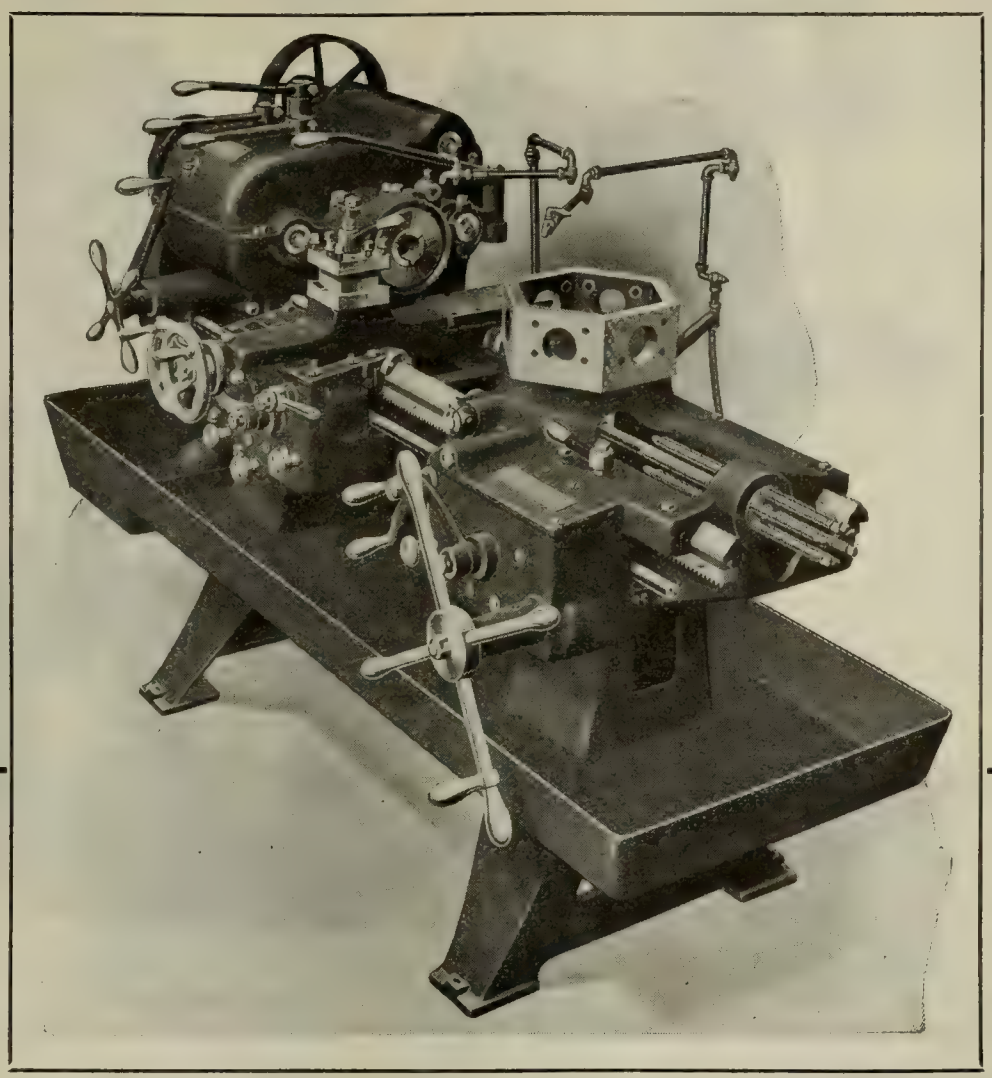
Air Hoists, Trolleys and Tracks.



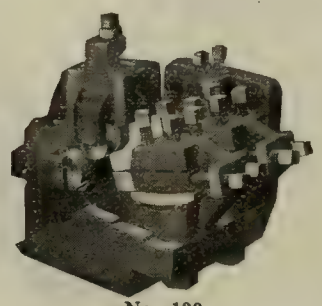
Type No. 20 Air Hoist.

Northern Crane Works, Limited

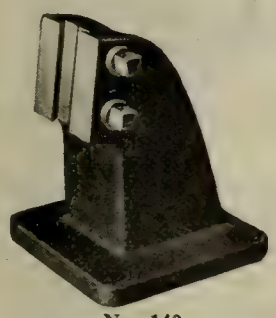
Walkerville, Ontario, Canada



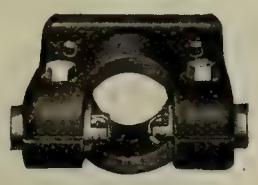
No. 138
Single Cutter Turner



No. 139
Multiple Cutter Turner



No. 149
Rear Forming Tool Holder



No. 143
Knurling Tool

Bar Equipment

These are only four of the many standard tools that substantiate the claim of the designer that the 1-B Universal Turret Lathe is the biggest producer of bar work of its class and size.

Note the rigidity of the Single Cutter Turner, and in connection herewith consider the effect of rigidity on production, also the time-saving effected by the graduated dial in setting the tool.

The Multiple Cutter Turner is the big time-saver on lighter work. As shown in the cut, it can carry four cutters and a drill for simultaneous operations, but on special order it can be equipped to carry six cutters and a drill, making seven cutting tools in all.

THE COMBINATION OF FOSTER MACHINE AND FOSTER TOOLS—MAXIMUM PRODUCTION.

Please note, however, that this applies to all of the general machines built by

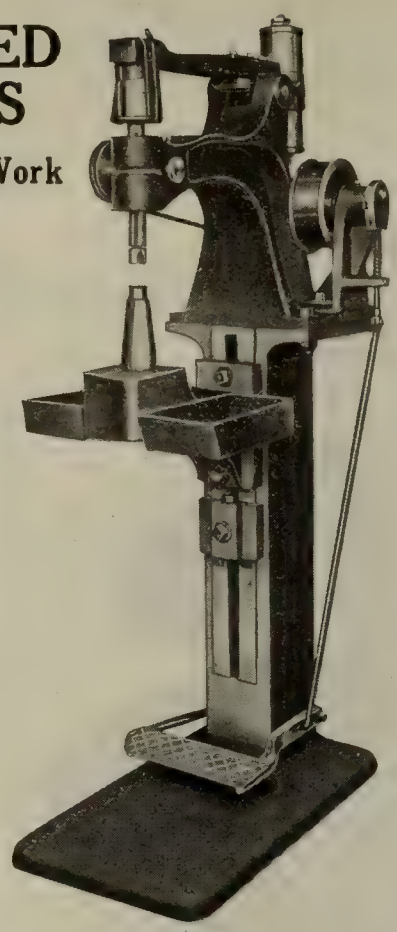
FOSTER MACHINE COMPANY

Elkhart, Indiana

HIGH SPEED HAMMERS

For High Speed Work

FEATURES:



Economy in floor space, elimination of weight and a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushings are used throughout.

No riveting too intricate for us; no riveting which our machine cannot accomplish.

Send for our **High Speed Hammer Book.**

THE HIGH SPEED HAMMER CO.
Rochester, N.Y.

Sales Agents: The A. R. Williams Machinery Company, Limited, Toronto, Ontario.

"ERIE" STEAM FORGING HAMMERS

are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

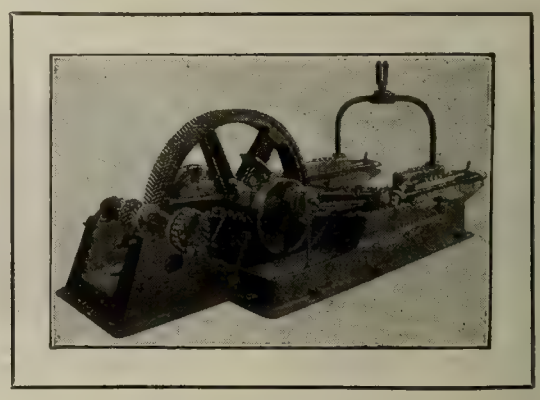
ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U. S. A.

SHEET METAL STAMPINGS

The quality of our production is one grade — THE BEST. Our facilities and equipment enable us to give a very attractive price and prompt service.

Dominion Forge and Stamping Co., Limited
WALKERVILLE, ONTARIO

DROP FORGINGS



ELMES

18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

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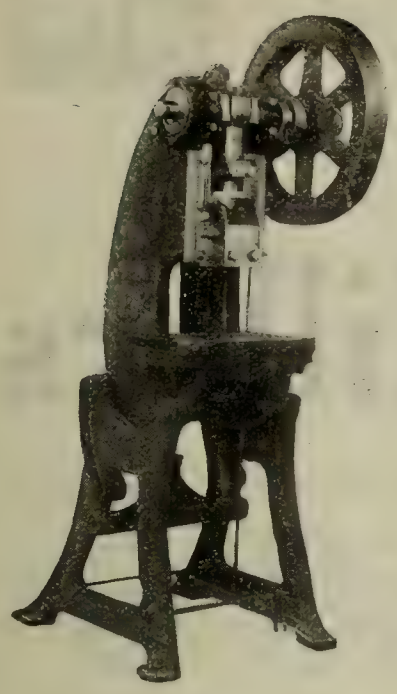

Consolidated Presses

appeal to discriminating users because of the massive construction of all working parts, the generous crank shaft bearings, the increased diameter of crank pins, liberal crank cheeks, long and carefully fitted slide bearings, abnormally large connection screws, powerful gearing, and above all, the skill and care exercised in their construction.

These are features which should be considered when purchasing.

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Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

Her Sure Touch

Her deep-rooted desire to do thoroughly whatever work is expected of her makes

WOMAN

ideally fitted for operating the Grant

Silent Riveter

Instead of nerve-racking, hammer-like blows; with this Grant Rotary Rivet Spinning Machine there is absolute quiet. Noiseless twin rolls, revolving independently of each other, roll heads on the rivets under pressure. One rivet every second, and never a bent shank, whether rivets are soft brass or hard steel. Heads finished perfectly smooth, show no mark of the riveting tool.

Thousands of articles now being riveted on Grant Noiseless Riveters. **Write.**

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Mfg. and Machine Co.

BRIDGEPORT, CONN., U.S.A.

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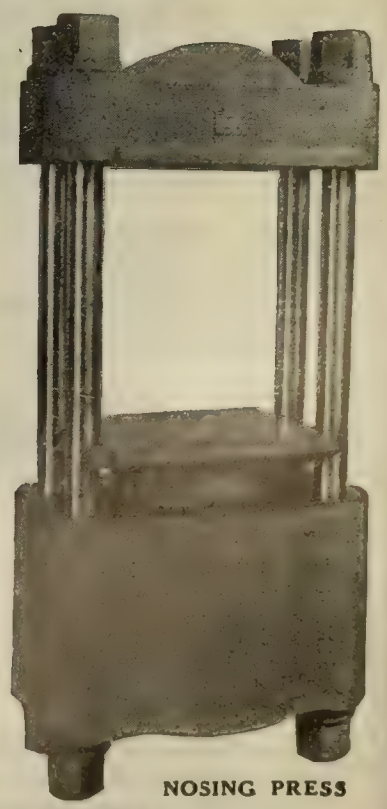
Pumps and Accumulators

FOR ALL PURPOSES

Made in Canada



NOSING PRESS

WILLIAM R. PERRIN, Limited

TORONTO

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Bilton Gear Millers

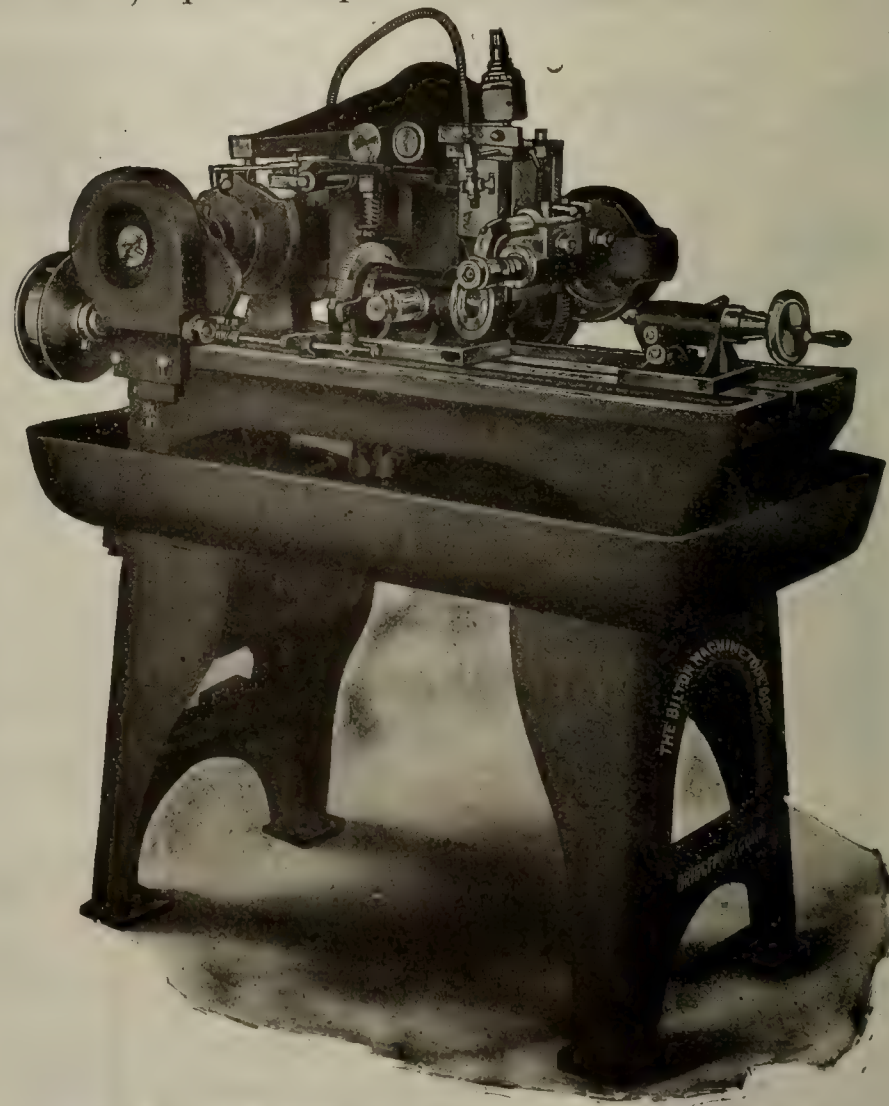
MACHINE TOOLS Bilton BRIDGEPORT

MACHINE TOOLS Bilton BRIDGEPORT

For your shop—if every working hour must deliver a predetermined quantity of output beyond the ordinary;
If the cutting of spur and bevel gears, taps and form work must be absolutely accurate.
In the never-varying service of Bilton Gear Millers you will realize satisfaction wholly unusual.
The cutter of a Bilton Gear Miller is actually removing metal 90% of the time. And while on its return stroke, lifted clear of the work, the indexing is done automatically.
Moreover, any angle from the horizontal to an angle of 90 degrees is accurately milled.
For *guaranteed* estimate of Bilton Gear Miller performance on your output, send us blue prints of your work. Or send a few blanks for us to finish, in which case we can show you the quality of Bilton work as well as positive proof of time saved.

Also Manufacturers of—
- Plain Horizontal Millers
- Automatic Millers
- Plain and Ball Bearing
- Bench and Column Drills
- Riveting Machines
- Milling Cutters

Catalog 30 on request



The Bilton Machine Tool Co.

Succeeding The Standard Mfg. Company

Housatonic Ave., Bridgeport
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Foreign Agents:
- Alfred Herbert, Limited
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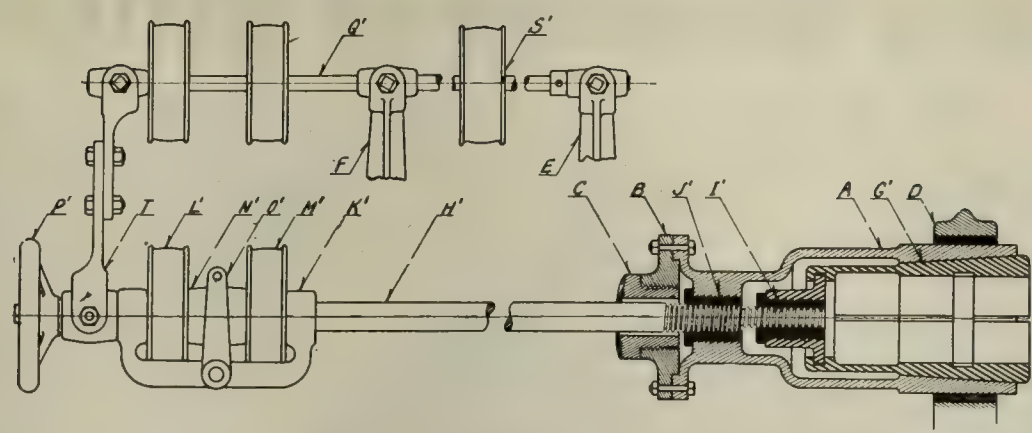


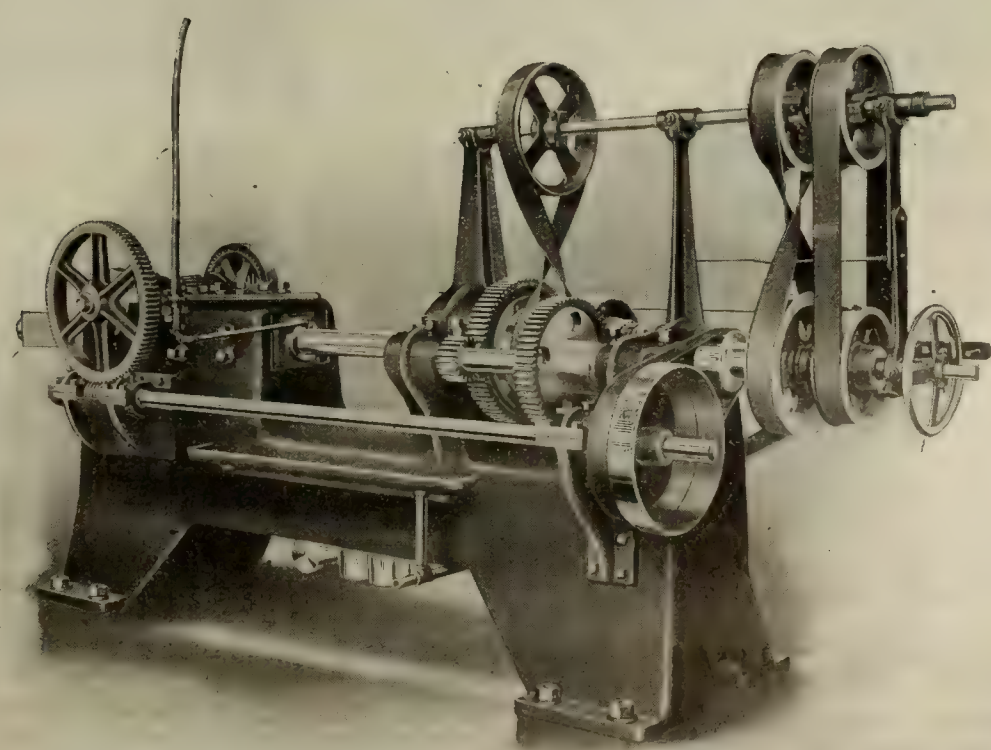
6" Boring — 75 Rough 100 Finish

10 HOUR DAY

A close study of the above chuck will reveal strength that enables this machine to give this production *all the time* in 10 hours. The illustration below shows the wonderful sturdiness of the machine. Inquire of us. The prices are exceptional. Made in Canada.

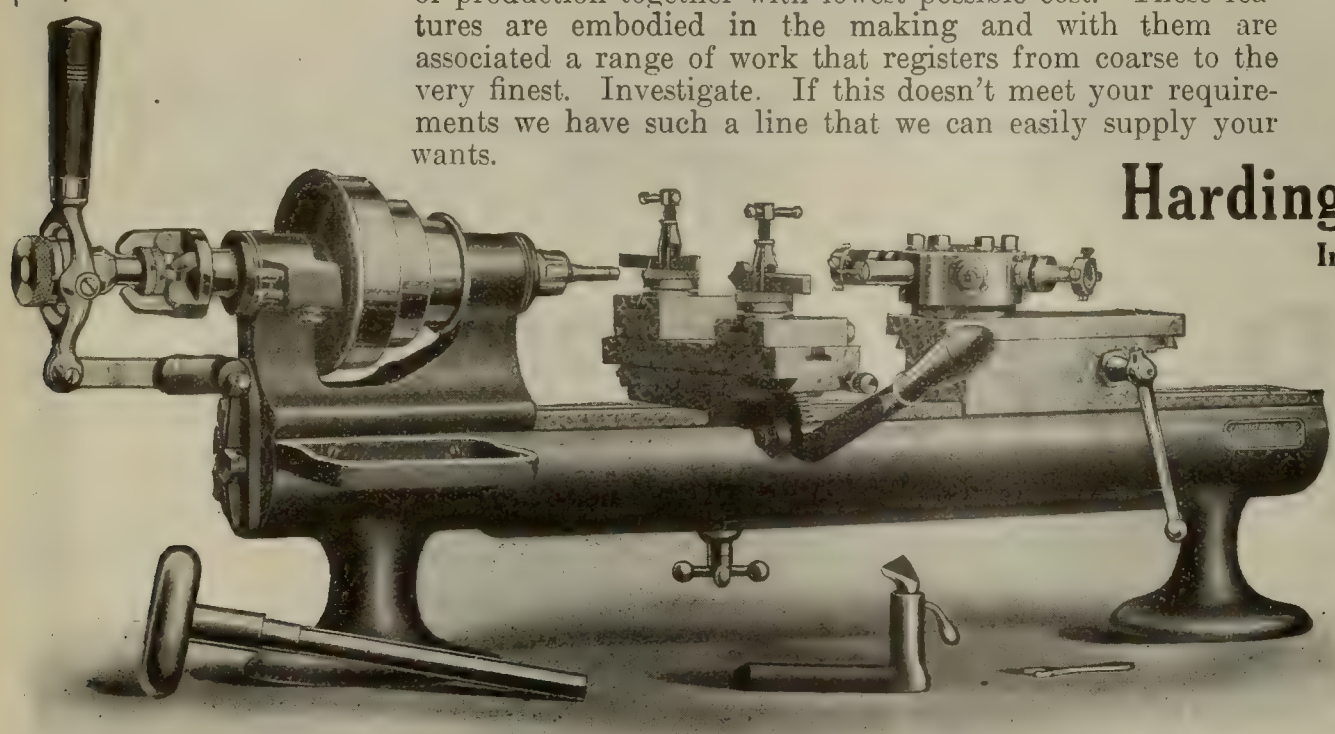
The Plessisville Foundry

PLESSISVILLE, QUEBEC



If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.



Hardinge Bros.
Inc.
1770 Berteau Avenue,
CHICAGO
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Two Cuts at One Time

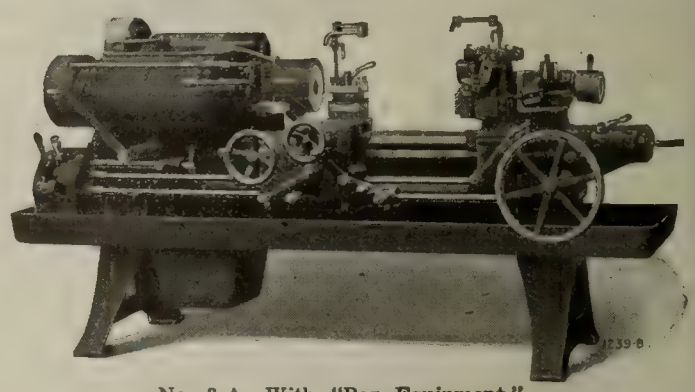
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

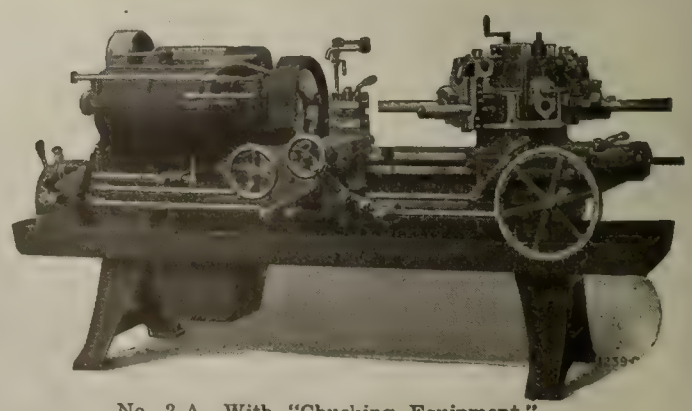
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



No. 2-A—With "Bar Equipment."

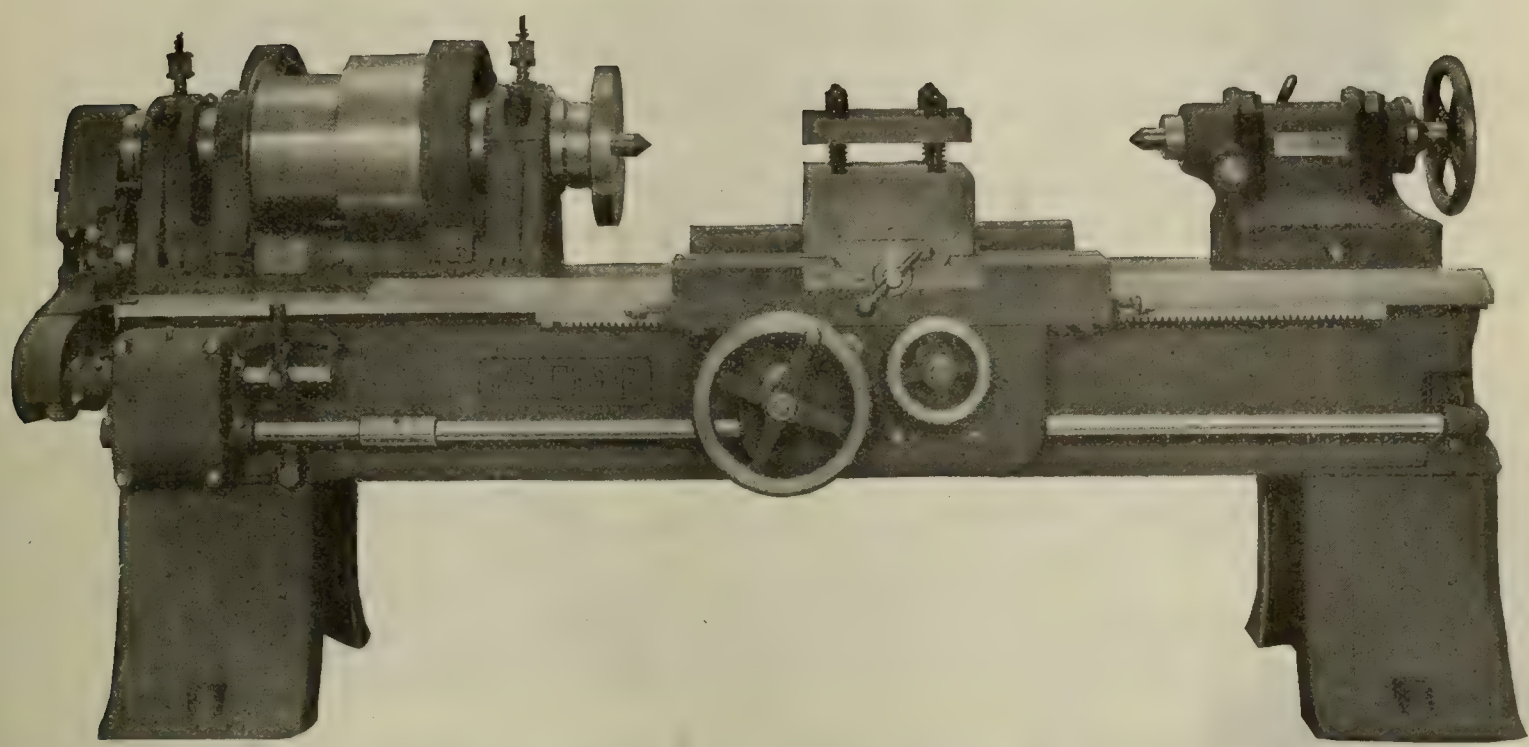


No. 2-A—With "Chucking Equipment."

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal, Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia

PETRIE Heavy Duty Manufacturing Lathe—*20-Inch Swing*



A Heavy Simplified Lathe for Rapid Production Work

Designed and built especially for Machining High Explosive and Shrapnel Shells up to and including 8-inch. Used and Endorsed by many of the Largest and Most Successful Shell Manufacturers.

DESCRIPTION

HEADSTOCK All Headstock journals are provided with well lubricated, , renewable bronze bearings. Alternat heat treated steel and bronze washers take the end thrust and a simple adjustment is provided to take up wear. All gears are covered with neat and substantial cast iron guards that may be quickly removed when desired.

BED The Bed is of deep construction and width to give the greatest rigidity under heavy cuts. The shears are made extremely massive and the bed walls extra thick, providing the necessary mass of metal to absorb the vibration and shocks incident to heavy turning at high speeds. Heavy box girths tie the front and rear walls of the bed together at close intervals. Improved type wide angle V on front shear to take thrust of cutting tool. The rear bearing of carriage on bed is flat instead of V-shaped. At the rear of the bed planed pads are provided for attaching Taper and Forming Attachments.

CARRIAGE The bridge is very wide and extraordinarily deep; it will not spring under the heaviest cuts. The carriage is gibbed to the bed at the rear on the outside and will not lift under any conditions.

APRON The apron is of heavy double plate type affording a support or bearing to both ends of all shafts. Apron is tongued and grooved to the carriage, also bolted and dowelled. The feed friction has a greatly increased diameter and will pull the heaviest feeds and cuts without slipping. For engaging the friction a hand wheel several inches in diameter is provided and seats the friction firmly with very small effort on the part of the operator. All studs in apron revolve and simple but adequate oiling facilities are provided.

FEEDS Positive Gear drive through headstock spindle, steel gears in gear box, three rates of feed are provided for through sliding key type. Feeds per revolution of spindle being 1/8 in., 1-16 in. and 1-32 in. All gears in the feed train are fully guarded.

TAILSTOCK The tailstock is a massive casting, rigidly braced internally, and is provided with a long nose, making it unnecessary to extend the tailstock spindle for ordinary work. It is clamped to the bed by four large locking bolts operated at the top of the barrel. A simple binder locks the tailstock spindle in correct alignment; this clamp is located at the extreme front end, where it grips the spindle with the utmost rigidity and absolutely does away with distortion of any kind. The screw is unusually large to resist any buckling tendency. Suitable screws are provided for setting over for Taper Work.

EQUIPMENT Unless otherwise specified Lathes are furnished with 8 ft. bed, one driving plate, hand cross feed, heavy duty plain rest, necessary wrenches, and two-speed tight and loose countershaft. Forming attachment, turret tool post, hand or power feed bed turret, oil pan, pump, and connections can be furnished as extras when desired.

DIMENSIONS

Swing over bed	20 in.
Swing over carriage	11 in.
Length of Bed Standard	8 ft.
Distance between centres 8 ft. bed	40 in.
Width of bed overall	19½ in.
Height from floor to centres	40 in.
Dimensions of front spindle bearing	4 15/16 in. x 6¾ in.
Dimensions of rear spindle bearing	4 in. x 5½ in.
Diameter Nose of spindle	4 in.
Hole through spindle	1 5/16 in.
Diameter Tailstock spindle	3⅜ in.
Travel of Tailstock spindle	6 in.
Morse Taper—Centers	No. 5
Width of Tool Slide	12 in.
Diameter of Headstock Cones	11 in. and 14 in.
Belt Width	6 in.
Number of Feed Changes	3
Feeds per Revolution of Spindle	⅛ in., 1/16 in., 1/32 in.
Speed of Countershaft	110 R.P.M.
Size of Tight and Loose Pulleys	16 in. x 6¼ in.
Ratio of Back Gearing	6.7 to 1
Face of Back Gears	2¾ in. and 2¼ in.
Length of Carriage Bearing	30 in.
Width of Carriage Bridge	12 in.
Number of Spindle Speeds with Two-Speed Countershaft	8
Weight—Approximately, 8 ft. Bed	5,300 lbs.

Immediate Deliveries. Telegraph or write for Prices and Further Particulars

H. W. PETRIE of Montreal, Ltd., Montreal, Que.

If any advertisement interests you, tear it out now and place with letters to be answered.

¼-in. Vertical Tapper

Without—Impossible!

Users pause to consider the increased speed, the bettered work, the fewer taps broken. Their conclusions, in sentiment, are at all times the same: "Without—impossible!"

Rickert-Shafer Tappers

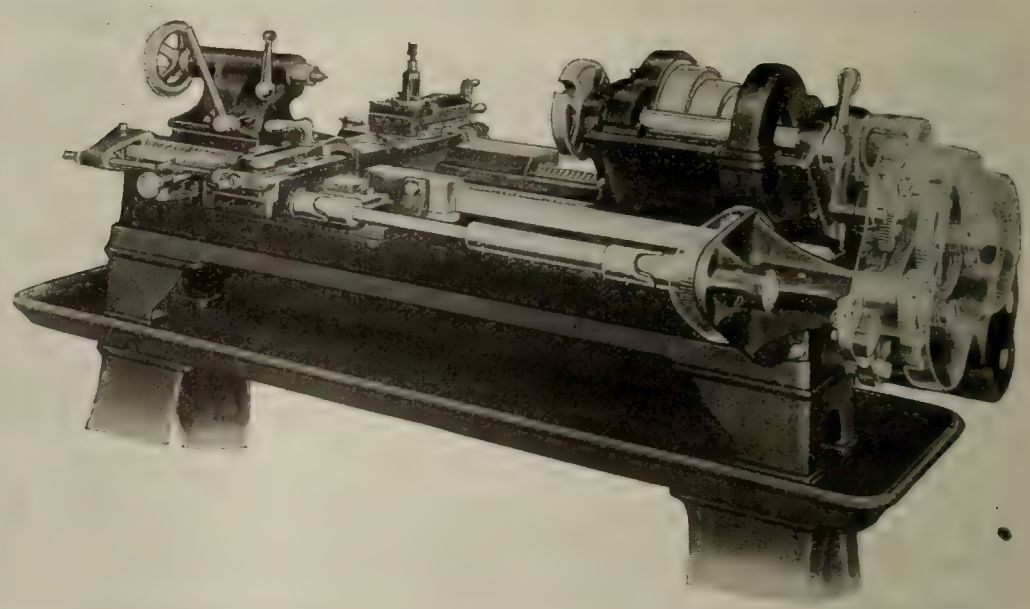
are doing work that hopelessly broke other tappers. Rickert-Shafer Tappers will do your work at a constant speed no other tapper can attain and hold. Rickert-Shafer Tappers behind your output will earn you many times their cost. *Write NOW for the reason-why details.*

Rickert-Shafer Company, Erie, Pa., U. S. A.

This is Our Address—How Can We Serve You?

Tool Room Precision

Nicest accuracy in the making of your tools is a road to profit that your better judgment will not overlook. It means speed in your shop as well as work far within a hair's breadth of absolute perfection.



Mulliner Quick Change Lathe

is guaranteed to bore and turn true within .001 inch. Still it is rugged enough to stand long and heavy strain. Its quick change mechanism provides 37 different threads and feeds. Accurately cut gears of special tumbler-gear design ensure smooth and quiet engagements.

Both front and rear journals are self-adjusting and also adjustable independent of each other.

The headstock spindle is special carbon hammered crucible steel.

Mulliner Lathe illustrated features the ring self-oiling system and is equipped with all tool-room attachments.

Write for additional facts.

Mulliner-Enlund Tool Co., Inc., Syracuse, N. Y.

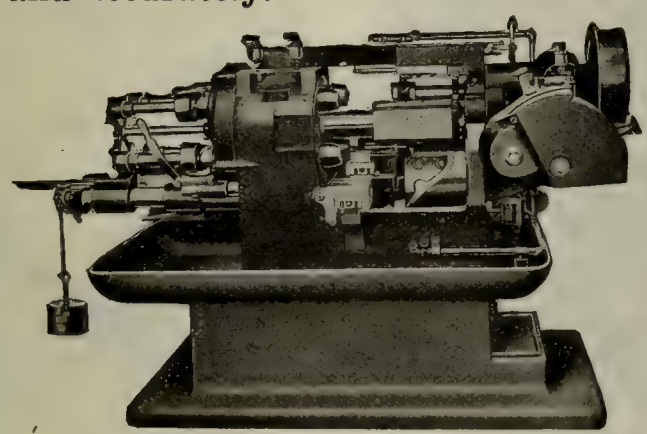
Quebec Representatives, Foss & Hill Machinery Co., Montreal **Ontario Representatives, H. W. Petrie, Ltd., Toronto**

MACHINE-POWER

AS AN AID TO MAN-POWER

is being used more and more as the labor shortage becomes acute and the demands for production greater.

The continued use of **GRIDLEY AUTOMATICS** has proved their value as modern machine tools which produce duplicate parts, up to 5" diameter, **rapidly, economically** and **accurately.**



They are meeting the test—greater production.

Our quotations on your blue prints or samples will show you how Gridleys can aid you.

GRIDLEY Multiple Spindle Automatic Screw Machines, capacities up to 2⅝" Chuck.

GRIDLEY Single Spindle Automatic Turret Lathe, capacities up to 5" chuck.

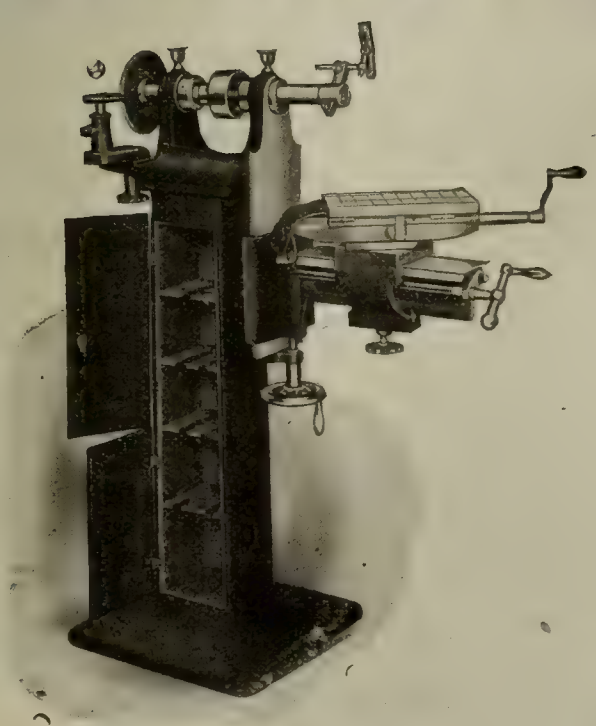
The National Acme Company, Cleveland, Ohio

New England Plant Windsor, Vermont **BRANCH OFFICES:** **Canadian Plant Montreal, P.Q.**

NEW YORK, BOSTON, CHICAGO, DETROIT, ATLANTA, SAN FRANCISCO. **Representatives in Foreign Countries.**

Makers of Gridley Single and Multiple Spindle Automatics at Windsor, Vermont; and Acme Automatics, Threading Dies and Screw Machine Products at Cleveland, Ohio.

OBTAIN THE BEST RESULTS



GARVIN No. 3, Universal Cutter and Surface Grinder.
Use Code—Banish.

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL

CUTTER AND SURFACE GRINDERS

Simple **Light Running** **Accurate**

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14 in. x 6 in.; SURFACES, 9½ in. x 6 in.

For Further Information *ASK YOUR DEALER or WRITE US DIRECT*

IMMEDIATE DELIVERIES

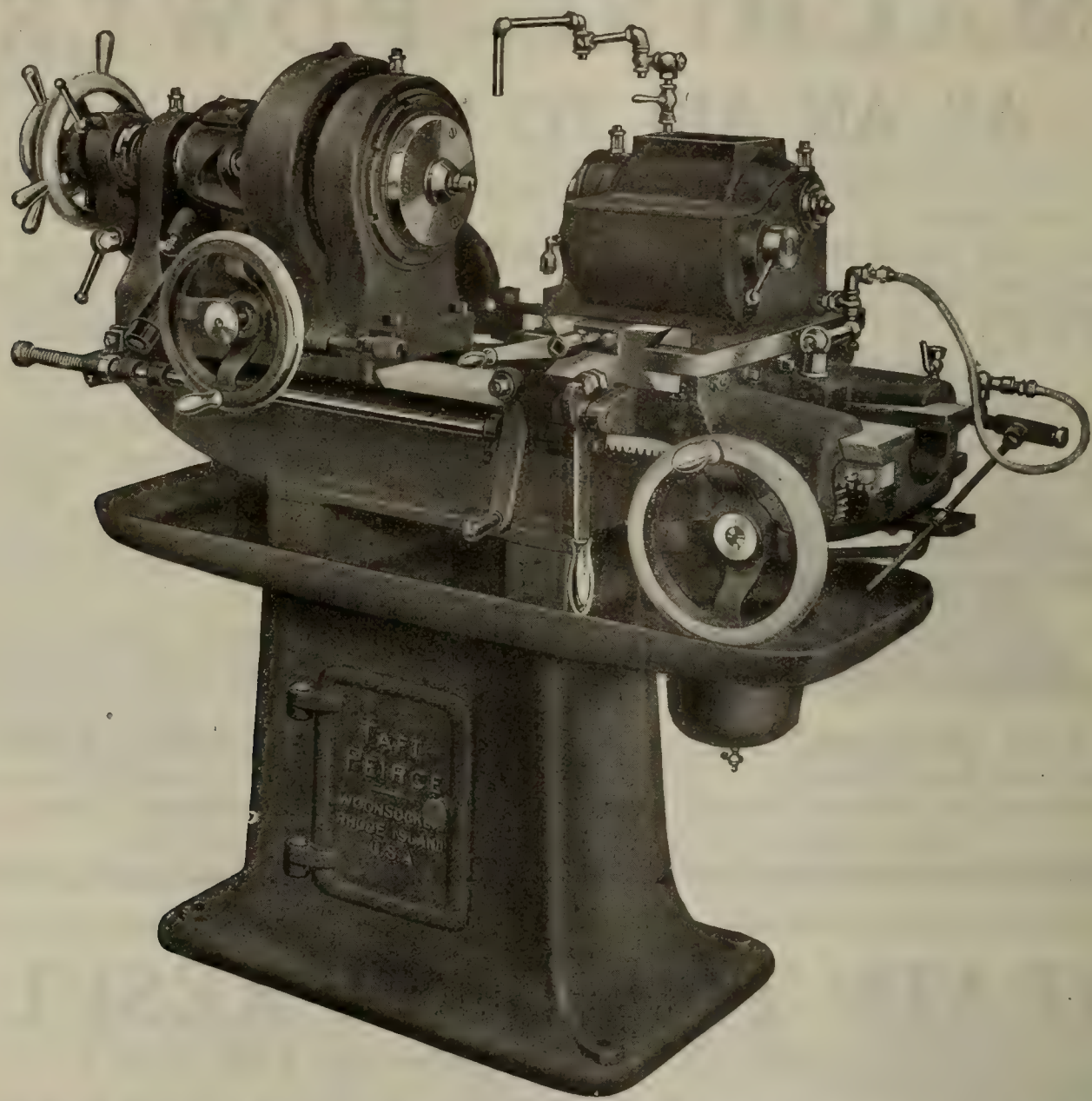
Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY

Spring and Varick Streets ***(Visitors Welcome)*** **50 Years New York City**

WE CAN NOW MAKE DELIVERIES



THE TAFT-PEIRCE THREAD MILLER

Completes a Thread in One Revolution

This machine is designed for threading operations where quality, accuracy and *speed* are essentials. It is strong, rigid, rapid and easily handled. The thread is milled with a multiple cutter the same length as the section to be threaded. Threads, external or internal, can be started at any predetermined point on the circumference of the work and completed at a single revolution of the work spindle. The Taft-Peirce Thread Miller is admirably adapted for threading rifle barrels and similar parts. One operator can attend two or more machines.

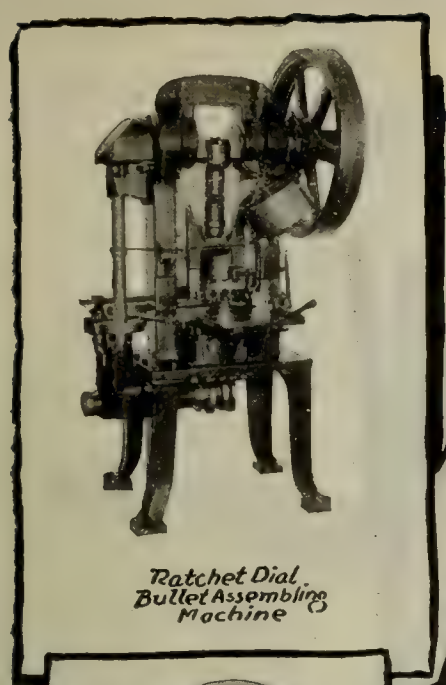
We shall be glad to show what the Taft-Peirce Thread Miller can do for you. Send us any piece or pieces on which you desire estimates. We can make deliveries promptly. Complete specifications, etc., sent on request.

TAFT-PEIRCE
Woonsocket, R.I., U.S.A.

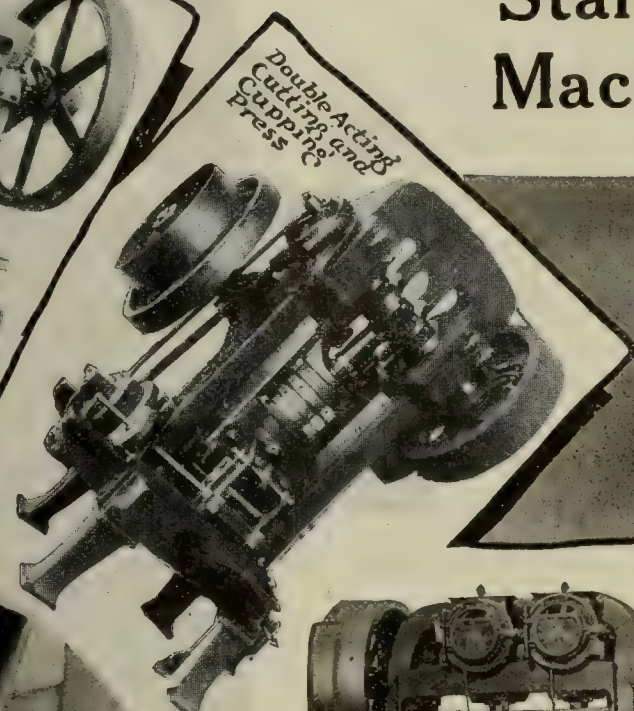
New York, Woolworth Building **Detroit, Majestic Building**

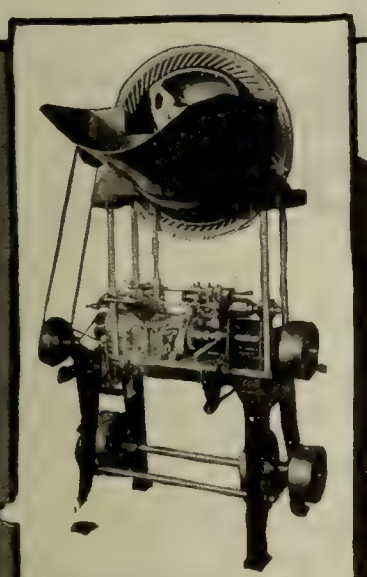
CARTRIDGE MACHINERY

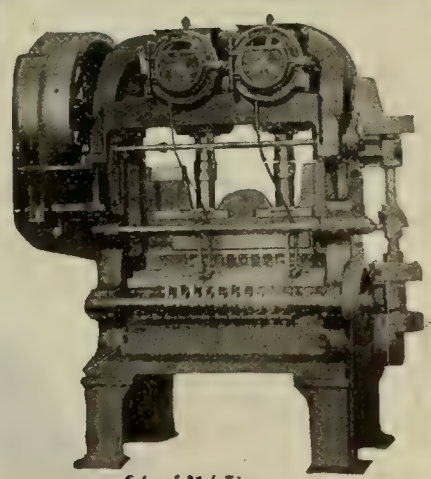
Waterbury Farrel Standard Machines

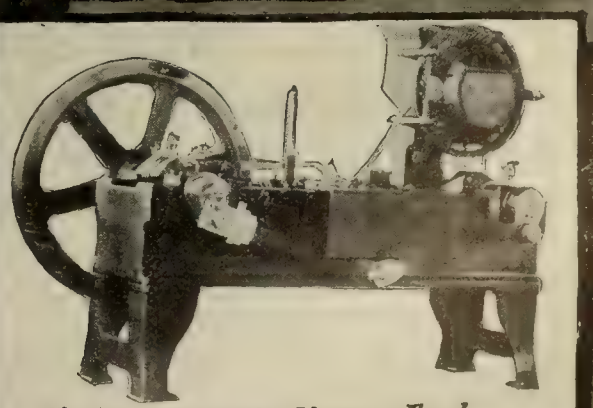

Ratchet Dial Bullet Assembling Machine

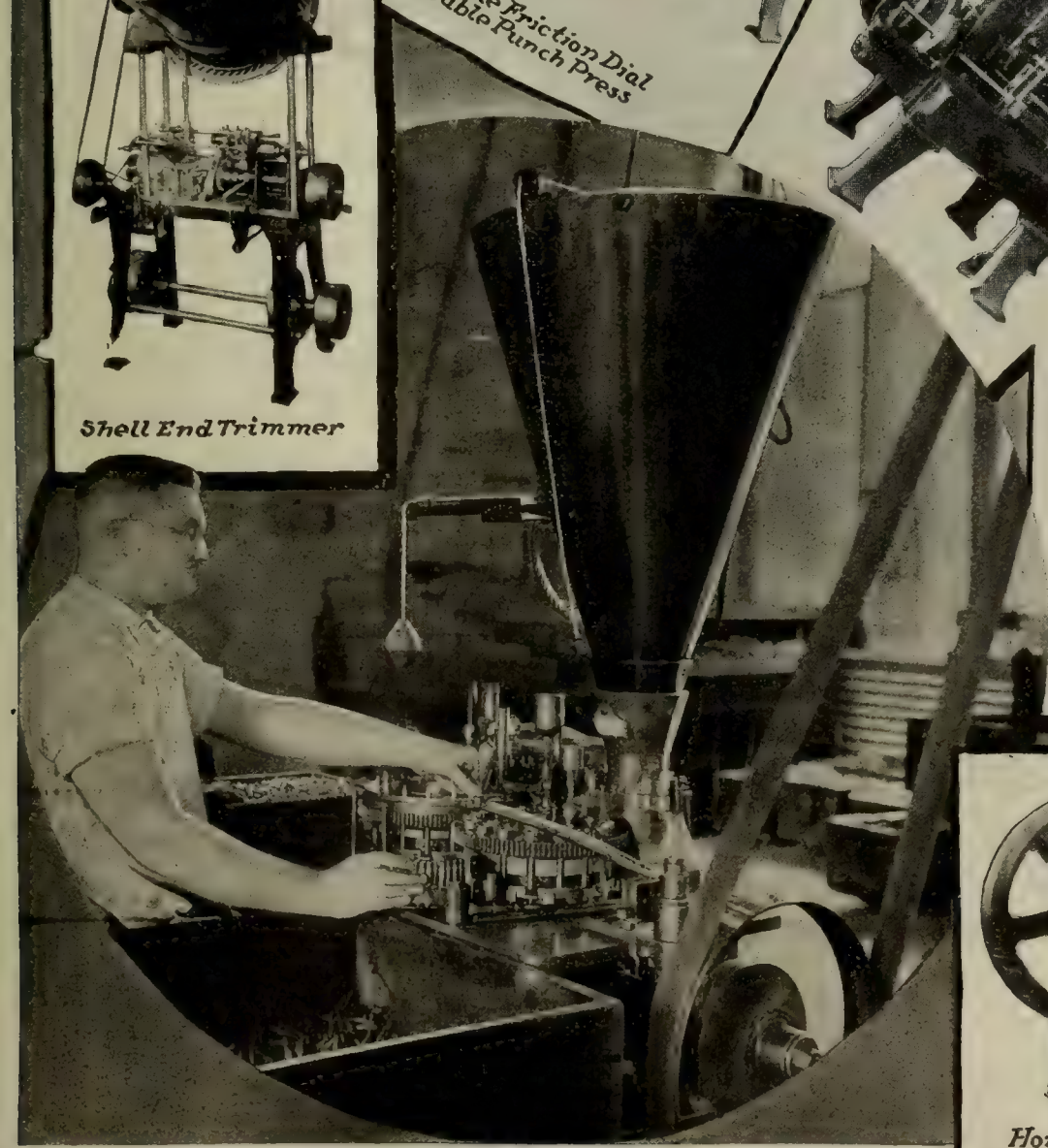
Double Friction Dial Double Punch Press


Double Acting Cutting and Cupping Press


Shell End Trimmer


Straight Line Bullet Assembling Machine

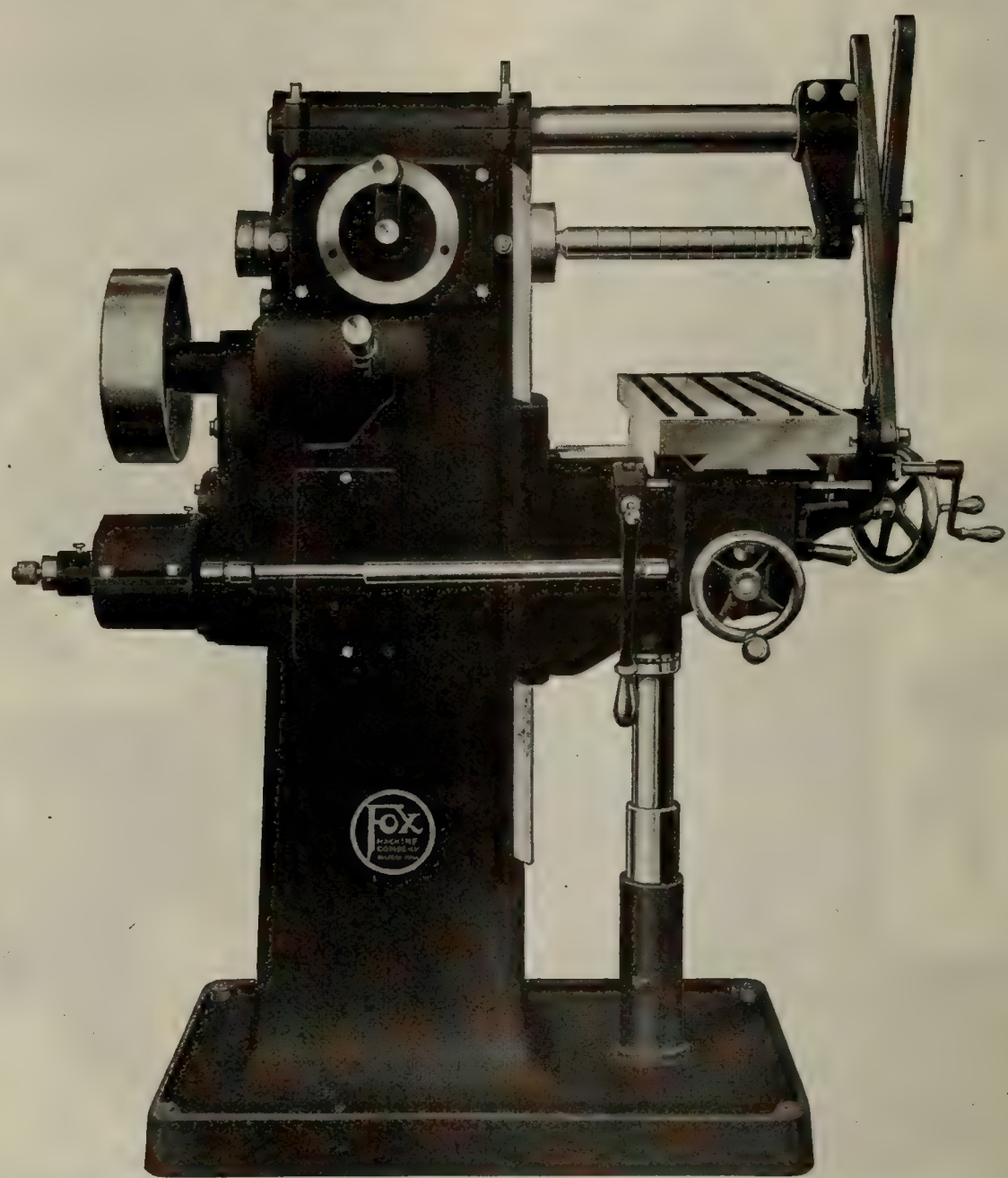

Horizontal Header Hopper Feed


Standard Loading Machine in Government Arsenal

The Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn., U.S.A., has appointed me to be the sole manufacturer for export of their entire line of Cartridge and Shot Shell-Making Machinery. Proposals and Estimates covering complete plants or separate units, required for export will be furnished on request.

FREDERICK S. BLACKALL, Woolworth Tower, New York, U.S.A.

FOX



No. 2B PLAIN MILLER

Intensive Production requires machines of exceptional strength and durability. The 2-B Fox Plain Miller is a single pulley constant drive machine. Bronze bearings are used throughout, and hardened steel gears insure long life.

Table size	8½" x 37"	Longitudinal Movement	25½"
Vertical Movement	14½"	Taper in spindle	No. 9 B & S
Transverse Movement	8½"	Weight, net	1,075 lbs.

We build UNIVERSAL MILLERS, dividing heads, vises, MULTIPLE SPINDLE DRILLING MACHINES, Pipe Cutters and Wood Trimmers.

Write to-day for full information.

THE FOX MACHINE COMPANY

1047 West Ganson Street, JACKSON, MICH. ***Formerly of* Grand Rapids, Mich.**

Cincinnati Automatic Millers

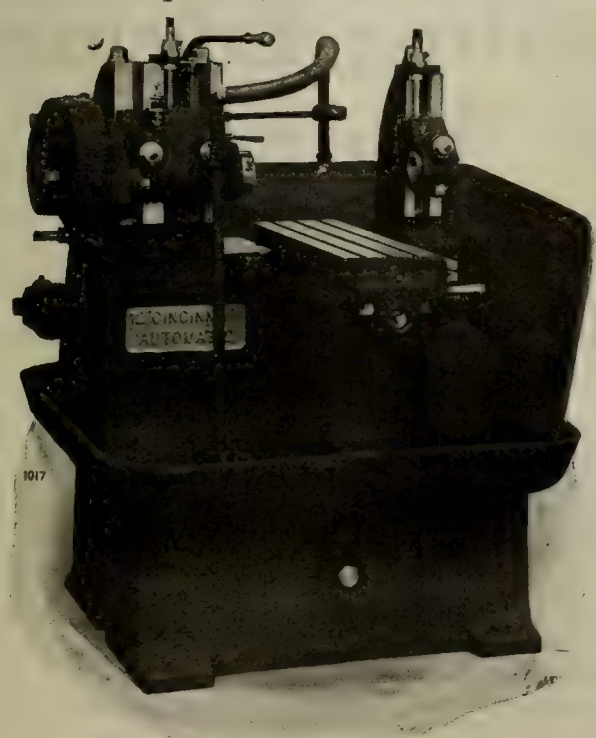
for Manufacturing

RIFLE AND MACHINE GUN COMPONENTS
and similar parts

The surface of the piece is absolutely unmarred. Because after the cut, the cutter is automatically brought to a standstill—the work returns under it while the spindle is stationary.

They have the intermittent feeding feature, which has proven so successful on our earlier machines, with this addition—after the cut is taken the spindle is stopped automatically so that the work returns beneath it while the cutter is stationary —no danger of marring the surface of the work because of a revolving cutter.

Consider too, the advantage of this from the standpoint of safety. The operator removes the finished piece and chucks a new one while the cutter is stationary. He can't get caught by a swiftly revolving although idle cutter. After he chucks the new piece, he moves one lever—and immediately both the spindle and feed movements start again.



This is one improvement on the Cincinnati Automatic. There are others equally vital. Do you wonder this new machine has already made a place for itself in the esteem of a number of big munitions shops?

For manufacturing parts in quantities it offers exceptional advantages.

Bulletin containing details will be sent you upon request.

The Cincinnati Milling Machine Co.

CINCINNATI, OHIO

KEMPSMITH

UNIVERSAL MILLING MACHINES

Every Kempsmith Milling Machine of whatever size, is provided with a slotted spindle nose for positive drive of arbor and for positive drive of face milling cutter in either direction.

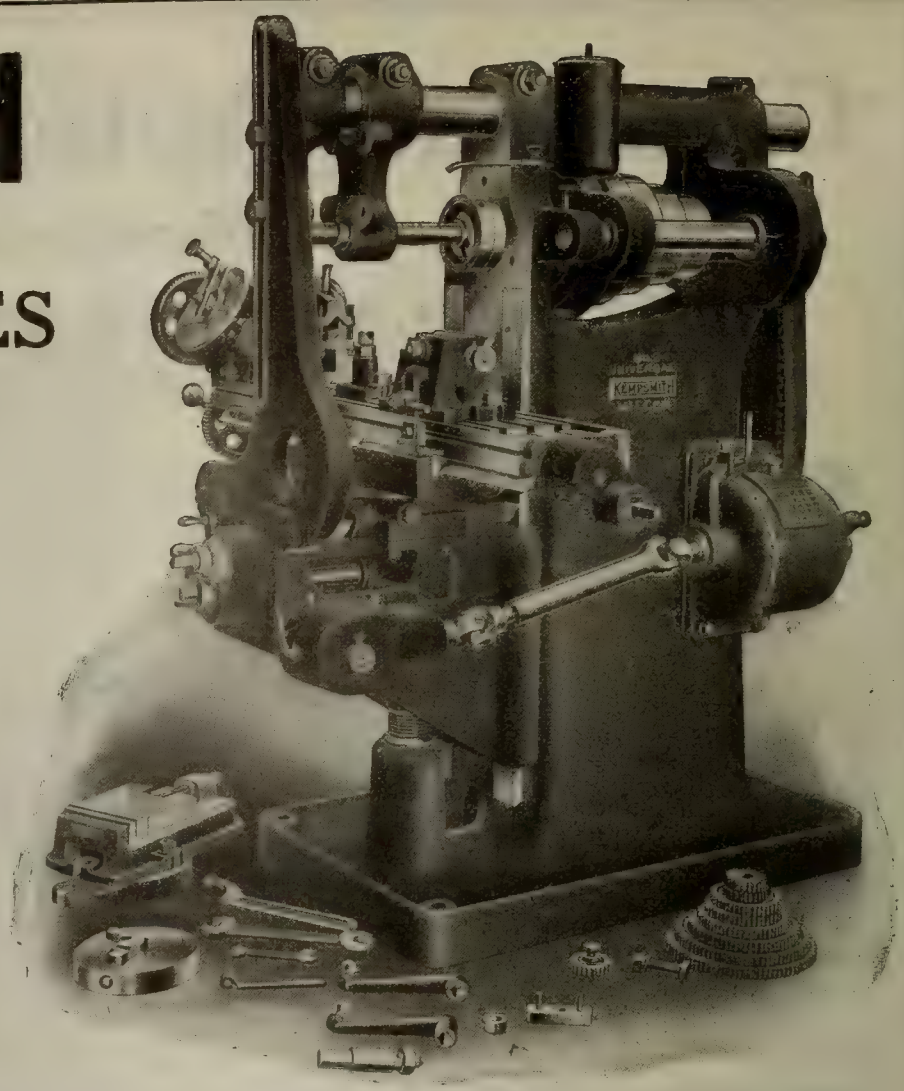
Every machine is equipped with our patented keyed overhanging arm which insures positive alignment of arbor and boring bar and also prevents the cutter being pounded out of line under cut.

Kempsmith machines are heavy, with weight well distributed and their accuracy is guaranteed within very close limits.

Send for Illustrated Catalogue.

Kempsmith Manufacturing Co.
MILWAUKEE, WIS., U.S.A.

AGENTS:
Foss & Hill Machinery Co., Montreal.
General Supply Company, Toronto and Ottawa.
Canadian Western Foundry & Supply Co., Calgary, Alta.

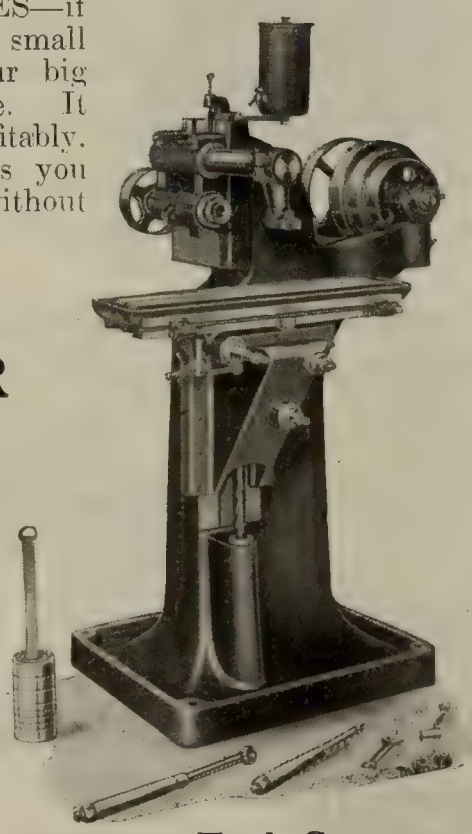


CARTING A BARREL TO CARRY A CUPFUL

Figuratively, YES—if you are putting small work up to your big milling machine. It cannot do it profitably. Small work costs you twice too much without a

U.S. MILLER

in your shop. A little machine of great strength and big capacity; it does quickly and accurately work that no other miller of its size can touch.



WRITE FOR CATALOGUE.

United States Machine Tool Company
CINCINNATI, OHIO, U.S.A.

Sterling Engine Works

Successors to the
DOTY ENGINE WORKS

Expert Engineers, Machinists and Boiler Makers

Gasoline Engines, Steam Engines and Boilers, new and second-hand. Castings in iron or brass. Forgings. Machine and Boiler repairs. Cold Rolled Shaftings.

CUT GEARS

We have the only automatic Gear-Cutting Machine in Western Canada. We specialize in this work. Also in Marine and Hoisting Engines, Contractors' Equipment, Dredge Work, Dippers, etc.

Estimates gladly given on big or small orders.

Works and Office: Foot of Water Street

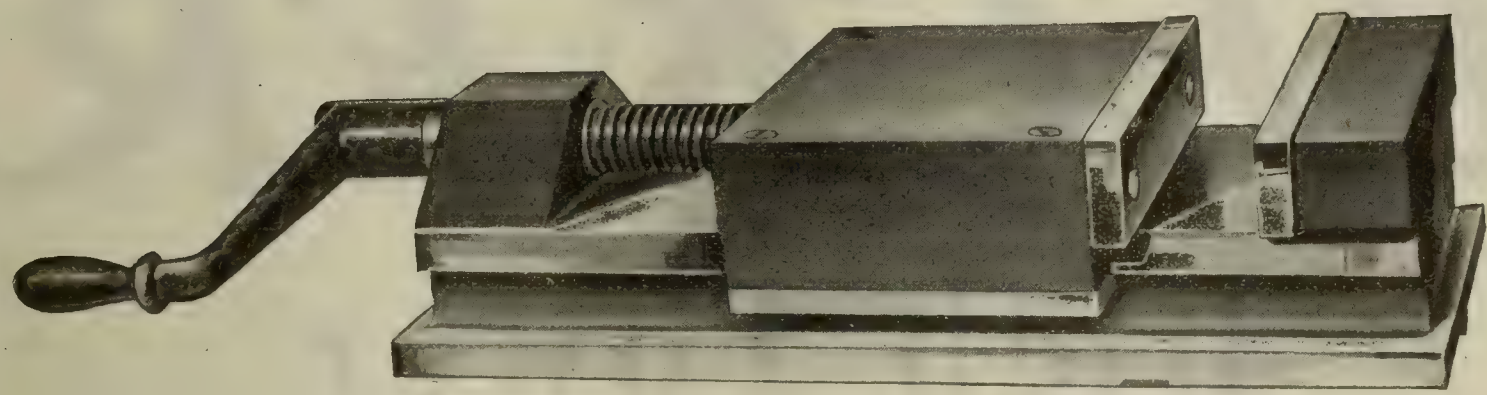
Phone: Main 9543

WINNIPEG, MANITOBA

(c22m)

The Cleveland Milling Machine Co.

PLAIN VISE



HAS been designed with as much care and forethought as we have given our milling machines, cutters, and other products. There are good features in all vises, and bad features in some. When designing this vise, we took into consideration all the difficulties encountered, because of the shortcomings and faulty construction of vises which had come to our attention, and have endeavored, to the best of our ability, to eliminate these objectionable features.

It is a fact that the milling machine vise in many instances is expected to take the place of a jig, or fixture, and becomes quite an efficient addition to the milling machine, especially when used in pairs, so that one vise can be loaded or unloaded while the cutters are working on the piece, or pieces to be milled, in the other vise. Realizing this, we have made the tongue slot, on all vises, an exact distance from the face of the solid jaw. This feature is taken care of by efficient jigs for milling these slots.

All milling machine vises should be made as low as possible, without sacrificing strength and the facilities for clamping. This we have accomplished by having a cast, and machine finished flange on all four edges of the vise, thus allowing it to be clamped in any position on the table.

The jaws are of steel and can readily be removed for occasionally increasing the range, or inserting special jaws for holding pieces of irregular shape.

The ways of the vise are solid, giving the base greater strength, and the construction of block and gibbs such that they wipe the ways free of chips and foreign matter.

The movable jaw is made of ample thickness to allow for as large a diameter of screw as is consistent with the height of the vise. Tongue slots are milled at right angles to each other, so that the vise can be held parallel, or at right angles with the spindle.

It is also a fact that nearly all vises break diagonally from the corner of the solid jaw to the base, or on a diagonal line from the screw bearing to the base. We find that in casting these bases, this part of the vise has hitherto been solid, and has contained a larger amount of metal; the shrinkage, therefore, being greater at both ends, causes the metal there to be spongy and as this is where the greatest amount of stress comes, the castings usually break at these points. To overcome this trouble, we have set cores in both ends, as shown in sectional view below. These cores allow an even distribution of metal all around, eliminating shrinkage, and makes for stronger construction throughout.

The movable jaw is gibbed around the outside. This design eliminates the objectionable feature of having slots cut in the base of the vise for clamping the gibbs directly underneath. These gibbs, however, do not interfere in any way with the clamping of the vise onto the milling machine table.

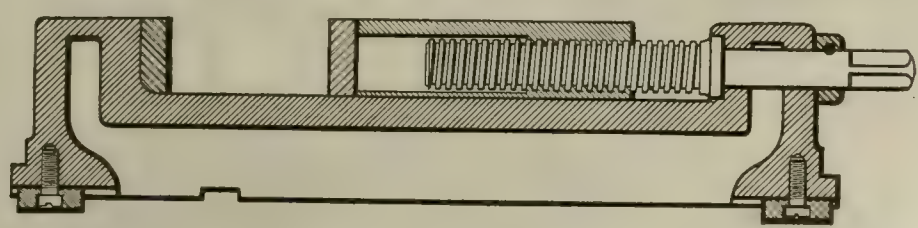
Depth of jaws, 1½".
Width of jaws, 6".
Open with steel jaws, 4⅜".
Open without steel jaws, 5⅜".

The regular equipment furnished with this vise is as follows:

One pair of clamps and bolts.
One crank handle.
Hardened and ground tongues.

Since the demand for this vise has been very great, we have arranged to keep them in stock, for immediate delivery.

PRICE ON APPLICATION



Cutters carried in stock by our agents:—

Dale-Brewster Machinery Company, Inc.,
547 W. Washington Bldg.,
Chicago, Ill.
New York Office, 30 Church Street, New York City,

and

D. Nast Machinery Company,
Bourse Bldg.,
Philadelphia, Pa.
4 East German Street,
Baltimore, Md.

The Cleveland Milling Machine Co.

CLEVELAND, OHIO

Milling Cutters Milling Machines Relieving Machines

BECKER

High Power Vertical Miller

MODEL AB.

For high-speed work demanding great precision, this machine is earnestly recommended to you for the following reasons:

It has extraordinary rigidity.

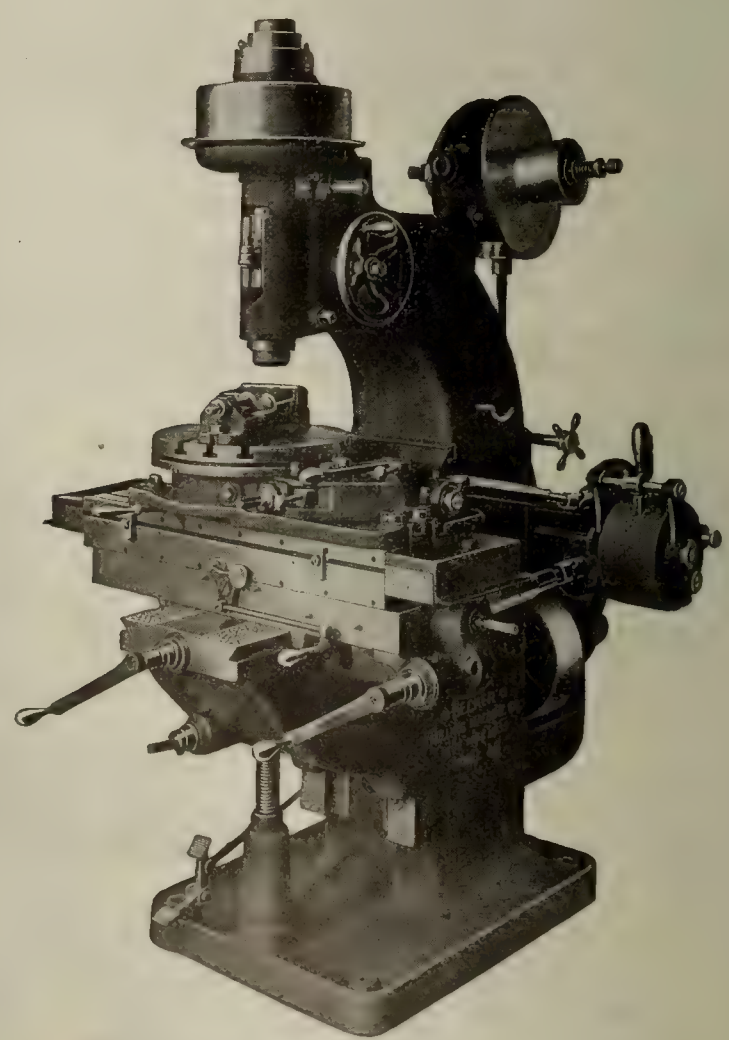
It requires 1/3 to 1/2 less power than other millers of corresponding sizes.

It has the famed Becker patented roller feed and positively non-slipping belt drive.

It holds an unbeaten record for output speed.

This excellent machine is offered for

Early Delivery



Write or Wire for Full Information to

Becker Milling Machine Co., HYDE PARK, BOSTON, MASS., U.S.A.

Gorton Cutting-Off Machine

Maintains a Feed of 1 Inch or More per Minute

Understand that it **maintains** this feed cutting the toughest stock. Ordinary stock it cuts at the great rate of 2″ feed per minute.

Any metal in round 1″ to 4½″, in squares 1″ to 3¼″, or in any other shape that comes within a 4½″ circle, it cuts day in and day out faster than any other machine. We can send you the names of largest rolling mills, locomotive works, navy yards and engine builders using our machines.

Gorton Cutting-off Machines, in material and workmanship, equal the finest built lathe or miller.

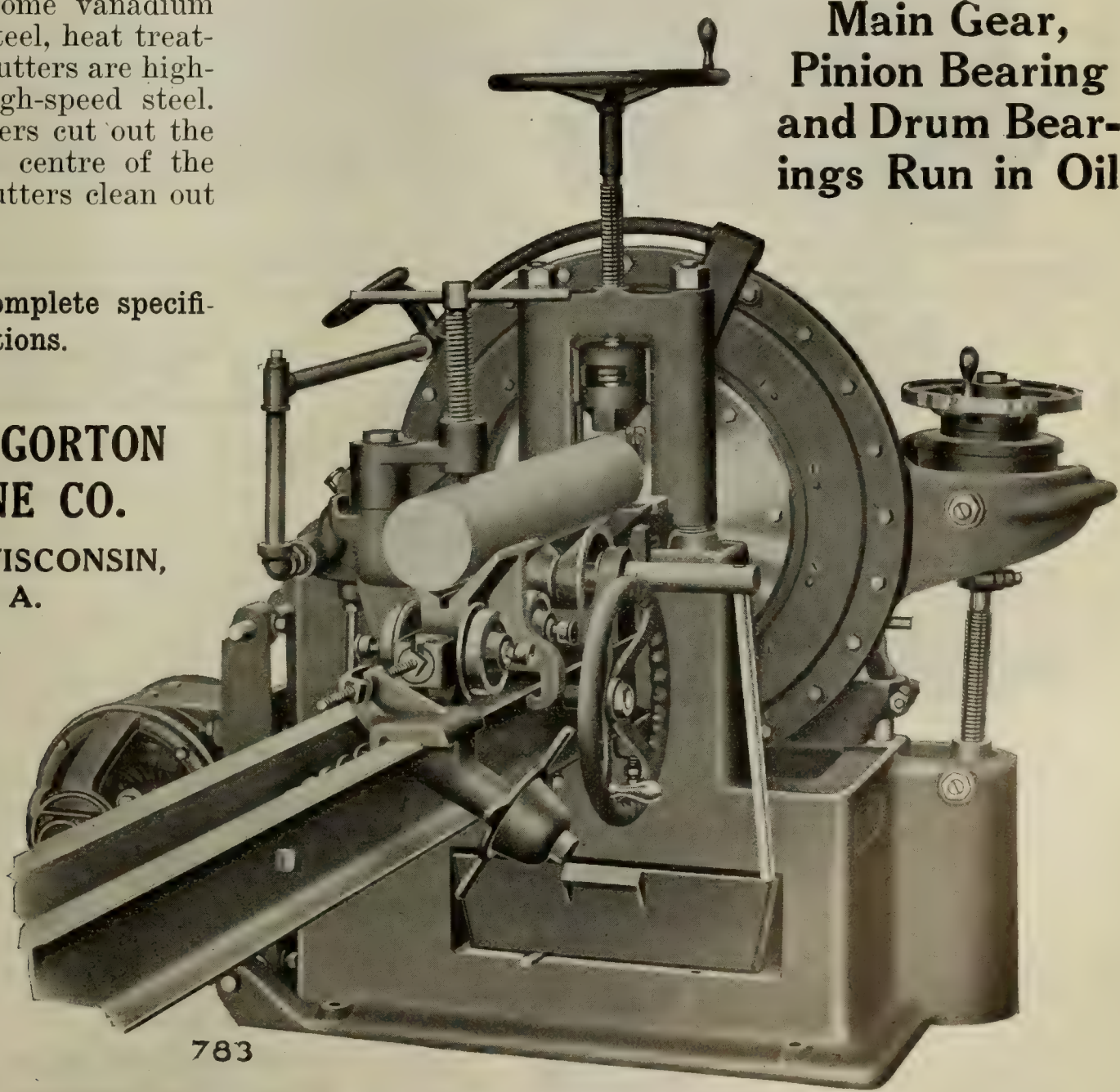
Blade is chrome vanadium manganese steel, heat treated. The 10 cutters are highest grade high-speed steel. Narrow Cutters cut out the metal in the centre of the cut; Wide Cutters clean out the corners.

Main Gear, Pinion Bearing and Drum Bearings Run in Oil

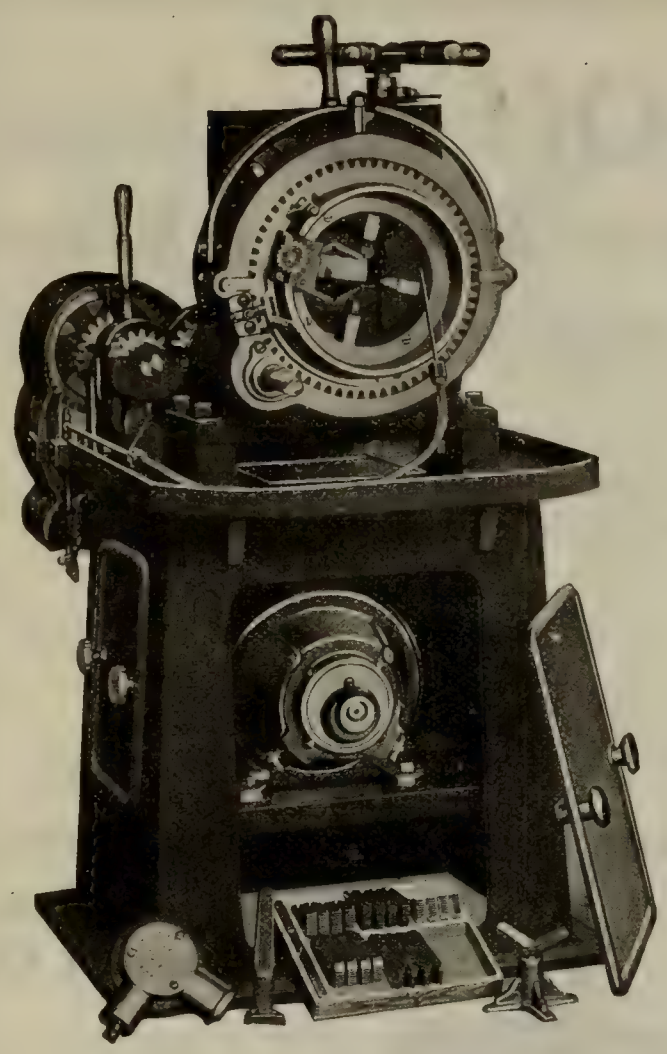
Write for complete specifications.

GEORGE GORTON MACHINE CO.

RACINE, WISCONSIN, U. S. A.



FRONT VIEW OF GORTON No. 2-D HEAVY-DUTY CUTTING-OFF MACHINE



A Forbes Cuts Right

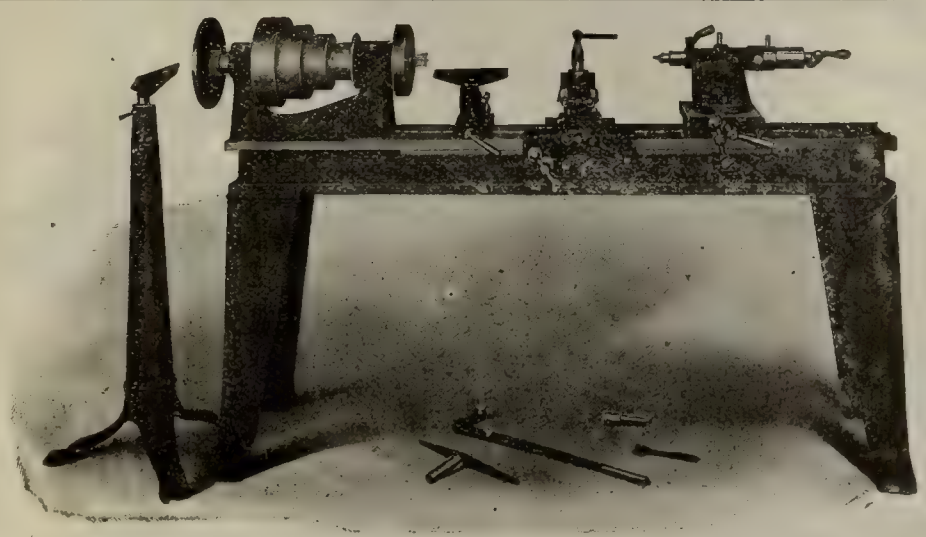
THREADS cut with a Forbes are threads cut right. If the class of work you are doing demands accuracy —and most work does—you need a Forbes.

It is the only machine on the market with receding gear which carries the dies on to the pipe. Instead of turning the heavy length of pipe in the dies, it turns the comparatively light dies around the pipe. The steel is adjustable to compensate for wear.

A powerful, compact machine—saves labor because it can be carried right to the job. Does away with the old stock and die method.

Further particulars should interest you. We will gladly send them.

The Curtis & Curtis Company
Garden Street, Bridgeport, Conn.



A Favorite---

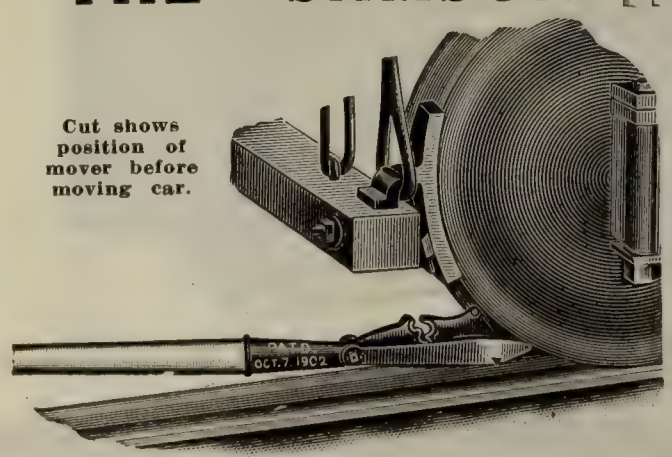
Blount Pattern-makers' Lathe

FAST AND ACCURATE—Equipped with set over swivel tailstock and carriage, and outside face plate and tripod. Built in 16" swing with beds 6 or 8 feet in length. Spindle is made of high carbon steel, is hollow and fitted with Morse Taper and runs on self-oiling bronze bearings.

Our catalog gives a full description of this strong and highly efficient machine, also our other quality speed lathes and grinders. Give us your address.

J. G. BLOUNT COMPANY
EVERETT, MASS, U.S.A.

THE "SAMSON" RAILWAY CAR MOVER



Cut shows position of mover before moving car.

Every railway siding should be supplied with one of these tools. Takes the place of fifteen men and puts the heaviest loaded car just where you want it. It will pay for itself in 30 days.

It is one of the most simple and powerful devices for moving cars by hand.

It is provided with Never-Slip Spurs, which is the most important feature on a Car Mover.

Special attention given to export orders.

Dillon Manufacturing Company

Oshawa, Ontario

Eastern Sales Agent
Alexander Gibb
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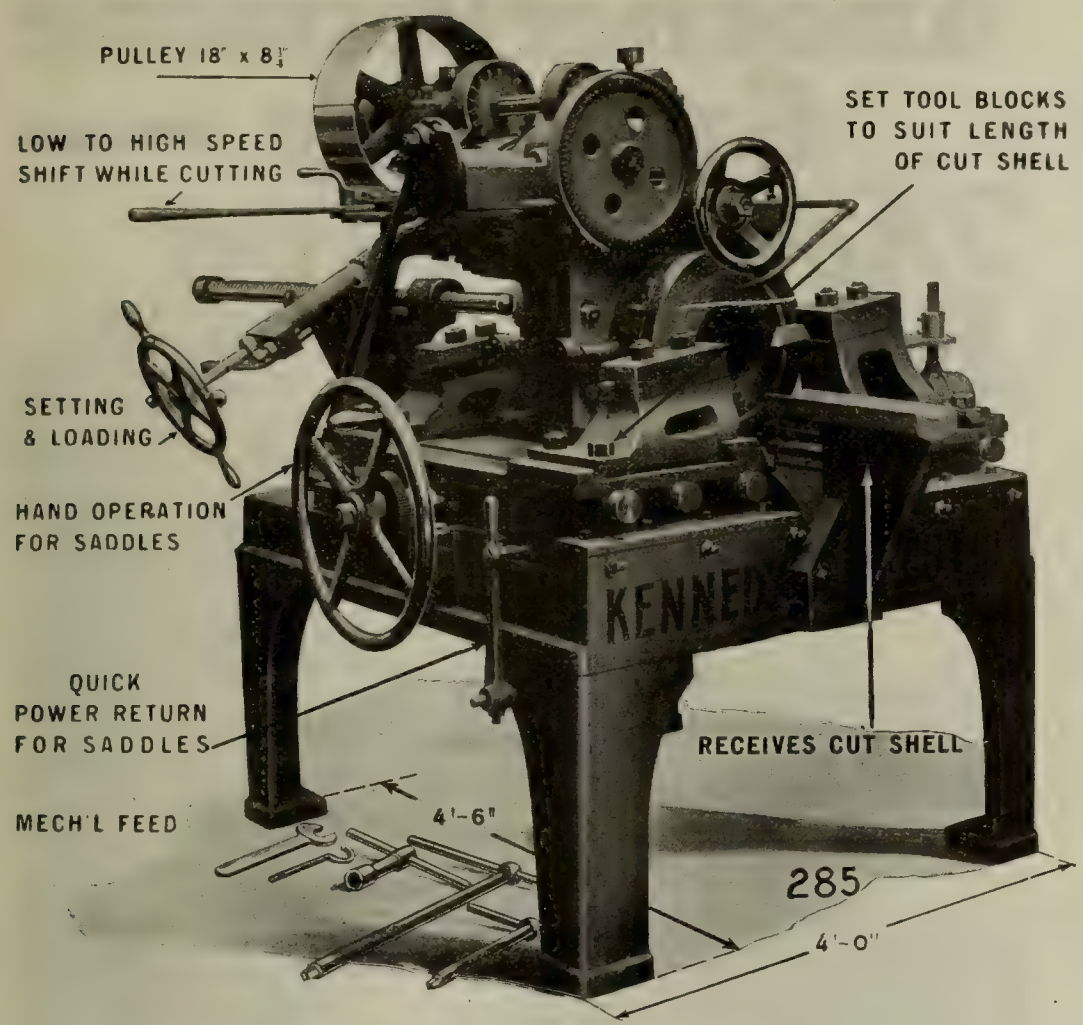
Western Sales Agent
D. Philip
138 Portage Ave., Winnipeg, Man.



CUTTING-OFF MACHINES

Cuts both ends at once

except 8 in. and 9 in. sizes which cut one end only

Forgings load in one end and discharge out the other when cut

A Girl can operate it

6—4.5" Machines in Stock

The

Wm. Kennedy & Sons,

Limited

Owen Sound

HALL

Pipe Threading Machinery

AND

Shell Cutting-off Machines

This illustration shows the new No. 8 Hall Gear Box Driven Pipe Lathe. Regular Capacity 2½" to 8" inclusive.

The last word in Pipe Machine Construction

Let us give you full particulars of this machine which is only one of a large number having capacity ⅛" to 18" pipe.

Write us for catalog and prices on:

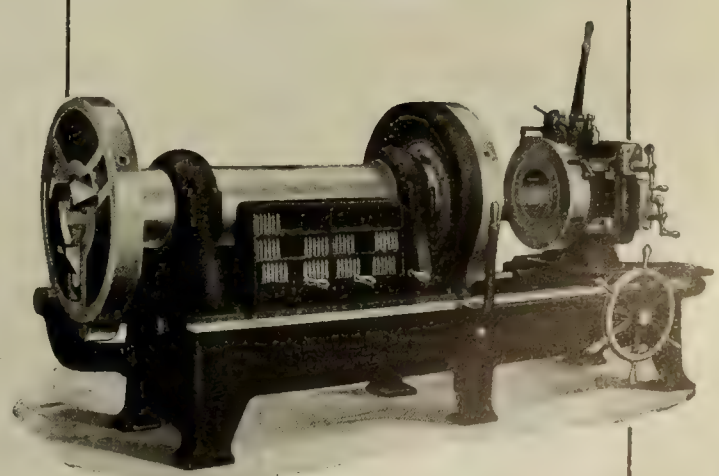
Pipe Threading Machines Nipple Threading Machines
Roller Pipe Cutters
or
Cutting-off Machine for shells or bar stock.
Any capacity ⅛" to 18".

John H. Hall & Sons, Ltd.

BRANTFORD, CANADA

EUROPEAN AGENTS:
Universal Machinery Corporation, Limited, London

Made in Canada



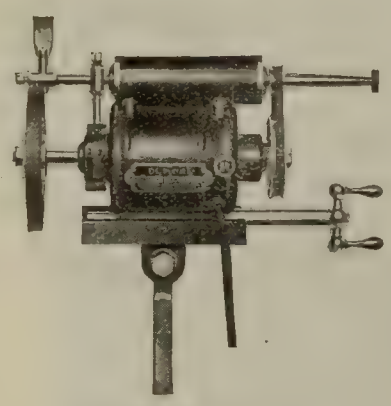
Capacity

2½" to 8"

inclusive

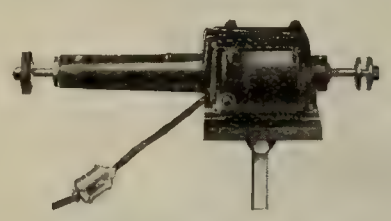
If interested, tear out this page and keep with letters to be answered.

Equipment for the Standard Dumore Grinder



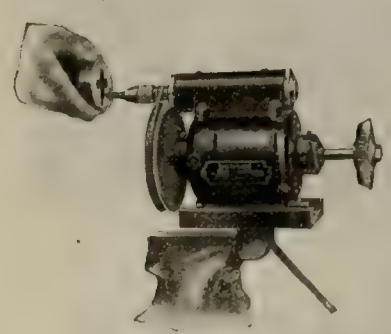
EQUIPMENT A

General Tool Room use. Includes high-speed internal spindle. Reach, 3 inches; speed, 30,000 R.P.M.; motor spindle speed, 10,000 R.P.M.



EQUIPMENT B

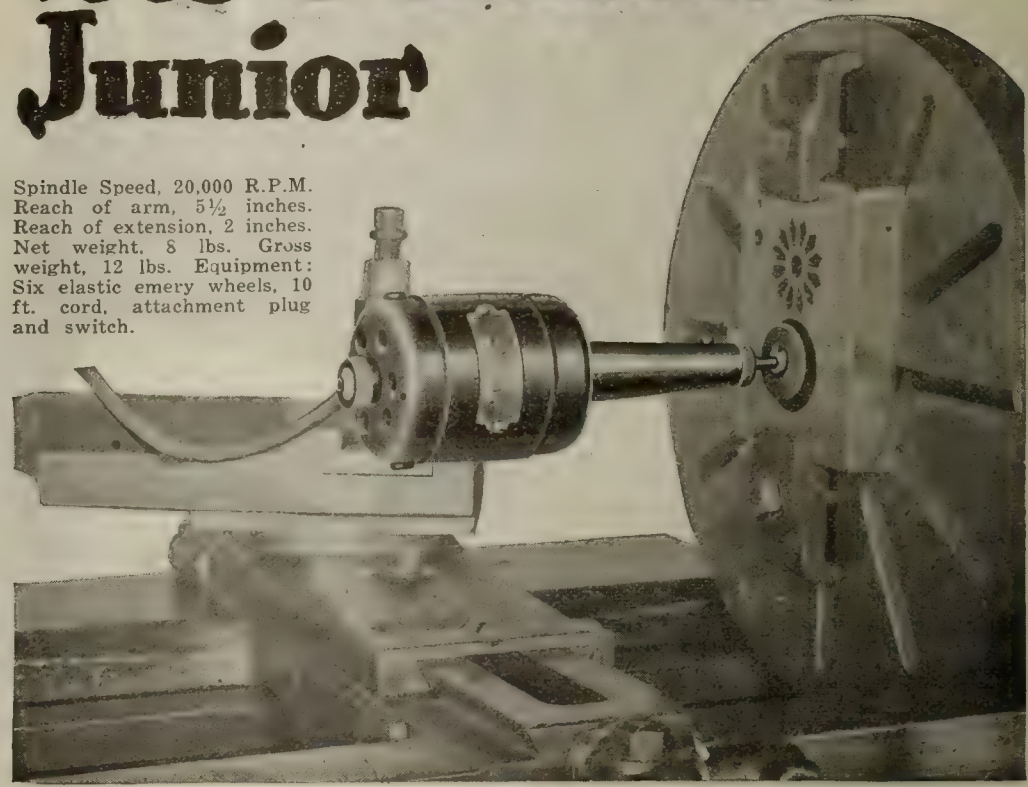
Deep Internal Work, 10-inch extension arm. Speed, 10,000 R.P.M.



EQUIPMENT C

Button Die Grinder. Speed, 50,000 R.P.M.

Another Dumore Grinder — The Dumore Junior



Spindle Speed, 20,000 R.P.M. Reach of arm, 5½ inches. Reach of extension, 2 inches. Net weight, 8 lbs. Gross weight, 12 lbs. Equipment: Six elastic emery wheels, 10 ft. cord, attachment plug and switch.

The Dumore Junior Grinder has been designed to meet the requirements of the manufacturer who desires a light grinder which will do accurate work, yet who does not wish to invest in a larger and more expensive tool. Invaluable for the accurate grinding of tools, dies and gages—can be quickly attached to lathes or other machine shop equipments. The

DUMORE JUNIOR PORTABLE ELECTRIC GRINDER

is built in the same conscientious manner, and embodies the same special features as the larger Dumore Grinders. The armature is dynamically balanced, and the spindle operates at 20,000 R.P.M. Friction is reduced to minimum by using high-grade Ball Bearings. This scientific construction has entirely eliminated vibration, and any work ground with the Dumore Junior will be found accurate and free from chatter marks.

Like all other Dumore products, this new grinder is sold on its merits. Write to-day for descriptive literature.

Wisconsin Electric Co., 1717 Dumore Bldg., RACINE, WIS.

Sold in England by Canadian-American Machinery Co., Limited, 8 Bouverie St., London, E.C., England

We are not Playing Checkers

Every man-jack of us at the Carborundum plant is working like the proverbial beaver, for never before has there been such a demand for Carborundum and Aloxite Products.

We are doing our level best to meet this big demand—enlarging our plants, increasing our forces, speeding up production—we are even building a big 20,000 horse power furnace plant in Canada in our efforts to keep up with things. We have a definite service to perform for we are helping to produce the necessities of war.

Carborundum and Aloxite Products are Doing Their Bit

They are grinding shrapnel shells, high-explosive shells, rifle barrels and parts—grinding bayonets and sabers. They are grinding a hundred and one different parts of the aeroplane and the auto truck, the machine gun and the field gun. They are shaping armor plate and grinding car wheels; grinding plowshares, and the tools of the metal-working trades of the world. They are grinding torpedo tubes and torpedoes, grinding submarine engine bases; beveling the lenses of periscopes and buffing the soles of the army shoes and grinding the shears for the pocket kits of the "Sammies." They are doing a thousand and one war tasks quicker and better than they have ever been done before.

Carborundum and Aloxite products are surely doing their bit, but with it all we haven't neglected for one instant our regular patrons—we are doing all in our power to keep up with the pace; to keep up to the standards of Carborundum service.

THE CARBORUNDUM COMPANY

NIAGARA FALLS, N. Y.

NEW YORK CHICAGO BOSTON PHILADELPHIA CLEVELAND CINCINNATI MILWAUKEE PITTSBURGH GRAND RAPIDS

Watch a Capable Mechanic Test a File—

See him pass his thumb over the teeth.

By instinct, he knows, at once, whether a file will do its work.

He senses, at once, the quality of the steel—its balance—and the sharp-edged teeth.

He makes no mistakes in buying —and his choice every time will be for "Famous Five" Files.

Be influenced by *his* judgment and specify "Famous Five" Files when ordering.

They are:

Tel. Main 6755 Jos. Bickerstaff, Mgr.

THE ELM CUTTING OIL COMPANY

645 East King Street
TORONTO

You have tried the rest. Now use the best for screw cutting and threading.

Our standard is uniformity at all times and a guarantee of quality with every barrel of oil produced.

PRICES ON APPLICATION

The Greenfield

For General Tool Room Work

This Grinder is furnished with attachments for grinding all kinds of milling cutters, reamers, counterbores, and other machine shop tools.

It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angle can be at once obtained.

The whole machine is thoroughly well built, well finished and will be found a dependable, convenient grinder.

Greenfield Machine Company
GREENFIELD, MASS., U.S.A.

DON'T be governed by World-Wide Reputations and Previous Records in selecting your next Cutting-Off Equipment. The NEW IMPROVED PEERLESS High Speed Heavy Duty Metal Cutting Saw has completely revolutionized and upset all metal cutting standards.

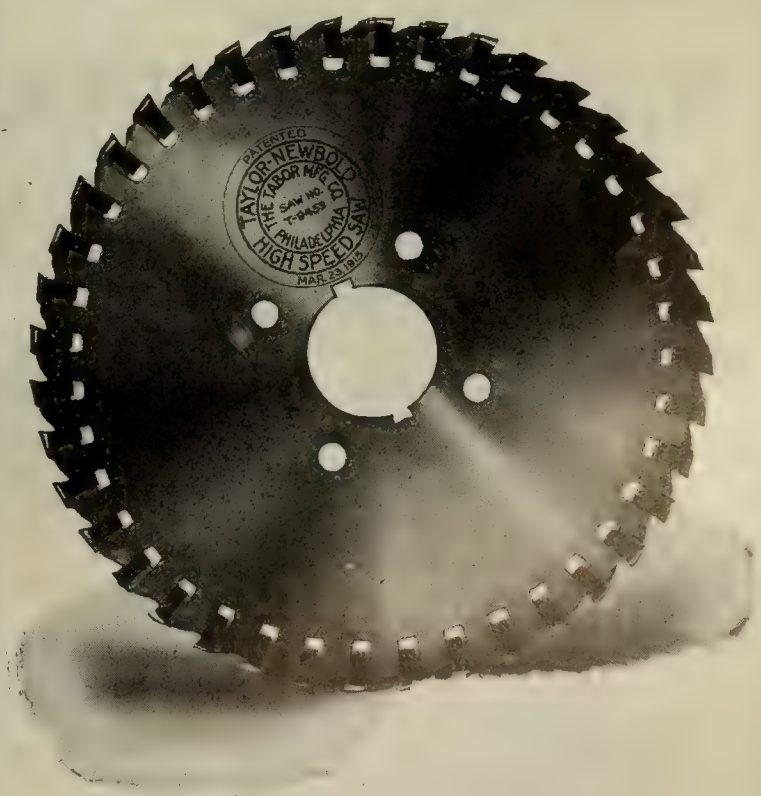
This statement is based entirely upon the reports and repeated orders received from concerns that had heretofore used tools such as referred to.

To induce investigation we will gladly ship one for a comparative test. If you do not consider it the best and most profitable tool you have ever purchased, you are under no obligations to keep it, and we will stand the freight charges both ways.

Would you like to see a list of large manufacturers that are continually repeating their orders? We have it ready for you.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

THE IMPROVED
TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW
WRITE FOR BULLETIN T-S
Tabor Mfg. Co., Philadelphia, U.S.A.

If interested, tear out this page and keep with letters to be answered.

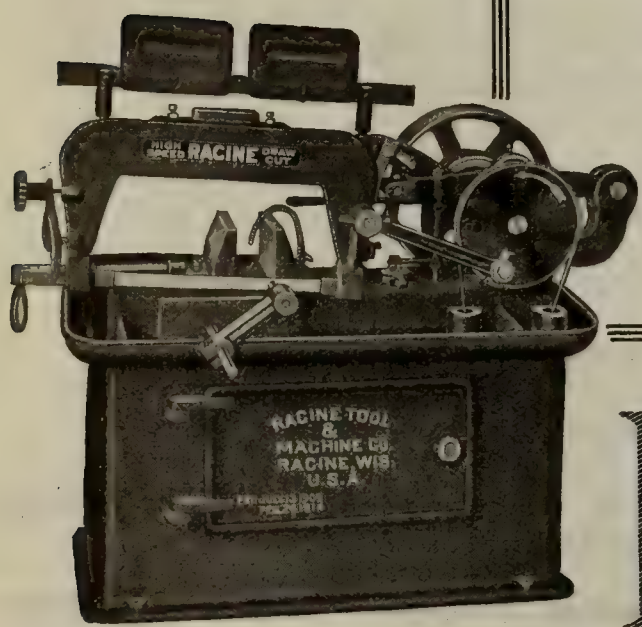
Known the World Over
Admitted to be Superior

The Racine for Scientific Metal Cutting

Demonstrate the value of this machine in your own shop, on your own work. Our confidence in the ability of this machine is such that we will send it to you on *trial.* This will give you ample opportunity to study the machine from close quarters; to verify our statements regarding simple construction and operation, accuracy and speed, features that stamp our machine in a class by itself.

We invite your inquiries for full information and installation

Racine Tool & Machine Co.
15 Melbourne Ave. Racine, Wis., U.S.A.



RACINE

J. E. WING
TOOL ROOM
SURFACE GRINDER

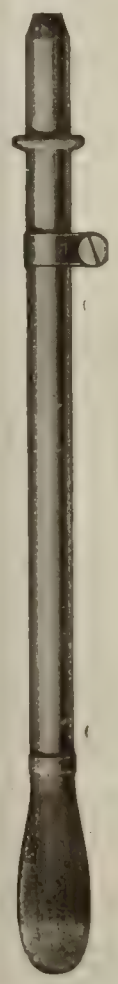
is extra strong in every part, easily adjusted, and unbeatable for fast and accurate tool room work. Use it for 10 minutes and you'll know the advantage of its rigid grinding surface—its rigid construction throughout. Is equipped with large tray and water pot combined.

PUT YOUR SPECIAL MACHINERY WANTS UP TO US.

We are experts on special designs and guarantee satisfaction.

J. E. Wing & Son, Hamilton, Canada

Grinding Wheel Dressers

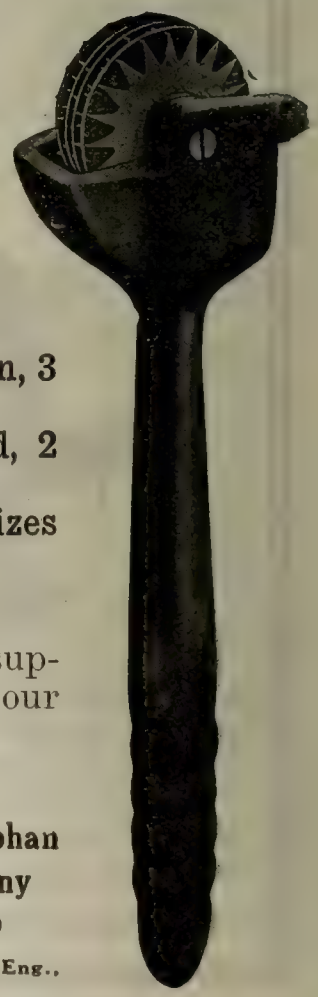


We are specialists in Grinding Wheel Dressers and can recommend the best types for any particular needs.

Our Dressers are:

Diamo-Carbo
Desmond Huntingdon, 3 sizes
Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

We can promptly supply your needs from our stock.

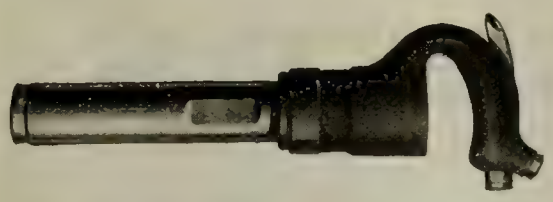


The Canadian Desmond-Stephan Manufacturing Company
HAMILTON, ONTARIO

Alfred Herbert, Ltd., Coventry, Eng., Agent for Great Britain.

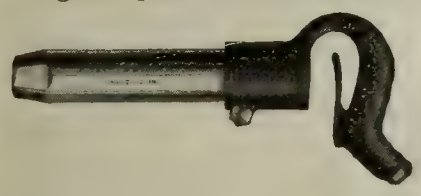
CLEVELAND RIVETING, CHIPPING, CALKING AND BEADING HAMMERS

MOST POWERFUL AND EFFICIENT AIR TOOLS ON THE MARKET



Cleveland Pocket-in-Head Riveters are made in 15 styles, with Outside and Inside Latch, and have driving capacities of ¼-in. to 1½-in. rivets in Boilers, Tanks, Stacks, etc.

The New Cleveland Pocket-in-Head Riveter is shorter over all, hits a harder blow, uses less air in operation; has higher speed with less recoil than any riveter on the market. Let us prove it in your shop.



CLEVELAND CHIPPING HAMMERS

are made in 19 styles and sizes to suit all classes of work. They are ideal tools for foundries, as they have high-speed, no recoil, and are practically dust-proof.

CLEVELAND WOOD-BORING MACHINES

FOR BUILDING WOOD CARGO SHIPS, Etc.

The Cleveland No. 20W Wood Boring Machine illustrated, is a light-weight, high-speed motor with a capacity of 2-in. in wood; it is very compact and easily handled by one man. We make four sizes, covering a range in wood from 1 inch to 4 inches. We also manufacture 61 types and sizes of Air Drills for Metal Drilling, Reaming, Tapping, etc.

IN STOCK: Riveting and Chipping Hammers, Air Drills, Wood Drills, Sand Rammers, Bowes Air Hose Couplings, Rivet Sets, etc.

Write for Latest Catalog No. 14.

Address all inquiries to

CLEVELAND PNEUMATIC TOOL CO. OF CANADA, Limited

84 CHESTNUT STREET, - TORONTO, ONT.

Stow Shell Grinders Increase Production

Suspended Pedestal Mounted on Truck

Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.

Binghamton, New York, U.S.A.

Oldest Portable Tool Manufacturers in America

Carry Your Grinder to the Work Not Your Work to the Grinder

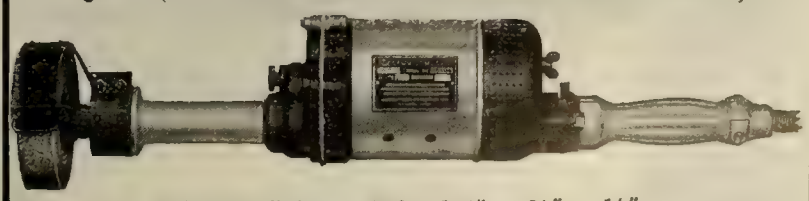
Thor

Portable Electric GRINDER

Equipped with Universal Motor for Operating on Direct or Alternating Current

110 TO 250 VOLTS

(Licensed Under Burke Universal Motor Patent.)



No. 6 Grinder-Wheel 4" x ¾" x ½"

ATTACH TO ANY LAMP SOCKET

Thor Portable Electric Grinder is equipped throughout with ball and roller bearings, and has a specially constructed motor, insuring speed, power, ease of operation and increased capacity.

IT RUNS AT 4,500 R.P.M.

Independent Pneumatic Tool Company

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THE SUN
NEVER SETS
ON
QUALITY SAWS
EVERY TOOTH CUTS
ON EVERY QUALITY SAW
THEY CUT STRAIGHTER AND LAST LONGER
Canadian Representatives : F. Bacon & Company, Montreal, Canada
NAPIER SAW WORKS Inc.
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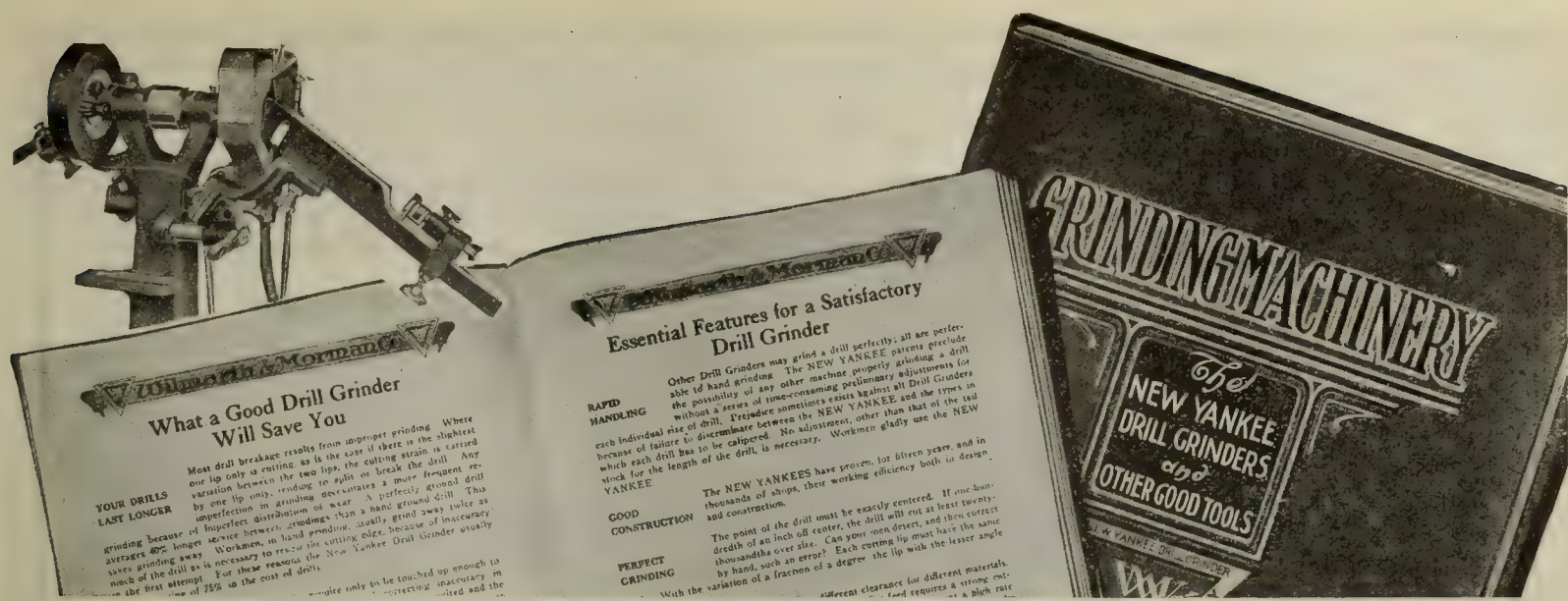

10,000 New Yankee Drill Grinders

ARE SAVING

MILLIONS OF DOLLARS

FOR THEIR USERS

Catalog No. 107 describes 100 styles and sizes of New Yankee Drill Grinders. Also W. & M. Surface Grinders and Universal Cutter and Tool Grinders. It's free. Sign and mail coupon now.

WILMARTH & MORMAN CO.

1200 Monroe Ave., N.W., Grand Rapids, Michigan, U. S. A.

Also Manufacturers of Surface and Universal Grinders

Wilmarth & Morman Co.,
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Gentlemen:

Please mail Catalog No. 107 and advise regarding New Yankee to meet our requirements.

Our drills range from.....to.....

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STERLING

HACK SAWS

Are known the world over for their efficient cutting quality which insures conomy and satisfaction.

You will make no mistake in buying "Sterling" Blades for the following reasons:

1st—They are made of the very best quality of steel rolled by any mill in the world.

2nd—The best mechanical construction which has been acquired by many years of experience.

3rd—Special heat treatment which goes to make the efficiency both for maximum quality and uniformity.

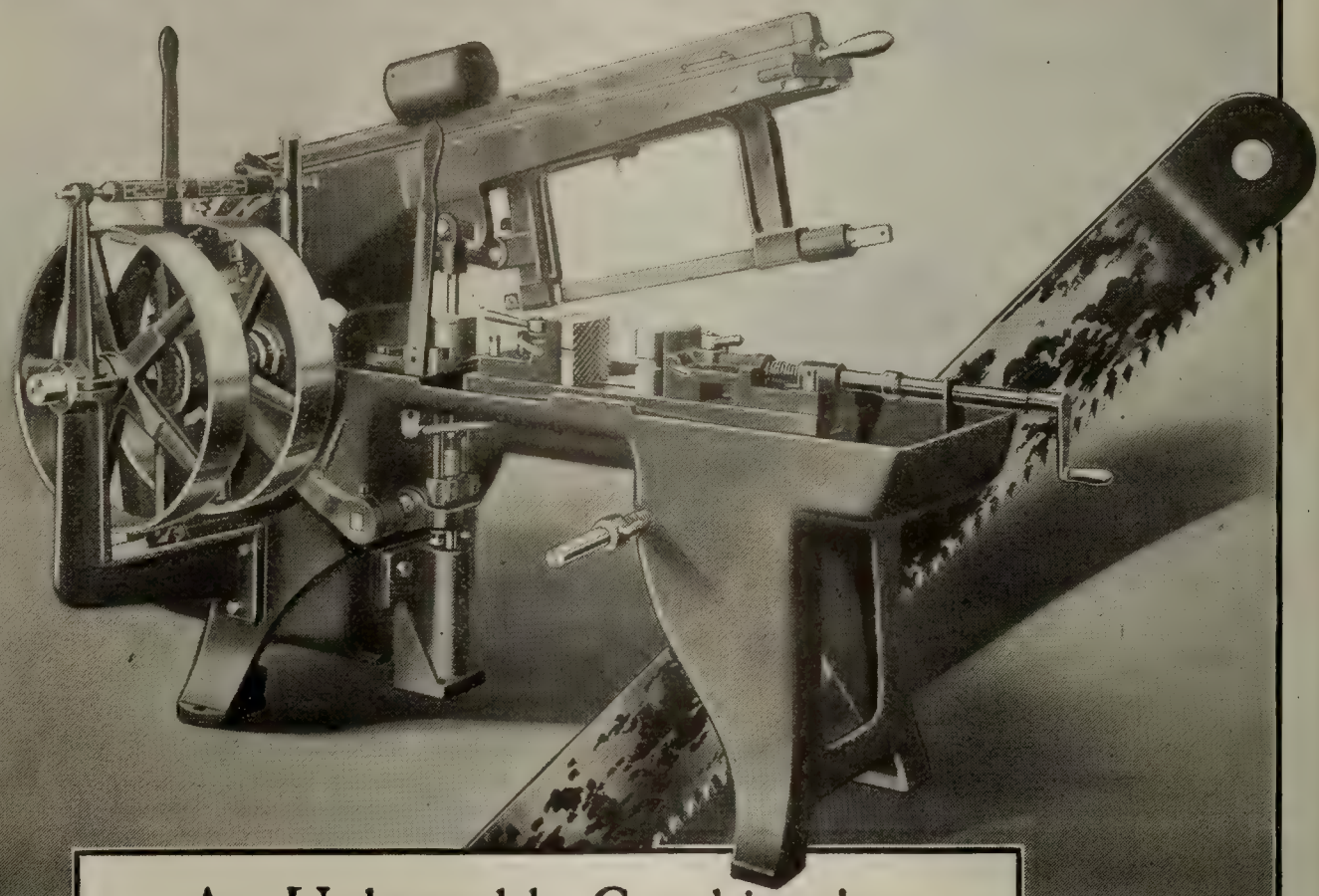
A trial will convince you.

MANUFACTURED BY

Diamond Saw & Stamping Works

BUFFALO, N. Y., U.S.A.

An Unbeatable Combination



An Unbeatable Combination

Are you a manufacturer of metal products, where accuracy, speed, production and economy count, and which require constant cutting-off of stock.

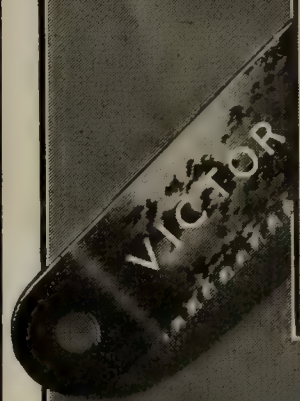
Here's The Combination You Are Looking For

The V. S. W. No. 5 High Speed Hack Saw Machine equipped with a VICTOR blade is unbeatable when it comes to increased production, and a minimum amount of power blade breakage and consumption.

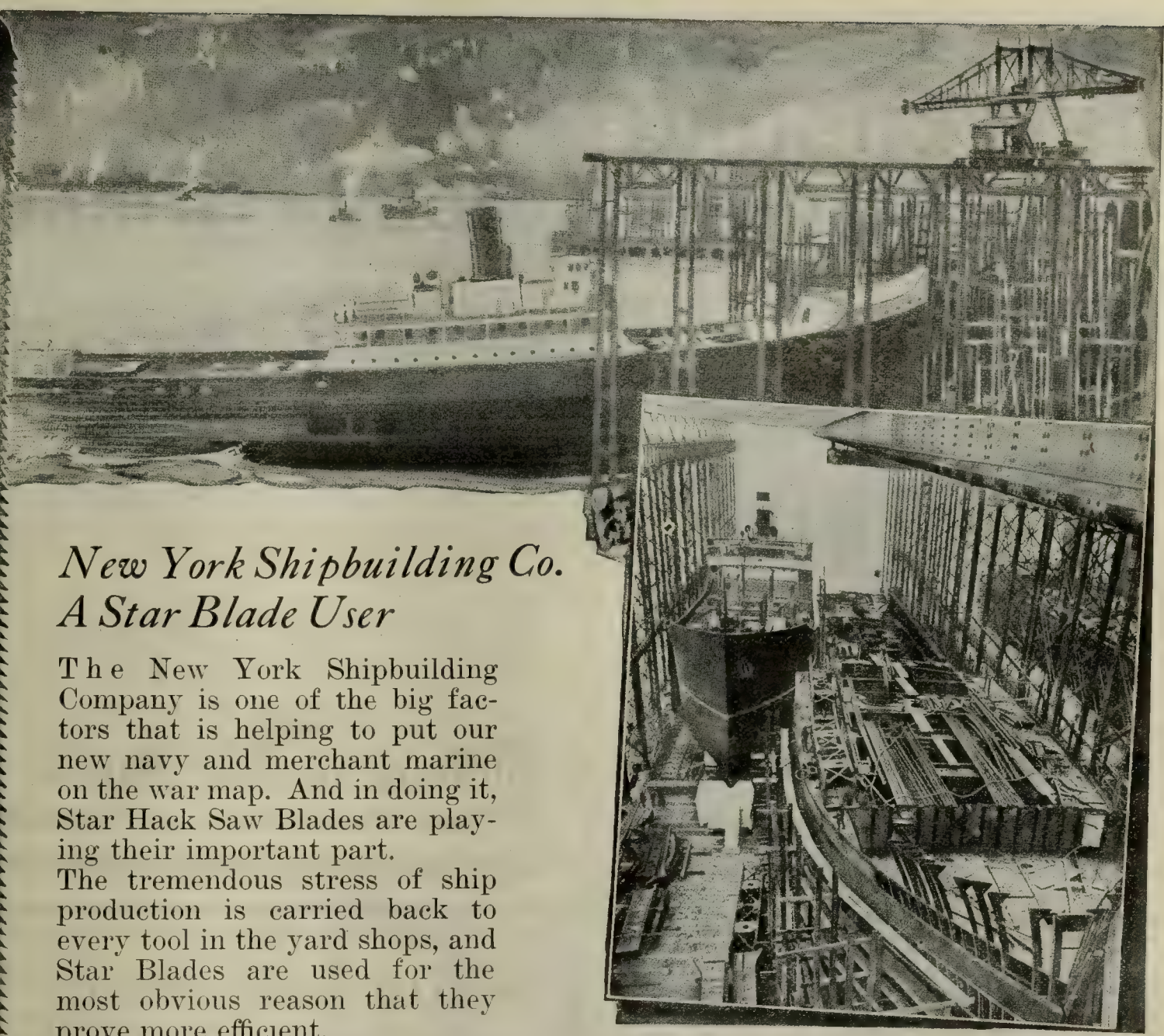
Why?

An actual machine and blade operated by one of your own men in you own shop will be the most convincing demonstration we can make.

Let us send you one V. S. W. machine on a thirty days' trial, with enough VICTOR blades to show you why.



VICTOR SAW WORKS LTD - HAMILTON, CANADA



New York Shipbuilding Co. A Star Blade User

The New York Shipbuilding Company is one of the big factors that is helping to put our new navy and merchant marine on the war map. And in doing it, Star Hack Saw Blades are playing their important part.

The tremendous stress of ship production is carried back to every tool in the yard shops, and Star Blades are used for the most obvious reason that they prove more efficient.

Here's still another proof of Star Blade betterness that ought to impress every man who uses a hack saw.

When you are looking for the most efficient saw, play safe and follow the big concerns with millions in production at stake who have spent thousands to find out the facts. Do as they do and you will standardize on

STAR HACK SAW BLADES

Or make the tests yourself—for speed, for endurance or for low cutting cost and you cannot help coming to the same conclusions if you make a thorough test.

The Star was the first modern hack saw blade and for thirty years its distinctly better quality has kept it the largest selling blade.

This greater efficiency and endurance of Star Blades is no accident but the result of hundreds of thousands of tests of steel composition, of tempering, of relative dimensions and of shape and setting of teeth.

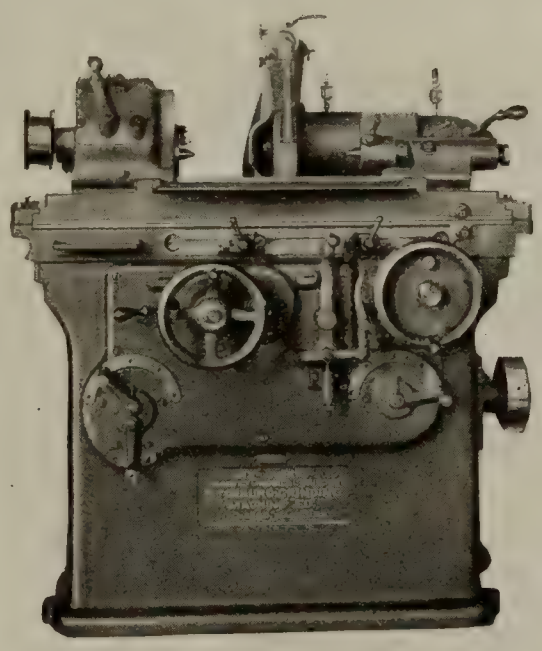
Then the standards set for Star Blades has been uniformly attained in production at every stage by special automatic machinery which gauges to the finest limits that make the smallest variation a mechanical impossibility. At the same time this special machinery gives us an enormous quantity production at a minimum factory cost.

If you are not satisfied with your present metal cutting results, have any reason to believe they can be improved or have any special cutting problems, write our Engineering Department, 230 River St., Millers Falls. We are at your service, regardless of what blades you are using.

Manufactured By
CLEMSON BROS. INC.
MIDDLETOWN, NEW YORK

Sole Distributors
MILLERS FALLS CO.
MILLERS FALLS, MASS.

FITCHBURG SIX-TWENTY



Bulk Doesn't Make a Grinder

any more than bulk makes a man.

Both watch and clock tell time. But isn't the little watch almost always the more reliable?

Bulkier Machines cannot grind more accurately than this compact Fitchburg Six-Twenty. Bulkier Machines fall behind when it comes to speed.

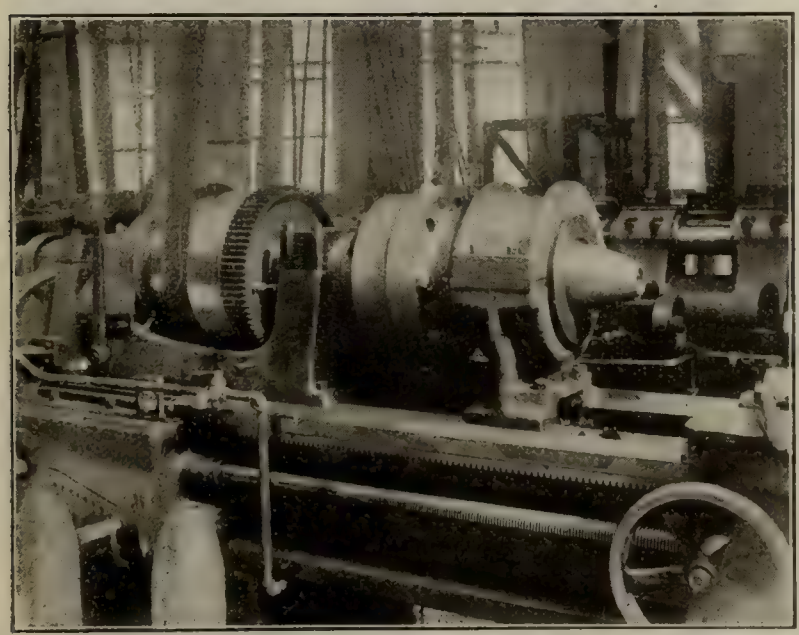
Occupying much less floor space, demanding considerable less effort, Fitchburg Six-Twenty best grinds all work within its range—and its range admits a big percentage of all Straight and Taper work.

The travel of the table is within control of a single lever, and may be started or stopped at any part of its stroke. Variable table dwell and automatic cross-feed with positive stop facilitate duplicate grinding.

Write us to-day for all the facts and illustrated catalog.

Fitchburg Grinding Machine Co.

76 Winter Street Fitchburg, Mass.



Cut shows Chuck on nosing operation. This is one of over two hundred in this Canadian plant.

This chuck is *built on the duplicate part system. It is simple, effective and fool-proof.*

It grips the shell in a predetermined position. The jaws will not slip on the shell. It has shell interior and exterior adjustable stops.

A trial on one of your lathes will convince you that this is THE chuck for shell work.

A Big Efficiency Unit in Your Shell Plant

A. J. LAVOIE'S

LOW PRESSURE

Compressed Air Chuck

This chuck can be applied to any make of lathe, without alteration to the machine, and will increase production from 25% to 75%. It grips and releases the shell while in motion—no need to stop your machine.

It is a single unit combination attached to the face plate of lathe, supported by an additional heavy duty bearing, thus making a heavy duty lathe out of a light machine. A small lever operates the chuck. Will operate with a pressure of 60 lbs. per sq. in.

MANUFACTURED BY

The Montreal General Tool Co.

673-5 Notre Dame Street, Maisonneuve, Montreal, P.Q.

Also manufacturers of shell tools, and special machine attachments of all kinds made to order.

MODERN

SELF-OPENING and ADJUSTABLE DIE HEADS

The Die Heads that have made good on every threading operation, and which are constantly meeting the demand where Die Heads are required for accurate thread-cutting.

In purchasing "MODERN" Die Heads you have the assurance that you are getting tools of "quality," mechanically perfect in design and construction and uniformly efficient in all sizes.

Illustration shows an installation of "MODERN" Die Heads threading Shell Ogives, where the requirements are precision and large production.

Complete information regarding the use of "MODERN" Self-Opening Die Heads upon request.

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Main Office and Works:
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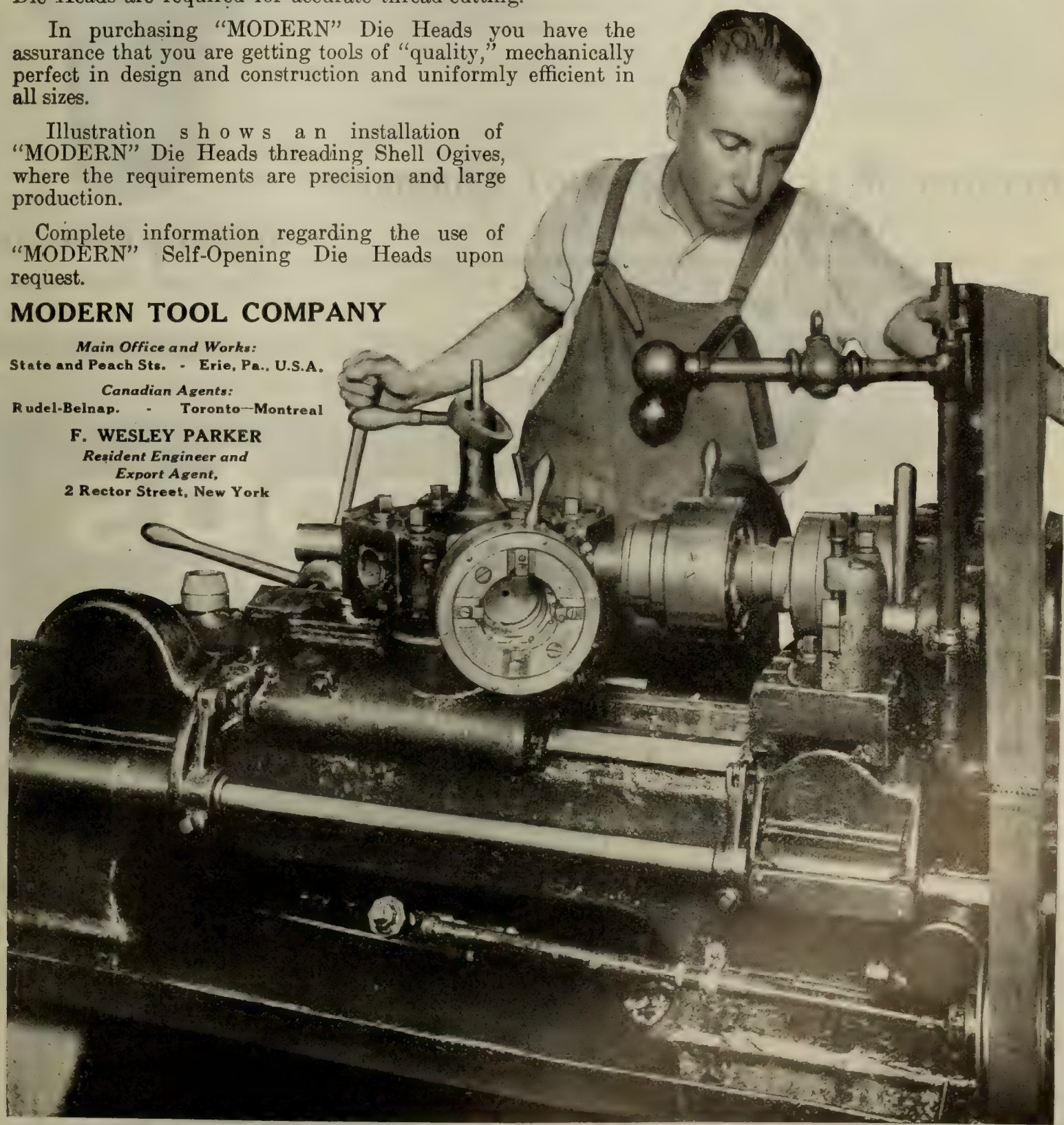
Canadian Agents:
Rudel-Belnap. - Toronto—Montreal

F. WESLEY PARKER
Resident Engineer and Export Agent,
2 Rector Street, New York



Handle 75-M/M Shells Just Once

Two Murchey Taps on your lathe completely finish this shell so that when it comes off the machine there is no more handling or re-sizing to do. Therefore

Murchey Tap Them

By using Murchey Collapsing and Adjustable Taps, you save two minutes or more on every 75-mm. Shell. Figure that in dollars for yourself!

Practically all the large plants of the United States are lining up with Collapsing Taps to thread the nose of this shell. No minute must be knowingly wasted.

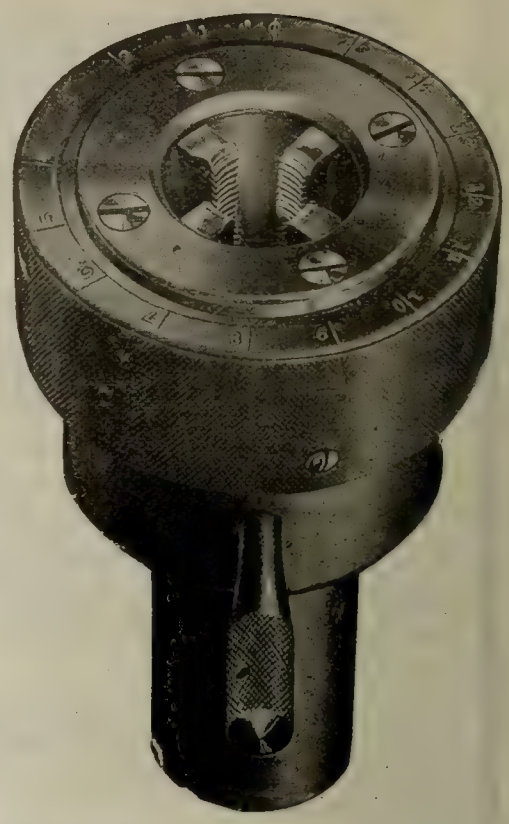
Murchey Chasers are quickly adjusted to compensate for wear, and Murchey Adjustable Taps serve as long as ten solid Taps.

WRITE AT ONCE FOR ALL PARTICULARS.

Murchey Machine & Tool Company

75 Porter Street, Detroit, Mich.

The Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, S. W., England, Glasgow, Newcastle-on-Tyne, and Fenwick Freres & Company, 15 Rue Fenelon, Paris, France



Lightning Deliveries

—That is Murchey Service

Jacobs IMPROVED Drill Chuck

A Winner By Sheer Merit

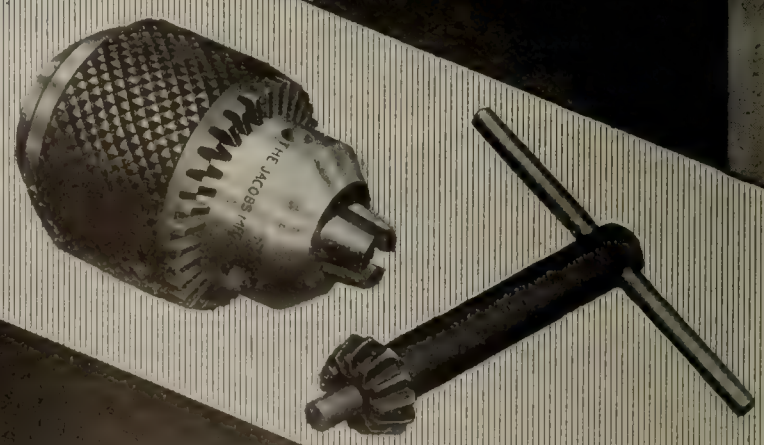
Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

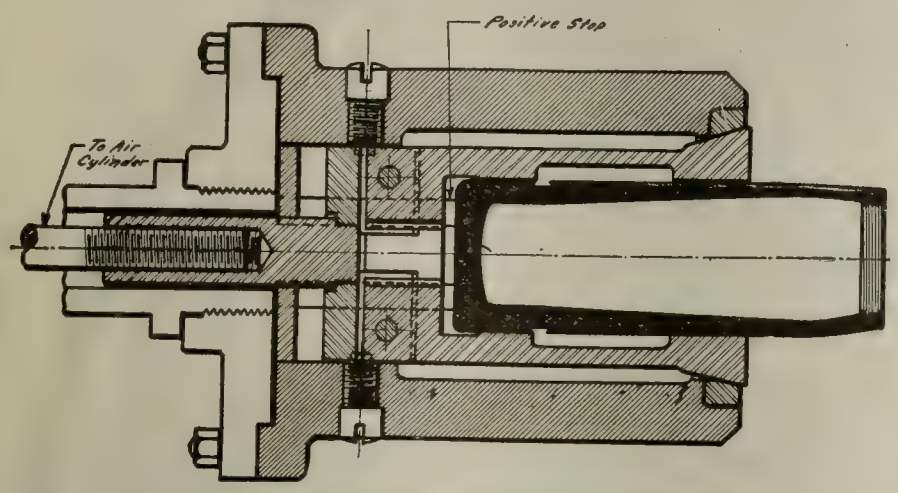
MADE BY

The Jacobs Manufacturing Co.

Hartford, Conn., U.S.A.



EVERY MINUTE EVERY DAY PRODUCTION SPEEDED



M. E. C. THREE JAW HINGED COLLET CHUCKS

with steel body are almost everlasting. Not one complicated part to get out of order. Grip firm and positive, their simple air valve control greatly facilitates the quick insertion or withdrawal of work.

Instead of wasted minutes chucking with slow hand-operated chucks, do the same work in seconds, and do it better, with M. E. C. Three Jaw Chucks—compressed air operated.

M. E. C. Chucks
Air Operated

are 100% efficient wherever rapid manufacturing and absolute accuracy are the demands.

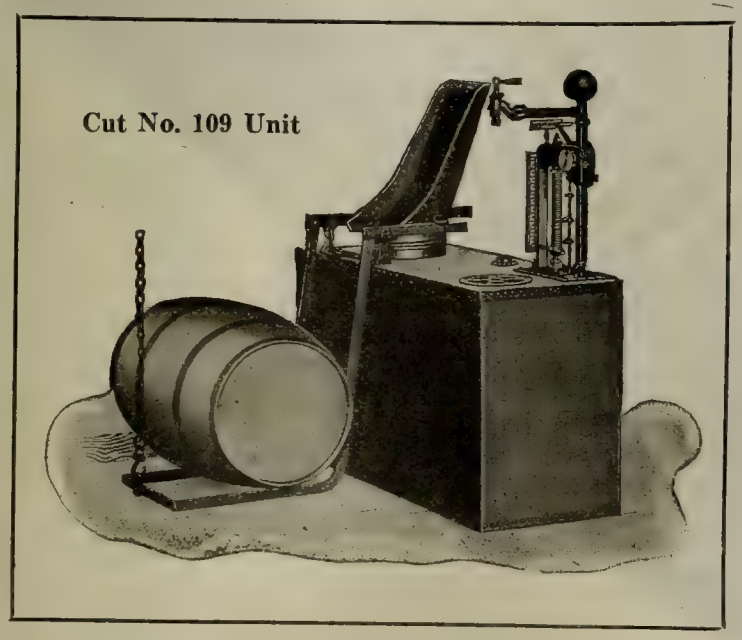
Know what great helps to speed production M. E. C. Chucks and Air Cylinders have proved themselves. Write to-day for our catalogue and 30-day free trial plan.

Manufacturers Equipment Company

175-179 North Jefferson St., CHICAGO, ILL.

CANADIAN AGENTS: J. R. Stone Tool and Supply Co., Detroit, Mich.
New York: J. R. Stone Tool and Supply Co., 30 Church St.

A Convenience—*that brings*—Economy



The Bowser System can be added to whenever more storage capacity is required. It is convenient, economical and fire-proof. Write for illustrated bulletin—to-day.

ECONOMY is the great thing to-day. It applies to every necessity; in the shop to time, labor and materials—it means quicker and greater production with less effort and cost. Production is increased when machines are lubricated properly; upkeep and labor is reduced and time saved.

Oil, therefore, is a necessity that should be protected by modern storage and handling facilities so that waste, careless handling, evaporation and deterioration of oil will be stopped, and the danger of interruption to production by fire, removed.

Ideal provision for the economical Storage and Distribution of Oil is embodied in the

BOWSER ESTABLISHED 1885

Oil Storage System

It is designed and built for any oil storage or distributing requirement, large or small, hand or power operated.

It is durable, accurate and safe; promotes efficiency, suggests cleanliness, lightens labor, and saves oil and money.

Every Shop Needs It.

S. F. Bowser & Co., Inc.

TORONTO, ONTARIO, CANADA
Sales Offices in All Centers — **Representatives Everywhere**

Every Butterfield Tap comes to you ready for long, hard service.

It is made by expert workmen—from the finest materials obtainable—and thoroughly tested before shipment.

For the tap that is uniformly dependable in service — specify Butterfield.

Butterfield & Co., Inc.
Rock Island :: Quebec

Toronto Office:
1505 Traders Bank Building : Phone Main 1382
H. A. HARRISON, Manager

Catalog No. 16 containing the complete line of Butterfield Tools awaits your request.

BUTTERFIELD

"Each Operator Averaged 10 More Shells per Day"

In his report to plant owner the works manager quoted recommended disposal of all remaining screw-operated box chucks.

His report was made three months after a partial change to Hannifin Air Chucking.

Six weeks later every lathe in the plant was equipped with Hannifin Air Operated Chucks.

At this time Hannifin Air Operated Mandrels were also installed.

The plant in question is producing 6-inch shells.

It is nothing unusual for Hannifin Air Operated Chucking and Clamping Equipment to add an extra day in time saved to each week.

In many of the largest plants in this country and Canada, Hannifin Air Operated Equipment has increased output from 20 to 80 per cent. In a number of plants it has actually *doubled* output.

If your work requires quick handling and rigid never-slip grip, for you to do without Hannifin Air Operated Chucking and Clamping Equipment is to do without profits within your reach.

Say you would like our catalog.

HANNIFIN MFG. COMPANY, Chicago, U.S.A.

LOCAL REPRESENTATIVES: C. C. Firmin, Detroit; Carl Naumann, Syracuse; R. E. Ellis Engineering Company, Chicago, Ill.
FOREIGN REPRESENTATIVES: A. R. Williams Machy. Co., Ltd., Toronto, Can.; Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, Glasgow and Newcastle-on-Tyne; Fenwick Freres & Company, 1500 Rue Fenelon, Paris, France; Iznosskoff, Suckau & Co., Petrograd, Moscow, Ekaterinberg and Odessa, Russia.

HINTS TO BUYERS

TRADE MARK
BRISTOL'S REG. U. S. PAT. OFFICE. **ELECTRIC PYROMETERS**

FOR EVERY SERVICE

Bristol's Recording Pyrometer furnished with patented frictionless smoked chart recording system, especially valuable for processes requiring continuous heat treatment.

Simplicity of construction and ruggedness make them ideal shop pyrometers. The ONLY pyrometer equipped with Weston milli-voltmeter movement.

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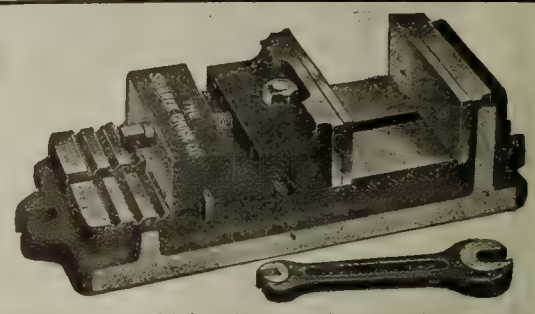
THE BRISTOL CO.
WATERBURY, CONN., U.S.A.

SKINNER DRILL PRESS VISE



A substantial, durable tool which will pay for itself in short order in any machine shop. Four sizes to accommodate a wide range of work. Try one and you'll buy more.

Printed matter promptly mailed on request.

THE SKINNER CHUCK COMPANY

New York Office, 94 Reade Street — London Office 149 Queen Victoria St. — San Francisco Office Rialto Bldg.
Factory and Main Office, New Britain, Conn., U.S.A.

THOUSANDS of Dollars are saved every year by our clients, because we have experts who are trained to make exhaustive tests of all the material you are purchasing, whether raw material or finished products.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED

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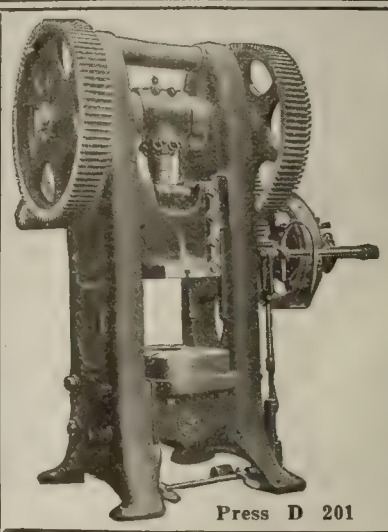
TORONTO, WINNIPEG, EDMONTON, VANCOUVER, NEW GLASGOW



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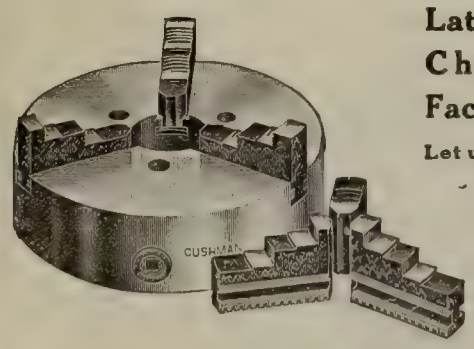

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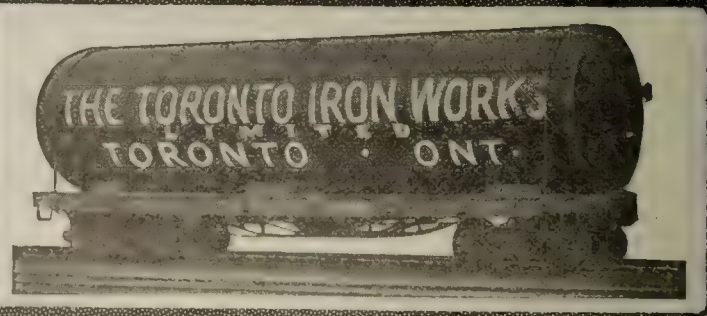

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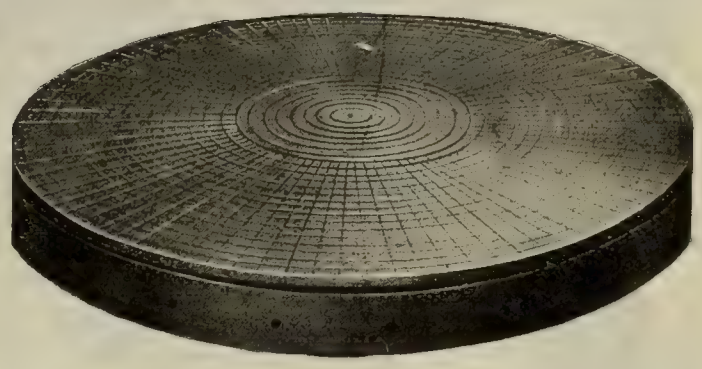

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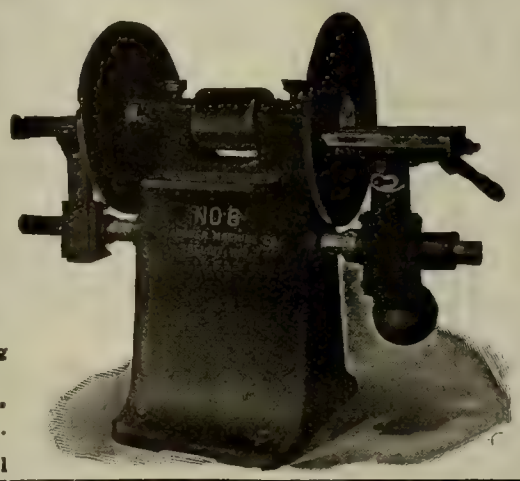

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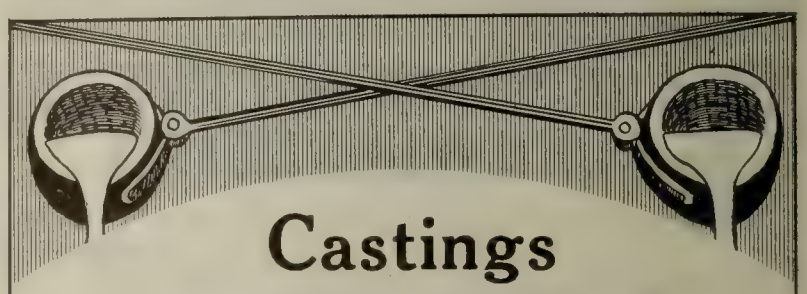

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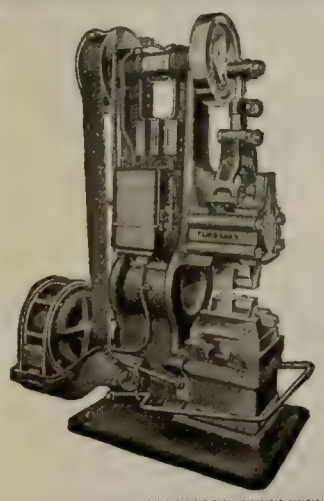

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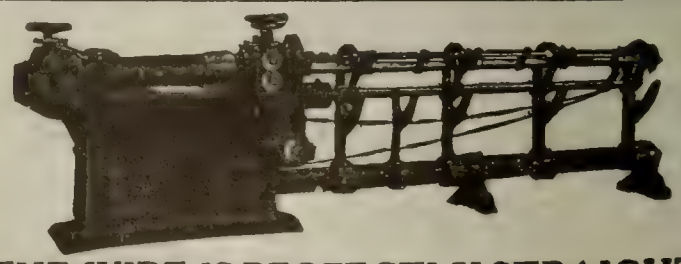

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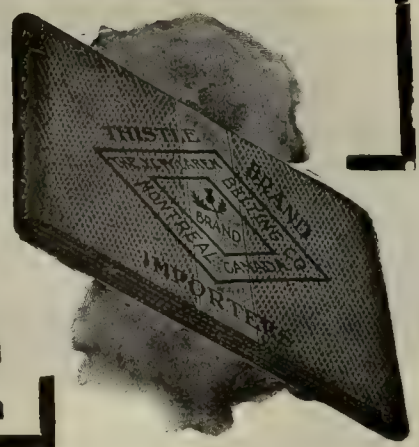

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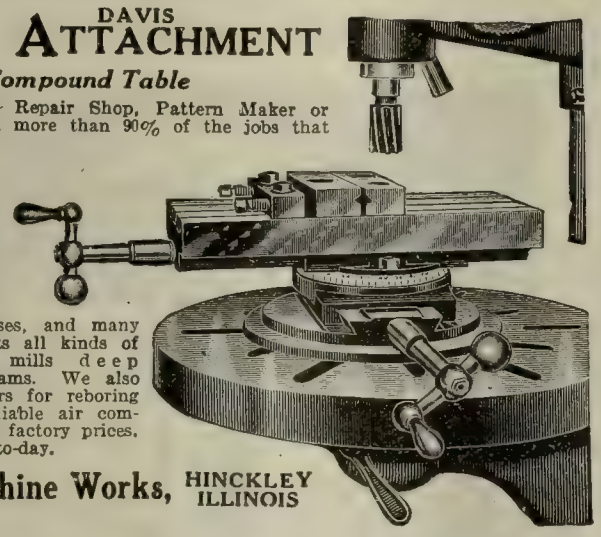

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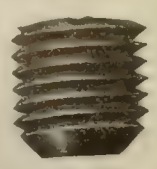

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Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, UPRIGHT AND HORIZONTAL
John Bertram & Sons Co., Dundas
Canada Machinery Corp. Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Roelofson Machine & Tool Co., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, STOVE AND COAL
Cumming & Son, J. W., New Glasgow, Canada

BORING AND TURNING MILLS
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
R. E. T. Pringle, Ltd., Toronto, Ont.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland
New Britain Mach. Co., New Britain, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.

BRASS AND COPPER BARS, RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto

BRASS FOUNDERS
St. Lawrence Welding Co., Montreal, Que.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto, Ont.
Warner & Swasey Co., Cleveland
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machy. Co., Toronto

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MacKinnon, Holmes Co., Sherbrooke

BRONZE RODS AND SHEETS
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BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

BUBBLERS
Puro Sanitary Dk'g Fountain Co., Haydenville, Mass.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.

BUCKETS, CLAM SHELL, CRAB, DUMP
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Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

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John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.

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Gray Mfg. & Mach. Co., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.

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BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque.

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Ferracute Mach. Co., Bridgeton, N.J.
Brown, Boggs & Co., Hamilton, Can.
Prest-O-Lite Co., Inc., Toronto, Ont.

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Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CARS, STEEL BODY
Marsh & Henthorn, Ltd., Belleville, Ont.

CAR MOVERS
Dillon Mfg. Co., Oshawa, Ont.

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Blackall, Fred. S., Woolworth Tower, New York.
Bliss Co., E. W., Brooklyn, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.

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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Sterling Engine Works, Winnipeg, Man.
St. Lawrence Welding Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, GRAY IRON
Bernard Industrial Co., The A., Fortierville, Que.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Steel Foundries, Ltd., Montreal, Que.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Marsh & Henthorn, Ltd., Belleville, Ont.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.
Sterling Engine Works, Winnipeg, Man.
Welland Mach. & Foundries, Ltd., Welland, Ont.

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Dominion Steel Foundry Co., Ltd., Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.

CASTINGS, MALLEABLE
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Cumming & Son, J. W., New Glasgow, Canada.

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.

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Gardner, Robt., & Son, Montreal.
Petrie, Ltd., H. W., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
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Gardner, Robt., & Son, Montreal.
Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

CHAIN DRIVES
Jones & Glassco, Montreal, Que.

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Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.

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Union Tool Chest Works, Rochester, N.Y.

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Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, DRILL, LATHE AND UNIVERSAL
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Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Skinner Chuck Co., New Britain, Conn.
D. E. Whiton Machine Co., New London, Conn.

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Can. Blower & Forge Co., Kitchener, Canada.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.

CHUCKS, MAGNETIC
H. E. Streeter, 523 New Birks Bldg., Montreal.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.

CHUCKING MACHINES
Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.

CLOCKS, WATCHMAN, PORTABLE
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Jones & Glassco, Montreal, Que.

CLUTCHES, FRICTION AND PULLEY
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Johnson Machine Co., Carlyle, Manchester, Conn.
Jones & Glassco, Montreal, Que.
Positive Clutch & Pulley Works, Ltd., Toronto.

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MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

COILING MACHINERY, WIRE AND SPRING
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COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

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COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.

COMPOSITION INGOT
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Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
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Petrie, Ltd., H. W., Toronto, Ont.
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Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.

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A. R. Williams Machy. Co., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

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Whiting Foundry Equipment Co., Harvey, Ill.

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John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

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Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

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Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.

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Bernard Industrial Co., The A., Fortierville, Que.

COUPLINGS, PLAIN AND FLEXIBLE
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Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES, LOCOMOTIVE
Northern Crane Works, Walkerille.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

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Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.

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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
Butterfield & Co., Rock Island, Que.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass.
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Mchy. & Supplies, Ltd., Montreal, Que.
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CYLINDERS, AIR
Manufacturers Equipment Co., Chicago, Ill.

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Hinckley Machine Co., Hinckley, Ill.

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Butterfield & Co., Rock Island, Que.
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Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
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Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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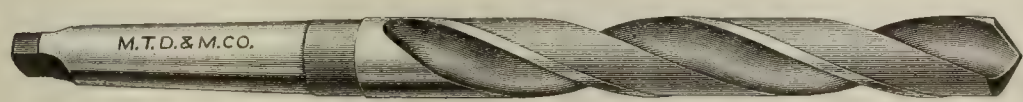

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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, O.
A. R. Williams Machinery Co., Toronto.

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Martin Machine Co., Greenfield, Mass.

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Bilton Mach. Tool Co., Bridgeport, Conn.
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.

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Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
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Fox Machine Co., Jackson, Mich
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Hespeler, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rockford Drilling Mach. Co., Rockford, Ill.

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Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
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Petrie, Ltd., H. W., Toronto, Ont.

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De Mooy Machine Co., Cleveland, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
D. McKenzie Machinery Co., Guelph, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, Ohio.

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John Bertram & Sons Co., Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.

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Keystone Mfg. Co., Buffalo, N.Y.
Silver Mfg. Co., Salem, Ohio.

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Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Millers Falls Co., Millers Falls, Mass.
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Pratt & Whitney Co., Dundas, Ont.
United States Electrical Tool Co., Cincinnati.

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Cleveland Twist Drill Co., Cleveland.
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A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.

DRILLS, ELECTRIC AND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.

DRILLS, HIGH SPEED
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Can. B. K. Morton, Toronto, Montreal.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Marshall & Co., Geo. A., Toronto, Ont.
McKenna Brothers, Pittsburgh, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
W. F. & John Barnes Co., Rockford, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

DRILLS, MULTIPLE SPINDLE
Henry & Wright Mfg. Co., Hartford, Conn.
Niles-Bement-Pond Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Niles-Bement-Pond Co., New York.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Millers Falls Co., Millers Falls, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Cleveland Twist Drill Co., Cleveland.
Clark Equipment Co., Buchanan, Mich.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Morse Twist Drill & Mach. Co., New Bedford.

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Atkins & Co., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Butterfield & Co., Rock Island, Que.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

DRINKING FOUNTAINS
Puro Sanitary Dk'g. Fountain Co., Haydenville Mass.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sheldons, Ltd., Galt, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

DUST ARRESTERS (FOR TUMBLING MILLS)
Northern Crane Works, Walkerville.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

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Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
A. R. Williams Machy. Co., Toronto.

ELEVATOR ENCLOSURES
Canada Wire & Iron Goods Co., Hamilton, Ont.

ELEVATORS AND BUCKETS
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Whiting Foundry Equipment Co., Harvey, Ill.

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Can. Matthews Gravity Carrier Co., Toronto, Ont.
Marsh & Henthorn, Ltd., Belleville, Ont.

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Stow Mfg. Co., Binghamton, N.Y.

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Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Ford-Smith Mach. Co., Hamilton, Ont.
Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.

ENGINES, BALANCED VALVE
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Plessisville Foundry Co., Plessisville, Que.

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Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
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Sterling Engine Works, Winnipeg, Man.

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Johnson Mach. Co., Carlyle, Manchester, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Sheldons, Ltd., Galt, Ont.
A. R. Williams Machy. Co., Toronto.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Parmenter & Bulloch Co., Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

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Puro Sanitary Dk'g. Fountain Co., Haydenville, Mass.

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Canada Wire & Iron Goods Co., Hamilton, Ont.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

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Can. B. K. Morton Co., Toronto, Ont.
Delta File Works, Philadelphia, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Port Hope File Mfg. Co., Port Hope, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.

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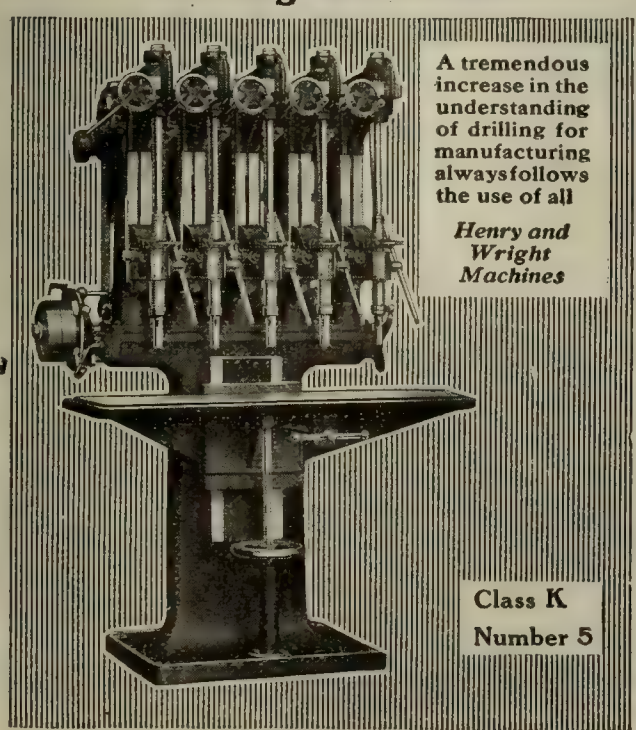

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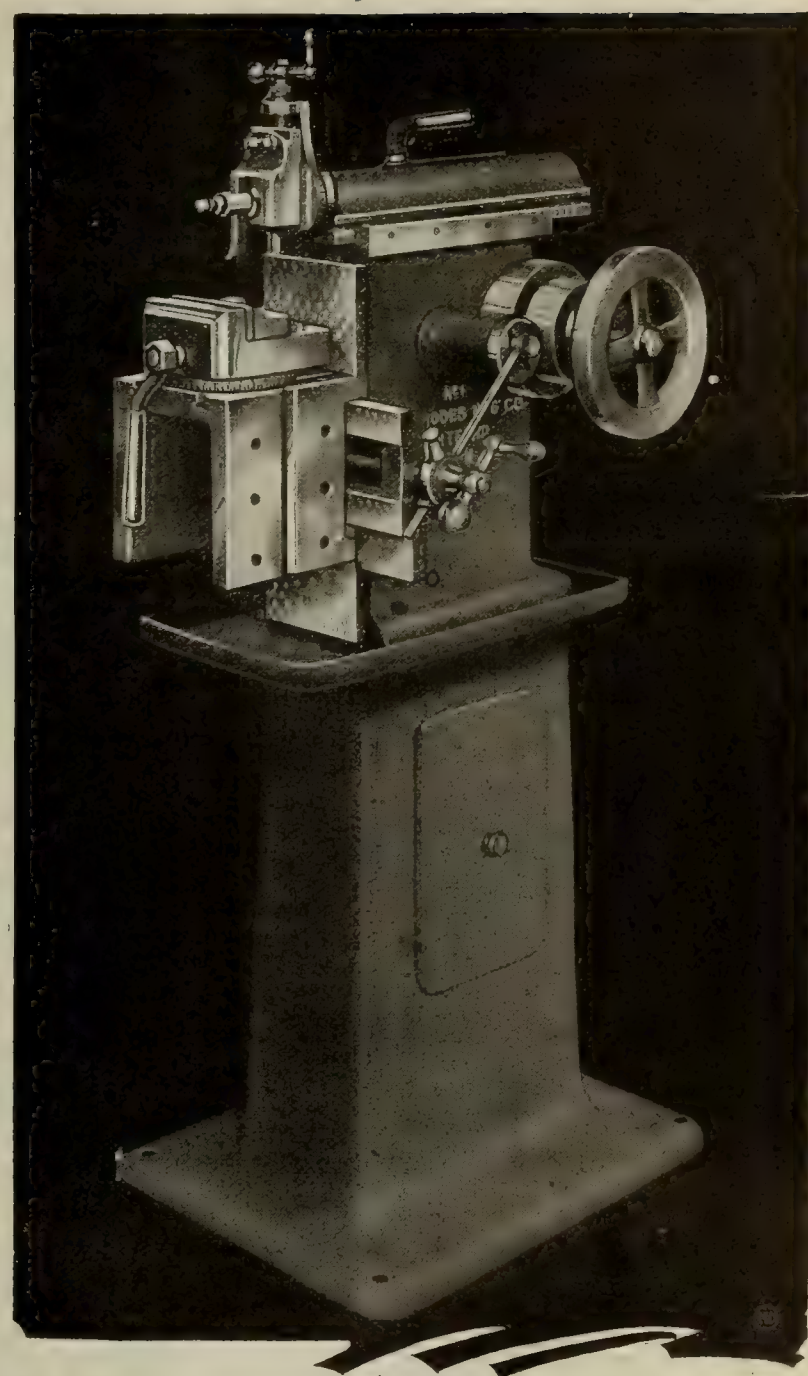

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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Tate-Jones & Co., Leetsdale, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.
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Toronto Iron Works, Ltd., Toronto.
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Whiting Foundry Equipment Co., Harvey, Ill.
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Gilbert & Barker Mfg. Co., Springfield, Mass.
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Oven Equipment & Mfg. Co., New Haven, Conn.
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Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Normas Machine Co., St. Catharines, Ont.
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Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
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Wells Brothers Co. of Canada, Galt, Ont.
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Garlock-Walker Machinery Co., Toronto, Ont.
Hamilton Gear & Machine Co., Toronto.
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Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
The Smart-Turner Machine Co., Hamilton.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
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Himoff Mach. Co., Inc., Astoria, L.I., New York.
GEAR TURNING MACHINES, BEVEL
Bridgeford Mach. Tool Works, Rochester, N.Y.
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Baxter & Co., Ltd., J. R., Montreal, Que.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Foundries, Ltd., Hull, Que.
Illinois Tool Works, Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
The Smart-Turner Machine Co., Hamilton.
Sterling Engine Works, Winnipeg, Man.
Winnipeg Gear & Engr. Co., Winnipeg, Man.
GEARS, RAWHIDE
Hamilton Gear & Machine Co., Toronto.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Jones & Glassco, Montreal.
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A. R. Williams Machy. Co., Toronto.
Winnipeg Gear & Engr. Co., Winnipeg, Man.
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Lancashire Dynamo & Motor Co., Toronto.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
Sturtevant Co., B. F., Galt, Ont.
A. R. Williams Machy. Co., Toronto.
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Willson & Co., Inc., T. A., Reading, Pa.
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Hickory Steel-Grip Glove Co., Chicago, Ill.
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Hickory Steel Grip Glove Co., Chicago, Ill.
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Garlock-Walker Machinery Co., Toronto, Ont.
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Modern Tool Co., Erie, Pa.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Brown & Sharpe Mfg. Co., Providence, R.I.
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Norton Grinding Co., Worcester, Mass.
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Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
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Gardner Machine Co., Beloit, Wis.
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Garvin Machine Co., New York.
United States Electrical Tool Co., Cincinnati, O.
Wilmarth & Morman, Grand Rapids, Mich.
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Brown & Sharpe Mfg. Co., Providence, R.I.
Fitchburg Grinding Mach. Co., Fitchburg, Mass.
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Greenfield Machine Co., Greenfield, Mass.
Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
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Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
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Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
United States Electrical Tool Co., Cincinnati, O.
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Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
LeBlond Mach. Tool Co., R. K., Cincinnati.
Niles-Bement-Pond Co., New York.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
Wilmarth & Morman, Grand Rapids, Mich.
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Can. B. K. Morton, Toronto, Montreal.
Carborundum Co., Niagara Falls.
Ford-Smith Mach Co., Hamilton, Ont.
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Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
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Ford-Smith Machine Co., Hamilton, Ont.
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Stow Mfg. Co., Binghampton, N.Y.
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Aikenhead Hardware Co., Toronto, Ont.
Baxter Co., Ltd., J. R., Montreal, Que.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Ford-Smith Machine Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Millers Falls Co., Millers Falls, Mass.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Montreal.
Racine Tool & Machine Co., Racine, Wis.
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Standard Machy. & Supplies, Ltd., Montreal, Que
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Zenith Coal & Steel Products, Montreal, Que.
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Garvin Machine Co., New York City.
Millers Falls Co., Millers Falls, Mass.
Victor Saw Works, Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.
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Canada Machinery Corp., Galt, Ont.
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A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Plessisville Foundry Co., Plessisville, Que.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
HAMMERS, HELVE POWER
Canada Machinery Corp., Galt, Ont.
West Tire Setter Co., Rochester, N.Y.
HAMMERS, POWER
Beaudry & Co., Boston, Mass.
Erie Foundry Co., Erie, Pa.
United Hammer Co., Boston, Mass.
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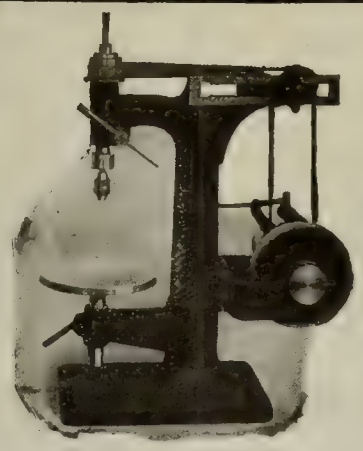

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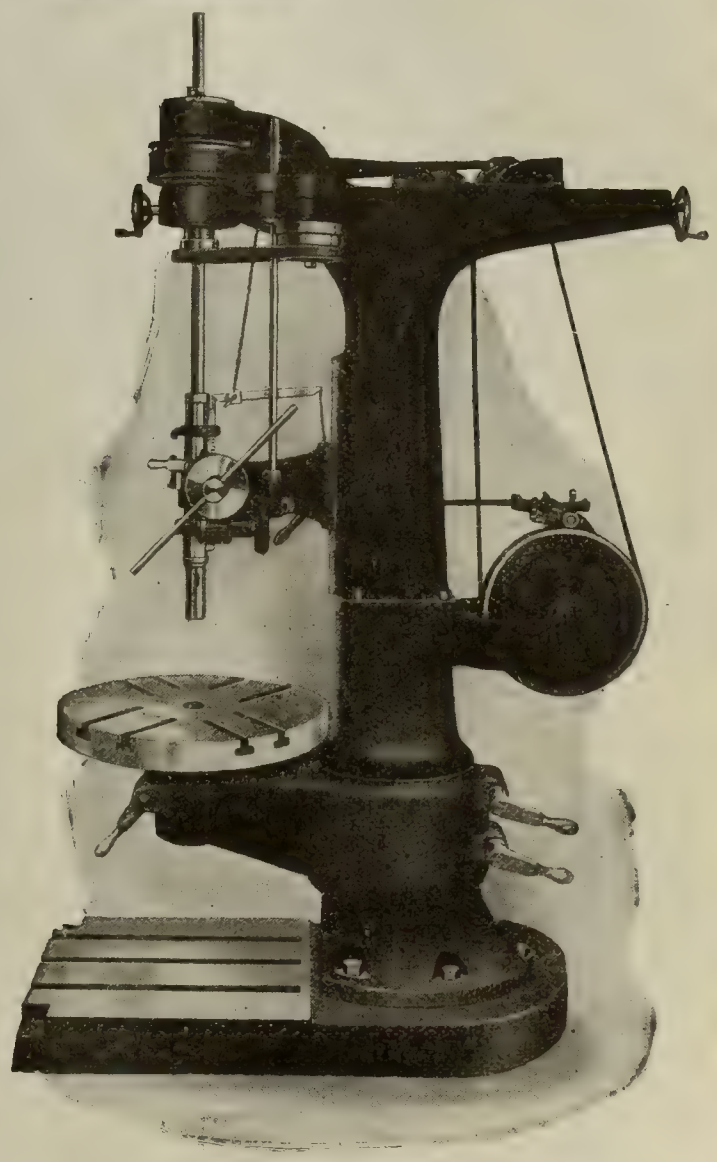

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Buchanan, Mich. U. S. A.

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Brantford Oven & Rack Co., Brantford, Ont.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVENS FOR DRYING, TEMPER AND UNDER TRUCKS
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Oven Equipment & Mfg. Co., New Haven, Conn.

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Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.

OXY-ACETYLENE WELDING AND CUTTING PLANT
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

OXYGEN (SEE ACETYLENE)
L'Air Liquide Society, Montreal, Que.

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New Britain Mach. Co., New Britain, Conn.

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MacKinnon, Holmes & Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

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Garlock-Walker Machinery Co., Toronto, Ont.

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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
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A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Petrie, Ltd., H. W., Toronto, Ont.
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A. R. Williams Machy. Co., Toronto.

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John H. Hall & Sons, Ltd., Brantford, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Wells Bros. Co. of Canada, Galt, Ont.

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Armstrong Bros. Tool Co., Chicago.

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Can. Fairbanks-Morse Co., Montreal.
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Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

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Sheldons, Ltd., Galt, Ont.
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Canadian Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Conn.

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Metalwood Mfg. Co., Detroit, Mich.

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Ferracute Machine Co., Bridgeton, N.J.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

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Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
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Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
West Tire Setter Co., Rochester, N.Y.

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Can. Fairbanks-Morse Co., Montreal.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Toledo Machine & Tool Co., Toledo.

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Standard Machy. & Supplies, Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Toledo Machine & Tool Co., Toledo.
West Tire Setter Co., Rochester, N.Y.
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Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
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Consolidated Press Co., Hastings, Mich.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
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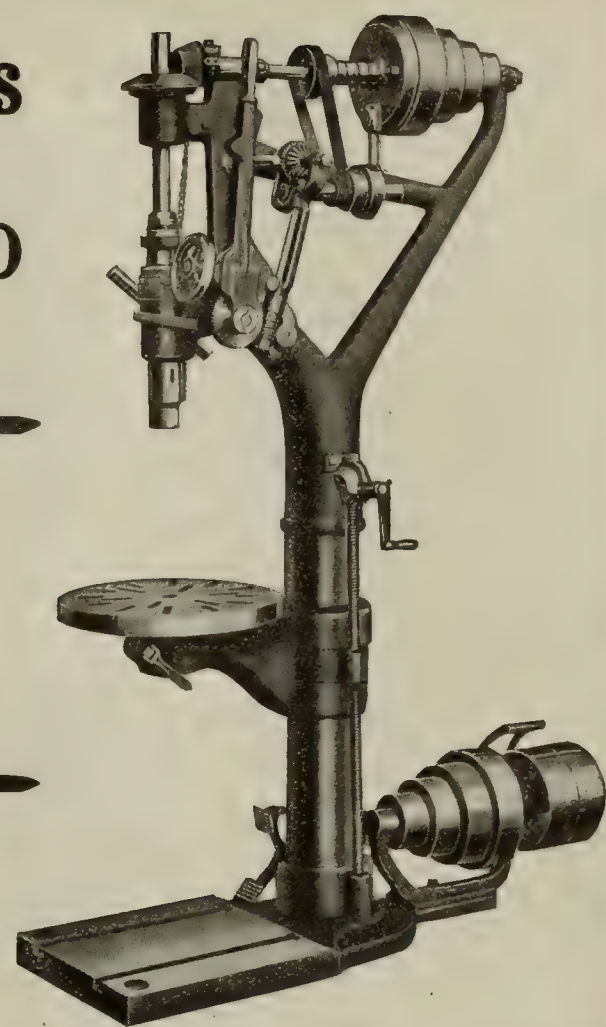

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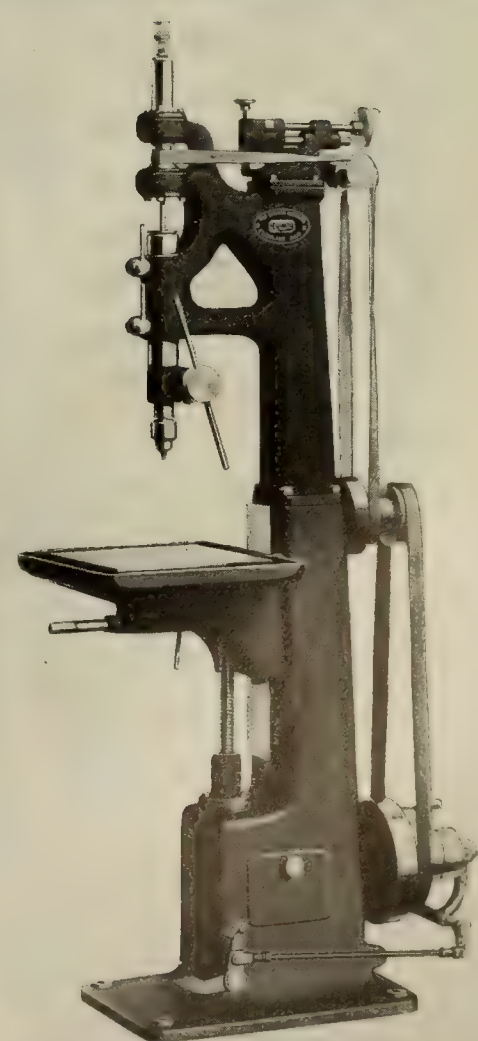

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Shore Instrument & Mfg. Co., New York City
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Hamilton Mach. Tool Co., Hamilton, Ohio
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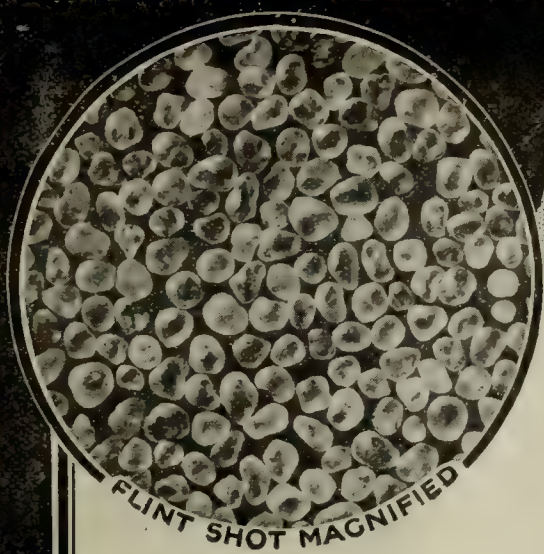

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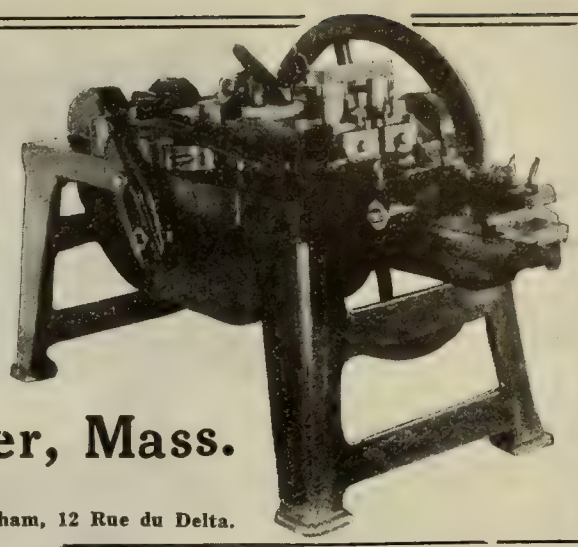

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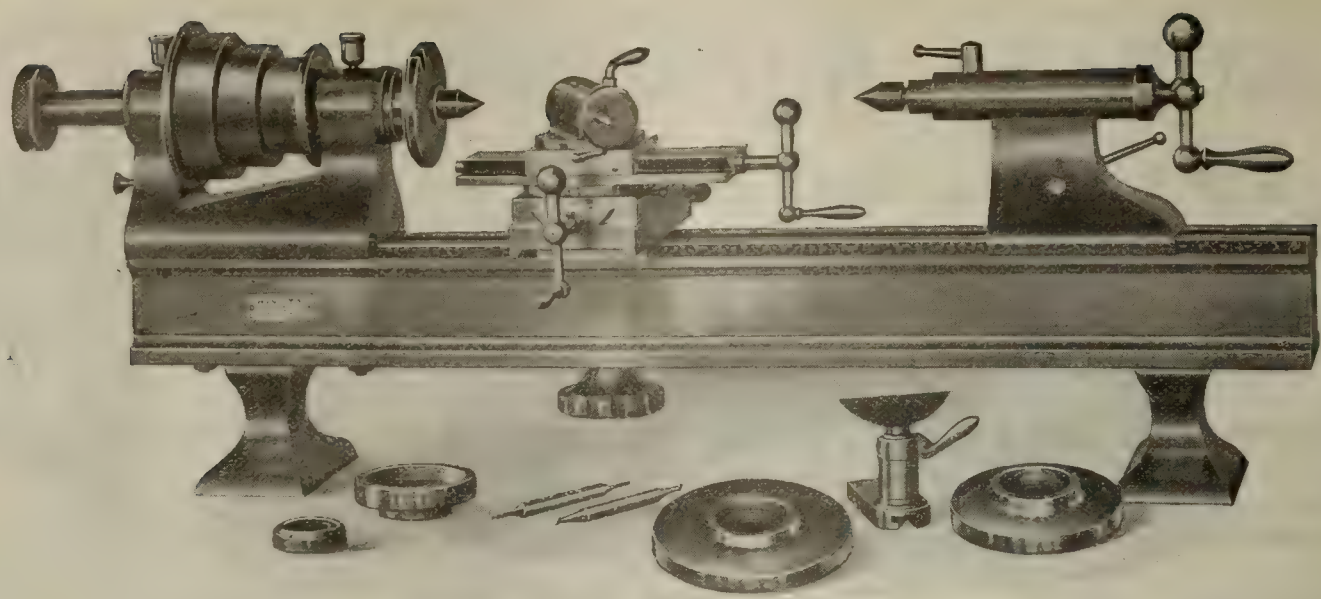

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AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

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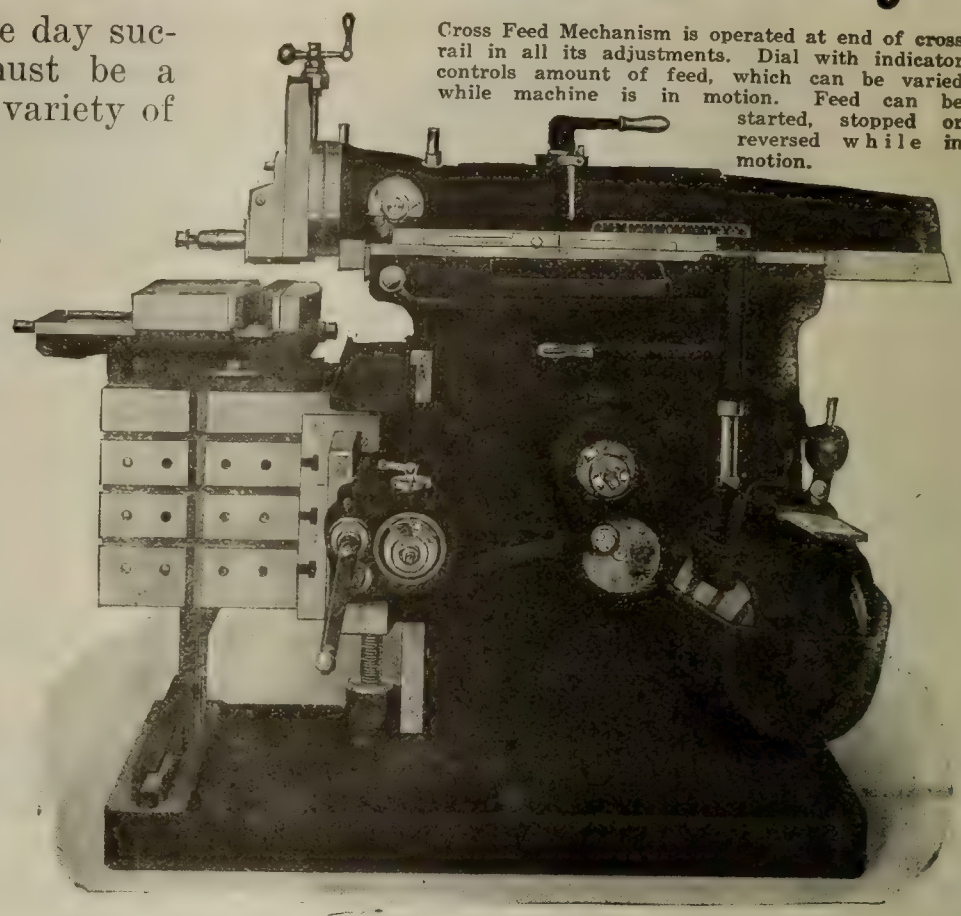

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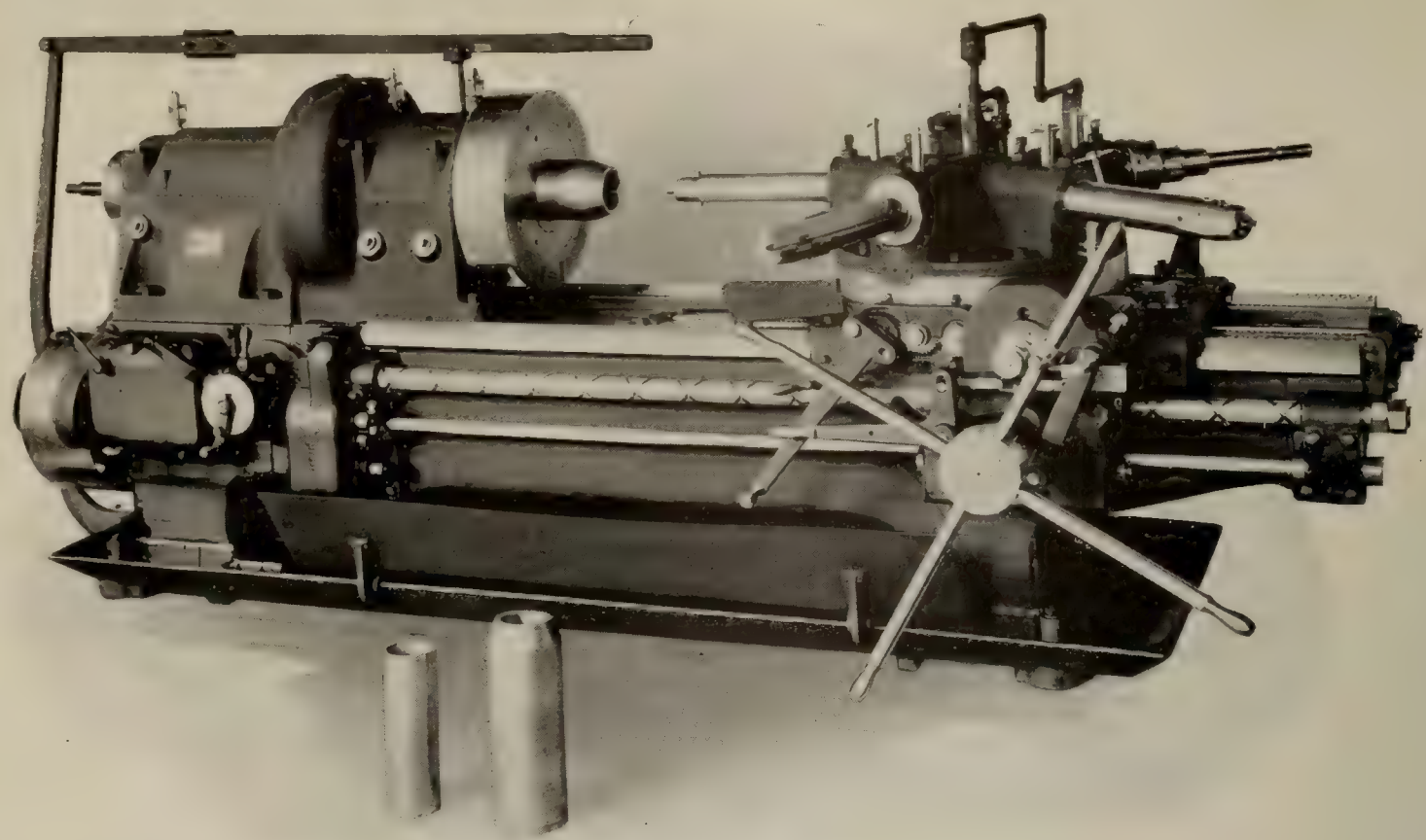

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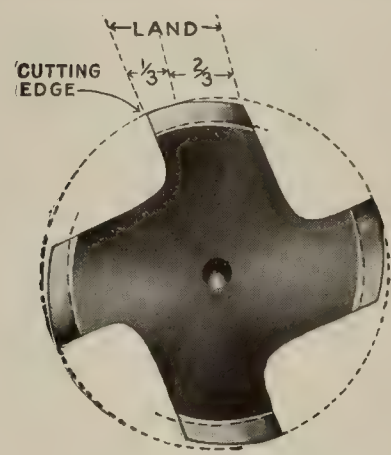

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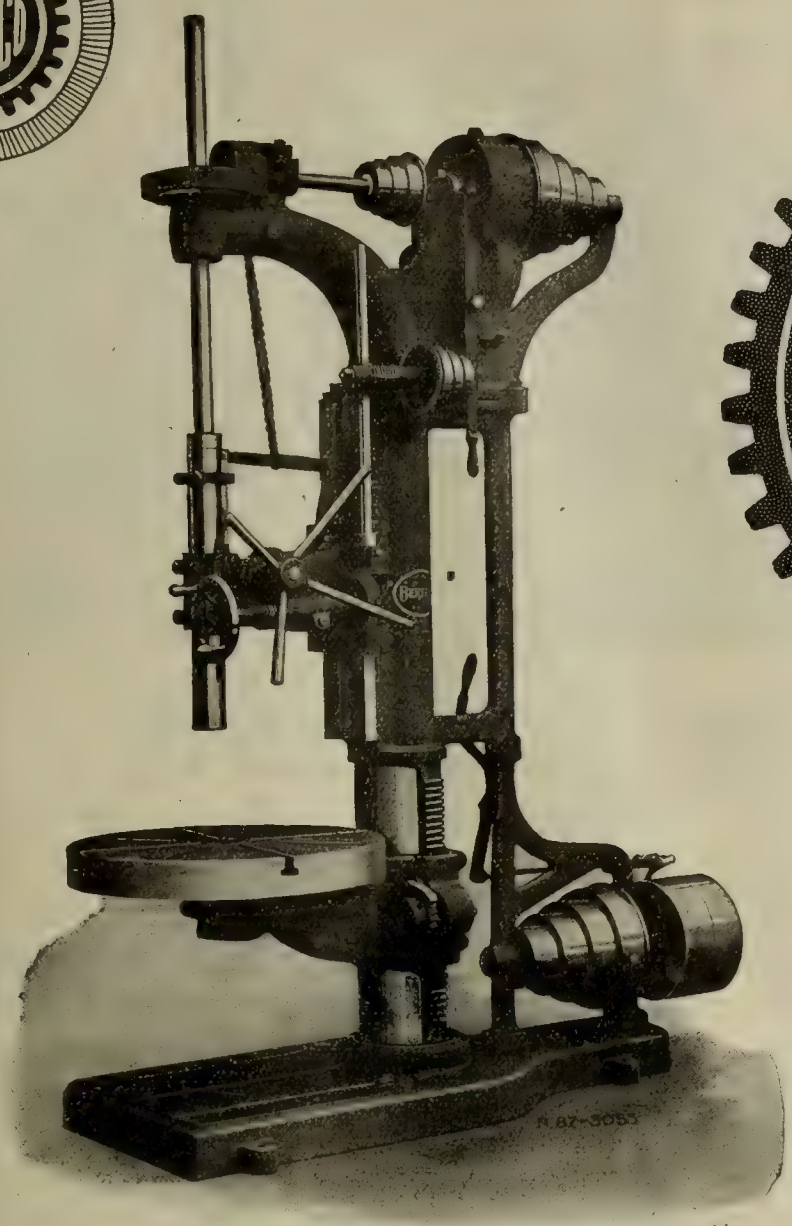

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The Publisher's Page

TORONTO December 13, 1917

Big Business Ahead

AS announced in Canadian Machinery recently, Canadian munition makers are receiving orders which will carry them far into the new year. This means more buying.

The United States Government is placing contracts with our manufacturers for immense quantities of a certain type of shell. This means more buying.

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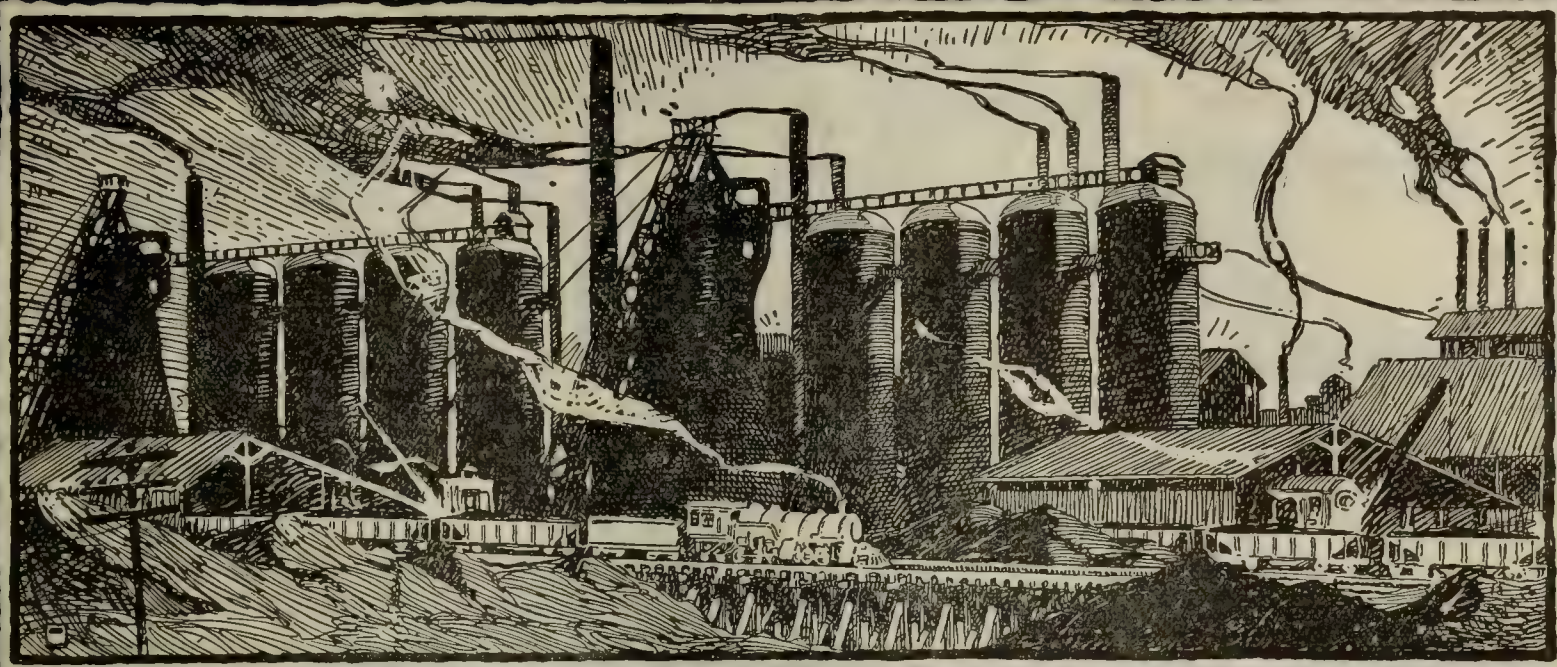

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P.O. Box 1185

Telephones: M. 1899 & M. 2527

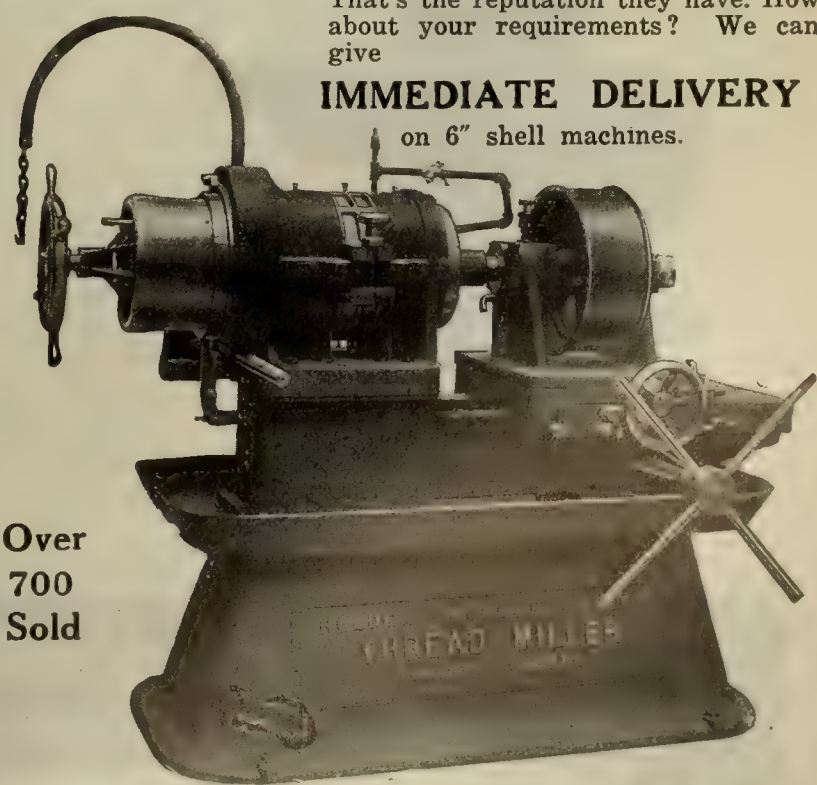
70 Holden-Morgans in One Plant

Another firm would not accept a contract until assured they could get HOLDEN-MORGANS.

That's the reputation they have. How about your requirements? We can give

IMMEDIATE DELIVERY

on 6" shell machines.



Over 700 Sold

THE A. R. WILLIAMS MACHINERY CO.

W. FRONT ST. (Limited) TORONTO

If interested, tear out this page and keep with letters to be answered.

The Johnson Friction Clutch Is Being Used As A Part Of This Machine

Here

Courtesy of Foote-Burt Co., Cleveland, Ohio

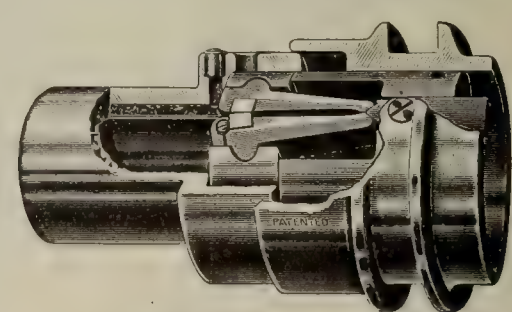
The Johnson Friction Clutch is used in the throw-out back gears in this new 15½ Foote-Burt Multiple-Spindle Machine.

"Records Are Much Better Than Promises"

That is the reason why we run the cut at the top of the page, driving home the record, "the Johnson Friction Clutch is being used as a part of this machine."

Week after week has the evidence been piling up as to the extensive use of the Johnson Friction Clutch in various types of machines.

And this record of wide use is duplicated by another record of satisfactory service.

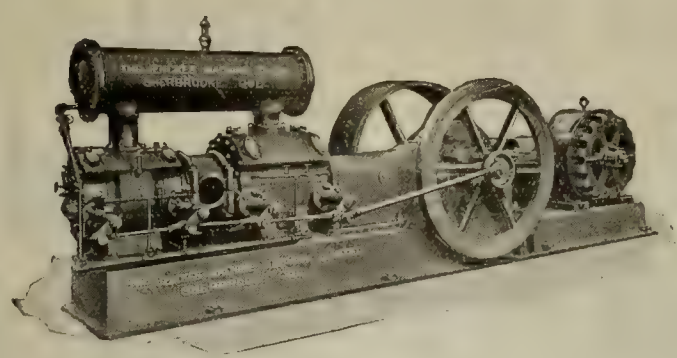


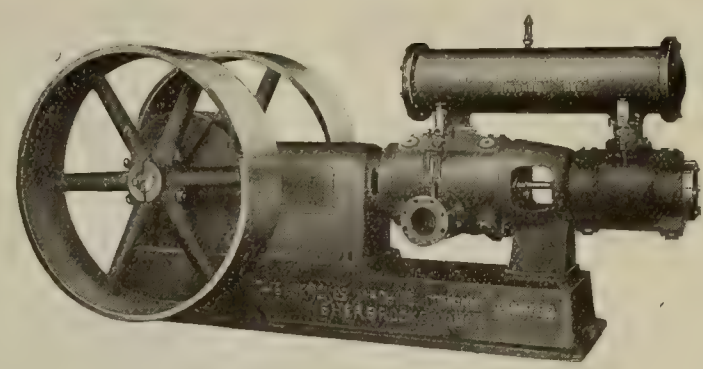
Single Clutch—Interior.

The Johnson Friction Clutch embodies all the principles which make a perfect friction clutch. Our YELLOW DATA SHEETS and Booklet, "Clutches as Applied in Machine Building," explain this fully. Will you have them?

THE CARLYLE JOHNSON MACHINE CO.
MANCHESTER, CONN.

Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal; Can. Fairbanks-Morse Co., Ltd., Toronto.
England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.





Compressor Problems Vanish

In a comparative test the quality of a machine will then be judged fairly. We invite your comparison. Our confidence that these machines excel is not only based on our knowledge of their construction, but also because of the manner in which they appeal to our customers. We know they are built right. Our patrons have proved it. Let us get together.

Jenckes Machine Company, Limited

Works: ST. CATHARINES, ONT.
Works: SHERBROOKE, QUE.

Sales Offices: 710 C.P.R. Bldg., Toronto; 908 E. T. Bank Bldg., Montreal; West Chester Ave., St. Catharines; Cobalt, Ont.

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We have often been asked, "What gives Uranium High Speed Steel the toughness and strength not found in the ordinary high speed steel?" The answer is that by combining the proper amount of uranium to our mixture a high speed steel of the finest quality is produced—a steel that works at greater speeds, takes deeper cuts and lasts longer.

Consult your steel man or write us for full details.

STANDARD ALLOYS COMPANY

FORBES AND MEYRAN AVES.

PITTSBURGH, PENNA.

"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

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We guarantee shipment within 24 hours of receipt of order

SISCO

"Extra" "Special" "High Speed" **Tool Steels**

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SIS-CO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

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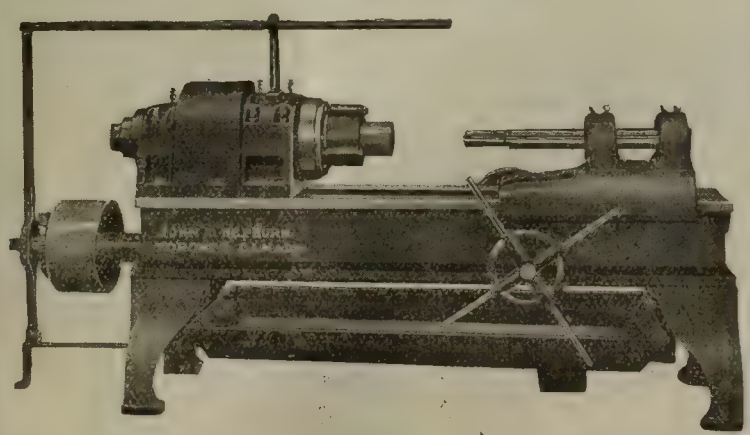
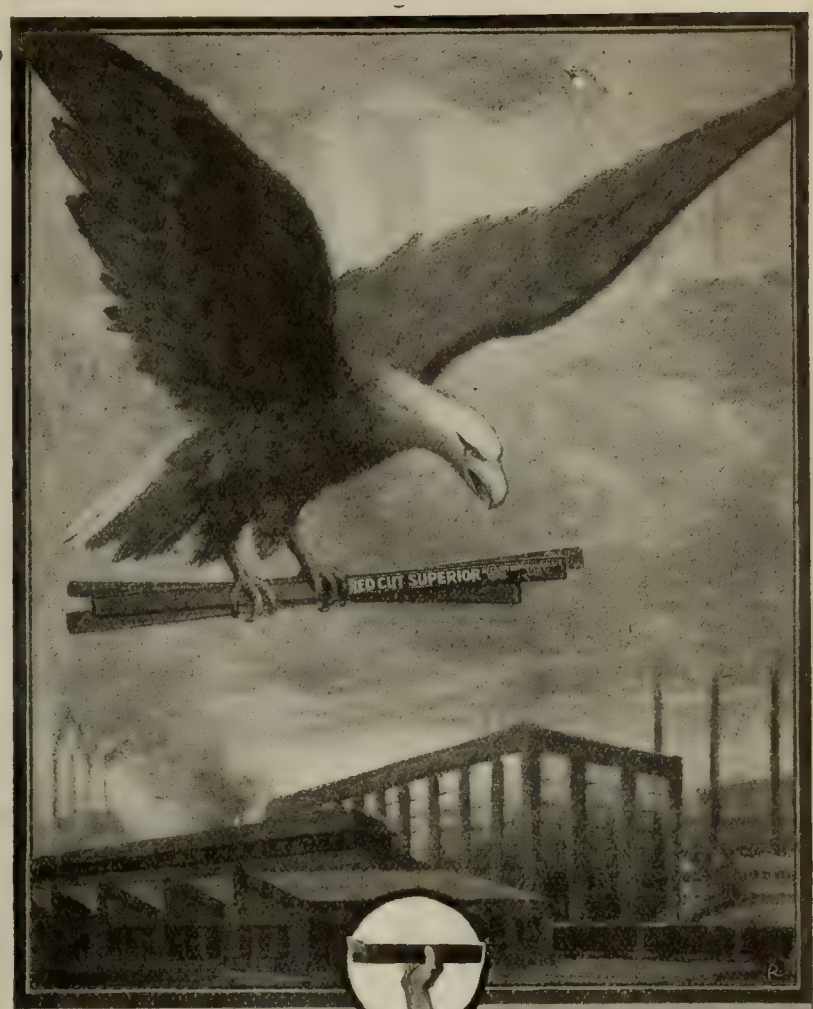
that many lathes fail to perform creditably on shell work; for at the time designed, the extraordinary demands of shell work were not known, let alone provided for. Natural rather than remarkable is it, therefore, that a NEW STYLE BORING LATHE of extra rigid build and specially designed to meet shell-making demands should hold an unbeaten record for quality output and unfailing accuracy. Write for all particulars about this—the

Hepburn Lathe

WE REBUILD LATHES



John T. Hepburn, Limited
18-60 Van Horne Street Toronto, Ontario



HIGHEST IN QUALITY NATIONALLY KNOWN

OUR Country requires the extreme limit of production from every lathe, planer, miller or other machine tool.

BE PATRIOTIC

"Red Cut Superior"

The Nationally Known First Quality

HIGH SPEED STEEL

Will enable you greatly to increase your output

"IT'S THE BEST FOR ALL MACHINE WORK"

VANADIUM-ALLOYS STEEL CO.
PITTSBURGH, PA. Works at LATROBE, PA.

CARRIED IN STOCK AT THESE WAREHOUSES:

E. T. WARD'S SONS, 44 FARNSWORTH ST., BOSTON, MASS. — GEO. NASH CO., 304 HUDSON ST., NEW YORK, N. Y. — FIELD & CO., INC., 721 ARCH ST., PHILADELPHIA, PA. — VANADIUM-ALLOYS STEEL CO., PITTSBURGH, PA., AND LATROBE, PA. — GEO. NASH CO., 646 WASHINGTON BLV'D, CHICAGO, ILL.

If interested, tear out this page and keep with letters to be answered.

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High Speed Steel

Carbon Steel

Gauge Steel

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SOLE MAKERS
Samuel Osborn & Co. Ltd.
SHEFFIELD

Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)
Limited
Head Office and Works: Montreal, P.Q.
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STEEL *for*

Shrapnel Shells and Shell Blanks

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

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Steel Ingots
by the
HARMET
Liquid Process

TRADE MARK

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"WACO"

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HIGH SPEED STEEL

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TWIST DRILLS

"DOUBLE WACO" Quality

Specially Adapted for Munition Work

"TURTLE" BRAND

High Class Tool Steel, Files, etc., of all descriptions.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

Reliance Steel Works

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For particulars apply to our

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70 Lombard Street Toronto, Ontario

IF YOU WANT THE

BEST BASE PLUGS, BUY BANFIELD'S

Have in stock for immediate shipment either threaded or bevel Plugs for 4.5", 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. *Write for prices.*

EDWIN J. BANFIELD

STAIR BLDG. .·. TORONTO, ONT.

Manufacturer of Plug Milling Machines for above size shell. Prices and deliveries on application.

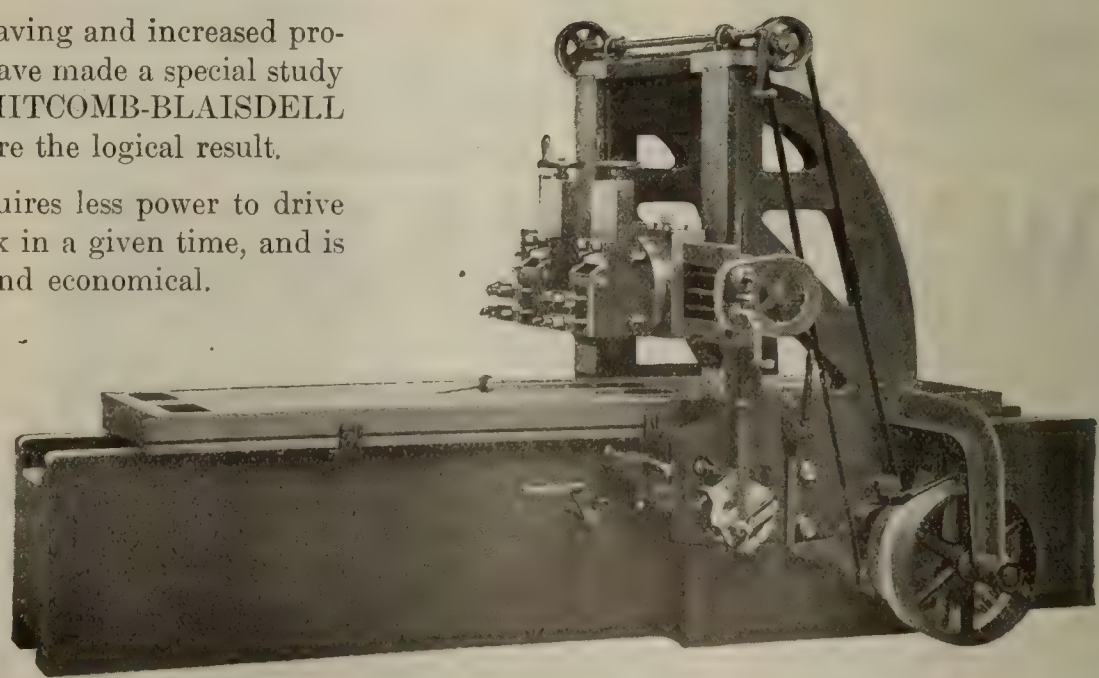
WHITCOMB-BLAISDELL

Second-Belt Drive Planers

Does power saving, time saving and increased production interest you? We have made a special study of these points and WHITCOMB-BLAISDELL Second-Belt Drive Planers are the logical result.

The second-belt drive requires less power to drive the machine, does more work in a given time, and is noiseless, smooth running and economical.

Write for new catalogue.

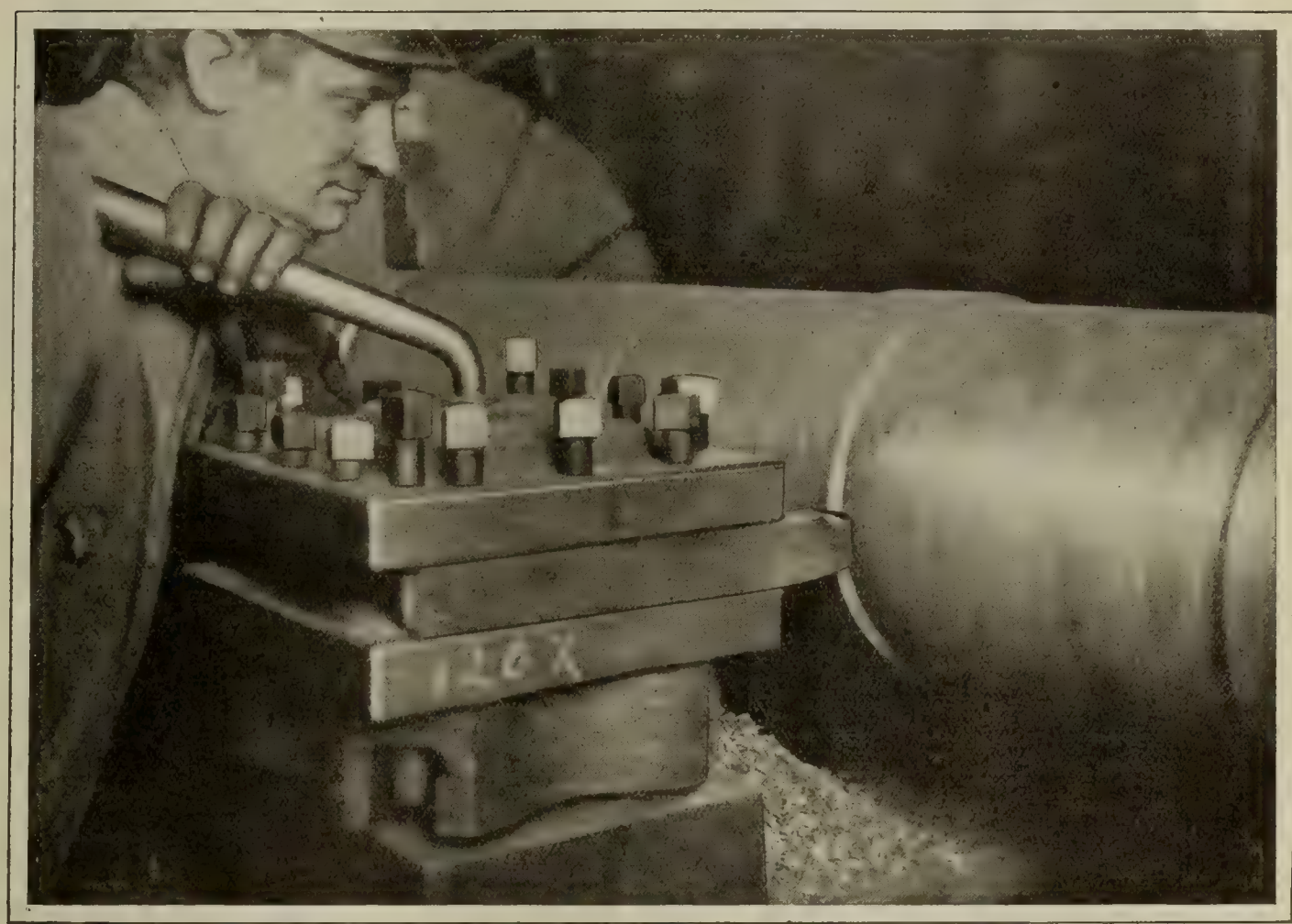


30" x 30" x 8"
PLANERS

WHITCOMB-BLAISDELL MACHINE TOOL CO.

Worcester, Mass., U. S. A.

"CoCo" Turning Steel



"CoCo" Goes on Working Long After Other Steels Stop

"CoCo" will do the same in your shop—will cut faster or longer than other steels. Here are some proofs:—

"CoCo" is cutting Semi-steel Castings at 100 ft. per minute, cut ½" deep. 30 hours continuous service between grinds.

"CoCo" is turning Cast Iron Hydrant Caps at 169 ft. per minute, feed ⅛", cut ⅜" and turns 4 hydrants per grind where less than one per grind used to be standard.

"CoCo" is turning .40 Carbon O. H. Forged Rams at 95 ft. per minute, feed ¼", cut 3/32" turning 3 rams in the same time it formerly took to do one.

CAN YOU BEAT IT?

"CoCo" Steel does not do stunts—It does the work. It will do yours as well. Ask us.

COLONIAL STEEL COMPANY

PITTSBURGH BOSTON DETROIT NEW YORK PHILADELPHIA ST. LOUIS CHICAGO

If interested, tear out this page and keep with letters to be answered.

THE Crank Shafts of all Consolidated Presses are made from .50 to .60 carbon steel hydraulic forgings, accurately machined and ground to size. The body bearings are carefully scraped to fit, thus insuring a perfect bearing.

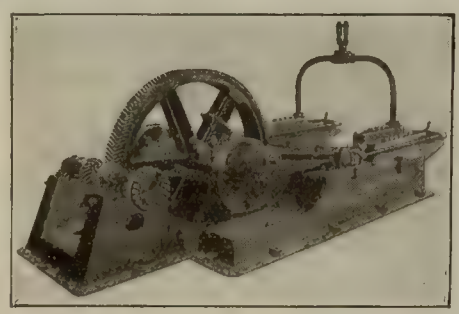
The Crank Pins are larger in diameter than the main bearings. This has always been a Consolidated feature. Crank cheeks are liberal and guarantee strength and rigidity in the shaft; this, together with the enlarged crank pin, materially resist torsion when the press is in operation.

You cannot ignore these features.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* **MICHIGAN**

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver



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18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

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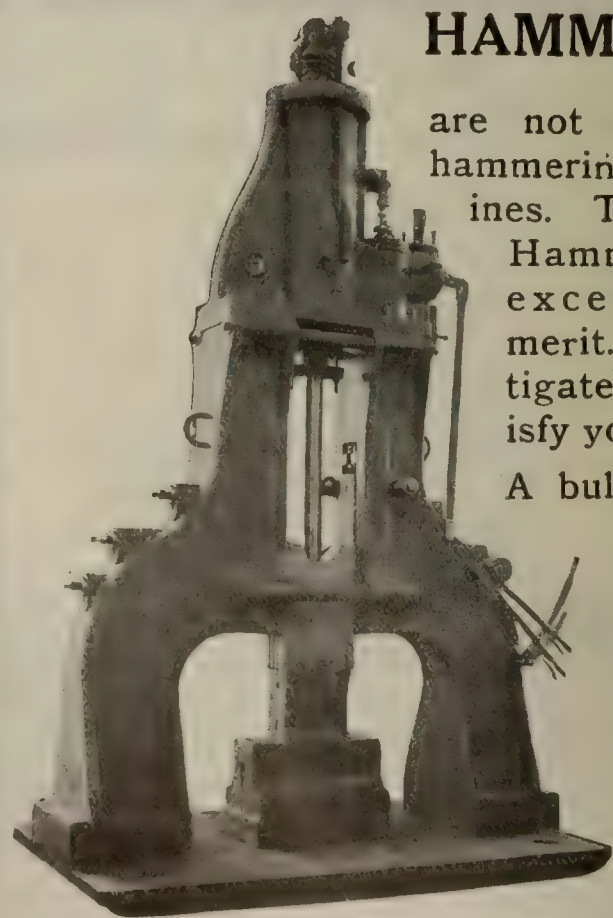
"ERIE" STEAM FORGING HAMMERS

are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

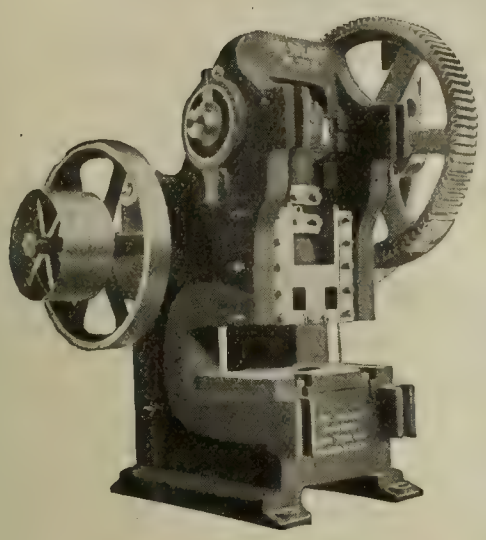
A bulletin for the asking.



ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U. S. A.

THE "TOLEDO"

Open Back Power Presses



The choice of shrewd buyers who make a study of press construction as regards efficiency and durability.

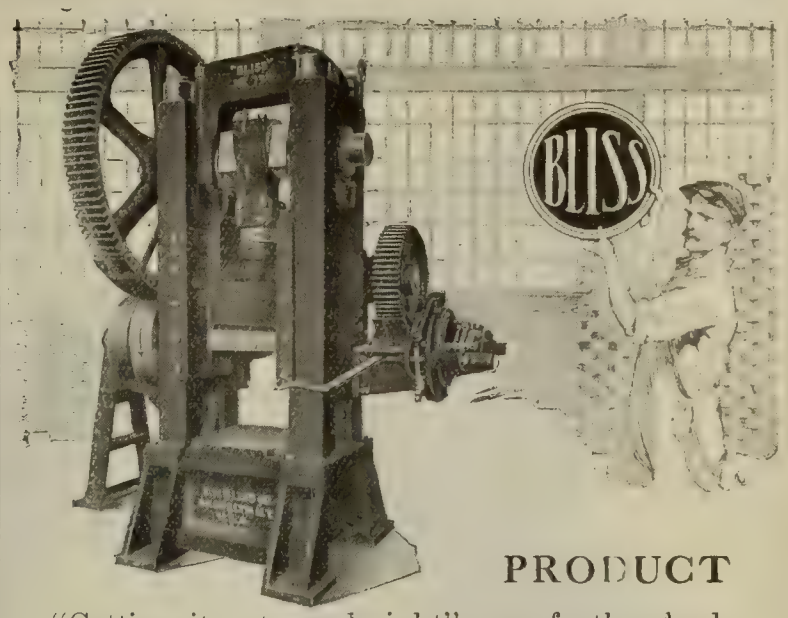
For over 30 years the dominant press for punching, shearing, perforating, bending and forming operations, trimming drop forgings, etc.

Many exclusive features have been added from time to time without any radical change in the design. We ask you to test our ability to solve your sheet metal problems.

The Toledo Machine & Tool Co.

Toledo, Ohio

Representatives—Allied Machinery Co. of America, 19 Rue de Rocroy, Paris, France; Vie XX Settembre 12, Turin, Italy; 16 Seidengasse, Zurich, Switzerland.



PRODUCT

"Getting it out—and right" goes further back than the selection of the machine. It may go back 10 or 20 or 40 years to some point or problem solved in our 60 years' development of Presses that produce.

If you want machines with production capacity based on *longest* practical experience, buy "Bliss."

BLISS **E. W. BLISS CO.** BLISS

Brooklyn, N.Y., U.S.A.

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TEST PRESSES

For Applying Internal Pressure Physical Test to Shells

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For Pressing in Copper Rotating Bands on Shells.

Metalwood Manufacturing Co.

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Designers and Builders of High Speed Hydraulic and Special Machinery for all Purposes

Complete Hydraulic Installations

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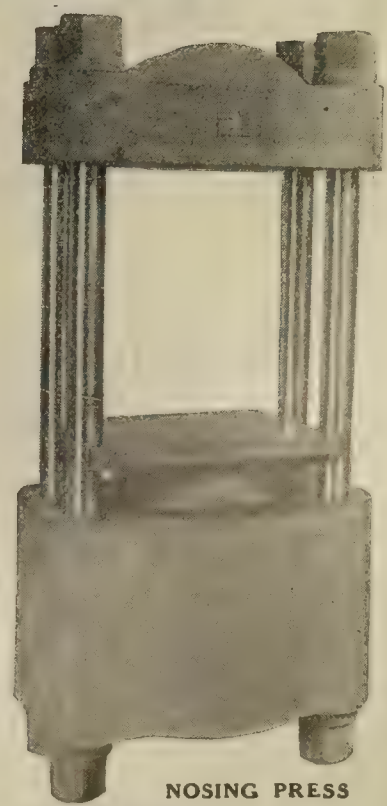
R. E. Ellis Engineering Co., 621 Washington Blvd., Chicago, Ill., Sales Representatives. For Great Britain and Continent, address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

PRESSES

Pumps and Accumulators

FOR ALL PURPOSES

Made in Canada



NOSING PRESS

WILLIAM R. PERRIN, Limited

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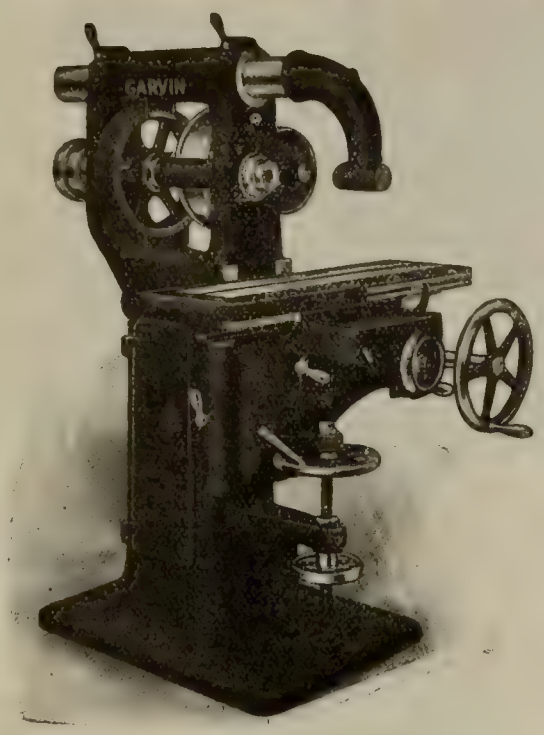
If any advertisement interests you, tear it out now and place with letters to be answered.

GARVIN No. 21 Plain Miller

Back Geared



No. 21 B.G. PLAIN MILLING MACHINE
Back Geared
Use Code - Abject

For Plain and Gang Milling for general manufacturing, and is used mostly in gangs of 5 or 6 machines to one operator. Spindle runs in adjustable bronze boxes, and is driven by a 3" belt through back gears (3 to 1).

Knee is our improved solid top design, rigid and stiff to resist side pressure of heavy cuts.

DIMENSIONS:

Automatic Feed at Table	18 in.
Adjustment in line with Spindle	6 in.
Vertical adjustment under Spindle	13 in.
Table, inside Oil Pockets	6 x 10 in.
Changes of Speed	6
Changes of Feed	6
Net Weight, Skidded	1,575 lbs.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY

Spring and Varick Streets *(Visitors Welcome)* **50 Years New York City**

Bilton Automatic Gear Millers—Spur or Bevel Gears

CAPACITY

No. 1 - - 14 Pitch
No. 2 - - 10 Pitch
No. 3 - - 8 Pitch

The Bilton Machine Tool Company

Succeed The Standard Mfg. Company

Housatonic Ave., Bridgeport, Conn., U.S.A.

Also Manufacturers of—
Plain Horizontal Millers
Automatic Millers
Plain and Ball Bearing
Bench and Column Drills
Milling Cutters
Riveting Machines

Catalog 30 on request

Foreign Agents:
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M. Mett Engineering Company
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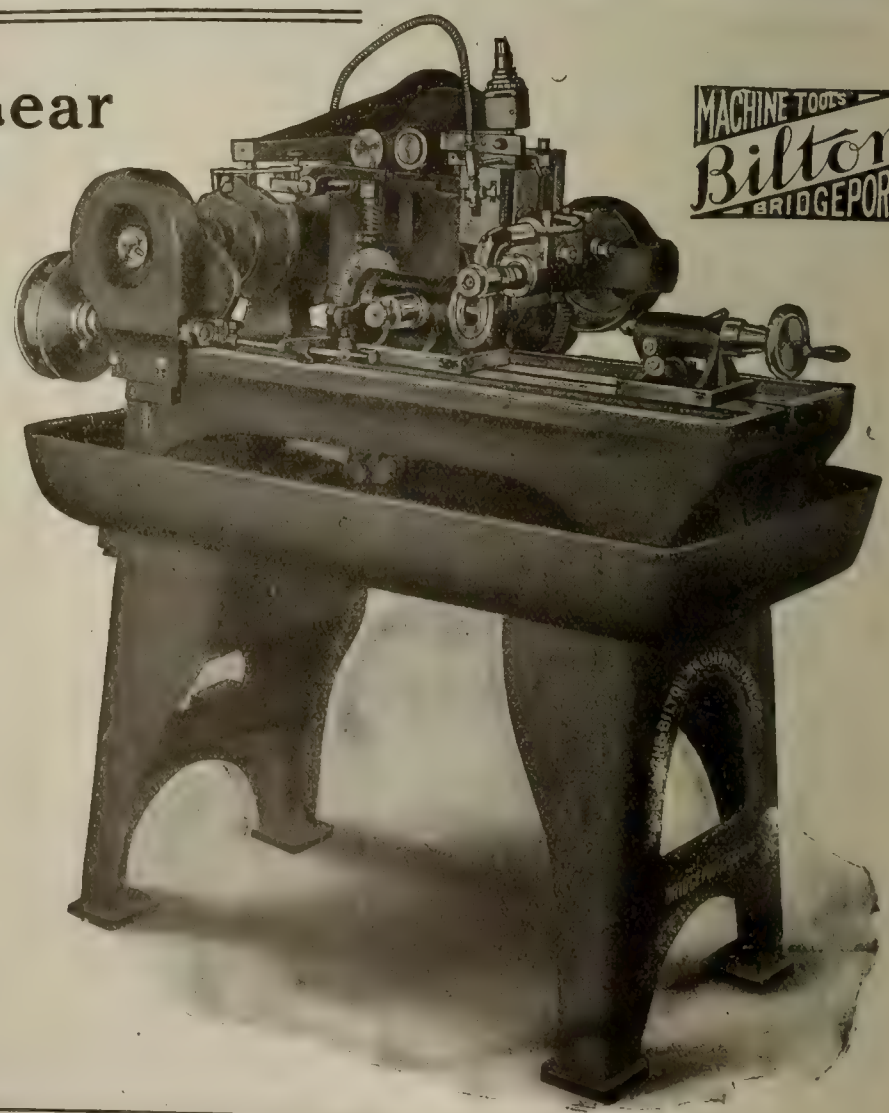
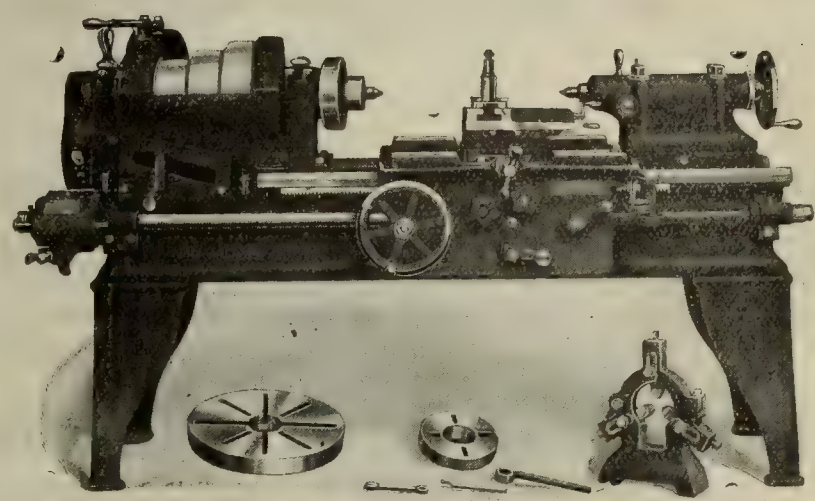


LOOK—Lodge and Shipley Engine Lathes

IMMEDIATE SHIPMENT

SIZE
14" x 6' or 8' Bed.

Double Back Gears and Quick Change Gear Box.



If *you* can use this size lathe, write for specifications and prices. Remember these are the highest quality tools manufactured.

GARLOCK-WALKER MACHINERY CO., LTD.

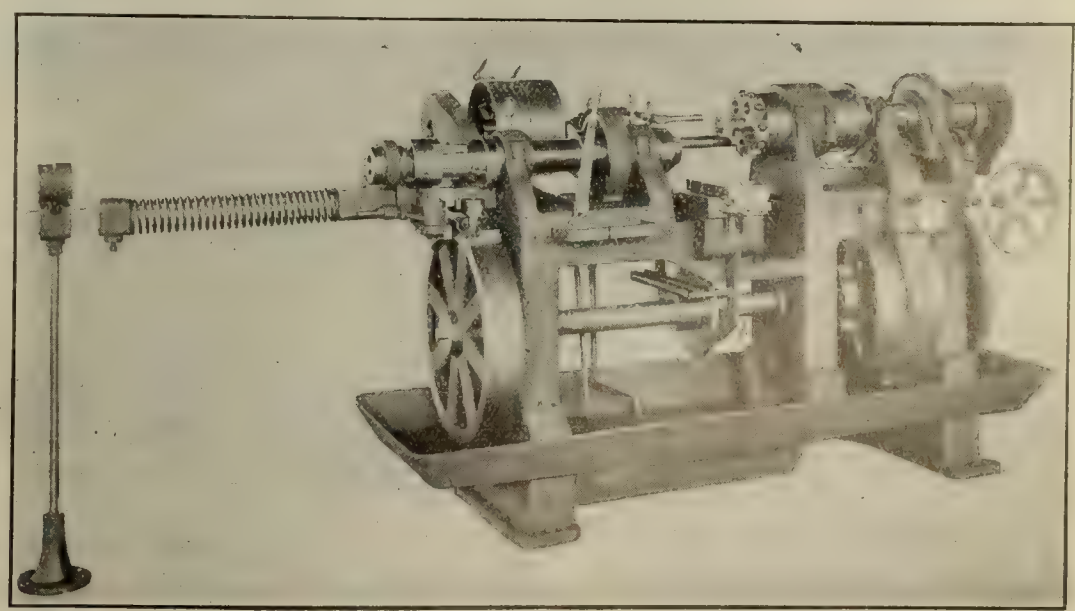
32 FRONT STREET WEST, TORONTO, ONT.

"EVERYTHING IN MACHINERY"

Power is Costly--- Don't Waste It

A STRIKING feature of the Chicago Automatic is the 100 per cent. utilization of power. Operated by a single belt run direct from the lineshaft, troublesome overhead belting and countershafts, with the power they waste, are eliminated, making it easy to install one or a battery of these machines.

Equally as important is the general simplicity of construction; there is no reversing or belt shifting, no complicated mechanisms, and all parts are readily accessible. Action is positive. results unvaryingly uniform and accurate. The machine is extremely well built in every particular and produces fine work at very low costs. Made in ¾", 1¼", 1⅝", 2" sizes. Catalog for full particulars.



John MacNab Machinery Co.

90 West St., New York

John MacNab, Hyde, England

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USED THE WORLD OVER

SATISFACTION

Atlas Babbitts

MADE IN CANADA

AMACOL
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DURASTIC
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TIN-TOUGHENED
W. E. W. BABBITT

These Babbitts are the result of years of experience and have a world-wide reputation for uniformity and reliability.

No Shock Too Severe No Load Too Heavy No Speed Too Great

ATLAS METAL & ALLOYS COMPANY OF CANADA, LIMITED, MONTREAL

Sales Agents:

The Canadian B. K. Morton Co., Limited

MONTREAL: 49 Common Street. TORONTO: 86 Richmond Street East.

Sterling Engine Works

Successors to the
DOTY ENGINE WORKS

Expert Engineers, Machinists and Boiler Makers

Gasoline Engines, Steam Engines and Boilers, new and second-hand. Castings in iron or brass. Forgings. Machine and Boiler repairs. Cold Rolled Shaftings.

CUT GEARS

We have the only automatic Gear-Cutting Machine in Western Canada. We specialize in this work. Also in Marine and Hoisting Engines, Contractors' Equipment, Dredge Work, Dippers, etc.

Estimates gladly given on big or small orders.

Works and Office: Foot of Water Street

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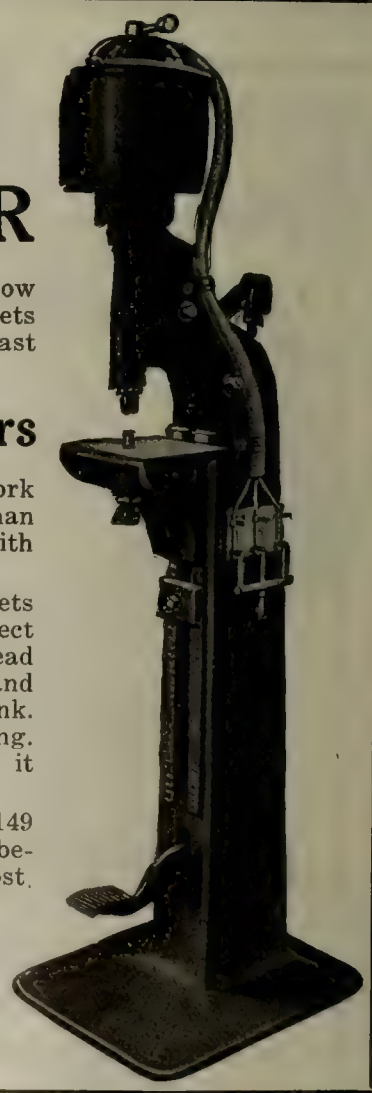
WINNIPEG, MANITOBA

(22m)

GRANT SILENT RIVETER



Works the noiseless, no-blow way. It rolls the heads on rivets under pressure at a speed as fast as you desire.

Women Operators

produce far more work—work far superior in finish—than either they or men could with any other riveter.

Use rivets of soft brass or rivets of steel for equally perfect results. It spins the rivet head to polished smoothness, and never bends the rivet shank. Can't break or scar the casting. Strong, swift and noiseless, it should be in your shop.

Write for catalogue listing 149 articles you can rivet away below your present riveting cost.

GRANT MFG. & MACHINE CO.
HOLLAND AVE.
BRIDGEPORT, CONN.

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy chucking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6" shells.

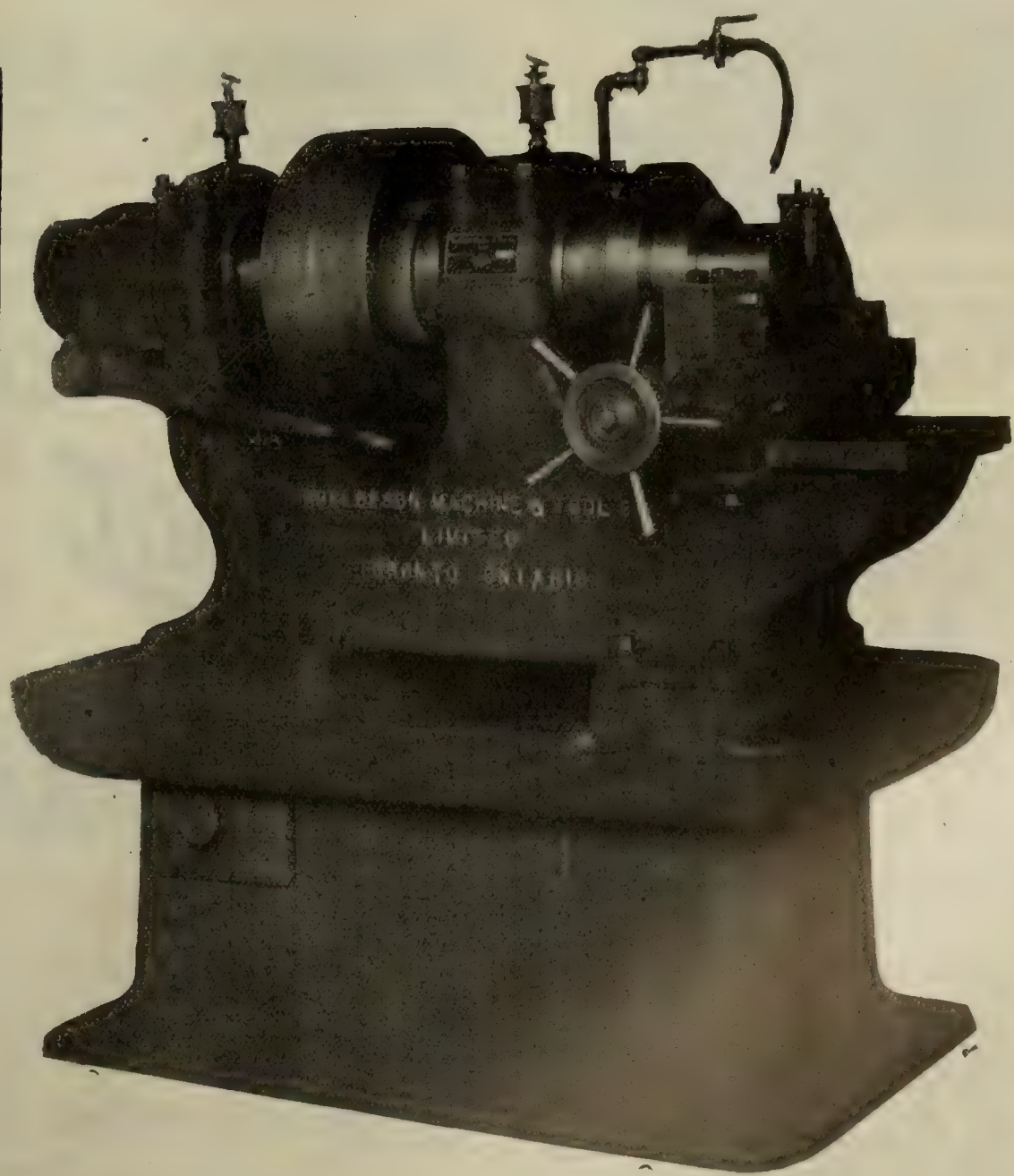
Roelofson Machine & Tool Co., Ltd.

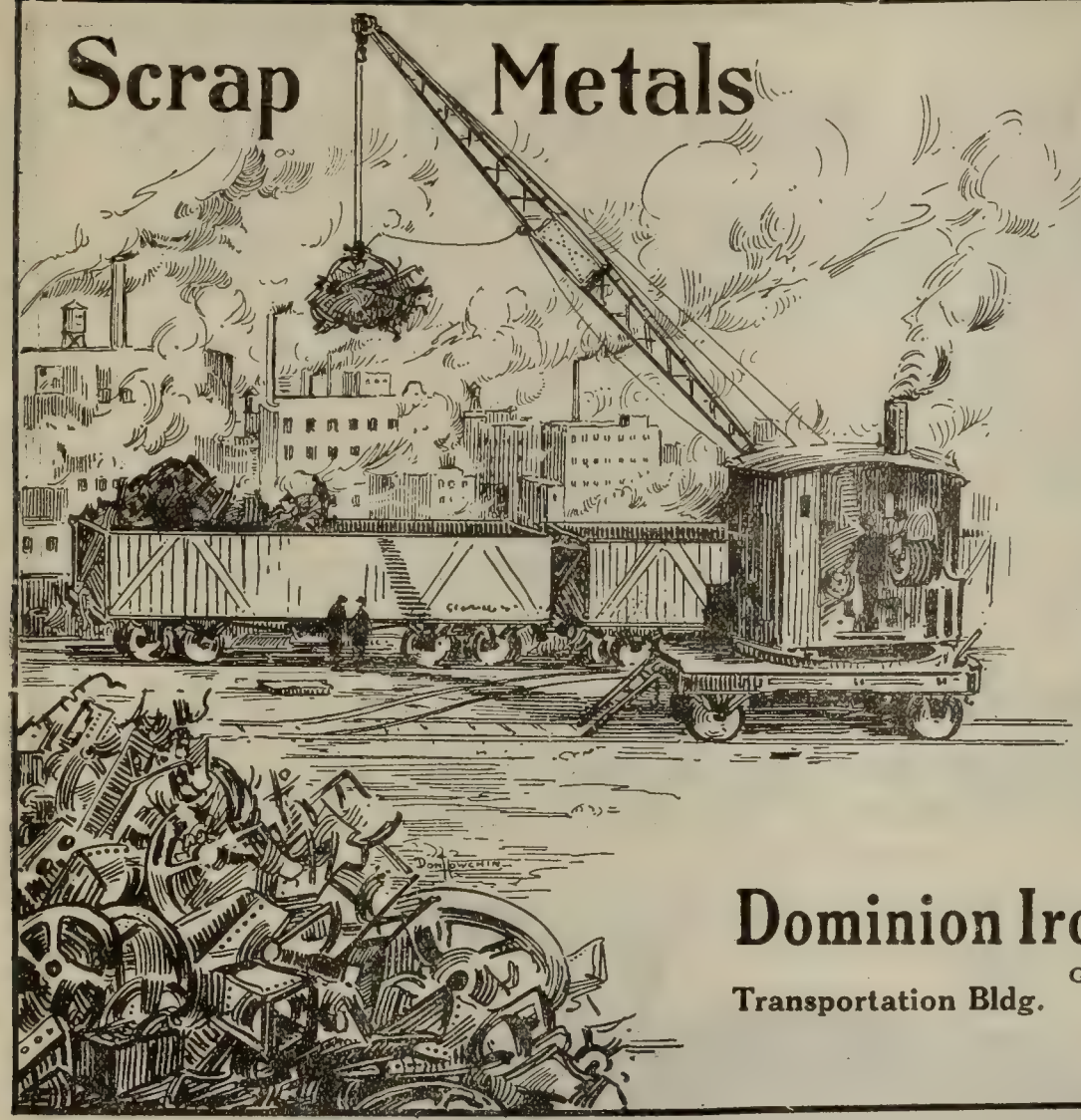
Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6" shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.





Scrap Iron, Steel and Metals

No undertaking is too large for us. We are Scrap Metal Specialists, and can co-operate with you in the dismantling of railway equipment, bridges, plants, steamers, mills and will take your rails and machinery.

Shell Makers. We can take care of all your scrap materials, at highest prices.

Give us particulars and we will relieve you of all worry.

Dominion Iron & Wrecking Co.

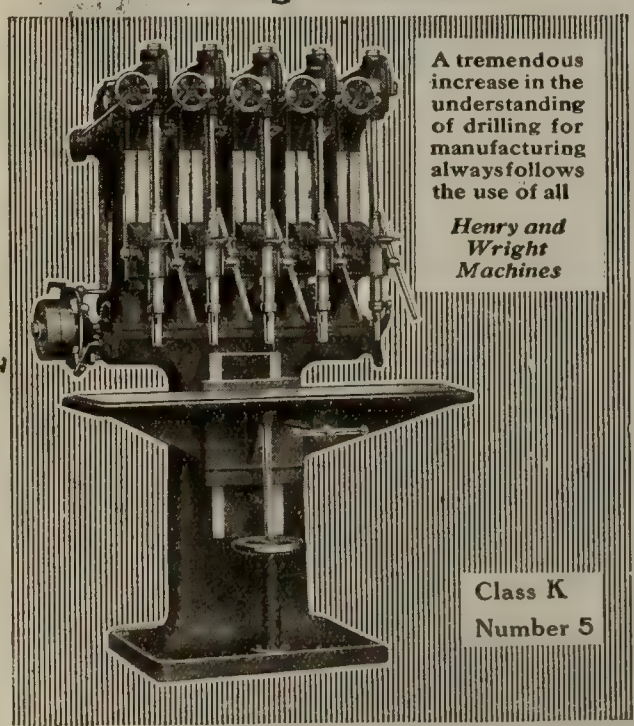
LIMITED

Transportation Bldg. General Offices: - Montreal, Quebec

Quebec, Que.

HENRY & WRIGHT

Drilling Machines



The Henry & Wright Mfg. Co.

Hartford, Conn.

Carry Your Grinder to the Work Not Your Work to the Grinder

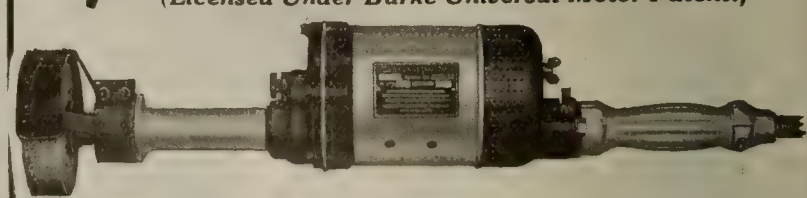
Thor

Portable Electric GRINDER

Equipped with Universal Motor for Operating on Direct or Alternating Current

110 TO 250 VOLTS

(Licensed Under Burke Universal Motor Patent.)



No. 6 Grinder-Wheel 4" x ¾" x ½"

ATTACH TO ANY LAMP SOCKET

Thor Portable Electric Grinder is equipped throughout with ball and roller bearings, and has a specially constructed motor, insuring speed, power, ease of operation and increased capacity.

IT RUNS AT 4,500 R.P.M.

Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.

Toronto: 32 Front St. W.; Winnipeg: 123 Bannatyne Ave. E.; Vancouver: 1142 Homer Street

A New Rockford

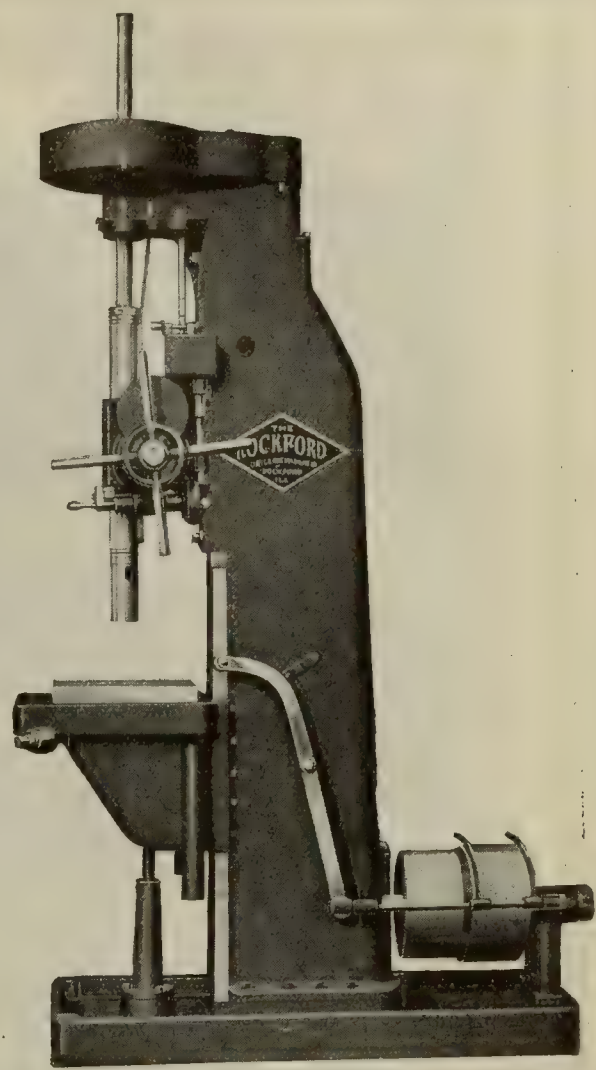
Column Type Machine

This High-Powered, Heavy Duty Rockford Drilling Machine—is our new box column type machine with capacity for driving high-speed drills up to 2½ inches diameter.

It is built in three styles, each possessing distinct constructive points that render positive rapid production, quality work and economy.

Just as powerful as it looks.

Investigate the New Rockford before you buy. Write us and get full particulars by return mail.



Rockford Drilling Machine Co.

Rockford, Illinois - - - U.S.A.

Lower Your Production Cost!

AURORA

Drilling Machine

Strength is the word that distinguishes this machine. Special care has been used in bringing this Drill up to its present point of efficiency. If you are in the market for drills which must have speed and accuracy, consult us. This is an ideal machine for HIGH EXPLOSIVE SHELLS. Inquire—we have the goods.

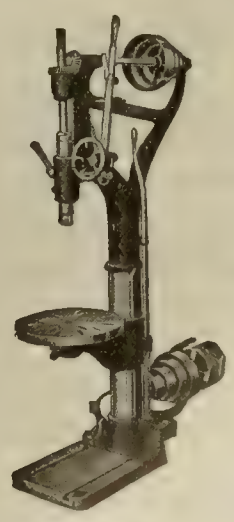
Stationary head sizes—20", 21".
Sliding head sizes—22", 24".

The Aurora Tool Works

AURORA, INDIANA, U.S.A.

The BARNES DRILLS

TRADE MARK W.F. & J.C.



Complete line. 8-inch to 50-inch swing

Gang Drills.—Horizontal Drills.

SEND FOR CATALOG.

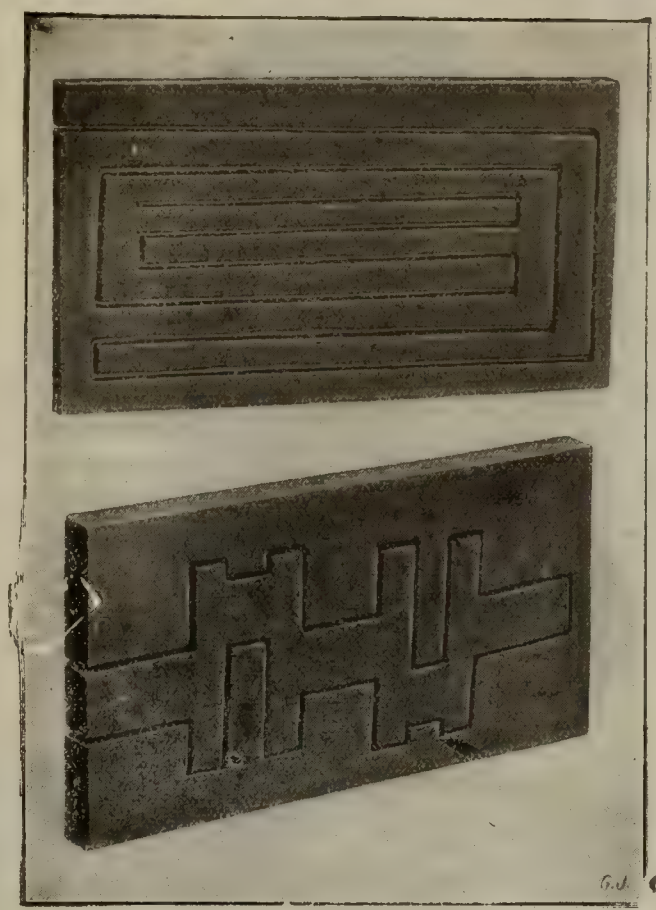
W. F. & JOHN BARNES CO.

104 Ruby Street - ROCKFORD, ILL.

Canadian Agents—A. R. WILLIAMS MACHINERY CO.
Toronto, Winnipeg, Vancouver, and St. John, N.B.
WILLIAMS & WILSON, Montreal

If interested, tear out this page and keep with letters to be answered.

Cutting Iron and Steel by Oxy-Acetylene Process



Examples of Cutting by an "A.L.S." Oxycutter.

Wherever the Cutting of Iron and Steel is necessary, this method is universally adopted, with a **Saving of Time, Money and Labor.** An "A.L.S." Oxy-Acetylene Welding Outfit may be instantly converted into a complete cutting unit by the addition of an "A.L.S." Oxycutter.

For Cutting manholes and portholes in Steel Plates; Burning off rivet heads before driving out rivets; and hundreds of other similar purposes, the Oxy-Acetylene Process is more economical and efficient than any other method, and sometimes performing work otherwise impossible.

WHY NOT LET US TELL YOU HOW MUCH YOU CAN SAVE?

Many firms have not yet realized all that Oxy-Acetylene Welding and cutting will do for them. You may be one of them. If so, write to-day, we shall be pleased to give you all the information necessary to enable YOU to judge how much YOU may benefit by the Process. An ordinary purchaser of an Outfit saves the cost many times over during a year, many save the cost on the first job. Is this not worth investigation?

A few minutes of your time will enable us to put before you the result of years of experience.

L'AIR LIQUIDE SOCIETY

Canadian Factories:

MONTREAL **TORONTO** **WINNIPEG**

HALIFAX (under construction)

Double-Quick Cutting-Off

THE HURLBUT-ROGERS CUTTING-OFF AND CENTERING MACHINE has the advantage of two cutting tools.

Each tool is rigidly supported in a stationary block at an angle which permits a strong shearing cut.

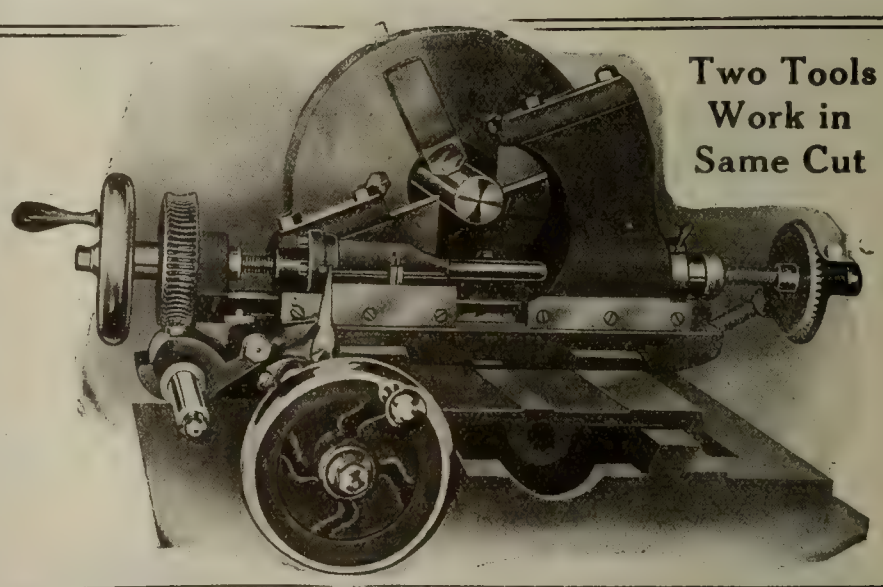
WITH THIS MACHINE PRODUCTION CAN BE NEARLY DOUBLED, and the utmost accuracy maintained under the hardest of work.

Read full details. Write for catalogue.

Hurlbut-Rogers Machinery Company

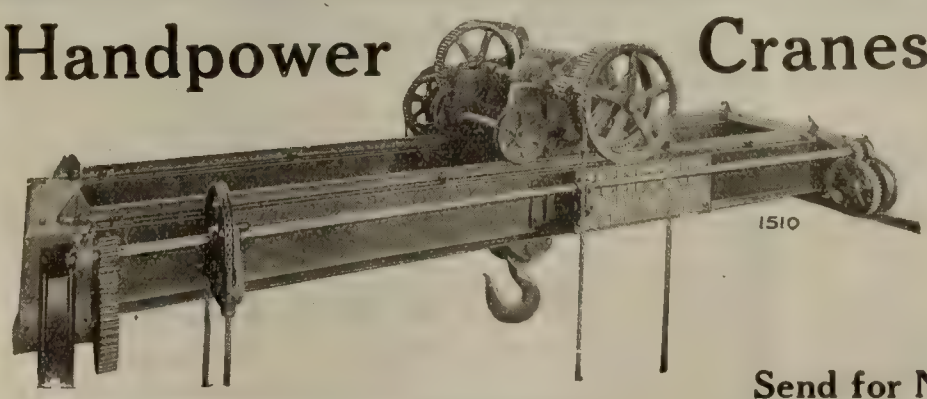
South Sudbury, Mass., U. S. A.

FOREIGN AGENTS—England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow, Newcastle-on-Tyne. H. W. Petrie, Toronto, Canada.



Two Tools Work in Same Cut

Handpower Cranes for quick delivery



Can make quick shipment of short span handpower cranes of medium and light capacity, single or double I-beam.

Our rope-drum trolley has two speeds and automatic brake. Load held at all times. Floor control.

Complete Foundry Equipment
CRANES OF ALL TYPES

Send for New Catalog No. 130

WHITING FOUNDRY EQUIPMENT CO.
HARVEY-ILL. U.S.A.
CHICAGO SUBURB

"Over the Top"

Right down in the front trenches of metal working, in the no-man's land of production, the

Starrett Hack Saw

is doing its bit. The sharp, hardened tungsten steel teeth cut their way through rod or sheet, steel or copper as a machine gun cuts its way through opposing infantry.

While the excellence of Starrett blades has long been an accepted fact, never before have they been accorded the confidence they enjoy to-day. The rush and bustle attendant upon forced production have created a demand for a hack saw blade that will "stand up"—cut quicker and last longer.

Because we have made careful and thorough tests we are able to tell you just which numbered blade is best suited for each class of work. The result of these important tests, together with the unexcelled quality of Starrett Hack Saws, have placed our blades in the first rank of industrial preparation.

What blade to use is indicated on page 208 of our Catalog No. 213. Send for your copy.

STARRETT HACK SAWS CUT QUICKER LAST LONGER

The L. S. Starrett Company

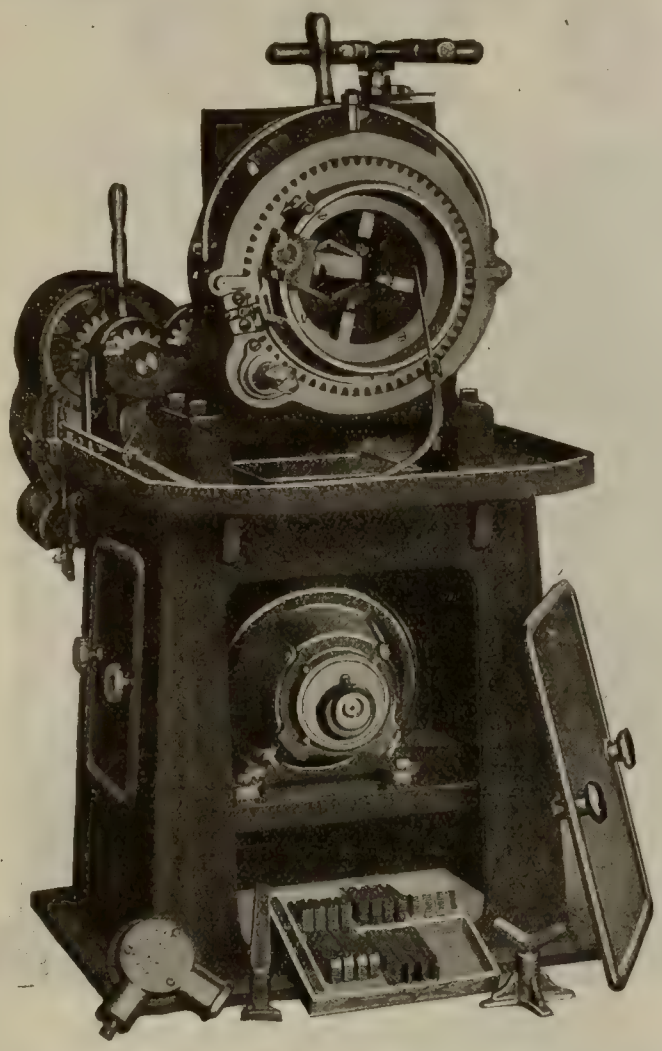
THE WORLD'S GREATEST TOOL MAKERS

ATHOL, MASS.

NEW YORK **LONDON** **CHICAGO**

BY INVITATION MEMBER OF NEW YORK, U.S.A.

42-749



"Forbes Facts"

1. One man can do the work of six against the old stock and die method of cutting.
2. It is the only machine on the market with receding gear.
3. It is self-contained and motor-driven.
4. It is portable.

These are convincing arguments for the construction and utility of this machine. Thread cutting can be performed fast, clean and true. Equipped with self-centering vise.

The Curtis & Curtis Co.
115 Garden St., Bridgeport, Conn.

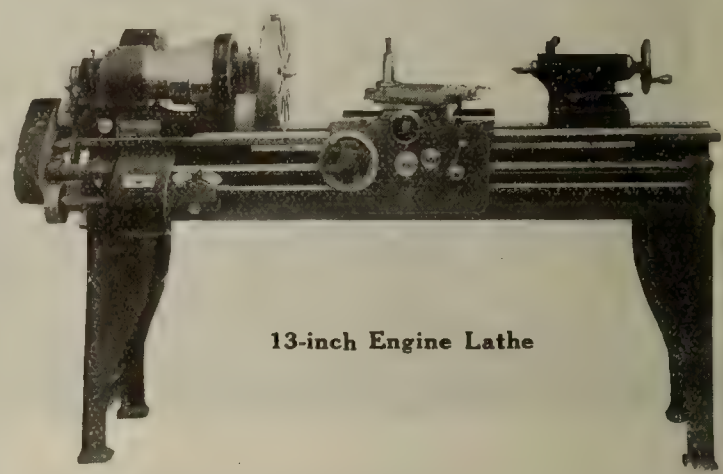
Decidedly Quality

That is the verdict of our clients.

In construction, operation and results, quality is evident. That is the reason why Filsmith has occupied the foreground in lathedom. In Canada and United States you will find Filsmith quality is based on what it is now doing, not on history. Full webbed headstock, 50-point carbon steel spindle, and rigidly clamped tailstock.

An enquiry will secure you full information.

THE PHILIP SMITH MFG. CO.
SIDNEY, OHIO, U.S.A.



13-inch Engine Lathe

For Rapid Production and Accurate Work

USE THE

"BRIGGS"

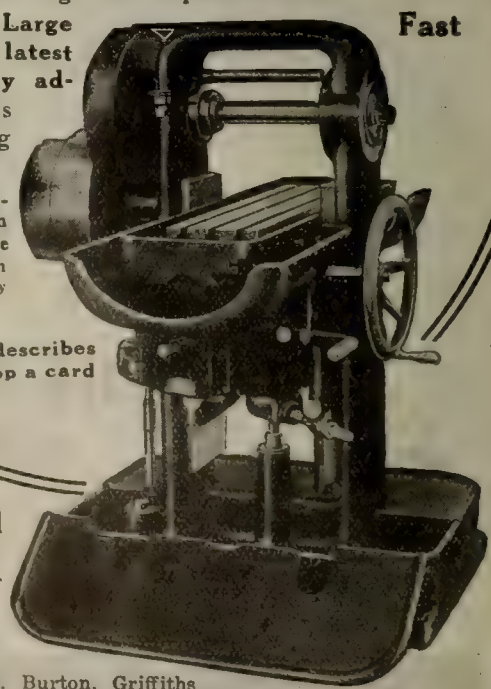
The Briggs Miller handles work no other machine of its size can touch. It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

The Base Tank and Large Gear Pump is the latest addition to its many advantages. Tank holds 20 gallons of cutting lubricant

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

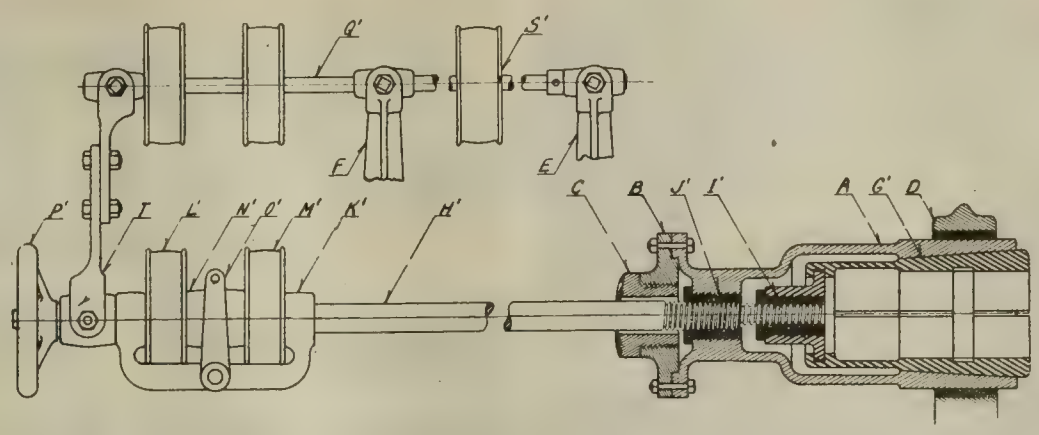
Our booklet describes fully. Drop a card for it.

Fast



Gooley & Edlund
Inc.
Cortland, N.Y., U.S.A

Foreign Agents: Allied Machinery Co. of America, Paris, Petrograd, Turin; Machinery Company of Russia, Scandinavia; C. W. Burton, Griffiths Co., London, Manchester and Glasgow; Barandiaran, Metivier, Gazeau & Cia., San Sebastian, Spain.



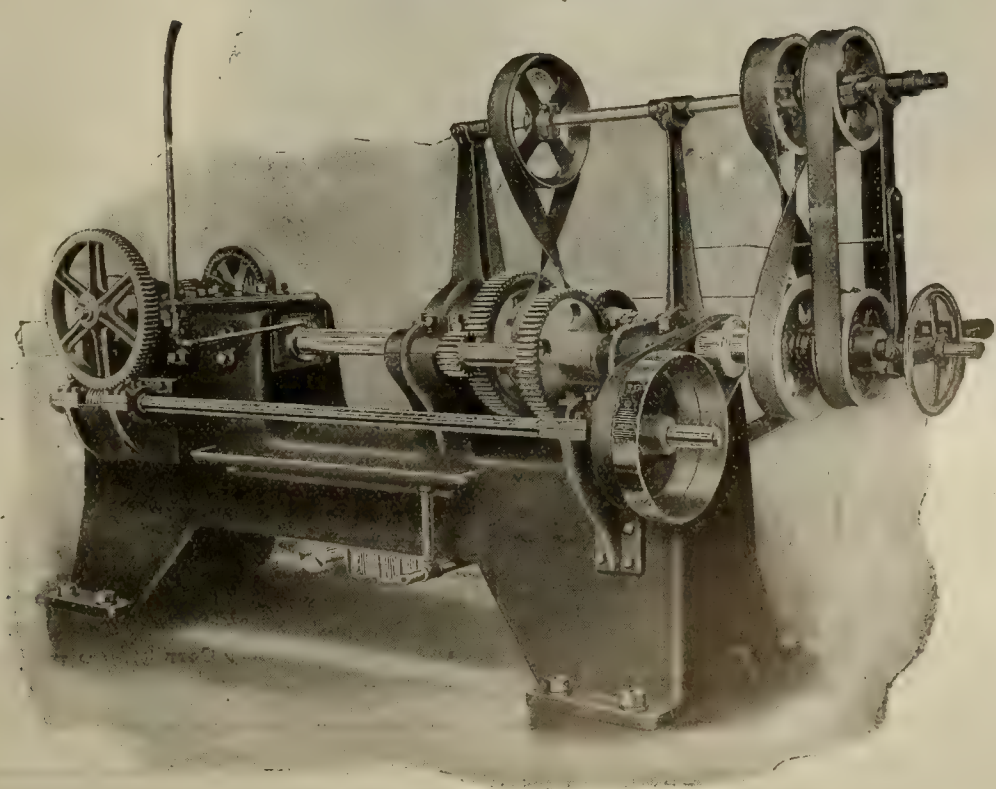
6" Boring — 75 Rough 100 Finish

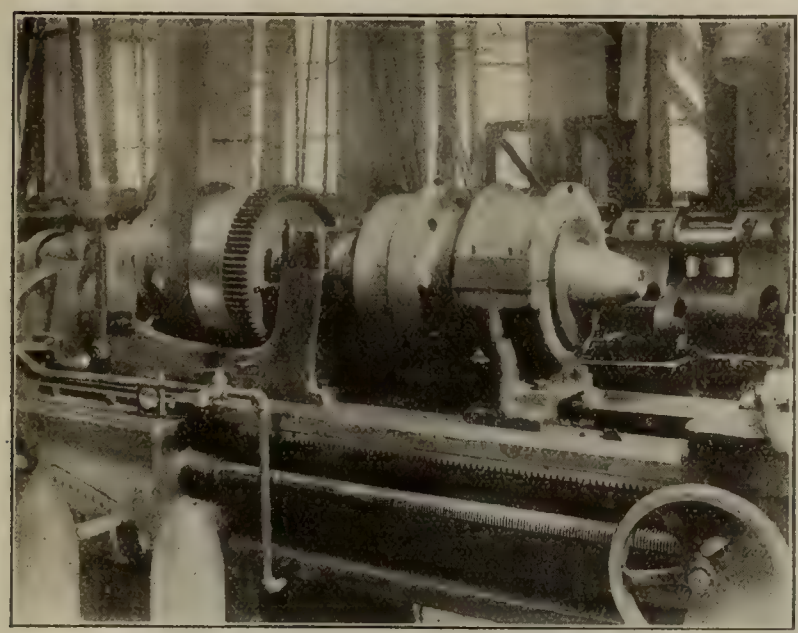
10 HOUR DAY

A close study of the above chuck will reveal strength that enables this machine to give this production *all the time* in 10 hours. The illustration below shows the wonderful sturdiness of the machine. Inquire of us. The prices are exceptional. Made in Canada.

The Plessisville Foundry

PLESSISVILLE, QUEBEC





Cut shows Chuck on nosing operation. This is one of over two hundred in this Canadian plant.

This chuck is *built on the duplicate part system. It is simple, effective and fool-proof.*

It grips the shell in a predetermined position. The jaws will not slip on the shell. It has shell interior and exterior adjustable stops.

A trial on one of your lathes will convince you that this is THE chuck for shell work.

A Big Efficiency Unit in Your Shell Plant

A. J. LAVOIE'S

LOW PRESSURE

Compressed Air Chuck

This chuck can be applied to any make of lathe, without alteration to the machine, and will increase production from 25% to 75%. It grips and releases the shell while in motion—no need to stop your machine.

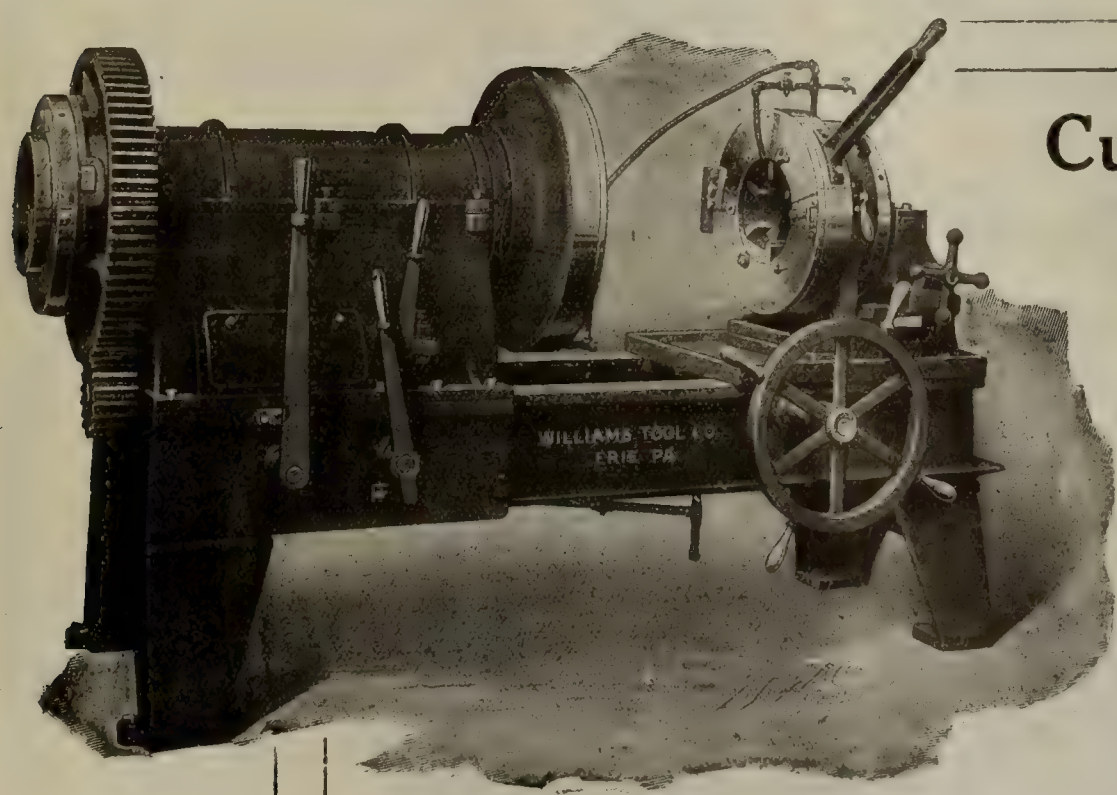
It is a single unit combination attached to the face plate of lathe, supported by an additional heavy duty bearing, thus making a heavy duty lathe out of a light machine. A small lever operates the chuck. Will operate with a pressure of 60 lbs. per sq. in.

MANUFACTURED BY

The Montreal General Tool Co.

673-5 Notre Dame Street, Maisonneuve, Montreal, P.Q.

Also manufacturers of shell tools, and special machine attachments of all kinds made to order.



Cutting-off and Threading

By the decree of expert judges Williams Cutting-off Machine has been declared the most **efficient.**

We have made this claim all along and this judgment only verifies it.

Made in 11 sizes and each size has a range of 8 to 10 consecutive sizes between 1/4" and 18" diameter.

Write us about them. They will save you money, time, and increase the quality of your product.

Williams Tool Company

Erie, Penn., U.S.A.

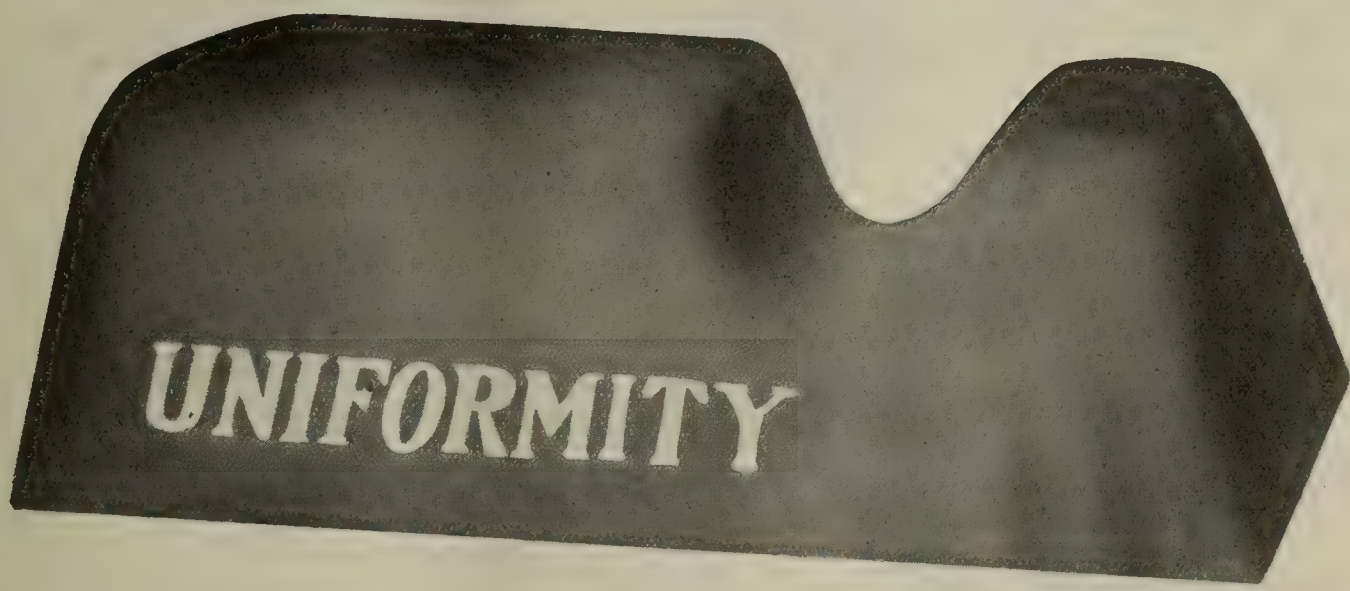
Canadian Agents:
The A. R. Williams Machinery Co., Ltd., Toronto, Canada

European Agents:
Universal Machinery Corp. London, England

INGOTS

Brass, Bronze and Composition

Any Alloy According to Your Formula



ALSO

INGOT-COPPER

99.9% PURE

For High-Grade Castings

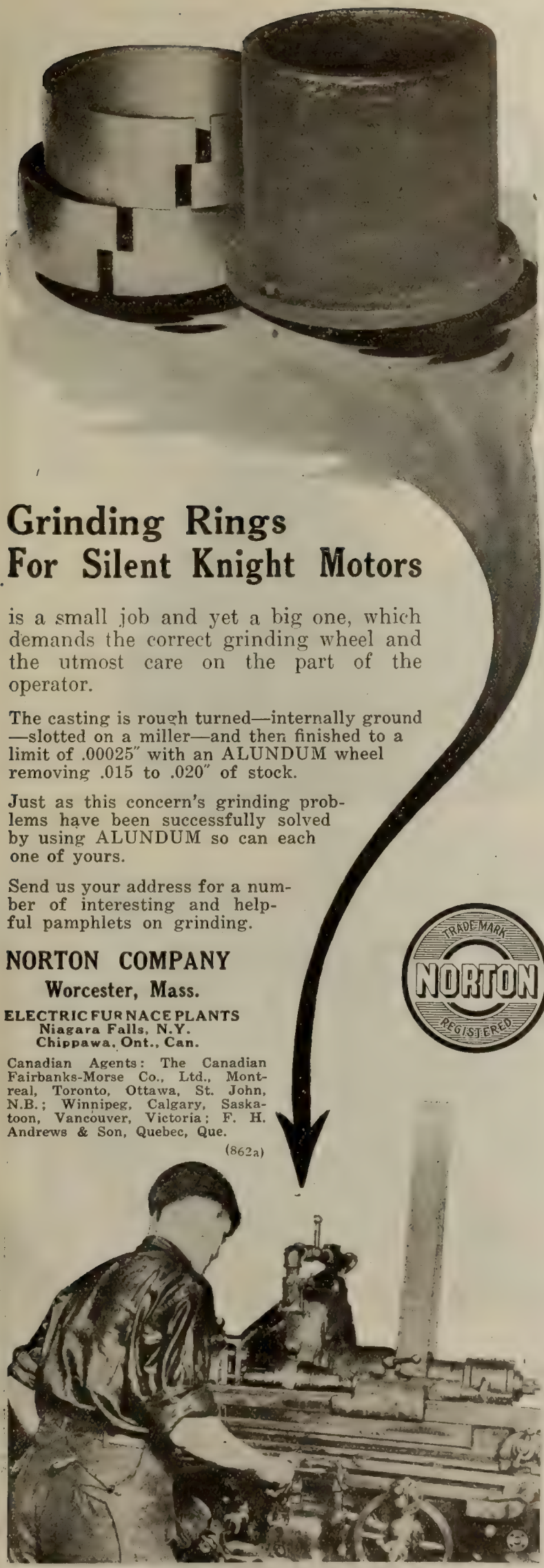
Wire or Write for Prices

We are Purchasers of Copper Bearing Material

BROWN'S COPPER & BRASS ROLLING MILLS, LIMITED

NEW TORONTO, CANADA

Near Toronto



Grinding Rings For Silent Knight Motors

is a small job and yet a big one, which demands the correct grinding wheel and the utmost care on the part of the operator.

The casting is rough turned—internally ground—slotted on a miller—and then finished to a limit of .00025″ with an ALUNDUM wheel removing .015 to .020″ of stock.

Just as this concern's grinding problems have been successfully solved by using ALUNDUM so can each one of yours.

Send us your address for a number of interesting and helpful pamphlets on grinding.

NORTON COMPANY
Worcester, Mass.

ELECTRIC FURNACE PLANTS
Niagara Falls, N.Y.
Chippawa, Ont., Can.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B.; Winnipeg, Calgary, Saskatoon, Vancouver, Victoria; F. H. Andrews & Son, Quebec, Que.

(862a)

TRADE MARK NORTON REGISTERED

Your Mark

On your product—is it the kind that proves your pride in the product? If your product is good, if its service is likely to recommend it, mark it so any one can easily tell who made it.

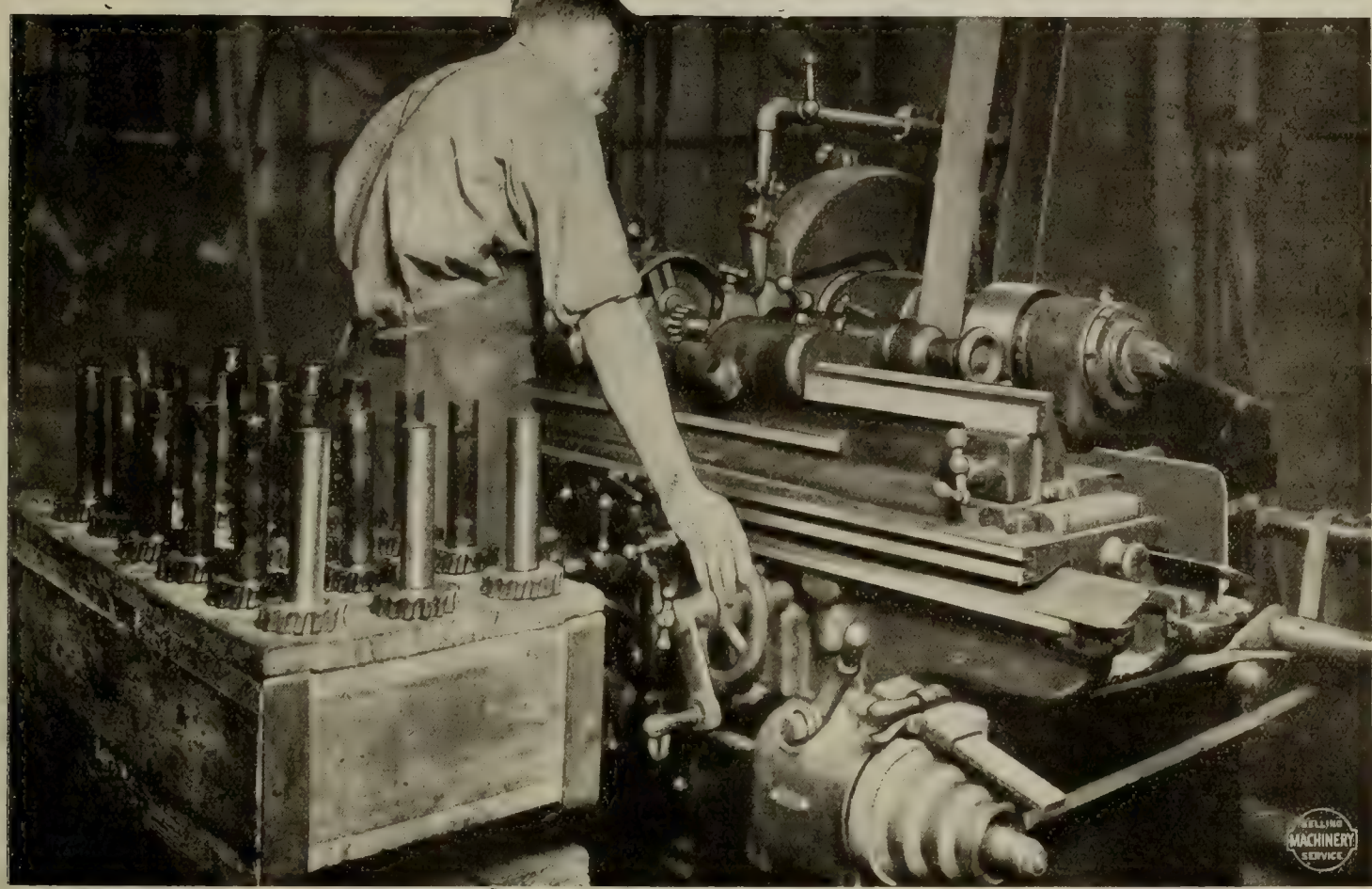
We make any form of a steel lettering die or stamp to mark your name, address, trade-mark, or any distinctive mark you desire to show on your product. Sixty-seven years in business as the largest manufacturers of our kind is the record behind Matthews steel lettering dies and stamps.

Our catalogue illustrates and describes a complete line of dies and stamps for every marking purpose. Send for it to-day.

Jas. H. Matthews & Co.
Established 1850
Pittsburgh, Pa.

Distributors for Canada
The Canadian Fairbanks-Morse Co.
Montreal, St. John, Toronto, Winnipeg, Calgary, Vancouver, Ottawa, Quebec, Saskatchewan, Victoria.

400 Shafts and Shoulders in 10 Hours on a NORTON Grinding Machine



If you are doing roughing or finishing in a lathe, these figures will be interesting —and may open your eyes! This record is not a sprint, stunt or stampede— simply an every day, all day, steady jog with the Gemmer Mfg. Co., Detroit

The subject shown is part of an automobile steering worm mechanism. Shaft is 5½-in. long, 1⅛-in. diameter. Carries a shoulder 2-in. diameter by ⅜-in. wide which must be at right angles to the shaft. The limit is very close. Production is 400 in 10 hours.

Do you know the Norton Grinding Machine in very many shops is superseding **both roughing** and **finishing** on the lathe? Doing the work in less time, with less labor and greater ease in handling? The finished result admits of no comparison.

The advantages of Norton Grinding Machines are past enumeration here. If you will just write us we'll go into the subject as far as you like.

NORTON GRINDING COMPANY

Worcester, Mass.

CANADIAN SELLING AGENTS:

The Canadian Fairbanks-Morse Company, Limited

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

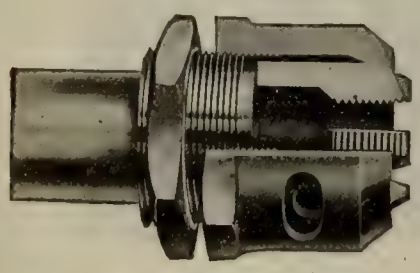
If interested, tear out this page and keep with letters to be answered.

A Time And Money Saver

THE ACORN DIE

will save time and money for you because the wear is borne equally by all four lands—due to the improved method of adjusting—consequently the die lasts longer.

It will save money for you because there will be fewer rejections for poor threads.



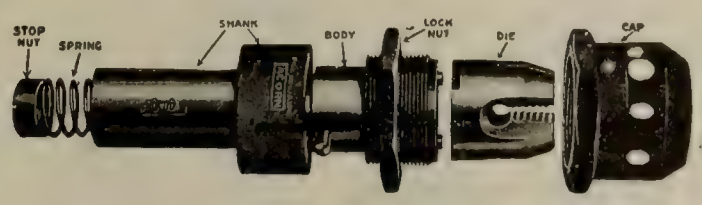
It will save time spent in grinding because it will run longer between grindings—another result of the adjusting feature, which distributes the wear equally on all lands.

It will save time in "set-up" because when a dull die is removed from the holder for grinding, a new one can be substituted, the cap screwed on and the machine is ready for work again.

It will save time on repairs or breakdowns because it is simple and there is nothing to get out of order.

Extremely accurate adjustment is obtained by turning the cap—see illustration—which forces all four lands an equal distance towards a common center.

Investigate this time and money-saving die at once.



Send for a copy of our Acorn Die booklet.

Wells Bros. Co. of Canada, Ltd.

GALT, ONT.

SALES AGENTS: The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary

That Wear-Longer Argument

It is claimed that the length of service of a file is immaterial, that it is the work done quickly which counts.

Our files agree with the cutting argument, but—they go a little further. They cut quickly first, last and all the time, and, like tried friends—

THEY WEAR

They have the teeth and they have the stock. Remember this brand and cut your filing costs.

PXH

TRADE MARK

QUALITY FILES

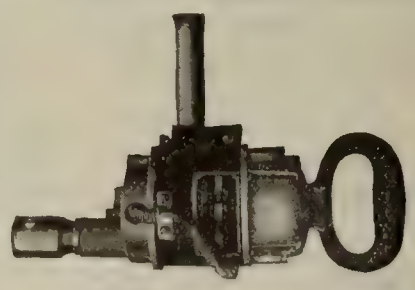
PORT HOPE FILE MFG. CO., LIMITED

Port Hope, Ontario

"Ask your jobber" (26.)

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.

⅞" and 1¼ Universal Motor DRILL.

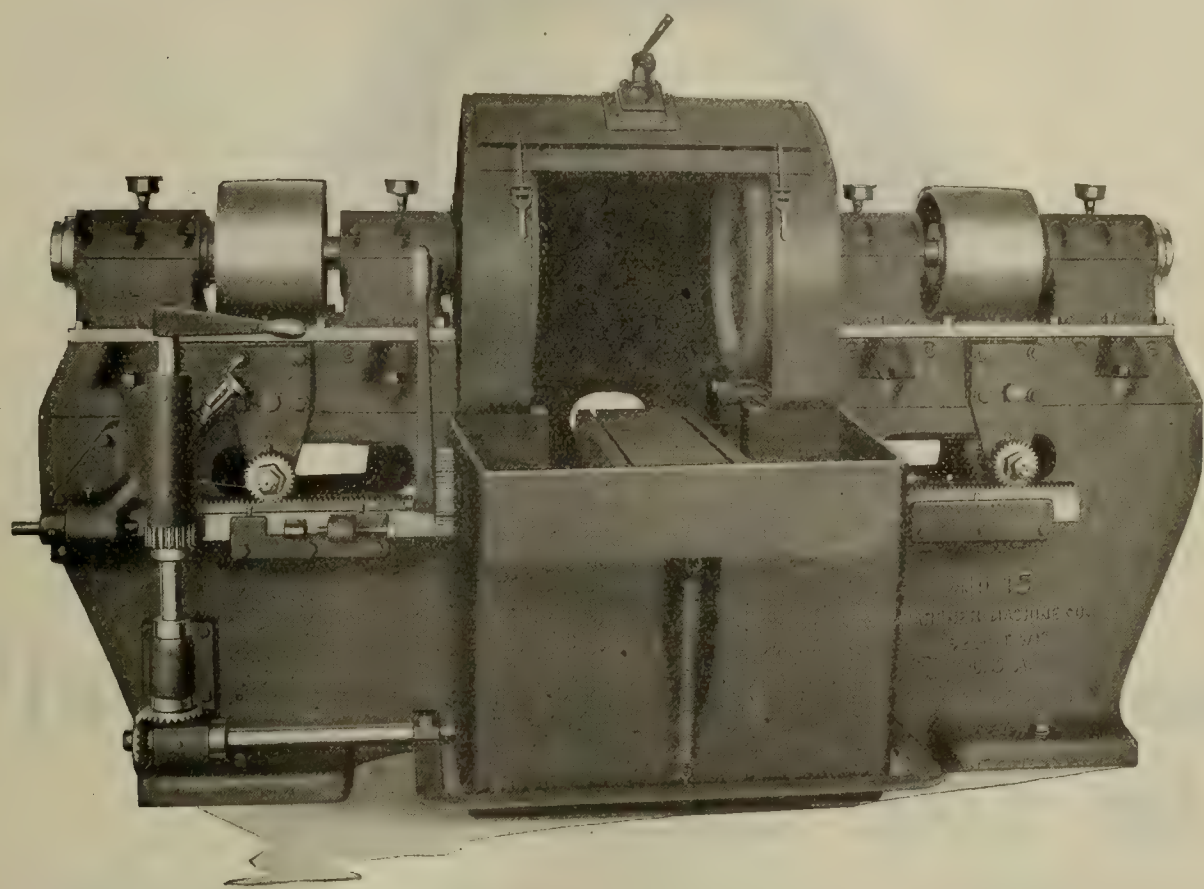
For Sale By

The Canadian Fairbanks-Morse Co., Limited

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.

CINCINNATI, OHIO



Solve Your Grinding Troubles

Possibly your trouble is that you are "letting well enough alone." Your grinding may not be up to the grade of efficiency desired. You have no doubt thought about that. Have you ever sought information or help from a firm who feature their organization by the service they render? If not, we would welcome your starting on us.

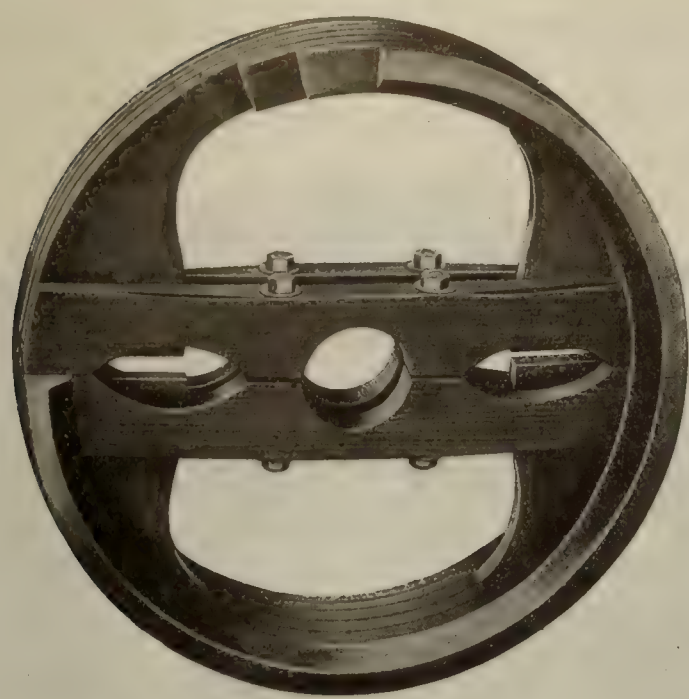
This No. 15 Double Spindle Grinder is but one of a great number we manufacture. It is specially adapted for builders of guns, ammunition and motor cars. It carries 24″ disc wheels or 2″ ring wheels. It has 8½″ face pulleys, giving abundant driving capacity and all other dimensions are proportionately large and powerful. Both types of grinding wheels are interchangeable. Get in tou ch with us on any grinding problem. Give our Service Department a test.

GARDNER MACHINE COMPANY

Beloit, Wisconsin, U.S.A.

Canadian Sales Agents: **THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED**

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria



Shall it be Wood or Steel?

Take Your Choice—

There are places where it would be unwise to use the one—the other must be chosen.

Practical men are familiar with the advantages of both and with the present-day inclination to use Steel Pulleys in place of Wood Pulleys. Whichever you choose, specify on your order

Fairbanks Wood Split Pulleys

OR

Oneida Steel Split Pulleys

The names Fairbanks and Oneida stand for the best design and highest grade construction that man can devise.

The Fairbanks web construction connecting arms and rim insures maximum service.

The Oneida structural arms and seamless crown rim gives maximum rigidity and belt-gripping power.

Ask us for full information about any transmission appliances.

CFM

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED.

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

St. John Quebec Montreal Ottawa Toronto Hamilton Windsor
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Notes on Machining Operations on 75mm. U.S. H.E. Shell

By M. H. Potter

While similar in general principle to known types of high explosive shells already produced in this country, the 75-mm. U.S. high explosive shell varies in detail,—the provision of a base protecting plate, walls of comparative thinness, a nosed-in mouth, and the acceptance of a forged interior finish are among the principal features of the design. The knurled band seat is already familiar through Russian work, but the internal hydrostatic test is an additional requirement not hitherto met with in other shells.

IN the following description of machine work on the 75 mm. shell as now being produced in this country for the United States government, the sequence of operations is such as to be readily adaptable by the majority of existing shell shops. Change of sequence, and subdivision of any particular operation into two or three stages may be undertaken if rendered advisable by special individual conditions.

When women operators are employed it has been found more practical and better results have been obtained when each operation is as simple as possible. The shells are light and therefore easily handled. This of course is only true when air operated chucks are used.

The principal dimensions and working limits of this shell are as follows: Diameter of body proper and base 2,925 in. + .005 — .010: diameter of body above shoulder 2.938 in. + .00 — .005: diameter at nose 1.88 in. + .010: length over all 10.39 in. + .08; width of groove (no undercut) .48 in. + .01: thickness of walls .318 in. + .01 in.; over all diameter of driving band 3.008 + .003; thickness through nose .83 in., (not habitually gauged): length of threads in nose 1.397 in. + .000 — .006: the threads are U.S. standard form, 12 per inch; diameter over threads 1.397 in. + .000 —.006: diameter fuse hole rear of threads 1.54 in. + .20: angle of fuse hole 60 deg.

The base cover plates consist of one disc of lead 2.22 in. dia. and one sheet of brass 2.56 in. dia. with the edge turned at 45 deg.

The shells are heat treated practically the same as the British shrapnel, and the accompanying illustrations show the shell during the various machining operations, the details which apply to each operation being enlarged in the sketches to facilitate reference.

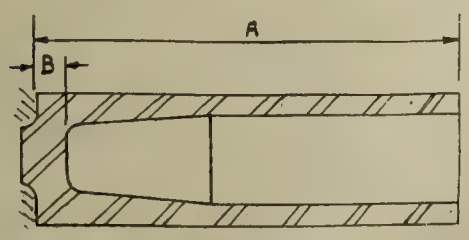


FIG. 1.

Cut Off

1st operation, Fig. 1. Special cut off machine or engine lathe with plain barrel chuck having four set screws to tighten against shell. The two cut off tools are opposite each other and fed towards the centre. The depth of bore is gauged (see A. Fig. 1). B is checked before this operation to make certain that the forging will clean-up on the base.

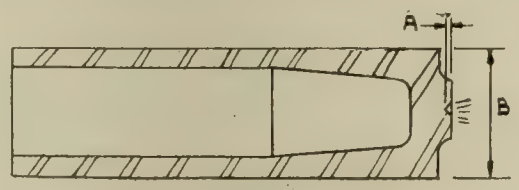


FIG. 2.

Centre

2nd operation, Fig. 2. Engine lathe with expanding mandrel having two sets of three jaws each, one set to grip shell close to the closed end the other just forward of the open end. The special fixture consists of a drill spindle with racks and pinion mounted in a casting having a vee slide to enable operator to slide the fixture to the rear when placing or removing shell. The base is clamped to the ways of the lathe. A special drill with no body clearance and a 60 deg. point is used. The shell is gauged for concentricity before this operation (see B Fig. 2), and A (see Fig. 2) is gauged.

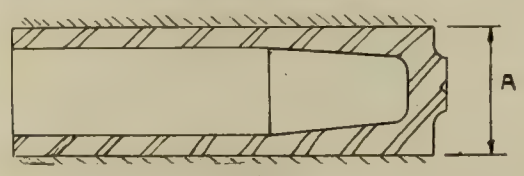


FIG. 3.

Rough Turn

3rd operation, Fig. 3. An engine lathe is used with a mandrel having three fixed tool steel hardened jaws set at a slight taper in a machine steel shank to fit lathe spindle centre. The tail stock centre is applied to the centre in the closed end of shell. The cutting tool employed consists of a machine steel shank with a welded stelite tip—A (see Fig. 3) is gauged.

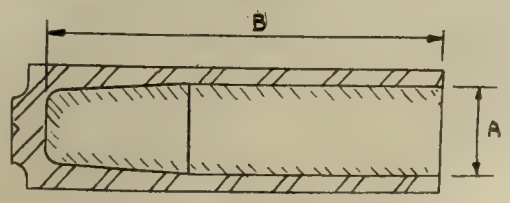


FIG. 4.

Bore

4th operation, Fig. 4. Rough and finish bore on a turret lathe. Three or four boring bears employed. The shell is held in a clamp or collet chuck. The first bar, which may be omitted, has a short cutter for removing the scale from the bottom of the bore, the second bar has the cutter for the straight part, the third bar the contour cutter for roughing (old cutters from the fourth turret

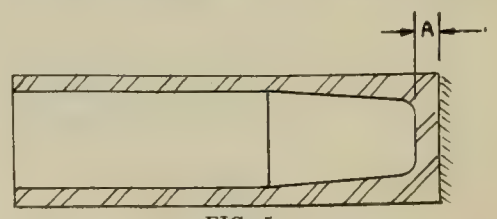


FIG. 5.

notched) the fourth bar carries the finish contour cutter. A and B are gauged (See Fig. 4).

Face Base

5th operation, Fig. 5. The shell is held in a collet chuck, it being forced against a stop fixed in the centre of the chuck. This enables the operator to set the tool the required distance from the stop, another stop on the carriage is then set which prevents a low base. Although a lathe can be used to advantage, special open end machines are more suitable. A is gauged (see Fig. 5).

Re-centre

6th operation, Fig. 6. This operation

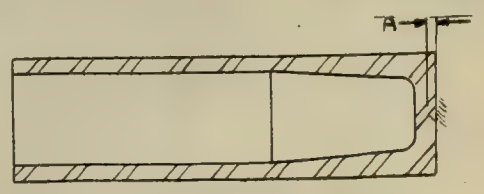


FIG. 6.

is carried out the same as operation 2. A (see Fig. 6) is gauged. This operation is necessary as the centre is used for re-rough turning and grinding the outside of the shell.

Re-rough Turn

7th operation, Fig. 7. The shell is held on an expanding mandrel as in operation 2. A is gauged (see Fig. 7).

Bevel and Face Open End to Length

8th operation, Fig. 8. The shell is

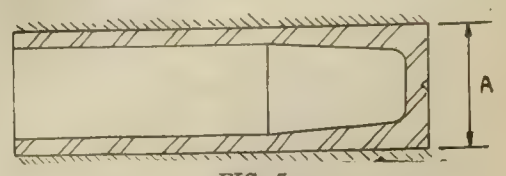
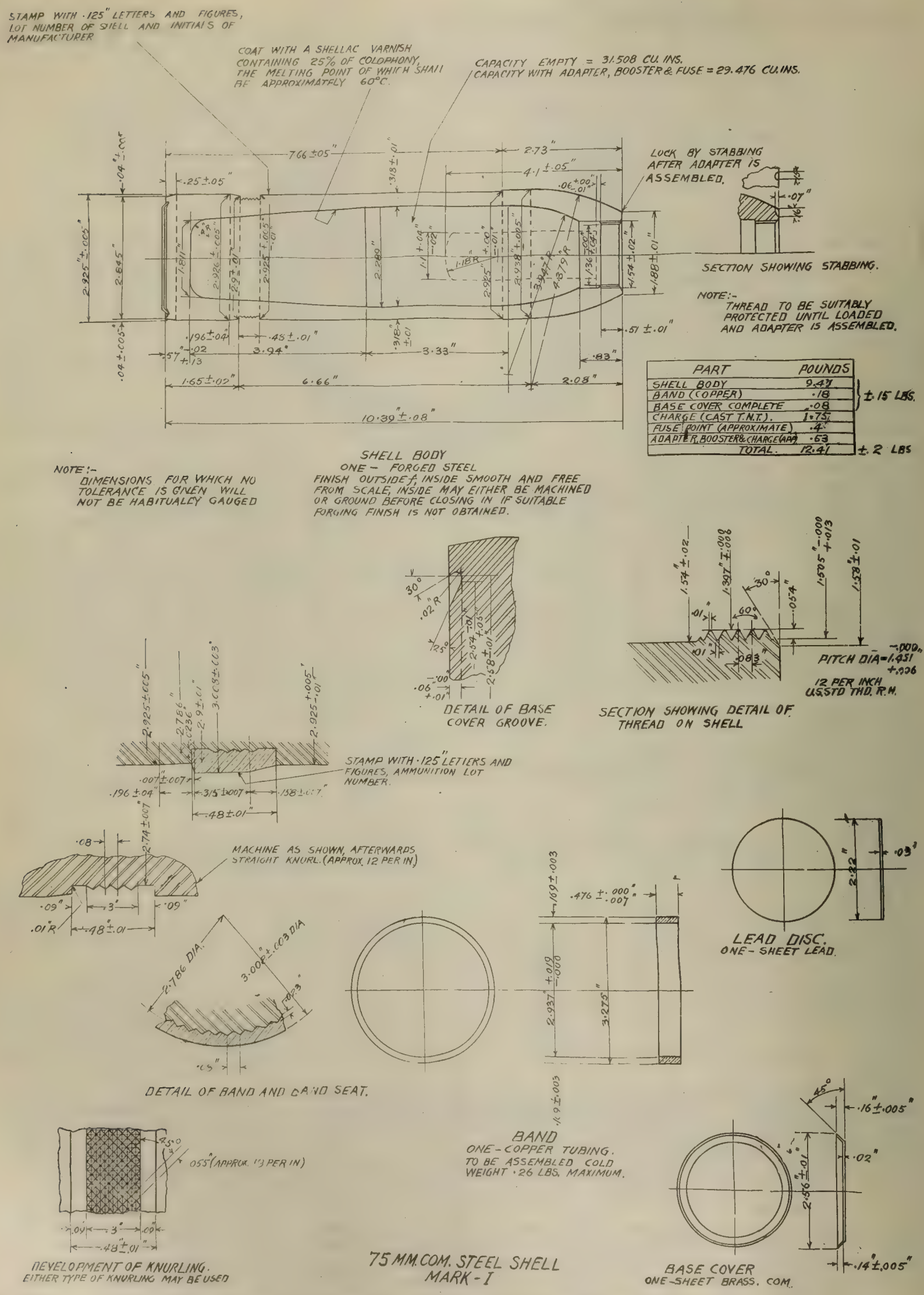


FIG. 7.

held as in operation 5 but with the open end protruding. A special block tool holder is used. The chamfering tool is held at right angles to the shell (in front). The facing tool is in line with the shell. This operation is taken care



PART	POUNDS	
SHELL BODY	9.47	± .15 LBS.
BAND (COPPER)	·18	
BASE COVER COMPLETE	·08	
CHARGE (CAST T.N.T.)	1.75	
FUSE POINT (APPROXIMATE)	·4	
ADAPTER, BOOSTER & CHARGE (APP.)	·63	
TOTAL	12.41	± 2 LBS

CONSTRUCTIONAL DETAILS OF THE UNITED STATES 75-MILLIMETRE HIGH EXPLOSIVE SHELL.

of by a lathe, the tools being set and the carriage feed put on. When the carriage almost reaches the stops, the operator releases the feed and runs the carriage up against the stop by hand. The cross feed is not required. A, B and C are gauged (see Fig. 8).

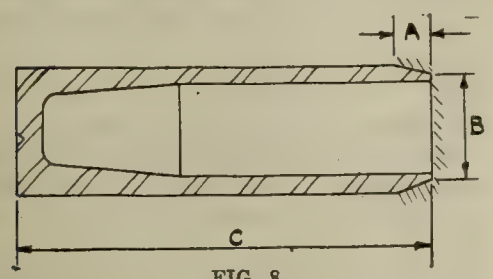


FIG. 8.

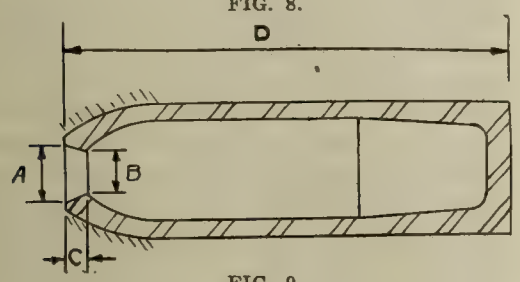


FIG. 9.

Nose in

9th operation, Fig. 9. A hydraulic press is used. The open end of the shell is heated in an oil or gas furnace, an oil furnace being preferable. The shell is then placed in the press against three locating pins, the die brought down and the shell nosed in. Although cast iron dies are successfully used, machine steel case hardened ones stand up to the work better. Two upright stops, (one at each side) determine the length of the shell. The pin in the centre of the die determines the size of the fuse hole. A, B, C and D are gauged (see Fig. 9).

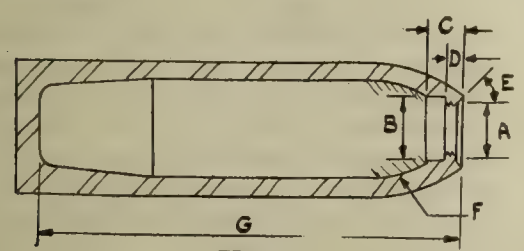


FIG. 10.

Finish Fuse Hole and Inside Contour

10th operation, Fig. 10. A turret lathe equipped with a collet chuck as in operation 5 but with the nose end protruding. The first tool rough bores and faces to length, it carries a stop which strikes the bottom of the bore. The second tool recesses the rear part of the fuse hole (rear of threads). The third tool (forming cutter) bores the inside contour, a roller at the end of the cutter in line with same brings this cut in line with the bore. The fourth tool, a rose reamer, reams the hole over the threaded portion. The fifth tool, a collapsible tap, is next run in. A, B, C, D, E, F and G are gauged (see Fig. 10).

Form Outside Contour

11th Operation, Fig. 11.—The shell is held by its base diameter in a collet chuck and a screw centre in the nose end supported by the tail stock centre. The profiling tool (a flat forming cutter) is held in a box tool holder. A stop prevents the operator from making the shell too small at the nose. A and form of nose are gauged (see Fig. 11).

Grind Body and Shoulder

12th Operation.—A grinder is employed for this operation. A, B and C are gauged (see Fig. 12).

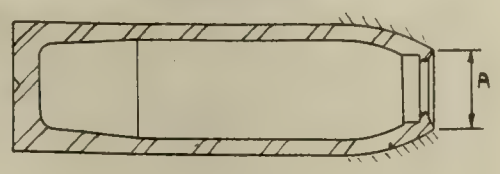


FIG. 11.

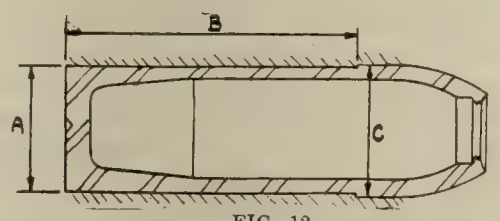


FIG. 12.

Finish Face Base

14th Operation, Fig. 13.—The shell is held as in operation 5, the inside of the base being set against a stop as in that operation. A stop on the lathe bed is in line with this stop. By means of blocks, as explained in operation 13, the operator has a fixed thickness to work to. The carriage is brought up to this stop and the tool then fed across the base. A is gauged and B checked (see Fig. 13).

Weigh

13th Operation.—By means of an ordinary pair of scales or special basket scales. A table of weights calculated from a finished shell is tabulated in accordance with each thirty-second of an inch across the base of the shell, between the high and low limits. The amount of stock to be removed to bring the shell within the required weight is stamped on the base, i.e., 1-32, 2-32, etc. Any shells over weight must be returned to operation 10 and have stock removed from the inside contour by means of a similar contour tool (third tool, operation 10) with a cutter having a larger radius, care being taken not to make a thin wall. By taking a trial shell through to the last operation, the desired weights at this stage can be ascertained.

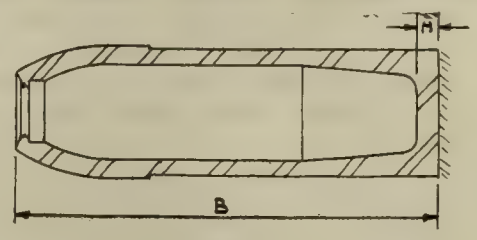


FIG. 13.

Check Weight

15th Operation.—Scales similar to those used in operation 13.

Groove and Knurl Barrel Recess and Chamfer, Also Chamfer Base

16th Operation, see Fig. 14.—Engine lathe or special open end machine having a four-way tool holder. First tool grooves, leaving a raised portion in the centre of the groove. The second tool chamfers the back edge of the groove. The third tool chamfers the base. Stops are used to determine the diameters and the proper distance from the base. A, B, C, D, E, F and G are gauged (see Fig. 14).

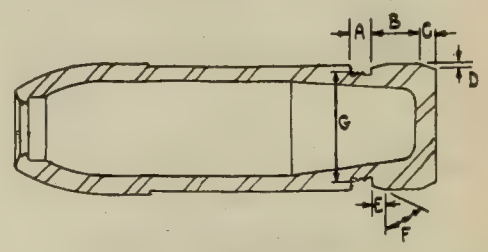


FIG. 14.

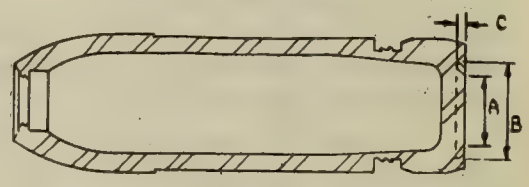


FIG. 15.

Groove Base

17th Operation, Fig. 15.—The shell is held as in operation 5, a similar stop being used inside the bore. A flat forming tool held in a block tool holder is used. A stop on the carriage fixes the depth of cut. A, B, C and the form of groove are gauged (see Fig. 15).

Wash and Sand Blast

18th Operation.—Special machines are now on the market, the use of which saves time and insures first class results.

Preliminary Shop Inspection

19th Operation.—The shells are arranged according to serial numbers and then submitted. The following gauges are used to check the shell: high body ring gauge; low body ring gauge; high base ring gauge; low base ring gauge; snap gauge high and low diameter driving band recess; snap gauge high and low diameter of knurling; width of driving band recess; high and low distance from base (combination gauge); length and angle of driving band recess chamfer; length and angle of base chamfer; form of base groove; high and low diameter of base groove; calliper gauge for thickness of wall; calliper gauge for thickness of base.

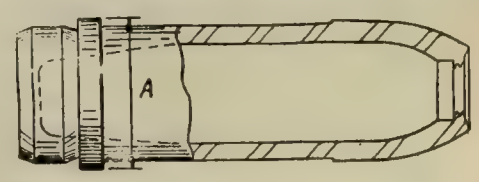


FIG. 16.

Preliminary government inspection immediately follows the foregoing.

Applying Base Cover Plates

20th Operation.—The shell is held in a special hand champ with lead pad at bottom for nose of shell to rest on, its base being upwards. The lead plate is placed over the base and the brass disc, with its flange in the groove, is placed over it and planed into the base groove.

Apply Driving Band

21st Operation, Fig. 16.—The band is applied cold by means of a special banding press. A is gauged occasionally (see Fig. 16).

Stamping

22nd Operation.—The required stamping is done just above the driving band. The shell is placed in a groove in the bench. The stamps are held in a special holder.

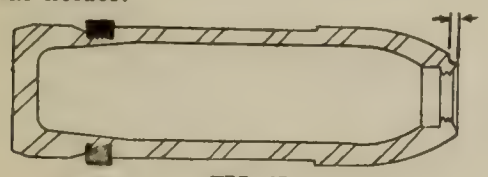


FIG. 17.

Mill Slot in Nose

23rd Operation, Fig. 17.—The shell is held in two vee blocks and fed into the milling cutter. Both dimension and form of slot are gauged, see Fig. 17.

Hand Tap and Reseat

24th Operation.—The shell is held as in operation 20, but with its nose upwards. A hand tap is used to insure a clean smooth thread and also for sizing purposes. A rose reamer is employed to smooth the angle of the fuse hole. Its shank is threaded at the bottom to suit the threads in nose of shell; at the upper end (above the reamer) are two threaded collars to keep the reamer against the shell. A combination gauge for the threads and angle of seat is used.

Wash and Clean

25th Operation.—Special washing machine as used in operation 18.

Varnish and Bake

26th Operation.—The shell is varnished while rotating on belt-driven rollers, a varnish spray gun being used. The shells are then placed nose downwards in a rack mounted on rollers and run into a gas oven.

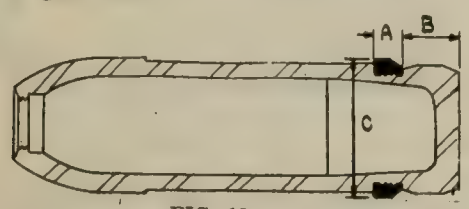


FIG. 18.

Turn Bevel

27th Operation, Fig. 18.—The shell is held as in operation 5. A special open end machine or engine lathe is used. At the forward end of the carriage is a block tool holder which holds the two trimming tools (operated separately by hand screws) which turn the band to the proper width. The holder which supports the two shaving tools (roughing and finishing) is mounted at the back of the carriage and passes under the shell. A, B, C and form of band are gauged (see Fig. 18). As no cutting compound is used the shell does not become dirty again. This operation is placed last as the driving barrel is easily damaged.

Final Shop Inspection

27th Operation.—The shells are now submitted for final inspection. It is again weighed and the following gauges used: ring gauge high base; profile of nose; concentricity (cylinder) gauge.

Final government inspection concludes the work on the shell which is most directly connected with machine shop methods.

MAN POWER BIGGEST FACTOR IN INDUSTRY

WHAT is going to happen if the output of steel is not increased? The fate of the war depends largely upon the steel production of the United States, and the out-turn is being seriously retarded by lack of fuel, iron, transportation facilities and labor.

The seat of the trouble which is hampering production at this time is labor. There are not enough men to man the steel plants. There is also not sufficient fuel to operate them for the same reason, and the facilities of transportation have proven entirely inadequate to the extra strain. The consequence has been that production instead of increasing is declining, and the out-turn of some mills is reported to have been reduced to 50 per cent. of normal capacity.

As for iron, the outlook is still more serious. The lack of man power is holding up production of ore, of fuel, and consequently of iron and steel. In the Eastern market recently there were inquiries for upward of 25,000 tons of basic and foundry iron. The great bulk of this demand must disappear because there is nothing with which to satisfy it. It is estimated that of the tonnage asked for probably not more than 5,000 tons will be found available for distribution.

The inquiries are for large and small lots for delivery from now to next July. The furnaces are also growing cautious about extending their engagements for next year, as they are already well sold up and behind on their present contracts for the year. Steel makers and foundry men are clamoring for iron all over the country, and the market has probably never before been subjected to such a combing process with so little tangible result. It is well for industry in general that the price is fixed or the market would undoubtedly be thrown into an unprecedented state of panic.

WASHINGTON DISTRIBUTES WAR ORDERS

ORDNANCE Bureau has distributed orders for about five hundred thousand 200-millimeter and seven hundred and fifty thousand 155-millimeter shells. Contracts for forgings for nine hundred thousand 240-millimeter projectiles have also been awarded, and contracts for machining these will probably be concluded within a few days. Further contracts for guns and gun forgings have also been let.

The order for seven hundred and fifty thousand 155-millimeter went to American Brake Shoe & Foundry Co., which also is expected to secure a contract for about half the 240-millimeter shells to be placed. American Car & Foundry Co. will also get contracts for 240-millimeter shells.

The half million 200-millimeter shells have been awarded to Westinghouse Electric Co. and McMyler-Interstate Co. of Cleveland.

Orders for forgings for the 155-millimeter, 200-millimeter and 240-millimeter shells were divided among following companies: Bethlehem Steel, Midvale Steel, Pollack Steel, American Steel Foundries, Taylor-Wharton Steel & Iron, Curtis & Co., Whitaker Glesner Co., Carnegie Steel, Pennsylvania Steel, American Rolling Mills, and Cape Ann Anchor Works.

Some of these concerns already have substantial orders for guns or shells. Bethlehem and Midvale, it is known, have a record-breaking volume of business from the United States Government, most of it of this character, but details of the contracts are being withheld. American Brake Shoe has a contract for three thousand 155-millimeter howitzers, closed August 24, and is now actually producing these guns. Westinghouse Electric has a contract for 1,800,000 six-inch shells (practically the same size as the 155-millimeter) for Great Britain and for 75-millimeter shells for this Government.

Pollack Steel has contracts for forgings for 1,000,000 British six-inch shells and for gun forgings and battleships and destroyer forgings.

It is estimated that the ordnance department has placed total contracts since beginning of war for 60,000,000 shells of different sizes, of which about 29,000,000 were 75-millimeter, and for over 20,000 guns from 75-millimeter up.

TWENTY-FIRST ANNUAL MEETING OF NATIONAL FOUNDERS' ASSOCIATION

ON the occasion of its twenty-first annual meeting, held at the Hotel Astor, New York, Nov. 14 and 15, the National Founders' Association demonstrated as far as possible in a meeting of this nature the loyalty and patriotism of its members. A new high record was set for attendance, this event being largely influenced by the great amount of labor disturbance throughout the United States. The apprehension felt by the members regarding results likely to arise from the attitude of labor unions was strongly evidenced by the president, William H. Barr, who stated that national efficiency and prosperity rested upon that foundation of industrial equality and liberty known as the open shop, and he further insisted that in time of war the 8-hour day is an economic waste and a grave menace.

Increased Output With Reduced Labor

The question of maintaining normal production of castings despite reduced labor facilities was discussed to a large extent. The opinion was expressed that jobbing founders are not producing in excess of 50 per cent. of their capacity, and president Barr emphasized the patriotic duty of jobbing casting manufacturers to maintain their normal production in spite of the labor shortage.

The results obtained through the installation of moulding machines and similar labor-saving equipment were convincingly shown in a series of motion pictures taken in various progressive plants in the United States and Canada. Moulding, pouring and shaking-out work when performed with suitable equipment had yielded increased output up to four and fivefold, and in some of the shops shown the skilled labor had been replaced entirely by handymen. Piecework payment prevailed and combined with the increased output, had resulted in greatly enhanced wages. Operations at the following plants were shown by the pictures: King Sewing Maching Co., Buffalo; Buick foundry of the General Motors Co., Flint, Mich.; Eddy Valve Co., Waterford, Conn.; McClary Mfg. Co., London, Ont., and the Lumen Bearing Co., Buffalo. In connection with the latter plant it was stated that the employes are now averaging an output of 1,108 pounds of castings each, of an average weight of less than three pounds per casting.

Officers and Council

New officers of the N. F. A. are: President, William H. Barr, Lumen Bearing Co., Buffalo; Vice-President, Samuel L. Moore, Moore Bros. Co., Elizabeth, N.J.; Secretary, J. M. Taylor, Chicago; Commissioner, A. E. McClintock, Chicago.

The following members of the seventh district committee were chosen: George W. Watts, Canada Foundry Co., Ltd., Toronto, Ont.; A. R. Goldie, Goldie McCulloch Co., Ltd., Galt, Ont.; H. Cockshutt, Cockshutt Plow Co., Brantford, Ont.; J. C. Russell, John McDougall, Caledonian Iron Works Co., Ltd., Montreal, Que.; W. M. Gartshore, McClary Mfg. Co., London, Ont.

MORE FUEL OIL FOR STEAMERS

AN important change which has been comparatively lost sight of owing to the stress of war conditions is the increasing use of crude oil as fuel for steamships. Without a great deal of publicity having been given to the fact, a not unimportant portion of the American merchant marine has been turned into oil burners. The navies of the world, of course, have been using oil as fuel much longer than the merchant services. In this connection it may be noted that at a recent conference held at Washington between representatives of the American and British governments. Standard Oil officials and the Shipping Board, an ample supply of oil for the British navy was assured.

The chief advantages claimed for oil as fuel are a saving of bunker space in the ship and a saving of dead-weight. Up to comparatively recent years the drawback has been the price of oil, but with the unprecedented enhancement in the price of coal which war conditions have brought with them the economic opportunity to use oil has presented itself. Speaking generally the increase in the Texan, Mexican, and Californian oil supply which has taken place during recent years has made possible a greater use of oil for generation of steam on ships. Hitherto oil was usually too valuable to be used in ships furnaces.

Particularly on the Pacific Coast and in trade with the Orient has the war promoted the use of oil as fuel on ships, the source of supply in the Gulf region and California being relatively near at hand.

Five steamers now in course of construction for the New York- Valparaiso service are to be oil burners. Eighty per cent. of the Standard Oil steamers now afloat are equipped as oil burners. The Southern Pacific Railway, which has oil fields of its own, has been the leader in this country in the use of oil fuel for locomotive engines. In 1915 the company had 1,927 oil-burning locomotives out of a total of 2,046 engines. The Southern Pacific is also using oil as fuel for its steamers to a very considerable extent.

The Luckenbach Steamship Co. has a couple of oil-burning steamers. There was launched last month at the yards of the Fore River Shipbuilding Co., Quincy, Mass., a large oil-burning freighter of 10,000 tons dead-weight intended originally for the Luckenbach Steamship Co., but now taken over by the Government. The fuel oil is carried in the double bottom and in the forward and after peak tanks.

The Atlantic, Gulf & West Indies Steamship Lines have seven or eight oil-burners. Most of the newer ships have been equipped to use liquid fuel, the policy being to build all new ships with facilities for the use of either coal or oil. The Munson Line has two or three oil burners of 7,500 tons dead-weight, and other American companies have one or more vessels equipped in this way, as for instance the United Fruit Co. Some of the Cunarders will be oil-burning ships.

RECENT DEVELOPMENTS IN POTASH PRODUCTION

THE influence which it is possible for the cement and iron industries to exert on the production of potash is of considerable importance at this time, and the possibility of this influence increasing in the future is the belief of Richard K. Meade, expressed in an article in the "Manufacturers' Record." The necessity for development work on this continent has been growing more urgent with the continuance of the war, some idea of the urgency being conveyed by the statement that the imports of pure potash from Germany before the war amounted to 250,000 tons, while 10,000 tons only were produced in the United States last year, as estimated by the Geological Survey.

Recent reports in Canada indicated the probability of production being increased by suitable treatment of feldspar in connection with cement manufacture. It seems, however, that the loss of potash by volatilization from rotary cement kilns was pointed out as far back as 1903, and that from blast furnaces still earlier, but before 1914 nothing was done to collect the substance from either source.

Some ten years ago a dispute arose between the orange growers in South California and the cement mills over the question of the damage caused by the dust from the mills being deposited on the fruit trees, and to settle the matter the Riverside Portland Cement Company installed a process for precipitating the dust by the Cottrell electrical system. This process not only proved efficient as a dust-catching device, but also collected the potash with the dust. Most of the potash being water-soluble, it can be dissolved out of the dust by leaching with water. Before the war the raw materials used at Riverside were low in potash, and hence the amount volatilized was small, but after the outbreak of war the company found they could increase the output of potash from their kilns by the aid of feldspar, which can be used without injury to the cement. They also found that mixing fluorspar with the raw materials increased the amount of potash volatilized to 90 per cent. of the amount contained in the raw materials, as against 50 per cent. volatilized under usual conditions. They next extracted the potash from the dust, and by crystallization obtained a potash salt containing at least 35 per cent. of potash. The crust which collects in the stacks of the rotary cement kilns contains from 6 to 12 per cent. of potash, and of this large quantities have been sold to the fertilizer companies since 1914.

In the summer of last year the Security Cement and Lime Company put the Cottrell process into operation in order to catch all their kiln dust. They found that the addition of salt to their raw materials increased the yield of potash, and at present they are obtaining about 20 tons of dust a day, averaging 10 per cent. of water-soluble potash. The Santa Cruz Portland Cement Company are recovering 700 lb. of potash daily from their kilns by a process of their own, and a number of other cement companies are installing or have installed Cottrell plant. When all these plants are in operation Mr. Meade estimates that they will yield about 10,000 tons of potash annually, and this amount, he states, could be very greatly increased by using feldspar as a raw material.

As to potash from blast furnaces, the only iron company in America, so far as he is aware, selling potash at present is the Bethlehem Steel Company. Up to the present only the dust which can be collected by means already at hand has been sold, the amount being estimated at about 4 per cent. of the total potash liberated; but the chemist of the company believes that apparatus could easily be installed to catch at least 50 per cent. of the potash now lost, and that the apparatus, so far from interfering with the operation of the plant, would benefit it through the better cleaning of the gas for the engines. It is estimated that of the potash volatilized in the blast furnaces the amount recoverable will average at least 10 lb. per ton of pig iron, so that with an annual production of 25,000,000 tons of pig iron the blast furnaces of the United States would produce, say, 125,000 tons of potash.

Heat Treating and Annealing Furnace with Oil Fuel Equipment

Staff Article

Despite the variety of equipment now available for all lines of manufacture, and the degree of perfection attained in the design and production thereof, circumstances occasionally arise where individual requirements influence the production of articles more or less at variance with standard types. The furnace described herewith is an apt example of personal initiative combined with adaptation of stock equipment.

OPPORTUNITIES for obtaining first hand experience in furnaces burning coal, oil and gas, have been particularly numerous since the shell industry came to this country. Previous to that time there were, of course, many plants which employed furnaces on a large scale—steel works, enamelling plants, and specialized factories of various kinds. The great majority of machine shop establishments, however, had their requirements capably met by small and medium sized gas fired furnaces, and in some cases coke fired furnaces were used.

Features of Fuels

The beginning of munitions making resulted in a widespread activity, mostly of an experimental nature at the start, which embraced the three fuels mentioned, and finally resulted, in probably the majority of cases, in the adoption of oil fuel. The less general availability of gas militated against its use except in the larger industrial centres, where its convenience, cleanliness, and the comparatively greater familiarity of most workmen with its operation influenced its frequent adoption. For use on a large scale the cost is sufficiently high to compel consideration being given other fuels.

Coal Displaced

With careful manipulation and suitable furnace construction, anthracite coal has in one particular instance given very satisfactory results but here again the installation was of medium size and under more or less constant operation. Such conditions, however, did not obtain in the case of the plant where the furnace shown in the accompanying illustrations is installed. Previous to recent reconstruction, this furnace was of the old side fired type, using soft coal. The fire chamber extended along the right hand side where the oil burners are now located, giving a long narrow grate, difficult to fire properly, and increasing the width of the furnace by about 50 per cent. over that shown. In addition, a brick stack was carried up through the floor above. The lighting up of such a furnace was never a pleasant proposition. The amount of smoke around the rooom till the draft caught on properly, the length of time heating up to a working temperature and the unavoidable variation in temperature, all combined to render it unsuited for the work on which it was employed by the Radcliff Saw Mfg. Co., of Toronto, and an investigation of numerous oil fired furnaces in the surrounding district convinced them of the merits of that fuel.

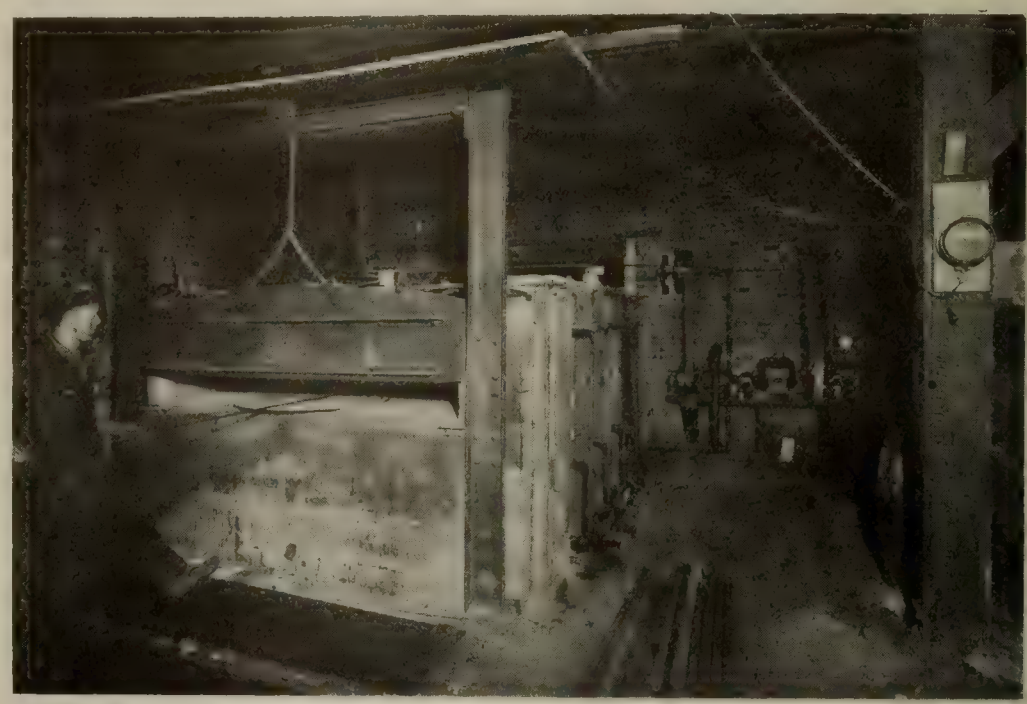


FIG. 1. GENERAL EXTERIOR VIEW OF FURNACE. OIL TANK IN FOREGROUND AND PUMPING EQUIPMENT AT BACK.

Features of Design

While the general principles of oil firing are more or less similar, there are opportunities for the exercise of individual judgment, both in the manner of consuming the fuel and in the arrangement of combustion chamber, baffles and flues which exercise an important influence over the distribution and control of temperature. The design of the furnace proper is the work of the company's superintendent, J. C. Hills, while the fuel burning apparatus is Tate-Jones & Co.'s low pressure system. Owing to cost of materials, etc., the foundation and brick-work were executed by local furnace builders, the burners and pumping equipment being erected by the Radcliff Co.

The general appearance of the exterior is shown in Fig. 1. A cross section is shown in Fig. 2, while Figs. 3, 4 and 5 are respectively a part longitudinal cross section and elevation, sectional view of burner, and view of pumping equipment. The hearth is 7 ft. 2 in. wide by 11 ft. 2 in. long, and is composed of tiles 18 in. by 13 in. by 3 in. laid with their length across the furnace, and supported by eight cross walls. These cross walls are of standard size fire-brick spaced as shown, and a burner set opposite each alternate one so that the flame, after striking on the large renewable baffle brick (shown cross hatched), percolates through the spaces into

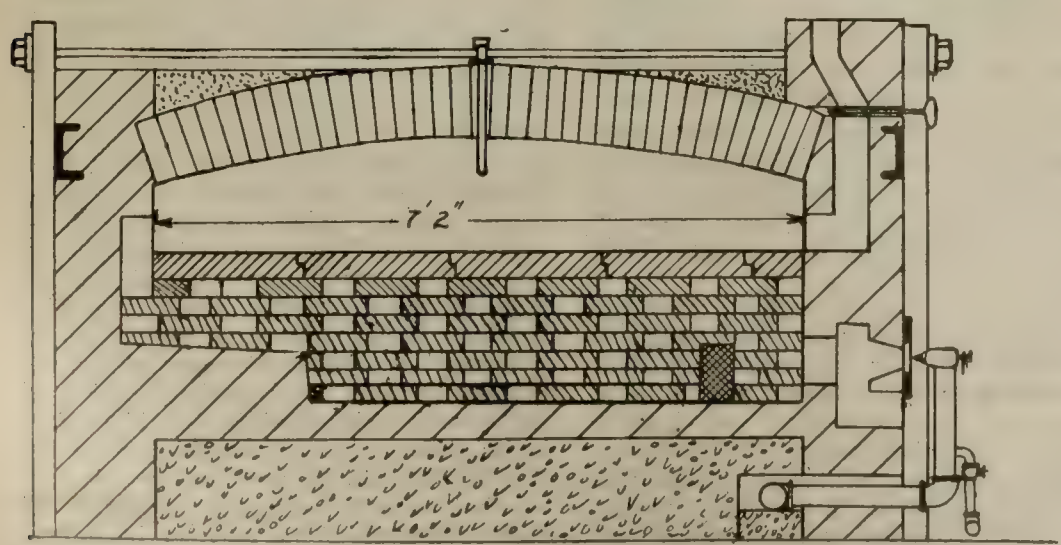


FIG. 2. CROSS SECTION OF FURNACE SHOWING ARRANGEMENT OF BURNER PASSAGE AND BAFFLE BLOCK

the adjacent [illegible] nd meets the hot gases from the next burner.

Action of Gases

The hot gases thus distributed pass across to the opposite side of the combustion chamber under the influence of the draft from the four flues shown. It will be noticed that the perforations in the cross walls extend into the flue area and thus allow it to draw on the outer cross passages. On ascending into upper or work chamber, the gases flow across the surface of the arch and make their exit by four similar flues in the right hand wall, each flue having a separate passage to atmosphere with individual dampers. See cross section, Fig. 2.

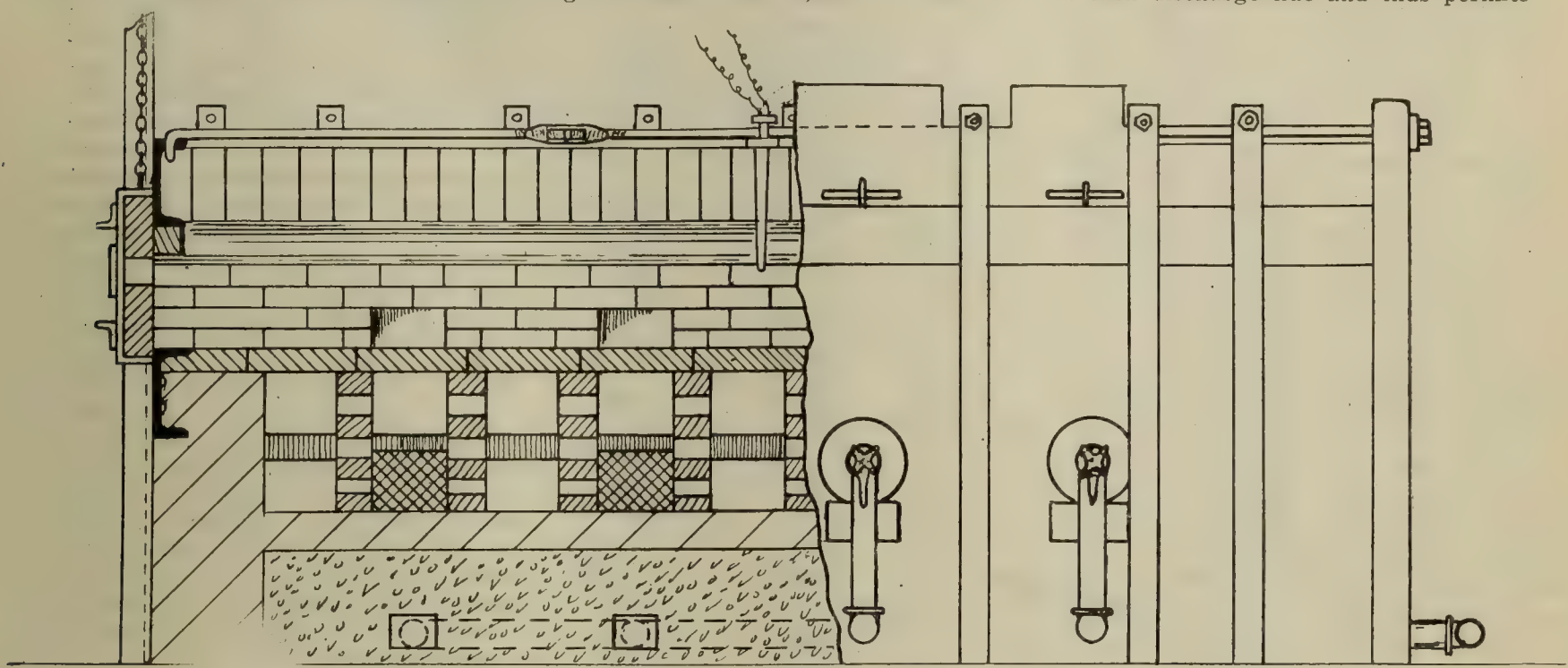


FIG. 3. PART SECTION AND ELEVATION SHOWING PERFORATED SUPPORTING WALLS UNDER HEARTH.

Low-Pressure System

The low-pressure system of burners is so termed because of the small air pressure required for operation. Those installed are Tate-Jones L-1 type, operating with air at approximately 2 lbs. pressure per sq. in., while the fuel is supplied at a pressure of 20 lbs. per sq. in. As shown in sketch Fig. 4, the fuel is supplied through the ⅜ in. pipe which enters the 2 in. air pipe near the ground, and extends upward to an internal nozzle, its exit from which is controlled by a needle valve adjusted by a star wheel.

This internal nozzle is movable bodily to or from the mouth of the burner casing by means of a threaded bushing having a suitable handle, which therefore allows the proportion of air to be increased or diminished without altering the fuel valve setting, the inside fuel pipe readily springing the maximum distance traveled by the bushing in adjusting the air supply.

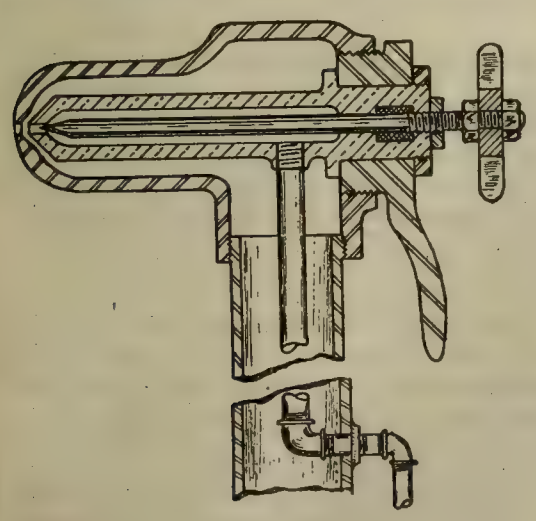


FIG. 4. SECTION OF BURNER SHOWING INTERNAL OIL PIPE AND NEEDLE VAVLE.

Auxiliary Air Supply

The openings in the wall through which the fuel and air pass to the combustion chamber are of enlarged conical section for one-third of the distance, when they are joined by extra air passages from below, so arranged as to surround the ingoing streams of air and oil with an additional body of air, the entire product then passing through the remaining straight third of the wall and impinging on the baffle blocks previously referred to. The resulting combustion is extremely good, the complete atomisation of the fuel being assured, while the auxiliary air flues described reduce the possibility of danger when a flare-back occurs as may happen once in a great while through careless adjustment.

The tendency of the heat to rise gives every chance for the hearth to get well saturated at high temperature and thus prevents undue cooling when the furnace is loaded up; the heating is also correspondingly more rapid. During operation the roof arch is swept by the hotter gases and the resulting radiation of heat down on to the work gives excellent uniformity of temperature throughout.

Individual Dampers

A simple type of slide damper is fitted in each discharge flue and thus permits the heat to be distributed or localized according to the shape and size of work being heated. The combustion gases pass upward to a large hood, Fig. 1, whence they escape to atmosphere through a small steel pipe which replaced the former massive brick shaft.

Toward the back of Fig. 1 is seen the pumping equipment which is remarkable for its compact arrangement. Fig. 5 shows this in more detail. Just below the lower right hand corner the oil storage tank is sunk in the ground, the oil being drawn therefrom and pumped to the fuel burner by a small De Laval rotary pump which maintains a steady pressure of 20 lbs. per sq. in. An overflow relief valve on the discharge side prevents damage or trouble when all of the burners are shut off suddenly. At the far end of the bench is a No. 4 P.H. and F.M. Roots positive pressure blower

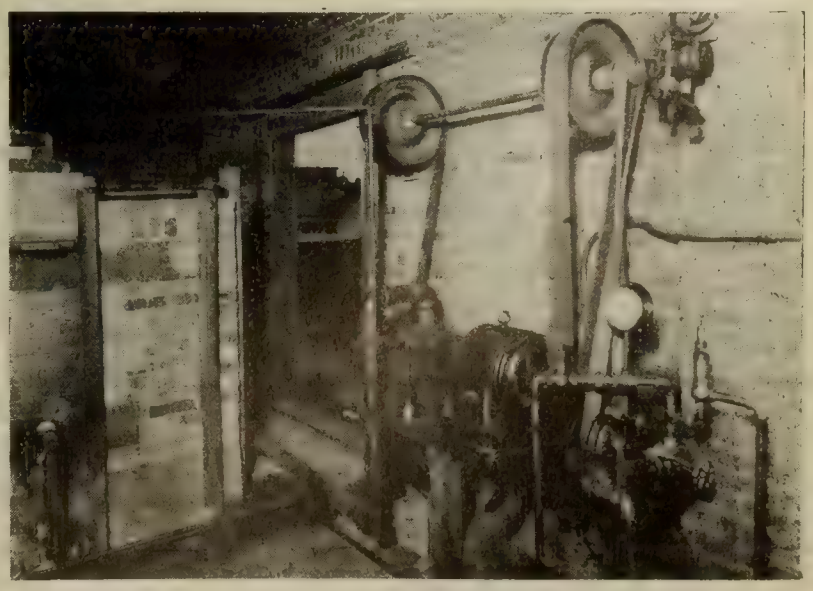


FIG. 5. COMPACT ARRANGEMENT OF MOTOR, PRESSURE BLOWER AND OIL FUEL PUMP FOR FURNACE

supplying air through a 2-in. pipe at 2 lbs. per sq. in. This air pipe is led into a passage formed in the furnace foundation and is thus considerably preheated before mixing with the fuel.

A three-phase 25-cycle Chapman and Walker motor is located between the two pumps, driving them by counter-shaft as shown.

Quenching Facilities

The work for which the furnace was originally built consists of hardening saws thus necessitating a low wide chamber. The quenching bath is shown in Fig. 1, being 9 ft. by 18 in. by 10 ft. deep sunk in the floor below the operator. Suitable overhead tackle enables the saw to be held vertically and revolved at a proper speed while being quenched. A Taylor Instrument Co.'s pyrometer outfit reading to 1,800 deg. F. covers the range of all of the work at present. Considerable special work has been done, however, such as heat treating aeroplane axles, several being in the foreground of Fig. 1, while the annealing of special sheet steel stock is handled to great advantage, the fuel system enabling the composition of the gases to be kept free from oxidizing effects on the metal.

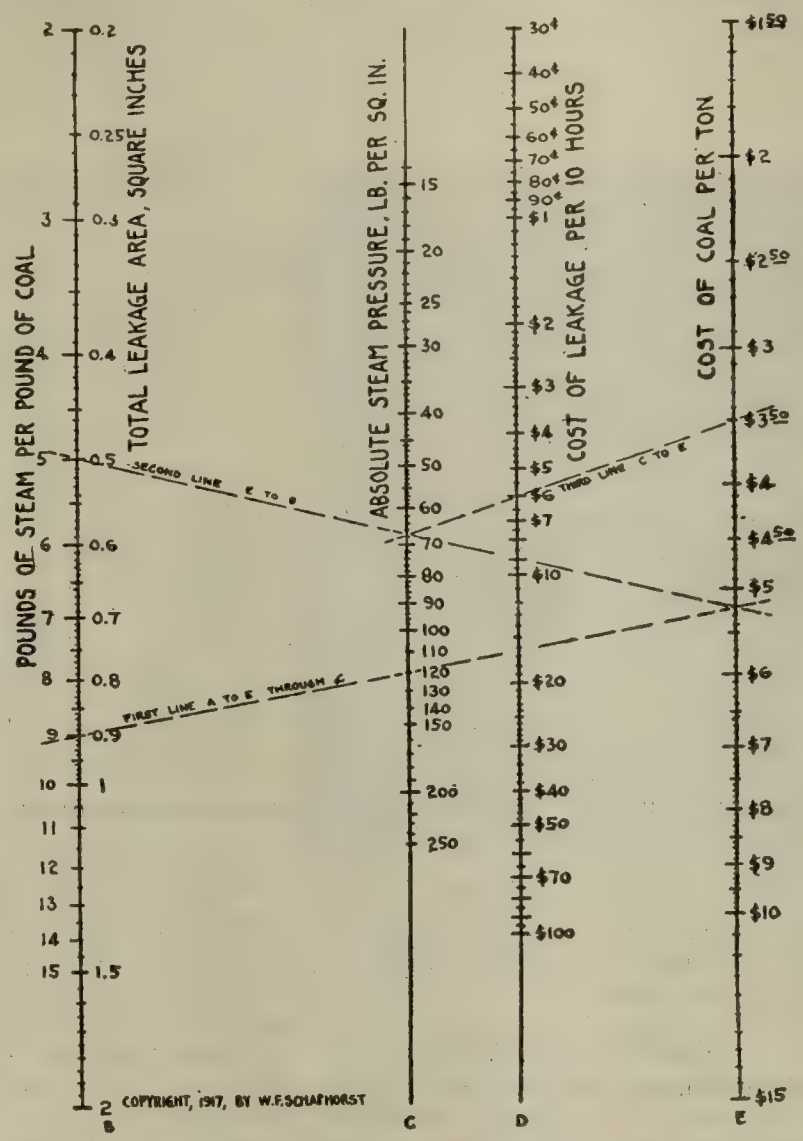
THE COST OF LEAKING STEAM

By N. G. Near.

TO determine the cost of leaking steam with any degree of accuracy we must know at least four factors: (1) The number of pounds of steam evaporated by 1 lb. of coal; the greater this is the less is the cost of leaky pipes, other conditions being the same; (2) the total area of leakage; (3) the absolute steam presure, which is equal to the gauge pressure, plus the atmospheric pressure; at sea level this is usually reckoned as gauge pressure, in pounds per square inch, plus 14.7; and (4) the cost of coal per ton of 2,000 lbs.

For example, how much money is lost every 10 hours under the following conditions: Nine lbs. of steam are generated by each pound of coal. The total area of leakage is ¼ sq. in. The gauge pressure is 105 lbs. per square inch (making the absolute pressure very close to 105 + 14.7 = 120 lbs. per square inch). The cost of coal is $3.50 per ton.

Referring now to the chart, lay a straightedge across the chart three times as indicated by the dotted lines and the problem is solved. Run the first line from the 9 (column A) through the 120



(column C) and locate the intersection in column E. Run the second line from that point of intersection to the 0.5 (column B) and locate the intersection in column C. From that point of intersection run the third line to the $3.50 (column E) and the answer is found at the intersection with column D. The answer is $6 loss per 10 hours.

In case it is found that the total leakage area is less than shown in column B, the chart may be used by shifting decimal points. For example, if, in the above problem, the leakage area had been 0.05 instead of 0.5 sq. in. the answer would be 60 cents instead of $6 per 10-hour day.

When using the chart, the steps must follow in the order shown and above described. First line, A to E through C. Second line, E to B. Third line, C to E.

The range of the chart is great enough to easily handle any ordinary problem.

BRONZE FINISHED BUTTONS

ARMY buttons are made from solid copper with a brass screw back fastener. The finish is a rich dark brown tone without lustre. Navy buttons are made from brass and finished in ormolu gold by a combination of mercury or fire gilding and electro-gilding.

In producing the military bronze finish, unless the button and fastener are made entirely of copper, they must be copper-plated, says Charles H. Proctor in "The Metal Industry." After plating the buttons are washed and dried. A saturated solution of copper nitrate is prepared by dissolving all the copper nitrate possible in water heated to 180 degrees. The buttons are then placed in a tumbling barrel, revolved at from 4 to 6 revolutions per minute, and a sufficient amount of the copper nitrate solution applied so the buttons will be covered uniformly by rotation. An excess of the copper nitrate should be avoided or the buttons will come out patchy in the final finish. After tumbling for a few minutes the buttons will have a dark stained appearance.

Remove the buttons and place upon sieve pans made from iron wire mesh, then heat the buttons to a temperature of 700 or 800 degrees in a closed retort with provisions for carrying off the smoke fumes. After the smoke fumes have all been eliminated the heating operation is finished and as a result the copper nitrate is converted into brownish black oxide of copper, which proves to be a permanent finish.

It is a whole lot easier to tell how a thing ought to have been done than to tell how it ought to be done—and there still remains the difficulty of doing it.

AN alloy that has proved very satisfactory for ships' propellers is turbadium bronze. This material has a tensile strength of about 35/42 tons with an elongation of 14/20 per cent. on a 2-in. test piece, and it is not appreciably corroded by seawater. Its composition is, approximately, copper 48 per cent., zinc 46.45, tin 9.5, lead 0.1, iron 1, aluminum 0.2, manganese 1.75, nickel 2.

The United States super-dreadnought Tennessee will be driven by four alternating-current motors, one to each propeller shaft, supplied by current at 3,400 volts from two 13,500 horse-power turbo-generators. The motors will be wound for both 36 poles and 24 poles, operating on the former as squirrel-cage machines and on the latter as wound-rotor machines.

To deaden the noise from trucks rumbling over a concrete floor, a factory has successfully used a heavy tar paper pasted to the floor by paint. The method of application is as follows: The floor to be protected is first given one coating of grey cement paint. On the following day, when the paint is thoroughly dry, a second coat is applied. At the same time one side of a five-ply tar paper is painted and when both paper and floor are still wet the paper is carefully laid, wet side down, on the floor and rolled with either a roller or wide tired truck until all signs of air pockets beneath the paper disappear. The surface seems to improve with age and very effectively reduces upkeep to an extremely low cost.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

SPECIAL GRINDING ATTACHMENT

By J. H. R.

THE maintenance of forming cutters for boring operations has given many manufacturers considerable trouble, particularly in production of shells, the machining of which has necessitated the use of large numbers of these flat cutters. Much of the difficulty experienced has been due to inability to maintain the desired shape and dimensions of the tool, owing to the rapid wear of the cutting edge.

The more efficient method of grinding boring cutters is to give an eccentric or convex shape to the clearance face, as shown to the right of Fig. 1. By this method it is possible to grind for ample top rake and yet retain a cutting angle that will give sufficient strength and metal to resist the pressure or the heat generated by the cut. It can be seen that the "cutting" qualities of the tool to

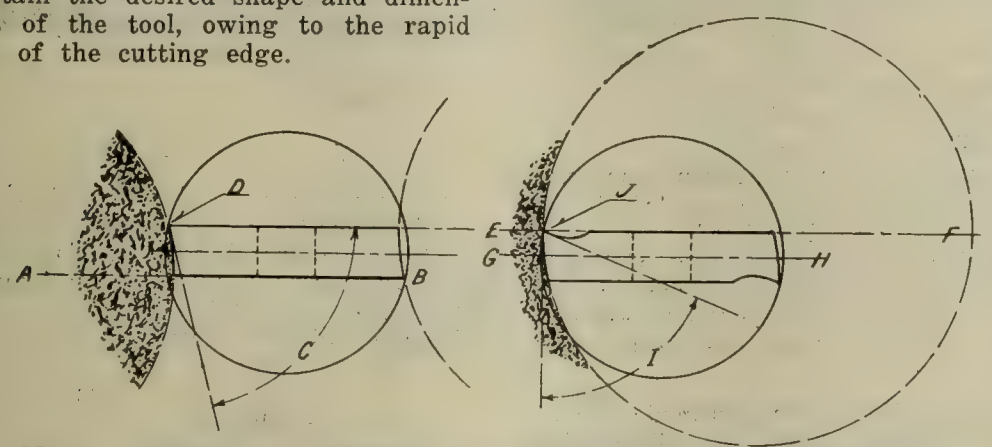


FIG. 1. ILLUSTRATING PRINCIPLE OF GRINDING FLAT BORING CUTTERS.

General practice in grinding this type of cutter is to use a wheel that cuts on its outer circumference, as shown to the left of Fig. 1, leaving the side with a concave appearance. In order to obtain sufficient clearance at the heel of the cutter it is necessary to grind in such a manner that the actual clearance angle is often very pronounced, as indicated by the angle C. If this clearance was from a diametrical point on the cutter, the cutting qualities of the tool would not be greatly affected, but without top rake the point D has a scraping rather than a cutting tendency, owing to the edge being one-half the width of the blade above the center line. To give the proper rake to this tool the cutting angle must be reduced, and in doing so the effectiveness of the edge is further destroyed, owing to the increased possibility of chipping or over-heating.

the right are much better than those of the other. The cutting angles C and I are about the same but the advantages of the eccentric ground tool are readily appreciated by a glance at the cutting edges D and J.

Application of Principle

Fig. 2 illustrates the method adopted for grinding shell boring cutters in a plant known to the writer. Discarded wheels from a Landis grinding machine were utilized for this purpose, these wheels having an interior diameter of about 5 in. When the Landis machine is through with these wheels the outer diameter has been reduced to about 8 in., so that they were readily adapted for their new duties. The fixture for holding these wheels, so as to provide an interior grinding surface, consists of a box casting A threaded to fit the nose of the spindle, and with sufficient length to allow the longest cutter to pass the grinding wheel. The wheel B is dressed to fit the recess in A and is afterwards clamped by the nut C. The bearings of the lathe upon which these grinders were used were redesigned somewhat, and the machine belted to give a surface cutting speed of about 5,000 ft. per min.

In order to get the desired eccentric clearance on the cutter, the turret was raised equal to half the thickness of the blade, and one of the holes bored to fit the shank F, so that when the turret was returned to its proper position the upper face G of the forming cutter was in the same horizontal plane as the lathe spindle, but the center line D-E of the cutter arbor was lower by half the thickness of the blade. Locating points H were provided in the shank to determine the proper position for grinding either side of the cutter. Facilities were also provided to swing and lock the turret at a slight angle to grind the tapering end of the forming cutter.

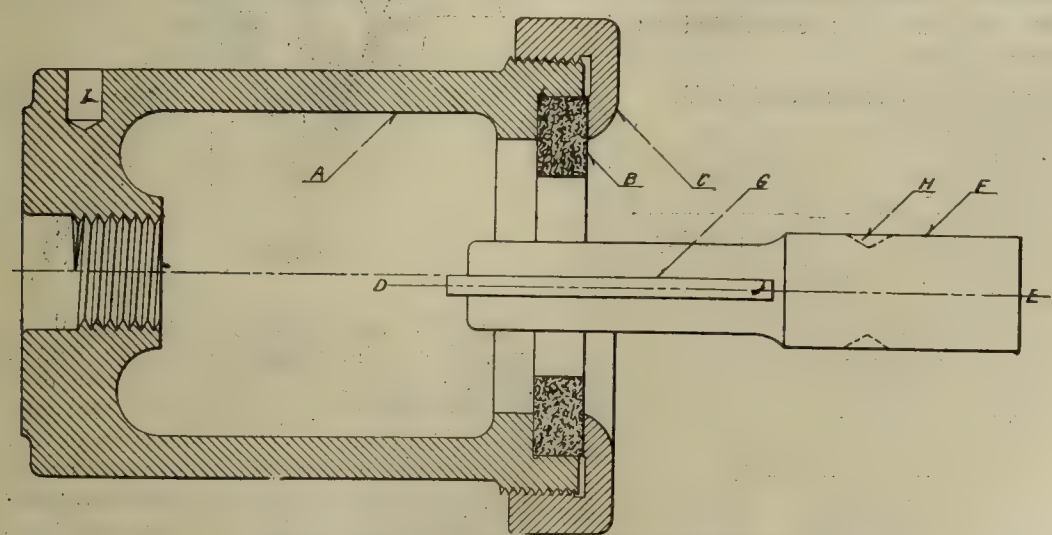
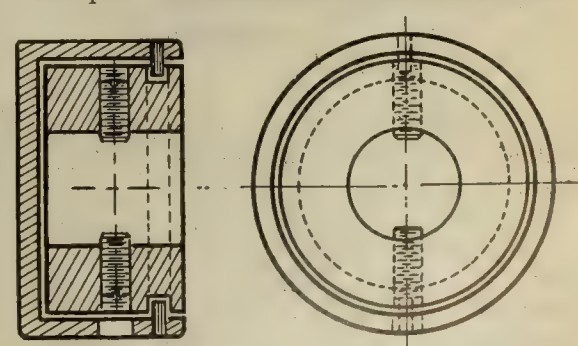


FIG. 2. DEVICE FOR APPLYING PRINCIPLE SHOWN IN FIG. 1.

SAFETY-COLLAR FOR EXPOSED SHAFT ENDS

By J. Wright.

A VERY suitable protective means for preventing workmen from getting caught on the exposed ends of overhead shafting is the end safety-collar, shown in sketch. It consists of an inner collar having two headless screws for fastening this to the shaft. A loose fitting outer collar is placed over this. The inner collar has a square groove near the edge, cut reasonably deep, and wide enough so that the two pins fastened in the outer collar will hold it in position, while allowing the shaft and inner collar to revolve freely.



SAFETY COLLAR FOR EXPOSED SHAFT ENDS

The shaft hole in the inner collar can be made large enough so it can be used on shafts of different diameters, it being only necessary to adjust the screws, and for this purpose a hole is made in the outer collar to insert a screw-driver.

It is readily seen that pressure on the outer collar from a workman's arm or sleeve will cause it to stop instantly, preventing damage such as would be done by the bare end of a revolving shaft.

MANUFACTURE OF HARDENED THREAD GAUGES—IV.*

By G. Doorakkers.

IT does not require many special checks for inspecting male screw gauges. All dimensions can be ascertained by using a micrometer. The outside or major diameter can be taken direct. The pitch diameter is taken over one or three wires again by using a micrometer. The minor or core diameter can be taken with a micrometer by the aid of the attachment shown in Fig. 22. For verifying male screw gauges that have been put into use it is an advantage to have a final full thread female check, which has, of course, to be inspected for all the dimensions like a female gauge. From practice it will be found satisfactory to allow a shrinkage and lapping allowance of .001 for medium and large gauges and .0005 for small gauges.

Checks for Female Gauges

It requires several checks to test a female screw gauge effectively. (1) Check for minor diameter; (2) check for major diameter; (3) check for pitch diameter; (4) check for full thread.

Check for minor diameter.—The minor diameter can be measured with a plain plug gauge with two diameters, a "go" and a "not go" diameter. The "go" diameter is made the required size of the gauge and the "not go" diameter one-

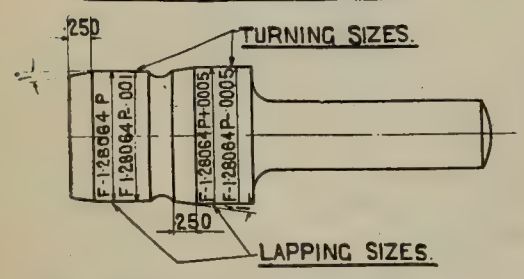


FIG. 27.

half thousands over the required size. A lead of 2 deg. included angle is ground about ¼ in. up on both diameters.

As hardened female gauges require lapping out, and have also a tendency to open out slightly in hardening, we require two gauges for every size, a turning gauge and a lapping gauge. It has been found good practice to allow .001 in. between the turning size and the lapping size for medium-sized gauges.

Fig. 27 represents the checks for the minor diameters.

The material is mild steel, which is carbonized hardened and ground.

Example.—The diameters for the checks for minor diameter for a female gauge 1.998 = 14 R.H. are—

Minimum diameter of turning check = F — 1.28064 P — .001 = 1.998 — .09148 — .001 = 1.90552.

Maximum diameter of turning check = F — 1.28064 P — .0005 = 1.998 — .09148 — .0005 = 1.90602.

Minimum diameter of lapping check = F — 1.28064 P = 1.998 — .09148 = 1.90652.

Maximum diameter of lapping check = F — 1.28064 P + .0005 = 1.998 — .09148 + .0005 = 1.90702.

Checks for major diameter.—The major diameter of a female screw gauge must be measured with a check that touches the radius only and is free everywhere else. The flanks of the thread are cut with a sharp pointed tool with an included angle of 50 deg. and the radius is cut with a female master tool. The gauges are made of mild steel and kept soft all over except on the thread, where the carbon is left in so that the thread will be hard.

Fig. 28 shows two types of these checks, the principle of which is the same, only Type 1 is for the larger diameters and Type 2 for the smaller diameters.

The hole H in Type 1 is made to suit a handle shown in Fig. 29. Dimension G for both types is turned under the bottom diameter of the thread. Dimension W is in both cases ½-in. + 8 P. These checks are again required for turning and lapping sizes. Assume F the finished major diameter of the female screw gauge, then:

For the turning check—
A = F — .001 in.
B = F + 2 x — .001.
C = F — .0005.
D = F + 2 x — .0005.

For the lapping check—
A = F.
B = F + 2 x.
C = F + .0005.
D = F + 2 x + .0005.

The value of x is calculated as follows:—

In Fig. 30, in triangle D B E:
D B = ½ P.

$$DE = \frac{DB}{\tan 25 \text{ deg.}} = \frac{P}{2 \tan 25 \text{ deg.}}$$

In triangle A B C:
A C = R.

$$AB = \frac{R}{\sin 25 \text{ deg.}}$$

$$DG = AB - R = \frac{R}{\sin 25 \text{ deg.}} - R.$$

$$EG = DE - DG = \frac{P}{2 \tan 25 \text{ deg.}} - \frac{R}{\sin 25 \text{ deg.}} + R.$$

In triangle E M F:

$$ME = \frac{FM}{\sin 25 \text{ deg.}} = \frac{d}{2 \sin 25 \text{ deg.}}$$

$$EH = EM + MH = \frac{d}{2 \sin 25 \text{ deg.}} + \frac{d}{2}.$$

$$X = EH - EG = \frac{d}{2} - \frac{1}{\sin 25 \text{ deg.}} + 1$$

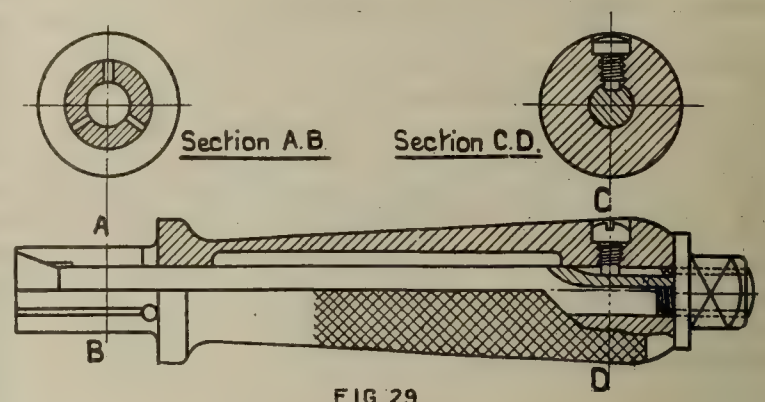


FIG. 29

$$- \frac{P}{2 \tan 25 \text{ deg.}} - \frac{R}{\sin 25 \text{ deg.}} + R.$$

Example.—The diameters for the checks for major diameter for a female gauge 1.998 = 14 R.H. are:—

Diameter wire d = .040.

$$X = \frac{.020}{\sin 25 \text{ deg.}} + .020 - \frac{.035714}{\tan 25 \text{ deg.}} - \frac{.0098}{\sin 25 \text{ deg.}} + .0098$$

= .067324 — .063200 = .004124.

For the turning check,
A = 1.998 — .001 = 1.997.
B = 1.998 + .0082 — .001 = 2.0052.
C = 1.998 — .0005 = 1.9975.
D = 1.998 + .0082 — .0005 = 2.0057.

For the lapping check,
A = 1.998 = 1.998.
B = 1.998 + .0082 = 2.0062.
C = 1.998 + .0005 = 1.9985.
D = 1.998 + .0082 + .0005 = 2.0067.

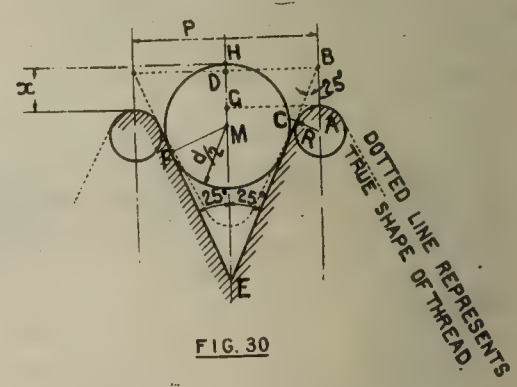
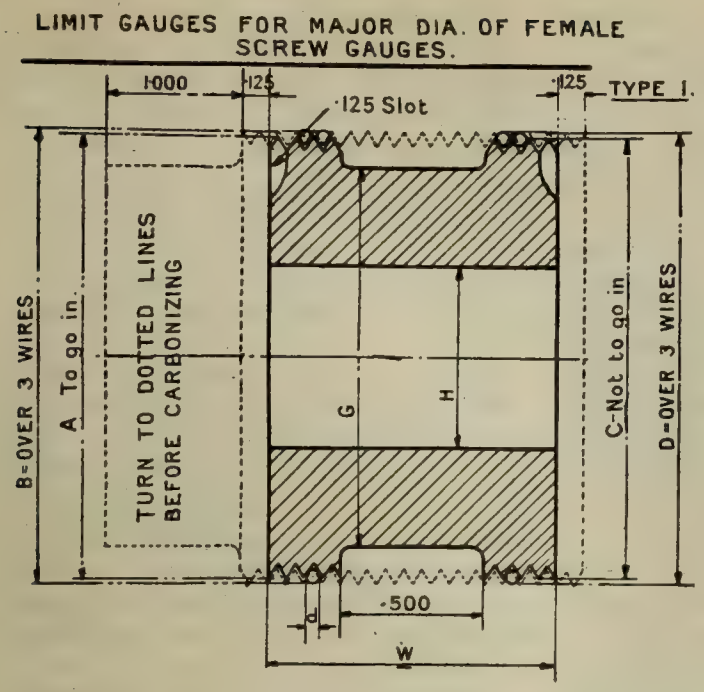


FIG. 30

The 50 deg. sharp pointed tool is ground on the fixture shown in Fig. 3 by using a packing piece or a bush of a certain thickness between the tool and the bottom pegs. The thickness of the bush or the packing piece to obtain a 50 deg. angle is calculated as follows:—In Fig. 31 A B = .188. The new angle of inclination with the vertical is 65 deg. B D is a line drawn parallel with A C. B D therefore makes an angle of 2 deg. 30 min. with the line joining the centres of the pegs. D C = A B. In triangle B D E: D E = 2.624 × sin 2 deg. 30 min. = .114457. E C = D C + D E = .188 + .114457 = .302457.

*Contributed to a recent number of "The Engineer." No. 3 appeared Nov. 22.



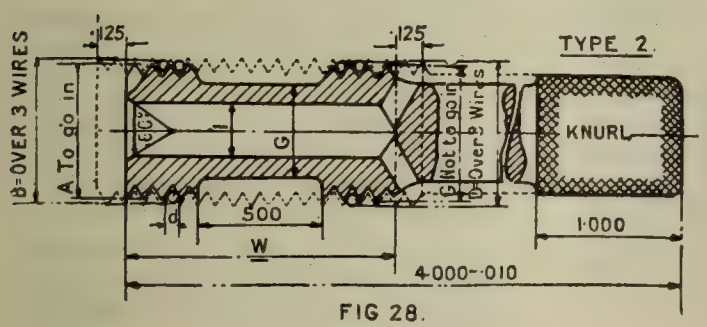


FIG 28.

The thickness of the bush or the packing piece is therefore .302457 — .188 = .114457.

The operations on type 1 are as follows:—(1) Cut off. (2) Grind off tit. (3) Centre both ends. (4) Turn shank. (5) Turn diameter thread. (6) Rough thread (to about two-thirds of depth). (7) Carbonising. (8) Heat up to 800 deg. and cool four times in water. (9) Anneal in charcoal. (10) Bore hole. (11) Cut off boss. (12) Face off one side (face to be smooth). (13) Face off to width (dead size, see operation 29). (14) Turn groove in middle. (15) Grind diameter thread maximum side (.0025 over size). (16) Grind diameter thread minimum side (.0025 over size). (17) Rough screw maximum end with 50 deg. sharp pointed tool. (18) Rough screw minimum end with 50 deg. sharp pointed

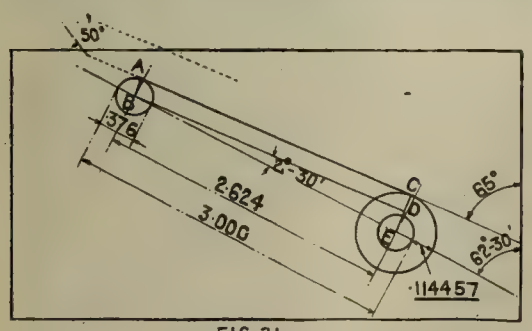


FIG. 31

tool. (19) Finish screw maximum end with 50 deg. sharp pointed tool. (20) Finish screw minimum end with 50 deg. sharp pointed tool. (21) Radius top maximum end (allow one thousandth for lapping). (22) Radius top minimum end (allow one thousandth for lapping). (23) Mill slot minimum end. (24) Turn away part thread. (25) Burring and marking. (26) Heat up to 800 deg. and harden in oil. (27) Cleaning. (28) Sand blasting. (29) Test for shrinkage lengthways. (30) Ream hole. (31) Lap radius.

The operations on type 2 are:—(1) Cut off. (2) Grind off tit. (3) Centre both ends. (4) Turn knurled end. (5) Knurling. (6) Turn diameter thread. (7) Rough thread (to about two-thirds of depth). (8) Carbonising. (9) Heat up to 800 deg. and cool four times in water. (10) Anneal in charcoal. (11) Drill hole and countersink (note ⅛ in. has to be faced off. (12) Turn down middle. (13) Face ⅛ in. off front (to dead size, see operation 30). (14) Turn groove middle. (15) Drill vent hole (for hardening purpose). (16) Grind diameter thread maximum side (.0025 over size). (17) Grind diameter thread minimum side (.0025 over size). (18) Rough screw maximum end with 50 deg. sharp pointed tool. (19) Rough screw minimum end with 50 deg. sharp pointed tool. (20) Finish screw maximum end with 50 deg. sharp pointed tool. (21) Finish screw minimum end with 50 deg. sharp pointed tool. (22) Radius top maximum end (allow .001 for lapping). (23) Radius top minimum end (allow .001 for lapping). (24) Mill slot minimum end. (25) Turn away part thread. (26) Burring and marking. (27) Heat up to 800 deg. and harden in oil. (28) Cleaning. (29) Sand blasting. (30) Test for shrinkage lengthways. (31) Lap radius.

Check for Pitch Diameter.—This check must only touch the flanks of the thread, so there must not be a radius on the major diameter and the root must be sharp pointed. It is cut with a 55 deg. sharp pointed master tool ground on the fixture shown in Fig. 3. As the pitch of these checks must be absolute, it is best to make them out of cast steel and to finish them soft throughout.

Fig. 32 shows an enlarged view of the shape of the thread and the check itself. The diameter over the three wires B is major diameter of the female gauge + 2 x where x is calculated as follows: For Fig. 32:

$x = LO - LN.$

$LO = KL + \frac{1}{2} d.$

$KL = \frac{d}{2 \sin 27\frac{1}{2} \text{ deg.}}.$

$LO = \frac{d}{2 \sin 27\frac{1}{2} \text{ deg.}} + \frac{1}{2} d.$

$LN = .8004 P.$

$X = \frac{d}{2 \sin 27\frac{1}{2} \text{ deg.}} + \frac{1}{2} d - .8004 P.$

A = major diameter of female gauge — 2 × .073916 P (see Fig. 1).

The checks are again divided in two types.

Dimension D is made to suit the handle and the width C is made to suit the gauge to be checked. This check must enter the female and be a good fit without any slack.

Example.—Wanted a check for pitch diameter for a female gauge 1.998 = 14 R.H.

Diameter wire = .404.

$A = 1.998 - .0106 = 1.9874 \text{ in.}$

$B = 1.998 + \frac{.040}{.4617486} + .040 - .11434 = 2.01028 \text{ in.}$

Check for Full Thread.—The last and final check has a full thread that checks the entire shape. The distance over the three wires is the same as for the check for the pitch diameter. The major and minor diameter are exactly the same as for the female gauge. It has to enter the female gauge tightly like the check for the pitch diameter.

These checks are again divided in two types according to size.

The hole in type 1 and the width C are the same as for the check for the pitch diameter.

The material used is cast steel and it is finished and used soft.

The setting of the 55 deg. master tool for cutting upright is accomplished by a setting piece, similar to the one shown in Fig. 16, only the angle in a section through the centre must be 55 deg. and the gap is ground central.

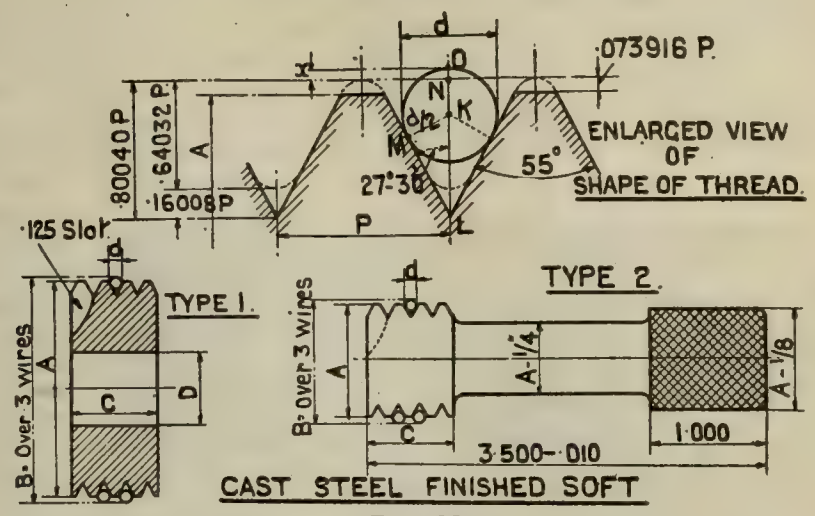


FIG. 32

Example.—Wanted a full thread check for a female gauge, 1.998 = 14 R.H.

Outside or major diameter = 1.9980.

Dimension from top of thread one side to root of thread, other side = 1.998 — .04574 = 1.95226.

Dimension over three .040 wires = 1.998 + .01228 = 2.01028.

EFFORT TO CONSERVE FUEL SUPPLY

THE U.S. Fuel Administration is making an energetic effort not only to stop the waste of coal but to limit its use as nearly to necessary purposes as the conditions of supply require. A great deal of coal is used for purposes that can be easily dispensed with, even where there is not actual waste.

The official directions sent out to practically all the producers in the East and Middle West require preference to be given to the Government orders, railway fuel, household needs, public utilities, steel plants, coke ovens and munition plants, in that order.

The assumption seems to be that all of these may be adequately supplied if preference can be given to them in deliveries. Their importance is obvious enough, though in the case of household requirements many exceed what is really necessary for health and comfort.

One of the savings proposed is to be effected by the conservation of electric power, which is developed by a large consumption of coal. Among other things it is proposed that railroads which use that power, as most local and short lines do, shall limit their schedules and dispense with extra cars as far as feasible. It is also proposed that they use in cars less heat and light derived from electricity, which is generated by consuming coal. This is likely to be acceptable to operating companies as it will reduce their expense, but it rather comes in conflict with some demands, not only of those using the facilities but of local authorities.

Within that same period of memory not so very long, there was no electric light at all. Now it is squandered on a huge scale in cities, not in a comfortable degree of lighting merely, but in extravagant illumination of many kinds, kept up the greater part of long winter nights.

BOARD TO HANDLE EXPORT STEEL TRAFFIC IN U.S.

THE entire export traffic of the Eastern railroads in the United States in the unmanufactured forms of iron and steel, except those articles designed for use by the American Government, has been placed in the hands of a newly appointed committee of seven railroad presidents, representing Atlantic ports from Boston, Massachusetts, to Norfolk, Va.

These unmanufactured forms include billets, bars, plates, scrap and pig iron.

The committee's offices will adjoin those of the representatives of the Entente Governments in New York, who are in charge of purchase and transportation of munitions from this country.

At an organization meeting in New York the committee planned to take over ultimately all the overseas traffic of the Eastern roads, if the Government approves. Such traffic will include other commodities besides iron and steel.

George D. Ogden, freight traffic manager of the Pennsylvania Railroad, was appointed chairman of the committee. The committee was organized after a conference attended by British, French and Russian representatives interested in overseas traffic, and representatives of the railroads' war board and the trunk line association, together with officials of fourteen railroads.

ELECTRICALLY-CONTROLLED MOTOR BOATS

THE British Admiralty recently made the following statement on the subject of electrically-controlled motor boats:

The electrically-controlled motor boats used on the Belgian coast are twin petrol engined vessels partially closed in, and travel at a high speed. They carry a drum with between 30 and 50 miles of insulated single core cable, through which the boat is controlled electrically. The forepart carries a considerable charge of high explosive, probably from 300 lb. to 500 lb. in weight. The method of operating is to start the engine, after which the crew leave the boat.

A seaplane, protected by a strong fighting patrol, then accompanies the vessel at a distance of three to five miles, and signals to the shore operator the helm to give the vessel. These signals need only be "starboard," "port," or "steady." The boat is zig-zagged while running; this may be either intentional or unintentional. On being steered into a ship the charge is exploded automatically.

The device is a very old one. A boat similarly controlled was used in H.M.S. Vernon—the torpedo experimental ship —as far back as 1885. The only new features in the German boats are petrol engines and W.T. signals, neither of which existed then.

On November 3 the Admiralty announced that on the same day an attack by an electrically-controlled high speed boat was defeated and the boat destroyed. It was then pointed out that electrically-controlled craft, whether surface boats or torpedoes, were no novelty, and that in trials made in Stokes Bay in 1892 with an electrically-controlled torpedo the length of wire cable used was about 4,500 yards.

"HUSH" SHIPS DESCRIBED

A. ROUSSEAU, the naval critic of the "Temps," who returned recently to Paris from visiting the Grand Fleet, has been permitted by the British Admiralty (says a "Times" Paris telegram) to give French readers the first description of the famous "hush" boats, about which the authorities have succeeded in maintaining hitherto a profound secrecy.

"We were passing in front of ships of unusual aspect, specially constructed craft for war purposes, when certain of these vessels caught our attention, especially by their outline and dimensions. They were very long, with immense decks fore and aft. They appeared to lie low on the water. In the middle of the vessel rises a very squat central castle, at the extremities of which are heavy artillery turrets for two guns of biggest calibre.

"The secondary artillery, the calibre of which is the same on all vessels of the same type, is at the limit of the average of small artillery. The stem of these craft is tapered more like the stem of a yacht than that of a battleship, and has certainly been determined in order to realize very high speed, and as a matter of fact these vessels are very swift, much faster than the fleet test of pre-war cruisers.

"These craft—we may call them battle cruisers—are of two types, or rather dimensions, for their elements of power are, we believe, the same except as regards protection. These vessels have been created since the war. Inspired by the lessons of the war, they were begun in 1915, and have been in service twelve months, an admirable result of the organization of labor in British dockyards.

"Other vessels of the kind are under construction, their dimensions being yet more considerable. We were received on two of these vessels, and visited the fighting quarters, blockhouse, look-out station for submarines, a turret with its enormous guns, which fire two shells a minute, weigh 96 tons, and throw a shell weighing 1,947 pounds.

"Everything is organized to have fire control in one and the same hand and the laying by one and the same eye. The system invented by Sir Percy Scott a few years ago has made progress; heavy artillery and secondary artillery are no longer autonomous. Everything acts under one and the same direction. It is a truly remarkable system, and one which beyond all doubt has produced highly satisfactory results. Its installations on the new ships show that it has stood the test.

"These ships are capable of surprise action against which the enemy cannot guard himself, and their speed is a guarantee against a torpedo; but nevertheless they are fitted with devices to neutralize the explosion as far as possible. They are proof of the confidence of the British Navy in the powerful surface vessel, capable of heavy hitting, the only one which is able to assure mastery of the seas."

"THIS is a queer little hole of a country of yours, Pat," said one of the Fly boys to our friend the other day.

"Begorra, an' as quare as it is," replied Pat, "there's wan thing ye can do in it that ye can't do in yer own country."

"And what is that?" asked the draft evader.

"Hide!" replied Pat.

PROGRESS IN NEW EQUIPMENT

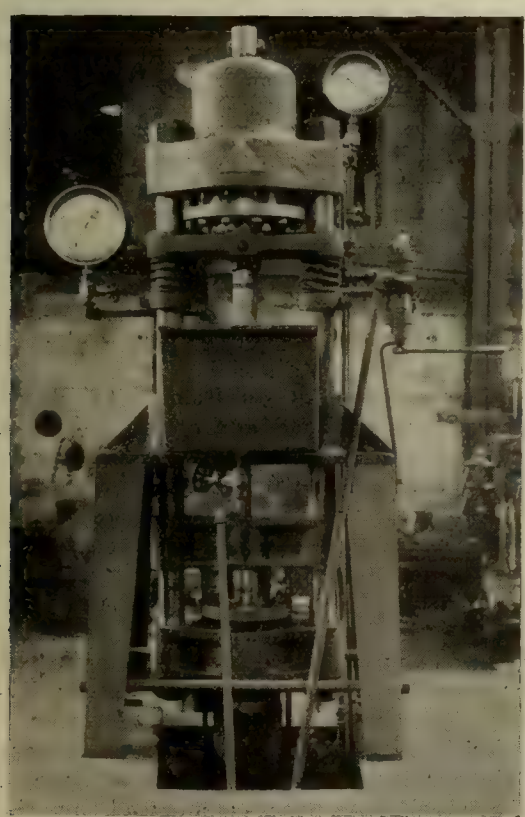
There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

HYDRAULIC TEST PRESS FOR 75 MM. SHELLS

AMONG the more or less novel features characterizing the manufacture of 75 mm. shell now being produced for the United States Government is the internal hydraulic test, and with a view to the rapid and efficient performance thereof a hydraulic press has been specially designed and is now being built by the Metalwood Mfg. Co., Detroit.

The purpose of the press is to provide suitable and convenient apparatus which will enable the shell to be filled, sealed, brought up to pressure and held there for the specified 15 seconds' duration of test. Observing this requirement, the press has a capacity of over two shells per minute, allowing an average of 1,200 to 1,500 shells per 10-hour period; the actual output varies somewhat with the ability of the operators to handle the work to and from the press.

The machine is so arranged that it combines both direct and intensified systems of operation based on a constant pressure of 1,500 lbs. per sq. in. in the accumulator reserve line. This is accomplished by having a suitably proportioned intensifying cylinder having a resistance head against which the nose of the shell is held. The intensifying cylinder is carried in a cross head, supported by two side frames, while the small ram



HYDRAULIC TESTING MACHINE FOR APPLYING INTERNAL PRESSURE TO 75 MM. U.S. SHELL.

which generates the intensified pressure is connected to the crosshead of the lower cylinder which extends below the floor level. The lower end of the lower cylinder is provided with a pull-back ram for withdrawing the intensifying plunger.

The cross-head referred to supports entire assembly of cylinders, which are two turned steel columns or tension members. The cylinder at the upper end of the columns clamps the shell against the resistance head in the bottom of the tank and is returned by pull-back springs.

In operating the press, the shell is immersed open end up to insure escape of all the air. It is then inverted and placed on the resistance head and clamped down tightly by the upper cylinder. The lower cylinder, which, as well as the upper one, operates under 1,500 lbs. pressure, forces the intensifying ram into the high pressure cylinder, the resulting pressure being communicated to the interior of the shell through the resistance head which seals the nose and maintains the internal pressure at the required amount, viz., 18,500 lbs. per sq. in. for 15 seconds. The remaining part of the test consists of a reversal of the foregoing.

Cast alloy steel is used for the high pressure cylinder, and a steel casting for the pull-back cylinder; the crosshead carrying the intensifying ram is a semi-steel casting, with bronze bearings.

The press is piped up complete for connecting to regulating valves, and the operation of intensifier and sealing clamp cylinder are controlled simultaneously by a single quick operating valve. High and low pressure gauges are included in the equipment.

EXCESS ELECTRIC POWER CONVERTED INTO STEAM

A TYPE of electric steam generator which for some years past has been in use in large numbers in many Italian works is illustrated in Figs. 1 to 5. The apparatus according to "Engineering," to which we are indebted for the illustration, is an invention of Engineer Revel,

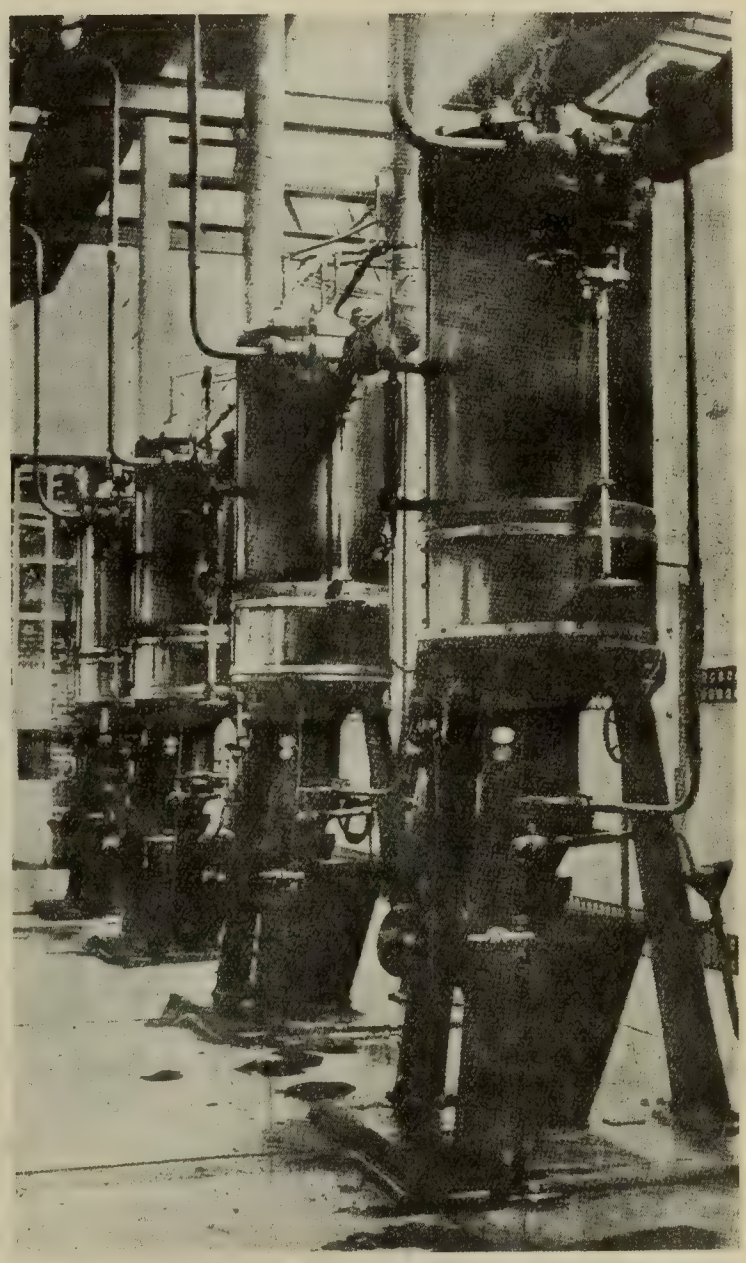


FIG. 5. EXTERIOR VIEW OF BATTERY OF ELECTRIC STEAM GENERATORS

Colonel in the Italian Army, the manufacturing rights being held by Messrs. Luigi Boselli & Co., Milan.

The principle on which it works is the evaporation of water into steam by means of the heat dissipated in overcoming the resistance of the water to the passage of an electric current. As the flow of current depends on, and varies directly as, the volume of contained water acting as a conducting medium, the control is entirely automatic and demands no attention. Thus lack of feed water would only result in a decrease or stoppage in the production of steam until the supply of water to the boiler was resumed. An efficiency as high as 98 per cent. is characteristic of this type of boiler since the whole of the heat generated by the electrical energy is absorbed by the water, the only loss being that caused by radiation from the body of the apparatus.

Alternating current of from 200 volts

to 3,600 volts may be applied, the only difference between the high tension type and the low tension type being a modification in the shape of the electrodes and the dimensions of the steam dome. Fig. 5 illustrates the half of an installation of eight units taking three phase current at 6,000 volts, each apparatus being capable of generating 405 pounds to 450 pounds of steam per hour.

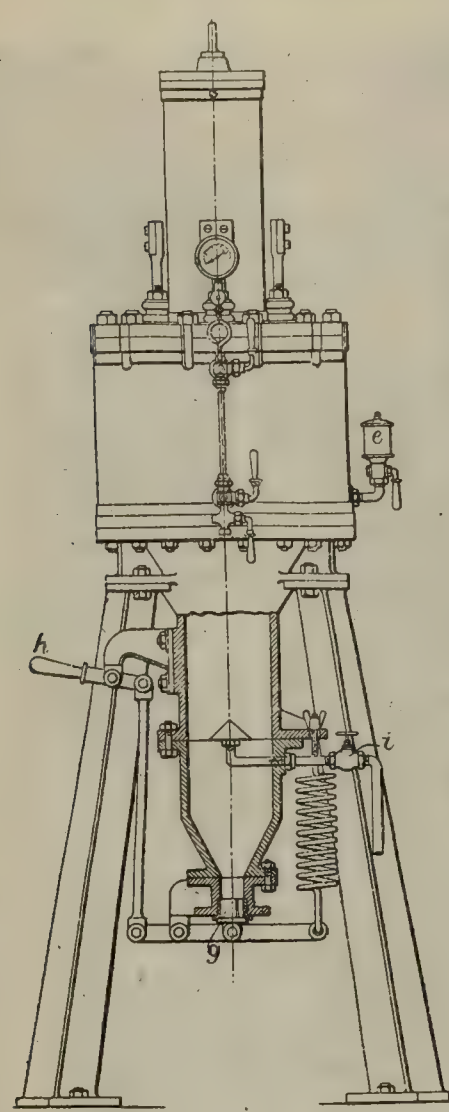


FIG. 1.

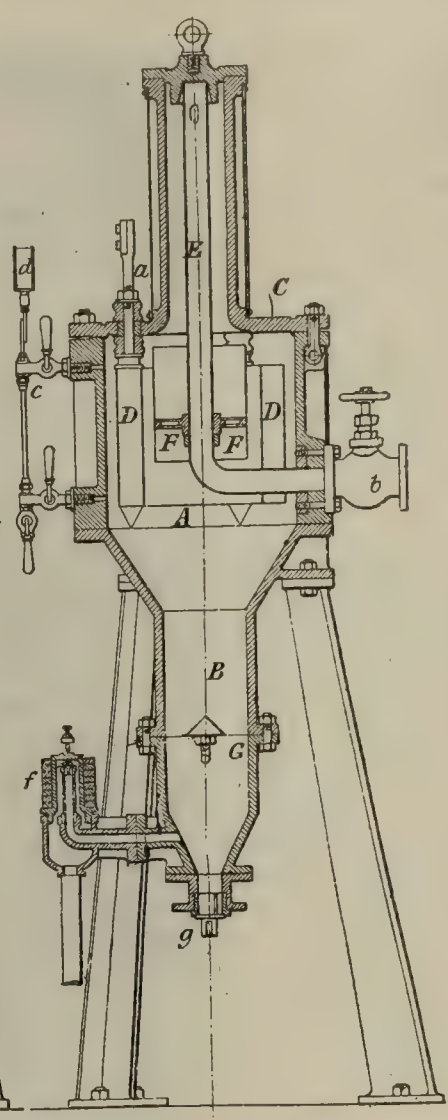


FIG. 2.

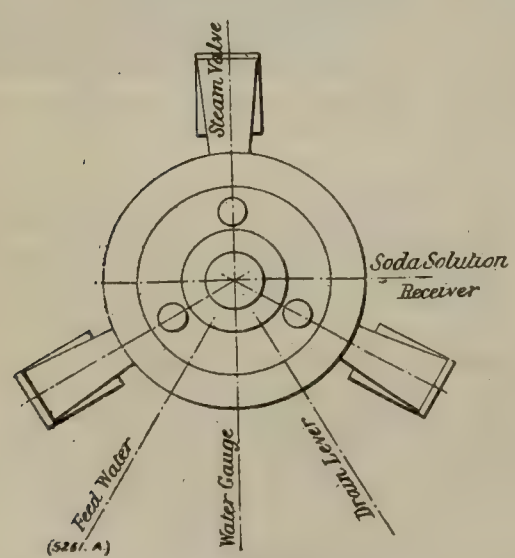


FIG. 3.

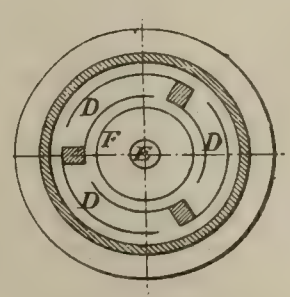


FIG. 4.

Figs. 1 to 4 illustrate a similar apparatus designed for 500 volts, the arrangement of the component parts being clear from the explanatory notes accompanying the illustration. For starting the generator the circuit-breaker is closed, the valve i is opened, and a small quantity of soda solution is introduced from the small receiver e to give a suitable conductivity to the water. When the water has reached the height of the lower edge of the electrodes the current flows through the water and commences to raise steam, the steam production increasing as the water-level rises, until it reaches the working pressure required. At this moment the regulator f enters into action, and the water-level and hence the steam production remain constant. In order to stop the apparatus the feed-water valve i is closed, the steam valve b is closed slowly, and the drain valve g is opened by acting upon the hand lever h until the ammeter has returned to zero.

When the feed water leaves a calcareous deposit it is advisable, every five or six hours, to free the boiler of the sediment deposited at the bottom of the truncated cone. This is obtained, without interrupting the working of the machine, by increasing the water feed and by acting at the same time on the handle h, the excess water washing away the sediment; this operation, by a suitable action upon the valves i and g, and by following closely the ammeter and maintaining the current intensity constant, is carried out without changing the water-level and without impairing the working of the apparatus.

The Revel generators are constructed to work at any pressure up to 14 atmospheres, and can be connected up at any time with the steam pipes from the ordinary steam boilers; owing to the rapidity of their action they take up any excess of hydro-electric energy which may be available even for a short time. They may, in fact, be considered as serviceable appliances for turning to account any superfluous hydro-electric power available, and as such they were utilized in numerous installations in Italy before the war, when the price of coal did not exceed 32s. per ton. At the present time they are also found to be practical and economical, even in cases where hydro-electrical power has to be paid for at the rates now ruling.

GUN-METAL FINISH

GUN-METAL finish consists in giving the surface of the material a thin coating of a chemical solution applied with a brush or sponge. After coating, the work is placed in a steam bath and maintained at a temperature of 100 degrees F. After a slight rust appears covering the entire surface, the work is taken out, placed in boiling water for about 20 minutes and then dried. When this is done a coating of black oxide will appear covering the surface. The operation must be repeated several times, scratch brushing the surface between each coating.

Several chemical solutions may be used to produce this gun-metal finish, of which the following represent good practice, according to Brass World:

Eight parts alcohol, 1 part ferric chloride, 8 parts water; or 3 parts hydrochloric acid, 4 parts nitric acid, 2 parts copper sulphate and 80 parts perchloride of iron; or 1 part each of chloride of copper and chloride of bismuth, 2 parts chloride of mercury, 6 parts hydrochloric acid and 50 parts of water.

With all of the above methods a very thin coating is formed on the surface of the steel. A process adopted by the French Government consists in applying chemical solutions which act on the metal, causing a thin layer to change its color, the shade depending upon the time of treating and the temperature. The exact formula for the chemical solutions used is not known.

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IS ENGINEERING ABILITY APPRECIATED AT ITS TRUE WORTH?

THE extent to which engineers of all grades have been called upon to participate in the war,—not, it is true, in the fighting line pure and simple, but in the production, supply and maintenance of all the gear necessary for the conduct of operations on present-day lines,—has done more to inform the world of its indebtedness to the engineering industry than would have been accomplished in fifty years of agitation along constitutional lines. Acknowledgement, however, must be made to Germany for having recognized the potential and active value of engineers, and for having encouraged to the point of insistence their education and training as part of the nation's business. That their value as wealth producers in peace and destroyers in war was also most fully recognized by that nation has been borne in upon the Allies only too well.

In considering the engineer as a factor in civilization, it is convenient to classify his efforts under three sections —first, the pure scientist who reasons and deduces; second, the applied scientist who searches, develops and demonstrates; third, the commercial scientist whose ability influences every line of industrial effort from making tacks to building "tanks." The third section embraces the great bulk of the profession, yet, except in the case of well-known men who have achieved fame as manufacturers and also of notable subordinates employed by them, its members are not brought prominently into the fierce glare of general publicity, while, in discharging their duties in any large aggregation of employees, their natural reservedness and acceptance of conditions as they are militates against a true recognition of the real value of their services.

The buoyant, assertive salesman, glibly recounting totals from his sales sheets, impresses all with his indispensability to his employer. Without him there would be no sales, with no sales no money, with no money no job. Therefore, all hail the salesman. How often though does the real and primary state of affairs dawn on those in authority? That the truth does occasionally come home is known to a few close observers, but that the man, who produces the wherewithal for the salesman to juggle with, gets, on the average, anything like the same thanks, tangible or otherwise, is a very rare occurrence.

Take a case in point,—during the depression before the war, a factory decided to add a certain apparatus to their product, and like many others before them copied, as a start, a competitor's design. Certain defects coupled with the prospect of litigation compelled them to drop the design, but the superintendent and draftsman were "ordered" to get out something to circumvent the competitive article. In other words they had to invent to specification. Success attended their efforts, but while done with the company's time and the company's money, the resulting design owed its success to a principle far removed from anything else of the kind and which would not have been thought of or successfully developed had not the superintendent and draftsman drawn upon their years of experience in other fields.

It is from this point onward that the inadequate recognition of the engineer becomes apparent. Produced in dull times, the device met with a favorable reception, entirely merited, and in actual fact had a great influence on the company's ability to weather the first few months of the war, but circumstances at the time were sufficiently unpropitious to induce the inventors to accept the promise of a very moderate sum in acknowledgment.

Soon after, trade improved; every other munition shop and other kinds of shops as well found the device useful, and the salesman began to smile for the first time in months. At the end of the year a good fat commission and a raise were his, also three weeks' vacation till orders were caught up on. The bargain with the other parties having been made when times were dull was out of all proportion to the respective merits of producers and salesman. Not only so, but a continual harassing for production to fill the orders turned in by the aforesaid salesman was the recoil effect suffered by the two engineers, while his resulting personal profits and prestige dwarfed their's completely.

The unfairness is obvious, yet the facts are substantially as stated. When times are good and everybody buys, the salesman is king, while the producing engineer is chased for deliveries. When times are dull and the salesman keeps out of sight, the designer has to both worry over goods which will induce sales and also reduce his cost of production. Yet of the two, which is the more indispensable?

The extent to which civilization has rested on the industrial accomplishments of man, the degree in which science and industry have contributed to the physical welfare and comfort of humanity has engendered, so gradually as to be almost unnoticed, a complete dependency on the engineer. The deprivation of numerous essential commodities, the excess of demand over supply, the search for equipment and materials for new processes, all these and other contributory conditions have to a considerable extent reversed the roles of salesman and engineer, and the man who can design and produce is, for the first time in years, valued at something approaching his true worth.

The chief feature in future business will be the ability to deliver the goods. For years to come the salesman must play the part of a man who goes out to look for known conditions, not to produce unsound demand and inflated sales. His success will be directly dependent on the confidence with which he can rely on the producer at home—if he knows that varying conditions will be met with cheerful adjustment, that unfair opportunities for excessive profits will not be snatched up viciously to the undoubted detriment of future business, if he will realize that without the goods he is helpless, then, perhaps, he may reconcile himself to being placed on an equal footing, both as to reward and prestige, with the man who gives him the wherewithal to barter.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

Government prices.

	Montreal	Toronto
Hamilton	....	50 00
Victoria	....	50 00

FINISHED IRON AND STEEL

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3/16 in.	13 20
Chequered floor plate, ¼ in.	13 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	*2 90
Tank plates, Pittsburgh	*3 25
Structural shapes, Pittsburgh	*3 00
Steel hoops, Pittsburgh	3 50
F.O.B., Toronto Warehouse	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	4 10
Structural shapes	4 20
Plates	4 45

*Government prices.

FREIGHT RATES

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Lake copper	$33 00	$32 00
Electro copper	33 00	32 00
Castings, copper	32 00	31 00
Tin	78 00	80 00
Spelter	10 50	10 50
Lead	9 50	8 50
Antimony	18 00	18 00
Aluminum	60 00	62 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ¼ to ½	$13 00	$12 00
Heads	13 30	12 30
Tank plates, 3-16 in.	13 10	12 10

WROUGHT PIPE

Effective July 5, 1917.

Standard Buttweld Size	Black Per 100 feet	Galvanized
⅛ in.	$5 00	$6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00

Standard Lapweld		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ ins.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 45%.

4½" and larger, 40%.

4" and under, running thread, 25%.

Standard couplings, 4" and under, 35%.

4½" and larger, 15%.

OLD MATERIAL

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	21 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	15 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	20 50
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	6 00	7 00
Tea lead	5 00	5 75
Aluminum	28 00	25 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up.	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 20
Elevator bolts	5
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	15
Boiler rivets, base ¾-in. and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	72½
Wood screws, O. & R., bright	67½
Wood screws, flat, brass	37½
Wood screws, O. & R., brass	32½
Woodscrews, flat, bronze	27½
Wood screws, O. & R., bronze	25

MILLED PRODUCTS

	Per cent.
Set screws	25
Eq. & Hex. Head Cap Screws	20
Rd. & Fil Head Cap Screws	net
Flat ⅞ But. Hd. Cap Screws plus	net
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and semi-fin. nuts over 1½ in., up to 2 in.	plus 10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4 50
Cold pressed nuts over 1½ in.	add $7 00

BILLETS

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$5 50	$5 45
Cut nails	5 70	5 80
Miscellaneous wire nails	60%	
Spikes, ⅜ in. and larger	$7 50	
Spikes, ¼ and 5-16 in.	8 00	

MISCELLANEOUS

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drums	4 75
White lead, pure, cwt.	16 55
Red dry lead, 100-lb. kegs, per cwt.	16 25
Glue, English	0 38
Tarred slater's paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 78
Linseed oil, raw, single bbls.	1 42
Linseed oil, boiled, single bbls.	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery cloth	list plus 33 1-3
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Drilling cables, Manila	0 41
Plumbers' oakum, per lb.	0 09
Packing, square braided	0 34
Packing, No. 1 Italian	0 40
Packing, No. 2 Italian	0 32
Pure Manila rope	0 39
British Manila Rope	0 33
New Zealand Hemp	0 33
Transmission rope, Manila	0 45
Cotton Rope, ¼-in. and up	0 47

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

CARBON DRILLS AND REAMERS

	Per Cent.
S.S. drills, wire sizes up to 52	30
S.S. drills, wire sizes, No. 53 to 80	net
Standard drills to 1½ in.	30
Standard drills, over 1½ in.	30
3-fluted drills, plus	10
Jobbers' and letter sizes	20
Bit stock	25
Ratchet drills	15
S.S. drills for wood	30
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 30
Bridge reamers	52½
Centre reamers	10
Chucking reamers	net
Hand reamers	10

COLD ROLLED SHAFTING

At mill ..... list plus 40%

At warehouse ..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Canadian malleable, A, add 35%; B and C, plus 25%; cast iron, net; standard bushings, 25%; headers, 60; flanged unions, 5; malleable bushings, 30; nipples, 45; malleable lipped unions, 40.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$9 50	$9 00
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	9 70
Premier, 10¾ oz.	13 85	10 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B	
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

1/8 in.	$15 50
3-16 in.	11 70
1/4 in.	8 40
5-16 in.	7 40
3/8 in.	6 35
7-16 in.	6 35
1/2 in.	6 35
5/8 in.	6 35
3/4 in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	40
Black Diamond	40
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	37½
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke .....
Connelsville Foundry Coke.....
Steam Lump Coal .....
Best Slack .....
Net ton f.o.b. Toronto.

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun, Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White.	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16
Colored.	
Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14 x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base	64 00	60 00
Braziers', in sheets, 6 x 4 base	55 00	52 00

BRASS.

Brass rods, base ½ in. to 1 in. rod	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	06
Emery glue	15 to 20
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt, sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

Market Condition and Tendency

Iron and Steel Shortage Continues—Pig-Iron Unchanged, Coke Scarcity Reduces Output—Lead and Spelter Prices to be Fixed.

AS was to be expected, the coming general election is having an unsettling effect on business. In spite of this, however, there is considerable activity in most industries although the shortage of raw materials is tending to restrict production. This is particularly true of manufacturers using iron and steel. The shortage of iron and steel is becoming serious, more especially in materials imported from the United States, where the extraordinary industrial activity is causing an enormous demand for steel. The large tonnage required for war purposes is placing the private consumer in a difficult position in regard to getting supplies for manufacturing purposes. This situation is reflected in Canada and is becoming more acute. There has been no change in prices of steel products this week and the market continues firm. Business in the steel trade is quiet and will likely remain so for the balance of the year. The mills on the other hand are very busy and continue to operate at capacity. The situation in the pig-iron market is unchanged, there still being a scarcity of basic iron for steel-making. The shortage of coke continues to cause considerable anxiety. In the States it has caused a serious reduction in the output of pig-iron, and in turn, of steel. Prices of non-ferrous metals are all unchanged. It is expected that prices of lead and spelter will be fixed shortly at Washington, which will steady the market. Tin continues in short supply although an effort is being made to relieve the situation.

MONTREAL, Que., Dec. 8, 1917.—Twice in as many weeks has Canada been brought face to face with two of the most important factors in the prosecution of a war; that of the raising of stupendous sums of money and the devastating character of the creations arising therefrom. The death and destitution which has been brought to our very door through the Halifax tragedy may give us a fuller realization of what the actual conditions must be in some of those European countries that have been overrun by the contesting armies, and thereby encourage us to "carry on" with renewed energy, so that our every effort may bring us nearer to an enduring and lasting peace. The activities that are likely to follow the closing of the loan are already in evidence and in all possibility business will receive added impetus before the opening of the New Year.

Pig Iron

The supply of pig iron for existing requirements is still a question of vital importance and conditions show little signs of improvement. Recent difficulties in connection with furnace operation and the inability to obtain sufficient raw materials for maximum production has intensified the acute situation that has been more or less marked for a considerable period. The action of the Government in endeavoring

to relieve the transportation congestion so very pronounced in certain districts may soon result in a better regulation of the distribution of materials and supplies; how this will be effected is as yet problematical but with the co-operation of the railroad companies the result will undoubtedly be improved facilities in transportation.

Steel

The steel situation may be said to be nearing another milestone in the uncertain developments that have marked the progress of events during the past six months. The time is approaching when the expected revision of prices as previously arranged will receive the consideration of the American Government, and with this end in view the War Industries Board and the heads of the copper and steel interests are expected to hold separate meetings within the next two weeks, at which conditions will be thoroughly investigated, and any readjustment for early future regulation will be determined on. While it has been stated that the beginning of the year would probably see some readjustment in various lines of steel commodities, the general feeling appears to be that, as the prices now ruling have only been in effect for a comparatively short time, no changes will be made in the immediate future. Some effort may be made to so regulate the price of steel that relief may be given to the domestic situation, but with the war demands ever on the increase, this development can only be a possibility, in view of the fact that every facility must be provided to maintain the production of essentials at the highest possible maximum. In this connection it is interesting to note that the American Government has taken steps to study the industrial situation with a view to curtailing such activities as are not directly associated with the prosecution of the war. The local situation has developed no features of consequence and dealers report unchanged conditions with prices holding firm at last week's quotations.

Metals

The metal trades are awaiting the outcome of the conference that will take place this week between the leading copper interests and the Government, at which meeting the question of revising the price of copper will be taken up. Other metals are expected soon to be placed under Government regulation, and this has the tendency to keep the market in a nervous condition. Tin is the all-absorbing question for the immediate present as the market is completely demoralized and prices are soaring. Spelter is unsettled but relatively firm. Lead is quiet with an easier tone. Antimony is in a stronger position and aluminum is firm.

Copper.—Without known exception, all trading in copper from the producer to the dealer or large consumer is now carried on under the regulations imposed by the Government, and as far as can be learned no transactions of any importance are carried on under the competitive basis. Small consumers are now in a better position to obtain desired supplies owing to the concession given to the dealers to dispose of small quantities of metal at a 5 per cent. commission over the fixed price of 23½ cents per lb. During the coming week a meeting will be held between the War Industries Board and the leading copper interests to consider the question of revising the price now governing the sale of copper. Maximum production is the essential factor at the present time and if a higher price would increase the available supply it is not unlikely that the Government may concede a better figure than that now ruling. War requirements, however, will receive the priority consideration even at the cost of lowering the prevailing price or maintaining it at the present level. Serious deliberation should nevertheless be given to the requirements of those users who, though not directly connected with the manufacture of war necessities, are in dire straights for lack of metal. A better figure on the open market would no doubt induce the smelters to produce more tonnage without materially affecting the demands for war purposes. The local market is devoid of features, and dealers are quoting last week's price of lake and electro, and 32 cents for castings.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.

Tin.—The market is in a position of extreme nervousness over the increasing shortage of tin supplies, and the inability to obtain reliable information regarding tin shipments from abroad. The situation in the States is becoming very acute and measures will soon have to be taken to avoid a condition fast approaching a tin famine. What little tin is now available is practically controlled by the Government and this is being conserved to the utmost. The London market has continued to rise to a record high position but has shown a slightly easier tone during the past few days. An advance of 4 cents per lb. has been noted on the New York quotations, the nominal price now asked being 85 cents per lb. The demand on the local dealers has shown an increase and prices have been advanced to 78 cents, this being 6 cents higher than last week.

Spelter.—The situation is still marked by the unrest that has been characteristic for many weeks, owing to the delay on the part of the Government in fixing prices to control the sale and distribution of the metal. While this uncertainty is so pronounced, the situation will continue to be more or less demoralized, as producers are not anxious to operate their plants at capacity under prevailing conditions, or until the Government announce the volume of their future requirements. The New York market is quiet and weak; dealers here report a steady market with prices firm at 10½ cents per lb.

Lead.—The market is quiet pending the action of the American Government towards the regulation of prices, a feature that is expected to develop in the very near future. It is anticipated that a one-price-for-all will be the basis of the regulations, but some concession may be given to dealers for their part in the handling of the metal. The New York market is being well maintained but price quotations show an easier tone, particularly on the part of the independents. Local lead is selling at about 9½ cents per lb. on a quiet but steady market.

Antimony.—The market has taken on a firmer tone and prices are stronger. Dealers appear to be acquiring metal but apparently the consumer demand has shown little increase. Generally the situation is better with an undertone of early activity. Prices in New York have advanced 1⅛ cents during the week, the current price being 15½ cents per lb. The local market is a little more active and dealers have advanced to 18 cents, this quotation being one cent higher than last week.

Aluminum. — The situation is quiet but with a better undertone; prices are unchanged and firm at 60 cents per lb.

Machine Tools and Supplies

The expected revival of munitions activity has renewed the interest in the machine tool industry, the importance of which has been reflected in the gradual increase in business that has been noted in this direction, much of recent demand being for equipment suitable for shell production. Plants that have received contracts for American shells are rapidly being equipped and manufacturing operations will soon be in full swing. Inquiry for general tool equipment has not been so active during the past week but the volume is still of an encouraging character. A feature of the present situation is the increasing difficulty experienced in obtaining machinery from the States, this being due to the abnormal demand for equipment in Government plants there, and those plants that are exclusively operating on Government work. Even work on order for Canadian buyers may be commandeered for use in the States on the priority claim of the American Government. These conditions are expected to give considerable impetus to the production of Canadian-made tools when further orders have been placed for additional shells. A more stabilized condition exists in the market for machine tool supplies, this no doubt resulting from the more uniform condition prevail-

ing in the prices of the raw and semi-finished materials. Quotations on supplies are, however, very firm with the demands slightly on the increase.

Scrap

The failure of the scrap dealers to agree regarding the fixing of a reasonable price to govern the sale of various scrap materials is delaying the action of the American Government in setting prices on old materials. It was thought that the scrap situation would automatically adjust itself to the conditions that would arise from the fixing of steel and metal prices, but the market in scrap has been in a very unsettled state for the past two months, everyone uncertain as to what the next move was to be. Tin scrap of all kinds is very strong and higher prices are asked but the general market is unchanged with quotations uncertain but nominally the same as last week.

Toronto

TORONTO, Ont., Dec. 11.—The coming general election is affecting business in that it is tending to create unsettled condition inevitable under the circumstances. Business is as active as the shortage of raw materials will permit, and in this respect there are no indications of improvement.

The unfortunate fire at the Polson Iron Works has not stopped operations in any of the departments, except the pattern shop. The most serious loss was a large number of patterns. About fifty plates on a freighter under construction were damaged and will have to be replaced, while the furniture and rigging for this vessel were also destroyed. A new pattern shop is being built on another site.

Steel

There have been no developments of importance in the iron and steel market during the week. There is a general complaint concerning the shortage which appears to be affecting everybody in the trade, merchant and consumer alike. What will eventually happen is difficult to say, but the situation is getting more acute as time passes. It is becoming more apparent that little relief may be looked for in regard to supplies of iron and steel from the United States, for even consumers in that country are experiencing considerable difficulty in obtaining steel for purely domestic purposes. This being so, consumers in Canada can hardly expect preferential treatment, except when the material is required for war purposes. The outlook for the manufacturing consumer is not at all encouraging, the demand for steel for war purposes getting heavier all the time, with the result that manufacturing operations will become even more restricted than at present.

The Canadian steel companies continue to enjoy unusual prosperity and have plenty of business on hand. Considerable of this business is for munitions and other war purposes; as a result, consumers not engaged upon war work are finding it difficult to get material as quickly as they would like. It is more than likely that the mills will get further behind on deliveries on account of the new munition contracts. There have been no price changes announced during the week and the market continues firm. Prices of imported material have not undergone any change. Although the fixed prices on semi-finished and finished steels are being quoted on all new enquiries in the United States market, buyers find it almost impossible to get any material for prompt delivery. Canadian importers are, therefore, unable to meet the demand and business is suffering in consequence. The fixed price schedule comes up for revision in January, but there are no indications that any change will be made from the prevailing level. The continued decline in new business in the States is shown in the further decrease in the U.S. Steel Corporation unfilled tonnage. The unfilled orders of this Corporation on November 30 last were 8,897,106 tons, representing a decrease of 112,569 tons as compared with the orders on October 31.

Pig Iron

The pig iron market is quiet and prices continue unchanged. Foundry irons are in fair supply, but there is a shortage of basic pig iron and, as a result, steel mills have been importing basic iron from the States. There is practically no relief in the coke situation which is causing much uneasiness among users of imported coke. In the States, on account of the shortage of coke, it is feared that operations at the furnaces will be further restricted, thus seriously affecting the steel mills.

Scrap

The market continues dull with no business to speak of. Conditions in the scrap market are much the same as they have been for some weeks. The scarcity of cast iron and steel scrap is keeping prices firm for these materials, but copper, lead and zinc., etc., are weak, although prices are unchanged.

Machine Tools

The situation in the machine tool market is unchanged. Business continues good with prospects of increased activity in the near future. It is becoming more difficult than ever to obtain machine tools from the States, owing to the heavy demand there. Government business predominates to the exclusion of everything else, with the result that private buyers have to wait.

Supplies

Business in machine shop supplies continues good at firm prices. There is an upward tendency in some lines on account of the high cost of raw materials, but as a rule the market is steadier than it was a few months ago. Maple Leaf cotton duck belting has advanced, the new discount being 25 and 5 per cent. off list, the former discount being 25 and 10 per cent. off. The principal grades of crude oil have advanced in the States, ranging from 10c to 25c per barrel, according to grade. Pennsylvania crude advanced 25c to $3.75 per barrel. Local prices of gasoline and oils have not changed.

Metals

The situation in the metal markets is the same as last week and prices are unchanged. There is no apparent relief in the tin situation, there being no spot tin available and considerable uncertainty in regard to future supplies. The copper market is quiet and situation unchanged. The pending orders for shrapnel have not as yet produced any activity in lead and antimony, although a heavier demand for these metals is anticipated.

Copper.—The copper situation is improving, although the market continues quiet and prices unchanged. Production of copper is gradually increasing and prospects are that there will be soon sufficient metal to meet the general commercial demand. Lake and electrolytic are quoted at 32c and castings at 31c per pound.

Tin.—The scarcity of tin continues to be acute, there being practically no spot metal obtainable. The industry is anxiously watching the result of negotiations between Washington and London, in the hope that existing regulations may be modified and a more liberal supply of tin be allowed to come forward. Tin is unchanged and nominal at 80c per pound.

Spelter.—The market is quiet and there is very little demand. It is expected that the U.S. Government prices for spelter will be announced in a few days. Local price 10½c per pound.

Lead.—Government prices are also expected for lead in a few days which should have the effect of stabilizing the market. The market is quiet and is likely to remain in this conditions for balance of the year. Lead is quoted locally at 8½c per pound.

Antimony.—The situation in antimony is unchanged and the market is quiet, although prices are firm at 10c per pound.

Aluminum.—The market is steady and quotations unchanged at 62c per pound.

Pittsburgh

PITTSBURGH, Pa., Dec. 8.—Official announcement was made during the week by the Council of National Defense that representatives of the steel and copper industries had been invited to meet the War Industries Board on Monday, Dec. 10 and Friday, Dec. 14, in view of the fact that the price agreements were upon the understanding that the prices were subject to "possible revision" at the expiration of four months in the case of copper and "prior to Jan. 1" in the case of iron and steel. Early in the price fixing operation the iron and steel producers had an idea that the Washington authorities would be disposed to contend for further reduction Jan. 1 or soon thereafter, but as costs have been mounting and manufacturing difficulties increasing they have lately doubted whether any serious effort would be made to secure reductions. It is pointed out that even if there is no definite desire that a change be made in prices it is necessary that some action be taken prior to Jan. 1, otherwise the trade would be left in doubt. The balance of

probability is that next Monday's conference will result in no price change, the agreement being continued either to a specified date or indefinitely. As there is some prospect of the Pomerene iron and steel price fixing bill becoming a law, now that Congress is again in session, the Washington authorities might prefer to have the agreement continued without any definite date.

Greater Scarcity

Pig iron, unfinished steel and the general run of finished steel products are still scarcer. It is practically impossible to buy any Bessemer or basic iron in this district, and little if any foundry iron except for shipment after April 1. In billets and sheet bars there are only occasional odd lots available, chiefly steel, off in analysis, which must seek a consumer who can use the particular material. There are almost unlimited offerings of discard steel, and even when the mill will roll to sizes desired, even down to 1½-inch billets, there is only occasional demand. Such discard steel is offered at the set prices for soft steel or at a shade less. In bars, shapes and plate there are scarcely any offerings. Wire products are in moderately fair supply, as are sheets, while tubular goods are extremely scarce.

Practically all the trade reports in the past three weeks have been of the tenor that there has been such a great restriction in the production of both pig iron and steel, due chiefly to shortage of coke, that a fresh scarcity has resulted. The conclusion was based largely upon theory and partial information. The supply of Connellsville coke has been extremely scant, and furnaces depending upon the region have had to bank in many cases for longer or shorter periods. The amount of steel consumed for ordinary commercial purposes has continued to decrease. Nevertheless steel has grown scarcer if anything, and certainly has not grown more plentiful. The conclusion in most quarters has been that the supply has been feeling the effects of restricted production. This is not correct. What has been lost in production in some districts has been made up in others. Production of pig iron in November was at a slightly greater rate, on an average, than production in October. The Pittsburgh district gained a trifle, the Youngstown district and some others losing, while Chicago made quite a gain. The steel ingot statistics for November are not yet available, but they will in all probability show an increase, for there has been decreased consumption of pig iron by iron foundries and pig iron on the ground has been well cleaned up.

The unknown element, which apparently has confused the judgment of so many, is the tonnage of war steel being produced. There are various reports as to Government orders placed, mentioning specific tonnages, but it should strike one as curious that those who make these interesting reports never stop to add up the tonnages, nor do they state the period of time in which delivery is to be made. The fact is that nobody knows how much steel per month the war is taking, or is about to take. From the fact that the rate of production is well maintained, and the further fact that the commercial consumption of steel is constantly decreasing, it is evident that the war tonnage has greatly increased. While there seemed to be reason two or three months ago to conclude that the amount of steel required by the Government and its Allies for war purposes, direct and indirect, would not be less than 30 per cent. or more than 40 per cent. of the total production, on the basis of a rate of production of finished rolled steel of 33,000,000 gross tons a year, it is well to conclude now that the tonnage is going to be greater, if it is not already greater. A proportion of 35 per cent. would be one million tons a month.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Capacity

While production is maintained, it is well below capacity, because capacity is increased. The country may be making steel ingots at the rate of more than 44,000,000 tons a year, the rate shown for October, but the capacity is estimated at 50,000,000 tons, whereas the production of 41,400,000 tons in 1916 represented very nearly the entire capacity available in that year. In pig iron, too, the rate of 39,300,000 tons a year shown for the past few months is probably 2,500,000 tons short of what could be done if all conditions were favorable, particularly as to transportation.

Better Freight Movement

The General Operating Committee, conducting a pooling of the facilities of the railroads east of Chicago so as to produce maximum freight movement, issued certain orders, as noted in last report, aimed particularly at clearing the congestion in the Pittsburgh district. These orders have already borne a little fruit, conditions being visibly improved, though not much as yet. The whole matter has been put in broader form before Congress by the report made last Wednesday by the Interstate Commerce Commission, looking to the Government taking over the operation of all the roads, or the roads being allowed freely to form a general pool. The prospect distinctly is that there will be continually improved freight movement, except for restrictions imposed by winter weather (there has been a heavy snowfall in the past few hours), with consequent better movement of coal and coke and heavier production of pig iron and steel, also that there will be some large orders placed for locomotives and cars, under Government priority orders throughout, as to the furnishing of the materials and despatch of the work in the car and locomotive shops. In other words, prospects are that there will be more steel produced and still more war steel required.

Markets Inactive

The markets have been quite inactive, there being scarcely any material to offer. Output is fully taken up with Government orders and requirements in commercial steel against old contracts, even though specifications against contracts are as a rule at a relatively light rate. The set prices are being well observed in the case of buying by the Government, its Allies, and the domestic trade. They do not apply to export sales of ordinary commercial steel.

TO RETURN CARS TO CANADA

U. C. GILLON, Chairman of the Administration Board of the Canadian Railway Association for National Defence; Sir George Bury, vice-president Canadian Pacific Railway Co., and W. M. Neal, general secretary of the Association, were in New York, December 6, to have a conference with members of the American Railway Association in an endeavor to have the American railways send to Canada the Canadian cars that are now in the United States or an equivalent number of cars owned by railroads in the United States.

They pointed out at the meeting that there were 20,000 more Canadian-owned cars in the United States than there are American-owned cars in Canada, and that, although promises have been made that Canadian or American cars would be sent from time to time, yet in two months, notwithstanding several thousand American-owned cars have been sent to Canada, the Canadian roads had gained less than 990 cars .

ITALIAN MARKET FOR PIPE FITTINGS

A REPORT from the United States Consulate at Florence published in Commerce Reports for April 27, 1915, stated that the Italian market for pipe fittings was controlled by German and Swiss manufacturers and that fittings made by American manufacturers had been found unsatisfactory.

At the present time there is an urgent demand throughout Italy for fittings. Stocks of German and Swiss goods have been sold out, Great Britain requires

its goods for its own use, and France seems to be unable to pick up the Italian trade. A good market is offered to American manufacturers if they will conform to local requirements. The principal requirement is that fittings must have right-hand threading of English standard. Even left-hand thread might be used if of English standard. The differences between English and American standard thread is shown in the following table:—

Size of pipe, in inches—	Threads per inch English	American
⅛	28	27
¼	19	18
3-5	19	18
½	14	14
¾	14	14
1	11	11½
1¼	11	11½
1½	11	11½
1¾	11	11½
2	11	11½
2½	11	8
3 to 6	11	8

These standards for pipe up to 2½ inches look so much alike that without actual counting and measurement careless employees are apt to get them mixed, with consequent cutting of threads or jamming of fittings. It must be said, however, that this market is accustomed to and wants fittings with English standard threading. This is true of most of Europe. American manufacturers who hope to compete with European manufacturers must make up their minds to this fact.

The American practice of threading sleeves at each end does not obtain here. Sleeves in Italy carry a right-hand thread through their length. Furthermore, this market uses quantities of bends, particularly 90 deg. bends, which seem to be no longer made in the United States. Before the war, these could be obtained in any desired quantity from German and Swiss manufacturers. At the present time there is a tremendous demand for wrought iron flanges, which seem to be unobtainable.

With one or two exceptions, the materials used in and the finish of American fittings are said to be markedly inferior to those of Swiss and German manufacture. It is claimed that roughly finished moulds are used in castings and a poor quality of iron employed, with the result that the finished product has numerous pits inside and out. These cause rough threads and rust. Swiss and German fittings are of better material, stronger, and of lighter weight. Owing to the use of better moulds in casting, fittings have smooth, even surfaces. As to splitting, the consulate has been told that they seldom split, whereas this is of frequent occurrence with American fittings.

Other complaints of American fittings are that those for pressure use have flat bands instead of the round bead wanted in this country; and that reducers, instead of carrving the same thickness of metal throughout in proportion to the diameter of the several openings, carry the same outside diameter, which, according to Italian taste, makes a bulky, ugly piece of work. This taste requires a careful finish and proportion in all metal work. Whether or not American work is as strong or stronger is not the question. The point is that work must be turned out to suit the market. Any American manufacturer willing to do this can get a hold on this market at the present time that will insure him a permanent outlet for his goods.

Fittings and pipes are not separately classified in Italian import statistics but are lumped with other manufactures of iron. Pipes of American manufacture are the best in this market and have commanded the trade for years. If care were taken with fittings, American fittings, helped by the reputation of American pipe, would soon have the same enviable position here.

THE INVENTION OF THE STEAM HAMMER

NASMYTH invented his huge steam hammer to forge the paddle shaft of the Great Britain on Nov. 24, 1834, but Brunel recommended the screw propeller after the trials of the Archimedes by Francis P. Smith, and this upset all the arrangements for the use of the hammer, but the iron trade which had been slack for some time revived and Nasmyth used and patented his hammer in 1842 after his return from France. The hammer was so accurately made that he showed the Lords of the Admiralty at Devonport Dockyard, how a blow could be made so gentle as to crack the end of an egg placed in a wine-glass, as if done by an egg-spoon, and the next blow so violent as to rattle all the china in a home a quarter of a mile distant.

Another of Nasmyth's inventions was riveting by compression. One wet wintry Sunday afternoon he went to his workroom to perform some repairs to a small stone which required to be riveted, and as the noise of riveting might be heard he solved the difficulty by using the jaws of his bench vice to press in the hot rivets. This system of riveting was long afterwards patented by Smith of Deanston, with William Fairbairn of Manchester. It is extensively used in boilers, girders, and all other wrought-iron structures where sound riveting is absolutely essential, and by hydraulic power a considerable portion of iron shipbuilding is carried out by the silent squeeze system in place of hammers. When Nasmyth continued the silent and very effective method of riveting he named it "The Sunday Rivet."

INDUSTRIAL DEVELOPMENT IN JAPAN

THE following observations regarding the formation of industrial companies in Japan since the outbreak of the war have been furnished by E. F. Crowe, Acting Canadian Trade Commissioner, Yokohama:

Metals

Although the iron industry of Japan is still in its infancy, it gives promise of assuming considerable importance in the future. Before the war the annual production of Japan was about 260,000 tons of iron, this being around one-half of its consumption. Since the war several new companies have been formed for the production of iron. Six companies with a combined capital of 40,000,000 yen have established new works.

With regard to steel, three new companies have commenced operations and four new works have been established. Their total combined capital is estimated at 5,000,000 yen. One company is producing steamer shafts, railway wheels, and tires as well as supplying the home trade. They have received orders from China and India. It is stated that the intention of this company is to devote all its energy to the export trade rather than to the domestic field.

It is generally conceded that the future of the zinc industry of Japan is good and that a large export trade is to be expected after the war. One company is already manufacturing zinc for exportation. Japanese zinc ore contains many other metals, such as gold, silver, and copper and the refining of these metals is carried on along with the treatment of the ore. Five new zinc companies are operating six works for the treatment of Japanese zinc ore and have a total combined capital of 7,600,000 yen.

In March, 1916, a company was formed with a capital of 1,000,000 yen for the manufacture of aluminum. It is stated that the process to be used is different from that in vogue in Europe and the United States. The alumina is obtained from a clay which is a product especially of Japan and is treated by an electrolytic process.

A company was formed in January, 1917, with a capital of 100,000 yen for the purpose of producing sheet lead for the use of chemical industries. Sheets are being turned out measuring ten feet by four feet and it is claimed that they are superior to any which have hitherto been manufactured in Japan.

Metal Goods

A company which was first established in 1913 for the manufacture of galvanized iron sheets and galvanized iron wire has increased its capital from 300,000 yen to 700,000 yen. Up to the present its output has been confined to the home market but it intends to export its products later.

Two companies with a combined capital of 1,500,000 yen have been formed for the purpose of manufacturing wire netting.

Machinery

For the manufacture of machinery, three new companies with a combined capital of 2,300,000 yen have been established. In addition to the manufacture of munitions, rotary printing machines, etc., and gun metal are also being manufactured.

Electrical Supplies and Accessories

There have been formed during the period under review six companies for the manufacture of electrical supplies and accessories, such as electric motors, dynamos, switches, lamp bulbs, carbon electrodes, carbon brushes, etc. Their total combined capital is 4,530,000 yen and they operate eleven factories. An improved process for the manufacture of micanite has enabled a Japanese com-

pany to turn out insulators both for the domestic and export trade.

Mining

There have been organized three coal mining companies with a combined capital of 1,550,000 yen. One company is also producing coke in large quantities. In December, 1916, a company was formed with a capital of 120,000 yen to exploit a sulphur mine. A special process is used in refining the raw material.

Note.—A yen equals approximately 50 cents at the normal rate of exchange.

TRADE ENQUIRIES

THE following trade enquiries have been received by the Department of Trade and Commerce, Ottawa. Further particulars may be obtained on application to the Department.

1470. **Agency.**—A firm of Government contractors in South Africa who are also contractors for a number of large concerns throughout the country wish to arrange to act as agents for Canadian motor-cars, tires and tubes and motor-cycle tires. They are particularly anxious to make connections for after-the-war business.

1473. **Acetate of cobalt and manganese.**—A London company asks to be placed in touch with Canadian producers of acetate of cobalt and of manganese, who can offer supplies.

1475. **Raw potash felspar.**—A Midlands company asks to be placed in communication with Canadian producers of raw potash felspar who are favorably situated for export to the United Kingdom.

1482. **Wire for bedstead manufactures.**—A firm of Birmingham, Eng., bedstead manufacturers requires large quantities of wire of the following kinds: Coppered hook wire; bright spring wire; galvanized mat wire; tinned hood wire; 1C4 bright spring wire, quality as the japanned spring; galvanized strip. Further particulars and samples of wires may be had on application to Commercial Intelligence Branch, Department of Trade and Commerce, Ottawa.

1486. **Sulphite lye.**—A London manufacturing company wish to ascertain if they can obtain sulphite lye, a by-product of the pulp industry, from Canada, and would be glad to hear from producers able to offer regular supplies. Full particulars obtainable at Commercial Intelligence Branch, Department of Trade and Commerce, Ottawa.

1488. **Acetate of soda.**—A Lancashire firm asks for names of Canadian manufacturers of acetate of soda.

1495. **Sulphite (wood) pulp.**—London firm ask for quotations c.i.f. Bilbao, Spain, or Genoa, Italy, for 100 tons and 1,000 tons of strong, easy bleaching and bleached sulphite (wood) pulp.

1497. **Heating Appliances, flooring, etc., paints and oils.**—An inquirer in Newfoundland wishes to be placed in touch with Canadian manufacturers of church and house-heating appliances, maple flooring and cedar shingles, paints and oils.

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

CHILE—Valparaiso, British Consul General.

COLOMBIA—Bogota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT—Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director-General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul. Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA—Caracas, British Vice-Consul.

BRAZIL—Bahia, British Consul. Rio de Janeira, British Consul General.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Rey, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, 73 Basinghall Street, London, E.C.2, England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Anne's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

CANADIAN COMMERCIAL AGENTS.

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum, Grubbegd No. 4 Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE.

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Thorold, Ont.—A hydro-electric by-law will be submitted to the ratepayers.

Calgary, Alta.—The Calgary Rolling Mills are building an addition to their plant.

Owen Sound, Ont.—It is understood that J. H. Cole has selected a site for the proposed screw factory.

Toronto, Ont.—A building permit has been issued to the Canada Metal Co., for a factory addition at 17 Fraser Ave., to cost $2,000.

Chatham, Ont.—The T. H. Taylor Co. is in the market for a complete outfit of Jones under feed stokers, and for two boiler installations, including engines and fans, etc.

Toronto, Ont.—A building permit has been issued by the City Architect to the Liquid Air Society to erect a one storey tile and steel addition to their factory at 18 Boler street. The cost will be $2,600.

Toronto, Ont.—The Hydro-Electric Commission propose making extensions to the Ontario Power Co's. plant at Niagara Falls, so that by July next some 25,000 extra horse-power will be available and another 20,000 a month or so later. The cost is estimated at $1,000,000.

Toronto, Ont.—Fire on Friday evening destroyed the pattern shop and pattern storage, and also damaged one end of the plate shop at Polson Iron Works. A large number of valuable patterns were destroyed and a freighter which was under construction was damaged. The loss is estimated at about $200,000, which is covered by insurance. The company have already started building a new pattern shop.

GENERAL

Winnipeg, Man.—The Prest-O-Lite Co. will build a factory at St. Boniface, to cost $10,000.

Oshawa, Ont.—A shoe factory may be established here if satisfactory arrangements can be made with the council by the company interested in the project.

Sault Ste. Marie, Ont.—Fire on Dec. 3 of unknown origin caused a loss of several thousand dollars to the Standard Chemical Co. plant. The loss in the latter fire was $7,000.

Orangeville, Ont.—It is reported that the local cement plant, which has been idle for four years, has been sold to a Kingston concern who propose manufacturing a fertilizer.

Toronto, Ont. — The Massey-Harris Co. have taken out a permit to build a dry kiln on the west side of Shaw street, near Strachan avenue and King street, to cost $5,000.

MUNICIPAL

Lumsden, Sask.—The Town Council will appropriate $7,000 to acquire the plant and equipment of the local electric light and power company.

Whitby, Ont.—The by-law granting a loan of $25,000 to the United Rubber Mfg. & Reclaiming was passed by the ratepayers by a large majority.

Galt, Ont. — The City Council have passed two by-laws, one to pay $45,000 on extensions to the hydro-electric system and another to extend the waterworks system at a cost of $18,558.

Sherbrooke, Que.—The city attorney has been instructed to prepare a by-law authorizing the city to issue debentures to the amount of $150,000. This sum is made up as follows: New power dam, accessories, generators and turbines, on Frontenac street, $116,000; turbines, transformers, regulators, tools and apparatus at Rock Forest power station, $34,000.

Toronto, Ont.—Works Commissioner Harris has recommended that the Board of Control instal air chambers at the main waterworks pumping station. He explained that the air chambers were needed to safeguard the works from damage to the machinery in case of any temporary suspension of the Hydro service which might occur. Commissioner Harris estimated that the work would cost about $50,000. He was authorized to receive tenders for the work.

Montreal, Que. — The Canadian Machine Co., who contemplate building a factory at Maisonneuve, have asked the city council for a guarantee of $250,000 debentures. The council stated that no action could be taken on this matter until it was known how much the company would invest, and that the company would have to conform to the city by-law in the matter of securing aid. It was stated that the company had factories at Nashua, N.H., and Boston, Mass.

BUILDINGS

Toronto, Ont.—City Architect Pearse has granted a building permit to the Bank of Hamilton to erect a three-storey brick bank building at 341 Yonge street at a cost of $4,000.

Toronto, Ont.—Permission has been granted the T. Eaton Co. to erect a one-storey brick delivery building, to cost $45,000, at the corner of Coxwell avenue and the G.T.R. right of way. Building operations have already been commenced.

PERSONAL

L. W. Adam of Bethlehem, Pa., has been appointed to the position of General Superintendent of the Nova Scotia Steel & Coal Co's. plant at Trenton, N.S. Mr. Adam will reside at New Glasgow, N.S.

Lawrence Russel, who for several years has been sales manager of the Armstrong, Whitworth Co. of Canada, Montreal has been appointed assistant general manager of the company.

Herbert Johnston of the sales staff of the Armstrong, Whitworth Co., Montreal, has been appointed city sales manager, to succeed L. Russel, recently appointed assistant general manager.

John Ross, general superintendent of the mill of the Abitibi Power & Paper Co. at Iroquois Falls, Ont., was caught in the transmission and instantly killed recently. Mr. Ross was one of the highest paid paper experts in America and had been employed at the Abitibi about one year. He was forty-two years of age.

Capt. Arthur J. Latornell, B.A.Sc., at one time city engineer of Edmonton, Alta., has died of wounds received in action in France. Capt. Latornell, a Huguenot by descent, was born in Meaford, Ont. After graduating with honors in civil engineering, Capt. Latornell became city engineer of Edmonton, an appointment which he gave up early in 1916 to qualify for an overseas commission.

Henry J. Fuller, president of the Canadian Fairbanks-Morse Co., has been elected president of E. & T. Fairbanks & Co., of St. Johnsbury, Vt. The election of Mr. Fuller to this office will unite more closely the Canadian and American organization. Mr. Fuller is also a director of the Canadian Bank of Commerce, the National Trust Co. and other industrial concerns in the Dominion. Although born in St. Johnsbury, Vt., Mr. Fuller came to Montreal in 1897, two years after completing his education at Worcester Polytechnic Institute, and established a branch of the Fairbanks Co., which later developed into the Canadian Fairbanks-Morse Co., of which he is now the chief executive.

TRADE GOSSIP

Aikenhead Hardware, Ltd., are now distributors for Canada of the Simplex two-speed chain hoists manufactured by J. G. Speidel, Reading, Pa.

November Fire Loss.—The "Monetary Times" estimate of Canada's fire loss during November is $959,059, as compar-

ed with the October loss of $704,605 and $923,235 for November of last year.

U.S. Steel Corp. Unfilled Orders.—Unfilled orders of the United States Steel Corporation on Nov. 30 last were 8,897,106 tons according to the monthly statement issued last Monday. This is a decrease of 112,569 tons compared with the orders on October 31.

Japan Needs Steel Plates.—Japan cannot continue much longer to aid the Entente Allies with shipping unless permitted to import steel plates from the United States, Baron Megata, head of the special Japanese finance commission, said at a dinner given by Japanese bankeds in New York recently.

Firm Changes Back to Old Name.—The directors of the International Engineering Works, Ltd., Amherst, N.S., have decided to change the name of the concern to Robb Engineering Works, the former title. A meeting of shareholders will be held in Montreal on Dec. 19 to confirm this arrangement.

First Train Over Quebec Bridge.—The first freight train crossed the Quebec Bridge on Dec 3, composed of eighteen cars. The total weight of the train was 1,245 tons and it was just the length of the central span. When the full weight of the train was on the span the deflection of the structure was only 5/16 inch.

S.S. Turbinia for Overseas. — The steamer Turbinia has been sold at a reported price of $300,000 and is now being overhauled in preparation for trans-Atlantic service. She was the first steamer of the turbine type to be operated on the Canadian lakes, and was built in Glasgow, Scotland, at a cost of $220,000.

To Build Shell Plant.—Negotiations have been completed between the chamber of commerce of Batavia, N.Y., and a Canadian interest for the establishment of a shell factory in that city. The Canadian company, which has secured a contract from the United States Government for shells, plans to have the new plant operating about January, 1918.

The Dominion Bridge Co., Montreal, have obtained a controlling interest in the International Engineering Co., Amherst, N.S., and will carry on the business as a subsidiary. It is understood that the Dominion Bridge Co. have secured contracts for steam turbines and boilers in connection with the marine end of the business.

Montreal, Que.—At the annual meeting of the Mechanics' Institute held at Montreal recently, it was decided to begin the erection of the new building on the site purchased on the corner of Atwater avenue and Tupper streets, next spring. The building will include a reading room, library, lecture room, class or club rooms and a smoking room. The bulding, fully equipped, will cost in the neighborhood of $100,000.

Heavy Copper Contracts.—Contracts being placed by United States Government for copper are reported as enormous, and the trade has figured that approximately 90 per cent. of the available supply is being taken for war purposes. Regular consumers are still endeavoring to get their orders booked but dealers are fighting shy of agreeing ev. tentatively to make deliveries.

U.S. Price-Fixing Power.—Early enactment of legislation extending the United States Government's price-fixing power is expected by administration officials to follow President Wilson's declaration in his message to Congress that authority in this respect is now too limited. The feeling has been growing here that more power is needed to keep down rising prices; and industry, speaking through the Chamber of Commerce of the United States, has declared for the widest possible powers for the Government in this respect.

Grecian Magnesite Exports in 1916.—Magnesite exports of all grades from Greece in 1916 are given as 176,383 tons. Of raw magnesite the United Kingdom took 60,511 tons; the United States, 56,504 tons; France, 24,607 tons; Italy, 3,100 tons; the Netherlands, 320 tons. Of the caustic and calcined mineral the United Kingdom took 13,127 tons, the United States 9,514 tons, and the Netherlands 730 tons. Of the dead burned grade, the United Kingdom took 3,975 tons and France 3,462 tons.

Lake Superior Ore Shipments.—A record for the month of November in the movement of ore from the Lake Superior district was established last month, when the cargo carriers on the lakes loaded 7,331,804 tons, according to figures just issued. This is an increase over November, a year ago, of 1,616,351 tons, and brings the season's total to December 1, up to slightly more than 61,500,000 tons. The season's total, however, is approximately 2,000,000 tons less than for the same period last year.

Production of Explosives in U.S.—The production of explosives in the United States during 1916 was in excess of 500,000,000 pounds, an increase of about 44,000,000 over 1915. The total included 215,575,615 pounds of black powder, 253,154,780 pounds of "high" explosives other than permissible explosives, and 34,685,240 pounds of permissible explosives. The value of the exported explosives, which in 1914, the first year of the war, were valued at about £2,000,000, reached a total value in 1916 of some £144,000,000.

Four Steamers Ordered.—The first war order to come to Vancouver since the floating of the Victory Loan is, by coincidence, for $7,254,000, almost exactly the amount of the city's contribution to the loan issue. The contract came from the Imperial Munitions Board to Coughlan's, Ltd., and provides for the construction of four additional 8,800-ton steel freight steamers, turbine propelled, similar to the six already under construction in the yards. The Coughlan yards have now building contracts to the value of more than $15,000,000.

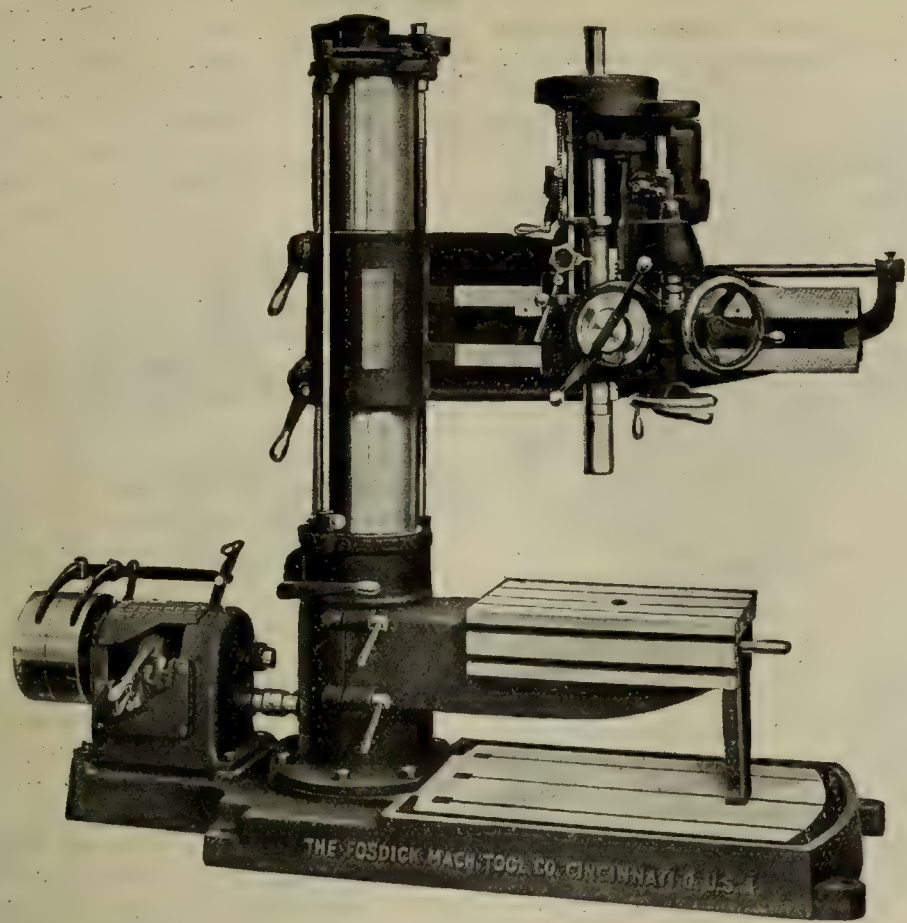
Coal Shipments on Lake Superior.—The up-lake coal movement to December 1, was 25,855,737 tons, or 1,938,675 tons greater than for the corresponding 1916 period. Coal movements have virtually ceased, but the year's total likely will exceed 26,000,000 tons. Abnormally heavy uplake coal movement offers a partial explanation for the shortage which prevailed in eastern Ohio and western Pennsylvania industrial districts for months past, greatly crippling operations and reducing the iron and steel output. Coal movement virtually stopped on Dec. 1.

Big Harbors Needed When War Over.—Improvement in sea transportation was discussed at the London, England, Chamber of Commerce, on Dec. 5, when Lord d'Abernon emphasized the need of bigger ships of great speed after the war. He suggested the government should start the provision of big harbors. About $20,000,000 would provide for vessels of 38-foot draught at practically all the leading harbors from Great Britain to the furthest dominion. The report of the Dominion Royal Commission just issued gives memoranda and tables as to harbors throughout the Empire.

Traffic Heavy at the Soo.—Freight shipments of all kinds through the locks at Sault Ste. Marie in November totalled 11,154,508 tons which is a new traffic record for that month. The figures have just been made public by the United States engineer's office. They show a heavy movement of grain, wheat shipment totalling 37,992,913 bushels. Flour shipments eastward amounted to 1,293,410 barrels. Shipments of soft coal through the locks for the month amounted to 1,685,586 tons; hard coal 332,210 tons. The figures on iron ore show a movement of 7,214,058 tons. Vessel passages through the locks for the month totalled 2,772.

Forest Survey in Ontario.—The Commission of Conservation hopes soon to undertake a survey of the forest resources of Ontario, similar to the investigations it has already made in British Columbia and Saskatchewan. Only the most fragmentary data respecting the forests of Ontario are now available, although there is a vast amount of detailed information in the possession of timber owners, Government officers and railways, which could probably be secured. The commission is handicapped in undertaking such an investigation by the scarcity of competent foresters. Last year at the height of the fire season its staff consisted of about 1,000 men.

Manganese Ore Prices.—Indian manganese ore has sold recently in the United States as high as $1.30 per unit, seaboard, for high-grade material. Brazilian ore has been quoted at $1.10 to $1.20 per unit, seaboard. For domestic ores a leading dealer is now offering the following prices: $1.20 per unit for ore containing 50 per cent. or more manganese; $1.10 per unit for ore averaging 46 to 49.99 per cent.; $1 per unit for 42 to 45.99 per cent. ore, and 90c per unit for 38 to 41.99 per cent. ore. For all these grades



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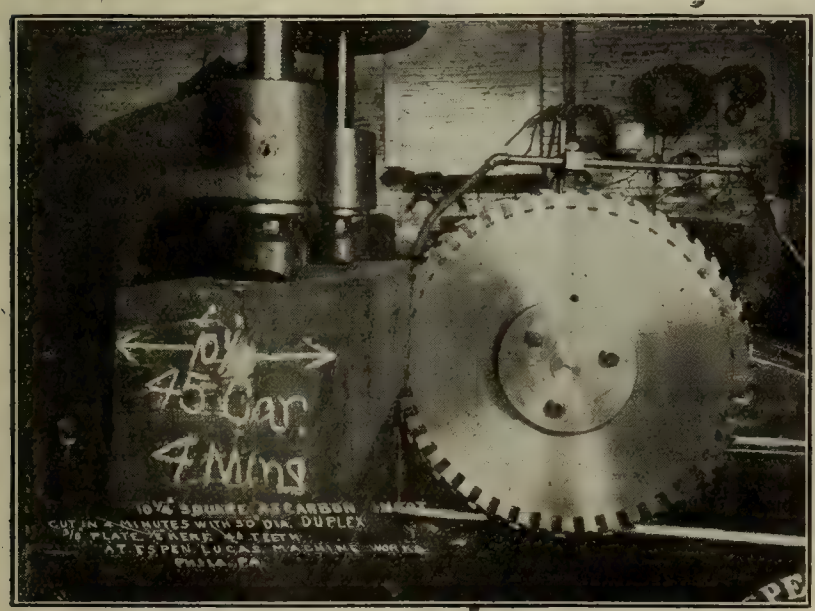

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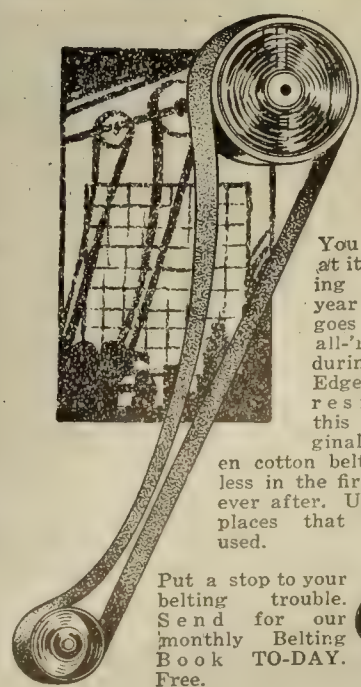

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British Need More Iron Ore.—Sir John Ferguson at the last meeting of Bolckow, Vaughan & Co., made a most interesting statement concerning iron ore. He thought the iron and steel manufacturers of Great Britain might, with advantage to themselves and to the national trade, act together in securing the control of some of the undeveloped deposits of iron ore, and he suggested that the Government interest itself in the matter. There are very large deposits in Brazil which from a national point of view should be secured for future use.

Dominion Resources Directory.—The first comprehensive and authoritative directory of Canada's natural resources is to be published without delay by the Commission of Conservation. Sir Clifford Sifton, the chairman, gave the first intimation of this at the annual meeting of the Commission last week. Inventories of the various sections of the country will be arranged, and published geographically, provinces having similar resources being grouped together. One division, for instance, will cover the Maritime Provinces, another the Prairie Provinces, another Ontario, etc. The information to be published, it is believed, will be of the utmost importance in the solution of after the war problems.

Shortage of Hydro Power.—The increasing shortage of hydro power has prompted the Hydro-Electric Commission of Ontario to develop an additional 45,000 h.p. at the Ontario Power Co's. plant at Niagara Falls. It is expected that this will relieve the situation until the Chippewa Creek development is in operation. The Chippewa development will furnish 300,000 horse-power and will cost something in the neighborhood of $23,000,000. The Western Ontario natural gas, which has been providing the motor power for many important industries, is falling down, and unless these people can get Hydro power several flour mills will have to suspend operation. Several companies are appealing to the Hydro to help them out now that they can't get natural gas.

Magnesite Production in 1916.—Normally about 6 lbs. of magnesite was formerly used for every ton of steel made by the basic open-hearth process. but now not more than ½ lb. is used, and at some steel plants cheaper and less satisfactory refractories have been substituted, says Hoyt S. Gale in a U. S. Geological Survey Bulletin 666-BB on "Magnesite." More raw magnesite was produced in the United States in 1916 than ever before. Last year's output was 158,759 net tons as compared with 30.499 tons in 1915 and 9.632 tons in 1913. Imports for consumption of the raw mineral were 75,345 tons in 1916, also exceeding any previous record, but the imports of calcined magnesite were only 9.270 tons as compared with 167.094 tons in 1913. The total consumption calculated as calcined mineral in 1916 was 126,322 tons as compared with 66,706 tons in 1915 and 178,530 tons in 1913.

The International Business Machines Co. has been launched with a capital of $2,000,000. The new concern will take over the plants and stocks of the International Time Recording Co. and the Computing Scale Co., both Toronto concerns, and the Canadian Tabulating Machine Co., of Montreal. The operations of this latter concern will be at once transferred to this city. By bringing these three companies together a great saving in the cost of management and operation will be effected. Thomas J. Watson will be the president of the new combination, and F. E. Mutton the vice-president and general manager. J. S. Ogsbury is the secretary. L. A. Davidson has been appointed sales manager for the scales division and St. George Bond, of Montreal, will have charge of the tabulating section. The company has $100,000 in cash available for immediate expansion.

Entertained Employees. — The employees of the Hall Engineering Works, Montreal, were recently given a dinner by the directors of the concern at Cooper's restaurant, there being about one hundred persons present. Toasts were given and a musical programme provided. A toast to the employees was proposed by T. Fisher, and responded to by W. F. Fletcher, director, and Wm. Forbes. In the course of the remarks it was evident that a fine spirit existed between employers and employees. A toast to the army, navy and mercantile marine was proposed by W. S. Johnson, and responded to by Lt. Matthews and Capt. Reed. Other toasts were "Our Guests," proposed by Thomas Hall, president of the company, and responded to by Thomas Arnold, and "Our President," proposed by F. H. Fox, secretary-treasurer.

Included among the guests from outside were Mayor Ballantyne, of Montreal West; Messrs. C. W. Baker, Geo. G. Fox, W. S. Johnson, C. A. Bishop, W. Stewart, D. J. S. Tyrer, Lt. Matthews, Geo. Wood, W. Graveley, W. J. Alderson, and Capt. Archibald Reed.

TENDERS

Toronto, Ont.—Tenders will be received, addressed to the Chairman, Board of Control, City Hall, Toronto, up to January 15, 1918, for the construction of a drainage system (wrought iron pipe) for the Don Bridge, Bloor Street Viaduct. Specifications and forms of tender may be obtained upon application at the Bloor Street Viaduct Field Office, 89 Castle Frank Road.

Ottawa, Ont.—Tenders will be received until December 17 for the electric conduits, outlets and fittings required in the reconstruction of the Parliament Building. All tenders to be based on the supplying and delivering on the site of the quantities of the schedule of material for electric conduit, outlets and fittings, in strict conformity with the specifications and the samples submitted and to the satisfaction of the architect. Deliveries to commence so far as possible immediately after the signing of contract and to continue as directed in such quantities as to ensure complete delivery by March 1, 1918. The schedule of material, specification and any other information required can be obtained at the office of the P. Lyall & Sons Construction Co., Ottawa.

MARINE

Victoria, B.C. — The C.P.R. steamer Princess Ena is again in commission after an overhaul at the Victoria Machinery Depot, and has left for the North. The Princess Royal will resume service at the end of the week.

Sarnia, Ont.—The Imperial oil tanker Royalite has arrived here from up lake ports and will go into winter quarters at once. The crew reports that it encountered floating ice in Lake Hurton.

Hantsport, N.S.—The Noel Shipbuilding and Transportation Co. now have under construction a 450 ton (net) schooner, 138 feet long with a beam of 35 feet and a 13 feet hold. This three-master was begun in October and will be framed by Christmas.

Victoria, B.C.—The Victoria Whaling Co. tender Gray, which has been undergoing repairs at Yarrows, Ltd., for the past month, has been turned over to the owners, and will begin at once loading empty oil drums for Sechart, Kyuquot and other West Coast stations.

Victoria, B.C. — The Cameron-Genoa Mills Shipbuilders, Ltd., have laid the keel for the fourth wooden steamer to be built at the Point Ellice yards to the order of the Imperial Munitions Board. This is the tenth keel to be laid by the company since it was established last spring, the other six being the auxiliary wooden schooners built for the Canada West Coast Navigation Company.

Victoria, B.C.—The Dominion fisheries patrol vessel Alcedo, which is at Yarrow's yards, has been hauled out on the slip for repairs to its keel, necessitated by the accident on November 27, when it ran aground in Houston's Passage, close to Cowichan Gap. The fishery vessel Restless has also been placed on the ways for general overhaul. Both vessels will probably be in the water again in the course of a week.

Victoria, B.C.—Announcement was made at the offices of the B. C. Coast Service of the C.P.R. recently that the fast passenger liner Princess Victoria has been withdrawn from service to be overhauled. A cracked tail-shaft, which has to be drawn and replaced, and run-down cylinders which have to be bored, are some of the things that will have to be given attention by the repair crew when the vessel goes on the ways. The entire machinery will undergo a complete overhauling, and it is expected that the job will occupy about six weeks.

New Westminster, B.C.—Although delayed at the start by a shortage of material, the New Westminster Construction and Engineering Co., which is building four wooden steamers for the Im-

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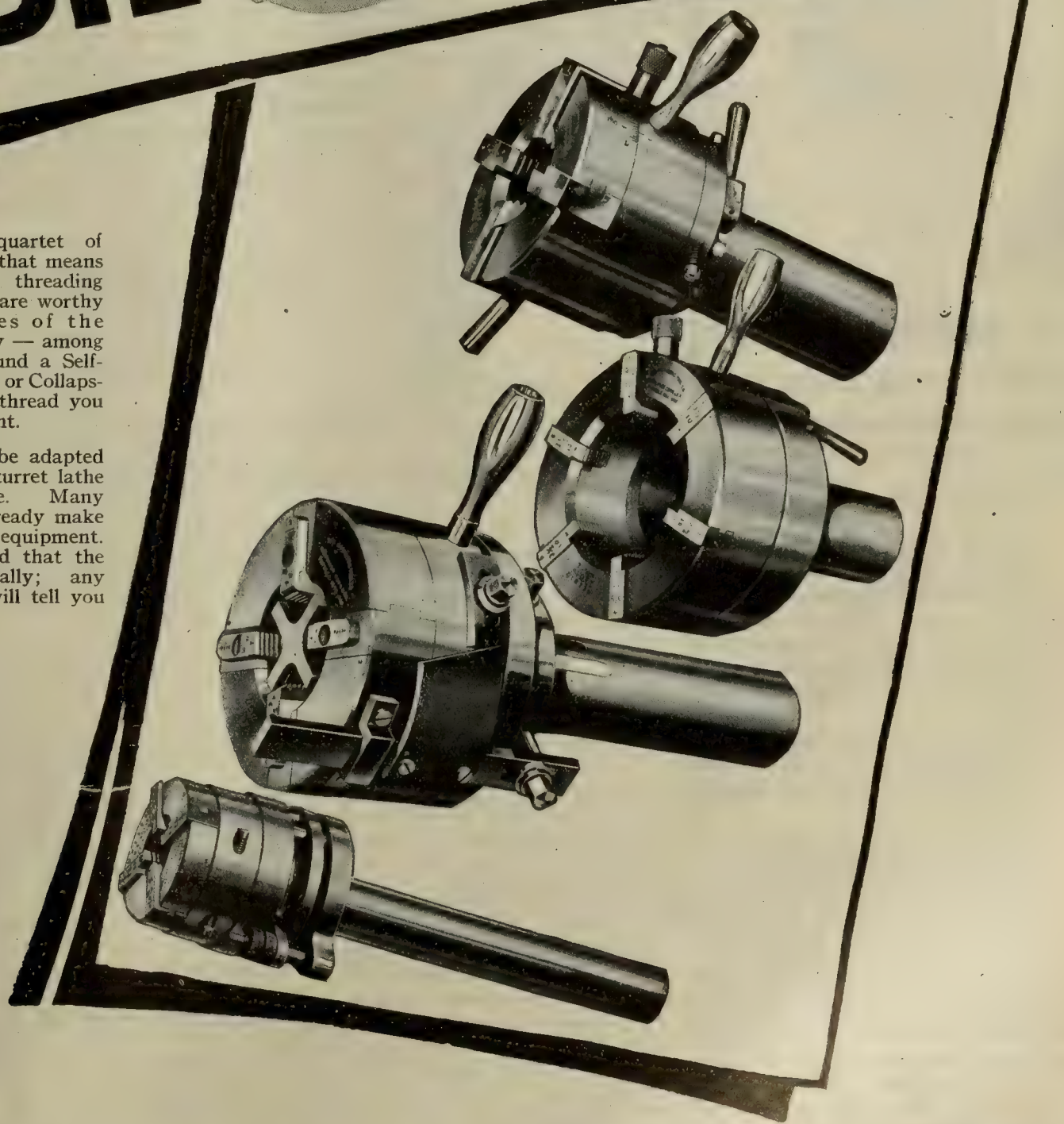

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perial Munitions Board at the Poplar Island yard, in fully confident of launching the first of them by Feb. 1, the date scheduled. The work is now progressing at a satisfactory rate. Planking is under way and the first of the hulls is nearly ready for the beams. The second hull is about ten days behind the first, and will probably be launched about a week later while the third will come on shortly thereafter. The keel of the fourth boat is laid and the sternpost set up.

Vancouver, B.C.—The John Coughlan Co. have been offered a contract for four steel steamers by the Imperial Munitions Board. The four vessels would be identical in construction with five now being built for the Imperial Munitions Board in the Coughlan yards here. These vessels are valued at $1,250,000 each, so that if four more are added to the fleet, it will mean an additional $5,000,000 worth of ships for this city. The Coughlan programme at the present time represents between $7,000,000 and $8,000,000. With the addition of the new contracts, approximately $13,000,000 worth of shipping will be turned out of these yards within the next year or two. The vessels will be of 8,800 tons and of the same type as the Luis Nielsen and the Niels Nielson, launched at Seattle yards this year.

CONTRACTS

Hamilton, Ont.—P. H. Secord & Son, Brantford, have been awarded the contract for factory addition for the Frost Wire Fence Co., to cost $25,000.

Hamilton, Ont.—The general contract for an addition to a factory for the Canadian Shovel Co. has been given to George E. Mills, Hamilton, at $25,000.

Galt, Ont.—P. H. Secord & Son, Brantford, have the general contract and the Hamilton Bridge Works Co., Hamilton, the steel contract for $30,000 addition to foundry for the Canada Machinery Corporation.

INCORPORATIONS

Eastern Chemical Co. has been incorporated at Ottawa with a capital of $200,000 to manufacture pumice stone and chemicals of all kinds. The head office is at Montreal, and the incorporators are J. O. Dion, J. W. Pion, and A. Coutant, all of Montreal.

British Molybdenite, Ltd., has been incorporated at Ottawa by Kenneth McRae, Cecil E. Dillistone, and Charles W. Milburn, all of Toronto, to own and develop mineral deposits and treat ores of all kinds. The head office is at Toronto, and the concern is capitalized at $100,000.

International Business Machines Co. has been incorporated at Ottawa by Frank E. Mutton, Edmond B. Ryckman, and John S. Denison, all of Toronto, to manufacture all kinds of tabulating, recording and adding machines. The head office is at Toronto and the company is capitalized at $2,000,000.

WOODWORKING

Cobalt, Ont.—Fire on Nov. 30 destroyed the lumber mill at Moose Lake belonging to C. J. Price. The loss is estimated at $8,000; there was no insurance.

CATALOGUES

Brass and Copper Products.—The Tallman Brass & Metal Co., Hamilton, Ont., have distributed a stock list of brass and copper products, ready for immediate shipment. The product includes brass and copper rods, sheets, tubing and bars, etc.

Torsion Meter.—Catalogue describing and illustrating the Gary-Cummings torsion meter made by the Cummings Ship Instrument Works, Boston, Mass. This meter, which is used on ships for measuring shaft horsepowers, is described at length in regard to its construction, care and operation. The catalogue also contains an equation for calculating the horsepower and a calibration data sheet. The illustrations show the instrument in detail and also installed.

Cochrane Precision Meter.—Engineering Bulletin No. 21 deals with the Cochrane precision meter, volumetric type, made by the Harrison Safety Boiler Works, Philadelphia, Pa. A comprehensive description is given of the meter while reference is made to installations on United States battleships. Copies may be obtained on application from Canadian Allis-Chalmers, Ltd., Toronto, agents for Canada.

Industrial Motors.—The second of a series of catalogues of industrial motors has just been distributed by the Westinghouse Electric & Mfg. Co. of East Pittsburgh, Pa. This is known as catalogue 30 and covers the company's complete line of direct current motors and generators for industrial service. After several pages giving general information regarding the ordering, classification and selection of direct current motors there follows complete description, rating and dimensions for type SK commutating-pole motors, various modifications of type SK elevator motors, reversing planer motor equipment, type CD motors, headstock equipment for woodworking plants, type SK and CD motor generators and arc welding equipment. Much new information is given especially on such subjects as arc welding, headstock equipment, motion picture service and battery charging service. The new catalogue is identical in size and will fit the binder for the company's line of catalogues covering supply apparatus and small motors.

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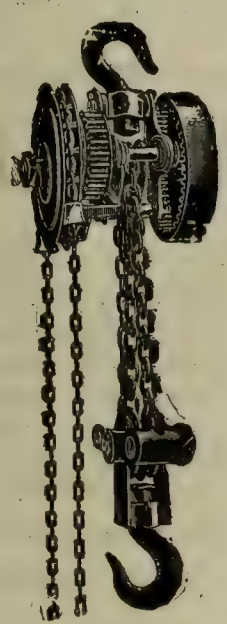

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FOR SALE

SIX COMPRESSORS FOR SALE — VERY cheap. The National Quarry, 81 St. Peter St., Quebec. c22m

FOR SALE — NEW ONE TURBO WING blower, twelve-inch; one Mason hydraulic damper regulator, No. 4; one ten-inch air cylinder and two-way valve for air chuck; one No. 3, two No. 5 Acme automatic steam engines, all new. Bargains; make bid. Reliance Machine Company, Toronto. (c24m)

THREE TONS COLD ROLLED STRIP STEEL, drawing quality 8" wide, .065 thick. Dillon Manufacturing Co., Oshawa. c1m

PUNCHING MACHINE — POWERFUL BELT-driven geared multiple punching machine; capable of punching 30 holes ¾" dia. at 2½" pitch through ¾" plate; distance between housings 6' 0"; having two bed plates, one 24' long, fitted with adjustable screw-driven plate carriage for feeding plates to punch, and one 26' long, fitted with plain plate carriage, which is operated by hand-power draw winch; machine has large equipment, including punches and bolsters, for ½", ⅝", ¾" and ⅞", and one rack of fixed punches and bolsters 11-32" at 1¼" pitch; made by Hanna, Donald & Wilson; f.o.b. Glasgow. William C. Wilson & Co., 21 Camden Street, Toronto. c23m

FOR SALE — ONE INGERSOLL-RAND AIR Compressor with receiver. Displacement 64 cubic feet per minute. In good shape. $300.00. Perfection Stove Co., Ltd., Sarnia, Ont.

HOISTING ENGINE—NEW.

ONE 16" x 24" "MEAD-MORRISON" DOUBLE cylinder, single drum, first motion hoisting engine, reversible, drum is 30" diameter and 70" long between flanges; is grooved for wire rope 1" diameter. Rope capacity in single coil 500' 0", but flanges will allow of four or five layers. I. Matheson & Co., Ltd., New Glasgow, N.S. (c24m)

FOR SALE CHEAP—16" SHAPER; 24 x 24 x 6 planer; two heavy duty roughing lathes for 6" shells; 1 Hall No. 6 cut-off machine; 1 2-ton heavy Morris chain block—all guaranteed and in first class condition. Dominion Machinery Co., Toronto. c24m

FOR SALE

in Manitoba, one of the best Equipped Foundries in Western Canada for Gray Iron and Brass Casting. Also Machine Shop, Pattern Shop and Blacksmith Shop (3 fires.)

Write for particulars to
Box 355 CANADIAN MACHINERY (c23m)

Flat Braiders For Sale

Twenty-five---53 Spindles, No. 1 Make

New England Butt Co. and R.I. Braiders in perfect working condition. Write for particulars. Greenwood Braiding Co., Greenwood, R.I. (c23m)

SITUATIONS WANTED

MECHANICAL AND CONSTRUCTION ENgineer desires change; twenty years' general experience; specialty steam power plants; knowledge pulverized coal. Box 343, Canadian Machinery. c21m

GENERAL SUPERINTENDENT, WITH PRACtical shop as well as efficient production experience, desires change. One having considerable munition experience, principally shells of various sizes. Box 358, Canadian Machinery. (c25m)

GENERAL SUPERINTENDENT DESIRES position—years of machine shop and toolroom experience, efficient production methods, as well as extensive experience with various sizes of shells. Box 350, Canadian Machinery. c22m

SITUATIONS VACANT

ASSISTANT WANTED WITH PRACTICAL, technical and commercial machine tool experience, by large exporters of machine tools; give age, experience and salary. Box 361, Canadian Machinery. (25)

WANTED

WANTED — SECOND-HAND CUPOLA AND other foundry equipment. State full particulars and price. Box 346, Canadian Machinery. c21m

WANTED—A GOOD, HEAVY, POWERFUL, single purpose lathe for 4.5 shells. Send fullest particulars and best price at once. Box 359, Canadian Machinery. (c24m)

WANTED — COMPLETE BOLT AND NUT machinery to manufacture sizes ¼-inch diameter and up. Advise offerings in either second-hand or new. Box 360, Canadian Machinery, Toronto. (c2m)

WANTED—VERTICAL MILLING MACHINE with table not less than 26" x 10", minimum distance centre of spindle to face of column 14". Reply, giving full particulars, price and where machine can be inspected. Box 352, Canadian Machinery. c21m

MANUFACTURERS' OPPORTUNITY

A responsible American Concern desires to arrange with a reliable Canadian Machinery Manufacturer for the production in quantities of a small Marine Motor, for the Canadian and Export Trade. A modern equipment, with knowledge of economical production of interchangeable machinery and parts, and good shipping facilities essential. To such party a very favorable, if not continuous, contract is offered. Address Box 353, Canadian Machinery. (c22m)

AGENTS WANTED

WANTED — LIVE REPRESENTATIVE TO handle good specialty; one who hasn't too many irons in the fire Apply Box 348, Canadian Machinery, stating lines you now represent and the ground you are prepared to cover. c23m

WANTED—BY STEEL WORKS IN PENNSYLvania, United States, producing exclusively crucible cast steel, principally high speed steel, a representative in Canada who is thoroughly familiar with the tool steel business and will devote his entire attention to same. Reply Box 354, Canadian Machinery. c24m

WANTED—PARTY TO TAKE OVER CANAdian and European patents of good paying machine. The machine, which costs less than thousand dollars to build, is in daily operation in Pittsburgh steel mill, with a saving of thirty dollars per day. Apply to Box 356, Canadian Machinery. (c25m)

SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto

LET OUR MACHINE SHOP HANDLE YOUR overflow. We have a well equipped shop and can handle turret lathe, engine lathe, shaper, drill, screw machine work, as well as fitting. We will gladly quote you prices. Webber Bros. Machine Co., Dupont St., Toronto. (c26m)

FOR SALE

2—16" x 5' Reed Lathes, elevating rest.
1—16" x 6' Reed Engine Lathe, plain rest.
1—16" x 6' Reed Engine Lathe, R. and F.
1—18" x 8' Davis Engine Lathe, D.B.G.
1—18" x 8' Porter Engine Lathe.
1—22" x 10' Nicholson & Waterman Engine Lathe.
1—No. 3 Brown & Sharpe Automatic Gear Cutter.
1—30" old-style Brainerd Automatic Gear Cutter.
1—5" x 48" Pratt & Whitney Plain Grinder.
1—No. 3 Lees-Bradner Thread Miller.
1—15" Jungst Shaper.
2—24" x 24" x 6' Powell Standard Planers.
2—30" x 30" x 8' Powell Standard Planers.

Brownell Machinery Co.
Providence, R. I.

Are You Thinking of Building?

We have for Immediate Shipment

A STEEL BUILDING 120' x 300' IN TWO BAYS

With Runways for Cranes

If you want a Factory, Erecting Shop, Forge Shop or Structural Shop, it is here waiting for you. Ask us for further particulars.

MACHINE TOOLS

PLANERS

66 x 66 x 20" CANADA TOOL WORKS, two heads.
52 x 52 x 16 CANADA TOOL WORKS, one head.
36 x 42 x 12 CINCINNATI, two heads.
36 x 36 x 12 McDOUGAL, three heads.

SHAPERS

14, 16 and 20" SMITH & MILLS.
16, 20 and 24" KELLY.
20 and 24" GOULD & EBERHARDT.

DRILLS

15", 20", 25", 26", 28" and 34" BARNES.
24, 26. 28 and 30" SIBLEY.
6 ft. BERTRAM Radial.
5 ft. REED PRENTICE.
2½ ft. FOSDICK Heavy Duty.

MILLERS

3H and 2H LeBLOND Universal.
No. 2 and No. 3 CINCINNATI Universal.
No. 2 FORD-SMITH Plain.

MISCELLANEOUS

10 ft. NILES Vertical Boring Mill, two swivel heads.
BERTRAM Horizontal Boring Mill, 4" spindle.
No. 4 and 23 NILES Bulldozers.
BERQUE Automatic Multiple Punch —capacity 18—⅞ holes takes 26 ft. plates.
42" BERTRAM Car Wheel Boring Machine, hub facing attachment.

CUT-OFF MACHINES

4—6" WILLIAMS.
1—6" HALL.
1—4" HALL.
2—3½" DAVIS.
1—3½" HURLBUT ROGERS.

The A. R. Williams Machinery, Co., Limited

64-66 Front Street E. - TORONTO

COMPLETE SHRAPNEL PLANT

Can be seen in Operation, comprising Lathes, Turrets, Presses, etc., including the following:—
7—16" McDougal Engine Lathes
11—No. 2 Warner & Swasey Turrets
15—C. M. C. Turning Lathes
4—Davis Turret Lathes

SIX INCH SHELL MACHINERY

2—Nearly New Hercules Rough Turning Lathes, with Oil Pan and Pump. Used one month.

4.5 SHELL MACHINES

No. 6 Hall Cut-off Machine
Norwood Propting Machine

MISCELLANEOUS

2—25" Foote-Burte Drills
2—18" x 8 Rhan Larmon Lathes, Double Back Geared, Quick Change Gear
1—16" Shaper with Vice and Countershaft
1—16" Crawford Tool Room Lathe, Quick Change Gear, Oil Pan and Pump, Taper Attachment, Draw-in Collet.

The above is only a part of our stock. Let us know your requirements.

DOMINION MACHINERY CO.

110 Church Street, TORONTO Warehouse: 14 Darling Ave.

Your Ad in this Section

will get the attention of the busy men. They find grouped here a big list of equipment for immediate shipment, and they use it as a catalogue when they need any. Will they see your list?

PETRIE'S LIST
of

New and Used Machine Tools

In Stock for Immediate Delivery

TURRET LATHES AND SCREW MACHINES

16" x 5½' Pratt & Whitney, D.B.G. (3).
16" x 5½' MacGregor, D.B.G. (2).
16" x 6' Pratt & Whitney, B.G.
18" x 10' Libby (2).
20" x 10' Bridgeport, B.G.
22" x 8' Pratt & Whitney, B.G.
22" x 8' Martin, single purpose (2).
22" x 8' Davis, D.B.G.
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
2" x 24" Stevens Screw Machines.
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

6" x 30" Dalton, B.G., bench.
13" x 6' Filsmith, D.B.G., comp. rest.
14" x 6' Lodge & Shipley, taper attachment.
15" x 6' Sebastian, B.G., comp. rest (3).
16" x 8' McDougall, B.G., comp. rest (2).
16" x 8' Porter, B.G., comp. rest.
18" x 10' Putnam, back geared.
20" x 8' Fifield, B.G., plain rest.
21" x 8' Bawden, heavy duty (4).
22" x 8' Pond, B.G., plain rest.
24" x 11' Pond, B.G., comp. rest.
26" x 14' Gleason, D.B.G.
30" x 10' Ames, B.G., plain rest.
31" x 16' Fifield, back geared.

DRILLS

14" Excelsior, sliding head, lever feed (5).
15" Avey, high-speed, ball-bearing.
16" Barr, sliding head, lever feed.
20" Barnes, 3-spindle, lever feed (2).
20" Baker, tapping attachment.
24" Foote-Burt, heavy duty.
24" Kerkhoff, back geared, power feed.
32" Cincinnati, heavy duty.
40" Bickford, back geared.
46" Allfree, back geared, power feed.
No. 10a Baush, 16-spindle.
D-8 Colburn, heavy duty.

GRINDERS

10" x 30" Landis, universal.
No. 1 Cincinnati, universal.
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer (2).
24" Barnes, wet tool.
2¼" Yankee, twist drill (3).

IRON PLANERS

20" x 20" x 5' Bertram (2).
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Pond, two heads
40" x 40" x 12' New Haven, power feed.
72" x 72" x 11' Canada, power feed.

MILLING MACHINES

Bertram, plain.
Brown & Sharpe, power feed, plain.
Gray Nose-thread Miller.
No. 2 Cincinnati, universal, cone type.
No. 2 Ford-Smith, plain.
No. 4 Fox, universal.

SHAPERS

16" Petrie, back geared (2).
16" Canada Mach. Corp., back geared.
16" Cincinnati, back geared (3).
24" Gould & Eberhardt, back geared.
30" Morton, back geared, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6' Robertson Hack Saws.
4½" Martin Cutting-off Machine.
No. 2 Grant Rotary Riveting Hammer.
⅜" Garvin Vertical Tapping Machine.
No. 3½ Greenerd Arbor Press.
No. 180 Brown-Boggs Power Presses (2).
No. 18 Can. Hanson & Van Winkle Power Press.
No. 3 Goldie & McCulloch Hydraulic Banding Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.

FRONT STREET WEST, TORONTO

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RIVERSIDE Machinery Depot

We Own Every Tool Offered

NEW MACHINE TOOLS

For Immediate Delivery

1—18 x 8 Springfield Standard Engine Lathe.
2—16 x 8 Springfield Q.C.G. Engine Lathes.
1—16 x 6 Springfield Q.C.G. Engine Lathe.
2—16" Springfield B.G. Shapers.
2—20" Springfield B.G. Shapers.
1—25" Springfield B.G. Shaper.
3—14" Pierce Turret Lathes.
2—1 x 8 Pierce Hand Screw Machines.
3—No. 1½ American Milling Machines.
1—No. 20 Bliss O.B.I. Press.
1—No. 19 Bliss O.B.I. Press.
1—No. 18C Bliss O.B.I. Press.
1—No 18 Bliss O.B.I. Press.
5—20" Buffalo B.G., P.F. Drill Presses.
3—20" Canedy-Otto B.G., P.F. Drill Presses.
2—20" Champion B.G., P.F. Drill Presses.
3—20" Champion Plain Drill Presses.
3—20" Silver Plain Drill Presses.
3—20" Canedy-Otto Plain Drill Presses.
2—14" Champion Plain Drill Presses.

USED MACHINERY

ENGINE LATHES

1—22 x 14 Putnam Standard Engine Lathe.
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastion Standard Engine Lathe.
1—14 x 6 Springfield Standard Engine Lathe.
1—14 x 6 Prentiss Standard Engine Lathe.
1—14 x 6 Sebastian Standard Engine Lathe.
2—13 x 8 Barnes Standard Engine Lathes.
1—13 x 5 Barnes Standard Engine Lathe.
1—10 x 4 Sebastian Standard Engine Lathe.

TURRET AND SCREW MACHINES

2—No. 6-A Potter & Johnson Automatic Lathes.
1—4½" Gridley Auto. Screw Machine, motor driven.
2—No. 4 Foster F.G.H. Hand Screw Machines.
2—No. 3 Foster F.G.H. Hand Screw Machines.
1—No. 5 Pierson F.G.H. Hand Screw Machine.
6—No. 2 W. & S. Plain Hand Screw Machines P.F.T.
3—No. 3 S. & K. Plain Hand Screw Machines
2—No. 2 S. & K. Plain Hand Screw Machines.
4—12" W. & S. Turret Lathes with air chucks.
4—16" W. & S. Turret Lathes with air chucks.
4—No. 107 Wells Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jigger feed.
1—⅝-¾" Cleveland Automatic Screw Machine.

MILLING MACHINES AND GRINDERS

1—No. 2 Hendy Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Mill. Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drill. Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
1—No. 2½ Heath Universal Grinder.
1—No. 12 Modern Plain Grinder.
1—No. 14 Modern Plain Grinder.
1—No. 1 Landis Internal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.

DRILL PRESSES

1—3-spindle 8" overhang Henry & Wright High Speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.

SHAPERS AND PLANERS

1—36 x 36 x 10' New Haven Planer, S.H.
1—27 x 27 x 7' Cincinnati Planer, S.H.
1—24 x 24 x 6' Flather H.P. Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS

1—Waterbury Farrell O.B.I. Press, geared.
1—Wright Heavy Stamping Press, 76" housings.
1—No. 55 Toledo S.S., B.G., 10" stroke.
1—No. 55 Toledo S.S., B.G., 14" stroke.
3—No. 2-W Bliss Wiring Presses.
1—No. 5 Michigan O.B.I. Plain Press.
1—No. 5 Niagara O.B.I. Plain Press.
1—No. 4 Niagara O.B.I. Plain Press.

AIR COMPRESSORS

1—9 x 11 Chicago Pneumatic Belt Driven Air Compressor.
1—8 x 8 Fairbanks-Morse Belt Driven Air Compressor.
1—8 x 8 Gardner Single Belt Driven Air Compressor.
1—8 x 8 Ingersoll-Rand Belt Driven Air Compressor, inclosed.
1—8 x 6 Westinghouse Steam Air Compressors.
1—8 x 6 Ingersoll-Rand Belt Driven Air Compressor.

We also carry a large assortment of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machine tools large and small.

RIVERSIDE MACHINERY DEPOT
29 St. Aubin Ave.,
DETROIT, MICH.

Good Used Equipment

Traveling Cranes.

20-ton Browning Trolley, 5-ton zux., 56½" ga. (new).
20-ton Shaw, 56' 3" span, 110 V.D.C.
10-ton Case, 58' 3" span, 220 V.D.C.
20-ton Box, 49' span, 220 V.D.C.

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Single 48" tht., cap. 3 x 1¼", Providence.
Single 6" tht., cap. ⅞ x ⅞", Cleveland.
Single 15" tht., cap. ¾ x ½" (hand) new Doty.
Single, 9" tht., cap. 1 x 1", belted (3).
Single, 27" tht., cap. ¾ x ¾", belted.
Single, 32" tht., cap. 1 x 1", belted.
Double 15" tht. cap. ¾ x ¾" Fischer.
Double, Queen City, 12" thts., cap. ⅝" x ⅝".
Double 12" blades, bar shear, cap. 2" sq., crucible.
Univ. Plate Shear, 18" blades, cap. ¾", Cleveland belted.
Univ. Plate Shear, 26" blades, cap. ½", Lewis belted.
Guillotine Shear, cap. 2½" sq., belted, Perkins No. 6.
Guillotine Shear, No. O. H. & J., 6 and 7" blades (2).
Guillotine Shear, Fisher, 21" blade, cap. 8 x 2".
Squaring Machine 120", cap. 3/16".

Miscellaneous.

Bolt Cutter, Acme 2", Class A, single head, dies.
Boring Mill, 10' Niles, Vertical, 2 heads.
Forging and Upsetting Machine, 1½" Acme, with dies.
Forging and Upsetting Machine, 2½" Ajax.
Hammer, 80-lb. Bradley, Cushion Helve.
Hammer. 35-lb. Maggowan & Finigan (Perfect). belted.
Rotary Planer, 36" Cleveland, motor driven.
Rotary Planer. 60" Cleveland, motor 60 cy., 440 V.
Milling Machine, No. 24 Osterlein Universal.
Pipe Machine, 8" E. C. & B.
Pipe Machine, No. 11 Jarecki.

GOOD CONDITION.
PROMPT SHIPMENT.

McGoy-Brandt Machinery Co.
216-18 Penn Ave.
PITTSBURGH, PA.

Machine Tools For Sale

1—No. 3 Foster Turret Lathe,
1—16" Fox Monitor Lathe,
1—Graham Double Disc Grinder,
2—Bilton Gear Cutters,
1—24" London Machine Tool Shaper,
1—No. 3 Bliss Spinning Lathe,
1—No. 5 Bliss Spinning Lathe,
4—Ford-Smith Shrapnel Tool Grinding Machines,
1—No. 23½-B Niagara Toggle Drawing Press,
1—No. 66 Consolidated Press,
1—400 pound Bliss Drop Hammer,
1—No. 5 American Gas Forge,
1—No. 16 American Oven Furnace,
1—12 x 42 Landis Grinder,
1—10 x 30 Landis Grinder,
3—No. 3 Waymoth Variety Lathes,
2—Waymoth Pointing Machines,
1—Crescent Universal Borer,
1—35 H.P. "Heer" Stationary Gasoline Engine,
1—15 H.P. International Portable Gasoline Engine,
1—15 H.P. International Stationary Gasoline Engine,
1—7 x 10 Double Cylinder Single Drum Hoist,
2—6 x 8 Double Cylinder Single Drum Hoists,
1—7 x 10 "Jenckes" Special Winding Engine (for Cableway)
1—20 K.W., D.C. Generator, 115 Volts,
1—8 x 10 Ideal High Speed Steam Engine,
2—40 H.P. Locomotive Type Boilers,
1—60 H.P. Locomotive Type Boiler,
1—75 H.P. Return Tubular Boiler, with full front fittings,
1—15 H.P. Upright Boiler,
3—150 H.P. Return Tubular Boilers, full front fittings,
15-Ton 20 lb. Rail with fasteners,
1—½ Yard London Concrete Mixer mounted on trucks, complete with water tank and automatic loading skip,
1—12 x 18½ x 12 x 10 Worthington Steam Pump,
1—14 x 12 x 14 Worthington Steam Pump,
1—20 H.P., 2 phase, 440 volt, 1200 R.P.M. Electric Motor,
1—75 H.P., 3 phase, 2200 volt, Electric Motor,
1—450 H.P. Goldie & McCulloch Corliss Engine,

We would be glad to hear from you with regard to the above.

The General Supply Co. of Canada, Ltd.
Ottawa, Canada

(26)

USED MACHINERY IMMEDIATE DELIVERY

DRILLING MACHINES.

30" Lodge & Davis, S.H., B.G., P.F.
No. 0 Bickford Radial, tapping attachment.
4' Mueller Plain Radial.
Four No. 310 Baker Heavy Duty.
3-spindle Rockford.
4-spindle Rockford.
4-spindle Washburn, with power feed.
4-spindle Allen.
No. 11 Pratt & Whitney, 10 spindles.

GEAR CUTTERS.

24" x 7" G. & E., spur gears.
No. 3 26" B. & S., spur gears.
30" x 9" G. & E., spur and bevel gears.
36" x 9" G. & E., spur and bevel gears.
36" Walcott, spur gears.
No. 1 Schuchardt & Schutte Gear Hobber.

GRINDERS.

No. 1 Cincinnati Universal Tool and Cutter.
No. 1½ Cincinnati Cutter and Tool.
No. 2 Woods Tool and Cutter.
Brainard Cutter.
Leland Universal, with power feed.
No. 2 Landis Universal.
No. 6-A Diamond Universal.

LATHES.

10" x 5' LeBlond, C.R., with chuck.
14" x 6' Hamilton, C.R., chuck.
14" x 6' Rockford, C.R.
15" x 6' Rockford Tool Co., C.R.
15" x 6' Prentice Lathe, C.R.
16" x 8' Bradford, C.R.
18" x 6' Bradford, C.R., taper attachment.
18" x 8' Lodge & Shipley, pat. head, C.R., taper attachment.
20" x 14' Blaisdell, C.R.
21" x 12' New Haven, C.R.
24-27½" x 14' Lodge & Shipley, selective geared head, Q.C.G., 18" chuck fitted.
24-27" x 12' Reed-Prentice, geared head, single pulley drive.
32" x 12' Schumacher & Boye, 28" chuck, fitted.
36" x 18' Schumacher & Boye, T.B.G., Q.C.G.
36" x 20' American, T.B.G.

PLANERS.

24" x 24" x 6' American, one head.
26" x 26" x 8' Pease, one head.
36" x 36" x 8' Powell, 2 heads.
36" x 36" x 14' Sellers, one head.
39" x 39" x 12' New Haven, one head.

SCREW MACHINES.

No. 1 Warner & Swasey, plain head.
No, 2 P. & W., friction head.
No. 3 Pratt & Whitney, B.G., double friction head, A.C. and W.F.
No. 3 Bardons & Oliver, plain head, A.C. and W.F.
No. 4 Pearson, friction head, A.C. and W.F.
No. 5 Foster, geared friction head, A.C., P.F. to turret slide, and P.F. to cross slide.

TURRET LATHES.

No. 2 Foster-Kimball, plain head.
No. 22 Garvin, plain head.
16" Lodge & Davis, back geared.
16" Warner & Swasey, friction head.
2 x 24" J. & L., cone head.
24" Gisholt, 4¼" spindle hole, taper attachment.
No. 3-A Warner & Swasey, bar attachment.

PUNCHES AND PRESSES.

No. 2 Rockford, O.B.I.
No. 20 Thiem, O.B.I.
No. 3 Loshbough-Jordan, O.B.I.
No. 3 Loshbough-Jordan, O.B.I.
No. 4 Rockford, O.B.I.
No. 4 American Can., O.B.I.
No. 74½ Bliss, str. side, geared.
Blake & Johnson Embossing.

MISCELLANEOUS.

7'-10' Betts Boring Mill.
No. 2 Garvin Auto. Tapper.
No. 2½ Hendey Lincoln Type Miller.
No. 24 Oesterlein Universal Miller.
4" Nutter & Barnes Cutting-off Machine.
6 x 48" P. & W. Thread Miller.
No. 3 Cincinnati Vertical Milling Machine.
20 H.P. Nash 2-cylinder Vertical Gas Engine.
6 H.P. Fairbanks-Morse Horizontal Gas Engine.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., CHICAGO, ILL.

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15" three-jawed chuck.
1—Lathe, 28" swing, 8' bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22" Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15" three-jawed chuck.
1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 24" wheel.
1—Lathe, 14" swing, 6' bed.
2—Ford Smith Shell Grinders, complete.
1—17" LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
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1—6 H.P. Canadian General Electric Motor for same.
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26-in	Swing—	18-ft.	Bed
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24 "	"	16 "	"
24 "	"	14 "	"
24 "	"	12 "	"
21 "	"	12 "	"
21 "	"	10 "	"
18 "	"	12 "	"
18 "	"	10 "	"
18 "	"	8 "	"
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2—32" Bullards, 1 turret head.
1—37" Baush, 2 heads.
1—37" Bullard, 2 heads.
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2—10' Niles, 2 swivel heads.

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1—No. 2 Barrett, 5" bar.

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1—No. 2 Williams & White, 16" stroke.
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1—No. 12 Ajax, single pulley drive.
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1—4" Hurlburt & Rogers.
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6—8" Automatic.

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1—NEW Walker No. 2, outfit K, capacity 9"x26".
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3—NEW 8" x 30" Modern Self-contained.
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1—12 x 36" Cincinnati.
1—No. 4 Cincinnati; capacity 12 x 72".

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1—Colburn 4", capacity 43" stroke.
1—No 2 Knowles, 60" stroke.

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1—16" x 6' Prentiss, geared head, quick-change, taper attach.
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3—NEW 16" x 6' Cleveland Tool Room Lathes, complete equipment.
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12—NEW 17" x 8' LeBlond Pan Bed, Quick Change Gears.
1—18 x 8 Prentiss, geared head, taper attachment, quick change.
3—20 x 8 Lodge & Shipley, quick change, turret on ways.
1—NEW 2 " x 10' Cleveland Geared Head.
2—20" x 10' Lodge & Shipley, quick change.
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7—22" x 10' Putnam, oil pan and pump.
1—NEW 24" x 10' American, high duty, quick change.
2—24" x 10 Lodge & Shipley, quick change.
1—24" x 10' Schumacher & Boye, quick change, taper attachment.
1—NEW 26" x 48" x 12' McCabe Double Spindle.
1—NEW 26" x 48" x 22' McCabe Double Spindle.
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3—27" x 12' Bridgeford Heavy Duty, plain turning, 2 carriages, motor driven.
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1—30" x 14' Lodge & Shipley Single Pulley Drive. Quick Change.
1—NEW 36" x 12' Pittsburg Pattern.
1—36" x 13' Putnam, face plate drive.
1—36" x 17' Pond, triple geared, quick-change.
1—36" x 16' New Haven, quick change.
1—36" x 20' American, triple geared.
6—40" x 18' Pittsburg, quick change, gear, face plate drive.
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1—84" x 18' Special Boring Lathe.

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2—21" Gisholt, 18" chuck, quick traverse, taper attachment.
5—2 x 24 Jones & Lamson.
1—NEW 18" Libby.
3—24" Libbey, Universal Facing Head, 3-jaw chuck.
18—6A Potter & Johnson.
1—NEW 3¼" x 4" Greenlee.
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1—24" Davis.
1—No 24 New Britain, arranged for motor drive; almost new.

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1—No. 2 Kempsmith, Vertical Attachment.
1—No. 2 Kempsmith 13" Dividing Head.
1—NEW No. 2 Kempsmith.
1—No. 1½ Cincinnati.
1—NEW No. 2 Rockford High Power.
2—NEW No. 2 Garvin.
3—No. 2 Cincinnati.
1—No. 2 LeBlond.
2—NEW No. 3 Cincinnati High Power; Jan. del.
1—NEW No. 3 Kempsmith.
1—No. 25 Oesterlein.
1—NEW No. 34 Oesterlein Heavy Duty; latest type.

MILLING MACHINES—Knee Type, Plain.
1—No. 0 Cincinnati.
1—NEW No. 2B Brown & Sharpe, heavy type.
1—NEW No. 2 Rockford.
1—No. 2 Cincinnati.
1—No. 3 Cincinnati, single pulley drive.
1—No. 3 LeBlond.
1—NEW No. 3 Cincinnati.
2—No. 3 Kempsmith.
1—No. 15 Garvin.

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4—Morris-Thompson, arranged for motor drive.
10—No. 3 Lees-Bradner.
5—No. 3C Lees-Bradner, for 9.2" English shells.
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3—NEW No. 2 Pratt & Whitney.
2—NEW No. 3 Garvin.
10—NEW Becker, table 20" x 5½".

MILLING MACHINES—Vertical.
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1—No. 3 Cincinnati Heavy Duty.
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3—NEW No. 5-B. Becker; Rotary Table.
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1—Ingersoll Slab 16" x 48" capacity.
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1—22" x 22" x 5' Ingersoll.
1—24" x 24" x 12' Bement & Niles.
1—30" x 30" x 8' Ingersoll No. 928, Single Spindle with Motor.

MILLING MACHINES—Lincoln Type.
2—Briggs type, high duty.
3—NEW No. 4 Sterling.
14—No. 7 Becker.

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1—24" x 12' Detrich & Harvey, open side, one head, also milling attachment.
1—25" x 8' Detrich & Harvey, open side, good as new, one head.
1—26" x 26" x 10' Gray, one head.
1—36" x 36" x 10' American; 2 Heads.
1—36" x 30" x 12' Detrich & Harvey, open side, 3 heads.
1—36" x 36" x 14' Pond; one head.
1—36" Rotary Planer, Motor Driven.
1—36" x 36" x 8' Gray; One Head.
1—42" x 36" x 14' American, 2 heads.
1—42" x 42" x 12' Butler, high speed, 3 heads; almost new.
1—48" x 48" x 12' Scott; Heavy Type; Milling Attachment, on Rail.
1—60" x 60" x 16' Betts; 2 Heads.
1—60" x 60" x 21' Pond; 3 Heads.
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1—72" x 60" x 14' Smith Globe; 2 Swivel Heads.

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1—Providence Steam-driven Punch, 48" throat, cap. 3" through 1¼"; almost new.

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1—1" Pierce.
10—NEW No. 2 Owens Kent, wire feed, automatic chuck, 1 1/16" capacity.
4—20" Cincinnati Acme, friction geared head.

SCREW MACHINES—Automatic
2—NEW ⅝" Cleveland, Model A.
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10—1¾" Gridley, mult. spindle; good as new.
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4—4¼" Gridley, single spindle.
2—No. 0 Brown & Sharpe.
2—No. 1 Brown & Sharpe.
1—No. 2 Brown & Sharpe.
9—No. 56 National Acme, mult. spindle, 2¼" cap.
1—No. 515, 9-16" capacity, National Acme; late model.

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1—NEW 16" Springfield.
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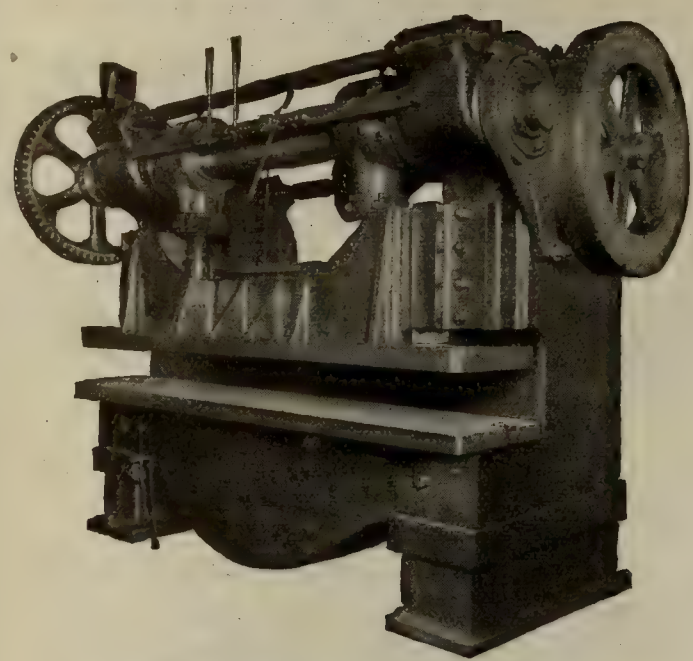

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1—45" x 12' Niles Two-head Planer, with extensions.
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THE American Museum of Safety conferred a Gold Medal Award upon the Puro Sanitary Drinking Fountain at the First International Exposition of Safety and Sanitation.

The Puro Sanitary Drinking Fountain won because it deserved to win—Puro had merits that made it stand head and shoulders above any other drinking apparatus.

Safe Simple
SANITARY Economical
Quickly Attached

These are the qualities that forced the leading safety and sanitary engineers to pick Puro in preference to all others.

No device can be as efficient that does not contain all these qualifications; and Puro was not tied for first place; Puro was first.

Don't be satisfied with half-way goodness, or makeshift drinking arrangements for your employees.

If the men in your factory must drink, give them a clean drink.

Puro is clean—it does not rust or corrode.

Puro is economical. It allows just the proper amount of cool, clean, fresh water to come through the bubbler. No spurting, no overflowing, no loss. Puro regulates itself. You can attach it in five minutes.

Tell us how many men in your factory and your water pressure in pounds—

We'll tell you just what it will cost to "PURO-FY" YOUR WATER SUPPLY.

PURO SANITARY DRINKING FOUNTAIN

TRADE MARK

147 University Ave. TORONTO, ONT.

Prompt Deliveries

on Gauges, Tools, Dies, Jigs and Fixtures.

Special Machinery

CUT GEARS

Contracting and Repairing Machinists

Quotations cheerfully submitted.

Normac Machine Co.

55 Vine Street, St. Catharines, Ont.

If interested, tear out this page and keep with letters to be answered.

SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

"SERVICE"

At This Period "Service" is our

MOTTO

With our well equipped Tool Dept. we are in a position to give you immediate Service on all kinds of Tools, Gauges, Jigs, Fixtures, Dies, General Machine Work.

Equipment Overhauling

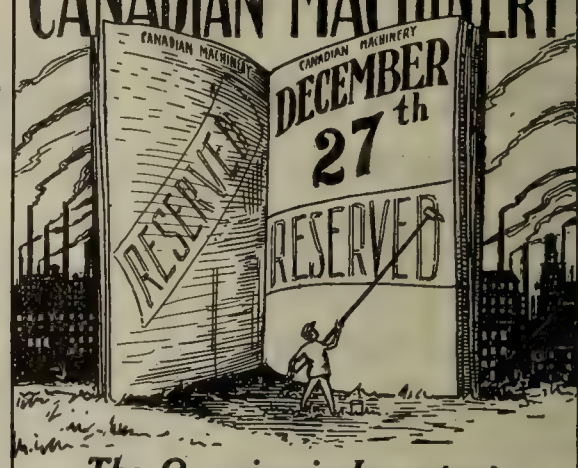
We also make Metal Stampings, Brass and Aluminum Castings.

ELECTRO-PLATING.

Monarch Brass Mfg. Co., Limited.

71 Browns Ave. TORONTO

Reserve Your Space NOW
IN THE
Annual Review Number
CANADIAN MACHINERY



The Occasion is Important
Do Justice to Your Line

SEE PAGE TWO FOR PARTICULARS

GEAR

GEARS AND GEAR CUTTING
SPROCKETS AND CHAINS

In stock and to order, any size from one-quarter inch to six-foot in diameter, any material. Estimates and gear advice cheerfully furnished.

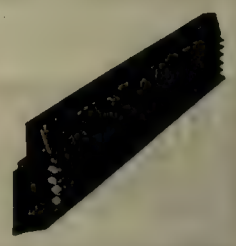
Grant Gear Works, Inc., 151 Pearl St. Boston, Mass. U.S.A.
G. B. GRANT

LANDIS MACHINE CO., INC.
WAYNESBORO, PENNA.

Manufacturers of BOLT and PIPE THREADING MACHINERY

Exclusive Canadian Agents:
Williams & Wilson, MONTREAL, CAN.

Write for Catalogue No. 22



WANTED
Work for Machine Shop

Details of Facilities Furnished on Request

KING CONSTRUCTION CO.
40 Dovercourt Road Toronto

COMPLETE MACHINES AND PARTS MANUFACTURED

Send us your sample or blueprint of work and get our estimate.

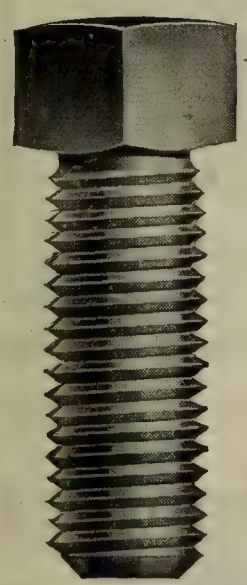
CANADIAN BARKER CO., LTD., Sault Ste. Marie, Ont.

SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

ACCURACY



The discriminating buyer is the one we like to meet—the one who insists on accurate product. He will eventually buy "GALT" Cap and Set Screws because they measure up to his standard

Your rush orders for S. F. Hex. nuts taken prompt care of. Better finished nuts—try a sample.

THE
GALT MACHINE SCREW CO., LIMITED
GALT, ONTARIO

Eastern Representatives: The Canadian B. K. Morton Company, Limited, 49 Common St., Montreal, Que.

Shell Manufacturers

Who expect **New Shell Orders** either from **Canada** or the **United States,** may need some of their shell equipment **overhauled** and **repaired** or **rebuilt.** We can handle it **completely, satisfactorily** and **promptly.**

NOW IS THE TIME.

The
Preston Machinery Co., Ltd.
PRESTON :-: ONTARIO, CANADA

(2)

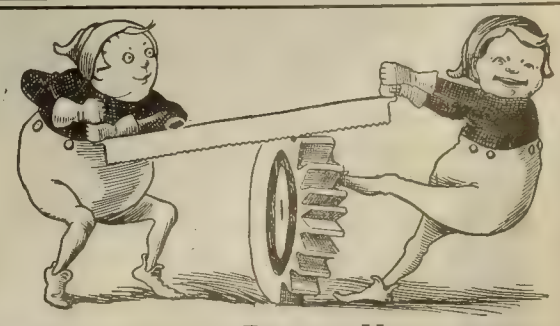
WE CAN SELL

Your second-hand machinery.

Let us tell you about the results from condensed ads in

CANADIAN MACHINERY
Classified Advertising Section

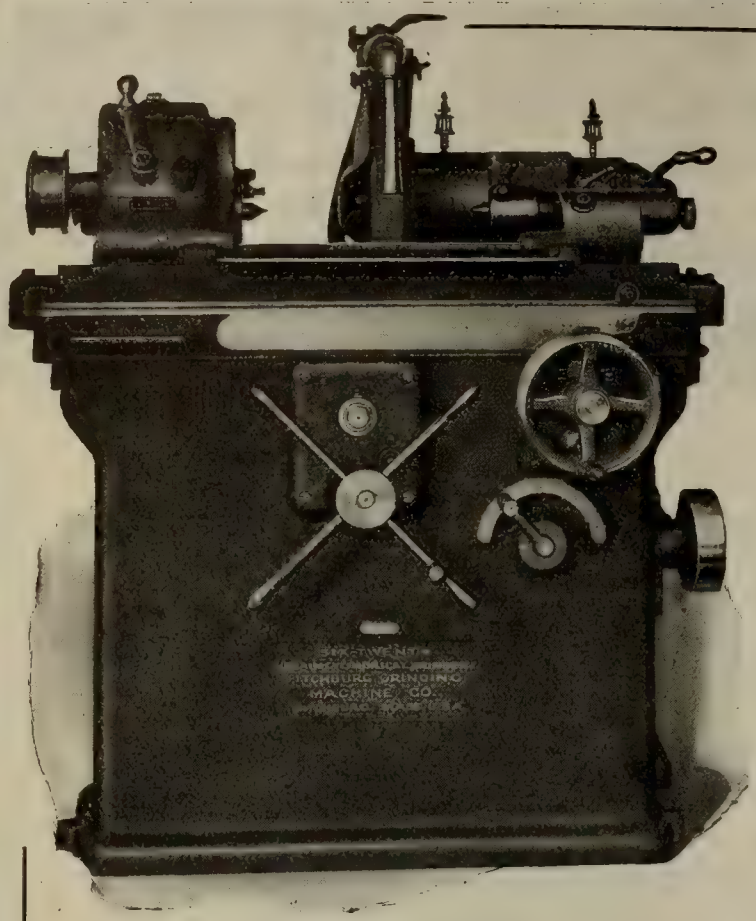
We Cut Gears
Rawhide, Steel, Iron, Brass.



We Make Grinder Heads, Power Hack Saws, Friction Pulleys, Index Heads.

We cut racks any width, any pitch, to 8 feet in length.
DESIGN AND BUILD SPECIAL MACHINERY

WINNIPEG GEAR & ENGINEERING Co.
197-199 PRINCESS ST., WINNIPEG



MODEL "B"

Six x Twenty Grinder

A Fitchburg Model

Equally as efficient on small work as on that of larger dimensions. Therein lies its value. It is a compact, energetic worker that will do more for its size than any machine of similar wheel dimensions. It is saving in floor space. Its speed will give you greater production. Investigation or trial will impress you. 1300 to 1800 R.P.M. 16 x 3 grinding wheel. 6 x 4 pulleys. 7 horsepower required. Floor space 52 x 66. Send for complete specifications.

Fitchburg Grinding Machine Co.
FITCHBURG MASS. U.S.A.

WE BUILD THEM BY HUNDREDS

Standardized Production enables us to offer this powerful **Waterbury Grinder** at such a low price. It grinds rapidly and accurately, all flat surfaces, dies, punches, planer, lathe, and other tools. Has adjustable table and tool rest with large radius of travel. Rigid, 3-point table supports giving great steadiness. A reliable, practical grinding outfit.

The Blake & Johnson Co., Waterbury, Conn.

Stow Shell Grinders Increase Production

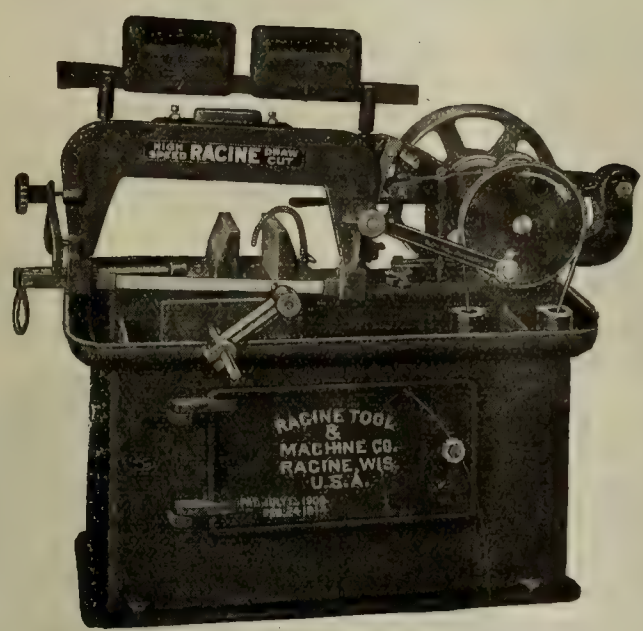
Suspended Pedestal Mounted on Truck

Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.
Binghamton, New York, U.S.A.
Oldest Portable Tool Manufacturers in America

NO DRAGGING BACK ON THE NON-CUTTING STROKE



To protect users of Racine High-Speed Metal-Cutting Machines, we carry a large stock of the famous Racine H.S. Tungsten Blades.

A patented device of this Racine High Speed Metal Cutting Machine automatically lifts the blade clear of the work on every return stroke.

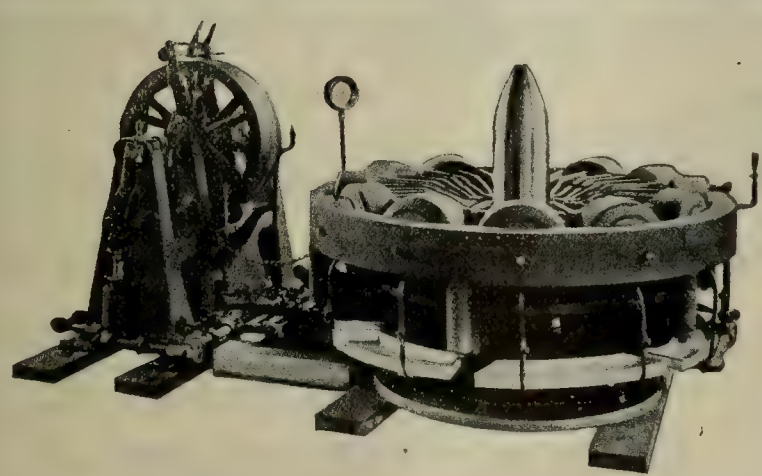
In this feature alone the Racine increases both output and endurance of the blade 500 per cent.

Therefore time saved—blades saved—would soon return to your pocket the reasonable cost of a Racine.

This fact—because it is a fact—could be proved to your satisfaction if you'd let us send you names of Canadian plants using Racines—one Montreal plant is using 168 — or if you'd let us ship a Racine on trial terms that you consider fair.

Write us to-day.

RACINE TOOL & Machine Co., 15 Melbourne Ave., Racine, Wis., U.S.A.



The New "West" Banding Press

For 9.2" and 8" shells

12 Cylinders; Ample Power; Ample Strength; Reasonable Price.

NO ACCUMULATOR REQUIRED.

The West Tire Setter Co.

255 Mill Street, Rochester, N.Y.

DON'T be governed by World-Wide Reputations and Previous Records in selecting your next Cutting-Off Equipment. The NEW IMPROVED PEERLESS High Speed Heavy Duty Metal Cutting Saw has completely revolutionized and upset all metal cutting standards.

This statement is based entirely upon the reports and repeated orders received from concerns that had heretofore used tools such as referred to.

To induce investigation we will gladly ship one for a comparative test. If you do not consider it the best and most profitable tool you have ever purchased, you are under no obligations to keep it, and we will stand the freight charges both ways.

Would you like to see a list of large manufacturers that are continually repeating their orders? We have it ready for you.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

If interested, tear out this page and keep with letters to be answered.

Better Cut Gears

Hamilton cut gears are better than ordinary gears, for they are the product of a highly specialized gear-cutting organization with years of experience behind it.

Let our engineering department help you solve your gear problems.

Hamilton Gear & Machine Co.

Van Horne Street - TORONTO

You Don't Like to Shave with a Blunt Razor

—It tries your temper and spoils your skin.

Then don't expect your men to file with blunt files.

It makes them *grouchy* and spoils *your* work.

That costs *you* money any way you look at it.

Give your men "Famous Five" files to work with, and you'll get good results; because "Famous Five" files are hard, sharp and retain their keen cutting qualities for the longest time.

Remember this and specify them when ordering. They are:

MAKE NAILS! NOT NOISE!

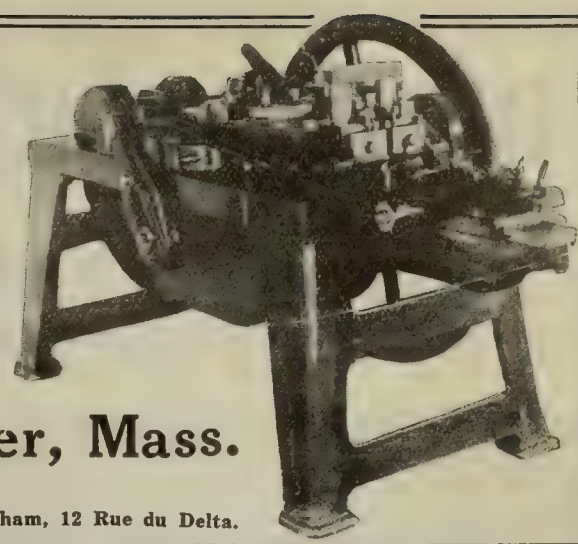
We offer the trade new types of

WIRE NAIL MACHINES

QUIET IN OPERATION; WITH VERY HIGH OUTPUT; ALL PARTS ACCESSIBLE; DECREASED MAINTENANCE COSTS; GREAT CAPACITY; OCCUPYING SMALL FLOOR SPACE.

Smoothly running machines, with balanced mechanical motions and no rotating cams. Built in 5 sizes, handling wire from No. 17 to ⅜" diam.

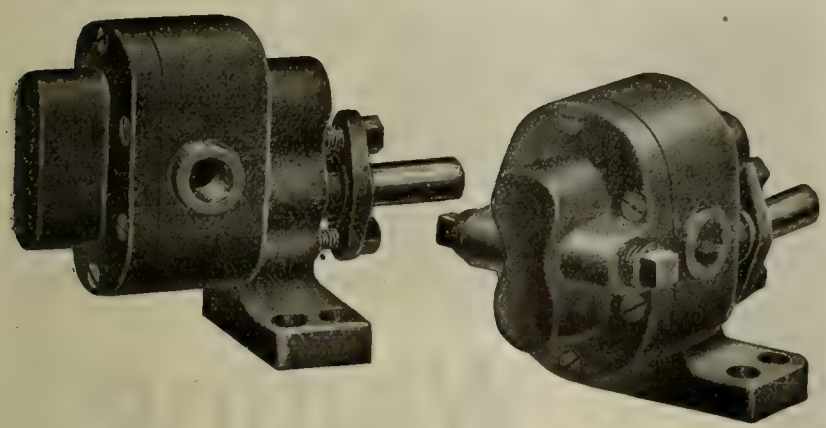
PRACTICALLY NOISELESS IN OPERATION



Sleeper & Hartley, Inc., Worcester, Mass.

CANADIAN BRANCH, COATICOOK, P.Q.

London, England, F. A. Perry, 63 Queen Victoria Street, E.C. 4. Paris, France, Edgar Bloxham, 12 Rue du Delta.



Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

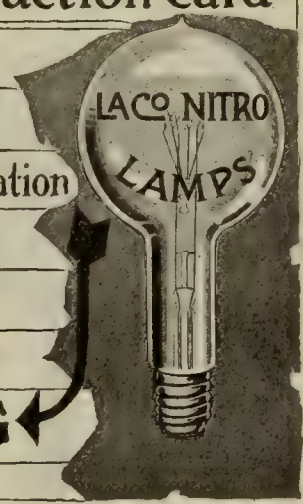
Inquire. You will get valuable information anyway.

C. F. ROPER & CO.

Hopedale : Mass. : U.S.A.

Cost of Production Card

Material
Labor
Machinery Depreciation
Spoilage
Errors
Overhead
LIGHTING



LACO NITRO LAMPS

May cost you a trifle more
But they save
30% TO 50%
OF YOUR LIGHTING EXPENSE

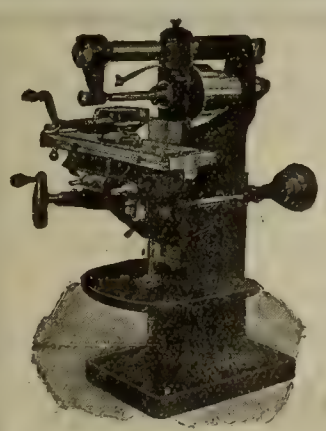
This will buy new lamps after the minimum guarantee period of 1,000 hours of service is completed, although longer service is usually secured from these lamps.

ASK YOUR DEALER.

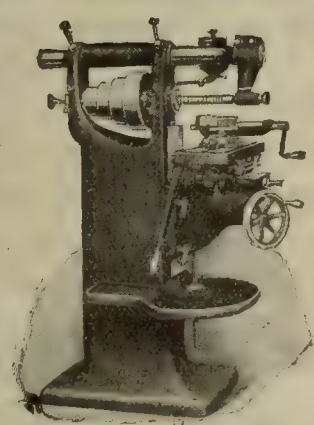
CANADIAN LACO-PHILIPS CO., Limited

Stocks Available at
MONTREAL TORONTO WINNIPEG and VANCOUVER

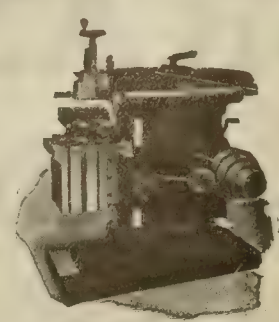
Increased Production Means Increased Profits



Large Millers
for large work
—STEPTOE
MILLERS
for small work.



Large Planers
for large work
—STEPTOE
SHAPERS
for small work.



Will result in increased production; less money invested in machinery, and increased profits.

THE JOHN STEPTOE COMPANY

CUMMINSVILLE, CINCINNATI, OHIO, U.S.A.

Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.

If any advertisement interests you, tear it out now and place with letters to be answered.

DEPENDABILITY

Has Made

HARRIS HEAVY PRESSURE

THE MOST POPULAR BABBITT METAL IN THE DOMINION

Manufactured by

THE CANADA METAL CO., LTD.

Hamilton, Montreal, TORONTO, Winnipeg, Vancouver

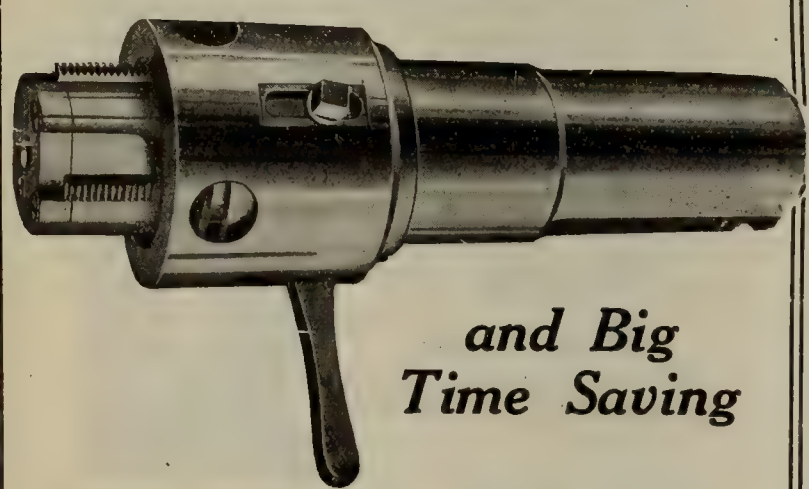
IT FLOWS FREELY

IT WILL NOT CRACK

IT IS COPPER COATED

IT IS COPPER HARDENED

For Positive Accuracy—

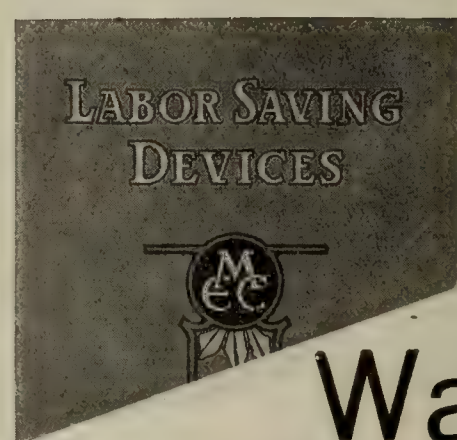


and Big Time Saving

VICTOR Collapsible TAPS

"Victor" Collapsible Taps are simple in construction; the few parts can be made large and strong; the body is machine steel, and the chasers are high-speed; screw adjustment from front end makes it easy to maintain close accuracy; trip is automatic; reset by means of lever. The above features—and others—make the "Victor" a time and money saver for severe service. It is being used by many shell manufacturers.

Victor Tool Company
Waynesboro, Pa., U.S.A.



Waiting Your Request

Is the M.E.C. illustrated catalog. It describes minutely the most dependable labor-saving devices including these deservedly famed

M E C Air Cylinders, Air-Operated 2 and 3 Jaw Chucks, M.E.C. Master Hinge Collet Chucks and Collapsible Taps.

In your hands it will point the better way to compensate for any shortage of skilled labor with which you may be contending. Write to-day for your copy.

MANUFACTURERS EQUIPMENT COMPANY

75-179 N. JEFFERSON STREET, CHICAGO, ILL.

Canadian Agents: J. R. Stone Tool and Supply Co., Detroit, Mich.
New York: J. R. Stone Tool and Supply Co., 30 Church Street

BRASS Castings

The coupling of expert work with unexcelled equipment enables us to produce on a large scale Brass Castings of any size or alloy.

Our prices, too, are most reasonable; for our large purchases direct from the smelters command their every price favor.

For better Brass Castings at a money saving, send your orders to us. We promise that our work will please you.

The St. Lawrence Welding Company, Ltd., Montreal, P.Q.

Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, Etc. Electric Welders, Oxy-Acetylene Welders. Boiler Repairs. Lead Burning and Brass Foundry Work.

Office: 138 Inspector Street Works: 39 Olier Street Telephone: Office, Main 5779, Manager's Res., Westmount 3483

CHAPMAN

DOUBLE BALL BEARINGS

The ordinary line shafting consumes from 15 to 60 % of power developed—

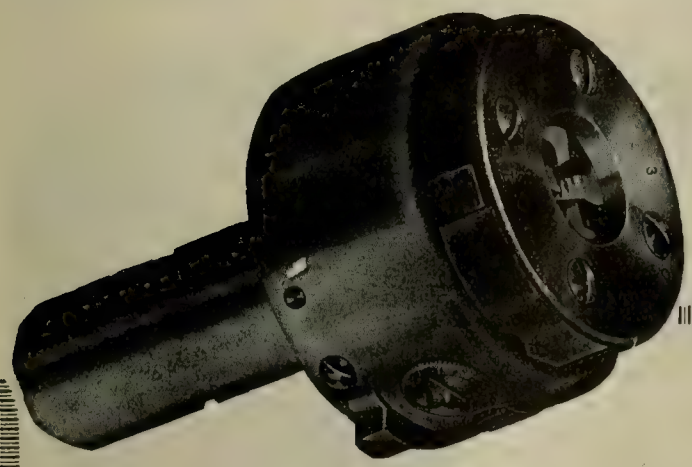
But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.



Your Die Heads

are giving you the kind of threads you are now getting. Do you like them? Is the head consuming too much of your time, adjusting and repairing? H. & G. Automatic Self-opening Die Heads eliminate all that. The chasers are locked, and no stoppage or changing in size required. The quick release allows cutting to a certain point each time. It also permits cutting right up to the shoulder when necessary.

Our booklet will tell you all about it. Write for it, anyway; it is valuable to have around.

Eastern Machine Screw Corp.
New Haven, Conn., U.S.A.

H & G

IF self-interest be the mainspring of a man's actions, then you should act at once, because the "Clipper" Belt Lacer saves money for you.

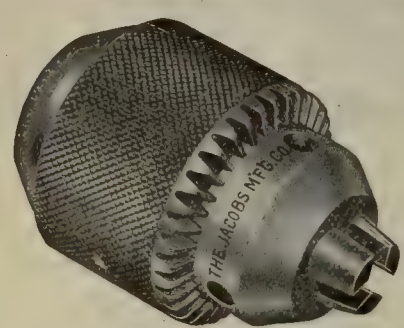
Each time a belt breaks from 1 to 150 men and machines are idle.

"Clipper" lacings have been made in 45 seconds. The maximum time required is only three minutes. How long are *your* men and machines idle when a belt breaks?

Clipper Belt Lacer Company
976 Front Avenue Grand Rapids, Mich.

JACOBS

IMPROVED DRILL CHUCK



There is no "chuck reason" for poor holes or broken drills when this chuck takes hold. No wobbling—no slipping or chewing up of shanks—just "In Again—Out Again," leaving as clean a hole as the drill can make.

You can always depend on a Jacobs to back you up when you wish to try out some new, faster cutting drill. Give some a trial.

The Jacobs Mfg. Company
Hartford, Conn.

Handle 75-M/M Shells Just Once

Two Murchey Taps on your lathe completely finish this shell so that when it comes off the machine there is no more handling or re-sizing to do. Therefore

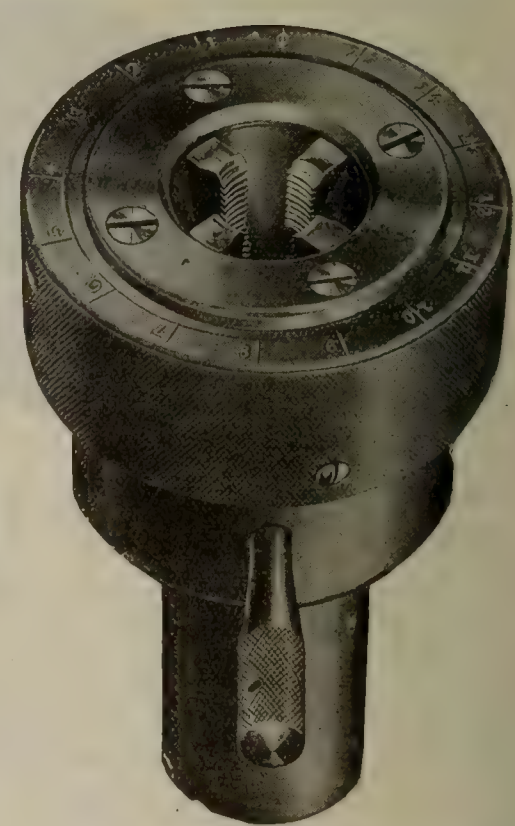
Murchey Tap Them

By using Murchey Collapsing and Adjustable Taps, you save two minutes or more on every 75-mm. Shell. Figure that in dollars for yourself!

Practically all the large plants of the United States are lining up with Collapsing Taps to thread the nose of this shell. No minute must be knowingly wasted.

Murchey Chasers are quickly adjusted to compensate for wear, and Murchey Adjustable Taps serve as long as ten solid Taps.

WRITE AT ONCE FOR ALL PARTICULARS.



Murchey Machine & Tool Company
75 Porter Street, Detroit, Mich.

The Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, S. W., England, Glasgow, Newcastle-on-Tyne, and Fenwick Freres & Company, 15 Rue Fenelon, Paris, France

Lightning Deliveries
—That is Murchey Service

"Each Operator Averaged 10 More Shells per Day"

In his report to plant owner the works manager quoted recommended disposal of all remaining screw-operated box chucks.

His report was made three months after a partial change to Hannifin Air Chucking.

Six weeks later every lathe in the plant was equipped with Hannifin Air Operated Chucks.

At this time Hannifin Air Operated Mandrels were also installed.

The plant in question is producing 6-inch shells.

It is nothing unusual for Hannifin Air Operated Chucking and Clamping Equipment to add an extra day in time saved to each week.

In many of the largest plants in this country and Canada, Hannifin Air Operated Equipment has increased output from 20 to 80 per cent. In a number of plants it has actually *doubled* output.

If your work requires quick handling and rigid never-slip grip, for you to do without Hannifin Air Operated Chucking and Clamping Equipment is to do without profits within your reach.

Say you would like our catalog.

HANNIFIN MFG. COMPANY, Chicago, U.S.A.

LOCAL REPRESENTATIVES: C. C. Firmin, Detroit; Carl Naumann, Syracuse; R. E. Ellis Engineering Company, Chicago, Ill.
FOREIGN REPRESENTATIVES: A. R. Williams Machy. Co., Ltd., Toronto, Can.; Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, Glasgow and Newcastle-on-Tyne; Fenwick Freres & Company, 1500 Rue Fenelon, Paris, France; Iznosskoff, Suckau & Co., Petrograd, Moscow, Ekaterinberg and Odessa, Russia.

HINTS TO BUYERS

TRADE MARK
BRISTOL'S
REG. U. S. PAT. OFFICE.

ELECTRIC PYROMETERS
FOR EVERY SERVICE

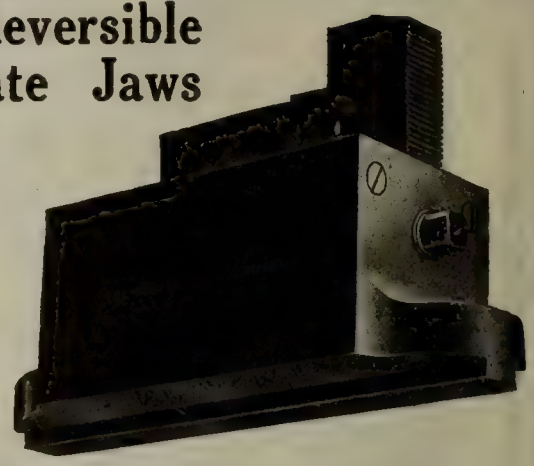
Bristol's Recording Pyrometer furnished with patented frictionless smoked chart recording system, especially valuable for processes requiring continuous heat treatment.

Simplicity of construction and ruggedness make them ideal shop pyrometers. The ONLY pyrometer equipped with Weston milli-voltmeter movement.

Write for Bulletin I-205.

THE BRISTOL CO.
WATERBURY, CONN., U.S.A.

Skinner Reversible Face Plate Jaws



Everything in the line of Chucks.

Write for illustrated catalog.

Iron or Steel Body, Single Rib for Large Lathes and Double Ribs Boring Mills

THE SKINNER CHUCK CO.

Factory and Main Office: New Britain, Conn.

New York Office: 94 Reade St. | San Francisco Office: Rialto Bldg. | London Office: 149 Queen Victoria St.

Uncertainty becomes Certainty when you have your material and apparatus tested and inspected by us.

Get the benefit of many years of service.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED

Head Office and Main Laboratories—MONTREAL

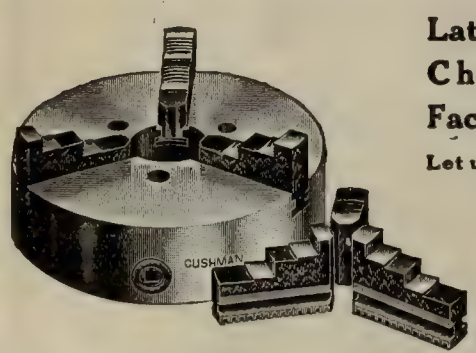
Branch Offices and Laboratories:
TORONTO, WINNIPEG, EDMONTON, VANCOUVER, NEW GLASGOW

STEEL CASTINGS

We are well equipped to make all kinds of steel castings, 100 lbs. to 50,000 lbs.

Dominion Steel Foundry Co.
LIMITED
Hamilton Ontario

Cushman Chucks



Lathe Chucks, Drill Chucks, Portable Face Plate Jaws.

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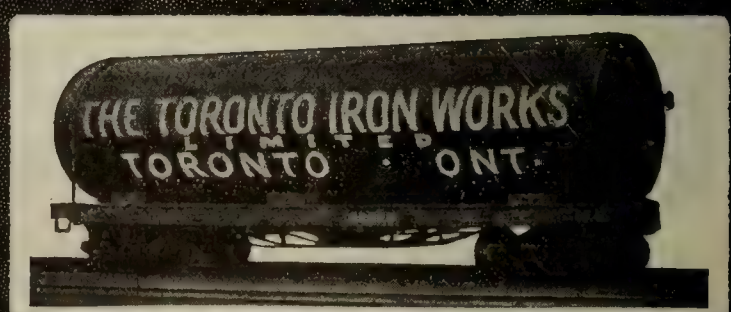

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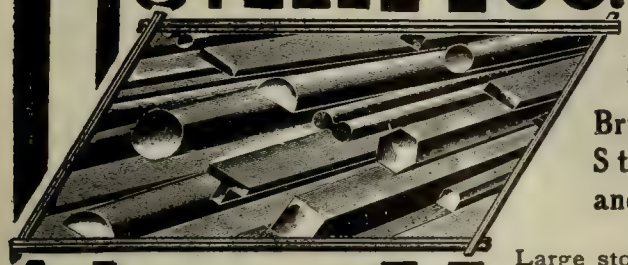

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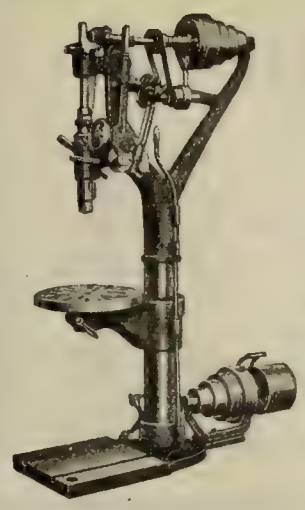

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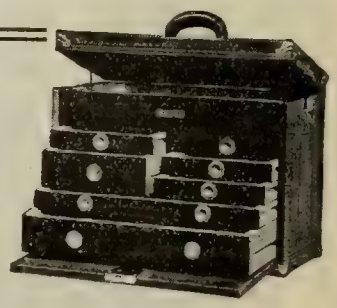

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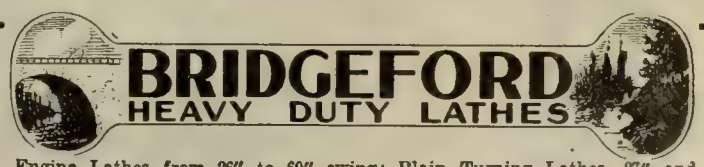

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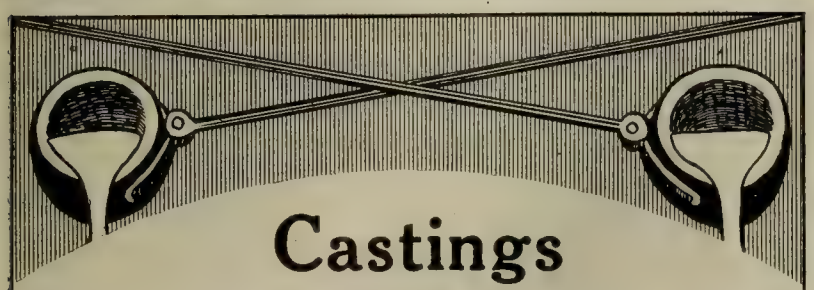

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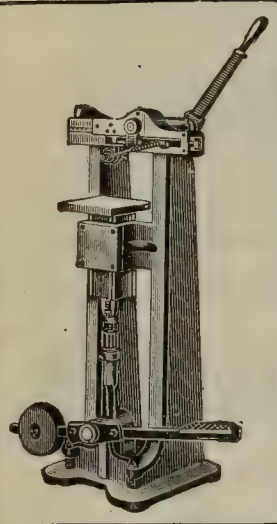

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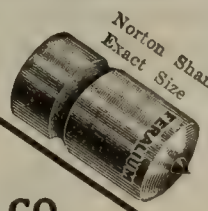

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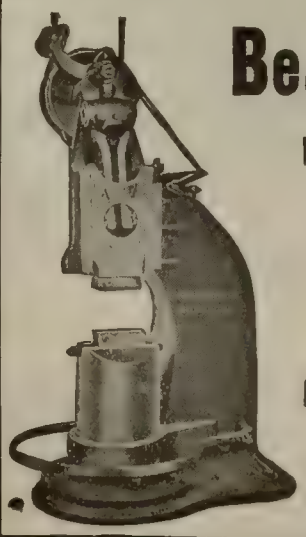

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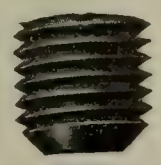

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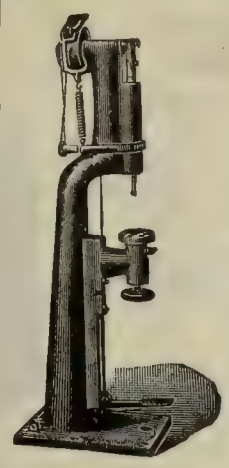

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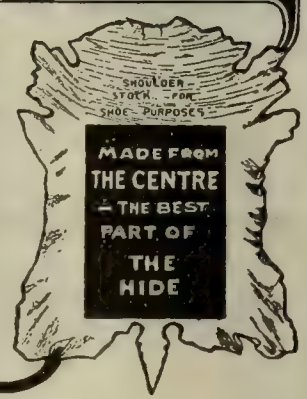

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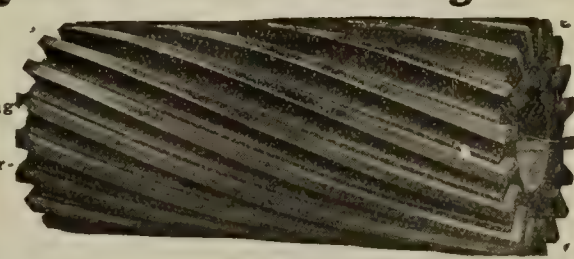

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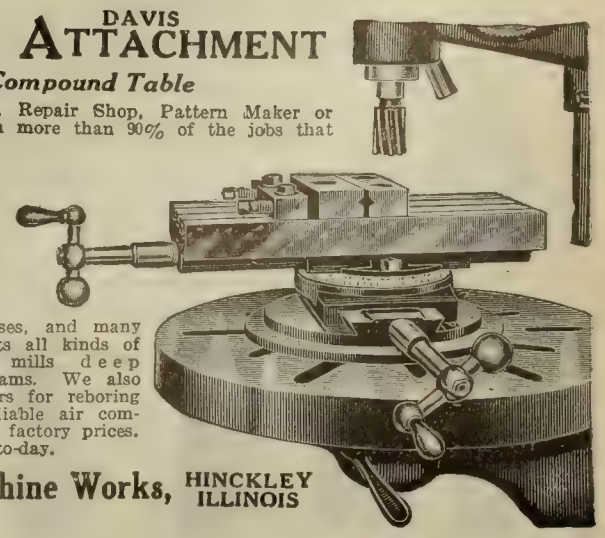

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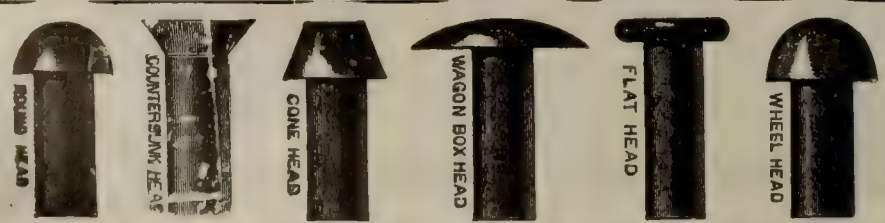

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Steel Bending Brake Works, Chatham, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
Toronto Iron Works, Ltd., Toronto, Ont.

BLASTING MACHINES, SHOT AND STEEL GRIT
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U. S. Silica Co., Chicago, Ill.

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Sheldons, Ltd., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Sturtevant Co., B. F., Galt, Ont.

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L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

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Dominion Central Drawing Office, McGill Bldg., Montreal, Que.

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Geo. A. Joyce Co., Ltd., New York, N.Y.

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MacKinnon, Holmes Co., Sherbrooke
Marsh & Henthorn, Ltd., Belleville, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Sterling Engine Works, Winnipeg, Man.

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Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

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Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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Canada Machinery Corp., Galt, Ont.
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Gardner & Son, Robt., Montreal.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
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Northern Crane Works, Walkerville.
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Dominion Bridge Co., Montreal.
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Northern Crane Works, Walkerville.
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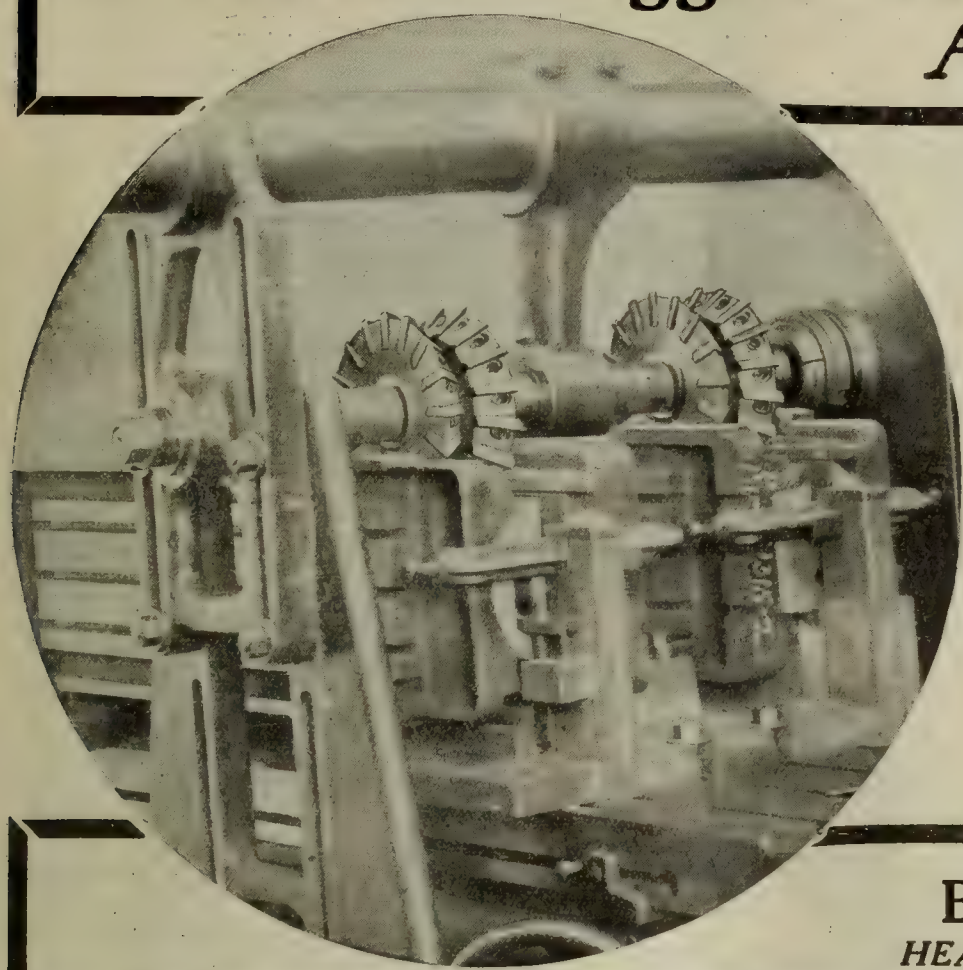

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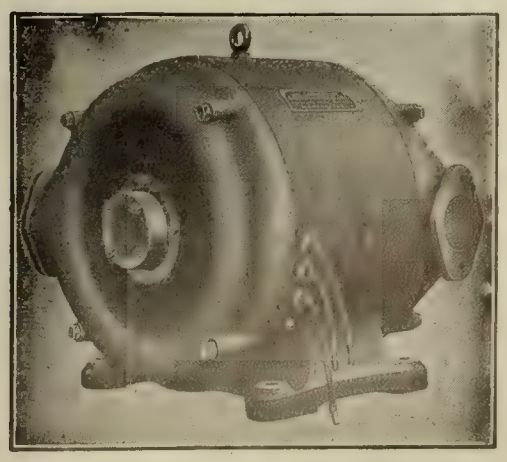

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Prest-O-Lite Co., Inc., Toronto, Ont.
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Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
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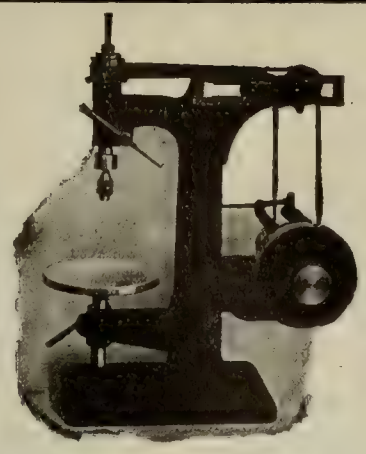

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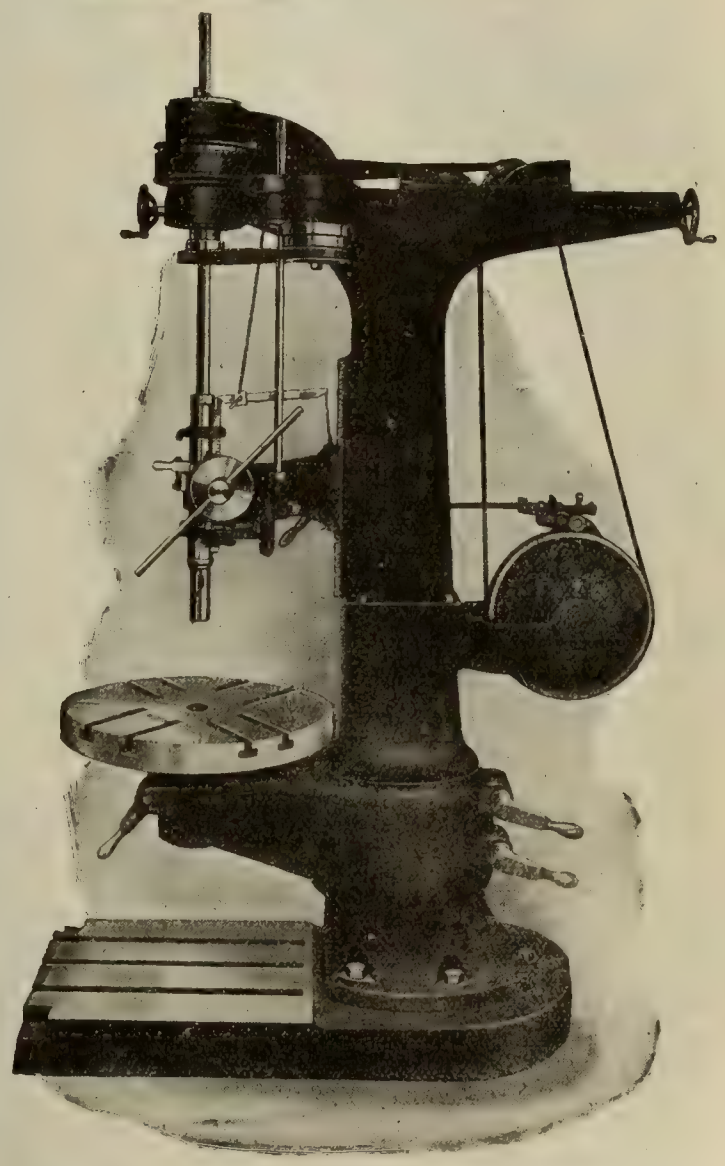

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Greenfield Machine Co., Greenfield, Mass.
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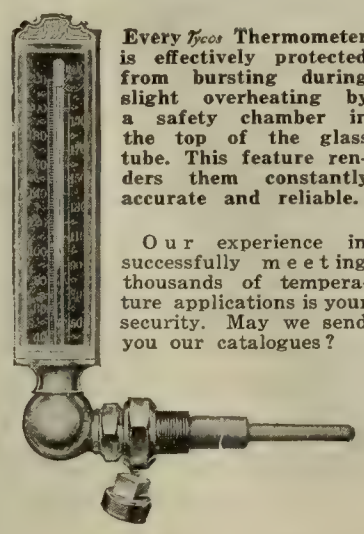

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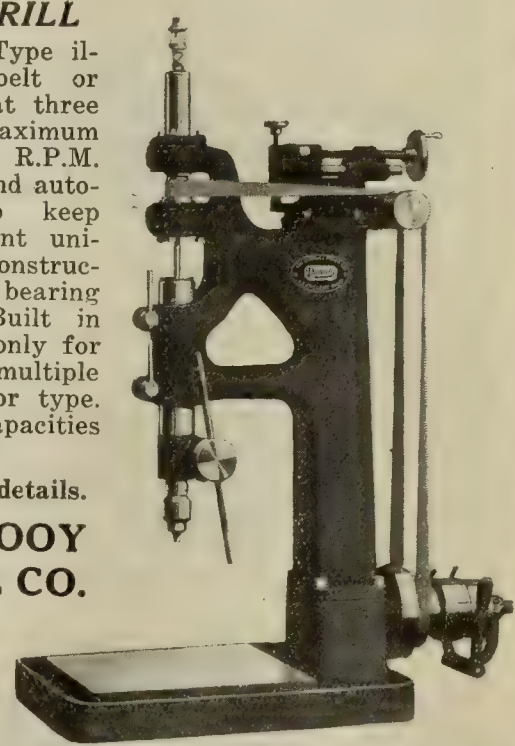

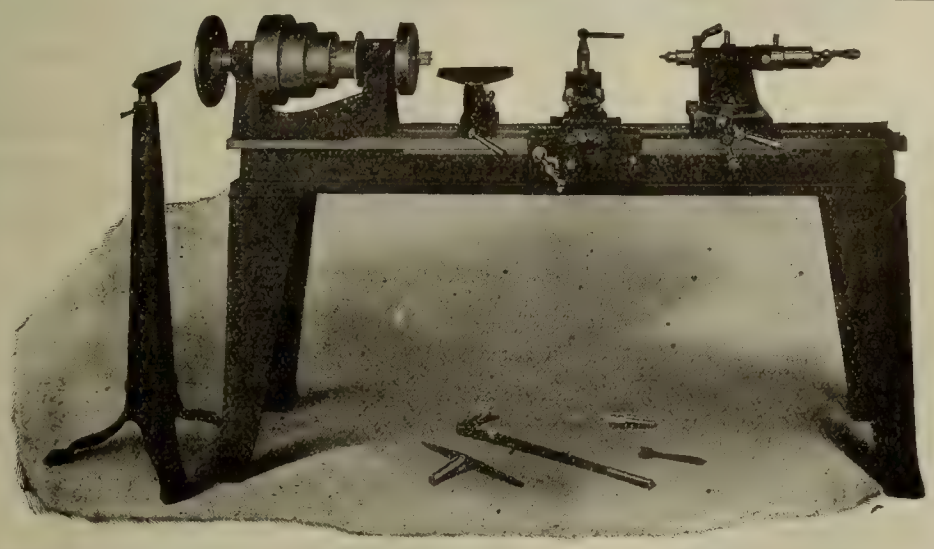

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TRUST Leacock to see a chance for his witty and humorous pen. He deals with the humorous phases of electioneering in Canada in his usual vein.

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THIS contribution, by Col. John Bayne Maclean, goes backward many years—to the time of the South African War in 1899-1900. That was when Canada first took up arms for the Empire. Politics, of a high order, was back of the decision to send Canadian troops to the Antipodes. It is "inside" history.

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A LONG instalment of Oppenheim's absorbing story, The Pawns Count, is given in the December MACLEAN'S. A short story, by A. C. Allenson is seasonable. Madge Macbeth contributes a complete novelette, The Man Who Wasn't. And Ethel Watts Mumford, teller of delightful tales, delicately told, gives us the first of a series of short stories—Love and the Locksmith.

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At All News-Stands 15c.

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Robt. W. Service is back again

BACK in MACLEAN'S, that is—in body, he is still in Flanders—where the fighting grows uglier all the time. Service has taken time to write verse for MACLEAN'S. You know well the virility of his style, and the gripping, human character of his verse. It is about life and men in the trenches he writes—about our boys far from us. It is worth something to see our boys as Service sees them. Read "The Shape at the Wheel" in the December MACLEAN'S.

Arthur Stringer writes a Beautiful Christmas Poem

STRINGER is a wonderful man—wonderfully versatile, wonderfully human. He is a master of the short-story and of the detective and mystery type of story; and he can climb the heights of literary endeavor, as he has in this passing sweet poem—Christmas Bells in War-time. Your heart is tender these times of horrible slaughter and of heroic achievement, and you'll be grateful to Stringer for putting beautifully your innermost thoughts and feelings.

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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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L'Air Liquide Society, Montreal, Toronto.
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Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Toledo Machine & Tool Co., Toledo.
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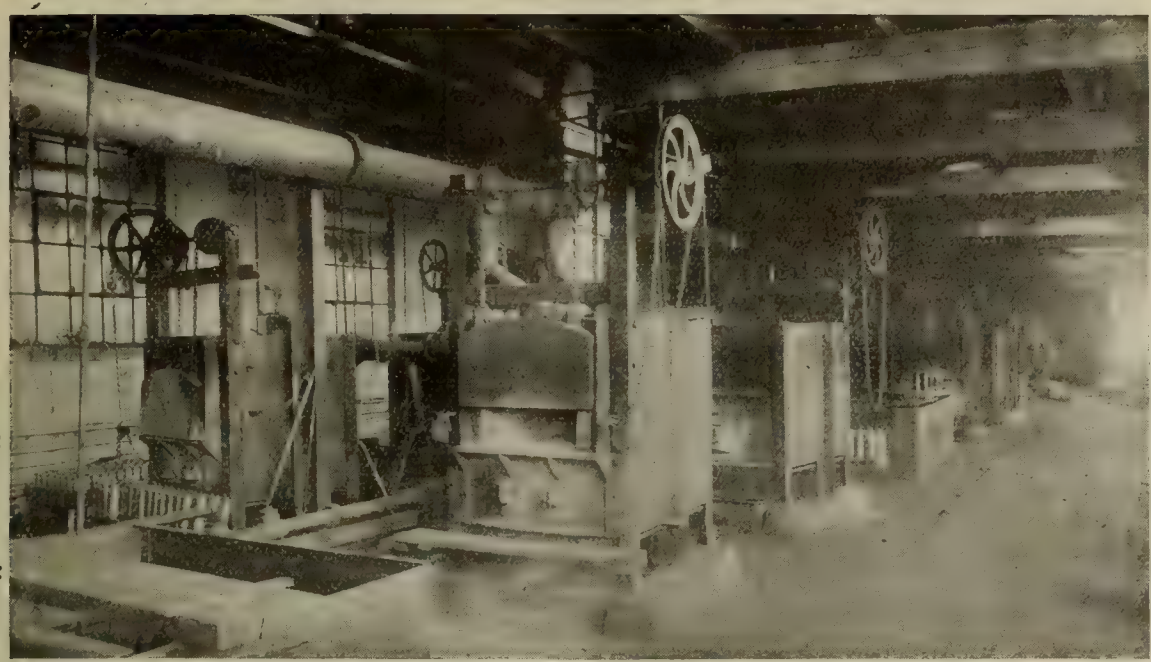

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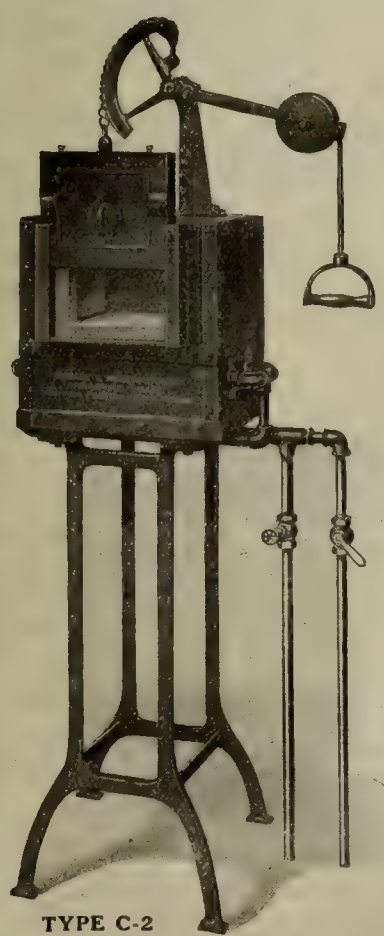

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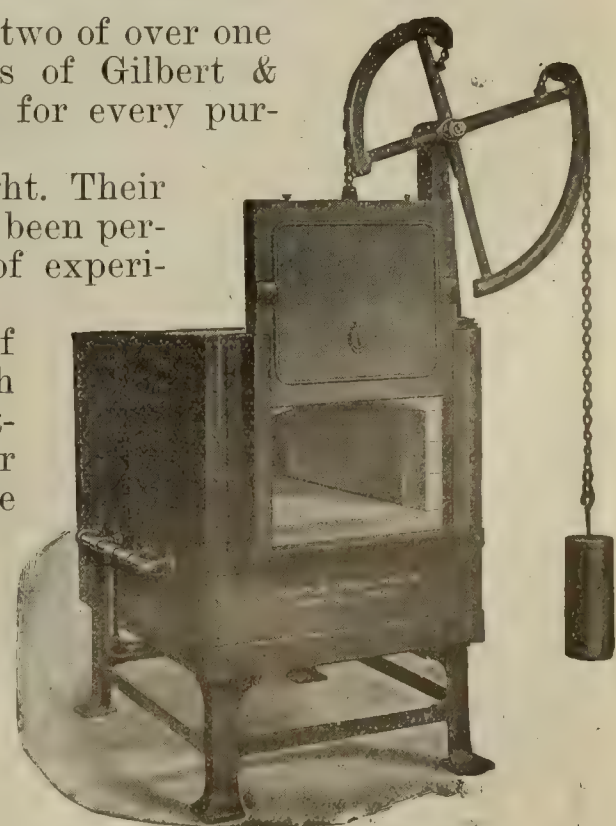

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Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
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Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
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Can. Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
REAMING MACHINES, PNEUMATIC
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Garlock-Walker Machinery Co., Toronto, Ont.
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Taylor Instrument Co., Rochester, N.Y.
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Can. Blower & Forge Co., Kitchener, Ont.
Grant Mfg. & Machine Co., Bridgeport, Conn.
National Machinery Co., Tiffin, O.
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Steel Co. of Canada, Ltd., Hamilton, Ont.
RIVETS, IRON, COPPER AND BRASS
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
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Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
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Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
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High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.
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Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo, O.
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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
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Bertrams, Ltd., Edinburgh, Scotland
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Brown & Sharpe Mfg. Co., Providence
James Chesterman & Co., Ltd., Sheffield, Eng.
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Strong, Kennard & Nutt Co., Cleveland, Ohio.
SAFETY APPLIANCE GOGGLES
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Curtis Pneumatic Machinery Co., St. Louis, Mo.
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SANDING MACHINES
Canada Machinery Corp., Galt, Ont.
SAW MILL MACHINERY
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Canada Machinery Corp., Galt, Ont.
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Napier Saw Works, Springfield, Mass.
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SAWS, HACK (SEE HACK SAWS)
SAWS, INSERTED TOOTH
Hunter Saw & Mach. Co., Pittsburgh, Pa.
Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.
SAWS, BAND AND COPING
Napier Saw Works, Springfield, Mass.
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Shore Instrument & Mfg. Co., New York City
H. E. Streeter, New Birks Bldg., Montreal, Que.
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Johnson Mach. Co., Carlyle, Manchester, Conn.
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Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
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Himoff Mach. Co., Inc., Astoria, L.I., New York.
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New Britain Machine Co., New Britain, Conn.
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Pratt & Whitney Co., Dundas, Ont.
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Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto
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New Britain Machine Co., New Britain, Conn.
Riverside Machinery Depot, Detroit, Mich.
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Can. B. K. Morton, Toronto, Montreal
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.
SCREW PLATES
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wells Bros. Co. of Canada, Galt, Ont.
Wilkinson & Kompass, Hamilton, Ont.
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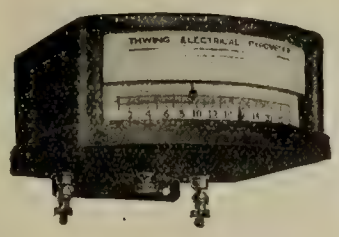

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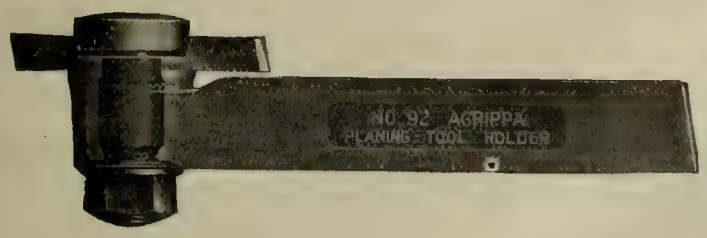

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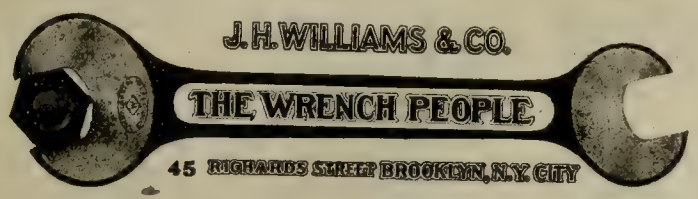

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Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
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Gray Mfg. & Mach. Co., Toronto, Ont.
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National-Acme Co., Cleveland, Ohio.
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William R. Perrin, Ltd., Toronto.
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Marshall & Co., Geo. A., Toronto, Ont.
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Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
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National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
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Pratt & Whitney Co., Dundas, Ont.
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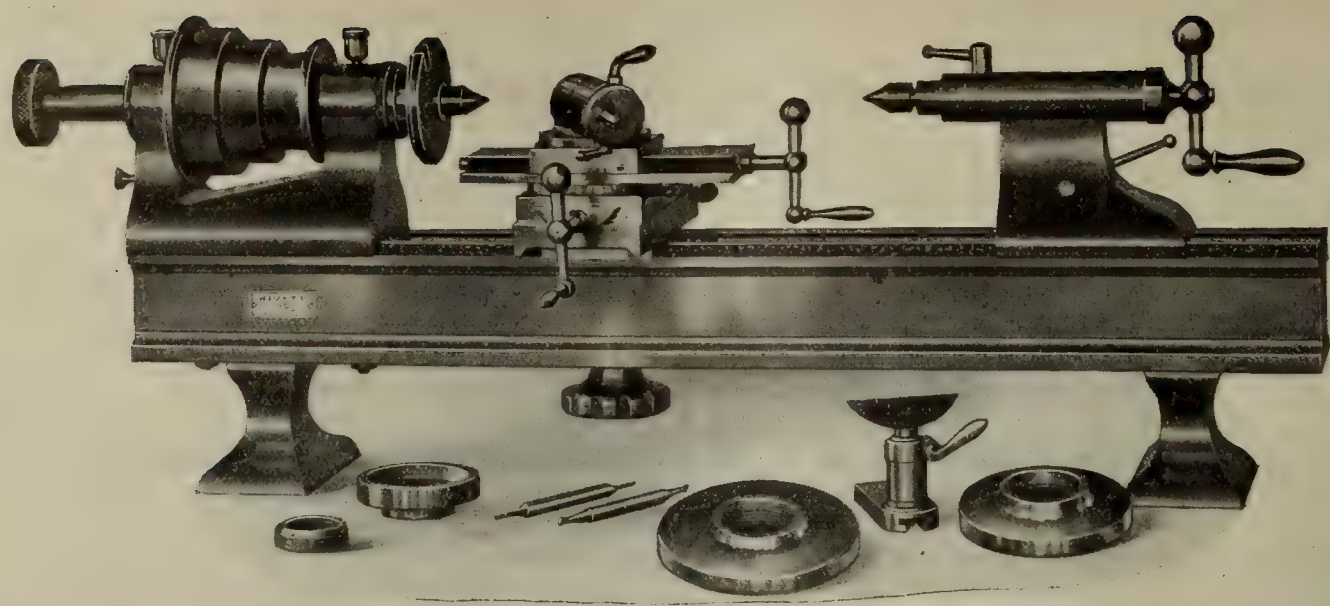

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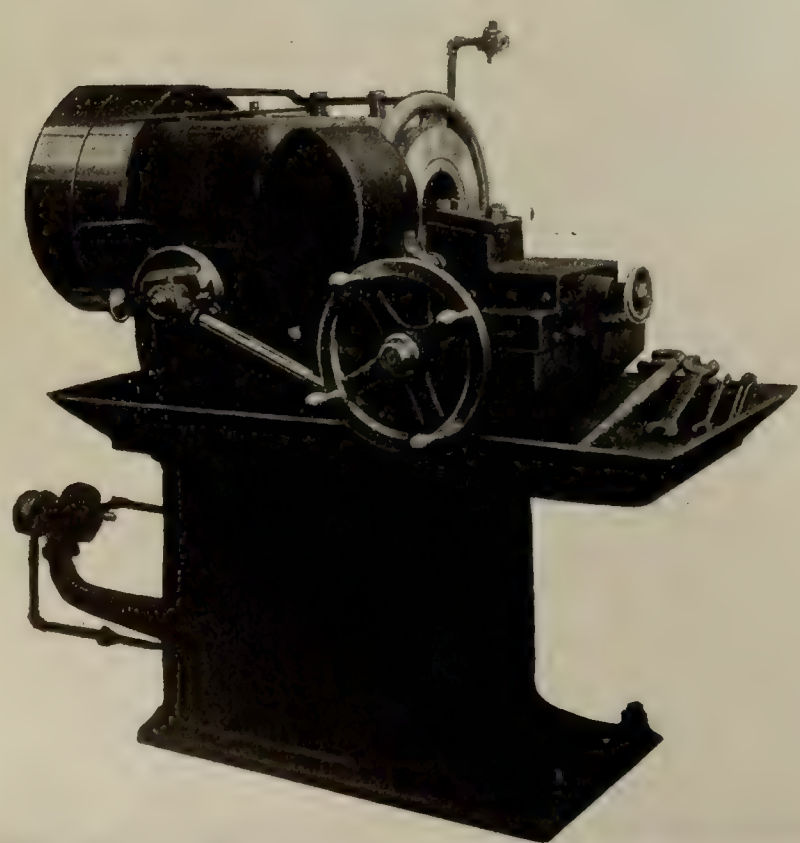

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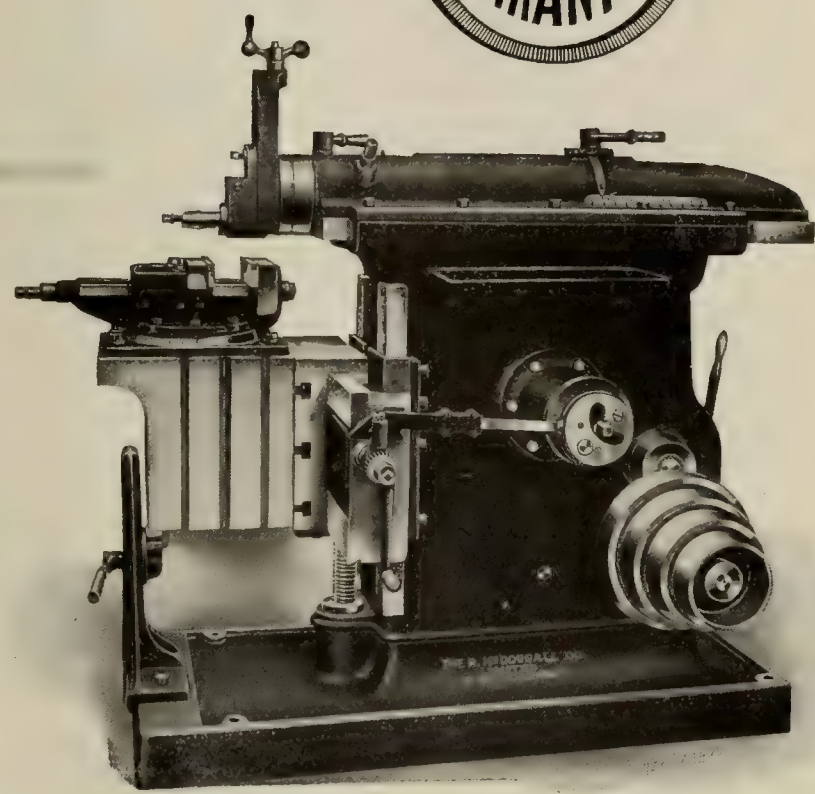

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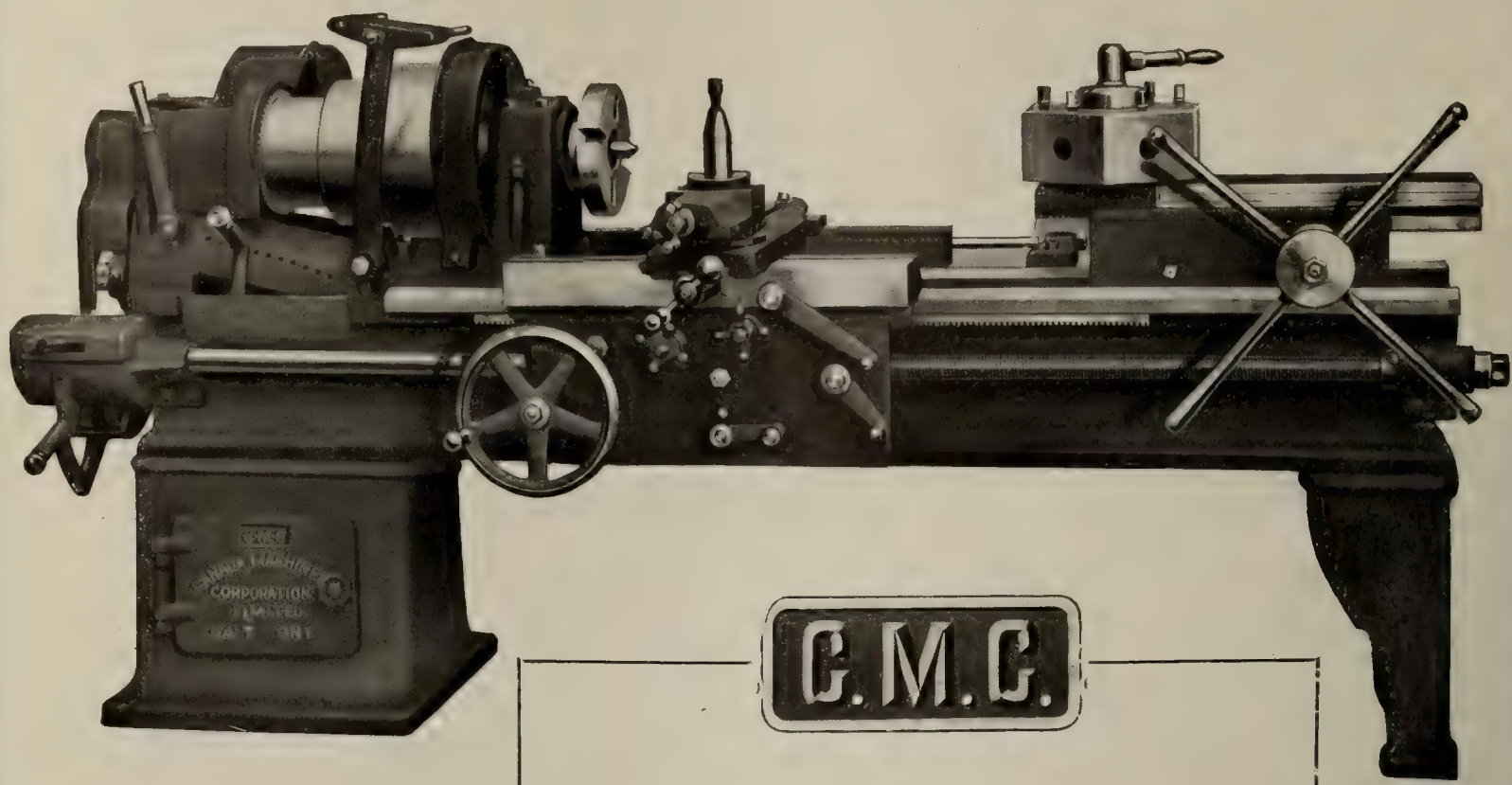

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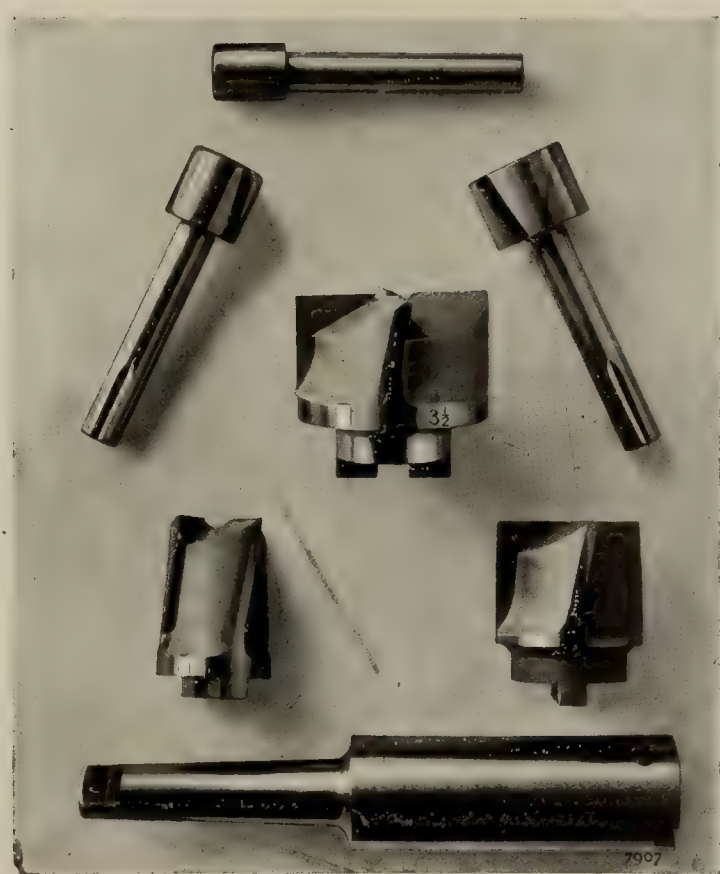
SMALL TOOLS

Equip Your Tool Room With

PRATT & WHITNEY

Interchangeable Cutter Counterbores



and get the right combination at once.

HOLDER, CUTTER and GUIDE

With this combination you can immediately make the right combination for every counterboring job.

HOLDERS

End of holder is milled to receive the driving lug of the cutter, and there is also a hole and set screw to accommodate the shank of the guides.

GUIDES

Are of hardened tool steel. They are held in place by means of a set screw in the holder engaging a V-slot in the shank of the guide.

CUTTERS

Can be furnished of either carbon or high-speed steel.

The shank of the guide passes through the hole in the cutter and the shoulder between the guide and its shank keeps the cutter in place. Cutters can be sharpened on the face and the guide is simply pushed further in the hole after grinding.

Holders, Cutters and Guides are furnished in a wide range of sizes.

PROMPT SERVICE

is assured at our nearest store where P. & W. Small Tools are carried in stock. Place your order there to-day.

PRATT & WHITNEY CO.

of Canada, Limited

Works: DUNDAS, ONTARIO

MONTREAL	TORONTO	WINNIPEG	VANCOUVER
723 Drummond Bldg.	1002 C.P.R. Bldg.	1205 McArthur Bldg.	B.C. Equipment Co.

BERTRAM MACHINE TOOLS

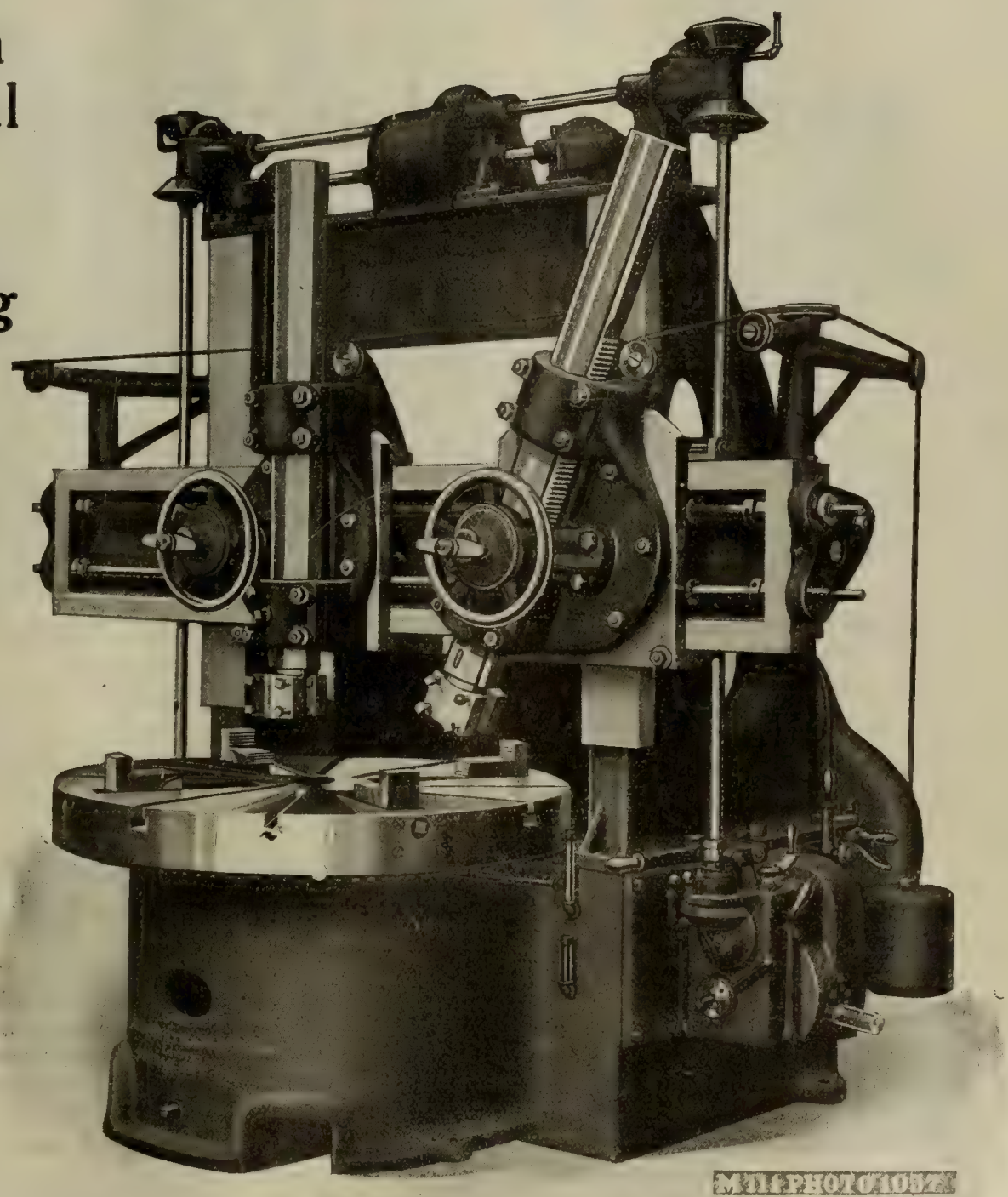
42-inch Vertical Boring and Turning Mill

Niles Type

Motor Driven Through Speed Box

Built in sizes from 42-inch to 100-inch Swing.

Drop us a line for Photographs and full particulars.



The John Bertram & Sons Company Limited

DUNDAS, ONTARIO, CANADA

MONTREAL 723 Drummond Bldg. | TORONTO 1002 C.P.R. Bldg. | VANCOUVER 609 Bank of Ottawa Bldg. | WINNIPEG 1205 McArthur Bldg.

The Publisher's Page

TORONTO December 20, 1917

A true word well spoken

WE received a day or two ago a blotter-calendar—from one of our advertising friends. It is of fine quality, the printing good and the color pleasing. It is the message which the blotter conveys, however, which makes it unusual and interesting. Here it is:

American business men do not realize the value which trade journals and technical magazines might be to them in increasing their efficiency and in giving them a broad and comprehensive view of their business. Our foreign competitors read almost every article published upon their business with great care and thoroughness. Our trade journals and technical papers are the best in the world and they should be encouraged and supported by our business men.

"These papers are preaching the gospel of sound business on practical lines and are helpful, not only to business, but to the country as a whole. If the suggestions made by them in the past had been followed by our business men it would not be necessary at this time to point out some of the fundamental weaknesses in American business."

Adapted from the book, "Awakening of Business," by Edward N. Hurley, Chairman of the Federal Shipping Board.

The following excerpt from the letter which accompanied the blotter in question is equally interesting explaining as it does the reason why the advertiser spends his good money on expensive advertising to "boost" as he says the technical journal. The letter was written by the general sales manager and his name and the name of the concern he represents, though withheld here, will be supplied upon request.

Several people have asked me why I am "boosting the game" of the trade papers. They find it difficult to understand just how I expect to sell our product by getting people to read the technical journals; and many of them think me a fool for spending hundreds of dollars of my company's money to distribute these blotters. * * * *

My position in this matter is taken because of a very firm conviction that the people who read the trade papers are much better business men and hence easier to sell a **good** product to, than the men who do not read the trade papers. I have studied this question for several years and do not think that I ever found a man consistently reading the trade papers who was not a "live wire" and the sort of fellow I like to do business with.

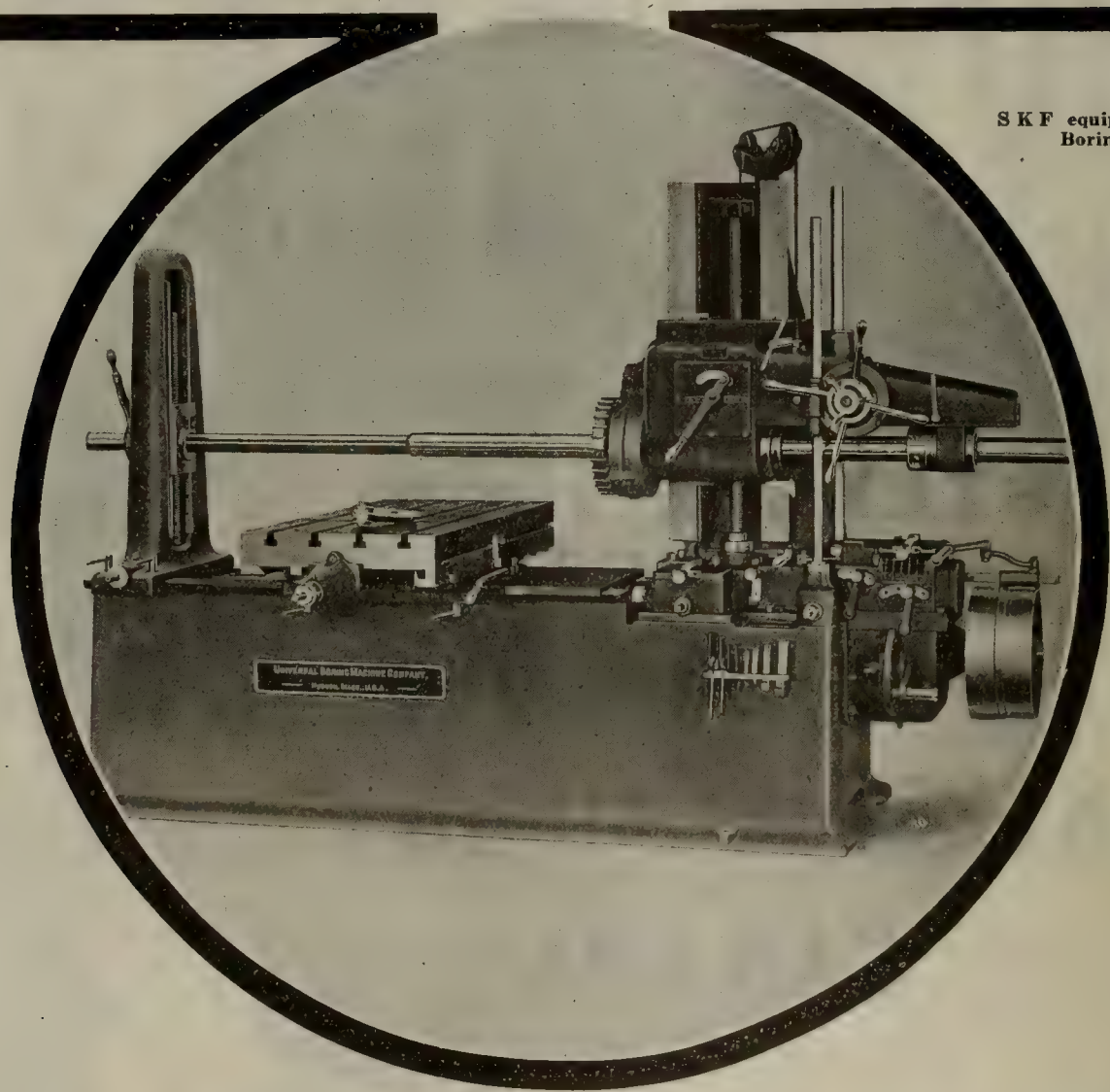
On the other hand, I have found that the men who do not read the trade journals are unprogressive, addicted to haggling over trivial points and, on the whole, very hard to do business with. The people who read the business papers know what's what, and, in selling them, it is not necessary to spend hours of valuable time in the discussion of elementary points.

My attitude in this matter is possibly an unusual one but I am firmly convinced that it is the right attitude. Furthermore, I believe that if my ideas on this subject were brought to the attention of the people selling goods in the marine field many of them would see the matter in a new light and would actively co-operate with you in getting your publication into the hands of, even more, the men to whom they wish to sell.

The trade papers are doing a wonderful work; and every good business man should boost them all he can all the time.

If any advertisement interests you, tear it out now and place with letters to be answered.

SKF BALL BEARINGS



S K F equipped "Universal" Boring Machine

No. 2 of a Series of S K F Equipped Boring Machines

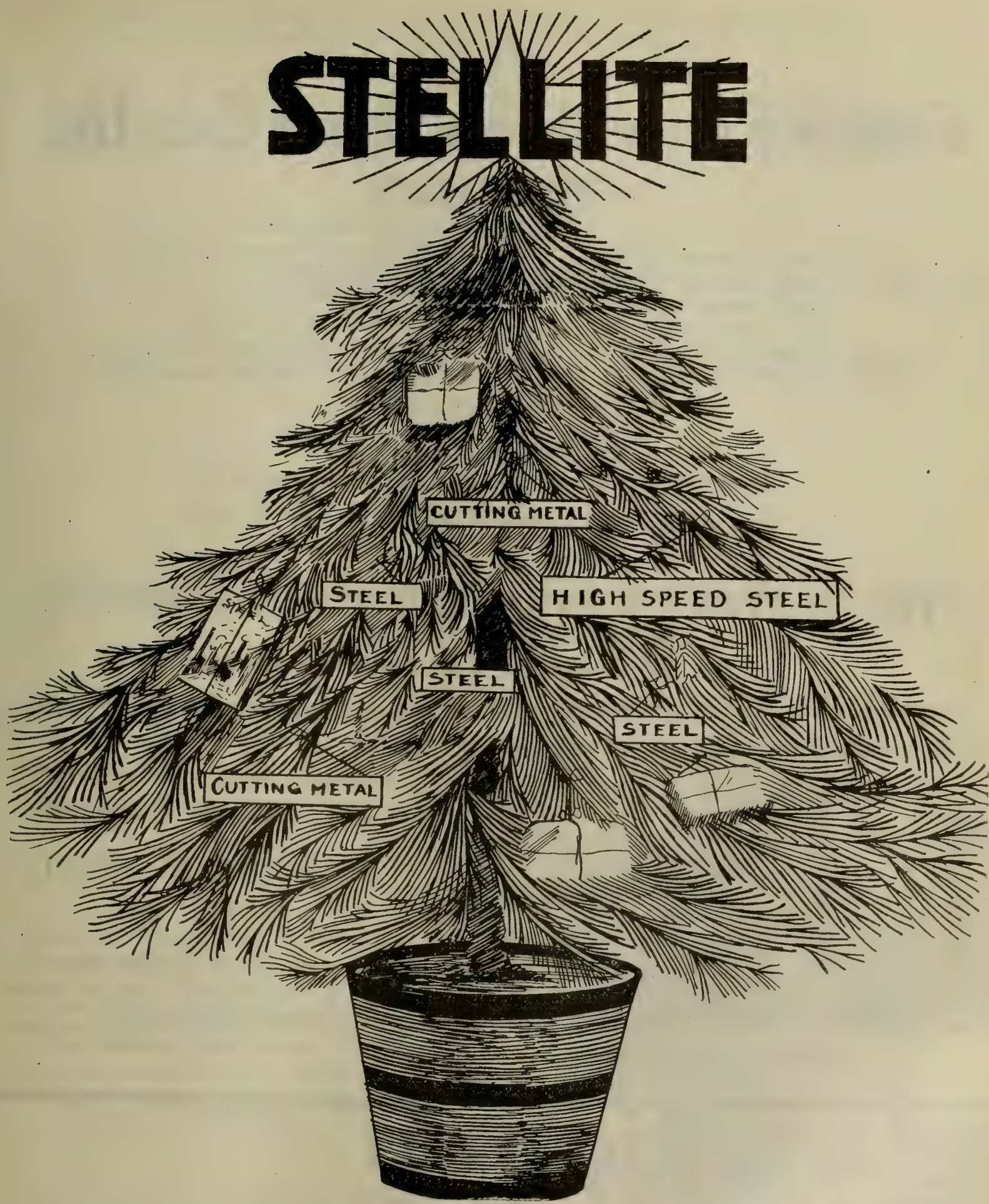
ENDURANCE

The bearings used in boring machines must be wearproof. That is why the best makers use S K F.

Made of the finest steel, to most exacting standards, S K F are not only accurate, they are lastingly accurate. The parts they carry are held with exactness; there is no shake, no looseness, no play.

If you are looking for enduring accuracy, consult our Engineering Service Department. Through their long experience they can recommend an S K F that will give you perfect satisfaction.

Canadian SKF Company, Limited
TORONTO, ONT., CANADA



The Top of the Tree for Doubled Production and
A MERRY CHRISTMAS

Deloro Smelting and Refining Company Limited

TORONTO
200 King St., W.

MONTREAL
315 Craig St. W.

The

Fairley Davidson Steel Co., Inc.

SPECIALISTS

	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
High Strength Steels	"Hehtemnd"
High Speed Steel	RUSHITOFF No. 6
Tool and Die Steels	"Fondwot" and "Giant"
Magnet Steels	Tungsten or Chrome
Non-Changeable Die Steel	Nugget "B" oil hardening

CHROME VANADIUM, oil hardening or case hardening

CHROME NICKEL, oil hardening or case hardening

Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

Canadian Agents:

THE FACTORY SUPPLY AND STEEL COMPANY

149 Craig Street West, Montreal, Canada

We carry a complete stock at our Montreal Warehouse

Works: LONGUEUIL, QUE.

Armstrong, Whitworth of Canada Limited

Standard Sizes of

HIGH SPEED STEEL

Carried in Stock

CARBON AND ALLOY STEELS

Shop Tools, Gauges, etc.

HEAD OFFICE: 298-300 St. James St., Montreal

Branches: Dominion Bank Bldg., TORONTO
27 King William Street, HAMILTON
McArthur Bldg., WINNIPEG, MAN.

Coal
Coke
Iron Ore

Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

M.A. HANNA & CO.

Sales Agents, CLEVELAND

Canadian Office:

'03 C.P.R. Bldg., Toronto

MALLEABLE CASTINGS

Capacity
Two Thousand Five Hundred Tons per Month

Our Prices, Quality and Delivery are Right

Send Us Your Inquiries.

THE PRATT & LETCHWORTH COMPANY, Limited
P.O. BOX 1630, MONTREAL
Works: BRANTFORD, ONTARIO

Air Chucks for 6" Shells in Stock

General Machine Work of All Kinds

Gear Cutting, Etc.

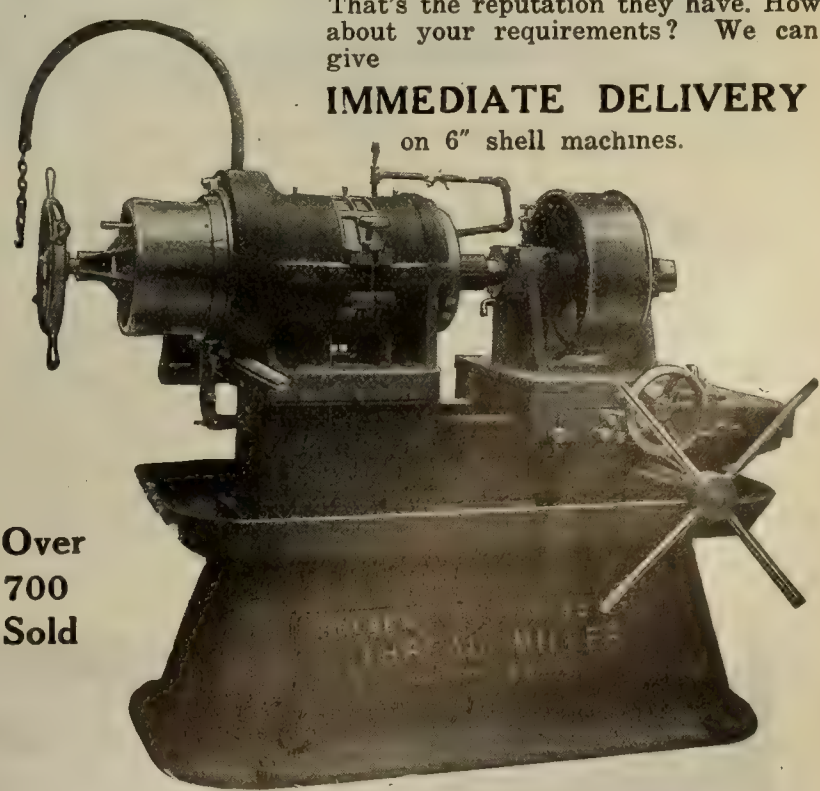
Hyde Engineering Works
27 William St., Montreal
P.O. Box 1185
Telephones: M. 1899 & M. 2527

70 Holden-Morgans in One Plant

Another firm would not accept a contract until assured they could get HOLDEN-MORGANS.

That's the reputation they have. How about your requirements? We can give

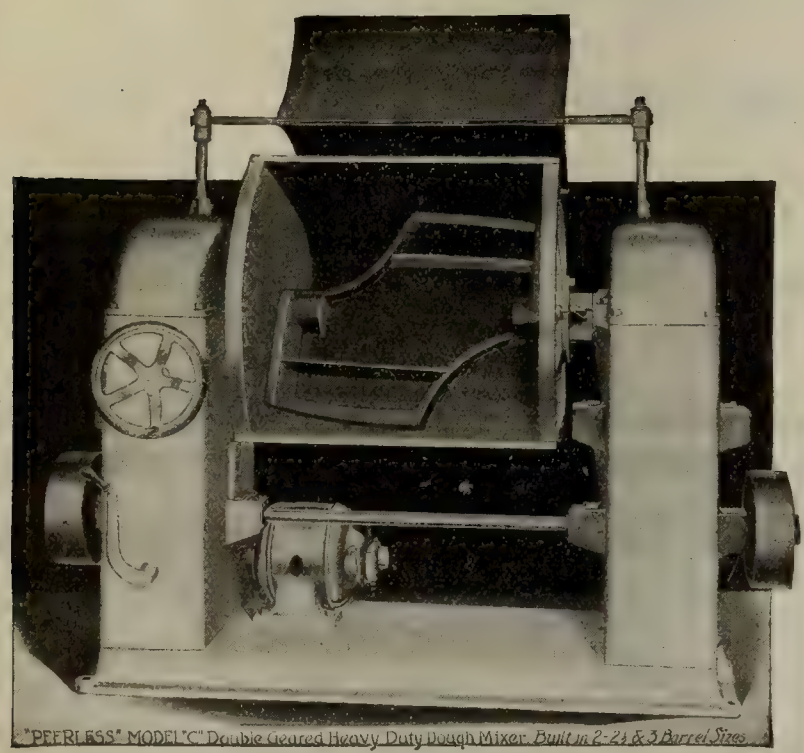
IMMEDIATE DELIVERY
on 6" shell machines.



Over 700 Sold

THE A. R. WILLIAMS MACHINERY CO.
W. FRONT ST. (Limited) TORONTO

The Johnson Friction Clutch Is Being Used As A Part Of This Machine



Courtesy The Peerless Bread Machine Co., Sidney, Ohio.

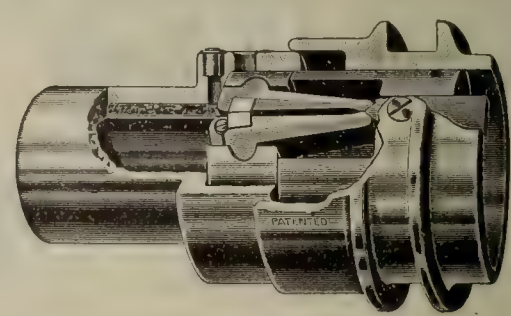
Mixing Dough

is the vocation of this machine and the mixer is controlled by JOHNSON FRICTION CLUTCHES installed on the horizontal shaft and two Johnson clutches are used, one in each of the vertical columns. You know how Mother mixed her bread. You know how careful she was not to overknead it. The same is true with automatic mixers. The mixer must knead the bread to a certain consistency and then the Machine is stopped through the use of JOHNSON FRICTION CLUTCHES.

This installation is but another instance of Johnson Friction Clutch Satisfaction.

For Your Own Machines—

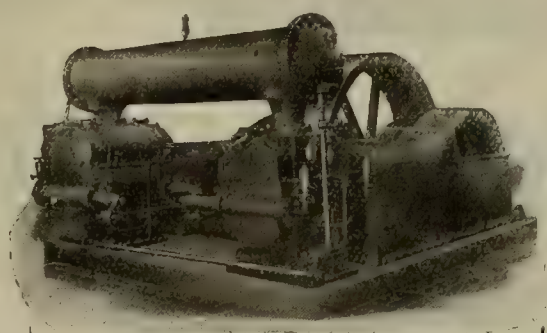
Have you thought of incorporating clutches? You know that people are known by the company they keep. So are all other things. Have you noticed the machines the JOHNSON FRICTION CLUTCHES are associated with? Let us introduce you to clutch satisfaction, THE JOHNSON FRICTION CLUTCH, so your machines may become acquainted. Write us about your requirements to-day.



Single Clutch Interior.

THE CARLYLE JOHNSON MACHINE CO.
MANCHESTER, CONN.

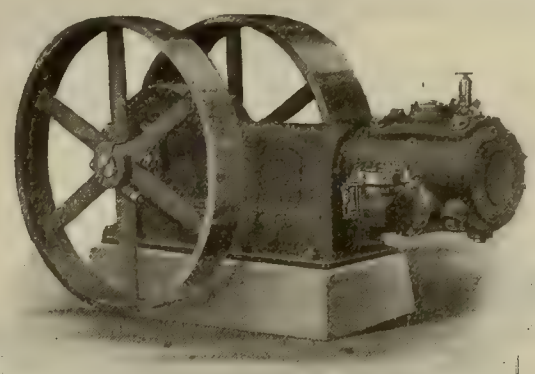
Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal; Can. Fairbanks-Morse Co., Ltd., Toronto.
England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.



JENCKES CLASS DB-2 AIR COMPRESSOR

If you understand compressors look over the following outline. If you are not acquainted with these machines it would delight us to give you an introduction.

Inlet Valves are of the Corliss type, the outlet valves of the disc type; flood type lubrication, allowing a continuous flood of oil over bearings, crank pins, etc., while in motion. Machine of the enclosed type.



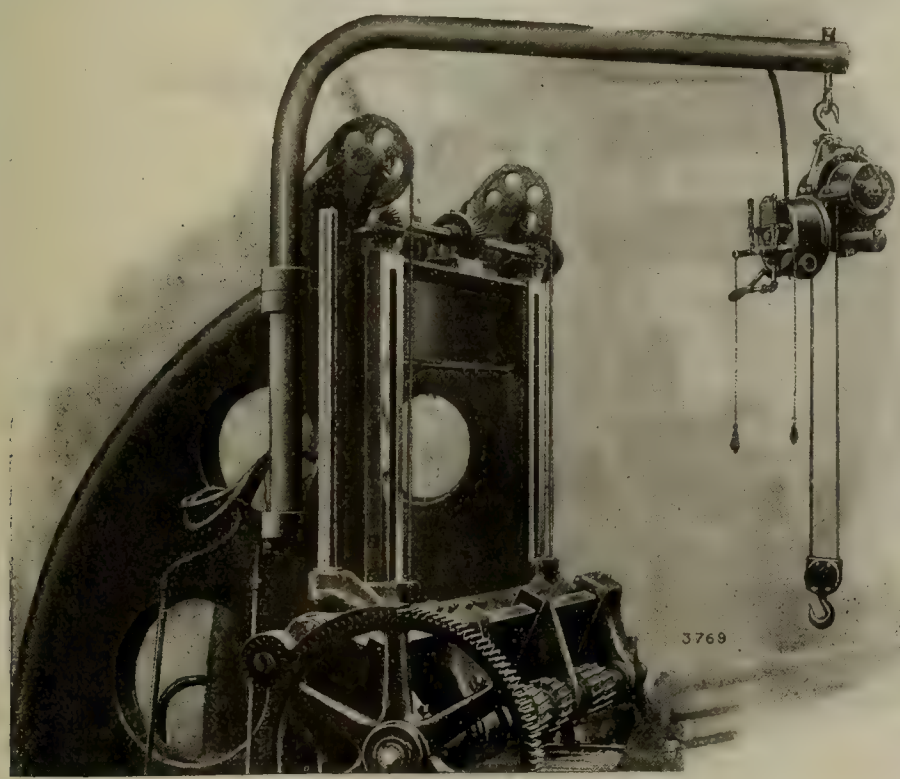
JENCKES CLASS CB-1 AIR COMPRESSOR

If your requirements do not justify either of the above machines, just bear in mind that we have a very comprehensive range that will cover all usual and unusual needs. The above is equipped with inlet and outlet disc valves; splash gravity lubrication system; extra large bearings; machine entirely enclosed.

The Jenckes Machine Company, Limited

Works: ST. CATHARINES, ONT.
Works: SHERBROOKE, QUE.

Sales Offices: 710 C.P.R. Bldg., Toronto; 908 E. T. Bank Bldg., Montreal; West Chester Ave., St. Catharines; Cobalt, Ont.



WHY DO WE USE "IMPERIAL" MOTOR HOISTS?

Because they are—
- Very Compact
- Moderate in Weight
- Perfectly Controlled
- Simple and Durable

Because they have—
- Most Efficient Gearing
- Most Thorough Lubrication
- Reliable Automatic Stop
- Ball-bearing Hook Block

And they have still other good features.

Write for Bulletin 8006—It tells the whole story.

Canadian Ingersoll-Rand Company, Limited

General Offices: 260 St. James St., Montreal, Que.

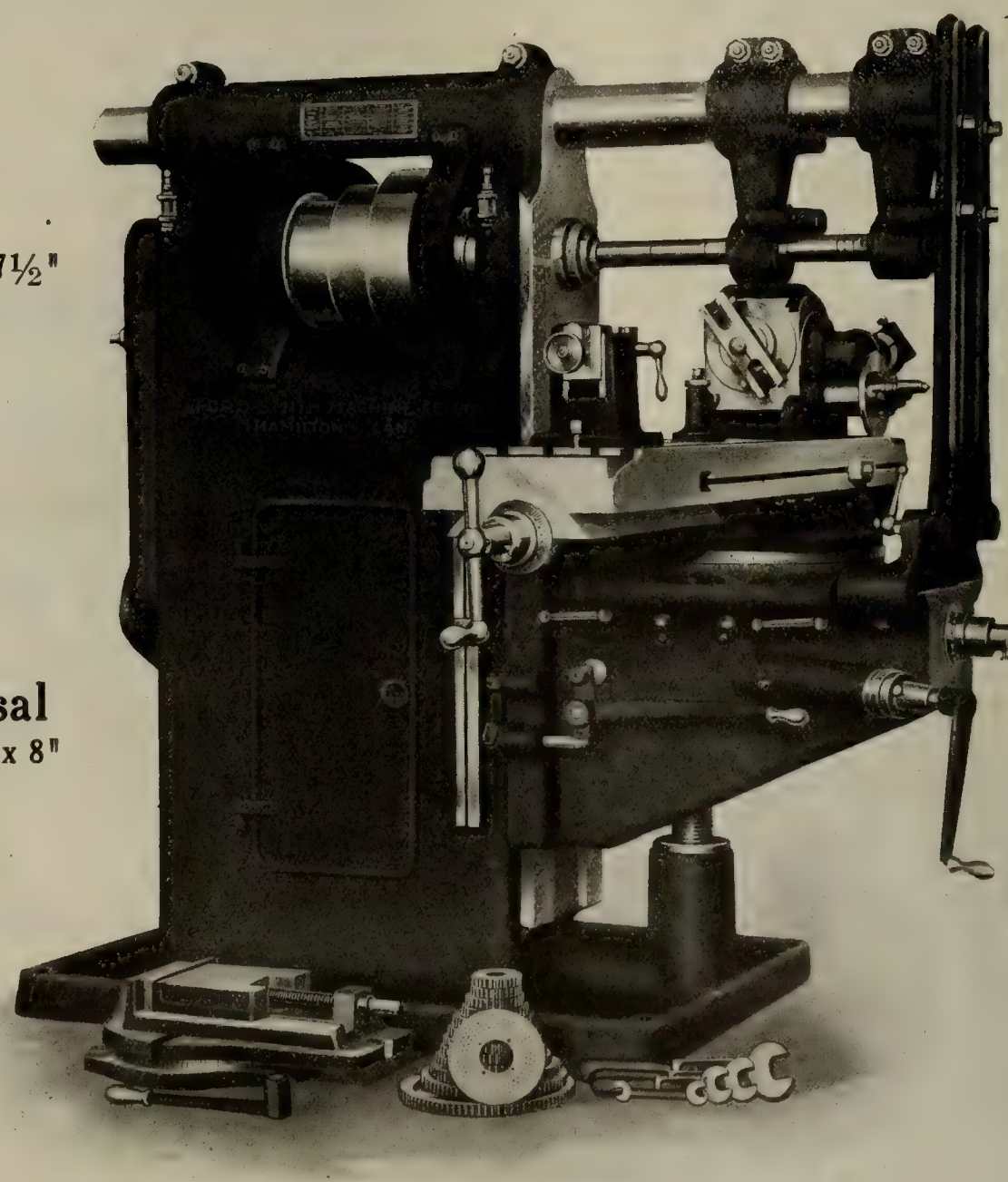
Branches: Sydney, Sherbrooke, Montreal, Toronto, Cobalt, Timmins, Winnipeg, Nelson, Vancouver

The Ford-Smith Machine Company

Adv't. No. 10 MILLER SERIES

Conclusion

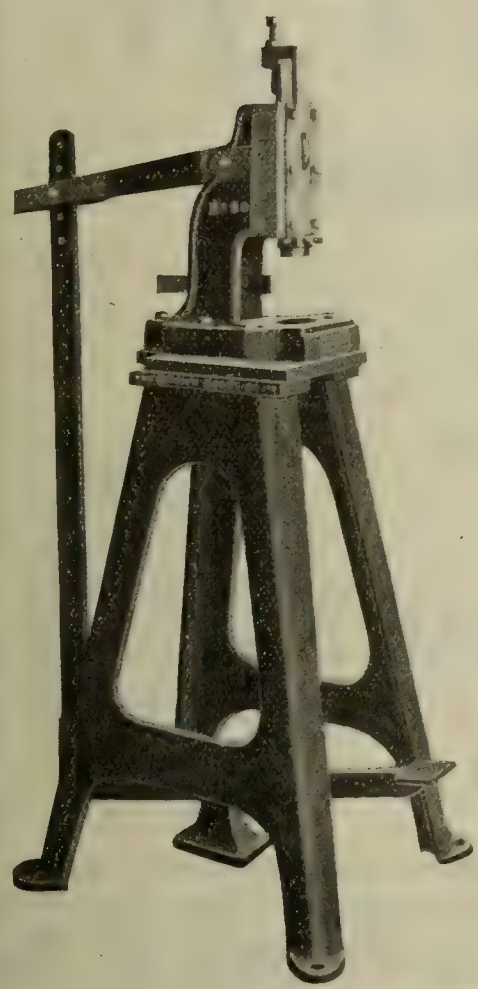
We have come to the close of our series. Have they been successful in bringing before you the various reasons why a Ford-Smith Miller should be a part of your equipment. We sincerely hope our efforts have been a success—in any case —let's hear from you. We aim to state only facts.



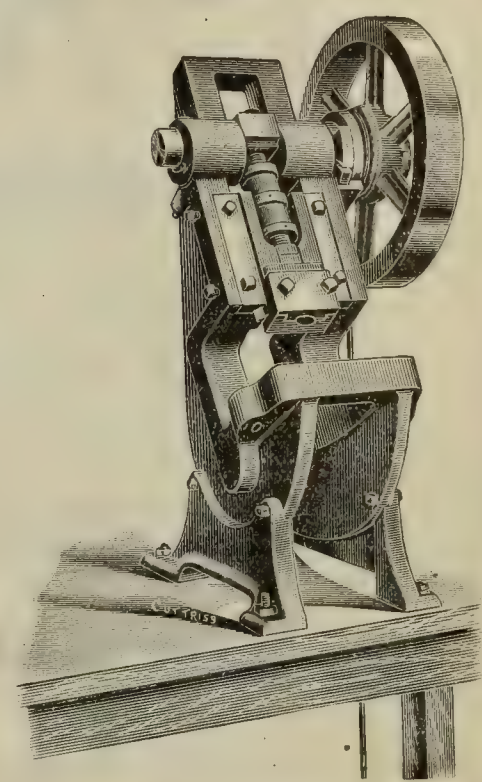
Just remember we build Four Sizes as shown above. One of the sizes may be the machine you require. If so, we want your order. If you let us have your first —we know we will get all your future business—so drop us a line.

The Ford-Smith Machine Company, Limited
HAMILTON ONTARIO CANADA

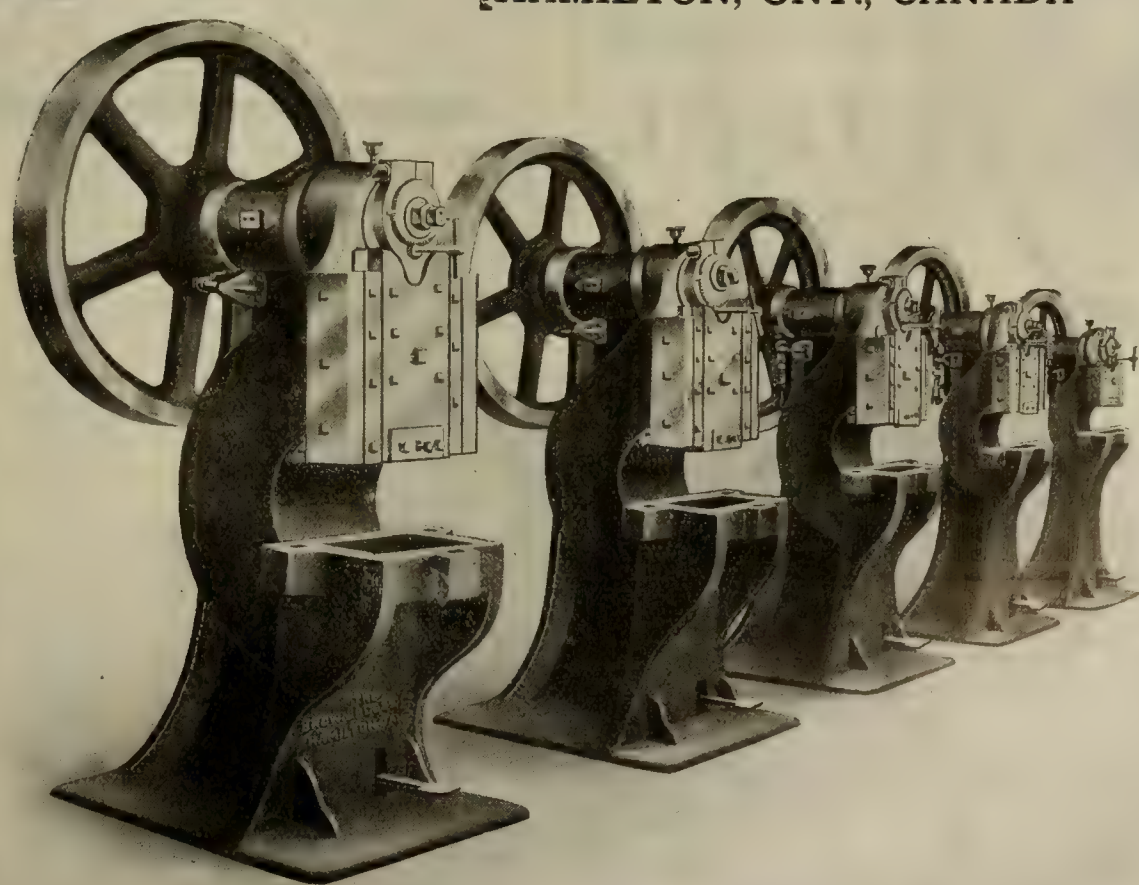
WHY A "B. B.?"



Experience has proved
that
B.B. PRESSES
qualify for
Economy
Durability
Speed



The Brown, Boggs Co.,
LIMITED
HAMILTON, ONT., CANADA



URANIUM

HIGH SPEED STEEL

Fewer Trips to the Grinder

The man who leaves his machine every few minutes to grind his tool is an expensive employee. Something is wrong. Nine times out of ten it is the high speed steel he is using.

By adding Uranium to high speed steel we have produced a cutting steel that is tough, that is strong, that will hold its cutting edge after ordinary tools have crumpled or burnt.

Cut down those expensive trips to the grinder by putting Uranium to work for you.

STANDARD ALLOYS COMPANY

FORBES AND MEYRAN AVES.

PITTSBURGH, PENNA.

High-Speed STEEL

The tools that are made with "Wolfram" High Speed Steel are warranted to be super-keen at the edge and super-strong at the neck.

WOLFRAM

Embodies a true and permanent alloy of Tungsten, Chrome, Vanadium and Iron. No better High Speed Steel in the world.

VULCAN CRUCIBLE STEEL COMPANY

ESTABLISHED 1900

Aliquippa - Pa., U.S.A.

Represented in Canada by Messrs. Norton, Callard & Company, Montreal.

Electrite

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium—make this a steel of truly remarkably cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.

LATROBE, PA.

High Speed Steel

Uranium

DOUBLE

MUSHET

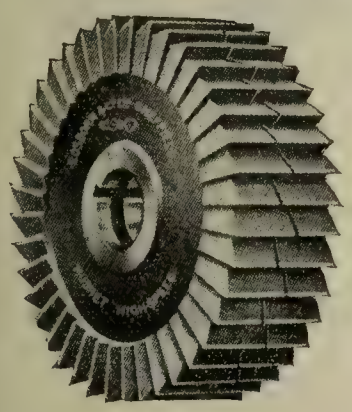
High Speed Steel

Carbon Steel

Gauge Steel

Alloy Steels

SOLE MAKERS
Samuel Osborn & Co. Ltd.
SHEFFIELD



Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)
Limited
Head Office and Works: Montreal, P.Q.
Branch Office: Toronto, Ontario

STEEL *for*

Shrapnel Shells and Shell Blanks

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Steel Ingots
by the
HARMET
Liquid Process

Nova Scotia Steel and Coal Co., Limited

Head Office:
New Glasgow, N.S.

Western Sales Office:
Room 14 Windsor Hotel
MONTREAL

TRADE MARK

of the Famous

"WACO"

BRAND

HIGH SPEED STEEL

AND

TWIST DRILLS

"DOUBLE WACO" Quality

Specially Adapted for Munition Work

"TURTLE" BRAND

High Class Tool Steel, Files, etc., of all descriptions.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

Reliance Steel Works

SHEFFIELD, ENG.

TRADE MARK

For particulars apply to our
Sole Representatives for Canada

TRADE MARK

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy chucking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6" shells.

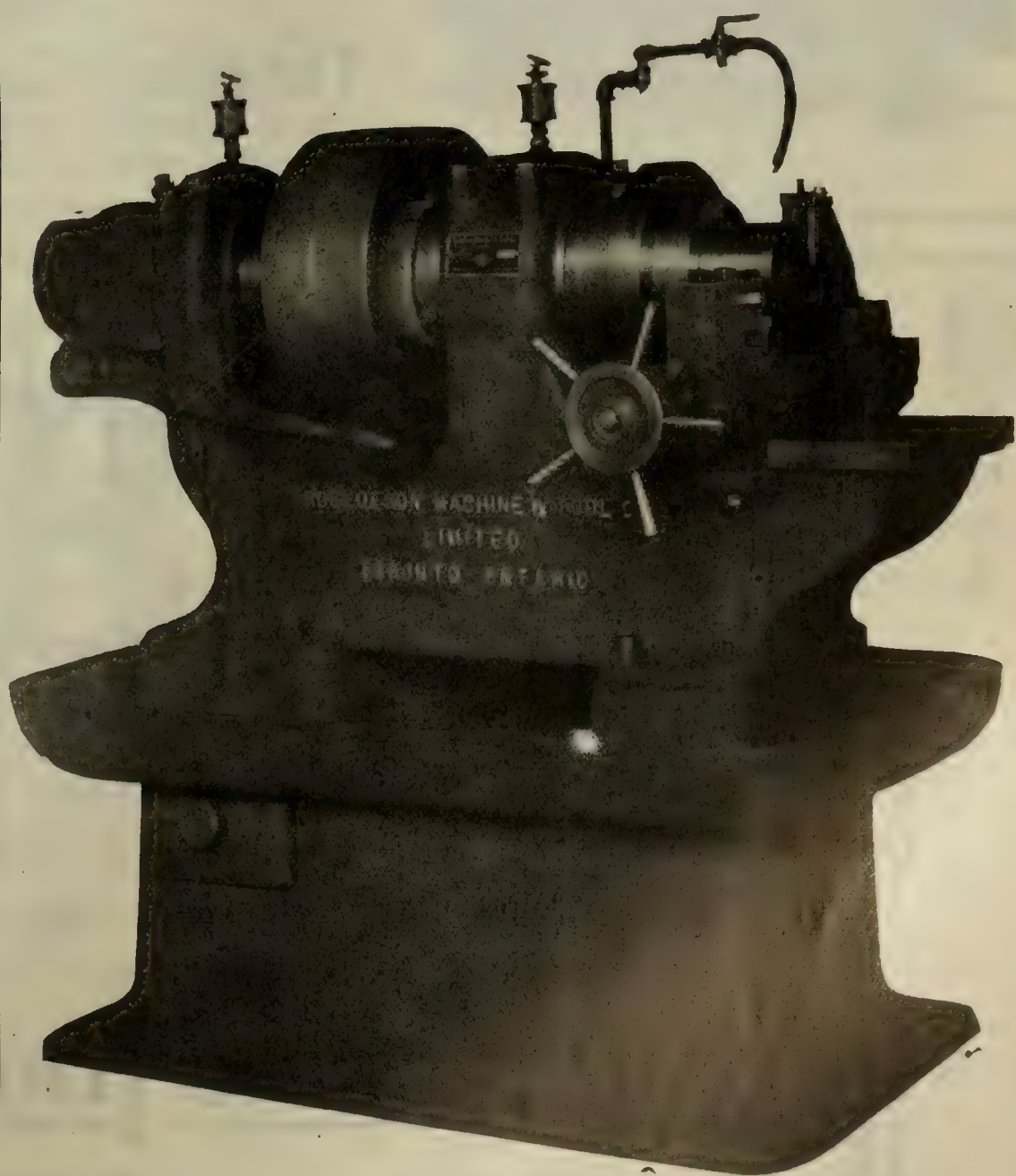
Roelofson Machine & Tool Co., Ltd.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6" shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.



If any advertisement interests you, tear it out now and place with letters to be answered.

GRINDING SEED WHEAT

WOULD YOU DO IT?

To grind seed wheat would be to deprive the future. It would rob men of fighting strength and those at home of bread.

To stint and save in the purchase of a machine that is to be depended upon to produce fighting and farming tools speedily and accurately is like grinding seed wheat—it deprives the future of materials that men will need badly.

A suggestion: before you buy lathes, carefully examine the merits of the high-quality "Sidney for Service" line which are sold in Canada by—

The Geo. F. Foss Machinery & Supply Co.
MONTREAL, QUEBEC.

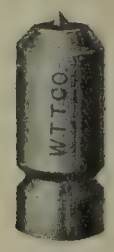
AND

H. W. Petrie, Ltd.
TORONTO, ONTARIO

TRADE SIDNEY FOR SERVICE MARK

The Sidney Tool Company
SIDNEY, OHIO, U.S.A.
WRITE FOR BULLETIN 30

DIAMOND



LANDIS NORTON

All sizes, finest quality, awaiting your command, stones

"THAT SUIT"

either unmounted or mounted in our improved (any style) CAST STEEL MOUNTING;

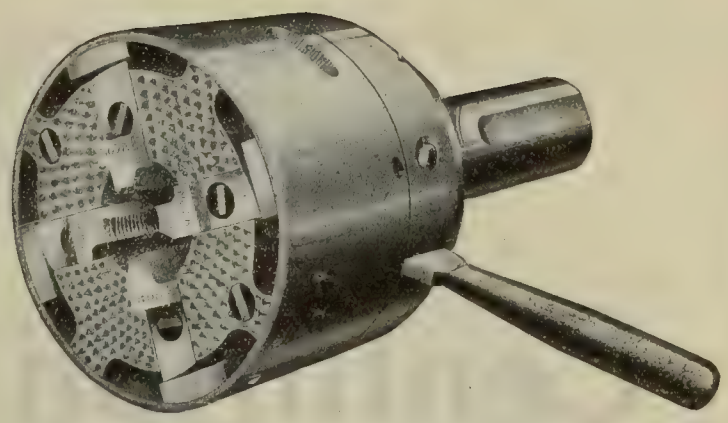
GUARANTEED TO BRING RESULTS.

"MADE IN CANADA"

WHEEL TRUEING TOOL CO.

88 WEST PITT STREET WINDSOR, ONTARIO

NAMCO
Self-Opening DIES



Accuracy and *Durability* are predominant in NAMCO Dies. Their construction has insured the productive results that they are constantly giving.

NOTE—
Solid one-piece head
Simplicity of working parts
Support of chasers directly back of cutting edges
Thorough cleansing and lubrication, due to open construction.

NAMCO Dies are made in both revolving and non-revolving types for use on any kind of screw machines, turret lathes and special threading machine.

For internal threading we build the NAMCO Collapsing Tap for which there is "NO HOLE TOO DEEP."

Catalogs on each?

There's a NAMCO Die for practically every threading requirement.

Send for catalog or submit blueprints for quotations.

The National Acme Company

NEW ENGLAND PLANT WINDSOR, VERMONT — **Cleveland, Ohio** — **CANADIAN PLANT MONTREAL, QUE.**

Branch Offices: New York, Boston, Chicago, Detroit, Atlanta, San Francisco, With Foreign Representatives.

Makers of Gridley Single and Multiple Spindle Automatics at Windsor, Vermont, and Acme Automatics, Threading Dies, and Screw Machine Products at Cleveland, Ohio.

IF YOU WANT THE

BEST BASE PLUGS, BUY BANFIELD'S

Have in stock for immediate shipment either threaded or bevel Plugs for 4.5", 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. ***Write for prices.***

EDWIN J. BANFIELD

STAIR BLDG. ∴ TORONTO, ONT.

Manufacturer of Plug Milling Machines for above size shell. Prices and deliveries on application.

One of the

Steels of the Century

Centurion High-Speed

Made from the BEST Materials

Iron, Tungsten, Chrome, Vanadium

Melted by the BEST Process

The Crucible Furnace Method

Handled by the BEST Workmen

Melters, Forgemen, Annealers, Metallurgists

CONSEQUENTLY

Will do the BEST Work

Quality *Delivery* *Service*

We have a catalog waiting for you. Write for it.

THE CENTURY STEEL CO. OF AMERICA

MANUFACTURERS OF HIGH-GRADE CRUCIBLE STEELS

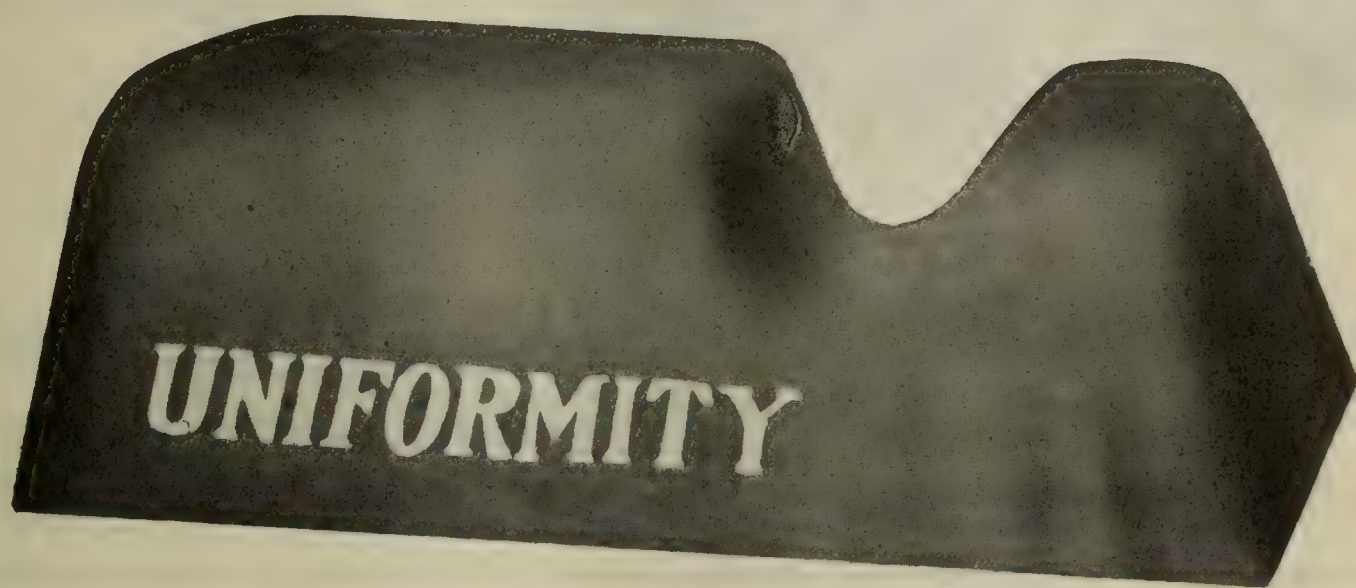
General Office and Works:
POUGHKEEPSIE,
N.Y.

Sales Offices:
120 BROADWAY,
NEW YORK

INGOTS

Brass, Bronze and Composition

Any Alloy According to Your Formula



ALSO

INGOT-COPPER

99.9% PURE

For High-Grade Castings

Wire or Write for Prices

We are Purchasers of Copper Bearing Material

BROWN'S COPPER & BRASS ROLLING MILLS, LIMITED

NEW TORONTO, CANADA
Near Toronto

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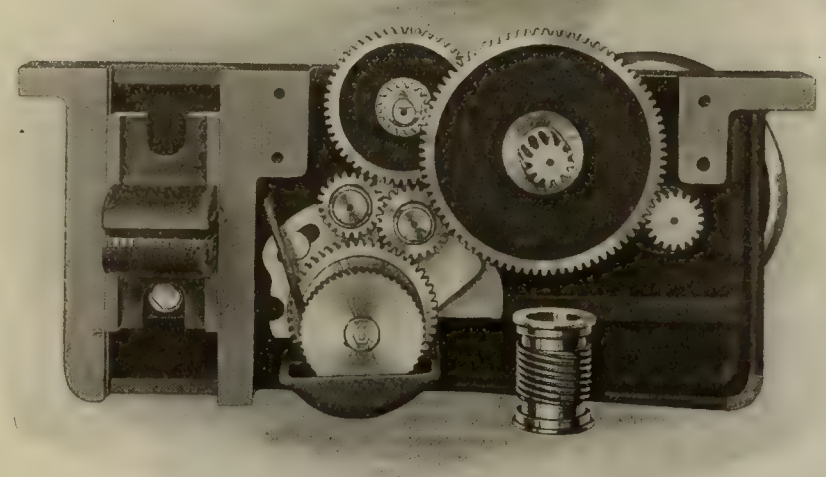

Note the compactness
See the rigidity
Count the few parts
Observe the simplicity
Mark the fool-proof points
A CISCO APRON
Like all other parts of CISCO
Lathes, is built for
Simplicity in operation
Power and pull
Economy and efficiency

THE LATHE WITH THE PULL
THE LATHE OF SIMPLIFIED ACCURACY
CISCO 14"-16"-18"-24" ***Has No Equal***

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The A. R. Williams Machinery Co., Ltd.

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"Extra" "Special" "High Speed" **Tool Steels**

Made in Sweden from selected Dannemora Ore

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We have the only automatic Gear-Cutting Machine in Western Canada. We specialize in this work. Also in Marine and Hoisting Engines, Contractors' Equipment, Dredge Work, Dippers, etc.

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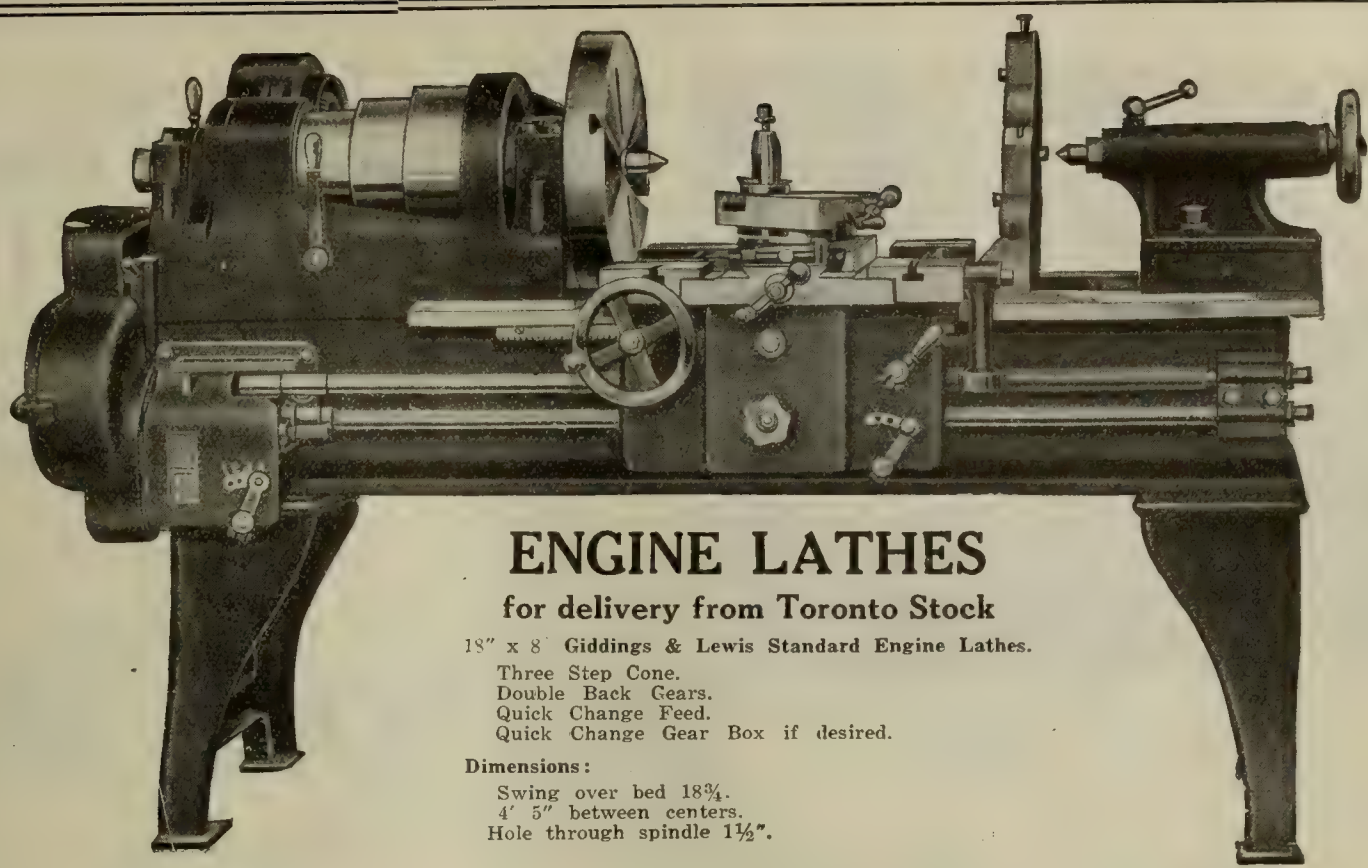

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18" x 8' **Giddings & Lewis Standard Engine Lathes.**

Three Step Cone.
Double Back Gears.
Quick Change Feed.
Quick Change Gear Box if desired.

Dimensions:

Swing over bed 18¾.
4' 5" between centers.
Hole through spindle 1½".

These are strongly built, accurate machines. Will give equal satisfaction in tool-room or shop.
The following extras can be furnished if desired: Taper, Relieving or Draw-in attachment, Waving attachment, Hexagon turret on carriage, Pan pump and piping.

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Lathe For Shell Work

Put into your shop this Hepburn Single Bar Boring Lathe, because it has been proven to have no equal on shell work. We will send the proof—or find it yourself in many of the larger shell plants of Canada. Your old lathe rebuilt to embody latest improvements. Write for the facts about our service.

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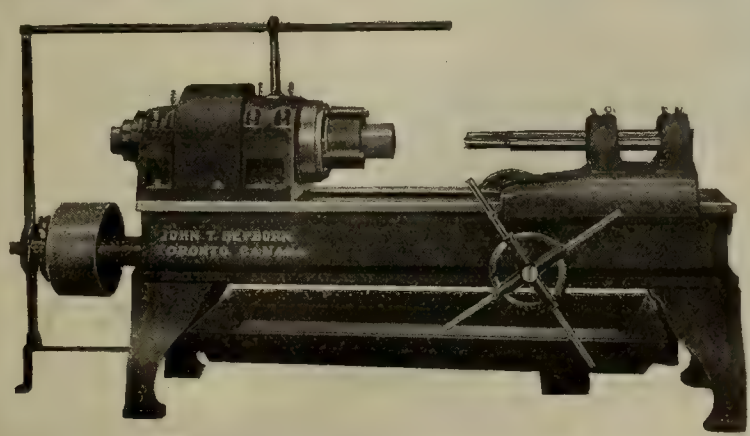

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Automatic cut-off guards against waste of air.

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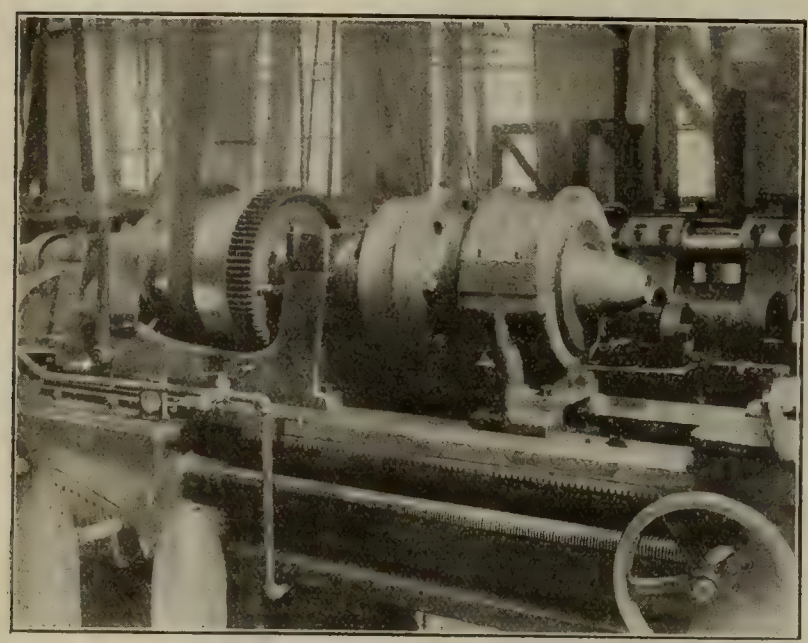

Cut shows Chuck on nosing operation. This is one of over two hundred in this Canadian plant.

This chuck is *built on the duplicate part system. It is simple, effective and fool-proof.*

It grips the shell in a predetermined position. The jaws will not slip on the shell. It has shell interior and exterior adjustable stops.

A trial on one of your lathes will convince you that this is THE chuck for shell work.

A Big Efficiency Unit in Your Shell Plant

A. J. LAVOIE'S

LOW PRESSURE

Compressed Air Chuck

This chuck can be applied to any make of lathe, without alteration to the machine, and will increase production from 25% to 75%. It grips and releases the shell while in motion—no need to stop your machine.

It is a single unit combination attached to the face plate of lathe, supported by an additional heavy duty bearing, thus making a heavy duty lathe out of a light machine. A small lever operates the chuck. Will operate with a pressure of 60 lbs. per sq. in.

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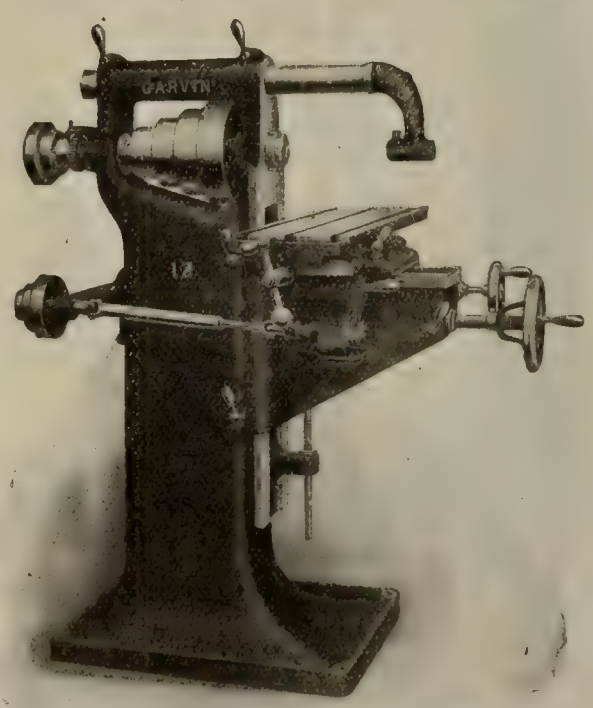

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FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rapidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

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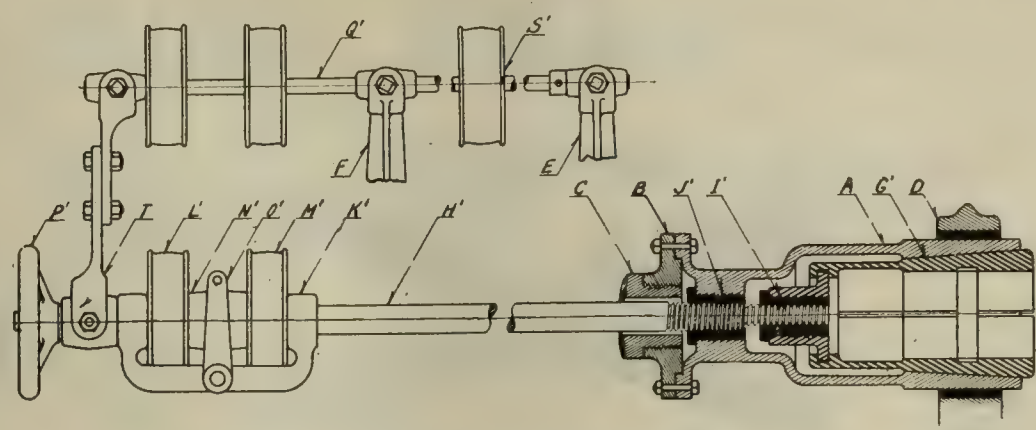

6" Boring — 75 Rough 100 Finish

10 HOUR DAY

A close study of the above chuck will reveal strength that enables this machine to give this production *all the time* in 10 hours. The illustration below shows the wonderful sturdiness of the machine. Inquire of us. The prices are exceptional. Made in Canada.

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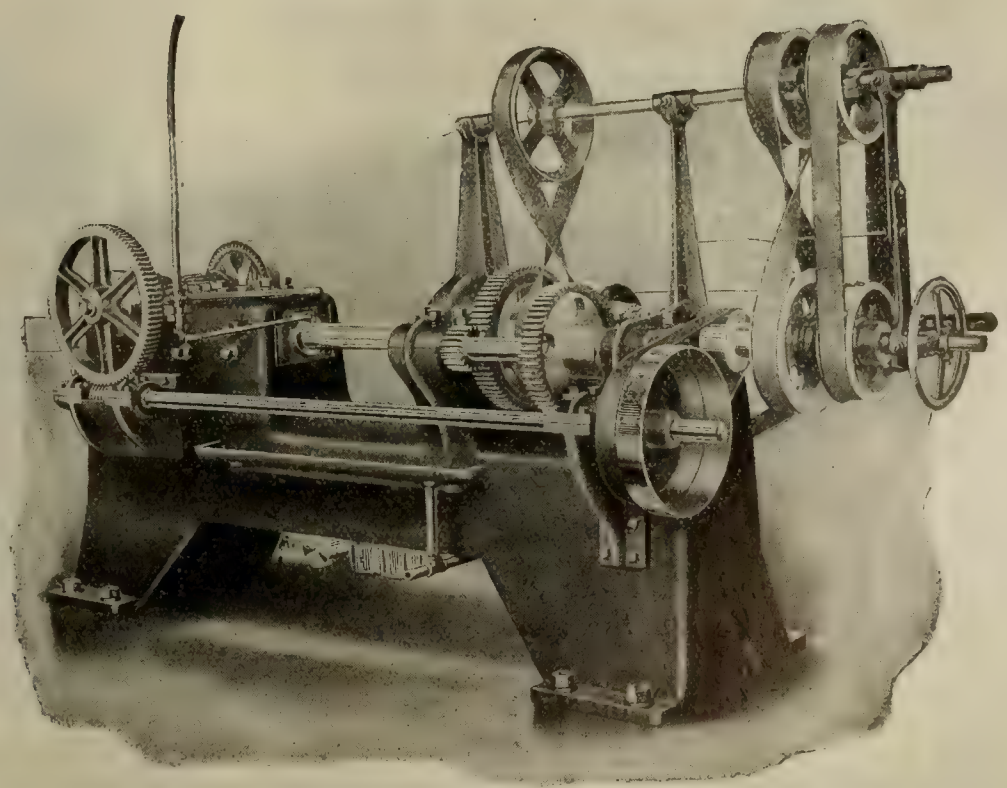

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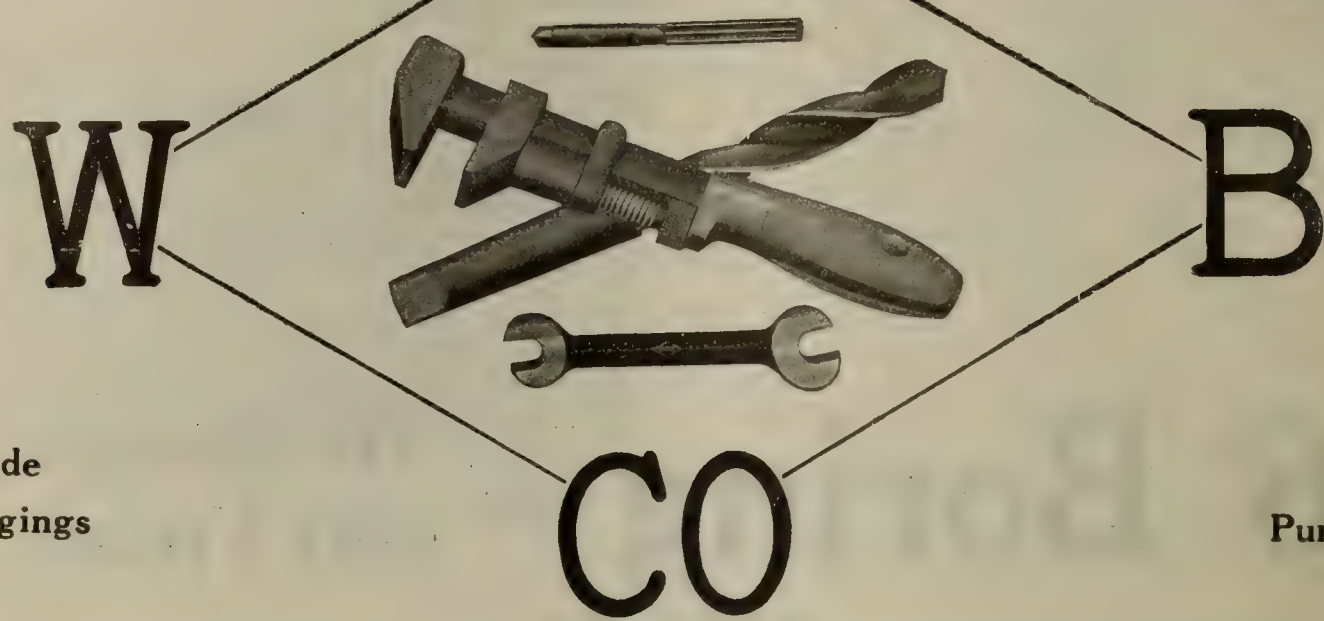

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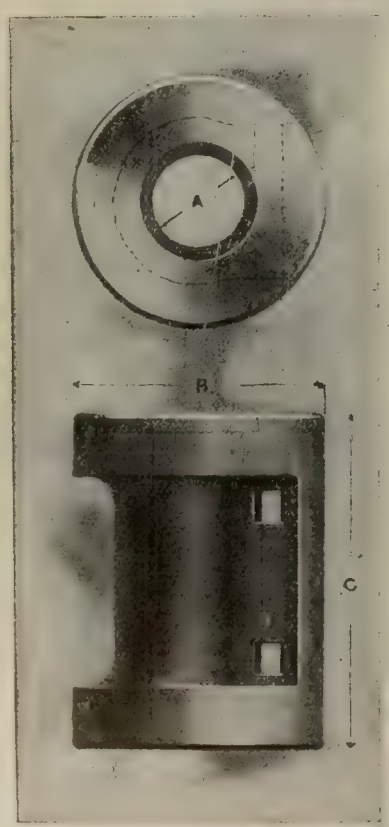

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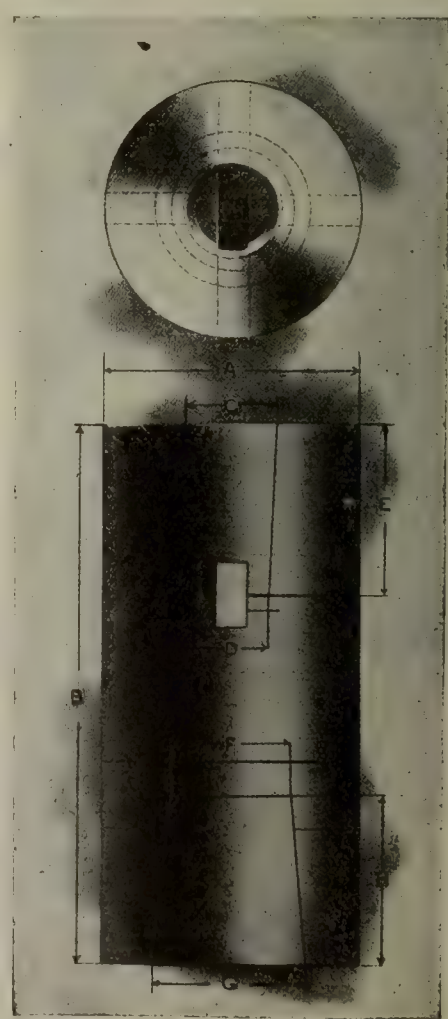

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"Almost Rickert-Shafer Tapping Speed"

WHAT an admission to come from a competitor's salesman! And still, all honor to the man who thus qualified his claim.

The truth is: Every Rickert-Shafer Tapper is solemnly pledged to work with unerring accuracy on toughest jobs *for longer than any other tapper built.*

Rickert-Shafer Tappers are built in Bench, Vertical and Horizontal Types for tapping of all kinds—3-16 to 5/8 inch.

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ALFRED HERBERT, Foreign Agent.
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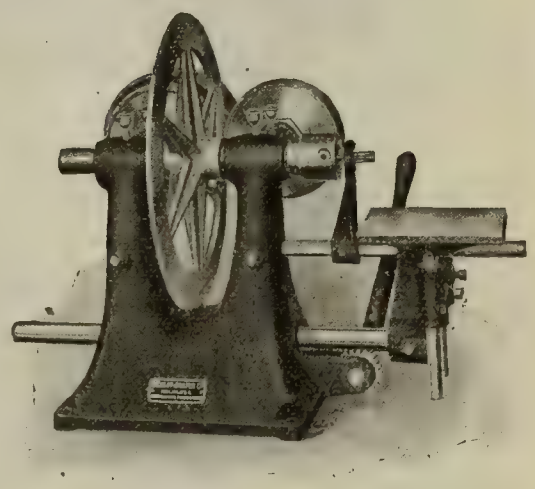
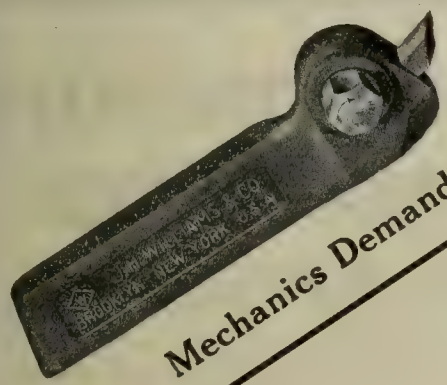
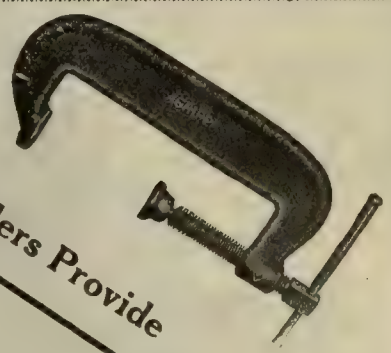


Bench Tapper



Mechanics Demand



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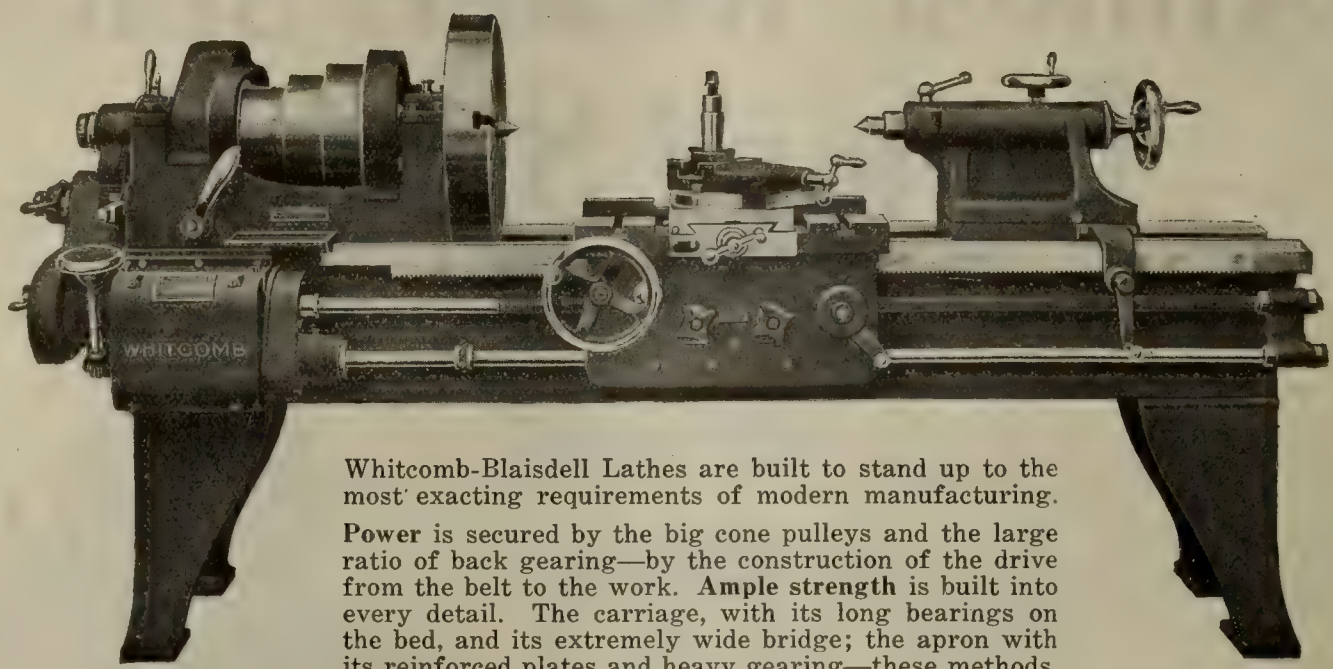

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Power is secured by the big cone pulleys and the large ratio of back gearing—by the construction of the drive from the belt to the work. **Ample strength** is built into every detail. The carriage, with its long bearings on the bed, and its extremely wide bridge; the apron with its reinforced plates and heavy gearing—these methods, consistently followed throughout the design, build a powerful, durable machine tool.

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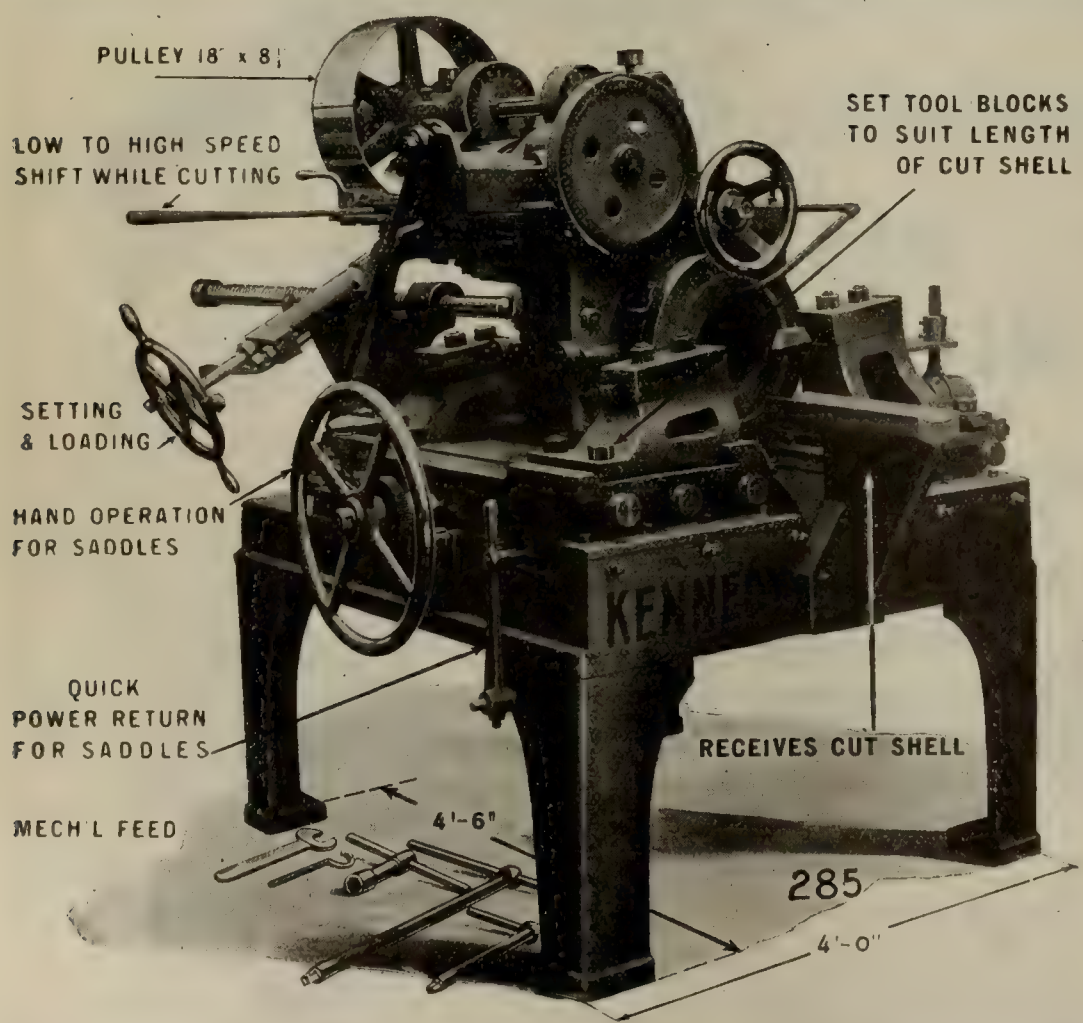

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Cuts both ends at once

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A Girl can operate it

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Every machine is equipped with our patented keyed overhanging arm which insures positive alignment of arbor and boring bar and also prevents the cutter being pounded out of line under cut.

Kempsmith machines are heavy, with weight well distributed and their accuracy is guaranteed within very close limits.

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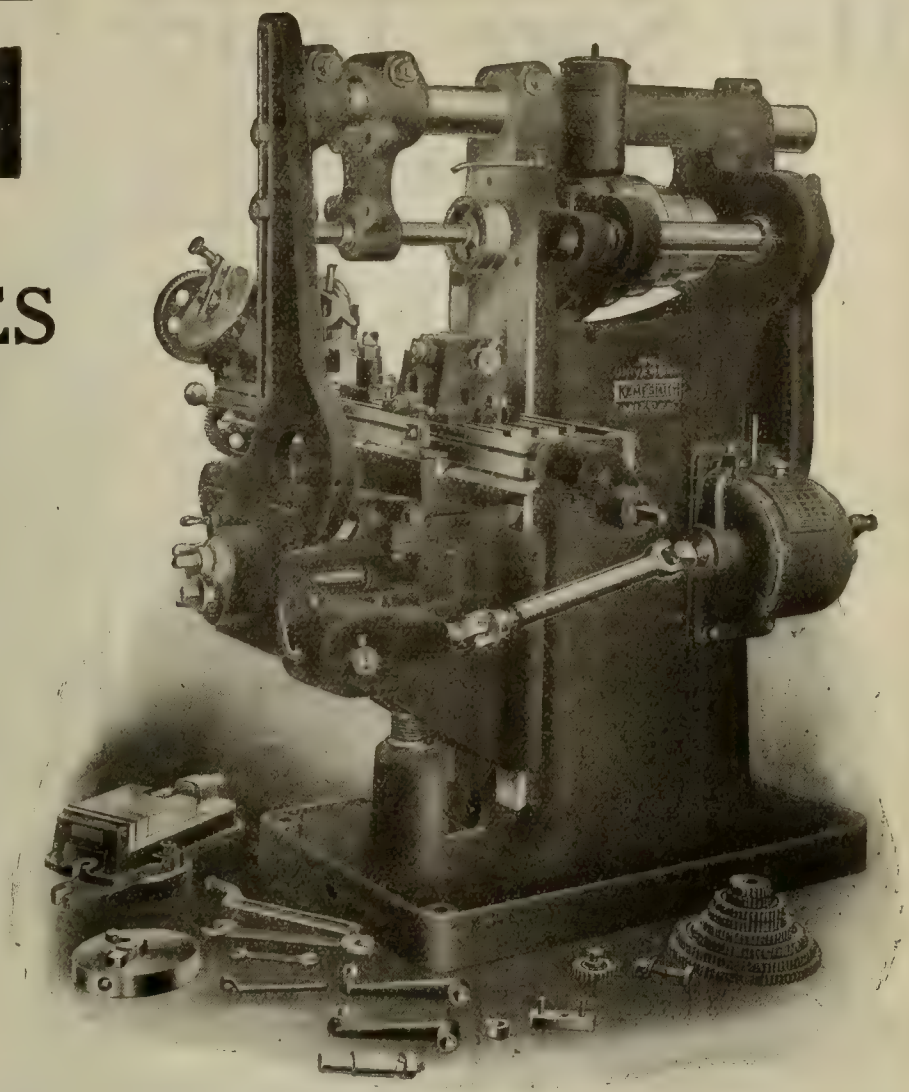

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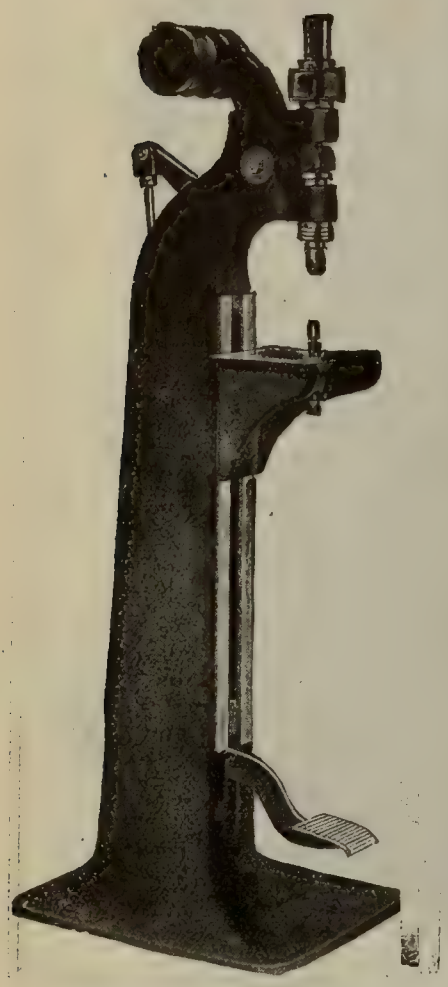

Her deep-rooted desire to do thoroughly whatever work is expected of her makes

WOMAN

ideally fitted for operating the Grant

Silent Riveter

Instead of nerve-racking, hammer-like blows; with this Grant Rotary Rivet Spinning Machine there is absolute quiet. Noiseless twin rolls, revolving independently of each other, roll heads on the rivets under pressure. One rivet every second, and never a bent shank, whether rivets are soft brass or hard steel. Heads finished perfectly smooth, show no mark of the riveting tool.

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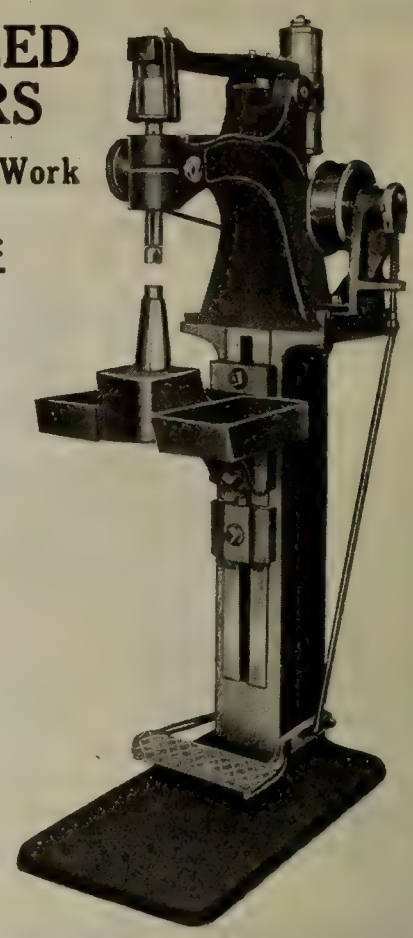
For High Speed Work



FEATURES:

Economy in floor space, elimination of weight and a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushings are used throughout.

No riveting too intricate for us; no riveting which our machine cannot accomplish.

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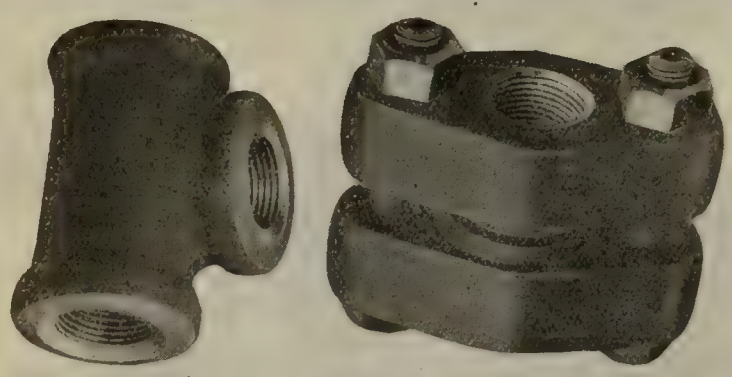

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They are made after a thorough study of the requirements of these fittings. Our manufacturing knowledge of the machines these fittings are for has given us an intimate knowledge of the strength required.

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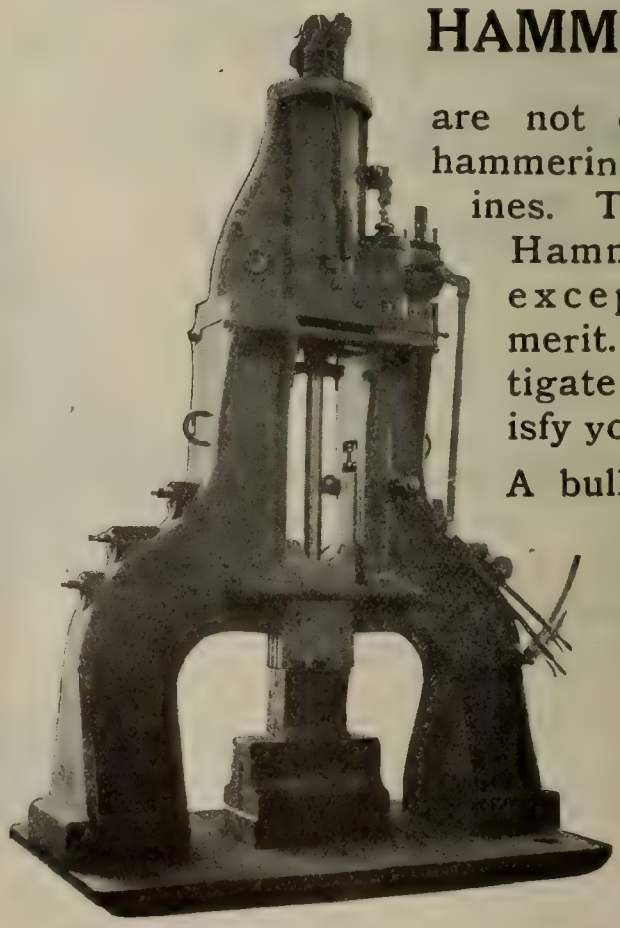

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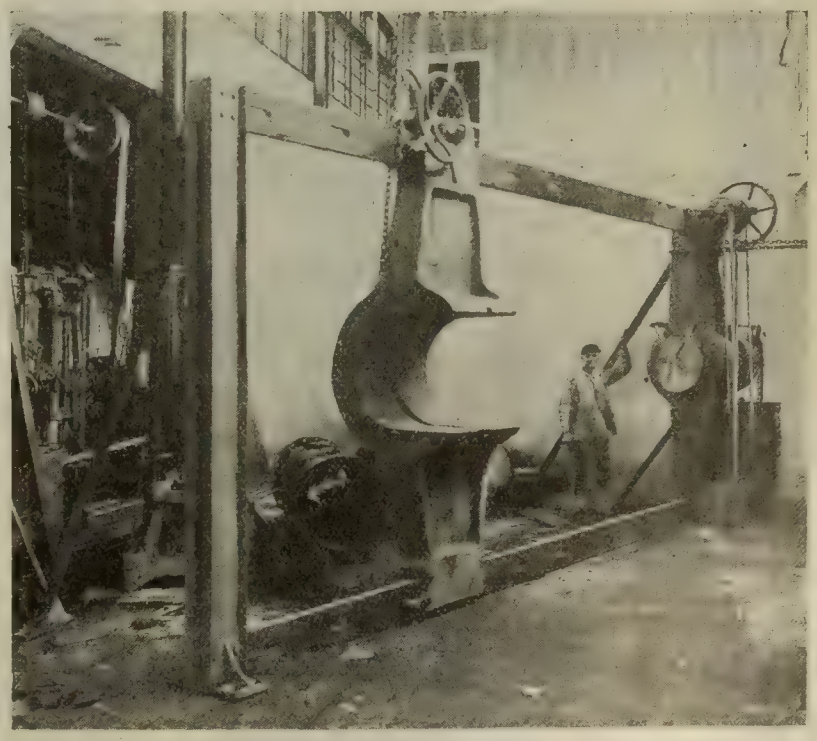

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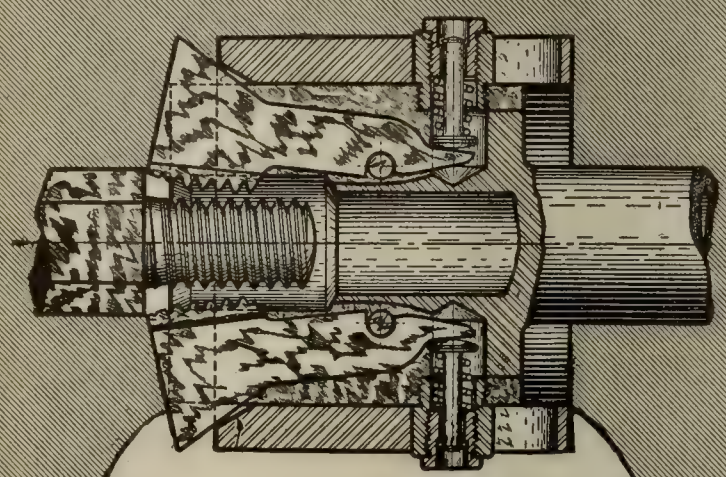

QUALITY OF THREADS

The quality of threads cut by the W. S. O. D. is due to construction of the die head.

Chasers are held to the work by a solid steel shell which bears on all four lands directly back of the cutting teeth. (See diagram above). This shell also releases and closes the chasers, moving backward or forward in doing so.

The chasers fit in slots in a solid steel body. This prevents any tendency of the lands to tip, etc.

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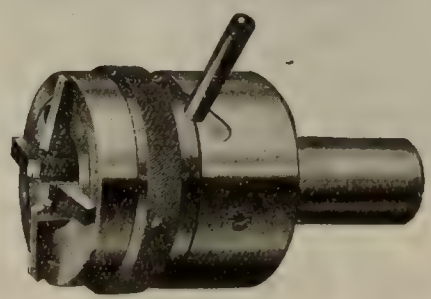
The saving in time taken to back off, the free, easy cutting of the lands, the absence of trouble with the die head, all make for big, gratifying production.

LOWER COSTS

Saving in time, increased production, etc., mean lower costs, and consequently recommend this die for your use.

The W. S. O. D. is made in three models, one of which is particularly adapted to your special requirement. Tell us what your work is and we will recommend the right head for the job. Ask for literature and catalog.



Wells Self-Opening Die
Model B

Wells Bros. Co. of Canada, Ltd.
Galt, Ontario

Sales Agents: The Canadian Fairbanks-Morse Company, Limited
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for Heat, Test and Inspection Marking of Shells

Special Champion Holders concave on face for marking sides of shells.

Special Holder shown, with the type chamber curved radially for marking the base of shells. Small illustration shows style of type used in these holders.

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is doing its bit. The sharp, hardened tungsten steel teeth cut their way through rod or sheet, steel or copper as a machine gun cuts its way through opposing infantry.

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What blade to use is indicated on page 208 of our Catalog No. 213. Send for your copy.

STARRETT HACK SAWS CUT QUICKER & LAST LONGER

The L. S. Starrett Company

THE WORLD'S GREATEST TOOL MAKERS

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THEY WEAR

They have the teeth and they have the stock. Remember this brand and cut your filing costs.

PXH

TRADE MARK

QUALITY FILES

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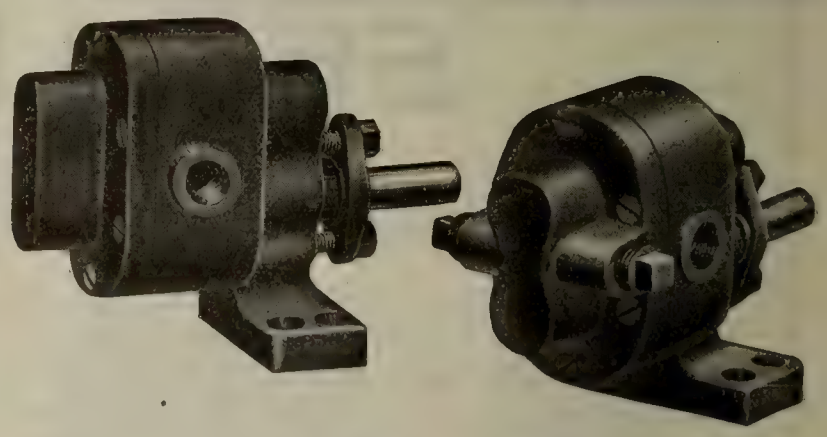

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Machining the British 6 in. Mark XI. High Explosive Shell

By M. H. Potter

Changes in the complexion of the shell industry have followed each other in recent months with kaleidoscopic rapidity, and the resources of manufacturers have on frequent occasions been severely tried in adjusting themselves to changes in type. The design of shell described herewith is that upon which many manufacturers are at present concentrating.

INASMUCH as many manufacturers have found this particular shell rather difficult to produce, and have experienced considerable trouble and delay in securing rapid and steady production, this article will no doubt be of timely interest. Special attention is called to the sequence of operations, the working gauges used and the tool equipment involved.

To those who seek the shortest methods and the least number of operations attention is especially called to the method as pursued in this instance. After actual tests by practical experience, the following was found to be the best in the long run. In other words, the easiest way is not always the best, nor is it the shortest. Air-operated mandrels and collet chucks were purchased.

Cut Off Open End

Operation 1, see Fig. 1.—Special machine or engine lathe with two cut-off tools set opposite; tools operated towards the centre by means of a cross-feed screw; the feed screw is operated by worm gears driven from lathe headstock gear.

Gauges.—Length gauge to extend from the end of bore, having a centre punch to mark shell before this operation.

Centre Closed End

Operation 2, see Fig. 2.—Engine lathe with special fixture; the shell and drill revolve in opposite directions; the fixture consists of a drill spindle mounted in a casting, having a V slide cross-wise to the shell centres, which allows the operator to place or remove the shell. The drill is ground at 60°, and has no side clearance.

Gauges.—A flat depth gauge is used.

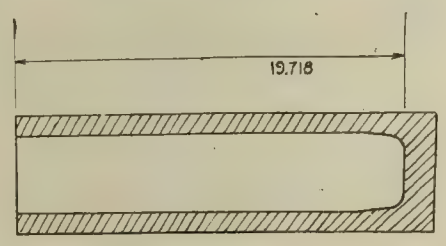


FIG. 1.

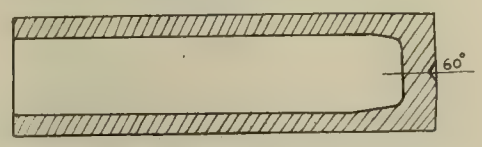


FIG. 2.

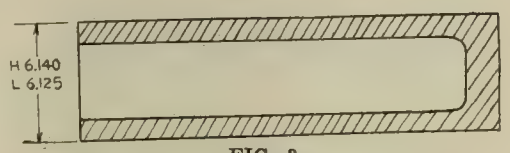


FIG. 3.

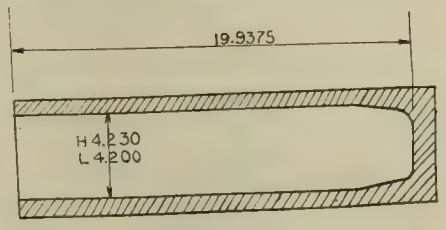


FIG. 4.

Rough Turn

Operation 3, see Fig. 3.—The cutting tool is stellite welded to a machine steel shank.

Gauges.—A snap gauge for low and high diameters.

Bore

Operation 4, see Fig. 4.—Boring machine with single boring bar, having a taper hole and slot for driving key. The three boring heads are as follows: First, for roughing the straight part of bore; the two cutting tools are ¾ in. square and expanded to size by means of a taper plug screwed into the end of the boring head. Second, for roughing the taper and bottom of bore; two form cutting tools extending 1 in. on the straight part, held in taper slot in boring head by two machine screws; the holes (for the machine screws) are slightly elongated to permit the tool to be "packed up" to size. Old finishing tools are used in this head. Third, for finishing the bore; same boring head and tools (new) as used for the second cut.

Gauges.—Plug gauges for high and low diameter of bore; plunger gauge for depth of bore.

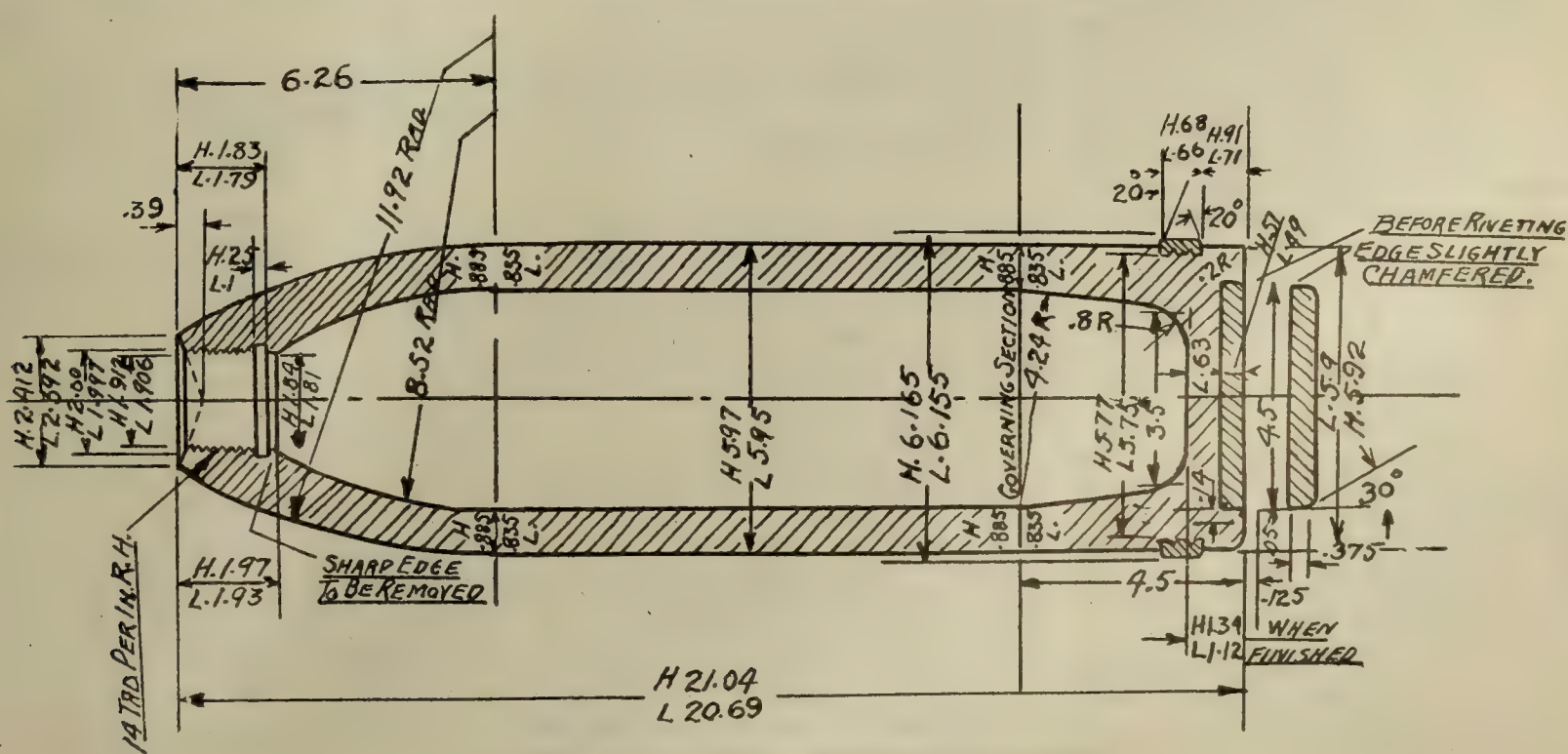
Rough Face Base

Operation 5, see Fig. 5.—Special open-end machine or engine lathe.

Gauges.—Length gauge to extend from bottom of bore to end (outside) of base, having a centre punch.

Re-centre

Operation 6, see Fig. 2.—Same as operation 2.



PRINCIPAL DIMENSIONS OF BRITISH 6-IN. H.E. SHELL.

Re-rough Turn

Operation 7, see Fig. 6.—Re-rough body and finish turn base; engine lathe with single-pointed cutting tool.

Gauges.—Snap gauge for high and low diameters of body; similar gauge for high and low base diameters; form gauge for length of base diameter.

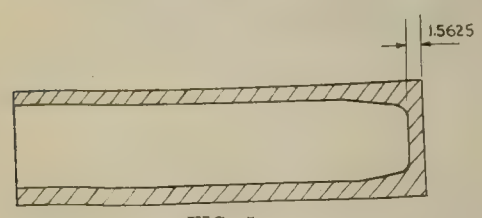


FIG. 5.

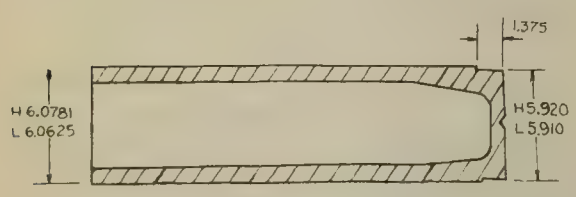


FIG. 6.

Chamfer Open End

Operation 8, see Fig. 7.—Engine lathe with special tool holder; the tools being set so that the cross-feed is not required.

Gauges.—Flat gauge for form of chamfer.

Re-rough Face Base

Operation 9, see Fig. 8.—Same as operation 5, a similar gauge being used (distance between end of gauge and centre punch being 1.50).

Nose-in

Operation 10, see Fig. 9.—Hydraulic press and oil furnace; the shell is placed (about 6 in. of the open end in the furnace) and heated to a white heat for a distance of 1½ in. down the open end.

Gauges.—Outside length gauge for over-all length of shell; ball gauge for diameter of hole in nose.

Bore and Ream Fuse Hole

Operation 11, see Fig. 10.—Turret lathe, 1st turret; drill 1 11-16 in. diameter; 2nd turret, facing cutter, having an adjustable rod to extend to base (inside); 3rd, two single-pointed boring tools for double diameter of nose, having two threaded collars to regulate depth of bore; 4th turret, double diameter reamer, with adjusting collars, as used on 3rd turret; 5th turret, rose reamer for angle of fuse seat, with pilot pushing in bore of nose.

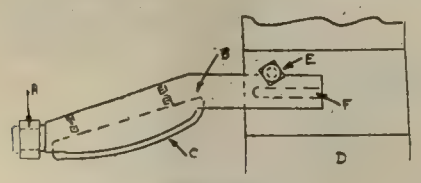


FIG. 11.

B is the machine steel holder with a round shank to fit in the tool block D. The taper pin clamp E and key F permit of quick handling, as the tool must first be placed in the nose of shell and then clamped in position in the tool block. The shank at B is made as large as possible. The blade C is kept in line with the guide roller A, which keeps the bored contour in line with the bore proper.

Gauges.—Plunger gauge for distance of fuse seat to bottom of bore; plug gauge for high and low diameters of gaine seat; similar gauge for high and low diameters of fuse hole proper; length gauge for length of bore in fuse hole.

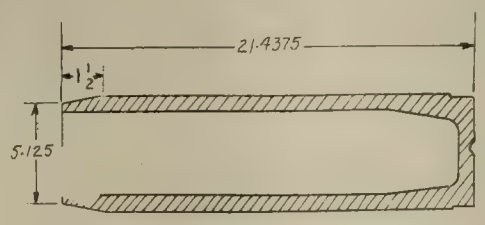


FIG. 7.

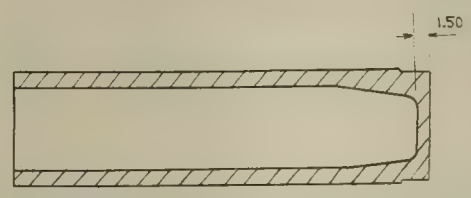


FIG. 8.

Finish Contour Inside Nose

Operation 12.—Engine lathe, with boring fixture (see Fig. 11), with explanatory note.

Gauge.—Length gauge for length of fuse hole.

Finish Turn Body and Nose

Operation 13, see Fig. 12.—Engine lathe with cam profiling attachment; expanding centre in nose end of shell, see Fig. 13.

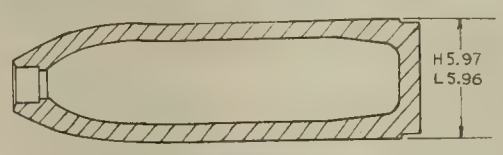


FIG. 12.

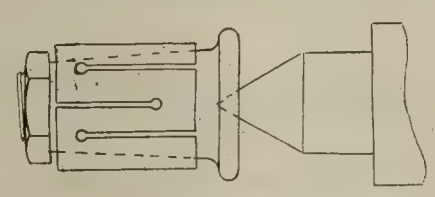


FIG. 13.

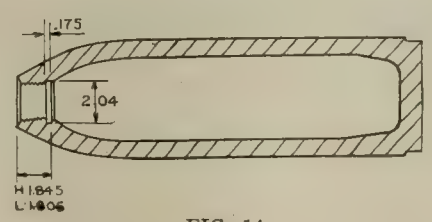


FIG. 14.

Gauges.—Snap gauge for high and low diameter of body; ring gauge for high body; ring gauge for low body; two latter used by inspector for checking; form gauge for nose profile.

Recess and Thread Nose

Operation 14, see Fig. 14.—Engine lathe, with special tool post and tools (see Fig. 15 and explanatory note).

Gauges.—Combination (thread) gauge for threads and checking angle of fuse hole; length gauge for distance of recess from fuse hole seat.

Weight

Operation 15.—Special Fairbanks basket scale or regular platform scale (platform set flush with bench top); see Fig. 16 and explanatory note.

Recess for Base Plate and Form Bead

Operation 16, see Fig. 17.—Open-end machine or engine lathe, with special attachments; see Fig. 17A and explanatory note.

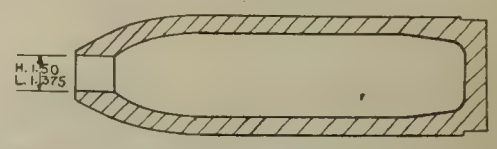


FIG. 9.

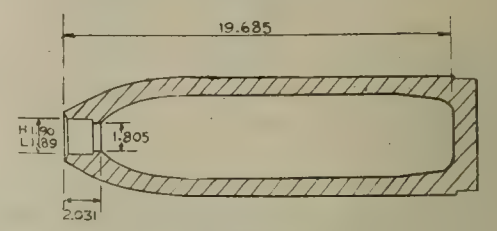


FIG. 10.

Gauges.—Plug gauge for diameter of recess; form gauge for bead; flat gauge for high and low depth and flatness of recess.

Check Weight

Operation 17.—See scales as used in operation 15.

Gauges.—Gauge for checking thickness of base.

Groove and Wave

Operation 16, see Fig. 18.—Open end machine or engine lathe with tool block and tools, as shown in Fig. 19.

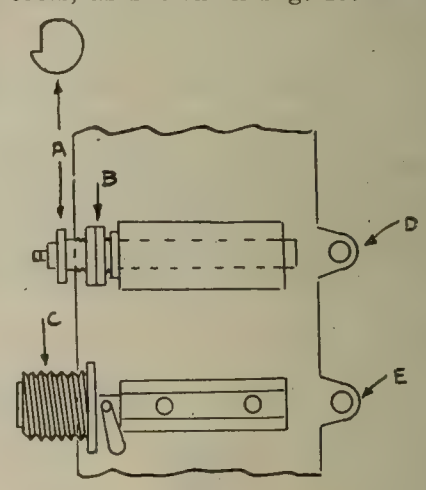


FIG. 15.

A is the circular recessing tool; B the threaded collars which determine the distance of the recess from the fuse hole edge; C is a standard collapsible tap; D and E are the pin stops which lock the tools on centre.

Gauges.—Flat gauge for angle of undercut; flat gauge for width of groove; flat gauge for distance of groove from base; flat gauge for height of ribs; snap

TABLE OF WEIGHT TO BE REMOVED

	LBS.	OZS.		LBS.	OZS.	BLOCK	INCHES
HIGH LIMIT	84	15	to	85	2	1	0
	85	3	-	85	6	2	1/32
	85	7	-	85	10	3	1/16
	85	11		85	14	4	3/32
	85	15		86	2	5	1/8
	86	3		86	6	6	5/32
W LIMIT	86	7		86	10	7	3/16

FIG. 16.

Explanation of table: Should the shell weigh 85 lbs. 12 oz. it is stamped 4, which means that block 4 is used in the following operation (16).

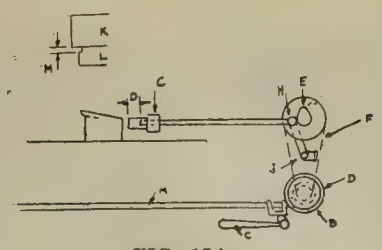


FIG. 17A.

The shaft A is lengthwise of the lathe, and is driven by the headstock gears; at the rear is the worm B. The lever C carries a cam which meshes the worm with the worm wheel. The hand wheel D (when A is not in mesh) allows the operator to bring the cam E into the desired position. The chain F drives the main cam shaft G. The roller on H swings from J and carries the block C. These blocks (Nos. 1, 2, 3, 4, 5, 6, 7) vary in thickness at D in 32nds of an inch (see table, Fig. 16). The cam E has a lift which gives a feed of 100th of an inch to one revolution of the shell. The tools K and L are against each other, the distance M being 1/32 larger than the finished shell, which permits the tool K (recessing) to be brought to the left 1/32 of an inch to take a finishing cut off the side of the recess.

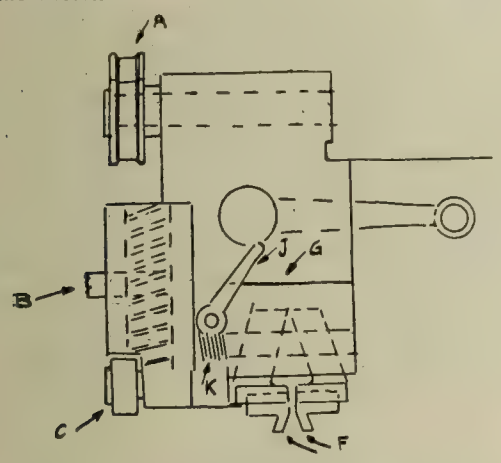


FIG. 19.

The turret carries three independent tools—A the circular grooving tool; B the flat waving tool, which is operated by a face cam running against the roller C. The coil spring E keeps the tool holder against the cam. The undercutting tools F are mounted in the holders G, which have racks cut in their shanks. The gear H meshes with G, and by means of the handle J (through the worm and worm wheels K) the tools are fed forward.

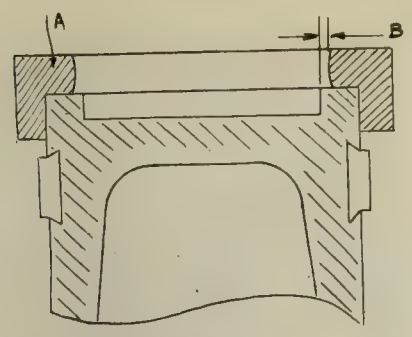


FIG. 20.

The ring A is a slide fit over the base end of the shell, the distance B being equal to one-half the width of the planing chisel.

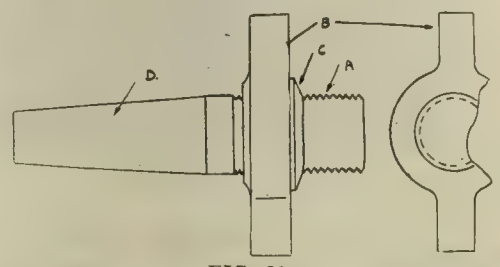


FIG. 21.

The nose of the shell is screwed on the threads A. The threaded lock nut is then driven against the nose (the taper C being 18° to match the taper of the fuse hole angle). The taper shank D fits the lathe spindle.

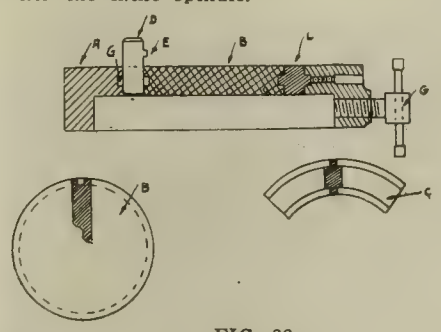


FIG. 22.

The outer ring A is grooved at G; the spacers (2 set opposite) C lock this (A) outer ring to the inner ring B. The stamps D (projection E) prevents the stamps from falling out when the fixture is not in place on the shell. Blank pieces a little shorter in length than the stamps are used to fill in with.

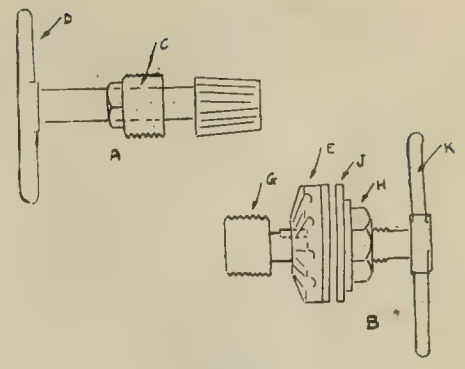


FIG. 23.

A is the sizing reamer for the gaine seat diameter. The threaded nut C is screwed into the fuse hole and the reamer operated by means of the handle D. B is the seating (rose) reamer. The reamer proper is keyed to the threaded stem G. The nut H forces the thrust bearing J against the reamer. It is operated by the handle K.

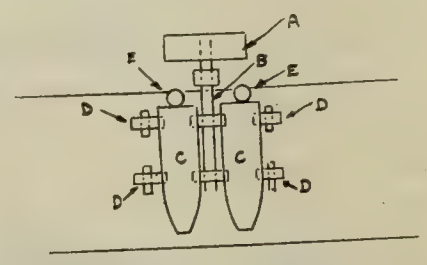


FIG. 24.

The belt-driven pulley A drives the shaft B. The shells are represented by C. The idle rollers D are bracketed to the bench; E are roller stops, which hold the shell in place.

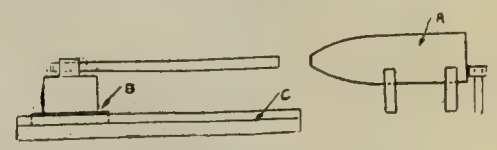


FIG. 25.

The shell A is revolved in rollers, as in Fig. 24. The varnish spray gun is mounted on a base B, which is flanged to slide along, the board C, which is also flanged to suit the base of the spray gun.

gauge for high and low diameters of ribs; snap gauge for high and low diameter of groove.

Sand Blast, Wash and Clean

Operation 17.—Special machines used.

Preliminary Shop Inspection

Operation 18.—The following gauges are used after the shells have been col-

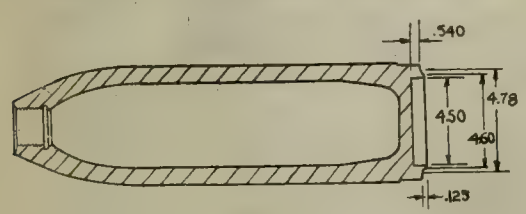


FIG. 17.

lected in series: Ring gauge high diameter of body, 5.97 in.; ring gauge low diameter of body, 5.95 in.; ring gauge high base, 5.92 in.; ring gauge low base, 5.90 in.; snap gauge high and low diameter of driving band groove, 5.77 in. and 5.75 in.; width of driving band recess, .680 in. and .660 in., and distance from base, .910 in. and .710 in.; caliper gauge thickness of wall, .885 in. and .835 in.

Preliminary Government Inspection

Press on Band

Operation 19.—Special banding press.

Fit and Rivet Base Plate

Operation 20.—A pneumatic hand hammer is used; see Fig. 20 for special fixtures.

Gauges.—The usual test for tightness.

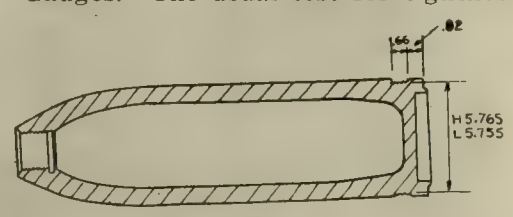


FIG. 18.

Finish Face Base

Operation 21.—Open end machine or engine lathe; see Fig. 21 for method of holding shell.

Gauges.—Flat gauge for form of base radius; ring gauge for high base check.

Check Weight

Operation 22.—Scale as used for weighing in operation 15.

Stamp Base

Operation 23.—See Fig. 22 for fixture.

Hand Re-tap and Seat

Operation 24.—The ordinary expanding hand tap; see Fig. 23 for seating and sizing reamers.

Wash and Clean

Operation 25.—Special washing ma-

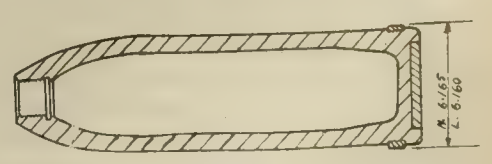


FIG. 26.

chine; see Fig. 24 for roller fixture for revolving shell to facilitate cleaning.

Varnish and Bake

Operation 26.—Special shell varnishing machine or fixture; see Fig. 25. Gas ovens to accommodate roller trucks, with structural steel racks to hold shell's nose downward; the required heat and length of time required depends upon the varnish used.

Turn Band

Operation 27, see Fig. 26.—Open end machine or engine lathe; for fixture see Fig. 27.

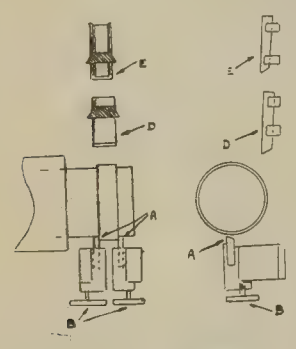


FIG. 27.
The two tools A for trimming to width are fed in independently by the handles B; D is the rough forming tool, and E the finish forming tool.

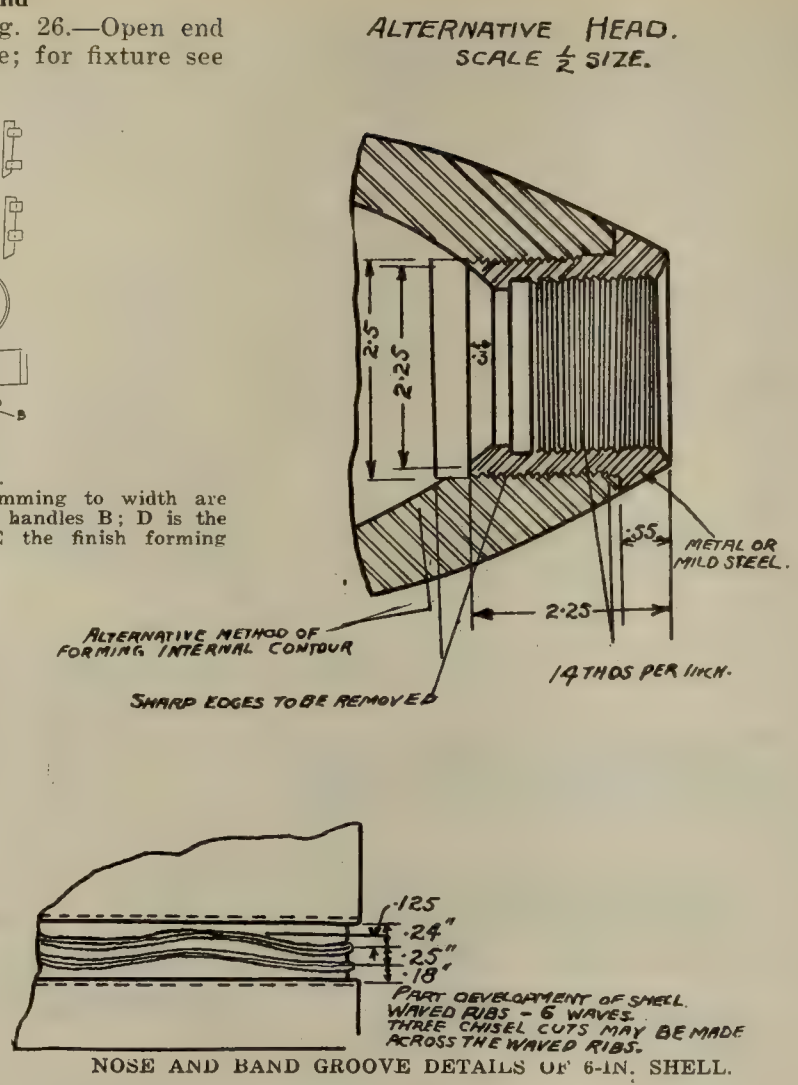
Gauges. — Snap gauge low and high diameter of band; ring gauge high diameter of band; ring gauge low diameter of band; flat gauge for form of band; high and low width of band and high and low distance from base.

Final Inspection

The following gauges are used: Ring gauge for high base; flat form gauge for profile of nose; cylinder gauge for concentricity.

Final Government Inspection

After which the shells are placed in the bond room previous to boxing and shipping.



NOSE AND BAND GROOVE DETAILS OF 6-IN. SHELL.

SUBMARINES TO RAISE SUNKEN SHIPS

THAT the submarine considered as an engineering creation may be put to practical constructive use in salvaging sunken ships seems likely from the details which have been received regarding an invention by W. D. Sisson, an American engineer. Full particulars of the contrivance are not at present available, but from such as are given the general working scheme may be deduced.

The four accompanying engravings are from photographs taken in the shop where the diving bell was built, and it is uncertain whether it has yet received its initial test in actual working conditions.

The hull is a vanadium steel sphere, 8 ft. in diameter, and consists of two halves with a water-tight joint, by means of which they are bolted together. It is built sufficiently strong to withstand the high pressure which will be encountered when submerged to great depths and is roomy enough for the two operators and the working apparatus.

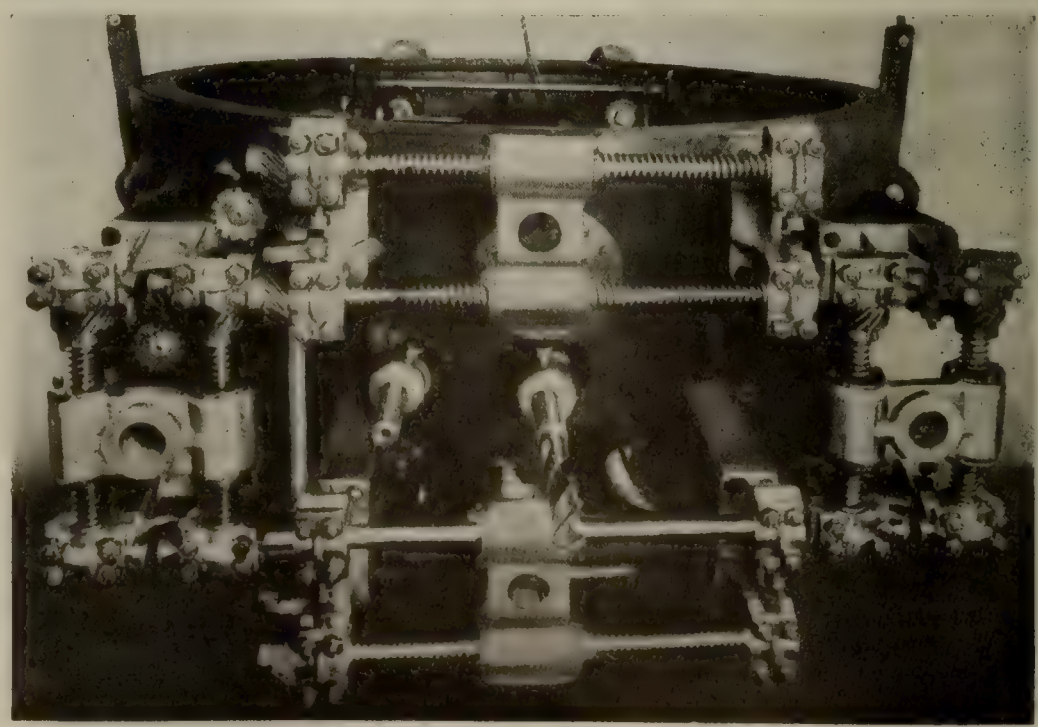
The object of the invention is to provide a device which will drill hobs in the sides of the sunken ships, thus affording a means of attaching a series of sunken pontoons to the vessel to be lifted, so that when the requisite number of pontoons is in position the water in them may be pumped out, and the resulting buoyansy will lift the ship. The drills used are 2 in. in dia. and driven by electric motors inside the shell. The sphere is held tightly against the sides of the vessel on which it is operating by means of a series of electro-magnets attached to the outside of the sphere by spindles passing through holes in the four adjustable saddles, which may be seen in the two engravings. Four 3,000 candle-power incandescent electric lamps enclosed within a 2 in. glass protector, reinforced with steel net, are attached near the magnets, outside the shell, for throwing light on the work and the operators are enabled to see what they are doing by looking through lenses 4 in. thick in the sphere.

It may be explained that the steel pontoons which will be used are 40 ft. long and 15 ft. dia. and each has a lifting power of 300 tons when exhausted. It is proposed to have the submarine guide the pontoons to their places after drilling the holes, and for the purpose there are four propellers and a rudder so arranged as to propel the globe in a horizontal or vertical direction, as desired, at a speed of two miles per hour. Just how the actual attachment of the pontoons to the ship will be accomplished we are unable to state.

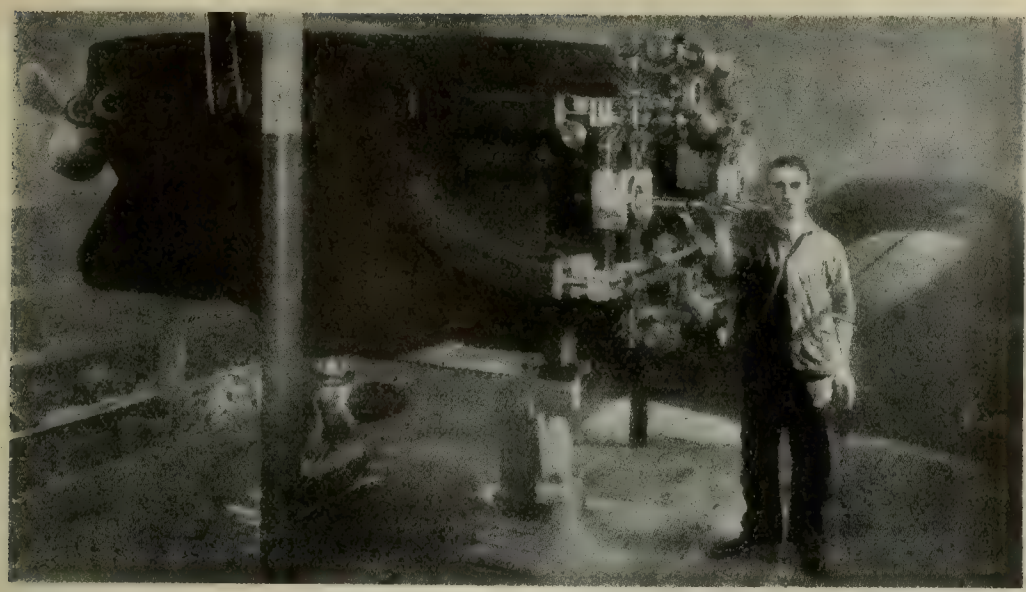
The submarine and equipment weigh 6 tons in the air and are lowered into the water by means of a cable strong enough to support a weight of 56 tons. Through this cable also run the wires for carrying current to the electric machinery and lights as well as the telephone wires. The atmosphere within the sphere is replenished by oxygen from a cylinder capable of supplying sufficient oxygen over a working period of 72 hours. Chemicals are doubtless provided to absorb the carbonic acid gas produced by respiration.

OVERALLS NOT NECESSARY FOR WOMEN WORKERS

CHESTER B. LORD, general superintendent of the Wagner Electric Manufacturing Company, of St. Louis, declared at the recent convention of the American Society of Mechanical Engineers that the women workers in munitions and other plants who consent to wear overalls are of the masculine type and are usually lacking in sex-consciousness. He believed, however, that all women workers in a plant should be made to dress alike and his plant had found out



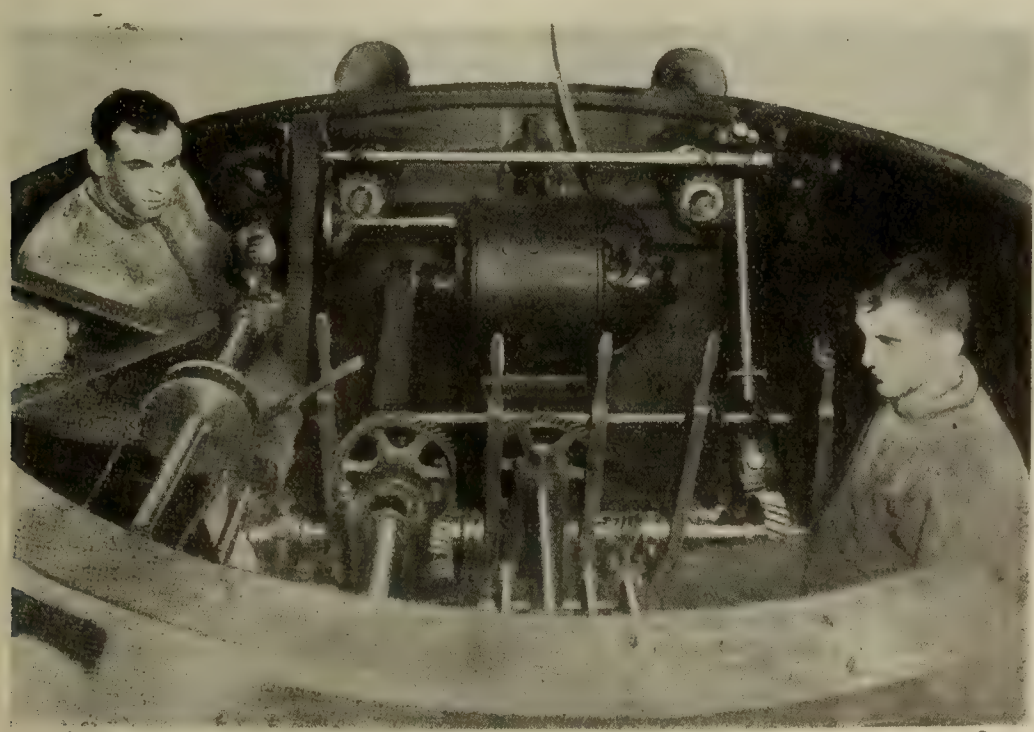
ARRANGEMENT OF DRILL MAGNETS AND SHIFTING DEVICES.



EXTERIOR MECHANISM OPPOSITE PROPELLERS.

by experience that the best clothes for women workers were a dark skirt, an unfadeable blue linen waist of standard design and a uniform apron. He said that all women workers would usually obey such rules about their clothes provided the rule were enforced for everyone. The uniform clothes were optional on Saturdays as many women desired to shop on the half holiday. Woman workers had usually an inherent fear of men and were willing to follow to the letter rules laid down for them.

Mr. Lord said that in employing women successfully in plants many little things had to be taken care of that would contribute to their contentment of mind without which they were not efficient. He said that all the machines in the shops of his company employing women were painted white and special attention had to be given to cheerfulness and cleanliness throughout the workrooms and conveniences. He also said that in his plant there were on an average of two marriages per month among the employees and they were always very successful chiefly because under the conditions of working, women depended entirely upon their natural advantages to attract the men, and the clothes consciousness and vanity of the woman were eliminated.



LOOKING INTO THE LOWER HALF, SHOWING LAYOUT OF MACHINERY.

LABOR SAVING APPLIANCES IN FERRO-CONCRETE WORK

By O. C.

IT has always been the policy of modern engineers to encourage the design of machines for the efficient, rapid and economical performance of work formerly carried out entirely by manual labor. The extended employment of machinery is more than ever necessary to-day in view of the existing labor shortage. Owing to the circumstance that ferro-concrete work is executed on the site without previous preparation of the materials, the suggestion may perhaps be made that this class of work offers little scope for labor saving appliances. That may be so in comparison with steel construction, for which a large amount of preliminary work has to be carried out in the machine shops, the fitting shops, and the erecting yard, but mechanical aids are of much value to the reinforced concrete builder.

Amongst them may be mentioned appliances for handling materials delivered on the site, machinery for crushing, screening and otherwise preparing aggregates in mixing concrete, for hoisting and distributing this mixed material expeditiously to the places where it is to be used, for cutting, bending, and otherwise preparing bars and strips, employed as reinforcement, and for various woodworking operations incidental to the construction of moulds, not to mention anything of the elaborate plant required in connection with the execution of large contracts. It is sometimes possible to execute all the necessary work by means of very simple mechanical appliances but as a general rule it will be found advantageous to make a special study of the aids available for the substitution of machinery in the place of hand labor.

EXTERIOR VIEW. NOTE PROPELLERS AND RUDDER.

AN important activity of the American Society of Mechanical Engineers is its work in co-operation with government bureau chiefs and manufacturers in securing and maintaining uniform standards in gauges used in the production of guns, ammunition, motor trucks, aircraft and other war material, and a public meeting of its gauge committee, held recently, was largely attended by manufacturers and their representatives.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

MACHINING BLOCKS FROM POT CASTING

By Frank H. Mayoh.

AN example of machining thin square-shaped blocks in a rather interesting manner is shown by the accompanying illustrations. These blocks have a round hole bored in them, and the dimensions of the same are shown in the lower view of Fig. 1. In the upper view of Fig. 1 a pot casting from which these blocks are made is shown, and it will be noticed in this connection that a round beveled flange is cast at one end. This flange is for gripping purposes while performing the various operations.

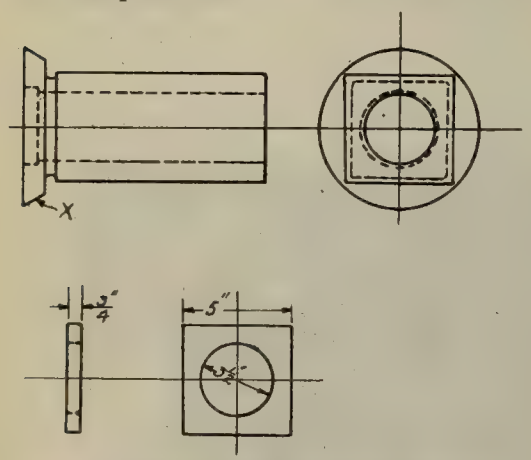


FIG. 1. POT CASTING TO BE MACHINED AND FINISHED BLOCK.

In making these square blocks, the operations are performed in the following manner, the first of which is turning the beveled flange. This is accomplished by gripping the pot casting in a four-jawed chuck in the usual manner on a lathe, when by using a broad nose tool the beveled surface X is turned true, this being a necessary preliminary operation, as by so doing we have a satisfactory gripping surface from which the pot casting may be held true while performing the remaining operations. The second operation is performed on a chucking machine, as illustrated by Fig. 2, the method of doing this being obvious, as it merely consists of boring the hole with the cutter A held in a boring

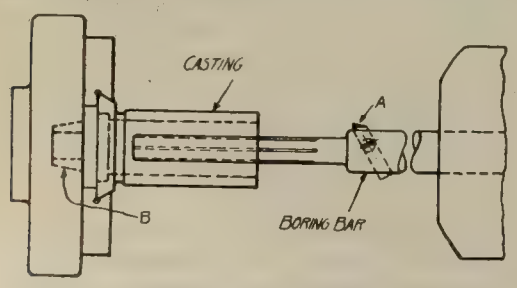


FIG. 2. METHOD OF BORING THE POT CASTING.

bar, the pot casting being gripped by the flange in a three-jawed chuck.

The boring bar at this operation is piloted in a bushing B held in the chuck. Having bored the hole, it is now necessary to machine the four sides of the pot casting and saw it apart. Machining of the sides in this case is performed on a shaper using index centres, and the man-

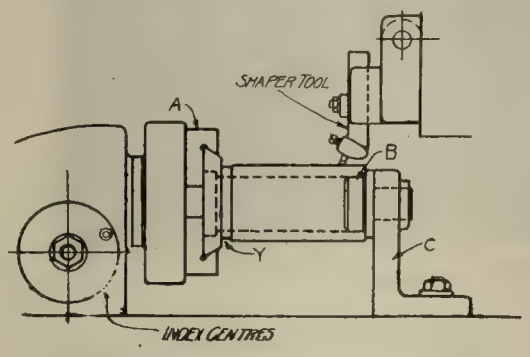


FIG. 3. METHOD OF SHAPING THE POT CASTING SQUARE.

ner of performing this is shown by Fig. 3.

For this operation the pot casting is again held in a three-jawed chuck A by the flange, while the other end is supported by means of a plug B in the bored hole; the plug is held in an angle plate C, which in turn is bolted to the platen of the shaper. One side of the pot casting is now machined by feeding the tool across the work in the usual manner, and after one side has been machined the pot casting is indexed quarter-way round and machined in the same manner,

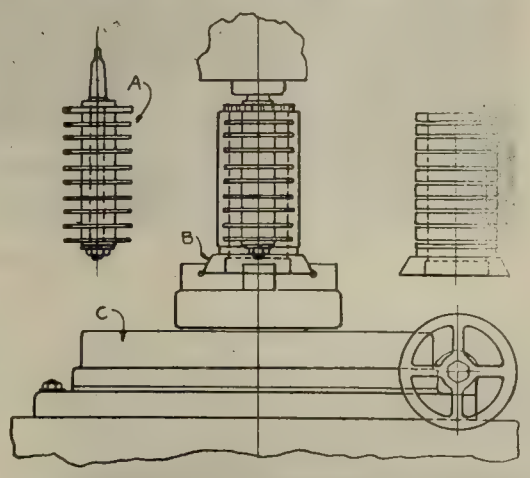


FIG. 4. METHOD OF MILLING OUT BLOCKS.

likewise the two remaining sides are machined, thus completing the rectangular shape of the pot casting. In this connection it is well to notice the recess Y in the pot casting which was provided as tool clearance for shaping into.

The pot castings being now finished, we come to a very interesting operation: that of cutting the pot casting into blocks. Anyone who is familiar with turning square bars in a lathe knows how hard this operation is on the tool and machine when starting to cut, as the tool is only cutting during four intermittent periods of each revolution and, therefore, there is a tendency for the tool to dig in or pound as it takes the cut.

Nevertheless, while the turning of square or irregular-shaped work may be readily accomplished in the lathe by using a rugged tool, this operation becomes increasingly difficult when using a narrow cutting-off tool; therefore, it was decided to perform the cutting-off operation of the blocks on a vertical milling machine, as shown in Fig. 4. For doing this the gang of cutters A was provided; the casting itself was again gripped in a chuck B, which in turn was held on a circular milling attachment C. To cut off the blocks the cross-slide was brought out enough to allow the work to be clear of the cutters while it is being placed in the chuck, following this the cross-slide was fed in until the cutters were through the hole of the pot casting. In this position the cross-slide of the milling machine was clamped, when by causing the rotary attachment to revolve the blocks were sawed apart. A view of the pot casting showing the saw cuts through it is indicated as D, and it will be noticed that the upper cutter on the arbor is a surface mill for facing the end of the casting.

Another point in connection with this gang of cutters is that each cutter is slightly larger than the one below, so that the upper block will be cut off first and each one below in turn will be cut off next.

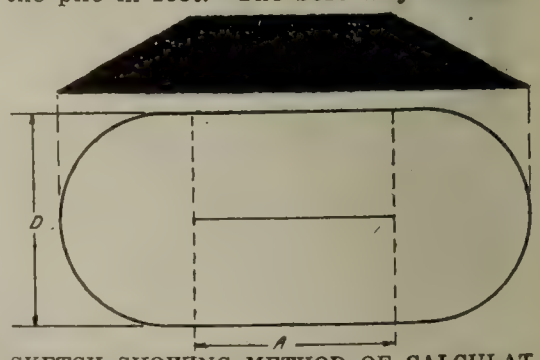
TONS OF COAL IN ELONGATED PILES

By N. G. Near.

WHEN bituminous coal is piled in a conical pile the tonnage in the volume is easily estimated from the formula, $0.00248\ D^3$, where D is the diameter of the pile in feet at its base. But coal is often stored in elongated piles, as shown in the accompanying sketch, in which case the tonnage of bituminous coal is computed from the formula:

$$0.00248\ D^3 + 0.00474\ AD^2 = \text{tons (bituminous)}$$

where A is the length of the "crest" on the pile in feet. The best way to deter-



SKETCH SHOWING METHOD OF CALCULATING COAL PILE CONTENTS.

mine the length of this crest is to subtract D from the total length of the pile at its base.

The sketch shows one of these piles both in elevation and in plan. The plan

shows clearly how the pile can be cut up into three parts. The two curved end portions, when added together, give us a pure and simple cone, whence we have the 0.00248 D^3 in the formula. The central portion has a triangular section from end to end, and its volume is one-half as great as would be the volume of a rectangular block having the same base and height. The tonnage in this central triangular portion is 0.00474 AD^2. Adding the two together we, therefore, have $0.00248\ D^3 + 0.00474\ AD^2$.

Where the coal is anthracite instead of bituminous the formula becomes

$$0.00172\ D^3 + 0.0033\ AD^2 = \text{tons anthracite.}$$

D and A are both measured in feet.

These formulas are based on the fact that one ton of coal occupies 38 cu. ft. on the average, whether anthracite or bituminous. The natural cone of anthracite is 0.25 as high as it is in diameter at its base. For bituminous coal the value is 0.36.

LOADING TIME FUSES

By G. C. White.

ALTHOUGH there have been many thousands of time fuse component parts made in this country, there are very few who know the essentials of the loading operation and while not strictly of a mechanical nature the process is interesting. Like the manufacture of components, the loading requires great exactitude and attention to detail. It is not the intention of this article to deal with all the operations necessary in loading, but to give a general idea.

Holes to Be Drilled

The real loading is performed on the top and bottom rings by pressing a certain mixture of powder or composition, as it is called, into the routing channel. This composition must have a vent in order that it may burn, for if there were no vent and the burning were confined, an explosion would occur and the slow burning or time effect would

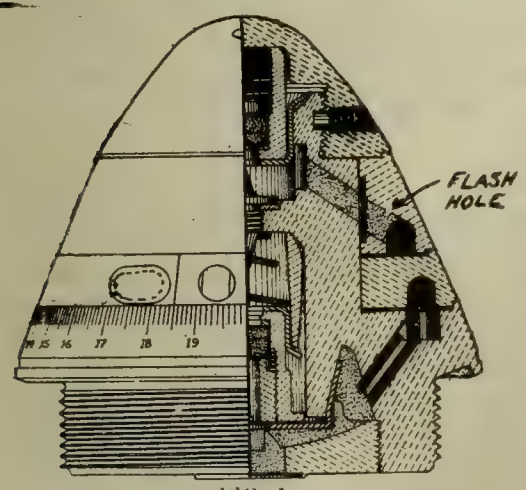


FIG. 1.

be lost. The vents are what the manufacturer of components calls the escape holes and they are elliptical in shape on the British fuse. The escape holes are connected with the composition channels by holes drilled through the escape hole. The extreme end, next to the flash hole where the flame from the detonator in time pellet comes through into the ring, is drilled with a hole in the powder vent called the vent hole, which enables the powder to commence burning, until such time as the powder pellets, which have been inserted into the hole connecting up the end of composition channel and escape hole and the escape hole itself, can be ignited.

Jigs for Drilling Holes

All work done in drilling these holes and in routing is located by a work hole. The jigs used are shown in Figures 2, 3 and 4, and their operation needs no explanation. The jig for drilling the flash hole in bottom ring is somewhat different from that used for the top ring as it must be drilled and counterbored. The jig proper is made with a wing and after the counterbore is drilled the

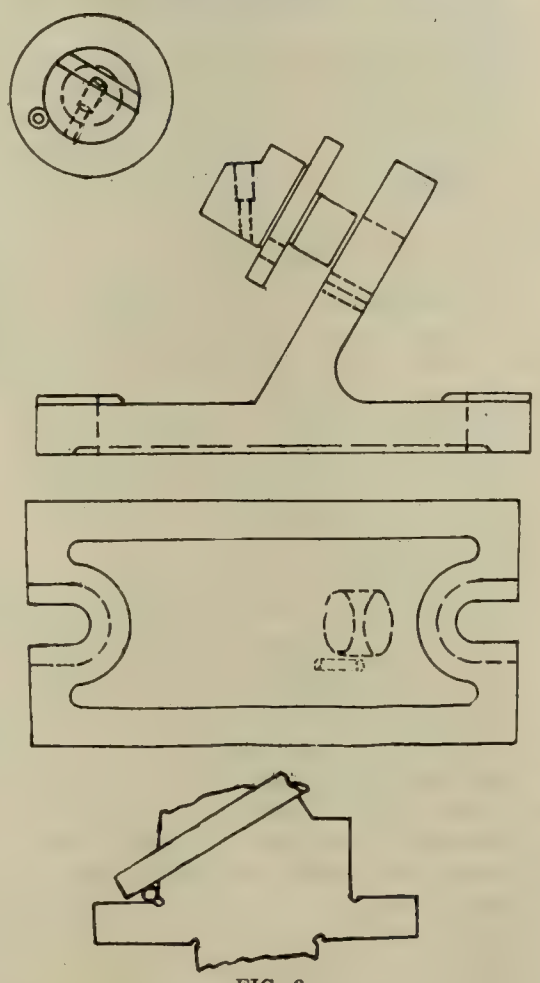


FIG. 2.

wing is thrown out of the way and the jig moved along the guides until it strikes the stop, when the other hole is drilled. A double spindle Avey drill is used. All these operations are done after the fuse composition has been pressed in.

Blending and Loading the Powder

The blending of the powder is a very important part of the loading and in this department nothing is left to chance. The powder used for loading is of two kinds, grain and mealed, but for the purpose of this description it is unnecessary to go into the details of their respective merits. It is sufficient to say that there is very little difference in their efficiency. The powder is divided into two grades, low powder 21.5 to 21.8 seconds and high powder 22.2 to 22.5 seconds. The ideal blend is of course half and half, but it is sometimes necessary to mix two to one. A trial mixture is made up and sample fuses are tested at rest in an electrical machine which automatically records the length of time consumed. A sample is also tried by spinning a fuse at 2,500 revolutions per

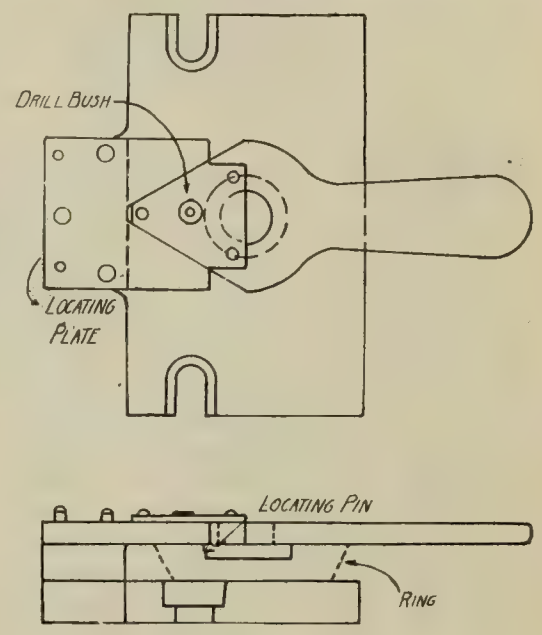


FIG. 3.

minute in a specially designed lathe and the time also recorded. If these tests are satisfactory, a sufficient quantity to load a lot of fuses is made up and a retest is made. If this is satisfactory the required amount is weighed out and sent in air-tight cases to the loading rooms.

These loading rooms and the powder blending department are conditioned, or in other words kept at a temperature of 70 degrees, and at a constant atmospheric condition, as it is an established fact that barometric conditions affect the time of burning and so exacting are the specifications in regard to the time, that compensations must be made for variations in atmospheric conditions. As a safety first precaution, the loading de-

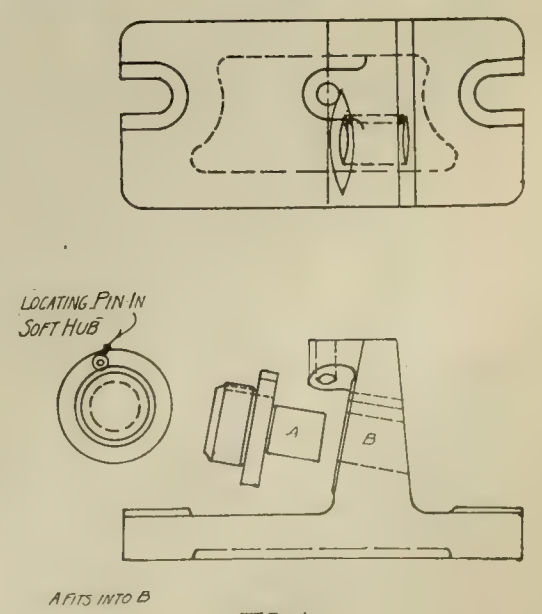


FIG. 4.

partments are divided into small compartments, each capable of turning out about 4,000 rings per day with 13 men. The loading operation consists of weighing out the powder, evenly distributing

it over the ring, assembling the loading tool, compressing the powder and disassembling the tool.

The Loading Tool

The loading tool consists of a mould

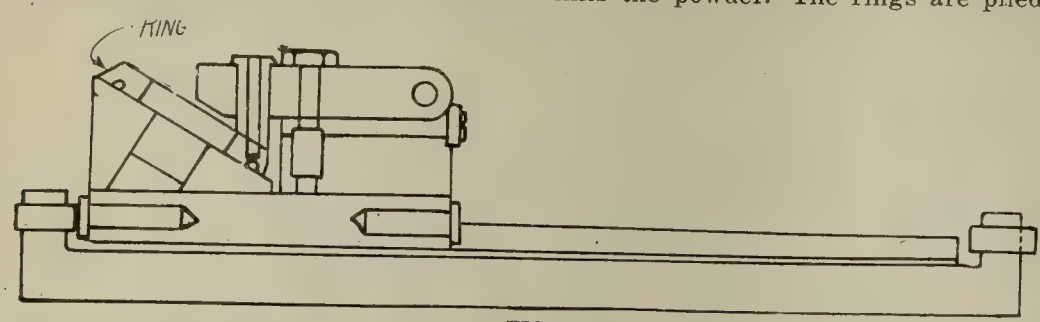
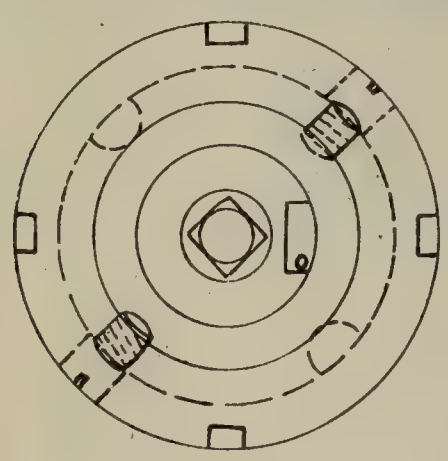


FIG. 5.

which affords support to the bottom and outer diameter of the ring. A circular plug is inserted into the bore with a press fit, the idea being to prevent the ring from distorting under the loading pressure which is applied under a slightly modified Riele or Olsen testing machine. The pressure required is approximately 40,000 and 46,000 pounds for the top and bottom rings respectively, which works out approximately 29 tons per square inch. This pressure does distort the ring and after the centre support has been pressed out the bore will close in, making it necessary to ream the ring, which is the first assembly department operation. These operations may be divided up as per the operation table, from which it will be seen that the top ring, bottom ring and body operations are kept separate.

The rings are now faced off on shaving machines which run about 600 r.p.m., which is not fast enough to ignite the powder. Surplus brass and composition cut off in the shaving operation is drawn by air through a galvanized iron container to a tank containing water which kills the powder. The rings are piled on trays for convenience in handling and sent to the assembly sections where the holes are drilled as described.



Operations on Top Ring

Rebore.
Drill powder vent.
Drill flash hole.
Lacquer.
Insert escape hole pellet, seal and shellac and put on paper washer, dry and trim edges.
Put on wax.
Put powder pellet in flash hole.

Operations on Bottom Ring

The work on the bottom ring is similar to the above with the addition of the following operations:

Put on felt washer with 100 pounds pressure.
Inspect to see that hole in felt washer coincides with flash hole.
Body operation.
Put on shellac.
Insert powder pellet in flash hole.
Put on felt washer under pressure.
Inspect to see that hole in felt washer coincides with hole in body.
Put rings in place.
Drill securing pin holes.
Take off rings and remove cuttings and burrs with a file.
Reassemble and insert securing pins.
Inspect and insert time arrangement.
Put on cap.
Tighten cap.
Drill for set screw and insert.
Tighten set screws.
Try tension on bottom ring after being sure felt washers have had time to dry.

Insert percussion arrangement after having inspected it and inspect to see that all parts of the arrangement are correct in place.

Tighten base plug.
Put in base charge of powder.
Put in filling hole plug.
Shellac base.
Solder on weather cover.

The assembly departments are for convenience divided up into sections, each capable of turning out 6,000 fuses per day of 10 hours. The components are handled separately on long tables until is becomes necessary to assemble, when they are grouped together.

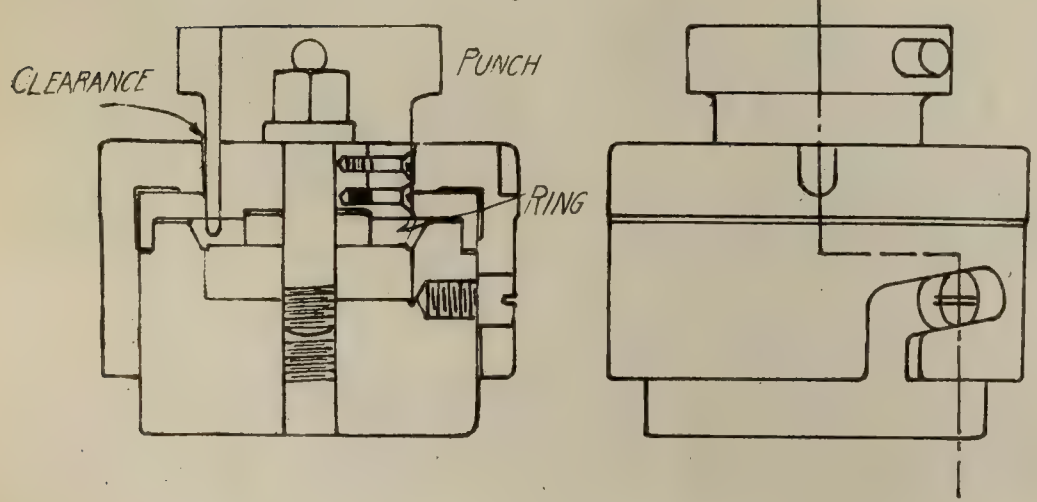
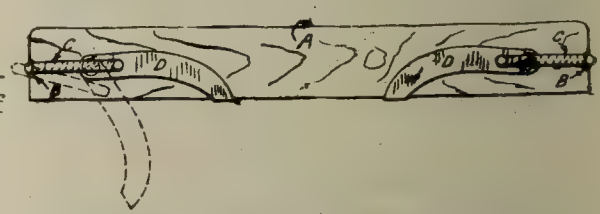


FIG. 6.

CLAMPING BLOCK FOR EMERY CLOTH

By R. Hamilton

WHEN it is required to fasten emery cloth or sand paper to a block of wood the general practice is to fasten the cloth on the wooden strip by means of small tacks; the sketch here shown illustrates a very handy and serviceable device for this purpose and one that can be easily made from a small piece of



CLAMPING BLOCK FOR EMERY CLOTH.

wire and sheet steel stock. The wooden block can be made of any desirable size and by cutting a groove in each end as shown at B will provide an efficient means for clamping the cloth by means of the toggle arrangement of the U-shaped wire and clamping lever D. The dotted line shows the clamp open to allow of inserting the cloth which is placed over the top A and between the end of the block and the wire C. When the cloth is in position the piece D is pressed back against the block so that the center line of the wire C is forced over the center of D, thus locking the toggle and also the cloth in position.

TO deaden the noise from trucks rumbling over a concrete floor, a factory has successfully used a heavy tar paper pasted to the floor by paint. The method of application is as follows: The floor to be protected is first given one coating of grey cement paint. On the following day when the paint is thoroughly dry, a second coat is applied. At the same time one side of a five ply tar paper is painted and when both paper and floor are still wet the paper is carefully laid, wet side down, on the floor and rolled with either a roller or wide tired truck until all signs of air pockets beneath the paper disappear. The surface seems to improve with age and very effectively reduces noise at a low cost to the lowest possible minimum.

Modern Welding and Cutting Processes in Locomotive Works*

By A. F. Dyer **

The practical applications of processes which but a few short years ago were looked on in the light of scientific novelties is only confirmatory evidence of the soundness of reasoning and courage of conviction which prompted the different pioneers in each line. The manner in which the two processes have proved to be complementary to each other is additional evidence that there is a field for every advancement in applied science.

At the present price of material, scarcity of labor and difficulty of obtaining steel and iron, welding and cutting by both the above processes has proved a great boon and an almost indispensable factor in railroad repair shops.

Seven years ago we employed one man as an acetylene welder and owing to failures through his lack of experience the process was nearly condemned, but as we gathered experience both gas and electric welding developed, so that now instead of one man we employ eighteen and have often to work them overtime.

Acetylene Systems

The low pressure acetylene gas system is used and the whole shops are piped for the acetylene; every other repair pit has a drop connection; in roundhouses we use dissolved acetylene in cylinders, which saves the expenses of a generator and piping where the process is only in use occasionally.

There is a great difference in opinion as to the relative merits of high or positive pressure and low pressure gas, the manufacturers of pressure outfits contending that you save oxygen by using their type of generators and claim that you can not get so near to a netural flame with the low pressure gas as you can with the high; the makers of the low pressure outfits claim that by the use of an injector embodied in the torch or welding head a neutral flame can easily be obtained; we find we can obtain a flame as nearly neutral as can be obtained with the outfit we use, although with pressure gas you can obtain a much larger flame for the same size head than with the low pressure. The principal factor, however, that made us decide on the low pressure outfit was the fact that our main supply pipes are carried overhead throughout the shops, and as nearly all, if not all, oil, steam and water pipes are overhead, we had to consider a very well known motto, viz., "Safety First," for if a man was working overhead and by mistake broke a joint of the gas pipe his torch or candle might cause an explosion, which might wreck the shop. I may say that, though we have been using the acetylene gas for eight years, we have never had an explosion of any sort yet. Our low pressure generator went through a big fire two years ago, and we were enabled to repair it and use it for several weeks till we received our new outfit.

Electric Outfits

There are many kinds of electric welding outfits on the market, and, of course, each one is claimed to be the best by its respective makers; each has its advantages, and the old prejudice very often exists among operators that the machine they are using and are familiar with is the best, and they will stick to that opinion until they become accustomed to the new machine. A new equipment using alternating currents instead of the direct current is now being put on the market, and only weighs 150 lbs., and gives from 20 to 200 amperes, and is about 50 per cent. cheaper than any D.C. machine on the market.

The electric welding outfit consists of two generators, each operating four welding circuits; the shops are wired, and at convenient places connection boxes are placed and only need a lead and ground wire connected to them and the work on which the welder is engaged.

The outfit used has panel controls, which allows each man to control his amperes independent of the other welders.

The processes have proved themselves fitly to be ranked amongst the greatest time and labor savers, and also we may safely say money-savers, introduced for a long period. For instance, in the not very distant past, a locomotive with a broken frame was due for a period of several days in the shops before they could strip down one side and remove the frame to the smith's shop, weld it, and perhaps have it machined and then replaced; now we drop the pair of wheels which may cover the break, cut out the crack with the cutting torch to the shape of a double V at an angle of 90°, clean off the oxide caused by cutting and weld up with the metal electrode, using soft steel or Swedish iron, a frame 4 in. x 5 in. being cut and welded in under 14 hours, and it can be done in less time by having two operators on the frame at once, but the men do not like facing each other's arcs, as when they are changing their filling rods their eyes get sore.

Frames, when worn by brake gear and stays, are built up and worn holes are plugged and welded instead of reaming them out to a larger size and thereby weakening the frame. In rebuilding and superheating engines the same boilers are seldom used on their original frames, and in very few cases do the various holes in angle irons, furnace bearers, etc., come into alignment with frames or boilers; these holes are welded up and redrilled.

The present price of tool steel demands that none shall be wasted; therefore, we use it down to the last inch by welding it to tire steel. Twist drills, taps and reamers when broken near the socket end are welded and put into use again; for this purpose we use either the electrode or gas, but in both cases we use vanadium steel filling rods, as we find this gives the best results. Spokes of driving wheels are welded and flat spots on tires have been successfully welded up when it was necessary to do so.

Up to now we have not had much success on cast iron with the iron electrode, although with the carbon you can make a fair job, but the gas is unquestionably the best for any of this material. We have successfully welded with the gas, steam shovel engine frames, slides and cylinders by welding in patches of cast iron where worn or broken. When our contract for shells was completed and the lathes that were used for this purpose were being overhauled, it was found that most of the V slide beds were worn down by the tool carriers; these were built up with the gas, which saved machining these beds down in many cases ⅜ in.

Boiler Work

In regard to boiler work, most of the welding is done with the iron electrode, using a mild steel or Swedish iron as a filler; it is found that the electric process localizes the heat more so than the gas, though it is the writer's humble opinion that the gas makes a closer and neater weld, as all welds made by the electrode are more or less porous unless hammered up. It pays better whenever possible to do so to put quarter or half sides in order to get out of the fire line in preference to putting in a patch, for, as a rule, however well the patch is welded it generally gives out in from twelve to eighteen months' service, and the same applies to cracks, whereas the half or quarter side should last as long as the firebox.

When a nest of small cracks is found round the staybolts the bolts are removed and the holes countersunk and welded up. This method has been found to be very successful. Corner patches are welded in by running the patch into the tube or back sheets, as the case may be, at the same time removing the flanges. If it is decided to do away with a number of tubes, plugs are welded in the holes, first countersinking the holes and having the plugs punched by a countersunk die which gives the proper bevel for welding.

A great deal of trouble was experienced when welding in the superheater flues and tubes when this was first started, but after a little experience much better success was arrived at. Some operators prefer the tubes belled and others

*Read before the Canadian Railway Club, Montreal, Dec. 11, 1917.

**General Foreman, Welding Dept., Grand Trunk Railway, Montreal.

prefer them beaded; some prefer the water in the boiler and others do not.

The operators I am connected with like the belled methods best and with the water in the boiler. This keeps the tube sheet from heating, especially round the smaller tubes. Tubes are set in with copper ferrules set back 1/32 in. and the flues are belled out 3/16 in. to 7/32 in. and the small tubes 3/16 in. The sheet is roughened all round the tubes and flues, and the oil is then burnt off with the oxy-acetylene flame and tubes and flues welded in with electrode, using ⅛ in. mild steel or Swedish iron; the latter is preferred if caulking is needed.

Output Performance

A sample of an average day's work is as follows for a gang of 12 men:

14 rivet holes in smokebox and 4 peg holes in foundation ring.

10 tube holes in upper portion of firebox tube sheet.

2 air pipes which were worn through.

In the tool room:

1 ratchet for jack (2 teeth replaced).

1 gear spindle built up.

1 chuck screw key end built up.

1 boring shaft built up from 2½ in. to 2⅞ in.

2 tool holders rebuilt.

1 air hammer handle repaired.

6 teeth in lathe gear built in.

1 cone, small end filled up solid.

2 1¼-in. holes in top rail of frame filled up.

4 cracks 18 in. long in right side sheet welded.

14 bottom tube holes welded up.

2 washout plug holes built up for retapping in round head.

Cut out frame for welding and started welding same.

Welded bushes in pony truck stays.

Cut out 3 sets of boiler tubes.

Cut out 1 set of superheater flues.

Build up caulking edge of fire hole.

Heated corners of tube sheet for closing.

Welded broken superheater damper bracket.

Built up reversing lever where worn.

Built up 2 side rods where worn.

Cut out 48 flexible staybolts in firebox.

Welded 2 cracks in throat sheet.

Air Brake Department:

1 broken flange of air brake cylinder.

In addition to this list two men are engaged continuously on cutting around the shops.

For cutting steel and wrought iron the oxy-acetylene process has practically no competitor, it being impossible with the carbon point to cut as fast or as fine and neatly as the gas torch, although for scrapping fireboxes and frames, the carbon point is cheaper if time is no object and labor cheap.

The foregoing examples only enumerate a very small fraction of the uses to which the two methods of welding and cutting are being put to in locomotive repairing and machine shops, and fresh uses are being found for it every day.

Both Processes Valuable

No roundhouse should be without an oxy-acetylene outfit, both for repair work and as a part of the wrecking outfit; many days are lost by engines being tied up through parts having to be sent to the nearest big shops for repair, which could be repaired on the spot with a welding and cutting outfit. All large roundhouses should have both processes, as they would pay for themselves over and over again.

In concluding, I would state that though there are many different opinions as to which is the best process, no shop is complete unless it has both equipments, although the gas has really the widest range, but, on the other hand, a heavy piece of steel or iron needs no preheating with the electrode, but welding can be commenced as soon as your arc is drawn; 95 per cent. of the failures which occur, instead of being laid on the process, should be placed on the shoulders of the operators.

Welding should not be treated as a side line of the machinists' or boilermakers' business, but should be treated as a trade in itself, as it really is, for it needs the entire concentration of a man's mind, careful study, plenty of practice and a conscientious man to make a welder.

Wherever possible a separate building or suitable space should be provided for bench work, and should be equipped with a suitable furnace for heating and annealing castings, and also have plenty of floor room to allow of charcoal fires being built for preheating cast iron jobs for welding.

A TREATISE ON SHELL VARNISHING

By Chief Examiner

THE question of varnishing a high explosive shell is one the importance of which cannot possibly be too strongly impressed upon the minds of all concerned in its manufacture. Many lives have been wantonly sacrificed, and countless dollars worth of damage has been done, through carelessly and improperly varnished shells.

Why is a shell varnished at all? To give it a nice, pretty appearance? No. It is varnished:—First, to make absolutely certain that the bore is smooth—perfectly smooth; second, to protect the bore from rust; third, to prevent the high explosive from coming in contact with the steel and thereby forming "Picric."

Now comes the question—What is the best varnish to use? The obvious answer is "That which has passed the government analytical test." But it does not follow that "passing the test" is enough. This test is principally to ensure that no lead is in any of the ingredients used in making up the varnish—not even a "trace" of lead. It may pass the test well enough, and yet, may not function properly when applied to the shell. Again, the varnish may be good, but may not be applied in the right manner. Or the shell may not have been properly cleaned before being varnished. These points are all worth consideration and might be discussed individually.

How to Clean Shells

Let us begin at the beginning and take the question of cleaning first. Some firms wash the shell thoroughly with gasoline or benzoline and then dry it out with rags. This is a method that often causes trouble partly owing to the poor quality of the gasoline of the present day. Some of it is more like kerosene or coal oil than gasoline, and possesses a kind of grease which remains on the steel in a white film after the spirit has evaporated.

Then, again, the rags that are used should not have any lint on them because this is sure to stick to the steel. It is very important to be sure that the compressed air—if such is used for drying out—is quite dry because, if not dry, spots of rust will form on the steel after the varnish has been applied, and has dried or been baked.

Some firms merely blow out the shell and wipe it thoroughly with a succession of rags. This method never brings success. Other firms wash the shell in a solution of soda or soda preparation used at almost boiling point. This is not approved of on account of the soda getting in between the steel and copper band, and thereby forming verdigris. Besides this, it is almost impossible to remove all traces of the soda, and as a natural consequence neither the varnish inside, nor the paint outside, will adhere to the steel.

The best known method, the one which is sure to bring the best results, is the following—it is of course a little more expensive to operate, but when one comes to add so much for every shell that has to be "rectified" for varnish—i.e. revarnished—perhaps the more expensive way is the cheapest after all. Wash the interior with a jet of steam hot solution of one of the cleansers permitted by the government inspector. Then dry it, after washing it in perfectly clean hot water, by using 1st, a mop, 2nd, a dry cloth, 3rd, a clean dry cloth, 4th, chamois skin, 5th, a perfectly clean chamois—then apply the varnish while the shell is warm, and you will get a varnish coat that is absolutely smooth, clean, and free from overlapping.

Applying the Varnish

Some firms prefer the spray or varnish gun, while others like the pouring method best. Splendid success has been attained with each method, but with the pouring there is invariably more trouble caused by the varnish getting into the threads in the nose. This must of course be completely removed, thereby causing more work and discontent—because it certainly is a tedious job.

There is very little airdrying varnish used now-a-days, because the authorities in England do not approve of it. The varnish used, should be copal baking. There are two sorts—clear and dyed. Take my advice and always use the clear stuff. All imperfections and dirt can be at once seen through the clear

varnish, but with the colored stuff imperfections may be and are covered up. It has been known where, in certain cases, this covering up with a second coat of the dyed varnish has been done on purpose, to save the trouble and expense—about 30c—of revarnishing the shell. No examiner, if he would be considered any good at all, will pass any varnish that is in slightest degree faulty, or of which he is not absolutely sure. If he is in the slightest doubt whatever, he should have the shell varnished again, the old varnish being thoroughly removed, whether the firm like it or not. The varnish question is too important to be trifled with.

In the earlier days of shell making, it was permissible to use air-drying varnish. This has, however, been done away with, except in some special cases, because it was found that it cracked and peeled off after the shell had been stored for some time, thereby leaving bare spots of steel exposed to the action of the explosive. It has been found much better, and safer to use copal baking varnish. This, as I said before, should be applied while the shell is warm. The shell is then placed in an oven and baked for from 2 to 2½ hours at a temperature of 300 deg. F.

Baking Hints

When a number of shells are placed in the oven at one time, the shells being cold naturally reduce the temperature of the oven, so that it is very necessary to note exactly how much this is reduced and give the shells the extra time required. The shells should not be left in the oven too long. If this is done the varnish will come out burnt and consequently flake off, which is just as bad as air-drying. The steel also takes on a burnt color and the inspector will turn the shell back to be polished with emery cloth, to enable him to give it a proper visual examination.

Great care and constant watchfulness is therefore required when baking, and a firm is wise to appoint a man to act as inspector for them who not only thoroughly understands the varnish question, but who will give his entire attention to the work.

If a shell is not properly varnished and is sent out to be re-done, every scrap of the old varnish must be removed by blasting, or otherwise, and the old varnish being baked hard is sometimes difficult to remove. Not only this, the time taken in re-doing work that should have been properly done at first means money lost to the firm and owing to the extra time taken in re-baking sometimes a whole shipment is held up for the sake of half a dozen shells.

Sometimes the varnish takes a mottled or piebald appearance. This is mainly due to spots of greasy gasoline, and means that while the spotted portion may be covered the covering is much thinner on the spots than on the remainder. Therefore this would constitute a dangerous varnish to pass.

A great deal of trouble is caused by the varnish "running"—overlapping. The specifications call for a "smooth continuous coat," therefore if an overlapping or wave develops, the shell has to be re-done. Patching up faulty places in the varnish is not acceptable because these patches bake hard, and cause roughness on the surface.

Another good point to remember, is, never let your varnish thicken up. As it is against the rules to "thin" it out, a firm will be wise if they buy their varnish in one gallon cans, and not by the barrel.

Conclusion

To sum up—The points to watch are perfect cleanliness before varnishing, or the varnish will not adhere. Apply the varnish while the shell is warm. Whether using the "gun" or pouring method, watch for overlapping. Be exact in the baking time. Don't do any "patchwork." When cleaning the threads be careful not to let drops of "Taxite," "Brantine," or other strong varnish remover fall into the shell, because if you do that shell will have to be re-varnished.

When one thinks it all over, one sees how simple the whole thing is, provided of course, that the men, boys, or girls, in the varnish room, are interested in their work. As remarked at the beginning of the article, the varnish question is one the importance of which cannot possibly be too strongly impressed on the minds of all concerned—manufacturers, shop inspectors, yes, and government men too. A chief examiner is held personally responsible on the varnish question and he is a fool if he yields one fraction of an inch in this matter.

WHEELS FOR GRINDING STELLITE

CONSIDERABLE interest has been shown lately in the grinding of stellite. Much depends upon the personal element and grinding conditions. A recent number of *Grits and Grinds* contained some recent experiments conducted in laboratories and in some shops where considerable of this material is being used, which may prove helpful to those who have had stellite grinding as one of their problems. The tests were conducted in order to answer the following questions:

1. Do the different grades of stellite require different grinding wheels on the same operation?

2. What grains, grades and abrasives are most satisfactory for cylindrical grinding, surface grinding, tool and cutter grinding and cut-off grinding?

3. Is there any advantage in wet grinding?

4. Are wheels commonly employed for hardened carbon and high speed steels satisfactory for grinding stellite?

5. Will finer grits be better than those usually employed for steel tools?

The conclusions reached by these laboratory reports and by reports from salesmen of the various territories where stellite is ground successfully are as follows:

1. The No. 38 alundum is by far the most desirable abrasive for the precision operations and most of the tool grinding. However, regular alundum is satisfactory for the cut-off grinding and may be used for free-hand grinding of heavy tools.

2. Vitrified wheels should be used in preference to silicate or elastic.

3. No. 3 stellite seems to require slightly finer and softer wheels than No. 2 stellite.

4. The advantage of wet grinding, especially on the precision grinding operations, is in more rapid and accurate sizing of the work and slight retardance of glazing. Finish is also somewhat improved. On tool grinding no pronounced improvement in wet grinding, except that it keeps the wheel face cleaner and enables the operator to handle the tools easier.

5. Wheels used for stellite are interchangeable to a certain extent with those used for high speed steel grinding. This applies especially on the precision grinding operations. On the free-hand operations, our laboratory tests call for No. 38 alundum, slightly finer and softer than would be used on steel tools.

6. The general tendency is undoubtedly toward finer grits, while grades follow other conditions which vary greatly in different shops. No. 46 grit is the coarsest size which produce a satisfactory finish in most cases.

7. For cylindrical grinding we suggest 3846-L on No. 2 stellite and 3846-K or 3860-J on No. 3.

8. For surfacing with straight wheels we suggest 3836 and 3846-H on No. 2 stellite and 3846 and 3860-H on No. 3 stellite. For surfacing with cup wheels approximately the same wheels may be used, but outside conditions will undoubtedly call for softer wheels on the cup wheel grinding operations.

9. For tool grinding we suggest 3860-M or N as found satisfactory in our tests. However, outside reports indicate the same deviation from this, namely, 36 and 46-O, also 46-K and 60-J regular alundum.

10. For cut-off grinding, 60-3 or 46 grades 4 and 5 alundum elastic should be used.

These suggestions and recommendations may only serve as a starting point in many instances. Outside conditions and practice are so varied that it is impossible to develop standards readily. Undoubtedly, as stellite comes into more general use, more experience in grinding will be obtained and then more definite statements and conclusions can be drawn.

MANUFACTURING ACTIVITIES IN THE U. S.

THE effect of three years of war upon the manufacturing industries of the United States can now be measured, in some degree at least, by certain official data which renders possible the comparison of conditions in 1917 with those of 1914. An analysis by the National City Bank of New York of figures of export of manufactures compared with those of 1914 indicates a wonderful development

in the exports and evidently a large growth in the manufacturing industries of the country in that short period.

Manufactures exported in the nine months of 1917, for which figures are now available, are more than four times as great in value as in the same months of 1914. Finished manufactures ready for consumption exported in the nine months ending with September, 1917, amount to $2,063,000,000, against $466,000,000 in the same months of 1914. Manufactures for the use in manufacturing are $957,000,000, against $262,000,000 in the corresponding months of 1914. Thus the total of manufactures exported in nine months of 1917 is $3,020,000,000, against $728,000,000 in the same months of 1914.

Export Figures

While this very large increase occurs, to a considerable extent, in strictly war material, it also applies to a large proportion of the classes of goods produced by our manufacturers. Iron and steel manufactures as a whole, for example, show a total export value in the eight months ending with August, 1917, of $803,767,000, against $140,246,000 in the corresponding months of 1914, being thus six times as much in value in 1917 as in 1914. Manufactures of cotton show in the eight months of 1917 total exports $91,907,000, against $34,028,000 in the same months of 1914, having thus a little more than trebled in value of exports in the period in question. Cars and carriages, including in this term freight and passenger cars for railways, automobiles, both freight and passenger, aeroplanes, motorcycles, and bicycles, show a total for the eight months of 1917 of $111,073.000, against $30.361.000 in 1914, having thus nearly quadrupled in value in the period under consideration. Copper of all sorts exported in the eight months of 1917 was $349.676.000, against $89,713.000 in the same months of 1914. having practically trebled in value in the three-year period.

Paper and manufactures thereof exported in the eight months of 1917 amounted to $26.841.000. against $13,337.000 in 1914. Tinplate showed a total in 1917 of $24.211.000, against $2.950.000 in the same months of 1914. Refined sugar, which has seldom formed an important factor in the export trade, showed for the eight months of 1917 exports amounting to $48,421,000, against $2.595.000 in the corresponding months of 1914. The wood and lumber industry is apparently the only one of the great manufacturing industries which has not prospered as a result of the war, the total value of wood and manufactures thereof exported in the eight months of 1917 having been but $41,832.000, against $61,279,000 in the same months of 1914.

Import Figures

Evidence of the activities of our manufactures is also shown by an examination of the import figures. The bank's statement shows that the total value of raw material imported for use in manufacturing in the eight months of 1917 is $886,683,000, against $436,234,000 in the same months of 1914, having thus practically doubled in the three-year period. Manufactures for further use in manufacturing imported in the eight months of 1917 amounted to $346,287,000 in 1917, against $198,584,000 in the same months of 1914, having also nearly doubled in the three-year period. These two great groups of manufacturing material show for 1917 an aggregate of $1,051,000,000, against $635,000,000 in the same months of 1914. Raw cotton imports in the eight months of 1917 amounted in value to $35,182,000, against $18,025,000 in the same months of 1914. Fibres in the 1917 period amounted to $55,462,000, against $36,291,000 in 1914; hides and skins in 1917 $166,679,000, against $86,807,000 in 1914; India rubber and substitutes thereof in 1917 $170,588,000, against $50,088,000 in 1914; raw silk in 1917 $111,787,000, against $63,407,000 in 1914; pig tin in 1917 $43,746,000, against $24,334,000 in 1914; and wool in 1917 $134,139,000, against $50,521,000 in the corresponding months of 1914.

While no official census of manufactures in the United States has been taken since the year 1914, the very large increase in production is illustrated not only by the above figures of increased imports of manufacturing material and increased exports of manufactures, but also by the fact that the quantity of pig iron produced in the country in the eight months ending with August, 1917, was 25,660,000 tons, against 16,355,000 tons in the same months of 1914, and that the quantity of cotton used by the factories of the United States has increased approximately 25 per cent. in the same period indicates that the actual quantity of manufactures turned out has enormously increased, while the advance in prices has still further increased the total value of the output as compared with 1914.

A. S. M. E. ELECTS NEW HEAD

MR. CHARLES T. MAIN, of Boston, a consulting engineer, who has served in several public offices for the purpose of advancing the idea of good government, has been elected president of the American Society of Mechanical Engineers, which includes in its membership 8,500 mechanical engineers.

Mr. Main was born in Marblehead, Mass., in 1856, and was educated at the Massachusetts Institute of Technology, from which he graduated in 1876. After extended service in the engineering field he became. in 1907, partner in the consulting firm of Dean and Main, with offices in Boston.

Among the numerous industrial, steam power and water power plants which Mr. Main has designed and successfully completed, might be mentioned the Wood, Worsted and Ayer Mills in Lawrence, Mass., and four hydro-electric developments for the Montana Power Co., aggregating about 280,000 horse-power.

He is a member of the American Society of Civil Engineers and a number of other engineering and technical societies.

B. C. FISHERIES

THE report of the British Columbia Fisheries Department for the year ended March 31 has been issued.

The report shows that the value of the fishery products of British Columbia for the twelve months was $14,538,320, which represented 40.54 per cent. of the fishery products of the Dominion, which totalled $35,860,708. The British Columbia production exceeded that of Nova Scotia by $5,371,469.

Notwithstanding the fact that the fisheries of the province show an increase in value of $3,023,234 over that of the previous year, the quantity of the leading species of fish caught was notably less. The gain in value is due to an increase in the price received for the catch.

Of the fish marketed, salmon was valued at $10,726,818; herring, $1,009,708; halibut, $1,972,000; cod, $300,049; oysters and clams, $98,180. There were twenty-one species marketed.

PULPWOOD REFORESTRY

THAT the greater portion of the cut-over pulpwood lands of Canada will take from 30 to 100 years to reforest themselves instead of about 20 years, as lumbermen have supposed, is the statement made by Dr. C. D. Howe, of the Faculty of Forestry, University of Toronto, to the Commission of Conservation.

Of special significance, in view of a possibility of the diminishing coal resources of the United States soon forcing Canadian railways to use hydro-electric energy for traction purposes, was the address of S. T. Dodd, traction expert of the General Electric Co., Schenectady, N.Y. He fully described the electrified western section of the Chicago, Milwaukee and St. Paul Railway, which covers a distance of 440 miles, and has found electric traction to be considerably cheaper than steam.

ALCOHOL is made from the cheapest starchy materials available, such as potatoes, maize, turnips, molasses. The raw material is mashed with about 5 per cent. of malt, and fermented in the usual way. After distillation in a Coffey still, the spirit is diluted with water, filtered through wood charcoal to remove fusel oil and redistilled through a fractionating column. The products are separated into three grades: first runnings, and first and second quality spirits. The first runnings, containing about 95 per cent. of alcohol with a small quantity of aldehyde, may be used for burning and give rise to no deleterious effects. The first and second qualities, which are 96 to 97 per cent. in strength and contain only traces of aldehyde—the second quality also containing a small quantity of fusel oil—are known as silent spirit, because they afford no evidence of their source. These qualities are used for drinking purposes—liqueurs and factitious brandy and whiskey—and for pharmaceutical preparations.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

OVAL TURNING

THE article on elliptical lathe work appearing in a recent issue of this journal reminds me of an attachment used some time for turning a few irregular shapes, the dimensions of which were not required to be very accurate, but had to conform to the desired throw of the difference of the minor and major axis. To hold ourselves to the dimensions given in the article of recent date, where the major axis was 7½ inches and the minor axis 4 inches, the oval was developed from the oscillating motion derived from an eccentric, this being transferred to a reciprocating movement of the cross slide by suitable linkage. The arrangement of the device as attached to a lathe is shown in Fig. 1, the work A being held in a chuck secured to the face plate of the machine. The bracket B was secured to the back of the carriage and from the lower support carried the lever C, the upper end of which contained a small hardened steel piece D, the point bearing on the surface of the eccentric E. This eccentric, with a throw of 1½ inches, or the difference between the major and minor axis, was keyed to the shaft that turned in the bearings of the fork bracket B. This shaft F was driven by suitable gearing arranged at the rear of the lathe, so that the train could be set up to suit the work required. The fulcrum of lever C was located in a vertical midway position between the two extreme points of travel of the controlling point of the steel block D. Connection was made between the device and the cross slide by means of the rod G, the small bracket H being secured in a position to suit the size of the work. With the cross feed screw removed, tool adjustment is made by means of the compound rest; contact of the point on the eccentric being maintained by the action of the small cable I and the weight K, the former passing over the small pulley located on the side of the bracket J. Better results are obtained when the strain is equalized by using a cable on either side of the cross slide.

The action of this device is illustrated by the graphical sketch, Fig. 2. It must be understood that to derive an oval or ellipse from an eccentric in this manner it is necessary that the eccentric make two revolutions while the work is making one. To determine the approximate outline of the oval that the attachment will produce draw two circles representing the two diameters of the piece required, in this case 7¼ and 4 inches. The centre of motion of the eccentric will be at X. From this point divide the circle into 8 equal parts, each having an angle of 45 deg. The intersection of the radial lines with the eccentric circle will be the points on the circumference in contact with the controlling point for each 45 deg. of movement. From the various intersections, using X as a centre, draw arcs, cutting the horizontal diameter at A, B, C and D, these points representing the lateral travel of the cross slide for each 45 deg. passed through by the generating eccentric; and as the work is revolving at one-half the speed, it will pass through an angle of 22½ deg. in the same period of time. Therefore, transferring these distances to the portion of the line A-B lying between the two circles, and describing arcs cutting the various radii in the points 2 ft., 3 ft., etc., will give the points through which the curve can be developed. Fig. 3 shows the outline that would result if the eccentric were used in the ordinary, where the centre of the connecting rod passes through the circle 1-b-d-b. If the connecting rod were of infinite length the developed outline would be more elliptical in shape than here shown.

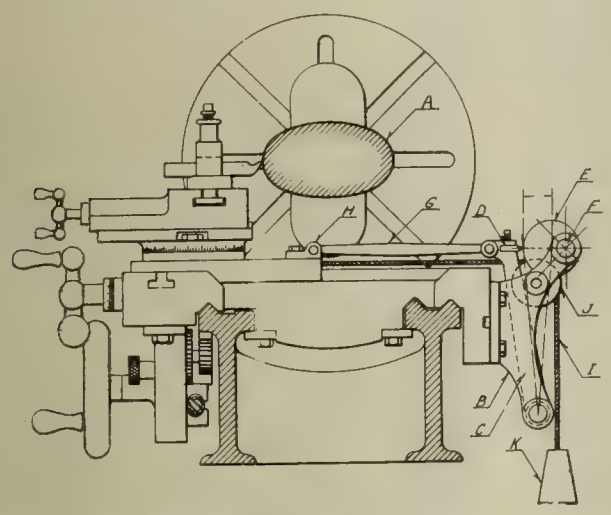


FIG. 1. ARRANGEMENT FOR RECIPROCATING THE CROSS-SLIDE.

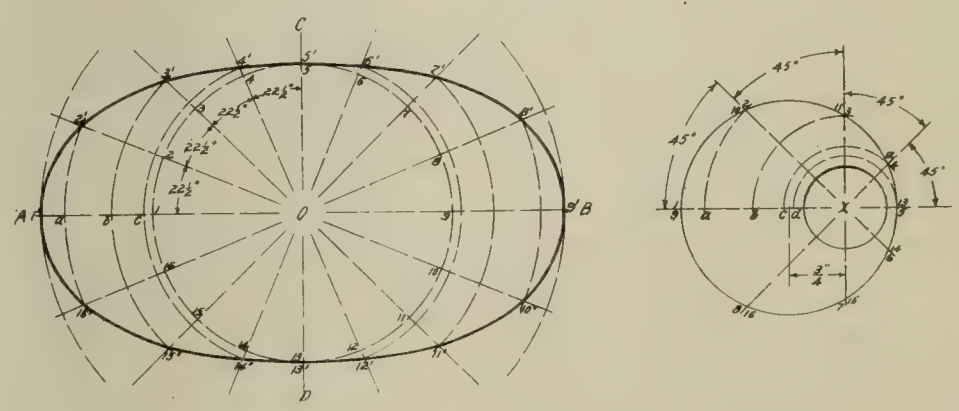


FIG. 2. GRAPHICAL DEVELOPMENT OF OVAL.

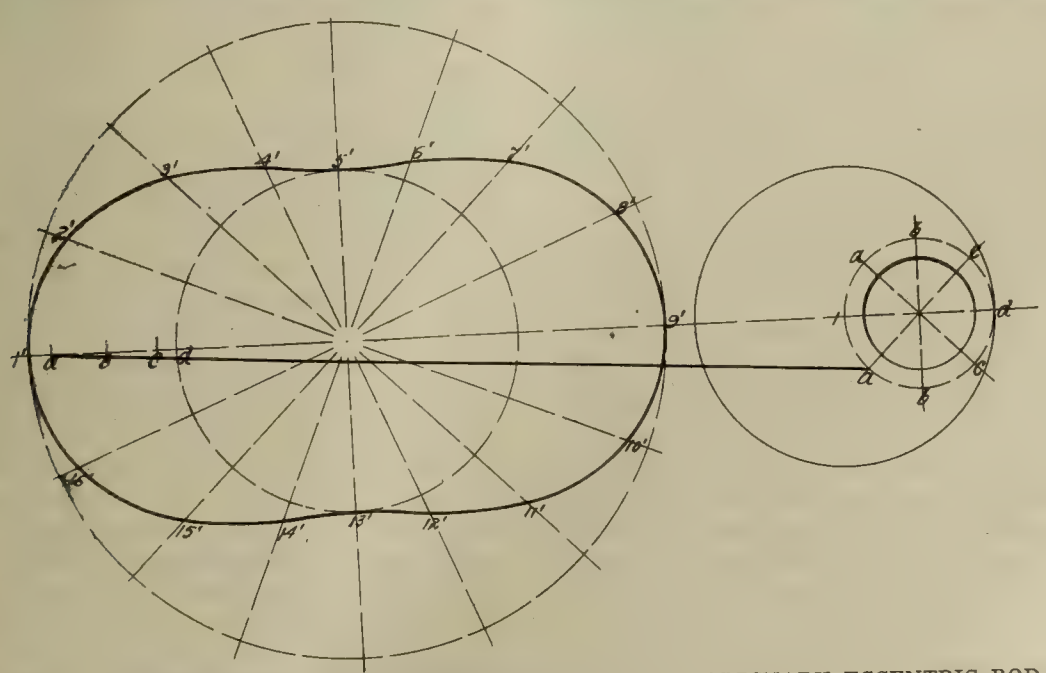


FIG. 3. OUTLINE WHICH WOULD RESULT FROM USE OF ORDINARY ECCENTRIC ROD.

MARINE USES OF CONCRETE

By L. E.

BESIDES being used for the construction of ships of all classes, there appear to be indications that when normal conditions return ferro-concrete will be used for lighters, floating docks, buoys and other floating objects where weight does not play a very important part. The weight of ferro-concrete would, however, detract from the carrying capacity of sea-going vessels and make it difficult for ferro-concrete vessels to compete with steel vessels in normal times. Experience from ferro-concrete construction ashore is not directly applicable to vessels.

Fixed structures, as a rule, are only subjected to a load the maximum of which is known, and which only acts in one direction, whereas the load to which a vessel may be exposed cannot directly be calculated, and its direction is constantly varying, especially in a turbulent sea. Under these circumstances, pending fresh experience, the strength of a ferro-concrete vessel must be determined by comparison with that of a steel vessel of the same type and dimensions. That, however, is a difficult problem, as a steel vessel, on account of peculiarities in construction and building, in some directions may have more material than is necessary from general strength considerations, and also because several qualities of concrete, which it is necessary to know in order to make fairly reliable comparisons, with steel vessels, are not yet sufficiently ascertained.

The actual building process of a ferro-concrete ship is such that the quality of the material and the workmanship cannot be controlled with the certainty obtaining for steel vessels. The tensile strength of concrete is very limited. Tensile stresses must, therefore, be carried as far as possible by the reinforcing steel. In a floating structure, however, the concrete cannot be altogether guarded from tensile stresses, which are apt to create small cracks. Such cracks may also arise during the setting of the concrete. On shore they are generally considered to be of minor importance, but it is by no means certain that such cracks may not play a different part in a vessel exposed to varying stresses and the effect of penetrating sea water.

THE GYROSCOPIC COMPASS

By C. T.

THE French physicist Foucault was the first to analyse the phenomenon of the gyroscope which underlies its application to the compass. Foucault's efforts, which were made in 1851, resulted in the deduction of two laws: firstly, that a rapidly rotating wheel suspended with freedom to move about all axes will maintain its plane of rotation in space; and secondly, that a gyroscope suspended will tend to process or turn about the vertical axis in an effort to place its plane of rotation coincident with that of the earth. The question of utilising this phenomenon in an instrument which would seek and maintain the true north meridian, regardless of position, speed or course, or oscillating movement of the body on which it was mounted, involved a great many problems.

Early in his work the American inventor Sperry became convinced that the major problem was one of pure engineering in devising a suspension which would be frictionless about the vertical axis, allowing the gyroscope to turn with perfect freedom in its effort to seek the meridian. The problem was solved by suspending the gyroscope or sensitive element from a strained wire, the top of which is carried in a frame surrounding the gyroscopic element, the frame being oriented by an electric follow-up system in such a way as to cause the frame to follow any tendencies of the gyroscopic element to move about the vertical axis.

Numerous other problems quite as difficult of solution were encountered. Perhaps the most difficult of all was that involved in so suspending the sensitive element that it would be unaffected by the acceleration pressures arising from movements of the vessel on which it was mounted. In developing that point it was necessary to collect a large amount of data relating to the time taken by all classes of vessels to accelerate from one speed to another. From this data, the acceleration pressures were calculated and actually applied to the experimental instrument by means of weights allowed to act for a certain length of time. The Sperry Gyro-Compass as it is in service to-day demonstrates how all these difficult problems have been solved.

A TALE OF A RUN-DOWN SHOP

By H. Middleton.

WHEN Bob Philips undertook the job of rehabilitating the Drew Hat Co. he thought he would have a great deal of hydraulic work to do; in fact, it was because of his experience as a machinist on such work and his ability as an organizer that the second generation of Drews hired him. The elder Drew had founded the business shortly after he came to America, and having always made money in it, had been satisfied to let things go on as they were; but after his death the sons decided on a more up-to-date policy.

The hat business is a big user of presses and steam—hydraulic, steam. lever, and toggle presses. Philips found the hydraulic presses in good shape, also the accumulators, pumps, and piping; they were of English make, and had been in charge of a Yorkshire man, who took pride in them because of that. But the lever and toggle presses being so "simple," had had little or no care, simply because they had been left to the unskilled hands who worked on them.

A saving of over $500 on the first trip through the press room is rather unusual, but it was made in this instance. The hand-operated presses are all counterweighted, and Philips noticed an unusual form of counterweight, consisting of a box filled with junk. His investigation led to an examination of the junk, which proved to be spelter and lead—and from 150 to 300 lbs. of it on every machine. The substitution of a baser metal scrap for the spelter made a good start. Further savings were made on the overhead by such simple means as washing the windows and so cutting down the light bill; having the floor swept in the corners and under the presses, netting an unbelievable heap of well chewed tobacco quids, which sold for $15 for fertilizer; and in having the rusted joints of some of the presses that "wouldn't work" loosened up and oiled, thus increasing the capacity of the press room twenty per cent.—which goes to show that there are homely ways of making money without spending it.

FORETHOUGHT AS A SAFETY FACTOR

By S. H. R.

EXPERIENCE is one of man's best educators but it is very often a hard taskmaster. The bulk of the knowledge that most of us have acquired has been doled out by this ever existing and often unrelenting teacher; and it is probably well that it is so, as many of the lessons thus learned are more likely to make a lasting impression upon us than if the same were handed down to us as a hereditary legacy. How many men to-day profit by the experience of their elders? The majority of us are like the child that must touch the fire even after being told that by doing so he will get burnt. Shop accidents are more often caused by thoughtlessness or carelessness on the part of the workmen than from the faulty condition of the plant equipment. The human element is the most perverse factor in the safety problem of shop management. We are prone to criticize the actions of those about us, but too often fail in a proper analysis of our own accomplishments. A frequent cause of injury to machinery is the impulsiveness of the operator, this trait being particularly pronounced in young apprentices and inexperienced mechanics. The first duty of a workman, when placed upon a new machine, is to become familiar with its operating mechanism.

Many machine tools of to-day are equipped with every facility for maximum efficiency, and at the same time relieve the workman of much of the physical and mental effort incidental to the manipulation of equipment of the last decade. This does not mean that it requires a less skilful operator to do effective work on a modern machine, as it is probable that closer attention is now required than ever before, owing to the greater possibility of becoming confused by the various knobs and levers. The semi-automatic nature of present day metal working tools has, however, destroyed much of that reasoning power that in former days was so common in the average workman. Apprentices and older mechanics should endeavor to cultivate the habit of speedy but accurate forethought in the discharge of their duties, as a mental review of possible developments will often prevent injury to a machine or an operator.

To illustrate by an example: Some time ago a young mechanic was boring piston ring castings, which in the rough weighed about 80 lbs. After completing

the work on one of these he placed another one in the chuck without removing the boring tool from the tool-post. In order to center the work—a four jaw chuck being used—one of the jaws was slackened, leaving the casting supported by two others; turning the work through an angle of 180 deg., and with the right hand placed on the upper portion of the ring to steady it, he started to adjust the casting to position. One of the side jaws, however, had apparently been resting on a small lump, so that the downward pressure from the top screw released the work, causing the piece to fall from the chuck, and catching the man unprepared his hand was caught between the tool and the work, resulting in a badly lacerated finger. A little forethought in removing the tool, or supporting the work while setting, would likely have prevented the injury sustained. Accidents occur every day through over impulsive action on the part of workmen, which a moment's forethought would oftentimes prevent.

ELECTRIC DRIVE FOR WARSHIPS

By D. Street.

IT is confidently expected by those who favor electric transmission for ship propulsion that the electrically-driven cruisers and battleships now building for the American Navy will demonstrate conclusively that the electric drive is superior to all others for naval vessels of this class. The features upon which this confidence is mainly founded are the maintenance of a high efficiency at all speeds, and the diminished risk of a vessel being temporarily crippled by a breakdown in the engine room.

No attempt is made to claim for electrical transmission as high an efficiency at full power and speed as can be obtained from the geared drive. In the new battle cruisers the losses from turbine to propeller shaft will be about 7 per cent. at top speed. It is conceded that at full speed a geared drive will show a better figure than this—better, perhaps, by 2 per cent.—but a battleship is only on full speed for a fraction of its time, and the normal cruising speed requires only about one-tenth of full power. It is here that the electric drive is expected to show great advantages. At light loads the efficiency of the geared turbine equipment falls off considerably owing to the reduced thermal efficiency of the main turbines themselves, and to the relatively greater drag of gearing, bearings, reversing turbines, and idle parts of the main turbines.

Even though special cruising turbines are fitted, the efficiency at cruising speed must be low, for such turbines cannot have the efficiency of a single large main turbine, and they add still more to the drag. With the electric drive the transmission efficiency can, on the other hand, be kept equally good at all speeds; the number of motors and turbines used can be adapted to the demand for power, and this gives a very important gain in economy at all speeds below the maximum. At 19 knots only one turbine is required to drive the ship, and it runs at full speed instead of at half-speed as it would in a geared equipment. Thus the steam efficiency at 19 knots—a desirable cruising speed—is equal to the best attainable at any speed, and as cruising economy gives increased cruising radius without renewal of fuel supplies, high efficiency at this speed is a matter of the greatest importance.

Breakdown Possibilities

In regard to the risks of complete breakdown, it is pointed out that in the geared equipment each shaft has a system of turbines, gears, bearings, thrust-balancing devices, and lubricating systems, all mechanically locked together, and that with high speed machinery any kind of trouble with any of these parts generally necessitates the immediate stoppage of the whole system, whilst if a breakdown has occurred it may be necessary to stop the ship while the wreckage is cleared away and the shaft uncoupled, after which the idle propeller would still act as a very serious drag on a fast vessel. In the electrically-driven ship there is no mechanical connection of the shaft to anything but the rotors of the motors, which cannot be subject to mechanical interference.

The shafts are subject to the same possibilities of bearing or thrust trouble as shafts in other ships, but the presence of the motors does not increase this danger, and the speed being low, it is remote in any case. With this equipment any motor, generator, or turbine, if in any kind of trouble, can be instantly disconnected without stopping the ship and with only a small loss from the highest speed capacity. The versatility of transmission constitutes one of the most important advantages of electric drive in such a ship. With one motor out of eight in trouble only one-eighth of the maximum capacity is lost, and the ship's maximum speed is impaired by only about one knot. If a generator or turbine is in trouble the maximum speed is reduced only about two knots. With two generating units and four motors out, the ship can make 26 knots, and with three generators and four motors out she can make 19 knots. If parts give trouble they are simply cut out and repaired at leisure, or as opportunity affords.

Self-Contained Reverse

A further point made is that the electric drive dispenses with the need for reversing turbines and eliminates complications which they involve. Importance is also attached to the large gains in fuel economy afforded by super-heat, and it is expected that the demonstration of the ability to use safely high degrees of super-heat may constitute one of the most important reasons for adopting the electric drive. In opposition to these claims can only be advanced one, that of greater weight. This can be discounted on the heavy ships, where protection is of vital importance. On the light fast vessels, such as destroyers and scouts, where no protection exists, everything is sacrificed for speed, and for such vessels the mechanical reduction gear stands pre-eminent to-day.

VELOCITY OF SOUND IN SEA-WATER

By T. J.

AS is well known, the aberration to which aerial sound signals are subject makes the transmission of sound through water a much more desirable medium for the exchange of signals, but there is a certain amount of error always found in short distances from the shore when a ship is endeavoring to find her distance by echo. The elasticity of the water is a great determining factor, as the velocity of sound through a medium is equal to the square root of the quotient found by dividing the elasticity of the medium by its density. The elasticity of sea water is 2.02 by 10.10, and its usual density is 1.03; and the computed velocity of sound through the ocean is therefore 1,400 metres, or 4,593 feet per second. Owing to the uncertainty of locating the place from which the sound waves are reflected to form an echo any method of finding distances in navigation by means of submarine echoes is not at all serviceable. In the location of sound signals every effort is made to avoid the formation of echoes on account of the uncertainty which their presence produces in locating the submarine signal.

U. S. ENGINEERS DISCUSS WAR TOPICS

WAR topics predominated at the convention of the American Society of Mechanical Engineers, recently held at the Engineering Societies Building, 29 West 39th Street, New York, the engineers discussing the shipbuilding problem, the aircraft problem, the fuel problem, the agricultural problem, etc.

Methods were considered whereby the problem of fuel conservation will be met either by compelling coal consumers to execute such measures of economy as the authorities prescribe, or else by disseminating correct information regarding the mining and consumption of coal, accompanied by an appeal to the patriotism of the consumers.

Such subjects as expenses and costs, accident prevention, labor turnover expense, and the relation of industrial management to engineering, were discussed. Dr. John A. Brashear, past-president of the society and widely known in connection with the development of the modern telescope, addressed the members and their guests, taking for his subject "The Science of the Beautiful in Commonplace Things."

Honorary membership in the American Society of Mechanical Engineers was conferred upon Major-General George W. Goethals in recognition of his achievements in engineering, and Ex-President Taft gave an address on "The War's Call to Professional Men." These functions, which were held in the impressive auditorium of the engineers' building, were followed by a reception to the new president of the society, Mr. Charles T. Main.

PROGRESS IN NEW EQUIPMENT

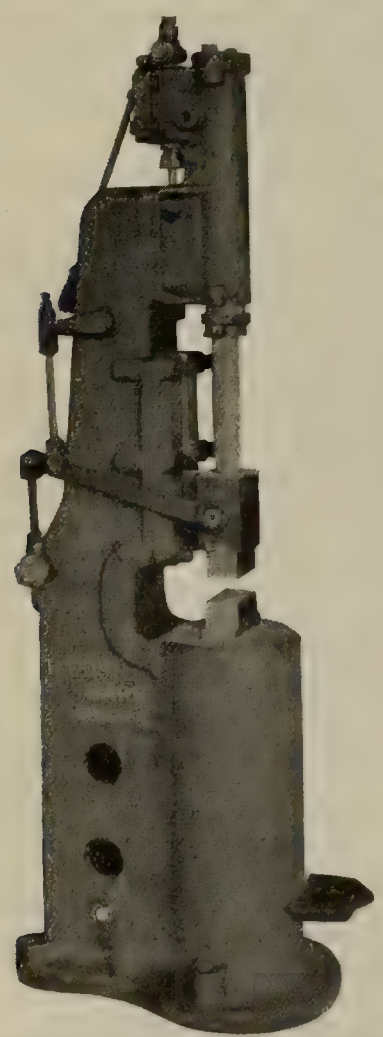
There is Here Provided in Compact Form a Monthly Compendium of Shipbui ding and Marine Engineering Auxiliary Product Achievement

PNEUMATIC LIGHT FORGING HAMMER

EXTENSIVE experience in the design and manufacture of pneumatic equipment has enabled H. Edsil Barr, Inc., Erie, Pa., to develop a pneumatically operated light forging hammer which possesses all the desirable features of power hammers in addition to being independent of shafting and belts.

The weight of the complete hammer is 1,200 lbs. and it is expressly suited for handling all sorts of light miscellaneous tool dressing, forging, welding, straightening, blacksmithing, etc., ordinarily done by hand, thus avoiding the uneconomical tying up of a large hammer, and providing a hammer readily movable to the work in shipyard, shop, mine, quarry or contract work.

The main frame consists of a heavy



PNEUMATIC LIGHT FORGING HAMMER.

anvil portion cast solid, and having a rigid integral box housing supporting the working parts. Cylinder is bored and reamed and has a key across the entire face of frame in addition to four bolts. Ports are large and direct and main valve is quickly accessible through cover plate on valve chest. Main stuffing box gland is of ample length, is bushed with bronze and made in halves for easy removal.

Heat treated vanadium alloy steel is used for the one-piece piston and rod; the ram head and guide shoe are made of a single open-hearth forging, and have a long taper fit on the rod. Vanadium alloy steel is used for the valve gear pin inside of ram. Liberal wearing surface is provided on the guides which extend down as far as practicable. Dies are of the plain forging type of special tool steel suitably tempered. The upper die is dovetailed and keyed to ram, while lower die is dowelled to anvil.

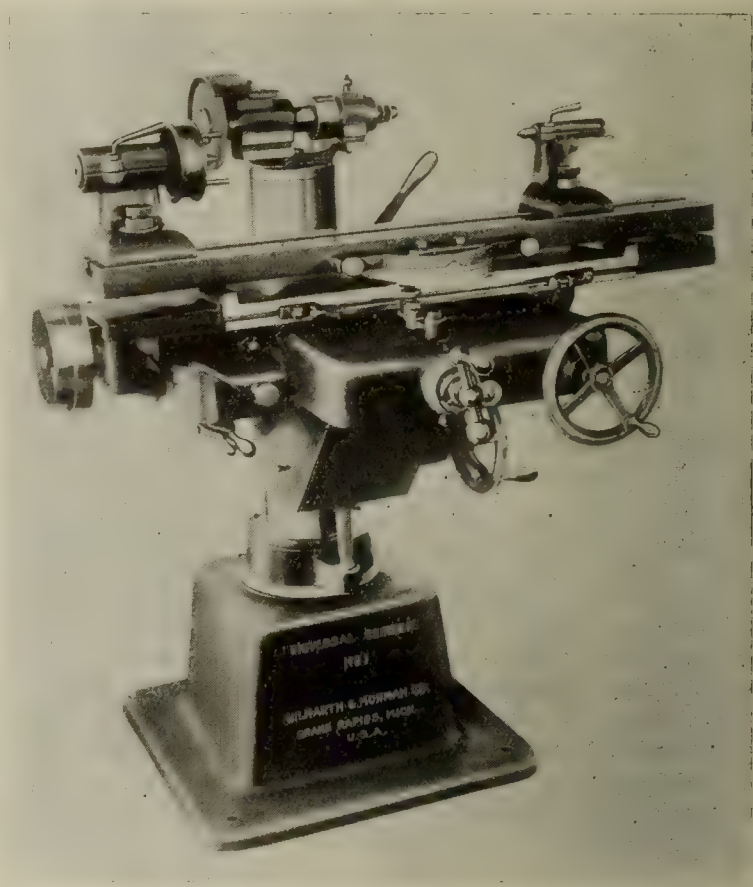
Operation is controlled by pressure on the foot lever, the speed depending on the air pressure and thickness of stock—from 150 to 200 blows per min. The higher speed automatically occurs on thicker sizes of the hammer's range which is from 1/16 in. to 2 in. inclusive. No adjustment is required in striking and reversing on any thickness within the above capacity, speed and force being controlled directly by amount foot lever is depressed. Hot iron 2 in. square is readily worked.

The hammer occupies a floor space 14 in. by 24 in.; is 66 in. high; dies 2¼ in. by 4½ in.; requires 30 cu. ft. free air per min. at 90 lb. pressure per sq. in. for steady operation at full speed.

UNIVERSAL CUTTER AND TOOL GRINDER

A UNIVERSAL cutter and tool grinder of modern design and adapted for a very wide range of tool room work is built by Wilmarth & Mormon Co., Grand Rapids, Mich. Their No. 1 Universal grinder is shown in the accompanying engraving, and has eight speed changes for table travel graduated from 12 in. to 75 in. per min.

The travel and reversing mechanism is contained in a gear box at the left of the saddle and somewhat to the rear. It is a complete unit in itself and is so arranged that it can be attached to the hand feed machines of this type already in service with very little work. It is driven by the two step cone pulley at the extreme left, four speeds being obtained on each step.



UNIVERSAL CUTTER AND TOOL GRINDER.

The gearing from the box to the table is arranged so that it can be entirely disengaged leaving the table free for operation by the handwheel at the front of the saddle or the lever at the rear without operating any of the power feed mechanism which drives the table.

The front of the table is provided with a tee-slot which carries adjustable dogs for operating the reversing mechanism at the desired points on the work, allowing the operator to shorten or lengthen the stroke as desired.

All of the mechanism is entirely self contained with none of the working parts exposed to grindings or dirt, and all of the gears are run in a bath of oil to insure long wear.

AMPLE STEEL SUPPLIES FOR THE WAR

AMPLE supplies of steel for all the Government's war needs were assured to the War Industries Board by representatives of the largest steel mills in the United States. They proposed, however, a different system of allocating orders to take into consideration idle capacity, the fuel supply and transportation conditions. In line with this suggestion, hereafter placing of orders will

be centralized in the hands of J. L. Replogle, the board's steel expert, and it is believed that deliveries will be expedited. Ways and means of expediting production of the war instruments which are to bring victory in the war occupied the attention of the conference almost exclusively during the two hours the meeting was in progress. Whether the filling of war orders would leave sufficient steel for private industries was declared to be "another question," which none of those present would answer definitely.

CANADIAN RAILWAY CLUB HELPS HALIFAX

THE Canadian Railway Club meeting at Montreal last week decided to forego their annual dinner this year, owing to the general conditions that prevail at the present time. In view of the fact that the war is still at its height and the recent devastation at Halifax, it was thought advisable to postpone the event. By a unanimous vote a grant of $200 was passed for the relief committee of the stricken city, the money being wired while the club was in session.

DOCTORS ARE REALLY ENGINEERS

COL. W. O. OWENS, in charge of the Motion Picture Department of the American Medical Museum in Washington, under the direction of General Goorgas, declared at the recent convention of the American Society of Mechanical Engineers that he had come to look upon doctors and medical men as biological engineers, inasmuch as their chief business was to keep the human engine in perfect working order. His statement was emphasized by Major Frank D. Gilbreth of the Engineers Officers' Reserve Corps, who described how the soldiers crippled in the war are provided with means for performing useful industrial work and making themselves self-supporting. In the course of the discussion on the crippled workers, illustrations were shown of men putting on their trousers with blacksmiths' tongs, one-armed men driving nails with magnetic hammers quicker than two-armed men could with ordinary hammers. Major Gilbreth urged the universal employment of cripples in work which they could perform and said it would be socially indecent for employers to give a job to a normal person when a cripple could just as well do it. He told how efficient cripples were in industrial plants.

WELDING WORK DISCUSSED BY RAILWAY MEN

AT the last regular meeting of the Canadian Railway Club a paper was read on "Oxy-Acetylene and Electric Welding in Locomotive Work" and the discussion that followed proved to be the most interesting and instructive that the members have so far experienced. The center of the discussion hinged on the advantages and disadvantages of the lap and butt weld as applied to construction and repair of fire-boxes and flue sheets. While no definite conclusion was arrived at considerable data and information were brought forward that will be of value for future operation of this class of welding.

SOUTHERN CANADA POWER CO. DEVELOPMENTS

THE map accompanying the annual report of Southern Canada Power Co. recently issued shows that the company's operations cover an exceptionally wide range of territory, doubtless the largest east of the Niagara power zone. On the south power is carried across the international boundary into Derby, Vermont. On the west the transmission lines approach as near to Montreal as St. Johns, Iberville, St. Hilaire and Beloeil. On the north Drummondville and adjacent municipalities are tapped, while on the east the principal points of consumption are Sherbrooke, Lennoxville, Richmond and Compton. These distances are approximately 70 to 75 miles east and west, north and south.

It is quietly but gradually developing into an important development, and is extending a network of power wires throughout the south-eastern section of the Province of Quebec, and working up the available hydro-electric propositions in that area.

The report states:

"Considerable progress has been made during the year in the consolidation of the subsidiaries acquired, as referred to in the last report. Since then the company has purchased the municipal plants of the City of Granby and the Town of Bromptonville, and is now engaged in the joining up of its various isolated properties.

"The company at present has under construction about eight-five miles of transmission lines from Sherbrooke to Granby and Cowansville, from Sherbrooke to Bromptonville, and from St. Cyrille to St. Germain through Drummondville, with the necessary sub-stations and distribution systems.

"The power development at Richmond, Drummondville, Foster and Granby are being considerably improved and enlarged and put into shape for the most economical operation, through the transmission lines, with the other plants of the company.

"A great deal of work has been done in connection with the engineering investigation of the company's water powers, and additional riparian and other rights have been acquired, so that practically all such work usually preliminary to such developments is now completed."

A HIGH speed steel alloy recently patented in Great Britain has the following composition: Carbon, 0.5 to 0.8 per cent.; molybdenum, from 6 to 10 per cent.; chromium, from 3 to 6 per cent.; vanadium, 0.15 to 2 per cent.; manganese, 0.2 to 0.4 per cent., and silicon, 0.2 to 0.4 per cent. The amount of vanadium may be lowered and partly replaced by cobalt, of which latter element from 0.5 to 3.5 per cent. may be incorporated.

Screenings

Little Tommy—"Say, papa, what is meant by beastly weather?"

Papa—"When it's raining cats and dogs."—Brooklyn Citizen.

The boy came into the house weeping and his mother was naturally solicitous. "What's the matter, Willie?" she asked.

"The boy across the way hit me," he replied.

"Oh, well, I wouldn't cry for that," she returned. "Show that you can be a little man."

"I ain't crying for that," he retorted. "He ran into the house before I could get at him."—Philadelphia Press.

A policeman popped his head inside a crowded car.

"Excuse me, ladies and gentlemen," he said, "but there are two swell thieves in here."

"Dear me!" cried a nervous-looking individual. "I cannot risk my reputation in here."

Up jumped another gentleman with a gold watch chain and white waistcoat.

"I must get out at once," he said. "I have just taken some money out of the bank and I won't chance being robbed."

The policeman nudged the conductor.

"It's all right now, drive on; they've both got out."

The dominie was told by his family doctor that a glass of toddy would do him no harm. "I canna manage it," said the minister, "my housekeeper wad gossip among the church women."

"Oh, keep it in your private cupboard, and when you get your shaving water in the morning, get a little extra supply."

A month later one of the female parishioners who was calling on the housekeeper enquired as to the dominie's health.

"I'm sair afraid the meenister is losing his mind," was the answer.

"My goodness, how is that?" said the visitor.

"Weel, he asks for shaving water five or sax times a day."

A good story is being told concerning Sir Francis Hopwood, the Secretary of the Irish Convention, who has recently been made a peer.

It appears that he was once cross-examining a witness in an agrarian case in Ireland, and the man, describing how a tenant was evicted from his holdings by the bailiffs, remarked that the beam used to break down the door of the cabin was shaped like a battering-ram.

Sir Francis saw an opening—or he thought so, at all events.

"Have you ever seen a battering-ram?" he asked.

"I have," replied the witness stolidly.

"Where?" snapped Sir Francis.

"In London."

"Whereabouts in London?" persisted Sir Francis, with a smile of incredulity.

"In the South Kensington Museum."

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TRAINING BRAINS FOR AFTER-WAR TRADE.

WAR is still with us, and may be for a while. With the echo of the first shot in the war there awoke in progressive business minds the thought of trade after the war. Not "Business as Usual" but "Business far Better than Before" is the slogan to follow. Leaders in business life are busy upon after-the-war problems to-day. Already the key-word to their thoughts is out.

That word is Education. Its effect is found in the decision of the Tootal Broadhurst Lee Co., Manchester, to appropriate $50,000 a year for five years for research to improve their products, and for education to improve the general efficiency of their employees. "Without improved education, and a closer link between science and industry, our future trade cannot expand as it should," says the Chairman of their Board of Directors. "In this respect we are behind some other countries."

So part time instruction in a works school during working hours is provided for, and employees who show outstanding ability are to be selected for further education. In special cases they may have whole time education and a university course to develop them. The purpose of the appropriation is to produce more specialized expert help for the company. Part of the fund is to be spent in research work by already available experts. The educational policy pursued is to bring out more experts.

The race for trade after the war will be closely contested. The countries best prepared by the education of the industrial and business brains that are to run their commercial concerns will come out winners. Financial as well as industrial training is demanded. Sir Richard Vassar Smith, in a recent address before the Institute of Bankers in London, said that recent developments of international banking meant a demand for young men with a knowledge of foreign languages, foreign exchange, and the commercial and financial conditions of other countries. Clearly a call for still further specialized education for the men who are to make a winner of trade after the war.

WHAT HATH THE YEAR BROUGHT US?

THE approaching close of the year bids many of us glance backward and in silent retrospect consider whence we have come and whither do we go. Each year has seen the prediction that the war would soon be over, and each year still sees it with us, influencing our thoughts, words and deeds to such an extent that, when it does reach a conclusion, the void left by the disappearance of such a mainspring of industrial activity will be immediately unfathomable.

Military events have influenced activities of the past year very greatly, for instance, the alternate depression and cheerfulness which have marked the fluctuations in munitions manufacture. That such happenings should take place is incidental to the nature of their origin, but that their effect on our private and national disposition should pass unnoticed is not right. It must be constantly kept in mind that the readjustments necessary during the transition period will have a much more acute influence on our individual lives than any temporary depression has had hitherto.

Viewing the turnings and twistings of Fortune's ship, and admitting however unwillingly that results are not what seemed likely to materialize at certain periods, we must take such comfort as we can from the saying that "things are never so bad but what they might be worse." There is a mean level to which all influences gravitate, some upward and some downward. Mankind is not gifted with such powers of intuition that basic principles can be ignored, and of these the law of action and reaction is not the least important.

As a nation, Canadians in Canada have suffered less than any other. That we can expect to see the business through and remain on Easy Street while the rest of the world is struggling in by-ways and vacant lots is absolutely foolish. Knowledge to plan, ability to execute and determination to support our share of the world's burden, willingly as well as uncomplainingly, are the essentials for our future guidance. It is a pleasing feature of the situation that financial interests realize the extent to which they will be strained in the period of readjustment—their ability to withstand it will determine more than anything else its duration and intensity.

The time for preparation is here—preparation for any eventuality, and the tentative evidences during the past year of all that readjustment will imply must receive more than ordinary consideration from those directly concerned with the industrial future of the country. If the year has done nothing else than bring to us all a sterner realization of the present and determination to face the future, it has not been unavailing.

INDUSTRIAL NOTABILITIES

HERBERT MARVEN EWAN, B.Sc., Vice-President, Taylor and Arnold, Ltd., Railway and Marine Supplies, Montreal; Vice-President, Central Engineering Co., Ltd., Montreal; Vice-President of American Flexible Bolt Co. of Canada, Montreal; Director of Canadian Brakeshoe Co., Ltd., Sherbrooke; Director, Boss Nut Co. of Canada, Ltd., Montreal, was born in Montreal, Oct. 19, 1876, son of Alexander and Kate Gourd (Bellhouse) Ewan, both of Scotland.

After receiving his education at Montreal Grammar School and McGill University, he began his career as assistant experimenter in tin plate manufacture, Bridgeport,

HERBERT MARVEN EWAN.

Connecticut, in 1899, leaving this in 1900 to serve a two year's apprenticeship in England with the firm of John H. Andrew and Co., Ltd., Sheffield. He subsequently returned to Montreal to take up sales work in the steel business, and after extended experience in this capacity became sales manager of Canadian Steel Foundries, 1913, and in the following year joined the firm with which he is now associated as Vice-President.

On May 23, 1907, Mr. Ewan married Blanche Gilmour, daughter of Duncan Gilmour, Sheffield, Eng., and has one daughter.

He is a member of numerous clubs, among them the Engineers'; Winter; St. George's Snowshoe; Royal St. Lawrence Yacht; University of Montreal, as well as the Royal Canadian Yacht and University Club of Toronto. His one society affiliation is A. F. and A. M. and he holds a commission as lieutenant in the Victoria Rifles. Tennis, yachting, fishing and skating are his favorite recreations.

Mr. Ewan is Conservative in politics and Protestant in religion and resides in The Linton Apartments, Montreal, Que.

—Photo courtesy British and Colonial Press

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

Government prices.

	Montreal	Toronto
Hamilton	....	50 00
Victoria	....	50 00

FINISHED IRON AND STEEL

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3/16 in.	13 20
Chequered floor plate, ¼ in.	13 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	*2 90
Tank plates, Pittsburgh	*3 25
Structural shapes, Pittsburgh	*3 00
Steel hoops, Pittsburgh	3 50
F.O.B., Toronto Warehouse	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	4 10
Structural shapes	4 20
Plates	4 45

*Government prices.

FREIGHT RATES

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Lake copper	$33 00	$32 00
Electro copper	33 00	32 00
Castings, copper	32 00	31 00
Tin	78 00	80 00
Spelter	10 50	10 50
Lead	9 50	8 50
Antimony	18 00	18 00
Aluminum	60 00	62 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ¼ to ½	$13 00	$12 00
Heads	13 30	12 30
Tank plates, 3-16 in.	13 10	12 10

WROUGHT PIPE

Effective July 5, 1917.

Size	Black Standard Buttweld Per 100 feet	Galvanized Standard Lapweld
⅛ in.	$5 00	$6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ ins.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 45%.

4½" and larger, 40%.

4" and under, running thread, 25%.

Standard couplings, 4" and under, 35%.

4½" and larger, 15%.

OLD MATERIAL

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	21 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	14 00	15 75
Light brass	10 00	10 00
Medium brass	14 00	14 00
Heavy brass	15 00	16 00
Heavy melting steel	21 00	20 50
Steel turnings	12 60	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	38 00	30 00
Mach. shop turn'gs.	9 00	8 50
Cast borings	12 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 50	6 50
Heavy lead	5 50	7 00
Tea lead	5 00	5 75
Aluminum	25 00	25 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up.	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 20
Elevator bolts	5
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	15
Boiler rivets, base ¾-in. and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	72½
Wood screws, O. & R., bright	67½
Wood screws, flat, brass	37½
Wood screws, O. & R., brass	32½
Woodscrews, flat, bronze	27½
Wood screws, O. & R., bronze	25

MILLED PRODUCTS

	Per cent.
Set screws	25
Sq. & Hex. Head Cap Screws	20
Rd. & Fil Head Cap Screws	net
Flat ⅞ But. Hd. Cap Screws plus	net
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and semi-fin. nuts over 1½ in., up to 2 in. plus	10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws list plus	20
Collar screws list plus 30,	10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4 50
Cold pressed nuts over 1½ in.	add $7 00

BILLETS

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$5 50	$5 45
Cut nails	5 70	5 80
Miscellaneous wire nails	60%	
Spikes, ⅜ in. and larger	$7 50	
Spikes, ¼ and 5-16 in.	8 00	

MISCELLANEOUS

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drums	4 75
White lead, pure, cwt.	16 20
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 38
Tarred slater's paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 74
Linseed oil, raw, single bbls.	1 36
Linseed oil, boiled, single bbls.	1 39
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery cloth	list plus 20
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	1 80
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Drilling cables, Manila	0 41
Plumbers' oakum, per lb.	0 09
Packing, square braided	0 34
Packing, No. 1 Italian	0 40
Packing, No. 2 Italian	0 32
Pure Manila rope	0 39
British Manila Rope	0 38
New Zealand Hemp	0 33
Transmission rope, Manila	0 45
Cotton Rope, ¼-in. and up	0 47

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

CARBON DRILLS AND REAMERS

	Per Cent.
S.S. drills, wire sizes up to 52	30
S.S. drills, wire sizes, No. 53 to 80	net
Standard drills to 1½ in.	30
Standard drills, over 1½ in.	30
3-fluted drills, plus	10
Jobbers' and letter sizes	20
Bit stock	25
Ratchet drills	15
S.S. drills for wood	30
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 30
Bridge reamers	52½
Centre reamers	10
Chucking reamers	net
Hand reamers	10

COLD ROLLED SHAFTING

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Canadian malleable, A, add 35%; B and C, plus 25%; cast iron, net; standard bushings, 25%; headers, 60; flanged unions, 5; malleable bushings, 30; nipples, 45; malleable lipped unions, 40.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$9 50	$ 8 50
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	9 70
Premier, 10¾ oz.	13 85	10 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B	
¼ in.	$12 35
5-16 in.	11 85
⅜ in.	11 50
7-16 in.	10 90
½ in.	11 20
9-16 in.	11 20
⅝ in.	11 10
¾ in.	11 00
⅞ in.	10 90
1 inch	10 65
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

1/8 in.	$15 50
3-16 in.	11 70
1/4 in.	8 40
5-16 in.	7 40
3/8 in.	6 35
7-16 in.	6 35
1/2 in.	6 35
5/8 in.	6 35
3/4 in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	40
Black Diamond	40
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	37½
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke	....
Connelsville Foundry Coke	....
Steam Lump Coal	....
Best Slack	....

Net ton f.o.b. Toronto.

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun, Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White.	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16
Colored.	
Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	10%
Best grades	15%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	48 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	55 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 16 oz. base	64 00	49 00
Braziers', in sheets, 6x4 base	55 00	48 00

BRASS.

Brass rods, base ½ in. to 1 in. rod	0 43
Brass sheets, 24 gauge and heavier, base	0 48
Brass tubing, seamless	0 55
Copper tubing, seamless	0 60

PLATING SUPPLIES.

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	06
Emery glue	15 to 20
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt, sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

Market Condition and Tendency

Trading Easier With Approach of Christmas—Steel for Private Work Scarce—Washington Price Revisions Awaited—Coke Shortage Continues.

BUSINESS generally this week has been upset on account of the elections but in other respects there is practically no change in the situation. Trading will likely be quiet for the remainder of the year as the Christmas holidays intervene. Merchants report quiet times in the iron and steel trade owing to the difficulty being experienced in obtaining supplies of steel for ordinary purposes which is restricting manufacturing operations. Consumers not engaged upon war orders are thus in an extremely difficult position, and the demand from such sources has fallen off. It is not very difficult to obtain steel for war work, but a considerable part of this is direct mill business and special arrangements exist for facilitating the procuring of supplies. Prices of steel products continue firm except for lighter gauges of black sheets which are easier; a slight decline in steel plates is expected in the near future. No announcements have been made following an important meeting in Washington to discuss the revision of prices on steel products. It is, however, believed that no change will be made from the prevailing schedule. The shortage of coke continues to restrict the production of pig-iron and the situation in the States is getting more acute. Furnaces in this district are also feeling the effects of the coke shortage. The non-ferrous metal markets are quiet, interest being centered on developments at Washington where an announcement is expected shortly concerning fixed prices on copper, lead and spelter.

MONTREAL, Que., Dec. 17, 1917.—Industrial activity continues unabated, although general business has been somewhat disorganized by the unusual interest being taken in the Federal House elections. The recent heavy snow and cold weather has added another to the difficulties under which manufacturers labor at the present time, as it has been almost impossible under certain conditions to secure delivery on much needed material. The recent calamity at Halifax resulted in the destruction of a large number of cars, a feature that has added to the acute condition of car shortage. Embargoes on exports from the States makes it increasingly difficult for manufacturers to obtain material and supplies from American centers.

Pig Iron

The situation in pig iron is unchanged although producers have been working under difficulties during the past week owing to inability to obtain raw materials, the recent storms and continued cold weather creating a serious factor for the furnaces. The situation, however, has shown a little improvement during the past few days but the shortage of iron is still more or less pronounced. In some quarters expectancy is shown that some revision will be made on the prices now ruling in the States.

Steel

No new developments have taken place

to alter the general tone of the steel situation. No definite announcement has apparently been given out regarding the decision arrived at during the recent meeting between the Government officials and the steel producers and manufacturers. While there is some possibility that prices may be readjusted in the near future, it is not likely that this will take place until well into the New Year, and even then it is not anticipated that such revisions will materially effect the present condition of the market, although some steps may be taken to relieve the pressure that is felt in certain directions.

The recent trend of events, however, has not been such as to remove the uncertainty that has characterized the situation for several weeks so that all buying is accomplished in a more or less cautious manner. This attitude is more pronounced in those steel products that are not in great demand for Government purposes. In addition to the increasing requirements for war necessities, the weather conditions during the past week or so have greatly hampered the transportation of all classes of materials so that production has suffered in many respects; this at a time when the recent closing of inland navigation has placed additional pressure on the various railroads.

Conditions are becoming so acute that unless consumers are working on Government contracts it is practically impossible to obtain steel and this tendency is daily becoming more pronounced. The freight congestion in the Eastern States has necessitated placing an embargo on all export material other than that specified for war purposes. The open market on billets and sheet bars is now virtually a thing of the past as producers are conserving their entire output for Government requirements. This condition also applies to structural material and domestic users of this class of steel have had to suspend operations until relief is assured. The urgent need for more cars and the stupendous program of shipbuilding is taxing the plate mills to their fullest capacity and this situation is likely to become worse before it is better. The same applies to almost every other line of steel product and Canadian conditions are reflected in those prevailing in the States. It has been reported that some difficulty is being experienced by those of our manufacturers who have secured American shell contracts, in obtaining the required steel from the States owing to the deferred action of the authorities at Washington.

The Canadian situation on the whole is unchanged and is likely to remain so until the turn of the New Year, as the elections here and the coming holiday season will have the result of disorganizing business to some extent. The heavy snow and cold of the past week has materially affected transportation facilities and manufacturers have suffered in consequence. Dealers report a very strong market with all price quotations very firm.

Metals

The general situation in the metal market is unchanged with tin still holding the center of interest. Conditions in the States are still hinging on the pending price fixing on some of the metals, definite action on which is expected at any time. The coming holiday season, however, has interfered with the progress of the work and the New Year may arrive before an anouncement is made. Copper is quiet, no early possibility of price revision being apparent. Tin is very strong but the acute condition of the past few weeks is less pronounced. Spelter is active under Government orders but the open market is very quiet. Lead is quiet but firm. Antimony is again weak and aluminum is in less demand.

Copper.—Steps have been taken during the past week towards coming to an understanding as to the price that will govern the sale of copper during the coming year or at least for such a period as may be agreed upon by producers and the Government. The announcement that some of the smaller producers find it very difficult to operate at a profit under the prices now ruling might indicate that any change would be in an upward direction. However, nothing definite has yet been done and it is still problematical just what conditions will prevail during the months of the coming year. Readjustments will probably depend upon developments, their nature at the present time being very uncertain. Local activity is light but prices are well maintained, dealers here are quoting 33 cents for lake and electro, and 32 cents for castings.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.

Tin.—The market in tin continues to be the feature of the metal situation, and although the most recent reports point to a relief of the existing acute conditions, there is still a pronounced shortage of tin both here and in the States. While nothing has been made public as to the progress made by the American Government towards obtaining better shipments of tin from England or other points under the control of the British Government, consumers are beginning to feel the pinch as the available supply of spot tin is becoming noticeably less. Some consumers who were fortunate enough to have covered their requirements have been induced to dispose of small quantities of metal to other users to meet their immediate needs. Early prospects, however, seem to be towards an easier situation, but this can only be shown by future developments. The latest reports show a practical suspension of business on the New York market, with the latest quotation at the nominal figure of 86 cents per lb. Dealers here report active market with prices very firm, the current quotation being 78 cents per lb.

Spelter.—The general demand for spelter has shown no tendency to increase although the buying by galvanizers for Government sheet contracts has been recently quite heavy, manufacturers not being inclined to take any chance on the market for a lower price, rather showing a tendency to amply cover their requirements at present prices. The attitude of the American Government in connection with the fixing of spelter prices appears to be very uncertain and it is expected that this factor will be left for trade conditions to automatically adjust as the demand becomes more on a par with production. The New York quotation shows a weaker tendency, the quotation of 7¾ cents being a decline of ¼ cent on the week. Prices here are unchanged at 10½ cents per lb.

Lead.—The situation in lead has shown no tendency to develop special features and the market is at present unsettled owing to the uncertainty that prevails regarding the contemplated action of the American Government in the setting of price to regulate the sale of metal. While this was expected to have been announced before this it is not likely that definite action will be taken until after the holidays. Reports of pending business of considerable volume have given a stronger tone to the general situation. Lead is quoted at 9½c but with a weaker tendency.

Antimony.—Reaction has followed the recent slight activity in the antimony market and quotations have again declined; New York is quoting 15 cents, a decline of ½ cent over that quoted last week. The local quotation is firm and unchanged at 18 cents per lb.; the demand being fair.

Aluminum.—The market is not active and the demand is light, prices are unchanged but with an easier undertone. Dealers here are asking 60 cents per lb., but the market is weak with a lower undertone.

Machine Tools and Supplies

The machine tool industry is at present regulated by the requirements of the government, particularly in connection with the business in the States, a factor that to a large extent, may be said to prevail also in Canada, as manufacturers here are dependent to a large degree on the American market for their supplies in machine shop equipment. The restrictions that have been placed on the export of machinery from the States have, however, given increased impetus to tool builders here in Canada, as shown in the greater activity in certain lines. While the week has been fairly quiet, the volume of sales has been sufficient to maintain

an interest in the market. Political activity has somewhat disturbed the regular progress of events and it is not anticipated that any great business will be in evidence until the country has become settled and the holiday season is over. It is known that several industrial developments have been suspended until the election returns are announced. A return to normal conditions may follow the holiday season and in anticipation, many dealers are looking optimistically forward to it. Business in small supplies has shown a little falling off and this is accounted for by the disturbed condition of the country at the present time. No weakening tendency has developed in the prices quoted on small supplies and quotations are generally very firm.

Scrap

The market is generally quiet with an unsettled tendency owing to the nervous situation that prevails in the States. It is expected that some action will be taken early in the New Year towards the regulation of prices controlling the sale and distribution of old materials, a factor that will tend to put this market in a more stable relation to that of other markets. The local situation has shown an inclination to weaken on metal scrap but steel and iron scrap is firm with stronger quotations on steel axles and machine shop turnings. Scrap brass has declined one cent during the week; heavy quoted at 15 cents and light brass at 10 cents per lb. Heavy lead is now 5½ cents, a drop of ½ cent per lb. Aluminum is weaker, the quotation of 25 cents representing a decline on the week of 3 cents per lb. Scrap zinc has become a litle stronger, an advance of ½ cent raising the price asked to 5½ cents per lb. Steel axles are in good demand and quotations have advanced, although the ruling prices are on the sliding scale; a nominal quotation being $38 per ton. Machine shop turnings show an advance of 50 cents per ton, the current quotation being $9 per ton.

Toronto

TORONTO, Ont., Dec. 18.—Interest this week has centred almost entirely in the General Election, with the usual effect on business. Apart from this there have been no developments of importance. The favorable result of the election ensures a continuance of the "Carry-on-with-the-War" policy which will be to the benefit of the industrial situation in Canada.

The shortage of raw materials, particularly of steel, is assuming more serious proportions, and there is no relief in sight. A serious shortage of coal has recently been revealed in some parts of this province, while the natural gas supply has failed in Western Ontario, due to the severe weather prevailing. A number of factories have been practically closed down, causing a dislocation of business.

Steel

The shortage of iron and steel, which has already caused some restriction in manufacturing operations, shows no signs of improvement, and the outlook is not by any means satisfactory. Little difficulty is being experienced in obtaining steel for war purposes, but for ordinary manufacturing requirements consumers are not able to obtain material in sufficient quantities to satisfy their needs. The result is that business is dull, particularly for merchants.

Comparatively dull conditions will likely prevail for the balance of this year, and probably for the greater part of the first quarter of 1918. This applies to purely domestic business, and not to that section of the trade engaged upon war orders. Special arrangements exist for facilitating the production of war equipment and for obtaining all necessary materials for this purpose, but this is not the case for normal manufacturing activities. War requirements take precedence over all other work, which means that consumers not engaged upon war orders will have to be content to take what they can get. The mills are exceptionally busy now, but war needs have first call upon their output.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

As far as can be judged at present no marked price recessions are likely to be made this year. The lighter gauges of black sheets are easier, having declined again, and a decline in boiler plate is expected shortly. Apart from these two products, there is no indication of an immediate fall in prices on steel products generally. The situation, however, in regard to prices is somewhat uncertain, and may to some extent depend upon developments at Washington. An important meeting was held in that city towards the end of last week, when, it is understood, the question of revising the fixed price schedule was discussed. No announcement has been made in regard to the result of the conference, but it is believed that the present schedule of steel prices will be reaffirmed by the Government.

President Wilson had previously fixed steel prices with the understanding that they would be subject to review after January 1. At last week's meeting the steel men pointed out that reductions in the present rates, which it is understood had been contemplated, would seriously impair the efficiency of the industry. It is considered almost certain that the Government will allow the present schedules to stand.

The unfilled tonnage statements of the U. S. Steel Corporation for November revealed a shrinkage of about 150,000 tons from the previous month, but it was the smallest decrease that has been shown for some time, and as there was no let up in shipments, it is a sign that the current business of steel companies is showing a big increase, with prospects good for an increase in unfilled tonnage for December. At present time the volume of steel business is showing some increase over what it has been at any time previously since price-fixing was first announced, with private consumers good buyers and a number of large Government contracts being placed.

Pig Iron

The shortage of coke continues to cause much anxiety to consumers, and as a result the pig iron situation is growing more serious. Production of pig iron in this district has not yet suffered much from the lack of coke, but will likely do so unless conditions improve materially in the near future. In the United States the shortage of pig iron, in view of the heavy demand, has reached an acute stage, and is steadily growing worse, with little hope of improvement in sight. Instead of meeting the growing demand, the furnaces have been barely able to keep the output from falling behind, the output not being sufficient to meet the consuming requirements of the trade.

Scrap

There is little to be said in regard to conditions in the market for scrap metals. Business is very quiet; in fact, there is hardly enough business passing to form a correct opinion of prices. The principal reason for the dull market is the contemplated price-fixing in the States. On this account consumers are staying out of the market pending a definite settlement of fixed prices.

Machine Tools

This has been a comparatively quiet week in the machine tool business, with no developments of particular importance. The demand is principally for tools for those munitions plants which are preparing to execute new orders for shells. It is becoming increasingly difficult to get equipment from the States, as a license has to be obtained before any machine can be shipped, and also the demand there is so heavy that deliveries now run into several months.

Supplies

Business continues steady, with firm prices ruling. Gasoline and coal oil are very firm, due to the advance in crude oil. Higher prices for coal oil are not unlikely. An advance in Pratt & Cady

stocks and dies is announced. One line, No. 1086, which formerly carried a discount of 22½ per cent., is now quoted at 10 per cent., while No. 1087, that formerly sold at 10 per cent. off, is now net list. No. 1085 stocks and dies are now quoted at list plus 30 per cent., the recent price being net list. A considerable advance has been made in the price of Barnes pipe cutters and Saunders pipe cutters, together with the parts therefor. Where Barnes pipe cutters were formerly quoted at 37½ per cent. off list, they are now quoted at 30 per cent. off list. Parts for Barnes pipe cutters are now quoted at 25 per cent. off list, the former discount being 32½ per cent. Saunders pipe cutters, that were formerly quoted at 27½ per cent. discount from list, are now quoted at 16 2/3 per cent. discount. Parts for Saunders pipe cutters are now quoted at a discount of 10 per cent. off list, the former discount being 22½ per cent. Linseed oil and turpentine have both declined. Linseed oil is now selling at range of $1.36 to $1.48 for raw and $1.39½ to $1.51 for boiled oil. Turpentine is now quoted at 71c to 74c per gallon.

Metals

Although prices for the most part continue firm and unchanged, the market is unsettled, due to conflicting reports from Washington concerning the situation in regard to prices of copper, lead and spelter. The price of copper was established some time ago, but there is an impression that it will be revised in an upward direction. An announcement regarding fixed prices for lead and spelter is expected any time, but there is no indication as to what the trend will be. The tin situation continues very unsatisfactory owing to the shortage and unusually high prices. The shortage of tin is serious, particularly for manufacturers of tin plate. Business in the local metal trade is steady and fairly active.

Copper.—Considerable uncertainty prevails in regard to the revision of copper prices, which are being considered at Washington. The general feeling seems to be that if any change is made at all it will be upward. It is generally believed that there will be sufficient copper to meet all demands, and the situation in this respect is satisfactory. Copper prices are unchanged, lake and electrolytic being quoted at 32c and castings at 31c per pound.

Tin.—The serious shortage of pig tin, evident for over a month, threatens to cut down the production of tin plate. This shortage has already been responsible for a sharp advance in price, and there is no indication of any improvement in the situation in the meantime. It is understood that the U. S. Government is taking steps to have the British regulations modified in respect to tin, so as to allow of adequate consignments being shipped to the States. Tin quotations locally are nominal and unchanged at 80c per pound.

Spelter.—The market is inclined to be easy pending the expected announcement from Washington, which may fix the price for prime Western and the higher grades. Local price is unchanged at 10½c per pound.

Lead.—The market is unsettled, being influenced by the price-fixing now under consideration at Washington. The impression prevails that if a Government price is established it will probably be below the current market. In the meantime lead is unchanged at 8½c per pound.

Antimony.—The market, which was active some days ago, is now quiet. Quotations are unchanged at 18c per pound.

Aluminum.—The market for aluminum is steady and unchanged at 62c per pound.

Washington

WASHINGTON, D.C., Dec. 15.—Chairman E. N. Hurley, of the United States Shipping Board, this week announced that the Board in co-operation with the Federal Bureau of Standards will undertake the construction of concrete cargo ships. This decision follows an investigation by the Bureau of Standards of a 4,500-ton concrete vessel now under construction at San Francisco. The Shipping Board and the Bureau of Standards will send special representatives to the San Francisco yard at once to gather information regarding the methods of construction. These will be used in later concrete construction by the Government.

Concrete Ship Construction

The Shipping Board has negotiated a provisional contract with Matthew Hale, of Boston, for the construction of twenty concrete ships of 3,500 tons each, by a Boston Company, to be called the Liberty Shipbuilding Corporation. The contract provides for a concrete vessel now under construction by the Boston concern being accepted by the Emergency Fleet Corporation. The Boston interests plan to construct their ships in a Southern yard, to be located either in South Carolina or Georgia. In presenting the proposal to the Shipping Board, Hale stated that the plans of his clients had been approved by marine experts of the Massachusetts Institute of Technology. The Shipping Board is further considering the construction of concrete barges to be used in the coastwise traffic.

Barge and Tug Construction

Chairman Hurley has announced that the Shipping Board has transferred $3,360,000 of its available funds to the War Department for the construction of twenty-four barges and four tugs to be used on the Mississippi river. These craft are essential, it was stated, in moving lumber and steel to the Gulf shipyards.

Merchant Service Control

Following weeks of discussion regarding control of the personnel of the merchant service, a compromise has been reached whereby the Shipping Board and the Navy Department will exercise joint control. The plan for joint jurisdiction was explained in an announcement, issued by the Shipping Board, as follows:

"The bulk of vessels under the American flag, whether engaged in the trans-Atlantic trade or elsewhere, so long as they retain their character as merchantmen, will continue to be manned by merchant sailors. Troopships and vessels carrying whole cargoes of munitions or supplies for the army and navy, however, for military reasons, will be manned by naval crews."

Acting on this plan the Shipping Board has adopted a comprehensive program for obtaining civilian crews that will be needed on the new fleets of the merchant marine. About 58,000 officers and men will be required for the ships the Board aims to put into commission before the end of 1918.

Explosive Plant Construction

Daniel C. Jackling, of San Francisco, managing director of a group of copper mines, has been designated by Secretary of War Baker to take charge of the building of the Government's explosive plants. Expenditure of more than $90,000,000 is contemplated in the erection of these plants to supplement the present output of the private munitions manufacturers.

Thomas A. Edison, with four other internationally known scientists, may soon be called upon to rule on the genuineness of what is claimed to be the greatest invention of mankind. The "Garabed" resolution, providing investigation of the purported discovery of Garabed T. K. Giragossian of a virgin natural force has passed the House of Representatives. If the Senate and President Wilson approve it, a committee of five eminent scientists to which the invention will be demonstrated will be appointed.

Closing hours of the debate on the resolution produced a strange scene. Opponents of Garabed, after interposing every known parliamentary obstruction, had brought into the House floor an electrical machine which they claimed paralleled the Garabed invention, but it was removed shortly after. Henry Perrigo, Kansas City, Mo., electrician, whose machine figured in the wrangle, stated he will attempt to induce Congress to subject his invention to the same committee of scientists which will pass on the "Garabed." Perrigo claims to be able to produce unlimited electricity from the air without the use of fuel. Garabed's claims are not based on electricity.

Under schedule 2531½, the Bureau of Supplies and Accounts, Navy Department, will open bids on December 28 for furnishing machine tools. On the same day, under schedule 2529½ the Bureau will open bids for furnishing 64 motor generators and 29 dynamo motors to various navy yards.

A quantity of pipe, nuts, rivets, hoes, etc., are required by the Panama Canal Commission, bids for which will be opened December 28, under Circular 1189, which can be obtained from General Purchasing Agent, this city.

The Alaskan Engineering Commission is inviting bids until December 27 for

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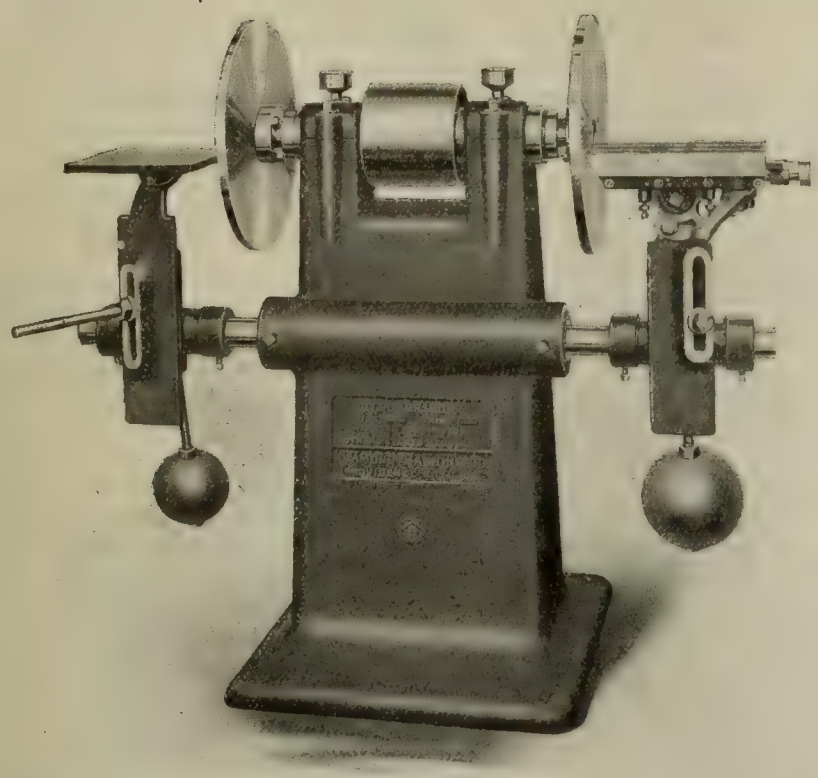

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We can supply any of the above complete, ready for use, **at about half the cost of ordinary tools for the same purpose**, or we can furnish you with **a complete set of castings** ready for you to machine and set up.

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furnishing a quantity of machinery. Details can be secured from C. E. Dole, general purchasing agent, Seattle, Wash.

Admiral F. R. Harris, chief Bureau of Yards and Docks, Navy Department, is soliciting bids until Jan. 7, for furnishing one 40-ton and two 10-ton electric overhead traveling cranes.

New York

NEW YORK, Dec. 15.—Government munition orders are still being placed with a liberal hand, and other war contracts are in readiness as soon as the factories have been adjusted to take them. Freight congestion, railroad embargoes, snowstorms and zero weather, while curtailing plant operations in New England, have failed to check the ardor of manufacturers, who are giving almost their entire time to assisting the Government to produce guns, shell and air craft for the army and navy. There is scarcely a New England factory that has not received an order of some kind from the Watertown Arsenal covering gun parts and mechanisms and tools to equip the new extensions at Watertown.

At Bridgeport the Liberty Ordnance Co. is preparing to greatly increase its output of 5-inch naval guns, and the Remington Arms U. M. C. Co. is increasing production of rifles and cartridges. The Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., is rapidly equipping its plant at Meriden, which was recently acquired. Half of the Mayo radiator plant at New Haven, belonging to the Marlin Arms Co., is being converted for the manufacture of rapid fire machine guns, and it is also increasing the output of its Norwich plant. The Sterling Motor Co., Brockton, Mass., is building an addition in order to be in position to execute new contracts for shell and for gun sights, recently received from the Government.

Airplane Plant Organization

Furniture manufacturers of Grand Rapids, Mich., at the behest of the Government have mobilized their plants for the manufacture of airplanes and have organized the Grand Rapids Airplane Co. with a capital stock of $200,000, through which individual manufacturers will receive their orders from the Government. Automobile plants at Lansing, Mich., are preparing their factories to turn out war munitions. The Reo Motor Co. is making changes in its shop equipment for the manufacture of shrapnel cases. The Lincoln Motor Co., of Detroit, who recently purchased $2,500,000 worth of machine tools to manufacture Liberty airplane motors, expects to have the new plant, now under construction, ready for operation by the middle of February. Dodge Bros., Detroit, who have been awarded a large contract for recoil gun devices by the Government, expect to have their new plant ready in the spring, and fifty of the tools recently commandeered by the Government in New York have been ordered shipped to Detroit.

Fewer large contracts for machinery were placed in the New York market in the past week, but there is still an active demand for small lots of tools needed by plants on the seaboard as well as in the interior. The American Can Co., which has an order for four million 75 mm. shell from the Government, is preparing to purchase 150 tools for the equipment of its Edgewater, N.J., plant. This company is also going to increase its plant at Jersey City. The Standard Ordnance Corporation, which is to build 155 mm. gun carriages at Hamilton, Ohio, has made additional purchases of tools in the New York market. The United States Government is still in the market for cranes for installation in the new shops at the Washington Navy Yard and for equipping the Sandy Hook Proving Ground.

Steel Output Will Meet Requirements

At the Washington conference last Monday between the War Industries Board and representatives of the Iron & Steel Institute it is understood that assurance was given by the producers that while the output of steel is being cut down by coke shortage and freight congestion, an ample supply of all products will be available to meet war requirements of the United States Government and its Allies. The question of price revision to be made after the 1st of January was only referred to incidentally, but some consideration was given to prices at the meeting held yesterday.

The Iron & Steel Institute is preparing a pamphlet giving in detail the base and differential prices with tables of "extras" established by agreement between the Government and the manufacturers, which, by request of the War Board, will be issued to the trade as the official guide. It is known that some members of the Federal Trade Commission are in favor of revising prices in the near future, but this sentiment is not accepted by the War Industries Board. and the steel manufacturers and distributors are strongly opposed to any changes until time has been given to test the schedules already adopted.

Pittsburgh

PITTSBURGH, Pa., Dec. 15.—The steel market has turned still quieter in the past week. There is an effort made by some authorities in the trade to ascribe the quieter conditions of the past fortnight to the resuscitation at Washington of the price question. At the same time they profess to feel assured that the Washington authorities are not going to make any serious effort to have prices revised downward, and no one contends that there is any hope of the producers having them revised upwards. It seems more natural to attribute the quietness of trade to the season of the year and the fact that the country is getting still more on a war basis.

Last Monday's conference between the War Industries Board and the iron and steel makers was devoted chiefly to consideration of revised methods for apportioning war steel tonnage and placing the actual orders. Prices, it is said, were mentioned only casually. The programme is that following yesterday's conference between the Federal Trade Commission and representatives of the steel industry the Commission will submit to the War Industries Board some of the cost data it has been accumulating in the past six months, whereupon the board will call another meeting with the steel industry prior to Jan. 1. As the various set prices were definitely announced to run to that date, it is necessary to take some formal action, if only to pronounce them good for a further period or for an indefinite time.

Operating Difficulties

A cold snap, with zero weather, descended upon the whole central west immediately after last report was written, and in the past week all operations in the iron and steel industry have been materially reduced. There has been a fresh shortage of coal at many steel plants and the shortage of coke at blast furnaces has been accentuated. There have also been difficulties with frozen ore, frozen pipes and other obstacles to full production.

While much is made in trade circles of the decreased production arising from weather and transportation difficulties, it is important to observe that the steel makers have given the Government authorities fresh assurances that all the war steel required will be furnished on time, while on the other hand ordinary buyers do not seem to be incommoded seriously by insufficient deliveries of steel. If they are not receiving as much as they could use under normal conditions, their own operations have likewise been interfered with by much the same influences that have operated in the steel industry.

Production Varies

The rate of production shows wide variations in different lines. Steel is diverted to the finishing departments, whose product is most needed. Sheet bar supplies to tin mills are almost normal, while to sheet mills they are greatly reduced. In the past week the tin mills have operated at between 90 and 95 per cent. of capacity, the sheet mills at only about 50 per cent. Production of shell steel and plates seems to have been well maintained, while production of standard steel pipe and wire has suffered greatly. All the American Steel & Wire Co. plants at Cleveland were down at the beginning of the week, chiefly from lack of coal.

Pig Iron

It continues to be the case that there is practically no pig iron offered in the market for early deliveries. There is no basic or Bessemer at all, and foundry iron can only be bought, if at all, by regular customers of the furnaces. There is, however, some foundry iron business being done for second quarter and second half of next year. The requirements of foundries are much lighter than formerly, but there is correspondingly light production, so many furnaces being operated on basic iron. Quotations when made are always at the set prices, $33 for basic or No. 2 foundry, $36.30

(Continued on page 62.)

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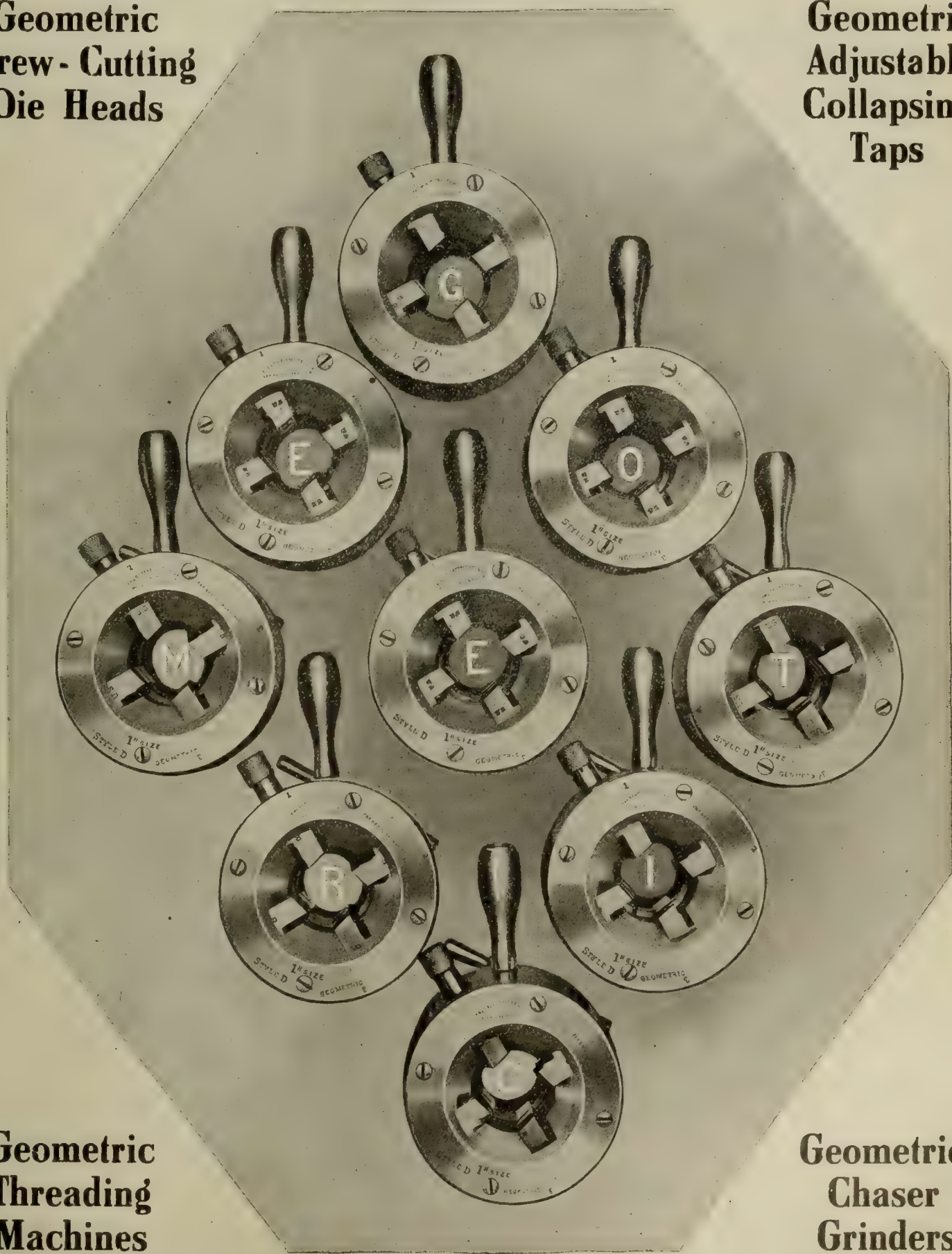

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PITTSBURGH MARKETS

(Continued from page 60.)

for Bessemer, $33.50 for malleable, and $32 for forge, f.o.b. furnace.

Discard Steel Offered

Nothing but odd lots of ordinary soft steel billets are offered, and then only occasionally. There are, however, free offerings of discard steel, arising from the manufacture of shell steel, and this steel does not find sale equal to the offerings by any means. Some of the mills will roll the steel to specification, down to 1½-inch, and the highest price they usually ask is the set price for soft steel of corresponding size:—Billets, $47.50; small billets, $51; slabs, $50; Pittsburgh or Youngstown. No tonnage figures are available as to shell steel, but it is evident that the production has been increasing very considerably.

Prospects of Supplies

While the market situation presents the appearance of strength, with deliveries in practically all lines rather difficult to secure, except upon old contracts, there is little doubt but that with anything like full production of the basic materials, pig iron and crude steel, there would be fairly plentiful supplies of finished steel in certain forms, those not largely required for prosecuting war. The finished steel industry has only a certain amount of flexibility, the total finishing capacity only slightly exceeding the total capacity for producing raw steel.

With the production of raw steel curtailed, the output can be allotted in accordance with the needs for finished products, the mills making the products most in demand being operated as fully as possible while the mills whose product is not so much needed receive correspondingly less steel. If the production of steel were at capacity, instead of in the neighborhood of 85 per cent. of capacity, the steel could be finished only by diverting more of it to the departments now operating at far below their capacity, and such finished products would then be found to be relatively plentiful. The question is whether the blast furnaces and steel-making departments can operate at capacity at any time this winter.

Iron and steel exports in October amounted to 571,893 gross tons, against 489,415 tons in September, and a monthly average of 543,000 tons in the 12 months November, 1916, to October, 1917, inclusive, approximately the twelvemonth period of heaviest exports. While some exports have been embargoed, and the shipping situation is unsatisfactory, it is evident that shipments of war material are going to be so forced as to maintain a good total tonnage of exports right along.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Valleyfield, Que.—The power house at the Montreal Cottons, Ltd., plant was destroyed by fire on Dec. 13.

Brantford, Ont.—The Steel Company of Canada propose building an addition to their plant here at a cost of $100,000.

Beamsville, Ont.—Work will commence shortly on the construction of hangars and other buildings for the proposed aviation plant which will be located here.

Toronto, Ont.—A building permit has been issued to The Canadian Aeroplanes, Ltd., for an additional storey to a building on Dupont Street, to cost $27,000.

Winnipeg, Man.—The Transcona Shell Co., which has been operating the G.T.P. shops at Transcona will it is understood establish a plant for making munitions at Batavia, N.Y.

Toronto, Ont.—The city architect has granted a permit to the Canadian Fairbanks-Morse Co. to erect a one-storey munition shop adjacent to their present plant on Bloor Street. The estimated cost is $5,000.

Ladysmith, B.C. — The Ladysmith smelter was blown in again on Dec. 3, for at least a few weeks run. It is hoped that before the present supply of ore is exhausted that there will be enough additional supplies in sight to warrant the management continuing the run for an extended time.

Wallaceburg, Ont.—Damage to the extent of $100,000 was done on Dec. 11 by fire to the Wallaceburg plant of the Dominion Sugar Co. The fire followed an explosion believed caused by an explosion of gas used for reheating the dryers in the pulp building. The blaze completely destroyed the building and machinery and 7,000 bags of pulp.

Vancouver, B.C.—A permit has been granted to the Schaake Engineering Co. for the first unit of engineering works to be erected shortly. The first unit will comprise a machine shop that will cost $46,750 for the building alone. The firm will be able to handle almost any class of repair work, as well as build machinery of all kinds.

Sault Ste. Marie, Ont.—The Algoma Steel Corporation will make considerable additions and improvements to its plant, including the installation of 25 by-product coke ovens, with by-product equipment. Construction will be started immediately, and it is expected that the plant will be completed by the middle of 1918. The contract for the installation of the coke ovens has been awarded to the Wilputte Coke Oven Corporation, New York.

Niagara Falls, Ont.—A 13-foot wood-stave pipe line will be laid from the river to Queen Victoria Park down to the development at the foot of the Falls. This pipe line will enable the Ontario Power plant to be developed to its full capacity, and will produce an extra 25,000 horse-power. The new pipe line will provide enough water for additional generators as well, and to utilize it tenders will be let for the installation of additional turbines, with penstock and generator complete. This will give another 20,000 horse-power available ten months from now.

Montreal, Que.—An influential syndicate has been formed to finance and operate a new glass company in a suburb of Montreal called St. Pierre, to be known as the Consumers' Glass Co., and to work in opposition to the Dominion Glass Co., which has several plants throughout the country, including factories at Toronto, Hamilton and Wallaceburg. The new company is taking over the plant of a company formerly called the Premier Glass Co., which previously had taken over the plant of the Atlas Glass Co., and both of which proved failures.

ELECTRICAL

Kingston, Ont.—On Thursday afternoon engineers Kribs and Johnson of Toronto turned on the Hydro-Electric power from the Trent at the Kingston sub-station, and everything worked satisfactorily.

GENERAL

St. Johns, Que.—A serious fire, supposed to have started in the boiler room of the Excelsior Straw Works, last Thursday destroyed the Excelsior Straw Works, St. Johns Straw Works, Thuote Moving Picture Theatre, and several other buildings. The total loss is about $125,000, partly covered by insurance.

Toronto, Ont. — The newly-erected manufacturers' building of W. T. Dillon and Company, 183 George Street, was the scene of a fire on Dec. 10, that damaged the building and contents about $7,000. The chief sufferer was the John Crane Co. Their loss is estimated at about $5,000, of which about $1,500 is to machinery. The damage to the building is placed at $1,500.

MUNICIPAL

Galt, Ont.—A by-law will be submitted to the ratepayers on Jan. 1 to provide money for extensions to the waterworks system to cost $18,558.

Alliston, Ont.—A by-law will be voted on by the ratepayers on Jan. 7 to authorize an expenditure of $6,000 for electrifying the municipal pumping plant.

Toronto, Ont. — The Harbor Commissioners have referred to the board's engi-

neer and to Fire Chief Smith the proposal that a fire boat be purchased for protecting the water front and island.

Toronto, Ont.—Fire Chief Smith has recommended the purchase of two motor fire trucks, to cost $24,000, to protect the district surrounded by Liberty Street, Dufferin Street, Hanna Avenue and the G.T.R. tracks. Works Commissioner Harris reports that new high-pressure mains in the district would cost $20,000.

Windsor, Ont.—The Water Commissioners have decided to instal at once two motor-driven pumps to obviate danger which threatened to arise as a result of the fuel shortage. It is proposed to use Hydro power to drive the pumps and to keep the present steam installation for auxiliary purposes. However, in order to relieve the load upon the Hydro system in the early evening the steam pumps will be used for an hour or two.

Chatham, Ont. — A serious situation has developed in Western Ontario on account of a shortage in supply of natural gas. The gas pressure failed in Chatham last Saturday, the available supply being hardly sufficient to keep water from freezing in the boilers. There is also very little coal in the city and a number of factories may have to close down. Unless there is a change in the temperature very little relief can be expected.

Hamilton, Ont.—At a special meeting of the Barton Township Council held last Saturday, it was proposed to enact a by-law for the purpose of raising $55,000 for the purpose of installing a Hydro system in the township. It will require $22,000 as a first investment to buy out the present system, the rest of the funds to be held for extensions, etc. The question will be placed before the electors of the township when they ballot for the municipal elections.

North Vancouver.—The district of North Vancouver council on Nov. 29 passed a resolution authorizing the clerk to prepare a general loan by-law to provide the sum of $35,000 for waterworks purposes. The money, which in the event of this by-law passing at the general elections in January, is intended for the establishment of a waterworks system east of Seymour river. The principal need for such a system is to provide a steady and sure supply to the two large industries at Roche Point—the Canadian Robert Dollar Co. and the Vancouver Cedar Mills, Ltd.

CONTRACTS

Hamilton, Ont.—The Board of Control has awarded a contract to the City Brass Co., Hamilton, for the year's supply of brass at $2,465.

Toronto, Ont.—The Board of Education has awarded the contracts for the Alexandra school annex. The tenders amounted to $102,081 whereas only $70,000 was provided for this work in the estimates. The successful tenderers were as follows: Masonry, $38,500, Witchall & Sons; carpentry, $22,171, Frank Armstrong; heating and plumbing, $21,998, Purdy, Mansell; iron work, $3,675, Can. Wire & Iron Co.; plastering, $4,950, Geo. White; painting, $2,525, Jas. Casey; concrete, $2,147, Concrete Construction Co.; flooring, $1,345, Can. Glass, Mantel & Tile Co.; galvanizing, $1,345; heat regulators, $1,183, Johnston Temperature Co.; electrical work, $897, Can. Electric; roofing, $1,345, J. F. Flowers.

TRADE GOSSIP

New Tonnage Equals Losses.—British tonnage completed in the month of November was within measurable distance of the tonnage losses in that period by enemy attacks, it was announced in the House of Commons on Dec. 11, by Sir Leo Money, Parliamentary private secretary to the Ministry of Munitions.

Contracts Adwarded for 4,000 New Ships.—Contracts have been let by the United States Federal Shipping Board for 4,000 ships with net dead-weight carrying capacity of eight million tons. Raymond B. Stevens, vice-chairman of the board, told the members of the Academy of Political Science at the opening of their thirty-seventh annual meeting at New York on Friday that he thought at least six million tons would be available next year.

Buy Machinery for China in U. S.—A party of eight Chinese has arrived in New York to arrange for the purchase of a large quantity of machinery for shipment to China. The report has gone out that the purchase was to be of agricultural implements and machinery, but Mr. Ying said this was not so. Mr. Ying emphasized the fact that they had been appointed by the Chinese Government to handle the machinery purchase, and they would have nothing to do with any other matter while in America.

U.S. Steel Output.—Considering all the difficulties against which the steel companies have been obliged to contend, production in November was satisfactory, being slightly larger than in September or in July. The average monthly output of steel since July 1 by the Steel Corporation has been approximately 1,640,000 tons. The production of rolled products in November is indicated to have been a little under 1,200,000 tons, and the average monthly output since July 1 is 1,235,000 tons.

War Expenditure for November.—Canada's war expenditure during the month of November totalled $18,714,472, making a grand total of war expenditure to November 30 of $151,969,271. The total net debt on November 30 was $958,000,700. as compared with $706,128,082 on November 30. 1916. Revenue for the month on consolidated fund account was $24,322,946. and expenditure for the month $12,922,635. Revenue for the eight months period to November 30 was $170,042,006 and expenditure $79,566 862.

James Carruthers Gives Aeroplanes.—According to the *Westminster Gazette*, London, James Carruthers, of Montreal,

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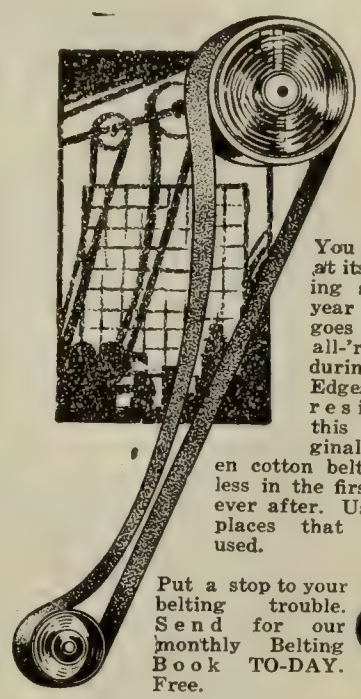

You will wonder at its great pulling strength; as year after year goes by, at its all-'round enduring goodness. Edges treated to resist shifters, this — the original solid woven cotton belt—costs you less in the first place and ever after. Used in most places that leather is used.

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ex-President of the Montreal Board of Trade and President of the Canada Steamship Lines, has offered to the British Government, through Lieutenant-Colonel W. Grant Morden, the gift of four battleplanes for use on the Western front, and the Air Board, in accepting the gift, has expressed its warm appreciation of so generous a contribution. Mr. Carruthers has already presented three aeroplanes to the Canadian authorities, and has given upwards of a quarter of a million dollars to Canadian patriotic funds.

Bill to Get Rid of German Control. — The non-ferrous metal bill, which gives the British Government control of all dealings in metals not containing iron and is intended to destroy what hitherto had been a virtual German monopoly in these metals, was passed on the second reading by the House of Commons, London, England, on Dec. 9. In the course of the debate Andrew Bonar Law, Chancellor of the Exchequer, said he wished to let Germany know that Great Britain realized her power commercially, and that when the time came she should use it. Germany should also remember, he said, that the longer the war lasted, the less raw material there would be to go round and the allies would help themselves first.

To Build Training Ship.—The Danish-Canadian Patriotic Fund of Toronto has launched a campaign for a subscription of $100,000, which is to pay for the building and rigging of a school-ship for the training of young lads in practical seamanship. It is the intention of the organization to build other ships for the same purpose. These will be stationed at such points as St. John, Quebec, Montreal, Winnipeg, Vancouver, etc. The "Denmark," as the first ship will be called, is to be presented to the Canadian Navy League, and will be stationed at Toronto. It will be considered the flagship of the fleet. All money orders and cheques should be made payable to the Danish-Canadian Patriotic Fund and sent to the Wesley Building, Toronto.

Canada Large Buyer of U.S. Tin Plate.—According to the United States Department of Commerce imports of pig tin and palm oil, both essential in the manufacture of tin plate, show an increase for the ten months ended October 31, 1917, over the corresponding period for 1916, while exports of domestic tin plate and terne plates show a falling off. Imports of palm oil amounted to 33,703,671 pounds, against 24,976,235 pounds in 1916, and imports of pig tin were 126,125,792 pounds as compared with 121,048,537 pounds for the first ten months of 1916. Exports of tin plate up to October 31, 1917, totalled 421,137,657 pounds, compared with 433,000,173 pounds in 1916. Argentina and Canada were the largest customers for American tin plate, the former country leading for the first time in this respect.

New Car Ferry Being Built at Levis. —The new ferry now building at the yards of the Davie Shipbuilding and Repairing Co., Levis, Que., will have a speed of 14 miles an hour and will have a hold capacity of 70,000 cubic feet. It is designed to carry 20 cars, will be 308 feet in length over all and of 52 feet breadth, with a depth of 20 feet 6 inches. The gross tonnage is estimated at 5,000 tons and the net at 3,000 tons. The engines installed will be one four-cylinder triple, 2,200 i.h.p., and the boilers installed will be four of the Scottish marine type, 11½ feet in diameter, 175 pounds working pressure, having 5,500 square feet of heating surface and 143 feet of grate area. The capacity of No. 1 hold will be 40,000 cubic feet, and of No. 2 hold 30,000 feet. The area of the main deck will be 13,000 square feet.

Power Canal Making Progress.—Excellent progress is now being made on the Chippawa Hydro-electric Power Canal and the preliminary work has got well under way. The construction railway which will carry away the material excavated has been completed from the Whirlpool to the power-house, and the rest of the line is being pushed forward. The Hydro engineers were handicapped by shortage of labor, but now about 350 men are employed. At the present time operations are being centred on the erection of a concrete bridge for the Niagara, St. Catharines & Toronto Railway tracks at Stamford, Ont. This is only one of about thirty bridges which will have to be built. The engineers are filling in a great many ravines around the Niagara River with the earth taken out in excavating the canal.

Japan Needs Chemicals.—The ban on cotton and restriction on steel have caused much anxiety throughout Japan, but now chemical importers are at the fore protesting against the shutting off of their supplies of caustic soda, glycerine, and soda ash, all of which are largely obtained from the United States. These three articles are much wanted in Japan. Soda ash is required for glass manufacture, and, to the end of August of this year, was imported to the value of $1,696,484. Much more than 50 per cent. of this came from the United States. England has now prohibited export of any of these chemicals. Attempts have been made to manufacture soda ash in Japan, but they are still in the experimental stage. Glycerine is produced in Japan by a few concerns, but their combined output is entirely inadequate.

G.T.R.'s Annual Track Inspection Completed.—The annual inspection of track over the Grand Trunk Railway System has just been completed. This inspection has occupied six weeks, and has included a thorough examination of rails, ties, etc., on the 1,145 miles of main line, and on some thousands of miles of branch lines. The inspection party travelled over the system in a specially constructed car fitted with electrically controlled devices for registering the efficiency marks gained by the various sections for excellency of track maintenance. There was the keenest competition between the various section gangs, foremen and supervisors for the honors which are given to the section considered to represent the highest standard of maintenance work. These inspection trips serve to increase the enthusiasm of the men engaged in this important branch of railroad work, and enable the officers to give the closest supervision to the maintenance of the track in a high state of efficiency.

PERSONAL

Herbert Johnston has been appointed Canadian sales manager of the Armstrong Whitworth Co. of Canada, Montreal, not city sales manager as was stated in last week's issue.

Captain Arthur C. May, one of the best-known vessel masters on the Great Lakes, died at his home in Port Huron, Mich., on Dec. 11, after an illness of five months. He was 58 years old, and resided in Port Huron 28 years.

G. H. Smith, vice-president of the International Petroleum Co., Toronto, has been elected president in succession to Walter C. Teagle, now president of the Standard Oil Co., of New Jersey.

Lt. J. K. L. Ross, of the R.N.C.V.R., has been promoted to the rank of commander for the splendid services he has rendered to the Department of the Naval Service and for his generosity in many other ways.

William Clark Hawkins, managing director of the Dominion Power and Transmission Co., of Hamilton, Ont., has been elected president of the Southern Canada Power Co., of which he was already a director. Mr. Hawkins was born at Orange, N.J., in 1866. He became associated with the D. P. & T. Co. in 1901 and was appointed managing director in 1912.

Lieut. George H. Forster, who, before going overseas was manager of the Linde Canadian Refrigeration Co., Montreal, has been badly gassed in the recent fighting while serving with the British army. Although his condition is serious, there is hope of his recovery. Lieut. Forster joined the 148th McGill Battalion, under the command of Lieut.-Col. Magee, and left in 1916 for England, but later was transferred to the Imperial Forces.

Lieut. Commander J. A. M. Murray, one of the C.P.R. fleet captains, was instantly killed in the explosion at Halifax. Capt. Murray was for about 15 years in the Elder-Dempster West African trade, and also in the West India line. When the C.P.R. took over the Elder-Dempster line, Captain Murray went with the ships and served under the C.P.R. until four years ago, when he became Harbor Master of Quebec. When the war broke out, he was sent by the Canadian Government in the winter to Halifax. Later he was at Sydney, and last summer returned to Halifax, where he was put in the Imperial service. He was in command of the Lake Manitoba for a long time before taking the command of the Empress of Britain.

RAILWAYS & BRIDGES

Port Arthur, Ont.—Fire starting in the basement of the C.N.R. station building on Dec. 12 did material damage to the extent of about $15,000.

TENDERS

Toronto, Ont.—Tenders are now being called for the building of Child's Restaurant at the corner of Yonge and Dundas Sts., on the site of the old Vendome Hotel, to cost $100,000. It will be of structural steel, blue stone and granite construction.

BUILDING

Ottawa, Ont.—About a month's time will be required for the restoration of Pier Two, the reception hospital and clearing depot at Halifax, which were badly damaged by the Mont Blanc explosion.

MARINE

Port Colborne, Ont.—Storm warnings have been discontinued here for the season.

Port Colborne, Ont.—The Welland Canal was officially closed for the season, December 15th.

Vancouver, B.C.—Following upon the announcement that John Coughlan & Sons had been awarded contracts by the Imperial Munitions Board for the construction of four steel steamers at an approximate cost of $7,000,000, comes information that the Coughlin plant will be greatly extended at a cost of approximately $250,000. At present there are 1,000 men at work on the six steel steamers. It is proposed by the firm to employ at least 2,000 men.

CATALOGUES

Dwight Co. Indicator.—Bulletin "C" illustrating and describing the Dwight Co. indicator made by the Dwight Mfg. Co., Chicago. Copies of the bulletin may be obtained from the Allen General Supplies, Ltd., Toronto, who are the Canadian agents for this instrument.

Atlas Babbitts-Catalogue issued by the Atlas Metal & Alloys Co. of Canada, Ltd., Montreal. The catalogue describes an extensive line of "Atlas" babbitt metals and other alloys for all kinds of bearings. Details of a friction test of "Atlas" metals and a long list of steamships is given in which "Tenaxas" metal has been employed in the main engine bearings.

Tool Grinding is the title of an interesting booklet just issued by the Norton Company, Worcester, Mass., containing a great deal of useful information on tool room grinding. The booklet explains the correct way to grind cutters of all kinds, reamers, drills, lathes, planer tools, and dies. A number of grinding operations are illustrated to assist the reader in following the text.

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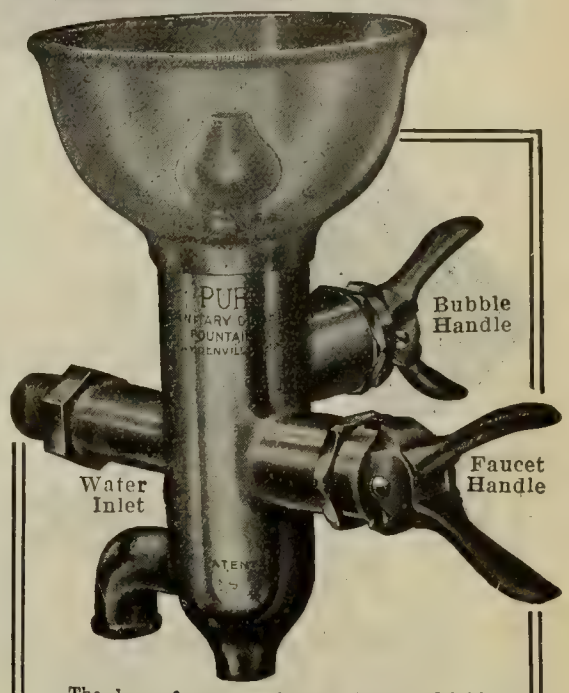

The loss of a man through impure drinking water is a crime that "the front office" must bear.
An ugly statement, isn't it? But true, absolutely.
When a man comes to work in your factory he puts his health in your keeping.
Are you willing to take chances on such a trust?
Impure drinking conditions are responsible for more tragedies than any machine ever built.
Apply the "Safety First" Principles to your water supply; don't deny your men a clean, fresh drink of water.
Conserve their health and they will improve your profits; make yourself as worthy of the name of "employer."
Install the Gold Medal winner Puro in your plant, office and shop alike.
The only Sanitary Drinking Fountain that is safe, sanitary, simple, automatic in control and easily attached.
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WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

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Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order

Pneumatic Tools.—Kellar Pneumatic Tool Co., Fond du Lac, Wis., have issued three pamphlets dealing with a line of chipping and riveting hammers and a sand rammer. In the first two the construction of the hammers is explained in some detail, with illustrations of the various styles that can be supplied and their component parts. In the last bulletin the advantages of pneumatic ramming in foundries and for other work is touched upon with illustrations of the different types available.

Tool Room Specialties.—Taft-Peirce Mfg. Co., Woonsocket, R.I., have distributed a catalogue describing a line of tool room specialties, which includes bench plates, boring equipment, gages of all kinds, knees, parallels, sine bars and v-blocks. Each specialty is given a single loose leaf with an illustration, brief description and in some cases tables of the various sizes that can be supplied. A feature of the catalogue is its paging according to the style numbers of the various articles covered. Mention is also made of the work which the company is prepared to do in the design and manufacture of special gauges, fixtures or tools.

TENDERS WANTED FOR TELEGRAPH EQUIPMENT

THE Canadian Trade Commissioner in Cape Town, W. J. Egan, has forwarded to the Department of Trade and Commerce copies of indent No. 151, issued by the Department of Posts and Telegraphs of the Union of South Africa and recently transmitted to the High Commissioner for South Africa in London. Interested manufacturers will note that this indent is not to be executed until after the termination of the war. The requirements represented in the indent include such items as galvanometers, single and double-current keys, circular carbon protectors, wheatstone receivers, relays, sounder screens, wheatstone transmitters, magneto bells, terminal blocks, terminal boxes, pay station telephone apparatus, repeating coils, distributing frames, lightning protectors, protectors with carbons and fuses, jacks, receivers, switches, switchboards, frames, cross-connecting fields, battery boxes, protector strips, test plugs, telephone (magneto wall, central battery wall, central battery table), telephonemeters, telurs, test sets, galvanized iron arms, galvanized bolts, brackets, cement, clamps, clips, connectors, insulators, spindles, cupholders, washers, manhole covers, milonite nails, cast-iron pipes, copper plates, sheet iron plates, plumbers' metal, iron tapered telegraph poles, screw rings, lightning rods, parallel poles, cable suspension rings, salamac, lead sleeves, paper sleeves, solder resin, tinman's solder, stay rods, pole steps, tape, copper tapes and binders, copper wire, galvanized iron wire, barbed wire, steel suspension wire, vulcanized india-rubber wire, braided indoor wire, bridle wire, flameproof wire, aerial vulcanized india-rubber cable, underground telephone cable, armoured telephone cable, silk and cotton telephone cable, switchboard cable, aerial telephone cable. These requirements should be of service in pointing out to Canadian manufacturers the necessity of representation in South Africa or London. This indent may be seen at the Department of Trade and Commerce. (Refer File No. 18760.)

TRADE ENQUIRIES

THE following trade enquiries have been received by the Department of Trade and Commerce, Ottawa. Further particulars may be obtained on application.

1506. **Pig-iron, steel plates for shipbuilding, marine oil engines, etc.**—A Genoese firm who are contractors to the Royal Italian Government, and to the leading shipyards, engineering companies, and shipowners in Italy, are prepared to open negotiations, for after-the-war trade, with Canadian concerns who manufacture the following: Pig-iron, metals, steel plates and sections for shipbuilding, auxiliary machinery, marine oil engines and other materials used directly or indirectly in the shipbuilding and engineering trades.

1507. **Electrical equipment.**—An importing house in Genoa, Italy, which is thoroughly conversant with the electrical needs of the Italian market, wishes to correspond immediately with Canadian manufacturers of electric motors, transformers, dynamos, turbines, and electrical cable.

1511. **Machinery and metals.**—An important firm of merchants and representatives in Italy, with head offices in Genoa, and branches in Milan and Naples, would welcome Canadian agencies in metals and machinery, etc., such as agricultural machinery, pumps, railway supplies, machine tools, wrenches, pliers, diesel and semi-diesel twin motors, 100 to 400 horse-power.

1513. **Metals, ferrous and non-ferrous, etc.**—An agent in Milan, Italy, would like to open negotiations with Canadian manufacturers of ferrous and non-ferrous metals, and of metal, woodworking, and machine-shop tools.

1514. **Lumber.**—A. Desio (Milan), Italy, manufacturer of artistic furniture, is anxious to buy Canadian lumber suitable for furniture making. He is also prepared to handle a Canadian lumber agency for after the war.

1515. **Wood-pulp.**—An import house in Milan, Italy, familiar with the wood-pulp requirements of the Italian market would like to hear from Canadian shippers of same, with a view to representation either now or after the war.

1516. **Arsenic.**—A Plymouth firm wants to import arsenic 99½ per cent. pure and to contain no impurities, especially sulphur, as it turns black when used in manufacture. Arsenic is generally imported in casks of 3¼ to 4 cwts. (112 pounds to cwt.).

Frank Mutton, Salesman

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THEY get wheat sifted from the chaff. They get news and information about the things that really count in the conduct and movements of business and Canadian public affairs. They get a clear interpretation of news, events, happenings and factors that determine present and future developments. They read what big men have written or said about Canadian business and public affairs, and what exceedingly well-informed men glean about securities, markets, tendencies and other phases of business and investments; they read a commercial newspaper most interestingly written, admirably edited, sane and unpartizan. When a newspaper of this type and quality is available, the wonder is that any business executive or salesman or salesmanager tries to get along without it.

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Attention, Editor

Recently we sent you a subscription covering the delivery of "The Financial Post" to each of our Sales Agents and Salesmen throughout Canada. This was prompted by the fact, that in our opinion, your paper is the best barometer in Canada of what is going on in the different industries from one ocean to the other in this Country. Your paper contains information that is invaluable to any travelling representative of any firm.

Yours very truly,
F. E. MUTTON,
General Manager,
International Time Recording Company of Canada, Limited.
Toronto, Oct. 12, 1917.

Prior to his connection with International Time Recording Company, Mr. Mutton was Canadian manager of National Cash Register Co.

NO salesman or salesmanager can do his best work without knowing the kind of news which THE FINANCIAL POST exists to provide. Anything that multiplies a salesman's or salesmanager's knowledge and ability required in the selling of goods and in meeting buyers and customers, is likely to be a cheap, cheap investment. Mr. Mutton was and is a success because he incorporated into himself and his organization outer forces of power. Read his letter again.

OUR POINT IS:

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GENERAL SUPERINTENDENT, WITH PRACtical shop as well as efficient production experience, desires change. One having considerable munition experience, principally shells of various sizes. Box 358, Canadian Machinery. (c25m)

EXPERIENCED METAL PATTERN MAKER desires change. Experienced on lathe and bench and match plates; good on tool and machine work. Box 362, Canadian Machinery. (c1m)

SITUATIONS VACANT

ASSISTANT WANTED WITH PRACTICAL, technical and commercial machine tool experience, by large exporters of machine tools; give age, experience and salary. Box 361, Canadian Machinery. (25)

WANTED

WANTED—A GOOD, HEAVY, POWERFUL, single purpose lathe for 4.5 shells. Send fullest particulars and best price at once. Box 359, Canadian Machinery. (c24m)

WANTED — COMPLETE BOLT AND NUT machinery to manufacture sizes ¼-inch diameter and up. Advise offerings in either second-hand or new. Box 360, Canadian Machinery, Toronto. (c2m)

4.5" Shell Machines

The following machines successfully used on 4.5" shells are offered for sale at prices that are especially attractive:

1—No. 6 "Hall" cut-off.
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1—"Bertram" wave rib attachment.
1—"Lymburner" copper band turning attachment.
1—"Matheson" nose nick miller.

The "Hall" machine can be inspected in Toronto, the others at our works.

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Manufacturing Engineers,
New Glasgow, Nova Scotia

FOR SALE

SIX COMPRESSORS FOR SALE — VERY cheap. The National Quarry, 81 St. Peter St., Quebec. c22m

FOR SALE — NEW ONE TURBO WING blower, twelve-inch; one Mason hydraulic damper regulator, No. 4; one ten-inch air cylinder and two-way valve for air chuck; one No. 3, two No. 5 Acme automatic steam engines, all new. Bargains; make bid. Reliance Machine Company, Toronto. (c24m)

THREE TONS COLD ROLLED STRIP STEEL, drawing quality 8" wide, .065 thick. Dillon Manufacturing Co., Oshawa. c1m

PUNCHING MACHINE — POWERFUL BELTdriven geared multiple punching machine; capable of punching 30 holes ¾" dia. at 2½" pitch through ¾" plate; distance between housings 6' 0"; having two bed plates, one 24' long, fitted with adjustable screw-driven plate carriage for feeding plates to punch, and one 26' long, fitted with plain plate carriage, which is operated by hand-power draw winch; machine has large equipment, including punches and bolsters, for ½", ⅝", ¾" and ⅞", and one rack of fixed punches and bolsters 11-32" at 1¼" pitch; made by Hanna, Donald & Wilson; f.o.b. Glasgow. William C. Wilson & Co., 21 Camden Street, Toronto. c23m

FOR SALE — ONE INGERSOLL-RAND AIR Compressor with receiver. Displacement 64 cubic feet per minute. In good shape. $300.00. Perfection Stove Co., Ltd., Sarnia, Ont.

HOISTING ENGINE—NEW.

ONE 16" x 24" "MEAD-MORRISON" DOUBLE cylinder, single drum, first motion hoisting engine, reversible, drum is 30" diameter and 70" long between flanges; is grooved for wire rope 1" diameter. Rope capacity in single coil 500' 0", but flanges will allow of four or five layers. I. Matheson & Co., Ltd., New Glasgow, N.S. (c24m)

FOR SALE CHEAP—16" SHAPER; 24 x 24 x 6 planer; two heavy duty roughing lathes for 6" shells; 1 Hall No. 6 cut-off machine; 1 2-ton heavy Morris chain block—all guaranteed and in first class condition. Dominion Machinery Co., Toronto. c24m

HOISTING ENGINE — NEW

ONE 16" x 24" "MEAD-MORRISON" double cylinder, single drum, first motion hoisting engine, reversible, drum is 30" diameter and 70" long between flanges; is grooved for wire rope 1" diameter. Rope capacity in single coil 500' 0", but flanges will allow of four or five layers. I. MATHESON & CO., LTD., ENGINEERS, NEW GLASGOW, N.S. (c26m)

AGENTS WANTED

WANTED — LIVE REPRESENTATIVE TO handle good specialty; one who hasn't too many irons in the fire Apply Box 348, Canadian Machinery, stating lines you now represent and the ground you are prepared to cover. c23m

WANTED—PARTY TO TAKE OVER CANAdian and European patents of good paying machine. The machine, which costs less than thousand dollars to build, is in daily operation in Pittsburgh steel mill, with a saving of thirty dollars per day. Apply to Box 356, Canadian Machinery. (c25m)

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MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto.

LET OUR MACHINE SHOP HANDLE YOUR overflow. We have a well equipped shop and can handle turret lathe, engine lathe, shaper, drill, screw machine work, as well as fitting. We will gladly quote you prices. Webber Bros. Machine Co., Dupont St., Toronto. (c26m)

FOR SALE

2—16" x 5' Reed Lathes, elevating rest.
1—16" x 6' Reed Engine Lathe, plain rest.
1—16" x 6' Reed Engine Lathe, R. and F.
1—18" x 8' Davis Engine Lathe, D.B.G.
1—18" x 8' Porter Engine Lathe.
1—22" x 10' Nicholson & Waterman Engine Lathe.
1—No. 3 Brown & Sharpe Automatic Gear Cutter.
1—30" old-style Brainerd Automatic Gear Cutter.
1—5" x 48" Pratt & Whitney Plain Grinder.
1—No. 3 Lees-Bradner Thread Miller.
1—15" Jungst Shaper.
2—24" x 24" x 6' Powell Standard Planers.
2—30" x 30" x 8' Powell Standard Planers.

Brownell Machinery Co.
Providence, R. I.

Automatic Multiple Punch

By D. Bergue & Co., Manchester, Eng.

SPECIFICATIONS:

CAPACITY TO PUNCH.....18 ⅞" holes in ⅞" plate, or 20 ¾" holes in ¾" plate, or 27 ⅝" holes in ⅝" plate.

Each punch is independently adjustable for centers. All punches can be operated together or any individual punch can be instantly thrown out of action.

EQUIPMENT.....1 set 18 ⅞", and 1 set 27 ⅝" punches and dies.
TAKES PLATES..... 26' long by 6' 6" wide.
DISTANCE BETWEEN HOUSINGS.....7' 0"
STROKE OF RAM.....3"
DIE SPACE—STROKE UP.....12"
WIDTH OF FACE OF RAM.....12"
(to which punches are secured)
WIDTH OF TABLE.....18"
(to which dies are clamped)
TABLES..... ...Extend for a distance of 29' 0" in front and at rear of machine measuring from center line of punches. which is ample for 26' plates.
PLATES ARE FED INTO MACHINE AUTOMATICALLY by means of rollers in tables. Feed is controlled by operator from front of machine.
BELT OR MOTOR DRIVE.....Motor drive is recommended, motor being directly belted to driving shaft.
Driving pulley .....40" x 7½"
Fly wheel .....64" x 6"
Driving shaft is double geared into main shaft.
Main shaft .....12" diameter.
WEIGHT..... About 50,000 lbs. net.

Condition equal to new

IMMEDIATE SHIPMENT

Full details on request

A. R. Williams Machinery Co., Ltd.

64-66 Front Street E. Toronto

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TRAVELING CRANES.

20-ton Browning Trolley, 5-ton zux., 56½" ga. (new).
20-ton Shaw, 56' 3" span, 110 V.D.C.
10-ton Case, 58' 3" span, 220 V.D.C.
10-ton Northern, 74' 6" span, 220 V.D.C.
15-ton Niles, 55' 6" span, 220 V.D.C.

PUNCHES AND SHEARS.

Single 48" tht., cap. 3 x 1¼", Providence.
Single 6" tht., cap. ⅞ x ⅞", Cleveland.
Single 15" tht., cap. ¾ x ½" (hand) new Doty.
Single, 9" tht., cap. 1 x 1", belted (3).
Single, 27" tht., cap. ¾ x ¾", belted.
Single, 32" tht., cap. 1 x 1", belted.
Double 15" tht. cap. ¾ x ¾" Fischer.
Double, Queen City, 12" thts., cap. ⅝" x ⅝".
Double, No. 3-A Royersford, 18" thts., cap. 1" x ⅞".
Double, No. 13 Williams-W., cap. 1¾ x 1", 20" throats.
Double 12" blades, bar shear, cap. 2" sq., crucible.
Univ. Plate Shear, 18" blades, cap. ¾", Cleveland belted.
Univ. Plate Shear, 26" blades, cap. ½", Lewis belted.
Guillotine Shear, cap. 2½" sq., belted, Perkins No. 6.
Guillotine Shear, No. O. H. & J., 6 and 7" blades (2).
Guillotine Shear, Fisher, 21" blade, cap. 8 x 2".
Squaring Machine 120", cap. 3/16".

MISCELLANEOUS.

Bolt Cutter, Acme 2", Class A, single head, dies.
Boring Mill, 10' Niles, Vertical, 2 heads.
Forging and Upsetting Machine, 1½" Acme, with dies.
Forging and Upsetting Machine, 2½" Ajax.
Hammer, 80-lb. Bradley, Cushion Helve.
Hammer, 35-lb. Maggowan & Finigan (Perfect), belted.
Rotary Planer, 36" Cleveland, motor driven.
Rotary Planer, 60" Cleveland, motor 60 cy., 440 V.
Pipe Machine, 8" E. C. & B.
Pipe Machine, No. 11 Jarecki.

GOOD CONDITION. PROMPT SHIPMENT.

McCoy-Brandt Machinery Company

216-18 Penn Ave., Pittsburgh, Pa.

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7" x 5' Fitchburg, lo-swing.
16" x 5½' Pratt & Whitney, D.B.G. (3).
16" x 5½' MacGregor, D.B.G. (2).
16" x 6' Pratt & Whitney, B.G.
18" x 10' Libby (2).
20" x 10' Bridgeport, B.G.
22" x 8' Pratt & Whitney, B.G.
22" x 8' Martin, single purpose (2).
22" x 8' Davis, D.B.G.
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
2" x 24" Stevens Screw Machines.
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

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6" x 30" Dalton, B.G., bench.
13" x 6' Filsmith, D.B.G., comp. rest.
14" x 6' McKenzie, taper attachment.
14" x 6' Lodge & Shipley, taper attachment.
15" x 6' Sebastian, B.G., comp. rest (3).
15¼" x 8' Carrol-Jamieson, D.B.G.
16" x 8' Monarch, B.G., compound rest.
18" x 10' Putnam, back geared.
20" x 8' Fifield, B.G., plain rest.
20" x 8' Hercules, heavy duty.
21" x 8' Bawden, heavy duty (2).
22" x 8' Pond, B.G., plain rest.
24" x 11' Pond, B.G., comp. rest.
26" x 14' Gleason, D.B.G.
31" x 16' Fifield, back geared.

DRILLS

12" Reed, 4-spindle.
12½" Avey, ball-bearing.
14" Excelsior, sliding head, lever feed (5).
15" Avey, high-speed, ball-bearing.
16" Barr, sliding head, lever feed.
20" Barnes, 3-spindle, lever feed (2).
20" Baker, tapping attachment.
24" Foote-Burt, heavy duty.
32" Cincinnati, heavy duty.
40" Bickford, back geared.
46" Allfree, back geared, power feed.
54" Hand-feed Radial.
D-8 Colburn, heavy duty.

GRINDERS

10" x 30" Landis, universal.
No. 1 Cincinnati, universal.
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer (2).
2¼" Yankee, twist drill (3).

IRON PLANERS

20" x 20" x 5' Bertram (2).
24" x 24" x 6½' Bertram.
36" x 36" x 10' Pond, two heads
40" x 40" x 12' New Haven, power feed.
72" x 72" x 11' Canada, power feed.

MILLING MACHINES

Bertram, plain.
Brown & Sharpe, power feed, plain.
No. 2 Ford-Smith, plain.
No. 4 Fox, universal.
Gray Thread Miller.
Monarch, vertical.

SHAPERS

16" Petrie, back geared (2).
16" Canada Mach. Corp., back geared.
16" Cincinnati, back geared (3).
24" Gould & Eberhardt, back geared.
30" Morton, back geared, draw cut.

MISCELLANEOUS

4", 6" and 12" Power Hack Saws.
4½" Martin Cutting-off Machine.
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⅜" Garvin Vertical Tapping Machine.
No. 3½ Greenerd Arbor Press.
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No. 2 West Tire Setter, Hydraulic Banding Press.
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1500-lb. Toledo Drop Hammer.
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2—16" Springfield B.G. Shapers.
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1—25" Springfield B.G. Shaper.
3—14" Pierce Turret Lathes.
2—1 x 8 Pierce Hand Screw Machines.
3—No. 1½ American Milling Machines.
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5—20" Buffalo B.G., P.F. Drill Presses.
3—20" Canedy-Otto B.G., P.F. Drill Presses.
2—20" Champion B.G., P.F. Drill Presses.
3—20" Champion Plain Drill Presses.
3—20" Silver Plain Drill Presses.
3—20" Canedy-Otto Plain Drill Presses.
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USED MACHINERY

ENGINE LATHES

1—22 x 14 Putnam Standard Engine Lathe.
1—16 x 8 Porter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastion Standard Engine Lathe.
1—14 x 6 Springfield Standard Engine Lathe.
1—14 x 6 Prentiss Standard Engine Lathe.
1—14 x 6 Sebastian Standard Engine Lathe.
2—13 x 8 Barnes Standard Engine Lathes.
1—13 x 5 Barnes Standard Engine Lathe.
1—10 x 4 Sebastian Standard Engine Lathe.

TURRET AND SCREW MACHINES

2—No. 6-A Potter & Johnson Automatic Lathes.
1—4½" Gridley Auto. Screw Machine, motor driven.
2—No. 4 Foster F.G.H. Hand Screw Machines.
2—No. 3 Foster F.G.H. Hand Screw Machines.
1—No. 5 Pierson F.G.H. Hand Screw Machine.
6—No. 2 W. & S. Plain Hand Screw Machines P.F.T.
3—No. 3 S. & K. Plain Hand Screw Machines
2—No. 2 S. & K. Plain Hand Screw Machines.
4—12" W. & S. Turret Lathes with air chucks.
4—16" W. & S. Turret Lathes with air chucks.
4—No. 107 Wells Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jigger feed.
1—⅝-¾" Cleveland Automatic Screw Machine.

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1—No. 2 Hendy Plain Milling Machine.
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1—No. 1 Cincinnati Plain Milling Machine.
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1—3-spindle 8" overhang Henry & Wright High Speed Drill.
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2—4-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
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1—36 x 36 x 10' New Haven Planer, S.H.
1—27 x 27 x 7' Cincinnati Planer, S.H.
1—24 x 24 x 6' Flather H.P. Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS

1—Waterbury Farrell O.B.I. Press, geared.
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1—No. 55 Toledo S.S., B.G., 10" stroke.
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3—No. 2-W Bliss Wiring Presses.
1—No. 5 Michigan O.B.I. Plain Press.
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1—9 x 11 Cihcago Pneumatic Belt Driven Air Compressor.
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1—Cutting-off Machine, with 15" three-jawed chuck.
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1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—5 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
Sherbrooke, Que.

FOR SALE

1—90' Thomas Spacing Table complete with indicator carriage, trolley carriage, stands, adjustable roller, racks, etc. Capacity: Plates, 48' long x 48" wide; angles, 8' long x 8" wide. Further particulars on application.

1—40 H.P. Horizontal Gasoline Engine complete and in running order.

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1—Air Compressor driven by Twin Cylinder Fairbanks Gasoline Engine. (Mounted).

Complete equipment for machining 4.5 H.E. Shell Nose Plugs. Capacity, 10,000 per day.

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1—Graham Double Disc Grinder.
1—Crescent Disc Grinder.
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1—24" London Machine Tool Shaper.
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1—8 x 10 Ideal High Speed Steam Engine.
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2—40 H.P. Locomotive Type Boiler.
1—60 H.P. Locomotive Type Boiler.
1—75 H.P. Return Tubular Boiler, full front setting.
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3—150 H.P. Return Tubular Boilers, full front setting.
1—6½ x 8 Napanee D.C., D.D. Hoisting Engine.
1—7 x 10 D.C., S.D. Hoisting Engine.
2—6 x 8 D.C., S.D. Mine Hoists.
1—7 x 10 Bacon Special Cableway Winding Engine.
1—4 H.P. Novo Reversible Gasoline Hoist.

MISCELLANEOUS

1—No. 5 American Gas Forge.
1—No. 16 American Gas Furnace.
1—6" Peerless Hack Saw.
2—No. 3 Waymoth Variety Lathes.
1—Waymoth Pointing Machine.
1—Crescent Universal Boring Machine.
1—20 K.W. D.C. Generator, 115 volts.
1—½ yard London Concrete Mixer, mounted on truck, with steam engine and boiler, complete with water tank and automatic loading skip.
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1—75 H.P., 3-phase, 2200-volt, 60-cycle Electric Motor.
2—Bilton Gear Cutters.
1—Gray Sandblast Machine.

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30" Lodge & Davis, S.H., B.G., P.F.
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4' Mueller Plain Radial.
Four No. 310 Baker Heavy Duty.
3-spindle Rockford.
4-spindle Rockford.
4-spindle Washburn, with power feed.
4-spindle Allen.
No. 11 Pratt & Whitney, 10 spindles.

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24" x 7" G. & E., spur gears.
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30" x 9" G. & E., spur and bevel gears.
36" x 9" G. & E., spur and bevel gears.
36" Walcott, spur gears.
No. 1 Schuchardt & Schutte Gear Hobber.

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No. 1½ Cincinnati Cutter and Tool.
No. 2 Woods Tool and Cutter.
Brainard Cutter.
Leland Universal, with power feed.
No. 2 Landis Universal.
No. 6-A Diamond Universal.

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10" x 5' LeBlond, C.R., with chuck.
14" x 6' Hamilton, C.R., chuck.
14" x 6' Rockford, C.R.
15" x 6' Rockford Tool Co., C.R.
15" x 6' Prentice Lathe, C.R.
16" x 8' Bradford, C.R.
18" x 6' Bradford, C.R., taper attachment.
18" x 8' Lodge & Shipley, pat. head, C.R., taper attachment.
20" x 14' Blaisdell, C.R.
21" x 12' New Haven, C.R.
24-27½" x 14' Lodge & Shipley, selective geared head, Q.C.G., 18" chuck fitted.
24-27" x 12' Reed-Prentice, geared head, single pulley drive.
32" x 12' Schumacher & Boye, 28" chuck, fitted.
36" x 18' Schumacher & Boye, T.B.G., Q.C.G.
36" x 20' American, T.B.G.

PLANERS.

24" x 24" x 6' American, one head.
26" x 26" x 8' Pease, one head.
36" x 36" x 8' Powell, 2 heads.
36" x 36" x 14' Sellers, one head.
39" x 39" x 12' New Haven, one head.

SCREW MACHINES.

No. 1 Warner & Swasey, plain head.
No. 2 P. & W., friction head.
No. 3 Pratt & Whitney, B.G., double friction head, A.C. and W.F.
No. 3 Bardons & Oliver, plain head, A.C. and W.F.
No. 4 Pearson, friction head, A.C. and W.F.
No. 5 Foster, geared friction head, A.C., P.F. to turret slide, and P.F. to cross slide.

TURRET LATHES.

No. 2 Foster-Kimball, plain head.
No. 22 Garvin, plain head.
16" Lodge & Davis, back geared.
16" Warner & Swasey, friction head.
2 x 24" J. & L., cone head.
24" Gisholt, 4¼" spindle hole, taper attachment.
No. 3-A Warner & Swasey, bar attachment.

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No. 2 Rockford, O.B.I.
No. 20 Thiem, O.B.I.
No. 3 Loshbough-Jordan, O.B.I.
No. 3 Loshbough-Jordan, O.B.I.
No. 4 Rockford, O.B.I.
No. 4 American Can., O.B.I.
No. 74½ Bliss, str. side, geared.
Blake & Johnson Embossing.

MISCELLANEOUS.

7'-10' Betts Boring Mill.
No. 2 Garvin Auto. Tapper.
No. 2½ Hendey Lincoln Type Miller.
No. 24 Oesterlein Universal Miller.
4" Nutter & Barnes Cutting-off Machine.
6 x 48" P. & W. Thread Miller.
No. 3 Cincinnati Vertical Milling Machine.
20 H.P. Nash 2-cylinder Vertical Gas Engine.
6 H.P. Fairbanks-Morse Horizontal Gas Engine.

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14,000 SQUARE FEET OF FLOOR SPACE

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All-Steel Quick-Change Gear-box

3-step Cone—Double Back-Gears

(Get Bulletins with complete specifications.)

26-in	Swing—	18-ft.	Bed	
26 "	"	16 "	"	
26 "	"	14 "	"	
26 "	"	14 "	"	
24 "	"	18 "	"	
24 "	"	16 "	"	
24 "	"	14 "	"	
24 "	"	12 "	"	
21 "	"	12 "	"	
21 "	"	10 "	"	
18 "	"	12 "	"	
18 "	"	10 "	"	
18 "	"	8 "	"	
16 "	"	10 "	"	
16 "	"	8 "	"	
16 "	"	6 "	"	

"McCabe" Double Spindle Lathe

26-48-in. SWING; 12-ft., 22-ft. and 24-ft. Beds in stock.

So many other Tools in Stock — you will have to get our latest Bulletin 283 — just issued — to get complete list of everything.

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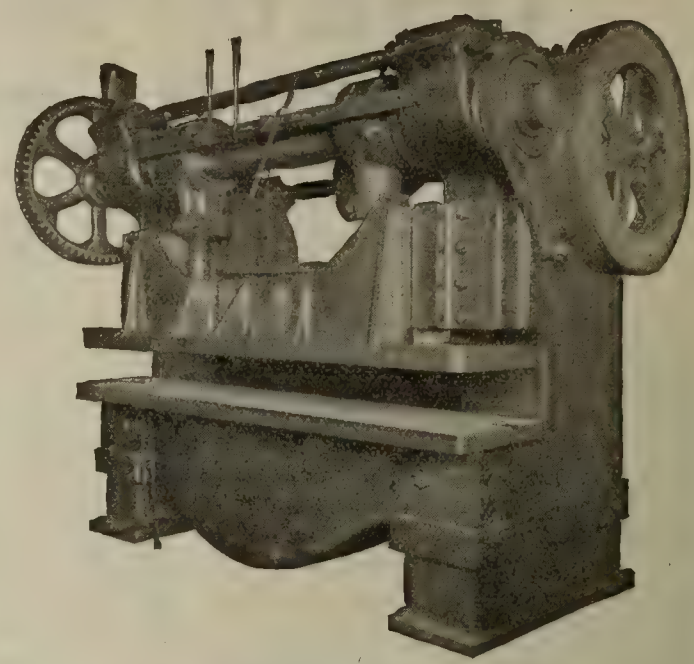
149 BROADWAY - NEW YORK

FOR SALE



Large Blanking Press

76" between housings, 8" shaft, 3½" stroke, 8¾" die space.

Very good condition and for immediate delivery.

RIVERSIDE MACHINERY DEPOT

17-29 St. Aubin Ave. - - DETROIT, MICH.

Machinery and Plant for Sale

LOCATION, BRITISH COLUMBIA

Plant completely equipped for manufacturing frogs and switches.

Equipment may be bought independent of plant.

Specifications: Modern Building, 100′ x 200′ on 7½-acre site. Ideal wharfage and C.P.R. spurs running into plant.

PRINCIPAL EQUIPMENT

MACHINERY

1—18" Barr Double Arm Punch and Shear.
1—26" Prentice Drill Press.
1—40" Buffalo Blower.
1—5′ Bellers Radial Drill.
1—2-ton Chain Block and Swedge Block.
1—48" Espen Lucas Cold Saw, 2 blades.
1—72" x 72" x 14′ Enterprise Planer, 2 heads and grinder head.
3—Air Hoists, 1 4′, 2 7′.
1—2" Acme Bolt Cutter, 3 complete sets of dies.
1—12 x 12 Rand Steam-driven Air Compressor, with tank.
1—36" x 36" Niles Planer, with two heads.
1—45" x 12′ Niles Two-head Planer, with extensions.
1—54" Putnam Gear Cutter, with cutters.
1—Gisholt Tool Grinder.
1—32" x 48" Brainard Slab Miller.
1—Power Hack Saw.
1—1½" Spindle Double-end Grinder.
1—48" Morton Draw-cut Shaper.
1—1210A Mason Boiler (T.P. 240, W.P. 160).
1—Dudley Car Frame and Trucks.
Several Electric Motors.

Complete Information and Inspection Upon Demand

The Call Switch Co., Limited

New Birks Bldg. - MONTREAL

(c1m)

MACHINE TOOLS—READY FOR DUTY

BORING MACHINES—Vertical.
1—30" Bullard, 1 turret head.
2—32" Bullards, 1 turret head.
1—36" Bullard, 2 heads.
1—37" Bullard, 2 heads.
1—38" Bausch, 2 heads.
1—42" Bullard, two swivel heads.
1—NEW 42" Gisholt, 2 heads.
1—48" Gisholt, 2 heads; almost new.
2—10' Niles, 2 swivel heads.

BORING MACHINES—Horizontal.
1—2½" bar, Niles.
1—Bement, knee type, 2½" bar.
1—Williams Sellers, knee type, 2½" bar.
1—Beaman & Smith, 2-3" spindles.

BULLDOZERS.
2—No. 23 Williams & White, belt-drive.
1—No. 26 Williams & White, belt drive.
1—No. 4 Ajax, 20" stroke.

CRANES—Traveling.
1—8-ton Chisholm & Moore, 13½' span, hand power.
1—10-ton Toledo, 3 motors, 30' span.
1—10-ton Whiting, 48' 8" span.
1—10' Shaw, 72' span, 4 motors.

CRANES—Locomotive.
3—10-15-ton McMyler Broad gauge Steam Locomotive, 60' boom, bucket, 3 drums.
1—15-ton Browning, 8-wheel, 38' boom.
1—15-ton Brown Hoist Locomotive, 36' boom, bucket, 8 wheels.
1—20-ton Orton & Steinbrenner, steam locomotive. 8-wheel, double drum, 37' boom, bucket.
1—20-ton Brown Hoist, 8 wheel, 40' boom, bucket.
1—20-25-ton Industrial, 8 wheel, 50' boom, bucket.
1—25-35-ton McMyler, 8 wheel, 70' boom, bucket.

CUTTING-OFF MACHINES.
1—4" Hurlburt & Rogers.
30—4½" Davis.
10—4½" Williams.
1—5" Hurlburt & Rogers.
6—8" Automatic.

DRILLING MACHINES—Radial.
3—NEW 3' Mueller, speed box drive; March del.
3—NEW 3' American, Sensitive, tapping attachment.
1—4½' Full Universal, cone drive.
1—NEW 5' Western Plain, with motor.
3—NEW 5' Mueller, speed box drive; March del.
2—6' Reed-Prentice, latest type, belt driven; January del.
1—NEW 6' Triumph, motor drive; January del.

DRILLING MACHINES—Heavy Duty.
2—D-2 Colburn Heavy Duty, 3½" cap., arranged for motor drive.
4—No. 25 Foote-Burt, heavy duty, 2½" capacity.
10—No. 310 Baker, single pulley drive, late type, arranged for motor drive.
10—Moline Hole Hogs, heavy duty, 2½" cap.

DRILLING MACHINES—Sliding Head.
2—NEW 25" Cleveland, high duty.
5—NEW 28" Sibley.
2—NEW 30" Sibley.
2—NEW 34" Barnes; December delivery.

DRILLING MACHINES—Multiple Spindle.
1—NEW Cleveland, 4-spindle, ball-bearing.
1—4-spindle 20" Barnes, all geared.
2—6-spindle Rockford: Economy type.

GEAR CUTTING MACHINES.
1—No. 1 Schuchardt & Schutte Gear Hobber, spur and bevel.
1—No. 2A Newark, 24" x 8" cap.
3—No. 3 Brown & Sharpe Auto Gear Cutter, spur.
1—36" Newark.
1—30" Whiton, for spur and double gears.
2—36" x 9" Gould & Eberhardt, new type, spur gears.
1—15" Gleason Bevel Gear Planer.
1—20" Grant-Lees Gear Hobber, bevel spur and spiral attachment.
1—28" Rhemania Gear Hobber, spur and worm gears.
2—NEW 30 Flather, solid pattern.
1—36" Fellows Gear Shapers.
1—36" x 10" Newark, for spur gears.
1—72" Gould & Eberhardt, spur and bevel.

GRINDERS—Universal for Cutters, Drills, Reamers, Etc.
5—NEW No. 190 Wells.
2—No. 1 Cincinnati.
1—NEW Gisholt Universal.
1—NEW Premier, Universal.
1—NEW Wilmarth & Morman, style B.X.
1—NEW Walker No. 1, outfit B.
2—NEW No. 2 Oesterlein Universal.

GRINDERS—Cylindrical, Plain.
2—American Waltham Precision, cap. 7" x 2½".
1—NEW 8" x 30" Modern Self-contained.
2—NEW 10" x 24" Modern Self-contained.
4—12" x 36" Modern Self-contained.
2—12" x 42" Landis Self-contained.
5—12" x 48" Modern Self-contained.
1—12 x 66" Landis.

GRINDERS—Cylindrical, Universal
3—NEW No. 1½ Landis, 10 x 30 capacity.
1—NEW Thompson 10 x 36".
3—NEW No. 3 Modern, cap. 13" x 40".
1—No. 4 Cincinnati; capacity 12 x 72".

GRINDERS—Internal
1—No. 75 Heald.
1—No. 1½ Landis.

GRINDERS—Disc.
1—NEW No. 4 Gardner, including disc press, 23" disc.
3—No. 14 Besley, including ring, wheel, chucks.
1—NEW No. 17 Gardner, 30" disc.

GRINDERS—Cylindrical.
1—No 60 Heald, single pulley drive.

GRINDERS—Surface.
4—NEW No. 1 La Salle Plain, with Micro. Adj.
1—NEW No. 1½ Walker's, complete.
4—NEW No. 2 Reid (Same as B. & S.).
1—3' Pratt & Whitney Vertical, Magnetic Chuck.
12—Carrigus type, mag. chuck.

HAMMERS—Board Lift Drop.
1—100-lb. Bradley upright, Beaudry type.
3—300-lb. McWilliams.
1—No. 4 Standard Machinery Co., 400-lb.
1—E. W. Bliss, 800-lb.
1—1500-lb. Toledo.
1—3000-lb. Williams & White.

HAMMERS—Steam Forging.
1—600-lb. Niles, single frame.
1—7000-lb. Morgan Special Double Stand.
1—12-ton Bement.

KEYSEATERS.
1—No. 1 Catlin.
1—No. 1 Baker.
1—Morton, cap. 2" keyways, 18" stroke.
1—Colburn 4", capacity 43" stroke.
1—No. 2 Knowles, 60" stroke.

LATHES—Manufacturing, not Screw Cutting
2—NEW No. 3 Harding Brothers, Bench Lathes.
10—NEW 26" x 12' Simplex Shell Bor. Mill, 5" boring bar, quick-change gears; arranged for motor drive.
21—No. IX Reed-Prentice, 16" swing, single pulley drive.
4—Norwood, used on 9.2 English Shells.

LATHES—Engine.
2—NEW 12" x 5' Cleveland Tool Room Precision, geared head, taper attachment.
14—NEW 15" x 6' Rockford.
3—NEW 16" x 6' Cleveland Tool Room Lathes, complete equipment.
1—NEW 17" x 8' National Quick Change, Double Back Gears.
12—NEW 17" x 8' LeBlond Pan Bed, Quick Change Gears.
1—18 x 8 Prentiss, geared head, taper attachment, quick change.
3—20 x 8 Lodge & Shipley, quick change, turret on ways.
1—NEW 20" x 10' Cleveland Geared Head.
2—20" x 10' Lodge & Shipley, quick change.
19—NEW 21" x 10' Porter, S.B.G.
7—22" x 10' Putnam, oil pan and pump.
1—NEW 24" x 10' American, high duty, quick change.
2—24" x 10 Lodge & Shipley, quick change.
1—24" x 10' Schumacher & Boye, quick change, taper attachment.
1—NEW 26" x 48" x 12' McCabe Double Spindle.
1—NEW 26" x 14' Bridgeford pattern, geared head, heavy pattern.
3—27" x 12' Bridgeford Heavy Duty, plain turning, 2 carriages, motor driven.
7—28" x 12' Bridgeport, geared head, heavy duty, taper attachment.
1—NEW 30" x 14' American Double Back Geared, Quick Change.
1—30" x 14' Lodge & Shipley, patent head.
1—36" x 13' Putnam, face plate drive.
1—36" x 17' Pond, triple geared, quick-change.
1—36" x 16' New Haven, quick change.
1—36" x 20' American, triple geared.
6—40" x 18' Pittsburg, quick change, gear, face plate drive.
1—42" x 4' Niles, triple geared.
1—54" x 22' Worcester, Triple Geared.
1—58" x 18' 6" Dodge Lathe. Very Heavy.
1—60" x 26½' Thayer Houghton, triple geared.
1—NEW 66" x 46 Putnam Triple Geared, Face Plate Drive, 5-step Cone; 6½" belt; Jan. del.
1—84" x 18' Special Boring Lathe.

LATHES—Turret.
8—NEW 21" Gisholt H-21.
2—21" Gisholt, 18" chuck, quick traverse, taper attachment.
5—2 x 24 Jones & Lamson.
1—NEW 18" Libby.
3—24" Libbey, Universal Facing Head, 3-jaw chuck.
18—6A Potter & Johnson.
1—NEW 3¼" x 40" Greenlee.
1—24" Brown & Sharpe Vertical, chucking mach.
1—24" Davis.
1—No. 24 New Britain, arranged for motor drive; almost new.

MILLING MACHINES—Knee Type, Universal.
1—No. 2 Kempsmith, Vertical Attachment.
1—No. 2 Kempsmith 13" Dividing Head.
1—No. 1½ Cincinnati.
1—NEW No. 2 Rockford High Power.
2—NEW No. 2 Garvin.
3—No. 2 Cincinnati.
1—No. 2 LeBlond.
2—NEW No. 3 Cincinnati High Power; Jan. del.
1—NEW No. 3 Kempsmith.
1—No. 25 Oesterlein.

MILLING MACHINES—Knee Type, Plain.
1—No. 0 Cincinnati.
2—NEW No. 1 Kempsmith.
5—NEW No. 1B Hendey, with dividing heads.
1—NEW No. 2 Rockford.
1—No. 2 Cincinnati.
1—NEW No. 2 Kempsmith.
1—No. 3 LeBlond.
1—NEW No. 3 Cincinnati, complete.
2—No. 3 Kempsmith.
1—No. 15 Garvin.
1—No. 5 Cincinnati, quick change, double back gear.

MILLING MACHINES—Thread.
4—Morris-Thompson, arranged for motor drive.
10—No. 3 Lees-Bradner.
5—No. 3C Lees-Bradner, for 9.2" English shells.
2—Archdale, Taft, Pierce, for 6" English shells.

MILLING MACHINES—Hand.
1—No. 1 Bickett.
3—NEW No. 2 Pratt & Whitney.
2—NEW No. 3 Garvin.
10—NEW Becker, table 20" x 5½".

MILLING MACHINES—Vertical.
1—No. 2 Pratt & Whitney.
1—No. 3 Cincinnati Heavy Duty.
2—NEW No. 4B Becker.
1—Newton Vertical, Continuous, Motor Driven, for shell work.

MILLING MACHINES—Planer Type.
1—Ingersoll Slab 16" x 48" capacity.
1—NEW 17" x 5' Eynon Planer Type.
1—19" x 8' Beaman & Smith; in fine condition.
1—22" x 22" x 5' Ingersoll.
1—24" x 24" x 12' Bement & Niles.
1—24" x 24" x 14' Bement.

MILLING MACHINES—Lincoln Type.
2—Briggs type, high duty.
3—NEW No. 4 Sterling.
3—New American, No. 1.
1—No. 7 Becker.

PLANERS.
5—NEW 24" x 24" x 6' Powell, single head.
1—24" x 12' Detrich & Harvey, open side, one head, also milling attachment.
1—26" x 26" x 10' Gray, one head.
1—NEW 30" x 8' Powell, 2 heads.
1—30" x 30" x 8' Ohio, late model.
1—30" x 30" x 8' Garvin, open side, fine condition.
1—32" x 32" x 16' Niles, 2 heads.
1—36" x 36" x 10' American; 2 Heads.
1—36" x 30" x 12' Detrich & Harvey, open side, 3 heads.
1—36" x 36" x 8' Gray; One Head.
1—36" x 36" x 14' Cincinnati, 2 heads.
1—42" x 36" x 14' American, 2 heads.
1—42" x 42" x 19' Powell, 2 heads.
1—60" x 60" x 21' Pond; 3 Heads.
1—62" x 62" x 20' Canada Tool Works Planer: 2 Heads.
1—72" x 60" x 14' Smith Globe; 2 Swivel Heads.
1—17' Plate Planer, will plane any length of plate.

PUNCH AND SHEARS.
1—Waterbury-Farrell Alligator Shears, cap. 2½".
1—Cincinnati Gap Shears, 17" gap, 78" blade, ¼" capacity.
1—No. 411-G Toledo Squaring Shears, capacity 97", weight 12,600 lbs.
1'Badger Alligator, cap. ½, round stock.
1—Cleveland Punching Shear, 36" throat, capacity 1" x ½".
1—Providence Steam-driven Punch, 48" throat, cap. 3" through 1¼"; almost new.

SCREW MACHINES—Hand.
3—No. 0 Brown & Sharpe.
1—1" Pierce.
10—NEW No. 2 Owens Kent, wire feed, automatic chuck, 1 1/16" capacity.
4—20" Cincinnati Acme, friction geared head.

SCREW MACHINES—Automatic
2—NEW ⅝" Cleveland, Model A.
3—1¼" Cleveland, Model B, full auto.
1—NEW 1¼" Gridley Mult. Spindle, Belt Driven.
10—1¾" Gridley, mult. spindle; good as new.
5—2¼" Gridley, mult. spindle, arranged for motor drive.
20—3¼" Gridley, single spindle.
4—4¼" Gridley, single spindle.
2—No. 0 Brown & Sharpe.
1—No. 1 Brown & Sharpe.
1—No. 2 Brown & Sharpe.
9—No. 56 National Acme, mult. spindle, 2¼" cap.
1—No. 515, 9-16" capacity, National Acme; late model.

SHAPERS.
1—NEW 16" Springfield.
1—16" Motor Driven Rockford.
5—NEW Barker 24".
1—16" Motor-driven Rockford.
1—NEW 18" Steptoe.
1—20" Ohio; almost new.
2—NEW 24" Milwaukee.
2—NEW 24" Potter & Johnson Universal.
1—NEW 24" High Duty Gould & Eberhardt.
1—NEW 24" Steptoe.
2—30" Morton Draw Cut.

W. F. DAVIS MACHINE TOOL COMPANY

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Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

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on special order work no less than faultless workmanship comes under our guarantee to please.

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Work for Machine Shop

Details of Facilities Furnished on Request

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We also make Metal Stampings, Brass and Aluminum Castings.

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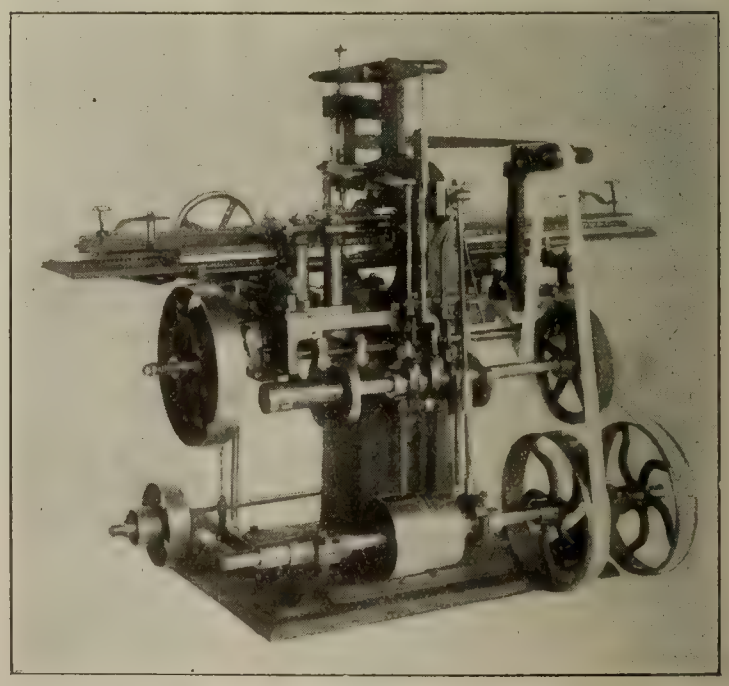
We will show here from time to time some machines we build that you may judge our capabilities in this line.



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What Can You Save?
By Using Parts Made in the Punch Press

Look over your standard parts, Mr. Manufacturer, and see what parts can be made (or could be made by slight change in design) by this process.

You will be surprised at the saving you can effect.

We make Blanking, Perforating, Drawing, Forming and all classes of dies and tools for plain or difficult stamping to suit the production required.

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Who expect **New Shell Orders** either from **Canada** or the **United States,** may need some of their shell equipment **overhauled** and **repaired** or **rebuilt.** We can handle it **completely, satisfactorily** and **promptly.**

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Preston Machinery Co., Ltd.

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(2)

DEMCO DRILLS

At a speed of 12,000 R.P.M. or at any one of 4 lower speeds, drills true to most exacting requirements.

DEMCO

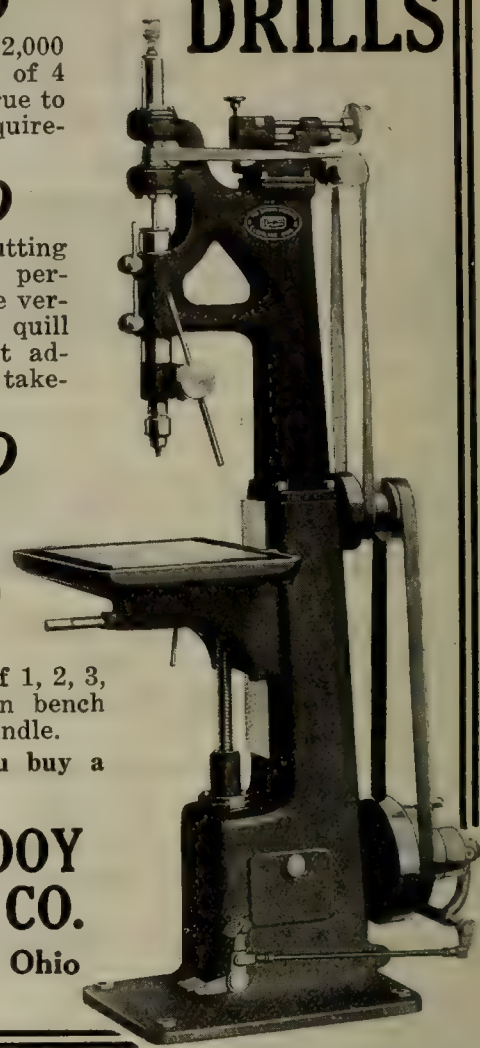
maintains the cutting drill in alignment perfectly true. Note the vertically adjustable quill bracket and the belt adjuster and automatic take-up.

DEMCO

is of ball-bearing construction throughout. No friction; no vibration — NO BROKEN DRILLS.

Built in floor types of 1, 2, 3, 4 and 6 spindles; in bench type with single spindle.

At no price can you buy a better drill. Write.



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A Steptoe Hand Miller or small power feed can be handled quickly and will cut your production cost. You will have less money invested in your Milling Machines and have more machines to do the work.

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A Steptoe Shaper will do the work faster because it can be handled quicker.

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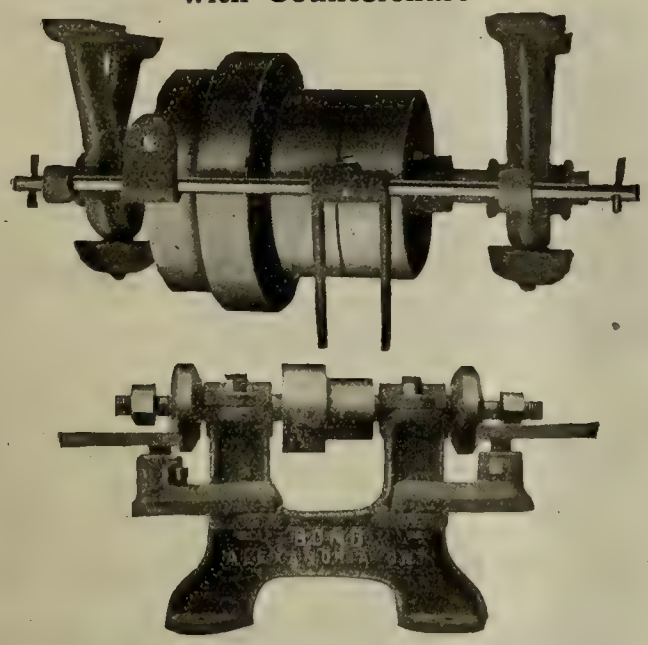
with Countershaft



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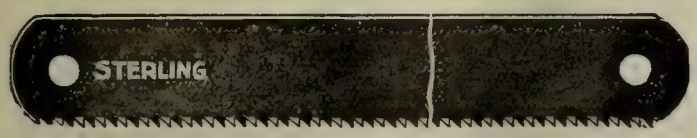

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CHEAP LAMPS DO COST YOU MORE

Look at this chart. Test reports on five different type lamps. Study it over and decide.

NAME OF LAMP	WATTAGE AND CANDLE POWER CLAIMED FOR TESTED LAMPS	ACTUAL CANDLE POWER OF TESTED LAMPS	ACTUAL WATTAGE OF TEST LAMPS	COST 1000 C.P. LIGHT FOR 1000 HRS. AVERAGE COST CURRENT 2½¢ PER K.W.HR.			1000 HOUR LOSS
				LAMPS NEEDED	TOTAL WATTS USED	1000 HR COST	
LACO NITRO	100	111.5	104	9	936	$23.40	NONE
COMPETING LAMP "A"	100	78.5	101	13	1313	32.83	$ 9.43
" " B	100	87.5	109.5	12	1314	32.85	9.45
" " C	100	66.9	103	15	1545	38.63	15.23
" " D	100	63.0	100	16	1600	40.00	16.60

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Show an Actual 30% to 50%

Saving in Cost of Current Consumed

THIS SAVING WILL BUY A NEW SET OF LAMPS AT THE END OF THE MINIMUM GUARANTEED PERIOD AND LONGER LIFE IS FREQUENTLY SECURED.

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Prest-O-Lite PROCESS

has become standard practice on steel pipe lines in thousands of factories and plants. It is widely used in the construction of piping systems for steam, gas or air—in office buildings, hotels, factories, power plants, mines, machine shops and refrigerating installations.

The Prest-O-Lite Process employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene (ready to use) is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost. Adaptable for oxy-acetylene cutting by the addition of a special cutting blow-pipe.

Full instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the process quickly and easily. Write for valuable illustrated literature and data on work others are doing by this process, in construction, manufacturing and repairing. It may prove to be the solution of your problems.

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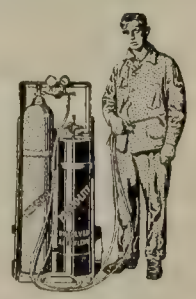

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A corner of one of L'Air Liquide Society's Canadian factories for manufacturing Oxygen and Dissolved Acetylene.

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The Oxy-Acetylene process, to be the means of saving you money, time and labor, must be supported by an efficient service for gases (Oxygen and Dissolved Acetylene). On this alone depends the success or failure of the process when applied to your industry. Neither effort nor money expenditure has been, or is being, spared to give the word "Service" its true and distinct definition, so that you may derive ALL the benefits from the process when applied in conjunction with "A.L.S." apparatus and "A.L.S." service.

When in the market for Oxy-Acetylene apparatus, before making a final decision, ask for particulars of our service which is worth many times more to you than the value of any apparatus you can buy. Being the pioneers of the process throughout the world from the time of its inception, our advice is invaluable to you and guards you against possible disappointment—and it is free for the asking. We shall be pleased to give you ALL particulars as to how you may benefit by the process.

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The Pioneers of the Process throughout the world

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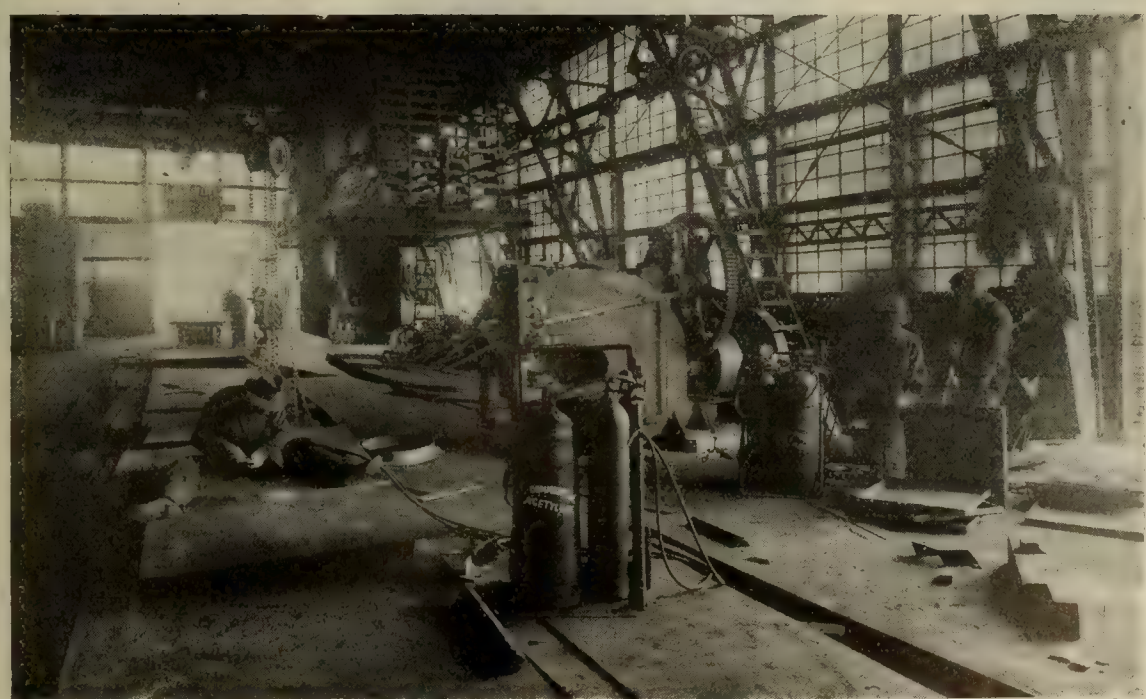

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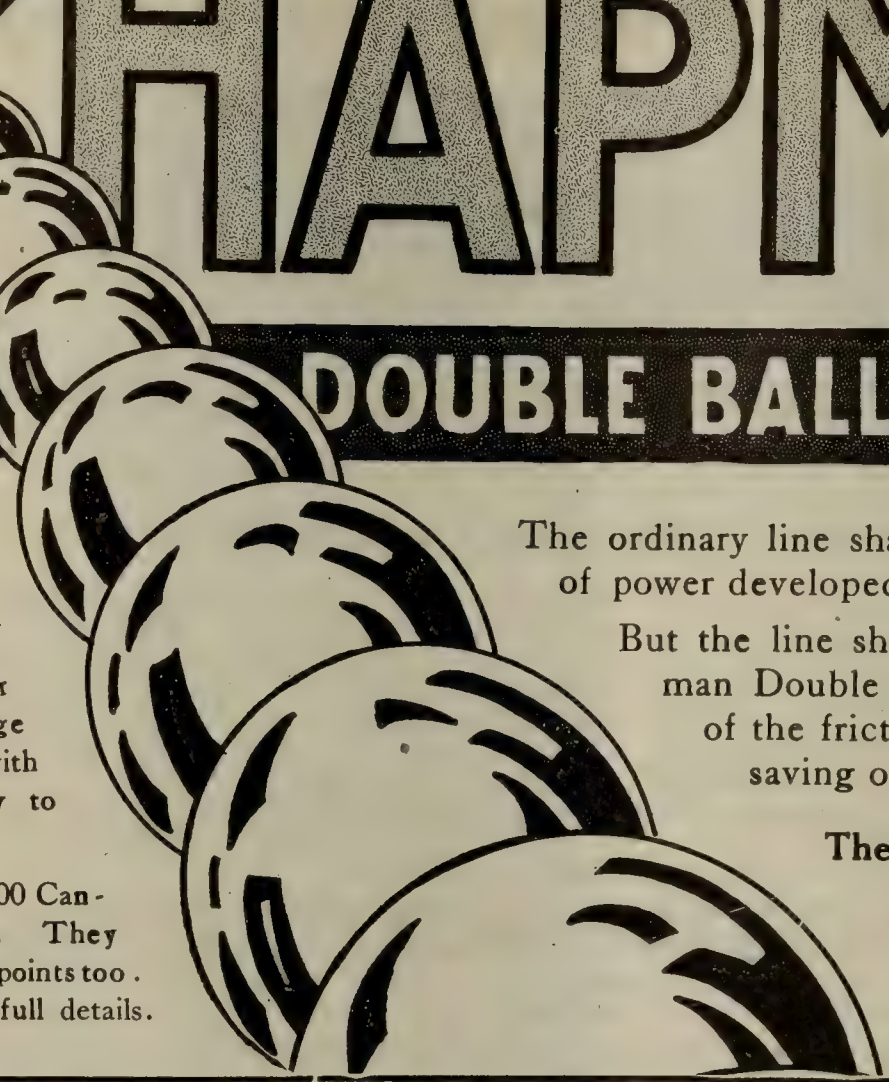

Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

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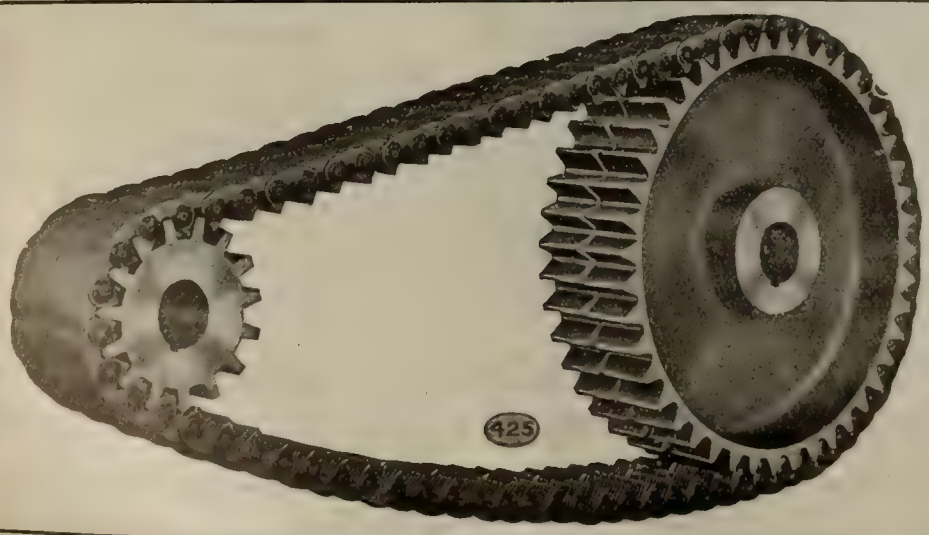

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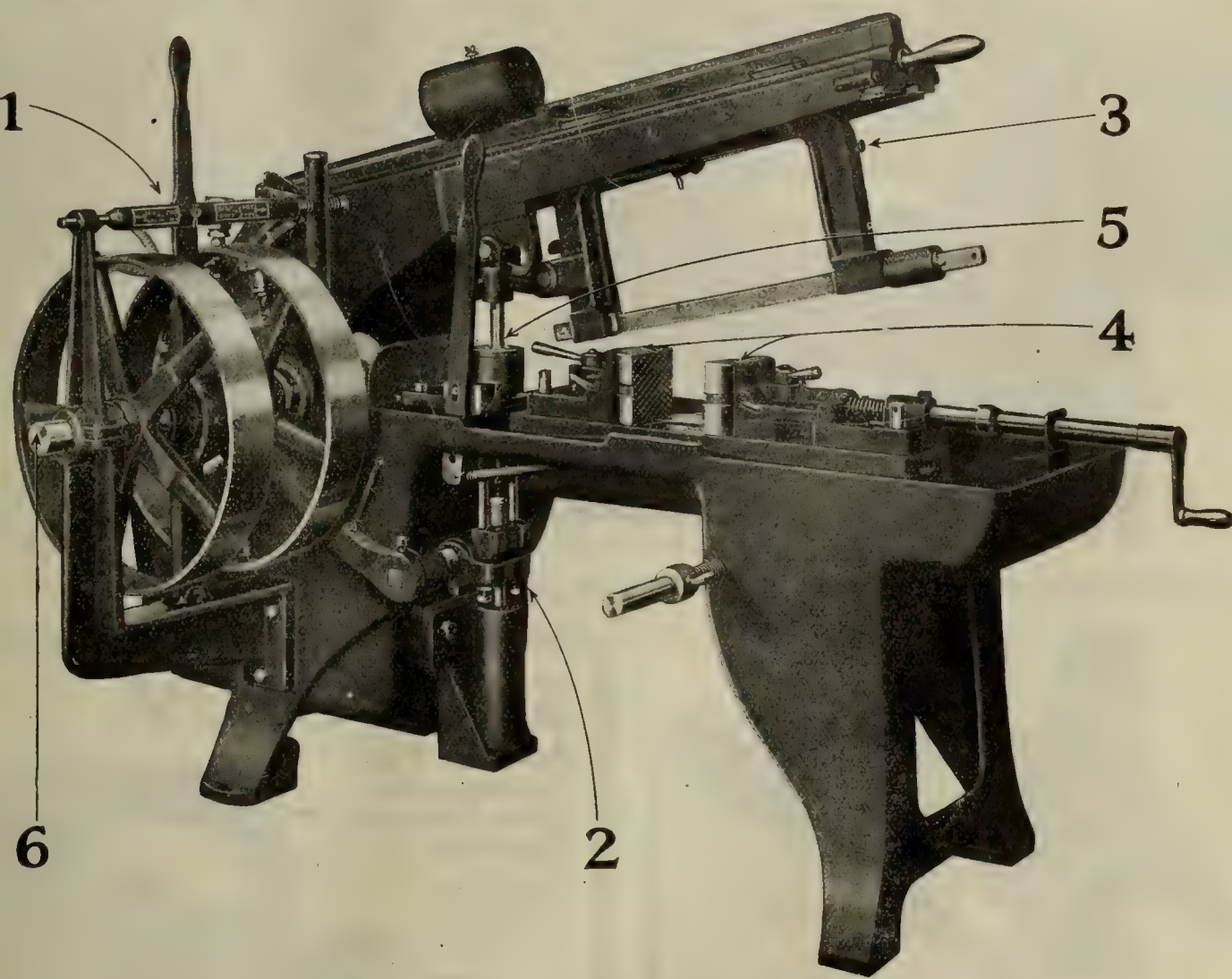

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3. Extension Frame.
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6. Frame Swings on Shaft Center.
7. Rotary Pump.
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10. Tank.
11. Perfect Blade Alignment.
12. Lubricating System.
13. Draw-Cut.

For Explanation of these and other features send for Circular

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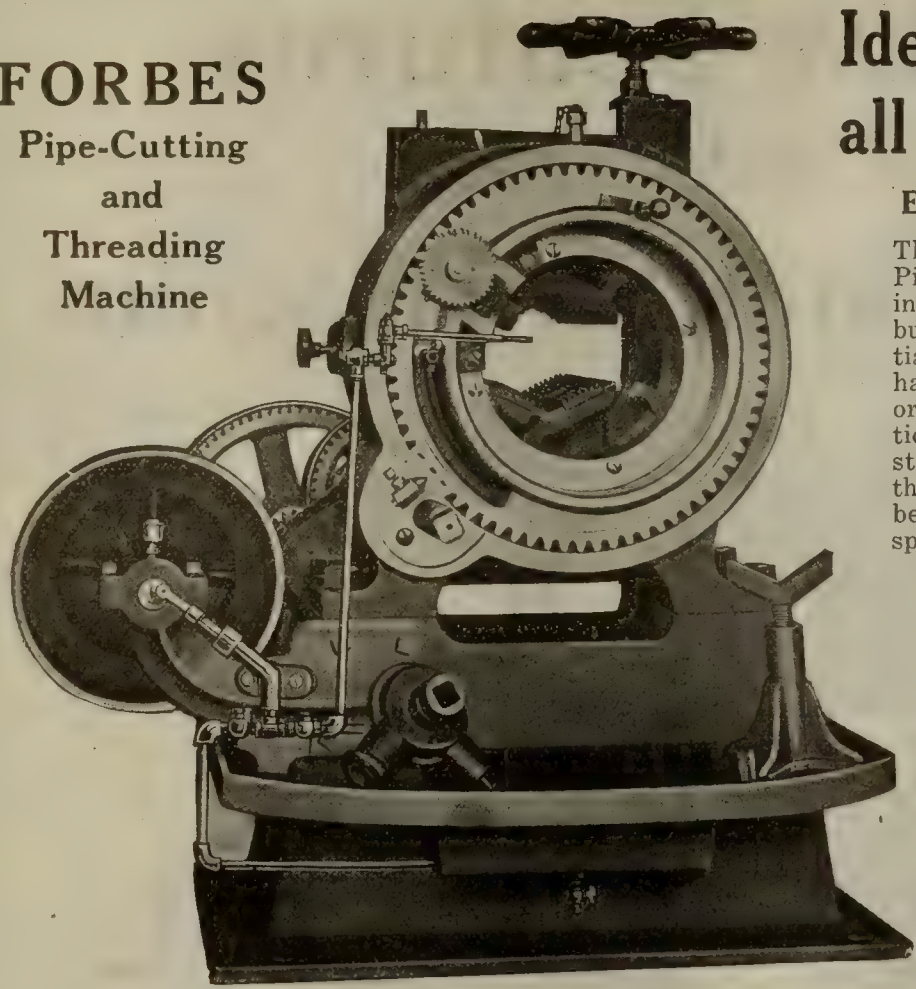
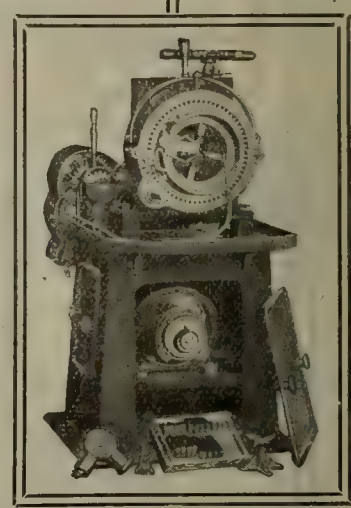
Pipe-Cutting and Threading Machine



Ideal Machine for all Kinds of Work

Especially Fine Work

The "Forbes" is the ideal Pipe Cutting and Threading Machine for any job, but it is especially essential where the work in hand is of a high class order—where the reputation of your firm is at stake. Joints threaded by the Forbes Machines will bear the most critical inspection. They never leak.



It is the only machine on the market with receding gear which carries the dies into the pipe. It is also entirely self-contained, motor-driven and can be easily carried to its work.

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The Desmond Huntington No. 2 is the best dresser ever devised for use on large and coarse wheels.

We can make prompt deliveries of any type of Dresser desired.

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Wouldn't a proposition interest you that would solve these problems? We have proven to hundreds of others that our New Improved Peerless High Speed Heavy Duty Metal Cutting Saw will do more work with less labor and save floor space. Instead of using several machines, one Peerless will do the work.

You are losing money in delaying your production and tying up ready cash when building.

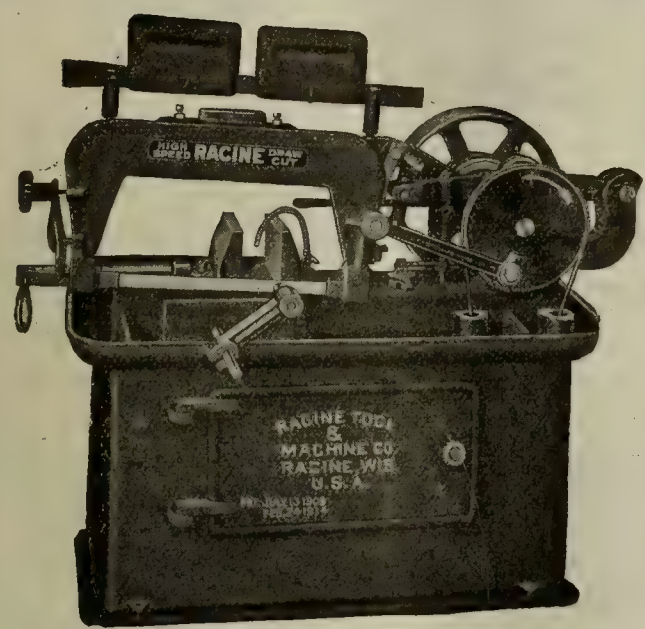
Now can you afford to pass up this proposition? You take no chances, we allow you thirty days' free trial before you decide to purchase. No previous records or world-wide reputations are given consideration after this tool is once installed.

It takes but a moment for any manufacturer to realize the real value of this tool after a comparative trial. Many find them so profitable that they are ordering additional machines by express.

It will surprise you to note the large list of users. May we send you a copy?

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

NO DRAGGING BACK ON THE NON-CUTTING STROKE



To protect users of Racine High-Speed Metal-Cutting Machines, we carry a large stock of the famous Racine H.S. Tungsten Blades.

A patented device of this Racine High Speed Metal Cutting Machine automatically lifts the blade clear of the work on every return stroke.

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Therefore time saved—blades saved—would soon return to your pocket the reasonable cost of a Racine.

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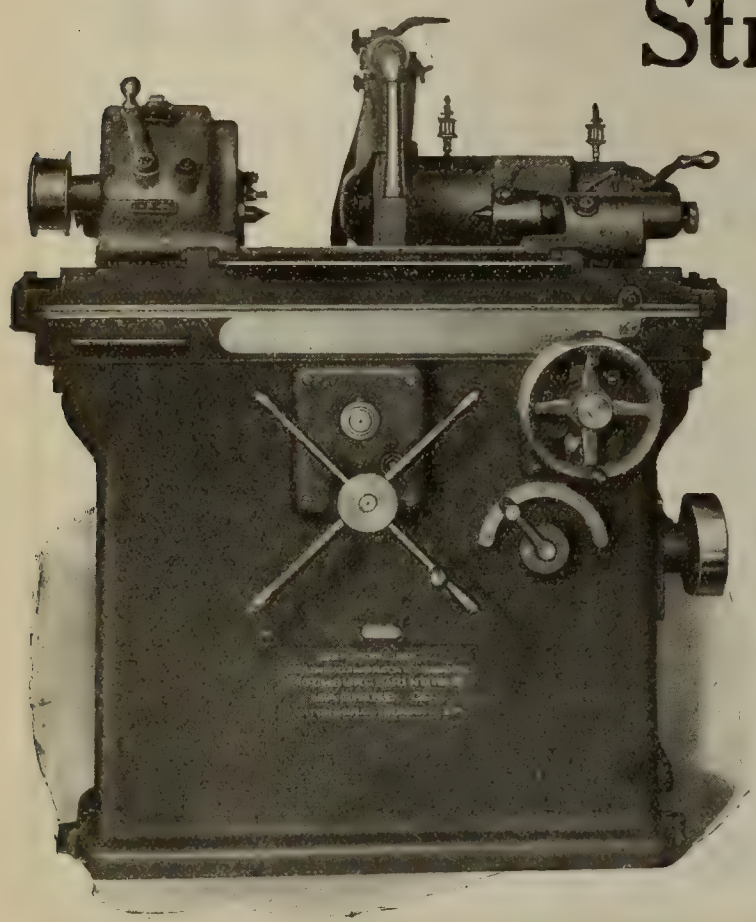

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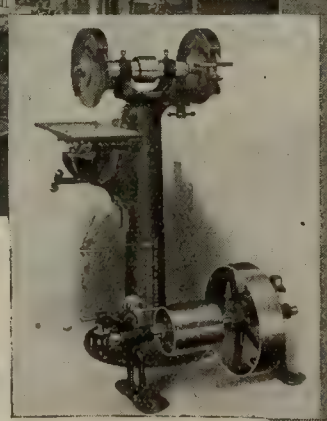

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Machinery Castings of all kinds, Motor Frames, etc., for electrical trade, Pedestal and Miscellaneous Bridge Work, Rolling Mill and Blast Furnace Castings, Gears and Gear Blanks.

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In your hands it will point the better way to compensate for any shortage of skilled labor with which you may be contending. Write to-day for your copy.

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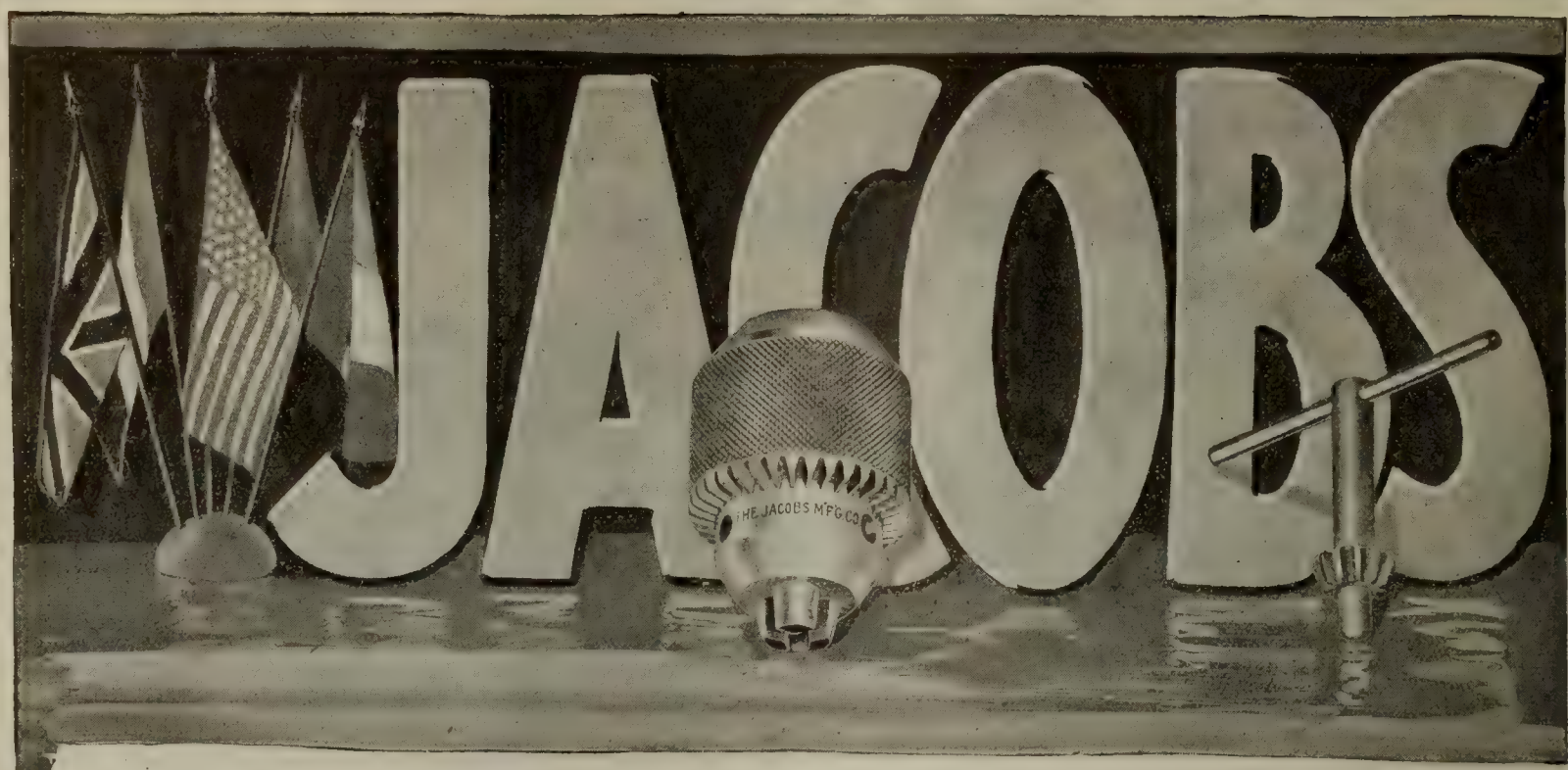

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JACOBS IMPROVED DRILL CHUCKS are among the modern industrial devices that are meeting the war-time demand for quick, efficient and economical service. They keep down expense and increase the output. If you haven't used them, put some to the test.

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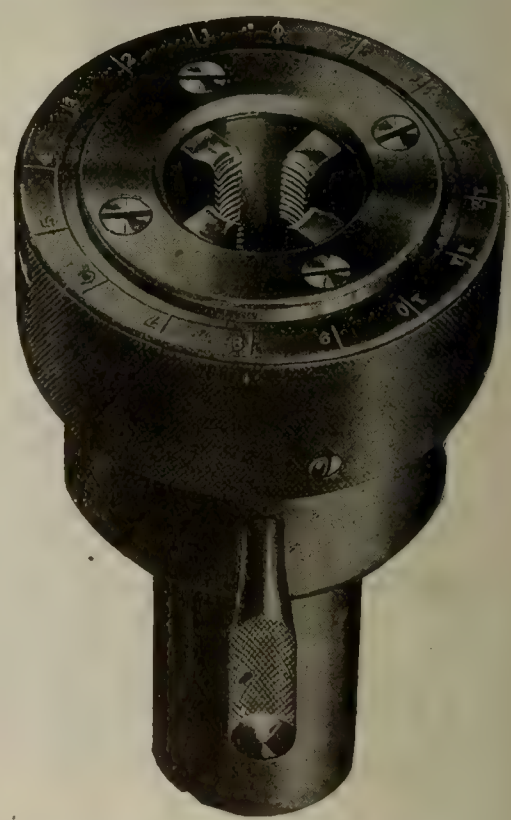
Handle 75-M/M Shells Just Once



Two Murchey Taps on your lathe completely finish this shell so that when it comes off the machine there is no more handling or re-sizing to do. Therefore

Murchey Tap Them

By using Murchey Collapsing and Adjustable Taps, you save two minutes or more on every 75-mm. Shell. Figure that in dollars for yourself!

Practically all the large plants of the United States are lining up with Collapsing Taps to thread the nose of this shell. No minute must be knowingly wasted.

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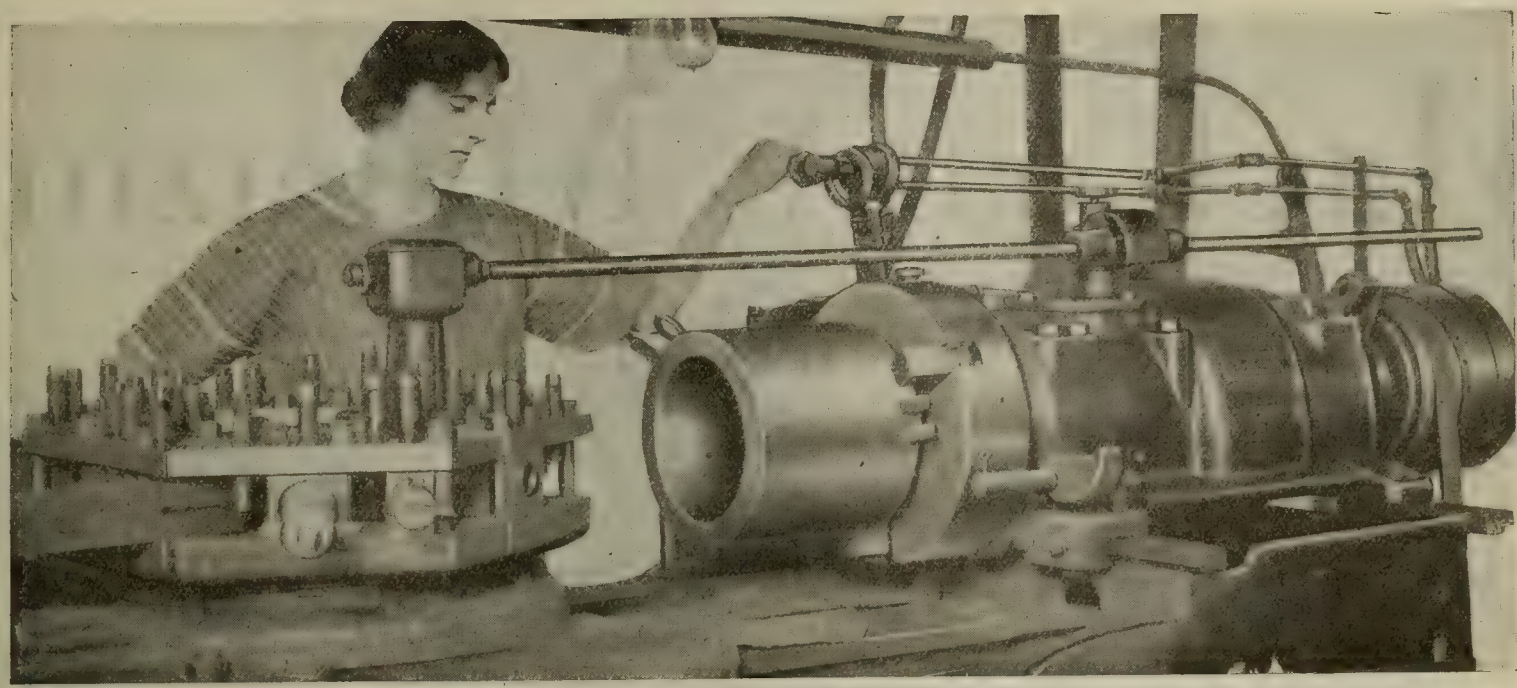

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MacLean's Magazine

for JANUARY

Chasing the Submarine—by a Canadian

A CANADIAN, whose name is withheld, in the Motor Boat Patrol Service in the North Sea, tells in the January MacLean's the story of the work and life and triumphs of the Service to which he is attached. It is a fine performance by MacLean's to get this story for the Canadian people. Successes of this sort have made MacLean's go far forward in public favor during past months.

If the horrid and terrible submarine warfare and the conquest of this pest of the deep interest you, learn more about submarines and their capturing in the January MACLEAN'S, and pass on to others the news of this unsigned contribution.

Ships—more ships—and yet more ships

THIS is a very strong article which Miss Agnes C. Laut contributes. As usual she is very well informed. Regarding the duration of the war she voices American opinion when she says that it is likely to be long drawn-out. The United States people are buckling down to a stern struggle. At this time we want very much to read what well-informed, virile thinkers and writers have to say about the war, since things are not any too bright in certain directions. Miss Laut has a good deal to say about the shipping programme of the United States, and certainly she gives facts and sets us thinking as few writers do.

"Jim" by Robert W. Service

A POEM by this strong poet—a poem wrought amid the smoke and hell of battle, yet fanciful and tender. One wonders how men can write fanciful verse amid surroundings that seem so adverse to thinking and writing, yet some gifted can detach themselves and let fancy play; or is it that their minds see through the real and horrible—through the immediate environment into inner things? Whatever it may be, we ought to be glad for the verse that men like Service give us, remembering how and where it is produced.

Adam and Arthur William Brown, Brothers

ADAM BROWN is a Canadian short story writer of large promise. His brother, Arthur William, is one of New York's foremost illustrators. Both brothers have joined their gifts to make Hannibal Helps a mighty good feature of the January MACLEAN'S.

A New Serial by Alan Sullivan

ALAN SULLIVAN'S recent novel, The Inner Door, is being well received. Perhaps we have no better novelist of his type in Canada to-day. He writes books that show introspection and fine analysis. This serial, The Magic Makers, adds venture and mystery to psychological study, and is a rare good thing. Arthur Heming illustrates the story, which begins in Scotland and is transferred to Canada where the stage is set.

The Regular Departments of MacLean's

REVIEW of Reviews, Women at Work, The Business Outlook—are present in goodly measure. Oppenheim's The Pawns Count, Trench Pictures, and first-class illustrations by artists of note help to make the January MACLEAN'S good value for money.

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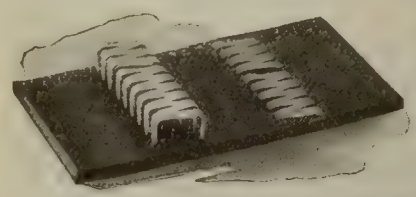

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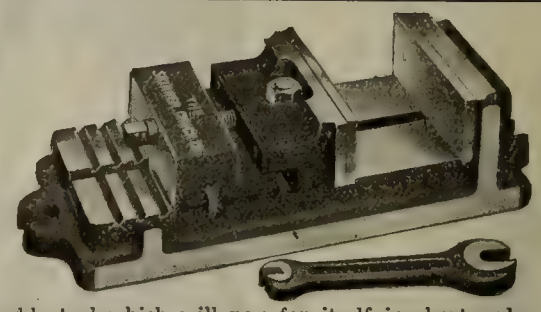

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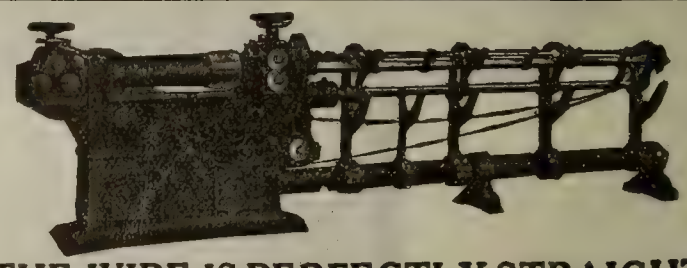

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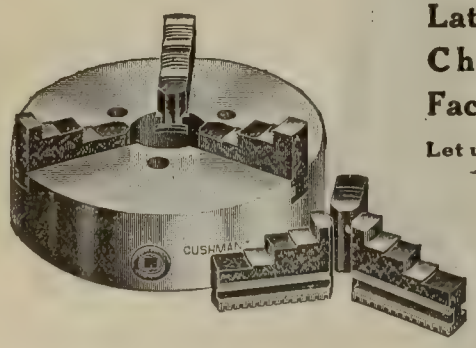
Also makers of Riveting Machines, Sprue Cutters, Cotter Pin Machines, etc.

Cushman Chucks



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Let us send you our catalog.

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RIVETED STEEL TANKS FOR EVERY PURPOSE

OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
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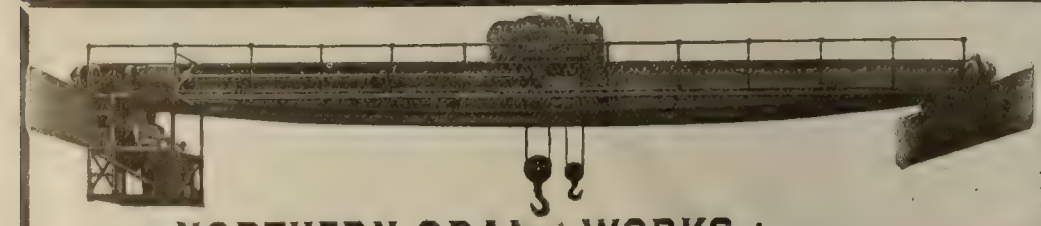

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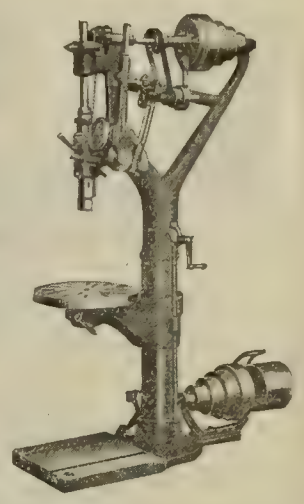

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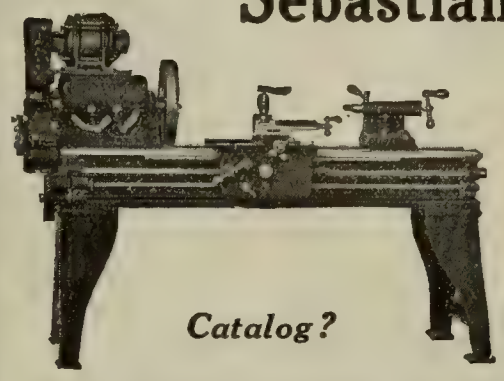

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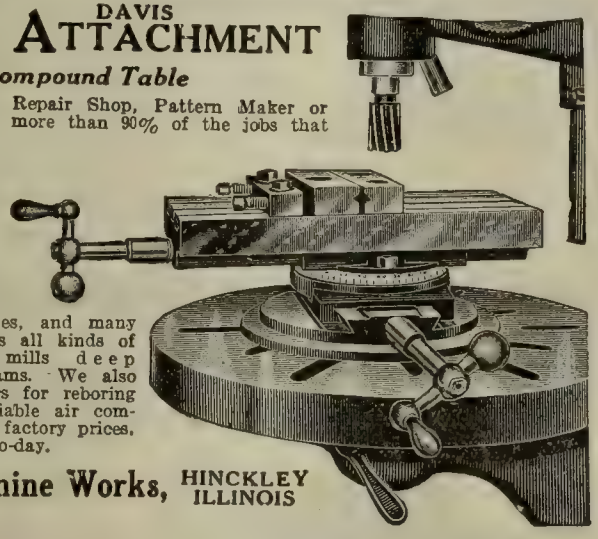

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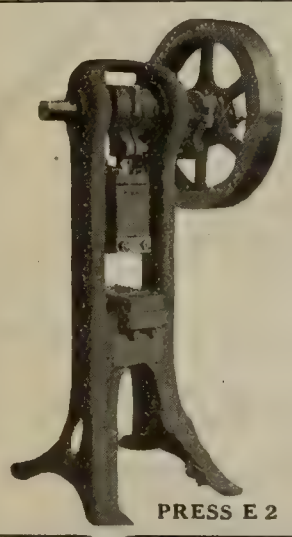
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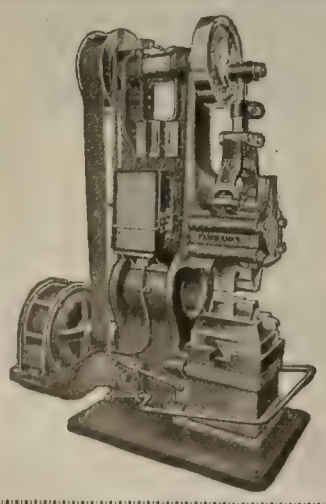

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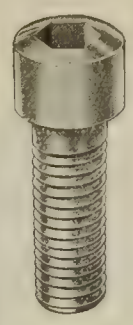

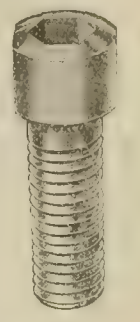

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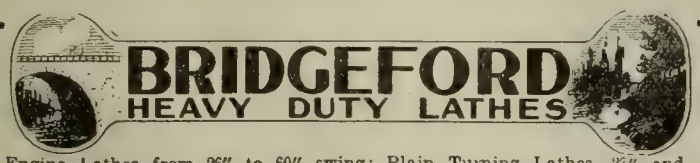

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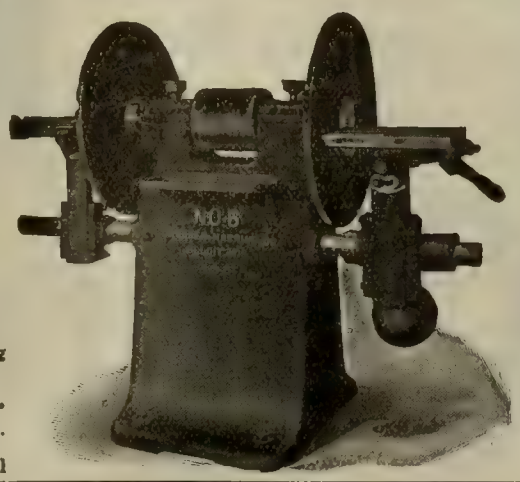

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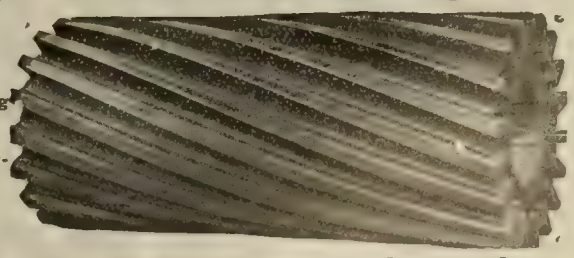

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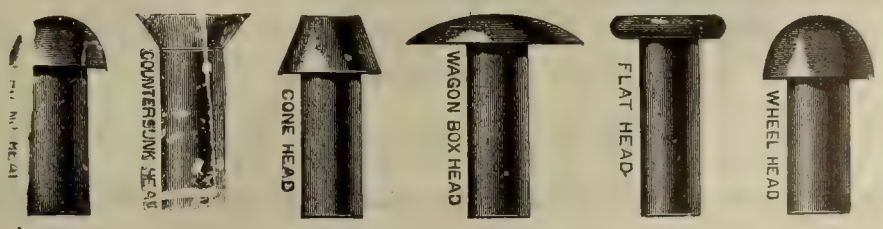

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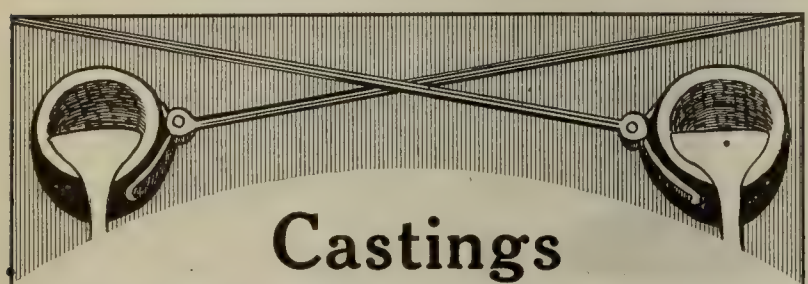

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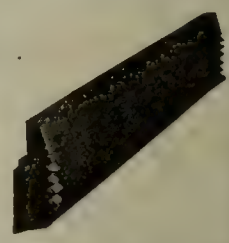

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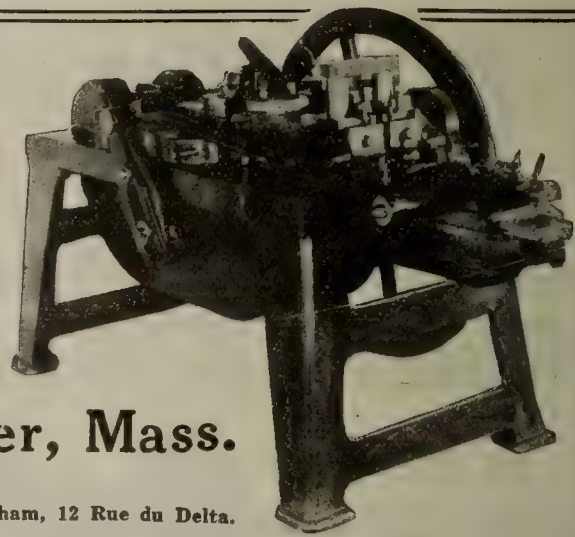

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BORING MACHINES, UPRIGHT AND HORIZONTAL
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Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Roelofson Machine & Tool Co., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
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BORING MACHINES, STOVE AND COAL
Cumming & Son, J. W., New Glasgow, Canada

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Niles-Bement-Pond Co., New York
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
R. E. T. Pringle, Ltd., Toronto, Ont.

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Garlock-Walker Machinery Co., Toronto, Ont.
Warner & Swasey Co., Cleveland
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machy. Co., Toronto

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Wm. Kennedy & Sons, Ltd., Owen Sound.
Marsh & Henthorn, Ltd., Belleville, Ont.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.
Sterling Engine Works, Winnipeg, Man.
Welland Mach. & Foundries, Ltd., Welland, Ont.
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Dominion Steel Foundry Co., Ltd., Hamilton, Ont
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
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CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.
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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.
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Union Tool Chest Works, Rochester, N.Y.
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CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Manufacturers Equipment Co., Chicago, Ill.
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Manufacturers Equipment Co., Chicago, Ill.
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Gardner Machine Co., Beloit, Wis.
CHUCKS, SPLIT
Rivett Lathe & Grinder Co., Brighton, Mass.
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Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.
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Hardinge Bros., Inc., Chicago, Ill.
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Jones & Glassco, Montreal, Que.
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Johnson Machine Co., Carlyle, Manchester, Conn.
Jones & Glassco, Montreal, Que.
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Whiting Foundry Equipment Co., Harvey, Ill.
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Zenith Steel & Coal Products, Montreal, Que.
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Sturtevant Co., B. F., Galt, Ont.
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Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
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Hinckley Machine Co., Hinckley, Ill.
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Petrie, Ltd., H. W., Toronto, Ont.
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Northern Crane Works, Walkerville.
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Whiting Foundry Equipment Co., Harvey, Ill.
CRANES, TRAVELLING, ELECTRIC AND HAND POWER
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Dominion Bridge Co., Montreal.
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Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.
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Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
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Pratt & Whitney Co., Dundas, Ont.
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Cleveland Pneumatic Tool Co. of Canada, Toronto
CUTTERS, PIPE (SEE PIPE CUTTERS)
CUTTERS, MILLING
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Cleveland Milling Mach. Co., Cleveland, Ohio.
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Garvin Machine Co., New York.
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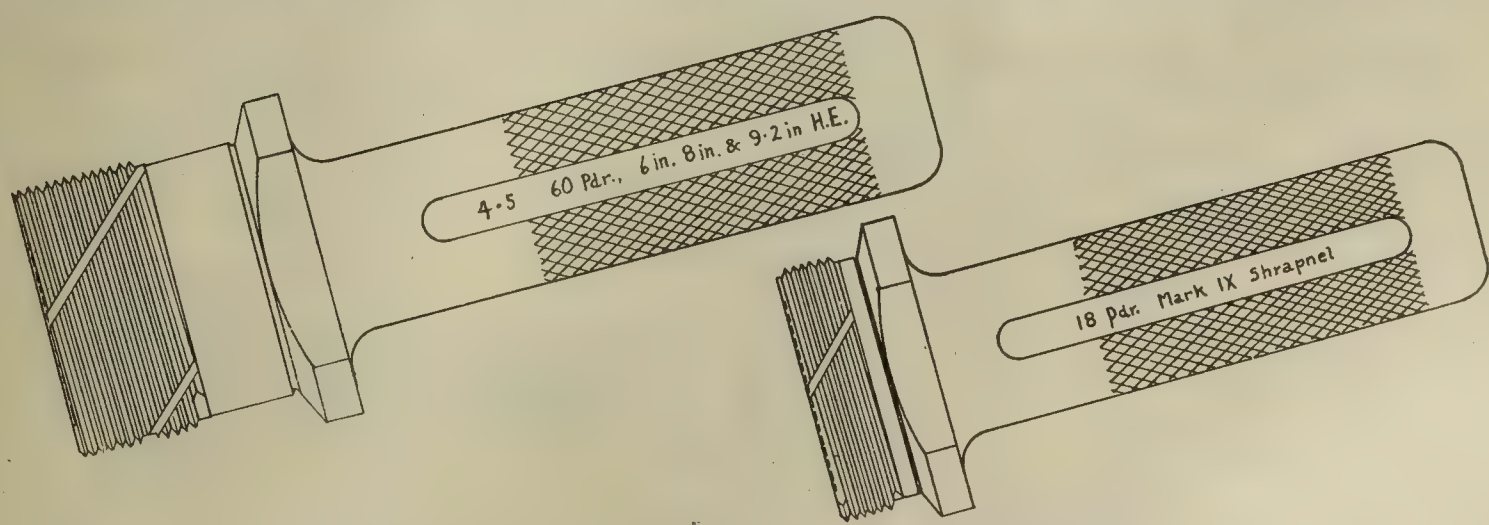

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Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal.
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Garvin Machine Co., New York.
A. B. Jardine & Co., Hespeler, Ont.
National-Acme Co., Cleveland, Ohio.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
D. McKenzie Machinery Co., Guelph, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, Ohio.

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Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.

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Keystone Mfg. Co., Buffalo, N.Y.
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Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Millers Falls Co., Millers Falls, Mass.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
United States Electrical Tool Co., Cincinnati.

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Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Petrie of Montreal. Ltd., H. W., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.

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Morse Twist Drill & Machine Co., New Bedford.

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Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
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A. R. Williams Machinery Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.

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Canadian Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Can. B. K. Morton, Toronto, Montreal.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Marshall & Co., Geo. A., Toronto, Ont.
McKenna Brothers, Pittsburgh, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
W. F. & John Barnes Co., Rockford, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
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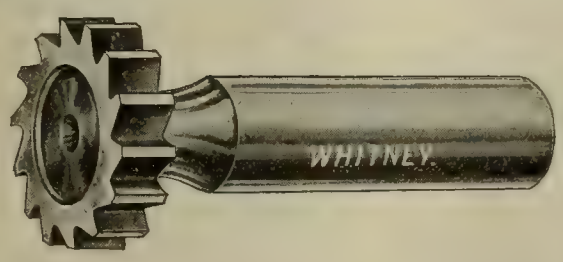

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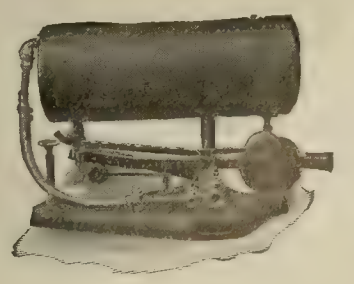

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HAMMERS, AIR
Erie Foundry Co., Erie, Pa.
HAMMERS, DROP AND BELT-DRIVEN
Beaudry & Co., Boston, Mass.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canadian Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
Erie Foundry Co., Erie, Pa.
High Speed Hammer Co., Rochester, N.Y.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Plessisville Foundry Co., Plessisville, Que.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
HAMMERS, HELVE POWER
Canada Machinery Corp., Galt, Ont.
West Tire Setter Co., Rochester, N.Y.
HAMMERS, POWER
Beaudry & Co., Boston, Mass.
Erie Foundry Co., Erie, Pa.
United Hammer Co., Boston, Mass.
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Cleveland Pneumatic Tool Co. of Canada, Toronto.
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Carry Your Grinder to the Work Not Your Work to the Grinder

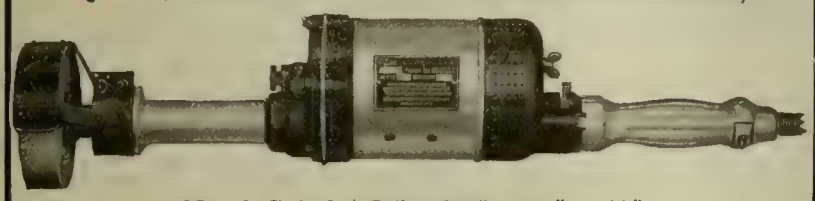
Thor

Portable Electric GRINDER

Equipped with Universal Motor for Operating on Direct or Alternating Current

110 TO 250 VOLTS

(Licensed Under Burke Universal Motor Patent.)



No. 6 Grinder-Wheel 4" x ¾" x ½"

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Thor Portable Electric Grinder is equipped throughout with ball and roller bearings, and has a specially constructed motor, insuring speed, power, ease of operation and increased capacity.

IT RUNS AT 4,500 R.P.M.

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> "Of course we would not have sold it without letting people know it was here, that is obvious, and thanks are due you for letting the people know it was for sale."

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Canadian Machinery

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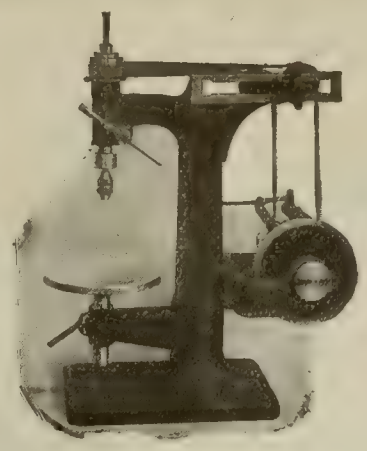

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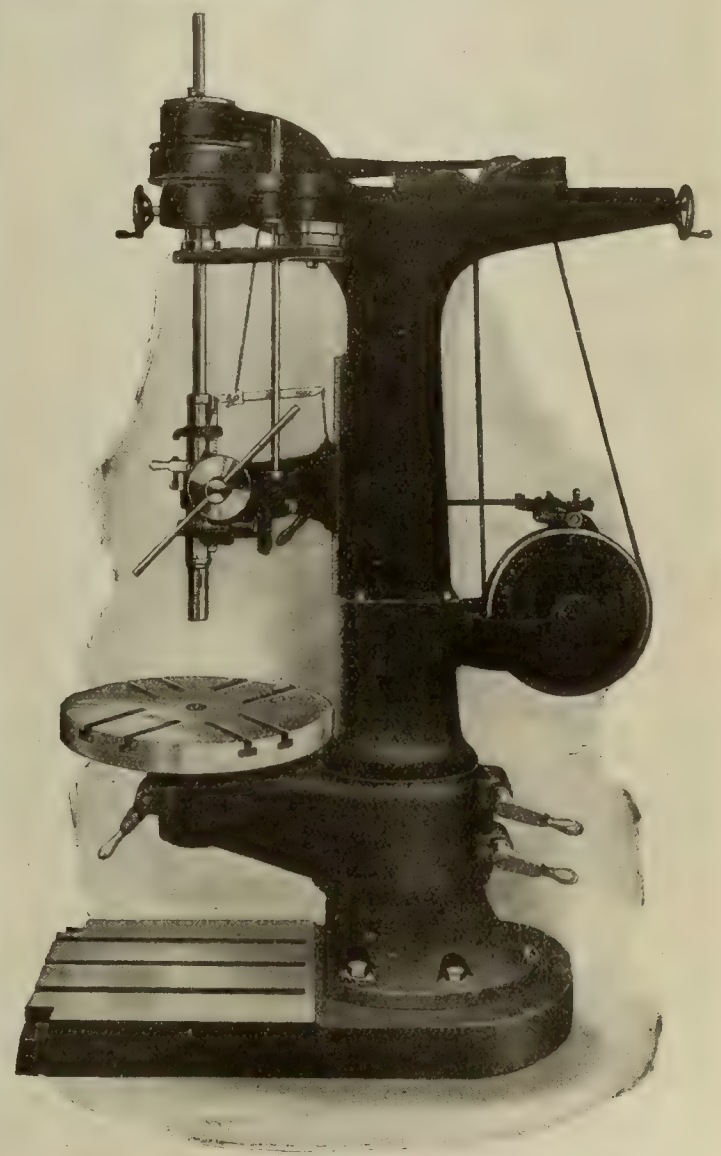

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as to size, if you want to get the machine most suitable to your work, get the

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The widest line in sizes,—the greatest variety in styles:—higher speeds, together with extreme simplicity and convenience, enable you to specialize to best advantage.

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United Hammer Co., Boston, Mass.

HAMMERS, STEAM
John Bertram & Sons Co., Dundas.
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Niles-Bement-Pond Co., New York.

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Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Can. S K F Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
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Shore Instrument & Mfg. Co., New York.

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Sturtevant Co., B. F., Galt, Ont.

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HINGES
London Bolt & Hinge Works, London, Ont.

HOBS
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Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

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Butterfield & Co., Rock Island, Que.

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Jenckes Mach. Co., Sherbrooke, Que.
Jones & Glassco, Montreal.
Marsh & Henthorn, Belleville, Ont.
Northern Crane Works, Walkerville, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Whiting Foundry Equipment Co., Harvey, Ill.

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Garlock-Walker Machinery Co., Toronto, Ont.
Ford Chain Block & Mfg., Philadelphia, Pa.
Independent Pneumatic Tool Co., Chicago, Ill.
Jenckes Mach. Co., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Northern Crane Works, Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
Wright Mfg. Co., Lisbon, Ohio.

HOISTS, ELECTRIC
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Kennedy & Sons, Owen Sound, Ont.
Northern Crane Works, Walkerville, Ont.
Winnipeg Gear & Engrng Co., Winnipeg, Man.

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Matthews, Jas. H., & Co., Pittsburgh, Pa.

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Goodyear Tire & Rubber Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Wells Bros. Co. of Canada, Galt, Ont.

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Garlock-Walker Machinery Co., Toronto, Ont.
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Niles-Bement-Pond Co., New York.
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Petrie, Ltd., H. W., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

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Brown & Sharpe Mfg. Co., Providence, R.I.
L. S. Starrett Co., Athol, Mass.

INDEX CENTRES
Fred C. Dickow, Chicago, Ill.
Garvin Machine Co., New York.

INDICATING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

INGOT METAL
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

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Hanna & Co., M. A., Cleveland, O.

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Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Petrie, Ltd., H. W., Toronto, Ont.

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Charles F. Elmes Eng. Works, Chicago.

JACKS, PNEUMATIC
Northen Crane Works, Walkerville.

JACKS, PIT AND TRACK
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.

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Skinner Chuck Co., New Britain, Conn.

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Illinois Tool Works, Chicago, Ill.
Normas Machine Co., St. Catharines, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Toronto Tool Co., Toronto, Ont.

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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich.
A. R. Williams Machy. Co., Toronto.

KEYS, MACHINE
Whitney Mfg. Co., Hartford, Conn.

KILNS
Can. Blower & Forge Co., Kitchener, Ont.
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Sheldons, Limited, Galt, Ont.

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Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

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Can. Laco-Philips Co., Toronto, Ont.

LAMPS, TUNGSTEN (Vacuum and Gas Filled)
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H. E. Streeter, New Birks Bldg., Montreal, Que.

LATHES, CHUCKNG
Acme Machine Tool Co., Cincinnati, Ohio.

LATHE CHUCKS (SEE CHUCKS)

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Curtis & Curtis Co., Bridgeport, Conn.
Hendey Machine Co., Torrington, Conn.
Rivett Lathe & Grinder Co., Boston, Mass.
Williams & Co., J. H., Brooklyn, N.Y.
Winnipeg Gear & Engrng Co., Winnipeg, Man.

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W. F. & John Barnes Co., Rockford.
Blount, J. G., & Co., Everett, Mass.
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The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hardinge Bros., Chicago, Ill.
New Britain Mach. Co., New Britain, Conn.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.

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Warden King Co., Montreal, Que.

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Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Inc., Chicago, Ill.

LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, Ohio.
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Cincinnati Iron & Steel Co., Cincinnati, Ohio.
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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
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McKenzie Machy. Co., D., Guelph, Ont.
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Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Standard Machy. & Supplies, Ltd., Montreal, Que.
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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McCabe, J. J., New York, N.Y.
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Garlock-Walker Machy. Co., Toronto, Ont.
Gray Mfg. & Mach. Co., Toronto, Ont.
Hepburn, John T., Ltd., Toronto.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
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Plessisville Fdy., Plessisville, Que.
Roelofson Mach. & Tool Co., Toronto, Can.

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Bertram, John, & Sons Co., Dundas, Ont.
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Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto.
McCabe, J. J., New York, N.Y.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

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McCabe, J. J., New York, N.Y.

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Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto, Ont.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
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New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
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Rivett Lathe & Grinder Co., Boston, Mass.
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L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

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Trahern Pump Co., Rockford, Ill.

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Garlock-Walker Machy. Co., Toronto, Ont.
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Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

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MACHINERY REPAIRS
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Sterling Engine Works, Winnipeg, Man.
Sumbling Mach. Co., W. H., Toronto, Ont.

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Manufacturers Equip. Co., Chicago, Ill.
Monarch Brass Mfg. Co., Toronto, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

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Matthews, Jas. H., & Co., Pittsburgh, Pa.

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Noble & Westbrook Mfg. Co., Hartford, Conn.
Perrin, Wm. R., Toronto.

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Pratt & Whitney Co., Dundas, Ont.

MEASURING TAPES AND RULES
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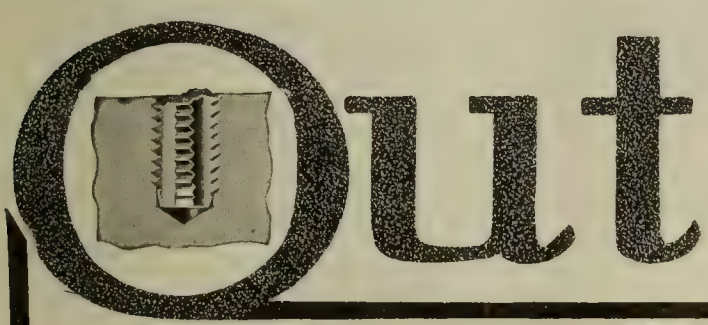

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First: Because in our Extractor, we use a steel of different analysis than that in the taps themselves. Second: Because it is not tempered the same, for taps have to be left exceedingly hard in order to maintain their cutting edge and they are therefore brittle. Third: Because the Fingers of our Extractors are further from the axis of the tap than is any solid portion of the tap itself and they thus have a greater leverage in their favor; and Fourth: Because they are shaped to fit the grooves of the tap, using, therefore, the greatest amount of material.

Write for particulars of 60-day trial offer.

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The Right Heat

is the only heat to work with if you are going to turn out good work.

An ordinary mechanic can keep a Gilbert & Barker Furnace steady and even, insuring a uniform temperature.

G. & B. are built right—from the ground up. The built-up construction with heavy sheet metal is reinforced with heavy angle iron straps riveted and bolted. The counterbalanced door clears the opening to full height, admitting the heaviest charge. Fire brick chamber lining, door lining and floor tile are of best quality.

And in every G. & B. furnace you get the benefit of 52 years of experience and study with gaseous and liquid fuels. Our line includes more than one hundred types of furnaces.

At present we are making prompt delivery on many types. Stock list 24 describes them all.

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JAMES DEVON
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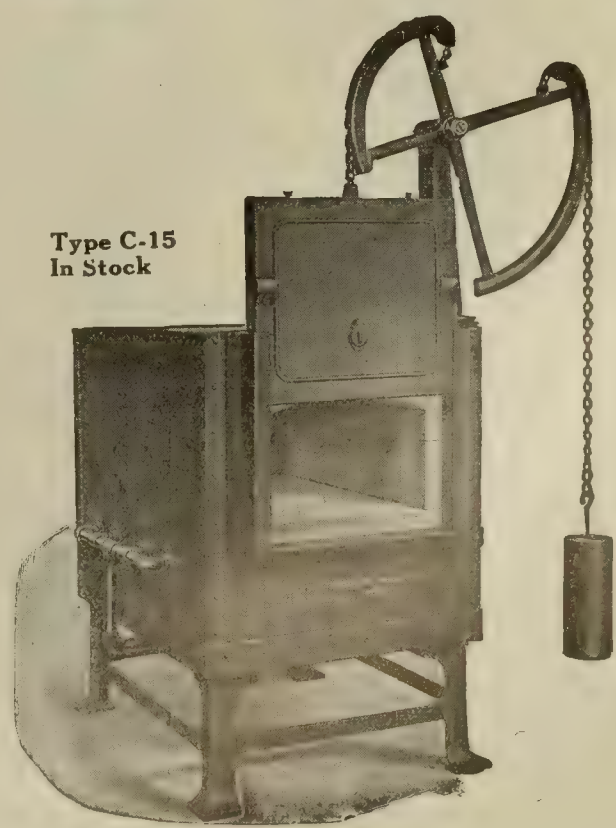

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In Stock

If any advertisement interests you, tear it out now and place with letters to be answered.

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Cincinnati Milling Machine Co., Cincinnati.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
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Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.

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Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
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Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.
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Whitney Mfg. Co., Hartford, Conn.
A. R. Williams Machy. Co., Toronto.

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Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

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Garvin Machine Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.

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Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Tabor Mfg. Co., Philadelphia, Pa.

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Cummings & Son, J. W., New Glasgow, Canada.
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
Marsh & Henthorn, Belleville, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Jenckes Mach. Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

MITTENS
Hickory Steel-Grip Glove Co., Chicago, Ill.

MODEL WORK
Windsor Mach. & Tool Co., Windsor, Ont.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Mach. Co., New Britain, Conn.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Elm Cutting Oil Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

MUNITION MACHINERY
Petrie of Montreal, Ltd., H. W., Montreal, Que.

MUNTZ METAL
Dominion Central Drawing Office, McGill Bldg., Montreal, Que.

NAIL MACHINERY
Reeder & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Can.

NICKEL SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
John H. Hall & Sons, Ltd., Brantford, Ont.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

NOSE SOCKETS
Jas. McKay Co., Pittsburgh, Pa.

NUTS, SEMI-FINISH AND FINISHED
Canadian B. K. Morton, Toronto, Montreal.
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton, Ont.

NUT BURRING MACHINES
National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

NUT MACHINES (HOT)
National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machy. Co., Tiffin, O.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

OIL, DRAWING
Elm Cutting Oil Co., Toronto, Ont.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Machine Co., The, Hamilton.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford, Ont.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.

OVENS FOR DRYING, TEMPER AND UNDER TRUCKS
Brantford Oven & Rack Co., Brantford, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.

OXY-ACETYLENE WELDING AND CUTTING
Can. Welding Works, Montreal, Que.
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.

OXY-ACETYLENE WELDING AND CUTTING PLANT
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

OXYGEN (SEE ACETYLENE)
L'Air Liquide Society, Montreal, Que.

PACKINGS, ASBESTOS
Bennett, W. P., 51 Montford St., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
New Britain Mach. Co., New Britain, Conn.

PACKINGS, LEATHER, HYDRAULICS, ETC.
Graton & Knight Mfg. Co., Worcester, Mass.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.

PAPER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.

PATENT SOLICITORS
Budden, Hanbury, A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

PATTERNS
Winnipeg Gear & Engr. Co., Winnipeg, Man.

PERFORATED METALS AND ORNAMENTAL IRON GOODS
Canada Wire & Iron Goods Co., Hamilton.

PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PIPE CUTTING AND THREADING MACHINES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Petrie, Ltd., H. W., Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
A. R. Williams Machy. Co., Toronto.

PIPE RIVETED STEEL
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
John H. Hall & Sons, Ltd., Brantford, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Wells Bros. Co. of Canada, Galt, Ont.

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Niles-Bement-Pond Co., New York.

POWER HACK SAWS
McKenzie Machy. Co., D., Guelph, Ont.

PLIERS
Aikenhead Hardware Co., Toronto.
Canadian Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Conn.

PRESSES, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Hannifin Mfg. Co., Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
E. W. Bliss Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.

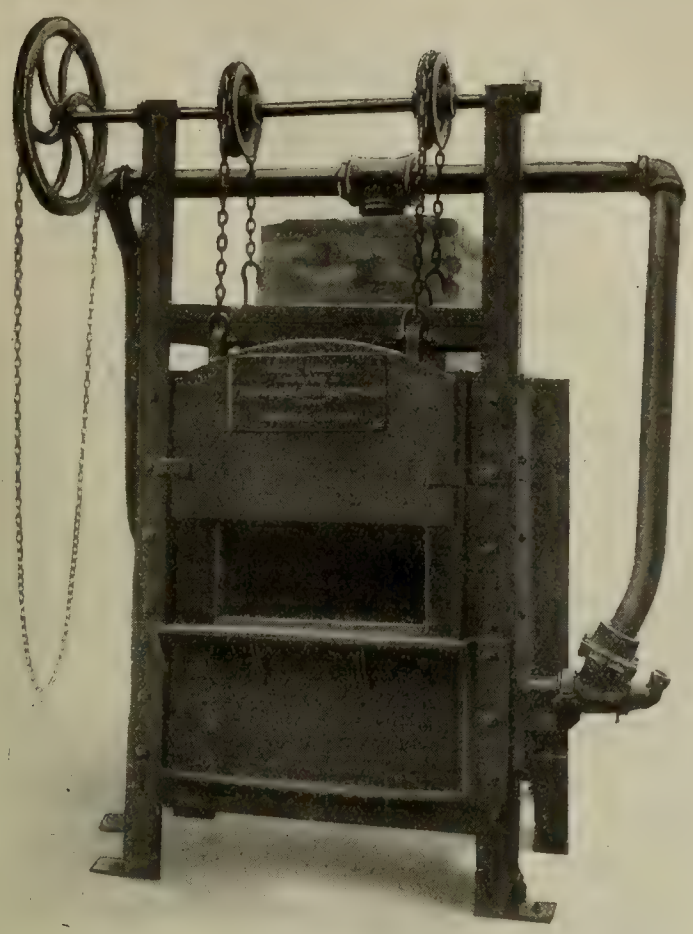
PRESSES FOR SHELLS
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
West Tire Setter Co., Rochester, N.Y.

PRESSES, FILTER
William R. Perrin, Ltd., Toronto.

PRESSES, DROP AND FORGING
W. H. Banfield & Son, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Charles F. Elmes Eng. Works, Chicago.
Can. Fairbanks-Morse Co., Montreal.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Toledo Machine & Tool Co., Toledo.

PRESSES, HYDRAULIC
John Bertram & Sons Co., Dundas.
Charles F. Elmes Eng. Works, Chicago.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Toledo Machine & Tool Co., Toledo.
West Tire Setter Co., Rochester, N.Y.
A. R. Williams Machy. Co., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Toledo Machine & Tool Co., Toledo.
A. R. Williams Machy. Co., Toronto.

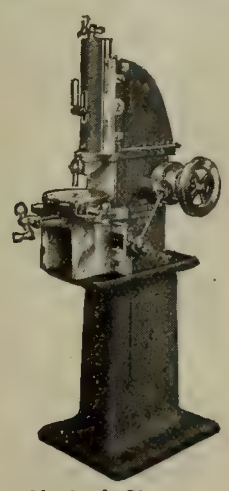


It's a "Mecol"

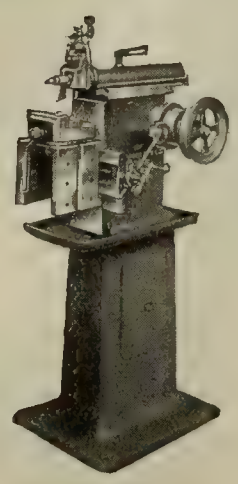
And that word "Mecol" stamps the character of the furnace. The best firms, the largest firms, small concerns with the systems and organization up to highest pitch have installed the "Mecol" products. They realize the value to be obtained from our furnaces.

Illustration shows our Gas Fired, Heat Treating Furnace with preheater. Consult us regarding your needs of this nature.

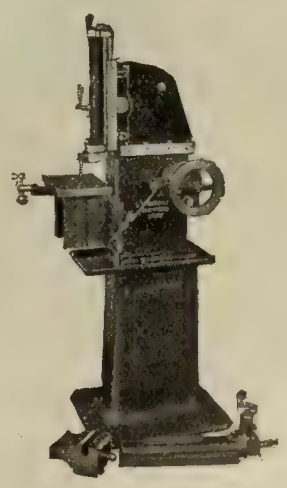
Mechanical Engineering Co., Ltd.
Three Rivers Que. Canada



3½-inch Slotter



7-inch Shaper



Combination

Three of the machines that by their cost-reducing features have established themselves "solid" with the home users and by these same merits are reaching out in foreign countries. A silent, but powerful message of the Rhodes efficiency.

Their capacity is greatly promoted by the adjustments which may easily and quickly be attached. For shaping, slotting, die making, tool making, etc., these machines stand paramount. An inquiry on your stationery will receive prompt attention.

The Rhodes Mfg. Company

Owned and Operated by the Jacobs Mfg. Co.

Hartford, Conn., U. S. A.

If interested, tear out this page and keep with letters to be answered.

PRESSES, BALING
William R. Perrin, Ltd., Toronto.
PRESSES, PNEUMATIC
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.
PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
PRESSES, SCREW
Barnes, W. F., & John, Co., Rockford, Ill.
Bliss Co., E. W., Brooklyn, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
William R. Perrin, Ltd., Toronto.
PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Erie Foundry Co., Erie, Pa.
Ferracute Mach. Co., Bridgeton, N.J.
PRODUCTION WORK
Windsor Mach. & Tool Co., Windsor, Ont.
PROPELLERS
Kennedy & Sons, Wm., Owen Sound, Ont.
PULLEYS
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal.
Dominion Machy. Co., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Positive Clutch & Pulley Works, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
The Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
PULLEYS, FRICTION CLUTCH
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Positive Clutch & Pulley Works, Ltd., Toronto.
Jones & Glassco, Montreal.
PULLEY MACHINERY, DRILLING AND TAPPING
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Wells Bros. of Canada, Galt, Ont.
PULP MILL MACHINERY
Can. Barker Co., Sault Ste. Marie, Ont.
PUMPS, AIR
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Smart-Turner Mach. Co., Hamilton.
PUMPS, CENTRIFUGAL
Bowser & Co., Inc., S. F., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Mach. Co., Hamilton.
Sturtevant Co., B. F., Galt, Ont.
PUMPS, FUEL OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.
PUMPS, HIGH PRESSURE
Blake Pump & Condenser Co., Fitchburg, Mass.
Charles F. Elmes Eng. Works, Chicago.
William R. Perrin, Ltd., Toronto.
Smart-Turner Mach. Co., Hamilton.
PUMPS, ALL KINDS
Blake Pump & Condenser Co. Fitchburg, Mass.
Can. Blower & Forge Co., Kitchener, Ont.
Charles F. Elmes Eng. Works, Chicago.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
PUMPS, HYDRAULIC
Blake Pump & Condenser Co., Fitchburg, Mass.
Charles F. Elmes Eng. Works, Chicago.
Metalwood Mfg. Co., Detroit, Mich.
Smart-Turner Mach. Co., Hamilton.
William R. Perrin, Ltd., Toronto.
PUMPS, LUBRICANT, OIL
Bellevue Industrial Furnace Co., Detroit, Mich.
Bowser & Co., Inc., S. F., Toronto, Ont.
Roper, C. F., Co., Hopedale, Mass.
Trahern Pump Co., Rockford, Ill.
PUMP LEATHERS
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.
PUMPS, ROTARY, POWER DRIVEN
Bowser & Co., Inc., S. F., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.
PUNCHES AND DIES
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Kitchener, Ont.
Ferracute Mach. Co., Bridgeton, N.J.
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Toledo Machine & Tool Co., Toledo, O.
PUNCHES, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Ferracute Mach. Co., Bridgeton, N.J.
Niles-Bement-Pond Co., New York.
PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Niles-Bement-Pond Co., New York.
W. A. Whitney Mfg. Co., Rockford, Ill.
PURIFYING AND SOFTENING APPARATUS
Scaife & Sons Co., Wm. B., Pittsburgh, Pa.
PYROMETERS
Bellevue Industrial Furnace Co., Detroit, Mich.
Can. Hoskins, Ltd., Walkerville, Ont.
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York City.
H. E. Streeter, New Birks Bldg., Montreal, Que.
Taylor Instrument Co., Rochester, N.Y.
Thwing Instrument Co., Philadelphia, Pa.
QUARTERING MACHINES
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.
RAILING, IRON AND BRASS (SEE GUARDS)
RAIL BENDERS
Niles-Bement-Pond Co., New York.
RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
Niles-Bement-Pond Co., New York.
RAILS, STEEL
Cumming & Son, J. W., New Glasgow, Canada.
RATCHETS
Keystone Mfg. Co., Buffalo, N.Y.
RAW HIDE PINIONS (SEE GEARS)
REAMER FLUTING MACHINES
Garvin Machine Co., New York.
REAMERS, ADJUUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
H. E. Streeter, New Birks Bldg., Montreal, Que.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Aikenhead Hardware Co., Toronto.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
McKenna Brothers, Pittsburgh, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
REAMERS, PIPE, CYLINDER AND LOCOMOTIVE
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
RECORDING INSTRUMENTS
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.
REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.
RESPIRATORS
Strong, Kennard & Nutt Co., Cleveland, Ohio.
RIVET MACHINES
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Grant Mfg. & Machine Co., Bridgeport, Conn.
National Machinery Co., Tiffin, O.
RIVETS, TUBULAR, BIFURCATED
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.
RIVETS, IRON, COPPER AND BRASS
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ot.
RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
RIVETING MACHINES, ELASTIC ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport, Conn.
High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.
ROLLER CHAINS
Jones & Glassco, Montreal.
ROLLS, BENDING AND STRAIGHTENING
John Bertram & Sons Co., Dundas
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo, O.
ROLLS, CRUSHING
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
RUBBER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland
RULES
Brown & Sharpe Mfg. Co., Providence
James Chesterman & Co., Ltd., Sheffield, Eng.
L. S. Starrett Co., Athol, Mass.
SAFETY APPLIANCES
Strong, Kennard & Nutt Co,, Cleveland, Ohio.
SAFETY APPLIANCE GOGGLES
T. A. Wilson, Reading, Pa.
SAND BLASTS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
SANDING MACHINES
Canada Machinery Corp., Galt, Ont.
SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Gardner, Robt., & Son, Montreal
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto
SAWS, CIRCULAR METAL
Hunter Saw & Machine Co., Pittsburg, Pa.
Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.
SAWS, HACK (SEE HACK SAWS)
SAWS, INSERTED TOOTH
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Napier Saw Works, Springfield, Mass.
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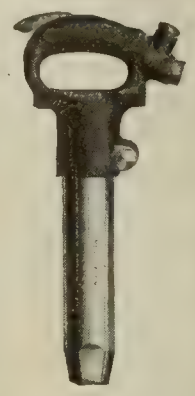

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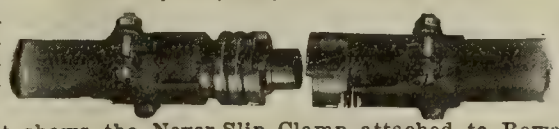

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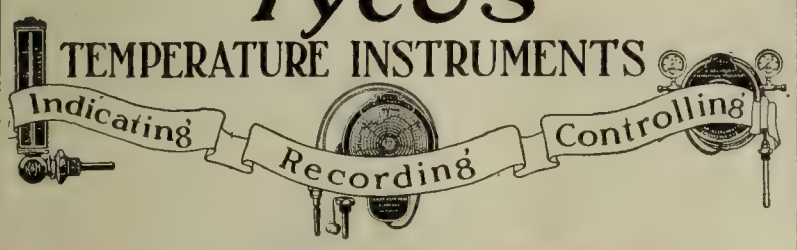

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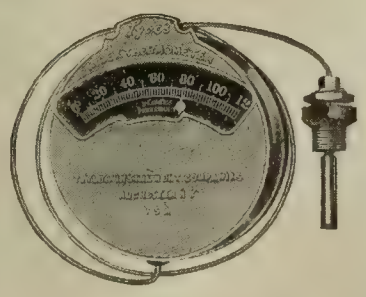

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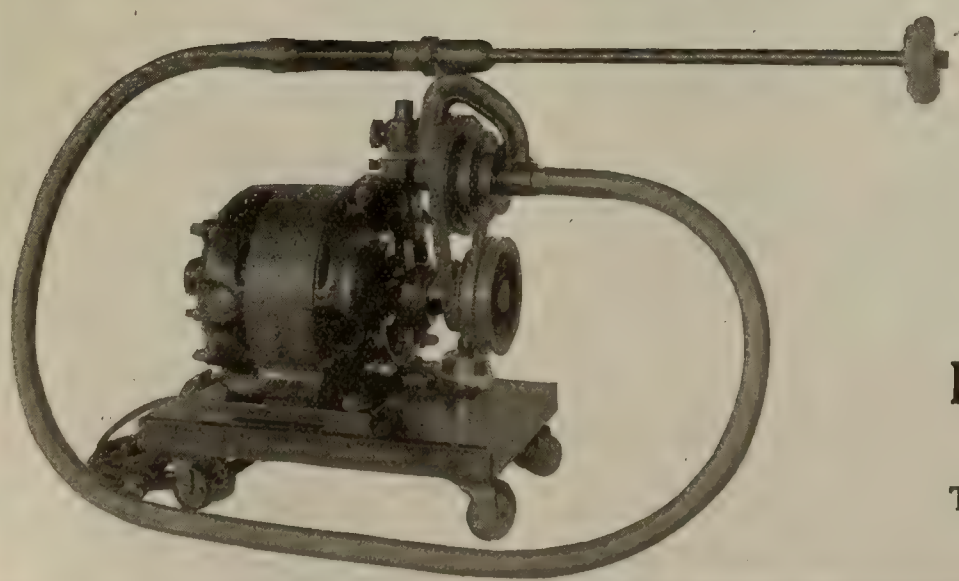

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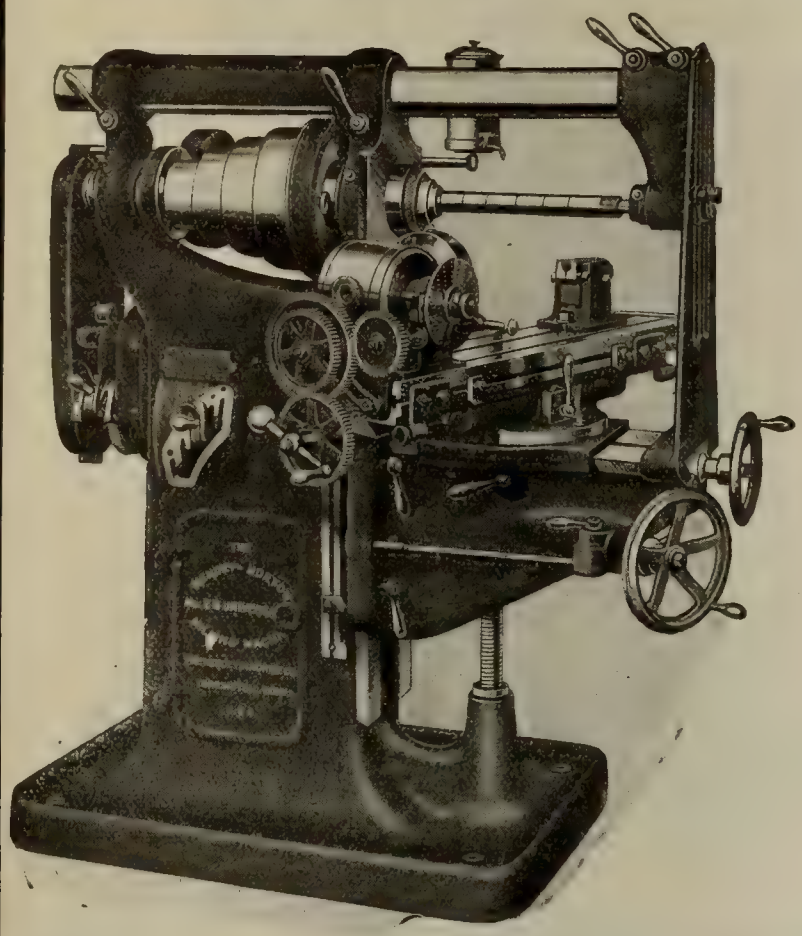

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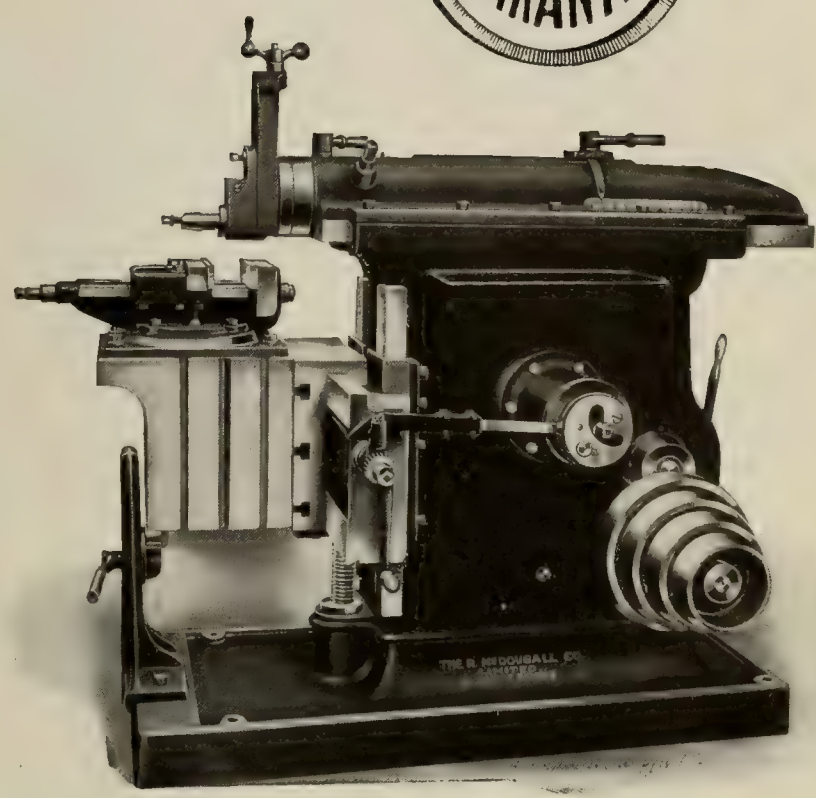

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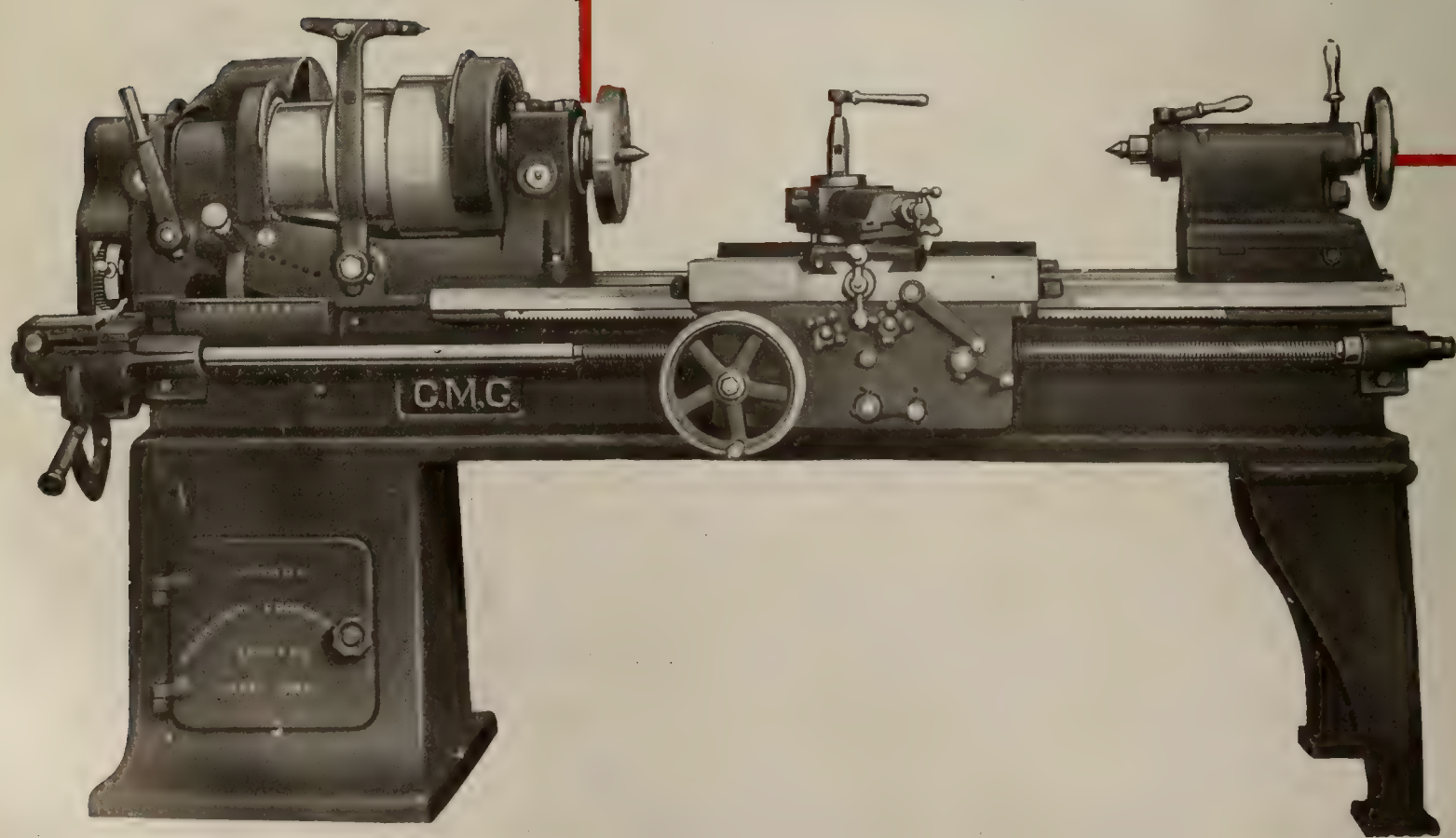

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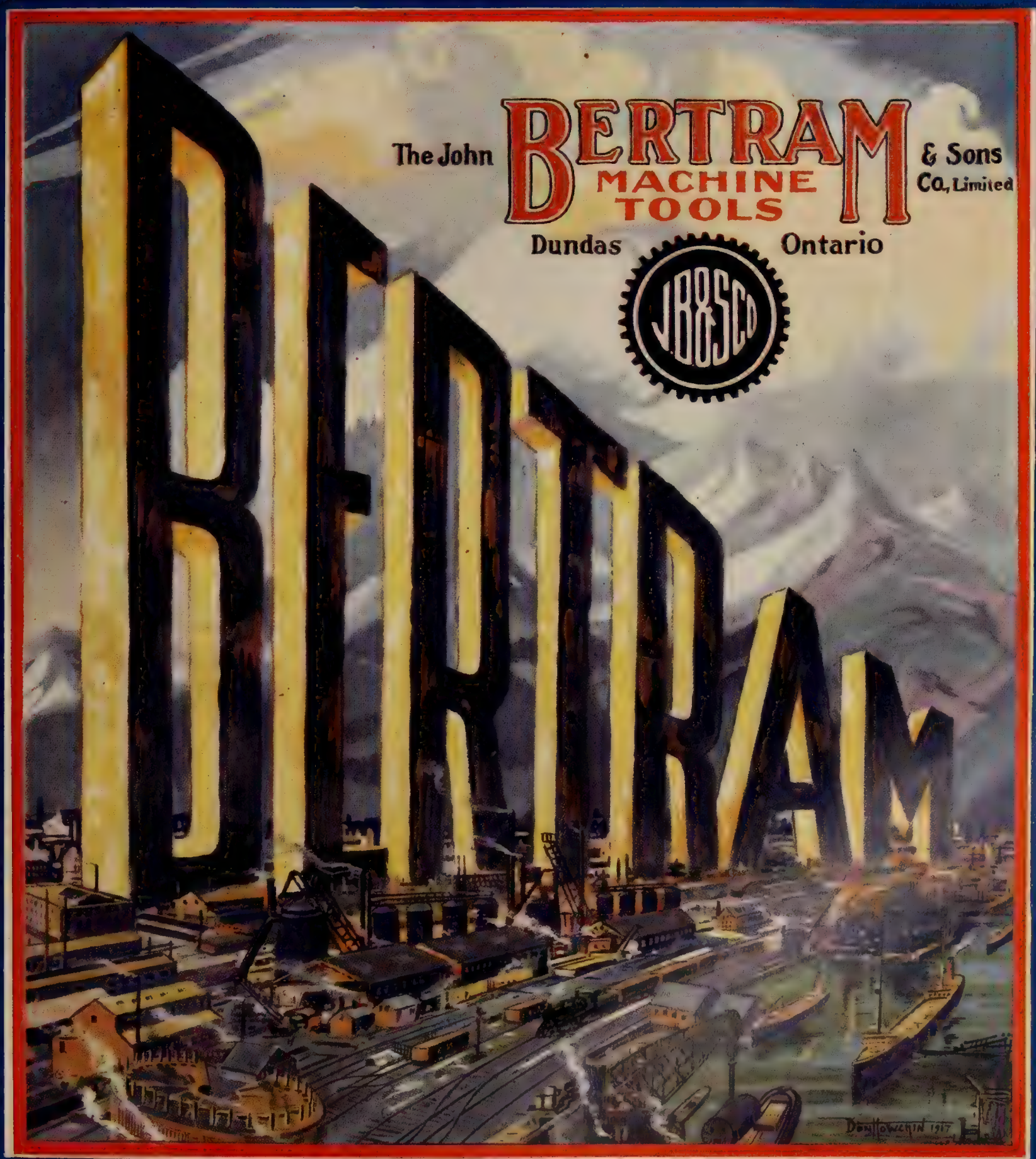

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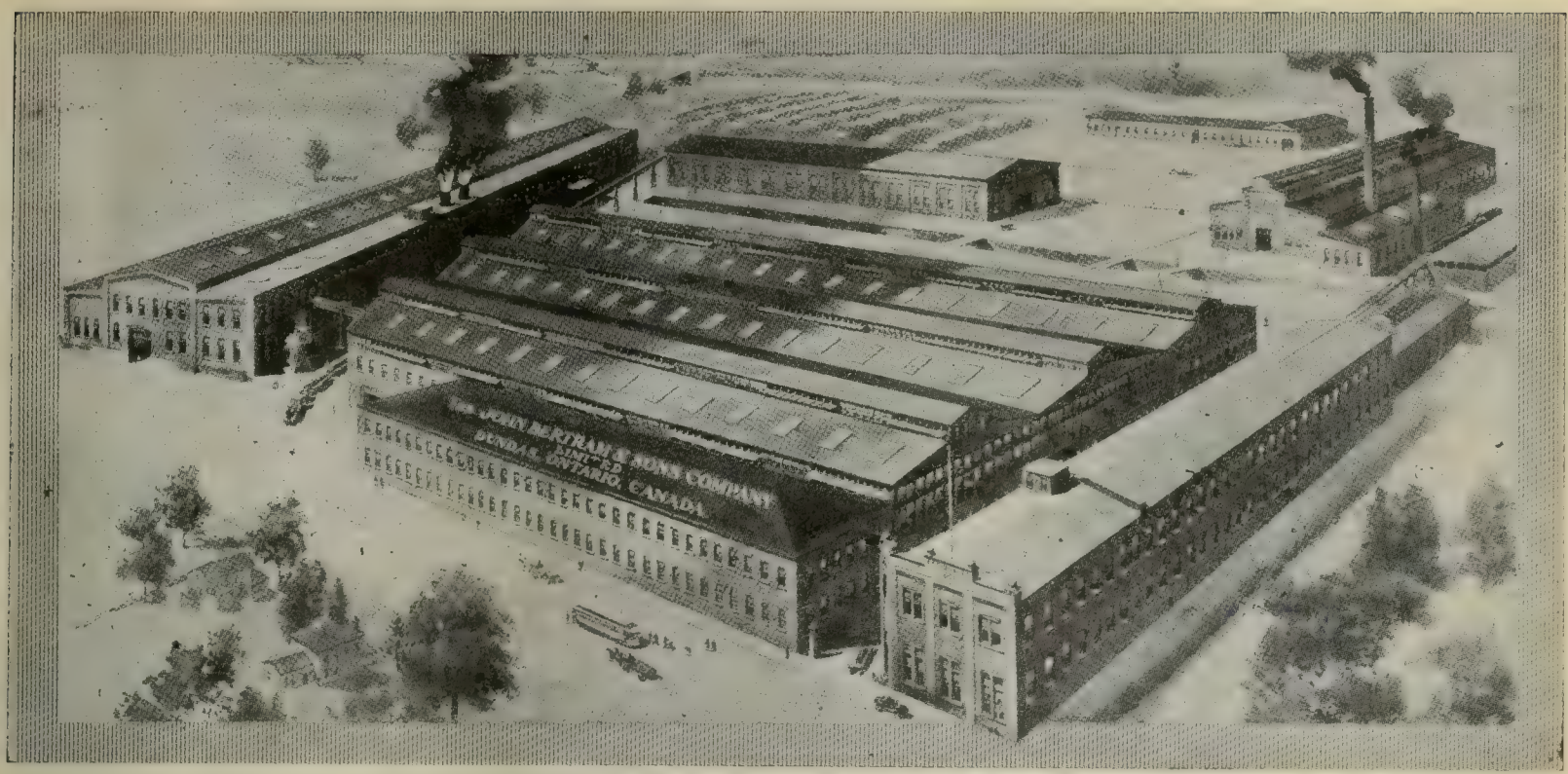
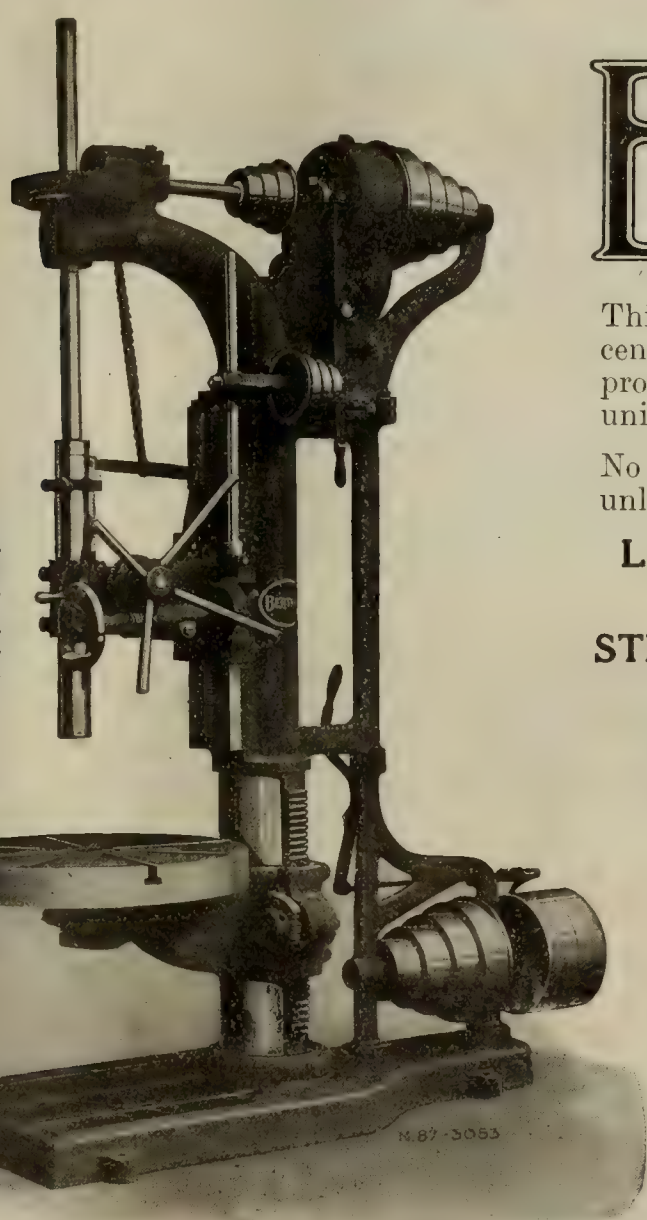




30-inch Vertical Drilling Machine. Photographs and full particulars gladly mailed upon request.

THE PLANT BEHIND

BERTRAM MACHINE TOOLS

This large plant represents the fruit of half a century of building quality and service into our product and proves the value of a consistent, universal square deal.

No plant could make such a wonderful advance unless its product and its reputation were good.

LOCOMOTIVE AND CAR SHOP EQUIPMENT

STRUCTURAL AND BRIDGE SHOP MACHINERY

REPAIR SHOP MACHINERY

GENERAL MACHINE SHOP EQUIPMENT

The John Bertram & Sons Co., Limited

DUNDAS, ONTARIO, CANADA

MONTREAL, 723 Drummond Bldg.
VANCOUVER, 609 Bank of Ottawa Bldg.
WINNIPEG, 1205 McArthur Bldg.
TORONTO, 1002 C.P.R. Bldg.

If any advertisement interests you, tear it out now and place with letters to be answered.

Our Sacred Duty

To contribute to Funds for relief does not discharge or liquidate the duty we owe to the brave men who are sacrificing their lives in the Trenches that we may live and enjoy the Blessings of Liberty and Happiness.

Better by far that we extend our Consideration in an effort to use in our Mills, our Factories, in our Cities and our Homes and all over this fair land, the products that Canadian labor produces, so that when the Boys come marching Home, they will be welcomed back to a Prosperous and Happy Canada.

Their sacrifice is worthy of our greatest effort--Our Duty is plain; Canada with Canadian Labor and Capital can produce, manufacture and distribute products sufficient to keep the Wheels of Industry Turning to the limit. The song of Prosperity and Happiness should ring out all over the land.

Let us sincerely pledge, to the extent of our needs, to purchase materials produced in Canada by Canadian Workmen, and the result of our efforts will return to us the Blessings of a Prosperous and Happy Nation.

The Steel Company of Canada
Limited

Hamilton Montreal

If any advertisement interests you, tear it out now and place with letters to be answered.

Our Material Duty

Consideration, Courtesy and Right Intent, all add to the sum of Human Happiness. Not only do they benefit those to whom they are extended, but they survive in various forms, and add to the well-being of the Business World.

Quality plus Service is the basis on which prices are made. Competition in Quality and Service is a healthy condition, but competition in price alone tends to business ruination. All Service rendered has a far-reaching effect which tends to a better understanding, and Quality is remembered long after the price is forgotten.

Let the Standard of the Canadian Manufacturer and Producer be as High as the Best, and "Made in Canada" officially stamped on any article correspond with the mark "Sterling" on Silver.

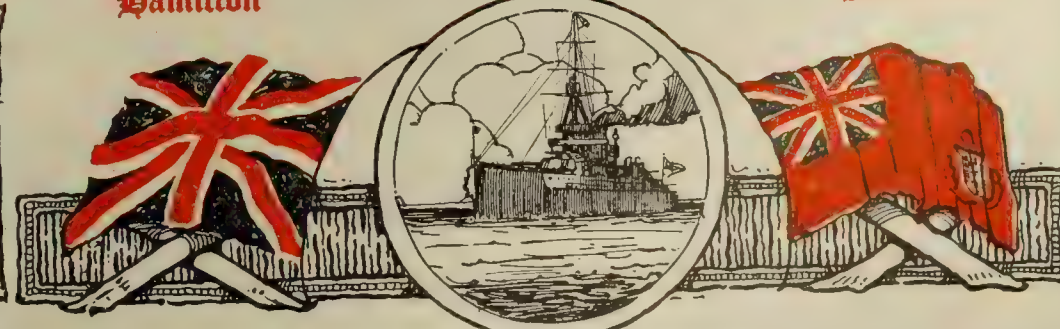
Let us attune ourselves to the Highest Standard of Quality and Service, and pledge to devote to this end all the means we possess, in the belief that Bigger Business will result through the gratitude of those we serve.

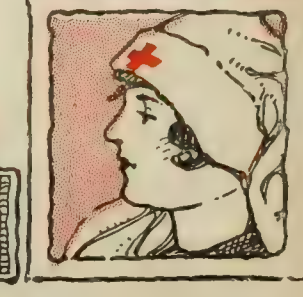
We are all one. No one can Thrive alone. No one Suffers alone. Industrial Prosperity tends to Happiness for all, and the Manufacturer who nails to the mast the Flag of Quality and Service is assisting in the development of a better and saner Business condition.

The Steel Company of Canada

Limited

Hamilton Montreal





TRADE MARK

of the Famous

"WACO"

BRAND

HIGH SPEED STEEL

AND

TWIST DRILLS

"DOUBLE WACO" Quality

Specially Adapted for Munition Work

"TURTLE" BRAND

High Class Tool Steel, Files, etc., of all descriptions.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

Reliance Steel Works

SHEFFIELD, ENG.

TRADE MARK

"WACO"

For particulars apply to our

Sole Representatives for Canada

TRADE MARK:

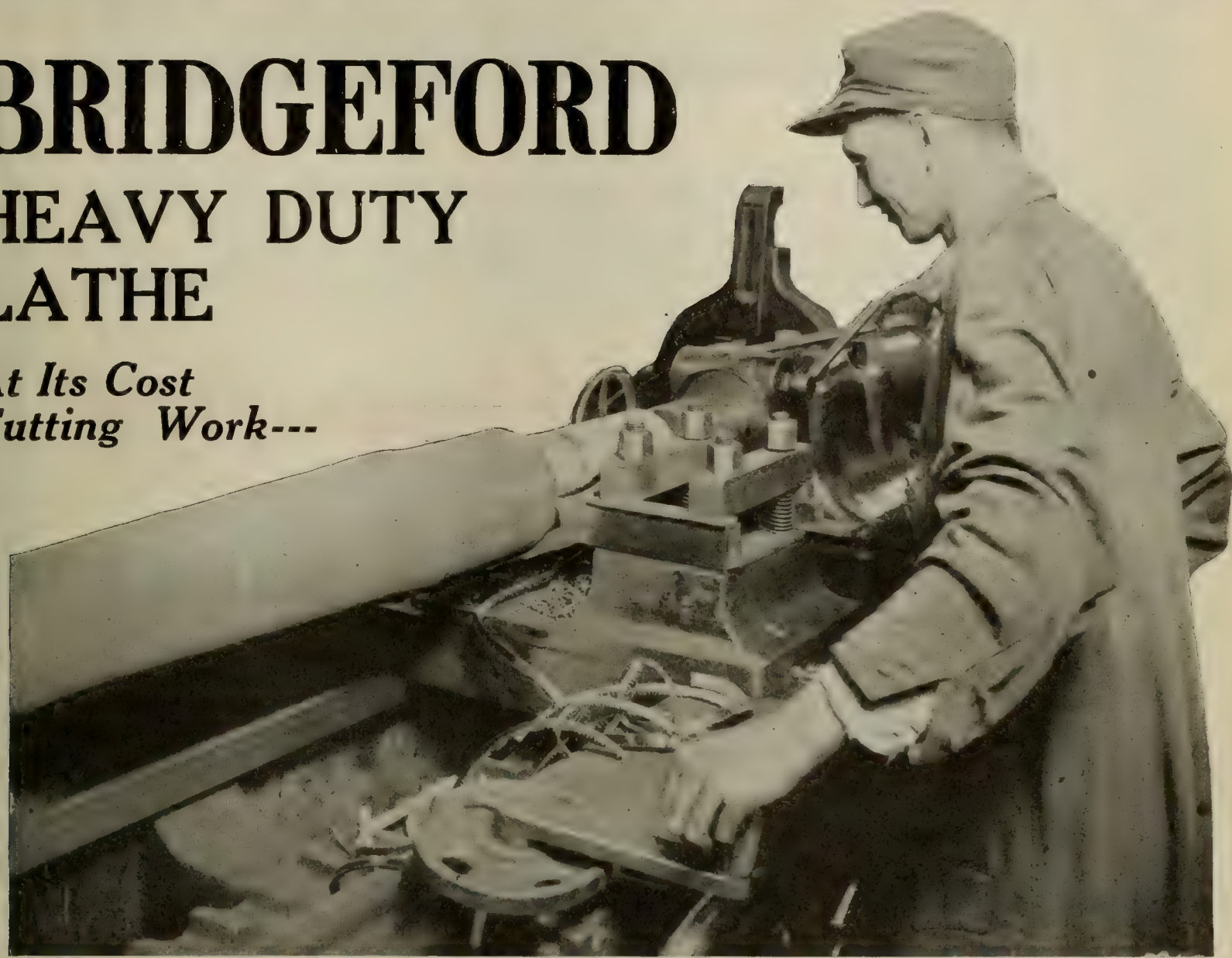
GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario

BRIDGEFORD

HEAVY DUTY LATHE

At Its Cost Cutting Work---



What those big chips say---

Big chips mutely but eloquently express big production. Here is a true picture of the Bridgeford in action in a well-known shop. It is rough-turning axles, taking off ¾ in. at the rate of 4 per nine hours. Material is 40 carbon steel. This is the kind of production needed to-day in the shops of Canada to meet with the demand for big and rapid production.

Designed for heavy duty, yet very simple throughout and convenient and easy to operate, it never fails to answer the hardest requirements within its range; and turns out work, the accuracy of which is never questioned.

Let us tell you of our full line of 26″ and larger Swing, Heavy Duty Lathes for every purpose.

BRIDGEFORD MACHINE TOOL WORKS

161 Winton Road N., Rochester, N.Y.

NEVER let it be said in this war of wars that we have failed to keep our troops well supplied. It is everyone's duty to support, to the utmost, these brave soldiers of the Republic.

There must be no shortage of Guns, Shells, Trucks, Aeroplanes, Ships, Etc.

"Red Cut Superior"

The Nationally Known First Quality

HIGH SPEED STEEL

The best for all machine work.

VANADIUM-ALLOYS STEEL CO.

PITTSBURGH, PA. Works at LATROBE, PA.

If interested in High Speed Steel and you care to receive our printed matter at intervals, send us your name and address for mailing list.

STOP false economy—purchase only that which you know is best.

Seconds and minutes count. Cheap, inferior tools mean excessive grinding and breakage. First quality tools mean VICTORY.

"Red Cut Superior"

The Nationally Known First Quality

HIGH SPEED STEEL

The best for all machine work.

VANADIUM-ALLOYS STEEL CO.

PITTSBURGH, PA. Works at LATROBE, PA.

If interested in High Speed Steel and you care to receive our printed matter at intervals, send us your name and address for our mailing list.

The Eagle & Globe Steel Co., Limited

Announcement

Permit us to advise you that we are taking over the business previously carried on under the style of THE EAGLE & GLOBE STEEL CO., Limited, commencing January 1st, 1918.

It is our intention to cater to the requirements of Munitions Manufacturers and other consumers operating their plants for the National good, and to this end we hope to be able to secure sufficient supplies from England to maintain complete stocks.

We take this opportunity of assuring you of our prompt and careful attention to your future inquiries and orders.

Arthur Balfour & Co., Limited

Dannemora Steel Works, SHEFFIELD, ENGLAND

Ontario Office and Warehouse:
36 Colborne Street, Toronto

W. A. BRADBURY
128 Craig Street West
Montreal, Quebec

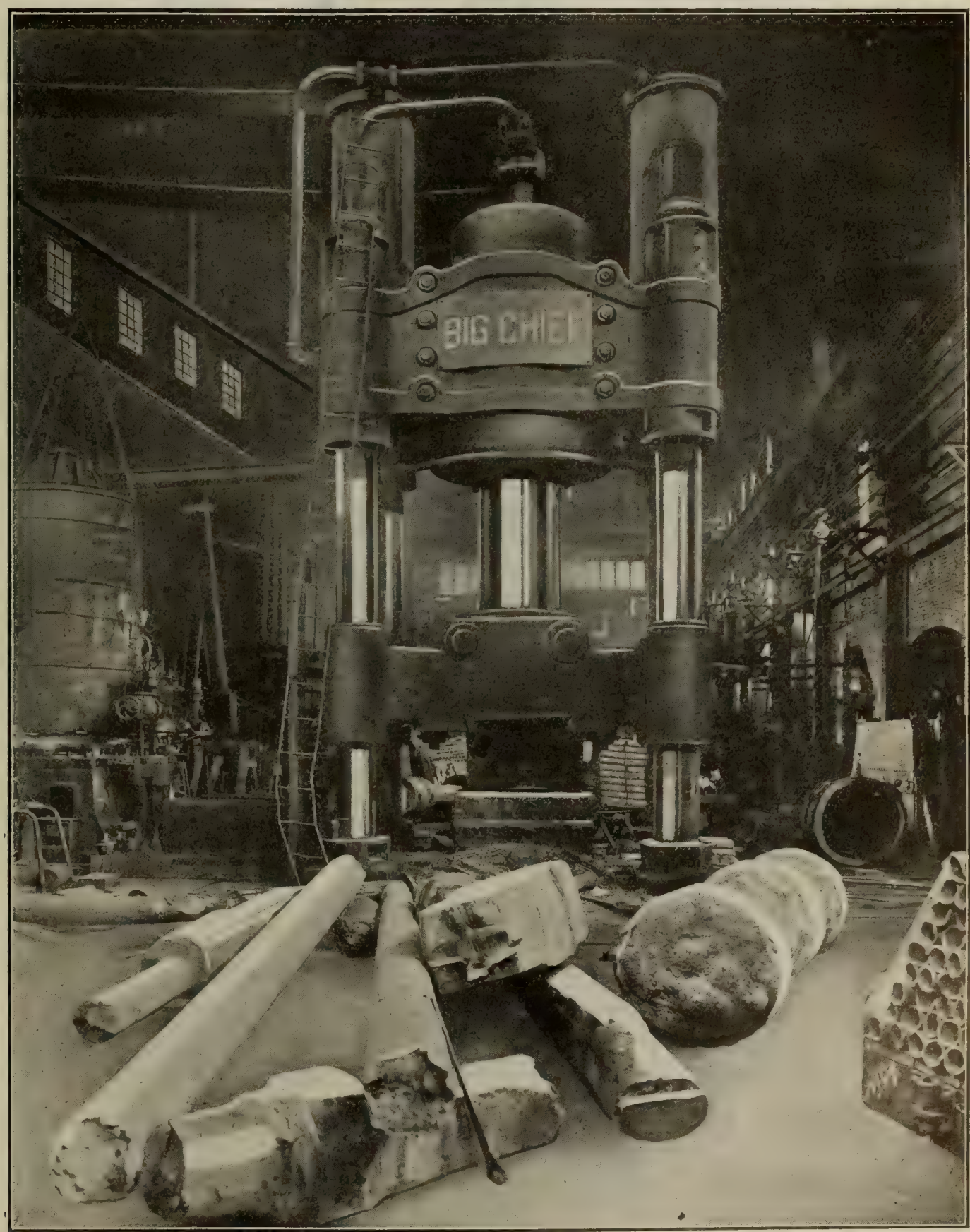
Winnipeg:
Dominion Equipment & Supply Co.

Vancouver: Frank Darling & Company

Nova Scotia Steel & Coal Company

Limited

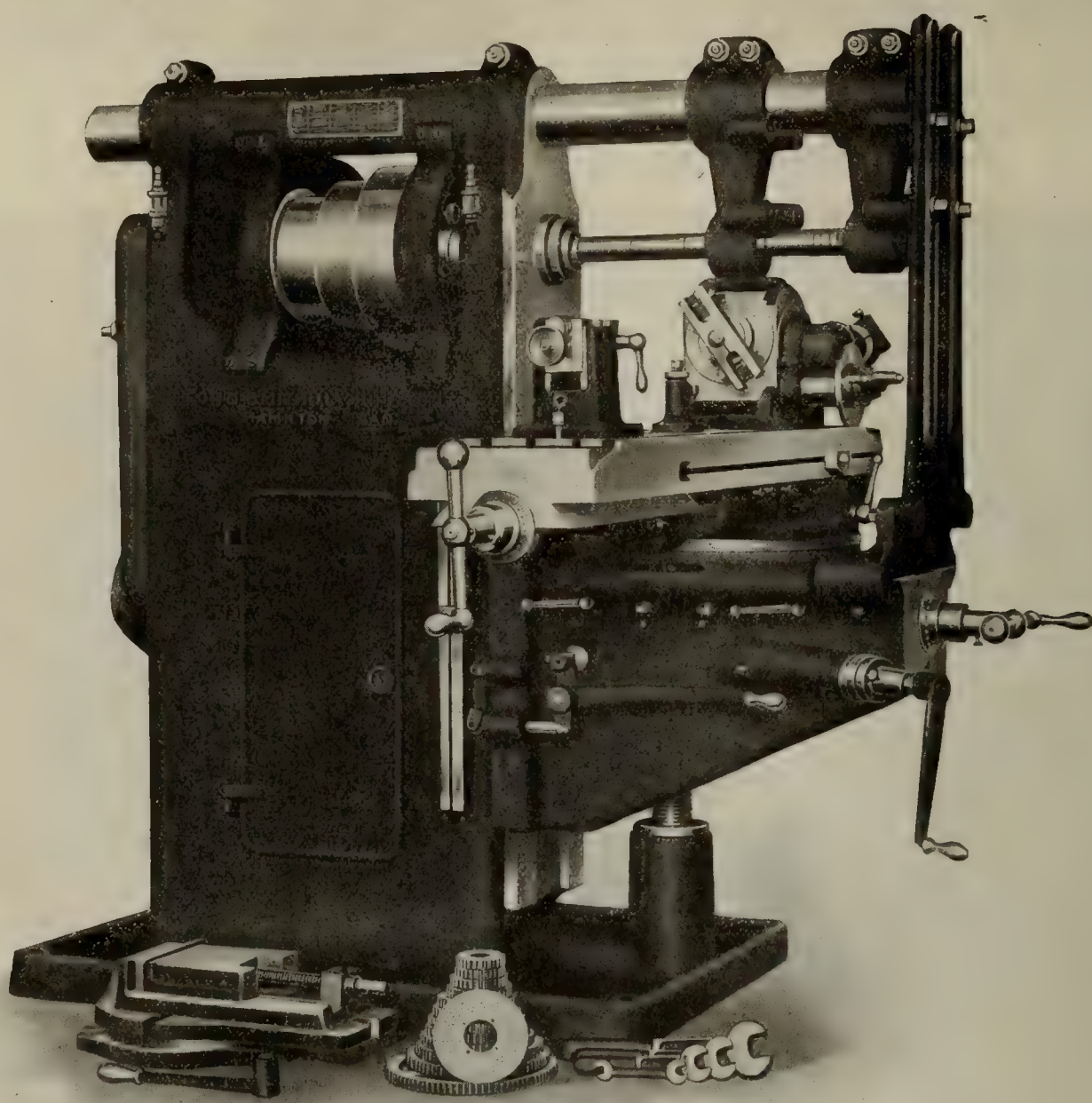
New Glasgow, Nova Scotia, Canada



4,000 TON STEAM HYDRAULIC FORGING PRESS FOR MARINE AND OTHER HEAVY FORGINGS.

The product of a modern steam-hydraulic press is denser and more homogeneous than can be obtained with the steam hammer, due to the effect of the blow of the latter not penetrating to the centre, in contradistinction to the uniform kneading effect of the press; while the amount of work that can be done by the latter at one time with little variation in temperature, strongly tends toward a better product. The greater uniformity and reliability of steam hydraulic forgings make their use imperative wherever high-class products are required.

The Ford-Smith Machine Company



FORD-SMITH MILLERS

are now built in 4 Styles

No. 2 Plain Miller with a range of 24" x 8" x 19"
No. 3 Plain Miller with a range of 34" x 10" x 20"
No. 2 Universal Miller with a range of 25" x 8" x 17"
No. 3 Universal Miller with a range of 30" x 10" x 19"

WE CAN FILL YOUR MILLER REQUIREMENTS

MAY WE FIGURE ON YOUR PRESENT WANTS.

The Ford-Smith Machine Company, Limited

HAMILTON ONTARIO CANADA

STELLITE

SAY, WHAT IS STELLITE?

THE HARDEST, TOUGHEST, FASTEST CUTTING METAL KNOWN.

EVER TRY IT?

LUCKILY, YES.

LIKE IT?

I SHOULD SAY.

THEN WHAT DOES IT CUT?

EVERYTHING,—STEEL, IRON, BRASS, BRONZE, IVORY, CELLULOID, SHELL, ETC.

FOR ALL PARTICULARS WRITE TO

Deloro Smelting & Refining Co., Ltd.

HEAD OFFICE AND WORKS—DELORO, ONTARIO

TORONTO
200 King St. W.

MONTREAL
315 Craig St. W.

If interested, tear out this page and keep with letters to be answered.

Steels of the Century

CENTURION-SUPERIOR No. 1
Finest grade high-speed steel for heavy work.

PO-KIP-C No. 3
Standard grade high-speed steel.

C.T.V. No. 5
Special tungsten valve steel for high power motors.

S.H.S. No. 7
Self-hardening tool steel.

OTDI. No. 9
High-grade alloy steel for hot-heading dies.

SEMI-RAPID No. 11
Special oil-hardening steel for taps, twist drills, milling cutters.

DOUBLE WIT-EDGE No. 21
High tungsten turning and finishing steel.

CLASS K No. 23
Regular grade turning and finishing steel.

WIT-EDGE No. 25
Tungsten-carbon steel for all around machine work.

CENTURY STEEL COMPANY of AMERICA

General Office and Works:
POUGHKEEPSIE, N.Y.

New York Sales Office: Century Steel Co. of America, 120 Broadway, N.Y. **Cleveland Sales Office:** J. E. Rawson, Rose Building. **Chicago Sales Office:** E. P. Bartlett & Co., 13-17 N. Jefferson St. **Philadelphia Sales Office:** Century Steel Co. of America, Real Estate Trust Bldg.

Steels of the Century

ARDNOX No. 27
Special alloy chisel steel for pneumatic tools.

CENTAUR No. 36
Oil hardening, non-shrinking die steel.

MARATHON No. 38
Crucible chrome steel for ball-races.

BLUE-RIBBON No. 40
Warranted best crucible cast tool steel.

BLUE-RIBBON No. 41
Warranted best crucible cast die steel.

W.D.P. No. 48
Warranted best crucible steel for wire drawing plates.

N.S.D. No. 55
High-grade alloy non-sinking die steel for cold stamping dies.

C.C.V. No. 57
Warranted crucible chrome vanadium.

C.C.N. No. 59
Warranted crucible chrome nickel.

CENTURY STEEL COMPANY of AMERICA

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The

Fairley Davidson Steel Co., Inc.

SPECIALISTS

	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
High Strength Steels	"Hehtemnd"
High Speed Steel	RUSHITOFF No. 6
Tool and Die Steels	"Fondwot" and "Giant"
Magnet Steels	Tungsten or Chrome
Non-Changeable Die Steel	Nugget "B" oil hardening

CHROME VANADIUM, oil hardening or case hardening

CHROME NICKEL, oil hardening or case hardening

Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

Canadian Agents:

THE FACTORY SUPPLY AND STEEL COMPANY

149 Craig Street West, Montreal, Canada

We carry a complete stock at our Montreal Warehouse

ELECTRITE-URANIUM

High-Speed Steel

Will amaze you in its ability to remove metal

The introduction of this rare element—"URANIUM"—into the mixture of our already superb cutting product, has supplied the final perfection of the qualities of toughness and durability which has been the hitherto impossible goal of metallurgical hopes.

Electric Furnaces, Automatically regulated, produce inevitably similar results at every melt.

We are ready to assist your inquiry in every way possible.

Write

Latrobe Electric Steel Company
Latrobe, Pennsylvania

LESCO

We guarantee shipment within 24 hours of receipt of order

SISCO

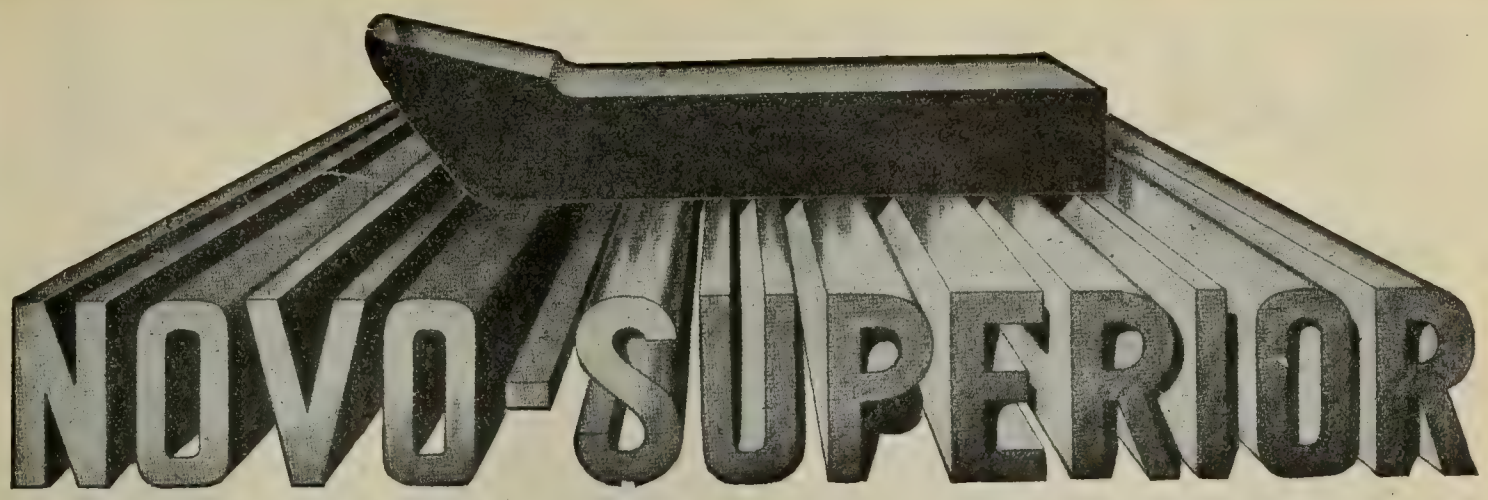
"Extra" "Special" "High Speed" **Tool Steels**

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SIS-CO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.

MONTREAL, QUE.



HIGH SPEED STEEL

INTRA STEEL

(CARBON-TUNGSTEN ALLOY)

COMBINING

(HARDNESS AND TOUGHNESS)

FOR

Punches, Dies, Taps, Cutting Tools, Gun Snaps, Gauges.
Dead Soft Annealed, Non-Fussy, Easiest Handled Tool Steel

TOOL STEEL—For Every Purpose

ALL MANUFACTURED BY

Sir Joseph Jonas, Colver & Co., Ltd., Sheffield, England

Twist Drills, Reamers, Taps, Hack Saw Blades, Milling Cutters,
General Machine Shop Supplies.

MUSIC WIRE FOR SPRINGS

Sole Agents for Canada H. Boker & Co., Inc. (Formerly Hermann Boker & Co.)

Established 1837 **332 St. James Street, Montreal, Que.** **Incorporated 1914**

If interested, tear out this page and keep with letters to be answered.

"CoCo" Turning Steel

"CoCo" Goes on Working Long After Other Steels Stop

"CoCo" will do the same in your shop—will cut faster or longer than other steels. Here are some proofs:—

"CoCo" is cutting Semi-steel Castings at 100 ft. per minute, cut ½" deep. 30 hours continuous service between grinds.

"CoCo" is turning Cast Iron Hydrant Caps at 169 ft. per minute, feed ⅛", cut ⅜" and turns 4 hydrants per grind where less than one per grind used to be standard.

"CoCo" is turning .40 Carbon O. H. Forged Rams at 95 ft. per minute, feed ¼", cut 3/32" turning 3 rams in the same time it formerly took to do one.

"CoCo" Steel does not do stunts—It does the work. It will do yours as well. Ask us.

COLONIAL STEEL COMPANY

PITTSBURGH BOSTON DETROIT NEW YORK PHILADELPHIA ST. LOUIS CHICAGO

FIRTH'S

"SPEEDICUT" HIGH SPEED STEEL

FOR

MACHINING SHELLS

Also STANDARD brands of Firth's CARBON TOOL STEEL. Sold in every country where Steel is used.

We Also Manufacture:

Armour-Piercing and **High Explosive Projectiles; Forgings** of every description for Heavy Ordnance, Propeller Shafts, Turbine and Engine Work, etc.

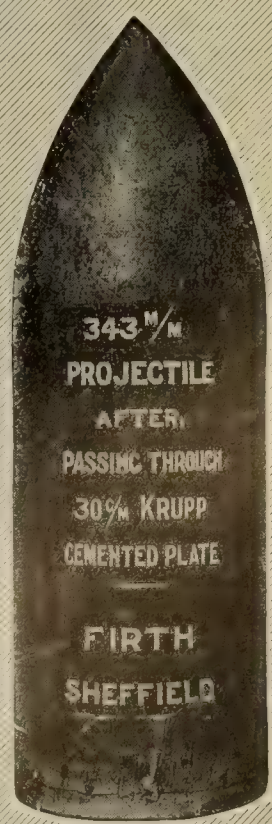
Nickel, Nickel-Chrome and other **Alloy Steels.**

Tyres, Sword and Bayonet Steel, Bullet-Proof Steel for Armoured Cars, Aeroplanes, etc.

Cutlery Steel, Stainless Steel for Cutlery, etc. (Originally discovered by our Research Dept. in 1913.)

Mining Drill Steel, Shoes and Dies, Files and Rasps, etc.

13½ inches Diam.



Weight 1,400 lbs.

Thos. Firth & Sons, Limited

Norfolk Works and Tinsley Works

SHEFFIELD, ENGLAND

Established 1840.

Works also at Riga, Russia; McKeesport, Pa., and Washington, D.C.

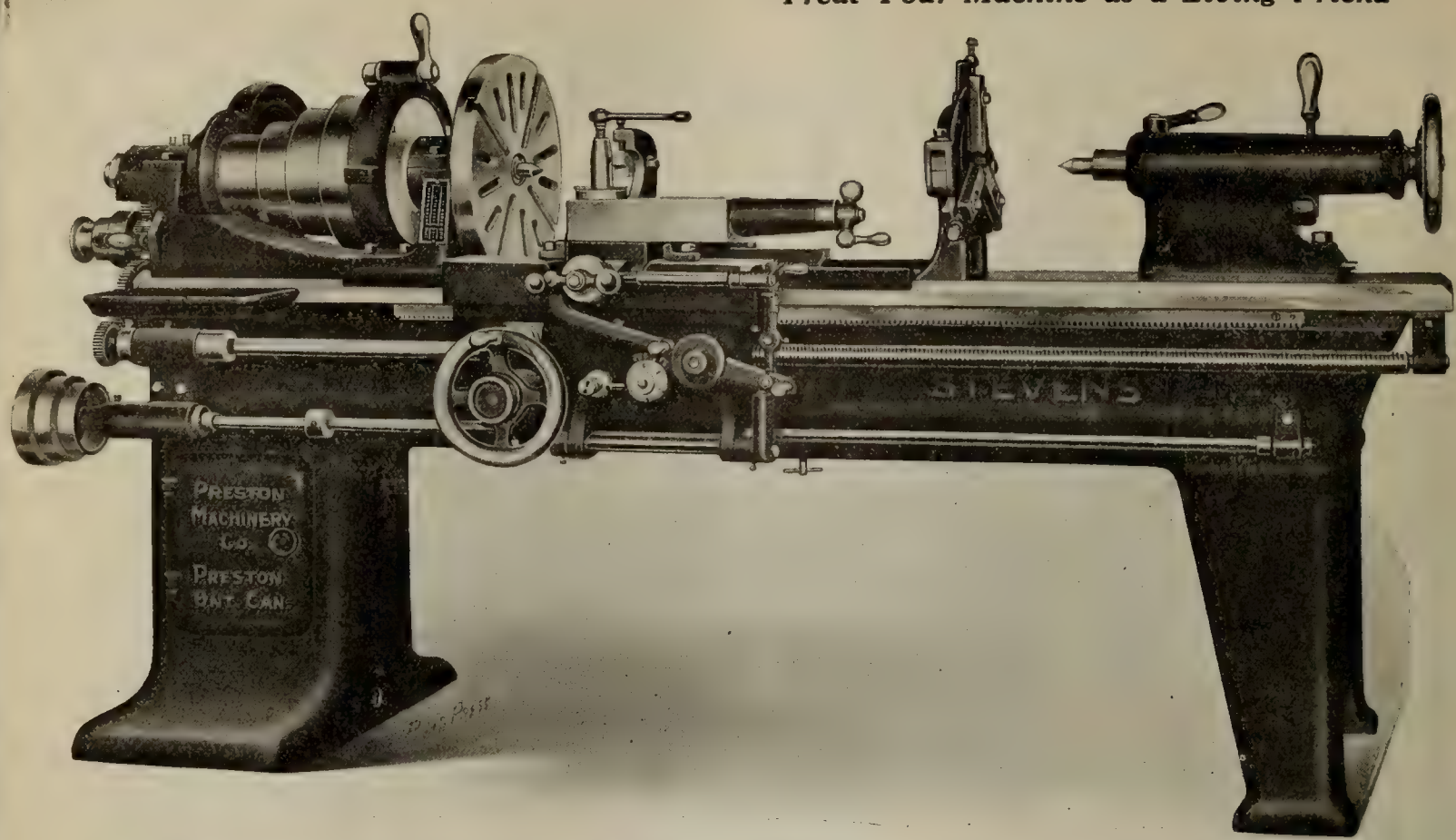
CANADIAN WAREHOUSES:

449 St. Paul St. W., MONTREAL
79 Adelaide St. W., TORONTO

J. A. SHERWOOD,
Canadian Manager

If any advertisement interests you, tear it out now and place with letters to be answered.

"Treat Your Machine as a Living Friend"



"Stevens" 18" Engine Lathe

Made in 6 ft., 8 ft., 10 ft. and 12 ft. Sizes.

Powerful and Accurate. Simple Yet Efficient.

A General Purpose Machine that will meet all your requirements and give 100 per cent. results.

200 OF THESE LATHES have been built and shipped by us to the MINISTRY OF MUNITIONS, LONDON, ENGLAND, for use in different British Arsenals. EACH AND EVERY LATHE was subjected to a rigid inspection and test by a BRITISH GOVERNMENT INSPECTOR before shipment was made. The following is a copy of their inspection sheet as supplied us:—

"INSPECTION SHEET"

For Lathes under Contract by Preston Woodworking Machinery Company for Imperial Munitions Board.

Lathe No. 101

LATHE SPINDLE TESTS MADE WITH BAR 12" LONG FITTING FIRMLY IN LATHE SPINDLE.

	In 12"
Fast head spindle parallel with surface of bed	Error .001
Fast head spindle parallel with side of bed	Error .000
Loose head parallel with side of bed	Error .0015
Loose head parallel with surface of bed	Error .000
Spindle center to run true	Error .001
Both centers same height loose head low, if any	Error .002
Both centers parallel with side of bed	Error .000
Saddle square to fast head	Error .0015
Test cone for running true	Error .007
Test face plate for running true when supplied — Error	side .0015 face .000

Date July 26th, 1916

I certify that the above lathe was inspected by me and found satisfactory.

R. F. HENDERSON,
Inspector for British Government

We have adopted THEIR TEST as our OWN TEST. That is why you can rely on the accuracy of every "Stevens" Lathe. **They must be ready to stand real tests of manufacture that they may back up our best possession—OUR REPUTATION.**

The Preston Machinery Co., Limited

PRESTON, ONTARIO, CANADA

Armstrong, Whitworth Plant at Longueuil, Que.

"A.W.P." "TYR"

High Speed Steels

"A.W.P." and "T.Y.R." High Speed Steels are the essence of **good quality** and for the purpose for which they are intended these Canadian made products are equal to the best in the world.

We have made a careful study of the requirements of the munition manufacturers and can supply Special Form Cutters for every operation in the manufacture of shells, including Gauges of all types.

CARBON AND ALLOY STEEL
MISCELLANEOUS SHOP TOOLS

ARMSTRONG, WHITWORTH OF CANADA, LIMITED

WORKS AT LONGUEUIL, QUE.

Montreal **Toronto** **Hamilton** **Winnipeg**

DOUBLE

MUSHET

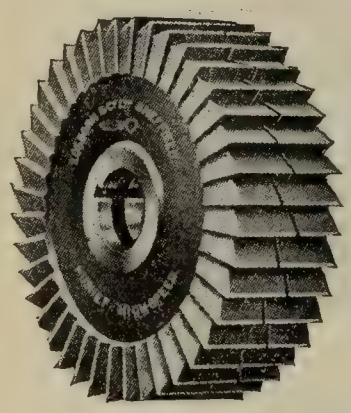
High Speed Steel

Carbon Steel

Gauge Steel

Alloy Steels

SOLE MAKERS
Samuel Osborn & Co. Ltd.
SHEFFIELD



Twist Drills and Reamers, Milling Cutters and Slitting Saws

Sam'l Osborn (Canada)
Limited
Head Office and Works: Montreal, P.Q.
Branch Office: Toronto, Ontario

URANIUM

HIGH SPEED STEEL

Fewer Trips to the Grinder

The man who leaves his machine every few minutes to grind his tool is an expensive employee. Something is wrong. Nine times out of ten it is the high speed steel he is using.

By adding Uranium to high speed steel we have produced a cutting steel that is tough, that is strong, that will hold its cutting edge after ordinary tools have crumpled or burnt.

Cut down those expensive trips to the grinder by putting Uranium to work for you.

STANDARD ALLOYS COMPANY
FORBES AND MEYRAN AVES.
PITTSBURGH, PENNA.

Seventeen Years in the Service of our Customers

YOU, as a user of Tool Steel, are vitally concerned with the Company manufacturing that steel. Obviously, for on it necessarily depend the quality of the steel and the service you receive.

THE VULCAN CRUCIBLE STEEL COMPANY was established in 1900 and has enjoyed a steady, normal growth—the result of satisfied customers. The personnel consists of experienced executive and practical men who have worked together for years. The equipment of the plant is modern and complete and assures you of prompt, dependable service—Natural gas, oil and electricity for melting; steam and electricity for mill driving, etc.

THIS COMPANY HAS ALWAYS CONSCIENTIOUSLY CARED FOR THE NEEDS OF ITS CUSTOMERS. In view of the conditions that have prevailed during the last two years, this is certainly a record of which to be proud.

These are some of the points that make relations with our customers so pleasant, and which are making the bonds of friendship and good-will stronger every day.

VULCAN CRUCIBLE STEEL COMPANY

ALIQUIPPA, *ESTABLISHED 1900* **PA., U.S.A.**

Represented in Canada by: MESSRS. NORTON, CALLARD & CO., Montreal, Que.

If any advertisement interests you, tear it out now and place with letters to be answered.

Forging Billets

Chrome Steel
Chrome Vanadium
Nickel Steel
Chrome Nickel

SPECIAL ALLOY STEEL
FOR
PUNCHES

PROMPT SHIPMENT.

WRITE FOR PRICES.

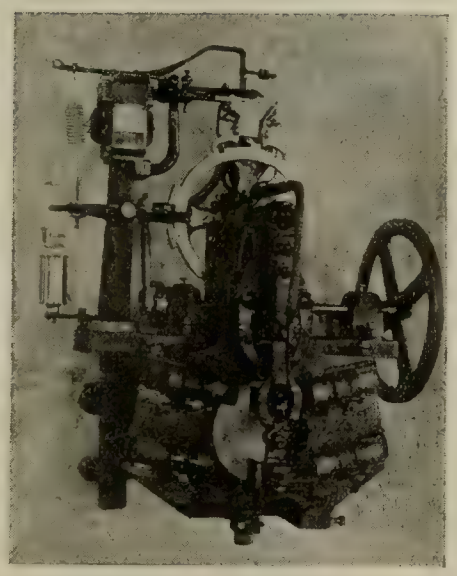
The ANDREWS STEEL CO.
NEWPORT, KY., U.S.A.

Complete Equipment for Electric Furnaces

Thury Regulators

The only practical automatic regulator for all kinds of electric furnaces. Over 400 in use.

Magnetic Brakes



Thury Regulator

Electric Winches

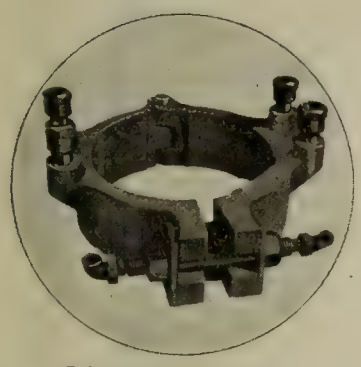
suitable for all sizes of electric furnaces

Steel Electrode Holders

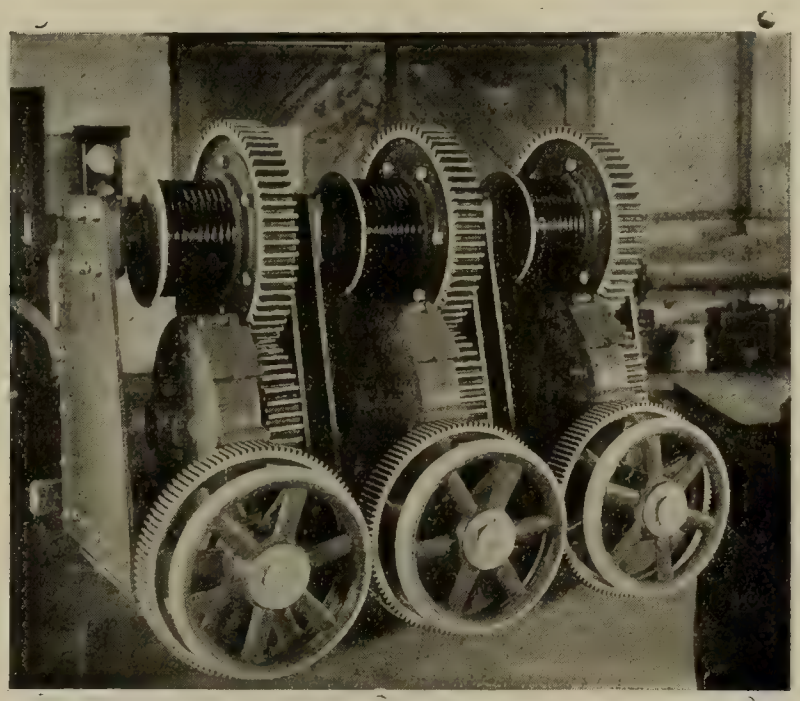
water-cooled for copper bar and pipe connections

Roof Cooler Rings

new style, give longer life to roofs of electric furnaces



Electrode Holder



Triple Winch for Steel Furnaces

Roof Cooler Ring

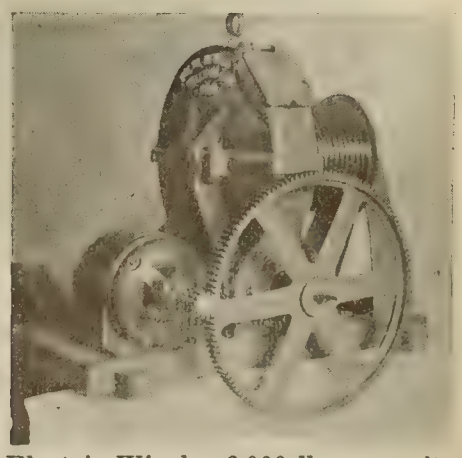
Electric Winch—3,000 lbs. capacity

VOLTA MFG. CO.

WELLAND, ONT.

CANADA

Users of electric furnaces can save money by buying from us. Apparatus built to customer's own design or special requirements.



Electric Winch—6,000 lbs. capacity

Address Enquiries to R. Turnbull, Box 416, Welland, Ont.

BROWN'S

BEAVER BRAND METALS

MADE IN CANADA

The following are Beaver Brand Products, all dependable and satisfactory:

Copper, Brass, Bronze, Canada Silver, and Gilding Metal in Sheets, Rolls, Plates and Rods. Naval Bronze, Yellow Metal and Muntz Metal in Sheets and Rods for Shipbuilding requirements. Specify Beaver Brass Rod for Drilling and Free Cutting. Extruded Shapes.

Guaranteed Ingot Metals — Yellow, Red and Composition Ingots.

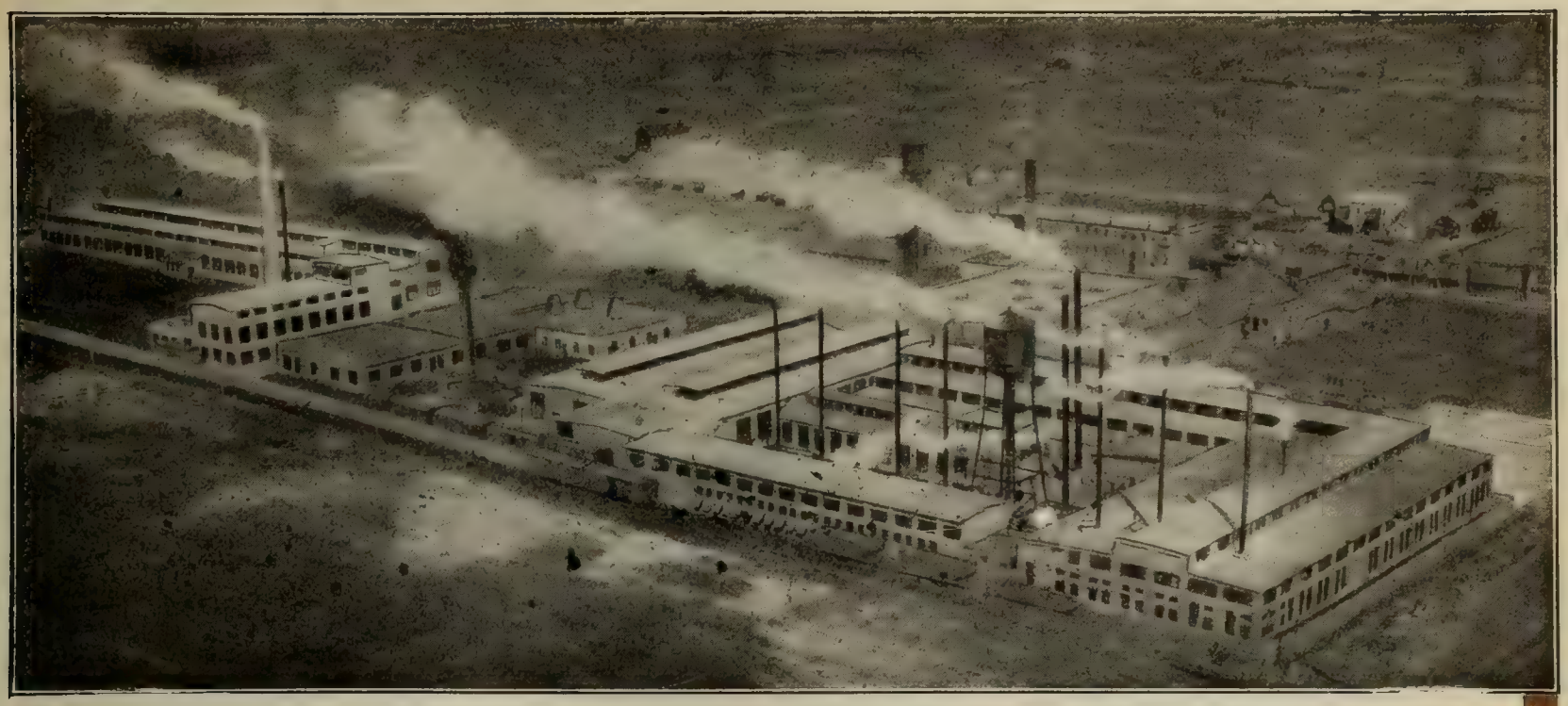
We are Purchasers of Copper Bearing Material. Send an order and become acquainted with the merits of Beaver Brand Products.

BROWN'S COPPER AND BRASS ROLLING MILLS, LTD.

GENERAL OFFICES AND MILLS:

NEW TORONTO (Near Toronto) ONTARIO, CANADA

COPPER & BRASS BROWN'S QUALITY ROLLING MILLS



This is a Reproduction from an Actual Photograph (not a Visionary Drawing) of the Works of BROWN'S COPPER & BRASS ROLLING MILLS CO., Limited, at New Toronto, near Toronto, Canada.

Ingots

Copper, Brass, Bronze and Composition

We make any alloy according to your Formula. Our INGOT COPPER is 99.9% pure—ideal for high grade castings.

We purchase Copper Bearing Material. All enquiries receive prompt attention.

Brown's Copper & Brass Rolling Mills, Limited

NEW TORONTO - - - - ONTARIO

Near Toronto

COPPER & BRASS BROWN'S QUALITY ROLLING MILLS

Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy chucking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6" shells.

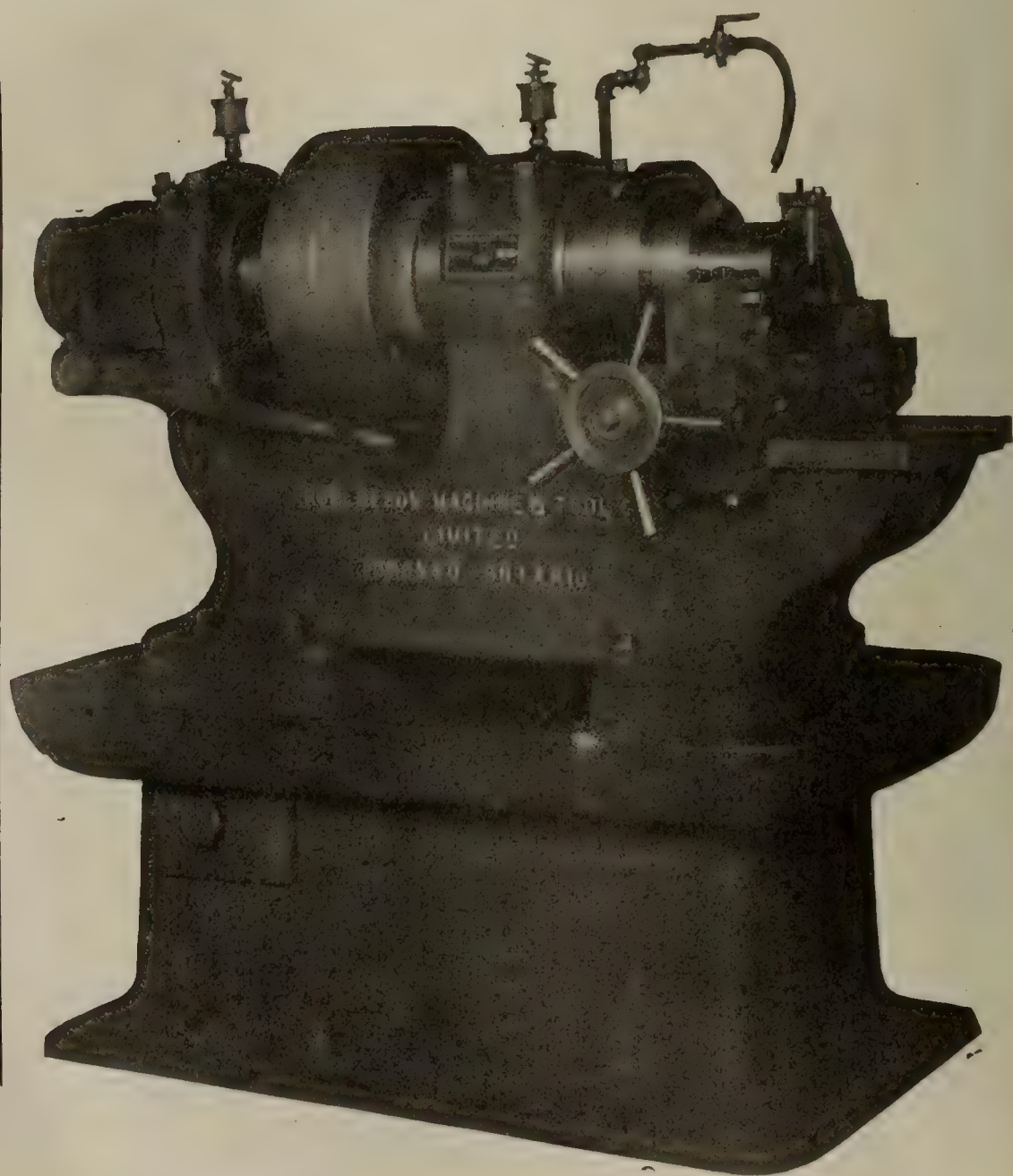
Roelofson Machine & Tool Co., Ltd.

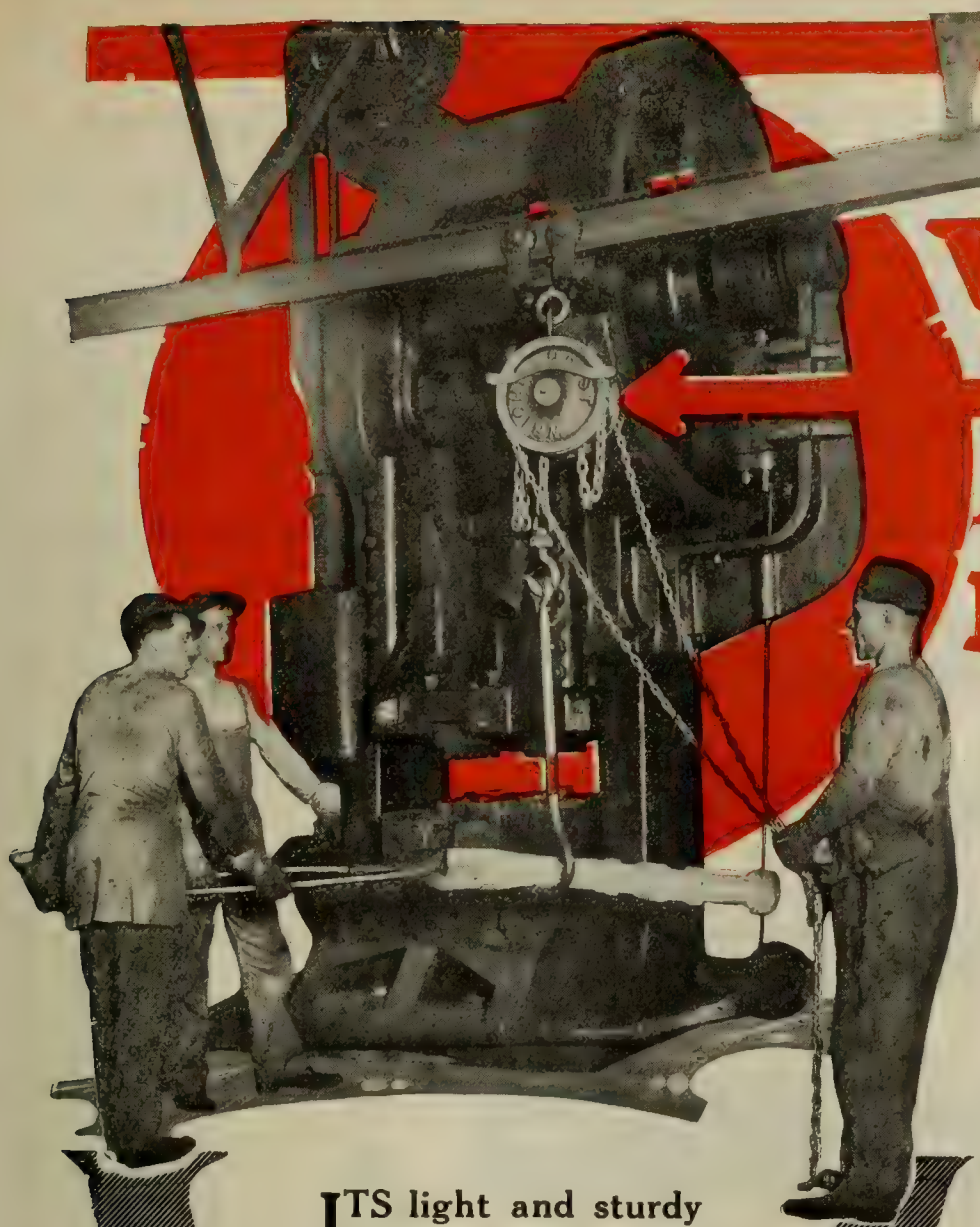
Head Office. 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6" shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.





WRIGHT

High Speed HOISTS

IN your organization think over every detail, from the raw beginning to the finished product. Is there any unnecessary handling of the material? Some precarious method that momentarily threatens disaster? Some point or points where a speedy, strong hoist could handle the work quicker, more thoroughly and more economically?

The Wright High Speed Steel Hoists are featured with a non-fouling chain guide. Constructed of steel they represent the highest quality on the market. (One Canadian firm installed 70 in their shell plant). Let us give you further information on this subject.

ITS light and sturdy construction makes it adaptable to a multitude of uses.

Wright Mfg. Company
Lisbon Ohio U.S.A.

Canadian Distributors:
A. R. WILLIAMS MACHINERY CO., LIMITED
Toronto, Winnipeg, Vancouver, St. John, N. B.

WRIGHT

BRITISH MADE

ENOX

BRITISH MADE

HACKSAW BLADES

ARE THE BEST

AGENTS IN CANADIAN TOWNS WANTED

Liberal Terms offered to firms willing to carry stocks and act as sole agents for the district.

Sole Makers:—

FRY'S (LONDON) LTD. 46 Upper Thames St., E.C. 4
Works - Greenwich, S.E.10

AN ENTIRELY BRITISH COMPANY

MAIN PLANT OF MACKINNON, HOLMES & CO., LIMITED, SHERBROOKE, QUE., CANADA.

Engineers, Manufacturers and Erectors of Steel Structures

Our new and extensive plant and the most modern methods of manufacturing enable us to turn out and complete work in the quickest time.

We Specialize in

TANKS

Steel Plate and Structural Work

FOR

Pulp and Paper Mills, Chemical Works, Oil Refineries, etc. We also build Steel Structures to support them.

PENSTOCKS
Illustration shows the class of work we are doing in this line for Pulp and Paper Mills.

Miscellaneous Steel Plate and Structural Steel Work

Engineers, Manufacturers and Erectors of Steel Structures, such as Bridges, Towers, Tanks, Penstocks, Roof Trusses, Columns, Smoke Flues and Stacks, Coal Bins, Ore Bins, Buckets, Stills, Air Receivers, etc.

We also have a first-class, up-to-date hydraulic press equipment for forging plugs, sockets, shrapnel, high explosive shells and other similar articles.

First-class work. Estimates and full particulars gladly furnished. Prompt deliveries.

MacKinnon, Holmes & Co.

LIMITED

MacKinnon Steel Co., Limited

SHERBROOKE, QUE., CANADA.

DUMORE

PORTABLE ELECTRIC GRINDERS

To-day, the big call everywhere is for increased production. That means methods of greater efficiency—**in every part of the shop—in performing every operation.**

For grinding your tools, gages and dies and on similar work, use Dumore Grinders,—the highest speed portable grinders made.

The high speed of Dumore Grinders gives the correct surface speed to the various size of emery wheels. Another important feature of these grinders is their extreme accuracy. They leave no chatter marks, no bell mouth or taper to the work. That's because the armatures are dynamically balanced, eliminating all vibration.

There are three standard equipments, all operating on either direct or alternating current—all equipped with high-grade ball bearings—quality grinders in every way.

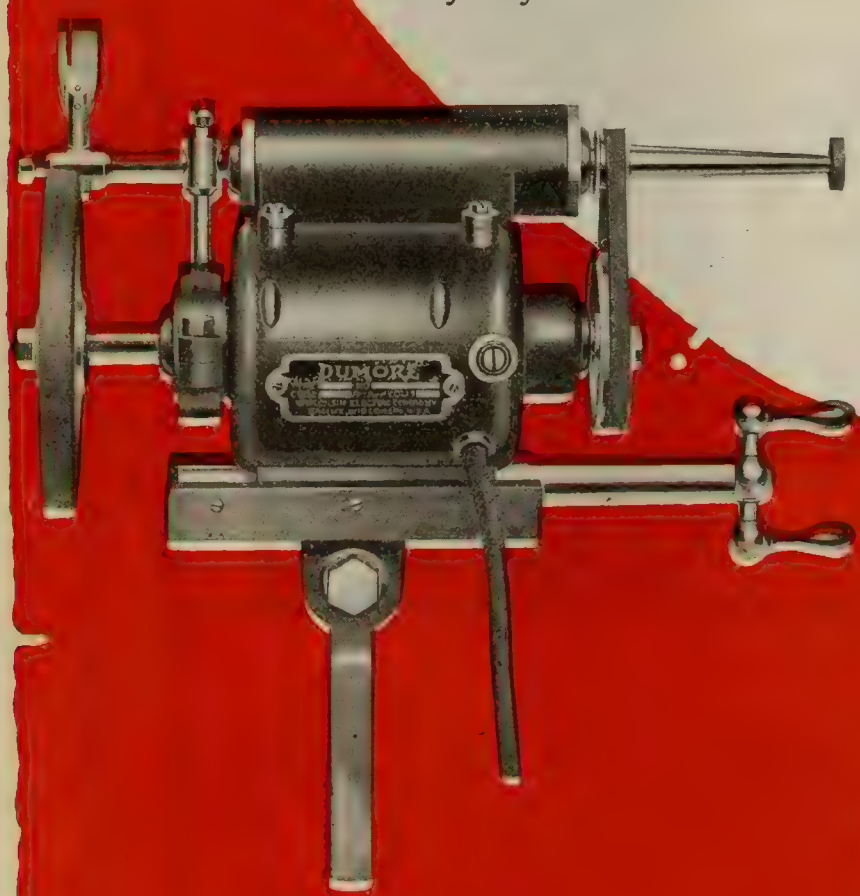
Wisconsin Electric Co.

1718 Dumore Bldg., RACINE, WIS.

Sold in England by
CANADIAN-AMERICAN MACHINERY CO., LIMITED
8 Bouverie St., London E. C., England.

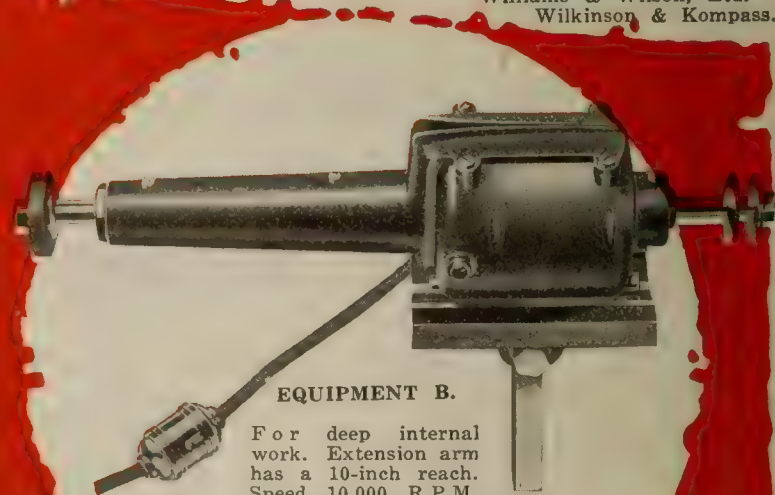
Dumore Grinders are carried in stock by the following Canadian Distributors:

Aikenhead Hardware Company, Ltd.
Canadian Fairbanks-Morse Company, Ltd.
General Supply Company of Canada, Ltd.
Mechanics Supply Company, Ltd.
McNaughton-McKay Electric Company.
A. R. Williams Machinery Company, Ltd.
Northern Electric Company.
H. W. Petrie, Ltd.
Williams & Wilson, Ltd.
Wilkinson & Kompass.



EQUIPMENT A.

This equipment is for general tool room use. It includes High Speed Internal Spindle A, with a reach of 3 inches, speed 30,000 R.P.M. Motor spindle speed is 10,000 R.P.M. Comes fully equipped. Weighs 17½ pounds.



EQUIPMENT B.

For deep internal work. Extension arm has a 10-inch reach. Speed 10,000 R.P.M. Arm is interchangeable with internal spindle on Equipment A.

DUMORE JR.

PORTABLE ELECTRIC GRINDER

Here is another Dumore quality product—brought out to fill the demand for a light tool post grinder which will do accurate work.

All the popular features of the larger Dumore grinders are incorporated in the Dumore Junior. It's a high speed grinder—operates at 20,000 R.P.M. The armature is dynamically balanced so there is no vibration. This is done by special machines, designed by us and manufactured in our own shops. Dumore Grinders are the only portable grinders that have this feature.

The Dumore Junior is used for either external or internal grinding. It can be attached to any lathe, shaper or milling machine and as it is light it is very handy for portable use.

Let us send you literature on the Dumore Junior or any of the standard equipments. Write us to-day.

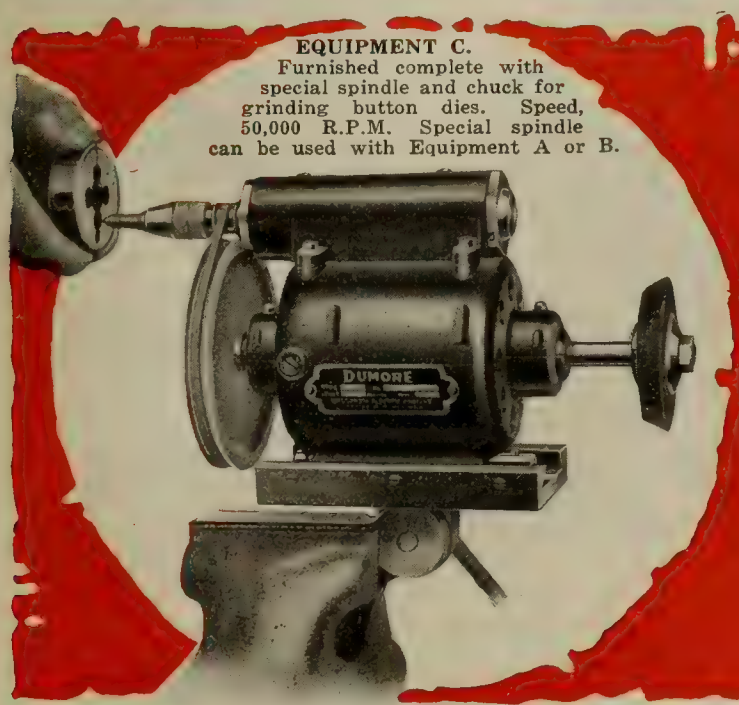
Wisconsin Electric Company

1718 Dumore Building, RACINE, WIS.

Sold in England by Canadian-American Machinery Co., Ltd., 8 Bouverie St., London, E.C., Eng.

Dumore Grinders are carried in stock by the following Canadian Distributors:

Aikenhead Hardware Company, Ltd.
Canadian Fairbanks-Morse Company, Ltd.
General Supply Company of Canada, Ltd.
Mechanics Supply Company, Ltd.
Northern Electric Company.
McNaughton-McKay Electric Company.
H. W. Petrie, Ltd.
A. R. Williams Machinery Company, Ltd.
Williams & Wilson, Ltd.
Wilkinson & Kompass.



EQUIPMENT C.
Furnished complete with special spindle and chuck for grinding button dies. Speed, 50,000 R.P.M. Special spindle can be used with Equipment A or B.

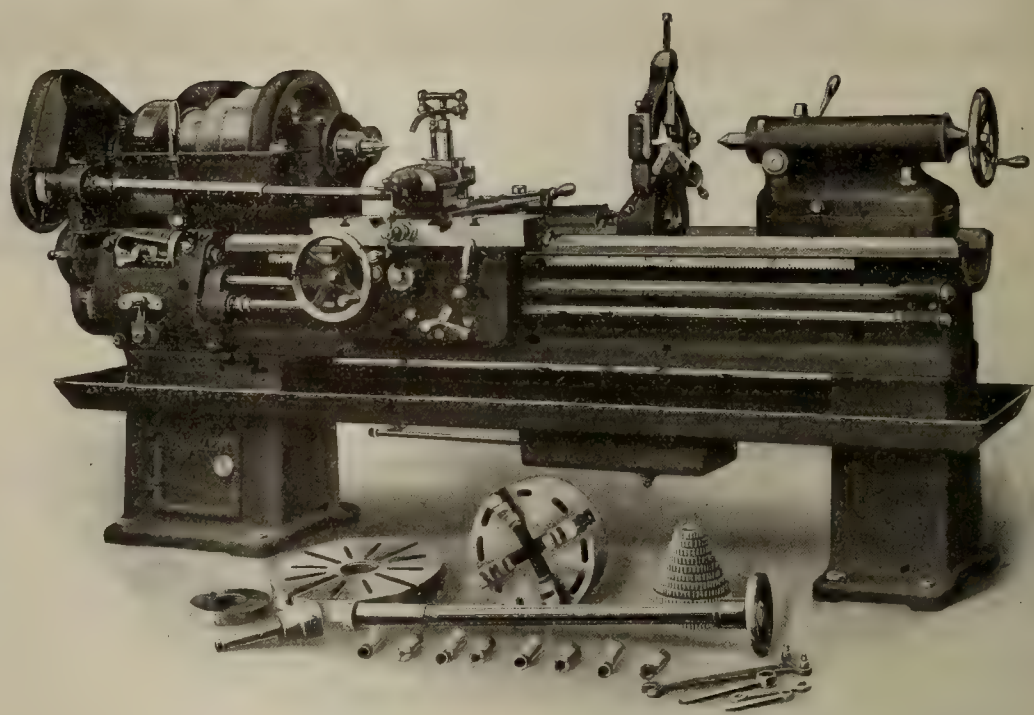
THE DUMORE JUNIOR.

This grinder is furnished with extension shaft of 2½ inches to accommodate wheels as small as ⅜" in diameter. With this extension you can handle very fine work. Speed, 20,000 R.P.M. Weight 8 pounds.

Labor Shortage?

You can combat this problem with OLIVER TOOLS

Even the most up-to-date shops have a tool here and there that is not up to the efficiency mark demanded by war time conditions. Put Oliver Time Saving tools in their place and meet the skilled labor shortage.

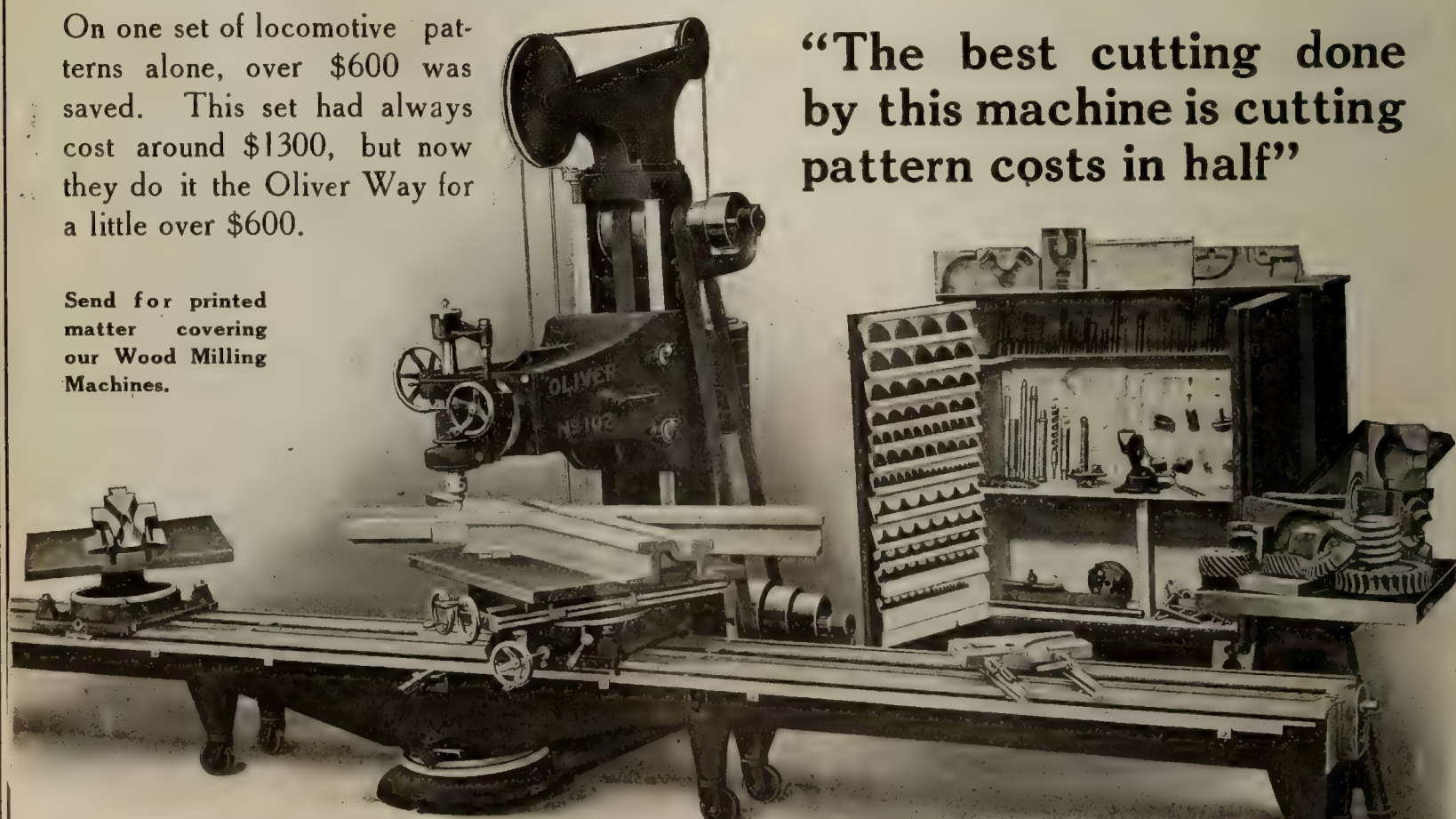


In one Pattern Shop $30,000 worth of patterns had been destroyed in a flood, but with the Oliver No. 102 Universal Wood Miller the patterns were restored in a very short time.

On one set of locomotive patterns alone, over $600 was saved. This set had always cost around $1300, but now they do it the Oliver Way for a little over $600.

"The best cutting done by this machine is cutting pattern costs in half"

Send for printed matter covering our Wood Milling Machines.



OLIVER MACHINERY CO.

4 Coldbrook St. - Grand Rapids, Mich., U.S.A.

"Oliver" No. 102 Universal Wood Milling Machine working on a pattern for a Railroad Crossing.

RUDEL-BELNAP MACHINERY CO LIMITED

TORONTO MONTREAL

Representing Machine Tools of Quality

THE lines shown in this collective advertisement are exclusively represented in Canada by the Rudel-Belnap Machinery Co., Montreal and Toronto.

All are products of highest quality and are universally recognized as leaders. We shall appreciate a careful study of the following pages.

We invite your enquiries

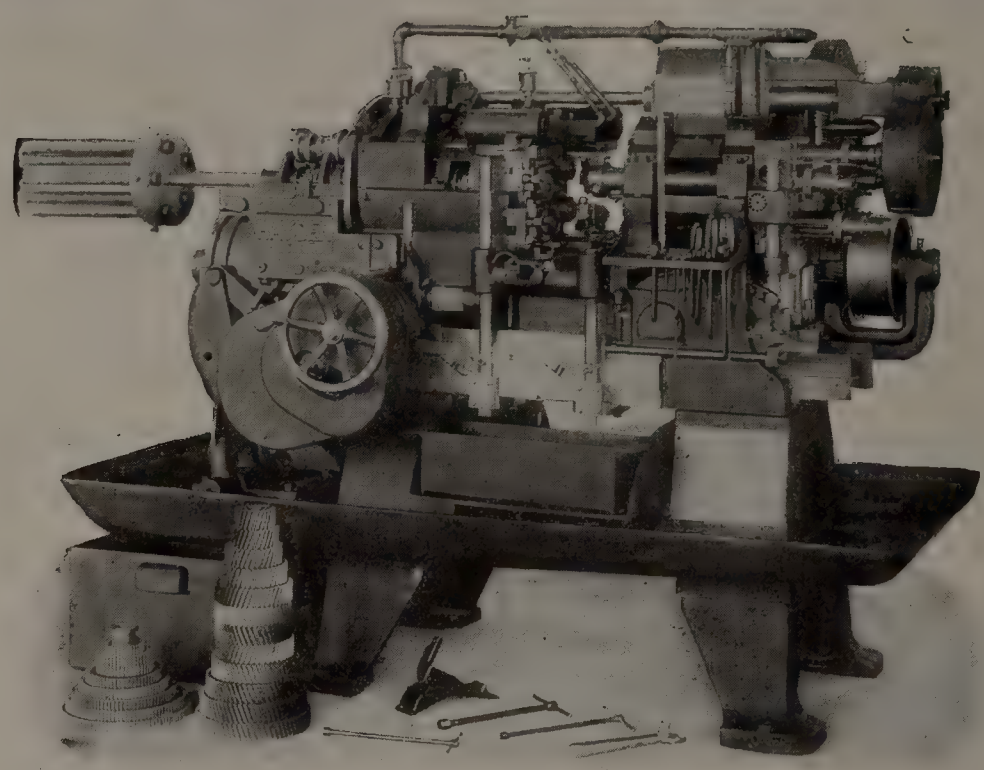
Rudel-Belnap Machinery Company
Limited

TORONTO MONTREAL

RUDEL-BELNAP MACHINERY Co LIMITED
TORONTO MONTREAL

HAYDEN

5 Spindle Automatic Screw Machine



This is the machine that's succeeding to-day. In designing it, we considered every requirement you could wish for in a machine for individual needs. This accounts for so many distinct features of superior worth found in the Hayden Five-Spindle Full Automatic—Capacity ¾-in. by 3 in.

Think of these:

16 Spindle Speeds
20 Time Changes
Low Threading Speed
Four Cross Slides
Five Longitudinal Slides
And there are 40 more.

Our latest catalog contains some meaty arguments for Hayden production.

Write for it to-day.

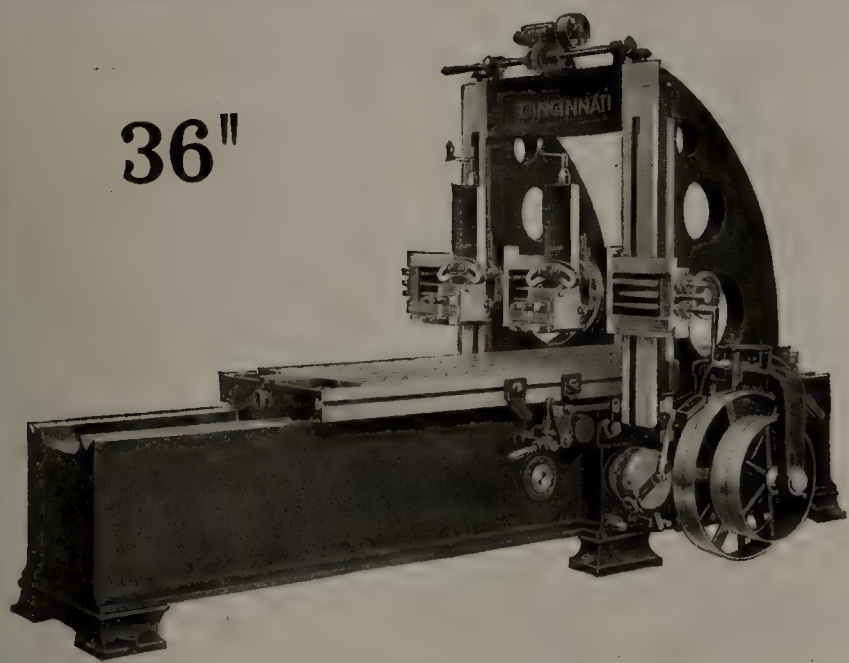
Cincinnati Automatic Machine Company
Cincinnati, Ohio

Canadian Agents: Rudel-Belnap Machinery Co., Toronto and Montreal.

RUDEL-BELNAP MACHINERY CO. LIMITED

TORONTO MONTREAL

36"

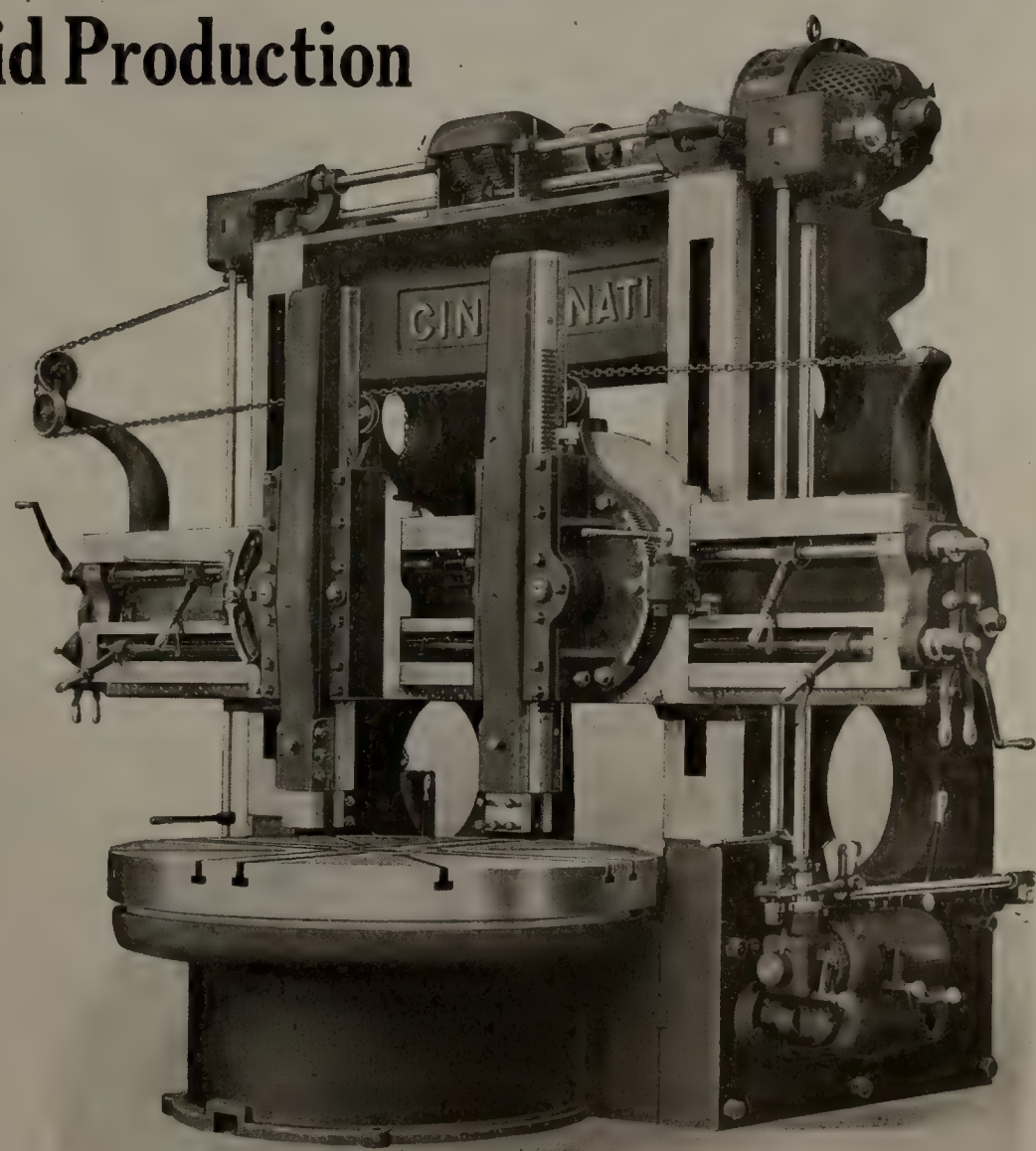


The Cincinnati Tu-Speed Planer

With this machine in operation two speeds are acquired—
The right speed for roughing.
The right speed for finishing.
Two cutting speeds to the table and a constant return. The changing from one to the other is accomplished instantly while the machine is running.
You are losing money if you are attempting to get along with one speed. The single speed planer is handicapped.

Cincinnati Rapid Production Boring Mills

RAPID production—get those words fixed in mind in connection with Cincinnati Boring Mills. With them boring and turning is no longer a slow, tedious job. Even on the heaviest work they hustle the job through in a manner that amazes the man used to old-fashioned boring mills. Every job, big and small, is a paying proposition on a "Cincinnati." Convenient and adaptable; can be quickly changed from one job to another; handles a wide range of work. Everything necessary to big returns in boring and turning is embodied in the "Cincinnati" design. Get our bulletin and check it up point for point. We build several sizes, to meet all requirements.



The Cincinnati Planer Co.

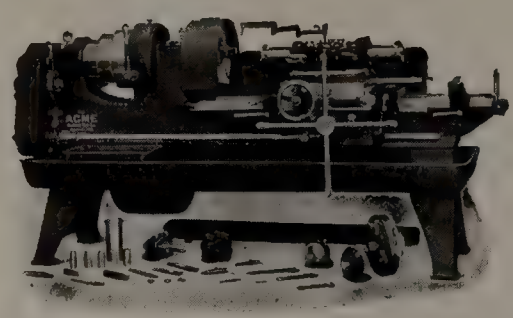
Cincinnati, Ohio, U.S.A.

Canadian Representatives:
Rudel-Belnap Machinery Co.
Toronto and Montreal

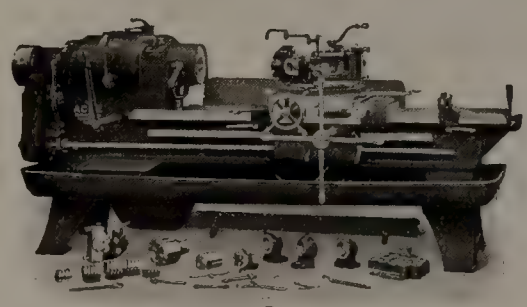
RUDEL-BELNAP MACHINERY CO LIMITED
TORONTO MONTREAL

CINCINNATI ACME

Flat Turret Lathes Screw Machines Turret Lathes



2¼"x26" Flat Turret Lathe with Chucking Equipment.



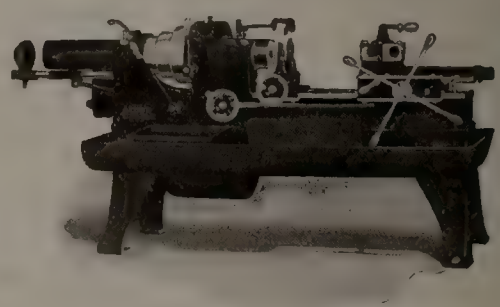
3¼"x36" Flat Turret Lathe with Bar Equipment.

Cincinnati Acme Flat Turret Lathes are noted for their rigidity, accuracy and efficiency. They are the double purpose machines adapted to both bar and chucking work with the use of simple and inexpensive tools. Among many features embodied in these machines are the cross sliding turret, head and bed cast solid, centralized control, etc. Capacity 2¼" and 3¼" bar stock and chucking work 12" to 16" diameter.

18" Universal Turret Lathe.

Cincinnati Acme Screw Machines are made for rapid production and are being used by all the leading manufacturing concerns of this country. Some of the features embodied in these machines are, head cast solid with bed, automatic chuck forged solid on end of spindle, renewable babbitt bearings and many others. Capacities, ⅝" to 2¼" bar stock, 11" to 20" swing. Made with plain head or friction back gears.

Cincinnati Acme Turret Lathes for rapid production, especially advantageous in brass shops, etc. Made in four sizes from 14" to 20" swing with plain or friction back gears. Furnished with plain, set-over, or universal turrets, chasing attachment, forming attachment and all tool accessories.



2¼"x11" Screw Machine.

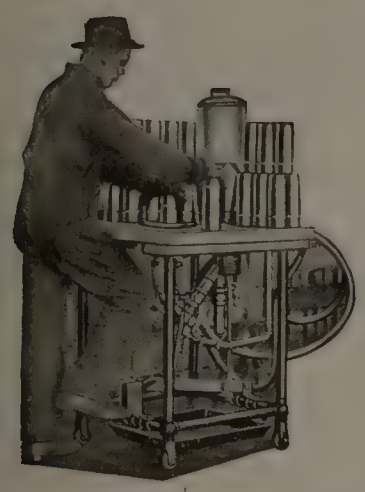
If you have never investigated the possibilities of Cincinnati Acme Turret Machinery in your factory, you have missed an opportunity to increase your production and decrease your operating expense. Our catalog giving many more features and details of our machines, will be sent upon request.

THE ACME MACHINE TOOL COMPANY
CINCINNATI, OHIO, U.S.A.

RUDEL-BELNAP MACHINERY CO LIMITED

TORONTO MONTREAL

Spraco Air Gun Painting



15,000 Shells per Hour

are painted with the Spraco machine shown above. It applies all kinds of paints, varnishes, enamels and lacquers. For shrapnel, high explosive shells, cartridge cases, etc., it is actually 500 times faster than the old hand way. Can you afford not to investigate an economy like this?

The unskilled operator simply points the gun and pulls the trigger. In other words, he directs the gun—the rest is practically automatic. In coatings thick or thin, free from streaks and brush-marks, he

Paints More in One Day than 12 Skilled Painters

Spraco Pneumatic Equipment with interchangeable nose pieces for the Spraco standard gun applies all kinds of liquid coatings to rough or smooth surfaces of metal, wood or any material. Rugged, perfected in every particular for painting indoors or out.

Send This Information

and Spraco engineers will gladly assist in solving your painting problem. They will probably show the way to a saving of at least 50%. Neither charge nor obligation.

1. Brief description of surface or object to be painted.
2. Name and nature of coating material.
3. Where unusual materials are involved it would be advisable to send us at least a one-quart sample. This will enable us to recommend the proper equipment after laboratory test.
4. Air pressure available.

If compressed air is not available, we furnish complete gasoline engine or motor-driven air compressor units.

SPRACO PRODUCTS

SPRAY ENGINEERING COMPANY

Engineers for Spray Cooling Systems, Irrigation Systems, Aerating Reservoirs, Air Conditioning.

Manufacturers of Air Washing Equipment, Spray Cooling Equipment, Paint Spraying Equipment, Park Sprinklers, Flow Meters, Nozzles for All Purposes.

General Offices: 93 Federal St., BOSTON, MASS., U.S.A. New York, Chicago

Cable Address—SPRACO BOSTON. Code—WESTERN UNION.

Representatives in Canada:

RUDEL-BELNAP MACHINERY CO., 95 McGill St., MONTREAL, QUEBEC, CANADA

RUDEL-BELNAP MACHINERY CO LIMITED

TORONTO MONTREAL

Accuracy in

HEAT TREATING

is essential—

NOW

as never before

Made by

TATE-JONES & CO., Inc.

Established 1898
FURNACE ENGINEERS
PITTSBURGH - PENNSYLVANIA

IRRESPECTIVE of the size of the work handled Tate-Jones Overfired Accurate Temperature Annealing Furnaces will give uniform temperatures that can be accurately and easily controlled and maintained indefinitely.

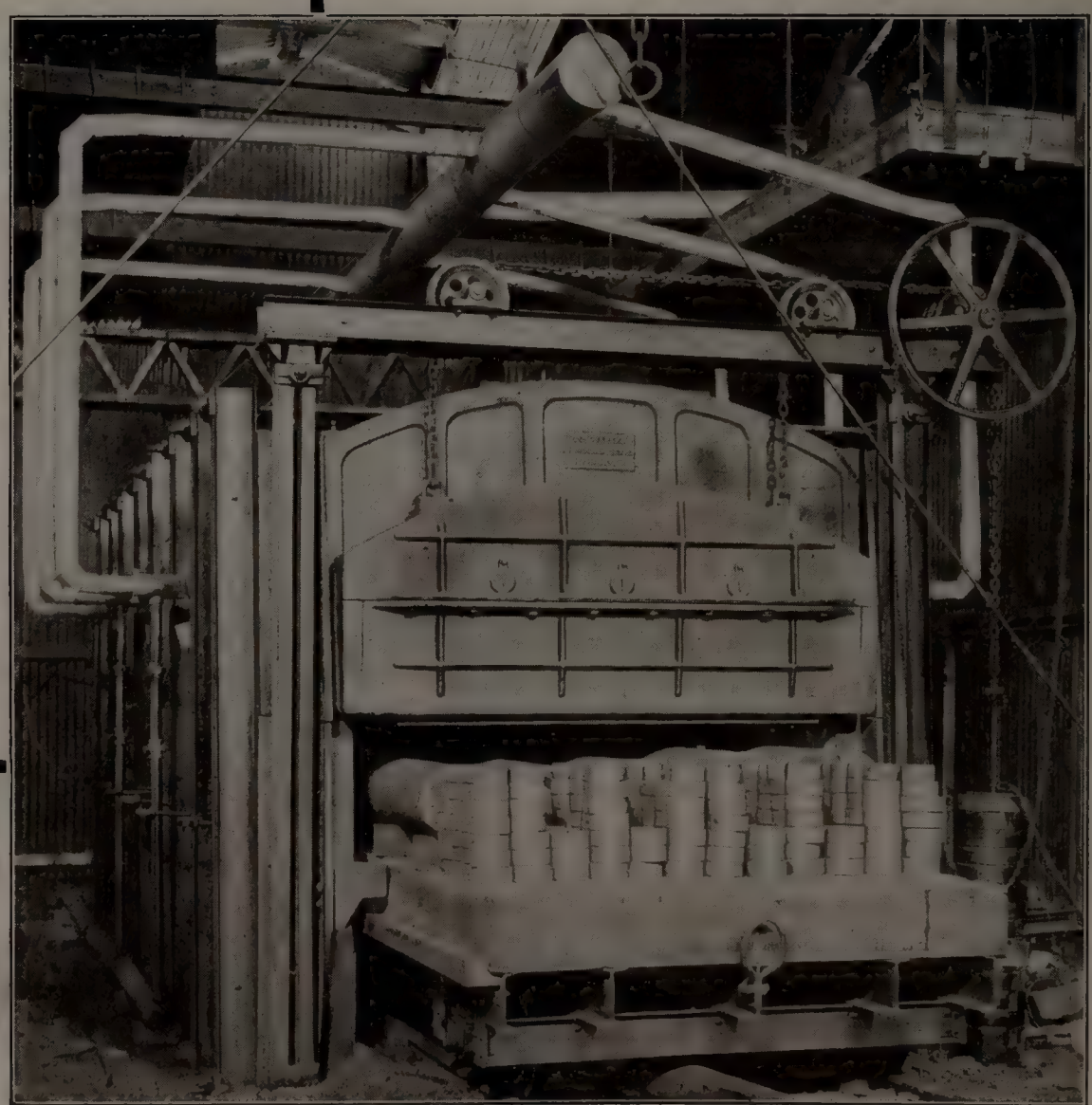
Output is so vital to the nation's welfare at this time, that these features of "accuracy" and "temperature control" should be given first place when furnace installation is under consideration.

The saving of time in preparation, the elimination of spoiled work—which means a large amount of quickly finished good work—should give these Tate-Jones Furnaces the preference.

Another feature which is of prime importance at this time is the saving in fuel. These furnaces are scientifically planned and built. The ease of handling is also a great time and money saving feature.

Made in car type and in two types of stationary hearth: (1) all fire brick; (2) fire brick with cast iron bars imbedded in the top. Made for either gas or oil fuel or both.

For explicit information write for Bulletin No. 154. Mention your possible requirements and we will offer suggestions.

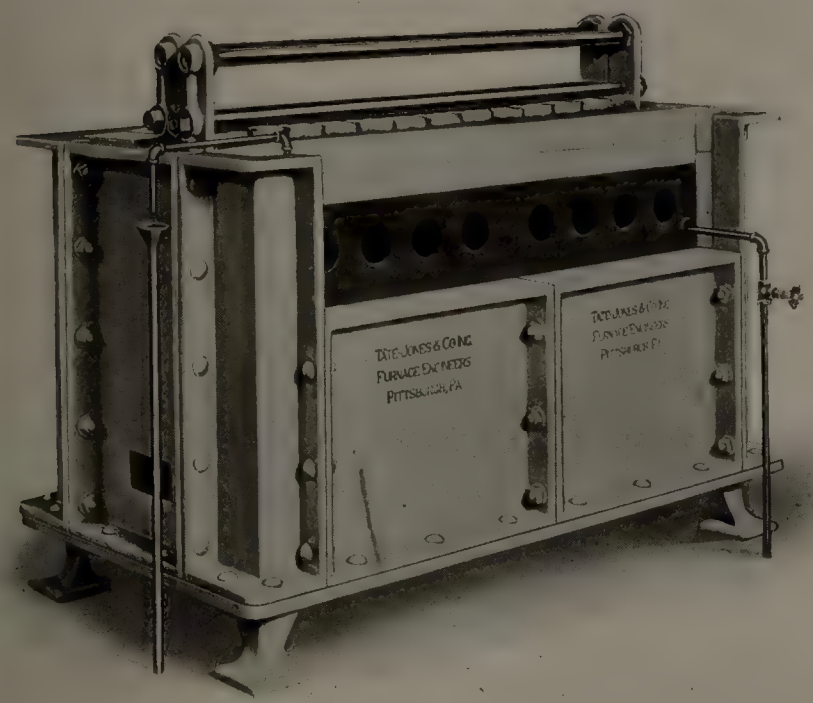


A Tate-Jones Overfired Car Type Furnace

RUDEL-BELNAP MACHINERY CO LIMITED

TORONTO MONTREAL

TATE-JONES SHELL NOSING FURNACES



The furnace illustrated is especially made for the nosing operation of shell manufacture. Through the opening in the front, which is water-cooled, the shells are placed. This permits them to become heated (by direct fire) to certain predetermined distance. The water keeps the body of the shell cool and prevents the heat from traveling back on the shell.

This furnace has a large combustion chamber below the work. The radiation from this chamber, together with the hot gases which strike the work as they leave the chamber at their highest temperature, cause the shells to become heated very rapidly.

These furnaces are provided with either oil or gas burners or combination oil and gas burners, as desired.

This furnace is made in two sizes, with fronts for different shells as listed below:

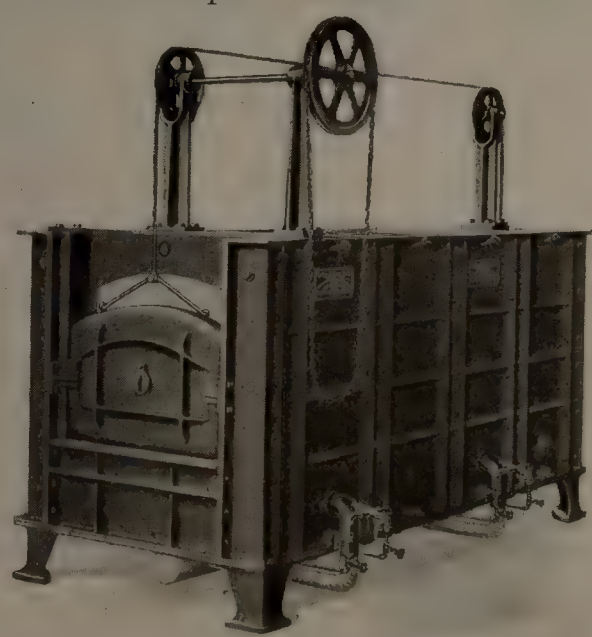
REGULAR SIZES.

No.	3" SHELLS Holes in Front	3" SHELLS Hourly Production	4.5" or 4.7" SHELLS Holes in Front	4.5" or 4.7" SHELLS Hourly Production	6" SHELLS Holes in Front	6" SHELLS Hourly Production	Weight
4058-N	10	100-125	7	70- 80	5	25-30	6,600
4059-N	14	140-160	10	10-115	7	40-45	8,600

TATE-JONES SEMI-MUFFLE TYPE FURNACES

For all annealing processes, pack and case hardening and general heat treating.

The combustion chamber is below the heating chamber with a fire brick slab separation between. Uses oil or gas fuel. Supplied with either oil or gas burner or combination oil and gas burner which permits the use of either fuel at will.



MADE IN 37 REGULAR SIZES.

Other Tate-Jones Furnaces for the Shellmaker.

Besides the above which are used for shell making, we can supply Tate-Jones Lead Bath Furnaces, Circular Semi-Muffle Furnaces, Lead Bath Nosing Furnaces, Enamel Baking Furnaces, Furnace for Banding, Cartridge Case Annealing, Flash Annealing.

There is a Tate-Jones Furnace for every possible use in the line of heat treating of metals

Made by

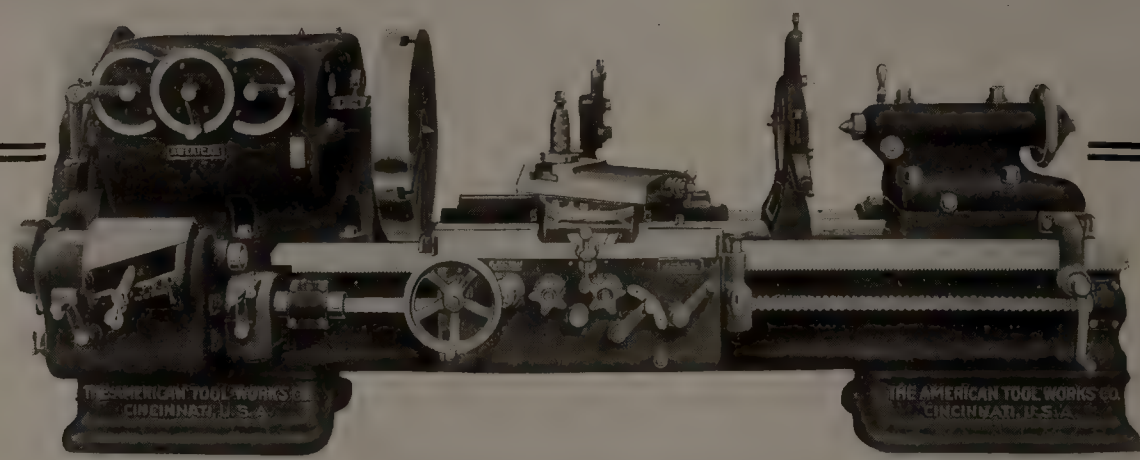
TATE-JONES & COMPANY, Inc.

FURNACE ENGINEERS ESTABLISHED 1898

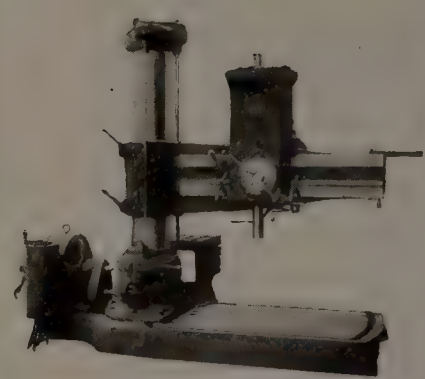
PITTSBURGH, PA.

RUDEL-BELNAP MACHINERY CO LIMITED

TORONTO MONTREAL



"American" 30 Geared Head Lathe.

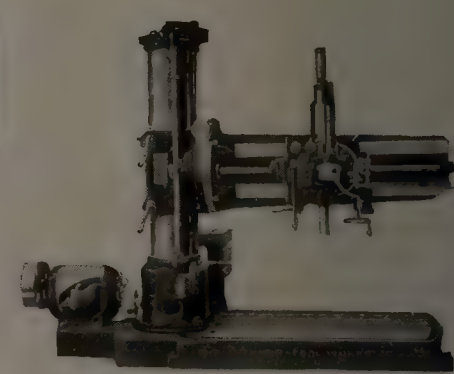


6 ft. "American" Triple Purpose Radial.

AMERICAN

It is not enough in these extraordinary times that a machine tool should be efficient. Modern demand calls for **high efficiency** coupled with **high speed.**

In these **"American" Lathes, Planers, Shapers and Radials** you see tools in which years of experience, research, specialization and skilful endeavor have produced results in keeping with the most exacting modern demands. The eye of the skilled mechanic can see at a glance that these tools are of exceptional design—**well equipped, powerful, convenient.**



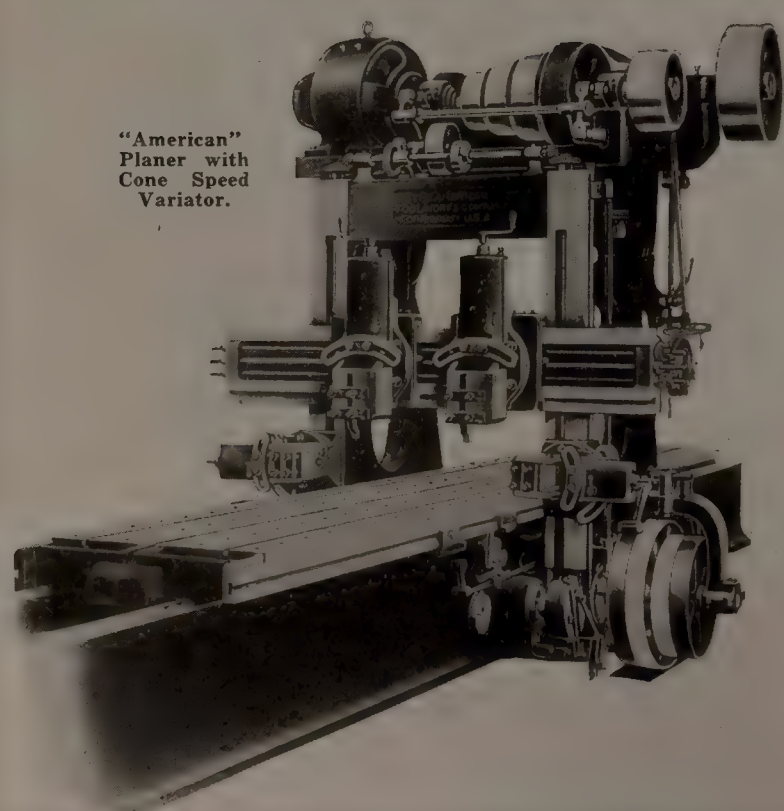
5 ft. Full Universal Radial Drill.

They are equal to their appearance when in action and breathe ACCURACY of every turn.

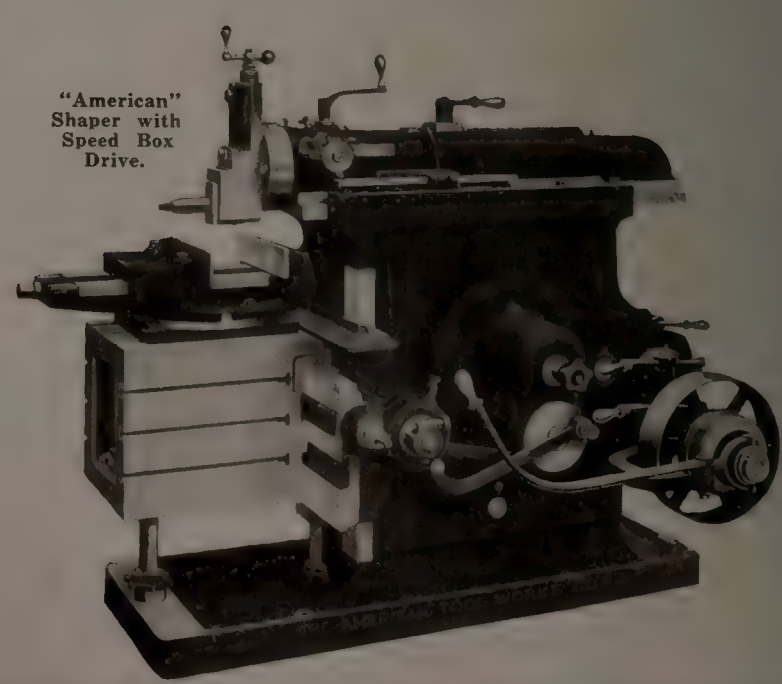
These are the tools you need in your shop to get the best-paying result every day in the year.

Write for the full story of "American" Machine Tools.

The American Tool Works Co., Cincinnati, Ohio



"American" Planer with Cone Speed Variator.



"American" Shaper with Speed Box Drive.

RUDEL-BELNAP MACHINERY CO LIMITED
TORONTO MONTREAL

Reaming Deck Plates

2600 Holes Per Day

That's hastening shipbuilding!

And the CELFOR is the reamer that is doing this big day's work.

2600 15/16" holes reamed in tough steel deck plates 7/8" thick. What more convincing proof can be asked for than this real performance—something that actually has been accomplished?

The accomplishment of such tasks has been made possible through the advantages of the "twisted process" by which CELFOR drills and reamers are made.

With this process the sections are forged and twisted while hot. This gives the metal that greater density which makes the keen, durable cutting edge for which CELFOR reamers are noted.

CELFOR

Send for catalog 15.

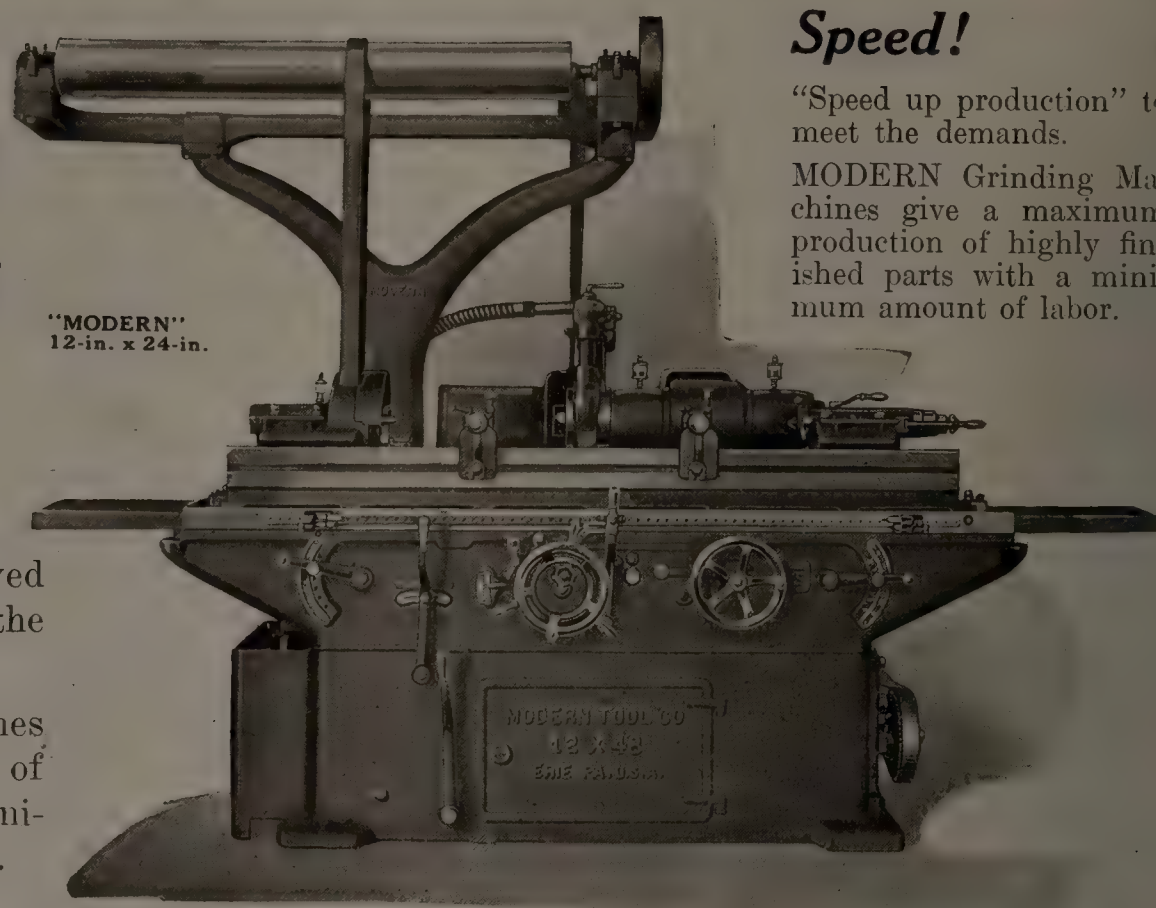
CLARK EQUIPMENT COMPANY
BUCHANAN, MICHIGAN

Canadian Agents: Rudel-Belnap Machinery Co., Limited, Toronto, Montreal

RUDEL-BELNAP MACHINERY Co LIMITED

TORONTO MONTREAL

Modern Self-Contained Plain Grinding Machine



"MODERN" 12-in. x 24-in.

Speed!

"Speed up production" to meet the demands.

MODERN Grinding Machines give a maximum production of highly finished parts with a minimum amount of labor.

Every means for convenient, rapid and positive operation is employed with a view to minimizing the labor.

MODERN Grinding Machines are made in a wide range of sizes and include Plain, Universal and Internal Types.

Modern Die Chaser

MAKE YOUR DIE TROUBLES A THING OF THE PAST.

Nine-tenths of all die trouble is due to imperfect grinding, and a sure, efficient and quick way to eliminate this trouble is to install a MODERN Chaser Grinder. Made for belt drive or a complete motor driven unit.

Special attachments for grinding Spring Dies, Pipe Dies, Reamers, Taps, Hobs, Spiral and End Mills, Milling Cutters, etc., can be furnished with the regular equipment.

Bulletin CG will tell you all about it.

Progressive manufacturers everywhere have realized the advantage of equipping with MODERN Machines and Tools.

SERVICE IS OUR WATCHWORD.

MODERN TOOL COMPANY

Main Office and Works:

State and Peach Streets, Erie, Penna.

Canadian Agents: Rudel-Belnap Machinery Co., Toronto and Montreal

New York Office: 50 Church Street Chicago Office: 32 N. Clinton Street

F. WESLEY PARKER

Resident Engineer and Export Agent

2 Rector Street, New York

RUDEL-BELNAP MACHINERY CO LIMITED
TORONTO MONTREAL

THE MODERN WAY is the QUICKEST WAY

MODERN Self-Opening Die Heads and Collapsible Taps save thousands of dollars in a year's time, but, of greater importance, they are man savers.

Think of the **time** you save with these **Modern** appliances. And **time** was never as valuable to you as it is at this period. Labor is scarce and the demands made upon shops of Canada increases in proportion as the war continues. **Modern** tools will help you out.

Illustration shows a **Modern** installation. See the self-opening and adjustable die heads in operation, threading shell ogives. In the shop where the picture was taken **large production** and **accurate work** is the every-day practice.

Modern Die Heads and Collapsible Taps are used on all styles of Hand and Automatic Screw Machines, Turret Lathes, Chucking Machines, Drill Presses, in fact on any machine that is used for thread-cutting.

Complete information regarding the use of MODERN Self-Opening Die Heads upon request.

MODERN TOOL COMPANY

Main Office and Works:
State and Peach Sts., Erie, Pa., U.S.A.

Canadian Agents:
Rudel-Belnap, Toronto and Montreal

F. WESLEY PARKER
Resident Engineer and Export Agent
2 Rector Street, New York

RUDEL-BELNAP MACHINERY Co LIMITED

TORONTO MONTREAL

Representing Machine Tools of Quality

IN the pages immediately preceding will be found described the various lines exclusively represented by The Rudel-Belnap Machinery Company.

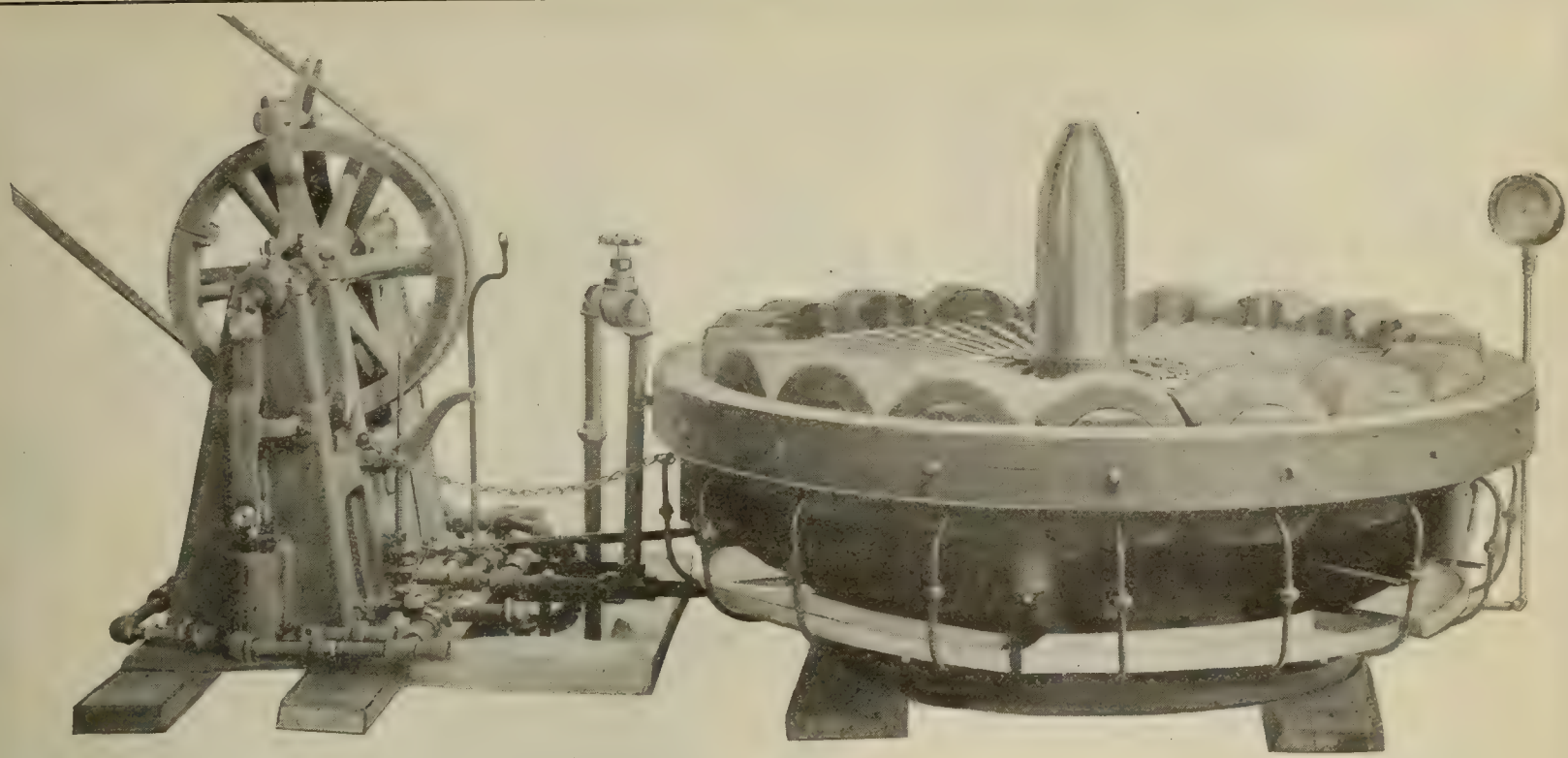
In addition to these lines, admittedly of the highest quality, we offer you the benefit of our own experience and engineering service.

We shall be pleased to offer you standard lines of other factory equipment not included in the foregoing pages.

Write us about your requirements.

Rudel-Belnap Machinery Company
Limited

TORONTO MONTREAL



Hydraulic Shell Banding Presses

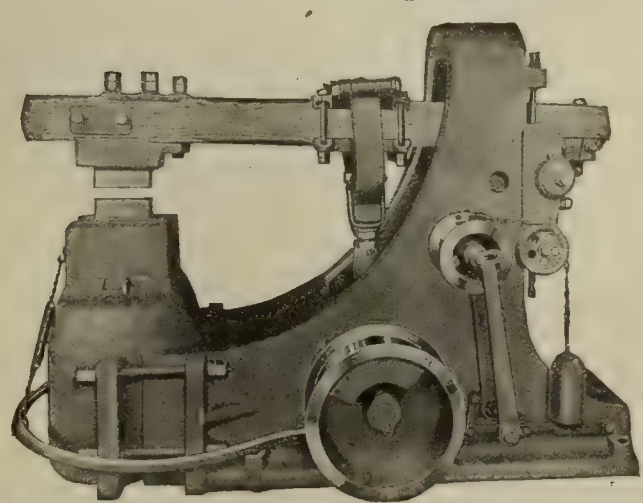
BUILT IN SIX REGULAR SIZES SUITABLE FOR BANDING SHELLS FROM 3" TO 16" DIAMETER

Our presses are now in use by a large number of Canadian and United States Contractors, giving excellent and positive results. Can furnish pumps for either belt or direct motor drive as preferred.

Write or wire for prices, specifying size of shells and dimensions of bands.

We also manufacture Tire Setting Machines, Hub Banders and special machines for other circular compressing.

Write us your requirements.



Rochester Helve Hammer

A well-built, substantial tool for welding and general forging. Made in six sizes, 25 lb. to 100 lb. heads, and two styles of frame.

Send for catalogue and give us information regarding character of your work.

THE WEST TIRE SETTER COMPANY

ROCHESTER, N.Y., U.S.A.

"MADE IN CANADA"

Hydraulic and Power Presses

For

Pulp and Paper Mills, Packing Houses, Veneer Manufacturers, Tanneries, Leather Belting Manufacturers, Forging Manufacturers, Machine Shops, Powder Manufacturers.

Hydraulic Piping Fittings and Valves. Acid Resisting Bronze Valves and Fittings. Quick Opening Gate Valves.

Pulp and Paper Mill Machinery.

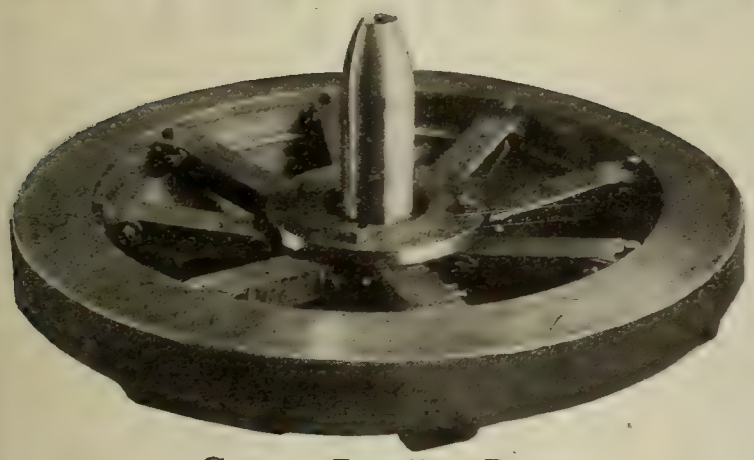
FULL SPECIFICATIONS AND PRICES COVERING YOUR REQUIREMENTS SENT UPON REQUEST.

The Hydraulic Machinery Co.
Limited

18 Tansley Street **MONTREAL, CAN.**

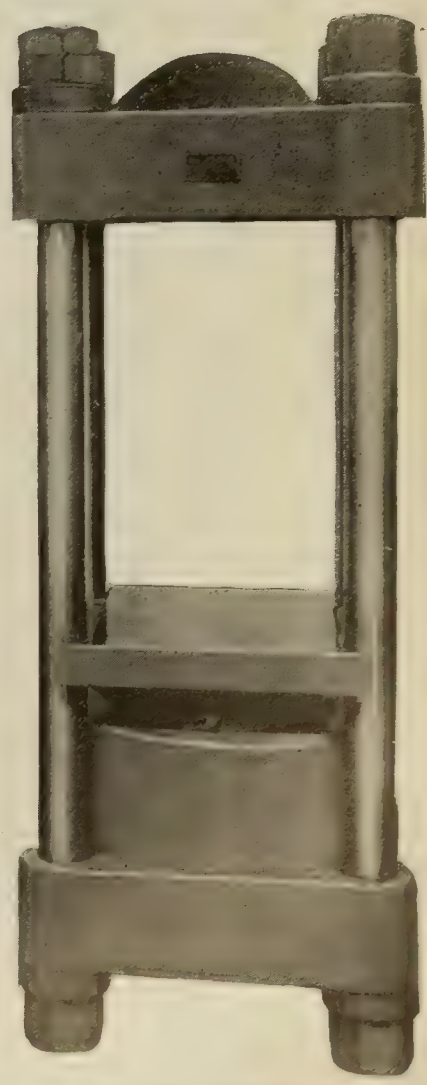
Cable Address "Pressco"

PRESSES



Copper Banding Press

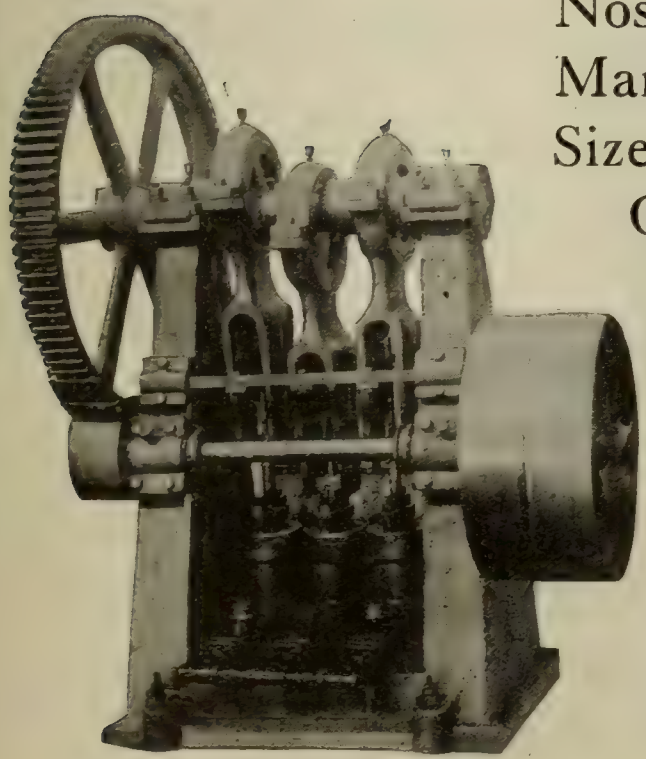
Hydraulic Presses, Pumps and Accumulators



Nosing Press

Nosing, Banding and Marking Presses for all Size Shells. Presses for General Purposes.

Write for prices and deliveries



Triple Geared Pump

Made in Canada

William R. Perrin, Limited

TORONTO, ONTARIO, CANADA

LACO NITRO LAMPS COST LESS

Why do you buy lamps?

To give money to a lamp manufacturer—to consume current, or to actually get light?

The following tabulation of actual laboratory test proves that cheap bulbs are expensive even if given to you free of charge.

NAME OF LAMP	WATTAGE AND CANDLE POWER CLAIMED FOR TESTED LAMPS	ACTUAL CANDLE POWER OF TESTED LAMPS	ACTUAL WATTAGE OF TEST LAMPS	COST 1000 C. P. LIGHT FOR 1000 HRS. AVERAGE COST CURRENT 2½¢ PER K.W.HR.			1000 HOUR LOSS
				LAMPS NEEDED	TOTAL WATTS USED	1000 HR. COST	
LACO NITRO	100	111.5	104	9	936	$23.40	NONE
COMPETING LAMP "A"	100	78.5	101	13	1313	32.83	$ 9.43
" " B	100	87.5	109.5	12	1314	32.85	9.45
" " C	100	66.9	103	15	1545	38.63	15.23
" " D	100	63.0	100	16	1600.	40.00	16.60

A Saving of 30% to 50% in Current Consumed During 1000 Hours by Using Laco Nitro Lamps

Without cost to you, our nearest office will have official laboratory tests made of any of your lamps to prove our claims.

STOCKS AND WAREHOUSES AT

MONTREAL TORONTO WINNIPEG VANCOUVER

Canadian Laco-Philips Company, Limited

"The Light That Gives MORE LIGHT"

Actual Cost Computed From Table

Cost of 13 competitive lamps (assumed low average cost of $1.00 each)	$13.00	
Cost of current to produce 1000 candle power for 1000 hours (average)	36.08	$49.08
Cost of 9 Laco Nitro Lamps at maximum cost of $1.65 each....	$14.85	
Cost of current to produce 1000 candle power for 1000 hours.....	23.40	38.25

Saving - $10.83

LACO NITRO LAMPS ARE GUARANTEED

60 watt size ..... 700 hours
100 to 1000 watt size.....1000 hours

and many users get two or three times this service.

Can you afford to buy cheap lamps when Standard Laco Nitro Lamps effect such savings?

Ask your dealer to-day about these lamps.

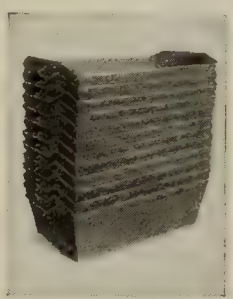
Canadian Laco-Philips Company, Limited

STOCKS AND WAREHOUSES AT

MONTREAL TORONTO WINNIPEG VANCOUVER

"NEW BRITAIN" SHOP FURNITURE

"NEW BRITAIN" SHOP FURNITURE



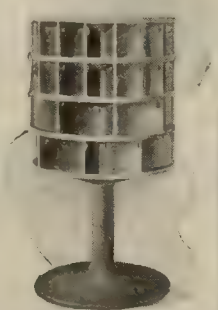
NEW BRITAIN NB NONE BETTER

THAT dear old phrase, "None Better,"
Is all right in its way;
But "New Britain" as a slogan,
Means *the best by far* today.

Increase your shop efficiency;
In times like these it pays;
And let us help you do it—
We've studied out the ways.

Accept the season's greetings,
We wish you goodly cheer,
May health and strength to do your bit,
Be yours throughout the year.

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONN.



BRASS

BRONZE

REDUCED FROM LARGE TABLET.

Memorial Tablets

ENGRAVED IN HIGH RELIEF OR SUNK LETTERS FILLED WITH RED AND BLACK ENAMEL

DESIGNS MADE FOR APPROVAL

Call and see sketches of plates made if convenient. All enquiries given prompt attention.

STEEL STAMPS

For Marking Shells, Etc.

Our stamps are in use in many Canadian munition plants and giving perfect satisfaction. Write for prices.

Pritchard-Andrews Company

Engravers and Brass Workers

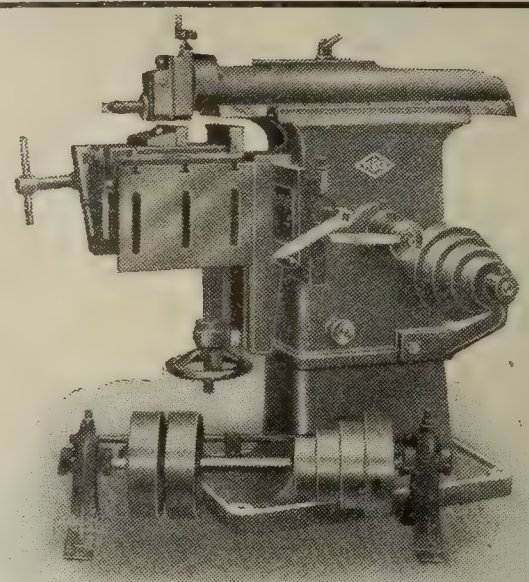
ESTABLISHED 37 YEARS

264 Sparks Street - - Ottawa, Ont.

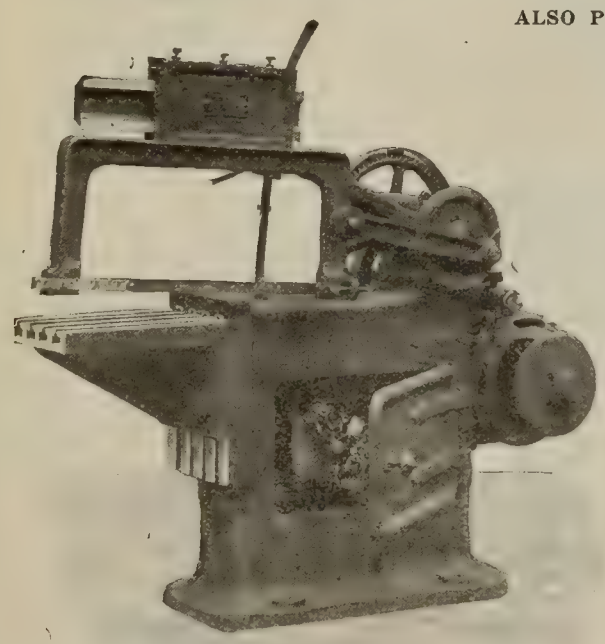
"Perco" Manufactures:

"PERCO" COTTER GRINDERS
Ball-bearing Spindle, including Countershaft, £22.
Also DRILL AND WET TOOL GRINDERS.

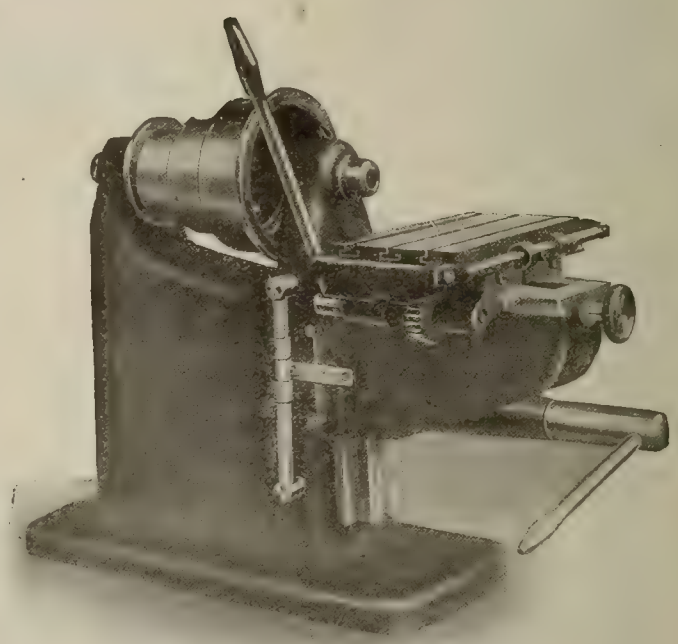
"PERCO" FOOT PRESSES
For Drawing, Stamping, Riveting, etc.
In three powers, at £13, £15, £18.
ALSO POWER PRESSES



"PERCO" SHAPERS
12-inch Crank Type
With Vice and Countershaft, £55.



"PERCO" HACK SAWS
Above is our No. 4B; capacity 14-in. x 9-in.
Adjustable stroke, auto stop. £14 5s. 0d.
Motor Drive extra.
SEVEN OTHER STYLES MADE.

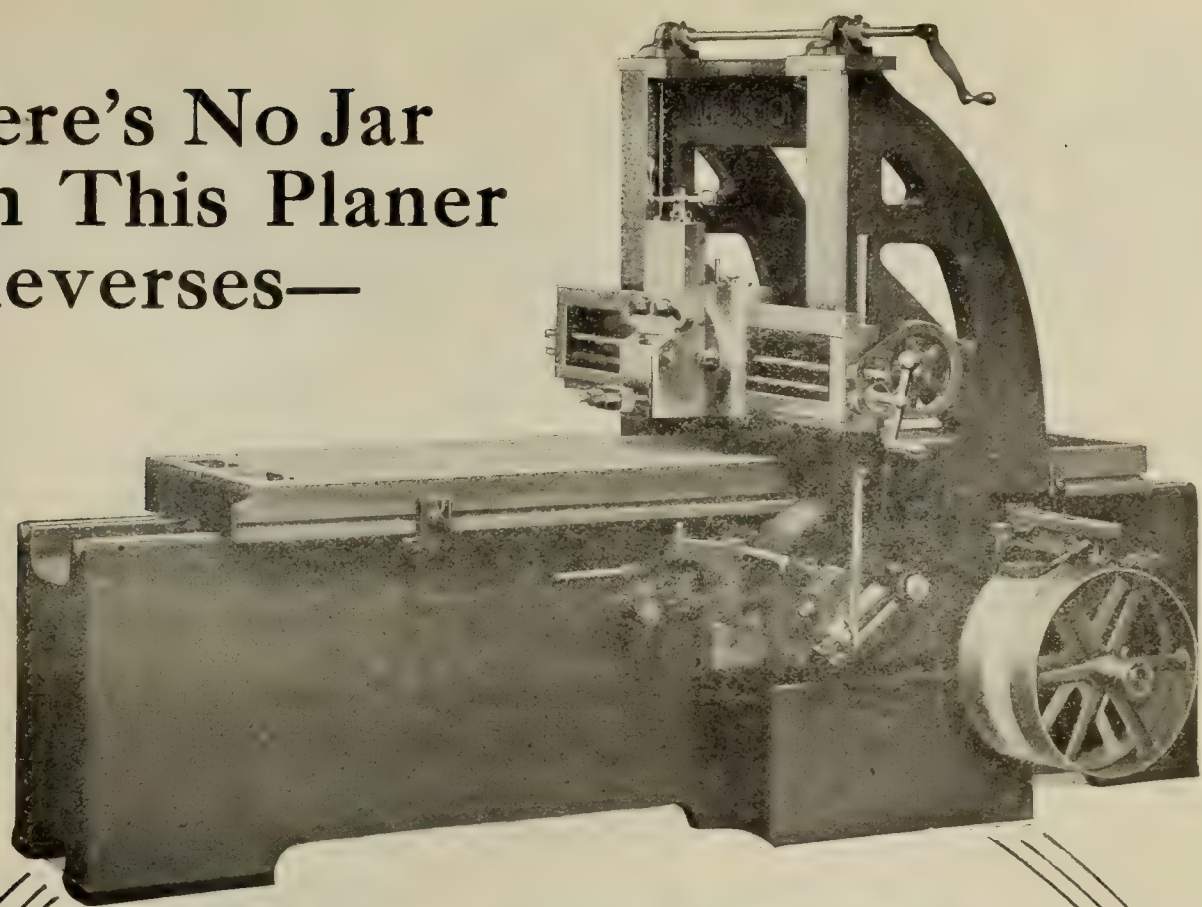


"PERCO" BENCH MILLERS
Table 12-in. x 6-in. Auto or Lever Feeds. 3-in. Belt £24 10s. Vertical Attachment, 65s.
Also STANDARD MILLERS
Table, 30 x 10½-in.

DELIVERIES FROM STOCK. ILLUSTRATED LISTS ON REQUEST.

PERKIN & CO., Limited, STANLEY WORKS LEEDS, ENG.

There's No Jar When This Planer Reverses—



Whitcomb-Blaisdell 24-inch Planer with Second-Belt Drive.

The Whitcomb-Blaisdell Second-Belt Drive cushions the reverse.

The "Second-Belt" replaces the usual bull-wheel and train of high-speed gears.

All the shocks and jars of rapid-running gears are entirely eliminated. The Second-Belt, while driving positively, imparts to the table a smooth, easy action.

It secures greater accuracy and better finish. Furthermore, it prolongs the life of the entire machine.

The absence of shock at the end of stroke—the "cushioning" of the reverse—permits the Whitcomb-Blaisdell to run at extremely high table-speeds.

Thus the Second-Belt Drive secures speed, smoothness and accuracy in cutting.

There are many details of construction in the Whitcomb-Blaisdell—details that mean production—that you should know.

Write for the Whitcomb-Blaisdell Planer Book.

LATHES From 14" to 30" SWING

WHITCOMB-BLAISDELL MACHINE TOOL CO.
WORCESTER, MASS., U.S.A.

PLANERS From 17" to 48" WIDE

DOMINION BRIDGE CO., Limited

MONTREAL, P.Q., CANADA

Engineers, Manufacturers and Erectors of

STEEL STRUCTURES

Railway and Highway Bridges, Turntables, Electric and Hand Power Travelling Cranes, Lift Locks and Hydraulic Regulating Gates. Transmission Poles and Towers.

TANK AND PLATE WORK OF EVERY DESCRIPTION

FORGINGS

Gear Cutting and General Machine Work.

MARINE BOILERS AND ENGINES

Head Office and Works: LACHINE LOCKS, P.Q., CANADA

P.O. Address: MONTREAL, P.Q. Cable Address: "DOMINION"

Branch Offices and Works: TORONTO, OTTAWA, WINNIPEG

Sales Offices: MONTREAL, TORONTO, OTTAWA, WINNIPEG, REGINA, VANCOUVER

Large Stock of Structural Material at all Works

DOMINION COPPER PRODUCTS CO., Limited

MONTREAL, P.Q., CANADA

Copper, Brass and Copper Alloy

TUBES, SHEETS AND RODS

Rolled, Drawn and Extruded Metals

Office and Works; LACHINE LOCKS, P.Q., CANADA

P.O. Address: MONTREAL, P.Q. Cable Address: "DOMINION"

FORD TRIBLOC

SAFE!

Conditions often make it necessary for men to work or walk directly underneath heavy loads held in suspension. At such times safety in a chain hoist is imperative.

Safety has always been one of the outstanding features of the Ford Tribloc Chain Hoist. In fact, the Ford Tribloc was born out of the need for safer and longer chain hoist service, and it was born free of the heritage of old patterns or tools "that had to earn their cost."

We were free to build a hoist along improved lines—and we did. We insured safety and durability for it by making all working parts of steel. Speed was increased and operating troubles eliminated by endowing it with the LOOP Hand Chain GUIDE that prevents "gagging." Efficiency was assured by using planetary type spur gearing.

A five-year guarantee speaks louder than self-praise. Get the details from Catalog No. 3.

Ford of Philadelphia

FORD CHAIN BLOCK & MANUFACTURING CO.

139-141 OXFORD STREET

PHILADELPHIA

2094-D

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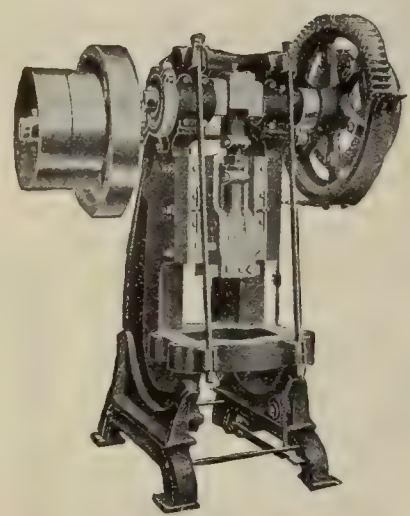
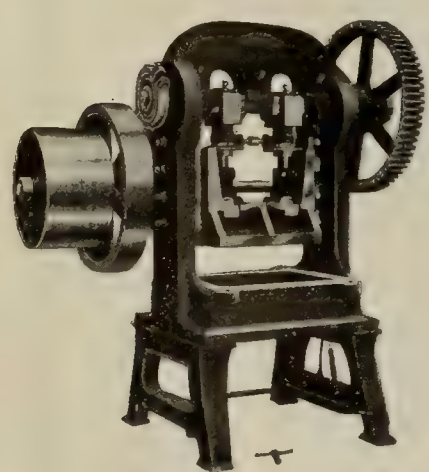

No. 215—Power Stamping Press

Superior Designs in Sheet Metal Working Machinery

Inasmuch as the success of your business depends upon the efficiency of your force of employees, whether the force be big or small, so does the success of your employees depend upon the efficiency of the equipment with which they have to work.

Brown-Boggs Sheet Metal Working Goods gives your employees the opportunity to produce maximum results. They are modern in design, labor-saving and capable of producing high grade work.

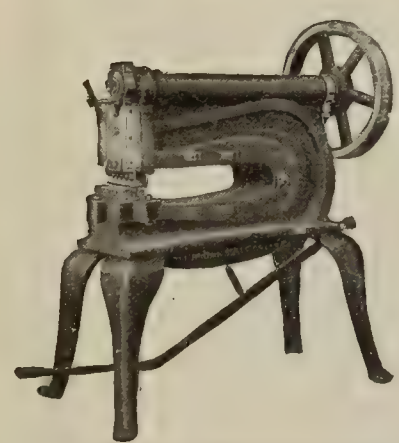
B-B Tools include all kinds of Tinsmiths' and heavy Sheet Metal Working Machinery.

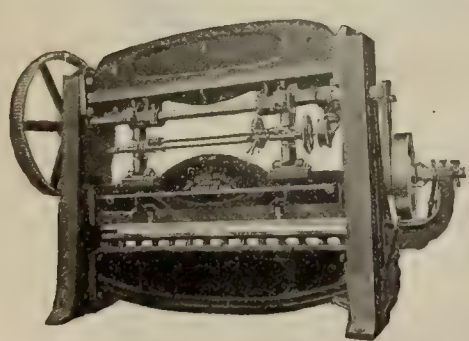

No. 20½—Power Press

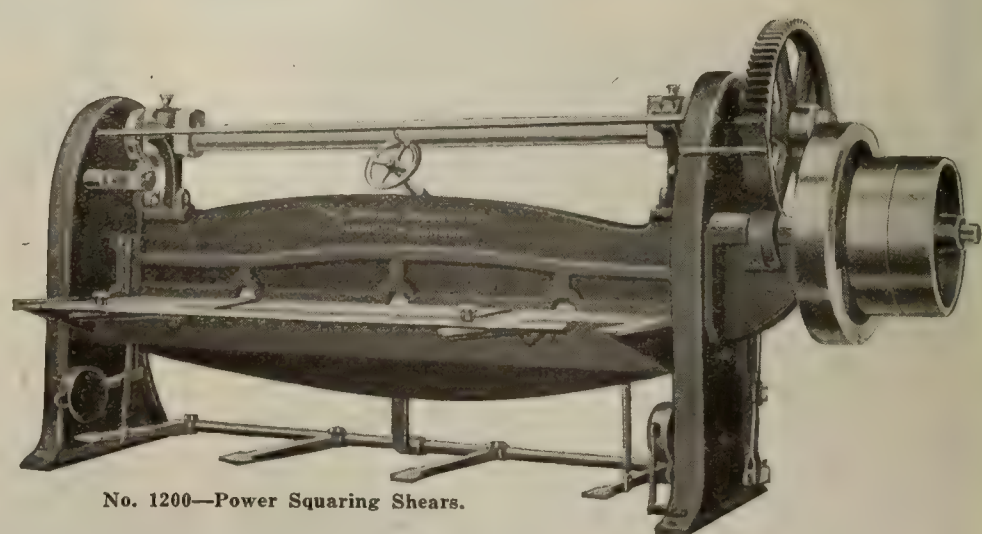
The Brown-Boggs Co., Limited

HAMILTON, CANADA

Montreal Agent: W. L. Haldimand, Jr.
Western Agents: Bisset & Webb, Winnipeg.
British Columbia Agents: E. A. Earl & Co., Vancouver.

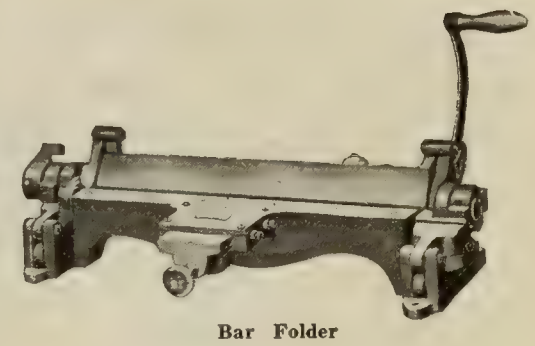

No. 126—Deep Throat Power Punch


No. 500—Power Brake or Press


No. 1200—Power Squaring Shears.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Tinsmiths' and Sheet Metal Workers' Tools of all kinds


Bar Folder

With labor scarce and cost of production high, it behooves every manufacturer to adopt every labor-saving, cost-cutting device feasible.

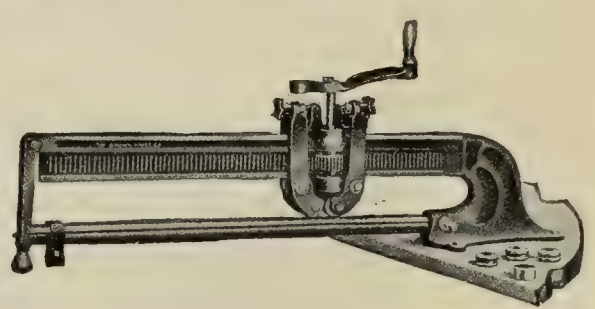
Brown-Boggs Machinery embodies all the latest improvements devised for the saving of labor and reduction of costs.

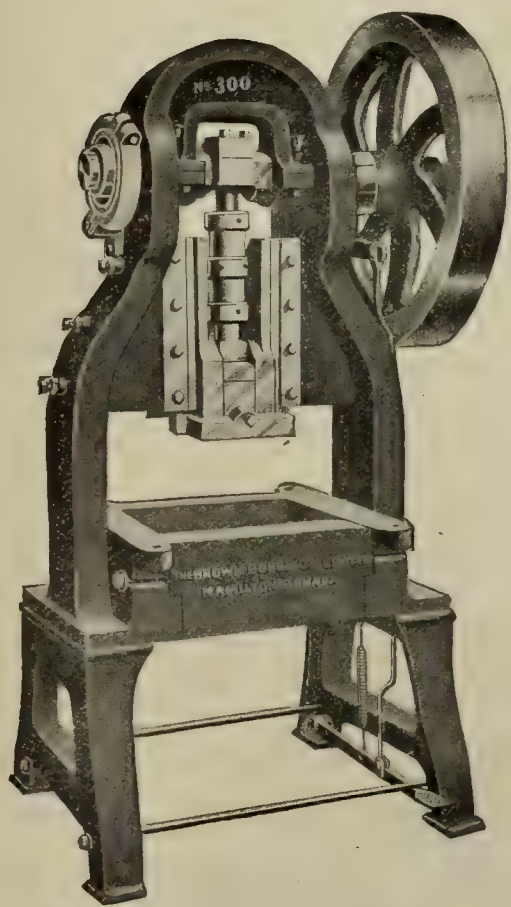
Write for description of full list of designs.
Orders for Export receive prompt attention.

No. 9—Slip Roll Former

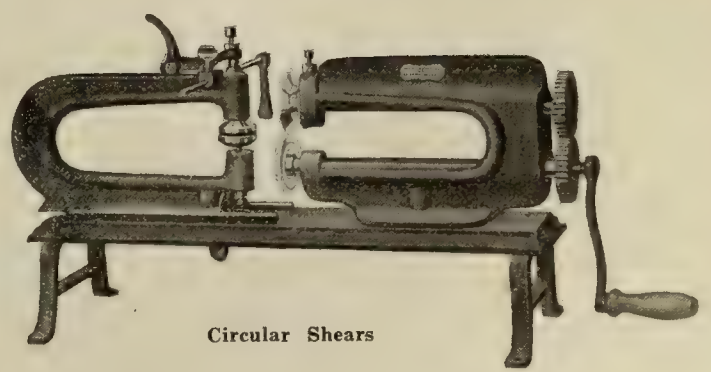
The Brown-Boggs Co., Limited
HAMILTON, CANADA

Montreal Agent: W. L. Haldimand, Jr.
Western Agents: Bisset & Webb, Winnipeg.
British Columbia Agents: E. A. Earl & Co., Vancouver.

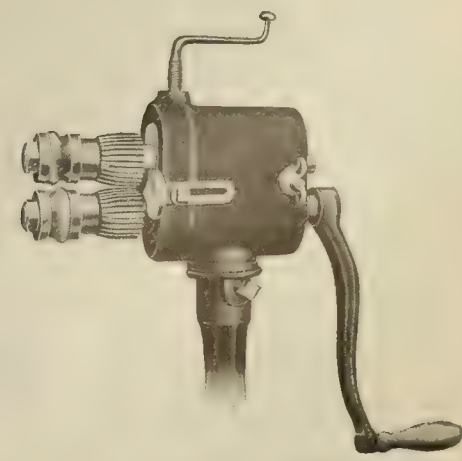

Noyes Groover



No. 300—Arch Press


Circular Shears

Encased Small Turner


No. 9—Crimper and Beader

If any advertisement interests you, tear it out now and place with letters to be answered.

SIDNEY *for*

"Give me a SIDNEY LATHE for real service!"

—so say those who, during these months of special stress, have been driving Lathes day and night—and who have put SIDNEY lathes to the supreme test of swift, endless and terrific service.

SIDNEYS make light work of heavy work.

Because of their mechanical perfection—fully explained in the descriptive pamphlet—it is an inspiration to work on a SIDNEY lathe. One duty after another swings along with uninterrupted smoothness.

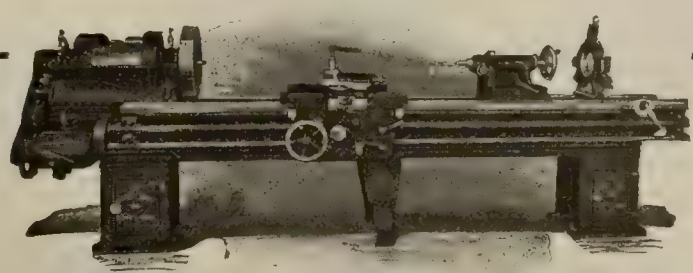
One of the most efficient combinations standing behind the Soldiers and Sailors is a good mechanic at a Sidney Lathe.

This helpful SERVICE is "at your call."

Why not write us—or get in early touch with one of our Canadian representatives?

We invite you to thoroughly investigate the "SIDNEY FOR SERVICE" line of lathes before making additional requisitions for machines. They pay in service.

THE
Sidney Tool Company
SIDNEY, OHIO



CANADIAN AGENTS:

Foss & Hill Machinery Co.
Montreal, Que.

H. W. Petrie, Limited
Toronto, Ont.

FILES Canadian Standard

IMPERIAL
TRADE MARK

EQUAL TO THE WORLD'S BEST

PXH
TRADE MARK

English, Canadian and American-made files have been on the Canadian Market for many years, and each have claimed points of superiority.

Here are **All-Canadian Files** which for cutting and wearing qualities are an improvement on all other brands, and which are

THE STANDARDS OF FILE EFFICIENCY

Hard as a diamond and straight as a string, they are processed all through by expert workmen from Best Clay Crucible Cast Steel exclusively, are noted for the long service they render, and the speed with which they cut.

MADE IN CANADA BY CANADIAN CAPITAL AND CANADIAN LABOR, THEY ARE THE BEST THAT EXPERT WORKMEN CAN PRODUCE.

You've tried the rest, now get the best.

Port Hope File Mfg. Co.

Port Hope, Ontario

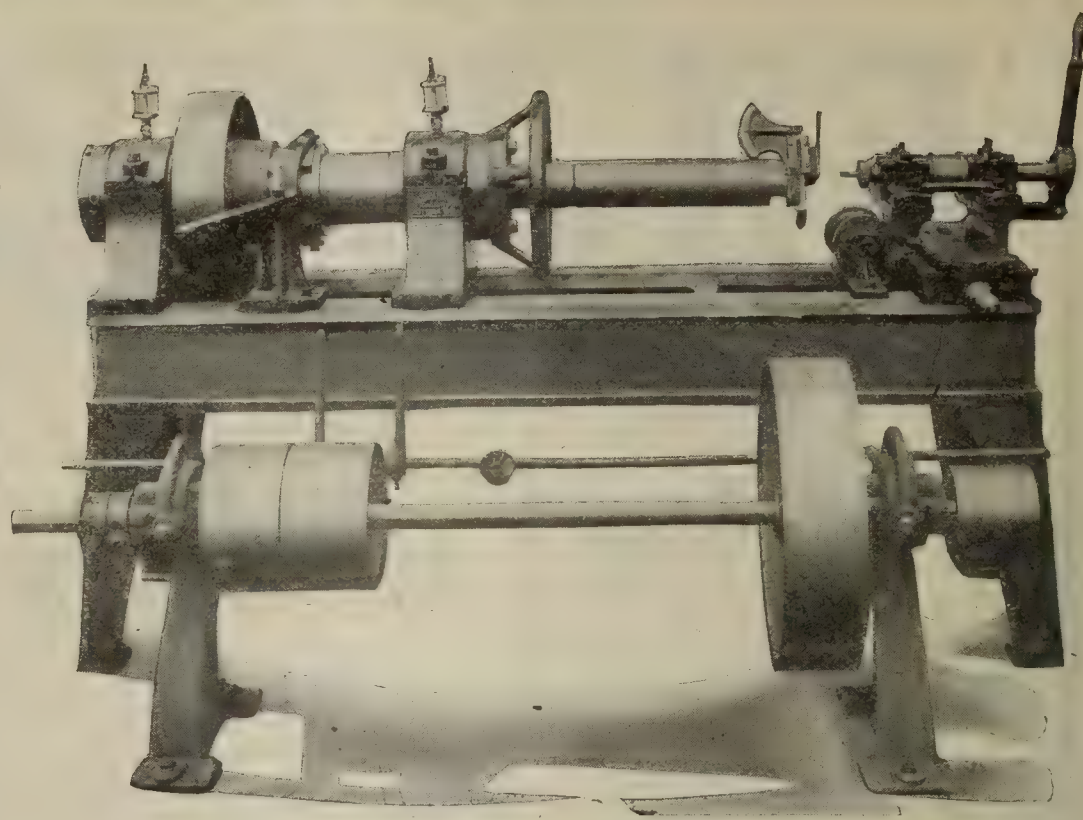
"ASK YOUR JOBBER"

In Shops Where Accuracy is Most Important You'll Find

VICTORIA MACHINE TOOLS

Victoria Foundry products are particularly adapted for special and exacting work. They are rigidly constructed and have more power than they are called upon to deliver.

Then, to the manufacturer whose work must be handled with rapidity, we would say *"Victoria" Speed* is as notable as *"Victoria" Accuracy.*



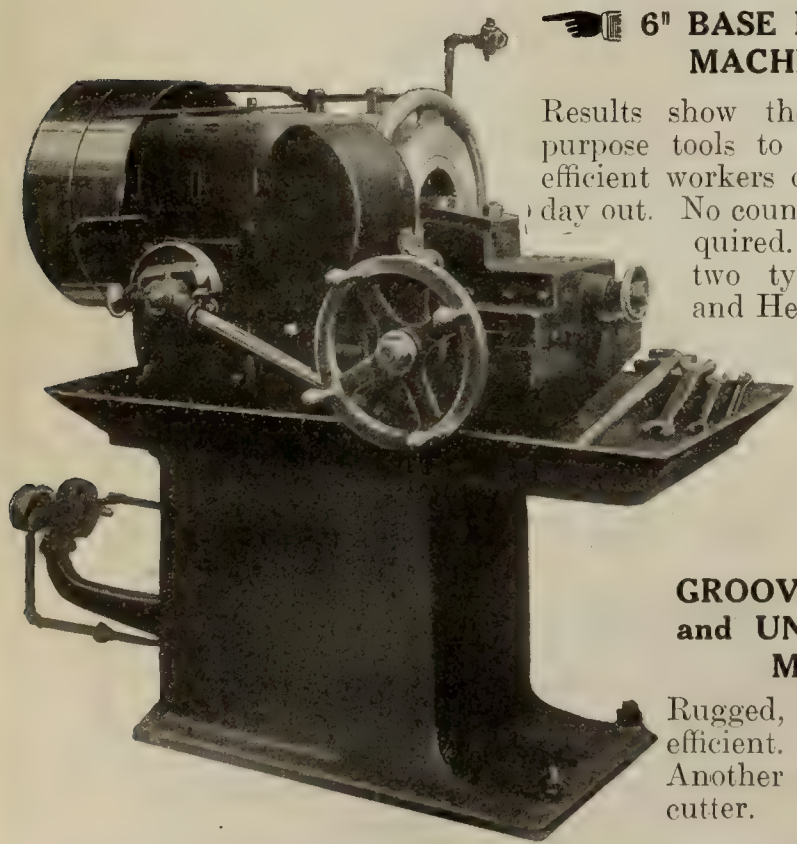
Improved Centering Machine

This tool is helping many shell makers to counter the high cost of production successfully.

Are you well posted on Victoria Tools? Let us tell you all about them.

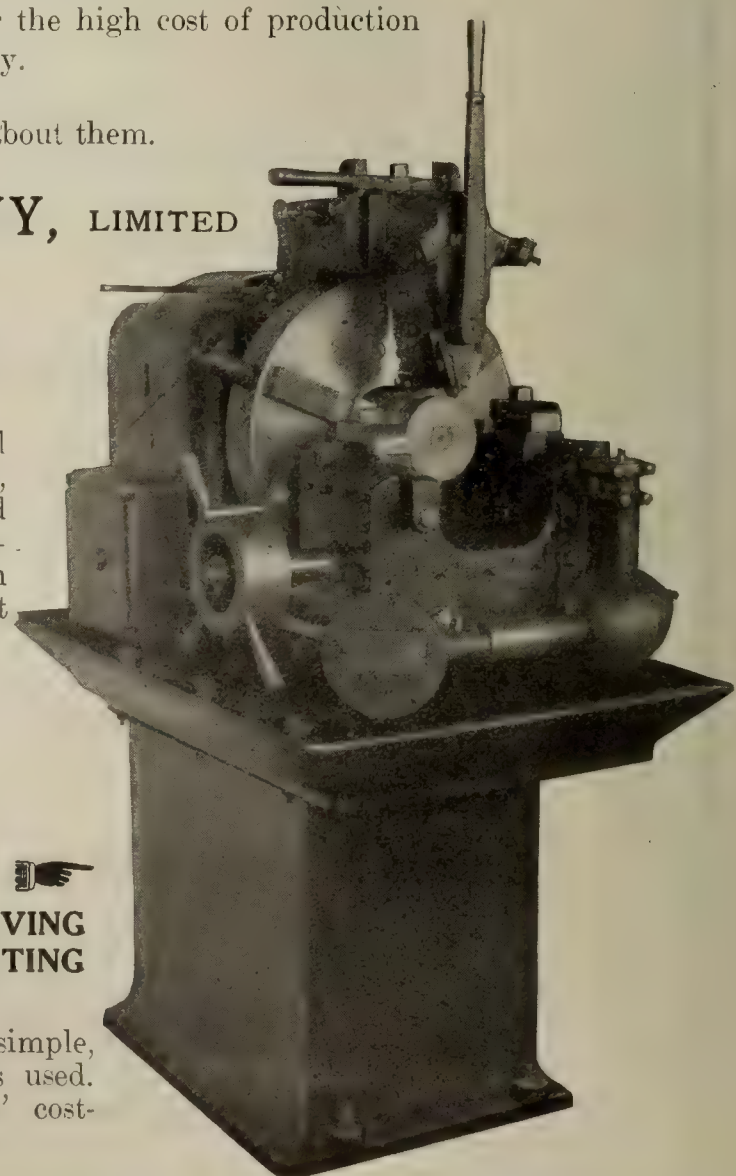
VICTORIA FOUNDRY COMPANY, LIMITED

OTTAWA, ONTARIO



6" BASE FACING MACHINES

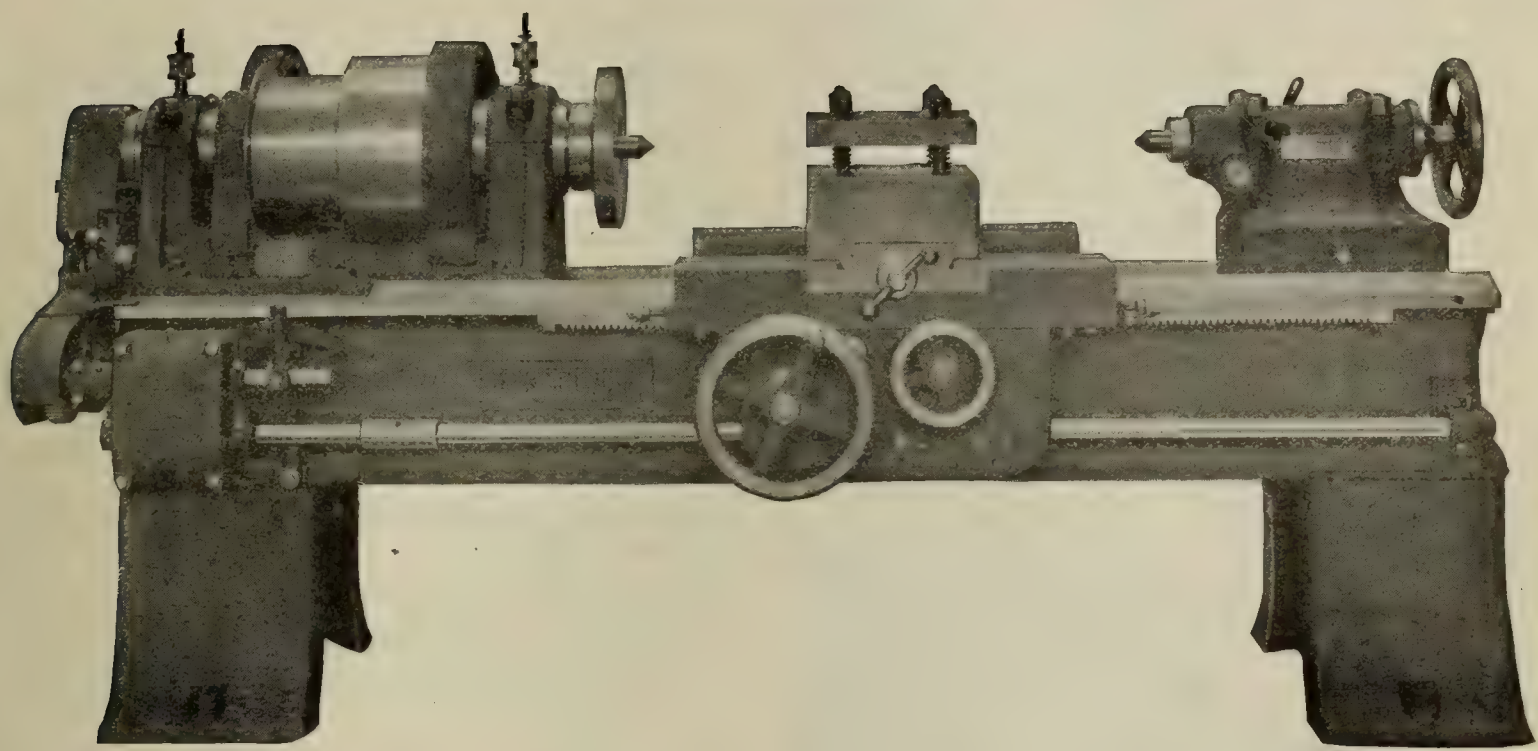
Results show these special purpose tools to be steady, efficient workers day in and day out. No countershaft required. Built in two types, Light and Heavy.



GROOVING, WAVING and UNDERCUTTING MACHINE

Rugged, compact, simple, efficient. No cams used. Another "Victoria" cost-cutter.

PETRIE Heavy Duty Manufacturing Lathe—*20-Inch Swing*



A Heavy Simplified Lathe for Rapid Production Work

Designed and built especially for Machining High Explosive and Shrapnel Shells up to and including 8-inch. Used and Endorsed by many of the Largest and Most Successful Shell Manufacturers.

DESCRIPTION

HEADSTOCK All Headstock journals are provided with well lubricated, renewable bronze bearings. Alternat heat treated steel and bronze washers take the end thrust and a simple adjustment is provided to take up wear. All gears are covered with neat and substantial cast iron guards that may be quickly removed when desired.

BED The Bed is of deep construction and width to give the greatest rigidity under heavy cuts. The shears are made extremely massive and the bed walls extra thick, providing the necessary mass of metal to absorb the vibration and shocks incident to heavy turning at high speeds. Heavy box girths tie the front and rear walls of the bed together at close intervals. Improved type wide angle V on front shear to take thrust of cutting tool. The rear bearing of carriage on bed is flat instead of V-shaped. At the rear of the bed planed pads are provided for attaching Taper and Forming Attachments.

CARRIAGE The bridge is very wide and extraordinarily deep; it will not spring under the heaviest cuts. The carriage is gibbed to the bed at the rear on the outside and will not lift under any conditions.

APRON The apron is of heavy double plate type affording a support or bearing to both ends of all shafts. Apron is tongued and grooved to the carriage, also bolted and dowelled. The feed friction has a greatly increased diameter and will pull the heaviest feeds and cuts without slipping. For engaging the friction a hand wheel several inches in diameter is provided and seats the friction firmly with very small effort on the part of the operator. All studs in apron revolve and simple but adequate oiling facilities are provided.

FEEDS Positive Gear drive through headstock spindle, steel gears in gear box, three rates of feed are provided for through sliding key type. Feeds per revolution of spindle being ⅛ in., 1-16 in. and 1-32 in. All gears in the feed train are fully guarded.

TAILSTOCK The tailstock is a massive casting, rigidly braced internally, and is provided with a long nose, making it unnecessary to extend the tailstock spindle for ordinary work. It is clamped to the bed by four large locking bolts operated at the top of the barrel. A simple binder locks the tailstock spindle in correct alignment; this clamp is located at the extreme front end, where it grips the spindle with the utmost rigidity and absolutely does away with distortion of any kind. The screw is unusually large to resist any buckling tendency. Suitable screws are provided for setting over for Taper Work.

EQUIPMENT Unless otherwise specified Lathes are furnished with 8 ft. bed, one driving plate, hand cross feed, heavy duty plain rest, necessary wrenches, and two-speed tight and loose countershaft. Forming attachment, turret tool post, hand or power feed bed turret, oil pan, pump, and connections can be furnished as extras when desired.

DIMENSIONS

Swing over bed	20 in.
Swing over carriage	11 in.
Length of Bed Standard	8 ft.
Distance between centres 8 ft. bed	40 in.
Width of bed overall	19½ in.
Height from floor to centres	40 in.
Dimensions of front spindle bearing	4 15/16 in. x 6¾ in.
Dimensions of rear spindle bearing	4 in. x 5½ in.
Diameter Nose of spindle	4 in.
Hole through spindle	1 5/16 in.
Diameter Tailstock spindle	3⅜ in.
Travel of Tailstock spindle	6 in.
Morse Taper—Centers	No. 5
Width of Tool Slide	12 in.
Diameter of Headstock Cones	11 in. and 14 in.
Belt Width	6 in.
Number of Feed Changes	3
Feeds per Revolution of Spindle	⅛ in., 1/16 in., 1/32 in.
Speed of Countershaft	110 R.P.M.
Size of Tight and Loose Pulleys	16 in. x 6¼ in.
Ratio of Back Gearing	6.7 to 1
Face of Back Gears	2¾ in. and 2¼ in.
Length of Carriage Bearing	30 in.
Width of Carriage Bridge	12 in.
Number of Spindle Speeds with Two-Speed Countershaft	8
Weight—Approximately, 8 ft. Bed	5,300 lbs.

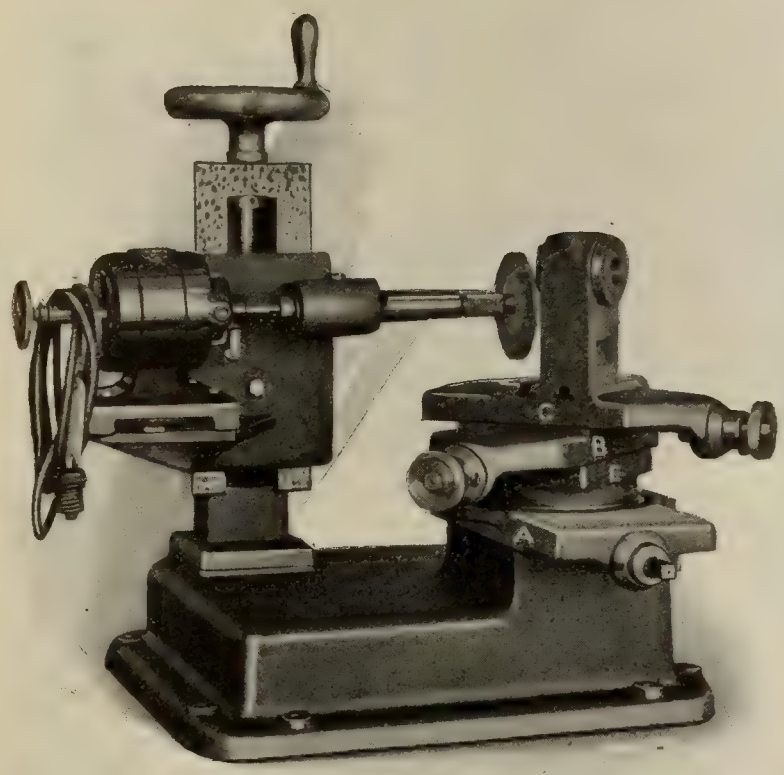
Immediate Deliveries. Telegraph or write for Prices and Further Particulars

H. W. PETRIE of Montreal, Ltd., Montreal, Que.

If any advertisement interests you, tear it out now and place with letters to be answered.

The Cleveland Milling Machine Co.

PROFILE GRINDER



IS used to Grind, Concave and Convex Cutters, Cutters for Fluting Drills, Cutters that are irregular but having a number of true curves, accurately rounding the corners on Side Mills and Face Mills, Formed Tools for Screw Machines and Corner Rounding Tools for the Lathes, Planers and Shapers.

The maximum radius that can be ground is 3 inches, either convex or concave up to 12" dia.

The wheel carrying spindle is direct connected onto the motor shaft and has adjustable bronze bearings and carries a wheel 4" diameter, ¼" wide, ⅜" hole.

Complete equipment is furnished for all classes of work as follows:

1—Dumore Type D Universal Motor with 10 ft. of Wire, and Plug to fit any lamp socket, 110 volts, direct or alternating current.

1—4" x ¼" x ⅜" Hole Emery Wheel.

4—Work Posts.

1—⅞" Work Arbor.

1—1" Work Arbor.

1—Tooth Rest.

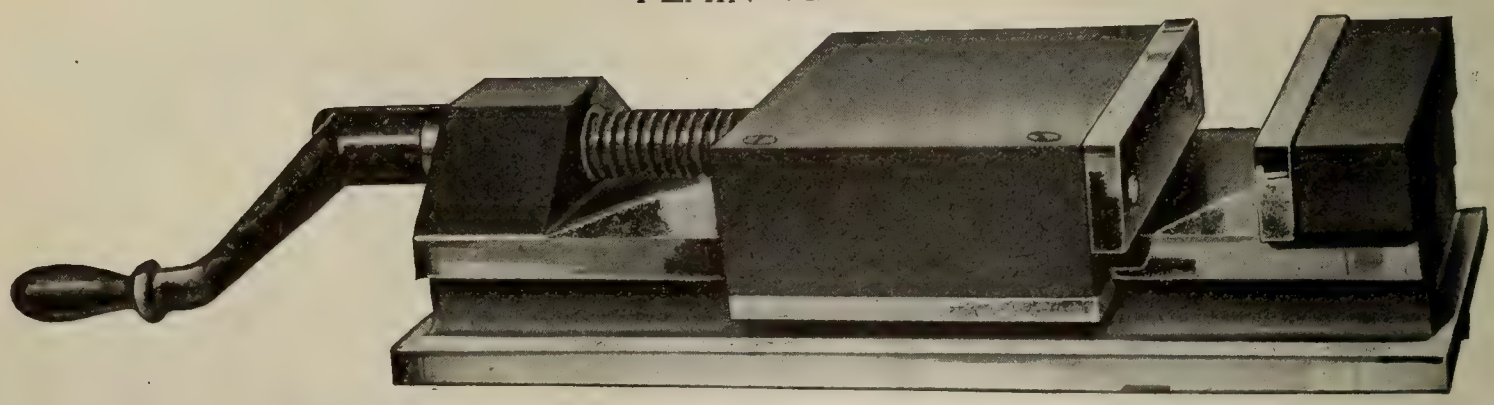
1—Gauge for radius setting.

All necessary wrenches.

Immediate delivery if you get your order in now.

The Cleveland Milling Machine Co.

PLAIN VISE



The dominant idea in designing this vise has been to incorporate compactness, rigidity and strength.

Our engineers' efforts have successfully combined these desirable features in the vise which is illustrated.

Vise opens with steel jaws	4⅜"	Depth	1½"
Vise opens without steel jaws	5⅜"	Width	6"

These jaws are removable for increasing the vise range or insertion of special jaws.

The regular equipment furnished with this vise is as follows:

One pair of Clamps and Bolts. One Crank Handle. Hardened and Ground Tongues.

We have a limited quantity of these vises on hand for immediate delivery. Write for circular. Price on application.

CUTTERS CARRIED IN STOCK BY OUR AGENTS

THE DALE-BREWSTER MACHINERY CO.
547 Washington Blvd., Chicago, Ill.
New York Office, 30 Church Street, New York, N.Y.

D. NAST MACHINERY CO.
Bourse Bldg., Philadelphia, and
4 East German St., Baltimore, Md.

The Cleveland Milling Machine Co.

CLEVELAND OHIO

Milling Cutters Milling Machines Relieving Machines

Cleveland Milling Machine Cutters

are as near perfect as human skill and modern machinery can make them.

They have

Accuracy
Uniformity
Strength and Finish

which are the qualities essential to perfect cutter making.

Do you receive our "Stock List of Cutters," published the fifteenth of each month?

This list should be on your desk for ready reference.

Write for it.

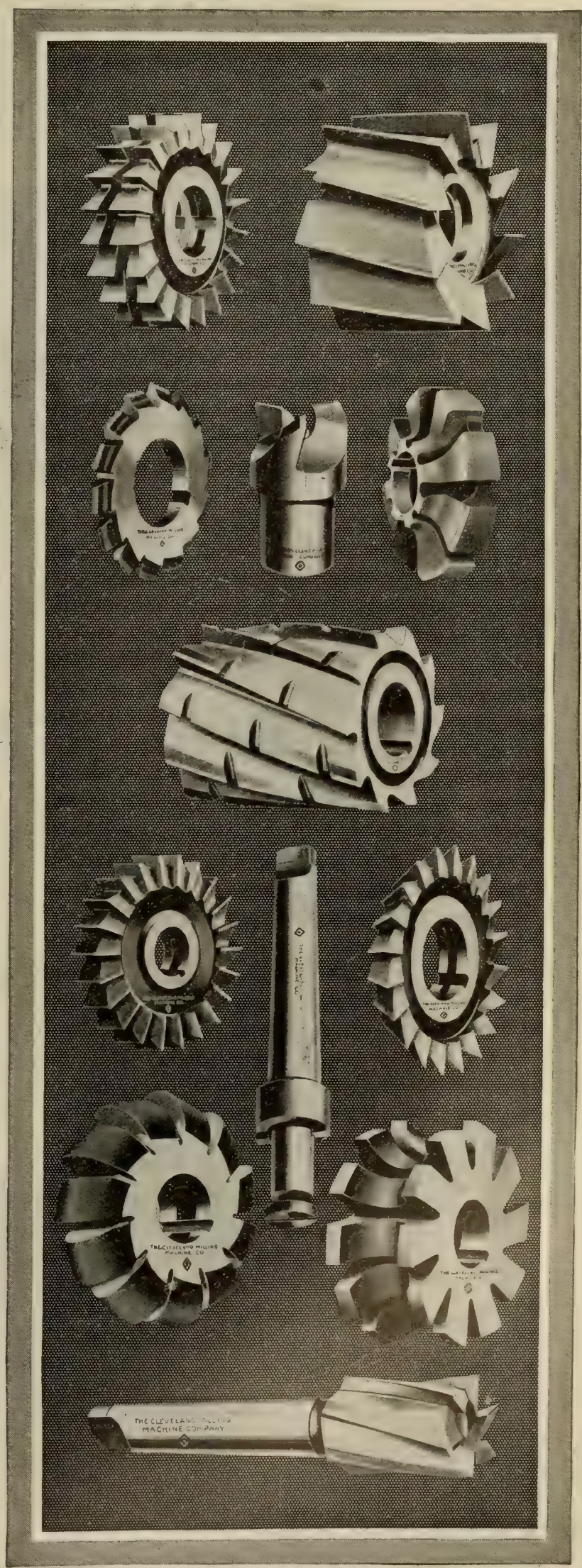
CUTTERS CARRIED IN STOCK BY OUR AGENTS

THE DALE-BREWSTER MACHINERY CO.
547 Washington Blvd., Chicago, Ill.
New York Office, 30 Church Street, New York, N.Y.

D. NAST MACHINERY CO.
Bourse Bldg., Philadelphia, and
4 East German St., Baltimore, Md.

The Cleveland Milling Machine Company

CLEVELAND, OHIO



WORLD TRADE DEMANDS UNIFORM STANDARDS

Standard of the World

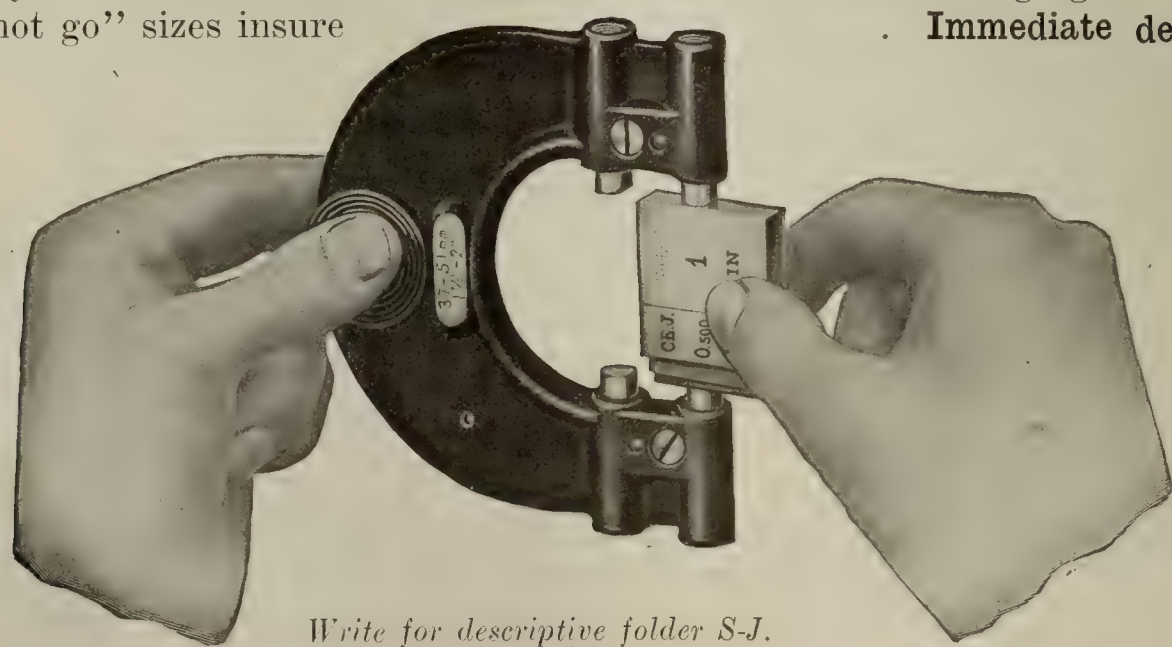
Guaranteed Accuracy 0.00001 in.

Far-sighted, ambitious manufacturers, in reaching out for world trade, have learned the necessity of basing their gaging system on size standards which are truly international. Johansson Standard Gages are used by Governments and manufacturers the world over to standardize sizes. Their usefulness in toolroom and inspection department is unlimited.

JOHANSSON GAGING SYSTEM

Interchangeability is insured by standardizing sizes and establishing limits. **The Johansson Adjustable Limit Snap Gage** can be quickly set to your sizes and limits. It's fixed "go" and "not go" sizes insure the production of work which is "just right." It reduces your cost of maintaining limit gages, because it is adjustable for wear, different sizes and changing limits

Immediate deliveries.



Write for descriptive folder S-J.

THE SWEDISH GAGE COMPANY, Inc.

New Birks Building **Montreal, Canada**

THE "NEW BRITAIN"
An All-Round Screw Machine

THE "New Britain" Six-Spindle Automatic is anything but a special purpose machine.

Its economic use is not restricted to the handling of work whose multiplicity of operations prevents its completion on the bar by machines of less tooling capacity.

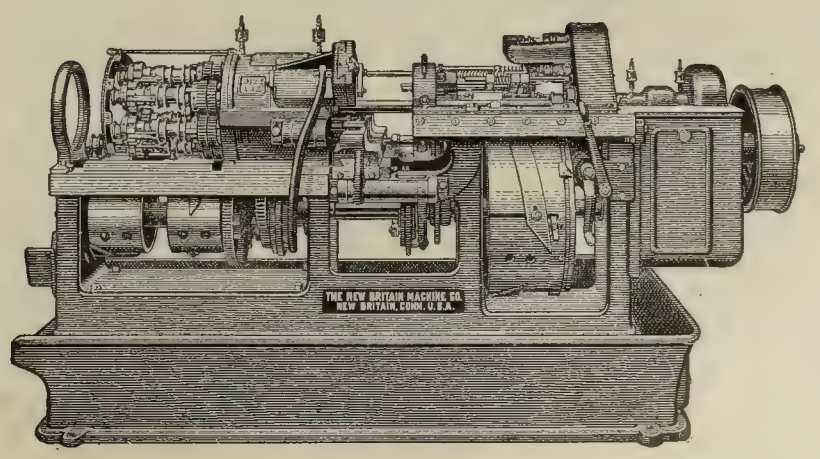
This extra tooling capacity gives it an equal advantage on the ordinary run of work by permitting the subdivision of the longer operations—thus doubling and sometimes trebling production of machines of older type.

On work of still greater simplicity the Six-Spindle Automatic renders possible the production of two or three pieces at each indexing—cutting off in two or three positions.

If you are seeking means for cutting costs and increasing production an interview with the "New Britain" man will show you the quickest way. Write us.

The New Britain Machine Company

Automatic Screw and Chucking Machines **New Britain, Connecticut, U.S.A.**



GALVANIZE

to

PREVENT CORROSION

Rods, bolts, boat spikes, clinch rings and other steel pieces employed in the shipbuilding industry are galvanized in MEAKER UNITS at lowest cost and the galvanized coating produced is of uniform thickness, heavily applied and superior in every way.

Small parts used in the manufacture of aeroplanes and munitions are cleaned and galvanized at small operating cost in our INTERMITTENT ROTATING GALVANIZING MACHINES.

Several hundred manufacturers located throughout the world have proven that their investment in Meaker Unit is recovered by them several times each year—isn't it good business to own a galvanizing plant that saves each year an amount of money greatly exceeding its original cost—can you invest a moderate sum to better advantage? If you send your product out to be galvanized it will pay you to consider our proposal. If your galvanizing equipment is inadequate in size to meet present requirements, our Engineering Department offers you expert service without charge.

Booklets mailed on request contain much general information on the subject of galvanizing.

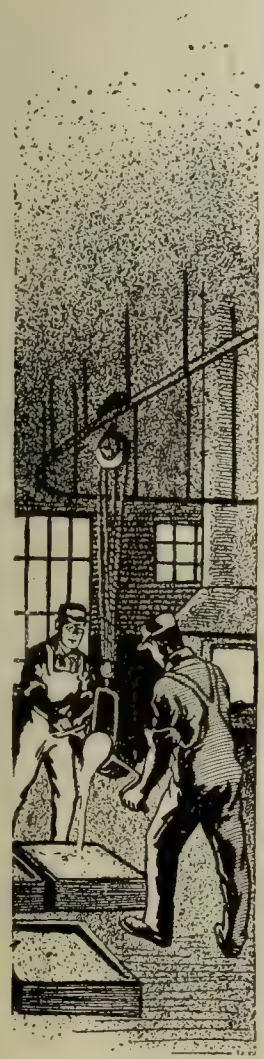
Meaker Galvanizing Company

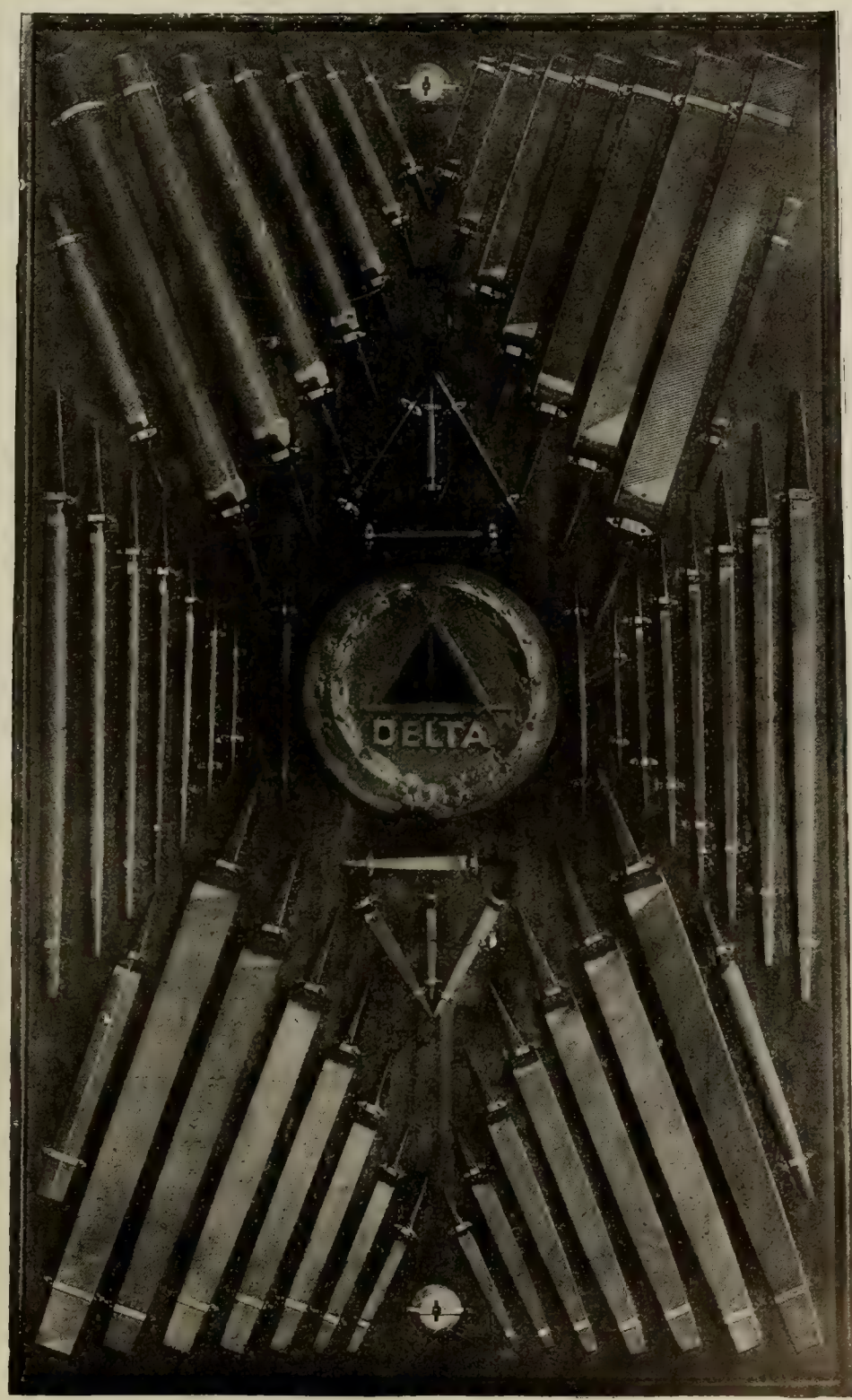
Corner Fulton and Elizabeth Streets

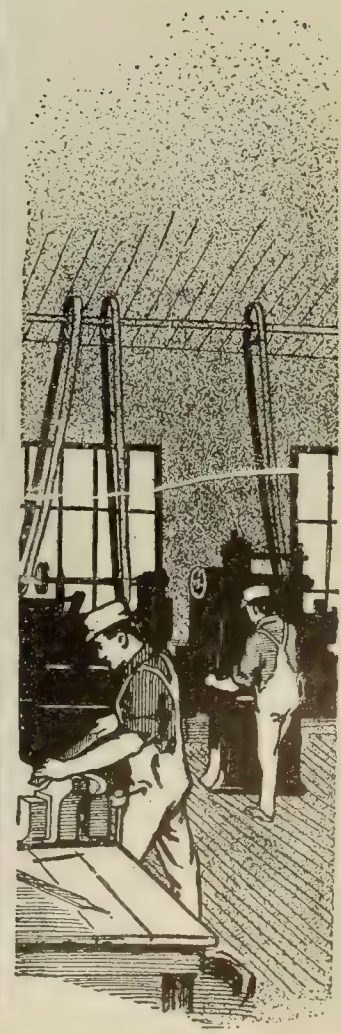
CHICAGO, ILLINOIS

THE WINNERS

Used in Every Shop Where Economy and Efficiency Are Practised







FILES OF QUALITY

TRADE MARK DELTA

The File You Will Eventually Use—As Perfect As Will and Skill Can Make—Clean, Strong, Sharp Teeth

DELTA FILE WORKS, Philadelphia, U.S.A.

Used in Every Shop Where Economy and Efficiency are Practised

If any advertisement interests you, tear it out now and place with letters to be answered.

Every Machine Right at Hand

Another Pexto innovation! This time it's a handy revolving standard that swings every machine into the right position at a moment's notice. A time saver, a labor saver and a space saver all in one. A sturdy standard that keeps your machines off the floor and out of the way when not in use but keeps them right at hand when they're wanted.

Holdall Revolving Machine Standard

The illustrations on this page will tell you this interesting and practical story — the first one shows the standard without machines. The revolving turret will carry four machines on strong adjustable machine holders. It swings quickly to any position and easily locks with a handy lever. Can you imagine an easier way of handling successive sheet metal operations? Then, too, look at the six additional machine holders and you'll appreciate how this handy Pexto Standard will save valuable bench space and still keep your equipment within easy reach.

Now look at the lower illustration. Four machines on the turret ready for business. All the others ready to be put in position. All off the floor and a bench clear for action.

One man or four can work around this new standard. It's another high speed Pexto Helper that will increase your shop output.

We've just completed a new book which illustrates and describes this practical device in every detail. A copy will be on the way the moment we hear from you.

The Peck, Stow & Wilcox Co.

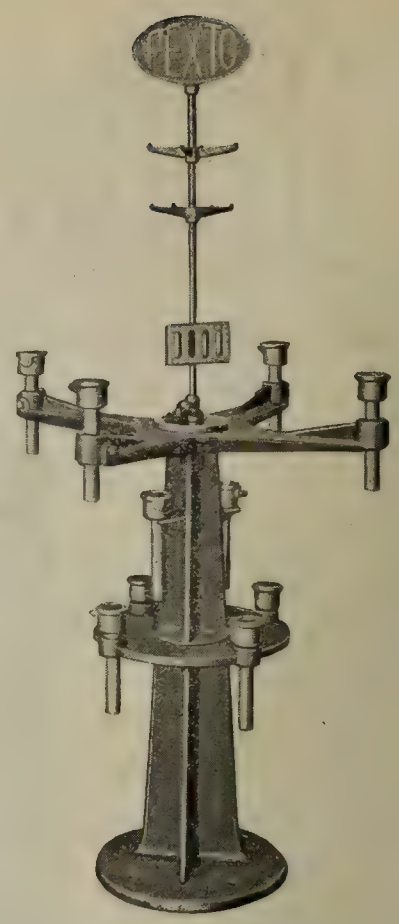
Mfrs. Mechanics' Hand Tools, Tinsmiths' and Sheet Metal Workers' Tools and Machines, Builders' and General Hardware.

Southington, Conn. **Cleveland, Ohio.**

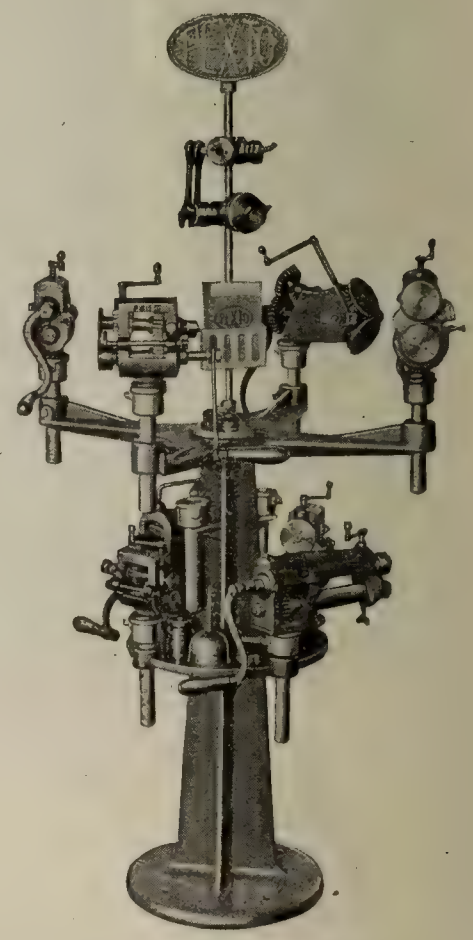
Address all correspondence to
205 W. Center St., Southington, Conn.

PEXTO

SHEET METAL WORKERS' MACHINES & TOOLS



Holdall Revolving Machine Standard, No. 969 (Without Machines)



Holdall Revolving Machine Standard, No. 969 (With Machines)

FOR PRODUCTION AND PROTECTION

Northern Electric

DAVIS

FLOOD LAMPS

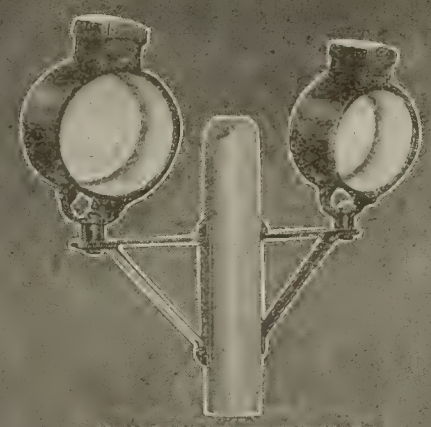
For Production

Give your night timber gang the benefit of "electric daylight" from a battery of these lamps—in fact, give all your above-ground workings the same daylight working conditions at night—and watch your production increase.

For Protection

These flood lamps will put a circle of electric daylight around the workings that no marauder or prowler will dare to enter. They make the workings as safe at night as they are in daytime.

One lamp alone placed 60 feet above ground will illuminate an area of over 100,000 square feet.



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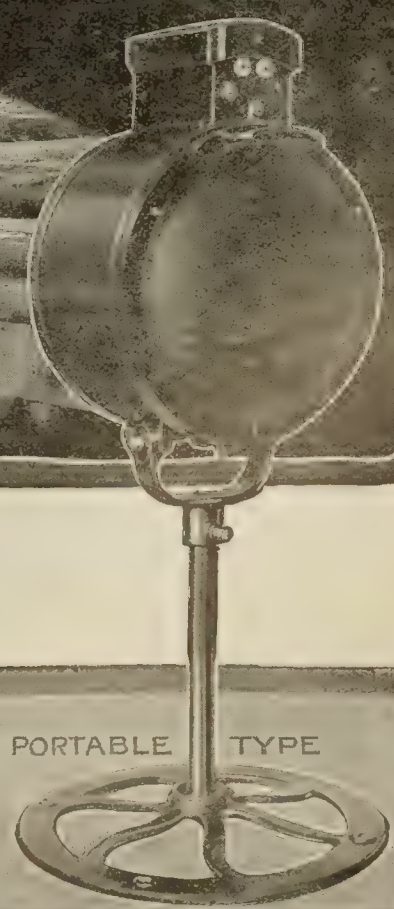
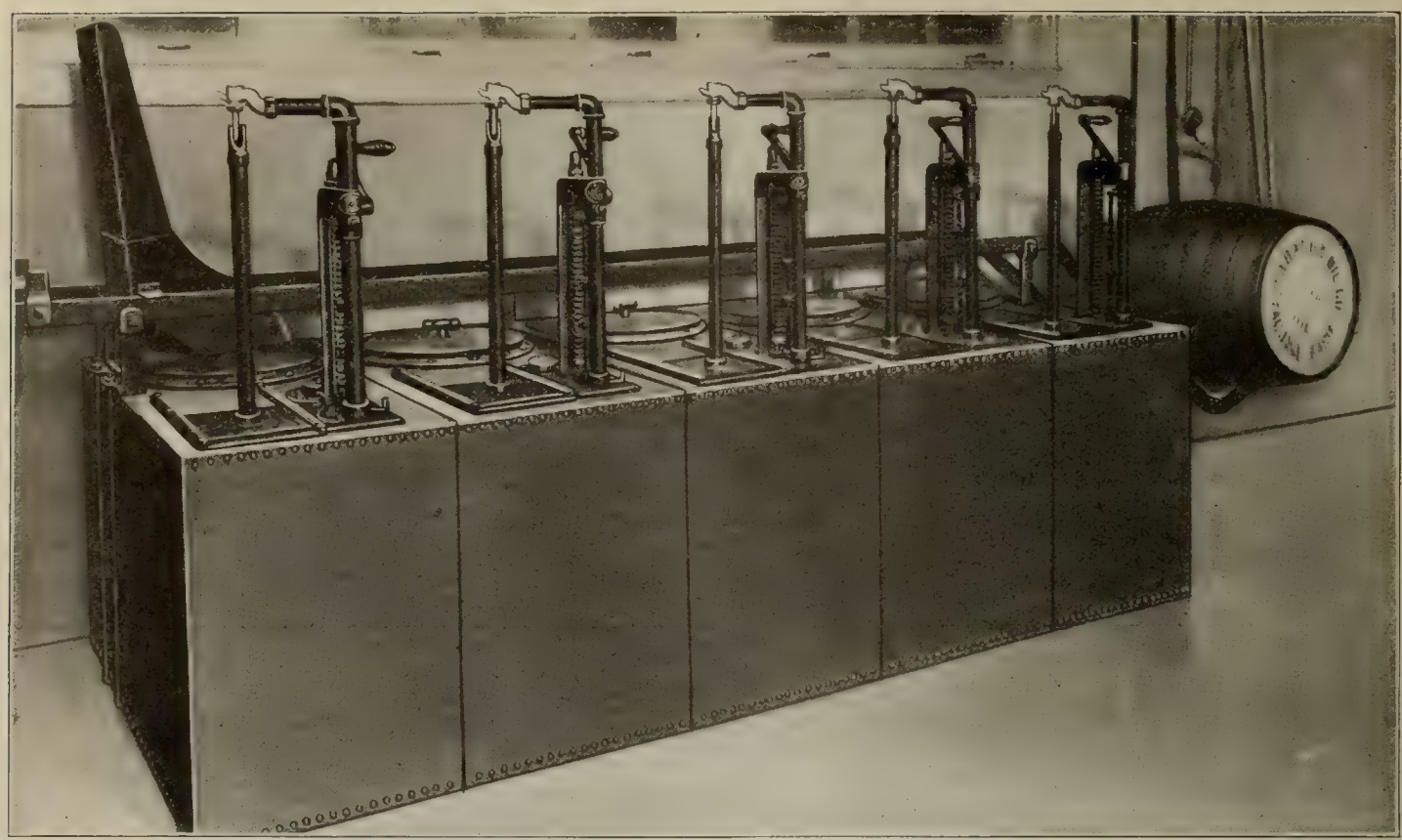


PORTABLE TYPE

Northern Electric Company
LIMITED

MONTREAL TORONTO REGINA
HALIFAX LONDON CALGARY
OTTAWA WINNIPEG VANCOUVER



When Oils are High and Labor is Scarce

what are you doing to meet these difficulties?

¶ Are you equipping your factory to fight against waste of materials, waste of time, labor and money? If not, you are not giving yourself nor your business a square deal. Your machinery deteriorates without proper care — without lubricants, and lubricants which have lost their original qualities, that are filled with dirt, grit and dust are not practical.

BOWSER ESTABLISHED 1885 **LUBRICATING OIL STORAGE SYSTEMS** THE STANDARD ALWAYS

are made to handle any capacity, to meet any requirement. There is no problem too small nor any too large but what we can handle it efficiently.

¶ Tanks are built to eliminate loss from leakage, careless storing and handling, evaporation, deterioration and space wasting. Provide a safe place for the storing of expensive and inflammable oils—the fire hazard is done away with.

¶ Pumps built to discharge, with accuracy, from one gallon to half-pint. Self-measuring; easy to operate; a check on amount drawn, and a time-saver.

¶ It can easily be seen that no careless workman can leave the spigot open and over-run the oil upon the floor. The workman saves time and labor—Bowser saves oil, space, time and labor —and you save the combination—MONEY.

In a few words, Bowser Systems insure a spotless, economical oil department.

Write for Interesting Booklet.

Sales offices in all centres

S. F. Bowser & Co., Inc.
Toronto, Canada

Representatives Everywhere

WM. W. HICKS

Manufacturers Agents

567 Banning Street

WINNIPEG MANITOBA

Machinery and Supplies

We handle products of leading manufacturers whose lines can be relied upon to give the best of service. We represent:

Garlock-Walker Machinery Co., Toronto — Woodworking and Metal-working Machinery.

Canadian Sirocco Co., Ltd., Windsor, Ont.—Ventilating Apparatus, Steam Traps.

E. Leonard & Sons, London, Ont.—Boilers and Engines.

Main Belting Co. of Canada, Ltd., Montreal — Anaconda and Leviathan Belting.

Ric-Wil Co., Cleveland—Heat Insulating Products.

Falls Machine Co., Sheboygan Falls, Wis. — Automatic Engine Stops.

The Mechanical Appliance Co., Milwaukee, Wis.—Watson Direct and Alternating Current Motors.

The Wm. B. Pierce Co., Buffalo, N.Y.—Dean Boiler Tube Cleaner and Hays Gas Analysis Instruments.

Machine shops of Western Canada get quick and economical service by ordering from us.

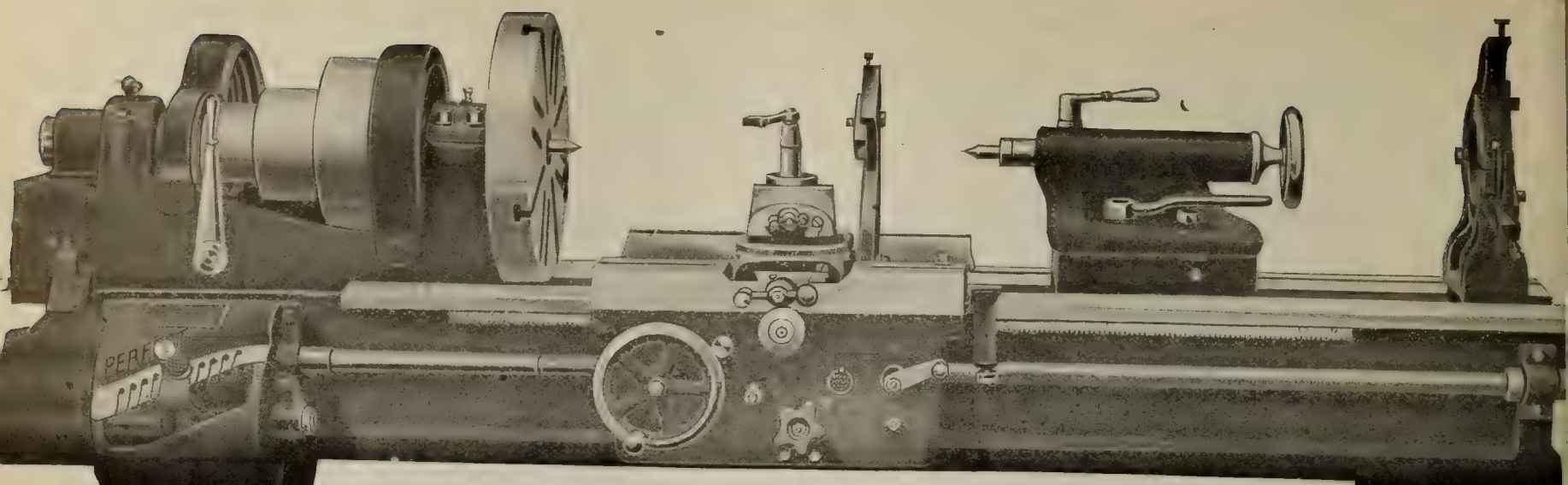
We carry an extra big stock of **Anaconda and Leviathan Belting.** Any demand supplied on short notice.

Western Representative For

RICH HIGH SPEED DRILLS

Reamers and Chucks

STOCKED FOR PROMPT DELIVERIES

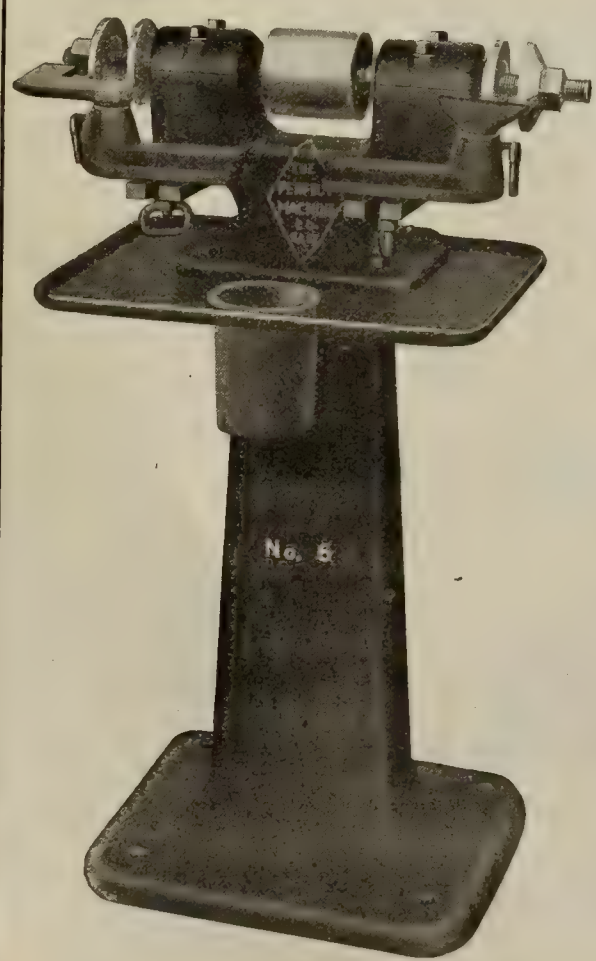


No. 23

Double Back-Geared, Quick Change Gear, "Perfect" 18" Lathe

It's Economical. It Produces Results. It's Rigid. It Has Strength. It's Built Right with the Right Materials

"PERFECT" COLUMN GRINDER.—Base, bearings and spindles are all made in exact proportion, giving a smooth, even revolution. No quivering—no shaking. There's economy represented in a good grinder, and you can buy our grinders for less money than any other grinder on the market.



No. 6

Number 19 is an 18" Geared Drill, geared 2 to 1, has a 2" flat belt and takes a 1" drill. Weight 450 lbs. There's no better 18" drill on the market.

We have gained a commendable reputation for our line of machine tools by reason of their quality and reasonable price. They merit your investigation.

Every tool is tested before leaving the factory. And every tool we make is guaranteed.

Get our catalog and price lists.

Perfect Machine Company, Limited

GALT, ONTARIO

Represented by the Leading Machinery Dealers in Canada

No. 19

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

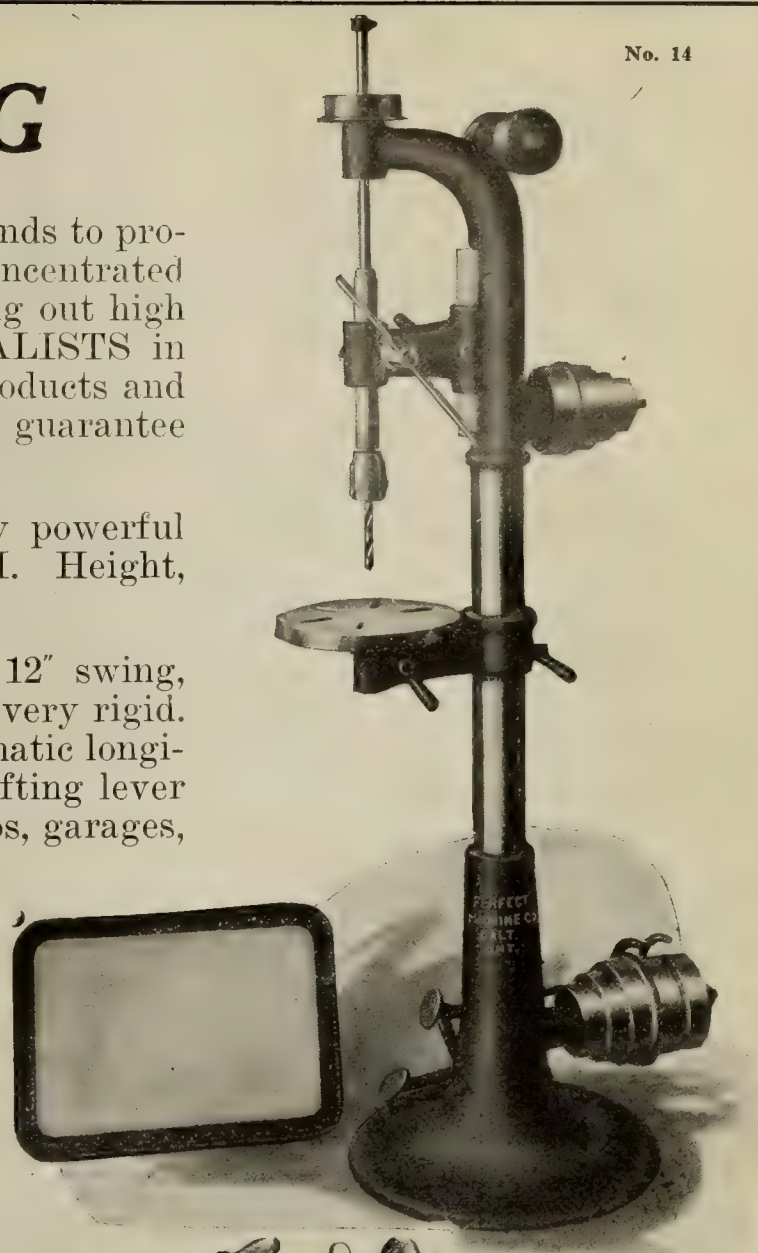
SPECIALIZING

Specializing on a certain line of endeavor tends to produce the utmost in efficiency. We have concentrated our efforts for a number of years in turning out high grade work and are regarded as SPECIALISTS in our line. **PERFECT** is the name of our products and perfect we guarantee them to be. We **do** guarantee every tool we make.

Our 14″ Sensitive Drill is an exceptionally powerful tool. Drills up to ½″ holes at 2,000 R.P.M. Height, 6′ 3″. Weight, 350 lbs.

"Perfect" Screw-cutting Engine Lathe — 12″ swing, 17″ swing in gap, 6′ bed. Compound rest is very rigid. Spindle bearings are of split bronze. Automatic longitudinal and cross-feeds are reversed by shifting lever on apron. A valuable tool for machine shops, garages, experimental shops, trade schools, etc.

We also manufacture High Speed Hack Saws, ordinary Hack Saws, etc. Get our catalog and price lists for full particulars.



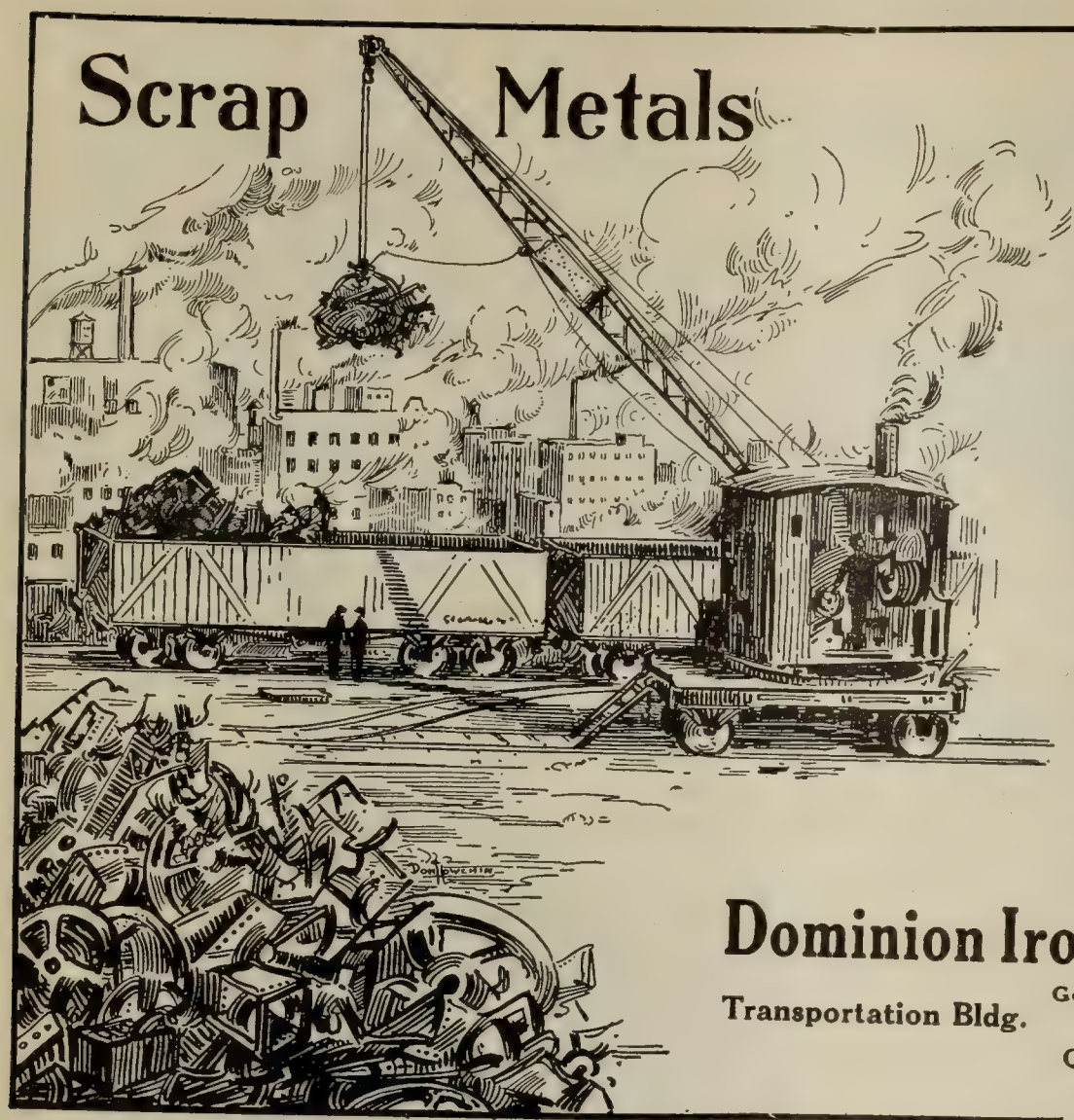
No. 14

No. 21

Perfect Machine Company, Limited

GALT, ONTARIO

Represente by the Leading Machinery Dealers in Canada



Scrap Iron, Steel and Metals

No undertaking is too large for us. We are Scrap Metal Specialists, and can co-operate with you in the dismantling of railway equipment, bridges, plants, steamers, mills and will take your rails and machinery.

Shell Makers. We can take care of all your scrap materials, at highest prices.

Give us particulars and we will relieve you of all worry.

Dominion Iron & Wrecking Co.

LIMITED

Transportation Bldg. General Offices: - Quebec, Que. Montreal, Quebec

Wire Cloth

of every description

We make **Machinery Guards** of all kinds.
Metal Lockers for Clothes
Steel Shelving for all purposes.

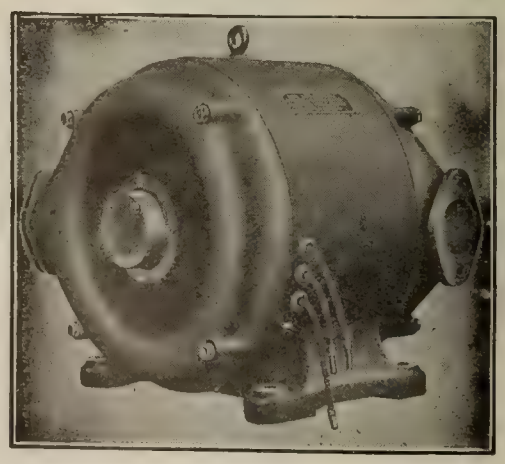
Drop a line for full details.

CANADA WIRE & IRON GOODS CO.
HAMILTON, ONTARIO
Eastern Representatives:
H. E. Bull, 184 Mance St.
Montreal, P.Q

The Lancashire Dynamo & Motor Company, of Canada, Limited

107-109 Duke Street, TORONTO

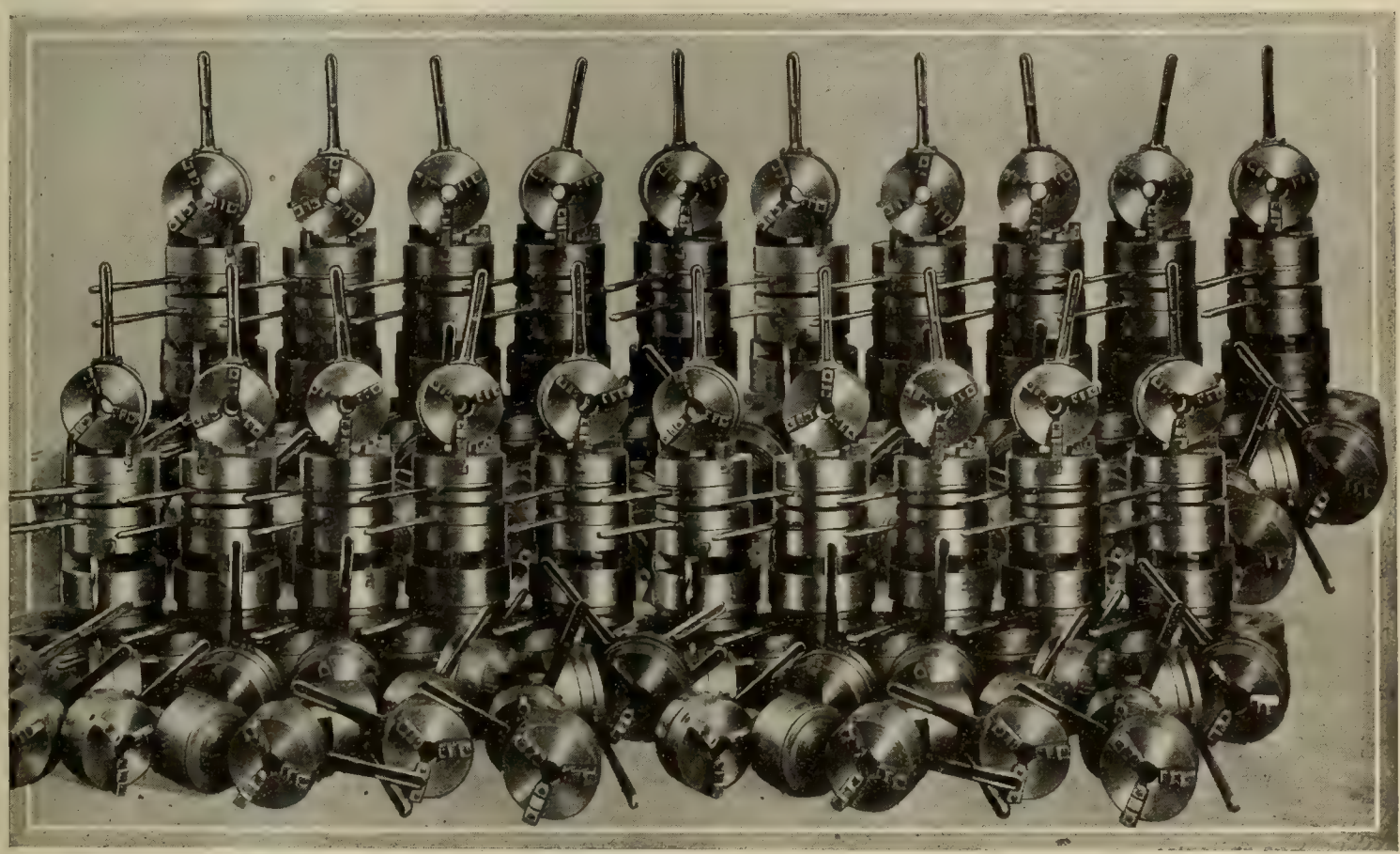
ELECTRICAL MACHINERY for all Purposes.
ELLIOTT BROS'. { INSTRUMENTS / RECORDING GAUGES



PIPE VENTILATED A C MOTOR
FOR VERY DIRTY PLACES

BARKER

WRENCHLESS CHUCKS



Recent Shipment

ENLISTED FOR SERVICE IN FRANCE

Every ounce of man power that France can command is needed on the firing line. So French captains of industry have scoured the world in search of labor-saving devices for the efficient and rapid production of munitions of war with the result that the **Barker Wrenchless Chuck** has been enlisted for service in France.

The Barker Wrenchless Chuck can reduce chucking time on all repetition work. It is a safe chuck; self-contained; rapid and positive in action; built of carefully selected materials and with finest workmanship.

These are features of "Barker" which won the esteem of the French Experts.

What is good for the French is good for her Allies.

Under any condition, on any work, on any machine operated by man or woman, Barker Wrenchless Chucks increase output. All we ask is the opportunity to prove "Barker" efficiency in reducing chucking time to the minimum. WRITE US.

THOMAS ELEVATOR COMPANY

22 South Hoyne Avenue **CHICAGO, ILL., U.S.A.**

Represented abroad by Selson Engineering Co., Ltd., London, Paris, Turin, Melbourne.

The PHOTOSTAT—An Investment

(Reg. U. S. Pat. Off.)

The **United States Government** bought PHOTOSTATS for several Departments where copying was required. The records of the savings as published in the official report, follow:

Department of Justice (Period 6 months)		
Cost by previous method	$1,955.00	
Cost by Photostat method	794.50	
Saved by the Photostat		$1,160.50
Bureau of Animal Industry (Period 5 months)		
Cost by former method	504.00	
Cost by Photostat method	222.60	
Saved by the Photostat		281.40
Bureau of Chemistry (Period 5 months)		
Cost by former method	1,041.66	
Cost by Photostat method	210.00	
Saved by the Photostat		831.66
Navy Department (Period 5 months)		
Cost by former method	680.80	
Cost by Photostat method	225.00	
Saved by the Photostat		455.80
Department of Commerce and Labor (Period 5 months)		
Cost by former method	10,000.00	
Cost by Photostat method	1,657.60	
Saved by the Photostat		8,342.40
Total savings for period		$11,071.76

Since making these first installations the United States Government has bought over one hundred additional Photostats.

Does Your Business Need a PHOTOSTAT?

The Photostat, which is manufactured by the Eastman Kodak Co., is a combined camera and copying machine. The copy is made directly onto a roll of paper. No intermediate glass plate or film or other negative has to be made. By copying thus directly onto the paper, the copy is made very quickly and at a low cost. Also the copy is a facsimile of the original, so that there can be no mistake in it. The print is developed and fixed right in the apparatus itself; this part of the process, as well as the focusing and exposing, all being mechanical. The print is then removed to a tank of running water in which it is washed free from chemicals. Finally the print is taken from the water and dried and is then ready for use. The whole process is a rapid one, the average speed per print being from one to five minutes.

One Mining Company writes us that they use the Photostat as follows:

All progress maps, new work, etc., are laid out either in pencil or ink, and the Photostat copies are given to the underground foremen and shift bosses.

The same thing is done with regard to stope maps, positions of pillars, etc.

The use of blue prints in the machine shop, foundry and other construction departments is practically discontinued.

In the office all deeds, leases, etc., are copied as soon as they arrive and the Photostat copy is sent to the home office for filing. This has the advantage of giving an exact copy of the original, with all changes, signatures, etc., faithfully reproduced.

The Photostat copies at actual size, in reduction, or in enlargement.

Pencil Drawings, Sketches, Blue Prints, Shop Orders, Tracings, Maps, Pages from Books, etc.

A small book giving detailed description will be sent to you upon request to the

This cut shows the operator examining copy of a 36-in. drawing which he has just made in less than a minute.

COMMERCIAL CAMERA COMPANY

343 State Street, Rochester, N.Y. **325 Grosvenor Building, Providence, R.I.**

Alfred Herbert, Ltd., Agents, Coventry, England

Three Great Powers in Beltdom

Lanco Balata Belting

A really waterproof belt and as nearly stretchless as is possible in a good belt.

We carry stock up to 18 inches in width, and can make good deliveries.

Scandinavia Belting

for direct drives is a very satisfactory and economical belt. Has great strength. Stands up well on shifters.

The original solid woven belt.

"Belts"

Are you receiving our monthly publication, "Belts"? It is sent free to users of belting, whether they use ours or not. If you are not receiving it, fill out attached coupon.

Federal Engineering Co. Limited

172 John St., Toronto, Ont.

Federal Engineering Co., Ltd.,
172 John Street, Toronto.
Please enter my name on your mailing list to receive "Belts."
Name .....
With Firm .....
Position held .....
Street .....
City .....

Chapman Double Ball Bearings

Here is a ball-bearing that offers sound and practical *economy* in power transmission. For Chapman Double Ball Bearings reduce friction loads 75 per cent., making an average total saving of power 15 per cent. to 30 per cent.

Further, they reduce lubrication expenses 95 per cent.

They have been constructed to fit any of the standard frames on the market, interchanging with self-oiling boxes of the same shaft size.

Chapman Double Ball - Bearings are substantial in construction and have a long and serviceable life, even under the most strenuous conditions.

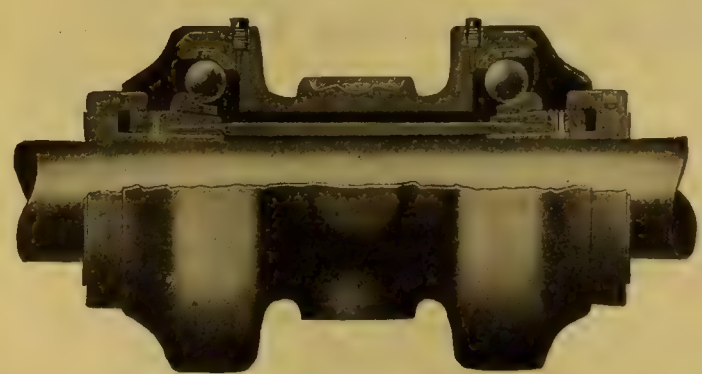
Used in Over 2000 Canadian Factories

Saves 75% Shaft Friction

Saves 100% Re-babbitting.

Saves 95% Lubrication.

High cost of production makes **Chapman Double Ball-Bearings** worthy of your instant adoption. They'll save you money.



THE CHAPMAN DOUBLE BALL BEARING COMPANY OF CANADA, Limited

339 to 351 SORAUREN AVENUE

TORONTO, CANADA

Transmission Ball Bearing Co., 1050 Military Road, Buffalo, New York

Sadler AND Haworth

IN normal times it's the best policy to adopt HIGH QUALITY belting, but in these days of WAR ECONOMY the policy is doubly strong.

Quality belting ensures you of least slippage, least breakage; takes up all the power and delivers all the power.

S. & H. Belting is high quality belting.

LEATHER
Like Gold
Has No Substitute

SADLER & HAWORTH

Tanners and Manufacturers of Oak Tanned Leather Belting since 1876.

511 William St., Montreal, P.Q.

Toronto, Ontario—38 Wellington Street E. **Winnipeg, Manitoba**—Galt Building. **Vancouver, B.C.** — 111 Water Street. **St. John, N.B.**—49 Prince William Street.

SURROUND YOUR BUSINESS WITH NEVER-FAIL BELTING

DUNLOP "GIBRALTAR" BELTING

SEAL OF QUALITY

"Strength of Gibraltar," while not our phrase, aptly applies to the rubber belting made by us and sold under the name **"Gibraltar Redspecial."**

It would be interesting to us if you, as a user of belting, would, before making your next purchase, get a verdict on **"Gibraltar"** from some of your friends.

Ask them if a stronger belt than **"Gibraltar"**—one giving more service with less loss of power—can be obtained anywhere; if any other product will survive heavy loads better; and, if, in withstanding the jerky strains consequent on fluctuation of power, any other belt can show a higher quality of friction in uniting the plies than **"Gibraltar Redspecial."**

We have evidence aplenty, in the form of voluntary testimony, which shows that for strength, durability and general service **"Gibraltar Redspecial"** is matchless. In the Biggest Saw Mills, Biggest Pulp and Paper Mills, Biggest Manufacturing Plants, one "driving force" is nearly always in evidence—Dunlop **"Gibraltar"** Belting.

For Drives, Rotaries, Edgers, Lath and Shingles Machines, or any kind of Transmission work, there is nothing better than Dunlop **"Gibraltar Redspecial"** Belting.

And what Dunlop **"Gibraltar Redspecial"** means to users of Transmission Belting, Dunlop **"Samson"** ensures to users of Conveyor or Elevator Belting.

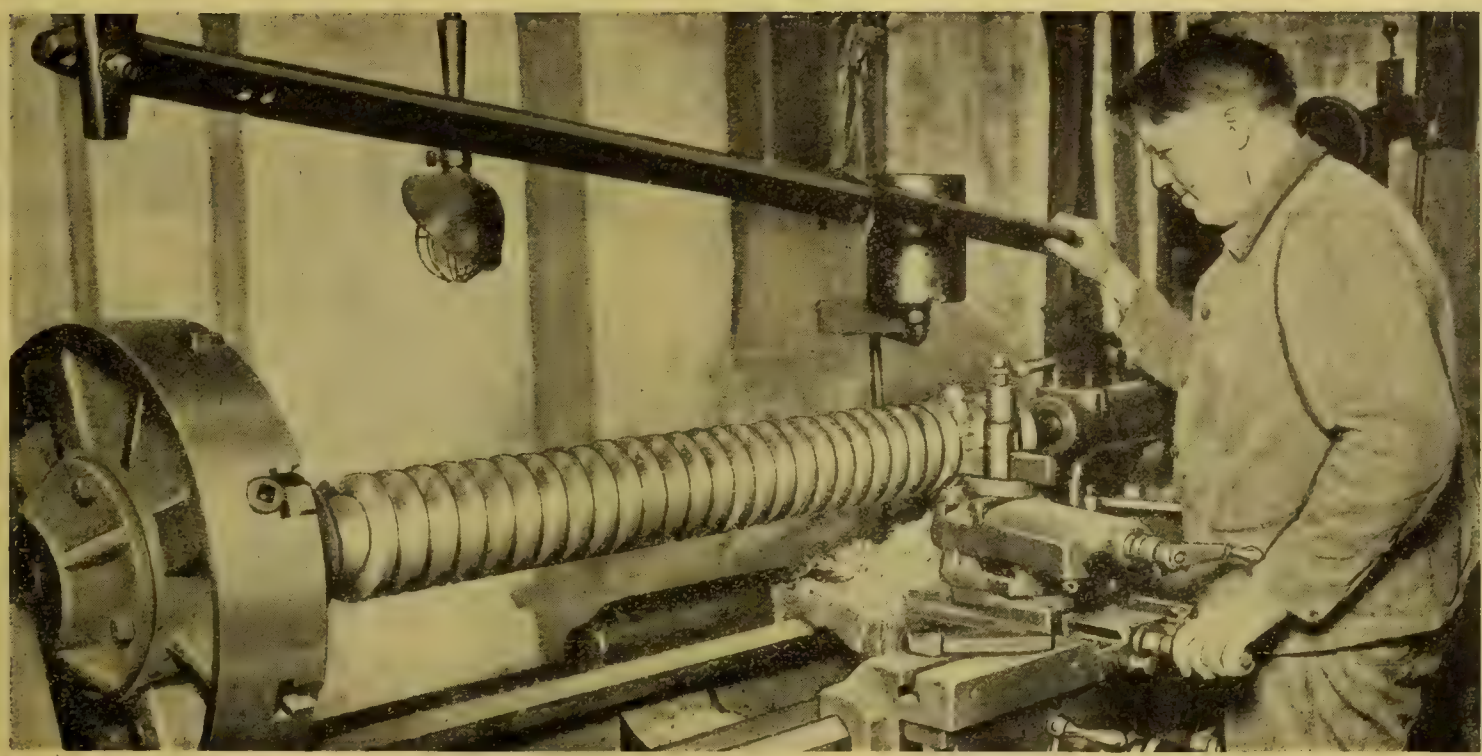
NO LOAD TOO HEAVY

DUNLOP "GIBRALTAR" BELTING

NO SERVICE TOO EXACTING

D. 26

DUNLOP TIRE & RUBBER GOODS CO., Limited



PHILADELPHIA
GEAR *TIME*

"Every Second Counts"

Worms or Worm Wheels?

THE United States is now calling on Canada to make shells. Canada will undoubtedly be calling on the United States for different machine shop equipment. If it's gears, we make them. All sizes from the largest gears made to the smallest. Nothing too big for us to handle and *handle quick*. For instance, worm wheels shown here. They have cast steel centres, phosphor bronze rims. Diameter 59.206, sixty teeth, 3″ pitch, 7″ face. If it's rawhide pinions, spiral or bevel gears or anything with teeth we are prepared to maintain equivalent service.

We are all in this war to win. Canada is doing her bit. We are out to do ours.

PHILADELPHIA GEAR WORKS

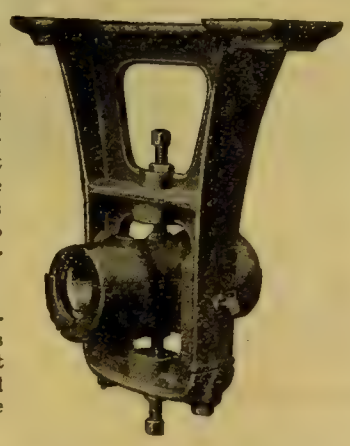
VINE AND 11th STREETS
PHILADELPHIA, PA., U.S.A.

LITTLE LEAKS and LITTLE PROFITS

STEADY dropping of water will wear away a stone—and steady little leaks wear holes in the P. & L. Statement.

The steadiest loss in most plants is in small power losses, which are only revealed by testing and are generally "simply accepted as inevitable" by the management.

BOND Ring Oiling Hangers cut these transmission losses to the minimum. The ring oiling device provides positive lubrication without waste of oil. Once the oil reservoir is filled, it requires no special attention for six months.



The universal adjustment corrects even the slightest misalignment, and thus cuts down the wear.

THE Spiro Compression Coupling is the greatest power-saving coupling you can instal. It is locked to the shaft by a graduated grip. The pull of the bolts on the two halves of the coupling acts on the spiral slotted sleeve until it grips the full surface of the shaft with a never-slip-hold. Every bolt pulls, and with every pull the grip grows.

And it can be removed as quickly as it can be installed.

STOP your power leaks by installing these two efficient power savers in your plant. The investment will yield a steady return with every revolution of your shafting.

The Bond Hanger Book describes our complete line of power appliances. Send for your copy to-day—now.

Canadian Bond Hanger & Coupling Co. Limited

ALEXANDRIA ONT.

IF self-interest be the mainspring of a man's actions, then you should act at once, because the "Clipper" Belt Lacer saves money for you.

Each time a belt breaks from 1 to 150 men and machines are idle.

"Clipper" lacings have been made in 45 seconds. The maximum time required is only three minutes. How long are *your* men and machines idle when a belt breaks?

Clipper Belt Lacer Company

976 Front Avenue Grand Rapids, Mich.

ADVERTISING to be successful does not necessarily have to produce a basketful of inquiries every day.

The best advertising is the kind that leaves an indelible, ineffaceable impression of the goods advertised on the minds of the greatest possible number of probable buyers, present and future.

NEW PROCESS

RAWHIDE OR METAL

Serviceable
Silent
Efficient

First Grade Products!
We make gears to suit every purpose, big and little—rawhide or metal.
Our 65 years' experience has taught us how to make gears.
"Theoretically Correct."

GEARS

Scientific production and a factory equipped with the best of modern machinery assures uniformity of quality and minimum prices.

Guaranteed to meet any metallurgical specifications and to be perfect in all tooth characteristics.

Why go to the expense of cutting your own Gears? Send us your blue prints and instructions and the prices we will quote will make you change your mind.

Materials of your own or our selection, cut to your specifications, heat treated and hardened as your work demands, in a plant devoted specially in gearing.

Designers and Manufacturers of

Special Machinery

Bread, Biscuit and Cracker Machinery, Lathes and Planers. High class work — reasonable prices.

Expert advice on all special machinery problems. Consult us.

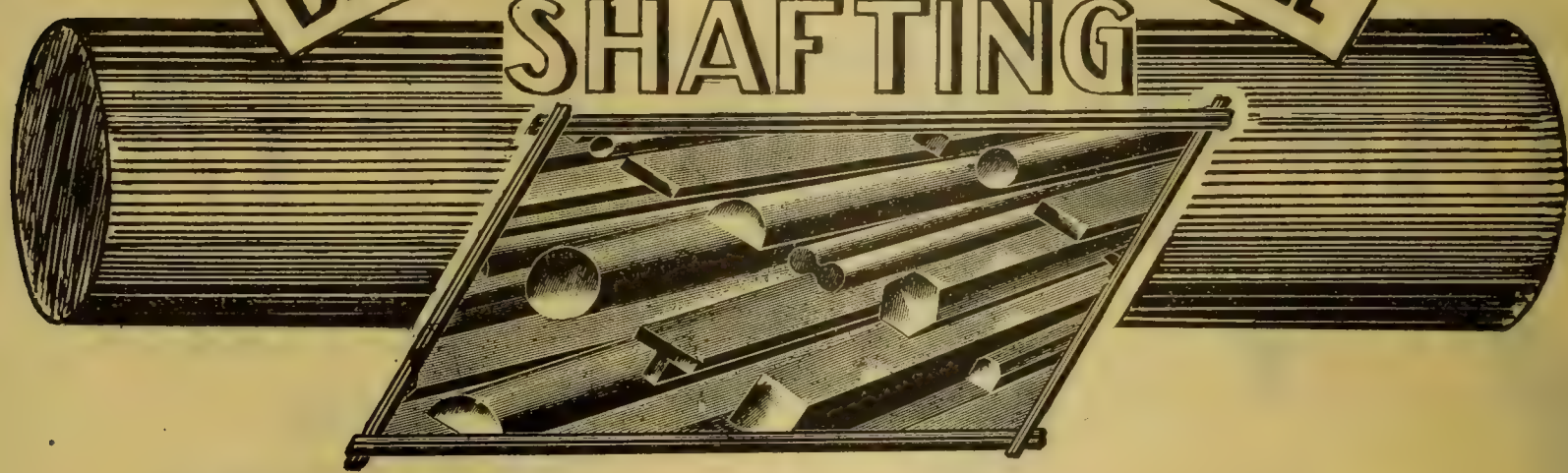
Robert Gardner & Son, Limited

52 Nazareth Street - - MONTREAL, QUE.

UNION DRAWN

BRIGHT COLD FINISHED STEEL

SHAFTING



Maximum Strength and Accurate Size

Besides maximum strength and accurate size you get absolute straightness and highly polished surface in *UNION DRAWN, BRIGHT, COLD-FINISHED STEEL PRODUCTS.*

Our process of COLD DIE ROLLING increases tensile strength almost 30 per cent.; and increases the elastic limit by over 61 per cent. By the same process the resistance to transverse stress is increased about 100 per cent. and the torsional strength is increased over 50 per cent.

We Manufacture:

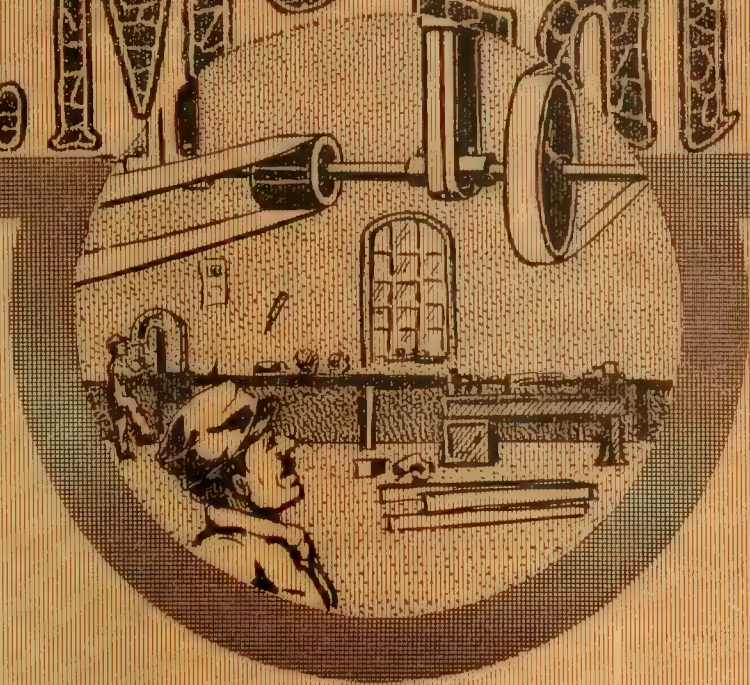
Bright, Cold-finished Steel in Rounds, Flats, Squares, Hexagons and Special Shapes for Machine Construction, Pump Rods, Piston Rods, Roller-Bearing Rods, etc.

Large stock constantly on hand to meet demands for prompt delivery. Pay you to keep well posted on our prices—none better, quality of products considered.

Union Drawn Steel Company, Limited

Hamilton Ontario Canada

D. K. McLaren's



GENUINE OAK

GENUINE OAK

British Oak Tanned BELTS

There is more solid leather to the foot in D. K. McLaren's belting than in any other belting. This claim has been founded upon investigation and it is a claim we strive to live up to.

All British Tanned, conceded to be the best process known to science.

No shoulders, necks or bellies used—all hides are closely trimmed after being tanned, leaving the choicest part for the belting.

A vigorous system of inspection assures the maintenance of high quality throughout the process of manufacture.

Special Belts—If a situation arises requiring a special belt, get in touch with us—this is one of our specialties.

Wood Split PULLEYS

EVERY known precaution is used in the manufacture of our Pulleys; the arms are tenoned into the rim and a perfect give joint made; after this they are dowelled, each section of the rim is thoroughly glued with water-proof cement, under great pressure and nailed. They are then lathe-turned, inside and out, painted and varnished (2 coats) and guaranteed to be in perfect balance. Our Wood Split Pulleys transmit power economically and they are strong and lasting.

Let us put you in touch with some users of D. K. McLaren's Belts and Pulleys.

D·K·McLAREN LIMITED

HEAD OFFICE AND FACTORY:
351 ST. JAMES STREET, MONTREAL, P.Q.,

VANCOUVER, B.C. 849 Beatty St. | ST. JOHN, N.B. 90 Germain St. | TORONTO, ONT. 194 King St. West

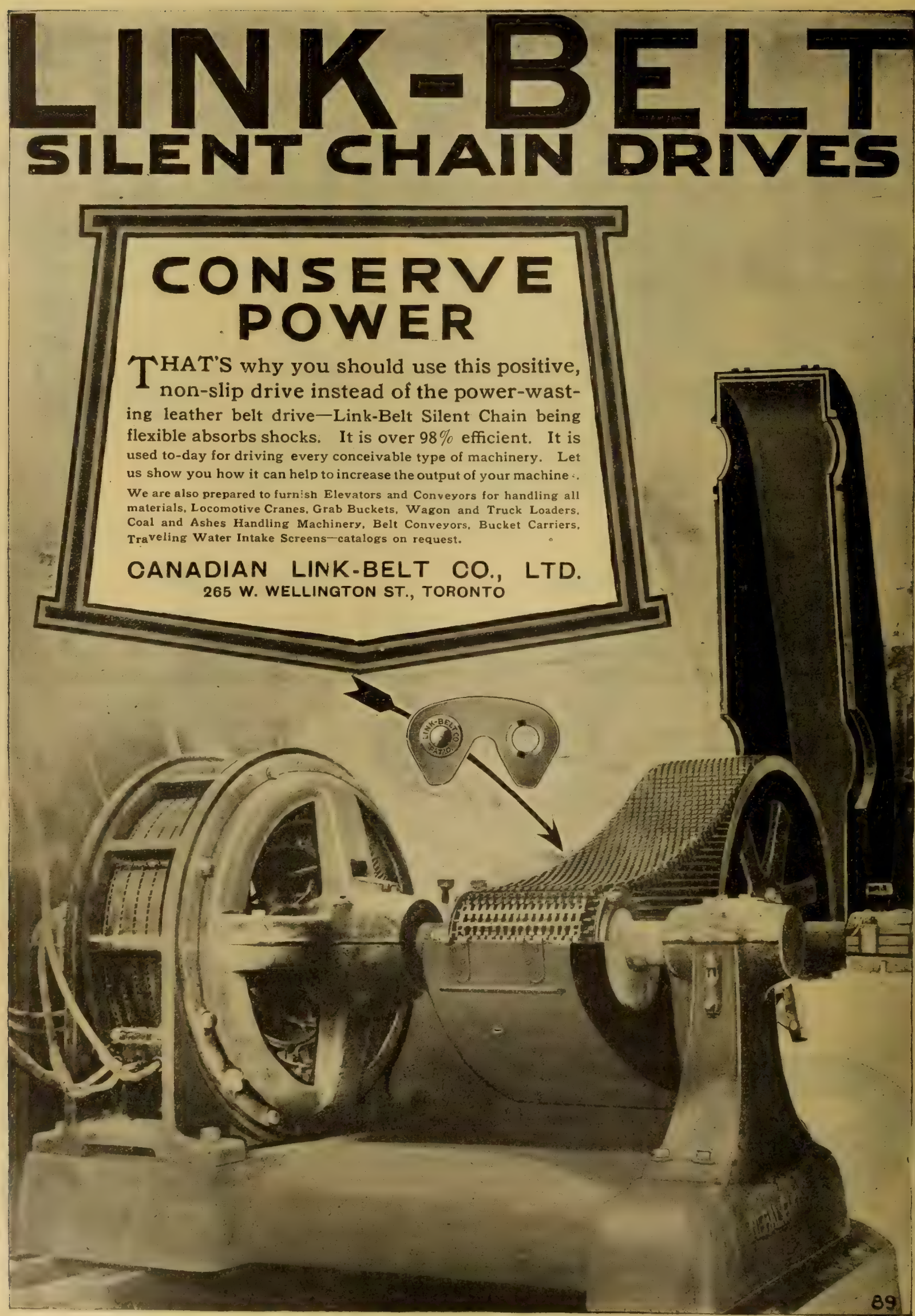
LINK-BELT
SILENT CHAIN DRIVES

CONSERVE POWER

THAT'S why you should use this positive, non-slip drive instead of the power-wasting leather belt drive—Link-Belt Silent Chain being flexible absorbs shocks. It is over 98% efficient. It is used to-day for driving every conceivable type of machinery. Let us show you how it can help to increase the output of your machine.

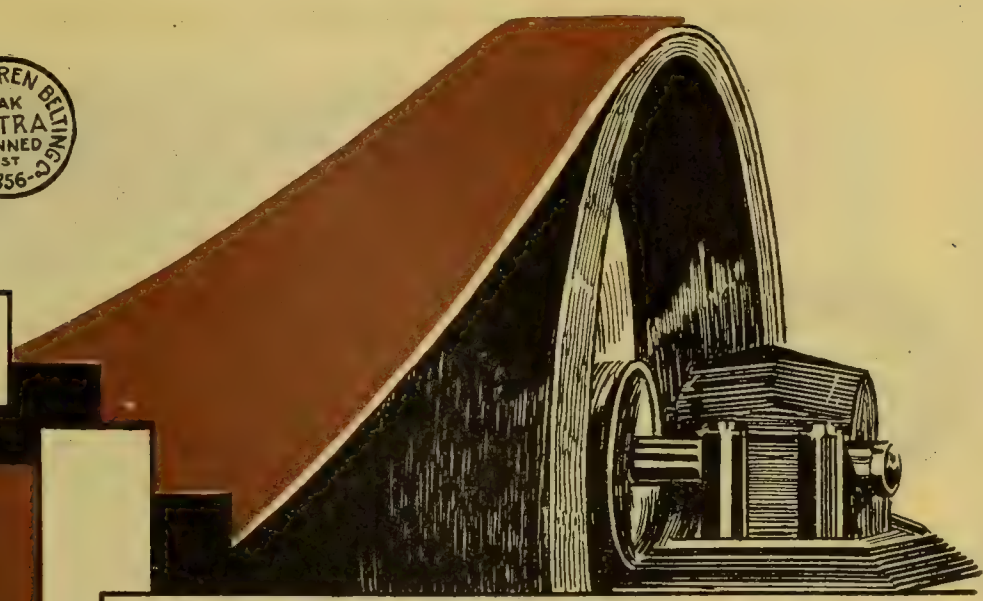
We are also prepared to furnish Elevators and Conveyors for handling all materials, Locomotive Cranes, Grab Buckets, Wagon and Truck Loaders, Coal and Ashes Handling Machinery, Belt Conveyors, Bucket Carriers, Traveling Water Intake Screens—catalogs on request.

CANADIAN LINK-BELT CO., LTD.
265 W. WELLINGTON ST., TORONTO



BELTS

THE J. C. McLAREN BELTING CO. OAK EXTRA TANNED EST 1856



J. C. McLAREN

Be Sure of the QUALITY of Your Belting

Quality in the belting you use determines to a great extent the output of your plant. The better the belting the better the output.

J. C. McLaren's products represent a **quality** in belting that is unsurpassed.

They are flexible, gripping, tough—they will carry all the power that any belting can possibly carry, yet wear long and always give good service.

The cost records of scores of plants bear witness to the fact of J. C. McLaren's belting economy and efficiency.

Sixty-one years of successful experience!
Put your belting problems in our hands.

J. C. McLaren Belting Co., Ltd.

MONTREAL TORONTO WINNIPEG

This photo was taken in a large shell shop "Somewhere in Canada." All the belting you see is "Anaconda"—6000 ft., 1" to 12", in 4, 5 and 6 ply, was supplied by us. Machines are working on 6" shells.

Anaconda Belting

THE right belting for Heavy Duty Drills, Grinders, Turret Lathes, etc. that use liquid cutting compound, because it is filled with a composition to withstand heat and acid, which also makes it waterproof.

"Anaconda" way, makes belts more waterproof, with less slip, less stretch and of greater general serviceability than any other belt of any kind—Leather, Rubber or Balata, including Canvas.

Our 64-page illustrated book is yours for the asking. Tells of

Transmission Belts	High Speed Belts
Conveyor Belts	Waterproof Belts
Elevator Belts	Gas and Heat Resisting Belts
Big Belts	Endless Belts
Small Belts	

CONTAINS CHAPTERS ON

The Matter of Stretch, Joining Belts, Fasteners, Belt Dressings, Capacities and Pulley Sizes, Belt Making, Belt Conveyors, Belt Elevators, Conveyor Equipment, Installing Belts, and other practical matters about belts.

WRITE FOR IT NOW.

"Anaconda" Belting reduces belt repairs and "take-up" to a minimum and materially increases the mechanical efficiency of the plant.

"Anaconda" will deliver you more service per dollar than any other type of belt made. A trial is convincing.

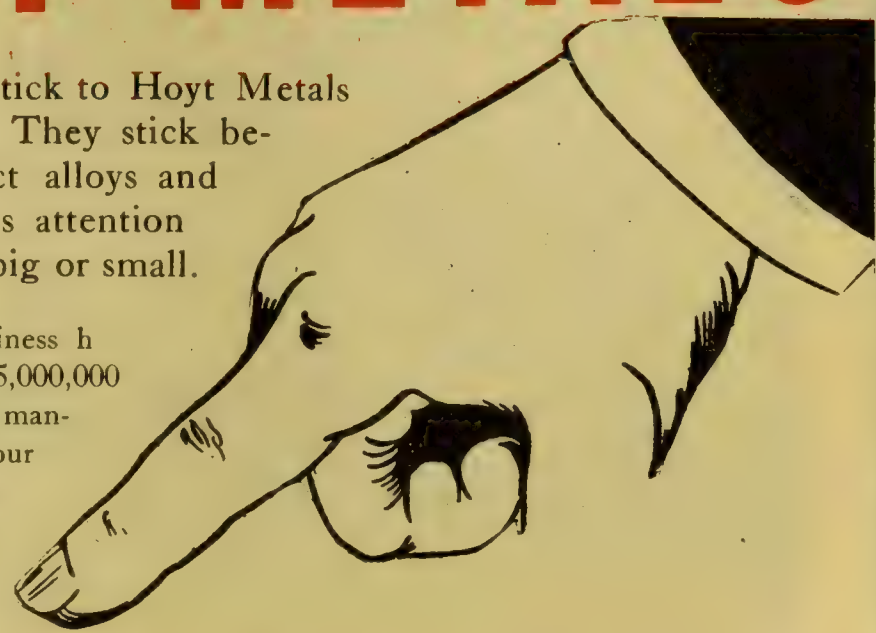
MAIN BELTING CO. OF CANADA
LIMITED

MONTREAL 10½ St. Peter St. **TORONTO** 32 Front St. West **EDMONTON and CALGARY** Gorman, Clancy & Grindley, Edmonton, Alberta

WINNIPEG, W. W. Hicks, 567 Banning Street

HOYT METALS

HOYT customers stick to Hoyt Metals year after year. They stick because they get perfect alloys and prompt and courteous attention whether the order be big or small.



Our methods of doing business h evid ntly pleased. For over $5,000,000 is expended by the world's manufacturing plants in buying our lines annually. This is the world's largest trade in Babbitt Metals.

"Nickel Genuine"
"Trojan"
"Frost King"
Babbitts

We have a babbitt metal for every purpose. If you are not acquainted with our line give them a trial. You'll see a difference in your babbitt cost if you couple yourself with our service.

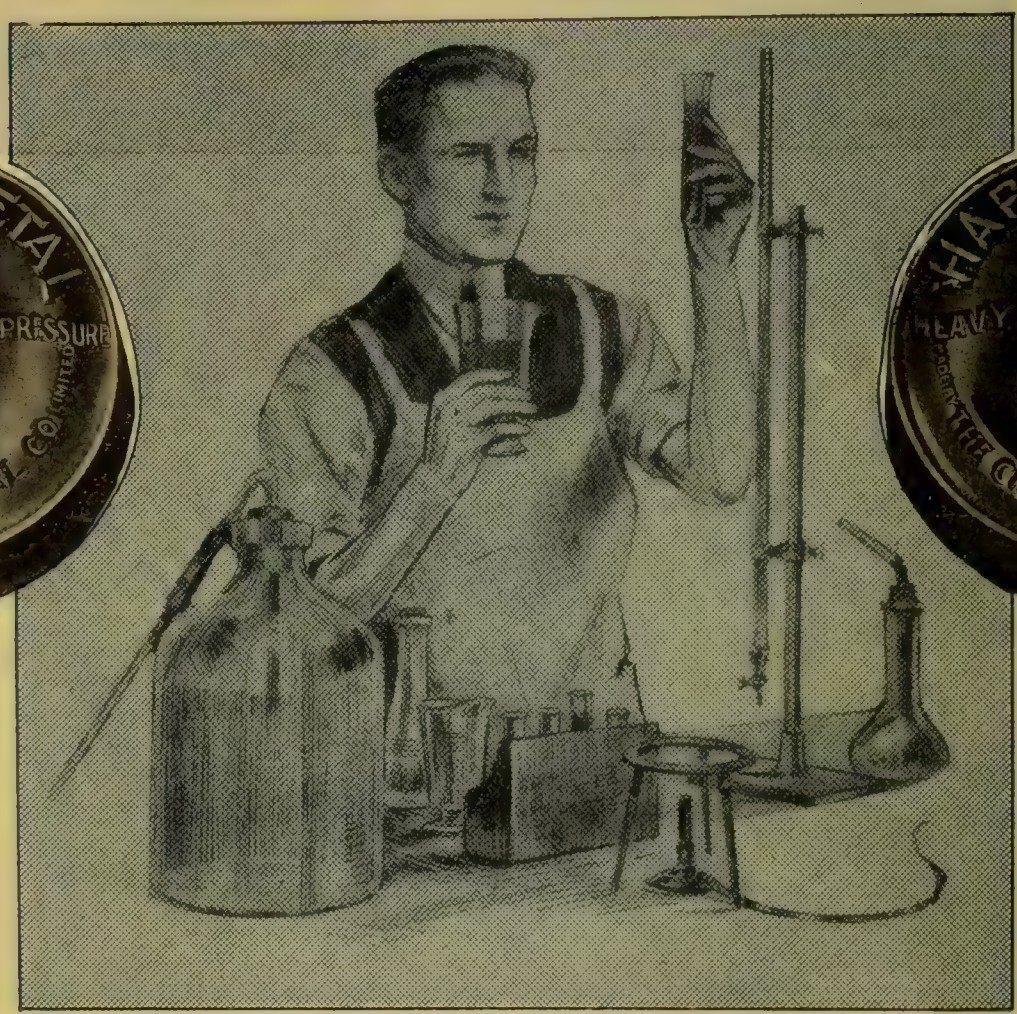
Hoyt's metals have been used with success for over forty years.

HOYT METAL COMPANY

London, England — EASTERN AVENUE and LEWIS STREET — *New York*
TORONTO, CANADA — *St. Louis*

If any advertisement interests you, tear it out now and place with letters to be answered.

"Science, when well digested, is nothing but good sense and reason."



The Science of Chemistry and Harris Heavy Pressure Babbitt Metal

Chemistry is the keystone to modern industrial efficiency. It reveals the constituent parts of substances and can transform a weakness into great strength.

In no industry does the science of chemistry play a more important part than it does in the manufacture of high grade Babbitt Metals.

In the making of the famous HARRIS HEAVY PRESSURE BABBITT an expert metallurgical chemist guarantees every particle of the various ingredients that are included in its composition.

This never-ending maintenance of high quality has its reward in producing a babbitt "WITHOUT A FAULT."

We manufacture a Babbitt Metal for every purpose. Every one reliable and used the world over.

WRITE FOR COMPLETE LIST.

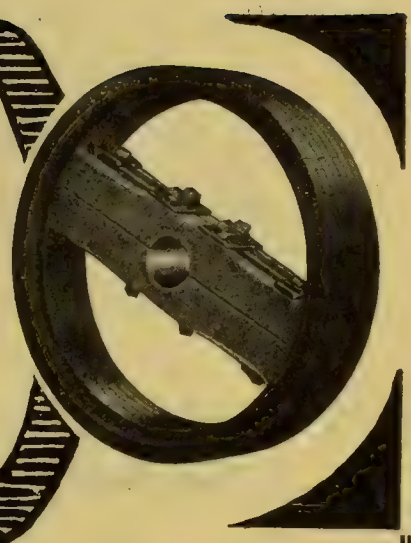
The Canada Metal Company, Limited

Montreal
Hamilton

Toronto

Winnipeg
Vancouver

BERNARD



WOOD SPLIT PULLEY

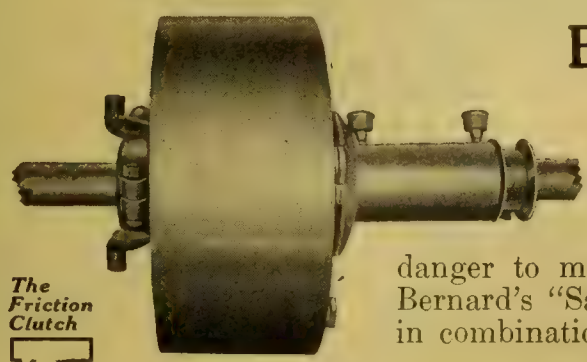
Advantages of this Pulley in Your Shop—

Advantage 1—Bernard Wood Split Pulleys are lighter than solid or split iron or steel pulleys, permitting the use of less expensive shafting and hangers.

Advantage 2—Bernard Wood Split Pulleys lessen weight on bearings, reduce friction, and thus make a significant saving in power.

Advantage 3—Better belt surface reduces wear and thus effects a saving in belting.

These are advantages you can't afford to overlook. And there are other advantages too, which, when taken in the aggregate with three great advantages shown above, account for the general favor shown the **"Bernard"** line in the shops of Canada.



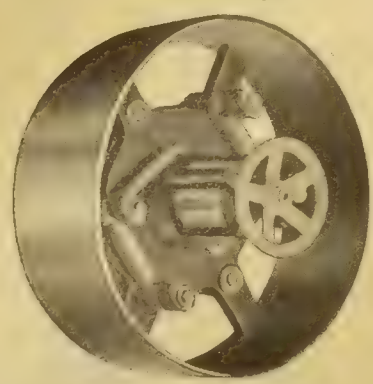
The Friction Clutch

Bernard Friction Clutch

An increasing number of repeat orders signify the success of this perfect-working Bernard Transmission appliance.

Bernard Friction Clutch is Safe, Simple and Reliable. Discard dangerous clutches that are a constant danger to men working near them, and use Bernard's "Safety First" clutch. Can be used in combination with pulley, sprocket or gears.

Bernard Double Friction Pulley



Here is another Bernard Transmission appliance that is recording marked success. Used on gasoline engines. Built to stand severe service. Simple in operation. Easy to attach to engine.

Its serviceable quality are widely recognized and is now used as a standard equipment on many high grade engines.

Special proposition to Dealers in all cities, where not represented.
Write now, our stock is complete, our price low, and quality unsurpassed.

The A. Bernard Industrial Company

Manufacturers of High-Grade Power Transmission Appliances

Office and Works: FORTIERVILLE, QUE., CANADA

RENOLD

JONES & GLASSCO

(Registered)

ENGINEERS

MONTREAL and TORONTO

Specialists in

Power Transmission Chains

Canadian Agents for

"RENOLD"
PATENT SILENT
and BUSH ROLLER
CHAINS

"MORSE"
ROCKER JOINT
SILENT
CHAINS

Chain Drives from 1/4 HP to 5000 HP
in successful operation

Write for particulars to

Head Office
St. Nicholas Building
MONTREAL

Branch Office
1204 Traders Bank Building
TORONTO

MORSE

48

The Joints of Morse Rocker-Joint Silent Chains

THE "ROCKER-JOINT" was devised over twenty years ago, long before the era of silent chains, as a scientific principle for eliminating frictional losses. It was immediately recognized throughout the mechanical world as *the one perfect joint.* The MORSE CHAIN CO. was the first to adapt this "ROCKER" principle to a chain joint, and the patent laws of every civilized country prevent its use on any other chain. Chain manufacturers everywhere have attempted to find a substitute for the "ROCKER" principle—some other principle which would also do away with the friction of the ordinary joint. But to this day the "ROCKER-JOINT" STANDS ALONE, the only chain joint which eliminates *destructive sliding friction.*

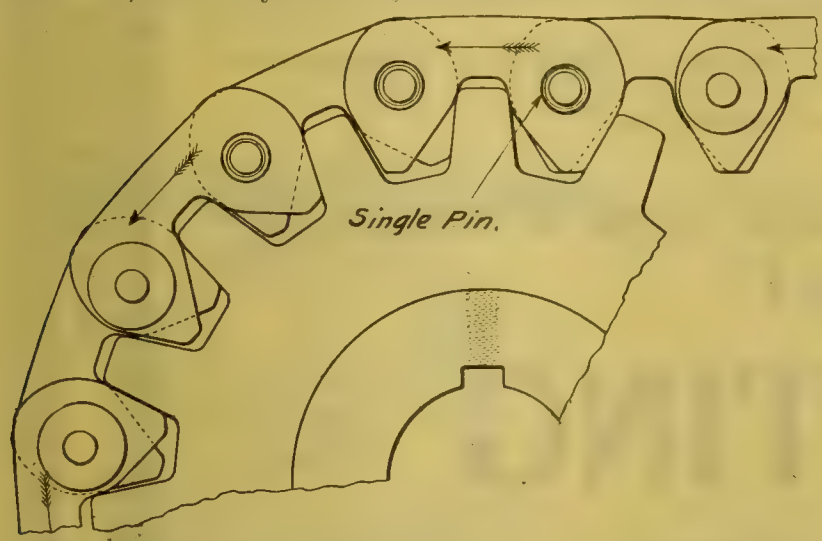


Fig. 1. The ordinary chain bending over the sprocket.

The ordinary silent chain joint is formed by a round hole at each end of each link, through which runs a round pin holding the rows of links together. This pin forms the axis about which the links twist in bending over the sprocket teeth. Obviously, as the load on the chain increases, the **sliding friction** on this single pin and on the holes of the link increases. A plentiful supply of lubricant and hardened bushings are essential to this joint and at best, wear and loss of power are certain.

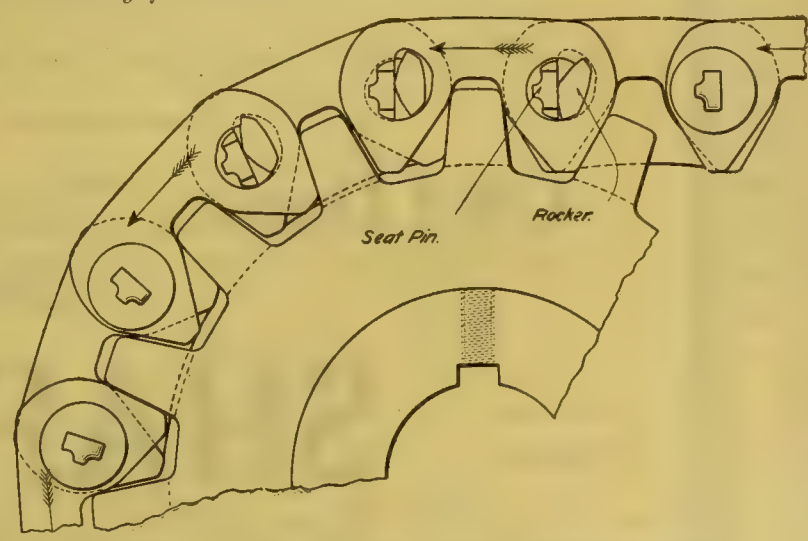


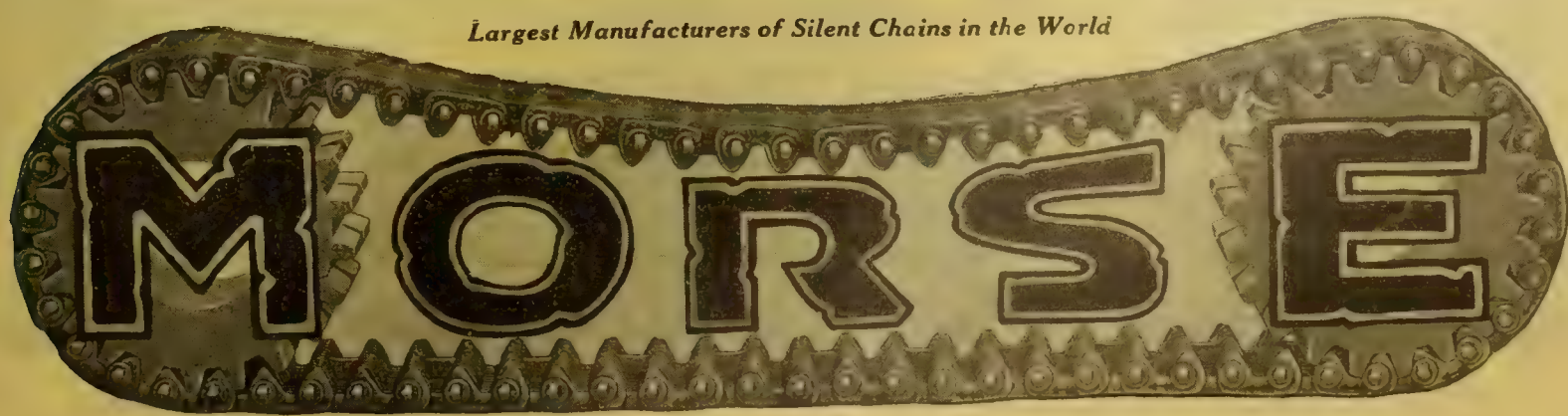
Fig. 2. The "Rocker-Joint" on the sprocket.

The "Rocker-Joint" is formed by two special, case-hardened steel pins, both of them seated in the holes of the links, the seat pin in the row of links to the left of the joint, and the Rocker pin in the row to the right. As the chain bends in circling around a sprocket, the curved side of the Rocker pin rolls or rocks against the broad, flat side of the Seat pin. THIS IS THE ONLY MOVEMENT IN THE JOINT. There being no action between the hardened pins and the softer edges of the hole, bushings are unnecessary.

The "ROCKER-JOINT" depends upon its construction, not upon lubricant, for its life and efficiency.

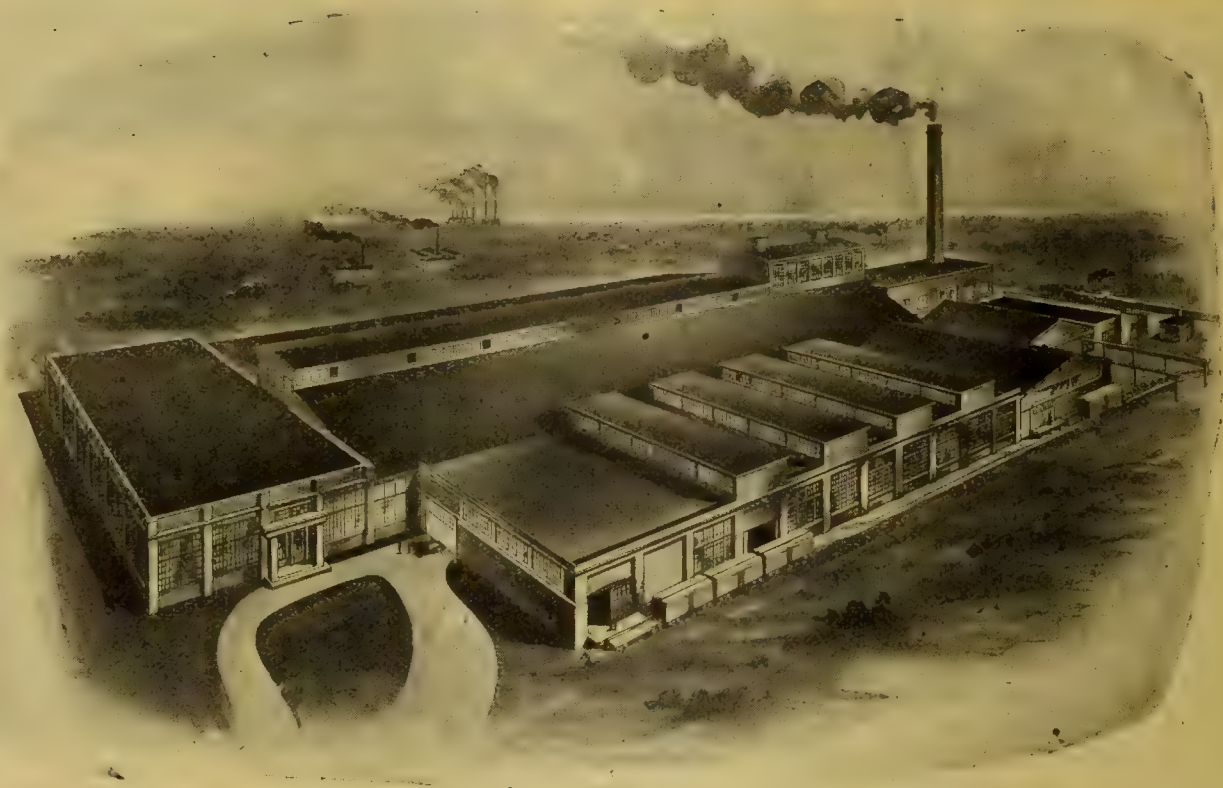
MORSE CHAIN CO., Ithaca, N. Y.

Largest Manufacturers of Silent Chains in the World



If any advertisement interests you, tear it out now and place with letters to be answered.

CANADIAN



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PLANT OF THE CANADIAN DRAWN STEEL COMPANY, HAMILTON,

Headquarters in Canada for

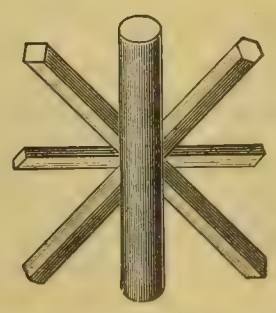
Cold Drawn, Turned and Polished Steel

Flawless Products

SHAFTING

Quickest Service

Rounds and Squares



Hexagons and Flats

Finished Machine Keys, all ready to drive.

Free Cutting Screw Stock and Piston Rods.

The Canadian Drawn Steel Company, Limited

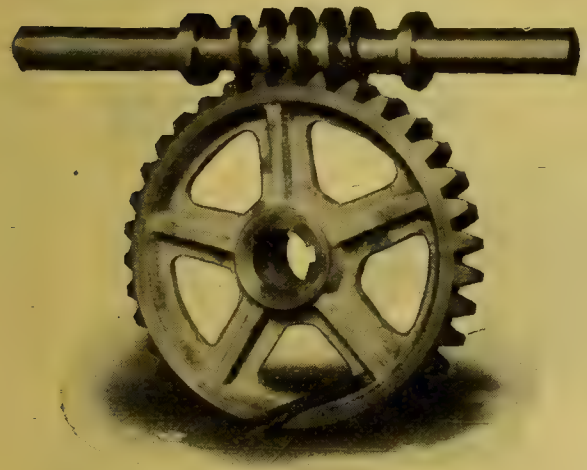
HAMILTON, CANADA

CANADIAN

CUT GEARS

The manufacture of Cut Gears has been our specialty for years, and the result of our experience is a product scientifically correct.

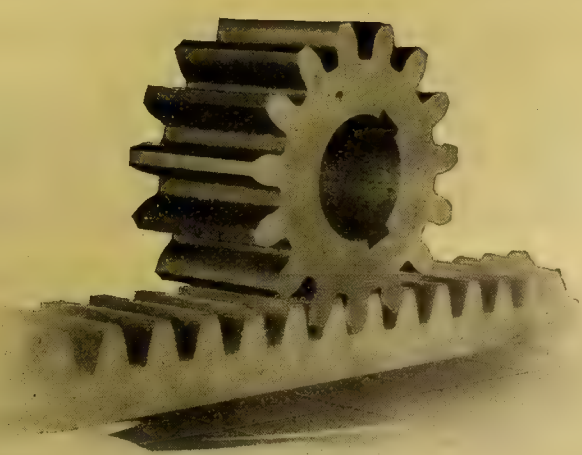
Our enlarged plant and increased facilities mean for gear users quick delivery and reasonable prices on all types of gears.



Write for quotations.

Hamilton Gear & Machine Co.

Van Horne Street - TORONTO



THE STANDARD OF MEASURE

WAGNER MILLING COMPANY,
Manufacturers of Flour, Feed and Meal

Magnolia Metal Co. Pedro, Ohio, 5/28/16

Gentlemen:—

I use Magnolia Metal. I have had a great many years' experience around power plants, cement plants, saw mills and blast furnaces, and can say that we always consider "Magnolia" Metal the Standard by which to measure other metals.

I am engaged in a small business of my own and still use Magnolia when necessary.

Yours truly,

O. L. HARPER, Sec'y. and Treas.

PRACTICAL ENGINEER POCKET BOOK:

Over 600 pages. A valuable reference work imported from England and sold as an advertising medium at the low price of 40c post paid.

Address Montreal Office.

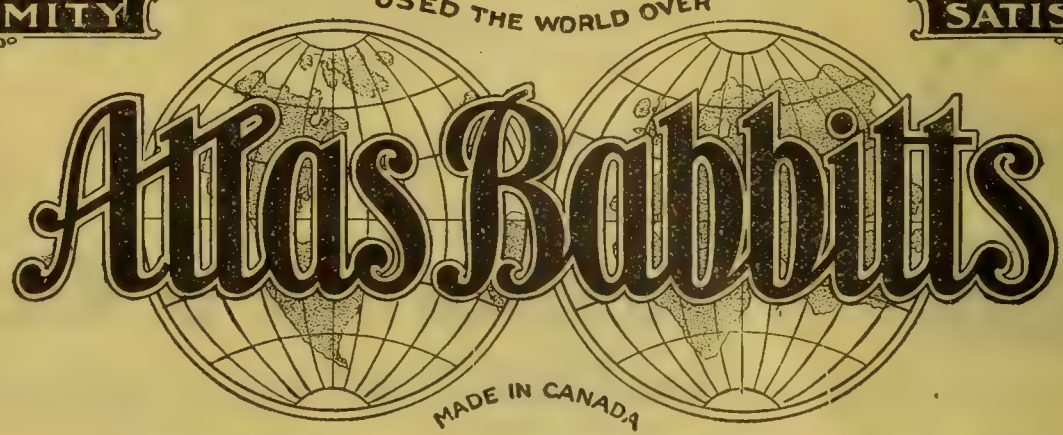
SOLD BY LEADING DEALERS EVERYWHERE OR BY

MAGNOLIA METAL CO.

OFFICE AND FACTORY:

225 St. Ambroise Street Montreal

UNIFORMITY USED THE WORLD OVER SATISFACTION



AMACOL **TENAXAS** **DURASTIC** **TIN-TOUGHENED**
ADAMUS **ATLAS** **MASCOT** **W. E. W. BABBITT**

These Babbitts are the result of years of experience and have a world-wide reputation for uniformity and reliability.

No Shock Too Severe No Load Too Heavy No Speed Too Great

ATLAS METAL & ALLOYS COMPANY OF CANADA, LIMITED, MONTREAL

Sales Agents:

The Canadian B. K. Morton Co., Limited

MONTREAL: 49 Common Street. **TORONTO: 86 Richmond Street East.**

MADE IN CANADA

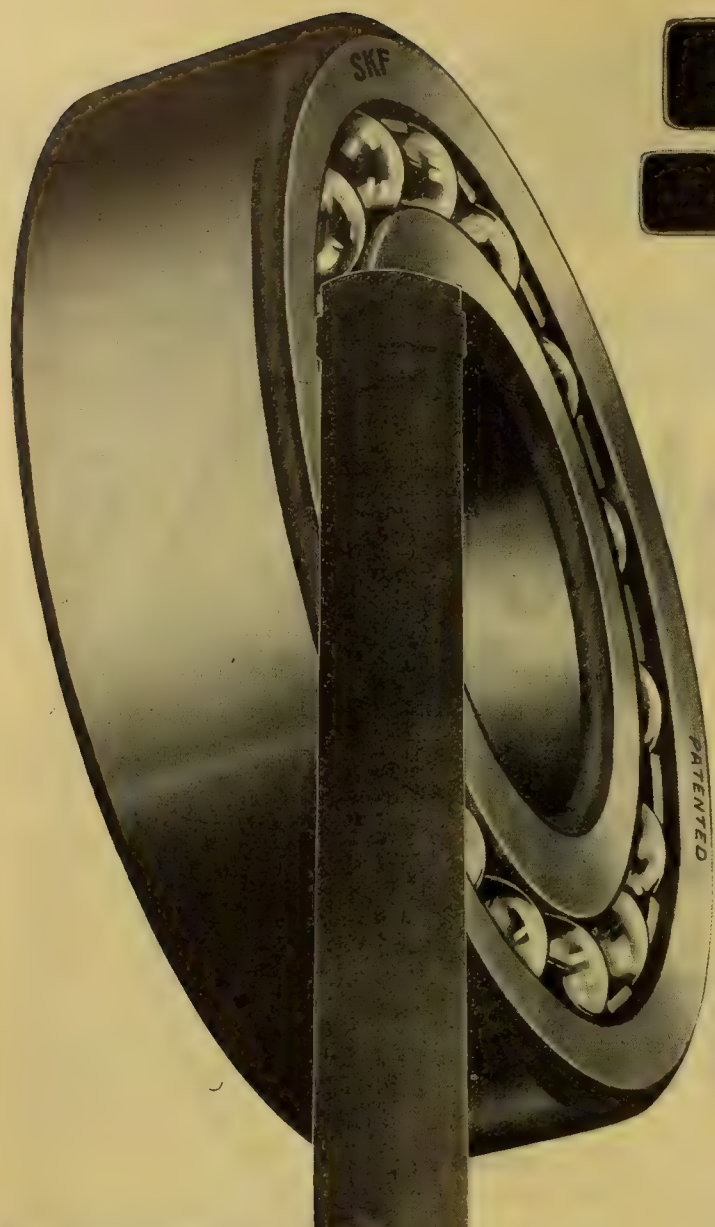
Detachable Link Belting

A FULL LINE OF PINTLE AND DETACHABLE CHAIN TOGETHER WITH CONVEYING ATTACHMENTS FOR BOTH, MANUFACTURED AND CARRIED IN STOCK BY

FITTINGS LIMITED

OSHAWA, CANADA

SKF



THE use of S K F Ball Bearings is universal. They are used in all types of machinery and in all parts of the world.

Automobiles, motor lorries, tractors, agricultural machinery, electric motors, industrial trucks, textile machinery, cotton seed oil machinery, grain milling machinery, machine tools, woodworking machinery, paper making machinery, cranes, hoists, elevators and power transmission equipment are some of the places where S K F Ball Bearings are used to advantage.

CANADIAN SKF COMPANY, Limited
TORONTO, CANADA

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What SKF Will Do!

Reduce friction to the minimum.

Prevent heating, wear and binding.

Prevent dry bearings and fire.

Permit high speeds.

Prevent oil leakage.

Keep product uncontaminated.

Improve production in quality and quantity.

SKF

THE widespread use of these bearings testifies to S K F quality. The highest attainable quality both in material and workmanship is always maintained. Added to this there are the exclusive S K F features—self-alignment, two rows of balls, single piece retainer.

Our Engineering Service Department is prepared to make recommendations on any application of ball bearings in which you may be interested. We have also issued a special catalog for each industry.

CANADIAN SKF COMPANY, Limited
TORONTO, CANADA

246

What SKF Will Save

60 to 80% of the friction load.

15 to 33% of the total load.

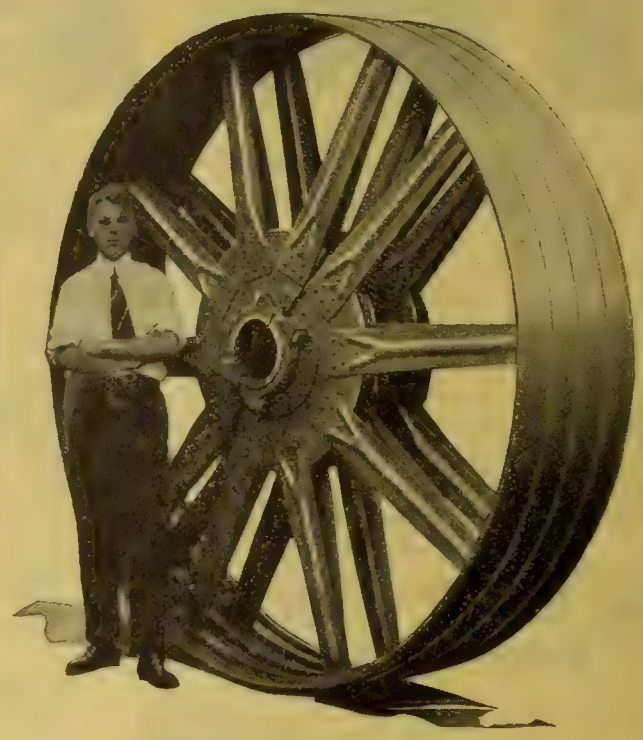
80% of the oil bill.

80% of the repair bill.

100% on trouble.

A large part of the belt wear.

Annoyance, delay and trouble common with plain bearings.



THE entire output of the majority of factories and mills, running into millions of dollars each year, is dependent on the service of belt pulleys.

If a pulley breaks or fails to hold on the shaft costly time and production losses occur.

Belt slip causes fuel and power losses amounting to thousands of dollars in many factories. The belt slip loss is a constant one which often seriously curtails the profit.

Every manufacturer should give the same careful attention to the selection of pulleys as to the selection of machinery for production.

This is done by the most efficient manufacturing organizations of the country. The Ford Motor Co., International Harvester Co., Western Electric Co., National Cash Register Co., Brown Shoe Co., B. F. Goodrich Co., American Car & Foundry Co., Packard Motor Car Co., and many others equally well known are all extensively equipped with and are large users of American Steel Split Pulleys.

There are over 25,000 "Americans" in the Ford Motor plants, over 20,000 in use in the Western Electric Company's Chicago plant and 25,000 in the plant of the Cadillac Motor Car Co., of Detroit.

AMERICAN STEEL SPLIT PULLEYS

Over three million and a half American Steel Split Pulleys have been sold because they have proved themselves to be the most efficient and economical pulleys in the market. They reduce belt slip and wind resistance to a minimum. "Americans" do away with useless weight on the shafting, and with the extra power it entails. They combine lightness with great strength.

American Steel Split Pulleys not only transmit maximum power with minimum belt slip, but endure higher speeds than any other standard metal pulley. They are guaranteed for double belt duty and any American Steel Split Pulley failing in service from a defect in material or workmanship will be replaced without charge.

Our booklet "Pulley Efficiency", is a most valuable one for manufacturers. Sent free on request.

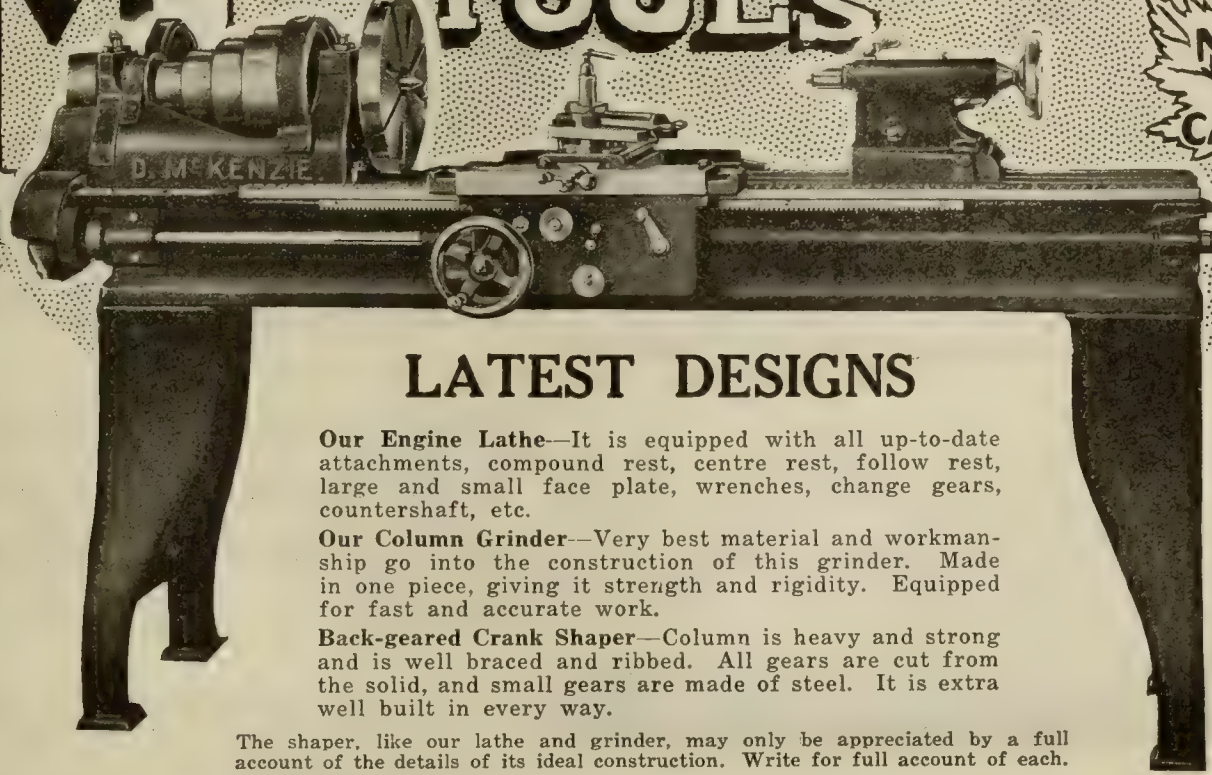
The American Pulley Co., Philadelphia, Pa.

Canadian Distributors:

Williams & Wilson, Ltd., Montreal, Quebec; A. R. Williams Machinery Company, St. John, N.B.; A. R. Williams Machinery Company, Toronto, Ontario; A. R. Williams Machinery Company, Vancouver, B.C.; A. R. Williams Machinery Company, Winnipeg, Manitoba; H. W. Petrie, Ltd., Toronto, Ontario.

McKENZIE TOOLS

MADE IN CANADA



LATEST DESIGNS

Our Engine Lathe—It is equipped with all up-to-date attachments, compound rest, centre rest, follow rest, large and small face plate, wrenches, change gears, countershaft, etc.

Our Column Grinder—Very best material and workmanship go into the construction of this grinder. Made in one piece, giving it strength and rigidity. Equipped for fast and accurate work.

Back-geared Crank Shaper—Column is heavy and strong and is well braced and ribbed. All gears are cut from the solid, and small gears are made of steel. It is extra well built in every way.

The shaper, like our lathe and grinder, may only be appreciated by a full account of the details of its ideal construction. Write for full account of each.

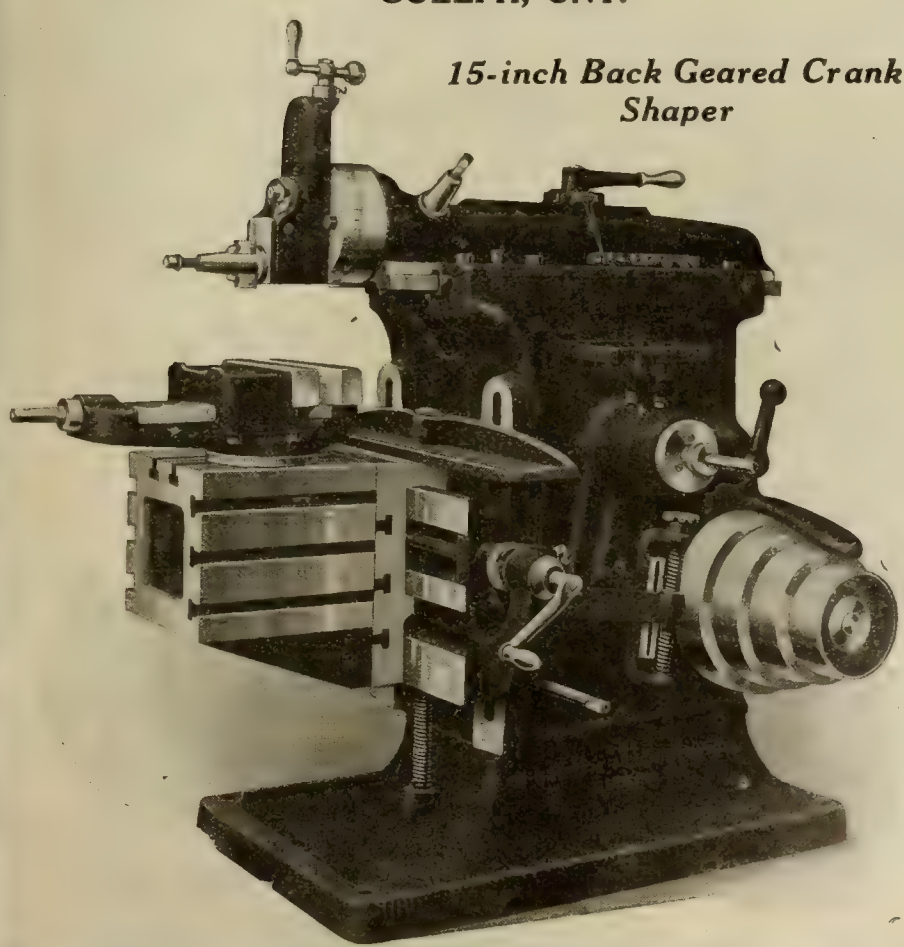
Engine Lathe

14-inch x 6-feet

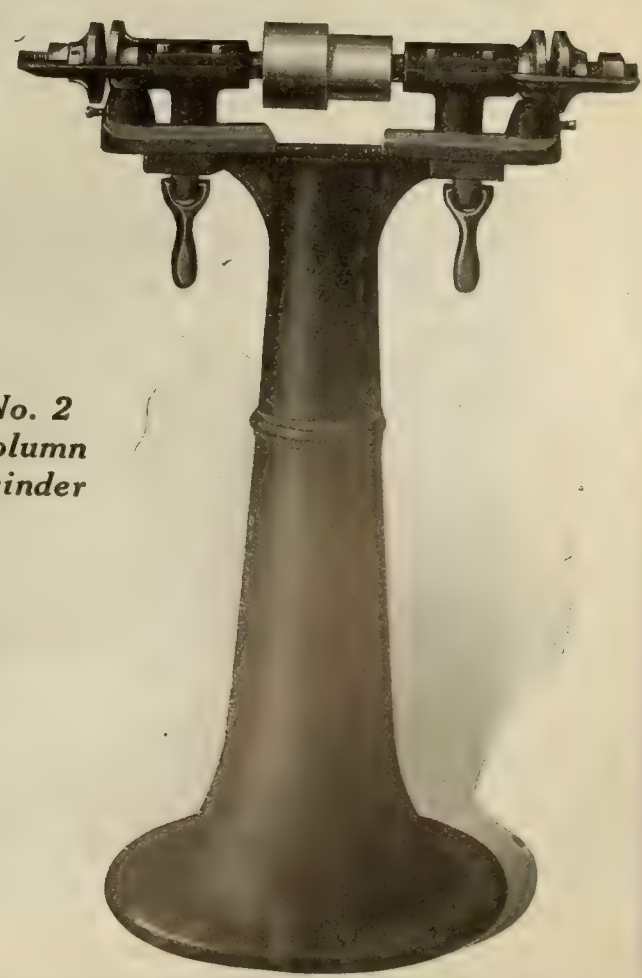
THE D. McKENZIE MACHINERY CO.

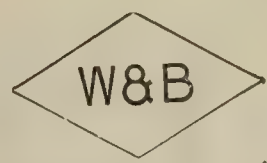
GUELPH, ONT.

15-inch Back Geared Crank Shaper



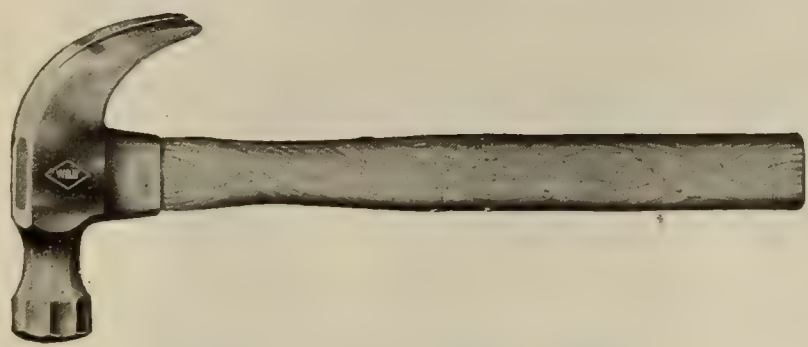
No. 2 Column Grinder



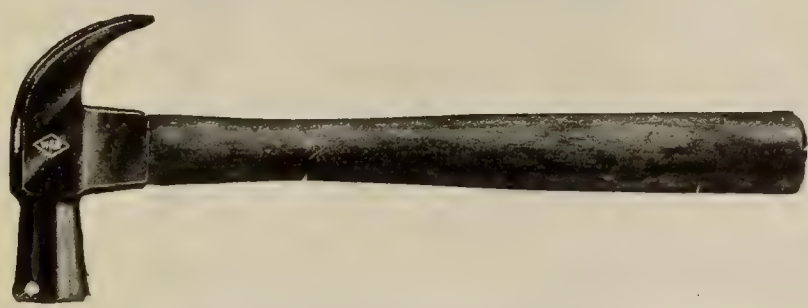


TRADE MARK Reg U S Pat Off.

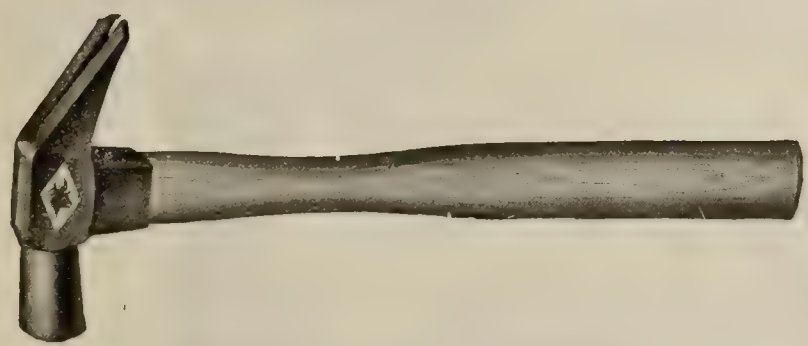
HAMMERS



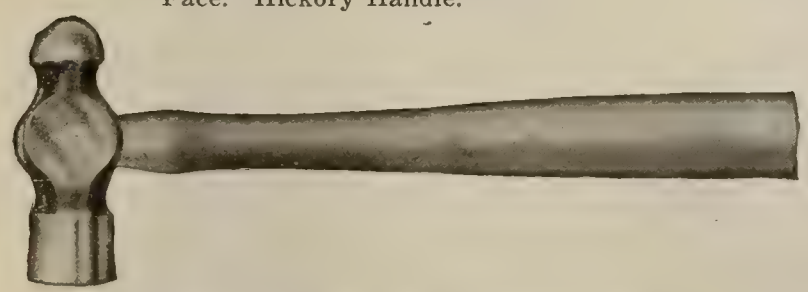
Adze Eye Nail Hammer. Octagon Pattern. Bell Face. Hickory Handle.



Adze Eye Nail Hammer. Plain Face. Hickory Handle.



Adze Eye Box-opener Hammer. Plain Face. Hickory Handle.



Machinists' Ball Pein Hammer. Octagon, Poll Drop-forged. Best Quality Steel. Selected White Hickory Handle.

Every Article Guaranteed.

There's a W. & B. Hammer to meet every demand of the machine shop.

They have recorded 64 years of successful service and can be thoroughly relied upon.

Our line of tools includes:---
Special High Grade Drop Forgings
Screws and
Drop Forged Wrenches
Hammers
Auto Pliers, Etc.

If your jobber or dealer can't supply you, write direct. Send for Catalogue.

DEALERS—If you are not handling W. & B. lines, write for proposition.

The Whitman & Barnes Mfg. Co.

Established 1854

Canadian Office and Factory;

ST. CATHARINES, Ont., Can.

Plant No. 2 recently erected to keep pace with the increasing business of The Dominion Forge and Stamping Company

SHEET METAL STAMPINGS and DROP FORGINGS

Growth of drop-forging and stamping work in this country has been steady and continuous for a number of years, and the magnitude of operations and extent of equipment installed serve to convey some idea of its increasing importance.

And as conditions revert to normal after the war this branch of Canadian industrial effort is fully expected to expand to great proportions.

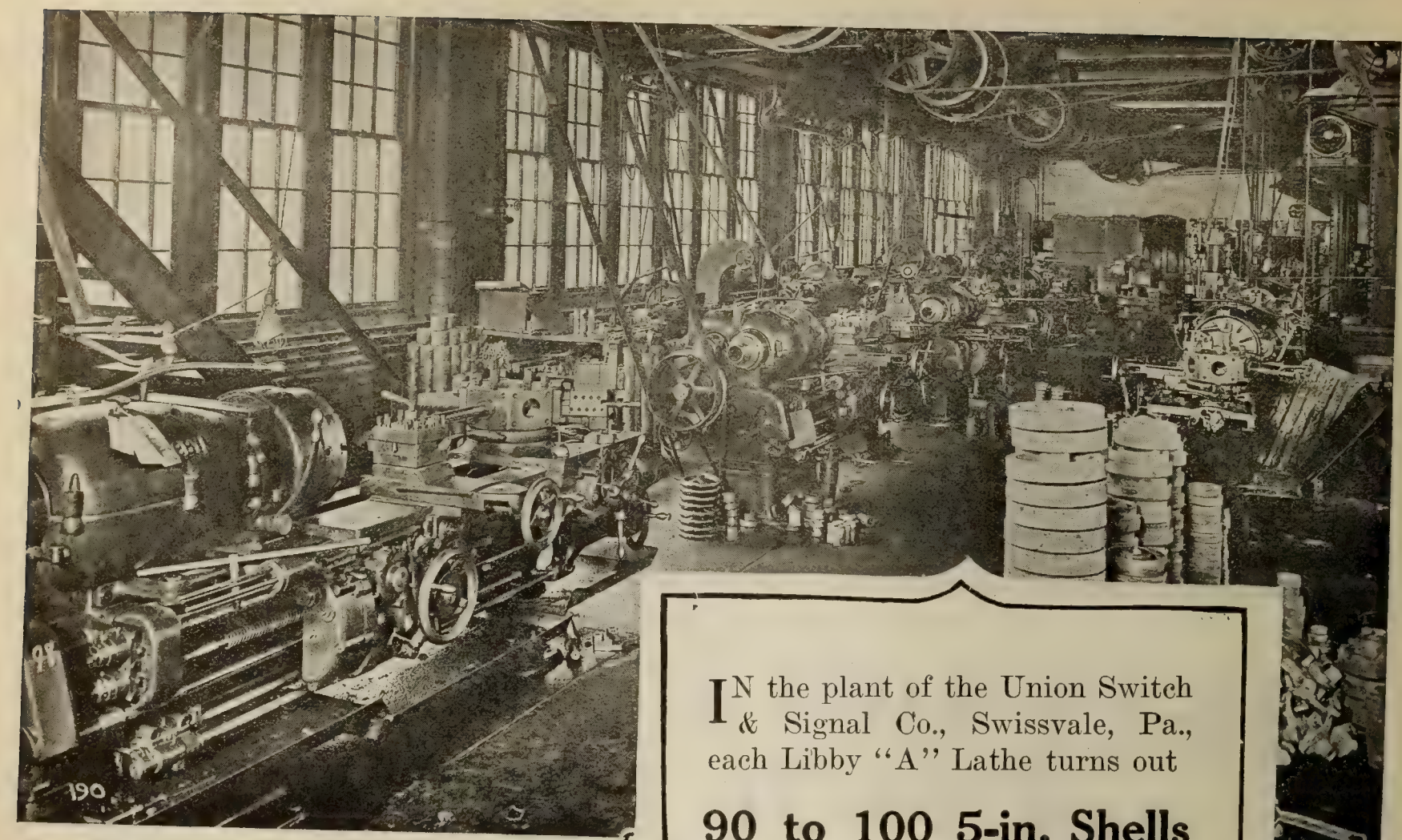
It was not any more through the pressure of present demands, than faith in a prosperous future, that proved an incentive for the expansion of the plant of the Dominion Forge and Stamping Company.

Stamping and Drop Forging pave the way to economical production and only through this method of manufacturing may profitable competition be maintained.

The Dominion Forge & Stamping Company, Ltd.

WALKERVILLE, ONT.

Main building of Plant No. 1, where Head Office of Company is located.



IN the plant of the Union Switch & Signal Co., Swissvale, Pa., each Libby "A" Lathe turns out

90 to 100 5-in. Shells per 10-hour day.

18-in. LIBBY "A" TURRET LATHE

Note that drawing-to-scale shows the required interior boring and reaming of this shell.

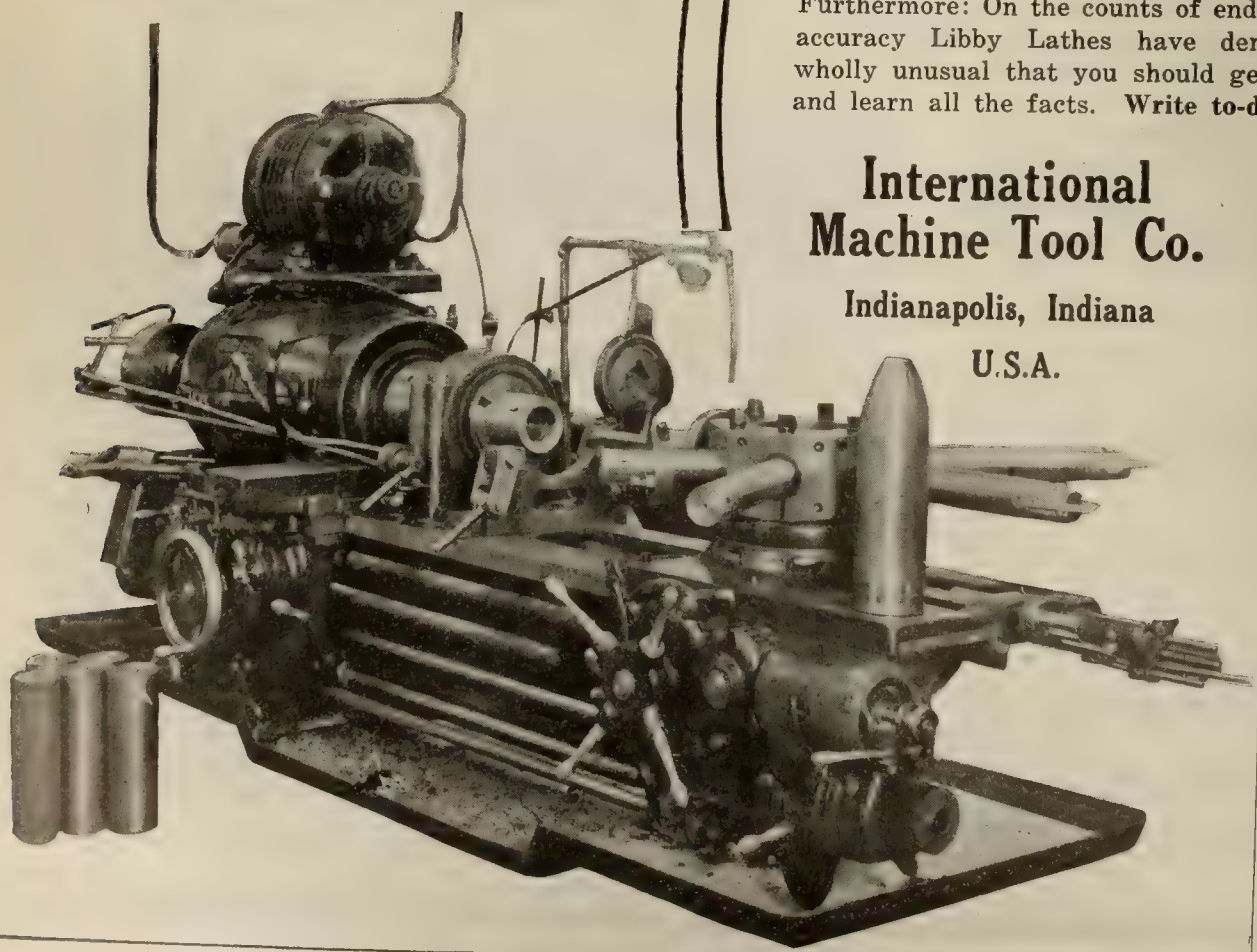
Doing this work, every Libby "A" Lathe maintains the aforesaid output day after day.

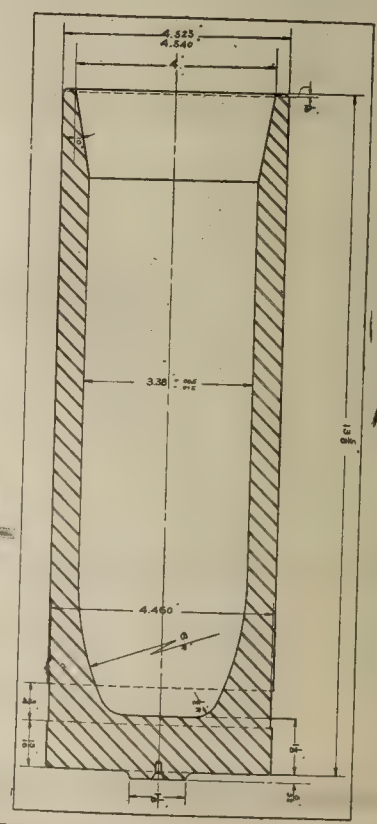
Furthermore: On the counts of endurance and maintained accuracy Libby Lathes have demonstrated ability so wholly unusual that you should get in touch with users and learn all the facts. **Write to-day for Catalog.**

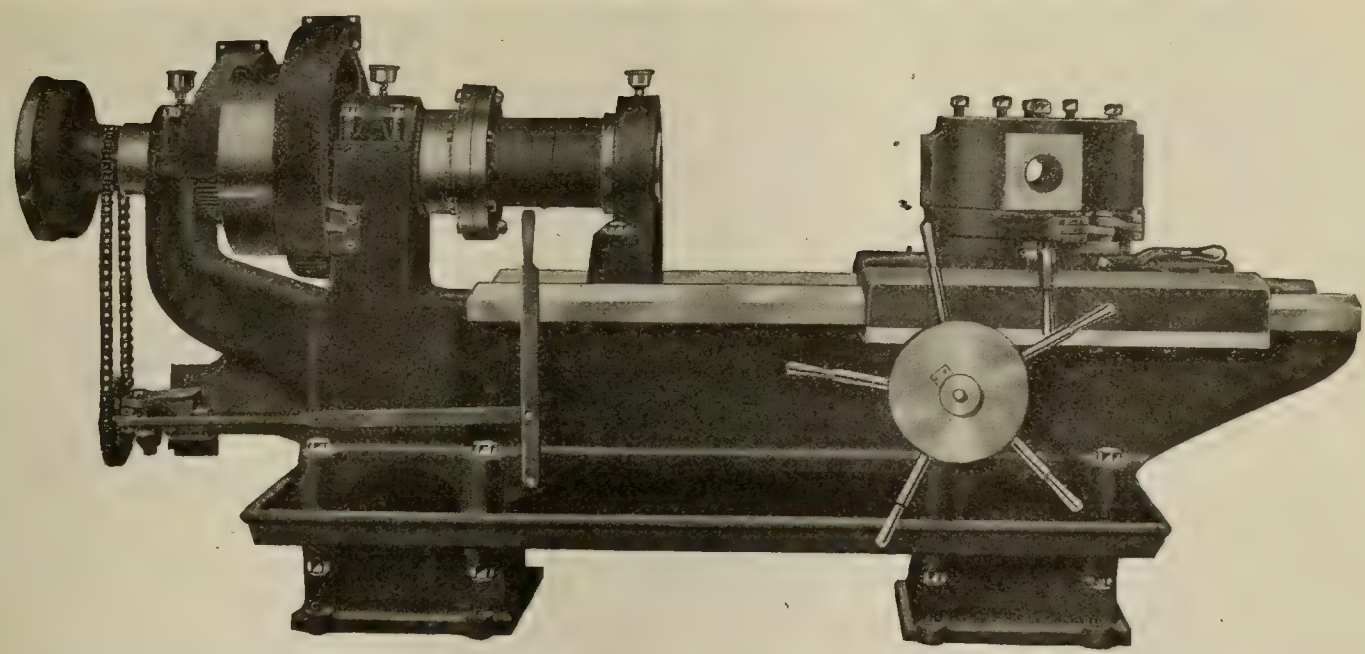
International Machine Tool Co.

Indianapolis, Indiana

U.S.A.







Boring Lathe Up To 6"

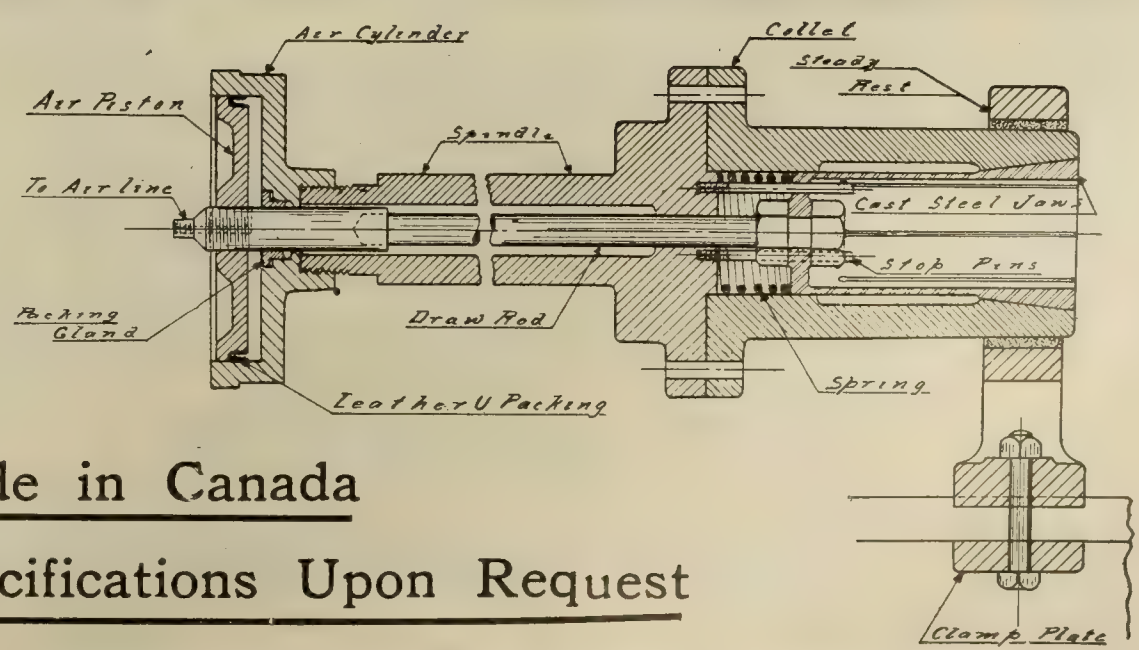
Air Collet Chuck 3" to 9.2"

Write us for Prices and Full Particulars

Write us for Deliveries

HYDE ENGINEERING WORKS

P.O. Box 1185 **27 William St., Montreal, Que.**



Made in Canada

Specifications Upon Request

Do You Use or Handle Pig Iron?

If so, read the balance of this advertisement—it's worth your while.

The following were taken from letters written to us by **Canadian** users of our Pig Iron Conveyor:

"We might say we are getting good results from your Pig Iron Conveyor. We are sending to-day, to your Mr. Yates, an order for 30 ft."—(This is the second order.)

"In reply to your letter of June 21st, regarding the Pig Iron Conveyor which we purchased from you some time ago, we might say that it is a great success, and lightens the work of the men considerably."

"We are quite satisfied that in unloading Pig Iron from cars we have saved 50%."

Write for our Bulletin No. C

Canadian Mathews Gravity Carrier Co., Ltd.

484 Richmond Street West **TORONTO, ONT.**

MAKING FILES FOR FIFTY YEARS

IF fifty years of specializing and progressive experience in the manufacture of one thing tends to quality and efficiency, then the "Famous Five Files" are of the best quality and the most efficient.

For example: innumerable investigations were made before a formula was finally adopted for the steel. Each file is now made from steel best suited to the class of work for which it is intended.

The shape of the teeth has been subject to careful experiments. You can always get a "Famous Five File" with teeth that will cut fastest, and leave the best surface on any kind of metal.

Our hardening process insures long life to each file. Finally, every file is inspected several times during process of manufacture, and, if it shows the slightest defect, at any stage, it is rejected.

Every "Famous Five File" is mechanically perfect. Their qualities are standardized in the trade. Specify them when ordering. They are:

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
AND
GLOBE

Made in Canada by

NICHOLSON FILE CO
PORT HOPE
ONTARIO

If any advertisement interests you, tear it out now and place with letters to be answered.

ARE YOU NEGLECTING

the almost unlimited advantages to be derived from

THE OXY-ACETYLENE PROCESS

HERE IS AN EXAMPLE OF MONEY SAVED

A piece cut out and a patch welded in a Boiler, making it practically equal to new at a fraction of the cost of replacing it and without the inevitable delay. What would a repair of this nature mean to you?

INVESTIGATE THIS MATTER TO-DAY

The conservation of time and material is imperative. Put your problems up to us. Being Pioneers of the Process since its inception and manufacturers of "Made in Canada" Apparatus of the highest efficiency, with an unequalled Service for gases, places us in a unique position to insure your complete satisfaction.

L'AIR LIQUIDE SOCIETY

Canadian Factories:

MONTREAL TORONTO WINNIPEG HALIFAX: Under Construction

FOR HARDNESS TESTING

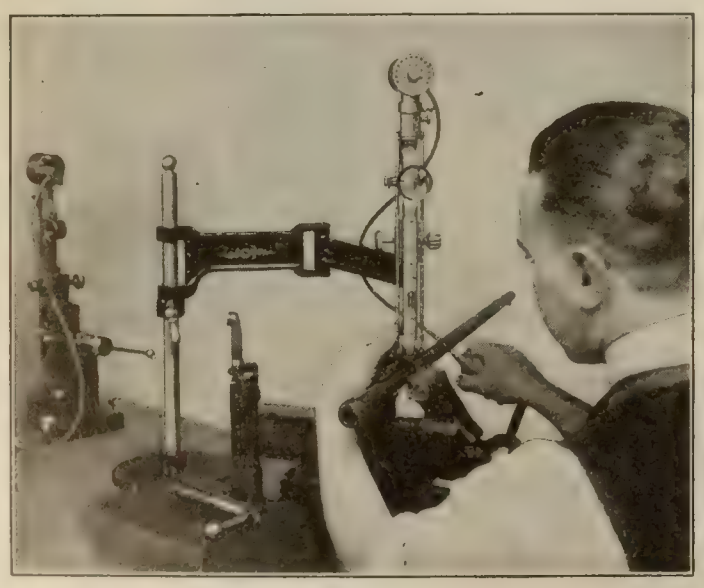
of Shells and Other Munition Materials

THE STANDARD SCLEROSCOPE

is now universally used. It is direct reading as a thermometer and makes 5,000 tests a day. It does not leave marks on the finished work and can be operated by unskilled labor. Send for 80-page booklet free.

THE PYROSCOPE FOR HEAT TREATMENT

Is the common-sense heat measuring instrument that makes straight for results without fuss. Costs least of all; burns simple kerosene; never varies. It is the one available trusty in the grimy hands of furnace men, hardeners, carburizors, and is also being universally adopted by colleges owing to the correctness of the principle utilized. Our best customers are those who have tried all other means of heat measuring.



The Pyroscope in use

Send for Our Free Circular P.

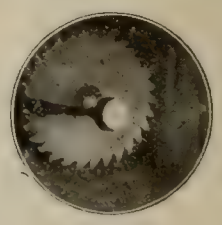
SHORE INSTRUMENT & MFG. CO., INC.

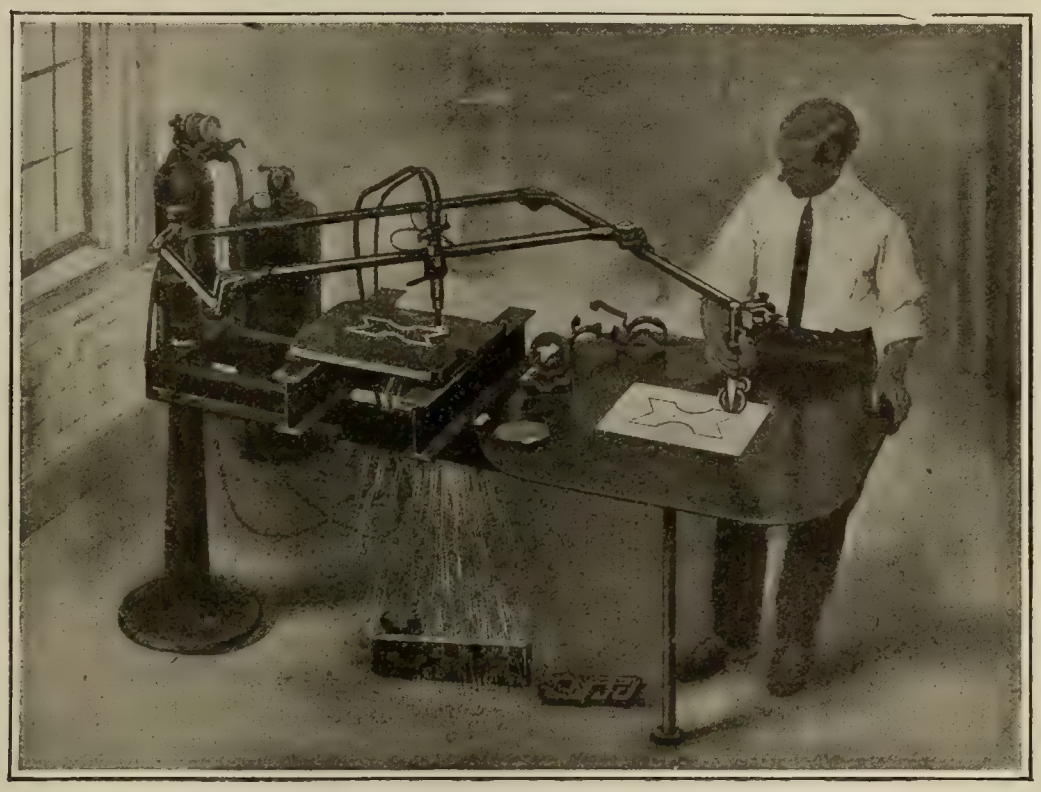
555-557 West 22nd Street, New York

Agents in all Foreign Countries

Sales Agents:

The A. R. Williams Machinery Co., Limited
Toronto, Canada





THE Oxygraph is one of the exclusive developments by the Davis-Bournonville Company for mechanical cutting of steel plate with the oxy-acetylene or oxy-hydrogen flame. With the oxygraph steel plate from 1 to 18 inches thick is readily cut in any direction, according to pattern or tracing, following straight or irregular lines, curves or sharp angles with equal facility. This machine is also used for cutting dies. Locomotive links can be cut out in 8 minutes, locomotive rods in 15 minutes. It is being extensively used by the

Canadian Locomotive,
Canadian Westinghouse,
General Electric Company,
Carnegie Steel,
American Locomotive,
Bethlehem Steel Company,
Lukens Iron & Steel Company,
Pennsylvania Shipbuilding,
Youngstown Sheet & Tube Company,
New York Shipbuilding & Drydock,
Westinghouse Electric,
Lima Locomotive Company,
Marion Steam Shovel,
Camden Forge Company,
United States Navy Yards at Boston, Brooklyn, Philadelphia, Norfolk, Washington, San Francisco and Seattle.

Let us demonstrate this machine to you and prove to you our claims. It will save you hundreds of dollars monthly.

"DAVIS-BOURNONVILLE APPARATUS LEADS THE WORLD"

Carter Welding Company of Toronto, Limited

9 Sheppard Street, TORONTO

If interested, tear out this page and keep with letters to be answered.

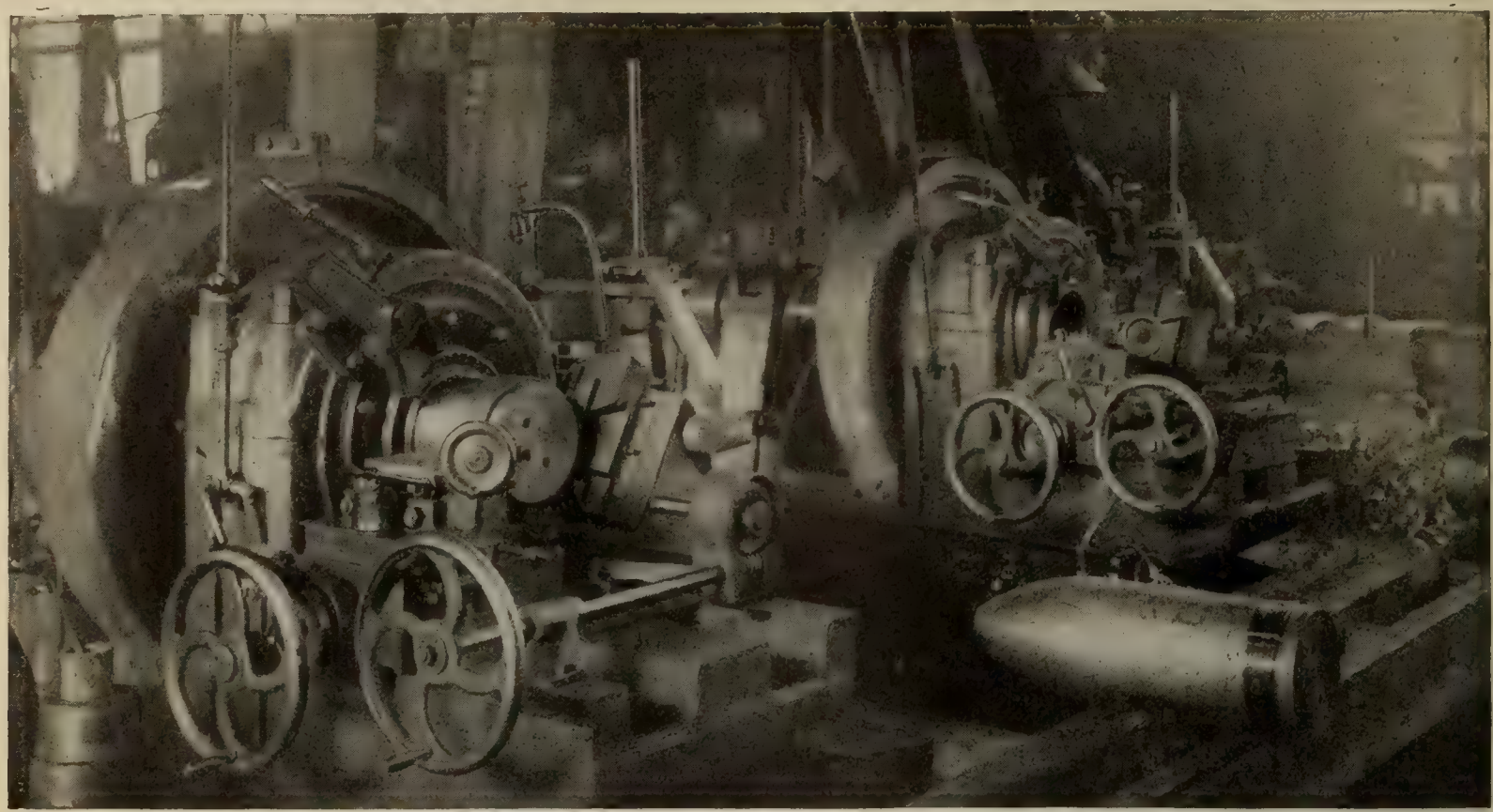


Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

These machines are built for turning bands on 8", 9.2" and 12" shells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. Write for full particulars and price.

Bennett Ave. **Warden King Limited** **Maisonneuve, P.Q.**

60 Days Free

Does your shop lose taps? Are any of your taps stolen? No. Your tool-room system provides against both of these. Did you buy any taps this year? Yes.

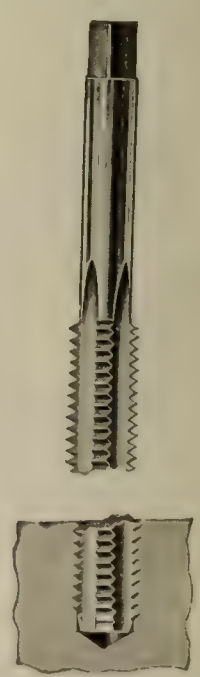
Why? Because they became broken—the only remaining method of loss.

How long does it take usually to get out each broken end and how many were broken, or in other words, how many did you buy to maintain your supply. These figures show the total number of hours time the shop has lost from production.

Would you not like to try for say 60 days, our device for removal of these broken ends, a

Walton Tap Extractor

It operates immediately and its strength will surprise you.



The Walton Company

Hartford - Connecticut

Demco

Vibrationless High-Speed Drills

Even at 12,000 R.P.M.—the maximum speed recommended for Demco Drills—there can be no friction and no vibration. Thanks to the all-ball-bearing construction and the Belt Adjuster and Automatic Take-up.

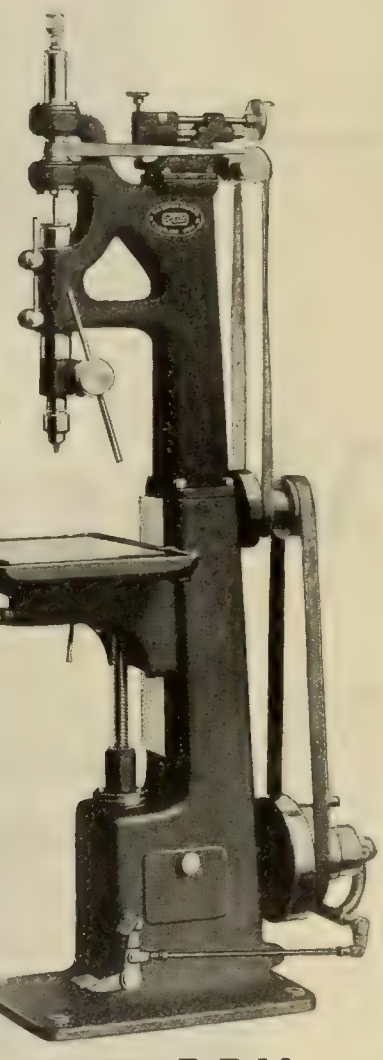
But important as these Demco features are, it is the Vertically Adjustable Quill Bracket that, in point of service, lifts Demco High-Speed Drills shoulder and head above others. It is this exclusive Demco feature that gives you all

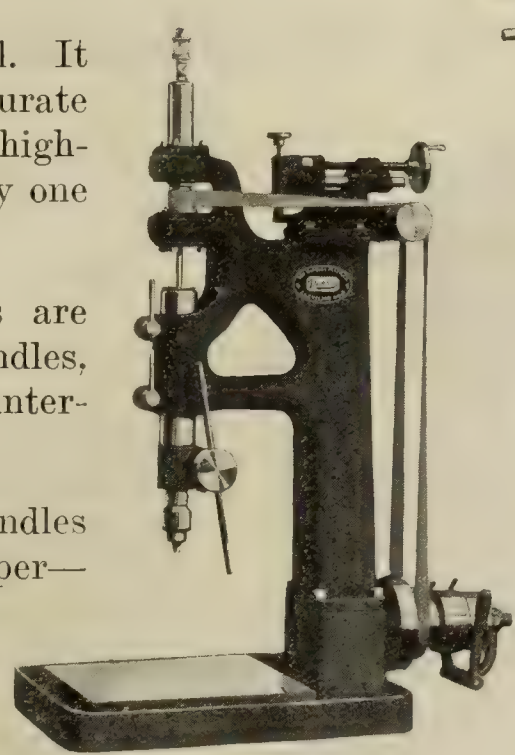
Sliding Head Advantages at Part the Cost

of a sliding-head type drill. It means to you positively accurate drilling all the time at the highest possible speed, or at any one of five speed changes.

Demco Floor Type Drills are built in 1, 2, 3, 4 and 6 spindles, complete with lower countershaft.

Demco Bench Types — spindles fitted with No. 2 Morse Taper—drill to full 3/4-inch capacity in soft material with absolute accuracy.





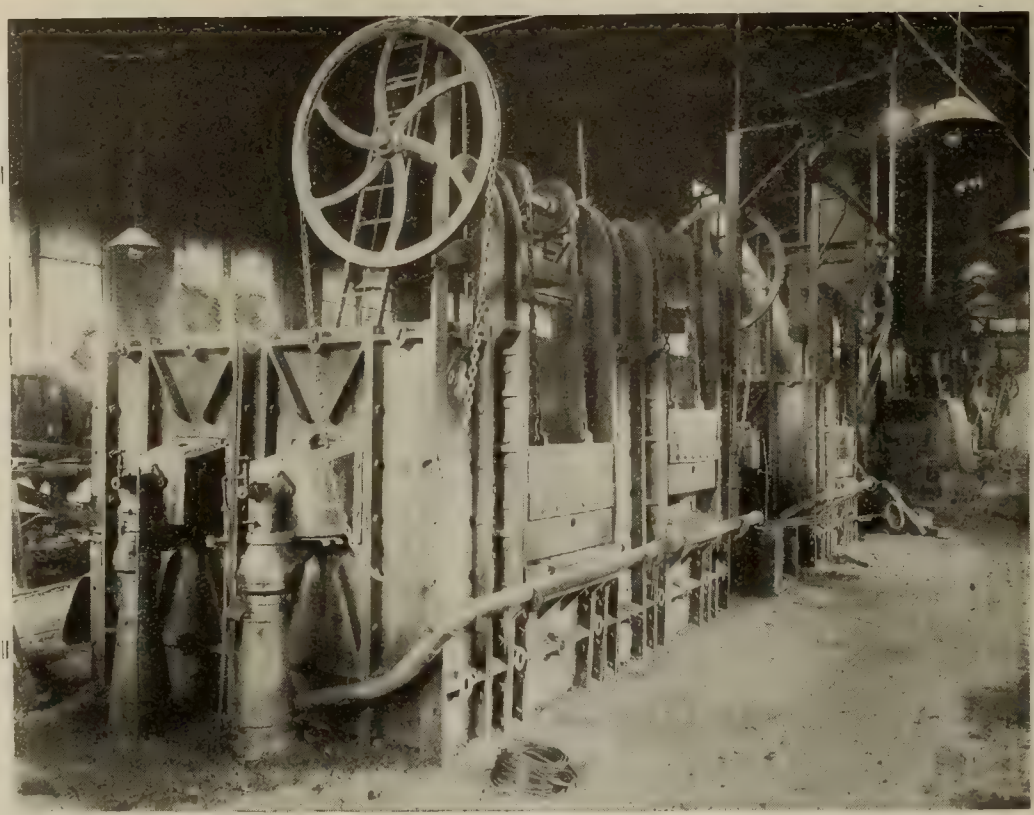
12,000 R.P.M.

is the maximum spindle speed of this Demco Floor Type Drill, which is specially adapted for drilling 3/16 inch and under. Capacity possible in soft material is 3/8 inch. You can't find its equal at any price.

Say you want Demco Catalog and Performance Facts.

THE DeMOOY MACHINE CO.

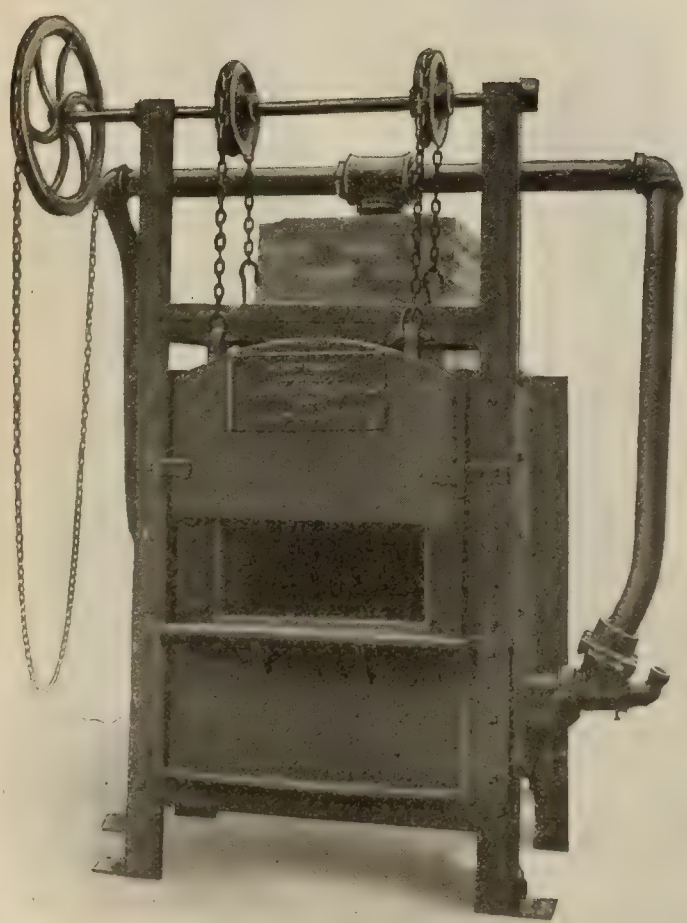
CLEVELAND, OHIO, U.S.A.



Battery of twin hearth Forging Furnaces installed at the Canadian Allis-Chalmers Co., Ltd., Rockfield Plant

Mecol Furnaces

Facilitate Production



Gas Heat-Treating Furnace with Air Pre-heaters.

War has brought about industrial conditions which place these furnaces in the first place of importance to you. For they save fuel, save labor and give a bigger and better output than ordinary furnaces. Their adoption in place of coal results in—

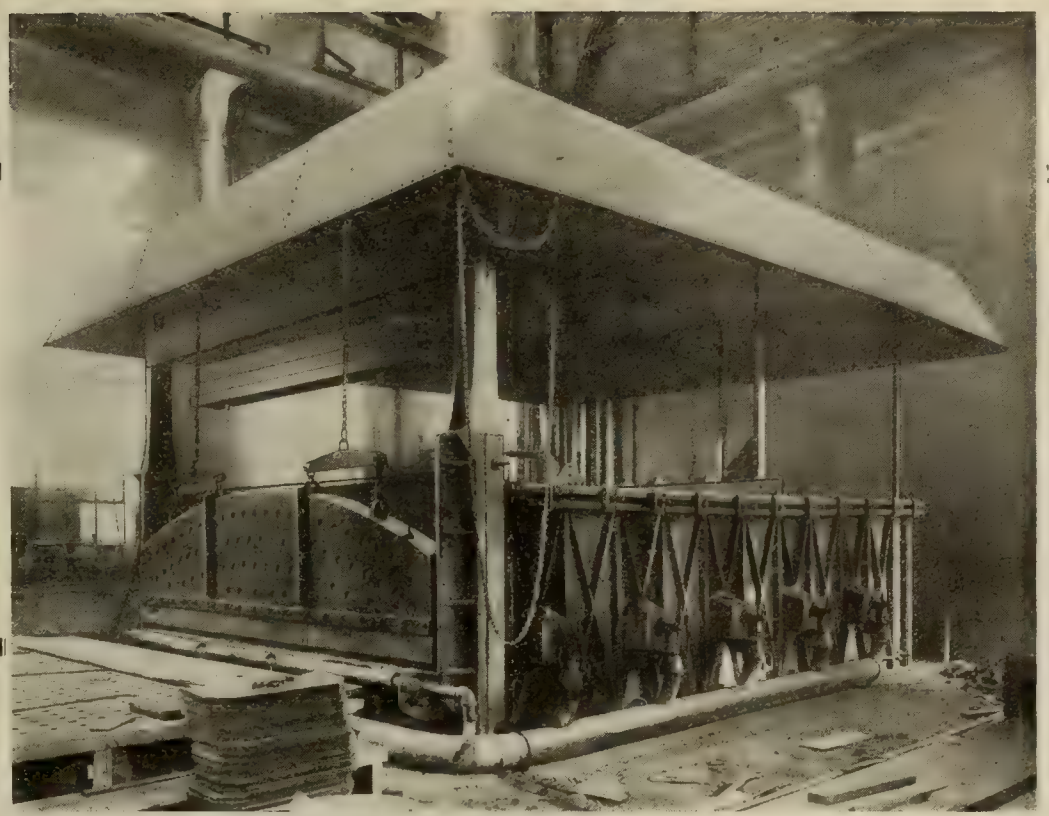
A Clean Workshop without Smoke or Soot

Only half the furnace space necessary.
Less than half first cost of furnaces.
No chimneys or flues.
Instantaneous and perfect control of temperature.
No heaters, coal or ash handlers.
Less fuel and less time required to bring furnaces up to working heat.
No waste of fuel after work is done, as supply is shut off instantly.

We manufacture furnaces for all purposes to be used with any kind of fuel.

Mechanical Engineering Company, Limited

Three Rivers, Quebec



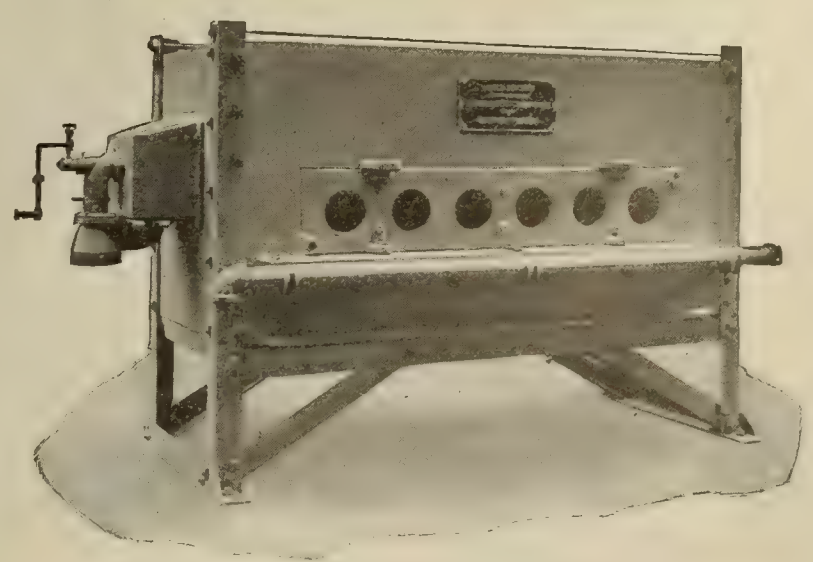
14′ x 20′ Flanging Furnace Installed at Canadian Vickers, Ltd.

Mecol Furnace

Doing Its Bit

IT has proved itself highly efficient and an economical producer.

We build furnaces to meet any special requirement and if you have any ideas to work, consult us. We have the experience, the facilities and the organization necessary to successfully cope with all heat treating problems.



60 pr. 6″ and 155 mm. End Nosing Shell Furnace

Mechanical Engineering Company, Limited

Three Rivers, Quebec

If any advertisement interests you, tear it out now and place with letters to be answered.

CATARACT

MYSTIC ACME SPECIAL

Cutting Compounds

Mean

SPEED ACCURACY PRODUCTION EFFICIENCY AT MINIMUM COST

Unequaled for machining Shrapnel Shells.
Keep tools cool. Prolong tool life.
Will not separate, rust nor gum.

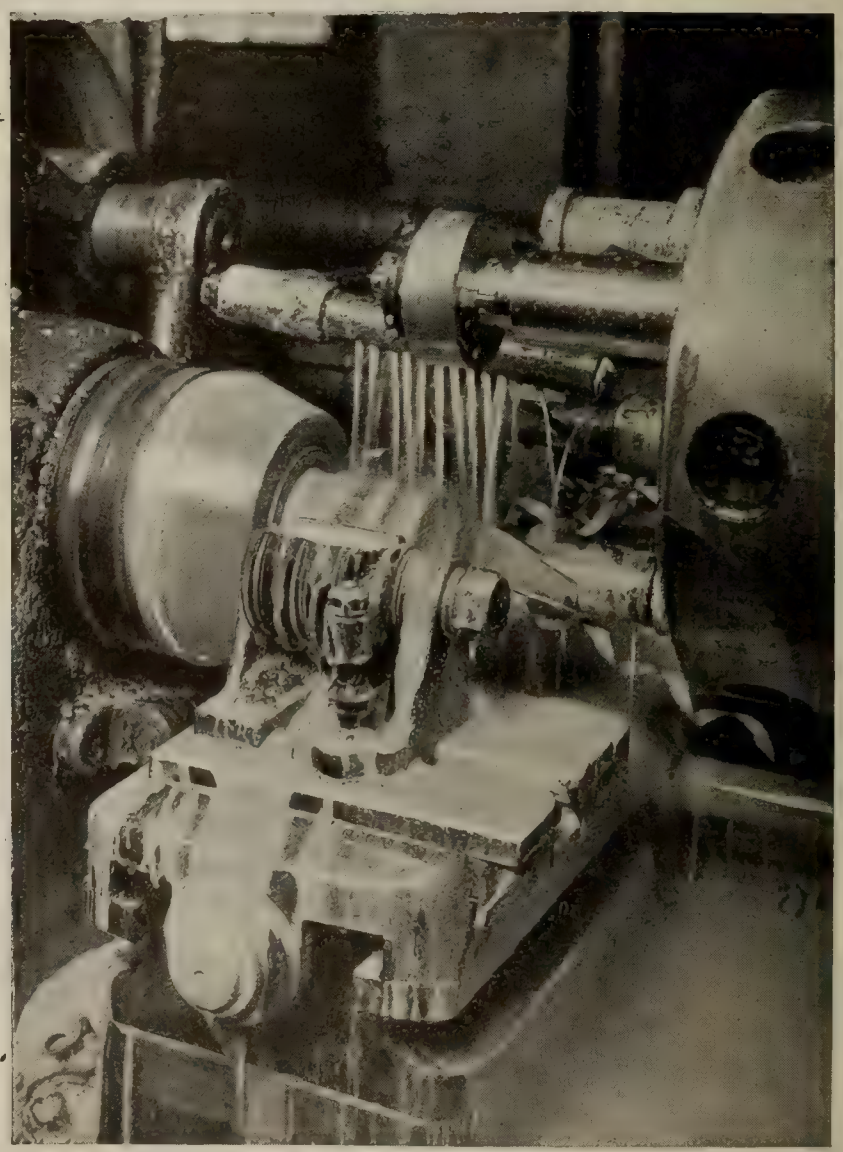
Heat Treatment plays an important part in preparing steel for machining.

Cataract Quenching Oils

are scientifically blended to meet every requirement.

Will demonstrate to your satisfaction or no charge.

PROMPT SHIPMENTS



CATARACT REFINING COMPANY, Limited

TORONTO, CANADA **LONDON, ENGLAND**

P & B RIVETS

For Every Purpose

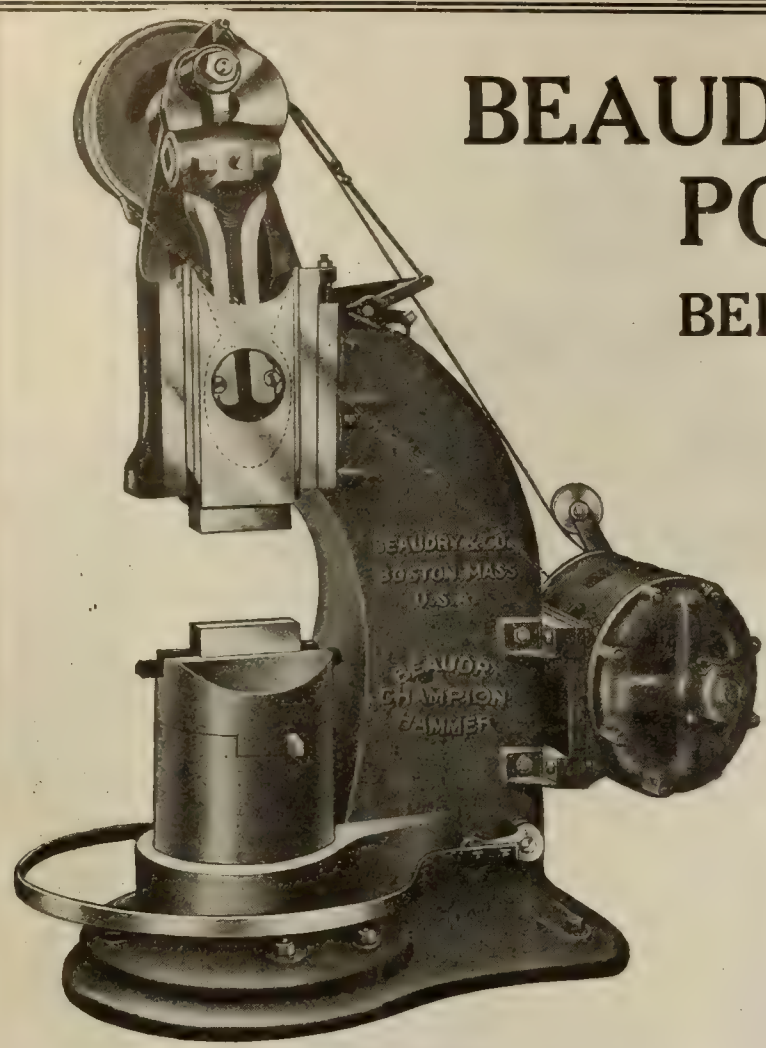
Our rivet service will meet with all your demands. All designs and sizes—½-inch and smaller. Reliable quality.

Copper belt rivets and burrs. Coppered belt rivets and burrs. Bifurcated or slotted rivets. Tubular rivets.

Become a regular purchaser of our lines and you'll save money. Rivets is our specialty and we can offer matchless values.

Parmenter & Bulloch Company
LIMITED

Gananoque, Ontario



MOTOR DRIVE

BEAUDRY "CHAMPION" POWER HAMMER

BELT OR MOTOR DRIVEN

Built in sizes of 50 to 500 lb. Weight of Ram.

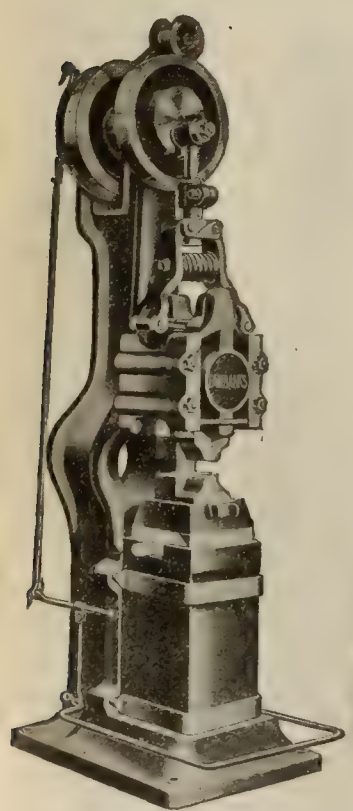
Simple in Operation
Easily Adjusted
Low Power Consumption

CATALOG MAILED ON REQUEST.

Beaudry & Company,

INCORPORATED

141 Milk St. - BOSTON, MASS.



BELT DRIVE

Adapted To Work Stock Up To 5 Inches Round or Square

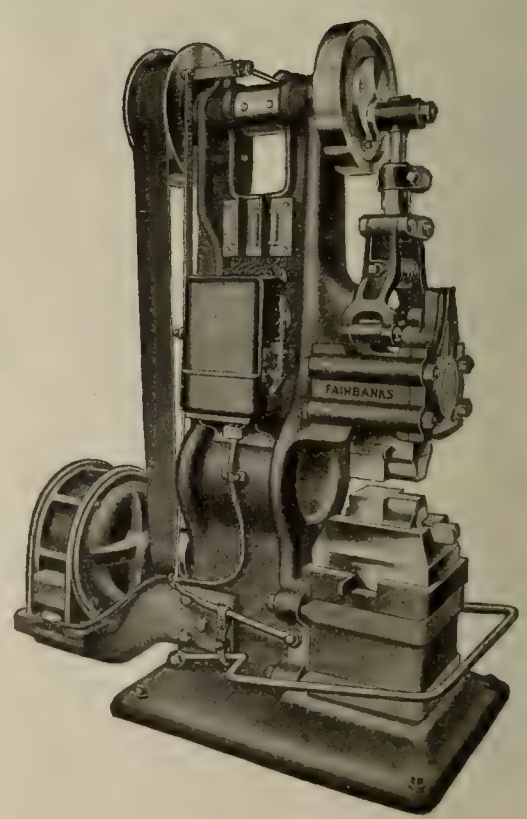
FAIRBANKS POWER HAMMERS

BELT OR MOTOR DRIVEN

The Ideal Tool for General Forge Work and Tool Dressing. 25 to 300 lb. Rams.

PROMPT SHIPMENT *FAIR PRICES*

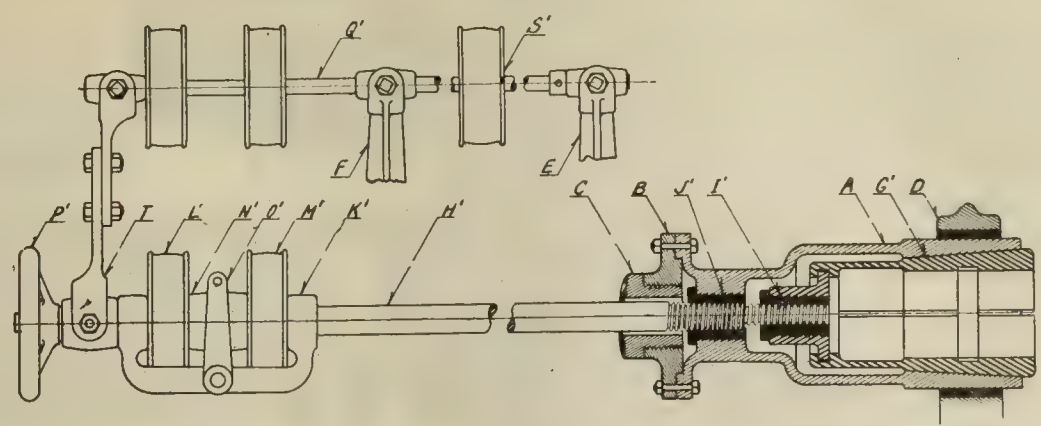
LET US QUOTE YOU ON YOUR REQUIREMENTS



MOTOR DRIVE

UNITED HAMMER CO.

OLIVER BUILDING - BOSTON, MASS.



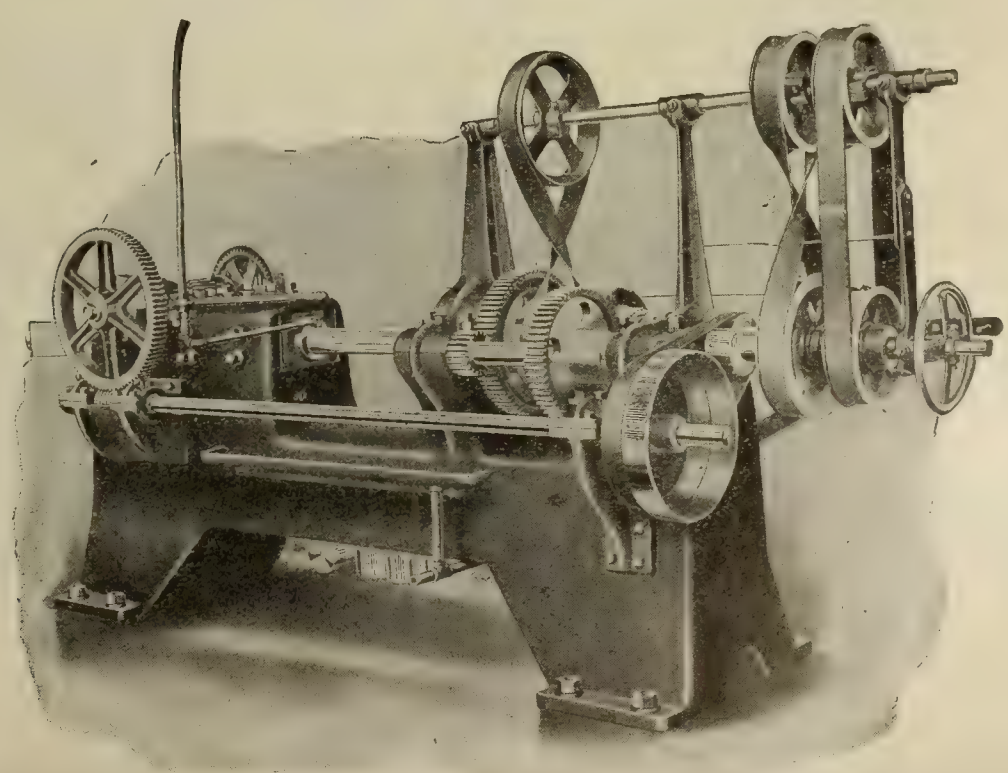
6" Boring — 75 Rough 100 Finish

10 HOUR DAY

A close study of the above chuck will reveal strength that enables this machine to give this production *all the time* in 10 hours. The illustration below shows the wonderful sturdiness of the machine. Inquire of us. The prices are exceptional. Made in Canada.

The Plessisville Foundry

PLESSISVILLE, QUEBEC



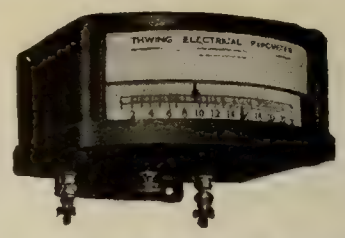
If interested, tear out this page and keep with letters to be answered.

The Lees-Bradner Company

Cleveland, Ohio

Gear Generators

Thread Milling Machines



Insuring Accurate Temperature Measurements

THWING

HIGH RESISTANCE MULTIPLE RECORD

PYROMETERS

are instruments of exact precision. Yet they have the rugged durability to withstand hard usage in the toolroom, the steel mill, and similar places.

Thwing Instruments are furnished in either the Indicating or Recording style, giving as many as twelve readings on a single recorder.

Our New Catalog No. 8 covers the entire line. Send for copy.

Canadian Representative:
Mr. James DeVon, 227 Davenport Road, Toronto

Thwing Instrument Co.

34th Street and Lancaster Ave.,
PHILADELPHIA, PA.

Decidedly Quality

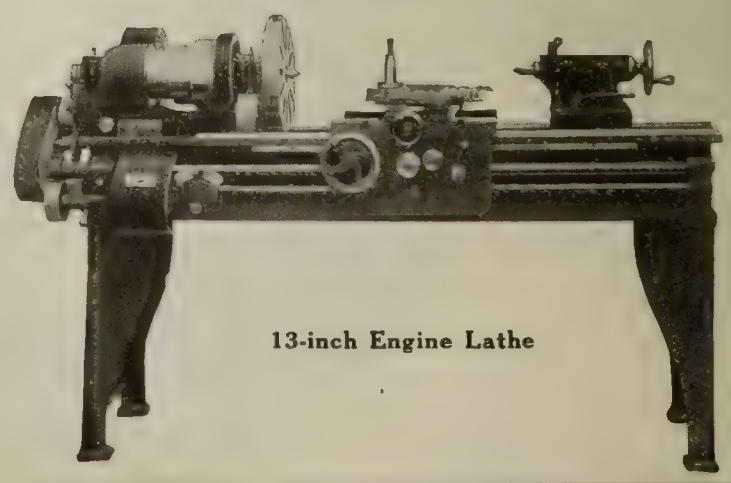
That is the verdict of our clients.

In construction, operation and results, quality is evident. That is the reason why Filsmith has occupied the foreground in lathedom. In Canada and United States you will find Filsmith quality is based on what it is now doing, not on history. Full webbed headstock, 50-point carbon steel spindle, and rigidly clamped tailstock.

An enquiry will secure you full information.

THE PHILIP SMITH MFG. CO.

SIDNEY, OHIO, U.S.A.



13-inch Engine Lathe

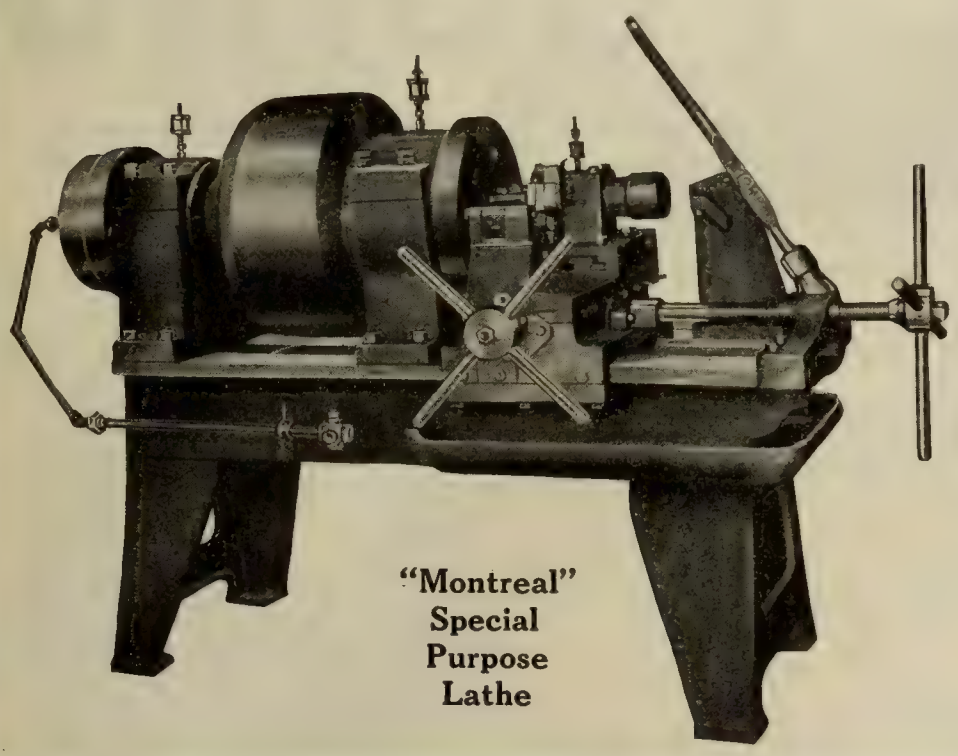
Record Shell Producers

Glance at the cut opposite. It shows battery of **Montreal General Tool Co. Single Purpose Lathes** in action on 6″ shells. They have been running steadily for two years in one of Canada's largest munition works, producing more shells per machine than any other type of tool.

This plant has turned out approximately ONE MILLION 6″ shells.

The chuck is instantaneous in action; positively cannot slip, very rigid; operated by simply turning a lever; 60 lbs. air pressure is sufficient. Very efficient on the following operations: Inside profile; base recess; groove and wave; rivet and face base; turn copper bands; and various other operations. Our claims for this machine have been substantiated by their records in several Canadian munition plants. Absolutely no repairs. No gears to break.

If it is chucks you are interested in look over this Lavoie Air Chuck. Simplest, strongest, and best on the market, 200 in use in one 6″ Shell plant, numerous others on all operations all over the country. Increases output by big margin. Has low air pressure. Note—The whole chuck is attached to front end of spindle, as in photo on solid spindle lathe.



"Montreal" Special Purpose Lathe

Let us tell you more about these tools. Get in touch with us now.

Makers of Shell Tools and Special Machine Attachments.

Montreal General Tool Company

673-5 Notre Dame Street
Maisonneuve, MONTREAL, Que.

FIGHTING AVIATORS

possess a sixth sense that our scientists call the "sense of equilibrium."

It is this sixth sense that tells Ty. Cobb the balanced weight of a baseball bat the minute he lifts it.

By this sixth sense certain skilled mechanics know the perfect balance of a tool. That these mechanics prefer to work with

KEYSTONE TOOLS

we consider is a mark of high merit. That they, using their own money, buy and prize KEYSTONE TOOLS is a compliment that **"Keystone Quality"** shall everlastingly continue to be worthy.

Supplied by better wholesale houses everywhere. Write for name of nearest dealer.

The Keystone Mfg. Co.
Buffalo, N.Y., U.S.A.

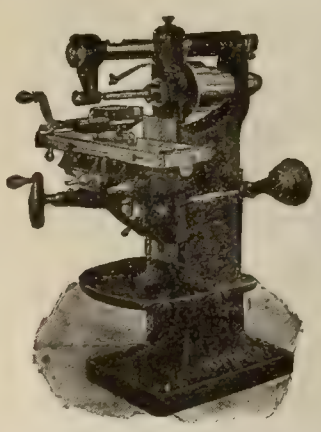
STEEL TUBING

High Carbon Structural

CANADIAN METAL PRODUCTS LIMITED
GUELPH, ONT.

Butted and Brazed **Bends and Shapes**

Don't Crowd Your Large Machines

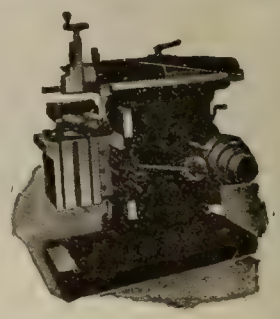


You cannot manufacture small parts economically on a large machine. Steptoe Small Power Feed Millers and Hand Millers are especially adapted for that kind of work, a stiff, heavy tool that can be quickly handled and crowded to the limit. That is the machine to buy for small parts.

If your Planers are crowded take the small jobs and put them on a Steptoe Shaper and you will do them quicker and you will have less money invested in equipment.

STEPTOE SHAPERS "Just a Little Better."

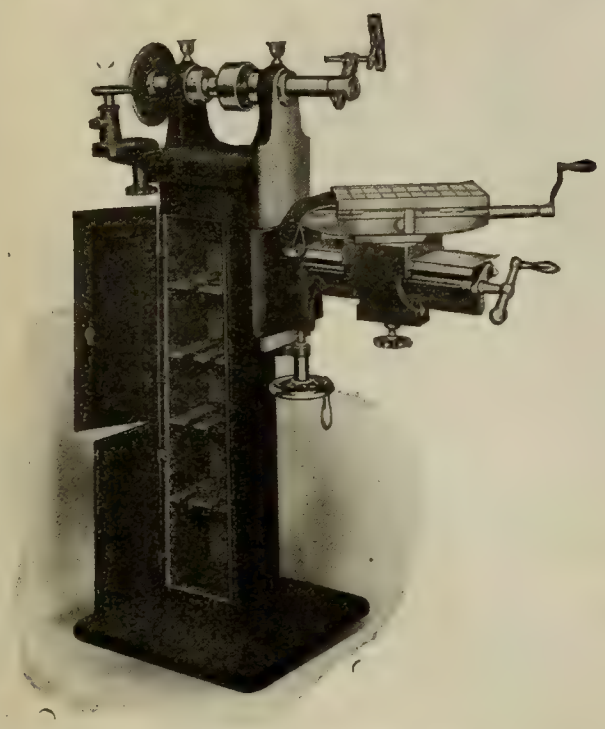
CIRCULAR ON REQUEST.



John Steptoe Co., Cumminsville, Cincinnati, Ohio, U.S.A.

Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.

OBTAIN THE BEST RESULTS



GARVIN No. 3, Universal Cutter and Surface Grinder.
Use Code—Banish.

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL

CUTTER AND SURFACE GRINDERS

Simple Light Running Accurate

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14 in. x 6 in.; SURFACES, 9½ in. x 6 in.

For Further Information {*ASK YOUR DEALER or WRITE US DIRECT*

IMMEDIATE DELIVERIES

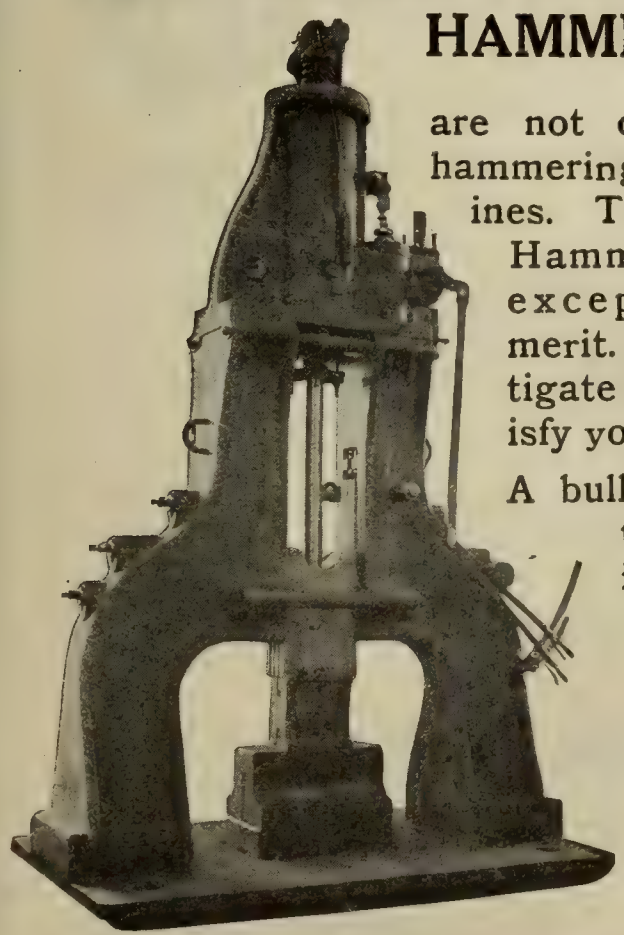
Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) **50 Years New York City**

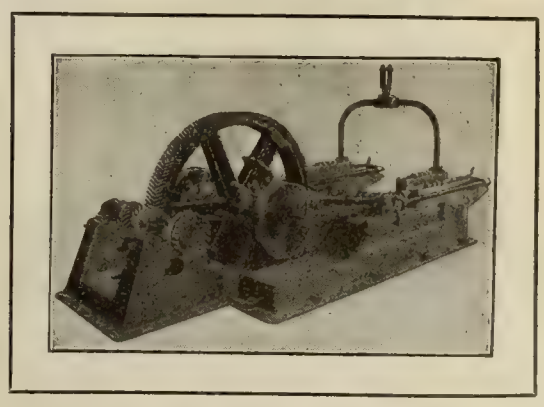
"ERIE" STEAM FORGING HAMMERS



are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

ERIE FOUNDRY COMPANY
ERIE, PENNSYLVANIA, U. S. A.



ELMES

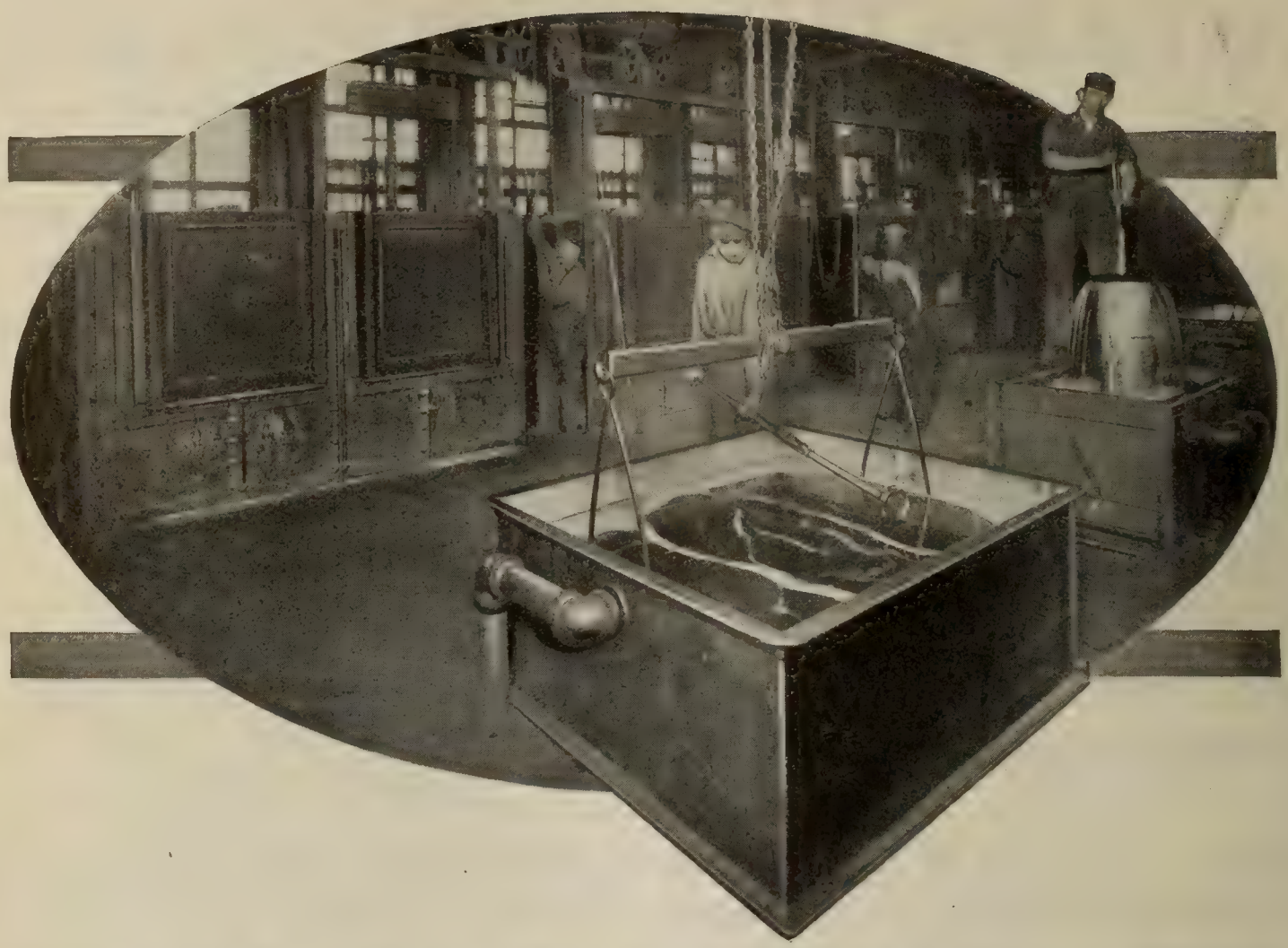
18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217 No. Morgan Street CHICAGO, ILL.



CASE HARDENING EFFICIENCY

QUICK and steady heats are the first requisite of an efficient case hardening plant.

Our numerous installations, one of which is shown above, have proved that the ease of control and operation of the GILBERT & BARKER furnaces fitted with our low pressure, adjustable tip, oil burners make them especially adaptable for this kind of work.

Steady production is important—this we can insure, due to the simple, yet durable construction of these furnaces.

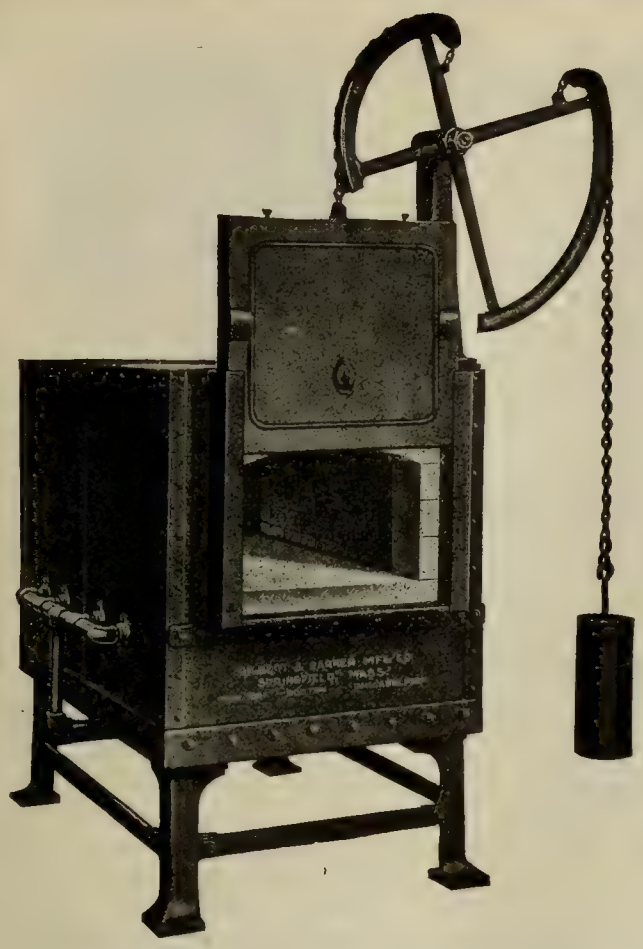
Let us figure on your requirements. Send for catalog No. 24.

GILBERT & BARKER MFG. COMPANY

SPRINGFIELD, MASS., U.S.A.

CANADIAN AGENTS:

James DeVon, 227 Davenport Road, Toronto, Ont. **Williams & Wilson, Montreal, Que.**



IMMEDIATE DELIVERIES

FOR the present we are able to make immediate deliveries on many types of G. & B. furnaces, including those illustrated. All of the furnaces embodied in this offer are supplied for gas or oil fuel, as may be desired, or can be furnished with our Special Combination gas and oil burners.

Look over your heat-treating department to-day; send us your requirements and let us quote you on a furnace adapted to your need.

HEAT TREATING

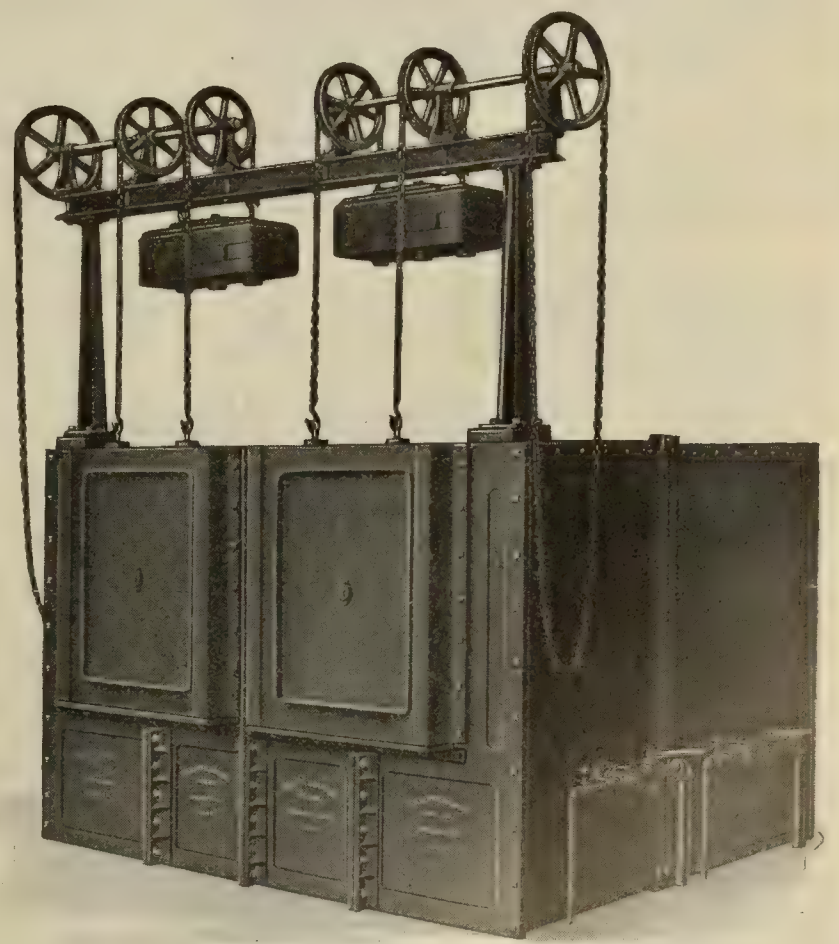
with Speed, Economy and Certainty

The simplicity of construction and ease of operation—the ready control of temperature—eliminate unnecessary labor, excessive first and upkeep cost in

GILBERT & BARKER

Singe and Double Chamber Furnaces

Many successful manufacturers using GILBERT & BARKER Furnaces have found them entirely satisfactory. These furnaces can be supplied with doors at both ends, which facilitates the work of two operators.



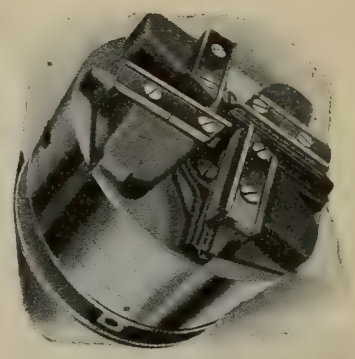
GILBERT & BARKER MFG. COMPANY

SPRINGFIELD, MASS., U.S.A.

CANADIAN AGENTS:

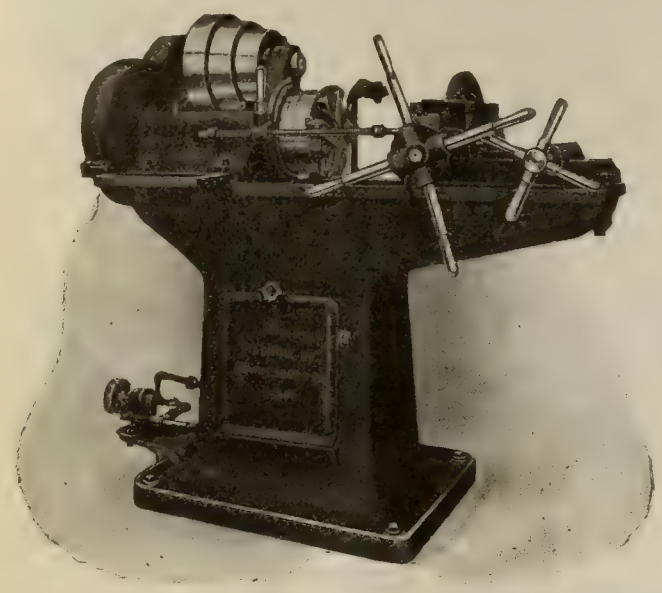
James DeVon, 227 Davenport Road, Toronto, Ont. **Williams & Wilson, Montreal, Que.**

Have you Landis-ized your threads?



Are you using the Landis Die to cut your threads and thereby obtain a maximum production of high quality threads at a low cost?

If not, get in line with other progressive manufacturers and make your threading profitable. One customer writes, "We have made an increase in production of 30 to 40% and a saving in the cost of chasers of 50 to 60% since installing your machine."



Consider the design of the Landis chaser. It never requires annealing, hobbing or retempering, merely a slight grinding at the end renews it; right and left hand threads are cut with the same set of chasers; it is ground like a lathe tool, permitting any desired clearance without changing the cutting contour and it has a line contact with the stock, permitting of the highest cutting speeds.

Learn the many other distinctive features. Write for catalogues:—

No. 22—Bolt Cutters.

No. 23—Pipe Threading Machines.

Landis Machine Company, Inc.

Waynesboro, Pa., U.S.A.

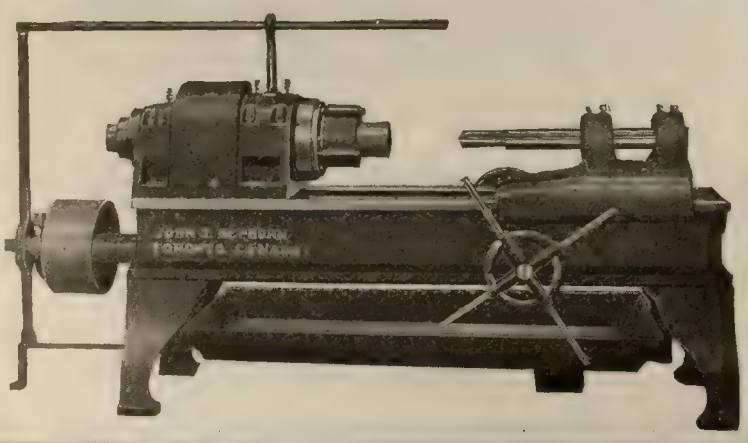
HEPBURN

Lathe For Shell Work

Put into your shop this Hepburn Single Bar Boring Lathe, because it has been proven to have no equal on shell work. We will send the proof—or find it yourself in many of the larger shell plants of Canada. Your old lathe rebuilt to embody latest improvements. Write for the facts about our service.

JOHN T. HEPBURN, LIMITED

18-60 Van Horne Street **Toronto, Ontario**



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AFTER fifteen years' study of the Miner's and Lumberman's wants, we know just what is and what is not required in tools for them.

Practicality has been the keynote of our organization. Experience has aided us in eliminating all unnecessary parts and in perfecting the design of our tools.

The use of best material and finest workmanship enable us to manufacture tools that are unexcelled.

We make a complete line.

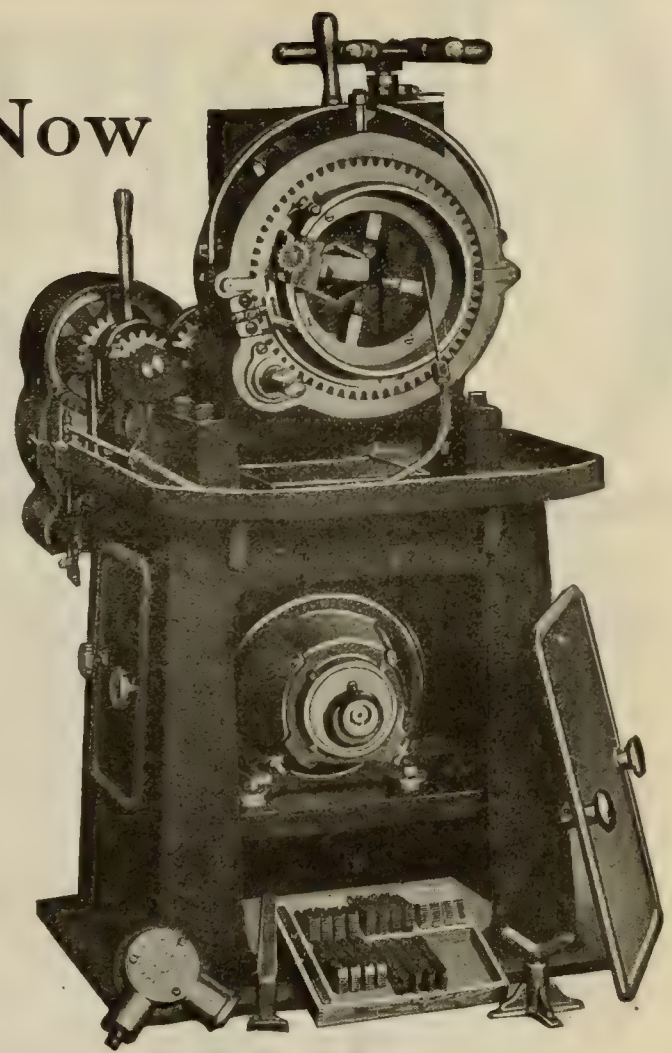
Write us for prices.

J. W. CUMMING & SON, LTD.

NEW GLASGOW, - - CANADA

Wood or Steel, let Cummings make it.

We Can Ship A Forbes Promptly If Ordered Now



In your rush to increase production, do not forget the importance of having your pipe threading and cutting done quickly and efficiently at the time it is needed. Unless your pipe work is well done you cannot expect the lines to work at full capacity. If you are not yet short of labor you may be when you least expect it.

The FORBES machine enables one man to do the work usually requiring three or four men by the old, inefficient method. The FORBES is well known for its ease of operation, its clean-cut, burrless threads and cut-offs. It can be taken to the work anywhere. It is made for hand or power drive, bench or trench. The many time, labor and money-saving features of the FORBES Pipe Cutting and Threading machine have so increased the demand that we are being swamped with orders. In view of this condition and the advancing prices, as well as congested shipping facilities of the railroads, we wish to impress upon you the wisdom of ordering NOW, while we are able to make prompt deliveries. Or, if you will place your order at once, we will make delivery when you are ready.

Be safe. Order promptly and specify delivery. Telegraph at our expense if you're in a rush. Act before you lay this aside. Have you our catalog? Get that, too.

The Curtis & Curtis Co.

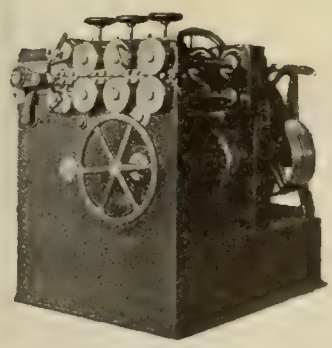
115 Garden Street, Bridgeport, Conn.

The Machines that put the "Rings" in Springs!

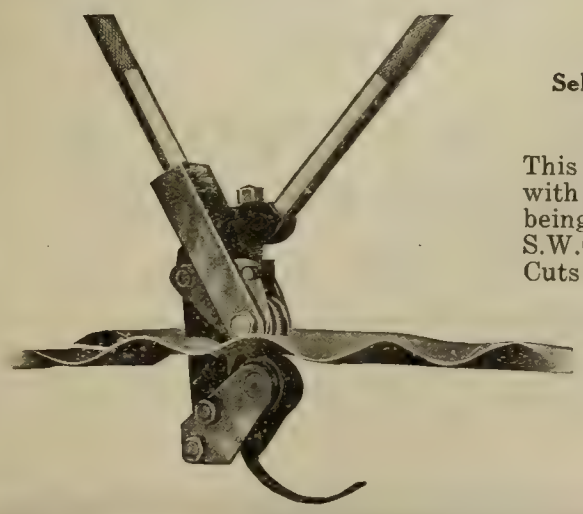
More Than Forty Standard Spring Making Machines.

High-Speed Automatics for Making Fuse and Small Arms Springs.

Flexible Metallic Tube and Casing Coilers.



Sleeper & Hartley, Inc., WORCESTER, MASS. and COATICOOK, P.Q.



TANGENT

Self-feeding HAND TOOL FOR CUTTING **Non-distorting**

CORRUGATED SHEETS

Can. Pat. No. 167666

This tool will cut sheets on **any angle**, limited curves and **through the centre** with **no distortion** of cut edges. Sheets can be cut to required shape when being **fixed in position on the job.** Made in two styles, as illustrated, for 20 S.W.G. (weight 5 lbs.); with compound leverage for 18 S.W.G. (weight 6½ lbs.). Cuts 100% faster than any other hand method.

Write for Illustrated Pamphlet and Prices.

Montgomery, Smith & Co., Limited

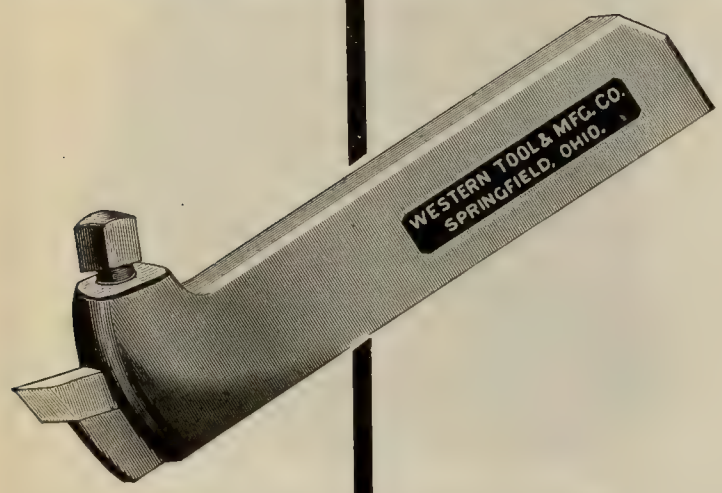
Patentees and Manufacturers

Tangent Works, Keynsham, Somerset, England

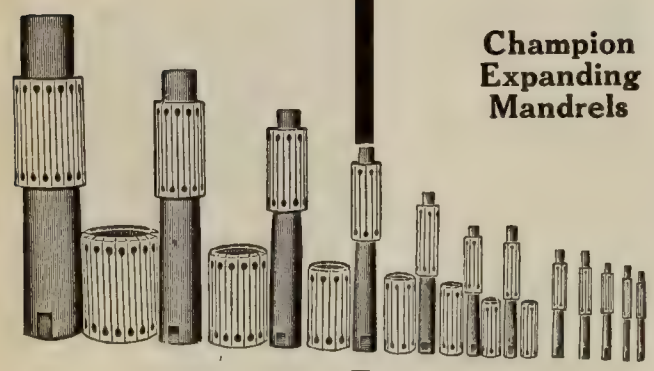
Applications for selling agencies or rights to manufacture under license will be considered.

If any advertisement interests you, tear it out now and place with letters to be answered.

Champion Tools

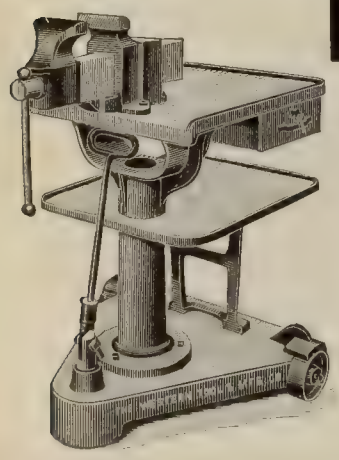


Champion Turning Tool

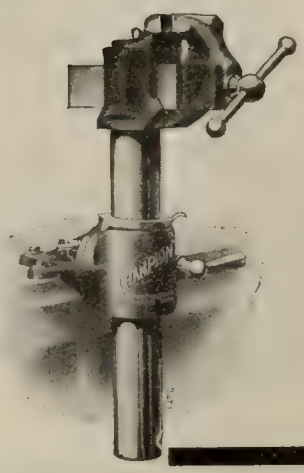


Champion Expanding Mandrels

Champion Shop Furniture



Champion Vise



BULLDOG JAW AND A BULLDOG GRIP

The "CHAMPION" TOOL HOLDER grips the cutting tool with bulldog tenacity. Note the heavy extended lip which protects the tool. This holder stands up under the heaviest service. It can effect a distinct saving for you in breakage. A further saving is effected with this holder, since it can use up the small ends of cutters. High Speed Steel is expensive and difficult to obtain. Better economize your present supply—make it last longer and turn out more work by using "Champion" Tool Holders.

"CHAMPION" EXPANDING MANDRELS

They have no claws—cannot injure work. They are simple, accurate and low in cost. A complete set as shown makes any size mandrel between ½ and 6½ in. immediately available. They are the ideal equipment for economy in first cost and for the production of accurate work.

SHOP FURNITURE

Including Portable Benches, Steel Racks, Tool Stands, Trucks for moving boxes, heavy castings, etc., Lathe Pans, Steel Boxes, etc., etc.

The "CHAMPION" VISE will easily handle any odd-shaped work as well as ordinary shapes. It is more quickly positioned than any other vise. The work can be kept in proper position before the eyes of the workman in the best light without the necessity of stooping or other tiresome and awkward attitudes at the bench. A long stride toward correct work. Simple—Durable—Accurate.

THE WESTERN TOOL & MANUFACTURING CO.

SPRINGFIELD, OHIO, U.S.A.

Also Makers of Emery Wheel Dressers, Vises, Shop Furniture, etc., etc.

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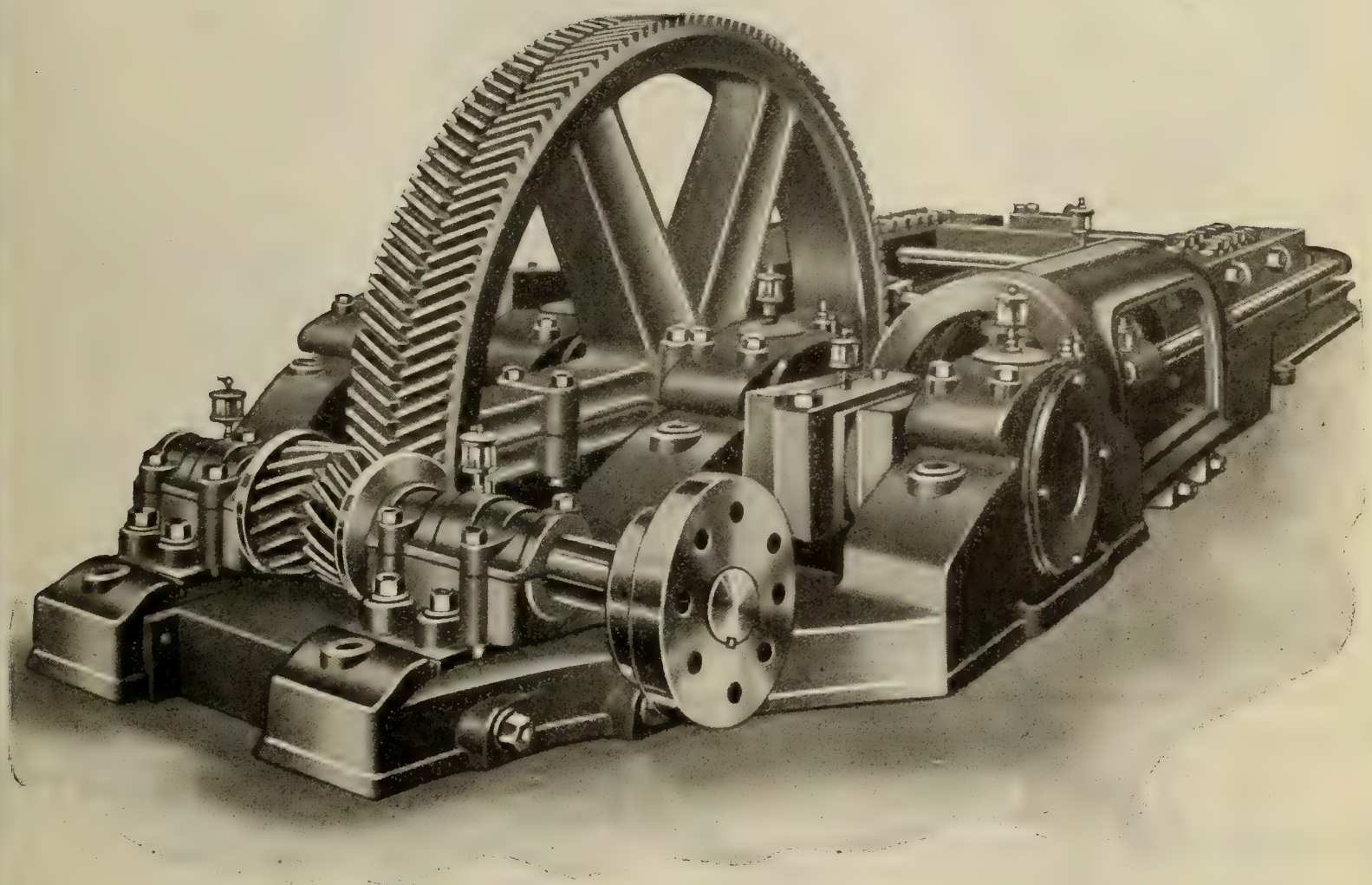
ASK FOR CATALOG.

Hydraulic Pumps



We are builders of High Pressure Pumps to be used in connection with accumulators and presses for making forgings of all kinds.

Immediate shipment to Canada or any part of the world of pumps and motors.

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Standard Machinery & Supplies, Ltd., 260 St. James Street, Montreal, Canada

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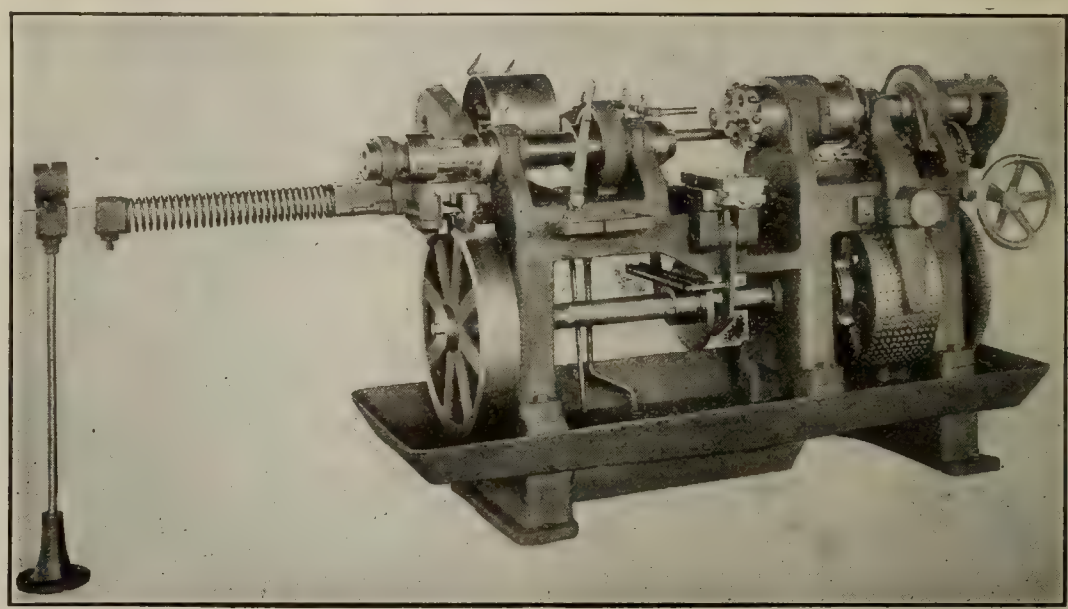
Power is Costly--- Don't Waste It

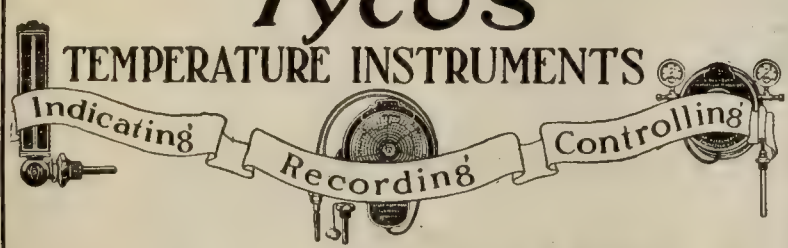
John MacNab Machinery Co.
90 West St., New York
John MacNab, Hyde, England

A STRIKING feature of the Chicago Automatic is the 100 per cent. utilization of power. Operated by a single belt run direct from the lineshaft, troublesome overhead belting and countershafts, with the power they waste, are eliminated, making it easy to install one or a battery of these machines.

Equally as important is the general simplicity of construction; there is no reversing or belt shifting, no complicated mechanisms, and all parts are readily accessible. Action is positive, results unvaryingly uniform and accurate. The machine is extremely well built in every particular and produces fine work at very low costs. Made in ¾", 1¼", 1⅝", 2" sizes. Catalog for full particulars.



Tycos
TEMPERATURE INSTRUMENTS



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- Thermometers of all kinds for home and general use.

Tycos **Pyrometer**
High Resistance Wall Type Indicator

In selecting the proper equipment for the measurement of high temperatures, progressive manufacturers invariably choose *Tycos* Pyrometers.

May we send you our catalogues which explain these *Tycos* Instruments fully?

Taylor Instrument Companies
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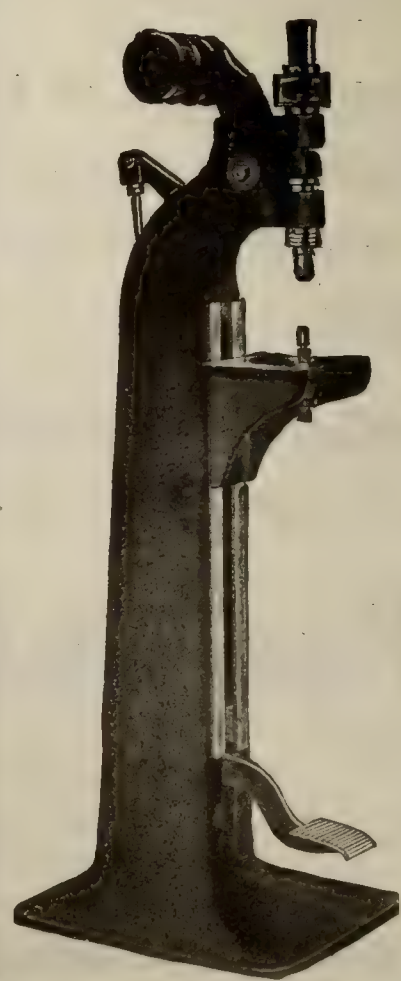
60

Her Sure Touch



Her deep-rooted desire to do thoroughly whatever work is expected of her makes

WOMAN

ideally fitted for operating the Grant

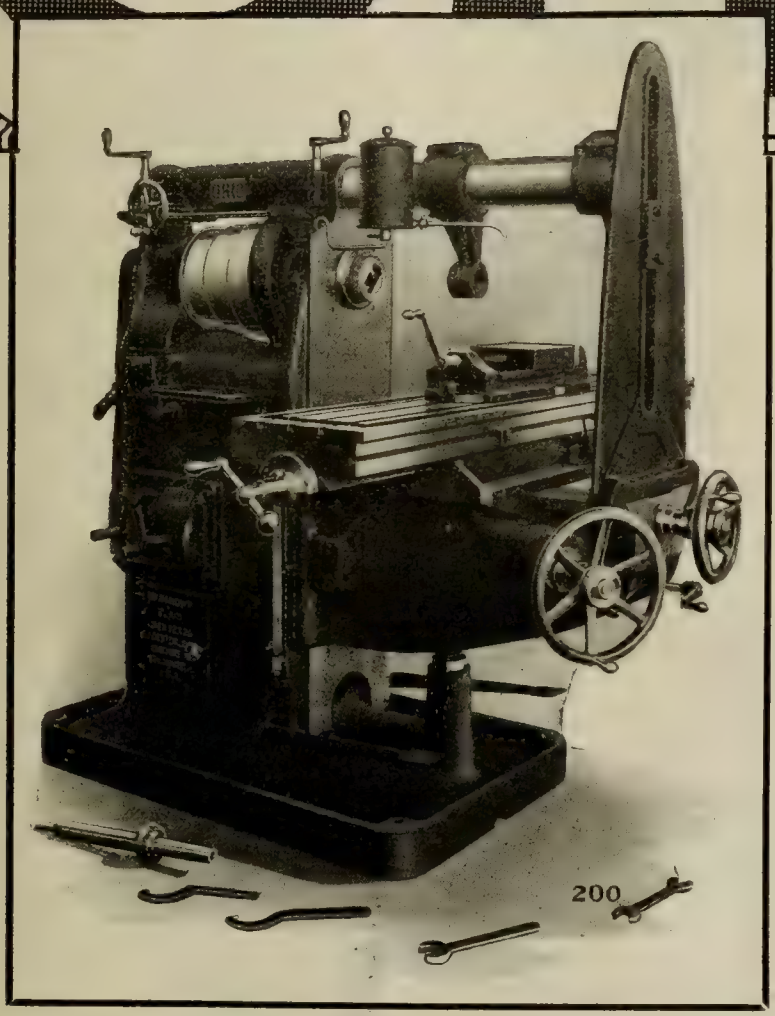
Silent Riveter

Instead of nerve-racking, hammer-like blows; with this Grant Rotary Rivet Spinning Machine there is absolute quiet. Noiseless twin rolls, revolving independently of each other, roll heads on the rivets under pressure. One rivet every second, and never a bent shank, whether rivets are soft brass or hard steel. Heads finished perfectly smooth, show no mark of the riveting tool.

Thousands of articles now being riveted on Grant Noiseless Riveters. Write.

GRANT
Mfg. and Machine Co.
BRIDGEPORT, CONN., U.S.A.

OHIO



A Miller of Exceptional Range

The "OHIO" Milling Machine has many features unsurpassed by any other Miller on the market. One of its strongest points is the Range, due to the expansive, although accurately proportioned knee.

This machine has other advantages, too numerous to list in this limited space, but a few of the most marked are: the rigidity of the column, the adaptability to all kinds of milling, whether it be for tool-room or commercial work, convenience of control for the operator, and others. If you are looking for a Miller to cut cost figures, take a look at the "OHIO" and you will find your wants supplied.

Write for our complete catalog which illustrates and describes our Milling Machines in full.

The Oesterlein Machine Company

Cincinnati, Ohio

OHIO

If interested, tear out this page and keep with letters to be answered.

And the first Norton is still doing business—

R. HOE & CO.

PRINTING PRESS,
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THIS COMPANY WILL NOT BE BOUND BY PROMISES OR AGREEMENTS MADE OR PURPORTING TO BE MADE IN ITS BEHALF UNLESS SUCH SHALL BE IN WRITING SIGNED BY ONE OF ITS EXECUTIVE OFFICERS. SALESMEN HAVE NO AUTHORITY TO MODIFY OR WAIVE THE PROVISIONS OF ANY CONTRACT OR AGREEMENT SO APPROVED. PROPOSALS SUBMITTED WILL BE SUBJECT TO CHANGE WITHOUT NOTICE. THE COMPANY WILL EXERCISE DUE DILIGENCE IN TRYING TO FILL ORDERS AT TIMES PROMISED AND WILL KEEP SUCH PROMISES UNLESS PREVENTED BY DELAYS OF CARRIERS OR BY STRIKES, FIRE, OR OTHER CAUSES NOT FULLY WITHIN ITS POWER TO CONTROL IN WHICH EVENT IT WILL NOT BE RESPONSIBLE FOR POSSIBLE LOSS OR DAMAGE WHICH MAY BE BROUGHT ABOUT THROUGH SUCH DELAYS.

Hill Publishing Co.,
10th Avenue & 36th St.,
New York City, N.Y.

Gentlemen:

Replying to your verbal request for some data regarding the first large cylinder Grinder built by the Norton Grinding Company of Worcester, Mass.

This machine was ordered by the firm of R. Hoe & Co., of New York about the latter part of December 1900 or early in January 1901.

In the early part of 1900 the writer became convinced of the necessity of finishing certain rollers and cylinders used in rotary printing presses, in a more accurate manner than we were able to do on an engine lathe, and after some preliminary investigation by the late Mr. Hoe he decided to give the order as above. The machine was delivered to us in 1901, and the writer of this, having charge of the department in which it was installed, tested it out on the work for which it was designed.

Mr. Chas. E. Norton came on and was with the undersigned several days trying out different grades of grinding wheels.

The machine was put in operation and has been running continuously since.

For several years after installation the writer kept watch and I can say that there were no repairs necessary other than the water circulating pump which has been renewed at least once; otherwise there has been no expense to speak of since we have had the machine.

Yours sincerely,

G. W. Church
Supt. Saw Dept.

GWC

Norton Grinding Company
Worcester, Mass.

The First Norton—Doing the Same Class of Work as when it started—17 Years ago

At the Hoe plant, 'way over on the lower east side of New York, you'll find a Norton Grinding Machine which is marked No. 1. For it was the first machine for cylindrical grinding we ever sold—back in the early part of 1900.

And it's not under glass as a relic, but out in the busiest part of the shop, lined up with a dozen other Nortons—**doing the same class of work that it was purchased for**—the finishing (to extremely close limits) of printing press fountain rolls.

We don't expect you to believe that we consider 17 years an exceptionally long life for **any** machine tool — but you must certainly be deeply impressed with the fact that with little or no repairs this machine will still deliver a product of marked accuracy.

THE NORTON GRINDING COMPANY, Worcester, Mass.

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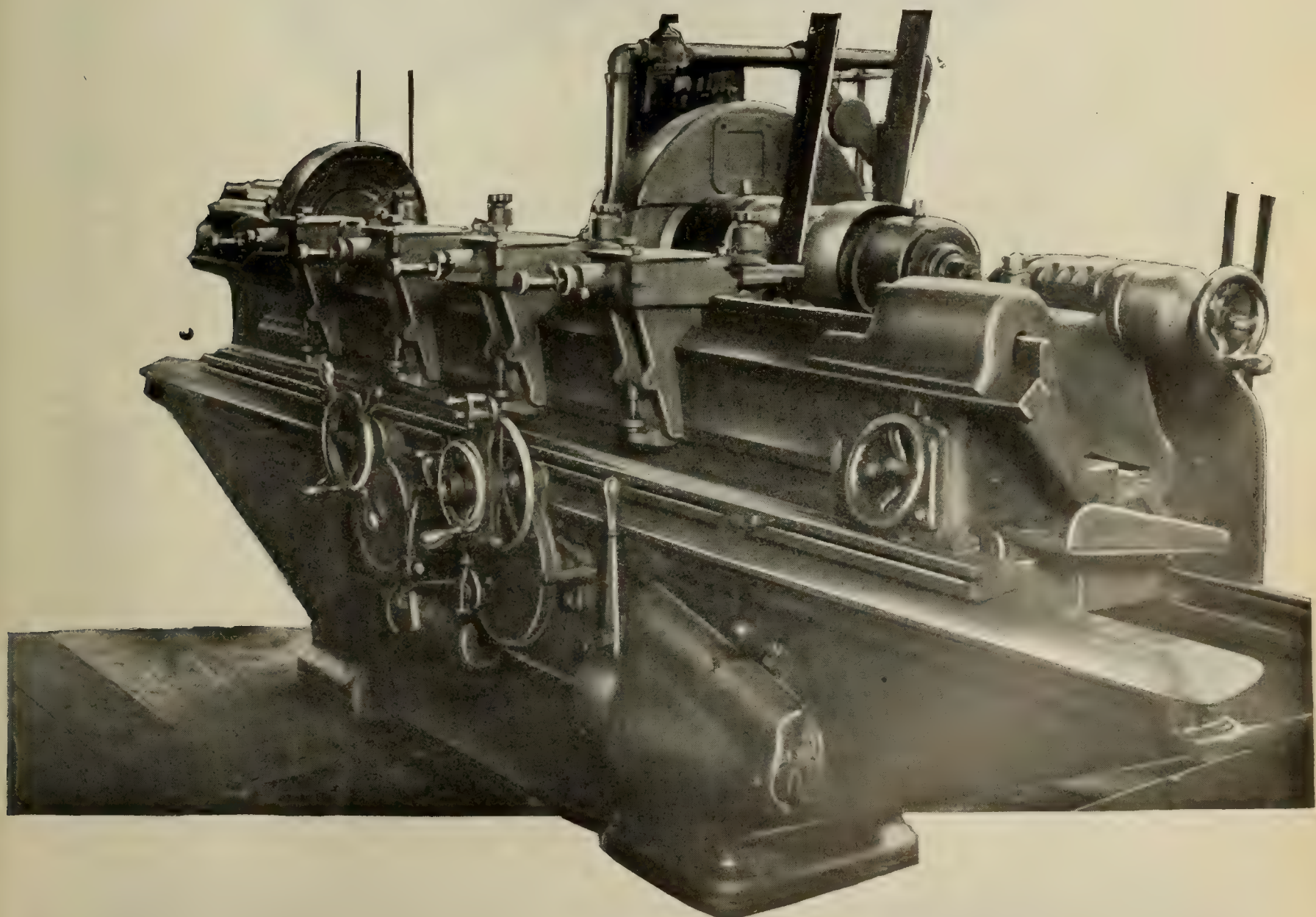
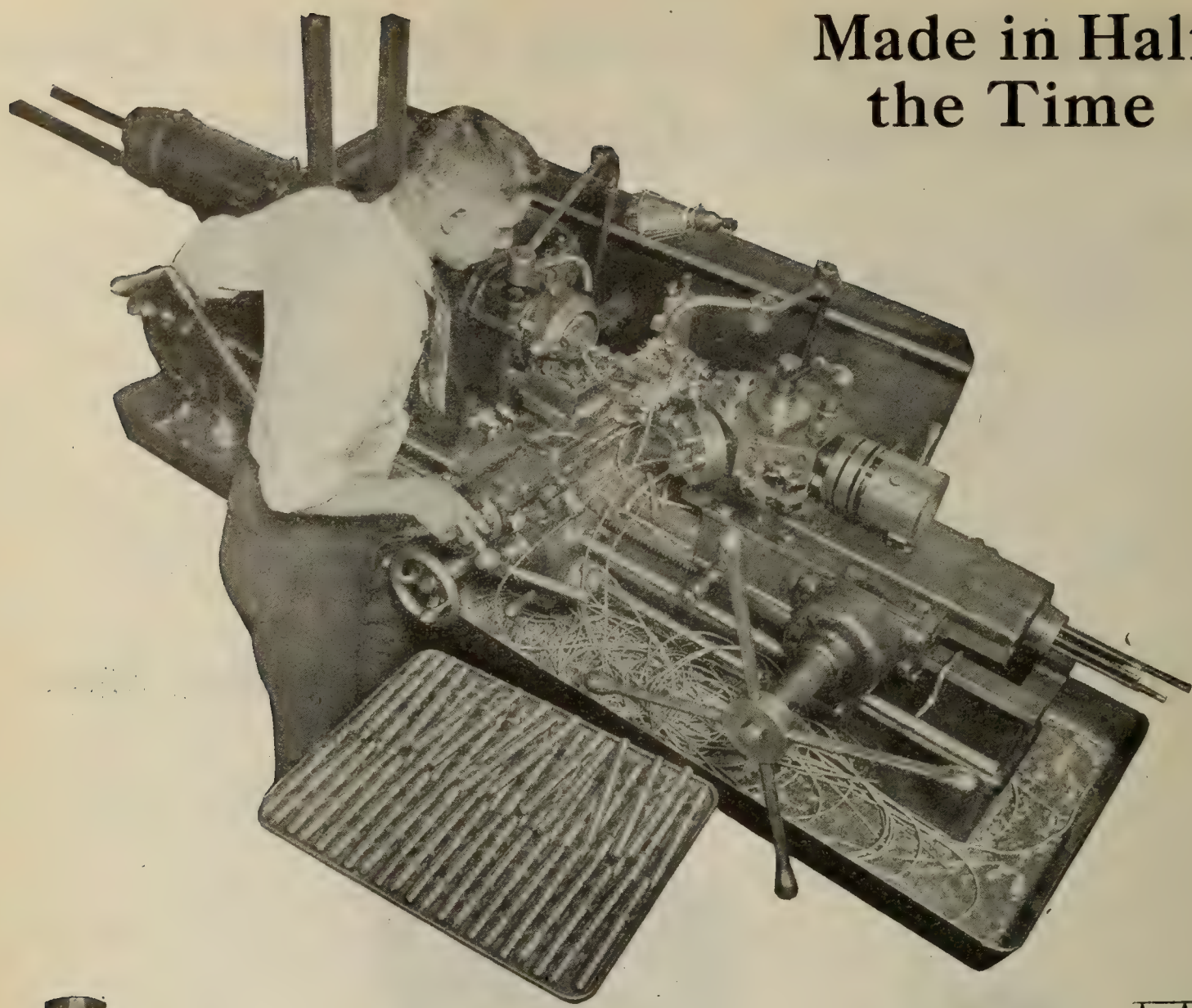


Made in Half the Time



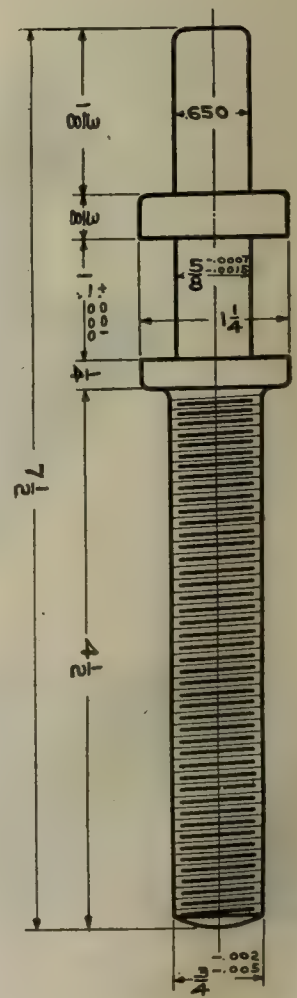
It takes but 5½ minutes—about half the time of the ordinary screw machine—to complete this carbon steel screw on the

No. 4 Universal Turret Screw Machine

Like the Universal Hollow-Hexagon Turret Lathes, this machine takes two cuts at one time, because the carriage has a power operated feed shaft, with eight feeds in either direction, independent of the hexagon turret.

In this example, while the threaded end is being turned and threaded by the hexagon turret, the opposite end is formed and turned by the square turret on the carriage.

Ask us to show how this machine could save time on your work. Send blueprints with rough and finished samples.



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CLEVELAND, OHIO, U.S.A.

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BRASS WORKING MACHINE TOOLS.

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GARLOCK-WALKER MACHINERY CO. LIMITED

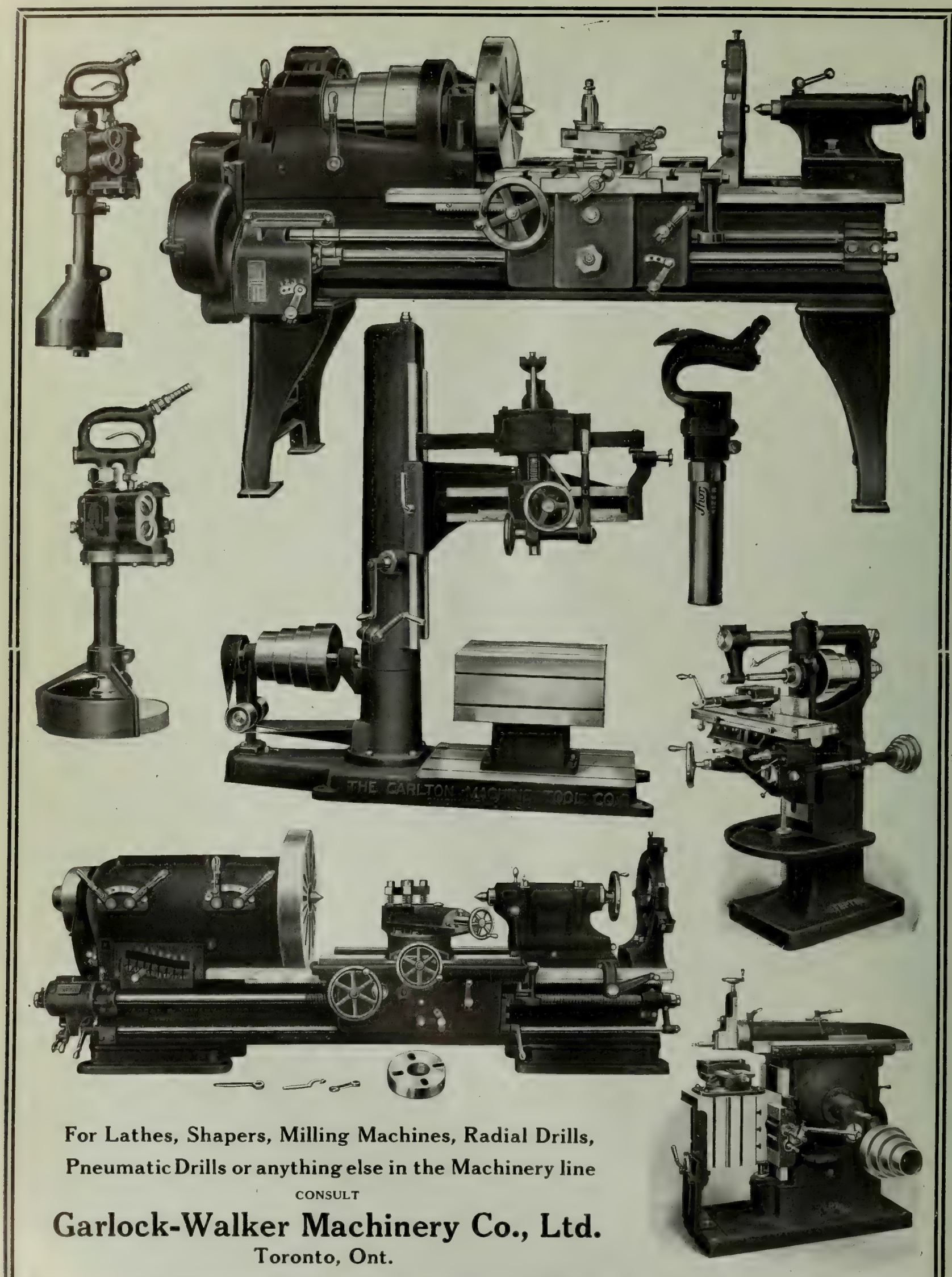
32 FRONT ST. WEST, **TORONTO** TELEPHONE MAIN 5346

Another year is about to pass, and, looking back at what we have accomplished, it behooves us to express our appreciation to those whose courtesies and patronage aided us in our progress.

We are thankful to you for the many favors rendered to us, and extend to you the Season's Compliments, with sincere wishes for a joyous and prosperous New Year.

GARLOCK-WALKER MACHINERY COMPANY, LIMITED

METAL and WOODWORKING MACHINERY of all Kinds



For Lathes, Shapers, Milling Machines, Radial Drills,
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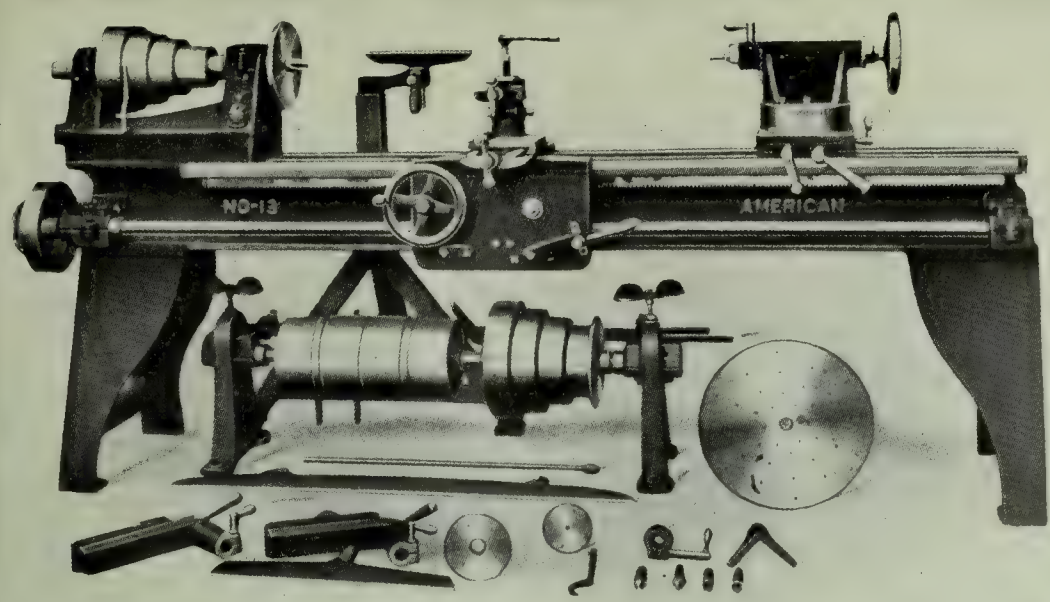
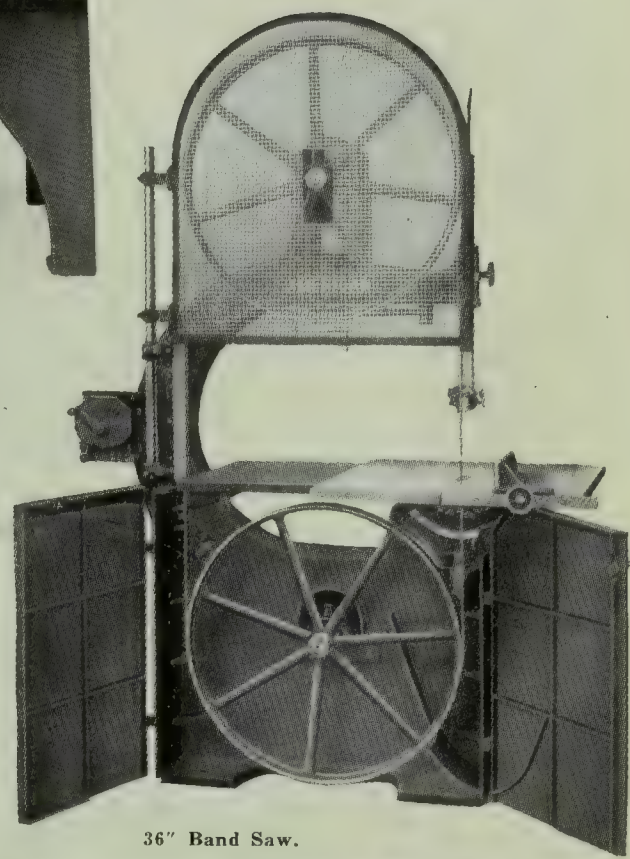
Garlock-Walker Machinery Co., Ltd.

Toronto, Ont.

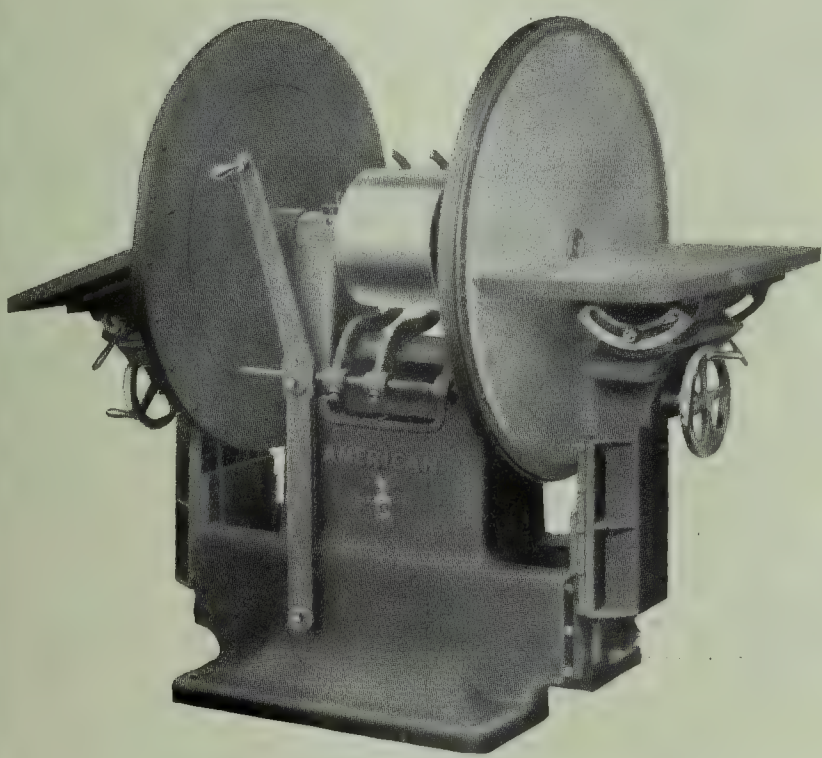
Pattern Shop Equipment



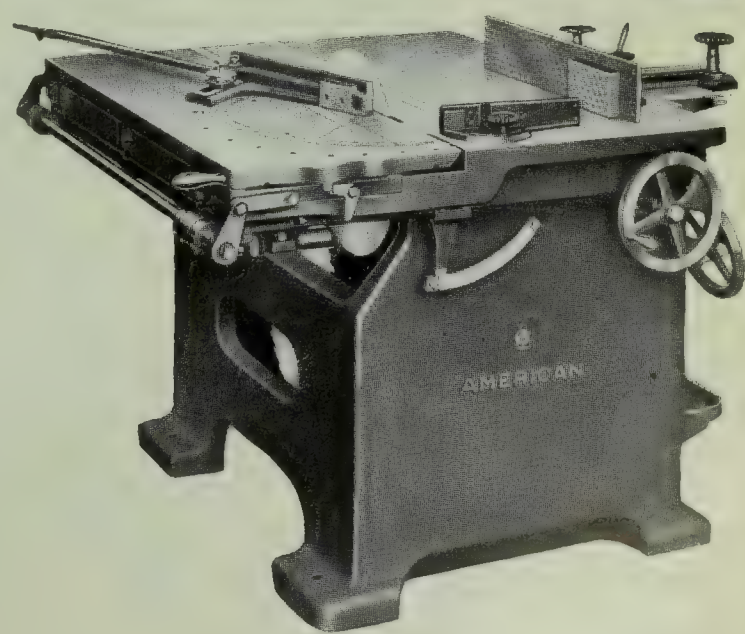
Pattern Makers' Lathe.



36" Band Saw.



Double Disc and Disc and Drum Sander.



Bench Jointer.

Universal Saw Bench

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WOOD-WORKING TOOLS FOR
YOUR PATTERN SHOP.

Our line is complete.

GARLOCK-WALKER MACHINERY CO., LTD., 32 Front St. W., Toronto

TO STEEL SHIPBUILDERS

We can quote on:

Punch and Shears,

Single End
Double End
with angle, notching and coping attachments.

Beam Bending Machines.

Countersinking Machines. Plate Bending Rolls. Plate Edge Planers. Plate Shears. Straightening Rolls. Hydraulic Riveters, etc., etc.

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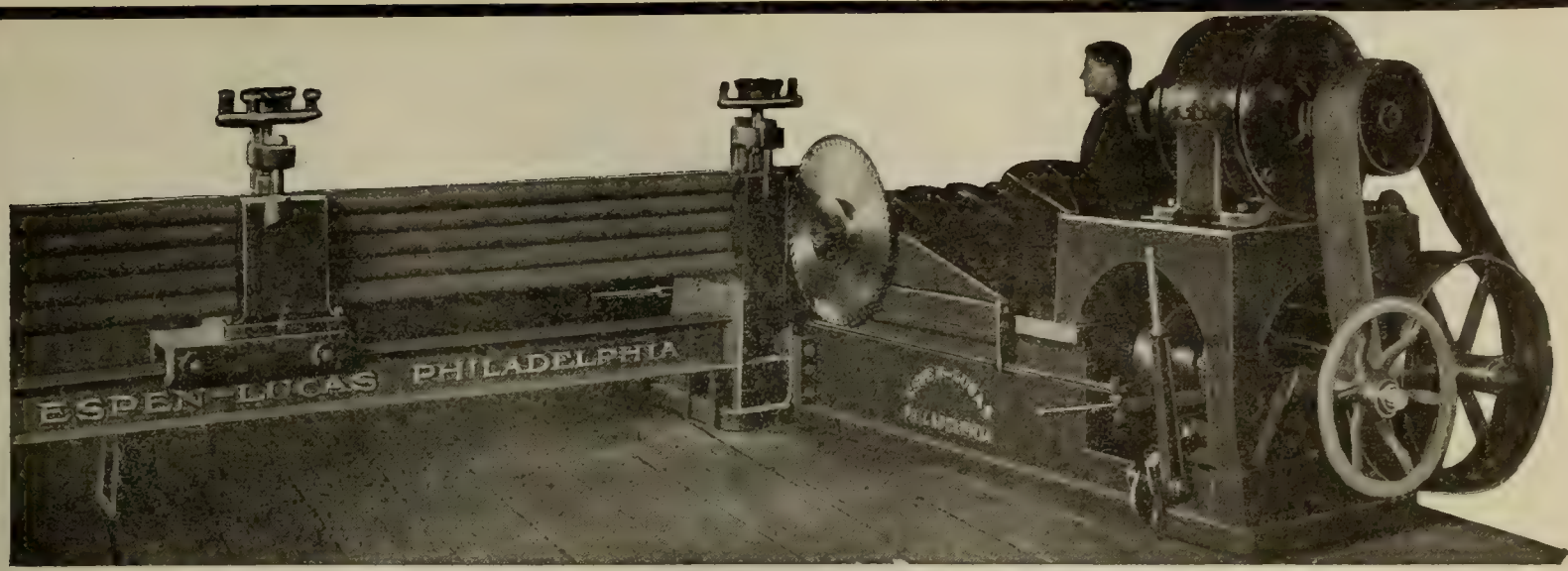
Planers and Matchers. Bevel Ship Band Saws. Timber Sizers. Moulders. Band Resaws. Swing Cut-off Saws. Filing Room Equipment. Mould Loft Equipment. Sash and Door Equipment. Interior Trim Equipment. Machine Shop Tools.

If you need machinery for any purpose, you cannot afford to buy without consulting us. Let us know exactly how we can serve you.

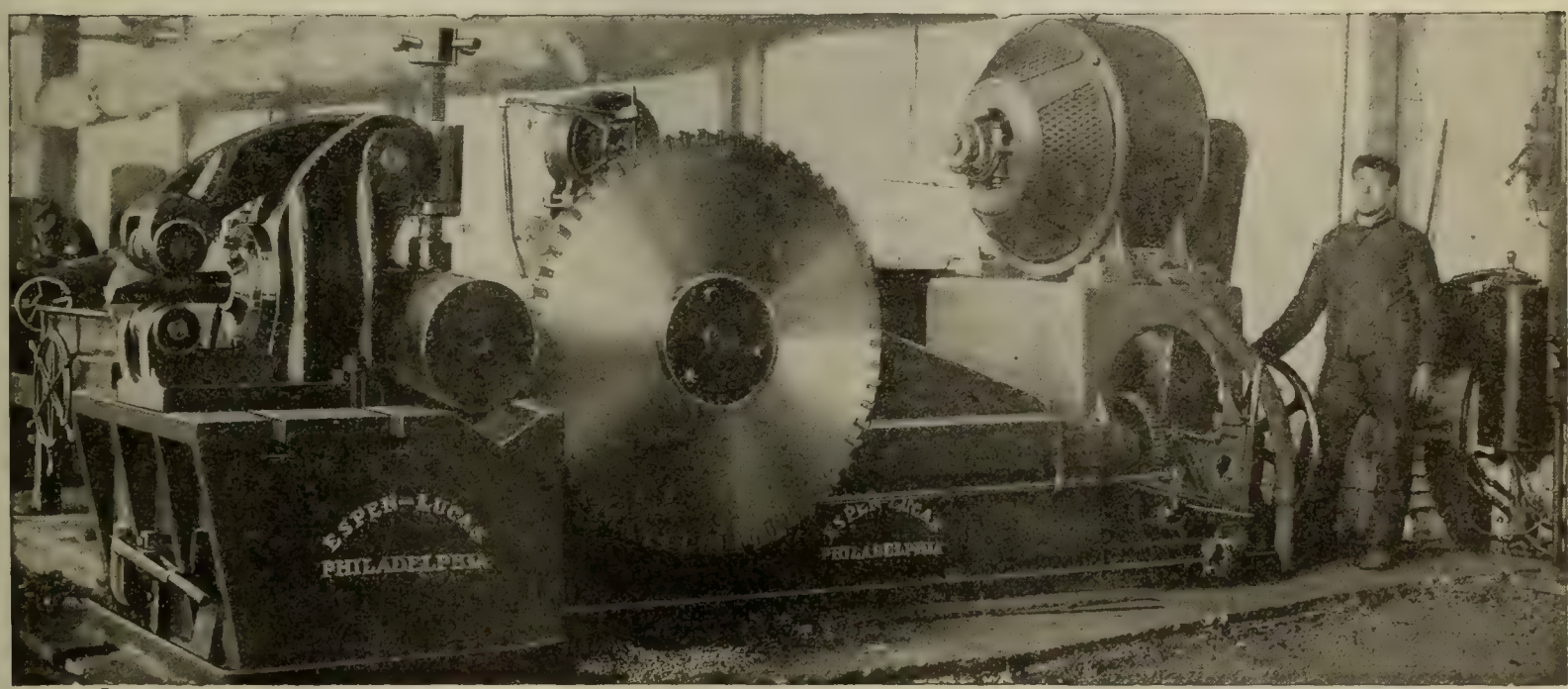
EVERYTHING IN WOODWORKING OR METALWORKING MACHINERY.

Garlock-Walker Machinery Company, Limited

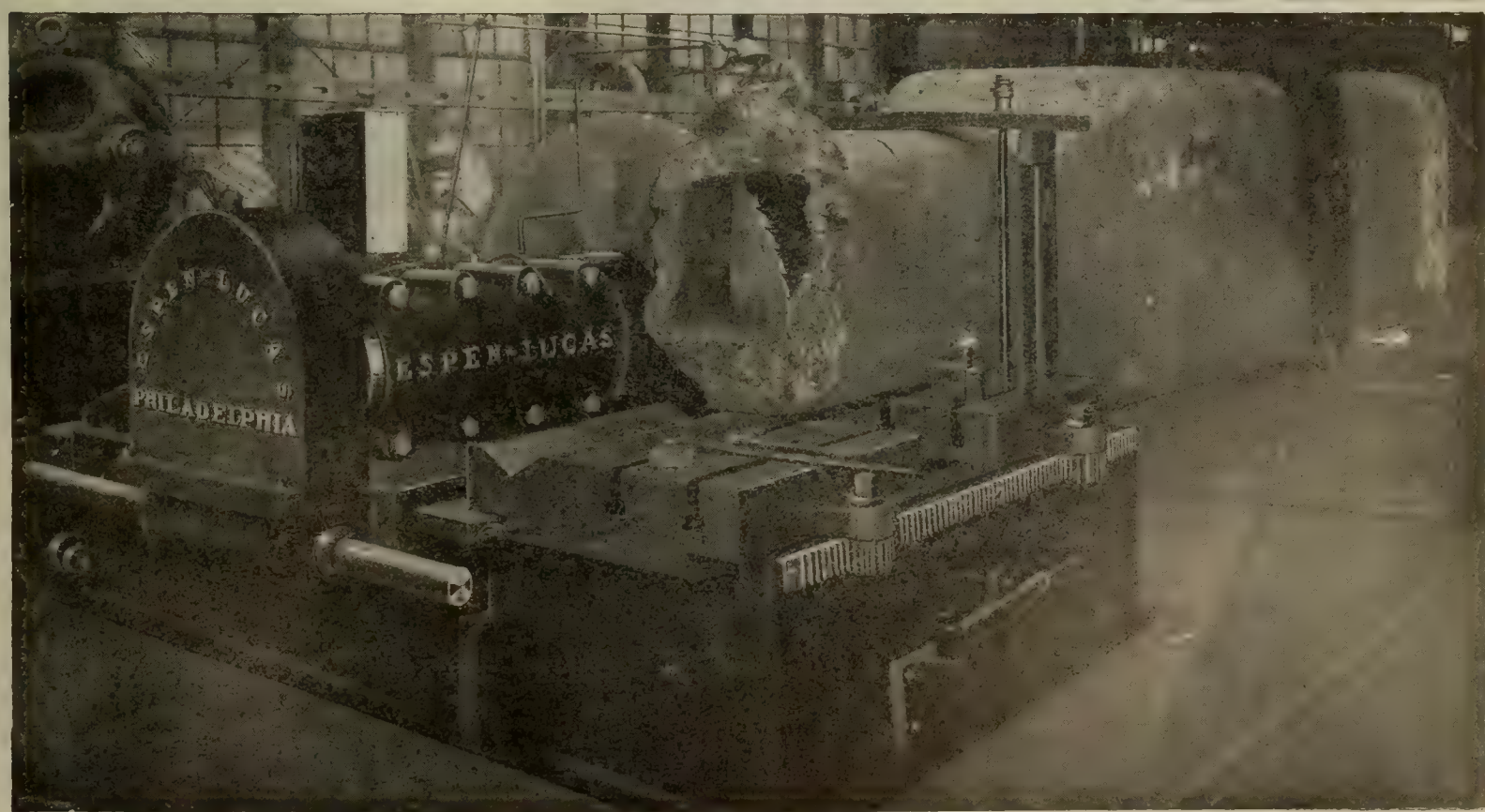
32 FRONT ST. WEST, TORONTO, CANADA



Used by all Large Shrapnel Manufacturers.



Nova Scotia Steel and Coal Co.



Penna. Steel Co.

THE ESPEN-LUCAS MACHINE WORKS, FRONT & GIRARD AVENUE PHILADELPHIA, PENNA., U. S. A.

CANADA FOUNDRIES & FORGINGS LIMITED

Machinists' or Engineers' Hammers (Solid Cast Steel)

Straight Pein. Octagon.

Machinists' Hammers Supplied Complete with Hickory Handles.

Ball Pein. Octagon.

Cross Pein. Octagon.

Blacksmiths' Sledges

No. 37. Cross Pein.

No. 37½. Straight Pein.

Write for prices and particulars of the above and our other patterns of Light and Heavy Hammers.

The Canada Foundries & Forgings, Limited

BROCKVILLE, ONT. JAS. SMART PLANT WINNIPEG, MAN.

CONSIDER its minimum feed of 1 inch per minute cutting the toughest metal of any shape that comes within a 4½ inch circle.

Consider its great maximum feed of 2 inches per minute cutting all ordinary metal stock.

Take into account that its workmanship equals the finest built lathe or miller; that its main gear, pinion bearing and drum bearings run in oil; that the blade is made of chrome manganese, vanadium steel, heat treated and ground.

And you have several reasons why the

Gorton
CUTTING-OFF MACHINE

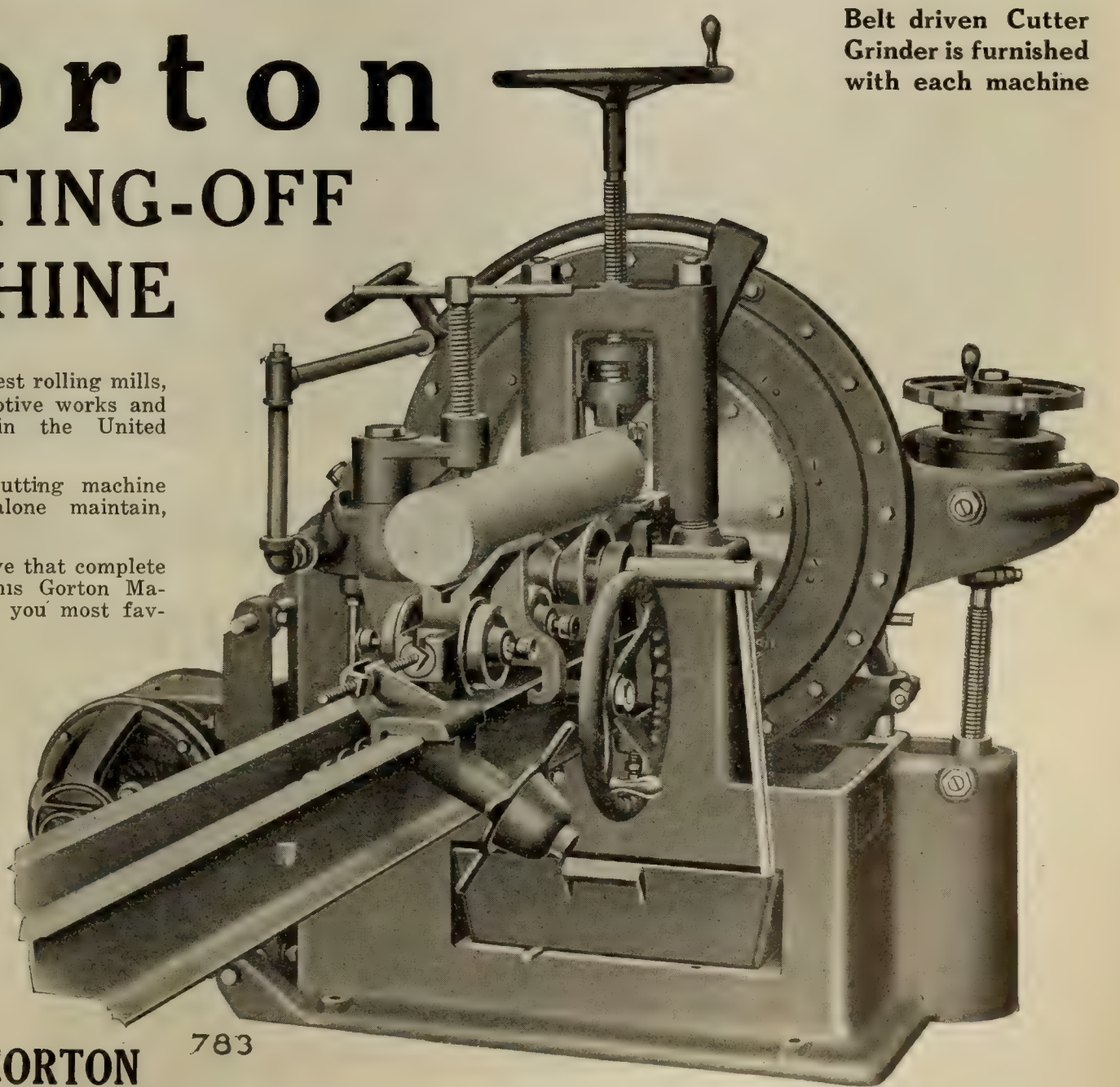
Belt driven Cutter Grinder is furnished with each machine

is used by the largest rolling mills, navy yards, locomotive works and engine builders in the United States.

No other metal cutting machine can attain, let alone maintain, Gorton efficiency.

We earnestly believe that complete specifications of this Gorton Machine will impress you most favorably.

Write



GEORGE GORTON MACHINE CO.

Racine, Wis., U.S.A.

FRONT VIEW OF GORTON No. 2-D HEAVY-DUTY CUTTING-OFF MACHINE

"Racine" High Speed Metal Cutting Machines

The above picture shows a battery of 250 "RACINE" High Speed Metal Cutting Machines doing duty for the Allies, cutting 6" shell stock.

This is only one of many installations in other large plants throughout the world.

The "Racine" has gone "over the top"

Write us for further particulars.

THE RACINE TOOL & MACHINE COMPANY

15 Melbourne Avenue, RACINE, WIS., U.S.A.

Known the World Over

Admitted to be Superior

"Racine" High Speed Metal Cutting Machine

The World's Standard

The "RACINE" is the only speed metal cutting machine that is absolutely positive in every action and will duplicate itself in every cut during the entire life of the machine. All wearing parts are adjustable and accurately machined.

We claim superiority in rapidity and accuracy of cut, simplicity of construction, economical operation, and saving in blade costs.

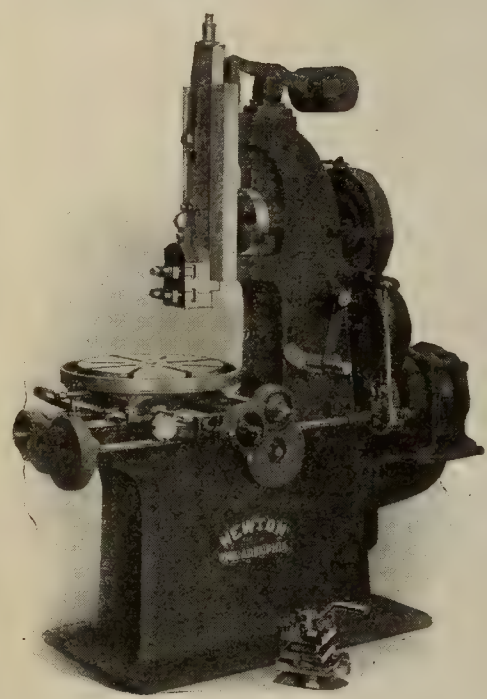
Write us for further particulars.

THE RACINE TOOL & MACHINE COMPANY

15 Melbourne Avenue, RACINE, WIS., U.S.A.

NEWTON MACHINE TOOL WORKS, INCORPORATED

23rd and Vine Streets Philadelphia, U.S.A.

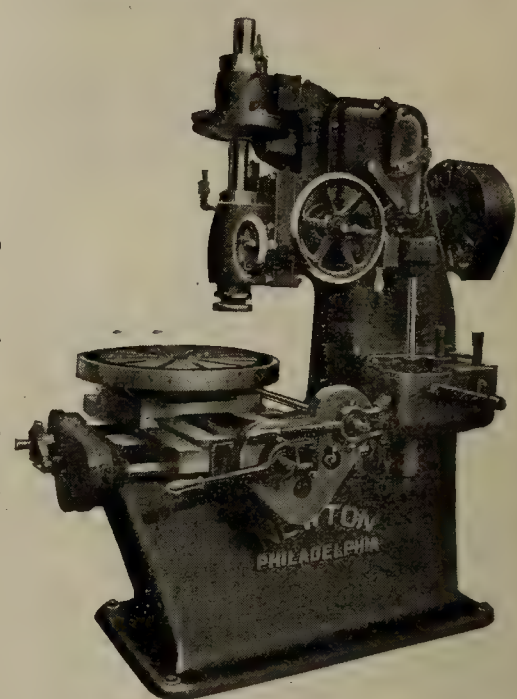


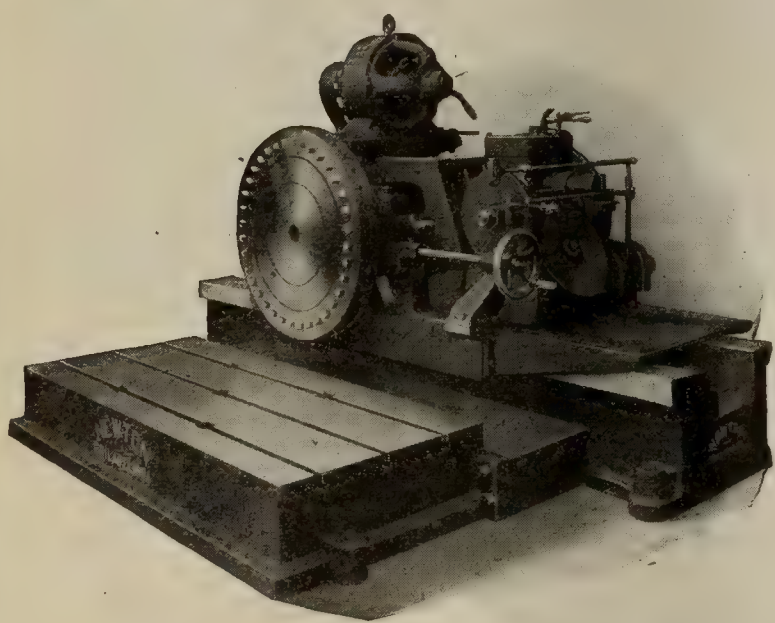
THE NEWTON-SIX—

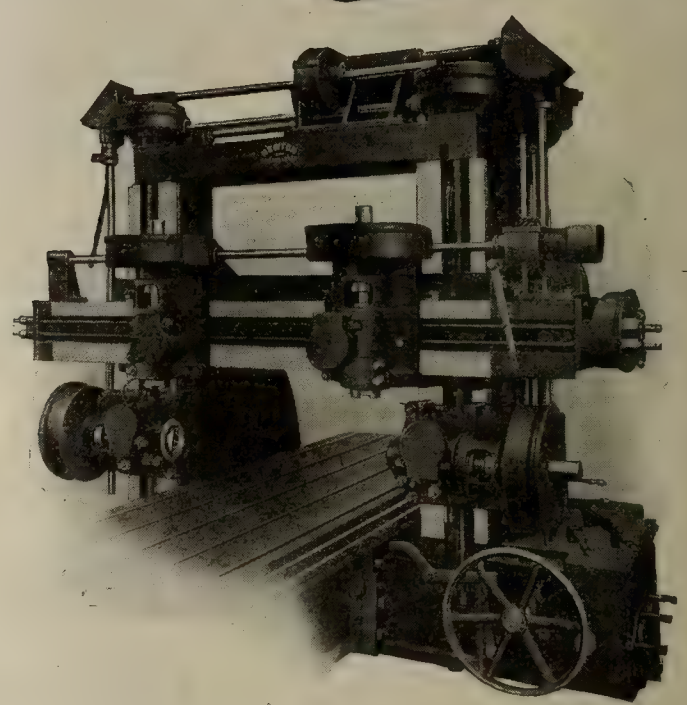
PROMINENT STANDARDS

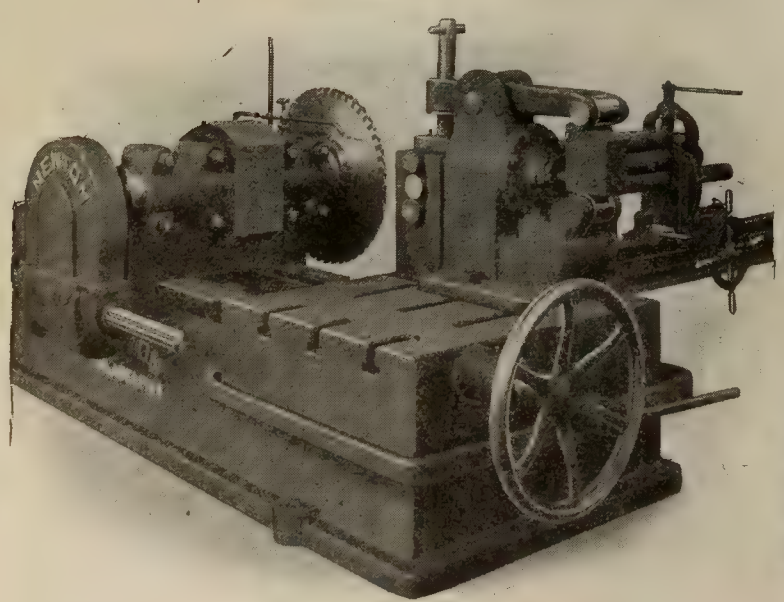
Have proven profitable:— in Ship Yards, Arsenals, Forges, Foundries, Locomotive Bridge Works, Shops and Electrical Works.

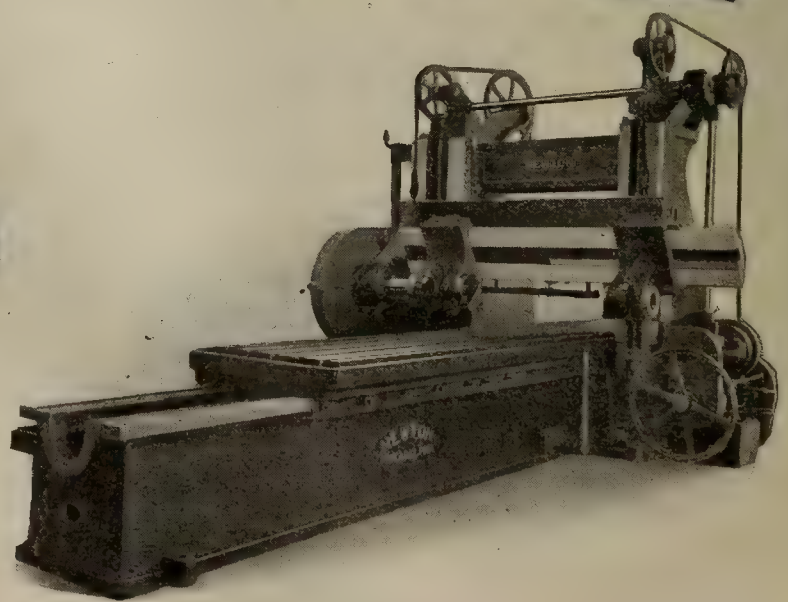
Appropriate catalogues sent on request.











HUNTER

"DUPLEX"

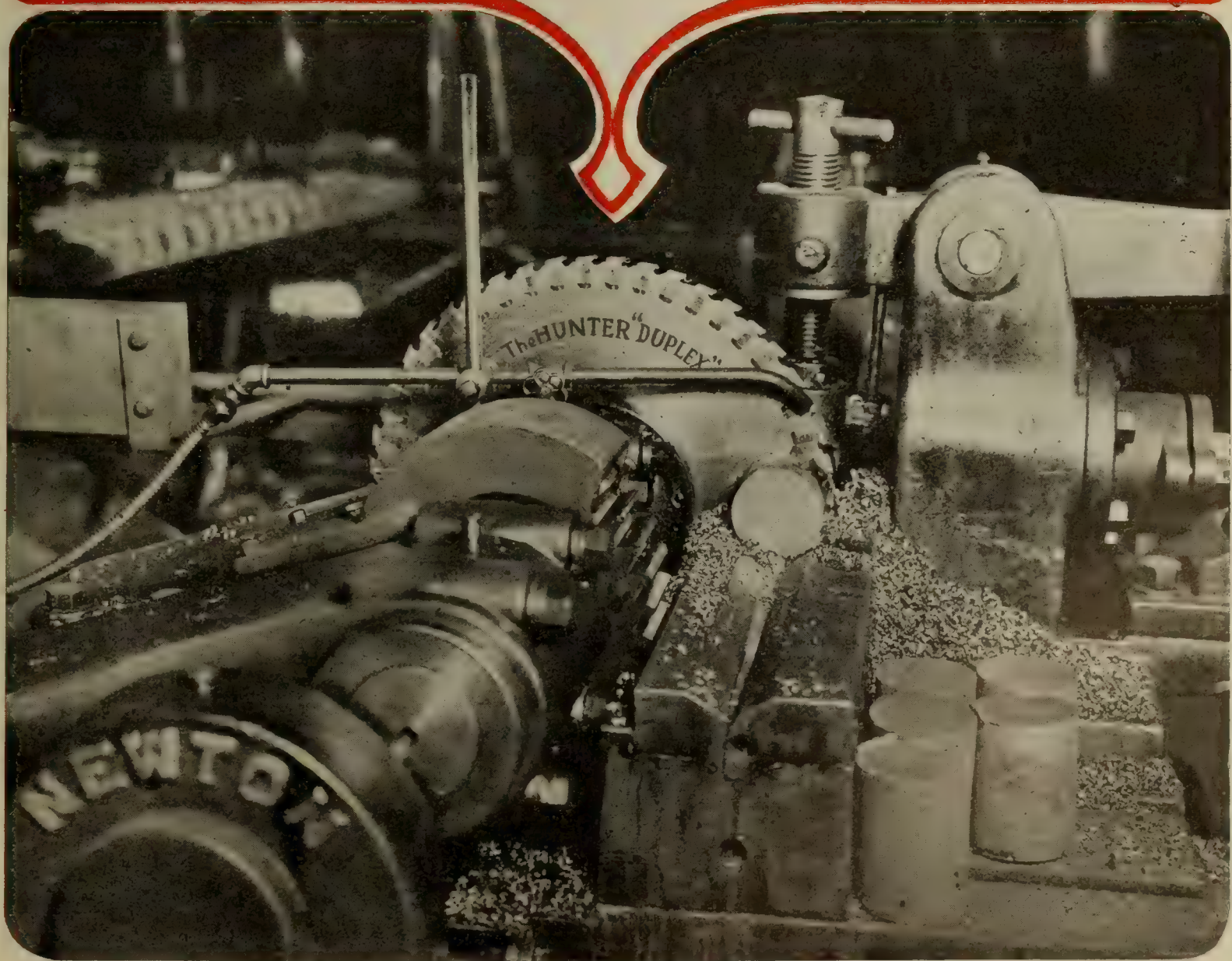
Cutting Billets for 18 pdr. Shrapnel Shells

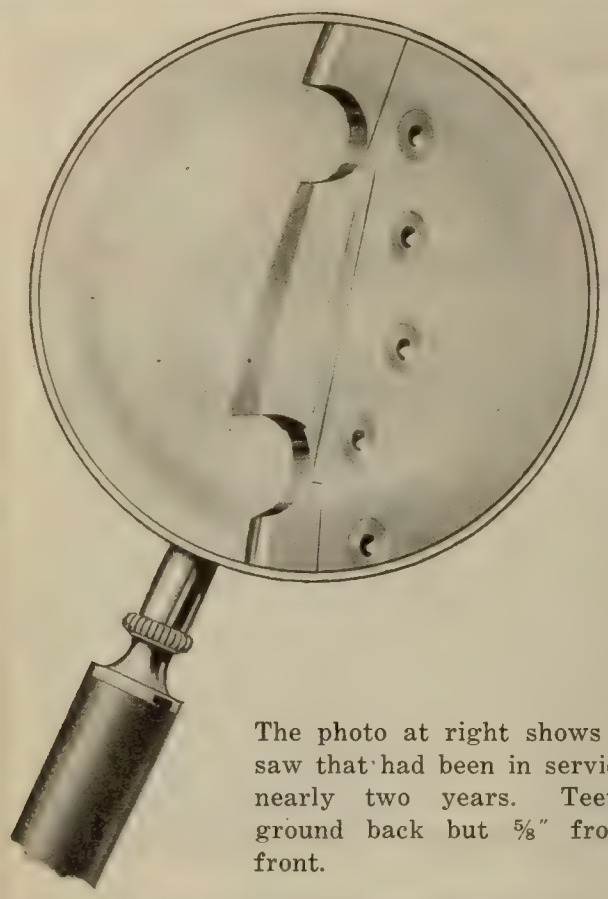
It takes a **good** saw to cut shrapnel stock—week after week—and to cut costs at the same time. Hunter saws are doing it in many plants.

No matter how large and difficult the job or how tough the steel the Hunter "Duplex" will go through it.

This cutting ability is due to the physical structure of the Chrome Vanadium heat treated plate and the positive method of holding the high speed steel inserted teeth.

Hunter Saw and Machine Co., Pittsburg, Penn., U.S.A.





You Need These Thin Fast Cutting Saws

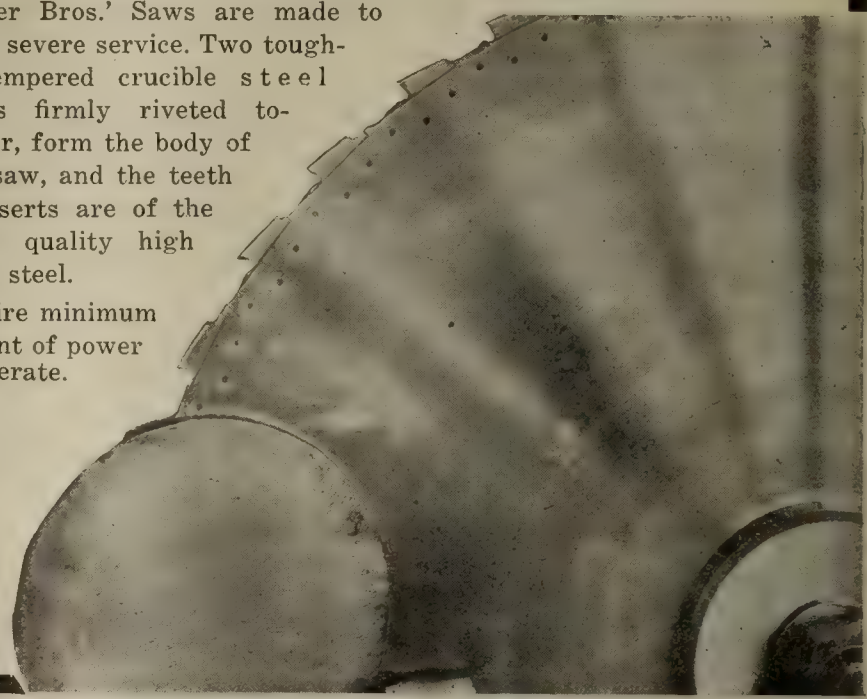
Higher wages for men and higher prices for materials make you keenly on the watch for opportunities to economize in production. Here's one sound and practical way—use HUTHER BROS.' SAWS!

Note the cost-cutting speed, 35 to 55 peripheral feet per minute, feeding against the stock at the rate of ¾″ to 1½″ per minute, according to the nature of the stock and the capacity of the machine.

Huther Bros.' Saws are made to stand severe service. Two toughly tempered crucible steel plates firmly riveted together, form the body of this saw, and the teeth or inserts are of the finest quality high speed steel.

Require minimum amount of power to operate.

The photo at right shows a saw that had been in service nearly two years. Teeth ground back but ⅝″ from front.



Huther Bros. Saw Mfg. Co.
2502 University Ave., Rochester, N. Y.

More and Better Work

That's the news we get from shops which have introduced

BLOUNT'S GRINDING MACHINES

Cut shows machine for wheels 16″ x 2½″ x 1¼″.

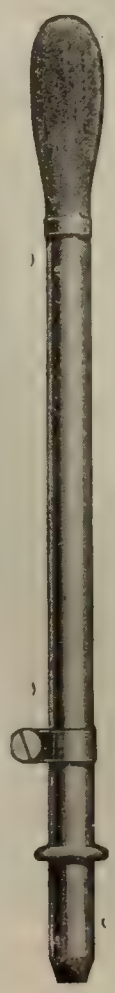
Has self-oiling, line-reamed, babbitted bearings.

Caps milled to lock on to boxes, and parts of uniform dimensions. Spindle made of high-grade steel and bearings and wheel No. 5, with self-oiling guards.

Write for catalog giving complete description of grinders and lathes.

J. G. Blount Co., Everett, Mass.

Grinding Wheel Dressers

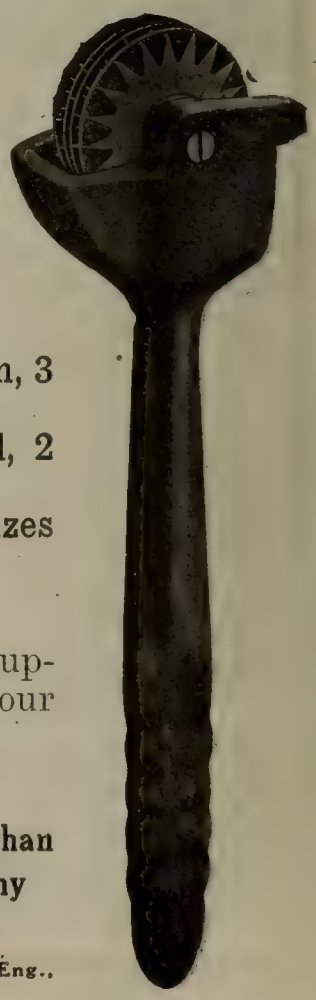


We are specialists in Grinding Wheel Dressers and can recommend the best types for any particular needs.

Our Dressers are:

Diamo-Carbo
Desmond Huntingdon, 3 sizes
Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

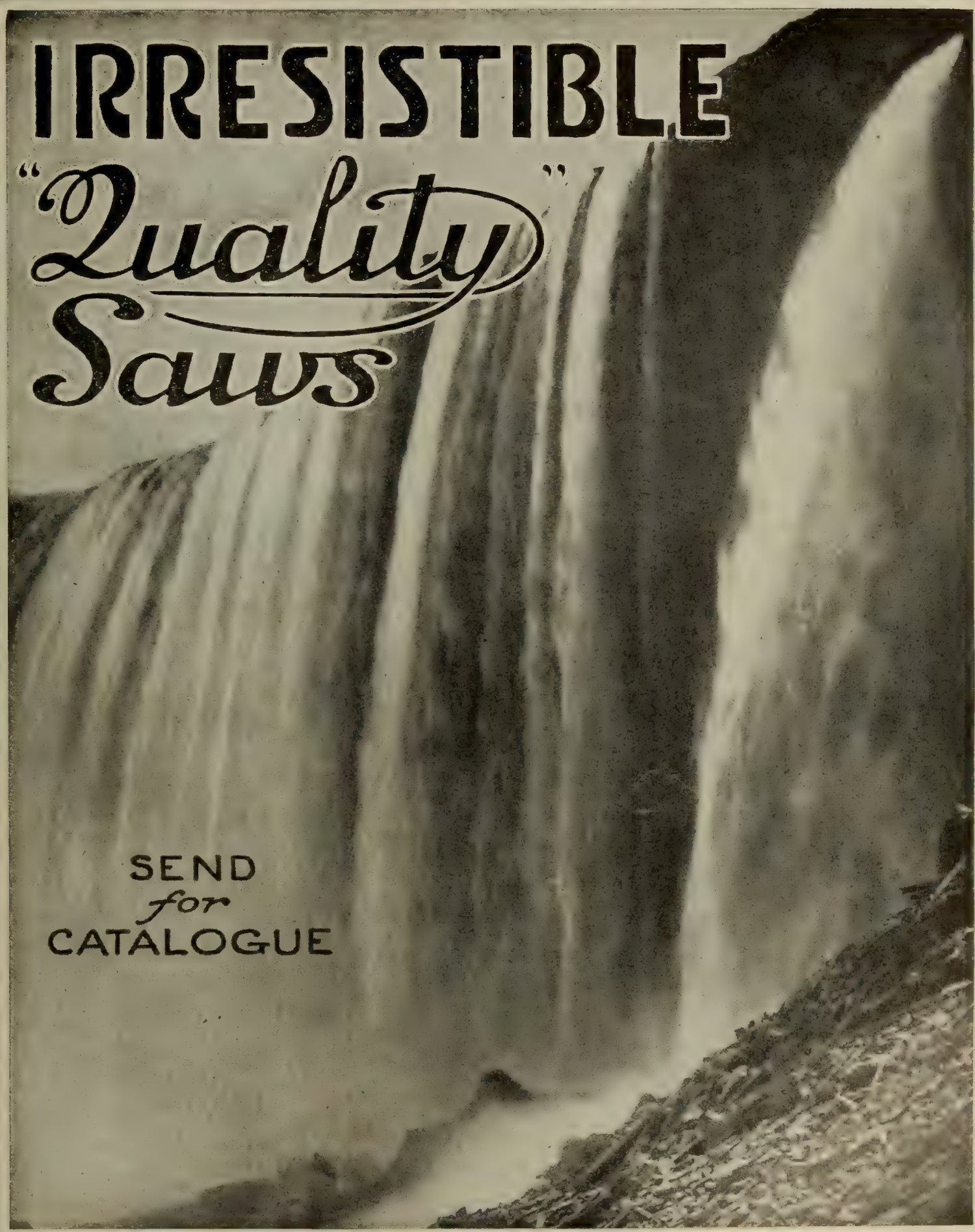
We can promptly supply your needs from our stock.



The Canadian Desmond-Stephan Manufacturing Company
HAMILTON, ONTARIO

Alfred Herbert, Ltd., Coventry, Eng., Agent for Great Britain.

If any advertisement interests you, tear it out now and place with letters to be answered.



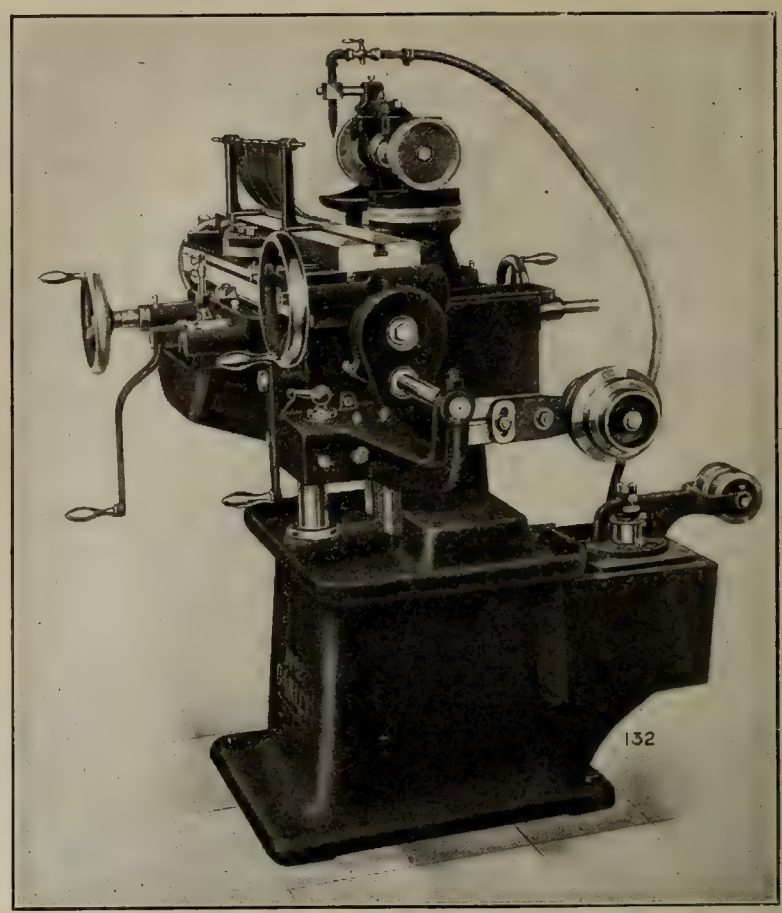
NAPIER SAW WORKS, INC.

SPRINGFIELD, MASS., U.S.A.

Manufacturers of the "QUALITY" BRAND
HACK SAWS BAND SAWS

No. 2 Oakley Universal and Tool Grinder

with Longitudinal Power Feed and Wet Grinding Attachment



Three Table Speeds { 6" per min. / 10½" ,; / 18" ,,

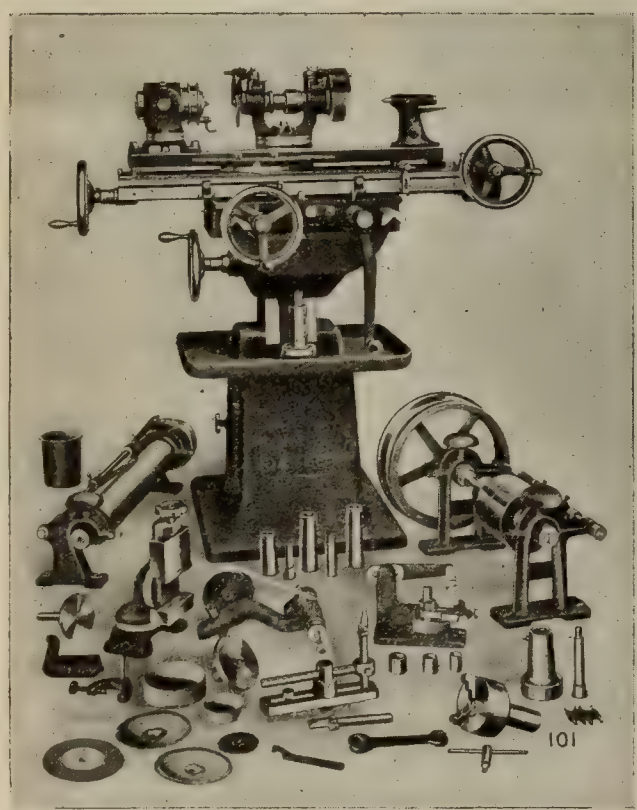
The stop dogs are hinged so that the operator may run the work past the setting to measure both external and internal work.

The machine can be operated by hand by disengaging the clutch.

Furnished with plain or universal equipment.

These machines are exceptionally

Heavy, Rigid and Accurate



No. 2 Oakley Universal Cutter and Tool Grinder.

Range on both machines:

Longitudinal movement	17"
Vertical movement	10½"
Cross movement	9"

Work Centers:

Maximum swing over table	10"
Maximum length	20"
Will swing a cutter at right angles	16"

This machine, within its range, will sharpen rapidly and accurately any style or shape of milling cutter, and when furnished as a universal machine, equipped with attachments for gear cutter, cylindrical internal and surface grinding, it will grind all work that comes to the tool room.

The Oakley Machine Tool Co.

Cincinnati U.S.A.

CANADIAN AGENTS: Williams & Wilson, Montreal. The A. R. Williams Machinery Co. Ltd., of Winnipeg. The A. R. Williams Machinery Co. Ltd., of Vancouver

RICH

FORGED DRILLS

Put them up Against Your Toughest Work!

Just to judge of their merits in a thoroughly practical manner order a few of these *Rich* drills and put them up against the hardest propositions in your shop, then watch the results. Compare the showing they make with any other drills you are using. Do this and you'll get an agreeable surprise.

Their value is in their ability to stand up under exceptional speed or extra tough work. The reason for this is that being forged, this drill is more durable. Burning or binding is unknown. The result is a clean-cut operation.

We make High-Speed Twist Drills, Reamers, Track Bits, Flat Drills, Bonding Drills, Drill Chucks, Reamer Chucks and Rivet Sets.

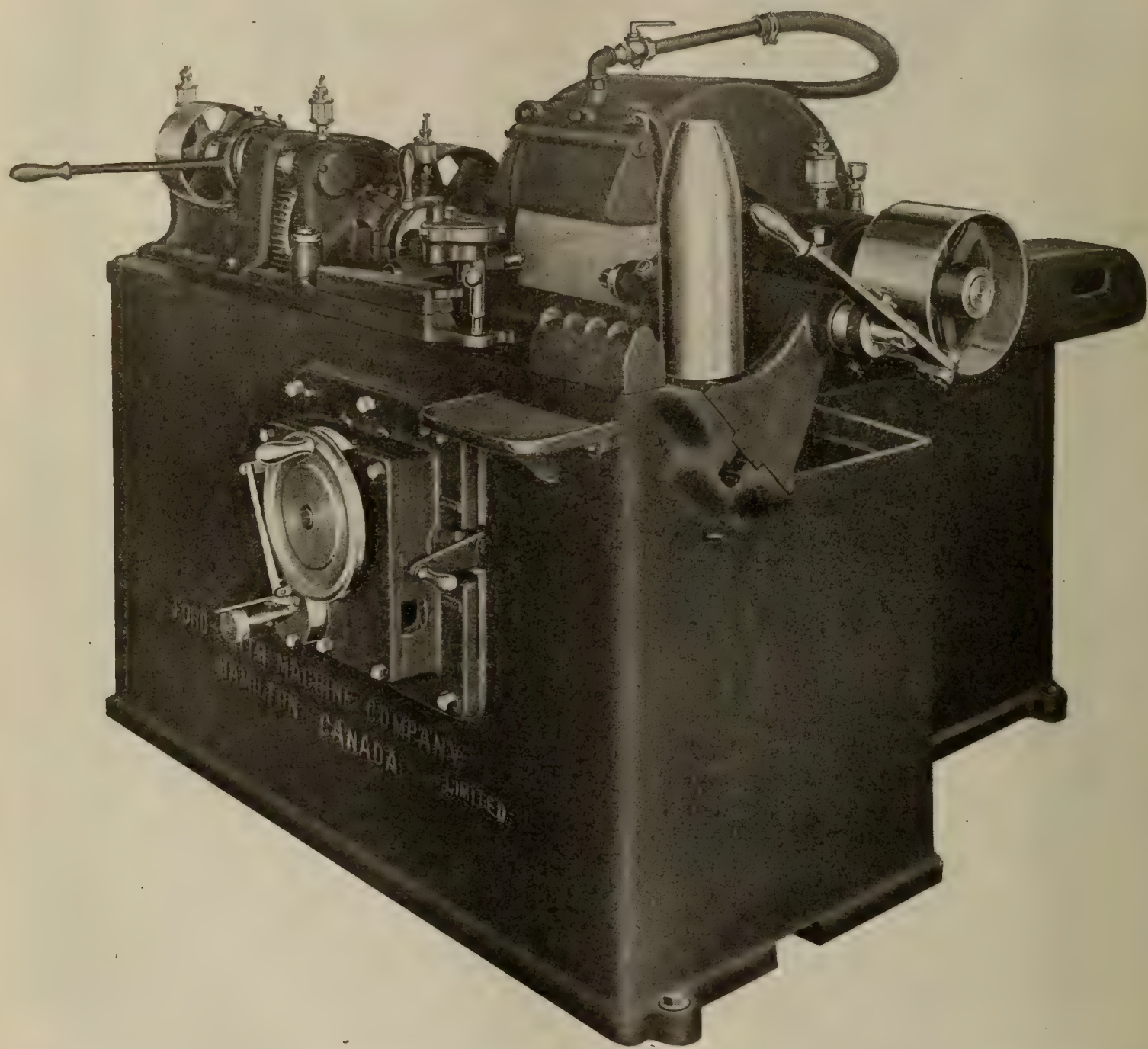
Rich Tools are of the highest standard quality. Write for description of full line.

Standard Machinery & Supplies, Limited, Montreal, Que.

260 St. James Street

Western Representative: Wm. W. Hicks, 567 Banning Street, Winnipeg, Man.

The FORD-SMITH SHELL GRINDER



The Most Powerful Shell Grinder on the Market

Fitted with Air Chuck, etc., as standard equipment. Over 175 of these machines are now in use throughout Canada, United States, Great Britain and Allied Countries, finish-grinding millions of shells. These concerns have found it profitable to use our machines.

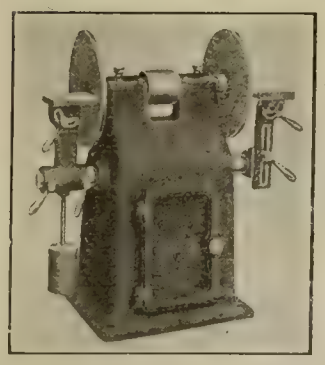
WHY NOT YOU ?

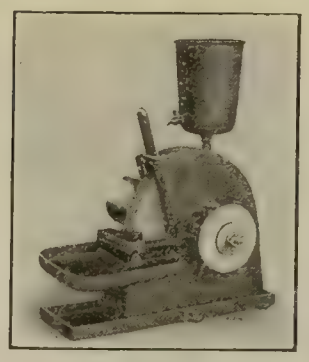
At present we offer interesting deliveries. A card will bring you our Bulletin.

The Ford-Smith Machine Co., Limited

HAMILTON, CANADA

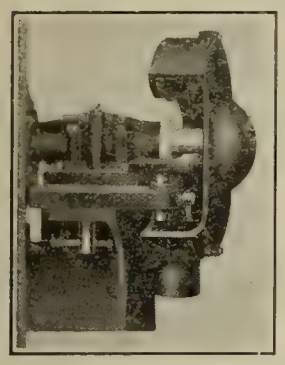
The Ford-Smith Machine Company


Disc Grinders


Bench Water Tool Grinders

Safety Flanges

Water Tool Grinders


Safety Hoods

FORD - SMITH GRINDERS

We do not pretend to manufacture a cheap, unreliable line of Grinders, but will guarantee, that for a reasonable price we can supply a grinder that is a First Class Machine Tool.

The QUALITY in our Grinders goes clean through

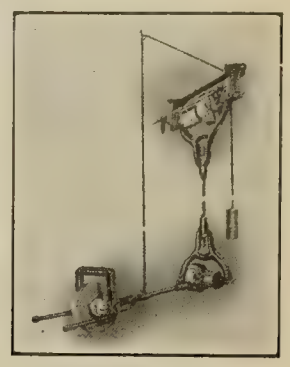
Any special grinder work will always receive our best and careful attention, as we often make special operation Grinders to suit our customers' requirements.

Our Complete Catalogue is well worth procuring. A post card or letter will bring it promptly.

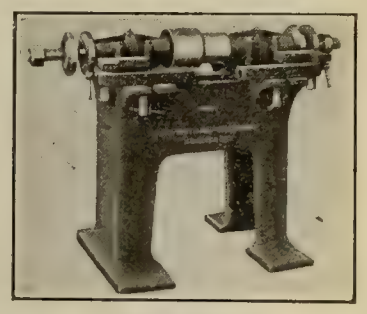
We should like to serve you.

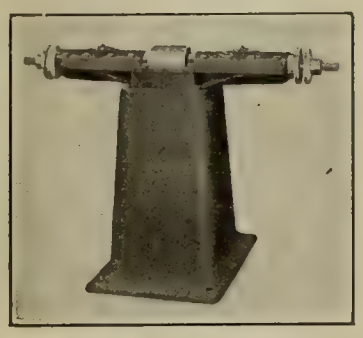
The Ford-Smith Machine Company, Limited

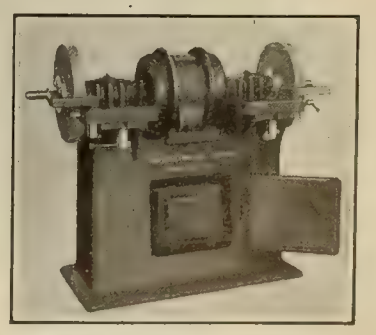
HAMILTON CANADA


Swing Grinders

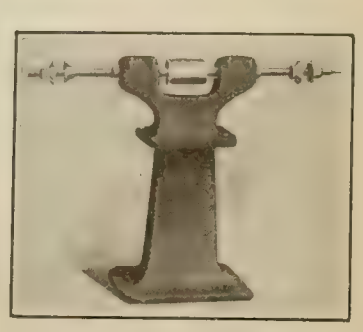
Light Type Grinders


Floor Grinders


Heavy Type Polishers

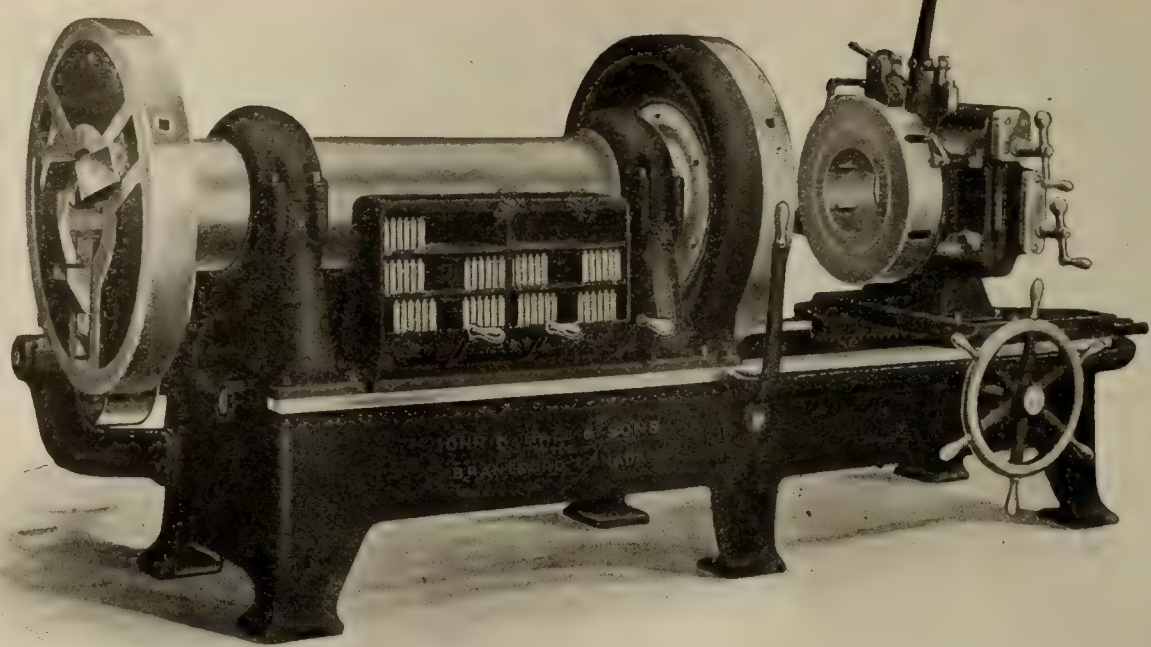

Motor Driven Grinders

Plow Grinders


Light Type Polishers

A Proven Success

No. 8



Hall Duplex Improved Pipe Machine

Hall Shell Cut-off Machines Never fail

Write for prices

Prompt delivery

No. 6

For 4.5, 5 or 6" Shells or bar stock

John H. Hall & Sons, Limited

BRANTFORD, CANADA

DOMINION

Newly Equipped for Rapid, Efficient Production

Dominion Grinding Wheels

Illustrating the new plant equipped with the most modern appliances where those superior abrasive grinding wheels, "Exolite" and "Carbolox," are manufactured. Located at Mimico, Ontario (Suburb of Toronto).

Exolite

(Aluminum oxide.) This name specifies a specially treated grinding wheel that has no rival for general grinding tool room and precision work.

Carbolox

(Carbide of Silicon.) For grinding materials of low tensile strength, such as cast iron, chilled iron, brass, marble and granite.

Dominion Abrasive Wheel Co., Ltd.

Mimico Ontario Canada

CANADIAN HART WHEELS

"MADE IN CANADA"

"REXITE"

Rexite Wheels are free and cool-cutting. These electric furnace products have no superior for grinding all kinds of steel materials of high tensile strength.

Rexite Wheels are being used with great success in grinding Shrapnel and High Explosive Shells. They are produced from Bauxite, which mineral is the purest form of Alumina found in Nature. Analysis shows about 96% Alumina.

"GRESOLITE"

In our Gresolite Wheels you'll find abrasives which will strike you as remarkably hard and long-lived.

Gresolite is a carbide of Silicon in crystalline form. Our experience of many years tells us that in this product we have something superior to anything else made for the purpose for which it is intended.

Used for grinding Gray Iron Castings, Chilled Iron, Brass, Marble, Granite Pearl and all materials of low tensile strength.

Canadian Hart Wheels cut faster and longer than any other grinding wheels. They save time and money.

Put your grinding wheel problems up to us. You can have the benefit of our thirty-six years' experience for the asking.

Canadian Hart Wheels, Limited

Manufacturers of Grinding Wheels and Machinery

Hamilton **Canada**

Blanchard High Power Vertical Surface Grinder

A massive, powerful, accurate tool for finishing flat surfaces on castings, forgings and stampings, either hard or soft, rough or machined.

Holds magnetically all flat iron or steel pieces, including rough castings, on Blanchard One Piece Steel Magnetic Chuck. Irregular pieces can be magnetically chucked with simple and cheap fixtures.

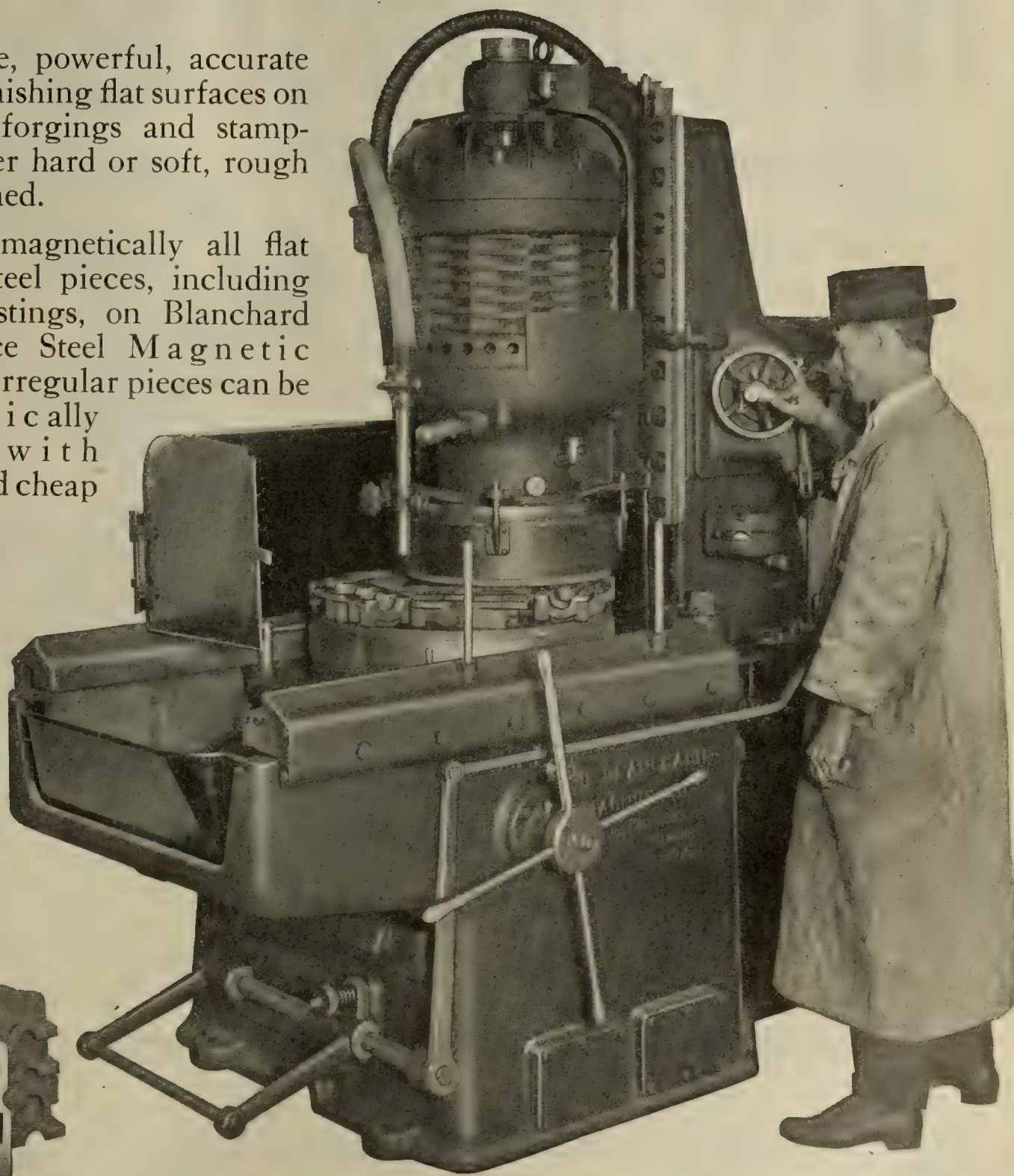


Illustration shows our Direct Motor Drive Type of BLANCHARD GRINDER at work on cast iron bearing caps 10″ x 5″, 1/8″ metal to remove, ground two sides each, *25 caps per hour*. The surface is required to make an oil-tight joint.

Send blue prints or samples of your work for estimates. Catalog on request.

THE BLANCHARD MACHINE COMPANY

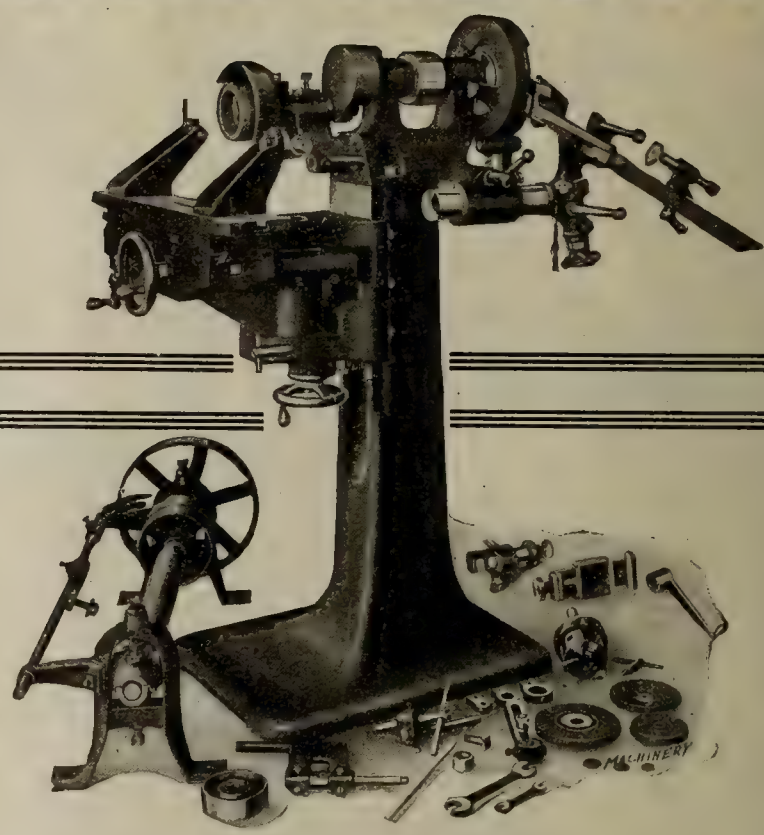
CAMBRIDGE, MASS., U.S.A.

Represented in Canada by: **Williams & Wilson, Limited, Montreal; A. R. Williams Machinery Co., Limited, Toronto, Winnipeg, Vancouver**

UNIVERSAL SERVICE IN YOUR TOOL ROOM

Grand Rapids Grinder No. 2

Most serviceable Grinding Machine at any price—yet the price is very moderate.



This Grand Rapids No. 2 gets closer to the literal meaning of *Universal* than other tools of its kind.

Your milling cutters, your reamers, your gauges and all like tools are easy propositions for the Grand Rapids No. 2. It grinds every shape any other machine will grind, and two, three or four-lip drills, countersinks, etc., too. And it does each and every job *efficiently*.

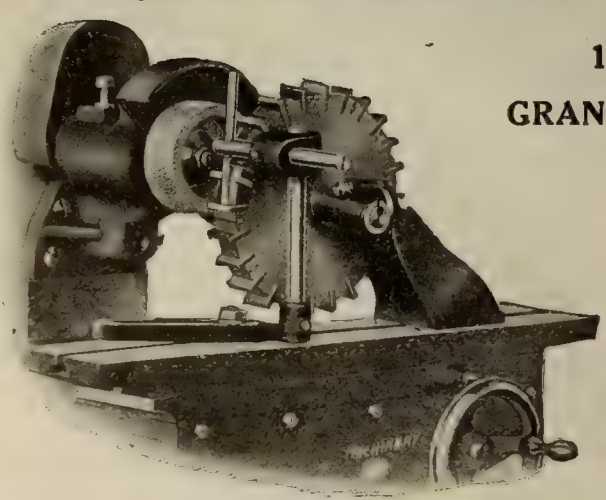
The secret of this machine's superiority is found in its unique, but simple construction. Simplicity of construction tells the *why* of its moderate price. Yet its construction is high-grade. Has genuine crucible steel spindles, ground and running in ring oiled bronze bearings, and many other features worthy of your investigation in these days of greater production.

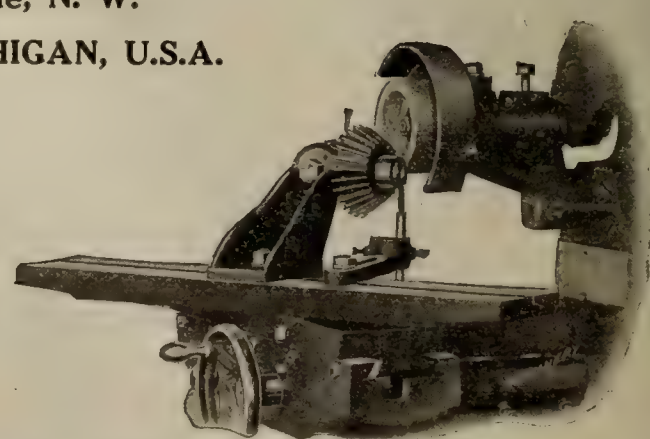
WRITE FOR THE FULL STORY OF GRAND RAPIDS NO. 2 GRINDER.

GRAND RAPIDS GRINDING MACHINE CO.

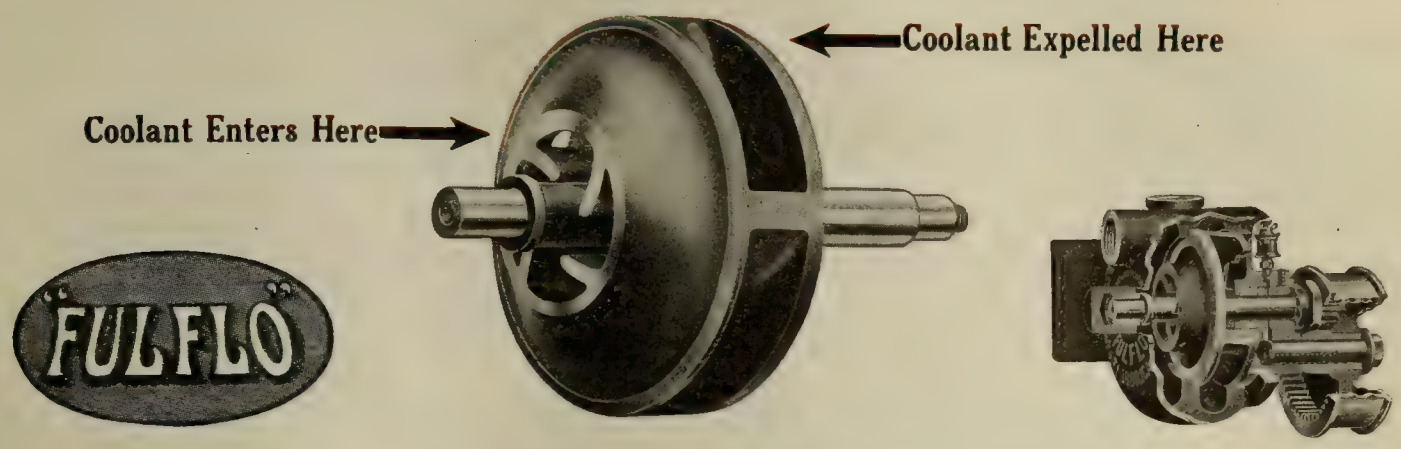
18 Ottawa Avenue, N. W.

GRAND RAPIDS, MICHIGAN, U.S.A.





A Force for Greater Production



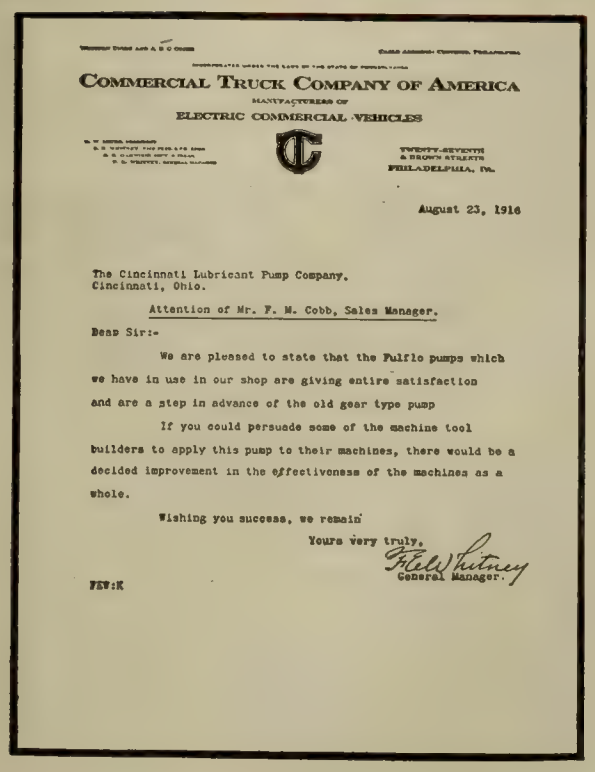
This is the Impellor of the "Fulflo" Lubricant Pump

The impellor shown above is the only pumping part of the "FULFLO" Pump. Note its simplicity, no gears or other parts grinding one against the other. It does not contact with any other part as you will see in the cut-out view of pump. Therefore, there can never be any impairment of its pumping action through wear. This construction also positively precludes clogging and insures large, continuous volume.

Summarized briefly—the "FULFLO" lubricant pump *does* have the following features without which a lubricant pump is not all that it should be.

First—Has long pumping life.
Second—Is Non-clogging.
Third—Delivers large, continuous volume.
Fourth—Cannot lose its prime.

The lubricant pump you buy should contain these very essential features and we believe you will agree with us that we have shown you conclusively that the "FULFLO" does possess them. Check up our claims and the proof offered.



COMMERCIAL TRUCK COMPANY OF AMERICA
MANUFACTURERS OF
ELECTRIC COMMERCIAL VEHICLES

TWENTY-SEVENTH & BROWN STREETS
PHILADELPHIA, PA.

August 23, 1916

The Cincinnati Lubricant Pump Company,
Cincinnati, Ohio.

Attention of Mr. F. M. Cobb, Sales Manager.

Dear Sir:-

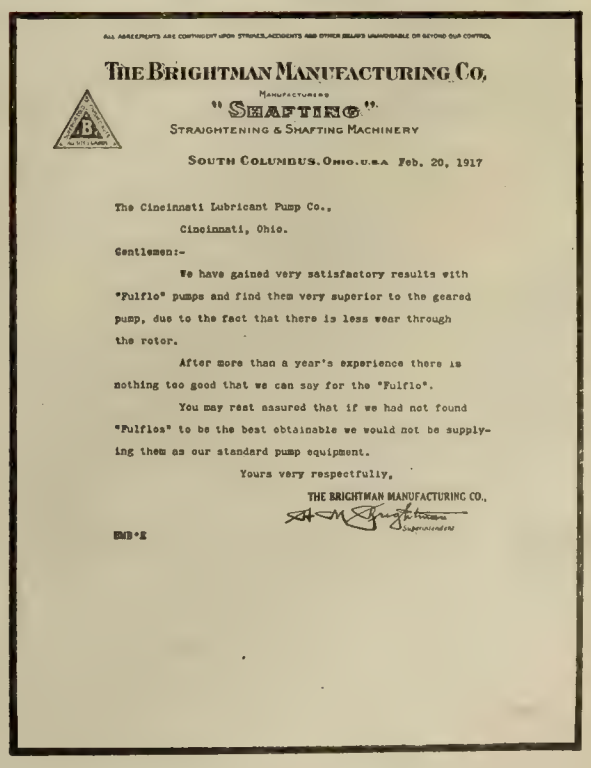
We are pleased to state that the Fulflo pumps which we have in use in our shop are giving entire satisfaction and are a step in advance of the old gear type pump

If you could persuade some of the machine tool builders to apply this pump to their machines, there would be a decided improvement in the effectiveness of the machines as a whole.

Wishing you success, we remain

Yours very truly,
Fred Whitney
General Manager.

FEW:K



THE BRIGHTMAN MANUFACTURING CO.
MANUFACTURERS
"SHAFTING"
STRAIGHTENING & SHAFTING MACHINERY

SOUTH COLUMBUS, OHIO, U.S.A. Feb. 20, 1917

The Cincinnati Lubricant Pump Co.,
Cincinnati, Ohio.

Gentlemen:-

We have gained very satisfactory results with "Fulflo" pumps and find them very superior to the geared pump, due to the fact that there is less wear through the rotor.

After more than a year's experience there is nothing too good that we can say for the "Fulflo".

You may rest assured that if we had not found "Fulflos" to be the best obtainable we would not be supplying them as our standard pump equipment.

Yours very respectfully,
THE BRIGHTMAN MANUFACTURING CO.,
Superintendent

EMB:E

THE FULFLO PUMP CO., Cincinnati, Ohio

Sales Offices: Mercantile Library Building

FOREIGN AGENTS: ALFRED HERBERT, Ltd., exclusive agents for England, France, Japan and Northern Africa. DE FRIE & CO., Milan, Italy. BEVAN, EDWARDS, PROPTY Limited, Melbourne, and Sydney, Australia.

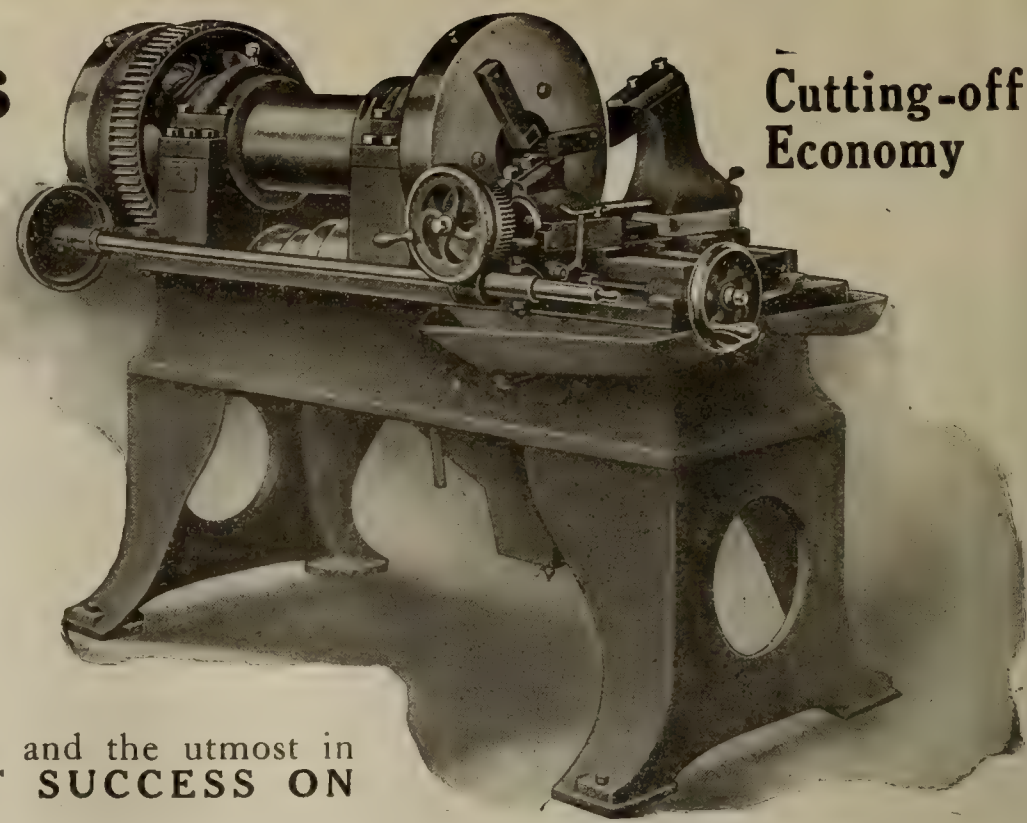
Two Cuts

Simultaneously

One up, the other down. This is what makes the **Hurlbut-Rogers Cutting-Off and Centering Machine** virtually double the output and reduce the cost per piece about one-half.

The Hurlbut-Rogers Machine gives you capacity of two machines at the expense and in the floor space of one machine.

We build them for hard work and the utmost in accuracy—and their **GREAT SUCCESS ON SHELLS** shows it.



Cutting-off Economy

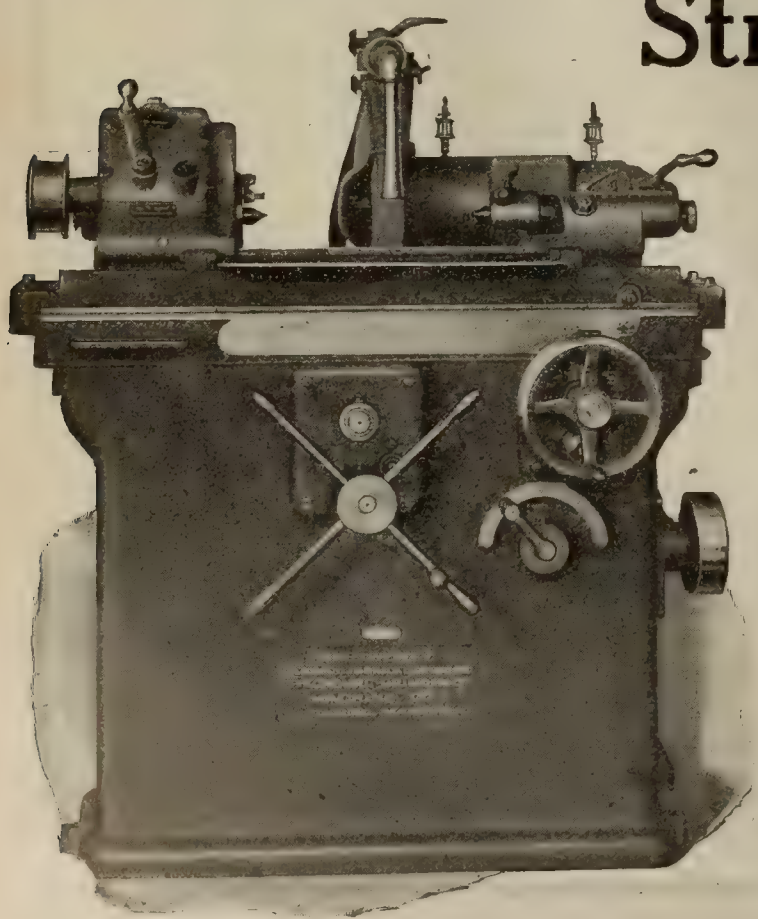
5-inch Cone-Driven Machine

Let us go into details.

HURLBUT-ROGERS MACHINERY CO., South Sudbury, Mass.

FOREIGN AGENTS—England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow and Newcastle-on-Tyne. H. W. PETRIE, TORONTO, CANADA.

Specially Adapted for Grinding Straight or Tapered Shafts



The Fitchburg Grinder illustrated weighs about 4,100 pounds and occupies 52″ x 66″ floor space. In design it is conveniently compact; in build, uncommonly strong. It will save you price cost in the first place and repair cost later on. Occupies much less floor space, and, at the same time, does all the various grinding work with equal if not greater speed than machines of much larger capacity. **Write for interesting facts and Catalogue.**

Fitchburg Grinding Machine Co.

FITCHBURG, MASS., U.S.A.

We are not Playing Checkers

Every man-jack of us at the Carborundum plant is working like the proverbial beaver, for never before has there been such a demand for Carborundum and Aloxite Products.

We are doing our level best to meet this big demand—enlarging our plants, increasing our forces, speeding up production—we are even building a big 20,000 horse power furnace plant in Canada in our efforts to keep up with things. We have a definite service to perform for we are helping to produce the necessities of war.

Carborundum and Aloxite Products are Doing Their Bit

They are grinding shrapnel shells, high-explosive shells, rifle barrels and parts—grinding bayonets and sabers. They are grinding a hundred and one different parts of the aeroplane and the auto truck, the machine gun and the field gun. They are shaping armor plate and grinding car wheels; grinding plowshares, and the tools of the metal-working trades of the world. They are grinding torpedo tubes and torpedoes, grinding submarine engine bases; beveling the lenses of periscopes and buffing the soles of the army shoes and grinding the shears for the pocket kits of the "Sammies." They are doing a thousand and one war tasks quicker and better than they have ever been done before.

Carborundum and Aloxite products are surely doing their bit, but with it all we haven't neglected for one instant our regular patrons—we are doing all in our power to keep up with the pace; to keep up to the standards of Carborundum service.

THE CARBORUNDUM COMPANY

NIAGARA FALLS, N. Y.

NEW YORK CHICAGO BOSTON PHILADELPHIA CLEVELAND CINCINNATI MILWAUKEE PITTSBURGH GRAND RAPIDS

INEFFICIENCY MUST GO

There's every reason now why inefficiency must go—time is precious to the human race, every manufacturing minute counts—and time costs money. If a piece is to be sawed, the mechanic's time must be conserved as far as is possible and wasted metal and scrapped pieces must be reduced to the lowest figure.

This calls for quick, labor-saving cutting.

Now, if a new, sharp saw is put into a frame or machine, it will not necessarily do efficient cutting—it may clog, dull or snap because not suited to the shape or kind of metal. These mishaps may be the result of selecting a saw with teeth too small or too large; the teeth may have too little or too much set; or the saw may be too soft or too hard.

Begin the selection by thinking of the

Starrett Hack Saws

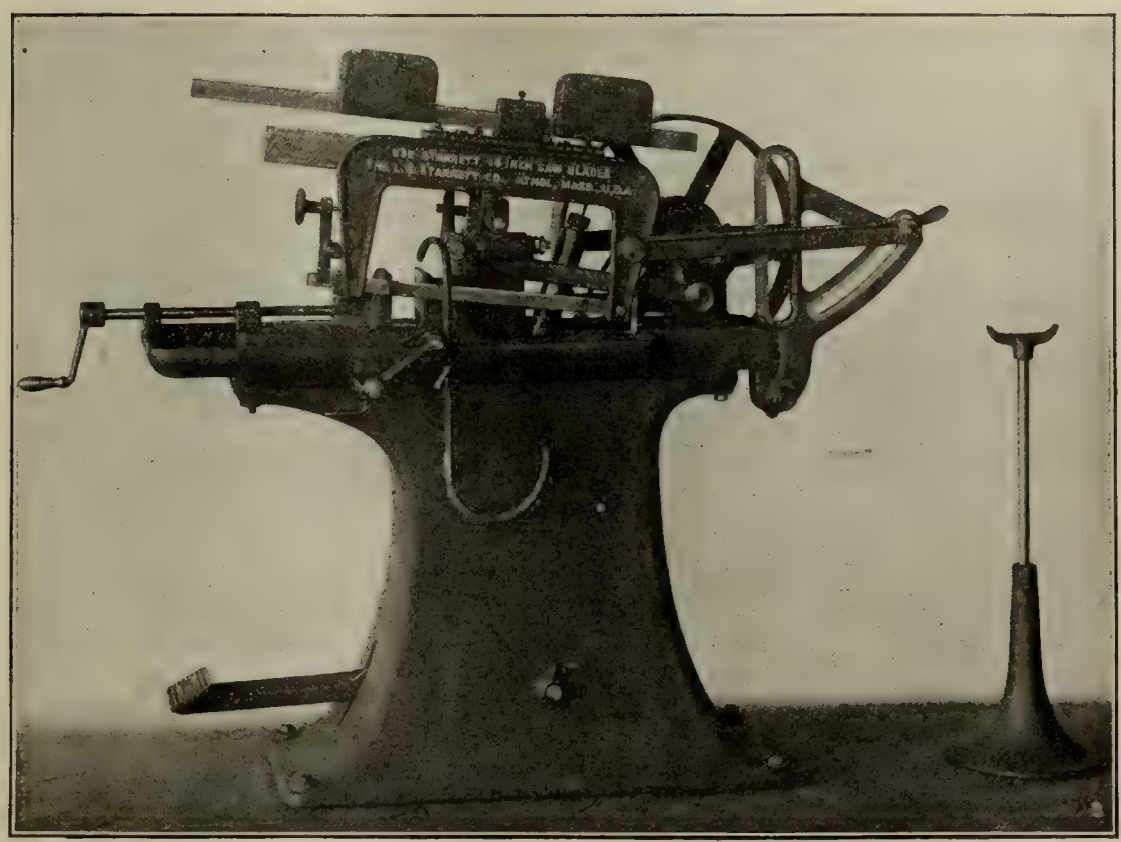
this name "Starrett" is already in your mind connected with fine tools. Next determine *what* Starrett Hack Saw. They're all numbered and each number bristles with significance. It's just as important to use the right numbered Starrett as it is to use the right lathe tool, or the right milling cutter, or the right file. Of course, all these tools and hack saw blades will do some work, but a wrong use won't chase away that word "inefficiency."

But the right selection is not difficult—turn to page 208 of the Starrett Catalog No. 213—there you will find the numbers that correspond to most efficient usage. Remember that using the right numbered Starrett is the utmost in Hack Saw Thrift for such a blade Cuts Quicker—Lasts Longer.

42-752

Starrett Hack Saws *are Unexcelled*
Just as* Starrett Tools *are Unexcelled

INEFFICIENCY MUST GO



For highest efficiency in severing metal the complete outfit should be Starrett—blades—hand—frame—machine.

The Starrett Hack Saw Machine gets the most out of a blade. The stroke can be adjusted to use the full length of the blade on every piece cut.

It prevents breakage of blades and stripping by easing the saw onto the work by means of a dash pot.

The saw doesn't drag on the return stroke, and an automatic locking device holds the saw at any height when stopped.

A special bulletin describes this machine.

The L. S. Starrett Company

NEW YORK
LONDON
CHICAGO

The World's Greatest Toolmakers

ATHOL, MASS.

42-752

TOOL ROOM SURFACE GRINDER

This Machine is BUILT WITH EXTREME CARE

We Even Balance the Driving Pulleys!

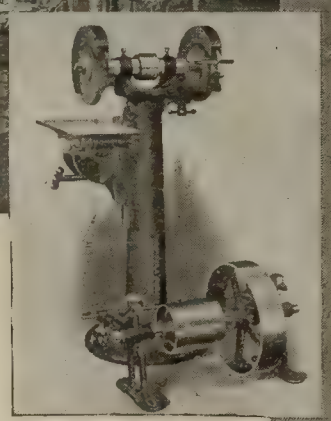
That's an example of how painstaking we are in the details of the construction of this justly famous grinder. Then there is the best of experience behind our efforts.

Result: a better-than-ordinary grinder, a grinder capable of exceptional *speed, accuracy, strength* and *simplicity.* Don't you think this is a good machine to buy? Presents rigid grinding surface and large tray and water pot combined. Easily adjusted.

SPECIAL MACHINERY

Put your requirements up to us—experts on special designs. Product, price and service top notch.

J. E. WING & SON, Hamilton, Can.



WE BUILD THEM BY HUNDREDS

Standardized Production enables us to offer this powerful Waterbury Grinder at such a low price. It grinds rapidly and accurately, all flat surfaces, dies, punches, planer, lathe, and other tools. Has adjustable table and tool rest with large radius of travel. Rigid, 3-point table supports giving great steadiness. A reliable, practical grinding outfit.

The Blake & Johnson Co., Waterbury, Conn.

Stow Shell Grinders Increase Production

Suspended Pedestal Mounted on Truck

Any Size Any Current

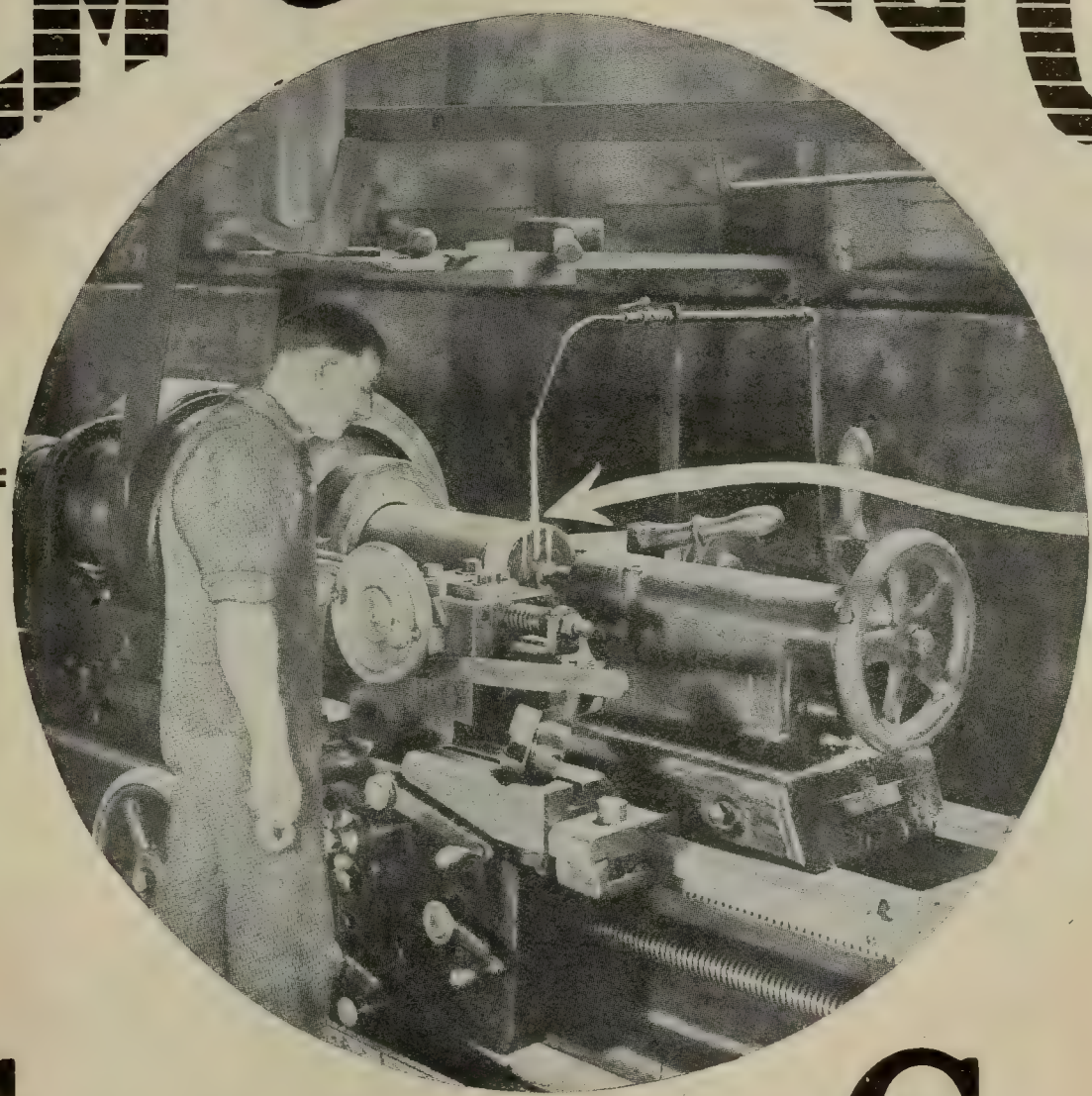
Immediate Shipment

Stow Manufacturing Co.

Binghamton, New York, U.S.A.

Oldest Portable Tool Manufacturers in America

ELM CUTTING OIL



Cutting the Costs

We specialize in three kinds of oils which have proven their ability to substantially cut costs: *Cutting, Drawing* and *Motor Oils.*

Elm Cutting Oil. Illustration shows the oil at its cost-cutting work. Its use results in clean-cut threads, longer life for tools, larger production and a lowering of cost. It is antiseptic and pleasant to work with too.

Elm Drawing Oil. Adapt this oil and you'll have no scratches from tools. Tools last longer, too, and production is large and more economical where Elm drawing oil is continuously used. Antiseptic and pleasant to work with.

Elm Motor Oils. Less carbon and many more miles per gallon is always the result produced by the use of this **Elm** product. Their use assures lower costs, less motor trouble and better service in general.

Cost of production is above normal just now. Every means by which costs can be reduced should appeal to you. Elm products offer you a saving worth while. Try them. They are cutting costs for others and will cut costs for you.

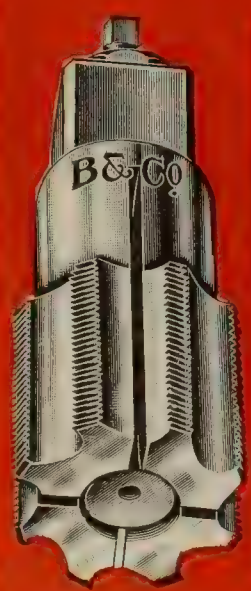
ELM CUTTING OIL COMPANY, TORONTO

Butterfield

TAPS, Solid and Adjustable

For speed and accuracy, for strength and durability — Butterfield Taps.

Look at these tools—don't they impress you with their power and efficiency?



Why They're Favorites

It is the knowledge *just how* to make the best, together with the employment of the highest skilled labour and best steel, that have made BUTTERFIELD PRODUCTS the favourites with all discriminating tap users. Our taps are as near perfect as it is possible to make them, due largely to our special hardening and tempering process, the result of thirty years' experience.

For faster speeds, faster feeds, for a still more rapid production, *Butterfield* taps will set the pace.

Give them a trial.

Butterfield & Co., Inc.
Rock Island, Quebec

REECE'S SCREW PLATES

Give Your Men This Tool

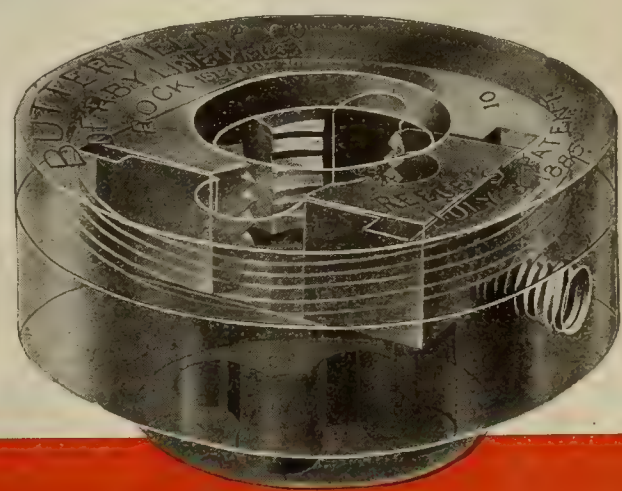
The modern way is to study your men and give them tools that they like. The reward is better work, increased output and all attendant advantages. Introduce Reece's screw plates into your plant and watch the output take a jump upward. Your men will enthuse over them!

Reece's Screw Plates are ADJUSTABLE, and have all the advantages of a solid die with none of the disadvantages. To cut smaller, simply turn in the adjusting screws on either side of the collet. To enlarge turn these screws out, loosen cover, push back dies and tighten cover.

Impossible for dies to loosen and cut cross threads, because guide portion is CAST SOLID with (and is a PART of) collet.

You can cut PERFECT THREADS CLOSE TO THE SHOULDER with a single cut. No "backing and filling." Another advantage—can be reversed in collet and used in a lathe or other machine.

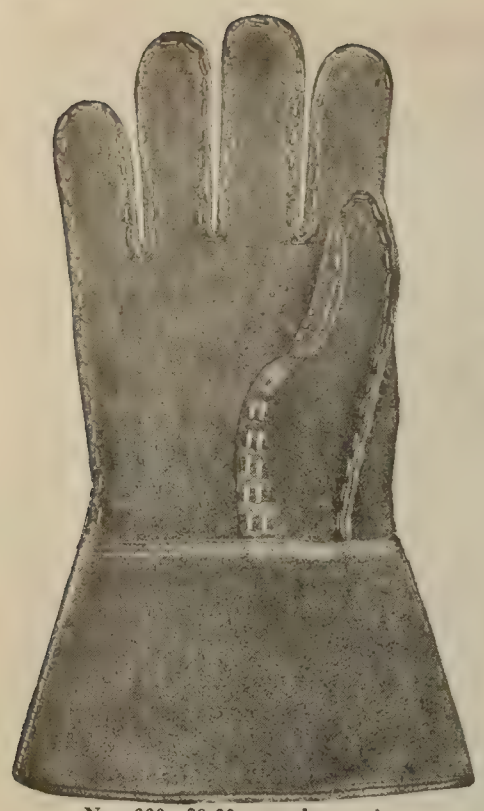
Reece's screw plates are practically everlasting. Try one in competition with others and note the difference!



Butterfield & Co., Inc.

Rock Island, Quebec

If any advertisement interests you, tear it out now and place with letters to be answered.



No. 660, $9.60 per doz. pairs.
(Or all lefts or rights)

No. 605, $9.00 per doz. pairs
(Or all lefts or rights)

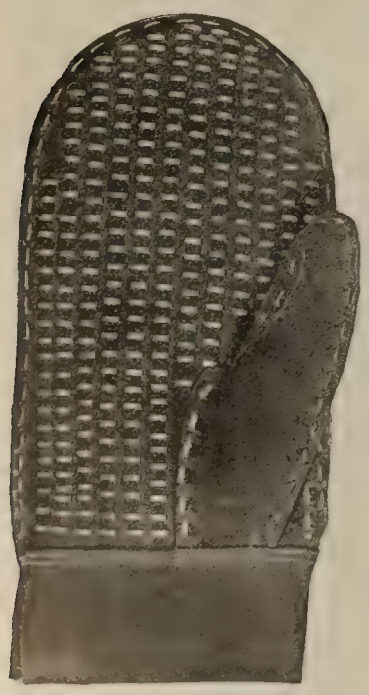
No. 640, $10.50 per doz. pairs
(Or all lefts or rights)

STEEL-GRIP GLOVES AND MITTENS

Reinforced at wearing points with steel ribbons—sewed with steel thread, guaranteed not to rot, rip or tear.

Sand-blasters—handlers of pig-iron, scrap, castings, sheet metal need effective hand protection. Steel-grip gloves and mittens give that protection—eliminate accidents and promote production.

One firm tried a dozen pair; now they have 2,500 pair in use. Pick out the gloves or mittens best suited to your work—have your men use them and notice the increased efficiency and production.



No. 674, $9.00 per doz. pairs.

A few users in he United States:

American Car & Foundry Co.
American Steel Foundries
Anaconda Copper Mining Co.
Bethlehem Steel Co.
E. W. Bliss Co.
Crane Company
General Electric Co.
International Harvester Co.
National Cash Register Co.
Staten Island Shipbuilding Co.
Vulcan Louisville Smelting Co.
Western Electric Co.
Willys-Overland Co.
U.S. Navy Yards

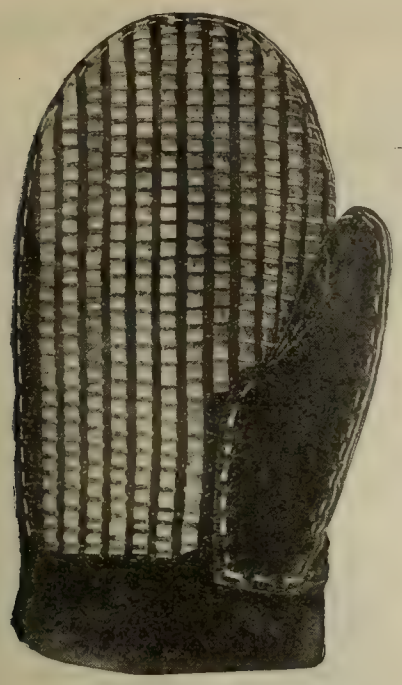
SOLE MANUFACTURERS;

HICKORY STEEL-GRIP GLOVE CO.

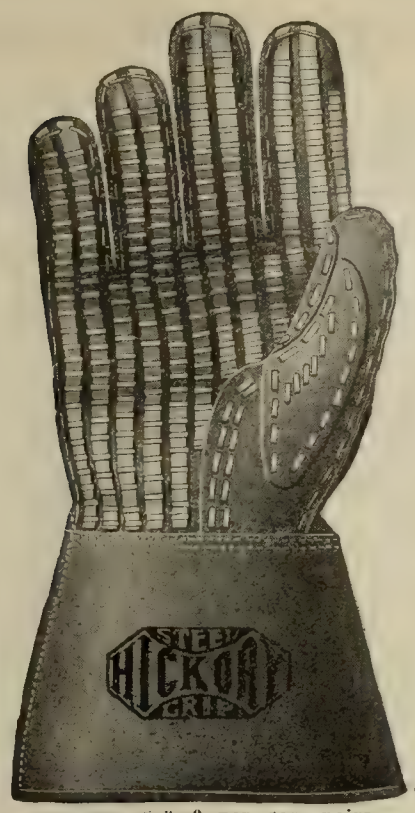
INC.

Box B-6, CHICAGO, ILLINOIS

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



No. 681, $10.50 per doz. pairs
(Or all lefts or rights)



No. 624, $13.50 per doz. pairs
(Or all lefts or rights)

No. 678, $7.50 for 24 Mitts
This Mitt is reversible.

PROMOTORS OF PRODUCTION

GUARDIANS AGAINST ACCIDENTS

A man can't use his full strength or ability if his hands are undergoing torture. Neither can he put his whole heart and soul into ANY job where he knows that suitable, sensible protection is lacking.

A few users in Canada and Great Britain:

American Cyanamid Co.
Taylor Forbes, Ltd. (Shell Dept)
Crowe's Iron Works
The Steel Equipment Co.
Metal Drawing Co., Ltd.
Nicholson File Co.
The William Kennedy & Sons, Ltd.
The Williams Mfg. Co., Ltd. (Munitions Dept.)
England—
Agent: R. E. Boulton, Leigh, Westbury, Wilts.

Knowing this, and realizing the immense field that there is for gloves and mittens that really protect, we have long since made them our specialty.

We have speeded up the production in numerous plants in Canada, England and the United States. May we serve you?

No. 1050—"Doub.use" Sand Blast Gauntlet, $24.00 for 24 Gloves.

SOLE MANUFACTURERS:

HICKORY STEEL-GRIP GLOVE CO.

INC.

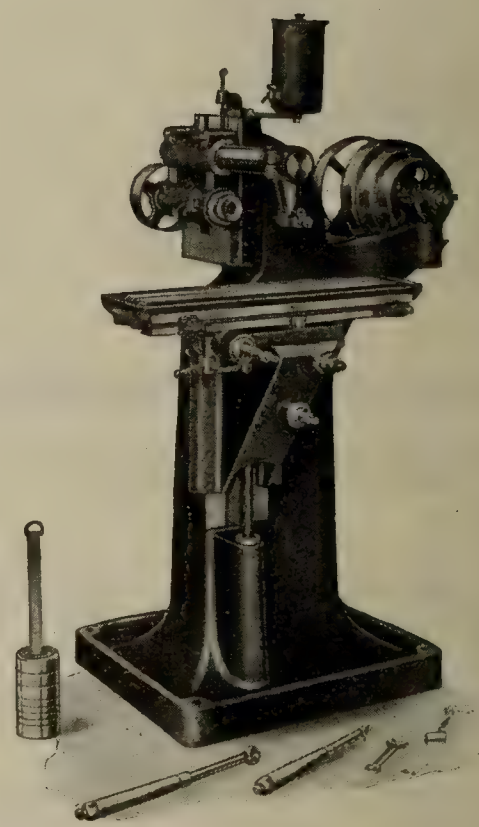
Box B-6, CHICAGO, ILLINOIS

If any advertisement interests you, tear it out now and place with letters to be answered.

U.S. Hand and Weight Milling Machine

The most conclusive milling costs recorded prove the actual cost of milling small parts approaches the actual cost of milling large parts. The milling of small parts costs one-third to one-half more in proportion. Nor do the figures we have in mind take into account the frequent and unprofitable holding up of large parts owing to big millers being glutted with small milling work.

This serious inroad on your profits the U.S. Improved Hand and Weight Milling Machine positively overcomes. It



Mills More Small Parts At Away Less Cost Then Your Big Miller

It so greatly increases output of small parts as to actually reduce milling cost per part 1/3 to 1/2.

Neither in power nor capacity is any other miller of similar size its equal.

Its vertical and horizontal feeds are independent. Work is held close to the table; speedy profiling is possible, and in milling long or heavy parts there is no danger of breaking cutters.

Table is operated by hand lever, or crank feed with rack and pinion. The pinion shaft, mounted in eccentric bushing, allows for adjustment of pinion with rack. With weight attachment furnished, both table and head are fed automatically, and adjustable stops for both table and head limit the travel in either direction.

If Desired

Two-step cone and side pulleys, which take 2½" belt for heavy work, will be furnished instead of the three-step cone illustration shows, which takes 1¾" belt.

Regular equipment includes: Countershaft, oil pot, two-feed handles, wrenches and weights.

For catalogue write to-day.

THE UNITED STATES MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

WELLAND

Offers the Strongest Combination of Industrial Advantages in Canada

Twenty-five big industries of continental reputation have proved this during the last five years.

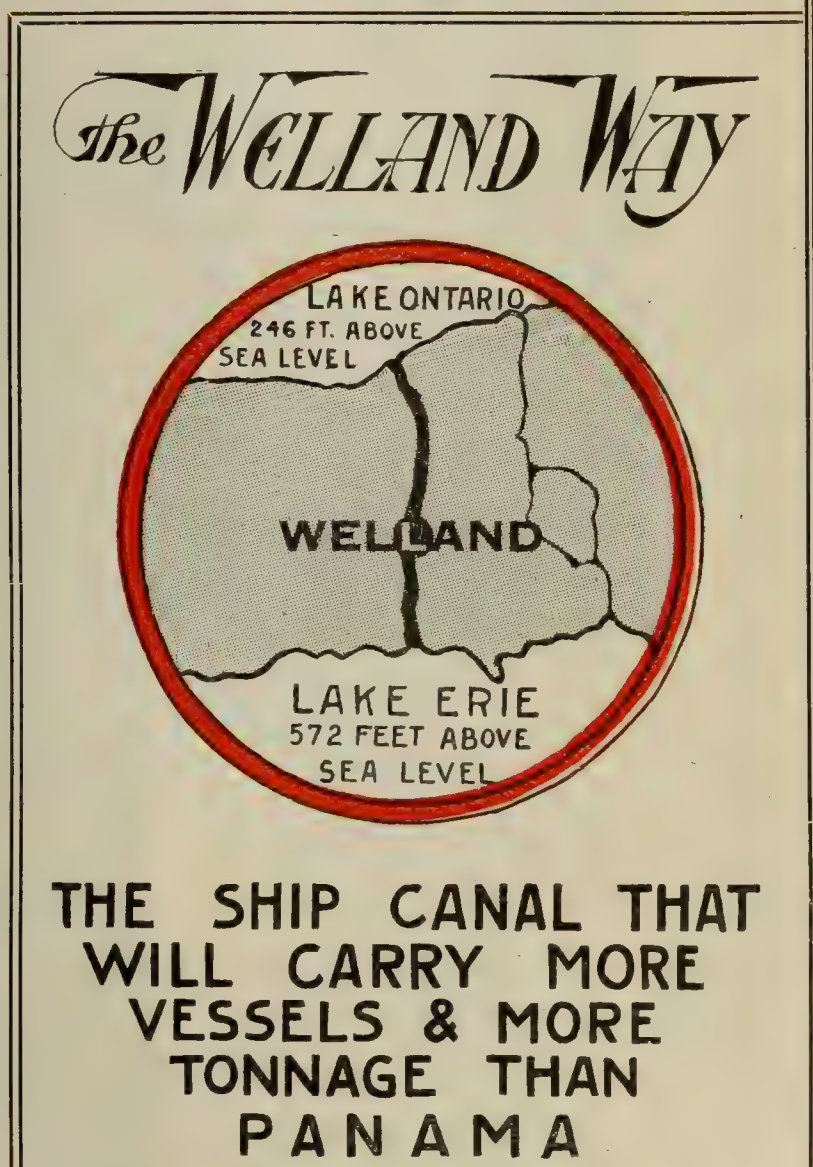
The International Nickel Company sent their engineers out to examine industrial sites. They examined prospective sites from the Atlantic to Lake Huron. The result of the investigation is the building of a five million dollar plant in the Welland Canal zone.

Why?—Because Welland offers the

Cheapest Power in Canada

Unrivalled Rail Facilities

Lake Shipping Advantages



LAKE SHIPPING

Railroad Rates:—Rates from Welland to the North-west and Pacific Coast, all rail, are the same as from all other manufacturing points in Eastern Canada lying between the Detroit River and Montreal. These rates are fixed by the Board of Railway Commissioners for Canada.

On account of the close proximity to the border, Welland is in the Buffalo switching group and takes the Buffalo rates from the east and south and enjoys quick delivery on all raw material imported from the United States.

The fact that all of these roads centre here creates competition, and is the biggest lever the manufacturers have for securing efficient service from the railroads.

The seven railroads are as follows:—

Grand Trunk—Michigan Central—Toronto, Hamilton & Buffalo—Canadian Northern—Pere Marquette—Canadian Pacific—Wabash.

Power Rates:—Welland is the industrial hub of the Niagara Peninsula where an unlimited amount of electric power is available and sold at competitive prices, owing to the numerous power companies represented there.

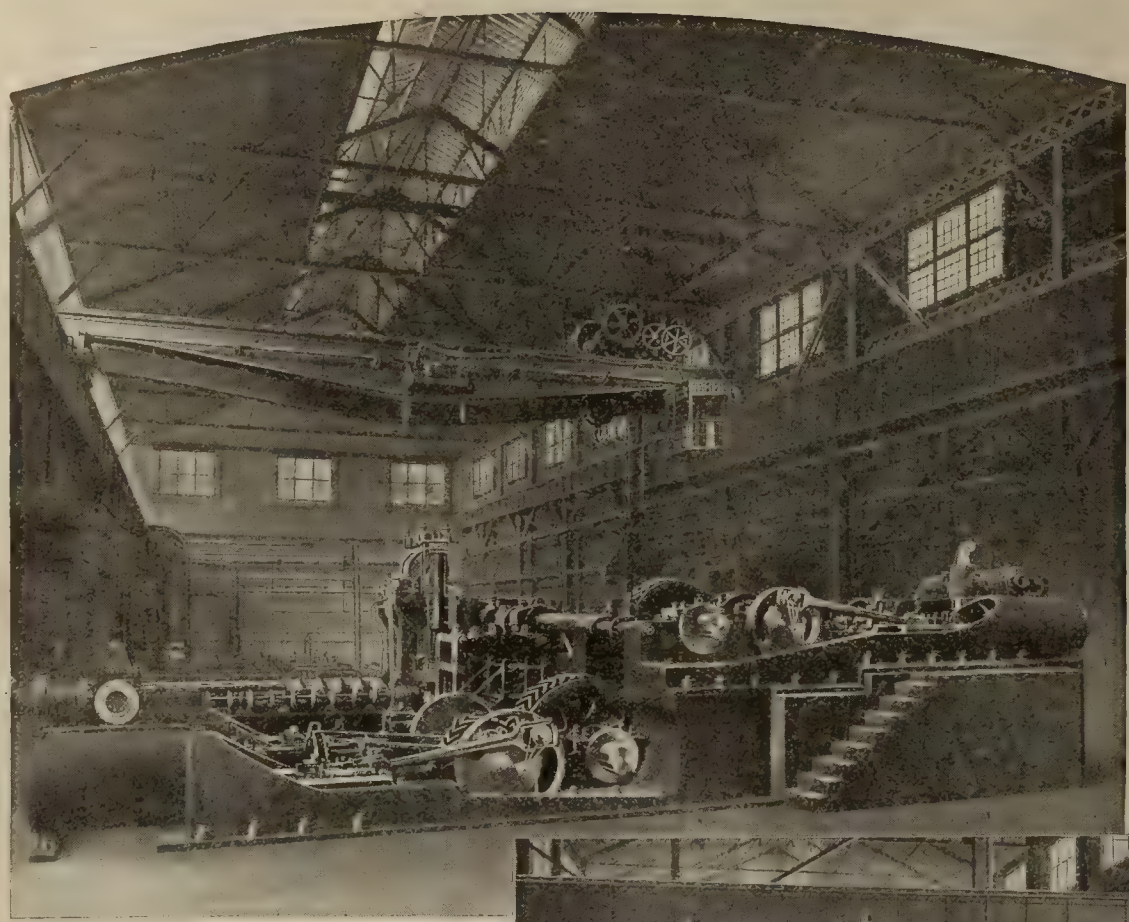
Every factory in Welland is driven by electric power supplied by the Ontario Power Company, of Niagara Falls, which is about twelve miles east of Welland, or from the Dominion Power Company of DeCew Falls, which is about twelve miles north of Welland. The fact that we have competitive companies operating in this district gives us competitive prices on power.

Lake Shipping:—Welland is situated on the Welland Canal, the great marine highway, between tide water and the Canadian North-west, with daily freight service both ways.

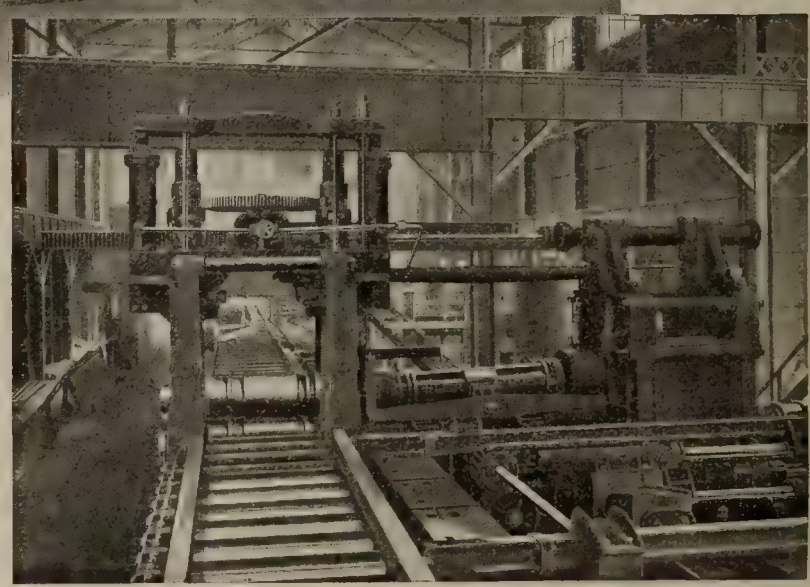
Send for booklet that tells the story of Welland from the manufacturer's standpoint.

Louis Blake Duff

Industrial Commissioner, Welland, Canada



32" Reversing Universal Slabbing Mill, Tables and Engines.



40" Reversing Blooming Mill—with Wellman-Kennedy Manipulator.

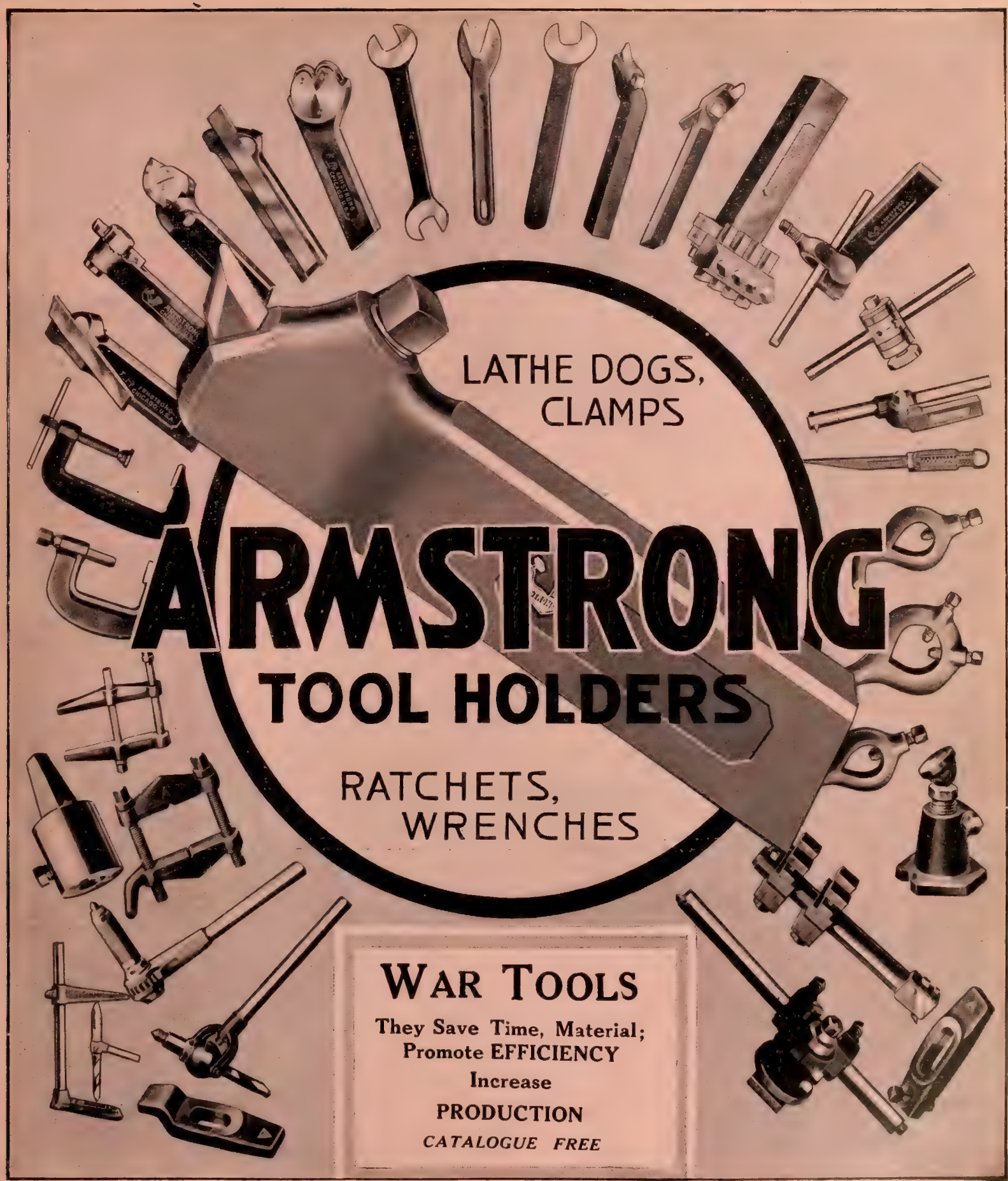
We have designed and built the largest and heaviest types of rolling mills and rolling mill equipment in the world.

No job too large for us.

MACKINTOSH-HEMPHILL & CO.

Fort Pitt Foundry

Pittsburgh, Penna., U. S. A.



War Brings Out the Best and Worst in Men and Tools

With men's lives and National Existence depending upon INCREASED PRODUCTION Armstrong Tool Holders have gained and retained the preference over forged tools and Tool Holders of other makes strictly upon their merits as demonstrated in actual work under conditions of use and abuse unparalleled in the World's industrial history.

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

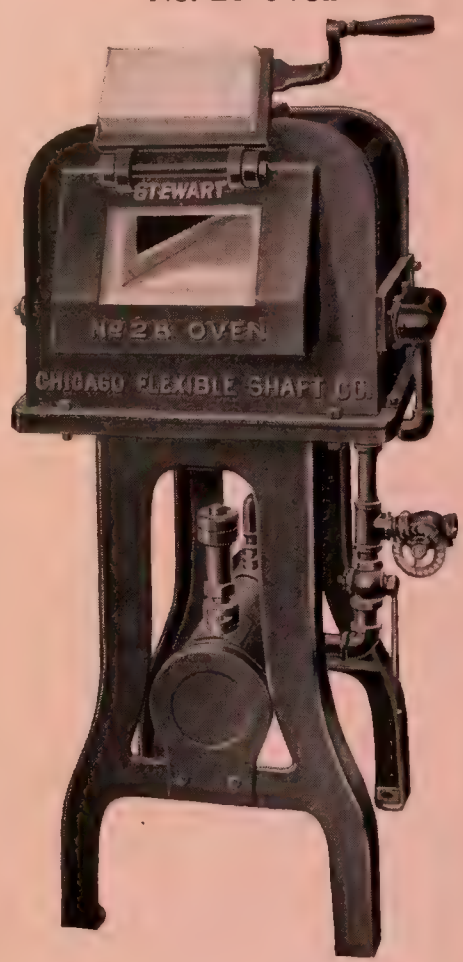
306 N. FRANCISCO AVE. CHICAGO, U.S.A.

STEWART FURNACES

(GAS OR OIL)

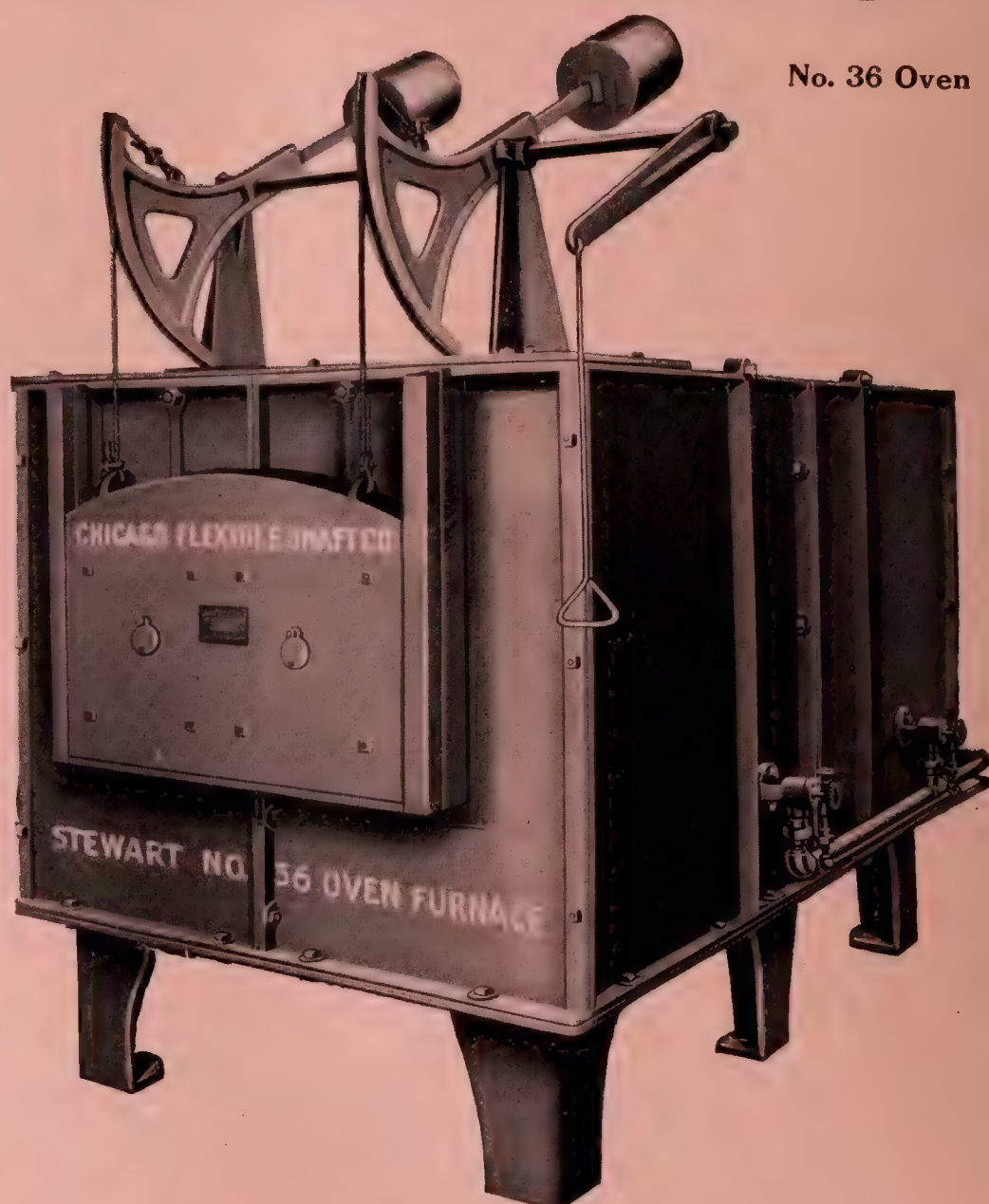
For the Heat Treatment of Metal

No. 28 Oven



Ovens (indirect heat) in all sizes from the small one to the left with heating space 8" x 12" x 4" high for carbon or high speed steel, to the one shown below with an opening 20" high 36" wide and 72" deep. For treating motor cylinders, shell cases, case hardening, annealing etc.

No. 36 Oven



The makers of the lathes, planers, cutters and special tools used in your present work and advertised in this paper use Stewart furnaces somewhere in the process of manufacture.

Ask them their experience.

CANADIAN DISTRIBUTORS:

General Supply Co. of Canada, Ltd.

CHICAGO FLEXIBLE SHAFT CO.

CHICAGO, U.S.A.

STEWART FURNACES

(GAS OR OIL)

For Bending, Forming, Shaping, etc.

DROP HAMMER FORGE

Where a quick, intense heat is required a direct flame is necessary. Opening both ends if pieces are to be heated toward centre only.

The width or depth may be changed from standard sizes at a slight increase in cost. The forge shown here is made in eight sizes. A stock size in *any type* is preferable, as repairs are always available and much cheaper.

Tell us what work you have and the guarantees to be handled and a recommendation will be made on the one to do it.

STEWART FURNACES

have always been sold on a money-back, thirty-day trial offer. Catalog No. 61 shows over 100 types and sizes and contains reliable data on heat-treating methods.

General Supply Co. of Canada, Limited

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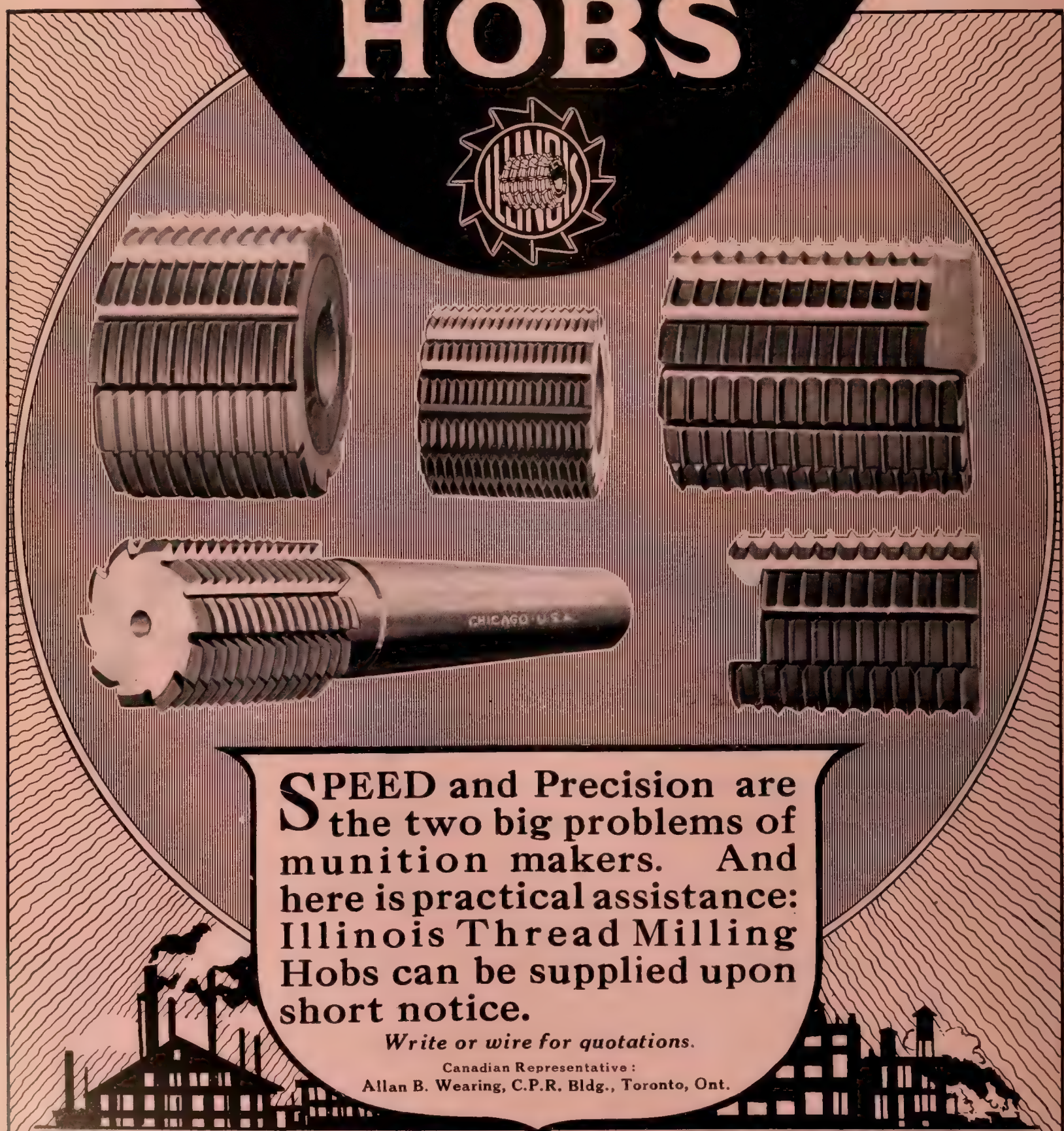
TORONTO OTTAWA MONTREAL

CHICAGO FLEXIBLE SHAFT CO.

CHICAGO, U. S. A.

ILLINOIS

THREAD MILLING HOBS



SPEED and Precision are the two big problems of munition makers. And here is practical assistance: Illinois Thread Milling Hobs can be supplied upon short notice.

Write or wire for quotations.

Canadian Representative:
Allan B. Wearing, C.P.R. Bldg., Toronto, Ont.

ILLINOIS TOOL WORKS, CHICAGO, U. S. A.

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

GRATON & KNIGHT

Standardized Series

LEATHER BELTING

Tanned by us for belting use

GRATON AND KNIGHT

Production is Paramount

INDUSTRIAL production demands Standardization,—Standardization of machinery and machine parts, and Standardization of belting because belting *is* machinery. Buy a belt as you would buy a machine, with *greatest production* the paramount thought.

Graton & Knight Standardized Leather Belts are insuring maximum production in Arsenals, Navy Yards, Munition Plants—everywhere, because they take up all the power, carry all the power and deliver all the power.

There is always one right belt for the job,—you can't afford to take chances with any other. Graton & Knight Standardized Leather Belts are a set of standards which enable you to secure the **one** right belt for every drive, each belt uniform in tannage, quality and performance.

Standardize your belting,—it is the only safe, sane and profitable way with present demands on industrial production.

Let a Graton & Knight representative tell you about Standardization of Belting, particularly about Graton & Knight Standardized Leather Belts.

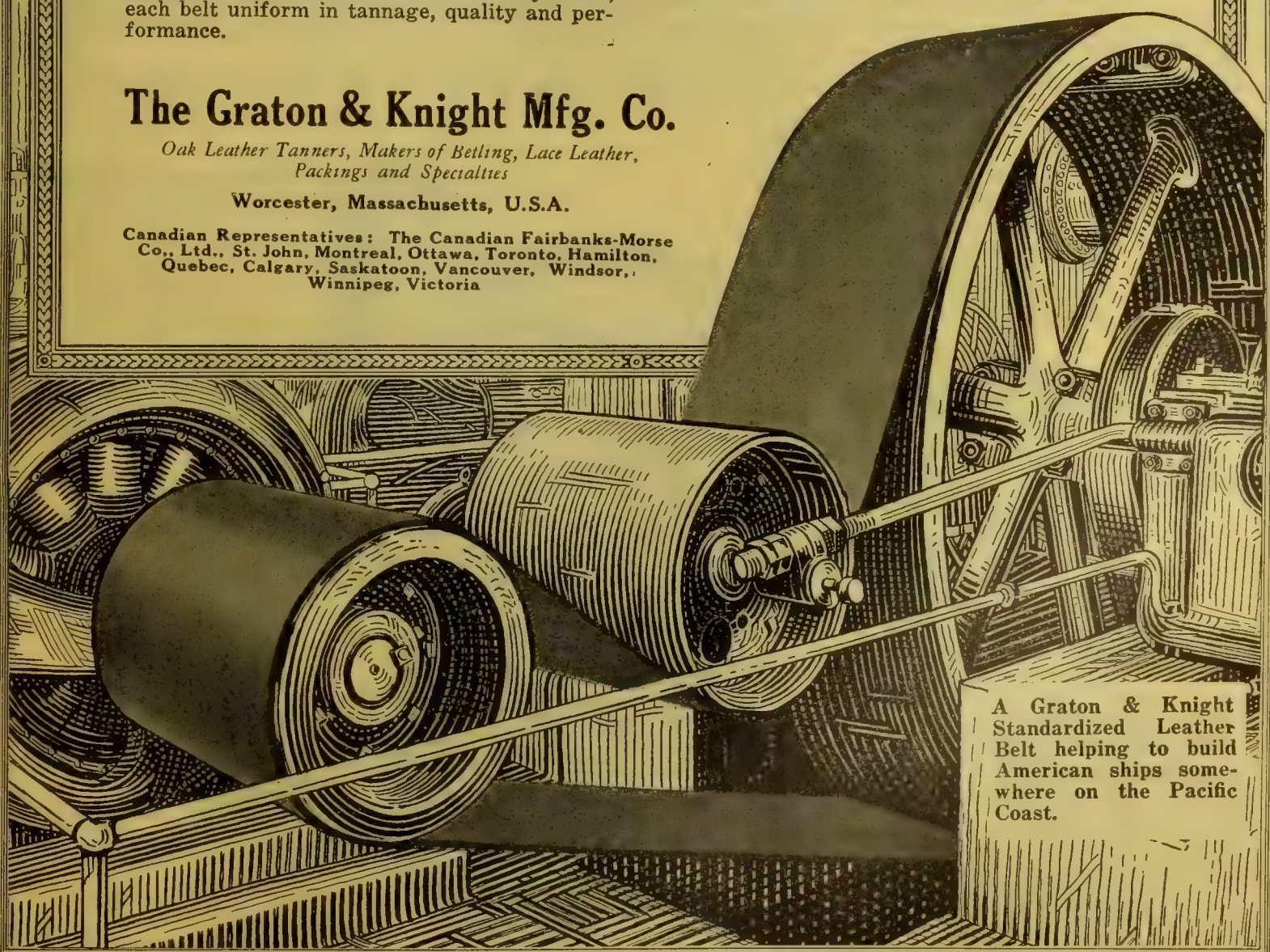
Complete information cheerfully given and without obligation.

The Graton & Knight Mfg. Co.

Oak Leather Tanners, Makers of Belting, Lace Leather, Packings and Specialties

Worcester, Massachusetts, U.S.A.

Canadian Representatives: The Canadian Fairbanks-Morse Co., Ltd., St. John, Montreal, Ottawa, Toronto, Hamilton, Quebec, Calgary, Saskatoon, Vancouver, Windsor, Winnipeg, Victoria



A Graton & Knight Standardized Leather Belt helping to build American ships somewhere on the Pacific Coast.

THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

What Counts Save Results?

Embodied in the meaning of that word "Results" are—quality, quantity and the efficiency of the machine. So, when the quality is undoubted, speed is the primal requisite.

This No. 7½, Single Spindle Grinder, is built with unusually large dimensions throughout. The 30″ disc wheel is interchangeable with the 20″ ring wheel chucks. Spindle, 2¾″ diameter and mounted in self-aligning radial and thrust ball bearings. The rocker shaft is 3½″ diameter and supports two Lever Feed Tables. The 9″ face of the pulley gives wonderful driving power.

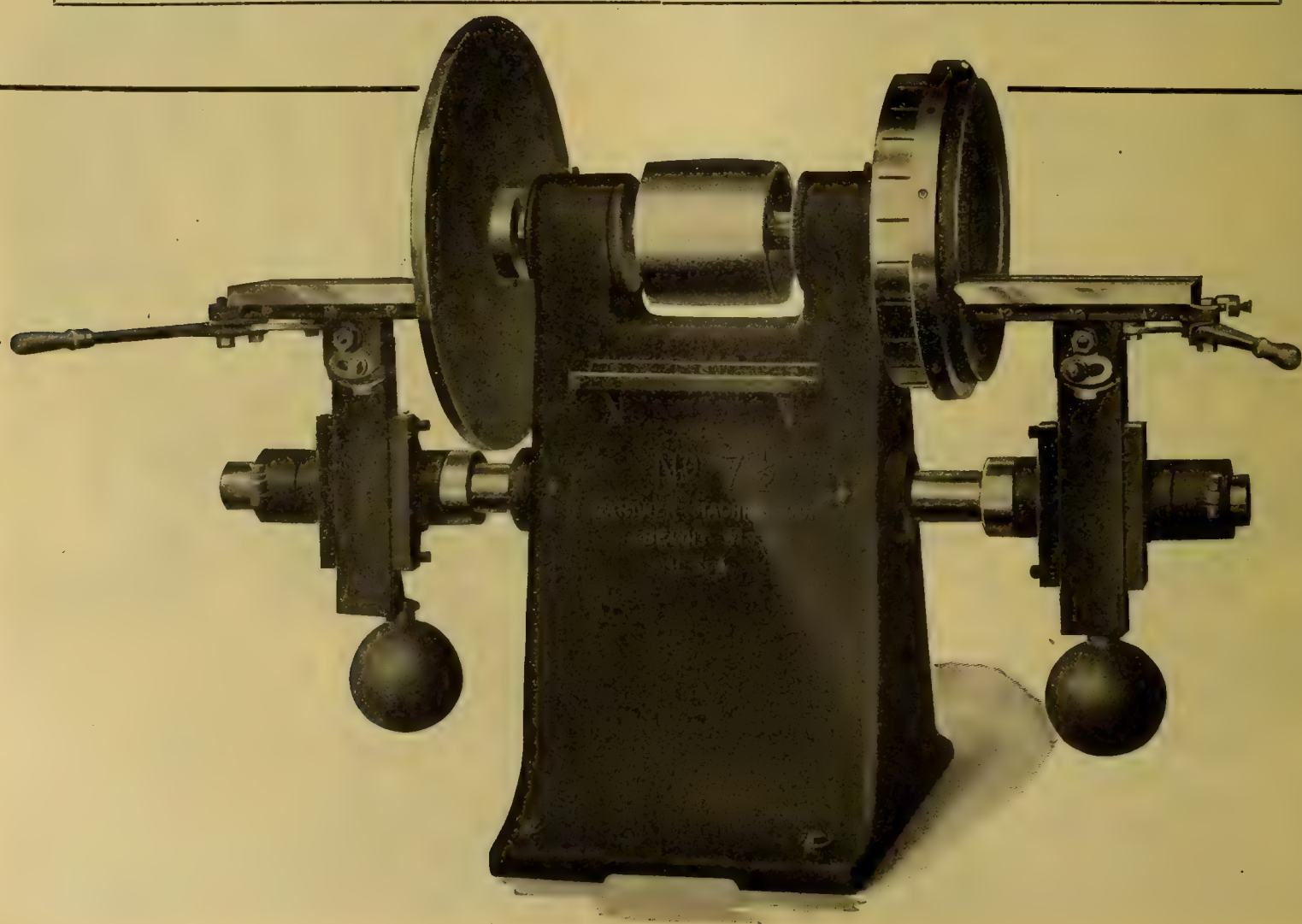
If you are not acquainted with the Gardner line of Single or Double Spindle Grinders, consider it a pleasure for us to supply you with all the information you desire. Our line is most comprehensive. We maintain a Service Department solely to give valuable service to the trade. Write us. We could help one another.

GARDNER MACHINE COMPANY

Beloit, Wisconsin, U.S.A.

Canadian Sales Agents: **THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED**

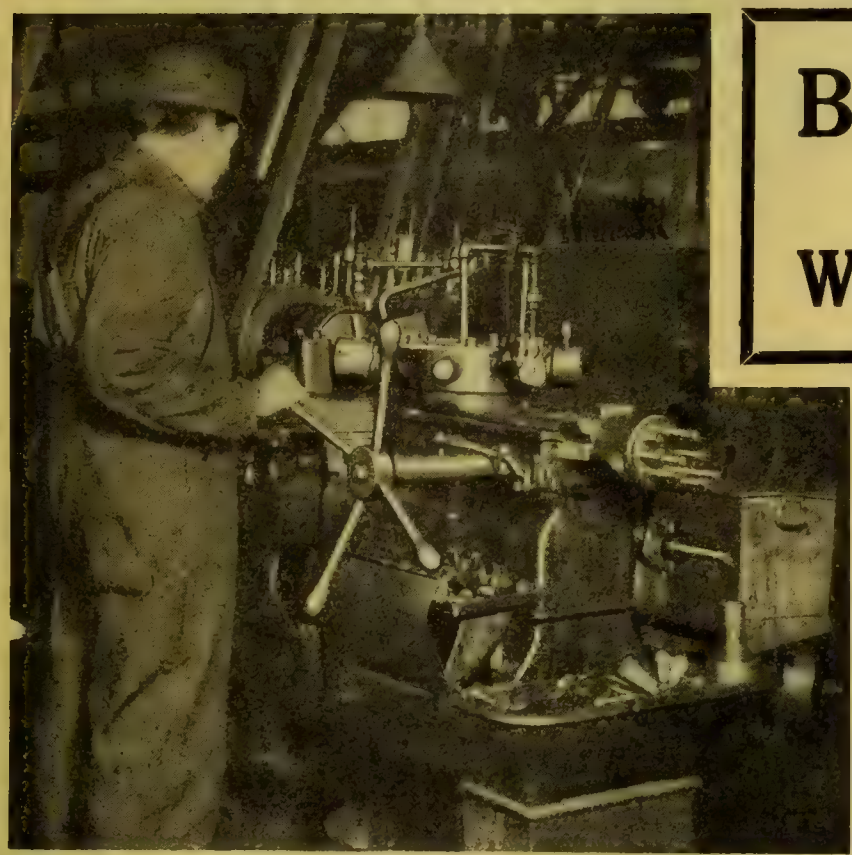
St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria



THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

Three-lever Centralized Control
Means Fast Production on Bar Work



Brown & Sharpe
Nos. 4 and 6
Wire Feed Screw Machines

The making of lost motions is practically eliminated —the operator's position being always similar to that shown in photograph. One lever opens chuck, feeds stock and locks the chuck again. The second lever starts, stops and changes speeds while a slight movement of a third lever changes feed of turret slide. Other features just as attention-compelling are given in detail in literature which will be sent on your request.

Brown & Sharpe Mfg. Co.
PROVIDENCE, R.I., U.S.A.

Canadian Agent:
CANADIAN FAIRBANKS-MORSE CO., LTD.
Toronto, Montreal, Winnipeg, Calgary, Vancouver, St. John

McDougall Shapers

ARE-MAC-DEE IS A GUARANTEE

These are up-to-date Shapers, designed for modern shop production.

They are plain in design, yet embody all essential features necessary for efficient work.

Every adjustment is convenient for the operator and fine for the most accurate work.

Let us have your inquiry.

The R. McDougall Company Limited
Manufacturers
GALT, ONTARIO, CANADA
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CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

REED-PRENTICE COMPANY

R-P Co

WORCESTER MASS. U.S.A.

ARE YOUR PROFITS INSURED?

QUEER TIMES ARE AHEAD. THE EXACT TURN AFFAIRS WILL TAKE IS UNCERTAIN.

ONE BIG FACT CASTS ITS SHADOW BEFORE—THE HIGHEST EFFICIENCY OF MAN AND MACHINE WILL BE ABSOLUTELY NECESSARY.

IT IS THE PROGRESSIVE SHOP THAT USES MODERN MACHINE TOOLS. THE SHOP OF TO-MORROW WILL BE THE MODERN SHOP OF TO-DAY.

REED-PRENTICE LATHES, RADIAL AND UPRIGHT DRILLS ARE YOUR SAFEST INSURANCE. THEIR RECORD OF ACHIEVEMENT—PAST AND PRESENT—IS YOUR GUARANTEE FOR RESULTS IN THE FUTURE.

CANADIAN FAIRBANKS-MORSE COMPANY, LTD.
MANNING, MAXWELL & MOORE, INC., NEW YORK
ALLIED MACHINERY CO. OF AMERICA, PARIS
FENWICK FRERES, PARIS

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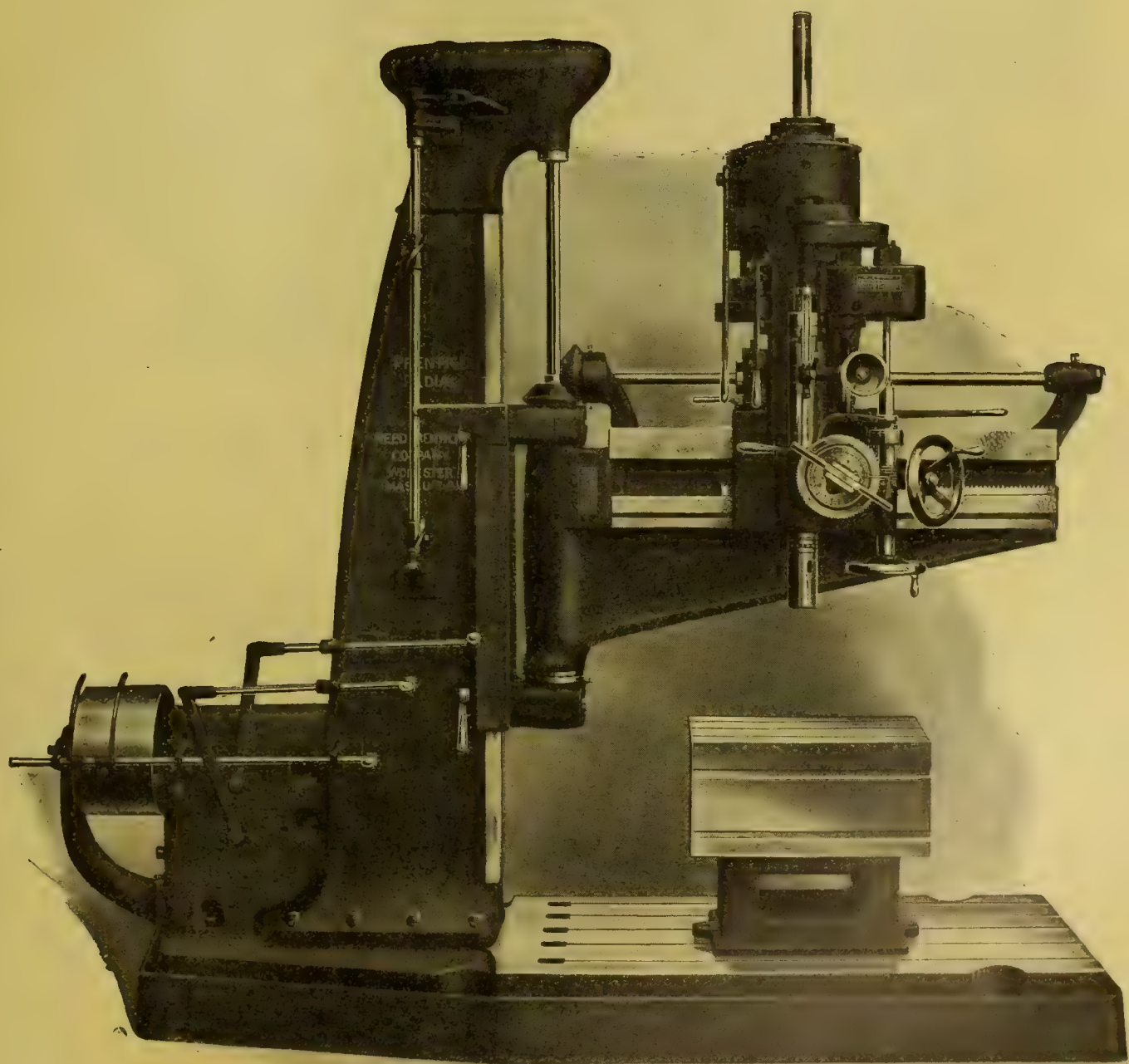
REED-PRENTICE COMPANY

R-P

WORCESTER MASS. U.S.A.



RADIAL DRILLING MACHINE

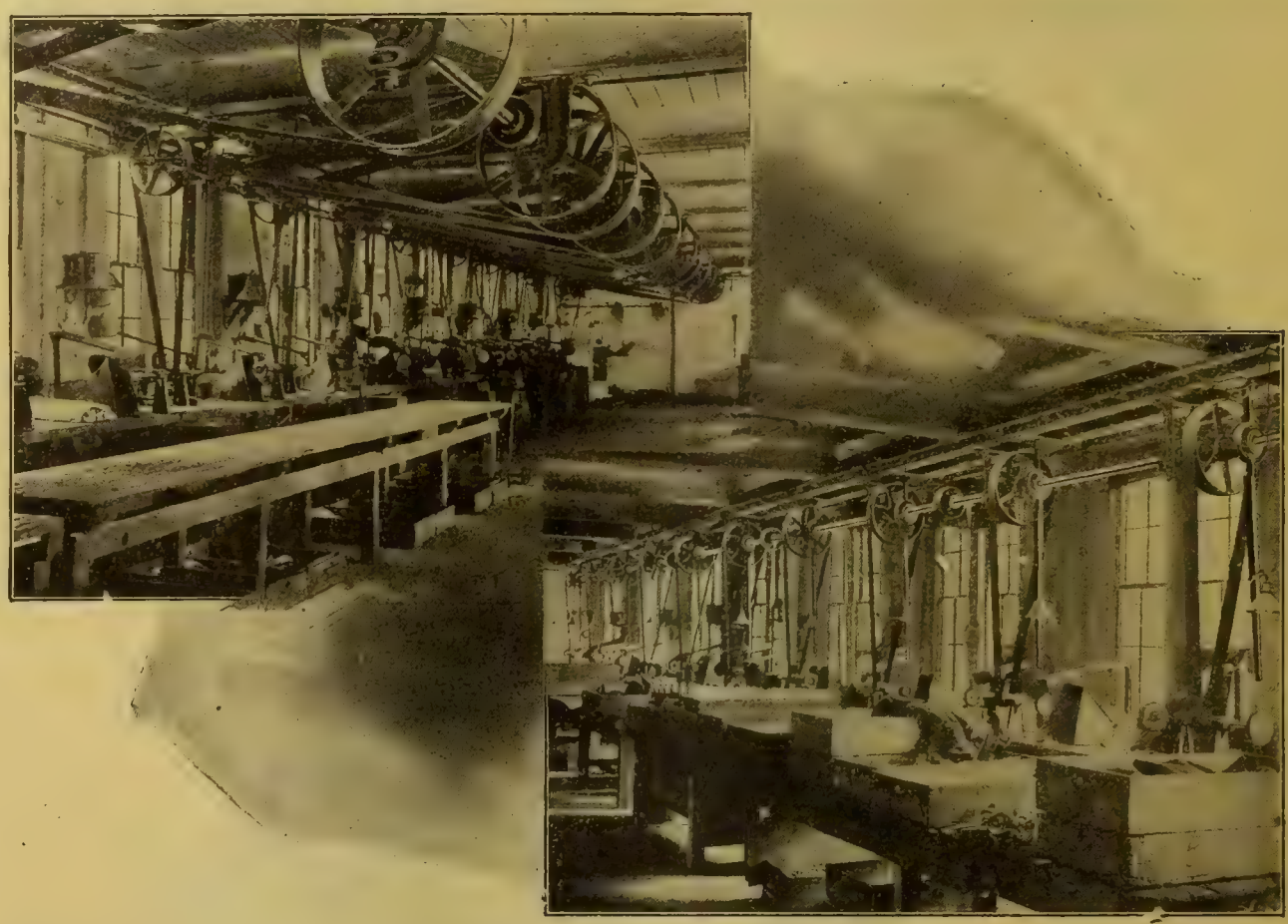
THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

THE JOHNSON FRICTION CLUTCH

HAS CHANGED POWER TRANSMISSION

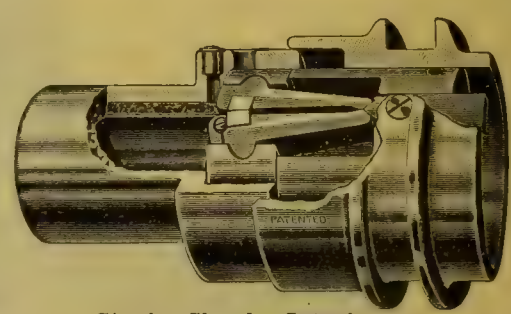
The Old Way →



The New Way

"Johnsons" Drive Direct from Line Shafting

JOHNSON Friction Clutches mounted over every machine allows any machine to be stopped or started at the will of the operator while the others are still running. This method eliminates the cross belting from the regular line shaft to the countershafting and consumes a great deal less power. There is only one-half the transmission equipment necessary when the countershafting is eliminated, which means one-half less initial cost, one-half less friction, one-half less trouble and repair, one-half less space occupied, and a cleaner, neater and lighter machine room. Although small in size the Johnson Friction Clutch is designed to drive considerable power at high speeds. It works in a field of its own, as we do not build a clutch to handle more than 50 H.P. at 1,000 R.P.M.



Single Clutch—Interior.

It is the clutch the conservative engineers specify. Let us help you derive clutch satisfaction. We have the clutch for your requirements. Write for our booklet, "Clutches as Applied in Machine Building," and our yellow data sheets.

England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles.
Australia: Edwin Wood, Ptg., Hardware Chambers, 231 Elizabeth Street, Melbourne, Victoria

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

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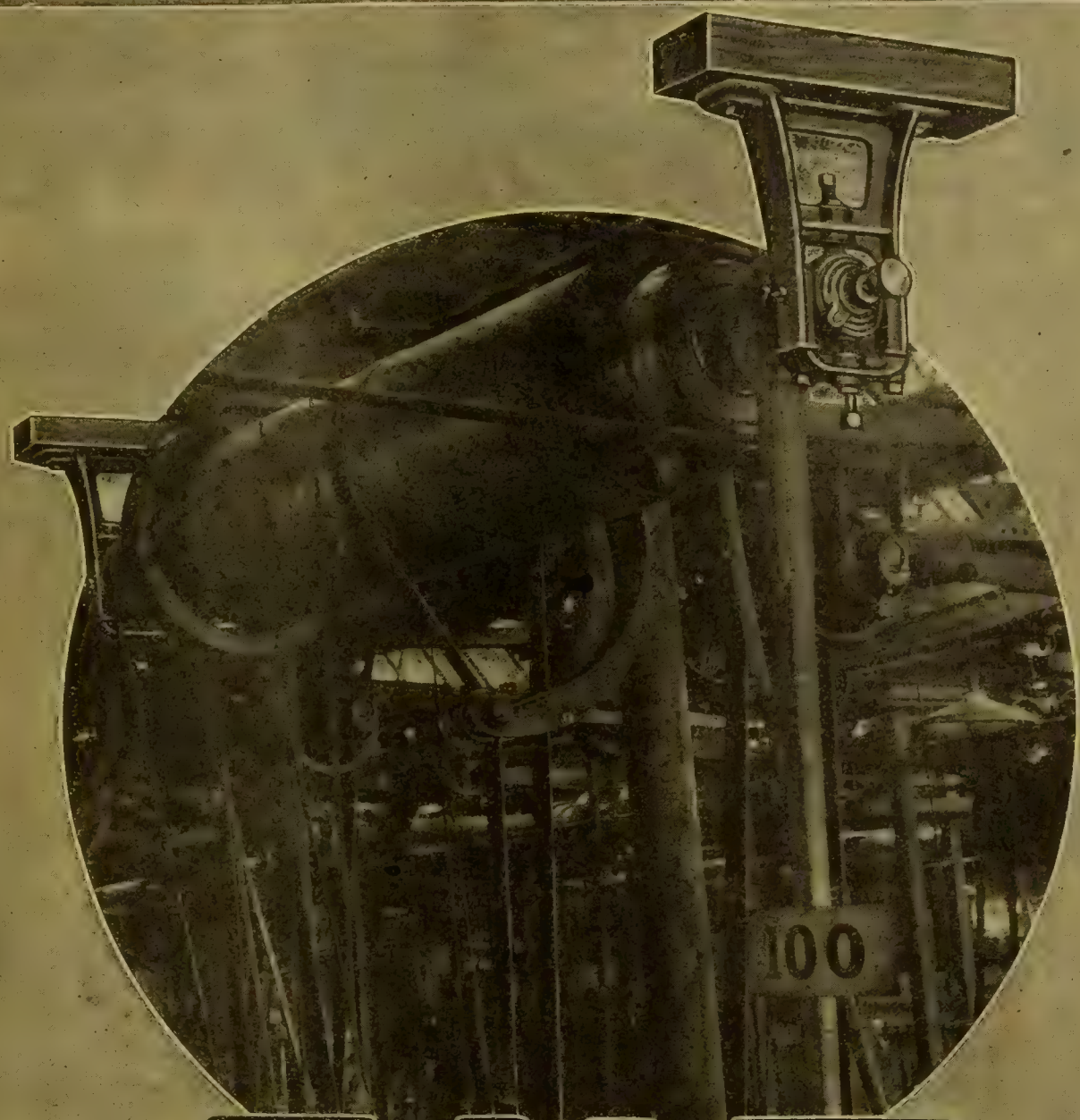

SKF

BALL BEARING HANGERS

For full information, write

CANADIAN SKF COMPANY, LIMITED, Toronto, Ont.

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THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

THE CLEVELAND TWIST DRILL COMPANY

· Cleveland · New York · Chicago ·

The Meanest Job in the Shop-Is

As Easy as Winding a Watch

The nastiest of all jobs—removing a broken screw—is no job at all, *if* you have an

EZY-OUT

SCREW EXTRACTOR SET
(*Pat. 1914*)

Just drill a hole in the broken section, slip in an "Ezy-out," slap on a tap wrench and ***twist***—and out comes the broken part, ***on its own threads,*** and the job's done.

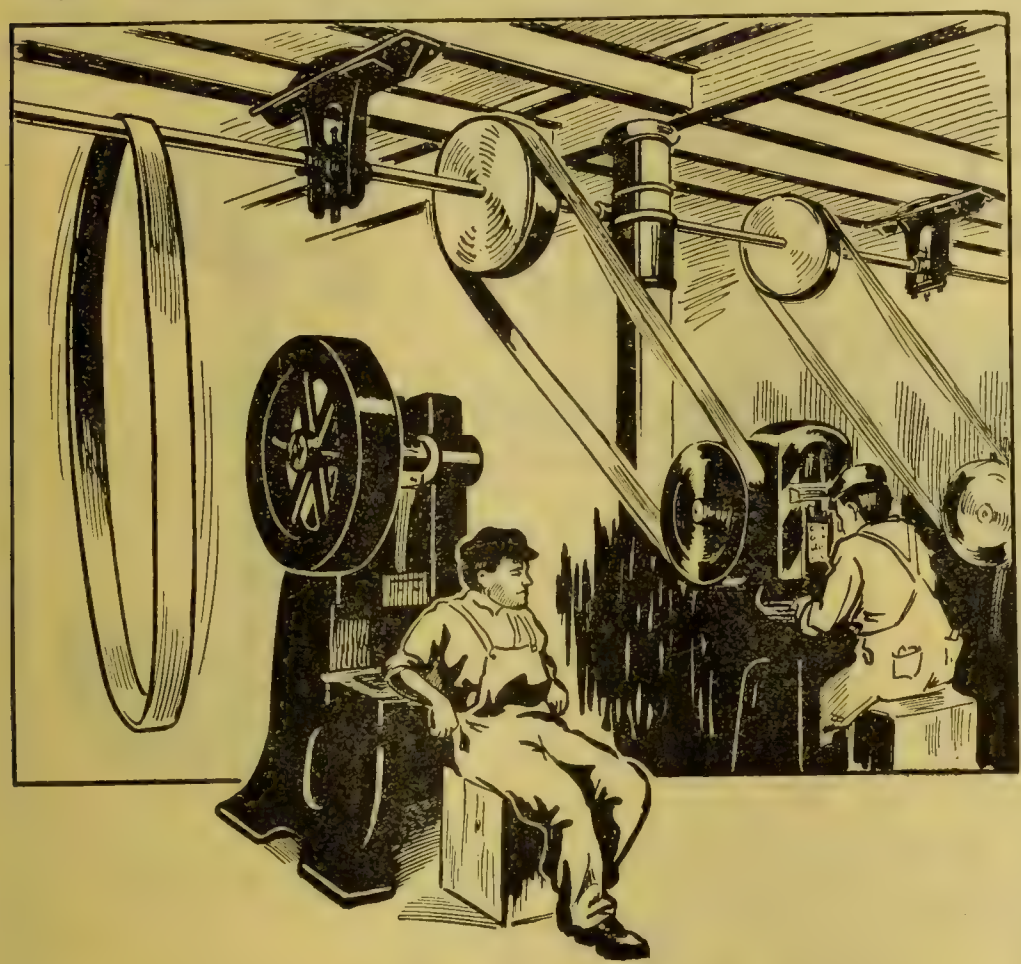
For Sale By
The Canadian Fairbanks-Morse Co.
Limited
St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

Ask Your Dealer to Show You "Ezy-Out." There's a Set for Every Sort and Size of Work.

"The Best Way Out" Describes and Illustrates the Three "Easy-Out" Sets. Send for it.

THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS



LOST TIME

the bugbear of all manufacturers, may be entirely overcome as far as your pulleys are concerned by the use of

ONEIDA STEEL SPLIT PULLEYS

"The closest approach to pulley perfection"

The seamless rim makes the Oneida superior to all other Steel Pulleys. In every other feature of construction and attachment to shaft the Oneida is superior to every other pulley. The ultimate economy characteristics of the Oneida must not be overlooked in your factory.

Made in all sizes.

Manufactured By

Dodge Sales & Engineering Co.

MISHAWAKA, IND.

SOLE CANADIAN AGENTS:

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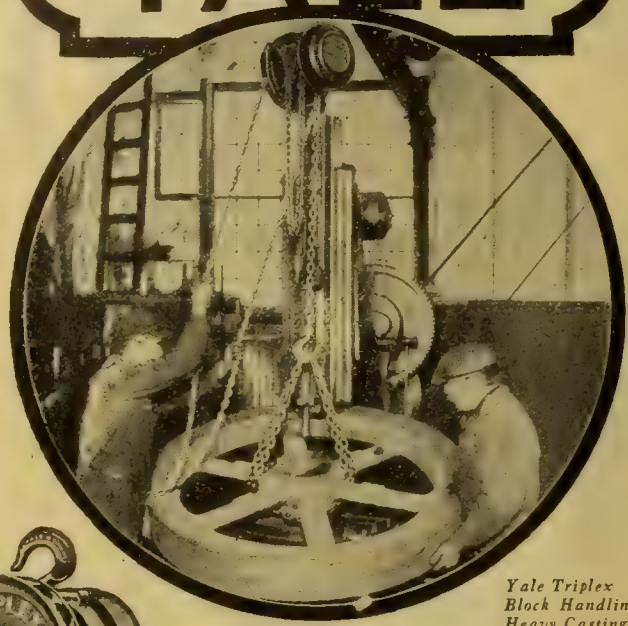
THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

TRADE YALE MARK



Yale Triplex Block Handling Heavy Castings

The Yale Triplex Block

Yale Hoists—their great usefulness

Many buyers install the Yale Triplex Hoist for a *specific* use or a *particular* service.

But its performance and ready adaptability suggest many other applications beyond those contemplated when the hoist went into service.

The Yale Triplex Block lends itself to a wide range of applications in every industry where the safe, economical and rapid handling of loads is important.

Carefully selected materials, sound design, approved manufacturing practice and rigid tests are reflected in the completed hoist—and its wide range of usefulness often under most trying conditions.

Put your hoisting problems up to us.

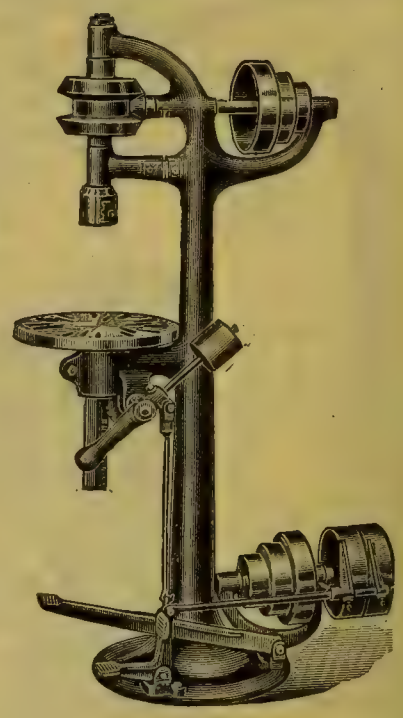
Ask for new catalog.

The Yale & Towne Mfg. Co.

9 East 40 St., NEW YORK

Distributors for Canada
The Canadian Fairbanks-Morse Co., Limited
Montreal, St. John, Toronto, Winnipeg, Calgary, Vancouver, Ottawa, Quebec, Saskatchewan, Victoria.

St. Louis Tapping Machines



Quick work, true holes, with no breakage of taps is the keynote of St. Louis Tapping Machines.

Every convenience is provided to facilitate operation. Made in several sizes up to 1" capacity.

St. Louis Machine Tool Company
ST. LOUIS, MO., U.S.A.

Burke Bench Milling Machine

"CONCENTRATED EFFICIENCY"

We have combined convenience, power, rigidity, accuracy and ability to rapidly handle any work within range of this machine. Fitted with slotting attachment, index centers, either stationary or tilting head, vertical milling attachment, etc., the No. 3 is one of the most serviceable small-work machines built.

We make a high grade line of Milling, Drilling and Tapping Machines. Cutting-off Saws, etc.

Write for complete catalog

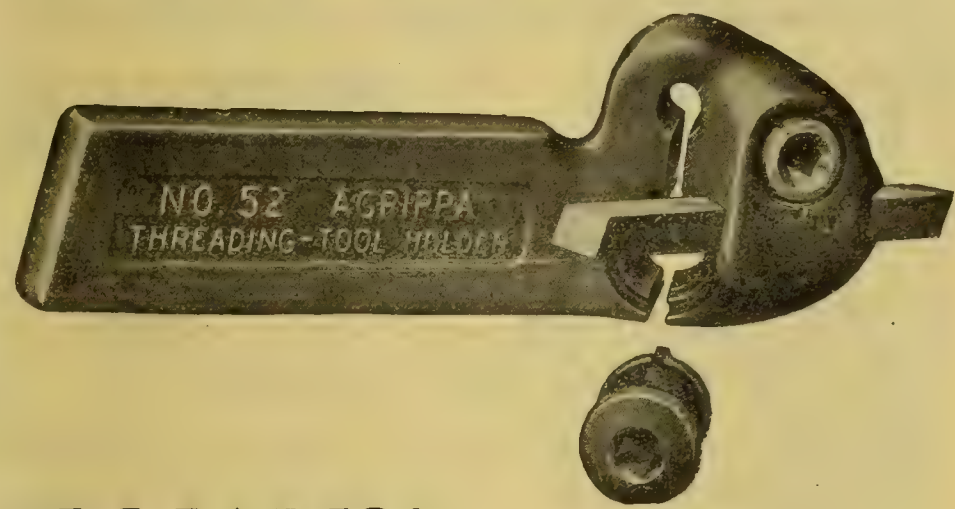
THE BURKE MACHINE TOOL CO.
Conneaut, Ohio, U.S.A.

THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

The Measure of Superiority of

The Threading Tool, with lockable spring head, will do roughing, finishing and threading, at one setting in the tool post



WILLIAMS'
"AGRIPPA"
TOOL HOLDERS

"THE HOLDERS THAT HOLD"

The Planing Tool has a serrated ring of improved steel, which affords unequaled variety and rapidity of adjustment. The ring is correctly hardened to resist the wear of the cutter. The body of the holder receives a very different heat treatment that prevents breakage

is the proportion in which they excel and endure

You can verify our GUARANTEE of their exceptional resistance, adjustment, interchangeability, usefulness, life and economy by exhaustively testing them on your own machines

THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

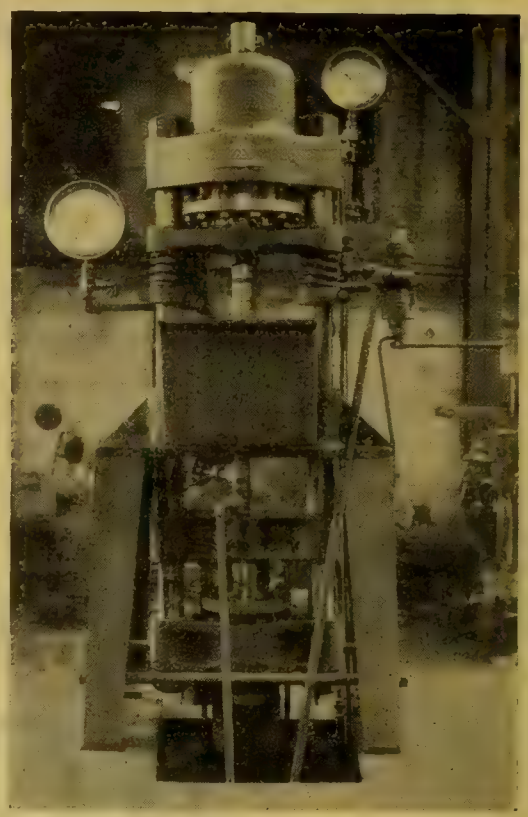
CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

METALWOOD

TEST PRESSES

Reg. U.S. Pat. Office

For Applying Internal Presses Physical Test to Shells



Hydraulic Testing Machine for applying internal pressure to 75-mm. U.S. Shell.

This Metalwood Hydraulic Testing Machine provides the most convenient and durable apparatus for the internal hydraulic test to which 75-mm. shells must be subjected.

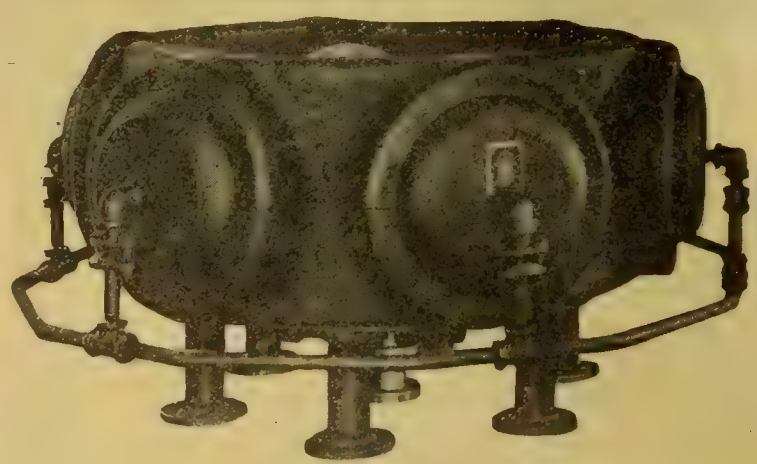
It enables more than two shells per minute to be filled, sealed, brought up to 18,500 lbs. pressure per sq. in. and held at this specified pressure for the required 15 seconds.

From 1,200 to 1,500 shells per 10-hour day are well within this perfected machine's capacity.

It combines with direct and intensified systems of operation based on a constant pressure of 1,500 lbs. per sq. in. in the accumulator reserve line.

You and every Canadian manufacturer of 75-mm. shells can profit by the experience of a number of the largest shell makers in the United States. Assuredly no other method is so simple, so speedy, so altogether efficient.

Write for all particulars about this Metalwood Hydraulic Testing Machine.



For banding 6" to 12" Shells.

Banding Presses

For Pressing in Copper Rotating Bands on Shells

Their sturdy construction allows them to stand up under severe service. This is the reason for their higher price. Such extra care, better material and expert workmanship are required that the results warrant the high cost.

They have six 11" semi-steel rams which move ½" or more if necessary. All rams returned by levers on plates with heavy Vanadium Steel Springs. Cylinder removable of alloy steel.

All fittings dropped forged steel. All parts under strain, alloy steel castings and forgings.

Built also in smaller size of same type for banding "pounder" to 6" shells.

We are Designers and Builders of High Speed Hydraulic and Special Machinery for all Purposes. Complete Hydraulic Installations.

Metalwood Manufacturing Company, Detroit, Michigan

Canadian Fairbanks-Morse Co., Ltd., Sales Representatives for Canada
R. E. Ellis Engineering Co., 621 Washington Blvd., Chicago, Ill., Sales Representatives. For Great Britain and Continent, address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

MURCHEY
TAPS AND DIES

PROBABLY you never heard a finer business story than the substantiated facts about Murchey Collapsing Taps, Hand-Sizing Taps and Automatic, Self-Opening Dies—what they have done, are doing, and why. In England, France and Russia, but little less than here at home, they have opened wise eyes to unthought-of possibilities. With their whole story before you—the exact facts in respect to production increases and unmatched economies attained—you will also conclude that Murchey Tools are simply indispensable to absolute accuracy and greatest profits.

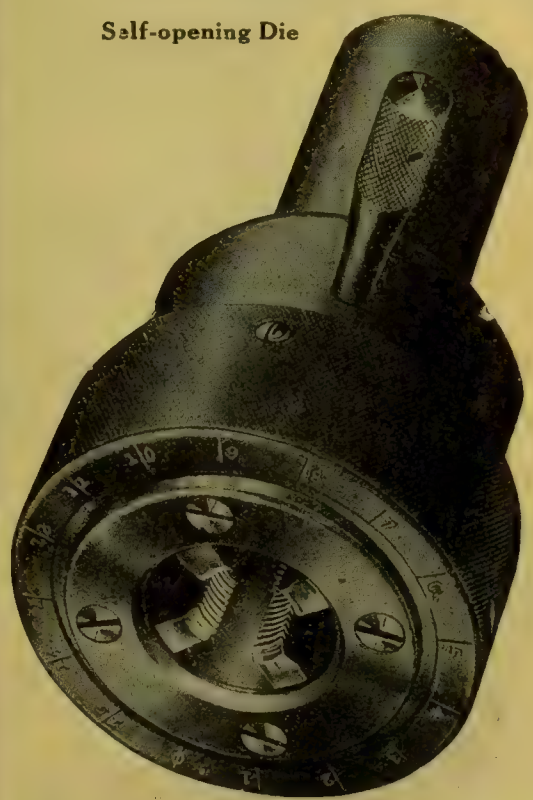
Write to-day for your copy.

Adjustable Tap

Handle 75-M/M Shells Just Once

Two Murchey Taps on your lathe completely finish this shell so that when it comes off the machine there is no more handling or re-sizing to do. Therefore

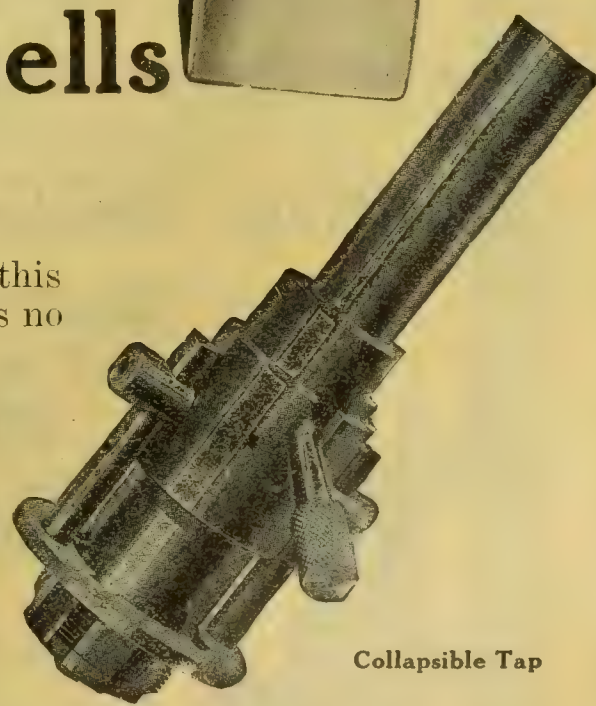
Self-opening Die



By using Murchey Collapsing and Adjustable Taps, you save two minutes or more on every 75-mm. Shell. Figure that in dollars for yourself!

Practically all the large plants of the United States are lining up with Collapsing Taps to thread the nose of this shell. No minute must be knowingly wasted.

Murchey Chasers are quickly adjusted to compensate for wear, and Murchey Adjustable Taps serve as long as ten solid Taps.



Collapsible Tap

Write at once for all particulars.

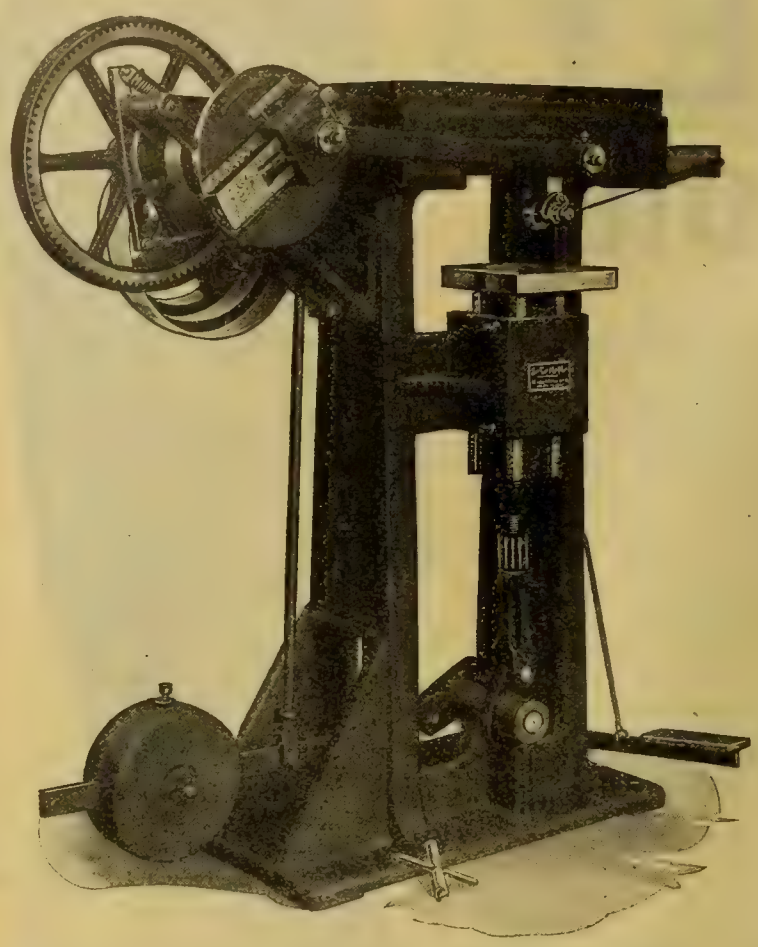
Murchey Machine & Tool Company

75 Porter Street, Detroit, Mich.

The Coats Machine Tool Company, Ltd., Caxton House, Westminster, London, S. W., England, Glasgow, Newcastle-on-Tyne, and Fenwick Freres & Company, 15 Rue Fenelon, Paris, France

THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS



DWIGHT SLATE TRADE MARK MARKING MACHINE

Do you want your trade mark to look good on your work? Do you want to

REDUCE THE COST OF YOUR MARKING; IMPROVE THE QUALITY

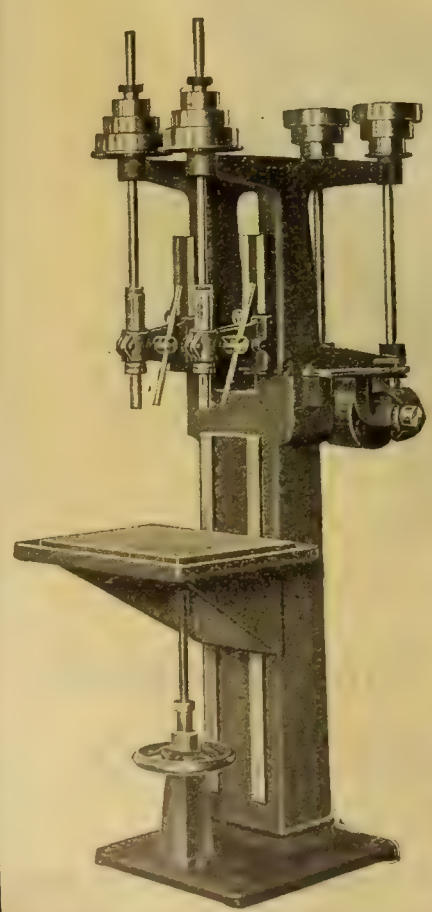
Just that is what a Dwight Slate Marking Machine will do for you. They are manufactured by us, and both hand and power types are especially designed for marking.

We also have a department devoted to steel lettering and die engraving.

SEND FOR FREE BOOK No. 4

Noble & Westbrook Mfg. Co.
18 Asylum Street
HARTFORD, CONN., U.S.A.

Sensitive Drilling Machines



Bench Drilling Machines with one to four spindles with ½" capacity

FLOOR DRILLING MACHINES WITH ONE TO SEVEN SPINDLES

Capacity ½" and ¾".

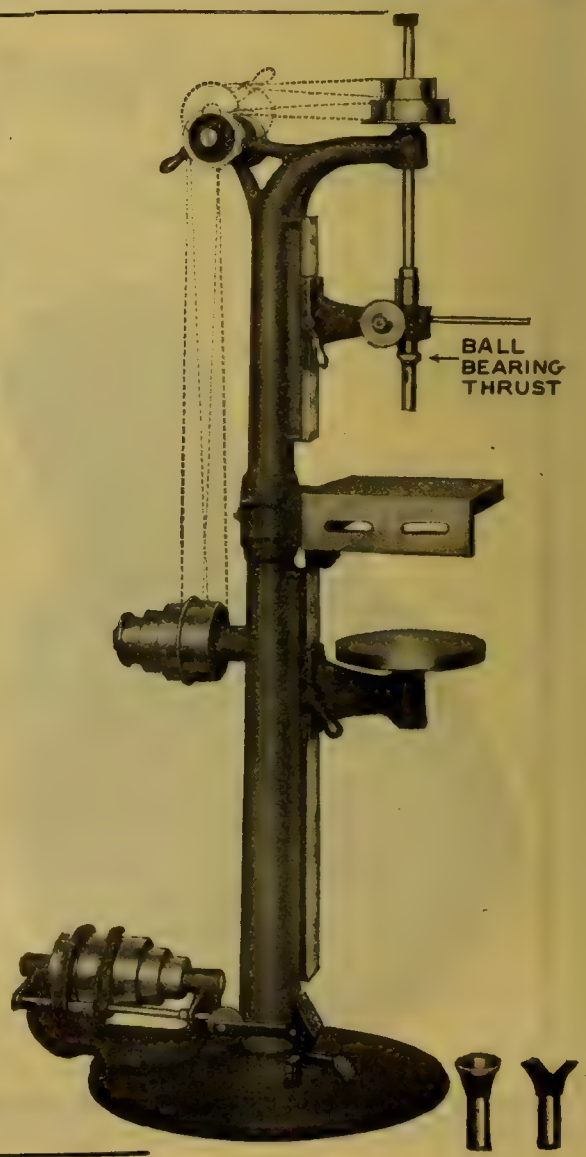
Power Feed on as many spindles as desired.

Tapping Attachment on as many spindles as desired.

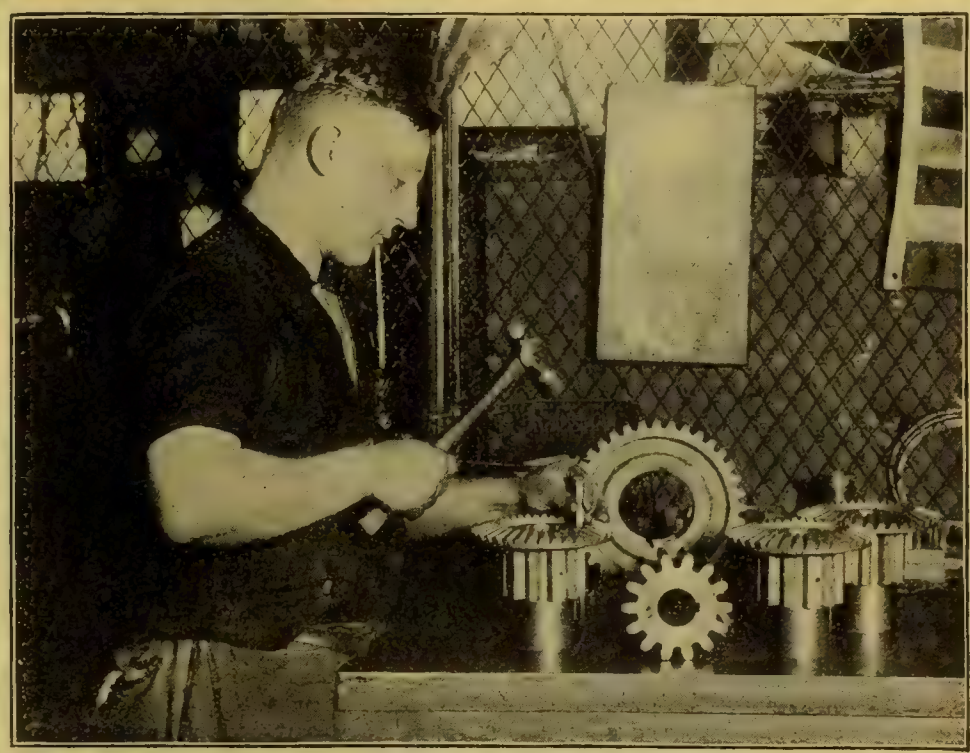
Oil Equipment fitted when desired.

In fact, write us and we can fit you out with most any combination to suit your requirements.

FRANCIS REED CO.
43 Hammond Street, Worcester, Mass.



MATTHEWS DIES AND STAMPS



The Importance of Marking Your Products

CLEAN-CUT characteristic markings give your products that individuality that enables the buyer to recognize them at a glance.

Your firm name and address stamped in a prominent place by MATTHEWS' Marking Devices will be permanently legible.

Serial numbers, part numbers, and drawing numbers enable replacements to be ordered intelligently.

Code numbers recording material lots, workmen, or machines can be used to trace cause of defects due to faulty material, careless workmanship, and inaccurate machining.

Parts can be numbered to facilitate distribution of material to proper departments and to provide quick identification on the assembly floor.

MATTHEWS Marking Devices have been used for years by many prominent concerns who will vouch for their dependability and worth.

A copy of our catalog will acquaint you with the complete line of MATTHEWS stamps, dies, stencils and marking devices.

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MATTHEWS A PRODUCT WORTH MARKING IS WORTH MARKING RIGHT MARKING DEVICES

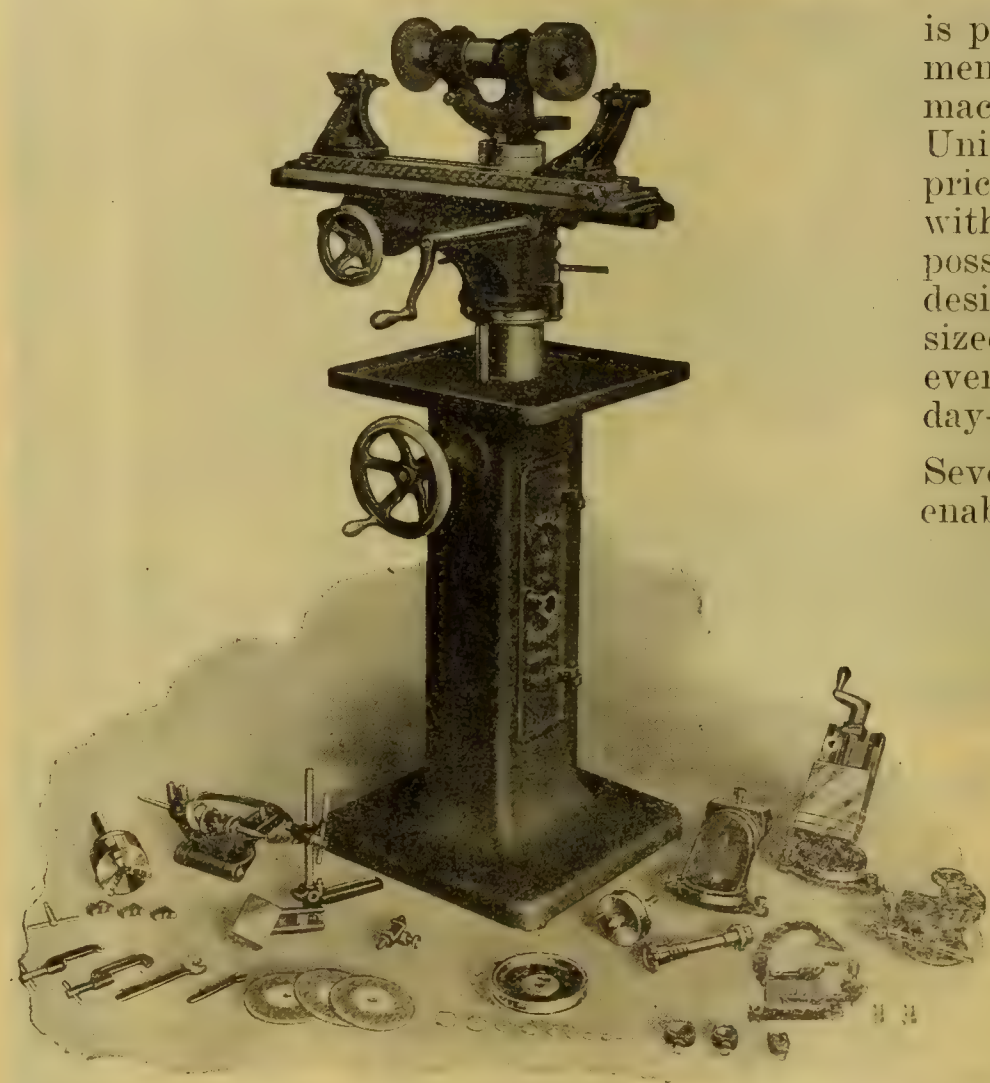
JAS. H. MATTHEWS & CO.

FORBES FIELD PITTSBURGH, PA.

THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED

CANADA'S DEPARTMENTAL HOUSE FOR MECHANICAL GOODS

Wells Universal Grinder



is pretty sure to meet your requirements at a lower cost than does the machine you are now using. This Universal Grinder is the only low-priced machine having a swivel table with vertical adjustment, making possible the use of cup wheels. It is designed for grinding all ordinary sized tools. At a low price your every want is filled by this practical day-after-day-job machine.

Seven combinations of attachments enable the machine to meet the needs of every particular job.

By means of the Wells Locking Device the table may be raised or lowered at any angle without changing position.

Then, too, you can find no higher grade machine with regard to workmanship, accuracy and finish.

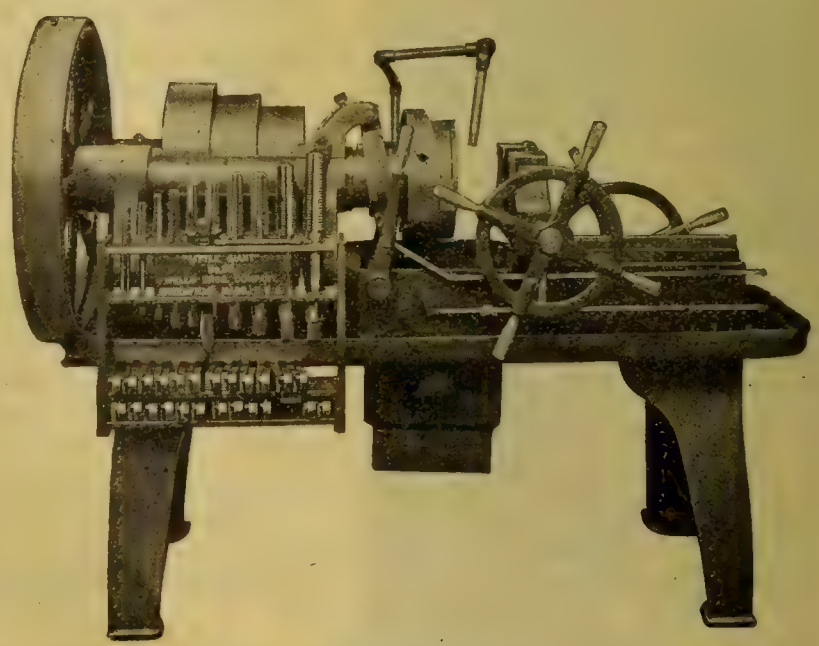
Little Giant

Threading Machines

are free from time-consuming operations. Any shop employee can set one up in a few minutes. They are easily operated. Any length of thread can be cut with the power machines as they are fitted with hollow spindles.

The Little Giant line includes a complete range, from the large machines with opening die heads to the smaller hand bench outfits with non-opening, adjustable die heads.

Ask for complete catalog.



Little Giant **Threading Machine with Automatic Opening Die Head**

WELLS BROTHERS COMPANY OF CANADA, LIMITED

GALT, ONTARIO

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THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

Wells No. 140 Hand Screw Machine

Wells Hand Screw Machines

If in the market for Hand Screw Machines, look into the Wells No. 140. Below are some of the specifications:

Length that can be turned, 5″.
Swing over ways, 11″.
Diameter of hole in spindle, 1⅛″.
Maximum capacity of push-out collet, ⅞″.
6 hole turret, diameter of holes 1″.
Fitted with wire stock feed attachment operated by hand lever at left.
Cross carriage, 6 hole turret, 2 tool post and forming tool holder, oil pump, etc.

Ask for full particulars, price, etc.

Wells Brothers Company of Canada, Limited

Galt, Ontario, Canada

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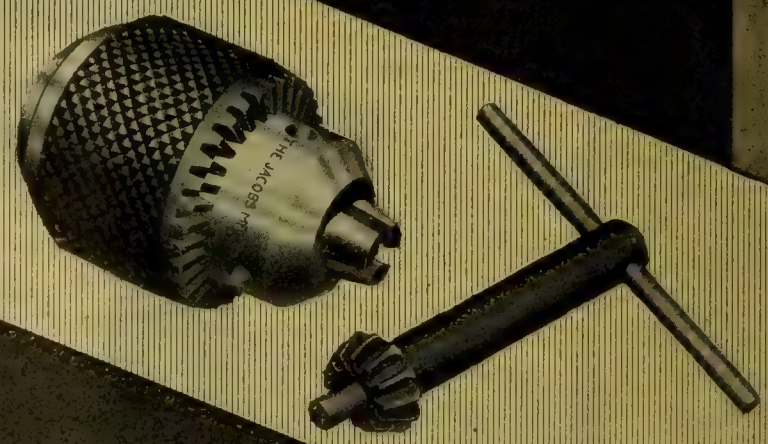
Jacobs IMPROVED Drill Chuck



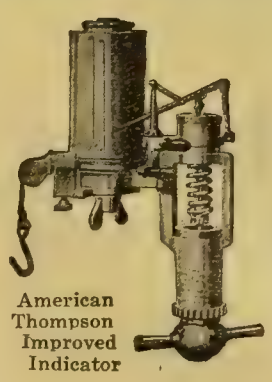
A Winner By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

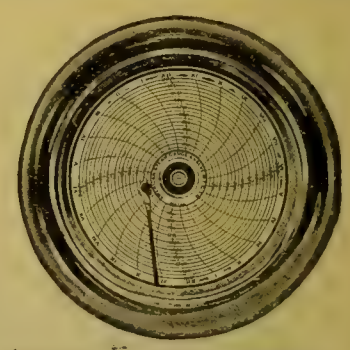
MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.

American Power Plant Specialties



American Thompson Improved Indicator

Uniformly accurate satisfactory service is assured the user of these well-known Power Plant Instruments which have been on the market for sixty-five years. Tell us your needs.



American Recording Gauge

AMERICAN STEAM GAUGE & VALVE MFG. COMPANY

BOSTON, MASS., U.S.A.

SOLE CANADIAN AGENTS

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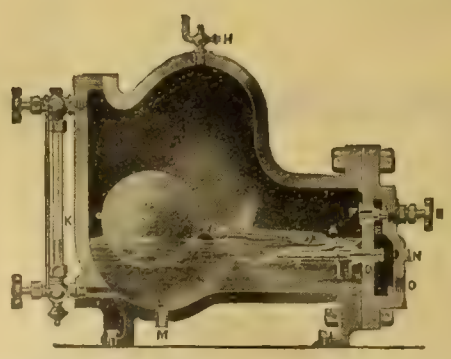
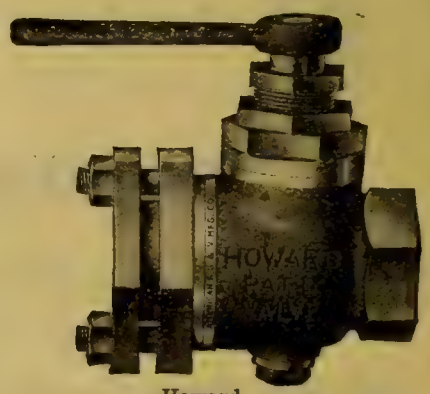


American Ideal Steam Trap

Brass Pop Valve

Iron Pop Valve

Whistle



Howard Improved Ball Valve

THE CANADIAN FAIRBANKS-MORSE COMPANY LIMITED

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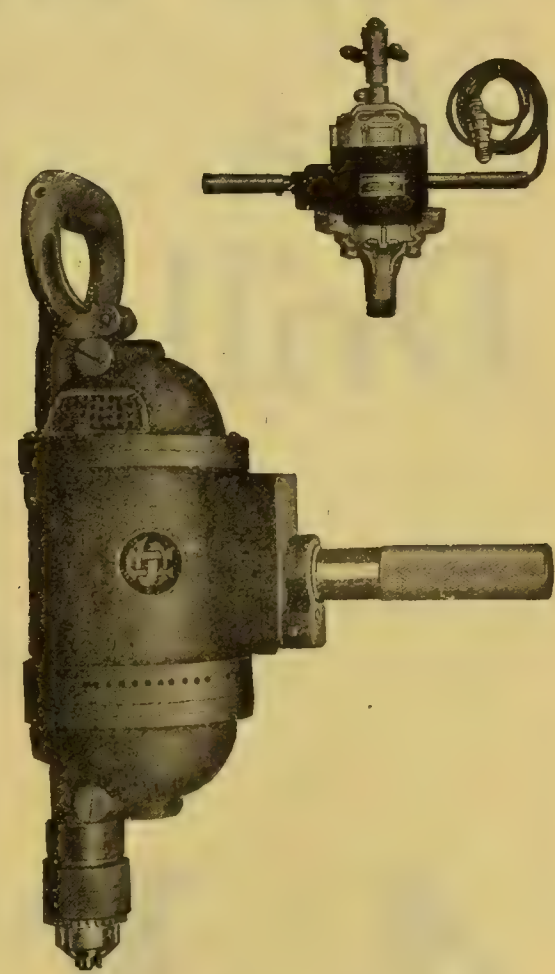
Drills
Grinders
Buffers
to the Job and

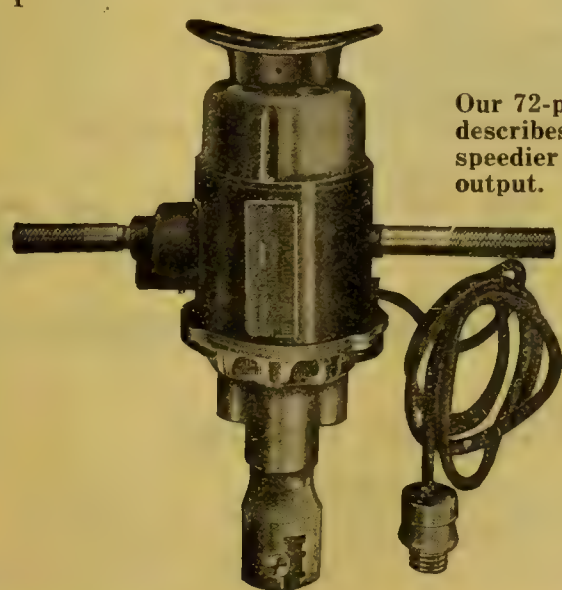
Save 4/5 the Time

For 25 years U.S. Portable Electrics have shortened labor and lengthened profits in hundreds of plants like yours. They've proved it's 4/5s faster to take the tool to the job—provided the tool's a U.S. Portable Electric always "right there" with a will to do.

One gathers a lot of practical knowledge in a quarter century of specialized work and study. This is clearly illustrated by the long-life service of U.S. Electrics, by the fool-proof and weather-proof improvements alone characterizing U.S. Electric Portable Tools.

Any lamp socket is the source of power. Any U.S. Electric Tool is a source of greater profit.





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Cincinnati, Ohio

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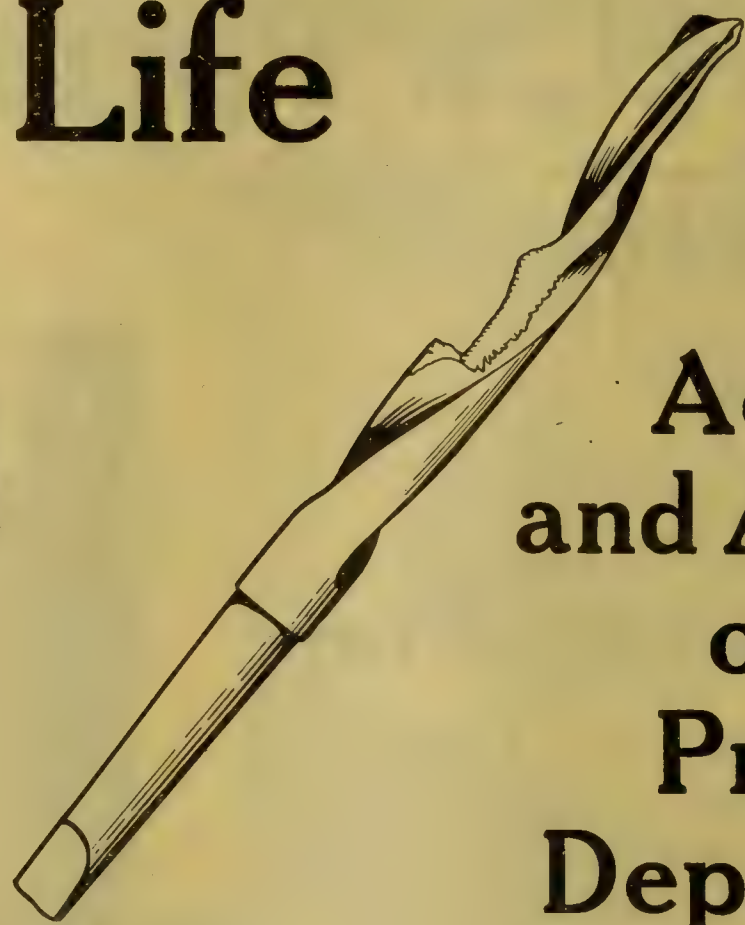
The Life of a Drill



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4 Factors

BULLETIN 301

Gives practical data on the use of Drills and the Worcester Drill Grinder.

THE WASHBURN SHOPS

of the WORCESTER POLYTECHNIC INSTITUTE, WORCESTER, MASS., U.S.A.

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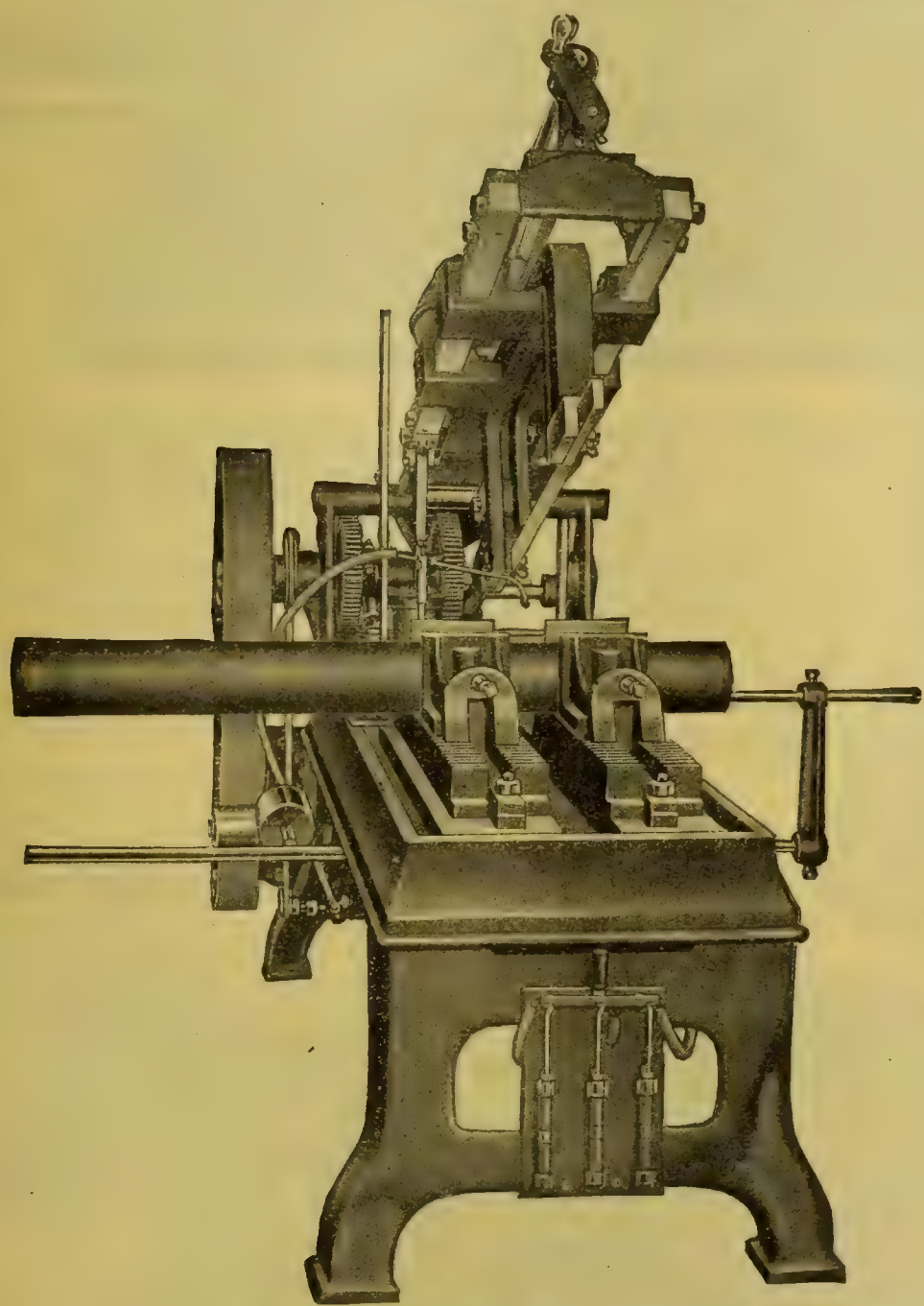
For Speed, Accuracy and Economy



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We have a printed list of Average Cutting Speeds which you might like to compare with the results you are getting. Send for this and general catalogue showing both the blades and machine. Also ask for names of some users in your vicinity.

Weight 9" Model, 1335 lbs.

A Real Machine Tool **Four Sizes, 6", 7", 9", 12x15"**

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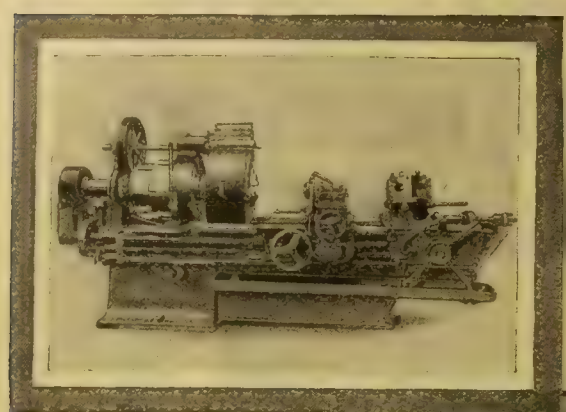
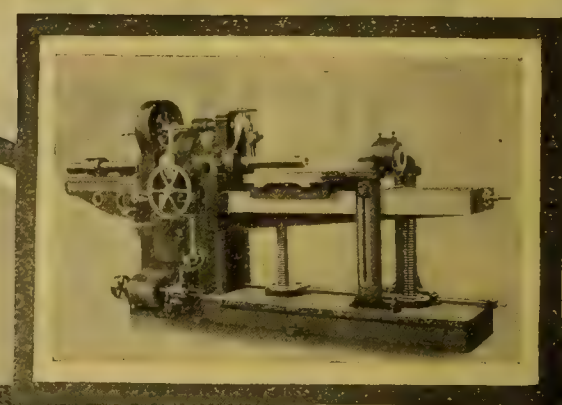
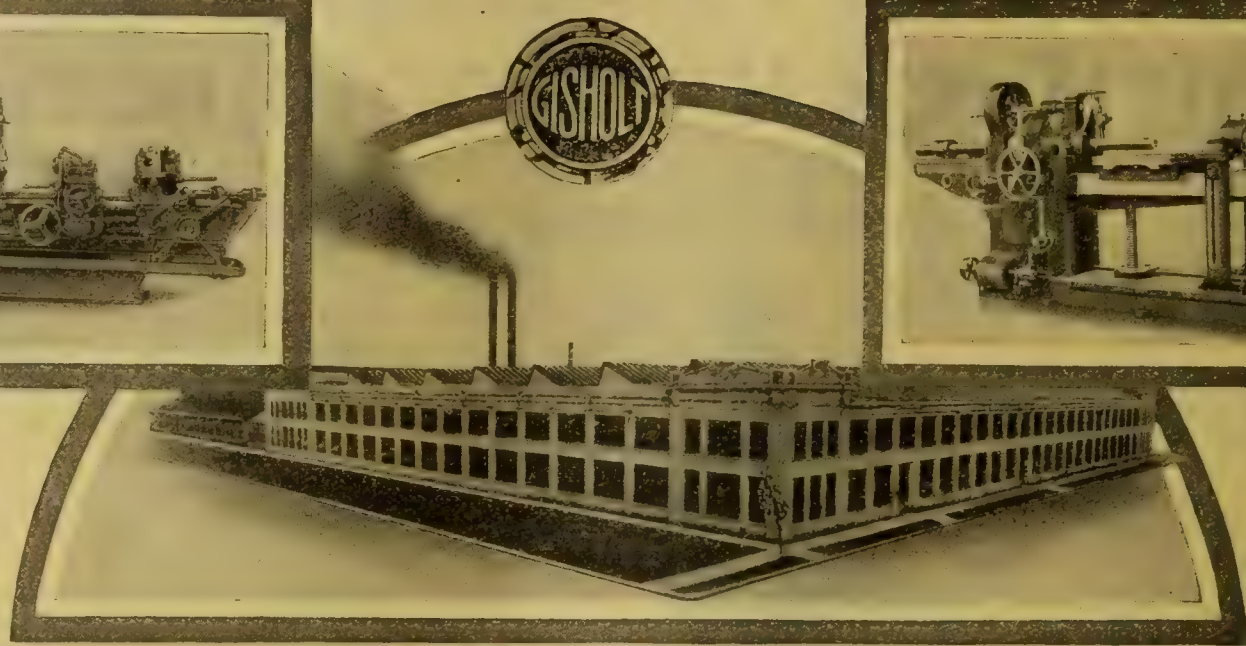
GISHOLT PRODUCTS





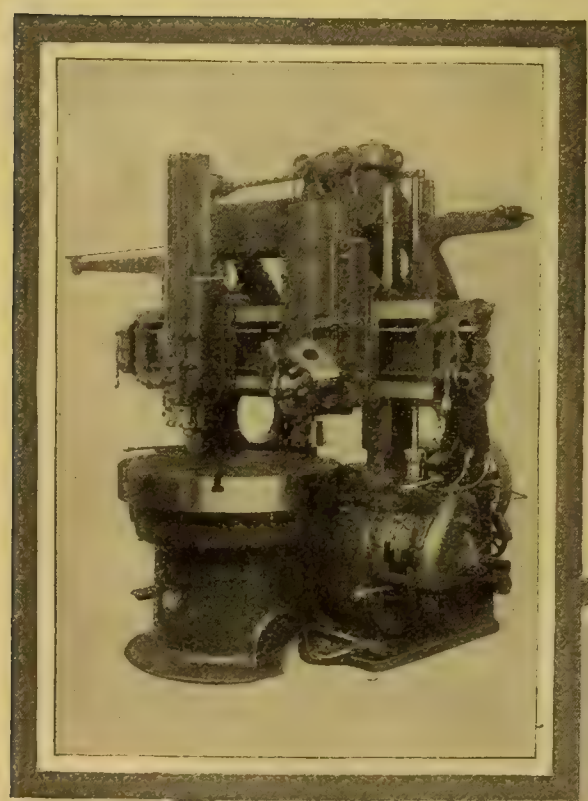


Main Works, Madison, Wis.

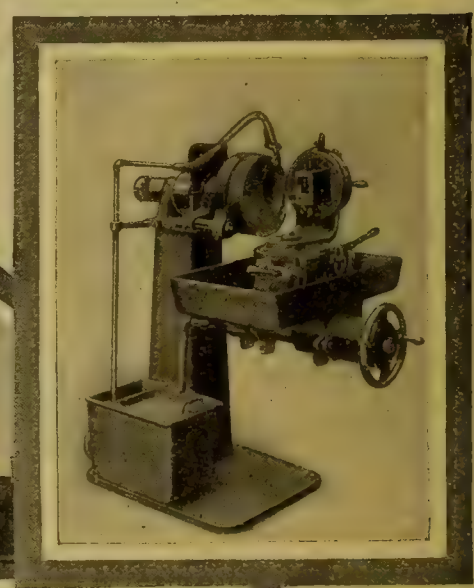
AT YOUR SERVICE

If you are going to manufacture any parts which involve the machining of circular or cylindrical work, such as castings, forgings, bar stock, etc., we offer our manufacturing equipment, engineering organization and experience for your assistance.

Let us get together.



Warren Works, Warren, Pa.



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GISHOLT MACHINE COMPANY

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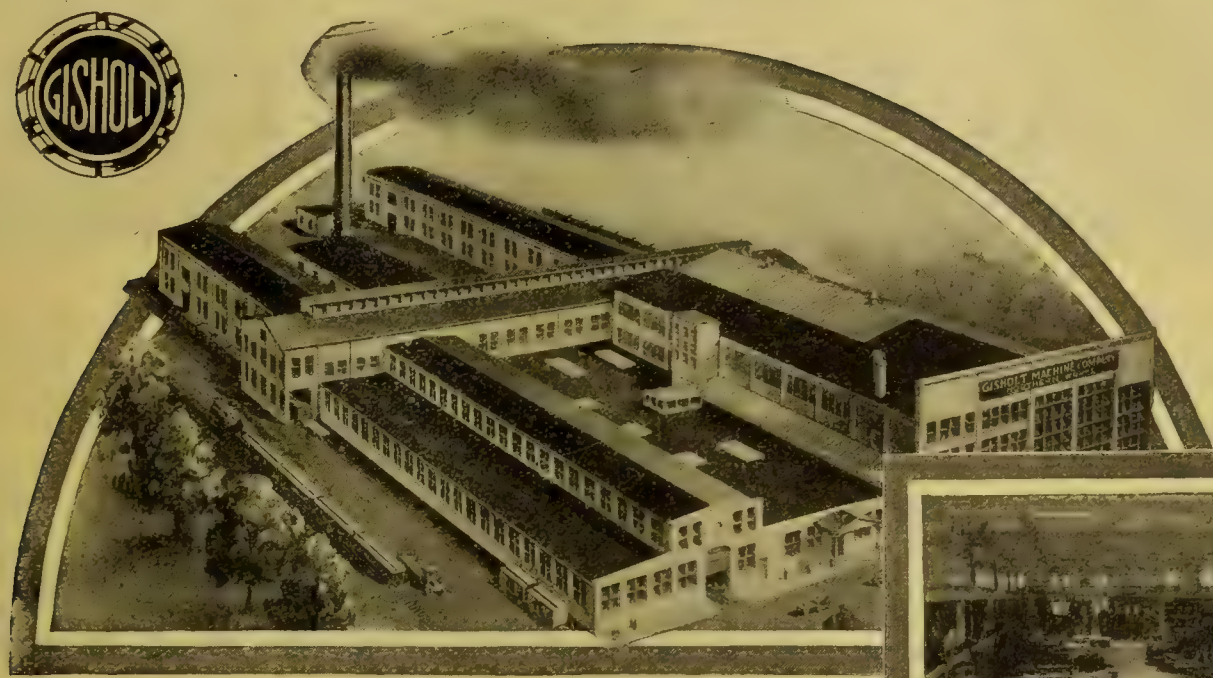
GISHOLT PLANTS



Northern Works, Madison, Wis.

AT YOUR SERVICE

Since the foundation of the Company, the Gisholt business has been governed by the Service idea. In following these high standards, the Gisholt Machine Company believes it can say to the purchaser that he will find back of its equipment a Service which is Co-operation with the purchaser in the highest sense of the word.

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The name Fairbanks stands the world over for originality, accuracy, and reliability. Fairbanks Scales are backed by nearly a century of success in Scale manufacture.

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and any Machinery or Supplies sold under the Fairbanks-Morse name are of the highest grade. They are designed and built to give maximum service.

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THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED

THE year now closing has been an eventful one in world affairs, nationally, internationally, politically, socially, industrially, and commercially. The grim spectre of war still tarries with us, not only so, but its nature, intensity, and territorial scope give as yet little evidence of having reached their zenith. We in Canada during the past year have had brought home to us more fully than ever before the realization of our part in the gigantic struggle, not in one or a few ways, but in every conceivable direction, and it may well be that in the coming twelve months a still keener sense of our participation will be given practical demonstration.

Intensified War Effort

We have accomplished much during the year to be proud of, although on all points we have not been as united as we might or should have been. In the matter of men for the fighting line, who would uphold not only our national and Empire honor, but step into the gaps left by our sick, wounded, and dead, we have replaced voluntary enlistment by compulsory service, although not a little heartburning is abroad in consequence. That a change had become both necessary and urgent all students of the war situation are unanimously agreed.

Our most outstanding national achievements have been, however, the flotation of a huge domestic Victory Loan and the election to power of a Union Government, with a mandate to utilize every resource of our Dominion in a legitimate manner to help bring the war to a speedy termination.

Importation Difficulties

The entry of the United States into the conflict on the side of the Allies may be reckoned as the big international event of the year, the Russian debacle notwithstanding, and, while inconveniences have arisen as a result of the former, in the matter of materials of construction for metal-working industries, large quantities of which we have always been obliged to import from the States, it must be admitted that the benefits generally accruing to the former Allies, ourselves included, easily offset any disabilities under which we labor meantime, and which may not improbably be removed, just as soon as the American war machine gets properly into action, which is no far-off event.

Ring out, wild bells, to the wild sky,
The flying cloud, the frosty light;
The year is dying in the night;
Ring out, wild bells, and let him die.

Ring out old shapes of foul disease;
Ring out the narrowing lust of gold;
Ring out the thousand wars of old,
Ring in the thousand years of peace.

Machine Tool Activity

The activity in machine tools this year has again been due almost entirely to the munitions industry but business has not been quite so good as it was last year. The reason is easily explained. Last year was an extraordinarily busy one in the machine tool business, because so many shell plants had to be equipped to produce the various sizes of shells then required. For the first three or four months of this year the expenditure on munitions was practically as heavy as during the latter part of 1916, but later on fewer contracts were given out and for some months only about $30,000,000 a month has been expended as against $100,000,000 formerly.

Furthermore, fewer plants have been equipped this year as so much had been done in this direction previously. If, however, a comparison is made with conditions in normal times, the volume of business this year has been remarkably good, more particularly during the first five or six months. Since that time there has been a gradual decline in demand for machine tools for munitions, but an improvement in demand for machinery for general purposes and also for shipbuilding yards.

Shipbuilding Tools

In regard to shipbuilding, the demand for machinery for this industry hardly came up to expectation. For one reason practically all the new yards were established for building wooden ships and existing plants building steel ships did not require much new equipment. The shipbuilding activity, however, has been a source of some business and practically cleaned up the market of a certain class of tool not in demand at the time for any other purpose.

Machine tool builders in Canada have had another satisfactory year, not as good as 1916, but better perhaps than many anticipated. There was a falling off in business during the summer, but recent developments in the trade have considerably improved the outlook and it is not unlikely that next year will be a prosperous one for the industry. Developments in the United States have opened up an opportunity for Canadian firms to take up new lines and specialize more than they have done in the past. If some of our leading concerns embrace this opportunity it should be a lasting benefit to themselves and to the industry generally. All indications point to the increasing difficulty in obtaining machinery from the United States which should be sufficient inducement to develop new lines.

Tools for Shellmaking

Builders of special tools for shell production have had a good year on the whole. During the last five or six months they have not been quite so busy but quite recently business improved and when the new shell contracts are placed they will benefit accordingly. The war has undoubtedly been beneficial to the machine tool industry, apart altogether from the increased business, in that it has been responsible for the development of new machines, and improved methods while workmanship has been correspondingly more accurate. The financial position of the concerns has also been considerably strengthened, enabling them to improve their plants and develop new lines.

Conditions in the United States have a distinct bearing on the situation of the trade in Canada, owing to the number of machine tools of various kinds that have been imported. Prior to the United States entering the war, the situation in regard to deliveries was not particularly satisfactory and prices were decidedly high. Some lines were easier to obtain than others, but as a rule deliveries were backward, particularly on tool room equipment; which was at a premium. Since that time the situation has been growing worse and worse and would have been serious if the demand in Canada had been as heavy as during 1916. As it was, the difficulty in obtaining machine tools was bad

enough, but became worse as the activity in the States increased.

Early in October the Exports Administrative Board at Washington prohibited the exportation of certain tools, except under license, the list issued at the time including vertical boring mills 42-inches and larger; engine lathes with 42 inches swing and larger, and planers 36-inches wide and larger. Since the embargo was put in effect it has become more difficult to obtain licenses even for machinery for munitions plants.

The demand for machine tools of all kinds in the States at the present time is such that practically the entire output is required for domestic use. Early in November the Dominion Government issued an order prohibiting the exportation of plant, machinery, and equipment, of all kinds necessary for the production of munitions, except under license. Needless to say it is practically impossible to obtain a license as the equipment is required in Canada.

For a time previous to this order being issued, as small firms had completed their contracts and the plants were standing idle, the necessity of the export prohibition was obvious particularly in view of fact that the Imperial Munitions Board contemplated placing further orders for shells when necessary financing could be arranged. About this time the American Government distributed orders for 75 m.m. shells among about a dozen of the largest concerns who had been making shrapnel. This helped to keep the ball rolling as some 6-inch shell for the British Government had been given out previously. It is fully expected that early in 1918 the Imperial Munitions Board will place large contracts for 6-inch, 4.5-inch and shrapnel all of which will benefit the machine tool industry as a whole,

Shipbuilding and Marine Engineering Prominent

Shipbuilding and marine engineering as factors in Canadian industrial development and progress have come into the spotlight during the year, both wood and steel vessel construction figuring prominently.

Shell-making, although active, has been less evident compared with the years 1915 and 1916; nevertheless many metal-working plants continue to find a more or less profitable outlet for their operations in that direction.

The completion of the Quebec Bridge in September stamps that structure as one of the world's great engineering achievements, and gives its designers and builders, the St. Lawrence Bridge Co., an honored place in world craftsmanship.

Tragedies of the Year

Tragedy, as might be expected, has not been lacking in our national experience and, in its train, bereavement. Our sick and maimed are being returned from the far-flung battle front in large numbers, and cables on ocean's bottom tell of our sons and brothers who have made the supreme sacrifice. On sea, on land, and in air, lives are being spent both in action and preparatory thereto, which leads us to mention the overwhelming disaster which overtook the City of Halifax in the closing weeks of the year.

From every point of view its occurrence is deeply regrettable, and whether by accident or design, the latter of which we see no reason to credit, such a war-time happening within our borders should be the means of stimulating a closer supervision of the competency of the men entrusted with ship and railroad transportation movements, as indeed of every manner of enterprise likely to menace the life of the individual or cause destruction of valuable property of any kind.

Public Works Curtailed

Public works have featured the year's activities little, expenditures of that nature being almost wholly eliminated. Among the prominent enterprises discontinued for the period of the war at least are those of the new Welland Canal and the Hudson Bay Railway and Terminal at Le Pas, Man. Dock and harbor work has been cut down to the irreducible minimum, and in some cases suspended altogether. Railroad transportation facilities, improvement and enlargement, and manufacturing plant extensions have been conspicuously absent, aside from those required for carrying out the munitions or shipbuilding programmes.

Iron, steel and metals have as usual a special department in this issue, the charts and accompanying text matter demonstrating the price movements of the more generally used commodities entering into machine and general engineering construction.

Season of Navigation

The season of navigation on our lakes, rivers, and ocean shores has again been a profitable one, both as to passengers and freight carried. More Great Lakes vessels have been transferred to ocean and ocean coast trade. The high freight rates prevailing, due to deep sea tonnage shortage, have, of course, made the transfer easily worth while, the added risks notwithstanding.

Steel and wood vessel construction, also marine propelling and auxiliary engine building are featured in another department of this issue, sufficient, therefore, to note here that the twin industries of shipbuilding and marine engineering have at no time in Canada's history been so active, nor has the immediate and future outlook warranted an equal measure of optimism.

Power development, municipal enterprise and building may be said to warrant their activities again being classed as well below normal. Munitions production and shipbuilding during the year have continued to make large demands on available sources of power supply, and perhaps in Ontario more than in any other province of the Dominion has the electrical energy procurable become dangerously inadequate. Development of water power resources is, however, being steadily prosecuted, and expectations are that before the winter of 1918 is upon us a reserve of hydro-electric power will again be registered.

Labor Market

The labor situation has been more or less acute all year, and will not, while the war lasts, show any large measure of easement. Skilled labor shortage is perhaps most keenly felt in the spheres of shipbuilding and marine engineering, for while unskilled male and female help have been successfully requisitioned in munitions making, neither have as yet shown aptitude to tackle the work of relieving the shipping shortage.

The value of the telephone to commerce and industry was given formal appreciation on October 24 of this year, when a memorial was unveiled at Brantford, Ont., by His Excellency the Duke of Devonshire, Governor-General of Canada, to commemorate the invention of the instrument in that city by Dr. Alexander Graham Bell in 1874. The venerable gentleman, we are pleased to say, was present and participated in the interesting function.

Considering the prevailing shortage of "bottoms," a considerable export business has been done by many Canadian manufacturers, the commodities ranging all the way up to such weighty units as railroad box cars and locomotives.

Shipbuilding in Reinforced Concrete

Shipbuilding in reinforced concrete has been undertaken on a moderate scale in Montreal during the year, a small steam-driven vessel having been constructed and launched there. The shortage of shipping has stimulated activity in this direction, and while the effort has been restricted for the most part to craft of the barge type for canal and river service, there is little doubt that, with the prolongation of the war and the continuance of the submarine menace, some attempt will be made to create a class of vessel more akin to that of the well-known standard steel ocean-going freighter.

Fuel Shortage

A shortage of fuel for both domestic and manufacturing purposes has prevailed all through the year, and in these closing weeks the situation has developed an acuteness amounting almost to a menace. Canada is largely dependent on the United States for its fuel supply, hence she suffers from the restrictions placed on the shipment of coal between points in the two countries. A pleasing feature of the situation, however, is the fact that we are not being discriminated against in any way; as a consequence, just as soon as the congestion on American railroads can be relieved we may hope to receive again the fullest service possible.

The United States is giving every indication of its willingness to meet Canada at least half-way as regards international business relations, and we, through responsible Government at Ottawa, should be at once willing and anxious to do likewise.

Aero-Plane Construction in Canada

Our Newest Industry

Staff Article

That aeroplane building in Canada has reached a stage which entitles it to be considered a staple industry will be evident to the reader of the following article. It is indeed a tribute to the manufacturing ability of Canadians that under circumstances of great urgency they should have undertaken successfully the manufacture of such widely varying items as shells, ships and skyboats.

DESPITE the paucity of official bulletins and communications on the subject of aviators' work at the front, sufficient facts have filtered through to show that Canadian recruits receive a high valuation from the Imperial authorities in regard to the peculiar qualifications necessary for successful work in this branch of the service. Coolness, daring, intrepidity, physical fitness and courage are amongst the essential requirements.

Canada a Training Ground

While the final stages of training and instruction preparatory to actual participation in fighting must, in the nature of things, be received as near the scene of hostilities as convenient, it has been possible and in some respects desirable to impart the rudiments and groundwork of flying in the native land of the aviator. Nature has so favored Canada as a training ground that not only are her own sons trained in large numbers, but during the past year large numbers of United States aviators sojourned at the different camps here, the proximity of the two countries rendering any change of venue comparatively void of influence on the final quality of material turned out.

The desirability of producing machines as well as men in this country was recognized some time ago, public interest in the matter being stimulated by the occasional donation of machines by individuals, localities or towns. That aeroplane building in Canada has reached a stage which entitles it to be considered as a staple industry will be evident to the reader from the photographs reproduced herewith.

Naturally Favored

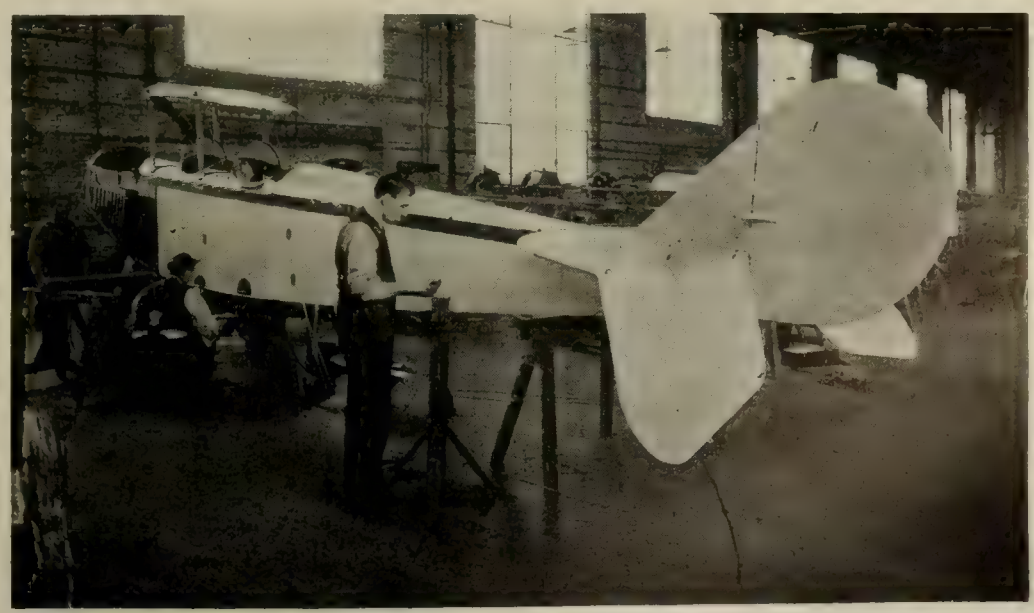
While our Southern neighbor has had considerable advantage in the matter of material and manufacturing resources with regard to the building of engines and mechanical accessories, the all important problems of wood and fabric supplies are more satisfactorily met with home products. When to this is added the experience being gained by hundreds of workers, and the problems which have had to be solved by the different organizations employed, the certainty of the Dominion enhancing its reputation as an aviator's land in the future seems more than assured.

It is indeed a tribute to the manufacturing versatility and ability of Canadians that, possessed of limited knowledge and resources a few short years ago, they should have successfully undertaken, under circumstances of great urgency, such widely varying items as shells, ships and skyboats. And yet a visit to a typical aeroplane factory reveals nothing mysterious in the way of methods and devices; rather does one find an industry into which the best of several others has been gathered—men, machines and minds—all directing their efforts to perfection in design and manufacture as in few other industries.

Plant Personnel

Metallurgists and chemists — toolmakers, machinists, pressworkers—welders and heat treaters—lumber experts, woodworkers, assemblers — seamstresses, fabric workers, varnishers—all these expert operators, many of them women, are engaged in the newest and most interesting industry.

Safety, so far as it is humanly possible to insure such under circumstances, is the first consideration, and the visitor to an aeroplane factory is, therefore, not surprised at the extreme



AEROPLANE FUSELAGE IN COURSE OF FINAL ASSEMBLY. CONTROL WIRES BEING CONNECTED UP AND BODY AND ENGINE DETAILS COMPLETED.

plant in operation. I believe, however, that as time goes on this question will automatically settle itself.

I feel that the coming year is bound to be one of general industrial activity and prosperity.

BANK PRESIDENT'S VIEWPOINT

By Sir Vincent Meredith.

BUSINESS conditions in Canada continue buoyant. There is no recession in the great wave of industrial and commercial activity of the past few years, and trade in all lines, including what are generally known as luxuries, is highly prosperous. There is little or no movement in real estate, and building operations are restricted. Labor is fully employed at high wages, and there continues to be a deficiency in the supply.

In the ten-year period, 1905 to 1915, the amount of capital employed in manufacturing industries in Canada increased from $846,585,000 to $1,994,103,000, or by 135 per cent., while the value of the products of these establishments rose from $718,352,000 to $1,407,000,000, a gain of 96 per cent. The output of munition plants has doubtless been a factor, though it is obvious that the industries of Canada are steadily enlarging the volume of their business and finding new markets.

The Readjustment Period

I am hopeful of prosperous business conditions being continued for some time during the readjustment period following the war. In this connection the desirability of the extension of Canadian trade in all directions during the period of post-bellum reconstruction, either through commercial intelligence agents, acting directly for the Government or a board approved by the Government, should not be lost sight of.

No one can tell how long the war will last. The imperative need, therefore, for efficiency and increased production, together with economies in all public and private expenditure is obvious and cannot be repeated too often or urged too strongly.

The unbounded prosperity of Canada, referred to a year ago, is fully reflected by the abnormal trade figures. In the seven months to October 31 last the aggregate value of imports and exports was $1,586,616,000, or $273,000,000 more than in the corresponding period of the preceding year. Eliminating the item of coin and bullion, as well as that of foreign produce in transit through Canada, our foreign trade was $1,550,000,000 for the period as compared with $1,084,000 last year, an increase of 50 per cent.

Our country is one of the most productive in the world. Our gold holdings per capita almost equal those of the United States. Our natural resources are unbounded and our credit is irreproachable. There are no doubt difficulties and anxieties ahead which we shall still have to face, but I think we may look forward with confidence to providing without undue strain for the burden of our patriotic endeavor.

BANK MANAGER'S VIEWPOINT

By Sir Frederick Williams-Taylor.

ABOVE all other events the entry of the United States of America into the war stands paramount and bears upon the Canadian economic and banking position with a force the effect of which is only now commencing to be felt.

Shortly after the outbreak of war Wall Street, as every one knows, took the place of the London market for our country's public loans, and continued in that place until a few months ago. Now the influx of American capital is scanty, the inflow of borrowed money from the United States—which we had come to look upon as a matter of course—is suspended, it may be until the end of the war, and Canada is "on her own."

Canada On Her Own Resources

In other words, little money is coming into Canada except in payment of exports, and, therefore, for the first time since Confederation the Dominion is cast upon her own financial resources. By some this will be regarded too seriously, by others not seriously enough. Actually, the stoppage will have far-reaching consequences. On the one hand, industrial development will be checked, but on the other hand the inability to borrow may prove a blessing in disguise, once we have adjusted our affairs to the changed conditions.

It is surely well for us to learn to do without financial assistance, especially as the country at large already has a debt abroad, the interest on which runs into the great sum of about $500,000 per day. So long as the stream of money flowing into the country was uninterrupted it was difficult, if not impossible, for our people to see the necessity for economy. Personal extravagance is still conspicuous in many directions, but presently economy will become general—from high motives, we hope; if not, then from stern necessity.

Borrowings Necessary for Development

The development of Canada could never have reached its present stage but for moneys borrowed abroad, and, therefore, Canada is grateful, first, to Great Britain, and, secondly, to the United States, for the help they have thus contributed to the remarkable progress which our country has made, particularly during the past twenty years.

Our misuse of borrowed money is in great measure responsible for some of the chief evils that have come upon us. I refer especially to the inflation which before the war started the increase in the cost of living, and to the creation of debt unrepresented by productive investment. Now that the inflow of money is suspended we must pull ourselves together, practise economy, till the soil, produce to a greater extent the manufactured goods we require for our own use, until in the fullness of time we emerge a wiser and a better people in a sounder economic position.

Having learned our lesson, this is clearly no time for us to brood over the errors of the past score of years, but rather to take stock of our resources, and with stout hearts to set about the work of conservation and rehabilitation. We are the fortunate possessors of a splendid, healthful and beautiful country, abounding in natural wealth; and, what is equally important, we can properly claim to be a virile, industrious and ambitious people.

PROGRESS IN DRY DOCKS AND MARINE RAILWAYS

DURING the past two decades there has been great progress made in the engineering of dry docks, and particularly in the three general types, the graving or basin dry dock, floating dry dock, and the marine railway. In the first of these, with the exception of the introduction of modern electric motors, their operation is practically the same. This device has been a welcome addition to the pumping equipment. Another improvement is the adoption of the bilge block system of supporting vessels, which had its first real impetus in 1892, when the United States Government adopted the system of equipping battleships with docking keels under the bilges for supporting the ship by this means instead of relying on side shores. So far as the size of these docks is concerned, they are being built to-day from 1,000 to 1,200 feet long, where a score of years ago a 600-foot dock was considered a large one.

All-Steel Floating Dry Docks

In 1897 the Clark & Stanfield Co. had built a 10-000-ton all-steel floating dry dock at Havana, Cuba, which was considered the last word in that type. In 1900 the first all-steel floating dry dock in America was built. This was of the Clark & Stanfield type, and its capacity was 18,000 tons. It was constructed for the United States Government. Great Britain has adopted floating dry docks for her larger war vessels, having installed two such of 32,000 tons capacity each at its most important naval stations. The German Government has an even larger floating dry dock at Kiel, the capacity of which is 40,000 tons, while at Hamburg there is one of 35,000 tons. The largest floating dry dock in America has a lifting capacity of 25,000 tons.

Marine Railways

During the past twenty years the marine railway has also come into prominence, and while there were marine railways previous to 1896 they were of a crude type, both in Europe and in this country. The type that has been most highly developed in this and other countries is the Crandall railway, named for its originator. In 1896 there were three of these railways in the United States of from 1,200 to 2,000 tons capacity and two in Canada of 2,500 tons, in addition to a number of smaller ones. In 1900 a 4,000-ton Crandal railway was built, and now there are many with a capacity of from 3,000 to 5,000 tons. In the latter type, equipped with modern electric machinery, it is possible to pick up a 5,000-ton vessel practically as she floats in the water and haul her out in less than half an hour.

Obituary Record of Canadian Business and Public Men

The year 1917 bears away on its bosom at least its fair share of our business and public men—young and old, although due to the sacrifice exacted by war service, we are perhaps poorer than otherwise, especially as regards the former. Whatever the circumstances, the record of their passing to the Shadow-Land merits specific reference being made to their place and part in the upbuilding of our national fabric, industrial and otherwise.

James P. Wood, a member of the firm of Wood Bros., foundry, died at Chatham, Ont., on March 16, aged 45.

Capt. William Matthews, a well-known mariner of the Great Lakes, died at Cobourg, Ont., on July 17, aged 69.

William Sherman Smith, harbor master at Dalhousie, N.B., for over twenty years, died on January 4, aged 65.

Thomas J. Gerry who for over twenty-five years was connected with the Dodge Manufacturing Co., Toronto, as traveller died at his home there early in April.

Frank Paul, founder of the Belding, Paul Co., Montreal, now known as the Belding-Paul-Corticelli Co., silk manufacturers, died on Jan. 23, aged 70.

Martin N. Todd, president of the G. P. and H. Railway and general manager of the L. E. & N. Railway, died suddenly at his home in Galt, Ont., on Aug. 29, aged 58.

Lieut. Hugh A. Kennedy, eldest son of Colin R. Kennedy, vice-president and manager of the A. R. Williams Machinery Co., of Vancouver, was killed in action in France on Nov. 16.

John Grundy, engineer at the works of the Canada Carriage Co., Brockville, Ont., was accidentally killed on Jan. 1. in the performance of his duties. Deceased was 65 years of age.

George Forest McKay died at New Glasgow, N.S., on March 13, at the age of 82 years. Mr. McKay assisted in the founding of the Nova Scotia Steel & Coal Co., and was its oldest director.

O. M. Hennessy, manager of the Abitibi Pulp and Paper Co., was drowned in July in the Couchiching Rapids, near Lake Abitibi. He was appointed manager of the company six years ago when that concern was organized.

Capt. Joseph A. Tymon, one of the best known of inland water sailors, and for many years commander of a Toronto Ferry Co. steamer, passed away on June 5 at his residence, 227 Logan Avenue, Toronto, aged 50.

Corp. Robert John Dawson, of the P.P.C.L.I., was killed in action in March. He went overseas with the 3rd University Company. Prior to enlisting he was salesman for the Canadian Fairbanks-Morse Co., Front Street, Toronto.

J. A. Sanderson, a prominent business man of Brantford, Ont., died at his home in that town on March 14. The deceased was 60 years of age. He was president of the Brantford Carriage Co., and a director of the Cockshutt Plow Co.

Capt. James Murray, one of the oldest captains on the lakes, passed away on February 21, at Clayton, N.Y. The deceased was born in Ireland, but came to Canada at an early age and went into the marine business. For many years he was known in marine circles as one of the most capable officers of the Montreal Transportation Co.

William Lyon Mackenzie, bridge engineer of the C.N.R., died at his home in Winnipeg on Feb. 8, at the age of 57 years. Mr. Mackenzie formerly was connected with the C.P.R. and Grand Trunk Railways.

Thomas Peck, president of the Peck Rolling Mills, Montreal, died at Kennebunk Beach, Me., on Sept. 5, aged 75. Mr. Peck had been associated with the steel business all his life and had been president of the concern for the last five years.

Capt. David Sylvester, well known on the Great Lakes, died in Toronto on July 18. Capt. Sylvester was born in Scarborough, Ont., in 1838. For some years he conducted a commission and brokerage business at Church Street Wharf, Toronto.

Capt. Henry Oldenburg, who for almost half a century had sailed the waters of Detroit River, and for the past twenty years has been in command of the Grand Trunk car ferry, Lansdowne, died at his home in Windsor, Ont., on September 4, aged 68.

Major Gordon D. Powis, at one time representative of the Canadian Westinghouse Co., at Edmonton, was killed in action, in November. Major (then Captain) Powis went overseas in April, 1916, with the 63rd Battalion but was later transferred to another unit.

Hugh Russel, a life-long resident of Montreal, died on March 22 at his residence, 423 Guy Street, there. Mr. Russel was president of Hugh Russel & Sons, Ltd., iron and steel merchants, Place d'Armes, and had been in business for himself since 1868. He was born in Montreal on August 17, 1844.

Fred S. Henning, who was superintendent of the Island filtration plant, Toronto, for a number of years died in July in Toronto after a long illness. Mr. Henning was born at St. Catharines, Ont., in 1856 and was at one time Grand President of the Canadian Marine Engineers' Association.

Lieut.-Col. Wood Leonard, D.S.O., of London, Ont., was killed in action last March, in France, while in command of the 3rd Artillery Brigade. Col. Leonard was associated with his father and brothers in the firm of Leonard & Sons, London, Ont. He was a graduate of the Royal Military College, Kingston, Ont., and went overseas in 1914 in command of the 6th Field Battery. Col. Leonard was 34 years of age.

Hugh McCulloch, one of Galt's most prominent residents, died there on January 8, in his sixty-first year. He was president of the Goldie & McCulloch Co., vice-president of the Galt Malleable Iron Co., and of the Galt Art Metal Co., and a director of the Gore Mutual Fire Insurance Co.

Almond Penfield Turner, formerly president of the Canadian Copper Co., a subsidiary of the International Nickel Co., died on May 18 in Oakville, Ont., at the age of fifty-two. The late Mr. Turner spent most of his life in Cleveland, but was in Copper Cliff, Ont., for ten years, with the Canadian Copper Co., joining same in a junior position and rising to the presidency.

J. H. Welsford, president of the Union Steamship Co., of British Columbia, died in May at his home in Liverpool, England. Mr. Welsford was a prominent shipowner in Great Britain, but frequently visited British Columbia. He purchased a controlling interest in the Union Steamship Co. in 1911.

James Pender, for the past twenty-five years managing director of James Pender & Co., St. John, N.B., nail and wire manufacturers, died on May 30. The late James Pender had a long connection with the trade, having commenced his business career fifty-one years ago as a clerk with T. McAvity & Sons, of St. John.

John Ross, general superintendent of the mill of the Abitibi Power & Paper Co., at Iroquois Falls, Ont., was caught in the transmission and instantly killed at the plant early in December. Mr. Ross was one of the highest paid paper experts in America and had been employed at the Abitibi about one year. He was forty-two years of age.

S. R. Sheldon, vice-president and chief engineer of Sheldon's Ltd., Galt, Ont., the well known manufacturers of heating and ventilating equipment, died on May 7, aged 40. Mr. Sheldon was originally with the McEachren Ventilating Co. and about fifteen years ago took over the business with his brother, W. O. Sheldon. The company was at a later date incorporated as Sheldons Ltd.

Capt. Gilbert Johnston, a well-known figure on the St. Lawrence and the Great Lakes, and long activity connected with the Richelieu & Ontario Navigation Co. and the Canada Steamship Lines, Ltd., died at his residence in Montreal on March 13, after a long illness. Captain Johnston was of Scottish ancestry and was born in Kingston, Ont., sixty-four years ago, being a son of the late Gilbert Johnston. In 1894 he was appointed mechanical superintendent for the

Richelieu & Ontario Navigation Co., a position which he filled with conspicuous success.

Frank Gilbert a well known engineer died at his home in Montreal on Jan. 23, after a long illness. Mr. Gilbert was born in Montreal in 1847. After graduating at McGill University, he started in 1870 in the foundry business, later joining the firm of E. E. Gilbert & Sons, engineers and contractors. Mr. Gilbert founded the old Canadian Engine Works

James Spelman, president of the John S. Metcalf Co., grain elevator engineers and builders of Montreal, London, Chicago and Melbourne, died at his home, Westmount, Que., on May 27. Born at Ottawa, Ont., December 10, 1860, he was employed for some time on C.P.R. construction work in the West and later was associated with the Metcalf Company for twenty years. He was president for the past five of these.

Henry A. Sverett, at one time a prominent street railway magnate of Cleveland, O., died at Pasadena, Cal., on April 11, aged 60. He was formerly president of the Cleveland Railway Co., the Toledo Railways & Light Co., and London Street Railway Co., London, Ont., electrical engineer of the Montreal Street Railway, and was financially interested in many electric traction companies in Canada and United States.

Capt. Arthur J. Latornell, B.A.Sc., at one time city engineer of Edmonton, Alta., died early in December of wounds received in action in France. Capt. Latornell, a Huguenot by descent, was born in Meaford, Ont. After graduating with honors in civil engineering, Capt. Latornell became city engineer of Edmonton, an appointment which he gave up early in 1916 to qualify for an overseas commission.

Lieut. Commander J. A. M. Murray, one of the C.P.R. fleet captains, was instantly killed in the explosion at Halifax. Capt. Murray was for about 15 years in the Elder-Dempster West African trade, and also in the West India line. When the C.P.R. took over the Elder-Dempster line, Captain Murray went with the ships and served under the C.P.R. until four years ago, when he became Harbor Master of Quebec. Last summer he returned to Halifax to join in the Imperial Service.

Dr. David H. Browne, widely known throughout the United States and Canada as a metallurgist of note, died at his home in Montclair, N.J., on March 30. He was 52 years old. In 1891 he joined the forces of the newly-organized Canadian Copper Co., and it was in the service of this concern that he brought about great improvement in the refining of metals and added much to the knowledge of metallurgy in this country.

Robert Weir, president and director of J. & R. Weir, Ltd., Montreal, marine engineers, boilermakers and machinists, died on Oct. 8, at the Western Hospital, Montreal. He was in his 72nd year, and had been a resident of Montreal for forty-six years. Mr. Weir was born in Glasgow, Scotland, in 1846, and came to Montreal in 1871. With his brother J. C. Weir he established a marine engineering and machinist business. In 1875 they formed the partnership of J. & R. Weir, which later expanded and became J. & R. Weir, Ltd.

James Fulton Cummings, a pioneer electrical engineer, who for many years was associated with the interests controlled by Thomas A. Edison, died on July 27, at Long Beach, N.Y. Mr. Cummings, who was born in London, Ont., 48 years ago, installed the first electric light stations in Philadelphia, Cincinnati and a number of other cities.

John J. Drummond, of Midland. Ont., died at the home of his brother, George E. Drummond, in Montreal, on April 7. Mr. Drummond was long identified with the development of the iron and steel industry in Canada. He was president of the Zenith Machine Co., Midland, Ont. The deceased was born in the North of Ireland in 1856 and came to Canada at an early age.

John Taylor, founder of the firm of Taylor & Arnold, Ltd., general railway supplies, died on Dec. 19 at the residence of Thomas Arnold, Montrose Avenue, Westmount. He was born at Ayr, Scotland, March 18, 1833. He came to Canada in 1837, and had resided in Montreal ever since. At one time he was a member of the firm of Moreland, Watson & Co., which organized the Rolling Mills, now part of The Street Co. of Canada. He was one of the organizers of the Royal Montreal Golf Club in 1876, and was the first Captain and gold medalist, and one of the best-known golfers in Canada.

Sir Lyman Melvin Jones, president of the Massey-Harris Co., died in Toronto, on April 16. The late Sir Lyman was a native of York County, and was born in 1843. In 1879 he was sent to Winnipeg as Western manager of the A. Harris Son & Co., Brantford, and later was made general manager. The formation of the Massey-Harris Co. in 1891 brought him to Toronto as general manager of the consolidation. He became president in 1902, and held that post until his death. He was also president of the Bain Wagon Co., Woodstock, Ont., and the Johnston Harvester Co., Batavia, N.Y.

Joseph Hobson, noted civil engineer, died at Hamilton, Ont. Mr. Hobson was born near Guelph, Ont., in 1833, and was educated professionally in Toronto. Whilst still a young man, he joined the firm of contractors that built the section of the main line of the Grand Trunk Railway from Toronto to Guelph. In 1870 he was appointed bridge engineer of the southern division, formerly the Great Western Railway, and in that capacity he had charge of the construction of the international bridge from Buffalo to Fort Erie, and of the replacement of the old Suspension Bridge below the Falls of Niagara. For ten years he held the position of Chief Engineer of the Grand Trunk Railway System, from 1896 to 1907; since which latter date he had been consulting engineer. Two of his great achievements were the construction of the St. Clair tunnel and the rebuilding of the Victoria Bridge at Montreal.

CANADIAN LOCOMOTIVE CO. YEAR

THE Canadian Locomotive Co., Kingston, Ont., have completed and shipped during 1917 a total of 108 steam locomotives, of which 40 were to the orders of the British Government and the remainder for domestic service. The plant has enjoyed possibly the most prosperous year in its history, munitions production entering into the activities as well as that of locomotives. The outlook for the coming year is bright and will in all probability eclipse the present twelve months' record. A list of locomotive orders received during 1917 follows, also a detail of the shipments made.

Name of Railroad or Company	No.	Type	Dimen. of Cylin.	Wgt. Eng. in Working Order	Max. Trac. Pow.
T., H. & B. Ry.	4	060	21"x28"	165,000	37,000
G. T. Ry.	10	282	27"x30"	284,800	51,625
Can. Gov. Rys.	50	282	27"x30"	278,000	53,100
T., H. & B. Ry.	6	060	21"x28"	165,000	37,000
Locomotives Shipped During 1917 by Canadian Locomotive Company, Limited					
Can. Gov. Rys.	37	282	27"x30"	277,500	53,100
Mnville Asb. Co.	2	060 T	18"x24"	116,285	27,040
British Gov.	40	280	21"x28"	159,000	37,400
T., H. & B. Ry.	4	060	21"x28"	165,000	37,000
G. T. Ry.	10	282	27"x30"	284,800	51,625
Can. Gov. Rys.	15	282	27"x30"	278,000	53,100

Dependence on U.S. Coal.—The total coal production of Canada in 1916 was 14,500,000 tons, while the imports were 17,500,000 tons. This shows our dependence on the United States and the necessity for retaining public control of waterpowers.

CANADIAN CAR & FOUNDRY CO. 1917 OUTPUT

Railroad or Company	Number	Type	Capacity Pounds	Car Body Steel, Steel Fr. or Wood	Underframe Steel Comp. or Wood	Draft Rigging Fr. or Sp.
Can. Government Railways	5,000	Box	80 000	Comp.	Steel	Spring.
Can. Government Railways	1,000	Stock	60,000	Wood	C.S. Dr. Sills	Spring.
Russian Government	2,000	Box	1 200 Pood	Comp.	Steel	European
Temiskam'g & Nor. Ont. Ry.	100	Box	80,000	Comp.	Steel	Friction
Essex Terminal Co.	50	Ballast	80,000	Wood	Comp.	Friction
Paris & Orleans	850	Gondola	30,000	Comp.	Steel	European
Can. Government Railways	500	Box	100,000	Comp.	Steel	Spring.
Can. Government Railways	20	Sn. Pl.		All Steel	Steel	Spring.
Can. Government Railways	200	Box	60,000	Wood	Comp.	Spring.
Quebec Central Ry.	100	Box	60,000	Wood	Comp.	Spring.
Anglo Newfoundland Co.	12	Flat		Wood	Wood	Spring.
Anglo Newfoundland Co.	12	Box		Wood	Wood	Spring.
Moncton & Buctouche Ry.	1	Sn. Pl.		Wood	Wood	Spring.
Can. Steel Foundries	15	Ingot		All Steel	Steel	Link & Pin
Reid Newfoundland Ry.	50	Box	40,000	Wood	Wood	Spring.
French State Railway	1,000	Gondola	40,000	Comp.	Steel	European
Can. Government Railways	100	Refrig.	80,000	Wood	Comp.	Spring.
Can. Steel Foundries	12	Flat	80 000		Steel	Spring.
Can. Car & Foundry Co.	8	Flat	80,000		Steel	Spring.

INDUSTRIAL NOTABILITIES

CHESTER B. HAMILTON, Jr., mechanical engineer, proprietor Hamilton Gear & Machine Co., Toronto, Ont., was born in that city, April 8, 1884, son of Chester B. Hamilton and Anna (Van Wagner), Hamilton, and is of old United Empire Loyalist stock.

Mr. Hamilton received preparatory education at the Provincial Model School and Jarvis Street Collegiate. Mr. Hamilton attended the University of Toronto, graduating from the School of Practical Science with the degree of B.A.Sc.

After a number of years of general engineering experience over a fairly broad field Mr. Hamilton started in business on his own account in 1911 and devoted his efforts

CHESTER B. HAMILTON, Jr.

entirely to the manufacture of machine cut gears, this work, however, having been considerably supplemented by the production of munitions, gauges and allied war products. Actual experience as a practical mechanic has further qualified Mr. Hamilton to carry on successfully the highly specialized line of work undertaken by his firm.

His interest in technical affairs is evidenced by his society activities—member American Society of Mechanical Engineers, being secretary of Ontario Section of same; associate member American Institute of Electrical Engineers; member (Mechanical Engineering representative) of Joint Committee of Technical Organizations (Ontario branch). He is also a member of the Engineers' Club, Toronto.

Mr. Hamilton is Independent in his political views, and is an Anglican. His residence address is 43 Madison Ave., Toronto, Ont.

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THE SEASON'S GREETINGS

TO the subscribers to and advertisers in CANADIAN MACHINERY we, as its publishers, extend heartiest Christmas Greetings, and express the hope that the New Year on which we are about to enter may not only bring "Grist to the Mill" as has its immediate predecessors, but usher in that era of peace and goodwill overdue, yet so much desired, in both a national and international relationship sense. Canadian manufacturers look to the future hopefully, the attitude being based on a new and proved conception of their capacity not only to procure business but to turn out products in variety and type world competitive as and when offering.

FINANCE AND INDUSTRY

THE reports of the Canadian banks now coming to hand indicate the great extent to which our financial machinery has been devoted to national operations during the year. In practically all the statements thus far made public the outstanding feature has been the increase in the holding of securities of the Canadian and British Governments; in some cases as high as one-third of the bank's total assets are evidently thus represented. However, this national financing has been accomplished without materially reducing the funds available for commercial and industrial purposes although credits for stock operations have been curtailed. Generally speaking, the Government investments are a counterbalance of the increased deposits, indicating in a small circle the effect of war purchases on the funds of the people.

It should be pointed out in regard to the holdings of Government securities that the statements referred to were for a period ending when the Government advances were approaching their maximum. There will in the near future be an important readjustment through the funds raised by the Victory Loan. So far as the position of the banks is concerned, the statements to the end of November indicate materially increased profits and strengthened liquid position, a satisfactory reflection of operations in national finance.

As a result of the success of the Victory Loan, industrial activity will be stimulated, particularly in the direction of provision of the means to prosecute that feature of the war which hinges on munitions and shipbuilding, in which respect, as a nation we are possibly in a much more favorable position than at any time since hostilities began. The close co-operation of finance and industry is indispensable to our development and progress, and 'twould appear that the war, notwithstanding its many otherwise disagreeable features, has contributed to a more pronounced unity of purpose than had previously been apparent.

AT DUTY'S CALL

THE approaching call to the colors of the men enrolled under the Military Service Act will bring to both employers and employees a more intense personal appreciation of affairs than has hitherto seemed possible or probable.

That machinists as a class have voluntarily contributed their quota to all branches of the service is appreciated by all; if any class of workman had a right to claim indispensability for his services, surely the munitions worker, shipbuilder and general engineering employee had as good a right as any. Judging a man's skill by standards obtaining in other countries it is not unreasonable to expect that the majority of workmen whose skill renders them indispensable have passed the upper limit of the present class of recruits, and this hypothesis would seem to account for the refusal of many exemption claims. In fine arts and music there have appeared occasional stars whose phenomenal accomplishments put them, while still young, so far above their elder contemporaries that they really were irreplaceable. These cases, however, are altogether exceptional and are based on a natural enthusiasm and inspiration operating in a field where unrestrained vent can be given to the emotions.

Such conditions do not obtain in engineering circles, and the budding genius who thinks he has a message to deliver in the way of demonstrating his accomplishments very soon finds himself dispensed with. In straight manufacturing work the active energetic producer can, by the aid of suitable machines and women operators, be dispensed with if necessary, but the machinist of mature years, who has worked as toolmaker, draftsman, and frequently foreman or superintendent possesses a higher degree of appreciation of all that is involved in the production of accurate machine work on economical lines. He has lived long enough to have made a few mistakes; if he is wise he has remembered them and profited thereby; if not, he would not hold his present job. Such men as these are the real backbone and mainstay of firms.

It must be admitted that the question of depleting the machinists' ranks of men who under normal conditions would be the next generation of wiseacres is greatly to be regretted, yet why should we as a nation, and machinists as a class wish to act less nobly than others. The fighting spirit of the Welsh coal miners caused so many of them to enlist during the early stages of the war that the coal industry was imperilled to a degree that threatened the safety of the Empire. Can we say that such a state would begin to be reached if every physically fit machinist in Canada between twenty and thirty-four years of age were to cease work? The requirement of physically fitness puts an entirely different aspect on the case, and many physicall unfit machinists possess a very high degree of manual skill and technical training sufficient to carry on.

We have to thank the various corporations and other interests represented in this issue for the privileges of securing information relative to their plants, and for such illustrations a sappear through their courtesy.

Our War-Created Opportunities and Responsibilities

Contributed and Selected

Being expressions of opinion from men prominent in the administration and management of iron, steel and associated enterprises regarding development in trade, commerce, agriculture, manufacturing, etc., during 1917, and their bearing on the immediate and more remote future outlook relative to our Dominion. Optimism will be found predominant.

THE MACHINE TOOL VIEWPOINT

By Sir Alexander Bertram

THE future is always of more interest than the present, and it is the future of the Dominion of Canada which absorbs the attention of manufacturers and financial men in our country. This colossal war must end some time. Wartime activities have taught us methods and means of development. Both our agricultural and our natural resources have undergone intensive stimulation. Land speculation and stock gambling are at a standstill.

Prior to the outbreak of war the stagnant trade conditions caused a great deal of anxiety. Foreign competition took advantage of our initiative in developing export trade and with the aid of cheap labor and cheaper materials, robbed us of the fruits. Since 1914 our natural resources have been uncovered. We knew they were there. We have been compelled to learn efficiency in their development. More than a billion dollars worth of munitions have been made in Canada and sold. The profits from this war industry has placed our factories upon a sound financial basis. Now, is Canada's time and opportunity to prepare for the great reconstruction period which must follow when the world regains its ideals of humanity and civilization.

Make Optimism Practical

In our production of munitions, it has been proven that Canadian manufacturers have excelled themselves in producing materials at a low rate of cost in close competition with other countries. Taking full advantage of present prosperity by improving all equipment, by introducing efficient methods of shop handling, by cutting the time in detail operations, our manufacturers can place themselves in a position to compete with the world. The spirit of optimism now prevailing throughout the country must be brought to a practical basis. We must right away cultivate ways and means.

Canada's Natural Resources

Think of Canada with its illimitable resources, its vast deposits of coal and iron, copper and lead, and yet before the war, we imported from foreign countries half our whole domestic consumption. We were always bringing coals to Newcastle. Even to-day we are importing large quantities of our raw material, products which are dormant in our own country. Again, think of this; forty per cent. of the available water power of the world is in Canada. We have sufficient white coal to drive all the factories of Europe. Canada has long stood at the threshold. She has now opened the door and entered.

Business is war. Clean up your old guns and stand ready to go over the top when the Angel of Peace returns to earth.

THE WAR EFFORT OF THE CANADIAN UNIVERSITIES

By Sir Robert A. Falconer.

DURING the war the Canadian universities have thrown themselves with great energy into a variety of efforts. Of graduates and undergraduates of Canadian universities over 14,000 have already enlisted, of whom some 6,000 are undergraduates. More than 800 have fallen. The distribution of these enlistments covers East and West, the new universities of the West having risen nobly to the call for men. Distinctions have come in large numbers to university men, both in the way of high commands and of rewards for special service. The university man has made an excellent officer, but there are thousands of graduates and undergraduates in the ranks, as might be expected in a democracy such as that of the Dominion of Canada.

Staff Members on Active Service

Large numbers from the staffs of the universities have gone on active service, and many of them are employed in giving instruction. Special work also has been carried through, for which the universities were particularly well equipped. This is especially manifest in the Faculties of Medicine. At least six of the universities have sent larger or smaller hospitals, manned for the most part by their own staffs or graduates, and given additional support to that which is provided by the Government, through the generosity of friends. Some of the smaller universities have sent field ambulances. The record of this medical service has been particularly fine, not only in the character of the work done in the hospitals for wounded and sick soldiers, but also in the scientific results that have been accomplished by certain members of the staffs.

In the laboratories of the universities war work has been conducted for the Imperial and Dominion Governments. Investigations have been conducted in regard to munitions, explosives, and chemical possibilities. Antitetanus, typhoid and other sera have been prepared in the university laboratories, securing for the Canadian soldier good material and for the Government a great reduction in price.

Buildings in Military Service

Many buildings in the different universities have been set aside for military purposes, as hospitals or barracks, or as in the University of Toronto, for the Royal Flying Corps. The spaces around the universities have been turned into drilling grounds.

Members of the staffs of the universities have by lecturing and by writing done a great deal to explain the meaning of the war to their constituencies, and by this means, as well as by the advocacy of the students who have enlisted, the universities have powerfully moulded opinion with regard to the war throughout the country.

STEEL MILL VIEWPOINT

By W. M. Currie.

THE problems confronting Canadian steel manufacturers were never so perplexing and difficult to solve as at the present time. During the past year all steel plants have operated to capacity and I can see no let up in sight for the coming year. The plants capable of turning out steel for munitions have been kept almost exclusively occupied with that class of business, with the result that other plants have been taxed to capacity to take care of the ordinary trade requirements.

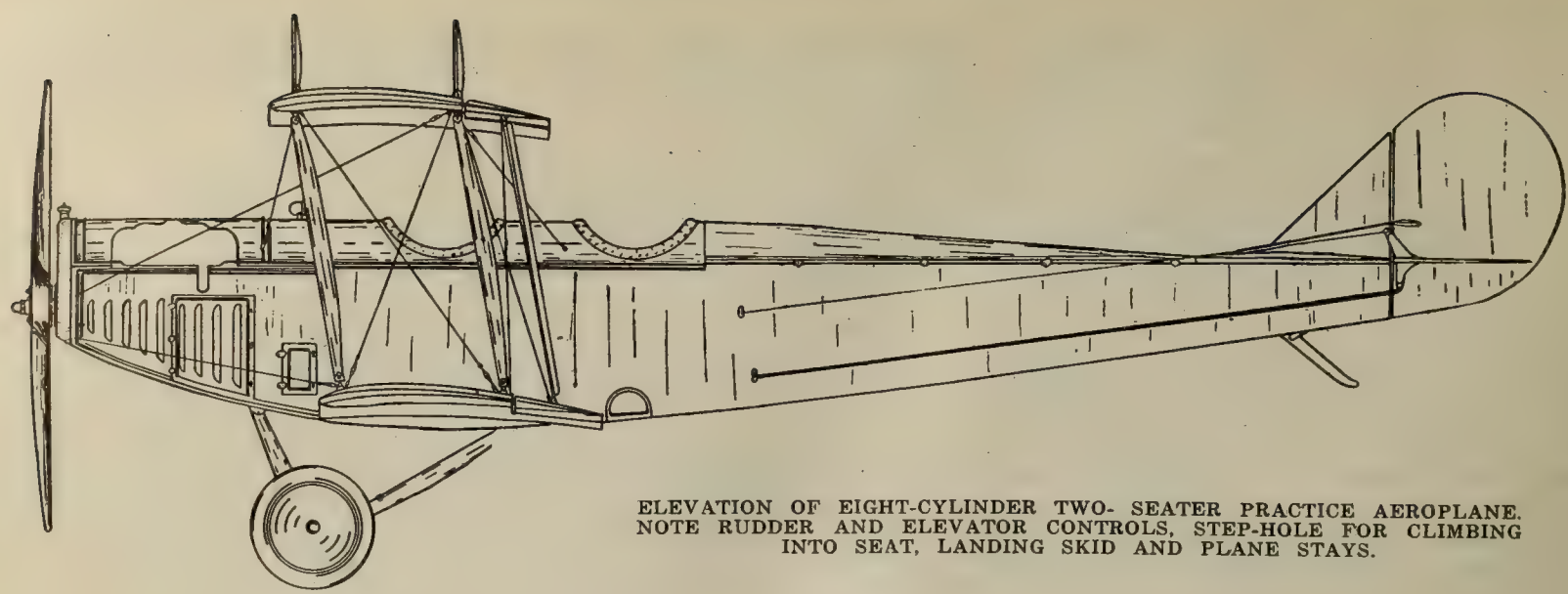
In addition to the domestic market, export trade, both to Europe and the Orient, has been excellent. Prospects for this latter class of business are, however, very uncertain, owing to the shortage of ships on the Atlantic and the unsettled condition of the market in the Orient. With further reference to the export trade, while it has been profitable during the last few years, I feel that it is one which cannot be held to any large extent in normal times and that every effort should be made to take care of the home market.

During the past year we, along with every other industry, have experienced a labor shortage, but have always managed to get sufficient to keep operating to full capacity. It has, of course, been impossible to secure experienced help, but by taking rough labor and educating it, this difficulty has been very satisfactorily overcome, and I do not anticipate further trouble in this respect during the coming year.

Raw Material Receipts

The most difficult problem which we have had to face has been how to secure the necessary raw materials to keep our mill in operation. The transportation companies were tied up in every direction with embargoes and manufacturers as a result got behind in their deliveries. Therefore, in order to make sure of not being caught without necessary raw mamaterials and coal, we had to anticipate our requirements by months. This has created a very dangerous situation, and most manufacturers have given great thought to the question of reducing as much as possible high-priced stocks, although this can only be done to a very limited extent if one wishes to keep his

Continued on page 694.



ELEVATION OF EIGHT-CYLINDER TWO- SEATER PRACTICE AEROPLANE. NOTE RUDDER AND ELEVATOR CONTROLS, STEP-HOLE FOR CLIMBING INTO SEAT, LANDING SKID AND PLANE STAYS.

degree to which inspection is carried. Starting in the wilds of British Columbia forests, where the finest aeroplane lumber in the world is cut, the process of scrupulous selection decides which of the upstanding timber are to be felled and utilized in airplane construction. After the timber is sawn up in the mill, it is subjected to a minute inspection for knots, irregularities in the grain, and other defects which might spell disaster in the crucial test, and all prices showing weak spots are eliminated. This ensures only wood of certified quality reaching the factory, but even with this precaution a close check is put upon every stage of its progress through the shops, to detect any possible flaw which might develop in the course of construction.

To begin with, all wood received into stock is checked by Government inspectors at the factory, after which it may be released to be worked up into longerons, struts, and so on down to the thinnesb lamination of a web piece. During the course of manufacture, each and every piece is inspected by shop inspectors after passing through an individual operation. The larger pieces must conform to a required weight within certain limits and be absolutely free from knots, cracks, twists, worm holes, etc., after which the finished piece is inspected by Government inspectors and stamped before entering into the makeup of the machine.

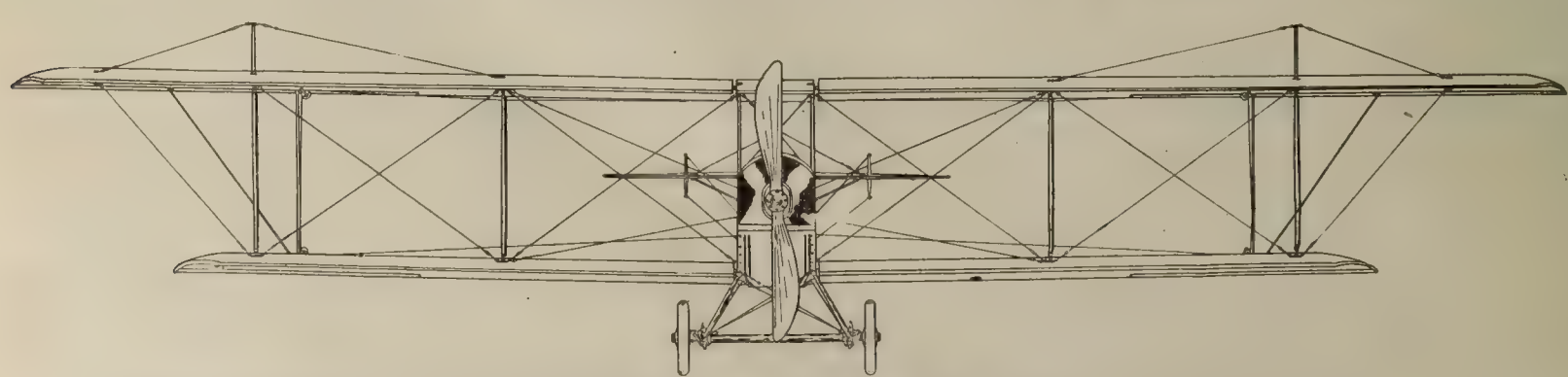
ASSEMBLING WING STRUCTURE. TWO LONGITUDINAL MEMBERS ARE CONNECTED BY CROSS RIBS COMPOSED OF NOSE-PIECE, CENTRE AND TAIL-PIECE.

Material Testing

The same care is exercised with metal and fabric. In the testing laboratory one sees a 100,000 lbs. horizontal tensile testing machine for material such as bronze and steel rods bolts, etc., and a 20,000 lb. vertical machine for tests on wire, turnbuckles and similar items of aeroplane construction. Passing into the metal shop, the diversity of material and processes becomes more apparent. Aluminum, steel and bronze are seen on every hand: sheets, rods, bars and tubes. Modern methods and arrangement are immediately evident. The actual amount of metal work in an aeroplane, outside of the engine, is not of great bulk or quantity, but in quality it must be of the best. A simple but very important item in this respect is the turnbuckle. Of harmless appearance, simple design, and small size, this innocent looking article is a vital component of the structure. A burst turnbuckle is just as certain to cause the collapse of a machine as a torn artery will cause the death of a man.

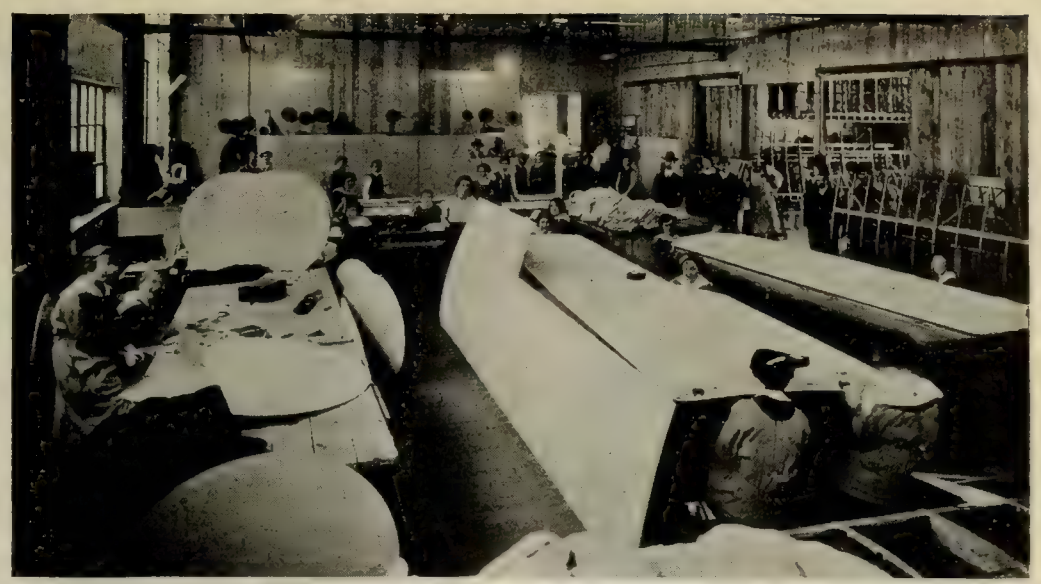
Structural Requirements

A study of the structure of an aeroplane frame or fuselage as it is technically termed makes this clear. Of rectangular form with a convex deck, the fuselage is formed of four longi-



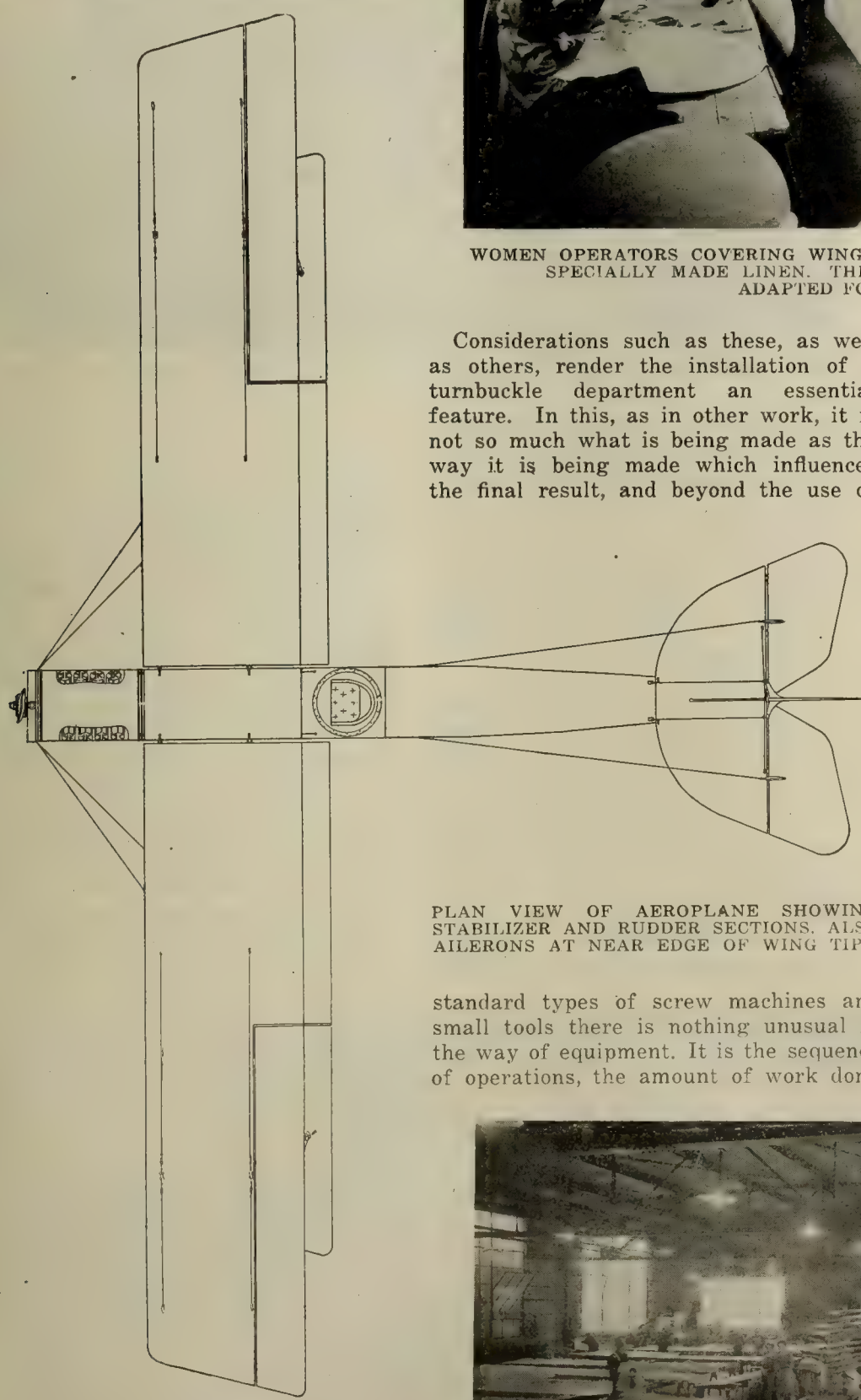
FRONT ELEVATION OF TWO-SEATER SHOWING SYSTEM OF STAYS AND STRUTS FOR STIFFENING WINGS.

tudinal members or longerons, spaced apart by wooden compression members, and given the desired strength and resilience by means of a multiplicity of wire stays which intersect in every panel of the fuselage both longitudinal and transverse. The adjusting of these stays is done by means of turnbuckles which in the hands of a skilled operator enable the tension in the various parts of the structure to be so balanced that each component receives no more than its due stress while the machine is in use. If through bad adjustment or defective manufacture, a turnbuckle receives or takes less than its due share of the stresses, some other one is overtaxed, and, with the small margin of safety allowed, disaster is sure to follow.



WOMEN OPERATORS COVERING WING FRAMES AND CONTROL DETAILS WITH SPECIALLY MADE LINEN. THE DEFT FINGERS OF GIRLS ARE WELL ADAPTED FOR THIS WORK.

Considerations such as these, as well as others, render the installation of a turnbuckle department an essential feature. In this, as in other work, it is not so much what is being made as the way it is being made which influences the final result, and beyond the use of standard types of screw machines and small tools there is nothing unusual in the way of equipment. It is the sequence of operations, the amount of work done at certain stages, plus a rigid inspection system which has insured the success of this vital work.



PLAN VIEW OF AEROPLANE SHOWING STABILIZER AND RUDDER SECTIONS. ALSO AILERONS AT NEAR EDGE OF WING TIPS.

Press Work and Welding

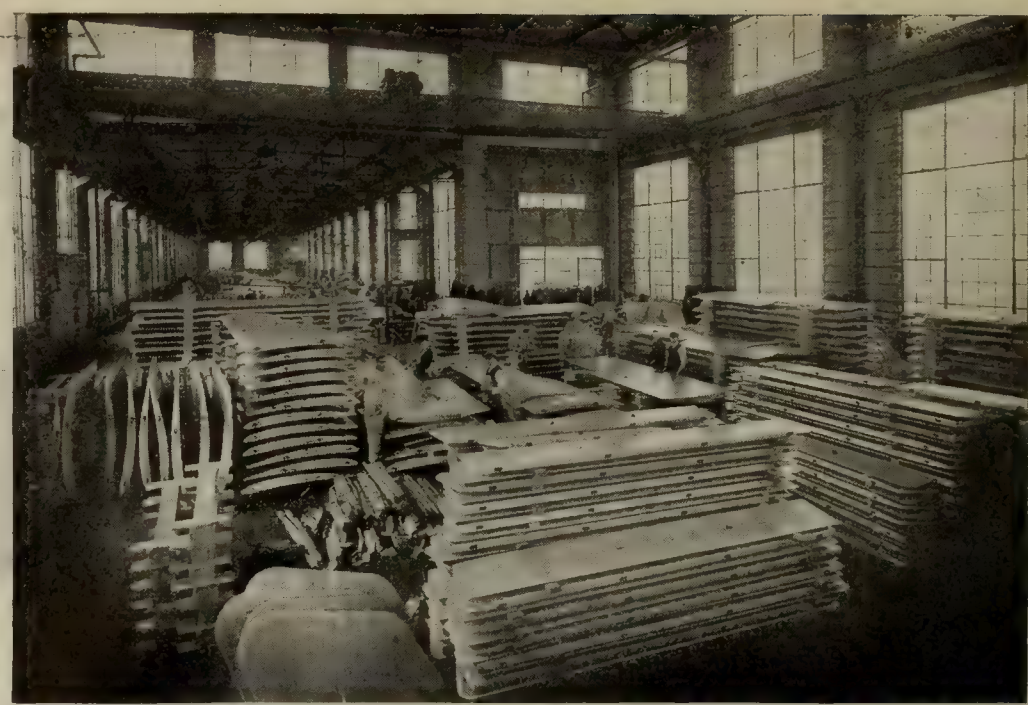
The work of the press department consists in cutting and forming aluminum sheets into deck housings, engine hoods and side panels, and the stamping and forming of the numerous sheet steel parts which are afterwards welded to form the brackets which are used at the junctions of the different struts or compression members. A particularly fine piece of this latter work is the radiator cradle which rests on the front end of the longerons and supports the radiator. Stamped from sheet steel with an intricacy of perforations it is formed by hand on complicated die blocks and has additional members secured by welding resulting in a most efficient piece of construction when weight and duty are considered.

Both oxy-acetylene and electric welding are employed, the variety of work performed being such that ample opportunity is found for the special application of either process.

All the work from the metal shop

SEVERAL COATS OF VARNISH ARE APPLIED TO THE LINEN FABRIC, MAKING IT IMPERVIOUS TO ATMOSPHERIC INFLUENCES, AND REDUCING SKIN FRICTION IN THE AIR.

TESTING CONSTRUCTION DETAILS WITH LOADED SANDBAGS.



FINISHED WINGS, RUDDERS AND ELEVATORS READY FOR SHIPMENT. SPACE, LIGHT AND EFFICIENT HANDLING EQUIPMENT ARE DESIRABLE.

passes through two separate inspection departments before acceptance for assembly. The first of these is the regular plant department, while the second is the Army Inspection Department maintained by the Imperial authorities who control aeroplane construction in this country the same as in Britain.

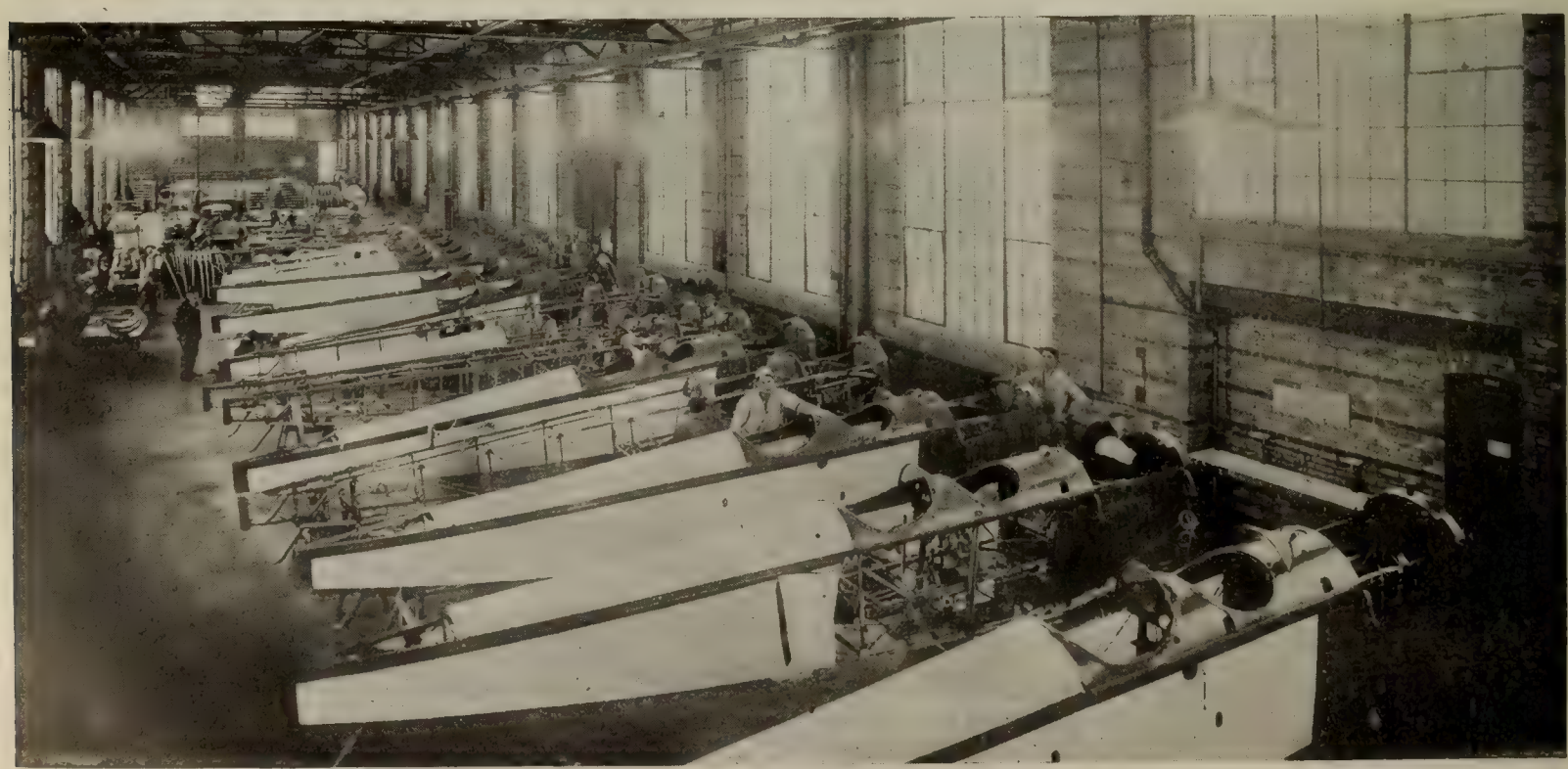
Plating and Enamelling

After being passed for workmanship and material, much of the work has to be plated to stand exposure to weather, which in the case of aeroplanes is more than ordinarily severe. Plating machines are installed for mechanically handling screws and similar small parts, while the larger parts which require individual handling are plated in vats of conventional type. In addition to the plated finish, there is a considerable quantity of parts which are finished in enamel, both black and white being extensively employed. All of the tubular frame work of the rudder, stablizer and elevators which is afterwards covered with fabric is heavily coated with white enamel. The destructive effects of rust on the fabric covering render it imperative that the metal tubing be made rust proof as far as possible, a requirement which is not facilitated by exposure to the atmosphere at high speeds in all kinds of weather.

For this purpose air brush equipment has given satisfactory results, the liquid enamel being sprayed by a jet of air under pressure which atomizes the enamel and causes it to impinge on the work with considerable force so that adhesion is improved and the density and smoothness of the protective coating is considerably enhanced.

Heat Treating

The exceptional conditions of service call for heat treating of much of the metal work. Axle tubing, turnbuckle eyebolts, levers, brackets and similar articles are made of special alloy steels whose characteristic qualities of extreme toughness, stiffness, hardness or flexibility can only be made available by a suitable series of heating and quenching operations. Such work demands carefully designed furnaces and skilled operators and the widespread application of heat treatment in shell manufacture has done much to facilitate a due appreciation of the importance of this work both by management and operators. Sandblasting, brazing and trimming are also required at various stages, and the nature of equipment renders their location adjoining the heat treating department desirable; polishing and grinding work is likewise included in this group.



AEROPLANE CHASSES RECEIVING FINAL DETAILS. THE WING SECTIONS ARE SHIPPED DIRECT TO THE TRAINING GROUND AND ASSEMBLED THERE.

Woodworking Features

It is not until the wood shop is entered, however, that the real aeroplane atmosphere begins to affect the visitor. The indispensability of wood as a material of construction and its use in large pieces for essential elements such as wing frames, struts and other conspicuous parts enable the parts to be recognized in the rough and their gradual approach to finished shape with each succeeding operation retains the interest of the layman to a surprising degree.

Following a large timber of considerable length, one sees it split into two by a powerful band saw, then thicknessed and straightened, routed out on the sides to reduce weight and finally, after careful finishing to exact sizes and weight, it is assembled with nose pieces, centres and tail pieces to form the wing frame which is covered with linen and finally varnished. A finished wing is a wonderful achievement when strength and weight are considered and its satisfactory manufacture in quantities can only be achieved by the use of the best of materials and workmanship.

An interesting stage of the woodshop is where the longerons are steamed and bent to shape. These extremely important parts are made of the highest grade of ash and are subjected to a series of weighing at various stages to insure uniformity of seasoning. They measure roughly about 25 ft. in length, by 1½ in. square, and after being steamed in a chest for some length of time, they are withdrawn rapidly, clamped by one end to a templet, and then bent around the curved outline and secured at several points, after which it is allowed to cool naturally and retains the shape imparted to it by the templet.

Laminated Engine Beds

Another operation which demands attention in this department is the building up of engine foundation timbers. This work is of the first importance as fracture or looseness in this part of a machine is fatal. Approximately 4 in. by 3 in. by 3 or 4 ft. long, these timbers are made of laminations about ⅜ in. thick, selected for grain so that by skilful disposition of oppositely grained pieces the resulting timber is proof against warping and possesses exceptional resistance against torsion, bending and shock.

So the various components gradually assume shape until they are ready for erection or final assembly. Here the future flying machine takes form rapidly. Longerons and struts are assembled, stays and turnbuckles adjusted, axle and wheels attached beneath the front end, and landing skid below the tail. In close succession the stabilizer and rudder are placed in position and the control wires coupled up to the seats. The engine is bolted down and the operating mechanism adjusted to the front seat. Accessory equipment such as revolution indicators, barometer, etc., are installed. The wing sections are finally fitted in place and every part subjected to a minute inspection before being disassembled for shipment.

The End Not Yet

And thus the work of building the most marvellous of man's creations goes on in our midst. The one problem which has baffled mankind from the beginning of time has been solved through the combined labors of scientists and investigators, engineers and daredevils of many nations. Gradually, but irresistibly the aeroplane has become a familiar sight and topic with the general public and the certainty of its manufacture assuming industrial and commercial importance rivalling that of the automobile is not the least noteworthy belief of those whose efforts are devoted to it in its present stage.

WATER-POWERS OF CANADA

WITH coal at a high price and the prospect that we shall soon have to depend largely on our water-powers for heating our houses and running our railways, a reliable estimate of what our water-power resources are is of great value. The Commission of Conservation first published an estimate of this kind in 1911. Since then, it has conducted water-power surveys of British Columbia, Alberta, Saskatchewan and Manitoba, and has secured aditional data on the powers in other provinces. It now submits the figures below as being the latest available.

Province	Total Possible H.P.*	Developed H.P.
Ontario	5,800,000	760,000
Quebec	6,000,000	640,000
Nova Scotia	100,000	26,000
New Brunswick	300,000	15,000
Prince Edward Island	3,000	500
Manitoba		76,000
Saskatchewan	3,500,000	10
Alberta		33,000
Northwest Territories		Nil
British Columbia	3,000,000	250,000
Yukon	100,000	12,700
Total for Canada	18,803,000	1,813,210

* The figures in this column are given with much reserve since it is practically impossible to arrive at exact amounts for any country. In addition to detailed surveys and flow records, such factors as artificial storage, economic head to be developed and kind of industry to be established all vary the estimates for each individual site.

INDUSTRIAL DEVELOPMENT AT CANADIAN HEAD OF GREAT LAKES

AT Port Arthur and Fort William, the great inland twin ports of Canada, activity and progress are again evident after a stagnation period caused by the world-wide war. These cities are the great transhipping ports for the ever-increasing products of our western provinces, and will become (with the deeper channel to the sea which in the improved Welland Canal is in its initial development) practically an ocean seaport for half a continent.

There is no site on the American continent that has so great a future ahead as the twin ports of Canada. In the territory adjoining the essentials to manufacturing prosperity are found—unlimited areas of pulpwood lands for pulp and paper manufacture, vast iron ore lands, gold, silver, nickel and other minerals; in fact, no place on the continent has a superiority of indications of so vast and varied mineral wealth, which is only awaiting the necessary capital for successful development. Besides the great mineral bodies adjacent to the twin ports, there is also abundance of agricultural lands for raising produce; besides there is that great essential to economical mineral development and manufacture—cheap power.

Power Available

Within connecting distance of the twin ports are magnificent water powers, which only await the time of harnessing for industrial development. In the Pigeon River, Kakabeka, Dog Lake, Virgin and Cameron Falls, besides other waters capable of being utilized, are embodied vast potentials for industrial activity and progress. It is computed that at least 250,000 horse-power of electrical energy is capable of development for use at the twin ports. Previous to the war coal was laid down at the docks for less than fifty cents a ton freight from Lake Erie.

Industrial Enterprise Progress

With 35 miles of deep water lake and river frontage capable of being utilized for dock, factory and mill purposes within a radius of 5 miles from a central point, there is scarcely a limit to future possibilities. At Port Arthur during the past year there has been erected the first unit of a large pulp and paper mill by the Port Arthur Pulp & Paper Co., this unit being the first of the total projected capacity of 150 tons of pulp daily. There is also a pulp and paper company with even a greater output in sight under organization, the necessary pulpwood areas already having been secured. Another Port Arthur industry of note is that of the Port Arthur Shipbulding Co., which has had a busy season, having had about 1,000 men constantly employed, chiefly in the construction of ocean steamships of approximately 4,000 tons capacity, the limit possible for passage through the St. Lawrence Canal.

The Port Arthur Waggon Works has also been continuously employed in manufacturing waggons and other implements. The Government Fish Hatchery, located at Port Arthur, has achieved splendid results this year, having developed and placed in waters suitable for their full development millions of young fish. The construction of large terminal elevators on the water front at Port Arthur goes merrily along.

During the year the Grain Growers' Grain Co. hospital elevator has been increased by 300,000 bushels, making this plant 600,000 bushels capacity. This concern, which embraces approximately 20,000 Western farmers as shareholders, will concentrate all terminal facilities at Port Arthur, the site there, already secured, being fully adequate for their needs. The next unit projected is that of a 2,500,000 terminal storage elevator. The Saskatchewan Co-operative Grain Co., which represents approximately the same number of Western farmer shareholders as the other, have their big ter-

minal elevator of 2,500,000 bushels just about completed, while the Eastern Elevator Co. are making good headway with the construction of their 2,000,000-bushel elevator. With the completion of the elevators now under erection the twin ports will have a grain storage capacity of 51,575,000 bushels.

Munitions production has been undertaken at the shipbuilding and other plants.

The mineral depots adjacent to Port Arthur are receiving greater attention than formerly owing principally to the mineral exhibit and school established through the Port Arthur Board of Trade for the education of explorers in minerals and their location. Several copper mines in the district are already shipping ores to smelter.

On the whole, Port Arthur, in her industrial and commercial life, has experienced one of the most prosperous seasons of her existence.

IMPORTS PROHIBITED INTO U.S.

THE following articles are included in a list issued by the United States Government recently of commodities that cannot be imported into the United States, from any country, except under license. Antimony, antimony ore, asbestos, balata; castor oil; cotton; chrome, chrome ore, or ferro-alloy or chemical extracted therefrom; cobalt, cobalt ore, or any ferro-alloy or chemical extracted therefrom; all ferro-alloys; flax; gutta joolatong; gutta percha; gutta siak; hemp; hides and skins; jute, iridium; leather; manganese, manganese ore, or any ferro-alloy or chemical extracted therefrom; mica, molybdenum, molybdenum ore, or any ferro-alloy or chemical extracted therefrom; naxos emery and naxos emery ore; nickel, nickel ore, matte, or any ferro-alloy or chemical extracted therefrom; sodium, potassium, or calcium nitrates; optical glass; palm oil; platinum; plumbago; pyrites; rubber, raw, reclaimed, waste or scrap; scheelite; shellac; sisal; spiegeleisen; sugars; tanning materials; tin in bars, blocks, pigs, or grain or granulated; tin ore and tin concentrates, or any chemical extracted therefrom; titanium, titanium ore, or any ferro-alloy or chemical extracted therefrom; tungsten, tungsten ore, or any ferro-alloy or chemical extracted therefrom; vanadium, vanadium ore, or any ferro-alloy or chemical extracted therefrom.

WAR HAS DEVELOPED MOLYBDENUM PRODUCTS

THE demand for molybdenum for use in the manufacture of special steels has greatly stimulated prospecting and development of our molybdenite resources. Numerous discoveries have been made which vary in importance from mere mineral occurrences to deposits which have already given considerable production. The most important deposit yet proven is that near the village of Quyon, Quebec.

The Federal Department of Mines has done much to encourage the concentration of these ores. After trial shipments had been made for test runs in the United States, the ore from Quyon mine was principally sent to the concentrating plant of the Mines Branch. The company has recently completed a concentrating plant to take care of their output.

CO-OPERATIVE FOREST PROTECTION IN QUEBEC

QUEBEC has made a distinctive contribution to forestry work in establishing the success of co-operative fire protection associations. In these, the timber owners band themselves together to protect their limits from fire, sharing the expense on an acreage basis. The Provincial Government also contributes towards the expenses in consideration of the protection afforded unlicensed Crown timber lands. One great advantage of the association idea, especially when the provincial forest service is appointed for political reasons instead of for merit, is that the owner-members of the association see that only competent rangers are employed.

Quebec now has under co-operative fire protection fully 67,000 square miles of forest lands, comprising the greater portion of the licensed Crown timber lands as well as a large portion of the Crown granted lands. Under this arrangement, the St. Maurice Forest Protective Association, the pioneer in the movement, looks after the St. Maurice district, the Ottawa River Association guards the large territory bordering on the Ottawa, and the newly formed Laurentian and Southern St. Lawrence Associations protect the districts on the north and south of the St. Lawrence river, respectively, in the eastern portion of the province.

POWDERED FUEL

A LARGE proportion of Canada's reserves of coal is unsuitable for use in the ordinary way as locomotive fuel. The coals of Manitoba, Saskatchewan and portions of Alberta are lignite or sub-bituminous, high in moisture, and owing to excessive "sparking" cannot be used as locomotive fuel because of their liability to set fires. There is a possibility that pulverization will overcome the disabilities of this type of fuel, and W. J. Dick, mining engineer of the Commision of Conservation, is investigating the problem and compiling information respecting the use of powered coal and peat as a fuel for locomotives, stationary boilers, cement plants and metallurgical purposes. This class of fuel has already been used with economic success in a few plants. If it can be proven to be a sucess generally, it will mean that we can utilize much low-grade coal that, heretofore, has been largely wasted, and will lessen the ever-increasing cost of generating power from high-grade coals and fuel oil.

GASOLINE SUPPLY CONSERVATION

ABOUT 20 per cent. of the gasoline we use is produced from Canadian crude oil, while the remainder is either imported or is produced from imported crude oil. For both petroleum and gasoline we are largely dependent upon the United States. There, the consumption of gasoline is greater than the production, the excess being drawn from the surplus production of earlier years, and the greater demand, for war purposes, in 1918, will inevitably result in a greater consumption than formerly. At the same time, while the production of gasoline in the United States in 1917 will probably be less than in 1916, it is estimated that the consumption this year will exceed production by 60,000,000 barrels. This enormous deficiency must be drawn from the surplus of 150,000,000 barrels that was in storage on January 1 of the present year.

In view of this situation and its effect on Canada, together with the necessity for conserving gasoline for war purposes, it behooves us to prevent waste, or needless use, to encourage the use of substitutes, and, if economically possible, to develop the oil-shale industry in Canada. One-half of the gasoline used in the United States is used in pleasure riding, and doubtless the same proportion holds good in Canada.

NEARLY FIVE MILLION WOMEN MOBILIZED

ILLUMINATING facts, showing the enormous increase in the number of women workers since the outbreak of war are set forth in a recent issue of the Imperial Government *Labor Gazette.*

In July last 4,766,000 women workers were employed in Great Britain—a number exceeding by 1,421,000 those employed in July, 1914. The number of women who have directly replaced men since the war is given as 1,392,000. About 670,000 women are employed on munition work and 632,000 on other Government work, such as the manufacture of clothing and food for the troops.

The estimated number of females employed in July, 1914, and the increase in July last in the chief occupations, are shown in the appended table:—

	July, 1914	Increase
Industries	2,184,000	518,000
Gov. establishments	2,000	202,000
Agriculture, permanent	80,000	23,000
Agriculture, casual	50,000	39,000
Transportation and trains	17,000	72,000
Trams, municipal	1,200	16,000
Banking and finance	9,500	54,000
Commerce	496,000	324,000
Professions	67,500	20,000
Hotels, theatres	176,000	22,000
Post office	60,500	45,000
Civil service	4,500	53,000
Municipal service	196,200	29,000

The above return does not tell the full tale of the labor of women, since domestic servants and women employed in very small workships in the dressmaking trade are excluded, as well as women at work in military, naval, and Red Cross hospitals. Under the last head there has been an increase equal to 38,000 full time workers. On the other hand, there has been a displacement of 400,000 from small workshops and omestic service.

B. C. Metal Mines Reopen.—The Labor Department, Ottawa, has received word to the effect that work has been resumed in the smelters at Trail, B.C., and that all metal mines in the district which have been closed for the past six weeks owing to the smelter strike will resume operations.

Pushing Yourself Upward in Position and Pay

By John C. Kirkwood

Every man his own salesman—The shame of remaining poor—Most men can double their pay—Examples of self-selling—To get more, sell more—Paying dearly for the privilege of being a leaner—Are you your godmother's beloved child? It's all up to you.

EVERY right-minded man wants to get on in the world—to get higher up and to get higher pay. But not every man with the desire to get on is trying to get on. Many are in a state of semi-repose, waiting for someone, or some force without themselves, to promote them. Because of their lack of initiative, many good men lag behind and remain poor.

No Virtue in Being Poor

Let it be said straightway that there is no virtue in being poor, or lowly-placed, but that, on other hand, there may be discredit and disgrace in being poor and lowly-placed. Many a man earning no more than "the scale" or the market price for the particular kind of service rendered by him should be earning twice as much as he is now getting; and he can earn double his present wage if he has the grit and purpose to multiply his wage by two. The great obstacle in the way of the advancement of many wage-earners in position and pay is a certain contentment with their wages and positions—a contentment that robs them of initiative and ambition.

Leaning on Broken Reeds

Go into any place where men earn wages—so much pay for so much service—and ask each man what he is doing to get on—to get higher up and to get more pay; and the great majority will say, "I'm trying to do my work just as well as I know how. I hope that my employers will perceive my fidelity and the good quality of my work; and that they'll promote me and advance my pay."

You will get an answer like this from common laborers, from skilled artisans, from clerical workers, from executives, from managers, from salesmen, from teachers and professors, from chemists and engineers, from journalists and editors—in short, from all classes of employees.

These men seem to have been taught —perhaps self-taught—that fidelity, ability and first-class performance will, unaided, send them upward and forward. The truth is that while fidelity, ability and superior performance are the bases of advancement, promotion should get its impulse from the employee himself. In other words, if a man wants to get ahead, he should push himself ahead. Failure to get ahead is very often explained by absence of self-pushing.

Doing More Than a Day's Work

If a man wants to get ahead, in pay and position, he must do more than just perform his day's work well. He must, at the same time, be preparing himself for a job higher up—getting ready in advance, by special study. The man who is studying for a job higher up, with the higher pay that usually goes with a higher grade or quality of service, usually possesses purpose. Purpose and Push begin with the same letter. Indeed, if you look at the words relating to advancement, they all seem to be "P" words:—

Purpose	Prod
Push	Practice
Progress	Principles
Promotion	Pep
Power	Performance
Perseverance	Personality
Punch	Proficiency
Preparation	Prosperity
Persistency	Promptness
Pertinacity	Pluck
Polish	Popularity
Publicity	Perception

Failures omit from their vocabulary many of the "P" words listed above—purpose, push, preparation, power. They seem to prefer words beginning with "L":—

Leisure	Laxity
Laziness	Loitering
Listlessness	Languor
Limpness	Lounging
Looseness	Lateness
Lagging	Lackadaisical
Leaning	Lukewarmness

You, the reader of these words, can get some index to the quality of your own life by answering honestly this question —Am I a "P" man or an "L" man?

I.

WHAT are the chances of getting on for an artisan—a machinist, or moulder, or shipwright, for example?

Or to put it more broadly: What are the chances of getting on of the wage-earner—the man who gets so much an hour, or day, or week, or month?

Or to put it more broadly still: What are the chances of getting on for employed men—men who sell their skill, or fidelity, or knowledge, or ability to perform technical or semi-technical work, including professional men such as engineers, teachers, chemists, and so on?

Getting the Right Idea

The chances of getting on, in pay and position, of any class of worker, can be made very certain—almost certain—if the worker himself (1) gets the right idea and (2) has the grit to follow the right idea in the direction of its beckoning.

The right idea is: Every man must sell himself, by the exercise of his own initiative, to those who will pay him his worth; and he must keep on in this selfsame selling effort.

You ask, How can a man sell himself? What do you mean by "selling himself?" Let us answer these questions with suggestive illustrations.

A printer—a compositor—went to his employer with a new floor arrangement of composing frames, imposing table, galley racks, linotype positions, paper-cutting machine, presses, and so on; an arrangement that meant less waste motion, much saved time, and greater output at no increased cost. For his initiative and because of the indubitable value of his suggestions, this compositor was promoted to a higher position, with higher pay. This compositor sold himself to his own employer—sold an idea of his own thinking and observation. He did not wait for promotion, but speeded its coming by an effort of his own.

A Carpenter Has a Bright Idea

A carpenter showed his employers—a wood-working firm—how they could utilize much waste wood for the making of small wooden toys. For this suggestion, representing, as it did, a new source of revenue, and ultimately a new and highly profitable department, this carpenter was promoted in position and pay. In other words he sold something —an idea, a new business—to his employers.

A grocer's clerk showed his employer how he could find a new and extensive customer out of whom much extra profit could be made. He suggested that his employer should open a restaurant at a location where a restaurant was greatly needed. The grocer took up the suggestion, and found himself selling bread, biscuits, canned vegetables, tea, coffee, cheese, fruits, pickles, rice, potatoes, and a score of other grocery lines at higher-than-store prices, and always for cash. The grocer's clerk making the suggestion was given an interest in the new undertaking, and improved his income very substantially. That is, an employed one sold something of his own —an idea—to a buyer of it, and was well paid for his merchandise.

He Sold Himself to Himself

A machinist took up a correspondence course in draughtsmanship, in order to lift himself into a higher grade of occupation, with higher pay. When fully prepared, he applied for a position advertised, got it, and improved his grade of employment. While a draughtsman, he prepared himself as an electrical engineer, taking evening work in an institute of technology; and finally its examinations. To-day he is a consulting engineer, obtaining high fees. The machinist became possessed of market-

able wares which brought in a higher rate of pay than the sum per hour he received as a machinist. In other words, he sold himself—his ability and training—in a better market; and he continued to sell his wares—his ability and training, which he steadily improved—in still higher markets.

A teacher in a High School took post-graduate work at Harvard, secured his degree of Doctor of Philosophy, and in the course of a few years of directed purpose became a University professor at a higher annual remuneration than he could ever hope for as a High School teacher. At the same time, he increased himself in prestige, and shortened his working year from September-June to October-May. This teacher, by preparation, guided by purpose, and by the exercise of initiative, sold his wares—superior learning—in a better market.

A manager, on salary, wanting and needing more money, conceived the idea of a central buying agency for a number of retailers. He took his idea to an astute business man and sold it to him along with his own services. To-day that manager is making five times what he formerly made, and owns a substantial interest in the business he originated.

Promotion Lags For Some

The men who get ahead in this world are those who lift themselves to higher positions, who acquire fitness for higher positions in advance of seeking and occupying them. Most of us are willing to take higher positions and higher pay, promising ourselves, if we get higher positions and pay, by favor more than desert, to qualify for the higher post and pay **afterward.**. Promotion lags for the unprepared, and rightly so. Men that won't move forward beforehand are not likely to carry into higher posts a progressive spirit.

II.

THE message of this contribution to CANADIAN MACHINERY is addressed in particular to artisans—machinists, foundrymen and men in like employment; to clerical workers, to secretaries; and even to managers; especially to those who are not making progress in position and pay. If you are worth more money than you are now receiving, it is a burden upon your own shoulders to get the money you are worth. It is for you to seek more money, some place, on your initiative. In other words, you must sell yourself to some buyer who will give you a better price for what you have to sell than you are now getting. Perhaps—probably—this buyer is your present employer.

You Must Have More to Sell

If you are not worth more money than you are now getting, and yet desire more money or advancement, it is clearly up to you to make yourself worth more money. In other words, you must have more to sell—more skill, knowledge, productive, executive, or managerial ability. Having more to sell, you are in a favorable position to demand more money or recognition, or both.

III.

IT has been said that there are two classes of people in the world—leaners and lifters; and the leaners are in overwhelming majority. These leaners want to be carried; want their way to be made easy for them; want other men to find work for them; need others to watch over them in order to do their best work; and want others to lift them to better-paid work and work of a better sort.

They remain dependent children all their life long; and if they get some kicks and curses for leaning their weight on others who want to get ahead, or for hanging on to the coat-tails of men of greater strength and speed, they feel aggrieved, and develop socialistic views. And when old age comes, these leaners, grown feeble from their much dependence, may become a burden on their friends or kindred or perhaps on the State.

Leaners or Lifters—Which?

The question is inevitable: Are you a leaner or a lifter? If you are a leaner, and continue to be one, you cannot possibly earn as much as the man of equal fidelity, ability and performance with initiative and courage to exercise these qualities.

When you lean on a man—rely on him to find work for you and keep you at work, for wages—you pay him a substantial sum each year for the service you require of him. If you get from an employer $3.50 a day, then he expects to get back $5 or so for the $3.50 he gives you; and he gets this $5 or so out of what you produce. That is, he expects to get $1.50 a day, or $9 a week, or $450 a year per employee, over and above what he pays the employee. And if he employs 100 employees, it means that he gets $45,000 more than he pays them. Applied personally, it means that you, a leaner, pay your employer $450 or so each year as a fee for finding you work.

A Machinist Gets the Right Idea

When this idea sank into the mind of a certain machinist, he determined that he would sell himself to himself, and not to any other. He had a little money saved up—less than $500, and with this capital he opened up a small machine shop in the basement of his house. Here he worked nights until he developed a connection sufficient to permit him to give up his day job elsewhere. It was not long before this machinist with initiative found it necessary to transfer his machine shop from the basement of his dwelling to a regular shop and to employ assistance. To-day this man is an employer, and is drawing a very satisfying income by collecting $1.50 a day or so from each of twenty men who want their jobs found and maintained for them.

IV.

HOW is it with you, brother? Are you depending on your fidelity, ability and superior performance to advance you in pay and position, or are you practising salesmanship—doing a little pushing on your own account in the direction you want to go? Are you acquiring more in order to be able to sell more—more education, more knowledge, more skill—in short, more of the kind of merchandise you are selling?

How are you using your spare time—the time you call your own? Are you converting it into capital for to-morrow's needs? Are you reading books above your level—the only kind of books that educate you, stimulate you, lift you? Do your dreams lull you to sloth and sleep, or do they drum you out of repose and inaction?

Time—your free time—is a godmother, ready to bestow all manner of wealth on you, if you are her beloved child.

None but yourself condemns you to positions of lowliness and low pay. If you want to earn twice as much as you are now doing, you can surely do it, if you make yourself worth twice as much, and make others know your worth. It's all up to you.

EASTERN CAR CO. 1917 OUTPUT

THE Eastern Car Co., New Glasgow, N.S., has not been without a fair share of the manufacturing activity arising from railroad rolling stock contracts placed during the present year. A total of 4,640 freight cars have been built and shipped, outstanding features being that the majority were to foreign order and all were of steel frame construction. The shipments were as follows:

Paris-Orleans Railway, 1,600 box cars of 20 tons capacity.

French State Railway, 540 gondola cars of 20 tons capacity.

Russian Imperial Government, 2,000 box cars of 1,200 pood capacity.

Canadian Government Railways, 500 box cars of 50 tons capacity.

CANADIAN FURNACE CO., 1917 OUTPUT

DUE to the scarcity and high price of pig iron during the year, it may perhaps be superflous to state that the plant of the Canadian Furnace Co., at Port Colborne, Ont., has been operating to capacity in the twelve-month period. Only foundry and malleable pig iron are produced and of these commodities the total out for the year on a close estimate is 109,000 gross tons, all of which was sold to Canadian consumers. Due to the continuance of abnormal metal-working plant activity, the outlook for the coming year is of the brightest possible description.

Hydro-Electric Development. — The development of hydro-electric power in Canada, and especially in the Provinces of Ontario and Quebec, during the last ten years has been almost incredible. At the beginning of the work of the Ontario Hydro-Electric Commission, the late Premier, Sir James Whitney, stated the Commission would not require so much as 10,000 h.p. There is now, in round figures, an immediate demand for 300,000 h.p., and the demand cannot be satisfied.

Plant, Equipment, and Product, The Goodyear Tire & Rubber Co of Canada.

The rise of rubber in industrial importance from a laboratory curiosity to one of the most indispensable substances of civilization, in peace or war, forms one of the romances of the nineteeth century. The extent to which rubber enters into the needs of mankind's daily existence are numerous beyond belief, and the immensity of the plant described in this article, devoted as it is to one special product, will serve to emphasize the importance of rubber.

THE factory which the Goodyear Tire & Rubber Co. of Canada, Ltd., have recently built at New Toronto, Ont., is symbolical of the remarkable success which has attended the automobile tire manufacturing business in the Dominion, and, judging from the plans which this concern has made for future enlargement, there is every expectation of even greater expansion in this industry. The Goodyear Co., as is perhaps well known, supplied until now the Canadian trade from their factory at Bowmanville, Ont. The need for greatly increased manufacturing facilities to meet the demand for their product ultimately became urgent, and New Toronto was selected as the best location for the new tire plant. The Bowmanville factory, however, is still in operation, and is devoted exclusively to the production of mechanical rubber goods. The removal of the tire plant to the new factory will permit of a greatly increased output of mechanical rubber goods at Bowmanville, while the production of tires at the New Toronto factory will, of course, be considerably greater than at the old plant.

Experience Plus System

Advantage has been taken of many years' experience in the tire business to plan the layout of machinery and equipment at the new factory, and in this respect it may be said that nothing has been omitted whereby the rapid and efficient production of tires is made possible. The various processes, from the mixing of the raw materials to the finished product, follow one another in regular sequence, with no waste effort or back trucking. Each operation or process has also been carefully planned to produce a perfect tire without any undue expenditure of either time or energy. The resultant efficiency enables producing costs to be kept within prescribed limits.

An elaborate cost system is employed, which enables the staff to keep track of all charges and eliminate unnecessary expenditure of time or material. An experimental department is maintained to try out new ideas either in the mixing of raw materials or in manufacturing processes. In connection with this department is a chemical and physical testing laboratory. The statistical department collects and prepares all kinds of data relative to the operations in the factory, while there is also an efficiency department. Needless to say, all the departments work together with the common aim of maintaining a high standard of over-all efficiency.

Social Features

A suggestion system is in force, many valuable ideas having been submitted by its means and adopted. Boxes with paper and pencil are located at various points to receive suggestions, and any practicable ideas are rewarded in a substantial manner, according to their value to the firm. This system has the advantage of making the employees interested in their work, as well as being beneficial to the company. A welfare department has been organized to adjust complaints and generally look after the health and comfort of the employees. In this connection an athletic field will be laid out and sports of all kinds instituted. This feature will not be inaugurated until the spring, when the weather will permit of laying out the grounds. On the top floor is a cafeteria, where four meals a day are served at cost price. This is a great convenience on account of the entire absence of restaurants in New Toronto.

The company have a property covering about 26 acres, with a frontage facing south on the Toronto-Hamilton Highway. The factory stands some way back from the road, thus leaving sufficient space for future extensions. A spur from the Grand Trunk Railway System enters the property at the back or north side, where the power house is located. The factory comprises one large main building, a power house, cement department and spreading room. The last three mentioned are separate buildings, and are at the back of the main structure. It is the intention of the company to lay out the grounds surrounding the factory in an attractive manner when the weather becomes more favorable for turfing and planting trees. The surroundings will be made as congenial as possible for the employees. The space in front of the main factory building is sufficiently large to allow of two more units being constructed, provision having been made for extensions when the present factory was planned. The same idea was kept in view when the power house was designed, extensions being possible without interfering in any way with the present layout.

Building Details

The main building is 460 feet long by 100 feet wide, and is laid out in 20 feet bays each way. The building comprises four storeys and basement, and is approximately 70 feet high from the ground level. The basement is 12 feet high, and the first floor 22 feet high. The second and third floors are both 15 feet high, while the top floor is 12 feet high to the lower chord of the roof truss, plus 5 feet for the latter. The general construction material of the building is steel and brick, all internal columns through-

out being encased in concrete. In the construction of the main building 2,200 tons of steel were used and approximately 2,225,000 brick. The brick work is of high quality in spite of the fact that the greater part of it was laid during the winter, the successful carrying on of the work being made possible by a liberal use of salamanders. The ground was broken in July, 1916, the erection of the steel work started in November, and the first brick laid on January 3, 1917. Manufacturing operations were commenced in September of this year.

Fenestra steel sash is used exclusively. There are approximately 45,000 sq. feet of sash in the main building, the sections being about 17 feet wide, and ranging from 8 ft. to 15 ft. high. Each sash is equipped with from one to four ventilators. The monitor in the roof, which extends the full length of the building, is made up of three rows of glass on each slope, two of these rows on each side being equipped with opening mechanisms operated by hand from the floor. With so much space devoted to windows, the factory is exceptionally bright and well ventilated. This feature strikes the visitor immediately upon entering, and is a valuable one in that it means healthy conditions for the employees, and consequently more efficient work.

The basement extends under the entire building except for 100 feet at the west end. The basement floor is made up of 8-inch concrete, on which is laid two ply of waterproofing material. On this again is laid 1½ inches of mastic ashphalt. Under the floor is a complete system of tile drainage leading to sewers which are laid in the centre of the building throughout its entire length. There are three lines of sewers for drainage, rainwater, and water from the factory respectively. Downspouts from the roof are placed 40 feet apart inside the building, and are carried to one of the abovementioned sewers. The first floor is made up of 2 by 4's, laminated on steel and finished with maple flooring for a length of 320 feet.

Another section of the floor, comprising 60 feet, is concrete on steel, with mastic finish laid on waterproofing. The remaining 80 feet is composed of wood blocks laid on concrete. The second floor is made up of 2 by 4's, laminated on steel, with maple finish, except for 80 feet, which consists of wood blocks on concrete. The third floor is composed of laminated 2 by 4's laid on the steel, with maple finish, except for a length of 80 feet at the west end, which is of concrete with cement finish and hardened. The fourth floor is of the same construction as the third. The roof is constructed of 1⅞ by 6 in. boards laid on steel purlins and covered with 4-ply felt. The pitch was poured and not mopped, while the felt is covered with slag instead of gravel.

Elevators and Lavatories

The building is at present equipped with three elevators, but provision has been made for two more. The capacity of each elevator is 6,000 pounds, and the platform is 7 by 11 feet. All the elevators run from the basement to the top floor and are electrically driven. Each elevator at each floor is equipped with a rising gate, and the openings are protected with steel rolling shutter doors. The elevator and stair wells are of brick and steel construction. All floors and landings are of concrete on steel and have a mastic ashphalt finish. The stairway construction is steel trough, with concrete filling and mastic treads. One notable feature in the construction is the absence of foundations for supporting the heavy mill lines and other heavy machinery on the first floor. The machines are supported on steel beams carried on the main columns of the building. This method of construction gives a clear and unobstructed basement.

FIG. 1. COMPOUNDING DEPARTMENT WHERE RUBBER AND THE VARIOUS INGREDIENTS ARE WEIGHED AND PLACED IN BOXES.

Considerable attention has been given to the welfare of the employees in the matter of lavatory accommodation. Lavatories and toilets are provided on each floor, being located on the stairway landings and in separate rooms. The lavatories are provided with hot and cold water, while liquid soap is piped to each bowl from a small overhead tank. Paper towels are provided in preference to the old-fashioned and unsanitary roller towel.

A well-equipped machine shop occupies a part of the main floor at the west end. The equipment installed includes a general line of machine tools suitable for effecting repairs and making parts for the machinery in the factory, the company being independent of outside help in this respect except for castings or heavy work.

Transmission Equipment

The transmission equipment in the factory was supplied and installed by the Dodge Mfg. Co., Toronto, while the ball bearings on the line shafting are of the Chapman type, there being over one hundred sets of ball bearings of one size, in addition to others of varying sizes.

Fire Protection System

A sprinkler system is installed throughout the plant connected to the overhead tank and fire pump. Branches from the system are taken off from four separate risers at different points in the building, each riser having a control valve. There are 6 sprinkler heads to every 20 feet square bay on all floors. The entire system including valves is painted red, all other piping being black. The sprinkler system was installed by

FIG. 2. SECTION OF MAIN FLOOR SHOWING WARM UP MILLS AND CALENDERS. NOTE CONSTRUCTION OF FLOOR AND LOFTY INTERIOR.

the H. G. Vogel Co., Buffalo, N.Y. The tank for the sprinkler system has a capacity of 75,000 gallons and was constructed by the Chicago Bridge & Iron Co., Bridgeburg, Ont.

The power house is one of the outstanding features of the Goodyear factory, embracing as it does some unusually fine equipment. The building is of large proportions and substantial construction while the architectural features are also noteworthy. In the layout, provision has been made for installing additional units and also for making extension to the building when necessary without interfering with the plant as installed at the present time.

Constructional Features

The building is of steel and brick construction and is divided into four sections, namely, the boiler room, pump room, motor generator room, and transformer room. These rooms have the following dimensions:—Boiler room 58 feet by 88 feet; pump room 40 feet by 66 feet; motor-generator room 36 feet by 66 feet, and transformer room 22 feet by 66 feet. This gives the building a total length of 156 feet and a width of 88 feet at the boiler room end and a width of 66 feet for the remainder of the length. The boiler room is 40 feet high, as are also the others.

The windows are of steel sash, are arched in semi-circular form which improves greatly the general appearance of the building. The roof is composed of 2-inch concrete reinforced with ferro-inclave, laid on steel purlins, the ferro-inclave being plastered on the underside. On top of the concrete are laid 2 inch boards which in turn are covered with 4 ply felt roofing, the pitch for same being poured not mopped. This again is covered with slag. The building is fireproof, while the wood over the concrete prevents the roof from sweating.

The basement under the boiler room is 16 feet deep. Two of the basement walls while acting as retaining walls are constructed of brick to allow for future extensions in both these directions. The boiler foundations are of concrete, 16 feet deep. They are constructed so as to take care of expansion and contraction, expansion joints being provided as in the case of the boiler setting. The stack is built in one bay of boiler room, the gases being led to it through a smoke duct in boiler foundations. The stack is 250 feet high and 15 feet internal diameter at the top. Its foundation is of reinforced concrete 36 feet square and designed for a maximum load of 3 tons per sq. foot.

The stack is constructed of radial perforated brick laid with strong cement lime and forming a very strong bond. The perforations form a dead air space around the chimney, insulating the hot column of rising gases on the inside from sudden changes of temperature of the outer air, resulting in a maximum draft under practically all conditions. The stack is large enough to take care of a duplicate boiler installation or a total of six boilers. The stack was constructed by the Custodis Canadian Chimney Co., Toronto.

Equipment Contractors

The power house and its equipment layout were designed by F. H. Breor, chief engineer for the Goodyear Co. Robert L. Finlay is engineer in charge. The entire installation of pumps with one exception were supplied by Epping-Carpenter Pump Co., Pittsburg, Pa. The high pressure piping and fittings were supplied by the Walworth Co., Boston, Mass.; pipe covering by the Canadian H. W. Johns-Manville Co., Toronto; pressure reducing valves by Kiely & Mueller Co. through Arthur S. Leitch Co., Toronto; and steam traps by V. D. Anderson Co., Cleveland, O. The valves are principally by the Lunkenheimer Co., Cincinnati, Ohio. The Crane Co., of Chicago, also supplied some valves. The auxiliary steam turbine and generator set was supplied by the Canadian General Electric Co.

The entire electrical equipment in the power house was supplied and installed by the Canadian Westinghouse Co., Hamilton, Ont. The International Engineering Works, Amherst, N.S., built and installed the boilers. The stokers were supplied by the American Engineering Co., Pittsburgh, Pa.; the fan by the American Blower Co., Detroit, Mich.; and the ash conveyor by the American Steam Conveyor Co., Chicago. All the piping was installed by Bennett & Wright, Toronto. The travelling crane was made by the Northern Crane Wks., Walkerville, Ont. The building was erected by the Dominion Construction Co., and the rolling doors in each of the rooms were supplied by the A. B. Ormsby Co., Toronto. The "Venturi" meter was supplied by Allen General Supplies Ltd., Toronto.

FIG. 3. SECOND FLOOR. FIRE CONSTRUCTION DEPARTMENT WITH STOCK TABLES ON THE LEFT AND BUILDING MACHINES ON THE RIGHT.

Boiler Installation

The boiler installation comprises two 600 h.p. Edgemoor type water tube boilers built and installed by the International Engineering Works, Amherst, N. S. Provision has been made for another unit of same capacity when required. They are among the largest boilers ever built in Canada. A feature of this type of boiler consists in the three longitudinal drums which run into the box header. Another point of interest is the distance between the tubes and grate. The first row of tubes is 12 feet from the grate allowing more than the usual amount of space for combustion so that the gases will be thoroughly burned before coming in contact with any part of the boiler having a lower temperature which would create condensation and thus cause smoke. The boilers have flanged headers and seamless steel tubes,

FIG. 4. WEST END OF SECOND FLOOR WHERE TIRES ARE CURED AND VULCANIZED.

the latter being 4 inch diameter and 20 feet long. The boilers are designed for a working pressure of 200 lbs. per square inch, but are only operated at 175 lbs. They are equipped with Lunkenheimer non-return stop valves, there being a runway with chainblock overhead to handle the valves. Access is gained to the top of the boilers by means of a steel stairway. Reference to the piping is made under another heading. The boiler fronts are equipped with rolling steel doors supplied by the A. B. Ormsby Co.

Mechanical Stoker Installation

The boilers are equipped with Taylor power dump stokers supplied by the American Engineering Co., Philadelphia, Pa. This is a seven retort machine with a continuous overload capacity of 200 per cent. boiler rating and a maximum peak load capacity of 250 per cent. for four hours; the maximum operating economy is obtained at approximately 150 per cent. boiler rating. The Taylor is a gravity underfeed stoker with inclined fuel bed, and has a hinged dump plate operated by a steam cylinder located underneath. The coal from the hopper is fed into the magazine or retort from which two cylindrical rams driven by connecting rods from a crank shaft, and assisted by gravity, push it into the furnace at an angle to the fire surface. The upper ram shoves the coal outward and upward, distributing it in the coking zone. The lower ram working with the upper acts similarly, but instead of forcing in fresh coal, it impels the fuel bed and the refuse toward the dump plates in the rear.

The necessary air to support combustion is furnished by a power-driven fan located in the boiler room basement. The fan which is direct connected to two vertical steam engines, was supplied by the American Blower Co., Detroit, Mich. The air is driven through ducts to the wind box, thence into the tuyere boxes, and in turn through the fuel bed. The driving unit for the fan drives both the fan and speed shaft, which, in turn, drives a crank shaft which actuates the rams. The crank shafts are in sections; there being a section for each pair of rams, while each group of sections is driven from its own gear box. Since the same driving unit operates both stoker and fan, a change of speed simultaneously changes both rate of feeding coal and rate of supplying air.

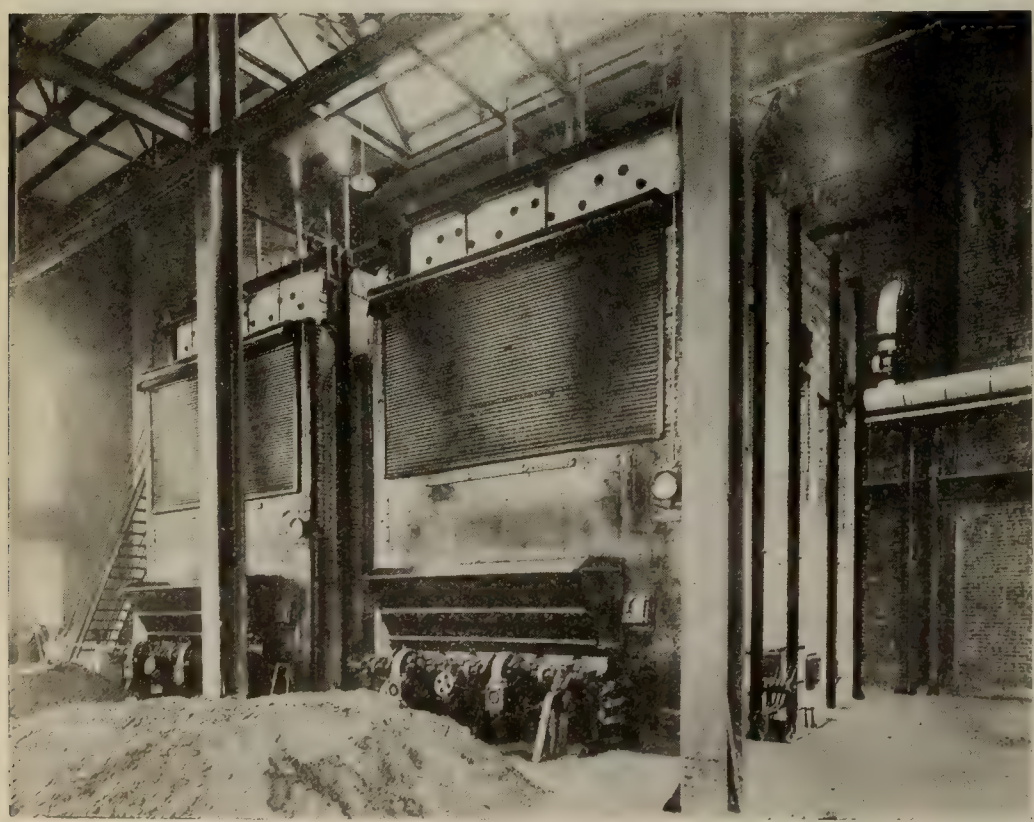


FIG. 5. TWO 600-HORSEPOWER ROBB WATER TUBE BOILERS WITH TAYLOR STOKERS.

Ash Ejector

A Griffin ash conveyor is installed along the front of the ash pit, which conveys the ashes to a pit outside the building. The conveyor which is operated by steam jet was supplied by the American Steam Conveyor Co., Chicago, Ill.

Pump Room

In the pump room are installed all the pumps required for the various services, also the feed water heater, and air compressor. The layout is as follows:—On the west side are two hot well pumps and feed water heater, a boiler feed pump, two high pressure hydraulic pumps, balancing tank and the accumulator. On the opposite or east side are the fire pump, booster pump, two low pressure hydraulic pumps, air compressor and vacuum pumps. All the valves in the piping system connecting the pumps are located in the basement, and are controlled from floor stands in the pump room. The ten ton overhead Northern travelling crane installed here is operated by hand from the pump room floor. All the piping, both steam and water, is carried under the ceiling of the basement under the pump room. The basement is 12 feet high allowing ample head room. At one end of the basement is a sump for waste water and drainage. The sump is equipped with a bilge pump for delivering its contents into the sewer. The pump is a 3-inch Yeoman Bros. submerged centrifugal, driven by a Canadian Westinghouse motor.

All clean returns from the factory services, traps, etc., discharge normally into the hot wells. Make-up water is supplied to the hot wells to make up for losses. Water is pumped from the hot wells by two 7½ x 8½ x 6 in. pumps located near the feed water heater in the pump room. The hot wells are cross connected so that either can be used independently of the other. A 5 x 8½ x 6 in. Epping-Carpenter duplex pump is installed in the basement for delivering clean returns from a sump to hot wells, in case difficulty is experienced at any time in raising returns direct to hot wells. There is a tank on the main floor for settling sand and sediment in the raw water from the lake that goes to the presses. This tank is at a sufficient elevation to put a head on the pump sections. The tunnel through which all the piping is carried to the factory runs from this basement to the factory building basement.

Returning to the pump room there are two 7½ x 8½ x 6 inch Epping-Carpenter duplex horizontal pumps for drawing from the hot wells and discharging to the feed water heater. The 4,000 h.p. feed water heater was built by Warren, Webster & Co. Camden, N.J. Next in the line is a 3 inch, 4-stage Epping-Carpenter centrifugal boiler feed pump which supplies water to the boiler from the heater at 225 lbs. pressure. This pump is direct connected to a 35 h.p. Can. Gen. Electric a. c., 2200 volts, induction motor. In the line between this pump and the boilers is a 3 x 1 inch, type M register-indicator-recorder. "Venturi" meter supplied by the Builders Iron Foundry, Providence, R.I., through the Allen General Supplies, Ltd. On the same side of the pump room are installed two Epping-Carpenter 10 x 2 x 2 inch duplex, horizontal, outside packed, pot valve, steam driven pumps. These supply water at 1,500 lbs. pressure to the hydraulic presses in the factory, and operate in conjunction with an accumulator having an 8 inch ram of 8 feet stroke. The valves and fittings on these pumps are Crane Co. make. The balancing tank for the low pressure hydraulic pumps is situated on this side. It is 42 inches in diameter by 12 feet high.

Fire Pump and Air Compressor

On the east side of the pump room there is installed at the south end a Blake-Knowles 18 x 10 x 12 inch, horizontal, duplex, Underwriters' fire pump, having a capacity of 1,000 gallons per minute. This pump supplies the sprinkler tank and fire system lines for the factory. The next unit is a booster pump for factory water supply, or alternatively for the fire system. This pump delivers water at 125 lbs. pressure to the factory. It is a 6 inch, 3-stage Epping-Carpenter turbine unit direct-connected to a 150 h.p. Curtis steam turbine running at 1,500 r.p.m. Next in line are the pumps for supplying water at 225 lbs. pressure for the presses in the factory. There are two units for this service, both Epping-Carpenter make, of 12 x 6 x 12 inch, duplex, horizontal pot valve type. These pumps operate in conjunction with the balancing tank, but can also be used for boiler feeding in an emergency.

A Laidlaw-Dunn-Gordon air compressor is located on the same side of the plant. This unit is a 10 x 16 x 16 x 10 x 12 inch, cross compound steam driven, 2-stage machine, and delivers compressed air at 100 lbs. pressure throughout the entire plant. It also operates in connection with the balancing tank and a receiver, the pressure being controlled by a Fisher pressure regulator. The vacuum pumps for the heating system are installed at the north end and east side of the pump room. There are two of these pumps, both being Epping-Carpenter 6 x 10 x 12 inch units. They are controlled by a Mason regulator. The gauge board installed alongside the Venturi meter will have 14 Bristol gauges and recorders for steam, hydraulic and water service pressures, vacuum, etc. In the illustration showing the west side of the pump room, two steam lines will be seen. The one on the left hand is the 10-inch steam line for the factory, and the one on the right hand is the 8 inch line feeding the distributing header for the pumps.

Piping System

The piping system is one of the features of the power plant and a great deal of time and ingenuity has been expended on the layout. In designing the system, the principal objective of the engineers was to have the piping for the various services so installed that a tie-up in the factory would be practically impossible. To provide for all contingencies, the various pumps are connected up with the water mains in such a manner that if one pump fails another can be by-passed into the line; in other words, flexibility is the feature of the piping system. The water is pumped to the power-house from the lake by two 8 inch, 3 stage Bawden turbine pumps located in the municipal pumping station there. The water is delivered to the factory through a 12 inch main direct to the factory distributing system. This water, however, can be by-passed to a 200,000 gallon storage reservoir so that, in the event of the pumps at the lake failing, the factory can be supplied from the storage reservoir by means of a 6 inch, 3-stage turbine pump which delivers the water direct into the factory distributing system. One instance of the flexibility of the piping arrangement is the fire protection system. A Blake-Knowles Underwriters' pump can deliver water from the reservoir direct to the factory supply line or from the regular 12 in. supply line. In the event of the fire pump being out of commission, a turbine pump can be by-passed into the line, thus providing four alternative methods of supplying the factory fire system apart altogether from the overhead sprinkler tank.

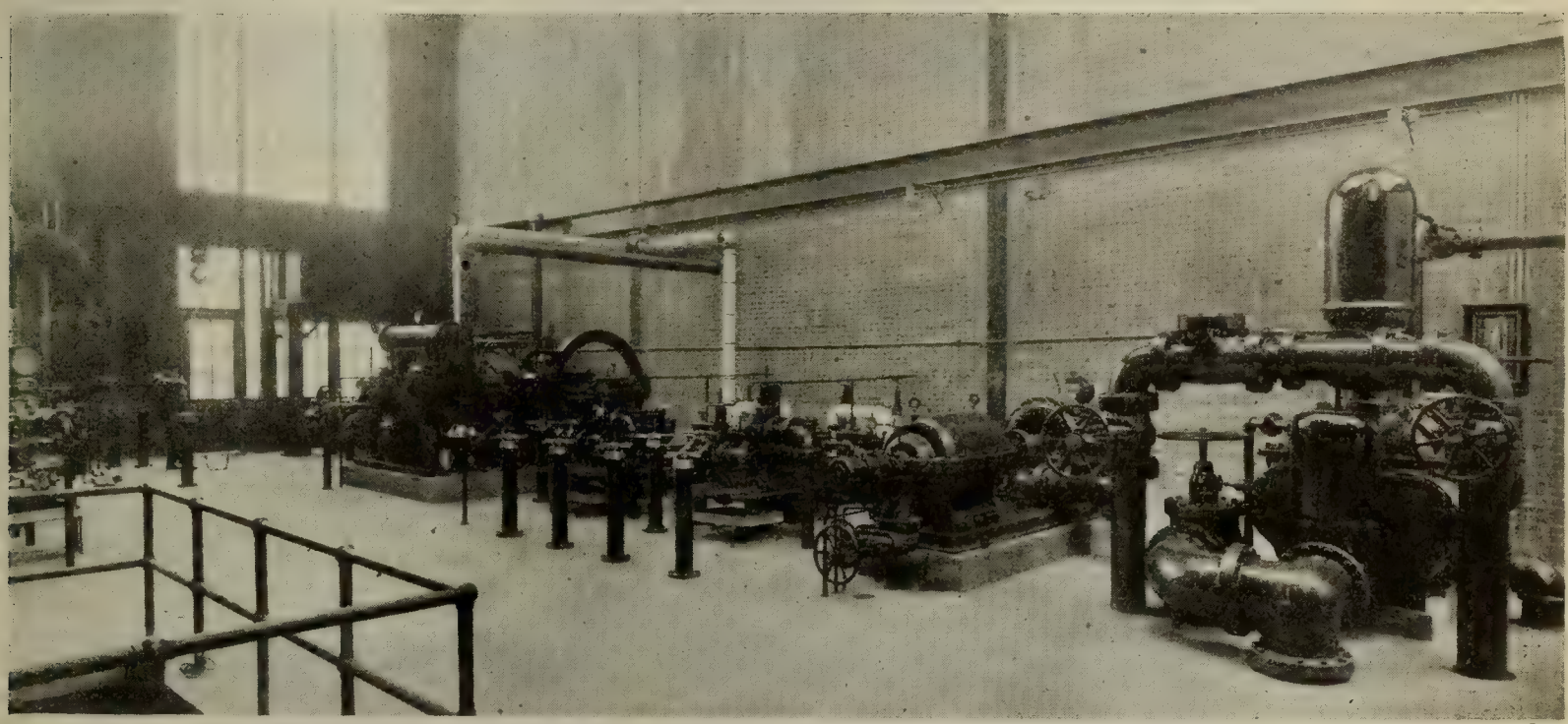


FIG. 6. EAST SIDE OF PUMP ROOM SHOWING, FROM RIGHT TO LEFT, FIRE PUMP, BOOSTER PUMP, LOW PRESSURE HYDRAULIC PUMPS, AND AIR COMPRESSOR.

Alternative methods of boiler feeding are also provided, either direct from the feed water heater, which is the regular way, or from either of two hot wells for which another pump is used, or from either or both the low pressure and high pressure hydraulic pumps. The piping system although complicated has proved thoroughly satisfactory in practice. A detailed description of the system would take up considerable space and would doubtless be confusing to the reader so a more general description only will perhaps better serve the purpose of this article. Taking the piping system as a whole, great credit is due Mr. Breor, the Goodyear Co. engineer who designed the

layout, and to Bennett & Wright, of Toronto, who carried out the work.

Steam Piping System

Taking the steam piping first, steam is received from the boilers by two 8 inch lines to the header. The header is 14 in. in diameter, of wrought steel, with wrought steel nozzles or branches welded to it by the oxy-acetylene process. The flanges are of cast iron and the header is 20 feet long. There is a 10 inch line to the factory, an 8 inch line from the header to the pumps and air compressor on the East side of pump room, and two 4 inch lines, one for the pumps on the West side of the pump room and the other line to the boiler room basement for the ash conveyor, fan engine, etc. The piping is designed for 175 lbs. per sq. inch working steam pressure with 100 degrees Fah. superheat.

The 10-in. line extra heavy steel pipe is carried under the pump room into the basement where the pressure is reduced from 175 lbs. to 100 lbs. by a Kiely & Mueller reducing valve. At this point the line leading to the factory is by-passed, and is equipped with an expansion joint, a steam separator, two Lunkenheimer valves, and an Anderson steam trap. From here the main steam line leading to the factory is carried through the tunnel to a point in the factory basement where the steam is distributed for the heating system and for factory purposes, such as heating, vulcanizing, etc.

A relief is installed at each regulating valve to prevent the pressure building up. The distributing line for the heating system is 6 inches on the high pressure or inlet side, and 12 inches on the low pressure or outlet side of the reducing valves. The pressure from the main line for the heating system is reduced from 100 to 30 lbs., and from 30 to 2 lbs. by Kiely & Mueller reducing values.

The 12-in. exhaust steam header is carried the entire length of the pump room basement and collects the exhaust from all the pumping units, and discharges into the feed water heater, or is by-passed to the atmosphere. The exhaust steam header is of standard steel construction with steel flanged fittings. The exhaust pipe from one pump and the by-pass from header consist of spiral riveted wrought iron pipe.

All the fittings which carry boiler pressure are of cast-steel and have Vanstone joints, both fittings and bends being supplied by the Walworth Co., Boston, Mass. All the reducing valves were supplied by Kielly & Mueller, and the steam traps by V. D. Anderson & Co., Cleveland, Ohio. All piping carrying high pressure is covered with 85 per cent., 1½-in. sectional magnesia, with the exception of the tanks, vulcanizers, etc., which are covered with 85 per cent. magnesia block. The exhaust steam piping and low pressure heating line are covered throughout with 1-in. sectional air cell. All covering is painted with two coats of lead and oil, and is finished with brass bands, the whole presenting a neat and workmanlike appearance. The pipe covering was supplied by the Canadian Johns-Manville Co., and was installed by Bennett & Wright.

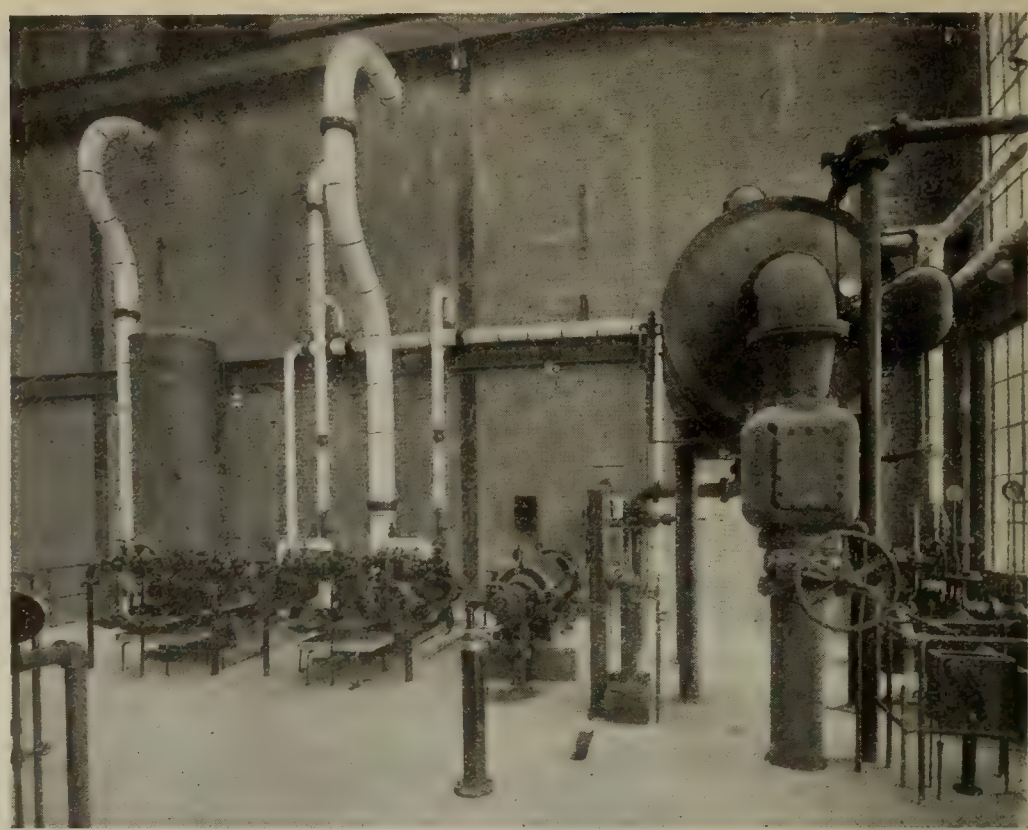


FIG. 7. WEST SIDE OF PUMP ROOM SHOWING BOILER FEED PUMPS, FEED WATER HEATER, AND HIGH PRESSURE HYDRAULIC PUMPS.

All the high pressure valves are cast steel and were supplied by the Lunkenheimer Co., as were also the non-return valves on the boilers. All clean returns from the factory discharge into two hot wells under the pump room floor. Make-up water is also supplied to the hot wells in sufficient quantity to take care of losses.

Hydraulic Piping System

The raw water which is pumped from the lake is carried in a 12-in. main to the pump room to supply the various pumps, tanks, etc., or direct to the factory supply main. A line is carried from the inlet main to a 6-in. turbine booster pump which supplies water to the factory for general purposes at 125 lbs. per sq. inch. A second connection goes to the fire pump, a third to the low pressure hydraulic pump, and a fourth to the boiler feed make-up water. A 250-lb. pressure line is carried from

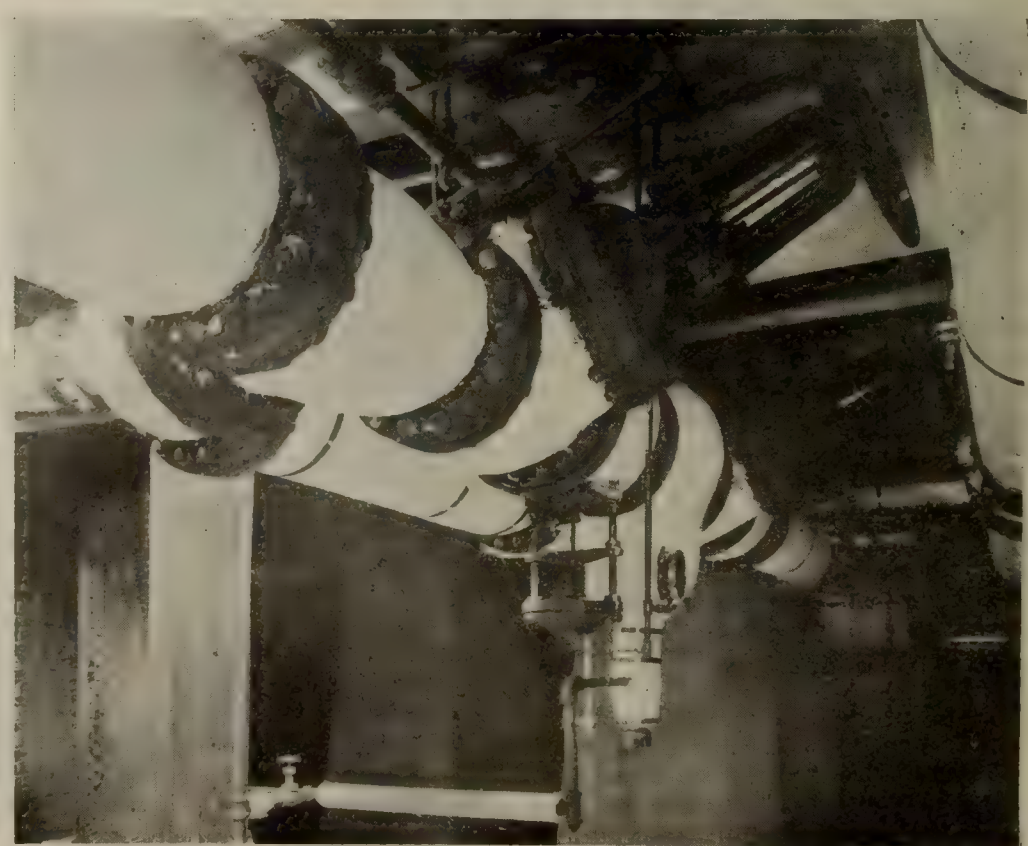


FIG. 8. PUMP ROOM BASEMENT SHOWING MAIN STEAM LINE TO FACTORY WITH SEPARATOR, REDUCING VALVE, AND BY-PASS PIPE.

the low pressure hydraulic pump to the presses in the factory, while another line carrying 1,500 lbs. pressure is taken from the high pressure pump, also to the presses. The high pressure service is used for operating the presses and the low pressure service for putting the presses in position for operating.

A 4-in., 50-lb. pressure line is carried to the factory for the plumbing system, while a 2½-in. suction line is taken from the 250 lb. water service line to the hydraulic pump which boosts the pressure to 1,500 lbs. A balancing line is taken from the balancing tank in pump room to obtain uniform pressure on the system. The high pressure pumps operate in conjunction with a hydraulic accumulator also located in the pump room. There is a 2½ inch line connecting the balancing tank with the air compressor. The material used in the low pressure lines is extra heavy steel pipe with cast iron fittings. For the lines carrying 250 lbs. and upwards, extra heavy steel pipe and cast steel fittings are used. Crane cast steel valves are used in the 1,500 lb. lines, and Lunkenheimer valves in the lines carrying pressures below this.

The Blake-Knowles fire pump delivers from the 12-in. intake supply line to the stand pipes in the factory and also to the sprinkler tank. It will also pump water from the storage reservoir to the fire system. The booster pump is connected up to deliver water to the factory for general purposes or to the fire system, taking the water from the incoming line or from the storage reservoir. The two low pressure hydraulic pumps are connected up so that they can be used for boiler feeding in case of emergency. All hydraulic returns are collected in a tank and returned to the pumps.

Heating System

The heating arrangements for the factory are on the low pressure vacuum return system which has been designed to give a temperature of 70 degs. at 10 deg. below zero, Fahr., with maximum wind pressure. In designing the system particular care had to be taken to allow for the large area of glass and somewhat high wind pressure on account of the exposed location of the factory. There is a total of approximately 40,000 sq. ft. of radiation. The building is warmed throughout with wall radiators placed below the windows, each radiator containing an average of 200 sq. ft. of radiating surface. On the supply end of each radiator is a Jenkins valve and on the return end a Dunham vacuum trap. The radiators are hung with special wrought iron brackets which are built into the wall. They are in two feet wall sections, are of new pattern, and were supplied by the Dominion Radiator Co., Toronto.

The distributing mains for the heating system are carried on the second floor ceiling, while risers take care of the third and fourth floors, with drop risers for the floors below. The vacuum return system is carried along basement ceiling to the tunnel and back to the vacuum pumps in the pump room. The roof monitors are taken care of by 1¼ and 1½ inch pipe coils, there being twelve coils containing 10,500 feet of pipe complete with headers, elbows and supports. The coils are arranged so that the entire bank can be cut off by a valve placed on the floor line. The pressure is reduced from 100 lbs. to 30 lbs. and then from 30 lbs. to 2 lbs. by reducing valves which are situated in the factory basement near the tunnel. The entire heating system was designed and executed by Bennett & Wright.

The original plans did not call for a steam heating installation in the power house as it was thought to be unnecessary. Owing, however, to the efficiency of the steam pipe insulation, it was finally found necessary to heat the building. In the power house there are 2,700 feet of radiation. The heating system is similar to that installed in the factory. The cement house and spreading house have a total of 1,500 feet of radiation, and the same system is installed in these two buildings as in the main factory building. The only variation is that the radiators were supplied by Steel & Radiation, Toronto, instead of by the Dominion Radiator Co.

Electrical Installation

There are a number of interesting features in the electric power and lighting installation. The company takes power from the Hydro System but considerable direct current power is also required for a number of the factory motors. The equipment in the motor generator and transformer room will be taken together in the description given below, being naturally dependent upon one another. In the motor generator room, provision has been made for an additional unit which may be installed in the near future. Runways have also been provided for an electric traveling crane which however has not as yet been installed. The accompanying illustration shows the switchboard gallery which is 14 feet wide and extends the entire length of the room. It will also be observed that there is a rolling door for each room; these were supplied by the A. B. Ormsby Co., Toronto.

Transformers and Switches

The plant receives 3 phase 25 cycle power at 2200 volt through an overhead line from the Hydro sub-station a short distance from the company's power house. The line enters the building at the transformer room. The system is protected by a set of Westinghouse type AK electrolytic lightning arresters. These are mounted on a gallery about 25 ft. from the floor. Disconnecting switches are also here provided for cutting off the entire supply. On the main floor of this room there are installed four 150 KVA. O. I. S. C. transformers, 2200/550 volts. Three of these are ordinarily used connected in delta, the fourth being a spare unit which can take the place of either of the others in case of breakdown. On a pipe structure immediately above the transformers there is mounted a set of disconnecting switches for both the high and low tension side of each transformer, and, over the spare transformer, these switches are double throw and connected in such a manner that the spare transformer can be put into service by simply closing the proper switches.

FIG. 9. MOTOR-GENERATOR ROOM WITH SWITCHBOARD GALLERY AND 550-VOLT SWITCH STRUCTURE UNDERNEATH THE D.C. BOARD AT FAR END.

Directly opposite the transformers in the same room is located the 2200 volt switch structure. This consists of the usual pipe framework with a laminated copper bus running along the top. Beneath this are mounted all the electrically operated remote controlled oil switches which control the various outgoing 2200 volt feeders to the factory, and also the primary of the transformer bank. Between the oil switches and the bus there is a set of disconnecting switches on each circuit, and at the end

of the structure the main incoming line switch, which is also electrically operated, is located, likewise the disconnecting switches.

There is also mounted adjacent to this structure another set of Westinghouse type AK electrolytic lightning arresters which are connected directly to the 2200 volt bus. All series transformers are connected in on the load side of the circuit breakers and immediately above the potheads on the end of the lead covered cables. The cables pass from here down through the floor into the underground duct system, which will be spoken of later.

A.C. and D.C. Switchboards

Next to the transformer room there is the motor-generator room which also contains the operating gallery on which is mounted the nine-panel a.c. switchboard, and five panel d.c. switchboard, both of Westinghouse manufacture. The material used on both these switchboards is black marine slate, having a total height of 7 ft. 6 ins., composed of one panel 25 ins. high, and another 5 ft. 5 ins. high, supported on angle iron frame work. The width of the panel varies according to the amount of apparatus mounted thereon, but none are less than 20 ins. wide. The thickness of the slate is 2 ins. and each panel has the edges of the slate beveled. The a.c. board controls all the 2200 and 550 volt circuits and the incoming line switch. As all these switches are remote controlled and electrically operated, only the controls and the indicating lamps are mounted directly on the switchboard.

A totalizing panel is provided which contains a Westinghouse graphic recording wattmeter, graphic recording frequency meter, graphic recording power factor meter, and graphic recording voltmeter. At the left-hand end of this board, on a swinging bracket, are mounted a voltmeter and an indicating power factor meter, the voltmeter being arranged so that it can be plugged on to any one of the three phases, and the power factor meter arranged so that by inserting a plug into a receptacle provided on each one of the feeders, the power factor of that load may be read. The relays protecting all the circuits on this board are Westinghouse type B shunt trip, and are located on brackets at the back of the board.

Motor Generator and Connections

In a plant of this kind it was found advisable to use direct current motors on the calenders, and for supplying this load there has been installed a Canadian Westinghouse motor-generator set. This is a three-bearing machine, consisting of a 510 h.p., self-starting synchronous motor, 3 phase 25 cycle 2200 volt, direct connected to, and on a common bedplate with, a 350 k.w. 230 volt 3-wire d.c. generator. The speed of the set is 750 r.p.m., and there is a 6 k.w. exciter mounted on the end of the shaft for exciting the synchronous motor. Balance coils are provided capable of carrying unbalanced load up to 50 per cent. of the generator capacity. The d.c. leads from the generator are carried through conduit up to the back of the d.c. switchboard on the gallery, where the usual switches and circuit breakers are provided.

The starting panel for the synchronous motor forms part of the d.c. switchboard. On it are mounted two controllers and three signal lamps, which work in conjunction with three electrically operated oil switches on the switch structure immediately below the gallery. This panel also mounts relays, a field switch, and two ammeters, one in the field circuit of the synchronous motor, and the other in the primary circuit. To the right of the d.c. generator panel there are two d.c. feeder panels consisting of 800 amp. carbon circuit breakers, ammeters and knife switches. The last panel on this switchboard is for controlling a 25 k.w., 125 volt, General Electric Co., turbo-generator, which is used for emergency lighting in case the power should be off. On a swinging bracket at the right-hand end there is mounted a 300 volt d.c. voltmeter.

FIG. 10. VIEW OF TRANSFORMER ROOM. 2,200-VOLT SWITCH STRUCTURE ON THE RIGHT AND TRANSFORMERS ON THE LEFT.

Switch Structure Details

The switch structure, which is mentioned as being underneath the switchboard gallery, in addition to mounting the oil switches for the synchronous motor, also has mounted on it the 550 volt electrically operated oil switches. These are fed from an overhead bus through disconnecting switches, and the entire structure is very similar to the 2200 volt structure in the transformer room. Altogether there is a total of 18, either 2200 volt or 550 volt Westinghouse type B electrically operated remote controlled oil switches in this plant.

By the use of these switches the Goodyear Co. have been able to concentrate all their controllers on a comparatively small switchboard which would not have been possible had they mounted the oil switches directly behind the switchboard panels as is so often done in installations of this kind. On all parts of the electrical equipment there has been provided ample room for future extension. Both switch structures can be extended a considerable distance; and there is room for two more motor-generator sets as well. Both a.c. and d.c. switchboards can be extended in either direction, and the a.c. switchboard is even now provided with two blank panels which can be equipped with instruments and controllers when the occasion arises.

All the cables leaving the power house are three-conductor, cambric insulated, and lead covered. These pass through an underground duct system consisting of about sixty 3-inch fibre conduits, to a brick cable vault located at about the centre of the factory building in the basement. From here the various cables are distributed. The 2200 volt cables to the large motors run direct through in iron conduits. The other circuits, consisting of 550 volt power and the direct current circuits change to rubber insulated braid covered cable, run in iron conduits, to the various machines or distributing points.

Lighting Details

The lighting of the factory is taken care of by three 35 k.w. oil insulated single phase transformers, located in a sub-station in the basement of the factory. In this room there is also a 2200

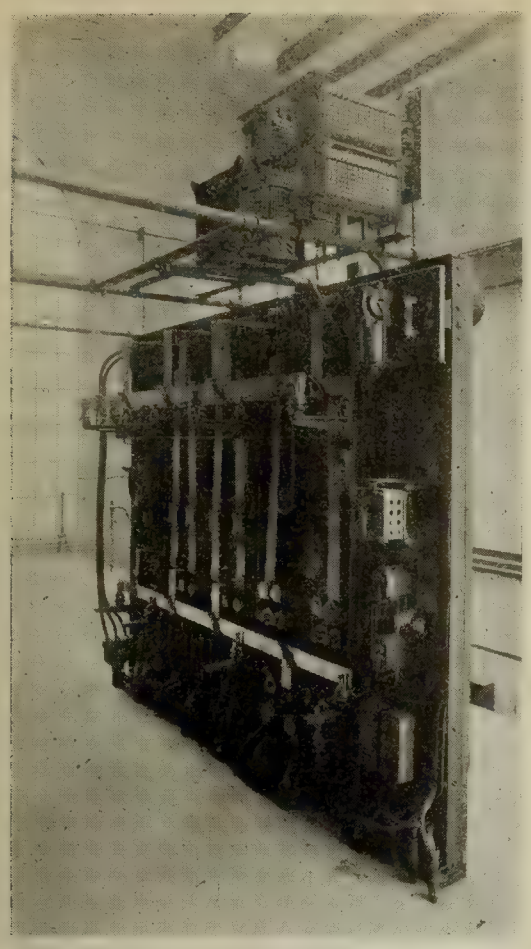


FIG. 11. BACK OF D.C. SWITCHBOARD SHOWING ARRANGEMENT OF BUSES.

volt oil switch for controlling the primary, and a number of knife switches and fuses for controlling the secondary circuits. This apparatus is mounted on two black marine slate panels of standard height and dimensions. A 6-wire cable bus is run from the low tension side of the transformers over the top of the switchboard panels, and connected to the laminated copper bus which distributes power to the various lighting circuits.

Factory Motors and Equipment

The various lines of mixing mills, warming up mills and washing mills in the factory are driven by Westinghouse type CCL squirrel cage induction motors, 3 phase, 25 cycle, 2200 volt, 500 r.p.m., 2-bearing pedestal type, there being three of 400 h.p., one of 300 h.p., and one of 200 h.p. These are each direct coupled to a reducing gear by means of a Cutler-Hammer magnetic clutch coupling, which in turn is connected with a safety switch located over each mill, so that in case of accident the operator may by tripping the safety switch disengage the magnetic coupling which operation also sets two magnetic brakes, one connected to the motor shaft, and the other to the reducing gear shaft, and also opens the motor switch, so that the whole outfit is immediately brought to a standstill.

The starting panels for each of these large motors are in each case located just a few feet away from the motor. In addition to a double-throw starting oil switch for the motor, and a double-throw oil switch for reversing the motor in case of necessity, there is also mounted the relay apparatus for controlling the brakes and clutch couplings. An ammeter connected in the primary circuit of the motor completes the equipment of these panels. The apparatus at the back of the panels is neatly enclosed in a steel housing, with a ventilator at the top. The auto-transformers and cable terminals, etc., are also mounted within this housing.

For driving calenders there are provided three 75 h.p. variable speed direct current motors. These are of steel frame pedestal type construction, and are equipped with interpoles. They are operated from the 3-wire 115-230 V. system and have a range of speed from 375 to 750 r.p.m. The various speeds on the lower range are obtained by connecting the motor to the 115 volt leads, and by using control. The higher speeds are obtained by connecting the motor to the 230 volt leads, and also using field control. The control panels, which are of Cutler-Hammer manufacture, are mounted directly beside the calendars, and are operated from a master controller mounted right on the calender frame.

In addition to the equipment mentioned above, there have been installed at various points in the factory, a large number of smaller sized induction motors, mostly of Canadian Westinghouse manufacture. Some of these are started with the Westinghouse type K auto-starters and some of them in the smaller sizes are provided with a Westinghouse type H oil circuit breaker.

In case of the failure of supply from the Hydro, the 25 kw. turbo generator is connected through 3 pole d.t. automatic switches to feeders on all floors to supply necessary lighting to complete any operations requiring immediate attention such as vulcanizing, etc.

The main equipment was supplied and installed by the Canadian Westinghouse Co., Hamilton, Ont.; the bus bar equipment by the General Devices & Fitting Co.; the wires and cable by the Standard Underground Cable Co., Hamilton, and the Northern Electric Co., Montreal. The wiring for lighting and 550 volt power was installed by G. J. Beattie, Toronto.

Electric Lighting Installation

The electric installation for the lighting of the factory is fed from the three 40-k.w. single-phase transformers already mentioned, these being connected in double delta to obtain a 3-wire, 230-115 volt, single-phase system.

From the switchboard in basement sub-station, two sets of three wire mains run to each floor in conduit, changing into open wire at second bay on either side of the centre of the building. The three wires run the entire length of the building on E. E. E. bus insulators mounted on beam clamps to lower web of each I beam, and slack is taken up by strain insulator and J bolts at each end. On the mains in the basement is the only place where conduit has been used, junction boxes being placed at short intervals to allow of alterations and additions.

The circuits are fed from 4-circuit, 2-wire fuse cabinets placed about 10 ft. from the ground on the columns (to prevent unauthorized persons tampering with fuses). From the cabinets the branch circuits are run in conduit to centre of distribution of each circuit, changing into cleat wiring, split knobs mounted on Universal beam clamps, being used to support the wiring as it passes across the I beam from bay to bay; this method of wiring gives a very flexible arrangement, allowing alteration of position of lights to be made quickly and economically.

Nitrogen lamps of 100 watts, with Abolite shades and shock absorbers, have been used in basement, second, third and fourth floors, while 200-watt nitrogen lamps, with suitable shades, are in-

FIG. 12. EXTERIOR VIEW OF FACTORY AND POWER HOUSE, WEST END.

stalled on first floor, which has a high ceiling. General illumination has been used mostly throughout the factory, except in spaces set apart for tire manufacture, etc., in which group lighting suitable to the various operations has been installed.

In the power house, owing to the height of the roof, 500-watt nitrogen lamps, with distributing shades, are utilized, with the addition of bracket lights around walls in generator room, pump room, and boiler room. Approximately 24 miles of rubber-covered wire and cable have been installed, together with seven hundred 100-watt, one hundred 200-watt, and twenty-five 500-watt nitrogen lamps of Westinghouse manufacture.

Properties of Crude Rubber

In passing it may be of interest to refer briefly to the raw material from which tires and other rubber products are made. While tires are not made entirely of rubber, this material forms the basis of their manufacture. Crude rubber is imported from tropical regions of Asia, Africa, and America. Most of it is obtained primarily in the form of an aqueous emulsion or latex secreted by the bark of certain trees. This must not be confused with the sap inside the tree, as it is obtained by cutting the bark only. From this latex the rubber is won as a tenacious, springy self-adhesive mass by various methods of coagulation. The rubber produced in America and Africa is usually more or less moist, dirty and inhomogeneous. Asiatic rubber comes from Ceylon, Malay Peninsula and Archipelago and India. These rubbers are clean and dry as the preparation is more thorough. The former are known as "Wild" rubbers and the latter as "Plantation" rubbers.

Wild rubber is shipped in the form of sheets, blocks or slabs, and balls. Each kind of rubber has a characteristic and a more or less strong odor. Wild rubbers are usually soiled with vegetable refuse, earthy impurities and contain considerable moisture. In the manufacture of rubber goods, the crude wild rubber is first washed and dried and takes the form of corrugated sheets or crepes which are light grey when wet and dark grey or brown when dry. Plantation rubbers are produced on scientific lines and do not as a rule require washing at the factory. The rubbers are shipped in the form of sheets, crepes or translucent blocks. The color is mostly light yellow. Smoke sheet and crepe rubbers have a dark red color and a pronounced smoky smell.

Vulcanizing

Rubber must be cured or vulcanized to produce tires and kindred goods; in fact all rubber must undergo some kind of curing process before the products can be used for commercial purposes. Heat cured rubber goods are made by compounding rubber, sulphur, and other materials required to give the product the desired properties, and vulcanizing the mixture at a comparatively low temperature as will be noted later. Fabric is used in the manufacture of tires, in combination with the rubber and other materials. After curing, the goods retain their constituents practically unaltered except that part of the sulphur combines with the rubber. Sulphur, which is the vulcanizing agent, is next to the rubber itself the most important raw material used. When mixed with sulphur and heated to a temperature above 250 degrees Fah. the raw rubber enters into chemical combination with the sulphur and becomes vulcanized. The vulcanized rubber differs from the uncured product in that it is stronger mechanically, is insoluble in rubber solvents, is practically indifferent to changes of temperature within fairly wide limits and is a more stable substance generally.

Tire Manufacture—Compounding

The preliminary operation begins at the east end of the plant main floor where the compounding department is located. The basement is utilized as a storage for plant supplies, raw material, etc. In the compounding department, the raw materials which are to be incorporated with the crude rubber are carefully weighed along with the latter and placed in steel boxes preparatory to being taken to the mill room. In this department there are two rows of bins containing the various compounds, the bins being charged from the mezzanine floor above. The proportions of compounds and quality of crude rubber used are regulated according to carefully drawn specifications which are adhered to until the tire is ready for shipping. As the proportions of these compounds have a direct relation to the vulcanizing or curing process, it follows that the mixture must be pre-determined at this stage of manufacture, hence the necessity of a specification. The specifications are drawn up by the laboratory staff and cover all processes, as well as the composition and quality of all the materials entering into the finished goods.

Washing Rubber

As already stated the crude rubber is either "wild" rubber or comes from the plantations in a more or less clean condition. The Goodyear plant is laid out to take care of either of these varieties. The "Wild" or dirty rubber has to be washed and dried before being mixed in the mill room. Before being washed the rubber is passed through a cracker or masticating machine. This machine consists of a strong cast iron frame supporting two steel rolls having very coarse teeth which tear and shred the rubber. A stream of water plays on the rubber constantly, washing out the coarser dirt and foreign matter, preparing the rubber for its final washing.

The washing machine is located in line with the masticator and is operated by the same motor. The washing machine has two groved or corrugated rollers and the process consists of squeezing the raw rubber repeatedly through these rollers under a constant shower of cold water. The batch is worked up into a sheet of sodden crepe which is passed through several times, the rollers being screwed up gradually into closer contact until the wash water flows off colorless and free from suspended matter. The washed crepe is eventually hung up to drain for an hour or two and is then ready for drying which is done in specially equipped drying rooms or in vacuum dryers. The difference in weight between the original batch of crude rubber and the fully dried washed crepe, calculated as a percentage of the former, represents the washing loss.

Mixing Operation

From this point onwards the processes are identically the same for both plantation and wild rubber. Mixing is done on a machine consisting of two horizontal rolls which masticate rubber and incorporate it into sulphur and other necessary materials. The mixer is motor-driven, the speed of the shaft being reduced by a Falk transmission. There is a safety clutch installed in the line controlled electrically from a safety device in front of each roll to prevent the operator's hands being drawn between the rolls. The rolls which are hollow are equipped with piping for warming them up before the mill starts and for cooling the rolls during the mixing operation. One roll revolves at a slower speed than the other in order to mix the rubber properly. This causes friction and heat and the cooling system is necessary. The rubber is passed through the rolls several times until all the materials are thoroughly incorporated in the mass. When the rubber leaves the rolls finally it is in the form of a flat sheet. These sheets are powdered to prevent them from sticking to one another and are laid on portable racks ready for the calendar. All the mixing mills installed were designed by the Goodyear Company.

Rubber Coating Fabric

Each sheet of rubber when placed on the racks is tagged. Before going to the calendar the sheets are weighed, the weights being systematically recorded. The sheets are then moved along to a mixing mill to be warmed up preparatory to being calendared. The calendars are specially designed machines having three rolls, fitted with a cooling system, similar to the mixing mills. The calendars have electrically controlled safety devices for preventing accidents. In the calendars the fabric is skin-coated with rubber, the friction caused by the rollers presses the rubber into the fabric. The rollers revolve at odd or even speed according to the work being put through; the speed depending upon the quality of stock. The calendared stock which is used for building up tires is sent up to the second floor for further treatment. The fabric before being used on the calendar is ironed and dried out on a special machine for this purpose called an ironer. This machine consists of twelve 60-inch rolls in two stands, the rolls being steam-heated. After the fabric has been ironed it is placed in a steam-heated oven and remains there until wanted at the calendars.

Stock Preparation Department

On the second floor at the east end is the stock preparation department which as its name indicates is the place where the fabric, treads and beads stock are made up into such form as can be used in the building up of the tire. The frictioned or skin-coated fabric is cut into strips and also cut into lengths on a bias cutter. There is also a machine for cutting the fabric into narrow strips. After being cut, the fabric is assembled in rolls, according to width, ready for use on the tire building machines.

At the same end of the floor is the department where the tread and bead stock is made. The stock for the tire treads is first warmed up in a mill, the same type as used for mixing. The tread stock is cut up into short lengths, rolled up by hand and put into a "Royle" tubing machine. The machine is driven by a Can. Westinghouse 25 h.p. motor through "Falk" transmission. The tubing machine has a cooling system. The stock which is forced through the machine by means of a screw comes out in strips and is then cut into lengths. There is another machine of the same type, only a smaller size installed for the same purpose. This machine is driven by a 15 h.p. motor. There is another machine nearby for insulating bead wire for detachable tires. The bead stock for clincher tires is also made in the stock preparation department.

The rubber enters the machine in round strips and comes out in a "V" section. The stock is then pressed on a steam-heated press to the required section. The bead stock, which at this stage is in long lengths, is now put through a wrapping machine, being first cemented before being wrapped in frictional fabric. The bead stock is afterwards cut to length and then spliced.

In another section of this department the detachable tire wire beads are assembled on revolving tables and then finished in a hydraulic press. Adjoining this section is the department where the lengths of fabric are spliced and rolled.

Building Up Department

About the center of this floor is the building department where the tire carcasses are built up previous to being cured. There are a number of machines in this department specially designed for this particular purpose by company. The machine consists primarily of a stand to hold a number of spools of fabric, a revolving form to build the tire on and set of small rollers for pressing the layers of fabric together. The fabric is laid on in strips lengthways, the thickness of material varying according to the size of tire and regulated by specification. The beads are built in with the tire carcass. The tires are then finished building where strips of rubber are applied to form the outside of the carcass. For this operation the form on which the tire is built up is recured on a stand with a ball bearing fixture which can be placed in any position and the strips of rubber and fabric are laid out on a table. These strips are made of varying widths and gauge to suit any size of tire.

Curing or Vulcanizing Department

The curing process is a very important one as the quality of tire depends largely upon a proper vulcanization of the rubber. The time and temperature vary according to the compound in the stock and for this reason no definite figures can be given. It is sufficient to say, however, that the temperatures are carefully controlled. In this department, which is situated at the west end of the second floor, are located the heaters or vulcanizers. A noteworthy feature about this installation is that the heaters are not placed in a pit, which is usually the case, but are so arranged that the heaters and piping are easily accessible from the floor below.

The accompanying illustration shows the top of the heaters, the rest being below the floor of this department. The steam piping connecting the heaters is suspended from the ceiling of the main floor, that is underneath the second floor. These heaters are not only used for curing the tire carcasses but are also presses. There is a hydraulic ram in each heater, the top of the ram being in the form of a table upon which are placed the moulds containing the tires. Each heater will hold about 25 moulds, the ram falling as the moulds are being placed in the heater. When full the cover of the heater is screwed on and the steam turned on. The pressure is applied to the ram which presses the tire to completely fill the mould thus making the tire a homogeneous mass. At the same time the company's name and size of tire are moulded on the side of the carcass.

When the cure is completed the moulds are lifted out by chain blocks suspended on overhead tracks between the two rows of heaters; the ram rising as the moulds are taken out. The moulds are laid on steel racks and the tires taken out. Each heater is equipped with valves for controlling the steam, a "Bristol" recording thermometer and a mercury thermometer. This department is well ventilated having a monitor roof over each side, with ventilators operated from the floor by hand, in addition to the ventilators in the window sash.

Tread Department

It will be necessary at this juncture to take up the manufacture of the bond or tread which is done on the third floor and leave the tire proper for the moment, for the tread is applied to the tire before the final curing process. At this stage the tread is in the form of a strip and must be pressed to the desired form and pattern. It is at this operation that the well known Goodyear "Diamond" pattern is formed on the tread. While the hand is being pressed heat is applied which cures or vulcanizes the tread at one operation. The presses are operated by hydraulic power.

Before the vulcanized tread is applied to the tire, both tread and tire are roughed to make them stick together more readily. The tires are roughed by hand but the treads are done on a special machine designed by the company. The next process consists of cementing the tire, the cement being applied by hand while the tire revolves. The cement is carried around from one machine to another in a Bowser portable tank. When the cement has dried, the band is laid on the tire, and pressed on in a tread ing machine. During this process the tire revolves while the two rollers are pressing the tread on.

Final Curing

The tread is now firmly attached to the tire. The next process is the second or final cure. The tires are first wrapped with canvas on a special machine for this purpose and hung on a truck having two long arms. The trucks are wheeled into the heaters which are horizontal and remain there for a predetermined period the heaters being heated by steam and held at a certain fixed temperature. This process cures the complete tire. After the tires are taken out of the heaters the wrapping is removed and the tires taken over to the lining table. There is a special machine for rewrapping the canvas on to spools.

Final Tire Operations

The next process is the finish trim. The inside edge of the tire at the bead is trimmed up, the inside of the tire coated with a preparation which reduces the amount of friction between the tire and inner tube and the tires moved over to a long table where the final inspection takes place. The tires are now finished and ready for shipping. The tire storage occupies a considerable part of the east end of the third floor and is equipped with long steel racks where the tires are stored according to sizes, etc.

Tubes and Accessories Departments

The fourth or top floor is devoted to the manufacture of tubes and accessories while there is also a tire repair department. These departments occupy nearly three-quarters of the floor space while the rest is utilized for office and laboratory, etc., and also a cafeteria. The office and cafeteria are only here temporarily and will be removed when the space is required for manufacturing purposes.

The tube stock is prepared in the same way as tire stock, that is, it passes through the mixers and calendars. On the calendars the tube stock is sheeted out to very thin gauge and carefully inspected. The sheets are rolled up carefully on top of each other to make the desired thickness of finished tube. The sheets are then cut to the required width, the edges skived, cemented and joined together thus making the inner tube. These operations are all done with specially designed equipment. The tube lengths are then weighed, laid on a shelf and cured.

Before being cured the tube is pulled over a steel tube mandril by hand, compressed air being used to facilitate the operation. The tube is then straight wrapped with a long sheet of linen on a bench and then taken to a machine to be cross wrapped with long linen strips. For this operation the tube is held in a machine, and revolved while the operator wraps the linen round. The wrapping is for the purpose of protecting

the tube while being cured. The tubes are then piled on a truck and run into an oven where they are cured or vulcanized. When cured the cross wrapping is taken off on a machine similar to the wrapping machine. The tubes are then stripped off the steel tube by hand, compressed air being also used. The rubber tubes are then hung on a rack of special design for this purpose.

The tubes then go to a punching machine to have the air valve hole punched after which the ends are skived on a special machine. The valve stem is then put in, and the tube taken over to a machine to be spliced. In this department is a machine known as a "Clicking" machine for stamping patches out of fabric. This completes the tube manufacturing. As in the case of the tires, the above description is of necessity abbreviated as an explanation of every detail in the process of manufacturing tubes would take up more space than is available for this article. It is also for the most part specialized work and involves a number of features not necessarily known in the trade.

Tire Repair Departments

A well equipped and up-to-date plant has been installed for repairing tires and retreading, etc. This plant is located on the fourth floor.

Cement Department.

The company manufactures cement for use in the factory and also for the trade. Owing to the inflammable nature of the ingredients used for making the cement, the manufacturing is carried on in a separate building situated on the north side of the main factory building. The building is of brick construction and fireproof, being 33 feet by 56 feet. It is divided into two sections, the mixing room and storage. Mechanical mixers are installed for mixing the various ingredients. The cement is used for manufacturing and repairing tires and also in the manufacture of boots and shoes, etc.

Spreading Department

Adjoining the cement house and also in a separate building is the spreading department. This building is also of brick construction and is 30 feet by 30 feet and one storey high. In this department the company is equipped to manufacture anything in the line of waterproofing material and also balloon and aeroplane fabrics, etc.

Cord Tires

The company has installed a plant for manufacturing cord tires, being the first plant of its kind to be operated in Canada. The process of manufacturing the cord tire is somewhat similar to that for other tires except that it requires special equipment. It is a marked improvement over fabric tires. It is hand made and is built up of cords placed loosely side by side in diagonal layers, without cross weave. Cord tires are made in all standard sizes with all-weather or ribbed treads.

General Features

Both the factory and power house were designed by the engineering staff of the Goodyear Company. F. H. Breor, chief mechanical engineer, supervised the construction work. The construction of the factory is in accordance with the latest practice, the best materials only being used and no expense being spared in the carrying out of the work. Tire manufacturing is to a large extent a specializied business and much of the machinery used is thus of special design for the particular process where it is used. The company has developed and perfected a number of machines and processes which are used in plant. The location of the various departments and equipment used was determined after a full consideration of the requirements of the situation and in accordance with the experience gained during a number of years in the manufacture of tires. The layout of the plant thus represents the embodiment of all this experience.

Although the factory is not yet operating at capacity, the layout of the plant will not be affected as the output increases. In other words the production of tires can be increased to the maximum capacity without necessitating any change in location of machinery or in routing. There is room in each department for expansion up to a certain point; the floor space although well occupied is not crowded. Wonderful progress has been made in getting the plant to its present state of efficiency, considering that the factory has only been operating no more than three months. It speaks well for the organizing ability of the high officials backed by the efforts of the staff that so much has been accomplished in so short a time.

The output of the factory when operating its full capacity will be approximately 3,000 tires and tubes. The tires are of standard quality and carry the "Goodyear" trade name with the "Diamond" or "All-Weather" tread and are of the same quality as are made at Akron, Ohio, where the American end of the company has a very large factory.

It has already been stated that the company does not manufacture mechanical rubber goods at New Toronto, the factory at Bowmanville being now devoted exclusively to this end of the business. The company makes an extensive line of mechanical rubber goods including hose for all purposes, particularly fire hose, various grades of rubber belting, packings, gaskets, pump valves and rubber moulded goods, etc. The basic material for these goods, the friction fabric of which they are made, and the initial process including vulcanizing are the same for mechanical rubber goods as for tires, the final operations being of course somewhat different.

Sales Offices and Executive

The head office of the Goodyear Company is located at the corner of Richmond and Simcoe Streets, Toronto, while the company maintains twelve branch sales offices in the principal cities of the Dominion from Halifax to Vancouver. The president of the company F. A. Seiberling, is the only executive officer not located in Toronto, being at Akron, Ohio. The other officials are R. P. D. Graham, vice-president; C. H. Carlisle, treasurer and general manager; C. J. Oille, assistant treasurer and secretary, and H. C. Lower, general sales manager. Mr. Carlisle came over from the United States in 1910 when the Goodyear Company bought out the Durham Rubber Co. of Bowmanville. He was at that time secretary-treasurer, but since 1910 has had full management of the company. The Bowmanville plant since that date has of course been considerably extended. The principal officials at the New Toronto factory are as follows: S. H. Koken, superintendent; F. H. Breor, chief engineer, and A. R. Stannah, master mechanic.

Contractors

The principal contractors for the construction and equipment of the factory include the following: General contractors, the Dominion Construction Co., Toronto; heating system and piping, Bennett & Wright, Ltd., Toronto; electrical equipment, Canadian Westinghouse Co., Hamilton; electric wiring, George J. Beatty, Toronto; sash, Steel & Radiation Co., Toronto; waterproofing, the Carmichael Waterproofing Co., Toronto; glazing, Britannia Plate Glass Co., Toronto; glass, Pilkington Bros., Toronto; plumbing, Keiths Ltd., Toronto; sprinkler system, H. G. Vogel Co., Buffalo, N. Y.; mastic floors, Construction Supply Co., Toronto.

STEEL SUPPLY SHORTAGE

THE present supply of iron and also of steel in the United States is falling a long way short of meeting national requirements and the problem of how to increase production which must be successfully solved is by no means a simple one. As things stand to-day, blast furnaces in all iron producing sections of the country have fallen seriously behind in the fulfillment of their contracts with consumers, and instead of gaining are steadily losing ground.

The aggregate production is holding up, it is true. In fact, last month showed a slight gain over October, but when measured by demand it was pitifully small. The outturn for November was 3,205,794, tons, or 106,869 tons a day, as compared with 3,305,038 tons in October, or 106,550 tons a day. The increase in the average daily production as shown by the figures was only 309 tons, while for the entire month there was an actual decrease of 97,244 tons. At the November rate the production for the year would be 38,400, 000 tons, as against a total production during 1916 of 39,-400.000.

There are no reliable figures yet available, but it is fairly safe to assume that the demand for iron during the current year has increased at least 10 per cent. over 1916. The result has been that there is not a ton of stock to-day in sellers' hands available for immediate delivery. As an illustration of the general situation, the American Warrant Company has cancelled its last warrant, which signifies that all reserve supply is completely exhausted.

Duty Trials on Two 24-Million Gallon Pumping Units

Contributed

The pumping engines whose performances are recorded in the following report are driven by De Laval steam turbines, and form part of the installation at the Main Pumping Station, Toronto Waterworks. The duty trials were made March 6 and 8, 1917, by Robert W. Angus, professor of Mechanical Engineering, University of Toronto.

ALL of the water used by the City of Toronto is pumped through the Main Pumping Station at the foot of John Street. This station is equipped with a number of steam driven pumps and also a number of electrically driven units, the latter receiving electric current from the general city supply. In so far as the electrically driven units can be operated without raising the city's power peak, they are kept in service, but whenever the electrical operator finds that the peak is being approached, he has one or more electrical pumps stopped and then the delivery pressure of the station may slightly decrease while a steam pump is being brought into service, but, on the whole, these variations in pressure and in supply are not noticeable in the city.

Description of the Units

Some few years ago it was decided to increase the pumping capacity of the Main Station, and, with this in view, a new pump room with adjacent boiler room was built. The pump room now contains five pumping units, two of which are driven by induction motors, and three of which have been built by the De Laval Company, and are driven by steam turbines. It is with two of the latter pumps that the report deals.

Each unit consists of a De Laval steam turbine connected through a reduction gear to a pair of centrifugal pumps, which are connected so as to work in series.

The units are exact duplicates.

The turbines are of standard De Laval construction, type 1,600 T. D., for steam pressure of 150 pounds, and a vacuum of 29 inches, the normal speed being 3,430 revolutions per minute. Each is direct-coupled to a speed reduction gear having a ratio of 33 to 197, so that the pump shaft rotates at normal speed of 575 revolutions per minute.

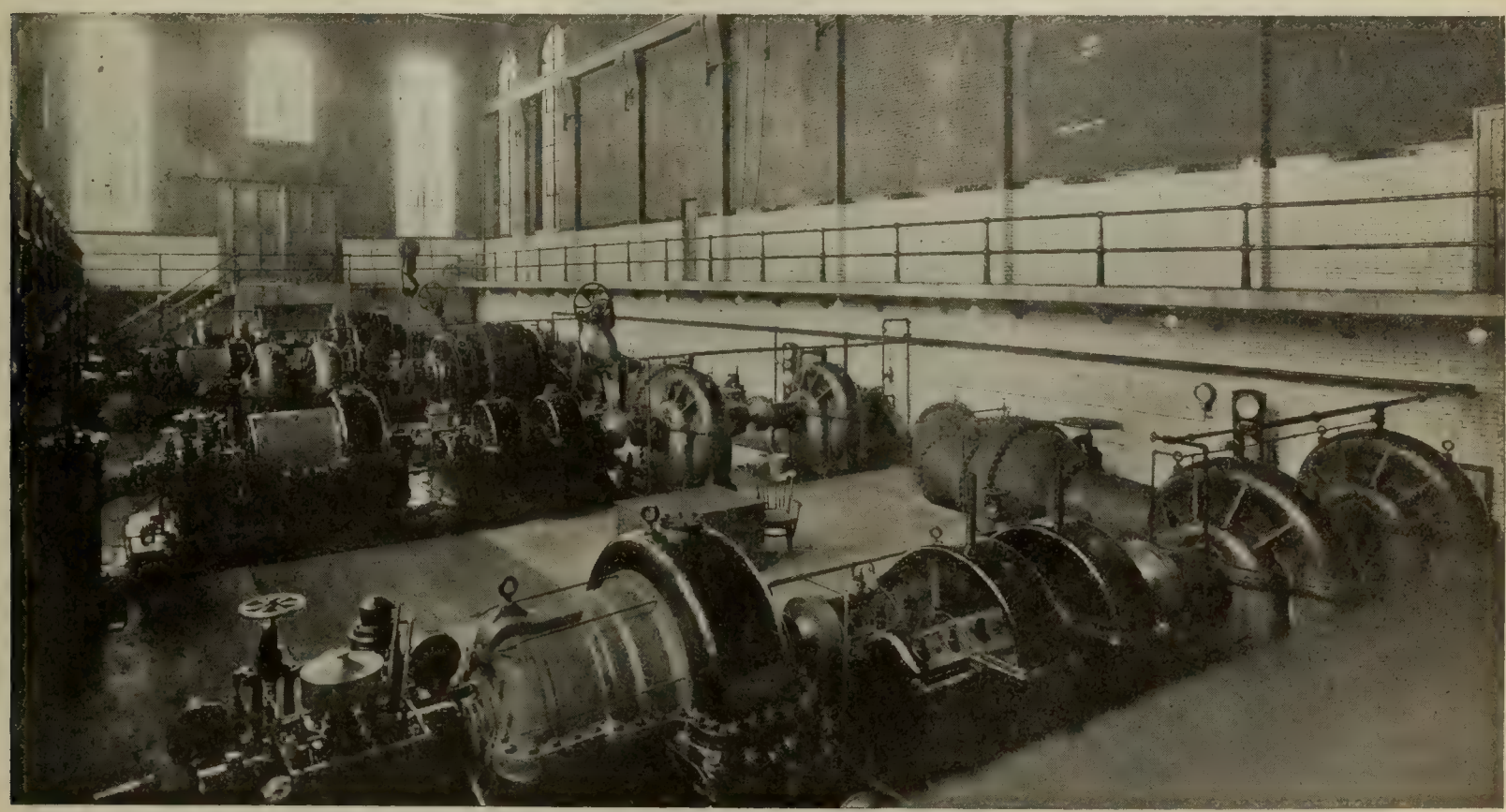
The steam supply pipe is 4½ inches, with 36-inch exhaust to a standard Wheeler surface condenser, so placed that all the water delivered by the unit passes through it as cooling water before reaching the main pumps.

The vacuum pump is a 20-inch x 40-inch Rotrex pump built by the C. H. Wheeler Company, and is direct connected to a 7-inch x 7-inch engine designed for a normal speed of 200 revolutions per minute, but which ran at a much lower speed during the trials. The exhaust from this engine is delivered back into the steam turbine somewhere near the middle stage, and is made use of in doing work there.

The boiler feed pump is chain driven from the pump shaft. It is a Goulds single acting triplex plunger pump with plungers 3½-inch diameter and 6-inch stroke, and in one of the units the crank shaft driving the plungers turns at about 47 revolutions per minute, a speed which is too low to supply the necessary feed to the boiler for this pumping unit; in the other unit the speed is 66 revolutions per minute, which is satisfactory.

There are two single stage double suction pumps on each unit, the two pumps being piped together in series. There are no outside guide vanes, but the castings are of the volute form and the pumps run very quietly. The name plate states that the pump is of Type P-24, and is designed for a total head of 250 feet, and a discharge of 20,000 U.S. gallons per minute (which is equivalent to 24,000,000 Imp. gallons per 24 hours) at a speed of 575 revolutions per minute.

The water piping begins with a 42,-inch suction, which is the size of the inlet to the condenser. At the condenser outlet the diameter is reduced to 36 inches and this is again reduced to 24 inches where it enters the pump. The series piping between the pumps is 30 inches, being reduced to 24 inches at the point of connection with each pump. To the discharge end of the pump a 24-inch x 36-inch tapering enlarger has been



GENERAL VIEW OF PUMPING WITH UNITS UNDER TEST IN FOREGROUND.

attached to connect with the 36-inch discharge main. The inlet and outlet openings on all the pumps are 24-inch diameter.

The pump impellers are of bronze.

The Duty Trials

The duty trials on the machines were run on March 6th and 8th, 1917, respectively, and in order to see that the conditions were uniform before the tests began, the machines were run for at least an hour under full load immediately preceding the duty trial.

The boiler fires were properly cleaned, and everything put in as good condition as possible to insure uniformity, but some slight variations naturally occurred. It was necessary to run the trial during the daytime, owing to the demand for water in the city, and therefore an effort was made to start as near seven o'clock in the morning as possible, although in both cases the trials did not begin till nearly an hour later.

The city's electrical power peak occurred shortly after the trial began in each case, and the electrical pumps were therefore shut down, causing a heavy draught on the pump under test. There was a consequent decrease in pressure, but as the discharge increased at the same time, the load on the steam turbine driving the pump did not vary greatly. Throttling of the pump discharge was temporarily resorted to, in order to prevent undue fluctuations, and another steam pumping unit elsewhere in the station was put into service as quickly as possible, but the extra draught of steam from the boilers caused some slight variations in steam pressure.

All of these variations, however, were of short duration and were productive of but slight inconstancy in the general conditions, and the machines were given exceptionally steady loads during their entire trials.

Conditions Governing the Trials

In the contract dated August 14th, 1914, the conditions governing the conduct of the duty trials are given, and the following clauses referring thereto are copied here for reference:

"54. Each turbine shall have sufficient power capacity when connected by flexible or other approved coupling to the centrifugal pump to raise from the suction conduit directly into the pipe system of the city not less than 24 million Imperial gallons of water in 24 hours, against a pressure difference of 107 pounds per square inch between suction and discharge mains, the pressures to be measured at approximately the same level.

"57. The turbine to be designed for speed not in excess of 4,000 revolutions per minute, and the centrifugal pump to to be operated at speed not exceeding 600 revolutions per minute, with provision for a ten per cent. (10%) increase in speed, if necessary.

"58. The pumping capacity of the unit shall be determined by Venturi meter measurement, and if the capacity of the unit, when running the pump at a speed not in excess of 600 revolutions per minute, and a turbine speed not exceeding 4,000 revolutions per minute, is less than 24 million Imperial gallons, the Commissioner may deduct from the amount to be paid to the contractor two and one-half per cent. (2½%) of the contract price for each one per cent. (1%) less than the specified capacity, at the specified pressure, and pro rata for fractional parts.

"If the capacity as shown by the official trial of the unit does not reach 92% of the specified capacity, the Commissioner may, at his option, reject the unit, and in case of such rejections the contractor shall return all moneys paid him on account, and shall, without compensation, allow the unit to remain in the service of the city and under the control of the commissioner for such reasonable time as may be required to install a new unit.

"The steam turbine driven unit shall perform a duty of not less than one hundred and twenty million (120,000,000) foot pounds for each one thousand (1,000) pounds of steam containing less than 1½% of entrained water, as determined by throttling calorimeter measurements, used by the engine and any auxiliary pumps supplied by the contractor and operated during the duty trial, when pumping not less than 24 million (24,000,000) Imperial gallons in 24 hours.

"In computing the duty, the work performed by the unit shall be based upon Venturi meter measurement. The head for computing the duty shall be that shown by an accurate pressure gauge attached to the discharge main at a point inside the engine room and beyond the last pump, less the reading shown by a gauge attached to the supply conduit at or near entrance to pumps, an allowance being made for any difference in the level of the gauges. No allowance shall be made for friction of water between the gauge points, between which shall be situated the complete machine as supplied by the contractor.

"In computing the duty, the total steam used, including that used by jackets, air pumps, air compressor, boiler feed pump and any other auxiliary pumps, shall be charged up to the engine. No allowance shall be made for any heat returned to the boilers derived from the exhaust steam from the turbine or from any auxiliary.

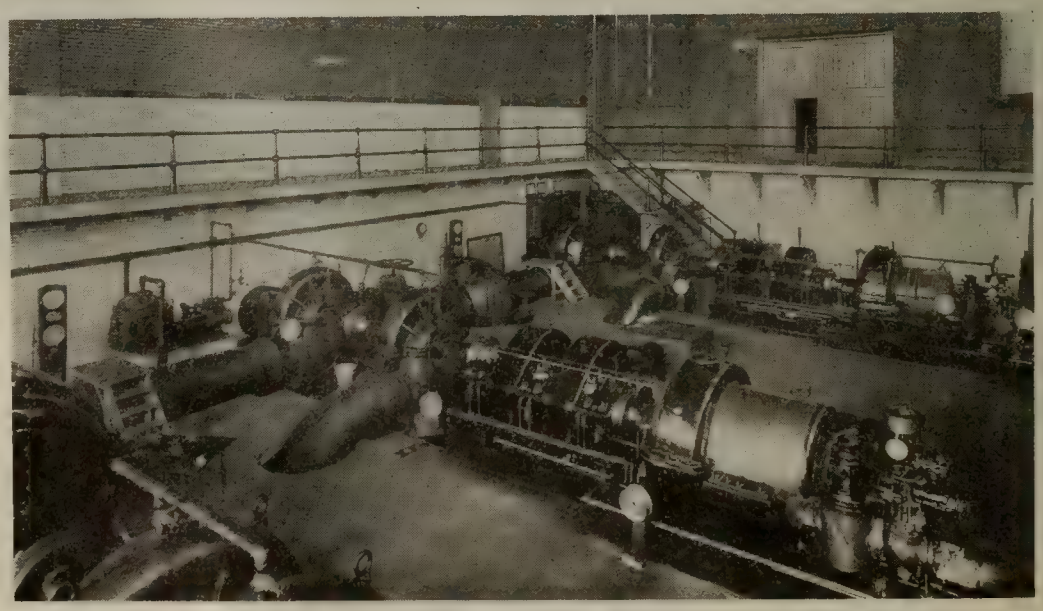
"After the unit has been in successful operation for sixty (60) days, a duty trial of 24 hours' duration shall be made. The unit shall be operated continuously at its rated capacity, against a pressure difference of 107 pounds per square inch as above specified, and shall be supplied with steam of not more than 150 pounds per square inch, by gauge, at the boiler, and containing not more than 1½% of entrained moisture.

"During the trial the unit shall be operated by the regular engineers of the station, at the speed and pressures specified, but otherwise shall be under the control of the contractor. The trial shall be conducted by the Commissioner, or persons appointed by him, in the presence of a representative of the contractor. The city shall pay all expenses of the trial, except that the contractor shall pay his own men.

"If the duty shown by the official trial of the steam turbine driven unit shall be less than 120,000,000 foot pounds, the Commissioner shall deduct from the amount to be paid the contractor the sum of $2,500 for each 1,000,000 foot pounds unperformed below 120,000,000 foot pounds, and pro rata for fractional parts down to 115,000,000 foot pounds.

"If the duty shown by the official trial of the steam turbine driven unit shall be less than 115,000,000 foot pounds, the Commissioner may, at his option, reject the unit; and in case of such rejection, the contractor shall return all moneys paid to him on account, and shall, without compensation, allow the unit to remain in the service and under the control of the Commissioner for such reasonable time as may be required to install a new unit.

"If the duty as shown by the official trial of the engine exceeds 120,000,000



VIEW OF UNITS UNDER TEST FROM OPPOSITE DIRECTION.

foot pounds, the city shall pay to the contractor the sum of $1,500 for each 1,000,000 foot pounds above the stipulated duty, and pro rata for fractional parts, but the bonus shall not exceed $7,500.

"59. While the duty specified for the steam turbine driven unit is 120 million foot pounds, tenderers are requested to state any higher duty they are prepared to guarantee, and any higher duty guaranteed, together with the contractor's ability to fulfil same, in the opinion of the Commissioner, will form a factor in the awarding of the contract. Should the contractors guarantee a duty in excess of that specified, when using saturated steam containing not more than 1½% of entrained moisture, the duty guaranteed will be substituted for this amount, and for each one million (1,000,000) foot pounds in excess of the guarantee the corporation shall pay to the contractor the sum of fifteen hundred dollars ($1,500), and pro rata for fractional parts, but the total bonus shall not exceed seven thousand five hundred dollars ($7,500). Should the duty as shown by the official trials be less than the guarantee the Commissioner shall deduct from the amount paid to the contractor the sum of two thousand five hundred dollars ($2,500) for each one million (1,000,000) foot pounds unperformed, and pro rata for fractional parts down to five million foot pounds less than the guaranteed duty.

"If the duty as shown by the official test be more than five million foot pounds below the guaranteed duty, the Commissioner may, at his option, reject the unit, and in case of such rejection, the contractor shall return all moneys paid to him on account and shall, without compensation, allow the unit to remain in the service and under control of the Commissioner for such a time as may be required to install a new unit, and shall fully reimburse the city for any loss or damage suffered by reason of the contractor having failed to fulfil his guarantee."

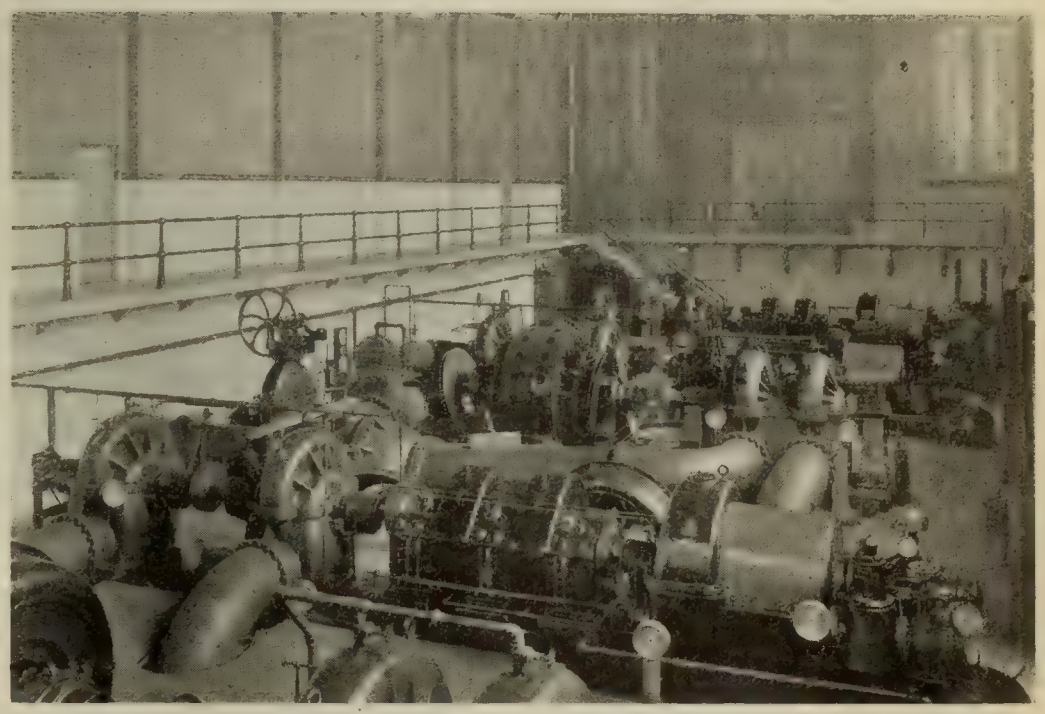
In accordance with clause 59, the contractors guaranteed a duty of 141.5 million foot pounds of work per 1,000 pounds of stream used, and this duty was therefore inserted in the contract.

Details of the Trials

The duty trials were run in exact conformity with the specifications, with the single exception of the duration of each, which is specified as twenty-four hours. On discussing the matter with the city's engineers, it was found that the conditions in the station made such a long run very undesirable, and it was agreed that the run should be shortened to ten hours. The contractor agreed to this, and a copy of his letter relating to the matter accompanies this report.

There is no doubt that the results for the ten-hour period would be practically identical with those for twenty-four hours.

The specifications require that the gauge pressure on the boilers supplying the turbines shall be 150 pounds per square inch. A battery of four boilers was used in each case, and on top of each boiler there is a stop valve bolted to the steam drum, and from the top of this stop valve the steam pipe from the boiler leads to a header which is common to all boilers. To this header the supply pipe for each pumping engine is connected by a fairly long, well-lagged pipe.



GENERAL VIEW OF STATION. NOTE ELECTRICALLY-DRIVEN PUMP.

To avoid any possible sources of loss in the boiler stop valve, the gauge used on the trial was connected to the steam pipe within six inches of the stop valve. The gauge pipe was so arranged that the gauge was brought down to the level of the fireman's eye, and correction was made for water column. An observer remained constantly in the boiler room so as to keep this pressure uniform, and readings were noted every 15 minutes.

The quality of the steam was taken by throttling calorimeter attached to the steam pipe about six inches from where it entered the turbine stop valve. For the purpose of determining the quality, the engine pressure was taken and is also recorded; it was taken at the point where the calorimeter was attached. These readings were at 15-minute intervals.

Exhaust Pressure and Temperature

To determine the exhaust steam condition, both a mercury column and a thermometer were used, the mercury column being attached to the turbine casing slightly below the level of the main shaft, while the thermometer was inserted in a cup in the exhaust pipe about half way between the turbine casing and condenser. Much care was taken to push the thermometer well into the cup, so that the bulb was at least 9 inches in from the pipe wall, and the mercury column connections were also carefully tested for leakage. A comparison of the two readings given in the table herewith shows that the temperature is lower than that corresponding to the mercury column, possibly due to the difference in location, and partly to the presence of air in the exhaust. Both results are quite accurate and equally reliable.

Speeds

The speeds were taken with an ordinary revolution counter, or else were actually counted, those on the main pump being at 15-minute intervals; the others were not so frequent. It was not possible to get the speed of the steam turbine directly, and hence it had to be calculated from the pump speed, using the gear ratio given by the contractor of 197 teeth in the gear to 33 teeth in the pinion. The pump and turbine speeds were well below the maximum specified.

Steam Used During Trial

To get the steam used during the trial, the ordinary pipe for delivering the condensate into the feed tank was broken and a connection put in so that the water was delivered into a storage tank, from which it was run into a tank on scales as desired. The leakage from the air pump glands was caught and has been added to that coming directly from the air pump discharge. There was only one trap on the turbine plant, and, as it was plugged, no leakage occurred there.

On the first unit tested the gland leakage was not great, but as it was in the form of steam it could not be measured. In the second unit the leakage was much more marked, due to defective carbon rings, but the steam thus escaping would not have formed any appreciable proportion of the total, and its effect on the duty would be very slight.

The weighing tank was capable of holding a net weight of only about 1,000 pounds, and, in order to keep well within the limits, the weight of steam condensed every three minutes was taken. In order to have no error due to the storage tank, the water in it was brought

to the same level at the end of the test as at the beginning. All weights were taken to half pounds.

The steam used by the air pump is automatically included with that from the turbine, and the feed pump was chain driven from the pump shaft.

Water Pressures

For convenience and greater accuracy the pressure and suction gauges were both piped to the same point, close to the suction inlet pipe, and in the results allowance was made for the difference in levels between them.

Before the test began, considerable discussion took place between the contractors and myself regarding the position of the discharge gauge connection, and also as to whether velocity head was to be allowed for. In this connection it is pointed out that the suction pipe up to the condenser is 42-inch, and the discharge outlet from the pump 24-inch and a tapering enlarger and valves are used to connect the 24-inch pump outlet to the 36-inch delivery pipe provided by the city. The difference in pressure between the two ends of this enlarger was slightly over 7/10 pound per square inch, being greater at the 36-inch end, and amounted to about 7/10 of one per cent. of the total head.

The nature of the specifications prevented allowance being made for difference in velocity head between suction and discharge pipes, and it was also agreed that the discharge connection should be placed on the outlet from the pump where its diameter was 24-inch, and the results are reported on this basis.

The discharge pressures were taken with a sensitive Bourdon gauge, and the suction pressures by mercury manometer; there was always a slight pressure in the suction pipe at its centre line.

Both readings were taken every five minutes, the discharge gauge being carefully calibrated.

Measurement of the Water Pumped

The specifications required that the water pumped should be measured by Venturi meter, and both of the pumps discharged through a 36-inch meter with 21-inch throat. The quantity was calculated from readings of a mercury manometer, using the coefficient supplied by the Builders Iron Foundry, the makers of the meter, who state that a manometer reading of 5.07 inches of mercury corresponds to a discharge of 25.30 millions of Imperial gallons daily.

Readings were taken on the manometer at five-minute intervals, and in order to check the record for the meter, readings were also taken on it, and the results are included for reference.

Observers and Representatives

The observers were all fourth year students in engineering at the University of Toronto, and were well skilled in the work required.

The contractors for the units were the Turbine Equipment Company, Toronto, who were represented by their manager, Mr. Austin, and also by Messrs. Salt and Petersen of the De Laval Turbine Company, Trenton, who designed the machinery and built much of it. The writer represented the city of Toronto, and personally conducted both the trials and desires to express his thanks for the co-operation of the above parties, and also of Mr. James Milne, Mechanical and Electrical Engineer of the Works Department.

Remarks on the Trials

The results obtained on the units are a matter of great satisfaction, partly because they have so far exceeded the guarantees of duty, and partly because the results are exceptionally high for this class of pumping unit, and have probably not ever been exceeded by any similar unit running under similar conditions of steam and of equal water pressures. The city is to be congratulated on having pumps which will give such good results.

Respectfully submitted,
ROBERT W. ANGUS.

Toronto, March 20th, 1917.

GENERAL DIMENSIONS OF THE UNITS. BOTH ARE EXACTLY ALIKE.

Turbine—	
Normal speed .....revs. per min.	3,430
Diameter of steam pipe.....in.	4.5
Diameter of exhaust pipe.....in.	36
Double Helical Reduction Gear—	
Number of teeth in pinion.....	33
Number of teeth in gear.....	197
Ratio of teeth	5.97
Pump speed corresponding to turbine speed above	575
Pump—	
Number of stages	2
Suction and discharge openings...in.	24
Suction inlet to condenser.....in.	42
Size of city's discharge main.....in.	36
Enlarger from pump discharge to main .....in.	24x36
Rated speed .....revs. per min.	575
Air Pump—Wheeler Rotrex—	
Size .....in.	20x40
Size of direct coupled driving engine .....in.	7x7
Rated speed .....revs. per min.	200
Feed Pump—	
Goulds Triplex Single Acting—	
Size of plungers .....in.	3½x6
Speeds in the two units..revs. per min.	47 & 66

RESULTS OF TRIALS.

	Westerly Unit No. 10	Easterly Unit No. 9
Date of trial 1917	March 6th	March 8th
Duration of trial.....hours	10	10
Aver. barometer reading..in.	30.06	29.43
Pounds per sq. in.....	14.77	14.45
Pressures and Temperatures—		
Average boiler pressure—lbs. per sq. in.	149.4	148.4
Steam pressure at the turbine —lbs. per sq. in.....	144.7	144.6
Pressure in the calorimeter—lbs. per sq. in.	1.36	1.38
Temperature in the calorimeter —deg. F.	294.8	300.2
Moisture in steam at turbine—per cent.	0.66	0.35
Vacuum in exhaust chamber—in.	29.33	28.69
Temperature of steam in exhaust pipe—deg. F.....	60.3	61.9
Water Pressures—		
Suction pressure as read—lbs. per sq. in.	0.89	1.19
Delivery pressure near suction pipe level—lbs. per sq. in...	107.34	107.97
Difference of gauge levels reduced to lbs. per sq. in....	0.79	0.40
Net pressure produced by pump —lbs. per sq. in.	107.24	107.18
Net pressure specified—lbs. per sq. in.	107.0	107.0
Quantity of Water Pumped—		
Size of Venturi meter tube—in.	21x36	21x36
Average manometer reading — in. mercury	4.895	4.99
Corresponding discharge—millions of Imperial gallons per 24 hours	24.86	25.10
Specified discharge — millions of Imperial gals. per 24 hrs.	24.00	24.00
Dial on recorder gave—millions of Imp. gals. per 24 hrs....	24.80	24.99
Speeds—		
Aver. pump speed—revs. per min.	582.6	574.8
Corresponding turbine speed—revs. per min.	3,478	3,431
Average air pump speed—revs. per min.	151	147
Feed pump speed, double strokes each plunger	66	47
Water Horse Power—		
Net pressure produced by pump lbs. per sq. in.	107.24	107.18
Discharge — million Imperial gals. per 24 hours	24.86	25.10
Work done per hour—foot pounds 2,562,679,427		2,585,972,052
Corresponding water horse-power	1,294.3	1,306.0
Steam Used per Hour—		
Steam condensed during test, including drips—lbs. 169,803.5		168,010.0
Steam used per hour—lbs....	16,980.3	16,801.0
Steam used per water horse-power hour—lbs.	13.14	12.88
Duty—		
Work done per hour—foot lbs. 2,562,679,427		2,585,972,052
Steam used per hour—lbs....	16,980.3	16,801.0
Duty obtained—millions of ft. lbs. of work per 1,000 lbs. steam used	150.92	153.92
Duty specified	141.5	141.5
Amount that the unit exceeded the guarantee under specified conditions—millions of foot pounds	9.42	12.42

ROBERT W. ANGUS.

Toronto, March 20th, 1917.

COAL PRODUCTION IN CANADA

ALTHOUGH, according to a recent report issued by the Department of Mines, Ottawa, it is shown the production of coal during the third quarter of the year was larger than either of the two preceding ones, yet the total for the twelve months promises to be slightly below that of 1916, unless during the fourth quarter the increase is sufficient to make up for the deficiencies of the nine months' operations. The figures for each of the three first quarters of the year are as follows:

	Tons.
First quarter	3,610,991
Second quarter	2,543,429
Third quarter	3,731,123
Total	9,885,543

These figures apply only to the coal that is sold or used by the mine operators and do not include waste and unmarketable slack brought to the surface of the mines.

The total quantity of coal produced by the mines of Canada for the twelve months of 1916 was 14,483,397 tons.

SHIPBUILDING IN B. C.

IT is possible that the shipyards of British Columbia may soon be constructing vessels for the Australian Government. Australia wants vessels, and wants them badly, and negotiations are now being carried on by the shipbuilders of British Columbia with the Government of the Commonwealth with a view to securing orders.

The cost of the material that must be applied to the completion of the ships now under construction in the province will, it is estimated, approximate $1,700,000. In order to finance the shipbuilding undertakings, actual and contemplated, the British Columbia Manufacturers' Association is endeavoring to secure from the Dominion Government what it terms a "shipbuilding loan."

This firm is a good example of continuity of ownership, its duration dating from the establishment of the enterprise some sixty years ago. In the interval, the size of the original plant and the scope and variety of its activities have shown steady development and expansion. As might be expected, effort in these war years has been concentrated to a large extent on munitions production and that of ship deck and other marine equipment.

THE business of William Kennedy & Sons, Ltd., Owen Sound, Ont., was founded by the late William Kennedy in 1857. He was born near Glasgow, Scotland, and came to Canada in 1831, settling first at Prescott, Ont., and later moving to Athens, Ont., where he established himself in business as a millwright. Mr. Kennedy at that time was a lieutenant in the Militia and participated in the Battle of Windmill Point in 1837. He settled in Owen Sound in 1856 and started a foundry and millwright business in 1857. This was the foundation of the present enterprise. In 1860 the plant was established on Sixth Street and was known as William Kennedy & Sons. Two of the founder's eight sons, Thomas and Matthew, at this date joined him in the firm, which then carried on foundry and machine shop work, together with wood planing and the manufacture of sash and doors.

In 1868 the firm sold out their woodworking and specialized in the manufacture of turbine water wheels, heavy shafting gears, pulleys, bearings, etc., required in the driving of mills, power, and pumping plants. In 1873 the manufacture of ship propellers was added to the firm's activities. One of the sons, Thomas Kennedy, died in 1873, and two of his brothers, John (now Sir John Kennedy), and William, Jr., joined the firm in 1879. The founder, William Kennedy, Sr., died in 1885 at the age of 77 years. From that date until 1896, the business was conducted by Matthew as head and Alexander and William Kennedy, Jr. Sir John was only with the firm two years, 1868 to 1870, leaving to become chief engineer of the Great Western Railway, later absorbed by the Grand Trunk. Sir John was some thirty-five years engaged as chief engineer of Montreal Harbor and though blind is still retained as their consulting engineer. He enjoys an international reputation in harbor engineering.

VIEW SHOWING SOUTH END OF DRAWING OFFICE, OWEN SOUND PLANT.

New Plant Erected

In 1880 a part of the premises on Sixth Street was burnt down, business was, however, carried on there until the end of 1884. During the summer of the latter year new shops were constructed on the present site on the harbor front, these consisting of grey iron foundry, machine shop and pattern shop. Operations were commenced in the new plant in January, 1885. In 1887 the Kennedys built for the town of Morrisburg their first water works pumps of any note. These were rapidly followed by similar and larger installations at Welland, Niagara Falls, etc. These pumps with their water wheels and gearing are still in daily service and giving good satisfaction in spite of their age. Alexander Kennedy, who was superintending personally the installation of the Niagara Falls plant, had his arm sheared off between the pump main spur gear and its connecting rod. The accident affected his general health, and after disposing of his stock to the other members of the firm, he died in 1903 very suddenly while at work.

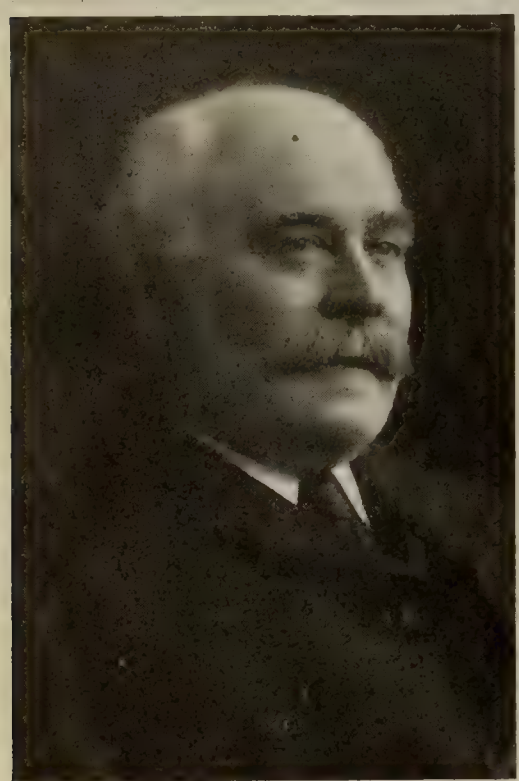
In the meantime, William Kennedy, Jr., was sent to Montreal to open up and conduct an hydraulic engineering office for the company. Some years later he sold out his holdings and severed his connection with the concern in order to carry on the business of consulting engineer on his own account. He

has been for years one of Canada's leading hydraulic engineers and acted as consulting engineer for such plants as the Ontario Power Co., Niagara Falls; the Cataract Power Co., De Cew Falls near St. Catharines; City of Winnipeg; Calgary Power Co.; etc. The name Kennedy has long been well known throughout Canada in connection with the design, manufacture and installation of water power plant machinery.

In 1905 the president's youngest son, T. Dowsley Kennedy, was sent to Switzerland for six months and later to Germany to take a four year University course in hydro-mechanical engineering. He graduated and returned in 1909, and a year later joined the firm.

The present officers and directors are: Matthew Kennedy, president and general manager; D. John Kennedy, 1st vice-president, and manager open hearth

OLD FRAME BUILDING WHERE THE KENNEDYS STARTED BUSINESS IN 1858.



MATTHEW KENNEDY,
President and General Manager.

steel plant at Collingwood, Ont.; Matthew Kennedy, Jr., 2nd vice-president and manager Bessemer steel plant, Owen Sound, Ont.; D. E. Armstrong, sec.-treas.; T. Dowsley Kennedy, director and manager iron foundries and machine shops.

In January, 1916, the iron foundry and machine shop capacities were greatly increased. A year later the iron foundry was entirely remodelled and again extended to take care of the demand for exceptionally large, solid, ship propellers required in connection with Canada's shipbuilding programme.

The most important development, however, took place in 1916 when the Kennedys took over the defunct Northern Iron & Steel Co. open hearth steel plant and rolling mills at Collingwood, to produce shell steel, about which more appears further on. In 1917 they installed at this plant their first electric furnace, principally for the manufacture of pig iron. With these new acquisitions, the company has two steel plants, the first one having been established at Owen Sound in 1899.

Extent of Business

The Wm. Kennedy & Sons control and operate three distinct plants, the two at Owen Sound working in conjunction on the general business of the concern while the steel plant at Collingwood is working at present exclusively on the production of steel for shells. After the war when the Collingwood plant is turned over to the production of steel for commercial purposes, it will be an extremely useful adjunct to the company's general business. The Collingwood plant comprises two open hearth furnaces, giving a total capacity of sixty to seventy-five tons of steel per day. The electric furnace can also be used to produce steel. At Owen Sound, steel is produced by the Bessemer process, giving altogether considerable latitude in the type of steel produced.

Owen Sound Plant

The head office and plant at Owen Sound will be described first, being the mainstay of the entire business. It is self-contained, the plant being arranged and equipped so that production of practically all the company's lines can be done there. The plant comprises the office building, pattern shop, machine shop, grey iron foundry, steel foundry, cleaning rooms, pattern storages, etc.

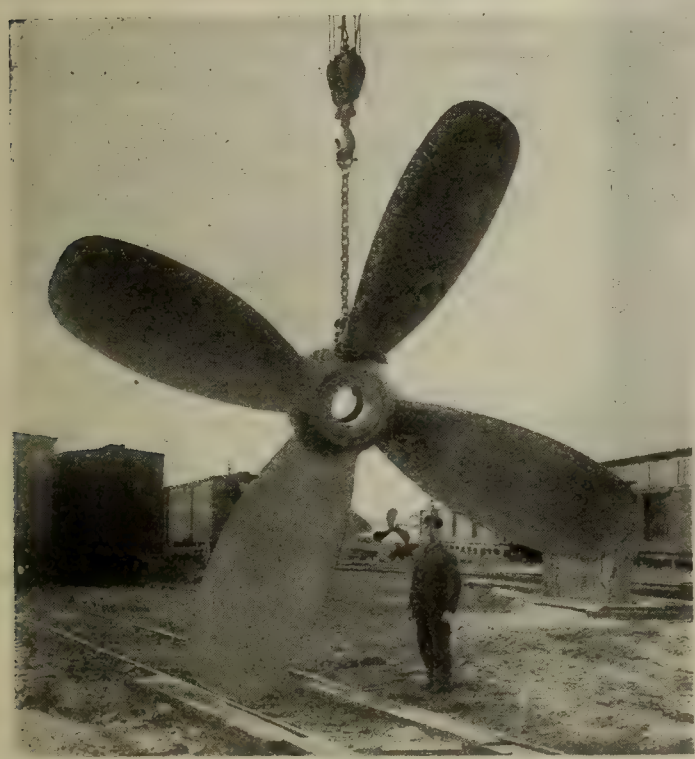
SOUTH-WEST CORNER OF PRESENT-DAY OWEN SOUND PLANT.

There is also ample yard space for storing raw materials, molding flasks, etc. The office building is 30 ft. x 50 ft. and contains the general, private, and drawing offices, the latter being upstairs.

The building is of solid brick construction and was erected in 1905. The drawing office is equipped with vertical adjustable drawing boards and the vertical system of filing drawings is used together with suitable card indexes. An overhead bridge proves to be a considerable time saver in the usual traffic between draughting room and pattern shop. The pattern shop is located over a part of the machine shop, and is well suited for handling a variety of work, being equipped to turn out patterns for heavy machinery, more particularly large propellers, heavy gears, and water turbines.

The machine shop is 140 feet long by 40 feet wide, and is suitably equipped with a variety of machinery for handling the extensive line of product manufactured by the firm. In addition to the ordinary tools usually found in a machine shop, there is a large boring mill and two specially fitted drills particularly required for propeller and turbine work; also a Gleason gear planer for machining gears of very large pitch.

EAST END OF MOULDING FLOOR, OWEN SOUND PLANT.



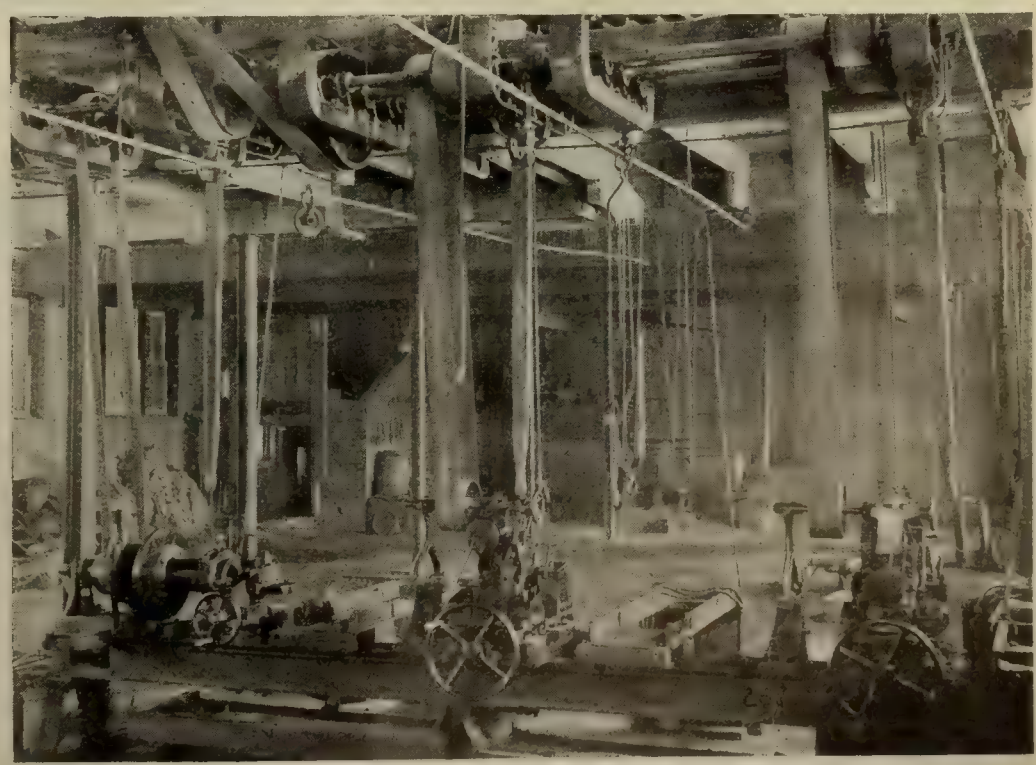
SOLID PROPELLER FOR OCEAN-GOING FREIGHTER WEIGHING 10 TONS AND 17 FT. IN DIAMETER.

The grey iron foundries, 100 ft. long by 45 ft. wide and 60 ft. by 45 ft. wide, are capable of producing a wide variety of work both large and small. As an instance of this, reference may be made to the one piece propeller shown in process of moulding in one of the accompanying illustrations. This is one of a recent order of four 17 ft. diameter wheels weighing 9 tons. To further facilitate the handling of this propeller foundry work, there has recently been installed another up-to-date electric overhead travelling crane of 15 tons capacity and Northern make.

A heavy jolt machine with a table 4 ft. x 5 ft. and operated by compressed air is a big time saver, ramming up moulds for such work as base plates and frames for anchor windlasses and cargo winches, as well as ingot moulds, etc. A 2-ton compressed air steel jib crane having a radius of 27 feet is used exclusively to serve this "jolter." Pneumatic floor hand sand rammers are used on most large work, and air chippers for removing fins and lumps when cleaning castings.

The steel foundry is an important factor in the company's business, and has recently been enlarged to take care of the increased demand for steel castings. The main building of the steel foundry is 182 feet long x 82 ft. wide; part of it is utilized as a cutting-off room. The steel made here is by the Bessemer process in a two-ton capacity converter, the blast being supplied by a Roots blower driven direct by a steam engine. The mixture for the converter is melted in a Sheldon cupola, the blast being supplied by a Sheldon motor-driven fan. The materials are hoisted to the charging floor by means of a 3 ton Sprague electric hoist. The molten metal is transferred from the cupola to the converter in a truck ladle.

The quantity and quality of materials used in the converter are carefully checked by analysis and are controlled by their own laboratory tests, the company maintaining a metallurgist for this purpose. One advantage in having the Bessemer process is that the cupola can be used for either steel or iron foundry work as required. This cupola is, of course, additional to their regular iron foundry melting equipment. Close laboratory control is also effected in the use of materials and alloys so that different grades of steel and iron castings can be produced as required. There are two 5-ton Northern overhead electric travelling cranes in the steel foundry which can operate in the iron foundry when necessary in case of breakdown or

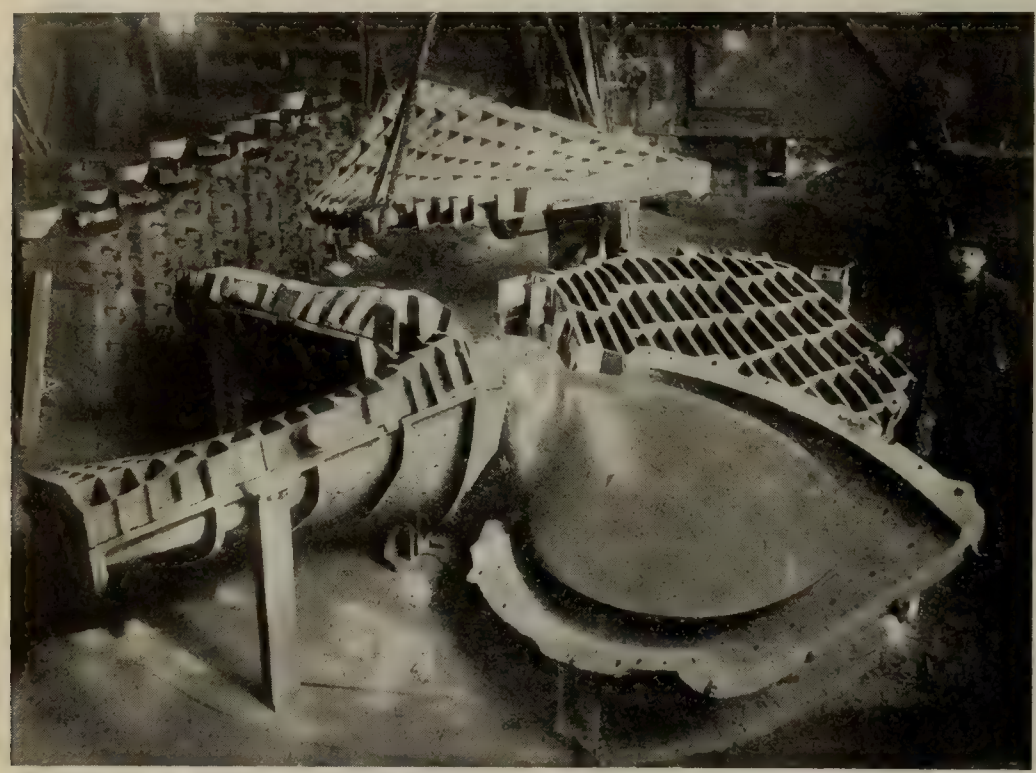


STEEL FOUNDRY CLEANING ROOM, OWEN SOUND PLANT.

for helping out on extra heavy lifts.

Adjoining the steel foundry is the sand mixing room in connection with which is a sand handling plant of considerable merit. The new silica sand and clay are elevated by a vertical bucket conveyor into large overhead storage tanks. From the tanks the materials drop through chutes and are accurately measured before being mixed in the 6 foot motor-driven rotary mixer and grinder. From there the sand is carried in dump buckets to the various sections of the moulding floor by means of a monorail system. All moulds are carried by the travelling cranes from the moulding floor to large drying ovens where they are dried. The moulds then pass out at the opposite end of the ovens and are distributed on the casting floor by the same cranes; the ovens being located between the moulding and casting floors give a proper routing of work through the shop. The moulders, therefore, do nothing else than actual moulding work.

The cleaning room 50 ft. x 100 ft., with storage in second storey, is equipped with motor-driven tumblers, a sand blast, pneumatic chipping tools, etc. Patterns are stored in large fire-proof rooms conveniently adjoining moulding floors. The storage is divided into sections and indexed for convenient reference. Adjoining the pattern storage is the electrician's department where are also the switchboard appliances for distributing power from the Hydro System. There is located in the pattern storage a heating and ventilating system for the foundry. This plant was supplied by Sheldons Ltd. of Galt. A similar plant is installed in the iron foundry.



MOLDING LARGE SOLID PROPELLER—TOP SECTION OF MOLDING BOX REMOVED TO SHOW PATTERN. OWEN SOUND PLANT.

A steam power plant is situated alongside the steel foundry, in which are installed a return tubular boiler for heating purposes, the steam engine driving the converter blower, a motor-driven Ingersoll-Rand 300 cubic feet twin cylinder air compressor for suppling compressed air for various purposes throughout the plant. In the cutting off room of the steel foundry, there is installed among other equipment an oxy-acetylene welding and cutting outfit. The flask storage for the steel foundry is served by a network system of overhead monorails, while the flask storage for the iron foundry is handled by a 75 ft. power derrick with a 60 ft. boom.

Products Classified

The firm have continuously developed the scope of their business, particularly during recent years, until now it includes:—

Auxiliary ship machinery including propellers.

Water power plant machinery.

Heavy transmission machinery, cut gears, etc.

Steel and iron castings.

Kennedy cutting-off machines for trimming shell forgings and cutting heads off steel ingots.

Shell steel and pig iron.

Auxiliary Ship Machinery

This section may be sub-divided to include the following:—Anchor windlasses, chain stoppers, steering engines, cargo winches, ash hoist, propellers, etc.

Propellers are made in steel, iron or bronze, sectional or solid. Following up their policy of expansion in the auxiliary ship machinery end of the business resulting from the submarine menace, the Kennedys have secured the sole Canadian manufacturing rights for the equipment made by the well known Hyde Windless Co., Bath, Maine. This concern, like the Kennedys, has had the benefit of over fifty years' experience in this class of work and had done over half of U.S.A. Government naval and

INTERIOR VIEW OF STEEL FOUNDRY SHOWING BESSEMER CONVERTER AT LEFT. OWEN SOUND PLANT.

merchant marine work up to the time of the war.

The Kennedy anchor windlasses as now constructed are, therefore, the result of many years' experience of two old concerns and embrace details of construction which have made these units well suited to the work they have to perform. Some of the principal features claimed for the Hyde-Kennedy windlasses are accessibility to all parts for repair; their widest part is aft, thus following approximately the shape of the boat so as to allow as uniformly a clear deck space around the machine as possible. All gearing and shafting are also aft, so as to be well clear of the action of anchor chains. The warping drums run at a high speed for quick handling of hawsers or other ropes. The "Wild Cats" or chain sprockets are also easily thrown in or out of gear when full strain is on the anchor chains and friction brakes.

Probably the best known steering engines manufactured are those of the quadrant, drums, steam-tiller and battleship screw types. The cargo winch is made with either vertical or horizontal engines, the latter being more popular on the Pacific Coast although seldom used on the Atlantic.

Propellers

Kennedy propeller wheels are the result of long, untiring and successful effort. Methods of manufacture have been developed by which castings are true to pattern, uniform in weight, and smooth in finish. The view of a propeller being moulded shows specially developed equipment for doing this class of work. The illustration shows one blade with the top half of moulding flask removed, the other blades being covered. The rigid cast iron moulding flasks prevent any straining or warping of the mould.

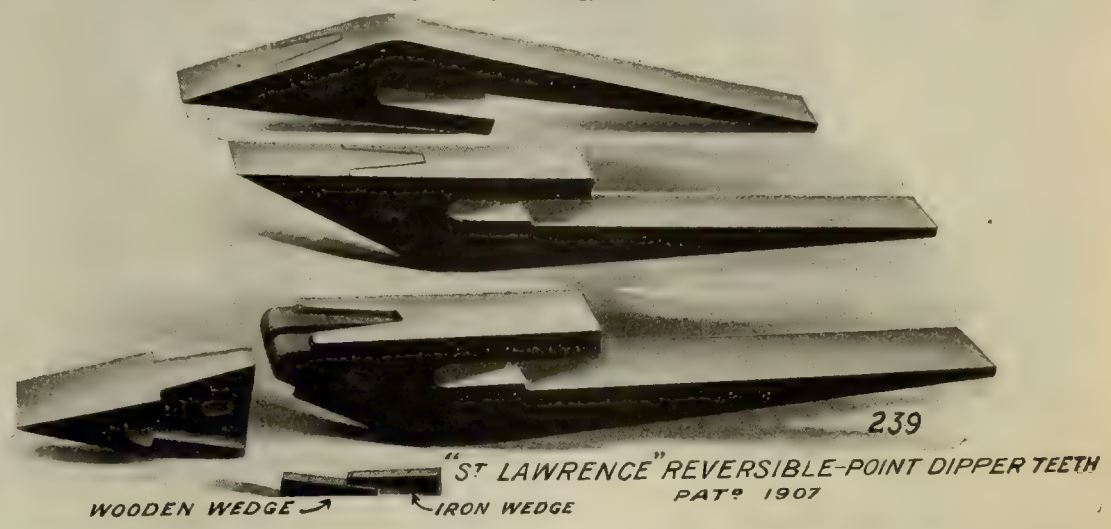
At Owen Sound there have recently been completed a number of what are probably the largest sized solid propellers yet made in Canada. These wheels were made for Canadian Vickers, Ltd., of Montreal for ocean-going cargo steamers and are 17 ft. in diameter. An interesting steel propeller hub recently made for the S.S. Hamonic of the Canada Steamship Lines is also illustrated.

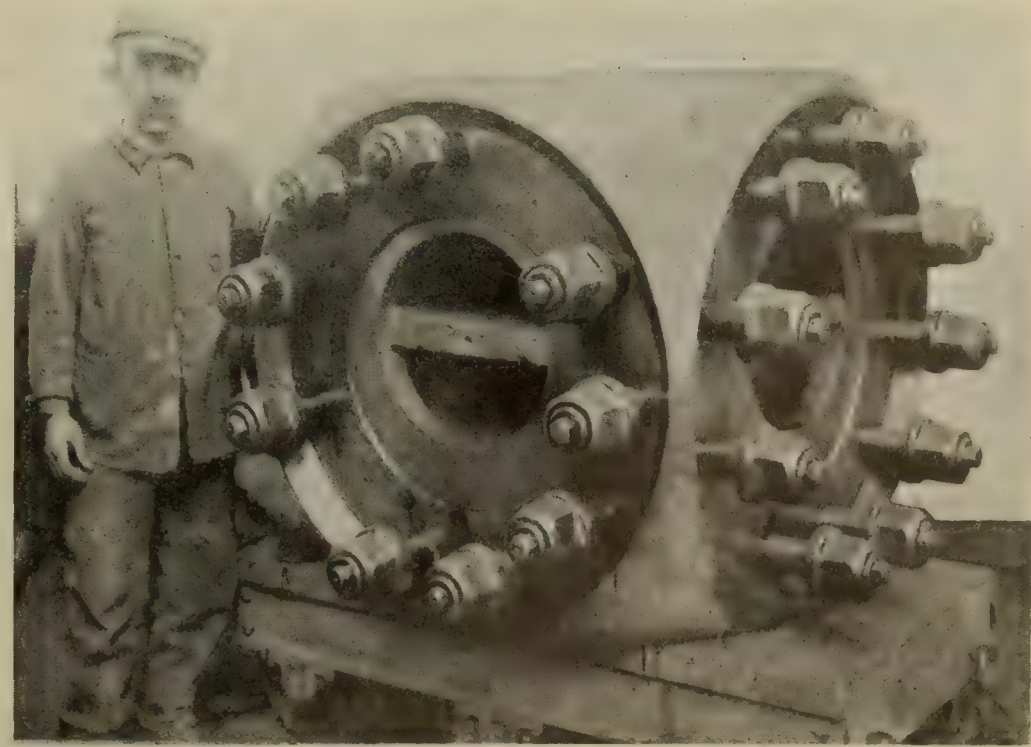
Water Power Plant Machinery

In the year 1868 when the Kennedys first began to make water wheels, the hydro-electric method of generating power was in its infancy in Canada and the plants in operation consisted as a rule of comparatively small units. In later years, the water powers in the country, which are a tremendous asset, have been turned to good account and are now in many districts the principal source of power. This is true of a large number of private plants as well as Government and municipal installations. At the Owen Sound plant there have been produced the units for numerous installations throughout Canada. This branch of the business has made its greatest development in the last decade, in which time the design of the turbine has been considerably improved.

The bulk of the Kennedy made turbines are of the Francis reaction-type which was developed to a high degree of perfection in Europe. These turbines have horizontal or vertical shafts and are suitable for medium and low pressures. As a rule the heads under which they work are sufficient to enable the modern turbine to give a speed high enough to allow direct coupling to a generator. The specific speed of Francis wheels, by which is meant the r.p.m. which a single runner turbine would have if operating under meter head and developing metric horse-power, may be varied by suitable design between 150 and 400 practically without reducing the efficiency. The wide speed variations possible with the Francis turbine is the principal reason for its popularity for reaction work. The best European makers have developed several standard series of Francis runners to secure a wide range of speed corresponding to specific speeds of 150, 200, 275, 350 and 400, the first two being generally used for medium pressure turbines; the other three, especially the last two, for low pressure turbines. Medium pressure turbines are in successful operation for heads up to 350 feet.

Following are a few instances of important water turbine installations carried out by the firm. A large water turbine was built for the Wahnapitae Power Co., of Sudbury, Ont. This unit is a twin horizontal central discharge turbine with end intake, and is rated at 2,500 h.p. Several units of water turbines each having a capacity of 4,500 h.p. have been built and installed in the Ottawa and Hull Power Mfg. Co. plant at Chaudiere Falls. A feature of these units is the internal heating system in the gates of the turbines to prevent clogging by frazil ice. Other plants since installed in the same district have been similarly equipped as a result of satisfactory performance. Five turbines have been installed at Campbellford, Ont., for the Seymour Power Co., these units being twin vertical type with central discharge. The oil step is of special construction supporting not only the entire weight of the turbine rotating parts but also the generator rotor, which is direct-connected to the turbine.





STEEL PROPELLER HUB FOR UPPER LAKES PASSENGER AND FREIGHT STEAMER "HAMONIC."

CHARGING FLOOR 17-TON ACID OPEN HEARTH FURNACE.

Stop Log Hoists

Another specialty to be included in the water power equipment class is the stop log winch or hoist. The firm are pioneers in the manufacture of winches or hoisting machines for lowering, raising, and piling of stop logs used in sluice dams. These dams have given great satisfaction and are favorably looked upon by engineers owing to the large quantity of water which can be put through them during times of high water and they have also the advantage that during times of low water the head can be kept up to the maximum, thus greatly increasing the efficiency of a water power installation.

The stop-log hoists or winches are of very rigid and heavy construction, so as to ensure safe and quick handling of the logs when operating against full flow and pressure of water. A 27-ton capacity installation at the Calgary Power Co. plant at Kamanaskis in the Rockies, is operated by electricity even to the piling of the stop logs on the deck of the dam where they remain during high water. Handpower stop log hoists are also manufacture. Standard machines are built in three sizes—35, 27, and 17 ton rated capacities.

Transmission Gears

Heavy gears are a prominent specialty of the firm. They regularly make large machine cut gears both bevel and spur up to 100 inch pitch diameter, and 20 inch face. A number of heavy gears were recently supplied the Goodyear Tire & Rubber Company, New Toronto.

TAPPING OUT 17-TON HEAT OF STEEL.

Steel Castings

This branch of the business covers the whole wide field so fully that it is unnecessary to particularize here.

Reversible Dipper Tooth

The reversible point dipper tooth for dredges and steam shovels was designed and patented by Sir John Kennedy and is made at Owen Sound to meet the requirements of hard service in dredging. The interesting feature of this tooth is that the wearing point is reversible. In other words when one side wears down the points may be reversed and so on until it is entirely worn out. The reversing operation takes only a few minutes and no special tools are required in its performance. When the point wears out, it is just as quickly replaced by a new one. They have proved satisfactory even in digging rock.

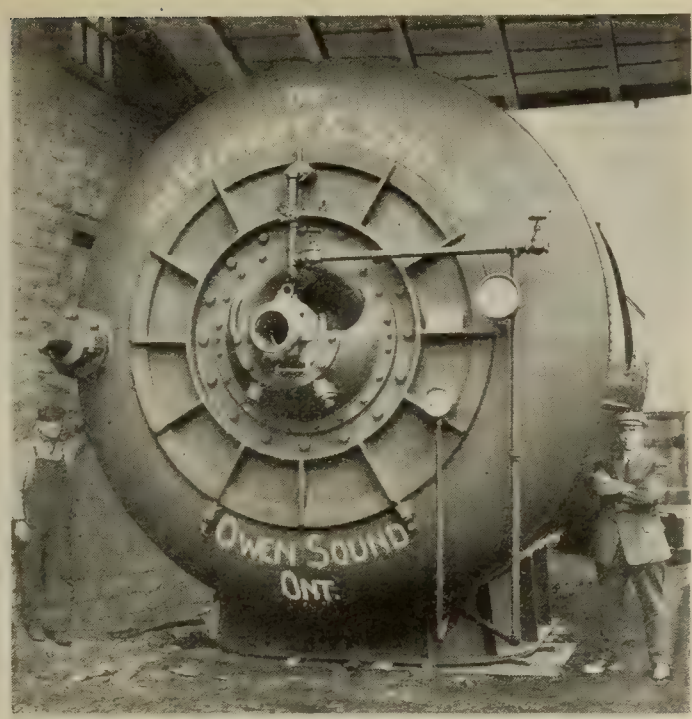
Collingwood Steel Plant

Early in the fall of 1915, after the completion of the 4.5 inch shell steel contract at Owen Sound it was found that no further contract could be received. This was due to the limited tonnage of steel that could be produced by the Tropenas converter, and the exceptionally high cost of the output on account of the greater quantity of low phosphorus pig iron used in this process than in the open hearth. It was therefore felt that some other means should be adopted so that the experience gained by the firm in the manufacture of high grade steel would not be lost to the country in time of war. With this in mind it was decided to look around for some suitable place in which to locate to produce munition steel. After examining several plants it was agreed to repair and commence operating the plant of the old Cramp Steel Co., the latter owned by the Northern Iron & Steel Co., Collingwood, Ont. This plant had been idle for fifteen years and the machinery and buildings were in a very bad state of repair. It was found

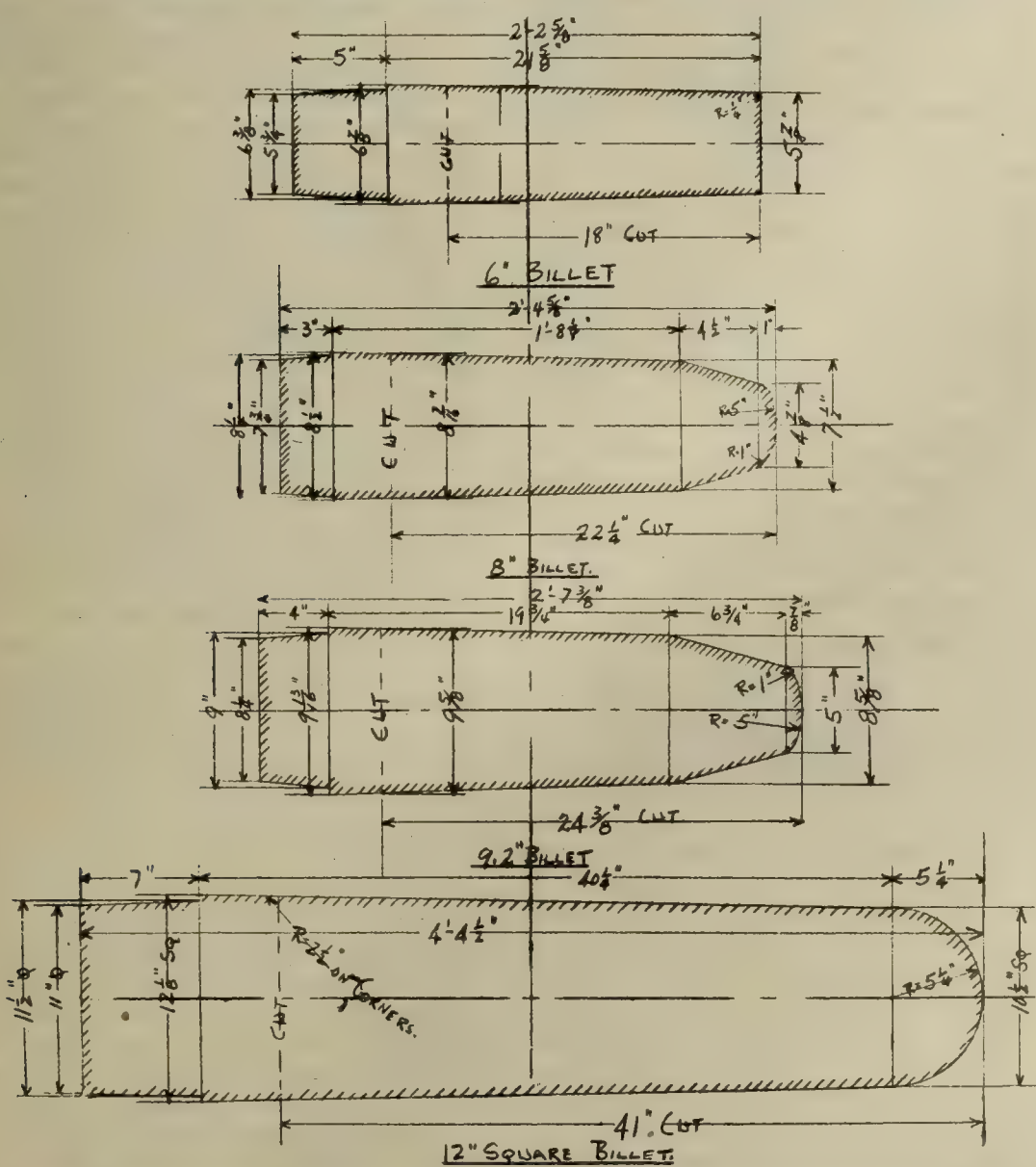
STRIPPING 9.2 IN. H.E. SHELL BLANKS.

that the two fifteen-ton basic open-hearth furnaces would have to be torn down and rebuilt as acid furnaces. Besides repairing and entirely remodelling the property, it was necessary to instal new machinery and two railroad sidings to take care of the ingots produced. This work was commenced in January, 1916, and it was not until July of the same year that the first heat was taken off.

Since that date there have been manufactured three sizes of steel ingots —the 8-in. shell blank weighing 390 lbs. when cast, and 283 lbs. when shipped; the 9-2 in. shell blank weighing 500 lbs. cast and 390 lbs. shipped and the 12-in. x 10¼-in. square steel ingot for rolling, which weighs 1,500 lbs. cast and 1,350 lbs. shipped. The plant is now casting 6-in shell blanks at the rate of 1,000 per day. The rolling mill is capable of rolling rods and bars up to 3½ finished diameter, but has not been operated as yet by the Kennedys, although they would entertain a reasonable proposition from any reliable experienced rolling mill men to do so. The dimensions of these different sizes are shown on sketches marked A, B, C, and D, respectively.



2,500 H.P. WATER TURBINE OF TWIN HORIZONTAL CENTRAL DISCHARGE TYPE WITH END INTAKE, BUILT AT OWEN SOUND PLANT.



STEEL BILLETS FOR VARIOUS SIZE AND TYPE SHELL PRODUCED AT COLLINGWOOD PLANT.

The operations cover a twenty-four hour day. The charging floor and casting floor labor involves three shifts of 8 hours each. The cutting off and electric furnace departments are two shifts of twelve hours each. The four hundred employees turn out two thousand shipping tons monthly.

During the spring of 1917, the low phosphorus pig iron situation became very acute. The production was less than the demand, and the prices advanced very rapidly. Arrangements were made for a supply of electric power to operate an electric pig iron furnace. This furnace reduces turnings, etc., into low phosphorus pig iron with the addition of carbon and ferro silicon. It produces from 12 to 15 tons daily, according to the amount of power received. About 1,000 h.p. is required.

COAL AND STEEL IN NOVA SCOTIA DURING 1917

By F. W. Gray, M.I. Min. E.*

IN an article reviewing the coal industry for 1916 which appeared in CANADIAN MACHINERY a year ago, the writer forecast that the coal output for 1917 would decline to a figure between 5½ and 5¾ million tons. From present indications it appears that the production of 1918 will show a still further decline to between 5¼ and 5½ million tons. The capacity of the Nova Scotia coal mines for output is 7½ million tons per year, so that the present rate of production is not less than two million tons per year below the possible tonnage were sufficient labor available.

The coal production of Nova Scotia in long tons during the war period compares with the year preceding the war as follows:

1913	7,263,485
1914	6,650,038
1915	6,708,695
1916	6,190,000
1917 (about)	5,735,000

The cumulative shortage for the war period to the end of 1917, computed on the 1913 basis, is about six million tons. At a value of $4.00 per ton, this shortage represents a sum of say $25,000,000 that has been expended in the United States for a raw material which could and should have been produced in Canada. A sum of this magnitude is not a negligible factor in the matters of trade balance and the rate of exchange, apart altogether from the throttling of industry that is caused by coal shortage.

The most notable decline in production is in the case of the Dominion Coal Co., its output having dropped from 4,091,790 tons in 1916 to 3,575,000 tons in 1917, if the Glace Bay collieries only are included. The output of the Springhill Collieries remained about the same as in

*Dominion Steel Corporation, Sydney, N.S.

1916. A noteworthy feature of the year is the aggregate tonnage of the smaller operators, situated principally on the fringes of the Pictou field and in the neighborhood of Maccan and Athol. This amounts to no less than 100,000 tons. Unfortunately, however, this increase in smaller operations does not begin to counterbalance the reduction in the outputs of the larger companies, nor is it a factor of permanence. The exploitation of abandoned areas and crop workings is an ephemeral condition caused by the prevailing coal shortage and the high price obtainable for coal in local markets. These small operators will in large measure disappear when the coal markets again become normal.

No Excess Supply Imminent

It must be admitted, however, that there is no immediate prospect of any excess of supply over demand in the coal market. So far as Nova Scotia is concerned, the shortage of labor has forced a cessation of all new development at the coal mines, and whenever a sufficient labor supply becomes available it will be found that the existing coal mines will have been so depleted that several years must elapse before the lost ground can be regained.

The decline in the coal outputs has indeed reached a stage where it threatens to restrict the production of steel. The product of the coal seams is not uniformly suitable for metallurgical purposes, and in several instances the supply of metallurgical coal is not at all reassuring for future expansion of steel manufacture.

Numerous Wage Increases

The year 1916 was marked by a succession of wage increases at the collieries, these being granted in quicker rotation and more substantial in amount than in any comparable period in the history of coal mining in the province, but 1917 in this respect has equalled the record of 1916. In May of this year the Provincial Workmen's Association made a demand upon the coal operators of the Sydney district for an increase in wages of 25 per cent. The matter was complicated by the attitude of the rival Miners Union, the U. M. W. of Nova Scotia. Applications were made for a conciliation board by several parties, but eventually a Royal Commission was appointed which devoted its chief attention to a reconciliation of the rival unions.

On the recommendation of the commission an increase in wages was granted to workmen at the collieries of 12½ per cent. plus an increase of 10 cents per day to workmen earning less than $2.50 per day. A provisional union of the two labor organizations was brought about. This was consummated later in the year, resulting in the formation of the Amalgamated Mine Workers of Nova Scotia, which body took over the existing wage agreement between the P. W. A. and the operators, more particularly the arrangement between the P. W. A., and the Dominion Coal Co.

Demand for Further Wage Increase

The A. M. W. of Nova Scotia has served the operators in the Sydney district with notice of the termination of the existing wage agreement as at the end of the year, and has demanded a wage increase ranging from a minimum of 30 per cent. up to 75 per cent. advance on existing rates. It is absolutely impossible, from the standpoint of the operators, to grant an increase of the magnitude asked, as it would necessitate an increase in the selling price of coal of from $1.50 to $2.00 per ton, and even at this increase in selling price some of the less remunerative collieries would be compelled to cease operations.

In view of the fact that the increases which have been granted in wages have already exceeded the calculated increase in the cost of living, it is felt that there is no real justification for the heavy increase asked by the A. M. W. of Nova Scotia. It is not anticipated that any stoppage of work will result, and the disagreement between the A. M. W., and the operators will probably end in the appointment of a board of conciliation.

The Explosion at New Waterford

The most important single occurrence of the year was the explosion at the No. 12 Colliery of the Dominion Coal Co. at New Waterford which resulted in the death of 65 men. Arising out of this, three prominent mine officials, namely, the superintendent of the Waterford district, and the manager of No. 12 Colliery, both officials of the Dominion Coal Co., and the deputy inspector of mines for the Waterford district, an official of the Provincial Department of Mines, reporting to the Inspector of Mines, have been indicted by a Grand Jury on a charge of manslaughter. The indictment has caused much comment among the mining officials of the province as there is no precedent in the latter for the criminal prosecution of mining officials, except through the intervention and direction of the Inspector of Mines. The indictment of the Deputy Inspector of Mines is regarded as a particularly unprecedented incident.

Dominion Steel Corporation

Large plans for extension of the steel industry in the Sydney district are mooted, but so far the shortage of labor has been a serious deterrent to any undertakings of consequence in this direction, with the exception of the new coke ovens of the Dominion Iron & Steel Co., which are making fair progress towards completion. The brick stacks are erected, the foundation work mostly finished, and the site of the oven structures has been thoroughly built-in for protection from the weather so that the erection of the ovens can proceed uninterruptedly throughout the winter. It is hoped that the first block of ovens will be making coke in the early summer of 1918.

One of the blast furnaces of the Dominion Iron & Steel Co. has been completely re-built on a much larger scale, and will be ready for operation next spring.

As part of the plan which includes the re-building of No. 1 blast furnace and the erection of the new coke-ovens, the Dominion Iron & Steel Co. are also erecting a new coal-washer, and the combination of modern coke-ovens with the latest type of coal-washer is expected, with the new blast furnace, to bring about a great improvement in the yield and quality of steel, accompanied by considerable economies in the practice.

Nova Scotia Steel & Coal C.

There are indications that the policy of the Nova Scotia Steel & Coal Co. will in the future concentrate more upon the manufacture of steel and steel products than upon the mining of coal for sale in the open market. During 1917 the Nova Scotia Steel & Coal Co. did not send any coal to the Montreal market, while the Dominion Coal Co. shipped only 50,000 tons, which compares with 2,000,000 tons in seasons prior to the war period.

The fabrication of steel freighters has proceeded steadily throughout the year at New Glasgow, and it may be confidently expected that further development is to take place in shipbuilding in the province. Indeed the hesitancy and lack of enterprise shown by the province in this matter of steel shipbuilding is in strange contradiction to the usual attitude of Nova Scotians whenever opportunities have offered in the past. There was surely never a time in history when the demand for steel ships was so insistent, and so likely to remain insistent as is the case to-day.

The Canadian Government made a capital mistake when it cancelled the privilege previously granted to Norwegian and other foreign ships to trade in Canadian coastal waters and did not simultaneously offer a system of bounties to encourage shipbuilding in Nova Scotia. The cancellation of the coasting privileges without the necessary corollary of a policy to stimulate shipbuilding in the province seemed incomprehensible at the time, but to-day it stands revealed as a first class omission.

To sum up the prospect for the steel industry in the province seems quite encouraging, but the thing that causes disquietude is the ever declining coal output, and the probability that production of coal is bound to continue declining.

Dinner was a little late. A guest asked the hostess to play something. Seating herself at the piano, the good woman executed a Chopin nocturne with precision. She finished, and there was still an interval of waiting to be bridged. In the silence she turned to an old gentleman on her right and said: "Would you like a sonata before dinner?"

He gave a start of surprise and pleasure. "Why, yes, thanks!" he said. "I had a couple on my way here, but I think I could drink another."

Staff Article

The inherent possibilities of shipbuilding and marine engineering are realized as never before in our experience, combining as they do staple industries in themselves of large proportions and the medium through which a myriad other enterprises, large and small, agricultural, mineral and manufacturing, may find opportunity to more fully expand and develop.

THE revival of shipbuilding on her lake and ocean shores has been an outstanding feature of Canada's industrial achievement during the past year. Wood as well as steel has entered largely into individual vessel construction, the former constituting the hull material not only for auxiliary powered schooners but for ocean-going steamships propelled by standard type marine engines or steam turbines as well. Needless to say, the revival is entirely due to the necessity of our aiding to offset the losses arising from German submarine activity and the otherwise abnormal demand for tonnage to maintain the world's commerce and to keep the Allied fronts supplied with both men, munitions, and merchandise.

Many new shipyards have been established all of which together with those of many years standing being taxed to capacity with orders at least twelve months ahead. Complete returns are not yet available of the year's output, nevertheless, although it will not eclipse the banner year of 1874, the tonnage for which mounted up to some 190,000 tons for 487 vessels, a reasonably close approach to that tonnage will be the ultimate record. Number of vessels will also be fewer.

Marine Engineering

Marine engine building, ship deck and engine room auxiliary machinery manufacture are lines of endeavor to which Canadian metal working plants have applied themselves as a result of the shipbuilding activity, and in each of these spheres perhaps even greater success has been achieved than in the purely ship construction feature, due to the fact that many plants specializing in more or less similar equipment for stationary or land requirements found little difficulty in meeting the specification demand for boardship installations.

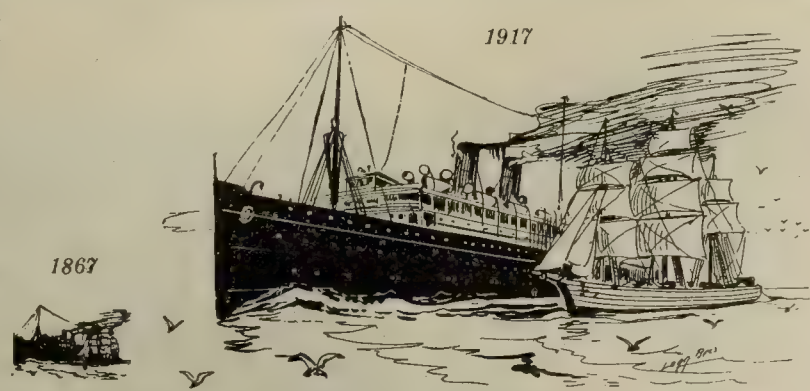
Wood Schooner Construction

In the early part of the year quite a number of auxiliary powered ocean-going schooners of wood construction were built and completed in British Columbia, and several of them have already made voyages to Australia and back. The advent of the Imperial Munitions Board, Ottawa, with contracts for large steam-engine propelled steel and wood ocean-going freighters had the effect of halting the construction of auxiliary powered wood schooners, hence the concentration of effort on the former in recent months.

Wood schooner construction continues to be actively prosecuted, however, in Nova Scotia, some twenty-five or thirty little shipyards being engaged in the building of that type of craft in tonnages ranging from 150 to 1,000 tons gross.

The placing in the early spring by the Dominion Government of contracts for a large number of trawlers and drifters in wood and steel, and steam engine propelled, intensified the otherwise briskness that had begun to make itself felt in shipbuilding and marine engineering circles, especially as deliveries of these craft were called for in all cases before the season of navigation closed.

Numerous contracts have been received during the year by our steel shipbuilding yards from interests unconnected with either the Imperial or Dominion Governments, data concerning which will be found in the individual plant references that follow .



COMPARISON BETWEEN CANADA'S SHIPPING—SEA-GOING, COASTAL, LAKE AND RIVER VESSELS AT CONFEDERATION AND NOW.

It is of course well known that the American Government through its Shipping Board and Emergency Fleet Corporation has a gigantic shipbuilding programme on hand, the vessel constituent of which embraces both wood and steel construction as in the case of the contracts placed by our Imperial Munitions Board. Propelling and auxiliary machinery, the latter including that required for ship deck and engine room, has been ordered in a majority of instances separate as to location of vessel hull construction as well as separate as to firm engaged on the latter.

The idea behind the scheme is of course to enable plants with contracts for hulls and their accessories to concentrate wholly on these, and the plants with machinery contracts to concentrate wholly on that particular feature.

Participation in U. S. Contracts

A number of enterprising Canadian metal-working plants took advantage of what appeared to them an opportunity to participate in the distribution of machinery orders for vessels on the American Government programme, and we are pleased to say that several hundred thousand dollars worth of such business has been secured as a result. At this writing, we are in a position to state that good progress is being made in the matter of this particular equipment output, and little doubt is entertained but that further substantial contracts are likely to be booked from the same source.

A gratifying feature of the shipbuilding and marine engineering industry in Canada during the year has been the absence of labor troubles, of such a nature at least as to tie up production for any great length of time. Departmental strikes have been of frequent occurrence nevertheless, the demand more often than not being for higher wages.

Labor scarcity—skilled and unskilled—has affected adversely the output of new construction at many centres, and now that conscription is operative, there is little chance of relief being afforded until the war is over.

Canadian shipyards have also been

much hampered in their operations as a direct result of the United States war activities. The plate and shape requirements of the latter for its shipbuilding programme added to its munitions steel needs called for an embargo being placed on commodities of that nature, and while provision is made whereby export under license may be effected, no end of inconvenience and delay has been experienced in procuring material.

At the moment no relief is in sight notwithstanding the fact that our Government and our manufacturers, individually and collectively, have sought a "way out."

Ship construction costs come high these war times both from a wage and material point of view, yet having regard to the need of "bottoms," it may be said without fear of contradiction that cost is secondary to either prompt receipt in quantity of the steel, or the labor to make use of that steel to the best advantage.

I. M. B. Steel Vessel Contracts

As already stated, the Imperial Munitions Board have placed contracts for wood as well as steel ocean freighters, both classes of vessel being steam engine propelled. The total number of steel ships ordered by the Board up to December 3rd is given as forty-four, of which four had been delivered. Their individual capacity ranges from 1,800 to 8,800 tons d.w., making a grand total carrying capacity of 213,600 d.w. tons.

The steel ships are being built at New Glasgow, N.S.; Montreal, Toronto, Welland, Midland, Collingwood, and Port Arthur, Ont.; Vancouver and North Vancouver, B.C. The majority of the vessels are of the 3,400, 3,500 d.w. capacity class, each shipyard being responsible to a great extent for the creation of the necessary specifications and drawing.

I. M. B. Wood Vessel Contracts

The total number of wood steamships ordered by the Imperial Munitions Board up to December 3rd is given as forty-six. Twenty-seven of these are being built in British Columbia and nineteen in Eastern Canada. The individual carrying capacity of the wood ships is 2,500 tons d.w., making a total carrying capacity of those on order of 115,000 d.w. tons.

BOW VIEW OF S.S. "PORSANGER," SHOWING ALSO LAUNCHING PLATFORM AT CANADIAN VICKERS SHIPYARD, MONTREAL.

The wood ships are being built at Liverpool, N.S.; St. John, N.B.; Isle of Orleans, Cote St. Paul, Quebec and Three Rivers, Que.; Toronto and Fort William, Ont.; Coquitlam, New Westminster, Vancouver, North Vancouver, and Victoria, B.C.

From the foregoing it will be noted that the Imperial Munitions Board have placed orders during the year for new construction—wood and steel, covering ninety vessels of an aggregate tonnage, carrying capacity, of 328,600 d.w. tons.

Norwegian Vessel Contracts

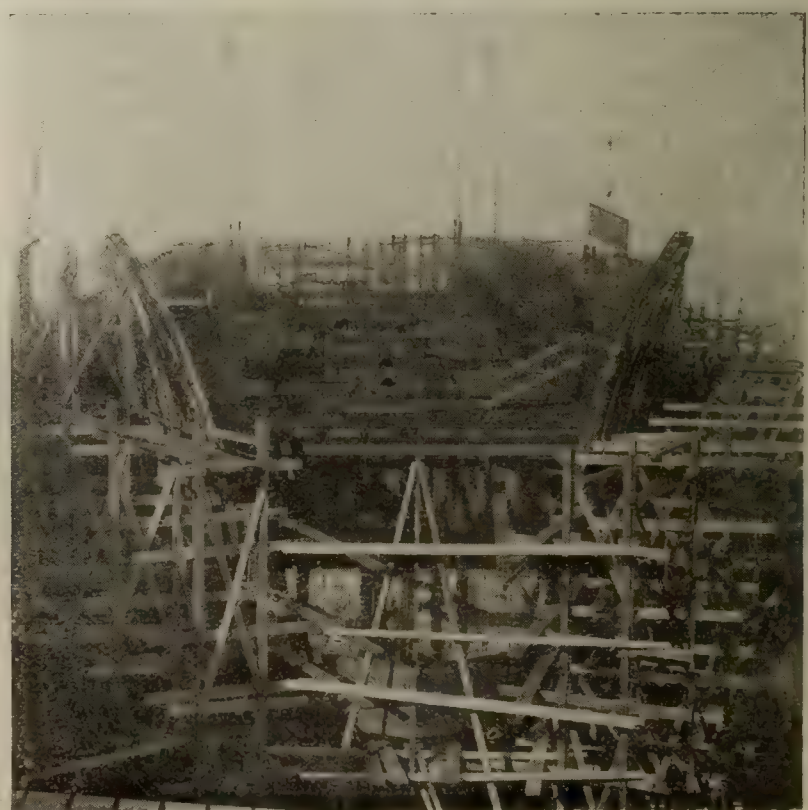
In addition to the vessels placed with Canadian shipyards to Imperial Munitions Board orders, twenty-two steel steamships of 3,500 tons d.w. capacity have been ordered by outside companies on Norwegian account, or a total in this connection of 77,000 d.w. tons. Adding this to the wood and steel tonnage placed by the I. M. B., there is shown under contract in the Dominion a total of 405,600 d.w. tons, the value of which somewhat exceeds $80,000,000.

Canadian Allis-Chalmers, Bridgeburg, Ont.

The Canadian Allis-Chalmers, Toronto, Montreal and Bridgeburg, Ont., have contracted with the Imperial Munitions Board, Ottawa, for the construction of four steel steamships of 3,500 tons each, and good progress has already been made on the plant layout and with the equipment installation, notwithstanding the fact that a definite decision to include shipbuilding and marine engineering among the other activities of the Company was only come to within the last two months or so.

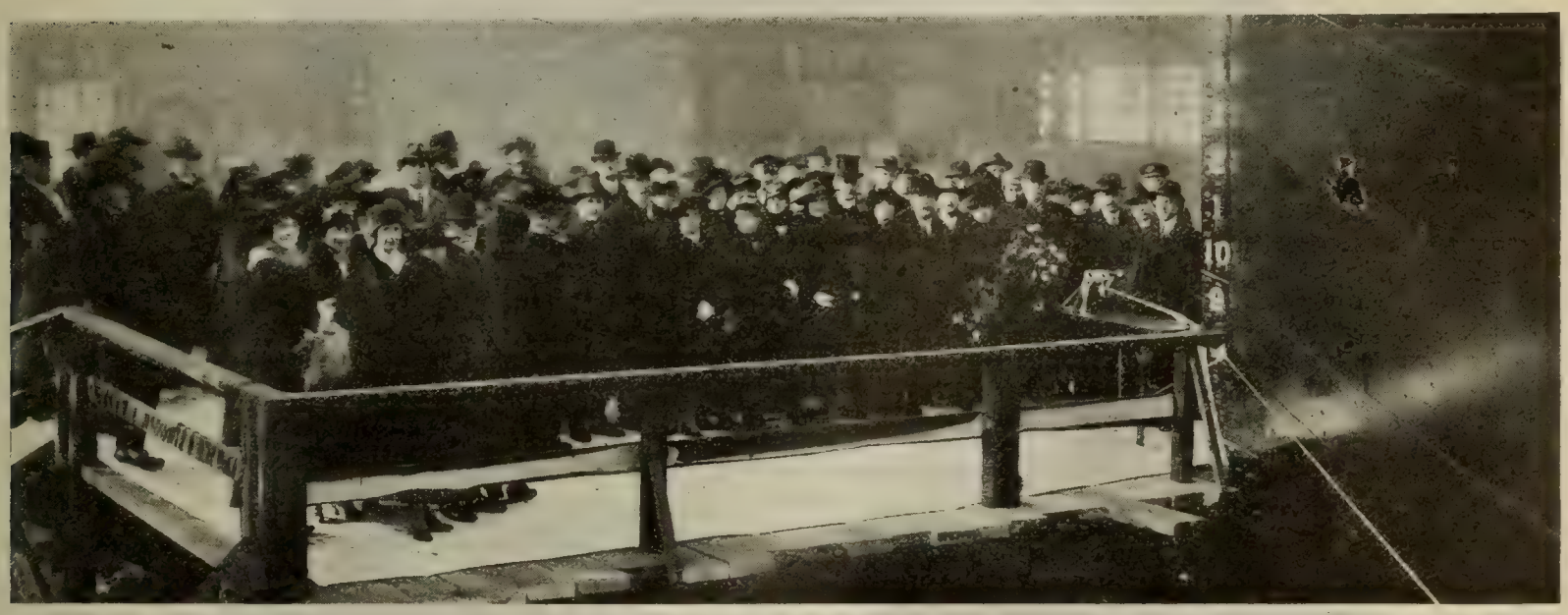
Some ten years ago a lake freighter was built at the Bridgeburg plant, but since then the fabrication of structural steel has constituted the principal output. The leading dimensions of each of the four vessels are as follows:

TANK TOP OF STEEL VESSEL UNDER CONSTRUCTION IN SHIPYARD OF J. COUGHLAN & SONS, VANCOUVER, B.C.



STEEL VESSEL IN FRAMES AND PARTLY PLATED IN SHIPYARD OF J. COUGHLAN & SONS, VANCOUVER, B.C.

STEEL SHIPBUILDING YARD OF J. COUGHLAN & SONS, VANCOUVER, B.C.



SCENE ON LAUNCHING PLATFORM IMMEDIATELY BEFORE THE S.S. "PORSANGER" LEFT THE WAYS AT CANADIAN VICKERS SHIPYARD, MONTREAL.

S.S. "PORSANGER" TAKING THE WATER FROM CANADIAN VICKERS SHIPYARD, MONTREAL.

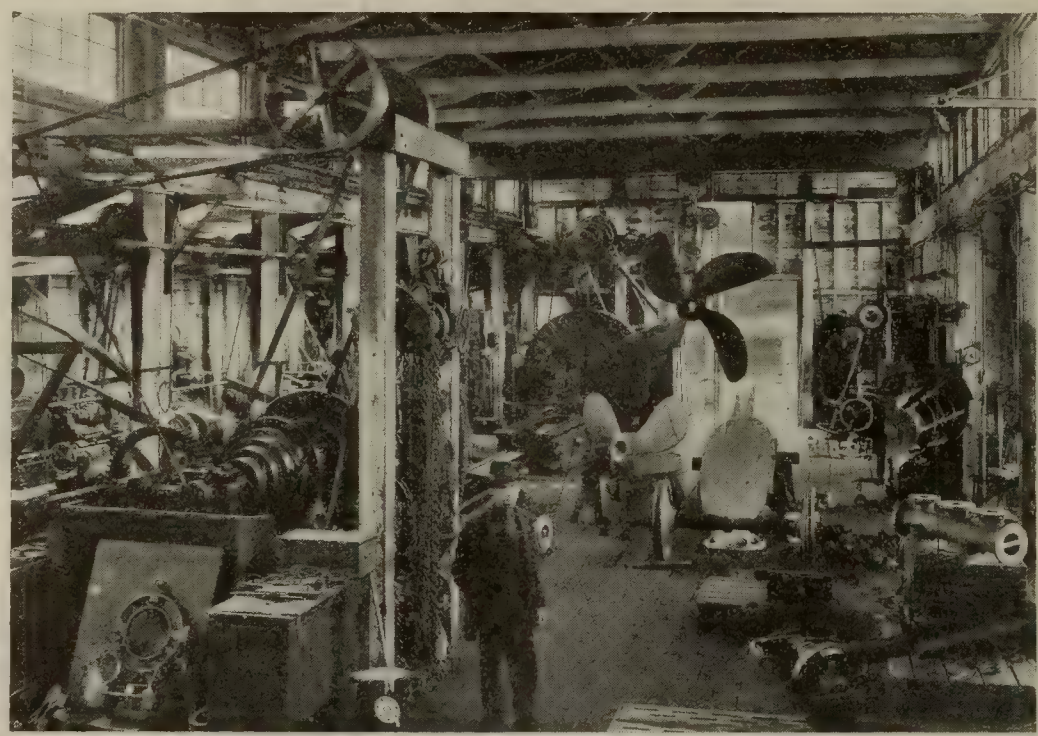
Length over all, 261 ft.; beam molded, 43½ ft.; depth molded, 23 ft. They will be of the usual bulk cargo type, of Class 100 A. I. Lloyd's Register, and will embody in their design, structural detail, and equipment, such features and appliances as will render them immune to the fullest possible extent from enemy submarine attacks.

The steel is being supplied by the British Government through the Cunard Steamship Co., and we understand that a considerable tonnage has already been delivered to the plant.

The propelling machinery is to be built at the Company's Davenport Works, Toronto, and will consist of single screw triple expansion engines of the surface condensing type, the cylinder diameters being 20 in., 33 in., and 54 in., by 40 in. stroke. There will be two boilers in each ship, of 14 ft. in diameter by 12 ft. long. Howden's system of forced draught will be installed and the working steam pressure will be 180 pounds per sq. inch.

Coal bunkers of 500 tons capacity will be located in the wings of the boiler space and under the bridge deck. The cargo holds will be three in number, that abaft the engine room having two hatches and those forward having one hatch only. Each cargo hatch will be served by two independent cargo derrick booms of 5 tons capacity, and each boom will have its independent cargo winch.

A steam steering engine will be located in a special house abaft of the engine casing on the upper deck. The life-saving equipment will consist of two 25 ft. lifeboats and one 18 ft. working boat. The water ballast tanks of three feet depth amidships will extend the entire length from the collision bulkhead forward to that of the peak tank aft. Living quarters will be steam heated and electric lighting will be installed throughout.

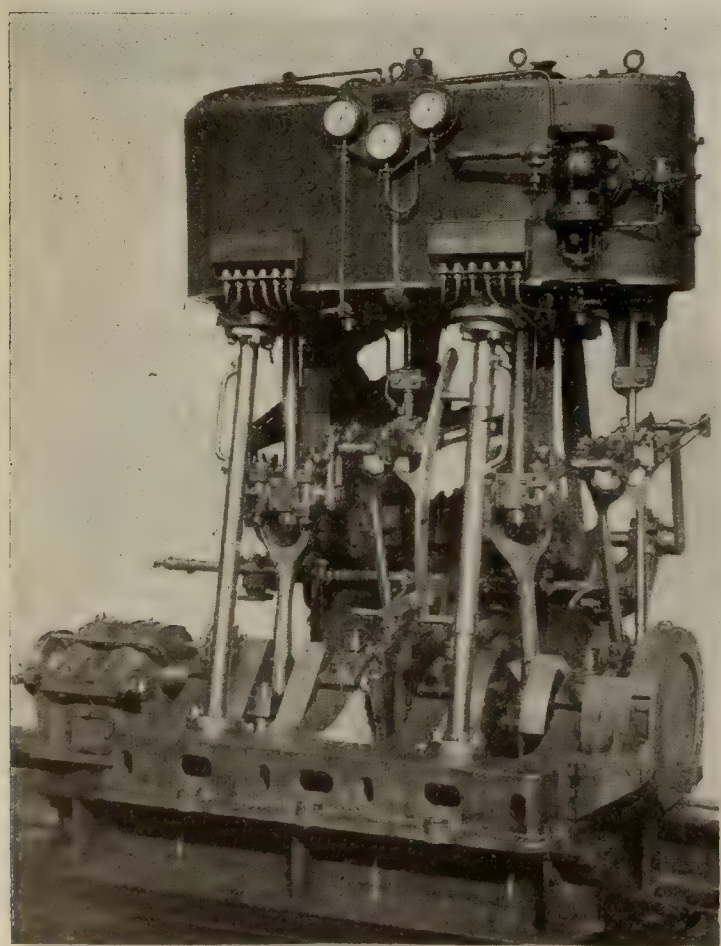


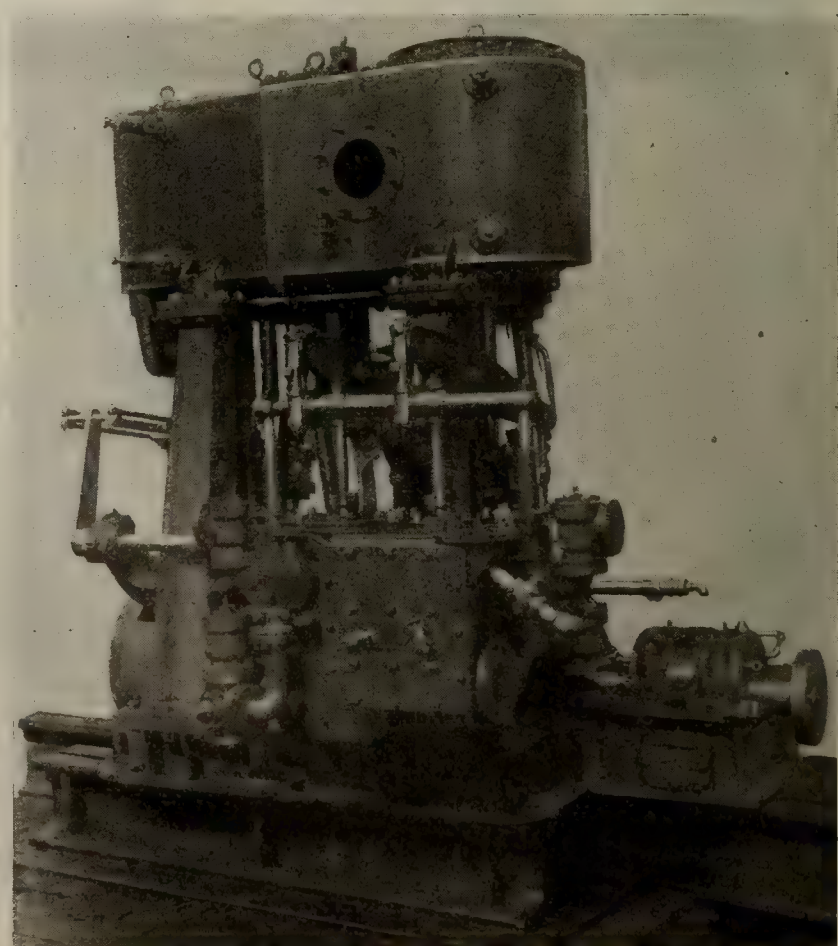
SECTION OF MACHINE SHOP, YARROWS, LTD., ESQUIMALT, B.C.

Yarrows, Ltd., Esquimalt, B.C.

During the present year, Yarrows, Ltd., Esquimalt, B.C., have carried out a considerable amount of naval repair work for the Imperial, Canadian, and Japanese Governments, and when this statement was prepared activities in the like direction had by no means ceased. Apart from the foregoing, the firm during the past twelve months has undertaken much work of a general marine character, among which may be mentioned that of a Grand Trunk Pacific Co. steamship that had been ashore. This vessel was repaired at Esquimalt, which involved the renewel of practically the ship's bottom for a length of 180 ft.

Among other repair work of an interesting and arduous nature to which the energies of the plant have been directed in recent months may be cited that of the Niels Nielson, an 8,800 ton cargo vessel, which had sustained heavy dom-





FRONT AND BACK VIEWS OF COMPOUND SURFACE CONDENSING MARINE ENGINE WITH CYLINDERS 18 IN. AND 38 IN. IN DIAMETER BY 24 IN. STROKE, BUILT BY GOLDIE & McCULLOCH, GALT, ONT.

age due to stranding; the fitting of an 18 ft. diameter manganese bronze propeller to a new fully laden vessel of 8,800 tons cargo capacity which had been brought back from sea in a disabled condition; the removal of some 37 plates, the relining and straightening, and removal of the stern frame of the steamship Gray which, in addition to being badly damaged generally, had her back broken and buckled.

Aside from the foregoing, a large number of vessels of various sizes and types have been drydocked for minor repairs and overhaul.

In the matter of new work during 1917, the firm have completed and shipped to India two sternwheelers of 132 ft. in length and 32 ft. beam, two more exactly similar and one of larger dimensions being at present under construction.

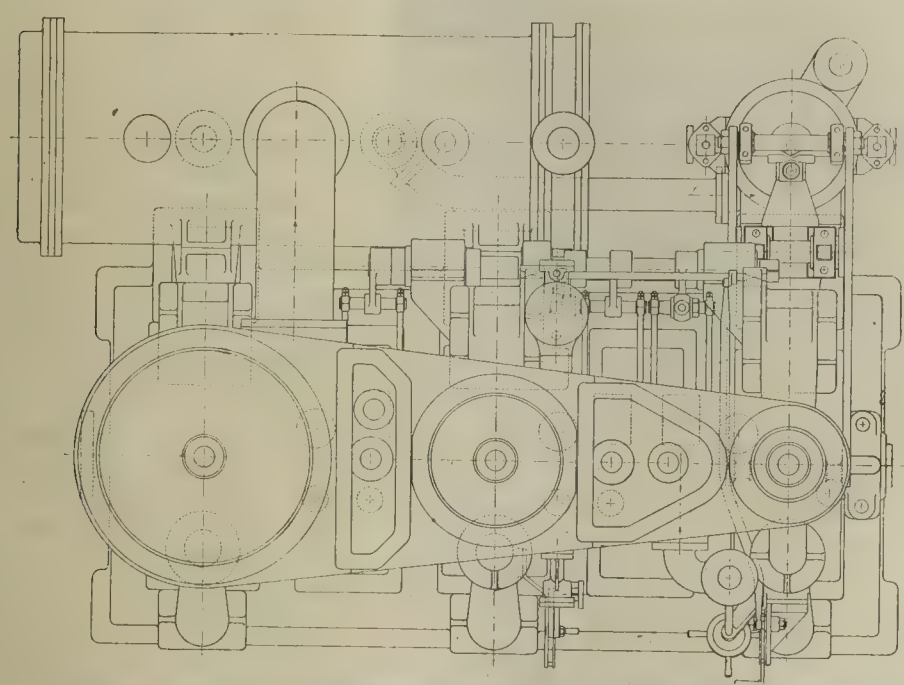
Yarrows Ltd. have made a specialty of the manufacture of cast iron and manganese bronze propeller blades, some of the latter weighing as much as 12 tons. In this connection it may be mentioned that the 18 ft. diameter manganese bronze propeller already referred to was cast, fitted, and the ship made ready for sea within a week without docking or disturbing her cargo, the work being carried out by building a wood cofferdam around the stern of the vessel.

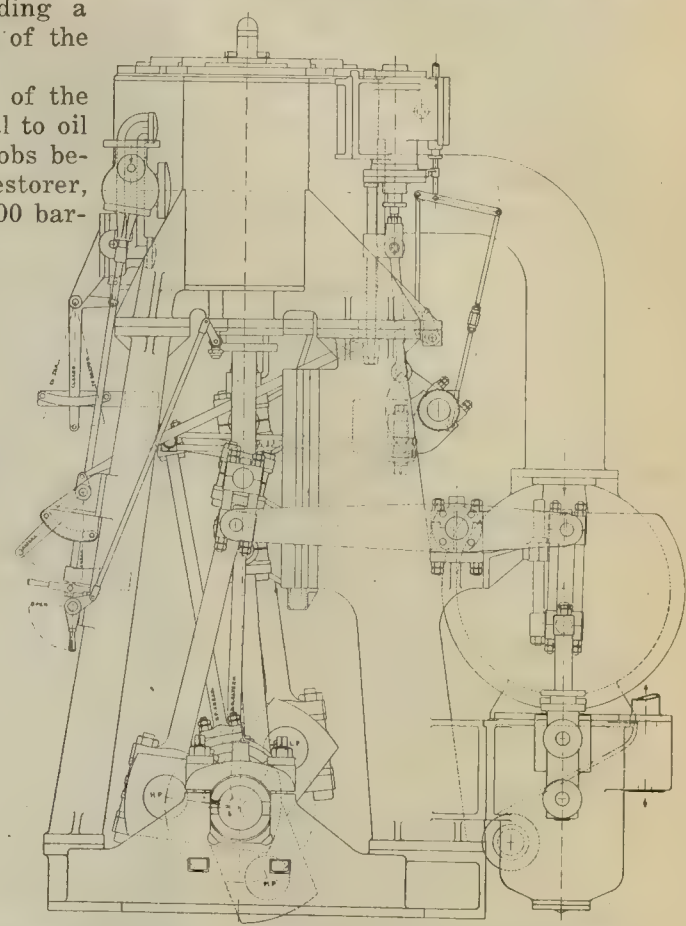
A specialty has also been made of the conversion of steamships from coal to oil burning, one of the most recent jobs being that of the cable ship Restorer, which was fitted out to carry 10,000 barrels of fuel oil. Several of the C.P.R. steamers, the coast fleet of the G.T.P. and various local dredges have all been converted from coal to oil burning.

During the year the firm has made many large marine engine and other castings, consisting of bedplates, cylinders for triple expansion engines of 24 in., 38 in., and 62 in. diameter by 42 in. stroke; also some large nitric acid retorts running up to a weight of 8 tons each.

An oxy-acetylene cutting and welding outfit, a galvanizing plant, and the provision of the necessary equipment to handle expeditiously and efficiently special coppersmithing and pipe work, round out a shipyard installation admirably adapted to meet the needs of the local shipping and those of much farther afield.

The yard is situated at Esquimalt Harbor adjoining the site of the proposed new Government drydock, and covers an area of about 8 acres. The wharf is over 500 feet long and can accommodate on both sides vessels sent in for overhaul and repairs. The marine railway can take care of vessels up to 300 feet in length and of 2,500 tons deadweight. Vessels of larger size up to 480 feet are handled in the drydock. A 60 ton shearlegs and a 10 ton floating





TRIPLE EXPANSION MARINE ENGINES WITH CYLINDERS OF 12¾ IN. 21¼ IN. AND 35 IN. IN DIAMETER BY 24 IN. STROKE, BUILT BY GOLDIE & McCULLOCH, GALT, ONT.

MARINE RAILWAY AND REPAIR SLIPS, YARROWS, LTD., ESQUIMALT, B.C.

derrick are conveniently located for dealing with heavy lifts. There is also a floating compressed air plant for use on vessels lying off the yard. An average of 250 men are employed the year round.

Yarrows, Ltd., of Esquimalt, B.C., has direct association with Yarrows & Co., Ltd., of Glasgow, Scotland.

Goldie & McCulloch Co., Galt, Ont.

The Goldie & McCulloch Co., Galt, Ont., up till early in the present year had not undertaken the building of marine engines; the statement which follows is, therefore, the more interesting, as showing what can be done by an engineering firm well equipped and organized in other than its regular lines of manufacture.

The company was asked early in the year if they could undertake the building of a number of compound marine engines, with pumps, surface condensers, etc., complete from stop valves to propellers, of a size to develop 200 indicated horse-power with steam at 140 lbs. per sq. in. working pressure, and piston speed of 500 ft. per minute. The accompanying line cut and half tones serve to illustrate the completed engine features. The cylinder diameters are 18 in. and 38 in. in diameter by 24 in. stroke. A total of one hundred of these engines was required of which the Goldie & McCulloch Co. were awarded forty, the remainder being placed in lots of thirty downward among plants in Canada and the United States.

BOW VIEW OF STEEL FREIGHTER "WAR DOG" WHILE ON THE WAYS.

As all the firm's machine tools were not available at the time, a large number being employed on munitions work, an arrangement was made with the Canada Machinery Corporation, Galt, Ont., to undertake some of the machine work, the various parts being divided into unit groups capable of being finished and assembled complete in themselves.

As the drawings, all of which were supplied to the different contractors, arrived, they were at once sent into the shops and at the same time jigs were put in hand for machining and drilling the various parts. These jigs were ready ahead of the castings and forgings for which they were intended, so there was no delay on that score.

The first drawing was received about April 10. Pattern work was at once started, a number of special moulding boxes, some in duplicate for certain parts, being got ready at same time. Casting proceeded at a rapid rate and it was a common occurrence for a cylinder, bed-plate, condenser shell, propeller, two stern tubes and a quantity of smaller castings to be made per day for several consecutive days. Several sets of the larger castings were at the same time made for another concern. The firm were considerably handicapped by slowness in delivery of heavy forgings, condenser tubes, etc., which they had to purchase, and also by the fact that sufficient skilled labor to run a night shift was not procurable. Good progress was made notwithstanding.

The stern tubes, tail shafts, and propellers being required first to let the shipbuilders finish the hulls, the first effort was concentrated on these and shipment averaged five complete sets per week for several weeks. The first engine and condenser were shipped on

OCEAN FREIGHTER "WAR DOG," 300 FT. B. P., 45 FT. BEAM, AND 27 FT. MOLDED DEPTH, BEING LAUNCHED FROM WALLACE SHIPYARDS, NORTH VANCOUVER, B.C.

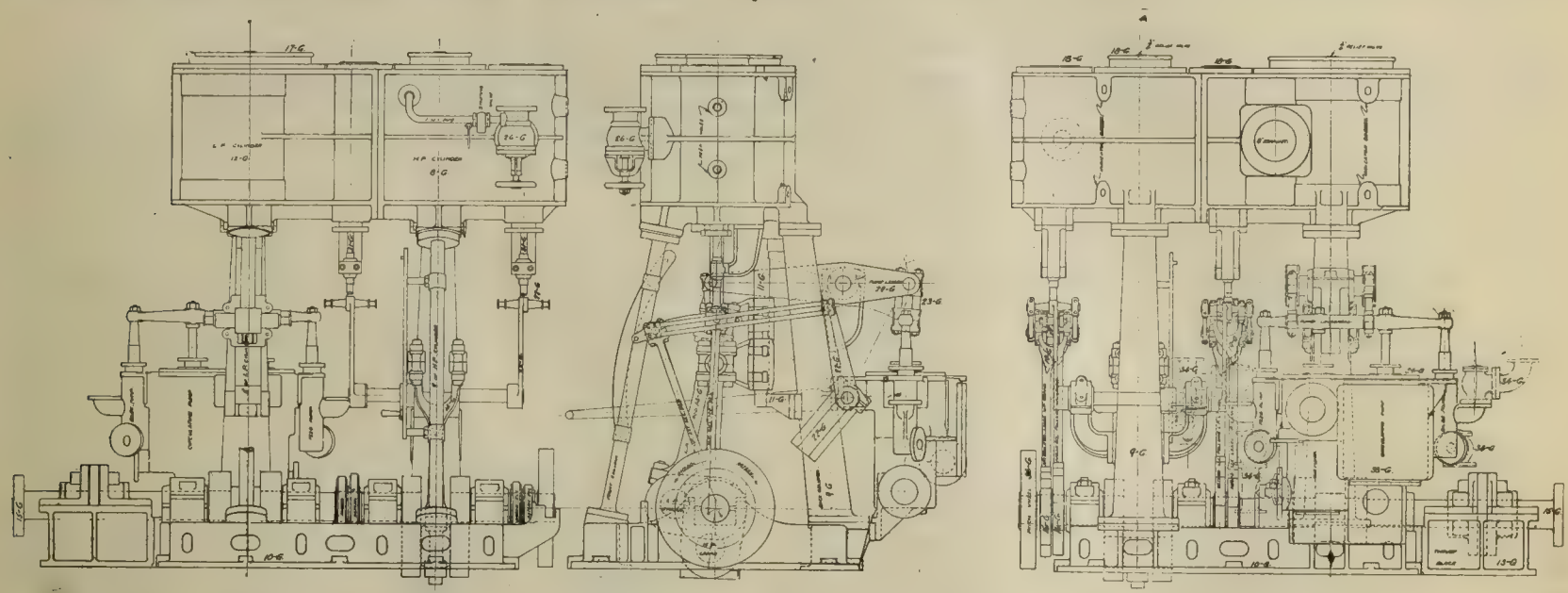
August 24, and the last on November 27 —about 13 weeks. It will be seen from the above that shipments over this period averaged over three engines per week.

At the start shipments were naturally slower but as the work came forward and the men got used to it they speeded up with the result that, for six weeks, shipments averaged four per week, and for two weeks five engines were completed and tested each six days. We understand, that when about thirty-five engines had been shipped, the total received from the eight or nine other builders combined, had been equalled.

While these engines were being constructed, the Goldie & McCulloch Co. were also busy on other work in their engine department. Thirty-three shiplighting engines of their well known forced lubrication type were completed, and considerable work was done on another order of fifty of same type. They are building at present some one hundred and twenty of these engines for lighting sets, connecting to fans, and pumps for shipboard work, for various shipbuilders, government and naval requirement, including the United States Emergency Shipping Board.

The vertical enclosed forced lubrication engine is used to the exclusion of almost all others by British shipbuilders for small auxiliary engines and the Goldie & McCulloch Co. have developed it in accordance with the best British practice. One of their compound admiralty type installations is shown connected to armoured generators made by the Electric Ordnance & Accessories Co., Birmingham (Vickers Lt.), and fitted on a Russian naval vessel.

The company are now building a number of triple expansion marine engines of 500 horse-power, the accompanying line drawing showing the general design. Further large contracts are pending. They have also specialized in ships' sidelights, marine type vertical boiler feed pumps, bilge and ballast pumps, also some special lines of brass work, etc. The name—Goldie & McCulloch has always stood for high class products and progress, and as might be expected they are in the forefront of the new Canadian industry of marine engineering.



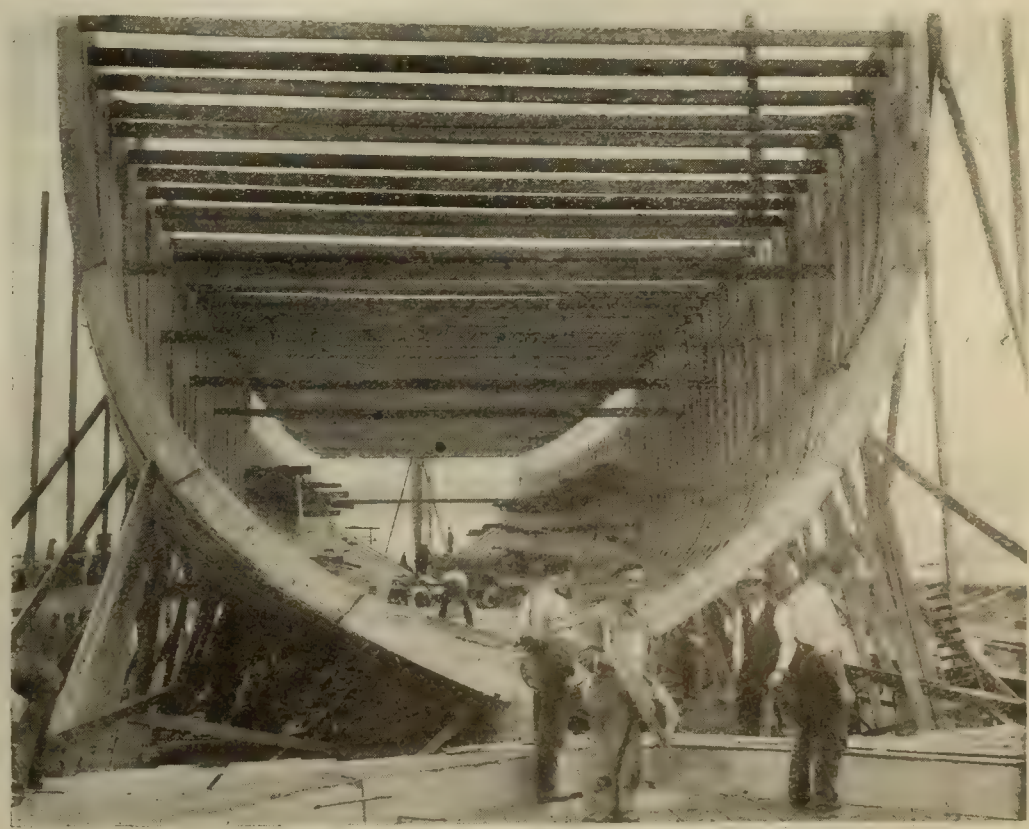
COMPOUND MARINE ENGINES WITH CYLINDERS 12 IN. AND 26 IN. IN DIAMETER BY 16 IN. STROKE, BUILT BY THE JOHN McDOUGALL CALEDONIAN IRON WORKS, MONTREAL.

J. Coughlan & Sons, Vancouver, B.C.

J. Coughlan & Sons is a private enterprise, being controlled by J. Coughlan, a British Columbia pioneer, and his two sons J. J. Coughlan and S. H. Coughlan Prior to the war the firm was engaged in the sale and fabrication of structural steel for railway and highway bridges and steel frame buildings as well as in the manufacture of building bricks. They were highly successful in these spheres of commercial endeavor, having constructed almost all of the steel frames now standing in British Columbia in addition to a number of railway bridges.

The outbreak of war put a stop to the demand for specialties of the nature indicated, consequently new fields of enterprise had to be sought. Contracts were secured for six steel vessels of 8,800 tons deadweight capacity each, delivery of all to be guaranteed by the end of the year 1918.

It was found necessary to completely overhaul and re-equip the structural steel fabricating plant and in this regard no expense was spared, the result being that to-day the shipbuilding capacity of the yard will compare very favorably with any similar establishment north of San Francisco. Four keels have been laid down and construction work is proceeding simultaneously on



OCEAN-GOING WOOD SCHOONER CONSTRUCTION IN BRITISH COLUMBIA.

three of the vessels, the first of which will be launched shortly.

Each ship is to be steam turbine driven, contracts for the turbines having been placed in the United States. The boilers of Scotch type will, however, be built in the J. Coughlan & Sons' yard at Vancouver.

The firm is meantime giving employment to over 1,000 men and expectations are that before long as many more men will be on the pay-roll. The illustrations give a fairly comprehensive idea both of the extent of the plant and the magnitude of the work being carried out.

Early in December a contract for four more 8,800 ton freighters similar in all respects to the six already on hand was received from the Imperial Munitions Board.

Nova Scotia Steel & Coal Co., Trenton, N.S.

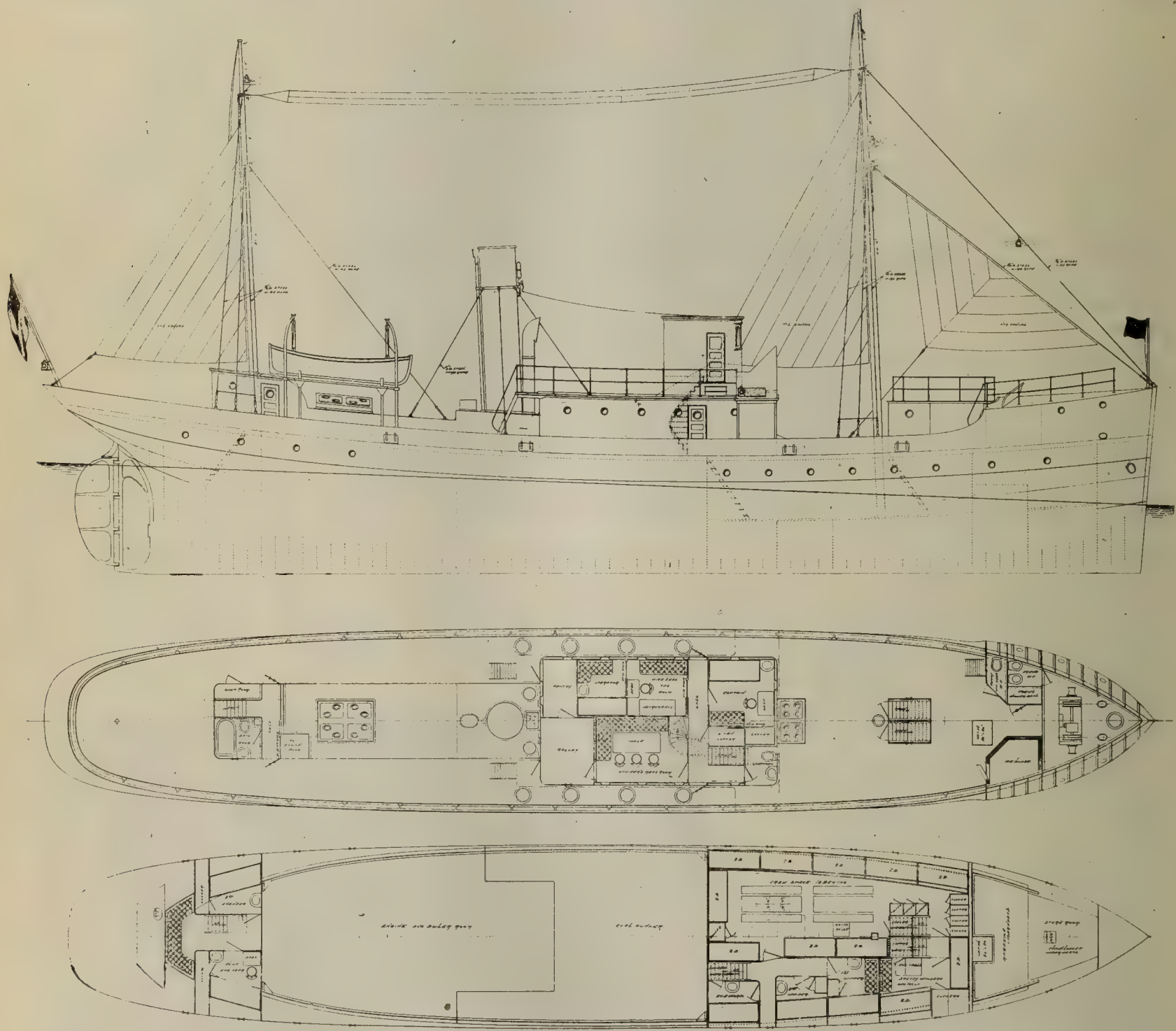
Although meantime engaged in the dual crafts of shipbuilding and marine engineering along with its other metal-working activities, no definite decision has been arrived at concerning the permanent establishment of either or both enterprises as part of the Nova Scotia Steel & Coal Co. future industrial programme. Two steel ocean-going steamships are at present under construction, and about the middle of the year a similar vessel was completed and sent to sea. The latter was steam turbine driven, while those now under construction will have regular type triple expansion surface condensing marine engines of "Scotia" manufacture.

It was hoped to have launched one of the vessels this fall, but shortage of labor made this impossible. As a result the launching will not now take place until the spring of next year. About 240 men are employed on the two ships now building, and something like 25 men are engaged on the engines at the New Glasgow plant of the company.

Port Arthur Shipbuilding Co., Port Arthur, Ont.

Early in the present year the Western Dry Dock & Shipbuilding Co., Port Arthur, Ont., gave place to the Port Arthur Shipbuilding Co. The capacity of the plant then was that of two 4,200-ton steel freighters building at one time, or an annual output of six vessels. Additional berths have since been constructed, which will about double the capacity, and there is little doubt but what full advantage will be taken of the enlarged accommodation to help relieve the shipping shortage.

The present year has been the biggest in the history of the yard as regards new construction, several ocean-going freighters and a number of deep sea trawlers having been completed and passed into service. The last official statement available showed a total of 16,267 tons of new construction on hand, of which seven cargo vessels represented 14,737 gross tons.



ACCOMMODATION AND RIGGING PLANS OF A FLEET OF FISHERIES PROTECTION VESSELS BUILT IN CANADA DURING 1917.

Collingwood Shipbuilding Co., Collingwood, Ont.

On January 2 this year transfer of the property of the Collingwood Shipbuilding Co. was made to H. B. Smith, J. W. Norcross, and R. M. Wolvin, the capitalization named in connection with the transfer being $2,000,000. During the present year nine steel vessels of a total of 15,000 gross tons have been built, launched engined and completed, the individual units consisting of one cargo steamer of 550 feet in length and 7,988 gross tons; two oil tankers, each 250 feet in length and of 2,642 gross tons; six deep sea trawlers, 125 feet in length and of 288 gross tons each. Several sets of engines and boilers were also constructed for vessels building elsewhere.

Needless to say the order books of the shipyard carry capacity on new construction well into the New Year which, taken in conjunction with anticipation of at least the average amount of repair work and overhauling, leads to the expectation that the ensuing twelve months will be the banner year in the company's history. It is of interest to note that from 1900, the year in which the shipyard was organized, until the present, 58 new vessels have been built.

THE COLLINGWOOD SHIPBUILDING CO. VESSELS LAUNCHED DURING 1917.

Type	Name	Yard No.	Dimensions Length	Breadth	Depth	Gross Tons	D.W. Tons	Engines	Boilers.	Speed Knots	H.P.	Owners	Launching Date
Cargo	Westmount	48	550	58	31	7,988	11,000	24-40-66 / 42	3@13′ 0″ x 11′ 0″	12	2,400	Montreal Trans. Co.	May
Oil tanker	Reginolite	49	250	44	25	2,642	3,700	18-30-50 / 36	2@13′ 6″ x 11′ 0″	10.5	1,200	Imperial Oil Co.	June
" "	Tararolite	50	250	44	25	2,642	3,700	18-30-50 / 36	2@13′ 6″ x 11′ 0″	10.5	1,200	International Oil Co.	Oct.
Deep sea trawler	T. R. 7	53	125	23½	13½	288	185	12¾-21½-35 / 24	1@13′ 6″ x 10′ 6″	10	500	Dept. Naval Service	Sept.
"	T. R. 8	54	"	"	"	"	"	"	"	"	"	"	"
"	T. R. 9	55	"	"	"	"	"	"	"	"	"	"	Oct.
"	T. R. 10	56	"	"	"	"	"	"	"	"	"	"	Nov.
"	T. R. 11	57	"	"	"	"	"	"	"	"	"	"	Dec.
"	T. R. 12	58	"	"	"	"	"	"	"	"	"	"	Dec.
		9				15,000					7,800		

Lyall Shipbuilding Co., North Vancouver, B.C.

The Lyall Shipbuilding Co., North Vancouver, B.C., have a contract to build six wood freighters for the Imperial Munitions Board, and not only have keels for all six been laid down, but one of the six took the water during the present month. As regards shipyard equipment, travelling derricks have been installed, and in the matters of a mill and small tools, these have been provided with a view to securing rapid and efficient output in every case.

M. Beatty & Sons, Welland, Ont.

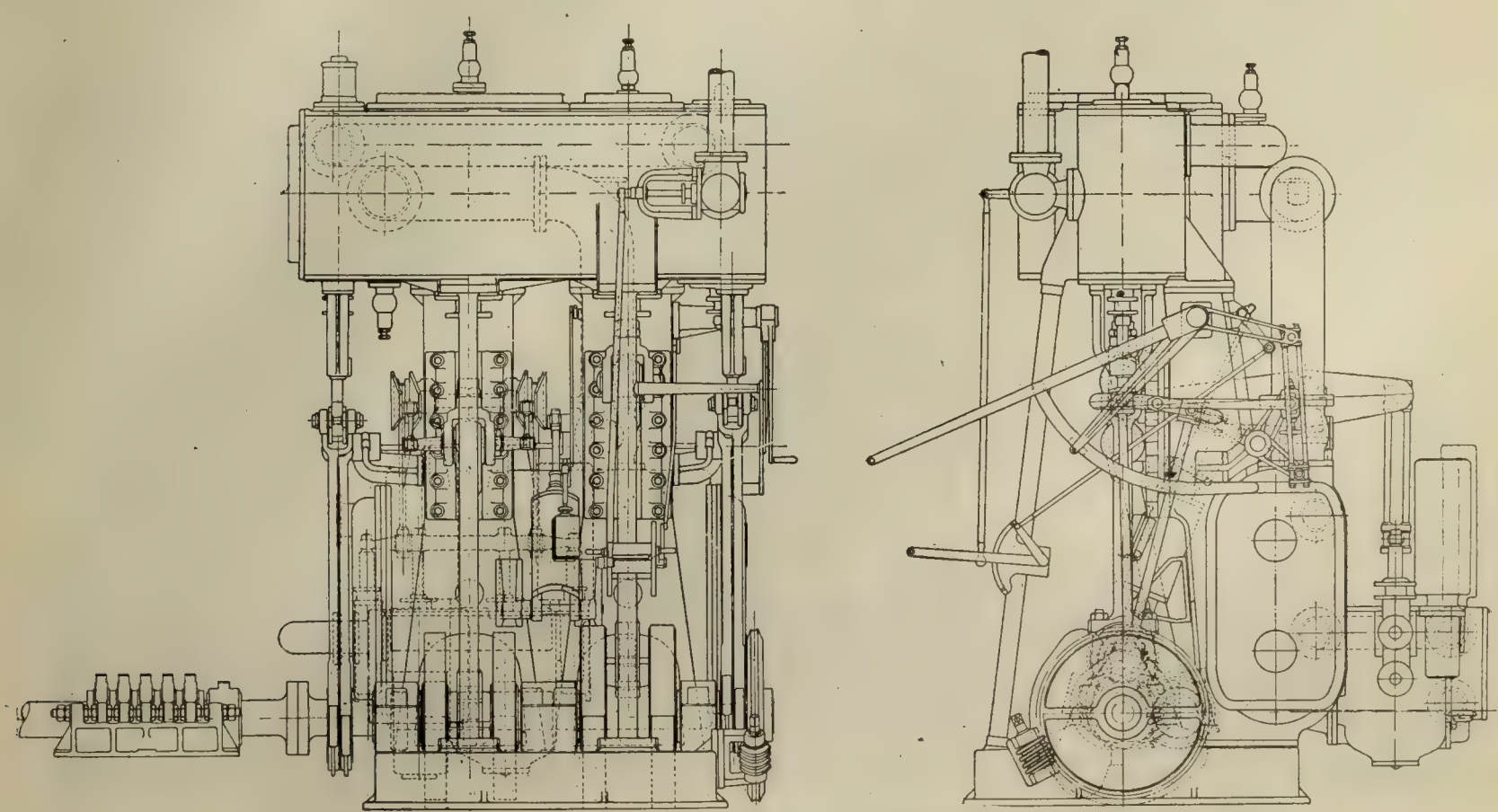
This old-established concern on the Welland Canal have leased their shipyard and plate shop to the Welland Shipbuilding Co., who are building two standard steel steamships, and are understood to have other orders on hand.

M. Beatty & Sons' principal product at the moment consists of cargo winches, anchor windlasses, and ash hoists. In addition to building these to the order of the Imperial Munitions Board, they are also supplying them to the order of private shipbuilding interests throughout the Dominion.

They have not yet gone into the building of propelling engines or boilers, their equipment for turning out the larger horse powers at least being scarcely heavy enough. The building of marine engines for vessels of 1,000 tons and under is, however, under consideration.

Canadian Government Shipyard, Sorel, Que.

The Canadian Government shipyard at Sorel is under the direction of the Department of Marine and Fisheries, Ottawa, and aside from new construction, much repair work on the various units of the



COMPOUND SURFACE CONDENSING ENGINES FOR FISHERIES PROTECTION VESSELS.

MOTOR SHIP "CHIRALITE" AS SHE APPEARED ON HER TRIAL TRIP AT VANCOUVER.

St. Lawrence River ship channel fleet and on the Department of Public Works vessels in the district is undertaken the year round. Construction of buoys for the Department is another direction in which the activities of the plant tend, buoys of various designs being shipped to waterways in all parts of the Dominion. During each winter the St. Lawrence ship channel fleet, embracing 15 dredges and attendant vessels—about 100 in all, are wintered at the sorel plant, where repairs are made and the different vessels are overhauled and outfitted for the following season of navigation.

The new work completed during the present year includes the following: Steel staff tug "Berthier" for the St. Lawrence Ship Channel. Length, b.p., 120 ft.; breadth molded, 24 ft.; depth molded, 12 ft. 6 in.; gross tonnage, 368; indicated horsepower, 550; speed 13 miles per hour. The propelling machinery which is of the twin screw compound surface condensing type was, along with the boiler, built at the shipyard.

Steel steamer "Argenteuil," built for buoy service on the Ottawa River: Length over all, 100 ft.; breadth molded, 21 ft.; depth molded, 9 ft.; gross tonnage, 175; indicated horsepower, 190; speed, 10 miles per hour. The machinery is of the single screw compound jet condensing type and was purchased outside. The boiler was, however, built at the shipyard. A winch and derrick for handling buoys up to 6 tons is installed.

Three wood and three steel vessels were built for the Imperial Government. Boilers for the former, and boilers and engines for the latter, were also constructed at the shipyard. All of these have been delivered except one steel vessel which is in the water, but cannot be completed until the opening of the 1918 season of navigation. During the present year an average of 800 men have been on the payroll, their efforts being directed to both new and repair work.

Thor Iron Works, Toronto

At the Thor Iron Works, Toronto, new vessel construction has embraced two ocean-going steel stamships and two steel deep-sea trawlers. One of the former and the two latter were launched and completed during the year. The second freighter will be launched early in January. The trawlers are similar in every respect to those built at Collingwood and by tre Polson Iron Works, in which circumstances it will be unnecessary to feature them here. The freighters were ordered in the first instance by the Great Lakes Transportation Co., but changed hands later. Their leading dimensions and propelling machinery details are as follows: Length over all, 261 ft.; beam, 43 ft. 6 in.; depth, 28 ft. 2 in.; d.w., 4.300 tons; engine cylinders, 20-33-54 in. in diameter by 40 in. stroke; two boilers each 14 ft. 6 in. in diameter by 11 ft. long; indicated horsepower, 1,300.

Contracts on hand consist of two freighters similar in every respect to the above except htat they will be of American registry. By the end of January it is expected that the keels of both will have been laid. The machinery for all of the vessels is being taken care of by the John Inglis Co., Toronto.

Taylor Engineering Co., Vancouver, B.C.

The Taylor Engineering Co., Vancouver, although really naval architects and consulting engineers have during the past two years constructed a number of small wood craft all under 100 ft. in length, the most notable being the motor ship "Chiralite," a photograph of the vessel appearing in this section.

The "Chiralite" is 85 ft. over all and has a beam of 18 ft. Being intended to enter fairly shallow water ports, her draft loaded has been kept down to 6 feet. She was contracted for by the International Petroleum Co. for service off the South American Coast. Her motor equipment consists of two sets of 70 horsepower Sterling engines. On her trial trips she developed a sped of 9½ knots. The fuel capacity amounts to 2,400 gallons, being sufficient to keep the machinery running continuously at full speed for two weeks. The vessel is lighted throughout from a Delco electric plant installation. Electric fans are installed in every cabin and state room, also in the engine room.

Muir Bros. Dry Dock Co.

Muir Bros. Dry Dock Co., whose plant is located at Port Dalhousie, the Lake Ontario end of the Old Welland Canal, report a busy season, repair work having been abundant to the extent that their two dry docks have been employed more than ever, especially by the larger class of vessels using the Welland Canal highway of Great Lakes shipping. These dry docks have probably a longer record of continuous business than any others on the lakes, having been owned and oper-

OCEAN FREIGHTER "ANGOULEME," BUILT AT THE THOR IRON WORKS, TORONTO, 1917.

ated by one family since 1850. The company has so far not revived its shipbuilding, but has confined its entire efforts of late years to repair work, mostly in wood, although steel vessels have often been docked for minor repairs.

The two dry docks which have been rebuilt within the last two years, are at 255 ft. and 185 ft. keel lengths respectively, the former of which is sufficient to accommodate the longest ships able to pass through the canal. The shipyard adjoining the docks is modernly equipped, the unit installation consisting of a mill for sawing timbers, frames, etc.; compressed air plant, forge, machine shop, etc. The various buildings are nearly all of brick and stone construction with metal roofs, and the yard has suace for shipbuilding should Muir Bros. or some other firm acting with them decide to take up same.

Polson Iron Works, Toronto

Polson Iron Works, Toronto, in common with other Canadian shipbuilding establishments, has experienced an abnormally busy year. The launches for the period include one 3,500 gross ton ocean-going freighter and ten deep sea trawlers. Four freighters similar to the above are under construction, and one of them will be launched in January of next year. During the past twelve months the shipyard has been generally enlarged and extended, so much so that notwithstanding the good tonnage output, as shown on the accompanying table, a very much better one is expected in the ensuing year. It should also be stated that in addition to the shipbuilding feature the propelling machinery, including boilers, is also constructed at the plant.

British Yukon Navigation Co., Vancouver, B.C.

Although the British Yukon Navigation Co. are not in the shipbuilding business but operate a fleet of boats on the Yukon River and the Atlin Lake, nevertheless during the present year they built two vessels for the latter service. One was of the composite freight and passenger type carrying about 100 tons of cargo on her freight deck and 85 first-class passengers on her saloon and texas decks. She was a stern-wheeler, 165 ft. long, by 35 ft. beam, and was propelled by engines of 16 in. cylinder diameter by 72 in. stroke.

The other vessel was for day service only, therefore had no sleeping accommodation. She was 85 ft. long and of 20 ft. beam, and was driven by twin screws operated through 280 horsepower Buffalo gasoline engines. The average speed of both vessels is 13½ miles per hour. No new construction is contemplated for the coming year.

John McDougall Caledonian Iron Works, Montreal

In common with other important and old established general engineering concerns in Canada, the John McDougall Caledonian Iron Works, Montreal, have taken up the manufacture of marine propelling engines, boilers, and engine room auxiliary equipment. A detail of the work completed and in progress follows:

Six sets of compound engines with cylinders 12 and 24 inches in diameter by 16 inches stroke, of 210 indicated horsepower each.

Six marine Scotch type boilers each 9 ft. 6 in. in diameter by 9 ft. long.

Six sets of ships' side valves.

Six sets of surface condensers of 400 sq. ft. C.S. each.

The foregoing have all been completed, delivered, and installed.

The work on hand and in progress consists of:—

Two sets of triple expansion engines with cylinders 12¾, 21½ and 35 inches in diameter by 24 inches stroke, of 560 indicated horsepower each.

Two sets of ships' side valves.

Two surface condensers of 600 sq. ft. C.S. each.

Two sets of triple expansion engines with cylinders, 20, 33 and 54 inches in diameter by 40 inches stroke, of 1,250 indicated horsepower each.

Two condenser circulating pumps independently driven by vertical marine type engines.

Two sets of 1,750 I.H.P. triple expansion engine castings, the cylinders of which are 21, 35 and 67 inches in diameter by 54 inches stroke.

Canadian Vickers Ltd., Montreal

The shipbuilding plant of Canadian Vickers, Montreal, easily takes precedence of all others in Canada both as regards the amount and nature of the operating equipment, extent of layout, etc., and the scope, weight and variety of vessel product capable of being turned out. Unfortunately little data is available concerning the activities of the present year; it may be affirmed, however, that merchant and naval vessel construction (new and repair), have not been lacking. We are safe in saying that more men are employed by Canadian Vickers than by all the other shipbuilding yards of the Dominion combined, a condition likely to prevail permanently, irrespective of what future development may take place in the industry within our borders.

On November 29 the ocean freighter "Porsanger" was launched, and the opening of the 1918 season of navigation will see her sister ship take the water. Both vessels are on order to Norwegian account and are of the following leading dimensions, etc.: Length over all, 394 ft. 6 in.; breadth molded, 49 ft. 3 in.; depth molded, 30 ft.; deadweight capacity, 7,000 tons; gross tonnage, 4,670; load draught, 24 ft. The propelling machinery consists of triple expansion engines, two main and one donkey boilers. The hull subdivision embraces 14 separate water-tight compartments, while a double bottom extends fore and aft throughout each ship's length. The water ballast capacity is 1,630 tons. Cargo handling, navigating and lighting equipment installed are of the most modern and efficient type.

The plant is meantime taxed to capacity in the matter of keels laid, notwithstanding the big extensions and additions to buildings and equipment that have been made during the year.

Fraser, Brace & Co., Montreal

Among recently established wood shipbuilding plants, attention may be directed to that of Fraser, Brace & Co., of Montreal. Although a new departure for this firm, they go into it with a wide expert knowledge of large construction work and engineering undertakings generally. They have acquired a very desirable location for the plant site, which consists of approximately eight acres adjoining the Lachine Canal, on the south side of the latter and in the district known as Cote St. Paul. The shipyard offers ideal conditions for its specific purpose, forming an old basin that is readily and rapidly being transformed into an excellent slip or dry dock. When this basin was formerly used, the entrance was bridged by the bascule bridge on the C.P.R. which runs parallel

POLSON IRON WORKS, TORONTO—VESSEL OUTPUT DURING 1917.

Name.	Yard No.	Length Ft.	Breadth Ft.	Depth Ft.	Gross Tons	D.W. Tons	Engine Cylinders	Boilers.	Speed Knots	H.P.	Owners.	Launching Date	Type
Toronto	134	261	43½	23	2,350	3,500	20½–33–54 / 36 / 18x38	Two 14 ft. by 12 ft.	10½	1,250	Christopher Hannevig	October	Cargo steamer
Ypres	135	135	23½	13½	325	....	24	Howden two-element W. tube	10	500	Dominion Government	June	Deep sea
Vimy	136	"	"	"	"	....	"	"	"	"	"	"	
Messines	137	"	"	"	"	....	"	"	"	"	"	"	Trawlers
St. Julien	138	"	"	"	"	....	"	"	"	"	"	"	
St. Eloi	139	"	"	"	"	....	"	"	"	"	"	July	
Festubert	140	"	"	"	"	....	"	"	"	"	"	"	
T.R. 15	141	125	23½	13½	288	....	12¾–21½–35 / 24	One 13 ft. 6 in. by 10 ft. 6 in.	10	500	Dept. Naval Service	Nov.	
T.R. 16	142	"	"	"	"	....	"	"	"	"	"	"	
T.R. 17	143	"	"	"	"	....	"	"	"	"	"	"	
T.R. 18	144	"	"	"	"	....	"	"	"	"	"	"	

to the canal; the abutments for the bridge being of concrete. The dam that at present prevents the water of the canal from entering the basin will eventually be replaced with a lock gate, so that the basin will form a dry dock 600 feet long and 150 feet wide; sufficiently large to provide erection and working space for four wood ships, each of which will be 250 feet long and of 42 feet beam.

The initial contract secured is for four standard 2,500 ton boats, and construction is now well advanced for two of these the keels being placed on the pile foundations which have been laid on the eastern bank of the slip. The first two will be side-launched when completed. The keels for the other two will be laid in the bed of the slip, and when the boats are finished they will be floated by simply flooding the slip, water being allowed to pass through the canal entrance. This method will eliminate the construction of launching ways and will also facilitate the actual "launching" operation.

A tentative contract has been obtained for other four boats of the same class, and provision is being made to accommodate the entire eight at the one site; four in the slip and the remainder on the upper level. Buildings have been erected for offices, stores, air compressors, transformers, saw mill, also carpenter and machine shops. A mold loft 150 feet by 50 feet has also been provided. The power used throughout will be electric. The property adjoins both the G.T.R. and the C.P.R., admitting of facilities for the handling of materials promptly and direct to the job.

It is anticipated that within a few months Fraser, Brace & Co. will have a force of about 600 men employed as the first four boats are to be delivered by the middle of 1918. Their contract covers the building of the hulls only, the installation of propelling machinery, general equipment and the interior fittings being taken care of by other contractors.

The Foundation Co., Victoria, B.C.

The Foundation Co. with shipyard at Victoria, B.C., have contracts on hand for five 2,500-ton wood ships and in view of the fact that virgin ground was broken for construction purposes, it may occasion some surprise when we state latest advices give indication of some real live progress.

Wallace Shipyards, North Vancouver, B.C.

The Wallace Shipyards at North Vancouver, started the present activity on that part of the Pacific Coast. The original programme called for the construction of six auxiliary powered schooners for the Canada West Coast Navigation Co., all of which, according to our information are now completed. Later the order to build a similar vessel was received from the Federal Government, its particular service to be for the most part between the Atlantic and the Pacific. Arrangements were next made for the building of three steel setamships. One of these has been completed and is now in commission. Work on the second is well advanced and she will be launched early in the New Year. The outlook for the coming twelve months is unusually bright, the firm's order books showing contracts on hand to cover 4 cargo steamers of 17,500 combined gross tonnage.

Western Canada Shipyards Vancouver, B.C.

The Western Canada Shipyards with plant located on False Creek are building six wood steamships for the Imperial Munitions Board, and good progress has already been made on two of them.

Cameron-Genoa Mills Shipbuilders, Vancouver, B.C.

This firm have all but completed the contract they had on hand early in the year for six auxiliary powered schooners for the Canada West Coast Navigation Co., as a result they are now devoting almost their whole attention to the building of 4 wood steamships for the Imperial Munitions Board.

Grant & Horne, St. John, N.B.

The young general contracting firm of Grant & Horne, have gone into the business of wood shipbuilding at Courtenay Bay, St. John, N.B., a contract having been received from the Imperial Munitions Board for two wood steamships of 2,800 gross tons each. Latest reports indicate good progress, present anticipations being that the first vessel will take the water in the early spring of next year.

D. A. Saker & Co., West St. John, N.B.

The wood shipbuilding plant of D. A. Saker & Co. is located on what is known as the Straits Shore, West St. John, N.B. The necessary buildings have been erected and the equipment installed. One wood auxiliary powered schooner is at present under construction, her length being about 180 feet. She is not under contract, it being the intention of the builders to sell her while on the way or after completion.

Pacific Construction Co., Coquitlam, B.C.

The Pacific Construction Co. has taken over the plant of the Coquitlam Shipbuilding Co. at Coquitlam, B.C. and are there engaged in turning out two wood steam freighters of 2,800 gross tons each.

Montreal Dry Dock Co., Montreal, P.Q.

The Montreal Dry Dock Co. has experienced a year of unusual activity, the greatest trouble having been to furnish the necessary docking facilities to meet the demand. Shortage of skilled labor operated towards a prolongation of the time spent by vessels when in dock, thus aggravating the situation still further.

Hall Engineering Works, Montreal, P.Q.

Marine repairs both ship and engine continue to be a feature of the activities of the Hall Engineering Works, Montreal, so much so that notwithstanding the lesser number of ships using the harbor of the Canadian Metropolis than was the case in normal or peace-time years, due in large measure to fewer of them being available, the past twelve months appears to have been about the busiest of any similar period since the enterprise was established.

Kingston Shipbuilding Co., Kingston, Ont.

The Kingston Shipbuilding Co. in addition to at least its normal amount of repair, overhaul, and dry dock activities, built and completed two deep sea trawlers similar to those referred to elsewhere. The dry dock at Kingston is owned by the Federal Government and is leased by the Kingston Shipbuilding Co., the latter being somewhat in the nature of a subsidiary of the Collingwood Shipbuilding Co.

Dominion Bridge Co., Montreal, P.Q.

The Dominion Bridge Co. in addition to active participation in munitions production on its own behalf and that of its subsidiaries has also interested itself to a very great extent in the marine engineering side of the shipbuilding activity now so widespread throughout the Dominion. Not only has marine engine and boiler building been undertaken on a big scale, but an interest has been secured in the International Engineering Works, Amherst, N.S., where marine engine work has been in progress for some several months. Judging from the enterprise record of Dominion Bridge in the past, it may not be too much to expect that before the coming year is very old the scope of operations on marine specialties will tend to dwarf in many instances otherwise effort.

AUXILIARY POWERED SCHOONER LAUNCHED

WITH the Governor-General, the Duke of Devonshire, Lieut.-Governor Barnard and a host of other notables looking on, the auxiliary wooden schooner Beatrice Castle took the water on the morning of November 23 from the launching ways at the Cameron-Genoa shipyards.

Workmen engaged in shaping the big wooden hulls on adjacent slips paused while the vessel, released from the holding wedges, received its baptism of the sea, and, with hats raised, cheered lustily as the schooner, with bunting and the Union Jack waving, backed out into the Inner Harbor and was taken under escort by the waiting tugboats. The Beatrice Castle was the sixth and last schooner built under contract with the Canada West Coast Navigation Co.

The ceremony took place at 9.45 in the morning, and several minutes before the scheduled time the care carrying His Excellency and Lieut.-Governor Barnard, with Mrs. Barnard, and H. J. Muskett, his private secretary, reached the yards. The Governor-General's suite, composed of Lord Richard Neville, Col. Henderson and Capt. Rivers-Bulkley, also witnessed the launching. When the final blocks were cleared away, Mrs. H. W. Brown broke the tradition bottle of champagne across the bow of the retreating vessel.

New Canadian Plant of Butterfield & Co., Rock Island, Que.

Staff Article

Numerous metal-working plants which in pre-war days were recognized as leaders in specific lines of manufacture have, as a result of the happenings of the past three years, not only added to their former reputation and become more firmly established but, through the mediums of new and enlarged factory buildings and the installation of high-class, up-to-date equipment, have placed themselves on record as being out to cater to the needs of that much wider field generally anticipated when the clash of arms and the roar of guns ceases.

THE plant of Butterfield & Company, located on the border line between Canada and the United States, at Rock Island, Que., and Derby Line, Vt., was established in 1880 by Col. F. D. Butterfield; the initial structure consisting of a two-storey building 60 ft. by 40 ft., located about one-third of a mile from the site of the present factory. About the year 1890 the Colonel's brother, Frank G. Butterfield, and several others, became associated with the firm, as a result a company was incorporated in 1897. From that time the growth of the business has been quite rapid, the name Butterfield & Co. becoming a household word in the field of mechanical engineering. In 1913 the Union Twist Drill Co. of Athol, Mass., bought out the entire stock of both the Canadian and United States branches; all business, however, continued to be carried on under the former name of Butterfield & Company.

With the plant operating at capacity previous to the opening of the war, it was natural that with the enormous demand for small tool equipment following the placing of shell orders in Canada, an added impetus was given to the manufacture of drills, taps, dies, milling cutters and numerous other small tools.

Recent Development

It was more than evident, during the first year of the hostilities, that the capacity of the then existing plant, operating day and night, would be inadequate to the abnormal situation. Steps were therefore immediately taken towards enlarging the factory to take care of the ever-increasing business that was being virtually thrust upon them.

The Canadian plant was finished a few months ago, and with possibly one or two exceptions is now completely equipped with all the necessary machinery for the production of a full line of product. The buildings are all of reinforced concrete and brick construction, absolutely fire-proof, and having exceptionally spacious windows with pivoted steel sash; the structure throughout representing the most modern type of machine shop design. The main building, 175 ft. by 70 ft., is three storeys high with an 8 ft. basement under the entire ground floor. The basement is used for storage of lubricating oils, etc., and also contains the pumping units for circulating the brine used for hardening purposes. The brine tanks are so designed that the to suit the requirements of small or large production, an essential factor where variable quantities of tools are being handled.

NEW THREE-STOREY ADDITION TO CANADIAN PLANT OF BUTTERFIELD & CO., ROCK ISLAND, QUE.

Beneath the polishing room is located a large Canadian Buffalo Forge Co. exhaust fan which takes all the particles of emery and steel dust from the various grinding and polishing machines and discharges same into a large concrete vault installed in the basement.

Transmission Facilities

Electric power is used throughout for the operation of the machinery in the various departments. This power is purchased from the Sherbrooke Railway & Power Co., and is delivered to the plant at a voltage of 22,000, and transformed to a voltage of 550 and 110 for power and lighting respectively. All machinery is driven on the group or line shaft system, the motors being invariably suspended from the ceiling; this method providing increased floor space for manufacturing purposes, and also avoiding the use of inclined belts that are often a source of annoyance and accident, when motors are located on the floor or semi-elevated platforms.

A notable feature in connection with the transmission installation in this plant is the method adopted for the erection of the various line and counter shafts. In the construction of the different floors, suitable appliances were imbedded in the concrete and secured to the reinforcing members to support small I beams and angle irons that could be located on any section of the ceiling where shafting was required. The advantages of this method are at once realized, as facilities are provided for rapid and labor saving adjustment or erection of additional transmission equipment.

The entire first floor is devoted to the manufacture of all types of milling cut-

OLD FACTORY OF BUTTERFIELD & CO., ROCK ISLAND, QUE., NOW USED AS OFFICES AND SHIPPING ROOM.

ters, while the second floor is equipped for the production of twist drills. These two lines are the most recent departure of the Butterfield Co., the Canadian plant not being equipped for this work when brought under the control of the Union Twist Drill Co. This, however, does not imply that the Canadian product is in the hands of novices; on the contrary, the manufactured article of the Rock Island plant is equal in every respect to that produced in Athol, Mass., as the work is under the direct supervision of experienced engineers from the parent concern.

The third or top floor of the main building is used for the manufacture of the original line of Butterfield taps, dies, reamers and screw plates. Machinery on all three floors has been especially designed for the tools made in the particular departments. The annex, a one-storey building 175 x 70 ft., is utilized for the storage of tool steel stock; the cutting-off machines, forge department, electric welding and annealing furnaces, hardening and tempering, and the polishing and finishing departments are also embraced.

Routing and Inspection

In the arrangement of each department careful attention has been given to the systematic placing of the machines to avoid "overlapping" when routing the semi-finished work in process of production; thus eliminating the loss of time and possibility of confusion that ultimately results when this important detail is not given the proper consideration. Efficiency is not so much dependent upon the saving of time on an actual operation, as on the effective methods adopted for minimizing the expense in the "unproductive" handling of the material between succeeding operations. All tools, whether taps, dies or cutters, start in the cutting-off department where the blanks are sawn off from bar stock. From there they pass through the various departments in rotation as the different operations are performed, until they are placed before the final inspectors. When work is passed as entirely satisfactory both as to finish and accuracy, it is transferred to the shipping department where it is packed and crated.

It might be here mentioned that in addition to the rigid inspection given every finished tool, each individual piece is carefully examined between each detail operation. This not only eliminates useless machining on spoiled or defective work, but assists in keeping a check upon the different workmen and machines. While the quality of the product of this plant is largely dependent upon the special design and accuracy of the machinery used, the equipment is not "fool proof," and therefore the human element must be considered when efficiency is the watchword. It is therefore imperative that, apart from the possibility of neglect or carelessness on the part of the operator, the output of each machine be carefully and constantly examined to avoid the multiplication of errors or mistakes of either the men or the machines.

Each batch in process, be it large or small, is accompanied by a production slip that is checked and verified by every intermediate inspector, so that every piece of spoiled or defective work can be traced to the man or machine responsible, and steps taken to rectify the trouble. The system is so effective that it is a rare thing for the final inspectors—and they are almost infallible—to detect a fault in the work delivered to them. Owing, however, to the fact that we are all human, occasion will arise when a slightly defective tool will find its way to the shipping department, but this possibility is very rare indeed.

Hardening and Tempering

Special mention might be made of the very elaborate hardening and tempering system that has been installed. The various lead baths and oil-fired hardening furnaces, also the oil tempering vats, are each provided with suitable pyrometers to guide the operators in the accurate regulation of the temperature for the particular grade of steel and type of tool. Another feature of this department is the installation of automatic electric timing devices to insure the proper amount of heat treatment to suit the purpose for which the tool is to be used and the degree of hardness required in relation to its particular size and shape; thus leaving nothing to guesswork. It is claimed that this is the most complete and scientifically equipped hardening room of any plant in Canada.

Plant Features

An outstanding feature in connection with every department of the plant is the absolute cleanliness. Wholesome environment contributes much to the health, not only of the body but also to the mind of employees, who readily adapt themselves to conditions that are conducive to maximum production and general efficiency. The average height of each floor is about 20 ft., giving ample room for overhead shafting and effective ventilation. Walls and ceilings are of mill white to reflect the light in such a manner, both by day and night, as to avoid excessive shadows in any section of the room. Artificial lighting is by tungsten drop globes, arranged for uniform distribution. Office lighting is by the indirect nitrogen filament system.

Wash rooms, cloak rooms, and toilets are provided on each floor. In each department first aid equipment has been installed for emergency purposes. It is also planned to remodel a section of the basement now unoccupied into employees' recreation room. In addition to the fire-proof character of the buildings, each floor is provided with stand-pipes fitted with a length of fire hose, always readily accessible. The office building is equipped with a sprinkler system, water supply for this purpose being obtained from the city reservoir located on one of the adjacent hills, which gives a head of approximately 140 feet. All other water used on the premises is pumped from driven wells and distributed by one of the now well known pneumatic systems.

The original unit of the present factory, built in 1890, consisted of a two-storey concrete and brick building, 100 ft. by 30 ft., and is now used as the main offices and the shipping room, the latter being on the ground floor. The L section adjoining this building was added in 1903 and is now utilized as the source of the heating system, which consists of the forced circulation of hot water, generated in two 150 h.p. Leonard boilers; the working pressure for the system being between 100 and 135 lbs. per sq. in.

From what we can learn, business is growing so rapidly that it is only a question of a little time before additional buildings will have to be erected; provision has been made for this in the original plans. The company is now building a large addition to the existing plant in the United States, just across the border, which when completed, will be almost a counterpart of the Canadian plant adjoining.

JAPANESE SHIPBUILDING SUBSIDIES

H.M. COMMERCIAL Attache at Yokohama (E. F. Crowe, C.M.G.) has forwarded a translation of a Japanese law, which is of considerable interest to shipowners and shipbuilders both in Japan and elsewhere. The law relates to the suspension of shipbuilding subsidies, and was passed at a recent special session of the Japanese Diet.

Mr. Crowe writes that the Shipbuilding Encouragement Law, which came into force in 1896, and was amended in 1910, gave a powerful impetus to shipbuilding in Japan, and the advent of the European War greatly accelerated development of the industry. The unprecedented prosperity which is now ruling in shipbuilding circles in Japan can only be ascribed to the abnormal conditions brought about by the war. All the private yards have earned very considerable profits, and there is every indication that the number of shipbuilding concerns will be largely augmented in the near future.

In view of the profits now being made, the opinion has frequently been advanced that the time had come to abolish the subsidies granted to shipping and shipbuilding, and this feeling has been accentuated by the fact that within the past few months many of the vessels recently constructed in Japan have been transferred to foreign ownership, which no doubt gives rise to a belief that, under present conditions at least, when tonnage is at such an extravagant figure, the Japanese taxpayer is being taxed for the benefit of the foreigner. For the present, however, the diet in this new law has confined itself to cutting off subsidies conferred on vessels which are sold to foreign owners.

Year's Building in Montreal.—Up to December 19, building permits numbering 1574 of $4,348,873 value were granted during the year 1917, as against 1880 permits value $5,333,204 in 1916. No great change either way is anticipated in the coming year.

By the Editor

The uncovering and reclamation of Canada's mineral resources contribute no insignificant chapter to her national development progress. The subject matter of the accompanying review prepared from official records for the Mail and Empire's Special Trade Expansion Number points to such a conclusion. Following a general reference to the Dominion production as a whole, the hidden wealth of each Province is discussed in its variety detail.

RESEARCH into and the utilization of Canada's natural resources have made gigantic strides during this war-time, and so far as our mineral wealth is concerned there is little doubt, judging by the achievement of the past three years, that its expeditious and profitable extraction is not only assured, but what is of greater importance, its reduction to a state which admits of easy adaptation to the needs of metal-working and kindred industries within our borders is in process of being satisfactorily solved. The designation, Canada's mineral wealth, is no misnomer, and in proof of same, the classification content which follows should be ample evidence.

Metallic Products — Aluminum, antimony, cobalt, copper, gold, iron, lead, mercury, molybdenum, nickel, platinum and palladium, silver, tin, tungsten, zinc.

Non-Metallic Products.—Abrasive materials. Actinolite, alunite and pyrophyllite, arsenic, asbestos, barytes, chromite, gypsum, magnesite, manganese, mica, mineral pigments, mineral water, natural gas, peat, petroleum, phosphate, pyrites, quartz, salt, talc.

Structural Materials and Clay Products.—Cement, clay products, lime, sand-lime brick, sand and gravel, slate, stone. Numerous minerals of economic importance occur, widely distributed, in the Dominion of Canada, although even yet only fractions of the probable productive areas have been carefully prospected. Within her boundaries Canada still possesses large areas of great potential importance, and each season is bringing to light new deposits not hitherto uncovered.

Mining Lands and Rights

The conditions under which mining lands or mining rights may be acquired in Canada are not uniform throughout the country, but vary with the different provinces. This is due to the fact that, with certain exceptions, Crown lands or mining rights are owned or controlled by the provinces, and each of the latter sells or leases mining lands or mining rights according to its own laws or regulations. The exceptions are the Provinces of Manitoba, Saskatchewan, Alberta, the Yukon and North-West Territories, the public lands of which are still held by the Federal Government at Ottawa, and are leased or disposed of under Dominion regulations. In certain of these exceptions, the Province, although not controlling the land or mining rights, exercises control over the mining operations; thus the Province of Alberta administers the coal mining regulations, and appoints provincial inspectors for the carrying out of the law. In nearly every case where provincial control is exercised, the making of annual returns is required. There are, however, some provinces in which there is practically no local record and in which the local record covers only certain products.

COMPARATIVE CANADIAN MINERAL PRODUCTION, 1867-1917.

Although the mining of gold and coal and probably a few other minerals had been in progress for many years, it was not until 1886 that any comprehensive record of Canada's annual output or mineral production became available. Statistics of gold mining in British Columbia have been procurable since 1858, and in Nova Scotia since 1850, while statistics of coal sales in the latter have been recorded since 1785. The compilation of records of production of minerals of lesser importance had apparently, however, been given little attention.

Development Grows Apace

In 1886, the total mineral production of the Dominion of Canada was valued at $10,250,000 of which $2,250,000 was for non-metallic structural materials and clay products. Of the balance of $8,000,000, over 70 per cent. was made up of gold, coal, and petroleum; while another 20 per cent. consisted of copper, silver, asbestos, phosphate, and salt. Seven years later, in 1893, production had increased in value to rather over $20,000,000, made up of a little over $5,000,000 in building materials and clay products generally, $10,000,000 in other non-metallic minerals, chiefly coal and petroleum; and a little less than $5,000,000 in metallic minerals, nickel, copper, gold and silver being the more important.

In the immediately succeeding years, the metalliferous ores in British Columbia began to show substantial development. The nickel deposits of the Sudbury district of Ontario had been opened up and were being operated with annually increasing output, while the discovery of the rich gold placers of the Yukon in 1896 resulted in a heavy increase in an already growing mineral production.

Our coal mining industry has made wonderful strides, not only in the Western Province, where new mines are be-

ing regularly opened up, but also in Nova Scotia, where the growth of large steelmaking enterprises makes a necessarily heavy demand on coal supplies. The extension and development of our railroad systems have also exerted a stimulating influence on the mining of coal.

In the realm of metallic ores, the development of the large deposits of low-grade copper ores of the Boundary District of British Columbia deserve special mention, resulting as they have in a large and important production of copper from that territory. The discovery and shipment of the rich silver ores from the Cobalt District of Ontario contributed very materially to the enhancement of mineral output values during the last decade.

The growth of the country both in population and industrially has resulted in great activity in the development of non-metallic structural materials and clay resources, while the manufactures of cement, brick, and lime, and the quarrying of stone are growing yearly in value. From 1895 to 1899, the total mineral production increased from a little over $20.000,000 to $50,000,000, and to nearly $66,000,000 in 1901. During the next three years, the output was somewhat less, but increased again in 1905 to nearly $70,000,000. In 1910 the production value passed the hundred million mark, the figures for that year showing the substantial total of $106,-823,623. As showing, however, what real intensive application to the development of our mineral resources has accomplished, it is only necessary to state that in 1913 the output value reached $145,634,812, and that for the year 1916 the hitherto unapproached value of $177,357,454 was realized. Anticipations for the present year, based on the available records of the months already gone, are that the $200,000,000 mark will be comfortably passed.

Having in the foregoing dealt with the mineral production of the Domionion as a whole and in a general way, it seems advisable to discuss the resources of each individual province and by so doing demonstrate the contribution the latter make in kind and value to the yearly grand total.

PROVINCE OF NOVA SCOTIA

As far back as 1672, Nova Scotia was known to possess important mineral deposits, but they only began to attract attention in the first part of the nineteenth century, while their exploitation to any considerable degree dates practically from 1830, when the first deep shaft of the General Mining Association was sunk in a coal seam. Statistical records of mining in this Province date back to eighty-two years before Confederation.

In the report of the Chief Gold Commissioner for the year 1862, the statement is made that "the earliest discovery of gold in the Province made known to the public, occurred during the summer of 1860 at a spot about 12 miles north from the head of Tangier Harbor." At this time, coal mining was a fairly well established industry. From these early beginnings, the development and working of some of the mineral deposits have been actively carried on, while others, although promising, still remain undeveloped. Coal constitutes the main mineral product of the Province. The carboniferous formation occupies a large portion of Nova Scotia, covering over half the area of Cape Breton Island, as well as a large part of Cumberland, Pictou, and Hants Counties. Four important coalfields have been developed, viz.: Sydney, Cumberland, Pictou, and Inverness.

The Maritime Provinces, owing to their geographical position on the Atlantic seaboard, were the first in Canada to have their mineral resources explored. In mining, but more especially in the production of bituminous coal, Nova Scotia has for over 200 years had an enviable reputation; while its gypsum deposits, which are among the most extensive in existence, may be said to be only in the primary stages of development.

In addition to these particular resources, an appreciable commerce is carried on in the metallic ores of iron, gold, and antimony, also in minerals of economic value such as dolomite, limestone, fluorspar, and other materials employed in metallurgical processes, besides clays, building stones, etc. In the manufacture of steel on a big scale and by means of the most approved methods, Nova Scotia has shown and continues to show commendable enterprise.

The initial attempt to mine coal was made in the year 1720, it having become necessary to procure a supply of fuel for the men who came from France to lay the foundations of the fortress at Louisburg. The pit openings then made can still be seen at Port Morion, Table Head, etc.

Intensive Development of Resources, Etc.

To the Nova Scotia Steel & Coal Co. and to the Dominion Coal Co. belongs the credit for the development of the coal resources of the Province. On February 1, 1893, the Dominion Coal Co. was organized with a capital of $18,000,000. This corporation amalgamated the coal properties of the south side of Sydney harbor, Cape Breton. With the advent

Annual Production of Peat.

Calendar Year	Tons	Value
1900	400	$1,200
1901	220	600
1902	475	1,663
1903	1,100	3,300
1904	800	2,400
1905	80	260
1906	474	1,422
1907	50	200
1908	60	180
1909	60	240
1910	841	2,604
1911	1,463	3,817
1912	700	2,900
1913	2,600	10,100
1914	685	2,470
1915	300	1,050

Annual Production of Coal Showing Increase or Decrease.

Year	Short tons	Value	Increase (i) or decrease (d) Short tons		Per cent.
1785 to 1873	*8,592,150	$14.507,000	.....		..
1874	1,063,742	1.763.423	.....		..
1875	1,039,974	1.747.016	(d)	23.768	2.2
1876	994,762	1.729.546	(d)	45,212	4.3
1877	1,036,670	1.794.415	(i)	41,908	4.2
1878	1,089,744	1.941.285	(i)	53.074	5.1
1879	1,126,497	2,657,194	(i)	356,217	31.6
1880	1,482,714	2 050.639	(i)	36,753	3.4
1881	1,537,106	2.688.621	(i)	54.392	3.7
1882	1,848.148	3.248.446	(i)	311.042	0.2
1883	1,818,684	3.109.635	(d)	29.464	21.6
1884	1,984,959	3.593.831	(i)	166.275	9.1
1885	1,920.977	3.417.807	(d)	63.982	3.2
1886	2,116,653	3.739.840	(i)	195.676	10.2
1887	2,429,330	4.388.206	(i)	312.677	14.8
1888	2,602,552	4.674.140	(i)	173.222	7.1
1889	2,658,303	4.894 287	(i)	55,751	2.1
1890	3,084,682	5,676,247	(i)	426,379	16.0
1891	3,577,749	7.019.425	(i)	493.067	16.0
1892	3,287,745	6.363.757	(d)	290.004	8.1
1893	3,783,499	7.359.080	(i)	495.754	15.1
1894	3,847,070	7,429,468	(i)	63.571	1.7
1895	3,478.344	6.739,153	(d)	368.726	9.6
1896	3,745,716	7.226.462	(i)	267.372	7.7
1897	3,786,107	7.303.597	(i)	40.391	1.1
1898	4.173.108	8.224.288	(i)	387,001	10.2
1899	4,925,051	10.283.497	(i)	751.943	18.0
1900	5,777,319	13,742,178	(i)	852,268	17.3
1901	6,486.325	12.699.243	(i)	709.006	12.3
1902	7,466.681	15.210.877	(i)	780 356	15.1
1903	7,960.364	15.942.833	(i)	493.683	6.6
1904	8.254.595	16.592.231	(i)	294.231	3.7
1905	8.667.948	17.520 263	(i)	413.353	5.0
1906	9.762 601	19.732.019	(i)	1,094.653	12.6
1907	19,511,426	24 381.842	(i)	748.825	7.7
1908	10 886.311	25 194.573	(i)	374.885	3.5
1909	10.501,475	24,781,236	(d)	384,836	3.5
1910	12,909,152	30,909,779	(i)	2,407,677	22.93
1911	11,323.388	26.467.646	(d)	1,585.764	12.28
1912	14.512.829	36 019.044	(i)	3,189.441	28.04
1913	15,012.178	37.334.940	(i)	499.349	3.44
1914	13.637.529	33.471.801	(d)	1,374 649	9.16
1915	13,267.023	32.111.182	(d)	370.506	2.72
1916	14,483,395	38,817,481	(i)	1,216,372	9.17

*The total production for the years 1785 to 1873 is made up as follows:—
Nova Scotia (1785 to 1873) ..... 8,053,670 tons of 2.000 pounds
British Columbia (1836 to 1873) ..... 538,480 tons of 2,000 pounds

of this big industrial enterprise, a new era in Nova Scotia coal mining began. Mine workings , railway extensions, shipping and discharging facilities were developed, old coal markets expanded and new ones opened up, the result being that the whole coal outlook of the Province was revolutionized. In the first year of the Company's operations (1893), the coal mined amounted to 826,208 long tons, from 8 collieries. As showing the development that has taken place in the interval, the output of 1914 may be cited, the total for that year being 4,800,000 long tons from 20 collieries operating. Due to the labor scarcity since 1914, arising from enlistments, lessened outputs have been the rule, hence the insertion of that year by way of comparison.

In 1900, the Nova Scotia Steel & Coal Co. acquired the later mining rights of the General Mining Association already referred to, and in addition to operating the existing collieries, have opened up new mines, erected iron and steel works which include blast and open hearth furnaces, coke oven plant, etc., all in close proximity to the working collieres. Their Princess Pit was in 1873 the first submarine mine in North America, the coal being won from workings under the sea. The shafts are of unique construction, consisting of metal cribbing or tubbing.

Some six years after the Dominion Coal Co. had been in operation, the necessity for a larger market for its product was realized. Steps were therefore taken by a number of the principal shareholders to establish a steel and iron industry in the vicinity of the coalfields. The advantage, it was believed, would be specially marked during the winter season, as a sure market for a considerable portion of the output would be provided, whereas, after the close of navigation on the St. Lawrence, if the mines are not closed down altogether, it is necessary to bank the produce.

In consequence, the Dominion Iron & Steel Co. was incorporated under the laws of Nova Scotia Province in March 30, 1899, with an authorized capital stock of $20,000,000 common stock and $5,000,000 preferred stock, the par value of each share being $100. A site for the plant was secured within the city limits of Sydney, Cape Breton, which comprises an area of 440 acres. It was valued at $83,000, and was given to the company as a bonus by the city of Sydney. In recent years, the Dominion Steel and Dominion Coal Companies amalgamated under the title of the Dominion Steel Corporation.

The iron ores of Nova Scotia are not confined to any particular geological horizon. In fifteen out of the eighteen counties of the Province, iron ore of more or less extent has been located. Many of these discoveries have been just sufficient to tempt, but not sufficient to reward exploitation; others, again, are found to be valuable. The more important known deposits are those at Torbrook, Annapolis County, owned by the Annapolis Iron Co.; the Londonderry deposits owned and operated by the Londonderry Iron & Mining Co.; and the East River deposits, Pictou County, owned principally by the Nova Scotia Steel & Coal Co. As evidence, perhaps, of the general unimportance of the iron ore resources of the Province, it may be stated that both the Dominion Steel Corporation and the Nova Scotia Steel & Coal Co. derive their ore supply from their properties on Bell Island, Newfoundland.

The gold production of the Province which is derived almost entirely from quartz ores amounted to 6,863 fine ounces of a value of $141,872 in 1862, and reached a maximum of 30,348 fine ounces of a value of $6,627,357 in 1902. It then decreased gradually, reaching

Mineral Production of Canada in 1916.

Product.		Quantity.	Value.
Antimony ore (exports)	*Tons	794	$ 48,158
Cobalt metallic and contained in oxide, etc.	Lbs.	841,859	926,045
Copper, value at 27.202 cents per pound	"	119,770,814	32,580,057
Gold	Ozs.	926,963	19,162,025
Iron, pig from Canadian ore	Tons	115,691	1,328,595
Iron, ore sold for export	"	140,608	393,689
Lead, value at 8.513 cents per pound	Lbs.	41,593,680	3,540,870
Molybdenite, MoS2 contents at $1.00 per pound	"	159,000	159,000
Nickel, value at 35 cents per pound	"	82,958,564	29,035,497
Platinum	Ozs.	15	600
Silver, value at 65.661 cents per oz.	"	25,669,179	16,854,635
Zinc, value at 12.804 cents per pound	Lbs.	23,515,030	3,010,864
Total		.....	$107,040,035
Non-Metallic.			
Actinolite	Tons	250	2,750
Arsenic, white	"	2,186	262,349
Asbestos	"	136,016	5,183,332
Asbestic	"	18,500	27,147
Chromite, crude ore (a)	"	27,030	299,753
Coal (b)	"	14,428,278	38,797,437
Corundum	"	67	10,307
Feldspar	"	19,166	71,357
Fluorspar	"	1,284	10,238
Graphite	"	3,971	285,362
Grindstones	"	3,328	50,982
Gypsum	"	341,618	730,831
Magnesite	"	55,413	563,829
Manganese	"	979	90,791
Mica	"	914	122,541
Mineral pigments—			
Barytes	"	1,368	19,393
Oxides	"	8,811	58,711
Mineral water	"	.....	114,587
Natural gas	M. cu. ft.	25,238,568	3,924,632
Peat	Tons	300	1,500
Petroleum	Brls.	198,123	392,284
Phosphate	Tons	203	2,514
Pyrites	"	309,411	1,084,019
Quartz	"	135,803	241,806
Salt	"	124,033	668,627
Talc	"	10,651	36,475
Tripolite	"	620	12,139
Total		.....	$ 53,015,693
Structural Materials and Clay Products.			
Cement, Portland	Brls.	5,359,050	6,529,861
Clay products—			
Brick: common, pressed, paving		.....	2,358,245
Sewerpipe		.....	716,287
Tile, pottery, refractories		.....	1,104,901
Kaolin	Tons	1,750	17,500
Lime	Bush.	5,482,876	1,089,505
Sand and gravel (not complete) (c)		.....	1,498,009
Sand-lime brick	No.	13,825,307	113,136
Slate	Sq.	1,262	6,223
Stone—			
Granite		.....	1,277,019
Limestone		.....	2,326,519
Marble		.....	118,810
Sandstone		.....	145,711
Total structural materials and clay products		.....	17,301,726
All other non-metallic			53,015,693
Total value, metallic			107,040,035
Grand total, 1916			177,357,454

* Tons of 2,000 pounds.
(a) Ore and concentrates finally marketed estimated as 13,834 tons.
(b) Additional returns increase production to 14,461,678 tons, $38,857,557.
(c) Additional returns increase value to $1,734,183.
** Subject to revision.

Annual Production of Coke.

Calendar Year	Short tons	Value	Average per ton
1886	35,396	$101,940	$2.88
1887	40,428	135,951	3.36
1888	45,373	134,181	2.96
1889	54,539	155,043	2.84
1890	56,450	166,298	2.95
1891	57,084	175,592	3.08
1892	56,135	160,249	2.85
1893	61,078	161,790	2.65
1894	58 044	148,551	2.56
1895	53,356	143,047	2.68
1896	49,619	110,257	2.22
1897	60,686	176,457	2.91
1898	87 600	286,000	3.26
1899	100 820	350,022	3.47
1900	157,134	649,140	4.13
1901	365,531	1,228,225	3.36
1902	502,043	1,519,185	3.03
1903	561,318	1,734,404	3.09
1904	554,083	2,032,048	3.66
1905	700 488	2,436,211	3.48
1906	782,055	2,863,503	3.66
1907	842 003	3,583,468	4.26
1908	858 257	3,449,361	4.02
1909	862,011	3,484,393	4.04
1910	902,715	3,462 872	3.84
1911	935,651	3,630,410	3.88
1912	1,411,229	5,164,331	3.66
1913	1,530 499	5,919,596	3.87
1914	1,023 860	3,658,514	3.55
1915	1,170,473	4,258,580	3.64
1916	1,469,741	6,049,412	4.12

Annual Production of Coke-Oven By-products.

Year	Tar Gallons	Sulphate of ammonia Short tons
1901	2,662,612	1,614
1902	4,094,135	2,393
1903	3,281,249	3,207
1904	1,649,197	1,773
1905	3,407,784	2,500
1906	3,725,723	2,364
1907	4,424,615	1,738
1908	4,450,166	3,342
1909	4,016,824	3,416
1910	3,963,591	3,491
1911	6,464,155	7,124
1912	8,428,896	11,289
1913	8,371,600	10,608
1914	5,714,172	8,572
1915	7,365,931	10,448
1916	9,012,202	11,040

in 1913 a minimum of 2,174 fine ounces of a value of $44,935. Since then, there has been a marked increase in output, and correspondingly in values, the latter showing $60,031, $157,180, and $103,359, for the years 1914, 1915, and 1916, respectively. It may be stated that the decrease in 1916 as compared with 1915 arose from water shortage which interfered seriously with the operation of the hydro-electric plants.

Miscellaneous Mineral Resources

Ores of manganese and barytes have been mined annually but in comparatively small quantities, while there has also been a fairly steady production of grindstone abrasives. Tripolite or infusorial earth deposits have been worked since 1896. From the clays of the Province, widely distributed, there is a substantial annual output of brick and tile products. Marbles, granites and sandstones of excellent quality for building and ornamental purposes are found in abundance, as well as limestone for building, fluxing, or lime-making. Cement and brick are made from blast furnace slag, and the slag is also used for the manufacture of fertilizer. The manufacture of coke is accompanied by the recovery of by-products, sulphate of ammonia, tar, and constituents of high explosives. Ores of tungsten, antimony, and arsenic, have been mined, and tin, lead, and copper ores have been found.

Annual Production of Manganese Ore.

Calendar Year	Tons	Value	Value per ton
1886	1,789	$41,499	$23.20
1887	1,245	43,658	35.07
1888	1,801	47,944	26.62
1889	1,455	32,737	22.50
1890	1,328	32,550	24.51
1891	255	6,694	26.25
1892	115	10,250	89.13
1893	213	14,578	68.44
1894	74	4,180	56.49
1895	125	8,464	67.71
1896*	123½	3,975	32.19
1897*	15¼	1,166	76.46
1898	50	1,600	32.00
1899	1,581	20,004	12.65
1900	30	1,800	60.00
1901*	440	4,820	10.95
1902*	172	4,062	23.62
1903	91	2,775	30.49
1904	66	2,700	41.51
1905*	22	1,720	78.18
1906*	93	925	9.95
1907*	1	22	22.00
1908	Nil	....	....
1909	Nil	....	....
1910	Nil	....	....
1911	5½	300	54.55
1912	75	1,875	25.00
1913	Nil	Nil	....
1914	28	1,120	40.00
1915	201	9,360	46.57

PROVINCE OF NEW BRUNSWICK

The mining industry in the Province of New Brunswick appears to occupy as yet a comparatively unimportant position. Gypsum, coal, iron ore, manganese ore, sandstone abrasives, natural gas, petroleum, oil shales, together with limestone, building and ornamental stones of granite and sandstone, form the principal mineral resources, although the occurrence of other minerals has been noted from time to time. With the exception of the gypsum, brick and stone industries, and coal on a small scale, little has been done in the direction of development.

The lack of mineral development activity is, perhaps, hard to explain, except on the ground that attention hitherto has been almost entirely devoted to the great timber resources of the Province, hence little systematic demand for this ore is in the manufac- prospecting for minerals has been undertaken. Iron ores are found in the following localities—Woodstock, Carleton County, where the occurrence of hematite beds has been known since 1863; West Beach, St. John County; Black River, St. John County; Gloucester County on the Nepizguit River, 21 miles from the town of Bathurst.

Copper ores are found widely distributed throughout the Province, but with few exceptions little work has been undertaken. The occurrence of bituminous coal in the Province of New Brunswick has been known for over two hundred years, and while small, seams of more or less importance have been discovered in the interval, the most valuable area remaining is that known as the Grand Lake coalfield, which is situated 70 miles north of the city of St. John, in a direct line between Fredericton and Moncton, and 20 miles east of the former town. The total area of the field is 112 square miles.

The first discovery of antimony was made in 1863, at Prince William, York County, where it occures as sulphide of antimony—stibnite, and as native antimony. Many years ago, the property was worked by the Lake George Mining Co., and a small smelter was erected from which when in full operation a production of about one ton per week was maintained. Unfavorable market conditions and litigation over disputed claims forced the company into liquidation. The property is now owned and operated by the Canadian Antimony Co., we understand. It embraces an area of four square miles of mineral rights, and 440 acres in fee simple. The mineral rights include antimony, gold, and silver, free from royalty. The principal ture of babbitt metal and type metal; smaller quantities are used in enamelling, the manufacture of glass, rubber, and some varieties of paint. In this war-time, not a little antimony is finding a place as a munitions constituent.

The manganese industry of New Brunswick was at one time of considerable importance, but of late years it has not been quite so active, possibly for the reason that the largest known deposits are situated far from shipping facilities, and the cost of transportation is therefore excessive. The surface indications and geological conditions meanwhile justify the belief that in the future a considerable production of manganese will be possible from the mines of the Province.

Annual Shipments of Asbestos and Asbestic.

Calendar Year	Asbestos Short tons	Asbestos Value	Asbestos Per ton	Asbestic Short tons	Asbestic Value	Asbestic Per ton
1880 (a)	380	$ 24,700	$ 65.00			
1881 (a)	540	35,100	65.00			
1882 (a)	810	52,650	65.00			
1883 (a)	955	68,750	71.99			
1884 (a)	1,141	75,097	65.82			
1885 (a)	2,440	142,441	58.38	.....	.....	...
1886 (a)	3,458	206,251	59,64			
1887	4,619	226,976	48.92			
1888	4,404	255,007	48,92			
1889	6,113	426,554	69.78			
1890	9,860	1,260,240	127.81			
1891	9,279	999,878	107.76			
1892	6,082	390,462	64.20			
1893	6,331	310,156	86.81			
1894	7,630	420,825	55.15			
1895	8,756	368,175	42.05			
1896	10,892	423,066	38.84	1,358	$ 6,790	$5.00
1897	13,202	399,528	29.99	17,240	45,840	2.66
1898	16,124	475,131	29.47	7,661	16,066	2.10
1899	17,790	468,635	26.34	7,746	17,214	2.22
1900	21,621	729,886	33.76	7,520	18,545	2.42
1901	32,892	1,248,645	37.96	7,325	11,114	1.52
1902	30,219	1,126,688	37.28	10,197	21,631	2.20
1903	31,129	915,888	29.42	10,548	13,869	1.31
1904	35,611	1,213,502	34.08	12,854	12,850	1.00
1905	50,669	1,486,359	29.33	17,594	16,900	0.96
1906	60,761	2,036,428	33.52	21,424	23,715	1.11
1907	62,130	2,484,767	39.99	28,296	20,275	0.74
1908	66,548	2,555,361	38.40	24,225	17,974	0.74
1909	63,349	2,284,587	36.06	23,951	17,188	0.72
1910	77,508	2,555,974	32.98	24,707	17,629	0.71
1911	101,393	2,922,062	28.82	26,021	21,046	0.81
1912	111,561	3,117,572	27.95	24,740	19,707	0.80
1913	136,951	3,830,909	27.97	24,135	19,016	0.79
1914	96,542	2,892,266	29.96	21,031	17,540	0.83
1915	111,142	3,553,166	31.97	25,700	21,819	0.85
1916	136,016	5,133,332	37.74	.....	.....	...

(a) Exports.

PROVINCE OF PRINCE EDWARD ISLAND

This little Province, consisting of the island of the same name in the Gulf of St. Lawrence, has, practically speaking, no mineral resources or industries. It is uniformly fertile, is well peopled, and has important fisheries. Red sandstone suitable for masonry may be quarried in some places, and clays occur that may be used for brick-making. It may be that coal seams underlie the island or some part of it, but if so, they appear to be at a depth too great for meantime utilization.

PROVINCE OF QUEBEC

In the earliest historical records of the Province of Quebec, the references to mining are very meagre. In 1737, the right of mining and smelting iron ore in the district of St. Maurice, near Three Rivers, was granted to a company by Louis XIV., then King of France. From that date until recent years, the mining and dredging of bog or cake ore, the metallurgical reduction of same into pig iron, had been carried on at the Rednor and Drummondville furnaces as an important industry. Several other attempts to smelt iron ore on a commercial scale were made at Moisie in 1867; at St. Urbain in 1873; at Hull in 1867 and 1872; but with only partial success.

Quebec, with its boundaries extended to include the great north country of Ungava, reaching to the shores of Hudson Bay and Hudson Strait, is geographically the largest Province in the Dominion of Canada, but, as in all of the Central and Western Provinces, the settled or populated section is confined to a comparatively narrow fringe of territory along the southern border, the greater part of the northern area being for the most part unexplored.

Quite a variety of mineral products are to be found in Quebec Province, among which may be noted the following:— Zince ore, copper, gold, iron ore, silver, asbestos, feldspar, graphite, magnesite, mica, mineral waters, ochres and iron oxides, peat, phosphate, pyrites, quartz, cement, clay products, kaolin, lime, slate, stone, etc. In the southeastern portion of the Province, south of the St. Lawrence River, in an area known as the Eastern Townships, are to be found alluvial gold deposits, copper pyrites, asbestos, chromide deposits, bog iron ores, also large marble and granite quarries. North of the St. Lawrence are bog iron ores at Three Rivers, and titanium ores north of Montreal, while further west, and north of the Ottawa River, are to be found magnesite, graphite, phosphate, feldspar, mica, barytes, iron ore, and molybdenite, with lead and zinc at Notre Dame des Anges, Calumet Island, and near Lake Timiskaming.

The asbestos deposits are extensively quarried and supply a large percentage of the world's requirements of this product are, perhaps, the most important of the mineral resources of the Province. The alluvial gold deposits have not been productive for several years, yet investigation appears to indicate that there are still opportunities for development. The production of chromite and phosphate has been limited by the availability of more cheaply mined products in other countries. Natural gas has been found in the vicinity of Three Rivers. The limestone and igneous rocks of the Province furnish almost inexhaustible cement building resources, as well as ornamental stone and materials of construction generally. Provincial clays are extensively employed in the manufacture of sewer pipe, brick, etc. Phosphorus has been manufactured in electric furnaces at Buckingham, and occasionally ferro-alloys such as ferro-phosphorous and ferro-chrome. Aluminum is manufactured at Shawinigan Falls from imported bauxite ores.

Production of Silver by Provinces, 1887-1916.

Year	Ontario Ounces	Ontario Value	Quebec Ounces	Quebec Value	British Columbia Ounces	British Columbia Value	Yukon Territory Ounces	Yukon Territory Value
1887	190,495	$ 186,304	146,898	$143,666	17,000	$ 17,301	.....	.....
1888	208,064	195,580	149,388	140,425	79,780	74,993	.....	.....
1889	181,609	169,986	148,517	139,012	53,192	49,787	.....	.....
1890	158,715	166,016	171,545	179,436	70,427	73,666	.....	.....
1891	225,633	222,926	185,584	183,357	3,306	3,266	.....	.....
1892	41,581	36,425	191,910	168,113	77,160	67,592	.....	.....
1893	.....	8,689	.....	126,439	.....	195,000	.....	.....
1894	.....	.....	101,318	63,830	746,379	470,219	.....	.....
1895	.....	.....	81,753	53,369	1,496,522	976,930	.....	.....
1896	.....	.....	70,000	46,942	3,135,343	2,102,561	.....	.....
1897	5,000	2,990	80,475	48,116	5,472,971	3,272,289	.....	.....
1898	85,000	49,521	74,932	43,655	4,292,401	2,500,753	.....	.....
1899	202,000	120,352	40,231	23,970	2,939,413	1,751,302	230,000	$137,034
1900	161,650	99,140	58,400	35,817	3,058,175	2,427,548	290,000	177,857
1901	151,400	89,250	41,459	24,440	5,151,333	3,036,711	195,000	114,953
1902	145,000	75,632	42,500	22,168	3,917,917	2,043,586	185,900	96,985
1903	17,777	9,502	28,600	15,287	2,996,204	1,601,471	156,000	83,362
1904	206,875	118,376	15,000	8,583	3,222,481	1,843,935	133,170	76,201
1905	2,451,356	1,479,442	19,620	11,841	3,439,417	2,075,757	89,630	54,093
1906	5,401,766	3,607,894	17,686	11,813	2,990,262	1,997,226	63,665	42,522
1907	9,982,363	6,521,178	16,000	10,452	2,745,448	1,793,519	35,988	23,510
1908	19,398,545	10,254,847	13,299	7,030	2,631,389	1,391,058	63,000	33,304
1909	24,822,099	12,784,126	13,233	6,815	2,649,141	1,364,387	45,000	23,176
1910	36,366,366	16,241,755	7,593	4,061	2,407,887	1,287,883	87,418	46,756
1911	30,540,754	16,279,443	18,435	9,827	1,887,147	1,005,924	112,708	60,078
1912	29,214,025	17,772,352	9,465	5,758	2,651,002	1,612,737	81,068	49,318
1913	28,411,261	16,987,377	34,573	20,672	3,312,343	1,980,483	87,626	52,392
1914	25,139,214	13,779,055	57,737	31,646	3,159,897	1,731,971	92,973	50,959
1915	22,748,609	11,302,419	63,450	31,524	3,565,852	1,771,658	248,049	123,241
1916	21,975,942	14,429,623	97,000	63,691	3,235,764	2,124,635	360,466	236,686

PROVINCE OF ONTARIO

Ontario has the distinction of possessing not only the greatest variety of mineral products, but also of delivering the biggest annual output of all the provinces of the Dominion. Some idea of the extent and variety of her resources may be gathered from the following detail:—Lead, nickel oxide, cobalt oxide, cobalt residues and mixed oxides, copper, gold, pig iron from domestic ore, nickel silver, zinc ore, actinolite, arsenious oxide, corundum, feldspar, fluorspar, graphite, gypsum, mica, mineral water, natural gas, peat, petroleum, pyrites, quartz, salt, talc, cement, clay products, lime, sand-lime brick, stone, etc., are available in greater or lesser quantity.

The principal metalliferous ores are the nickel-copper deposits of the Sudbury district; the silver-cobalt-nickel arsenides of the Cobalt and surrounding areas; the goldfields of Eastern Ontario and of Porcupine; numerous other widely scattered areas in the northern and western sections; the iron ores of Hastings and Frontenac Counties, of Moose Mountain, north of Sudbury, of Michipicoten south-west of Sault Ste. Marie, of Atikokan, west of Port Arthur, in addition to numerous undeveloped deposits throughout the northern and western parts of the province.

The occurrence of native copper on

Annual Production* of Cement.

Calendar Year	Natural rock cement Barrels	Natural rock cement Value	Portland cement Barrels	Portland cement Value	Total Barrels	Total Value
1887	.....	.....	.....	.....	69,843	$ 81,909
1888	.....	.....	.....	.....	50,668	35,593
1889	90,474	$ 69,790	Nil.	Nil.	90,474	69,790
1890	87,521	74,822	14,695	$ 17,583	102,216	92,405
1891	90,846	103,479	2,633	5,082	93,479	108,561
1892	88,187	94,912	29,221	52,751	117,408	147,663
1893	126,673	130,167	31,924	63,848	158,597	194,015
1894	72,965	74,842	35,177	69,795	108,142	144,637
1895	66,219	60,795	62,075	112,880	128 294	173,675
1896	70,705	60,500	78,385	141,151	149,090	201,651
1897	85,450	65,893	119,763	209,380	205,213	275,273
1898	87,125	73,412	163,084	324,168	250,209	397,580
1899	147,387	119,308	255,366	513,983	396,753	633,291
1900	125,428	99,994	292,124	562,916	417,552	662,910
1901	133,328	94,415	317,066	565,615	450,394	660,030
1902	127,931	98,932	594,594	1,028,618	722,525	1,127,550
1903	92,252	74,655	627,741	1,150,592	719,993	1,225,247
1904	56,814	50,247	910,358	1,287,992	967,172	1,338,239
1905	14,184	10,274	1,346,548	1,913,740	1,360,732	1,924,014
1906	8,610	6,052	2,119,764	3,164,807	2,128,374	3,170,859
1907	5,775	4,043	2,436,903	3,777,328	2,441,868	3,781,371
1908	1,044	815	2,665,289	3,709,139	2,666,333	3,709,954
1909	0	0	4,067,709	5,345,802	4,067,709	5,345,802
1910	0	0	4,753,975	6,412,215	4,753,975	6,412,215
1911	0	0	5,692,915	7,644,537	5,692,915	7,644,537
1912	0	0	7,132,732	9,106,556	7,132,732	9,106,556
1913	0	0	8,658,805	11,019,418	8,658 805	11,019,418
1914	0	0	7,172,480	9,187,924	7,172,480	9,187,924
1915	0	0	5,681,032	6,977,024	5,681 032	6,977,024
1916	0	0	.....	.....	5,359,050	6,529,861

*Quantities sold or used.

both shores of Lake Superior was apparently known to the Indians in very remote days, as evidenced by ancient workings. The attention of Europeans was not, however, drawn to the matter until about the year 1767, when a trader named Henry, who had passed the winter on Michipicoten Island, reported the existence of lead at Mamianse, and of gray ore of copper, there and at various other places. Three years later a company was organized in England to work mines in the Lake Superior district, but the vein on which mining was undertaken narrowed to four inches after sinking had been carried down some 30 feet, and discouraged by this circumstance the work was abandoned.

No further effort in the direction of copper mining in Canadian territory was made until 1845, when a company was organized in Montreal to explore for minerals on the north shore of Lake Superior. Two parties, numbering in all eighty or ninety persons, were sent out, and the coast from Sault Ste. Marie to Pigeon River, a distance of approximately 500 miles was surveyed, and 18 tracts or mineral locations—each 10 square miles—were taken up; their subsequent development, however, proved productively disappointing. Some 21 years later, the celebrated Silver Islet silver vein was discovered within the limits of one of these tracts. In 1847, the company above referred to purchased from the discoverers the Bruce Mines locations, and during the next three years expended a large sum of money in developing and equipping the property; but no profits were realized until 1853 when a small dividend was paid. Unprofitable operations were continued until 1865, and again at intermittent periods under different managements.

Several other mines were worked in the earlier years of Canada's industrial development, but the only discovery of special historic interest was that of the Wallace Mine in 1846, near the mouth of Whitefish River on the north shore of Lake Huron. This was notable since it was the first recorded discovery of nickel in the province, although not apparently occurring in sufficient quantity to justify extensive exploration. Ten years later, nickel and copper ores were discovered six miles north of Whitefish Lake and less than half a mile distant from what is now the main pit of the Creighton Mine; probably the most important deposit of nickeliferous pyrrhotite in the world. No developments, however, were undertaken until several years later, when the district became readily accessible by the construction in 1884 of the Canadian Pacific Railway. Within ten years from that date, all the present important productive mines were located. The ores were first mined for their copper content alone in 1886, production in that year amounting to 3,307 tons, valued at $16,404; but in 1887 the output decreased to 567 tons.

Annual Production of Nickel.

Calendar Year	Pounds of nickel in matte shipped	Cents per pound	
1889 (a)	830,477	60	$ 498,286
1890	1,435,742	65	933,232
1891	4,035,347	60	2,421,208
1892	2,413,717	58	1,399,956
1893	3,982,982	52	2,071,151
1894	4,907,430	38½	1,870,958
1895	3,888,525	35	1,360,984
1896	3,397,113	35	1,188,990
1897	3,997,647	35	1,399,176
1898	5,517,690	33	1,820,838
1899	5,744,000	36	2,067,840
1900	7,080,227	47	3,327,707
1901	9,189,047	50	4,594,523
1902	10,693,410	47	5,025,903
1903	12,505,510	40	5,002,204
1904	10,547,883	40	4,219,153
1905	18,876,315	40	7,550,526
1906	21,490,955	42	8,948,834
1907	21,189,793	45	9,535,407
1908	19,143,111	43	8,231,538
1909	26,282,991	36	9,461,877
1910	37,271,033	30	11,181,310
1911	34,098,744	30	10,229,623
1912	44,841,542	30	13,452,463
1913	49,676,772	30	14,903,032
1914	45,517,937	30	13,655,381
1915	68,308,657	30	20,492,597
1916	82,958,564		29,035,497

(a) Calculated from shipments made by rail.

Nickel Resources

The discovery of the presence of nickel in the ores of the district is claimed by Robert R. Hedley, who was engaged at the time as assayer for the Orford Copper Co., and as a direct result, a plant was shortly afterwards installed by the Canadian Copper Co. for the production of copper and nickel matte. In October, 1888, Francis L. Sperry, chemist for the latter concern, found that the ores from the Vermilion Mine contained an arsenide of platinum, which was subsequently named sperrylite in honor of its discoverer. The Canadian Copper Co. was organized in January, 1886, with a capital of $2,000,000 to operate the Copper Cliff, Stobie, and Evans mines. The first blast furnace was blown in at the close of 1888, and in the autumn of 1889, a second blast furnace was in operation. The Creighton Mine which was destined to become later the main source of the company's ore supply, was not opened until the year 1900.

In 1902 the International Co. was organized in New Jersey, U.S.A., to consolidate and control the nickel production of the world, the various concerns, the Copper Co., the Orford Copper Co., the Anglo-American Iron Co., and the Mermilion Mining Co., constituting the merger. Since then, operations have been conducted on an increasingly important and comprehensive scale. Among other important resources development relating to the Sudbury district may be mentioned those of the Victoria Mines of the Mond Nickel Co. which are operated independently of the International Co. Nickel production on a limited scale has been secured from the silver-cobalt mines of the Cobalt district. While the nickel-copper mines of the Sudbury district are the chief source of the copper production in Ontario, a considerable tonnage of copper ores is obtained from the copper mines on the north shore of Lake Huron, the copper from which averages fully 4 per cent.

The nickel deposits of the Sudbury district are probably the most important of the known sources of nickel, and supply an increasingly large portion of the world's requirements. The ore reserves are known to be enormous, and nickel production is going up by leaps and bounds, the total for the year 1916 being in round figures $83,000,000 pounds, as compared with something like 50,000,000 pounds three or four years ago. Not only copper, but small amounts of gold, silver, platinum, and palladium constitute valuable by-products.

Annual Production of Gypsum.

Calendar Year	Tons	Value
1886	162,000	178,742
1887	154,008	157,277
1888	175,887	179,393
1889	213,273	205,108
1890	226,509	194,033
1891	203,605	206,251
1892	241,048	241,127
1893	192,568	196,150
1894	223,631	202,031
1895	226,178	202,608
1896	207,032	178,061
1897	239,691	244,531
1898	219,256	232,515
1899	244,566	257,329
1900	252,101	259,009
1901	293,799	340,148
1902	333,599	379,479
1903	314,489	388,459
1904	345,961	373,474
1905	469,022	643,294
1906	469,022	643,294
1907	485,921	646,914
1908	340,964	575,701
1909	473,129	809,632
1910	525,246	934,446
1911	518,383	993,394
1912	578,458	1,324,620
1913	636,370	1,447,739
1914	516,880	1,156,207
1915	474,815	854,929
1916	341,618	730,831

The nickel-copper ore, derived from nine separates mines in the Sudbury district, supplemented by a small tonnage of similar ores from the Alexo Mine in Timiskaming is reduced in smelters and converters at Copper Cliff, and Coniston to a Bessemer matte containing from 77 to 82 per cent. of the combined metals and is shipped in that form to Great Britain and the United States for refining, the product of the Canadian Copper Co. going to New Jersey, and that of the Mond Nickel Co. to Wales. A refinery is now under construction at Port Colborne, Ont., by the International Nickel Co., in which a portion at least of the matte produced by the Canadian Copper Co. will be refined. The British American Nickel Corporation has been actively engaged during the past year in the development of its nickel properties in the Sudbury district and in the erection of a smelter.

Silver Production

Towards the close of the eighteenth century, silver was understood to have been located by a Russian explorer just across the Canadian border near Sault Ste. Marie, but the first discovery of importance on the north shore of Lake Superior was not made until 1866, when the Thunder Bay Mine was staked off. Several other silver mines were worked during the next three or four years, but the silver yield was at best inconsiderable until 1870, when an American syndicate acquired a mining tract of 107,000 acres, in which was included the famous Silver Islet Mine. The purchase price was $225,000, and the sellers were the Montreal company already referred to in connection with the mining of copper. Before operations were suspended on the Silver Islet property, in 1884, ore to the value of $3,089,157 had been extract-

ed, the general average value being something just under $1,500 per ton, although a number of shipments yielded as high as $7,000 per ton. At other mines in the vicinity, rich but limited shoots of ore were worked for a period, while other discoveries were made from 1882 onward. Production steadily declined, however, the output value falling in 1903 to $8,949.

In the autumn of 1903, the first discoveries of the phenomenally rich silver-cobalt-nickel ores of the Cobalt area were made, being, so to speak, an immediate result of the installation of the Timiskaming & Northern Ontario Railway in that region. As a consequence, we find the production of silver increasing in the Province from 17,777 fine ounces in 1903 to 2,451,356 fine ounces in 1905, and reaching a maximum of 30,540,754 fine ounces in 1911. The maximum value $17,772,352 was reached in 1912. The 1916 silver output of the province amounted to 21,975,942 ounces valued at $14,429,623, or 85.6 per cent. of the whole production of the Dominion.

It is of importance to note that the production from the ores of Cobalt and adjoining silver camps account for 21,885,057 ounces of the 1916 total.

Gold Production

As in the production of silver, so with gold, the province of Ontario occupies premier place in the whole Dominion, having done so since 1914. Although gold had been found in a number of different localities, and gave early promise of becoming an important industry, it has only been since 1913 that anything approaching the nature of the latter has been realized. In that year the gold production of the province exceeded the total of all the other years since 1886, only to be doubled itself in turn by the production for 1916, which amounted to 489,679 fine ounces valued at $10,122,563. The Porcupine district, has, since its development, been the main producer. Other producing territories are those of Kirkland Lake and Munro Township in the Timiskaming district, and Long Lake near Sudbury in the Algoma district. The remarkable increase of the last four years has been brought about by the successful development of the Porcupine district and of course more recently still by the extension of milling facilities in that camp. To the 1916 output, the Hollinger Consolidated Mines contributed about 48 per cent., and the Dome about 21 per cent.

Copper Production

The Ontario production of copper comes principally from the nickel-copper ores of the Sudbury district and from the Alexo Mine in Timiskaming, supplemented by a small recovery from the Cobalt district silver ores and by shipments made from six copper properties under development. The total production in 1916 was 44,997,035 pounds, being an increase of 12½ per cent. over the previous year.

Iron Ore and Miscellaneous

Although a number of locations of iron ore have been determined in the province, some expressive of very extensive ore bodies, actual mining has been carried on in but few instances. Mining operations are largely confined to the Helen and Magpie Mines of the Algoma Steel Corporation in the Michipicoten district. The total shipments in 1916 were 339,600 short tons valued at $814,004, as compared with 398,112 tons valued at $774,427 shipped in 1915.

Such of the mineral resources of the province as have been already featured have been dealt with at greater or lesser length because of their meantime special commercial and manufacturing importance, and also because of the fact that in quite recent years specially marked activity has been in evidence relative to them. Regarding the mineral wealth of the province generally, it may be said that same in a variety form is well distributed. In the eastern portions are to be found important deposits of corundum, feldspar, fluorspar, graphite, mica, phosphate, pyrites, talc, lead and zinc ores, etc.; while in the southern section, including a highly developed agricultural area, are found deposits of petroleum, natural gas, gypsum, and salt; this area also contains numerous stone quarries, lime kilns, clay and cement plants. In one very essential resource, that of coal, either anthracite or bituminous, Ontario is absolutely lacking so far as known up to the present.

Blast furnaces for the reduction of iron ore are installed at Hamilton, Deseronto, Port Colborne, Midland, Parry Sound, Sault Ste. Marie, and Port Arthur, while metallurgical plants for the reduction of nickel, copper, silver, or lead ores, are to be found at Copper Cliff, Coniston, North Bay, Orillia, Thorold, Kingston, Deloro, etc.; electric furnaces for the production of ferro-alloys are located at Welland and Sault Ste. Marie. For the encouragement of metal refining, a small bounty is offered for the production of refined nickel, nickel oxide, cobalt, cobalt oxide, copper sulphate, and on white arsenic from mispickel ores, under the conditions and regulations provided in the "Metal Bounty Refining Act."

Annual Production of Silver.

Year	Ounces	Value
1887	355,083	$347,271
1888	437,232	410,998
1889	383,318	358,785
1890	400,687	419,118
1891	414,523	409,549
1892	310,651	272,130
1893	.....	330,128
1894	847,697	534,049
1895	1,578,275	1,030,299
1896	3,205,343	2,149,503
1897	5,558,456	3,323,395
1898	4,452,333	2,593,929
1899	3,411,644	2,032,658
1900	4,468,225	2,740,362
1901	5,539,192	3,265,354
1902	4,291,317	2,238,351
1903	3,198,581	1,709,642
1904	3,577,526	2,047,095
1905	6,000,023	3,621,133
1906	8,473,379	5,659,455
1907	12,779,799	8,348,659
1908	22,106,233	11,686,239
1909	27,529,473	14,178,504
1910	32,869,264	17,580,455
1911	32,559,044	17,355,272
1912	31,955,560	19,440,165
1913	31,845,803	19,040,924
1914	28,449,821	15,593,630
1915	26,625,960	13,228,842
1916	25,669,172	16,854,635

Annual Production of Zinc.

Year	Zinc Ore Shipped		Metallic Zinc in Ore Shipped	
	Tons	Spot value	Pounds	Final value
1898	1,162	$11,000	788,000	$36,011
1899	865	18,165	814,000	46,805
1900	261	4,810	212,000	9,342
1901	...	....	.....	....
1902	158	1,659	142,200	6,882
1903	1,000	10,500	900,000	48,660
1904	597	3,700	477,568	24,256
1905	9,413	139,200	*	*
1906	1,154	23,800	*	*
1907	1,573	49,100	*	*
1908	452	3,215	*	*
1909 (a)	18,371	242,690	16,468,204	906,245
1910	5,063	120,003	4,361,712	240,766
1911	2,590	101,072	2,346,849	135,132
1912	6,415	215,149	5,354,700	371,777
1913	7,889	186,827	7,060,800	371,302
1914	10,893	262,563	9,101,460	474,459
1915	14,895	554,938	12,231,439	1,618,219

*Figures not available.
(a) Includes 7,424 tons shipped late in 1908.

PROVINCE OF MANITOBA

Outside of clay and quarry products, gypsum is the only mineral being mined in the province of Manitoba, although the occurrence of gold has been noted, and gold claims have been exploited on the south-eastern border of the adjoining Ontario boundary and in an area immediately east of Lake Winnipeg. Salt was for many years produced in small quantities from brine near Lake Winnipegosis. There is also a lignite coalfield of considerable extent near the southern boundary of the province, but mining operations have not been conducted thereon. Gypsum is quarried near Lake St. Martin, north of Lake Winnipeg, and is calcined in mills in Winnipeg. Portland cement is made in the latter from local clays and limestone is obtained about 130 miles further north. A natural Portland cement is also made at Babcock. Clay products, chiefly building brick, are manufactured in numerous localities. Limestone is quarried for building stone, and the manufacture of lime is carried on at Stonewall, Stony Mountain, Tyndall, etc.

PROVINCE OF SASKATCHEWAN

The provinces of Manitoba, Saskatchewan and Alberta embrace an enormous area of comparatively level land, and are essentially agricultural territory. Each, however, is underlain by important coal areas, consisting of lignites in the two former, changing to bituminous and semi-anthracite as the "Rockies"

are approached. The raw materials for the manufacture of brick, tile, and cement are found in fair quantity in Saskatchewan, while limestones and building stones also occur. Lignite coal is mined in the southern part or the province at Estevan, Roche Percée, Pinto, Bienfait, and the Dirt Hills district. Coal has also been reported near Wood Mountain in the Eagle Hills, and on the Saskatchewan River near Swift Current. Brick clays are widely utilized, and to the south of Moose Jaw a refractory clay is found which has been employed in the manufacture of fire brick. The sands and gravels of the province are largely used for concrete work of all kinds. Natural gas has not yet been obtained in commercial quantities but there is expectation that it will shortly be found. In the northern part of the province in the Beaver Lake district some gold has been located.

The coal deposits of Saskatchewan furnish coal of the lignite variety only, and as some of the physical characteristics of same in its raw state tend to prevent its successful and economic use, the production of recent years shows but a slight increase, in no way comparable to the increase of population of the province, and the consequent increased demand for fuel for heating and power purposes. The importance of devising better methods for the utilization of the lignite has prompted both the government and the province fuel testing division of the mines branch, Ottawa, to undertake investigation of Western lignites. The production for the year 1916 amounted to 280,835 tons of a value of $442,136, the increase in each case being of a substantial nature as compared with the immediately preceding years.

PROVINCE OF ALBERTA

The mineral resources of the province of Alberta being actively exploited include coal, natural gas, alluvial gold, clay and quarry products. Petroleum has been tapped although small in amount, and, notwithstanding the "oil fever" which was rampant in the province about three years ago, little progress has been made towards making any of the then discoveries real paying propositions. The oil is of light character, with a varying specific gravity. It grades from light green in color to colorless and has a paraffin base. Some of the product has been used in the crude state to run gasoline tractors.

The production of coal has increased very rapidly during the past few years which leads to the belief that Alberta will in the near future be the largest coal producer of all the provinces of the Dominion. Natural gas has been found over a wide area, while in the north there is an enormous tract of tar sands, the commercial value of which has perhaps not as yet been fully determined. Salt and gypsum are also understood to have been located.

Lignite, bituminous, and anthracite coal are each produced in the province, bituminous comprising over 50 per cent. of the output, lignite between 40 and 45 per cent., and anthracite less than 5 per cent. of the grand total. In 1912 Alberta became the second largest coal-

Exports of Products of the Mine and Manufacture of Mine Products, Calendar Year, 1916.

PRODUCTS.		Quantity.	Value.
Arsenic	Cwt.	39,505	$ 197,458
Asbestos	Tons	96,775	3,872,463
Asbestos sand and waste	"	33,564	241,272
Coal	"	2,135,359	7,099,387
Cobalt (nine months only)		.....	712,880
Chromite (Chromic Ore)	"	12,633	152,534
Corundum	"	56	8,583
Felspar, Magnesite, Talc, etc.		.....	329,215
Gold-bearing quartz, dust, nuggets, etc.		.....	18,382,903
Gypsum or plaster, crude	Tons	221,156	252,476
Metals, viz.:—			
Copper, fine, contained in ore, matte, regulus, etc.	Cwt.	1,249,424	20,776,536
Lead, metallic, contained in ore, etc.	"	90,484	558,180
Nickel, fine, contained in ore, matte, or speiss	"	804,417	8,662,179
Platinum, contained in concentrates or other forms	Ozs.	532	41,945
Silver, metallic, contained in ore concentrates, etc.	"	25,279,359	15,637,885
Mica	Lbs.	1,308,793	379,720
Mineral pigments, iron oxides, ochres	Cwt.	33,917	25,312
Mineral water, natural, not in bottles	Gals.	229	22
Mineral wax	Cwt.	80,987	201,653
Oil:—			
Mineral, coal and kerosene, crude	Gals.	137,647	11,439
Mineral, coal and kerosene, refined	"	446,595	48,137
Gasoline and naphtha	"	54,806	14,194
Ores:—			
Antimony	Tons	794	48,158
Iron	"	161,260	541,779
Manganese	"	957	89,544
Other	"	69,331	1,348,540
Phosphates	Tons	103	1,543
Plumbago, crude ore and concentrates	Cwt.	6,223	13,114
Pyrites	Tons	156,722	557,024
Salt	Cwt.	3,059	2,223
Sand and Gravel	Tons	1,114,913	388,309
Stone, ornamental, granite, marble, etc., unwrought	"	15,967	7,989
Stone, building, freestone, limestone, etc., unwrought	"	128,453	103,796
Stone, crushed	"	26,754	27,611
Stone, for manufacture of grindstones, rough	"	356	1,764
Other articles of the mine		.....	17,694
Total mine products		.....	$ 80,817,792
MANUFACTURES.			
Agricultural implements and machines, viz.:—			
Mowing machines	No.	6,672	$ 233,024
Cultivators	"	4,219	142,028
Reapers	"	1,115	65,011
Drills	"	4,713	317,831
Harvesters and binders	"	7,495	814,517
Ploughs	"	17,700	483,650
Harrows	"	6,691	97,214
Hay rakes	"	2,011	43,746
Seeders	"	2	128
Threshing machines	"	1,522	465,209
All others		.....	292,603
Parts		.....	750,966
Asbestos, manufactures of		.....	4,714
Bricks	M.	1,746	13,942
Cement		.....	2,424
Clay, manufactures of		.....	58,550
Coke	Tons	48,539	221,334
Cream separators		.....	34,567
Drugs, chemicals and medicines, viz.:—			
Acetate of lime	Cwt.	73,589	216,397
Acid, sulphuric	"	31,517	74,527
Calcium carbide	"	1,469,663	4,369,085
Phosphorus	Lbs.	834,950	122,323
Earthenware, and manufactures of		.....	7,620
Fertilizers		.....	3,338,413
Gasoline engines	No.	529	86,310
Grindstones, manufactured		.....	43,178
Gypsum or plaster, ground		.....	154,630
Iron and steel and manufactures of, viz.:—			
Stoves of all kinds		.....	29,956
Gas buoys and parts of		.....	2,484
Castings, N.O.P.		.....	167,881
Ferro-silicon and ferro compounds	Tons	22,802	1,352,013
Pig-iron	"	23,304	374,383
Linotype machines, and parts of		.....	35,465
Machinery, N.O.P.		.....	1,206,863
Sewing machines, and parts of		.....	82,032
Washing machines, domestic, and wringers		.....	5,763
Typewriters	No.	3,597	246,761
Scrap iron or steel	Cwt.	2,285,991	1,357,018
Hardware, viz.:—			
Tools, hand or machine		.....	376,549
Wire, and wire nails	Cwt.	2,450,517	8,597,320
Hardware, N.O.P.		.....	515,613
All other N.O.P.		.....	38,974,154
Lead in pigs, etc.	Cwt.	1,121	7,710
Lime		.....	66,406
Metals:—			
Aluminium in bars, blocks, etc.	Cwt.	184,253	5,201,066
Aluminium, manufactures of		.....	26,780
Brass, old, and scrap	Cwt.	375,037	6,064,779
Copper, in pigs, bars, sheets, etc.	"	24,304	581,268
Copper, old and scrap	"	58,466	1,284,895
Metallic shingles and laths and corrugated roofing		.....	30,563
Plated ware, N.O.P.		.....	15,050
N.O.P.		.....	3,143,135
Mineral and aerated waters in bottles		.....	1,576
Oil, N.O.P.	Gals.	3,391,857	1,038,025
Plumbago, manufactures of		.....	304,919
Stone of all kinds, dressed		.....	4,592
Tar		.....	50,352
Tin, manufactures of		.....	16,284
Vehicles:—			
Automobiles	No.	12,579	6,078,668
Automobiles, parts of		.....	672,060
Bicycles	No.	580	50,894
Bicycles, parts of		.....	5,877
Total manufactures		.....	$ 90,043,122
Grand total		.....	$171,240,911

producing Province, a position which it still holds. The output for 1916, the highest in its history, amounted to 4,563,020 of a total value of $11,496,106. It is of interest to note that the Province abounds with small operators, and because of so many new ones entering the field each year, the Department of Mines at Ottawa state that it is exceedingly hard to keep track of all of them. In 1915, there were 39 companies reporting a production in excess of 10,000 tons, their aggregate making nearly 93 per cent. of the total of the province. Eight of these reported an output of over 100,000 tons each, the largest operator being the Canadian Pacific Railway with a total of 541,567 tons from Bankhead and Lethbridge.

NORTHWEST TERRITORIES

The Northwest Territories as at present constituted include all that northern portion of Canada above the 60th parallel of latitude, extending from Hudson Bay on the east to the Yukon district on the west, and including all the northern Arctic Islands that belong to Canada. It is practically unpopulated, except for a few Indians and fur traders. Little is known of the country beyond what has been learned from a few explorations of some of the principal rivers. The occurrence of coal in the Mackenzie River Basin and of native copper in the Coppermine River district have been known for a long time.

Alluvial gold has been found in many of the streams, while the occurrence of iron ores, mica, graphite, salt, and gypsum have been noted. The northern part of this continent and the great Arctic Archipelago further north still contain large areas of the older rocks in which metalliferous and other minerals will no doubt eventually be developed, but in regard to which little is yet known. The area embraced by the Northwest Territories amounts to 1,242,224 square miles, and the population according to the 1911 Census totalled 17,196.

PROVINCE OF BRITISH COLUMBIA

The history of the mining industry of British Columbia is largely that of two well-defined periods—the era of pick and shovel mining, 1858 to 1878; and the era of machinery mining 1887 up to the present time. The first period opened with the Fraser River gold rush in 1858, and closed after the discovery of the Cassiar placers in 1874, and their subsequent exhaustion about the year 1878. This was an era of placer gold mining activity. While authorities vary in their estimates as to numbers, it may perhaps be within the mark to say that between April and June, 1858, some 20,000 persons embarked from San Francisco bound for the Fraser River diggings. The majority soon became disillusioned and disheartened, however. A million dollars represented the yield from the Cassiar field during the first year of operation, this being equivalent to over 50 per cent. of the aggregate production of the country.

Thenceforward, individually directed placer gold mining gradually declined,

Annual Production of Graphite.

Calendar Year	Tons	Value
1886	500	$4,000
1887	300	2,400
1888	150	1,200
1889	242	3,160
1890	175	5,200
1891	260	1,560
1892	167	3,763
1893	Nil	Nil
1894*	3	223
1895	220	6,150
1896	139	9,455
1897	436	16,240
1898	...	13,698
1890	1,130	24,179
1900	1,922	31,040
1901	2,210	83,780
1902	1,095	28,300
1904	728	23,745
1904	452	11,760
1905	541	16,735
1906	387	18,300
1907	579	16,000
1908	251½	5,565
1909	864	47,800
1910	1,392	74,087
1911	1,269	69,576
1912	2,060	117,122
1913	2,162	90,282
1914	1,647	107,203
1915	2,635	124,223
1916	3,971	285,362

hydraulicing on a comparatively large scale being employed instead. In 1898 due to the discovery of gold-bearing gravels in what became known as the Atlin Lake Mining Division, individually directed placer mining again became active. In a short time, however, the majority of the claims were absorbed by syndicates and corporations, with the inevitable result that hydraulicing and dredging became the rule as it had done in the case of the Cassiar.

The second and more important period of mining activity dates from about the year 1887 and, as already remarked, it constitutes the machinery era. In July, 1890, all the more important mines of the Rossland camp, including Le Roi, War Eagle, and Centre Star, were located, and the following year witnessed the discovery of the extraordinarily rich silver-lead mines of the Slocan. Thenceforward, prospecting was vigorously prosecuted throughout the central and southern sections of the Province, the whole of which has proved to be more or less richly mineralised. Silver and lead were the first minerals to be marketed. The first production of copper was made in 1888-1889 from the Hall Mines near Nelson, a consignment of 100 tons of ore showing from 220.5 ounces of silver and 17 per cent. of copper, to 574 ounces of silver and 43.36 per cent. of copper per ton. Regular production did not actually commence until 1894.

Coal Mining Takes Precedence

Chronologically, coal mining takes precedence of all established enterprises on Canada's Pacific Coast, and is to-day, perhaps in point of tonnage, output and value, the most important of the mining industries of the Province. Coal was first discovered by servants of the old Hudson Bay Co. in 1835, but no developments of consequence took place until 1857 when the extensive coal measures at Nanaimo, Vancouver Island, where opened. The development of the coal mining industry proper, however, belongs to the second well-defined period of the history of the Province, since its rapid growth and expansion in the last 35 years is very largely due to the demands created by the new conditions arising from the development of metal mining. The newest and largest productive coal areas have been discovered during this period. The Crows' Nest Pass field was not exploited until 1897, and since then numerous other coal areas have been uncovered. The coal, generally, is bituminous and of excellent quality for domestic or steam raising purposes.

For many years, British Columbia was the premier mining Province of Canada, and was only displaced so far as output was concerned in 1907, when Ontario forged ahead. In a certain sense, our Pacific Coast Province is still of first importance owing to the fact that mining is probably its most important industry. The Province embraces a series of mountain ranges beginning at the "Rockies" which form the eastern border, and extend to the Pacific Coast. Coal and metalliferous ores including gold, silver, copper, lead, and zinc, together with clays, building stone, and gypsum, constitute the chief mineral resources. Antimony, platinum, and molybdenum, and mercury are also found.

With the exception of the placer gold mining of the Caribou and Atlin districts, active productive mining operations are confined principally to the extreme southern portion of the Province and to the districts on Vancouver Island and on the coast. Excluding placer gold, practically the entire mineral production has been obtained from that portion of the Province lying within 100 miles of the southern boundary, or within the area provided with transportation facilities.

Chief Centres of Activity

Among the chief centres of activity are included the coal mines of the Crows' Nest Pass in Eastern Kootenay which produce over 50 per cent. of the provincial coal output. Silver-lead and zinc ores have been extensively mined at Marysville, Moyie, Ainsworth, Slocan, Sendon, Silverton, and other points in East and West Kootenay, while to the south at Nelson and Rossland gold and copper are the principal values in the

Mineral Production by Provinces, 1915 and 1916.

	1915.		1916.			
	Value of Production	Per cent. of total	Value of Production	Per cent. of total	Increase (+) or Decrease (—).	
Nova Scotia	$ 18,088,342	13.19	$ 19,963,985	11.26 +	$ 1,875,643	10.37
New Brunswick	903,467	0.66	878,446	0.49 —	25,021	2.77
Quebec	11,619,275	8.48	14,397,909	8.12 +	2,778,634	23.91
Ontario	61,071,287	44.54	80,379,352	45.32 +	19,308,065	31.62
Manitoba	1,318,387	0.96	1,819,921	1.03 +	501,534	38.04
Saskatchewan	451,933	0.33	583,708	0.33 +	131,775	29.16
Alberta	9,909,347	7.23	13,336,702	7.52 +	3,427,355	34.59
British Columbia	28,689,425	20.92	40,191,744	22.66 +	11,502,319	40.09
Yukon	5,057,708	3.69	5,805,687	3.27 +	747,979	14.79
Dominion	$137,109,171	100.00	$177,357,454	100.00 +	$40,248,283	29.35

ores mined. At Sheep Creek in the Nelson division is an important gold camp in which the ores are mainly free milling. Further west in the area known as the Boundary District, low grade copper ores carrying gold and silver values have been found in very large deposits from which the annual production has ranged between one and two million tons. At Hedley there is located perhaps the most important gold mine in the Province. On the coast, copper ores are mined at Britannia Bay, Texada Island, and at Granby Bay or Anyox.

Vancouver Island possesses the oldest and most important coal mines as well as important metalliferous deposits. The Hazelton district has in recent years come to the front as a mineral centre. Prospecting and development is being undertaken at many points on or near the coast, while due to the construction of the Grand Trunk Pacific Railway access has been provided to hitherto untapped mineral territory. Important smelting industries have been established at Trail, Grand Forks, and Greenwood, in the southern interior, the fuel for which is provided by the coal mines of the Crows' Nest, or of Alberta. A new copper smelting plant started operation at Anyox in March, 1914.

Since the latter year, and arising from the necessity that we should supply to the fullest extent possible the metal requirements of our intensive munitions industry, additional smelting and refining plants have been in process of establishment and are being now gradually developed into front rank producers. With a view, however, to a better grasp being had of the capacity provision now available for treating the various ores recovered, a detail embracing all Canada follows a little further on.

Pig Iron in Canada

MONTHLY PRODUCTION, EXPORTS AND IMPORTS (IN SHORT TONS).

	Production.		Exports.		Imports.	
	1916.	1917.	1916.	1917.	1916.	1917.
January	562,097	89,187	1,635	106	4,456	5,473
February	†.....	83,801	1,393	732	4,101	3,502
March	†.....	103,789	2,725	1,394	5,602	7,442
April	†.....	101,564	80	629	5,963	5,916
May	†.....	108,799	30	966	6,489	7,189
June	†.....	99,858	221	1,483	3,190	9,336
July	92,012	97,047	394	1,823	3,773	7,412
August	87,864	110,624	3,902	1,885	3,961	5,624
September	102,744	100,638	1,534	1,998	5,001	1,945
October	113,608		4,344		5,933	
November	104,436		4,055		3,310	
December	106,496		2,991		6,351	
Total	1,169,257		23,304		58,130	
Monthly average	97,438	99,478	1,942	1,135	4,919	5,982

†Monthly average of 93,683.

Steel in Canada

MONTHLY PRODUCTION, EXPORTS AND IMPORTS (IN SHORT TONS).

	Production of Steel Ingots and direct Steel Castings.		**Exports.		*Imports.	
	1916.	1917.	1916.	1917.	1916.	1917.
January	589,553	130,990			4,212	13,322
February	†.....	120,629			7,288	15,213
March	†.....	152,420			5,206	32,590
April	†.....	139,669		4,372	10,877	19,792
May	†.....	155,346		4,811	8,542	26,823
June	†.....	137,695		5,788	11,368	31,700
July	100,817	137,531		7,203	10,742	6,761
August	107,273	144,243		5,405	13,412	4,735
September	113,411	147,260		4,736	10,433	
October	123,469				12,958	
November	124,431				12,723	
December	116,265				10,309	
Total	1,275,219				118,070	
Monthly average	106,268	140,576		5,386	9,839	16,772

*The figures given hereunder represent the exports of steel, ingots and billets from the United States to Canada, and are compiled from the monthly reports of "Foreign Commerce and Navigation of the United States," Washington, D.C. The total exports to Canada during the eight months ended August 31, 1917, were 150,946 short tons, valued at $10,670,739.

**Exports of ingots or billets, not separately recorded previous to April, 1917.

†Monthly average of 98.259.

YUKON TERRITORY

The Yukon Territory, which geographically is a continuation of the Rocky Mountain range extending north-westerly from the 60th degree of Latitude; the northern boundary of British Columbia to the 141st Meridian; and the Alaska boundary, became famous on account of the Klondike gold fields located in the vicinity of Dawson on the Yukon River. Placer gold is still the principal mineral product, although there is an interesting output of copper and silver ores, and of coal, the district possessing important areas of the latter. Gold ores and ores of copper, silver, lead, and antimony, have been found widely distributed, and without doubt, the region possesses enormous mining possibilities.

The first reference to the occurrence of gold in the Yukon appears in a book published in London in 1869, the author, F. Whymper, cursorily mentioning the discovery by Hudson Bay Co. men of minute specks of gold, and adding "but not in quantity to warrant a rush to the locality." In 1878, a prospector named Holt made a journey to Teshintoo and reported having found coarse gold, but his statements were not confirmed by miners who afterwards prospected the locality. It was not until 1881 that the first discovery of paying placers was made by a party of four miners who ascended the Big Salmon River for about 200 miles, and found gold along its course and in the river bars.

During the next few years exploration of other sections of the territory were undertaken, and gold was found on Fortymile Creek on the upper part of the Lewes River, and on the Upper Pelly. In 1887, some 250 miners were engaged in working claims or prospecting in the Upper Yukon. It was not until 1894, however, that the Klondike district was discovered by the finding of gold in Quartz Creek, while a year later, discoveries were made on Goldbottom, a tributary of Hunker Creek; in 1896, the phenomenal richness of Bonanza Creek was made known.

This discovery was followed by the historic excitement of 1897-1898, when a stream of adventurers from all parts of the world flowed into the territory. In 1900 the production of gold amounted in value to $22,000,000. From that year, however, it has gradually declined, the latest available returns, those for 1916, showing a value of $4,391,669 only. The goldfields are included in an area of about 800 square miles, bounded by the Yukon River on the west, the Klondike River on the north, by Flat Creek, a tributary of the Klondike River, and Dominion Creek, a tributary of the Indian River, on the east, and by the Indian River on the south.

In addition to the gold output noted above for the year 1916, there were produced 360,466 ounces of silver valued at $236,686, and approximately 3,980,640 pounds of copper.

CANADA'S FUTURE MINERAL PRODUCTION

From what has preceded, it will have become apparent that in the last quarter century, if not throughout the full fifty and a half years of Confederation, quite marked progress has been made in the uncovering of Canada's mineral resources, and while it goes without saying that development will grow in intensity and be supplemented by even greater and richer discoveries as the years come and go, there must be neither hesitancy nor indifference shown as to the primary disposition of the various products. Powerful influences are now at work with the idea of ensuring that to the utmost limit mineral matter recovered shall be reduced and converted into marketable commodities by factories of one kind or another within our own borders and while, during these three war years, achievement towards the end indicated has been highly creditable, its good effect will be entirely lost were we to cease to maintain and strengthen deter-

Manufacturers of Oven Coke.

Operator.	No. of Ovens and Type.		Location of Ovens.
*	45	Bee-Hive	Stellarton, N.S.
Intercolonial Coal Mfg. Co.	36	"	Westville, N.S.
*	97	"	Londonderry, N.S.
Nova Scotia Steel & Coal Co.	150	Bernard (120)	Sydney Mines, N.S.
		Bauer (30)	
Dominion Iron & Steel Co.	620	Otto Hoffman	Sydney, N.S.
*	100	Bee-Hive	Port Arthur, Ont.
The Algoma Steel Corp.	110	Koppers	Sault Ste. Marie, Ont.
*Hamilton By-Product Coke Ovens.		(Proposed)	
International Coal & Coke Co.	216	Bee-Hive	Coleman, Alta.
*West Canadian Collieries	50	Bernard	Lille, Alta.
*Leitch Collieries	101	Mitchell	Passburg, Alta.
Crow's Nest Pass Coal Co.	454	Bee-Hive	Fernie, B.C.
Crow's Nest Pass Coal Co.	486	"	Michel, B.C.
*	240	"	Hosmer, B.C.
Can. Collieries (Dunsmuir)	150	"	Union Bay, B.C.

minedly so vital a requirement of our national well-being.

Canada's Metallurgical Works

It is the writer's opinion that mining and manufacture have not gone hand in hand as they should, in the past, and that as a result, both have suffered in progress and development. The outlook is for a greatly improved condition in this respect, and is traceable to the single-purpose idea of boosting Canadian industry. In order to familiarize readers with the chief manufacturing resources of the Dominion which are allied with mines and minerals, the most recently compiled and authoritative detail is appended.

Upper Ottawa Conservation. — The water-power interests have been greatly benefited by the conservation dams completed in 1915 on the Upper Ottawa to regulate the flow of that river. The resrvoirs can supply an additional flow of 10,000 cu. ft. per second, thus increasing the total power possibilities between Mattawa and Carillon by some 400,000 h.p., while at Ottawa alone, where the water is being fully utilized, the increase is approximately 30,000 h.p.

Most Recently Compiled Detail of Canadian Metallurgical Works

Iron Blast Furnaces.

Company.	Location of Plant.	Number of Furnaces	Rated Capacity of Completed Furnaces
NOVA SCOTIA.			
Dominion Iron & Steel Co.	Sydney, C.B.	Six completed	1,680 tons per day
Nova Scotia Steel & Coal Co.	Sydney Mines, C.B.	One "	250 " "
†Londonderry Iron & Mining Co.	*Londonderry	One "	100 " "
ONTARIO.			
Algoma Steel Corporation	Steelton	Three "	1,064 " "
Atikokan Iron Co.	*Port Arthur	One "	175 " "
Canada Iron Foundries, Ltd.	Midland	Two "	375 " "
Canadian Furnace Co.	Port Colborne	One "	225 " "
Standard Iron Company of Canada, Ltd.	Deseronto	One "	67 " "
Standard Iron Company of Canada, Ltd.	Parry Sound	One "	67 " "
Steel Company of Canada, Ltd.	Hamilton	Two "	690 " "

†In liquidation.

Ferro-Alloys.

Company.	Location of Plant.	Products.
QUEBEC.		
The Electric Reduction Co.	Buckingham	Ferro-phosphorus (electric furnace).
ONTARIO.		
Electro-Metals, Ltd.	Welland	Ferro-silicon (electric furnace).

Steel Furnaces.

Company.	Location of Plant.	Furnaces.
NOVA SCOTIA.		
Dominion Iron & Steel Co.	Sydney, C.B.	(Ten 50-ton basic open-hearth furnaces. (Three 15-ton Bessemer basic converters. (Three metal mixers (one 300-ton, two 350-ton).
Nova Scotia Steel & Coal Co.	Sydney Mines, C.B.	Four 40-ton and one 50-ton basic open-hearth.
Londonderry Iron & Mining Co.	*Londonderry	One 5-ton basic open-hearth.
QUEBEC.		
Armstrong-Whitworth of Canada, Ltd.	Longueuil	(Four 12-pot crucible furnaces. (One 3-ton Heroult electric furnace.
Canadian Steel Foundries, Ltd.	Longue Pointe	Three 30-ton acid open-hearth furnaces.
Canadian Steel Foundries, Ltd.	*Pt. St. Charles	Two 15-ton acid open-hearth furnaces.
Thos. Davidson Mfg. Co.	Montreal	One 1-ton Snyder electric furnace.
Canada Cement Co.	Montreal	Four 6-ton electric furnaces, 3 phase arc type.
Standard Steel Co.	Montreal, Hutchison & AtlanticSts.	One 1½-ton Baillot special converter.
Canadian Brake Shoe Co.	Sherbrooke	(Four 2½-ton and one 1-ton electric furnace.
F. X. Drolet Co.	Quebec	(One 2-ton Snyder electric furnace.
Beauchemin & Fils	Sorel	One 1½-ton acid Baillot converter.
Joliette Steel Co.	Joliette	Two converters.
Hull Iron & Steel Foundries	Hull	One 1½-ton converter.
ONTARIO.		
Algoma Steel Corporation	Steelton	Three 2-ton converters. Two 40-ton, three 45-ton, two 50-ton basic open-hearth furnaces and one 300-ton mixer. Two 5-ton Bessemer converters, 150-ton mixer. One 20-ton Bessemer converter, and one 200-ton tilting basic open-hearth furnace for duplexing.
Canada Steel Foundries	Welland	One 20-ton and one 25-ton basic open hearth furnace.
Dominion Steel Foundry Co.	Hamilton, Depew St.	Two 20-ton, one 20-ton acid open-hearth furnaces, and one 2-ton converter.
Steel Co. of Canada	Hamilton	200-ton metal mixer and ten basic open-hearth furnaces (two 25-ton, five 50-ton and three 80-ton).
Electric Steel & Metal Co.	Welland	One 5-ton and one 6-ton Heroult electric furnaces.
Moffat Irving Steel Works	Toronto, 400 Wellington E.	One 1½-ton electric furnace.
Tivani Electric Steel Co.	Belleville	One 1-ton electric furnace.
Swedish Crucible Steel Co. of Canada	Windsor	Three 4-pt. crucible furnaces and one 2-ton converter.
Wm. Kennedy & Sons	(Owen Sound	One 2-ton Tropenas converter.
	(Collingwood	Two 15-ton acid open-hearth furnaces.
Wabi Iron Works	New Liskeard	One 1-ton Heroult electric furnace.
BRITISH COLUMBIA.		
Vancouver Engineering Works	Vancouver	One 2-ton converter.
Port Moody Steel Works	Port Moody	Two 15-ton basic open-hearth furnaces (under construction).

*Idle during 1915.

Rolling Mills.

Company.	Location of Plant.	Products.
NOVA SCOTIA.		
Canadian Car & Foundry Co.	Amherst	Bars and rods (iron and steel).
Dominion Iron & Steel Co.	Sydney	Billets, rails, wire rods, bars, angles, etc., wire and wire nails.
Nova Scotia Steel & Coal Co.	New Glasgow	Billets, plates and sheets, rails, bars and angles, etc., angle splice bars, nails and spikes, forged products.
Starr Mfg. Co.	Dartmouth	Iron bars.
NEW BRUNSWICK.		
Portland Rolling Mills	St. Johns	Bars.
QUEBEC.		
Armstrong-Whitworth of Canada	Longueuil	Taps, dies, milling cutters, gauges, special tools.
*Canadian Rolling Mills Co.	Montreal	Iron and steel bars.
Grand Trunk Rolling Mills	Montreal	Iron bars.
*Peck Rolling Mills	Montreal	Bars.
Steel Co. of Canada	Montreal, Notre Dame	Billets, plates and sheets, bars, nails and spikes, wire, horse shoes (steel and iron), iron bars.
Steel Co. of Canada	Montreal, St. Patrick St.	Sheets and plates, bars, nails and spikes, iron horse-shoes, iron bars.
ONTARIO.		
Algoma Steel Corporation	S. Ste. Marie	Billets, rails, bars, angle splice-bars, fish-plate, etc.
Burlington Steel Co.	Hamilton	Bars and rods.
Canadian Steel Foundries	Welland	Billets and bars.
Wm. Kennedy & Sons	Collingwood	Billets, wire rods and bars.
London Rolling Mills Co.	London	Iron and steel bars.
Steel Company of Canada	Belleville Works	Iron and steel bars, spikes and horse-shoes.
Steel Company of Canada	Hamilton Works	Billets and wire rods, bars and rods, nails and spikes, forged products.
Steel Company of Canada	Hamilton, Ontario	Bars, fish-plate, tie plate, etc.
Steel Company of Canada	Fort William, Superior	Wire and wire nails.
Canadian Horse Shoe Co.	Hamilton	Horseshoe bars.
MANITOBA.		
*Manitoba Rolling Mills Co.	Selkirk	Iron bars.
ALBERTA.		
Alberta Rolling Mills Co.	Medicine Hat	Bars, balls and nuts.
Redcliff Rolling Mills & Bolt Co.	Redcliff	Bars.
BRITISH COLUMBIA.		
*Port Moody Steel Works	Port Moody	Iron bars.

*Idle or not reporting during 1915.

Nickel Copper Smelters.

Company.	Location of Plant.	Number of Furnaces, Capacity and Products.
ONTARIO.		
Canadian Copper Co.	Copper Cliff	Seven furnaces with capacity of 3,000 tons of ore per day, five basic converter stands. Two McDougall reverberatories, four wedge roasting furnaces. Product Bessemer matte.
Mond Nickel Co.	Coniston	Three furnaces with capacity of from 1,600 tons to 1,800 tons of ore per day, three Pierce-Smith Standard basic converters. Product Bessemer matte.

Copper Smelters.

BRITISH COLUMBIA.		
British Columbia Copper Co.	Greenwood	Three furnaces with capacity of 2,000 tons of ore per day; converter plant of two stands and seven shells with daily capacity of 35,000 lbs. of blister copper.
Cons. Mg. S. Co. of Canada	Trail	Five furnaces with capacity of 3,000 tons of ore per day, two Great Falls type converters and electrolytic refinery with daily capacity of 10 tons refined copper under construction.
Granby Cons. Mg. S. & Power Co.	Grand Forks	Eight furnaces with capacity of 4,000 tons of ore per day; three converter stands, and ten shells with daily capacity of 100,000 pounds of blister copper.
Granby Cons. Mg. S. & Power Co.	Anyox	Four furnaces with capacity of 3,000 tons of ore per day; two Great Falls type converters. Product blister copper.
*Tyee Copper Co.	Ladysmith	Two furnaces with capacity of 500 tons of ore per day. Product copper matte.

Lead Smelters.

ONTARIO.		
*North American Smelting Co.	Kingston	Two small furnaces with capacity of 50 tons per day; idle since 1913.
BRITISH COLUMBIA.		
Cons. Mg. & S. Co. of Canada	Trail	Four lead furnaces and electrolyte refinery with capacity of 125 tons of refined lead per day. Products: pig lead pipe, fine gold, fine silver, copper sulphate and antimony.

*Idle during 1915.

Zinc Smelters.

Company.	Location of Plant.	Number of Furnaces, Capacity and Products.
ONTARIO.		
Electro Zinc Co.	Welland	Small plant for recovery of refined zinc from zinc oxide.
BRITISH COLUMBIA.		
Cons. Mg. & S. Co. of Canada	Trail	Electrolytic plant being installed with initial capacity of about 45 tons of spelter per day, which has been increased to approximately 70 tons per day.
French Complex Ore Reduction Co.	Nelson	Experimental development.

Aluminium Reduction Works.

QUEBEC.		
The Northern Aluminium Co.	Shawinigan Falls	Using Hall electrolytic reduction process. Products: Aluminium ingots, bars and wire.

Silver-Cobalt-Nickel Reduction Works.

ONTARIO.		
Coniagas Reduction Co.	Thorold	Products: Metallic cobalt, nickel and arsenic, white arsenic, cobalt and nickel oxides, cobalt and nickel sulphates and other cobalt salts and cobalt alloys.
Deloro Smelting & Refining Co.	Deloro	
Metals Chemical Co.	Welland	
Standard Smelting & Refining Co.	Chippewa	

Cobalt District Customs Concentrators and Reduction Works.

ONTARIO.		
Dominion Reduction Co.	Cobalt	Cyaniding, producing silver bullion.
Northern Customs Concentrator	Cobalt	Ore concentration only.
Nipissing Mfg. Co.	Cobalt	Cyaniding, producing silver bullion.

British Columbia Customs Concentrators.

BRITISH COLUMBIA.		
Kootenay Ore Treatment Co.	Kaslo	Products: Lead and zinc concentrates.
J. P. Keane	Roseberry	Products: Lead and zinc concentrates.

The Canada Metal Co. Ltd.: Its Development and Product

Staff Article

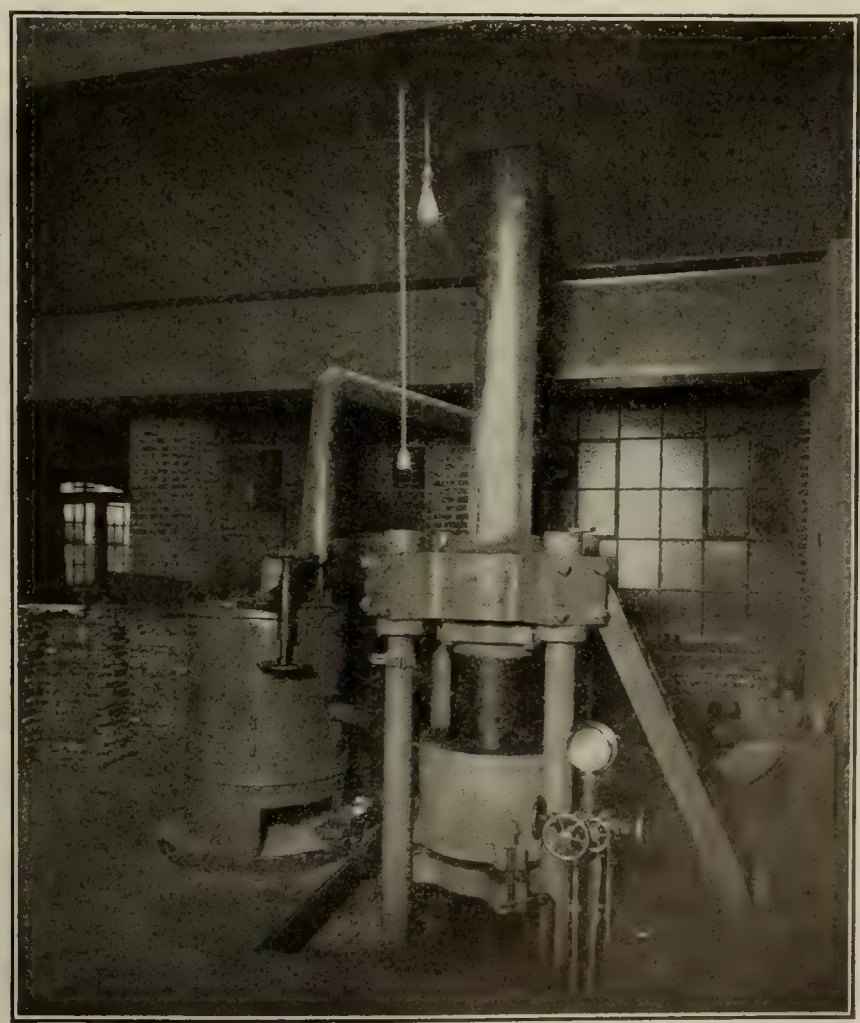
A feature of the numerous references frequently made regarding Canada's natural resources is the fact that non-ferrous metals constitute a more valuable portion of the total than is generally realized. The indispensability of the more familiar metals—lead, zinc, copper, etc.—has been brought home to us in a convincing manner this war time, thereby imparting a unique importance to such firms as operate in these and kindred metals.

THE extent to which engineering and iron and steel industries have been called upon to aid the cause of liberty has been so great and spectacular, that the degree to which the non-ferrous metal industry has contributed to the cause is not nearly so fully realized. The over shadowing of the soft metals by the hard is not altogether unexpected, but the indispensability of lead, antimony, aluminum, copper and zinc, to say nothing of tungsten, molybdenum, chrome, etc., will be evident to the casual reader when due consideration is given to the requirements of the war,—lead and antimony for bullets, aluminum for engine and aeroplane parts, copper for driving bands, and along with zinc for the numberless items of brass,—these alone indicate slightly the extent of the non-ferrous metal industry and impart more than passing interest to the plant and products of the Canada Metal Co., Toronto, Ont.

Consistent Growth

This firm occupies a prominent place in that category of manufacturing establishments whose growth has been contemporaneous with, and emblematic of the rapid industrial development of the Dominion during the last two decades. Like many other businesses typical of Canada's growth and opportunities, the company represents the life efforts of W. G. Harris, president, assisted by his son Wm. G. Harris, junior, vice-president; their operations commenced on a comparatively small scale, have been attended by a consistent growth and success now represented by branch factories in Montreal, Winnipeg and Vancouver. The range of product includes a great diversity of non-ferrous metals. Babbitt, battery zincs, solder, pig lead, lead pipe, antimony, ingot tin, stereotype and all white metal mixtures and the production of die-castings are but one part of the product. Plumbers' lead pipe fittings, metal bar for art glass work, ventilators, sash bars, etc., occupy a prominent place in the firm's output.

The production of babbitt metal is one of the most widely known of the company's activities and a close acquaintance with their plant and methods is confirmatory of the reputation gained by this product. One of the first things noticed by the visitor is the piles of tin pigs or ingots, especial interest attaching to this metal because the two principal, if not the only sources from which it can be obtained at present, are both in the British Empire. The Straits Settlements, that far eastern dependency of Britain, is the source of the finest and most tin in the world, and the fact that it is obtainable in reasonable quantity at this time is a tribute to Britain's control of the ocean. The other source referred to is in England itself—the ancient tin mines of Cornwall, worked by the Romans, and to-day supplying tin to a British colony, whose extent and potential wealth exceeds any thing the most ambitious Caesar ever dreamed of. And as if to prove that Canada lacks not herself, mounds of lead ingots from British Columbia lie alongside the tin, their birthplaces separated by a third of the globe's circumference, and here united to produce an article of Canadian manufacture which in many diverse applications is helping our forces win the war.

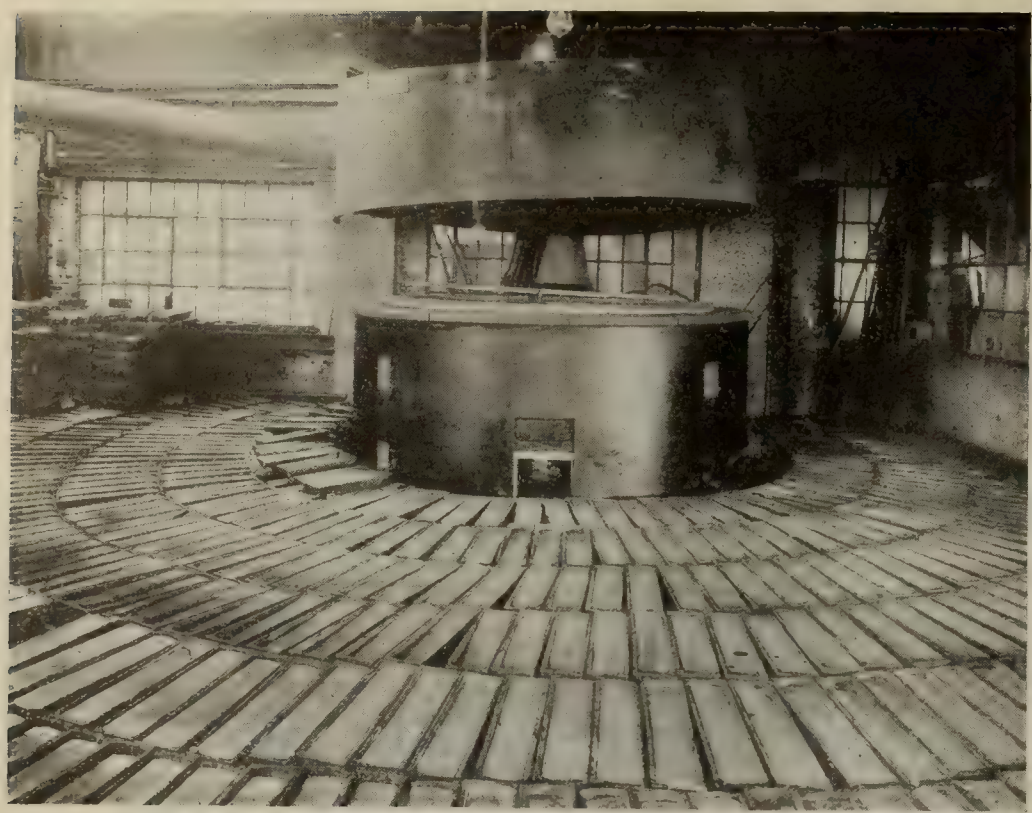


LEADPIPE PRESS FORMING A SINGLE LENGTH OF 12 IN. DIA. PIPE WEIGHING 900 LBS.

Babbitt and Lead Products

The production of babbitt metal is not accompanied by the clatter and rattle and din of shell manufacture nor is there the hustle and bustle of numerous operatives, gaugers and inspectors; instead there are large melting pots reminiscent of soldiers' soup boilers, next them are the various quantities of selected metals, while a silent individual passes to and fro, glancing at pyrometers which indicate the progress of the melt, sampling the products and despatching them to the laboratory for analysis to check his work, and finally when the alloy has reached the stage where the various contents are in proper condition to exert their full individual and collective influences, the metal is ladled out and poured into the metal moulds which give it the familiar form in which it reaches its users. The entire process is characterized by a confident calmness and unobtrusiveness of operation which reflects the confidence of the operator in the guiding influence of the laboratory worker.

And so it is with all of the work throughout the factory. Leaving the refinery with its cauldrons of liquid metal, not white hot and glaring like a steel works, but glittering with a sheen like liquid silver, and noting with interest the three 35-ton melting pots which are the largest of their kind in the British Empire, the visitor passes to the pipe shop, where a battery of six presses form the lead and various alloys into the numerous forms in which they reach the consumer. One of the illustrations shows a lead pipe press in operation. It is operated by hydraulic power, the cylinder which contains the ram extending down into a pit below the floor level. The upper end of the ram projects into the extruding cylinder which has suitably arranged dies on its upper end. This cylinder is filled with molten lead at a suitable heat, which, when subjected to pressure by the ram from below, is forced out through the dies, and



A CAST FROM ONE OF THE 35-TON MELTING POTS WHICH PRODUCE ANTI-FRICTION BEARING METALS.

assumes the desired shape—circular, square, oval or otherwise.

The engraving shows the melting pot next the press, in which the metal is kept at the required temperature. As shown, the press has just extruded a single piece of lead pipe having a diameter of 12 in. and a weight of almost 900 lbs. In the case of small pipe and rod, the product is guided as it leaves the dies and is wound around reels which form it up into the coils in which it is marketed. Machines of this type produce the miles of lead wire and solder which are annually consumed in all branches of manufacture.

Sheet Rolling

Equally interesting are the rolls in which thick slabs of lead are gradually squeezed down to the various thicknesses required in commerce. A slab of lead, say 30 in. by 18 in. by 3 in. thick is cast in the refinery and after analyses and grading, in placed on the table of the rolling mill. This table is fitted with numerous rollers similar to a steel mill, which enables the slab of meta to be moved back and forth easily. The slab is brought up against the rolls which are adjusted to a height somewhat less than the thickness of the slab. A slight pressure causes the revolving rolls to bite and the metal is drawn in and reduced in thickness as it passes through. The table extends a considerable distance on each side of the rolls so as to accommodate the increased length of the metal as it is gradually reduced from the slab to sheet form. At the far end of the top roll, shown in one of the illustrations, can be seen an operator feeding down the top roll to the required thickness of the finished sheet the amount of each reduction being dependent on the power of the mill and the grade of metal being worked, pure lead with a high degree of ductility being capable of much heavier reductions than other grades whose composition is varied for specific reasons.

From this department the sheet lead may either go to the shipping department or, if intended for final reduction to very fine thicknesses, it is taken to the finishing rolls, where such specialized products as tea lead and so forth are made. Here the rolls are of comparatively small size and very highly polished. They are fitted with wiping mops which remove any foreign particles from their surface and prevent damage to the thin high finished sheets which are so familiar in the form of tea packages, and linings for sheets. Needless to say, the high ductility demanded in lead for this purpose is easily obtained by the refining and controlling methods employed by the company.

The sheet and pipe forms of lead absorb a considerable portion of the output of this metal, but with characteristic progressiveness the firm has found other forms in which to market its product. Die casting, with its everincreasing applications has been successfully undertaken, and castings of any required white metal alloy are now produced in considerable quantity. The manufacture of hollow metal bars in various metals for use in art glass work, sash bar sections, and ventilator materials are allied lines, while further activities include the manufacture of special brass nails for aeroplane construction, and copper nails for shipbuilding requirements, the raw material for which is conveniently produced in the plant.

Subsidiary Developments

The valuable trade connections formed through the manufacture of plumbers' lead fittings gradually paved the way for the handling of bath room fixtures, tubs, lavatories, etc., and an extensive business in this line has developed in late years. A special department is devoted to the making of stone laundry tubs for domestic use, and the complete manufacture of these articles is done on the premises. Carefully selected materials, properly constructed moulds, and a closely controlled method of tempering or seasoning insure a finished article having perfect uniformity of quality, and reliability of construction.

ROLLING MILL DEPARTMENT WHERE LEAD INGOTS ARE ROLLED OUT INTO SHEETS.

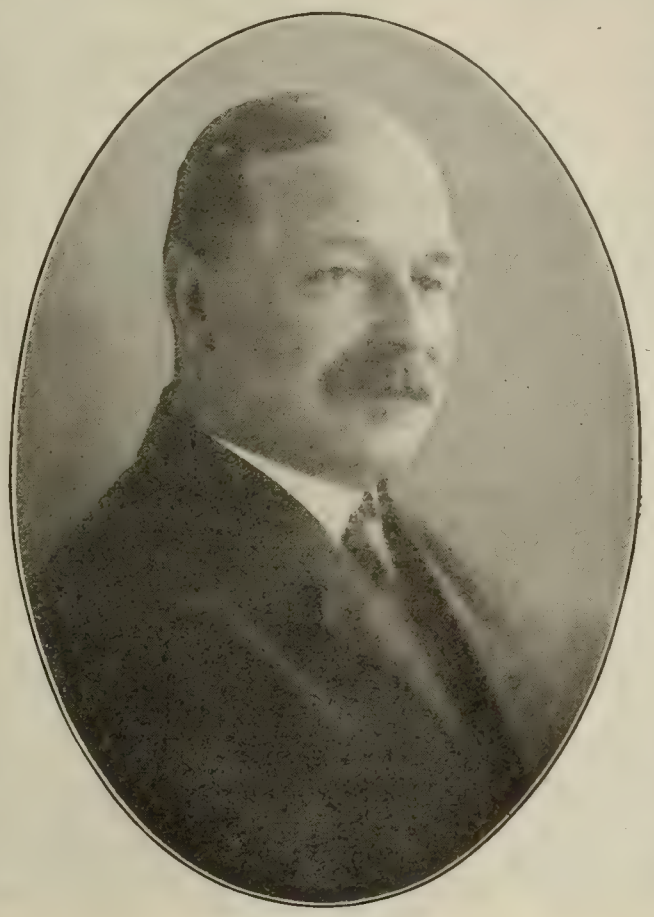
Two departments, not previously referred to in detail, contribute largely to the success of the company's efforts. These are the tool room and the laboratory. The former is necessary in order to build the various machines and devices which have been developed through years of concentrated effort and singleness of purpose. The latter is equally as necessary to check the product in various stages and devise new mixtures and alloys and assist in supplying material exact to customers' specifications. Each is equipped with the best and most suitable tools and equipment. Machines and tools for the rapid and accurate production of dies, or the building of special mechanism, are installed, and skilled labor familiar through long usage with the peculiar requirements of metal working apparatus is employed throughout. The laboratory, of which a view is reproduced, contains many delicate instruments, scales, furnaces, testing machines and reagents to enable the chemist to feel the pulse of the work at all stages, direct the efforts of the various departments intelligently and accurately, and at all times maintain the quality of the product up to specification. By such methods, equipment, plant and employees the Canada Metal Co. has gradually, rapidly and safely developed a highly specialized line of manuture which has stood the country in good, yet silent stead through these critical times, and which will doubtless prove of equally as great avail in the future.

OVERSEAS CORRESPONDENCE

IN a recent report, Harrison Watson, Canadian Trade Commissioner, London, writes as follows:—

"It is clear that owing to lack of means of ocean transportation, United Kingdom import restrictions, and the increasing Government control over the importation and distribution of supplies of all kinds, actual transactions in most lines of Canadian exports are practically impossible at the present time. Upon the other hand, it is a favourable time for propaganda work.

"Owing to complete trade dislocation resulting from the war, it is necessary to seek new sources of supply of most articles and this important subject is now receiving attention from both public bodies and business firms. As, in addition, there is a very strong desire to obtain these supplies from within the British Empire, and indeed to increase inter-Imperial trade relations of all kinds, Canadian producers, manufacturers, and shippers should be urged to take the fullest advantage of the opportunity.



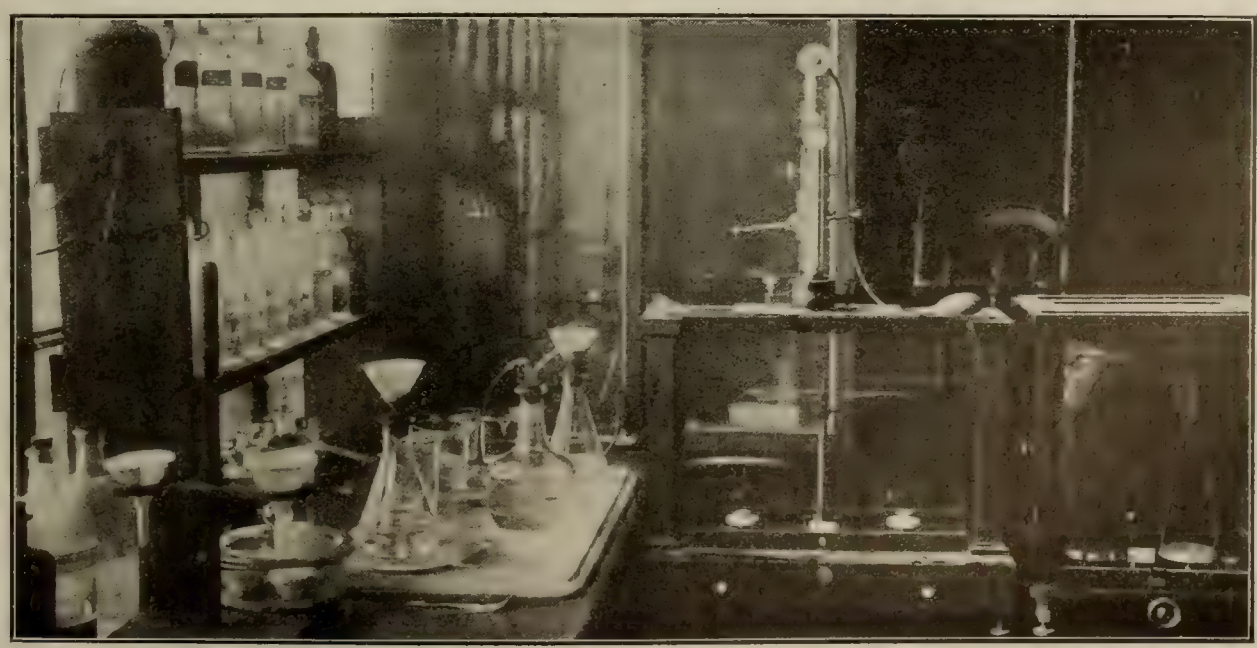
W. G. HARRIS,
President, Canada Metal Co.

"While it is apparent that under present circumstances the work of the Trade Commissioner service in Great Britain must necessarily be mainly confined to spreading a better knowledge of Canada's resources with a view to trade after the war—and this is even more the case in the provinces than in London—the Trade Commissioners, aware of the keen desire of Canada to increase and develop export trade, inform inquirers that Canadian shippers propose making every effor to increase their export trade, and while it is obvious that actual business is impossible at the present time they urge United Kingdom importers in the meantime to initiate correspopndence with Canadian houses, so that information can be supplied and arrangements negotiated which will make definite transactions possible when the war ends.

"For this reason Canadian exporters are urged to make a special effort to reply a little more fully to letters of inquiry addressed to them by potential customers in this country, as a means of getting hold of connections which should be valuable later on, this more particularly as it is so frequently brought to the notice of Trade Commissioners that firms in all parts of this country who have been supplied with the addresses of Canadian houses are greatly disappointed at the results of letters which they write to Canada and the meagre information supplied, in comparison with the response which they receive from other countries to which similar inquiries have been addressed.

Should Anticipate Future Business

"Although persons who are fully aware of the situation which has been existing in Canada for some time past, whereby the complete energy of manufacturers, shippers, and producers has been directed to furnishing war material and supplies for the Allies, will appreciate that Canadian business houses have had little time to attend to anything else, the majority of firms in this country are unaware of this position, and attribute delay, and even failure, to reply to letters to a lack of interest and cordiality. It is obvious that a prompter and fuller response to applications for information would materially assist the efforts of the Trade Commissioners in this country to attract attention to Canada's great resources and trade possibilities."



A CORNER OF THE LABORATORY, SHOWING BALANCES, TESTING MACHINES AND CHEMICAL APPARATUS.

B.C. BUILT SCHOONERS REPORTED SOLD

OFFICIAL announcement is being held in abeyance, but it is reported that the Canada West Coast Navigation Co. has disposed of at least nine of its twelve auxiliary schooners to the Societie Francaise Generals, which acted for the French Government in the transaction. It is said that more than a million dollars profit was made in the deal.

Several of the vessels involved in the reported deal are at sea. The Margaret Haney, first unit of the fleet launched in Victoria, is now trading off the coast of India, having made a quick voyage to Bombay on its initial charter. The Laurel Whalen, the Esquimalt, and the Malahat, are all away on their maiden voyages. The Jean Steadman and the Beatrice Castle are still tied up in the upper harbor awaiting the arrival of Bolinder engines. The Esquimalt and Beatrice Castle have been sold by the Canada West Coast Navigation Co. to other interests since completion.

NEW HIGH CANADIAN TRADE RECORD

EXPORTS of Canadian produce in November were valued at $187,315,515 and the excess of exports over imports amounted to $114,607,076, making new high records for any month in the history of the Dominion. The best previous showing was that of July last, when exports were about 177 millions, and the excess of exports over imports about 87 millions.

The spectacular exhibit for November was due to a heavy outward movement of both grain and manufactures. Exports under the head of agricultural produce reached a total of nearly 78 millions, the highest ever reported for any month. The total of manufactures record, but still high at nearly 68 mil- was considerably below the previous lions. There was some expansion, too, in the minor classifications, chiefly animals and their produce.

Contraction of Imports

The notable increase in the country's favorable balance for the month was partly due to a contraction in imports, which were the smallest of any month since February. If the recent contraction stood for any important economy in Canadian buying of luxuries in foreign markets, the decline would be encouraging. Possibly economy was some factor, but more probably it is due very largely to the new difficulties of Canadian manufacturers in securing raw materials in the United States. If that is the case, some decline in the volume of exports of manufactures must be looked for in due course, with adverse effect on the general trade figures.

Year's Results Impressive

The trade results for the current year become more and more impressive as the year draws to a close. For the eleven months to November 30, exports total $1,399,018,936 and the excess of exports over imports to $455,519,369, the latter comparing with $262,957,000 for the same period in 1916, $115,980,000 for the same period in 1915. In the same eleven months of 1912 there was a balance against Canada of $281,123,000.

Eleven months' figures to November 30 in each of the calendar years, as taken from the Montreal *Gazette* records, show the following comparisons:

Year.	Exports.	Imports.	Balance.
1917 ...	$1,399,018,000	$943,499,567	+$455,519,369
1916 ...	961,666,000	698,709,000	+ 262,957,000
1915 ...	521,953,000	405,973,000	+ 115,980,000
1914 ...	342,098,000	450,922,000	— 108,824,000
1913 ...	380,410,000	614,057,000	— 233,647,000
1912 ...	303,320,000	584,443,000	— 281,123,000

+Excess of exports.
—Excess of imports.

As usual, the figures are based on exports of Canadian produce only and imports entered for consumption, with gold exports and imports excluded.

The favorable balance of $114,607,000 for November compares with $36,868,000 in the same month last year. Exports increased nearly 80 per cent. in value, largely no doubt because of increased prices rather than increased volume, while imports were virtually stationary. Comparisons for November since 1912 follow:

Nov.	Exports.	Imports.	Balance.
1917	$187,315,515	$72,708,439	+$114,607,076
1916	109,558,000	72,690,000	+ 36,868,000
1915	92,931,000	45,217,000	+ 47,714,000
1914	42,872,000	31,552,000	+ 11,320,000
1913	57,762,000	50,202,000	+ 7,560,000
1912	43,781,000	59,318,000	— 15,537,000

November Details

As already noted, grain and manufactures were the principal factors in the record-breaking exports for November. In the usual official classification the exports compared with those for November last year and October this year as follows:

	Nov., 1917.	Nov., 1916.	Oct., 1917.
Mine .....$	6,879,290	$ 7,026,024	$ 7,668,525
Fisheries ..	4,315,983	2,600,021	3,744,367
Forest	5,438,570	5,172,272	4,900,739
Animals ..	23,237,442	13,603,193	18,679,265
Agricul. ..	77,961,781	36,789,632	45,504,815
Manuf. ...	68,947,268	44,119,094	74,419,973
Miscell. ...	535,181	248,714	176,060
Total .....$	187,315,515	$109,558,950	$155,093,744

The second half of the year is establishing large gains over the first half, and probably the December return will be but little inferior to the returns for the past few months. Exports and imports by months show:

1917.	Exports.	Imports.	Balance.
Jan. ....$	99,106,259	$ 72,323,074	+$ 26,783,185
Feb.	68,224,383	68,030,469	+ 193,914
March ..	122,415,312	102,335,886	+ 20,079,426
April ...	65,145,449	86,807,809	— 21,662,360
May	149,057,236	107,596,379	+ 41,460,857
June	116,285,841	97,515,067	+ 18,770,774
July	177,366,148	90,181,595	+ 87,184,553
Aug.	146,387,586	91,931,009	+ 54,456,577
Sept. ...	112,621,462	75,893,364	+ 36,728,098
Oct.	155,093,744	78,176,476	+ 76,917,268
Nov.	187,315,515	72,708,439	+ 114,607,076
Total .$	1,399,018,936	$943,499,567	+$455,519,369

STEEL PRODUCED FROM HYDRO-ELECTRIC ENERGY

THE electrical production of such products as fine steel, calcium carbide, carborundum and other substances requiring high heat, is growing, and will undoubtedly utilize an increasing share of the electric energy derived from Ontario's water-power.

The high prices now prevailing for coke and coal and for steel products make the electric furnace very attractive, and there is every indication that electric steel production in Ontario will grow rapidly during the next year or two. It is anticipated that the electric furnace will not only be applied to the production of high-speed tool steels, but that it will also be used to smelt the coarser grades now produced in the open-hearth furnace. There is also every indication that electric smelting of iron, copper and other ores will be an important factor in the mining districts of the province.

The British Forgings, Toronto, has installed ten electric furnaces of a capacity of 6 tons per heat each, or an annual capacity of 72,000 tons. This is the largest electric steel plant in the world, and uses electric energy generated at Niagara Falls. This, therefore, furnishes an additional reason why our water-powers should be kept under public control to ensure powers to industries at the lowest possible cost.

LOW-GRADE FUEL PROBLEMS

THE plants in Canada which use steam to generate electric energy are faced with difficulties owing to the present high prices and poor delivery of the grades of coal which heretofore have been most popular for steam-producing purposes. The problem is not so much to secure the largest number of kilowatt-hours per pound of coal, as to determine the fuel that can be utilized without making too many changes in the existing equipment, and to provide for its continuous delivery. Many other industries besides electric plants could profit by ascertaining the low-grade fuels available for their use, and, if necessary, so modifying their equipment that they could be used.

Many types of low-grade fuel are being successfully burned, such as soft coal with high ash content, bone coal, culm, lignite, coke breeze, anthracite screenings, etc. Before changing to the lower grade of coal, however, each company should first determine the methods whereby they will solve the problem involved in utilizing it. These problems include a reduced steam output from the same grate surface, additional moisture in fuel, clinkers, draft and the fusing of firebrick.

Electric companies now using lower grades of fuel than heretfore find it advantageous to co-operate with the mines in securing a full supply of coal in the summer, when the mines have an ample supply on hand and the railways are in the best position to handle it.

Year's Building in Montreal. — Up to December 19 building permits numbering 1,574 of $4,348,873 value were granted during the year 1917, as against 1,880 permits, value, $5,333,204, in 1916. No great change either way is anticipated in the coming year.

The power house plant, machinery and equipment described in the following article represent a degree of excellence in design and arrangement equalled by few plants elsewhere and possibly excelled by none. In addition to being evidence of the technical skill and ability of the officials concerned with its construction, it further affords convincing evidence of the manner in which reputable power companies realize both their duty to present consumers and the necessity of preparedness for emergencies as well as future developments.

THE tremendous war-created activity in metal working and power using plants throughout Ontario, with its resulting drain upon the electrical resources of the province, has directed so much of the general public's attention to hydro-electric power plants and schemes that comparatively little attention has been given to the scale on which privately-owned systems have been increasing their capacity and strengthening their system generally so as to insure continuity of service under any required circumstances.

Location and Capacity

These circumstances render more than ordinarily interesting the extremely modern and complete steam operated power station which has just been recently completed and put into service by the Dominion Power & Transmission Co., Hamilton, Ont. The plant is situated just outside the eastern limits of the City of Hamilton, and is designed to have an ultimate capacity of 75,000 K.V.A., of which 25,000 has been installed up to the present time. The output is delivered at a voltage of 42,000 to the high tension lines of the company, whose main source of supply is their hydraulic power plant at DeCew Falls, 34 miles distant from Hamilton.

In addition to its generating capacity, the steam plant is designed to act as a stepdown transformer station of 25,000 K.V.A. capacity to transform the high tension current to 13,200 volts for distribution to local factories in the manufacturing district in the near vicinity. Fifty per cent. of this stepdown capacity, i.e., 12,500 K.V.A., has been installed so far.

General Layout

A cross sectional elevation of the entire plant is shown in Fig. 1, and an exterior view of the building from the same viewpoint forms the title illustration. By comparing the location of the principal features a clear idea of the arrangement and disposition of the various equipment, items and departments will be obtained. Fig. 1 is particularly interesting, as the actual arrangement of the plant as shown enables the process of power generation to be followed in strict sequence of operation.

Coal Handling

Commencing at the right, the coal handling plant is shown where the fuel is dumped direct from the cars into the hopper of the coal crusher or placed in auxiliary storage provided in this building, which has 1,250 tons capacity. The coal handling plant, which was supplied by C. O. Bartlett & Snow Co., has a capacity of 60 tons per hour, and includes a feeder, crusher, elevator and weighing larry. The steel-cased double-plunger feeder has a 26 in. by 30 in. opening, the coal being moved by two plungers operated by adjustable eccentrics. It is driven by sprocket and chain drive from crusher countershaft through a clutch, so that it can be cut out at any time and the crusher driven independently.

The feeder discharge is coupled directly to the top of a 2-roll crusher, directly gear-driven by a 25 horse-power Westinghouse motor at 750 revs, per min. Each roll consists of two heavy cast iron spiders supporting six cast steel segments, forming a roll 26 in. dia. by 24 in. long. The roll shafts are 4 7/16 in. dia., one being rigidly supported, while the other is carried on adjustable sliding bearings backed up by heavy coil springs. They are set to deliver coal of 2 in. size and under.

The bucket type elevator is a conspicuous feature in Fig. 1, extending from the crusher below the train tracks up to the bunker between the stacks. It has a length of 138 ft., and is enclosed in a casing 5 ft. high by 9 ft. wide, with ladders on either side. The coal bunker has a capacity of 420 tons, and is pro-

vided with three 18 in. by 18 in. double undercut doors, through which it drops into the weighing larry.

Boiler Room

Interior view of boiler room, Fig. 2, shows the weighing larry in position for supplying fuel to the two nearest boilers. The hopper of the larry has a capacity of 5 tons, and as can be seen in the illustration, is supported on two cross girders like an overhead crane, the rail centres of the overhead track being 21 ft. The hopper scale has a capacity of 10 tons, with reverse reading beam. The gates on the delivery spouts which lead from the hopper to the stokers are controlled from the larry cage, as are also the overhead bunker doors. A 5 horse-power Westinghouse slip-ring polyphase motor is direct geared to the larry trucks for traversing purposes.

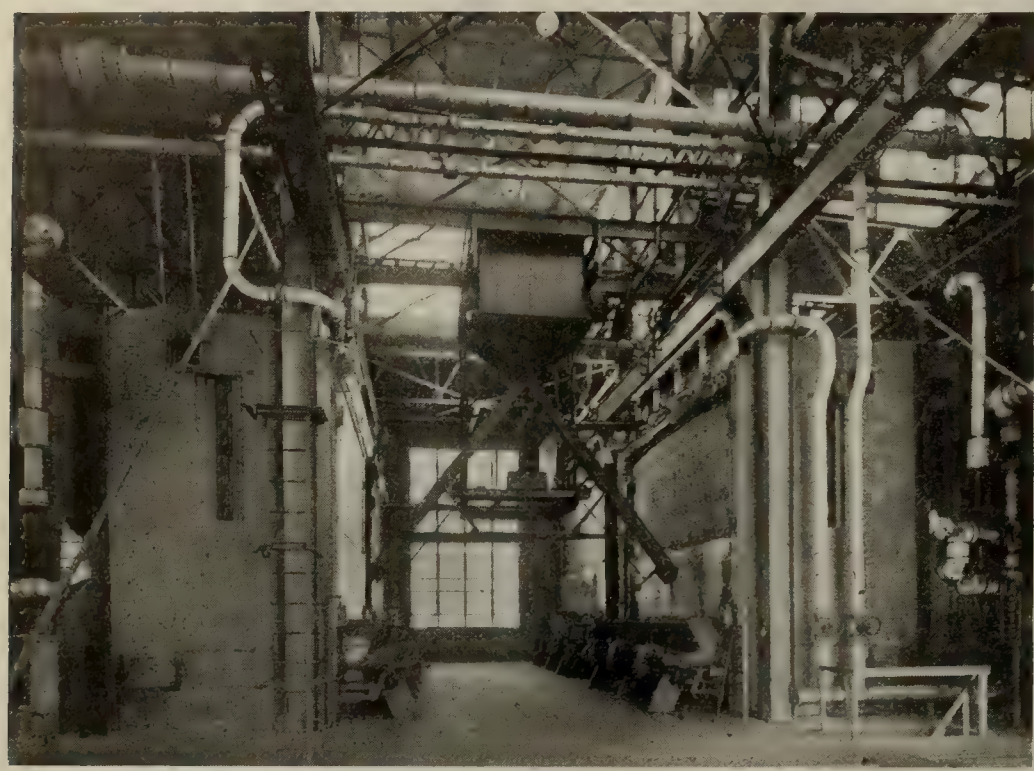


FIG. 2. MAIN AISLE OF BOILER ROOM, SH OWING OVERHEAD COAL LARRY WHICH WEIGHS THE FUEL AND DISTRIBUTES THROUGH CHUTES INTO THE STOKER HOPPERS.

Inclined Tube Boilers

Four water tube boilers of the inclined tube type are installed. These are built in single settings, and were supplied by the Edge Moor Iron Co., having an individual capacity of 1,050 horsepower. Each boiler has four drums made of 7/16 in. plate, with an outside diameter of 35⅛ in. and a length of 20 ft. They are constructed of fire box steel, and the longitudinal seams are double butt strapped and triple riveted.

Each boiler has 472 Am. standard soft steel tubes, 4 in. dia. by 20 ft. long, the two lower rows being No. 9 gauge and the balance No. 10. Flanged steel header construction is used, along with oval hand holes and inside covers, which are tightened by boiler pressure, and are independently removable.

Stoker Installation

The mechanical stokers were constructed by the Taylor Stoker Co., and each has 11 retorts, the total width being 19 ft. 6 in. and depth 8 ft. 3½ in. One stoker engine is provided for each pair of stokers, and the same practice is followed with the fan equipment. The fan engines were built by the Harrisburg Foundry & Machine Works, and are of horizontal type. They are located on the ground floor level next the condensers, and are supplied with heated air from the generator cooling system.

The fan wheels are direct connected to the engine crankshafts and are capable of delivering sufficient air to operate all of the stokers at 150 per cent. of their normal rating. The stokers, individually, are capable of firing their respective boilers at a sufficient rate to force them to 235 per cent. normal rating without difficulty. Boiler accessory equipment includes Ashton pop safety valves; Hancock feed water and check valves; Faver blow-off valves; Homestead blow-off cocks; Ashcroft steam gauge and Reliance water column. Automatic soot blowers and the customary instruments to enable the engineers to operate the boilers efficiently are likewise provided. Rolling doors provide convenient access to the tube header and form an attractive front to the boiler.

Foster superheaters are installed on each boiler, under guarantee to raise the temperature of 31,500 lbs. of steam per hour to 538 degs. F. which, at a pressure of 200 lbs. per sq. in. represents a superheat of 150 deg. When operating at 150 per cent. of boiler rating, this degree of superheat would be increased to 160.

Chimney Stacks

Flue gases are distributed to the atmosphere by two chimneys of radial brick construction, erected by Canadian Kellog Co. The stacks are of identical proportions, being 240 ft. high above foundation; 22 ft. 2 in. dia. base; 12 ft. internal top diameter. They are lined to a height of 40 ft. from a point 2 ft. below flue opening. The lightning conductors have 6 copper points, ¾ in. dia. by 8 ft. long with 1½ in. solid platinum tips all connected and grounded in accordance with best modern practice. Accessory equipment includes 4 in. H. and M. draft gauges and connections and 2 in. pyrometer connections.

Water Purification Plant

The make up water for the plant is obtained from Burlington Bay and in order to render it suitable for use is

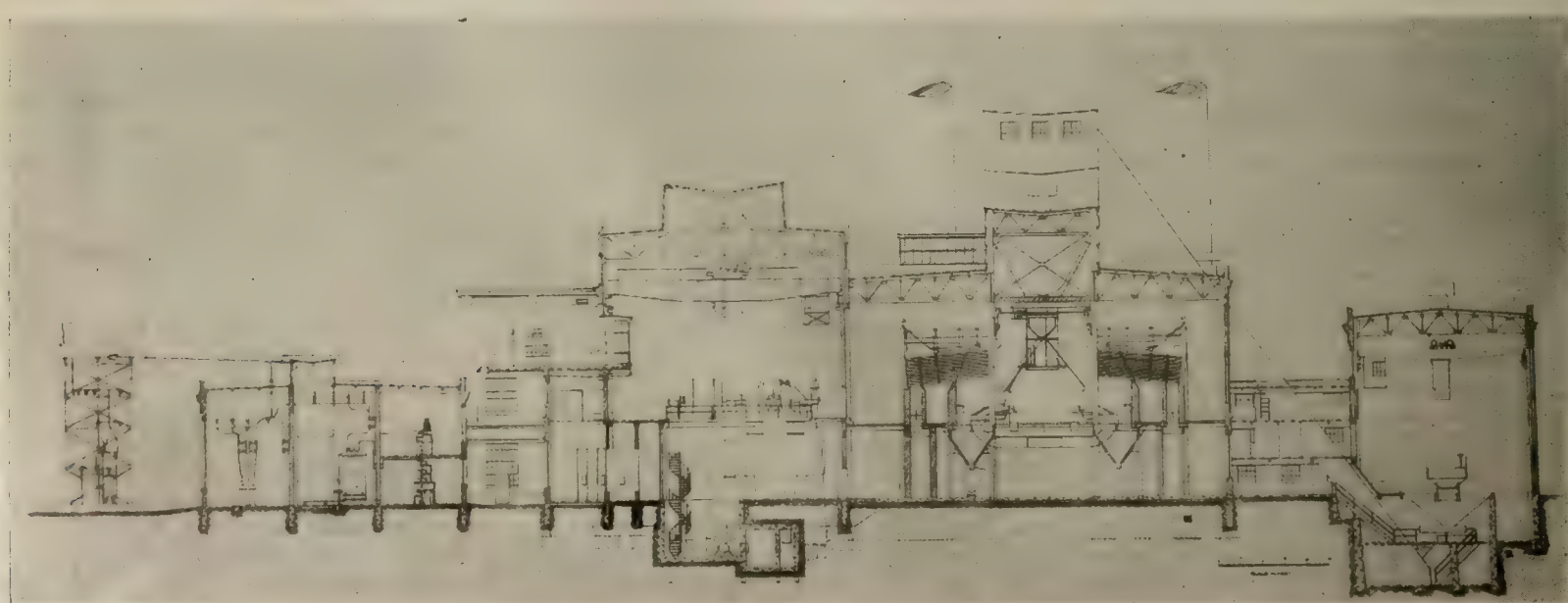


FIG. 1. SECTIONAL ELEVATION OF POWER STATION. NOTE SYSTEMATIC ARRANGEMENT OF OPERATIONS FROM RECEIPT OF FUEL AT RIGHT TO DELIVERY OF CURRENT TO DISTRIBUTING LINE AT LEFT.

treated by the We-Fu-Go system of water purification. This plant is housed in a separate building at the extreme left of the title illustration, and was installed by Wm. B. Scaife & Sons Co. It is of quite extensive proportions, and amongst principal items are two reaction ft. 4 in. high, equipped with mechanical 4 in. high, equipped with mechanical stirring devices and each requiring 4 hours for treatment of its capacity of water.

Two filter tanks 8 ft. dia. by 5 ft. 4 in. high contain the filter beds of crushed quartz (98 per cent. silica) supported by a layer of washed and graded gravel. The flow of water from the settling tank into the filter tank is regulated by brass-fitted balanced valves with seamless copper floats. Constant alarm bells operated by the floats ring in water softener and boiler rooms. The filter beds are provided with air wash pipes for cleansing purposes, having discharge openings equally distributed over the filter beds and connected to a pressure blower.

The two generating units installed are identical in type and size, being Westinghouse turbo-generators of 10,000 equivalent K.W. capacity, delivering 3-phase current at 6,600 volts; 1,100 amps. per terminal; 66 2-3 cycles. The generators are of the 4 pole type and run at 2,000 revs. per min.

The layout of the plant is such that when future extensions are completed, six turbo-alternator units will be accommodated, each of a maximum rated capacity of 12,500 K.V.A. giving a total station capacity of 75,000 K.V.A. or an equivalent of 60,000 K.W. at a power factor of 80 per cent.

The generator department occupies the central portion of the power house, the three principal parts—boiler room, generator department and switch and transformer rooms being parallel with each other, as shown in Fig. 1. There are three floor levels in the generator department; the lowest one is below ground level and forms the pump well for the condensed circulating pumps; the ground level floor on which are carried the condensers and auxiliary equipment, and on which rest the foundations for the turbo-generators; the main or operating floor on which the generating units are erected, and which is level with the boiler room floor (see Fig. 1). Two views of the main floor are shown in engravings Figs. 3 and 4 while a view of the auxiliary equipment for one unit is shown in Fig. 5. The plan layout of the entire generating equipment is shown in diagram Fig. 6.

Steam Turbines

The design of turbine adopted is that known as the "impulse reaction" type. The turbines are of Westinghouse construction and employ multiple expansion parallel flow.

Steam is admitted through primary admission valves of balanced poppet type enclosed in steam chest. Secondary admission valves, automatically operated by mechanical connection with governor, are arranged to admit steam to lower stage when load exceeds capacity of turbine with steam received through primary valve. The secondary value will also operate in this manner should vacuum or steam pressure fall to a point where the turbine is unable to carry the load normally, returning to its seat when excess capacity is no longer required.

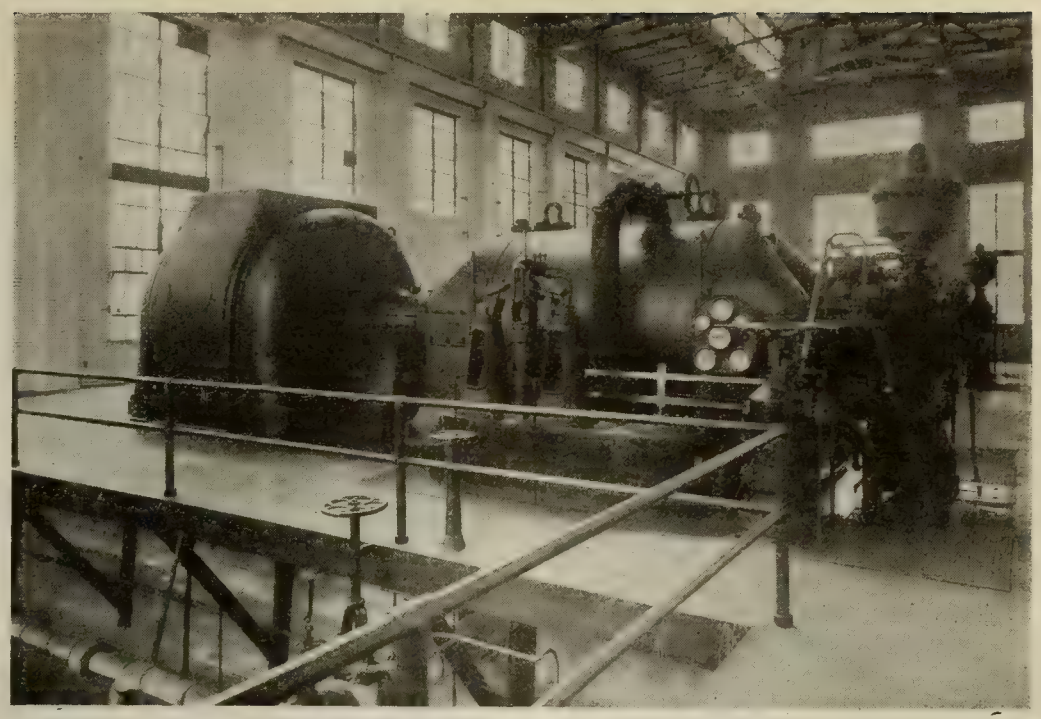


FIG. 4. ONE OF THE 12,500 K.V.A. TURBO-GENERATOR UNITS, SHOWING STEAM ADMISSION VALUES, GOVERNOR GEAR AND THROTTLE VALVE.

An automatic throttle valve, controlled by separate safety governor, is arranged to close before the turbine speed exceeds a safe limit. It can be adjusted for any predetermined speed, and means is provided for tripping by hand from a convenient location.

Blading

The impulse section consists of two rows of moving and one row of stationary blades, the balance of the machine consisting of reaction type blades. The steam passes through the impulse section towards the generator; and then towards the centre of the turbine where it divides and passes toward each end in opposite parallel flows. Nickel iron is the material of which the impulse blades are constructed, and phosphor bronze for the reaction blades.

The main bearings are self-aligning, and lubrication is effected by an oil pump operated from worm gear on turbine shaft, with delivery and return piping between reservoir and bearings, sufficient head being provided to insure ample flooding of bearings.

A speed variation of between 3 and 4 per cent. can be obtained under normal conditions, while a speed changing device is provided with remote control from the operating station.

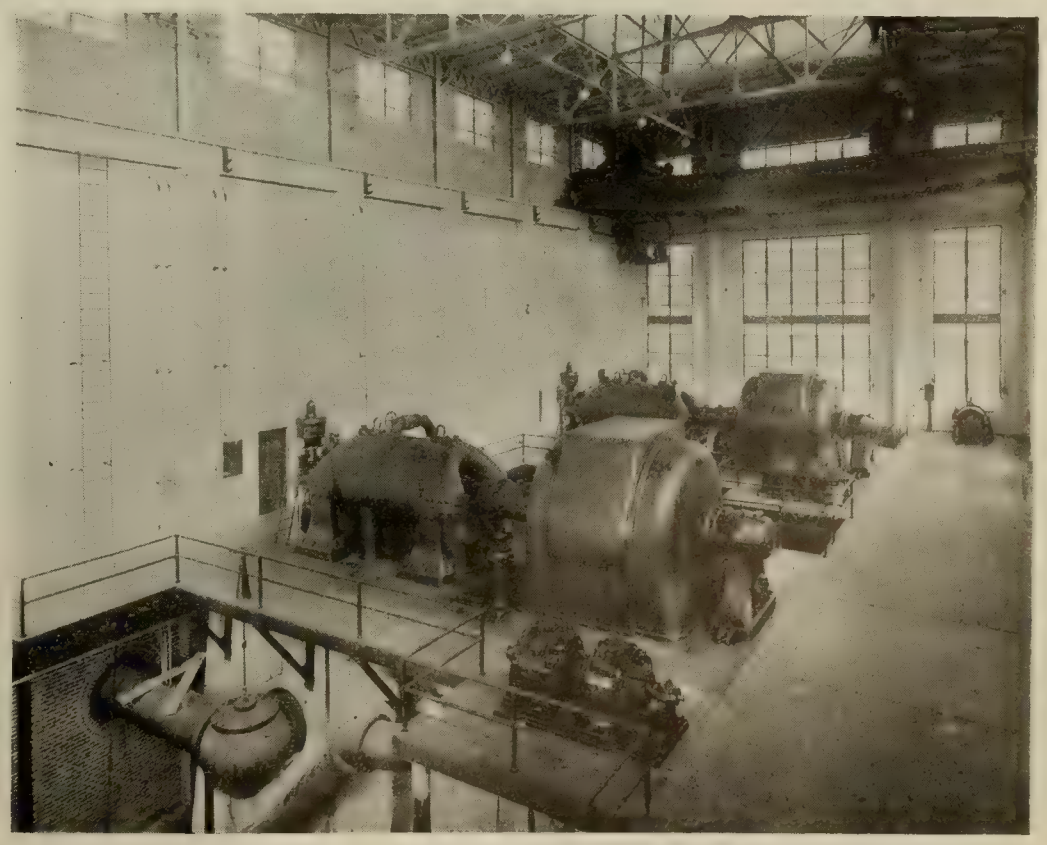


FIG. 3. MAIN FLOOR OF GENERATOR DEPARTMENT. NOTE EXCITER SET IN FOREGROUND, ALSO EXHAUST AND CIRCULATING WATER PIPES.

Condensing Plant

The circulating pumps in the pump well are turbine-driven centrifugals of the closed impeller type. The location of the pump is such that the intake level is 1 ft. below discharge level, the total pumping head, exclusive of friction head through condenser, being 2 ft. The pumps are gear-driven by Westinghouse impulse turbines through reduction gear of the Westinghouse self-aligning type, having right and left hand helical gears to equalize end thrust. The large gears are carried on solid bearings.

The condensers are located on the ground floor immediately below the turbines. They are of the surface type with two passes, the circulating water entering at the bottom and leaving at the top while the steam enters at the top. In the foreground of Fig. 3, can be seen the circulating discharge pipe going down at an angle, also an angle pattern of atmospheric relief valve with discharge pipe passing through wall into boiler room.

The effective cooling surface, measured on the outside of the condenser tubes is 15,000 sq. ft. there being in each condensor 3,040 tubes of 1 in. outside dia. by No. 20 gauge, active length of tubes being 18 ft. 10 in. Both tubes and tube plates are of muntz metal, the plates having a thickness of 1¼ in.

Condenser capacity is such that 13,800 gals. of water per minute will maintain a vacuum of 28 in. (referred to 30 in. barometer) when handling 143,000 lbs. of condensed steam per hour with injection water at a temperature of 68 deg. F.

Hot Well

Individual hot wells are provided for each condenser, the accessory equipment assembled in each group (see Fig. 5) including air pump, condensate pump, feed water heater and boiler feed pump.

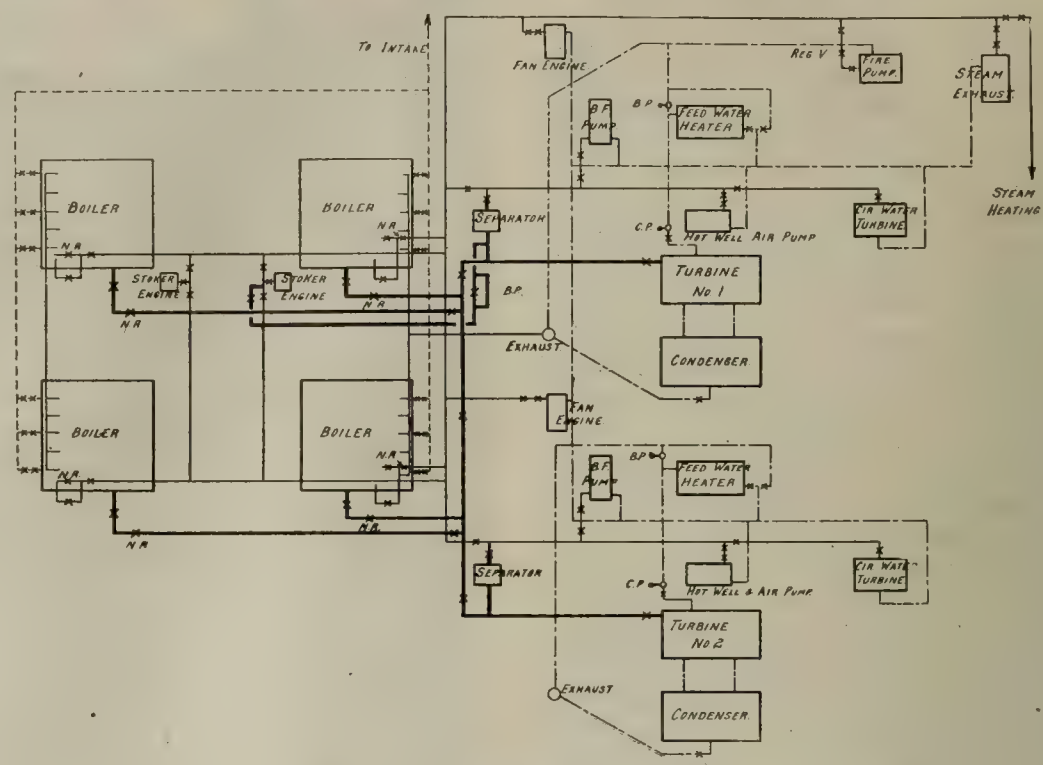


FIG. 6. PLAN LAYOUT OF BOILERS AND AUXILIARY EQUIPMENT.

The air and condensate pumps are mounted on a common shaft and are directly driven by a Westinghouse impulse turbine running at 2,500 revs. per min. The air pump is a Westinghouse-Leblanc rotary with solid bronze runner, and a capacity of 12-2-10 cu. ft. per sec. The condensate pump is centrifugal.

These pumps with the turbine are placed between the Cochrane open type feed water heater and the foundation wall of main turbine, see Fig. 5, the foreground on the illustration being the grating which covers the circulatting pump well. The circulating water pipe from the pump to the condenser can be seen at the left hand bottom corner where it passes through the foundation wall to the condenser.

Behind the feed water heater can be seen the boiler feed pumps and also the fan engine previously referred to.

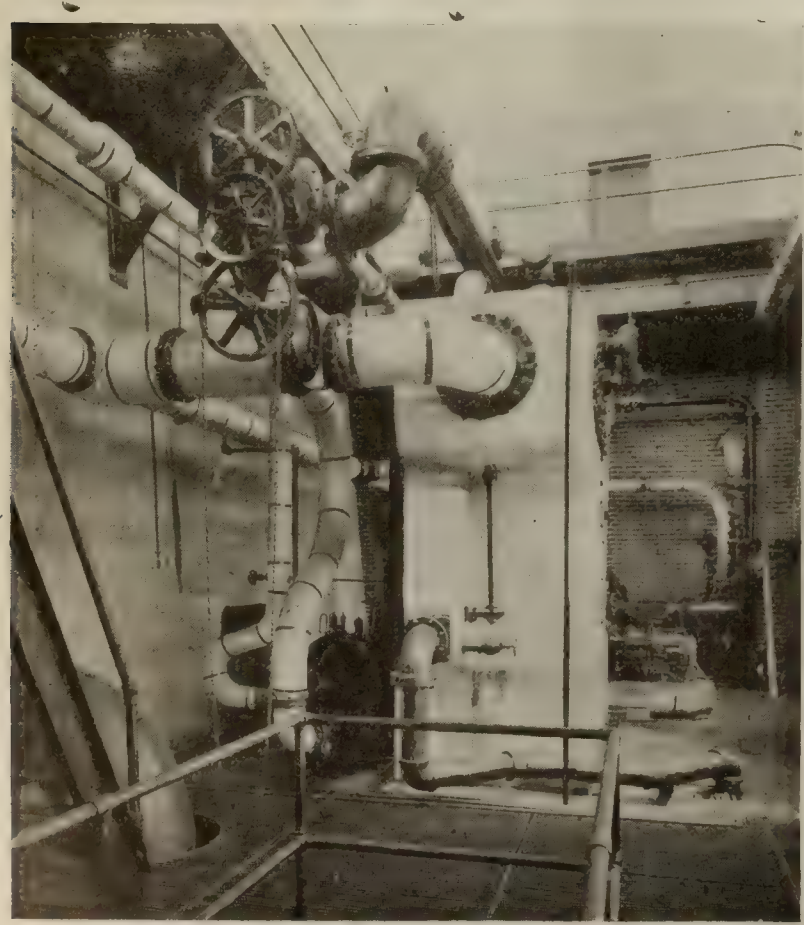


FIG. 5. AUXILIARY EQUIPMENT IN HOT WELL. AIR AND CONDENSATE PUMPS ARE AT LEFT OF FEED WATER HEATER, AND BOILER FEED PUMP BEYOND.

Boiler Feed Pumps

The boiler feed pumps are of the direct turbine driven centrifugal type. A Westinghouse horizontal impulse turbine running at 2,500 revolutions per minute drives a multistage centrifugal pump of the horizontal volute type with double suction, having 3 stages and a capacity of 525 U. S. gals. per min. The total head operated against, including pipe friction is 520 ft., and water up to 210 deg. F. can be handled. The horse-power of turbine at 200 lbs. per sq. in. is 125.

Generator Details

The general appearance of the generators will be gathered from views of main floor Figs. 3 and 4. They are of the revolving field type, with 4 poles, direct connected to the turbine shaft, and having removable end bells to allow access to windings. The field coils are wound with copper strap in slots cut in field core and the insulating material is capable of withstanding a temperature of 150 deg. C. without injury.

The armature core is built of laminated steel in cast iron frame and held firmly in place between two end plates. The armature winding is insulated with material with 90 deg. C. safe limit of temperature rise.

The windings and core are cooled by forced draught generated by two sets of fan blades attached to the rotor shaft which draw air from the air conditioning plant and force it towards the centre from both ends, whence it is expelled outward in a radial direction through air ducts into the passages which give the characteristic external appearance to generators of this type. The warm air is then returned to the conditioning plant where it is cleaned, cooled, and delivered to the intake passages of the generators again.

Air treating plant was installed by the Carrier Air Conditioning Co, and consists of 2 No. 263 F humidifiers with the necessary tanks, sprays, eliminators, pumps, piping and nozzles. Each has a normal capacity of 78,000 cu. ft. per min., with overload of 109,000 cu. ft.

The eliminators consist of vertical galvanized iron plates spaced uniformly in rows, and with parallel surfaces bent to a small angle so that a series of continuous sinuous passages are provided through which the air must pass. The first four corrugations of eliminator plates act as washing surface and are closely spaced so that air passing through is broken up in small thin layers, causing all particles of dust to come in contact with the wet surfaces. The air then enters the spray chamber in which are 560 spray nozzles which maintain a finely atomized spray against the direction of the flow of air. These spray nozzles are placed 3 ft. in front of the final eliminator plates which are provided with an independent set of flooding nozzles which maintain a constant sheet of water flowing down the wet surfaces and allow the spray nozzles to be shut off entirely in very humid weather and the washing procured through flooded eliminators only.

FIG. 7. INTERIOR OF CONTROL GALLERY AND OPERATING ROOM. BEHIND THE INSTRUMENT BOARD AT THE LEFT IS A LARGE BAY WINDOW GIVING UNOBSTRUCTED VIEW OF MAIN FLOOR (SEE FIG. 3.).

The casing for each humidifier which contains the foreging apparatus is 10 ft. long, 13 ft. 8 in. wide, and 13 ft. 1½ in. high. Each unit has a marine light inside, with external switch, and a 15 horse-power motor is provided for operating the centrifugal pump which supplies the water to the nozzles.

Exciters

Westinghouse motor generator exciter set is provided for, each generator being a 75 K.W. 125 volt, shunt interpole generator, driven by a 112 horse-power, 550 volt, 3 phase induction motor. motor.

Power for the exciters is taken from the 6,000 volt station service bus, through a bank of 6600/550 volt step down transformers, each exciter having its individual transformers and switching equipment, with circuit connections as shown in the schematic diagram Fig. 9.

As a precaution to ensure continuity of service, a spare exciter, driven by a steam impulse turbine, is available, which may be quickly connected to any machine in case of necessity. This is effected by tieing in on the 125 volt d.c. field bus, opening the field switch which connects the machine to the exciter and closing the field switch which connects its with the field bus. The two field switches are remote controlled circuit breakers mounted on a panel which also supports the motor operated contactor for inserting or cutting out resistance in the generator field, the rheostat for this purpose being located behind the panel.

The switch for tieing in the spare unit on the field bus is located on a panel in the operating room which panel also carries the switches for the 50 ton capacity service crane in the engine room. The other half of the same panel controls all circuits supplied by the storage battery, including direct current motors, control equipment, auxiliary d.c. lighting circuits, etc., a tie switch enabling the two sections of the panel bus to be tied together as shown in Fig. 9.

Transformers

Each generator is connected to a bank of three, single phase transformers which step up the voltage from 6600 to 42,000 volts. The machine together with the transformer constitutes a unit and these units are electrically connected only on the 42,000 volt bus, thus introducing two banks of transformers between machines to serve as buffers to the short circuit current, in the event of trouble in one. No special reactance coils are used in the system.

There are at present two banks of step up transformers installed in the power house in a room adjoining the high tension switch room, and separated from it by a brick wall. As shown in Fig. 8, partition walls form pockets to separate each bank of three, single phase, 4,000 k.v.a., 41,000/6,600 volt, oil insulated, water cooled, Westinghouse transformers representing a capacity of 12,500 k.v.a. per bank. They are delta connected on both the high tension and low tension sides.

The conductors from the high tension terminals are of ¾-in. copper tubing and are carried on wall and ceiling insulators through the wall insulator bushings to the 42,000 volt bus bar.

Openings are left in the side walls of the pockets for a passage aisle in front of the row of transformers. A car track runs along this aisle and should it be required to remove a transformer

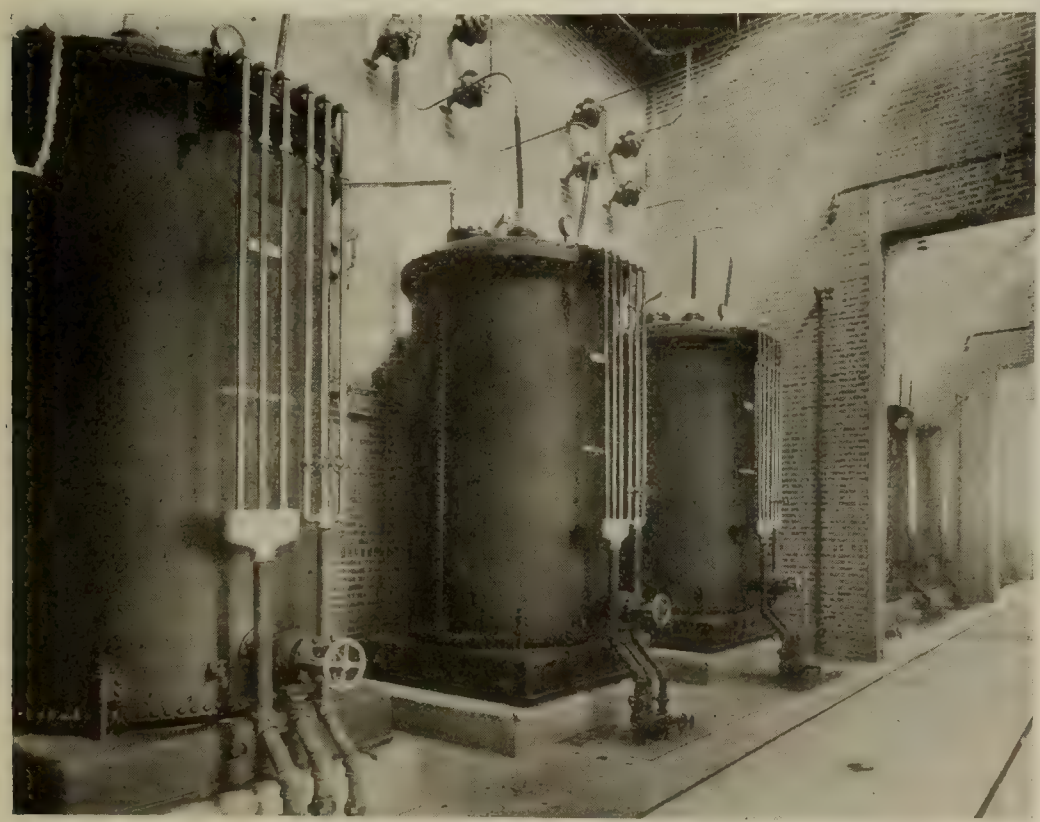


FIG. 8. TRANSFORMER EQUIPMENT. NOTE POCKET ARRANGEMENT OF ROOMS, ALSO WHEEL-MOUNTED BASE PLATES, WHICH FACILITATE REMOVAL OF INDIVIDUAL TRANSFORMERS IN CASE OF MISHAP.

for inspection or repair all that it is necessary to do is to cut the transformer out of the circuit, disconnect the unions on the oil and water pipes and roll the transformer, whose base is mounted on wheels, on the truck. It may then be removed out under the 10 ton capacity hoist in the inspection room at the end of the row, which is separated from the transformer room by a rolling steel door. The remaining two transformers in the bank would then constitute an open delta connection for carrying the load.

Step Down Feeder Transformers

In addition to its generating capacity, the station is designed to act as a step down transformer station for distributing power to the surriunding manufacturing district. The ultimate capacity of the plant devoted to this service will be, when completed, 25,000 k.v.a., but at the time of writing, equipment for a capacity of 12,500 k.v.a. is installed and one 13,200 volt feeder line leaves the station to supply power to the nearby plant of the National Steel Car Co.

The transformation is effected through a bank of three 42,000/13,200 transformers, identical in design and rating to those in the generator circuits. They occupy the last pocket at the North end of the system and are connected on the high tension side through disconnecting switches and a G. A. type circuit breaker to the 42.000 volt bus. The low tension 13,000 volt bus is at the north end of the 6,600 volt bus structure Fig. 12, as also are the switching apparatus, choke coils, and lightning arresters for the feeders. The feeder lines leave the building at this point through the roof and are carried across the roof to the outgoing pole line. The cells containing the aluminum cell lightning arresters are provided with asbestos doors and the choke coils are helices of aluminum rod.

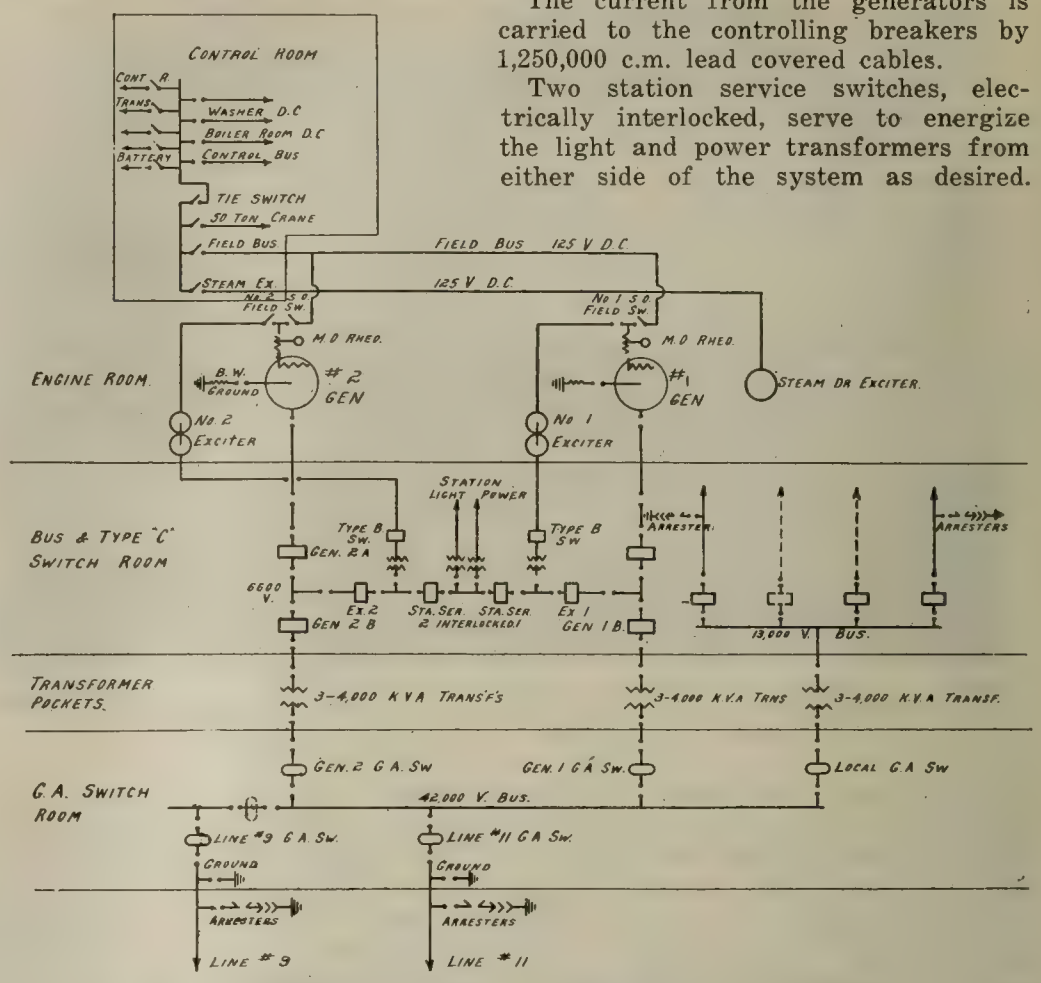


FIG. 9. DIAGRAM OF STATION WIRING SHOWING SWITCHES.

FIG. 10. INTERIOR OF SWITCH ROOM, SHOWING OIL SWITCHES AND BUSES FOR 42,000-VOLT CURRENT.

Low Tension Bus Arrangement

The 6,600 volt bus bar and switching room is divided into upper and lower compartments which contain the necessary switching and auxiliary equipment for supplying alternating current to exciter motors and station light and power service at a lower voltage than 6,600 volts. The low tension distributing, station service, transformers with disconnecting switches, shunt, and current transformers, are installed in a concrete structure in the lower compartment, Fig. 12, and on the floor above are 3 pole, oil circuit breakers shown in Fig .11 for the generators and supply circuits.

The current from the generators is carried to the controlling breakers by 1,250,000 c.m. lead covered cables.

Two station service switches, electrically interlocked, serve to energize the light and power transformers from either side of the system as desired. The controller operates the trip coil of one switch and at the same time energizes the closing coil of the other switch but the closing current cannot flow until the first switch is open, thus the closing of the switch does not commence until the other switch is open.

Control

The operating room shown in Fig. 7 is on the second floor, open to unobstructed daylight on the three sides and with a large bay commanding a view of the turbine room from the fourth side. Here the operator electrically controls the 6,600 volt generator circuits, the 42,000 volt oil switches on the transformers and transmission lines and the oil switches on the 13,000 volt feeders from the bench board.

The main switchboard faces the bay window overlooking the turbine room and is of the benchboard type with dummy buses with the indicating instruments mounted on pedestals in front of the benchboard. All oil switches are equipped with a telltale lamp system, indicating the "open" and "closed" position of the switches on the benchboard in the operating room, by small telephone lamps.

Directly behind the operator are mounted the totalizing panels which show by indicating and graphic recording meters, the total amount of power supplied by each unit to the outgoing lines. A feature of these panels is the row of test connections at the

base of the panels which facilitates inserting a test meter in any circuit desired, should the board meter be damaged or as a check on its accuracy.

The proximity of the panel to the stairway which leads to the room, warranted the enclosing of the rear of this panel by a structure, which gives it a more sightly appearance and at the same time allows of easy access for inspection.

The operating room is sufficiently large to accommodate the necessary control apparatus for the completed installation. The entire number of benchboard sections are in place and it only remains to drill and wire the board as further units are added. Another panel, not shown in Fig. 11 contains the tie switches for the direct current auxiliaries previously mentioned and this is mechanically operated.

FIG. 11. VIEW IN 6,600-VOLT SWITCH ROOM, SHOWING RANGE OF ENCLOSED SWITCHES.

Safety Measures

Reference to Fig. 9 will afford an idea of the ample safety protective devices employed, both for protecting the apparatus and for ensuring safety for the operating force when engaged in examining or repairing any part of the system. Every piece of apparatus may be segregated by means of disconnecting switches, one on each side of every oil switch, and when these are opened the wiring above and around the oil switch is dead and the oil switch can be inspected, and dismantled without danger. The outgoing lines are protected against lightning and static surges by electrolytic arresters. Another detail involving the safety of the operators and the proper operation of the station is the locking of the 13,000 volt disconnecting switches. Where the ordinary knife switch may open up by reason of the magnetic repulsion when carrying heavy loads, thus often seriously damaging adjacent apparatus by the intense heat of the arc, the lock type switch here employed in the feeder lines ensures a positive connection under heavy currents.

Auxiliary Equipment

In a separate room on the ground floor is located the storage battery reserve for supplying direct current to the control, crane service, and other circuits in case of an interruption of the main circuit. This battery consists of 66 cells, has a normal voltage of 125 volts, and a normal discharge rate of 200 amp for one hour.

The 50 ton power house crane is manufactured by Cleveland Crane and Engineering Co. and is the cage operated type. It is provided with mechanical brakes of the double friction, band type, self lubricating and running in oil. A solenoid operated electric brake is also connected to the armature shaft of the hoist motor and connected so as to apply itself in failure of current. It is equally effective in stopping motor in hoisting or lowering and is capable of sustaining the full load of the hoist. Each hoist is provided with Auto circuit breakers, which break the circuit when the hook is raised above or descends below a predetermined point.

A 10 ton capacity, hand operated hoist is provided in the inspection room on the transformer floor. In this room are also the oil tanks for the transformer oil, consisting of two tanks, one for clean, and one for dirty oil. Two small oil tanks for the oil switches and lightning arresters are mounted above the transformer oil tanks. Electro-Seal insulating oil is used.

The transformers and high tension oil switches are provided with sewer connections and provision is made so that in case of an explosion in the tank or a fire, the oil can escape to the sewers.

Two pumps form part of the equipment for handling the oil. One delivers oil from the tanks, up to the transformers and a centrifugal pump operates the small filter press output for filtering and drying the oil.

Transmission Lines

The two 42,000 volt transmission lines leaving the station are carried on one set of steel towers and deliver their output to the high tension out-door switching station at Bartonville, there to be linked in parallel with the long distance transmission lines from the hydraulic station at DeCew Falls.

In order to join the two stations together it is necessary to synchronize the two and therefore synchronizing equipment is provided in the control room. The signalling devices are an aid to the operator when bringing an incoming machine up to synchronism, as by means of it he may inform the turbine attendants, on the floor below, what is desired of them. The various

FIG. 12. ONE SIDE OF THE 6,600-VOLT BUS STRUCTURE LOCATED DIRECTLY BELOW SWITCH ROOM SHOWN IN FIG. 11.

orders are illuminated on the signal board, provided for each machine, by pressing an electric button. The attendant then executes the order and presses the corresponding button on his board, signifying to the operator that the order is carried out. When it is desired to call the attention of an attendant to any particular machine, a Klaxon horn is sounded and a lamp lights up over the machine intended.

It is quite interesting to note that the power station at DeCew Falls can feed back on the 42,000 volt bus in the steam station and cause the generators to operate as synchronous motors, when the turbines are throttled and just sufficient steam admitted to circulate through the turbine blades and keep them from becoming excessively hot through friction effect. This is a particularly valuable feature in this case, for until demand on the station necessitates every unit carrying a power load, those machines not generating may be put to economic use as synchronous condensers for regulating the power factor of the load, thus maintaining the required voltage at the receiving end of the hydraulic line from DeCew Falls under a wide range of load.

From the operating standpoint, this system is very advantageous, as it admits of regulation at the Hamilton end of the line, the generator field being overexcited to increase the power factor and decrease the voltage drop in the lines on heavy loads and underexcited to decrease the power factor and increase the voltage drop on light loads. The improvemnt in regulation thus effected will enable the lines from DeCew Falls to carry more power than before and incidentally show an immediate profitable return on the capital which has been expended, to provide for future power demands.

The power house is built entirely of brick and steel with reinforced concrete floors and is as fireproof as far as any station can be. The inside walls of the engine room are faced with white enamel brick up to the crane level, above which, the walls are satin brick and the ceiling a buff gypsum. The floor is laid with English red quarry tiles and conforms with the general interior finish of the power house to give it a neat and bright appearance. The steel throughout, and most of the cement floor surface, is painted gray.

Every convenience is provided for the operating staff, the equipment including adequate office accommodation for the superintendent, locker room and wash room for the employes, well equipped repair shop and intercommunicating and local telephone system. Excellent lighting is provided throughout, all the larger rooms being very effectively illuminated by properly contained nitrogen lamps suspended from the roof trusses. The plant has been in operation since June 1917, and was designed and built by the following members of the Co.'s organization: W. C. Hawkins, chief engineer and managing director: Geo. Service, mechanical engineer; Chas. H. Hutton, electrical engineer, to whom we are indebted for the illustrations and data accompanying the article.

MAILS BY AIR AROUND WORLD

ADDRESSING a large asembly of members of the Canadian Club at luncheon recently in Toronto, Lord Montague impressed upon his hearers the present and future importance of aviation. In the early days of the war many people had undertestimated the value of aircraft—the airplane and seaplane—in modern warfare. There was no doubt any longer as to the possibilities of the aircraft.

Lord Montagu predicted that the time was not far distant when airplanes would be used to carry the mails around the world. Lord Montague stated that he was a member of a committee in London which has under consideration a scheme for the establishment of an Imperial aircraft service when the roar of guns in the war zone ceases. He believes that all the colonies of the British Empire should be linked up in the scheme.

"Commercially the airplane will play a wonderful part in the developmen of business life of Canada after the war," said Lord Montagu. "Toronto has now become the aviation centre of the North American continent, and after the war the aviation factories and schools of instruction should be continued. They will be necessary. The Germans may be our superior in some respects in the matter of building machines, but they cannot beat us in the quality of the men. Canadian aviators have demonstrated to the Germans that they are constituted in make-up and fighting qualities of the right kind of stuff. Generals who watched them have told me that as fighters at a high altitude they are remarkable for courage, ingenuity and skill."

Eyes of the Army

Referring to the invaluable service rendered by the airplane and seaplane in the present struggle in Europe, Lord Montagu declared that the Generals are kept in close touch with what is going on behind the lines of the enemy. The Allied aviators had demonstrated their superiority over the Germans in this respect and could rightfully lay claim to the title, "Masters of the air." What the Allied armies lacked in man-power was more than made up in the invaluable branch of the army. Lord Montagu impressed upon upon his hearers the fact that with the exception of the United States there was a lack of man-power in the army of every Allied power fighting in Flanders. Consequently every month as the war goes on brings more vididly to the minds of the people the relative importance of the airplane and seaplane.

An Army of Pilots

In conclusion Lord Montagu made a special plea for co-operation in the matter of striving to keep the aviation service and schools of instruction in Toronto and elsewhere at a very high standard of efficiency. He said there were between 1,500 and 2,000 Canadian pilots at the front, while an additional 500 were in Toronto preparing to go to the front.

COAL MINING LEASES

COAL-MINING rights on Dominion lands are disposed of by the Dominion Government under leases, the provisions of which are so liberal as to afford the operator every encouragement. They do not, however, give any consideration to the relation of the coal seams, the order in which they should be worked to prevent waste, the quality of the coal in the several seams and the coal content in the leased areas. The result is that a tremendous tonnage of coal is wasted.

All other important coal-mining countries which dispose of coal-mining rights under a system of leasehold have found it necessary to prevent waste arising from the lessee sacrificing the public wealth for his private gain and waste due to injudicious mining. In Nova Scotia, Austria, Australia and Japan, and in the case of privately-owned coal lands in England, Scotland, and in certain portions of the United States, before a lease is granted or mining operations are begun, it is necessary for the applicant or the holder of a mining right to submit a scheme of intended operations to the proper authorities. To receive approval, this proposed method of mining must be such as to prevent wasteful mining, and, at the same time, provide for the safety of the miners. That the Dominion Government should take measures to prevent the waste under the present system of leasing needs no demonstration.

CANADA'S NICKEL REFINING CAPACITY

IT was pointed out at the first annual meeting of the Commision of Conservation in 1910 that, although Canada was possessed of the richest portion of the world's supply of nickel, we were deriving only a comparatively small amount of benefit from it. The most expensive portion of the work of recovering nickel from the raw ore was done in other countries. This anomaly is now in course of being remedied. As the result of constant agitation and discussion we are likely to see by far the greater part of the work done in Canada.

The British American Nickel Corporation has under construction near Sudbury a new electrically-operated smelting refinery which will have a capacity of 2,500 tons of ore daily and a nickel production of 20,000,000 pounds per annum. The smelter will produce a matte carrying 80 per cent. copper and nickel, which will receive final treatment in the refinery.

The International Nickel Co. is constructing a new refinery at Port Colborne at a cost of $4,000,000, which will be in operation in a few months. The initial capacity will be 15,000,000 pounds of nickel per annum, but it can be expanded in a few years to produce 60,000,000 pounds. The new plant, according to the company, will be able to supply the needs of the whole British Empire.

Review of the Past Year's Iron, Steel, and Metal Markets

Staff Article

The year 1917 has been the most prosperous in the history of the iron and steel trade in Canada, surpassing the immediately previous best twelve months both in regard to tonnage output and price. The most confirmed optimist would hardly have anticipated such developments as have taken place during the year. The war has, of course, been responsible for the increased activity through its enormous demand for steel for munitions and ship construction, and indications point to a continuance of this activity during 1918.

IN a general survey of the iron and steel situation in Canada, it is necessary to consider conditions in the United States as the two markets are so closely allied, particularly owing to the fact that this year the latter entered the war on the side of the Allies. The participation of the United States in the war changed considerably the aspect of the situation when their interests became common with the Allies. Association between the steel trade in the States and Canada became closer, to the mutual benefit of both countries. Very important developments have taken place in the States and considerable space must be devoted to these features as they have had an important effect upon the situation in Canada. Among these developments were the fixing of maximum prices of iron and steel products, and the embargo placed on the export of the latter. Another feature has been the steady advance in prices.

Improvement in the physical condition of Canadian steel plants has taken place during the year. In the time of bad trade there was a disposition to spend as little money as possible on repairs and improvements except when absolutely necessary. This condition has been to a large extent corrected, the cost being paid for out of earnings. The improvements have thus been made without increasing capital charges. During the past three years, important extensions have been made at all the steel plants and output has been considerably increased. These plant extensions have also for the most part been paid for out of earnings. This is an important feature to consider for not only have the plants been improved physically and made more efficient, but the capacities have been increased and earning power is consequently greater. All this has been achieved without increasing capital charges.

Operating Conditions

Operating conditions have not been entirely satisfactory this year. There has been a scarcity of suitable labor for one thing, while some concerns have been handicapped by a shortage of raw materials. For the first three months the mills in Ontario were handicapped through not being able to get full coke supplies on account of the freight congestion on the railways. This trouble eventually was eliminated but the mills got behind on their orders. The mills in Nova Scotia have not been troubled on this account as they have their own coke ovens. A shortage of coal has also affected operations.

During the summer, little complaint was heard regarding shortage of raw materials, but in the fall an acute situation developed in the coke market in the States which adversely affected Canadian consumers. The shortage of coke resulted in a number of blast furnaces being banked in the States which threatened to curtail the output of steel. The freight congestion on the American railways was the principal cause of the trouble although scarcity of labor at the mines and also at the ovens had something to do with it. The severe weather which set in during the early part of December further handicapped the railroads and also operations at the ovens. Drastic measures to relieve the situation are inevitable before conditions can become anything like normal.

Steel Production

The table which is given elsewhere in this issue, compiled by the Mines Branch of the Department of Mines, Ottawa, shows that there was an increase in output of both pig iron and steel during the first nine months of this year over the corresponding period of 1916. The figures also show the imports of iron and steel which are particularly interesting in view of the embargo on these materials from the United States.

The total production of steel ingots and direct castings during the first nine months was 1,265,183 short tons, as against 911,054 tons during the first nine months of 1916. The average monthly production during the first nine months of 1917 was 140,576 tons as against an average monthly production throughout 1916 of 106,268 tons.

The production of steel in electric furnaces, included above, was 30,960 tons during the first nine months of 1917. The production of steel in electric furnaces in September was over 5,000 tons or at the rate of over 60,000 tons per annum.

Electric Furnace Feature

The electric furnace is becoming more popular in steel plants, particularly where electric power is cheap, and constitutes perhaps the most interesting development of the iron and steel trade in recent years. Improvements in design are continually being made with a view to increased efficiency.

An electric furnace installation of considerable size was placed in operation in Toronto this summer. The units installed in Canada so far are mostly of the Heroult type. There are electric furnaces in operation at Toronto, Welland, Montreal, Collingwood, Belleville, Orillia. An electric furnace installation is contemplated at Port Moody, B.C., while there is also a small unit in Toronto producing steel from ore fines and flue dust.

Pig Iron Production

The table compiled by the Mines Branch, Department of Mines, Ottawa, gives the complete returns of the pig iron production for the first nine months of this year and also for 1916. These figures also show an increase in pig iron production for the above mentioned period. The total production of pig iron during the first nine months of the present year was 895,307 short tons as against 844,717 short tons during the first nine months of 1916. The average monthly production throughout 1916 was 97,438 tons, whereas in 1917 the average was about 99,478 tons, representing a slight increase which may be considered satisfactory in view of the difficulty that was experienced in the first three months of the year in obtaining coke, etc., owing to the tie up on the railways, which affected principally the furnaces in Ontario. The exports of pig iron, short tons, in 1916, averaged 1,942 tons monthly and for nine months of 1917 the average was 1,135. In contrast with this decrease, imports increased, the monthly average in 1916 being 4.919 tons and over nine months of the current year it was 5,982 tons.

Furnaces were in blast at Sydney and North Sydney, N.S.; Hamilton, Port Colborne, Sault Ste. Marie, and Deseronto, Ont. Small quantities of pig iron were also produced in electric furnaces from scrap steel at Orillia, Collingwood, St. Catharines, Toronto, and at Montreal. The total quantity of pig iron thus produced in electric furnaces during the nine months was 9,983 short tons.

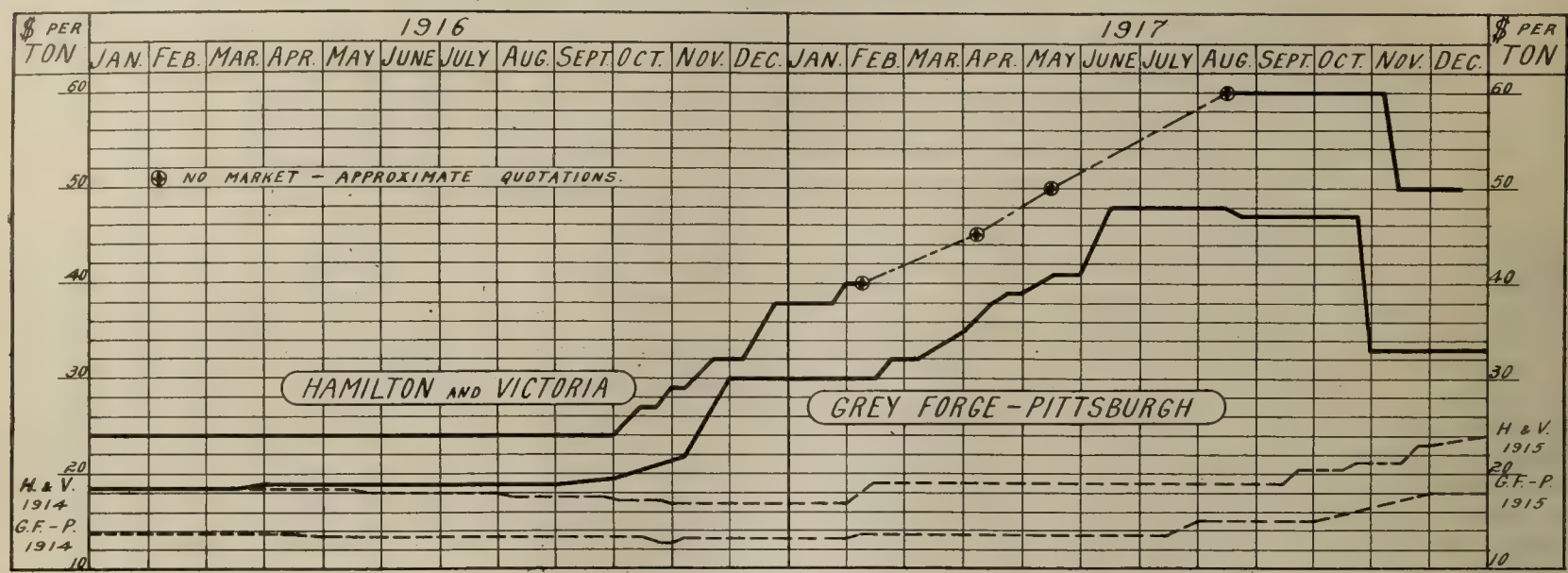
Prices of pig iron have been increasing steadily all the year and a record has been made; the highest price being $60 per ton. The heavy demand is partly the reason for this, with the furnaces for several months behind on deliveries. The most important producer of foundry iron for the open market has been the furnace at Port Colborne, Ont., the others having been for the most part making pig iron for the steel works. On this account there has been a shortage of

foundry iron, which still exists. The high cost of coke has been an important factor in the pig iron situation and has been largely responsible for the continued advances. The fixing of pig iron prices in the States has not affected the Canadian market to any great extent and the opinion is held in the trade that prices of domestic iron will not decline much further for some time, partly on account of the embargo and also because of the sold-up condition of the furnaces.

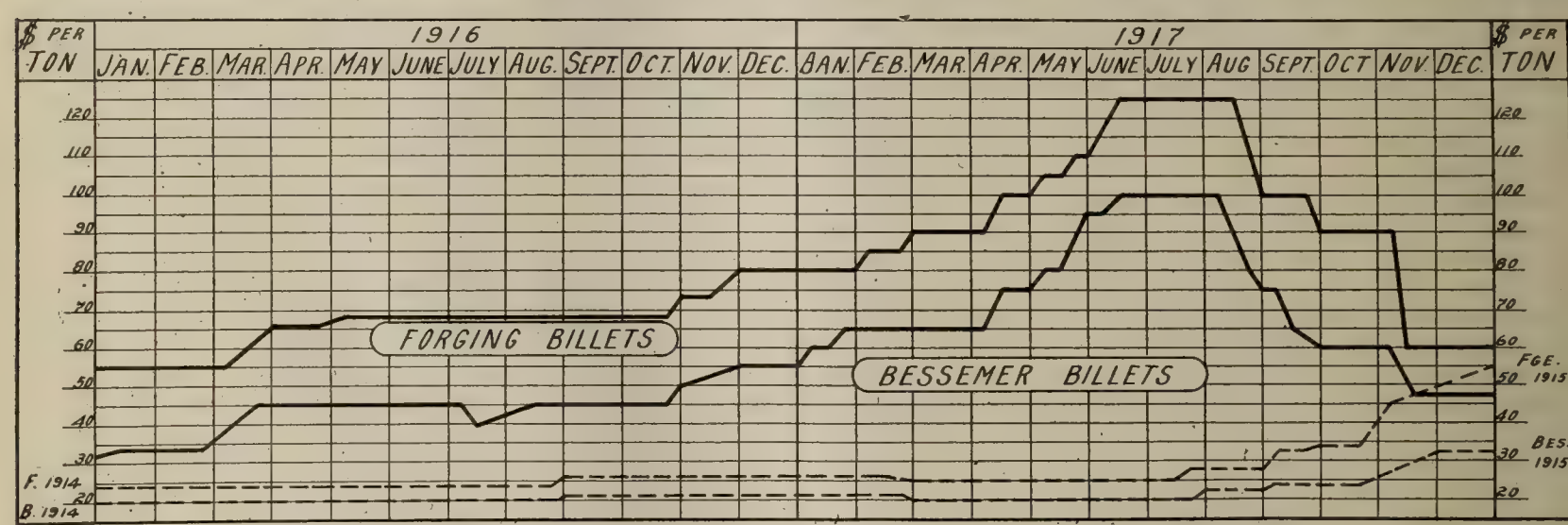
Production Has Increased

The extraordinary demand for steel for munitions was the principal reason for the great activity in the steel industry during the past two years or more. The urgency of the demand made it necessary to increase production and the steel concerns in Canada without exception responded to the call and extended their plants. A large percentage of these extensions was completed last year, therefore the producing capacity of steel has been higher in the past twelve months, which accounts for the increases shown in the tables. Further plant improvements are under way at the mills so that the producing capacity may be said to be still increasing. There is little doubt that full advantage will be taken of this situation and continued prosperity seems assured for the steel companies while the war lasts.

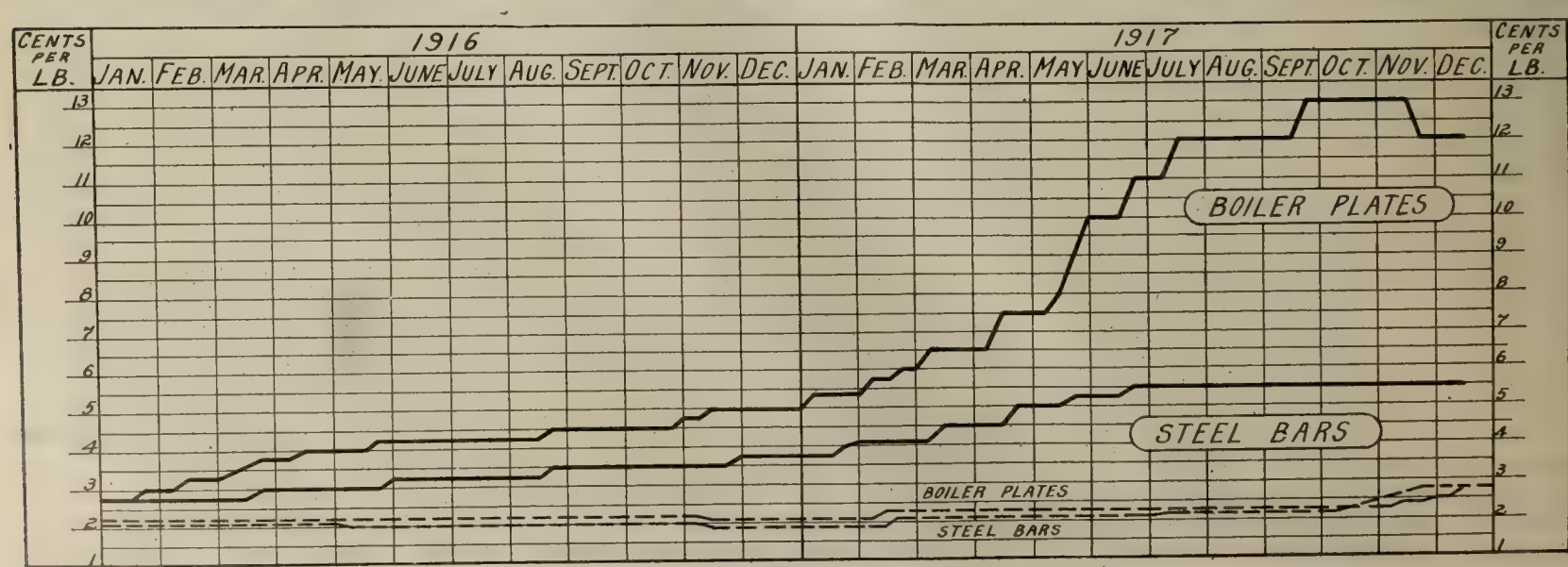
In view of the shortage of steel and increasing demand, Canadian mills will



PRICE FLUCTUATIONS OF PIG IRON DURING 1914-1915-1916-1917.



PRICE FLUCTUATIONS OF FORGING AND BESSEMER BILLETS DURING 1914-1915-1916-1917.



PRICE FLUCTUATIONS OF BOILER PLATE (¼ TO ½- INCH) AND STEEL BARS DURING 1914-1915-1916-1917.

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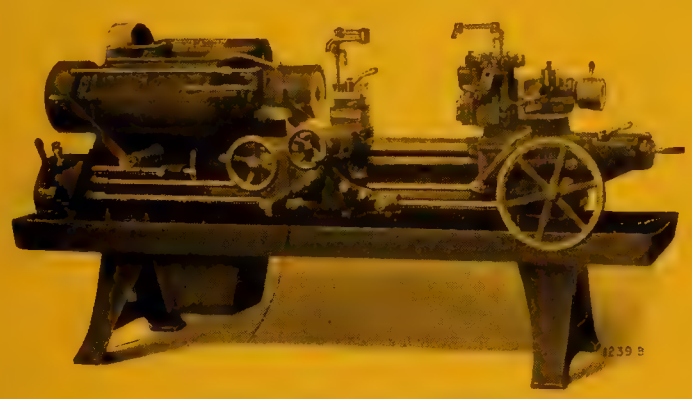

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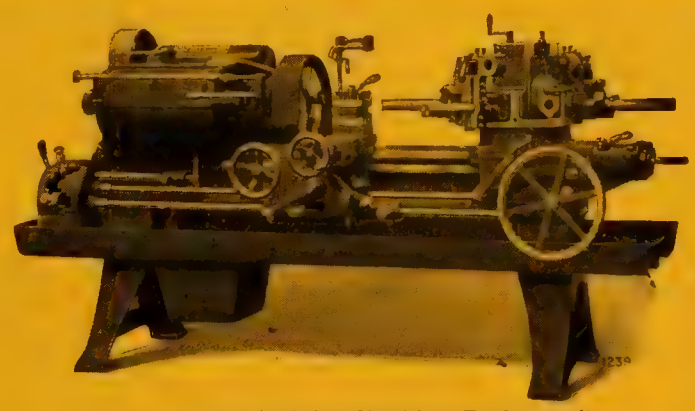

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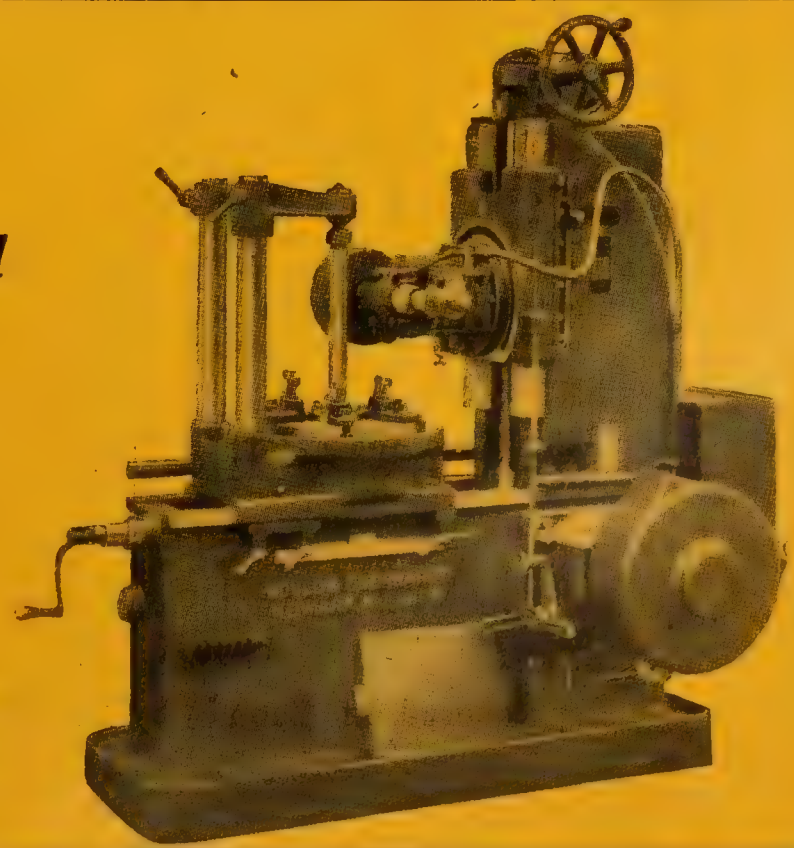

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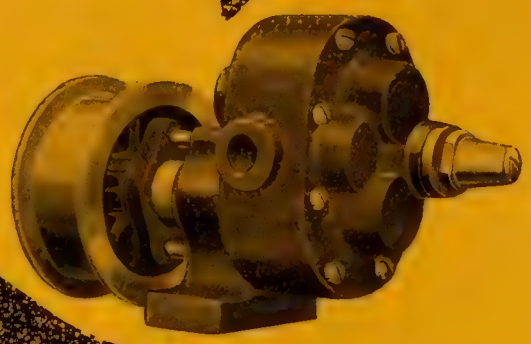

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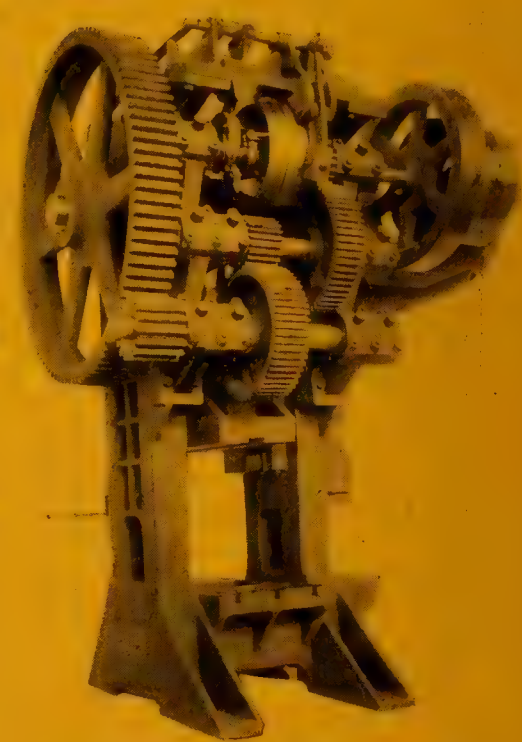

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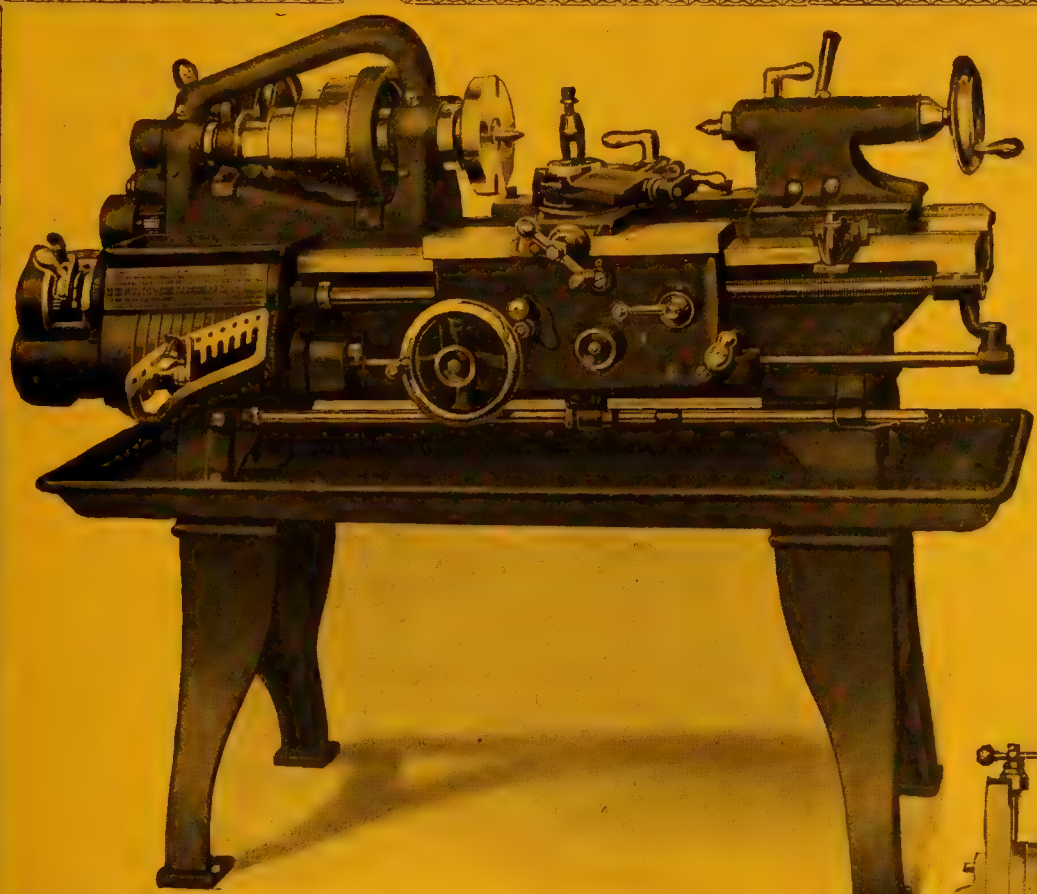

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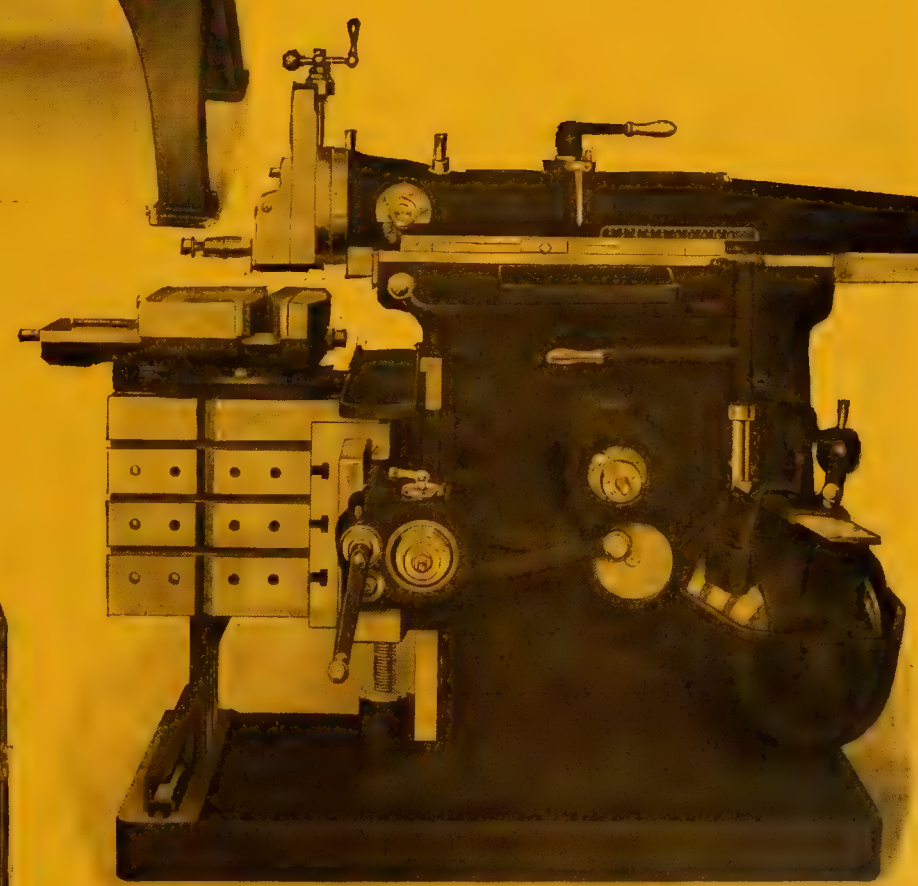

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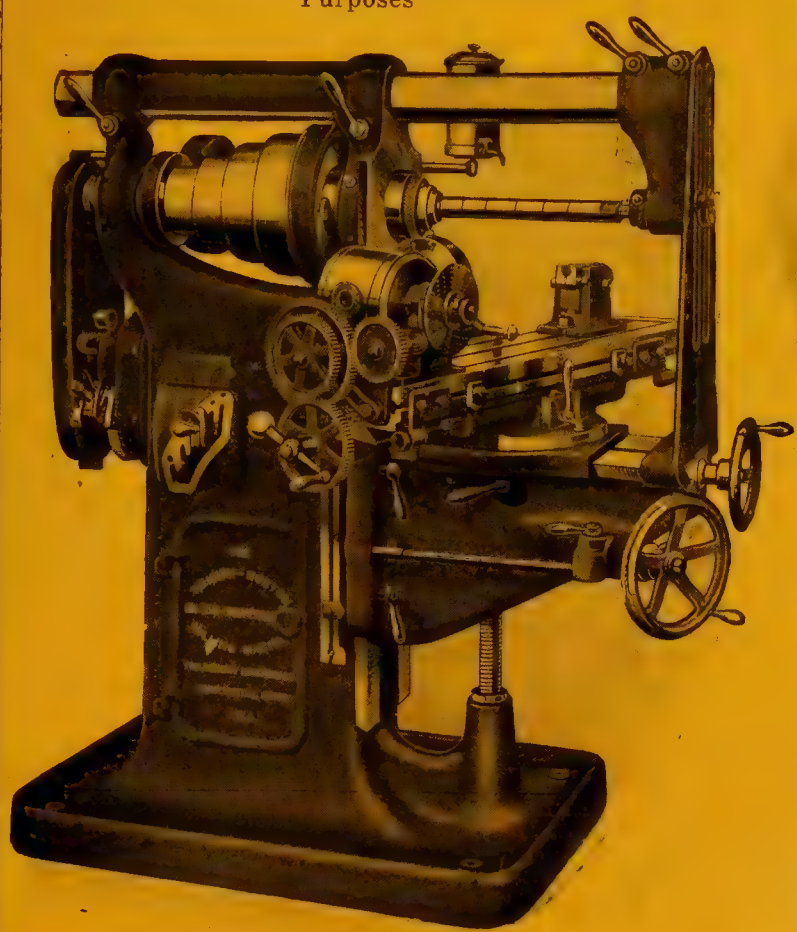

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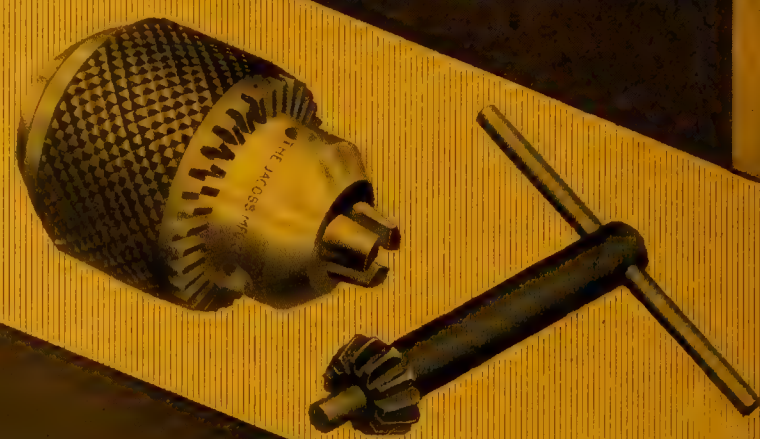

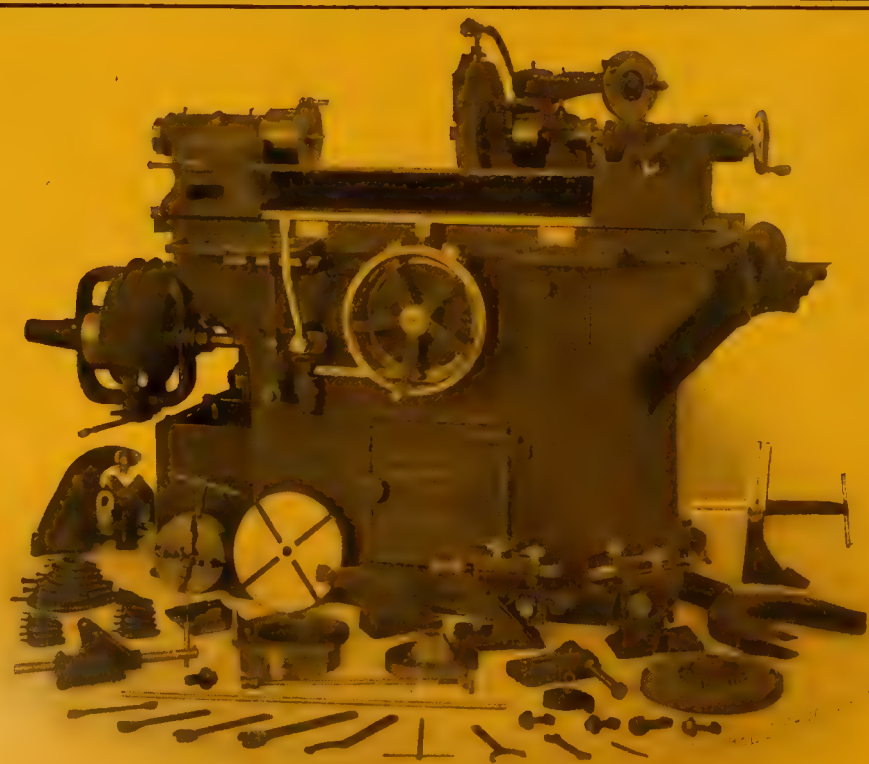

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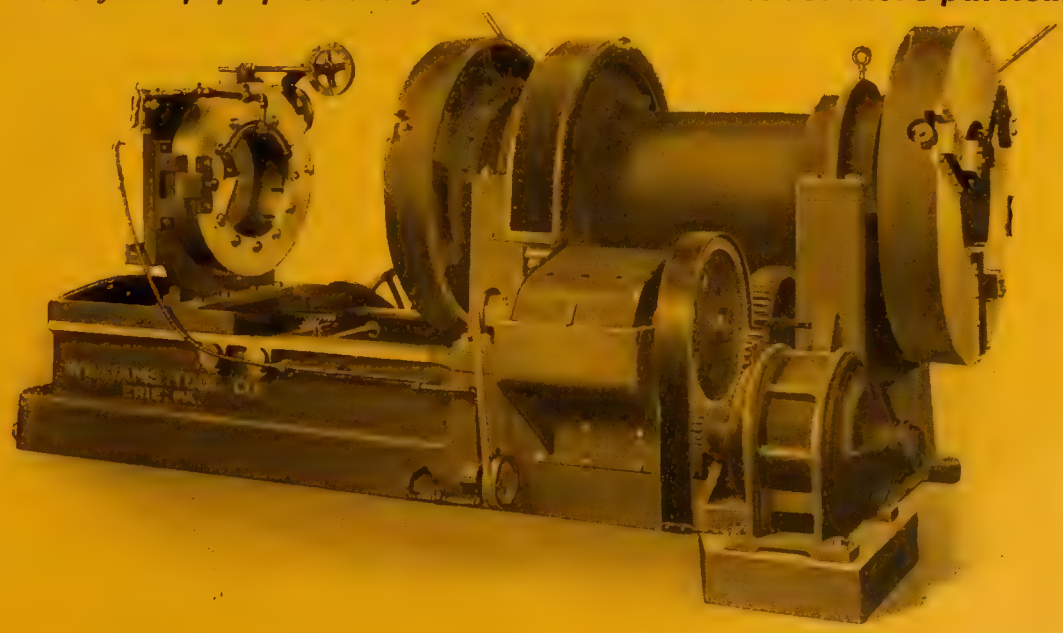

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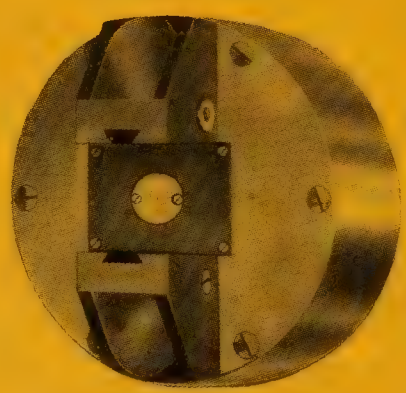

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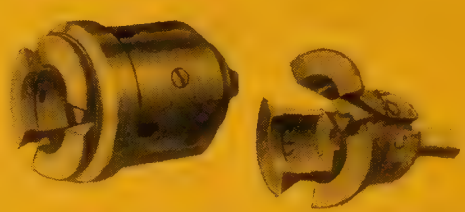

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be able to participate in conjunction with those in the United States. While it is true that munitions orders have been considerably reduced in Canada, there is still a comparatively large tonnage going into shell. An outlet for the tonnage not required for shell in Canada will be found, so the decline in munitions orders should not result in decreased output. The Dominion Government has arranged credits for munitions to cover the manufacture of 6-inch, 4.5-inch, and shrapnel, which will keep the firms engaged upon their production employed until next May. As a result, a considerable amount of business for the steel mills is assured for at least the first quarter of 1918.

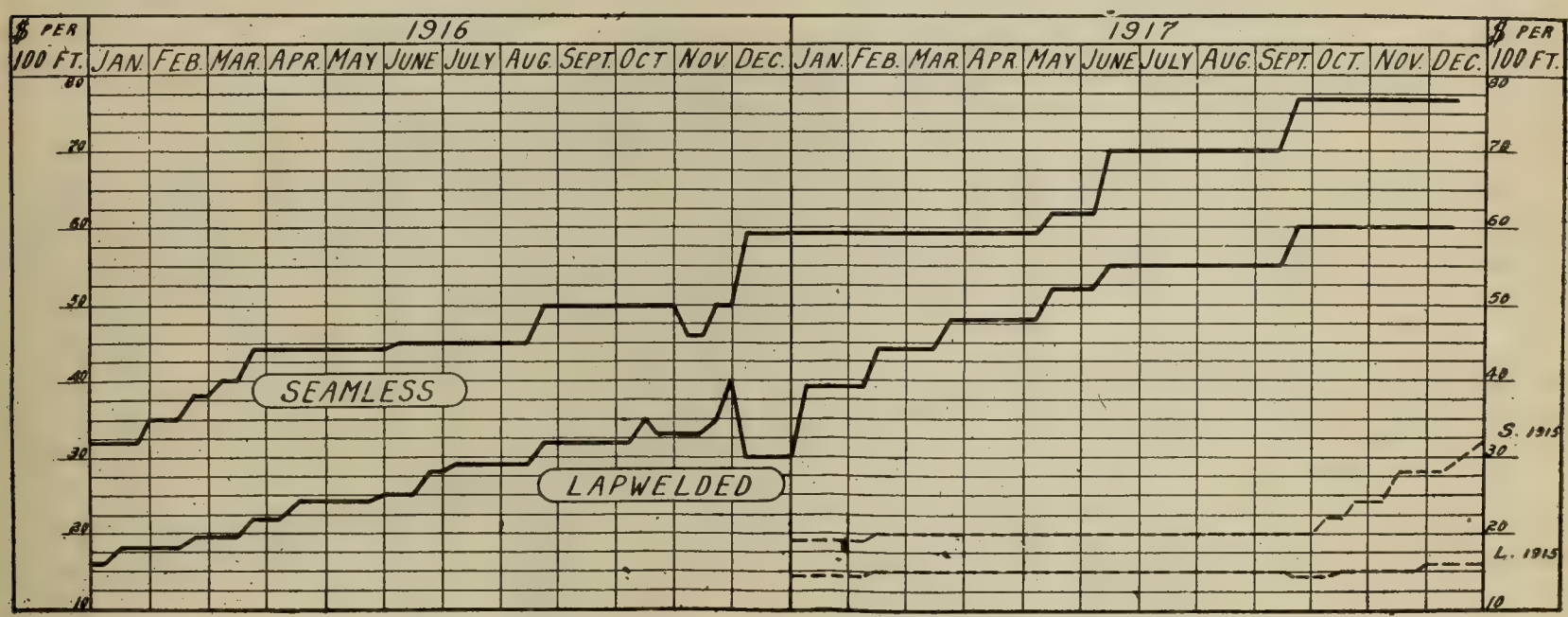
As the placing of further shell contracts depends upon the ability of the Dominion Government to finance them, it is unlikely that this industry will be as active in the future as it has been in the past. A strenuous effort will be made by the Government to raise funds, but as foodstuffs and other war supplies have also to be financed only a percentage of the total amount can be expended on munitions. This question has a direct bearing on the steel business which will benefit to a greater or less degree according to the sum set apart for the purpose. However, as already intimated, the surplus of steel not required for shell will doubtless be used in the manufacture of other products, such as rails, bars, shapes, wire and wire products, bolts, rivets, etc.

A considerable export business has grown up since the war started, and Canadian steel products of various kinds are now being shipped to different parts of the world. This export business would doubtless have attained bigger dimensions but for the shortage of ocean tonnage. However, orders have come from unexpected quarters and the result so far must be gratifying to the concerns engaged in it. How long it will last is uncertain, but the experience gained and connections made will be helpful after the war.

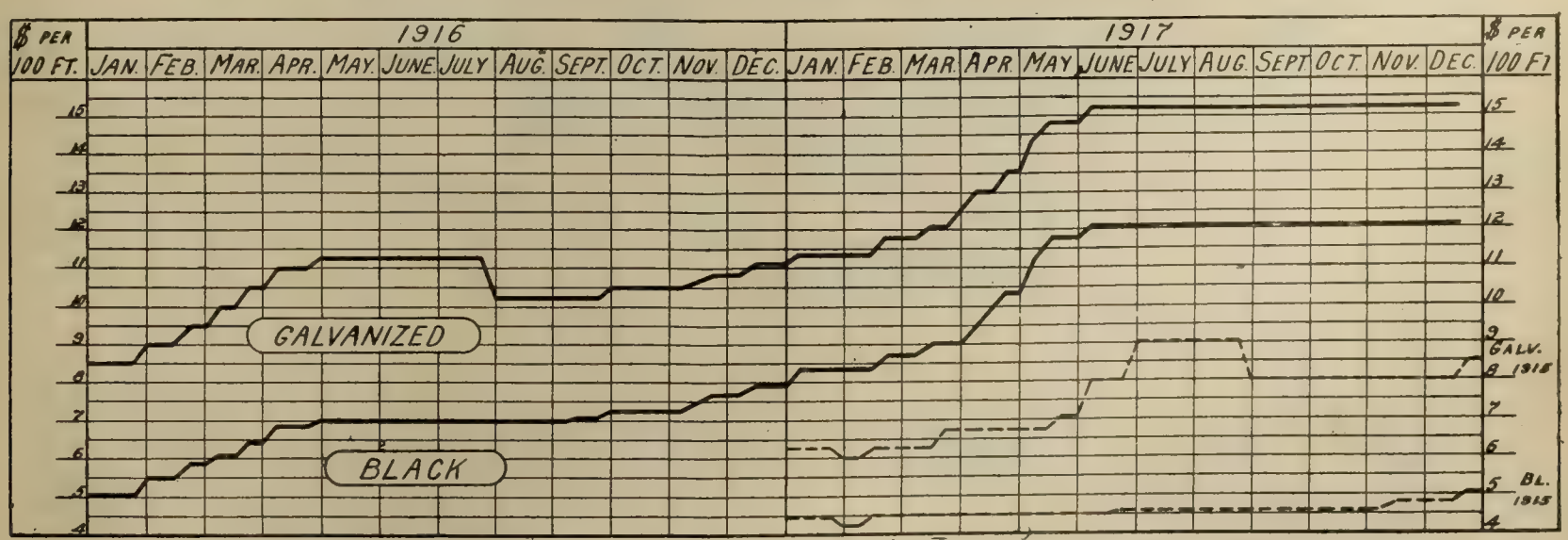
Unfortunately this development received a setback when the Dominion Government placed an embargo on the exportation of steel products except when destined for Great Britain or British Possessions. It is not unlikely that the embargo will be extended to include British Possessions on account of the acute shortage of steel which developed during the latter part of the year.

High Prices Prevailed

The high prices of steel which have prevailed throughout the year have been beneficial to the mills, while recent developments, in the form of an embargo, have also been favorable to them. Although operating costs have gone up, steel prices have advanced more in proportion and the mills have got the benefit. For the past three or four months there has been much excitement in the steel industry over the question of prices, which has been debated from every angle. For some weeks prior to the announcement of fixed prices at Washington it was predicted that there would be a general recession of values and there was very little private buying, except to fill urgent needs, in anticipation of lower prices. The steel market was very unsettled and although prices on the more important steel products have been fixed it cannot be said that the situation is much easier. The much discussed one-price-for-all policy was eventually adopt-



PRICE FLUCTUATIONS PER 100 FEET OF 3½-INCH SEAMLESS AND LAPWELDED BOILER TUBES DURING 1914-1915-1916-1917.



PRICE FLUCTUATIONS OF ONE-INCH WROUGHT IRON BUTT-WELDED PIPE DURING 1914-1915-1916-1917.

ed, thus putting the U. S. Government, the Allies, and domestic consumers all on the same buying basis.

That was all right as far as the U. S. was concerned, but it eventually transpired that steel for Canadian consumption was not affected by this policy. In other words Canadian consumers have had to pay on such steel as they imported from the States prices which were current before the agreed-upon prices were announced. How long this situation will continue is difficult to say as the mills in the U. S. have so much Government business on hand, and also in view of the fact that private consumers have considerable difficulty in getting material.

Steel and Iron

Although in comparatively few instances have there been any price recessions, and these have been entirely on imported material, it may be that when the mills have worked off the greater part of their unfilled tonnage booked at the high prices they may feel more inclined to accept business on the Government schedule. There is, however, the question of supply and demand to be taken into consideration, which will probably tend to stiffen prices in spite of Government regulations. The above remarks apply for the most part to conditions across the line, but have to be considered as conditions there affect steel products imported into Canada such as plates, sheets, billets, etc.

Take boiler plates as an instance. At the beginning of this year, ¼ to ½ in. plates were quoted at 5c per lb. Before July was over the price had more than doubled, being 12c, eventually reaching 13c. In November the price on plates in the States was fixed at 3¼c, but the price on the Canadian market for this material is now 12c per lb. Steel bars early in the year were quoted at 3¾c, eventually advancing to 5½c, which price still rules in spite of the fact that the fixed price in the States for this material is $2.90 per cwt. or a shade under 3c per lb.

The lighter gauges of black sheets and galvanized sheets are the only materials that have declined to an appreciable extent; No. 28 gauge black being now $8.50 whereas the top price was $11 per cwt. Boiler tubes advanced steadily until early in the fall when the crest was reached; they have been stationary since. Wrought pipe advanced steadily until early in July, but has been stationary ever since. Billets, open-hearth and Bessemer were quoted in Pittsburgh at $55 a ton in January. They eventually advanced to $100 a ton, reaching that point in June when forging billets were $125 a ton. This was the high water mark. Prices began to decline when the fixed-price schedule was announced, and they gradually worked down to the lower level that obtained early in the year. Bessemer and open hearth billets are now $47.50, and forging billets $60 a ton.

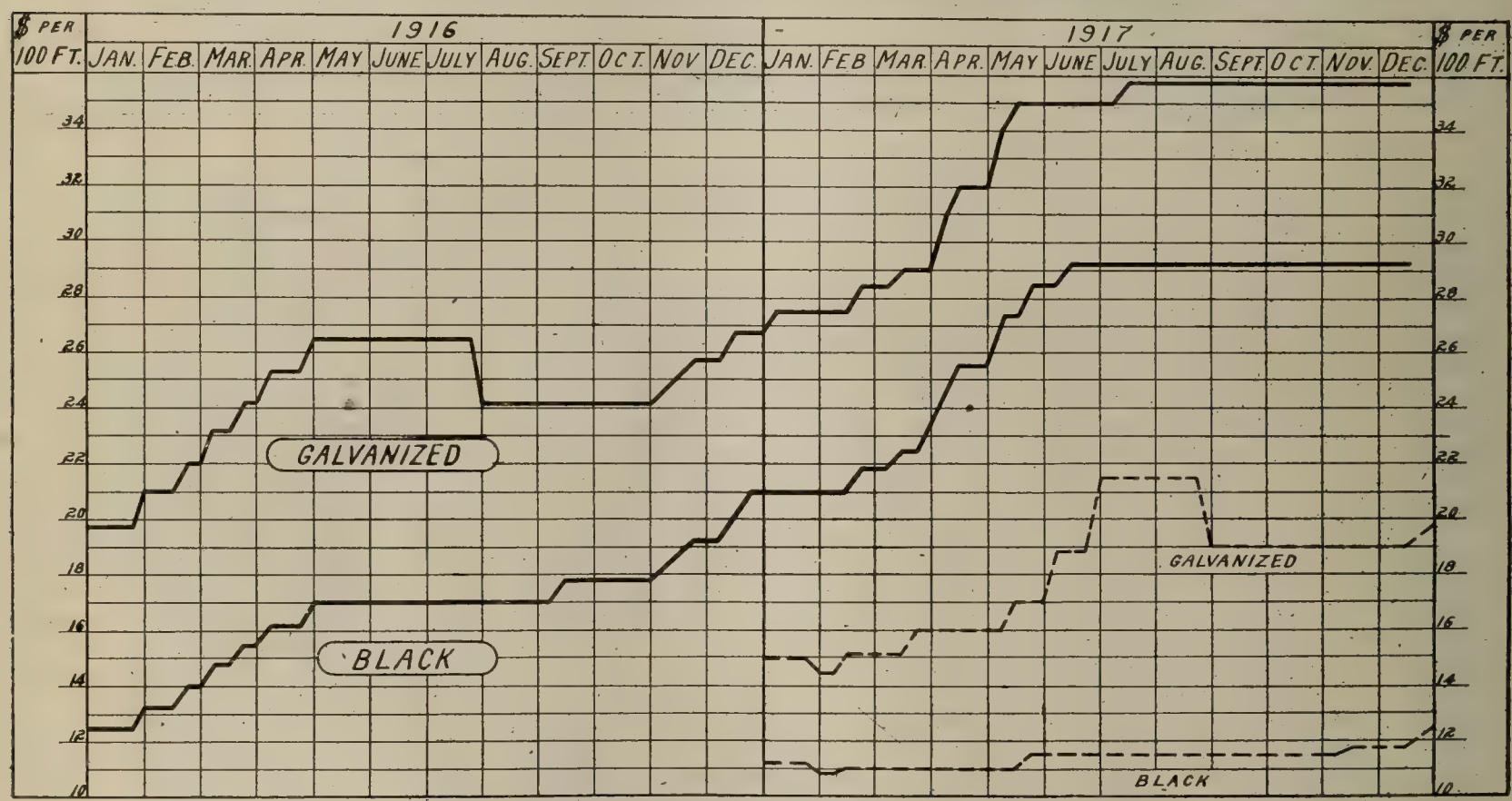
These figures cover the more important steel products and serve to show the peculiar situation that has prevailed during the year, and still exists. The outlook in regard to prices is decidedly obscure and it is impossible to say what will develop except that indications point to their continuance on a high level owing to the big demand for steel, and the unusual conditions prevailing in the market on both sides of the line.

Steel Prices As Fixed

It may be of interest at this juncture to quote the steel prices fixed by the War Industries Board at Washington. These prices serve to indicate what may be the trend in the future although they have not yet materially affected the situation in Canada. The agreed-upon prices are as follows and are subject to revision January 1, 1918. Iron ore, basis lower lake ports, price agreed upon $5.05 gross ton, no change. Coke, Connellsville, price agreed upon $6 net ton, recent price $16 a ton, a reduction of 62.5 per cent. Steel plates, basis Chicago and Pittsburgh, price agreed upon $3.25 per cwt., recent price $11 per cwt., a reduction of 70.5 per cent. Pig iron, price agreed upon $33 gross ton; recent price $58 gross ton, a reduction of 43.1 per cent. Steel bars, Pittsburgh and Chicago basis, price agreed upon $2.90 per cwt., recent price, $5.50 per cwt., a reduction of 47.3 per cent. Steel shapes, basis Chicago and Pittsburgh, price agreed upon $3 per cwt., recent price $6 per cwt., a reduction of 50 per cent.

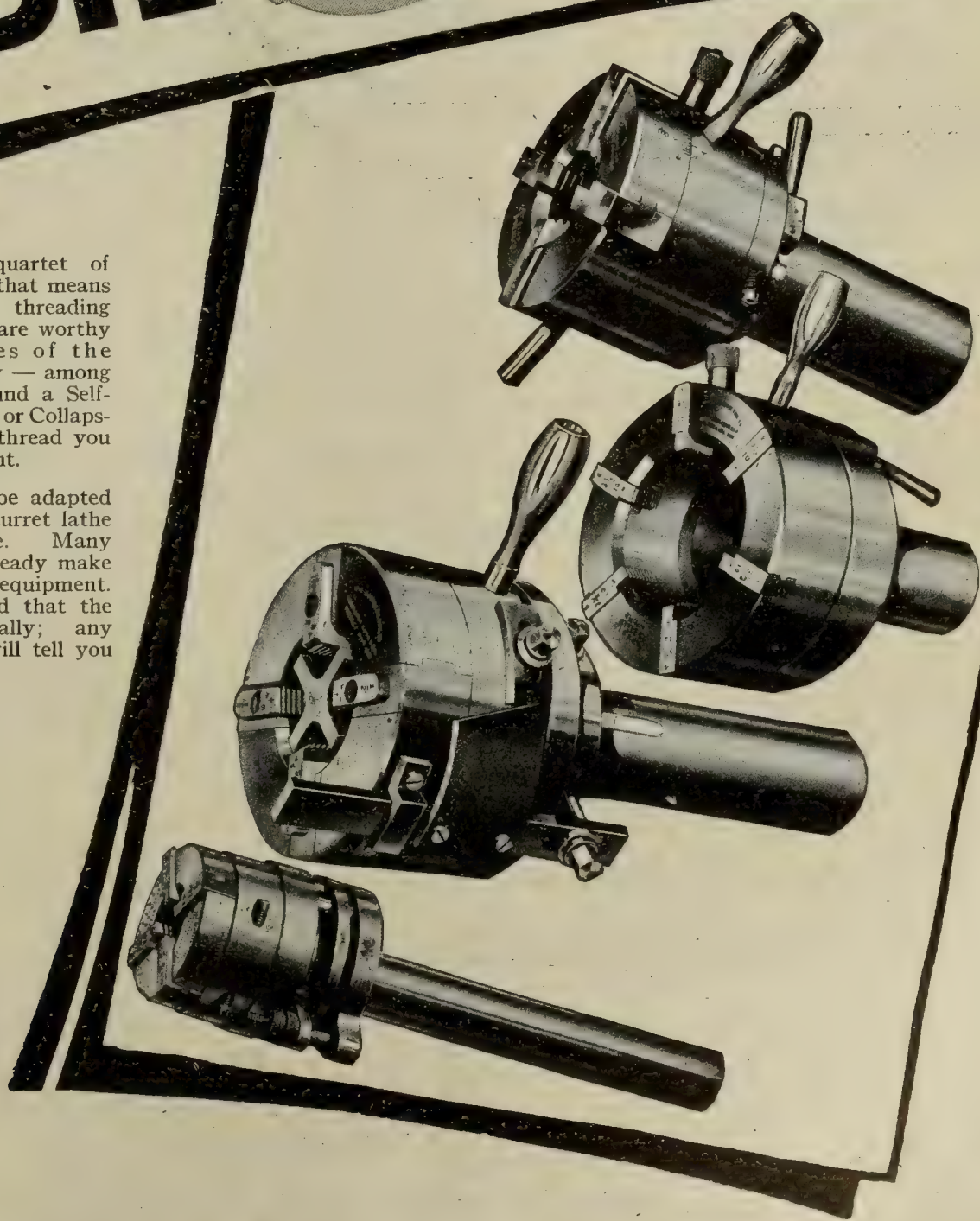
Shortly after the above prices were given out, a further list was issued by the Board which includes the following.—Those with Pittsburgh as base are: Steel bars (3 to 5 in.), $3.25 per 100 lbs.; steel bars (5 to 8 in.), $3.50; steel bars (8 to 10 in.), $3.75; steel bars, (over 10 inch), $4; skelp (grooved), $2.90; skelp (universal), $3.15; (sheared), $3.25. Blooms and billets, 4 by 4 in. and larger are now $47.50 gross ton; billets under 4 by 4 in. are $57; slabs $50; wire rods and sheet bars, $57, Pittsburgh and Youngstown bases. The prices will apply to private as well as to Government contracts.

The price of billets, fixed at $47.50, represents a reduction from the current



PRICE FLUCTUATIONS OF 2-INCH LAPWELDED WROUGHT IRON PIPE DURING 1914-1915-1916-1917.

GEOMETRIC DIE-HEADS



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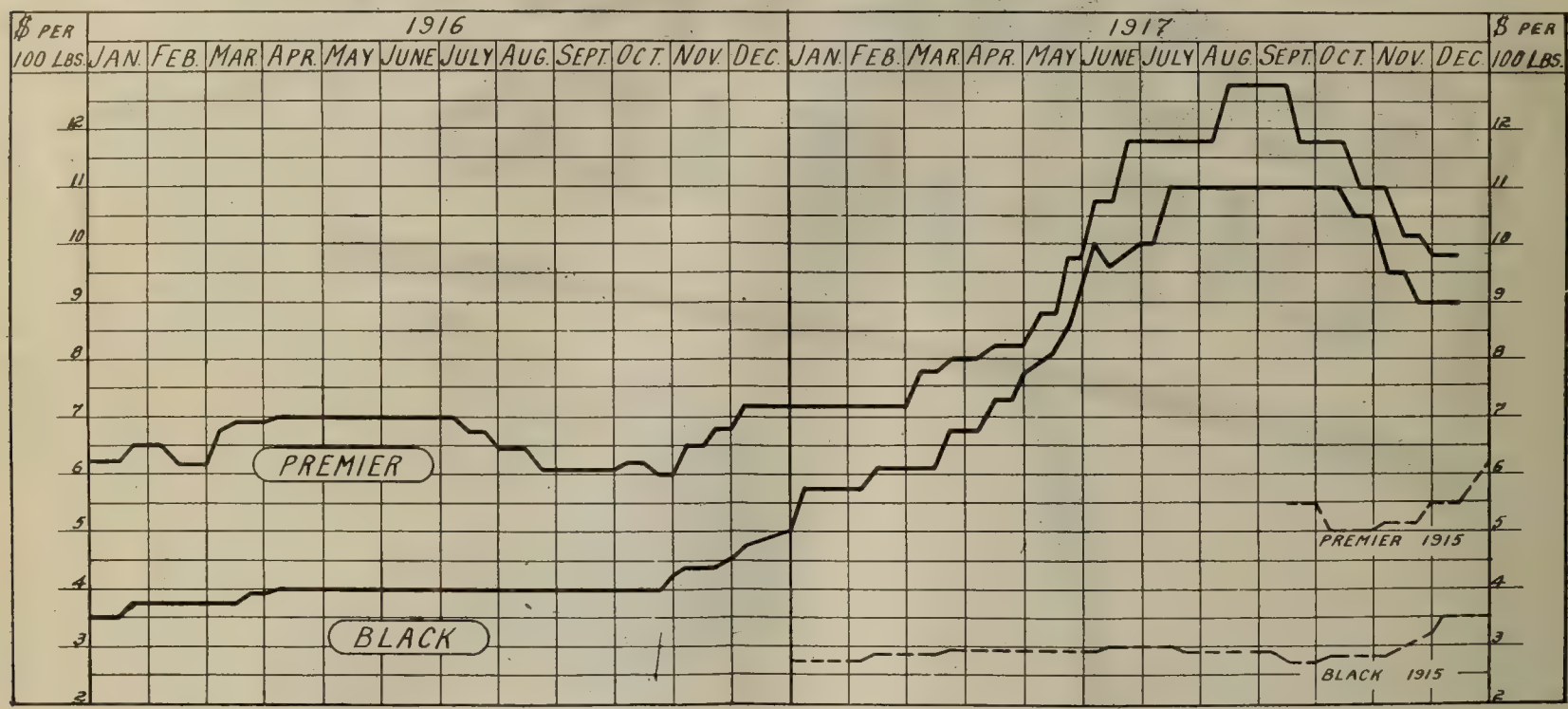
market price of about $22.50 a ton; billets at $51, a reduction of from $29 to $44 a ton, and wire rods fixed at $57 a reduction of $33 a ton. Soon after the above schedule was issued, prices were fixed on a large number of other steel products and pig iron differentials were also settled. All these prices come up for revision early in January but from what can be heard it is unlikely that there will be any important changes.



PRICE FLUCTUATIONS OF GALVANIZED (PREMIER) AND BLACK SHEETS (28-GAUGE) DURING 1914-1915-1916-1917.

Embargo Situation

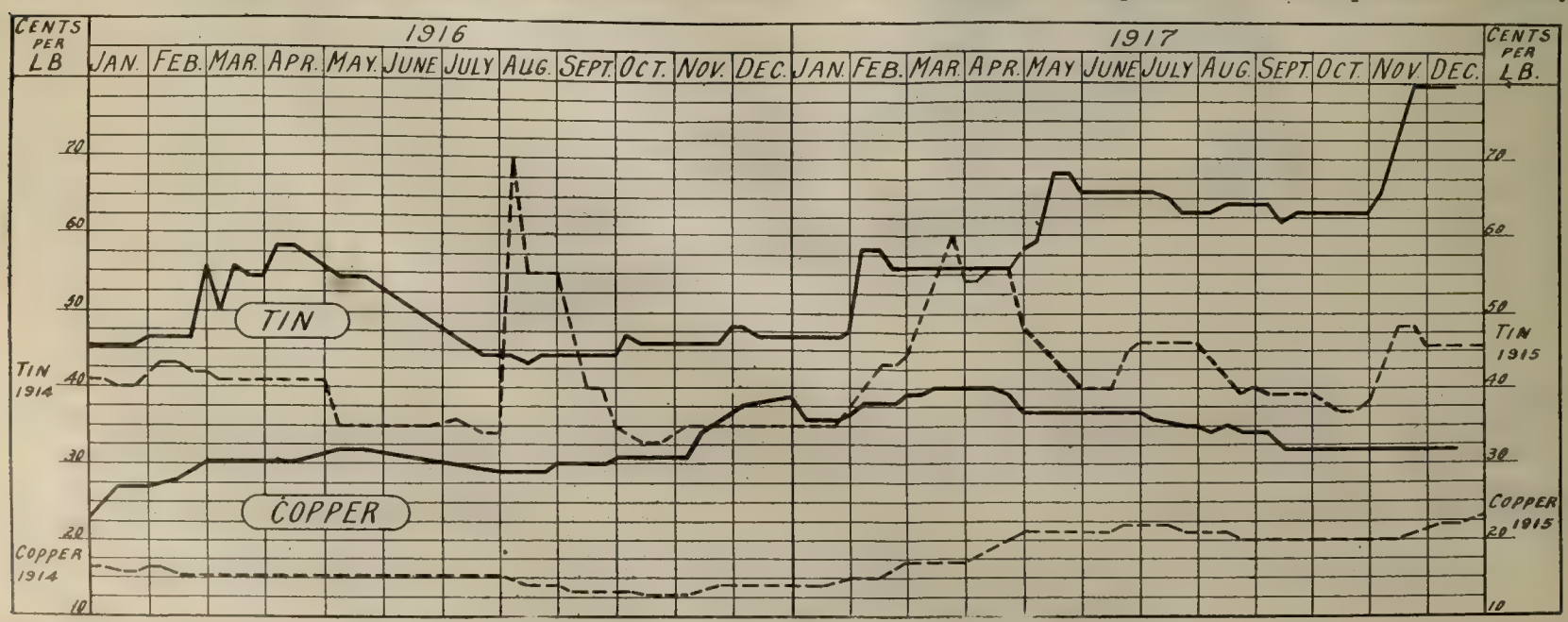
Owing to the necessity of conserving the supply of steel for war purposes, the United States Government, a few months ago, prohibited the export of steel except under license. Not only have prices been regulated by the Government, but the entire output of the mills will be supervised by the Priority Board, who will see that the U. S. Government and Allies have all the steel that is required for war purposes, and then allot what is left for commercial purposes.

In view of the large tonnage required for war purposes it will be a difficult matter to meet the demands of the ordinary consumer to the full extent of his requirements. This being the case, it is unlikely that the embargo placed on steel exports from the States will be modified to a greater extent than has already been done, although some leniency may be shown in the interpretation of the clause for war purposes or contributory thereto. In any event, consumers not working on war contracts are bound to suffer and manufacturing operations will be restricted. This is the most serious feature of the whole situation for those concerns using material such as can only be obtained from the States. Manufacturers who use domestic material will not be inconvenienced, except perhaps by some delay in deliveries, which can be overcome by judicious purchasing.

It is understood that the fixed prices do not apply on export business. This may be so for the time being, as the mills are not booking orders at the new prices, because they have no steel to deliver except on high-priced contracts. All new contracts will, of course, be subject to investigation by the Priority Board. The embargo also tends to neutralize the effect of the agreed-upon prices, and at the present time there is no indication of a general recession in the latter.

The embargo does not affect steel required for war contracts, shipbuilding and railroad betterment or equipment, and, therefore, will only be a hardship for consumers not working on war orders. This feature, however, is sufficiently serious to affect the general public, as a shortage of many articles made of iron and steel for every-day purposes will likely ensue. The embargo cannot help but restrict manufacturing operations in many plants, but nothing can be done to materially improve the situation as war work must not be held back.

It would appear that the embargo will benefit Canadian mills by eliminating competition in such products as they



PRICE FLUCTUATIONS OF TIN AND COPPER DURING 1914-1915-1916-1917.

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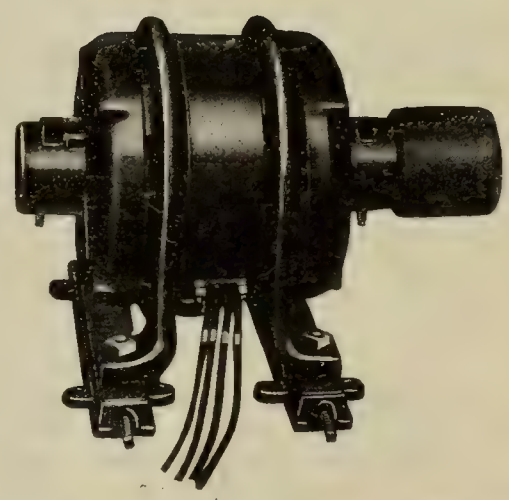

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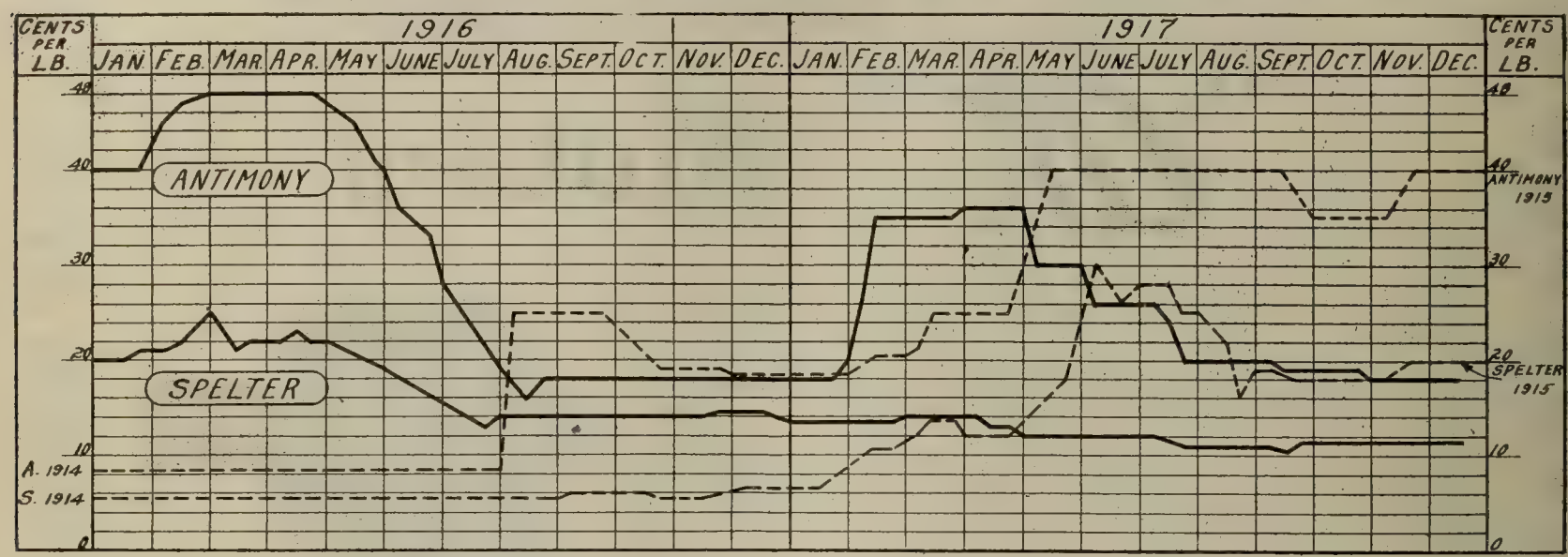
manufacture. It is apparently having a tendency to keep prices up, which is also favorable to the domestic steel industry. It is believed in the trade that prices will remain more or less stationary for an indefinite period and that the ultimate downward movement will be gradual.

tain and France will then be in a position to supply a large tonnage of steel for reconstruction and they will not have to rely upon the United States to the same extent as they do now.

It is generally conceded that there will be a period of depression in Canada, as in other countries, after the war and creased their producing capacity, which under normal conditions would tend to lower prices, based on the law of supply and demand. It is not unlikely that as a result, they would, as has been done in the past, cut prices on export orders, thus heading off competition. Under such conditions as these Canadian mills



PRICE FLUCTUATIONS OF ANTIMONY AND SPELTER DURING 1914-1915-1916-1917.

Future Prospects

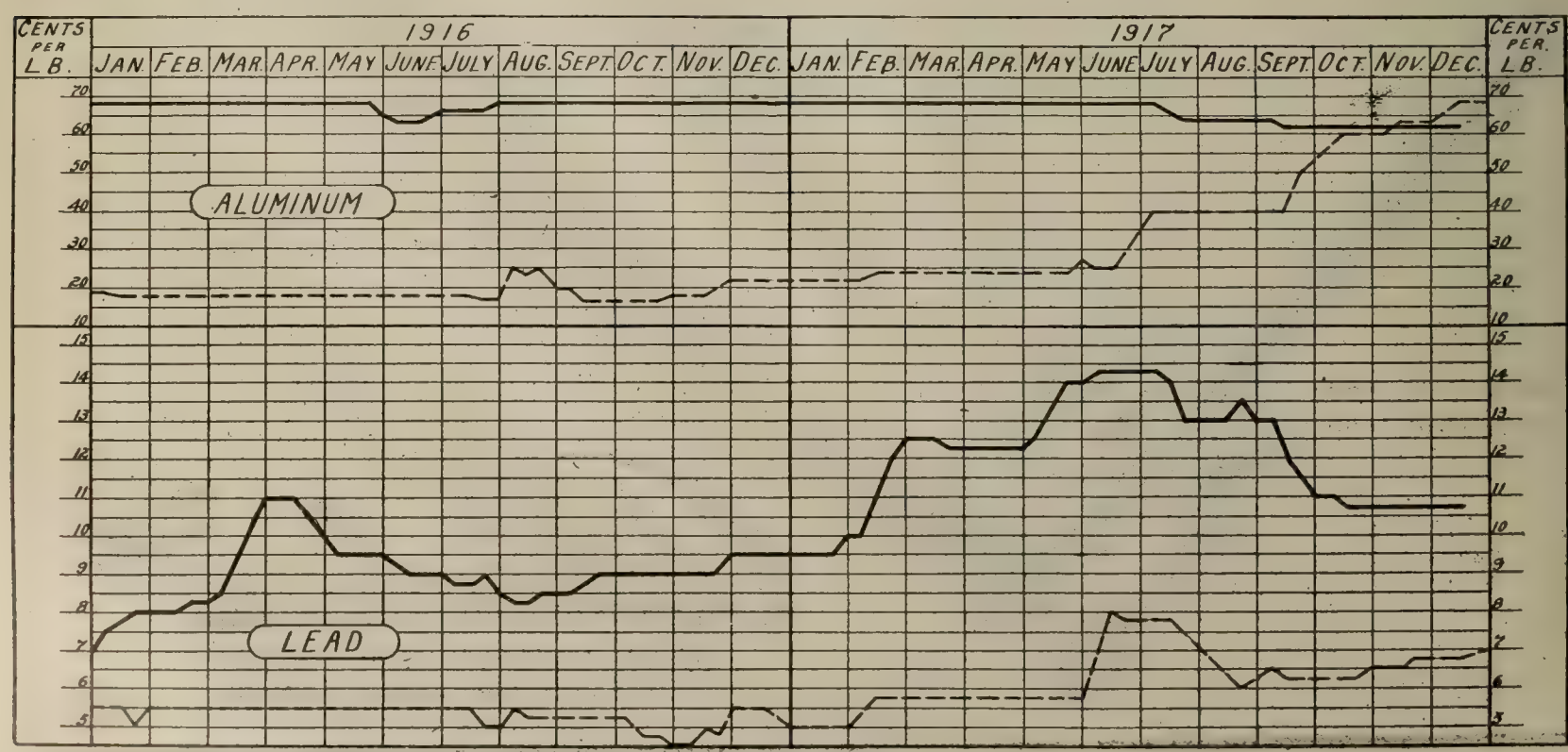
What the future holds for the steel industry in Canada is a difficult question to answer. For the duration of the war there will likely be no material change in the situation. While the war lasts there will be an enormous demand for steel and the mills in Canada and the States will be kept operating at capaccity. What the demand will be after the war is problematical. It has been asserted that the demand for steel during the reconstruction period in Europe will be such that the mills on this side will have all the business they can take care of. Against this it must be remembered that the mills in Great Bri-

with it a falling off in the demand for steel. While admitting that this may be the case, the Canadian steel concerns were never in better shape to meet a period of dull trade, so there is little fear of trouble in this respect. The question as to whether our steel companies can participate in export trade after the war is also a difficult one to answer.

The main point is, can they compete with the mills of the United States? At present this does not appear possible. In the past, they have not been able, so it is difficult to see how they can succeed in the future, under normal conditions. The U. S. mills have considerably in-

would be handicapped in export business as it is doubtful if they could come down to American prices.

Canadian steel mills are not at the present time able to compete with mills in the States in producing a number of steel products, principally plates and structural shapes, which eliminates them from much profitable business, both domestic and export. It is also doubtful if they can compete in many other lines as their production costs are higher. If legislation were enacted by the Dominion Government to increase the tariffs on steel products, it would benefit Canadian mills for domestic trade. Canadian steel companies are now financial-



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ly able to develop their trade connections by manufacturing new lines and something may yet be done to develop the industry. The producing capacity having been increased, the mills will have little difficulty in filling any business that can be obtained. The prospects for trade in the future in spite of keen competition are without doubt better than in the past.

NON-FERROUS METALS SITUATION

THE outstanding feature in the non-ferrous metal markets has been the entry of the United States into the world war, this resulting not only in increased consumption but also bringing all markets under the control of the Government there. It was, however, only during the latter part of the year that the Government stepped in and asserted its authority, therefore, the real benefit of this action is only just being felt and incidentally appreciated. As a result of this move prices have a lower tendency, speculation has been almost entirely eliminated and trading conditions have improved. Generally speaking, the markets have been steadier this year than last. There have, of course, been fluctuations in prices, but the up and down movements have as a rule been less violent. The metal trade has become more accustomed to war time conditions and consequently the situation has been under better control. An exception may perhaps be made in the case of tin, but this market is controlled by the British Government and has been recently seriously affected by war time conditions.

Production which has probably now reached its maximum for all metals is being readily absorbed, supply and demand being now fairly equal. In the case of spelter, however, the market has suffered from over production, resulting in a steady decline in prices. The situation as regards output and consumption of all metals is more stable than in the preceding twelve months. There have been shortages of metals at different times, of course, for varying periods, but in each case the situation has been relieved.

U.S. Government Requirements

Not long after the United States entered the war, there was a general impression that the Government there would ultimately take a hand in the situation to ensure a sufficient supply of metals for its needs. A close investigation of the industry both as to production and prices was made by competent officials and eventually a policy was decided upon. Before any direct action was taken, however, the U.S. Government purchased metals at its own prices, which were considerably below the market quotations current at the time. Take as an instance, copper. The Government purchased a considerable amount of this metal in the spring at 16½c per lb., at which time the market price in its home market was about 34c. Again in July the U.S. Government paid 25c when the regular price was still over 30c per pound. The same policy was adopted in regard to other metals. This was sufficient indication as to what would ultimately develop and as a result prices became easier and declined steadily.

At the present time, the price of copper is fixed and supplies are being distributed by a board appointed for the purpose. An announcement is expected any day now covering fixed prices on lead and spelter and possibly aluminum, while a revision of copper prices may be made. The supply of tin being almost altogether controlled by the British Government cannot be regulated as to prices by the American authorities. Antimony is in much the same position as tin as it is not produced in the United States.

Canadian Metal Situation

The situation in Canada has been dominated by the conditions prevailing across the line. The greater part of the copper, lead and spelter used in Canada comes from the States and prices here consequently are regulated by those prevailing there. Although tin and antimony are not produced in the U.S., prices of these metals in Canada are practically regulated by the New York quotations. New York is thus generally spoken of as being the primary market. To understand the metal situation in Canada it is necessary to follow closely developments in the United States, for conditions existing there are usually reflected in the Dominion.

Canada still relies largely on the States for supplies of metals in spite of the fact that considerable quantities of copper, lead and spelter are mined within her borders, but as they have to be sent to the States to be refined, the market for these metals is practically controlled in the States. Satisfactory progress is, however, being made at Trail, B.C., where the Consolidated Mining & Smelting Co. have built a large refinery. The production at Trail is 360 tons of copper, 1,700 tons of lead and 1,200 tons of zinc per month. Considering that this is a new Canadian industry, so to speak, the results are most gratifying.

Copper

There has been no lack of interest in the copper market this year and the red metal continues in the front rank of importance for the manufacture of munitions and other war supplies. The demand for copper has been exceptional, but at no time has it been beyond the capacity of the refineries, except during the strike period. Strikes at the mines in July, which lasted for several weeks, created considerable anxiety in official circles and cut down production, creating an acute shortage for a time. The evil effects of the strikes still remain, but it is understood that there is now sufficient supply on hand to take care of all requirements. Mine and smelter production of copper will this year be under the 1916 record-breaking total, as evidenced by the fact that the output of twenty-three properties of North and South America for the first eleven months of this year dropped about 55,000,000 pounds below the total noted for the corresponding period of a year ago. These properties turned out to December 1 approximately 1,517,585,000 pounds of copper, against 1,572,500,000 pounds in the first eleven months of 1916. It is estimated that the actual loss in mine and smelter output in the United States due to strikes exceeded 100,000,000 pounds, but against this there was an increase of 40,000,000 pounds in the amount produced by the three American-owned properties in Chile and Peru.

In the first three months of the year prices steadily advanced from 38c to 40c, this figure proving to be the maximum, about the middle of March. About this time the United States Government purchased about forty-five million pounds of copper at 16½c. Being a long way below the current New York price, the market consequently weakened. Prices, however, did not decline very much until the same Government in July purchased another large quantity at 25c per pound; again much lower than the market. This was a further indication that lower prices for copper would eventually be established and the market naturally continued to decline. In October the American Government appointed a Copper Producers' Committee to which was entrusted the distribution of copper for the U.S. Government and the Allies, and the division of what was left among domestic consumers.

About the same time the price was fixed at 23½c per pound. The market under control assumed a routine character and has been steady here since. Prices in Canada eventually declined to approximately 32c per pound. There is some talk of a revision of prices and it is possible that 25c may be fixed, but no definite announcement has yet been made.

Tin

The average price of tin has been higher this year than in 1916, for the most part due to a shortage, varying in intensity. No tin can be shipped to this continent without a permit from the British Government. For reasons not altogether easy to explain in this brief space, permits have been difficult to obtain and supplies have been coming over in comparatively small quantities, particularly during the latter part of the year. The shortage of tonnage is to a lesser or greater extent responsible for this condition, in any case the result has been very low stocks of tin on this side.

Since the United States entered the war, the demand for tin plate has greatly increased for use in the manufacture of containers, cans, etc., for supplies for the army. For this reason the demand for pig tin has greatly increased, but supplies have not been received in sufficient quantities to take care of the increased demand. An acute situation has developed owing to the serious shortage and the United States Government contemplate making an effort to have a sufficient supply released to meet its needs, which continue to increase.

At the beginning of the year tin was quoted at 47c, but made a sharp advance in February to 58c. There was another sharp advance in price in May to 68c, followed soon after by a decline to 66c. The market for a while was steady, but

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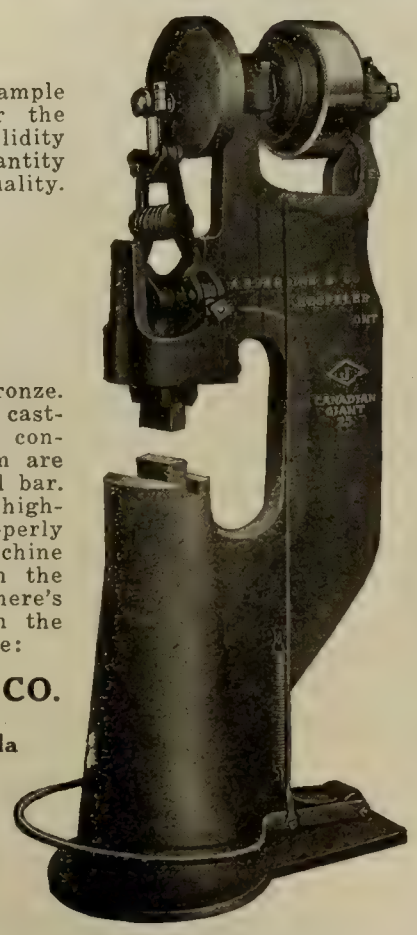

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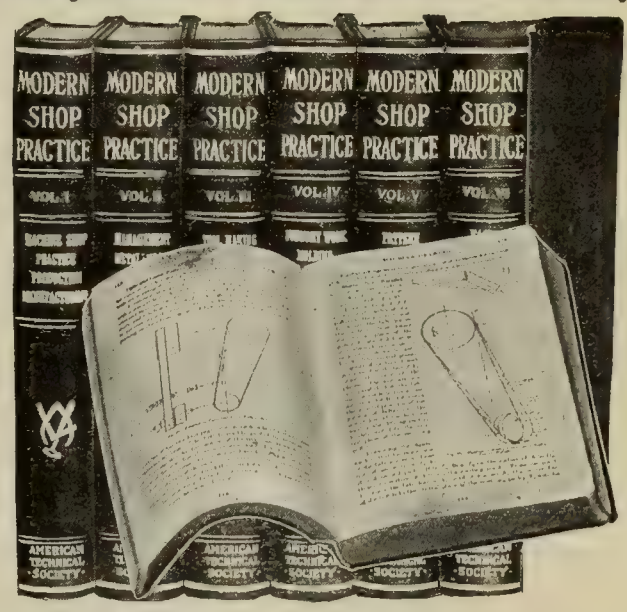

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easier, working back to 62c about the end of September. Early in November it became excited and prices advanced rapidly to 80c, at which level it still remains. If the authorities at Washington are able to influence the British Government to modify existing regulations thereby allowing a more liberal supply of tin to come forward there will likely be a drop in quotations.

Spelter

Spelter has been relatively the weakest of all the metals, due principally to the fact that the producing capacity of the refineries in the United States has increased to a greater extent than consumption called for. There has, of course, been a good demand, but the producing capacity was increased out of proportion to the consumption with the result that prices have been consistently weaker than those of last year, in fact the average price has been lower than the average for 1905. The zinc production of the United States has dropped over 30 per cent. from the highest levels attained when all plants, old and new, were running at full. This would indicate a curtailment of approximateiy 240,000 tons in the annual rate. During the first half of 1917, zinc was turned out at the rate of over 722,000 tons per annum, while in the ensuing quarter it was cut down to a basis of about 626,000 tons a year. The higher figure represented the top notch of spelter production resulting from increasing capacity for existing plants and the construction of many new smelters throughout the West. Production of zinc in Canada has increased this year, the largest refinery, located at Trail, B.C., turning out about 1,200 tons a month.

The highest price for spelter was early in March, when it touched 14c. It has since steadily declined until now it is quoted at 10½c per pound. The spelter market has also been affected by the proposal to fix prices, and has been weaker in consequence. After some delay the American Government early in December took the initial step in this direction by fixing the differentials. The latter for the U.S. Government prices between prime Western and the grades A and B were fixed at an advance of ¼c to ½c for brass, 2c for grade B and 3c to 3½c for grade A. The base price or the price of prime Western, however, has not been established, but will likely be so in the near future.

Lead

The lead market has been strong for the greater part of the year and the highest price since the beginning of the war was reached during the month of June. For the greater part of the year there has been a shortage of lead, varying in degree, which has resulted in the abnormally high prices affecting a number of lead products. At the beginning of the year lead was worth 9½c per pound. In February there was a sharp rise in price to 12½c followed by a steady advance which culminated in the record price of 14½c about the middle of June. In July the situation became easier and prices gradually slipped back, accompanied by some fluctuations, until September, when there was a sharp decline to 12c. The price ultimately dropped to 8½c, at which point it has been stationary for more than two months. The readjustment in prices was due more than anything else to the pending control of the market by the American Government, and by its purchases at a figure considerably below the market at the time.

The situation in regard to the supply of lead became easier during the latter part of the year until quite recently, when a scarcity developed. Prices, however, are not likely to change materially until the situation clears up following the action of the American Government. Even then it is doubtful if there will be any pronounced movement in either direction, for when the price is fixed the market will become steady.

Good progress has been made in the industry in Canada this year. The refinery at Trail is now producing lead at the rate of 1,700 tons per month and it is likely that the output will be increased in course of time. The Imperial Munitions Board have agreed to purchase the entire production of this refinery until March, 1918. The Board recently placed an order for 6,000 tons of lead with the Trail refinery. A few months ago the Dominion Government placed an embargo on the exportation of lead and zinc into the United States, but this order was eventually lifted following representations by the Provincial Government of British Columbia.

Antimony

The antimony situation this year has differed little from 1916, although the price has not advanced to the same extent. This metal owes its present importance entirely to the war and consequently the consumption has been fairly heavy. Practically all the antimony used on this continent now comes from China, English antimony being off the market. The production of Chinese antimony has been increased considerably during the past few years and the supply and demand is now fairly even. Shortages of varying duration have existed at different times, but the situation in this respect has never been very serious. The market has been devoid of any particularly exciting feature, although prices have been subject to some fluctuations.

At the beginning of the year antimony was worth 18c per pound, but made a sharp advance in February to 35c, reaching the high water mark, 36c, about the middle of April. Early in May weakness developed and prices declined until about the end of July, to 20c, remaining steady at this figure until September, when the price dropped to 19c, and in November to 18c, at which point it remained stationary. The price has thus worked back to the point where it started.

Aluminum

Conditions in the aluminum market this year has been practically a duplicate of those existing in 1916, doubtless due to the fact that the output of this metal is controlled, and as a result it has been sufficiently scarce to keep prices very high. The market has been more or less featureless during the entire year with no developments to create more than passing interest. Prices have been steady. For the first six months of this year, quotations were unchanged at 68c, which was, with the exception of two months, the same level as last year. In July prices dropped to 65c and in August to 64c, finally touching 62c in September and remaining stationary at the latter price for the balance of the year.

TRADE GOSSIP

Owen Sound, Ont.—The Town Council has granted J. H. Cole six months extension in the time allowed the Steel Corporation in its agreement with the town.

Kingston, Ont.—The Donnelly Wrecking Co. has been awarded the contract to raise the steamer Lehigh, which sank in the Welland Canal with a coal cargo while en route to Montreal.

W. H. Miner, who was elected to the directorate of the Southern Canada Power Co. recently, at the annual meeting in Montreal, is president of the Miner Shoe Co., Maisonneuve, and vice-president of the Miner Rubber Co., Granby, Que.

St. John, N.B.—Fire on Dec. 17 destroyed the factory of the National Clothing Manufacturing Co. The building was a four storey brick structure. The total loss is in the vicinity of $125,000, and is covered by insurance.

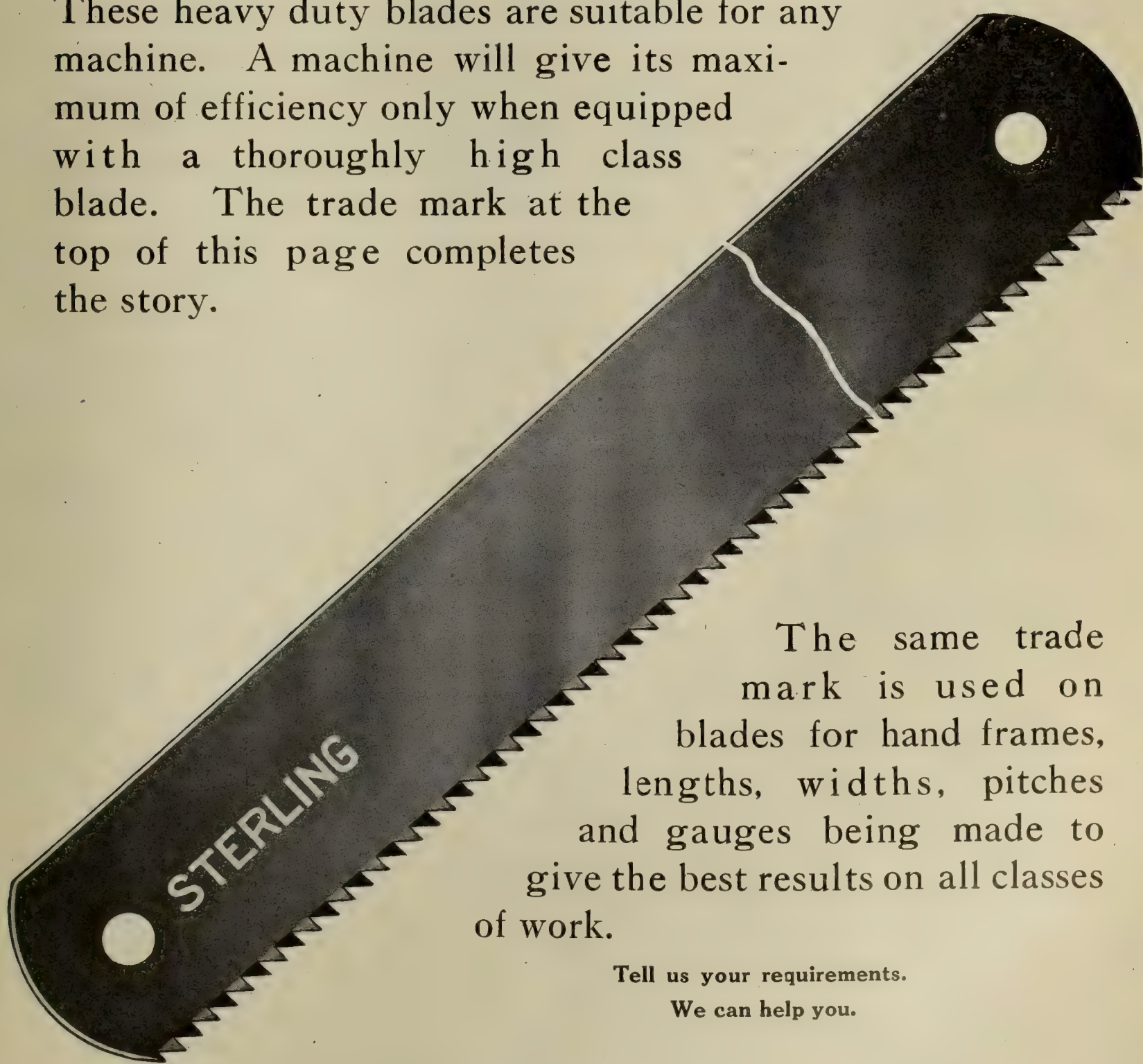
Baldwins Build One Locomotive an Hour.—The Baldwin Locomotive Works, of Philadelphia, are now turning out steam engines at the rate of one every hour, and this, officials say, is not the maximum accomplishment. Most of the engines are being sold to the United States Government and to foreign governments.

British Steel Concerns Merge.—Advices from London, England, state that arrangements have been made for the amalgamation of four prominent iron and steel companies—the Worthington Iron and Steel Co., of West Cumberland; the Phoenix Steel Works. of Rotherham; Samuel Fox and Co., of Sheffield, and the Frodingham Iron and Steel Co., of Lincolnshire. The capital will be at least £4.000.000 sterling. The total weekly output is about 25,000 tons of iron and 21,000 tons of steel.

Trading Firms Amalgamate. — Announcement was made a few days ago that the business of the Frontier Trading Co., of Ogdensburg, N.Y., and the Canada Shipping Co., of Montreal, had been taken over by the George Hall Coal & Transportation Co. The deal gives the Hall Co. an extra fleet of sixteen vessels with an aggregate tonnage of 20,000. The vessels will be placed in the coal and wood pulp trade between ports on Lake Ontario and the St. Lawrence River. Four vessels owned by the Hall Co. were commandeered recently by the United States Government.

"STERLING" HACK SAWS

These heavy duty blades are suitable for any machine. A machine will give its maximum of efficiency only when equipped with a thoroughly high class blade. The trade mark at the top of this page completes the story.



The same trade mark is used on blades for hand frames, lengths, widths, pitches and gauges being made to give the best results on all classes of work.

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We can help you.

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DIAMOND SAW & STAMPING WORKS

357 SEVENTH STREET BUFFALO, N. Y., U. S. A.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$32 75
Lake Superior, charcoal, Chicago	37 50
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

Government prices.

	Montreal	Toronto
Hamilton	....	50 00
Victoria	....	50 00

FINISHED IRON AND STEEL

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3/16 in.	13 20
Chequered floor plate, ¼ in.	13 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	*2 90
Tank plates, Pittsburgh	*3 25
Structural shapes, Pittsburgh	*3 00
Steel hoops, Pittsburgh	3 50
F.O.B., Toronto Warehouse	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	4 10
Structural shapes	4 20
Plates	4 45

*Government prices.

FREIGHT RATES

Pittsburgh to Following Points

	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Lake copper	$33 00	$32 00
Electro copper	33 00	32 00
Castings, copper	32 00	31 00
Tin	78 00	82 00
Spelter	10 50	10 50
Lead	9 50	8 50
Antimony	18 00	18 00
Aluminum	60 00	62 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ¼ to ½	$13 00	$12 00
Heads	13 30	12 30
Tank plates, 3-16 in.	13 10	12 10

WROUGHT PIPE

Effective July 5, 1917.

Size	Black	Galvanized
Standard Buttweld	Per 100 feet	
⅛ in.	$5 00	$6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 33	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00
Standard Lapweld		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ ins.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 45%.

4½" and larger, 40%.

4" and under, running thread, 25%.

Standard couplings, 4" and under, 35%.

4½" and larger, 15%.

OLD MATERIAL

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper, crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	21 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	14 00	15 75
Light brass	10 00	10 00
Medium brass	14 00	14 00
Heavy brass	15 00	16 00
Heavy melting steel	21 00	20 50
Steel turnings	12 60	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	38 00	30 00
Mach. shop turn'gs.	9 00	8 50
Cast borings	12 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 50	6 50
Heavy lead	5 50	7 00
Tea lead	5 00	5 75
Aluminum	25 00	25 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up.	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 20
Elevator bolts	5
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less	10
Blank bolts	net
Bolt ends	net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	15
Boiler rivets, base ¾-in. and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	72½
Wood screws, O. & R., bright	67½
Wood screws, flat, brass	37½
Wood screws, O. & R., brass	32½
Woodscrews, flat, bronze	27½
Wood screws, O. & R., bronze	25

MILLED PRODUCTS

	Per cent.
Set screws	25
Sq. & Hex. Head Cap Screws	20
Rd. & Fil Head Cap Screws	net
Flat ⅞ But. Hd. Cap Screws plus	net
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and semi-fin. nuts over 1½ in., up to 2 in.	plus 10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4 50
Cold pressed nuts over 1½ in.	add $7 00

BILLETS

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$5 50	$5 45
Cut nails	5 70	5 80
Miscellaneous wire nails	60%	
Spikes, ⅜ in. and larger	$7 50	
Spikes, ¼ and 5-16 in.	8 00	

MISCELLANEOUS

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drums	4 75
White lead, pure, cwt.	16 20
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 38
Tarred slater's paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 74
Linseed oil, raw, single bbls.	1 36
Linseed oil, boiled, single bbls.	1 39
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery cloth	list plus 20
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	1 80
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Drilling cables, Manila	0 41
Plumbers' oakum, per lb.	0 09
Packing, square braided	0 34
Packing, No. 1 Italian	0 40
Packing, No. 2 Italian	0 32
Pure Manila rope	0 39
British Manila Rope	0 33
New Zealand Hemp	0 33
Transmission rope, Manila	0 45
Cotton Rope, ¼-in. and up	0 47

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

CARBON DRILLS AND REAMERS

	Per Cent.
S.S. drills, wire sizes up to 52	30
S.S. drills, wire sizes, No. 53 to 80	net
Standard drills to 1½ in.	30
Standard drills, over 1½ in.	30
3-fluted drills, plus	10
Jobbers' and letter sizes	20
Bit stock	25
Ratchet drills	15
S.S. drills for wood	30
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 30
Bridge reamers	52½
Centre reamers	10
Chucking reamers	net
Hand reamers	10

COLD ROLLED SHAFTING

At mill	list plus 40%
At warehouse	list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 25% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings: Class B black, 24½c lb.; Class C black, 15¾c lb.; galvanized, Class B, 34c lb.; Class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$9 50	$ 8 50
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 00
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	9 70
Premier, 10¾ oz.	13 85	10 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B	
¼ in.	$12 35
5-16 in.	11 85
⅜ in.	11 50
7-16 in.	10 90
½ in.	11 20
9-16 in.	11 20
⅝ in.	11 10
¾ in.	11 00
⅞ in.	10 90
1 inch	10 65
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

Westmount Building Statistics.—The building permits issued during the year for the City of Westmount, Que., numbered 70, of an estimated value of $147,190.

Crow's Nest Pass Coal Output.—The collieries in the Crow's Nest Pass district of British Columbia, which are now operated under Government control, are producing 23,000 tons of coal a day, the greatest output in the history of the province. Word received by the Minister of Labor from the Director of Coal Operations in the district indicates that everything is running smoothly at the collieries.

Coal By-Products.—The by-products obtainable from coal are numerous and important, and the best authorities contend that it is unwise to burn it in the ordinary way. When burned under boilers to produce power, less than 15 per cent. of the heat units in the coal is utilized. By low carbonization, the valuable light and heavy oils are obtained, the gas can be used to generate power and the residuum coke containing nearly all the original fixed carbon can be burned in the ordinary way to produce heat and power.

Revision Unlikely in Steel Prices.—Advices from Pittsburgh state that there will be no revision of iron and steel prices January 1, and it is quite unlikely that there will be any important revision soon after that date. The War Industries Board evinces no desire, of its own initiative, to seek any revision. The Federal Trade Commission evidently feels that there should be more recognition of the large amount of cost data it has gathered, and is still receiving, but as it is back of the Pomerne iron and steel price-fixing bill that is to be pushed in Congress, it may be disposed to bide its time and not push the matter forward before the expected legislation is enacted. The opinion in steel circles is very strong that there should be no revision. The market needs stability, which it now has, and what it would lose in stability, through a revision, would greatly outweigh any slight irregularities that may exist in the present price schedule.

Large Order for Wooden Ships.—The Foundation Co., Inc. of New York, has received orders from the United States, French and British Governments for forty-five wooden ships, aggregating $20,000,000. Most of the work is being done on a "cost plus" basis. Additional large ship orders are also under negotiation and will probably be closed within the next few weeks. The order for the United States Government is for the hulls for ten 3 000-ton wooden steamers which are to be built at the company's yard at Newark, N.J. The contract from the French Government was closed some months ago and calls for thirty wooden sailing vessels of 3 000 tons each. These boats are to be fully equipped and will have auxiliary steam engines. The order from the British Government is for the hulls for five wooden steamers, 2,500 tons each, and these are being built at the company's yard at Victoria, B.C. The first of these will be launched next week and deliveries completed in April, 1918.

"Barnes-made" SPRINGS

are the result of over sixty years' experience in spring making, combined with unsurpassed equipment and the workmanship of men who have been with us, ten, twenty and in some cases thirty years.

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THE WALLACE BARNES COMPANY
218 South St., Bristol, Ct., U.S.A.
Manf'rs of "Barnes-made" Products
Springs, Screw Machine Products, Cold Rolled Steel and Wire

WIRE SPRINGS OF ALL KINDS

Machine Springs, Valve Springs, Automobile Cushion Springs, etc., of a quality that defies competition. Tell us your requirements. Send sample or specification for price.

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GUELPH, ONTARIO

JOHN STIRK & SONS, Limited
HALIFAX, ENG.
MACHINE TOOLS
Agents—The A. R. Williams Mcy. Co., Ltd.
Toronto, Winnipeg, Vancouver, St. John, N.B.

WM. MUIR & CO., LIMITED
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Machine Tool Makers.
Specialties: Patent Puncher Slotting Machines, Milling Machines, Boring Machines.
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Send for catalogue.

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Engineers
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PAPER MILL MACHINERY
and
MACHINE TOOLS for IRON WORKER
Catalogues offered to Purchasers.

The "Dupont" PATENT Power Hammer

The strength, durability, economy of power and simplicity of adjustment of the Dupont Power Hammer make it a decidedly superior tool.

Made carefully from carefully selected, high-class materials.

Positively Guaranteed

Seven sizes.
With rams from 25 to 300 lbs.

Write for full details.

THE PLESSISVILLE FOUNDRY
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METAL STAMPINGS

We are manufacturers of stamped parts for other manufacturers.

We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.

We can finish steel stamping in Nickel, Brass or Copper.

Send us a sample order.

W. H. BANFIELD & SONS
372 Pape Avenue, Toronto, Can.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	40
Black Diamond	40
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	37½
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke .....
Connelsville Foundry Coke.....
Steam Lump Coal .....
Best Slack .....

Net ton f.o.b. Toronto.

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	50
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun, Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White.	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16
Colored.	
Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	10%
Best grades	15%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	48 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	55 00	48 00
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 16 oz. base	64 00	49 00
Braziers', in sheets, 6x4 base	55 00	48 00

BRASS.

Brass rods, base ½ in. to 1 in. rod	0 43
Brass sheets, 24 gauge and heavier, base	0 48
Brass tubing, seamless	0 55
Copper tubing, seamless	0 60

PLATING SUPPLIES.

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	06
Emery glue	15 to 20
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	.08
Ammonium carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt, sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

Market Condition and Tendency

Holiday Season Affecting Business—Shortage of Steel for Ordinary Commercial Purposes But Prices Firm and Unchanged—Tin Advances But Other Metals Unchanged.

WITH the holiday season restricting industrial activity, trade is quiet with no change of importance to note in the situation. Existing conditions will prevail for the balance of the year. The iron and steel trade is quieter than usual at this time of the year which may be accounted for by the fact that the shortage of steel for ordinary commercial purposes is restricting manufacturing operations. It is not unlikely that many of the so-called non-essential industries may ultimately have their operations still further restricted owing to the increase in demand for steel for war purposes. The situation in the pig-iron market is unchanged. The shortage of coke in the States continues to curtail the output of pig-iron as additional furnaces have been banked. The severe weather has affected the railways, increasing transportation difficulties. The price of tin has advanced on account of scarcity and the situation in regard to this metal is more acute. The market for copper is unchanged. The machine tool market continues steady with a fair volume of business passing. Prices of machine shop supplies are holding firm.

MONTREAL, Que., Dec. 22, 1917.—Business conditions have now become normal following the elections, but until the Christmas and New Year holidays are over, it is not expected that vigorous activity will be renewed to any great extent. Transportation conditions are less acute owing to the recent break in the weather.

Steel

The priority regulations are maintaining munitions plants and other essential manufacturing with sufficient raw materials but general consumers are experiencing greater difficulty than ever in covering their requirements. The holiday traffic has added to the transportation problems of the railroads and a considerable condition of congestion exists in some localities. The Canadian steel situation is unchanged, with manufacturers and dealers waiting further developments in the United States. Dealers report a very strong market with prices unchanged but virtually nominal in most instances.

Metals

The metal situation is still more or less unsettled owing to the pending developments on the other side. Copper is steady but quiet. Tin is still at nominal quotations and very scarce both here and in the States. Spelter is more active and showing strength. Lead is firmer. Antimony and aluminum are both firm and unchanged.

Toronto

TORONTO, Ont., Dec. 24.—A big increase in the trade of the Dominion is shown in a statement for November recently issued by the Department of Customs. The total volume reached almost two billion dollars for eight months of the final year, which closed November 30. Manufactures, in point of value, headed the list, the products of Canadian factories sent out of the country being to the value of $489,327,640 as compared with $263,580,148 for the corresponding period last year.

Iron and Steel

On account of the holiday season the

steel market is quiet and there is no change in the situation, as reported last week. The volume of business has been falling off for some weeks, due to the increasing difficulty that is being experienced in obtaining supplies of steel for ordinary commercial purposes, as so much steel is being diverted for war equipment. It is within the range of possibility that many of the so-called non-essential industries may have their operations still further restricted owing to the Government requirements.

Conditions in the pig iron market are unchanged from last week. Production in the States continues to decline on account of shortage of coke, due to transportation difficulties, more furnaces having been banked because of coke deficiencies. It is feared that the output of the furnaces will fall behind during the winter instead of increasing as was hoped.

Metals

The outstanding feature this week continues to be the shortage of tin, with the result that there has been a further advance in price. Receipts of tin on this side are very light and the demand does not decrease. The market is very unsettled, as there is considerable uncertainty not only as to price, but also as to actual delivery. The copper market is quiet and prices unchanged. There is some doubt as to what may be done in regard to revision of copper prices, but the opinion is generally held that the present schedule will not be changed.

A scarcity of spot lead has developed in New York and the market is firm. The "Trust" price is unchanged at 6¼c, but on the outside market lead is quoted at 6½c to 6¾c per lb. No fixed price schedule for lead and spelter has yet been given out at Washington, but some announcement is expected almost any time. The antimony and aluminum markets are quiet. Tin, which is now quoted at 82c per lb., is the only price change. Current prices on metals are given in the selected market quotations.

New York

NEW YORK, Dec. 21.—Great activity developed in the machinery trade last week in the interior markets, especially at Cleveland, where both sales and new enquiries were larger than during any previous week this year. Several large sales were also made in Chicago and in New York. At New York, however, buying was less general and smaller in volume than for several weeks. The government is still the principal purchaser in the Eastern territory where it continues to secure tools for various arsenals, the Washington Navy yard and for the ordnance repair depot in France. Recent enquiries have developed the fact that there is almost a veritable famine in large machine tools and the government has been warned that if speedy action is not taken to immediately secure large tools that it will be unable to obtain more than 25 per cent. of its requirements. The demand for large heavy tools has recently been so great that fabulous prices are being paid for second-hand units of obsolete type.

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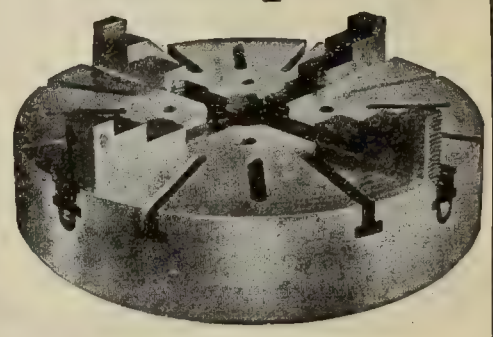
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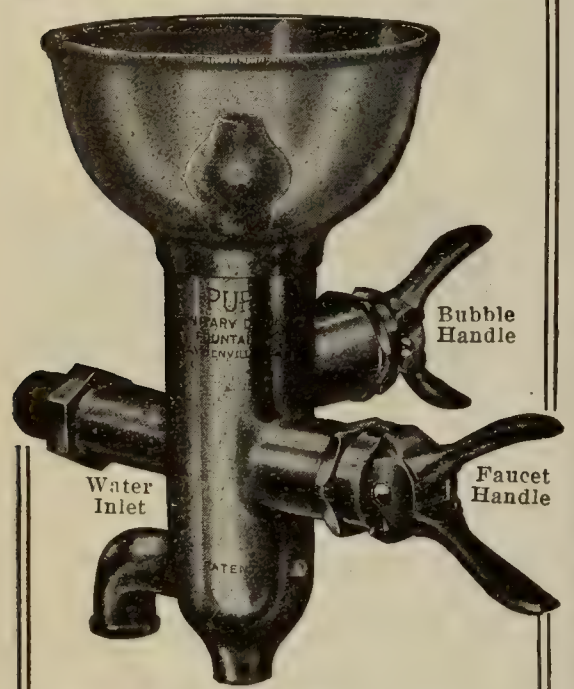

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The U.S. Army and Navy Departments are still competing in the purchase of machinery and naturally a conflict in priority of orders ensues. There is a heavy demand for rivets from ship builders and the Emergency Fleet Corporation has distributed orders for about 15,000 tons for shipment to Eastern yards. The Navy Department has given out orders for valves needed in the construction of submarine and torpedo boat destroyers.

PITTSBURG, Pa., Dec. 22.—It seems to be well established that no effort will be made at Washington to revise iron and steel prices at this time. If there is any revision it will probably occur after the fate of the Pomerene Iron and Steel Price Fixing Bill has been determined. This measure will probably be pushed by the Federal Trade Commission, and probably with a provision that some existing contracts can be suspended or abrogated entirely. The commission seems to be convinced that there are in existence some contracts, particularly for intermediate materials, that interfere with the system of uniform prices.

There are practically no offerings of pig iron by the merchant furnaces in the Pittsburgh and nearby districts. An occasional odd lot of prompt foundry is furnished as an accommodation, and there is some to be bought for second quarter and second half delivery. There are no offerings at all of basic or Bessemer.

Regular contract buyers of billets and sheet bars are being fairly well taken care of by their respective mills, but the consumer without a regular mill connection finds it almost impossible to buy soft steel. The offerings of shell steel discards continue to increase, but they are not well absorbed, although offered in billet form at about $2.50 less than the prices set for soft steel.

The sheet mills sold quite a tonnage of sheets in November after prices had been set, and with output restricted as it is at present they have little to offer. Sheet mills are operating at an average of only 50 to 60 per cent. of capacity.

Chain makers have promulgated a new list on chain, which ignores entirely the prices recently named by the American Iron and Steel Institute. This new list is based on 8.30c for 1-inch, ⅜-inch being 9.20c.

The whole iron and steel market has been extremely quiet, there being scarcely any commercial transactions. Government orders continue to be alloted as freely as formerly, but details are withheld. It is stated that 1,200,000 tons of shell steel has now been distributed, the whole programme involving 1,500,000 tons, all for shipment by the middle of June.

Quebec City Building Statistics.—The value of building permits issued between January 1 and December 15 this year totalled $2,457,516, as against $2,912,157 for the twelve months ending December 31 last year. The outlook for the New Year is reckoned none too bright.

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1—13 x 5 Barnes Standard Engine Lathe.
1—10 x 4 Sebastian Standard Engine Lathe.

TURRET AND SCREW MACHINES

2—No. 6-A Potter & Johnson Automatic Lathes.
1—4½" Gridley Auto. Screw Machine, motor driven.
2—No. 4 Foster F.G.H. Hand Screw Machines.
2—No. 3 Foster F.G.H. Hand Screw Machines.
1—No. 5 Pierson F.G.H. Hand Screw Machine.
6—No. 2 W. & S. Plain Hand Screw Machines P.F.T.
3—No. 3 S. & K. Plain Hand Screw Machines
2—No. 2 S. & K. Plain Hand Screw Machines.
4—12" W. & S. Turret Lathes with air chucks.
4—16" W. & S. Turret Lathes with air chucks.
4—No. 107 Wells Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jigger feed.
1—⅝-¾" Cleveland Automatic Screw Machine.

MILLING MACHINES AND GRINDERS

1—No. 2 Hendy Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Mill. Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drill. Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
1—No. 2½ Bath Universal Grinder.
1—No. 12 Modern Plain Grinder.
1—No. 14 Modern Plain Grinder.
1—No. 1 Landis Internal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.

DRILL PRESSES

1—3-spindle 8" overhang Henry & Wright High Speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.

SHAPERS AND PLANERS

1—36 x 36 x 10' New Haven Planer, S.H.
1—27 x 27 x 7' Cincinnati Planer, S.H.
1—24 x 24 x 6' Flather H.P. Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS

1—Waterbury Farrell O.B.I. Press, geared.
1—Wright Heavy Stamping Press, 76" housings.
1—No. 55 Toledo S.S., B.G., 10" stroke.
1—No. 55 Toledo S.S., B.G., 14" stroke.
3—No. 2-W Bliss Wiring Presses.
1—No. 5 Michigan O.B.I. Plain Press.
1—No. 5 Niagara O.B.I. Plain Press.
1—No. 4 Niagara O.B.I. Plain Press.

AIR COMPRESSORS

1—9 x 11 Chicago Pneumatic Belt Driven Air Compressor.
1—8 x 8 Fairbanks-Morse Belt Driven Air Compressor.
1—8 x 8 Gardner, Single Belt Driven Air Compressor.
1—8 x 8 Ingersoll-Rand Belt Driven Air Compressor, inclosed.
1—8 x 6 Westinghouse Steam Air Compressors.
1—8 x 6 Ingersoll-Rand Belt Driven Air Compressor.

We also carry a large assortment of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machine tools large and small.

RIVERSIDE MACHINERY DEPOT

29 St. Aubin Ave.,

DETROIT, MICH.

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15" three-jawed chuck.
1—Lathe, 28" swing, 8' bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22" Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15" three-jawed chuck.
1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 24" wheel.
1—Lathe, 14" swing, 6' bed.
2—Ford Smith Shell Grinders, complete.
1—17" LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
1—16" Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
1—Double End Painting Machine, with ¼ h.p. motor.
1—Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—5 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.

Sherbrooke, Que.

Chas. A. Strelinger Co.,

43-51 E. Larned St.

DETROIT - MICHIGAN

Machine Tools For Immediate Delivery

DRILLING MACHINES

No. 0 and No. 1 Burke Bench Sensitive.
No. 1-S Garvin B.G. Horiz., with oil pump.
No. 150 and No. 152 Buffalo Blacksmith.
No. 1-B Henry & Wright H.S.B.B.
No. 2-K Henry & Wright H.S.B.B.
12" Albany H.S.B.B. Tool Room.
14" Royersford Sensitive.
No. 7—15" Barnes Upright.
20" Barnes, sq. base, W. & L. feed.
No. 5—20" Buffalo, with power feed.

GRINDING MACHINES

Geometric Chaser with countershaft.
No. 2 Oakley Universal Cutter and Tool.
No. 2 and No. 3 Blount Double End Emery.
14" Diamond Double End Emery.
No. 3 Gardner B.B. Polishing Lathes.
No. 2 Diamond Aut. Surface Grinder.
No. 3 Wilmarth & Morman Aut. Surface.
No. 2 Diamond Wet Tool with wheel truing device.

LATHES

No. 5½ Sloan & Chace Precision Bench.
12" x 5' Seneca Falls Style "E."
14" x 6' Monarch Q.C., D.B.G. Engine.
16" x 6' Monarch Q.C., D.B.G. Engine.
16" x 8' Monarch Q.C., D.B.G. Engine.
17" x 6' Wickes Single Purpose with pl. rest.
17" x 8' Sidney Q.C., D.B.G. Engine.
18" x 8' Barnes Engine.
24" x 12' Wickes H.D. with Fay & Scott Turret Tool Post.
11" x 4' Blount Speed.

MISCELLANEOUS

No. 6 Whitney Hand Miller.
No. 1 Standard Hand Miller, with oil pump.
No. 38-B Chicago Small Miller.
No. 21 Garvin Plain Geared Miller.
No. 1½ Valley City Plain Miller.
No. 101 Niagara Power Presses.
Manhattan Ratchet Type Screw Press.
No. 18 Lea-Simplex Cold Metal Saw.

New and Used Machine Tools

In stock for immediate delivery

LATHES

1—No. 3 Foster Turret Lathe, geared head.
1—16" Fox Monitor Lathe.
1—No. 3 Bliss Spinning Lathe.
1—No. 5 Bliss Spinning Lathe.

GRINDERS

1—No. 4 Gardner Grinder.
1—Graham Double Disc Grinder.
1—Crescent Disc Grinder.
2—Ford Smith Shell Grinders.
1—12 x 42 Landis Grinder.
2—Dumore Electric Grinders.

SHAPERS AND PLANERS

1—24" London Machine Tool Shaper.
1—36" x 6' Bertram Planer.

PRESSES AND HAMMERS

1—23½B. Niagara Toggle Drawing Press.
1—No. 66 Consolidated Straight Sided Power Press.
1—400-lb. Bliss Drop Hammer.

PIPE-THREADING MACHINES

1—2" Loew Victor, Belt-driven.
1—2" John H. Hall Belt Driven.
1—4" Loew Victor Motor Driven S.P. 110/60.
1—6" Loew Victor Motor Driven S.P. 110/60.

PUMPS

1—2 x 1½ x 3 Gardner Feed Pump and Receiver.
2—3 x 2 x 3 Smart Turner B.F. Steam Pumps.
1—12 and 18½ x 12 x 10 Worthington Compound Duplex Double Acting Steam Pump.
1—14 x 12 x 10 Worthington Duplex Double Acting Steam Pump.

STEAM AND GASOLINE ENGINES

1—8 x 10 Ideal High Speed Steam Engine.
1—450 Goldie McCulloch Corliss Engine.
1—15 H.P. International Stationary Gasoline Engine.
1—15 H.P. International Portable Gasoline Engine.
1—35 H.P. Heer Stationary Gasoline Engine.

BOILERS AND HOISTS

2—40 H.P. Locomotive Type Boiler.
1—60 H.P. Locomotive Type Boiler.
1—75 H.P. Return Tubular Boiler, full front setting.
2—100 H.P. Return Tubular Boilers, full front setting.
3—150 H.P. Return Tubular Boilers, full front setting.
1—6½ x 8 Napanee D.C., D.D. Hoisting Engine.
1—7 x 10 D.C., S.D. Hoisting Engine.
2—6 x 8 D.C., S.D. Mine Hoists.
1—7 x 10 Bacon Special Cableway Winding Engine.
1—4 H.P. Novo Reversible Gasoline Hoist.

MISCELLANEOUS

1—No. 5 American Gas Forge.
1—No. 16 American Gas Furnace.
1—6" Peerless Hack Saw.
2—No. 3 Waymoth Variety Lathes.
1—Waymoth Pointing Machine.
1—Crescent Universal Boring Machine.
1—20 K.W. D.C. Generator, 115 volts.
1—½ yard London Concrete Mixer, mounted on truck, with steam engine and boiler, complete with water tank and automatic loading skip.
1—20 H.P., 2-phase, 440-volt, 60-cycle Electric Motor.
1—75 H.P., 3-phase, 2200-volt, 60-cycle Electric Motor.
2—Bilton Gear Cutters.
1—Gray Sandblast Machine.

General Supply Co. of Canada, Limited

OTTAWA, CANADA

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USED MACHINERY

IMMEDIATE DELIVERY

DRILLING MACHINES.

20" Mechanics.
22½ W. F. & J. Barnes, B.G., P.F.
30" Lodge & Davis, S.H., B.G., P.F.
3½' Hamilton Plain Radial, tapping attachment.
4' Mueller Plain Radial.
Four No. 310 Baker Heavy Duty.
3-spindle Rockford.
4-spindle Rockford.
4-spindle Washburn, with power feed.
4-spindle Allen.
No. 11 Pratt & Whitney, 10 spindles.

GEAR CUTTERS.

24" x 7 G. & E., spur gears.
No. 13 B. & S., spur gears.
30" x 9" G. & E., spur and bevel gears.
36" x 9" G. & E., spur and bevel gears.
36" Walcott, spur gears.
No. 1 Shuchardt & Schutte Gear Hobber.

GRINDERS.

No. 1 Cincinnati Universal Tool and Cutter.
No. 2 Woods Tool and Cutter.
Brainard Cutter.
Leland Universal, with power feed.
No. 2 Landis Universal.
No. 21 Landis Plain.
No. 1 Gardner Disc.
No. 24 Gardner Disc.
No. 6-A Diamond Universal.
10" x 36" Landis Plain (new).

LATHES.

14" x 6' Rockford, C.R.
15" x 6' Rockford Tool Co., C.R.
16" x 8' Bradford, C.R.
18" x 6' Bradford, C.R., taper attachment.
18" x 8' Lodge & Shipley, pat. head, C.R., taper attachment.
20" x 14' Blaisdell, C.R.
21" x 12' New Haven, C.R.
36" x 18' Schumacher & Boye, T.B.G., Q.C.G.
36" x 20' American, T.B.G.
36" x 16' Fifield.
42" x 28' Hamilton, T.B.G., raising blocks to swing 54".

PLANERS.

24" x 24" x 6' American, one head.
26" x 26" x 6' Gray, one head.
26" x 26" x 8' Pease, one head.
30" x 30" x 8' Woodward & Powell, one head.
36" x 36" x 14' Sellers, one head.
39" x 39" x 12' New Haven, one head.
48" x 48" x 10' Woodward & Powell, two heads.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES.

No. 1 Warner & Swasey, plain head.
No. 2 P. & W., friction head.
No. 2 Foster, plain head, A.C. and W.F.
No. 3 Bardons & Oliver, plain head, A.C. and W.F.
No. 4 Pearson, friction head, A.C. and W.F.
No. 5 Foster, geared friction head, A.C., P.F. to turret slide, and P.F. to cross slide.
No. 5 Foster, all geared head, A.C. and W.F., P.F. to turret slide.
1—¾" Gridley, 4-spindle automatic.
3—¼" Gridley, 1-spindle automatic.

TURRET LATHES.

No. 2 Foster-Kimball, plain head.
No. 22 Garvin, plain head.
16" Lodge & Davis, back geared.
16" Warren & Swasey, friction head.
2" x 24" J. & L., cone head.
24" Gisholt, 4¼" spindle hole, taper attachment.
No. 3-A Warner & Swasey, bar attachment.

PUNCHES AND PRESSES.

No. 74½ Bliss, str. side, geared.
Blake & Johnson Embossing.
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾", 12" throat (new).
No. 4 Long & Allstatter Single End Punch and Shear, ¾" x ¾", 18" throat (new).

MISCELLANEOUS.

24" Bullard Vertical Turret Lathe, turret head and one side head.
No. 00 Baker Keyseater.
6" x 48" P. & W. Thread Miller.
Industrial Gas Hardening Furnace with blower and pyrometer.
No. 2 B. & S. Plain Milling Machine.
No. 3 Cincinnati Vertical Milling Machine.
20 H.P. Nash 2-Cylinder Vertical Gas Engine.
6 H.P. Fairbanks-Morse Horizontal Gas Engine.

STOCKER-RUMELY-WACHS COMPANY

117-121 NO. JEFFERSON STREET CHICAGO, ILLINOIS

USED MACHINE TOOLS

AUTOMATIC SCREW MACHINES.

Acme No. 56 Multiple Spindle Automatics.
New Britain No. 24 Automatic Chucking Machines.
Gridley 1¾" Multiple Spindle Automatics.
Gridley 2¼" Multiple Spindle Automatics.
Gridley 3¼" Single Spindle Automatics.
Gridley 4¼" Single Spindle Automatics.
Potter & Johnston No. 6A Automatics.
Potter & Johnston No. 5A Automatics.
Reed-Prentice 2XH Semi-Automatics.

DRILLING MACHINES.

Baker No. 310 High Duty Drills.
Moline No. 117 Single Spindle "Hole-Hogs."
Rockford 6-spindle Gang Drill.

LATHES.

Lo-Swing 3½" x 24".
Lo-Swing 3½" x 60".
Yound 10" x 5' Screw Cutting.
Seneca Falls 11" x 5' Screw Cutting.
Mann 12" x 5' Screw Cutting.
Reed-Prentice 14" x 5' Stud and Bolt.
Porter-Cable 9" Manufacturing Lathe.
Putnam 26" x 12' Screw Cutting.
Bridgeford 27" x 12' Plain Turning.
Huntington 27" x 12' Plain Turning.
Norwood Plain Turning Lathes, for shells up to 9.2".
Fay & Scott Gap Lathe, 32" x 50" x 12', Screw Cutting.

GRINDERS.

Modern 12" x 24" Grinders.
Blount 20" Wet Tool Grinders.
Blount No. 2 and No. 3 Dry Grinders.
Whitney 20" Wet Tool Grinders.

MILLING MACHINES.

Becker Large Hand Millers.
Van Norman No. 1 Hand Millers.
Garvin No. 2 Hand Miller.
Garvin No. 3 Hand Miller.
Pratt & Whitney No. 2 Hand Miller.
Sellers Lincoln type Miller.
Briggs No. 1, Type "A" Power Miller.
Lees-Bradner No. 3D Thread Millers.
Lees-Bradner No. 3C Thread Millers.
Knight Duplex Lincoln Millers.
Morris-Thompson No. 3B Thread Millers.

MISCELLANEOUS.

Cooper 3" Shell Grinders.
Fairbanks 50 lb. Model "A" Power Hammer.
West No. 4 12-cylinder Banding Press.
Williams 9.2" Cutting-Off Machines.
Gas Furnaces, 26" x 30" x 12" capacity.
American, Victor and Connersville Pressure Blowers.
National No. 5 Oil Separator.
Standard Bilton 6" Automatic Gear Cutter.
Ferracute No. DD-66 Drawing Press.
Leland-Gifford 2-spindle Profilers.
Garvin No. 1 2-spindle Profilers.
D. & W. Magnetic Chucks, 110 V.D.C., 7½" x 16" (4).
Allis-Chalmers 3" Band Turning Machines.
Racine No. 1 Hack Saws.
Williamson Metal Band Saws, Capacity 10".
15 H.P., 220 A.C., 50-cycle, 3-phase motors (15).

NEW MACHINE TOOLS.
(Miscellaneous.)

Porter 21" x 10' Screw Cutting Lathes.
Becker Large Hand Millers.
Pratt & Whitney No. 2 Hand Millers.
Garvin No. 1, 2-spindle Profilers.
Betts No. 12, P. & W. type Profilers, 2-spindle.
Detrick & Harvey No. 12, P. & W. type Profilers, 2-spindle.
Newton No. 12, P. & W. type Profilers, 2-spindle.
Heald Style "W.T.A." Drill Grinders.

The above list will give you an idea of the large assortment of machine tool equipment that we are in position to furnish immediately. All equipment is offered subject to prior sale. We shall be glad at all times to make quotations and send full description and condition of the machines mentioned. The "used" machines, in a good many cases, are actually as good as new, having seen very little service.

Inter-Continental Machinery Corporation

165 Broadway, New York.

Here's the Equipment You Want

Immediate Delivery. Good Working Condition.

SLOTTERS.

18" Betts, heavy type, circular table.
10" New Haven.

LATHES.

60" x 11' New Haven Pulley Lathe, two 48" face plates.
Six (6) 40" x 18' Pittsburgh Lathes, quick-change gear.
32" x 20' Rahn Larmon.
24" x 12' Lodge & Shipley.

VERTICAL BORING MILLS.

50" Bridgeport Bullard.
48" Colburn, 2 swivel heads.
Two (2) 42" Colburn, single head.

PLANERS.

40" x 40" x 14' New Haven, single head.
30" x 30" x 12' Cincinnati, 2 heads.
Two (2) 30" x 30" x 10' Pease, single head.
25" x 25" x 8' Sellers, single head.
24" x 24" x 6' New Haven, single head.
42" x 42" x 12' Pond Planer, 1 head on rail, 1 side head.
30" x 30" x 8' Powell Planer, 2 heads.

RADIAL DRILLS.

60" Hamilton.
48" Gang, tapping attachment.
48" Niles.

GRINDERS.

No. 5½ Bath Duplex.
No. 3 Bath Universal.
12 x 60" Landis Universal.
No. 2 Bath Universal.
10 x 30" Atlas Universal.
Two (2) No. 2½ Bath Duplex, internal.
No. 11 Landis Plain.

MILLING MACHINES.

Two (2) Newton Vertical Milling Machines, 6" main spindle; equipped with 36" heavy facing cutter heads.
No. 5 Brown & Sharpe, Vertical.
No. 1½ Cincinnati Universal, dividing heads, etc.
No. 2 Putnam Universal, dividing head, etc.
No. 2½ Garvin Universal, dividing head, etc.
No. 2 LeBlond Plain.

GEAR CUTTERS.

16" Bilgram Bevel Gear Planer.
Wm. Sellers Son, 54", Spur and Bevel.
Brown & Sharpe 24" Automatic.

PRESSES.

No. 54 Garrison Straight-sided Single Crank Press, weight 26,000 lbs., 5" stroke, 25" between housings
93-A Toledo, weighs 14,000 lbs.
92-B Toledo, weighs 9,400 lbs.
No. 35 Arch Press, weighs 5,000 lbs.
No. 3 Perkins Double Action Toggle Press.
150-ton Ferracute Knuckle Joint Coining Press
75-ton Ferracute Knuckle Joint Coining Press.

POWER HAMMERS.

15-ton Morgan Steam Hammer.
1000-lb. Billings & Spencer, Board Drop.
Two (2) No. 4 Nazel Pneumatic.
500-lb. Bell Single Frame Steam.
500-lb. Bradley Upright.
400-lb. Ferris & Miles Steam.
200-lb. Beaudry Upright.
Two (2) 200-lb. Bradley Upright.
One (1) 40-lb. Bradley Helve.

UPRIGHT DRILLS.

36" Foote-Burt Heavy Duty.
26" Barnes.
24" Foote-Burt.
24" Prentice.

PIPE MACHINES.

8" Eaton, Burnham & Coles.
6" Jarecki.

CRANE.

15-ton Alfred Box Co. Traveling Crane, single motor, 15 H.P., 220 volts, 40' span.

MISCELLANEOUS.

10' Hilles & Jones Boiler Plate Rolls.
No. 3 Newton Cold Saw.

Write for Stock List.

GRAVES MACHINERY EXCHANGE

Offices: Suite 482, 50 Church Street, New York City
Telephone: Cortlandt 665
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LOCATION, BRITISH COLUMBIA

Plant completely equipped for manufacturing frogs and switches.

Equipment may be bought independent of plant.

Specifications: Modern Building, 100' x 200' on 7½-acre site. Ideal wharfage and C.P.R. spurs running into plant.

PRINCIPAL EQUIPMENT

MACHINERY

1—18" Barr Double Arm Punch and Shear.
1—26" Prentice Drill Press.
1—40" Buffalo Blower.
1—5' Bellers Radial Drill.
1—2-ton Chain Block and Swedge Block.
1—48" Espen Lucas Cold Saw, 2 blades.
1—72" x 72" x 14' Enterprise Planer, 2 heads and grinder head.
3—Air Hoists, 1 4', 2 7'.
1—2" Acme Bolt Cutter, 3 complete sets of dies.
1—12 x 12 Rand Steam-driven Air Compressor, with tank.
1—36" x 36" Niles Planer, with two heads.
1—45" x 12' Niles Two-head Planer, with extensions.
1—54" Putnam Gear Cutter, with cutters.
1—Gisholt Tool Grinder.
1—32" x 48" Brainard Slab Miller.
1—Power Hack Saw.
1—1½" Spindle Double-end Grinder.
1—48" Morton Draw-cut Shaper.
1—1210A Mason Boiler (T.P. 240, W.P. 160).
1—Dudley Car Frame and Trucks.
Several Electric Motors.

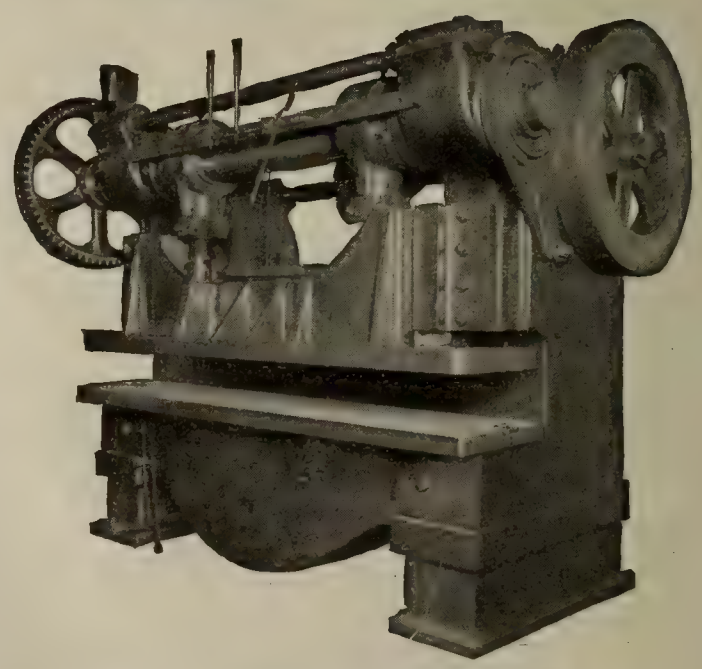
Complete Information and Inspection Upon Demand

The Call Switch Co., Limited

New Birks Bldg. - MONTREAL

(c1m)

FOR SALE



Large Blanking Press

76" between housings, 8" shaft,
3½" stroke, 8¾" die space.

Very good condition and for immediate delivery.

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17-29 St. Aubin Ave. - - DETROIT, MICH.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

MACHINE TOOLS—ANYTHING YOU WANT

BORING MACHINES—Vertical.
1—30" Bullard, 1 turret head.
2—32" Bullards, 1 turret head.
1—36" Bullard, 2 heads.
1—37" Bullard, 2 heads.
1—38" Bausch, 2 heads.
1—NEW 42" Gisholt, 2 heads.
2—10' Niles, 2 swivel heads.

BORING MACHINES—Horizontal.
1—2½" bar, Niles.
1—Bement, knee type, 2½" bar.
1—Williams Sellers, knee type, 2½" bar.
1—Binnse Knee Type, 2½" bar, for cylinder boring.
1—Beaman & Smith, 2-3" spindles.

BULLDOZERS.
1—No. 4 Ajax, 20" stroke.
2—No. 23 Williams & White, belt-drive.
1—No. 26 Williams & White, belt drive.

CRANES—Traveling.
1—8-ton Chisholm & Moore, 13½' span, hand power.
1—10-ton Toledo, 3 motors, 30' span.
1—10-ton Whiting, 48' 8" span.
1—10-ton Shaw, 72' span, 4 motors.

CRANES—Locomotive.
3—10-15-ton McMyler Broad gauge Steam Locomotive, 60' boom, bucket, 3 drums.
1—15-ton Browning, 8-wheel, 38' boom.
1—20-ton Brown Hoist, 8 wheel, 40' boom, bucket.
1—20-25-ton Industrial, 8 wheel, 50' boom, bucket.

CUTTING-OFF MACHINES.
1—4" Hurlburt & Rogers.
30—4½" Davis.
10—4½" Williams.
1—5" Hurlburt & Rogers.
6—8" Automatic.

DRILLING MACHINES—Radial.
3—NEW 3' Mueller, speed box drive; March del.
3—NEW 3' American, Sensitive, tapping attachment.
1—4' American, speed box drive, tapping attach.
1—4' Mueller.
1—4½' Full Universal, cone drive.
1—NEW 5' Western Plain, with motor.
3—NEW 5' Mueller, speed box drive; March del.
4—6' Reed-Prentice, latest type, belt-driven; January del.
1—NEW 6' Triumph, motor drive; February del.

DRILLING MACHINES—Heavy Duty.
2—D-2 Colburn Heavy Duty, 3½" cap., arranged for motor drive.
4—No. 25 Foote-Burt, heavy duty, 2½" capacity.
10—No. 310 Baker, single pulley drive, late type, arranged for motor drive.
10—Moline Hole Hogs, heavy duty, 2½" cap.

DRILLING MACHINES—Sliding Head.
2—NEW 25" Cleveland, high duty.
5—NEW 28" Sibley.
2—NEW 30" Sibley.
2—NEW 34" Barnes.

DRILLING MACHINES—Multiple Spindle.
1—NEW Cleveland, 4-spindle, ball-bearing.
1—4-spindle 20" Barnes, all geared.
2—6-spindle Rockford; Economy type.

GEAR CUTTING MACHINES.
1—No. 1 Schuchardt & Schutte Gear Hobber, spur and bevel.
1—No. 2A Newark, 24" x 8" cap.
3—No. 3 Brown & Sharpe Auto Gear Cutter, spur.
1—36" Newark.
1—30" Whiton, for spur and double gears.
2—36" x 9" Gould & Eberhardt, new type, spur gears.
1—15" Gleason Bevel Gear Planer.
1—20" Grant-Lees Gear Hobber, bevel spur and spiral attachment.
1—28" Rhemania Gear Hobber, spur and worm gears.
2—NEW 30 Flather, solid pattern.
1—36" Fellows Gear Shapers.
1—72" Gould & Eberhardt, spur and bevel.

GRINDERS—Universal for Cutters, Drills, Reamers, Etc.
5—NEW No. 190 Wells.
2—NEW Universal.
2—No. 1 Cincinnati.
1—NEW Gisholt Universal.
1—NEW Premier, Universal.
1—NEW Wilmarth & Morman, style B.X.
1—NEW Walker No. 1, outfit B.
2—NEW No. 2 Oesterlein Universal.

GRINDERS—Cylindrical, Plain.
2—American Waltham Precision, cap. 7" x 2½".
1—NEW 8" x 30" Modern Self-contained.
2—NEW 12" x 24" Modern Self-contained.
4—12" x 36" Modern Self-contained.
2—12" x 42" Landis Self-contained.
5—12" x 48" Modern Self-contained.
1—12 x 66" Landis.

GRINDERS—Cylindrical, Universal
1—NEW Thompson 10 x 36".
1—NEW No. 3 Modern, cap. 13" x 40".
1—No. 4 Cincinnati; capacity 12 x 72".

GRINDERS—Internal
1—No. 75 Heald.
1—1½ Landis.

GRINDERS—Disc.
1—NEW No. 4 Gardner, including disc press, 23" disc.
3—No. 14 Besley, including ring, wheel, chucks.
1—NEW No. 17 Gardner, 30" disc.

GRINDERS—Cylindrical.
1—No 60 Heald, single pulley drive.

GRINDERS—Surface.
4—NEW No. 1 La Salle Plain, with Micro. Adj.
1—NEW No. 1½ Walker's, complete.
4—NEW No. 2 Reid (Same as B. & S.).
1—3' Pratt & Whitney Vertical, Magnetic Chuck.
12—Carrigus type, mag. chuck.

HAMMERS—Board Lift Drop.
1—100-lb. Bradley upright, Beaudry type.
3—300-lb. McWilliams.
1—No. 4 Standard Machinery Co., 400-lb.
1—E. W. Bliss, 800-lb.
1—1500-lb. Toledo.
1—3000-lb. Williams & White.

HAMMERS—Steam Forging.
1—600-lb. Niles, single frame.
1—12-ton Bement.

KEYSEATERS.
1—Morton, 2" cap., 18" stroke.
1—No. 1 Catlin.
1—Colburn 4", capacity 43" stroke.
1—No. 2 Knowles, 60" stroke.

LATHES—Manufacturing, not Screw Cutting
2—NEW No. 3 Harding Brothers, Bench Lathes.
10—NEW 26" x 12' Simplex Shell Bor. Mill, 5" boring bar, quick-change gears; arranged for motor drive.
21—No. IX Reed-Prentice, 16" swing, single pulley drive.
4—Norwood, used on 9.2 English Shells.

LATHES—Engine.
2—NEW 12" x 5' Cleveland Tool Room Precision. geared head, taper attachment.
14—NEW 15" x 6' Rockford.
3—NEW 16" x 6' Cleveland Tool Room Lathes, complete equipment.
1—NEW 17" x 8' National Quick Change, Double Back Gears.
12—NEW 17" x 8' LeBlond Pan Bed, Quick Change Gears.
1—18 x 8 Prentiss, geared head, taper attachment, quick change.
3—20 x 8 Lodge & Shipley, quick change, turret on ways.
2—20" x 10' Lodge & Shipley, quick change.
19—NEW 21" x 10' Porter, S.B.G.
7—22" x 10' Putnam, oil pan and pump.
1—NEW 24" x 10' American, high duty, quick change.
2—24" x 10 Lodge & Shipley, quick change.
1—24" x 10' Schumacher & Boye, quick change, taper attachment.
1—NEW 26" x 48" x 12' McCabe Double Spindle.
1—NEW 26" x 16' Bridgeford pattern geared head, heavy pattern.
3—27" x 12' Bridgeford Heavy Duty, plain turning, 2 carriages, motor driven.
7—28" x 12' Bridgeport, geared head, heavy duty, taper attachment.
1—NEW 30" x 14' American Double Back Geared, Quick Change.
1—30" x 14' Lodge & Davis, patent head.
1—36" x 13' Putnam, face plate drive.
1—36" x 17' Pond, triple geared, quick-change.
1—36" x 16' New Haven, quick change.
1—36" x 20' American, triple geared.
6—40" x 18' Pittsburg, quick change, gear, face plate drive.
1—40" x 4' Niles, triple geared.
1—48" x 14' Fifield.
1—54" x 22' Worcester, Triple Geared.
1—58" x 18' 6" Dodge Lathe. Very Heavy.
1—60" x 26½' Thaver Houghton, triple geared.
1—60" x 24½' American, triple geared.
1—NEW 66" x 46 Putnam Triple Geared, Face Plate Drive, 5-step Cone; 6½" belt.
1—84" x 18' Special Boring Lathe.

LATHES—Turret.
2—21" Gisholt, 18" chuck, quick traverse, taper attachment.
2—24" Gisholt, taper attach.
5—2 x 24 Jones & Lamson.
4—3 x 36 Jones & Lamson, single pulley drive.
2—18" Libby, all equipment.
3—24" Libbey, Universal Facing Head, 3-jaw chuck.
18—6A Potter & Johnson.
1—NEW 3¼" x 40" Greenlee.
1—24" Brown & Sharpe Vertical, chucking mach.
1—24" Davis.
1—No. 24 New Britain, arranged for motor drive; almost new.

MILLING MACHINES—Knee Type, Universal.
1—No. 2 Kempsmith, Vertical Attachment.
1—No. 2 Kempsmith 13" Dividing Head.
5—NEW No. 1 Kempsmith.
1—No. 1½ Cincinnati.
1—NEW No. 2 Rockford High Power.
2—NEW No. 2 Garvin.
3—No. 2 Cincinnati.
1—NEW No. 2 Cincinnati.
1—No. 2 LeBlond.
2—NEW Kempsmith Universal.

MILLING MACHINES—Knee Type, Plain.
1—No. 0 Cincinnati.
4—NEW No. 1 Kempsmith.
5—NEW No. 1B Hendey, with dividing heads.
1—NEW No. 2 Rockford.
1—No. 2 Cincinnati.
1—NEW No. 2 Kempsmith.
1—NEW No. 3 Cincinnati, complete.
1—No. 3 LeBlond.
1—No. 3 Kempsmith.
1—No. 15 Garvin.
1—No. 5 Cincinnati, quick change, double back gear.

MILLING MACHINES—Thread.
4—Morris-Thompson, arranged for motor drive.
10—No. 3 Lees-Bradner.
5—No. 3C Lees-Bradner, for 9.2" English shells.
2—Archdale, Taft, Pierce, for 6" English shells.

MILLING MACHINES—Hand.
1—No. 1 Bickett.
3—NEW No. 2 Pratt & Whitney.
2—NEW No. 3 Garvin.
10—NEW Becker, table 20" x 5½".

MILLING MACHINES—Vertical.
1—Hilles & Jones heavy pattern, rotary table.
1—No. 2 Pratt & Whitney.
2—NEW No. 4B Becker.
1—Newton Vertical, Continuous, Motor Driven, for shell work.

MILLING MACHINES—Planer Type.
1—NEW 17" x 5' Eynon Planer Type.
1—19" x 8' Beaman & Smith; in fine condition.
1—22" x 22" x 5' Ingersoll.
1—24" x 24" x 12' Bement & Niles.
1—24" x 24" x 14' Bement.
1—30" x 30" x 8' Ingersoll, single spindle, motor driven.

MILLING MACHINES—Lincoln Type.
2—Briggs type, high duty.
3—New American, No. 1.
1—No. 7 Becker.
2—Pratt & Whitney.

PLANERS.
2—16" x 16" x 36" Pratt & Whitney Tool Room; almost new.
5—NEW 24" x 24" x 6' Powell, single head.
1—24" x 12' Detrich & Harvey, open side, one head, also milling attach.
1—26" x 26" x 10' Gray, one head.
1—NEW 30" x 8' Powell, 2 heads.
1—30" x 30" x 8' Ohio, late model.
1—30" x 30" x 8' Garvin, open side, fine condition.
1—32" x 32" x 16' Niles, 2 heads.
1—36" x 36" x 10' American; 2 Heads.
1—36" x 30" x 12' Detrich & Harvey, open side, 3 heads.
1—NEW 36" x 36" x 10' Wilson, 2 heads.
1—36" x 36" x 8' Gray; One Head.
1—36" x 36" x 14' Cincinnati, 2 heads.
1—42" x 36" x 14' American, 2 heads.
1—42" x 42" x 19' Powell, 2 heads.
1—48" x 48" x 10' Pond, 2 heads.
1—60" x 60" x 21' Pond; 3 Heads.
1—62" x 62" x 20' Canada Tool Works Planer: 2 Heads.

PUNCH AND SHEARS.
1—Waterbury-Farrell Alligator Shears, cap. 2½".
1—Cincinnati Gap Shears, 17" gap, 78" blade, ¼" capacity.
1—No. 411-G Toledo Squaring Shears, capacity 97", weight 12,600 lbs.
1—No. 2 Hilles & Jones Punch and Shear, 30" throat.
1—Cleveland Punching Shear, 36" throat, capacity 1" x ½".
1—Long & Allstatter, cap. ⅞ x ⅞.
1—Providence Steam-driven Punch, 48" throat, cap. 3" through 1½"; almost new.

SCREW MACHINES—Hand.
3—No. 0 Brown & Sharpe.
1—1" Pierce.
10—NEW No. 2 Owens Kent, wire feed, automatic chuck, 1 1/16" capacity.
4—20" Cincinnati Acme, friction geared head.

SCREW MACHINES—Automatic
2—NEW ⅝" Cleveland, Model A.
3—1¼" Cleveland, Model B, full auto.
1—NEW 1¼" Gridley Mult. Spindle, Belt Driven.
10—1¾" Gridley, mult. spindle; good as new.
5—2¼" Gridley, mult. spindle, arranged for motor drive.
20—3¼" Gridley, single spindle.
4—4¼" Gridley, single spindle.
2—No. 0 Brown & Sharpe.
1—No. 1 Brown & Sharpe.
1—No. 2 Brown & Sharpe.
3—No. 55 National Acme.
9—No. 56 National Acme, mult. spindle, 2¼" cap.
1—No. 515, 9-16" capacity, National Acme; late model.

SHAPERS.
1—NEW 16" Springfield.
1—16" Motor Driven Rockford.
1—NEW 18" Steptoe.
2—NEW 24" Milwaukee.
1—NEW 24" Potter & Johnson Universal.
1—NEW 24" High Duty Gould & Eberhardt.
1—NEW 24" Steptoe.
2—30" Morton Draw Cut.
5—NEW Barker 24".

SLOTTERS.
1—Wilmarth, 12" stroke.
1—New Haven, 10" stroke.

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PARTIAL LIST OF TOOLS

No. 3 Kempsmith New Plain Miller.
2—No. 2 Kempsmith New Universal Millers.
5—No. 0 Steptoe New Hand Millers.
2—3" x 36" Jones & Lamson Geared Head.
10" x 4' Seneca Falls Lathe.
13" x 5' 6" New Carroll Jamieson Quick Change Lathe.
14" x 6' New Carroll Jamieson Quick-change Lathe.
15" x 6' New Sidney D.B.G. Quick Change Lathe, swing 17".
12—17" x 8' New National Quick Change Lathe.
3—17" x 8' New Sidney D.B.G. Quick Change Lathe, swings 19".
9—19" x 8' New Sidney D.B.G. Quick Change Lathe, swings 21".
24" x 10' New Carroll Jamieson Lathe.
22" x 20' Reed Lathe.
32" x 24' Fay & Scott Lathe, raising blocks to swing 53".
30" x 30" x 10' Bement Planer, 2 heads.
24" x 24" x 6' Gray Planer.
16" American Shaper.
18" Barker Shaper.
5' Bickford Single Pulley Drive Radial.
4' Miller Single Pulley Drive Radial.
2—20" Rockford High Duty Drill.
2,000-lb. Bement Steam Hammers.
250-lb. New Little Giant Belt Hammer.
100-lb. New Little Giant Belt Hammer.
30-ton Watson & Stillmann Hydraulic Press.

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Some Tools of Particular Importance

2—Large Inclinable Presses, back-geared, 5" stroke, equal to new; weight 6,000 lbs.
1—Straight-side Press, geared, 5" stroke; 6,000 lbs.
1—190 Brown & Boggs Inclinable Press.
2—21" Hercules Rough Turning Lathes, suitable for 6" shells, oil pan and pump.
2—18" x 8' Engine Lathes, double back geared, quick-change.
1—13" x 5' New Champion Tool Room Lathe, with taper attachment.
1—16" x 6' Crawford Handy Type Tool Room Lathe, quick-change gear, taper attachment, oil pan and pump.
1—20" Back-geared Drill; nearly new.
1—14" New Sensitive Drill, tilting table.
1—14" Reid Drill, used.
1—16" Barker Cincinnati Shaper.
2—Heavy Duty Foote-Burt Drills, single pulley drive.
1—25 H.P. Motor, 25-cycle.
1—15 H.P. Motor, 25-cycle.
1—5 H.P. Motor, 25-cycle.

Every used tool fully guaranteed. We have a large stock, and we may have what you want. Why not inquire?

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New and Used Machinery

ENGINE LATHES

1—No. 9 Ames Precision Bench Lathes.
1—13" x 5' Phil-Smith Standard Engine Lathe.
1—17" x 8' Lodge & Davis standard lathe.
1—16" x 6' Greaves-Klusman stand., comp. rest.
1—16" x 6' Hamilton, Style A, quick change, comp. rest.
2—18" x 8' Greaves-Klusman, quick change, double friction back gear, chuck fitted.
1—18" x 10' Lodge & Shipley, quick change, single back gear and chuck.
1—14" x 6' Champion, quick change, single back gear chuck.
1—22" x 8' Greaves-Klusman, stand. double friction back gear, comp. rest, chuck.
1—30" x 14' Lodge & Davis, stand., single back gear, comp. rest, chuck.
1—20" x 8' Fay & Scott, stand, turret on shear, turret tool post and chuck.

DRILL PRESSES

1—Henry & Wright four-spindle class A 7, ½" overhang.
1—Detroit five-spindle horizontal automatic Drilling Machine.
1—Baush multiple drilling machine, 12-spindle, 1½" diam. spindle, 48" round head.
1—Baush multiple drilling machine, 8-spindle, 30" round head.

PLANERS

1—24" x 24" x 6' Lodge & Davis, 1 head.
1—26" x 26" x 10' Gray, 1 head.
1—36" x 36" x 14' Cincinnati, 2 heads.
1—42" x 36" x 8' Lodge & Davis, 2 heads.
1—42" x 36" x 14' American, 2 heads.
1—24" x 24" x 6' Ohio.

TURRET LATHES AND SCREW MACHINES

1—No. 4 Warner & Swasey hand screw machine, power feed to turret.
2—24" Gisholt Turret Lathes.

MISCELLANEOUS

1—Knight No. 1 drill'g and milling machine.
1—Atkins No. 7 Kwik Kut power hack saw.
1—18" Smith & Silk geared rack shaper.
1—Challenge power hack saw.
1—No. 4 Canton portable floor crane.
1—Jib crane 8" x 8" x 15', with 12"x12"x19' boom.
1—No. 18 Lea-Simplex cold metal saw, capacity 7" round.
2—No. 6, 35" Fellows gear shapers.
10—Potter & Johnson No. 3 manufacturers' lathes, with pump.
1—Barret No. 2 horizontal boring machine, with 5" bar.
1—Newton double housing milling machine, 21" between housing, 6' table.

The E. A. Kinsey Company

Cincinnati, Ohio.

FOR SALE

1—90' Thomas Spacing Table complete with indicator carriage, trolley carriage, stands, adjustable roller, racks, etc. Capacity: Plates, 48' long x 48" wide; angles, 8' long x 8" wide. Further particulars on application.

1—40 H.P. Horizontal Gasoline Engine complete and in running order.

1—30 H.P. Horizontal Gasoline Engine complete and in running order.

1—Air Compressor driven by Twin Cylinder Fairbanks Gasoline Engine. (Mounted).

Complete equipment for machining 4.5 H.E. Shell Nose Plugs. Capacity, 10,000 per day.

1—Powerful Hand Punching Machine.

1—Horizontal Steam Pump.

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NEW LATHES

were destined for "Somewhere Else" but withheld—so they are offered to you for

IMMEDIATE SHIPMENT

ALL STEEL QUICK-CHANGE GEAR MECHANISM

26-in. x 18-ft. Quick-change.
26-in. x 16-ft. Quick-change.
26-in. x 14-ft. Quick-change.
26-in. x 12-ft. Quick-change.
24-in. x 18-ft. Semi Quick-change.
24-in. x 16-ft. Semi Quick-change.
24-in. x 14-ft. Semi Quick-change.
24-in. x 12-ft. Semi Quick-change.

3-STEP CONE—DOUBLE BACK-GEARED

21-in. x 12-ft. Quick-change.
21-in. x 10-ft. Quick-change.
18-in. x 12-ft. Quick-change.
18-in. x 10-ft. Quick-change.
18-in. x 8-ft. Quick-change.
16-in. x 10-ft. Quick-change.
16-in. x 8-ft. Quick-change.
16-in. x 6-ft. Quick-change.

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NOT "SPECIAL PURPOSE" Machines, but regular style High Duty Lathes especially adapted for the purpose of finishing Shells or anything else you want a Lathe for, after you are all through with your Shell contract.

As Manufacturers of Lathes for a great many years, we can guarantee there is absolutely nothing better built in workmanship, power and convenience in handling, and they will be installed in your shop with that understanding.

Used by the prominent shops "over here" and "over there" who will have nothing but the best.

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HORIZ. CYLINDER BORING MACHINE
(Like New)

No. 2 Barrett 5-in. Boring Bar, auto. feed in either direction 48 in., having capacity for boring and facing both ends of cylinder at the same time.
Bed 12 ft. 6 in. long; widened part 60 in. by 52 in.
Will bore, counterbore and face off both ends of 10-in. by 18-in. cylinder in one hour.

52-IN. "PLANER TYPE" SLAB MILLING MACHINE
(Good as New)

"Becker-Brainard" — capacity for handling work up to 52 in. wide, 26 in. high and Table 10 ft. in length inside pockets.
Housings, Heavy, Double Web Box form, and both are adjustable in and out to extreme width of 52 in.
Eight changes of feed, 20 changes of speed.
Complete with Oil-Pump, two Tanks and Oil Reservoir, arranged for Motor-drive, but no Motor included.

BIG "LANDIS" GRINDER

"Landis"—having capacity for handling work 12 in. x 66 in.—complete with full equipment—in thoroughly good condition.

POWERFUL TURRET LATHE
(Just as good as ever)

Especially desirable now that Upright Boring Mills with Turret heads are so scarce. This machine has 40 in, swing over bed and geared up to 96 to 1.
Main Turret 48 in. diam. carries 5 Tools and four Tools on Supplementary Turret, which has Power cross feed.
Handles between Chuck and Turret 6 ft. 9 in. Wide range of Speeds and Feeds. Wt. 22,500 lbs.

PLANERS

24 in. x 24 in. x 6 ft. American, 1 Hd.
26 in. x 26 in. x 8 ft. Pond, 1 Hd.
28 in. x 28 in. x 6 ft. Gray, 1 Hd.
30 in. x 30 in. x 6 ft. Pond, 1 Hd.
36 in. x 36 in. x 8 ft. Whitcomb, 1 Hd.
36 in. x 36 in. x 12 ft. Niles, 1 Hd.
44 in. x 25 in. x 12 ft. Wilson, 1 Hd.

LATHES

80-in. Swing, Driving-Wheel Lathe, Double-hd. Sellers.
60-in. Swing, 12-ft. Triple-geared Face-plate Drive.
48-in. Swing, Pulley Lathe, Niles Tool Works.
48-in. Swing, 20-ft. bed, Putnam Mach. Co.
36-in. Swing, 20-ft. bed, Putnam Mach. Co.
36-in. Swing, 16 ft. bed, Fitchburg.
26-in. Swing, 16-ft. bed, Gleason, heavy.
26-in. Swing, 12-ft. bed, Bridgeford, Dble. B. G.
24-in. Swing, 15-ft. bed, Niles, with Chuck.
20-in. Swing, 14-ft. bed, Hamilton, Qk.-change.
18-in. Swing, 10-ft. bed, Porter,
18-in. Swing, 8-ft. bed, LeBlond.
18-in. Swing, 6-ft. bed, Seneca Falls, Qk.-change.
16-in. Swing, 6-ft. bed, Reed.
14-in. Swing, 6-ft. bed, LeBlond, with Chucks.

TURRET LATHES AND SCREW MACHINE

20-in. Potter & Johnston, full Automatic.
21-in. Gisholt, Gap style.
40-in. American, Hollow-spindle, 3¾-in. hole.
Garvin ¾-in. Wire-fd. Screw Machine.

RADIAL AND MULTIPLE DRILLS

2½-ft. Arm Radial Drill (2) Dreses-Simplex.
3-ft. Arm Radial Drill, Dreses Mch. Tool Co.
3½-ft. Arm Radial Drill, Bement-Miles, heavy.
8-spindle Multiple Drill, Baush, capacity 1-in. holes.

OTHER CHOICE TOOLS

No. 3 Vertical Milling Machine, Becker.
Upright Boring Mill, 32" Swing, Turret Hd., Colburn.
Upright Boring Mill, 36" Swing, Turret Hd., Brown & S.
Slotter, 10-in. stroke, New Haven.
Slotter & Keyseater, 30-in. stroke, Baker.
Gear Shaper, 36-in. capacity, Fellows, with Cutters.
Traveling-head Shaper, 12-in. Stroke, Sellers.
Cold Saw, 6-in. capacity, Espen-Lucas.
Cutting-off Machine, Dble-end, 10", Bement-Miles.
Steam Hammer, Single Frame, 2,500 lbs., Bement-Miles.
Drop Hammer, 900 lbs., Belt Lifter, Williams-White.
Milling Machines, Lincoln type, Tables 28" x 7".

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1—42" Bullard Vertical Mill, 2 swivel heads (like new)
1—36" Niles Horizontal Mill, 2½" Bar (like new)
1—84" Niles Vertical Mill, 2 swivel heads (like new)

RADIAL DRILLS

1—4' Mueller Radial Drill, cone drive (used)
1—3' Fosdick Radial Drill, cone drive (used)
1—3' Fosdick Radial Drill, gear box drive (used)
1—6' Radial Drill, Post type (used)
1—4' American Plain Radial, cone type (used)

MILLING MACHINES

1—No. 3 Brown & Sharpe Vertical Miller(like new)
1—No. 2 Brown & Sharpe Universal Miller (almost new)
1—No. 3 Le Blond Universal Miller (used)
1—No. 1½B Kearney & Trecker Vertical (like new)
1—No. 1½ Cincinnati Universal Miller (used)
1—No. 2 Rockford High Power Plain Miller (like new)
1—No. 1 Beaman & Smith Heavy Duplex Miller (used)
1—No. ½ Van Norman Duplex Miller (new)
2—6" x 14" Pratt & Whitney Thread Millers (like new)
1—Standard Hand Miller with pump (new)

GRINDERS

5—12" x 36" Modern Plain Grinders, late pattern (used)
3—No. 1 Wilmarth & Morman Universal Grinders (new)
1—Bryant Internal Chucking Grinder (new)
1—No. 2 Brown & Sharpe Surface Grinder (used)
4—80" x 32" Norton Plain Grinders (used)
1—No. 3 Oesterlein Universal Grinder (used)
1—6" x 18" Landis Plain Grinder (new)
2—No. 3 Wilmarth & Morman Surface Grinder (new)
2—No. 2 Wilmarth & Morman Surface Grinder (new)
1—Dominion Universal Tool Room Grinder (new)

SHAPERS AND PLANERS

1—48" x 48" x 10' Powell Planer 2 heads (used)
1—31" x 31" x 8' Whitcomb Planer, 1 head (used)
2—20" x 5' Travelling Head Shapers (like new)
1—24" Queen City B.G. Crank Shaper (new)
1—26" Lynd-Farquhar Open Side Shaper (new)
1—18" Juenget Crank Shaper (used)

LATHES

1—36" x 18' New Haven Triple Geared Lathe (like new)
1—30" x 20' Bradford Double Geared Lathe (new)
1—20" x 10' Bradford D.B.G., Q.C. Lathe (new)
6—18" x 8' Walcott D.B.G., Q.C. Lathes (new)
1—17" x 7' Street Bros. Heavy Duty Lathe (new)
1—15" x 6' Crawford Tool Room Lathe (used)

TURRET LATHES, SCREW MACHINES

2—Peglar 22" Heavy Duty Turret Chucking Machines (new)
2—C.M.C. 24" High Power Turret Lathes (new)
1—3¼" x 40" Greenlee Flat Turret Lathe (new)
1—2" x 24" Jones Lamson cone type (used)
1—1½" Wachs "Star" Screw Machine (used)
3—No. 4 1⅝" Smurr & Kamen Screw Machines (new)
2—No. 3 Smurr & Kamen Screw Machines (new)
4—1" Smith Hand Screw Machines (new)
2—⅝" Garvin Hand Screw Machines (used)
1—1" Steno Hand Screw Machine (used)
1—No. 3-A Warner & Swasey Turret Lathe (new)
2—4¼" Cleveland Automatic Screw Machines (like new)

PUNCHES, SHEARS, ETC.

1—Bliss 36" Single End Punch, cap. 1" through 1" (used)
1—Niagara No. 135 Single End Punch (used)
1—Bertch 10' Bending Roll, capacity 3-16" (used)
1—6" Rod or Tire Bending Roll (used)
1—8' P.S. & W. Cornice Brake, 14 gauge cap. (like new)
2—No. 3 Inclinable Punch Presses (new)
2—Royersford Foot Power Presses (new)

Over 1000 other machines in stock.

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BORING AND TURNING LATHE

96 INCH SWING by 20 FOOT BED POND TURNING and BORING LATHE, face plate drive, compound rest power cross feed, 9′ 6″ between centers.

BORING MILLS

No. 2 Barrett Horizontal Cylinder, 5″ bar.
Betts Horizontal, 2¼″ bar.
20″ Bullard Vertical Turret Lathe.
18″ Bullard Vertical Turret Lathe.
Four 30″ Bullard Vertical, swivel turret head.
40″ Putnam Car Wheel.
Niles Car Wheel, 48″ diameter table.

RADIAL DRILLS

Two 5′ Prentice Bros. Plain.
4½′ Niles Universal.
4½′ Niles Semi-Universal.
4′ Niles Plain.
3½′ Prentice Plain, tapping attachment.
3½′ Hilbert Plain, tapping attachment.
3½′ Prentice Bros. Plain.
3½′ Gang Plain.
3′ Fosdick Plain.
2½′ Gardam Semi-Universal.

NEW SHAPERS.

Twelve 24″ Hollingworth Improved Triple Geared Crank.

PIPE MACHINES

16″ Saunders, 8″ to 16″ capacity.
10″ Cox, 2½″ to 10″ capacity.
8″ Saunders, 2″ to 8″ capacity.
8″ Eaton-Cole-Burnham, 2½″ to 8″ capacity.
6″ Stoever, 1¼″ to 6″ capacity.
Two 6″ Curtis & Curtis, 2½″ to 6″ capacity.
Two 4″ Morris 2½″ to 4″ capacity.
4″ Armstrong, 2″ to 4″ capacity.
2″ Borden, ½″ to 2″ capacity.
2″ Jarecke, ¾″ to 2″ capacity.

PUNCHES AND SHEARS

No. 3 Royersford double end Punch and Shear, 16″ throats, punch 1¼″ in 1″, architectural jaw.
No. 3A Royersford double end Punch and Shear, 10″ throats, punch 1″ through ⅞″.
No. 1 Royersford double end Punch and Shear, 7″ throats, punch ⅞″ in ⅝″.
Ridgway & Sons Alligator Shear, 15″ blades.
Pels Beam Shear "T-40."
Columbus single end Punch, 24″ throat, punch ¾″ in ¾″.
Newell Direct Acting Gap Punch, 53″ throat, punch ½″ through ⅛″.
Several NEW HAND POWER PUNCHES and SHEARS.
3″ Bethlehem Bolt Heading and Upsetting Machine.

MILLING MACHINES

36″ x 36″ x 12′ Ingersoll heavy duty Horizontal Slab, adjustable rail.
Beaman & Smith 2 spindle Vertical Slab, table 24″ x 48″.
Ingersoll Slab, 23″ between housings, table 20″ x 60″.
Two No. 5 Brown & Sharpe Vertical.
No. 22 Garvin Vertical.
No. 3 Cincinnati Plain.
No. 2 Cincinnati Universal.
No. 2 Cincinnati Plain.
No. 1½ American Improved Plain—December delivery.
No. 1 Bickford Plain.
No. 13 Garvin Plain.
Four No. 12 Brown & Sharpe Manufacturing.

HAMMERS

1600-lb. Bemet single leg Steam.
800-lb. Pratt & Whitney Board Drop Forging.
New 400-lb. Bement-Miles double frame Steam.
200-lb. Bradley Upright Cushioned Compact.
200-lb. Waterbury-Farral Foundry Plain Drop.
75-lb. Belden Strap.
60-lb. Bradley Cushioned Helve.
50-lb. Beaudry Power.
40-lb. Bradley Cushioned Helve.
Three 40-lb. Gould & Eberhardt Hand Rope Drop.

UPSETTING MACHINE—BENDING ROLLS

3″ Bethlehem Bolt Heading and Upsetting Machine.
No. 1 Hilles & Jones Straightening Rolls, 5′2″ between housings, ¾″ plate.
Niles Double Geared Bending Rolls, drop end housing, 40½″ between housings.
36″ Power Bending Rolls.
30″ Hand Straightening Rolls.
30″ Hand Bending Rolls.

PRESSES

No. 73½ Bliss Straight Sided Geared, 4″ stroke.
Five No. 114 Bliss Double Crank, 4″ stroke.
P-4 Ferracute Punch Press, 3″ stroke.
Bliss Geared Punch Press, 2″ stroke.
No. 4 Toledo Inclinable Punch Press, 1½″ stroke.
No. 20 Bliss Inclinable, 2″ stroke.
No. 18 Inclinable, 1½″ stroke.
No. 3 Bliss Geared, 1½″ stroke.
No. 3 Farrel Power, 1½″ stroke.
No. 4 Farrel Punch Press 1½″ stroke.
No. 2B Brown, 1¼″ stroke.
Sanborn & Sons Double Crank Die and Cutting Press, 3″ stroke.

HYDRAULIC PRESSES

350-ton Hoe & Co. Vertical, with pump, will take 34″ x 31″ between rods.
200-ton Sellers Hydraulic Wheel Press, 6′4″ between bars, pump.
100-ton Shaffer Hydraulic Wheel Press, pump, motor.

GEAR CUTTERS

Three Newton Automatic Gear and Hopper.
36″ Brown & Sharpe Automatic Hob and Spur.
24″ Brainard Automatic Spur.
24″ Brown & Sharpe Automatic Spiral, right and left hand.
24″ Gould & Eberhardt Spur and Bevel.
18″ Becker-Brainard Automatic Spur.
19″ x 5″ Lees-Grant Automatic.
Two No. 12 Brown & Sharpe Automatic.

MISCELLANEOUS

24″ Baker Bros.
24″ Morton.
No. 2 Davis.
7″ Mitts & Merrill.
3½ Acme Bolt Cutter.
9″ Bement double end Cut-off Machine.
48″ x 16′ Niles Tire Wheel Lathe, face plate drive, triple geared.
36″ x 18′ Farrell Engine Lathe, face plate drive.
32″ x 22′ Gleason double back geared Engine Lathe, raising blocks to 66″.
28″ x 10′ Niles Engine Lathe, taper attachment.
26″ x 14′ Putnam Engine Lathe.
24″ x 24′ Fitchburg Engine Lathe, raising blocks to 30″.
2¼″ x 24″ Jones & Lamson Flat Turret Lathe, sliding head.
2″ x 24″ Jones & Lamson cone head Flat Turret Lathe.
21″ Gisholt Turret Lathe.
18″ Gisholt Turret Lathe.

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Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

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Men of invention, let us help you to succeed

Place your ideas in our hands, and if they bear the earmarks of success, we will offer you substantial help from our wide and varied experience, coupled with our modern equipment, to perfect your invention, as well as help in placing it on the market.

Let us help you perfect and construct your models.

We make instruments and machine specialties and fine gears to your order.

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For Slotting Nose of 75mm. shells

We are equipped to manufacture gauges for all purposes on this shell

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SPECIAL MACHINERY,
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ALL EQUIPMENT REQUIRED FOR RAPID AND ECONOMICAL PRODUCTION OF INTERCHANGEABLE PARTS.

Shell Manufacturers

Who expect **New Shell Orders** either from **Canada** or the **United States,** may need some of their shell equipment **overhauled** and **repaired** or **rebuilt.** We can handle it **completely, satisfactorily** and **promptly.**

NOW IS THE TIME.

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(2)

"SERVICE"

At This Period "Service" is our

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With our well equipped Tool Dept. we are in a position to give you immediate Service on all kinds of Tools, Gauges, Jigs, Fixtures, Dies, General Machine Work.

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Special Tools, Gauges, Jigs, Fixtures, Cutters and Equipment.

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Machine Parts in Quantities

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MAIN ST. and GAGE AVE., HAMILTON, ONT.

There may be some business we could do
If you knew us and we knew you.

STAMPING and TOOL WORKS

We are in a position to give you high quality work at a very reasonable price.

Why not let us submit prices and references? The experience of others should be of interest to you.

Small stamping work of all kinds a Specialty.

Write us now.

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Any Work Too Big to Handle?

Send it to us if you have.

Our plant is equipped with machine tools of extra large capacity. For instance we have a lathe swinging **5 feet.** Another lathe swinging **3 feet.**, with a 20-ft. bed. Other tools of similar capacity. Estimates given on special machinery.

We guarantee to turn out your work perfectly satisfactory and on time. Prices on application.

H. G. ROTHWELL

Machinist

11 and 13 Ferguson Ave. North

HAMILTON - ONTARIO

THESE illustrations show our Factory Building, and give some idea of the up-to-date manner in which it is equipped.

THE New Addition recently completed is a one story Building of Brick and Mill Construction, 52' x 85', provision being made for an additional story being added at any time. The roof was made especially rigid and strong to take care of overhead machinery, so that there would be the minimum of vibration.

The lighting is excellent, in that the maximum amount of natural lighting is procured by large steel sash and skylights. The artificial lighting has been carefully and successfully worked out. The floor is finished in hardwood, the wood sleepers being well bedded in a heavy under floor of concrete.

The new addition is joined directly to old work by taking out the adjoining walls entirely, making the entire first floor one. The equipment is of the finest and especially selected for the production of the most accurate work.

WE ARE MANUFACTURERS OF

MUNITIONS GAUGES

Jigs, Tools, Dies, Fixtures, Gauges and Special Machinery

WINDSOR MACHINE & TOOL WORKS

WINDSOR, ONTARIO

Exterior view of our new plant

The plant described above was built on service. Let us serve you.

Our Equipment and Experience as Designers and Builders

of

SPECIAL AUTOMATIC MACHINERY are at Your Service

Let us help in your Munitions Equipment and other mechanical problems. Send us your enquiry with blue prints or sketches of any special machines or lathes; H.S. Boring and Milling Cutters for Hobs and Tools, Chucks, Boring Bars, Drivers, Arbors, etc., Spur and Spiral Gears.

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Limited

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We are equipped to handle contract or special work from the design to the complete assembled machine.

Consult us about your requirements in automatic or other machinery, heat-treating and carbonizing.

Marine Work — Estimates furnished on marine engines and auxiliary work—winches, valves, etc.,—forging and welding.

Cut Spur Gears up to 13 feet diameter. Machine-moulded spur gears up to 18 feet diameter. Turned metal pulleys up to 13 feet diameter—solid or split. Special patterns and castings.

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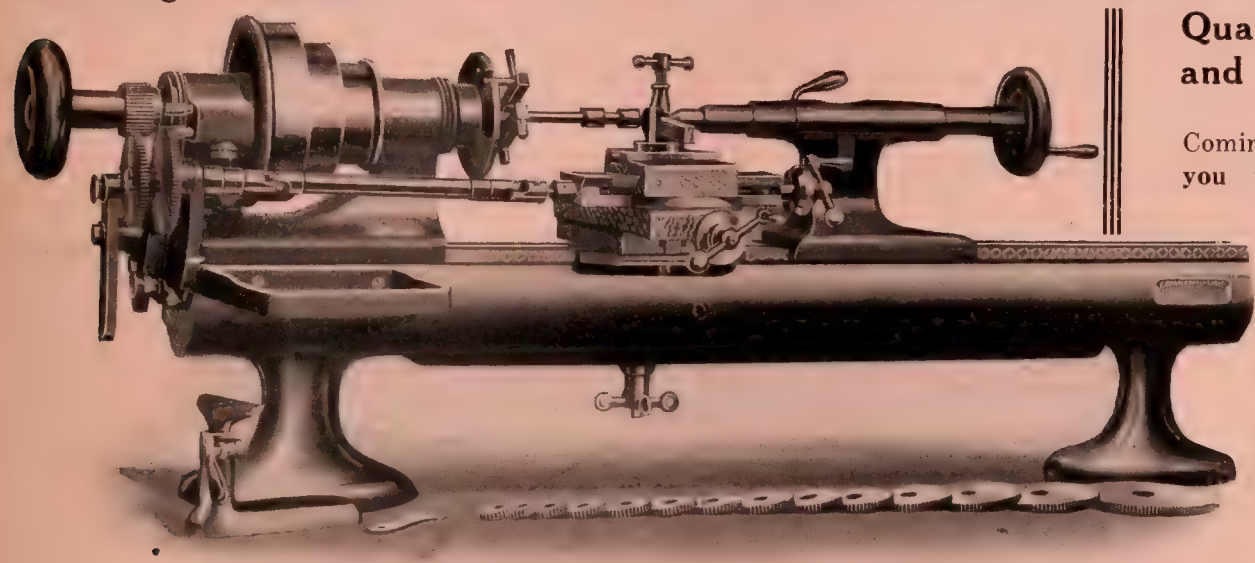
Our Engineering Staff Is At Your Service

Cataract Precision Bench Lathes and Attachments

Are doing Remarkable Work in a Number of Canadian Factories Where Their Splendid Qualities are Proved and Appreciated

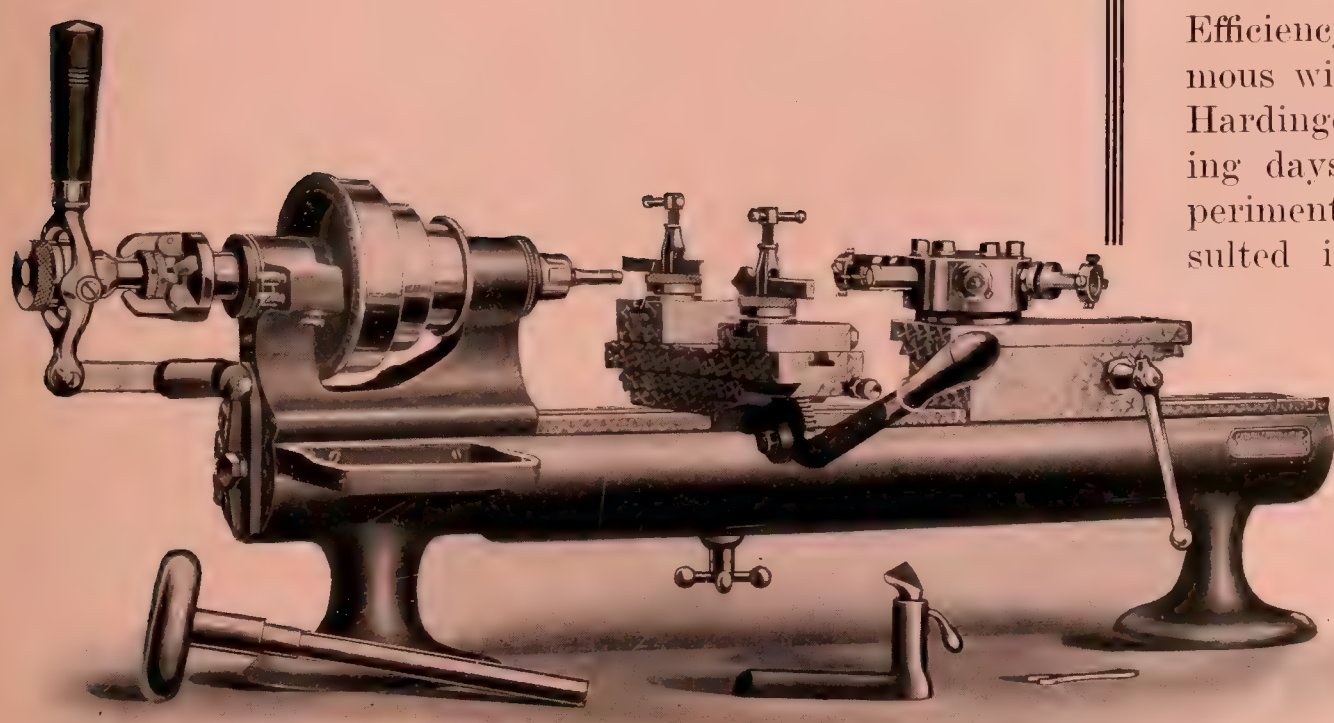


Coming down to facts, what do you think of this machine?

What do you think of the base, the circular bed, the sliding tool post, the strength suggested in that massive headstock, the range of gears, the special tailstock, and the arrangement of those gears? We think you will do as a great many other Canadian firms have done, write for our catalogue which gives the specifications, descriptions, etc.

"Write now."

If You are in the Market for 100% Efficiency Lathes



Write Us.

Efficiency is synonymous with the name of Hardinge. The pioneering days, spent in experimenting, have resulted in the finished product and right proud we are of it, too. Its quality is of the best, its price is most reasonable, its efficiency is beyond expectations. Do you know of any equipment with a Hardinge Lathe? What do they think of it? When you find out write for our Catalog, which will give you a complete line on our products. Get in touch with us.

Catalog No. 15 is ready to mail today. You should write "right" now.

Hardinge Bros.

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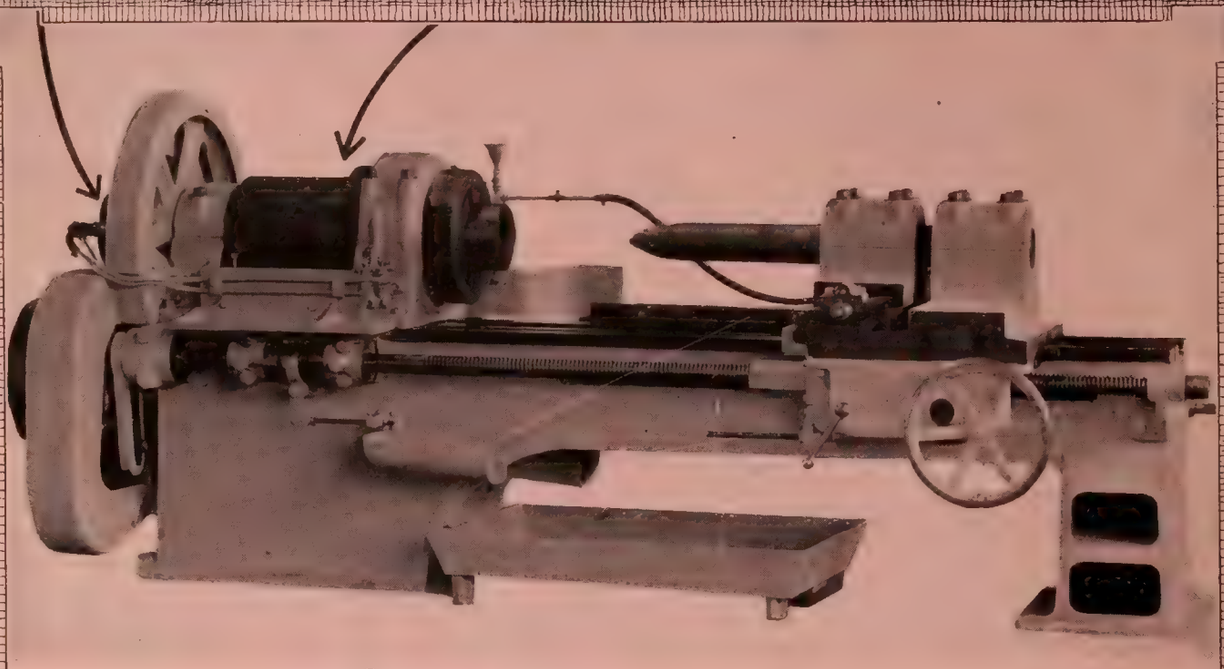
If interested, tear out this page and keep with letters to be answered.



M. E. C.

Master Hinge Collet Chuck and Air Cylinder

Ready for Making Shells for the Allied Governments

M.E.C. Air Equipment is satisfactorily filling the requirements of makers of shells for the U.S. and Allied Governments because of its superior design and its ability to increase production from 25 to 40% over any other method now employed.

M.E.C. Equipment being operated by air holds the piece being chucked absolutely rigid as the use of air assures constant pressure on the work.

M.E.C. Air Cylinder is the essence of simplicity—no 20 or 30 screws to take out to adjust packing—no danger of head blowing out due to poor construction—it is made to withstand severe service.

There are as many as 250 M.E.C. Air Equipments in a single installation.

Write for literature.

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AGENTS FOR CANADA—J. R. Stone Tool & Supply Co., Goebel Bldg., Detroit, Mich.
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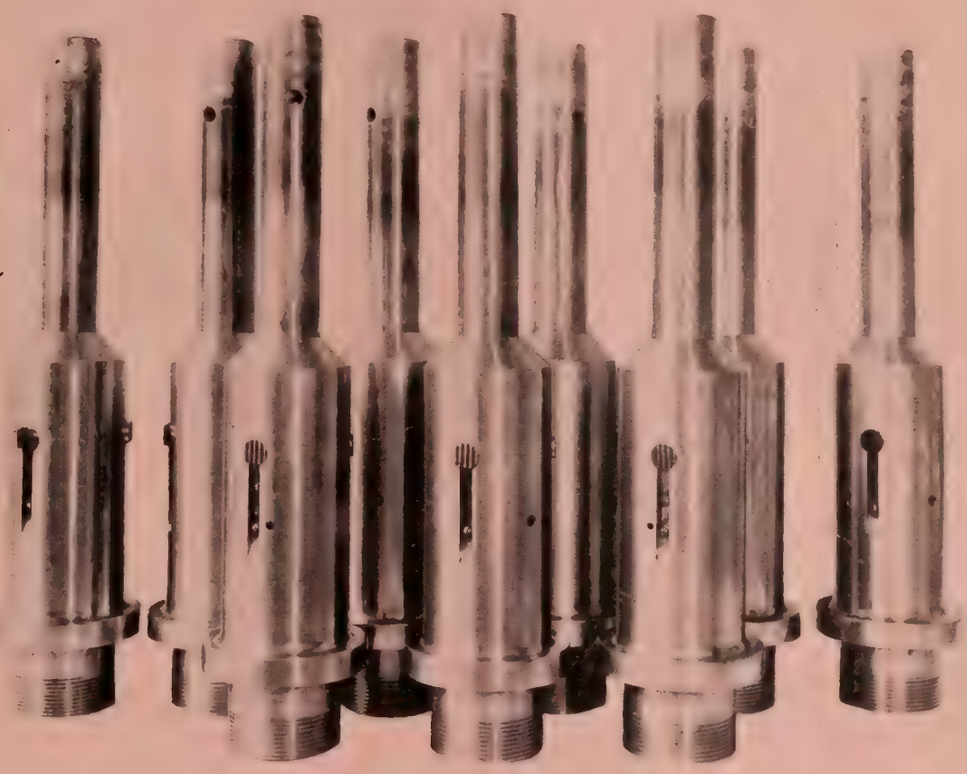

M. E. C.
Air-Operated Expanding Mandrels

The above picture shows part of a shipment of M.E.C. Mandrels to makers of shells for the Allied Governments.

These mandrels have proven highly efficient in munition plants, as our many big orders and repeat orders prove.

The M. E. C. Mandrel shown above is particularly adapted for rough and finish turning—compensating mandrel furnished for cutting rough shell forgings to length and for centering.

Write for information on all M. E. C. equipment.

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SAVES MEN—SPEEDS UP PRODUCTION—LOWERS COST

What are you doing to solve the labor problems? If you cannot get men, you must substitute with machines wherever possible.

Records show that a MERCURY TRACTOR replaces from 6 to 10 men, and operates at an expense equivalent to the daily wage of one man.

These tractors will utilize your present trucks as trailers, and silently and efficiently guide them in and out of narrow aisles and around sharp corners.

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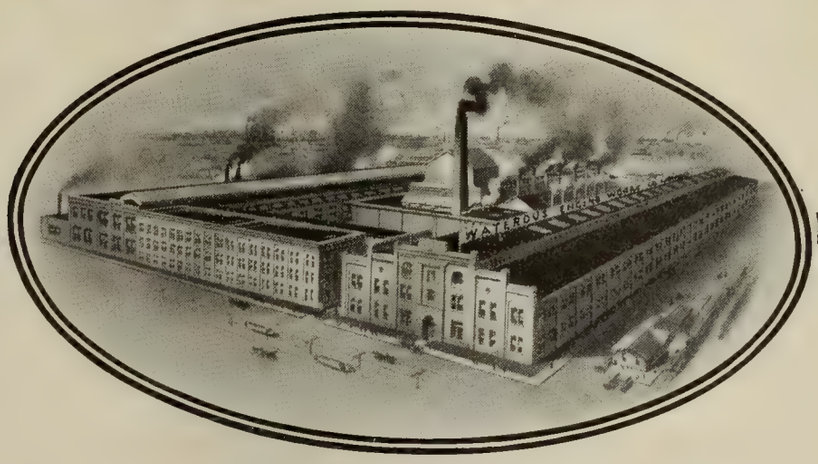

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High Speed Automatic "McEwen" (Simple and Compound)
Heavy Duty Saw Mill Engines
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Stationary Engines

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Feeds, Steam, Direct Acting
Feeds, Steam, Twin Engine
Filing Room Tools
Lath Mills and Bolters
Live Rolls and Drives
Log Chains
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Tanks
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Best System
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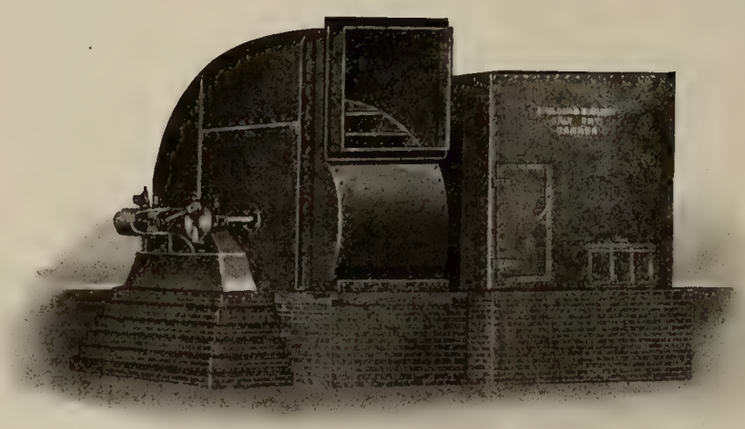

A Few Advantages:

(1) Entire system under one man's control.

(2) Building may be heated up quickly in the morning.

(3) No leaky valves or frozen pipes around the building.

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Take advantage of our experience and let our Engineers solve your heating problem for you.

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Built for Every Purpose

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Oil Storage Tanks, Pressure Tanks, Smoke Stacks, Riveted Steel Pipe, Penstocks and Storage Bins

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This has been the insistent demand for the past two years.

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Modern Equipment, Combined with an Experienced Operating and Engineering force, assure durable, dependable products.

We solicit your business on quick delivery. We will retain it by service and high-class workmanship.

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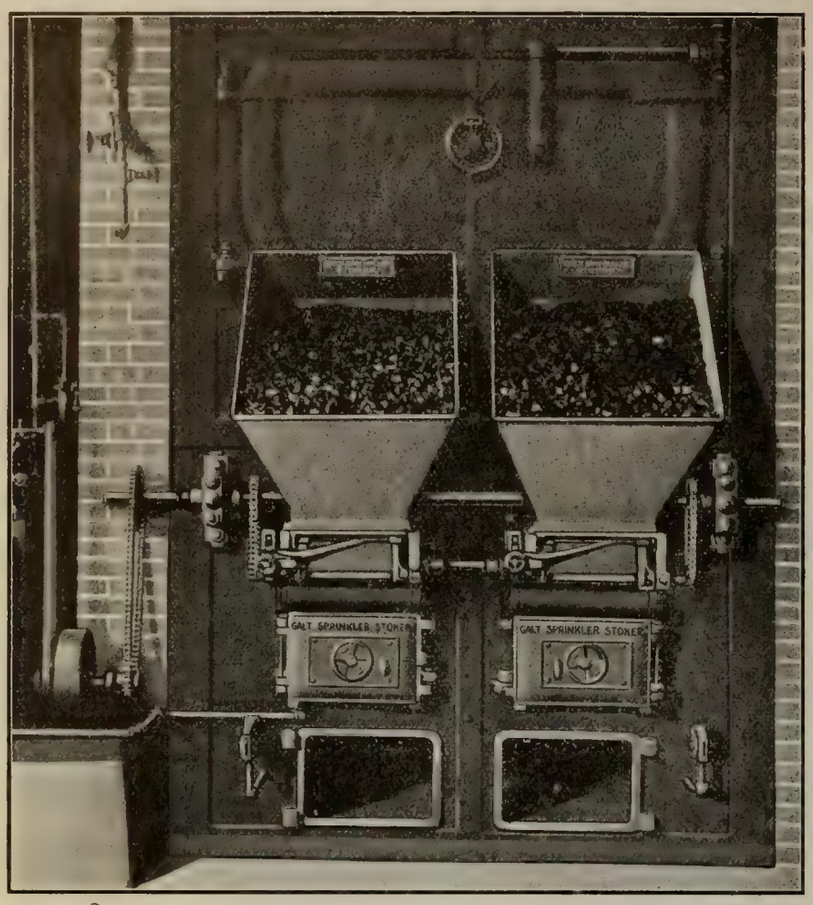

Two Type "A" Galt Sprinkler Stokers applied to 150 H.P. Return Tubular Boiler. (Coal Hoppers immediately removable.)

GALT SPRINKLER STOKER

Effects a saving in coal from 10% to 20%.
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Gives a brilliant, thin, perfectly level fire.
Gives smokeless combustion.
Increases the boiler capacity.
Increases the percentage of the CO.
Burns the fuel completely to the finest ash.
Operates for years without need of repairs.

The **Galt Sprinkler Stoker** automatically feeds and uniformly spreads the fuel to the furnace in a light, continuous stream, and gives a perfectly level fire, 3 to 4 inches thick.

Operates with natural, forced, induced or any kind of draft.

Burns any kind of fuel, anthracite, bituminous or lignite.

Its ability to save fuel commands your particular attention in this period of increasing coal prices.

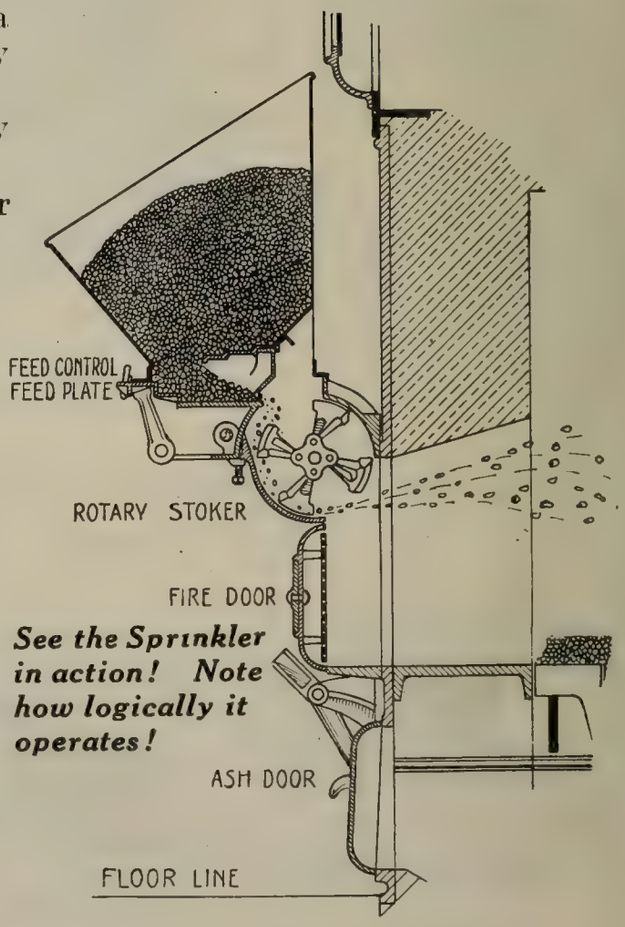
Its labor-saving virtues make a strong appeal in view of the scarcity of labor.

And its cost-cutting capacity in general deserves your immediate attention with the ever-increasing cost of production—for the **Galt Sprinkler Stoker** will make a saving in your plant that will prove worth while.

Galt Sprinkler Stokers fill every practical requirement of a mechanical stoker.

Let us tell you more about it. Write.

WE SUPPLY POWER-TURBO BLOWERS, McNAUGHTON ROCKING GRATES, DAMPER REGULATORS AND OTHER POWER PLANT EQUIPMENT. Send for illustrated catalog.



See the Sprinkler in action! Note how logically it operates!

GALT FOUNDRY CO., Galt, Ont.

TORONTO: W. M. McROBERT, Traders Bank Bldg.

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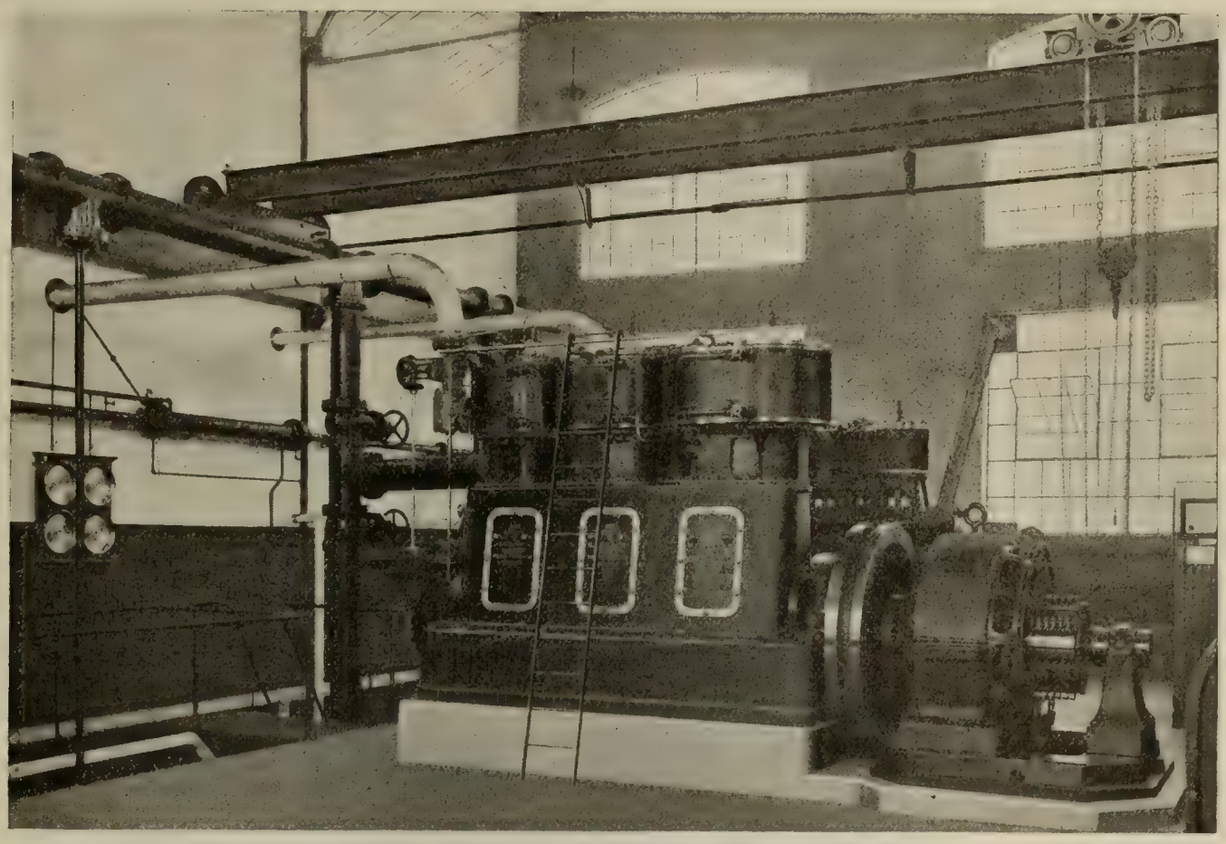

A corner in the Engine Room of our New Power Plant recently erected at our Main South Works. Equipped with G. & McC. Co. Three-Cylinder Compound and Two-Cylinder Compound Vertical Forced Lubrication Steam Engines.

The Cost-Cutting Way Produce Your Own Power

and Instal G. & McC. Equipment

Many Canadian manufacturers are depending on outside sources for their power when they could get better service and cheaper power by producing it themselves. Look the situation over in your plant and take Goldie & McCulloch engineers into your confidence—their expert advice free to you.

G. & McC. power equipment is a plain and easy solution to power satisfaction. Our engines, boilers, heaters and pumps are thoroughly modern in design.

We build Horizontal and Vertical Steam Engines; Steam Turbines; Return Tubular and Water Tube Boilers; Heaters; Tanks; Pumps and Condensers; Transmission Machinery; Safes, Vaults and Vault Doors.

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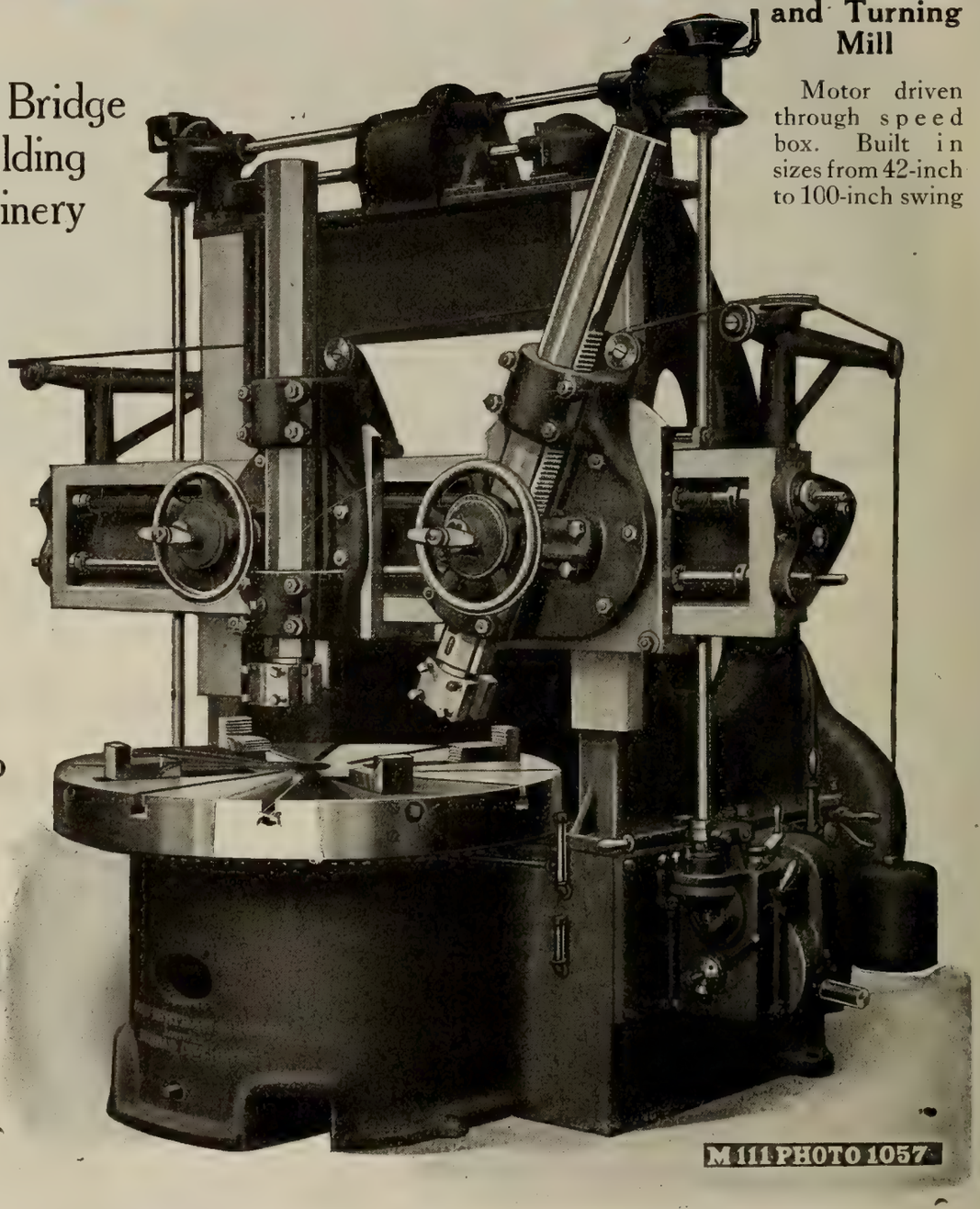
BERTRAM MACHINE TOOLS

42-inch Vertical Boring and Turning Mill

Motor driven through speed box. Built in sizes from 42-inch to 100-inch swing



Structural and Bridge and Shipbuilding Plant Machinery

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JB&SCO

GALT SCREWS

Scoring a hit when laying a gun is due to

ACCURACY

Galt Screws, Nuts, Studs and Patch Bolts have made a hit with Canadian Shipbuilders and Repairers because of their accuracy and uniformity. Once tested, always used.

Cap and Set Screws, Semi-Finished and Finished Nuts

Prompt Deliveries.

The Galt Machine Screw Company
GALT, ONTARIO Limited

Eastern Representatives:
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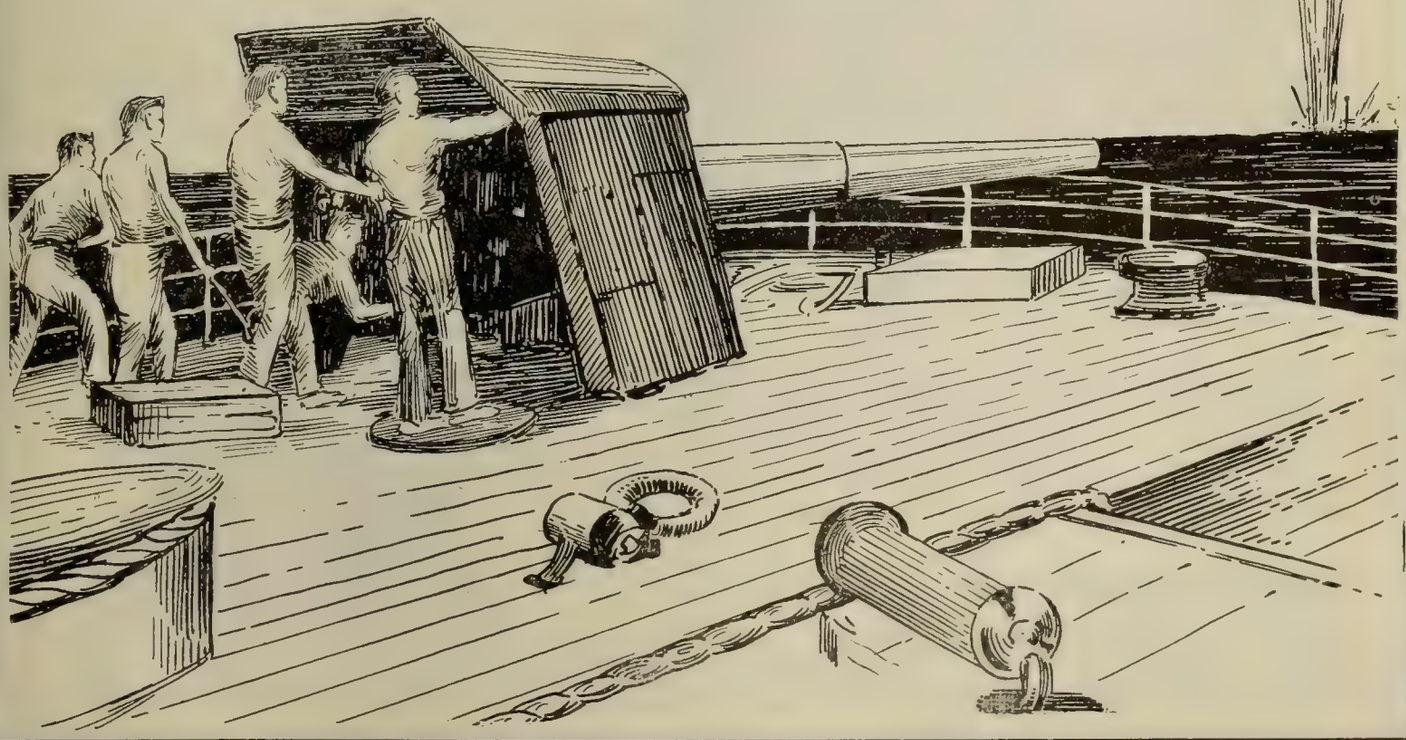
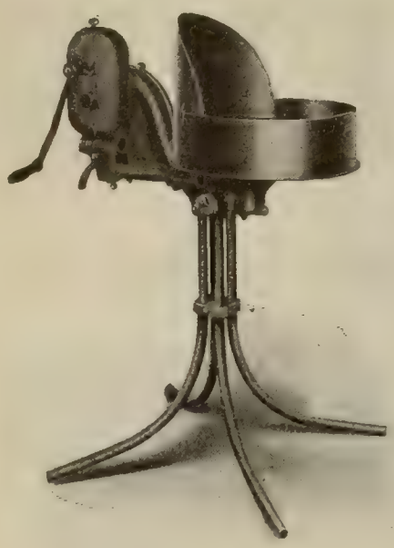


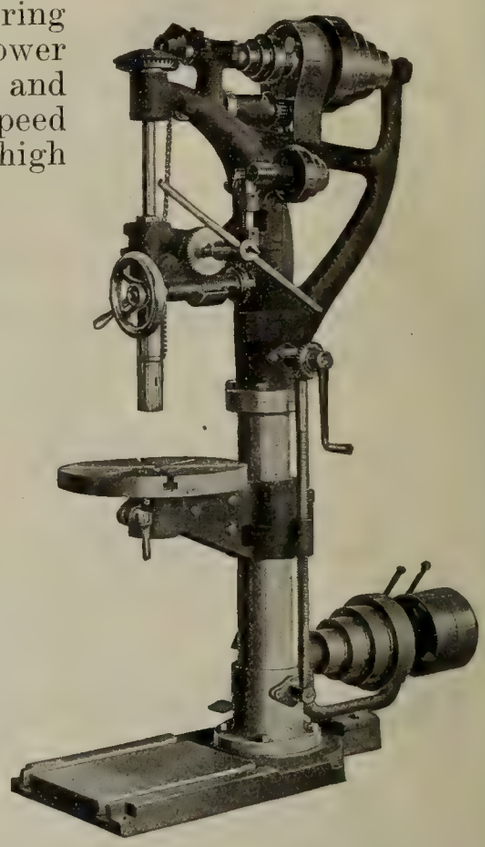


"Canadian" Rivet Forge No. 625

This is one of the most substantial forges built.

It has a strongly ribbed steel plate fire pan mounted in four securely braced steel pipe legs.

Blast is provided by means of the well known "Canadian" No. 200 Ball Bearing Silent Blower. This blower has helical cut gears and steel pinion. High speed pinion is mounted in high grade radial bearings.



"Canadian" 20" Upright Drill

Was designed and built to meet the demand for a moderate priced drill capable of doing accurate high grade work.

It can be changed instantly from plain drive to back geared drive.

All parts are carefully made and accurately fitted. All gears are machine cut and the crown gear runs in bronze bushing. Automatic feed stop; split adjustable bearings; worm feed wheel; table and base slotted and planed.

"Canadian" Stationary Forge

Built entirely of cast iron and is designed for the heaviest work.

Provided with "Canadian" patent Down Draft hood. This hood is adjustable by means of a lever to any position.

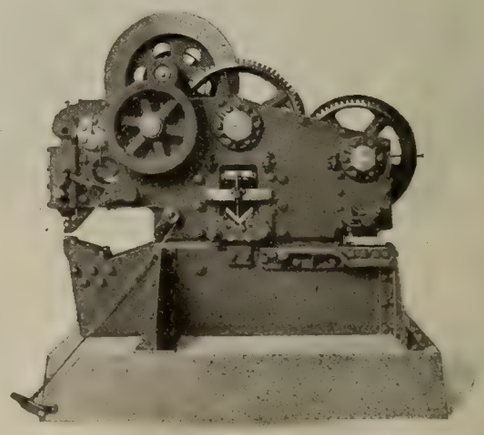
This insures a pure atmosphere all the time. All operating handles are conveniently located.

"Canadian" Universal Punch and Shear No. 25

A heavy duty machine designed to handle three kinds of work at one time. Cutting angles, squares, flats, rounds and all structural shops. Slits plates, punches angles, sheets, beams and channels. Mitres angles, right or left, up to 45°.

Built of "Armor Plate" steel—tensile strength 75,000 lbs. per sq. in., and only one-third as heavy as cast iron.

We'll be glad to send literature. **Write Dept. 16.**

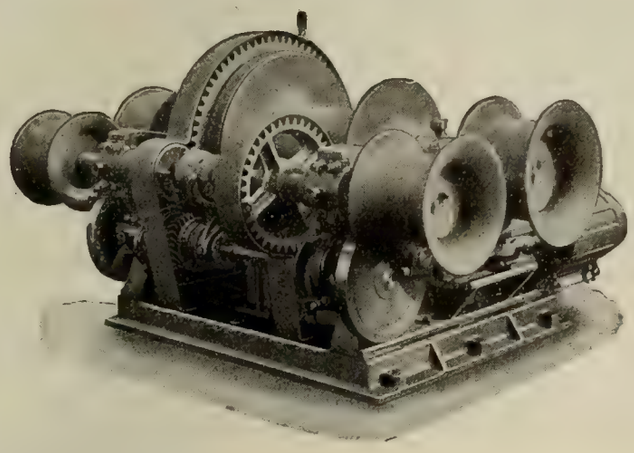


Canadian Blower & Forge Co.

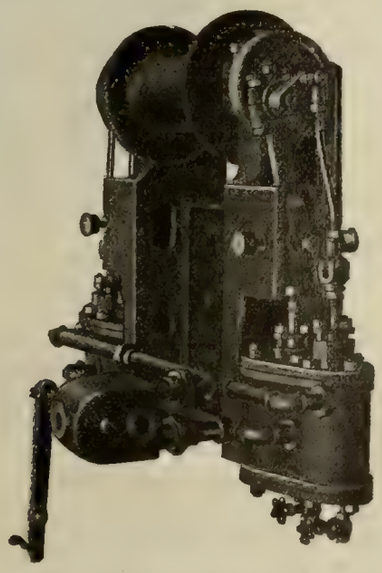
KITCHENER, ONT.

"BEATTY"

Auxiliary Ship Machinery. Cargo Winches. Warping Winches. Anchor Windlasses. Ash Hoists, Etc.



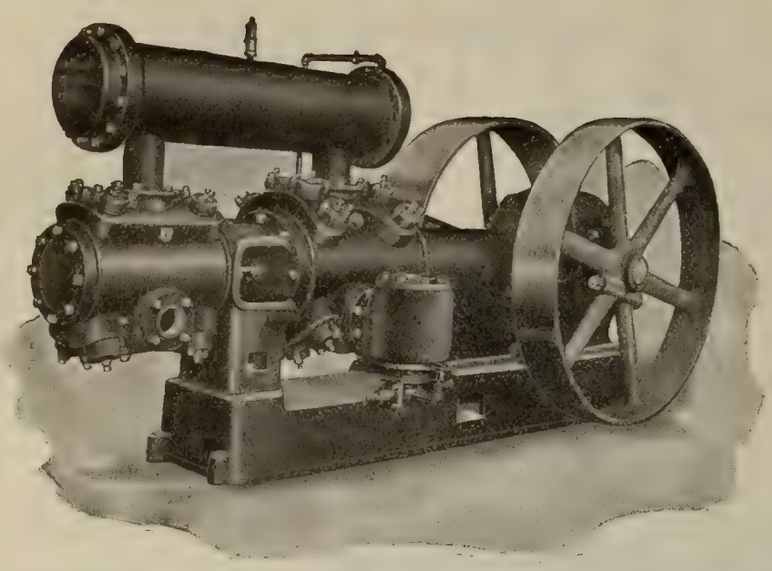
7 x 12 Double Cylinder, Single Drum, Link Motion, Two-speed Cargo Winch, with Two Whipping and Two Warping Ends, of the type we are building for a number of ships now under construction in Canada. Either Double Helical Tooth or Spur Gearing throughout.



4 x 4 Double Cylinder, Single Drum, Throttle Reverse Ash Hoist, as supplied Messrs. John Inglis & Son, John Coughlan & Son, The Welland Shipbuilding Co., and others. Variations of the above machine can be furnished to your order. All built to jigs, thus insuring interchangeability of parts. Let us have your inquiries for this class of equipment. We'll quote promptly.

M. BEATTY & SONS, Limited, Welland, Canada

If interested, tear out this page and keep with letters to be answered.



Class "EL-2" Power Driven, Two Stage, Straight Line Air Compressor, with Intercooler and Unloader.

Power-Driven Air Compressors

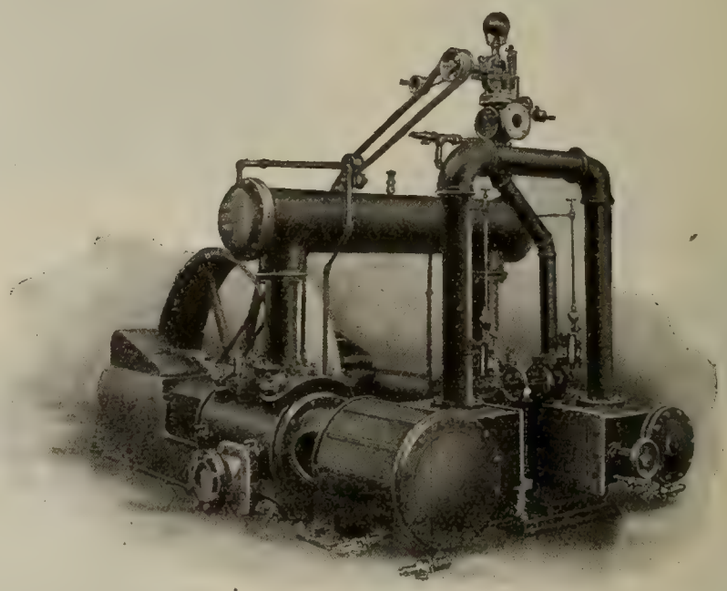
We manufacture these machines in either one or two stage, straight line or duplex types. All have leaf valves and flood lubrication, and are particularly noticeable for their simplicity and compactness, combined with easy accessibility to all parts. These points are very evident in the machine illustrated. The water-jacketing is unusually thorough and the intercooler surface is liberal, resulting in superior economy at all loads.

Our short-belt arrangement for driving these machines is the most economical where space is limited.

Steam-Driven Air Compressors

These machines are manufactured in straight line and duplex styles, and either single or two-stage. Duplex machines may have the steam cylinders compounded and fitted with adjustable cut-off valve gear when desired.

Practically all of our steam-driven machines may be converted to belt drive and back again to steam drive when necessary, and while in place. This is due to the location of the steam cylinders and is a point of convenience peculiar to our line of steam-driven compressors.



Class "RL-3" Duplex Steam Driven Air Compressor, Compound Steam and Air Cylinders. Meyer Adjustable Cut-off.

We are also manufacturers of Air Hoists, both Direct Lift and Motor styles; Air Lift Pumping Systems; Coal Cutting Machines; Drills for Rock, both Piston and Hammer types; "Little David" Pneumatic Tools, including Riveters, Chippers, Drills, Grinders, Reamers, etc.; Pumps, Steam and Centrifugal; Tie Tampers; Sand Rammers; Air Power Equipment of all kinds.

Send for Bulletins describing any of our products which interest you.

Canadian Ingersoll-Rand Company, Limited

General Offices: 260 St. James St., Montreal, Que.

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"Little David" Drills at work on steel ship

"Little David" Wood Borer

"LITTLE DAVID" TOOLS

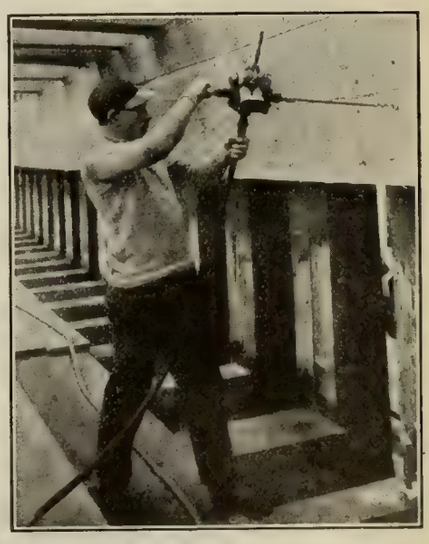
in Steel and Wooden Shipbuilding

give speedy results at low costs.

In its especial field, each "Little David" tool gives maximum work with least power consumption, the greatest speed of operation and the least expense for repairs, accompanied by an extremely long life.

Sizes cover every demand.

Bulletins promptly furnished on request



"Little David" Wood Borer

Canadian Ingersoll-Rand Company, Limited

General Offices: 260 St. James St., Montreal, Que.

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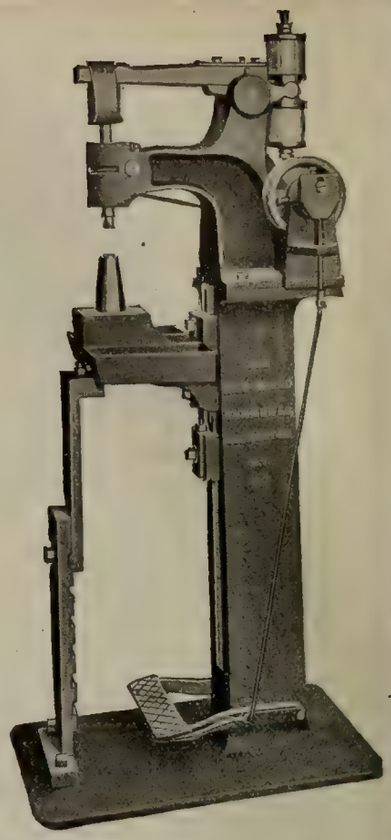
The High-Speed Riveting Hammer Guaranteed to Save 15 to 20%



on any class of riveting work — the most intricate flush riveting, filling of countersinks, etc., not excepted.

The High-Speed, Heavy-Duty Riveting Hammer forms heads any shape desired, and polishes head at the same time.

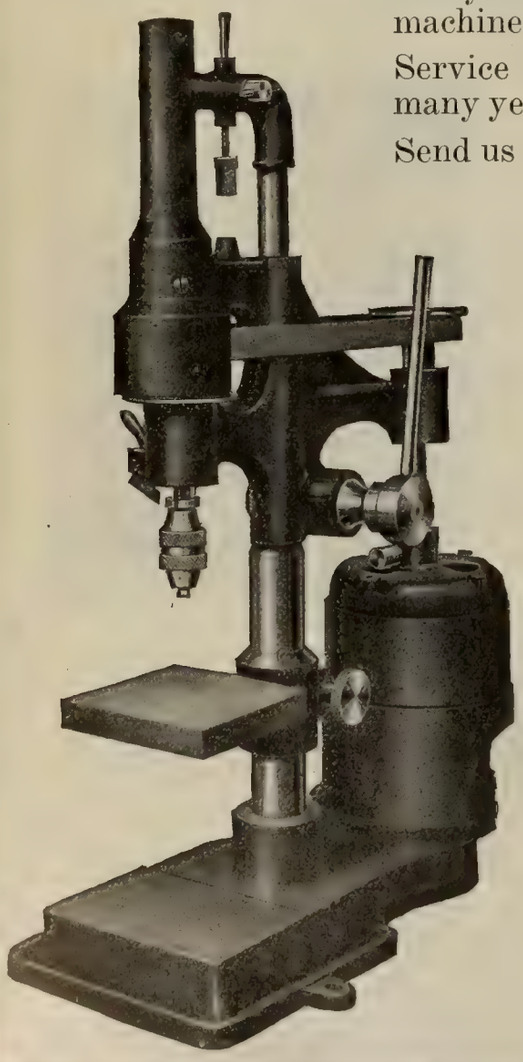
Women or boys can operate as well as men.

Two heavy rubber bumpers in rear of machine, another bumper between the hammer head and helve, deliver a succession of rapid, elastic blows, and hickory helve absorbs the shock of the rebound.

Drive is side friction at any speed up to 1,700 strokes per minute. It enables operator to strike a very sensitive or heavy blow at will, which is impossible with a clutch drive machine.

Service life of the High-Speed Riveting Hammer runs into many years. Bushings of phosphor bronze are used throughout.

Send us a few of your parts; we'll return them **properly** riveted.



Ball Bearing Model E Drill Press

has demonstrated extraordinary ability on work from the smallest to a 3/16" hole.

Main spindle is heat treated, ground to size, and guided through a bronze quill with support at each end in an annular ball-bearing.

2,100 and 6,000 R.P.M. are the standard spindle speeds. Special pulleys increase the speed to 10,000 R.P.M.

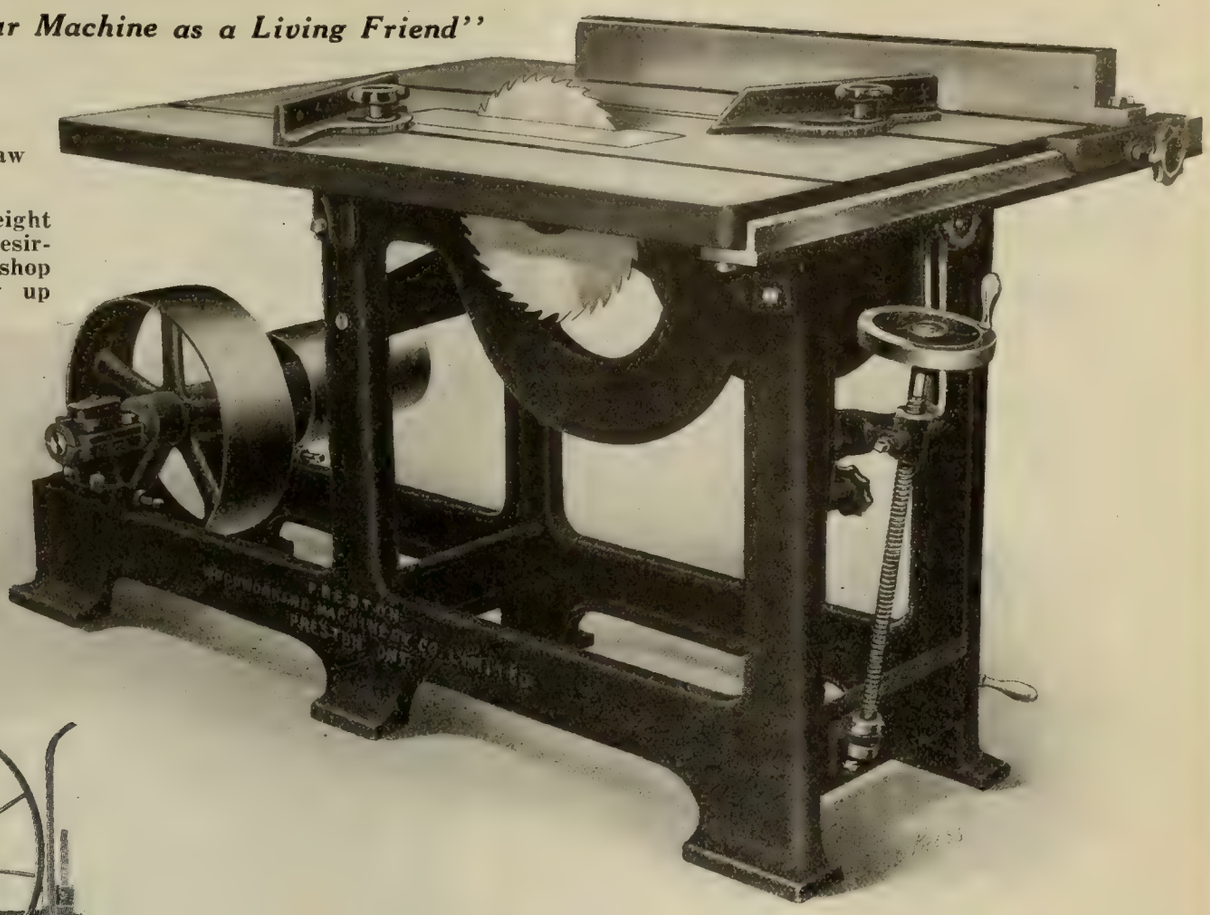
If your work demands extreme accuracy; if your output must be increased, it is to your interest to investigate this Drill.

WRITE

The High-Speed Hammer Co.

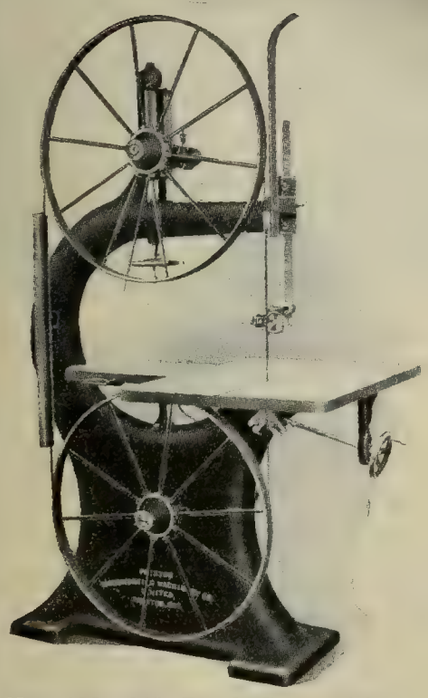
Rochester N.Y.

"Treat Your Machine as a Living Friend"



No. 125.
Tilting Top Saw Table.

A medium weight machine very desirable for pattern shop work. Capacity up to 3" thick.



No. 132—36" Band Saw with all-steel wheels.

Do you need any new machine in your PATTERN SHOP or CARPENTER SHOP?

MAYBE YOU DO.

Possibly this is a part of your plant which is neglected and not given the careful attention the more productive departments receive.

THIS VERY OFTEN IS THE CASE.

HAVE YOU A MINUTE to find out from your Superintendent if your Wood Shop is as MODERNLY EQUIPPED as it should be?

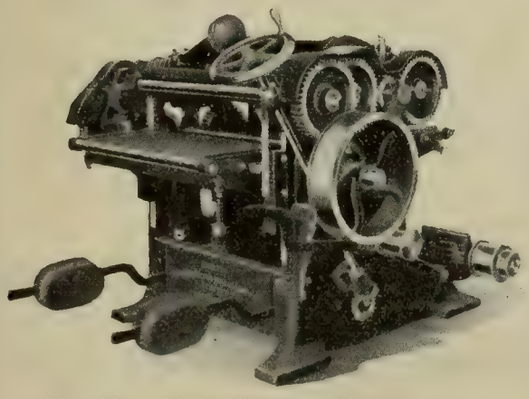
Then:—LOOK THESE MACHINES OVER.

If you buy one of them it will be an investment in a class with your VICTORY BONDS.

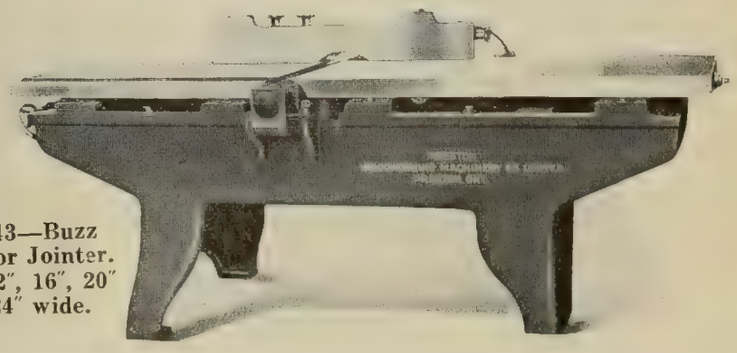
Ask us for prices. They will astonish you by reason of their reasonableness.

The Preston Woodworking Machinery Co. LIMITED

PRESTON, ONTARIO



No. 121—Light Surface Planer. Cylinder mounted in genuine Whitney Bearings. Planes either 20" or 24" wide x 8" thick.



No. 143—Buzz Planer or Jointer. Sizes 12", 16", 20" and 24" wide.

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"McAVITY" MARINE SPECIALTIES

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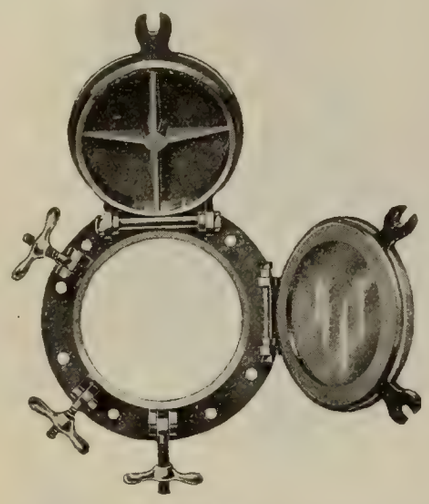
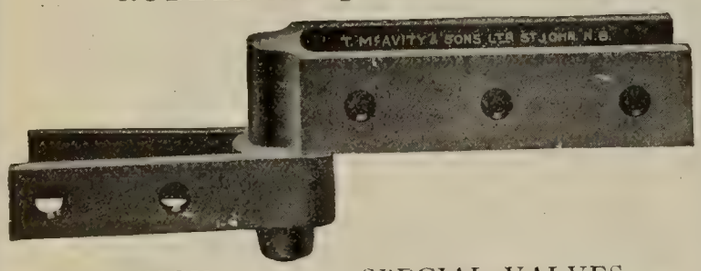
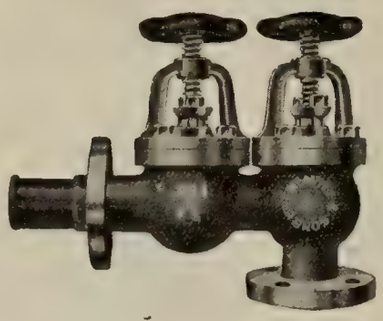


RUDDER AND DUMB BRACES



CLINCH RINGS

SPECIAL VALVES



Send for copy No. 1005 Marine Catalog.

T. McAVITY & SONS
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Brass and Iron Founders

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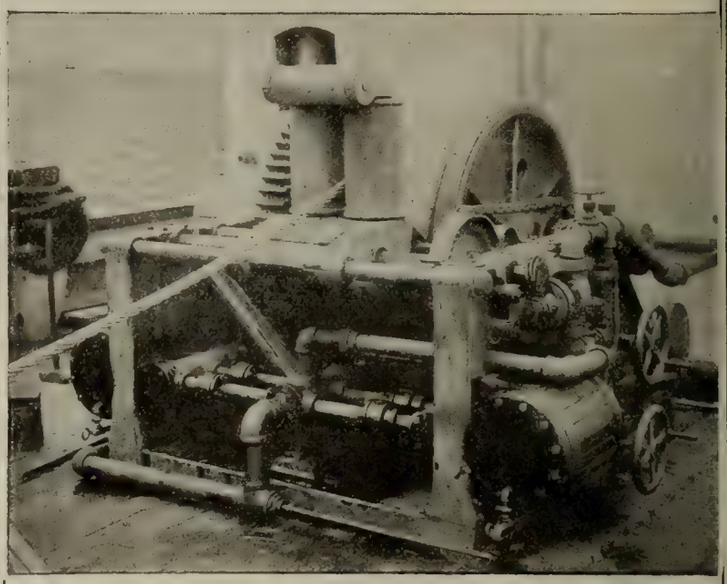
Branches at: Montreal, Toronto, Winnipeg, Vancouver, London, Eng., Durban, South Africa

The Corbet Automatic Steam Towing Machines

For Tugs and Barges



Made in 4 sizes to accommodate Steel Flexible Hawsers from ⅝ in. diameter up to 1⅛ in. diameter.

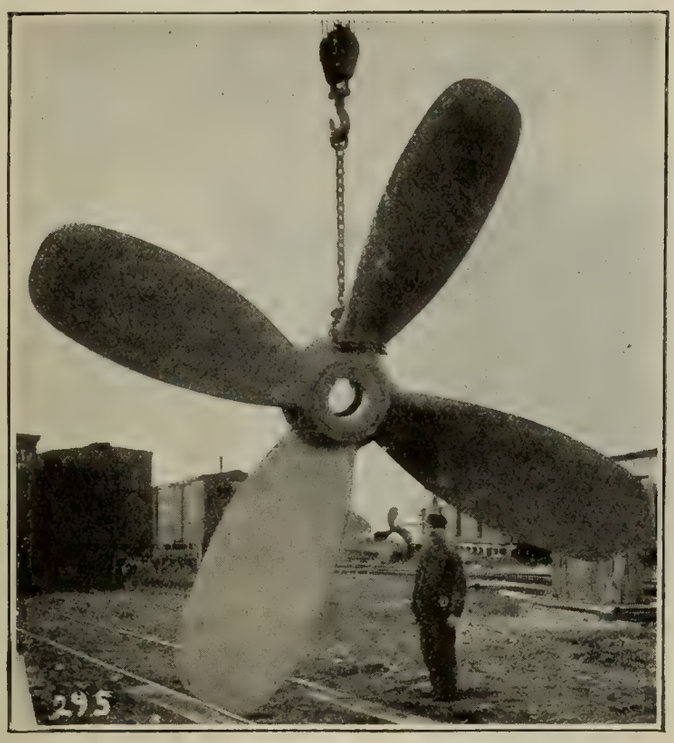
These machines are in active operation on tugs and steamers on the Atlantic and Pacific coasts and also on the Great Lakes. They are giving perfect satisfaction, as the numbers of testimonials from our customers will prove. Write for copies of testimonials and for full information. Order now for next Spring delivery.

We also manufacture cargo winches, anchor winches, automatic steam steering engines and steam capstans.

The Corbet Foundry and Machine Company, Ltd.

OWEN SOUND, CANADA

PROPELLER WHEELS

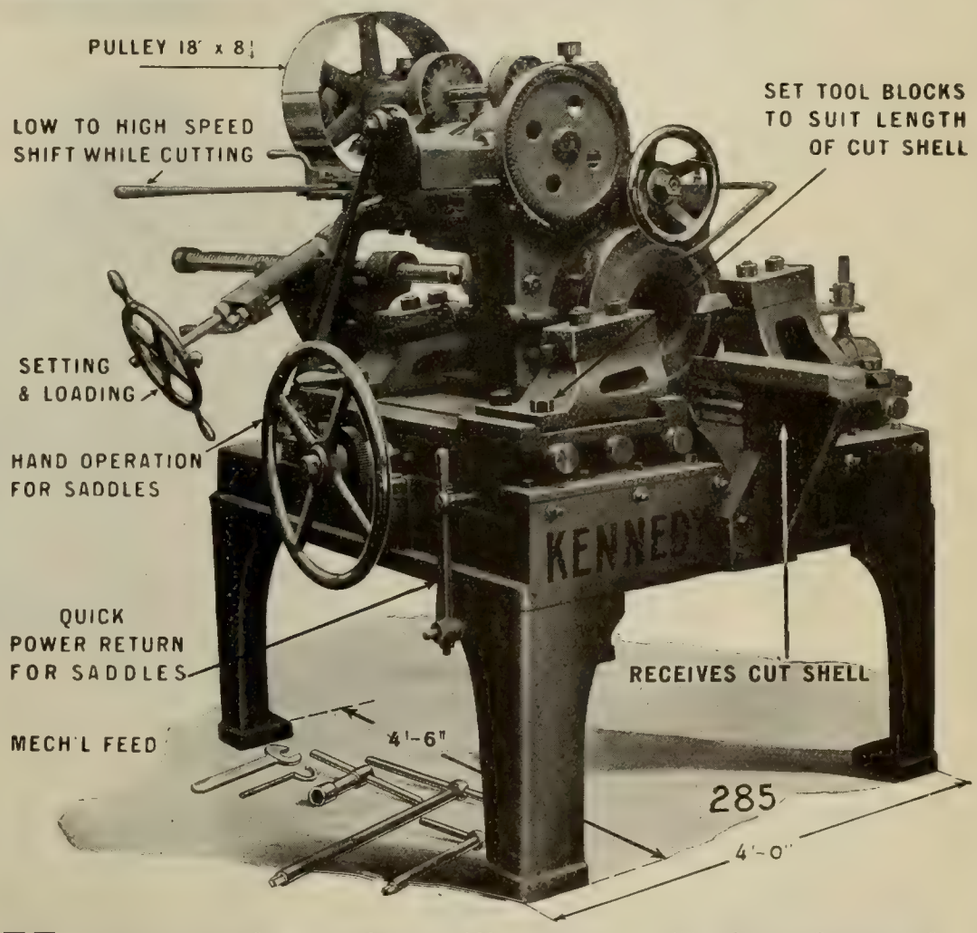


Largest Stock in Canada.

Cut shows largest solid propeller ever made in Canada.

STEEL CASTINGS

CUTTING-OFF MACHINES



Cuts both ends at once

except 8 in. and 9 in. sizes which cut one end only

Forgings load in one end and discharge out the other when cut.

A Girl can operate it

6—4.5" Machines in Stock

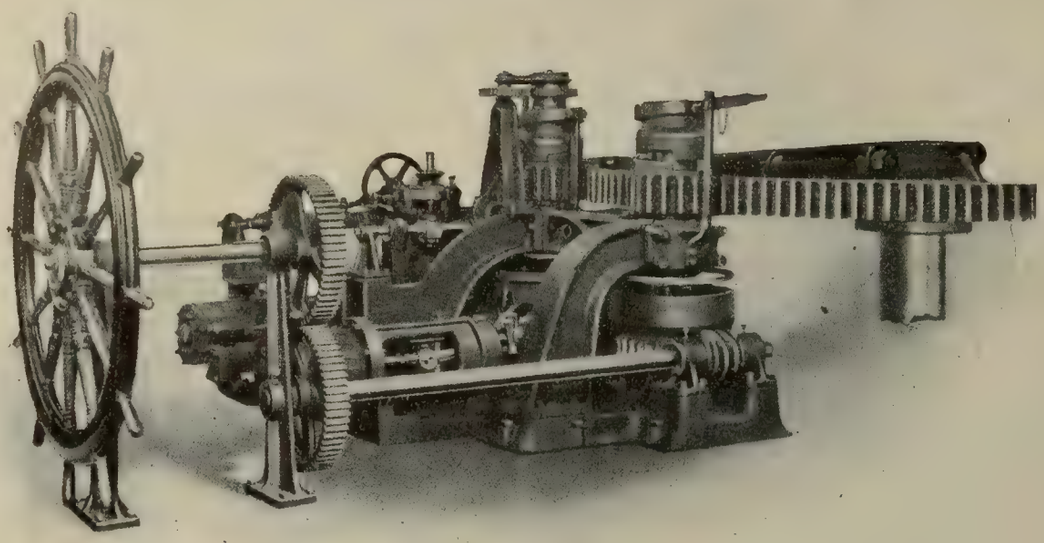
The Wm. Kennedy & Sons, Limited

Owen Sound, Ontario

Established 1860

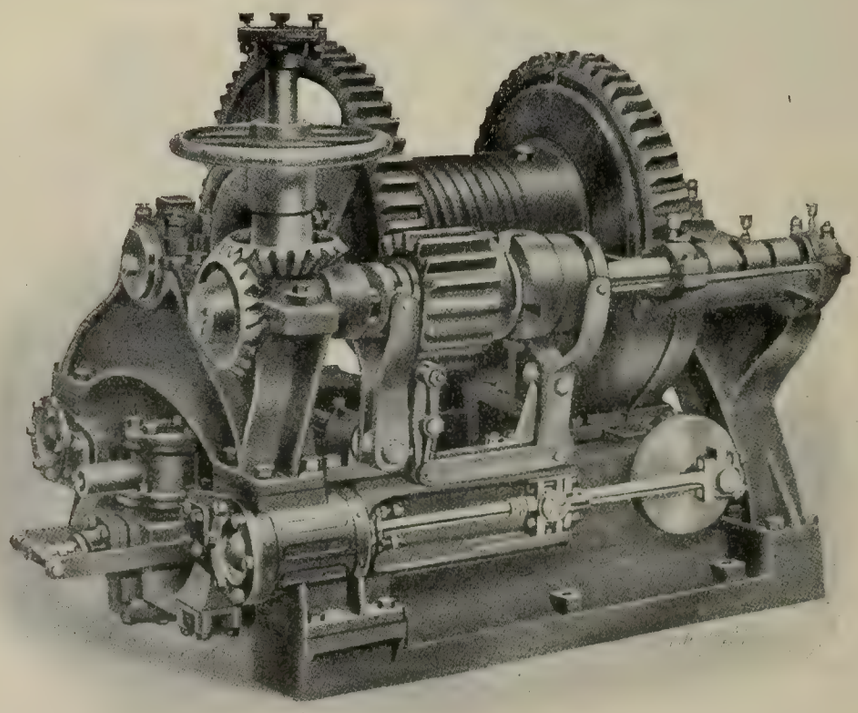
STEERING ENGINES

ALL TYPES



The "Hyde" Steam Steering Engine with Quadrant

(Combined with Hand Steering Gear)



The "Hyde" Combined Steam and Hand Steerer

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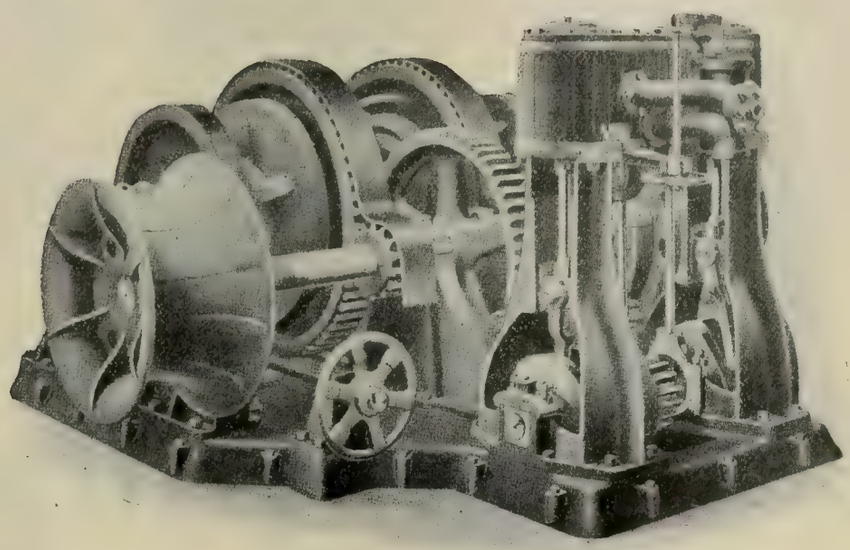
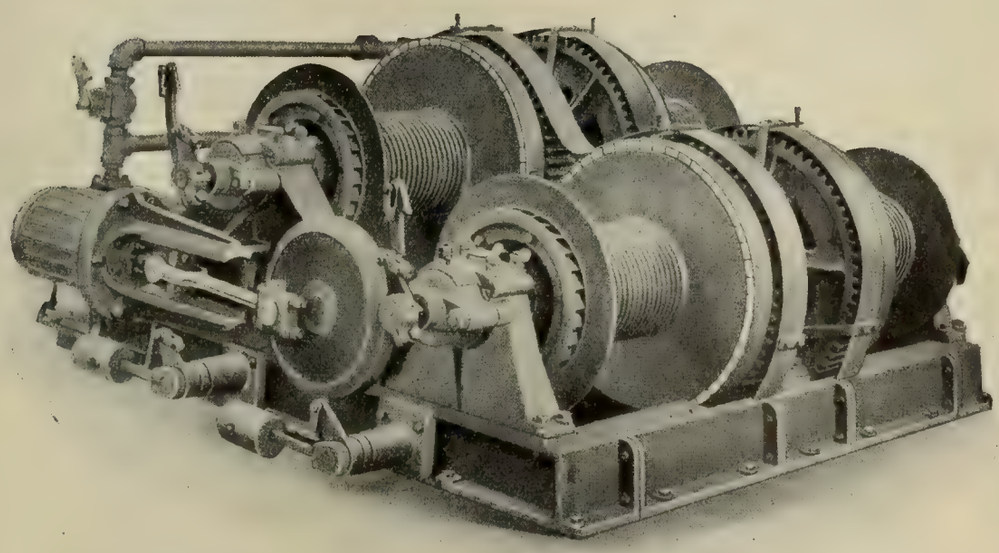
Owen Sound, Ont.

Sole rights in Canada for Hyde design

Anchor Windlasses and Cargo Winches



The "Hyde" Spur Geared Steam Windlass



The "Hyde" Four-Drum Horizontal Hoisting Engine

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Manufacturers of

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Tools and Gauges — Church Brass Work
Architectural Iron — Memorial Tablets
Fire Station Fittings — and Bronze Work

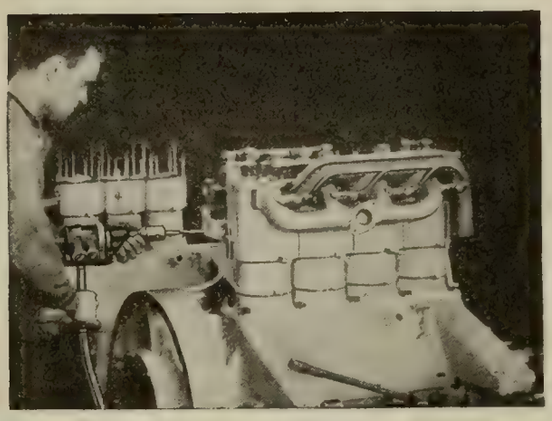
PUT YOUR WORK IN OUR HANDS

We cannot accept orders at present for the above material owing to our place being taken up with Munitions.

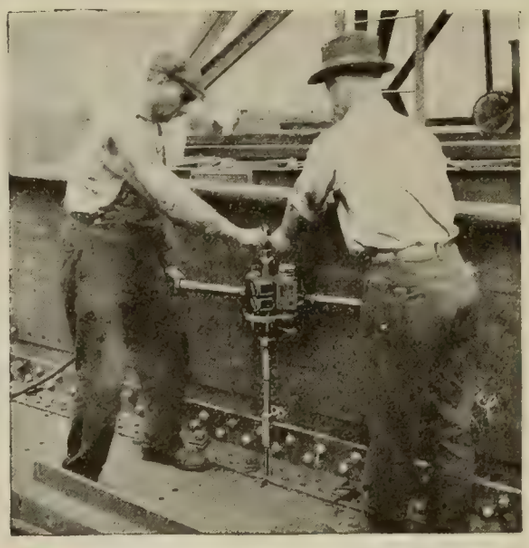
When this War Cloud is over, we will be pleased to receive inquiries, and could then attend to the work more satisfactorily than ever.

LYMBURNER, LIMITED

360 St. Paul Street East - Montreal, Canada



Thor No. 0 Drill at work on Automobile Engine. Equipped with Vanadium Pressed Steel Pistons and Connecting Rods, Corliss Valves and Roller Bearings.



Thor No. 43 Air Drill Reaming 1" Holes in Heavy Work on Water Way Bars. Equipped with No. 4 Morse Taper Socket Permitting the Use of Oversize Tangs and Shanks on Twist Drills and Reamers.

Thor Pneumatic Tools

THE great power and speed of THOR tools enable the operator to produce more work without any extra effort. Their durability reduces time lost in making repairs or adjustments and insures **steady service.** Convenience in handling and operating permits faster work. Most economical to operate and maintain.

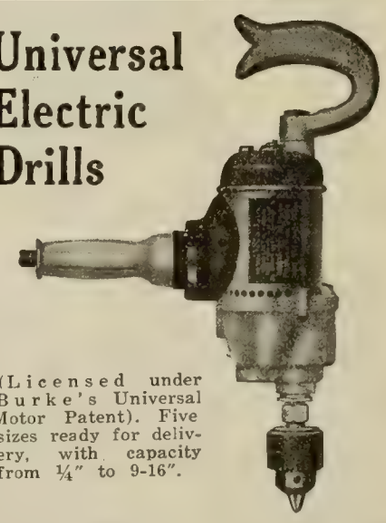
The best constructed Air and Electric Tools ever made.

A complete line of Thor pneumatic chipping, calking, flue beading and riveting hammers, Thor roller bearing piston air drills, Thor electric drills always in stock at all our branches. Service our constant aim.

Write for bulletin.

Thor Size B Single Valve Chipping Hammer Riveting in Base Plate of Shells.

Universal Electric Drills



(Licensed under Burke's Universal Motor Patent). Five sizes ready for delivery, with capacity from ¼" to 9-16".

Independent Pneumatic Tool Company

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GALT MALLEABLE IRON CO. LIMITED
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Brass, Phosphor Bronze, Copper and Aluminum
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We have the largest Jobbing Brass Foundry in Canada. Can make prompt delivery.

Tallman's reputation is in the goods.

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Our Special Lines Are:
Plumbers' Cast Iron Ware—
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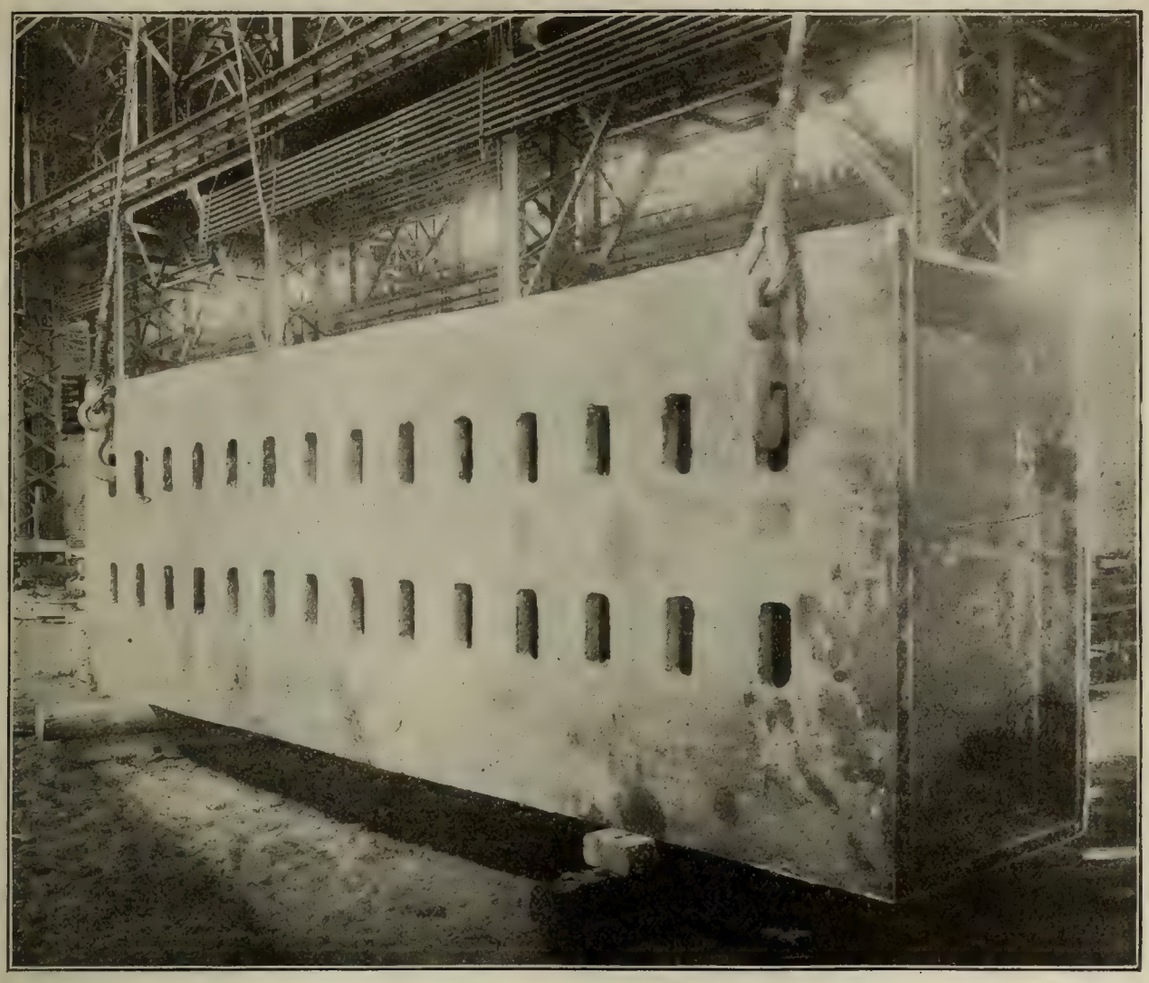
We have at the present time space available for a limited tonnage from Machine, Matchplate or Gated Patterns, medium weight, repetition castings, and for this class of work can quote attractive prices and delivery.



Shoe Casting for Cantilever of Quebec Bridge. Weight 43 tons.

Any Size
From
1 Pound
To
60 Tons

Manganese
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Titanium
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STEEL CASTINGS

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Machine-moulded Gears.

MALLEABLE AND CAST IRON PIPE FITTINGS

Also Malleable and Grey Iron Castings

The large extension to our Plant recently completed enables us to offer reasonably prompt delivery.

Annual capacity now 6,000 tons.

We can supply Malleable and Cast Iron pipe fittings, both screwed and flanged, black or galvanized, in all sizes.

We are equipped to make the general run of malleable and grey iron castings for machinery manufacturers, agricultural implements, automobiles and specialties.

Send us your enquiries.

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International Malleable Iron Company, Limited
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Steel, Chrome, Manganese and Nickel Steel Castings

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We specialize in the manufacture of all parts pertaining to Cement Mill and Mining Machinery Castings, Stamp Mills, Crushing Plants and Excavating Outfits.

EQUIPPED TO HANDLE BIG ORDERS PROMPTLY.

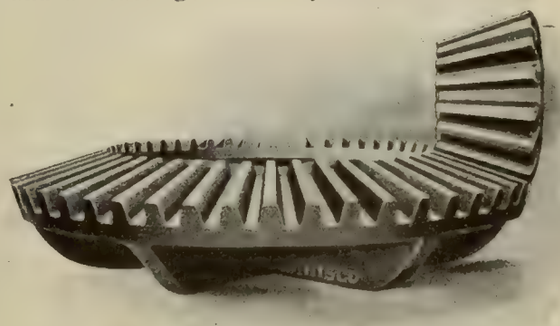
Steel Car Wheels, Locomotive Driving Wheels and all castings necessary for car builders.

GEARS MACHINE MOULDED. Any size and any kind up to 18 feet without the use of patterns.

All "HISCO" products are guaranteed to be A-1 quality.

Hull Iron & Steel Foundries Limited

Head Office and Works, HULL, Que., Canada

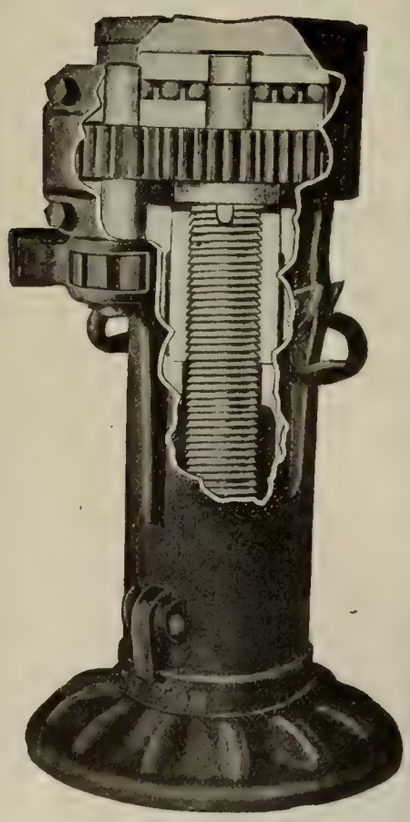


Machine Moulded Bevel Gear and Pinion

H & E

BALL AND CONE BEARING

Lifting Jacks



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STEEL CASTINGS

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Carbon or Manganese

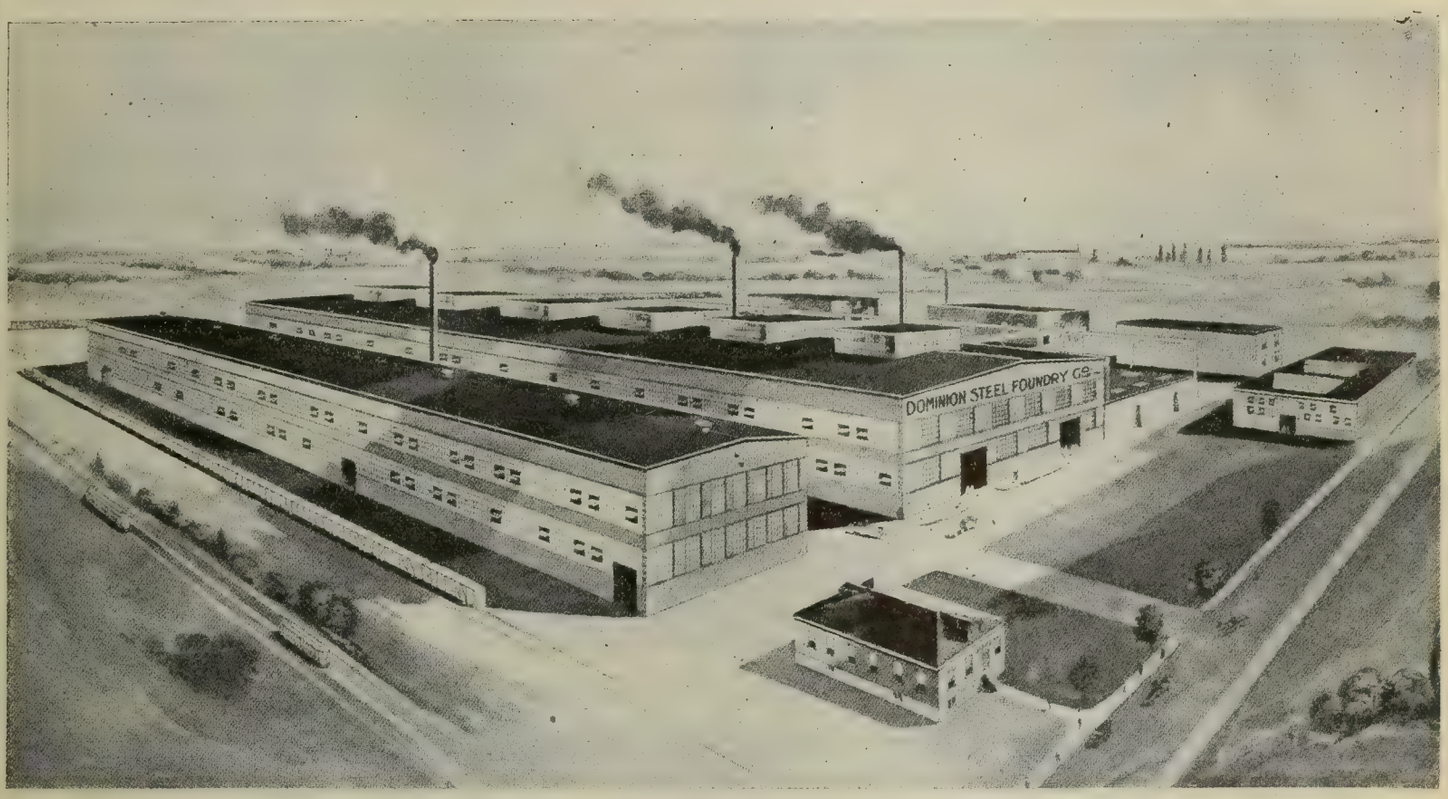
We are equipped with the plant, skilled workmen, and the ability to supply the trade with steel and manganese steel castings up to 5,000 lbs. We have produced castings of exceptional merit. Have you heard of them? Get in touch with us.

BRAKESHOES—Locomotive driver and truck shoes, freight and passenger cars, electric car shoes. We can give you excellent service on this. Write us.

Canadian Brakeshoe Co., Limited

Sherbrooke, Que., Canada

Dominion Steel Foundry Company, Limited



DOMINION STEEL FOUNDRY COMPANY, LIMITED
Office and Works: HAMILTON, CANADA

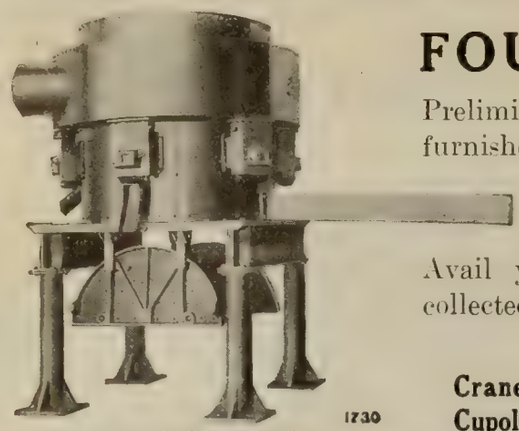
MANUFACTURERS OF

Steel Castings
Ship Forgings
Steel Plates
Rolled Forging Billets

Hard and Soft Centre Plow Steel
Rolled Bars
Car Axles

EQUIPPED FOR PROMPT DELIVERIES

If interested, tear out this page and keep with letters to be answered.



Continuous Melting Cupola

FOUNDRY EQUIPMENT

Preliminary layouts and helpful suggestions gladly furnished to those contemplating installation of Grey Iron, Brass, Car Wheel, Pipe, Converter Steel or Malleable Plants.

Avail yourself of the vast fund of information collected in over thirty years' experience.

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Cranes	Cars and Trucks	Air Hoists
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Tumblers	Turntables	Brass Furnaces
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Type "A" Tumbler

Cranes of All Types

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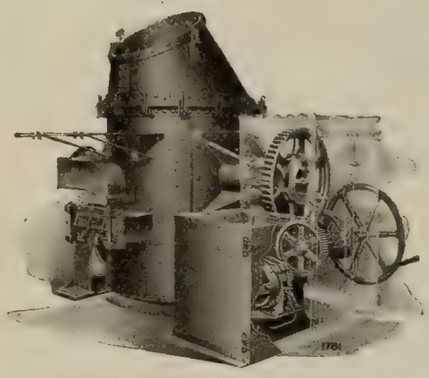

Side-Blow Steel Converter

WHITING
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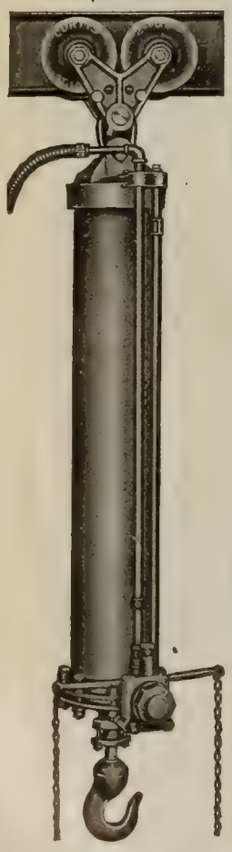
Drawer Core Oven



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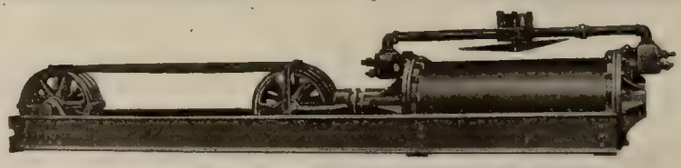

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Three Motor Patented Type E Crane

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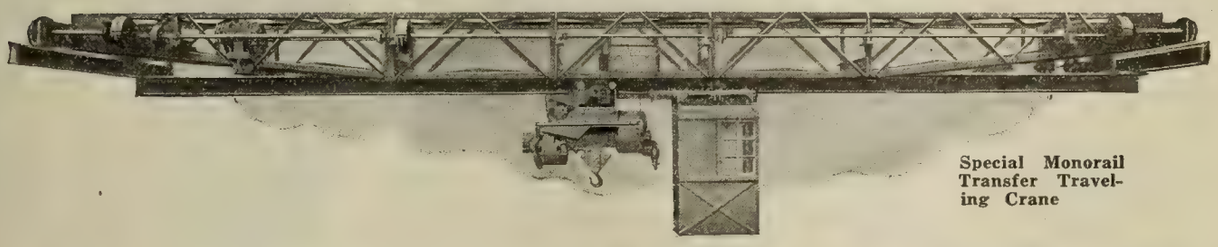
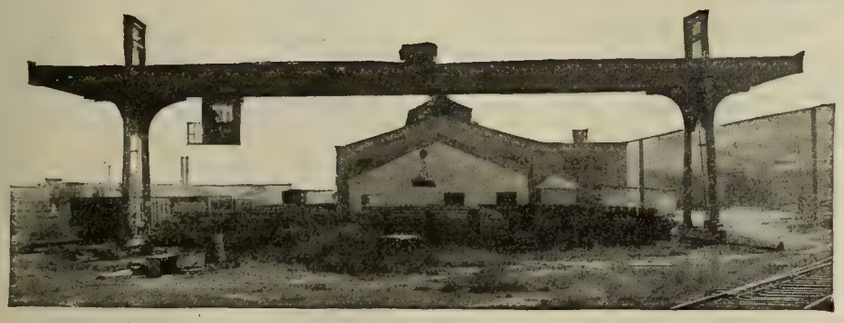
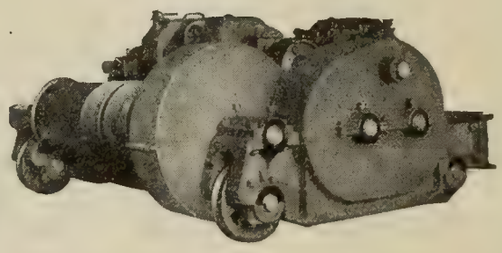


Special Monorail Transfer Traveling Crane

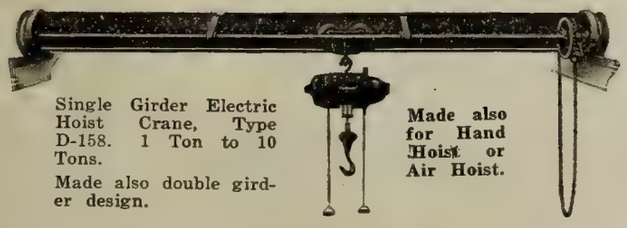


Electric Traveling Gantry Crane with Magnet



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada. All gears enclosed and non-overhung

Type E Traveling Crane

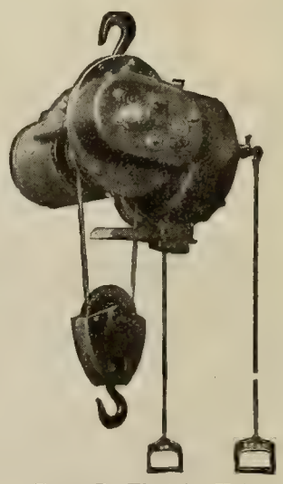


Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons.

Made also double girder design.

Made also for Hand Hoist or Air Hoist.

It is not necessary to go outside of Canada for good cranes and hoists. Our modern crane plant at Walkerville can take care of your crane needs. Whether you require electric or hand cranes we have modern designs. We also make electric hoists, air hoists and foundry equipment.



Type D Electric Hoists —½ to 10 Tons.

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THE clean white hardness of FLINT SHOT (a manufactured product) is of great value in enabling the operator to *see what he is doing!* This applies equally to "cabinet" sand-blasting, in which the man is outside, and to sand-blasting in an enclosed room. In the latter case, the cleanness of FLINT SHOT has a vital man-saving angle.

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Send for our Book on Sand Blasting—also ask for an envelope sample of FLINT SHOT so you can compare it with ordinary sand.

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Sole Producers of FLINT SHOT
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FLINT SHOT
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PIG IRON

from Port Colborne

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Foundry and
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Short of Help?

This Truck will Help You Out!

Universal Ball Bearing Elevating Truck

One man with this Universal Truck can do the work of a number of men with a number of trucks. It offers you a practical means of combating the labor shortage problem. It points a way to easy, quicker and safer trucking in all parts of your plant.

The Universal Elevating Truck is simple to operate. All material is stacked on the platforms. To move material the truck is backed under the platform, the handle of the truck is then pushed down, keeping the button depressed, which raises the truck bed, and with it the loaded platform, at the same time automatically locking it in its raised position.

When hauled to the desired position the button is pressed and the handle raised, lowering the platform to the floor. The truck is then drawn from underneath and is ready to move another platform.

Raising and lowering of the truck can be operated with one hand—can be raised or lowered at any angle.

Specially designed Chapman Ball Bearings are used on the Universal Truck. This assures the highest efficiency in a vital part and lends ease and convenience in its operation.

Send for literature telling all about the truck and its cost-cutting uses.

The Chapman Double Ball Bearing Co. of Canada, Limited

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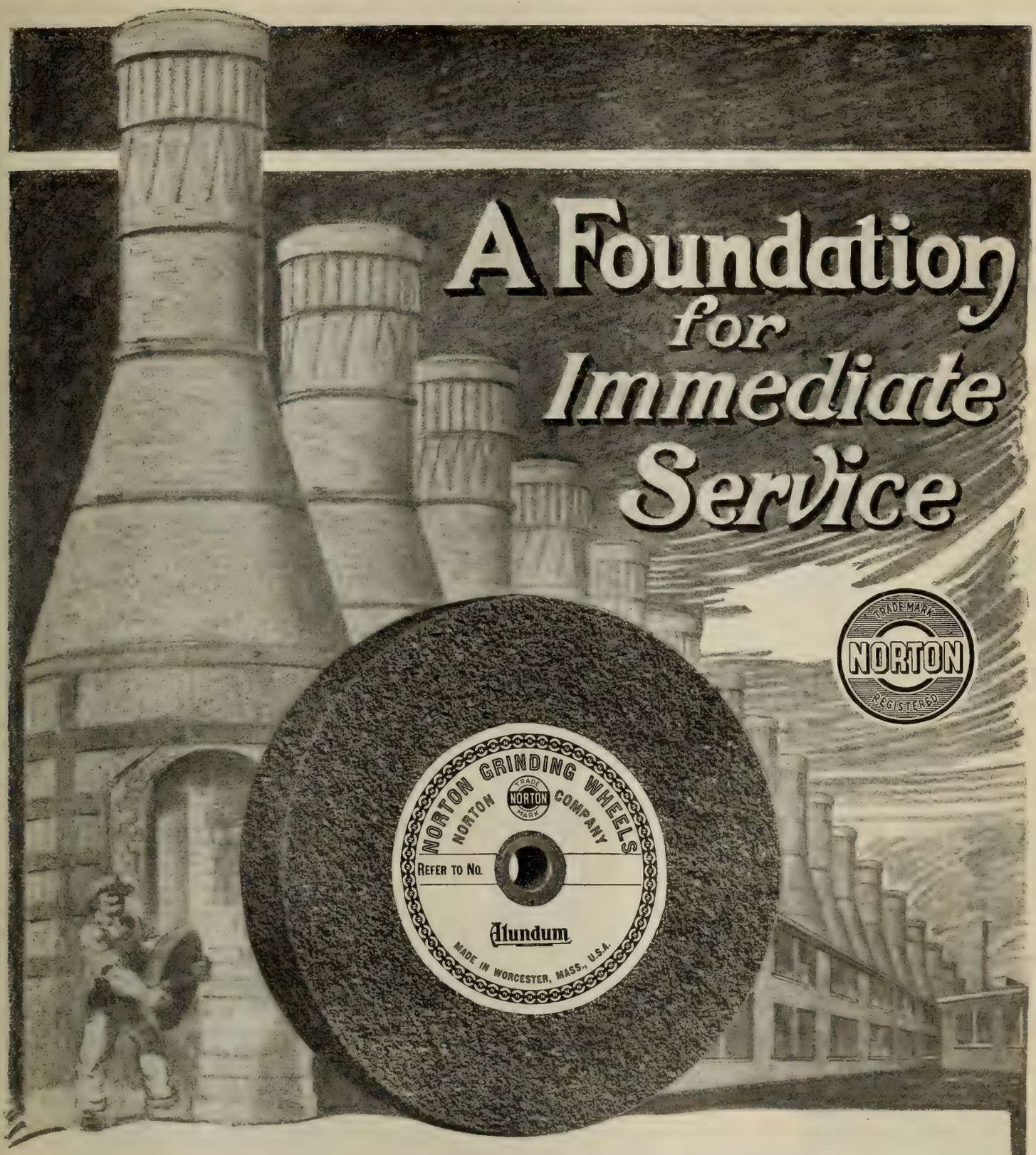

Increased force and equipment at the Bauxite mines—a new plant for the manufacture of ALUNDUM with three times the capacity of the old—enlarged organization, new factory buildings and equipment for grinding wheel manufacture.

Regular ALUNDUM wheel deliveries are now as follows:

Wheels over 4½ inches in diameter.....8 weeks
Wheels less than 4½ inches in diameter.....4 to 6 weeks

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Worcester, Mass., U.S.A.

Canadian Agents: THE CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto, Ottawa, St. John, N.B.; Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. ANDREWS & SON, Quebec, Que. ELECTRIC FURNACE PLANTS, Niagara Falls, N.Y., Chippawa, Ont., Canada.

Prepare to Meet Scarcity and High Cost of Labor

YOU NEED AND SHOULD USE

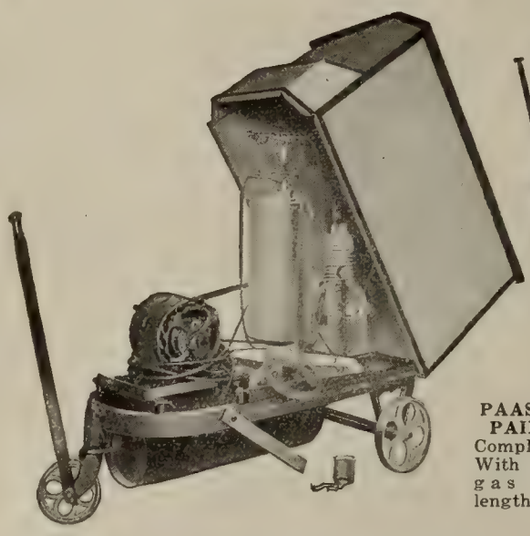
PAASCHE SUPERIOR FINISHING EQUIPMENTS

USED EXTENSIVELY and without an equal for painting factories, houses, stucco, cement and brick structures, schools, industries, theatre interiors, water tanks, bridges, battleships, launches and structural iron work!

Also used in aeroplane plants, tanneries and hundreds of other industries.

This "Marvel" paint machine does the work of six to eight brush hands.

Has a covering capacity of 20 to 40 sq. ft. per minute.



Illustrating the protection afforded the outfit when metal housing is closed.

PAASCHE PORTABLE PAINTING OUTFIT. Complete in every detail. With electric motor or gas engine and 25' lengths of hose.

Illustration showing Paasche Portable Painting Outfit

Indorsed and used by U.S. Ordnance, Somewhere in France

The Greatest Time and Labor-saving Devices ever Invented.

Reduces 50% of scaffolding.

Saves 200% in labor.

Applies all kinds and any make of paints, enamels, varnishes, dupont or celluloid solutions.

Covers in one coat equal to two or three coats as applied by hand brushes.

EVERY VITAL POINT IN FINISHING FULLY PROVIDED FOR

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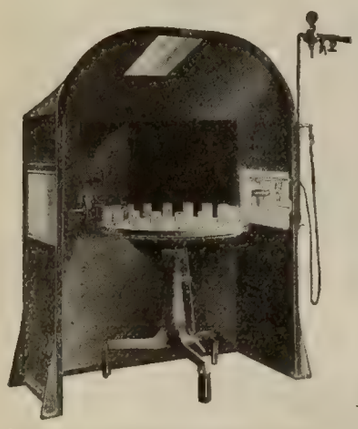

One of our many popular outfits in use among munition, hardware and fixture manufacturing plants. Showing 18-spindle, power-driven turntable used for speediest finishing of cylindrical articles.

Manufacturers of Munitions, Wood and Metal Products of Every Description Prefer

THE PAASCHE SYSTEM

Due to their great economy, unmatchable efficiency, durability, indispensable in modern plants for applying liquid finishing materials of every description.

Keeps your finishing costs down to minimum and your output at the maximum. Eliminates every annoying obstacle and solves all difficult problems in finishing. Thousands of gratified users praise Paasche equipments.

You will do likewise. Take it up with us to-day.

Paasche equipments made in all sizes to accommodate your particular product. For large or small work.

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TURRET

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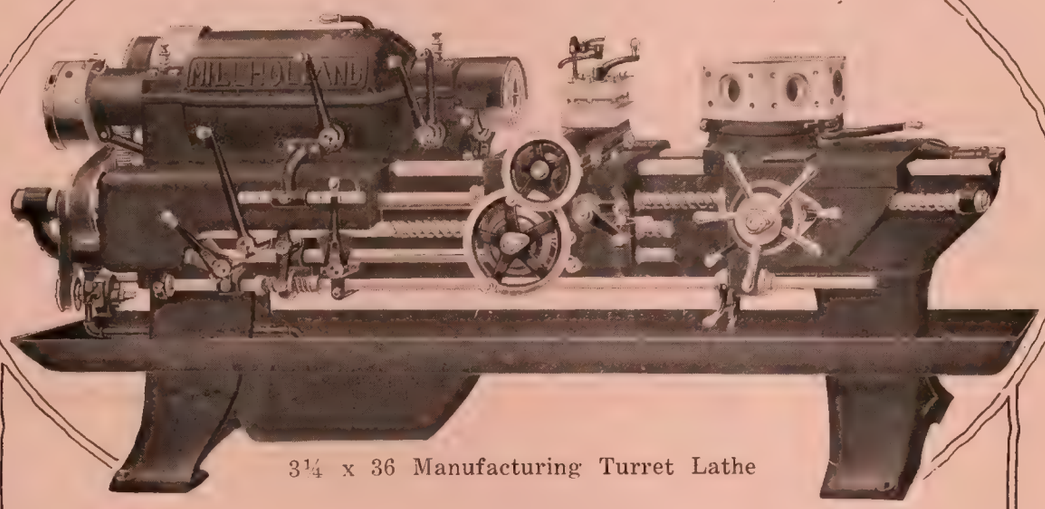
LATHES



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A battery of 400 Millhollands smashing production records in a British munition factory shows what Millhollands are doing on fuses, 75-mm. and 6" shells.

Get the Millholland Catalog showing our complete line of Turret Lathes, Screw Machines and Tools.

W. K. Millholland Machine Co.

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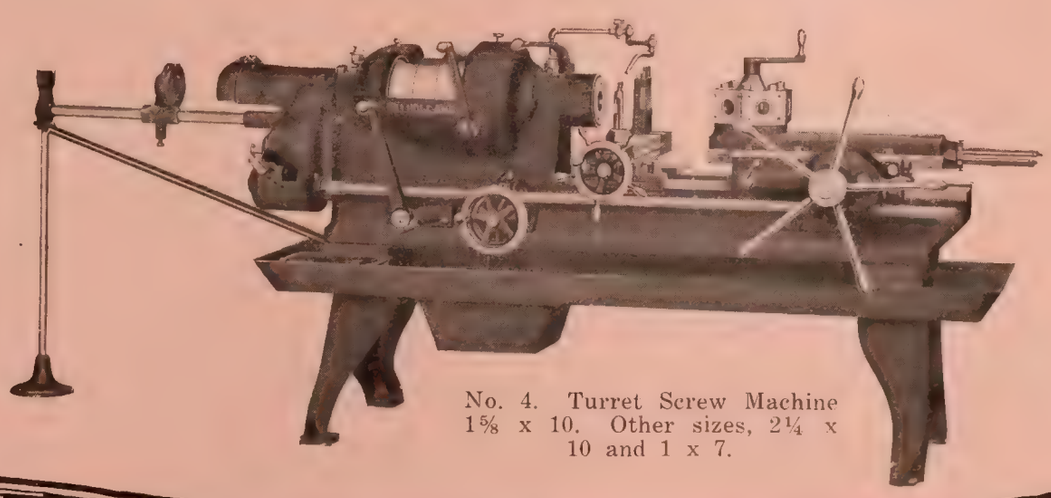

No. 4. Turret Screw Machine 1⅝ x 10. Other sizes, 2¼ x 10 and 1 x 7.

Ott Universal Grinder

Insures more straight and taper cylindrical parts properly ground; more chuck and face plate work, whether internal or external, properly accomplished. It is a strong, rigid Grinder of

PROVEN ABILITY UNUSUAL

Especially adapted for general tool room service, and also by reason of design and equipment admirably fitted for general manufacturing grinding within its range.

9″ x 26″; Wheel, 10″ x 1″.

For Bulletin and economical grinding possibilities it will pay you to know about. **Write:**

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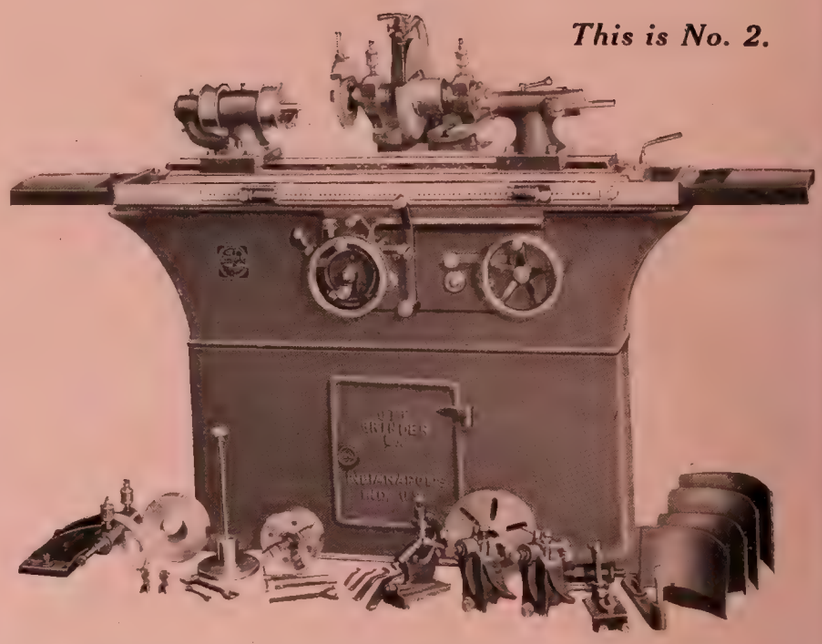

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Grind them all on this BX Combination Grinder

IT GRINDS—

FACE AND SIDE MILLING CUTTERS	12″ DIA.
ANGLE MILLING CUTTERS - -	8″ DIA.
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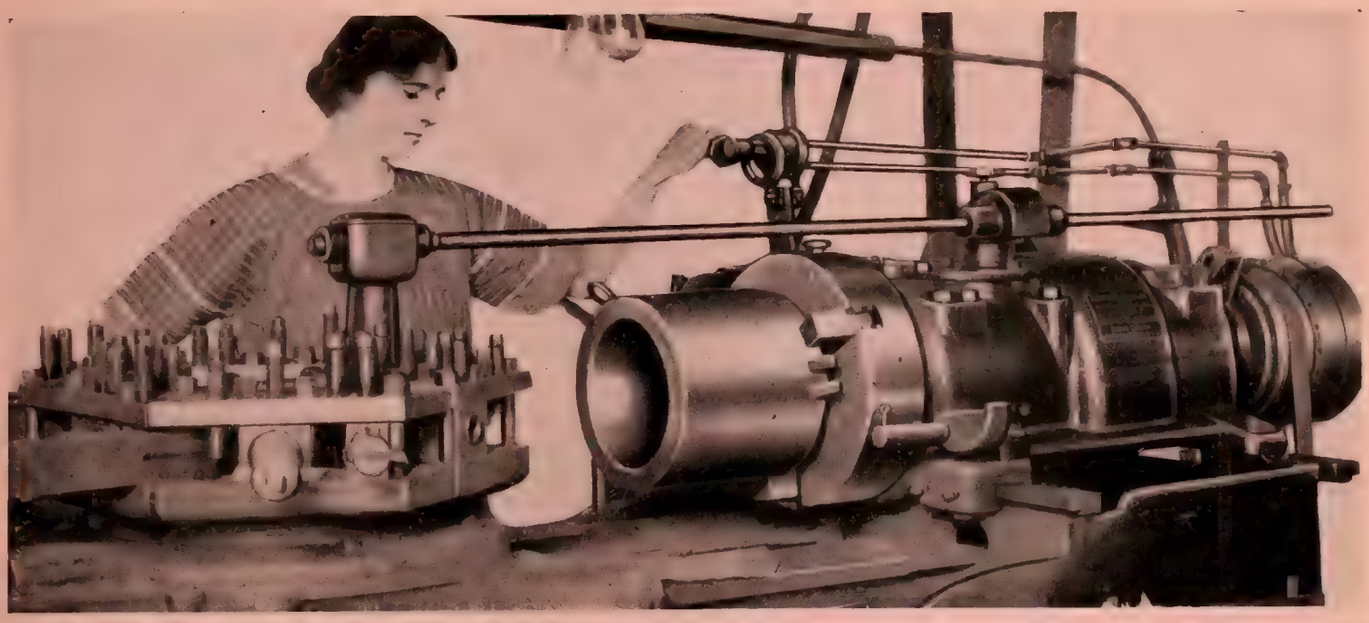

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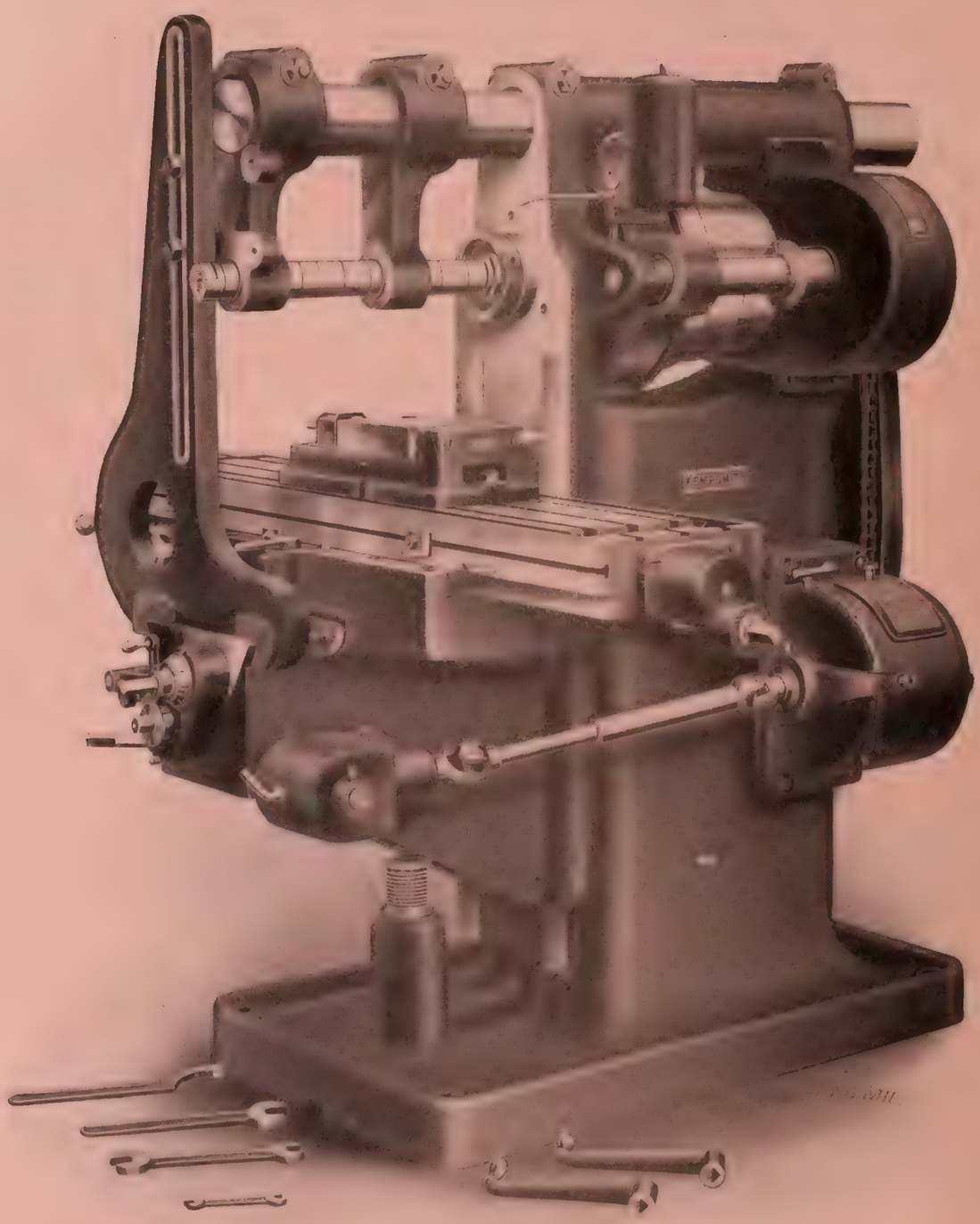

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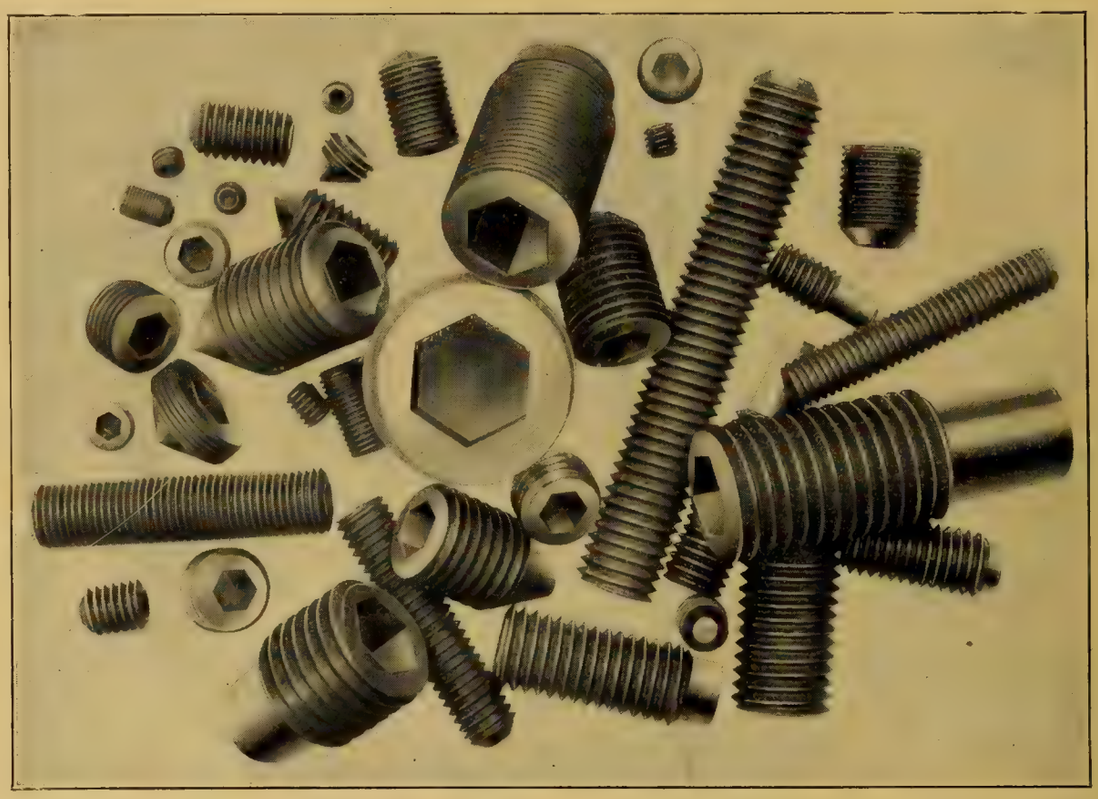

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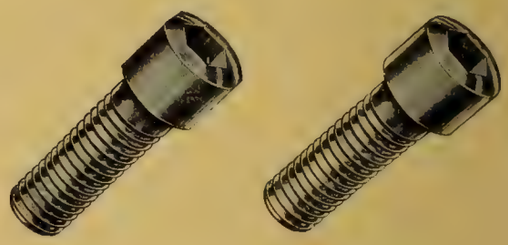
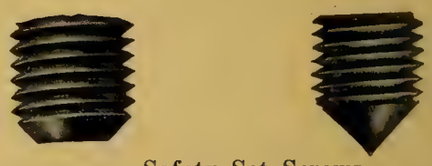
Because Allen Socket Screws are formed under the Allen Patented Process—a process proven to add 30% more strength to the screw metal.

Use Allen Hexagon Socket Screws for **positive** safety; because they enhance the finished appearance of any machine; because they are most economical.

We carry a large stock of both set screws and cap screws **with "V" threads.**



Socket Head Cap Screws



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Tap Extensions

Write for Allen Catalog and Free Sample Screws.

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The above seven brands of Babbitt have no superiors.

In Domeko Babbitt Metal you can find any type of bearing metal desired and every pound is guaranteed.

Manufacturers, shops of every description, and jobbers will find it to their advantage to have our goods, and service at their command.

You can save much money by buying steadily from us. Let us tell you why.

We have the most up-to-date Babbitt, and White Metal Plant in Canada. Customers are always welcome to visit our works.

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Prices quoted f.o.b. your nearest railway station. Catalogue free on request.

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JACOBS IMPROVED DRILL CHUCKS are among the modern industrial devices that are meeting the war-time demand for quick, efficient and economical service. They keep down expense and increase the output. If you haven't used them, put some to the test.

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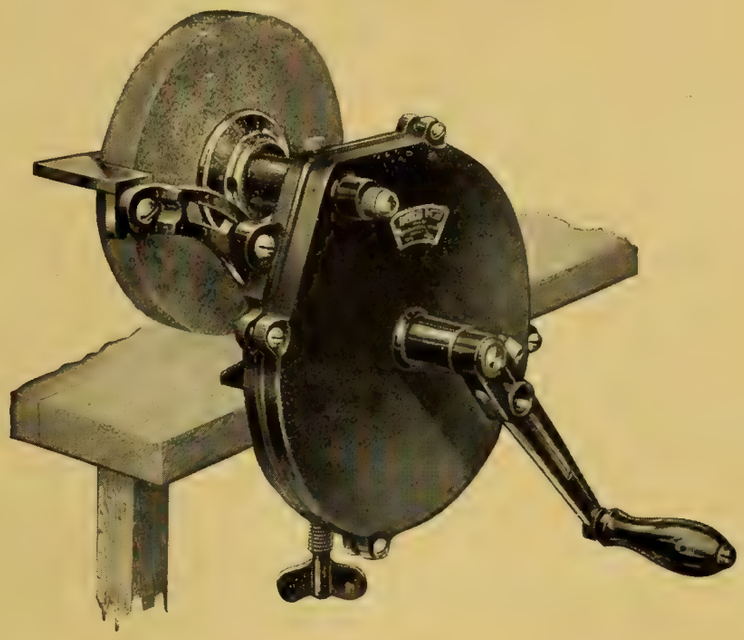

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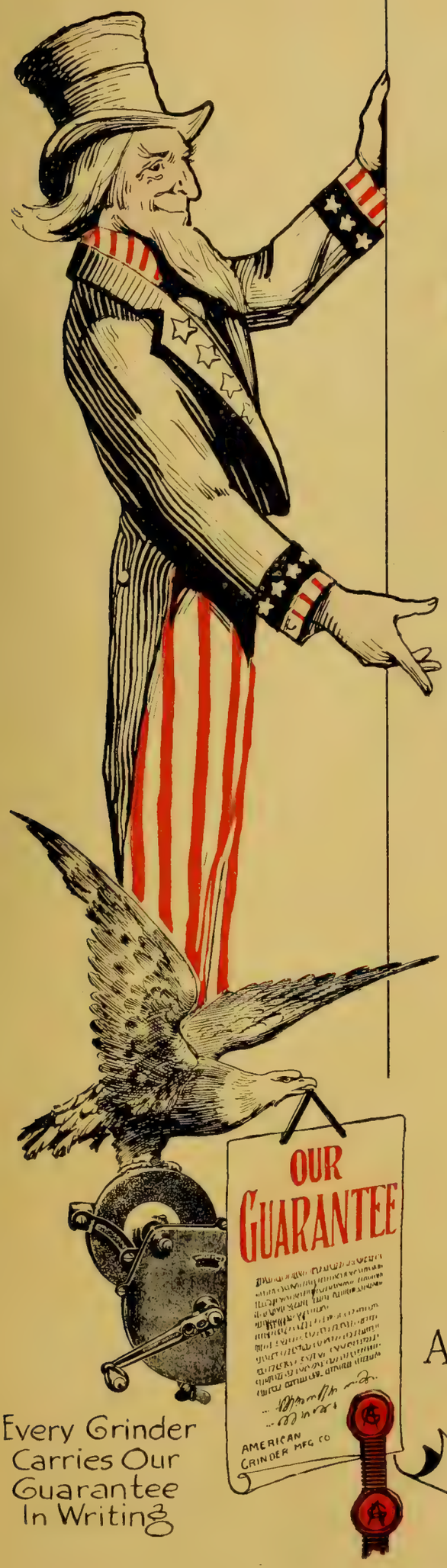

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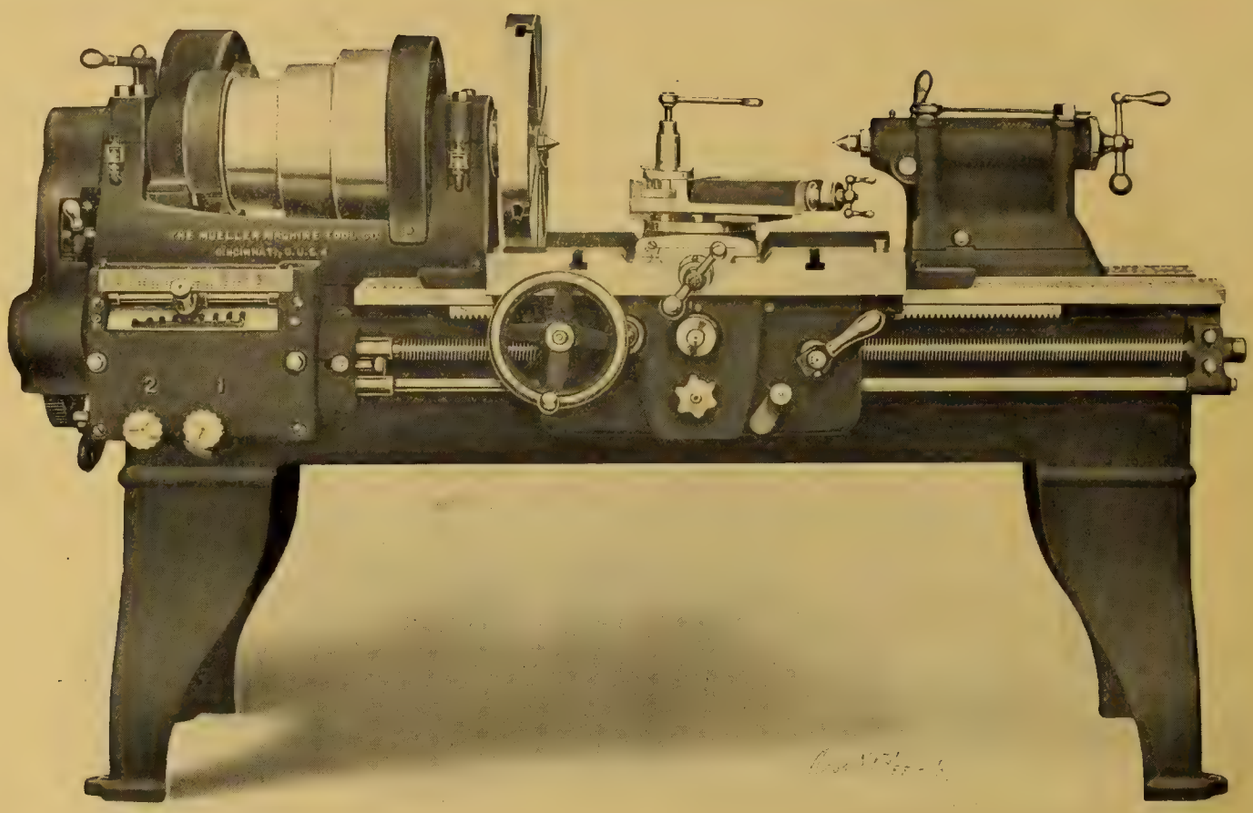

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If ever any machine deserved the name "Ever-ready" it is the Mueller Heavy Duty Lathe.

For light or heavy cuts, at high speed or low; from hogging off stock to the chasing of a fine thread, the Mueller is the one lathe for fast, accurate and economical operation. And it's not a "job" to set it for different work; there are no special attachments. The changes in the gear box itself provide for forty-five threads. Eighteen spindle speeds are under the control of a lever on the front of the machine. Complete description will show you the many other advantages. Ask for it.

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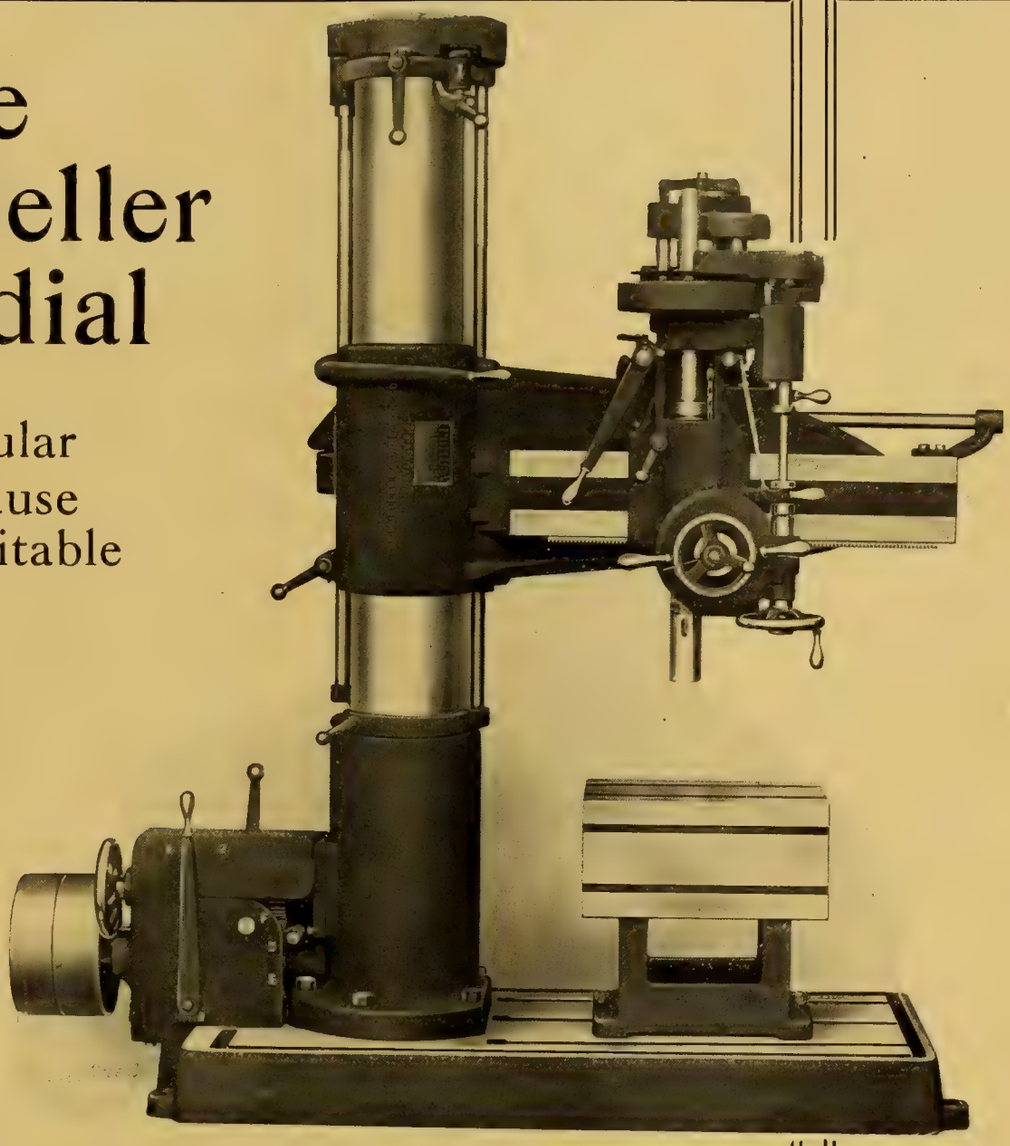
Popular
Because
Profitable



THE special features of the Mueller Radial were not designed to add grace and beauty to the machine, but to equip it for accurate drilling at high speeds—to prepare it to meet the requirements of modern manufacturing—to make it, in short, a profitable investment to the purchaser.

The column is cast in one piece—to which four internal webs add extra reinforcement; the arm has wide bearings on column, swings 360 degrees, clamps rigidly at any point and is so well balanced that accuracy is assured even at the top of the column and when drilling at the extreme traverse of the spindle.

Simple and centrally located controls, automatic trip for feeds and speeds and other well-designed and durably constructed features make for profitable drilling on the popular

MUELLER RADIAL

The Mueller Machine Tool Co.

Makers of Radial Drills and Lathes

CINCINNATI, OHIO, U.S.A.

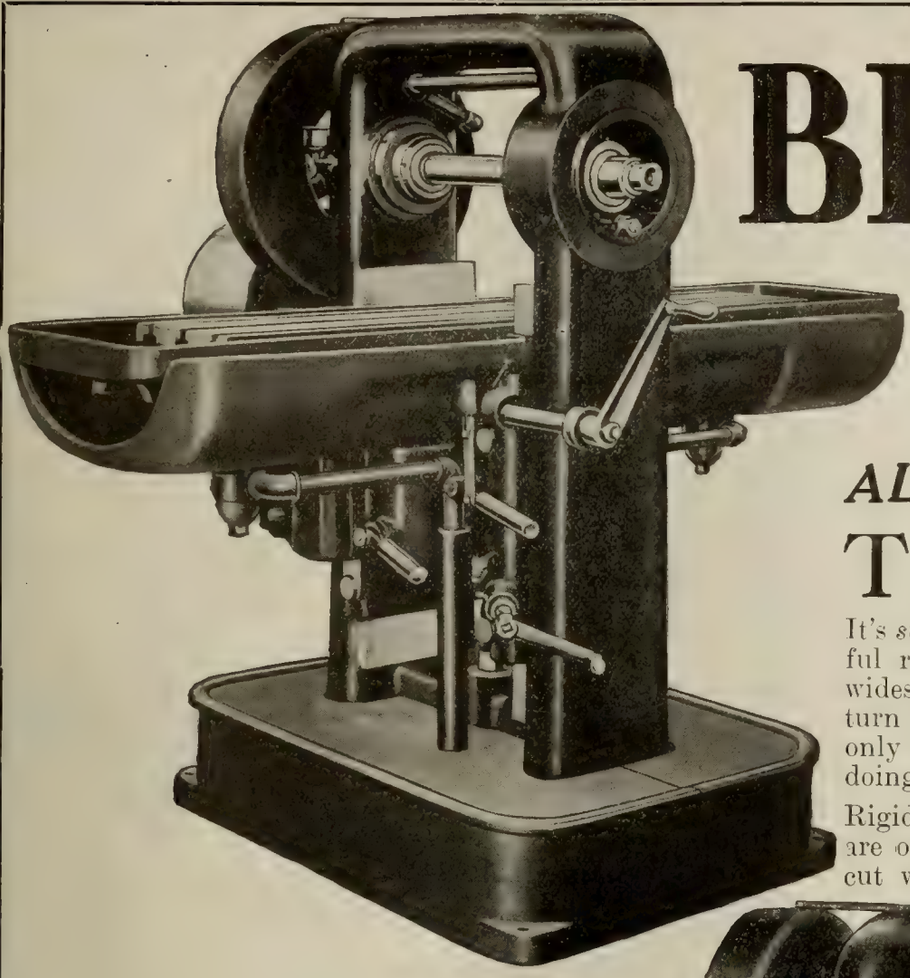
The GEO. F. FOSS MACHINERY & SUPPLY Co.
305 St. James Street - Montreal, Quebec

LEATHER BELTING
All Sizes and Plies Quality Guaranteed
COTTON BELTING "AZAK"
THE LATEST IMPROVED
SOLID WOVEN COTTON BELTING
PLIABLE, WILL NOT CRACK *VERY LITTLE STRETCH*
McARTHUR BELTINGS LIMITED
Factory—Brockville, Ont.
Stock carried by THE GEO. F. FOSS MACHINERY CO., Montreal

More Speed
Use
"TUNGSTEN"
Hack Saw Blades

The Hack Saw Blade that retains its cutting edge and its life is lengthened by fewer number of sharpenings. Supplied in any quantity and delivered to your specifications. Write us for supplies of all nature. Our line is complete, our stock is complete, our service unbeatable.

The Geo. F. Foss Machinery & Supply Co.
305 ST. JAMES STREET, MONTREAL, QUE.

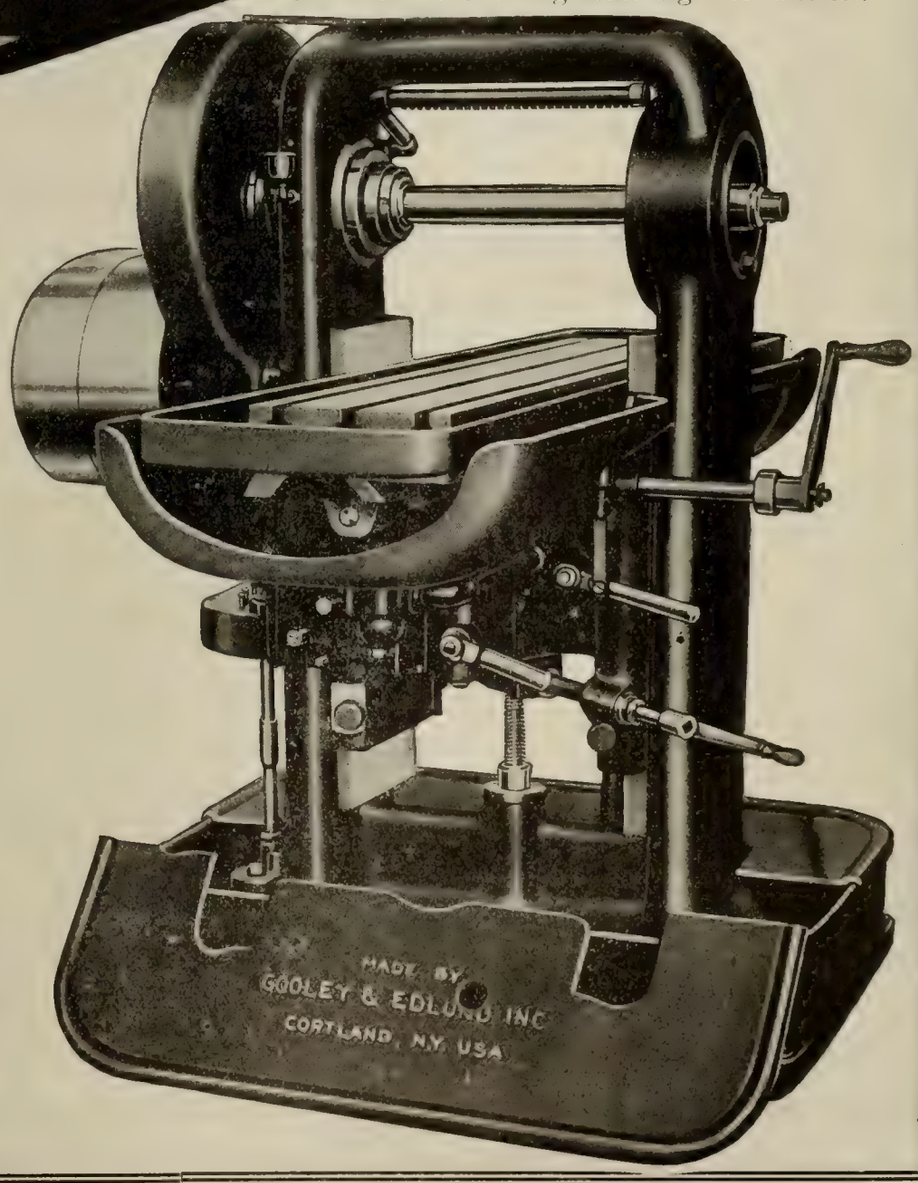


BRIGGS MILLER

THE TOOL FOR ALL 'ROUND WORK

THE "Briggs" is *different* because it represents a radical departure from the conventional type of milling machine. It's *superior* because it represents the successful result of painstaking efforts to meet a widespread demand for a machine that would turn out work *more economically*. But not only has it succeeded in cost-cutting—it is doing *better work*, too.

Rigid, powerful and easy to operate—these are outstanding features. Takes wide, deep cut without showing least sign of distress.



This is the Miller you have been thinking about. Get the full details of its excellent construction.

Our Catalog?—Certainly—What Address?

Gooley & Edlund Inc.

Cortland, N.Y. , U.S.A.

FOREIGN AGENTS: Allied Machinery Company of America, France, Belgium, Italy, Switzerland, Russia, Scandinavia; C. W. Burton Griffiths & Co., London, Manchester and Glasgow; Barandiaran, Metivier, Gazeau & Cia, San Sebastian, Spain.

If interested, tear out this page and keep with letters to be answered.

Oxy-Acetylene Welding and Cutting

Investigate the Money-saving Advantages of This Process

Oxy - Acetylene Welding Outfit Employing Prest-O-Lite ready-made Acetylene and compressed Oxygen, both in portable cylinders.

There is practically no line of metal manufacturing or repairing in which oxy-acetylene welding has not already established itself firmly as standard, routine method.

All kinds of metals are welded by the Prest-O-Lite process of oxy-acetylene welding. Valuable castings, and broken machinery parts worth thousands of dollars, are saved and quickly put back into service.

Through avoiding costly tie-ups and delays in production caused by the breakdown of an important machine—or by saving the cost of a new part—one Prest-O-Lite welding repair may save the cost of the entire welding outfit many times over.

If you are interested in making your plant more profitable—in reducing operating costs and effecting many economies in production—if you wish to make your product stronger, neater, better—investigate what Prest-O-Lite Welding will accomplish for you.

Prest-O-Lite PROCESS

employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Apparatus consists of an equal pressure blow pipe, automatic regulators and gauges, and all necessary equipment. Adaptable for oxy-acetylene cutting by the addition of special cutting blow pipe.

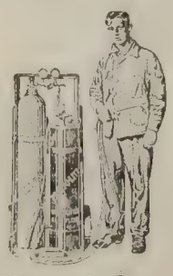
Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

We will gladly send illustrated literature and interesting data showing actual instances of sanvigs made by others. It may suggest valuable ideas to you. Write for it.

Address Dept. C-107.

THE PREST-O-LITE CO., INC.

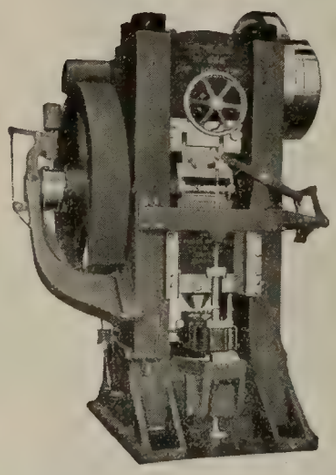
Canadian General Offices:
Prest-O-Lite Building
Corner Elm Street and Centre Avenue
TORONTO



Direct Factory Branches: Toronto, Ont: Montreal, Que.; Merritton, Ont.: Winnipeg, Man.
Canadian Plants: Toronto, Ont.: Merritton, Ont.: St. Boniface, Man.; Shawinigan Falls, Que.

World's Largest Makers of Dissolved Acetylene

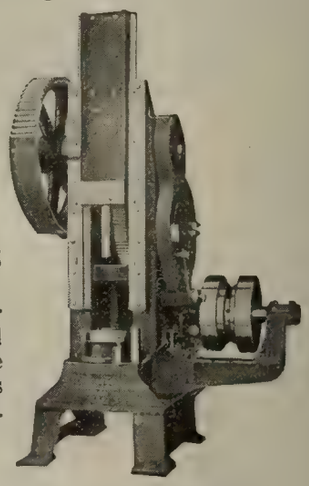
The "TOLEDO"



Heading Presses

Fitted with special automatic push-out and pick-off attachments, these presses are exceptionally efficient for heading large cartridge shells.

The construction embodies the latest and best improvements known for machines of this design.



Rack and Pinion Reducing Presses

Particularly recommended for reducing the wall thickness and the diameter of brass cartridge cases and other cups and shells drawn from heavy gauge metal.

Superior Presses for Unusual Performance

The Toledo Machine & Tool Co., TOLEDO OHIO

Representatives—Allied Machinery Co. of America, 19 Rue de Rocroy, Paris, France; Vie XX Settembre 12, Turin, Italy; 16 Seidengasse, Zurich, Switzerland.

Save Expensive Tools

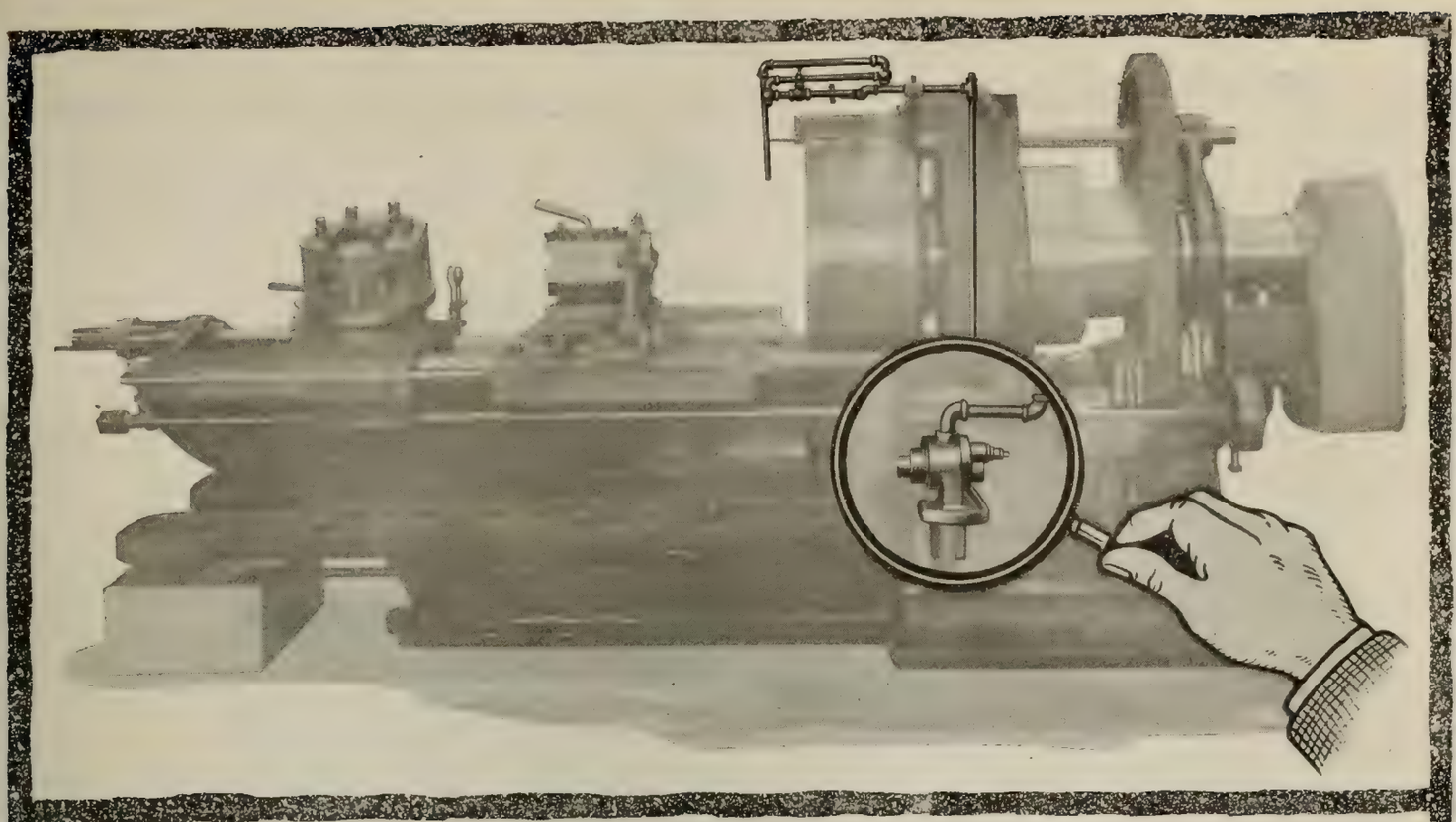
PROVIDE a proper receptacle for costly tools, parts, etc., and you will not see them lying on the floor, walked upon, scattered about and generally mistreated and damaged.

This **DENNISTEEL** Tool Stand is made expressly for the safe keeping of tools and parts.

Built exclusively of high-grade steel, with baked-on enamel finish. Used by railroads and largest firms in Canada.

Let us send illustrated descriptive matter.

THE DENNIS WIRE AND IRON WORKS CO. LIMITED
LONDON CANADA



Trahern Rotary Geared Pumps are used on this Gisholt Turret Lathe

BECAUSE the manufacturer knows that every unit of service must of necessity be of the same value as every other unit, and this is only possible when the accessories with which the machine is equipped measure up to the same relative standard. Our Pumps Do.

TRAHERN PUMPS will not clog or lose their prime. You can operate them at slow speed and obtain desired capacity; this conserves wearing qualities. Will work with or without pressure, performing the functions of two types of pumps. With TRAHERN positive drive you can shoot lubricant into deep bores or other work difficult to cool. This is not possible with a centrifugal pump.

It required sound, practical reasons to convince such concerns as the AMERICAN TOOL WORKS CO., GLEASON WORKS, PUTNAM MACHINE CO., and scores of others that TRAHERN PUMPS possessed numerous points of superiority. We are anxious to demonstrate to you also the truth of our statements.

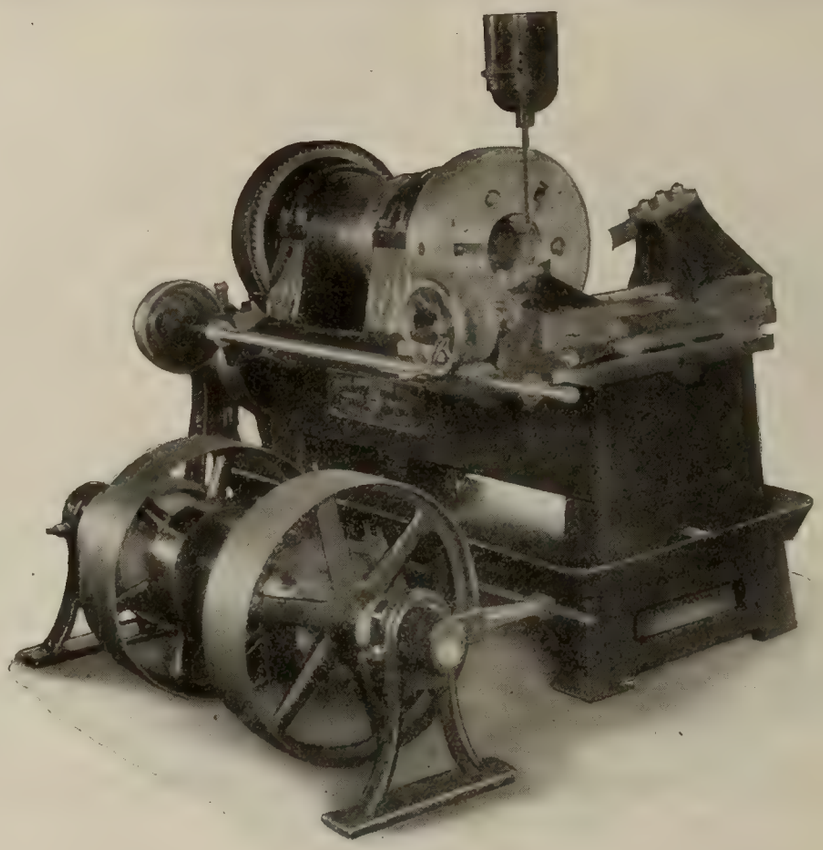
Send us your address and we will forward sample pump, free of charge, which will verify all that we say regarding our product.

TRAHERN PUMP COMPANY

ROCKFORD, ILLINOIS

Represented in Canada by A. R. WILLIAMS MACHINERY COMPANY

BUILT IN THREE SIZES



BUILT TO STAND THE STEADY GRIND

The Globe Cutting-off Machine

For Shell Forgings or Bar Stock

15 forgings for 6" Shells per hour, or 27% better production than one of the best American machines working by its side.

We are prepared to prove that "Globe Cutting-off Machines" are staying right on the job twenty-four hours per day, and giving more production with lower cost of maintenance than any other machine on the Continent.

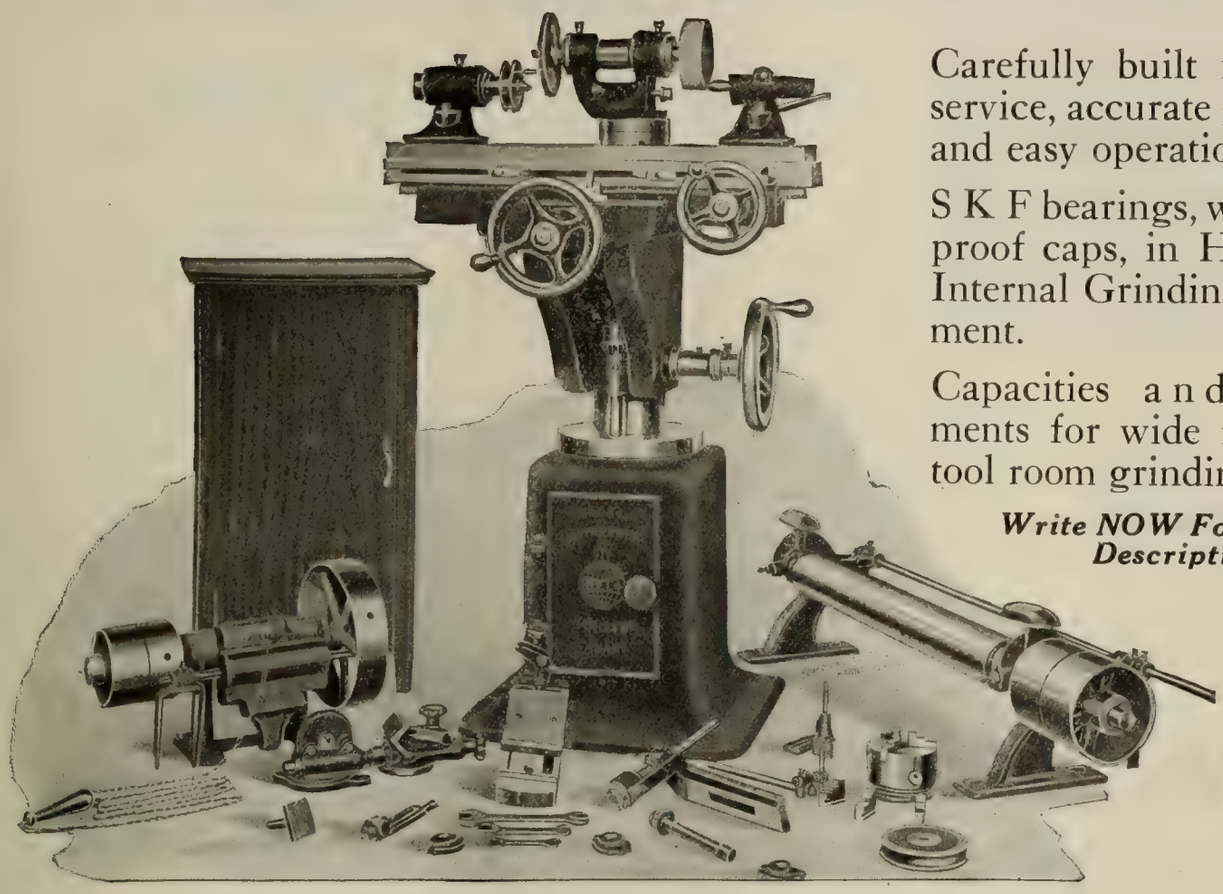
LET US SHOW YOU.

Globe Engineering Company, Limited

Hamilton GEC LIMITED **Canada**

If any advertisement interests you, tear it out now and place with letters to be answered.

The Globe Universal Tool and Cutter Grinder



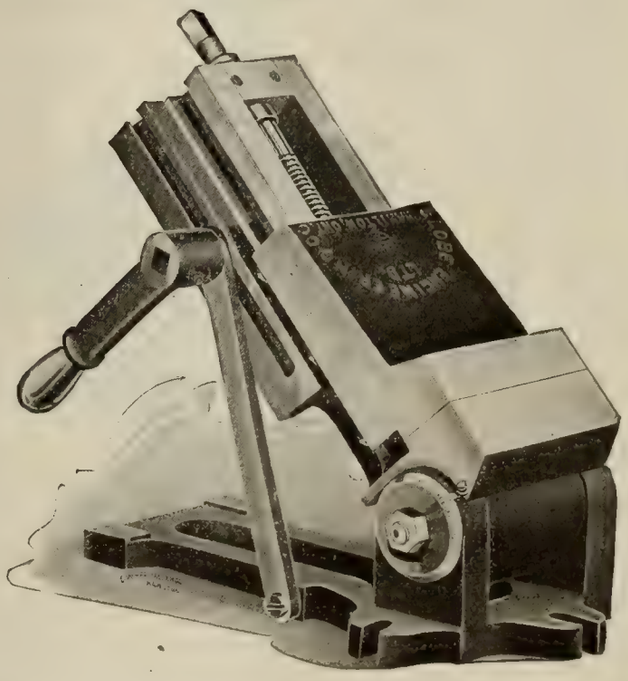
Carefully built for long service, accurate grinding and easy operation.

S K F bearings, with dust-proof caps, in Head and Internal Grinding attachment.

Capacities and attachments for wide range of tool room grinding.

Write NOW For Detailed Description.

The Globe Graduated Tilting Vise



Machined and fitted—not merely assembled. Adjusted to any angle in a jiffy.

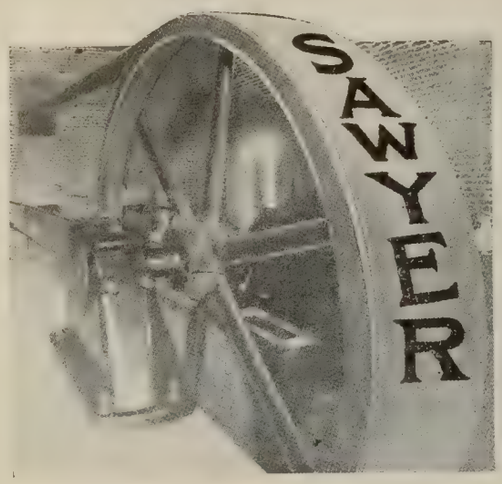
Rigid in any position.

Generous sized jaws of steel.

Prices on request.

Globe Engineering Company, Limited

Hamilton GEC LIMITED **Canada**



TRADE SAWYER MARK Registered

STITCHED CANVAS BELTING

Look for the Name

The "Sawyer" trade-mark is emblematic of a line of stitched canvas belting that saves money in transmitting power. Made a little better than it needs to be made to stand the severest service.

Machine Shop Supplies

We can supply Western Canada shops *quickly* and *economical* with a complete line of high quality machine shop requisites. What we sell—

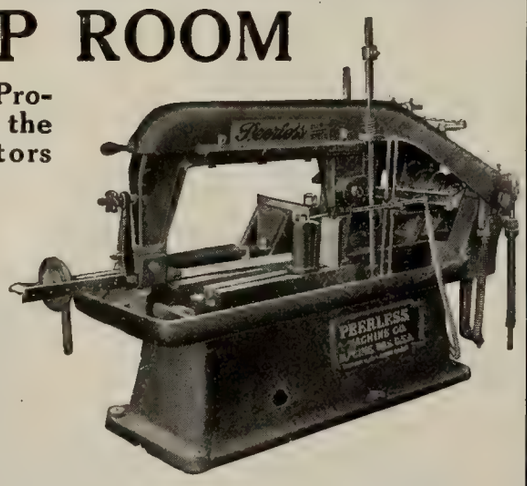
Asbestos Packing and Gaskets
Belting—Sawyer, Rubber, Leather, Balata
Belt Fastenrs
Belt Dressing
Babbitt
Cap Screws
Castellated Nuts
Cotter Pins
Drills—Carbon and High-Speed
Emery Wheels
Files
File Handles
Ford Gaskets
Gas Engine Packing
Hack-Saw Blades
Hose
Jacks
Lace Leather
Lock Washers
Pliers
Pipe Joint Compound (Tyte-Unyte)
Reamers
Semi-finished Nuts
Set Screws
Safety Set Screws
Steel—Carbon—High-speed Axle
Solder
Taps and Dies
Vises
Wrenches

Give our service and our lines a trial. "A good concern to do business with."

PLEWES LIMITED, Winnipeg, Man.

SHOP ROOM

Labor and Production are the Main Factors Nowadays



Wouldn't a proposition interest you that would solve these problems? We have proven to hundreds of others that our New Improved Peerless High Speed Heavy Duty Metal Cutting Saw will do more work with less labor and save floor space. Instead of using several machines, one Peerless will do the work.

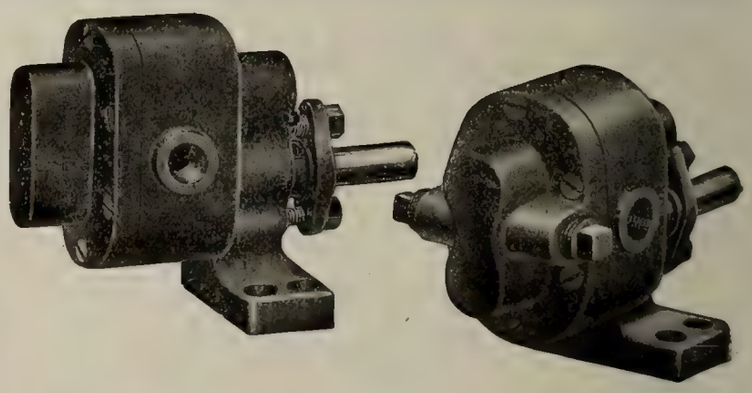
You are losing money in delaying your production and tying up ready cash when building.

Now can you afford to pass up this proposition? You take no chances, we allow you thirty days' free trial before you decide to purchase. No previous records or world-wide reputations are given consideration after this tool is once installed.

It takes but a moment for any manufacturer to realize the real value of this tool after a comparative trial. Many find them so profitable that they are ordering additional machines by express.

It will surprise you to note the large list of users. May we send you a copy?

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.



Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.

COTTON AND WOOL WASTE—
WASHED COTTON WIPERS

Prompt delivery from stock on all our grades of Cotton and Wool Waste or Wipers —as used by all Railways, Steamship Lines, Machine Shops, etc., etc.

In the following grades:

Polishing Waste	White Wiping Waste	Colored Wiping Waste	Wool Packing Waste	Washed Cotton Wiper
Cream	XXX Extra	Fancy	Arrow	White
	X Grand	Lion	Axle	Light
	X L C R	Standard	Anvil	Dark
	X Empire	Popular	Anchor	
	X Press	Keen		

SAMPLES WITH PRICES ON REQUEST.

Also Headquarters for

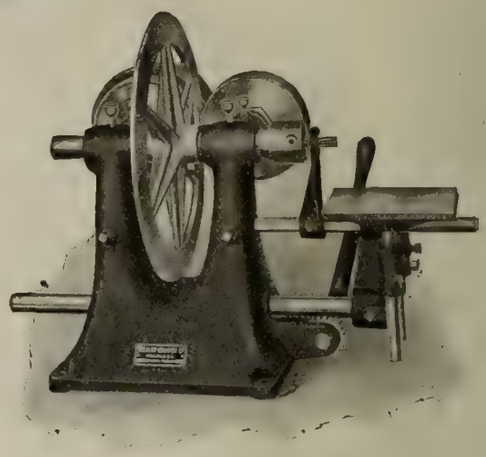
Cotton Duck	Cordage	Marine Hardware
Tents—Flags	Twines	Oakum—Pitch
Tarpaulins	Oiled Clothing	Fishermen's Supplies

SCYTHES & COMPANY LIMITED

Manufacturers and Jobbers

MONTREAL **TORONTO** **WINNIPEG**

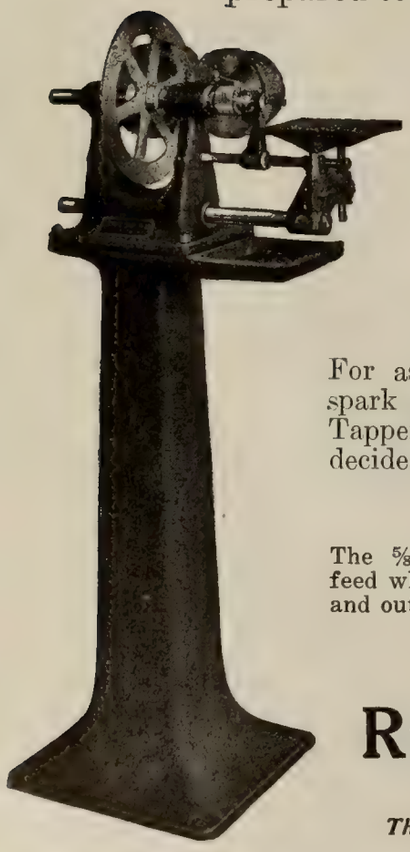
R-S TOOLS



Bench Tapper

TAPPING MACHINES

Faster tapping and quicker assembling — these are claims we make and claims we are prepared to prove for R-S Tapping Machines.



Column Type Horizontal Tapper

HERE'S THE PROOF—friction drive, absorbing all the shock, allows a chuck speed of 140 r.p.m. on ⅝-in. work—50% faster than the usual tapping speed for that size. Uses but 1 h.p.

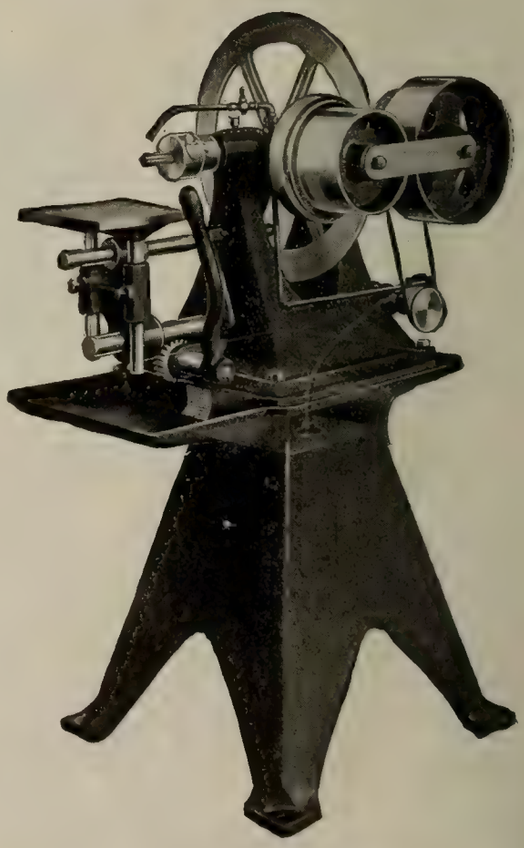
The smoother drive also reduces the strain on the taps. They wear longer —fewer delays from taps breaking in the work.

For assembling threaded parts (valve stems, spark plugs, instruments, couplings), R-S Tappers result in quicker assembling and a decidedly larger output from every operator.

R-S OIL FEEDER

The ⅝" Tapper is featured by the continuous oil feed which allows greater speed, increased efficiency and output and longer life.

All enquiries quickly attended to.



⅝ in. Oil Feed Tapper

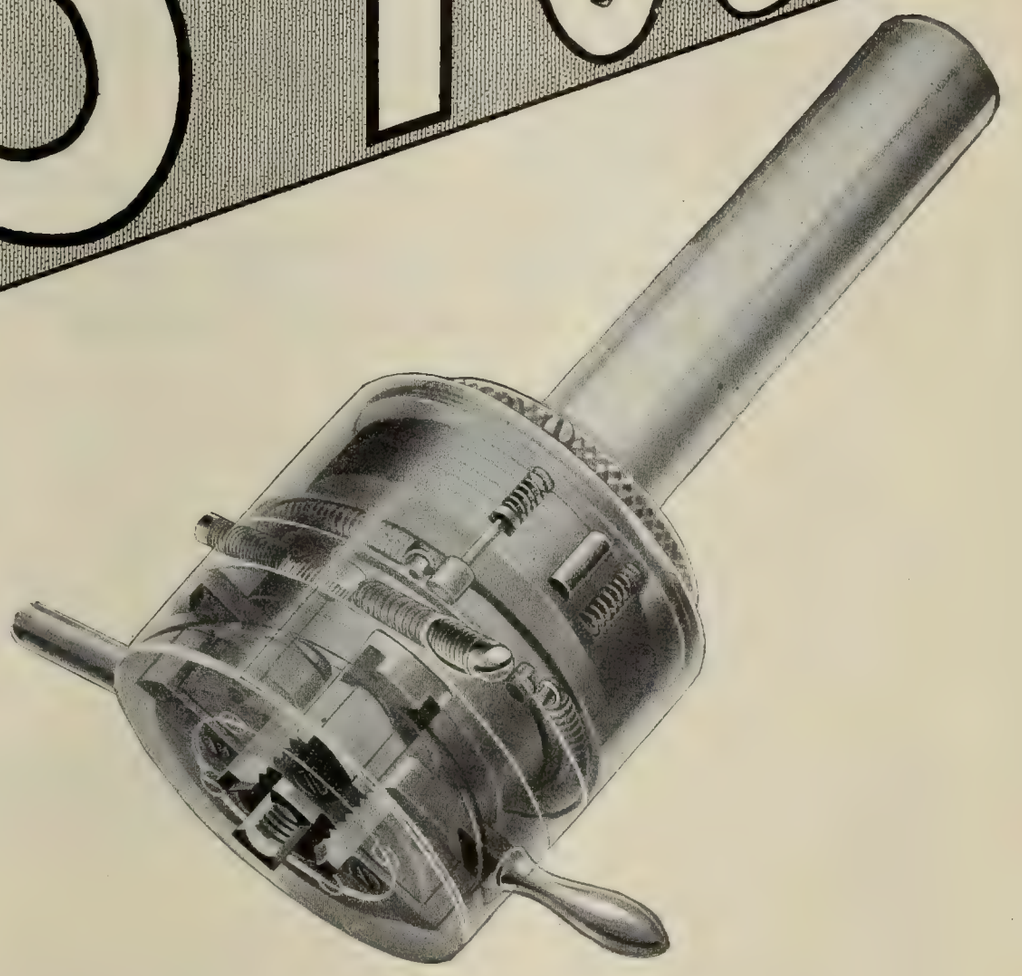
Rickert-Shafer Co.

ERIE - PA. - U.S.A.

This is Our Address—How Can We Serve You?

ALFRED HERBERT, Foreign Agent
COVENTRY, ENGLAND

R-S TOOLS



AUTOMATIC DIE HEADS

This R-S Tool, with its new construction (in which are embodied several practical improvements) offers you **more efficient** and **more economical** service than is possible with any other automatic die head.

The hardened and ground guides for the chaser is something new and better. Further, it has a positive opening and closing cam action. The chasers have the necessary radial movement to enable the die to open after the threading operation has been completed. They are supported by a cam ring throughout their entire length and width.

The chasers slide between hardened and ground guides, and are supported by carriers which have a groove in the outer end for the positive opening cam.

This cam, the locking pins, and the "float" have features that add to the distinctiveness of this "Boehm" Tool.

Built in sizes to cut from 3/8 to 9" diameter, or larger if so ordered, and with taper attachment and roughing and finishing attachment.

Rickert-Shafer Co., Erie, Penn.

This is Our Address—How Can We Serve You?

Brown and Sharpe.

Landis.

Bath Grinder—sets of three, one forward and two side.

Norton.

DIAMOND POINTED TOOLS

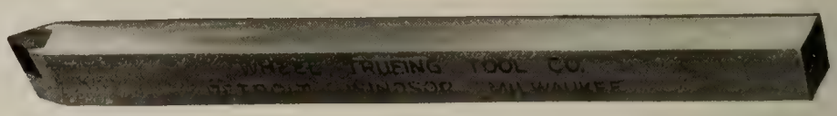
MADE IN CANADA

Our line comprises Diamond Pointed Tools for every industrial purpose. We are also equipped to manufacture and furnish promptly special tools of every variety. In the manufacture of our tools the greatest care in selecting the diamonds for each particular purpose is exercised. The utmost skill in setting the diamonds, as well as in every other step of manufacture, is made use of. Our Diamond Pointed Tools are the best that can possibly be made—the best that money can buy.

Specially Adjustable Turning Tool.

We are leading experts in the matter of Diamond-pointed Tools. Our service department is at your command, and it costs you nothing for advice. Just let us know of your particular problem and our service department will tell you how to solve it and get the best results.

All orders and enquiries promptly attended to. Goods submitted on memorandum to responsible firms.



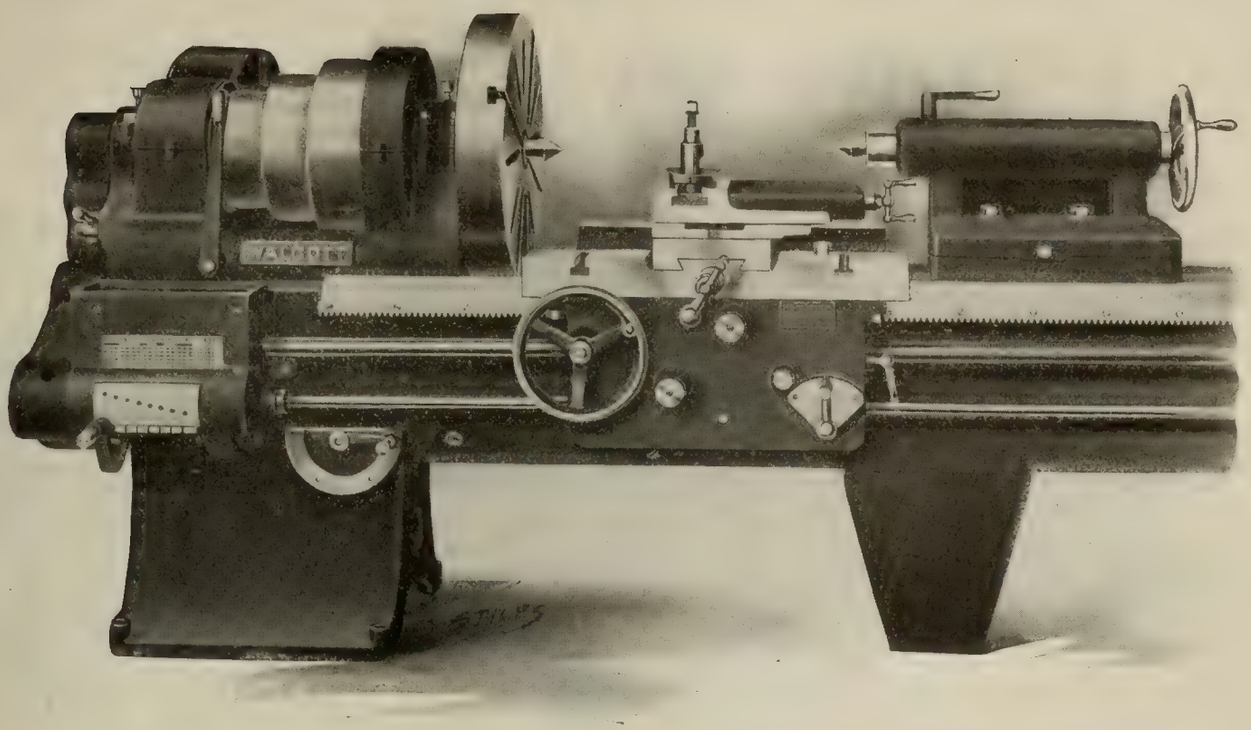
Turning Tool—V-Point Tool.

Ford-Smith.

Turning Tool—Round Nose Tool.

WHEEL TRUEING TOOL CO.

7 James Street, St. Catharines, Ont. 88 West Pitt, Windsor, Ont.



Answer the Challenge with the

"WALCOTT"

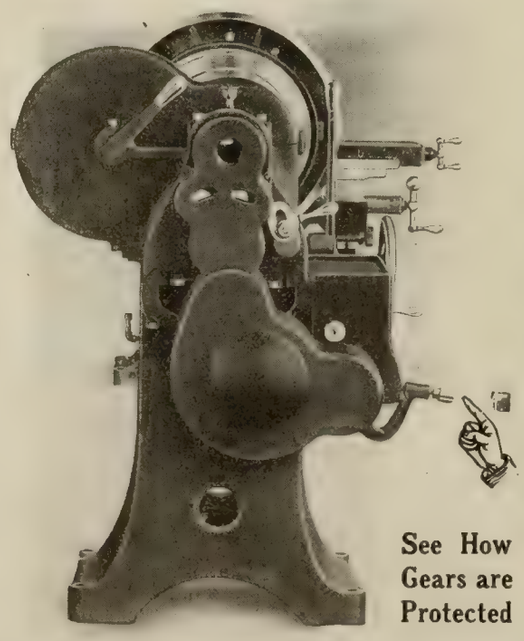
SPEED AND EFFICIENCY COUPLED WITH ECONOMY—
This is the challenge confronting Canada industrial plants to-day. **Walcott Lathes** have all the essentials necessary to meet this challenge successfully.

For thirty-five years *Walcott Lathes* have been producing satisfactory results. Much of this satisfaction is due to the design and construction of the *Walcott.*

The compound rest which has no overhand is as stiff as any plain rest. The Saddle Bearings are extra large. These and many more features make the *Walcott* an unusual Lathe.

We can make prompt deliveries. Sizes 14", 16", 18", 20", 26", 29".

Send for full details of the Walcott Lathes and the work our Special Department can do in designing extra equipment. Perhaps we can increase your production 25 per cent. or more. Investigate.



See How Gears are Protected

Walcott Lathe Company

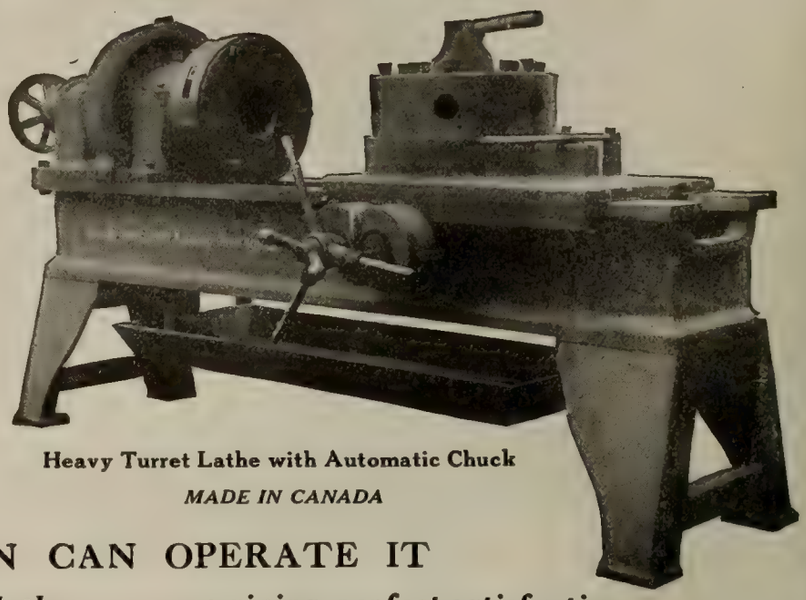
Calhoun Street, Jackson, Mich.

THE Corbet Improved Heavy Duty Turret Lathes for Shells

The Lathe that has proved its efficiency in producing 4.5" and 6" shells.

QUICK ACTION

When the Lathe is installed and receives the belt, you get immediate results. No delays waiting for or fitting chucks.



Heavy Turret Lathe with Automatic Chuck

MADE IN CANADA

ANY PERSON CAN OPERATE IT

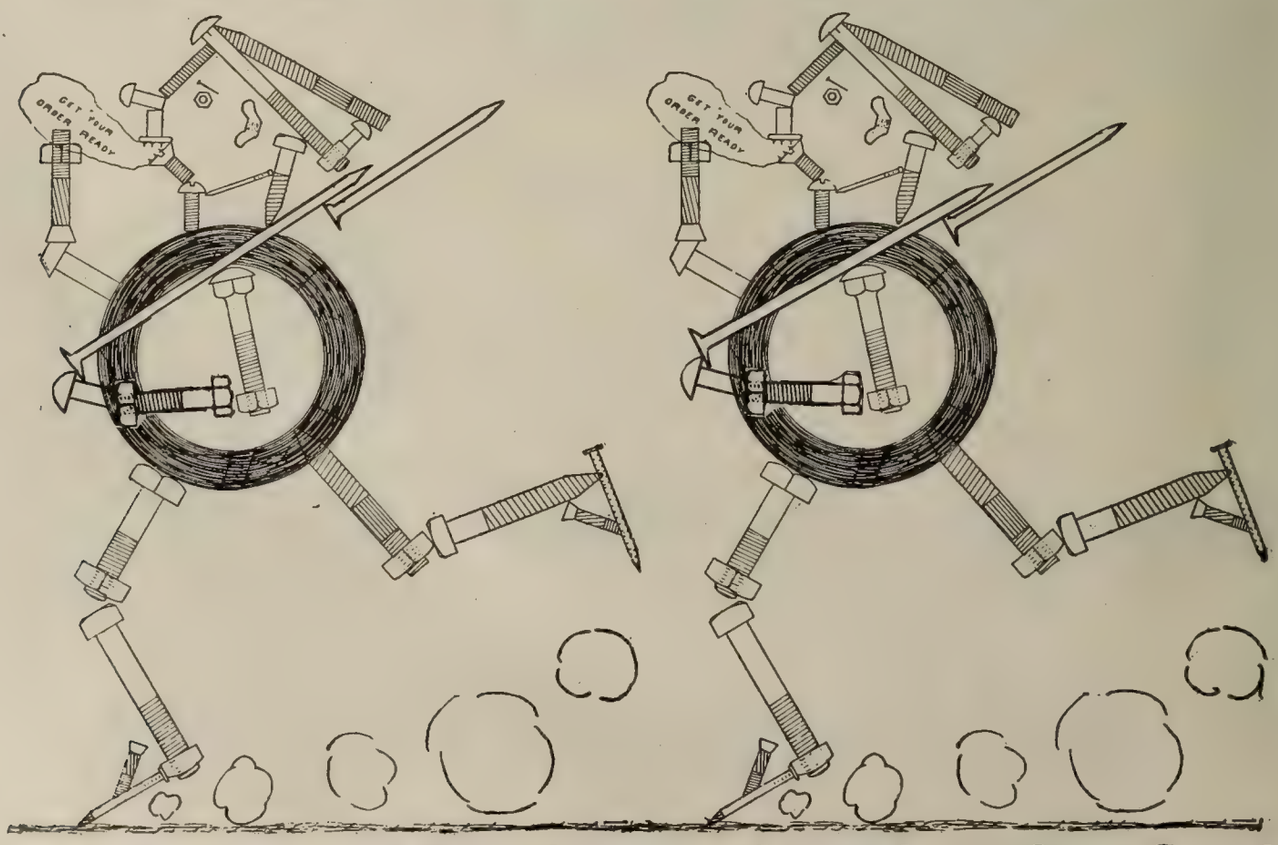
Nearly one hundred of these lathes are now giving perfect satisfaction in Munition Plants in Canada. Our guarantee is behind every lathe.

Write for full information

The Corbet Foundry and Machine Company Limited

Owen Sound, Canada

Made in Canada and, as Canadians, bound to get there, because they are made of the right kind of stuff



Northern Bolt, Screw and Wire Company, Limited, - Owen Sound, Ont.

THE BANFIELD PLUG MILLER

Patented in Canada and United States

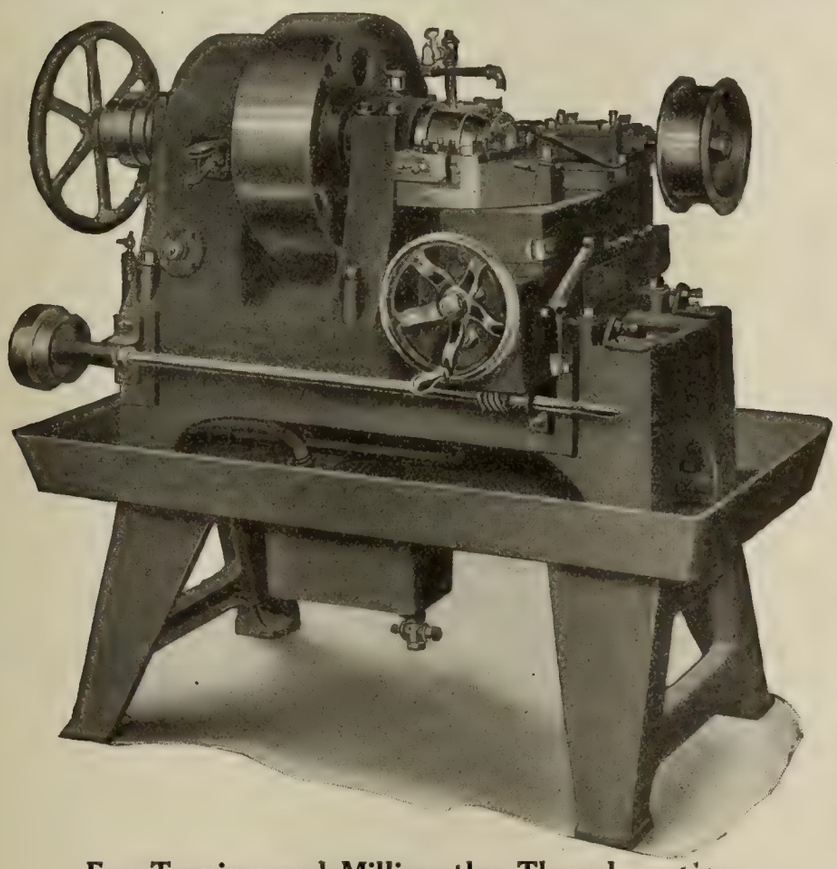
THE COMPLETE PLUG FINISHED IN SIX MINUTES BY UNSKILLED LABOR

A machine especially designed for finishing base plugs, turning the outside diameter, finishing the face with any camber desired and milling the thread—*all in one chucking.*

One man can operate two machines, considerably reducing your cost per plug.

The Banfield Plug Miller is equipped with quick draw in collet.

Drive pulley 18" x 6", with bronze bush having cut jaw clutch for turning and facing. Worm gear 100 to 1 ratio with jaw clutch for milling, driven by 10" x 1½" flanged pulley. The milling cutter is driven by an 8" x 2½" flanged pulley. Tool post carriage is equipped with power feed (two speeds), having automatic stop. Power feed pump with relief valve driven from worm shaft (all drives direct from main line shaft). Rigidly built; simple and economical to operate.



For Turning and Milling the Thread on Gas Check Plugs for 6-inch High Explosive Shells

Weight 1800 lbs.

For 18-pdr., 4.5 and 60-pdr. High Explosive Shells. Can furnish machines of same type, weighing 1250 lbs. Particulars on request. These machines are tooled up for finishing plain machined or bevel plugs if desired.

BASE PLUGS

Machined to Government Specification

Have in stock for immediate shipment machined base plugs for 4.5, 60-pdr., and 6" High Explosive Shells, either threaded or beveled.

Machine work subject to acceptance of Government inspector at your plant.

Capacity 4,000 *per day.* Write for prices.

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"KELOCK 788" HIGH SPEED STEEL

"Kelock 788" is the most serviceable high speed steel you can use for cutting tools. Used with marked success in munition plants of Canada. **Requires no special heat treatment**

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Oil-Hardening-Non-Skrinking

A steel especially adapted to the making of Dies, Punches, Guages and all tools where extreme accuracy is required after the hardening process.

CARBON TOOL STEEL

ALL TEMPERS

Drill Rods, Silver Steel Wire, Crucible Sheets, Nickel Steel, Chrome Nickel, Chrome Vanadium, Mining Steels (Hollow and Solid), Welding Steel, Auto Steel, Forgings.

Prompt shipment made from ample stock at Montreal

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Works: SHEFFIELD, ENG.
Established 1825

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High Power Vertical Miller

MODEL AB.

For high-speed work demanding great precision, this machine is earnestly recommended to you for the following reasons:

It has extraordinary rigidity.

It requires 1/3 to 1/2 less power than other millers of corresponding sizes.

It has the famed Becker patented roller feed and positively non-slipping belt drive.

It holds an unbeaten record for output speed.

This excellent machine is offered for

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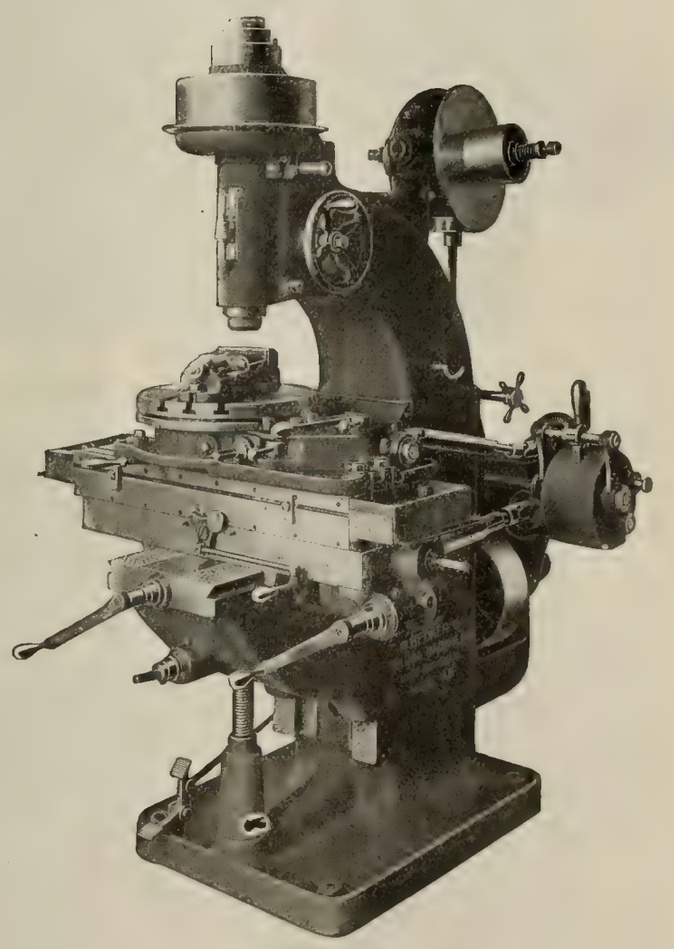

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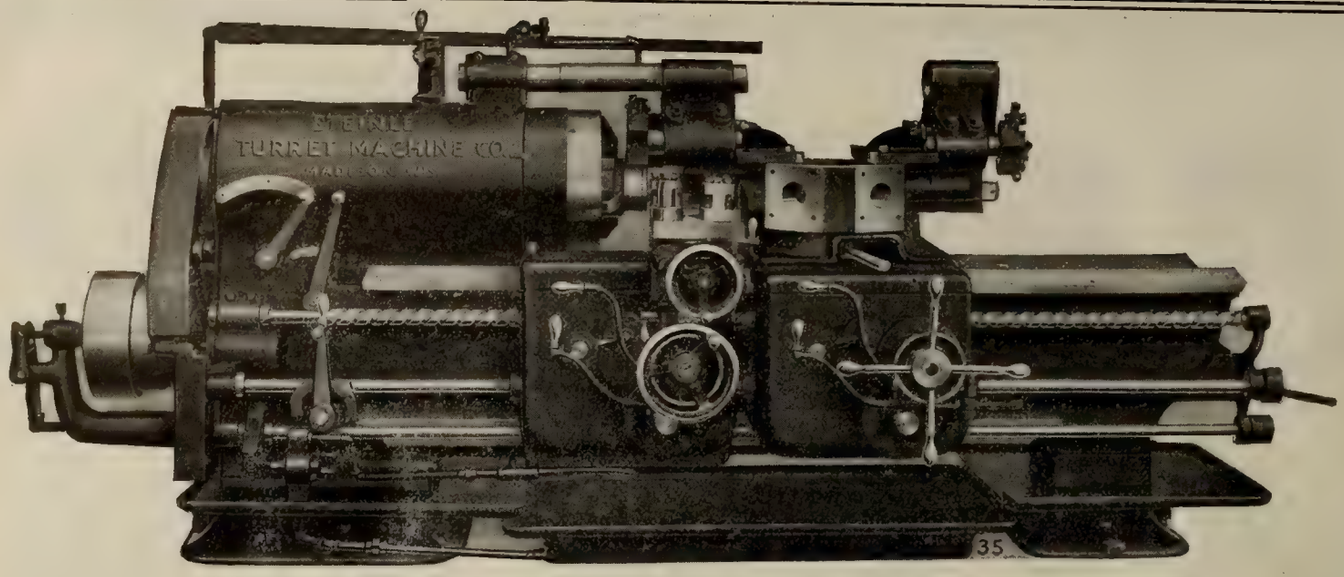
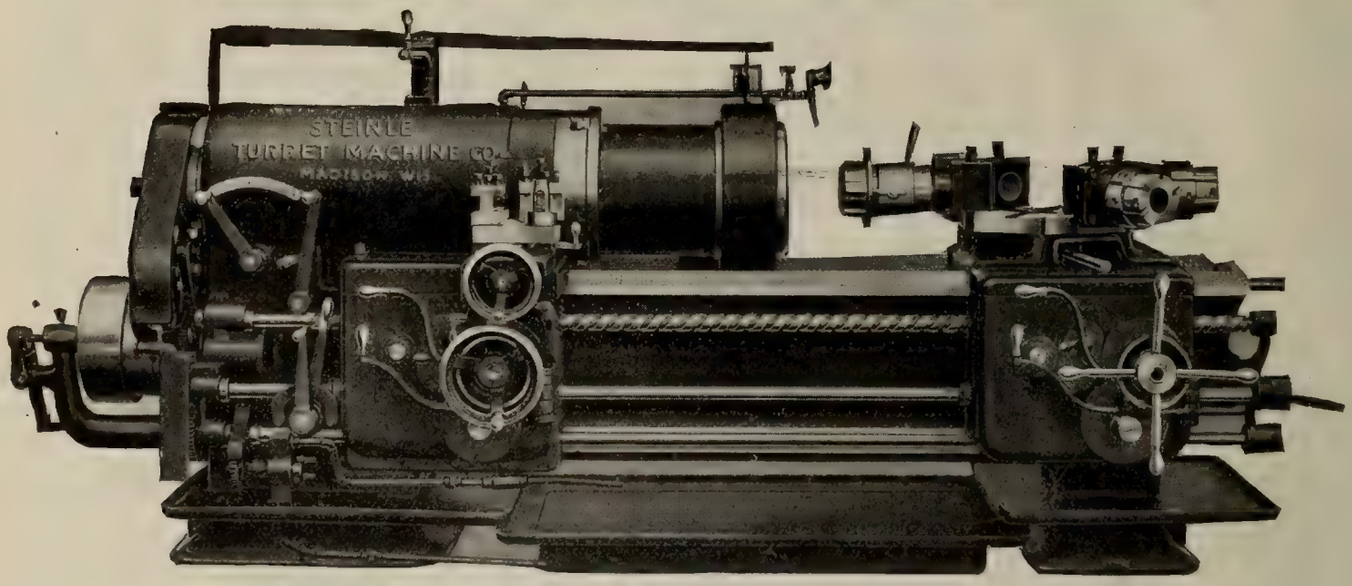
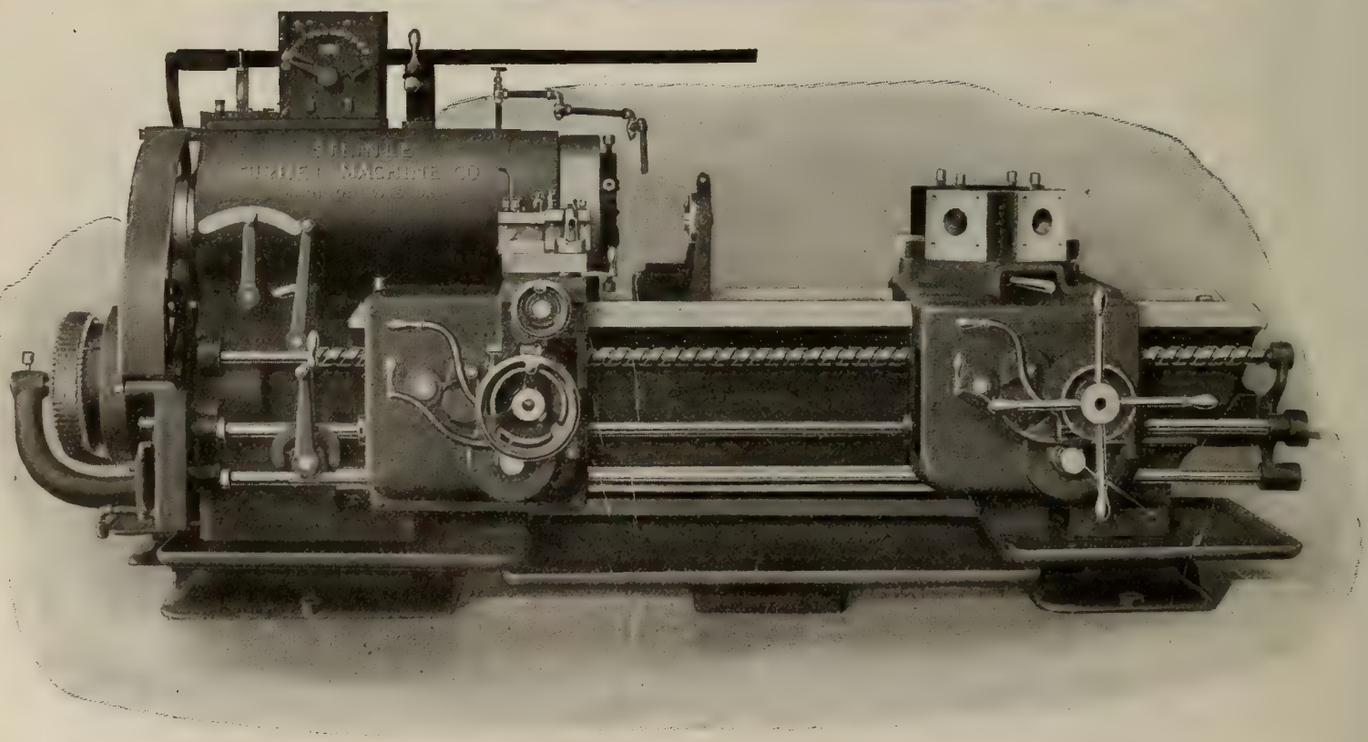
Becker Milling Machine Co., HYDE PARK, BOSTON, MASS., U.S.A.







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To Makers of Large Shells

WE can now make thirty-day delivery on Amalgamated Turning and Boring Machines, delivering ten machines per day. No skilled labor is required to operate these machines.

Amalgamated Turning and Boring Machines

hold all international records for this work. They will save you a high percentage of labor over the ordinary lathe. Catalogue gladly sent on request.

AMALGAMATED MACHINERY CORPORATION

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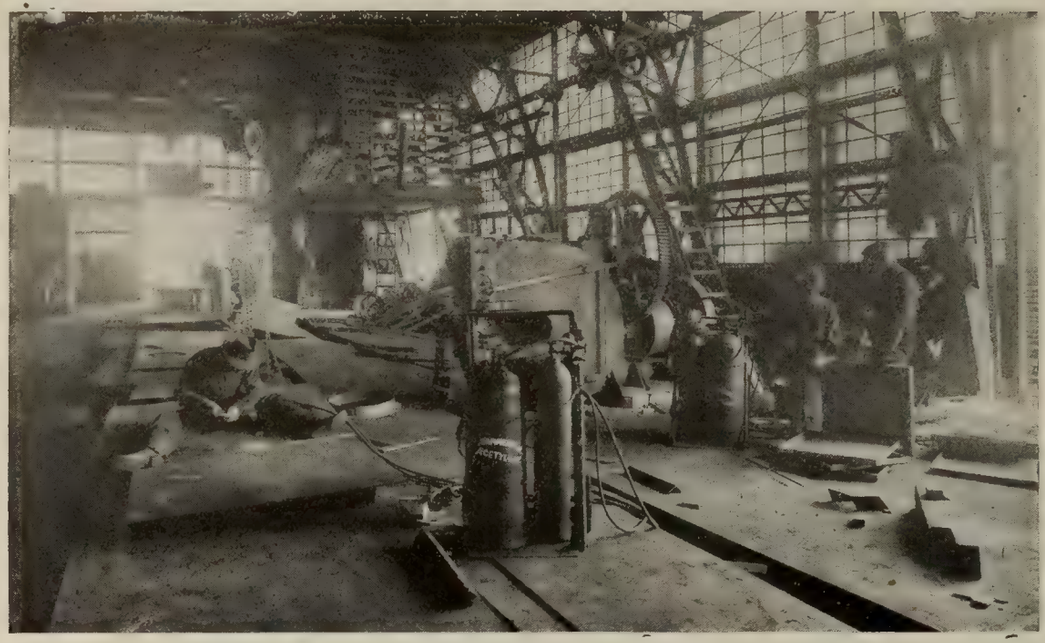

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Clean Shells, Castings and Forgings in the economical manner. Use

ANGULAR GRIT

The Scientific Metallic Blasting Abrasive

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does not break down and crumble into dust like sand. Cleans quicker than sand and also the globules, shot. One ton of ANGULAR GRIT will do as much work as one to four carloads of sand, doing it quicker and better and without dust.

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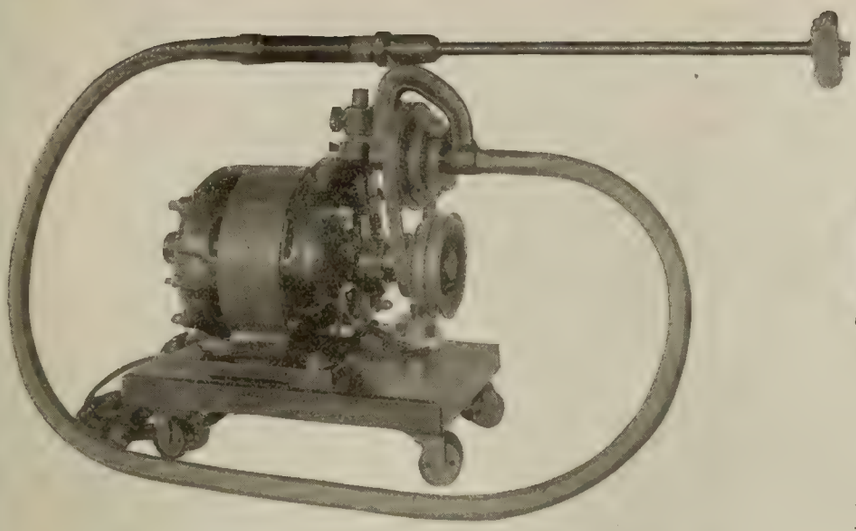

A Cost-Cutting Shell Worker

THE

Pringle

Flexib e Shaft Shell Cleaner and Γ tifier

Effectively cleans the interior wall or base of any size shell and retouches the rough spots; quickly goes through a pile of work.

For Light Retouching and Reclaiming Defective Shells.

The "Pringle" has a wide scope. For light grinding, polishing and drilling—as well as shell cleaning—it can't be beaten.

The "Pringle" is a favorite in Munition plants, and is used with unequalled success in ordinary manufacturing.

Freely flexible to a certain radius, where it automatically forms a stop, it positively prevents accidental short bends.

Three-speed countershaft and belts prevent overloading of the motor.

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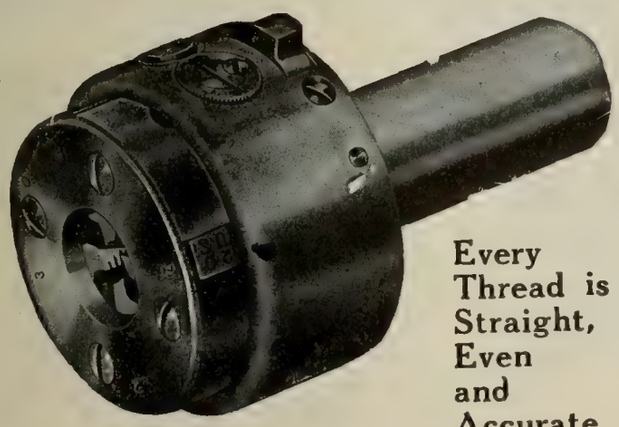


Every Thread is Straight, Even and Accurate

The Chasers in an *H & G Automatic, Self-Opening Die Head* are set and held in place by a steel cam. That cam once adjusted, locks; there is no stoppage or changing in size.

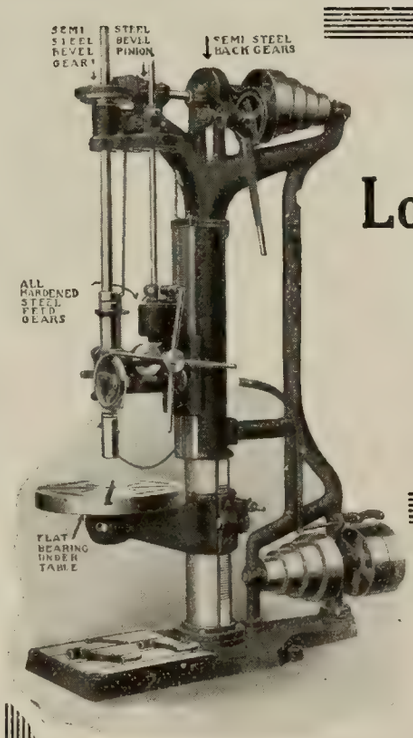
The quick release not only issues the cutting of the thread to a given point every time, but permits cutting right up to a shoulder when required.

Simple, Strong and Compact.

Our booklet tells more. ***Drop a card for it.***

Eastern Machine Screw Corp.

New Haven, Conn., U.S.A.



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Drilling Machine

Strength is the word that distinguishes this machine. Special care has been used in bringing this Drill up to its present point of efficiency. If you are in the market for drills which must have speed and accuracy, consult us. This is an ideal machine for HIGH EXPLOSIVE SHELLS. Inquire—we have the goods.

Stationary head sizes—20", 21".
Sliding head sizes—22", 24".

The Aurora Tool Works

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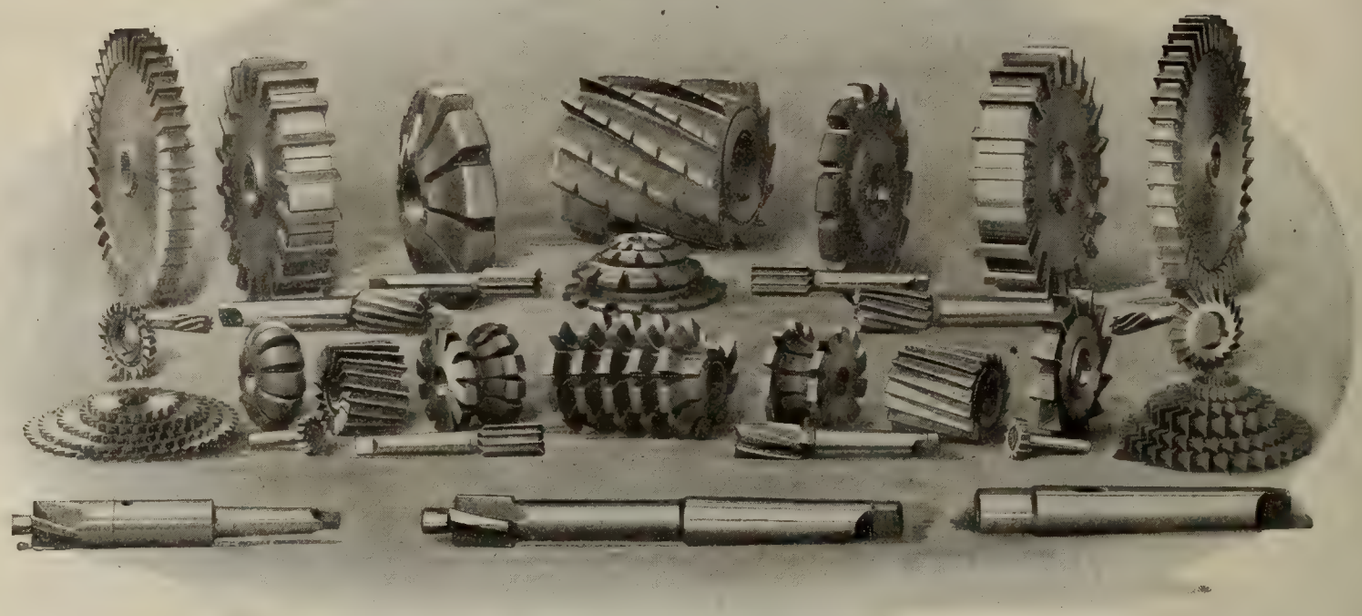

QUALITY MILLING CUTTERS AND SPECIAL TOOLS.
We are also equipped to furnish Thread Milling Cutters for Shell Work.

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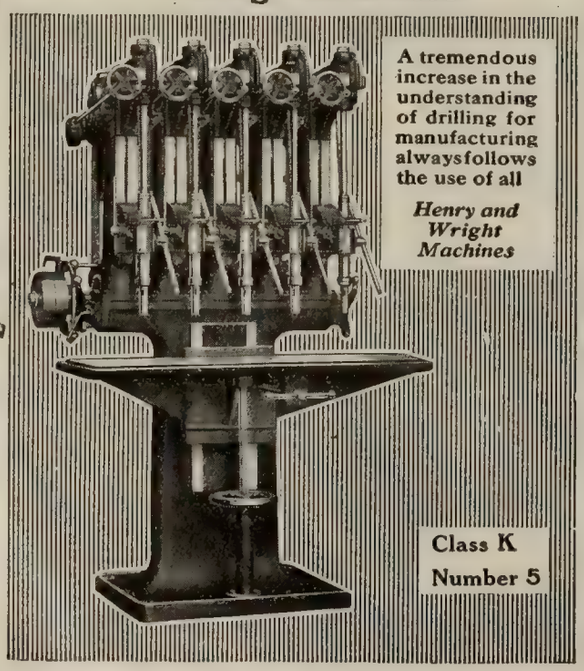
HENRY & WRIGHT
Drilling Machines



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Expert Engineers, Machinists and Boiler Makers

Gasoline Engines, Steam Engines and Boilers, new and second-hand. Castings in iron or brass. Forgings. Machine and Boiler repairs. Cold Rolled Shaftings.

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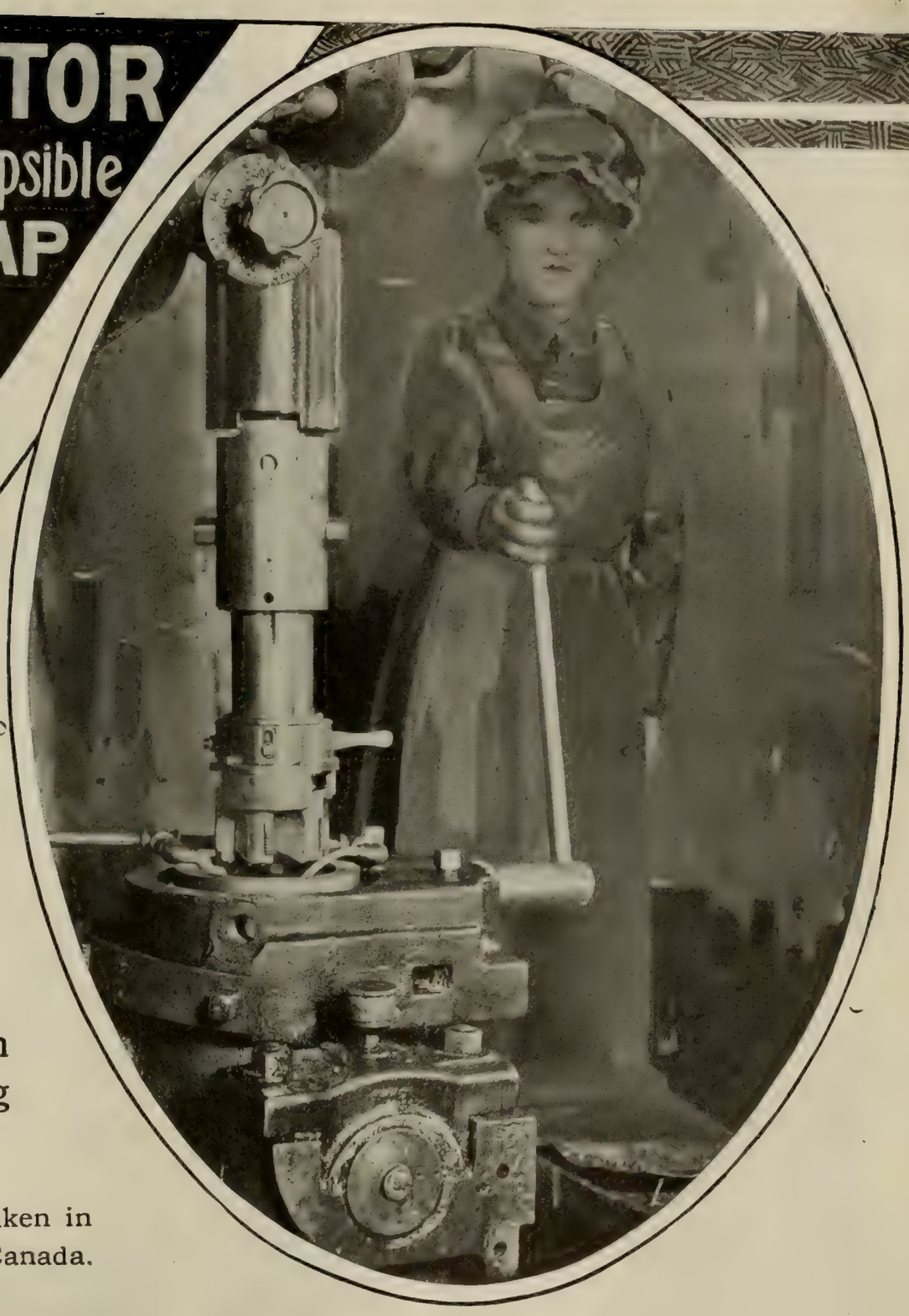

A Difficult Job made Easy

Tapping base of 8" shells on a drill press with Victor Collapsing Tap.

This photograph was taken in a large shell factory in Canada.

Adaptable for any size shell from 75 mm. up.

THESE TAPS are strong and durable and are made from the best materials obtainable. The bodies are machine steel, and the chasers best grade high-speed steel. Simple in construction, and taps are easy to set; screw adjustment from the front end maintains close accuracy; automatic trip reset by lever; adjustment at rear end regulates spring tension. Sizes 1 to 12 inches, any pitches. By adjustment they can be made to cut standard, large or small threads.

The very tool you need for that hard shell work. Used by many large shell manufacturers.

Send blue prints for estimate on Victor Equipment.

SERVICE IS OUR MOTTO

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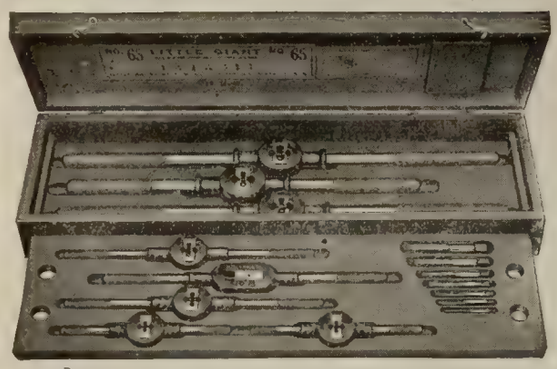
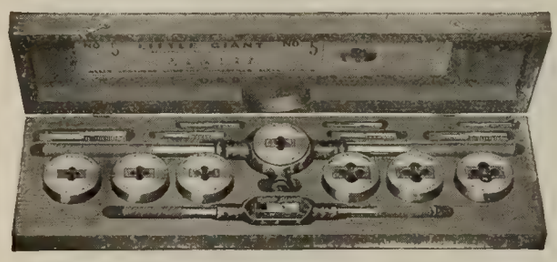
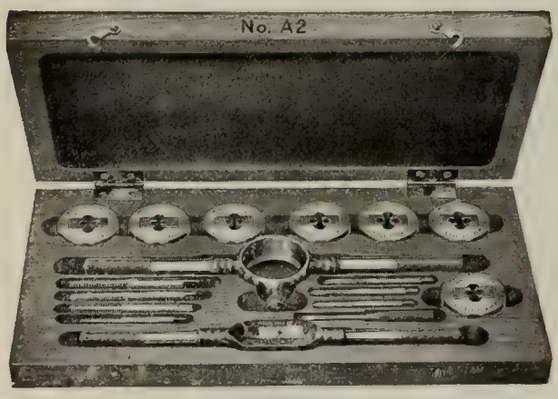


Full Mounted Assortments



Single Stocked Assortments

Combination Assortments
Both U.S.S. and S.A.E. Threads



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Set with Taper, Plug and Bottoming Taps

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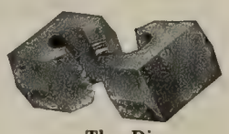
Screw Plates

There is a Little Giant Screw Plate for every possible need for mechanics, plumbers, blacksmith shops, garages, automobile owners, steamfitters, electrical conduit workers, ranches, mines, etc.

All Little Giant Screw Plates are furnished with Little Giant Dies. These have recently been improved by the application of a new idea.

Both sides of the die are bevelled so that the die may be reversed and the screw cut from either the face side or through the guide. Little Giant Dies are adjustable by means of set screws at the end of each half, and once adjusted and the guide screwed on, they are held in the collet as tightly as a solid piece.



The Die

The Guide

Die and Collet

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Wells Brothers Co. of Canada, Limited

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THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED

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There's a Winfield Welder For Your Shop

THERE is, and probably it is not a special machine either. In addition to being made in a wide range of sizes and designs, Winfield's Welders are most unique in their adaptability to different classes of work.

We have striven to make the "Winfield Way" an economical way. The salient features of the Winfield have been standardized to such an extent that it is possible in most cases to instal a stock welder that can be kept busy *every minute of the day.*

We have a welder for every conceivable sort of metal spot or butt welding. For this reason Winfield Welders are making good in the small shops, where the work is varied, as well as in large shops where there is more duplication.

Winfield Welders represent efficient spot-welding reduced to its simplest terms. Their operation and adjustment are simple—unskilled operators require little time to become expert. They consume very little power. The patented water-cooled electrode points last eight to ten times longer than non-cooled points and give neater welds during their life.

Have our advisory department send samples of welding as applied to your requirements, with data, re costs and time. Or—ask for "Electric Welding by the Winfield Way," an interesting booklet.

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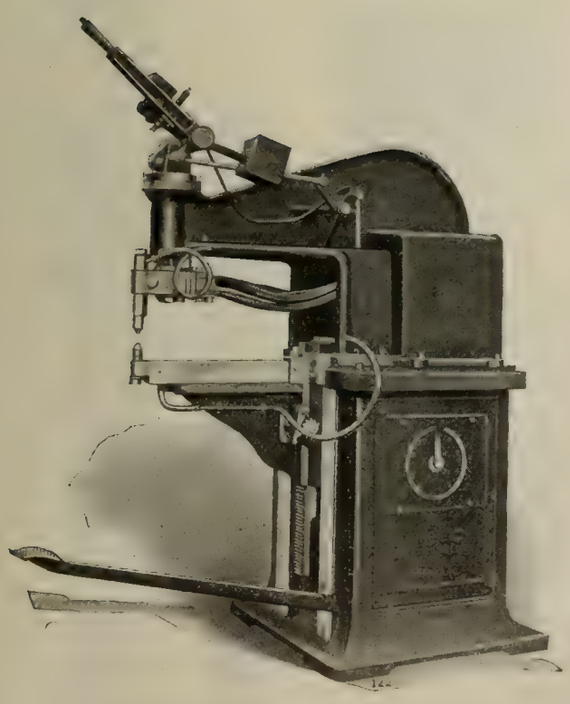
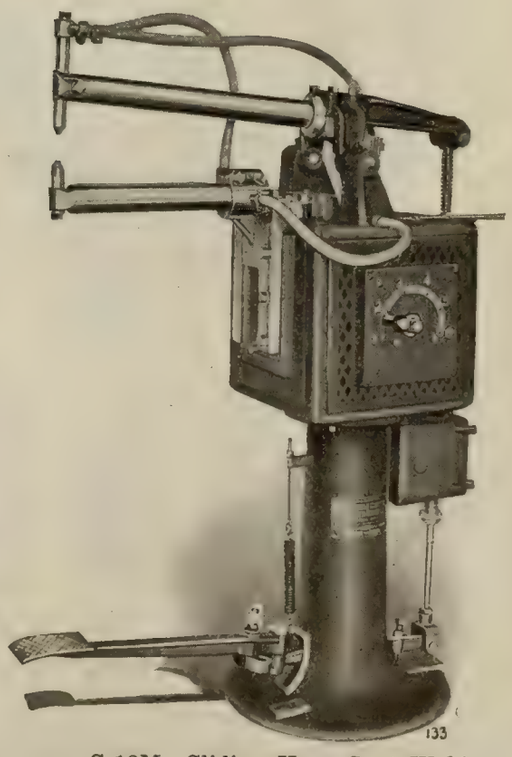
Canadian Office: 317 St. James Street, Montreal, Que.



S-24H. Sliding Horn Spot Welder. Horn at Top of Slide

B-110. No. 42. Butt Welder.



S-12M. Sliding Horn Spot Welder.

It turns poor heating systems into the most efficient. It costs you nothing because it saves more than its cost in fuel.

Morehead
Back to Boiler
SYSTEM

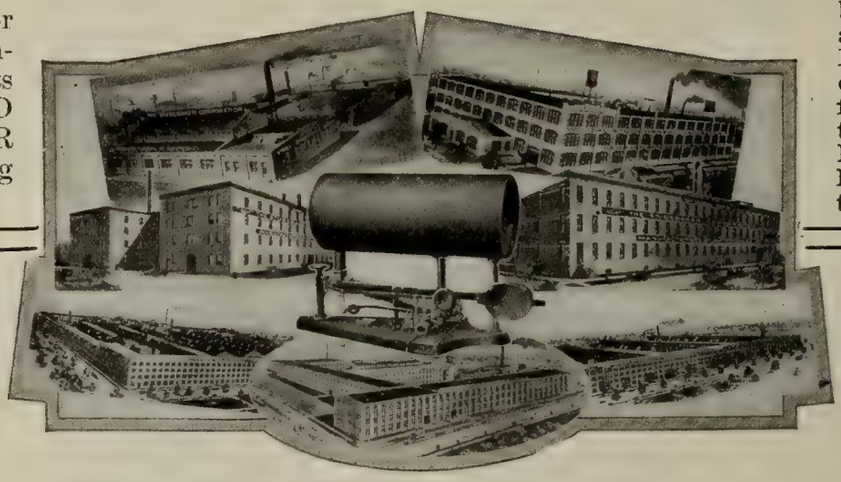
Hundreds of steam users have profited by reading the Morehead Book and taking advantage of our Free Consultation Service. It will pay you to investigate.

IN THE STUDEBAKER PLANTS

December 13, 1909, in their plant at Port Huron, Michigan, the Studebaker Corporation installed their first MOREHEAD BACK TO BOILER SYSTEM.
To-day, throughout their seven big plants a total of 15 **Morehead Traps** drain the exhaust steam heating systems, live steam heating systems, high pressure steam mains, heaters for forced heat circulation systems, dry boilers and enamelling ovens. Their last order, representing the **ninth repeat order,** was placed with us on April 25, 1912, for Plant No. 3 at Detroit.

Solely because widely known is the Studebaker Corporation singled out for mention. In hundreds of other plants the MOREHEAD BACK TO BOILER SYSTEM is giving equal satisfaction.

Canadian Morehead Manufacturing Co.
WOODSTOCK CANADA



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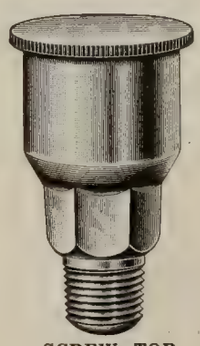
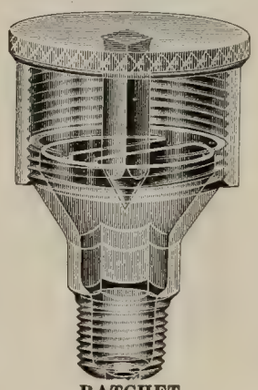
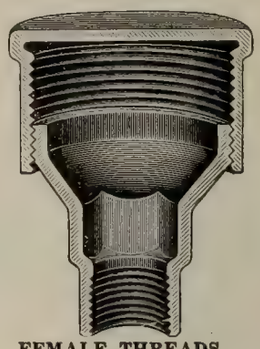


SCREW TOP OIL CUP

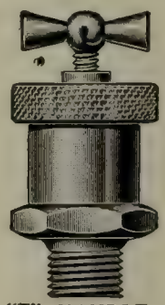


RATCHET

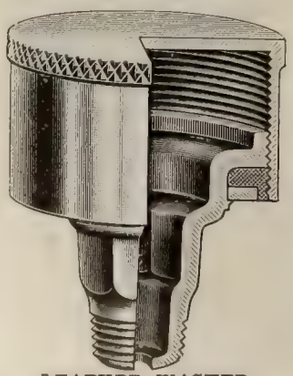
PLAIN



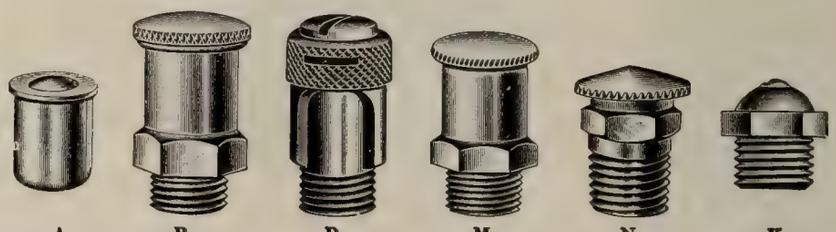
FEMALE THREADS



"T" HANDLE



LEATHER WASHER



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results from using this best of all Chrome Vanadium Steel.

It never Sticks to the work.

Use "Hawk" D Chrome Vanadium Steel. Use no other for shell forging. *Write*

Steel of Every Description

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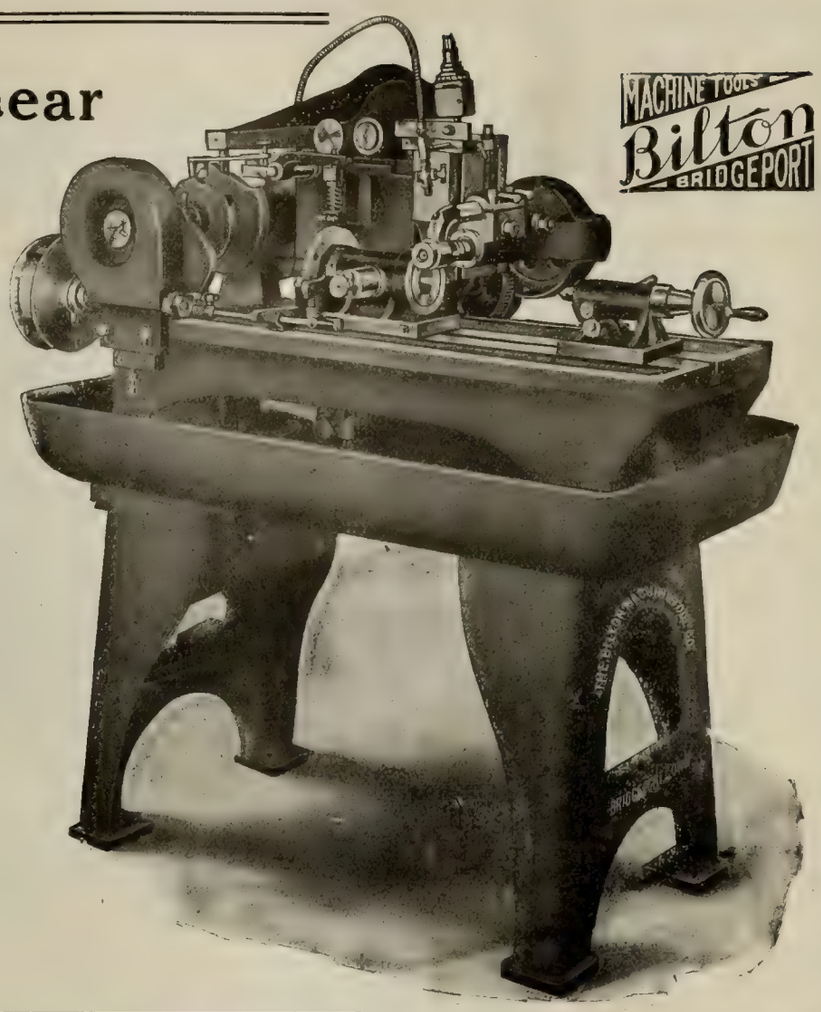
Bilton Automatic Gear Millers—Spur or Bevel Gears



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Iron Cements

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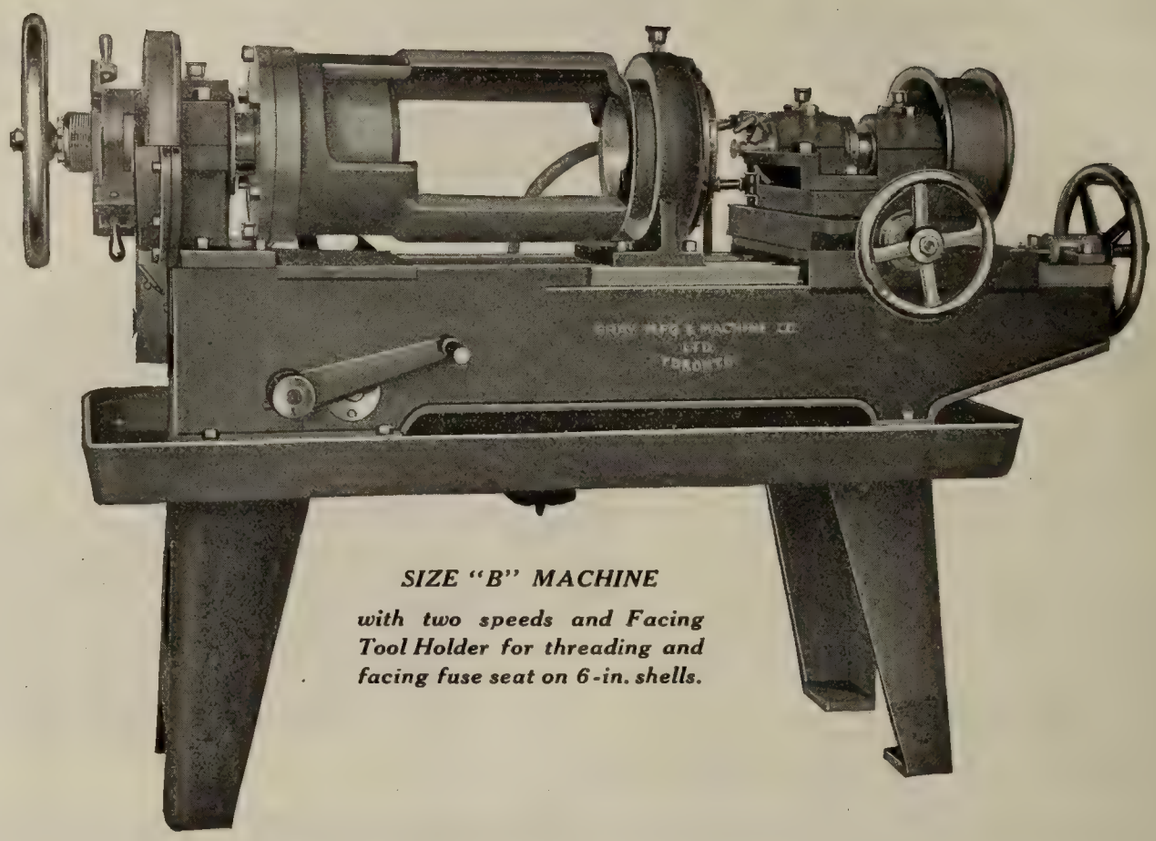
Send for New No.16 Illustrated Instruction Book

THREAD MILLERS



SIZE "B" MACHINE
with two speeds and Facing Tool Holder for threading and facing fuse seat on 6-in. shells.

Gray's Guarantee

that their THREAD MILLERS will MILL THREADS to SIZE, and TRUE UP FUSE SEAT, thus eliminating hand tapping and hand seating, and also guarantee a stated production.

Size "A" Machine handles Shells from 3-in. to 5-in.
Size "C" Machine handles 8-in. and 9.2 in. Shells and Adapters.

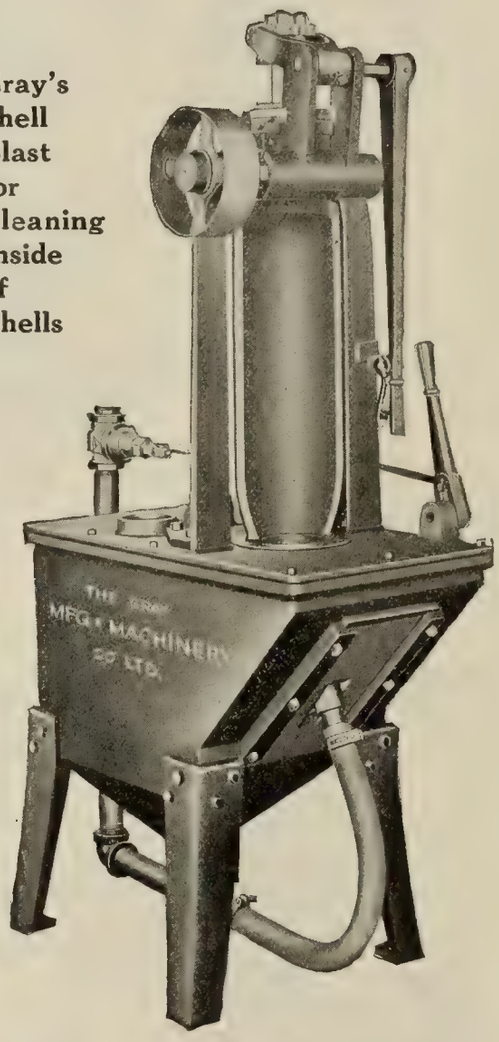
Thread Millers for Fuses and any line of manufacturing work.

PROMPT DELIVERIES

THE GRAY MFG. & MACHINE CO., LIMITED
686-692 St. Clarens Avenue TORONTO, CANADA

A Highly Developed Machine forShell Work

These machines have been developed for and are extensively used by munitions manufacturers. Both have demonstrated their efficiency and economy.



Gray's Shell Blast for Cleaning Inside of Shells

Gray's Shell Blast

quickly and thoroughly removes all scale or signs of boring tool marks from the inside of nosed-in shells. Operation is as simple as it is fast—two levers control the mechanism—shot is automatically drawn into the air line from the hopper—shell is rotated slowly a few times and the job is done.

Machine takes 4.5, 5- and 6-inch shells and can be arranged to handle other sizes. We'll be glad to quote production figures, prices, etc.

Heavy Duty Boring Mill

Horizontal Type—6-in. Bar

To fill the insistent demand we are commencing the manufacture of a heavy duty Horizontal Boring Mill. This machine is specially designed for heavy manufacturing work, such as gun mounts, etc.

Send for specifications and quotation

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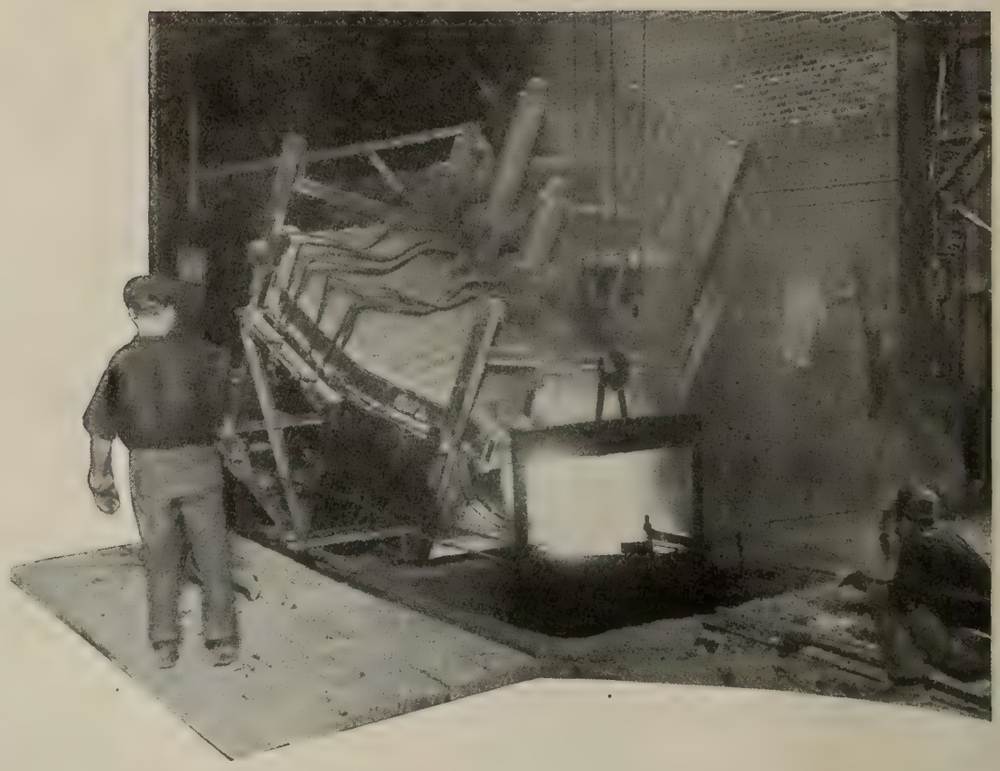

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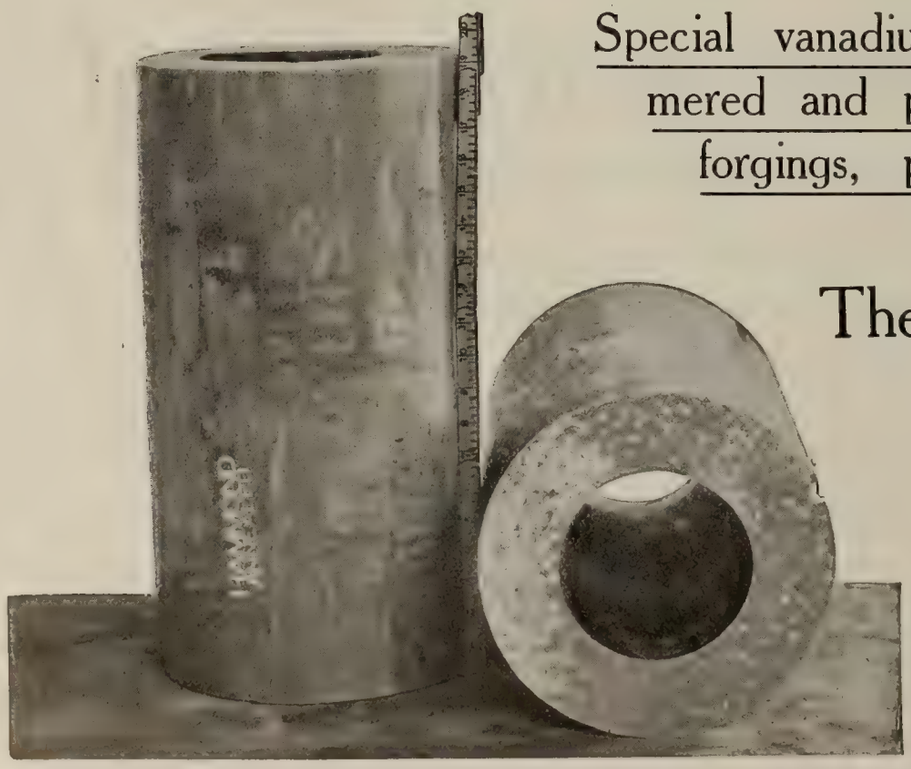

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WHERE work calls for exceptional accuracy, where production must be high class, where time is at a premium —the AVEY is the type of Drilling Machine needed.

Higher speeds, simplicity of design and convenience are attributes of the AVEY that make it a better-than-ordinary tool. Great range in sizes and great variety of styles is another AVEY feature worthy of notice.

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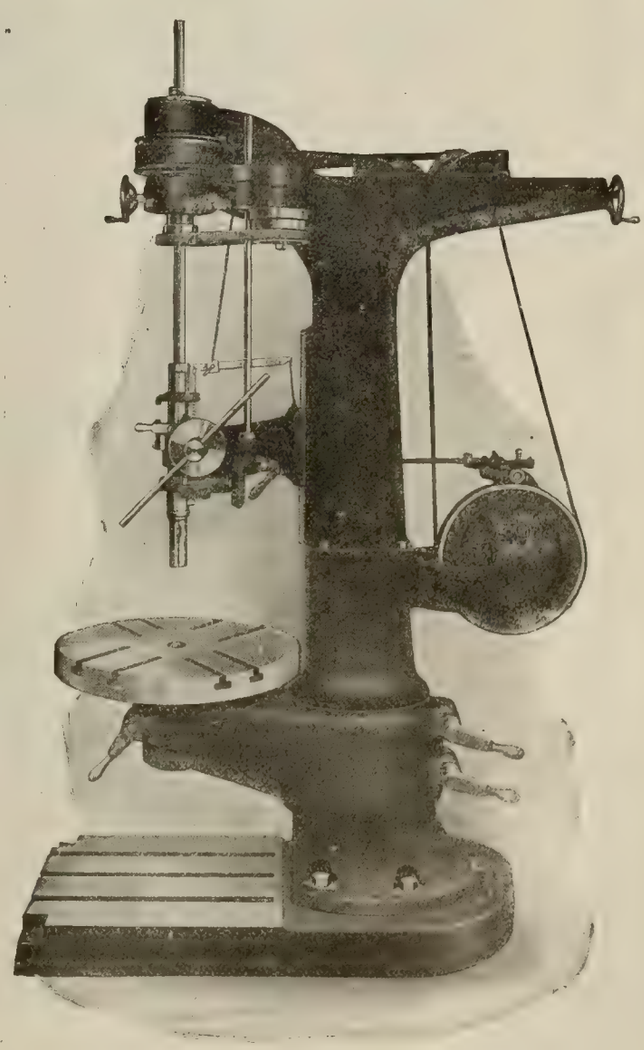

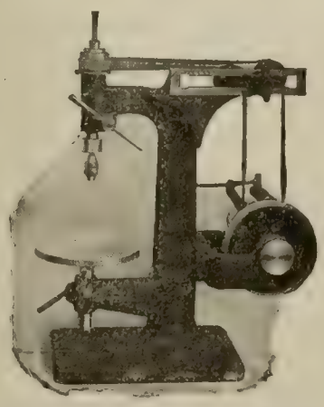

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Jacobs Chucks answer one need of the day. They not only protect your drills from breakage through bad aligning and sudden strains, but keep your drill shanks in good condition. Where you find drills well taken care of by the chuck used, you also find the **greatest record of ouput**, and invariably you find Jacobs Chucks.

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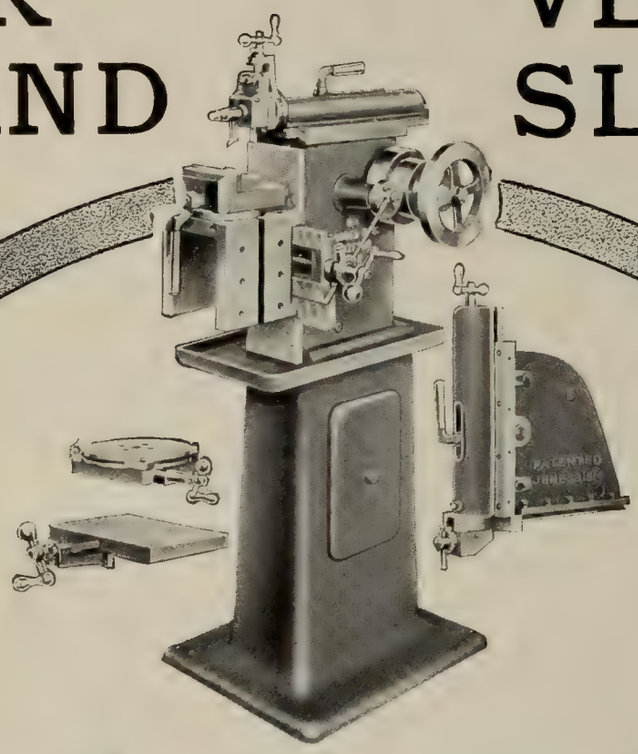
SHAPER AND VERTICAL SLOTTER



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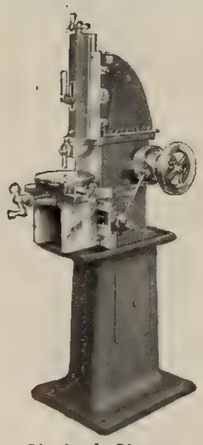
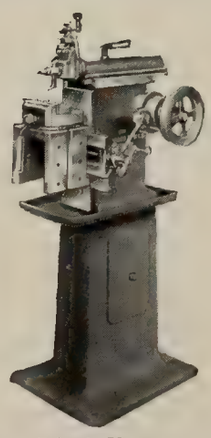
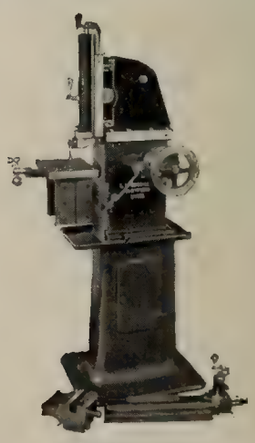


3½-inch Slotter



7-inch Shaper



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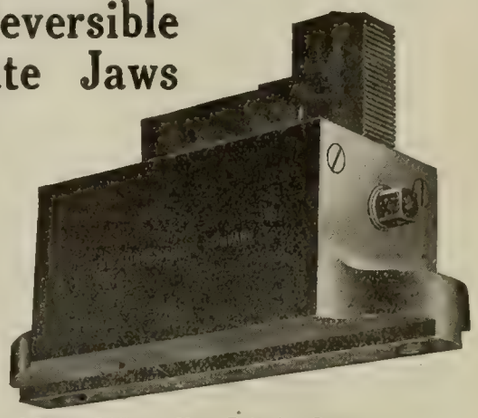

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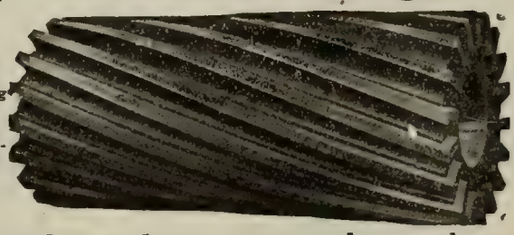

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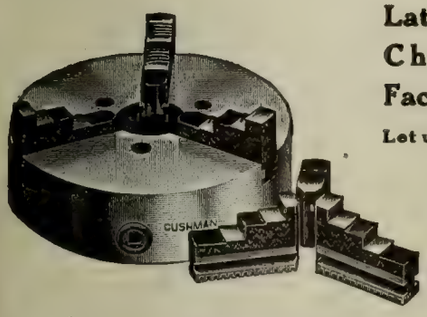

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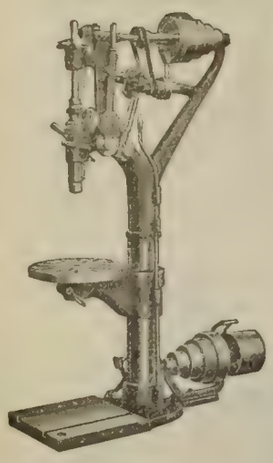

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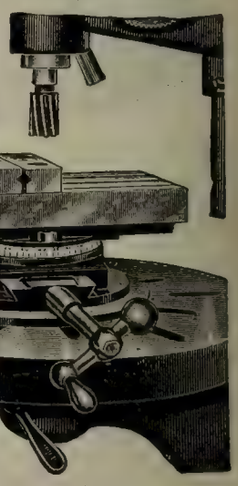

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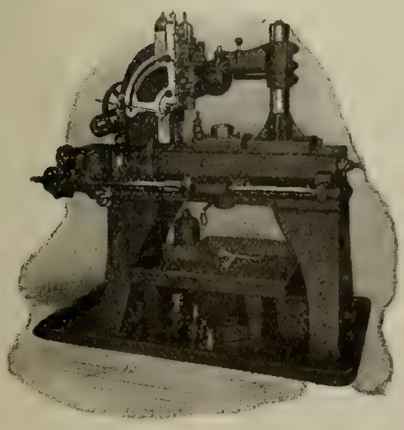

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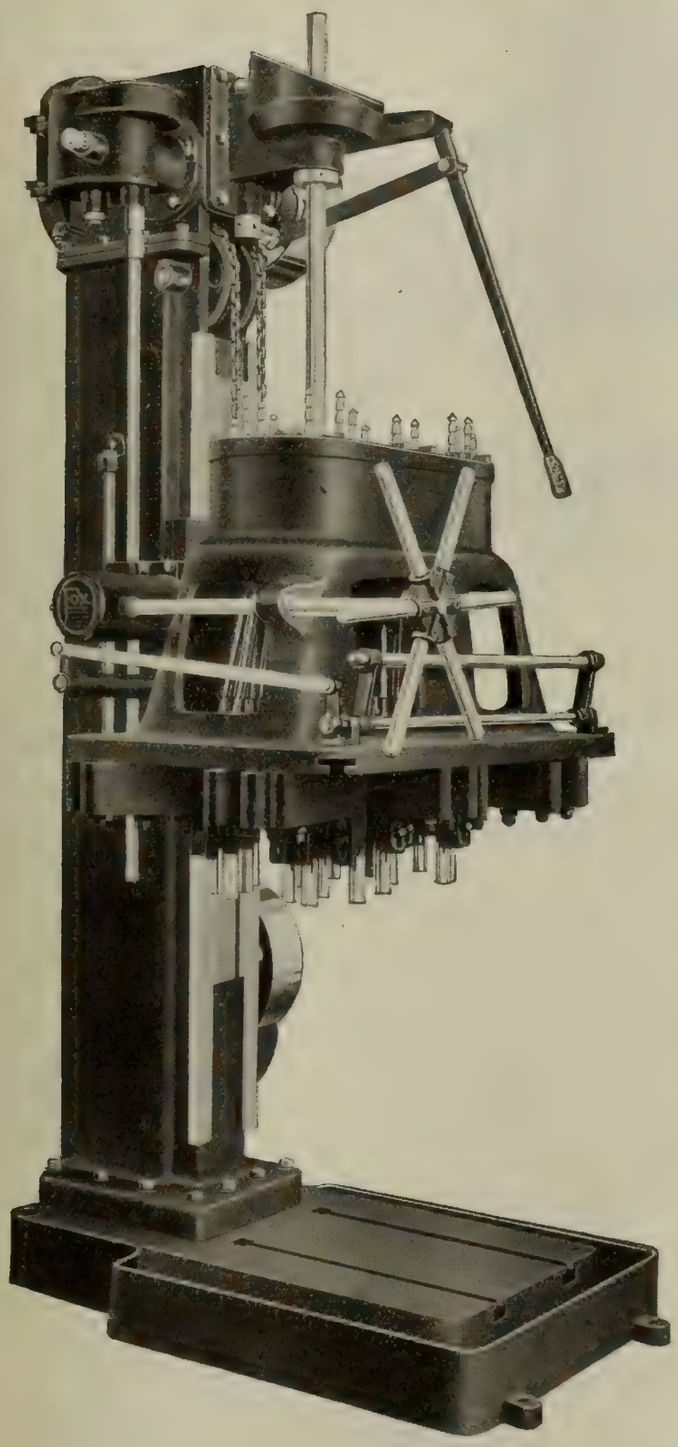
Independent FOX Drill Speeds

TRADE MARK



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The increase of both material and labor has demanded the construction of machines with the minimum of parts essential to intensive production required to-day. This **New Type** Multiple Spindle Drilling Machine embodies features which highly recommend it to all classes of drilling operations.

Strength

Production work to-day places severe strains on Drilling Machines. Each part in this FOX MULTIPLE has been given the greatest strength which design and material can impart, the result being a machine which will stand up on the most severe work.

Independent Drill Speeds

Many classes of work have large and small size holes which should be drilled simultaneously, each drill can be driven at approximately the correct peripheral speed. Fox Independent Drill Speeds are obtained by using gears having the same strength as those used when one speed only is provided for each spindle. Each spindle can be placed in a neutral position when not needed in drilling.

Spindle Construction

The Fox three-piece universal joints have all friction surfaces hardened, and eliminate all screws, pins and rivets.

We have adopted a design of spindle in which each part is constructed to give the maximum durability and strength.

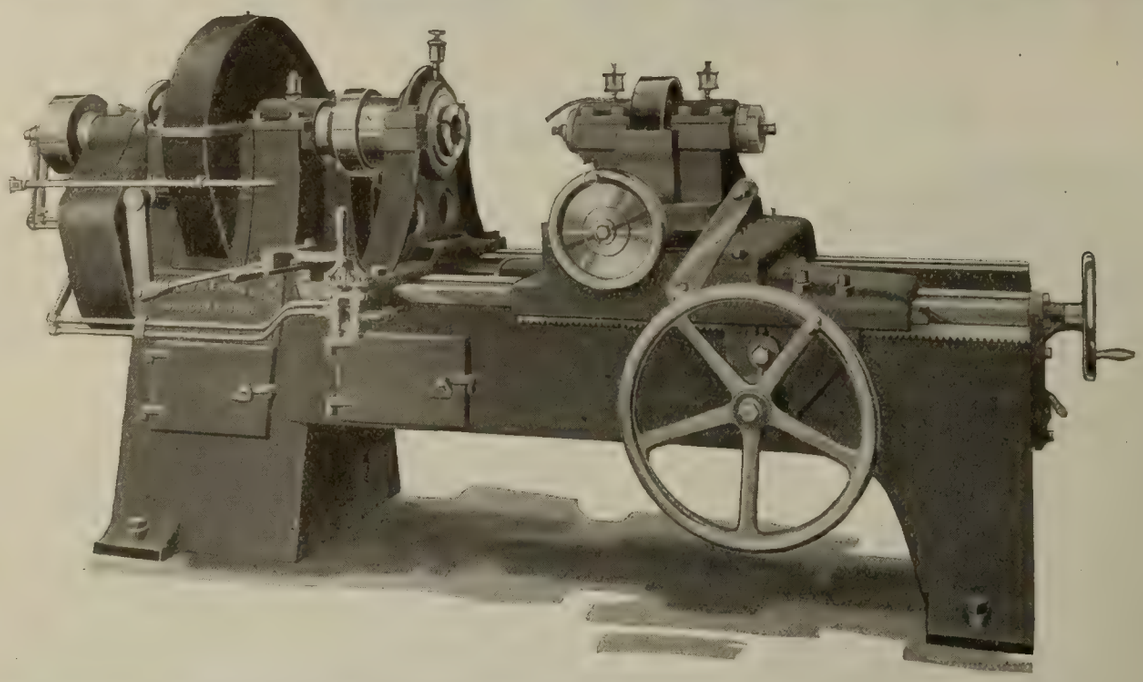
We have the machines specially adapted to meet your needs. Write to-day giving full particulars of your work.

The Fox Machine Company

1047 W. Ganson St. - - Jackson, Michigan

Formerly of Grand Rapids

SMALLEY-GENERAL THREAD MILLERS



This "A" size machine working on 3" shells with thread 2¼" diameter 12 pitch does the threading and TURNING PLUG SEAT in 1½ minutes from floor to floor.

We make all sizes of Thread Millers suitable for general work and for threading shells from 3" to 16" in diameter.

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Wind-up Measures, Steel, Linen and Metallic. With Improved Patent Flush Handle.

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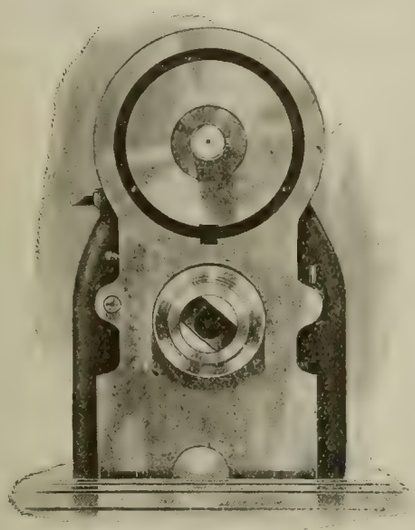
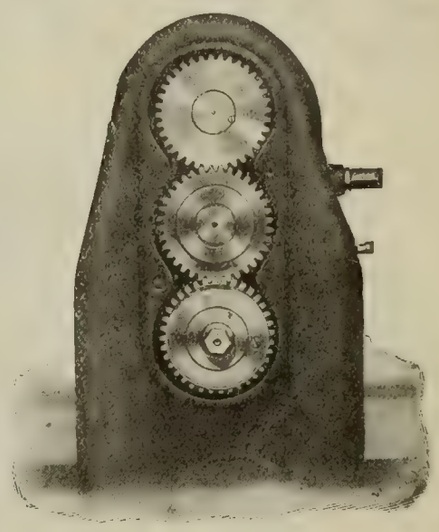
MASTER OF ALL MILLING THE ROCKFORD



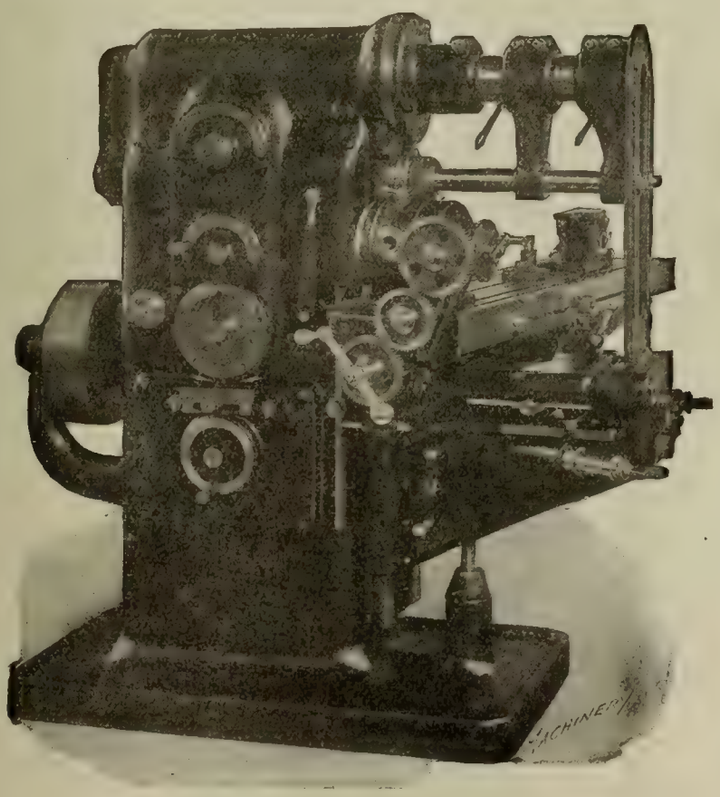
Our patented support bolts on to this flange on column, affording great stiffness and rigidity; minimizing vibration and materially increasing cutting capacity.

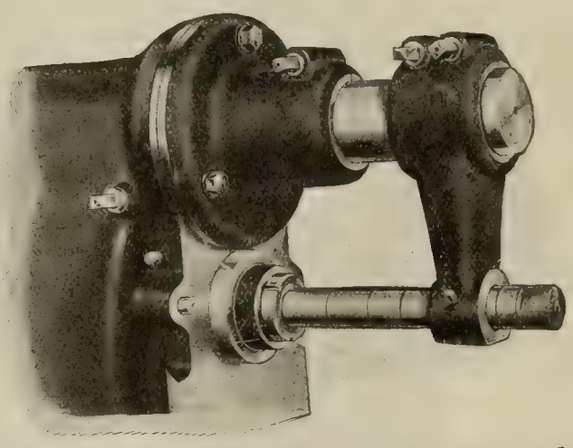
Big Cuts at unusual speed and enduring accuracy are given you in this Rockford Universal Milling Machine. Note that illustrations attempt to show its extreme rigidity.

But it is its great surplus power over the mightiest demands that makes it master of every milling job and master, too, of 99 out of every 100 other millers in the matter of production ability.



Note the heavy column with gear train operating from rear end of spindle to drive attachments, leaving spindle nose free for use as desired. A convenient arrangement.





Arrangement of back gears inside the column, at the front, brings them so closely together that chatter is prevented and more than enough power is generated to take the heaviest strains without taxing the great srength of this Rockford Milling Machine.

Other details you could know with profit.

WRITE TO-DAY.

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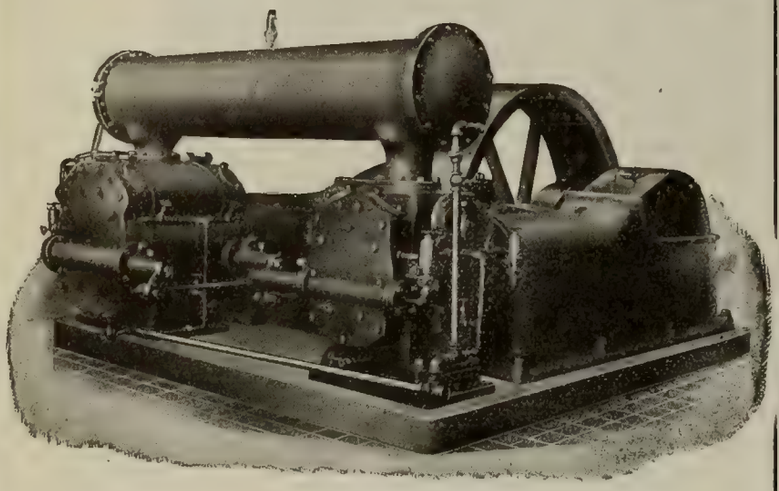
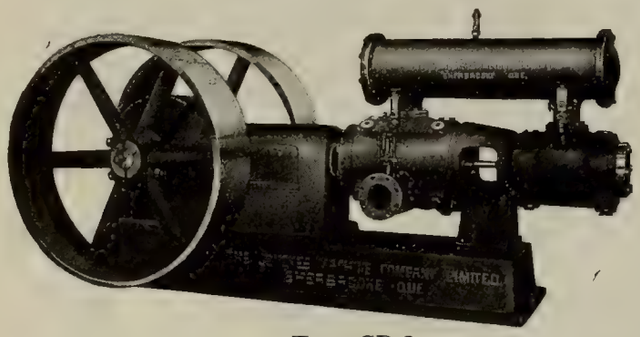


Type DB-2



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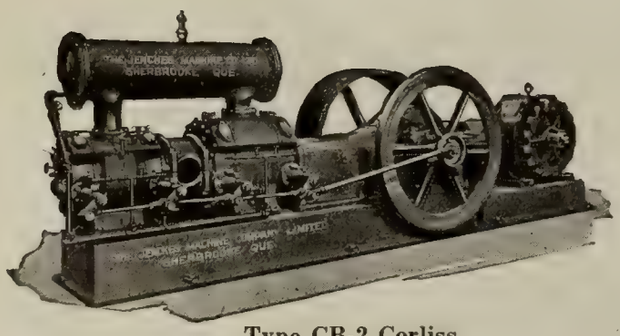

Type CB-2 Corliss

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The illustrations shown here will convey a comprehensive idea of the sizes, adaptability and range of the Jenckes Compressors. The care and mathematical exactness that characterize all our work is embodied into the construction of our compressors.

They are used

throughout North America, giving that sure, efficient service that can only be given by quality machines. Exactness of detail and finish are two features that are worthy of careful scrutiny.

Inquire of us

for full particulars, prices and shipments. We are always ready to give you the best of service, attention and information.

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From the Name

ROCKFORD

to the Drilled Hole—

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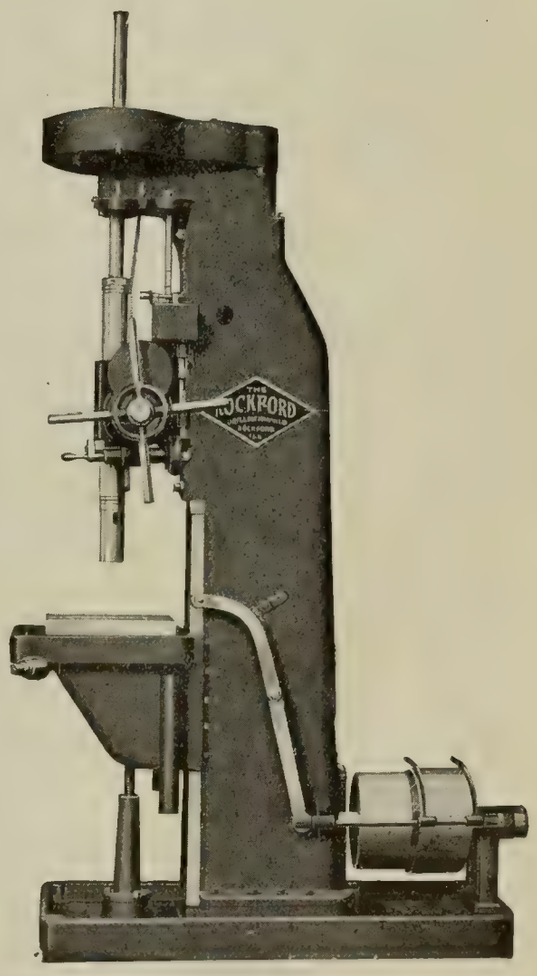
No stock is tough enough to slow its speed or swerve the cutting drill from true alignment.

It will bore up to 6 inches in both cast iron and steel.

Equipped with phosphor bronze bushings; automatic trip; three simple combination drives; and high carbon forged steel spindle. Nose is bored for No. 5 Morse taper slotted across the head for driving heavy boring and facing heads.



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Rockford Drilling Machine Co.
ROCKFORD, ILL., U.S.A.

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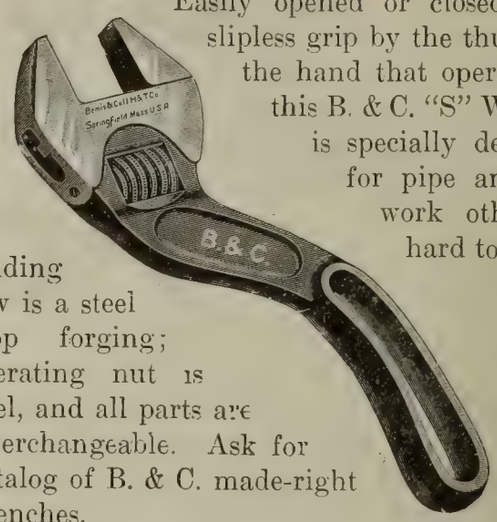
FOR PIPE OR NUT HARD TO REACH WITHOUT IT



Easily opened or closed to a slipless grip by the thumb of the hand that operates it, this B. & C. "S" Wrench is specially designed for pipe and nut work otherwise hard to reach.

Sliding jaw is a steel drop forging; operating nut is steel, and all parts are interchangeable. Ask for Catalog of B. & C. made-right wrenches.

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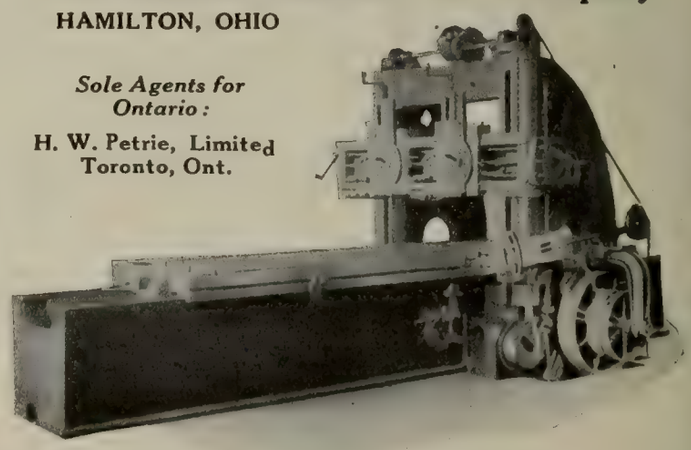

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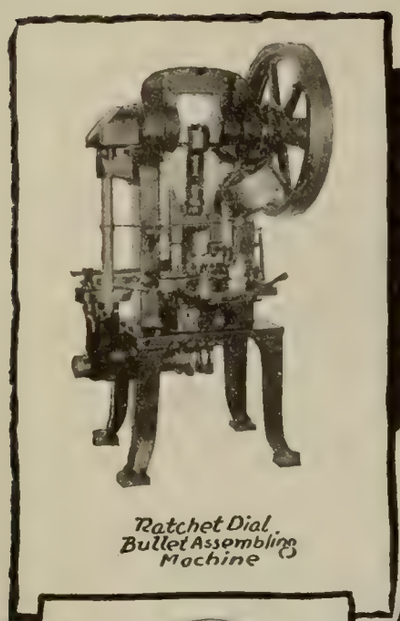
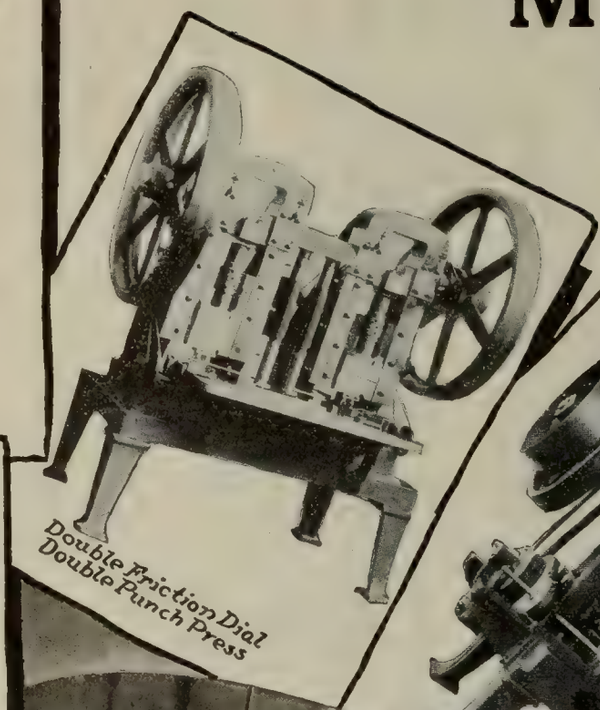
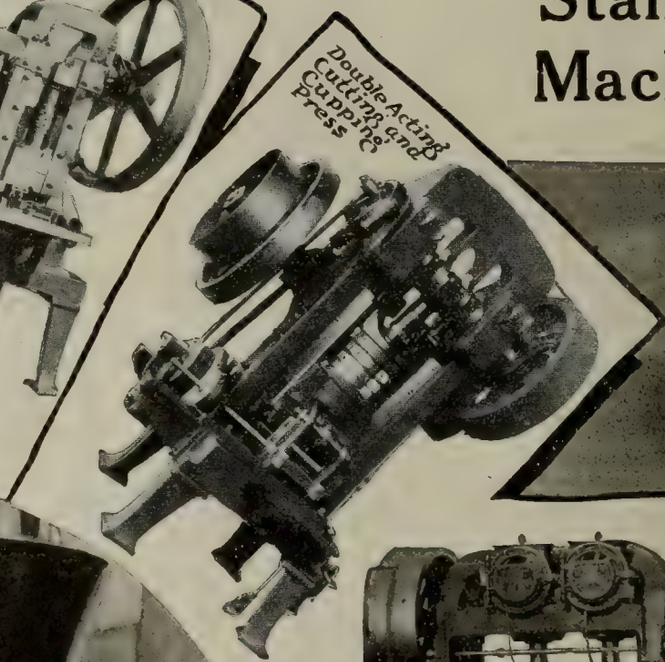
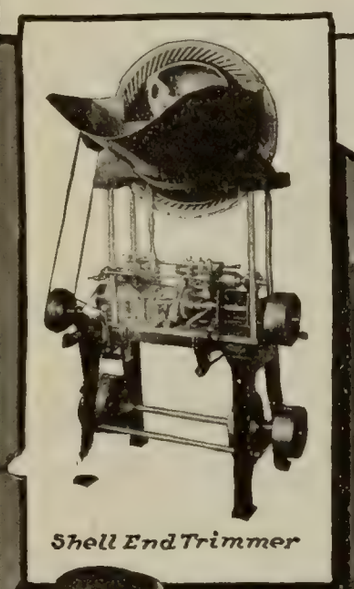
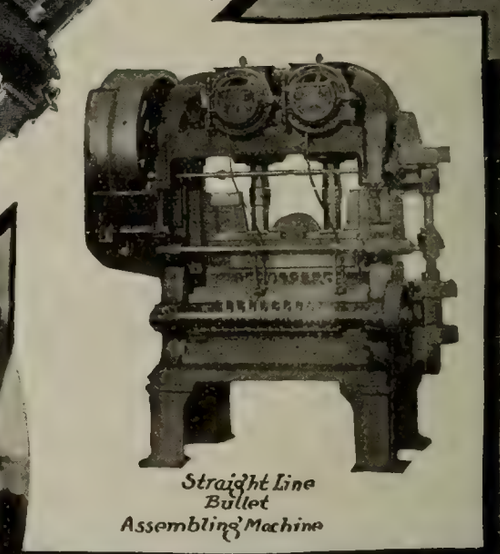
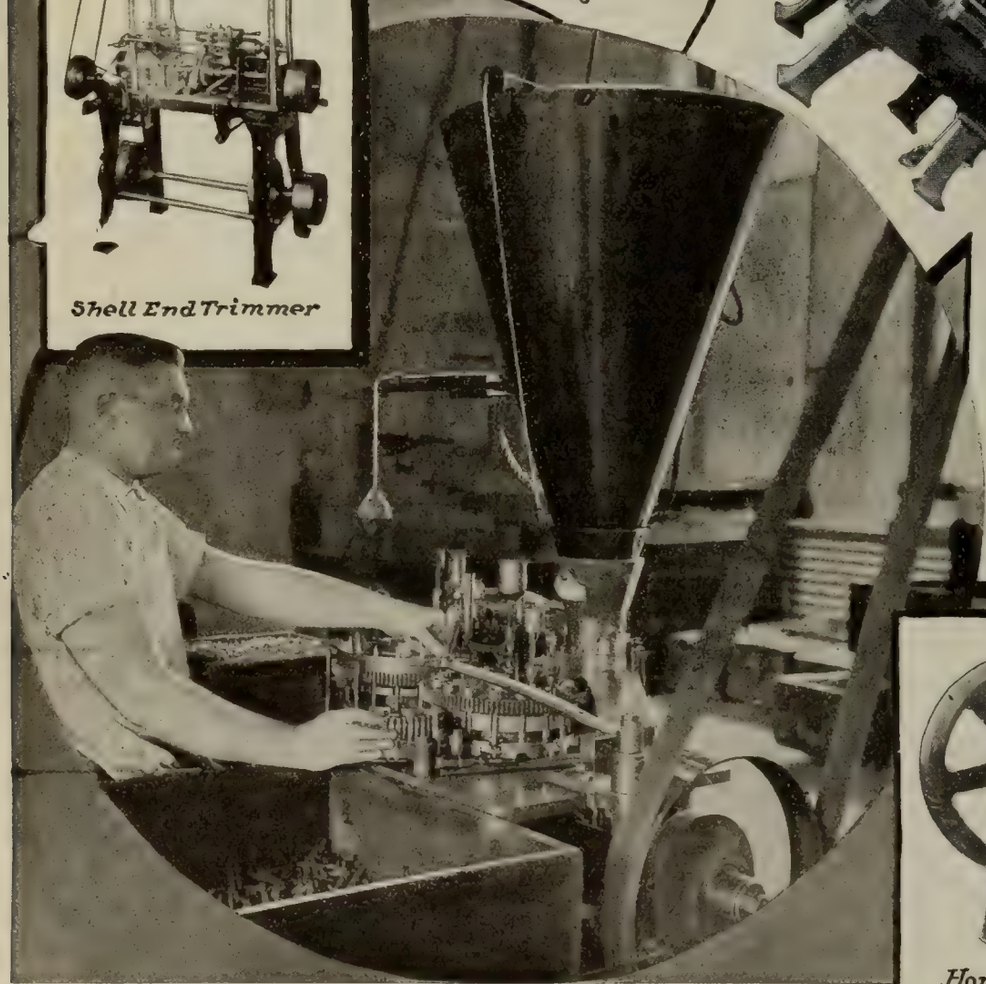

Ratchet Dial Bullet Assembling Machine


Double Friction Dial Double Punch Press


Double Acting Cutting and Cupping Press


Shell End Trimmer


Straight Line Bullet Assembling Machine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Horizontal Header Hopper Feed

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MacKinnon, Holmes Co., Sherbrooke
Marsh & Henthorn, Ltd., Belleville, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Sterling Engine Works, Winnipeg, Man.
Waterous Engine Works, Brantford, Ont.

BOILER STANDS
The Katie Foundry, Ltd., Galt, Ont.
BOILERS, RETURN TUBULAR
Goldie & McCulloch Co., Galt, Ontario.
BOILERS, MARINE
Goldie & McCulloch Co., Galt, Ontario.
BOILERS, WATER TUBE
Goldie & McCulloch Co., Galt, Ontario.
BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.
BOLTS
Aikenhead Hardware Co., Toronto, Ont.
Cumming & Son, J. W., New Glasgow, Canada
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
Northern Bolt, Screw & Wire Co., Owen Sound.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.
BOLT AND NUT MACHINERY
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machinery Co., Toronto
BOLTS, SPRING SHACKLE
Can. Winkley Co., Windsor, Ontario.
BOLT THREADING MACHINERY
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Victor Tool Co., Waynesboro, Pa.
BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co. of Canada, Toronto
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Stow Mfg. Co., Binghampton, N.Y.
BORING MACHINES, UPRIGHT AND HORIZONTAL
John Bertram & Sons Co., Dundas
Canada Machinery Corp. Galt, Ont.
Cincinnati Planer Co., Cincinnati, Ohio.
Garlock-Walker Machinery Co., Toronto, Ont.
Gisholt Machine Company, Madison, Wis.
Gray Mfg. & Mach. Co., Toronto, Ont.
Niles-Bement-Pond Co., New York
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Roelofson Machine & Tool Co., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Stow Mfg. Co., Binghampton, N.Y.
BORING MACHINES, STOVE AND COAL
Cumming & Son, J. W., New Glasgow, Canada
BORING AND TURNING MILLS
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Company, Madison, Wis.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Newton Mach. Tool Wks., Inc., Philadelphia, Pa.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
R. E. T. Pringle, Ltd., Toronto, Ont.
Rudel-Belnap Machy. Co., Toronto
BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland
New Britain Mach. Co., New Britain, Conn.
BRAKES
Brown, Boggs & Co., Hamilton, Can.
BRAKES, MAGNETIC
Volta Mfg. Co., Welland, Ont.
BRAKESHOES
Can. Brakeshoe Co., Sherbrooke, Que.
BRASS AND COPPER BARS, RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto
BRASS FINISHERS
Lymburners, Ltd., Montreal, Quebec.
BRASS FOUNDERS
St. Lawrence Welding Co., Montreal, Que.
BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto, Ont.
Warner & Swasey Co., Cleveland
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machy. Co., Toronto
BRICK MACHINERY
Rothwell, H. G., 11 Ferguson Ave. N., Hamilton, Ontario.
BRIDGES, RAILWAY AND HIGHWAY
Dominion Bridge Co., Montreal, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke
BRONZE RODS AND SHEETS, PLATES
Brown's Copper & Brass Rolling Mills, New Toronto
BRUSHES, AIR
Spray Engineering Co., Boston, Mass.
Paasche Air Brush Co., Chicago, Ill.
BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

BUBBLERS
Puro Sanitary Dk'g Fountain Co., Haydenville, Mass.
BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
BUCKETS, CLAM SHELL, CRAB, DUMP
Beatty & Sons, M., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.
Marsh & Henthorn, Ltd., Belleville, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
BULLDOZERS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
BURNERS, OIL AND NATURAL GAS
Bellevue Industrial Furnace Co., Detroit, Mich.
Gray Mfg. & Mach. Co., Toronto, Ont.
Northern Crane Works, Ltd., Walkerville, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.
BURRING REAMERS
Wells Bros. Co. of Canada, Galt, Ont.
BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque.
CABLE, RUBBER-COVERED
Northern Electric Company, Montreal, Que.
CANADA SILVER SHEETS, ROLLS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
CANNERS' MACHINERY
Bliss, E. W., Co., Brooklyn, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
Brown, Boggs & Co., Hamilton, Can.
Prest-O-Lite Co., Inc., Toronto, Ont.
CARBONIZING BOXES
Swedish Crucible Steel Co., Windsor, Ont.
CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Can.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
Hammant Steel Car & Eng. Wks., Hamilton, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Sheldons, Limited, Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
CARRIERS, GRAVITY
Can. Link-Belt Co., Toronto, Ont.
CARS, STEEL BODY
Marsh & Henthorn, Ltd., Belleville, Ont.
CAR MOVERS
Dillon Mfg. Co., Oshawa, Ont.
CARTRIDGE MAKING MACHINERY
Blackall, Fred. S., Woolworth Tower, New York.
Bliss Co., E. W., Brooklyn, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER
Cumming & Son, J. W., New Glasgow, Canada.
Alexander Fleck, Ltd., Ottawa.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Lymburners, Ltd., Montreal, Quebec.
Sterling Engine Works, Winnipeg, Man.
St. Lawrence Welding Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton.
CASTINGS, IRON
Can. Brakeshoe Co., Sherbrooke, Que.
CASTINGS, GRAY IRON
Anthes Foundry Ltd., Winnipeg, Man.
Bernard Industrial Co., The A., Fortierville, Que.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Steel Foundries, Ltd., Montreal, Que.
Fittings, Limited, Oshawa, Ontario.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Galt Foundry Company, Galt, Ont.
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
International Malleable Iron Co., Guelph, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
The Katie Foundry, Ltd., Galt, Ont.
Wm. Kennedy & Sons, Ltd., Owen Sound.
Manitoba Bridge & Iron Wks., Winnipeg, Man.
Marsh & Henthorn, Ltd., Belleville, Ont.
Perfect Machine Company, Galt, Ont.
Plessisville Foundry Co., Plessisville, Que.
Sheldons, Limited, Galt, Ont.
Sterling Engine Works, Winnipeg, Man.
Welland Mach. & Foundries, Ltd., Welland, Ont.
CASTINGS, SEMI-STEEL
Anthes Foundry, Ltd., Winnipeg, Man.
CASTINGS, STEEL CHROME AND MANGANESE STEEL
Can. Brakeshoe Co., Sherbrooke, Que.
Can. Steel Foundries, Ltd., Montreal, Que.
Dominion Steel Foundry Co., Ltd., Hamilton, Ont
Hull Iron & Steel Foundries, Ltd., Hull, Quebec.
Wm. Kennedy & Sons, Ltd., Owen Sound.
CASTINGS, MALLEABLE
Can. Steel Foundries, Ltd., Montreal, Que.
Cumming & Son, J. W., New Glasgow, Canada.
Galt Malleable Iron Co., Galt, Ontario.
International Malleable Iron Co., Guelph, Ont.
CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull, Que.
CEMENT MACHINERY
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.
Petrie, Ltd., H. W., Toronto, Ont.
CENTERS, PLANER
Cincinnati Planer Co., Cincinnati, Ohio.
CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.
CENTRE REAMERS
John Bertram & Sons Co., Dundas.
Gardner, Robt., & Son, Montreal.
Hurlbut, Rogers Mach. Co., South Sudbury, Mass.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.
Yale & Towne Mfg. Co., New York, N.Y.
CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Fittings, Limited, Oshawa, Ontario.
CHAIN DRIVES
Jones & Glassco, Montreal, Que.
CHEMISTS
Can. Inspection & Testing Lab., Montreal, Que.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Testing Laboratory, Ltd., Toronto.
CHESTS, TOOL
Embree, Ira, 281 Emerald St. N., Hamilton, Ont.
Union Tool Chest Works, Rochester, N.Y.
CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.
Hannifin Mfg. Co., Chicago, Ill.
CHUCKS, AIR
Hannifin Mfg. Co., Chicago, Ill.
Hyde Engineering Works, Montreal, Que.
Manufacturers Equipment Co., Chicago, Ill.
CHUCKS, COLLET
Hannifin Mfg. Co., Chicago, Ill.
Hyde Engineering Works, Montreal, Que.
Manufacturers Equipment Co., Chicago, Ill.
CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
John Bertram & Sons Co., Dundas, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Gisholt Machine Company, Madison, Wis.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Chicago, Ill.
Hyde Engineering Works, Montreal, Que.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pittsburg Steel Stamp Co., Pittsburg, Pa.
Skinner Chuck Co., New Britain, Conn.
Thomas Elevator Company, Chicago, Ill.
D. E. Whiton Machine Co., New London, Conn.
CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
Gisholt Machine Company, Madison, Wis.
Hyde Engineering Works, Montreal, Que.
Thomas Elevator Company, Chicago, Ill.
Whitney Mfg. Co., Hartford, Conn.
CHUCKS, PLANER
Cincinnati Planer Co., Cincinnati, Ohio.
CHUCKS, FRICTION AND TAP
Hyde Engineering Works, Montreal, Que.
Victor Tool Co., Waynesboro, Pa.
Wells Bros. Co. of Canada, Galt, Ont.
CHUCKS, MAGNETIC
Hyde Engineering Works, Montreal, Que.
H. E. Streeter, 523 New Birks Bldg., Montreal.
CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
Hyde Engineering Works, Montreal, Que.
CHUCKS, SPLIT
Hyde Engineering Works, Montreal, Que.
Rivett Lathe & Grinder Co., Brighton, Mass.
CHUCKS, VERTICAL BORING MILL
Gisholt Machine Company, Madison, Wis.
CHUCKING MACHINES
Garvin Machine Co., New York.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto, Ont.
Warner & Swasey Co., Cleveland, O.
CLEANERS, BOILER FLUE AND TUBE
Wm. B. Pierce & Co., Buffalo, N.Y.
CLEANING COMPOUND
Oakley Chemical Co., Toronto, Ont.
CLOCKS, TIME
Gisholt Machine Company, Madison, Wis.
CLOCKS, WATCHMAN, PORTABLE
Hardinge Bros., Inc., Chicago, Ill.
CLUTCHES, CHAIN
Jones & Glassco, Montreal, Que.
CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Jones & Glassco, Montreal, Que.
Osterlein Machine Co., Cincinnati, Ohio.
Positive Clutch & Pulley Works, Ltd., Toronto.
COAL HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Oesterlein Machine Co., Cincinnati, Ohio.
Dominion Bridge Co., Montreal, Quebec.
Marsh & Henthorn, Ltd., Belleville, Ont.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Northern Crane Works, Ltd., Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
COILING MACHINERY, WIRE AND SPRING
Sleeper & Hartley, Inc., Worcester, Mass.
COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

COLLARS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.
Manufacturers' Equipment Co., Chicago, Ill.
Rivett Lathe & Grinder Co., Boston, Mass.
COLUMN CAPS AND BASES
The Katie Foundry, Ltd., Galt, Ont.
COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Smart-Turner Machine Co., Hamilton, Ont.
Taylor Instrument Co., Rochester, N.Y.
CONDENSERS
Goldie & McCulloch Co., Galt, Ontario.
CONTRACT WORK
King Construction Co., Windsor, Ont.
Lymburners, Ltd., Montreal, Quebec.
Marten Machine Co., Hamilton, Ont.
Rothwell, H. G., 11 Ferguson Ave. N., Hamilton, Ontario.
Welland Motor & Machine Co., Welland, Ont.
CONTROLLERS AND STARTERS, ELECTRIC MOTORS
Petrie, Ltd., H. W., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.
CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.
CONVERTERS, STEEL SLIDE-BLOW
Whiting Foundry Equipment Co., Harvey, Ill.
COOLING EQUIPMENT, SPRAY
Spray Engineering Co., Boston, Mass.
COOLER RINGS, ELECTRIC FURNACE
Volta Mfg. Co., Welland, Ont.
COPING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.
COPPER, BUS BAR, SHEET, PLATES, RODS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
CORDAGE
Scythes & Co., Toronto, Ont.
COTTER PINS
Plewes, Ltd., Winnipeg, Man.
COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
COUNTERSHAFTS
Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.
Stow Mfg. Co., Binghampton, N.Y.
COUPLINGS
Waterous Engine Wks., Brantford, Ont.
COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
COUPLINGS, PLAIN AND FLEXIBLE
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
CRANES, LOCOMOTIVE
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerille.
CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.
CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.
CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.
CREAM SEPARATORS
Renfrew Machinery Co., Renfrew, Ont.
CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.
CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.
CUTTER GRINDERS AND ATTACHMENTS
Cincinnati Milling Machine Co., Cincinnati.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto
National Tool Co., Cleveland, Ohio.
CUTTERS, LOCK CORNER
Huther Bros., Rochester, N.Y.
CUTTERS, PIPE (SEE PIPE CUTTERS)
CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
Butterfield & Co., Rock Island, Que.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., Cleveland, Ohio.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.
CUTTING COMPOUND AND CUTTING OIL
Cataract Refining & Mfg. Co., Toronto.
Elm Cutting Oil Co., Toronto.
Racine Tool & Machine Co., Racine, Wis.
CUTTING-OFF MACHINES
Armstrong Bros. Tool Co., Chicago.
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Espen-Lucas Mach. Wks., Philadelphia, Pa.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Globe Engineering Co., Hamilton, Ont.
Gorton Machine Co., Geo., Racine, Wis.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Newton Mach. Tool Wks., Inc., Philadelphia, Pa.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Mchy. & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.
CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor, Ont.
CYLINDERS, AIR
Manufacturers Equipment Co., Chicago, Ill.
CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.
CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.
DAMPER REGULATORS
Canadian Fairbanks-Morse Co., Ltd., Montreal.
DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Beatty & Sons, M., Welland, Ont.
Dominion Bridge Co., Montreal.
Marsh & Henthorn, Ltd., Belleville, Ont.
Winnipeg Gear & Engr. Co., Winnipeg, Man.
DIAMONDS, BLACK AND ROUGH
Geo. A. Joyce Co., Ltd., New York.
DIAMOND TOOLS
Geo. A. Joyce Co., Ltd., New York.
Wheel Trueing Tool Co., Windsor, Ont.
DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pittsburg Steel Stamp Co., Pittsburg, Pa.
DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Banfield, W. H., & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass
Petrie, Ltd., H. W., Toronto, Ont.
Pittsburg Steel Stamp Co., Pittsburg, Pa.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Ltd., Montreal.
Wells Brothers of Canada, Galt, Ont.
DIE BLOCKS
Hammond Steel Co., Syracuse, N.Y.
DIES AND FIXTURES
Windsor Mach. & Tool Co., Windsor, Ont.
DIES FOR BIT BRACE USE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
DIES, NOSING
Marsh & Henthorn, Ltd., Belleville, Ont.
DIES, PIPE THREADING
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Butterfield & Co., Rock Island, Que.
Landis Machine Co., Waynesboro, Pa.
DIE SINKERS
Becker Milling Machine Co., Boston, Mass.
Garvin Machine Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.
DIE SINKING PRESSES, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago.
DIES, SELF-OPENING
Eastern Mach. Screw Corp., New Haven, Conn.
Geometric Tool Co., New Haven.
Ideal Tool & Mfg. Co., Beaver Falls, Pa.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
Rudel-Belnap Machy. Co., Toronto.
Wells Brothers Co. of Canada, Galt, Ont.
DIES FOR SCREW PLATES
Wells Brothers Co. of Canada, Galt, Ont.
DIES, SHEET METAL WORKING
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Normac Machine Co., St. Catharines, Ont.
Worth Engineering Co., Toronto, Ont.
DIES, SCREW AND THREAD
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Rudel-Belnap Machy. Co., Toronto.
Wells Brothers Co. of Canada, Galt, Ont.
DISCS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass
DOWEL PINS, BRASS
Can. Winkley Co., Windsor, Ontario.
DRAFT, MECHANICAL
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
DRAWINGS
Dominion Central Drawing Office, McGill Bldg., Montreal, Que.
DRAWING STANDS
Beatty & Sons, M., Welland, Ontario.
DISCS, LEATHER
Graton & Knight Mfg. Co., Montreal.
DREDGES
Washburn Shops, The, Worcester, Mass.
DRESSERS, GRINDING AND EMERY WHEEL
American Grinder Mfg. Co., Milwaukee, Wis.
Can. Desmond-Stephan Mfg. Co., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Burke Machine Co., Conneaut, Ohio.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Rothwell, H. G., 11 Ferguson Ave. N., Hamilton, Ontario.
Standard Machy. & Supplies, Ltd., Montreal.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, O.
A. R. Williams Machinery Co., Toronto.
DRILLING MACHINES, BENCH
Bilton Mach. Tool Co., Bridgeport, Conn.
Martin Machine Co., Greenfield, Mass.
DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Fox Machine Co., Jackson, Mich
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Hespeler, Ont.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rockford Drilling Mach. Co., Rockford, Ill.
DRILLING MACHINES RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Mueller Machine Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
DRILLING MACHINES, SENSITIVE
Aikenhead Hardware Co., Toronto, Ont.
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
De Mooy Machine Co., Cleveland, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Francis Reed Co., Worcester, Mass.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
D. McKenzie Machinery Co., Guelph, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Stow Mfg. Co., Binghampton, N.Y.
United States Mach. Tool Co., Cincinnati, Ohio.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Garlock-Walker Machinery Co., Toronto, Ont.
Gisholt Machine Company, Madison, Wis.
A. B. Jardine & Co., Hespeler, Ont.
R. McDougall Co., Galt.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto, Ont.
W. F. & John Barnes Co., Rockford, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
De Mooy Machine Co., Cleveland, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Millers Falls Co., Millers Falls, Mass.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
United States Electrical Tool Co., Cincinnati.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cleveland Twist Drill Co., Cleveland.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Machine Co., New Bedford.

DRILLS, ELECTRIC AND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Independent Pneumatic Tool Co., Chicago.
Northern Electric Company, Montreal, Que.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.

DRILLS, GEAR DRIVEN
Perfect Machine Company, Galt, Ont.

DRILLS, FLOOR
De Mooy Machine Co., Cleveland, Ohio.

DRILLS, HIGH SPEED
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Balfour & Co., Arthur, Montreal, Quebec.
Boker & Co., Inc., H., Montreal, Quebec.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Can. B. K. Morton, Toronto, Montreal.
H. A. Drury Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Hicks, W., 567 Banning Ave., Winnipeg, Man.
Marshall & Co., Geo. A., Toronto, Ont.
McKenna Brothers, Pittsburgh, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
W. F. & John Barnes Co., Rockford, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

DRILLS, MULTIPLE SPINDLE
De Mooy Machine Co., Cleveland, Ohio.
Henry & Wright Mfg. Co., Hartford, Conn.
Niles-Bement-Pond Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Independent Pneumatic Tool Co., Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Niles-Bement-Pond Co., New York.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

DRILLS, RADIAL
American Tool Works Co., Cincinnati, Ohio.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Millers Falls Co., Millers Falls, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
A. R. Williams Machy. Co., Toronto.

DRILLS, SENSITIVE
McKenzie Machy. Co., D., Guelph, Ont.
Perfect Machine Company, Galt, Ont.
Washburn Shops, The, Worcester, Mass.

DRILLS, TRACK
Cleveland Twist Drill Co., Cleveland.
Clark Equipment Co., Buchanan, Mich.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Morse Twist Drill & Mach. Co., New Bedford.

DRILLS, TWIST
Atkins & Co., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago.
Armstrong, Whitworth of Canada, Ltd., Montreal.
Butterfield & Co., Rock Island, Que.
Boker & Co., Inc., H., Montreal, Quebec.
Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Hicks, W., 567 Banning Ave., Winnipeg, Man.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rudel-Belnap Machy. Co., Toronto.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

DRINKING FOUNTAINS
Puro Sanitary Dk'g. Fountain Co., Haydenville Mass.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sheldons, Ltd., Galt, Ont.

DUCK, COTTON
Scythes & Co., Toronto, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

DUST ARRESTERS (FOR TUMBLING MILLS)
Northern Crane Works, Walkerville.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

DYNAMOS AND ELECTRICAL SUPPLIES
Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Meaker Galvanizing Company, Chicago, Ill.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELEVATOR ENCLOSURES
Canada Wire & Iron Goods Co., Hamilton, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Whiting Foundry Equipment Co., Harvey, Ill.

ELEVATING AND CONVEYING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Can. Matthews Gravity Carrier Co., Toronto, Ont
Marsh & Henthorn, Ltd., Belleville, Ont.
Strong-Scott Mfg. Co., Winnipeg, Manitoba.

EMERY GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Stow Mfg. Co., Binghamton, N.Y.

EMERY AND EMERY WHEELS
Can. Hart Wheels, Hamilton, Ontario.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Ford-Smith Mach. Co., Hamilton, Ont.
Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Plewes, Ltd., Winnipeg, Man.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.

ENGINES, BALANCED VALVE
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Plessisville Foundry Co., Plessisville, Que.

ENGINES, GASOLINE
Can. Barker Co., Sault Ste. Marie, Ont.

ENGINES, STEAM, GAS, GASOLINE
Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Lymburners, Ltd., Montreal, Quebec.
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Sterling Engine Works, Winnipeg, Man.
Waterous Engine Works, Brantford, Ont.

ENGINES, HORIZONTAL AND VERTICAL
Goldie & McCulloch Co., Galt, Ontario.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Johnson Mach. Co., Carlyle, Manchester, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que
Sheldons, Ltd., Galt, Ont.
Waterous Engine Works, Brantford, Ont.
A. R. Williams Machy. Co., Toronto.

ENGINES, MARINE
Goldie & McCulloch Co., Galt, Ontario.

ENGINES, HOISTING
Beatty & Sons, M., Welland, Ontario.

ENGINES, STEERING
Corbet Foundry & Mach. Co., Owen Sound, Ont.

ENGINES, LOGGING
Beatty & Sons, M., Welland, Ont.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ENGRAVING MACHINES
Gorton Machine Co., Geo., Racine, Wis.

ESCUTCHEON PINS
Parmenter & Bulloch Co., Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Northern Electric Company, Montreal, Que.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.

FAUCETS
Puro Sanitary Dk'g. Fountain Co., Haydenville, Mass.

FENCE, IRON AND FACTORY
Canada Wire & Iron Goods Co., Hamilton, Ont.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

FILE HANDLES
Plewes, Ltd., Winnipeg, Man.

FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Can. B. K. Morton Co., Toronto, Ont.
Delta File Works, Philadelphia, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Plewes, Ltd., Winnipeg, Man.
Port Hope File Mfg. Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.

FILING MACHINES
Noble & Westbrook Mfg. Co., Hartford, Conn.

FILTERS, OIL
Bowser & Co., Inc., S. F., Toronto, Ont.

FILTERS, WATER
W. B. Scaife & Sons, Pittsburgh, Pa.

FINISHING EQUIPMENT
Paasche Air Brush Co., Chicago, Ill.

FIRE ESCAPES
Canada Wire & Iron Goods Co., Hamilton, Ont.

FIRE EXTINGUISHERS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

FIRST AID CABINETS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

FISH PLATES
Can. Steel Foundries, Ltd., Montreal, Que.

FITTINGS, IRON PIPE
Fittings, Limited, Oshawa, Ontario.
International Malleable Iron Co., Guelph, Ont.

FIXTURES
Brown Engineering Corp., Toronto, Ont.
Factory Supply & Steel Co., Montreal, Que.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ontario.
Monarch Brass Mfg. Co., Toronto, Ont.

FLEXIBLE SHAFT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

FLINT SHOT
U.S. Silica Co., Chicago, Ill.

FLOOR SCUPPERS
The Katie Foundry, Ltd., Galt, Ont.

FORGES, HAND, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Canada.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Jas. McKay Co., Pittsburgh, Pa.
Sheldons, Ltd., Galt, Ont.

FORGINGS, CHAINS AND ACCESSORY
Jas. McKay Co., Pittsburgh, Pa.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE
Can. Billings & Spencer, Ltd., Welland, Ont.
Cumming & Son, J. W., New Glasgow, Canada.
Dominion Bridge Co., Montreal, Quebec.
Dom. Forge & Stpg. Co., Walkerville, Ont.
Jas. McKay Co., Pittsburgh, Pa.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING HAMMERS, BELT-DRIVEN
Bliss, E. W., Co., Brooklyn, N.Y.
Hammond Steel Co., Syracuse, N.Y.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING HAMMERS, STEAM OR AIR
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York, N.Y.

FORGING MACHINERY
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Erie Foundry Co., Erie, Pa.
Garlock-Walker Machinery Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

FORGINGS, PIERCING DIE
Hammond Steel Co., Syracuse, N.Y.

FORGINGS, SPECIAL
Dominion Bridge Co., Montreal, Quebec.
Keyser, Ellison & Co., Montreal, Que.
Jas. McKay Co., Pittsburgh, Pa.
Sterling Engine Works, Winnipeg, Man.

FOUNDRY SUPPLIES
Can. Hanson & Van Winkle Co., Toronto, Ont.

FUEL OIL SYSTEMS
Gilbert & Barker Mfg. Co. Springfield, Mass.

FRICTION LEATHERS
Graton & Knight Mfg. Co., Montreal.
FURNACES, ANNEALING, ETC.
Bellevue Industrial Furnace Co., Detroit, Mich.
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Mechanical Engineering Co., Montreal.
Rockwell Co., W. S., New York, N.Y.
Tate-Jones & Co., Leetsdale, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.
FURNACES, BLAST
Toronto Iron Works, Ltd., Toronto.
FURNACES, BRASS, MALLEABLE
Whiting Foundry Equipment Co., Harvey, Ill.
FURNACES, HEAT TREATING HARDENING AND TEMPERING
Bellevue Industrial Furnace Co., Detroit, Mich.
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Rudel-Belnap Machy. Co., Toronto.
Tate-Jones & Co., Leetsdale, Pa.
FURNACES, FORGING
Can. Hoskins, Ltd., Walkerville, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield, Mass.
FURNACES FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Can. Hoskins, Ltd., Walkerville, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.
FUSE BOXES, STEEL
Dominion Forge & Stpg. Co., Walkerville, Ont.
FUSE CAP MACHINERY
Noble & Westbrook Mfg. Co., Hartford, Conn.
R. E. T. Pringle, Ltd., Toronto.
GALVANIZING
Manitoba Bridge & Iron Wks., Winnipeg, Man.
Meaker Galvanizing Company, Chicago, Ill.
GALVANIZING MACHINERY
Erie Foundry Co., Erie, Pa.
Meaker Galvanizing Company, Chicago, Ill.
GALVANIZING SOLUTION
Meaker Galvanizing Company, Chicago, Ill.
GANG PLANER TOOLS
Armstrong Bros. Tool Co., Chicago.
GAS ANALYSIS APPARATUS
Wm. B. Pierce & Co., Buffalo, N.Y.
GASKETS, LEATHER, ETC.
Graton & Knight Mfg. Co., Montreal.
GAS BLOWERS AND EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
GAUGES, MERCURY COLUMN, DRAFT
Charles F. Elmes Eng. Works, Chicago.
GAUGES, FUSE HOLE
Windsor Mach. & Tool Co., Windsor, Ont.
GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.
GAUGES, LIMIT
Swedish Gage Co., New York, N.Y.
GAUGES, RECORDING
American Steam Gauge & Valve Mfg. Co., Boston, Mass.
GAUGES, STANDARD
Brown Engineering Corp., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Factory Supply & Steel Co., Montreal, Que.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Lymburners, Ltd., Montreal, Quebec.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Normas Machine Co., St. Catharines, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Swedish Gage Co., New York, N.Y.
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.
GEARS
Waterous Engine Works, Brantford, Ont.
GEAR BLANKS
Can. Steel Foundries, Ltd., Montreal, Que.
GEARS AND GEAR CUTTING
A. B. Jardine & Co., Limited, Hespeler, Ont.
GEAR-CUTTING MACHINERY
Bilton Mach. Tool Co., Bridgeport, Conn.
Dominion Machinery Co., Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Hamilton Gear & Machine Co., Toronto.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
The Smart-Turner Machine Co., Hamilton.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
GEAR HOBBING MACHINES
Himoff Mach. Co., Inc., Astoria, L.I., New York.
GEAR TURNING MACHINES, BEVEL
Bridgeford Mach. Tool Works, Rochester, N.Y.
GEARS, CUT, MORTISE, ANGLE, WORM
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Foundries, Ltd., Hull, Que.
Illinois Tool Works, Chicago, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
The Smart-Turner Machine Co., Hamilton.
Sterling Engine Works, Winnipeg, Man.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

GEAR GENERATORS
Lees-Bradner Co., Cleveland, Ohio.
GEAR TESTING MACHINERY
Gisholt Machine Company, Madison, Wis.
GEARS, RAWHIDE
Hamilton Gear & Machine Co., Toronto.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Jones & Glassco, Montreal.
Philadelphia Gear Works, Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.
Winnipeg Gear & Engr. Co., Winnipeg, Man.
GENERATORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Elm Cutting Oil Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Sturtevant Co., B. F., Galt, Ont.
A. R. Williams Machy. Co., Toronto.
GERMAN SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
GLASSES, SAFETY
Strong, Kennard & Nutt Co., Cleveland, Ohio.
Willson & Co., Inc., T. A., Reading, Pa.
GRAIN FOR POLISHING
Norton Co., Worcester, Mass.
GRAPHITE
Aikenhead Hardware Co., Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
GREASE CUPS, PRESSED STEEL AND BRASS
Can. Winkley Co., Windsor, Ontario.
GLOVES, LEATHER AND RUBBER
Hickory Steel-Grip Glove Co., Chicago, Ill.
GLOVES, STEEL GRIP, SAND BLAST
Hickory Steel Grip Glove Co., Chicago, Ill.
GLOVES AND MITTENS, WORKMEN'S
Hickory Steel Grip Glove Co., Chicago, Ill.
GRAVITY CARRIERS
Can. Matthews Gravity Carrier Co., Toronto, Ont.
GREASES (SEE LUBRICANTS)
GRINDER ATTACHMENTS
American Grinder Mfg. Co., Milwaukee, Wis.
Rivett Lathe & Grinder Co., Boston, Mass.
Wilmarth & Morman, Grand Rapids, Mich.
GRINDERS, AUTOMATIC KNIFE
American Grinder Mfg. Co., Milwaukee, Wis.
W. H. Banfield & Son, Toronto.
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
GRATE BARS, DUMPING
Galt Foundry Company, Galt, Ont.
GRATE BARS, ROCKING AND STATIONARY
Galt Foundry Company, Galt, Ont.
GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH
Blake & Johnson Co., Waterbury, Conn.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Globe Engineering Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rudel-Belnap Machy. Co., Toronto.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati, O.
GRINDERS, CUTTER
Brown & Sharpe Mfg. Co., Providence, R.I.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Grand Rapids Grinding Mach. Co., Grand Rapids, Mich.
LeBlond Mach. Tool Co., R. K., Cincinnati, O.
Norton Grinding Co., Worcester, Mass.
Oakley Machine Tool Co., Cincinnati, Ohio.
Oesterlein Mach. Co., Cincinnati, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wilmarth & Morman, Grand Rapids, Mich.
GRINDERS, DIE AND CHASER
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.
GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
GRINDERS, DRILL
Aikenhead Hardware Co., Toronto, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Grand Rapids Grinding Mach. Co., Grand Rapids, Mich.
United States Electrical Tool Co., Cincinnati, O.
Washburn Shops, The, Worcester, Mass.
Wilmarth & Morman, Grand Rapids, Mich.
GRINDERS, CYLINDER, INTERNAL
Brown & Sharpe Mfg. Co., Providence, R.I.
Ott Grinder Co., Indiannapolis, Ind.
Fitchburg Grinding Mach. Co., Fitchburg, Mass.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
Rivett Lathe & Grinder Co., Brighton, Mass.
Rudel-Belnap Machy. Co., Toronto.
GRINDERS, HAND
American Grinder Mfg. Co., Milwaukee, Wis.

GRINDERS, NAIL DIE
GRINDERS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
GRINDERS, PORTABLE, ELECTRIC, HAND, TOOL POST, FLOOR AND BENCH
American Grinder Mfg. Co., Milwaukee, Wis.
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
United States Electrical Tool Co., Cincinnati, O.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.
GRINDERS, RADIAL
Gisholt Machine Company, Madison, Wis.
Rivett Lathe & Grinder Co., Brighton, Mass.
GRINDERS, SELF-OILING
American Grinder Mfg. Co., Milwaukee, Wis.
GRINDERS, TILTING
American Grinder Mfg. Co., Milwaukee, Wis.
GRINDERS, TOOL AND HOLDER
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Blake & Johnson Co., Waterbury, Conn.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Oesterlein Mach. Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Grand Rapids Grinding Mach. Co., Grand Rapids, Mich.
Greenfield Machine Co., Greenfield, Mass.
National-Acme Co., Cleveland, Ohio.
Oakley Machine Tool Co., Cincinnati, Ohio.
Perkin & Co., Leeds, England.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.
Wing & Son, J. E., Hamilton, Ont.
GRINDERS, UNIVERSAL, PLAIN
Grand Rapids Grinding Mach. Co., Grand Rapids, Mich.
Fitchburg Grinding Machine Co., Fitchburg, Mass.
Modern Tool Co., Erie, Pa.
Oakley Machine Tool Co., Cincinnati, Ohio.
Ott Grinder Co., Indiannapolis, Ind.
Oesterlein Mach. Co., Cincinnati, Ohio.
Wilmarth & Morman, Grand Rapids, Mich.
GRINDERS, UNIVERSAL CUTTER AND TOOL
Oakley Machine Tool Co., Cincinnati, Ohio.
St. Louis Mach. Tool Co., St. Louis, Mo.
GRINDERS, VERTICAL SURFACE
The Blanchard Machine Co., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Pratt & Whitney Co., Dundas, Ont.
H. E. Streeter, 623 New Birks Bldg., Montreal, Que
Wilmarth & Morman, Grand Rapids, Mich.
Wing & Son, J. E., Hamilton, Ont.
GRINDING MACHINES
Rothwell, H. G., 11 Ferguson Ave. N., Hamilton, Ontario.
Perfect Machine Company, Galt, Ont.
GRINDING AND POLISHING MACHINES, PORTABLE, PNEUMATIC AND SPRING FRAME
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
LeBlond Mach. Tool Co., R. K., Cincinnati.
Newton Mach. Tool Wks., Inc., Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
St. Louis Mach. Tool Co., St. Louis, Mo.
Stow Mfg. Co., Binghampton, N.Y.
Wilmarth & Morman, Grand Rapids, Mich.
GRINDING WHEELS
Aikenhead Hardware Co., Toronto, Ont.
Baxter Co., Ltd., J. R., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Can. Hart Wheels, Hamilton, Ontario.
Can. B. K. Morton, Toronto, Montreal.
Carborundum Co., Niagara Falls.
Ford-Smith Mach Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Francis & Co., Hartford, Conn.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
GRIT, ANGULAR
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.
GUARDS, WINDOW AND MACHINE
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ontario.
Ford-Smith Machine Co., Hamilton, Ont.
Huther Bros., Rochester, N.Y.
New Britain Mach. Co., New Britain, Conn.
Stow Mfg. Co., Binghampton, N.Y.

HACK SAW BLADES
Aikenhead Hardware Co., Toronto, Ont.
Boker & Co., Inc., H., Montreal, Quebec.
Can. Fairbanks-Morse Co., Montreal, Quebec.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Ford-Smith Machine Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Fry's (London), Ltd.
Huther Bros., Rochester, N.Y.
Millers Falls Co., Millers Falls, Mass.
Osborn (Canada, Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Montreal.
Plewes, Ltd., Winnipeg, Man.
Racine Tool & Machine Co., Racine, Wis.
Rice Lewis & Son, Toronto, Ont.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Ltd., Montreal, Que
Victor Saw Works, Ltd., Hamilton, Canada.
West Haven Mfg. Co., New Haven, Conn.
Wilkinson & Kompass, Hamilton, Ont.
Zenith Coal & Steel Products, Montreal, Que.

HACK SAW FRAMES
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal, Que.
Garvin Machine Co., New York City.
Millers Falls Co., Millers Falls, Mass.
Victor Saw Works, Hamilton, Ont.
West Haven Mfg. Co., New Haven, Conn.
Wilkinson & Kompass, Hamilton, Ont.

HACK SAWS, POWER
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal Que.
Diamond Saw & Stpg. Wks., Buffalo, N.Y.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
McKenzie Machy. Co., D., Guelph, Ont.
Perfect Machine Company, Galt, Ont.
Perkin & Co., Leeds, England.
Peerless Machine Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
L. S. Starrett Co., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
West Haven Mfg. Co., New Haven, Conn.
Williams Machy. Co., A. R., Toronto, Ont.

HAMMERS, AIR
Erie Foundry Co., Erie, Pa.

HAMMERS, DROP AND BELT-DRIVEN
Beaudry & Co., Boston, Mass.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canadian Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
Erie Foundry Co., Erie, Pa.
High Speed Hammer Co., Rochester, N.Y.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Plessisville Foundry Co., Plessisville, Que.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.

HAMMERS, HELVE POWER
Canada Machinery Corp., Galt, Ont.
West Tire Setter Co., Rochester, N.Y.

HAMMERS, POWER
Beaudry & Co., Boston, Mass.
Erie Foundry Co., Erie, Pa.
United Hammer Co., Boston, Mass.

HAMMERS, CHIPPING, CAULKING, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

HAMMERS, MARKING
Matthews, Jas. H. & Co., Pittsburgh, Pa.

HAMMERS, MOTOR-DRIVEN
Beaudry & Co., Boston, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

HAMMERS, NAIL MACHINE
United Hammer Co., Boston, Mass.

HAMMERS, STEAM
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.

HAMMERS, SHELL NOSING
Beaudry & Company, Inc., Boston, Mass.

HAND LEATHERS OR PADS
Graton & Knight Mfg. Co., Montreal.
Hickory Steel-Grip Glove Co., Chicago, Ill.

HANGERS, SHAFT
Baird Machine Co., Bridgeport, Conn.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Can. S K F Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal.
Jones & Glassco, Montreal.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Pressed Steel Co., Philadelphia, Pa.
Waterous Engine Works, Brantford, Ont.

HARDENING AND TEMPERING
Holz, Herman A., 1 Madison Ave., New York.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.

HARDNESS TESTING INSTRUMENTS
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York.

HEATERS
Goldie & McCulloch Co., Galt, Ontario.
McAvity & Sons, T., St. John, N.B.
Scaife & Sons Co., Wm. B., Pittsburgh, Pa.
Sturtevant Co., B. F., Galt, Ont.

HEATING AND VENTILATING ENGINEERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

HEAT GAUGES, HARDENING AND ANNEALING
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York.

HIGH SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.

HINGE MACHINERY
Baird Machine Co., Bridgeport, Conn.
Illinois Tool Works, Chicago, Ill.

HINGES
London Bolt & Hinge Works, London, Ont.

HOBS
Illinois Tool Works, Chicago, Ill.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

HOBS, MILLING
Butterfield & Co., Rock Island, Que.

HOISTING AND CONVEYING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Can. Matthews Gravity Carrier Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
Jenckes Mach. Co., Sherbrooke, Que.
Jones & Glassco, Montreal.
Marsh & Henthorn, Belleville, Ont.
Northern Crane Works, Walkerville, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Waterous Engine Works, Brantford, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

HOISTS, ASH
Beatty & Sons, M., Welland, Ont.

HOISTS, CHAIN AND PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
Ford Chain Block & Mfg., Philadelphia, Pa.
Independent Pneumatic Tool Co., Chicago, Ill.
Jenckes Mach. Co., Sherbrooke, Que.
Marsh & Henthorn, Belleville, Ont.
Northern Crane Works, Walkerville, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
Wright Mfg. Co., Lisbon, Ohio.
Yale & Towne Mfg. Co., New York, N.Y.

HOISTS, ELECTRIC
Beatty & Sons, M., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Kennedy & Sons, Owen Sound, Ont.
Northern Crane Works, Walkerville, Ont.
Winnipeg Gear & Engrng Co., Winnipeg, Man.

HOISTS, SHIPYARD
Thomas Elevator Co., Chicago, Ill.

HOLDERS, ELECTRODE
Volta Mfg. Co., Welland, Ont.

HOLDERS, STEEL DIE FOR MARKING
Marsh & Henthorn, Ltd., Belleville, Ont.
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pittsburg Steel Stamp Co., Pittsburg, Pa.

HOPPERS
Dominion Bridge Co., Montreal, Quebec.
Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.

HOSE
Plewes, Ltd., Winnipeg, Man.

HOSE, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Toronto, Ont.
Goodyear Tire & Rubber Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Wells Bros. Co. of Canada, Galt, Ont.

HYDRAULIC MACHINERY
Charles F. Elmes Eng. Works, Chicago.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

INDICATORS, STEAM
American Steam Gauge & Valve Mfg. Co., Boston, Mass.

INDICATORS, SPEED
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
L. S. Starrett Co., Athol, Mass.

INDEX CENTRES
Fred C. Dickow, Chicago, Ill.
Garvin Machine Co., New York.

INDICATING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

INGOT METAL
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

INJECTORS
McAvity & Sons, T., St. John, N.B.

IRON, BAR, SHEET
Rice Lewis & Son, Toronto, Ont.

IRON ORE
Hanna & Co., M. A., Cleveland, O.

IRON SAND
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

JACKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Plewes, Ltd., Winnipeg, Man.

JACKS, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago.

JACKS, PNEUMATIC
Northen Crane Works, Walkerville.

JACKS, PIT AND TRACK
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.

JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.

JIGS, TOOLS, ETC.
Brown Engineering Corp., Toronto, Ont.
Factory Supply & Steel Co., Montreal, Que.
Gisholt Machine Company, Madison, Wis.
Homer & Wilson, Hamilton, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Normas Machine Co., St. Catharines, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Toronto Tool Co., Toronto, Ont.

JOIST HANGER CASTINGS
The Katie Foundry, Ltd., Galt, Ont.

KEY SEATERS
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich.
A. R. Williams Machy. Co., Toronto.

KEYS, MACHINE
Whitney Mfg. Co., Hartford, Conn.

KILNS
Can. Blower & Forge Co., Kitchener, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Sheldons, Limited, Galt, Ont.

LABELS AND TAGS
Matthews, Jas. H. & Co., Pittsburgh, Pa.

LABORATORIES, INSPECTION AND TESTING (SEE CHEMISTS)

LADLES, FOUNDRY
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

LAMPS, INCANDESCENT AND NITROGEN
Can. Laco-Philips Co., Toronto, Ont.

LAMPS, ELETRIC
Northern Electric Company, Montreal, Ont.

LAMPS, TUNGSTEN (Vacuum and Gas Filled)
Can. Laco-Philips Co., Toronto, Ont.
Factory Supply & Steel Co., Montreal, Que.

LATHES, AUTOMATIC AND SEMI-AUTOMATIC
Gisholt Machine Company, Madison, Wis.

LATHES, BENCH
H. E. Streeter, New Birks Bldg., Montreal, Que.

LATHES, CHUCKNG
Acme Machine Tool Co., Cincinnati, Ohio.

LATHE CHUCKS (SEE CHUCKS)

LATHE DOGS AND ATTACHMENTS
Armstrong Bros. Tool Co., Chicago.
Curtis & Curtis Co., Bridgeport, Conn.
Hendey Machine Co., Torrington, Conn.
Rivett Lathe & Grinder Co., Boston, Mass.
Williams & Co., J. H., Brooklyn, N.Y.
Winnipeg Gear & Engrng Co., Winnipeg, Man.

LATHES, AXLE
Bridgeford Mach. Tool Works, Rochester, N.Y.

LATHES, PRECISION, BENCH
W. F. & John Barnes Co., Rockford.
Blount, J. G., & Co., Everett, Mass.
Can Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hardinge Bros., Chicago, Ill.
New Britain Mach. Co., New Britain, Conn.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.

LATHES, BAND TURNING
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Roelofson Machine & Tool Co., Toronto, Ont.
Warden King Co., Montreal, Que.

LATHES, BRASS
Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Inc., Chicago, Ill.

LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, Ohio.
American Tool Works Co., Cincinnati, Ohio.
John Bertram & Sons Co., Dundas.
Bridgeford Mach. Tool Works, Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Iron & Steel Co., Cincinnati, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Gisholt Machine Company, Madison, Wis.
Hamilton Mach. Tool Co., Hamilton, Ohio.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
McCabe, J. J., New York, N.Y.
McKenzie Machy. Co., D., Guelph, Ont.
R. McDougall Co., Galt.
Mueller Machine Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Oliver Machinery Co., Grand Rapids, Mich.
Perfect Machine Company, Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Preston Machinery Co., Preston, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Rudel-Belnap Machy. Co., Toronto.
Sidney Tool Co., Sidney, Ohio.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Sebastian Lathe Co., Cincinnati, Ohio.
Walcott Lathe Co., Jackson, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

LATHES, HEAVY DUTY TURRET
Amalgamated Machinery Corporation, Chicago, Ill.
Corbet Foundry & Mach. Co., Owen Sound, Can.
International Mach. Tool So., Indianapolis, Ind.

LATHES, JOURNAL TRUEING
Bridgeford Mach. Tool Works, Rochester, N.Y.
McCabe, J. J., New York, N.Y.

LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McCabe, J. J., New York, N.Y.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

LATHES, SINGLE PURPOSE
Amalgamated Machinery Corporation, Chicago, Ill.
Bertram, John, & Sons Co., Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Mfg. & Mach. Co., Toronto, Ont.
Hepburn, John T., Ltd., Toronto.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McCabe, J. J., New York, N.Y.
Plessisville Fdy., Plessisville, Que.
Roelofson Mach. & Tool Co., Toronto, Can.

LATHES, SCREW CUTTING
Bertram, John, & Sons Co., Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto.
McCabe, J. J., New York, N.Y.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

LATHES, SPINNING
Bliss, E. W., Co., Brooklin, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
McCabe, J. J., New York, N.Y.

LATHE TOOLS
Gisholt Machine Company, Madison, Wis.

LATHES, TURRET AND HAND
Acme Machine Tool Co., Cincinnati, Ohio.
John Bertram & Sons Co., Dundas.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto, Ont.
Himoff Mach. Co., Inc., Astoria, L.I., New York
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio
McCabe, J. J., New York, N.Y.
Millholland Mach. Co., W. K., Indianapolis, Ind.
Mulliner-Enlund Tool Co., Syracuse, N.Y.
National-Acme Co., Cleveland, Ohio.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York.
Oliver Machinery Co., Grand Rapids, Mich.
Pratt & Whitney Co., Dundas, Ont.
H. W. Petrie, Toronto.
Rivett Lathe & Grinder Co., Boston, Mass.
Riverside Machinery Depot, Detroit, Mich.
Rudel-Belnap Machy. Co., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.

LEAD BURNING
St. Lawrence Welding Co., Montreal, Que.

LEATHERS, HYDRAULIC
Sadler & Haworth, Montreal, Que.

LEATHER, LACE
Sadler & Haworth, Montreal, Que.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, Mass.

LIFTS, PNEUMATIC
Whiting Foundry Equipment Co., Harvey, Ill

LIFTING JACKS, BALL BEARING
Can. Brakeshoe Co., Sherbrooke, Que.

LIGHTING SETS, SHIPS
Goldie &McCulloch Co., Galt, Ontario.

LINK BELTING
Can. Fairbanks-Morse Co., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

LIQUID AIR
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.

LOADERS, WAGON AND TRUCK
Can. Link Belt Co., Toronto, Ont.
Dennis Wire & Iron Works, London, Ontario.

LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Goods Co., Hamilton, Ont

LUBRICANTS
Cataract Refining & Mfg. Co., Toronto.

LUBRICATORS
Roper, C. F., & Co., Hopedale, Mass.
Trahern Pump Co., Rockford, Ill.

MACHINE WORK
King Construction Co., Windsor, Ont.

MACHINE TOOLS
Oakley Machine Tool Co., Cincinnati, Ohio.

MACHINERY DEALERS
Baird Machy. Co., W. J., Detroit, Mich.
Can. Fairbanks-Morse Co., Montreal.
Dickow, Fred C., Chicago, Ill.
Garlock-Walker Machy. Co., Toronto, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Hicks, W., 567 Banning Ave., Winnipeg, Man.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que
Standard Machy. & Supplies, Ltd., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

MACHINERY GUARDS (SEE GUARDS)

MACHINERY REPAIRS
Prest-O-Lite Co., Inc., Toronto, Ont.
Sterling Engine Works, Winnipeg, Man.
Sumbling Mach. Co., W. H., Toronto, Ont.

MACHINISTS' SCALES, SMALL TOOLS AND SUPPLIES
Can. Fairbanks-Morse Co., Montreal.
Marten Machine Co., Hamilton, Ont.
Frank H. Scott, Montreal.
Starrett Co., L. S., Athol, Mass.
Strong-Scott Mfg. Co., Winnipeg, Manitoba.
Western Tool & Mfg. Co., Springfield, Ohio.
J. H. Williams & Co., Brooklyn, N.Y.

MACHINISTS
Welland Motor & Machine Co., Welland, Ont.

MACHINE TOOLS
Oakley Machine Tool Co., Cincinnati, Ohio.

MANDRELS
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Hannifin Mfg. Co., Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Manufacturers Equip. Co., Chicago, Ill.
Monarch Brass Mfg. Co., Toronto, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Western Tool & Mfg. Co., Springfield, Ohio.

MARKING DEVICES
Pittsburg Steel Stamp Co., Pittsburg, Pa.
Pritchard-Andrews Co. of Canada, Ottawa, Ont.
Matthews, Jas. H., & Co., Pittsburgh, Pa.

MARKING MACHINERY
Brown, Boggs Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Martin Machine Co., Greenfield, Mass.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Perrin, Wm. R., Toronto.
Pittsburg Steel Stamp Co., Pittsburg, Pa.

MARINE HARDWARE
Scythes & Co., Toronto, Ont.

MEASURING MACHINES
Pratt & Whitney Co., Dundas, Ont.

MEASURING TAPES AND RULES
James Chesterman & Co., Ltd., Sheffield, Eng.

METALLURGISTS
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Ltd., Toronto.

METAL SLITTING SAWS
Huther Bros., Rochester, N.Y.

METERS, METAL TESTING
Holz, Herman A., 1 Madison Ave., New York.

METERS, FLOW
Spray Engineering Co., Boston, Mass.

METALS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
Can. B. K. Morton, Toronto, Montreal.
Dom. Iron & Wrecking Co., Ltd., Montreal, Que
Standard Machy. & Supplies, Ltd., Montreal, Que.

METERS, OIL, WATER
Bowser & Co., Inc., S. F., Toronto, Ont.

MICROMETERS
Rice Lewis & Son, Toronto, Ont.

MILLERS, GROOVE
Gorton Machine Co., Geo., Racine, Wis.

MILL MACHINERY
Alexander Fleck, Ltd., Ottawa.
Strong-Scott Mfg. Co., Winnipeg, Manitoba.

MILLING MACHINES, AUTOMATIC
Bilton Mach. Tool Co., Bridgeport, Conn.

MILLING ATTACHMENTS
Becker Milling Machine Co., Boston, Mass.
John Bertram & Sons Co., Dundas.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R.I.

MILLING MACHINES, BENCH
Burke Machine Co., Conneaut, Ohio.
Perkin & Co., Leeds, England.

MILLING MACHINES, HAND
Hardinge Bros., Inc., Chicago, Ill.
United States Mach. Tool Co., Cincinnati, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Whitney Mfg. Co., Hartford, Conn.

MILLING MACHINES, HARDENED RADIUS LINK
Newton Mach. Tool Wks., Inc., Philadelphia, Pa.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Becker Milling Machine Co., Boston, Mass.
Brown & Sharpe Mfg. Co., Providence.
John Bertram & Sons Co., Dundas.
Cleveland Milling Machine Co., Cleveland, Ohio.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Gisholt Machine Company, Madison, Wis.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Newton Mach. Tool Wks., Inc., Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.
Rockford Milling Machine Co., Rockford, Ill.
Steptoe, The John Co., Cincinnati, Ohio.
United States Mach. Tool Co., Cincinnati, Ohio.
Whitney Mfg. Co., Hartford, Conn.
A. R. Williams Machy. Co., Toronto.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Becker Milling Machine Co., Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Oesterlein Machine Co., Cincinnati, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.

MILLING MACHINES, THREAD
Lees-Bradner Co., Cleveland, Ohio.
Gisholt Machine Company, Madison, Wis.

MILLING MACHINES, PROFILE
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Riverside Machinery Depot, Detroit, Mich.
Rockford Milling Machine Co., Rockford, Ill.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Tabor Mfg. Co., Philadelphia, Pa.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Cummings & Son, J. W., New Glasgow, Canada.
Dominion Bridge Co., Montreal, Quebec.
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
Marsh & Henthorn, Belleville, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Jenckes Mach. Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

MITTENS
Hickory Steel-Grip Glove Co., Chicago, Ill.

MODEL WORK
Steele, R. W., 522 Rosedale Ave., Winnipeg, Mna.
Windsor Mach. & Tool Co., Windsor, Ont.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Mach. Co., New Britain, Conn.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Elm Cutting Oil Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Northern Electric Company, Montreal, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

MUNITION MACHINERY
Petrie of Montreal, Ltd., H. W., Montreal, Que.

MUNTZ METAL
Brown Copper & Bross Roller Mills, New Toronto, Ont.

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Can.

NICKEL, CHROME
Andrews Steel Co., Newport, Ky.

NICKEL SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NICKEL STEEL
Kayser, Ellison & Co., Montreal, Que.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLES AND COUPLINGS, WROUGHT
Fittings, Limited, Oshawa, Ontario.

NIPPLE THREADING MACHINES
John H. Hall & Sons, Ltd., Brantford, Ont.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.

NOSE SOCKETS
Jas. McKay Co., Pittsburgh, Pa.

NUTS, SEMI-FINISH AND FINISHED
Canadian B. K. Morton, Toronto, Montreal.
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Plewes, Ltd., Winnipeg, Man.
Wilkinson & Kompass, Hamilton, Ont.

NUT BURRING MACHINES
National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

NUT MACHINES (HOT)
National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machy. Co., Tiffin, O.
Victor Tool Co., Waynesboro, Pa.

NUT TAPPERS
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machy. Co., Tiffin, O.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

OAKUM
Scythes & Co., Toronto, Ont.
OIL CUPS
Can. Winkley Co., Windsor, Ontario.
OIL, DRAWING
Elm Cutting Oil Co., Toronto, Ont.
OIL, HOLE COVERS
Can. Winkley Co., Windsor, Ontario.
OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Machine Co., The, Hamilton.
OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
OILSTONE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.
OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, Ont.
OPTICAL MACHINES
Rothwell, H. G., 11 Ferguson Ave. N., Hamilton,
OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto
OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford, Ont.
Chicago Flexible Shaft Co., Chicago, Ill.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.
OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford, Ont.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Oven Equipment & Mfg. Co., New Haven, Conn.
Whiting Foundry Equipment Co., Harvey, Ill.
OVENS FOR DRYING, TEMPER AND UNDER TRUCKS
Brantford Oven & Rack Co., Brantford, Ont.
Oven Equipment & Mfg. Co., New Haven, Conn.
OXY-ACETYLENE WELDING AND CUTTING
Can. Welding Works, Montreal, Que.
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
OXY-ACETYLENE WELDING AND CUTTING PLANT
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto.
Prest-O-Lite Co., Inc., Toronto, Ont.
OXYGEN (SEE ACETYLENE)
L'Air Liquide Society, Montreal, Que.
PACKINGS, ASBESTOS
Bennett, W. P., 51 Montford St., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
New Britain Mach. Co., New Britain, Conn.
PACKINGS, LEATHER, HYDRAULICS, ETC.
Graton & Knight Mfg. Co., Worcester, Mass.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
PACKING, ASBESTOS
Plewes, Ltd., Winnipeg, Man.
PAINT SPRAYING EQUIPMENT
Spray Engineering Co., Boston, Mass.
PAPER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
MacKinnon, Holmes & Co., Sherbrooke, Que.
Sturtevant Co., B. F., Galt, Ont.
PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
PATENT SOLICITORS
Budden, Hanbury, A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.
PATTERNS
Marten Machine Co., Hamilton, Ont.
Winnipeg Gear & Engr. Co., Winnipeg, Man.
PERFORATED METALS AND ORNAMENTAL IRON GOODS
Canada Wire & Iron Goods Co., Hamilton.
PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.
PIPE CUTTING AND THREADING MACHINES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Petrie, Ltd., H. W., Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
A. R. Williams Machy. Co., Toronto.
Dominion Bridge Co., Montreal, Que.
PIPE, RIVETEED STEEL, SMOKESTACKS
PACKING, STEAM
Dunlop Tire & Rubber Goods Co., Toronto, Ont.
PHOSTOTATS
Commercial Camera Co., Providence, R.I.
PIPE FITTINGS, MALLEABLE AND CAST
Fittings, Limited, Oshawa, Ontario.
PIPE RIVETED STEEL
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.
PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
John H. Hall & Sons, Ltd., Brantford, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Wells Bros. Co. of Canada, Galt, Ont.

PIPE AND FITTINGS
McAvity & Sons, T., St. John, N.B.
PLANER JACKS
Armstrong Bros. Tool Co., Chicago.
PLANERS, STANDARD AND ROTARY
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
Newton Mach. Tool Wks., Inc., Philadelphia, Pa.
Niles-Bement-Pond Co., New York.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Preston Woodworking Machy. Co., Preston, Co.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
PLANERS, METALWORKING
Gorton Machine Co., Geo., Racine, Wis.
American Tool Works Co., Cincinnati, Ohio.
PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Rudel-Belnap Machy. Co., Toronto.
Steptoe, The John Co., Cincinnati, Ohio.
A. R. Williams Machy. Co., Toronto.
PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Niles-Bement-Pond Co., New York.
PLATING OUTFITS
Can. Hanson & Van Winkle Co., Toronto, Ont.
POWER HACK SAWS
McKenzie Machy. Co., D., Guelph, Ont.
PLIERS
Aikenhead Hardware Co., Toronto.
Canadian Billings & Spencer, Ltd., Welland.
Northern Electric Company, Montreal, Ont.
Peck, Stow & Wilcox Co., Southington, Conn.
Plewes, Ltd., Winnipeg, Man.
PRESSES, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Hannifin Mfg. Co., Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.
PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
E. W. Bliss Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Mackintosh, Hemphill & Co., Phittsburgh, Pa.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.
PLANERS
Cincinnati Planer Co., Cincinnati, Ohio.
PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
PRESSES FOR SHELLS
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
West Tire Setter Co., Rochester, N.Y.
PRESSES, FOOT
Perkin & Co., Leeds, England.
PRESSES, FILTER
William R. Perrin, Ltd., Toronto.
PRESSES, DROP AND FORGING
W. H. Banfield & Son, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Charles F. Elmes Eng. Works, Chicago.
Can. Fairbanks-Morse Co., Montreal.
Erie Foundry Co., Erie, Pa.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Toledo Machine & Tool Co., Toledo.
PRESSES, HYDRAULIC
John Bertram & Sons Co., Dundas.
Charles F. Elmes Eng. Works, Chicago.
Hydraulic Machinery Co., Montreal, Que.
Metalwood Mfg. Co., Detroit, Mich.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Toledo Machine & Tool Co., Toledo.
West Tire Setter Co., Rochester, N.Y.
A. R. Williams Machy. Co., Toronto.
PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Charles F. Elmes Eng. Works, Chicago.

Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
Hydraulic Machinery Co., Montreal, Que.
William R. Perrin, Ltd., Toronto.
Perkin & Co., Leeds, England.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Toledo Machine & Tool Co., Toledo.
A. R. Williams Machy. Co., Toronto.
PRESSES, BALING
William R. Perrin, Ltd., Toronto.
PRESSES, PNEUMATIC
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.
PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
PRESSES, SCREW
Barnes, W. F., & John, Co., Rockford, Ill.
Bliss Co., E. W., Brooklyn, N.Y.
Ferracute Mach. Co., Bridgeton, N.J.
William R. Perrin, Ltd., Toronto.
PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Erie Foundry Co., Erie, Pa.
Ferracute Mach. Co., Bridgeton, N.J.
PRODUCTION WORK
Windsor Mach. & Tool Co., Windsor, Ont.
PROPELLERS
Kennedy & Sons, Wm., Owen Sound, Ont.
PULLEYS
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal.
Dominion Machy. Co., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Positive Clutch & Pulley Works, Ltd., Toronto.
Standard Machy. & Supplies, Ltd., Montreal, Que.
The Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
PULLEYS, FRICTION CLUTCH
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Positive Clutch & Pulley Works, Ltd., Toronto.
Jones & Glassco, Montreal.
PULLEYS, STEEL
McLaren, Ltd., D. K., Montreal, Que.
Waterous Engine Works, Brantford, Ont.
PULLEYS, WOOD-SPLIT
McLaren, Ltd., D. K., Montreal, Que.
PULLEY MACHINERY, DRILLING AND TAPPING
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Pulley Machy. Co., Cincinnati, Ohio.
Wells Bros. of Canada, Galt, Ont.
PULP MILL MACHINERY
Can. Barker Co., Sault Ste. Marie, Ont.
Waterous Engine Works, Brantford, Ont.
PUMPS, AIR
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Smart-Turner Mach. Co., Hamilton.
PUMPS, CENTRIFUGAL
Bowser & Co., Inc., S. F., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Smart-Turner Mach. Co., Hamilton.
Sturtevant Co., B. F., Galt, Ont.
PUMPS, FUEL OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.
PUMPS, HIGH PRESSURE
Blake Pump & Condenser Co., Fitchburg, Mass.
Charles F. Elmes Eng. Works, Chicago.
McAvity & Sons, T., St. John, N.B.
William R. Perrin, Ltd., Toronto.
Smart-Turner Mach. Co., Hamilton.
PUMPS, ALL KINDS
Blake Pump & Condenser Co. Fitchburg, Mass.
Can. Blower & Forge Co., Kitchener, Ont.
Goldie & McCulloch Co., Galt, Ont.
Charles F. Elmes Eng. Works, Chicago.
William R. Perrin, Ltd., Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Smart-Turner Mach. Co., Hamilton.
A. R. Williams Machy. Co., Toronto.
PUMPS, HYDRAULIC
Blake Pump & Condenser Co., Fitchburg, Mass.
Charles F. Elmes Eng. Works, Chicago.
Metalwood Mfg. Co., Detroit, Mich.
Smart-Turner Mach. Co., Hamilton.
William R. Perrin, Ltd., Toronto.
PUMPS, STEAM
McAvity & Sons, T., St. John, N.B.
PUMPS, LUBRICANT, OIL
Bellevue Industrial Furnace Co., Detroit, Mich.
Bowser & Co., Inc., S. F., Toronto, Ont.
Fulflo Pump Co., Cincinnati, Ohio.
McAvity & Sons, T., St. John, N.B.
Roper, C. F., Co., Hopedale, Mass.
Trahern Pump Co., Rockford, Ill.
PUMP LEATHERS
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.
PUMPS, ROTARY, POWER DRIVEN
Bowser & Co., Inc., S. F., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

PUNCHES AND DIES
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Kitchener, Ont.
Ferracute Mach. Co., Bridgeton, N.J.
Can. Fairbanks-Morse Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marten Machine Co., Hamilton, Ont.
Mullner-Entund Tool Co., Syracuse, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Toledo Machine & Tool Co., Toledo, O.

PUNCHES, HAND
A. B. Jardine & Co., Limited, Hespeler, Ont.

PUNCHES, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Ferracute Mach. Co., Bridgeton, N.J.
A. B. Jardine & Co., Limited, Hespeler, Ont.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Niles-Bement-Pond Co., New York.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Niles-Bement-Pond Co., New York.
W. A. Whitney Mfg. Co., Rockford, Ill.

PURIFYING AND SOFTENING APPARATUS
Scaife & Sons Co., Wm. B., Pittsburgh, Pa.

PYROMETERS
Bellevue Industrial Furnace Co., Detroit, Mich.
Can. Hoskins, Ltd., Walkerville, Ont.
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York City.
H. E. Streeter, New Birks Bldg., Montreal, Que.
Taylor Instrument Co., Rochester, N.Y.
Thwing Instrument Co., Philadelphia, Pa.

QUARTERING MACHINES
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

RAILING, IRON AND BRASS (SEE GUARDS)

RAIL BENDERS
Niles-Bement-Pond Co., New York.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Cumming & Son, J. W., New Glasgow, Canada.
Niles-Bement-Pond Co., New York.

RAIL-DRILLING, SAWING, ENDING, GRINDING
Newton Mach. Tool Wks., Inc., Philadelphia, Pa.

RAILS, STEEL
Cumming & Son, J. W., New Glasgow, Canada.

RATCHETS
Keystone Mfg. Co., Buffalo, N.Y.

RAW HIDE PINIONS (SEE GEARS)

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
H. E. Streeter, New Birks Bldg., Montreal, Que.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

REAMERS
Rudel-Belnap Machy. Co., Toronto.
Hicks, W., 567 Banning Ave., Winnipeg, Man.
Plewes, Ltd., Winnipeg, Man.

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Aikenhead Hardware Co., Toronto.
Boker & Co., Inc. H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
Gisholt Machine Company, Madison, Wis.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
McKenna Brothers, Pittsburgh, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, PIPE, CYLINDER AND LOCOMOTIVE
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.

RECORDERS, TIME
Gisholt Machine Company, Madison, Wis.

RECORDING INSTRUMENTS
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

REPAIRS
Rothwell, H. G., 11 Ferguson Ave. N., Hamilton.
Marten Machine Co., Hamilton, Ont.

REGULATORS FOR ELECTRIC FURNACES
Volta Mfg. Co., Welland, Ont.

RESPIRATORS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

RIVET MACHINES
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Grant Mfg. & Machine Co., Bridgeport, Conn.
National Machinery Co., Tiffin, O.

RIVETS, TUBULAR, BIFURCATED
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

RIVETS, IRON, COPPER AND BRASS
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ot.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.

RIVETING MACHINES, ELASTIC ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport, Conn.
High-Speed Hammer Co., Rochester, N.Y.
F. B. Shuster Co., New Haven, Conn.

ROAD MAKING MACHINERY
Waterous Engine Works, Brantford, Ont.

ROLLS, MANGANITE
Mackintosh, Hemphill & Co., Pittsburgh, Pa.

ROLLING MILLS
Mackintosh, Hemphill & Co., Pittsburgh, Pa.

ROLLER CHAINS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

ROLLS, BENDING AND STRAIGHTENING
John Bertram & Sons Co., Dundas
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo, O.

ROLLS, CRUSHING
Can. Link Belt Co., Toronto.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.

RUBBER MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland

RULES
Brown & Sharpe Mfg. Co., Providence
James Chesterman & Co., Ltd., Sheffield, Eng.
L. S. Starrett Co., Athol, Mass.

SAFETY APPLIANCES
Strong, Kennard & Nutt Co., Cleveland, Ohio.

SAFETY APPLIANCE GOGGLES
T. A. Wilson, Reading, Pa.

SASH WEIGHTS, MAULS, ETC.
Anthes Foundry Ltd., Winnipeg, Man.
Fittings, Limited, Oshawa, Ontario.
The Katie Foundry, Ltd., Galt, Ont.
Rothwell, H. G., 11 Ferguson Ave. N., Hamilton,

SAW BENCHES
Oliver Machinery Co., Grand Rapids, Mich.

SAND BLASTS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.

SANDING MACHINES
Canada Machinery Corp., Galt, Ont.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Gardner, Robt., & Son, Montreal
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Preston Woodworking Machy. Co., Preston, Ont.
A. R. Williams Machy. Co., Toronto

SAWS, CIRCULAR METAL
Espen-Lucas Mach. Wks., Philadelphia, Pa.
Hunter Saw & Machine Co., Pittsburg, Pa.
Huther Bros, Rochester, N.Y.
Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (SEE HACK SAWS)

SAWS, INSERTED TOOTH
Hunter Saw & Mach. Co., Pittsburgh, Pa.
Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, BAND AND COPING
Napier Saw Works, Springfield, Mass.
Oliver Machinery Co., Grand Rapids, Mich.
Huther Bros, Rochester, N.Y.
Preston Woodworking Machy. Co., Preston, Ont.
West Haven Mfg. Co., New Haven, Conn.

SAWS, SWING
Oliver Machinery Co., Grand Rapids, Mich.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York City
H. E. Streeter, New Birks Bldg., Montreal, Que.

SCOWS
Beatty & Sons, M., Welland, Ont.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

SCREW MACHINE PARTS
Johnson Mach. Co., Carlyle, Manchester, Conn.

SCREW MACHINE PRODUCTS
Galt Machine Screw Co., Galt, Ont.
Eastern Mach. Screw Corp., New Haven, Conn.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York
Himoff Mach. Co., Inc., Astoria, L.I., New York
A. B. Jardine & Co., Hespeler
Millholland Mach. Co., W. K., Indianapolis, Ind.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto

SCREW MACHINES, AUTOMATIC, MULTIPLE SPINDLE
New Britain Machine Co., New Britain, Conn.
Riverside Machinery Depot, Detroit, Mich.
Rudel-Belnap Machy. Co., Toronto.

SCREWS
Can. B. K. Morton, Toronto, Montreal
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SCREWS, CAP
Plewes, Ltd., Winnipeg, Man.
Rice Lewis & Son, Toronto, Ont.

SCREW PLATES
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wells Bros. Co. of Canada, Galt, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SCREW SLOTTERS
Garvin Machine Co., New York
Pratt & Whitney Co., Dundas, Ont.

SECOND-HAND MACHINERY
Baird Machinery Co., W. J., Detroit, Mich.
Davis Machine Tool Co., W. F., New York
Dominion Machinery Co., Toronto
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Graves Machinery Exchange, New York, N.Y.
Hill, Clarke & Co., Chicago, Ill.
International Machy. Corporation, New York, N.Y.
Kinsey Co., The E. A., Cincinnati, Ohio.
McCabe, J. J., New York, N.Y.
New York Machinery Exchange, New York
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Strelinger Co., Chas. A., Detroit, Mich.
Stocker-Rumely-Wachs, Chicago, Ill.

SEPTIC TANK FITTINGS
Anthes Foundry Ltd., Winnipeg, Man.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto, Ont.
Allen Mfg. Co., Hartford, Conn.
Plewes, Ltd., Winnipeg, Man.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
American Tool Works Co., Cincinnati, Ohio.
John Bertram & Sons Co., Dundas
Can. Fairbanks-Morse Co., Montreal
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Gardner, Robt., & Son, Montreal
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton, Ohio
McKenzie Machy. Co., D., Guelph, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Perkin & Co., Leeds, England.
Preston Woodworking Machy. Co., Preston, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Rudel-Belnap Machy. Co., Toronto.
Steptoe Co., John, Cincinnati, Ohio

SHAFTING
Can. Bond Hanger & Coup. Co., Alexandria, Ont
Can. Fairbanks-Morse Co., Montreal
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sterling Engine Works, Winnipeg, Man.
Strelinger Co., Chas. A., Detroit, Mich.
Waterous Engine Works, Brantford, Ont.
A. R. Williams Machy. Co., Toronto
Wilkinson & Kompass, Hamilton, Ont.

SHAFTS, FLEXIBLE
Stow Mfg. Co., Binghampton, N.Y.

SHARPENING STONES
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

SHAVINGS, SEPARATOR
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas
Bertrams, Ltd., Edinburgh, Scotland
Canada Machinery Corp., Galt, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Montgomery, Smith & Co., Keynsham, Somerset, Eng.
Niles-Bement-Pond Co., New York
Toledo Machine & Tool Co., Toledo

SHEARS, POWER
John Bertram & Sons Co., Dundas
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Ferrachute Machine Co., Bridgeton, N.J.
A. B. Jardine & Co., Limited, Hespeler, Ont.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rothwell, H. G., 11 Ferguson Ave. N., Hamilton, Ontario.
Toledo Machine & Tool Co., Toledo

SHEARS, PNEUUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Canada

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Peck, Stow & Wilcox, Southington, Conn.
Steel Bending Brake Works, Ltd., Chatham, Ont.

SHEET METAL STAMPINGS
Dominion Forge & Stpg. Co., Walkerville, Ont.

SHEET METAL WORKERS
Strong-Scott Mfg. Co., Winnipeg, Manitoba.

SHELVING, STEEL
Dennis Wire & Iron Works, London, Ontario.

SHELL BANDING MACHINES, HYDRAULIC
Blaskill Wire Machy. Co., Montreal, Que.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., W. R., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.

SHELL CUTTERS
Blaskill Wire Machy. Co., Montreal, Que.

SHELL PAINTING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

SHELL RIVETERS
Grant Mfg. & Machine Co., Bridgeport, Conn.
High Speed Hammer Co., Rochester, N.Y.

SHELL TOOLS
Blaskill Wire Machy. Co., Montreal, Que.
Marsh & Henthorn, Ltd., Belleville, Ont.

SHOP FURNITURE
Western Tool & Mfg. Co., Springfield, Ohio.
Dennis Wire & Iron Works, London, Ontario.

SHRAPNEL SHELL MARKER
Brown, Boggs & Co., Hamilton, Canada
Noble & Westbrook Mfg. Co., Hartford, Conn.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton, Toronto, Montreal.

SIGNS, ENAMEL
Strong, Kennard & Nutt Co., Cleveland, Ohio.

SILENT CHAINS
Jones & Glassco, Montreal.

SILVER SOLDER
Geo. H. Lees & Co., Hamilton, Ont.

SINK BRACKETS
The Katie Foundry, Ltd., Galt, Ont.

SKATE SHARPENERS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

SLABBING MILLS
Mackintosh, Hemphill & Co., Pittsburgh, Pa.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SLOTTERS
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York
Rhodes Mfg. Co., Hartford, Conn.

SLOTTING MACHINES, CRANK, RACK-DRIVEN AND PORTABLE
Newton Mach. Tool Wks., Inc., Philadelphia, Pa.

SMOKESTACKS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.
Marsh & Henthorn, Ltd., Belleville, Ont.
Waterous Engine Works, Brantford, Ont.

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
J. H. Williams & Co., Brooklyn, N.Y.

SOCKET HEAD CAP SCREWS
Allen Mfg. Co., Hartford, Conn.

SOIL PIPE AND FITTINGS
Anthes Foundry Ltd., Winnipeg, Man.
The Katie Foundry, Ltd., Galt, Ont.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Canada

SOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Northern Electric Company, Montreal, Ont.
Plewes, Ltd., Winnipeg, Man.
Harton Machine Co., Hamilton, Ont.
Tallman Brass & Metal Co., Hamilton.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Banfield, W. H., & Sons, Toronto.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Brown Engineering Corp., Toronto, Ont.
Can. Barker Co., Sault Ste. Marie, Ont.
Can. Fairbanks-Morse Co., Montreal.
Charles F. Elmes Eng. Works, Chicago.
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
Grant Mfg. & Machy. Co., Bridgeport, Conn.
Gray Mfg. & Mach. Co., Toronto, Ont.
John H. Hall & Sons, Brantford.
Himoff Mach. Co., Inc., Astoria, L.I., New York.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
McClean & Son, F. W., Niagara Falls, Ont.
National-Acme Co., Cleveland, Ohio.
D. McKenzie Machinery Co., Guelph, Ont.
Mulliner & Enlund Tool Co., Syracuse, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Rothwell, H. G., 11 Ferguson Ave. N., Hamilton, Ontario.
Riverside Machinery Depot, Detroit, Mich.
Harten Machine Co., Hamilton, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.
Smart-Turner Machine Co., Hamilton, Ont.
T. C. M. Mfg. Co., Harrison, N.J.
Victoria Foundry Co., Ottawa, Ont.
Welland Motor & Machine Co., Welland, Ont.
William R. Perrin, Ltd., Toronto.
Windsor Mach. & Tool Co., Windsor, Ont.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

STEAM APPLIANCES
Darling Bros., Montreal.
Marten Machine Co., Hamilton, Ont.

SPECIAL TOOLS
Marten Machine Co., Hamilton, Ont.

SPEED REDUCING GEARS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

SPRINGS, MACHINERY
[illegible]es, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele, Ltd., Guelph, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

SPIRAL CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Can. Matthews Gravity Carrier Co., Toronto, Ont.

SPROCKETS, CHAIN
Grant Gear Works, Boston, Mass.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.

SOLDER
Jobborn, Geo. A., Hamilton, Ont.
Jones & Glassco, Montreal.

SPROCKET WHEELS, CAST
Can. Link-Belt Co., Toronto, Ont.
Perrin, Wm. R., Toronto.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS
Dillon Mfg. Co., Oshawa, Ont.
Dom. Forge & Stamping Co., Walkerville, Ont.
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Canada Machinery Corp., Galt, Ont.
Ferracute Mach. Co., Bridgton, N.J.
Noble & Westbrook Mfg. Co., Hartford, Conn.

STAMPS, STEEL ALPHABET, FIGURES
Matthews, Jas. H. & Co., Hartford, Conn.
Noble & Westbrook Mfg. Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

STEAM SEPARATORS AND TRAPS
American Steam Gauge & Valve Mfg. Co., Preston, Mass.
Can. Fairbanks-Morse Co., Montreal.
Can. Morehead Mfg. Co., Woodstock, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart-Turner Machine Co., Hamilton.
Sturtevant Co., B. F., Galt, Ont.

STEEL ALLOY (SEE ALLOY STEEL)

STEEL BENDING BRAKES
Steel Bending Brake Works, Ltd., Chatham, Ont.

STEEL FOR AXES, PLOWS, SAWS, DRILLS, ETC.
Colonial Steel Co., Pittsburgh, Pa.

STEAM SPECIALTIES
American Steam Gauge & Valve Mfg. Co., Preston, Mass.

STENCILS, STEEL
Pittsburg Steel Stamp Co., Pittsburg, Pa.

STEAM SEPARATORS AND TRAPS
Darling Bros., Montreal, Que.

SPECIAL TOOL
Darling Bros., Montreal, Que.

STEEL, CARBON, FERRO-TUNGSTEN
Boker & Co., Inc., H., Montreal, Quebec.
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Factory Supply & Steel Co., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Latrobe Electric Steel Co., Latrobe, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Plewes, Ltd., Winnipeg, Man.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa
Zenith Coal & Steel Products, Montreal, Que.

STEEL CASTINGS
Swedish Crucible Steel Co., Windsor, Ont.

STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Union Drawn Steel Co., Hamilton, Ont.

STEEL DRUMS
Smart-Turner Machine Co., Hamilton, Ont.

STEEL CHROME VANADIUM, NICKEL
Andrews Steel Co., Newport, Ky.

STEEL PRESSURE BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal
Balfour & Co., Arthur Montreal, Que.
Boker & Co., Inc., H., Montreal, Quebec.
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Century Steel Co. of America, New York
Colonial Steel Co., Pittsburgh, Pa.
H. A. Drury Co., Ltd., Montreal.
Factory Supply & Steel Co., Montreal, Que.
Fairley Davidson Steel Co., New York, N.Y.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Kayser, Ellison & Co., Montreal, Que.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Plewes, Ltd., Winnipeg, Man.
Rice Lewis & Son, Toronto, Ont.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.
Zenith Coal & Steel Products, Montreal, Que.

STEEL, GRIT
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

STEEL, CRUSHED
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

STEELS, HIGH STRENGTH, HOT-WORKING, DIE, MAGNET
Fairley Davidson Steel Co., New York, N.Y.

STEEL, VANADIUM
Drury, H. A., Co., Montreal, Que.
Hammond Steel Co., Syracuse, N.Y.
Kayser, Ellison & Co., Montreal, Que.
Standard Alloys Co., Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STELLITE, HIGH-SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.

STOCK RACKS FOR BARS, PIPING, ETC.
New Britain Machine Co., New Britain, Conn.

STOCKS, PIPE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Limited, Hespeler, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

STOOLS, STEEL, SHOP
New Britain Machine Co., New Britain, Conn.

STRAIGHTENING MACHINERY
Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

STRUCTURAL STEEL
Manitoba Bridge & Iron Wks., Winnipeg, Man.

SWITCHES, RAILWAY
Call Switch Co., Montreal, Que.
Can. Steel Foundries, Ltd., Montreal.

TACK (DOUBLE POINT) MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

TANKS, ASPHALTUM AND LEAD LINED
Can. Hanson & Van Winkle Co., Toronto, Ont.

TANKS
Manitoba Bridge & Iron Wks., Winnipeg, Man.

TANKS, GASOLINE AND OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
Dominion Forge & Stamping Co., Walkerville.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.

TANK HEATERS
Anthes Foundry Ltd., Winnipeg, Man.

TANKS, STEEL, RIVETED AND WELDED
Can. Hanson & Van Winkle Co., Toronto, Ont.

TANKS, STEEL, WATER PRESSURE
Bowser & Co., Inc., S. F., Toronto, Ont.
Can. Welding Works, Montreal, Que.
Dominion Bridge Co., Montreal, Quebec.
Jenckes Machine Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.
Waterous Engine Works, Brantford, Ont.

TANK WAGONS
Jenckes Mach. Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.

TARPAULINS
Scythes & Co., Toronto, Ont.

TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.

TAPPING MACHINES (PENUMATIC)
Cleveland Pneumatic Tool Co. of Can., Toronto.

TAPPING MACHINES AND ATTACHMENTS
Bertram, John, & Sons Co., Dundas.
Burke Machine Co., Conneaut, Ohio.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Rickert-Shafer Co., Erie, Pa.
St. Louis Mach. Tool Co., St. Louis, Mo.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.

TAPS, ADJUSTABLE
Baxter Co., Ltd., J. R., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Rudel-Belnap Machy. Co., Toronto.

TAPS, COLLAPSIBLE
Butterfield & Co., Rock Island, Que.
Geometric Tool Co., New Haven.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Rudel-Belnap Machy. Co., Toronto.
Victor Tool Co., Waynesboro, Pa.

TAPS, DIES AND WRENCHES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wells Bros. Co. of Canada, Galt, Ont.

TAP EXTENSIONS
Allen Mfg. Co., Hartford, Conn.

TELEPHONE SYSTEMS,
Northern Electric Company, Montreal, Ont.

TESTING INSTRUMENTS METALLURGICAL
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York City.

THERMOMETERS, ALL KINDS
Taylor Instrument Co., Rochester, N.Y.
Bellevue Industrial Furnace Co., Detroit, Mich.

TESTING LABORATORIES
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Geometric Tool Co., New Haven.
A. B. Jardine & Co., Limited, Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

THREADING TOOLS
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.

THREAD MILLING MACHINES
Gray Mfg. & Mach. Co., Toronto, Ont.
Smalley-General Co., Bay City, Mich.
Taft-Peirce Co., New York, N.Y.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Peck, Stow & Wilcox, Southington, Conn.

TIRE BENDERS
A. B. Jardine & Co., Limited, Hespeler, Ont.

TIRE SETTING MACHINES, HYDRAULIC
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL HOLDERS, PLANER
Cincinnati Planer Co., Cincinnati, Ohio.

TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Armstrong Bros. Tool Co., Chicago.
Can. B. K. Morton, Toronto, Montreal.
Deloro Smelting & Refining Co., Toronto, Ont.
Gisholt Machine Company, Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Western Tool & Mfg. Co., Springfield, Ohio.

TOOL CASES
Embree, Ira, 281 Emerald St. N., Hamilton, Ont.
Union Tool Chest Works, Rochester, N.Y.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOL STEEL
Atkins & Co., Wm., Sheffield, Eng.
Armstrong, Whitworth, Ltd. of Canada, Montreal.
Balfour, Arthur J., Montreal, Que.
Boker & Co., Inc., H., Montreal, Quebec.
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Deloro Smelting & Refining Co., Toronto, Ont.
H. A. Drury Co., Montreal.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Kayser, Ellison & Co., Montreal, Que.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Toronto, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.
Swedish Steel & Importing Co., Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

TOOLS, BLACKSMITHS'
A. B. Jardine & Co., Limited, Hespeler, Ont.

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago, Ill.
Stow Mfg. Co., Binghamton, N.Y.
A. R. Williams Machinery Co., Toronto.
United States Elec. Tool Co., Cincinnati, O.

TOOLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

TORCHES, STEEL
Armstrong, Whitworth of Canada, Ltd., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.

TRACK, PORTABLE STEEL
Hammant Steel Car & Engineering Works, Hamilton, Ont.

TRAINS, TRACKLESS FACTORY
Mercury Mfg. Co., Chicago, Ill.

TRACK SUPPLIES
Call Switch Co., Montreal, Que.

TRACK SYSTEMS
Dillon Mfg. Co., Oshawa, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
A. R. Williams Machinery Co., Toronto.
Can. Link-Belt Co., Toronto, Ont.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Manitoba Bridge & Iron Wks., Winnipeg, Man.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
The Smart-Turner Machine Co., Hamilton.
Strong-Scott Mfg. Co., Winnipeg, Manitoba.
Waterous Engine Works, Brantford, Ont.

TRANSMISSION ROPE
Jones & Glassco, Montreal, Que.

TRANSMISSION TOWERS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Dominion Bridge Co., Montreal, Quebec.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TRAPS, BATH, SINK
Anthes Foundry, Ltd., Winnipeg, Man.

TRAPS, STEAM
Hicks, W., 567 Banning Ave., Winnipeg, Man.
Mercury Mfg. Co., Chicago, Ill.

TROLLEYS
Wright Mfg. Co., Lisbon, Ohio.

TRUCKS, FACTORY, FREIGHT, ETC.
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing Co., Toronto.
Mercury Mfg. Co., Chicago, Ill.
Whiting Foundry Equipment Co., Harvey, Ill.

TUBING, HIGH CARBON STEEL, BUTTED AND BRAZED
Can. Metal Products, Guelph, Ontario.

TRUCKS, LUMBER AND KILN
Sheldons, Ltd., Galt, Ont.
Northern Crane Works, Walkerville.

TUBING, SEAMLESS, BRASS & COPPER
Standard Tube & Fence Co., Woodstock, Ont.

TUBING COILERS, FLEXIBLE METAL
Sleeper & Hartley, Inc., Worcester, Mass.

TUMBLING BARRELS
Baird Machine Co., Bridgeport, Conn.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TUNGSTEN FILAMENT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

TURNBUCKLES
Canadian Billings & Spencer, Ltd., Welland.

TURNTABLES
Can. Link-Belt Co., Toronto, Ont.
Hammant Steel Car & Engineering Works, Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

TURRETS, LATHE
Rothwell, H. G., 11 Ferguson Ave. N., Hamilton, Ontario.

TURRET MACHINES
Brown & Sharpe Mfg. Co., Providence
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney, Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURBINE WATER WHEELS
Jenckes Mach. Co., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.

TWINE
Scythes & Co., Toronto, Ont.

TYPE, STEEL
Pittsburg Steel Stamp Co., Pittsburg, Pa.

UPSETTING AND BENDING MACHINERY
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton, Canada.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Jenckes Mach. Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

VALVES
McAvity & Sons, T., St. John, N.B.
Plewes, Ltd., Winnipeg, Man.

VALVES, GATE
Hydraulic Machinery Co., Montreal, Que.

VACUUM PUMPS
Can. Blower & Forge Co., Kitchener, Ont.
Smart-Turner Machine Co., Hamilton, Ont

VALVE LEATHERS
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Montreal.
Sadler & Haworth, Montreal, Que.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

VALVES, FOOT
American Steam Gauge & Valve Mfg. Co., Boston, Mass.
Smart-Turner Machine Co., Hamilton, Ont.

VALVES, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago, Ill.
Hydraulic Machinery Co., Montreal, Que.
Metalwood Mfg. Co., Detroit, Mich.

VALVES, BACK PRESSURE, STEAM
American Steam Gauge & Valve Mfg. Co., Boston, Mass.
Sheldons, Limited, Galt, Ont.

VISES
Western Tool & Mfg. Co., Springfield, Ohio.
Plewes, Ltd., Winnipeg, Man.

VENTILATING APPARATUS
Brantford Oven & Rack Co., Brantford, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.
A. R. Williams Machy. Co., Toronto.

VISES, AIR OPERATED
Hannifin Mfg. Co., Chicago, Ill.

VISE STANDS, PORTABLE
New Britain Machine Co., New Britain, Conn.

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Cleveland Milling Machine Co.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

VISES, PIPE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.
J. H. Williams & Co., Brooklyn, N.Y.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.

VISES, TILTING
Globe Engineering Co., Hamilton, Ont.

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Barnes, Wallace, Co., Bristol, Conn.
Dillon Mfg. Co., Oshawa, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
London Bolt & Hinge Works, London, Ont.
Plewes, Ltd., Winnipeg, Man.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

WASTE, COTTON AND WOOL
Scythes & Co., Toronto, Ont.

WATER-INTAKE SCREENS
Can. Link-Belt Co., Toronto, Ont.

WATER PURIFYING AND SOFTENING APPARATUS
Wm. B. Scaife & Sons Co., Pittsburgh, Pa.

WATER CINDER MILLS
Whiting Foundry Equipment Co., Harvey, Ill.

WATER JACKETS
Can. Welding Works, Montreal, Que.

WATER TOWERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto.

WATER WORKS SUPPLIES
McAvity & Sons, T., St. John, N.B.

WATER WHEELS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.

WELDING, ELECTRIC, SPOT, BUTT, ETC.
St. Lawrence Welding Co., Montreal, Que.

WELDING MASKS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

WELDERS, ELECTRIC, SPOT, BUTT, ETC.
National Electric Welder Co., Warren, O.
Tabor Mfg. Co., Philadelphia, Pa.
Thomson Electric Welding Co., Lynn, Mass.
Winfield Electric Welding Mach. Co., Warren, Ohio.

WELDING, WORK AND SUPPLIES (Autogenous and Oxy-Acetylene) see OXY-ACETYLENE

WHISTLES
McAvity & Sons, T., St. John, N.B.

WHEELS, SPROCKET AND TRACTION
Can. Link-Belt Co., Toronto, Ont.

WINCHES
John H. Hall & Sons, Brantford.
Kennedy & Son, Wm., Owen Sound, Ont.
Marsh & Henthorn, Ltd., Belleville, Ont.
Northern Crane Works, Walkerville.

WINCHES, ELECTRIC
Volta Mfg. Co., Welland, Ont.

WINCHES, CARGO, ANCHOR, STEAM
Beatty & Sons, M., Welland, Ont.

TOWING
Beatty & Sons, M., Welland, Ont.

WIRE COILING AND POINTING MACHINERY
Baird Machine Co., Bridgeport, Conn.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE CLOTH AND PERFORATED METALS
Canada Wire & Iron Goods Co., Hamilton.

WIRE FORMING AND STAMPING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
McClean & Son, F. W., Niagara Falls, Ont.
F. B. Shuster Co., New Haven, Conn.

WINDLASSES, ANCHOR
Beatty & Sons, M., Welland, Ont.

WINCHES, HAND
Can. Brakeshoe Co., Sherbrooke, Que.

WIRE NAILS
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.

WIRE STEEL, BRASS, COPPER, BRONZE
Northern Electric Company, Montreal, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE, ANNEALED
Northern Bolt, Screw & Wire Co., Owen Sound, Ont.

WIRE RAILS
Northern Bolt, Screw & Wire Co., Owen Sound, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE, COPPERED
Northern Bolt, Screw & Wire Co., Owen Sound, Ont.

WIRE NETTING
Northern Bolt, Screw & Wire Co., Owen Sound, Ont.

WIRE, RUBBER-COVERED
Northern Electric Co., Montreal, Que.

WIRE, SILVER STEEL
Kayser, Elliston & Co., Montreal, Que.

WOOD BORING MACHINES
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

WIRE STRAIGHTENERS AND CUTTERS
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Canada.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WOODWORKING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
Oliver Machinery Co., Grand Rapids, Mich.
H. W. Petrie, Toronto.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que
Preston Woodworking Machy. Co., Preston, Ont.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machy. Co., Toronto.

WOOD LATHES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

WORKS STANDS, PORTABLE
New Britain Mach. Co., New Britain, Conn.

WRENCHES
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canadian Billings & Spencer, Ltd., Welland.
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, AUTOMOBILE NARROW JAW AND MONKEY
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, PIPE, MONKEY, TAP
Aikenhead Hardware Co., Toronto, Ont.
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Peck, Stow & Wilcox Co., Southington, Conn.
Rice Lewis & Son, Toronto, Ont.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, RATCHET AND BASIN
Bemis & Call Hdwe. & Tool Co., Springfield, Mass.
Keystone Mfg. Co., Buffalo, N.Y.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

WRENCHES, SOCKET
Allen Mfg. Co., Hartford, Conn.

For Sale
For Immediate Shipment

MOTORS

1—½ H.P. Emerson, 1,750 R.P.M., 220 V., single phase, 60 cycle.
1—1 H.P. Westinghouse, 1,700 R.P.M., 220 V., 3 phase, 60 cycle, back-geared.
1—5 H.P. Fairbank, 1,800 R.P.M., 220 V., 3 phase, 60 cycle, back-geared.
1—5 H.P. Westinghouse, 1,700 R.P.M., 220 V., 3 ph., 60 cycle, back-geared.
1—2 H.P. Westinghouse, 1,700 R.P.M., 220 V., 3 ph., 60 cycle, back-geared.
1—10 H.P. Fairbanks, 1,200 R.P.M., 220 V., 3 phase, 60 cycle.
1—40 H.P. Gen. Electric, 600 R.P.M., 220 V., 3 phase, 60 cycle, slip ring with controller and resistance starter.
7—30 H.P. Fairbanks, 1,200 R.P.M., 550 V., 3 phase, 60 cycle.
1—15 H.P. Fairbanks, 1,800 R.P.M., 550 V., 3 phase, 60 cycle.
2—3 H.P. Fairbanks, 1,800 R.P.M., 550 V., 3 phase, 60 cycle.
1—40 H.P. Lancashire, 855 R.P.M., 550 V., 3 phase, 60 cycle, slip ring, impregnated acid proof compensator and auto. overload relay.
1—80 B.H.P. Lancashire, 685 R.P.M., 550 V., 3 phase, 60 cycle, slip ring, impregnated acid proof compensator and auto. overload relay.

BOILERS

2—300 H.P. B. & W. Water Tube Boilers, with superheater.
1—100 H.P. Frost Tubular Boiler, 66 x 16, 125 lbs., suspended type, full front.

ALL GOOD AS NEW.

TANKS AND VATS

1—Vertical Steel Tank, 80" x 30", ¼ to ⅜" plate with manhole on side. Used as water still; has worm in barrel.
12—Beer Vats—12 ft. deep, 9' 6" diam. at bottom and 8' 9" at top, covered 2½" oak staves, 12 steel banks 4½" x ¼", manhole on side, all equipped with stands, thermometer, drain pipes, 160 bbls. cap.
2—Steel Tanks, 9' 6" high, 6' diam., 3-16" steel, varnished inside.
1—Vertical Steel Tank, 30" diam., 78" high, ⅜" steel with manhole.
1—Horizontal Steel Tank, 54" diam., 14' long, ⅜" plate with 60" gauge glass; made from boiler shell, holes blanked.
1—Vertical Galv. Iron Tank, 78" high, 36" dia.
1—Horizontal Steel Tank, 60" diam., ¼" shell 10' long.
1—Vertical Steel Tank, 78" high, 30" diam., ¼" steel with dished heads, legs and 1 manhole.
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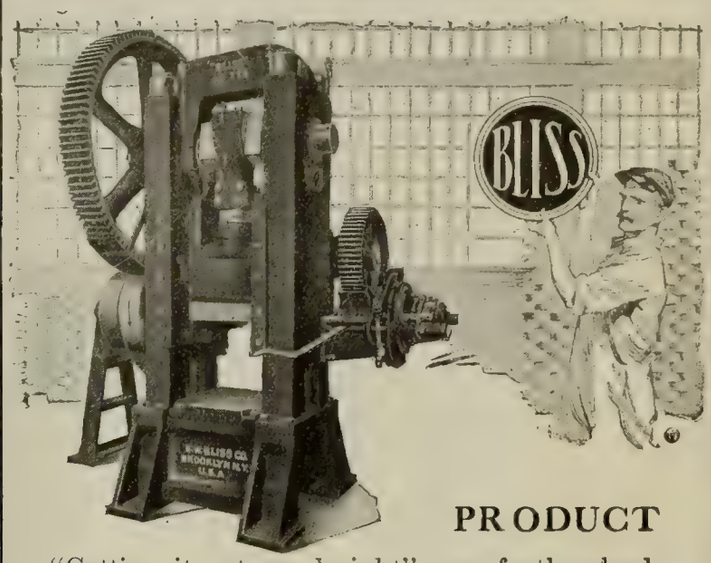

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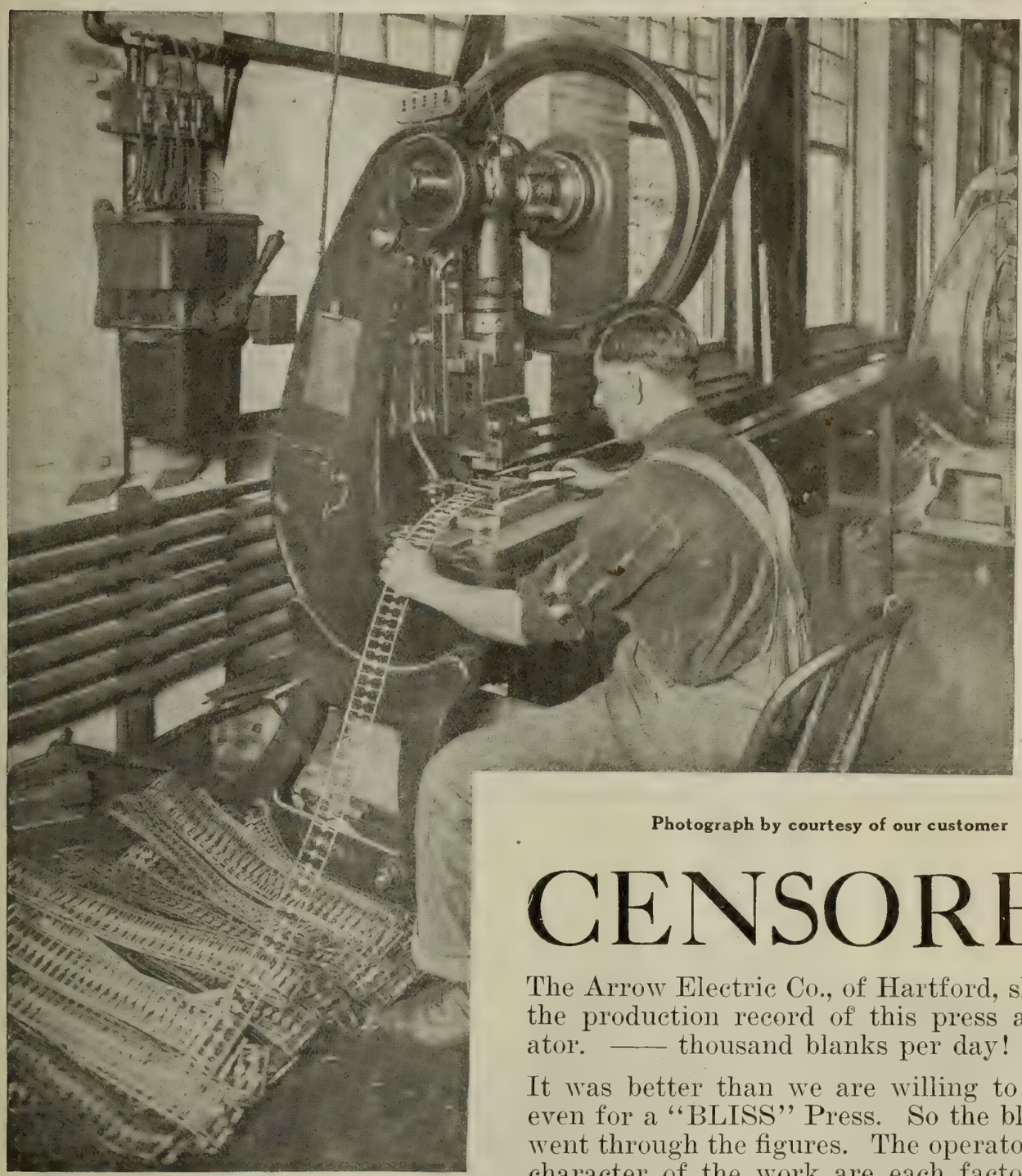

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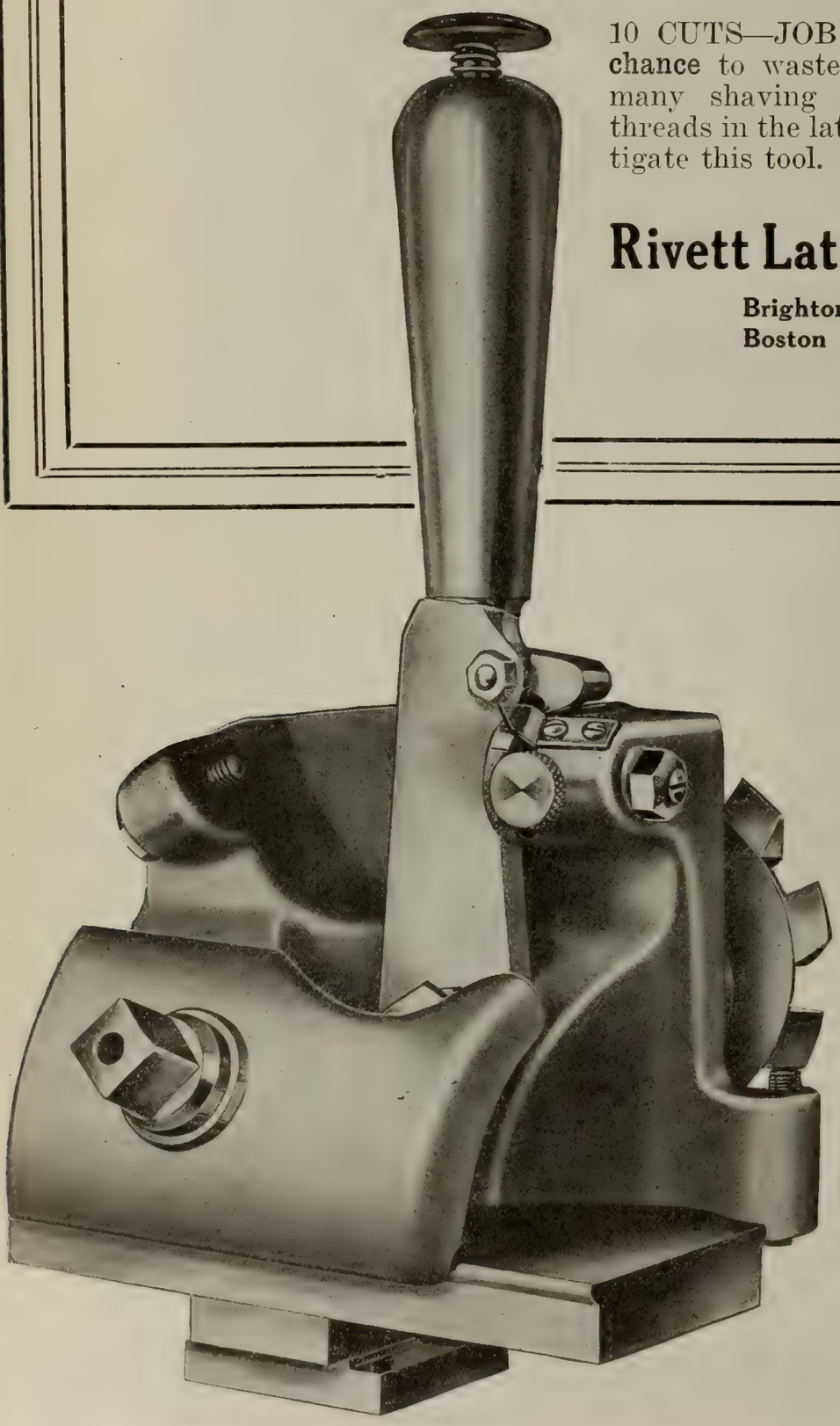

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AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XVIII. TORONTO, DECEMBER 27, 1917 No. 26

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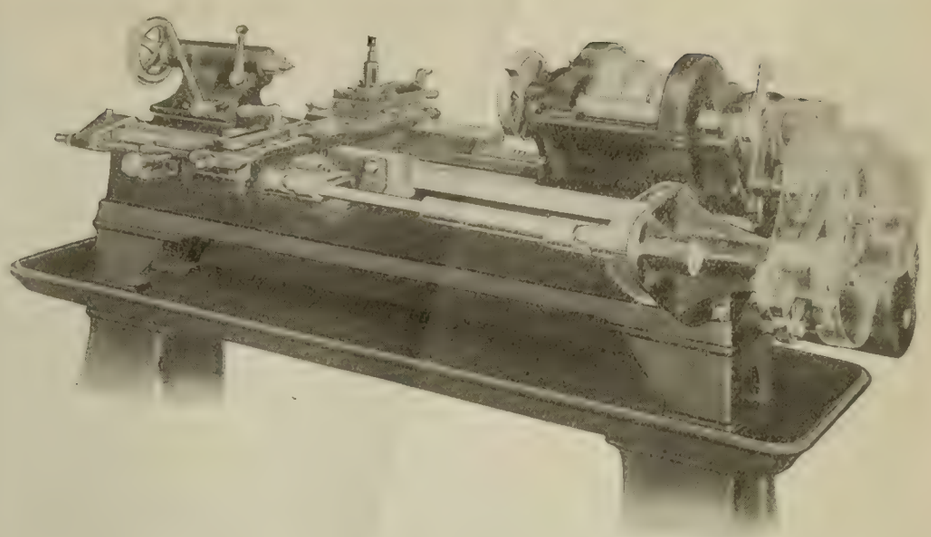

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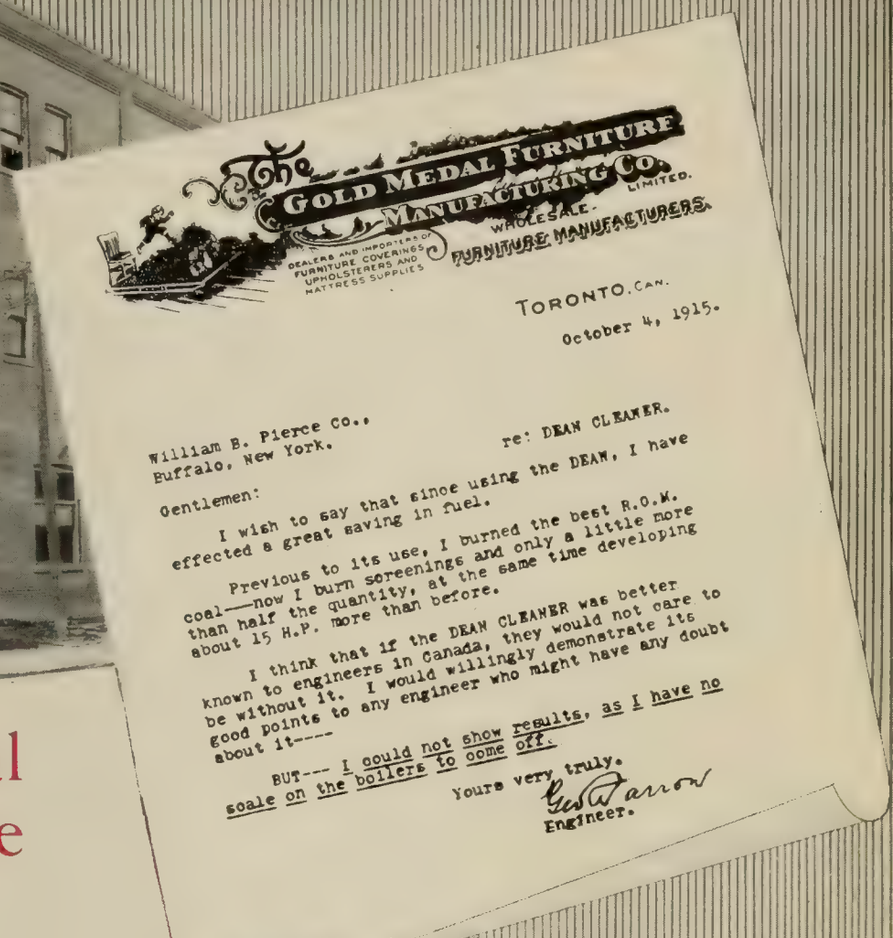

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Gentlemen:

I wish to say that since using the DEAN, I have effected a great saving in fuel.

Previous to its use, I burned the best R.O.M. coal——now I burn screenings and only a little more than half the quantity, at the same time developing about 15 H.P. more than before.

I think that if the DEAN CLEANER was better known to engineers in Canada, they would not care to be without it. I would willingly demonstrate its good points to any engineer who might have any doubt about it----

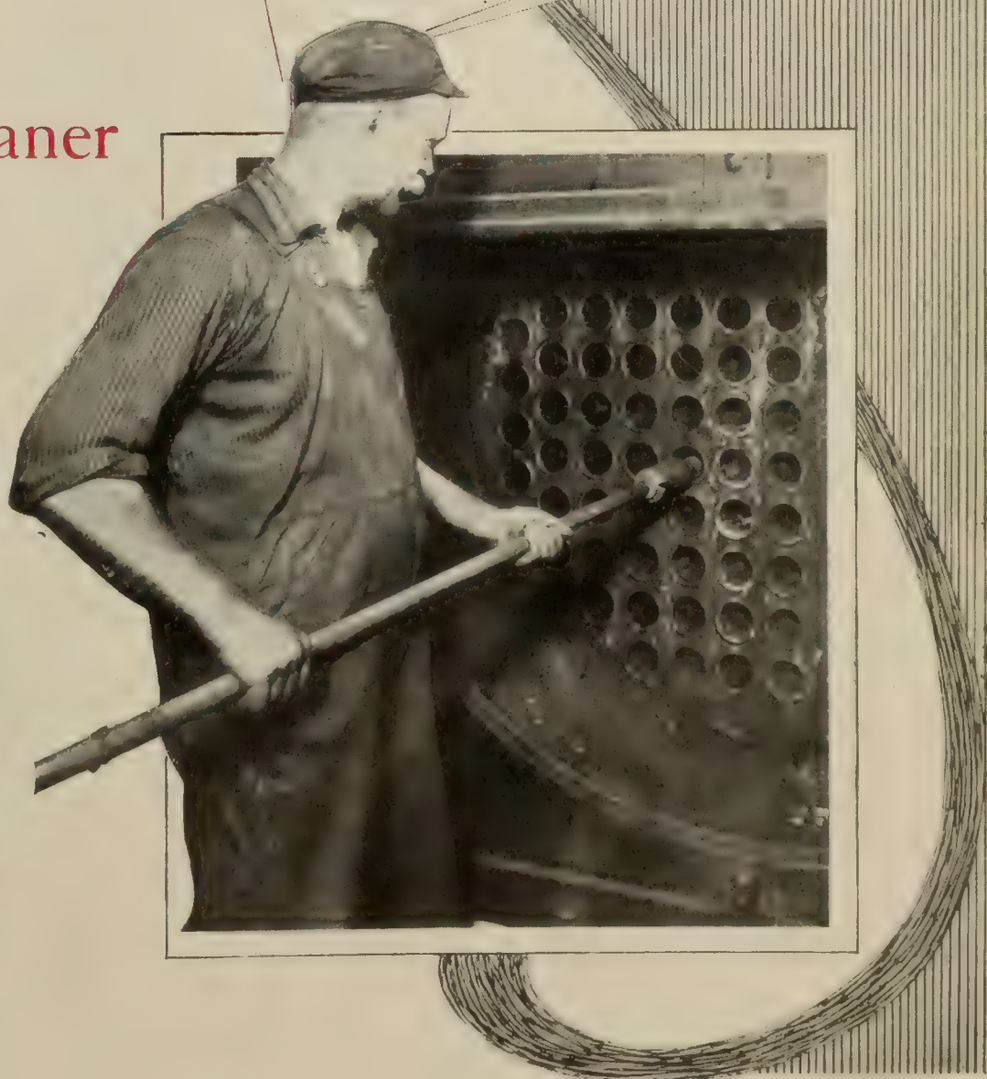
BUT--- I could not show results, as I have no scale on the boilers to come off.

Yours very truly.
Geo. Farrow
Engineer.

Conserve the Coal Supply by Using the

Dean
REG. U.S. PAT. OFF.

Boiler Tube Cleaner



Every engineer knows that clean boiler tubes mean better steaming. But not every one can be convinced that if he keeps his tubes free from ALL scale, he can frequently, by experimenting, use cheaper fuel—and still develop the same, or greater, horsepower.

Mr. Farrow used to burn the best run-of-mine coal. His employers thought the coal bills were too high. It seemed that substantial economies could be effected. So, a **Dean Boiler Tube Cleaner** was installed on trial.

(See Mr. Farrow's letter above for statement of results.)

We do not advance the argument that you can use the Dean Cleaner and equal Mr. Farrow's results. Possibly you have already solved this problem. But, we do believe that if you used the Dean, it would produce surprising results and be a valuable addition to your plant.

The great secret of the Dean Cleaner's success lies in the fact that it does not leave a particle of scale in the boiler, as so many other cleaners do, but **removes it ALL**, thus bringing into the most direct contact the heat and water.

A request for description of the Dean Cleaner will bring a prompt response, including details of free trial offer.

The Wm. B. Pierce Co.

CAXTON BLDG., BUFFALO, N.Y.

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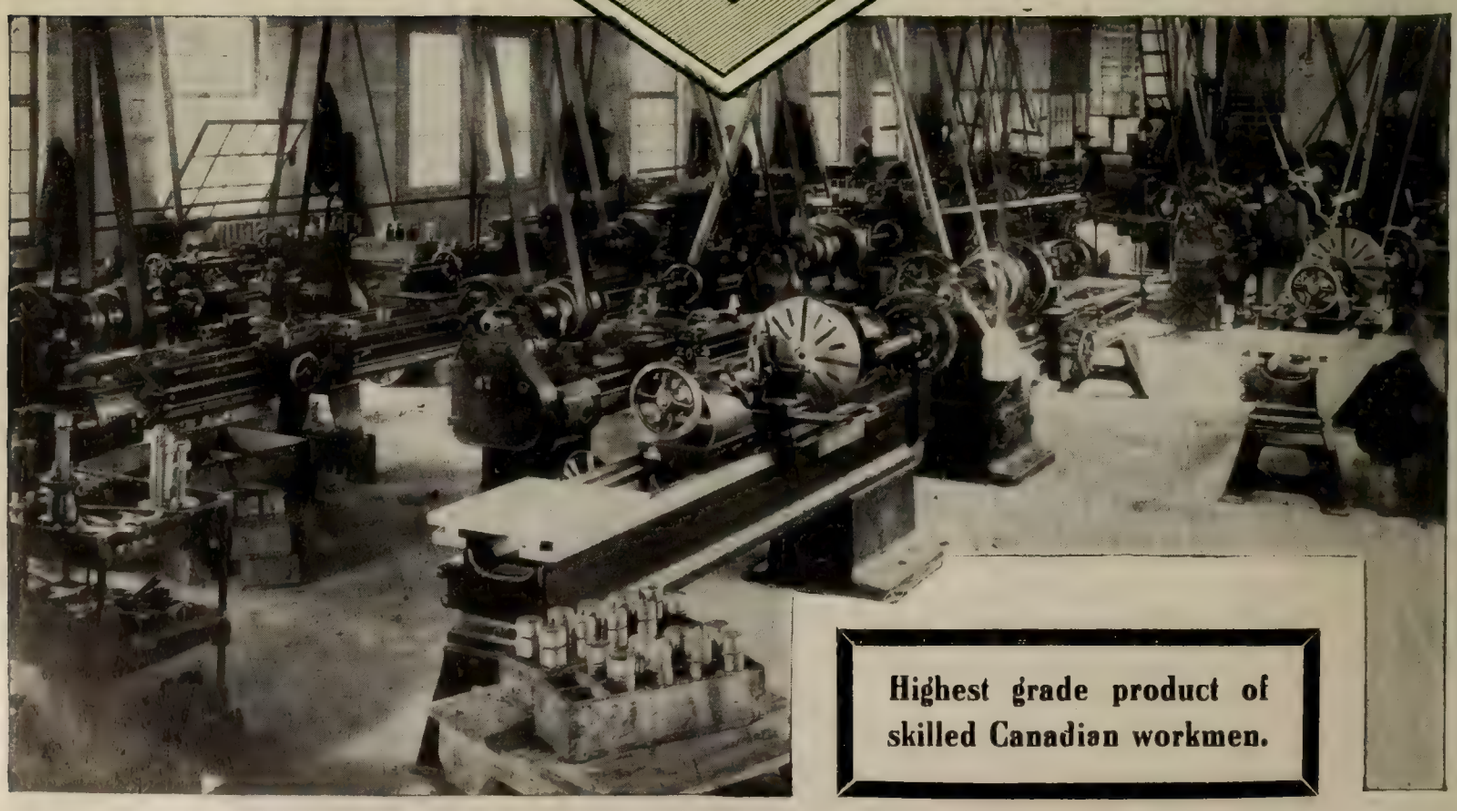

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